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RADIO SPECTRUM COMMITTEE

Working Document

**Opinion of the RSC
pursuant to Advisory Procedure under Article 4 of Regulation
182/2011/EU and Article 4.2 of Radio Spectrum Decision 676/2002/EC**

Subject: Mandate to CEPT to develop harmonised technical conditions for spectrum use in support of the introduction of next-generation (5G) terrestrial wireless systems in the Union

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MANDATE TO CEPT

TO DEVELOP HARMONISED TECHNICAL CONDITIONS FOR SPECTRUM USE IN SUPPORT OF THE INTRODUCTION OF NEXT-GENERATION (5G) TERRESTRIAL WIRELESS SYSTEMS IN THE UNION

1. PURPOSE

This Mandate should deliver harmonised technical conditions, including sharing conditions wherever needed, which are suitable for the initial launch (by the year 2020) of next-generation (5G) terrestrial wireless systems in the Union, in selected frequency bands. These conditions should comply with the overarching Union spectrum policy principles of technology and service neutrality and efficient use. In particular, they should ensure the (continued) provision of wireless broadband electronic communications services including relevant 5G usage scenarios such as wireless broadband or the Internet of Things. 5G terrestrial wireless systems are likely to operate both, in existing EU-harmonised frequency bands below 6 GHz and in pioneer frequency bands above 24 GHz.

Timely availability of spectrum designated to 5G in the Union is key for keeping up with the pace of global 5G developments and early infrastructure deployment¹. Therefore, timely deliverables under this Mandate are needed with focus on early available ('pioneer') frequency bands, in order to enable their harmonisation and use for 5G terrestrial wireless systems in the Union. Depending on the evolving assessment of 5G spectrum needs at Union level as well as international developments, the Commission may consider one or more follow-up mandates to CEPT.

2. POLICY CONTEXT AND INPUTS

The ITU-R vision for the next-generation mobile telecommunications² outlines three major 5G usage scenarios for the time frame of 2020 and beyond – enhanced mobile broadband (eMBB), massive machine type communications (mMTC), and ultra-reliable and low latency communications (URLLC). Furthermore, WRC-15 initiated studies on a list of potential additional frequency bands for next-generation (5G) terrestrial wireless systems within the 24.25-86 GHz frequency range³, which should provide deliverables to enable WRC-19 to take a decision under agenda item 1.13 with a focus on global harmonisation.

The 5G Infrastructure Public Private Partnership (5G-PPP)⁴ was launched by the European Commission in 2013 with the goal to develop 5G communication systems and services for the provision of ubiquitous super-fast connectivity and seamless service delivery and thus to foster European leadership in technology and standardisation. The 5G-PPP

¹ For example, Korea, Japan or the USA. In this regard, the US regulator (FCC) adopted on 14 July 2016 a Report and Order on 5G spectrum above 24 GHz ("Spectrum Frontiers")

² In the ITU context of "International Mobile Telecommunications for 2020 (IMT2020)", s. ITU Recommendation: https://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.2083-0-201509-I!!PDF-E.pdf

³ ITU-R Resolution 238 (WRC-15)

⁴ See <https://5g-ppp.eu/>

Infrastructure Association (IA) has delivered concept papers⁵ on a 5G vision as well as on the significance of novel use cases originating from connectivity to specific vertical sectors (such as transport, healthcare or media). In terms of spectrum, the 5G-PPP IA emphasizes the need for very wide contiguous carrier bandwidths (e.g. hundreds of MHz up to several GHz) to be provided at a very high overall system capacity with focus on carrier frequencies above 6 GHz. Furthermore, vertical sectors are considered drivers of 5G requirements from the outset with high priority, in particular within frequency bands below 6 GHz. It is also recommended to consider any new bands for 5G use based on assessment and recognition of other services using, or planning to use, these bands. The 5G-PPP IA has liaised with the Radio Spectrum Policy Group (RSPG)⁶ regarding pioneer frequency bands for the Union.

