



Who is Leading the 5G Patent Race?

2025 Report



Executive summary

The 5G cellular standard is transforming industries, extending connectivity far beyond smartphones and computers into the Internet of Things (IoT). From automotive and logistics to smart manufacturing, smart cities, and even smart healthcare, 5G is driving a revolution that reshapes entire sectors. Unlike any other technology, 5G is underpinned by thousands of Standard Essential Patents (SEPs)—patents essential to any implementation of the standardized technology.

The race for 5G patents has become more competitive than ever, with significant geopolitical implications as nations vie for leadership in critical technologies. This report analyzes over 85,000 5G patent families (comprising both pending and granted patents) declared to the European Telecommunications Standards Institute (ETSI) before October 31, 2024, with patent publication dates also before this date. The data for this analysis was retrieved on November 21, 2024, allowing for ETSI's processing timelines, and was derived from the LexisNexis IPlytics database. It includes all declarations submitted to ETSI before October 31, 2024 that were publicly available on ETSI's website by November 21, 2024. The data for this analysis reflects information that was publicly available as of November 21, 2024. Declarations published after that date and all other changes in patent ownership, corporate tree ownership, legal status or contribution submission, even if retroactively dated to October 31, 2024 or earlier, are not included in the analysis. As of this date, over 100,000 cellular patent families have been declared, with the number of worldwide granted 5G patent families steadily growing—more than 10,000 new families are declared annually. This dynamic shift is also reshaping the composition of 5G portfolios among major ultimate owners, with Chinese companies notably strengthening their positions.

This report not only provides unique insights into 5G patent data but also highlights the methodologies and challenges of creating reliable 5G patent datasets. Ensuring that variations in companies' declaration practices—such as timing, volume, and accuracy—do not skew rankings was a key focus of this report. Since patent declarations rely on self-reporting, these differences can significantly impact the data. For the first time, the report introduces the **"Cellular Verified"** initiative, a groundbreaking data-cleaning project. This initiative involved collaboration with over 30 ETSI-declaring companies to clean, match, deduplicate, classify, enhance, and finally verify patent declarations, resulting in the most reliable and comprehensive cellular patent data representation in the market.

Courts beyond the UK are increasingly involved in setting global fair, reasonable, and non-discriminatory (FRAND) rates, with Chinese courts becoming particularly active, and the Unified Patent Court (UPC) recently issuing its first FRAND ruling. The determination of FRAND rates often includes, among other evidence, a "top-down" approach, where the size of a 5G ultimate owner's portfolio is compared to the overall 5G patent stack to calculate the 5G share. Courts are also increasingly relying on robust 5G patent data to assess the comparability of license agreements, emphasizing the importance of reliable and transparent data in these decisions.

This report highlights the dynamic landscape of 5G SEP ownership and licensing, emphasizing the intricate interplay between innovation, litigation, and the evolving maturity of 5G technologies. As the industry progresses toward 5G Advanced and 6G, reliable data and strategic portfolio management will be essential in shaping the next decade of development.

For more details on our data retrieval and processing methodology, please visit our website: lexisnexisip.com/our-methodology-5g-report

¹ The LexisNexis Ultimate Owner concept recognizes that parent companies often exert control over patents held by subsidiaries, joint ventures, and affiliates.

Key findings

Continued 5G Investment

- The number of granted 5G patent declarations has more than doubled in the past three years, growing from slightly over 25,000 declared 5G granted patent families in 2021 to over 57,000 declared 5G granted patent families in 2024.
- As 5G technology continues to evolve towards 5G Advanced and 6G, investment in cellular technology is growing at an exponential rate.

Top 5G patent owners

- **Leading innovators:** **Huawei** (China), **Qualcomm** (U.S.), and **Ericsson** (Sweden) hold the top three positions in 5G patent ownership.
- **Leading region:** Chinese-headquartered companies now account for over 40% of 5G-declared patent families, while U.S., Korean, and European-headquartered ultimate owners each hold shares of 15–20%.
- **R&D-driven organizations:** Institutions like **InterDigital** (U.S.), **Fraunhofer Institute** (Germany), and **TNO Netherlands** demonstrate the impact of research-focused innovation. For example, **InterDigital** jumps from 17th to 7th in the 5G patent ranking when rankings consider the Patent Asset Index value metric instead of just patent family counts.
- **Patent Assertion Entities (PAEs):** PAEs are rising in rankings when analyzed through the value metric Patent Asset Index. Key examples include:
 - **Pegasus Wireless**, which acquired 5G patents from **KT Corp**, moved from 74 to 34.
 - **Longhorn IP**, which acquired 5G portfolios from **FG Innovation** and **Shanghai Langbo**, advanced its rank from 83 to 38.
 - **Key Patent Innovations**, which obtained a 5G portfolio from **Blackberry**, improved the ranking position from 79 to 42.
- **Other Notables:** **5G IP Holdings**, **IP Bridge**, and **NewRadio** also saw significant rank improvements due to strategic acquisitions.

Technical contributions

- **Standard contributing companies:** **Huawei** (China), **Ericsson** (Sweden), and **Nokia** (Finland) lead in 5G-related technical standard submissions.
- **Standard contribution trend:** The number of technical standards contributions related to 5G has surpassed 80,000, marking an all-time high as companies continue to heavily invest in 5G development. The upcoming release of 5G Advanced next year and the initiation of 6G development further underscore the industry's momentum.

Rising importance of 5G patent data

- **Growing role in licensing and litigation:** 5G patent data is critical in determining FRAND rates, assessing portfolio value, and resolving disputes. Data integrity has become a crucial factor in shaping SEP licensing outcomes.
- **Maturity of patent portfolios:** As 5G technology matures, many associated patents are nearing expiration. Historical ownership analysis indicates that a significant portion of 5G patents will expire within the next decade, impacting future licensing strategies.

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The transformative impact of 5G on SEP licensing and litigation

With a dramatic rise in 5G patent owners, 5G declared patents, and potential implementers compared to previous standards, 5G's impact goes far beyond technology. It is redefining legal and business frameworks and reshaping the SEP licensing and litigation landscape. While SEP licensing in the smartphone market is mature, cellular IoT licensing in many sectors is still in its infancy. As a result, 5G SEP licensing faces a long journey ahead, navigating geopolitical tensions, global disputes, and local regulations that create significant challenges and uncertainty for both SEP owners and implementers.

The evolving 5G SEP licensing market

Building on 4G-LTE, which extended cellular SEP licensing beyond telecom companies into adjacent industries, 5G is driving a deeper transformation. The proliferation of diverse products and use cases has significantly expanded the pool of implementers and potential licensees. This shift has led some SEP owners to adjust their strategies, with an increasing reliance on patent pools, particularly for non-core business segments. Notable examples include companies like **Qualcomm**, **InterDigital**, **Nokia**, and **Ericsson**, which have joined the **Avanci** 5G vehicle pool despite historically favoring bilateral negotiations. Patent licensing administrators like **Avanci** and **Sisvel** have also launched 5G patent licensing programs targeting cellular IoT, the automotive aftermarket, smart meters, and electric vehicle charging stations.

Technical experts have criticized the slow adoption of 5G, pointing out that many IoT applications, such as smart meters or tracking sensors, can achieve similar performance with 3G or 4G. As a result, most experts argue that 5G royalty rates for IoT applications must likely be lower than those for smartphones and tablets. However, there is yet no established FRAND rate for the IoT application of 5G. The IoT market also presents unique challenges. Unlike the relatively consolidated smartphone and automotive markets, the IoT sector includes thousands of small OEMs, while the IoT module market is far more concentrated. Yet there is no consensus on where in the value chain SEPs are most efficiently licensed and if for some IoT markets, it may after all be more efficient to license SEPs on the chip or module level and not on the OEM (Original Equipment Manufacturer) level.

Emerging trends in 5G SEP litigation

Legal disputes involving 5G SEPs continue to play out on a global scale, with litigation occurring across jurisdictions such as the United States, Europe and China, but also in Brazil, Colombia, and India. This necessitates a global strategy that accounts for the diverse approaches of different courts.

The United States remains a key player in SEP litigation, with the International Trade Commission emerging as a popular forum for SEP holders due to its ability to grant injunctive relief through exclusion orders. Meanwhile, district courts, particularly the Eastern District of Texas, have seen an uptick in cases involving 5G SEPs, setting important precedents for future disputes.

Germany and the UK have solidified their positions as prominent venues for SEP litigation. German courts, known for their efficient resolutions, have been central in cases like **Huawei v. ZTE**, which established clear negotiation principles for global licensing. Similarly, the UK's landmark decision in **Unwired Planet v. Huawei** confirmed the right of SEP holders to demand global FRAND licenses, further bolstering its reputation as a strategic forum for SEP disputes.

The newly established Unified Patent Court (UPC) is also gaining traction. In September 2024, the Munich Local Division issued its first decision on a SEP-related matter, ruling in favor of **Philips** against **Belkin**. The court granted an injunction against **Belkin** for infringing a SEP related to wireless charging standards. In October 2024, the Mannheim Local Division of the UPC issued its first FRAND decision, allowing **Panasonic** to present licensing agreements with third

parties in a case against **Xiaomi**. Additionally, the Mannheim Local Division recently ruled that **Oppo** infringed a **Panasonic** SEP, resulting in a sales ban on certain **Oppo** mobile devices within the UPC's jurisdiction.

Chinese courts, too, are becoming increasingly influential in SEP litigation. Known for their speedy resolutions and willingness to grant injunctive relief, they demonstrated their impact in cases like *Iwncomm v. Sony*. Although Chinese courts traditionally limit licenses to domestic SEPs, their role in the global FRAND determination landscape is expanding.

In summary, recent years have demonstrated that SEP litigation increasingly occurs through global campaigns, extending beyond traditional venues in the U.S. and Europe. Courts outside the UK have begun setting global FRAND rates, with Chinese courts becoming more active, and the UPC recently issuing its first FRAND ruling.

