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Phone: +1 646 783 7100 | Fax: +1 646 783 7161 | customerservice@law360.com

What IP Attorneys Need To Know About 5G

By **Ranganath Sudarshan and Jason Reinecke**
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Ranganath Sudarshan

Jason Reinecke

5G refers to the highly anticipated 5th generation cellular network that will replace the current 4G network. Compared to 4G, 5G promises to accommodate significantly more users at approximately 10 times faster data speeds[1] and one-fiftieth of the delay.[2] This dramatic improvement in both speed and delay is expected to be a key enabler for many new technologies such as self-driving vehicles, virtual reality, augmented reality, remote surgery and internet of things devices. 5G is currently in the test and standard-setting phase. While the official 5G standard is not set to be released until 2020, some companies plan to begin launching proprietary 5G services by the end of this year.

In this article, we provide IP attorneys with an introduction to the world of 5G. We begin with a 5G technical primer, then explain the state of play with regard to the 5G standardization process and conclude by discussing some legal issues likely to arise with 5G's rollout.

5G Technical Primer

Cellular networks allow devices to exchange information wirelessly via electromagnetic waves. These waves are exchanged between devices through a global network of transmitters and receivers called base stations. 5G will improve on 4G by incorporating several exciting new technologies. We provide a high-level overview of five of the most important 5G technologies below:

Millimeter Waves

Because wireless networks are currently crowding the same bands of the radio-frequency spectrum (<6 GHz), providers are planning to speed up 5G by broadcasting it over the less crowded millimeter wave spectrum (30-300 GHz).[3]

Small Cells

High frequency millimeter waves have difficulty passing through objects, so 5G networks will support large "cell tower" base stations with numerous small cells — small, low-power and portable base

stations — which will be spread throughout cities so that devices can more frequently and efficiently use unobstructed connections.[4]

Massive MIMO

Massive MIMO refers to incorporating large numbers of antennas on a single base station array to transmit and receive signals. In part because high frequency millimeter waves can accommodate smaller antennas, 5G is expected to make greater use of massive MIMO which could significantly increase the capacity of the network.

Beamforming

Due to the high density of massive MIMO antenna arrays, signals are more likely to cross and produce interference. 5G networks are expected to minimize these problems with beamforming, a signal processing technique that reduces interference by focusing signals on their target.[5] By better focusing signals, beamforming will also help easily obstructed millimeter waves reach their target.

Network Slicing

Network slicing refers to a virtual networking architecture that offers a way to simultaneously provide, on the same physical infrastructure, multiple different networks each tailored to different market segments.[6] For example, one "slice" of the network may provide the low latency and high reliability needed by self-driving vehicles and remote surgery. Yet another slice may be for small battery devices that must be energy efficient. This tailored way of providing network services will improve customer experience and network efficiency while also reducing cost.

5G Standardization

Numerous entities are currently working to define standardized requirements for 5G technology. The International Telecommunications Union, an agency under the United Nations, is planning to produce the set of official 5G standards called IMT-2020.[7] Organizations will submit technical proposals in 2019 to be considered by ITU.[8]

The most notable organization preparing to submit a proposal is 3GPP, a group of telecommunications standard setting organizations, or SSOs.[9] Participants in the 3GPP process include government entities, private companies and research organizations. 3GPP recently created the first full set of 5G technical specifications known as Release 15.[10] Release 15 includes specifications for a complete "standalone" 5G network as well as specifications for "non-standalone" 5G, which incorporates many new technologies while utilizing existing 4G infrastructure. Early 5G deployment in 2018 and 2019 is expected to be based on 3GPP's nonstandalone 5G specifications to exploit existing 4G infrastructure while the new infrastructure needed for standalone 5G is put in place.[11] 3GPP is expected to finalize its standalone 5G technical specifications in Release 16 in 2019 and will submit a combination of Release 15 and Release 16 to ITU for consideration.[12]

Some companies have already announced rates for licensing the patents they claim are essential to practice 3GPP's Release 15 technical specification. For example, Ericsson announced a $5 royalty rate per 5G multimode (3G/4G/5G) device in March 2017.[13] In August 2018, Nokia announced a 3 euro royalty rate per 5G handheld device.[14] In November 2017, Qualcomm initially announced a royalty rate of 2.275 percent of the device's selling price for single-mode handsets and 3.25 percent of the

device's selling price for multimode handsets, capping the selling price at $500 (resulting in a $16.25 royalty per multi-mode device costing $500 or more).[15] Qualcomm recently reduced the cap to $400.[16] These announcements are notable in that for many industries, the rates at which companies license their SEPs to others is unknown.