In April 2016, the Commission adopted a package on the "Digitisation of the European Industry"⁷, which identified as a political priority for the Union use cases for next-generation wireless services in the context of the Internet of Things but also stressed the need to prepare the introduction of next-generation wireless broadband services. In September 2016, the Commission adopted its Communication to the Council and the European Parliament "5G for Europe: An Action Plan"⁸, which inter alia puts forward proposed actions on the EU-level identification and harmonisation of spectrum for 5G – pioneer frequency bands as well as additional bands – based on the opinion of the RSPG. The preparatory work for the 5G Action Plan drew on a major input from industry in the telecom and vertical sectors – the "5G Manifesto for timely deployment of 5G in Europe"⁹ – which includes recommendations on pioneer frequency bands for 5G use in consistency with the views of the 5G-PPP.

Therefore, next-generation (5G) terrestrial wireless systems should operate both, in existing EU-harmonised frequency bands below 6 GHz and in new frequency bands above 24 GHz. Potential hybrid business models using fixed or mobile terrestrial network infrastructure and satellite platforms may impact on spectrum use in 5G frequency bands above 24 GHz in the context of providing complementary or convergent services.

The following EU-harmonised frequency bands for terrestrial systems capable of providing wireless broadband electronic communications services are already potentially available for future 5G use:

- Below 1 GHz¹⁰: 694-790 MHz ('700 MHz band'), 790-862 MHz ('800 MHz band'), 880-915 MHz and 925-960 MHz ('900 MHz band').

⁵ See the 5G-PPP brochures: "5G vision" at <https://5g-ppp.eu/wp-content/uploads/2015/02/5G-Vision-Brochure-v1.pdf>, and "5G empowering vertical industries" at: https://5g-ppp.eu/wp-content/uploads/2016/02/BROCHURE_5PPP_BAT2_PL.pdf

⁶ Document "Initiative on pioneer 5G bands" (8 July 2016) from the 5G-PPP to the RSPG public consultation on the Draft RSPG Opinion on spectrum related aspects for next-generation wireless systems (5G)

⁷ See <https://ec.europa.eu/digital-single-market/en/digitising-european-industry>

⁸ See: <https://ec.europa.eu/digital-single-market/en/5g-europe-action-plan>

⁹ Link: http://ec.europa.eu/newsroom/dae/document.cfm?action=display&doc_id=16579

¹⁰ Subject to Commission Decisions (EU)2016/687 (700 MHz band), 2010/267/EU (800 MHz band), 2009/766/EC amended by 2011/251/EC (900 MHz band), 2014/641/EU (PMSE in the 800 MHz band)

- Above 1 GHz¹¹: 1452-1492 MHz ('1.5 GHz band'), 1710-1785 MHz and 1805-1880 MHz ('1800 MHz band'), 1920-1980 MHz and 2110-2170 MHz ('paired terrestrial 2 GHz band'), 2500-2690 MHz ('2.6 GHz band'), 3400-3800 MHz ('3.6 GHz band').

It should be noted that in all these frequency bands, with the exception of the 900 MHz and 1800 MHz bands, the harmonised technical conditions are based on the concept of block edge masks, in order to facilitate a technologically neutral approach and least restrictive conditions, which allows for the use of any technology that complies with the block edge mask. For the 900 MHz and 1800 MHz frequency bands, the harmonised technical conditions are based on specific technologies referenced through ETSI standards, which are evolving to enable 5G use.

EU-harmonised bands for wireless broadband electronic communications services are potentially to be used for providing amongst other services vehicle-to-anything (V2X) connectivity, machine-to-machine or other IoT applications, e.g. by means of cellular networks. In this regard, the Commission has adopted a Communication on European Strategy on Cooperative Intelligent Transport Systems¹².

