Introduction

Nokia welcomes the opportunity given by Ofcom, through this consultation, to provide comments and views, on Ofcom's proposals regarding the UK's Shared Access Licence framework.

At Nokia, we create technology that helps the world act together. Our technology and innovation leadership in networking brings together the world's people, machines and devices to realise the potential of digital in every industry, amplifying the opportunity to transform business, industry and society.

Enterprises across all industries embrace the opportunities given through the advancements of Industry 4.0 to make their operation operations safer, greener, more efficient and more resilient. Governments, utilise the advanced digital technologies being available in the Industry 4.0 era to achieve their connectivity targets, connect underserved areas and close the digital divide. When every citizen is connected and services are made more accessible, economies thrive and communities can be more sustainable and inclusive. Digitalization fuelled by the industry's goals for efficiency, productivity and agility, brings new ways to connect people and workplaces, accelerates the shift to more sustainable business practices and measures environmental impacts with greater intelligence.

At Nokia, we recognise Ofcom's initiative to promote digital innovation becoming the first administration within CEPT to have developed a Shared Access Framework in the 3.8-4.2 GHz band. Almost four years after the launch of the Shared Access licencing framework, we believe Ofcom's experience, coupled with their multi-dimensional engagement with industry stakeholders, has become mature enough to provide targeted recommendations to the SAL framework which would improve the way the shared frequencies are licenced and utilised in the UK.

In the relevant sections below, we provide more specific comments to the consultation questions.

Your response

Question	Your response
Question 1: Do you have any comments on our proposals to gather additional antenna parameters, and would you prefer Ofcom to specify a small number of antenna pattern 'envelopes' or for users to provide details of the specific antenna parameters in use for Ofcom to assess? Please provide reasons for your views.	Confidential? – N We welcome Ofcom's acknowledgment that additional and more accurate information is needed regarding the antenna parameters of Shared Access Licensees to achieve more accurate coordination results. We encourage Ofcom to gather details of the specific antenna parameters which prospective licensees intend to use, as this will allow the assessment of the coexistence potential in a more realistic manner, thus we are supportive of Option (b).
Question 2: Do you have comments on the suggested approach to enable user-led coordination in certain circumstances?	Confidential? – N We are supportive of Ofcom's proposal to allow a more user-led coordination when licence requests are rejected from Ofcom's coordination assessment. Nevertheless, it has to be acknowledged that not all prospective licensees always have an in-depth technical understanding of network planning thus, factors such as the technology agnostic authorisation basis of Shared Access Licences might make the user-led coordination more challenging to achieve.
Question 3: Do you have any comments on our proposal to increase the power level of our Low Power product by 3dBm in the 3.8-4.2 GHz band?	Confidential? – N We welcome Ofcom's proposal to increase the EIRP of Low Power licences by 3dB. The need for increased power levels in this band to support a wider range of use-cases is a topic which has always been highlighted by Nokia. We also note that Ofcom has presented this proposal in the CEPT discussions for the 3.8-4.2 GHz band, with the intention to inform the other CEPT administrations regarding Ofcom's

	plans to support increased use of shared spectrum. Since the 2019 UK SAL framework had been identified by CEPT as the baseline framework for the development of harmonised technical conditions in this frequency band, our view is that Ofcom should not just be limited to only informing other administrations on the correctly identified need for higher EIRPs, but also recommend this additional level to be included in the CEPT harmonised technical conditions for this band.
Question 4 Do you have any comments on our proposal to remove the requirement for licensees holding a Low Power 3.8-4.2 GHz licence to keep a record of the address at which mobile terminals connected to an indoor base station will be used?	N/A
Question 5: Do you agree with our proposals to assume synchronisation between users, and coordinate base station to terminal instead of base station to base station in the 3.8-4.2GHz band? If no, please explain how other measures could increase sharing of the band.	Confidential? – N We understand that the shift towards proposing coordination between BS and terminals will increase the likelihood of having a licence application being accepted at a location where the coordination between BS to BS might be rejected and that such an alternative approach would increase densification in the band. While Ofcom adjusting the coordination process to increase the number of licences in this band is a desired outcome from our perspective too, it is of vital importance to maintain the flexibility for enterprises and local Shared Access users to deploy frame structures that suit the needs of their intended innovative applications. Assuming synchronisation as a default option for coordination might work well among licensees that plan to use the synchronised frame structures, but since with this alternative coordination approach the required geographical separation between licences will decrease, it might lead to potential interference when the prospective licensees decide to operate in an unsynchronised mode. This can be of even greater concern in the case when an existing licensee operates with an unsynchronised frame structure and the new licensee operates in a synchronised mode, in which case, if agreement among the two licence holders cannot be reached, the existing licensee will have to follow the synchronised

