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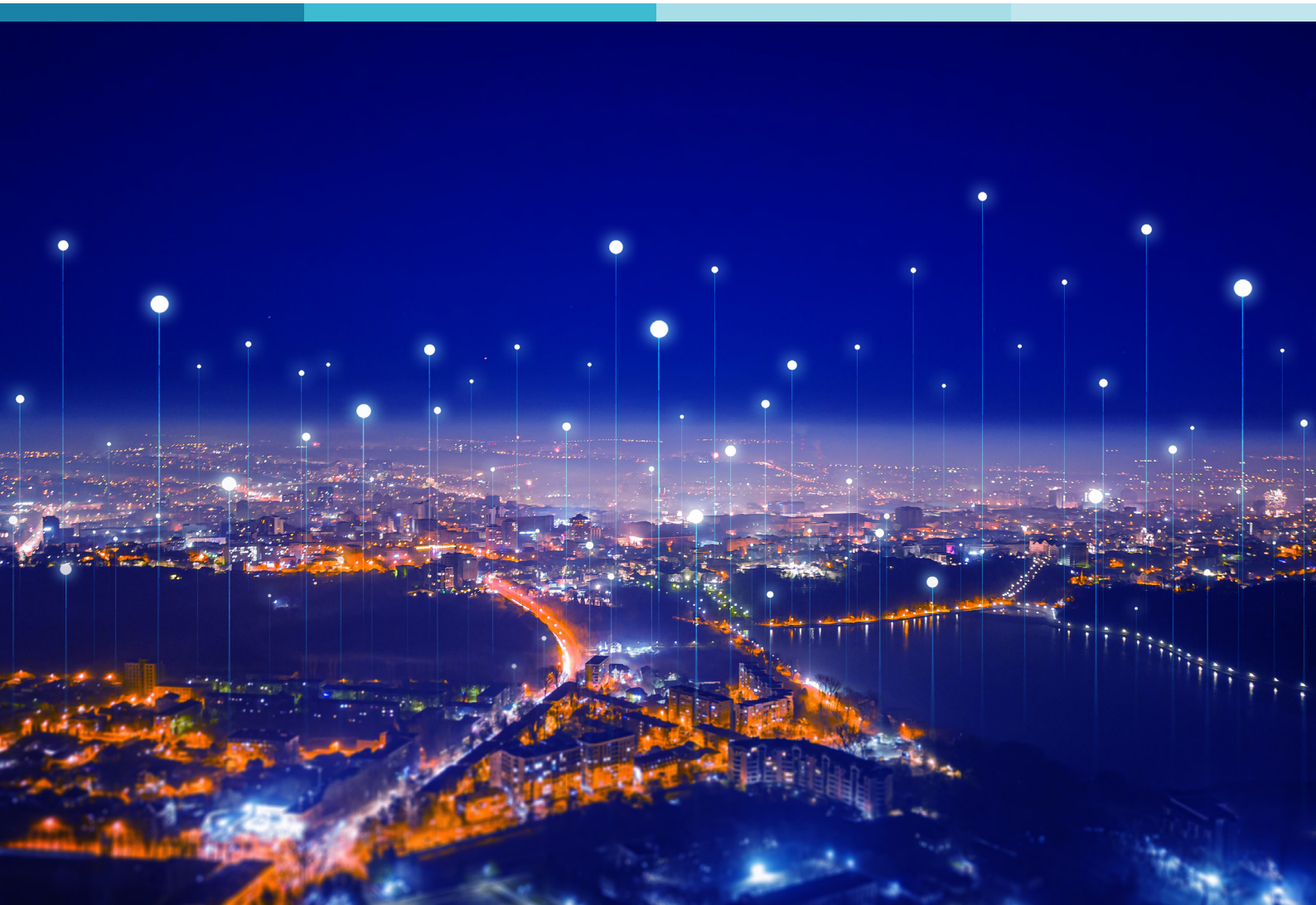
5G Standard Essential Patents

Key findings for facilitating 5G licensing negotiations globally - Q3 2023

Lite version



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Introduction

The mass adoption of 5G technology means it is becoming increasingly sensitive to cost and availability.

To ensure fair competition and to foster continued advancements within the telecommunications sector, it is crucial to have transparency around the true number of Standard Essential Patents (SEPs) owned by each company. This is particularly important given the rise in essential patents declared to standards bodies or Standards Developing Organisations (SDOs).

