

Landscape Analysis of Declared 5G Patent Families (as of October 18, 2022)

We have conducted a landscape analysis of the patent families with at least one patent application or patent that has been declared to standardisation organisations such as the European Telecommunications Standards Institute as essential to 5G. The main purposes of this analysis include establishing: (1) the number of declared 5G patent families of each patent holder, and (2) whether the number of the declared 5G patent families of each patent holder is still increasing. The information of the declared patent families is useful to capture the overall trend of 5G standardisation activities. We collected the declared 5G patent family data, which was available as of October 18 2022 from the IPlytics platform in view of Technical specifications (TS)/Technical reports (TR) related to 5G. More specifically, we collected the declared 5G patent family data by selecting “5G”, “5G/4G”, “5G/4G/3G”, or “5G/4G/3G/2G” as the technology generation.

Figure 1 shows the number of 5G patent families from January 2017 to September 2022. The blue area shows declared 5G patent families by quarter. The red line shows granted 5G patent families that have at least one granted patent as of October 18 2022. Some of the patent applications in the declared 5G patent families become granted patents over time. In each dot in the red line, we determined whether the declared 5G patent families in each quarter have at least one granted patent as of October 18 2022, rather than as of each quarter.

The substantial rise in declared 5G patent families started from around Q4 2017, and the number has grown continuously since then. This is mainly because the initial launch of 3GPP Release-15, which is a major release with respect to 5G technology, was frozen around Q4 2017 to Q1 2018. It was the first 3GPP release containing the full set of 5G standards.

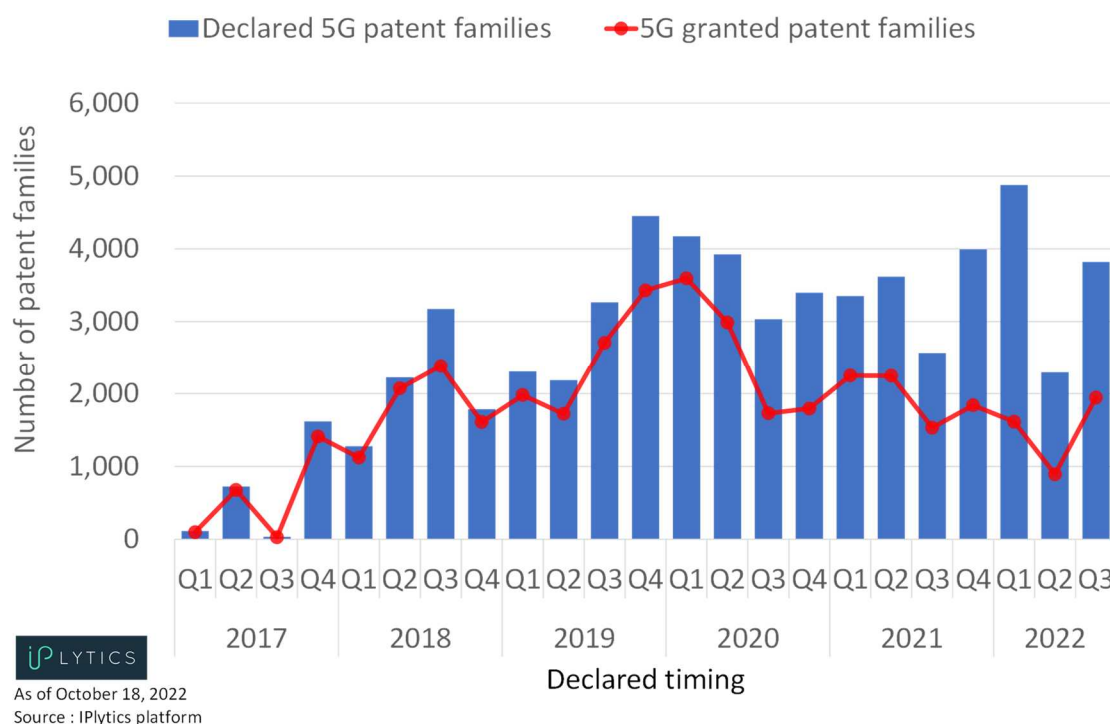


Figure 1: Number of declared 5G patent families in each quarter

Figure 2 shows the distribution of the published regions of the declared 5G patent families. China and US are the most popular published countries of declared 5G patent families, followed by EPO.

Published region	Number of declared 5G patent families*
CN	39,529
US	38,320
EP	30,393
KR	15,554
JP	15,239
TW	3,789
BR	3,083
AU	3,042
CA	2,878

As of March 18, 2022 | Source: IPlytics platform

*: both granted patent families and un-granted patent families

Figure 2: Published region of declared 5G patent families

Figure 3 shows the number of declared 5G patent families in each of the top 3 regions (China, US, and EPO) declared by the top 20 companies in terms of the number of declared 5G patent families. We used the same ranking order of the top 20 companies in Figure 4 when generating Figure 3. We integrated Nokia’s data with that of its subsidiary Alcatel-Lucent.

Huawei has the highest number of declared 5G patent families in each of China, US and at the EPO.

