Dense Air Ltd

Your response

Question	Your response
Question 1: (Section 4) Do you agree with our proposals on the coverage obligations as set out in this section? Please give reasons supported by evidence for your views.	Confidential? – ~~Y~~/ N The coverage obligations outlined in the consultation document are macro-cell orientated with an emphasis on serving outdoor users. This broadly suits 700MHz spectrum deployments but, does not address the compelling 4G & 5G deployment model using mid-band spectrum (3.6GHz). Dense Air request that OFCOM decouple the 700MHz and 3.6GHz coverage obligations and construct conditions associated with 3.6GHz that addresses delivering focussed wireless capacity to indoor and outdoor users and, taking into account that deployments of this nature are economically optimal when deployed on a neutral host basis. We would like to highlight the poor roll-out in previously auctioned 2.6GHz bands. Band 7 (2.6GHz FDD) currently covers a fraction of the population, and Band 38 (2.6GHz TDD) has not been utilised at all. As demonstrated by Sprint in the US, these are prime bands for utilising small-cell technology to in-fill coverage and capacity at cell edge, however when market share of individual operators are taken into account, the economics become challenging. Neutral Host small cells are the key to transforming the economics for these low density targeted installations. We therefore believe that, in order to avoid the under utilisation of 3.6GHz as happened with 2.6GHz, OFCOM should allocate a portion of the 3.6-3.8GHz band for 4G/5G Neutral Host operation by new entrants. We believe that this allocation should be between 20 and 40MHz which, when considering the amount of mid band spectrum already allocated to incumbent operators, would have no material impact on the current MNO's deploying credible 5G services. Dense Air strongly believes that the UK will

	benefit from new innovative wireless business models prompted by 5G use cases. These new business models will deliver neutral host extensions to existing mobile networks, as well as enabling new complementary use cases such as Private Cellular, Industrial Networks (including IOT), Smart Cities and Government applications. USA, Japan and Germany will all make 100MHz, 150MHz and 200MHz available respectively for 'non MNO' applications. The 3.6GHz auction is an ideal opportunity for the UK to join in this transformation of wireless services and to enable new comers to enter the market. This includes considerations stated throughout our response, but critically requires coverage obligations in 3.6GHz to be equally applicable to new comers and existing operators without prejudice. The coverage obligations in the consultation document do not achieve this. Coverage obligations for a new entrant, focused on small cells and neutral host should be different from existing MNOs. We believe that a level of rollout obligation for small cells should be present in order to ensure that the spectrum asset does not lie dormant or grossly under-utilised. In a similar spirit to discounts for rural coverage, we suggest that, for a new entrant deploying neutral host indoor smalls cells, discounts are applied with a commitment to install 500,000 small cells at 3.6GHz within 5 years of launch. The tactical deployment of this many buildings at MNO cell edge locations can make a dramatic impact to the availability of high quality 4G and 5G indoor coverage and capacity. Our supporting document illustrating current coverage short falls from 2.6GHz shows a significant number of under-served buildings, even in city centres. The tactical deployment of this many buildings at MNO cell edge locations can make a dramatic impact to the availability of high quality 4G and 5G indoor coverage and capacity.
Question 2: (Section 5) Do you agree that we have identified the correct competition concerns?	Confidential? – ¥ / N 5G has the potential to attract new business models including Private Cellular, Industrial Networks (including IOT), Smart Cities and Government applications, often deployed as Neutral Hosted networks. These new business

	models will attract potential new spectrum holders and enrich competition. The analysis outlined in the consultation appears to ignore this new market dynamic and, instead, continues to focus on the existing incumbents. We believe that the auction should be constructed to allow for new entrants with alternative business cases to the incumbent operators. The levels of indoor coverage being used in the consultation document to baseline the current license holder network performances do not align with our measured wireless coverage for typical mobile data usage (latest smartphone apps). Our analysis, using independent crowd sourced data, indicates that indoor mobile data coverage falls significantly lower than the figures being assumed by OFCOM. We have provided a separate (confidential) report showing our analysis. We note that OFCOM use a 2Mbps threshold and we suspect that this service is, in reality, shared by large clusters of indoor users. Our analysis takes account of real sharing (multiple access) conditions, and highlights where additional capacity is required in the networks. We would like to encourage OFCOM to consider network capacity as well as coverage in their analysis as this will give a more complete view of the UK network penetration.
Question 3: (Section 5) Do you agree with our assessment of these competition concerns, and our proposed measure for addressing them? Please give reasons supported by evidence for your views.	Confidential? – Y / ~~N~~ [✂] Redacted for publication
Question 4: (Section 6) Do you agree with our proposal to proceed with a conventional assignment stage?	Confidential? – ~~Y~~ / N The defragmentation of the 3.4-3.8GHz band is critical to any nationwide 5G deployment. At the heart of this process must be synchronization between operators. At present OFCOM proposes to lock sync to legacy 4G frame structure, which precludes 5G New Radio technologies delivering lower latency services critical to a huge number of new 5G use cases. In addition, 5G use cases beyond eMBB for MNOs, such as Industry 4.0, Connected Highways, Private network for Enterprise and

	Smart Cities are traditionally uplink centric. These solutions cannot be delivered using a mandated downlink centric frame structure as OFCOM proposes. We believe that spectrum holders should work together to agree what is the best frame structure for 4G and 5G and this should not be a matter for OFCOM to mandate.
Question 5: (Section 7) Do you agree with our proposal to use a CCA design for this award?	Confidential? – ¥ / N No comment.
Question 6: (Section 7) Do you have any comments on the proposed detailed rules for our CCA design?	Confidential? – ¥ / N No comment.
Question 7: (Section 8) Do you agree with our proposed approach to coexistence in the 700 MHz band?	Confidential? – ¥ / N No comment.
Question 8: (Section 8) Do you have any comments on the proposed licence obligation and guidance note (annex 19)?	Confidential? – ¥ / N No comment.
Question 9: (Section 9) Do you agree with our proposed approach to managing interim protections for registered 3.6-3.8 GHz band users?	Confidential? – ¥ / N No comment.
Question 10: (Section 9) Do you agree with our 3.6-3.8 GHz in-band restriction zone proposals?	Confidential? – ¥ / N No comment.
Question 11: (Section 9) Do you agree with our view that we do not need to include any specific conditions in 3.6-3.8 GHz licences to mitigate the risk of adjacent band interference?	Confidential? – ¥ / N No comment.

Question 12: (Section 10) Do you agree with the non-technical conditions that we propose to include in the licences to be issued after the award of the 700 MHz and 3.6-3.8 GHz bands?	Confidential? – ~~Y~~ / N No comment.
Question 13: (Section 11) Do you agree with the technical licence conditions we propose?	Confidential? – ~~Y~~ / N Dense Air views 3.6GHz as a band for network densification delivering high data capacity in targeted locations (mostly indoor). This is most effectively delivered by deploying small (low power) cells in close proximity to the end users. Creating license rules to allow the use of AAS and Massive MIMO deployments on conventional cell sites (rooftops or towers) with high EiRP levels poses operator co-existence challenges as well as creating health and safety concerns in public areas. We request that low EiRP limits are considered (in the order to 5W) in order to encourage a deployment model that enables network densification and maximises overall network spectral efficiency. The TDD synchronisation and frame structure rules proposed preclude 5G NR technologies delivering new services focused on vertical markets. We believe that spectrum holders should work together to agree what is the best frame structure for 4G and 5G and this should not be a matter for OFCOM to mandate.