



Huawei response to the Radio Spectrum Policy Group Public consultation on the Update of the RSPG Work Programme

Summary

Huawei welcomes the opportunity to provide feedback on this very important consultation on the RSPG Work Programme for 2016 and beyond. This document describes our views on spectrum related aspects for next-generation wireless systems (5G), Internet-of-things (IoT) including M2M and ITS spectrum strategy, and WRC-19 preparation.

In summary, our views are as follows:

Spectrum related aspects for next-generation wireless systems (5G)

- We recommend that the RSPG considers both the frequencies in the upper and lower ends of the 24-86 GHz range for future 5G in Europe. The 71-86 GHz range for high peak data rates, and the lower ranges (including 24-33 GHz) where (small cell) coverage can be achieved more cost-effectively.
- Given that the ITU-R has no future plans to examine 5G candidate bands in the range 6-24 GHz (as decided at WRC-15), we recommend that the RSPG assesses the viability of regional harmonized spectrum below 24 GHz and below 6 GHz in particular, for wider area (large cell) and nationwide 5G coverage.

The C-Band

- We recommend that the RSPG keeps the 3800-4200 MHz band in its strategic roadmap towards 5G, and in its planned RSPG Opinion. This is especially important in light of the outcome of WRC-15 which has not identified any potential bands for 5G studies between 6 and 24 GHz.

Sub-700MHz UHF (470-694 MHz)

- Huawei supports the "Flexibility" concept chosen by the RSPG for the delivery of new innovative services based on "downlink only" IMT technologies in the sub-700MHz UHF band.
- We are of the view that the spectrum made available through the "Flexibility" concept in the sub-700MHz UHF band will be predominantly used for the delivery of audio-video content.
- We recommend the RSPG to launch technical, regulatory and economic studies of possible options for the implementation of downlink only IMT technologies within the "Flexibility" concept in the sub-700MHz UHF band.

- Huawei believes the “Flexibility” concept can be most efficiently implemented through the voluntary and coordinated identification of a common sub-band of the sub-700 MHz UHF among groups of neighbouring “pioneer countries”.
- Huawei is of the opinion that it is best to allow the market to shape the possible new business models for the provision of new innovative services in the sub-700MHz UHF band.

Internet-of-things spectrum strategy

Machine-to-machine communications

- Licensed access to spectrum is essential for many important IoT applications where guarantees of quality of service are required.
- The use of harmonised spectrum for electronic communication networks (ECNs) will lower implementation costs of the IoT by leveraging the economies of scale in IMT equipment.
- It is important that no regulatory barriers exist towards the use of harmonised spectrum for electronic communication networks (ECNs) in support of IoT/M2M applications, in line with principles of service and technology neutrality.

Intelligent Transport Systems

- Licensed access to spectrum is essential for ITS applications where guarantees of quality of service are required.
- We recommend that the RSPG investigates the suitability of exclusive use (for ECN or ITS) of spectrum based on licensed authorisation for the support of safety-related applications of ITS (e.g., collision avoidance and self-driving cars), as well as other IoT applications with safety implications.

WRC-19 preparation

- In light of the outcome of the recent WRC-15, we recommend that the RSPG examines the spectrum range 24-86 GHz for priority bands which provide the best potential for European and global harmonisation.



Spectrum related aspects for next-generation wireless systems (5G)

We very much welcome the RSPG’s efforts in developing a strategic roadmap towards the future availability of spectrum for 5G in Europe, and its plan to deliver a draft RSPG Opinion addressing appropriate frequency bands for 5G, in particular additional bands above 6 GHz.

Huawei is willing to assist the RSPG through our global perspective, and expertise in studies and results from early field experiments and trials of 5G.

We especially note the plans for closer cooperation between China and the EU in the area of 5G, and “the identification of globally harmonised radio frequency bands to meet the additional spectrum requirements for 5G, reinforcing cooperation in the context of ITU and World Radio Conference (WRC)”.¹ Huawei will be pleased to reinforce and assist such initiatives.