Many companies own SEPs they claim are 'essential' to wireless telecom standards. However, not all patents are truly essential. There's a great deal of uncertainty about which of the declaring companies own essential patents and which have the dominant share.

We carried out a technical evaluation of a large sample of patents declared essential to 5G. Our engineers and experts reviewed and determined which of the declared patents are essential. In doing so, we found that the essentiality percentage is substantially different between patent owners.

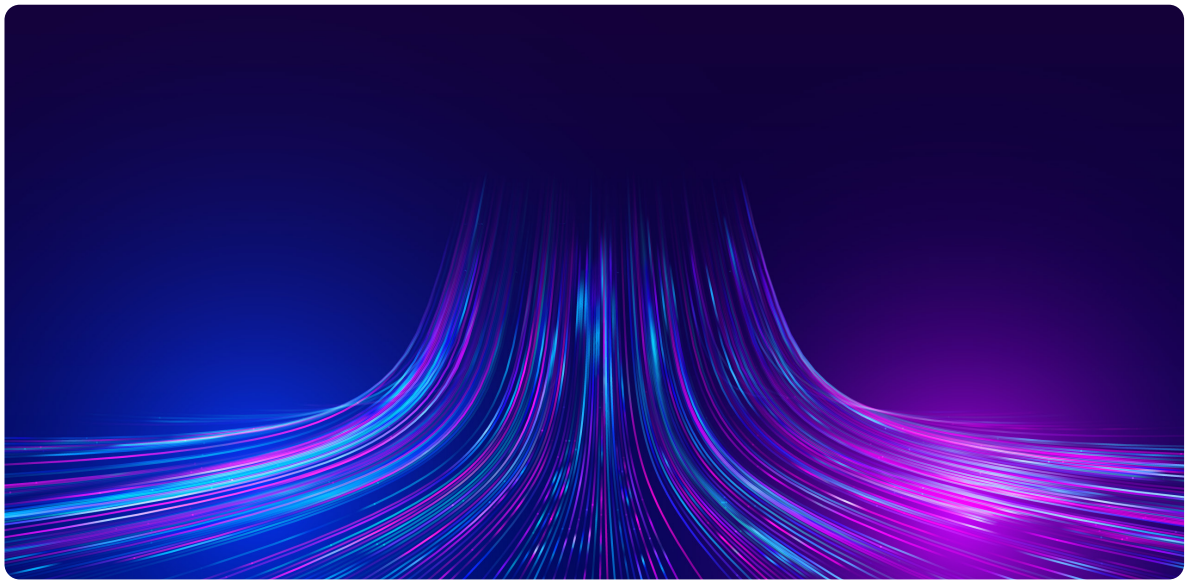
Our approach

Our evaluation methodology is based on a deep understanding of wireless specifications gained from developing handsets and infrastructure and working alongside patent attorneys.

This manual review approach, together with a robust sampling method, differentiates us from other 5G patent reports on the market. Manual reviews conducted on raw patent data pulled from ETSI by our engineers and experts enable us to identify patents that are truly essential to the technical standards. This provides a more accurate picture of the overall 5G SEP landscape and individual company 5G SEP share.

We found that portfolios with many declared patents but a small essentiality percentage may have fewer essential patents than portfolios with fewer patents but a higher essentiality percentage. Therefore, the number of declarations is a poor measure of the number of essential patents in a portfolio.

This document summarises some of the results of our analysis and conclusions relevant to licensors and licensees of 5G technology. Our full report (see page 15 for details) provides conclusions on the estimated number of essential patents in the universe, and for each patent holder. It's a benchmark that brings transparency to the true number of essential patent families.