	frame structure, with the potential of not being able to satisfy the requirements of their existing services/applications. So in our view, the alternative (synchronised) coordination proposal from Ofcom doesn't seem to strike a balance between better coordination and flexibility. In fact, it shifts the already existing imbalanced trade-off from worst-case protection to less flexibility and from allowing less licences with more flexibility to allowing more licences with reduced flexibility. In essence it solves one problem by creating another. As Nokia we have always been supportive of accurate coordination and sufficient protection for licences in the 3.8-4.2 GHz band (and its incumbents) and we are of the view that the revision of the existing framework is an opportunity to improve the way the band is utilised and the way licences are authorised in the UK. Therefore, we propose that Ofcom establishes two methods for coordinating licences. One method for synchronised licences where coordination is assessed on a BS to terminal approach and another method for unsynchronised licences where coordination is assessed on a BS to BS approach. Prospective licensees, since they already know the purpose of the application/service that they would like to offer using the 3.8-4.2 GHz licence, can indicate during the application process whether they plan to use the synchronised or the unsynchronised frame structure. Ofcom can then collect this frame structure information and use it to further assess (current and future) coordination accordingly. We believe this will not require extensive additional non-planned workload for Ofcom, since the methodology for the unsynchronised operation already exists in the current coordination toolbox and can be enhanced with the addition of the methodology for the synchronised operation as already suggested in this consultation's proposals. In some circumstances, such as for example for indoor licences, and considering the revised BEL value from Ofcom, the alternative coordination proposal, could potentially be a more suitable approach (compared to outdoor licenses), as long as the above mentioned risk of limiting flexibility is not impacted

Question 6. Please indicate whether you support our preferred option of coordination at -88 dBm/20 MHz (based on I/N of + 3dB, at 1.5m) or a more conservative alternative of -91 dBm/20 MHz (based on I/N of 0dB at 3m), with reasons for your view.	Confidential? – N Following from our response above, we ought to highlight that there has not been a clear and detailed presentation of the proposal how to perform coordination based on terminals. While licensees are required to keep track of the location (i.e. address/postcode) of their terminals, these terminals can be fixed, nomadic or mobile. How does Ofcom plan to utilise the non-static location of mobile terminals to assess coordination? What additional considerations need to be taken for more accurate coordination, e.g. similar to the existing addition of 2dB in the proxy BS power for the Low Power licences to account for the uncertainty (or flexibility) for licensees to deploy their Low Power BS anywhere within the 50m radius of their licence authorisation? Similarly what considerations need to be made for the terminals of Medium Power BS, for which the cell coverage can be larger than a single postcode? Having said that, and based on our recommendation to coordinate only synchronised licences on a BS to terminal basis, we support the more conservative alternative of an I/N of 0dB at 3m height. While indeed the assumption of 1.5m terminal height is more likely to represent a typical mobile UE height, the licences in the 3.8-4.2 GHz band are not exclusively used by UE handsets. There are many use-cases in which terminals are higher than 1.5m such as cranes, terminals in harbours and ports, windmill parks etc. As a result, we are of the view that the assumption of 3m height is more likely to include and better represent a wider variety terminal heights that we see in real life deployments in this band.
Question 7: Do you agree with our proposals for an increase in BEL in 3.8-4.2GHz? If no, are there alternatives which you consider could better achieve similar results?	Confidential? – N Yes, since the 14dB BEL is based on measurement data, noting that BEL values in certain buildings, or under certain conditions (i.e. closed windows) can lead to up to 20dB in some cases or even up to 30dB (for buildings with metallic glasses).
Question 8: Do you agree with our proposal that adjacent band protection for Shared	Confidential? – N