Declaring company name	Published regions of declared 5G patent families*					
	CN		US		EP	
	number	share	number	share	number	share
Huawei Technologies	8,163	20.7%	6,099	15.9%	5,770	19.0%
QUALCOMM	4,099	10.4%	5,153	13.4%	3,981	13.1%
Samsung Electronics	2,704	6.8%	4,504	11.8%	2,888	9.5%
LG Electronics	1,761	4.5%	4,056	10.6%	1,858	6.1%
ZTE	3,606	9.1%	1,499	3.9%	1,400	4.6%
Nokia Group	1,785	4.5%	2,624	6.8%	2,485	8.2%
Ericsson	1,441	3.6%	2,150	5.6%	2,158	7.1%
Catt	2,448	6.2%	781	2.0%	792	2.6%
Guangdong Oppo Mobile Telecommunications	2,138	5.4%	1,357	3.5%	1,243	4.1%
Xiaomi	1,980	5.0%	748	2.0%	494	1.6%
Vivo Mobile Communication	1,824	4.6%	862	2.2%	754	2.5%
Sharp	1,183	3.0%	1,288	3.4%	932	3.1%
NTT DOCOMO	1,413	3.6%	1,382	3.6%	1,389	4.6%
Apple	419	1.1%	645	1.7%	348	1.1%
Lenovo	467	1.2%	459	1.2%	439	1.4%
InterDigital	562	1.4%	644	1.7%	595	2.0%
Intel	277	0.7%	485	1.3%	288	0.9%
NEC	323	0.8%	480	1.3%	397	1.3%
MediaTek	546	1.4%	567	1.5%	232	0.8%
Fg Innovation	351	0.9%	393	1.0%	332	1.1%
Total**	39,529	-	38,320	-	30,393	-

As of March 29, 2022 | Source: IPlytics platform

*: both granted patent families and un-granted patent families

** : the total number not just from the top 20 companies but from others too

Figure 3: Published region of declared 5G patent families by company

Figure 4 shows the top 20 companies in terms of the number of declared 5G patent families (see column A), the number of granted 5G patent families (see column B), and the ratio of each company's granted 5G patent families based on the declared 5G patent families (see column C).

As column A of Figure 4 shows Huawei (8,773 patent families) is in first place. Other companies with more than 4,000 declared 5G patent families are Qualcomm (5,575), Samsung (5,275), and

LG Electronics (4,794). Comparing the data with NGB's data analysis as of March 29, 2022¹, Huawei's growth rate is 29.5%, Qualcomm's is 9.1%, and Samsung's is 7.9%. Along with these top companies, Xiaomi (growth rate: 50.6%) and FG innovation (growth rate: 40.2%) also show a high rate of growth.

Column B of Figure 4 shows, the number of granted 5G patent families and Huawei (6,933) is still first in the ranking. Column C of Figure 4 shows that a grant rate of the declared 5G patent families (= Number of 5G granted patent families / Number of declared 5G patent families) varies depending on a company. Huawei (79.0%), Media Tek (80.6%), Nokia (71.7%), Oppo (71.4%) and Catt (70.9%) have a higher grant rate, and Xiaomi (35.0%) and Lenovo (25.4%) have a lower grant rate, among the top 20 companies in terms of the number of the declared 5G patent families.

¹ https://www.ngb.co.jp/ngb_wp/wp-content/uploads/2022/04/Landscape-Analysis-of-Declared-5G-Patent-Families-as-of-March-29_-2022.pdf

Declaring company name	A Number of declared 5G patent families*	B Number of 5G granted patent families**	C Grant rate B / A [%]
Huawei Technologies	8,773	6,933	79.0%
QUALCOMM	5,575	3,850	69.1%
Samsung Electronics	5,275	3,657	69.3%
LG Electronics	4,794	3,253	67.9%
ZTE	3,895	2,008	51.6%
Nokia Group	3,388	2,429	71.7%
Ericsson	2,743	1,558	56.8%
Catt	2,475	1,754	70.9%
Guangdong Oppo Mobile Telecommunications	2,329	1,662	71.4%
Xiaomi	2,051	717	35.0%
Vivo Mobile Communication	1,834	1,263	68.9%
Sharp	1,824	1,254	68.8%
NTT DOCOMO	1,751	1,012	57.8%
Apple	1,175	492	41.9%
Lenovo	930	236	25.4%
InterDigital	918	522	56.9%
Intel	819	500	61.1%
NEC	590	406	68.8%
MediaTek	577	465	80.6%
Fg Innovation	453	250	55.2%

As of October 18, 2022 | Source: IPLYtics platform

*: both granted patent families and un-granted patent families

** : including at least one granted patent

***: the total number not just from the top 20 companies but from others too

Figure 4: Number of declared 5G patent families and granted patent families by company

Takeaways

What we have learned from this analysis is as follows:

1. China and the US are the most popular published regions of declared 5G patent families, followed by the EPO.
2. Huawei is in the leading position in the number of declared 5G patent families, followed by Qualcomm, Samsung and LG Electronics, and Huawei has the largest number of declared 5G patent families in China, US and at the EPO.
3. With respect to the grant rate of the declared 5G patent families, Huawei (79.0%), MediaTek (80.6%), Nokia (71.7%), Oppo (71.4%) and Catt (70.9%) have a higher grant rate, and Xiaomi (35.0%) and Lenovo (25.4%) have a lower grant rate, among the top 20 companies in terms of the number of the declared 5G patent families.

We hope that this report helps many stakeholders in 5G technology to have more practical discussions and make better determinations.

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