Key findings

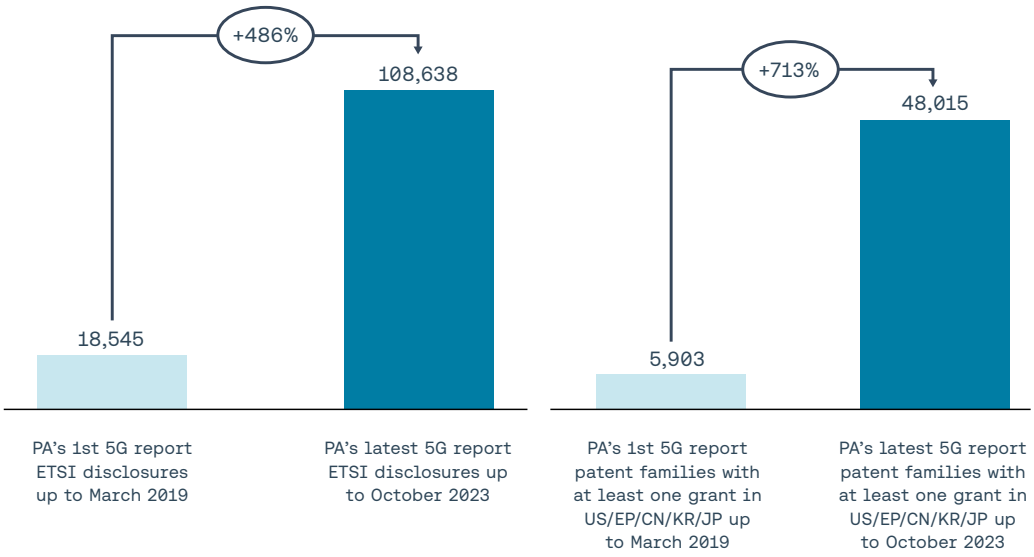
Our study reveals there has been a significant increase in the submission of patent declarations related to 5G technologies, resulting in a notable upswing in total potentially essential patents.

There is also considerable variation in the relative holding of essential patents, which represents a level of uncertainty in the domain for both SEP licensors and licensees.

Patent declarations grow exponentially, but the essentiality percentage decreases

In our latest report, we identified 108,638 unique patent disclosures relevant to 5G and made to the European Telecommunications Standards Institute (ETSI) up to 18 October 2023. Out of these disclosures, we identified 48,015 ETSI families with at least one granted patent in the world's five largest patent jurisdictions: US/EP/CN/KR/JP. This represents an eight-fold increase since we released our first 5G Standard Essential Patent (SEP) IPR report in November 2019.

Figure 1: Growth in the number of patent declarations to ETSI and identified patent families with at least one grant in US/EP/CN/KR/JP.



Out of the declared ETSI patent families with at least one grant up to October 2023:

- The 10 largest patent holders collectively hold approximately 78 percent of the identified 5G patent universe.
- The 30 middle patent holders collectively hold over 20 percent of the identified 5G patent universe.
- The remaining patent holders collectively hold over 1 percent of the identified 5G patent universe.

Further technical analysis by our experts shows:

- The actual number of essential patents is substantially lower than the number of declared, granted 5G patents.
- The overall 5G essentiality percentage is higher than that for 3GPP LTE standards, based on our previous generation of SEP reports.
- However, the 5G essentiality percentage has reduced substantially over time (compared to the ratio identified in previous versions of our 5G SEP report).

More declarations don't always translate into more granted patents

The table below includes a list of companies that declared patents and applications to ETSI, showing that a considerable number of applications have not been granted yet. Uncertainty in the number of applications that will eventually be granted means the actual number of granted patents can be significantly lower than the declarations.

Our engineers and experts conducted manual technical reviews on the patents to get an accurate assessment of essential patents. Given the large number of patent families declared as potentially essential to 5G ETSI Technical Specifications, an exhaustive analysis of all declared patent families was not practical. So we followed a stratified sample-based approach for the SEP essentiality patent ranking by performing technical reviews on each declaring company.

We identified inventions as disclosed to ETSI and evaluated them for technical essentiality. We mined patents declared to 5G relevant specifications and projects. We split the declaring companies into groups based on the number of declared ETSI patent families, with at least one granted patent in the jurisdiction of US/EP/CN/KR/JP.

Next, we carried out the essentiality analysis, scoring each patent. This meant determining whether any of the independent claims of the patent read onto normative parts of the 5G Technical Specifications. The team assessed the independent claims of each patent, being scored as technically essential when at least one of the independent claims was found to be essential. For each assessed patent, we give a rank from one to four, with one being potentially essential to the technical standards, and four being not relevant by domain. We carried out peer review processes to ensure consistency of scoring principles and accuracy of claims mapping.