The determination of FRAND rates in most cases incorporates a "top-down" approach, where the portfolio size of 5G ultimate owners is compared to the total 5G patent stack to calculate a share. Additionally, when assessing the comparability of license agreements, courts are increasingly relying on 5G patent data to determine whether an agreement is truly comparable.

In conclusion, reliable 5G patent data is playing an ever-growing role in SEP licensing and litigation. As such, 5G patent data integrity is becoming a critical topic, one that this report will explore and address in the following chapters.

The data challenge of 5G patent declarations

The European Telecommunications Standards Institute (ETSI) declaration database is the largest of its kind, currently containing over 555,000 declared patents and 102,943 patent families (INPADOC) as of October 31st, 2024 (LexisNexis® IPlytics™ identifies over 100,000 patent families based on INPADOC).

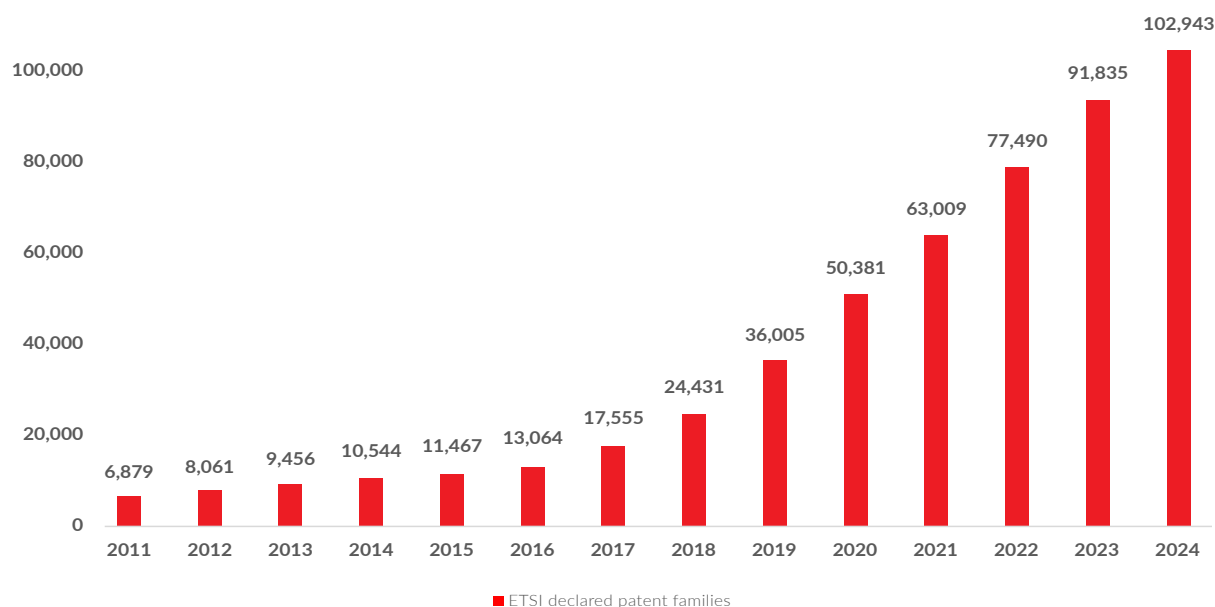


Figure 1: Total number of ETSI-declared patent families (INPADOC) by year of first patent declaration.

Following court rulings that late-declared patents cannot be enforced, many ETSI-declaring companies have changed their behavior, consequently self-declaring patents as early as possible. In some cases, this includes submitting unpublished provisional or priority applications. While this approach ensures the most comprehensive database—capturing a broad range of potentially essential patents for standards like 4G and 5G—the rate of patents that are actually standard essential has noticeably declined.

Due to the nature of self-declarations, companies submit patent numbers in various formats and types. When matching these numbers to normalized and cleaned patent information, 40% of the patents cannot be directly matched. Additionally, 20% of the matched numbers result in false positive matches, such as patents related to unrelated fields like chemical compounds or toothpaste. ETSI only requires companies to declare one basis patent of each patent family. While ETSI attempts to retrieve all other family counterparts through its Worldwide Espacenet link, on average, 20% of the granted family counterparts are missing from the ETSI database. Relying on the family counterpart identification from ETSI when analyzing declared patents in certain jurisdictions would be subject to missing data.

Over the past decade, patent data providers have developed sophisticated rules for matching patent numbers, enabling them to identify and link many declared patents. However, the complexity of this process has deterred some providers from fully committing to producing clean, standardized data. As a result, several 5G patent reports have presented conflicting and often confusing findings.

A key challenge lies in the variability of matching performance among patent owners. Some ETSI-declaring companies invest significant effort into redeclaring patents at multiple stages, such as when an application is published and later when the patent is granted. Others, however, only declare provisional or priority numbers, many of which may not yet be published and are difficult to match and identify when the patent is disclosed by the patent office.

When declared patents are not adequately cleaned and normalized, false positives are not identified, missing patent family members are not added, or worldwide ultimate ownership and corporate tree data are not considered. Rankings derived from this data are inherently biased, favoring certain patent owners. This inconsistency undermines the reliability of such analyses and creates a distorted view of the true landscape of publicly declared patents.



Cellular Verified – bringing clarity to declaration data



For many 5G patent experts, multiple reports on 5G patent ownership with conflicting rankings are a cause for concern, particularly when all the data originates from the same public source. If the underlying source for these reports is identical, it stands to reason that their rankings should align. This discrepancy has prompted SEP portfolio managers, licensing experts, IP professionals from both SEP owners and standards implementers, as well as global lawyers and economists, to ask critical questions: Which 5G patent report can be trusted? Which serves as the benchmark for the highest data quality? And how can we reconcile the differences between these studies? While it is not transparent how certain reports conclude their 5G patent shares, public 5G rankings may have an impact on licensing, as seen in recent FRAND litigation cases, where several 5G patent shares were presented for the use of a top-down approach.

While ETSI-declaring companies often have a thorough understanding of their own declared patent portfolios—and can quickly identify inaccuracies in reports about their portfolios—this knowledge is not universally accessible within the market. To address these challenges, LexisNexis launched the **Cellular Verified** declaration data cleaning initiative. In this collaborative effort, the LexisNexis team partnered with over 30 ETSI-declaring companies to clean, match, deduplicate, expand, classify, enhance, and verify self-declared ETSI patents. By comparing the public ETSI data with the LexisNexis matched data against each company's internal records, this initiative ensures the highest level of accuracy and reliability in 5G patent data, providing the industry with a trusted benchmark.

The following are simplified steps involved in our data cleaning and matching process:

1. **Manual review:** The LexisNexis team conducted a manual review of all ETSI-declared patents, verifying their alignment with official patent office records.
2. **Feedback from companies:** Detailed matching reports were shared with over 30 ETSI-declaring companies. These companies provided feedback by comparing unmatched declared patents against their internal patent databases.
3. **Refinement and classification:** The feedback was used to refine patent number matching rules, identify missing patent family counterparts, remove falsely declared patents, confirm global patent ownership, and improve classification into 3G, 4G, and 5G categories.
4. **Verification with declaring companies:** The LexisNexis team cross-verified with ETSI-declaring companies to ensure that all patent declarations were covered in their internal databases and were accurately declared under the correct standard generations, such as 3G, 4G, or 5G.

In instances where one of the 30+ ETSI-declaring companies flagged a patent internally as declared but where the patent was not found in the ETSI database, LexisNexis® encouraged the ETSI-declaring company to declare these patents. Throughout the process, the team only used publicly available data from the ETSI website and did not incorporate any privately shared patents.

The **Cellular Verified** initiative took one year to complete, during which the LexisNexis team worked closely with 30+ SEP leaders to create a reliable declaration database. This effort ensured the identification of all publicly declared patents, resulting in a clean and unbiased database that produces reliable and impartial patent counting statistics. To avoid any misunderstanding, the **Cellular Verified** initiative did not ask any of the ETSI-declaring companies to make comments about the essentiality or validity of their declared patents.

The following examples demonstrate how raw ETSI data can lead to significantly different and unreliable rankings, underrepresenting certain companies' 5G patent portfolios.

Matching various patent number formats

Companies submit patent numbers in various formats and types, leading to inconsistencies in matching ETSI-declared patent families. Figure 2 highlights the number of non-matched ETSI-declared patent families (INPADOC) by declaring company when relying solely on unprocessed patent number declarations.

The figure underscores how differences in declaration practices across companies significantly affect matching performance. The quality and completeness of patent declarations vary widely among declaring companies. For example, companies like **Xiaomi**, **Lenovo**, and **OPPO** provide clean and consistent declarations, always disclosing all published patent numbers. Notably, companies with a high proportion of provisional or priority numbers in their declarations—such as **Ericsson**, **Qualcomm**, **Nokia**, **Huawei**, and **Intel**—show particularly high numbers of non-matched ETSI-declared patent families.

