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| **Summary:**  |
| This ECO Bulletin provides a summary update on aspects of progress in spectrum management outside the CEPT. The items in this bulletin include:[1 Asia Pacific Region (APT)](#_Toc12461946)[1.1 India 5G spectrum auction](#_Toc12461947)[1.2 China awards 5G licence to state broadcaster](#_Toc12461948)[1.3 Singapore 5G plans](#_Toc12461949)[2 Americas (CITEL)](#_Toc12461950)[2.1 USA](#_Toc12461951)[2.1.1 Update on NGSO satellite plans and launches](#_Toc12461952)[2.1.2 Update on FCC mmWave auctions](#_Toc12461953)[2.1.3 FCC 5.9 GHz](#_Toc12461954)[2.1.4 FCC 95 GHz](#_Toc12461955)[2.1.5 FCC 5G FAST](#_Toc12461956)[2.1.6 FCC proposals for replanning of 900 MHz band](#_Toc12461957)[2.1.7 FCC proposed release of mid band spectrum for mobile use](#_Toc12461958)[2.1.8 FCC UWB ground penetrating radar for autonomous vehicles 103-403 MHz](#_Toc12461959)[2.2 Canada 600 mhZ auction results](#_Toc12461960)[2.3 CITEL questionnaire to administrations on unlicensed or license-exempt access to frequency bands](#_Toc12461961)[3 Global developments](#_Toc12461962)[3.1 5G deployments update](#_Toc12461963)[3.2 Alphabet Loon and softbank HAPS partnership](#_Toc12461964) |

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| **Proposal:** |
| ECC is invited to note this Bulletin.Several of the issues covered in this bulletin should be noted or discussed at the respective WG/ PT level, in particular in WG FM, WG SE, CPG, ECC PT1, FM44 and SE40. |
| **Background:** |
| The Office brings to each ECC meeting a bulletin on activities in radio communications in other regions outside CEPT, where a regulatory dimension is raised (e.g. by innovative services or technology). The primary objective is to identify whether the ECC needs to investigate further or consider possible new actions. A secondary but more frequently addressed objective is to enable comparison to be made with the regulatory approach in other regions for subjects already treated by the ECC (including, where relevant, to the work of the CPG). |

# Asia Pacific Region (APT)

## India 5G spectrum auction

The Indian spectrum auction, originally scheduled for June 2019, is now set to take place later in 2019. There are differing views from operators on whether to commence the auction as soon as possible or to delay until 2020.

In response to comments from operators on high reserve prices, the government has sought a comprehensive review of the telecom regulator’s recommendations for the upcoming auctions. The department of telecommunications (DoT) made the request to the Telecom Regulatory Authority of India (Trai) to ensure competition, sale of all spectrum and bringing the benefits of 5G to social sectors.

In addition, the DoT has recommended including previously unsold spectrum in the 700 MHz, 800 MHz, 900 MHz and 1800 MHz bands, in addition to the 3.3-3.6 GHz band.

 **(For information in ECC PT1 and WGFM)**

## China awards 5G licence to state broadcaster

The Chinese government have awarded a 4th 5G licence to the state broadcaster China Broadcasting Network (CBN).

In December 2018, MIIT awarded China Mobile 160 MHz of 5G spectrum in two bands: 2515-2675 MHz and 4.8-4.9 GHz. Rivals China Telecom and China Unicom received 100 MHz each in the 3.4-3.5 GHz and 3.5-3.6 GHz bands respectively.

It is thought that the three incumbents will get the same frequencies they received on a trial basis last December and that CBN will get spectrum in the 4.9-5 GHz band.

CBN is a cable television operator which also holds spectrum in the 700 MHz band but only as a broadcaster and not for mobile services. There has been a suggestion that CBN would be given 4.9-5 GHz in exchange for its 700 MHz frequencies. The latter band would then be made available to the incumbents.

However, it is now thought the Chinese authorities might award the newcomer 2 x 45 MHz in the 700 MHz band on top of the 4.9-5 GHz band, making a total of 190 MHz and creating a more viable rival to the three incumbents.

**(For information in ECC PT1 and WGFM)**

## Singapore 5G plans

The Singaporean regulatory authority IMDA have launched a consultation seeking views on the policy and regulatory framework for the introduction of 5G from 2020 onwards.

The IMDA wishes to see rapid deployment of 2 standalone 5G networks, however the key band for coverage of 3.4-3.6 GHz will not be available until 2021. IMDA is working with satellite operators and neighbouring countries to free up this band. An initial 150 MHz is planned to be made available, with 50 MHz for both outdoor and indoor deployments, and 100 MHz with a mixture of outdoor and restricted indoor only use.