In light of the outcome of the recent WRC-15, we recommend that the RSPG examines the spectrum range 24-86 GHz for priority bands which provide the best potential for European and global harmonisation.

We emphasise the need for bands which can accommodate the very large contiguous bandwidths required for peak data rates of 20 Gbit/s or more envisaged for 5G enhanced mobile broadband. Such bandwidths are available at the upper end of the 24-86 GHz range, including the E-Band (71-76/81-86 GHz), albeit for small cell coverage.

The use of advanced smart antenna technologies, combined with the small antenna dimensions at the upper end of the 24-86 GHz range, partly compensates for any increased propagation losses compared to frequencies at the lower end of the range, and facilitates spectrum sharing with existing users. In the case of the E-Band, we also note that the majority of the existing fixed links are for the provision of mobile (4G) backhaul. With the eventual transition of IMT from 4G to 5G, any required coordination or spectrum sharing with fixed links for the provision of access and backhaul can be readily managed.

We also emphasise the need for focus on the lower end of the 24-86 GHz range, including 24-33 GHz, where similar small cell coverage as higher frequencies can be achieved more readily and cost-effectively.

Given the absence of 5G candidate bands in the range 6-24 GHz for studies leading up to WRC-19, we recommend that the RSPG assesses the viability of regional harmonized spectrum below 24 GHz and below 6 GHz in particular, for wider area (large cell) and nationwide 5G coverage. As described below, we believe that the C-Band (on a shared basis) and the 470-694 MHz band may represent important opportunities for the development of wide area 5G coverage in Europe in frequency bands that have not been used previously for IMT.

¹ RSPG15-621 rev, RSPG, draft for public consultation, “Draft RSPG Opinion on the implementation of the current RSPG and its revision to address the next period,” October 2015.



The availability of such sub-6GHz spectrum for 5G should be considered with a view to the evolutionary timelines of LTE, and the need for sufficient spectrum for existing LTE deployments in the transition period from 4G to 5G.

In identifying spectrum for 5G, it is important to account for the likely variations in demand for 5G among Member States through the adoption of flexible policies, noting the need to meet the requirements of all European consumers, and by not linking the timelines of Europe-wide spectrum policies to those markets with the lowest demand.

We also recommend that European administrations continue to use the principle of technology neutrality in setting out spectrum regulations, as the nature of the technologies adopted are best decided by the market rather than through regulation.

We recommend that the RSPG considers both the frequencies in the upper and lower ends of the 24-86 GHz range for future 5G in Europe. The 71-86 GHz range for high peak data rates, and the lower ranges (including 24-33 GHz) where (small cell) coverage can be achieved more cost-effectively.

Given that the ITU-R has no future plans to examine 5G candidate bands in the range 6-24 GHz (as decided at WRC-15), we recommend that the RSPG assesses the viability of regional harmonized spectrum below 24 GHz and below 6 GHz in particular, for wider area (large cell) and nationwide 5G coverage.

The C-Band

The importance of spectrum below 6 GHz for IMT has become more evident following the WRC-15 discussions and conclusions which have shown the many difficulties associated with the introduction of 5G to spectrum in the 6 to 24 GHz range.

While acknowledging that the WRC-15 did not agree on the proposals from a few administrations to identify the 3800-4200 MHz range for IMT, we believe the 3800-4200 MHz range should remain an important candidate as a wide-area capacity band for provision of 5G services in Europe, being the largest contiguous band below 6 GHz, and due to its adjacency with the 3400-3800 MHz range already harmonized for IMT in the European Union.

The important role of the 3800-4200 MHz band was evident even prior to WRC-15. For example, the RSPG Opinion² of 2013, while recognizing that the 3800-4200 MHz band is primarily used for the incumbent FSS services, goes on to state that: "*Nevertheless, the frequency range 3800-4200 MHz has the potential to play a role in the provision of electronic communications services to ensure that the future capacity needs especially in urban areas, are met. Therefore, studies should be carried out into the possibility of sharing in Europe between the FSS and terrestrial wireless broadband services*".

