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.	We are supportive of gathering additional antenna parameters where this improves the initial coordination and likelihood of acquiring a Shared Access Licence where the applicant prefers to have it. Whilst this may not be feasible to all applicants, many network setups would have detailed plans on antenna tilt and direction available to be fed into the coordination tool. A small number of antenna pattern 'envelopes' may be useful to some applicants but there must be flexibility for more 'advanced' users to provide more detail.
Question 2: Do you have comments on the suggested approach to enable user-led coordination in certain circumstances?	Dense Air has been at the forefront of efforts to allow operator to operator coordination to improve both shared licence coordination and availability. This came about through our experience of purely propagation-based licence allocation which built inefficiencies into the shared band and resulted in significant sterilisation. Dense Air, together with other licensees in the region concerned, worked together to significantly improve spectrum availability for all players based on more advanced knowledge of system requirements, services, and technical parameters. Significant manual analysis was required to unwind issued licences, an effort that cannot be repeated, but if this approach is adopted for forward looking applications, the benefits are achievable. As such, Dense Air supports Ofcom's suggested approach to improved used-led coordination.
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?	We agree with Ofcom that the power level of the Low Power licence can be increased. This will bring the power level closer to that of CBRS. Nevertheless, if possible, a further increase of the Low Power licence transmit power could be considered to bring it to match the CBRS level. This would facilitate more viable deployments across markets.
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	Dense Air supports Ofcom's proposal to remove the requirement to keep records on Low Power licenses in indoor locations. This is the key to enabling Neutral Hosts to provide 5G services to UK MNOs using Shared Access Licenses. This

which mobile terminals connected to an indoor base station will be used?	change will enable additional innovation in the 3.8 - 4.2 GHz band (3.34) and improve the benefits of spectrum sharing inherent to the Shared Access License scheme. However, there is a question about what is "indoor" and what is an "Indoor Base Station". Many locations such as railway stations, airports, passenger facilities at ports, large industrial and manufacturing sites, sports centres, conference and exhibition centres, educational campuses, and other High Demand Density (HDD) locations can be defined as "indoors" and are some of the most attractive and important targets for neutral host deployment. These are often not completely "indoors," and it is unclear if these locations have entry loss parameters that are consistent with Ofcom assumptions. We also agree that it is highly unlikely that low power indoor deployments could be used to assemble a wide-area network (3.37) if some terminals operated outside of the building hosting the base station. In fact, this overspill coverage is essential to ensure neutral host networks provide reliable handover back to the nationwide mobile networks for example when extending 5G SA coverage into HDD locations. We believe that refining the definition of indoor to explicitly include important HDD locations, such as those listed above and removing the assumption that Indoor means inside of a building would be helpful. This may require an appropriate update to the building entry loss and/or an additional entry loss class that includes larger HDD locations. Finally, we request Ofcom to reconsider the requirement for record keeping of mobile terminals in a scenario where a Neutral Host enables public MNO services by stacking this use case onto a 5G Private Network deployment using Shared Access Licenses. Multiple use cases (and multiple revenue streams) are critical to the economics of any Shared Access License deployment and a Hybrid Private and Public Network is one of the most attractive use cases that a Neutral Host operator can deploy. These types of

	deployments will allow a neutral Host provider to enable public 5G SA MNO services into a range of use cases, including manufacturing, logistics & warehousing, hospitality, education, and Industry 4.0, accelerating the use of non-public 5G SA with acceptable economics for all parties. The removal of record keeping would of course be strictly controlled and limited to the private network footprint (i.e. the private land on which the private network is deployed). Given that the Shared Access License has already been allocated to the private network, the addition of a neutral host service for mobile operators as another use case on the same spectrum allocation would not impact any other or future spectrum allocation and would simply make better use of the spectrum, increasing spectrum efficiency, and enhancing the innovated spectrum sharing. We note that this approach is promoted in DSIT's recent Spectrum Sandbox Invitation to Tender (ITT).
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.	We fully agree with Ofcom that coordination based on synchronisation is beneficial. With user-led coordination the great reduction in separation distances far outweighs the potential increase in interference risk. The assumption of synchronisation is particularly helpful for deployments toward the lower edge of the 3.8 - 4.2 GHz SAL band, where proximity to MNO networks is a fact. We believe that an additional synchronisation requirement/assumption should be applied to the lower 60 MHz in the 3.8-4.2 GHz band. VMO2 has a national license from 3720-3800 MHz and Shared Access Licenses issued to Dense Air and others exist from 3805-3905 MHz. Dense Air believes that harmful interference will occur between VMO2 5G Services and any Shared Access License network across this boundary unless some type of synchronisation scheme is enforced, as part of the Shared Access License. This scheme would be for different for medium and low power scenarios and for indoor / outdoor deployments. Dense Air believes, based on its own analysis, some initial field measurements, and interim