In its "Strategic Roadmap towards 5G for Europe: Opinion on spectrum related aspects for next-generation wireless systems (5G)"¹³, the RSPG sets out its priorities and recommendations for pioneer frequency bands for the introduction of 5G terrestrial wireless systems in Europe as follows:

1. The RSPG considers the frequency band **3400-3800 MHz** to be the **primary band** suitable for the introduction of 5G-based services in Europe even **before 2020** given that it is already harmonised for mobile networks and offers wide channel bandwidth¹⁴.
2. The RSPG is of the opinion that 5G will need to be deployed also in bands already **harmonised below 1 GHz**, including particularly **the 700 MHz band**¹⁵, in order to enable nation-wide and indoor 5G coverage.
3. The RSPG recognises the need to ensure that technical and regulatory conditions for **all bands already harmonised** for mobile networks are **fit for 5G use**.

¹¹ Subject to Commission Decisions (EU)2015/750 (1.5 GHz band), 2009/766/EC amended by 2011/251/EC (1800 MHz band), 2012/688/EU (paired terrestrial 2 GHz band), 2008/477/EC (2.6 GHz band), 2008/411/EC amended by 2014/276/EU (3.6 GHz band)

¹² Commission Communication on European Strategy on Cooperative Intelligent Transport Systems (C-ITS) at: http://ec.europa.eu/transport/sites/transport/files/com20160766_en.pdf

¹³ Document RSPG16-032 FINAL of 9 November 2016

¹⁴ Ensuring regulatory predictability is important for this band taking into account the ongoing implementation of Decision 2014/276/EU across the Union

¹⁵ It should be noted that the 700 MHz band has been recently harmonised (Commission Decision 2016/687/EU of April 2016) and should remain stable in light of ongoing national award procedures between now and 2020.

4. The RSPG recommends the **24.25-27.5 GHz** (hereinafter '26 GHz') band as a **pioneer band** for Europe to be harmonised before 2020.

Furthermore, the RSPG considers the 31.8-33.4 GHz band as a promising band, and the 40.5-43.5 GHz band as a viable option in the longer term, for 5G use.

The RSPG expresses a vision that 5G will drive industrial and societal transformation and economic growth in Europe from 2020 and beyond. The strategic roadmap aims to facilitate the launch of 5G on a large scale by 2020, thereby ensuring that the benefits of 5G-based services are available to all European citizens in a timely manner. The RSPG expects that the first major commercial deployments will be based on lower frequencies. One of the reasons is the possibility to reach rapidly a sufficient coverage for addressing enhanced broadband communications and, above all, the machine-type communications market, which may require ubiquity, low latency and low complexity. As regards candidate bands for 5G use above 6 GHz, the RSPG has limited its consideration to the bands listed by WRC-15, focussing on the frequency bands proposed by Europe at WRC-15, in order to strengthen the global harmonisation opportunities. Therefore, enabling early availability of different pioneer frequency bands under harmonised technical conditions is of strategic importance for the Union for the introduction of commercial 5G services in Europe, possibly preceded by relevant trials and pilots.

The status of ITU-level spectrum allocations and the current use of potential frequency bands for 5G, in particular above 24 GHz, necessitate studies to assess **shared spectrum use** between 5G terrestrial wireless systems and existing or prospective incumbent use as well as compatibility studies with respect to adjacent bands. Sharing studies are of high relevance with respect to terrestrial backhaul or fixed satellite links, in particular with view to existing and future earth stations in the earth exploration satellite service (EESS), space research service (SRS), the fixed satellite service (FSS), and on-board receivers of data relay satellite systems (DRSS). In this regard, the RSPG provides recommendations on spectrum co-existence within the 26 GHz pioneer band, which are relevant for the development of technical conditions for shared spectrum use.

It should be noted that certain non-European countries have identified spectrum for 5G services on a national basis in frequency bands, which are adjacent to priority bands according to the RSPG opinion, most notably within the 27.5-29.5 GHz ('28 GHz') band¹⁶ or the 37-40 GHz band¹⁷. These developments should be taken into account in order to facilitate global interoperability and economies of scale of equipment based on the implementation of a common tuning range.

