



**Analysis of US Patent Referencing to IEEE Papers,  
Conferences, and Standards 2004-2023**

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## Executive Summary

Prior studies performed by 1790 Analytics have demonstrated a strong relationship between IEEE research and new patent development and have shown that citations to IEEE can often lead to higher impact patents. Specifically, the impact is measured by examining the extent to which patented inventions build upon papers from IEEE journals, IEEE-sponsored conferences, and IEEE standards. This is an update of previous reports and examines US patents issued from January 1, 2004 through December 31, 2023.

The main findings of this report are:

- New technology continues to build upon science, and the dependence is increasing. In this study, the top 50 firms (in 2023) were granted 84,259 patents, which made a total of 653,229 non-patent references (an average of 7.75 non-patent references per patent). Back in 2011 the top 25 firms were granted 51,826 patents. These patents made a total of 205,634 non-patent references, (an average of 3.97 non-patent references per patent) Thus, the number of patents is trending upward but the number of references from those patents is rising at a greater rate. Since many these non-patent references are to scientific articles and conference papers, this suggests that today's technology developments are increasingly linked to developments in published science.
- A large portion of this science base comes from papers presented at IEEE sponsored conferences and published in IEEE journals. The top 50 patenting firms in 2023 have referenced 2,706,789 articles in the last 20 years. About 25% (682,113) of those articles appeared in IEEE journals, IEEE sponsored conferences or IEEE Standards Documents (see Figure 2).
- In this study, we also went beyond the top 50 patenting companies and analyzed all patents from the last 20 years in several technology categories of interest to IEEE members and customers. For example, over 30% of all scientific references from Computer Hardware patents go to IEEE publications. The second most referenced publisher is ACM (Association for Computer Machinery) with 16.5% of the referenced publications. In other Information Technology areas, such as Information Storage, Semiconductor Manufacturing, and Computer Software, the results are similar.
- In Telecommunications technology, IEEE is particularly impactful. The 737,376 references to IEEE articles, conferences, and standards represent about 34% of all Non-Patent references (NPRs) from Telecommunications patents since 2004. However, Telecommunications references contain a higher number of standards than other technologies which understates the extent to which IEEE provides the science base to this technology. If we remove the standards from the NPRs then of course IEEE loses about 74,000 references to its 802 wireless standards, however, the 663,000+ remaining references to IEEE journal articles and conferences represent almost 50% of the total science references from Telecommunications patents. In

other words, IEEE provides half of the science base for new innovations in Telecommunications.

- Although we've generated reports like this for over two decades, we try to add technology categories that are currently hot or emerging. In recent years we've added Blockchain and Distributed Ledgers, Cybersecurity, and Virtual and Augmented Reality. In these emerging areas, IEEE receives the most references and enjoys roughly a 2-fold lead over second place ACM.
- We also have three other areas containing older technologies that are having a renaissance (Artificial Intelligence (AI) and Machine Learning, Autonomous Vehicles, and Internet-of-Things related patents). In each of these areas IEEE is the dominant publisher of the science base. In AI, IEEE enjoys more than a 3-fold lead over second place ACM. In Autonomous Vehicles, IEEE has a dominant lead (10-fold lead) over the second-place entry RELX/Elsevier. In the Internet-of-Things category IEEE has almost a 3-fold lead over second place 3GPP.
- In the Robotics and Intelligent Manufacturing category, 37% of the patent references are to articles published in IEEE journals or in proceedings of IEEE sponsored conferences. Second place RELX receives about one-fourth as many references in the category.
- IEEE is referenced a surprising amount in areas which are not central to its mission.
  - In broadcasting technologies IEEE leads with 30.07% of the references, which is about 2.5 times as many as second place International Telecommunication Union. The latter produces standards documents while the IEEE references are to standards documents as well as peer reviewed scientific papers from journals and conferences.
  - 8.01% of the science references from patents in medical devices go to IEEE publications. This ranks IEEE fourth behind RELX and Wiley, and Wolters Kluwer (with 19.94%, 9.91%, and 8.45% respectively). These publishers have hundreds of journals in the medical area, whereas IEEE has only a few, so the 8.01% figure is quite solid for a non-core area and not far behind second place Wiley's 9.91%.
  - Optics is also somewhat surprising. The two optics societies: OSA – The Optical Society of America, and SPIE – The International Society of Optical Engineering sponsor many conferences and have several journal articles, but OSA has only a slight lead over IEEE which has a slight lead over SPIE. Specifically, OSA receives 16.88% of the references, IEEE receives 13.61% and SPIE receives 12.54% of the references from optics related patents.

- In Measuring, Testing, and Control, IEEE gets 19.00% of all references, which ranks ahead of the 14.58% of second place RELX while, again, RELX has many more journal titles in the space.
  - Patents related to Power Systems and Transmission also reference IEEE publications most frequently. The 73,283 references to IEEE journal and proceedings papers are more than the next two top referenced publishers (RELX and American Chemical Society) combined. We also examined a specialized subset of the Power Transmission category related to smart meters and smart grids. In this category, 52.30% of the scientific references from patents go to IEEE journal or conference papers. The second most referenced publisher is RELX with only 9.59% of all references.
- Several years back we started tracking some green energy categories: Solar and Photovoltaic energy and Wind energy. In the Wind category IEEE science has a big advantage over the other publishers with more than 39% of the references. In solar energy, IEEE has a smaller lead over RELX. IEEE leads RELX even though RELX has 50+ journal titles related to the area including several high impact journals such as *Solar Energy Materials and Solar Cells*, *Thin Solid Films*, *Solar Energy*, *Synthetic Metals*, *Journal of Crystal Growth*, and *Solar Cells*, while IEEE has only a few titles.
  - It has been shown that high-quality, high-impact, and valuable patents tend to be cited more frequently by later patents. Citation impact is thus often used as a quantitative measure for evaluating patents (see [3]). In this study, we found that the patents that reference IEEE papers are cited more often than patents that do not. This was shown to be true for each of the twenty technology categories we examined. This suggests that, not only do IEEE publications frequently provide the science base for new inventions, but that inventions that build upon IEEE publications are more likely to be valuable in the future than inventions that do not build upon IEEE.
  - Although this study concentrates on patents in specific technology areas, it should be noted that the importance of scientific and technical literature to patented technology is increasing in all areas. Our research shows that the average US patent had only 2.76 non-patent references (NPRs) back in 1997. That number jumped to 13.07 by 2023 – a 373% increase. These numbers are for all issued US patents and not just those in the twenty categories covered in this report.<sup>1</sup> This means that in the overall patent system, patented technologies are increasingly referencing scientific articles.
  - Since we only look at specific categories of technology plus the top 50 firms, there is no way to know exactly how much referencing to IEEE has increased since 1997. However, we can make an estimate for the whole patent system by identifying any Non-Patent References that mention “IEEE” or “I.E.E.E.” (This will of course miss things like the *Journal of Lightwave Technology* or *Spectrum* which may not have

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<sup>1</sup> Including science intensive areas like Biotechnology, Pharmaceuticals, Chemicals, and other areas where IEEE typically has less influence.



IEEE in the reference, but it will be a reasonable estimate.) If we do a comparison as above, we find that there were just 14,635 patent references with IEEE or I.E.E.E in 1997, but 141,081 in 2023 (an 864% increase). Thus, science referencing and IEEE referencing have both increased greatly since 1997.

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## I. Introduction

In previous studies, it was found that patents reference papers from IEEE journals much more often than papers from other journal publishers. In this report, we update the previous results, and study US patents issued from January 2004 through December 2023. Although this report is an update of previous results, we have made our best efforts to make this report self-contained. The aim of this report, as in previous reports, is to analyze references from patents to journal articles, conferences, and standards documents, in order to assess IEEE's impact upon technological developments.

This report covers twenty subcategories of Technology where IEEE members and readers are active. Many, but not all are related to Information Technology. The categories patent counts are shown below in Table 1.

Table 1: Number of Patents for Each Category Covered in this Study

Category	# Patents 2004-2023
Artificial Intelligence and Machine Learning	59161
Autonomous Vehicles	12127
Blockchain/Distributed Ledger	6611
Broadcasting	234309
Computer Hardware	549709
Computer Software	334261
Cybersecurity	180237
Diagnosis/Surgery/Medical Instruments	275325
Information Storage	128482
IOT/Internet of Things	23488
Measuring, Testing and Control Devices	254727
Optics/Photography/Electrophotography	163164
Power Systems	156704
Robotics and Intelligent Manufacturing	45816
Semiconductors/Solid-State Devices/Electronics	336029
Smart Grid/Smart Meters/Energy Infrastructure	5114
Solar/Photovoltaic	16384
Telecom and Other Communications	802131
Virtual/Augmented Reality	29227
Wind Energy	10416

## II. Methodology

This study is based on referencing patterns from patents to prior art documents. When an inventor files a patent for an invention, he/she will typically reference earlier documents to show that the new invention either builds upon, or improves upon, what came earlier. The inventor's patent attorney and/or the examiner may also add prior art references to either clarify or limit the claims of the invention.

As an example, Figure 1 shows the front page of a patent owned by IBM. The prior art references on this patent come in two forms - references to earlier patents, and “other references”. These other references are often to scientific publications, such as those produced by IEEE. In this report we are primarily concerned with these other references, which are also sometimes called “Non-Patent References”.

It has been suggested that patents with many non-patent references are likely to contain new leading-edge ideas, whereas patents that only reference earlier patents are likely to be incremental improvements on earlier patented technologies. For a comprehensive study on various hypotheses surrounding the motivations of inventors in citing other references, see [1].

### ***Patent Sets used in the Analysis***

This study is based on two patent sets. Our analysis is based on determining the number of references from these patent sets to publications from publishers such as IEEE, RELX (formerly Elsevier), the American Institute of Physics, and others.

The first set contains patents from the top 50 patenting companies in 2023. Analysis of this patent set provides an insight into how the top tier companies rely upon science from IEEE and other publishers. The second set contains all patents in twenty technology categories from all companies, universities, government agencies, and individuals. The twenty technology categories examined are shown in Table 1 above. Analysis of this patent set reveals the wider influence of IEEE science in these technologies.

### ***Identifying Relevant Non-Patent References***

Non-patent references can be to any published document, from comic strips and brochures, to scientific articles and standards documents. The main difficulty in identifying relevant non-patent references for a study such as this is that inventors do not use a standard form for listing references. As an example, Table 2 contains eight different variants for the IEEE Global Telecom Conference. Note that some inventors just use the GLOBECOM shorthand, while others list the entire name. Sometimes IEEE is mentioned and sometimes it is not. When abbreviation variations are included such as Telecom, Tele, Tcom, Proc., Proceed., the number of variants increases further. The same issue exists for variants in journal names and standards documents. For example, there are more than 30 variant spellings of the journal title *Journal Of Thoracic And Cardiovascular Surgery* including numerous misspellings of thoracic and every conceivable way of abbreviating cardiovascular.

**Table 2 – Variants for IEEE Global Telecom Conference**

Proceedings of Globecom '96
IEEE Global Telecommunications Conference
GLOBECOM '90:IEEE
Proceedings of IEEE Globecom '94
IEEE GLOBECOM 2007 - IEEE Global Telecommunications Conference
IEEE Globecom, Global Telecommunications Conference and Exhibition
Proc of the Global Tele Conf, U.S. New York, IEEE

**Conference Identification** – to identify conference proceedings among the non-patent references, we first identified references containing keywords such as meeting, symposia, conference, etc. We then used parsing software to identify 2-word and 3-word phrases that appear frequently in this set of papers. The full string was identified for these string sub-sequences to identify frequently cited conferences. In this way, we identified the top conferences referenced in the patent sets, and standardized the names of these conferences (i.e., all the different variants of a conference were collected under a single name). As an example, Table 2 shows 8 of the 95 variant names for IEEE Globecom which are unified to the name ‘<conf> IEEE Global Telecommunications Conference (GLOBECOM)’ in this report and the underlying analysis database.

We look up each of these conferences on the web to determine who is listed as their primary sponsor. For example, many of the conferences are sponsored by organizations such as IEEE, ACM (Association for Computer Machinery) and ASME (American Society of Mechanical Engineers). Some conferences are jointly sponsored by multiple organizations and this is noted as well.

When we first started identifying conferences in the 2005 report, we looked up the top 100 most referenced conferences to identify the primary sponsors or hosts. In this current report we track the top 2,000+ conferences which appear under some 40,000 variant names.

**Standards Identification** – Standards documents are increasingly referenced, and in general they are easy to identify by looking for strings such as ‘standard’ or ‘std’. Once the records containing the standards were located, it is straightforward to identify the organization that produced each standard (ITU, IEEE, ISO, JEDEC, ANSI, etc.). Further, once the standards bodies are identified, we then identify references to other documents that do not specifically list the words ‘standard’ or ‘std.’ The latter step is necessary since some references look like this “ISO/TC97/SC21/N2066” or “IEEE 802.3” without a specific mention of the word “standard.” As a consequence, we also identify other non-standard documents released from these organizations including draft standards and “requests for comments” documents if they are cited by patents.

**Journal Identification** – identifying and standardizing journal names is a very difficult process because there are so many different journals, and their names can be abbreviated in many different ways. To make the problem more manageable, we base our analysis primarily to the 45,000+ journals covered by the combined databases of ISI/Clarivate, Elsevier/SCOPUS, and 1790 Analytics, LLC. This is not a severe limitation, since these databases include more than 200 IEEE journals, transactions, and magazines, 3,000+ RELX/Elsevier journals, and 1,200 Wiley journals. In addition, we also identify publishers of about 1,000 non-ISI, non-SCOPUS journals if they appear very frequently in the patent references, but do not appear in these databases.

Once restricted to these 45,000+ journals, we used software that transforms journal names into common abbreviations and then implements string matching. Care must be taken with string matching because, for example, searching for “Urology Journal” will also accidentally identify “Neurology Journal”. Similarly, a search for the journal “Science” would accidentally pick up

any reference with ‘science’ in the paper title as well as any of the 800+ journals with science in their titles such as “Game and Wildlife Science”. Our proprietary software for journal identification (along with some human intervention) deals with these problems, so that we generate an accurate match between the patent references and 45,000+ journals. After identifying all relevant journals, we then used the Clarivate and SCOPUS databases and web research to identify the publisher of each journal

### III. Results

#### *References from Top 50 Patenting Organizations*

Table 3 shows the 50 firms that were granted the largest number of US patents in 2023. It should be noted that many of these firms consist of multiple subsidiaries, and these firms patent under many names. (For example, General Electric has patents filed under 316 names, of which only a fraction contain General Electric in the name.) We identified all the subsidiary names for each company to ensure that our patent counts are accurate.

We identified the top 50 patenting firms because we want to understand the extent to which the current technology leaders use IEEE science. Figure 2 shows the 20 publishers of science whose publications are referenced most frequently by the 50 firms shown in Table 3. This figure shows that patents issued to the top 50 firms between 2004 and 2023 reference IEEE papers, conferences, and standards 682,113 times. This is nearly three times as many references as the second placed publisher RELX/Elsevier.

IEEE receives 25.2% of the science references from the patents of the top 50 companies. The next closest publisher (RELX/Elsevier) has 8.78% of the total.

Table 4 illustrates the reference distribution of IBM, which is second in patenting in 2023, but holds the most patents for the 20 year period from 2004-2023. This reference distribution is typical of the top 50 firms. The references from IBM to IEEE are to several different IEEE journals and conferences. In this table, IEEE journals are highlighted in yellow and IEEE conferences are highlighted in orange. The top overall reference is to IP.com which has a technical disclosure database of prior art that is often referenced by companies. IBM also references several internet standards frequently.

Notice that 31 of the top 70 journals and conferences referenced by IBM patents are published or sponsored by IEEE. Fifteen of the top 70 journals and conferences are published or sponsored by ACM. (Six of the fifteen are jointly sponsored between ACM and IEEE.) Since it’s primarily a software services firm, IBM tends to reference ACM much more than most of the top 50 firms, but still IBM references IEEE nearly twice as often as ACM as seen in Appendix A-10 (72,712 references to IEEE and 39,592 references to ACM.) The reader may notice the large number of references to ‘IEEE Unseparated’ or ‘Misc ACM’ in Table 4. These are articles that reference IEEE or ACM, but the inventor has not given a reference specific enough to identify the proper journal or conference. A few examples can be found in Table 5 below.

**Table 3 – Top-Patenting Firms in 2023**

Rank	Full Parent Name	2023 Patent Count	2004-2023 Patent Count
1	Samsung Electronics Co Ltd	9,114	121,356
2	International Business Machines Corp	3,946	128,483
3	Qualcomm Inc	3,921	37,063
4	Taiwan Semiconductor Manufacturing Co.	3,709	30,396
5	Canon Inc	3,223	65,111
6	Toyota Motor Corp	2,558	31,349
7	Alphabet Inc.	2,554	31,419
8	Apple Inc	2,554	28,980
9	LG Electronics Inc.	2,339	36,327
10	Huawei Technologies Company Ltd.	2,312	25,382
11	Intel Corporation	2,244	48,856
12	Micron Technology Inc.	2,242	27,936
13	Sony Group Corp	2,063	48,918
14	Dell Technologies Inc	2,000	20,822
15	RTX Corporation (f/k/a Raytheon Co.)	1,969	28,685
16	Microsoft Corporation	1,939	48,734
17	Amazon.com Inc.	1,854	21,350
18	BOE Technology Group Ltd	1,695	15,638
19	Hyundai Motor Co.	1,561	14,433
20	Kia Motors Corp.	1,538	8,470
21	Johnson & Johnson	1,479	20,557
22	Ford Motor Co.	1,353	21,186
23	Medtronic Inc	1,344	23,392
24	Panasonic Holding Corporation	1,291	47,770
25	Ericsson	1,207	21,178
26	Honda Motor Co. Ltd	1,164	20,387
27	General Electric Company	1,159	30,738
28	Seiko Epson Corporation	1,145	26,963
29	Fujifilm Business Innovation Co.	1,138	29,040
30	Saudi Arabian Oil Company (Saudi Aramco)	1,124	7,614
31	CapitalOne	1,025	4,173
32	Toshiba Corp	1,016	37,362
33	Bosch (Robert) GmbH	981	20,642
34	Applied Materials Inc.	956	11,040
35	Siemens Aktiengesellschaft	956	24,954
36	Texas Instruments Inc	941	19,372
37	Broadcom Ltd	933	30,715
38	Cisco Systems Inc.	930	18,973
39	Meta Platforms Inc. (formerly Facebook Inc)	930	8,850
40	NEC Corp	927	18,915
41	Honeywell International Inc.	914	20,091
42	Murata Manufacturing Co. Ltd.	883	9,712
43	SK Hynix Inc	883	15,817
44	General Motors Corp	871	19,091
45	Boeing Co. (The)	853	17,179
46	Hitachi Ltd	842	32,906
47	Mitsubishi Electric Corp	829	18,635
48	LG Chem Ltd.	812	8,444
49	Oracle Corporation	809	18,344
50	LG Display Co Ltd	788	12,772

**Table 4 – Reference Distribution from IBM Patents 2004-2023**

References	Journal/Conference/Standard
16975	IIP.com
7932	IETF Network Working Group
5864	Misc ACM
4411	<std> NIST Document
4395	IEEE Unseparated
3315	IBM JOURNAL OF RESEARCH AND DEVELOPMENT
3186	<conf> IEEE Int Electron Devices Meeting (IEDM)
2702	ACM SIGPLAN Notices
2673	APPLIED PHYSICS LETTERS
2499	<conf> Int Conf on Very Large Data Bases (VLDB)
2403	COMMUNICATIONS OF THE ACM
1792	IEEE tr ELECTRON DEVICES
1700	<std> IETF Document
1620	<conf> Proc ann IEEE ACM int symp on Microarchitecture (MICRO)
1614	<conf> USENIX Conference Proceedings
1557	<conf> IEEE/JPN Soc App Phys - symp on VLSI tech
1534	<std> IETF Std
1508	JOURNAL OF APPLIED PHYSICS
1505	<conf> IEEE int conf on Data eng (ICDE)
1439	Proc SPIE
1371	<conf> ACM/IEEE int symp on comp Architecture (ISCA)
1362	<conf> ACM/IEEE Design Automation conf
1340	Computer (IEEE)
1273	IEEE ELECTRON DEVICE LETTERS
1268	IEEE JOURNAL OF SOLID-STATE CIRCUITS
1249	<conf> ACM Conference on Human Factors in Computing Systems (CHI)
1238	ACM SIGOPS
1206	IBM SYSTEMS JOURNAL
1182	Proceedings of ACM SIGMOD
1158	IEEE tr COMPUTERS
1095	JOURNAL OF THE ACM
1040	<conf> Proceedings ACM SIGMOD Symp
1025	<conf> Usenix conf on File and Storage techogies
1011	<conf> ACM Conf On Architectural Support for prog Languages and Operating
989	SCIENCE
955	<conf> International Conference on Computational Linguistics (COLING)
953	NIST Special Publication
939	<conf> IEEE int Symp on High Performance Distributed comp
897	comp Architecture News
852	<conf> IEEE int symp On High Performance comp Architecture (HPCA)
852	NATURE
847	<conf> International World Wide Web Conference
824	NANO LETTERS
820	<conf> Neural inf proc sys conf (NIPS)
820	<conf> IEEE Misc Conf
819	Springer misc
797	IEEE tr Software eng
778	natl inst of Standards and tech
774	J Vac Sci tech
759	IEEE tr comp Aided Design of Integrated Circuits and sys
749	<conf> IEEE Int Conf Acous, Speech, and Sig Proc (ICASSP)
747	<conf> IEEE Proceedings
744	IEEE tr KNOWLEDGE AND DATA ENGINEERING
742	IEEE tr PARALLEL AND DISTRIBUTED SYSTEMS
732	<conf> IEEE/ACM Int Conf on Software eng (ICSE)
729	<conf> Proceedings ACM SIGCOMM Symp
692	<conf> International Conference on Machine Learning (ICML)
685	PHYSICAL REVIEW LETTERS
677	AAAI (misc)
663	JOURNAL OF THE AMERICAN CHEMICAL SOCIETY
660	IEEE tr MAGNETICS
656	<conf> IEEE int conf on Distributed comp sys
636	Recommendations of the natl inst of Standards and tech
634	<conf> ACSA/IEEE ann comp Security app conf (ACSAC)
631	<conf> IEEE Comp Soc comp Vision and Pattern Recognition
629	<conf> IEEE/ACM Proceedings on Supercomputing (SUPERCOMP)
616	<conf> IEEE Electronic Components and tech conf
607	IEEE tr INFORMATION THEORY
600	<conf> IEEE/ACM International Symposium on Cluster, Cloud, and Grid
594	<conf> proc IEEE int Solid State Circuits Conf (ISSCC)



These are relatively complete references; it is not clear why the inventors were not more careful about listing the full journal names.

Table 5 – Examples of References Mapped to “IEEE Unseparated”

Patent	NPR #	NPR Text
05692177	3	Lewis et al. "Hashing for dynamic and static internal tables." IEEE, pp. 45-56 Oct. 1988.
05699518	4	"The Design and Implementation of a Reliable Distributed Operating System--ROSE", Ng, IEEE, pp. 2-11, Apr. 1990.
05699518	5	"A service Platform for Distributed Applications", Popescu-Zeletin et al, IEEE, pp. 11-17, Jul. 1992.
05709219	5	Kotoku, Tetsuo et al., "Environment Modeling for the Interactive Display (EMID) Used in Telerobotic Systems," IEEE Nov. 3-5 1991, pp. 999-1004.
05709219	6	Kotoku, Tetsuo, "A Predictive Display with Force Feedback and Its Application to Remote Manipulation System with Transmission Time Delay," IEEE Jul. 7-10 1992, pp. 239-246.
05709219	8	Burdea, Grigore et al., "Distributed Virtual Force Feedback," IEEE May 2, 1993, Atlanta, GA, pp. 25-44.

### ***References from Companies in Twenty Technology Categories***

In the previous section, we analyzed the use of IEEE science by the top patenting organizations. Out of all science publishers, IEEE was cited most often by these organizations by a wide margin. However, looking only at the top companies tells an incomplete story. IEEE publishes journals and runs conferences mainly in information technology, electronics, and related areas. It is therefore useful to examine the extent to which IEEE science is referenced by all organizations that patent in specific technologies and not just by the leading companies.

As mentioned in the methodology section, we identified all patents in the twenty technology categories shown above in Table 1. 1790 Analytics has developed a classification scheme that categorizes all patents into 50 broad technology areas based on International Patent Classes (IPCs) and Cooperative Patent Classes (CPCs) which are assigned to each patent as part of the examination process. This scheme was used to identify all relevant patents for the current analysis.

We examined each of the technology areas separately, and the results are summarized in Figures 3-19. The first category shown (in Figure 3) is Artificial Intelligence (AI) and Machine Learning. We identified all non-patent references on patents related to this technology issued between 2004 and 2023. We then determined the science publishers responsible for the largest number of these non-patent references. Figure 3 shows the result of this analysis, namely that IEEE science is referenced far more in AI related patents than science from any other publisher. 31.01% of all science references from these patents go to IEEE journal papers or IEEE sponsored conference papers (the graphs also include standards documents, but most of the references are to journal or conference papers). In second place is the ACM with 8.74% of the references.

AI is currently a very hot area and often written about in the popular press. The same can be said for Autonomous Vehicles which are shown in Figure 4. Here again IEEE dominates in references. In this case almost half (48.52%) of all references are to IEEE in this category. IEEE receives about 10 times as many references from autonomous vehicles as second place Elsevier.

Blockchain and Distributed Ledgers is a relatively new category with only a few thousand patents (as opposed to AI which is a much more established category with 40,000+ patents). We see in Figure 5 that 4,086 (38.97%) of all science references from these patents go to IEEE. This is approximately 4 times as many as second place ACM with 997 (9.51%) of all references.

Figure 6 covers Broadcasting patents, which consists of US patents in the IPCs for Broadcast Communication and Pictorial Communication (Television). It would seem that this would be an area that is somewhat tangential to IEEE's core mission. However, IEEE leads in references in this category as well with 30.07%. The International Telecommunications Union is a distant second with 13.18% of all references.

Figures 7 and 8 show referencing patterns from Computer Hardware and Software patents. Here IEEE once again receives far more references than the other publishers. In both cases, ACM is the second most referenced publisher, but it receives about half of the references that papers published by IEEE receive.

Figure 9 shows references in the fast-growing area of Cybersecurity. This is a very hot area with a lot of recent patent growth, and again IEEE leads by a wide margin (28.18% of all references compared to 15.05% for second place ACM).

Figure 10 examines the top referenced publishers in the Medical Device field, which covers devices as well as diagnostic tools and surgical instruments. Here, IEEE is a respectable fourth in an area that is outside its core competency. RELX who has more than 400 journals in the field, such as *Annals of Thoracic Surgery*, and the *Journal of the American College of Cardiology* has a substantial lead with 19.94% of all references. Wiley with 9.91% of references and Wolters Kluwer (parent of Lippincott) with 8.45% of references are just ahead of IEEE's 8.01% of references in the category. (IEEE is slightly up from 7.78% of the references in last year's report for this category.)

Figure 11 contains the results for the information storage category. In this area, IEEE is particularly dominant. 41.12% of all the science references from patents in information storage are to papers in IEEE journals or conferences. IEEE's 91,925 references in this category are about six times as many as second place ACM.

Another hot technology area consists of Internet-of-Things patents. As Figure 12 shows, IEEE science is very important to the development of this new and active area of patenting. More than 36% of all science references are to IEEE content. 3GPP (a standards body) is a distant second with 12.44% of all references.

Figure 13 contains the results of patents covering Measuring, Testing, and Control technology. Patents in this category are related to measuring or testing force, pressure, weight, etc. as well as chemically measuring substances (e.g. measuring CO2 levels). The category also contains control devices since these technologies are often combined. For example, a patent might be related to a valve that adjusts at a certain pressure or at a certain pollution level. Since this type of measuring can be done both mechanically, magnetically, electrically, or chemically, it is not too surprising to see both IEEE and RELX and the Optical and Chemical Societies all near the top of Figure 13. IEEE receives the most references, but the lead is not as dominant as in the Information Technology related technology areas.

The results for the Optics category can be found in Figure 14. This is another area that is slightly outside the IEEE core. In this case IEEE is sandwiched between the two major optics societies. The Optical Society of America (OSA) leads with 39,621 science references, IEEE is second with 31,955 and the International Society of Optical Engineering (SPIE) is third with 29,440 references from optics patents.

Figure 15 contains results for the patents related to power generation and transmission. Although this is a non-information technology category, IEEE leads in references in this category as well. 30.80% of science references from patents in this category go to IEEE publications. RELX is second with 21.70% of all US patent references in the category.

Intelligent Manufacturing and Robotics contains patents related to robotics, and robotics and control systems related to manufacturing. According to Markets and Markets [8], service robotics market is projected to reach USD 103.3 billion by 2026 because of a population explosion in service robots that mow lawns, vacuum floors, and manufacture things.

As this industry grows, new innovations will be patented, and from Figure 16 it looks like those innovations will build upon ideas published in IEEE journal articles or presented at IEEE conferences. We see that 36.97% of all science references from patents in this space refer to IEEE published articles. RELX is the second ranked publisher, but its papers receive only 9.27% of the science references. In this category, IEEE has more references than the next dozen publishers combined.

Figure 17 shows that IEEE is also very strong in the Semiconductor category. Here, the inclusion of conferences gives IEEE a substantial boost. Approximately one-third of the references to IEEE are to conference papers. With conferences excluded, IEEE would be about the same level as the American Institute of Physics in terms of science references from semiconductor patents.

The Smart Meter/Smart Grid category covers patents related to improving the power grid as well as for advanced residential electric meters. This is a relatively small category but as we see in Figure 18, the IEEE provides the bulk of the science base with over half of all patent references.

Solar and Photovoltaic energy results are contained in Figure 19. IEEE holds a lead over RELX in this category in spite of having fewer journal titles. RELX has several strong journals in this category including *Solar Energy Materials and Solar Cells*, *Thin Solid Films*, *Solar Energy*, *Synthetic Metals*, *Journal of Crystal Growth*, *Solar Cells*, plus more than 50 smaller journal titles

related to this technology. The references to IEEE science in this category mainly go to the *IEEE Photovoltaic Specialists conference*, the *IEEE World conference on Photovoltaic Energy Conversion*, and *IEEE Transactions on Electronic Devices*.

The Telecommunications category is one of the strongest large categories for IEEE. IEEE articles receive more references than the next three publishers, (all of which are standards bodies). Standards are referenced more frequently in telecommunications than in other categories. About 36% of the 1.8 million total references are to standards documents with the other 64% going to journal and conference articles. In terms of standards documents, the 3GPP General Partnership Project, Internet Engineering Task Force and International Telecommunication Union received the most references in the category.

New telecommunications patents are referencing scientific articles to a larger extent than in the past. In last year's report this figure showed 706,000+ references to IEEE articles for the 20-year span of 2004-2023. Now as we see in Figure 20, there are more than 737,000+ references to IEEE for telecommunications patents in the 20-year period 2004-2023.

Standards documents are referenced increasingly often in Telecommunications patents. Six of the top 20 referenced publishers are standards bodies. Moreover, of the 737,000+ references to IEEE, over 74,000 are to various IEEE standards (mostly to the IEEE 802 family of standards).

Virtual and Augmented Reality is another relatively small but hot category. We see in this category that again IEEE leads by a wide margin with 30.15% of all science references from patents. ACM is in second place with 17.04% of references.

Wind Energy is another relatively small area where IEEE has a big lead. We see in Figure 22 that in this area 39.26 of all science references from Wind Energy patents go to IEEE journal and conference papers. This is about 2.5 times as many references as second place RELX receives, despite IEEE having fewer journal titles in the area than RELX does.

Figures 3-22 show aggregate counts of references from all patents in each technology category. Readers who wish to see the firms that reference IEEE publications in each category can consult Appendix B. This appendix contains the 100 organizations that reference IEEE most frequently in each category. Appendix C is similar, except that it contains the organizations that reference IEEE most frequently in the twenty technology categories combined.

### ***Citation Index for Patents Referencing IEEE***

In an earlier study (see [2]) it was shown that patents that reference specific IEEE journals perform better on a number of quality metrics. Moreover, it was shown that the results were statistically significant. In this report, we update a key figure from the previous study showing the citation index of patents that reference IEEE papers versus peer patents that do not reference IEEE.

The citation index is a normalized citation metric that takes the number of citations received by a particular set of patents and divides it by the expected number of citations for patents of the same

age and technology class. A random set of patents therefore should have a citation index of 1.0. Research has shown that patents cited by many later patents tend to contain important ideas upon which the later patents are building (see [3] and [6]). Citation indicators are also the basis for the patented financial models (see [4] and [7]) invented by the two 1790 founders Breitzman and Thomas.

Figure 23 contains the Citation Index for the patents in the twenty technology categories that reference IEEE papers and conferences. Also shown is the Citation Index for the set of the remaining patents in each category that do not reference IEEE. Note that the set of all patents in each category have an expected citation index of 1.0. Thus, we see that the patents that reference IEEE are cited sometimes 3 to 4 times more often than expected, while the patents that do not reference IEEE are cited up to 10% less often than expected in some categories. This of course does not imply that all patents that reference IEEE are likely to be more valuable than patents that do not reference IEEE, but it does suggest that in general, patented technologies that build upon IEEE published or sponsored science are more likely to be valuable than patented technologies that do not reference IEEE science.

#### **IV. Conclusions**

When a patent is filed, it must reference the prior art upon which it builds, as well as any prior art that limits the claims of the new invention. This study and prior studies show that science published by IEEE forms a significant portion of this prior art for new patents.

In this study, we examined two separate patent sets. The first patent set consisted of patents granted between 2004 and 2023 to the 50 organizations with the largest number of US patents granted in 2023. The second patent set consisted of all US patents granted between 2004 and 2023 patents in twenty key technologies: Artificial Intelligence, Autonomous Vehicles, Cybersecurity, and several other categories. In most of these patent sets IEEE is the dominant source of non-patent prior art. In other words, IEEE journals and conferences are key outlets for scientific discoveries relevant to cutting edge technology.

Finally, we conducted an analysis of citation indices for IEEE related patents and non-IEEE related patents. These types of metrics have been shown in validation studies to be good markers for the quality, impact, and potential value of patents [3]. In this study, it was shown that patents that build upon IEEE published science tend to have higher citation indices than patents that do not reference IEEE. This suggests but does not guarantee that patents that build upon IEEE science are more likely to become high-quality, high-impact, valuable inventions than patents that do not build upon IEEE.

Specific key results are identified in the Executive Summary.

## V. References

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# Figure 1: Sample Patent Front Page

United States Patent  
Bulzacchelli, et al.

7,822,114  
October 26, 2010

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Decision feedback equalizer using soft decisions

## Abstract

A decision feedback equalizer (DFE) and method include at least two paths. Each path includes the following. An adder is configured to sum an input with a first feedback tap fed back from a different path. A latch is coupled to the adder to receive a summation signal as input. The latch includes a transparent state, and an output of the latch is employed as the first tap in a feedback path to an adder of a different path, wherein a partially resolved first tap in the feedback path is employed during the transparent state to provide a soft decision to supply correction information in advance of a hard decision of the latch.

---

**Inventors:** Bulzacchelli; John F. (Yonkers, NY), Friedman; Daniel J. (Sleepy Hollow, NY)  
**Assignee:** International Business Machines Corporation (Armonk, NY)  
**Appl. No.:** 11/761,586  
**Filed:** June 12, 2007

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**Current U.S. Class:** 375/233; 375/229  
**Current CPC Class:** H04L 25/03057 (20130101); H04L 25/067 (20130101)  
**Current International Class:** H03H 7/30 (20060101)  
**Field of Search:** 375/233,229

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2006/0188043	August 2006	Zerbe et al.

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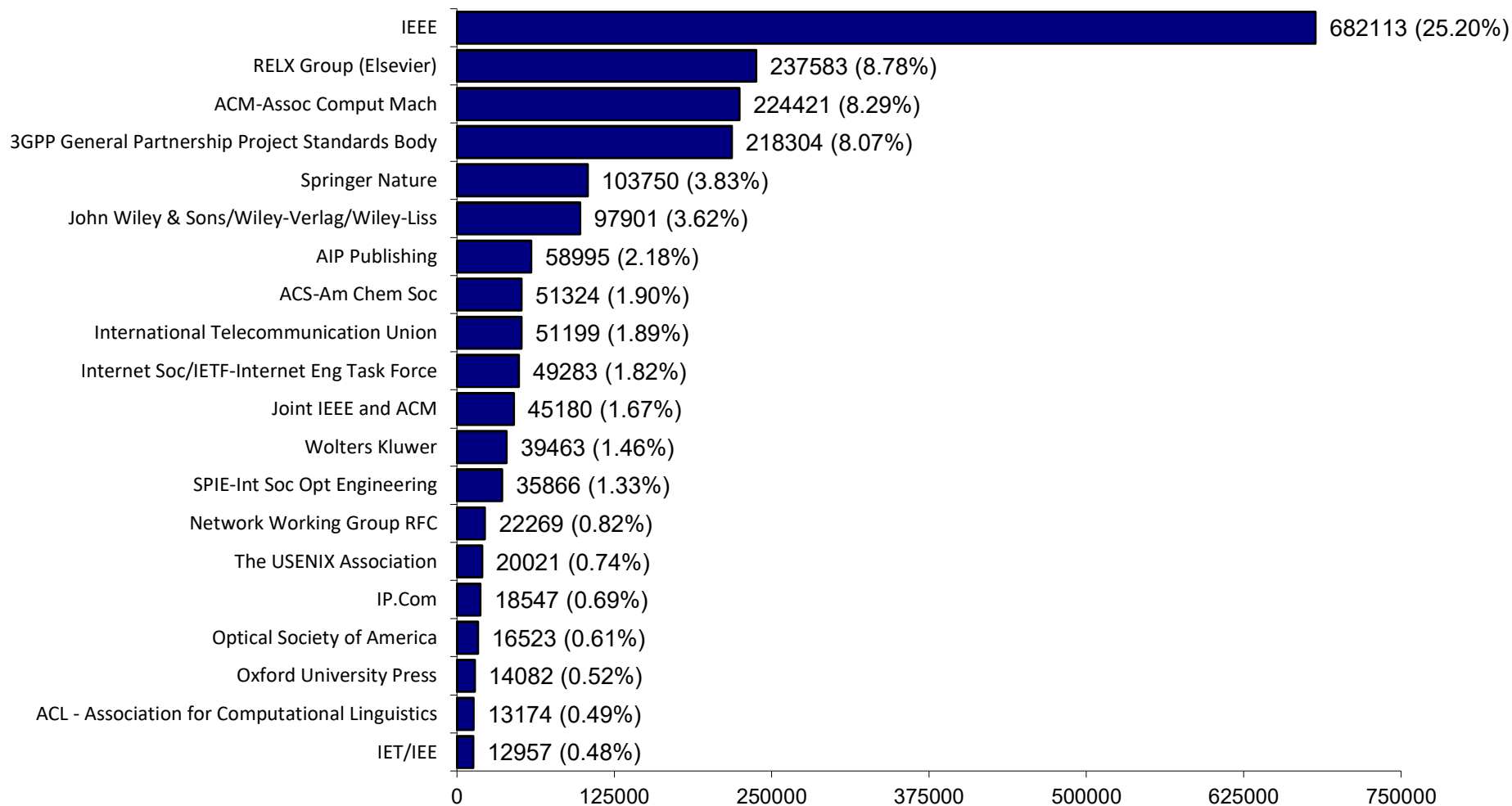
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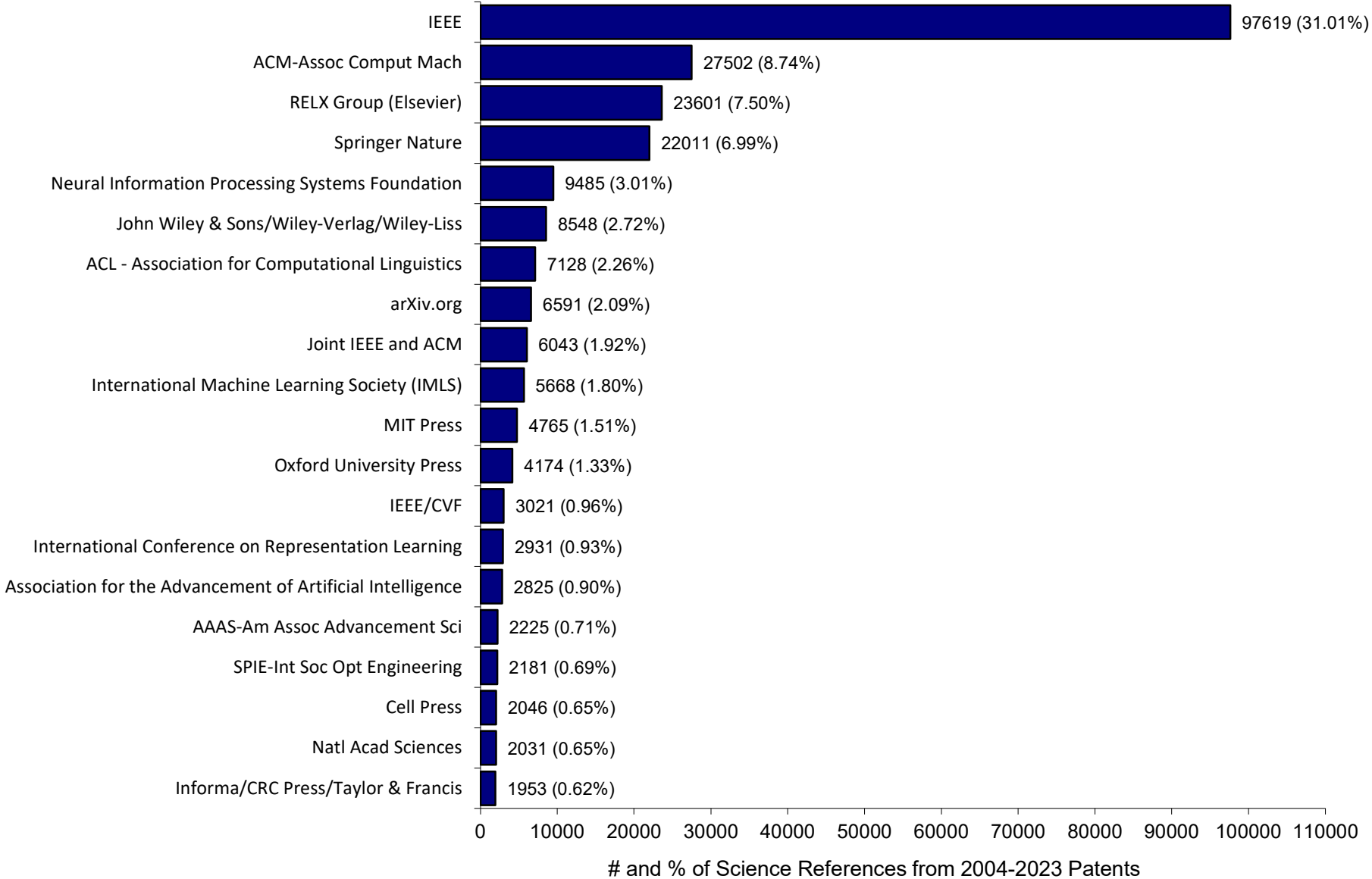
**Figure 2 - # and % of US Patent References from Top 50 Companies to Top 20 Journal Publishers**



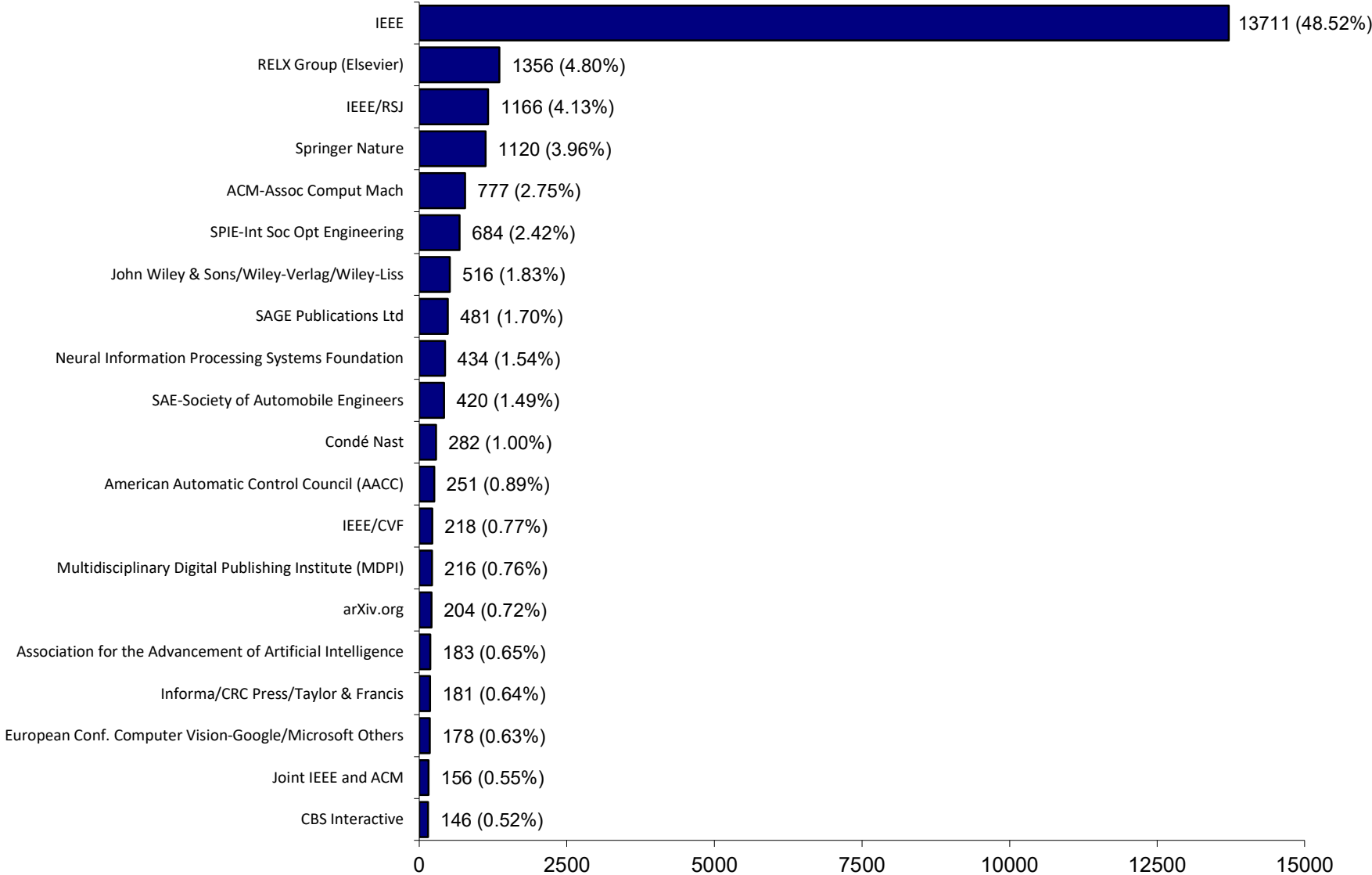
**# and % References to Papers/Standards/Conferences from 2004-2023 Patents**



**Figure 3 - # and % of Science References from 2004-2023 Artificial Intelligence and Machine Learning US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations**

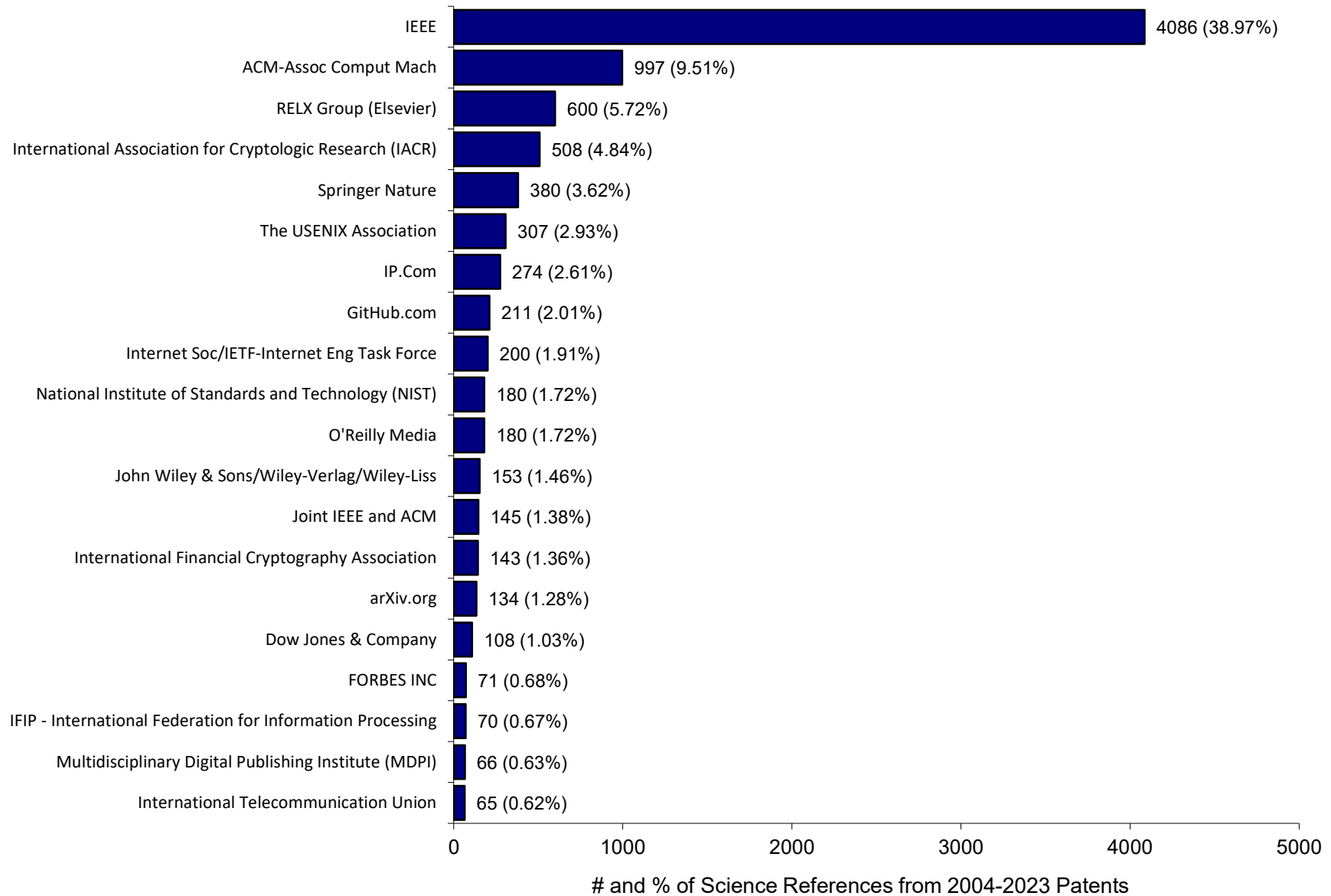


# Figure 4 - # and % of Science References from 2004-2023 Autonomous Vehicle US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

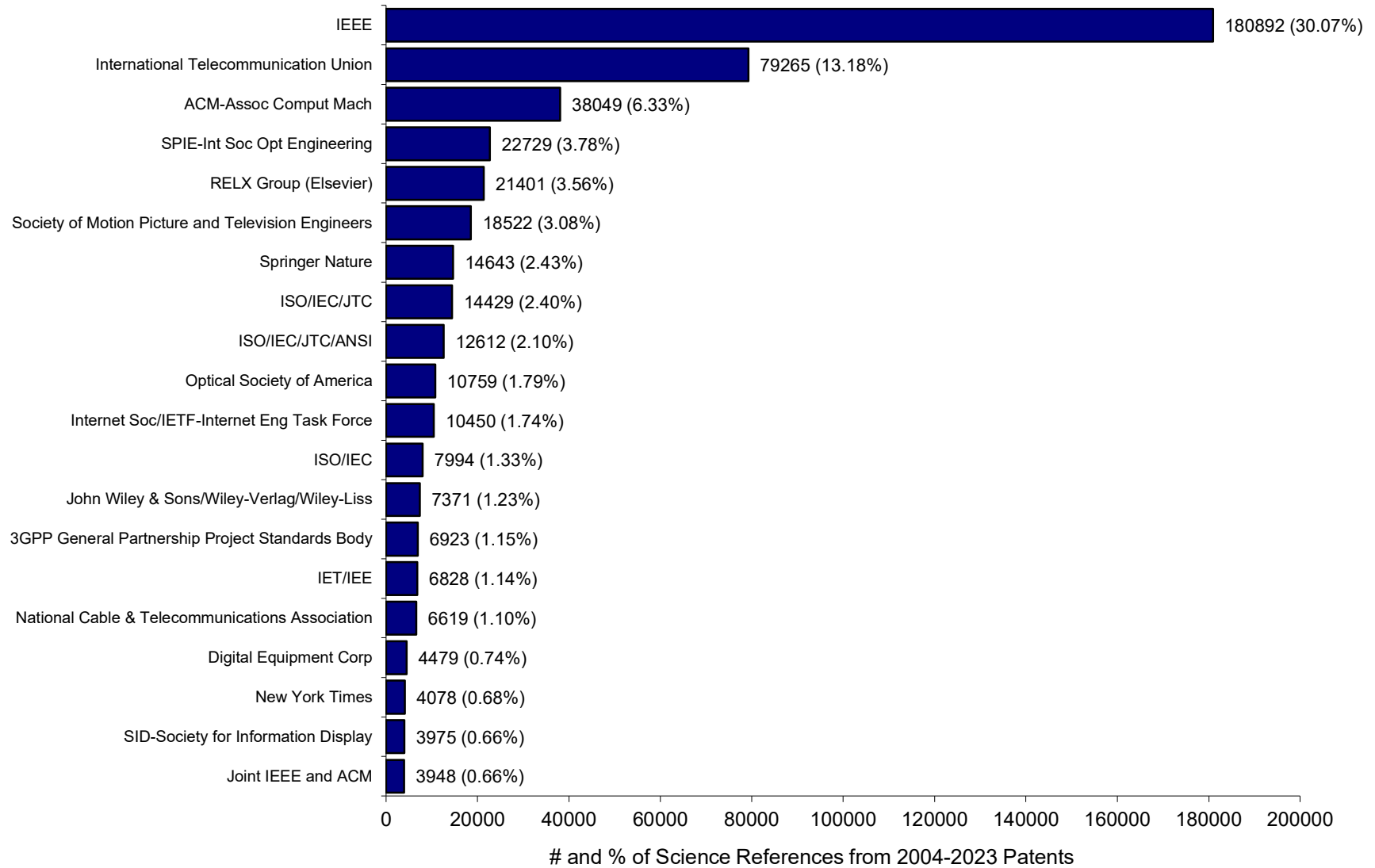


# and % of Science References from 2004-2023 Patents

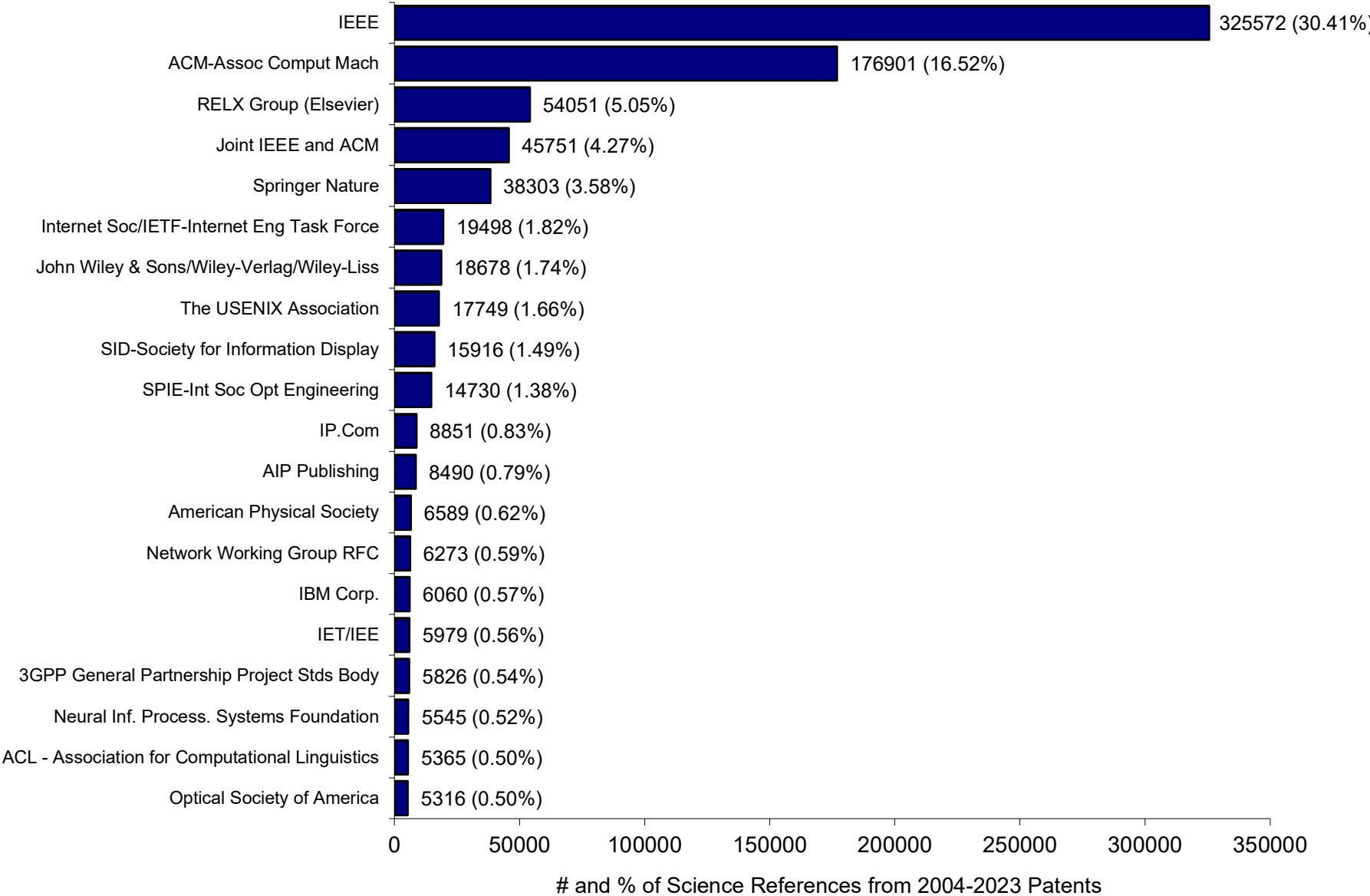
# Figure 5 - # and % of Science References from 2004-2023 Blockchain/Distributed Ledger US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