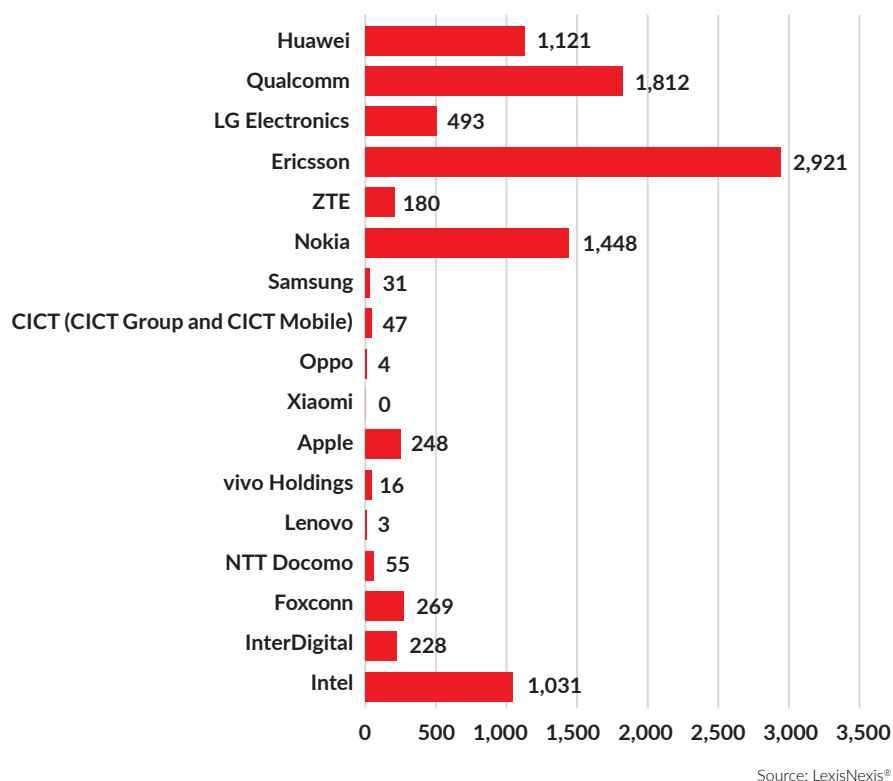


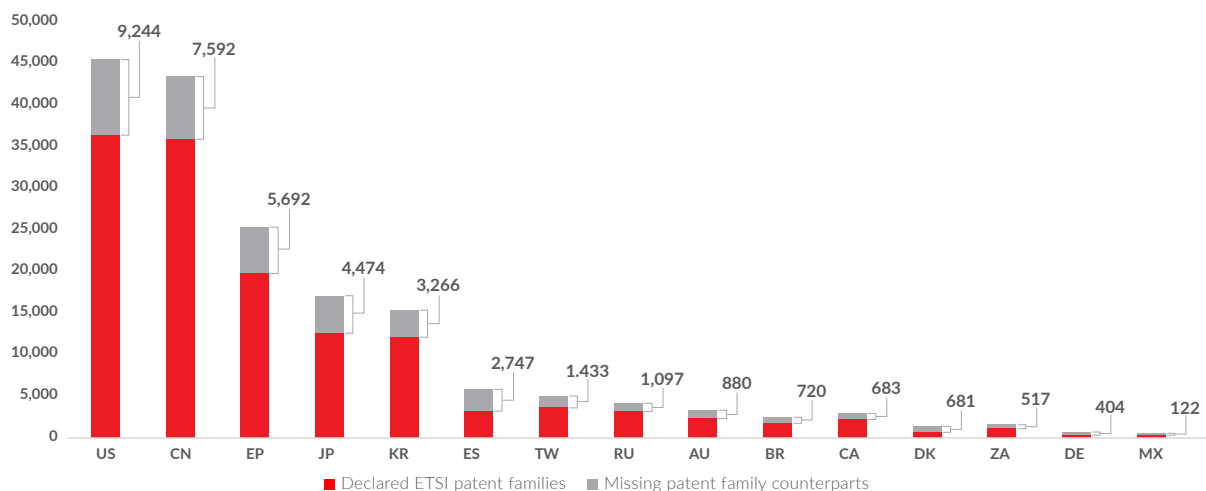
Figure 2: The number of non-matched ETSI-declared patent families (INPADOC) based on unprocessed patent number declarations.

Identifying missing patent family counterparts

Another major challenge is that the ETSI database does not comprehensively identify or maintain all patent family counterparts for declared patents. One key reason is that ETSI identifies patent family counterparts only at the time of declaration. If a patent is declared before its family counterparts are published, the database is not updated later to include those additional counterparts when they become available in other jurisdictions.

While some companies proactively re-declare family counterparts as they are published, others only declare the initial patent application. This practice leaves many global patent family counterparts unaccounted for in the ETSI database.

Figure 3 highlights this issue, showing that 9,244 granted U.S. patent counterparts are missing from the ETSI database, despite the corresponding basis patent being declared. Likewise, a significant number of granted counterparts for Chinese, European, Japanese, and Korean patents are also absent. The family expansion that was conducted, considers the ETSI IPR (Intellectual Property Right) policy, which stipulates that when a basis patent is declared, its counterparts are also subject to the FRAND commitment. Here, counterparts are determined based on ETSI's more restrictive patent family definition compared to INPADOC.



Source: LexisNexis®

Figure 3: The number of missing granted family counterparts (as to ETSI family definition compared to ETSI declared family members by jurisdiction.

Identifying patent ownership and corporate tree information

Especially for valuable patents such as cellular SEPs, ownership frequently changes, and in some cases, entire companies may be acquired. If patent ownership data is outdated and such changes are not rigorously tracked in global patent offices, or corporate tree information is not applied and company names are not harmonized, patent owner rankings can become highly unreliable and misleading.

Figure 4 illustrates the significant difference between rankings based on cleaned, normalized, and up-to-date ultimate owner data, identified through corporate trees, versus those relying on raw ETSI-declared company names. For example, Figure 4 shows that a significant portion of the Intel portfolio acquired by **Apple** would still incorrectly appear as owned by **Intel**. Companies like **Huawei**, **LG**, or **Samsung**, which have sold parts of their portfolios, would show inflated patent counts. Conversely, patents may be omitted if owner names are not normalized or subsidiaries are not recognized, as seen in the cases of **InterDigital**, **CICT**, **Qualcomm**, or **Lenovo**.

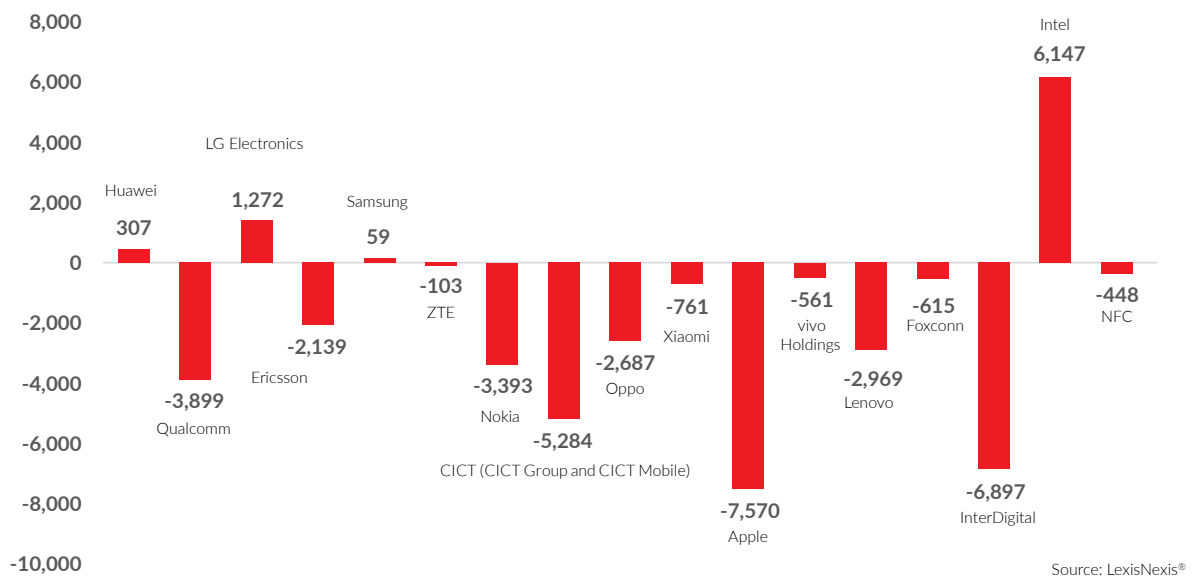


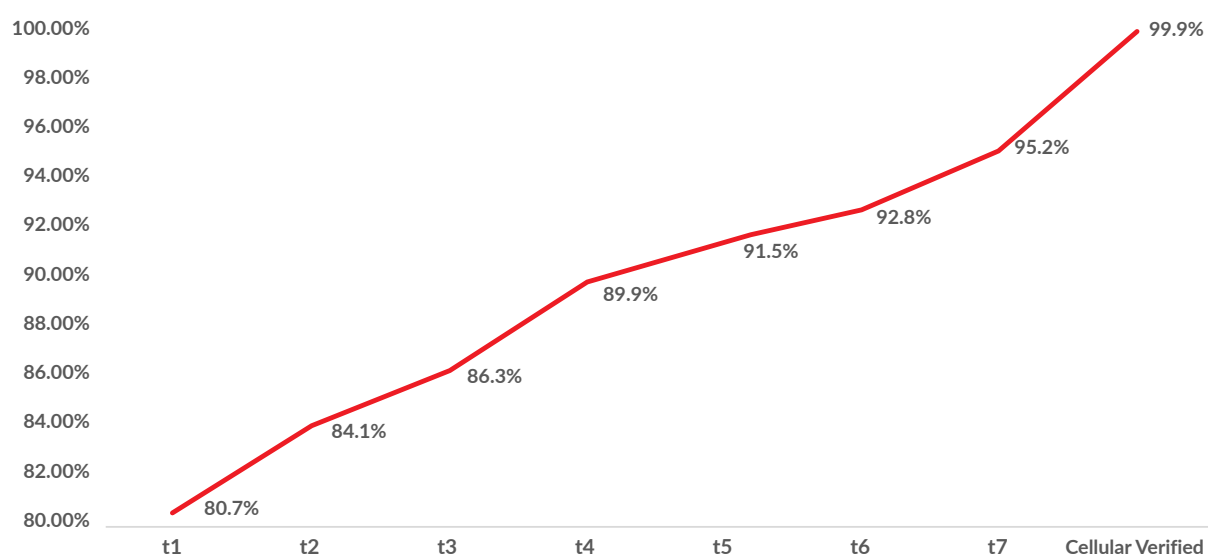
Figure 4: The difference of patent counts (unique patent application ID) when comparing cleaned, normalized, up-to-date, corporate-tree-identified ultimate owner data, to raw ETSI declaring company counts.