Therefore, comprehensive studies on the technical conditions for spectrum use in existing EU-harmonised frequency bands below 6 GHz and the pioneer band above 24 GHz¹⁸ for

¹⁶ A regulatory decision in the USA, according to the FCC's Spectrum Frontier Report and Order and Further Notice of Proposed Rulemaking of 14 July 2016 available at: <https://www.fcc.gov/document/spectrum-frontiers-ro-and-fnprm>; Korea plans to use the 26.5-29.5 GHz band for early 5G trials in 2018

¹⁷ A regulatory decision in the USA, according to the FCC's Spectrum Frontier Report and Order and Further Notice of Proposed Rulemaking of 14 July 2016; this band is also for study towards WRC-19

¹⁸ Ensuring regulatory predictability is important for the bands within the scope of the tasks of this mandate taking into account ongoing national award procedures until 2020

the introduction of 5G terrestrial wireless systems are necessary to enable deployment of evolving and new services and applications (under licensed or licence-exempt operation). These studies should be framed by the Union's policy strategy so as to provide an appropriate spectrum mix for various usage scenarios, to study co-existence scenarios with other radio services and to develop a European approach benefiting to the extent possible from global harmonisation. It is likely that results from the work at ITU level will deliver inputs to the studies under this Mandate¹⁹. In this regard, CEPT is already conducting studies on the pioneer 3.6 GHz and 26 GHz bands to assess harmonised technical conditions for 5G terrestrial wireless systems, as well as on potential extensions of the 1.5 GHz band.

3. JUSTIFICATION

Pursuant to Article 4(2) of the Radio Spectrum Decision²⁰ the Commission may issue mandates to the CEPT for the development of technical implementing measures with a view to ensuring harmonised conditions for the availability and efficient use of radio spectrum necessary for the functioning of the internal market. Such mandates shall set the tasks to be performed and their timetable. Pursuant to the Radio Spectrum Decision, activities under the Decision must facilitate policy making with regard to the strategic planning and harmonisation of radio spectrum use as well as ensure the effective implementation of radio spectrum policy in the EU while serving the aim of coordination of policy approaches. Furthermore, they shall take due account of the work of international organisations related to radio spectrum management²¹ (such as ITU).

The Radio Spectrum Policy Programme (RSPP) requires Member States, in cooperation with the Commission, to take all steps necessary to ensure that sufficient spectrum for coverage and capacity purposes is available within the Union, in order to enable the Union to have the fastest broadband speeds in the world, thereby making it possible for wireless applications and European leadership in new services to contribute effectively to economic growth, and to achieving the target for all citizens to have access to broadband speeds of not less than 30 Mbps by 2020. Furthermore, the RSPP calls on Member States and the Commission to ensure spectrum availability for the Internet of Things (IoT). The RSPP also stipulates that Member States, in cooperation with the Commission, shall, where appropriate, foster shared use of spectrum²².

Advances in international standardisation as well as rapid international developments regarding 5G trials and spectrum use until 2020 call for a swift and coordinated EU-level process on delivering sufficient and appropriate spectrum for 5G use in the Union according to anticipated deployment of 5G usage scenarios. Therefore, urgent action is needed in line with Union policy priorities and taking due account of relevant progress in international spectrum management to perform technical studies in order to develop harmonised technical conditions for spectrum use for the introduction of 5G terrestrial wireless systems.

¹⁹ Linked to Article 1.3 of the Radio Spectrum Decision

²⁰ Decision 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community, OJ L 108 of 24.4.2002

²¹ Article of Decision 676/2002/EC (Radio Spectrum Decision)

²² See Articles 6(1), 4(1) and 8(6) of the RSPP

4. TASK ORDER AND SCHEDULE

CEPT is herewith mandated to develop harmonised technical conditions for spectrum use of selected frequency bands, which is suitable for 5G terrestrial wireless systems, in compliance with the policy priorities set out in this Mandate. These conditions should allow the provisions of wireless broadband electronic communications services including 5G usage scenarios and take into account needs for shared spectrum use with existing or prospective incumbent uses. CEPT should give utmost consideration to overarching Union-level spectrum policy objectives²³ such as efficient spectrum use and take utmost account of applicable principles of Union law such as technological and service neutrality, non-discrimination and proportionality insofar as technically possible.

