Your response

Question	Your response
Do you have any comments on our proposals?	Confidential? – N Nokia welcomes the opportunity to provide feedback on Ofcom's workplan for 2022-2023, in particular in relation to the topics related to the radio spectrum, in line with Nokia's views as expressed in our response of February 2021 related to the spectrum strategy for 2020+. Please find enclosed our views.

Nokia is of view that radio spectrum is a scarce resource that needs to be efficiently used for the benefit of the overall society, people and businesses. A world-class digital infrastructure is indissolubly linked to the availability of the necessary spectrum, in a timely manner and in sufficient quantity, and, as such, spectrum should continue to be managed in an efficiently and effectively.

Moreover, availability of spectrum should cover several aspects, such as:

- Accommodate the growing mobile data traffic in the upcoming decade and ensure reliable mobile connectivity to all consumers and businesses;
- Support both national and local activities and encourage the use of mobile technologies like 4G, 5G and their evolution for industrial use;
- Assure availability of spectrum for wireless innovation that is essential for the further developments of 5G-Advanced and the path to 6G.

For these reasons we think that specific consideration should be given to secure sufficient spectrum for the future developments of wireless networks in all bands – low, mid, and high – and further consideration to how to enable the use of those frequency ranges by 5G and 6G technologies. To this end, we recognise the importance of opening up spectrum in mmWave bands like 26 GHz and 40 GHz and their availability to all interested actors, as well as consideration of higher frequencies such as the sub-THz ones. However, a large number of applications for the mass market will continue to depend on low and mid bands, and therefore making available additional spectrum in these ranges will be of paramount importance to support the growing demand for ubiquitous coverage and capacity.

Nokia would like to provide its views on specific aspects of Ofcom's workplan for 2022/23 related to spectrum:

Mobile strategy & Mobile spectrum demand – Nokia acknowledges the importance of these aspects and the need to have a strategy and regulation that support the growth of mobile networks to deliver the required connectivity and encourage innovation in networks to provide the best customer experience. Several technical and economic studies have been undertaken and results have been published in recent years 2019-2021(2) that evaluate mobile data traffic growth and the additional spectrum requirements to meet the growth. We will follow up on this topic and the milestones that Ofcom has settled to provide our inputs.

Award spectrum bands as they are cleared and released – availability of spectrum is of crucial importance for the stakeholders to allow deployment and development of their services. In respect to the mmWave, around 1000 MHz of contiguous spectrum should be made available per operator to enable the real features of 5G .

Database approach to spectrum management –As spectrum clearing is difficult to achieve, automated spectrum management through databases could be one way to enable the assignment, interference control and mitigation between vertical and horizontal sharing actors. It is worth noting that – depending on the co-existing services and usage scenarios – different levels of complexity will apply and vary case by case as illustrated by the US experiences, with a three-tier and more dynamic approach with the Spectrum Access Systems (SAS) SAS in the 3.5 GHz Citizen Broadband Radio Service (CBRS) band and a lighter and less complex approach with the Automated Frequency Coordination System (AFC) at the 6 GHz band for protection of the fixed links. Nokia can engage in discussions and share our experience and expertise in developing solutions like the recent ones in the USA, the SAS for the 3.5 GHz CBRS band and the AFC for the 6 GHz band.

2G/3G switch off – as mobile technologies evolve rapidly, we agree that the switch off of legacy networks is very important in order to refarm the spectrum for newer technologies. However, several

challenges are to be considered in order to minimize disruption of service and connectivity to people and business; for example, 2G-based IoT services would need to be migrated to solutions such as eMTC.

Engaging with industry on wireless and spectrum – Nokia is an engaged actor in the UK market and is following the developments related to spectrum in both consumer and business markets. We are available to continue our engagements with Ofcom on spectrum matters.

International engagements – WRC-23 is indeed an important topic that Nokia follows with a specific focus on the Agenda Items related to mobile and fixed services to ensure that their operations are protected, and sufficient spectrum is made available to supporting their future developments and technological evolutions. International harmonisation still plays a major role in developing robust ecosystems, and cooperation of stakeholders to reach common positions on spectrum-related aspects is therefore crucial. We encourage Ofcom to follow the WRC process and defer taking any decision on spectrum subject to the WRC-23 – especially in relation with AI 1.1, 1.2, 1.3, 1.4 and 1.5 on mobile spectrum matters – after the end of the Conference and in line with its decisions..

UHF 470-694 MHz – in the light of WRC-23 AI1.5 and the planned UHF review in Europe, Nokia suggests Ofcom to look into the band and possible additional use options. Ofcom has been most advanced in providing regulation for TV white space use of unused TV channels. Nokia sees options for improving specifically DL rural broadband network co-existing with DTT nation-wide and PMSE mainly applied in densely populated areas thus providing migration paths for the changing usage patterns (c.f. e.g. UK Media Nations Report 2021[1] Figure 2.10). This could include e.g. linear and non-linear video distribution paths via 5G and supplementary downlink (SDL) to transportation paths for in-car and in-train entertainment. Receivers in mobile devices supporting that band could also be specified to use such channels for SDL to carry non-linear content in carrier aggregation with conventional mobile network bands. Thus the band could provide choices to serve broadcast and mobile purposes while protecting existing services including PMSE, Radio Astronomy and Wind Profile Radars as needed.

Upper 6 GHz band – the spectrum in the mid bands is a very important topic to the mobile industry – operators and vendors – and Nokia is actively participating to secure that the necessary spectrum is made available for the wireless deployments of 5G and its evolution. As decisions at national level preferable be harmonised within CEPT and even at ITU level to create a healthy ecosystem, Nokia is urging Ofcom to delay decision for the upper 6 GHz in line with the ITU WRC-23 calendar.