Access users is in future limited to considering only the first 5 MHz above and below UK Broadband assignments?	We note that Ofcom uses as a basis for this proposal, the fact that a similar approach, implemented through a 5MHz guard band, has been taken for the protection of Shared Access users from MFCN services below 3.8 GHz. Our view is that since the consideration of 5MHz in the adjacent band coordination assessment is sufficient to protect Shared Access users from MFCN networks, it should also be sufficient to only consider the first 5MHz for the adjacent channel emissions from UK Broadband assignments into Shared Access users. We also note that the consideration of 5MHz guard band in 3800-3805 MHz is considered as a means not only for the protection of Shared Access users from MFCN services, but also for the protection of MFCN services from Shared Access users. Thus, we see a benefit in also considering only the first 5MHz for the Shared Access user emissions when assessing the protection of UK Broadband assignments. Since the consideration of emissions only in the first 5MHz in the adjacent band is considered enough by Ofcom to ensure protection of MFCN services, it should also be enough to protect UK Broadband assignments.
Question 9: Do you agree with our assessment that, in circumstances where localised shortages of spectrum have occurred, pricing can be used to influence requested spectrum amounts?	Confidential? – N We are of the view that sufficient and affordable spectrum is essential for industries to achieve the desired performance and operational efficiency. Although it may be true that in some areas, the demand may exceed to offered amounts of spectrum, increased cost of acquiring spectrum will inevitably increase the cost of the overall business case. Consequently, this may result in the risk of reducing the band's attractiveness for enterprises, translating into adverse effects compared to what Ofcom seeks from this band. One possible alternative to ensure that the spectrum acquired from licensees is in fact needed for their use-cases could be for Ofcom to seek justification from the prospective licensees that the requested bandwidths are needed for the intended use-cases.

	The first-come-first-served authorisation basis of the 3.8-4.2 GHz band, together with affordable spectrum cost for a justified business case and the deadline for deploying the intended networks, would help regulating the market in the cases where excess demand for spectrum exists.
Question 10: Do you agree that we should take measures to reflect the impact of bandwidth, power levels and urban/rural location in our pricing approach for the 3.8-4.2 GHz band? Do you think there are other factors we should be taking into account?	N/A
Question 11: How do you consider the illustrative prices would impact your spectrum requirements and future deployment plans in the 3.8-4.2 GHz band? Please provide evidence in support of your view.	N/A
Question 12: Do you have any comments on our proposals to clarify the circumstances in which exceptions are available, the tests we will apply, and how this supports user flexibility outside our overarching rules?	Confidential? – N Whilst we welcome Ofcom's intention to provide more clarification on the exception process, we find that the proposed measures for which Ofcom proposes to continue granting exceptions somehow contradicts the received feedback from their stakeholders. In paragraph 6.5, Ofcom reflects on this feedback stating that stakeholders *"broadly welcome the flexibility provided by this exception process"*. From an analysis of Ofcom's spectrum information portal, focusing on the medium powers for 3.8-4.2 GHz band, it was possible to identify a number of licences with antenna ERP at almost 79dBm, which is much higher than the maximum Medium Power limit in the existing framework. Furthermore, in the CEPT regulatory discussions, one of Ofcom's stakeholders presented[1] their experience of using the 3.8-4.2 GHz band, indicating the use of medium power licences with EIRPs higher than the maximum permitted power from the UK framework, a fact which was then clarified as being a result of the exemption process in the UK. Looking at the current measures under which Ofcom proposes to continue the exception process, we can see that the