Unbiased 5G patent rankings need rigorous cleaning and verification

The ETSI declaration database is the largest of its kind, built from self-declarations by members. The complexity of creating clean, standardized datasets has led some 5G patent data providers to avoid the effort, resulting in conflicting and sometimes confusing conclusions in various reports.

Given the sheer volume of declared patents, achieving a perfect match rate is nearly impossible without external validation. To overcome this limitation, feedback from 30+ declaring companies was incorporated into the process. Figure 5 illustrates the progress of matching and cleaning efforts, showing how the average matching rate improved from t1 (initial matching efforts) to t7 (final application of matching processes). One significant cleaning step, e.g., included a thorough investigation of identifying and matching provisional and priority patent application numbers between the periods of t6 and t7. While rigorous cleaning substantially enhances data accuracy, achieving a perfect match rate is nearly unattainable without direct input from declaring companies responsible for the declared patents. Figure 5 well illustrates that the Cellular Verified initiative successfully increased the matching accuracy to ultimately achieve 99.99% accuracy of all published patent documents².

This initiative underscores the importance of collaboration and advanced data processing in producing reliable 5G patent data information.



Source: LexisNexis®

Figure 5: The matching performance process after each cleaning step from t1-t7 and after the completion of the Cellular Verified data cleaning initiative.

² Some ETSI declaring companies declare priority application numbers or provisional application numbers that are not yet published by the world-wide patent offices. Once the patent application is published also priority application numbers or provisional application are disclosed and the numbers are integrated into the database. The match rate refers to matching all published numbers. The share of unpublished is as low as 0.04%.

Evolving 5G technology investments

The race for 5G dominance is clearly reflected in the data on public patent declarations and standards contribution submissions, which have been compiled and analyzed in this report. To evaluate and quantify leadership in 5G innovation, this analysis focuses on over 85,000 5G patent declarations submitted to ETSI before October 31, 2024 (including pending and granted patents). The data for this report was retrieved on November 21, 2024, and includes only declarations publicly available on ETSI’s website as of that date. Declarations added after November 21, even if retroactively dated to October or earlier, are not included in this analysis. This one-month window accounts for ETSI’s processing time for submitted declarations.

For more details on our data retrieval and processing methodology, please visit our website: lexisnexisip.com/our-methodology-5g-report

The identification of 5G patent declarations was conducted using the 3rd Generation Partnership Project (3GPP) technical specification (TS) database, mapping ETSI-declared TS to the 5G technology generation. The analysis also accounted for 5G bridging technologies between 3G to 5G and 4G to 5G, as well as patents declared to 5G projects. Patents were counted based on the INPADOC family definition and the LexisNexis ultimate ownership concept, referring to the most recent assignee and highest-level parent company as of October 31, 2024.

Despite the years of development of 5G technology, the volume of 5G patent declarations continues to rise. By October 31, 2024, over 57,000 active 5G patent families had been granted in at least one jurisdiction globally—a remarkable increase of almost 13,000 families compared to 2023, when over 44,000 active, granted 5G patent families were recorded. This steady annual growth underscores the rapid pace of innovation and competition in the 5G landscape.

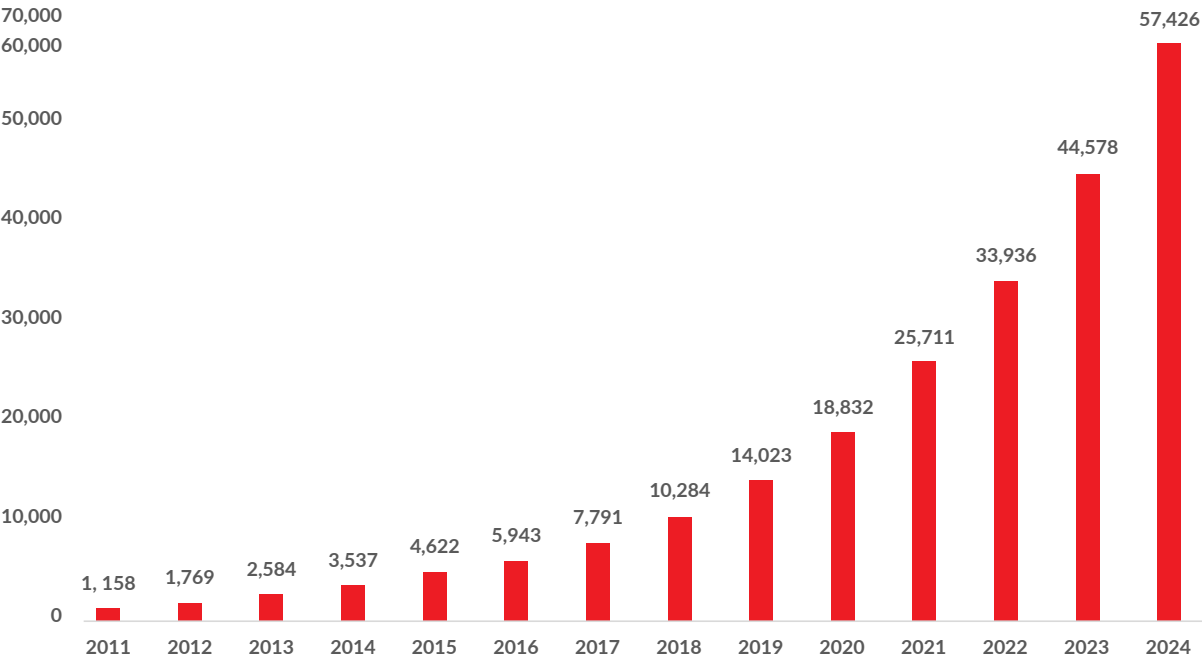


Figure 6: Cumulative number of worldwide granted 5G declared patent families by year of first publication.

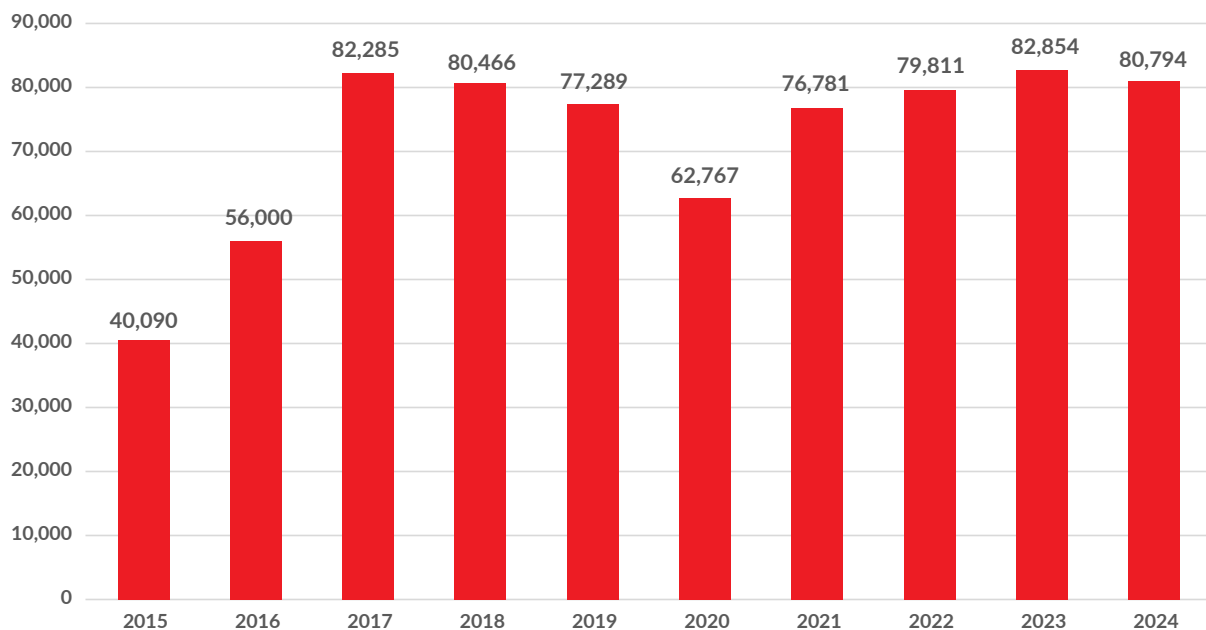
Source: LexisNexis®

Not only has the number of 5G patent declarations continued to rise significantly, but the level of participation from companies contributing to developing the 5G standard has also reached an all-time high.

A company's credibility in the 5G ecosystem depends heavily on its active involvement in developing high-quality standard specifications. Participation in the 3GPP—the standards organization responsible for creating 3G, 4G, and 5G specifications—enables companies to include their patented innovations in the standards. Consequently, 5G contribution data is a critical indicator of a company's commitment to and investment in shaping the evolution of 5G standards.

Figure 7 highlights the number of technical contributions to 5G specifications submitted annually, as of October 31, 2024. The 3GPP categorizes contributions to differentiate technical submissions from non-technical ones, such as editorial changes, comments, or agendas. The contribution counts presented in Figure 7 only consider technical contributions, ensuring the data reflects meaningful input.

In recent years, the volume of technical 5G standards contributions has remained consistently high. Remarkably, with two months left in the year, the number of contributions in 2024 has already exceeded 80,000, demonstrating the continued global commitment to refining and advancing 5G technology through the 3GPP framework.



Source: LexisNexis®

Figure 7: Number of submitted technical contributions related to 5G by year of publication.

Who is leading the 5G patent race?