The band will be awarded to two winners through a dual beauty contest and auction approach. Each winner will additionally receive 800 MHz in either the 26 GHz or 28 GHz band. The award process is expected to launch later in 2019.

**(For information in ECC PT1 and WGFM)**

# Americas (CITEL)

## USA

### Update on NGSO satellite plans and launches

The Federal Communications Commission (FCC) have approved a request from SpaceX reduce the altitude of 1500 of its 4425 originally approved Ku Band Starlink satellites from 1150 to 550 kilometres. The FCC also authorised SpaceX to slightly reduce the number of satellites in this part of the constellation from 4425 to 4409. The reduction is based on the fact that the lower orbit would reduce latency so fewer satellites would be needed. Additionally the lower orbit helps with debris mitigation, as any defunct satellites would re-enter the Earth’s atmosphere within 5 years, as well as providing increased distance to other proposed constellations (OneWeb, Telesat).

The FCC also approved the use of Ku Band gateway earth stations for fewer than 75 of these lower-altitude satellites (the remainder of the gateway links operate in Ka Band). This proposal raised objections from OneWeb and Kepler based on concerns over potential interference to their own satellite networks in the same band.

As it now stands, SpaceX has FCC approval for 11927 Starlink satellites at 3 orbit heights in the following frequency bands:

* **V Band**: 37.5-42 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space)
* **Ku Band**: 10.7-12-7 GHz (space-to-Earth), 14-14.5 GHz (Earth-to-space)
* **Ka Band**: 17.8-18.6 GHz and 18.8-19.3 GHz (space-to-Earth), 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space)

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| **Orbit height (km)** | **No. sats** | **Frequency bands** |
| 340 | 7518 | V Band |
| 550 | 1500 | V Band, Ku Band (user and 75 gateway links), Ka Band (gateway) |
| 1150 | 2909 | V Band, Ku Band (user), Ka Band (gateway) |

The first 60 operational satellites in the Starlink constellation were successfully launched on a Falcon-9 rocket from Cape Carnaveral on 23 May, and entered orbit at the 550 km height. SpaceX have announced they plan up to 5 additional launches by the end of the year, with the aim to start providing services at high latitudes in the US and Canada by 2020. Global coverage is planned to be achieved after 24 launches (1500 satellites).

This follows [OneWeb](http://www.oneweb.world/)’s successful launch of its first 6 satellites on a Soyuz rocket from Kourou, French Guiana, on Februrary 27. A major function of these satellites is to meet the ITU’s “bringing into use” deadline for OneWeb’s satellite filing. OneWeb plans a series of monthly launches starting in August or September 2021, to complete the first phase of the constellation of 648 satellites in 2021. Commercial services are planned from 2020. OneWeb plans to increase the constellation size to 2000 in future if successful, and recently announced it has secured an additional USD $1.25 billion in funding.

Meanwhile, Amazon have announced plans to join the race to provide satellite broadband access via their own NGSO constellation, dubbed ‘Project Kuiper’. Amazon plans a constellation of 3236 LEO satellites (784 at 590 km, 1296 at 610 km, 1156 at 630 km) operating in Ka Band frequencies (17.7-18.6 GHz and 18.8-20.2 GHz space-to-Earth, and 27.5-30 GHz Earth-to-space), through 3 ITU filings submitted by the USA. The constellation aims to provide coverage from 56 degrees north to 56 degrees south, covering 95% of the world’s population.

**(For information in WGFM, FM44, WGSE, SE40)**

### Update on FCC mmWave auctions

The FCC’s auction of spectrum at 24 GHz ([Auction 102](https://www.fcc.gov/auction/102)) completed on May 28 after 2 months of bidding rounds. A total of 2814 county level licences in 100 MHz blocks were awarded to 29 bidders within 24.25-24.45 GHz and 24.75-25.25 GHz, raising a total of USD $2 billion. Combined with the previous auction in the 28 GHz band, ([Auction 101](https://www.fcc.gov/auction/101)), a total of USD $2.7 billion was raised covering 5869 licences. The higher price at 24 GHz reflects the fact that these licences covered more high population areas.

The final millimetre wave spectrum auction under the FCC’s Spectrum Frontiers initiative is planned to commence in December 2019 ([Auction 103](https://www.fcc.gov/auction/103)). The FCC plans to release spectrum in the upper 37 GHz (37.6–38.6 GHz), 39 GHz (38.6–40 GHz) and 47 GHz (47.2–48.2 GHz) bands through an incentive auction. A [public notice](https://docs.fcc.gov/public/attachments/DA-19-397A1.pdf) issued in May sets out proposed options for reconfiguration of existing licences in the 39 GHz band.

