How much 5G is needed in cars?

A landscape analysis on declared patents and standards essential to the automotive domain.

March 2021

1. Standard essential patents and the connected car.

Similar to the transition in the mobile phone industry from feature phones to smartphones, in which business models, platforms and market participants transformed the way in which profits are distributed among companies, we look set to see shifts and profit redistribution within the auto industry. Currently, automotive connectivity is mostly used for automatic emergency calls (eg, eCall), smartphone signal enhancements, telematics and navigation. However, the transport sector will make use of connectivity for dynamic traffic management, intelligent parking and infrastructure to support the integration of autonomous vehicles into road traffic. While fully autonomous vehicles are likely to evolve over several stages, manufacturers are already implementing autonomous functions (eg, speed control and lane departure warnings).

The auto industry could be one of the first sectors outside of the smartphone world to heavily rely on 5G technologies. However, as the 5G standard is protected by potentially over 100,000 SEPs, the integration of 5G standards will include the payment of royalties for vehicle manufacturers. Licensing fees for SEPs in the communications industry (ie, 3G, 4G and soon 5G), can easily amount to hundreds of millions of dollars per year. However, licensing practices in the automotive industry differ significantly from those in the communications industry. A tier 1 supplier rarely receives royalties from an original equipment manufacturer (OEM). In licensing negotiations, royalties are usually based on a single component that has been improved by an invention. As such patents are not essential and there is always the option to invent around it, patent licensing costs have had little impact on vehicle prices. In contrast, with regard to SEPs there is no invent-around option if the auto manufacturer wants to integrate and be compliant to a standard (eg, 3G, 4G or 5G). SEP owners in the past few years have mostly targeted OEMs and avoided licensing their SEPs downwards the value chain.

However, a question that yet has not been publicly discussed is how much 4G or 5G functionality is actually needed in a car? Will the 4G or 5G standards implementation for vehicles significantly differ from the use in smartphones and – if so – does this mean that SEPs will be much less involved?

2. A deep dive into the 4G/5G implementation for vehicles.

Standards such as 4G and 5G are complex and currently comprise over 10,000 different technical specifications, according to the IPlytics database. However, only 500 of these specs are subject to SEPs. Table 1 summarises the top technical specifications for which patents have been declared.

Still, not all of these 500 must be implemented in a communication module when making a vehicle 4G or 5G compliant. Analysis conducted by IPlytics and ResearchWire shows that out of the 50 most patented 4G and 5G technical standards, only around 80% need to be integrated in currently built-in automotive connectivity boxes. ResearchWire analysed the top 50 technical specifications subject to patents to find for each spec at least one technology, which can be utilised in current or future automotive connectivity boxes. These can be used directly in the hardware or the software. The analysis shows that there are specs subject to SEPs that look not to be relevant for the automotive implementation.

Table 1: 4G/5G technical specifications subject to declared patents (as to IPlytics March 2021)

Technical standard	Declared patents	Declared patent families	Group	Release	Tech.	Title (short)
TS 38.331	40,732	13,775	R2	Rel-15	5G	NR; Radio Resource Contro…
TS 38.213	41,388	13,618	R1	Rel-15	5G	NR; Physical layer proced…
TS 38.211	33,598	11,192	R1	Rel-15	5G	NR; Physical channels and…
TS 36.213	53,629	10,740	R1	Rel-8	LTE	Evolved Universal Terrest…
TS 36.331	48,612	10,457	R2	Rel-8	LTE	Evolved Universal Terrest…
TS 38.212	29,329	10,420	R1	Rel-15	5G	NR; Multiplexing and chan…
TS 38.214	32,166	10,311	R1	Rel-15	5G	NR; Physical layer proced…
TS 36.211	41,925	7,788	R1	Rel-8	LTE	Evolved Universal Terrest…
TS 36.300	40,591	7,213	R2	Rel-8	LTE	Evolved Universal Terrest…
TS 38.300	21,286	7,027	R2	Rel-15	5G	NR; Overall description; …
TS 38.321	20,723	6,447	R2	Rel-15	5G	NR; Medium Access Control…
TS 36.212	25,847	4,892	R1	Rel-8	LTE	Evolved Universal Terrest…
TS 36.321	26,526	4,865	R2	Rel-8	LTE	Evolved Universal Terrest…
TS 23.501	8,959	2,776	S2	Rel-15	5G	System architecture for t…
TS 38.322	6,066	2,149	R2	Rel-15	5G	NR; Radio Link Control (R…
TS 38.101	6,282	1,995	R4	Rel-15	5G	NR; User Equipment (UE) r…
TS 23.401	8,927	1,746	S2	Rel-8	LTE	General Packet Radio Serv…
TS 23.502	4,667	1,508	S2	Rel-15	5G	Procedures for the 5G Sys…
TS 38.323	3,039	1,247	R2	Rel-15	5G	NR; Packet Data Convergen…
TS 38.423	2,846	1,212	R3	Rel-15	5G	NG-RAN; Xn Application Pr…
TS 37.340	3,121	1,209	R2	Rel-15	3G,5G,LTE	NR; Multi-connectivity; O…
TS 36.304	5,896	1,194	R2	Rel-8	LTE	Evolved Universal Terrest…
TS 38.413	2,415	1,163	R3	Rel-15	5G	NG-RAN; NG Application Pr…
TS 36.423	5,055	1,110	R3	Rel-8	LTE	Evolved Universal Terrest…
TS 38.215	2,325	978	R1	Rel-15	5G	NR; Physical layer measur…
TS 38.133	2,655	875	R4	Rel-15	5G	NR; Requirements for supp…
TS 36.413	3,397	835	R3	Rel-8	LTE	Evolved Universal Terrest…
TS 36.133	3,616	728	R4	Rel-8	LTE	Evolved Universal Terrest…
TS 24.301	4,176	715	C1	Rel-8	3G,5G,LTE	Non-Access-Stratum (NAS) …