[1] Contribution input to CG 4GHz #16: ECC PT1_CG4G(24)002

	potential of authorising licences with higher powers is not included. This, in essence is somehow contradicting the intention claimed by Ofcom as well as the feedback received from their stakeholders. In fact, limiting the measures of the exception process to only the height of the antenna and the location of Medium Power BS, reduces the already evident existing flexibility, and moves towards the opposite direction of what Ofcom identified as being beneficial to stakeholders. We note that the power levels of Medium Power BS, are being extensively discussed at CEPT level with an EIRP level of 51dBm/100MHz being considered as an option for the harmonised conditions to be developed. Thus, we see it as a significant oversight from Ofcom not to include the possibility of higher Medium Power EIRPs as part of the exception process, especially since Ofcom identified that such consideration is being welcomed and already utilised by their stakeholders, and since higher power levels are currently considered as part of the harmonised technical conditions for the rest of the CEPT countries. Regarding our view on the core tests associated with the assessment of exceptions, we highlight that Ofcom has not given a clear explanation of how "premises" are exactly defined, how they have been calculated in the consultation analysis and how will they be calculated in the exception assessment. Furthermore, Ofcom suggests that when the proposed exception exceeds the (arbitrarily set) sterilization number of 44,200 premises (which is an non defined term) in 3.8-4.2 GHz, then further testing will be made to assess whether there is *"plenty of spectrum"* available in the area and if there is *"little spectrum available"* the exception will not be granted. What exactly is "*plenty*" or "*little*" spectrum in quantifiable terms and what assumptions have been made for this conclusion? We are not entirely sure that the above proposals, to the level of detail provided in the consultation, really address the need for transparency in the exceptions process which Ofcom identified in the CFI responses. In the absence of clarity in the above definitions, methodology and assumptions under which Ofcom proposes to

	assess exception applications, we are not in a position to provide constructive feedback and we invite Ofcom to provide further information on their plans and current assessment, aligning with their own intentions of transparency.
Question 13: Do you agree with our overall approach based around refining our existing coordination framework for Shared Access, whilst monitoring future opportunities for more user led and outcomes led coordination where evidence suggests it would be of benefit?	Confidential? – N We want to highlight that not all deployments are the same and as a result, a degree of flexibility is required for innovation to continue to be enabled and grow in this band for enterprises, vertical industries and local communities. Deployments are primarily use-case and business-case driven. Thus, Ofcom should ensure that the technical rules and licence authorisation procedures in the UK enable suitable conditions for enterprises, vertical industries, local communities and the government to realise the digitisation innovations and benefits offered from the use-cases and applications in this band.
Question 14: Do you agree with our assessment of the potential impact on specific groups of persons?	N/A
Question 15: Do you agree with our assessment of the potential impact of our proposal on the Welsh language? Do you think our proposal could be formulated or revised to ensure, or increase, positive effects, or reduce/eliminate any negative effects, on opportunities to use the Welsh language and treating the Welsh language no less favourably than English?	N/A
Question 16: Do you have any other comments on the proposals set out in this document?	Confidential? – N Nokia is actively involved in the development of harmonised technical conditions of the 3.8-4.2 GHz band at European level by CEPT, under the EC mandate. To this end, we highlight that the ongoing work in CEPT has been based on the existing UK SAL framework and ongoing regulatory discussions are evolving around it. Therefore, we would like to suggest that any modifications to the existing UK regulation should be highlighted at European level, to allow CEPT to develop a flexible enough framework and toolbox, in which the changes in the UK's framework can be included. We

	consider that the scope at CEPT level is to assure a single European (not only EC) framework that allows sufficient flexibility and does not impose unnecessary restrictions when defining the equipment characteristics. Such flexible approach would encourage economic take-up of deployments in this band in UK, and also at European level, increasing demand for this band, which will in turn translate to economies of scale for affordable equipment.

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