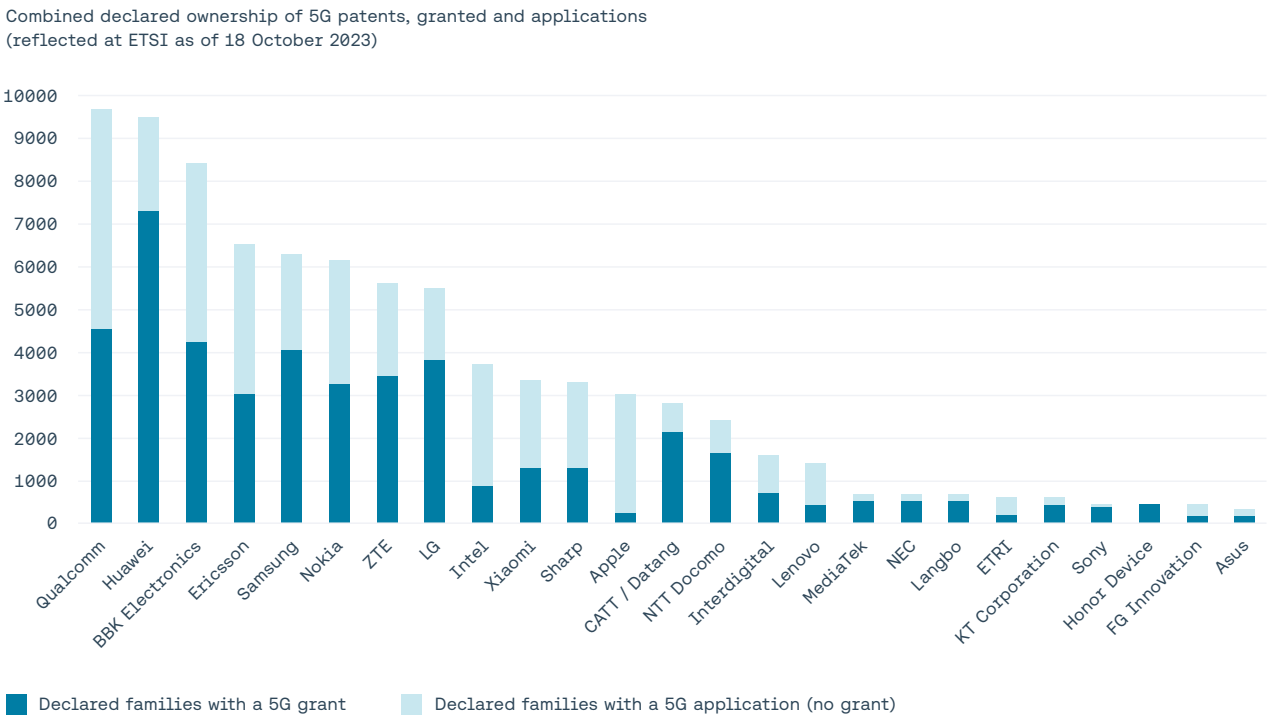
Table 1: Declared ownership of families with 5G patents and patent applications (declarations made to ETSI until 18 October 2023)

Declaring company	Number of declared families	Declared families with a 5G grant in US / EP / CN / KR / JP	Declared families without granted members in US / EP / CN / KR / JP
Qualcomm	9662	4552	5110
Huawei	9450	7284	2166
BBK Electronics	8387	4235	4152
Ericsson	6494	3028	3466
Samsung	6257	4034	2223
Nokia	6144	3292	2852
ZTE	5590	3448	2142
LG	5474	3800	1674
Intel	3727	886	2841
Xiaomi	3326	1289	2037
Sharp	3296	1318	1978
Apple	2984	243	2741
CATT / Datang	2811	2119	692
NTT Docomo	2381	1639	742
Interdigital	1546	681	865
Lenovo	1344	425	919
MediaTek	683	512	171
NEC	669	533	136
Langbo	658	559	99
ETRI	581	209	372
KT Corporation	564	444	120
Sony	440	395	45
Honor Device	430	425	5
FG Innovation	399	165	234
Asus	300	224	76
Panasonic	237	144	93
UNISOC / Spreadtrum	228	193	35
Fujitsu	217	179	38
HTC	208	208	

Declaring company	Number of declared families	Declared families with a 5G grant in US / EP / CN / KR / JP	Declared families without granted members in US / EP / CN / KR / JP
Fraunhofer	206	120	86
Google	199	173	26
Innovative Technology Lab	188	66	122
Wilus Group	179	36	143
Kyocera	131	125	6
ITRI	117	114	3
Blackberry	104	102	2
Transsion	92	22	70
Convida	89	67	22
KDDI Corporation	87	23	64
Philips	84	56	28
Siemens	77	72	5
Mitsubishi	64	63	1
Coolpad	49	49	
TCT Mobile	47	35	12
Orange	40	40	
Sun Patent Trust	39	39	
Deutsche Telekom	37	35	2
Hyundai	37	15	22
KPN	36	35	1
Innovative Sonic	34	33	1
Sierra Wireless	30	23	7
IPCom	25	18	7
Optis Wireless	24	24	
Thales	23	20	3
Institute For Information Industry	19	18	1
Voiceage	16	16	
Acer	15	15	
Cloudminds	14	14	