In this report, we followed expert-recommended data refinement and counting methods to ensure accuracy. These include counting unique patent families only, deduplicating across specifications, expanding family counterparts, and relying on ultimate patent ownership. The LexisNexis Cellular Verified data cleaning initiative ensures the highest level of data accuracy and rules out a systematic bias due to different patent declaration practices across the ETSI declaring companies.

For standards contribution data, we applied several cleaning steps as well as rigorous deduplication of similar contributions and the identification of real technical contributions excluding, e.g., editorial contributions. This approach ensures a more reliable assessment of 5G standardization leadership. The 3GPP operates on a consensus-driven decision-making process, requiring significant research and investment to develop technically sound and compelling contributions that gain approval and integration by all members. The contribution rank, therefore, represents the leadership of companies developing the 5G standard.

Quantitative ranking of top 5G SEP owners

Table 1 presents a ranking of all 5G ultimate patent owners, organized by their average ranking across the four key metrics. To arrive at this ranking, we applied four data approaches to count all 5G declared families as to the INPADOC family definition, with at least one patent pending or granted in worldwide jurisdictions. We consider patent declarations that were declared to either 5G TS, 5G and bridging TS or 5G projects. Each column after the Headquarters (HQ) location represents the following, in order:

1. 5G declared patent families (based on INPADOC) that are pending or granted across all jurisdictions, declared before October 31, 2024.
2. 5G declared patent families (based on INPADOC) that are granted in one worldwide jurisdiction, declared before October 31, 2024.
3. 5G declared patent families (based on INPADOC) that are granted in one worldwide jurisdiction, that were only declared to 5G and not declared to any earlier generation, declared before October 31, 2024.
4. 5G related technical contributions submitted at the 3GPP between January 1, 2015 and October 31, 2024.

The table highlights Huawei as the top-ranked company, followed by Qualcomm and Ericsson. Huawei consistently holds the first position across all columns, while rankings for other companies vary. For instance, Qualcomm secures the 2nd position in all three 5G patent count metrics but drops to 4th place when counting 5G technical contributions. In contrast, Ericsson ranks between 4th and 5th for 5G patent families but rises to 2nd place for technical 5G contributions.

The ranking aggregates ultimate owners as to its highest parent. Here CICT represents both CICT Group, the owner of CATT (China Academy of Telecommunications Technology) and CICT Mobile, the owner of Datang Mobile. We listed companies that operate independently from their parent organizations such as NTT Docomo, a subsidiary of NTT, and Honor Devices, a subsidiary of Shenzhen Smart City, separately, while the Foxconn 5G portfolio includes patents both from its Sharp acquisition as well as its own 5G portfolio.

Table 1: Ranking of top 50 5G ultimate patent owner and standards contributing entities

Rank	Ultimate Owner	HQ	Ranking 5G declared patent families pending and granted	Ranking 5G declared patent families granted	Ranking 5G declared patent families granted (only 5G declared)	Ranking submitted technical 5G standards contributions
1	Huawei	CN	1	1	1	1
2	Qualcomm	US	2	2	2	4
3	Ericsson	SE	5	5	4	2
4	LG Electronics	KR	3	3	3	10
5	Samsung	KR	4	4	6	6
6	ZTE	CN	6	6	8	5
7	Nokia	FI	7	7	9	3
8	Oppo	CN	8	8	5	14
9	CICT (CICT Group and CICT Mobile)	CN	10	9	10	8
10	vivo Holdings	CN	11	10	7	12
11	NTT Docomo (in: NTT)	JP	15	12	12	11
12	Xiaomi	CN	9	11	11	20
13	Apple	US	12	14	13	16
14	Intel	US	17	18	16	7
15	MediaTek	TW	19	16	15	13
16	Lenovo	CN	14	19	18	15
17	InterDigital	US	16	17	20	17
18	NEC	JP	18	15	19	21
19	Foxconn	TW	13	13	14	36
20	Sony	JP	24	22	23	28

Rank	Ultimate Owner	HQ	Ranking 5G declared patent families pending and granted	Ranking 5G declared patent families granted	Ranking 5G declared patent families granted (only 5G declared)	Ranking submitted technical 5G standards contributions
21	ETRI Korea	KR	20	24	26	35
22	UNISOC	CN	27	27	24	34
23	KT Corporation	KR	22	21	27	45
24	Fujitsu	JP	26	25	25	42
25	Panasonic	JP	30	29	28	38
26	ASUSTeK	TW	28	26	22	55
27	Fraunhofer	DE	29	30	31	46
28	KDDI	JP	42	44	36	31
29	ITRI	TW	38	34	30	52
30	Alphabet	US	32	32	39	53
31	Philips	NL	34	35	31	61
32	Orange	FR	54	46	55	23
33	Deutsche Telekom	DE	55	47	51	30
34	Kyocera	JP	33	31	33	91
35	BlackBerry	CA	46	38	57	48
36	HTC Corporation	TW	31	28	32	104
37	TCL	CN	50	45	37	73
38	Mitsubishi Electric	JP	43	37	40	98
39	Vodafone	UK	73	64	58	26
40	Verizon	US	75	68	56	27

Rank	Ultimate Owner	HQ	Ranking 5G declared patent families pending and granted	Ranking 5G declared patent families granted	Ranking 5G declared patent families granted (only 5G declared)	Ranking submitted technical 5G standards contributions
41	China Mobile	CN	83	75	62	9
42	SK Telecom	KR	69	61	52	51
43	Innovative Technology Lab	KR	45	54	42	96
44	Cisco	US	73	65	55	44
45	Siemens	DE	54	48	62	75
46	AT&T	US	85	77	62	19
47	WILUS	KR	44	45	61	103
48	Thales	FR	84	76	62	32
49	Telecom Italia	IT	84	76	62	37
50	Honor Device	CN	25	23	21	193

When examining the regional distribution of ultimate patent owners' headquarters, the data underscores the dominance of Chinese companies, followed by those from Korea, the United States, and Europe (Figure 8). Japan holds a smaller share in comparison. The dominance of Chinese companies is even higher when considering 5G patent counts compared to 5G standards contributions.

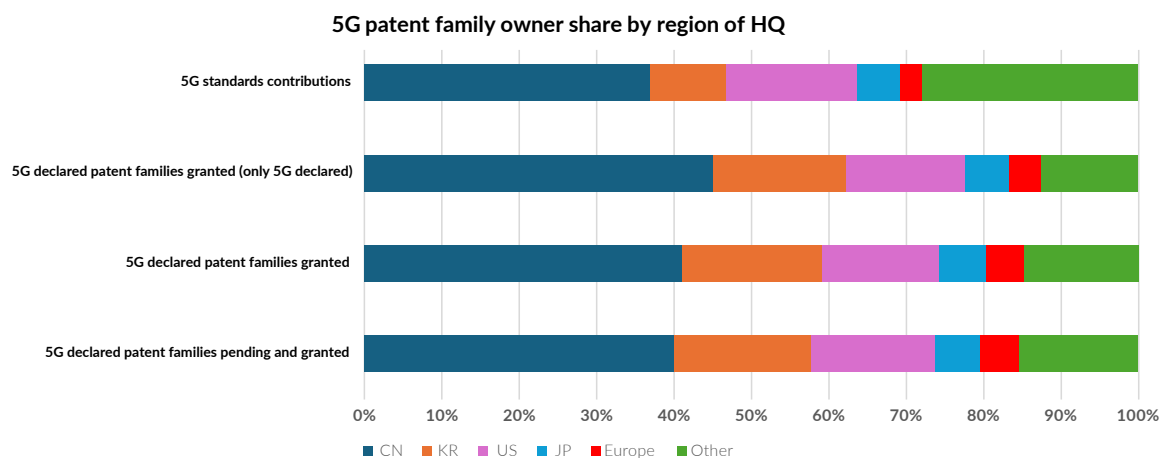


Figure 8: Share of 5G ultimate owners of declared patents and 5G standards contributors by region of headquarters.

Qualitative ranking of top 5G SEP owners

The value of patents, particularly SEPs, varies significantly depending on their scope and utility. While some SEPs encompass foundational technologies applicable across multiple generations of standards, others may cover incremental enhancements to niche features with limited practical use. Consequently, simply counting patent families may not accurately reflect the true value or enforceability of a patent portfolio.

A reliable indicator of a patent family's value is the extent to which other innovations build upon the technology it protects, and the breadth of protection deemed appropriate by its ultimate owner. The [Patent Asset Index](#) serves as a comprehensive measure of the innovative strength of a patent portfolio. This metric aggregates the Competitive Impact (average quality) scores of individual patent families within the portfolio, providing a relative value benchmark against other patents in the same technological domain.

Table 2 ranks the top 50 ultimate owners of 5G-declared patent families based on the Patent Asset Index. The results reveal notable shifts in rankings when compared to simple patent family counts. **Qualcomm** leads across all three 5G metrics, followed by **Huawei**, with **Samsung** moving up to third place. Significant rank advancements include **InterDigital**, which rose from 17 to 7, reflecting its focus on research and development (R&D) and SEP licensing. Similarly, the research lab of **Shanghai Langbo** advanced from 52 to 23, **Fraunhofer Institute** climbed from 27 to 24 and **TNO Netherlands** rose from 95 to 54— all emphasizing the strength of R&D-centric organizations.