**(For information in ECC PT1 and WGFM)**

### FCC 5.9 GHz

Last October, in its [Notice of Proposed Rulemaking (NPRM)](https://ecfsapi.fcc.gov/file/1024814219781/FCC-18-147A1.pdf), FCC proposed rules to promote new opportunities for unlicensed use in portions of the 1200 MHz of spectrum in the 5.925-7.125 GHz (6 GHz) band while ensuring that licensed services operating in the band continue to operate. Comments on this NPRM were due before February 15, while reply comments before March 18.

In the latest round of comments, FCC received in particular the reply from the US Cellular Telecommunications Industry Association (CTIA), which invites to act quickly to make available a proper amount of licensed spectrum for flexible use in the mid-band, above 3 GHz. CTIA believes there is no basis to designate the full 1200 MHz of the 6 GHz spectrum to unlicensed use. In their view, in light of evidence that substantial swaths of unlicensed spectrum lie nearly vacant, FCC should adopt a balanced approach to the 6 GHz band, including a spectrum sharing regime for unlicensed operations in the lower portion of the 6 GHz band and a framework for licensed, flexible use services in the upper 6 GHz band. CTIA finally observed that the 7.125-8.5 GHz band, currently allocated for federal use but underutilised, could accommodate fixed service operations relocated out of the 6 GHz band.

Several RLAN industries expressed a different opinion in their reply comment, restating that opening the entire 6 GHz band to unlicensed technologies is essential to meeting growing demand for wireless connectivity and this can be achieved without relocating large numbers of licensed incumbents, constraining their future growth, or dislocating federal users. FCC is invited to reject the proposal from CTIA to auction a portion of the band as the scheme is considered unworkable, unnecessary, and unsupported, since no concrete explanation of the plan has been provided.

**(For information in WGFM, FM57, SE45, CPG)**

### FCC 95 GHz

In March FCC adopted rules to encourage research and development in the spectrum between 95 GHz and 3 THz, creating a new category of license called the Spectrum Horizons License. In addition to offering users experimental licenses, the FCC designated 21.2 GHz of spectrum for unlicensed operations in the 116‑123, 174.8-182, 185-190 and 244- 246 GHz.

Prior to this action, no rules permitted communication, whether licensed or unlicensed, in the spectrum above 95 GHz. Use was limited to industrial, scientific, medical (ISM), amateur radio and radio experiments.

For the unlicensed bands, rules similar to those governing the 57 -71 GHz unlicensed band have been adopted. Devices may transmit a maximum e.i.r.p. of 40 dBm (average) and 43 dBm (peak). Outdoor point-to-point transmissions may have a higher maximum e.i.r.p.of 82 dBm (average) and 85 dBm (peak) if the transmitters use antennas with a minimum gain of 51 dBi. For antenna gain below 51 dB, the maximum power is reduced by 2 dB for each dB of antenna gain below 51 dBi. FCC did not limit the power at the input to the antenna (conducted power).

Spectrum Horizons Experimental Radio licenses may be issued in any frequency band between 95 GHz and 3 THz and in any geographic area. Before granting a license, the FCC will review each request to evaluate potential interference with other uses. Any licenses will be granted for a single 10-year term to encourage investments in this largely untested spectrum, and yield more useful long-term information and data. The status and results of the experimental use will be included in an interim report within five years.

The FCC ruling allows licensees to market and sell devices directly to users, to allow early adopters and other trial participants to help offset the costs of developing systems and equipment. However, any equipment sold must be retrieved or made inoperable at the end of the trial.

Airwaves between 95 GHz and 3 THz have propagation characteristics that can enable large numbers of devices to operate, while limiting the possibility of interference to existing uses, such as space research and atmospheric sensing. Researchers believe that this portion of spectrum could become integral to the sixth generation of wireless communications (6G).

**(For information in WG FM and WG SE)**

### FCC 5G FAST

FCC is pursuing a comprehensive strategy to Facilitate America´s Superiority in 5G Technology (the 5G FAST Plan). This includes three key components: (1) freeing up spectrum, (2) promoting telecommunication infrastructures and (3) modernising regulations.