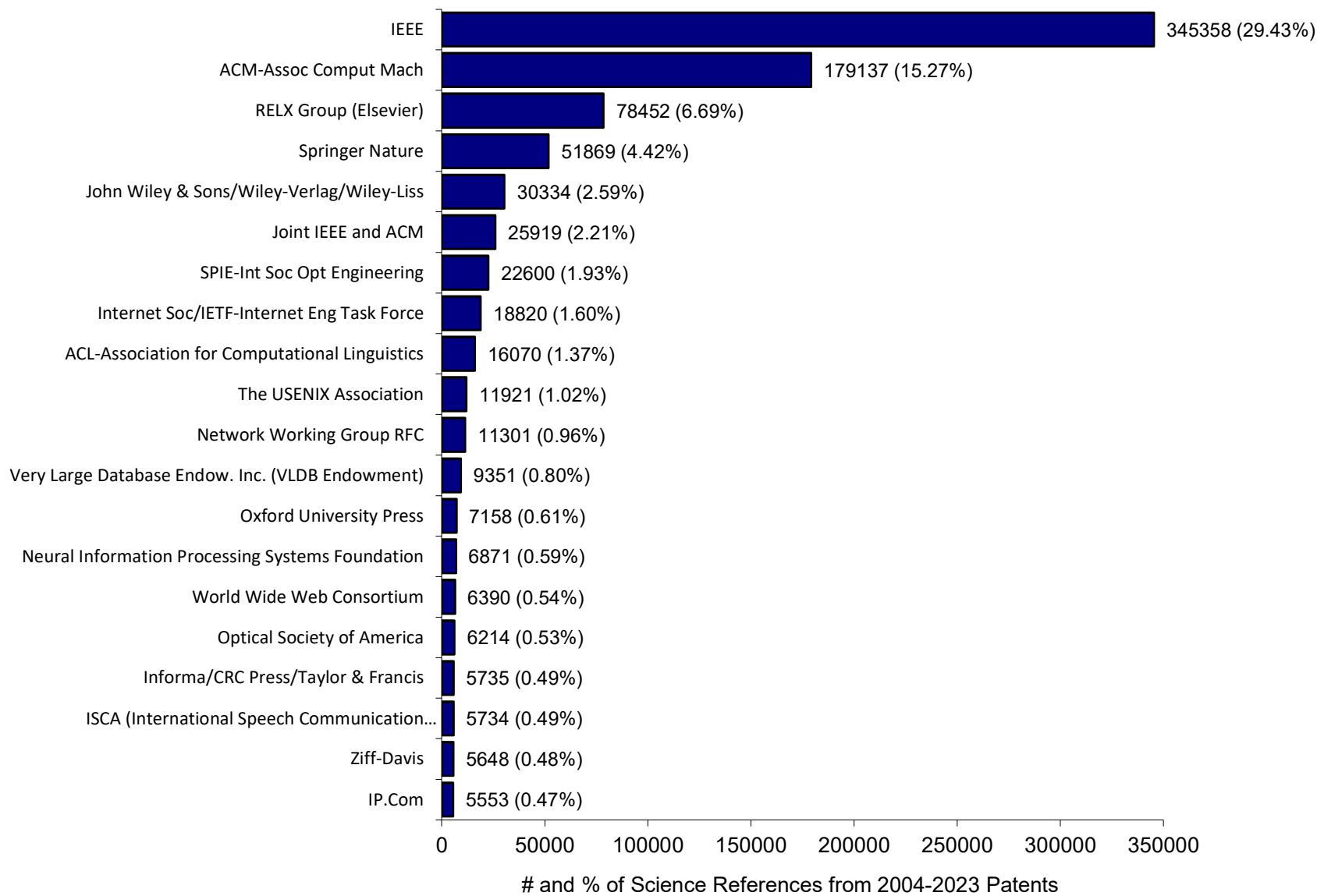
# Figure 6: # and % of Science References from 2004-2023 Broadcasting US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



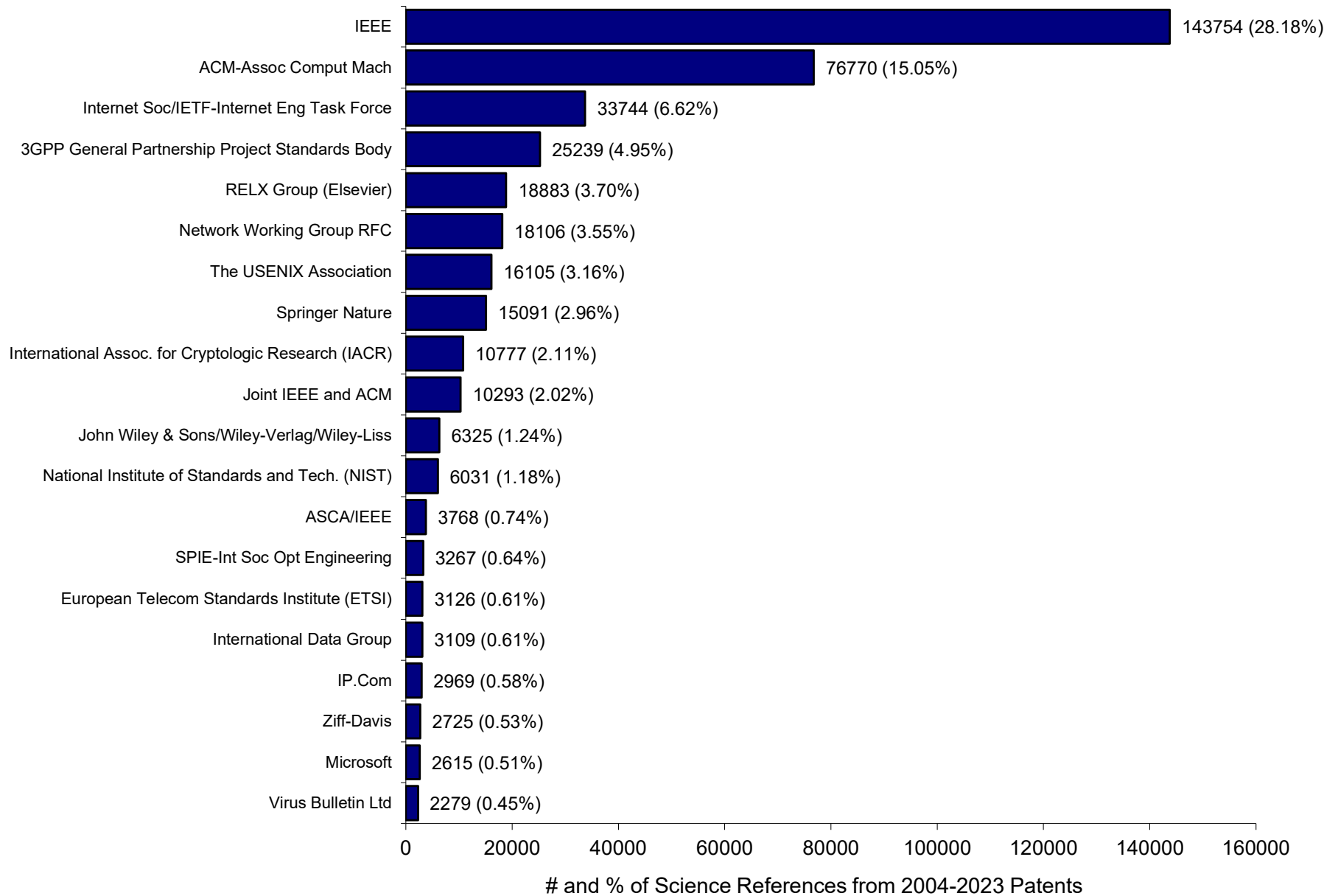
# Figure 7 - # and % of Science References from 2004-2023 Computer Hardware US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



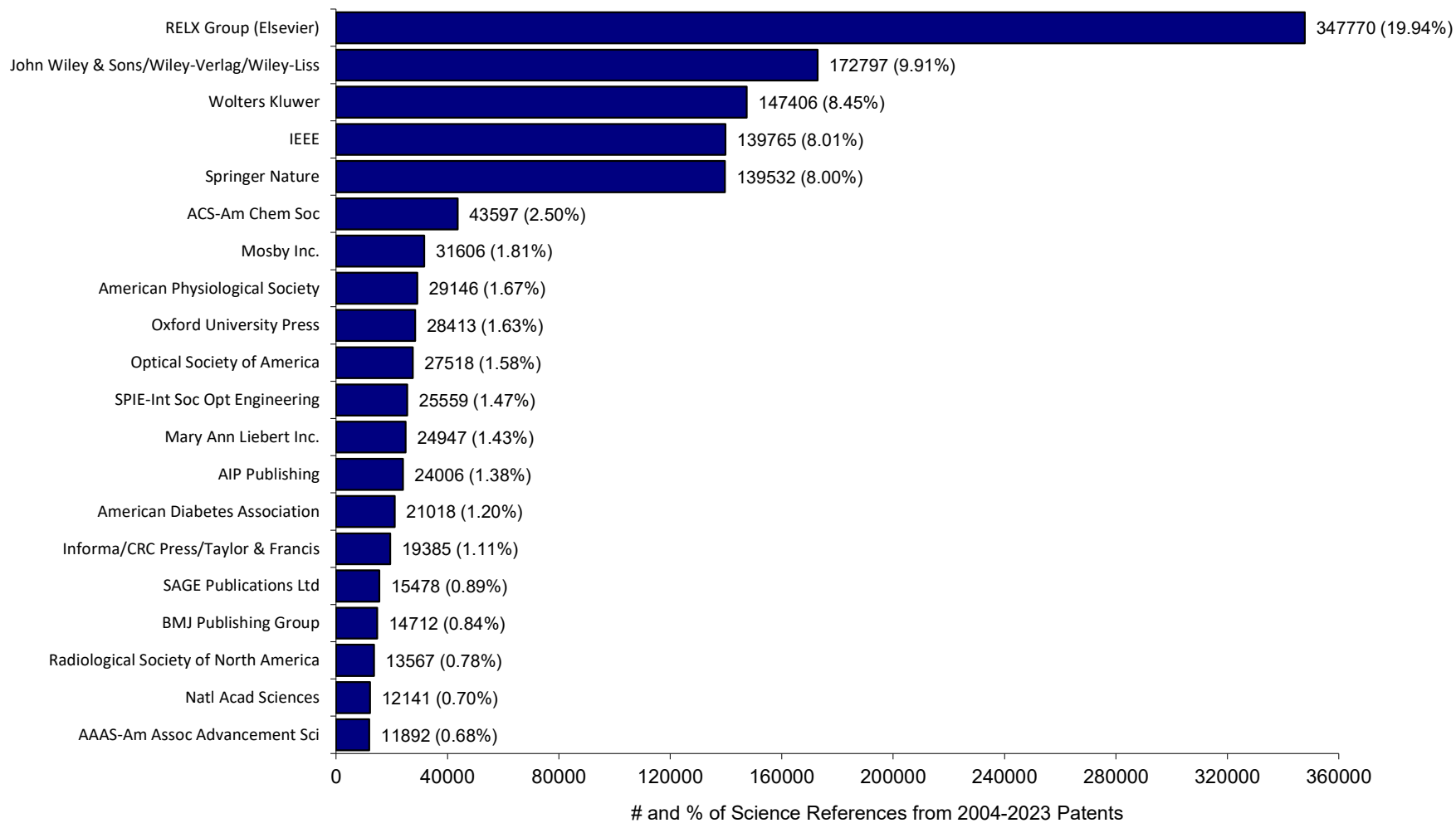
# Figure 8 - # and % of Science References from 2004-2023 Computer Software US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



# Figure 9 - # and % of Science References from 2004-2023 Cybersecurity US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

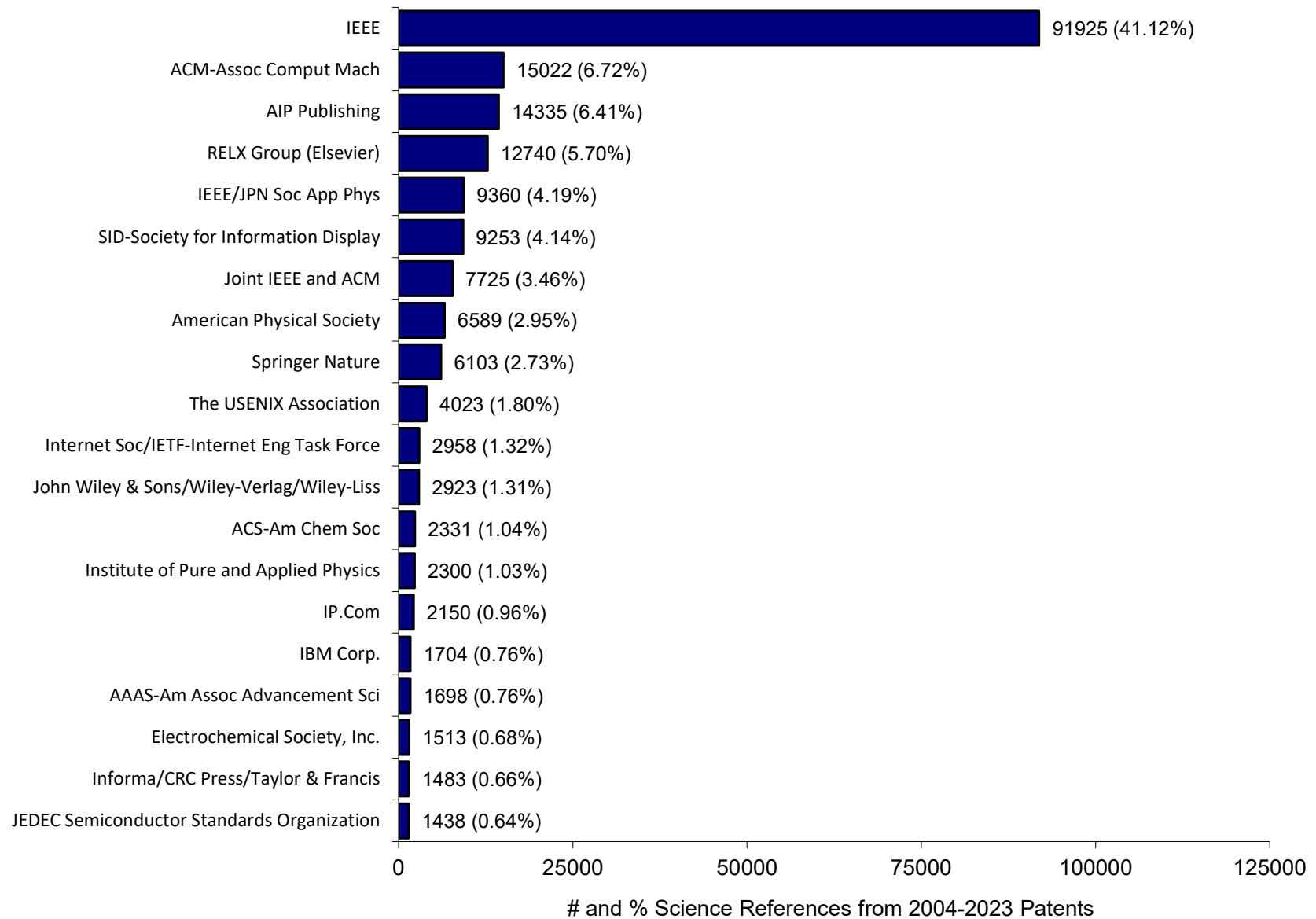


# Figure 10 - # and % of Science References from 2004-2023 Medical Device US Patents to Top 20 Publishers and Conference Organizers

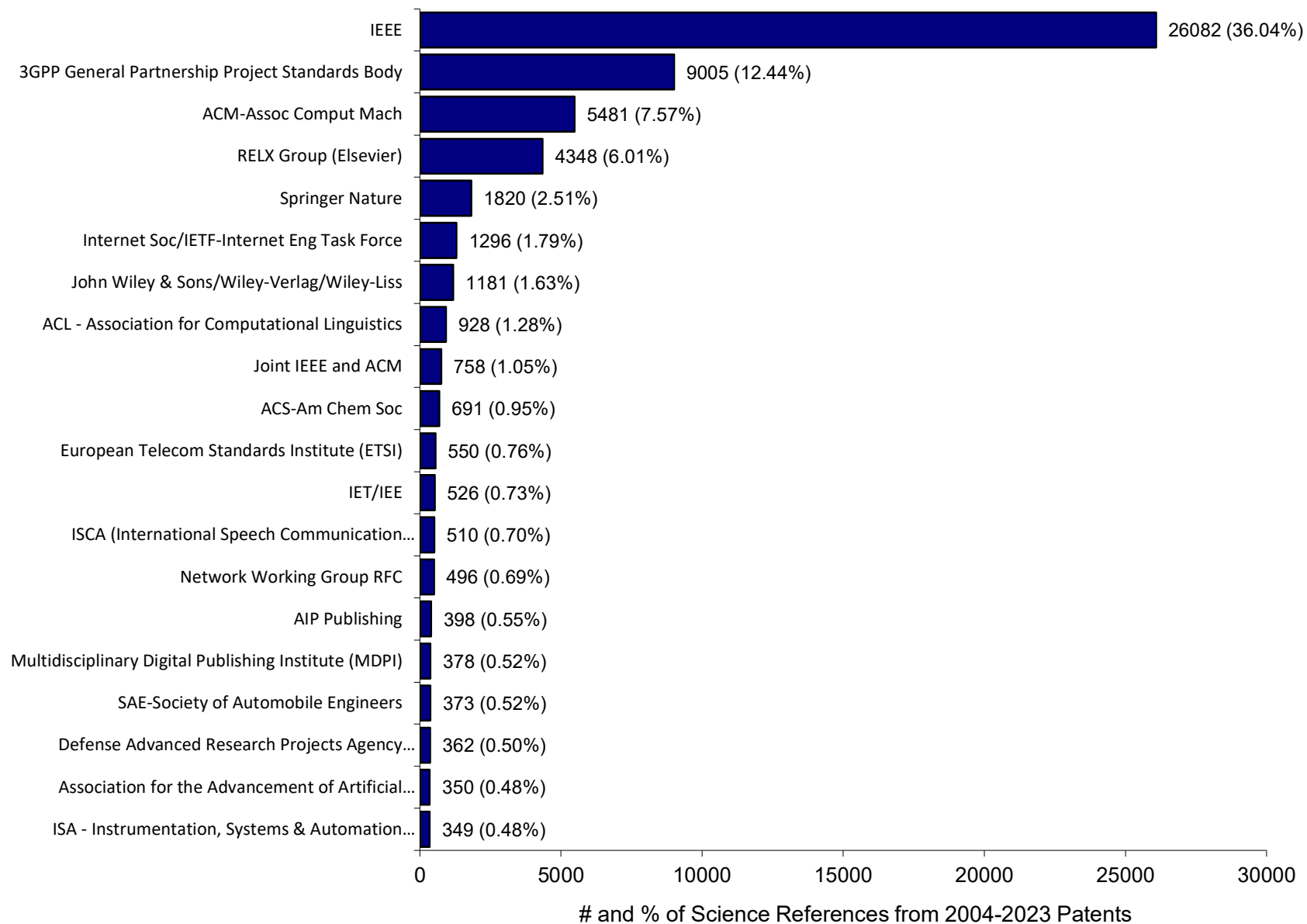




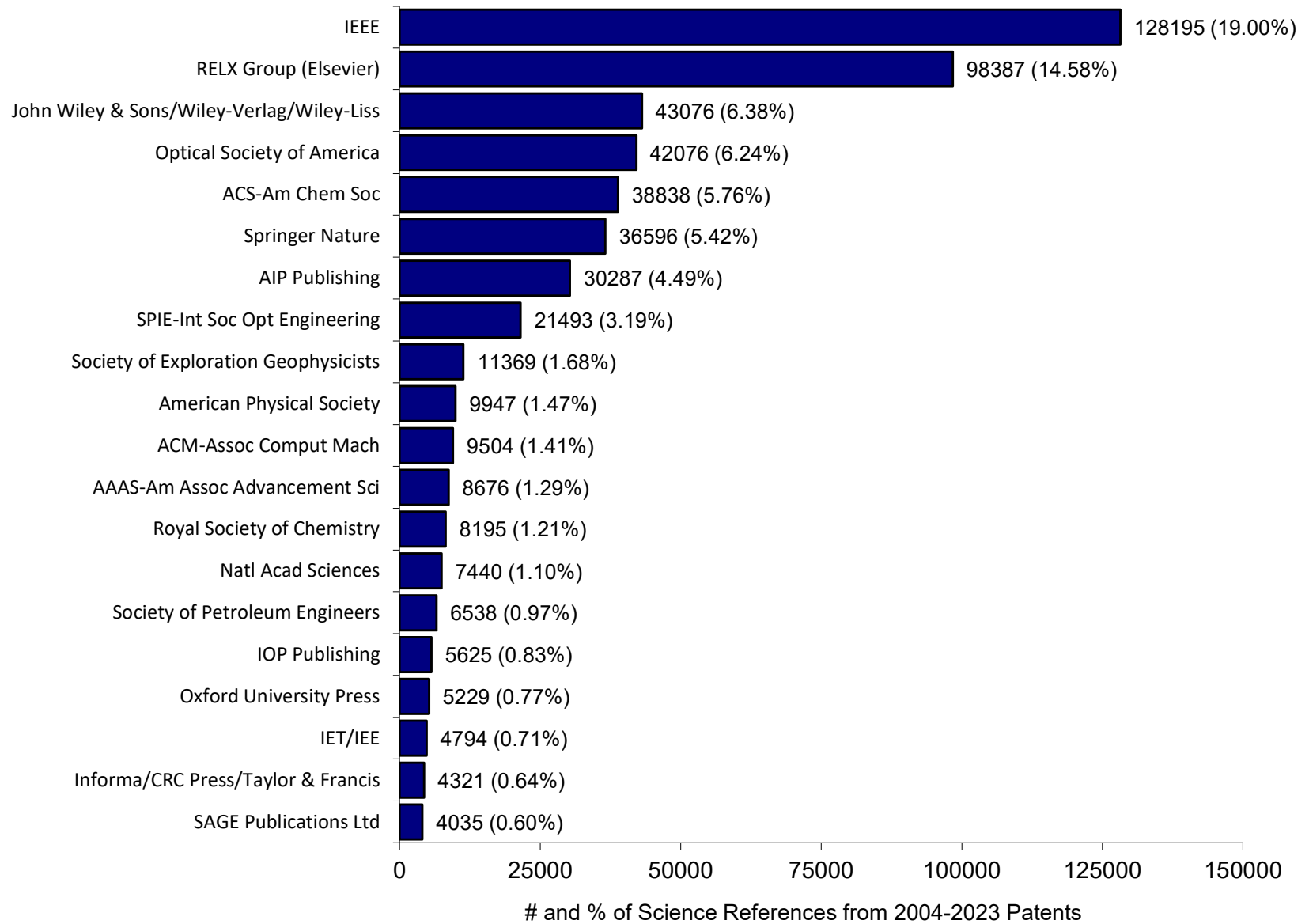
# Figure 11 - # and % of Science References from 2004-2023 Information Storage US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



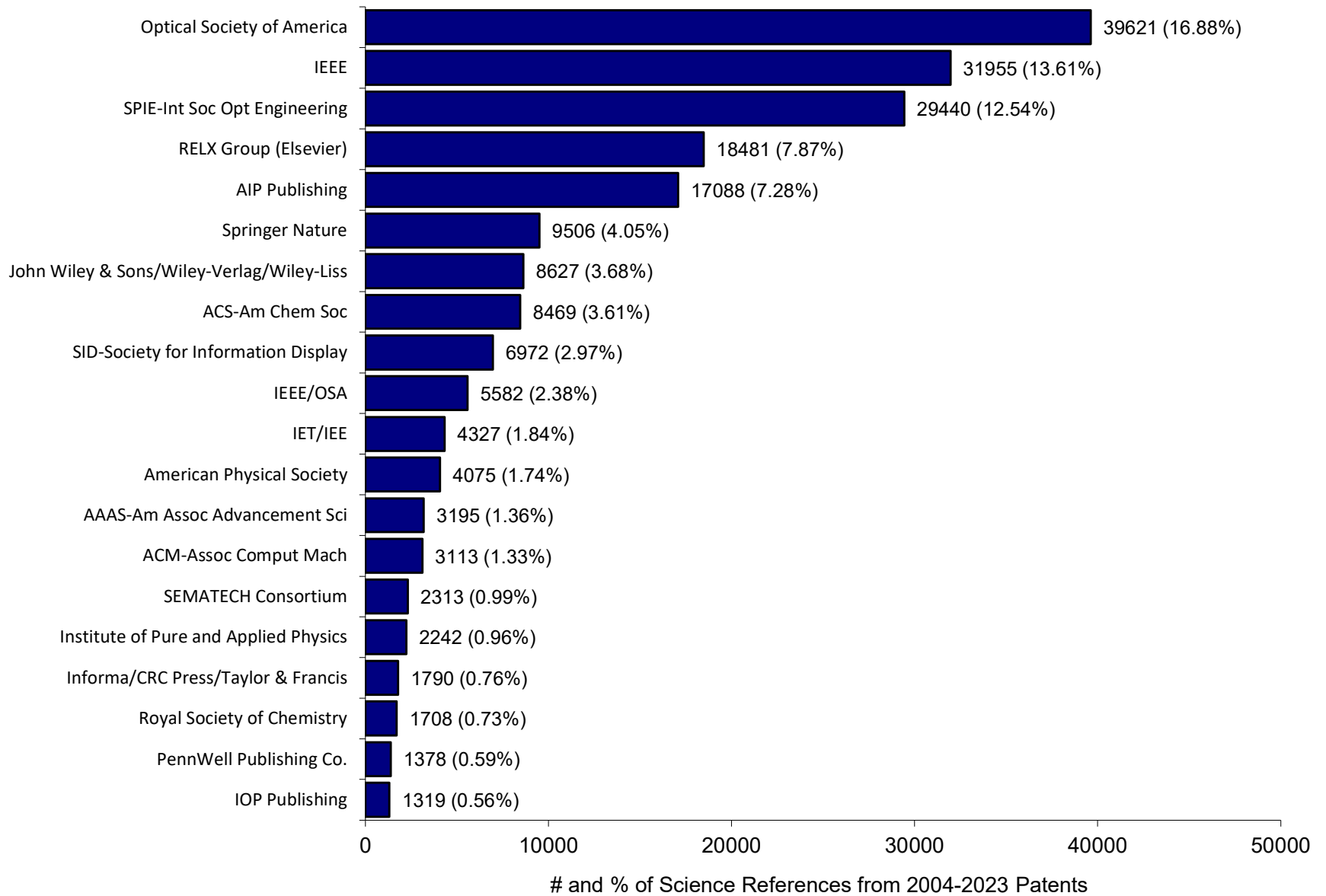
# Figure 12 - # and % of Science References from 2004-2023 Internet-Of-Things (IOT) US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



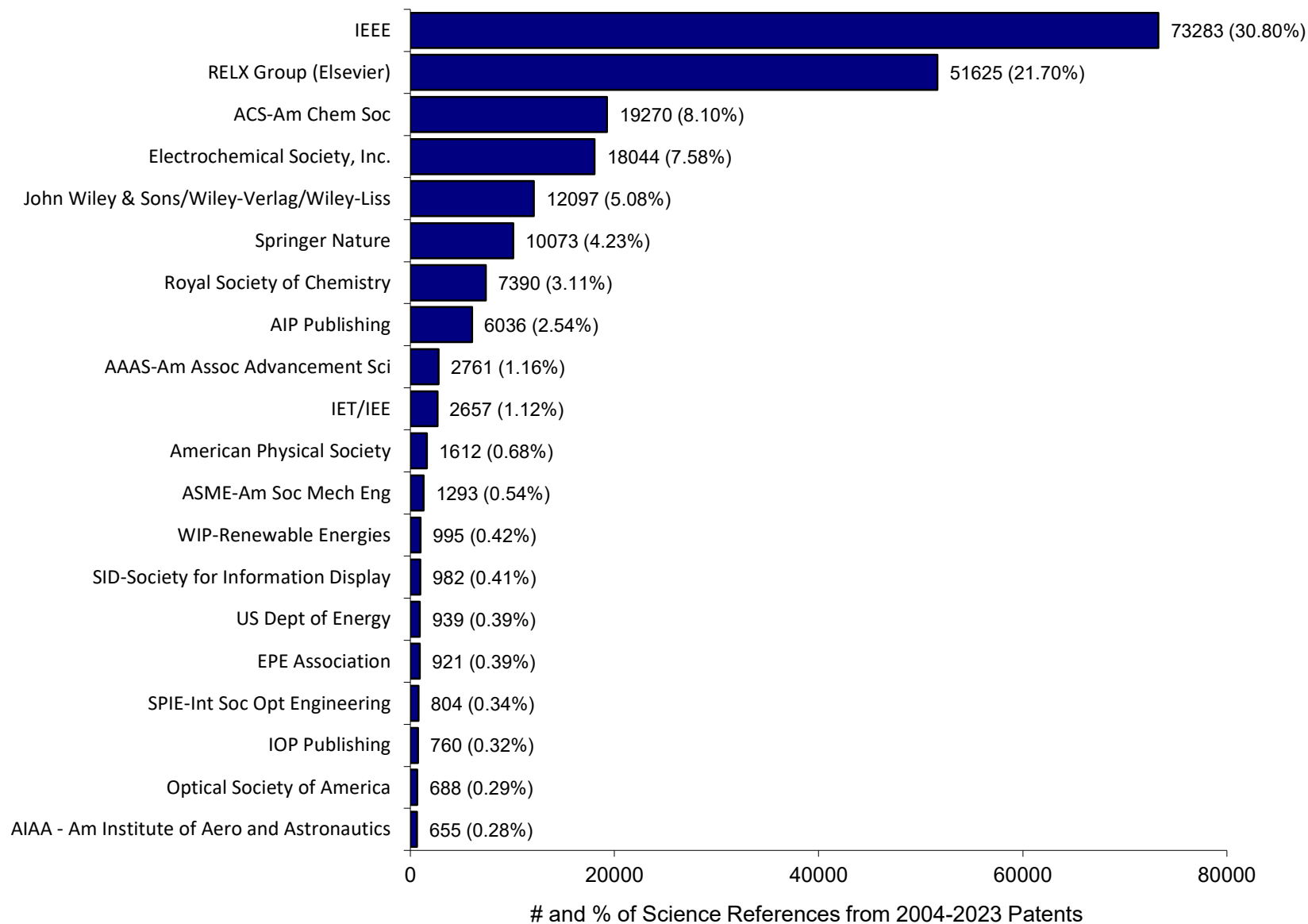
# Figure 13 - # and % of Science References from 2004-2023 Measuring/Testing/Control US Patents to Top 20 Publishers and Conference Organizers



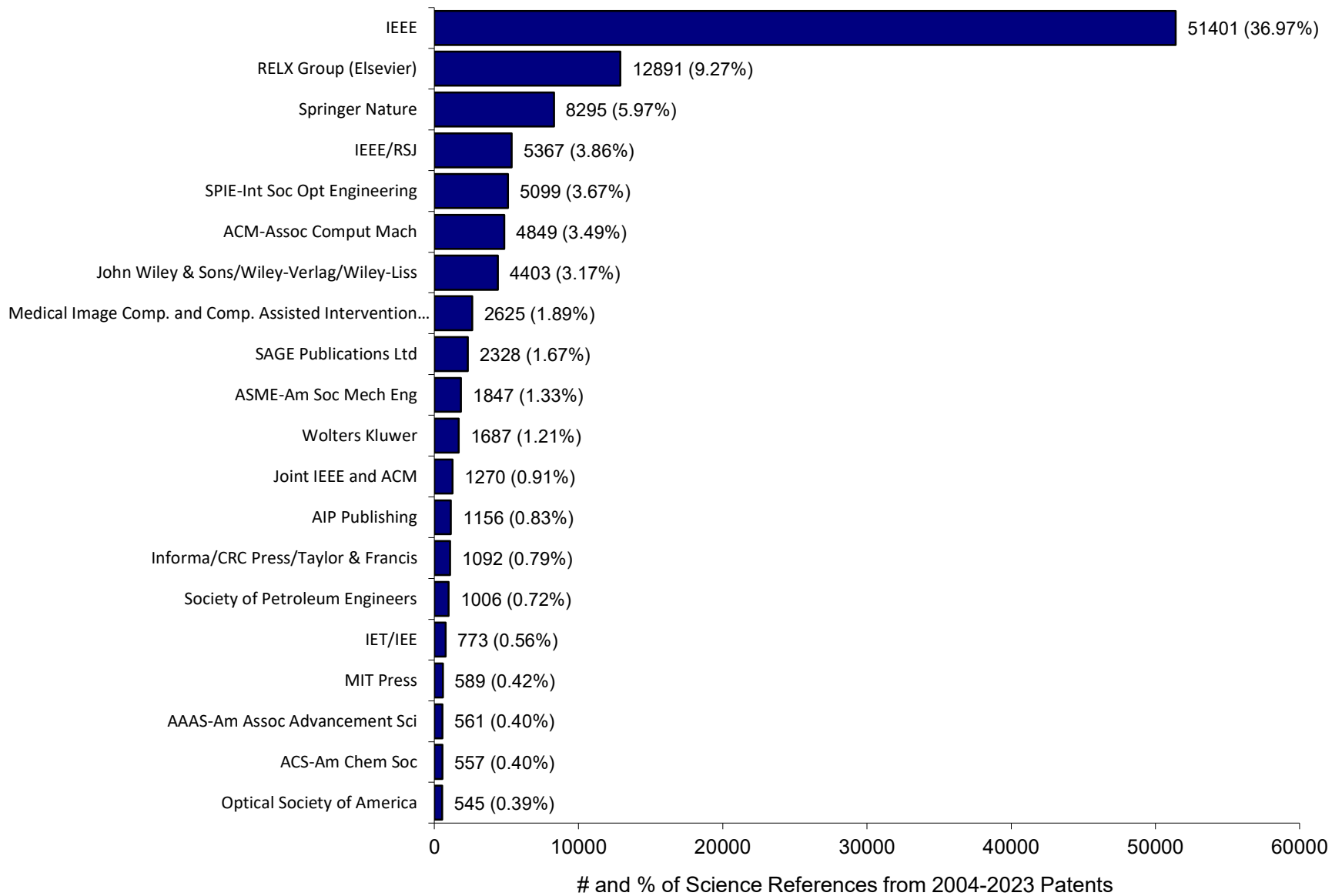
# Figure 14 - # and % of Science References from 2004-2023 Optics US Patents to Top 20 Publishers and Conference Organizers



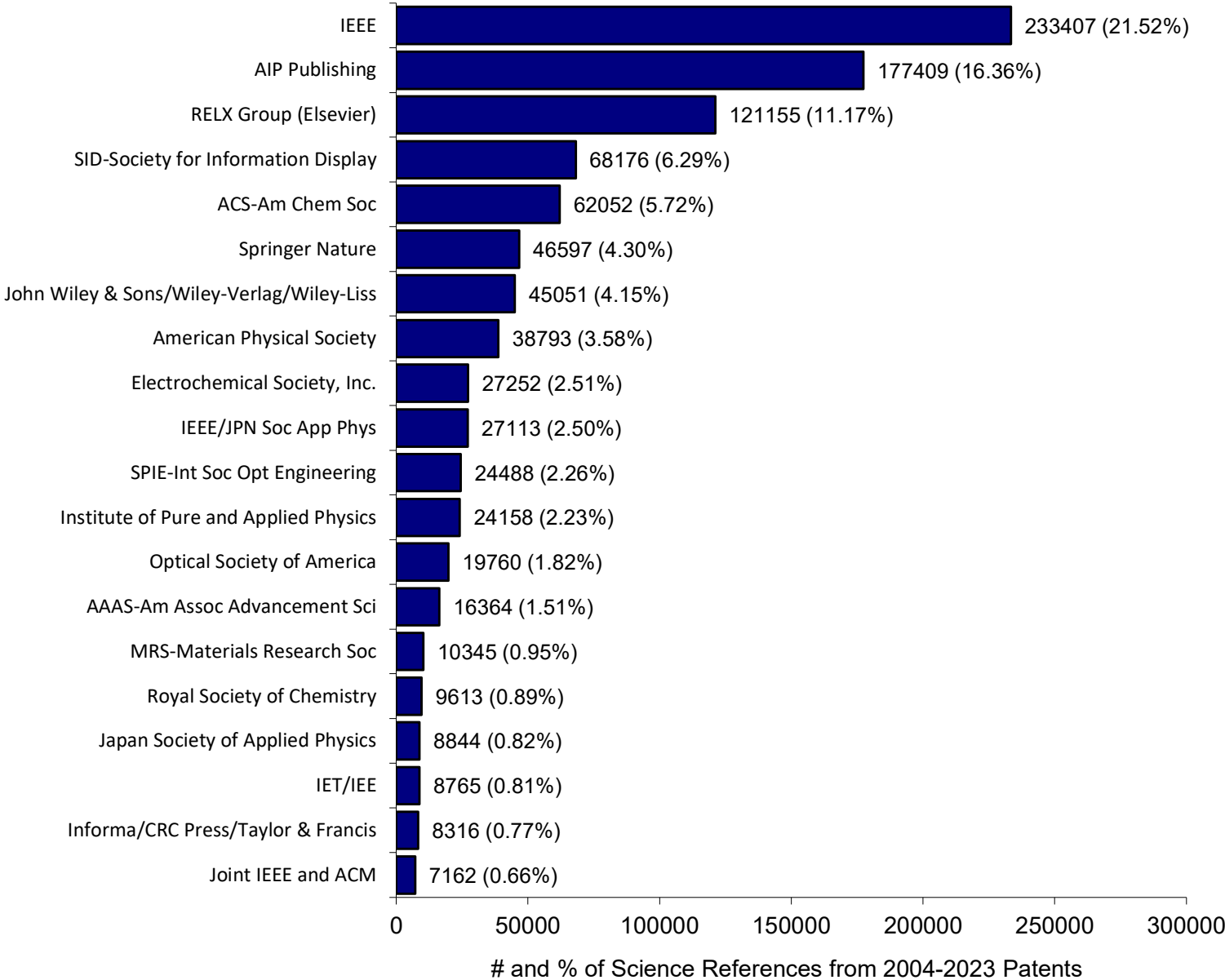
# Figure 15 - # and % of Science References from 2004-2023 Power Systems US Patents to Top 20 Publishers and Conference Organizers



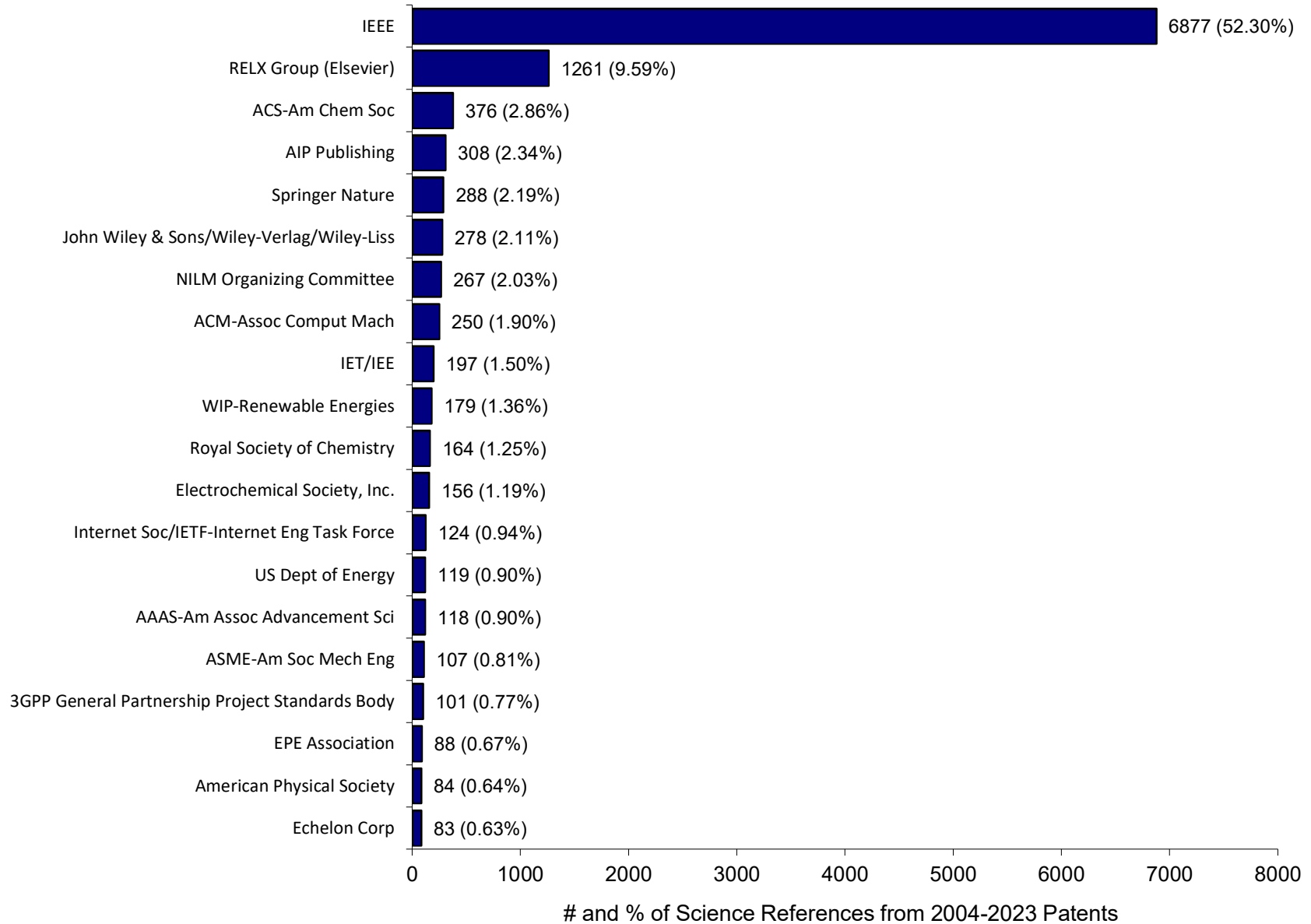
# Figure 16 - # and % of Science References from 2004-2023 Robotics and Intelligent Mfg US Patents to Top 20 Publishers and Conference Organizers



# Figure 17 - # and % of Science References from 2004-2023 Semiconductor US Patents to Top 20 Publishers and Conference Organizers

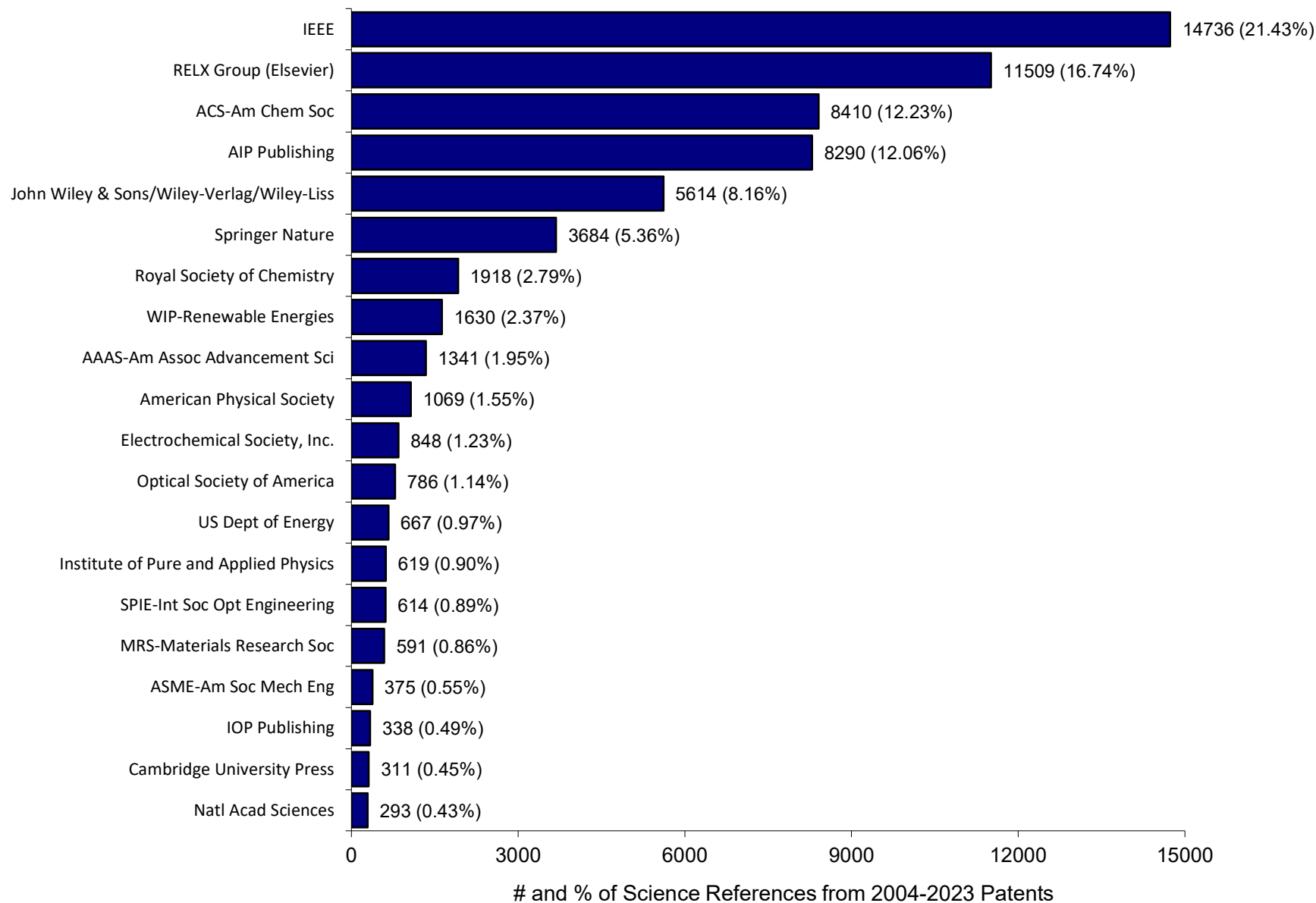


**Figure 18 - # and % of Science References from 2004-2023 Smart Meter/Smart Grid US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations**

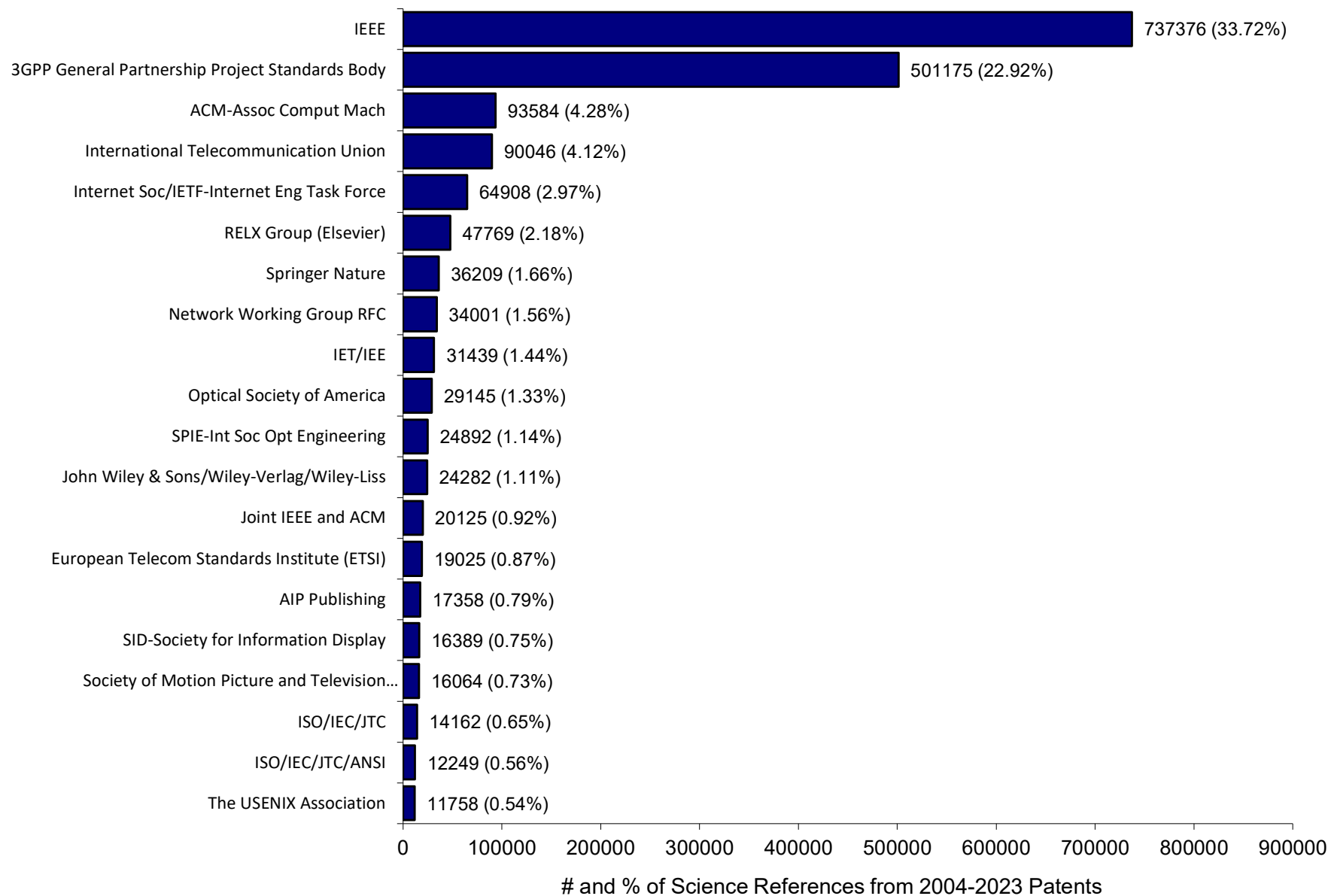




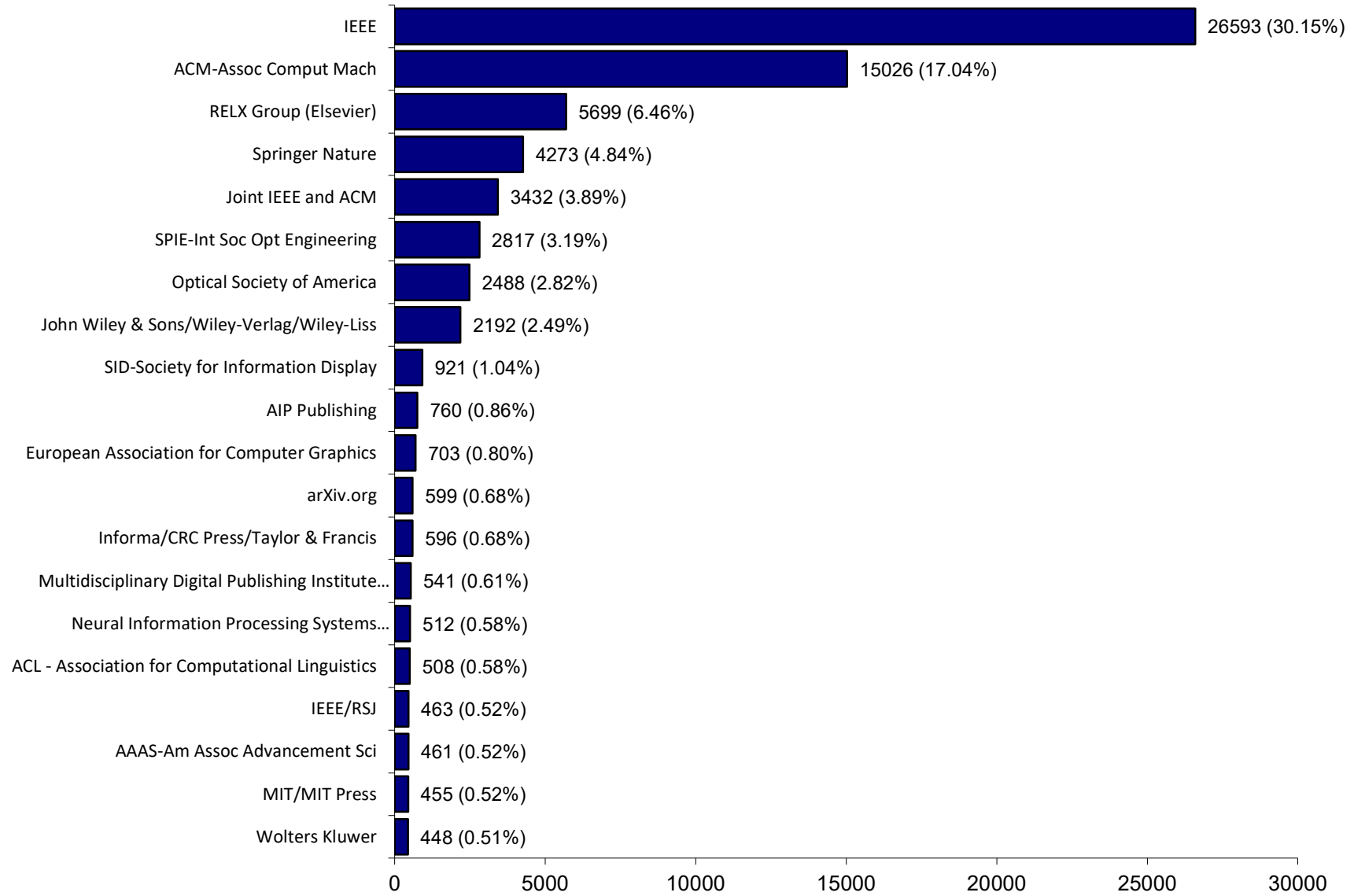
# Figure 19 - # and % of Science References from 2004-2023 Solar/Photovoltaic US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



# Figure 20 - # and % of Science References from 2004-2023 Telecommunications US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

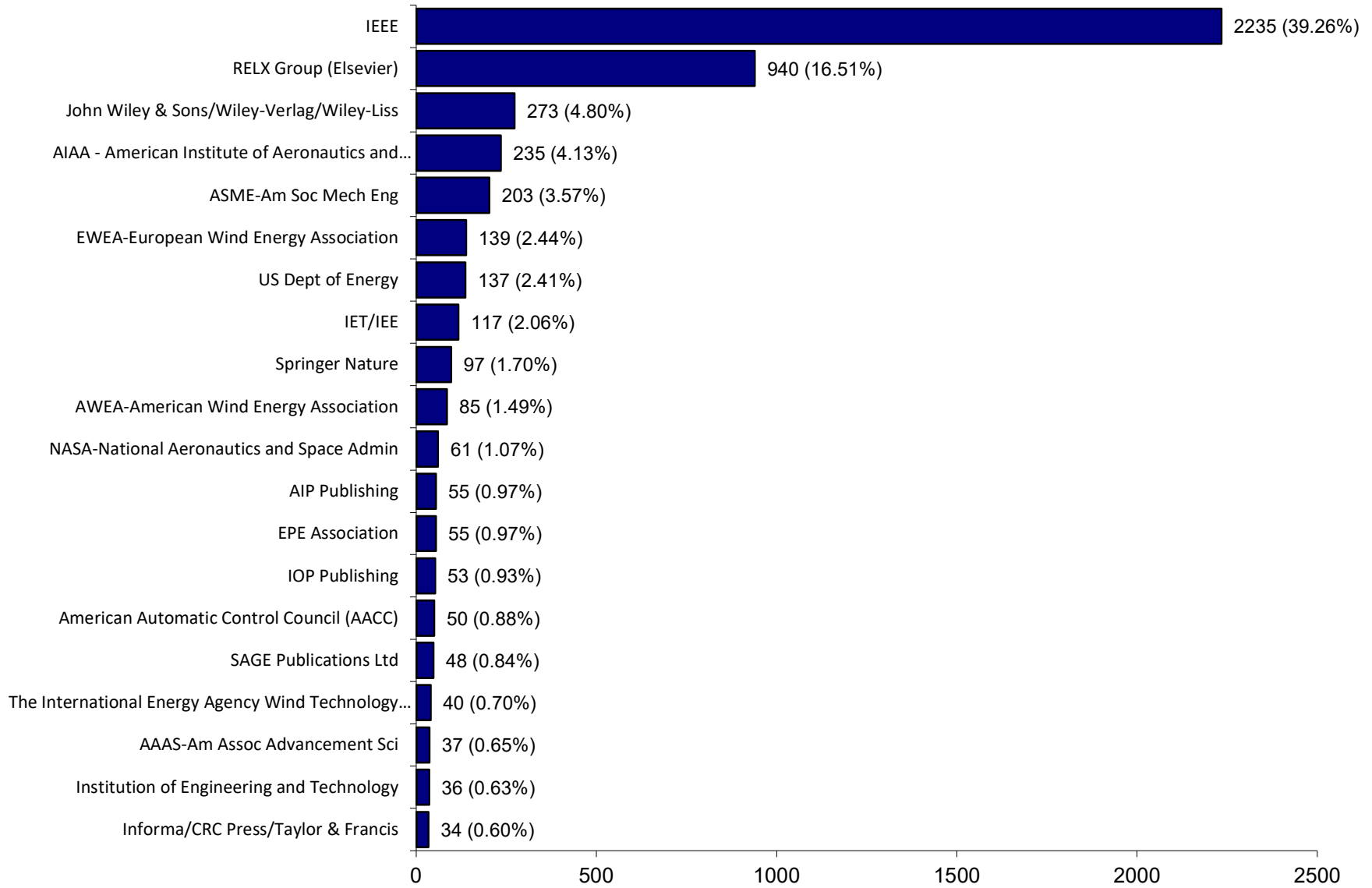


# Figure 21 - # and % of Science References from 2004-2023 Virtual/Augmented Reality US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