² RSPG13-521 Rev 1, RSPG, "RSPG Opinion on Strategic Challenges facing Europe in addressing the Growing Spectrum Demand for Wireless Broadband," June 2013.

Huawei is of the view that the work on considering the 3800-4200 MHz band for the provision of electronic communication networks (ECNs) based on IMT technologies should be continued. In this respect, we acknowledge the importance of reliable and efficient coexistence frameworks between ECNs and the existing Fixed Satellite Service and Fixed Service incumbents. We are confident that coexistence can be well achieved based on the recent advances in both technology and spectrum management techniques, including approaches for database-assisted access to the spectrum such as Licensed Shared Access (LSA). Previous studies at CEPT and ITU-R have clearly shown that protection of FSS Earth Stations at known locations is feasible.

It is to be noted that the ECC PT1 is already exploring the feasibility of sharing in the 3600-3800 MHz band in an *ad-hoc* Work Item on the “Operational guidelines for spectrum sharing to support the implementation of the current ECC framework in the 3.6-3.8 GHz range” that was established in November 2014. As an active partner in this item, we note that the regulatory tools and techniques being developed as part of this work are also applicable to the band 3800-4200 MHz.

We think it is important to see the proposed RSPG strand of work on the 3800-4200 MHz band in Europe in a global context of developing the IMT ecosystem in the C-band. Indeed, WRC-15 decided on the nearly global identification of the 3400-3600 MHz band for IMT. The Conference has also recorded an increased support (compared to WRC-07) for IMT identification in the 3600-3800 MHz from all Regions. Considering the interest shown at WRC-15 in the 3800-4200 MHz band from some key markets, e.g., Japan, Huawei expects a gradual development of a global ecosystem within the C-band for IMT. We consider that IMT equipment can be developed to operate in the whole 3400-4200 MHz range and, based on national circumstances, individual countries will decide when and which portions should be used for IMT in their territories.

We recommend that the RSPG keeps the 3800-4200 MHz band in its strategic roadmap towards 5G, and in its planned RSPG Opinion. This is especially important in light of the outcome of WRC-15 which has not identified any potential bands for 5G studies between 6 and 24 GHz.

Sub-700MHz UHF (470-694 MHz)

Huawei confirms its support for the “Flexibility” concept in the sub-700MHz (470-694 MHz) UHF band, proposed in the RSPG Opinion³ and now supported by the European Commission. We believe that opening the sub-700MHz UHF band for new innovative services, based on “downlink only” IMT technologies, may provide significant benefits both for the end users and market players, while ensuring the protection of the digital terrestrial TV (DTT) service which will remain in use for years to come.

We note that the delivery of audio visual content is one of the key drivers of rising demand for capacity in mobile broadband networks today, and that the UHF band is unique in its

³ RSPG15-595 FINAL, RSPG, “RSPG Opinion on a long-term strategy on the future use of the UHF band (470-790MHz) in the European Union,” February 2015.



ability to provide efficient nationwide coverage for such services. Therefore we expect that any portion of the sub-700MHz UHF band which might be made available on a voluntary basis for the introduction of new electronic communication services will be predominantly used for the delivery of audio-video content. We think that it is best to allow the market to shape the possible new business models in response to the rapidly evolving demand for mobile broadband services.

We therefore recommend the RSPG to launch technical, regulatory and economic studies of possible options for the implementation of the Flexibility concept.

In the context of such studies, Huawei prefers a focus on the coordinated and voluntary identification of a common (and preferably contiguous) sub-band of the sub-700MHz UHF band for the introduction of IMT technologies among groups of neighbouring "pioneer countries" where the penetration of the DTT services is low. Huawei is of the opinion that the alternative "white spaces" approach for implementing the Flexibility concept may lead to severe restrictions on the e.i.r.p of IMT base stations and thus would not allow the key advantage of the UHF frequency band, namely its favourable radio waves propagation characteristics, to be appropriately exploited.

