Nokia responses to the RSPG consultation on the DRAFT RSPG Opinion on spectrum related aspects for next-generation wireless systems (5G)

Nokia appreciates the opportunity to contribute to the RSPG discussion of a "STRATEGIC ROADMAP TOWARDS 5G FOR EUROPE" with respect to spectrum-related aspects for next-generation wireless systems (5G).

Nokia welcomes the initiative and the pace the RSPG is taking to advance spectrum availability for 5G in Europe and to support the 5G Action Plan of the EU Commission. Nokia also welcomes and supports the concrete target date of 2020 for a 5G launch on a large scale in Europe. We support the view that 5G will benefit all European citizens by facilitating industrial and societal transformation and economic growth from 2020 onwards.

Nokia would like to offer the following comments on the points under Section 2 of the draft RSPG opinion

1) Nokia agrees that Europe has a unique opportunity in the band 3.4-3.8 GHz to lead 5G deployments for eMBB use. Compared to lower IMT bands, this band enables substantially higher capacities with RF carrier bandwidths of hundreds of MHz and still reasonable coverage properties. This allows cost efficient macro-cellular deployments re-using existing sites with outdoor-to-indoor coverage possibilities. RF bandwidth is considered sufficient for low single digit Gbit/s data rates, but not for the ultimate 5G target of double digit Gbit/s data rates. Thus the band can enhance MBB user experience substantially, but not to the levels targeted for mature 5G. Further enhancements on the same site footprint could be achieved over time by adding the 3.8-4.2 GHz band, depending on changes to European regulation.

2) Nokia agrees that sub 1 GHz bands provide opportunities for large area coverage for certain 5G services in the mMTC and URLLC domain, while data rates in this frequency range will be limited due to limited amount of RF resources. However, 5G can be deployed at low bands like 700MHz if that band is not yet used for 4G/LTE. In addition, in the future, sub-700 spectrum may add downlink capacity via SDL for both broadcast and mobile broadband as suggested in the RSPG opinion on a long-term strategy on the future use of the UHF band (470-790 MHz) in the European Union of 19 February 2016 (http://rspg-spectrum.eu/wp-content/uploads/2013/05/RSPG15-595_final-RSPG_opinion_UHF.pdf)

3) Nokia agrees that all technical and regulatory conditions for all bands already harmonised for mobile networks must fit for 5G use. Technology neutrality as a guiding principle enables the most efficient use of existing bands within existing licences. Nokia expects, however, that re-farming of existing bands towards 5G will happen in a second wave and asynchronously between operators, as individual licensing conditions, remaining licence durations, and the individual legacy network infrastructure and terminal base will determine operator strategies towards re-farming investments. Consequently, Nokia expects 5G to start in cleared, commonly harmonised, bands such as 3.4-3.8 GHz, 700 MHz and one or more bands above 6 GHz.

4) Nokia supports the view that the industry needs an initial focus and prioritization on selected bands from the bands under study in WRC-19 under AI 1.13. Such focus provides early visibility and plannability and thus allows concentrated efforts to allow an early 5G launch

and a deployment lead in Europe.

Nokia shares the view that global harmonisation is key for affordable device ecosystems and reducing co-existence issues. Early guidance in CEPT may help establish a global ecosystem around bands favoured in Europe.

5) Nokia expects an ecosystem for the 28 GHz range to emerge around 2018 for US, Korea and eventually Japan. While this band may be applied in certain EU member states, Nokia sees little opportunity for quick EU harmonisation of the 28 GHz band. Consequently, Nokia agrees that EU and CEPT harmonisation efforts above 24 GHz should focus on bands under study under WRC-19 AI 1.13.

   The bands 24.5-27.5 GHz (25 GHz) and 31.8-33.4 GHz (32 GHz)are considered to be required for large contiguous RF carriers providing carrier bandwidths of several hundreds of MHz to enable up to double digit Gbps data rates with higher order MIMO and similar new technologies. Nokia acknowledges that the 32 GHz may be easier to be released earlier in certain EU member states than the 25 GHz band. The 32 GHz band, however, has specific challenges regarding the protection of the passive services right below and of military radiolocation service right above that band that significantly limit available RF bandwidth to 5G and also limit and restrict the usability of 32 GHz for 5G. Additionally, 32 GHz band is relatively small (1.6 GHz) compared to 25 GHz (3.25 GHz) and the band might be further reduced by the need to protect the services operating in the adjacent bands.

   Related to possible tuning range implementations with 28 GHz band (26.5/27.5-29.5 GHz), there is clear difference between the 25 and 32 GHz bands. The 25 GHz band is adjacent, right below 28GHz (and the 28 GHz band considered in Korea is overlapping by 1GHz) so the tuning range of 24.25 – 29.5 GHz could enable the 25GHz band become available in the devices early in Europe and with limited re-development efforts. However, 32 GHz band is not immediately adjacent to the 28 GHz band and relative size of the tuning range 26.5 – 33.4 GHz is bigger than of the tuning range 24.25 – 29.5 GHz. But the critical difference, in addition to the challenge that tuning range is bigger, is that in the middle of the tuning range of 26.5 – 33.4 GHz there is 800 MHz of passive service spectrum with stringent protection requirements, thus significantly limiting opportunities of that tuning-range implementation. Therefore Nokia prefers the band 24.25-27.5 GHz for 5G based on all above mentioned reasons.

   Furthermore, the 37-43.5 GHz band presents an excellent opportunity for global harmonisation and implementation, at least via use of a tuning range. Some parts, e.g. the 40.5-43.5 GHz band, are not extensively used by incumbents in Europe and could provide large additional 5G capacity in subsequent upgrade steps to 5G networks as more and more services will be put onto 5G networks.

6) Nokia sees a need to define the Least Restrictive Technical Conditions (LTRCs) for any early 5G band ahead of the WRC-19. Standardisation and implementation require early visibility and sufficient time. For 5G launch on a large scale by 2020, Nokia considers it would be appropriate to have LTRCs in place at least 2 years in advance, i.e. 2018, to allow for equipment to be ready by 2020. Nokia thus welcomes the RSPG willingness to act on European harmonisation measures before WRC-19.

7) Nokia welcomes the preparation by RSPG of a supplementary opinion dedicated to the implementation of 5G. In our view this opinion should present detailed proposals for a harmonized introduction of 5G in Europe by 2020. Nokia supports the consideration of the vertical markets in the supplementary opinion.

Nokia welcomes further engagement of RSPG in making 5G spectrum available timely and offers their support.