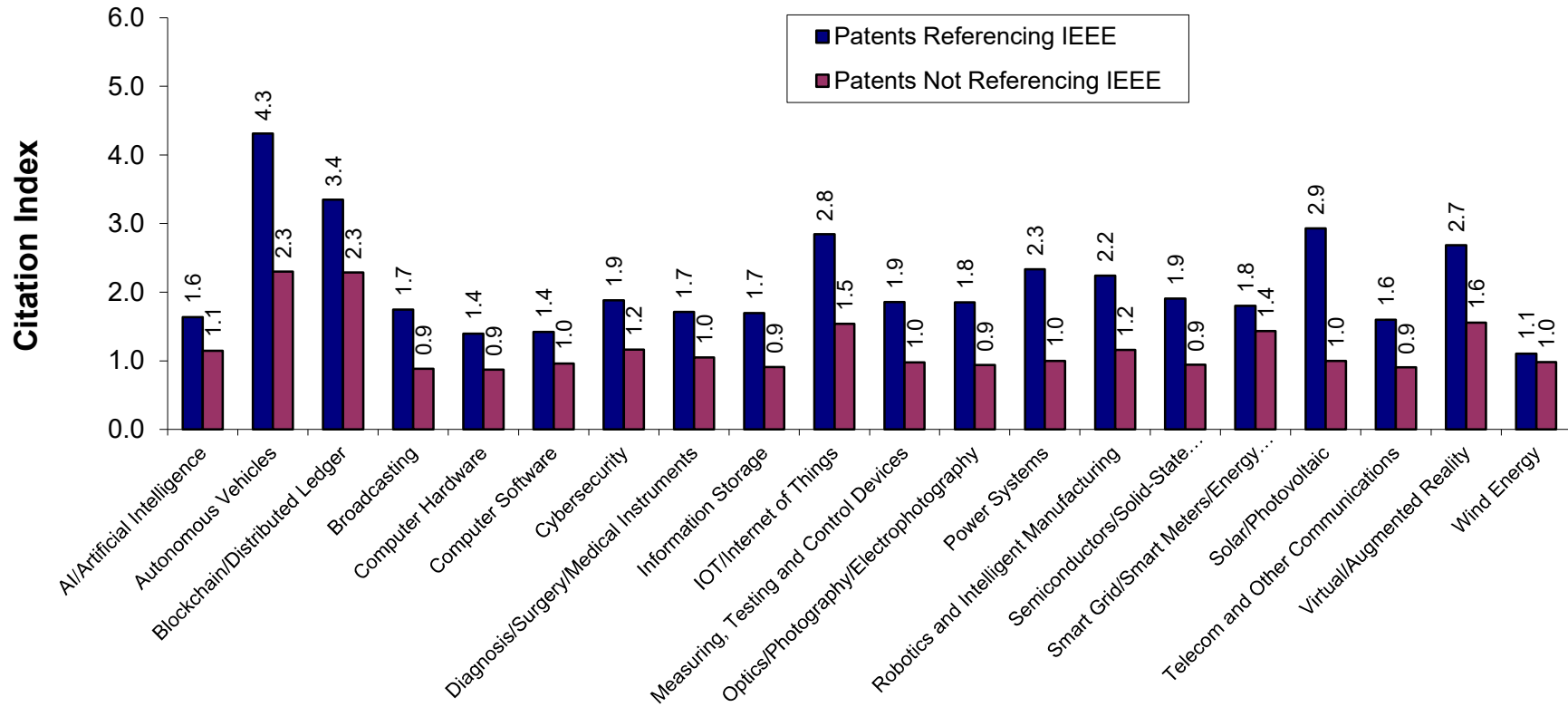
# and % of Science References from 2004-2023 Patents

# Figure 22 - # and % of Science References from 2004-2023 Wind Energy US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



# and % of Science References from 2004-2023 Patents

**Figure 23 - 2004-2023 Citation Index of US Patents Referencing IEEE Papers and Conferences Versus US Patents not Referencing IEEE for 20 Categories**



## ***Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<b><i>Publisher</i></b>	<b><i># Pat Refs to:</i></b>	<b><i>Percent of Total</i></b>
<b><i>Alphabet Inc.</i></b>		
IEEE	33016	30.5
ACM-Assoc Comput Mach	18369	16.9
RELX Group (Elsevier)	5785	5.3
Springer Nature	4286	4.0
International Telecommunication Union	3303	3.0
SPIE-Int Soc Opt Engineering	2609	2.4
Neural Information Processing Systems Foundation	2442	2.3
3GPP General Partnership Project Standards Body	2321	2.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1838	1.7
Joint IEEE and ACM	1891	1.7
ACL - Association for Computational Linguistics	1679	1.5
International Machine Learning Society (IMLS)	1459	1.3
CBS Interactive	1255	1.2
World Wide Web Consortium	1208	1.1
580 others with less than 1% each	26940	21.8
<b><i>Amazon.com Inc.</i></b>		
IEEE	17669	35.0
ACM-Assoc Comput Mach	7690	15.2
SPIE-Int Soc Opt Engineering	2573	5.1
RELX Group (Elsevier)	2204	4.4
IEEE/RSJ	1645	3.3
Springer Nature	1645	3.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1338	2.6
Internet Soc/IETF-Internet Eng Task Force	1260	2.5
Joint IEEE and ACM	984	1.9
Information Processing Society of Japan	567	1.1
The USENIX Association	577	1.1
333 others with less than 1% each	12388	22.4
<b><i>Apple Inc</i></b>		
IEEE	53838	30.6
ACM-Assoc Comput Mach	34082	19.4
RELX Group (Elsevier)	8866	5.0
3GPP General Partnership Project Standards Body	5934	3.4
ACL - Association for Computational Linguistics	5237	3.0
Springer Nature	4670	2.7
ISCA (International Speech Communication Association)	3518	2.0
Joint IEEE and ACM	3123	1.8
Association for the Advancement of Artificial Intelligence	2271	1.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1717	1.0
482 others with less than 1% each	52492	27.4

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b><i>Applied Materials Inc.</i></b>		
IEEE	5881	21.9
AIP Publishing	4632	17.2
RELX Group (Elsevier)	3936	14.6
Electrochemical Society, Inc.	1995	7.4
SPIE-Int Soc Opt Engineering	1104	4.1
MRS-Materials Research Soc	971	3.6
ACS-Am Chem Soc	972	3.6
Institute of Pure and Applied Physics	848	3.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	805	3.0
Springer Nature	647	2.4
PennWell Publishing Co.	607	2.3
Cahners Pub. Co.	385	1.4
AAAS-Am Assoc Advancement Sci	291	1.1
IOP Publishing	299	1.1
202 others with less than 1% each	3497	11.9

***BOE Technology Group Ltd***

IEEE	283	22.5
RELX Group (Elsevier)	129	10.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	112	8.9
ACS-Am Chem Soc	108	8.6
AIP Publishing	85	6.8
Springer Nature	78	6.2
SID-Society for Information Display	47	3.7
China Academic Journal Electronic Publishing House	37	2.9
Royal Society of Chemistry	35	2.8
Optical Society of America	28	2.2
ACM-Assoc Comput Mach	27	2.1
SPIE-Int Soc Opt Engineering	24	1.9
Institute of Pure and Applied Physics	19	1.5
American Physical Society	15	1.2
European Conference on Computer Vision-Google/Microsoft Others	12	1.0
Informa/CRC Press/Taylor & Francis	12	1.0
AAAS-Am Assoc Advancement Sci	13	1.0
93 others with less than 1% each	195	17.1

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Boeing Co. (The)</b>		
IEEE	5072	25.6
RELX Group (Elsevier)	3069	15.5
AIAA - American Institute of Aeronautics and Astronautics	1448	7.3
Springer Nature	797	4.0
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	748	3.8
AIP Publishing	697	3.5
SPIE-Int Soc Opt Engineering	611	3.1
ACS-Am Chem Soc	503	2.5
ACM-Assoc Comput Mach	440	2.2
NASA-National Aeronautics and Space Admin	402	2.0
SAE-Society of Automobile Engineers	350	1.8
Optical Society of America	270	1.4
SAGE Publications Ltd	245	1.2
IET/IEE	229	1.2
American Physical Society	226	1.1
ASME-Am Soc Mech Eng	211	1.1
423 others with less than 1% each	4489	19.2

***Bosch (Robert) GmbH***

IEEE	3690	25.7
RELX Group (Elsevier)	1400	9.8
Springer Nature	999	7.0
ACS-Am Chem Soc	388	2.7
American Diabetes Association	365	2.5
Amer Thoracic Soc	351	2.4
ACM-Assoc Comput Mach	326	2.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	323	2.2
Electrochemical Society, Inc.	302	2.1
SAGE Publications Ltd	224	1.6
American Medical Informatics Association	194	1.4
SAE-Society of Automobile Engineers	181	1.3
Georg Thieme Verlag	188	1.3
Royal Society of Chemistry	167	1.2
Wichtig Publishing	177	1.2
SPIE-Int Soc Opt Engineering	169	1.2
Ziff-Davis	159	1.1
Multidisciplinary Digital Publishing Institute (MDPI)	142	1.0
327 others with less than 1% each	4611	28.9



***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Broadcom Ltd</b>		
IEEE	34965	50.3
ACM-Assoc Comput Mach	8297	11.9
Internet Soc/IETF-Internet Eng Task Force	2744	4.0
The USENIX Association	2187	3.1
Joint IEEE and ACM	1568	2.3
RELX Group (Elsevier)	1496	2.2
International Telecommunication Union	1310	1.9
SMTA-Surface Mount Technology Association	1065	1.5
Network Working Group RFC	913	1.3
Springer Nature	846	1.2
PennWell Publishing Co.	749	1.1
ANSI-American National Standards Institute	690	1.0
3GPP General Partnership Project Standards Body	726	1.0
360 others with less than 1% each	11906	15.0
<b>Canon Inc</b>		
IEEE	6865	22.4
RELX Group (Elsevier)	3421	11.2
AIP Publishing	3027	9.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1959	6.4
SPIE-Int Soc Opt Engineering	1656	5.4
ACS-Am Chem Soc	1457	4.8
Springer Nature	1446	4.7
ACM-Assoc Comput Mach	987	3.2
Optical Society of America	897	2.9
International Telecommunication Union	664	2.2
Institute of Pure and Applied Physics	424	1.4
AAAS-Am Assoc Advancement Sci	407	1.3
American Physical Society	302	1.0
475 others with less than 1% each	7157	20.0

## ***Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<b><i>Publisher</i></b>	<b><i># Pat Refs to:</i></b>	<b><i>Percent of Total</i></b>
<b>CapitalOne</b>		
IEEE	949	24.1
CBS Interactive	303	7.7
ACM-Assoc Comput Mach	297	7.6
Network Working Group RFC	291	7.4
Springer Nature	256	6.5
Joint IEEE and ACM	199	5.1
RELX Group (Elsevier)	201	5.1
National Institute of Standards and Technology (NIST)	157	4.0
International Association for Cryptologic Research (IACR)	145	3.7
The Science and Information (SAI) Organization Limited	135	3.4
Neural Information Processing Systems Foundation	98	2.5
Cambridge University Press	96	2.4
ACL - Association for Computational Linguistics	73	1.9
arXiv.org	46	1.2
International Conference on Representation Learning	42	1.1
Association for the Advancement of Artificial Intelligence	39	1.0
124 others with less than 1% each	606	16.5

### ***Cisco Systems Inc.***

IEEE	19489	28.3
Internet Soc/IETF-Internet Eng Task Force	10943	15.9
Network Working Group RFC	7505	10.9
ACM-Assoc Comput Mach	7103	10.3
3GPP General Partnership Project Standards Body	5364	7.8
RELX Group (Elsevier)	1907	2.8
Springer Nature	1292	1.9
Joint IEEE and ACM	1338	1.9
The USENIX Association	1169	1.7
European Telecom Standards Institute (ETSI)	1130	1.6
International Telecommunication Union	791	1.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	710	1.0
340 others with less than 1% each	10106	12.5

## ***Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<b><i>Publisher</i></b>	<b><i># Pat Refs to:</i></b>	<b><i>Percent of Total</i></b>
<b><i>Dell Technologies Inc</i></b>		
IEEE	4262	32.9
ACM-Assoc Comput Mach	2379	18.4
The USENIX Association	1159	8.9
Joint IEEE and ACM	445	3.4
RELX Group (Elsevier)	440	3.4
Internet Soc/IETF-Internet Eng Task Force	373	2.9
Springer Nature	360	2.8
Network Working Group RFC	170	1.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	149	1.2
Microsoft	153	1.2
National Institute of Standards and Technology (NIST)	139	1.1
International Association for Cryptologic Research (IACR)	147	1.1
Very Large Data Base Endowment Inc. (VLDB Endowment)	146	1.1
268 others with less than 1% each	2629	17.9
<b><i>Ericsson</i></b>		
3GPP General Partnership Project Standards Body	37180	51.5
IEEE	15692	21.7
Network Working Group RFC	4951	6.9
Internet Soc/IETF-Internet Eng Task Force	4481	6.2
International Telecommunication Union	1303	1.8
ACM-Assoc Comput Mach	1160	1.6
European Telecom Standards Institute (ETSI)	1024	1.4
311 others with less than 1% each	6399	6.8
<b><i>Ford Motor Co.</i></b>		
IEEE	2444	25.5
SAE-Society of Automobile Engineers	2157	22.5
RELX Group (Elsevier)	1187	12.4
IP.Com	387	4.0
Springer Nature	288	3.0
ACM-Assoc Comput Mach	217	2.3
American Automatic Control Council (AACC)	187	2.0
IEEE/RSJ	174	1.8
ACS-Am Chem Soc	174	1.8
IET/IEE	125	1.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	119	1.2
ASME-Am Soc Mech Eng	100	1.0
256 others with less than 1% each	2012	18.7

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b><i>Fujifilm Business Innovation Co. (f/k/a Fuji Film Holdings Corp)</i></b>		
RELX Group (Elsevier)	2313	13.8
IEEE	2214	13.2
ACM-Assoc Comput Mach	1397	8.3
ACS-Am Chem Soc	1332	7.9
Springer Nature	1272	7.6
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1071	6.4
SPIE-Int Soc Opt Engineering	718	4.3
AIP Publishing	619	3.7
AAAS-Am Assoc Advancement Sci	254	1.5
Cell Press	257	1.5
Natl Acad Sciences	235	1.4
Optical Society of America	222	1.3
Oxford University Press	196	1.2
Royal Society of Chemistry	203	1.2
462 others with less than 1% each	4475	22.4

***General Electric Company***

IEEE	10960	26.9
RELX Group (Elsevier)	5888	14.4
International Telecommunication Union	2987	7.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2612	6.4
Springer Nature	1669	4.1
ACS-Am Chem Soc	1510	3.7
AIP Publishing	1120	2.7
ASME-Am Soc Mech Eng	835	2.0
SPIE-Int Soc Opt Engineering	728	1.8
AIAA - American Institute of Aeronautics and Astronautics	610	1.5
US Dept of Energy	482	1.2
NASA-National Aeronautics and Space Admin	505	1.2
ISO/IEC/JTC	404	1.0
652 others with less than 1% each	10464	21.3

## *Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>General Motors Corp</b>		
IEEE	1721	25.1
RELX Group (Elsevier)	1089	15.9
SAE-Society of Automobile Engineers	783	11.4
ACS-Am Chem Soc	440	6.4
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	358	5.2
Springer Nature	341	5.0
Electrochemical Society, Inc.	234	3.4
Royal Society of Chemistry	111	1.6
ASME-Am Soc Mech Eng	112	1.6
AIP Publishing	100	1.5
Optical Society of America	94	1.4
Trans Tech Publications Ltd.	88	1.3
ACM-Assoc Comput Mach	72	1.1
American Automatic Control Council (AACC)	71	1.0
IET/IEE	71	1.0
211 others with less than 1% each	1168	14.2

### **Hitachi Ltd**

IEEE	4379	25.5
ACM-Assoc Comput Mach	1258	7.3
RELX Group (Elsevier)	1182	6.9
AIP Publishing	874	5.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	566	3.3
IEICE-Inst Elec Info Comm Eng	535	3.1
Internet Soc/IETF-Internet Eng Task Force	537	3.1
Springer Nature	479	2.8
The USENIX Association	412	2.4
ACS-Am Chem Soc	389	2.3
Network Working Group RFC	338	2.0
International Telecommunication Union	315	1.8
SPIE-Int Soc Opt Engineering	294	1.7
Institute of Pure and Applied Physics	280	1.6
3GPP General Partnership Project Standards Body	253	1.5
Optical Society of America	236	1.4
IBM Corp.	225	1.3
SID-Society for Information Display	223	1.3
Joint IEEE and ACM	219	1.3
IET/IEE	207	1.2
American Physical Society	178	1.0
430 others with less than 1% each	3785	19.1

## ***Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<b><i>Publisher</i></b>	<b><i># Pat Refs to:</i></b>	<b><i>Percent of Total</i></b>
<b><i>Honda Motor Co. Ltd.(Honda Giken Kogyo KK)</i></b>		
IEEE	3589	32.9
RELX Group (Elsevier)	1478	13.5
Springer Nature	647	5.9
3GPP General Partnership Project Standards Body	605	5.5
ACS-Am Chem Soc	522	4.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	361	3.3
IEEE/RSJ	344	3.2
ACM-Assoc Comput Mach	282	2.6
ASME-Am Soc Mech Eng	146	1.3
IEEE/CVF	127	1.2
Neural Information Processing Systems Foundation	121	1.1
SAGE Publications Ltd	124	1.1
Royal Society of Chemistry	110	1.0
AAAS-Am Assoc Advancement Sci	109	1.0
281 others with less than 1% each	2344	18.8
<b><i>Honeywell International Inc.</i></b>		
IEEE	10319	24.5
RELX Group (Elsevier)	6387	15.2
ACS-Am Chem Soc	3349	8.0
SPIE-Int Soc Opt Engineering	2284	5.4
Springer Nature	2198	5.2
Optical Society of America	2028	4.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1882	4.5
AIP Publishing	1201	2.9
Royal Society of Chemistry	939	2.2
ACM-Assoc Comput Mach	528	1.3
American Physical Society	453	1.1
AAAS-Am Assoc Advancement Sci	415	1.0
570 others with less than 1% each	10075	19.4
<b><i>Huawei Technologies Company Ltd. (owned by HUAWEI Investment/Holding)</i></b>		
3GPP General Partnership Project Standards Body	40833	50.1
IEEE	18168	22.3
International Telecommunication Union	5943	7.3
Internet Soc/IETF-Internet Eng Task Force	3424	4.2
Network Working Group RFC	2072	2.5
ACM-Assoc Comput Mach	1610	2.0
European Telecom Standards Institute (ETSI)	825	1.0
339 others with less than 1% each	8619	8.4

## ***Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<b><i>Publisher</i></b>	<b><i># Pat Refs to:</i></b>	<b><i>Percent of Total</i></b>
<b><i>Hyundai Motor Co.</i></b>		
RELX Group (Elsevier)	367	26.3
IEEE	342	24.6
ACS-Am Chem Soc	101	7.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	66	4.7
Electrochemical Society, Inc.	62	4.5
3GPP General Partnership Project Standards Body	52	3.7
Springer Nature	47	3.4
SAE-Society of Automobile Engineers	37	2.7
ACM-Assoc Comput Mach	28	2.0
ISO/IEC/JTC	28	2.0
Royal Society of Chemistry	25	1.8
AIP Publishing	22	1.6
95 others with less than 1% each	216	16.9
<b><i>Intel Corporation</i></b>		
IEEE	38754	43.4
3GPP General Partnership Project Standards Body	10314	11.6
ACM-Assoc Comput Mach	7153	8.0
Joint IEEE and ACM	5643	6.3
RELX Group (Elsevier)	2643	3.0
Springer Nature	2133	2.4
AIP Publishing	1929	2.2
IET/IEE	1051	1.2
Internet Soc/IETF-Internet Eng Task Force	918	1.0
529 others with less than 1% each	18721	18.5
<b><i>International Business Machines Corp</i></b>		
IEEE	72712	27.6
ACM-Assoc Comput Mach	39592	15.0
IP.Com	17015	6.5
RELX Group (Elsevier)	12933	4.9
Joint IEEE and ACM	12304	4.7
Internet Soc/IETF-Internet Eng Task Force	11751	4.5
Springer Nature	9835	3.7
National Institute of Standards and Technology (NIST)	7549	2.9
AIP Publishing	6004	2.3
ACS-Am Chem Soc	5145	2.0
The USENIX Association	4676	1.8
IBM Corp.	4671	1.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4219	1.6
SPIE-Int Soc Opt Engineering	2514	1.0
Very Large Data Base Endowment Inc. (VLDB Endowment)	2626	1.0
1048 others with less than 1% each	50229	14.0

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Johnson &amp; Johnson</b>		
RELX Group (Elsevier)	73498	23.2
Springer Nature	34215	10.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	33051	10.5
ACS-Am Chem Soc	14315	4.5
Wolters Kluwer	12272	3.9
IEEE	10976	3.5
Natl Acad Sciences	7373	2.3
American Society for Biochemistry and Molecular Biology Inc.	4991	1.6
American SociETY for Microbiology	4879	1.5
Oxford University Press	4722	1.5
AAAS-Am Assoc Advancement Sci	4333	1.4
American Society for Pharmacology and Experimental Therapeutics	4101	1.3
Cell Press	4257	1.3
Mary Ann Liebert Inc.	3531	1.1
SAGE Publications Ltd	3064	1.0
838 others with less than 1% each	96566	25.6

***Kia Motors Corp.***

IEEE	234	25.2
RELX Group (Elsevier)	227	24.4
ACS-Am Chem Soc	63	6.8
3GPP General Partnership Project Standards Body	51	5.5
Electrochemical Society, Inc.	50	5.4
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	41	4.4
SAE-Society of Automobile Engineers	29	3.1
ISO/IEC/JTC	28	3.0
Springer Nature	23	2.5
AIP Publishing	14	1.5
Royal Society of Chemistry	14	1.5
ACM-Assoc Comput Mach	12	1.3
International Telecommunication Union	9	1.0
68 others with less than 1% each	135	13.8

***LG Chem Ltd.***

RELX Group (Elsevier)	2385	28.1
ACS-Am Chem Soc	1811	21.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1187	14.0
Royal Society of Chemistry	663	7.8
Springer Nature	433	5.1
AIP Publishing	304	3.6
Electrochemical Society, Inc.	245	2.9
American SociETY for Microbiology	97	1.1
AAAS-Am Assoc Advancement Sci	81	1.0
227 others with less than 1% each	1290	12.4



## ***Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<b><i>Publisher</i></b>	<b><i># Pat Refs to:</i></b>	<b><i>Percent of Total</i></b>
<b><i>LG Display Co Ltd</i></b>		
SID-Society for Information Display	1022	31.9
AIP Publishing	475	14.8
Korean Information Display Society (KIDS)	299	9.3
RELX Group (Elsevier)	268	8.4
ACS-Am Chem Soc	179	5.6
Institute of Pure and Applied Physics	135	4.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	133	4.2
IEEE	127	4.0
Springer Nature	105	3.3
SPIE-Int Soc Opt Engineering	82	2.6
Royal Society of Chemistry	76	2.4
72 others with less than 1% each	302	8.8
<b><i>LG Electronics Inc.</i></b>		
3GPP General Partnership Project Standards Body	41247	61.8
IEEE	10801	16.2
International Telecommunication Union	2887	4.3
ISO/IEC/JTC/ANSI	1684	2.5
European Telecom Standards Institute (ETSI)	1443	2.2
ATSC Std	1325	2.0
ISO/IEC/JTC	1017	1.5
Audio Eng Soc	835	1.3
211 others with less than 1% each	5466	7.3
<b><i>Medtronic Inc</i></b>		
RELX Group (Elsevier)	36153	17.3
Wolters Kluwer	26315	12.6
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	19192	9.2
Springer Nature	17002	8.1
IEEE	13684	6.5
Oxford University Press	6696	3.2
American Physiological Society	5742	2.7
American Association of Neurological Surgeons	4157	2.0
ACS-Am Chem Soc	3732	1.8
Radiological Society of North America	3497	1.7
International Federation of Gynecology and Obstetrics (FIGO)	3015	1.4
Mosby Inc.	2371	1.1
SPIE-Int Soc Opt Engineering	2160	1.0
American Heart Association (AHA)	2108	1.0
S. Karger AG	2104	1.0
626 others with less than 1% each	61141	26.5

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Meta Platforms Inc.(formerly Facebook Inc)</b>		
IEEE	4614	22.7
ACM-Assoc Comput Mach	3769	18.6
RELX Group (Elsevier)	1133	5.6
arXiv.org	839	4.1
Springer Nature	841	4.1
ACL - Association for Computational Linguistics	619	3.0
Optical Society of America	558	2.7
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	461	2.3
SPIE-Int Soc Opt Engineering	392	1.9
AIP Publishing	375	1.8
Dow Jones & Company	356	1.8
Joint IEEE and ACM	353	1.7
Neural Information Processing Systems Foundation	250	1.2
Internet Soc/IETF-Internet Eng Task Force	200	1.0
Association for the Advancement of Artificial Intelligence	207	1.0
239 others with less than 1% each	5347	24.0

***Micron Technology Inc.***

IEEE	43220	32.1
RELX Group (Elsevier)	22513	16.7
AIP Publishing	15076	11.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	5836	4.3
IEEE/JPN Soc App Phys	4951	3.7
ACS-Am Chem Soc	4567	3.4
Springer Nature	3221	2.4
Electrochemical Society, Inc.	3200	2.4
American Physical Society	3061	2.3
Institute of Pure and Applied Physics	2888	2.1
MRS-Materials Research Soc	1824	1.4
SPIE-Int Soc Opt Engineering	1768	1.3
Informa/CRC Press/Taylor & Francis	1462	1.1
IOP Publishing	1308	1.0
290 others with less than 1% each	19874	13.9

## ***Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<b><i>Publisher</i></b>	<b><i># Pat Refs to:</i></b>	<b><i>Percent of Total</i></b>
<b><i>Microsoft Corporation</i></b>		
IEEE	78268	30.8
ACM-Assoc Comput Mach	65583	25.8
Joint IEEE and ACM	8153	3.2
RELX Group (Elsevier)	8212	3.2
Springer Nature	7268	2.9
The USENIX Association	6131	2.4
International Telecommunication Union	4544	1.8
Microsoft	4352	1.7
Internet Soc/IETF-Internet Eng Task Force	3832	1.5
ACL - Association for Computational Linguistics	3203	1.3
SPIE-Int Soc Opt Engineering	3099	1.2
Very Large Data Base Endowment Inc. (VLDB Endowment)	2853	1.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2671	1.1
728 others with less than 1% each	55907	18.3
<b><i>Mitsubishi Electric Corp</i></b>		
IEEE	5202	39.7
3GPP General Partnership Project Standards Body	2361	18.0
ACM-Assoc Comput Mach	791	6.0
RELX Group (Elsevier)	439	3.3
IEICE-Inst Elec Info Comm Eng	424	3.2
International Telecommunication Union	369	2.8
IET/IEE	310	2.4
International Association for Cryptologic Research (IACR)	287	2.2
Springer Nature	259	2.0
AIP Publishing	200	1.5
SPIE-Int Soc Opt Engineering	157	1.2
Optical Society of America	154	1.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	137	1.0
260 others with less than 1% each	2021	13.0
<b><i>Murata Manufacturing Co. Ltd.</i></b>		
IEEE	12710	73.9
RELX Group (Elsevier)	828	4.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	501	2.9
Springer Nature	388	2.3
Joint IEEE and ACM	321	1.9
IEICE-Inst Elec Info Comm Eng	308	1.8
Institute of Pure and Applied Physics	260	1.5
IEEE/JPN Soc App Phys	233	1.4
AIP Publishing	227	1.3
IET/IEE	212	1.2
Horizon House Publications	209	1.2
European Microwave Association	192	1.1
92 others with less than 1% each	799	3.9

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>NEC Corp</b>		
3GPP General Partnership Project Standards Body	10981	36.7
IEEE	7341	24.5
ACM-Assoc Comput Mach	1557	5.2
IEICE-Inst Elec Info Comm Eng	853	2.8
RELX Group (Elsevier)	786	2.6
Springer Nature	638	2.1
Optical Society of America	478	1.6
Joint IEEE and ACM	458	1.5
AIP Publishing	387	1.3
Internet Soc/IETF-Internet Eng Task Force	362	1.2
International Telecommunication Union	332	1.1
398 others with less than 1% each	5776	18.3

**Oracle Corporation**

ACM-Assoc Comput Mach	15671	26.7
IEEE	13191	22.5
3GPP General Partnership Project Standards Body	3815	6.5
RELX Group (Elsevier)	2776	4.7
Joint IEEE and ACM	2389	4.1
Very Large Data Base Endowment Inc. (VLDB Endowment)	1961	3.3
Springer Nature	1780	3.0
Internet Soc/IETF-Internet Eng Task Force	1585	2.7
ACL - Association for Computational Linguistics	1528	2.6
The USENIX Association	1165	2.0
Network Working Group RFC	1038	1.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	880	1.5
407 others with less than 1% each	10855	15.7

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Panasonic Holding Corporation</b>		
IEEE	11145	29.0
3GPP General Partnership Project Standards Body	8523	22.2
International Telecommunication Union	2196	5.7
RELX Group (Elsevier)	2046	5.3
IEICE-Inst Elec Info Comm Eng	1666	4.3
AIP Publishing	1141	3.0
Institute of Pure and Applied Physics	784	2.0
Internet Soc/IETF-Internet Eng Task Force	684	1.8
ACS-Am Chem Soc	537	1.4
Springer Nature	553	1.4
European Telecom Standards Institute (ETSI)	481	1.3
ACM-Assoc Comput Mach	517	1.3
ISO/IEC/JTC/ANSI	463	1.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	473	1.2
ISO/IEC	449	1.2
Electrochemical Society, Inc.	434	1.1
SPIE-Int Soc Opt Engineering	415	1.1
436 others with less than 1% each	5956	12.3

**Qualcomm Inc**

IEEE	46909	32.9
3GPP General Partnership Project Standards Body	38027	26.6
International Telecommunication Union	17274	12.1
ISO/IEC/JTC/ANSI	3772	2.6
ISO/IEC/JTC	2697	1.9
ACM-Assoc Comput Mach	2735	1.9
Internet Soc/IETF-Internet Eng Task Force	2633	1.8
RELX Group (Elsevier)	2241	1.6
SID-Society for Information Display	1954	1.4
SPIE-Int Soc Opt Engineering	1647	1.2
Springer Nature	1612	1.1
ISO/IEC	1433	1.0
450 others with less than 1% each	19779	11.2

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b><i>RTX Corporation (f/k/a Raytheon Co.)</i></b>		
IEEE	7852	15.6
NASA-National Aeronautics and Space Admin	7758	15.4
RELX Group (Elsevier)	3388	6.7
IHS Markit	3215	6.4
ASME-Am Soc Mech Eng	2777	5.5
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2240	4.5
AIAA - American Institute of Aeronautics and Astronautics	2090	4.2
SAE-Society of Automobile Engineers	1548	3.1
SPIE-Int Soc Opt Engineering	1567	3.1
Optical Society of America	1503	3.0
Springer Nature	1356	2.7
ACS-Am Chem Soc	1131	2.2
AIP Publishing	912	1.8
Federal Aviation Administration	740	1.5
Cambridge University Press	711	1.4
McGraw Hill	607	1.2
Informa/CRC Press/Taylor & Francis	601	1.2
American Society of Mechanical Engineers	541	1.1
440 others with less than 1% each	9746	16.3

***Samsung Electronics Co Ltd***

3GPP General Partnership Project Standards Body	32468	31.1
IEEE	22881	21.9
RELX Group (Elsevier)	5143	4.9
ACS-Am Chem Soc	4964	4.8
AIP Publishing	3650	3.5
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3280	3.1
Springer Nature	3040	2.9
ACM-Assoc Comput Mach	2815	2.7
International Telecommunication Union	2717	2.6
SID-Society for Information Display	1605	1.5
SPIE-Int Soc Opt Engineering	1326	1.3
Royal Society of Chemistry	1102	1.1
European Telecom Standards Institute (ETSI)	1023	1.0
Optical Society of America	1089	1.0
671 others with less than 1% each	17263	13.1

## ***Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<b><i>Publisher</i></b>	<b><i># Pat Refs to:</i></b>	<b><i>Percent of Total</i></b>
<b><i>Saudi Arabian Oil Company (Saudi Aramco)</i></b>		
RELX Group (Elsevier)	11156	28.9
Society of Petroleum Engineers	5963	15.5
ACS-Am Chem Soc	5097	13.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2884	7.5
Springer Nature	1797	4.7
Society of Exploration Geophysicists	1648	4.3
Royal Society of Chemistry	1223	3.2
IEEE	765	2.0
AMER SOC TESTING MATERIALS	371	1.0
407 others with less than 1% each	7680	17.5
<b><i>Seiko Epson Corporation</i></b>		
IEEE	2490	32.7
RELX Group (Elsevier)	619	8.1
AIP Publishing	542	7.1
ACM-Assoc Comput Mach	487	6.4
Joint IEEE and ACM	471	6.2
SID-Society for Information Display	292	3.8
ACS-Am Chem Soc	270	3.5
Springer Nature	239	3.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	165	2.2
IEEE/JPN Soc App Phys	156	2.1
Institute of Pure and Applied Physics	161	2.1
SPIE-Int Soc Opt Engineering	111	1.5
IBM Corp.	103	1.4
American Physical Society	98	1.3
IP.Com	101	1.3
IEICE-Inst Elec Info Comm Eng	76	1.0
200 others with less than 1% each	1227	14.3
<b><i>Siemens Aktiengesellschaft</i></b>		
IEEE	13977	30.6
RELX Group (Elsevier)	5799	12.7
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	5742	12.6
SPIE-Int Soc Opt Engineering	2018	4.4
Springer Nature	2023	4.4
AIP Publishing	1162	2.5
Joint IEEE and ACM	1103	2.4
ACM-Assoc Comput Mach	912	2.0
Society of Magnetic Resonance in Medicine (SMRM)	737	1.6
Radiological Society of North America	665	1.5
Wolters Kluwer	603	1.3
IOP Publishing	515	1.1
The Medical Image Computing and Computer Assisted Intervention Society (MICCAI)	463	1.0
672 others with less than 1% each	9984	18.5

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>SK Hynix Inc</b>		
IEEE	1698	55.5
Joint IEEE and ACM	183	6.0
ACM-Assoc Comput Mach	177	5.8
AIP Publishing	130	4.2
RELX Group (Elsevier)	109	3.6
IEEE/JPN Soc App Phys	106	3.5
The USENIX Association	66	2.2
Springer Nature	58	1.9
Technical Association of Photopolymers	46	1.5
JEDEC Semiconductor Standards Organization	47	1.5
SPIE-Int Soc Opt Engineering	42	1.4
ACS-Am Chem Soc	33	1.1
88 others with less than 1% each	367	11.1

**Sony Group Corp**

IEEE	14373	33.1
3GPP General Partnership Project Standards Body	6476	14.9
International Telecommunication Union	2962	6.8
ACM-Assoc Comput Mach	2835	6.5
RELX Group (Elsevier)	1860	4.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	941	2.2
SPIE-Int Soc Opt Engineering	823	1.9
Springer Nature	810	1.9
ACS-Am Chem Soc	718	1.7
European Telecom Standards Institute (ETSI)	707	1.6
Internet Soc/IETF-Internet Eng Task Force	655	1.5
AIP Publishing	613	1.4
Joint IEEE and ACM	486	1.1
IEICE-Inst Elec Info Comm Eng	469	1.1
ISO/IEC/JTC/ANSI	442	1.0
488 others with less than 1% each	8236	15.3

**Taiwan Semiconductor Manufacturing Co.**

IEEE	11130	34.3
AIP Publishing	8203	25.3
RELX Group (Elsevier)	3365	10.4
Electrochemical Society, Inc.	1251	3.9
Institute of Pure and Applied Physics	1033	3.2
IEEE/JPN Soc App Phys	930	2.9
Springer Nature	906	2.8
SPIE-Int Soc Opt Engineering	862	2.7
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	740	2.3
ACS-Am Chem Soc	469	1.4
IET/IEE	309	1.0
190 others with less than 1% each	3231	8.7



## ***Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<b><i>Publisher</i></b>	<b><i># Pat Refs to:</i></b>	<b><i>Percent of Total</i></b>
<b><i>Texas Instruments Inc</i></b>		
IEEE	10929	58.5
International Telecommunication Union	1963	10.5
3GPP General Partnership Project Standards Body	759	4.1
RELX Group (Elsevier)	661	3.5
AIP Publishing	555	3.0
Joint IEEE and ACM	332	1.8
SPIE-Int Soc Opt Engineering	310	1.7
IEEE/JPN Soc App Phys	260	1.4
IET/IEE	263	1.4
Springer Nature	224	1.2
ACM-Assoc Comput Mach	219	1.2
230 others with less than 1% each	2195	9.6

### ***Toshiba Corp***

IEEE	9403	39.8
AIP Publishing	1715	7.3
RELX Group (Elsevier)	1540	6.5
IEEE/JPN Soc App Phys	741	3.1
International Telecommunication Union	729	3.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	707	3.0
Springer Nature	666	2.8
American Physical Society	560	2.4
IEICE-Inst Elec Info Comm Eng	506	2.1
ACM-Assoc Comput Mach	481	2.0
SPIE-Int Soc Opt Engineering	467	2.0
ACS-Am Chem Soc	398	1.7
Internet Soc/IETF-Internet Eng Task Force	385	1.6
Institute of Pure and Applied Physics	382	1.6
AACS-Advanced Access Content System	299	1.3
402 others with less than 1% each	4674	16.9

***Appendix A - Publishers Receiving Most References from Top 50 Companies  
(Top 50 Companies in terms of 2023 Patent Activity; References from 2004-2023 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Toyota Motor Corp</b>		
IEEE	3513	22.3
RELX Group (Elsevier)	2745	17.4
Springer Nature	1098	7.0
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	999	6.3
ACS-Am Chem Soc	836	5.3
AIP Publishing	409	2.6
American Society of Plant Biologists	391	2.5
ACM-Assoc Comput Mach	336	2.1
AAAS-Am Assoc Advancement Sci	310	2.0
SAE-Society of Automobile Engineers	266	1.7
Electrochemical Society, Inc.	254	1.6
Optical Society of America	248	1.6
Royal Society of Chemistry	246	1.6
IEEE/CVF	238	1.5
Natl Acad Sciences	215	1.4
338 others with less than 1% each	3629	20.5

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Artificial Intelligence and Machine Learning</i>										
1	Alphabet Inc.	6711	20150	33.3	IEEE	6711	33.3	Neural Information Processing Systems Foundation	1855	9.2
2	International Business Machi	5836	22658	25.8	IEEE	5836	25.8	ACM-Assoc Comput Mach	2510	11.1
3	Microsoft Corporation	5245	17300	30.3	IEEE	5245	30.3	ACM-Assoc Comput Mach	3189	18.4
4	Adobe Inc. (former Adobe Sy	3131	7727	40.5	IEEE	3131	40.5	ACM-Assoc Comput Mach	1327	17.2
5	STRONG FORCE IOT PORT	2045	2865	71.4	IEEE	2045	71.4	RELX Group (Elsevier)	255	8.9
6	Samsung Electronics Co Ltd	2012	4223	47.6	IEEE	2012	47.6	ACM-Assoc Comput Mach	194	4.6
7	Apple Inc	1953	5950	32.8	IEEE	1953	32.8	ACM-Assoc Comput Mach	1072	18.0
8	Magic Leap Inc	1531	2465	62.1	IEEE	1531	62.1	Neural Information Processing Systems Foundation	219	8.9
9	NVIDIA Corp.	1346	3091	43.5	IEEE	1346	43.5	ACM-Assoc Comput Mach	265	8.6
10	Amazon.com Inc.	1267	3453	36.7	IEEE	1267	36.7	ACM-Assoc Comput Mach	425	12.3
11	Intel Corporation	1182	2790	42.4	IEEE	1182	42.4	ACM-Assoc Comput Mach	298	10.7
12	Meta Platforms Inc.(formerly	1166	4552	25.6	IEEE	1166	25.6	ACM-Assoc Comput Mach	716	15.7
13	Brain Corporation	1069	3182	33.6	IEEE	1069	33.6	MIT Press	427	13.4
14	HRL Laboratories LLC	1020	2693	37.9	IEEE	1020	37.9	RELX Group (Elsevier)	231	8.6
15	The Arizona Board of Regent	920	2014	45.7	IEEE	920	45.7	ACM-Assoc Comput Mach	154	7.6
16	Salesforce Inc. (f/k/a Salesfor	852	3787	22.5	IEEE	852	22.5	ACL - Association for Computational Linguistics	847	22.4
17	Siemens Aktiengesellschaft	847	2777	30.5	IEEE	847	30.5	RELX Group (Elsevier)	361	13.0
18	Baidu Inc	835	2735	30.5	IEEE	835	30.5	arXiv.org	655	23.9
19	NUMENTA INC	776	3237	24.0	Numenta Inc.	1190	36.8	IEEE	776	24.0
20	Xperi Inc. (f/k/a Tessera Inc)	763	1434	53.2	IEEE	763	53.2	Joint IEEE and ACM	131	9.1
21	STRONG FORCE TX PORT	753	1848	40.7	IEEE	753	40.7	RELX Group (Elsevier)	366	19.8
22	Qualcomm Inc	707	2035	34.7	IEEE	707	34.7	Springer Nature	200	9.8
23	Honda Motor Co. Ltd.(Honda	684	1249	54.8	IEEE	684	54.8	IEEE/CVF	68	5.4
24	NEWVALUEXCHANGE LT	652	1862	35.0	IEEE	652	35.0	ACM-Assoc Comput Mach	420	22.6
25	Oracle Corporation	652	3749	17.4	IEEE	652	17.4	ACL - Association for Computational Linguistics	619	16.5
26	Toyota Motor Corp	611	1159	52.7	IEEE	611	52.7	IEEE/CVF	112	9.7
27	Cortica Ltd	594	908	65.4	IEEE	594	65.4	ACM-Assoc Comput Mach	107	11.8
28	Cisco Systems Inc.	593	1747	33.9	IEEE	593	33.9	ACM-Assoc Comput Mach	221	12.7
29	NEC Corp	530	1475	35.9	IEEE	530	35.9	ACM-Assoc Comput Mach	168	11.4
30	General Electric Company	522	967	54.0	IEEE	522	54.0	RELX Group (Elsevier)	83	8.6
31	UATC LLC	500	850	58.8	IEEE	500	58.8	IEEE/CVF	127	14.9
32	Bosch (Robert) GmbH	480	1101	43.6	IEEE	480	43.6	Neural Information Processing Systems Foundation	72	6.5
33	STMicroelectronics	440	711	61.9	IEEE	440	61.9	Joint IEEE and ACM	61	8.6
34	University of Alabama	439	580	75.7	IEEE	439	75.7	RELX Group (Elsevier)	28	4.8
35	DIVEPLANE CORP	420	1756	23.9	IEEE	420	23.9	Springer Nature	253	14.4
36	Huawei Technologies Compa	419	1036	40.4	IEEE	419	40.4	ACM-Assoc Comput Mach	117	11.3
37	Massachusetts Institute of Te	411	2453	16.8	Springer Nature	436	17.8	IEEE	411	16.8
38	Columbia University	407	1185	34.3	IEEE	407	34.3	ACM-Assoc Comput Mach	149	12.6
39	RTX Corporation (f/k/a Rayt	393	867	45.3	IEEE	393	45.3	RELX Group (Elsevier)	67	7.7

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	University of California	384	2429	15.8	IEEE	384	15.8	Springer Nature	350	14.4
41	IP RESERVOIR LLC	376	712	52.8	IEEE	376	52.8	ACM-Assoc Comput Mach	107	15.0
42	Xerox Corp	369	1203	30.7	IEEE	369	30.7	ACM-Assoc Comput Mach	133	11.1
43	Cambricon Technologies Co	364	1168	31.2	Joint IEEE and ACM	378	32.4	ACM-Assoc Comput Mach	376	32.2
44	SAS Institute	358	1439	24.9	IEEE	358	24.9	RELX Group (Elsevier)	190	13.2
45	Sony Group Corp	355	805	44.1	IEEE	355	44.1	ACM-Assoc Comput Mach	59	7.3
46	STATS LLC	353	704	50.1	IEEE	353	50.1	arXiv.org	58	8.2
47	Micron Technology Inc.	349	652	53.5	IEEE	349	53.5	ACM-Assoc Comput Mach	59	9.0
48	Fujitsu Limited	344	1063	32.4	IEEE	344	32.4	ACM-Assoc Comput Mach	116	10.9
49	TuSimple	324	522	62.1	IEEE	324	62.1	arXiv.org	50	9.6
50	Twitter Inc	318	458	69.4	IEEE	318	69.4	RELX Group (Elsevier)	27	5.9
51	Nokia Corporation	317	682	46.5	IEEE	317	46.5	ACM-Assoc Comput Mach	64	9.4
52	Koninklijke Philips N.V.	314	883	35.6	IEEE	314	35.6	RELX Group (Elsevier)	107	12.1
53	eBay Inc	311	604	51.5	IEEE	311	51.5	ACM-Assoc Comput Mach	76	12.6
54	CARTICA AI LTD	309	487	63.4	IEEE	309	63.4	ACM-Assoc Comput Mach	56	11.5
55	CapitalOne	307	1050	29.2	IEEE	307	29.2	RELX Group (Elsevier)	119	11.3
56	Battelle Memorial Institute	301	513	58.7	IEEE	301	58.7	RELX Group (Elsevier)	43	8.4
57	NEURALA INC	278	575	48.3	IEEE	278	48.3	MIT Press	55	9.6
58	Snap Inc	270	609	44.3	IEEE	270	44.3	ACM-Assoc Comput Mach	108	17.7
59	Canon Inc	269	564	47.7	IEEE	269	47.7	Neural Information Processing Systems Foundation	35	6.2
60	SRI International	265	782	33.9	IEEE	265	33.9	Neural Information Processing Systems Foundation	60	7.7
61	Naver Corp.	264	504	52.4	IEEE	264	52.4	ACL - Association for Computational Linguistics	49	9.7
62	Western Digital Corp.	261	647	40.3	IEEE	261	40.3	Joint IEEE and ACM	108	16.7
63	Ohio State University	248	339	73.2	IEEE	248	73.2	RELX Group (Elsevier)	20	5.9
64	Accenture Ltd.	247	950	26.0	IEEE	247	26.0	ACM-Assoc Comput Mach	138	14.5
65	CEREBRAS SYSTEMS INC	243	486	50.0	IEEE	243	50.0	Joint IEEE and ACM	84	17.3
66	AT&T Inc	232	675	34.4	IEEE	232	34.4	ACM-Assoc Comput Mach	153	22.7
67	Illumina Inc.	232	1114	20.8	Springer Nature	286	25.7	IEEE	232	20.8
68	Sap SE	227	814	27.9	IEEE	227	27.9	ACM-Assoc Comput Mach	116	14.3
69	AUTOBRAINS TECHNOLO	224	355	63.1	IEEE	224	63.1	ACM-Assoc Comput Mach	32	9.0
70	Purdue University	222	510	43.5	IEEE	222	43.5	ACM-Assoc Comput Mach	88	17.3
71	Cornell University	219	1762	12.4	RELX Group (Elsevier)	259	14.7	Springer Nature	228	12.9
72	Tencent Holding Ltd	217	535	40.6	IEEE	217	40.6	ACM-Assoc Comput Mach	32	6.0
73	INTRINSIC INNOVATION	214	457	46.8	IEEE	214	46.8	ACM-Assoc Comput Mach	51	11.2
74	Walt Disney Co.	214	773	27.7	IEEE	214	27.7	ACM-Assoc Comput Mach	197	25.5
75	23ANDME INC	211	5135	4.1	Cell Press	1025	20.0	Springer Nature	736	14.3
76	BERTEC CORP	209	314	66.6	IEEE	209	66.6	INRIA Grenoble - Rhône-Alpes	38	12.1
77	Hewlett Packard Enterprises	209	523	40.0	IEEE	209	40.0	ACM-Assoc Comput Mach	72	13.8
78	Dell Technologies Inc	207	619	33.4	IEEE	207	33.4	ACM-Assoc Comput Mach	83	13.4
79	Spotify AB	207	455	45.5	IEEE	207	45.5	International Society for Music Information Retrieval Conferen	63	13.8
80	Toshiba Corp	207	431	48.0	IEEE	207	48.0	Springer Nature	30	7.0

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	University of Tennessee Rese	206	502	41.0	IEEE	206	41.0	RELX Group (Elsevier)	63	12.5
82	COGNIZANT TECHNOLOG	205	1031	19.9	ACM-Assoc Comput Mach	207	20.1	IEEE	205	19.9
83	PINDROP SECURITY INC	202	347	58.2	IEEE	202	58.2	International Speech Communication Association (ISCA)	58	16.7
84	Intellective AI Inc (f/k/a Omn	199	242	82.2	IEEE	199	82.2	International Association for Pattern Recognition (IAPR)	26	10.7
85	Trellix (merger of FireEye Inc	185	525	35.2	IEEE	185	35.2	ACM-Assoc Comput Mach	87	16.6
86	Boeing Co. (The)	184	553	33.3	IEEE	184	33.3	RELX Group (Elsevier)	75	13.6
87	United States Navy	177	380	46.6	IEEE	177	46.6	RELX Group (Elsevier)	57	15.0
88	D-Wave Quantum Inc. (forme	172	808	21.3	IEEE	172	21.3	International Machine Learning Society (IMLS)	125	15.5
89	ASAPP INC	171	828	20.7	IEEE	171	20.7	ACL - Association for Computational Linguistics	160	19.3
90	University of Illinois	171	738	23.2	IEEE	171	23.2	Springer Nature	77	10.4
91	INCEPTION INSTITUTE OF	167	274	60.9	IEEE	167	60.9	IEEE/CVF	36	13.1
92	NEW VALUEXCHANGE L	165	462	35.7	IEEE	165	35.7	ACM-Assoc Comput Mach	102	22.1
93	University of South Florida	165	351	47.0	IEEE	165	47.0	RELX Group (Elsevier)	39	11.1
94	State University of New York	159	639	24.9	IEEE	159	24.9	ACM-Assoc Comput Mach	55	8.6
95	Aerospace Corp.	158	507	31.2	IEEE	158	31.2	RELX Group (Elsevier)	152	30.0
96	LIGHTELLIGENCE PTE LT	156	1395	11.2	Springer Nature	333	23.9	Optical Society of America	248	17.8
97	Northeastern University (Bost	153	353	43.3	IEEE	153	43.3	Springer Nature	31	8.8
98	Johnson & Johnson	150	402	37.3	IEEE	150	37.3	RELX Group (Elsevier)	55	13.7
99	Stanford University	150	1101	13.6	Springer Nature	225	20.4	IEEE	150	13.6
100	United States of America Dep	150	403	37.2	IEEE	150	37.2	Neural Information Processing Systems Foundation	33	8.2

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Autonomous Vehicles</i>										
1	Irobot Corp	1762	3385	52.1	IEEE	1762	52.1	SPIE-Int Soc Opt Engineering	429	12.7
2	TuSimple	1094	1690	64.7	IEEE	1094	64.7	Neural Information Processing Systems Foundation	135	8.0
3	Amazon.com Inc.	891	1400	63.6	IEEE	891	63.6	SAGE Publications Ltd	91	6.5
4	State Farm Mutual Automobi	616	1986	31.0	IEEE	616	31.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	126	6.3
5	UATC LLC	542	865	62.7	IEEE	542	62.7	IEEE/CVF	54	6.2
6	Alphabet Inc.	539	1015	53.1	IEEE	539	53.1	IEEE/RSJ	68	6.7
7	NVIDIA Corp.	470	909	51.7	IEEE	470	51.7	SAE-Society of Automobile Engineers	100	11.0
8	Nio Co. Ltd	318	571	55.7	IEEE	318	55.7	CBS Interactive	38	6.7
9	Walmart Stores Inc	297	840	35.4	IEEE	297	35.4	CBS Interactive	88	10.5
10	CARTICA AI LTD	285	448	63.6	IEEE	285	63.6	ACM-Assoc Comput Mach	51	11.4
11	FedEx Corp	284	532	53.4	IEEE	284	53.4	RELX Group (Elsevier)	68	12.8
12	Toyota Motor Corp	273	492	55.5	IEEE	273	55.5	IEEE/RSJ	32	6.5
13	Honda Motor Co. Ltd.(Honda	272	510	53.3	IEEE	272	53.3	RELX Group (Elsevier)	28	5.5
14	MOTIONAL AD LLC	222	473	46.9	IEEE	222	46.9	SAE-Society of Automobile Engineers	36	7.6
15	Aptiv Plc (former Delphi Aut	218	440	49.5	IEEE	218	49.5	RELX Group (Elsevier)	34	7.7
16	Intel Corporation	211	622	33.9	IEEE	211	33.9	Neural Information Processing Systems Foundation	54	8.7
17	Ford Motor Co.	193	366	52.7	IEEE	193	52.7	RELX Group (Elsevier)	26	7.1
18	Siemens Aktiengesellschaft	173	263	65.8	IEEE	173	65.8	Springer Nature	21	8.0
19	NURO INC	167	279	59.9	IEEE	167	59.9	IEEE/RSJ	18	6.5
20	Baidu Inc	162	255	63.5	IEEE	162	63.5	RELX Group (Elsevier)	16	6.3
21	Uber Technologies Inc	148	242	61.2	IEEE	148	61.2	RELX Group (Elsevier)	11	4.5
22	Brain Corporation	140	309	45.3	IEEE	140	45.3	Springer Nature	30	9.7
23	Nissan Motor Co. Ltd.	139	209	66.5	IEEE	139	66.5	Mcgraw Hill	15	7.2
24	International Business Machi	138	669	20.6	IEEE	138	20.6	IP.Com	105	15.7
25	HRL Laboratories LLC	131	245	53.5	IEEE	131	53.5	IEEE/RSJ	17	6.9
26	Boeing Co. (The)	116	266	43.6	IEEE	116	43.6	IEEE/RSJ	16	6.0
27	AUTOBRAINS TECHNOLO	114	179	63.7	IEEE	114	63.7	ACM-Assoc Comput Mach	16	8.9
28	Zebra Technologies Corp.	112	233	48.1	IEEE	112	48.1	ACM-Assoc Comput Mach	21	9.0
29	AURORA OPERATIONS IN	105	147	71.4	IEEE	105	71.4	International Machine Learning Society (IMLS)	9	6.1
30	DIVEPLANE CORP	104	452	23.0	IEEE	104	23.0	Springer Nature	72	15.9
31	Renault SA	97	140	69.3	IEEE	97	69.3	Mcgraw Hill	10	7.1
32	University of Pennsylvania	93	180	51.7	IEEE	93	51.7	Springer Nature	15	8.3
33	IFLIGHT Innovation Technol	90	191	47.1	IEEE	90	47.1	AIAA - American Institute of Aeronautics and Astronautics	21	11.0
34	TRIFO INC	88	115	76.5	IEEE	88	76.5	SAGE Publications Ltd	25	21.7
35	APEX ARTIFICIAL INTELL	81	295	27.5	IEEE	81	27.5	RELX Group (Elsevier)	44	14.9
36	SPHERO INC	79	82	96.3	IEEE	79	96.3	American Automatic Control Council (AACC)	3	3.7
37	Allstate Corp	76	172	44.2	IEEE	76	44.2	ACM-Assoc Comput Mach	19	11.0
38	PELTON TECHNOLOGY I	72	146	49.3	IEEE	72	49.3	American Automatic Control Council (AACC)	21	14.4
39	University of Massachusetts	70	108	64.8	IEEE	70	64.8	Mcgraw Hill	14	13.0

## *Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)*

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Bosch (Robert) GmbH	65	106	61.3	IEEE	65	61.3	IEEE/RSJ	5	4.7
41	California Institute of Techno	59	152	38.8	IEEE	59	38.8	IOP Publishing	12	7.9
42	INTOUCH TECHNOLOGIE	57	170	33.5	IEEE	57	33.5	IEEE/RSJ	16	9.4
43	General Motors Corp	56	96	58.3	IEEE	56	58.3	RELX Group (Elsevier)	9	9.4
44	Huawei Technologies Compa	54	83	65.1	IEEE	54	65.1	IEEE/RSJ	9	10.8
45	MAY MOBILITY INC	51	64	79.7	IEEE	51	79.7	IEEE/RSJ	13	20.3
46	Garrett Motion (f/k/a Garrett	43	152	28.3	SAE-Society of Automobile Engineers	48	31.6	IEEE	43	28.3
47	Qualcomm Inc	40	75	53.3	IEEE	40	53.3	SAGE Publications Ltd	6	8.0
48	Digimarc Corp.	39	96	40.6	IEEE	39	40.6	ACM-Assoc Comput Mach	14	14.6
49	NEC Corp	38	64	59.4	IEEE	38	59.4	European Conference on Computer Vision-Google/Microsoft	7	10.9
50	PERCEPTIVE AUTOMATA	38	59	64.4	IEEE	38	64.4	Neural Information Processing Systems Foundation	14	23.7
51	Zhejiang Geely Holding Grou	37	54	68.5	IEEE	37	68.5	Springer Nature	5	9.3
52	AT&T Inc	35	91	38.5	IEEE	35	38.5	RELX Group (Elsevier)	18	19.8
53	Apple Inc	34	93	36.6	IEEE	34	36.6	ACM-Assoc Comput Mach	12	12.9
54	CYBERNET SYSTEMS CO	34	58	58.6	IEEE	34	58.6	SPIE-Int Soc Opt Engineering	6	10.3
55	GECKO ROBOTICS INC	34	69	49.3	IEEE	34	49.3	IEEE/RSJ	17	24.6
56	Massachusetts Institute of Te	34	96	35.4	IEEE	34	35.4	RELX Group (Elsevier)	12	12.5
57	Micron Technology Inc.	34	76	44.7	IEEE	34	44.7	ACM-Assoc Comput Mach	7	9.2
58	Toshiba Corp	32	54	59.3	IEEE	32	59.3	European Conference on Computer Vision-Google/Microsoft	7	13.0
59	University of Michigan	32	52	61.5	IEEE	32	61.5	AAAS-Am Assoc Advancement Sci	3	5.8
60	AUTONOMOUS SOLUTIO	31	95	32.6	IEEE	31	32.6	American Automatic Control Council (AACC)	18	18.9
61	Here Global BV	31	55	56.4	IEEE	31	56.4	RELX Group (Elsevier)	7	12.7
62	PATRONESS LLC	29	52	55.8	IEEE	29	55.8	European Telecom Standards Institute (ETSI)	8	15.4
63	STRADVISION INC	29	47	61.7	IEEE	29	61.7	IEEE/CVF	5	10.6
64	TELADOC HEALTH INC	28	88	31.8	IEEE	28	31.8	IEEE/RSJ	8	9.1
65	Deere & Co.	27	68	39.7	IEEE	27	39.7	IP.Com	8	11.8
66	Deka Products LP	27	49	55.1	IEEE	27	55.1	JAPAN SOC MECHANICAL ENGINEERS	4	8.2
67	Lockheed Martin Corp.	27	548	4.9	American Physical Society	99	18.1	Springer Nature	99	18.1
68	CARTICA AL LTD	25	38	65.8	IEEE	25	65.8	ACM-Assoc Comput Mach	4	10.5
69	ROBART GMBH	24	34	70.6	IEEE	24	70.6	Joint IEEE and ACM	8	23.5
70	Oshkosh Corporation	23	30	76.7	IEEE	23	76.7	SAE-Society of Automobile Engineers	2	6.7
71	Samsung Electronics Co Ltd	23	39	59.0	IEEE	23	59.0	European Telecom Standards Institute (ETSI)	3	7.7
72	THE CHAMBERLAIN GRO	23	66	34.8	IEEE	23	34.8	International Association for Cryptologic Research (IACR)	10	15.2
73	EPISYS SCIENCE INC	22	48	45.8	IEEE	22	45.8	Springer Nature	6	12.5
74	Porsche Automobil Holding S	22	34	64.7	IEEE	22	64.7	arXiv.org	2	5.9
75	Hyundai Motor Co.	21	44	47.7	IEEE	21	47.7	Informa/CRC Press/Taylor & Francis	2	4.5
76	INDIVIDUAL PATENTER	21	25	84.0	IEEE	21	84.0	ACTA PRESS/I A S T E D, 4500-16TH AVE NW, STE 80, C	1	4.0
77	The Arizona Board of Regent	21	48	43.8	IEEE	21	43.8	Joint IEEE and ACM	6	12.5
78	THE CHAMBERLAIN GRO	21	63	33.3	IEEE	21	33.3	International Association for Cryptologic Research (IACR)	10	15.9
79	Aviation Industry Corporatio	20	34	58.8	IEEE	20	58.8	SAE-Society of Automobile Engineers	13	38.2
80	HANGZHOU ZERO ZERO	20	26	76.9	IEEE	20	76.9	SAGE Publications Ltd	4	15.4