	study results by CEPT PT1 (who is working towards the ECC report on 3.8-4.2 GHz WBB LMP) that a synchronisation requirement should exist across the first 60 MHz of the 3.8-4.2 GHz band (i.e. from 3805-3865 MHz). This synchronisation should be identical to the two frame structures (A and B) permitted in the UK Mobile Operators licenses in the n78 band (i.e. 3410-3800 MHz).
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.	We support the relaxation of coordination parameters with appropriate link protection in place. As we elaborated in Question 2, Dense Air and other licensees in the region managed to resolve coexistence problems through user-led coordination. With this tool better available under such circumstances we believe that the -88 dBm/20 MHz option is sufficient.
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?	We do support the proposal to increase BEL in the 3.8 - 4.2 GHz band. However, even the new proposed figure looks conservative. For example, when looking at ETSI TR 138 901 on the propagation models that 3GPP considers, outdoor-to-Indoor loss is 20 dB for sub-6 GHz frequencies. We also believe that there is a need for other indoor building entry loss that are better suited for HDD locations (such as railway stations, airports, passenger facilities at ports, large industrial and manufacturing sites, sports centres, conference and exhibition centres, and educational campuses).
Question 8: Do you agree with our proposal that adjacent band protection for Shared Access users is in future limited to considering only the first 5 MHz above and below UK Broadband assignments?	We agree that adopting a similar approach already in place at the 3.8 GHz boundary makes sense. Synchronisation of networks next to UK Broadband assignment should resolve any potential interference risk for those licensees that can do so. Other networks that cannot use frame structures that align with UK Broadband can operate further away within the SAL band.
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?	No. As an active current user of Shared Access Licences, we are concerned that the proposed annual fees may weaken the feasibility of future deployments. We expect that there should not be any retroactive increase of licence fees for existing licences where investments and proposed investments have already been made which a

	change in the license fees would potentially put at risk. Some of our current private network deployments using medium power licenses already attract significant annual fees, which are a major recurring cost component in our business model. The current cost of our 38 100 MHz licenses in one such large private network deployment covering around 500 acres (or 2 sq km) is £30,000 per annum (or around £300,000 over the expected lifetime of the network). Therefore, the cost per sqkm/MHz is around £150 per year. This is already extremely expensive (relative to all other Ofcom spectrum pricing), and any increase would undermine any similar deployments, which aim to provide high capacity, low latency 5G SA private network footprints for key use cases. In addition, the suggestion that any medium power, Urban 100 MHz SAL (granted by exception) should cost £10,000 is extremely surprising and we wonder in what scenario this could be economically possible, noting that almost all deployment would typically require multiple licenses to multiple clusters of base stations. We do not believe that it is Ofcom's role to use punitive pricing models to dissuade potential deployments in Urban areas at medium power, as many potential use cases can have huge national economic and social benefits. We also are not clear why two (2) 50 MHz licenses at the same location, which might be combined using Carrier Aggregation to create a 100 MHz services should attract lower fees (50% less) than a single 100 MHz license.
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?	It is widely understood that 100 MHz channels are the norm in 5G - gaining full benefit of the 5GS features requires 100 MHz bandwidth. This is typically understood when national administrations assign bandwidth to MNOs in auctions. We fail to see why the same benefit would not be allowed to entities setting up 5G networks at the 3800-4200 MHz band. The GSMA and other bodies have extensively modelled the impact of 5G channel size allocation. Smaller channel allocations increase deployment costs, for example using 60 MHz rather than 100 MHz increases the number of

