

Landscape Analysis of Declared 5G Patent Families (as of March 29, 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 March 29 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 March 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 March 29 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 March 29 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.

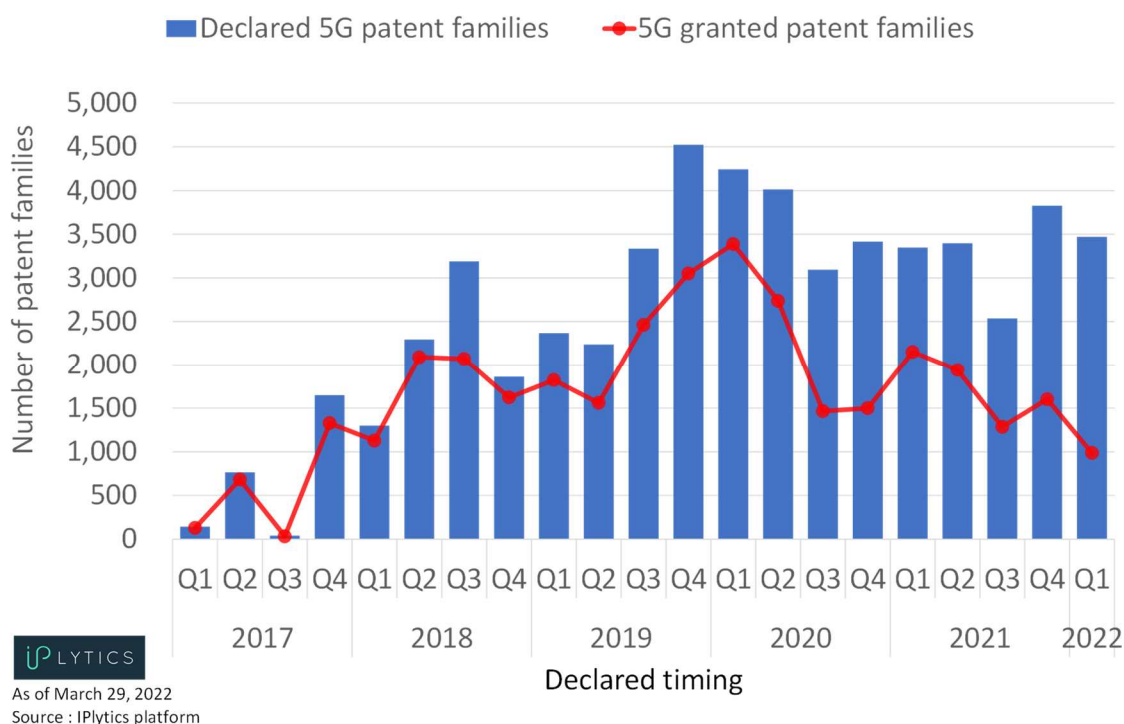


Figure 1: Number of declared 5G patent families in each quarter

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	34,093
US	33,638
EP	26,894
KR	14,240
JP	13,958
TW	3,656
AU	3,035
BR	2,914
CA	2,742

As of March 29, 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. On the other hand, ZTE (China), Oppo (China), Catt (China), Vivo (China) and Xiaomi (China) have a large bias towards declared 5G patent families in their home country.

Declaring company name	Published regions of declared 5G patent families*					
	CN		US		EP	
	number	share	number	share	number	share
Huawei Technologies	6,321	18.5%	5,023	14.9%	4,759	17.7%
QUALCOMM	3,595	10.5%	4,729	14.1%	3,581	13.3%
LG Electronics	1,636	4.8%	3,796	11.3%	1,777	6.6%
Samsung Electronics	2,568	7.5%	4,166	12.4%	2,670	9.9%
ZTE	3,266	9.6%	1,250	3.7%	1,166	4.3%
Nokia Group	1,667	4.9%	2,465	7.3%	2,363	8.8%
Ericsson	1,317	3.9%	1,815	5.4%	1,939	7.2%
Guangdong Oppo Mobile Telecommunications	2,124	6.2%	1,308	3.9%	1,210	4.5%
Catt	2,263	6.6%	644	1.9%	701	2.6%
Sharp	1,028	3.0%	1,189	3.5%	852	3.2%
NTT DOCOMO	1,216	3.6%	1,141	3.4%	1,197	4.5%
Vivo Mobile Communication	1,514	4.4%	667	2.0%	592	2.2%
Xiaomi	1,342	3.9%	456	1.4%	352	1.3%
Apple	351	1.0%	516	1.5%	302	1.1%
Intel	273	0.8%	469	1.4%	282	1.0%
Lenovo	359	1.1%	398	1.2%	373	1.4%
InterDigital	457	1.3%	538	1.6%	496	1.8%
MediaTek	536	1.6%	555	1.6%	247	0.9%
NEC	288	0.8%	406	1.2%	343	1.3%
Fg Innovation	249	0.7%	269	0.8%	240	0.9%
Total**	34,093	-	33,638	-	26,894	-

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 (6,777 patent families) is in first place. Other companies with more than 4,000 declared 5G patent families are Qualcomm (5,112), LG Electronics (4,968), and Samsung (4,887). Comparing the data with NGB’s data analysis as of October 5

2020¹, Huawei's growth rate is 6%, Qualcomm's is 11%, LG Electronics' is 86%, and Samsung's is 21%. LG Electronics has increased its number significantly, overtaking two companies (Samsung and Nokia) for third place. Along with these top companies, Apple (growth rate: 654%) and FG innovation (growth rate: 342%) also show a significant growth.

Column B of Figure 4 shows, the number of granted 5G patent families and Huawei (5,302) 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 (77.9%), Samsung (71.4%), and Nokia (70.9%) have a higher grant rate, and Xiaomi (31.0%) and Lenovo (23.0%) have a lower grant rate, among the top 20 companies in terms of the number of the declared 5G patent families.

Declaring company name	A Number of declared 5G patent families*	B Number of 5G granted patent families**	C Grant rate B / A [%]
Huawei Technologies	6,777	5,353	79.0%
QUALCOMM	5,112	3,532	69.1%
LG Electronics	4,968	3,248	65.4%
Samsung Electronics	4,887	3,489	71.4%
ZTE	3,561	1,527	42.9%
Nokia Group	3,243	2,300	70.9%
Ericsson	2,698	1,382	51.2%
Guangdong Oppo Mobile Telecommunications	2,337	1,439	61.6%
Catt	2,295	1,378	60.0%
Sharp	1,724	1,167	67.7%
NTT DOCOMO	1,605	765	47.7%
Vivo Mobile Communication	1,526	978	64.1%
Xiaomi	1,362	422	31.0%
Apple	905	437	48.3%
Intel	851	475	55.8%
Lenovo	793	182	23.0%
InterDigital	758	442	58.3%
MediaTek	580	452	77.9%
NEC	528	343	65.0%
Fg Innovation	323	173	53.6%

As of March 29, 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

¹ <https://www.managingip.com/article/b1plrrv4knsgnm/landscape-analysis-of-5g-patent-families>

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, LG Electronics and Samsung, 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%), Media Tek (77.9%), Samsung (71.4%), and Nokia (70.9%) have a higher grant rate, and Xiaomi (31.0%) and Lenovo (23.0%) 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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