Declaring company	Number of declared families	Declared families with a 5G grant in US / EP / CN / KR / JP	Declared families without granted members in US / EP / CN / KR / JP
Godo Kaisha IP Bridge 1	14	14	
Quectel	11	11	
SK Telecom	10	9	1
HMD Global	8	8	
Cisco	8	8	
Toyota	7	1	6
Wistron Corporation	6	6	
Verizon	6	5	1
National Instruments	4	4	
Unwired Planet International	3	3	
Dell	3		3
Lite-On	2		2
Comba	2	2	
Vodafone	2	2	
Anirudh Singh	2	1	1
Telecom Italia	2	2	
Texas Instruments	2	2	
Sisvel	1	1	
Polaran	1	1	
3G Licensing	1	1	
General Dynamics	1	1	
U-Blox	1	1	
Denso	1		1
Teleste Oyj	1	1	
Rakuten	1		1

Figure 2: Combined declared ownership of families with 5G patents and applications (reflected at ETSI as of 18 October 2023) for top 25 declaring companies



We carried out an updated landscape view of current patent ownership as of October 2023. The table below highlights the number of 5G families with granted patents owned per company.

Table 2: Updated current ownership of families with at least one 5G grant

Updated Assignee	5G families with granted patents
Huawei	7525
Qualcomm	4544
BBK Electronics	4269
Samsung	3946
LG	3798
ZTE	3383
Nokia	3263
Ericsson	3049
CATT / Datang	2125
NTT Docomo	1638
Xiaomi	1252
Sharp	1225
Apple	771
Interdigital	690
NEC	528
MediaTek	511
Langbo	489
KT Corporation	447
Lenovo	425
Sony	416
Intel	361
ETRI	245
Honor Device	232
Asus	224
HTC	207
FG Innovation	198
UNISOC / Spreadtrum	193
Fujitsu	180
Google	174
Panasonic	143

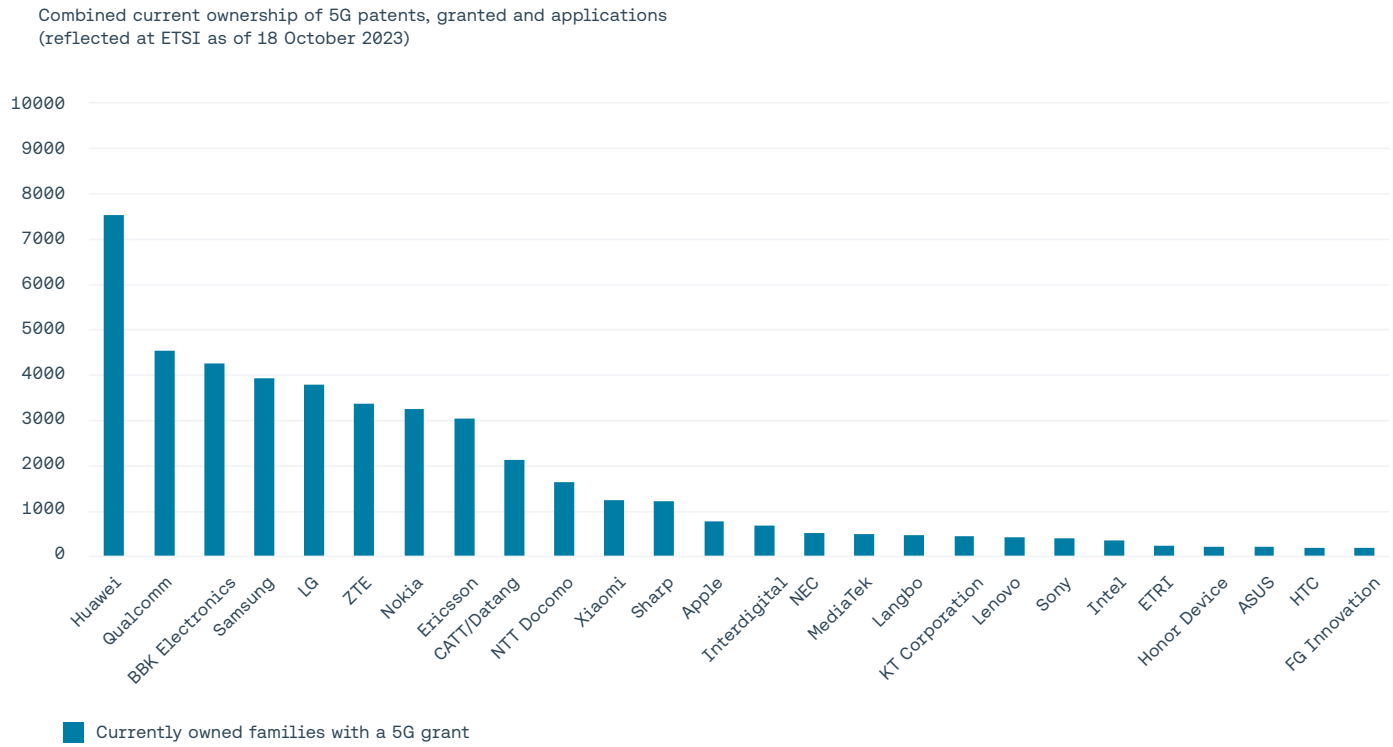
Updated Assignee	5G families with granted patents
Kyocera	125
ITRI	114
Fraunhofer	105
Philips	93
Siemens	78
Mitsubishi	63
Innovative Technology Lab	57
OT Patent	57
Coolpad	49
Blackberry	44
Orange	42
Sun Patent Trust	38
Korea Advanced Institute of Science & Technology (KAIST)	37
Deutsche Telekom	36
TCL Communication	35
KPN	35
Innovative Sonic	32
Longhorn IP	30
Convida	28
Wilus Group	27
Semtech / Sierra Wireless	23
KDDI Corporation	22
IP Bridge	19
IPCom	18
Institute For Information Industry	18
Telit Cinterion Deutschland	17