	cell sites required by 64%. Lower infrastructure cost is critical to both public and non-public operators. It should not surprise Ofcom that 80% of 3.8-4.2 GHz SAL applications have been for 100 MHz Mid-band spectrum is ideally suited for wide-channel bandwidths, which in turn support a range of differentiated use cases. RAN Equipment and UE vendor products are also optimised around 100 MHz and equipment availability for narrow channel bandwidths are not always supported, making it impossible in some scenarios to deploy narrower channel bandwidths.
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.	As per our response to question 9 the impact of the proposed price increases potentially represents a 100% increase in the annual fees payable for our deployments, which would destroy the investment case used for these network deployments in Shared Access Licenses. We do not believe that such an increase is warranted. This increase would undermine most of the planned deployments. It is possible that Ofcom's analysis of increasing spectrum fees is based on a specific use case, which does not require multiple licenses (sites) in a limited geographic area. We note that in some wide-area deployments such as FWA, which creates a lot of coexistence issues for other use cases, may not be sensitive to a 100% increase in license fees as the cost of spectrum is not a large part of the annual OPEX associated with the service provided. However, this is not the case for 5G SA private networks, or neutral host networks for High Demand Density locations that that can potentially use 3.8-4.2 GHz SALs for 5G SA low power deployment. These deployments require multiple sites and multiple licenses to create high performance contiguous footprints both indoors and outdoors. Any increase in the cost of a license per site / per base station has a significant impact on the viability of the business case.
Question 12: Do you have any comments on our proposals to clarify the circumstances in which exceptions are available, the tests we	A fundamental part of the Shared Access licensing scheme is based on the Ordnance Survey (UK Government) definition of Rural and Urban. The definition is derived from

will apply, and how this supports user flexibility outside our overarching rules?	settlements of 10,000 people with Urban being greater than 10,000 and Rural less than 10,000. However, the Rural-Urban classification allows for a variety of scenarios which are described as "Sparse settings" where there is clearly less than 10,00 people in an urban scenario. There are many areas of open countryside within the definition of Urban as this definition is based on settlement and dwelling density rather than the economic function or character or use of the land. We believe Ofcom should reflect this more specifically in its definition of Rural and Urban and include in the rules associated "with exception" the definition Urban to be closely associated with Urban Major and Minor conurbations (which is often described as Major towns and cities), but potentially not include Urban with City or Town or Urban with Significant Rural (which is often described as Built-up areas). This would more closely reflect the issues associated with allocation and license coexistence and reduce the number of exceptions which would be triggered by the current licensing process. In summary, we believe that Urban (which triggers an exception case) should be associated with the ONS definition of Towns and Cities and that Rural should include all rural areas, including area that are described as Built-up, but not part of a Town or City.
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?	The Spectrum Sandboxes ITT that DSIT has launched, and which commences in March 2024 will provide measurement-led evidence of various coordination scenarios, which we expect also to have projects focusing on the 3.8-4.2 GHz SAL band. The outcomes of the Spectrum Sandbox projects will be in many cases focused on better sharing and better spectral efficiency in the 3.8-4.2 GHz band. We believe that the results which will be delivered in Q1 and Q2 2025 from these projects should have an impact on SAL regulation in future and that Ofcom should commit itself to a further update of the rules associated with SALs, or Local Licenses in the 2H 2025.
Question 14: Do you agree with our assessment of the potential impact on specific groups of persons?	We have no comment on this question.

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?	We have no comment on this question.
Question 16: Do you have any other comments on the proposals set out in this document?	Dense Air is a strong proponent of the use of shared spectrum, we believe it brings players to the market that benefit mobile, private, and fixed user communities and the operators currently delivering services. We have made a few comments above which are summarised below to capture our general principles which we would like addressed as an output to this consultation: 1. Allowing the shared band to have similar technical characteristics to other markets such as CBRS in the US, to encourage scale deployment. 2. To enable neutral host sharing of spectrum and infrastructure in particular locations and facilities to efficiently attract mobile users. 3. To support improved operator to operator coordination to increase shared band efficiencies and availability. 4. To review indoor/outdoor and rural/urban definitions to refine power levels and handover potential for mobile users. 5. Remove the requirement to track mobile terminals. 6. The imposition of synchronisation processes and specifications to reduce potential interference and improve service interaction between operators both within and adjacent to the shared band.

Please complete this form in full and return to sharedaccessresponses@ofcom.org.uk.