



EUROPEAN COMMISSION

Directorate-General for Communications Networks, Content and Technology

Electronic Communications Networks and Services

Radio Spectrum Policy Group

RSPG Secretariat

Brussels, 09 November 2016

RSPG16-032 FINAL

RADIO SPECTRUM POLICY GROUP

STRATEGIC ROADMAP TOWARDS 5G FOR EUROPE

Opinion on spectrum related aspects for next-generation wireless systems (5G)

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1 Background and scope of work

An opinion¹ was sought in order to build on RSPG's efforts and contribute actively to the development of Europe's spectrum policy strategy regarding 5G.

In developing the strategic roadmap towards 5G for Europe the RSPG was requested to:

- Assess the spectrum related aspects for 5G in the long term, starting from the point of view of specific goals. (Such as how to ensure that the benefits of 5G-based services are available to all European citizens).
- Consider aspects related to system architecture (such as wireless network densification, network resilience and convergence), technology enablers and the variety of services and invite 5G-PPP to present the status of its work.
- Identify and analyse spectrum related challenges such as: spectrum sharing, usage and licence conditions, rural areas, policy implementation, incentive regulation, the principle of technology and service neutrality and the reuse of already harmonised spectrum to support the transition towards 5G.
- Assess appropriate frequency bands for 5G, in particular additional bands above 6 GHz.

However, the RSPG resolved to develop this early opinion as a first stage in order to give guidance and input to other associated European activities, such as the development of the European Commission 5G Action Plan and industry more generally. This opinion will be followed by a subsequent detailed opinion addressing the above requests.

The RSPG strategic roadmap towards 5G for Europe 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. The vision being that 5G will drive industrial and societal transformation and economic growth in Europe from 2020 and beyond.

It is expected that the first major commercial deployment 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, machine type communications market, which may require ubiquitous coverage, low latency and low complexity.

The implementation of frequency bands above 24 GHz remains needed to ensure all the performance targets of 5G, for example multi gigabit per second data rates. RSPG has strictly limited its considerations of bands above 6 GHz to the bands listed by WRC-15, focusing on the frequency bands proposed by Europe at WRC-15, in order to strengthen the global harmonisation opportunities, in particular for the bands 24.25-27.5 GHz, 31.8-33.4 GHz and 40.5-43.5 GHz.

¹ RSPG 16-007 Final of 24 February 2016

2 The opinion of the RSPG on the strategic roadmap towards 5G for Europe

This roadmap has been developed to facilitate the launch of 5G on a large scale in Europe by 2020. The goal is that the benefits of 5G-based services are available to all European citizens in a timely manner, driving industrial and societal transformation and economic growth in Europe from 2020 and beyond.

1. The RSPG considers the 3400-3800 MHz band to be the primary band suitable for the introduction of 5G -based services in Europe even before 2020, noting that this band is already harmonised for mobile networks, and consists of up to 400 MHz of continuous spectrum enabling wide channel bandwidth. This band has the possibility to put Europe at the forefront of the 5G deployment.
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, in order to enable nationwide and indoor 5G coverage.
3. The RSPG considers that there will be a need to ensure that technical and regulatory conditions for all bands already harmonised for mobile networks are fit for 5G use.
4. The RSPG stresses that there are many frequency bands above 24 GHz which are of potential interest for 5G in Europe. The RSPG will define the timeline for availability of bands taking into account sharing and transition challenges, for example for mobile access and fixed services (including backhauling).
5. The RSPG notes the support from mobile industry to the 24.25-27.5 GHz band as a pioneer band for earlier implementation in Europe of 5G above 24 GHz.
6. The RSPG recommends the 24.25-27.5 GHz as a pioneer band for 5G above 24 GHz and that:
 - Europe should develop harmonisation measures on the basis of the radio spectrum decision in this band before 2020 and
 - Member states should make available a portion of this frequency band for 5G in response to market demand, taking into account that 5G deployment in this frequency range is likely to remain geographically limited by 2020.
7. The RSPG is of the opinion that the harmonisation of the 24.25-27.5 GHz frequency band would need to take into account that:
 - The roll-out of 5G in this band is expected to be progressive, starting in major urban centres and to use only a portion of the band. It is also noted that mobile network operators are the main users of this frequency band for fixed service. This may reduce the need for extensive clearance of fixed links from the band. Consequently, demand for new spectrum for respective fixed service links for backbone purposes by the mobile network operators after repurposing the use of the band is expected to be managed within the existing frequency bands allocated to the fixed service.
 - It is expected that the number of EESS Earth stations in the 25.5-27 GHz frequency band will remain limited. However, appropriate

provisions are needed in the authorization for 5G to define precisely how existing and future earth stations will be protected and how future earth stations will continue to have the opportunity to be installed in order to safeguard in a proportionate way the possibility for future deployment in this frequency band.