Notably, businesses specializing in patent acquisition, monetization and enforcement, often referred to as Patent Assertion Entities (PAEs), show remarkable improvements in the Patent Asset Index rank. For example, **Pegasus Wireless**, which acquired 5G patents from **KT Corp**, moved from 74 to 34. **Longhorn IP**, which acquired 5G portfolios from **FG Innovation** and **Shanghai Langbo**, advanced its rank from 83 to 38 and **Key Patent Innovations**, which obtained a 5G portfolio from **Blackberry**, improved its position from 79 to 42. **5G IP Holdings**, which owns a former **FG Innovation** portfolio, climbed from 124 to 45. **IP Bridge**, which acquired 5G patents from **Huawei** and **Panasonic**, rose from 141 to 47. **NewRadio**, which owns 5G patents from **FG Innovation**, increased from 106 to 48. **IPCom**, which has its own R&D team to file 5G patents, increased from 127 to 53. **Advanced Standard Communication**, which acquired a portfolio from **ZTE**, increased from 82 to 55. **Atlantic IP**, which acquired 5G patents from **FG Innovation**, moved up from 80 to 66. **Vector Capital**, which obtained 5G patents from **Intel**, moved from 110 to 68. **G+ Communications**, which obtained 5G patents from **ZTE**, increased from 93 to 72 and **Brevet Capital Management**, the parent company of **Optis Wireless**, which acquired a 5G patent portfolio from **Ericsson**, improved its rank from 149 to 79.

These shifts underscore that applying a value-based metric like the Patent Asset Index to 5G-declared patent data alters the landscape, favoring R&D-driven companies and those with rigorous patent acquisition and monetization strategies. This approach highlights portfolios with higher value, providing a more meaningful assessment than raw patent counts alone.

Table 2: Ranking of top 50 5G ultimate patent owner, by Patent Asset Index

Rank	Ultimate Owner	HQ	Ranking Patent Asset Index of 5G declared patent families pending and granted	Ranking Patent Asset Index of 5G declared patent families granted	Ranking Patent Asset Index of 5G declared patent families granted (only 5G declared)
1	Qualcomm	US	1	1	1
2	Huawei	CN	2	2	2
3	Samsung	KR	3	3	3
4	LG Electronics	KR	4	4	4
5	Ericsson	SE	7	5	5
6	ZTE	CN	5	7	7
7	InterDigital	US	6	6	11
8	Nokia	FI	9	8	9
9	vivo Holdings	CN	11	10	6
10	Apple	US	8	9	10
11	Xiaomi	CN	10	11	8
12	CICT (CICT Group and CICT Mobile)	CN	14	13	12
13	Foxconn	TW	12	12	15
14	Oppo	CN	15	14	13
15	NTT Docomo (in: NTT)	JP	16	15	16
16	ASUSTeK	TW	18	17	14
17	Lenovo	CN	13	18	18
18	MediaTek	TW	17	16	17
19	NEC	JP	19	19	21
20	Sony	JP	20	20	20

Rank	Ultimate Owner	HQ	Ranking Patent Asset Index of 5G declared patent families pending and granted	Ranking Patent Asset Index of 5G declared patent families granted	Ranking Patent Asset Index of 5G declared patent families granted (only 5G declared)
21	Intel	US	21	21	19
22	ETRI Korea	KR	23	22	23
23	Shanghai Langbo	CN	24	25	22
24	Fraunhofer	DE	22	23	27
25	Honor Device	CN	27	24	24
26	Panasonic	JP	25	26	26
27	Fujitsu	JP	26	27	29
28	UNISOC	CN	29	31	25
29	Alphabet	US	28	28	34
30	KT Corp	KR	31	32	28
31	Philips	NL	34	34	30
32	Mitsubishi Electric	JP	36	35	36
33	HTC Corporation	TW	35	33	42
34	Pegasus Wireless	US	42	39	31
35	ITRI	TW	40	40	35
36	China Poly Group	CN	30	50	39
37	BlackBerry	CA	32	29	58
38	Longhorn IP	US	47	44	32
39	Kyocera	JP	41	41	43
40	Coolpad	CN	48	45	33

Rank	Ultimate Owner	HQ	Ranking Patent Asset Index of 5G declared patent families pending and granted	Ranking Patent Asset Index of 5G declared patent families granted	Ranking Patent Asset Index of 5G declared patent families granted (only 5G declared)
41	Hyundai Motor	KR	43	49	37
42	Key Patent Innovations	IE	33	30	75
43	Innovative Technology Lab	KR	49	52	41
44	Quectel	CN	50	54	40
45	5G IP Holdings	US	56	53	38
46	Cisco	US	54	47	46
47	IP Bridge	JP	44	42	66
48	NewRadio	CN	53	48	54
49	TCL	CN	59	56	45
50	KPN	NL	57	55	50

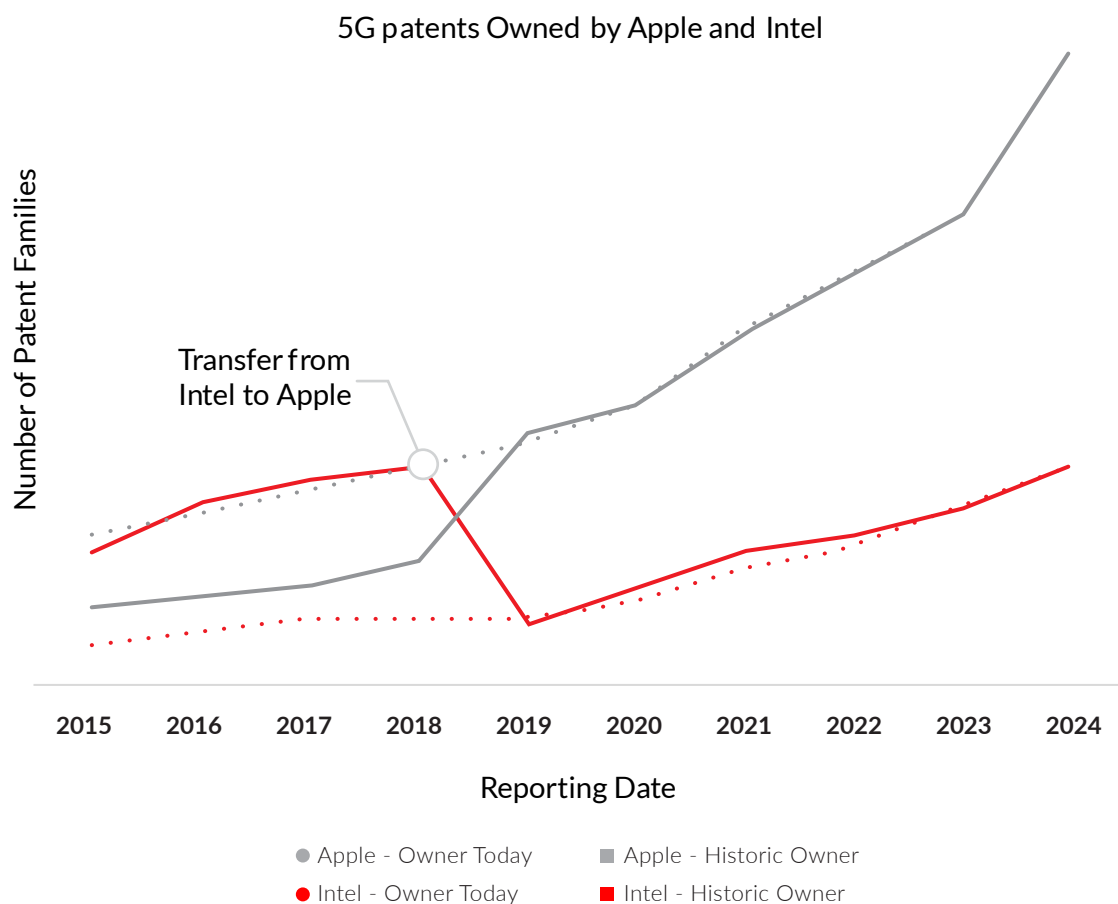
Bringing clarity to historical ownership data

SEP licensing is an ongoing process; license contracts typically expire every 3-5 years. Especially for a new technology generation, such as 5G, SEP owners and standards implementers must negotiate new contracts encompassing multiple generations, i.e., 3G, 4G, and 5G. These contracts also consider changes in the size of the active and granted patent portfolios. As patents expire or are lapsed, new patents may be granted. Additionally, patents may be acquired or sold. In some cases, acquisitions of whole companies can significantly alter the size of a 4G or 5G patent portfolio.

Reliable historical patent data is essential as deviations from actual ownership and legal status can significantly impact royalty rate calculations and potentially result in financial imbalances for licensors and licensees. At LexisNexis® Intellectual Property Solutions, we have a dedicated team of experts specializing in historical patent data, ownership records, and corporate hierarchy structures. This team meticulously monitors and timestamps every significant event within the evolving patent landscape, allowing users to retrospectively examine which patents were declared, active, or granted at any given moment, along with their ownership and corporate affiliations.

Between 2018 and 2023, 11% of the 4G and 5G portfolio became inactive, while a further 8% of patents changed ownership. Combined, this represents an 18% change in active portfolio size. Additionally, the portfolio has grown significantly with the addition of new patents, which now far exceed the number of active patents in 2018. As a result, the foundation upon which agreements were formed in 2018 has shifted substantially.