Additional spectrum is being made available in different kind of frequencies. With the auctions of high-band spectrum which are being completed this year in the 24-47 GHz range, FCC will release almost 5 GHz of 5G spectrum into the market. Moreover, FCC considers making possibly available 844 MHz of additional spectrum for 5G deployments in the mid-band ([2.5 GHz](https://www.fcc.gov/document/fcc-seeks-transform-25-ghz-band-nextgen-5g-connectivity), [3.5 GHz](https://www.fcc.gov/document/fcc-acts-increase-investment-and-deployment-35-ghz-band-0), and [3.7-4.2 GHz](https://www.fcc.gov/document/fcc-proposes-expand-flexible-use-mid-band-spectrum) bands), while the use of spectrum below 1 GHz (low-band) is currently being improved to achieve wider coverage. New opportunities will also be created for the use of unlicensed spectrum in the 6 GHz and 95 GHz bands.

FCC is also updating infrastructure policy and encouraging the private sector to invest in 5G networks with the intention to ease the deployment of a denser telecommunication infrastructure, on which 5G will rely more than the previous generations.

Outdated regulations are also being revised to promote wired backbone of 5G networks and digital opportunities for citizens. For instance, new rules were adopted to reduce regulatory impediments to deploy small-cells for 5G as well as to decrease cost and speed up the process for 5G backhaul deployment, thus expanding the reach of 5G for faster, more reliable wireless service. Revision of regulations addresses, in general, different areas to favour investments in next-generation networks and services, promote innovation while protecting internet openness and freedom and guarantee integrity in the equipment or service supply chain.

**(For information in WG FM)**

### FCC proposals for replanning of 900 MHz band

The FCC have issued a Notice of Proposed Rulemaking ([NPRM](https://docs.fcc.gov/public/attachments/FCC-19-18A1.pdf)) in April 2019 proposing to reorganise the 900 MHz band (896-901/935-940 MHz), designated for narrowband private land mobile radio, with deployed systems primarily used for two-way communication by land transportation, utility, manufacturing, and petrochemical companies. The proposals plan to reconfigure the band to allow for increased use by broadband applications such as smart grids.

The 900 MHz band currently consists of 399 narrowband 2 x 12.5 kHz frequency pairs grouped into 10 duplex blocks. Some of these licences are for 51 “major trading areas” while others are assigned on a site-by-site basis. The FCC proposes to realign the band so that a 2x3 MHz (897.5–900.5 MHz paired with 936.5–939.5 MHz) portion of it comprises a broadband segment and the two blocks of 2 x 1.5 MHz above and below that allocation are reserved for continued narrowband operations. The FCC is open to alternative realignments, including 2 x 5 MHz.

**(For information in WGFM)**

### FCC proposed release of mid band spectrum for mobile use

In an [NPRM](https://www.fcc.gov/document/fcc-moves-open-airwaves-mobile-services-1675-1680-mhz-band) issued in May, the FCC propose to open up access in 1675-1680 MHz for shared use between existing users and new fixed or mobile use. The band is currently allocated on a co-primary basis to MetAids/radiosondes and MetSat. The FCC is investigating the feasibility of geographical sharing between these uses and new flexible wireless broadband use,

The move is in response to a request from Ligado, who hold 5 MHz of spectrum below this range.

Separately, the FCC is understood to be exploring options in a range of bands with the aim of releasing up to 2125 MHz of additional “mid-band” spectrum, including 3100-3550 MHz and 7125-8500 MHz, and the ongoing plans for release of spectrum 3700-4200 MHz.

**(For information in WGFM and ECC PT1)**

### FCC UWB ground penetrating radar for autonomous vehicles 103-403 MHz

On June 19 the FCC issued a [public notice](https://www.fcc.gov/document/oet-seeks-comment-geophysical-survey-systems-inc-uwb-rules) announcing that they received a request for a waiver of their UWB rules for use of evaluation kits of a UWB ground penetrating radar device operating between 103-403 MHz. The request was received from Geophysical Survey Systems, Inc. (GSSI) who wish to market up to 2000 evaluation kits for use by autonomous vehicles (e.g. self-driving cars), which would use the device to read features of the road beneath the pavement and use this data for vehicle guidance.

GSSI seeks a rule waiver to permit it to use a stepped frequency configuration for its device which steps through its frequency range at 6 MHz intervals. The existing rules require that an UWB should have a [bandwidth](https://en.wikipedia.org/wiki/Bandwidth_%28signal_processing%29%22%20%5Co%20%22Bandwidth%20%28signal%20processing%29) exceeding the lesser of 500 MHz or 20% of the [center frequency](https://en.wikipedia.org/wiki/Center_frequency%22%20%5Co%20%22).