3. SEP licensing will depend on the use case.

While licensing SEPs in the telecom industry is well understood and 5G licensing negotiations with smartphone manufacturer will be comparable to those of 3G or 4G, licensing SEPs will be more difficult to navigate outside of the smartphone industry. What is more, each sector will apply connectivity differently, so licensing mechanisms will need to become more flexible as there is no one-size-fits-all model that will work across all industry verticals. The application of 4G and 5G in vehicles will differ greatly from implementation in smart phones, tablets and smart watches. Further, a uniform licensing model will not work. Instead, the SEP royalties for use cases (ie, smart home, smart factory, smart energy and smart vehicles) will likely need to be lower than those for smartphones. Although flexibility is vital, the industry must also find mechanisms that allow companies to aggregate and package the licensing of SEPs to avoid licensing inefficiencies that yield lengthy negotiations or patent litigation. Here, the industry must acknowledge that not all SEPs will be relevant for each 4G or 5G use case. Classifying how 4G and 5G technical specifications relate to different use cases – as carried out by IPlytics and ResearchWire – is a good starting point to get a much more accurate picture about which standards and patents subject to these standards are relevant. In the end, SEP royalties must be based on where the patented technology creates value for the application of the standard.

Many SEP owners find it difficult to predict how standards will be applied in different use cases. A car manufacturer will only implement connectivity standards if the enabled features add value and the standardised technologies are supported by the infrastructure.

While the telecoms industry and large SEP-owning companies are experts in standards development and worldwide SEP filing and licensing, other sectors, such as the auto industry, consumer electronics, industrial manufacturing, energy and medical healthcare, among others, have little knowledge about

connectivity standards that are subject to SEPs. IP professionals in these sectors will need to gain more expertise around patents and standards to understand that by making use of technology advances around connectivity, they will need to implement patented standards and will thus at some point will have to pay SEP royalties. Standard setting is not only about developing the core technology layer of communication, but also about developing application layers. Here industry experts with domain knowledge across industries where connectivity matters will need to look more closely at how standards are implemented and which patented technology is being used.

IP professionals as well as directors in standard development should bear in mind some key considerations:

- Future technologies that enable connectivity will increasingly rely on patented technology standards (eg, 4G and 5G, Wi-Fi, NFC, RFID and Bluetooth, among others).
- The number of SEPs depends on how a standard is implemented.
- Not all declared SEPs will be relevant for each standard implementation and therefore also royalties must consider these differences.
- IP professionals should not only consider information retrieved from patent filing data, but also understand more closely the implementation of standards.
- IP professionals need to be aware that while the market for 5G and other connectivity type technologies is fairly new, it is now time to be thinking about what the business will need two, five and 10 years in the future, and hand in hand with this, what the patent portfolio will need to support it.

For further information, please contact us.

IPlytics - The Gold Standard of Standards

Empowering IP professionals to understand the complexity of patents and standards in the connected world.

IPlytics is the first solution on the market to bring together comprehensive, highly indexed technical standards information, declared SEPs, patent pools, global patents and standards contribution data, to provide industry-leading analysis on the past, present and future of standards-essential technology. Unlike other tools that are overly complex, IPlytics provides fast, intuitive access to patents and standards to empower the user to strategically align patent portfolios to protect innovations and proactively engage in continuous strategic portfolio development as it relates to SEP assets, for initiatives such as licensing, acquisitions and joining patent pools, or to understand the respective positions of the competition. The next technology revolution will connect everything making it even more challenging to understand how technologies and IP rights overlap. IP professionals need to rethink - even revolutionize - how to approach both patent and standards data, to provide business-ready insights for actionable decision making across the organization.