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Mitsubishi Electric Corp	20	32	62.5	IEEE	20	62.5	RELX Group (Elsevier)	5	15.6
82	NONEND INVENTIONS N	20	22	90.9	IEEE	20	90.9	The International Association for Computers and Communicati	1	4.5
83	STARSHIP TECHNOLOGIE	20	46	43.5	IEEE	20	43.5	IEEE/RSJ	7	15.2
84	Brown University Research F	19	28	67.9	IEEE	19	67.9	RELX Group (Elsevier)	6	21.4
85	Duke University	19	28	67.9	IEEE	19	67.9	RELX Group (Elsevier)	6	21.4
86	Fujitsu Limited	19	30	63.3	IEEE	19	63.3	RELX Group (Elsevier)	2	6.7
87	Kia Motors Corp.	19	42	45.2	IEEE	19	45.2	Informa/CRC Press/Taylor & Francis	2	4.8
88	LG Electronics Inc.	19	25	76.0	IEEE	19	76.0	Multidisciplinary Digital Publishing Institute (MDPI)	2	8.0
89	Panasonic Holding Corporati	19	27	70.4	IEEE	19	70.4	Springer Nature	2	7.4
90	PLUSAI INC	19	38	50.0	IEEE	19	50.0	IEEE/RSJ	5	13.2
91	GATIK AI INC	18	25	72.0	IEEE	18	72.0	American Automatic Control Council (AACC)	7	28.0
92	RTX Corporation (f/k/a Rayt	18	46	39.1	IEEE	18	39.1	SPIE-Int Soc Opt Engineering	9	19.6
93	AFFECTIVA INC	17	33	51.5	IEEE	17	51.5	RELX Group (Elsevier)	5	15.2
94	Causam Enterprises (former	17	30	56.7	IEEE	17	56.7	RELX Group (Elsevier)	4	13.3
95	Comcast Corp	17	22	77.3	IEEE	17	77.3	Network Working Group RFC	2	9.1
96	Denso Corp	17	33	51.5	IEEE	17	51.5	RELX Group (Elsevier)	5	15.2
97	French National Institute for	17	23	73.9	IEEE	17	73.9	Association for the Advancement of Artificial Intelligence	1	4.3
98	NXP Semiconductors NV	17	20	85.0	IEEE	17	85.0	The European Association on Antennas and Propagation (Eur	1	5.0
99	Wipro Ltd	17	29	58.6	IEEE	17	58.6	RELX Group (Elsevier)	4	13.8
100	Battelle Memorial Institute	16	24	66.7	IEEE	16	66.7	IEEE/RSJ	6	25.0



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<i>Blockchain/Distributed Ledger</i>										
1	Advanced New Technologies	434	844	51.4	IEEE	434	51.4	ACM-Assoc Comput Mach	67	7.9
2	International Business Machi	377	1144	33.0	IEEE	377	33.0	IP.Com	241	21.1
3	STRONG FORCE TX PORT	208	474	43.9	IEEE	208	43.9	RELX Group (Elsevier)	84	17.7
4	NCHAIN LICENSING AG	130	489	26.6	IEEE	130	26.6	O'Reilly Media	70	14.3
5	Cisco Systems Inc.	121	213	56.8	IEEE	121	56.8	The USENIX Association	18	8.5
6	Hewlett Packard Enterprises	108	225	48.0	IEEE	108	48.0	ACM-Assoc Comput Mach	38	16.9
7	Alibaba Group Holding Ltd	105	221	47.5	IEEE	105	47.5	ACM-Assoc Comput Mach	34	15.4
8	INVENIAM CAPITAL PAR	88	136	64.7	IEEE	88	64.7	Dow Jones & Company	26	19.1
9	nChain Holdings Ltd	85	294	28.9	IEEE	85	28.9	GitHub.com	60	20.4
10	IP RESERVOIR LLC	84	155	54.2	IEEE	84	54.2	ACM-Assoc Comput Mach	27	17.4
11	Ant Group (ANT Financial S	82	142	57.7	IEEE	82	57.7	RELX Group (Elsevier)	15	10.6
12	BT Group PLC	62	164	37.8	IEEE	62	37.8	RELX Group (Elsevier)	25	15.2
13	Salesforce Inc. (f/k/a Salesfor	62	71	87.3	IEEE	62	87.3	Springer Nature	3	4.2
14	Bank of America Corp.	58	110	52.7	IEEE	58	52.7	New York Times	20	18.2
15	eBay Inc	55	88	62.5	IEEE	55	62.5	RELX Group (Elsevier)	14	15.9
16	Microsoft Corporation	49	148	33.1	IEEE	49	33.1	ACM-Assoc Comput Mach	37	25.0
17	MasterCard Inc	41	99	41.4	IEEE	41	41.4	ACM-Assoc Comput Mach	14	14.1
18	Dell Technologies Inc	39	107	36.4	IEEE	39	36.4	ACM-Assoc Comput Mach	38	35.5
19	Accenture Ltd.	37	186	19.9	ACM-Assoc Comput Mach	55	29.6	Springer Nature	39	21.0
20	AMERICORP INVESTMEN	37	46	80.4	IEEE	37	80.4	Comcast	2	4.3
21	ELUVIO INC	37	130	28.5	IEEE	37	28.5	ACM-Assoc Comput Mach	23	17.7
22	State Farm Mutual Automobi	37	63	58.7	IEEE	37	58.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	7	11.1
23	Juniper Networks Inc.	35	39	89.7	IEEE	35	89.7	Microsoft	1	2.6
24	NXGEN PARTNERS IP LLC	35	109	32.1	Optical Society of America	39	35.8	IEEE	35	32.1
25	NEC Corp	30	98	30.6	ACM-Assoc Comput Mach	38	38.8	IEEE	30	30.6
26	INDIVIDUAL PATENTER	28	39	71.8	IEEE	28	71.8	International Association for Cryptologic Research (IACR)	4	10.3
27	Marvell Technology Group Lt	28	34	82.4	IEEE	28	82.4	O'Reilly Media	2	5.9
28	EYGS LLP	27	117	23.1	IEEE	27	23.1	International Association for Cryptologic Research (IACR)	19	16.2
29	Intel Corporation	27	64	42.2	IEEE	27	42.2	ACM-Assoc Comput Mach	18	28.1
30	FACTOM INC	23	33	69.7	IEEE	23	69.7	Dow Jones & Company	10	30.3
31	JINAN UNIVERSITY	22	37	59.5	IEEE	22	59.5	ACM-Assoc Comput Mach	5	13.5
32	Oracle Corporation	21	67	31.3	IEEE	21	31.3	ACM-Assoc Comput Mach	14	20.9
33	COGNITIVE SCALE INC	20	52	38.5	IEEE	20	38.5	ACM-Assoc Comput Mach	8	15.4
34	SYMBIONT IO INC	20	61	32.8	IEEE	20	32.8	ACM-Assoc Comput Mach	11	18.0
35	University of South Florida	20	22	90.9	IEEE	20	90.9	ACM-Assoc Comput Mach	1	4.5
36	Meta Platforms Inc.(formerly	19	138	13.8	ACM-Assoc Comput Mach	53	38.4	International Association for Cryptologic Research (IACR)	20	14.5
37	Amazon.com Inc.	18	54	33.3	IEEE	18	33.3	ACM-Assoc Comput Mach	11	20.4
38	MILESTONE ENTERTAIN	18	52	34.6	IEEE	18	34.6	The USENIX Association	10	19.2
39	Causam Enterprises (former	17	30	56.7	IEEE	17	56.7	Springer Nature	4	13.3

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Wells Fargo & Co	17	92	18.5	International Telecommunication Union	24	26.1	ANSI-American National Standards Institute	23	25.0
41	Micron Technology Inc.	16	23	69.6	IEEE	16	69.6	Joint IEEE and ACM	4	17.4
42	Nokia Corporation	16	37	43.2	IEEE	16	43.2	Internet Soc/IETF-Internet Eng Task Force	3	8.1
43	BLOCKCHAIN ASICS INC	15	16	93.8	IEEE	15	93.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1	6.3
44	CapitalOne	14	37	37.8	IEEE	14	37.8	ACM-Assoc Comput Mach	5	13.5
45	Forcepoint LLC	14	20	70.0	IEEE	14	70.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3	15.0
46	LO3 ENERGY INC	14	47	29.8	RELX Group (Elsevier)	24	51.1	IEEE	14	29.8
47	AT&T Inc	13	24	54.2	IEEE	13	54.2	ACM-Assoc Comput Mach	3	12.5
48	Broadcom Ltd	13	19	68.4	IEEE	13	68.4	ACM-Assoc Comput Mach	2	10.5
49	FACETEC INC	13	15	86.7	IEEE	13	86.7	RELX Group (Elsevier)	1	6.7
50	LEDGERDOMAIN INC	13	109	11.9	National Institute of Standards and Technolog	36	33.0	IEEE	13	11.9
51	Emerson Electric Co.	12	14	85.7	IEEE	12	85.7	Informa/CRC Press/Taylor & Francis	1	7.1
52	Sony Group Corp	12	13	92.3	IEEE	12	92.3	Korea Society of Internet Information	1	7.7
53	TRANSACTIVE GRID INC	12	46	26.1	RELX Group (Elsevier)	27	58.7	IEEE	12	26.1
54	Visa Inc	12	65	18.5	ACM-Assoc Comput Mach	17	26.2	IEEE	12	18.5
55	ANCHOR LABS INC	11	39	28.2	IEEE	11	28.2	Condé Nast	10	25.6
56	Boeing Co. (The)	11	18	61.1	IEEE	11	61.1	IP.Com	3	16.7
57	EQUITY SHIFT INC	11	11	100.0	IEEE	11	100.0			
58	MOX-SPEEDCHAIN LLC	11	11	100.0	IEEE	11	100.0			
59	Sap SE	11	26	42.3	IEEE	11	42.3	IFIP - International Federation for Information Processing	2	7.7
60	THETA LABS INC	11	12	91.7	IEEE	11	91.7	ACM-Assoc Comput Mach	1	8.3
61	BLOCKCHAIN ASICS LLC	10	10	100.0	IEEE	10	100.0			
62	Cornell University	10	51	19.6	International Association for Cryptologic Rese	17	33.3	IEEE	10	19.6
63	DIGITAL ASSET (SWITZER	10	16	62.5	IEEE	10	62.5	IFIP - International Federation for Information Processing	2	12.5
64	GENESYS CLOUD SERVIC	10	13	76.9	IEEE	10	76.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3	23.1
65	WORLDPAY LLC	10	16	62.5	IEEE	10	62.5	Informa/CRC Press/Taylor & Francis	3	18.8
66	ACUANT INC	9	9	100.0	IEEE	9	100.0			
67	Block Inc. (formerSquare Inc)	9	13	69.2	IEEE	9	69.2	The International Association for Computers and Communicati	2	15.4
68	Ericsson	9	22	40.9	IEEE	9	40.9	Internet Soc/IETF-Internet Eng Task Force	5	22.7
69	SPEEDCHAIN INC	9	9	100.0	IEEE	9	100.0			
70	Via Technologies Inc.	9	16	56.3	IEEE	9	56.3	Joint IEEE and ACM	2	12.5
71	Baidu Inc	8	14	57.1	IEEE	8	57.1	RELX Group (Elsevier)	2	14.3
72	BRAVE SOFTWARE INC	8	17	47.1	IEEE	8	47.1	International Association for Cryptologic Research (IACR)	4	23.5
73	Huawei Technologies Compa	8	14	57.1	IEEE	8	57.1	ACM-Assoc Comput Mach	2	14.3
74	JPMorgan	8	14	57.1	IEEE	8	57.1	Australian comp soc	2	14.3
75	LG Electronics Inc.	8	9	88.9	IEEE	8	88.9	World Academy of Science Engineering and Technology	1	11.1
76	Northwestern University	8	26	30.8	IEEE	8	30.8	RELX Group (Elsevier)	6	23.1
77	R3 LTD	8	42	19.0	International Association for Cryptologic Rese	15	35.7	ACM-Assoc Comput Mach	8	19.0
78	SIDE INC	8	16	50.0	ACM-Assoc Comput Mach	8	50.0	IEEE	8	50.0
79	Siemens Aktiengesellschaft	8	27	29.6	IEEE	8	29.6	ACM-Assoc Comput Mach	8	29.6
80	SMARTAXIOM INC	8	9	88.9	IEEE	8	88.9	Joint IEEE and ACM	1	11.1

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81	THE TORONTO-DOMINIO	8	35	22.9	World Wide Web Consortium	10	28.6	Imagine Publishing	9	25.7
82	United Services Automobile	8	20	40.0	IEEE	8	40.0	ACM-Assoc Comput Mach	5	25.0
83	Workday Inc	8	9	88.9	IEEE	8	88.9	National Institute of Standards and Technology (NIST)	1	11.1
84	AGI SURETRACK	7	7	100.0	IEEE	7	100.0			
85	ALCHEMY INSIGHTS INC	7	17	41.2	Springer Nature	7	41.2	IEEE	7	41.2
86	American Express Co.	7	16	43.8	IEEE	7	43.8	ACM-Assoc Comput Mach	5	31.3
87	ANTHURIUM SOLUTIONS	7	42	16.7	ACM-Assoc Comput Mach	15	35.7	IEEE	7	16.7
88	THE VANGUARD GROUP I	7	20	35.0	IEEE	7	35.0	ACM-Assoc Comput Mach	4	20.0
89	Toyota Motor Corp	7	10	70.0	IEEE	7	70.0	IFIP - International Federation for Information Processing	1	10.0
90	TURING TECHNOLOGY IN	7	13	53.8	IEEE	7	53.8	RELX Group (Elsevier)	5	38.5
91	BULLISH GLOBAL	6	6	100.0	IEEE	6	100.0			
92	City University of New York	6	6	100.0	IEEE	6	100.0			
93	CME Group Inc	6	28	21.4	FORBES INC	17	60.7	IEEE	6	21.4
94	CROWN STERLING LTD L	6	8	75.0	IEEE	6	75.0	National Institute of Standards and Technology (NIST)	1	12.5
95	Intelligent Energy Holdings P	6	8	75.0	IEEE	6	75.0	ACM-Assoc Comput Mach	2	25.0
96	MASSACHUSETTS MUTU	6	7	85.7	IEEE	6	85.7	International Association for Cryptologic Research (IACR)	1	14.3
97	McAfee Inc	6	12	50.0	IEEE	6	50.0	ACM-Assoc Comput Mach	2	16.7
98	NUID INC	6	73	8.2	Internet Soc/IETF-Internet Eng Task Force	25	34.2	International Association for Cryptologic Research (IACR)	17	23.3
99	SYNIVERSE TECHNOLOGI	6	13	46.2	IEEE	6	46.2	European Telecom Standards Institute (ETSI)	2	15.4
100	THE BANK OF NEW YORK	6	9	66.7	IEEE	6	66.7	ACM-Assoc Comput Mach	1	11.1

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<i>Broadcasting</i>										
1	Microsoft Corporation	12283	29203	42.1	IEEE	12283	42.1	ACM-Assoc Comput Mach	3543	12.1
2	Xperi Inc. (f/k/a Tessera Inc)	10496	25124	41.8	IEEE	10496	41.8	SPIE-Int Soc Opt Engineering	2756	11.0
3	PERSONALIZED MEDIA C	8728	52560	16.6	Society of Motion Picture and Television Engi	15677	29.8	IEEE	8728	16.6
4	Alphabet Inc.	6827	20176	33.8	IEEE	6827	33.8	International Telecommunication Union	3117	15.4
5	Qualcomm Inc	6508	35882	18.1	International Telecommunication Union	16540	46.1	IEEE	6508	18.1
6	Magna International Inc.	5614	10436	53.8	IEEE	5614	53.8	SAE-Society of Automobile Engineers	843	8.1
7	Apple Inc	4234	12506	33.9	IEEE	4234	33.9	ACM-Assoc Comput Mach	1643	13.1
8	Sony Group Corp	3983	11736	33.9	IEEE	3983	33.9	International Telecommunication Union	2866	24.4
9	Samsung Electronics Co Ltd	3358	11722	28.6	IEEE	3358	28.6	International Telecommunication Union	2513	21.4
10	AT&T Inc	2791	6523	42.8	IEEE	2791	42.8	ACM-Assoc Comput Mach	849	13.0
11	General Electric Company	2270	7648	29.7	International Telecommunication Union	2939	38.4	IEEE	2270	29.7
12	LG Electronics Inc.	2219	11008	20.2	International Telecommunication Union	2649	24.1	IEEE	2219	20.2
13	Dolby Laboratories Inc	2217	8740	25.4	International Telecommunication Union	2435	27.9	IEEE	2217	25.4
14	Vantiva SA (former Technico	2073	4888	42.4	IEEE	2073	42.4	ISO/IEC/JTC/ANSI	351	7.2
15	Cisco Systems Inc.	2069	5355	38.6	IEEE	2069	38.6	ACM-Assoc Comput Mach	454	8.5
16	Sonos Inc	2017	6291	32.1	IEEE	2017	32.1	Open Connectivity Foundation	639	10.2
17	InterDigital Inc	1954	7604	25.7	International Telecommunication Union	1979	26.0	IEEE	1954	25.7
18	Intel Corporation	1941	4778	40.6	IEEE	1941	40.6	3GPP General Partnership Project Standards Body	1025	21.5
19	Broadcom Ltd	1878	3018	62.2	IEEE	1878	62.2	ACM-Assoc Comput Mach	186	6.2
20	Panasonic Holding Corporati	1769	6435	27.5	International Telecommunication Union	1913	29.7	IEEE	1769	27.5
21	Massachusetts Institute of Te	1762	3316	53.1	IEEE	1762	53.1	ACM-Assoc Comput Mach	286	8.6
22	Softbank Corp	1761	4407	40.0	IEEE	1761	40.0	ISO/IEC	340	7.7
23	Huawei Technologies Compa	1741	7740	22.5	International Telecommunication Union	3356	43.4	IEEE	1741	22.5
24	Adobe Inc. (former Adobe Sy	1482	3440	43.1	IEEE	1482	43.1	ACM-Assoc Comput Mach	782	22.7
25	Nokia Corporation	1423	4280	33.2	IEEE	1423	33.2	International Telecommunication Union	610	14.3
26	Fraunhofer Gesellschaft	1402	3333	42.1	IEEE	1402	42.1	International Telecommunication Union	380	11.4
27	Canon Inc	1284	3699	34.7	IEEE	1284	34.7	International Telecommunication Union	626	16.9
28	GoPro Inc	1256	2534	49.6	IEEE	1256	49.6	ACM-Assoc Comput Mach	262	10.3
29	Adeia Inc (f/k/a Xperi Holdin	1251	5033	24.9	IEEE	1251	24.9	ACM-Assoc Comput Mach	437	8.7
30	International Business Machi	1215	4179	29.1	IEEE	1215	29.1	Internet Soc/IETF-Internet Eng Task Force	633	15.1
31	Hon Hai Precision Industry C	1189	4464	26.6	IEEE	1189	26.6	International Telecommunication Union	1163	26.1
32	Tencent Holding Ltd	1111	4464	24.9	International Telecommunication Union	1672	37.5	IEEE	1111	24.9
33	NETWORK-1 TECHNOLOG	1046	3050	34.3	IEEE	1046	34.3	ACM-Assoc Comput Mach	710	23.3
34	ByteDance Ltd	1015	14883	6.8	International Telecommunication Union	7104	47.7	ISO/IEC/JTC	4983	33.5
35	HP Inc	891	1908	46.7	IEEE	891	46.7	ACM-Assoc Comput Mach	256	13.4
36	Cortica Ltd	863	1293	66.7	IEEE	863	66.7	ACM-Assoc Comput Mach	164	12.7
37	STMicroelectronics	858	1361	63.0	IEEE	858	63.0	RELX Group (Elsevier)	76	5.6
38	Commscope Holding (formerl	844	2824	29.9	IEEE	844	29.9	International Telecommunication Union	610	21.6
39	Honeywell International Inc.	797	3435	23.2	Optical Society of America	836	24.3	IEEE	797	23.2

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40	INTOUCH TECHNOLOGIE	759	2245	33.8	IEEE	759	33.8	IEEE/RSJ	217	9.7
41	Amazon.com Inc.	735	1693	43.4	IEEE	735	43.4	ACM-Assoc Comput Mach	250	14.8
42	Digimarc Corp.	729	2005	36.4	IEEE	729	36.4	SPIE-Int Soc Opt Engineering	356	17.8
43	Ricoh Co. Ltd.	712	1606	44.3	IEEE	712	44.3	ACM-Assoc Comput Mach	204	12.7
44	Ericsson	699	2590	27.0	IEEE	699	27.0	International Telecommunication Union	653	25.2
45	Meta Platforms Inc.(formerly	654	2913	22.5	IEEE	654	22.5	arXiv.org	402	13.8
46	California Institute of Techno	645	3938	16.4	Optical Society of America	1097	27.9	IEEE	645	16.4
47	Nielsen Holdings Plc	622	3670	16.9	IEEE	622	16.9	RELX Group (Elsevier)	467	12.7
48	Motorola Solutions Inc.	574	1144	50.2	IEEE	574	50.2	RELX Group (Elsevier)	77	6.7
49	Wisteria Trading Inc	570	1225	46.5	IEEE	570	46.5	SPIE-Int Soc Opt Engineering	135	11.0
50	Electronics and Telecommuni	564	2817	20.0	International Telecommunication Union	1556	55.2	IEEE	564	20.0
51	Columbia University	563	1292	43.6	IEEE	563	43.6	ACM-Assoc Comput Mach	188	14.6
52	Walt Disney Co.	544	1583	34.4	IEEE	544	34.4	ACM-Assoc Comput Mach	473	29.9
53	Mitsubishi Electric Corp	539	1317	40.9	IEEE	539	40.9	International Telecommunication Union	248	18.8
54	BLANDING HOVENWEEP	530	1463	36.2	IEEE	530	36.2	SPIE-Int Soc Opt Engineering	201	13.7
55	Blackberry Ltd.	522	1249	41.8	IEEE	522	41.8	International Telecommunication Union	195	15.6
56	SUN PATENT TRUST	520	7473	7.0	International Telecommunication Union	5832	78.0	IEEE	520	7.0
57	Xerox Corp	512	1299	39.4	IEEE	512	39.4	SPIE-Int Soc Opt Engineering	150	11.5
58	Koninklijke Philips N.V.	502	1297	38.7	IEEE	502	38.7	ACM-Assoc Comput Mach	116	8.9
59	Nippon Telegraph & Telepho	491	1549	31.7	IEEE	491	31.7	International Telecommunication Union	455	29.4
60	Toshiba Corp	490	1683	29.1	International Telecommunication Union	632	37.6	IEEE	490	29.1
61	Texas Instruments Inc	489	2705	18.1	International Telecommunication Union	1906	70.5	IEEE	489	18.1
62	Comcast Corp	482	1876	25.7	IEEE	482	25.7	ACM-Assoc Comput Mach	303	16.2
63	PixelWorks Inc	472	744	63.4	IEEE	472	63.4	SPIE-Int Soc Opt Engineering	66	8.9
64	Industrial Technology Researc	464	751	61.8	IEEE	464	61.8	SPIE-Int Soc Opt Engineering	55	7.3
65	Verance Corp	445	971	45.8	IEEE	445	45.8	SPIE-Int Soc Opt Engineering	127	13.1
66	Fujifilm Business Innovation	438	1286	34.1	IEEE	438	34.1	ACM-Assoc Comput Mach	316	24.6
67	Mediatek Inc.	438	2273	19.3	International Telecommunication Union	1182	52.0	IEEE	438	19.3
68	NEC Corp	423	1219	34.7	IEEE	423	34.7	International Telecommunication Union	262	21.5
69	NVIDIA Corp.	413	1033	40.0	IEEE	413	40.0	ACM-Assoc Comput Mach	141	13.6
70	Semiconductor Energy Labor	413	5085	8.1	SID-Society for Information Display	1782	35.0	AIP Publishing	622	12.2
71	Monolithic 3D Inc	412	725	56.8	IEEE	412	56.8	IEEE/JPN Soc App Phys	76	10.5
72	ACACIA MEDIA TECHNO	408	748	54.5	IEEE	408	54.5	ACM-Assoc Comput Mach	66	8.8
73	Twitter Inc	387	604	64.1	IEEE	387	64.1	ACM-Assoc Comput Mach	47	7.8
74	On Semiconductor Corporati	386	570	67.7	IEEE	386	67.7	SPIE-Int Soc Opt Engineering	54	9.5
75	Netflix Inc	374	684	54.7	IEEE	374	54.7	RELX Group (Elsevier)	46	6.7
76	Marvell Technology Group Lt	367	451	81.4	IEEE	367	81.4	ACM-Assoc Comput Mach	9	2.0
77	University of Minnesota (The	354	539	65.7	IEEE	354	65.7	SAGE Publications Ltd	38	7.1
78	The Arizona Board of Regent	349	2065	16.9	Optical Society of America	603	29.2	IEEE	349	16.9
79	Omnivision Technologies Inc	326	537	60.7	IEEE	326	60.7	SPIE-Int Soc Opt Engineering	64	11.9
80	Witricity Corp	324	609	53.2	IEEE	324	53.2	AIP Publishing	41	6.7

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Intellectual Ventures Manage	323	1297	24.9	IEEE	323	24.9	ACM-Assoc Comput Mach	174	13.4
82	Align Technology Inc	313	2681	11.7	JCO - Journal of Clinical Orthodontics	333	12.4	RELX Group (Elsevier)	323	12.0
83	REARDEN LLC	309	487	63.4	IEEE	309	63.4	Optical Society of America	51	10.5
84	ECOLE DE TECHNOLOGIE	297	526	56.5	IEEE	297	56.5	3GPP General Partnership Project Standards Body	52	9.9
85	Ostendo Technologies Inc	297	962	30.9	IEEE	297	30.9	SPIE-Int Soc Opt Engineering	163	16.9
86	INTRINSIC INNOVATION	296	608	48.7	IEEE	296	48.7	ACM-Assoc Comput Mach	76	12.5
87	Walmart Stores Inc	294	893	32.9	IEEE	294	32.9	CBS Interactive	88	9.9
88	ONPOINT MEDICAL INC	293	1331	22.0	IEEE	293	22.0	RELX Group (Elsevier)	214	16.1
89	BRIGHT DATA LTD	291	2996	9.7	Internet Soc/IETF-Internet Eng Task Force	1606	53.6	ACM-Assoc Comput Mach	323	10.8
90	EUCLID DISCOVERIES LL	289	563	51.3	IEEE	289	51.3	RELX Group (Elsevier)	141	25.0
91	University of Washington	283	841	33.7	IEEE	283	33.7	SPIE-Int Soc Opt Engineering	106	12.6
92	Toyota Motor Corp	280	736	38.0	IEEE	280	38.0	ACM-Assoc Comput Mach	87	11.8
93	Advanced Micro Devices Inc	278	476	58.4	IEEE	278	58.4	International Telecommunication Union	23	4.8
94	Dish Network Corp	276	525	52.6	IEEE	276	52.6	RELX Group (Elsevier)	49	9.3
95	Micron Technology Inc.	272	475	57.3	IEEE	272	57.3	SPIE-Int Soc Opt Engineering	47	9.9
96	BT Group PLC	267	534	50.0	IEEE	267	50.0	RELX Group (Elsevier)	42	7.9
97	Orange	267	522	51.1	IEEE	267	51.1	International Telecommunication Union	60	11.5
98	University of California	266	779	34.1	IEEE	266	34.1	Optical Society of America	73	9.4
99	RTX Corporation (f/k/a Rayt	265	747	35.5	IEEE	265	35.5	SPIE-Int Soc Opt Engineering	149	19.9
100	United Services Automobile	261	1363	19.1	IEEE	261	19.1	Source Media	223	16.4

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

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<i>Computer Hardware</i>										
1	International Business Machi	22061	84927	26.0	IEEE	22061	26.0	ACM-Assoc Comput Mach	17257	20.3
2	Microsoft Corporation	18627	75277	24.7	ACM-Assoc Comput Mach	24609	32.7	IEEE	18627	24.7
3	Apple Inc	15357	58652	26.2	ACM-Assoc Comput Mach	16620	28.3	IEEE	15357	26.2
4	Intel Corporation	11849	25922	45.7	IEEE	11849	45.7	ACM-Assoc Comput Mach	3522	13.6
5	Alphabet Inc.	7577	27336	27.7	IEEE	7577	27.7	ACM-Assoc Comput Mach	5786	21.2
6	Samsung Electronics Co Ltd	5795	14891	38.9	IEEE	5795	38.9	ACM-Assoc Comput Mach	1369	9.2
7	OneTrust	5768	17660	32.7	ACM-Assoc Comput Mach	8424	47.7	IEEE	5768	32.7
8	Broadcom Ltd	4703	10436	45.1	IEEE	4703	45.1	ACM-Assoc Comput Mach	2001	19.2
9	Oracle Corporation	4682	18119	25.8	ACM-Assoc Comput Mach	6226	34.4	IEEE	4682	25.8
10	Qualcomm Inc	3572	9377	38.1	IEEE	3572	38.1	ACM-Assoc Comput Mach	856	9.1
11	Cadence Design Systems Inc	3328	8424	39.5	IEEE	3328	39.5	Joint IEEE and ACM	3003	35.6
12	Immersion Corp.	3261	9595	34.0	IEEE	3261	34.0	ACM-Assoc Comput Mach	1026	10.7
13	Advanced Micro Devices Inc	3257	9224	35.3	IEEE	3257	35.3	ACM-Assoc Comput Mach	2839	30.8
14	Sony Group Corp	3166	7803	40.6	IEEE	3166	40.6	ACM-Assoc Comput Mach	1095	14.0
15	Commvault Systems Inc.	2796	4946	56.5	IEEE	2796	56.5	ACM-Assoc Comput Mach	904	18.3
16	Canon Inc	2560	6553	39.1	IEEE	2560	39.1	ACM-Assoc Comput Mach	539	8.2
17	Micron Technology Inc.	2435	4867	50.0	IEEE	2435	50.0	ACM-Assoc Comput Mach	444	9.1
18	Ricoh Co. Ltd.	2398	5187	46.2	IEEE	2398	46.2	ACM-Assoc Comput Mach	894	17.2
19	Cisco Systems Inc.	2271	7506	30.3	IEEE	2271	30.3	ACM-Assoc Comput Mach	1271	16.9
20	Nokia Corporation	2166	5841	37.1	IEEE	2166	37.1	ACM-Assoc Comput Mach	825	14.1
21	Fujitsu Limited	2082	5621	37.0	IEEE	2082	37.0	ACM-Assoc Comput Mach	679	12.1
22	Amazon.com Inc.	2075	8418	24.6	ACM-Assoc Comput Mach	2449	29.1	IEEE	2075	24.6
23	Sonos Inc	2022	6169	32.8	IEEE	2022	32.8	Open Connectivity Foundation	644	10.4
24	HP Inc	2015	6393	31.5	IEEE	2015	31.5	ACM-Assoc Comput Mach	1380	21.6
25	Siemens Aktiengesellschaft	1959	4371	44.8	IEEE	1959	44.8	Joint IEEE and ACM	406	9.3
26	Xperi Inc. (f/k/a Tessera Inc)	1903	4203	45.3	IEEE	1903	45.3	ACM-Assoc Comput Mach	284	6.8
27	AT&T Inc	1886	5467	34.5	IEEE	1886	34.5	ACM-Assoc Comput Mach	1132	20.7
28	Dell Technologies Inc	1873	5388	34.8	IEEE	1873	34.8	ACM-Assoc Comput Mach	966	17.9
29	MicroUnity Systems Enginee	1852	3061	60.5	IEEE	1852	60.5	Joint IEEE and ACM	266	8.7
30	IP RESERVOIR LLC	1763	3494	50.5	IEEE	1763	50.5	ACM-Assoc Comput Mach	586	16.8
31	Ignis Innovation Inc	1704	2417	70.5	IEEE	1704	70.5	SID-Society for Information Display	396	16.4
32	Huawei Technologies Compa	1667	5462	30.5	IEEE	1667	30.5	3GPP General Partnership Project Standards Body	673	12.3
33	PERSONALIZED MEDIA C	1661	10494	15.8	Society of Motion Picture and Television Engi	3109	29.6	IEEE	1661	15.8
34	Infineon Technologies AG	1592	2728	58.4	IEEE	1592	58.4	Joint IEEE and ACM	316	11.6
35	Rambus Inc.	1591	2331	68.3	IEEE	1591	68.3	JEDEC Semiconductor Standards Organization	121	5.2
36	Honeywell International Inc.	1582	4250	37.2	IEEE	1582	37.2	RELX Group (Elsevier)	340	8.0
37	Columbia University	1521	6010	25.3	IEEE	1521	25.3	ACM-Assoc Comput Mach	1235	20.5
38	Panasonic Holding Corporati	1504	3791	39.7	IEEE	1504	39.7	International Telecommunication Union	317	8.4
39	Fraunhofer Gesellschaft	1475	3830	38.5	IEEE	1475	38.5	Audio Eng Soc	598	15.6



## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	NEC Corp	1464	3994	36.7	IEEE	1464	36.7	ACM-Assoc Comput Mach	589	14.7
41	Sap SE	1460	5829	25.0	ACM-Assoc Comput Mach	1808	31.0	IEEE	1460	25.0
42	STMicroelectronics	1423	2526	56.3	IEEE	1423	56.3	Joint IEEE and ACM	127	5.0
43	Adobe Inc. (former Adobe Sy	1403	5169	27.1	ACM-Assoc Comput Mach	1838	35.6	IEEE	1403	27.1
44	Semiconductor Energy Labor	1400	21108	6.6	SID-Society for Information Display	7863	37.3	AIP Publishing	2599	12.3
45	Toshiba Corp	1373	3402	40.4	IEEE	1373	40.4	ACM-Assoc Comput Mach	214	6.3
46	Synopsys Inc.	1266	3316	38.2	IEEE	1266	38.2	Joint IEEE and ACM	694	20.9
47	Marvell Technology Group Lt	1259	1933	65.1	IEEE	1259	65.1	ACM-Assoc Comput Mach	148	7.7
48	NVIDIA Corp.	1244	3250	38.3	IEEE	1244	38.3	ACM-Assoc Comput Mach	643	19.8
49	Trellix (merger of FireEye Inc	1242	3620	34.3	IEEE	1242	34.3	ACM-Assoc Comput Mach	617	17.0
50	The Arizona Board of Regent	1227	3459	35.5	IEEE	1227	35.5	ACM-Assoc Comput Mach	339	9.8
51	Magic Leap Inc	1201	2991	40.2	IEEE	1201	40.2	ACM-Assoc Comput Mach	281	9.4
52	Softbank Corp	1201	2930	41.0	IEEE	1201	41.0	Joint IEEE and ACM	434	14.8
53	PACT XPP TECHNOLOGIE	1196	2065	57.9	IEEE	1196	57.9	ACM-Assoc Comput Mach	197	9.5
54	Texas A&M University	1161	1294	89.7	IEEE	1161	89.7	IET/IEE	20	1.5
55	Meta Platforms Inc.(formerly	1140	4052	28.1	IEEE	1140	28.1	ACM-Assoc Comput Mach	993	24.5
56	Blackberry Ltd.	1125	3033	37.1	IEEE	1125	37.1	ACM-Assoc Comput Mach	416	13.7
57	P4TENTS1 LLC	1087	2667	40.8	IEEE	1087	40.8	ACM-Assoc Comput Mach	396	14.8
58	Western Digital Corp.	1081	3054	35.4	IEEE	1081	35.4	ACM-Assoc Comput Mach	397	13.0
59	Xerox Corp	964	3934	24.5	IEEE	964	24.5	ACM-Assoc Comput Mach	911	23.2
60	Massachusetts Institute of Te	926	3089	30.0	IEEE	926	30.0	ACM-Assoc Comput Mach	392	12.7
61	Hewlett Packard Enterprises	918	2945	31.2	IEEE	918	31.2	ACM-Assoc Comput Mach	752	25.5
62	Vantiva SA (former Technico	911	1812	50.3	IEEE	911	50.3	ACM-Assoc Comput Mach	167	9.2
63	NXP Semiconductors NV	904	1702	53.1	IEEE	904	53.1	Joint IEEE and ACM	202	11.9
64	Hitachi Ltd	897	3328	27.0	IEEE	897	27.0	ACM-Assoc Comput Mach	551	16.6
65	Intellectual Ventures Manage	895	3945	22.7	IEEE	895	22.7	ACM-Assoc Comput Mach	633	16.0
66	Seiko Epson Corporation	888	2648	33.5	IEEE	888	33.5	Joint IEEE and ACM	317	12.0
67	TABULA INC	873	2423	36.0	IEEE	873	36.0	ACM-Assoc Comput Mach	865	35.7
68	LG Electronics Inc.	807	2717	29.7	IEEE	807	29.7	3GPP General Partnership Project Standards Body	378	13.9
69	Texas Instruments Inc	787	1408	55.9	IEEE	787	55.9	Joint IEEE and ACM	141	10.0
70	University of California	765	3716	20.6	IEEE	765	20.6	RELX Group (Elsevier)	412	11.1
71	Brain Corporation	756	2453	30.8	IEEE	756	30.8	MIT Press	363	14.8
72	PURE Storage Inc	739	5306	13.9	Internet Soc/IETF-Internet Eng Task Force	2465	46.5	ACM-Assoc Comput Mach	1135	21.4
73	Cloud Software Group	723	2093	34.5	IEEE	723	34.5	ACM-Assoc Comput Mach	321	15.3
74	Nippon Telegraph & Telepho	722	2451	29.5	IEEE	722	29.5	ACM-Assoc Comput Mach	267	10.9
75	Fujifilm Business Innovation	720	2215	32.5	IEEE	720	32.5	ACM-Assoc Comput Mach	482	21.8
76	General Electric Company	711	1754	40.5	IEEE	711	40.5	RELX Group (Elsevier)	187	10.7
77	Hon Hai Precision Industry C	706	3110	22.7	IEEE	706	22.7	SID-Society for Information Display	454	14.6
78	Tela Innovations inc	696	1921	36.2	IEEE	696	36.2	SPIE-Int Soc Opt Engineering	585	30.5
79	Ericsson	693	2439	28.4	IEEE	693	28.4	3GPP General Partnership Project Standards Body	381	15.6
80	HRL Laboratories LLC	690	1967	35.1	IEEE	690	35.1	ACM-Assoc Comput Mach	199	10.1



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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Netapp Inc	687	3523	19.5	ACM-Assoc Comput Mach	1408	40.0	IEEE	687	19.5
82	SRC Computers Inc.	684	770	88.8	IEEE	684	88.8	Springer Nature	31	4.0
83	Empire Technology Develop	678	2134	31.8	IEEE	678	31.8	Joint IEEE and ACM	640	30.0
84	Salesforce Inc. (f/k/a Salesfor	673	2661	25.3	IEEE	673	25.3	ACM-Assoc Comput Mach	326	12.3
85	Koninklijke Philips N.V.	657	1864	35.2	IEEE	657	35.2	RELX Group (Elsevier)	184	9.9
86	NEWVALUEXCHANGE LT	652	1862	35.0	IEEE	652	35.0	ACM-Assoc Comput Mach	420	22.6
87	Electronics and Telecommuni	650	1462	44.5	IEEE	650	44.5	ACM-Assoc Comput Mach	139	9.5
88	Mitsubishi Electric Corp	645	1426	45.2	IEEE	645	45.2	ACM-Assoc Comput Mach	202	14.2
89	Industrial Techology Researc	640	1313	48.7	IEEE	640	48.7	ACM-Assoc Comput Mach	128	9.7
90	Math Works Inc (The)	636	1689	37.7	IEEE	636	37.7	ACM-Assoc Comput Mach	363	21.5
91	RTX Corporation (f/k/a Rayt	623	1755	35.5	IEEE	623	35.5	RELX Group (Elsevier)	143	8.1
92	Wave Computing Inc.	623	2110	29.5	IEEE	623	29.5	ACM-Assoc Comput Mach	377	17.9
93	EXEGY INC	614	1195	51.4	IEEE	614	51.4	ACM-Assoc Comput Mach	202	16.9
94	InterDigital Inc	612	2431	25.2	3GPP General Partnership Project Standards B	754	31.0	IEEE	612	25.2
95	UltraLeap Holdings Limited (	606	1806	33.6	IEEE	606	33.6	ACM-Assoc Comput Mach	381	21.1
96	Digimarc Corp.	604	1715	35.2	IEEE	604	35.2	ACM-Assoc Comput Mach	300	17.5
97	III HOLDINGS 12 LLC	598	1255	47.6	IEEE	598	47.6	ACM-Assoc Comput Mach	144	11.5
98	Mosaid Technologies ( f/k/aC	597	852	70.1	IEEE	597	70.1	Joint IEEE and ACM	53	6.2
99	Dolby Laboratories Inc	591	1610	36.7	IEEE	591	36.7	Audio Eng Soc	196	12.2
100	Murata Manufacturing Co. Lt	591	776	76.2	IEEE	591	76.2	RELX Group (Elsevier)	30	3.9

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Computer Software</i>										
1	Microsoft Corporation	32558	1E+05	31.5	IEEE	32558	31.5	ACM-Assoc Comput Mach	26873	26.0
2	Apple Inc	24003	73889	32.5	IEEE	24003	32.5	ACM-Assoc Comput Mach	13983	18.9
3	International Business Machi	18520	71505	25.9	IEEE	18520	25.9	ACM-Assoc Comput Mach	13987	19.6
4	Alphabet Inc.	12912	41235	31.3	IEEE	12912	31.3	ACM-Assoc Comput Mach	8704	21.1
5	Adobe Inc. (former Adobe Sy	6164	16888	36.5	IEEE	6164	36.5	ACM-Assoc Comput Mach	4963	29.4
6	Xperi Inc. (f/k/a Tessera Inc)	5266	11272	46.7	IEEE	5266	46.7	ACM-Assoc Comput Mach	1033	9.2
7	Oracle Corporation	4630	20606	22.5	ACM-Assoc Comput Mach	6124	29.7	IEEE	4630	22.5
8	Siemens Aktiengesellschaft	3679	10118	36.4	IEEE	3679	36.4	SPIE-Int Soc Opt Engineering	1040	10.3
9	Intel Corporation	3675	8620	42.6	IEEE	3675	42.6	ACM-Assoc Comput Mach	1562	18.1
10	Qualcomm Inc	3657	8916	41.0	IEEE	3657	41.0	ACM-Assoc Comput Mach	507	5.7
11	Amazon.com Inc.	3563	13381	26.6	IEEE	3563	26.6	ACM-Assoc Comput Mach	3124	23.3
12	Cisco Systems Inc.	3499	12264	28.5	IEEE	3499	28.5	ACM-Assoc Comput Mach	2163	17.6
13	Dolby Laboratories Inc	2859	6040	47.3	IEEE	2859	47.3	Audio Eng Soc	983	16.3
14	AT&T Inc	2681	7042	38.1	IEEE	2681	38.1	ACM-Assoc Comput Mach	1032	14.7
15	Sap SE	2599	12595	20.6	ACM-Assoc Comput Mach	4391	34.9	IEEE	2599	20.6
16	Xerox Corp	2526	7881	32.1	IEEE	2526	32.1	ACM-Assoc Comput Mach	1480	18.8
17	Commvault Systems Inc.	2478	4357	56.9	IEEE	2478	56.9	ACM-Assoc Comput Mach	736	16.9
18	Ricoh Co. Ltd.	2237	4924	45.4	IEEE	2237	45.4	ACM-Assoc Comput Mach	790	16.0
19	Koninklijke Philips N.V.	2142	8144	26.3	IEEE	2142	26.3	RELX Group (Elsevier)	1028	12.6
20	Broadcom Ltd	2059	6153	33.5	IEEE	2059	33.5	ACM-Assoc Comput Mach	1507	24.5
21	HP Inc	1969	5459	36.1	IEEE	1969	36.1	ACM-Assoc Comput Mach	1197	21.9
22	Magna International Inc.	1942	3541	54.8	IEEE	1942	54.8	SAE-Society of Automobile Engineers	254	7.2
23	NVIDIA Corp.	1931	6370	30.3	ACM-Assoc Comput Mach	1965	30.8	IEEE	1931	30.3
24	General Electric Company	1858	4221	44.0	IEEE	1858	44.0	RELX Group (Elsevier)	406	9.6
25	Sony Group Corp	1842	4106	44.9	IEEE	1842	44.9	ACM-Assoc Comput Mach	664	16.2
26	Meta Platforms Inc.(formerly	1802	7595	23.7	ACM-Assoc Comput Mach	1890	24.9	IEEE	1802	23.7
27	Cortica Ltd	1801	2672	67.4	IEEE	1801	67.4	ACM-Assoc Comput Mach	291	10.9
28	Sonos Inc	1705	4978	34.3	IEEE	1705	34.3	Open Connectivity Foundation	382	7.7
29	Advanced Micro Devices Inc	1665	6981	23.9	ACM-Assoc Comput Mach	3236	46.4	IEEE	1665	23.9
30	Cadence Design Systems Inc	1664	3540	47.0	IEEE	1664	47.0	Joint IEEE and ACM	1000	28.2
31	Digimarc Corp.	1631	4329	37.7	IEEE	1631	37.7	SPIE-Int Soc Opt Engineering	704	16.3
32	Cognex Corp.	1595	3787	42.1	IEEE	1595	42.1	RELX Group (Elsevier)	703	18.6
33	Nokia Corporation	1574	4645	33.9	IEEE	1574	33.9	ACM-Assoc Comput Mach	470	10.1
34	Synopsys Inc.	1552	5018	30.9	IEEE	1552	30.9	SPIE-Int Soc Opt Engineering	1011	20.1
35	HRL Laboratories LLC	1546	3736	41.4	IEEE	1546	41.4	RELX Group (Elsevier)	309	8.3
36	Honeywell International Inc.	1505	2882	52.2	IEEE	1505	52.2	RELX Group (Elsevier)	268	9.3
37	Samsung Electronics Co Ltd	1423	3358	42.4	IEEE	1423	42.4	ACM-Assoc Comput Mach	300	8.9
38	Accenture Ltd.	1413	4483	31.5	IEEE	1413	31.5	ACM-Assoc Comput Mach	668	14.9
39	Irobot Corp	1406	2683	52.4	IEEE	1406	52.4	SPIE-Int Soc Opt Engineering	410	15.3

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	OneTrust	1376	4147	33.2	ACM-Assoc Comput Mach	1906	46.0	IEEE	1376	33.2
41	Blackberry Ltd.	1284	3670	35.0	IEEE	1284	35.0	ACM-Assoc Comput Mach	327	8.9
42	Applied Materials Inc.	1281	2334	54.9	IEEE	1281	54.9	AIP Publishing	121	5.2
43	Magic Leap Inc	1274	2708	47.0	IEEE	1274	47.0	ACM-Assoc Comput Mach	285	10.5
44	eBay Inc	1269	6511	19.5	IEEE	1269	19.5	ACM-Assoc Comput Mach	879	13.5
45	Walt Disney Co.	1266	5387	23.5	ACM-Assoc Comput Mach	2560	47.5	IEEE	1266	23.5
46	Honda Motor Co. Ltd.(Honda	1255	2554	49.1	IEEE	1255	49.1	RELX Group (Elsevier)	254	9.9
47	Fraunhofer Gesellschaft	1250	3410	36.7	IEEE	1250	36.7	Audio Eng Soc	460	13.5
48	Intuitive Surgical Inc.	1181	2814	42.0	IEEE	1181	42.0	The Medical Image Computing and Computer Assisted Interve	320	11.4
49	NEC Corp	1152	3017	38.2	IEEE	1152	38.2	ACM-Assoc Comput Mach	433	14.4
50	RTX Corporation (f/k/a Rayt	1149	2643	43.5	IEEE	1149	43.5	SPIE-Int Soc Opt Engineering	226	8.6
51	Salesforce Inc. (f/k/a Salesfor	1126	3779	29.8	IEEE	1126	29.8	ACM-Assoc Comput Mach	644	17.0
52	Intellectual Ventures Manage	1100	5796	19.0	IEEE	1100	19.0	RELX Group (Elsevier)	622	10.7
53	Yahoo Inc	1063	6651	16.0	ACM-Assoc Comput Mach	1904	28.6	IEEE	1063	16.0
54	PHOENIX SOLUTIONS INC	1037	3286	31.6	IEEE	1037	31.6	ISCA (International Speech Communication Association)	416	12.7
55	Palantir Technologies Inc	953	4524	21.1	IEEE	953	21.1	ACM-Assoc Comput Mach	944	20.9
56	MicroUnity Systems Enginee	939	1529	61.4	IEEE	939	61.4	Joint IEEE and ACM	140	9.2
57	Massachusetts Institute of Te	923	3050	30.3	IEEE	923	30.3	RELX Group (Elsevier)	301	9.9
58	LG Electronics Inc.	909	1977	46.0	IEEE	909	46.0	Audio Eng Soc	139	7.0
59	Canon Inc	908	2173	41.8	IEEE	908	41.8	RELX Group (Elsevier)	210	9.7
60	Battelle Memorial Institute	905	1446	62.6	IEEE	905	62.6	RELX Group (Elsevier)	121	8.4
61	STMicroelectronics	905	1543	58.7	IEEE	905	58.7	RELX Group (Elsevier)	99	6.4
62	Ericsson	895	3055	29.3	IEEE	895	29.3	3GPP General Partnership Project Standards Body	461	15.1
63	Dell Technologies Inc	876	3021	29.0	IEEE	876	29.0	ACM-Assoc Comput Mach	577	19.1
64	Boeing Co. (The)	861	2672	32.2	IEEE	861	32.2	RELX Group (Elsevier)	351	13.1
65	Huawei Technologies Compa	839	2573	32.6	IEEE	839	32.6	ACM-Assoc Comput Mach	236	9.2
66	University of California	838	5266	15.9	IEEE	838	15.9	RELX Group (Elsevier)	686	13.0
67	Bosch (Robert) GmbH	835	4514	18.5	IEEE	835	18.5	Springer Nature	393	8.7
68	Toyota Motor Corp	811	1681	48.2	IEEE	811	48.2	IEEE/CVF	146	8.7
69	The Arizona Board of Regent	810	2199	36.8	IEEE	810	36.8	RELX Group (Elsevier)	220	10.0
70	ParkerVision Inc	795	1717	46.3	IEEE	795	46.3	IET/IEE	491	28.6
71	Nippon Telegraph & Telepho	786	2779	28.3	IEEE	786	28.3	ACM-Assoc Comput Mach	344	12.4
72	Motorola Solutions Inc.	777	1289	60.3	IEEE	777	60.3	Springer Nature	78	6.1
73	Eagleview Technologies Inc	772	2692	28.7	IEEE	772	28.7	ACM-Assoc Comput Mach	521	19.4
74	Mitsubishi Electric Corp	741	1530	48.4	IEEE	741	48.4	ACM-Assoc Comput Mach	293	19.2
75	Snap Inc	731	1906	38.4	IEEE	731	38.4	ACM-Assoc Comput Mach	330	17.3
76	Columbia University	712	2485	28.7	IEEE	712	28.7	ACM-Assoc Comput Mach	399	16.1
77	Tela Innovations inc	703	2317	30.3	SPIE-Int Soc Opt Engineering	882	38.1	IEEE	703	30.3
78	Fujitsu Limited	700	2076	33.7	IEEE	700	33.7	Joint IEEE and ACM	334	16.1
79	Panasonic Holding Corporati	686	1771	38.7	IEEE	686	38.7	ACM-Assoc Comput Mach	131	7.4
80	IP RESERVOIR LLC	666	1348	49.4	IEEE	666	49.4	ACM-Assoc Comput Mach	236	17.5

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Nant Holdings IP Llc	661	2854	23.2	Joint IEEE and ACM	860	30.1	ACM-Assoc Comput Mach	688	24.1
82	Vantiva SA (former Technico	653	1451	45.0	IEEE	653	45.0	ACM-Assoc Comput Mach	124	8.5
83	State Farm Mutual Automobi	633	2108	30.0	IEEE	633	30.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	115	5.5
84	United Services Automobile	633	4311	14.7	Source Media	725	16.8	IEEE	633	14.7
85	INDIVIDUAL PATENTER	606	3020	20.1	IEEE	606	20.1	ACM-Assoc Comput Mach	422	14.0
86	Cloud Software Group	594	1967	30.2	IEEE	594	30.2	ACM-Assoc Comput Mach	360	18.3
87	Baidu Inc	590	1858	31.8	IEEE	590	31.8	arXiv.org	410	22.1
88	Lumen Technologies Inc. (for	583	2478	23.5	ACM-Assoc Comput Mach	702	28.3	IEEE	583	23.5
89	Open Text Corp	566	1953	29.0	IEEE	566	29.0	ACM-Assoc Comput Mach	410	21.0
90	STRONG FORCE TX PORT	564	1400	40.3	IEEE	564	40.3	RELX Group (Elsevier)	280	20.0
91	Hewlett Packard Enterprises	556	1952	28.5	IEEE	556	28.5	ACM-Assoc Comput Mach	496	25.4
92	SRI International	548	1378	39.8	IEEE	548	39.8	ACM-Assoc Comput Mach	89	6.5
93	Hon Hai Precision Industry C	540	1273	42.4	IEEE	540	42.4	ACM-Assoc Comput Mach	134	10.5
94	BT Group PLC	533	1220	43.7	IEEE	533	43.7	ACM-Assoc Comput Mach	127	10.4
95	Nielsen Holdings Plc	524	4063	12.9	RELX Group (Elsevier)	781	19.2	IEEE	524	12.9
96	Imagination Technologies Gr	518	1579	32.8	IEEE	518	32.8	ACM-Assoc Comput Mach	493	31.2
97	Math Works Inc (The)	518	1241	41.7	IEEE	518	41.7	ACM-Assoc Comput Mach	213	17.2
98	Seiko Epson Corporation	516	1037	49.8	IEEE	516	49.8	ACM-Assoc Comput Mach	98	9.5
99	Experian Plc	513	4714	10.9	IEEE	513	10.9	Source Media	503	10.7
100	Comcast Corp	511	1599	32.0	IEEE	511	32.0	ACM-Assoc Comput Mach	456	28.5

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Cybersecurity</i>										
1	OneTrust	7783	24065	32.3	ACM-Assoc Comput Mach	11462	47.6	IEEE	7783	32.3
2	Microsoft Corporation	7336	27865	26.3	IEEE	7336	26.3	ACM-Assoc Comput Mach	6558	23.5
3	International Business Machi	6707	29294	22.9	IEEE	6707	22.9	ACM-Assoc Comput Mach	5307	18.1
4	Cisco Systems Inc.	4713	16095	29.3	IEEE	4713	29.3	ACM-Assoc Comput Mach	2350	14.6
5	Trellix (merger of FireEye Inc	2828	8138	34.8	IEEE	2828	34.8	ACM-Assoc Comput Mach	1412	17.4
6	Intel Corporation	2401	6373	37.7	IEEE	2401	37.7	ACM-Assoc Comput Mach	758	11.9
7	Alphabet Inc.	2385	8361	28.5	IEEE	2385	28.5	ACM-Assoc Comput Mach	1575	18.8
8	Blackberry Ltd.	2166	8237	26.3	IEEE	2166	26.3	3GPP General Partnership Project Standards Body	933	11.3
9	Oracle Corporation	1971	9305	21.2	IEEE	1971	21.2	ACM-Assoc Comput Mach	1811	19.5
10	Apple Inc	1671	5672	29.5	IEEE	1671	29.5	ACM-Assoc Comput Mach	1114	19.6
11	AT&T Inc	1662	4866	34.2	IEEE	1662	34.2	ACM-Assoc Comput Mach	551	11.3
12	Columbia University	1563	6764	23.1	IEEE	1563	23.1	ACM-Assoc Comput Mach	1296	19.2
13	Amazon.com Inc.	1491	6529	22.8	IEEE	1491	22.8	ACM-Assoc Comput Mach	1067	16.3
14	Broadcom Ltd	1448	5279	27.4	IEEE	1448	27.4	ACM-Assoc Comput Mach	1189	22.5
15	Intertrust Technologies Corp	1372	8996	15.3	ACM-Assoc Comput Mach	1527	17.0	IEEE	1372	15.3
16	Massachusetts Institute of Te	1354	2398	56.5	IEEE	1354	56.5	ACM-Assoc Comput Mach	262	10.9
17	Wisteria Trading Inc	1320	2811	47.0	IEEE	1320	47.0	SPIE-Int Soc Opt Engineering	324	11.5
18	Nokia Corporation	1188	5722	20.8	3GPP General Partnership Project Standards B	1712	29.9	IEEE	1188	20.8
19	Cloud Software Group	1041	3131	33.2	IEEE	1041	33.2	ACM-Assoc Comput Mach	376	12.0
20	X ONE INC	1036	2954	35.1	IEEE	1036	35.1	ACM-Assoc Comput Mach	522	17.7
21	Qualcomm Inc	1033	4143	24.9	3GPP General Partnership Project Standards B	1196	28.9	IEEE	1033	24.9
22	Huawei Technologies Compa	957	6095	15.7	3GPP General Partnership Project Standards B	2947	48.4	IEEE	957	15.7
23	InterDigital Inc	956	4454	21.5	3GPP General Partnership Project Standards B	2976	66.8	IEEE	956	21.5
24	Gen Digital Inc. (formerly No	912	3519	25.9	IEEE	912	25.9	ACM-Assoc Comput Mach	747	21.2
25	McAfee Inc	912	4046	22.5	IEEE	912	22.5	ACM-Assoc Comput Mach	770	19.0
26	IP RESERVOIR LLC	902	1721	52.4	IEEE	902	52.4	ACM-Assoc Comput Mach	259	15.0
27	Nippon Telegraph & Telepho	900	4516	19.9	IEEE	900	19.9	ACM-Assoc Comput Mach	578	12.8
28	Juniper Networks Inc.	897	2060	43.5	IEEE	897	43.5	Internet Soc/IETF-Internet Eng Task Force	403	19.6
29	Headwater Partners 1 LLC	876	2124	41.2	IEEE	876	41.2	3GPP General Partnership Project Standards Body	397	18.7
30	NXGEN PARTNERS IP LLC	820	1632	50.2	IEEE	820	50.2	Optical Society of America	402	24.6
31	Ericsson	811	6205	13.1	3GPP General Partnership Project Standards B	2859	46.1	IEEE	811	13.1
32	Dell Technologies Inc	773	2649	29.2	IEEE	773	29.2	ACM-Assoc Comput Mach	506	19.1
33	Softbank Corp	771	2374	32.5	IEEE	771	32.5	Virus Bulletin Ltd	261	11.0
34	Comcast Corp	749	1717	43.6	IEEE	749	43.6	3GPP General Partnership Project Standards Body	652	38.0
35	CENTRIPETAL NETWORK	748	2257	33.1	IEEE	748	33.1	ACM-Assoc Comput Mach	413	18.3
36	STRONG FORCE TX PORT	745	1842	40.4	IEEE	745	40.4	RELX Group (Elsevier)	365	19.8
37	Digimarc Corp.	727	2090	34.8	IEEE	727	34.8	ACM-Assoc Comput Mach	260	12.4
38	Samsung Electronics Co Ltd	696	2539	27.4	3GPP General Partnership Project Standards B	1001	39.4	IEEE	696	27.4
39	Xerox Corp	693	2282	30.4	IEEE	693	30.4	ACM-Assoc Comput Mach	638	28.0