- It is expected that the number of FSS Earth stations in the 24.65-25.25 GHz frequency band will remain limited, given the applicable regulatory conditions. However, appropriate provisions are needed in the authorization for 5G to define precisely how to safeguard in a proportionate way the use of existing earth stations and the possibility for future deployment of FSS earth stations.
 - Protection of on-board receivers of the Data Relay Satellite Systems may require additional technical and regulatory measures depending on the outcome of sharing studies.
 - Protection of the passive service in the adjacent band (23.6-24 GHz) will require technical conditions to be developed to limit unwanted emissions.
 - All conditions relating to existing services in the international regulatory framework will be kept unchanged.
8. RSPG recognises that the band 31.8-33.4 GHz looks a promising band which could be made available relatively easily by many European administrations, taking into account the existing fixed service deployment in this band, for future deployment of 5G services. This frequency band will need further studies in order to assess the future availability, the demand from industry, the potential for global harmonisation and the required technical conditions to protect existing services, including passive services in the adjacent bands. RSPG recommends that, in the meantime, shift of use from other bands to this 31.8-33.4GHz band should be avoided as far as possible in order to keep the option open to make it available for 5G in the future.
9. RSPG considers that the band 40.5-43.5 GHz is a viable option for 5G in the longer term, taking into account the support from mobile industry and the need to take into account the general balance between mobile and satellite sector to access the 40/50 GHz range. Shift of use from other bands to this 40.5-43.5GHz band should be avoided as far as possible in order to keep the option open to make it available for 5G in the future.
10. The RSPG will prepare a supplementary opinion elaborating on the implementation of this opinion taking also into account the work of the RSPG working groups on IoT and ITS as well as existing licences in the pioneer bands.

Annex 1 Summary of the responses to the public consultation

A public consultation on the draft version of this Opinion was held from *14 June 2016 until 31 July 2016*. In all 38 responses were received. All responses can be found on the RSPG website: <http://rspg-spectrum.eu/2016/09/responses-to-the-public-consultation-on-5g-published/>

The responses received can be classified as from the following groups:

1. Member States
2. Mobile Telecommunication, Infrastructure, Terminal and Semiconductor Vendors
3. Telecom operators
4. Satellite sector
5. Broadcasting sector
6. Energy sector
7. Other

The RSPG is pleased to note that in general the responses voice a strong support for the opinion. RSPG also deeply appreciates all comments received.

In relation to the choice of the frequency bands above 24 GHz which should be harmonised in Europe for early 5G implementation, the respondents commenting on this issue represent three of the groups listed above and their related special interest associations:

- The majority of the Mobile Telecommunication, Infrastructure, Terminal and Semiconductor Vendors supported the 24.25-27.5 GHz band as the pioneer band. Reasons given are the large bandwidth of more than 3 GHz and the possibility for equipment to support a continuous tuning range with the 28 GHz band in order to facilitate economy of scale with US and Korea. The possibility to leverage the ongoing development for other markets is also deemed to lower the implementation risks and allow for early access to equipment.
Regarding the 31.8-33.4 GHz band several respondents note that this is an interesting band going forward. But the smaller available bandwidth (1.6 GHz) and the need to protect passive services below 31.8 GHz makes this less attractive as the pioneer band, the need to protect passive services below 31.8 GHz introduces an engineering risk that could further limit the available bandwidth and delay equipment availability.
Several respondents also highlight the potential for the 42 GHz band as a second step in the European introduction of 5G above 24 GHz.
- The responses from the Telecommunication operators is more diverse. Many of the answers are expressing support for both the 24.25-27.5 and 31.8-33.4 GHz band. Several of the respondents also highlight the importance of a common tuning range with the US and Korean 28 GHz band, something that is viewed as a possibility for both these bands.
- The majority of the responses from the Satellite sector supported the 32 GHz band as the pioneer band. The main reasons are the low current use and the fact that the band was proposed as a candidate band by all Regions at WRC 15 therefore making it good candidate for global harmonisation.

The responses from the broadcasting sector highlight the need to limit considerations of bands above 6 GHz to the band listed by WRC-15. The responses from the energy

sector are not relevant to this issue.

The RSPG is grateful to all respondents for their input. This input has been invaluable in the work to reach a decision on the band in this finalised RSPG opinion.

The RSPG also notes that many respondents have submitted proposals regarding spectrum and regulatory issues that go well beyond the scope of the current opinion. These inputs will be taken into account in the continuing work of RSPG and a second more comprehensive RSPG opinion on 5G.