The Need for 5G Spectrum

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* Disclaimer: the views expressed are those of the author and cannot be regarded as stating an official position of the European Commission.
Key Issues for the EU Level

Identify the spectrum mix

✓ Spectrum amount and quality
✓ Low-mid-high ranges: match the IoT/eMBB service mix

Designate common bands under harmonised conditions

✓ 5G 'fitness' of existing EU-harmonised bands
✓ Global bands to the extent possible

Extend 5G spectrum coordination

✓ Per service approach
✓ Coverage criteria and authorisation models
✓ Timely supply to the Single Market
5G Spectrum Roadmap

- 5GAP; RSPG 'pioneer bands'; 5G Mandate
- UHF Decision 700 MHz
- RSPG 5G roadmap; WRC-19 CPO
- COM Decisions 26 GHz 1.5 GHz 3.6 GHz? 900 MHz?
- EECC in force?
- 5G launch in all MSs
- Coordination of spectrum re-farming & assignment
- INVENTORY:
  - 1200 MHz
  - 5-6 GHz range
  - mm waves
  - sub-700 MHz
  - ['hybrid' systems]
- 5G Everywhere

Timeline:
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
- 2023
- 2024
- 2025

- 5G Standards
- WRC-19
- WRC-23

Today
EU Pioneer Bands – Status

700 MHz (harmonised; progressing assignment)

✓ COM Decision (28 April 2016): WBB & national options
  ✓ Transition schedule by mid-2020 (+ 2 years); first DE, FR, FI

3.6 GHz (harmonised, available, partly used)

✓ Review of COM Decision by 2019 (ongoing)
✓ Re-farming/defragmentation (not EU competence)

26 GHz (ongoing)

✓ COM Decision before WRC-19
✓ Harmonised technical/sharing conditions (incumbents!)
✓ Authorisation models (RSPG opinion, 5G-PPP input)
✓ Synergies with 28 GHz for the European priorities
RSPG Opinions (February 2017)

- No need for dedicated IoT spectrum,
- No current spectrum constraints for ITS;
- Utilise harmonised bands: licensed or licence-exempt

Sub-1GHz for IoT

- NB-IoT in 'mobile bands'; 2x3 MHz @ 700 MHz (an option);
- 800-900 MHz range

ITS: 5.9 GHz (& 63-64 GHz & 'mobile bands')

- Band extension (V2V & urban rail)
- Issue: competing standards vs. compatibility & spectrum efficiency

Audio-visual: sub-700 MHz band

- DTT/PMSE safeguards by 2030 and national flexibility → EU role
- Emerging mobile ecosystem at 600 MHz (USA)
EU Mapping Platform

Mapping fixed and mobile quality of broadband services in Europe

Common quality criteria and input data format
Central database with visualisation
Integration of different data sources
# Quality indicators for mobile connectivity

| QoS-1: Calculated availability of service | **What:** Theoretical network performance of existing infrastructure  
| | **How:** Data based on mobile operators’ radio field planning / geodata-based simulation models / prediction tools / no pure infrastructure data (backhaul network) |
| QoS-2: Measured provision of service | **What:** Provision of service measured  
| | **How:** Measurement through drive tests under controlled conditions to exclude bias of device / end user as much as possible |
| QoS-3: Measured experience of service | **What:** Actual user’s experience when using Internet Access Service (IAS)  
| | **How:** Measurement via online speed tests including end user’s environment |
Thank you for your attention!
## Priority Bands and International Context

<table>
<thead>
<tr>
<th>Frequency band</th>
<th>Bandwidth</th>
<th>For eMBB</th>
<th>Device availability</th>
<th>Spectrum availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>700 MHz</td>
<td>2x45 MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe: Band plan, USA: Band plan, JPN: partially, KOR: Band plan, CHN: Band plan</td>
</tr>
<tr>
<td>3.3-3.4GHz</td>
<td>100MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
</tr>
<tr>
<td>3.4-3.6GHz</td>
<td>200MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
</tr>
<tr>
<td>3.6-3.8GHz</td>
<td>200MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
</tr>
<tr>
<td>3.8-4.2GHz</td>
<td>400MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
</tr>
<tr>
<td>4.4-4.99GHz</td>
<td>500MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
</tr>
<tr>
<td>5.725-5.85GHz</td>
<td>125MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
</tr>
<tr>
<td>24.25-27.5GHz</td>
<td>3,250MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
</tr>
<tr>
<td>27.5-29.5GHz</td>
<td>2,000MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
</tr>
<tr>
<td>31.8-33.4GHz</td>
<td>1,600MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
</tr>
<tr>
<td>40.5-43.5GHz</td>
<td>3,000MHz</td>
<td>😞</td>
<td>😊</td>
<td>Europe:Band plan, USA:Band plan, JPN:Band plan, KOR:Band plan, CHN:Band plan</td>
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