As we expressed in previous responses to the Ofcom consultations, especially, on the 6 GHz band, the spectrum in the 6 GHz band provides the right balance between coverage and capacity that mobile networks will need to be able to respond to the data traffic growth in the 2025-2030 period.

The potential future use of the upper 6 GHz band is one of the most important spectrum topics across the globe today. Hereinafter, we elaborate our position in more detail.

1. The 6425-7125 MHz band– as part of the A.I. 1.2 of the WRC-23 - is subject to ongoing compatibility studies towards potential identification for IMT. This is the best available mid-band spectrum capable to respond to the 5G demands in the 2025-2030 period as its 700 MHz offer the right balance between capacity and coverage facilitating the use of the C bands base station grid. Nokia, as part of the mobile industry, sees the WRC-23 as the opportunity to identify the upper 6 GHz for IMT, providing the basis of (at least) regional harmonisation of the band for 5G macrocellular deployments.

[1] https://www.ofcom.org.uk/__data/assets/pdf_file/0023/222890/media-nations-report-2021.pdf

2. The market demand for 5G at 6 GHz: given the importance of this topic for the future of 5G, several studies have been conducted in the last couple of years to identify the connectivity demands of the different categories of users in both urban and rural environments. One of the most recent GSMA reports 5G Mid-Band Spectrum Needs – Vision 2030 recommends administrations to plan making available 2 GHz of mid-band spectrum in the 2025-2030 timeframe to guarantee the delivery of the 5G vision of user experience. The report provides a detailed analysis of the capacity demand and the matching available mid-band spectrum, including potentially refarmed spectrum, and concludes that in the absence of the necessary additional mid-band spectrum, the alternative of network densification to achieve the 5G data rate targets is unsustainable from a network rollout cost, energy consumption, and related supplemental carbon footprint. In short, for a typical large European city, the extreme densification translates into doubling the energy consumption and quadrupling the total network costs.

3. The socioeconomic benefits of IMT at 6 GHz – another recent study 6 GHz socio-economic benefits: considering licensed and unlicensed options has been conducted by GSMA in twelve specific markets for the period up to 2035, on the cost-benefit analysis of the authorisation options at 6 GHz and how they would maximise the social and economic value of the spectrum.

According to the study, depending on the country scenario:

i) Licensing the entire 6 GHz for 5G will deliver the largest benefits in countries where fixed broadband provides up to 10 Gbps maximum user speed, and if a portion of Wi-Fi traffic is offloaded to the 60 GHz band;

ii) The combination of licensed spectrum in the upper 6 GHz for 5G and licence-exempt in the lower 6 GHz will deliver the largest benefits if FTTH/B and cable broadband adoption is widespread, maximum user speeds of 10 Gbps is supported, and the 60 GHz is not utilised by Wi-Fi.

We invite Ofcom to consider the above-mentioned studies prior to any decision making on the future use of the upper 6 GHz spectrum.

4. Lack of demand for licensed Wi-Fi – as stated in the Ofcom plan regarding the upper 6 GHz, there is interest to use this band either in licensed mode by the mobile actors or in licence-exempt mode by the Wi-Fi proponents. However, it seems that no demand for licensed Wi-Fi-like equipment in the band has been observed coming from any potential users - businesses, industries, or others.

As Ofcom already implemented in 2021 the low-power licensing model for the 57-71 GHz, we recommend this experience to be considered when evaluating extending this approach to the upper 6 GHz band. Local area networks can already benefit of 500 MHz license-exempt in the 5925-6425 MHz band and additional 14 GHz in 57-71 GHz band for low-power licensing; priority consideration should be given to the licensed use of the upper 6 GHz for IMT in the upcoming future.

5. Excess supply of spectrum for indoor local licences – last but not least, we note that Ofcom has already made large amounts of spectrum available for indoor local use since 2019. Both mid and high bands are now open on technology neutral basis for local shared access, such as 3.8-4.2 GHz and 24.25-26.5 GHz (indoor). According to our knowledge a limited number of licenses have been issued, less than 300 low- and medium-power licences to less than 50 licensees, despite the fact that the shared access licensing framework is based on low-cost, single-tier, first-come-first-served approach. It is therefore our conclusion that the demand is not exceeding the supply of spectrum for local licences, whether indoor, outdoor, or combined. While we agree that the demand for such licences is expected to grow in the future, we consider that there is sufficient margin to address such further requests.

The actual supply of spectrum for local licences seems to be sufficient to cope with the demand and from this perspective we consider that additional spectrum is not required for this scope. As such, setting aside the upper 6 GHz band for local licensing does not seem neither necessary, nor justified.

6. Prevention of potential future uses of the band – according to Ofcom's statement, future potential users of the band will not be prevented by the actual proposal. Detailed technical evidence is needed for the industry to understand the basis of the statement and what type of analysis lead to such conclusions regarding potential coexistence of future mobile networks with either licence-exempt or low-power licensed Wi-Fi-like equipment in the band.

Nokia would like to have more information on the studies that led Ofcom to such conclusion on the potential future coexistence of different licensees and licencing models in this band.

All the above lead us to the conclusion that Ofcom's decision for the future of the upper 6 GHz band is premature and should be postponed after WRC-23. Additionally, Ofcom should take into account the various aspects we have highlighted, such us the ongoing studies at ITU level for IMT identification of the upper 6GHz band; the demand of additional mid-band spectrum for IMT in order to satisfy the future evolution of the 5G macro networks; the excess supply of spectrum for local shared access licences and for licensed Wi-Fi, as well as the respective limited demand. Moreover, the proposed Ofcom approach risks to restrict the future use of the band for other uses.

Nokia thanks Ofcom for offering the possibility to express our views on its workplan for 2022/23 and is happy to further engage on topics of relevance.