We consider that such studies are necessary to work out the most robust solutions from the perspective of interference management as well as to explore different aspects of the future regulatory regime and potential business incentives of various market players. If successful, these studies may lead to the provision of new advanced electronic communication services via the evolved IMT technologies, potentially representing a step forward in the direction of convergence between the Broadcasting and Mobile services.

Huawei is of the view that mobile network operators (MNOs) are well placed for providing the platform for the delivery of audio-video services in a future converged network. We also expect that Broadcasters will be increasingly focussing on content. However, more complex models cannot be excluded at this stage. In order to maximise the benefits for all stakeholders, and especially the end users, the issues related to future business models should encounter minimum necessary regulatory intervention. Whatever regulatory frameworks and business models emerge in the future, Huawei will be prepared to deliver standardised convergence solutions in a timely manner in line with the market demand.

We also believe that the suggested RSPG studies on the Flexibility concept in 2016 should be carried out with the involvement of all market players, including MNOs who will presumably play an important role in the implementation of the Flexibility concept. These studies should also help Europe in developing a clear view on possible changes which may be required to the international status of the UHF band in Region 1, such as a co-primary Mobile allocation.

Finally, Huawei is of the opinion that while in the coming years Europe will be busy with various studies and trials related to the introduction of the Flexibility concept, it should not lose sight of developments in the UHF band in other regions: those developments should be taken into account in setting out the European scenarios for the long-term evolution of the UHF band.

Huawei supports the "Flexibility" concept chosen by the RSPG for the delivery of new



innovative services based on "downlink only" IMT technologies in the sub-700MHz UHF band.

We are of the view that the spectrum made available through the "Flexibility" concept in the sub-700MHz UHF band will be predominantly used for the delivery of audio-video content.

We recommend the RSPG to launch technical, regulatory and economic studies of possible options for the implementation of downlink only IMT technologies within the "Flexibility" concept in the sub-700MHz UHF band.

Huawei believes the "Flexibility" concept can be most efficiently implemented through the voluntary and coordinated identification of a common sub-band of the sub-700 MHz UHF among groups of neighbouring "pioneer countries".

Huawei is of the opinion that it is best to allow the market to shape the possible new business models for the provision of new innovative services in the sub-700MHz UHF band.

Internet-of-things spectrum strategy

Machine-to-machine communications

The Internet of things (IoT) is expected to grow to include tens of billions of devices worldwide by 2022, enabled by machine-to-machine (M2M) radio communications, and encompassing a hugely diverse range of use cases.

Different types of spectrum are required for the different types of IoT applications.

Many use cases of the IoT involve short-range and/or delay-tolerant applications. These can be readily supported through licence-exempt authorisation for access to the radio spectrum, whereby equipment belonging to a variety of users operate on a non-interference non-protected basis.

However, certain important use cases of the IoT will involve delay-sensitive applications with high availability requirements. Examples include radio telemetry for the operation of national utility infrastructures (Smart Grid), the remote control of industrial processes (Smart Factory), and road safety intelligent transport systems (discussed in the next section). The nature of these applications demands licensed authorisation for access to spectrum for use by M2M communications, whereby the quality of service can be appropriately guaranteed.

With the predicted future explosion of the IoT globally, it is important that a sufficient amount of spectrum is available in Europe for M2M communications.

We expect that there will be sufficient harmonised spectrum available for licence-exempt use by the IoT in Europe. This spectrum may include the well-established 862-870 MHz, 2400-2483.5 MHz, 5 GHz⁴ and 57-64 GHz bands.

We also believe that harmonised spectrum that is designated for electronic communication networks (ECNs) is suitable for licensed use by the IoT. This is because it allows the quality of service to be effectively managed by the network operator, and enables the economies of scale for existing ECN hardware and infrastructure deployments to be exploited.

We very much welcome the RSPG’s plans to develop an Opinion on the IoT and M2M communications as part of its 2016 Work Programme. We recommend that the RSPG examines different models for licensed authorisation for access to spectrum for use by the IoT and M2M communications – including models which involve licensees of spectrum who operate public MFCNs – with a view to ensuring that no regulatory barriers exist in implementing such models throughout Europe.