## *Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)*

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Marvell Technology Group Lt	686	1101	62.3	IEEE	686	62.3	ACM-Assoc Comput Mach	78	7.1
41	Palo Alto Networks	680	1730	39.3	IEEE	680	39.3	ACM-Assoc Comput Mach	261	15.1
42	Sony Group Corp	660	1877	35.2	IEEE	660	35.2	ACM-Assoc Comput Mach	194	10.3
43	Verizon Communications Inc	645	2228	28.9	IEEE	645	28.9	Internet Soc/IETF-Internet Eng Task Force	550	24.7
44	VirnetX Holding Corp	587	11886	4.9	Network Working Group RFC	6287	52.9	Internet Soc/IETF-Internet Eng Task Force	1816	15.3
45	Commvault Systems Inc.	584	1010	57.8	IEEE	584	57.8	ACM-Assoc Comput Mach	159	15.7
46	Verance Corp	583	1183	49.3	IEEE	583	49.3	SPIE-Int Soc Opt Engineering	155	13.1
47	The Arizona Board of Regent	579	1688	34.3	IEEE	579	34.3	ACM-Assoc Comput Mach	419	24.8
48	Advanced New Technologies	567	1118	50.7	IEEE	567	50.7	ACM-Assoc Comput Mach	80	7.2
49	NXP Semiconductors NV	553	1108	49.9	IEEE	553	49.9	International Association for Cryptologic Research (IACR)	97	8.8
50	Accenture Ltd.	540	1626	33.2	IEEE	540	33.2	ACM-Assoc Comput Mach	272	16.7
51	Extreme Networks Inc	533	1219	43.7	IEEE	533	43.7	ACM-Assoc Comput Mach	146	12.0
52	Open Text Corp	519	1426	36.4	IEEE	519	36.4	ACM-Assoc Comput Mach	262	18.4
53	L3 Harris Technologies (f/k/a	505	889	56.8	IEEE	505	56.8	ACM-Assoc Comput Mach	84	9.4
54	Fortinet Inc	490	1043	47.0	IEEE	490	47.0	ACM-Assoc Comput Mach	189	18.1
55	Meta Platforms Inc.(formerly	490	2382	20.6	ACM-Assoc Comput Mach	542	22.8	IEEE	490	20.6
56	Johnson & Johnson	483	1626	29.7	IEEE	483	29.7	RELX Group (Elsevier)	338	20.8
57	RTX Corporation (f/k/a Rayt	480	1612	29.8	IEEE	480	29.8	American Physical Society	154	9.6
58	BT Group PLC	479	1320	36.3	IEEE	479	36.3	ACM-Assoc Comput Mach	97	7.3
59	HP Inc	478	1855	25.8	IEEE	478	25.8	ACM-Assoc Comput Mach	295	15.9
60	Hewlett Packard Enterprises	474	1533	30.9	IEEE	474	30.9	ACM-Assoc Comput Mach	275	17.9
61	NEC Corp	459	2562	17.9	3GPP General Partnership Project Standards B	768	30.0	IEEE	459	17.9
62	LG Electronics Inc.	456	1657	27.5	3GPP General Partnership Project Standards B	664	40.1	IEEE	456	27.5
63	Sap SE	449	1854	24.2	ACM-Assoc Comput Mach	572	30.9	IEEE	449	24.2
64	Assa Abloy AB	434	2104	20.6	IEEE	434	20.6	International Association for Cryptologic Research (IACR)	371	17.6
65	Sonos Inc	418	1276	32.8	IEEE	418	32.8	Open Connectivity Foundation	111	8.7
66	Ricoh Co. Ltd.	398	1046	38.0	IEEE	398	38.0	ACM-Assoc Comput Mach	235	22.5
67	Wells Fargo & Co	376	1123	33.5	IEEE	376	33.5	ACM-Assoc Comput Mach	100	8.9
68	Security First Corp	372	1391	26.7	ACM-Assoc Comput Mach	401	28.8	IEEE	372	26.7
69	CapitalOne	366	1643	22.3	IEEE	366	22.3	CBS Interactive	185	11.3
70	Advanced Micro Devices Inc	363	1996	18.2	ACM-Assoc Comput Mach	993	49.7	Joint IEEE and ACM	382	19.1
71	Fujitsu Limited	357	1253	28.5	IEEE	357	28.5	ACM-Assoc Comput Mach	177	14.1
72	THE CHAMBERLAIN GRO	348	1027	33.9	IEEE	348	33.9	International Association for Cryptologic Research (IACR)	157	15.3
73	Analog Devices Inc.	345	773	44.6	IEEE	345	44.6	ACM-Assoc Comput Mach	156	20.2
74	III HOLDINGS 12 LLC	343	685	50.1	IEEE	343	50.1	ACM-Assoc Comput Mach	82	12.0
75	DAMBALLA INC	341	1834	18.6	The USENIX Association	507	27.6	ACM-Assoc Comput Mach	364	19.8
76	Palantir Technologies Inc	337	1677	20.1	IEEE	337	20.1	ACM-Assoc Comput Mach	274	16.3
77	BLUERISC INC	336	955	35.2	IEEE	336	35.2	ACM-Assoc Comput Mach	220	23.0
78	Toshiba Corp	333	1498	22.2	IEEE	333	22.2	AACS-Advanced Access Content System	299	20.0
79	BRIGHT DATA LTD	329	3404	9.7	Internet Soc/IETF-Internet Eng Task Force	1802	52.9	ACM-Assoc Comput Mach	369	10.8
80	Forcepoint LLC	327	1233	26.5	IEEE	327	26.5	ACM-Assoc Comput Mach	225	18.2

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Witricity Corp	324	609	53.2	IEEE	324	53.2	AIP Publishing	41	6.7
82	Bank of America Corp.	317	729	43.5	IEEE	317	43.5	ACM-Assoc Comput Mach	127	17.4
83	DropBox Inc	316	807	39.2	IEEE	316	39.2	ACM-Assoc Comput Mach	168	20.8
84	Motorola Solutions Inc.	316	687	46.0	IEEE	316	46.0	Network Working Group RFC	68	9.9
85	Salesforce Inc. (f/k/a Salesfor	315	1038	30.3	IEEE	315	30.3	ACM-Assoc Comput Mach	135	13.0
86	FedEx Corp	310	652	47.5	IEEE	310	47.5	RELX Group (Elsevier)	78	12.0
87	T-Mobile USA INC	303	1119	27.1	IEEE	303	27.1	3GPP General Partnership Project Standards Body	118	10.5
88	Rambus Inc.	302	1163	26.0	International Association for Cryptologic Rese	348	29.9	IEEE	302	26.0
89	Panasonic Holding Corporati	297	1169	25.4	IEEE	297	25.4	3GPP General Partnership Project Standards Body	213	18.2
90	Empire Technology Develop	288	1024	28.1	IEEE	288	28.1	ACM-Assoc Comput Mach	200	19.5
91	Proxense Llc	283	725	39.0	IEEE	283	39.0	Dow Jones & Company	98	13.5
92	Yahoo Inc	282	1613	17.5	ACM-Assoc Comput Mach	304	18.8	IEEE	282	17.5
93	SILVERBROOK RESEARC	281	545	51.6	IEEE	281	51.6	RELX Group (Elsevier)	146	26.8
94	INDIVIDUAL PATENTER	275	891	30.9	IEEE	275	30.9	ACM-Assoc Comput Mach	128	14.4
95	Experian Plc	274	1531	17.9	IEEE	274	17.9	Source Media	136	8.9
96	Walmart Stores Inc	273	789	34.6	IEEE	273	34.6	CBS Interactive	75	9.5
97	Siemens Aktiengesellschaft	258	776	33.2	IEEE	258	33.2	Internet Soc/IETF-Internet Eng Task Force	99	12.8
98	WEST VIEW RESEARCH L	254	625	40.6	IEEE	254	40.6	SAE-Society of Automobile Engineers	86	13.8
99	Adobe Inc. (former Adobe Sy	245	704	34.8	IEEE	245	34.8	ACM-Assoc Comput Mach	123	17.5
100	Alibaba Group Holding Ltd	245	631	38.8	IEEE	245	38.8	ACM-Assoc Comput Mach	74	11.7



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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Diagnosis/Surgery/Medical Instruments</i>										
1	Medtronic Inc	12041	2E+05	6.5	RELX Group (Elsevier)	31342	16.8	Wolters Kluwer	25003	13.4
2	Johnson & Johnson	9566	1E+05	9.4	RELX Group (Elsevier)	21922	21.5	Springer Nature	10788	10.6
3	Boston Scientific Corp.	6446	94210	6.8	RELX Group (Elsevier)	23729	25.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	12133	12.9
4	Dexcom Inc	6089	1E+05	5.8	RELX Group (Elsevier)	26730	25.5	American Diabetes Association	10805	10.3
5	Intuitive Surgical Inc.	5975	16656	35.9	IEEE	5975	35.9	The Medical Image Computing and Computer Assisted Interv	1621	9.7
6	Abbott Laboratories	4704	1E+05	4.3	RELX Group (Elsevier)	25390	23.5	ACS-Am Chem Soc	10175	9.4
7	Masimo Corp	3251	6798	47.8	IEEE	3251	47.8	Springer Nature	601	8.8
8	Mass General Brigham (form	2762	45409	6.1	Optical Society of America	14080	31.0	RELX Group (Elsevier)	6956	15.3
9	Koninklijke Philips N.V.	2588	18073	14.3	RELX Group (Elsevier)	2751	15.2	IEEE	2588	14.3
10	Massachusetts Institute of Te	2084	10343	20.1	RELX Group (Elsevier)	2102	20.3	IEEE	2084	20.1
11	Intellectual Ventures Manage	1983	14304	13.9	IEEE	1983	13.9	Springer Nature	1802	12.6
12	Stryker Corp.	1842	16546	11.1	RELX Group (Elsevier)	2939	17.8	Springer Nature	1978	12.0
13	Guided Therapy Systems LL	1706	7385	23.1	IEEE	1706	23.1	RELX Group (Elsevier)	1229	16.6
14	University of California	1598	14015	11.4	RELX Group (Elsevier)	2616	18.7	IEEE	1598	11.4
15	Siemens Aktiengesellschaft	1466	9531	15.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1955	20.5	RELX Group (Elsevier)	1947	20.4
16	Vanderbilt University	1337	4021	33.3	IEEE	1337	33.3	RELX Group (Elsevier)	558	13.9
17	Valencell Inc	1295	3569	36.3	IEEE	1295	36.3	RELX Group (Elsevier)	347	9.7
18	LivaNova Plc	1182	22391	5.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4997	22.3	RELX Group (Elsevier)	4498	20.1
19	Smith & Nephew Plc.	1117	17374	6.4	RELX Group (Elsevier)	3343	19.2	Wolters Kluwer	1757	10.1
20	University of Minnesota (The	1098	4315	25.4	IEEE	1098	25.4	RELX Group (Elsevier)	865	20.0
21	Mevion Medical Systems Inc	988	3185	31.0	IEEE	988	31.0	RELX Group (Elsevier)	619	19.4
22	Baxter International Inc.	917	9478	9.7	RELX Group (Elsevier)	2155	22.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	977	10.3
23	Ossur hf	907	2966	30.6	IEEE	907	30.6	RELX Group (Elsevier)	635	21.4
24	Otto Bock Holding GmbH &	899	2827	31.8	IEEE	899	31.8	RELX Group (Elsevier)	597	21.1
25	Sotera Wireless	858	1862	46.1	IEEE	858	46.1	Springer Nature	362	19.4
26	Columbia University	850	5874	14.5	RELX Group (Elsevier)	1504	25.6	IEEE	850	14.5
27	VIVAQUANT LLC	846	1733	48.8	IEEE	846	48.8	RELX Group (Elsevier)	225	13.0
28	Stanford University	839	25066	3.3	RELX Group (Elsevier)	4500	18.0	Springer Nature	4087	16.3
29	Virginia Tech University	831	6033	13.8	RELX Group (Elsevier)	1334	22.1	Springer Nature	917	15.2
30	Alphabet Inc.	819	2618	31.3	IEEE	819	31.3	RELX Group (Elsevier)	290	11.1
31	University of Nebraska	767	3889	19.7	IEEE	767	19.7	Springer Nature	663	17.0
32	Butterfly Network Inc	749	854	87.7	IEEE	749	87.7	Acoustical Society of America	28	3.3
33	University of Illinois	749	11012	6.8	RELX Group (Elsevier)	1549	14.1	ACS-Am Chem Soc	1478	13.4
34	Saluda Medical Pty Ltd	721	4057	17.8	IEEE	721	17.8	RELX Group (Elsevier)	667	16.4
35	The Arizona Board of Regent	656	2836	23.1	IEEE	656	23.1	RELX Group (Elsevier)	488	17.2
36	University of Michigan	624	6695	9.3	RELX Group (Elsevier)	1879	28.1	IEEE	624	9.3
37	General Electric Company	623	2386	26.1	IEEE	623	26.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	374	15.7
38	Johns Hopkins University	583	4121	14.1	RELX Group (Elsevier)	693	16.8	IEEE	583	14.1
39	Maui Imaging Inc (a/k/a Mau	582	944	61.7	IEEE	582	61.7	RELX Group (Elsevier)	124	13.1



## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Cleveland Clinic (and Founda	573	3795	15.1	RELX Group (Elsevier)	772	20.3	IEEE	573	15.1
41	University of Washington	493	5263	9.4	RELX Group (Elsevier)	1029	19.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	568	10.8
42	AngioDynamics Inc.	477	4786	10.0	RELX Group (Elsevier)	1050	21.9	Springer Nature	623	13.0
43	MIRAMAR LABS INC	476	1356	35.1	IEEE	476	35.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	169	12.5
44	California Institute of Techno	466	4151	11.2	RELX Group (Elsevier)	561	13.5	Springer Nature	553	13.3
45	Becton Dickinson and Co.	457	31490	1.5	Wolters Kluwer	8675	27.5	RELX Group (Elsevier)	5471	17.4
46	University of Texas	442	5670	7.8	RELX Group (Elsevier)	1179	20.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	597	10.5
47	Otsuka Holdings Co Ltd	441	3078	14.3	RELX Group (Elsevier)	606	19.7	IEEE	441	14.3
48	FACENSE LTD	431	779	55.3	IEEE	431	55.3	RELX Group (Elsevier)	67	8.6
49	Asahi Kasei Corp.	407	4555	8.9	Wolters Kluwer	1152	25.3	RELX Group (Elsevier)	738	16.2
50	Nevro Corp	406	6205	6.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1140	18.4	Wolters Kluwer	1118	18.0
51	University of Florida	398	2073	19.2	IEEE	398	19.2	RELX Group (Elsevier)	380	18.3
52	Samsung Electronics Co Ltd	395	1120	35.3	IEEE	395	35.3	RELX Group (Elsevier)	126	11.3
53	INDIVIDUAL PATENTER	393	8708	4.5	RELX Group (Elsevier)	1880	21.6	Wolters Kluwer	1048	12.0
54	Blue Sail Medical Co. Ltd.	375	1272	29.5	IEEE	375	29.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	180	14.2
55	IWALK INC	372	1160	32.1	IEEE	372	32.1	RELX Group (Elsevier)	251	21.6
56	University Health Network	368	1368	26.9	IEEE	368	26.9	RELX Group (Elsevier)	243	17.8
57	Case Western Reserve Univer	366	1647	22.2	IEEE	366	22.2	RELX Group (Elsevier)	231	14.0
58	University of Pennsylvania	361	6798	5.3	RELX Group (Elsevier)	1099	16.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	856	12.6
59	GE Healthcare	356	1890	18.8	IEEE	356	18.8	RELX Group (Elsevier)	316	16.7
60	MIRADRY INC	351	954	36.8	IEEE	351	36.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	116	12.2
61	Bonutti Technologies LLC	339	3665	9.2	RELX Group (Elsevier)	983	26.8	Springer Nature	488	13.3
62	Globus Medical Inc	335	12302	2.7	Wolters Kluwer	5274	42.9	Springer Nature	1958	15.9
63	Nyxoah SA	331	886	37.4	IEEE	331	37.4	RELX Group (Elsevier)	106	12.0
64	BLUEWIND MEDICAL LT	323	760	42.5	IEEE	323	42.5	American Physiological Society	94	12.4
65	Canon Inc	320	1772	18.1	IEEE	320	18.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	205	11.6
66	INNEROPTIC TECHNOLO	314	1748	18.0	IEEE	314	18.0	SPIE-Int Soc Opt Engineering	236	13.5
67	Alcon Inc	309	7439	4.2	RELX Group (Elsevier)	2031	27.3	American Medical Association	600	8.1
68	BIO CONTROL MEDICAL (	309	1229	25.1	IEEE	309	25.1	Wolters Kluwer	200	16.3
69	Mayo Foundation for Medica	308	4232	7.3	RELX Group (Elsevier)	975	23.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	562	13.3
70	University of Pittsburgh	307	4810	6.4	RELX Group (Elsevier)	1370	28.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	597	12.4
71	Conformis Inc	305	10216	3.0	Springer Nature	1728	16.9	RELX Group (Elsevier)	1279	12.5
72	United States Department of	305	1590	19.2	RELX Group (Elsevier)	377	23.7	IEEE	305	19.2
73	Cirrus Logic Inc.	299	498	60.0	IEEE	299	60.0	Acoustical Society of America	74	14.9
74	KONA MEDICAL INC	286	1966	14.5	RELX Group (Elsevier)	523	26.6	IEEE	286	14.5
75	ICU Medical Inc	282	1969	14.3	IEEE	282	14.3	Springer Nature	280	14.2
76	Zimmer Biomet Holdings	279	11534	2.4	RELX Group (Elsevier)	2461	21.3	Springer Nature	1747	15.1
77	MEDISPECTRA INC	278	717	38.8	IEEE	278	38.8	RELX Group (Elsevier)	80	11.2
78	Merz GmbH & Co KGaA	266	1717	15.5	RELX Group (Elsevier)	426	24.8	IEEE	266	15.5
79	HIGHLAND INSTRUMENT	265	553	47.9	IEEE	265	47.9	RELX Group (Elsevier)	61	11.0
80	University of South Florida	262	1335	19.6	IEEE	262	19.6	RELX Group (Elsevier)	258	19.3

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	University of North Carolina	255	1986	12.8	RELX Group (Elsevier)	392	19.7	IEEE	255	12.8
82	BRAINGATE CO LLC	254	675	37.6	IEEE	254	37.6	RELX Group (Elsevier)	101	15.0
83	Align Technology Inc	251	2337	10.7	JCO - Journal of Clinical Orthodontics	335	14.3	RELX Group (Elsevier)	295	12.6
84	International Business Machi	247	1093	22.6	IEEE	247	22.6	RELX Group (Elsevier)	125	11.4
85	Washington University in St.	247	4718	5.2	RELX Group (Elsevier)	713	15.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	682	14.5
86	Duke University	246	2238	11.0	RELX Group (Elsevier)	320	14.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	312	13.9
87	Hologic Inc	242	3778	6.4	RELX Group (Elsevier)	825	21.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	658	17.4
88	Deka Products LP	241	521	46.3	IEEE	241	46.3	RELX Group (Elsevier)	72	13.8
89	VIRTUAL INCISION CORP	238	1014	23.5	IEEE	238	23.5	Springer Nature	170	16.8
90	University of Southern Califo	237	1380	17.2	IEEE	237	17.2	RELX Group (Elsevier)	225	16.3
91	DISTALMOTION SA	230	392	58.7	IEEE	230	58.7	IEEE/RSJ	68	17.3
92	Victhom Laboratory Inc (for	230	647	35.5	IEEE	230	35.5	RELX Group (Elsevier)	198	30.6
93	PULSE BIOSCIENCES INC	225	550	40.9	IEEE	225	40.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	81	14.7
94	Ecole Polytechnique Federale	224	1306	17.2	RELX Group (Elsevier)	232	17.8	IEEE	224	17.2
95	HEMOSONICS LLC	221	523	42.3	IEEE	221	42.3	RELX Group (Elsevier)	64	12.2
96	Bayer AG	219	2255	9.7	RELX Group (Elsevier)	342	15.2	Wolters Kluwer	315	14.0
97	MEDROBOTICS CORP	216	631	34.2	IEEE	216	34.2	Springer Nature	154	24.4
98	Kardium Inc	212	1591	13.3	IEEE	212	13.3	Springer Nature	198	12.4
99	PHYSIOWAVE INC	212	548	38.7	IEEE	212	38.7	Wolters Kluwer	128	23.4
100	Northwestern University	205	3439	6.0	RELX Group (Elsevier)	652	19.0	ACS-Am Chem Soc	418	12.2

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

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<i>Information Storage</i>										
1	Micron Technology Inc.	15807	32752	48.3	IEEE	15807	48.3	RELX Group (Elsevier)	4929	15.0
2	Zeno Semiconductors Inc	6780	9048	74.9	IEEE	6780	74.9	IEEE/JPN Soc App Phys	1436	15.9
3	Western Digital Corp.	6289	12472	50.4	IEEE	6289	50.4	AIP Publishing	1310	10.5
4	International Business Machi	5072	17203	29.5	IEEE	5072	29.5	ACM-Assoc Comput Mach	2647	15.4
5	Broadcom Ltd	2695	3858	69.9	IEEE	2695	69.9	ACM-Assoc Comput Mach	316	8.2
6	Macronix International Co. Lt	2569	4510	57.0	IEEE	2569	57.0	IEEE/JPN Soc App Phys	884	19.6
7	ATTOPSEMI TECHNOLOG	2380	2964	80.3	IEEE	2380	80.3	IEEE/JPN Soc App Phys	364	12.3
8	Semiconductor Energy Labor	2342	26438	8.9	SID-Society for Information Display	9159	34.6	AIP Publishing	3282	12.4
9	Mosaid Technologies ( f/k/a/C	2188	2655	82.4	IEEE	2188	82.4	IEEE/JPN Soc App Phys	199	7.5
10	Rambus Inc.	2023	3547	57.0	IEEE	2023	57.0	JEDEC Semiconductor Standards Organization	312	8.8
11	Intel Corporation	1581	4015	39.4	IEEE	1581	39.4	Joint IEEE and ACM	709	17.7
12	Apple Inc	1459	3078	47.4	IEEE	1459	47.4	AIP Publishing	253	8.2
13	Seagate Technology Plc	1394	4516	30.9	IEEE	1394	30.9	AIP Publishing	971	21.5
14	Toshiba Corp	1290	2961	43.6	IEEE	1290	43.6	AIP Publishing	396	13.4
15	Infineon Technologies AG	1209	1696	71.3	IEEE	1209	71.3	AIP Publishing	102	6.0
16	Monolithic 3D Inc	1164	2083	55.9	IEEE	1164	55.9	IEEE/JPN Soc App Phys	216	10.4
17	Renesas Electronic Corporati	1139	1553	73.3	IEEE	1139	73.3	IEEE/JPN Soc App Phys	118	7.6
18	INNOVATIVE SILICON SA	1051	1310	80.2	IEEE	1051	80.2	RELX Group (Elsevier)	57	4.4
19	Samsung Electronics Co Ltd	827	2351	35.2	IEEE	827	35.2	Joint IEEE and ACM	233	9.9
20	Microsoft Corporation	798	4035	19.8	ACM-Assoc Comput Mach	1485	36.8	IEEE	798	19.8
21	TDK Corporation	735	2610	28.2	IEEE	735	28.2	AIP Publishing	536	20.5
22	Commvault Systems Inc.	734	1260	58.3	IEEE	734	58.3	ACM-Assoc Comput Mach	225	17.9
23	Oracle Corporation	700	2634	26.6	ACM-Assoc Comput Mach	1129	42.9	IEEE	700	26.6
24	Netapp Inc	654	2965	22.1	ACM-Assoc Comput Mach	1214	40.9	IEEE	654	22.1
25	NXP Semiconductors NV	611	905	67.5	IEEE	611	67.5	Joint IEEE and ACM	86	9.5
26	Qualcomm Inc	589	1005	58.6	IEEE	589	58.6	Joint IEEE and ACM	96	9.6
27	Hitachi Ltd	580	1611	36.0	IEEE	580	36.0	ACM-Assoc Comput Mach	162	10.1
28	Softbank Corp	558	1229	45.4	IEEE	558	45.4	Joint IEEE and ACM	225	18.3
29	Marvell Technology Group Lt	552	766	72.1	IEEE	552	72.1	ECMA International	34	4.4
30	INNOVATIVE SILICON ISI	529	649	81.5	IEEE	529	81.5	IEEE/JPN Soc App Phys	28	4.3
31	Synopsys Inc.	508	954	53.2	IEEE	508	53.2	AIP Publishing	116	12.2
32	Texas Instruments Inc	496	763	65.0	IEEE	496	65.0	United Business Media/UBM Tech	56	7.3
33	Advanced Micro Devices Inc	494	1223	40.4	IEEE	494	40.4	Joint IEEE and ACM	305	24.9
34	Dell Technologies Inc	490	1359	36.1	IEEE	490	36.1	ACM-Assoc Comput Mach	314	23.1
35	Taiwan Semiconductor Manu	402	589	68.3	IEEE	402	68.3	IEEE/JPN Soc App Phys	66	11.2
36	Intellectual Ventures Manage	393	751	52.3	IEEE	393	52.3	ACM-Assoc Comput Mach	53	7.1
37	Microchip Technology Inc.	366	501	73.1	IEEE	366	73.1	IEEE/JPN Soc App Phys	20	4.0
38	Avid Technology Inc.	354	681	52.0	IEEE	354	52.0	ACM-Assoc Comput Mach	219	32.2
39	HP Inc	341	1067	32.0	IEEE	341	32.0	ACM-Assoc Comput Mach	184	17.2

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	SK Hynix Inc	337	573	58.8	IEEE	337	58.8	Joint IEEE and ACM	48	8.4
41	Hewlett Packard Enterprises	333	1023	32.6	IEEE	333	32.6	ACM-Assoc Comput Mach	273	26.7
42	Alphabet Inc.	305	792	38.5	IEEE	305	38.5	ACM-Assoc Comput Mach	220	27.8
43	Fujitsu Limited	304	577	52.7	IEEE	304	52.7	AIP Publishing	60	10.4
44	Sony Group Corp	304	865	35.1	IEEE	304	35.1	RELX Group (Elsevier)	72	8.3
45	Intertrust Technologies Corp	298	1918	15.5	ACM-Assoc Comput Mach	348	18.1	IEEE	298	15.5
46	Massachusetts Institute of Te	298	659	45.2	IEEE	298	45.2	Springer Nature	69	10.5
47	NVIDIA Corp.	294	668	44.0	IEEE	294	44.0	Joint IEEE and ACM	150	22.5
48	Crossbar Inc	290	1129	25.7	IEEE	290	25.7	AIP Publishing	152	13.5
49	RADIAN MEMORY SYSTE	280	731	38.3	IEEE	280	38.3	The USENIX Association	165	22.6
50	Netlist Inc	271	1097	24.7	IP.Com	295	26.9	JEDEC Semiconductor Standards Organization	295	26.9
51	STMicroelectronics	269	453	59.4	IEEE	269	59.4	RELX Group (Elsevier)	29	6.4
52	Nantero Inc	259	2205	11.7	ACS-Am Chem Soc	582	26.4	AIP Publishing	466	21.1
53	Global Foundries Inc	258	483	53.4	IEEE	258	53.4	Joint IEEE and ACM	28	5.8
54	The Arizona Board of Regent	251	516	48.6	IEEE	251	48.6	RELX Group (Elsevier)	37	7.2
55	Empire Technology Develop	241	508	47.4	IEEE	241	47.4	Joint IEEE and ACM	108	21.3
56	Trellix (merger of FireEye Inc	229	675	33.9	IEEE	229	33.9	ACM-Assoc Comput Mach	117	17.3
57	California Institute of Techno	228	345	66.1	IEEE	228	66.1	AAAS-Am Assoc Advancement Sci	18	5.2
58	Panasonic Holding Corporati	217	625	34.7	IEEE	217	34.7	Institute of Pure and Applied Physics	74	11.8
59	Boston Scientific Corp.	212	288	73.6	IEEE	212	73.6	IEEE/JPN Soc App Phys	34	11.8
60	Yonsei University	208	416	50.0	IEEE	208	50.0	Joint IEEE and ACM	75	18.0
61	QST HOLDINGS LLC	204	346	59.0	IEEE	204	59.0	Joint IEEE and ACM	40	11.6
62	Commissariat A L'Energie At	188	424	44.3	IEEE	188	44.3	AIP Publishing	62	14.6
63	PURE Storage Inc	165	1068	15.4	Internet Soc/IETF-Internet Eng Task Force	442	41.4	ACM-Assoc Comput Mach	231	21.6
64	PACT XPP TECHNOLOGIE	158	279	56.6	IEEE	158	56.6	ACM-Assoc Comput Mach	24	8.6
65	United Microelectronics Corp	158	323	48.9	IEEE	158	48.9	AIP Publishing	50	15.5
66	Kandou Bus SA	156	172	90.7	IEEE	156	90.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	8	4.7
67	Columbia University	154	384	40.1	IEEE	154	40.1	ACM-Assoc Comput Mach	67	17.4
68	Kioxia Corp (formerly Toshiba	150	356	42.1	IEEE	150	42.1	The USENIX Association	55	15.4
69	University of California	148	639	23.2	IEEE	148	23.2	ACS-Am Chem Soc	101	15.8
70	Sap SE	145	577	25.1	IEEE	145	25.1	ACM-Assoc Comput Mach	122	21.1
71	Avalanche Technology Inc	144	653	22.1	AIP Publishing	202	30.9	IEEE	144	22.1
72	Amazon.com Inc.	140	497	28.2	IEEE	140	28.2	ACM-Assoc Comput Mach	122	24.5
73	Hon Hai Precision Industry C	140	333	42.0	IEEE	140	42.0	AIP Publishing	52	15.6
74	OPTICAL DEVICES LLC	135	277	48.7	IEEE	135	48.7	RELX Group (Elsevier)	45	16.2
75	INDIVIDUAL PATENTER	134	263	51.0	IEEE	134	51.0	RELX Group (Elsevier)	24	9.1
76	Industrial Technology Researc	134	234	57.3	IEEE	134	57.3	IEEE/JPN Soc App Phys	20	8.5
77	NEC Corp	131	383	34.2	IEEE	131	34.2	AIP Publishing	73	19.1
78	Spin Memory	127	479	26.5	IEEE	127	26.5	AIP Publishing	101	21.1
79	Huawei Technologies Compa	126	370	34.1	IEEE	126	34.1	Joint IEEE and ACM	84	22.7
80	Purdue University	125	293	42.7	IEEE	125	42.7	Joint IEEE and ACM	29	9.9

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	University of Minnesota (The	123	661	18.6	Springer Nature	145	21.9	American Physical Society	141	21.3
82	MEMRAY CORP	113	271	41.7	IEEE	113	41.7	Joint IEEE and ACM	68	25.1
83	Tela Innovations inc	112	355	31.5	SPIE-Int Soc Opt Engineering	134	37.7	IEEE	112	31.5
84	Soitec SA	111	140	79.3	IEEE	111	79.3	IET/IEE	7	5.0
85	Cisco Systems Inc.	109	249	43.8	IEEE	109	43.8	ACM-Assoc Comput Mach	66	26.5
86	Round Rock Research LLC	109	480	22.7	RELX Group (Elsevier)	138	28.8	IEEE	109	22.7
87	Unisantis Electronics Ltd	99	123	80.5	IEEE	99	80.5	IEICE-Inst Elec Info Comm Eng	13	10.6
88	Texas A&M University	97	153	63.4	IEEE	97	63.4	ACM-Assoc Comput Mach	22	14.4
89	KEPLER COMPUTING INC	95	127	74.8	IEEE	95	74.8	IEEE/JPN Soc App Phys	17	13.4
90	Ecole Polytechnique Federale	89	136	65.4	IEEE	89	65.4	Joint IEEE and ACM	13	9.6
91	Nokia Corporation	86	241	35.7	IEEE	86	35.7	ACM-Assoc Comput Mach	29	12.0
92	QST HOLDINGS INC	86	146	58.9	IEEE	86	58.9	Joint IEEE and ACM	16	11.0
93	Interuniversity MicroElectron	85	179	47.5	IEEE	85	47.5	Joint IEEE and ACM	23	12.8
94	Waratek Ltd. ( former Warate	83	220	37.7	IEEE	83	37.7	ACM-Assoc Comput Mach	55	25.0
95	Alibaba Group Holding Ltd	82	178	46.1	IEEE	82	46.1	Joint IEEE and ACM	36	20.2
96	R & D 3 LLC	80	80	100.0	IEEE	80	100.0			
97	Glassbridge Enterprises Inc	76	139	54.7	IEEE	76	54.7	RELX Group (Elsevier)	11	7.9
98	SEEQC INC	75	135	55.6	IEEE	75	55.6	AIP Publishing	20	14.8
99	University of Michigan	73	173	42.2	IEEE	73	42.2	Joint IEEE and ACM	43	24.9
100	INSTON INC	72	239	30.1	IEEE	72	30.1	Springer Nature	51	21.3

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>IOT/Internet of Things</i>										
1	Apple Inc	5129	16306	31.5	IEEE	5129	31.5	ACM-Assoc Comput Mach	3143	19.3
2	SolarEdge Technologies Inc	1929	2424	79.6	IEEE	1929	79.6	WIP-Renewable Energies	146	6.0
3	STRONG FORCE IOT PORT	1291	1810	71.3	IEEE	1291	71.3	RELX Group (Elsevier)	159	8.8
4	Velatia Group	839	1120	74.9	IEEE	839	74.9	Echelon Corp	81	7.2
5	Comcast Corp	722	1226	58.9	IEEE	722	58.9	3GPP General Partnership Project Standards Body	413	33.7
6	SIPCO LLC	630	1102	57.2	IEEE	630	57.2	Internet Soc/IETF-Internet Eng Task Force	98	8.9
7	Cisco Systems Inc.	569	1375	41.4	IEEE	569	41.4	ACM-Assoc Comput Mach	164	11.9
8	International Business Machi	457	1267	36.1	IEEE	457	36.1	IP.Com	126	9.9
9	Rockwell Automation Inc	407	744	54.7	IEEE	407	54.7	ACM-Assoc Comput Mach	82	11.0
10	AT&T Inc	389	888	43.8	IEEE	389	43.8	RELX Group (Elsevier)	61	6.9
11	Samsung Electronics Co Ltd	342	5994	5.7	3GPP General Partnership Project Standards B	5392	90.0	IEEE	342	5.7
12	Honeywell International Inc.	333	511	65.2	IEEE	333	65.2	SAE-Society of Automobile Engineers	24	4.7
13	Alphabet Inc.	324	737	44.0	IEEE	324	44.0	ACM-Assoc Comput Mach	116	15.7
14	LG Electronics Inc.	323	703	45.9	IEEE	323	45.9	3GPP General Partnership Project Standards Body	258	36.7
15	Microsoft Corporation	279	748	37.3	IEEE	279	37.3	ACM-Assoc Comput Mach	113	15.1
16	Johnson & Johnson	265	570	46.5	IEEE	265	46.5	RELX Group (Elsevier)	90	15.8
17	ORIGIN WIRELESS INC	247	364	67.9	IEEE	247	67.9	American Physical Society	21	5.8
18	General Electric Company	243	357	68.1	IEEE	243	68.1	RELX Group (Elsevier)	22	6.2
19	STRONG FORCE TX PORT	232	566	41.0	IEEE	232	41.0	RELX Group (Elsevier)	118	20.8
20	Sonos Inc	228	643	35.5	IEEE	228	35.5	Open Connectivity Foundation	73	11.4
21	Intel Corporation	198	461	43.0	IEEE	198	43.0	3GPP General Partnership Project Standards Body	114	24.7
22	EAGLE HARBOR HOLDIN	175	490	35.7	IEEE	175	35.7	SAE-Society of Automobile Engineers	135	27.6
23	Schneider Electric S.A.	160	1405	11.4	ISA - Instrumentation, Systems & Automation	252	17.9	IEEE	160	11.4
24	Walmart Stores Inc	155	424	36.6	IEEE	155	36.6	CBS Interactive	43	10.1
25	Palo Alto Networks	153	236	64.8	IEEE	153	64.8	3GPP General Partnership Project Standards Body	38	16.1
26	TRILLIANT NETWORKS IN	151	225	67.1	IEEE	151	67.1	Internet Soc/IETF-Internet Eng Task Force	15	6.7
27	MAY PATENTS LTD	150	296	50.7	IEEE	150	50.7	SAE-Society of Automobile Engineers	61	20.6
28	ABB Ltd	146	178	82.0	IEEE	146	82.0	RELX Group (Elsevier)	6	3.4
29	California Institute of Techno	136	245	55.5	IEEE	136	55.5	RELX Group (Elsevier)	19	7.8
30	Johnson Controls Internationa	135	313	43.1	IEEE	135	43.1	RELX Group (Elsevier)	57	18.2
31	Qualcomm Inc	125	432	28.9	3GPP General Partnership Project Standards B	204	47.2	IEEE	125	28.9
32	Emerson Electric Co.	123	307	40.1	IEEE	123	40.1	RELX Group (Elsevier)	85	27.7
33	AMPT LLC	121	157	77.1	IEEE	121	77.1	RELX Group (Elsevier)	8	5.1
34	Battelle Memorial Institute	117	164	71.3	IEEE	117	71.3	RELX Group (Elsevier)	8	4.9
35	State Farm Mutual Automobi	102	450	22.7	IEEE	102	22.7	IP.Com	50	11.1
36	EchoStar Corp	101	175	57.7	IEEE	101	57.7	CBS Interactive	24	13.7
37	Siemens Aktiengesellschaft	98	189	51.9	IEEE	98	51.9	Internet Soc/IETF-Internet Eng Task Force	23	12.2
38	ASTROLINK INTERNATIO	97	129	75.2	IEEE	97	75.2	International Telecommunication Union	12	9.3
39	DOMINION ENERGY TEC	97	129	75.2	IEEE	97	75.2	International Telecommunication Union	12	9.3

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Toyota Motor Corp	96	302	31.8	IEEE	96	31.8	ACM-Assoc Comput Mach	52	17.2
41	Nokia Corporation	95	309	30.7	IEEE	95	30.7	3GPP General Partnership Project Standards Body	84	27.2
42	Sap SE	93	275	33.8	IEEE	93	33.8	ACM-Assoc Comput Mach	47	17.1
43	NETWORK-1 TECHNOLOG	86	310	27.7	IEEE	86	27.7	Internet Soc/IETF-Internet Eng Task Force	77	24.8
44	Amazon.com Inc.	83	261	31.8	IEEE	83	31.8	ACM-Assoc Comput Mach	44	16.9
45	III HOLDINGS 12 LLC	80	165	48.5	IEEE	80	48.5	ACM-Assoc Comput Mach	21	12.7
46	Georgia Institute of Technolo	77	247	31.2	ACM-Assoc Comput Mach	120	48.6	IEEE	77	31.2
47	UNIVERSITY OF SAO PAU	77	168	45.8	IEEE	77	45.8	National Institute of Standards and Technology (NIST)	24	14.3
48	Dexcom Inc	75	469	16.0	RELX Group (Elsevier)	94	20.0	IEEE	75	16.0
49	STATSIGNAL SYSTEMS IN	75	132	56.8	IEEE	75	56.8	Internet Soc/IETF-Internet Eng Task Force	14	10.6
50	Extreme Networks Inc	74	159	46.5	IEEE	74	46.5	ACM-Assoc Comput Mach	20	12.6
51	Alstom S.A.	73	90	81.1	IEEE	73	81.1	IET/IEE	11	12.2
52	Adaptive Computing Enterpri	72	148	48.6	IEEE	72	48.6	ACM-Assoc Comput Mach	27	18.2
53	KIP PROD P1 LP	70	133	52.6	IEEE	70	52.6	American Society of Plant Biologists	12	9.0
54	BORGIA/CUMMINS LLC	69	102	67.6	IEEE	69	67.6	SPIE-Int Soc Opt Engineering	17	16.7
55	Itron Inc.	69	120	57.5	IEEE	69	57.5	ACM-Assoc Comput Mach	18	15.0
56	Blackberry Ltd.	68	108	63.0	IEEE	68	63.0	ACM-Assoc Comput Mach	13	12.0
57	Causam Enterprises (former	68	127	53.5	IEEE	68	53.5	Springer Nature	17	13.4
58	Huawei Technologies Compa	67	471	14.2	3GPP General Partnership Project Standards B	230	48.8	IEEE	67	14.2
59	Zebra Technologies Corp.	66	107	61.7	IEEE	66	61.7	RFID Journal/YGS Group	11	10.3
60	University System of Maryla	62	66	93.9	IEEE	62	93.9	EPE Association	2	3.0
61	SENSE LABS INC	61	410	14.9	NILM Organizing Committee	285	69.5	IEEE	61	14.9
62	Aeris Communications Inc	60	82	73.2	IEEE	60	73.2	RELX Group (Elsevier)	13	15.9
63	TRIAX TECHNOLOGIES IN	60	102	58.8	IEEE	60	58.8	RELX Group (Elsevier)	12	11.8
64	MIDDLE CHART LLC	59	94	62.8	IEEE	59	62.8	Multidisciplinary Digital Publishing Institute (MDPI)	22	23.4
65	Hubbell Inc.	57	95	60.0	IEEE	57	60.0	RELX Group (Elsevier)	11	11.6
66	CARTICA AI LTD	56	83	67.5	IEEE	56	67.5	ACM-Assoc Comput Mach	8	9.6
67	Convida Wireless LLC	56	783	7.2	3GPP General Partnership Project Standards B	321	41.0	Internet Soc/IETF-Internet Eng Task Force	152	19.4
68	Ericsson	56	555	10.1	3GPP General Partnership Project Standards B	246	44.3	Internet Soc/IETF-Internet Eng Task Force	116	20.9
69	Koninklijke Philips N.V.	56	232	24.1	IEEE	56	24.1	Springer Nature	28	12.1
70	Western Digital Corp.	56	68	82.4	IEEE	56	82.4	RELX Group (Elsevier)	12	17.6
71	Dell Technologies Inc	55	139	39.6	IEEE	55	39.6	ACM-Assoc Comput Mach	24	17.3
72	Hewlett Packard Enterprises	55	131	42.0	IEEE	55	42.0	ACM-Assoc Comput Mach	12	9.2
73	SMART WIRES INC	55	79	69.6	IEEE	55	69.6	ACM-Assoc Comput Mach	6	7.6
74	AFERO INC	54	74	73.0	IEEE	54	73.0	United Business Media/UBM Tech	11	14.9
75	Irobot Corp	53	100	53.0	IEEE	53	53.0	SPIE-Int Soc Opt Engineering	10	10.0
76	DELTA ENERGY & COMM	52	137	38.0	IEEE	52	38.0	RELX Group (Elsevier)	35	25.5
77	InterDigital Inc	52	469	11.1	3GPP General Partnership Project Standards B	229	48.8	European Telecom Standards Institute (ETSI)	78	16.6
78	PTC Inc	52	133	39.1	IEEE	52	39.1	ACM-Assoc Comput Mach	21	15.8
79	SECURENET SOLUTIONS	52	136	38.2	IEEE	52	38.2	ACM-Assoc Comput Mach	22	16.2
80	HELLO INC	51	81	63.0	IEEE	51	63.0	ACM-Assoc Comput Mach	16	19.8



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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Panasonic Holding Corporati	51	91	56.0	IEEE	51	56.0	Network Working Group RFC	16	17.6
82	University of California	51	1378	3.7	ACS-Am Chem Soc	393	28.5	Royal Society of Chemistry	227	16.5
83	Deere & Co.	47	83	56.6	IEEE	47	56.6	SAGE Publications Ltd	5	6.0
84	3M Co	46	68	67.6	IEEE	46	67.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	8	11.8
85	FedEx Corp	46	272	16.9	RELX Group (Elsevier)	56	20.6	IEEE	46	16.9
86	TRILLIANT HOLDINGS IN	46	68	67.6	IEEE	46	67.6	RELX Group (Elsevier)	4	5.9
87	TRILLIANT INC	46	70	65.7	IEEE	46	65.7	Internet Soc/IETF-Internet Eng Task Force	5	7.1
88	Continental AG (Germany Fe	45	60	75.0	IEEE	45	75.0	Springer Nature	3	5.0
89	University of Minnesota (The	45	53	84.9	IEEE	45	84.9	RELX Group (Elsevier)	3	5.7
90	University of Texas	45	139	32.4	IEEE	45	32.4	RELX Group (Elsevier)	26	18.7
91	Abbott Laboratories	43	481	8.9	RELX Group (Elsevier)	59	12.3	Mary Ann Liebert Inc.	53	11.0
92	SENSEWARE INC	43	75	57.3	IEEE	43	57.3	Hitachi Ltd.	19	25.3
93	Commvault Systems Inc.	41	75	54.7	IEEE	41	54.7	ACM-Assoc Comput Mach	10	13.3
94	Solera Holdings Inc	41	57	71.9	IEEE	41	71.9	SAMS Publishing	4	7.0
95	STRONG FORCE LOT POR	41	58	70.7	IEEE	41	70.7	RELX Group (Elsevier)	4	6.9
96	PROXY INC	40	49	81.6	IEEE	40	81.6	Euromicro.org	8	16.3
97	Boeing Co. (The)	39	76	51.3	IEEE	39	51.3	RELX Group (Elsevier)	5	6.6
98	Schweitzer Engineering Labo	39	45	86.7	IEEE	39	86.7	ACM-Assoc Comput Mach	3	6.7
99	Westinghouse Air Brake Tec	39	50	78.0	IEEE	39	78.0	ACM-Assoc Comput Mach	4	8.0
100	NURO INC	38	66	57.6	IEEE	38	57.6	IEEE/RSJ	4	6.1



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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Measuring, Testing and Control Devices</i>										
1	Thermo Fisher Scientific Inc	3780	21573	17.5	RELX Group (Elsevier)	7396	34.3	IEEE	3780	17.5
2	Siemens Aktiengesellschaft	3578	9257	38.7	IEEE	3578	38.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2273	24.6
3	Sanken Electric Co. Ltd.	3348	4359	76.8	IEEE	3348	76.8	RELX Group (Elsevier)	714	16.4
4	Mass General Brigham (form	3054	49292	6.2	Optical Society of America	18000	36.5	RELX Group (Elsevier)	6726	13.6
5	International Business Machi	2623	8101	32.4	IEEE	2623	32.4	RELX Group (Elsevier)	508	6.3
6	Honeywell International Inc.	2222	7755	28.7	IEEE	2222	28.7	RELX Group (Elsevier)	1081	13.9
7	Irobot Corp	2178	4510	48.3	IEEE	2178	48.3	SPIE-Int Soc Opt Engineering	629	13.9
8	Texas Instruments Inc	1965	2382	82.5	IEEE	1965	82.5	Joint IEEE and ACM	77	3.2
9	Microsoft Corporation	1938	5504	35.2	IEEE	1938	35.2	ACM-Assoc Comput Mach	1305	23.7
10	STRONG FORCE IOT PORT	1760	2453	71.7	IEEE	1760	71.7	RELX Group (Elsevier)	210	8.6
11	FormFactor Inc	1749	3470	50.4	IEEE	1749	50.4	Springer Nature	642	18.5
12	General Electric Company	1438	5571	25.8	IEEE	1438	25.8	RELX Group (Elsevier)	971	17.4
13	Alphabet Inc.	1175	3317	35.4	IEEE	1175	35.4	ACM-Assoc Comput Mach	391	11.8
14	SolarEdge Technologies Inc	1161	1447	80.2	IEEE	1161	80.2	WIP-Renewable Energies	102	7.0
15	Illumina Inc.	1096	5311	20.6	IEEE	1096	20.6	Royal Society of Chemistry	743	14.0
16	University of Minnesota (The	1067	3657	29.2	IEEE	1067	29.2	RELX Group (Elsevier)	437	11.9
17	California Institute of Techno	1058	8818	12.0	IEEE	1058	12.0	RELX Group (Elsevier)	1050	11.9
18	Apple Inc	1029	2543	40.5	IEEE	1029	40.5	ACM-Assoc Comput Mach	325	12.8
19	Infineon Technologies AG	901	1495	60.3	IEEE	901	60.3	RELX Group (Elsevier)	144	9.6
20	Massachusetts Institute of Te	866	6185	14.0	IEEE	866	14.0	RELX Group (Elsevier)	790	12.8
21	Intel Corporation	806	2100	38.4	IEEE	806	38.4	RELX Group (Elsevier)	145	6.9
22	Qualcomm Inc	801	1758	45.6	IEEE	801	45.6	3GPP General Partnership Project Standards Body	261	14.8
23	Emerson Electric Co.	794	3128	25.4	IEEE	794	25.4	RELX Group (Elsevier)	555	17.7
24	AT&T Inc	774	1809	42.8	IEEE	774	42.8	ACM-Assoc Comput Mach	108	6.0
25	NXP Semiconductors NV	764	1144	66.8	IEEE	764	66.8	RELX Group (Elsevier)	66	5.8
26	ABB Ltd	725	1324	54.8	IEEE	725	54.8	RELX Group (Elsevier)	154	11.6
27	Amazon.com Inc.	710	1242	57.2	IEEE	710	57.2	IEEE/RSJ	63	5.1
28	Commissariat A L'Energie At	696	2445	28.5	IEEE	696	28.5	RELX Group (Elsevier)	556	22.7
29	SLB.com (former Schlumber	680	10949	6.2	Society of Exploration Geophysicists	2136	19.5	Society of Petroleum Engineers	1819	16.6
30	Boeing Co. (The)	678	2423	28.0	IEEE	678	28.0	RELX Group (Elsevier)	316	13.0
31	Applied Materials Inc.	674	1460	46.2	IEEE	674	46.2	AIP Publishing	129	8.8
32	Lockheed Martin Corp.	655	9604	6.8	Springer Nature	1533	16.0	AIP Publishing	1527	15.9
33	Midtronics Inc.	623	1442	43.2	IEEE	623	43.2	RELX Group (Elsevier)	259	18.0
34	STMicroelectronics	623	1040	59.9	IEEE	623	59.9	RELX Group (Elsevier)	135	13.0
35	Broadcom Ltd	620	1086	57.1	IEEE	620	57.1	Internet Soc/IETF-Internet Eng Task Force	51	4.7
36	Analog Devices Inc.	610	968	63.0	IEEE	610	63.0	RELX Group (Elsevier)	69	7.1
37	Intuitive Surgical Inc.	606	1727	35.1	IEEE	606	35.1	SAGES-Society of American Gastrointestinal and Endoscopic	165	9.6
38	Honda Motor Co. Ltd.(Honda	597	1417	42.1	IEEE	597	42.1	RELX Group (Elsevier)	142	10.0
39	University of Illinois	597	6366	9.4	AIP Publishing	936	14.7	RELX Group (Elsevier)	917	14.4

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40	Nokia Corporation	581	1677	34.6	IEEE	581	34.6	3GPP General Partnership Project Standards Body	115	6.9
41	TuSimple	569	874	65.1	IEEE	569	65.1	Neural Information Processing Systems Foundation	69	7.9
42	CPG Technologies Llc	550	1059	51.9	IEEE	550	51.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	134	12.7
43	RTX Corporation (f/k/a Rayt	549	1931	28.4	IEEE	549	28.4	RELX Group (Elsevier)	174	9.0
44	Toyota Motor Corp	544	1393	39.1	IEEE	544	39.1	RELX Group (Elsevier)	119	8.5
45	Johnson Controls Internationa	542	1709	31.7	IEEE	542	31.7	RELX Group (Elsevier)	482	28.2
46	Duke University	535	2874	18.6	IEEE	535	18.6	RELX Group (Elsevier)	364	12.7
47	Samsung Electronics Co Ltd	529	1523	34.7	IEEE	529	34.7	RELX Group (Elsevier)	143	9.4
48	Rockwell Automation Inc	522	916	57.0	IEEE	522	57.0	RELX Group (Elsevier)	90	9.8
49	Synopsys Inc.	511	652	78.4	IEEE	511	78.4	Joint IEEE and ACM	46	7.1
50	Battelle Memorial Institute	502	2070	24.3	IEEE	502	24.3	RELX Group (Elsevier)	490	23.7
51	Industrial Technology Researc	495	1157	42.8	IEEE	495	42.8	RELX Group (Elsevier)	231	20.0
52	University of California	478	8377	5.7	ACS-Am Chem Soc	1211	14.5	RELX Group (Elsevier)	1211	14.5
53	INDIVIDUAL PATENTER	476	2789	17.1	Optical Society of America	714	25.6	IEEE	476	17.1
54	Koninklijke Philips N.V.	470	3489	13.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1093	31.3	Society of Magnetic Resonance in Medicine (SMRM)	563	16.1
55	HEMOSONICS LLC	469	1343	34.9	IEEE	469	34.9	RELX Group (Elsevier)	225	16.8
56	Abbott Laboratories	466	14952	3.1	ACS-Am Chem Soc	3643	24.4	RELX Group (Elsevier)	3627	24.3
57	Schneider Electric S.A.	464	2691	17.2	IEEE	464	17.2	RELX Group (Elsevier)	307	11.4
58	University of Texas	456	2997	15.2	IEEE	456	15.2	RELX Group (Elsevier)	453	15.1
59	OMNI MEDSCI INC	438	5536	7.9	Optical Society of America	1860	33.6	RELX Group (Elsevier)	888	16.0
60	HRL Laboratories LLC	435	1060	41.0	IEEE	435	41.0	RELX Group (Elsevier)	111	10.5
61	INTOUCH TECHNOLOGIE	434	1270	34.2	IEEE	434	34.2	IEEE/RSJ	121	9.5
62	Marvell Technology Group Lt	427	499	85.6	IEEE	427	85.6	Joint IEEE and ACM	13	2.6
63	Schweitzer Engineering Labo	423	521	81.2	IEEE	423	81.2	RELX Group (Elsevier)	30	5.8
64	Stanford University	410	4571	9.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	544	11.9	Optical Society of America	474	10.4
65	Advantest Corp.	405	581	69.7	IEEE	405	69.7	AIP Publishing	26	4.5
66	FARO Technologies Inc.	398	1368	29.1	IEEE	398	29.1	SPIE-Int Soc Opt Engineering	254	18.6
67	Taiwan Semiconductor Manu	390	709	55.0	IEEE	390	55.0	RELX Group (Elsevier)	48	6.8
68	United States Navy	380	2274	16.7	IEEE	380	16.7	RELX Group (Elsevier)	291	12.8
69	Zebra Technologies Corp.	376	844	44.5	IEEE	376	44.5	ACM-Assoc Comput Mach	64	7.6
70	Bosch (Robert) GmbH	366	1343	27.3	IEEE	366	27.3	RELX Group (Elsevier)	256	19.1
71	Advanced Micro Devices Inc	362	595	60.8	IEEE	362	60.8	RELX Group (Elsevier)	42	7.1
72	Ericsson	351	934	37.6	IEEE	351	37.6	3GPP General Partnership Project Standards Body	236	25.3
73	Teradyne Inc.	346	779	44.4	IEEE	346	44.4	ASME-Am Soc Mech Eng	114	14.6
74	ParkerVision Inc	332	531	62.5	IEEE	332	62.5	IET/IEE	50	9.4
75	Xerox Corp	331	1394	23.7	IEEE	331	23.7	RELX Group (Elsevier)	159	11.4
76	Intellectual Ventures Manage	324	1814	17.9	IEEE	324	17.9	RELX Group (Elsevier)	181	10.0
77	Cisco Systems Inc.	315	1276	24.7	Internet Soc/IETF-Internet Eng Task Force	403	31.6	IEEE	315	24.7
78	NVIDIA Corp.	307	577	53.2	IEEE	307	53.2	SAE-Society of Automobile Engineers	36	6.2
79	Toshiba Corp	307	1083	28.3	IEEE	307	28.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	200	18.5
80	BLANDING HOVENWEEP	305	766	39.8	IEEE	305	39.8	SPIE-Int Soc Opt Engineering	116	15.1

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Brain Corporation	302	704	42.9	IEEE	302	42.9	MIT Press	70	9.9
82	General Motors Corp	297	560	53.0	IEEE	297	53.0	RELX Group (Elsevier)	59	10.5
83	The Arizona Board of Regent	296	2038	14.5	RELX Group (Elsevier)	316	15.5	IEEE	296	14.5
84	University of Southern Califo	292	891	32.8	IEEE	292	32.8	RELX Group (Elsevier)	72	8.1
85	TDK Corporation	291	667	43.6	IEEE	291	43.6	RELX Group (Elsevier)	127	19.0
86	Agilent Technologies Inc	287	1581	18.2	RELX Group (Elsevier)	305	19.3	IEEE	287	18.2
87	Ford Motor Co.	287	786	36.5	IEEE	287	36.5	SAE-Society of Automobile Engineers	78	9.9
88	Georgia Institute of Technolo	283	982	28.8	IEEE	283	28.8	Optical Society of America	118	12.0
89	Hitachi Ltd	281	1392	20.2	IEEE	281	20.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	200	14.4
90	MACAU UNIVERSITY OF	270	315	85.7	IEEE	270	85.7	RELX Group (Elsevier)	18	5.7
91	Purdue University	268	2215	12.1	ACS-Am Chem Soc	370	16.7	RELX Group (Elsevier)	354	16.0
92	University of Michigan	267	1796	14.9	IEEE	267	14.9	RELX Group (Elsevier)	251	14.0
93	Halliburton Co. (Holding)	265	5245	5.1	Society of Petroleum Engineers	1592	30.4	Society of Exploration Geophysicists	640	12.2
94	University of Alabama	264	1142	23.1	RELX Group (Elsevier)	304	26.6	IEEE	264	23.1
95	NEC Corp	263	752	35.0	IEEE	263	35.0	RELX Group (Elsevier)	51	6.8
96	University of Nebraska	263	876	30.0	IEEE	263	30.0	RELX Group (Elsevier)	94	10.7
97	State Farm Mutual Automobi	260	916	28.4	IEEE	260	28.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	67	7.3
98	HP Inc	258	1183	21.8	IEEE	258	21.8	ACS-Am Chem Soc	139	11.7
99	University of Pennsylvania	257	1458	17.6	IEEE	257	17.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	181	12.4
100	Canon Inc	255	2135	11.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	462	21.6	IEEE	255	11.9