**(For information in WGFM)**

## Canada 600 mhZ auction results

The Canadian [spectrum auction](http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf11331.html) of the 600 MHz band (617-652 MHz paired with 663-698 MHz) concluded on April 4 after 3 weeks of bidding. 9 bidders won a total of 104 licences, including 40 licences to regional providers. The auction raised a total of CAD $3.47 billion (approx USD 2.6 billion).

**(For information in ECC PT1 and WGFM)**

## CITEL questionnaire to administrations on unlicensed or license-exempt access to frequency bands

The 33rd Meeting of Permanent Consultative Committee II: Radiocommunications (PCC.II) met in Monterrey (Mexico) last 8-12 April and decided to hand out a questionnaire to CITEL administration on unlicensed or license-exempt access to frequency bands. The questionnaire is intended to understand the general and regulatory principles associated with the use of unlicensed or license-exempt access to frequency bands as a spectrum management technique. In particular, the questionnaire addresses possible specific regulation for ISM, as well as equipment homologation procedures and related regulations.

 **(For information in WG FM)**

# Global developments

## 5G deployments update

According to information from the GSMA, there are now 100 operators in 27 countries with 5G spectrum assignments.

GSA have reported that during the second quarter of 2019 several markets switched on 5G following the introduction of new 5G compatible smartphones. Some communications service providers have set ambitious targets of reaching up to 90 percent population coverage within the first year. As 5G devices increasingly become available and more service providers launch 5G, over 10 million 5G subscriptions are projected worldwide by the end of 2019. 5G subscription uptake is expected to be significantly faster than that of LTE.

According to GSA:

* There are 734 operators with commercially launched LTE networks (broadband fixed wireless access and or mobile). At least 112 other companies have licences suitable for LTE services, are deploying LTE, or are planning LTE networks; or are evaluating, testing or trialling LTE.
* 226 operators hold licences to use spectrum for TDD services, 160 of which have launched services.
* 298operators have deployed/launched LTE-Advanced or LTE-Advanced Pro technologies in their commercial networks. 174operators are investing in one or more LTE-Advanced Pro technologies
* 231 operators in 91 countries are investing in 5G networks in the form of tests, trials, pilots, planned and actual deployments.
* By mid-May 2019, 41 operators had announced that they had deployed either 3GPP or non-3GPP-compliant 5G technology in their networks. 14 had announced the launch of 5G mobile or FWA services (many of them with only very limited availability). 12 of those are understood to have deployed 3GPP-compliant networks. These figures are reduced by one since the last update as Nordic Telecom in Czechia has confirmed to GSA that its announced ‘5G’ service launch is currently based on LTE.

The number of available 5G devices has grown rapidly since the start of 2019 with the launch of commercial 5G services.

By the end of May, GSA had identified:

* 9 announced form factors (phones, hotspots, indoor CPE, outdoor CPE, laptops, modules, snap-on dongles/adapters, IoT routers, and USB terminals).
* 33 vendors that have announced available or forthcoming 5G devices.
* 64 announced devices, up from 50 in May and 33 in March (excluding regional variants, re-badged devices, phones that can be upgraded using a separate adapter, and prototypes not expected to be commercialised)
* 17 phones (plus regional variants)
* 6 hotspots (plus regional variants)
* 19 CPE devices (indoor and outdoor, including two Verizon-spec compliant devices)
* 16 modules
* 2 snap-on dongles/adapters
* 2 IoT routers
* 1 laptop
* 1 USB terminal.
* 5G chipsets from five vendors – Huawei, Intel, Mediatek, Qualcomm and Samsung – although Intel has announced its withdrawal from the 5G modem market.

**(For information in ECC PT1)**

## Alphabet Loon and softbank HAPS partnership

Softbank’s HAPSMobile has announced a USD $125 million investment in Alphabet’s Loon.

HAPSMobile began in 2017 as a joint venture between Softbank and Aerovironment, a U.S.-based aerospace company. The venture has developed a solar-powered drone, called Hawk 30, which travels up to 20 km above Earth’s surface for stratospheric telecommunications delivery, and has begun initial flight tests this year.

Alphabet’s Loon division builds high altitude balloons for delivering internet connectivity and has been in development since 2013. In 2017, Loon launched an internet service for some 100,000 residents in Puerto Rico, and in 2018 it installed ground infrastructure in Kenya with the aim to launch services later this year.

The two companies are now exploring commercial collaborations to accelerate the deployment of high-altitude network connectivity solutions, Softbank said. The companies are focused initially on expanding mobile internet to remote areas, enabling internet of things (IoT) applications, and expanding 5G deployments.

**(For information in CPG)**