⁴ We highlight regional and global initiatives to make the whole of the band 5150-5925 GHz available to RLANs. See the EC Mandate RSCOM13-32rev3 to CEPT of September 2013, or the more recently defined Agenda Item 1.16 of WRC-19.

Licensed access to spectrum is essential for many important IoT applications where guarantees of quality of service are required.

The use of harmonised spectrum for electronic communication networks (ECNs) will lower implementation costs of the IoT by leveraging the economies of scale in IMT equipment.

It is important that no regulatory barriers exist towards the use of harmonised spectrum for electronic communication networks (ECNs) in support of IoT/M2M applications, in line with principles of service and technology neutrality.

Intelligent Transport Systems

We note that the applications of intelligent transport systems (ITS) can be categorised as those relating to “telematics” and “road safety”.

Telematics refers to telecommunications and informatics; i.e., the communication of non-safety related information to and from vehicles. This can be implemented today either with existing licensed mobile communication networks and 2G/3G/4G technologies, or with licence exempt short range radio equipment and RFID, Bluetooth, Wi-Fi or other standardised technologies.

ITS applications which relate to road safety applications, on the other hand, require specialised technologies to support vehicle-to-vehicle and vehicle-to-infrastructure radio links with challenging performance targets such as low delay and high reliability. Examples include speed control, collision avoidance, and self-driving cars. These belong to the category of M2M communications whose nature demands access to spectrum through licensed authorisation, whereby the quality of service can be guaranteed. CEPT studies have estimated the need for around 20 MHz of bandwidth for such ITS applications⁵.

We are encouraged by the European Commission Decision 2008/671/EC of August 2008, and the ECC Decision (08)01 of July 2015, which designate the frequency band 5875-5905 MHz for safety-related applications of ITS. However, both Decisions state that this designation is on a non-exclusive basis, i.e., frequencies must be shared between ITS and other services⁶. The ECC Decision goes further by recommending that CEPT Member States licence exempt the ITS equipment in this band⁷.

We believe that authorisation through licence-exemption is not a suitable model for safety-related applications of ITS, since it does not allow quality of service and high availability to be guaranteed.

⁵ See ECC Decision (08)01.

⁶ The incumbent services in this band are the Fixed Service, and the Fixed Satellite Service (Earth-to-space). The non-exclusive designation further implies that the use of the band by other services is not precluded in the future.

⁷ We note that the earlier 2008 version of the Decision recommended that CEPT administrations shall exempt in-vehicle ITS equipment from individual licensing, but may, if necessary, impose an authorisation process for the roadside units (base stations).



Furthermore, in IoT use cases where safety of life might be at risk, for example safety-related ITS, it is desirable that the frequencies used for IoT and M2M communications are not shared by other services.

For the above reasons, we recommend that the RSPG initiates studies into the availability of spectrum based on licensed authorisation, and preferably harmonised for exclusive use by ECN or ITS, for the support of safety-related applications of ITS.

One possible example could be the unpaired 1900-1920 MHz band which is harmonised for ECN across the European Union and was assigned in the early 2000s for use by UTRA-TDD, but which remains broadly unused today.

Another example could be the 5905-5925 MHz band which has already been identified by ECC Decision (08)01 as a possible future candidate for designation for ITS.

We note that in light of the potentially high cost of national ITS infrastructures, spectrum below 5 GHz is preferred for use by safety related applications of ITS.

Licensed access to spectrum is essential for ITS applications where guarantees of quality of service are required.

We recommend that the RSPG investigates the suitability of exclusive use (for ECN or ITS) of spectrum based on licensed authorisation for the support of safety-related applications of ITS (e.g., collision avoidance and self-driving cars), as well as other IoT applications with safety implications.



WRC-19 preparation (common policy objectives for WRC-19)

We welcome the RSPG's planned Interim Opinion of February 2017.

In relation to WRC-19 AI 1.13, we recommend that the RSPG addresses issues of EU harmonisation at both the lower and higher frequencies in the 24-86 GHz range, for simpler achievement of cell coverage and the possibility of very high data rates, respectively.