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Optics/Photography/Electrophotography</i>										
1	Qualcomm Inc	1861	5276	35.3	IEEE	1861	35.3	SID-Society for Information Display	986	18.7
2	Infinera Corporation	1184	2206	53.7	IEEE	1184	53.7	IET/IEE	361	16.4
3	Mass General Brigham (form	985	15275	6.4	Optical Society of America	5810	38.0	RELX Group (Elsevier)	2136	14.0
4	coherent Corp (f/k/a II-VI Inc	652	2207	29.5	IEEE	652	29.5	Optical Society of America	497	22.5
5	IDC LLC	642	1779	36.1	IEEE	642	36.1	SID-Society for Information Display	236	13.3
6	Nikon Corp.	631	4222	14.9	SPIE-Int Soc Opt Engineering	1913	45.3	SEMATECH Consortium	849	20.1
7	Xperi Inc. (f/k/a Tessera Inc)	586	1351	43.4	IEEE	586	43.4	SPIE-Int Soc Opt Engineering	199	14.7
8	Massachusetts Institute of Te	584	3751	15.6	Optical Society of America	627	16.7	IEEE	584	15.6
9	Alphabet Inc.	570	2244	25.4	IEEE	570	25.4	SPIE-Int Soc Opt Engineering	342	15.2
10	Microsoft Corporation	570	2031	28.1	IEEE	570	28.1	ACM-Assoc Comput Mach	335	16.5
11	The Arizona Board of Regent	558	4419	12.6	Optical Society of America	1407	31.8	SPIE-Int Soc Opt Engineering	581	13.1
12	Corning Inc.	548	4738	11.6	Optical Society of America	963	20.3	RELX Group (Elsevier)	698	14.7
13	Magic Leap Inc	520	3108	16.7	IEEE	520	16.7	ACM-Assoc Comput Mach	347	11.2
14	Intellectual Ventures Manage	428	2039	21.0	IEEE	428	21.0	American Physical Society	277	13.6
15	Hoya Corp	421	1254	33.6	IEEE	421	33.6	AIP Publishing	257	20.5
16	YFY Inc	417	4951	8.4	SID-Society for Information Display	2040	41.2	IEEE	417	8.4
17	ASML Holding NV	398	10825	3.7	SPIE-Int Soc Opt Engineering	3981	36.8	AIP Publishing	1801	16.6
18	California Institute of Techno	395	5018	7.9	Optical Society of America	1647	32.8	Springer Nature	494	9.8
19	Screen Holdings Co Ltd (For	352	1309	26.9	IEEE	352	26.9	RELX Group (Elsevier)	199	15.2
20	NVIDIA Corp.	339	970	34.9	IEEE	339	34.9	IET/IEE	164	16.9
21	Nokia Corporation	330	1439	22.9	IEEE	330	22.9	Optical Society of America	314	21.8
22	International Business Machi	311	1940	16.0	SPIE-Int Soc Opt Engineering	398	20.5	IEEE	311	16.0
23	Intel Corporation	298	989	30.1	IEEE	298	30.1	SPIE-Int Soc Opt Engineering	148	15.0
24	Samsung Electronics Co Ltd	289	2075	13.9	Optical Society of America	357	17.2	IEEE	289	13.9
25	Monolithic 3D Inc	275	484	56.8	IEEE	275	56.8	IEEE/JPN Soc App Phys	50	10.3
26	Stanford University	273	2443	11.2	Optical Society of America	367	15.0	IEEE	273	11.2
27	Synopsys Inc.	269	1963	13.7	SPIE-Int Soc Opt Engineering	956	48.7	IEEE	269	13.7
28	Cisco Systems Inc.	267	670	39.9	IEEE	267	39.9	Optical Society of America	191	28.5
29	Global Foundries Inc	265	1162	22.8	Optical Society of America	537	46.2	IEEE	265	22.8
30	DIGILENS INC	242	8159	3.0	Optical Society of America	1643	20.1	SPIE-Int Soc Opt Engineering	1264	15.5
31	CHEETAH OMNI LLC	238	997	23.9	Optical Society of America	257	25.8	IEEE	238	23.9
32	ALENTIC MICROSCIENCE	237	880	26.9	IEEE	237	26.9	Royal Society of Chemistry	113	12.8
33	University of California	231	2203	10.5	Optical Society of America	347	15.8	Springer Nature	293	13.3
34	Texas Instruments Inc	221	803	27.5	IEEE	221	27.5	AIP Publishing	134	16.7
35	Adobe Inc. (former Adobe Sy	219	512	42.8	IEEE	219	42.8	ACM-Assoc Comput Mach	127	24.8
36	Lockheed Martin Corp.	194	1167	16.6	Optical Society of America	293	25.1	IEEE	194	16.6
37	Micron Technology Inc.	183	1762	10.4	AIP Publishing	326	18.5	RELX Group (Elsevier)	214	12.1
38	3M Co	175	3456	5.1	Optical Society of America	496	14.4	RELX Group (Elsevier)	380	11.0
39	Princeton University	175	425	41.2	IEEE	175	41.2	American Physical Society	49	11.5

## *Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)*

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	HP Inc	174	881	19.8	IEEE	174	19.8	Optical Society of America	94	10.7
41	Canon Inc	172	2023	8.5	SPIE-Int Soc Opt Engineering	236	11.7	AIP Publishing	231	11.4
42	Honeywell International Inc.	167	799	20.9	IEEE	167	20.9	Optical Society of America	156	19.5
43	Lumentum Holdings Inc	164	616	26.6	IEEE	164	26.6	Optical Society of America	134	21.8
44	RTX Corporation (f/k/a Rayt	163	2761	5.9	Optical Society of America	666	24.1	SPIE-Int Soc Opt Engineering	519	18.8
45	STEYPHI SERVICES DE LL	161	458	35.2	IEEE	161	35.2	Optical Society of America	104	22.7
46	Prysmian SPA	156	932	16.7	Optical Society of America	201	21.6	IEEE	156	16.7
47	Huawei Technologies Compa	153	400	38.3	IEEE	153	38.3	Optical Society of America	116	29.0
48	University of Colorado ( The	153	2235	6.8	Optical Society of America	886	39.6	RELX Group (Elsevier)	257	11.5
49	Electronics and Telecommuni	146	442	33.0	IEEE	146	33.0	Optical Society of America	88	19.9
50	Fujitsu Limited	143	657	21.8	IEEE	143	21.8	Optical Society of America	100	15.2
51	AUGMENTED VISION INC	137	1095	12.5	Optical Society of America	372	34.0	SPIE-Int Soc Opt Engineering	157	14.3
52	University of Texas	136	1343	10.1	AIP Publishing	199	14.8	Optical Society of America	198	14.7
53	Ericsson	133	521	25.5	Optical Society of America	166	31.9	IEEE	133	25.5
54	VASCULAR IMAGING CO	133	281	47.3	IEEE	133	47.3	IET/IEEE	80	28.5
55	CIRREX SYSTEMS LLC	131	556	23.6	IEEE	131	23.6	Optical Society of America	79	14.2
56	Viavi Solutions Inc	129	692	18.6	IEEE	129	18.6	SPIE-Int Soc Opt Engineering	125	18.1
57	MENTOR ACQUISITION O	127	361	35.2	IEEE	127	35.2	ACM-Assoc Comput Mach	114	31.6
58	Ostendo Technologies Inc	127	504	25.2	IEEE	127	25.2	ACM-Assoc Comput Mach	84	16.7
59	Emcore Corp.	126	157	80.3	IEEE	126	80.3	IEEE/OSA	9	5.7
60	Georgia Institute of Technolo	126	374	33.7	IEEE	126	33.7	Optical Society of America	44	11.8
61	University of Illinois	117	769	15.2	Optical Society of America	152	19.8	AIP Publishing	130	16.9
62	Meta Platforms Inc.(formerly	114	1424	8.0	Optical Society of America	276	19.4	SPIE-Int Soc Opt Engineering	180	12.6
63	STMicroelectronics	114	296	38.5	IEEE	114	38.5	SPIE-Int Soc Opt Engineering	42	14.2
64	Carl-Zeiss Stiftung	111	3333	3.3	SPIE-Int Soc Opt Engineering	1169	35.1	Optical Society of America	621	18.6
65	Skorpios Technologies Inc	111	245	45.3	IEEE	111	45.3	Optical Society of America	85	34.7
66	Nippon Telegraph & Telepho	108	606	17.8	Optical Society of America	111	18.3	IEEE	108	17.8
67	Xerox Corp	102	1090	9.4	ACS-Am Chem Soc	240	22.0	RELX Group (Elsevier)	132	12.1
68	Apple Inc	97	764	12.7	Optical Society of America	203	26.6	SPIE-Int Soc Opt Engineering	115	15.1
69	Applied Materials Inc.	95	595	16.0	SPIE-Int Soc Opt Engineering	173	29.1	IEEE	95	16.0
70	PTS CORP	95	218	43.6	IEEE	95	43.6	Optical Society of America	33	15.1
71	University of Washington	95	864	11.0	Optical Society of America	132	15.3	SPIE-Int Soc Opt Engineering	108	12.5
72	Industrial Technology Researc	93	409	22.7	IEEE	93	22.7	SPIE-Int Soc Opt Engineering	67	16.4
73	Furukawa Electric Co. Ltd.	92	738	12.5	Optical Society of America	246	33.3	IEICE-Inst Elec Info Comm Eng	95	12.9
74	Sumitomo Electric Industries	89	873	10.2	Optical Society of America	227	26.0	European Conference on Optical Communication (ECOC) Soc	121	13.9
75	OMNIGUIDE COMMUNIC	88	385	22.9	IEEE	88	22.9	Optical Society of America	80	20.8
76	NXP Semiconductors NV	87	275	31.6	IEEE	87	31.6	AIP Publishing	45	16.4
77	Columbia University	86	956	9.0	Springer Nature	172	18.0	Optical Society of America	150	15.7
78	Commscope Holding (formerl	86	1054	8.2	Optical Society of America	207	19.6	IEEE/OSA	178	16.9
79	Mitsubishi Electric Corp	84	205	41.0	IEEE	84	41.0	ACM-Assoc Comput Mach	38	18.5
80	Panasonic Holding Corporati	84	552	15.2	SPIE-Int Soc Opt Engineering	95	17.2	IEEE	84	15.2

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Hewlett Packard Enterprises	83	234	35.5	IEEE	83	35.5	Optical Society of America	67	28.6
82	Juniper Networks Inc.	83	173	48.0	IEEE	83	48.0	Optical Society of America	50	28.9
83	XANOPTIX INC	83	146	56.8	IEEE	83	56.8	SPIE-Int Soc Opt Engineering	27	18.5
84	Oracle Corporation	82	171	48.0	IEEE	82	48.0	Optical Society of America	40	23.4
85	BEIJING INSTITUTE OF TE	79	537	14.7	Optical Society of America	173	32.2	IEEE	79	14.7
86	Oewaves Inc	76	253	30.0	Optical Society of America	100	39.5	IEEE	76	30.0
87	ROCKLEY PHOTONICS LT	76	226	33.6	IEEE	76	33.6	Optical Society of America	71	31.4
88	Extreme Networks Inc	72	163	44.2	IEEE	72	44.2	ACM-Assoc Comput Mach	22	13.5
89	HRL Laboratories LLC	71	328	21.6	IEEE	71	21.6	AIP Publishing	53	16.2
90	Hong Kong University of Sci	69	151	45.7	IEEE	69	45.7	RELX Group (Elsevier)	11	7.3
91	Koninklijke Philips N.V.	68	752	9.0	SPIE-Int Soc Opt Engineering	159	21.1	Optical Society of America	93	12.4
92	Seiko Epson Corporation	68	274	24.8	IEEE	68	24.8	SID-Society for Information Display	52	19.0
93	University of Connecticut	68	365	18.6	Optical Society of America	149	40.8	IEEE	68	18.6
94	nLight inc	67	1270	5.3	Optical Society of America	439	34.6	SPIE-Int Soc Opt Engineering	276	21.7
95	Fujikura Ltd.	66	659	10.0	Optical Society of America	188	28.5	IEICE-Inst Elec Info Comm Eng	120	18.2
96	Johnson & Johnson	66	2179	3.0	Optical Society of America	397	18.2	RELX Group (Elsevier)	352	16.2
97	University of North Carolina	66	534	12.4	SPIE-Int Soc Opt Engineering	82	15.4	ACM-Assoc Comput Mach	74	13.9
98	Calient Technologies Inc.	65	141	46.1	IEEE	65	46.1	Optical Society of America	24	17.0
99	Commissariat A L'Energie At	65	402	16.2	Optical Society of America	77	19.2	IEEE	65	16.2
100	Cornell University	65	569	11.4	Optical Society of America	84	14.8	RELX Group (Elsevier)	69	12.1

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Power Systems</i>										
1	SolarEdge Technologies Inc	8798	10984	80.1	IEEE	8798	80.1	WIP-Renewable Energies	745	6.8
2	Witricity Corp	4620	8897	51.9	IEEE	4620	51.9	AIP Publishing	724	8.1
3	CPG Technologies Llc	2666	5192	51.3	IEEE	2666	51.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	633	12.2
4	Energous Corporation	1881	2419	77.8	IEEE	1881	77.8	RELX Group (Elsevier)	180	7.4
5	Cirrus Logic Inc.	1702	1862	91.4	IEEE	1702	91.4	ISO-International Standards Organization	50	2.7
6	Massachusetts Institute of Te	1671	4661	35.9	IEEE	1671	35.9	RELX Group (Elsevier)	630	13.5
7	Flex Ltd (F/k/aFlextronics Int	1666	1809	92.1	IEEE	1666	92.1	United Business Media/UBM Tech	79	4.4
8	ABB Ltd	1660	2358	70.4	IEEE	1660	70.4	IVI Foundation/SCPI Consortium	94	4.0
9	Totalenergies SE (formerly T	1485	1727	86.0	IEEE	1485	86.0	IET/IEE	54	3.1
10	General Electric Company	1371	2374	57.8	IEEE	1371	57.8	RELX Group (Elsevier)	263	11.1
11	Rockwell Automation Inc	1351	1513	89.3	IEEE	1351	89.3	EPE Association	41	2.7
12	AMPT LLC	1046	1381	75.7	IEEE	1046	75.7	RELX Group (Elsevier)	84	6.1
13	MOJO MOBILITY INC	1046	1371	76.3	IEEE	1046	76.3	RELX Group (Elsevier)	114	8.3
14	Texas Instruments Inc	978	1153	84.8	IEEE	978	84.8	RELX Group (Elsevier)	39	3.4
15	Renesas Electronic Corporati	959	1127	85.1	IEEE	959	85.1	IEEE/JPN Soc App Phys	28	2.5
16	Analog Devices Inc.	953	1375	69.3	IEEE	953	69.3	RELX Group (Elsevier)	203	14.8
17	Murata Manufacturing Co. Lt	922	1175	78.5	IEEE	922	78.5	RELX Group (Elsevier)	68	5.8
18	Vicor Corp	899	1126	79.8	IEEE	899	79.8	Center for Power Electronics Systems (Virginia Tech)	44	3.9
19	SYNQOR INC	872	998	87.4	IEEE	872	87.4	Penton/IPC, Inc.	45	4.5
20	Infineon Technologies AG	818	945	86.6	IEEE	818	86.6	EPE Association	20	2.1
21	NUCURRENT INC	662	823	80.4	IEEE	662	80.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	48	5.8
22	Intel Corporation	571	696	82.0	IEEE	571	82.0	Joint IEEE and ACM	17	2.4
23	NXP Semiconductors NV	560	688	81.4	IEEE	560	81.4	IET/IEE	19	2.8
24	STMicroelectronics	533	680	78.4	IEEE	533	78.4	RELX Group (Elsevier)	32	4.7
25	Qualcomm Inc	530	669	79.2	IEEE	530	79.2	RELX Group (Elsevier)	38	5.7
26	Battelle Memorial Institute	495	2643	18.7	RELX Group (Elsevier)	570	21.6	IEEE	495	18.7
27	University of California	486	3202	15.2	ACS-Am Chem Soc	635	19.8	RELX Group (Elsevier)	543	17.0
28	International Business Machi	447	1071	41.7	IEEE	447	41.7	RELX Group (Elsevier)	135	12.6
29	Enphase Energy Inc	442	481	91.9	IEEE	442	91.9	IET/IEE	8	1.7
30	Qorvo	441	497	88.7	IEEE	441	88.7	European Microwave Association	16	3.2
31	Industrial Technology Researc	416	896	46.4	IEEE	416	46.4	RELX Group (Elsevier)	223	24.9
32	RTX Corporation (f/k/a Rayt	396	1438	27.5	IEEE	396	27.5	NASA-National Aeronautics and Space Admin	166	11.5
33	Tigo Energy Inc	325	508	64.0	IEEE	325	64.0	WIP-Renewable Energies	137	27.0
34	Alstom S.A.	321	428	75.0	IEEE	321	75.0	IET/IEE	32	7.5
35	Delta Electronics Inc	317	351	90.3	IEEE	317	90.3	Korean Institute of Power Electronics	14	4.0
36	Siemens Aktiengesellschaft	311	472	65.9	IEEE	311	65.9	RELX Group (Elsevier)	41	8.7
37	California Institute of Techno	305	3649	8.4	RELX Group (Elsevier)	1043	28.6	ACS-Am Chem Soc	573	15.7
38	Irobot Corp	305	599	50.9	IEEE	305	50.9	SPIE-Int Soc Opt Engineering	92	15.4
39	Apple Inc	304	1437	21.2	IEEE	304	21.2	RELX Group (Elsevier)	289	20.1



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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Causam Enterprises (former	304	584	52.1	IEEE	304	52.1	Springer Nature	93	15.9
41	Power Integrations Inc.	293	433	67.7	IEEE	293	67.7	Penton/IPC, Inc.	54	12.5
42	THE FLORIDA INTERNATI	283	402	70.4	IEEE	283	70.4	RELX Group (Elsevier)	28	7.0
43	Huawei Technologies Compa	259	305	84.9	IEEE	259	84.9	RELX Group (Elsevier)	6	2.0
44	University of Illinois	255	1132	22.5	RELX Group (Elsevier)	385	34.0	IEEE	255	22.5
45	The Arizona Board of Regent	253	1415	17.9	RELX Group (Elsevier)	300	21.2	ACS-Am Chem Soc	296	20.9
46	Samsung Electronics Co Ltd	249	2180	11.4	RELX Group (Elsevier)	588	27.0	ACS-Am Chem Soc	380	17.4
47	Eaton Corp.	244	346	70.5	IEEE	244	70.5	RELX Group (Elsevier)	36	10.4
48	Honeywell International Inc.	240	785	30.6	IEEE	240	30.6	RELX Group (Elsevier)	220	28.0
49	Schneider Electric S.A.	240	311	77.2	IEEE	240	77.2	IET/IEE	10	3.2
50	Advanced Energy Industries I	239	276	86.6	IEEE	239	86.6	RELX Group (Elsevier)	10	3.6
51	Koch Industries Inc	230	289	79.6	IEEE	230	79.6	RELX Group (Elsevier)	13	4.5
52	Powervmat Technologies Ltd	228	242	94.2	IEEE	228	94.2	AIP Publishing	9	3.7
53	Broadcom Ltd	216	268	80.6	IEEE	216	80.6	AIP Publishing	10	3.7
54	On Semiconductor Corporati	211	249	84.7	IEEE	211	84.7	Penton/IPC, Inc.	6	2.4
55	Microchip Technology Inc.	203	248	81.9	IEEE	203	81.9	IEICE-Inst Elec Info Comm Eng	9	3.6
56	University of Alabama	197	231	85.3	IEEE	197	85.3	IET/IEE	11	4.8
57	Utah State University	196	302	64.9	IEEE	196	64.9	ACS-Am Chem Soc	23	7.6
58	University of Washington	191	1081	17.7	RELX Group (Elsevier)	319	29.5	IEEE	191	17.7
59	Hong Kong University of Sci	186	338	55.0	IEEE	186	55.0	RELX Group (Elsevier)	54	16.0
60	Semiconductor Energy Labor	185	4553	4.1	SID-Society for Information Display	933	20.5	RELX Group (Elsevier)	663	14.6
61	Microsoft Corporation	180	481	37.4	IEEE	180	37.4	ACM-Assoc Comput Mach	94	19.5
62	University of Wisconsin (WI	179	256	69.9	IEEE	179	69.9	RELX Group (Elsevier)	13	5.1
63	Boeing Co. (The)	178	526	33.8	IEEE	178	33.8	RELX Group (Elsevier)	83	15.8
64	Hitachi Ltd	177	342	51.8	IEEE	177	51.8	IET/IEE	53	15.5
65	Tesla Motors Inc	170	229	74.2	IEEE	170	74.2	RELX Group (Elsevier)	14	6.1
66	Midtronics Inc.	168	402	41.8	IEEE	168	41.8	RELX Group (Elsevier)	67	16.7
67	Vestas Wind Systems A/S	166	345	48.1	IEEE	166	48.1	RELX Group (Elsevier)	43	12.5
68	General Motors Corp	165	1249	13.2	RELX Group (Elsevier)	397	31.8	ACS-Am Chem Soc	172	13.8
69	R2 Semiconductor Inc	163	166	98.2	IEEE	163	98.2	European Microwave Association	2	1.2
70	Alphabet Inc.	162	257	63.0	IEEE	162	63.0	ACM-Assoc Comput Mach	15	5.8
71	AT&T Inc	162	337	48.1	IEEE	162	48.1	AIP Publishing	18	5.3
72	Toshiba Corp	156	840	18.6	RELX Group (Elsevier)	332	39.5	IEEE	156	18.6
73	TAE TECHNOLOGIES INC	152	298	51.0	IEEE	152	51.0	AIP Publishing	58	19.5
74	Koninklijke Philips N.V.	151	294	51.4	IEEE	151	51.4	ACS-Am Chem Soc	24	8.2
75	University of Colorado ( The	150	425	35.3	IEEE	150	35.3	RELX Group (Elsevier)	50	11.8
76	University of Florida	150	383	39.2	IEEE	150	39.2	RELX Group (Elsevier)	58	15.1
77	Commissariat A L'Energie At	149	780	19.1	RELX Group (Elsevier)	300	38.5	IEEE	149	19.1
78	Virginia Tech University	149	161	92.5	IEEE	149	92.5	Korean Institute of Power Electronics	2	1.2
79	Schweitzer Engineering Labo	148	153	96.7	IEEE	148	96.7	IET/IEE	3	2.0
80	University of Michigan	147	674	21.8	IEEE	147	21.8	RELX Group (Elsevier)	126	18.7



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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Silicon Laboratories Inc	146	165	88.5	IEEE	146	88.5	SAE-Society of Automobile Engineers	12	7.3
82	Mitsubishi Electric Corp	144	196	73.5	IEEE	144	73.5	IET/IEE	24	12.2
83	University of Minnesota (The	144	243	59.3	IEEE	144	59.3	AIP Publishing	21	8.6
84	O2Micro International Ltd.	143	217	65.9	IEEE	143	65.9	Texas Instruments	27	12.4
85	Marvell Technology Group Lt	137	174	78.7	IEEE	137	78.7	Texas Instruments	16	9.2
86	Mosaid Technologies ( f/k/aC	135	162	83.3	IEEE	135	83.3	Joint IEEE and ACM	13	8.0
87	Panasonic Holding Corporati	134	1373	9.8	RELX Group (Elsevier)	425	31.0	Electrochemical Society, Inc.	299	21.8
88	SMART WIRES INC	131	180	72.8	IEEE	131	72.8	ACM-Assoc Comput Mach	11	6.1
89	University of Hong Kong	131	154	85.1	IEEE	131	85.1	IET/IEE	9	5.8
90	INFINITE POWER SOLUTI	130	1398	9.3	RELX Group (Elsevier)	317	22.7	AIP Publishing	309	22.1
91	Western Digital Corp.	126	159	79.2	IEEE	126	79.2	McGraw Hill	16	10.1
92	Bosch (Robert) GmbH	125	1307	9.6	RELX Group (Elsevier)	325	24.9	Electrochemical Society, Inc.	259	19.8
93	University of Texas	123	1028	12.0	RELX Group (Elsevier)	238	23.2	IEEE	123	12.0
94	WIRELESS ADVANCED V	115	141	81.6	IEEE	115	81.6	Informa/CRC Press/Taylor & Francis	8	5.7
95	TDK Corporation	114	346	32.9	IEEE	114	32.9	RELX Group (Elsevier)	78	22.5
96	MOTOR EXCELLENCE LL	111	125	88.8	IEEE	111	88.8	IEEE/ASME	14	11.2
97	Intellectual Ventures Manage	110	254	43.3	IEEE	110	43.3	RELX Group (Elsevier)	39	15.4
98	FYRE STORM INC	105	110	95.5	IEEE	105	95.5	Scripta Pub Co.	2	1.8
99	NEC Corp	105	285	36.8	IEEE	105	36.8	RELX Group (Elsevier)	63	22.1
100	Lenovo Group Ltd	103	136	75.7	IEEE	103	75.7	RELX Group (Elsevier)	12	8.8

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Robotics and Intelligent Manufacturing</i>										
1	Intuitive Surgical Inc.	6943	17774	39.1	IEEE	6943	39.1	The Medical Image Computing and Computer Assisted Interv	1985	11.2
2	Irobot Corp	6030	11916	50.6	IEEE	6030	50.6	SPIE-Int Soc Opt Engineering	1583	13.3
3	Applied Materials Inc.	1542	2638	58.5	IEEE	1542	58.5	AIP Publishing	148	5.6
4	INTOUCH TECHNOLOGIE	1375	3992	34.4	IEEE	1375	34.4	IEEE/RSJ	387	9.7
5	Alphabet Inc.	1333	2848	46.8	IEEE	1333	46.8	IEEE/RSJ	235	8.3
6	Johnson & Johnson	1051	5996	17.5	RELX Group (Elsevier)	1305	21.8	IEEE	1051	17.5
7	Stryker Corp.	954	2922	32.6	IEEE	954	32.6	Springer Nature	447	15.3
8	Brain Corporation	838	2141	39.1	IEEE	838	39.1	MIT Press	237	11.1
9	Microsoft Corporation	812	2181	37.2	IEEE	812	37.2	ACM-Assoc Comput Mach	402	18.4
10	Vanderbilt University	798	1411	56.6	IEEE	798	56.6	RELX Group (Elsevier)	108	7.7
11	University of Nebraska	778	3557	21.9	IEEE	778	21.9	Springer Nature	623	17.5
12	Massachusetts Institute of Te	771	2272	33.9	IEEE	771	33.9	RELX Group (Elsevier)	377	16.6
13	Honda Motor Co. Ltd.(Honda	740	1855	39.9	IEEE	740	39.9	RELX Group (Elsevier)	222	12.0
14	International Business Machi	600	1879	31.9	IEEE	600	31.9	ACM-Assoc Comput Mach	218	11.6
15	Siemens Aktiengesellschaft	464	1059	43.8	IEEE	464	43.8	RELX Group (Elsevier)	118	11.1
16	Amazon.com Inc.	461	826	55.8	IEEE	461	55.8	International Foundation of Robotics Research	41	5.0
17	TELADOC HEALTH INC	450	1369	32.9	IEEE	450	32.9	IEEE/RSJ	125	9.1
18	PDF Solutions	393	599	65.6	IEEE	393	65.6	SPIE-Int Soc Opt Engineering	134	22.4
19	Samsung Electronics Co Ltd	335	547	61.2	IEEE	335	61.2	IEEE/RSJ	43	7.9
20	Walmart Stores Inc	300	834	36.0	IEEE	300	36.0	CBS Interactive	86	10.3
21	Sony Group Corp	298	511	58.3	IEEE	298	58.3	IEEE/RSJ	94	18.4
22	HRL Laboratories LLC	289	604	47.8	IEEE	289	47.8	RELX Group (Elsevier)	57	9.4
23	Boeing Co. (The)	284	736	38.6	IEEE	284	38.6	RELX Group (Elsevier)	112	15.2
24	Johns Hopkins University	270	591	45.7	IEEE	270	45.7	RELX Group (Elsevier)	41	6.9
25	MACAU UNIVERSITY OF	267	292	91.4	IEEE	267	91.4	Springer Nature	5	1.7
26	Otto Bock Holding GmbH &	249	788	31.6	IEEE	249	31.6	RELX Group (Elsevier)	166	21.1
27	MEDROBOTICS CORP	243	704	34.5	IEEE	243	34.5	Springer Nature	173	24.6
28	FedEx Corp	238	251	94.8	IEEE	238	94.8	IEEE/RSJ	8	3.2
29	SIPCO LLC	238	414	57.5	IEEE	238	57.5	Internet Soc/IETF-Internet Eng Task Force	35	8.5
30	General Electric Company	222	497	44.7	IEEE	222	44.7	RELX Group (Elsevier)	56	11.3
31	The Arizona Board of Regent	219	649	33.7	IEEE	219	33.7	RELX Group (Elsevier)	94	14.5
32	Emerson Electric Co.	205	755	27.2	IEEE	205	27.2	RELX Group (Elsevier)	157	20.8
33	VIRTUAL INCISION CORP	201	854	23.5	IEEE	201	23.5	Springer Nature	143	16.7
34	Toyota Motor Corp	200	456	43.9	IEEE	200	43.9	IEEE/RSJ	47	10.3
35	Immersion Corp.	199	530	37.5	IEEE	199	37.5	ASME-Am Soc Mech Eng	42	7.9
36	Cadence Design Systems Inc	194	470	41.3	IEEE	194	41.3	Joint IEEE and ACM	158	33.6
37	Koch Industries Inc	189	237	79.7	IEEE	189	79.7	RELX Group (Elsevier)	13	5.5
38	ABB Ltd	187	303	61.7	IEEE	187	61.7	RELX Group (Elsevier)	31	10.2
39	NVIDIA Corp.	181	348	52.0	IEEE	181	52.0	European Conference on Computer Vision-Google/Microsoft	22	6.3

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Cimpres NV	179	435	41.1	IEEE	179	41.1	RELX Group (Elsevier)	121	27.8
41	Honeywell International Inc.	174	448	38.8	IEEE	174	38.8	RELX Group (Elsevier)	89	19.9
42	Advanced Micro Devices Inc	171	363	47.1	IEEE	171	47.1	RELX Group (Elsevier)	53	14.6
43	INTRINSIC INNOVATION	171	373	45.8	IEEE	171	45.8	ACM-Assoc Comput Mach	35	9.4
44	Rockwell Automation Inc	161	313	51.4	IEEE	161	51.4	RELX Group (Elsevier)	36	11.5
45	SRI International	159	381	41.7	IEEE	159	41.7	SPIE-Int Soc Opt Engineering	56	14.7
46	Bonutti Technologies LLC	157	1216	12.9	RELX Group (Elsevier)	289	23.8	Springer Nature	199	16.4
47	SARCOS CORP	157	540	29.1	IEEE	157	29.1	RELX Group (Elsevier)	80	14.8
48	Harvard University	156	641	24.3	IEEE	156	24.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	83	12.9
49	University of Pennsylvania	155	285	54.4	IEEE	155	54.4	IEEE/RSJ	21	7.4
50	L3 Harris Technologies (f/k/a	152	239	63.6	IEEE	152	63.6	Society of Petroleum Engineers	16	6.7
51	ICOSYSTEM CORP	150	198	75.8	IEEE	150	75.8	IET/IEE	10	5.1
52	Magic Leap Inc	150	273	54.9	IEEE	150	54.9	arXiv.org	32	11.7
53	Align Technology Inc	144	1268	11.4	JCO - Journal of Clinical Orthodontics	220	17.4	SAGE Publications Ltd	157	12.4
54	GECKO ROBOTICS INC	144	260	55.4	IEEE	144	55.4	IEEE/RSJ	55	21.2
55	NEURALA INC	143	294	48.6	IEEE	143	48.6	MIT Press	30	10.2
56	INDIVIDUAL PATENTER	140	325	43.1	IEEE	140	43.1	Springer Nature	20	6.2
57	Boston Dynamics Inc	138	310	44.5	IEEE	138	44.5	IEEE/RSJ	65	21.0
58	Intel Corporation	135	273	49.5	IEEE	135	49.5	ACM-Assoc Comput Mach	28	10.3
59	Johnson Controls Internationa	135	417	32.4	IEEE	135	32.4	RELX Group (Elsevier)	106	25.4
60	OneTrust	134	425	31.5	ACM-Assoc Comput Mach	211	49.6	IEEE	134	31.5
61	Battelle Memorial Institute	133	311	42.8	IEEE	133	42.8	IEEE/RSJ	35	11.3
62	Softbank Corp	132	232	56.9	IEEE	132	56.9	ASME-Am Soc Mech Eng	36	15.5
63	University of Washington	129	329	39.2	IEEE	129	39.2	RELX Group (Elsevier)	24	7.3
64	IWALK INC	127	395	32.2	IEEE	127	32.2	RELX Group (Elsevier)	82	20.8
65	Walt Disney Co.	127	351	36.2	IEEE	127	36.2	ACM-Assoc Comput Mach	106	30.2
66	Canon Inc	126	283	44.5	IEEE	126	44.5	RELX Group (Elsevier)	25	8.8
67	Fanuc Ltd.	126	276	45.7	IEEE	126	45.7	RELX Group (Elsevier)	40	14.5
68	SPHERO INC	125	129	96.9	IEEE	125	96.9	American Automatic Control Council (AACC)	2	1.6
69	University of California	125	309	40.5	IEEE	125	40.5	RELX Group (Elsevier)	28	9.1
70	Monolithic 3D Inc	124	223	55.6	IEEE	124	55.6	IEEE/JPN Soc App Phys	24	10.8
71	Teradyne Inc.	124	330	37.6	IEEE	124	37.6	ASME-Am Soc Mech Eng	41	12.4
72	ROY-G-BIV CORP	120	385	31.2	IEEE	120	31.2	ISO-International Standards Organization	67	17.4
73	University of Southern Califo	120	194	61.9	IEEE	120	61.9	Springer Nature	16	8.2
74	University of South Florida	119	260	45.8	IEEE	119	45.8	IEEE/RSJ	25	9.6
75	Xerox Corp	119	343	34.7	IEEE	119	34.7	ACM-Assoc Comput Mach	45	13.1
76	LG Electronics Inc.	117	163	71.8	IEEE	117	71.8	IEEE/RSJ	10	6.1
77	Taiwan Semiconductor Manu	114	217	52.5	IEEE	114	52.5	RELX Group (Elsevier)	21	9.7
78	Zebra Technologies Corp.	113	230	49.1	IEEE	113	49.1	ACM-Assoc Comput Mach	17	7.4
79	Broadcom Ltd	112	209	53.6	IEEE	112	53.6	RELX Group (Elsevier)	38	18.2
80	STRONG FORCE TX PORT	111	277	40.1	IEEE	111	40.1	RELX Group (Elsevier)	54	19.5

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	University of Minnesota (The	109	205	53.2	IEEE	109	53.2	IEEE/RSJ	18	8.8
82	Toshiba Corp	107	183	58.5	IEEE	107	58.5	IEEE/RSJ	8	4.4
83	Tela Innovations inc	105	273	38.5	IEEE	105	38.5	SPIE-Int Soc Opt Engineering	96	35.2
84	Ecole Polytechnique Federale	103	376	27.4	IEEE	103	27.4	Springer Nature	64	17.0
85	BOSTON POLARIMETRICS	100	207	48.3	IEEE	100	48.3	SPIE-Int Soc Opt Engineering	25	12.1
86	Intellectual Ventures Manage	100	516	19.4	IEEE	100	19.4	RELX Group (Elsevier)	59	11.4
87	FASTBRICK IP PTY LTD	97	201	48.3	IEEE	97	48.3	RELX Group (Elsevier)	46	22.9
88	American Express Co.	96	343	28.0	IEEE	96	28.0	The USENIX Association	39	11.4
89	Lockheed Martin Corp.	95	240	39.6	IEEE	95	39.6	RELX Group (Elsevier)	21	8.8
90	Bosch (Robert) GmbH	94	298	31.5	IEEE	94	31.5	Springer Nature	35	11.7
91	Deere & Co.	93	200	46.5	IEEE	93	46.5	Springer Nature	19	9.5
92	Sap SE	93	353	26.3	IEEE	93	26.3	RELX Group (Elsevier)	59	16.7
93	Tokyo Electron Limited	92	232	39.7	IEEE	92	39.7	RELX Group (Elsevier)	26	11.2
94	RTX Corporation (f/k/a Rayt	88	280	31.4	IEEE	88	31.4	RELX Group (Elsevier)	39	13.9
95	Industrial Technology Researc	86	169	50.9	IEEE	86	50.9	RELX Group (Elsevier)	24	14.2
96	Caterpillar Inc.	85	229	37.1	IEEE	85	37.1	SAE-Society of Automobile Engineers	35	15.3
97	Panasonic Holding Corporati	85	233	36.5	IEEE	85	36.5	RELX Group (Elsevier)	28	12.0
98	TRX SYSTEMS INC	85	145	58.6	IEEE	85	58.6	ION-The Inst of Navigation	10	6.9
99	HP Inc	84	202	41.6	IEEE	84	41.6	ACM-Assoc Comput Mach	28	13.9
100	REMEDY ROBOTICS INC	83	166	50.0	IEEE	83	50.0	SAGE Publications Ltd	21	12.7

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Semiconductors/Solid-State Devices/Electronics</i>										
1	Monolithic 3D Inc	22579	40144	56.2	IEEE	22579	56.2	IEEE/JPN Soc App Phys	4169	10.4
2	Micron Technology Inc.	20884	80470	26.0	IEEE	20884	26.0	RELX Group (Elsevier)	15344	19.1
3	Semiconductor Energy Labor	12938	2E+05	6.7	SID-Society for Information Display	64578	33.2	AIP Publishing	27769	14.3
4	International Business Machi	10277	25433	40.4	IEEE	10277	40.4	AIP Publishing	3687	14.5
5	Taiwan Semiconductor Manu	8745	27825	31.4	IEEE	8745	31.4	AIP Publishing	7956	28.6
6	Qorvo	7509	9819	76.5	IEEE	7509	76.5	RELX Group (Elsevier)	504	5.1
7	Tela Innovations inc	5187	17059	30.4	SPIE-Int Soc Opt Engineering	6246	36.6	IEEE	5187	30.4
8	Macronix International Co. Lt	4845	9254	52.4	IEEE	4845	52.4	IEEE/JPN Soc App Phys	1807	19.5
9	Intel Corporation	4615	9837	46.9	IEEE	4615	46.9	AIP Publishing	1317	13.4
10	Wolfspeed Inc. (formerly Cre	4411	12171	36.2	IEEE	4411	36.2	AIP Publishing	2607	21.4
11	Western Digital Corp.	4333	9227	47.0	IEEE	4333	47.0	AIP Publishing	1211	13.1
12	ASM International N.V.	3980	46455	8.6	RELX Group (Elsevier)	8282	17.8	AIP Publishing	7721	16.6
13	Murata Manufacturing Co. Lt	3881	5173	75.0	IEEE	3881	75.0	RELX Group (Elsevier)	190	3.7
14	Infineon Technologies AG	3673	7046	52.1	IEEE	3673	52.1	AIP Publishing	854	12.1
15	Chipbond Technology Corp	2902	3633	79.9	IEEE	2902	79.9	RELX Group (Elsevier)	268	7.4
16	On Semiconductor Corporati	2807	4172	67.3	IEEE	2807	67.3	RELX Group (Elsevier)	330	7.9
17	NXP Semiconductors NV	2702	5357	50.4	IEEE	2702	50.4	AIP Publishing	820	15.3
18	Applied Materials Inc.	2616	13165	19.9	IEEE	2616	19.9	AIP Publishing	2604	19.8
19	University of Illinois	2606	26745	9.7	AIP Publishing	5359	20.0	ACS-Am Chem Soc	4311	16.1
20	PDF Solutions	2336	3704	63.1	IEEE	2336	63.1	SPIE-Int Soc Opt Engineering	843	22.8
21	Amberwave Inc	2272	6604	34.4	IEEE	2272	34.4	AIP Publishing	1954	29.6
22	Global Foundries Inc	2128	4214	50.5	IEEE	2128	50.5	AIP Publishing	507	12.0
23	Toshiba Corp	1934	5109	37.9	IEEE	1934	37.9	AIP Publishing	859	16.8
24	Broadcom Ltd	1865	5693	32.8	IEEE	1865	32.8	SMTA-Surface Mount Technology Association	1017	17.9
25	Zeno Semiconductors Inc	1844	2437	75.7	IEEE	1844	75.7	IEEE/JPN Soc App Phys	346	14.2
26	Adeia Inc (f/k/a Xperi Holdin	1787	4547	39.3	IEEE	1787	39.3	RELX Group (Elsevier)	708	15.6
27	Texas Instruments Inc	1781	3124	57.0	IEEE	1781	57.0	AIP Publishing	302	9.7
28	Samsung Electronics Co Ltd	1615	12384	13.0	AIP Publishing	2290	18.5	ACS-Am Chem Soc	2015	16.3
29	Renesas Electronic Corporati	1498	2612	57.4	IEEE	1498	57.4	IEEE/JPN Soc App Phys	302	11.6
30	United Microelectronics Corp	1489	3106	47.9	IEEE	1489	47.9	AIP Publishing	441	14.2
31	University of California	1399	17711	7.9	AIP Publishing	3787	21.4	ACS-Am Chem Soc	2283	12.9
32	Qualcomm Inc	1358	2767	49.1	IEEE	1358	49.1	AIP Publishing	230	8.3
33	coherent Corp (f/k/a II-VI Inc	1354	4605	29.4	IEEE	1354	29.4	AIP Publishing	744	16.2
34	STMicroelectronics	1342	3282	40.9	IEEE	1342	40.9	RELX Group (Elsevier)	496	15.1
35	Transphorm Inc	1320	2780	47.5	IEEE	1320	47.5	AIP Publishing	485	17.4
36	California Institute of Techno	1274	9164	13.9	AIP Publishing	1410	15.4	RELX Group (Elsevier)	1377	15.0
37	Analog Devices Inc.	1242	1824	68.1	IEEE	1242	68.1	RELX Group (Elsevier)	102	5.6
38	Massachusetts Institute of Te	1189	8407	14.1	AIP Publishing	1682	20.0	IEEE	1189	14.1
39	HRL Laboratories LLC	1126	2455	45.9	IEEE	1126	45.9	AIP Publishing	426	17.4

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40	Commissariat A L'Energie At	1119	5729	19.5	AIP Publishing	1248	21.8	IEEE	1119	19.5
41	Advanced Micro Devices Inc	1094	1804	60.6	IEEE	1094	60.6	AIP Publishing	157	8.7
42	Mevion Medical Systems Inc	903	2856	31.6	IEEE	903	31.6	RELX Group (Elsevier)	555	19.4
43	Fujitsu Limited	807	2216	36.4	IEEE	807	36.4	AIP Publishing	289	13.0
44	Xperi Inc. (f/k/a Tesseracore Inc)	805	2993	26.9	IEEE	805	26.9	AIP Publishing	600	20.0
45	Synopsys Inc.	790	1713	46.1	IEEE	790	46.1	AIP Publishing	326	19.0
46	Apple Inc	778	2059	37.8	IEEE	778	37.8	AIP Publishing	267	13.0
47	Crossbar Inc	738	2870	25.7	IEEE	738	25.7	RELX Group (Elsevier)	389	13.6
48	Panasonic Holding Corporation	735	3995	18.4	AIP Publishing	762	19.1	IEEE	735	18.4
49	Lam Research Corp.	733	5403	13.6	AIP Publishing	1296	24.0	IEEE	733	13.6
50	Unisantis Electronics Ltd	639	789	81.0	IEEE	639	81.0	Institute of Pure and Applied Physics	52	6.6
51	Hong Kong University of Science and Technology	586	1304	44.9	IEEE	586	44.9	AIP Publishing	246	18.9
52	Korvus Inc.	568	7420	7.7	AIP Publishing	2154	29.0	Institute of Pure and Applied Physics	1511	20.4
53	Michigan State University	554	7154	7.7	Optical Society of America	1532	21.4	AIP Publishing	1103	15.4
54	AMS Osram ( former AMS Axcelera)	547	4102	13.3	AIP Publishing	944	23.0	IEEE	547	13.3
55	Interuniversity MicroElectronics Corporation	540	1813	29.8	IEEE	540	29.8	AIP Publishing	311	17.2
56	Thermo Fisher Scientific Inc	536	2837	18.9	RELX Group (Elsevier)	885	31.2	IEEE	536	18.9
57	ACORN SEMI LLC	513	3234	15.9	AIP Publishing	1182	36.5	RELX Group (Elsevier)	585	18.1
58	Cubic Corporation	507	703	72.1	IEEE	507	72.1	The International Society of Infrared, Millimeter, and Terahertz Engineers	44	6.3
59	Hon Hai Precision Industry Corporation	504	3016	16.7	AIP Publishing	653	21.7	IEEE	504	16.7
60	SolarEdge Technologies Inc	494	620	79.7	IEEE	494	79.7	WIP-Renewable Energies	59	9.5
61	Mass General Brigham (formerly Partners HealthCare)	489	7611	6.4	Optical Society of America	2845	37.4	RELX Group (Elsevier)	1055	13.9
62	Nantero Inc	483	7563	6.4	ACS-Am Chem Soc	2278	30.1	AIP Publishing	1589	21.0
63	Industrial Technology Research Institute	478	1681	28.4	IEEE	478	28.4	RELX Group (Elsevier)	297	17.7
64	Aisin Corporation (Aisin Seiki)	475	3379	14.1	Optical Society of America	1218	36.0	IEEE	475	14.1
65	Rocket Lab USA Inc	456	924	49.4	IEEE	456	49.4	RELX Group (Elsevier)	144	15.6
66	General Electric Company	443	1444	30.7	IEEE	443	30.7	AIP Publishing	213	14.8
67	ARTILUX INC	437	858	50.9	IEEE	437	50.9	Optical Society of America	144	16.8
68	The Arizona Board of Regents	436	5302	8.2	AIP Publishing	936	17.7	RELX Group (Elsevier)	827	15.6
69	Jiangsu Changjiang Electronics Technology Co., Ltd.	418	556	75.2	IEEE	418	75.2	International Microelectronics And Packaging Society	61	11.0
70	United States Navy	417	2402	17.4	AIP Publishing	590	24.6	IEEE	417	17.4
71	Vishay Intertechnology Inc.	414	578	71.6	IEEE	414	71.6	RELX Group (Elsevier)	39	6.7
72	Sanken Electric Co. Ltd.	410	616	66.6	IEEE	410	66.6	RELX Group (Elsevier)	85	13.8
73	Power Integrations Inc.	402	638	63.0	IEEE	402	63.0	AIP Publishing	63	9.9
74	Soitec SA	390	2016	19.3	AIP Publishing	540	26.8	IEEE	390	19.3
75	ACORN TECHNOLOGIES INC	377	1784	21.1	AIP Publishing	528	29.6	IEEE	377	21.1
76	TDK Corporation	377	1984	19.0	AIP Publishing	508	25.6	IEEE	377	19.0
77	Totalenergies SE (formerly TotalEnergies)	377	744	50.7	IEEE	377	50.7	RELX Group (Elsevier)	95	12.8
78	Motorola Solutions Inc.	376	1347	27.9	IEEE	376	27.9	AIP Publishing	372	27.6
79	University of Wisconsin (Wisconsin Silicon Valley)	376	1873	20.1	AIP Publishing	501	26.7	IEEE	376	20.1
80	Silicon Genesis Corporation	373	1429	26.1	IEEE	373	26.1	AIP Publishing	273	19.1

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81	Sony Group Corp	373	1848	20.2	IEEE	373	20.2	AIP Publishing	360	19.5
82	Electronics and Telecommuni	372	1115	33.4	IEEE	372	33.4	AIP Publishing	231	20.7
83	RTX Corporation (f/k/a Rayt	370	1737	21.3	IEEE	370	21.3	AIP Publishing	266	15.3
84	SiOnyx Inc	364	2386	15.3	AIP Publishing	659	27.6	RELX Group (Elsevier)	370	15.5
85	Hitachi Ltd	357	1222	29.2	IEEE	357	29.2	AIP Publishing	253	20.7
86	Georgia Institute of Technolo	354	1078	32.8	IEEE	354	32.8	RELX Group (Elsevier)	153	14.2
87	Mitsubishi Electric Corp	354	832	42.5	IEEE	354	42.5	AIP Publishing	92	11.1
88	Honeywell International Inc.	351	2932	12.0	ACS-Am Chem Soc	488	16.6	AIP Publishing	359	12.2
89	INNOVATIVE SILICON ISI	351	429	81.8	IEEE	351	81.8	RELX Group (Elsevier)	18	4.2
90	Sin-American Silicon	346	846	40.9	IEEE	346	40.9	AIP Publishing	173	20.4
91	Seoul Semiconductor Co Ltd	341	3294	10.4	AIP Publishing	1202	36.5	RELX Group (Elsevier)	441	13.4
92	Atomera Inc (Formerly Mears	332	825	40.2	IEEE	332	40.2	American Physical Society	126	15.3
93	Bosch (Robert) GmbH	329	596	55.2	IEEE	329	55.2	RELX Group (Elsevier)	99	16.6
94	Xerox Corp	328	1930	17.0	AIP Publishing	505	26.2	IEEE	328	17.0
95	Microchip Technology Inc.	323	537	60.1	IEEE	323	60.1	AIP Publishing	41	7.6
96	Sanan Optoelectronics Techn	323	1466	22.0	AIP Publishing	566	38.6	US Dept of Energy	392	26.7
97	Columbia University	322	4174	7.7	AIP Publishing	1482	35.5	MRS-Materials Research Soc	443	10.6
98	Lockheed Martin Corp.	317	1896	16.7	Optical Society of America	348	18.4	IEEE	317	16.7
99	University of Michigan	316	2176	14.5	AIP Publishing	500	23.0	IEEE	316	14.5
100	ZENA TECHNOLOGIES IN	299	1350	22.1	IEEE	299	22.1	ACS-Am Chem Soc	282	20.9



## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Smart Grid/Smart Meters/Energy Infrastructure</i>										
1	SolarEdge Technologies Inc	2187	2747	79.6	IEEE	2187	79.6	WIP-Renewable Energies	161	5.9
2	Velatia Group	839	1120	74.9	IEEE	839	74.9	Echelon Corp	81	7.2
3	Honeywell International Inc.	240	309	77.7	IEEE	240	77.7	Pearson Education	15	4.9
4	SIPCO LLC	157	271	57.9	IEEE	157	57.9	Internet Soc/IETF-Internet Eng Task Force	27	10.0
5	General Electric Company	151	230	65.7	IEEE	151	65.7	RELX Group (Elsevier)	21	9.1
6	TRILLIANT NETWORKS IN	139	206	67.5	IEEE	139	67.5	Internet Soc/IETF-Internet Eng Task Force	14	6.8
7	California Institute of Techno	136	245	55.5	IEEE	136	55.5	Springer Nature	19	7.8
8	ABB Ltd	123	146	84.2	IEEE	123	84.2	IET/IEE	4	2.7
9	AMPT LLC	121	157	77.1	IEEE	121	77.1	RELX Group (Elsevier)	8	5.1
10	Battelle Memorial Institute	116	159	73.0	IEEE	116	73.0	RELX Group (Elsevier)	8	5.0
11	International Business Machi	105	202	52.0	IEEE	105	52.0	IP.Com	18	8.9
12	ASTROLINK INTERNATIO	97	129	75.2	IEEE	97	75.2	International Telecommunication Union	12	9.3
13	DOMINION ENERGY TEC	97	129	75.2	IEEE	97	75.2	International Telecommunication Union	12	9.3
14	Alstom S.A.	73	90	81.1	IEEE	73	81.1	IET/IEE	11	12.2
15	Witricity Corp	71	137	51.8	IEEE	71	51.8	AIP Publishing	10	7.3
16	Causam Enterprises (former	68	127	53.5	IEEE	68	53.5	Springer Nature	17	13.4
17	University System of Maryla	62	66	93.9	IEEE	62	93.9	EPE Association	2	3.0
18	Hubbell Inc.	60	100	60.0	IEEE	60	60.0	ACM-Assoc Comput Mach	10	10.0
19	Itron Inc.	60	104	57.7	IEEE	60	57.7	ACM-Assoc Comput Mach	18	17.3
20	SENSE LABS INC	60	389	15.4	NILM Organizing Committee	267	68.6	IEEE	60	15.4
21	SMART WIRES INC	55	79	69.6	IEEE	55	69.6	Research & Reviews	6	7.6
22	Enphase Energy Inc	52	54	96.3	IEEE	52	96.3	EPE Association	2	3.7
23	Qualcomm Inc	46	77	59.7	IEEE	46	59.7	3GPP General Partnership Project Standards Body	10	13.0
24	TRILLIANT HOLDINGS IN	46	68	67.6	IEEE	46	67.6	Joint IEEE and ACM	4	5.9
25	TRILLIANT INC	46	70	65.7	IEEE	46	65.7	Internet Soc/IETF-Internet Eng Task Force	5	7.1
26	University of Minnesota (The	45	53	84.9	IEEE	45	84.9	RELX Group (Elsevier)	3	5.7
27	University of Texas	44	120	36.7	IEEE	44	36.7	RELX Group (Elsevier)	23	19.2
28	3M Co	43	53	81.1	IEEE	43	81.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	5	9.4
29	DELTA ENERGY & COMM	40	106	37.7	IEEE	40	37.7	RELX Group (Elsevier)	27	25.5
30	Totalenergies SE (formerly T	36	45	80.0	IEEE	36	80.0	EPE Association	4	8.9
31	Schweitzer Engineering Labo	34	38	89.5	IEEE	34	89.5	IEC-International Electrotechnical Commission	1	2.6
32	Rockwell Automation Inc	33	44	75.0	IEEE	33	75.0	AIAA - American Institute of Aeronautics and Astronautics	4	9.1
33	Siemens Aktiengesellschaft	33	50	66.0	IEEE	33	66.0	RELX Group (Elsevier)	2	4.0
34	University of California	31	795	3.9	ACS-Am Chem Soc	227	28.6	Royal Society of Chemistry	131	16.5
35	Georgia Institute of Technolo	29	85	34.1	ACM-Assoc Comput Mach	47	55.3	IEEE	29	34.1
36	LS Electric co. Ltd. (f/k/aLSI	27	36	75.0	IEEE	27	75.0	IET/IEE	4	11.1
37	ENERGY TECHNOLOGY G	26	30	86.7	IEEE	26	86.7	RELX Group (Elsevier)	2	6.7
38	Microsoft Corporation	26	58	44.8	IEEE	26	44.8	ACM-Assoc Comput Mach	10	17.2
39	STEM INC	26	28	92.9	IEEE	26	92.9	Mcgraw Hill	1	3.6



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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Tigo Energy Inc	25	37	67.6	IEEE	25	67.6	WIP-Renewable Energies	9	24.3
41	Johnson & Johnson	23	79	29.1	IEEE	23	29.1	RELX Group (Elsevier)	17	21.5
42	SPARQ SYSTEMS INC	23	29	79.3	IEEE	23	79.3	RELX Group (Elsevier)	3	10.3
43	Ecole Polytechnique Federale	22	27	81.5	IEEE	22	81.5	RELX Group (Elsevier)	3	11.1
44	Schneider Electric S.A.	21	140	15.0	Siemens Aktiengesellschaft	35	25.0	ANSI-American National Standards Institute	27	19.3
45	Signify NV	21	25	84.0	IEEE	21	84.0	RELX Group (Elsevier)	1	4.0
46	TAE TECHNOLOGIES INC	21	440	4.8	AIP Publishing	211	48.0	American Physical Society	68	15.5
47	Empire Technology Develop	20	24	83.3	IEEE	20	83.3	Condé Nast	2	8.3
48	TEMPORAL POWER LTD	20	26	76.9	IEEE	20	76.9	NASA-National Aeronautics and Space Admin	2	7.7
49	Accenture Ltd.	19	25	76.0	IEEE	19	76.0	A B B Corporate Management Services AG	4	16.0
50	Commscope Holding (formerl	19	19	100.0	IEEE	19	100.0			
51	Mitsubishi Electric Corp	19	20	95.0	IEEE	19	95.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1	5.0
52	Panasonic Holding Corporati	19	27	70.4	IEEE	19	70.4	IEICE-Inst Elec Info Comm Eng	2	7.4
53	DOMINION ENERGY INC	18	20	90.0	IEEE	18	90.0	ANSI-American National Standards Institute	2	10.0
54	Intellectual Ventures Manage	18	34	52.9	IEEE	18	52.9	RELX Group (Elsevier)	6	17.6
55	New Jersey Institute of Techn	17	17	100.0	IEEE	17	100.0			
56	Alphabet Inc.	16	44	36.4	IEEE	16	36.4	ACM-Assoc Comput Mach	10	22.7
57	Massachusetts Institute of Te	16	22	72.7	IEEE	16	72.7	AMER SOC NAVAL ENG INC	4	18.2
58	CLEAN POWER RESEARC	15	42	35.7	RELX Group (Elsevier)	22	52.4	IEEE	15	35.7
59	EL ELECTRONICS LLC	14	28	50.0	IEEE	14	50.0	The USENIX Association	4	14.3
60	Landis & Gyr AG	14	15	93.3	IEEE	14	93.3	ANSI-American National Standards Institute	1	6.7
61	Toshiba Corp	14	28	50.0	IEEE	14	50.0	RELX Group (Elsevier)	4	14.3
62	ENEDYM INC	13	18	72.2	IEEE	13	72.2	American Automatic Control Council (AACC)	1	5.6
63	Industrial Technology Researc	13	16	81.3	IEEE	13	81.3	RELX Group (Elsevier)	2	12.5
64	King Fahd University of Petr	13	16	81.3	IEEE	13	81.3	United Business Media/UBM Tech	3	18.8
65	Sony Group Corp	13	45	28.9	SID-Society for Information Display	24	53.3	IEEE	13	28.9
66	Taiwan Semiconductor Manu	13	19	68.4	IEEE	13	68.4	Electrostatic Discharge Association	6	31.6
67	THE FLORIDA INTERNATI	13	28	46.4	IEEE	13	46.4	The USENIX Association	4	14.3
68	SUNVERGE ENERGY INC	12	16	75.0	IEEE	12	75.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4	25.0
69	United States of America Dep	12	37	32.4	IEEE	12	32.4	Optical Society of America	7	18.9
70	THE DETROIT EDISON CO	11	11	100.0	IEEE	11	100.0			
71	Alliance for Sustainable Ener	10	12	83.3	IEEE	10	83.3	IET/IEE	1	8.3
72	BRITISH COLUMBIA HYD	10	11	90.9	IEEE	10	90.9	Springer Nature	1	9.1
73	EI ELECTRONICS LLC	10	21	47.6	IEEE	10	47.6	The USENIX Association	3	14.3
74	Fortive Corporation	10	16	62.5	IEEE	10	62.5	RELX Group (Elsevier)	5	31.3
75	Nokia Corporation	10	20	50.0	IEEE	10	50.0	ACM-Assoc Comput Mach	3	15.0
76	Nth Degree Technologies Wo	10	102	9.8	Springer Nature	18	17.6	Optical Society of America	12	11.8
77	Roche Holding Ltd.	10	10	100.0	IEEE	10	100.0			
78	Cisco Systems Inc.	9	19	47.4	IEEE	9	47.4	Internet Soc/IETF-Internet Eng Task Force	7	36.8
79	DEPSYS SA	9	9	100.0	IEEE	9	100.0			
80	Digimarc Corp.	9	9	100.0	IEEE	9	100.0			