CEPT is requested to collaborate actively with the European Telecommunications Standardisation Institute (ETSI) which develops harmonised standards for conformity under the Radio Equipment Directive. In particular, CEPT should take into consideration emerging technologies and ETSI (harmonised) standards, which define 5G systems and facilitate shared spectrum use or foster economies of scale. Furthermore, CEPT is requested to take into account relevant developments at international level and to consider possible synergies.

When developing harmonised technical conditions, CEPT shall focus its efforts on the pioneer bands as identified in this Mandate and take due account of the relevant RSPG recommendations¹³ in respect to other radio services. More specifically, CEPT is mandated to perform the following tasks with view to creating sufficiently precise harmonised technical conditions for the development of EU-wide equipment for the introduction of 5G terrestrial wireless systems in the Union:

1. Review the harmonised technical conditions applicable to the **3.4-3.8 GHz ('3.6 GHz') frequency band, as a 5G pioneer band**, with view to their suitability for 5G terrestrial wireless systems and amend these, if necessary.
2. Study and assess the **24.25-27.5 GHz ('26 GHz') frequency band as a 5G pioneer band** for use under relevant 5G usage scenarios taking into account the co-existence issues highlighted in the RSPG opinion¹³ with respect to fixed links, earth exploration satellite and space research services, fixed satellite services, data relay satellite systems and passive services in the frequency band 23.6-24 GHz. In this regard, identify and study common *sharing scenarios* with incumbent radio services and applications, for which future demand has been identified.

Opportunities for interoperability and economies of scale of equipment such as a common tuning range, including the 26 GHz band, with possible 5G use outside Europe shall be taken into account. The impact of activities outside Europe in the adjacent frequency band for 5G use shall be considered, including a broad range of sharing scenarios that protect existing and future satellite services in the band.

3. Develop channelling arrangements and common and minimal (least restrictive) technical conditions²⁴ for spectrum use in the **26 GHz frequency band**, which are

²³ Enshrined in the RSPP and the Radio Spectrum Decision

²⁴ Such as the definition of appropriate Block Edge Masks (BEMs)

suitable for 5G terrestrial wireless systems, in conjunction with relevant usage and sharing scenarios.

In this regard, develop harmonised technical conditions to ensure spectrum usage *on a shared basis*, including *protection conditions* where necessary, pursuant to the sharing scenarios identified under Task 2, in close cooperation with all concerned stakeholders. These conditions should be sufficient to mitigate interference and ensure co-existence with incumbent radio services/applications in the same band or in adjacent bands, in line with their regulatory status, including at the EU outer borders.

4. Assess requirements for cross-border coordination, wherever relevant, including at the EU outer borders.

Overall, the CEPT should provide deliverables under this Mandate according to the following schedule:

Delivery date	Deliverable	Subject
March 2018	Draft Report A from CEPT to the Commission ²⁵	Description of the work undertaken and the results on Task 1.
June 2018	Final Report A from CEPT to the Commission taking into account the outcome of the public consultation	Description of the work undertaken and the results on Task 1.
March 2018	Draft Report B from CEPT to the Commission ²⁵	Description of the work undertaken and the results on Tasks 2 and 3.
June 2018	Final Report B from CEPT to the Commission taking into account the outcome of the public consultation	Description of the work undertaken and the results on Tasks 2 and 3.

The relevant results under Task 4 should be included in the deliverables above regarding different frequency bands.

CEPT is requested to report on the progress of its work pursuant to this Mandate to all meetings of the Radio Spectrum Committee taking place during the course of the Mandate.

The Commission, with the assistance of the Radio Spectrum Committee and pursuant to the Radio Spectrum Decision, may consider applying the results of this mandate in the Union, pursuant to Article 4 of the Radio Spectrum Decision and subject to international developments regarding 5G standardisation and spectrum management, and any relevant guidance of the RSPG.

²⁵ Subject to subsequent public consultation