Updated Assignee	5G families with granted patents
Optis Wireless	16
Cisco	16
Acer	15
Voiceage	14
Cloudminds	14
G+ Communications	14
Hyundai	14
Broadcom	13
Transsion	13
Quectel	12
SK Telecom	11
Gionee	9
Unwired Planet International	9
Tahoe Research	8
HMD Global	8
Sisvel	7
MiiCs & Partners	7
Crystal Clear Codec	6
5g Ip Holdings	6
Wistron Corporation	6
Eight Deer Ventures	5
Verizon	5
Malikie Innovations	5
Hedwig Wireless	5
Toyota	5
Apex Beam Technologies	5
National Instruments	4
Thales	4
Munitech	3
JVC Kenwood	3

Updated Assignee	5G families with granted patents
Shanghai Qiyu	3
3G Licensing	3
Denso	3
Wireless Future Technologies	3
Amazon	3
Vodafone	2
Telecom Italia	2
Zhigu	2
Comba	2
Cluster	2
AT&T	2
Intellectual Discovery Co	2
Texas Instruments	2
Daingean Technologies	2
Wsou Investments LLC	2
China Mobile	1
Hitachi	1
Fortress Investment	1
Daedalus Prime	1
Polaran	1
Coranci LLC	1
Stingray IP	1
Kia Corporation	1
University of Sherbrooke	1
Methode Electronics	1
DiDi	1
Han Hee	1
Canon	1
Anirudh Singh	1

Updated Assignee	5G families with granted patents
Kingsoft	1
Teleste Oyj	1
U-Blox	1
SiBeam	1
Aisin	1
FuRyu	1
Rfinity	1
RPX Corp	1
Hubbell	1
Cambridge Positioning Systems	1
Conversant	1

Figure 3: Current ownership of families with 5G patents and applications (reflected at ETSI as of 18 October 2023) for top 25 patent owners



Access our full findings

In our full 5G report, we provide a detailed analysis of the number of essential patents held by each patent holder, as well as the mapping of their portfolios to technology features and standards.

The report provides access to the full database of thousands of patent reviews in their entirety.

You can obtain a transparent view of essential 5G patents and full details of essentiality, with features of the patent portfolio of each holder, by subscribing to the full 5G IPR report. Available under licence. By enabling a comprehensive understanding of the evolving strengths within each licensor's declared patent portfolios, these findings play an important role in aiding 5G SEP licencing negotiations around the world.

Request full 5G report

If you have any further questions on our findings or methodology, please reach out to us.

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Produced by Design Studio at PA
8_364550 January 2024.