Comments on Huawei's Feedback to "World Radiocommunication Conference 2023 – EU position"

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Summary

Huawei shared us with the feedback and recommendations they provided on a common EU position and radio spectrum policies to be negotiated at WRC-23. There are four main issues that Huawei commented on according to the RSPG opinion. Overall, we agree with the views and recommendations of Huawei, and we come up with more suggestions/findings from academic perspective in conjunction with Huawei's feedback to further contribute to EU radio spectrum policy making.

In this report, we first provide comments and suggestions on all the four main issues discussed by Huawei. Then, one more point on extremely high frequency band (such as mmWave band or THz band) is discussed. Finally, we propose some more potential agenda items for WRC-27 based on Huawei's outlook.

Agenda Item 1.2: 3300-3400 MHz (amend footnote in Region 1)

In this agenda, the key point is that Huawei recommends the EU not to oppose the potential request from other Region 1 countries outside EU to vary the regulatory conditions for different purposes of using this band. We agree with this opinion, however, we suggest to provide strong evidence for it considering the importance of this band for the common security and defence policy of the EU. Some potential solutions can be provided as the evidence. For instance, physical layer security schemes can be exploited to make sure the desired signal can be recovered accurately. Moreover, the service with high transmit power and wide coverage (such as satellite communication) should not be suggested using this band, which could affect the security of EU network running the same band. In addition, this band should be seen as a licensed band, which is not allowed to share with other unlicensed users. With these regulations, we believe the EU has more reasons to take Huawei's recommendation.

Agenda item 1.2: upper 6 GHz (6425-7025 in Region 1, 7025-7125 globally)

In this item, the key point from Huawei is to recommend EU supporting IMT to identify upper 6GHz as the additional licensed band for cellular networks (5G and the beyond). We fully agree with this recommendation and believe Huawei provided strong evidence on this point. Moreover, we would like to discuss a

little bit more from both academic and business perspectives to further support Huawei's opinion.

It is reported from GSMA[1] that mid-band spectrum (about 2 GHz) will drive an increase of more than $610 billion in global GDP in 2030, producing almost 65% of the overall socio-economic value generated by 5G. However, up to 40% of the expected benefits of mid-band 5G could be lost if no additional mid-band spectrum is assigned to mobile services. Moreover, number of 5G private networks are expected to set up providing mobile network service to more users with diversified requirements. These new private networks call for additional radio spectrum. Therefore, from business perspective, it is quite necessary to expand more band for licensed use of cellular networks.

From academic perspective, current mid-band spectrum is very crowded, and the base station density is high, which means that increasing the number of base stations on the same radio band cannot improve the network capacity caused by the heavy interference. Although some other potential technologies such as edge intelligence, cloud/edge computing, semantic communication, etc. can be expected to improve the network capacity, the most effective way is to allocate additional license bands. Moreover, compared with other high frequency bands (such as mmWave), the propagation characteristics of upper 6 GHz is quite similar to that of 2 GHz (currently defined as the license band), which means that the spectrum harmonisation should be much possible.

Agenda Item 1.3: 3600-3800 MHz (in Region 1)

For this agenda item, Huawei recommended the EU position should be to upgrade the Mobile allocation to primary in Region 1. We believe that it is not much challenging from academic/technical perspective given 3600-3800 MHz band has similar propagation characteristics to 3400-3600 MHz, which has already been identified as the primary use for mobile communication service. Hence, if there is no policy restriction in the EU, they should be in favor of this recommendation.

Agenda item 1.5: UHF band review (470-694/698 MHz in Region 1)

This item mainly reviews the current use of UHF band and discusses possible regulatory actions on this band. One point from our side is that we believe this UHF band is more suitable for long-range wireless transmission, such as rural area. In addition, one possible way is to allow a hybrid band deployment, where the UHF band (470-694/698 MHz) is for providing a wide coverage and the mid-band (2 GHz and upper 6 GHz if approved) is used for a high data rate within a relevant short range or hop-spot to support some 5G private base stations. In this scenario, some intelligent algorithms can be exploited to manage the bandwidth/frequency allocation.

Agenda items 1.14, 1.15 and 1.16 (extremely high frequency band)

These three items discuss the policy of using the extremely high frequency band (from 12.75 GHz to 30 GHz and around 250 GHz). We know that the huge amount of available bandwidth resources is the significant benefit of these bands, and the critical challenge is mainly on the unique propagation characteristics including huge path loss, highly sensitive to block, and narrow direction beams. Therefore, we need to identify proper communication scenarios to use these extremely high frequency bands, as well as explore technologies to deal with these propagation characteristics.

Some suitable communication scenarios deploying extremely high frequency bands are listed below.

1) Backhaul link. This link is highly directional (the direction can be seen as fixed) with normally few blocks. Usually, backhaul link requires a high data rate which can be satisfied with a large amount of bandwidth.
2) Links between base stations through X2 interface. Similarly to the above link, X2 link is highly directional with few blocks (if the antenna is at a high altitude). However, two concerns here are i) the data rate through X2 interface normally is not very high, which cannot fully enjoy the benefit of a huge amount of bandwidth; and ii) most of X2 interfaces between base stations are not used currently, and it may need to modify the protocols once using X2 interface.
3) Communication links on highway or railway. The key point is that the road or railway is directional, which makes it possible to deploy the extremely high frequency band. However, how to deal with the mobility management of vehicles or trains is the main challenge.

Agenda Item 10 (agenda items for WRC-27)

Huawei pointed out several use cases expected to be enabled by future wireless networks, and drew the conclusion that spectrum bands to support much broader and contiguous bandwidths for IMT-2030 should be explored. We fully agree with the recommendation along with the proposed vision of use cases in future network. Besides, some more points from our end are proposed here that can be considered for WRC27 agenda.

1) Sensing spectrum identification. Many future use cases could require a great capability of sensing (such as XR delivery, autonomous driving and holographic communication), which means that the spectrum used for sensing task will be much more in the future. Therefore, it would be interesting to discuss the possibility of allocating some dedicated spectrum for performing wireless sensing.

2) Policy from a Net Zero perspective. Up to now, the most effort from WRC participants has been put on how to improve the network performance with a proper radio spectrum management policy. In the near future, energy consumption should be of vital importance according to the world-wide ambitions. Hence, it is highly recommended to discuss and explore how to manage radio spectrum from an energy-efficient perspective. Maybe it should reduce the amount of spectrum for some scenarios.

3) Spectrum harmonisation for different bands. Previously, most discussions are on how to properly use a single spectrum band. Although spectrum harmonisation has been mentioned sometimes in WRC conferences, there is very few policy stipulated the harmonisation rule. Considering more pieces of band are expected to be introduced in wireless networks, it would be important to discuss how to make policy for spectrum harmonisation. Intuitively, the bands with a large difference on frequency could have different harmonisation policies compared with the bands with close frequency.