SAMSUNG

STRATEGIC ROADMAP TOWARDS 5G FOR EUROPE

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

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Samsung Electronics fully supports the initiative of Commissioner Oettinger to develop a European Commission 5G Action Plan for Europe and to facilitate the launch of 5G on a large scale by 2020. Development of the RSPG Opinion to develop a strategic roadmap for 5G spectrum in Europe is a welcome early step.

Objectives

Samsung Electronics believes that for successful commercialisation of European 5G networks a carefully thought out strategy needs to provide a spectrum roadmap that can address a number of aspects:

A) To provide targeted spectrum opportunities to encourage technology development and enable demonstration of the 5G capabilities as early as possible in the development cycle.
B) To provide spectrum that can be used in test beds that will allow 5G technology to be trialled and understood particularly by potential users in the vertical industry sectors. This is particularly important for engaging these users early in the requirement setting and standards development process.
C) That works towards a framework of spectrum licensing for commercial operations that balances the need for early deployment against the uncertainties of the international spectrum negotiations in the ITU-R.
D) To identify a spectrum management regime that will enable access to spectrum that is consistent and synchronised with international market developments to ensure economies of scale and facilitate global devices.

Comments

With these objectives in mind Samsung Electronics provides the following comments on the draft Opinion:

Identification of the 3400-3800 MHz band may be considered as an initial band suitable for the introduction of 5G services in Europe but this must not reduce the momentum behind the identification of higher frequency spectrum which has the capacity to accommodate the

high data throughputs targeted by 5G development. The 3400-3800MHz band can be used to meet some 5G technology capabilities but not all.

Samsung Electronics believes that the higher frequency bands will be the crucial component that will enable the full suite of benefits that 5G capabilities will bring for European consumers, businesses and the Digital Economy generally. Samsung Electronics expects that the first mobile high frequency networks will be realised in the lower bands above 24 GHz and therefore supports the initial focus on the ranges 24.25-27.5 GHz, 31.8-33.4 GHz and 40.5-43.5 GHz for the future development of commercial networks in Europe.

In the early days particular interest will be focussed on both the 24.25-27.5 GHz and 31.8-33.4 GHz bands. Therefore Samsung expresses caution about conclusively identifying just one of these two bands too early in the international spectrum negotiation and identification process leading up to the WRC-19. There are several reasons for this:

1) Already some regions of the world have identified spectrum in the range 26.5-29.5 GHz for either 5G licensing in the US or 5G trials in Korea. The situation in the US has firmed up recently with a Report and Order from the FCC identifying the licensing and technical rules for 5G in a number of frequency ranges including the 27.5-28.35 GHz range (https://www.fcc.gov/document/fcc-adopts-rules-facilitate-next-generation-wireless-technologies). Technology to meet this anticipated market is already well into development. (E.g. https://news.samsung.com/global/samsung-electronics-develops-key-rf-technology-for-smaller-5g-equipment-and-devices).
2) Considering the range 24.25-27.5 GHz, it is possible that technology under development to address the 28GHz band US market may be relatively easily adapted for operation below 27.5 GHz without the need for extensive redesign or a new device implementation . Therefore early deployment in the 26 GHz range may be feasible especially if spectrum just below 27.5 GHz is made available for use.
3) Use of the 31.8-33.4 GHz band may require a new device implementation due in part to the lack of contiguity with the 28 GHz band and to the frequency band dependence of key components such as beam steering antenna arrays. With the focus of development on other ranges devices may be considered for a second (or subsequent) phase of development. Such devices would consequently be later to market.
4) Uncertainty exists around the outcome of the international spectrum identification discussions surrounding both these bands. Technical studies will be carried out in preparation for the decisions to be taken at WRC-19 that could affect the potential for globally harmonised allocations in these frequency ranges and their use for IMT technology. For the 31.8-33.4 GHz band, sensitive applications and services are incumbent in adjacent frequency ranges that could limit the spectrum available immediately above 31.8 GHz for mobile broadband and place more stringent technical conditions on devices that would need to be accounted for in the design processes.
5) WRC-15 Resolution 238 invites studies on the spectrum needs of IMT between 24.25 and 86 GHz and ITU-R WP5D is the responsible group for dealing with this issue. The work in WP5D is ongoing but already preliminary results are recorded in the WP5D chairman's report (ITU-R WP5D Doc 234 Ch4 Att.4.21). Based on methodologies proposed by some administrations these results indicate that around 3 GHz of spectrum will eventually be needed in the ranges from 24.25 – 33.4 GHz. Samsung

Electronics considers it possible that the 31.8-33.4 GHz range (currently with no mobile allocation) may not become fully available for mobile broadband so spectrum in the 24.25-27.5 GHz range may eventually be viewed as a more suitable alternative (perhaps supplemented by spectrum from the 31.8-33.4 GHz band) to meet the spectrum needs for high data rate mobile broadband delivery.

Therefore Samsung Electronics agrees that the RSPG should keep under review whether there is any requirement for European harmonisation measures in bands above 24 GHz (particularly in the ranges 24.25-27.5 GHz and 31.8-33.4 GHz) before WRC-19. However there should not be a conclusive priority set on just one of these bands individually at this time and Samsung Electronics considers they should both remain under consideration as the international spectrum allocation discussion moves forward.

Roadmap

With the objectives and comments above in mind, Samsung Electronics proposes the following 5G spectrum roadmap for RSPG consideration:

1) Encourage NRA's to make spectrum available in the 24.25-27.5 GHz range especially 26.5-27.5 GHz.

Samsung Electronics notes that according to ECO Report 025 the range 26.5-27.5 GHz is identified for military use. Although exclusive use would be preferred, great strides have been made recently in developing access to military use spectrum through the use of spectrum sharing tools such as **Licensed Shared Access (LSA)**. This could be a consideration.

2) Request CEPT to support study work for both the 24.25-27.5 and 31.8-33.4 GHz bands until a clearer picture emerges of the potential for either (or both) of these bands to be identified for IMT at WRC-19. Regional views will be forming ahead of the WRC. Industry might feel more confident to commit the resources required to developing appropriate devices once a clearer direction of travel emerges from the multi-region WRC-19 preparatory activities.

3) Taking account of the consensus forming around the international spectrum allocation discussion, start to consider the potential for European harmonisation measures at an appropriate time.

Early Trials

Samsung Electronics also believes that early trial systems and test beds should be encouraged in the 28 GHz band in particular in those parts of the band prioritised for terrestrial services according to ECC Decision(15)01. Over 1GHz (in two 500 MHz blocks) of spectrum could be considered.

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Samsung and 5G Technology

Samsung brings over 35 years of experience in developing innovative mobile telecommunications technologies and plays an active role in working with international standards organizations on standardizing 5G network development. The company has driven a wide range of 5G breakthroughs in the mmWave spectrum including:

•In 2013, Samsung recorded the world's first gigabit per second throughput benchmark to a distance up to 2 kilometers using next-generation prototype technologies in mmWave spectrum.
•In 2014, Samsung set a speed record at 7.5Gbps in a stationary environment and became the first to demonstrate stable and uninterrupted mobile connections at 1.2 Gbps from a vehicle traveling at over 100 km/h.
•In March 2016, Samsung announced the success of world's first multi-cell handover maintaining a gigabit data transmission, demonstrating a vehicle-in-motion maintaining a gigabit data transmission while moving between three transmitters.
•Recently, Samsung developed 5G-ready antenna and power amplifier technologies enabling smaller, more energy efficient 5G equipment and devices using 28 GHz millimeter wave (mmWave) spectrum.