

**Comments to ARCEP Public Consultation
“Allocation of new frequencies for 5G”**

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SAMSUNG

1. Executive Summary

Samsung Electronics Co., Ltd (hereinafter Samsung) is pleased to take this opportunity to submit this document to ARCEP in response to the consultation on “the allocation of new frequencies for 5G” in France. We have focused our response to the frequency related aspects and on the 3.5 GHz and 26 GHz bands in particular. We would be delighted to discuss with ARCEP the wider questions on 5G. Samsung thanks ARCEP for the opportunity to comment on this consultation, and looks forward to working closely with the ARCEP to enable 5G in 3.5 and 26 GHz spectrum to be deployed in France.

In summary we suggest that it is in the national interest for regulators to help encourage, via spectrum licensing, an ecosystem for both the 3.5 GHz and 26 GHz bands at the same time. Samsung has commercial infrastructure products available now for 26.5-29.5 GHz along with a CPE device and has announced that a mobile phone will be available in 2019. We have plans to extend this frequency band support to include 24.25-27.5 GHz in the second half of 2019. In addition to 26.5-27.5 GHz being licenced by 2020 we suggest that an ‘indoor layer’ of 5G deployments in stadiums, airports, malls etc is also possible without causing interference to outdoor fixed links and therefore the option for licensing of 24.25-27.5 GHz by 2020 should also be considered.

2. Questions

Part 2. The 3.4 GHz – 3.8 GHz band

Question No. 35. What guard band will be needed to ensure that 5G equipment is capable of complying with the power limits defined by CEPT, while ensuring its coexistence with the Ministry of the Armed Forces' radars using frequencies below 3.4 GHz? Within what timeframe do you think it will be possible to employ a narrower guard band?

Samsung: We support the compromise developed in the ECC on this matter. 20 MHz seems to be the general compromise and we will look at lower values on a case by case basis.

Question No. 40. Are you in favour of implementing synchronisation or semi-synchronisation between TDD networks? For what reasons? If synchronisation, what do you believe the right uplink/downlink time ratio would be? Do synchronisation parameters need to be stipulated in future licences, or defined in concert with the frequencies' licence-holders? What potential impact could this have on performances?

Samsung: Synchronisation is the method that is currently being implemented. Future advances in technology such as semi synchronisation will be considered so some licensing flexibility for future technology advances may be useful.

Question No. 45. What do you believe is the minimum quantity of frequencies required? What impact would being allocated only 20 MHz have on 5G performances? Same questions for 50 MHz? Same question for 80 MHz?

Samsung: The manufacturers mobile industry association, the GSA (www.gsacom.com), has provided detailed analysis on this topic which we support. In summary we support 80-100 MHz of contiguous spectrum per operator.

Question No. 46. With 5G, will network equipment make it possible to aggregate several blocks of non-contiguous blocks of frequencies? What are the potential restrictions for the channelling and channel spacing of non-contiguous blocks?

Samsung: The manufacturers mobile industry association, the GSA (www.gsacom.com), has provided detailed analysis on this topic which we support. In summary aggregation of blocks

should be avoided if at all possible during the licensing assignment stage as it significantly complicates initial equipment development and deployment.

Samsung additional comment: We believe that it is important that all impediments to wide area deployments in all areas are kept to an absolute minimum. For example we would encourage power restrictions to be removed if possible from Paris.

Part 3. The 24.25 – 27.5 GHz band

Question No. 49. What is your analysis of the 26 GHz band's virtues for the introduction of 5G? What is your assessment of how mature the ecosystem in the upper end of the band will be by 2020?

Samsung: The ecosystem development of 5G is in the initial stages, both for 3.5 GHz and also 26 GHz. Some players are focussed mainly on 3.5 GHz while others are focussed on both 3.5 and 26 GHz. We suggest that it is in the national interest for regulators to help encourage, via spectrum licensing, an ecosystem for both bands at the same time. Samsung has commercial infrastructure products available now for 26.5-29.5 GHz along with a CPE device and has announced that a mobile phone will be available in 2019. We have plans to extend this frequency band support to include 24.25-27.5 GHz in the second half of 2019.

Question No. 50. Are you in favour of implementing synchronisation, or a semi-synchronisation, between 5G TDD networks in this band? If so, why? If synchronisation were to be implemented, what do you think the right uplink/downlink time ratio would be? Do synchronisation parameters need to be stipulated in future licences, or defined in concert with the frequencies' licence-holders?

Samsung: Synchronisation is the method that is currently being implemented. Future advances in technology such as semi synchronisation will be considered in the future so some licensing flexibility for future technology advances may be useful. It is noted that ECC PT1 is currently considering this issue. Given the relatively short propagation distances and higher building isolation, relative to lower frequencies such as 3.5GHz, a more relaxed synchronisation approach may be beneficial.