Legal Issues Related to 5G Rollout

We expect numerous legal issues to surround the rollout of 5G. Those issues are likely to center around standard-essential patents, or SEPs, and commitments to license on fair, reasonable and nondiscriminatory terms. In addition, legal uncertainty regarding which 5G SEPs are vulnerable to patentability challenges under 35 U.S.C. § 101 will loom largely. These legal issues will take center stage as 5G hits the market for many reasons: (1) courts have only recently begun to weigh in on the legal issues surrounding SEPs, FRAND licensing commitments and the recently resurged patentable subject matter doctrine; (2) 5G technologies will constitute an unprecedented technological advance that could generate up to $3.5 trillion in aggregate revenue by 2035;[17] (3) many companies will be vying for this 5G-related revenue, especially considering that SEPs are expected to be more spread out for 5G than for 4G;[18] and (4) the licensing market will be much larger for 5G than 4G considering all the technologies 5G will support (e.g., autonomous vehicles, virtual reality, remote surgery).

Here, we highlight three legal issues that will arise with the rollout of 5G.

Calculating Appropriate Royalties

We expect it will be a challenging endeavor for courts to calculate appropriate royalties on 5G-related patents, particularly given 5G's complexity and the number of patented technologies involved. In one article lead-authored by an associate general counsel at Intel, the authors estimated that smartphone suppliers pay around $54 in royalties for 4G's "LTE" SEPs on a $400 phone, such that approximately 13.5 percent of the price of a $400 cell phone is due to 4G licensing demands.[19] Some observers expect that 5G royalties will be very substantial and possibly even higher than 4G royalties.

In the FRAND context, courts have used two fundamentally different approaches to calculate royalties: "bottom-up" and "top-down."[20] With the bottom-up approach, the value of asserted SEPs is estimated in isolation from the value of other SEPs governing the standard, such as by using comparable licenses to estimate SEP value. Conversely, the top-down approach requires determining a reasonable aggregate royalty for all SEPs governing a standard and then allocating that aggregate royalty to SEP holders based on the value of their SEPs in relation to the whole.

Some commentators believe the bottom-up approach best approximates patent value because it utilizes easily digestible and relevant information, such as comparable licenses. Others argue that patentees are routinely overcompensated when courts try to estimate the value of a feature without considering all the other features.[21] These commentators believe that the top-down approach advantageously recognizes that many patents contribute to the value of a standard and thus uses a more complete picture to estimate SEP value.[22]

While commentators disagree over which method most accurately compensates patentees, one thing is clear: the two approaches tend to diverge more as standards become more complex. Although United States courts have generally utilized bottom-up methodologies,[23] the Northern District of Illinois and the Central District of California have recently issued significant top-down FRAND royalty decisions.[24] Due to 5G's complexity and recent court approval of top-down methodologies, we believe courts will

frequently encounter disputes over whether bottom-up or top-down approaches best approximate SEP value in the 5G context.

Internationalization of 5G Royalty Issues

Given the number of stakeholders involved and the worldwide nature of the 5G endeavor, we expect courts from countries across the globe to begin to weigh in on key SEP and FRAND-related issues. Moreover, because many companies may announce global rates for their 5G portfolios, it is likely that countries whose courts have not yet spoken on FRAND issues will make their voices heard in 5G-related patent litigation. For instance, courts in India — the country with the second most mobile phone users[25] — have recently begun to weigh in on SEP issues. Early interim orders by the High Court of Delhi suggest that in the FRAND royalty context, the High Court approves of both using the net sales price of downstream products as the royalty base and utilizing comparable licenses.[26] On July 12, 2018, the High Court handed down its first post-trial SEP-related opinion.[27] In determining the appropriate FRAND royalty, the High Court reaffirmed using the net sales price of downstream products as the royalty base and also concluded that informal negotiations can inform FRAND royalty calculations.[28] Likewise, the Japanese Intellectual Property High Court has begun to weigh in on SEP issues and, in 2013, became one of the first courts to calculate a FRAND royalty using a top-down approach.[29] We expect the global nature of 5G to even further broaden the number of courts offering guidance on SEP issues.

From a procedural standpoint, courts are beginning to use multi-jurisdictional tools to efficiently manage related SEP cases being heard across the world. For example, anti-suit injunctions can be issued, under appropriate circumstances, by a court in one jurisdiction to temporarily prevent the continuation of related litigation in another jurisdiction.[30] Licensees alleging that licensors violated their FRAND commitments may be able to use an anti-suit injunction to prevent foreign patent infringement lawsuits until the underlying FRAND commitment dispute has been litigated. We expect such procedural tools to be increasingly important with 5G litigation.

§ 101

Many developments in 5G are algorithmic in nature. Given the present § 101 landscape, innovators will need to carefully craft their patents to secure patent protection. In particular, innovators may choose to focus on describing their 5G contributions in terms of system improvements. Ericsson's "5G Foundation patent application" is notable in this regard: this 400-page application[31] is purportedly directed to a "complete 5G telecommunications network" system, includes the work of 130 Ericsson inventors, and "intends to lay the foundation for all future mobile networks."[32] IP professionals should carefully watch the development of Ericsson's patent family to observe the extent to which the otherwise oft-discussed § 101 debate will practically affect the development of a significant industry player's 5G patent portfolio.

Ranganath Sudarshan is a partner and Jason Reinecke is a law clerk at Covington & Burling LLP.

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