1st ITU INTER-REGIONAL WORKSHOP ON WRC-19 PREPARATION
(Geneva, 21-22 November 2017)

The Technology path from LTE to 5G

Ericsson, Huawei, Intel, Nokia, Samsung and Qualcomm
ITU 1st Inter-regional workshop on WRC-19

Global mobile Suppliers Association
The Technology path from LTE to 5G

Making 26 GHz a Successful 5G band

The first phase of 5G has been specified, and the knowledge building is well underway. Subsequent commercial services are planned for Europe, China, and North America. 5G is available in Europe around 26 GHz. The 26 GHz spectrum can be used in Europe as well as the USA. The spectrum in Europe is therefore visible, and it is therefore of vital importance that Europe maximizes its spectrum efficiency.

LTE in Unlicensed Spectrum

GSA’s study on 5G network trials as well as deployments, and the availability of devices, modules, and phones. GSA welcomes additions.

Evolution from LTE to 5G – October 2017

This report is the latest update in a series of studies published by GSA tracking the development of mobile technology markets worldwide. We summarize network trials, deployments, and the availability of services across a variety of technology innovations and spectrum bands. Key metrics: 814 operators investing in LTE 644 commercially launched LTE or LTE-Advanced networks in 200 countries.

Spectrum reports

Report on the range 3300 – 4200 MHz C-band for 5G use

Industry reports

Ecosystem reports

https://gsacom.com
814 operators investing in LTE
644 commercially launched LTE, or LTE-Advanced, networks in more than 190 countries, including 100 LTE-TDD (TD-LTE) networks launched in 57 countries
212 launched networks are LTE-Advanced, in 105 countries
Cat-16 networks now 6% of total
GSA forecasts 680 – 700 commercially launched LTE networks by end of 2017
The Technology path from LTE to 5G

- 81 operators in 42 countries are currently investing in 5G
- more than 41 trials, most within the range 26.5 – 29.5 GHz for assessments of 5G networks performance, propagation, capacity, high vehicular speeds and applications
  - the lead countries are the USA, Korea, and Japan, according to national or operator announcements
GSA views on agenda item 1.13 (IMT-2020, 5G)

**24.25 - 27.5 GHz** identification supported
- suitable for broadband by means of at least 400-500 MHz and up to 1 GHz per network of contiguous bandwidth for nationwide use

**31.8 – 33.4 GHz** not preferred
- not suitable for broadband use due to its moderate size

**37.0 – 43.5 GHz** identification supported

**45.5 – 50.2 GHz** identification supported
- suitable for broadband by means of at least 800 – 1000 MHz and up to 2000 MHz per network of contiguous bandwidth for nationwide use

**50.4 – 52.6 GHz** could be supported
- lower interest for broadband use due to its moderate size

**66.0 – 71.0 GHz** identification supported
- suitable for broadband use, both licensed and unlicensed use

**71.0 – 86.0 GHz** could be supported
- but is preferred for backhaul solutions

- in combination with identification around 3.5 GHz and/or 4.5 GHz, would provide optimal solutions to deliver on the 5G promises
- indeed at 3.5 GHz and 4.5 GHz solutions can expect to provide in excess of a couple of Gbps peak data rates over 100 MHz of contiguous bandwidth
- while above 24.25 GHz blocks of 400 - 1000 MHz of contiguous spectrum would, by means of higher order modulation techniques, provide peak data rates of the order of tens of Gbps
Regional status on 5G spectrum considerations and use; general understanding of the GSA member companies

<table>
<thead>
<tr>
<th>Organization</th>
<th>Spectrum Considerations</th>
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<tbody>
<tr>
<td>APT/APAC</td>
<td>still building views, some focus on 3.5 GHz, 4.9 GHz, support for 24.25 / 24.75 – 27.5 GHz, and also 26.5 – 29.5 GHz</td>
</tr>
<tr>
<td>ASMG</td>
<td>3.5 GHz, support for 24.25 – 27.5 GHz, and 42 GHz</td>
</tr>
<tr>
<td>ATU</td>
<td>support for 24.25 – 27.5 GHz, 37.0 – 40.5 GHz, 40.5 – 42.5 GHz and 42.5 – 43.5 GHz</td>
</tr>
<tr>
<td>CEPT/EU</td>
<td>700 MHz, 3.5 GHz, support for 24.5 – 27.5 GHz (studies are ongoing on coexistence conditions by December) and 42 GHz</td>
</tr>
<tr>
<td>CITEL</td>
<td>still ongoing work, a survey was performed collecting the country views which will be debated in a upcoming meeting</td>
</tr>
<tr>
<td>CJK</td>
<td>very similar to the situation as in APT / APAC above</td>
</tr>
<tr>
<td>RCC</td>
<td>support compatibility studies in bands 24.25 – 27.5 GHz, 31.8 – 33.4 GHz, 40.5 – 42.5 GHz and 66 – 71 GHz</td>
</tr>
<tr>
<td>US/C</td>
<td>600 MHz, support for 27.5 – 28.35 GHz, 37 GHz, and 38 GHz</td>
</tr>
</tbody>
</table>

on the WRC-19 agenda item 1.13, regional bodies’ and their support for priority candidate bands for IMT identification under Resolution 238 (WRC-15), and support for sharing and compatibility studies for the band indicated, as well as other considerations.
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3GPP status and evolution

Evolution of LTE (eLTE)

Specifications

Releases 10-12
Releases 13-14
Releases 15-16

5G New Radio (5G NR)

5G NSA
December 2017

5G SA
June 2018

ITU - R IMT - 2020 submission

2017
2018
2018
2020

26 GHz 28 GHz 38 GHz 42 GHz

eLTE evolution for backwards compatibility securing smooth migration to 5G

5G NR for forward compatibility to ensure that new advanced features can be added over time, to efficiently addressing new use cases and requirements
The Spectrum Group within GSA is available to support regional and national regulators and policy makers

- the eight teams in the three Regions are supporting the work and studies towards WRC-19
- the team coordinators are the points of contact to provide support to the regional and national regulators and policy makers
- the 50+ team members will support the technical and regulatory work
Promoting the 3GPP Family of Technologies