Question No. 52. Should the allocation of the 26.5 – 27.5 GHz band be carried out as part of the same procedure as the 3.4 – 3.8 GHz band? Same question for 25.5 – 26.5 GHz band? Same question for the 24.25 – 25.5 GHz band?

Samsung: The ecosystem development of 5G is in the initial stages, both for 3.5 GHz and also 26 GHz. Some players are focussed mainly on 3.5 GHz while others are focussed on both 3.5 and 26 GHz. We suggest that it is in the national interest for regulators to help encourage, via spectrum licensing, an ecosystem for both bands at the same time. We therefore suggest that the licensing of both 3.5 GHz and 26 GHz is carried out at the same time. This would enable the full complete 5G vision to be realised and the full breadth of 5G services and applications to be realised.

Samsung: One aspect that has perhaps been overlooked and needs to be examined more closely is the use of 5G deployments indoors in areas such as sports stadiums, railway stations, airports, shopping malls, factories, offices, etc. Recent discussions within the ECC PT1 fixed links toolbox activity indicate that sharing between indoor 5G and outdoor fixed links should be feasible. Provided that the indoor 5G networks are professionally planned and installed then we think that the ‘indoor layer’ can be licenced across the whole of the 26 GHz spectrum without adversely affecting outdoor fixed links. So for example 24.25-27.5 GHz could be licenced and be available for indoor use and then some portion(s) of this (such as 26.5-27.5 GHz, and perhaps some of the unused spectrum in 24.25-26.5 GHz etc) also available for outdoor use. The licensees can then gradually extend their networks from inside to outside as the fixed links are migrated from the lower portion of the 26 GHz spectrum. This would enable the option for the whole of the 26 GHz band to be licenced in a single process by 2020.

To date, in terms of the 26/28 GHz spectrum & ecosystem, it is expected that for 5G the USA is commercialising 28 GHz band (27.5 – 28.35 GHz) in 2018, Korea would commercialize 28 GHz (26.5 – 28.9 GHz) together with 3.5 GHz band (3.4 – 3.7 GHz) in March 2019 and Japan would commercialize 28 GHz (27.0 – 29.5 GHz) together with portions of 3.6 – 4.2 GHz and 4.4 – 4.9 GHz around 2020. The USA is also planning to auction 24.25-24.45 GHz and 24.75-25.25 GHz and is consulting on 25.25-27.5 GHz. This 26 GHz band development in the US is significant in that it is anticipated that it will help generate and accelerate the global ecosystem for 26 GHz products in addition to the products that are already planned for 28 GHz. This means that products that support 26 as well as 28 GHz could be available in the 2020+ timeframe.

Question No. 54. What do you believe is the minimum quantity of frequencies required? What would be the impact on 5G performances of having a channel of only 200 MHz in the band? Do you think a spectrum cap is needed for this procedure? For the life of the licences? If so, what cap do you think is appropriate?

Samsung: We support the industry GSA view that the target amount of spectrum per network should be 800-1000 MHz of contiguous spectrum in the medium term. A 200 MHz channel would not enable full 5G mmWave capabilities to be realised. This is generally more of a question for operators to comment more in further detail. One option to consider would be the Italian approach of allowing operators to share some of their spectrum, at least in the initial phase, so that wider channels can be deployed.

Question No. 56. Should all or a part of the 26 GHz band be subject to an allocation, under a general authorisation regime for the deployment of 5G? Why? If so, what technical conditions would be appropriate and necessary to enable the use of these frequencies for 5G under such a regime?

Samsung: We suggest that the spectrum should be licenced to mobile operators. There is also the option to licence some of the spectrum to verticals if this is the policy decision that is taken in France.

Question No. 57. To what extent would it be advisable to have local allocations of the 26 GHz band under a general authorisation regime? What would be the most suitable geographical area?

Samsung: We suggest that the spectrum should be licenced to mobile operators. There is also the option to licence some of the spectrum to verticals if this is the policy decision that is taken in France.

Question No. 58. What are the pros and cons of having individual national licences for this frequency band?

Samsung: One of the pros of a national (country wide or multiple cities wide) licence is the development of an operator led ecosystem which is essential during the initial phase of the establishment of a 5G mmWave ecosystem. Verticals can then benefit from this at a later stage once a competitive ecosystem is established. Some say that having national licences

prevents the option for verticals. Verticals can be served by slicing, leasing, MNO use it or lease it clauses, etc in addition to owning their own spectrum. If France, for policy reasons, decides to make dedicated spectrum available for verticals, in addition to national licences for MNOs, then a portion of the spectrum in the lower 26GHz spectrum, could be considered on a local area basis.

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