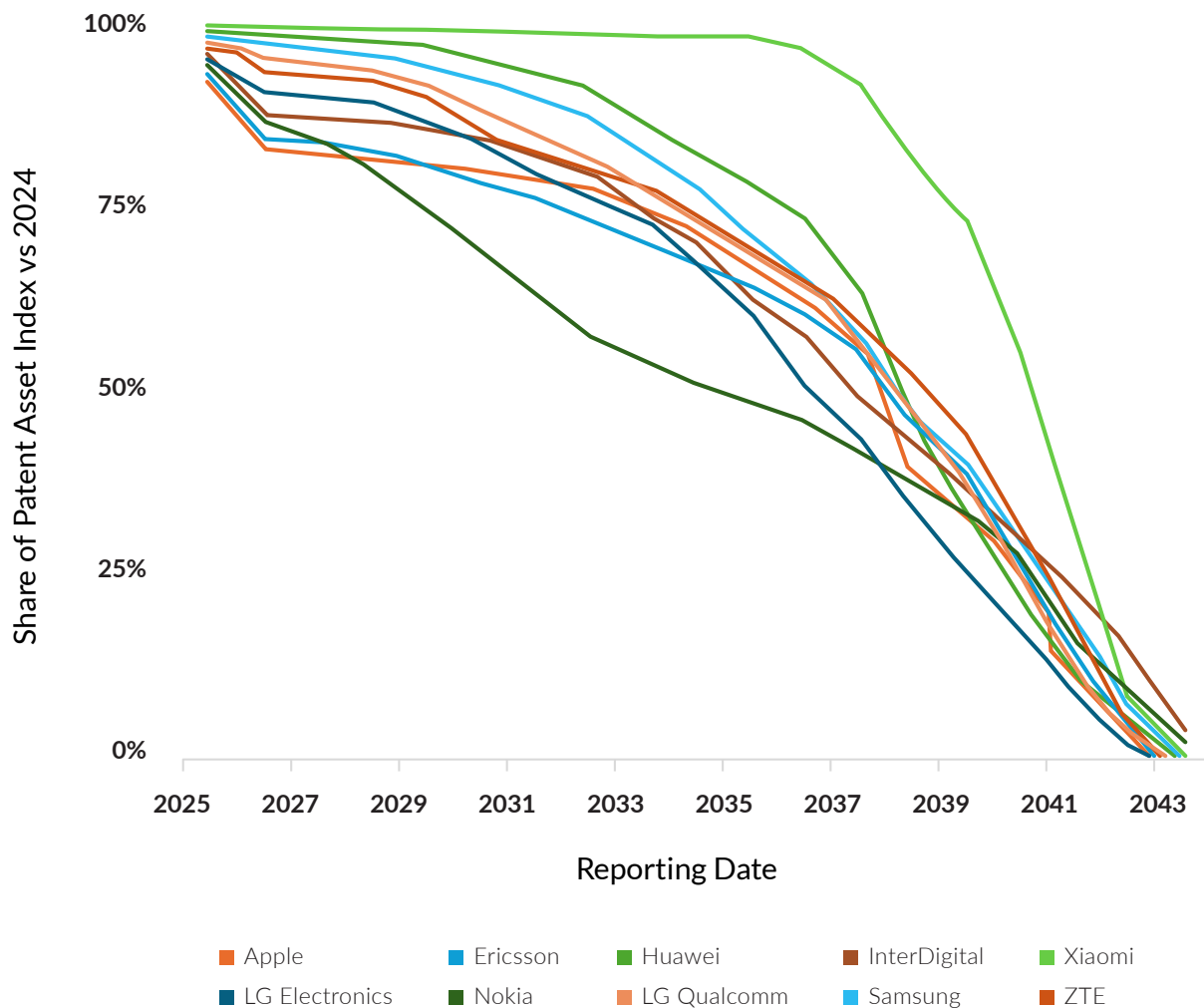
A widely known and reported transaction in this period was the sale of the Intel mobile modem business to Apple in 2019. Figure 9 displays the development of the two portfolios in terms of both the Owner as of today, the common way to analyze patents, and the assigned Ownership at each point in time, known as “Historic Owner”. This ownership concept aligns with historic business statistics like Revenue or Employee count.



Source: LexisNexis®

Figure 9: Development of the 4G and 5G portfolios of Apple and Intel over the past 10 years, by the ownership of the portfolios as of 2024, and the assigned ownership of the portfolios at each point in time - “Historic Owner”.

Examining the historical patent portfolios of 4G and 5G ultimate owners is as crucial as forecasting future trends. SEP licensing agreements often involve lump-sum payments and consider anticipated changes in a patent portfolio over time. Figure 10 effectively illustrates how declared 4G and 5G patent portfolios are projected to decrease in the coming years based on an annual calculation of expirations. This analysis does not predict new filings or patent ownership changes.



Source: LexisNexis®

Figure 10: Development of the portfolio of the top 10 5G and 4G patent holders, with forecasted patent expiration dates into the future.

Go beyond the ranking and gain access to 5G patent owner share data with **LexisNexis® IPlytics™** and **LexisNexis® PatentSight+™**.

Mastering SEP licensing challenges with high-quality data

Patent declaration databases provide critical insights into 5G patent ownership, serving as a foundational resource for stakeholders involved in patent licensing negotiations, patent commercialization, and patent pool formation. Access to comprehensive data on declared patents, pooled assets, and standards contributions is essential to navigate these processes effectively. SEP portfolios are inherently dynamic, evolving alongside advancements in patenting activity and the progression of standards. Understanding and calculating market share for a specific standard, such as 5G, requires a detailed analysis based on several key factors:

5G patent stack calculation:

- The denominator represents the total number of declared, active and granted 5G patents relevant to the standard in question.
- The numerator corresponds to the patent owner's specific 5G declared patent portfolio.
- Dividing the two figures above yields the 5G patent holder's share of the total 5G patent stack, providing a benchmark for comparison within the industry.
- The patent stack calculation can be based on the number of declared patents only or quality-adjusted via the Patent Asset Index.

These data points enable stakeholders to assess the value of patent portfolios available for licensing and prepare for FRAND negotiations. This approach also enables benchmarking SEP licensing offers against comparable agreements. In emerging verticals like IoT, where SEP licensing is still in its infancy, reliable, clean and validated 5G patent data becomes especially valuable. The lack of established reference points for FRAND rates in these industries necessitates robust data-driven analyses to guide licensing discussions and establish fair market practices for 5G-related technologies. 5G patent owners, as well as 5G standards implementers, benefit greatly by following a data-driven approach to solving challenges in the SEP licensing market.

Data-driven strategies for 5G patent owners

A comprehensive 5G patent landscape is critical for successful SEP licensing. The overarching objective for 5G patent owners is to maintain a robust SEP portfolio to support various strategies, including out-licensing to implementers, cross-licensing with other SEP owners, joining patent pools, or selling patents. Achieving this involves addressing several specific goals, which all require access to comprehensive 5G patent data:

1. SEP licensing strategy:

Licensing a 5G patent portfolio efficiently requires a data-driven approach to identify and classify patents for different commercialization approaches:

- Determine the most valuable and essential patents to include in an organization's licensing program.
- Identify essential patents that are better suited for patent pools.
- Spot patents for sale while ensuring that the remaining portfolio is sufficiently strong to meet other licensing and strategic objectives.

2. SEP portfolio development and pruning:

Managing and optimizing a 5G portfolio requires a data-driven process to answer the key questions:

- Which patents should be maintained, and which can be allowed to lapse?
- Are there gaps in the portfolio compared to competitors?
- How will the 5G portfolio develop over the next 5-10 years given the number of new filings and expiration of current assets?
- Does the patent portfolio align with the organization's broader strategy and goals?

3. SEP competitor monitoring:

Monitoring and evaluating a competitor's 5G patent portfolios require a data-driven process to answer key questions:

- How large, valuable, and essential are competitors' SEP portfolios?
- How does the organization's portfolio benchmark against those of competitors?
- How does the organization's portfolio compare to the overall patent landscape for the 5G standard?

4. Standards development monitoring:

Tracking standards development activities and aligning these with SEP filing strategies requires a data-driven process to answer key questions:

- Which standards are receiving the most contributions and R&D investment from the organization? How does this compare to competitors' contributions?
- Do these efforts align with the organization's defined technology standards strategy and long-term goals?

By addressing these objectives following a data-driven approach, SEP owners can ensure their portfolios remain strategically positioned to maximize value, support innovation, and maintain a competitive edge.

Data-driven strategies for 5G standards implementers

Manufacturers and providers of 5G standard-compliant products and services must be prepared to address royalty demands from patent holders and patent pools related to SEPs. The primary objective for standards implementers is to manufacture and sell products that incorporate the latest 5G standardized technologies while minimizing legal risks and avoiding excessive royalty costs. Achieving this goal requires addressing several critical areas:

1. Legal risks mitigation:

Standards implementers must identify and manage legal risks associated with using technologies covered by SEPs (Standard Essential Patents). This involves a data-driven approach to:

- Determining which standards integrated into their products are subject to SEPs.
- Identifying the total number of ultimate owners holding 5G patents.
- Assessing which 5G patent owners or patent pools are likely to seek royalties.
- Estimating the aggregate royalty payments required for 5G.
- Investigating past litigation involving 5G patents to assess potential risks.

2. Clear view of the 5G licensing landscape:

A deep understanding of the licensing market is essential for informed decision-making and effective negotiations. This involves a data-driven approach to:

- Analyze the proportion of patents covered by a specific patent pool for a given standard.
- Identifying patent holders who are members of a pool and those who are not.

Tracking changes in patent ownership to monitor if patents are being acquired by Patent

- Assertion Entities (PAEs), which could increase enforcement risks.

3. Patent quality evaluation:

A comprehensive assessment of patent quality helps implementers better understand the scope and value of SEPs. This involves a data-driven approach to:

- Reviewing the geographical coverage of patents related to the standards they implement.
- Analyzing the legal status of these patents, such as whether they are active, expired, or pending.
- Assessing the essentiality and value of patents to determine their significance within the standard.

By addressing these areas, standards implementers can reduce exposure to legal risks and manage SEP royalty obligations effectively.

Author's comment

The application of 5G SEPs in the mobile sector is rapidly expanding into other industries, presenting both opportunities and challenges for SEP owners and standards implementers alike. For IP professionals, it is vital to anticipate future business needs over the next two, five, and ten years and to ensure that their patent licensing strategy is well-positioned to support these objectives.

This requires a scientific approach to developing, evaluating, and analyzing 5G patent portfolios and understanding competitive landscapes across diverse industries. Access to reliable, well-curated data on patent declarations, pools, and standards contributions is critical for gaining insights into patent ecosystems and assessing the value of 5G portfolios when licensing, joining pools, or engaging in SEP transactions.