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Eaton Corp.	9	15	60.0	IEEE	9	60.0	Siemens Aktiengesellschaft	2	13.3
82	Energous Corporation	9	12	75.0	IEEE	9	75.0	The European Association on Antennas and Propagation (Eur	1	8.3
83	Hon Hai Precision Industry C	9	34	26.5	ACM-Assoc Comput Mach	16	47.1	IEEE	9	26.5
84	Johnson Controls Internationa	9	41	22.0	RELX Group (Elsevier)	12	29.3	IEEE	9	22.0
85	Northeastern University (Bost	9	13	69.2	IEEE	9	69.2	International Network for Scientific Information Publication (I	2	15.4
86	University of Hong Kong	9	11	81.8	IEEE	9	81.8	RELX Group (Elsevier)	2	18.2
87	University of Missouri	9	10	90.0	IEEE	9	90.0	Summit Technical Media	1	10.0
88	Electricite de France	8	10	80.0	IEEE	8	80.0	RELX Group (Elsevier)	1	10.0
89	RTX Corporation (f/k/a Rayt	8	19	42.1	IEEE	8	42.1	RELX Group (Elsevier)	4	21.1
90	Boeing Co. (The)	7	15	46.7	IEEE	7	46.7	AIAA - American Institute of Aeronautics and Astronautics	1	6.7
91	Clemson University	7	9	77.8	IEEE	7	77.8	AIP Publishing	1	11.1
92	CURRENT TECHNOLOGIE	7	12	58.3	IEEE	7	58.3	Hewlett-Packard Company	2	16.7
93	CURRETN GRID LLC	7	11	63.6	IEEE	7	63.6	Echelon Corp	2	18.2
94	INTERNATIONAL BROAD	7	13	53.8	IEEE	7	53.8	ISO-International Standards Organization	4	30.8
95	OPEN ACCESS TECHNOL	7	7	100.0	IEEE	7	100.0			
96	POWER TAGGING TECHN	7	8	87.5	IEEE	7	87.5	IET/IEE	1	12.5
97	Semikron Danfoss A/S	7	7	100.0	IEEE	7	100.0			
98	State Grid Corp of China	7	10	70.0	IEEE	7	70.0	IET/IEE	1	10.0
99	TACTILIS SDN BHD	7	7	100.0	IEEE	7	100.0			
100	Tata Sons Ltd	7	10	70.0	IEEE	7	70.0	Springer Nature	1	10.0

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Solar/Photovoltaic</i>										
1	SolarEdge Technologies Inc	4733	5920	79.9	IEEE	4733	79.9	WIP-Renewable Energies	414	7.0
2	AMPT LLC	872	1131	77.1	IEEE	872	77.1	RELX Group (Elsevier)	62	5.5
3	Totalenergies SE (formerly T	642	1054	60.9	IEEE	642	60.9	RELX Group (Elsevier)	122	11.6
4	Rocket Lab USA Inc	472	958	49.3	IEEE	472	49.3	RELX Group (Elsevier)	147	15.3
5	University of Illinois	465	5091	9.1	AIP Publishing	966	19.0	ACS-Am Chem Soc	916	18.0
6	Tigo Energy Inc	464	728	63.7	IEEE	464	63.7	WIP-Renewable Energies	198	27.2
7	Taiwan Semiconductor Manu	330	1611	20.5	AIP Publishing	578	35.9	IEEE	330	20.5
8	California Institute of Techno	318	1901	16.7	IEEE	318	16.7	AIP Publishing	299	15.7
9	International Business Machi	312	1583	19.7	RELX Group (Elsevier)	334	21.1	IEEE	312	19.7
10	Sanan Optoelectronics Techn	265	816	32.5	US Dept of Energy	399	48.9	IEEE	265	32.5
11	Tesla Motors Inc	236	593	39.8	IEEE	236	39.8	WIP-Renewable Energies	97	16.4
12	EMCORE SOLAR POWER I	216	435	49.7	IEEE	216	49.7	US Dept of Energy	76	17.5
13	Xtrion NV	216	2327	9.3	AIP Publishing	431	18.5	ACS-Am Chem Soc	415	17.8
14	Hanergy Holding Group Ltd	172	458	37.6	IEEE	172	37.6	AIP Publishing	72	15.7
15	Array Photonics Inc. (f/k/a So	168	887	18.9	AIP Publishing	275	31.0	RELX Group (Elsevier)	214	24.1
16	Alliance for Sustainable Ener	155	1268	12.2	AIP Publishing	233	18.4	RELX Group (Elsevier)	230	18.1
17	Xerox Corp	153	499	30.7	IEEE	153	30.7	RELX Group (Elsevier)	96	19.2
18	SEMPRIUS INC	150	1692	8.9	AIP Publishing	319	18.9	ACS-Am Chem Soc	307	18.1
19	Beamreach Solar Inc	135	626	21.6	RELX Group (Elsevier)	207	33.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	135	21.6
20	Boeing Co. (The)	129	295	43.7	IEEE	129	43.7	RELX Group (Elsevier)	56	19.0
21	CLEAN POWER RESEARC	125	329	38.0	RELX Group (Elsevier)	169	51.4	IEEE	125	38.0
22	The Arizona Board of Regent	111	546	20.3	RELX Group (Elsevier)	140	25.6	IEEE	111	20.3
23	Massachusetts Institute of Te	97	838	11.6	RELX Group (Elsevier)	154	18.4	AIP Publishing	114	13.6
24	LG Electronics Inc.	93	266	35.0	IEEE	93	35.0	AIP Publishing	48	18.0
25	Advanced Energy Industries I	84	91	92.3	IEEE	84	92.3	IET/IEE	4	4.4
26	Applied Materials Inc.	79	243	32.5	IEEE	79	32.5	WIP-Renewable Energies	51	21.0
27	University of California	79	1522	5.2	ACS-Am Chem Soc	329	21.6	RELX Group (Elsevier)	213	14.0
28	5N Plus Inc	77	203	37.9	IEEE	77	37.9	RELX Group (Elsevier)	44	21.7
29	STION CORP	77	671	11.5	RELX Group (Elsevier)	225	33.5	AIP Publishing	146	21.8
30	First Solar Inc	74	452	16.4	RELX Group (Elsevier)	197	43.6	IEEE	74	16.4
31	Witricity Corp	72	136	52.9	IEEE	72	52.9	AIP Publishing	11	8.1
32	ACORN SEMI LLC	69	468	14.7	AIP Publishing	181	38.7	RELX Group (Elsevier)	107	22.9
33	NANOSOLAR INC	61	838	7.3	RELX Group (Elsevier)	242	28.9	Electrochemical Society, Inc.	105	12.5
34	Texas Instruments Inc	60	73	82.2	IEEE	60	82.2	SAE-Society of Automobile Engineers	4	5.5
35	DuPont de Nemours Inc.	57	324	17.6	RELX Group (Elsevier)	94	29.0	IEEE	57	17.6
36	Lockheed Martin Corp.	56	221	25.3	IEEE	56	25.3	AIP Publishing	34	15.4
37	ZENA TECHNOLOGIES IN	55	240	22.9	IEEE	55	22.9	ACS-Am Chem Soc	49	20.4
38	United States Navy	53	200	26.5	IEEE	53	26.5	RELX Group (Elsevier)	32	16.0
39	Compagnie de Saint-Gobain	51	216	23.6	IEEE	51	23.6	SPIE-Int Soc Opt Engineering	44	20.4

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Dartmouth College	48	93	51.6	IEEE	48	51.6	RELX Group (Elsevier)	18	19.4
41	Ignis Innovation Inc	45	67	67.2	IEEE	45	67.2	SID-Society for Information Display	16	23.9
42	SUNIVA INC	45	88	51.1	IEEE	45	51.1	WIP-Renewable Energies	12	13.6
43	University of Minnesota (The	45	109	41.3	IEEE	45	41.3	AIP Publishing	25	22.9
44	University of Toledo	45	195	23.1	RELX Group (Elsevier)	91	46.7	IEEE	45	23.1
45	SOLYNDRA LLC	43	221	19.5	RELX Group (Elsevier)	71	32.1	IEEE	43	19.5
46	University of Michigan	39	443	8.8	AIP Publishing	108	24.4	ACS-Am Chem Soc	74	16.7
47	Commissariat A L'Energie At	38	280	13.6	RELX Group (Elsevier)	104	37.1	ACS-Am Chem Soc	41	14.6
48	Honeywell International Inc.	38	1085	3.5	ACS-Am Chem Soc	406	37.4	RELX Group (Elsevier)	206	19.0
49	Semiconductor Energy Labor	38	623	6.1	SID-Society for Information Display	224	36.0	AIP Publishing	87	14.0
50	Ostendo Technologies Inc	35	97	36.1	IEEE	35	36.1	RELX Group (Elsevier)	29	29.9
51	4POWER LLC	34	66	51.5	IEEE	34	51.5	AIP Publishing	18	27.3
52	University of Alabama	33	145	22.8	IEEE	33	22.8	Springer Nature	30	20.7
53	General Electric Company	31	287	10.8	ACS-Am Chem Soc	83	28.9	RELX Group (Elsevier)	41	14.3
54	Industrial Techology Researc	31	215	14.4	RELX Group (Elsevier)	55	25.6	IEEE	31	14.4
55	Teijin Ltd.	30	86	34.9	IEEE	30	34.9	WIP-Renewable Energies	24	27.9
56	AMI Research & Developme	28	74	37.8	IEEE	28	37.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	9	12.2
57	Interuniversity MicroElectron	28	130	21.5	RELX Group (Elsevier)	33	25.4	IEEE	28	21.5
58	Koch Industries Inc	28	328	8.5	RELX Group (Elsevier)	130	39.6	AIP Publishing	84	25.6
59	On Semiconductor Corporati	28	127	22.0	IEEE	28	22.0	AIP Publishing	25	19.7
60	The National Aeronautical an	28	208	13.5	Springer Nature	29	13.9	IEEE	28	13.5
61	Enphase Energy Inc	25	29	86.2	IEEE	25	86.2	EPE Association	2	6.9
62	Hanwha Solutions (Hhanwha	25	83	30.1	IEEE	25	30.1	AIP Publishing	19	22.9
63	Imperial College	25	69	36.2	IEEE	25	36.2	AIP Publishing	16	23.2
64	Nth Degree Technologies Wo	25	256	9.8	Springer Nature	47	18.4	Optical Society of America	32	12.5
65	Shin-Etsu Chemical Co. Ltd.	25	87	28.7	IEEE	25	28.7	RELX Group (Elsevier)	18	20.7
66	SOLYNDRA INC	25	140	17.9	RELX Group (Elsevier)	46	32.9	IEEE	25	17.9
67	Toshiba Corp	25	181	13.8	AIP Publishing	28	15.5	ACS-Am Chem Soc	26	14.4
68	INDIVIDUAL PATENTER	24	161	14.9	IEEE	24	14.9	AIP Publishing	24	14.9
69	King Abdullah University of	24	347	6.9	ACS-Am Chem Soc	98	28.2	Royal Society of Chemistry	50	14.4
70	Hon Hai Precision Industry C	23	190	12.1	RELX Group (Elsevier)	36	18.9	AIP Publishing	25	13.2
71	Panasonic Holding Corporati	23	192	12.0	AIP Publishing	42	21.9	RELX Group (Elsevier)	33	17.2
72	PRECURSOR ENERGETIC	23	1095	2.1	ACS-Am Chem Soc	481	43.9	RELX Group (Elsevier)	237	21.6
73	Qualcomm Inc	23	66	34.8	IEEE	23	34.8	SID-Society for Information Display	11	16.7
74	SOLARWORLD INNOVATI	23	66	34.8	IEEE	23	34.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	16	24.2
75	Solopower Inc	23	213	10.8	RELX Group (Elsevier)	101	47.4	AIP Publishing	43	20.2
76	Fraunhofer Gesellschaft	22	86	25.6	IEEE	22	25.6	RELX Group (Elsevier)	19	22.1
77	MAXEON SOLAR PTE LTD	22	56	39.3	IEEE	22	39.3	RELX Group (Elsevier)	10	17.9
78	City University of Hong Kon	21	49	42.9	IEEE	21	42.9	IET/IEE	12	24.5
79	SMA Solar Technology AG	21	23	91.3	IEEE	21	91.3	IET/IEE	1	4.3
80	Toyota Motor Corp	21	116	18.1	Optical Society of America	22	19.0	IEEE	21	18.1

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81	Catholic University Leuven	20	57	35.1	IEEE	20	35.1	RELX Group (Elsevier)	13	22.8
82	FLISOM AG	20	122	16.4	RELX Group (Elsevier)	50	41.0	Springer Nature	21	17.2
83	Stanford University	19	214	8.9	ACS-Am Chem Soc	35	16.4	AIP Publishing	34	15.9
84	TRANS ASTRONAUTICA C	19	291	6.5	AIAA - American Institute of Aeronautics and	68	23.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	42	14.4
85	University of New Mexico	19	60	31.7	IEEE	19	31.7	RELX Group (Elsevier)	14	23.3
86	ATHENAEUM LLC	18	104	17.3	RELX Group (Elsevier)	30	28.8	AIP Publishing	18	17.3
87	BEIJING APOLLO DING R	18	86	20.9	RELX Group (Elsevier)	27	31.4	IEEE	18	20.9
88	New Jersey Institute of Techn	18	34	52.9	IEEE	18	52.9	RELX Group (Elsevier)	10	29.4
89	Rensselaer Polytechnic Instit	18	75	24.0	IEEE	18	24.0	AIP Publishing	17	22.7
90	1366 TECHNOLOGIES INC	17	93	18.3	RELX Group (Elsevier)	49	52.7	IEEE	17	18.3
91	ASCENT SOLAR TECHNO	17	52	32.7	IEEE	17	32.7	RELX Group (Elsevier)	13	25.0
92	Canon Inc	17	75	22.7	IEEE	17	22.7	AIP Publishing	12	16.0
93	Reliance Industries Ltd	17	42	40.5	IEEE	17	40.5	RELX Group (Elsevier)	11	26.2
94	University of Oklahoma	17	272	6.3	AIP Publishing	103	37.9	RELX Group (Elsevier)	43	15.8
95	VERLIY LIFE SCIENCES L	17	38	44.7	IEEE	17	44.7	RELX Group (Elsevier)	4	10.5
96	Columbia University	16	246	6.5	ACS-Am Chem Soc	99	40.2	Springer Nature	24	9.8
97	Ecole Polytechnique Federale	16	169	9.5	ACS-Am Chem Soc	48	28.4	RELX Group (Elsevier)	26	15.4
98	ENEOS Group (formerly JXT	16	63	25.4	IEEE	16	25.4	RELX Group (Elsevier)	14	22.2
99	Georgia Institute of Technolo	16	63	25.4	IEEE	16	25.4	RELX Group (Elsevier)	10	15.9
100	PLANT PV INC	16	62	25.8	RELX Group (Elsevier)	21	33.9	IEEE	16	25.8

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Telecom and Other Communications</i>										
1	Qualcomm Inc	32906	1E+05	30.0	3GPP General Partnership Project Standards B	36789	33.5	IEEE	32906	30.0
2	AT&T Inc	32701	72614	45.0	IEEE	32701	45.0	RELX Group (Elsevier)	3531	4.9
3	Marvell Technology Group Lt	23678	29952	79.1	IEEE	23678	79.1	3GPP General Partnership Project Standards Body	3184	10.6
4	Broadcom Ltd	19632	37118	52.9	IEEE	19632	52.9	ACM-Assoc Comput Mach	4313	11.6
5	Microsoft Corporation	18440	47218	39.1	IEEE	18440	39.1	ACM-Assoc Comput Mach	7490	15.9
6	InterDigital Inc	14924	75541	19.8	3GPP General Partnership Project Standards B	50995	67.5	IEEE	14924	19.8
7	Huawei Technologies Compa	14437	71254	20.3	3GPP General Partnership Project Standards B	40242	56.5	IEEE	14437	20.3
8	Cisco Systems Inc.	13441	49305	27.3	IEEE	13441	27.3	Internet Soc/IETF-Internet Eng Task Force	8254	16.7
9	Intel Corporation	13334	31386	42.5	IEEE	13334	42.5	3GPP General Partnership Project Standards Body	9921	31.6
10	Ericsson	13001	64230	20.2	3GPP General Partnership Project Standards B	36021	56.1	IEEE	13001	20.2
11	Nokia Corporation	12660	41394	30.6	3GPP General Partnership Project Standards B	15533	37.5	IEEE	12660	30.6
12	REARDEN LLC	12293	15413	79.8	IEEE	12293	79.8	3GPP General Partnership Project Standards Body	946	6.1
13	Samsung Electronics Co Ltd	10553	53421	19.8	3GPP General Partnership Project Standards B	32357	60.6	IEEE	10553	19.8
14	International Business Machi	9841	29660	33.2	IEEE	9841	33.2	ACM-Assoc Comput Mach	4029	13.6
15	Apple Inc	9511	28411	33.5	IEEE	9511	33.5	3GPP General Partnership Project Standards Body	5761	20.3
16	ParkerVision Inc	9195	18057	50.9	IEEE	9195	50.9	IET/IEE	4059	22.5
17	LG Electronics Inc.	8698	60801	14.3	3GPP General Partnership Project Standards B	41170	67.7	IEEE	8698	14.3
18	PERSONALIZED MEDIA C	7667	45094	17.0	Society of Motion Picture and Television Engi	13455	29.8	IEEE	7667	17.0
19	Alphabet Inc.	7500	23672	31.7	IEEE	7500	31.7	International Telecommunication Union	3090	13.1
20	Panasonic Holding Corporati	7276	23004	31.6	3GPP General Partnership Project Standards B	8393	36.5	IEEE	7276	31.6
21	Sony Group Corp	7236	22965	31.5	IEEE	7236	31.5	3GPP General Partnership Project Standards Body	6426	28.0
22	Xperi Inc. (f/k/a Tessera Inc)	6827	16824	40.6	IEEE	6827	40.6	SPIE-Int Soc Opt Engineering	1940	11.5
23	Massachusetts Institute of Te	6585	12614	52.2	IEEE	6585	52.2	Optical Society of America	798	6.3
24	Fractus SA	6056	10911	55.5	IEEE	6056	55.5	IET/IEE	1418	13.0
25	Commscope Holding (formerl	5896	10757	54.8	IEEE	5896	54.8	International Telecommunication Union	706	6.6
26	Murata Manufacturing Co. Lt	5843	7642	76.5	IEEE	5843	76.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	221	2.9
27	Blackberry Ltd.	5421	24607	22.0	3GPP General Partnership Project Standards B	13031	53.0	IEEE	5421	22.0
28	NXP Semiconductors NV	5413	7028	77.0	IEEE	5413	77.0	3GPP General Partnership Project Standards Body	133	1.9
29	Nippon Telegraph & Telepho	4501	17648	25.5	3GPP General Partnership Project Standards B	7884	44.7	IEEE	4501	25.5
30	ADAPTIX INC	4375	6474	67.6	IEEE	4375	67.6	European Telecom Standards Institute (ETSI)	730	11.3
31	Rambus Inc.	4341	6284	69.1	IEEE	4341	69.1	IEEE/JPN Soc App Phys	317	5.0
32	Comcast Corp	4289	56457	7.6	3GPP General Partnership Project Standards B	49663	88.0	IEEE	4289	7.6
33	Fujitsu Limited	4136	13982	29.6	3GPP General Partnership Project Standards B	5018	35.9	IEEE	4136	29.6
34	Electronics and Telecommuni	4025	9448	42.6	IEEE	4025	42.6	3GPP General Partnership Project Standards Body	2095	22.2
35	University of Minnesota (The	3928	4689	83.8	IEEE	3928	83.8	ACM-Assoc Comput Mach	82	1.7
36	RTX Corporation (f/k/a Rayt	3698	7156	51.7	IEEE	3698	51.7	Optical Society of America	367	5.1
37	Columbia University	3589	6327	56.7	IEEE	3589	56.7	ACM-Assoc Comput Mach	632	10.0
38	NEC Corp	3534	18480	19.1	3GPP General Partnership Project Standards B	10863	58.8	IEEE	3534	19.1
39	Texas Instruments Inc	3418	6951	49.2	IEEE	3418	49.2	International Telecommunication Union	1850	26.6

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	L3 Harris Technologies (f/k/a	3387	5533	61.2	IEEE	3387	61.2	Internet Soc/IETF-Internet Eng Task Force	236	4.3
41	Mosaid Technologies ( f/k/aC	3375	6562	51.4	IEEE	3375	51.4	Primedia Business Magazines & Media Inc.	257	3.9
42	Analog Devices Inc.	3353	4449	75.4	IEEE	3353	75.4	ACM-Assoc Comput Mach	128	2.9
43	Toshiba Corp	3251	6009	54.1	IEEE	3251	54.1	International Telecommunication Union	586	9.8
44	CPG Technologies Llc	3031	5877	51.6	IEEE	3031	51.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	743	12.6
45	STMicroelectronics	2927	4267	68.6	IEEE	2927	68.6	European Telecom Standards Institute (ETSI)	130	3.0
46	Industrial Techology Researc	2906	4601	63.2	IEEE	2906	63.2	3GPP General Partnership Project Standards Body	557	12.1
47	Advanced Micro Devices Inc	2748	7239	38.0	IEEE	2748	38.0	ACM-Assoc Comput Mach	2603	36.0
48	SUN PATENT TRUST	2648	15896	16.7	3GPP General Partnership Project Standards B	5899	37.1	International Telecommunication Union	5271	33.2
49	Infineon Technologies AG	2602	3957	65.8	IEEE	2602	65.8	IET/IEE	107	2.7
50	RPX Corp	2493	5816	42.9	IEEE	2493	42.9	Internet Soc/IETF-Internet Eng Task Force	545	9.4
51	Corning Inc.	2471	4446	55.6	IEEE	2471	55.6	IET/IEE	329	7.4
52	Honeywell International Inc.	2459	5256	46.8	IEEE	2459	46.8	Optical Society of America	315	6.0
53	Mitsubishi Electric Corp	2457	7085	34.7	IEEE	2457	34.7	3GPP General Partnership Project Standards Body	2333	32.9
54	General Electric Company	2451	8118	30.2	International Telecommunication Union	2873	35.4	IEEE	2451	30.2
55	Vantiva SA (former Technico	2430	5249	46.3	IEEE	2430	46.3	ISO/IEC/JTC/ANSI	329	6.3
56	Motorola Solutions Inc.	2422	4434	54.6	IEEE	2422	54.6	3GPP General Partnership Project Standards Body	379	8.5
57	University of California	2397	4337	55.3	IEEE	2397	55.3	Springer Nature	225	5.2
58	Fraunhofer Gesellschaft	2391	5296	45.1	IEEE	2391	45.1	3GPP General Partnership Project Standards Body	491	9.3
59	Amazon.com Inc.	2335	8725	26.8	IEEE	2335	26.8	ACM-Assoc Comput Mach	1393	16.0
60	Renesas Electronic Corporati	2314	3725	62.1	IEEE	2314	62.1	IEEE/OSA	217	5.8
61	Viasat	2276	3556	64.0	IEEE	2276	64.0	AIAA - American Institute of Aeronautics and Astronautics	258	7.3
62	Semiconductor Energy Labor	2228	28598	7.8	SID-Society for Information Display	10557	36.9	AIP Publishing	3476	12.2
63	GENGHISCOMM HOLDIN	2225	2866	77.6	IEEE	2225	77.6	3GPP General Partnership Project Standards Body	119	4.2
64	Mediatek Inc.	2198	6204	35.4	IEEE	2198	35.4	3GPP General Partnership Project Standards Body	2027	32.7
65	SIPCO LLC	2080	3728	55.8	IEEE	2080	55.8	Internet Soc/IETF-Internet Eng Task Force	310	8.3
66	Intellectual Ventures Manage	2043	5771	35.4	IEEE	2043	35.4	3GPP General Partnership Project Standards Body	586	10.2
67	California Institute of Techno	2031	4536	44.8	IEEE	2031	44.8	Optical Society of America	429	9.5
68	Silicon Laboratories Inc	2025	2741	73.9	IEEE	2025	73.9	RELX Group (Elsevier)	120	4.4
69	Juniper Networks Inc.	2015	7839	25.7	Network Working Group RFC	2394	30.5	IEEE	2015	25.7
70	Verizon Communications Inc	2010	6005	33.5	IEEE	2010	33.5	Internet Soc/IETF-Internet Eng Task Force	1219	20.3
71	Kandou Bus SA	2003	2247	89.1	IEEE	2003	89.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	71	3.2
72	Dolby Laboratories Inc	1984	7857	25.3	International Telecommunication Union	2375	30.2	IEEE	1984	25.3
73	Softbank Corp	1977	4671	42.3	IEEE	1977	42.3	ISO/IEC	291	6.2
74	Oracle Corporation	1948	10189	19.1	3GPP General Partnership Project Standards B	3048	29.9	IEEE	1948	19.1
75	Quarterhill Inc	1919	3740	51.3	IEEE	1919	51.3	3GPP General Partnership Project Standards Body	644	17.2
76	HRL Laboratories LLC	1903	3492	54.5	IEEE	1903	54.5	IET/IEE	225	6.4
77	Boeing Co. (The)	1841	3735	49.3	IEEE	1841	49.3	RELX Group (Elsevier)	141	3.8
78	OneTrust	1805	5576	32.4	ACM-Assoc Comput Mach	2605	46.7	IEEE	1805	32.4
79	Digimarc Corp.	1773	4394	40.4	IEEE	1773	40.4	SPIE-Int Soc Opt Engineering	532	12.1
80	Qorvo	1751	2379	73.6	IEEE	1751	73.6	European Microwave Association	91	3.8



## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Hon Hai Precision Industry C	1739	15479	11.2	3GPP General Partnership Project Standards B	9874	63.8	IEEE	1739	11.2
82	The Arizona Board of Regent	1702	3435	49.5	IEEE	1702	49.5	ACM-Assoc Comput Mach	347	10.1
83	NXGEN PARTNERS IP LLC	1698	3639	46.7	IEEE	1698	46.7	Optical Society of America	912	25.1
84	Micron Technology Inc.	1683	2681	62.8	IEEE	1683	62.8	RELX Group (Elsevier)	155	5.8
85	Hewlett Packard Enterprises	1619	4228	38.3	IEEE	1619	38.3	ACM-Assoc Comput Mach	568	13.4
86	HP Inc	1615	3930	41.1	IEEE	1615	41.1	ACM-Assoc Comput Mach	416	10.6
87	Koninklijke Philips N.V.	1613	3795	42.5	IEEE	1613	42.5	3GPP General Partnership Project Standards Body	418	11.0
88	University of Washington	1598	2977	53.7	IEEE	1598	53.7	ACM-Assoc Comput Mach	400	13.4
89	NVIDIA Corp.	1556	3336	46.6	IEEE	1556	46.6	ACM-Assoc Comput Mach	291	8.7
90	Cubic Corporation	1554	2142	72.5	IEEE	1554	72.5	The International Society of Infrared, Millimeter, and Terahert	109	5.1
91	Canon Inc	1542	3962	38.9	IEEE	1542	38.9	International Telecommunication Union	617	15.6
92	Xerox Corp	1341	3871	34.6	IEEE	1341	34.6	ACM-Assoc Comput Mach	855	22.1
93	ORIGIN WIRELESS INC	1334	2031	65.7	IEEE	1334	65.7	American Physical Society	129	6.4
94	BT Group PLC	1318	3256	40.5	IEEE	1318	40.5	3GPP General Partnership Project Standards Body	438	13.5
95	TABULA INC	1316	3706	35.5	ACM-Assoc Comput Mach	1349	36.4	IEEE	1316	35.5
96	Microchip Technology Inc.	1275	1965	64.9	IEEE	1275	64.9	International Telecommunication Union	153	7.8
97	Trellix (merger of FireEye Inc	1240	3499	35.4	IEEE	1240	35.4	ACM-Assoc Comput Mach	612	17.5
98	Lenovo Group Ltd	1237	6701	18.5	3GPP General Partnership Project Standards B	4745	70.8	IEEE	1237	18.5
99	T-Mobile USA INC	1222	4897	25.0	IEEE	1222	25.0	3GPP General Partnership Project Standards Body	1049	21.4
100	Headwater Partners 1 LLC	1205	2894	41.6	IEEE	1205	41.6	3GPP General Partnership Project Standards Body	539	18.6



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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Virtual/Augmented Reality</i>										
1	Microsoft Corporation	3834	10495	36.5	IEEE	3834	36.5	ACM-Assoc Comput Mach	2534	24.1
2	Magic Leap Inc	2069	7228	28.6	IEEE	2069	28.6	ACM-Assoc Comput Mach	762	10.5
3	Apple Inc	1425	4103	34.7	IEEE	1425	34.7	ACM-Assoc Comput Mach	838	20.4
4	Meta Platforms Inc.(formerly	1283	5692	22.5	IEEE	1283	22.5	ACM-Assoc Comput Mach	999	17.6
5	Alphabet Inc.	1208	3808	31.7	IEEE	1208	31.7	ACM-Assoc Comput Mach	866	22.7
6	Immersion Corp.	1059	3074	34.5	IEEE	1059	34.5	ACM-Assoc Comput Mach	348	11.3
7	Sony Group Corp	597	1374	43.4	IEEE	597	43.4	ACM-Assoc Comput Mach	234	17.0
8	UltraLeap Holdings Limited (	496	1404	35.3	IEEE	496	35.3	ACM-Assoc Comput Mach	301	21.4
9	Qualcomm Inc	401	1186	33.8	IEEE	401	33.8	ACM-Assoc Comput Mach	200	16.9
10	The Arizona Board of Regent	356	2399	14.8	Optical Society of America	715	29.8	IEEE	356	14.8
11	International Business Machi	337	1505	22.4	IEEE	337	22.4	ACM-Assoc Comput Mach	283	18.8
12	ONPOINT MEDICAL INC	328	1516	21.6	IEEE	328	21.6	RELX Group (Elsevier)	240	15.8
13	Lincoln Electric Holdings Inc	320	1996	16.0	ACM-Assoc Comput Mach	478	23.9	IEEE	320	16.0
14	Snap Inc	319	837	38.1	IEEE	319	38.1	RELX Group (Elsevier)	123	14.7
15	Intellectual Ventures Manage	266	812	32.8	IEEE	266	32.8	ACM-Assoc Comput Mach	173	21.3
16	AT&T Inc	244	620	39.4	IEEE	244	39.4	ACM-Assoc Comput Mach	178	28.7
17	Samsung Electronics Co Ltd	241	626	38.5	IEEE	241	38.5	ACM-Assoc Comput Mach	112	17.9
18	Xperi Inc. (f/k/a Tessera Inc)	239	518	46.1	IEEE	239	46.1	SPIE-Int Soc Opt Engineering	59	11.4
19	P4TENTS1 LLC	229	559	41.0	IEEE	229	41.0	ACM-Assoc Comput Mach	79	14.1
20	Adobe Inc. (former Adobe Sy	220	895	24.6	ACM-Assoc Comput Mach	421	47.0	IEEE	220	24.6
21	Intel Corporation	214	590	36.3	IEEE	214	36.3	ACM-Assoc Comput Mach	133	22.5
22	InterDigital Inc	209	579	36.1	IEEE	209	36.1	ACM-Assoc Comput Mach	138	23.8
23	Nant Holdings IP Llc	178	426	41.8	IEEE	178	41.8	ACM-Assoc Comput Mach	65	15.3
24	Massachusetts Institute of Te	176	699	25.2	IEEE	176	25.2	Springer Nature	80	11.4
25	University of North Carolina	168	580	29.0	IEEE	168	29.0	ACM-Assoc Comput Mach	152	26.2
26	MENTOR ACQUISITION O	157	478	32.8	ACM-Assoc Comput Mach	158	33.1	IEEE	157	32.8
27	Nokia Corporation	147	416	35.3	IEEE	147	35.3	ACM-Assoc Comput Mach	60	14.4
28	AUGMENTED VISION INC	137	1095	12.5	Optical Society of America	372	34.0	SPIE-Int Soc Opt Engineering	157	14.3
29	3D Systems Corp.	136	290	46.9	IEEE	136	46.9	ACM-Assoc Comput Mach	72	24.8
30	Walt Disney Co.	135	385	35.1	IEEE	135	35.1	ACM-Assoc Comput Mach	107	27.8
31	Ostendo Technologies Inc	134	522	25.7	IEEE	134	25.7	ACM-Assoc Comput Mach	94	18.0
32	MIDDLE CHART LLC	127	197	64.5	IEEE	127	64.5	Multidisciplinary Digital Publishing Institute (MDPI)	47	23.9
33	BRAINGATE CO LLC	120	308	39.0	IEEE	120	39.0	RELX Group (Elsevier)	45	14.6
34	Digimarc Corp.	110	256	43.0	IEEE	110	43.0	ACM-Assoc Comput Mach	40	15.6
35	Medtronic Inc	109	229	47.6	IEEE	109	47.6	Springer Nature	26	11.4
36	Intuitive Surgical Inc.	104	266	39.1	IEEE	104	39.1	The Medical Image Computing and Computer Assisted Interve	34	12.8
37	Bosch (Robert) GmbH	101	178	56.7	IEEE	101	56.7	European Conference on Computer Vision-Google/Microsoft	13	7.3
38	INDIVIDUAL PATENTER	101	484	20.9	RELX Group (Elsevier)	115	23.8	IEEE	101	20.9
39	Tobii Ab	98	213	46.0	IEEE	98	46.0	ACM-Assoc Comput Mach	59	27.7

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40	NVIDIA Corp.	96	373	25.7	ACM-Assoc Comput Mach	110	29.5	IEEE	96	25.7
41	D3D TECHNOLOGIES INC	94	221	42.5	IEEE	94	42.5	RELX Group (Elsevier)	20	9.0
42	Honda Motor Co. Ltd.(Honda	94	202	46.5	IEEE	94	46.5	RELX Group (Elsevier)	18	8.9
43	University of Connecticut	93	629	14.8	Optical Society of America	227	36.1	IEEE	93	14.8
44	Cortica Ltd	91	139	65.5	IEEE	91	65.5	ACM-Assoc Comput Mach	22	15.8
45	Stanford University	91	341	26.7	IEEE	91	26.7	Springer Nature	43	12.6
46	Amazon.com Inc.	88	321	27.4	ACM-Assoc Comput Mach	110	34.3	IEEE	88	27.4
47	Empire Technology Develop	85	250	34.0	IEEE	85	34.0	ACM-Assoc Comput Mach	27	10.8
48	ELECTRONIC SCRIPTING	84	217	38.7	IEEE	84	38.7	Joint IEEE and ACM	41	18.9
49	Purdue University	82	377	21.8	ACM-Assoc Comput Mach	222	58.9	IEEE	82	21.8
50	Toyota Motor Corp	81	225	36.0	IEEE	81	36.0	ACM-Assoc Comput Mach	37	16.4
51	HRL Laboratories LLC	76	210	36.2	IEEE	76	36.2	ACM-Assoc Comput Mach	20	9.5
52	ULTIMATEPOINTER LLC	76	211	36.0	ACM-Assoc Comput Mach	94	44.5	IEEE	76	36.0
53	Canon Inc	74	234	31.6	IEEE	74	31.6	Joint IEEE and ACM	43	18.4
54	Autodesk Inc.	70	509	13.8	ACM-Assoc Comput Mach	326	64.0	IEEE	70	13.8
55	RealD	68	137	49.6	IEEE	68	49.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	13	9.5
56	TANGIS CORP	68	480	14.2	Joint IEEE and ACM	257	53.5	ACM-Assoc Comput Mach	79	16.5
57	Butterfly Network Inc	67	78	85.9	IEEE	67	85.9	Acoustical Society of America	4	5.1
58	GoPro Inc	67	135	49.6	IEEE	67	49.6	ACM-Assoc Comput Mach	17	12.6
59	Huawei Technologies Compa	65	238	27.3	IEEE	65	27.3	ACM-Assoc Comput Mach	30	12.6
60	Cox Enterprises Inc	60	115	52.2	IEEE	60	52.2	ACM-Assoc Comput Mach	17	14.8
61	Shure Inc	59	96	61.5	IEEE	59	61.5	Springer Nature	7	7.3
62	Siemens Aktiengesellschaft	59	168	35.1	IEEE	59	35.1	Joint IEEE and ACM	33	19.6
63	Nio Co. Ltd	58	121	47.9	IEEE	58	47.9	CBS Interactive	21	17.4
64	APPLIED RESEARCH ASS	56	118	47.5	IEEE	56	47.5	SPIE-Int Soc Opt Engineering	17	14.4
65	Cisco Systems Inc.	56	156	35.9	IEEE	56	35.9	The USENIX Association	21	13.5
66	STRONG FORCE TX PORT	56	123	45.5	IEEE	56	45.5	RELX Group (Elsevier)	21	17.1
67	Lockheed Martin Corp.	54	237	22.8	IEEE	54	22.8	SPIE-Int Soc Opt Engineering	43	18.1
68	ORCAM TECHNOLOGIES	54	64	84.4	IEEE	54	84.4	Springer Nature	5	7.8
69	Johns Hopkins University	53	102	52.0	IEEE	53	52.0	Joint IEEE and ACM	16	15.7
70	Johnson & Johnson	49	164	29.9	IEEE	49	29.9	RELX Group (Elsevier)	46	28.0
71	Ericsson	48	123	39.0	IEEE	48	39.0	ACM-Assoc Comput Mach	18	14.6
72	Honeywell International Inc.	48	131	36.6	IEEE	48	36.6	RELX Group (Elsevier)	14	10.7
73	Vantiva SA (former Technico	48	86	55.8	IEEE	48	55.8	Springer Nature	7	8.1
74	ARTILUX INC	47	89	52.8	IEEE	47	52.8	Optical Society of America	15	16.9
75	City University of Hong Kon	46	209	22.0	ACM-Assoc Comput Mach	91	43.5	IEEE	46	22.0
76	Ohio State University	44	86	51.2	IEEE	44	51.2	ACM-Assoc Comput Mach	10	11.6
77	Surefire LLC	44	55	80.0	IEEE	44	80.0	IEEE/OSA	11	20.0
78	SRI International	42	91	46.2	IEEE	42	46.2	RELX Group (Elsevier)	9	9.9
79	BERTEC CORP	41	70	58.6	IEEE	41	58.6	Springer Nature	9	12.9
80	Harvard University	41	186	22.0	IEEE	41	22.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	30	16.1

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	EYEDAPTIC INC	40	43	93.0	IEEE	40	93.0	Wolters Kluwer	3	7.0
82	TIPPING POINT MEDICAL	40	102	39.2	IEEE	40	39.2	RELX Group (Elsevier)	8	7.8
83	Boeing Co. (The)	38	118	32.2	IEEE	38	32.2	ACM-Assoc Comput Mach	16	13.6
84	Fujitsu Limited	38	92	41.3	IEEE	38	41.3	ACM-Assoc Comput Mach	15	16.3
85	HP Inc	38	126	30.2	ACM-Assoc Comput Mach	46	36.5	IEEE	38	30.2
86	EMERGE NOW INC	37	127	29.1	ACM-Assoc Comput Mach	39	30.7	IEEE	37	29.1
87	Comcast Corp	36	104	34.6	IEEE	36	34.6	SPIE-Int Soc Opt Engineering	27	26.0
88	Duke University	36	124	29.0	IEEE	36	29.0	Springer Nature	25	20.2
89	Koninklijke Philips N.V.	35	107	32.7	IEEE	35	32.7	ACM-Assoc Comput Mach	17	15.9
90	Korus Inc.	35	220	15.9	SAGE Publications Ltd	54	24.5	IEEE	35	15.9
91	Nintendo Co. Ltd.	35	164	21.3	Nintendo of America	49	29.9	IEEE	35	21.3
92	University of Central Florida	35	83	42.2	IEEE	35	42.2	ACM-Assoc Comput Mach	18	21.7
93	Acuity Brands Inc.	34	65	52.3	IEEE	34	52.3	Springer Nature	15	23.1
94	FACENSE LTD	34	89	38.2	IEEE	34	38.2	ACM-Assoc Comput Mach	11	12.4
95	University of Washington	34	188	18.1	ACM-Assoc Comput Mach	34	18.1	IEEE	34	18.1
96	CapitalOne	33	104	31.7	IEEE	33	31.7	RELX Group (Elsevier)	13	12.5
97	L3 Harris Technologies (f/k/a	33	74	44.6	IEEE	33	44.6	Joint IEEE and ACM	7	9.5
98	Panasonic Holding Corporati	33	78	42.3	IEEE	33	42.3	ACM-Assoc Comput Mach	9	11.5
99	Seiko Epson Corporation	33	140	23.6	Joint IEEE and ACM	50	35.7	IEEE	33	23.6
100	Oblong Inc. (f/k/ar GlowPoint	32	48	66.7	IEEE	32	66.7	ACM-Assoc Comput Mach	16	33.3

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Wind Energy</i>										
1	Vestas Wind Systems A/S	432	933	46.3	IEEE	432	46.3	AWEA-American Wind Energy Association	78	8.4
2	General Electric Company	316	739	42.8	IEEE	316	42.8	RELX Group (Elsevier)	104	14.1
3	University of Nebraska	167	222	75.2	IEEE	167	75.2	RELX Group (Elsevier)	28	12.6
4	ABB Ltd	146	249	58.6	IEEE	146	58.6	CIGRE-International Council on Large Electric Systems	12	4.8
5	Enercon GmbH	96	149	64.4	IEEE	96	64.4	RELX Group (Elsevier)	20	13.4
6	The Arizona Board of Regent	92	138	66.7	IEEE	92	66.7	RELX Group (Elsevier)	10	7.2
7	Siemens Aktiengesellschaft	65	120	54.2	IEEE	65	54.2	RELX Group (Elsevier)	15	12.5
8	SolarEdge Technologies Inc	62	77	80.5	IEEE	62	80.5	WIP-Renewable Energies	7	9.1
9	Siemens Energy Ag (formerly	55	129	42.6	IEEE	55	42.6	RELX Group (Elsevier)	15	11.6
10	Ingeteam Corporation SA	46	78	59.0	IEEE	46	59.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	6	7.7
11	University of Alabama	34	42	81.0	IEEE	34	81.0	IET/IEE	6	14.3
12	Rensselaer Polytechnic Instit	25	30	83.3	IEEE	25	83.3	AIAA - American Institute of Aeronautics and Astronautics	2	6.7
13	University of New Brunswick	25	27	92.6	IEEE	25	92.6	AIAA - American Institute of Aeronautics and Astronautics	1	3.7
14	NORTH CHINA ELECTRIC	24	29	82.8	IEEE	24	82.8	Institution of Engineering and Technology	3	10.3
15	Tigo Energy Inc	23	35	65.7	IEEE	23	65.7	WIP-Renewable Energies	9	25.7
16	INDIVIDUAL PATENTER	18	39	46.2	IEEE	18	46.2	ASME-Am Soc Mech Eng	7	17.9
17	National Cheng Kung Univer	18	19	94.7	IEEE	18	94.7	IET/IEE	1	5.3
18	UWM Research Foundation	17	19	89.5	IEEE	17	89.5	RELX Group (Elsevier)	1	5.3
19	BEIJING GOLDWIND SCIE	16	29	55.2	IEEE	16	55.2	RELX Group (Elsevier)	7	24.1
20	Nordex SE	15	23	65.2	IEEE	15	65.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4	17.4
21	NRG SYSTEMS INC	14	24	58.3	IEEE	14	58.3	RELX Group (Elsevier)	4	16.7
22	University of South Florida	14	14	100.0	IEEE	14	100.0			
23	UPTAKE TECHNOLOGIES	14	20	70.0	IEEE	14	70.0	National Institute of Standards and Technology (NIST)	3	15.0
24	INVENTUS HOLDINGS LL	13	21	61.9	IEEE	13	61.9	Association for the Advancement of Artificial Intelligence	2	9.5
25	TechnipFMC	13	17	76.5	IEEE	13	76.5	IET/IEE	1	5.9
26	University of Calgary	13	16	81.3	IEEE	13	81.3	IET/IEE	1	6.3
27	Fujitsu Limited	12	13	92.3	IEEE	12	92.3	RELX Group (Elsevier)	1	7.7
28	MOIXA ENERGY HOLDIN	12	14	85.7	IEEE	12	85.7	ACM-Assoc Comput Mach	2	14.3
29	UNIVERSITY OF ZAGREB	12	14	85.7	IEEE	12	85.7	China Electrochemical Society	1	7.1
30	SPARQ SYSTEMS INC	11	14	78.6	IEEE	11	78.6	IET/IEE	2	14.3
31	Woodward Inc	10	10	100.0	IEEE	10	100.0			
32	Zhejiang University	10	13	76.9	IEEE	10	76.9	IFAC Secretariat	1	7.7
33	Kite Gen Research Srl	9	21	42.9	IEEE	9	42.9	RELX Group (Elsevier)	7	33.3
34	PRENAV INC	9	11	81.8	IEEE	9	81.8	RELX Group (Elsevier)	2	18.2
35	State Grid Corp of China	9	13	69.2	IEEE	9	69.2	China Academic Journal Electronic Publishing House	2	15.4
36	Hitachi Ltd	8	13	61.5	IEEE	8	61.5	Hitachi Ltd.	3	23.1
37	IDENTIFLIGHT INTERNAT	8	13	61.5	IEEE	8	61.5	Massachusetts Institute of Technology	5	38.5
38	RTX Corporation (f/k/a Rayt	8	26	30.8	IEEE	8	30.8	RELX Group (Elsevier)	4	15.4
39	US WIND TECHNOLOGY L	8	16	50.0	IEEE	8	50.0	RELX Group (Elsevier)	4	25.0

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	GENEDICS CLEAN ENERG	7	63	11.1	RELX Group (Elsevier)	49	77.8	AAAS-Am Assoc Advancement Sci	7	11.1
41	Alliance for Sustainable Ener	6	40	15.0	RELX Group (Elsevier)	8	20.0	ASME-Am Soc Mech Eng	7	17.5
42	Alphabet Inc.	6	20	30.0	IEEE	6	30.0	Royal Society of Chemistry	3	15.0
43	GENEDICS LLC	6	47	12.8	RELX Group (Elsevier)	35	74.5	AAAS-Am Assoc Advancement Sci	6	12.8
44	Honeywell International Inc.	6	13	46.2	IEEE	6	46.2	AIAA - American Institute of Aeronautics and Astronautics	2	15.4
45	Imperial College	6	14	42.9	IEEE	6	42.9	RELX Group (Elsevier)	2	14.3
46	LS Electric co. Ltd. (f/k/aLSI	6	10	60.0	IEEE	6	60.0	RELX Group (Elsevier)	2	20.0
47	Medtronic Inc	6	7	85.7	IEEE	6	85.7	Springer Nature	1	14.3
48	Mitsubishi Heavy Industries	6	59	10.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	29	49.2	ASME-Am Soc Mech Eng	13	22.0
49	OKINAWA INSTITUTE OF	6	28	21.4	RELX Group (Elsevier)	7	25.0	IEEE	6	21.4
50	GREEN ENERGY CORP	5	5	100.0	IEEE	5	100.0			
51	NEC Corp	5	6	83.3	IEEE	5	83.3	Institute of Electrical Engineers of Japan	1	16.7
52	RHEINISCH-WESTFALISC	5	5	100.0	IEEE	5	100.0			
53	ROPE ROBOTICS APS	5	5	100.0	IEEE	5	100.0			
54	University of Western Ontari	5	5	100.0	IEEE	5	100.0			
55	Alstom S.A.	4	6	66.7	IEEE	4	66.7	A B B Corporate Management Services AG	2	33.3
56	COMBINED ENERGIES LL	4	5	80.0	IEEE	4	80.0	RELX Group (Elsevier)	1	20.0
57	HYPHER TECH RESEARCH	4	4	100.0	IEEE	4	100.0			
58	KK WIND SOLUTIONS A/S	4	4	100.0	IEEE	4	100.0			
59	POWER ENABLE SOLUTIO	4	6	66.7	IEEE	4	66.7	ASME-Am Soc Mech Eng	1	16.7
60	REARDEN POWER LLC	4	4	100.0	IEEE	4	100.0			
61	UNIVERSIDAD PUBLICA	4	5	80.0	IEEE	4	80.0	Instrument Society of America	1	20.0
62	AB SKF	3	3	100.0	IEEE	3	100.0			
63	ASPENTECH CORP	3	7	42.9	RELX Group (Elsevier)	3	42.9	IEEE	3	42.9
64	Baker Hughes Inc.	3	3	100.0	IEEE	3	100.0			
65	BEIJING GOLDWIND SCIE	3	4	75.0	IEEE	3	75.0	Power System Technology Press	1	25.0
66	CHARGEPOINT INC	3	3	100.0	IEEE	3	100.0			
67	Corteva Agriscience(former	3	24	12.5	RELX Group (Elsevier)	7	29.2	Springer Nature	3	12.5
68	Daewoo Shipbuilding & Mari	3	6	50.0	IEEE	3	50.0	MacMillan Publishing Company	1	16.7
69	Doosan Enerbility (former Do	3	4	75.0	IEEE	3	75.0	IET/IEE	1	25.0
70	EMPIRE MAGNETICS INC	3	3	100.0	IEEE	3	100.0			
71	GLOBAL ENERGYCONCE	3	5	60.0	IEEE	3	60.0	PCIM (Power Conversion, Intelligent Motion)	1	20.0
72	HARMONY TURBINES IN	3	6	50.0	IEEE	3	50.0	IOP Publishing	1	16.7
73	Huawei Technologies Compa	3	3	100.0	IEEE	3	100.0			
74	Institut Francais du Petrole (I	3	20	15.0	IOP Publishing	5	25.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4	20.0
75	International Business Machi	3	15	20.0	RELX Group (Elsevier)	8	53.3	IP.Com	3	20.0
76	Intertrust Technologies Corp	3	3	100.0	IEEE	3	100.0			
77	Korea Electric Power Corp	3	8	37.5	RELX Group (Elsevier)	4	50.0	IEEE	3	37.5
78	Microsoft Corporation	3	5	60.0	IEEE	3	60.0	New York Times	1	20.0
79	Nanyang Technological Univ	3	3	100.0	IEEE	3	100.0			
80	National Yang Ming Chiao T	3	7	42.9	IEEE	3	42.9	IOP Publishing	2	28.6

## Appendix B: Top 100 Organizations That Cite IEEE; (2004-2023 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	NORTHERN POWER SYST	3	4	75.0	IEEE	3	75.0	PennWell Publishing Co.	1	25.0
82	SAMAYS INNOVACIONES	3	5	60.0	IEEE	3	60.0	RELX Group (Elsevier)	1	20.0
83	Schweitzer Engineering Labo	3	3	100.0	IEEE	3	100.0			
84	University of Florida	3	52	5.8	AIP Publishing	12	23.1	ACS-Am Chem Soc	9	17.3
85	University of Wisconsin (WI	3	3	100.0	IEEE	3	100.0			
86	ADVANCED MAGNET LA	2	2	100.0	IEEE	2	100.0			
87	AGILE WIND POWER AG	2	7	28.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3	42.9	IEEE	2	28.6
88	Apple Inc	2	2	100.0	IEEE	2	100.0			
89	Boeing Co. (The)	2	18	11.1	NASA-National Aeronautics and Space Admi	5	27.8	AIAA - American Institute of Aeronautics and Astronautics	4	22.2
90	Bosch (Robert) GmbH	2	2	100.0	IEEE	2	100.0			
91	Consiglio Nazionale Delle Ri	2	2	100.0	IEEE	2	100.0			
92	CREATING MOORE LLC	2	5	40.0	IEEE	2	40.0	SAGE Publications Ltd	1	20.0
93	Dana Holding Corp.	2	3	66.7	IEEE	2	66.7	EVS.org	1	33.3
94	HAWAIIAN ELECTRIC CO	2	4	50.0	IEEE	2	50.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2	50.0
95	HUNAN UNIVERSITY	2	2	100.0	IEEE	2	100.0			
96	Kansas State University	2	3	66.7	IEEE	2	66.7	International Research Publication House	1	33.3
97	L3 Harris Technologies (f/k/a	2	6	33.3	RELX Group (Elsevier)	2	33.3	The Mitre Corp.	2	33.3
98	Nidec Corp.	2	5	40.0	ISA - Instrumentation, Systems & Automation	2	40.0	IEEE	2	40.0
99	ONSEMBLE LLC	2	4	50.0	IEEE	2	50.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2	50.0
100	PITT-OHIO EXPRESS LLC	2	5	40.0	IEEE	2	40.0	RELX Group (Elsevier)	2	40.0

## Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
1	Microsoft Corporation	74278	241850	30.7	IEEE	74278	30.7	ACM-Assoc Comput Mach	62637	25.9
2	International Business Machi	69939	243989	28.7	IEEE	69939	28.7	ACM-Assoc Comput Mach	38554	15.8
3	Apple Inc	53003	172660	30.7	IEEE	53003	30.7	ACM-Assoc Comput Mach	34147	19.8
4	Qualcomm Inc	45334	139885	32.4	IEEE	45334	32.4	3GPP General Partnership Project Standards Body	37973	27.1
5	Micron Technology Inc.	41571	123820	33.6	IEEE	41571	33.6	RELX Group (Elsevier)	21011	17.0
6	AT&T Inc	38478	87996	43.7	IEEE	38478	43.7	ACM-Assoc Comput Mach	5604	6.4
7	Intel Corporation	37032	84275	43.9	IEEE	37032	43.9	3GPP General Partnership Project Standards Body	10304	12.2
8	Alphabet Inc.	32250	105159	30.7	IEEE	32250	30.7	ACM-Assoc Comput Mach	18006	17.1
9	Broadcom Ltd	31789	64680	49.1	IEEE	31789	49.1	ACM-Assoc Comput Mach	8181	12.6
10	Marvell Technology Group Lt	26738	34288	78.0	IEEE	26738	78.0	3GPP General Partnership Project Standards Body	3237	9.4
11	Monolithic 3D Inc	25377	45170	56.2	IEEE	25377	56.2	IEEE/JPN Soc App Phys	4693	10.4
12	Samsung Electronics Co Ltd	21900	94086	23.3	3GPP General Partnership Project Standards B	32781	34.8	IEEE	21900	23.3
13	Cisco Systems Inc.	20188	71947	28.1	IEEE	20188	28.1	Internet Soc/IETF-Internet Eng Task Force	10963	15.2
14	Semiconductor Energy Labor	19290	277531	7.0	SID-Society for Information Display	93932	33.8	AIP Publishing	37807	13.6
15	Huawei Technologies Compa	17878	81379	22.0	3GPP General Partnership Project Standards B	41293	50.7	IEEE	17878	22.0
16	Nokia Corporation	17849	57626	31.0	IEEE	17849	31.0	3GPP General Partnership Project Standards Body	16509	28.6
17	Xperi Inc. (f/k/a Tessera Inc)	16147	38121	42.4	IEEE	16147	42.4	SPIE-Int Soc Opt Engineering	3294	8.6
18	InterDigital Inc	16144	80306	20.1	3GPP General Partnership Project Standards B	52455	65.3	IEEE	16144	20.1
19	Massachusetts Institute of Te	15528	54966	28.3	IEEE	15528	28.3	RELX Group (Elsevier)	5943	10.8
20	Ericsson	15080	71364	21.1	3GPP General Partnership Project Standards B	37134	52.0	IEEE	15080	21.1
21	Sony Group Corp	13581	39593	34.3	IEEE	13581	34.3	3GPP General Partnership Project Standards Body	6483	16.4
22	Medtronic Inc	13082	194907	6.7	RELX Group (Elsevier)	33319	17.1	Wolters Kluwer	25496	13.1
23	Western Digital Corp.	12836	27120	47.3	IEEE	12836	47.3	AIP Publishing	2605	9.6
24	REARDEN LLC	12604	15917	79.2	IEEE	12604	79.2	3GPP General Partnership Project Standards Body	964	6.1
25	Siemens Aktiengesellschaft	12545	37876	33.1	IEEE	12545	33.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	5090	13.4
26	Oracle Corporation	12472	54127	23.0	ACM-Assoc Comput Mach	14484	26.8	IEEE	12472	23.0
27	SolarEdge Technologies Inc	12152	15195	80.0	IEEE	12152	80.0	WIP-Renewable Energies	1075	7.1
28	Murata Manufacturing Co. Lt	11491	15197	75.6	IEEE	11491	75.6	RELX Group (Elsevier)	546	3.6
29	Infineon Technologies AG	11368	18973	59.9	IEEE	11368	59.9	AIP Publishing	1067	5.6
30	NXP Semiconductors NV	11319	17618	64.2	IEEE	11319	64.2	AIP Publishing	973	5.5
31	Panasonic Holding Corporati	11027	36538	30.2	IEEE	11027	30.2	3GPP General Partnership Project Standards Body	8507	23.3
32	LG Electronics Inc.	10868	67177	16.2	3GPP General Partnership Project Standards B	42035	62.6	IEEE	10868	16.2
33	Taiwan Semiconductor Manu	10761	31663	34.0	IEEE	10761	34.0	AIP Publishing	8128	25.7
34	Johnson & Johnson	10669	109553	9.7	RELX Group (Elsevier)	23441	21.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	11440	10.4
35	ParkerVision Inc	10645	20997	50.7	IEEE	10645	50.7	IET/IEE	4793	22.8
36	Texas Instruments Inc	10219	17543	58.3	IEEE	10219	58.3	International Telecommunication Union	1966	11.2
37	PERSONALIZED MEDIA C	10014	60185	16.6	Society of Motion Picture and Television Engi	17897	29.7	IEEE	10014	16.6
38	Qorvo	9876	13047	75.7	IEEE	9876	75.7	AIP Publishing	564	4.3
39	Advanced Micro Devices Inc	9660	27228	35.5	IEEE	9660	35.5	ACM-Assoc Comput Mach	8867	32.6
40	Amazon.com Inc.	9302	33568	27.7	IEEE	9302	27.7	ACM-Assoc Comput Mach	7201	21.5



## Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
41	General Electric Company	9292	28064	33.1	IEEE	9292	33.1	RELX Group (Elsevier)	3066	10.9
42	Adobe Inc. (former Adobe Sy	9207	26256	35.1	IEEE	9207	35.1	ACM-Assoc Comput Mach	7670	29.2
43	OneTrust	8972	27478	32.7	ACM-Assoc Comput Mach	12982	47.2	IEEE	8972	32.7
44	Toshiba Corp	8900	21469	41.5	IEEE	8900	41.5	AIP Publishing	1489	6.9
45	Honeywell International Inc.	8732	26143	33.4	IEEE	8732	33.4	RELX Group (Elsevier)	2661	10.2
46	Zeno Semiconductors Inc	8709	11607	75.0	IEEE	8709	75.0	IEEE/JPN Soc App Phys	1807	15.6
47	Intuitive Surgical Inc.	8662	23604	36.7	IEEE	8662	36.7	The Medical Image Computing and Computer Assisted Interve	2289	9.7
48	Fujitsu Limited	8588	26173	32.8	IEEE	8588	32.8	3GPP General Partnership Project Standards Body	5101	19.5
49	University of California	8457	60713	13.9	IEEE	8457	13.9	RELX Group (Elsevier)	8181	13.5
50	Rambus Inc.	8445	13384	63.1	IEEE	8445	63.1	IEEE/JPN Soc App Phys	691	5.2
51	STMicroelectronics	8368	14588	57.4	IEEE	8368	57.4	RELX Group (Elsevier)	1067	7.3
52	Blackberry Ltd.	8006	31867	25.1	3GPP General Partnership Project Standards B	13453	42.2	IEEE	8006	25.1
53	Koninklijke Philips N.V.	7910	37543	21.1	IEEE	7910	21.1	RELX Group (Elsevier)	4760	12.7
54	Mass General Brigham (form	7728	122781	6.3	Optical Society of America	42247	34.4	RELX Group (Elsevier)	17598	14.3
55	Macronix International Co. Lt	7710	14301	53.9	IEEE	7710	53.9	IEEE/JPN Soc App Phys	2791	19.5
56	Columbia University	7523	28321	26.6	IEEE	7523	26.6	RELX Group (Elsevier)	2583	9.1
57	Intellectual Ventures Manage	7382	35729	20.7	IEEE	7382	20.7	Springer Nature	3179	8.9
58	RTX Corporation (f/k/a Rayt	7145	36484	19.6	IEEE	7145	19.6	NASA-National Aeronautics and Space Admin	4962	13.6
59	University of Minnesota (The	7137	16703	42.7	IEEE	7137	42.7	RELX Group (Elsevier)	1704	10.2
60	Boston Scientific Corp.	7010	96158	7.3	RELX Group (Elsevier)	23974	24.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	12270	12.8
61	NEC Corp	6980	28235	24.7	3GPP General Partnership Project Standards B	10993	38.9	IEEE	6980	24.7
62	Analog Devices Inc.	6790	9756	69.6	IEEE	6790	69.6	RELX Group (Elsevier)	491	5.0
63	Tela Innovations inc	6774	21887	30.9	SPIE-Int Soc Opt Engineering	7940	36.3	IEEE	6774	30.9
64	California Institute of Techno	6758	40658	16.6	IEEE	6758	16.6	RELX Group (Elsevier)	5077	12.5
65	Renesas Electronic Corporati	6633	10448	63.5	IEEE	6633	63.5	IEEE/JPN Soc App Phys	554	5.3
66	HP Inc	6625	20656	32.1	IEEE	6625	32.1	ACM-Assoc Comput Mach	3298	16.0
67	Irobot Corp	6620	13363	49.5	IEEE	6620	49.5	SPIE-Int Soc Opt Engineering	1846	13.8
68	Commscope Holding (formerl	6557	13080	50.1	IEEE	6557	50.1	International Telecommunication Union	746	5.7
69	Mosaid Technologies ( f/k/aC	6532	10743	60.8	IEEE	6532	60.8	3GPP General Partnership Project Standards Body	299	2.8
70	Nippon Telegraph & Telepho	6441	24643	26.1	3GPP General Partnership Project Standards B	8090	32.8	IEEE	6441	26.1
71	Dexcom Inc	6419	108886	5.9	RELX Group (Elsevier)	27607	25.4	American Diabetes Association	11191	10.3
72	The Arizona Board of Regent	6413	26446	24.2	IEEE	6413	24.2	RELX Group (Elsevier)	2986	11.3
73	CPG Technologies Llc	6401	12426	51.5	IEEE	6401	51.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1548	12.5
74	Commvault Systems Inc.	6315	11067	57.1	IEEE	6315	57.1	ACM-Assoc Comput Mach	1953	17.6
75	Canon Inc	6156	22083	27.9	IEEE	6156	27.9	RELX Group (Elsevier)	1863	8.4
76	Fractus SA	6105	10974	55.6	IEEE	6105	55.6	IET/IEE	1419	12.9
77	NVIDIA Corp.	6052	15931	38.0	IEEE	6052	38.0	ACM-Assoc Comput Mach	3084	19.4
78	HRL Laboratories LLC	6001	14427	41.6	IEEE	6001	41.6	RELX Group (Elsevier)	1106	7.7
79	Abbott Laboratories	5979	131937	4.5	RELX Group (Elsevier)	30621	23.2	ACS-Am Chem Soc	15149	11.5
80	Xerox Corp	5881	21326	27.6	IEEE	5881	27.6	ACM-Assoc Comput Mach	3380	15.8



## Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Magna International Inc.	5767	11183	51.6	IEEE	5767	51.6	SAE-Society of Automobile Engineers	928	8.3
82	Industrial Technology Researc	5758	11678	49.3	IEEE	5758	49.3	RELX Group (Elsevier)	1147	9.8
83	Fraunhofer Gesellschaft	5647	14490	39.0	IEEE	5647	39.0	3GPP General Partnership Project Standards Body	1140	7.9
84	Dolby Laboratories Inc	5630	16002	35.2	IEEE	5630	35.2	International Telecommunication Union	2499	15.6
85	Electronics and Telecommuni	5616	13520	41.5	IEEE	5616	41.5	3GPP General Partnership Project Standards Body	2149	15.9
86	University of Illinois	5588	51110	10.9	AIP Publishing	8145	15.9	ACS-Am Chem Soc	7149	14.0
87	Cadence Design Systems Inc	5403	12688	42.6	IEEE	5403	42.6	Joint IEEE and ACM	4079	32.1
88	Ricoh Co. Ltd.	5260	12607	41.7	IEEE	5260	41.7	ACM-Assoc Comput Mach	1866	14.8
89	Comcast Corp	5103	59049	8.6	3GPP General Partnership Project Standards B	50016	84.7	IEEE	5103	8.6
90	Synopsys Inc.	5070	13900	36.5	IEEE	5070	36.5	SPIE-Int Soc Opt Engineering	2304	16.6
91	Witricity Corp	5045	9705	52.0	IEEE	5045	52.0	AIP Publishing	787	8.1
92	Thermo Fisher Scientific Inc	4786	28316	16.9	RELX Group (Elsevier)	9190	32.5	IEEE	4786	16.9
93	Mitsubishi Electric Corp	4772	12082	39.5	IEEE	4772	39.5	3GPP General Partnership Project Standards Body	2358	19.5
94	Applied Materials Inc.	4735	17902	26.4	IEEE	4735	26.4	AIP Publishing	2959	16.5
95	ADAPTIX INC	4627	6848	67.6	IEEE	4627	67.6	European Telecom Standards Institute (ETSI)	777	11.3
96	Wolfspeed Inc. (formerly Cre	4623	12582	36.7	IEEE	4623	36.7	AIP Publishing	2641	21.0
97	Sap SE	4613	20917	22.1	ACM-Assoc Comput Mach	6871	32.8	IEEE	4613	22.1
98	Boeing Co. (The)	4588	14246	32.2	IEEE	4588	32.2	RELX Group (Elsevier)	1468	10.3
99	Meta Platforms Inc.(formerly	4492	19592	22.9	IEEE	4492	22.9	ACM-Assoc Comput Mach	3776	19.3
100	L3 Harris Technologies (f/k/a	4471	7895	56.6	IEEE	4471	56.6	RELX Group (Elsevier)	377	4.8
101	Softbank Corp	4439	11080	40.1	IEEE	4439	40.1	ACM-Assoc Comput Mach	897	8.1
102	Sonos Inc	4317	13081	33.0	IEEE	4317	33.0	SPIE-Int Soc Opt Engineering	1161	8.9
103	Digimarc Corp.	4198	10958	38.3	IEEE	4198	38.3	SPIE-Int Soc Opt Engineering	1469	13.4
104	Dell Technologies Inc	4170	12568	33.2	IEEE	4170	33.2	ACM-Assoc Comput Mach	2306	18.3
105	Vantiva SA (former Technico	4095	8804	46.5	IEEE	4095	46.5	SPIE-Int Soc Opt Engineering	465	5.3
106	Motorola Solutions Inc.	4094	8162	50.2	IEEE	4094	50.2	AIP Publishing	398	4.9
107	ASM International N.V.	4071	47558	8.6	RELX Group (Elsevier)	8463	17.8	AIP Publishing	7903	16.6
108	On Semiconductor Corporati	4034	5911	68.2	IEEE	4034	68.2	RELX Group (Elsevier)	370	6.3
109	Hon Hai Precision Industry C	3998	25389	15.7	3GPP General Partnership Project Standards B	9952	39.2	IEEE	3998	15.7
110	Sanken Electric Co. Ltd.	3880	5160	75.2	IEEE	3880	75.2	RELX Group (Elsevier)	816	15.8
111	Hitachi Ltd	3861	13666	28.3	IEEE	3861	28.3	ACM-Assoc Comput Mach	1162	8.5
112	Immersion Corp.	3814	11163	34.2	IEEE	3814	34.2	ACM-Assoc Comput Mach	1178	10.6
113	Hewlett Packard Enterprises	3685	10879	33.9	IEEE	3685	33.9	ACM-Assoc Comput Mach	2114	19.4
114	Commissariat A L'Energie At	3669	12624	29.1	IEEE	3669	29.1	RELX Group (Elsevier)	2157	17.1
115	INDIVIDUAL PATENTER	3464	22106	15.7	IEEE	3464	15.7	RELX Group (Elsevier)	3176	14.4
116	ABB Ltd	3444	5422	63.5	IEEE	3444	63.5	RELX Group (Elsevier)	302	5.6
117	Global Foundries Inc	3443	7754	44.4	IEEE	3443	44.4	Optical Society of America	717	9.2
118	RPX Corp	3365	8432	39.9	IEEE	3365	39.9	Internet Soc/IETF-Internet Eng Task Force	872	10.3
119	Corning Inc.	3348	12911	25.9	IEEE	3348	25.9	RELX Group (Elsevier)	1724	13.4
120	Magic Leap Inc	3343	10853	30.8	IEEE	3343	30.8	ACM-Assoc Comput Mach	1058	9.7

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
121	Cirrus Logic Inc.	3325	4302	77.3	IEEE	3325	77.3	RELX Group (Elsevier)	137	3.2
122	Lockheed Martin Corp.	3319	21694	15.3	IEEE	3319	15.3	RELX Group (Elsevier)	2334	10.8
123	Masimo Corp	3301	7020	47.0	IEEE	3301	47.0	Springer Nature	621	8.8
124	Adeia Inc (f/k/a Xperi Holdin	3270	10148	32.2	IEEE	3270	32.2	RELX Group (Elsevier)	988	9.7
125	Stanford University	3232	40679	7.9	RELX Group (Elsevier)	5807	14.3	Springer Nature	5593	13.7
126	Bosch (Robert) GmbH	3160	12613	25.1	IEEE	3160	25.1	RELX Group (Elsevier)	1166	9.2
127	University of Washington	3121	15636	20.0	IEEE	3121	20.0	RELX Group (Elsevier)	2181	13.9
128	United States Navy	3007	10308	29.2	IEEE	3007	29.2	AIP Publishing	1072	10.4
129	Chipbond Technology Corp	2945	3686	79.9	IEEE	2945	79.9	RELX Group (Elsevier)	272	7.4
130	Honda Motor Co. Ltd.(Honda	2936	7594	38.7	IEEE	2936	38.7	RELX Group (Elsevier)	826	10.9
131	TABULA INC	2903	8132	35.7	IEEE	2903	35.7	ACM-Assoc Comput Mach	2898	35.6
132	Trellix (merger of FireEye Inc	2901	8366	34.7	IEEE	2901	34.7	ACM-Assoc Comput Mach	1453	17.4
133	Toyota Motor Corp	2890	8837	32.7	IEEE	2890	32.7	RELX Group (Elsevier)	1278	14.5
134	Juniper Networks Inc.	2826	10405	27.2	Network Working Group RFC	2869	27.6	IEEE	2826	27.2
135	MicroUnity Systems Enginee	2805	4610	60.8	IEEE	2805	60.8	Joint IEEE and ACM	407	8.8
136	IP RESERVOIR LLC	2772	5484	50.5	IEEE	2772	50.5	ACM-Assoc Comput Mach	927	16.9
137	SUN PATENT TRUST	2765	16684	16.6	3GPP General Partnership Project Standards B	5905	35.4	International Telecommunication Union	5832	35.0
138	coherent Corp (f/k/a II-VI Inc	2763	9069	30.5	IEEE	2763	30.5	Optical Society of America	1463	16.1
139	Verizon Communications Inc	2697	8494	31.8	IEEE	2697	31.8	Internet Soc/IETF-Internet Eng Task Force	1646	19.4
140	University of Michigan	2646	14979	17.7	RELX Group (Elsevier)	2745	18.3	IEEE	2646	17.7
141	Cortica Ltd	2639	3931	67.1	IEEE	2639	67.1	ACM-Assoc Comput Mach	444	11.3
142	Rockwell Automation Inc	2635	3891	67.7	IEEE	2635	67.7	RELX Group (Elsevier)	219	5.6
143	Microchip Technology Inc.	2632	4209	62.5	IEEE	2632	62.5	ACM-Assoc Comput Mach	188	4.5
144	Mediatek Inc.	2613	6919	37.8	IEEE	2613	37.8	3GPP General Partnership Project Standards Body	2053	29.7
145	PDF Solutions	2588	4119	62.8	IEEE	2588	62.8	SPIE-Int Soc Opt Engineering	912	22.1
146	University of Texas	2587	15803	16.4	IEEE	2587	16.4	RELX Group (Elsevier)	2544	16.1
147	Accenture Ltd.	2515	7837	32.1	IEEE	2515	32.1	ACM-Assoc Comput Mach	1264	16.1
148	Silicon Laboratories Inc	2485	3360	74.0	IEEE	2485	74.0	RELX Group (Elsevier)	142	4.2
149	ATTOPSEMI TECHNOLOG	2380	2964	80.3	IEEE	2380	80.3	IEEE/JPN Soc App Phys	364	12.3
150	Battelle Memorial Institute	2369	8405	28.2	IEEE	2369	28.2	RELX Group (Elsevier)	1468	17.5
151	Seagate Technology Plc	2357	6999	33.7	IEEE	2357	33.7	AIP Publishing	1280	18.3
152	Texas A&M University	2347	4344	54.0	IEEE	2347	54.0	RELX Group (Elsevier)	384	8.8
153	Viasat	2321	3723	62.3	IEEE	2321	62.3	AIAA - American Institute of Aeronautics and Astronautics	258	6.9
154	Kandou Bus SA	2307	2586	89.2	IEEE	2307	89.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	86	3.3
155	SIPCO LLC	2294	4088	56.1	IEEE	2294	56.1	Internet Soc/IETF-Internet Eng Task Force	334	8.2
156	Cubic Corporation	2276	3256	69.9	IEEE	2276	69.9	The International Society of Infrared, Millimeter, and Terahert	164	5.0
157	Amberwave Inc	2272	6604	34.4	IEEE	2272	34.4	AIP Publishing	1954	29.6
158	Empire Technology Develop	2246	6782	33.1	IEEE	2246	33.1	Joint IEEE and ACM	1020	15.0
159	BT Group PLC	2235	5577	40.1	IEEE	2235	40.1	3GPP General Partnership Project Standards Body	438	7.9
160	GENGHISCOMM HOLDIN	2230	2875	77.6	IEEE	2230	77.6	3GPP General Partnership Project Standards Body	119	4.1

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
161	Stryker Corp.	2225	18977	11.7	RELX Group (Elsevier)	3409	18.0	Springer Nature	2307	12.2
162	PACT XPP TECHNOLOGIE	2211	3844	57.5	IEEE	2211	57.5	ACM-Assoc Comput Mach	366	9.5
163	Lenovo Group Ltd	2204	8774	25.1	3GPP General Partnership Project Standards B	4848	55.3	IEEE	2204	25.1
164	TDK Corporation	2197	7462	29.4	IEEE	2197	29.4	AIP Publishing	1189	15.9
165	Energous Corporation	2196	2822	77.8	IEEE	2196	77.8	RELX Group (Elsevier)	212	7.5
166	Salesforce Inc. (f/k/a Salesfor	2182	8444	25.8	IEEE	2182	25.8	ACM-Assoc Comput Mach	1052	12.5
167	Seiko Epson Corporation	2150	6238	34.5	IEEE	2150	34.5	RELX Group (Elsevier)	464	7.4
168	Georgia Institute of Technolo	2140	6427	33.3	IEEE	2140	33.3	RELX Group (Elsevier)	687	10.7
169	Totalenergies SE (formerly T	2140	3352	63.8	IEEE	2140	63.8	RELX Group (Elsevier)	284	8.5
170	STRONG FORCE IOT PORT	2139	2968	72.1	IEEE	2139	72.1	RELX Group (Elsevier)	256	8.6
171	Walt Disney Co.	2114	8289	25.5	ACM-Assoc Comput Mach	3485	42.0	IEEE	2114	25.5
172	Infinera Corporation	2087	4817	43.3	IEEE	2087	43.3	Optical Society of America	853	17.7
173	Interuniversity MicroElectron	2082	4877	42.7	IEEE	2082	42.7	AIP Publishing	429	8.8
174	Quarterhill Inc	2073	4030	51.4	IEEE	2073	51.4	3GPP General Partnership Project Standards Body	659	16.4
175	University of South Florida	2009	6823	29.4	IEEE	2009	29.4	RELX Group (Elsevier)	1016	14.9
176	United Microelectronics Corp	2007	4127	48.6	IEEE	2007	48.6	AIP Publishing	588	14.2
177	Vanderbilt University	1998	7652	26.1	IEEE	1998	26.1	RELX Group (Elsevier)	1033	13.5
178	Fujifilm Business Innovation	1981	8477	23.4	IEEE	1981	23.4	ACM-Assoc Comput Mach	1271	15.0
179	Cognex Corp.	1970	4749	41.5	IEEE	1970	41.5	RELX Group (Elsevier)	803	16.9
180	Ignis Innovation Inc	1918	2736	70.1	IEEE	1918	70.1	SID-Society for Information Display	460	16.8
181	Netapp Inc	1900	10551	18.0	ACM-Assoc Comput Mach	4285	40.6	IEEE	1900	18.0
182	Flex Ltd (F/k/aFlextronics Int	1893	2716	69.7	IEEE	1893	69.7	CBS Interactive	340	12.5
183	NXGEN PARTNERS IP LLC	1893	4310	43.9	IEEE	1893	43.9	Optical Society of America	1126	26.1
184	Mevion Medical Systems Inc	1891	6044	31.3	IEEE	1891	31.3	RELX Group (Elsevier)	1175	19.4
185	Purdue University	1851	9760	19.0	IEEE	1851	19.0	RELX Group (Elsevier)	1362	14.0
186	INTOUCH TECHNOLOGIE	1842	5367	34.3	IEEE	1842	34.3	IEEE/RSJ	516	9.6
187	Cloud Software Group	1830	5627	32.5	IEEE	1830	32.5	ACM-Assoc Comput Mach	978	17.4
188	Lumen Technologies Inc. (for	1804	5948	30.3	IEEE	1804	30.3	ACM-Assoc Comput Mach	1121	18.8
189	Yahoo Inc	1801	10871	16.6	ACM-Assoc Comput Mach	3088	28.4	IEEE	1801	16.6
190	FormFactor Inc	1773	3539	50.1	IEEE	1773	50.1	Springer Nature	648	18.3
191	Zebra Technologies Corp.	1764	3572	49.4	IEEE	1764	49.4	ACM-Assoc Comput Mach	232	6.5
192	Emerson Electric Co.	1751	6659	26.3	IEEE	1751	26.3	RELX Group (Elsevier)	1055	15.8
193	Tencent Holding Ltd	1728	6091	28.4	IEEE	1728	28.4	International Telecommunication Union	1679	27.6
194	BAE Systems Plc.	1721	3099	55.5	IEEE	1721	55.5	SPIE-Int Soc Opt Engineering	185	6.0
195	Nielsen Holdings Plc	1721	11745	14.7	RELX Group (Elsevier)	1867	15.9	IEEE	1721	14.7
196	eBay Inc	1712	8381	20.4	IEEE	1712	20.4	ACM-Assoc Comput Mach	1209	14.4
197	illumina Inc.	1711	8959	19.1	IEEE	1711	19.1	RELX Group (Elsevier)	936	10.4
198	University of Southern Califo	1709	9511	18.0	IEEE	1709	18.0	ACS-Am Chem Soc	1244	13.1
199	Guided Therapy Systems LL	1706	7385	23.1	IEEE	1706	23.1	RELX Group (Elsevier)	1229	16.6
200	T-Mobile USA INC	1699	6538	26.0	IEEE	1699	26.0	3GPP General Partnership Project Standards Body	1103	16.9

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201	Wisteria Trading Inc	1681	3521	47.7	IEEE	1681	47.7	SPIE-Int Soc Opt Engineering	403	11.4
202	SK Hynix Inc	1667	2980	55.9	IEEE	1667	55.9	Joint IEEE and ACM	181	6.1
203	Palantir Technologies Inc	1637	8052	20.3	IEEE	1637	20.3	ACM-Assoc Comput Mach	1585	19.7
204	Northrop Grumman Corp	1635	3920	41.7	IEEE	1635	41.7	Optical Society of America	287	7.3
205	Ford Motor Co.	1613	4501	35.8	IEEE	1613	35.8	RELX Group (Elsevier)	472	10.5
206	Transphorm Inc	1612	3298	48.9	IEEE	1612	48.9	AIP Publishing	549	16.6
207	University of North Carolina	1608	7721	20.8	IEEE	1608	20.8	RELX Group (Elsevier)	995	12.9
208	GoPro Inc	1583	3325	47.6	IEEE	1583	47.6	ACM-Assoc Comput Mach	294	8.8
209	SRI International	1578	4999	31.6	IEEE	1578	31.6	RELX Group (Elsevier)	415	8.3
210	University of Florida	1561	6069	25.7	IEEE	1561	25.7	RELX Group (Elsevier)	932	15.4
211	Hong Kong University of Sci	1556	4008	38.8	IEEE	1556	38.8	RELX Group (Elsevier)	362	9.0
212	Headwater Partners 1 LLC	1531	3701	41.4	IEEE	1531	41.4	3GPP General Partnership Project Standards Body	693	18.7
213	University of Wisconsin (WI	1528	9087	16.8	IEEE	1528	16.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1179	13.0
214	Brain Corporation	1523	4389	34.7	IEEE	1523	34.7	MIT Press	574	13.1
215	Johnson Controls Internationa	1506	4536	33.2	IEEE	1506	33.2	RELX Group (Elsevier)	1040	22.9
216	Butterfly Network Inc	1496	1654	90.4	IEEE	1496	90.4	RELX Group (Elsevier)	41	2.5
217	TuSimple	1479	2288	64.6	IEEE	1479	64.6	Neural Information Processing Systems Foundation	180	7.9
218	Orange	1475	3185	46.3	IEEE	1475	46.3	3GPP General Partnership Project Standards Body	354	11.1
219	Gen Digital Inc. (formerly No	1468	5543	26.5	IEEE	1468	26.5	ACM-Assoc Comput Mach	1231	22.2
220	Intertrust Technologies Corp	1446	9560	15.1	ACM-Assoc Comput Mach	1617	16.9	IEEE	1446	15.1
221	Kyocera Corp.	1429	7181	19.9	3GPP General Partnership Project Standards B	2433	33.9	IEEE	1429	19.9
222	Thales	1423	3382	42.1	IEEE	1423	42.1	ACM-Assoc Comput Mach	220	6.5
223	Baidu Inc	1404	4124	34.0	IEEE	1404	34.0	arXiv.org	808	19.6
224	Valencell Inc	1399	3864	36.2	IEEE	1399	36.2	RELX Group (Elsevier)	368	9.5
225	University of Nebraska	1392	6246	22.3	IEEE	1392	22.3	Springer Nature	946	15.1
226	ORIGIN WIRELESS INC	1383	2082	66.4	IEEE	1383	66.4	American Physical Society	129	6.2
227	State Farm Mutual Automobi	1380	4398	31.4	IEEE	1380	31.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	259	5.9
228	Open Text Corp	1372	4254	32.3	IEEE	1372	32.3	ACM-Assoc Comput Mach	896	21.1
229	Schneider Electric S.A.	1351	6571	20.6	IEEE	1351	20.6	RELX Group (Elsevier)	673	10.2
230	Align Technology Inc	1350	11863	11.4	JCO - Journal of Clinical Orthodontics	1717	14.5	RELX Group (Elsevier)	1434	12.1
231	Johns Hopkins University	1325	8871	14.9	IEEE	1325	14.9	RELX Group (Elsevier)	1284	14.5
232	United States of America Dep	1309	5689	23.0	IEEE	1309	23.0	RELX Group (Elsevier)	772	13.6
233	Cornell University	1298	8445	15.4	IEEE	1298	15.4	RELX Group (Elsevier)	1197	14.2
234	Virginia Tech University	1290	7007	18.4	RELX Group (Elsevier)	1366	19.5	IEEE	1290	18.4
235	United States Army	1287	5675	22.7	IEEE	1287	22.7	AIP Publishing	570	10.0
236	P4TENTS1 LLC	1250	3008	41.6	IEEE	1250	41.6	ACM-Assoc Comput Mach	415	13.8
237	General Motors Corp	1248	3475	35.9	IEEE	1248	35.9	RELX Group (Elsevier)	572	16.5
238	Smith & Nephew Plc.	1223	17846	6.9	RELX Group (Elsevier)	3429	19.2	Wolters Kluwer	1768	9.9
239	Dassault Systemes SA	1216	10145	12.0	RELX Group (Elsevier)	1477	14.6	ACS-Am Chem Soc	1219	12.0
240	LivaNova Plc	1204	22536	5.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	5020	22.3	RELX Group (Elsevier)	4535	20.1

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241	UltraLeap Holdings Limited (	1204	3559	33.8	IEEE	1204	33.8	ACM-Assoc Comput Mach	703	19.8
242	NETWORK-1 TECHNOLOG	1202	3608	33.3	IEEE	1202	33.3	ACM-Assoc Comput Mach	724	20.1
243	Math Works Inc (The)	1192	3003	39.7	IEEE	1192	39.7	ACM-Assoc Comput Mach	580	19.3
244	Avaya LLC (f/k/a Avaya Inc/	1191	4503	26.4	IEEE	1191	26.4	Internet Soc/IETF-Internet Eng Task Force	811	18.0
245	Extreme Networks Inc	1186	2740	43.3	IEEE	1186	43.3	Network Working Group RFC	318	11.6
246	Velatia Group	1182	1564	75.6	IEEE	1182	75.6	Echelon Corp	113	7.2
247	PHOENIX SOLUTIONS INC	1173	3753	31.3	IEEE	1173	31.3	ISCA (International Speech Communication Association)	472	12.6
248	CONSTELLATION DESIGN	1166	1450	80.4	IEEE	1166	80.4	IET/IEE	49	3.4
249	PURE Storage Inc	1162	8722	13.3	Internet Soc/IETF-Internet Eng Task Force	4039	46.3	ACM-Assoc Comput Mach	1885	21.6
250	Skyworks Solutions Inc	1160	1591	72.9	IEEE	1160	72.9	Summit Technical Media	53	3.3
251	Agency for Science Technolo	1155	3480	33.2	IEEE	1155	33.2	RELX Group (Elsevier)	433	12.4
252	INNOVATIVE SILICON SA	1153	1437	80.2	IEEE	1153	80.2	RELX Group (Elsevier)	63	4.4
253	State University of New York	1133	4764	23.8	IEEE	1133	23.8	RELX Group (Elsevier)	597	12.5
254	National Instruments Corp.	1131	2214	51.1	IEEE	1131	51.1	3GPP General Partnership Project Standards Body	200	9.0
255	X ONE INC	1130	3237	34.9	IEEE	1130	34.9	ACM-Assoc Comput Mach	571	17.6
256	AMPT LLC	1129	1488	75.9	IEEE	1129	75.9	RELX Group (Elsevier)	90	6.0
257	Synaptics Inc.	1127	2264	49.8	IEEE	1127	49.8	ACM-Assoc Comput Mach	145	6.4
258	Carnegie Mellon University	1118	4803	23.3	IEEE	1118	23.3	RELX Group (Elsevier)	548	11.4
259	Crossbar Inc	1115	4319	25.8	IEEE	1115	25.8	AIP Publishing	581	13.5
260	Teledyne Technologies Incor	1105	2773	39.8	IEEE	1105	39.8	SPIE-Int Soc Opt Engineering	340	12.3
261	MOJO MOBILITY INC	1101	1442	76.4	IEEE	1101	76.4	RELX Group (Elsevier)	120	8.3
262	III HOLDINGS 12 LLC	1092	2236	48.8	IEEE	1092	48.8	ACM-Assoc Comput Mach	268	12.0
263	Washington University in St.	1091	8327	13.1	RELX Group (Elsevier)	1140	13.7	IEEE	1091	13.1
264	Ecole Polytechnique Federale	1087	4129	26.3	IEEE	1087	26.3	Springer Nature	464	11.2
265	Duke University	1081	6849	15.8	IEEE	1081	15.8	RELX Group (Elsevier)	775	11.3
266	Baxter International Inc.	1080	10415	10.4	RELX Group (Elsevier)	2268	21.8	IEEE	1080	10.4
267	University of Pennsylvania	1078	10524	10.2	RELX Group (Elsevier)	1530	14.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1147	10.9
268	ByteDance Ltd	1076	15082	7.1	International Telecommunication Union	7104	47.1	ISO/IEC/JTC	4983	33.0
269	Snap Inc	1072	3075	34.9	IEEE	1072	34.9	ACM-Assoc Comput Mach	572	18.6
270	REALTIME DATA LLC	1068	4223	25.3	IEEE	1068	25.3	Network Working Group RFC	546	12.9
271	Verance Corp	1067	2181	48.9	IEEE	1067	48.9	SPIE-Int Soc Opt Engineering	287	13.2
272	PME IP PTY LTD	1063	2756	38.6	IEEE	1063	38.6	ACM-Assoc Comput Mach	676	24.5
273	SLB.com (former Schlumber	1061	16083	6.6	Society of Petroleum Engineers	3792	23.6	Society of Exploration Geophysicists	2483	15.4
274	UATC LLC	1057	1789	59.1	IEEE	1057	59.1	IEEE/CVF	194	10.8
275	Imagination Technologies Gr	1054	2577	40.9	IEEE	1054	40.9	ACM-Assoc Comput Mach	626	24.3
276	ViaPath Technologies (F/k/a	1047	2209	47.4	IEEE	1047	47.4	Springer Nature	195	8.8
277	COMSovereign Holding Cor	1040	1506	69.1	IEEE	1040	69.1	IET/IEE	119	7.9
278	New Jersey Institute of Techn	1040	2576	40.4	IEEE	1040	40.4	RELX Group (Elsevier)	422	16.4
279	Ohio State University	1040	4026	25.8	IEEE	1040	25.8	RELX Group (Elsevier)	603	15.0
280	Fortinet Inc	1039	2017	51.5	IEEE	1039	51.5	ACM-Assoc Comput Mach	263	13.0

## Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
281	Charles Stark Draper Laborat	1037	3140	33.0	IEEE	1037	33.0	RELX Group (Elsevier)	287	9.1
282	Technion - Israel Institute of	1028	3259	31.5	IEEE	1028	31.5	RELX Group (Elsevier)	403	12.4
283	IDC LLC	1026	2862	35.8	IEEE	1026	35.8	SID-Society for Information Display	386	13.5
284	QST HOLDINGS LLC	1013	1754	57.8	IEEE	1013	57.8	Joint IEEE and ACM	193	11.0
285	City University of Hong Kon	999	2757	36.2	IEEE	999	36.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	271	9.8
286	Michigan State University	999	9661	10.3	Optical Society of America	1828	18.9	AIP Publishing	1321	13.7
287	VerintSys	996	6560	15.2	International Data Group	1438	21.9	ACM-Assoc Comput Mach	1144	17.4
288	Vicor Corp	989	1246	79.4	IEEE	989	79.4	Penton/IPC, Inc.	51	4.1
289	Harvard University	988	15400	6.4	Springer Nature	2107	13.7	RELX Group (Elsevier)	1852	12.0
290	McAfee Inc	983	4482	21.9	IEEE	983	21.9	ACM-Assoc Comput Mach	840	18.7
291	Northwestern University	983	10184	9.7	ACS-Am Chem Soc	1557	15.3	RELX Group (Elsevier)	1344	13.2
292	University of Alabama	981	3954	24.8	IEEE	981	24.8	RELX Group (Elsevier)	712	18.0
293	Maxlinear Inc	978	1258	77.7	IEEE	978	77.7	ACM-Assoc Comput Mach	47	3.7
294	Eagleview Technologies Inc	959	3914	24.5	IEEE	959	24.5	ACM-Assoc Comput Mach	642	16.4
295	AMS Osram ( former AMS A	955	4962	19.2	AIP Publishing	999	20.1	IEEE	955	19.2
296	Cleveland Clinic (and Founda	946	5710	16.6	RELX Group (Elsevier)	1123	19.7	IEEE	946	16.6
297	CapitalOne	940	3872	24.3	IEEE	940	24.3	CBS Interactive	297	7.7
298	Synergy Microwave Corp	934	1139	82.0	IEEE	934	82.0	Horizon House Publications	66	5.8
299	Nant Holdings IP Llc	933	3612	25.8	IEEE	933	25.8	Joint IEEE and ACM	906	25.1
300	Agilent Technologies Inc	925	3232	28.6	IEEE	925	28.6	RELX Group (Elsevier)	439	13.6
301	United Services Automobile	924	5757	16.1	IEEE	924	16.1	Source Media	853	14.8
302	SK Telecom Co. Ltd.	918	1298	70.7	IEEE	918	70.7	3GPP General Partnership Project Standards Body	182	14.0
303	Ciena Corp	917	2933	31.3	IEEE	917	31.3	Optical Society of America	466	15.9
304	Here Global BV	914	2086	43.8	IEEE	914	43.8	ACM-Assoc Comput Mach	246	11.8
305	Schweitzer Engineering Labo	913	1226	74.5	IEEE	913	74.5	ACM-Assoc Comput Mach	62	5.1
306	HTC Corporation	911	4461	20.4	3GPP General Partnership Project Standards B	2706	60.7	IEEE	911	20.4
307	Nikon Corp.	911	5132	17.8	SPIE-Int Soc Opt Engineering	2094	40.8	IEEE	911	17.8
308	3M Co	910	26991	3.4	RELX Group (Elsevier)	3634	13.5	Wolters Kluwer	3414	12.6
309	Ossur hf	907	2969	30.5	IEEE	907	30.5	RELX Group (Elsevier)	635	21.4
310	Otto Bock Holding GmbH &	907	2839	31.9	IEEE	907	31.9	RELX Group (Elsevier)	598	21.1
311	NUCURRENT INC	906	1124	80.6	IEEE	906	80.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	64	5.7
312	Eastman Kodak Company	892	3834	23.3	IEEE	892	23.3	RELX Group (Elsevier)	382	10.0
313	KLA Corporation (f/k/a KLA	891	6212	14.3	SPIE-Int Soc Opt Engineering	1957	31.5	IEEE	891	14.3
314	Princeton University	891	7110	12.5	AIP Publishing	1216	17.1	IEEE	891	12.5
315	ZTE Microelectronics Techno	885	7041	12.6	3GPP General Partnership Project Standards B	4792	68.1	IEEE	885	12.6
316	SRC Computers Inc.	883	1006	87.8	IEEE	883	87.8	Springer Nature	39	3.9
317	Midtronics Inc.	881	2059	42.8	IEEE	881	42.8	RELX Group (Elsevier)	366	17.8
318	INNOVATIVE SILICON ISI	880	1078	81.6	IEEE	880	81.6	RELX Group (Elsevier)	45	4.2
319	Sotera Wireless	872	1927	45.3	IEEE	872	45.3	Springer Nature	370	19.2
320	SYNQOR INC	872	998	87.4	IEEE	872	87.4	Penton/IPC, Inc.	45	4.5



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321	YFY Inc	872	10945	8.0	SID-Society for Information Display	4286	39.2	Korean Information Display Society (KIDS)	1040	9.5
322	New York University	871	6196	14.1	IEEE	871	14.1	RELX Group (Elsevier)	763	12.3
323	Tel Aviv University	861	3950	21.8	IEEE	861	21.8	RELX Group (Elsevier)	683	17.3
324	JPMorgan	856	6895	12.4	Source Media	1185	17.2	IEEE	856	12.4
325	University System of Maryla	852	6630	12.9	RELX Group (Elsevier)	1155	17.4	IEEE	852	12.9
326	Voxer Llc	848	1495	56.7	IEEE	848	56.7	Internet Soc/IETF-Internet Eng Task Force	140	9.4
327	Airbus SE	846	2232	37.9	IEEE	846	37.9	RELX Group (Elsevier)	275	12.3
328	VIVAQUANT LLC	846	1733	48.8	IEEE	846	48.8	RELX Group (Elsevier)	225	13.0
329	Korea National De La Reche	845	6661	12.7	RELX Group (Elsevier)	1584	23.8	IEEE	845	12.7
330	Korea Advanced Institute for	842	2520	33.4	IEEE	842	33.4	RELX Group (Elsevier)	182	7.2
331	NUMENTA INC	839	3483	24.1	Numenta Inc.	1257	36.1	IEEE	839	24.1
332	Lam Research Corp.	830	5816	14.3	AIP Publishing	1440	24.8	IEEE	830	14.3
333	Realtek Semiconductor Corp.	824	1015	81.2	IEEE	824	81.2	Springer Nature	20	2.0
334	EXEGY INC	821	1603	51.2	IEEE	821	51.2	ACM-Assoc Comput Mach	275	17.2
335	Nantero Inc	804	10407	7.7	ACS-Am Chem Soc	3047	29.3	AIP Publishing	2197	21.1
336	Alibaba Group Holding Ltd	798	2095	38.1	IEEE	798	38.1	ACM-Assoc Comput Mach	211	10.1
337	STRONG FORCE TX PORT	795	1931	41.2	IEEE	795	41.2	RELX Group (Elsevier)	379	19.6
338	SAS Institute	788	3186	24.7	IEEE	788	24.7	RELX Group (Elsevier)	454	14.2
339	Round Rock Research LLC	787	2437	32.3	IEEE	787	32.3	RELX Group (Elsevier)	356	14.6
340	GE Healthcare	776	3385	22.9	IEEE	776	22.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	506	14.9
341	Knowles Corp	774	1653	46.8	IEEE	774	46.8	RELX Group (Elsevier)	188	11.4
342	WILUS INSTITUTE OF STA	772	1333	57.9	IEEE	772	57.9	3GPP General Partnership Project Standards Body	432	32.4
343	ARTILUX INC	769	1489	51.6	IEEE	769	51.6	Optical Society of America	256	17.2
344	M/A-COM Technology Solut	764	1589	48.1	IEEE	764	48.1	AIP Publishing	197	12.4
345	TRILLIANT NETWORKS IN	763	1140	66.9	IEEE	763	66.9	Internet Soc/IETF-Internet Eng Task Force	79	6.9
346	Wave Computing Inc.	761	2576	29.5	IEEE	761	29.5	ACM-Assoc Comput Mach	487	18.9
347	Aisin Corporation (Aisin Seki	758	5226	14.5	Optical Society of America	1991	38.1	IEEE	758	14.5
348	CENTRIPETAL NETWORK	752	2271	33.1	IEEE	752	33.1	ACM-Assoc Comput Mach	413	18.2
349	National Yang Ming Chiao T	752	1608	46.8	IEEE	752	46.8	AIP Publishing	132	8.2
350	MegaChips Corp	751	1072	70.1	IEEE	751	70.1	American Physical Society	69	6.4
351	Wells Fargo & Co	750	2192	34.2	IEEE	750	34.2	ACM-Assoc Comput Mach	204	9.3
352	ASML Holding NV	749	14927	5.0	SPIE-Int Soc Opt Engineering	5714	38.3	AIP Publishing	2511	16.8
353	PixelWorks Inc	747	1178	63.4	IEEE	747	63.4	SPIE-Int Soc Opt Engineering	112	9.5
354	Otsuka Holdings Co Ltd	746	4885	15.3	RELX Group (Elsevier)	992	20.3	IEEE	746	15.3
355	Experian Plc	744	5975	12.5	IEEE	744	12.5	Source Media	568	9.5
356	Advanced New Technologies	743	1539	48.3	IEEE	743	48.3	ACM-Assoc Comput Mach	144	9.4
357	Yageo Corporation	741	1094	67.7	IEEE	741	67.7	IET/IEE	202	18.5
358	Palo Alto Networks	740	1870	39.6	IEEE	740	39.6	ACM-Assoc Comput Mach	278	14.9
359	Power Integrations Inc.	740	1145	64.6	IEEE	740	64.6	AIP Publishing	64	5.6
360	University of Virginia (and P	740	3478	21.3	IEEE	740	21.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	532	15.3

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
361	Unisantis Electronics Ltd	739	913	80.9	IEEE	739	80.9	Institute of Pure and Applied Physics	52	5.7
362	University of Pittsburgh	739	6734	11.0	RELX Group (Elsevier)	1606	23.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	753	11.2
363	North Carolina State University	733	3344	21.9	IEEE	733	21.9	RELX Group (Elsevier)	502	15.0
364	Seoul National University	733	2018	36.3	IEEE	733	36.3	ACM-Assoc Comput Mach	164	8.1
365	BANDSPEED INC	732	1321	55.4	IEEE	732	55.4	Bluetooth Special Interest Group	447	33.8
366	Korus Inc.	731	8941	8.2	AIP Publishing	2523	28.2	Institute of Pure and Applied Physics	1770	19.8
367	Mau Imaging Inc (a/k/a Mau	722	1176	61.4	IEEE	722	61.4	RELX Group (Elsevier)	154	13.1
368	Saluda Medical Pty Ltd	721	4059	17.8	IEEE	721	17.8	RELX Group (Elsevier)	667	16.4
369	Advantest Corp.	714	997	71.6	IEEE	714	71.6	AIP Publishing	37	3.7
370	FACENSE LTD	706	1304	54.1	IEEE	706	54.1	RELX Group (Elsevier)	109	8.4
371	Autodesk Inc.	705	5738	12.3	ACM-Assoc Comput Mach	3257	56.8	IEEE	705	12.3
372	III HOLDINGS 1 LLC	700	1006	69.6	IEEE	700	69.6	ACM-Assoc Comput Mach	32	3.2
373	University of Connecticut	698	3343	20.9	IEEE	698	20.9	Optical Society of America	571	17.1
374	Becton Dickinson and Co.	697	35304	2.0	Wolters Kluwer	8737	24.7	RELX Group (Elsevier)	5948	16.8
375	Northeastern University (Bost	694	2100	33.0	IEEE	694	33.0	RELX Group (Elsevier)	220	10.5
376	HEMOSONICS LLC	690	1866	37.0	IEEE	690	37.0	RELX Group (Elsevier)	289	15.5
377	Denso Corp	688	1472	46.7	IEEE	688	46.7	RELX Group (Elsevier)	105	7.1
378	IDEMIA	679	1687	40.2	IEEE	679	40.2	RELX Group (Elsevier)	158	9.4
379	Case Western Reserve Univer	677	2757	24.6	IEEE	677	24.6	RELX Group (Elsevier)	379	13.7
380	Visa Inc	670	2700	24.8	IEEE	670	24.8	ACM-Assoc Comput Mach	275	10.2
381	Aerospace Corp.	668	1857	36.0	IEEE	668	36.0	RELX Group (Elsevier)	280	15.1
382	Halliburton Co. (Holding)	668	10322	6.5	Society of Petroleum Engineers	3896	37.7	Society of Exploration Geophysicists	750	7.3
383	Blue Sail Medical Co. Ltd.	665	2226	29.9	IEEE	665	29.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	318	14.3
384	SILVERBROOK RESEARC	663	1910	34.7	IEEE	663	34.7	Springer Nature	440	23.0
385	National Taiwan University	655	1413	46.4	IEEE	655	46.4	AIP Publishing	123	8.7
386	INTRINSIC INNOVATION	654	1362	48.0	IEEE	654	48.0	ACM-Assoc Comput Mach	156	11.5
387	Asahi Kasei Corp.	653	8068	8.1	RELX Group (Elsevier)	1800	22.3	Wolters Kluwer	1169	14.5
388	NEWVALUEXCHANGE LT	652	1862	35.0	IEEE	652	35.0	ACM-Assoc Comput Mach	420	22.6
389	FARO Technologies Inc.	651	2089	31.2	IEEE	651	31.2	SPIE-Int Soc Opt Engineering	384	18.4
390	Keysight Technologies	651	1562	41.7	IEEE	651	41.7	3GPP General Partnership Project Standards Body	255	16.3
391	Uber Technologies Inc	647	1383	46.8	IEEE	647	46.8	ACM-Assoc Comput Mach	117	8.5
392	F5 Networks Inc	645	4109	15.7	IEEE	645	15.7	ACM-Assoc Comput Mach	619	15.1
393	THE FLORIDA INTERNATI	643	1866	34.5	IEEE	643	34.5	RELX Group (Elsevier)	245	13.1
394	Continental AG (Germany Fe	638	1178	54.2	IEEE	638	54.2	RELX Group (Elsevier)	75	6.4
395	PLUSN LLC	635	873	72.7	IEEE	635	72.7	IET/IEE	78	8.9
396	Walmart Stores Inc	635	2235	28.4	IEEE	635	28.4	RELX Group (Elsevier)	247	11.1
397	Aptiv Plc (former Delphi Aut	634	1102	57.5	IEEE	634	57.5	ACM-Assoc Comput Mach	74	6.7
398	Causam Enterprises (former	634	1078	58.8	IEEE	634	58.8	Springer Nature	161	14.9
399	United States Air Force	633	2321	27.3	IEEE	633	27.3	RELX Group (Elsevier)	245	10.6
400	EchoStar Corp	619	1339	46.2	IEEE	619	46.2	ACM-Assoc Comput Mach	80	6.0



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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
401	HI LLC	617	4244	14.5	AIP Publishing	801	18.9	IEEE	617	14.5
402	University of Notre Dame Du	617	1542	40.0	IEEE	617	40.0	RELX Group (Elsevier)	146	9.5
403	Bank of America Corp.	614	1816	33.8	IEEE	614	33.8	ACM-Assoc Comput Mach	281	15.5
404	Tigo Energy Inc	612	959	63.8	IEEE	612	63.8	WIP-Renewable Energies	260	27.1
405	National University of Ireland	605	1223	49.5	IEEE	605	49.5	RELX Group (Elsevier)	97	7.9
406	Soitec SA	602	2306	26.1	IEEE	602	26.1	AIP Publishing	546	23.7
407	Viavi Solutions Inc	601	2177	27.6	IEEE	601	27.6	Optical Society of America	246	11.3
408	General Dynamics Corp	599	1439	41.6	IEEE	599	41.6	American Physical Society	212	14.7
409	University of Utah	592	4095	14.5	RELX Group (Elsevier)	639	15.6	IEEE	592	14.5
410	ACORN TECHNOLOGIES I	591	2059	28.7	IEEE	591	28.7	AIP Publishing	528	25.6
411	Assa Abloy AB	591	3329	17.8	IEEE	591	17.8	International Association for Cryptologic Research (IACR)	402	12.1
412	TELADOC HEALTH INC	589	1801	32.7	IEEE	589	32.7	IEEE/RSJ	165	9.2
413	The National Aeronautical an	588	3044	19.3	IEEE	588	19.3	AIAA - American Institute of Aeronautics and Astronautics	393	12.9
414	VirnetX Holding Corp	587	11886	4.9	Network Working Group RFC	6287	52.9	Internet Soc/IETF-Internet Eng Task Force	1816	15.3
415	MACAU UNIVERSITY OF	586	846	69.3	IEEE	586	69.3	RELX Group (Elsevier)	74	8.7
416	University of Colorado ( The	582	5404	10.8	Optical Society of America	1331	24.6	RELX Group (Elsevier)	708	13.1
417	Yonsei University	579	1380	42.0	IEEE	579	42.0	ACM-Assoc Comput Mach	101	7.3
418	OMNI MEDSCI INC	578	7903	7.3	Optical Society of America	2702	34.2	RELX Group (Elsevier)	1252	15.8
419	AB Initio Technology LLC	577	2005	28.8	ACM-Assoc Comput Mach	611	30.5	IEEE	577	28.8
420	Teradyne Inc.	575	1169	49.2	IEEE	575	49.2	ASME-Am Soc Mech Eng	134	11.5
421	MULTI-TECH SYSTEMS IN	573	883	64.9	IEEE	573	64.9	ACM-Assoc Comput Mach	44	5.0
422	University of Central Florida	573	2847	20.1	IEEE	573	20.1	Optical Society of America	281	9.9
423	Eaton Corp.	571	857	66.6	IEEE	571	66.6	RELX Group (Elsevier)	61	7.1
424	Carl-Zeiss Stiftung	568	9689	5.9	Optical Society of America	2006	20.7	SPIE-Int Soc Opt Engineering	1851	19.1
425	Drexel University	565	4405	12.8	RELX Group (Elsevier)	979	22.2	AIP Publishing	669	15.2
426	NEWRACOM Inc	565	573	98.6	IEEE	565	98.6	SPIE-Int Soc Opt Engineering	4	0.7
427	Vestas Wind Systems A/S	565	1199	47.1	IEEE	565	47.1	RELX Group (Elsevier)	95	7.9
428	HeartFlow Inc	559	5787	9.7	Springer Nature	1312	22.7	RELX Group (Elsevier)	1213	21.0
429	Pennsylvania State University	559	3847	14.5	RELX Group (Elsevier)	630	16.4	IEEE	559	14.5
430	Saudi Arabian Oil Company (	555	9824	5.6	RELX Group (Elsevier)	1946	19.8	Society of Petroleum Engineers	1642	16.7
431	Swiss Federal Institute of Tec	550	2059	26.7	ACM-Assoc Comput Mach	649	31.5	IEEE	550	26.7
432	Nintendo Co. Ltd.	544	3118	17.4	ACM-Assoc Comput Mach	687	22.0	IEEE	544	17.4
433	Twitter Inc	544	1111	49.0	IEEE	544	49.0	ACM-Assoc Comput Mach	163	14.7
434	ICU Medical Inc	543	3384	16.0	IEEE	543	16.0	Springer Nature	454	13.4
435	Omnivision Technologies Inc	543	1361	39.9	IEEE	543	39.9	Optical Society of America	315	23.1
436	MAY PATENTS LTD	540	1064	50.8	IEEE	540	50.8	SAE-Society of Automobile Engineers	88	8.3
437	Screen Holdings Co Ltd (For	539	2035	26.5	IEEE	539	26.5	RELX Group (Elsevier)	299	14.7
438	University of Massachusetts	539	3335	16.2	IEEE	539	16.2	RELX Group (Elsevier)	397	11.9
439	Mayo Foundation for Medica	537	5916	9.1	RELX Group (Elsevier)	1162	19.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	782	13.2
440	EDGE 3 TECHNOLOGIES I	532	854	62.3	IEEE	532	62.3	RELX Group (Elsevier)	52	6.1

## Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
441	ECOLE DE TECHNOLOGIE	531	848	62.6	IEEE	531	62.6	3GPP General Partnership Project Standards Body	66	7.8
442	BLANDING HOVENWEEP	530	1464	36.2	IEEE	530	36.2	SPIE-Int Soc Opt Engineering	201	13.7
443	King Abdullah University of	530	3104	17.1	IEEE	530	17.1	ACS-Am Chem Soc	409	13.2
444	Sumitomo Electric Industries	530	3359	15.8	IEEE	530	15.8	AIP Publishing	434	12.9
445	III HOLDINGS 2 LLC	528	1240	42.6	IEEE	528	42.6	ACM-Assoc Comput Mach	237	19.1
446	Roche Holding Ltd.	528	9967	5.3	RELX Group (Elsevier)	2186	21.9	ACS-Am Chem Soc	1221	12.3
447	Avid Technology Inc.	526	1219	43.2	IEEE	526	43.2	ACM-Assoc Comput Mach	459	37.7
448	Tata Sons Ltd	524	1402	37.4	IEEE	524	37.4	ACM-Assoc Comput Mach	143	10.2
449	D-Wave Quantum Inc. (forme	523	4192	12.5	American Physical Society	1323	31.6	IEEE	523	12.5
450	BRIGHT DATA LTD	522	4955	10.5	Internet Soc/IETF-Internet Eng Task Force	2305	46.5	ACM-Assoc Comput Mach	594	12.0
451	Comtech Telecommunication	517	1185	43.6	IEEE	517	43.6	3GPP General Partnership Project Standards Body	301	25.4
452	Deere & Co.	517	1497	34.5	IEEE	517	34.5	RELX Group (Elsevier)	178	11.9
453	University of Rochester	517	3112	16.6	IEEE	517	16.6	Optical Society of America	406	13.0
454	Pulse Link Inc	516	631	81.8	IEEE	516	81.8	Springer Nature	24	3.8
455	ACORN SEMI LLC	513	3234	15.9	AIP Publishing	1182	36.5	RELX Group (Elsevier)	585	18.1
456	Lumentum Holdings Inc	513	1709	30.0	IEEE	513	30.0	Optical Society of America	371	21.7
457	ISCO International Llc	512	612	83.7	IEEE	512	83.7	3GPP General Partnership Project Standards Body	95	15.5
458	Enphase Energy Inc	511	558	91.6	IEEE	511	91.6	IET/IEE	8	1.4
459	Intellective AI Inc (f/k/a Omn	511	610	83.8	IEEE	511	83.8	International Association for Pattern Recognition (IAPR)	65	10.7
460	CREATIVE KINGDOMS LL	505	1700	29.7	IEEE	505	29.7	ACM-Assoc Comput Mach	457	26.9
461	Khalifa University of Science	505	877	57.6	IEEE	505	57.6	RELX Group (Elsevier)	58	6.6
462	Via Technologies Inc.	503	1141	44.1	IEEE	503	44.1	Joint IEEE and ACM	150	13.1
463	DropBox Inc	502	1379	36.4	IEEE	502	36.4	ACM-Assoc Comput Mach	354	25.7
464	A10 Networks Inc	500	981	51.0	IEEE	500	51.0	Joint IEEE and ACM	112	11.4
465	Charter Communications Inc	500	2200	22.7	IEEE	500	22.7	3GPP General Partnership Project Standards Body	317	14.4
466	INNOPHASE INC	500	559	89.4	IEEE	500	89.4	European Microwave Association	24	4.3
467	King Fahd University of Petr	500	1642	30.5	IEEE	500	30.5	RELX Group (Elsevier)	386	23.5
468	Technische Universitat Berlin	500	905	55.2	IEEE	500	55.2	AIP Publishing	109	12.0
469	Allstate Corp	499	1424	35.0	IEEE	499	35.0	ACM-Assoc Comput Mach	134	9.4
470	Hoya Corp	499	1594	31.3	IEEE	499	31.3	AIP Publishing	314	19.7
471	Commonwealth Scientific an	498	1179	42.2	IEEE	498	42.2	RELX Group (Elsevier)	132	11.2
472	Nanyang Technological Univ	498	3200	15.6	RELX Group (Elsevier)	548	17.1	IEEE	498	15.6
473	ST-Ericsson SA (Patents split	498	723	68.9	IEEE	498	68.9	3GPP General Partnership Project Standards Body	90	12.4
474	William Marsh Rice Universi	498	2674	18.6	IEEE	498	18.6	ACS-Am Chem Soc	348	13.0
475	Ostendo Technologies Inc	496	2083	23.8	IEEE	496	23.8	RELX Group (Elsevier)	242	11.6
476	THE CHAMBERLAIN GRO	487	1402	34.7	IEEE	487	34.7	International Association for Cryptologic Research (IACR)	177	12.6
477	3D Systems Corp.	486	1072	45.3	IEEE	486	45.3	ACM-Assoc Comput Mach	266	24.8
478	BLUERISC INC	484	1387	34.9	IEEE	484	34.9	ACM-Assoc Comput Mach	310	22.4
479	Olympus Corp.	484	1954	24.8	IEEE	484	24.8	RELX Group (Elsevier)	218	11.2
480	AngioDynamics Inc.	478	4793	10.0	RELX Group (Elsevier)	1052	21.9	Springer Nature	623	13.0

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
481	ZENA TECHNOLOGIES IN	478	2156	22.2	IEEE	478	22.2	ACS-Am Chem Soc	442	20.5
482	Fortive Corporation	477	1197	39.8	IEEE	477	39.8	RELX Group (Elsevier)	139	11.6
483	Tokyo Electron Limited	477	3576	13.3	AIP Publishing	490	13.7	RELX Group (Elsevier)	484	13.5
484	Deka Products LP	476	1048	45.4	IEEE	476	45.4	RELX Group (Elsevier)	113	10.8
485	MIRAMAR LABS INC	476	1356	35.1	IEEE	476	35.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	169	12.5
486	Delta Electronics Inc	475	674	70.5	IEEE	475	70.5	SPIE-Int Soc Opt Engineering	19	2.8
487	Nio Co. Ltd	474	915	51.8	IEEE	474	51.8	CBS Interactive	55	6.0
488	Rocket Lab USA Inc	473	972	48.7	IEEE	473	48.7	RELX Group (Elsevier)	147	15.1
489	UT-Battelle LLC	472	3882	12.2	RELX Group (Elsevier)	698	18.0	IEEE	472	12.2
490	Telecom Italia SPA	468	1205	38.8	IEEE	468	38.8	3GPP General Partnership Project Standards Body	172	14.3
491	Ceva Inc.	467	1074	43.5	IEEE	467	43.5	ACM-Assoc Comput Mach	117	10.9
492	Netflix Inc	467	992	47.1	IEEE	467	47.1	ACM-Assoc Comput Mach	100	10.1
493	Hexagon AB	465	1262	36.8	IEEE	465	36.8	ACM-Assoc Comput Mach	119	9.4
494	Rohde & Schwarz GmbH &	465	943	49.3	IEEE	465	49.3	ATSC Std	212	22.5
495	SiOnyx Inc	464	3013	15.4	AIP Publishing	830	27.5	RELX Group (Elsevier)	471	15.6
496	University of New Mexico	464	2752	16.9	IEEE	464	16.9	AIP Publishing	296	10.8
497	Catholic University Leuven	463	1278	36.2	IEEE	463	36.2	RELX Group (Elsevier)	136	10.6
498	Alstom S.A.	461	752	61.3	IEEE	461	61.3	ASME-Am Soc Mech Eng	50	6.6
499	Hologic Inc	458	5226	8.8	RELX Group (Elsevier)	997	19.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	853	16.3
500	Conduent Inc	457	1428	32.0	IEEE	457	32.0	RELX Group (Elsevier)	145	10.2