Proactivity is key—staying ahead of trends and preparing for future challenges will ensure success, while a reactive approach risks falling behind in an increasingly dynamic and competitive environment. Key considerations include:

- **Active monetization:** Patent holders are likely to aggressively monetize and enforce their SEP portfolios related to 5G standards in this dynamic, high-stakes environment.
- **Complex SEP landscape:** Negotiating within the complex SEP environment will be a major challenge for 4G and 5G adoption beyond smartphones. Both SEP owners and implementers must manage operational and financial risks while maximizing the value of 5G technologies.
- **Lack of reliable databases:** While ETSI maintains the world's largest cellular patent declaration database for 3G, 4G and 5G, the lack of data quality can lead to biased results underrepresenting certain 5G portfolios in the market. A validated 5G patent database is key to understand the magnitude of worldwide declared patent portfolios, allowing a data driven approach to patent licensing and patent portfolio management.
- **Correlation with standards contributions:** Rankings based on standards contributions often correlate with patent rankings, making them valuable for competitive intelligence and as another reference point in SEP licensing negotiations.
- **5G patent value analysis:** 5G patent rankings can shift significantly when incorporating value-based metrics like the Patent Asset Index. Although it does not predict essentiality, the Patent Asset Index offers a deeper perspective by assessing the quality and impact of patents, moving beyond simple patent family counts.

About the Authors



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Tim currently serves as Managing Director Americas and the Director of SEP Analytics at LexisNexis® Intellectual Property Solutions, following the acquisition of IPlytics by LexisNexis® in 2022. Previously, Tim founded IPlytics and served as its CEO for ten years. Tim earned his doctoral degree with the highest distinction from the Berlin Institute of Technology, where his dissertation focused on patenting and coordination in standardization. He subsequently worked as a post-doctoral researcher and consultant for the Law and Economics of Patents Group at CERN, MINES ParisTech.

As an economist and consultant, Tim identified a significant challenge: standards databases for technologies such as 4G, 5G, Wi-Fi, HEVC, and VVC lacked meaningful connections with comprehensive global patent databases. Recognizing the need to keep pace with the next technological revolution, Tim founded IPlytics with the vision of revolutionizing how IP professionals approach patent and standards data. IPlytics is the first market solution to integrate comprehensive SEP data, patent pool data, and technical standards and contribution data, providing industry-leading analysis on the past, present, and future of standards-essential technology. Unlike overly complex tools, IPlytics offers fast, intuitive access to patents and standards, empowering users to strategically align their patent portfolios, protect innovations, and proactively engage in continuous strategic portfolio development. This includes initiatives such as licensing, acquisitions, joining patent pools, and understanding the competitive landscape.

Tim has actively contributed to empirical studies for the European Commission, the World Intellectual Property Organization, and the German federal government on declared patents, standards contributions, patent transfers, and patent pooling behaviour. He is a recognized thought leader, panel speaker, and adjunct lecturer on Standard Essential Patents (SEPs), FRAND licensing, patent pools, and advanced patent intelligence. Tim has authored several peer-reviewed journal articles, as well as articles for Managing IP, IPWatchdog, and IAM Magazine. Additionally, he has contributed to some of the most-read industry reports for IAM Media.



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Marco Richter is Managing Director EMEA & South Asia and Director of IP Analytics and Strategy for LexisNexis Intellectual Property. Marco has more than 15 years expertise in the intellectual property space, initially working in the IP consulting business running projects for DAX 30 and Fortune 500 companies. He built the Data Harmonization Team and created the Consulting & Customer Success Team for PatentSight. He also actively drove the transformation of the German-based PatentSight start-up into a global software provider and played a key role in migrating the PatentSight application into the LexisNexis® Intellectual Property Solution's SaaS and DaaS offering. He has strong ties to academia and international patent offices and is actively engaging with IP leaders and practitioners. Marco is known for his extraordinary customer focus, embracing continuous change and development to find new opportunities to deliver better outcomes for the innovation community.



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Magnus Buggenhagen is a principal consultant at LexisNexis® Intellectual Property Solutions with expertise in patent analytics, standard essential patents, and standardization. His expertise has been honed through years of dedicated work, collaborating with prominent global enterprises to unravel the intricacies of patent landscapes and portfolios. His in-depth knowledge of standard essential technologies, combined with his holistic approach to patent evaluation, has positioned him as a go-to consultant for leading industry players seeking effective patent and standardization strategies, portfolio management, and informed decision-making. He has an economics background focused on innovation and standardization and experience in the consultancy and venture capital industry. Furthermore, he is an external researcher at the Technical University of Berlin.

About LexisNexis® IPlytics™

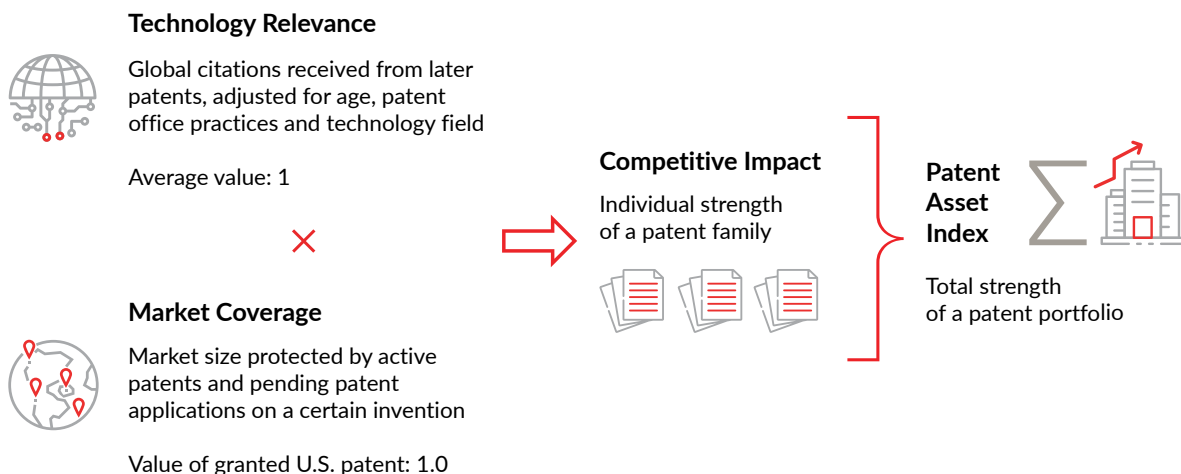
LexisNexis® IPlytics is a dynamic platform of patent and standardized technology intelligence, offering comprehensive insights and data-driven intelligence in standards-essential technologies. Built to address the intricate intellectual property landscape, IPlytics equips businesses, innovators, and decision-makers to navigate and excel in a rapidly evolving and highly competitive marketplace. The platform offers industry-leading analysis into the past, present, and future of standards-essential technologies providing fast, intuitive access to standard essential patents (SEPs), standards contributions, and standards documents. IPlytics empowers patent professionals to better understand the SEP landscape, align strategies and to make evidence-based and value-creating decisions in portfolio management and optimization, licensing, due diligence and joining patent pools. The platform's AI-based algorithms help to predict the essentiality of patent claims and standards sections as well as a patent portfolio's value for standardized technologies.

About LexisNexis® Intellectual Property Solutions

LexisNexis Intellectual Property Solutions brings clarity to innovation for businesses worldwide. We enable innovators to accomplish more by helping them make informed decisions, be more productive, comply with regulations, and ultimately achieve a competitive advantage for their business. Our suite of search, workflow and analytics solutions (LexisNexis TotalPatent One®, LexisNexis PatentAdvisor®, LexisNexis PatentOptimizer®, LexisNexis® PatentSight+™, LexisNexis® IPlytics™, LexisNexis® Classification, LexisNexis® TechDiscovery and LexisNexis® IP Data Direct) enables companies to be more efficient and effective at bringing meaningful innovations to our world. We are proud to directly support and serve these innovators in their endeavors to better humankind.

About the Patent Asset Index

The Patent Asset Index represents a measure of the innovative strength of a patent portfolio. A patent family is more valuable when other innovations build on the technology protected by this patent family and by the scope of protection that the patent family holder considers appropriate.



Ernst, H., Omland, N. (2011): The Patent Asset Index - A New Approach to Benchmark Patent Portfolios. World Patent Information 33, pp. 34–41.

Technology Relevance is a measure of the importance of a patent family and the technological invention it protects. It is calculated based on the total number of worldwide citations that are received from other patent families and is adjusted for the facts that (1) older patents are cited more often, on average, than younger patents; (2) international patent offices follow different citation rules; and (3) different citation practices are prevalent in different technology fields.

Market Coverage is measured as the size of the markets in which a patent family is protected, as benchmarked against the world's largest economy—the United States. In this context, the gross national income (GNI) of a country is used as a proxy for the relative size of its national market. Market Coverage is calculated based on granted and pending patents, adjusted for the patent family's protected market size.

Competitive Impact represents the individual strength of a patent family and is obtained by multiplying the Technology Relevance and the Market Coverage of each patent family. It is stated relative to the other patent families in the same field. For example, a value of three means that the patent family is three times as important as the average patent family in the field. The value obtained by adding up all the Competitive Impact values of all patent families constituting the portfolio is defined as the Patent Asset Index, which measures the overall strength of a patent portfolio.

The Patent Asset Index methodology is based on many years of scientific research and was validated in peer-reviewed academic publications and studies. Our patent analytics platform, LexisNexis® PatentSight+™, featuring the Patent Asset Index, has been used for several years by leading companies in many industries, as well as governmental bodies and organizations, e.g., in antitrust consideration or merger clearances. Numerous companies trust the Patent Asset Index to illustrate the strength of their patent portfolios in annual shareholder reports and other stakeholder communications.

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