11 March, 2019

Ofcom
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2A Southwark Bridge Road
London SE1 9HA
SharedSpectrumAccess@ofcom.org.uk
Attention: Ms. Siew Yoon Tan

Ref: Public Consultation on Enabling opportunities for innovation - Shared access to spectrum supporting mobile technology (in parts of 1.8 GHz, in 3.8-4.2 and 2390-2400 MHz)

Motorola Solutions thanks Ofcom for the opportunity to respond to this public consultation. This response is made available to Ofcom without any restriction over making the contents public, except for this cover letter and the annex.

I am at your disposal to provide any further clarification you may need.

[✂ - redacted for publication]

Attachments:

- *Response to selected questions*
- *Annex – Confidentiality response for consultation response template*

No of Pages: 12 (8 including cover letter + 4 pages Annex)

Motorola Solutions comments to Ofcom's *"Enabling opportunities for innovation"*

Introduction:

Motorola Solutions ("MSI") submits these comments in response to Ofcom's Consultation on "*Enabling opportunities for innovation: Shared access to spectrum supporting mobile technology*" (the "Consultation"). MSI applauds Ofcom for their efforts to offer highly innovative shared spectrum bands for localised or private broadband systems. We believe that these approaches will greatly improve broadband availability for enterprise and industrial applications, especially in rural areas and lead to improved productivity levels. The proposals put forth in the Consultation nicely complement existing proposals to auction the 3.6-3.8 GHz band for 5G services. Indeed, many 5G (as well as 4G) services can be offered in shared spectrum bands. One only has to look at the success of the WiFi shared bands and ecosystem worldwide to see the promise of shared bands and localised uses of spectrum. Similar successes can be had in locally licenced and shared spectrum bands as Ofcom proposes.

Shared spectrum can offer localised or private localised broadband systems unique capabilities through highly customized levels of coverage, capacity and security that nationwide or public cellular systems do not readily offer today. By offering a large range of shared bands (at 1.8 GHz, 2.3 GHz, and 3.8 GHz), Ofcom is efficiently increasing nationwide spectrum utilization while improving productivity and connectivity for millions of entities and users. Our responses to the specific questions in the Consultation are presented below.

Question 1: *(Section 3) Do you agree with our proposal for a single authorisation approach for new users to access the three shared access bands and that this will be coordinated by Ofcom and authorised through individual licensing on a per location, first come first served basis? Please give reasons supported by evidence for your views.*

MSI agrees with the proposal for a single authorisation approach for new users to access the three shared bands. MSI further supports Ofcom-managed coordination of individual localised licences (per area licences for low power systems, and per base station for medium power systems), on a first-come, first-served basis. The generally wide availability of spectrum across the shared access bands will improve spectrum access for local entities, and the certainty of having local licences (once obtained) will help spur investment and innovation in the band.

Question 2: *(Section 3) Are there other potential uses in the three shared access bands that we have not identified?*

MSI believes that narrowband IoT (NB-IoT) applications can be supported in at least some of the spectrum bands under consideration (and in particular the 1.8GHz band).

Question 3: *(Section 3) Do you have any other comments on our authorisation proposal for the three shared access bands?*

MSI supports allowing indoor and outdoor mobile device coverage in the 3.8-4.2 GHz band. Please see our comments below in regards to medium power licence restrictions and mobile coverage.

Question 4: *(Section 3) What is your view on the status of equipment availability that could support DSA and how should DSA be implemented?*

MSI believes that the three shared bands are well supported by 4G LTE and/or 5G New Radio technologies, and can additionally support Dynamic Spectrum Access (DSA) techniques. DSA functions can generally be performed in software at higher network control layers (e.g., in an Element Management System or similar network controller). In addition, allowing localised or private broadband access to unused spectrum in the 3.4-3.6 GHz band will allow reuse of 3GPP Band 42 and Band 48 equipment, which will greatly improve the availability and reduce the cost of equipment. As 5G deployments commence based on 3GPP band n77 covering the extended C-band 3.3-4.2GHz, the ecosystem is expected to rapidly develop and become commercially available.

MSI also believes it is possible to eventually automate some of the spectrum allocation processes to achieve rapid and automatic coordination among users, through cloud-based spectrum coordinators. This type of approach would allow priority preemption by certain classes of users. However, the Ofcom-proposed licence management approach is an effective approach in the near term.

Question 5: *(Section 4) Do you agree with our proposal for the low power and medium power licence? Please give reasons supported by evidence for your views.*

MSI generally supports the low power and medium power licence approaches (with the technical modifications recommended below). MSI also supports a licence option for enlarged low power licence areas (beyond the 50m proposed radius value, to perhaps 100-200m in order to decrease the number of licences that must be managed). The proposed licence fees are reasonable, and can be scaled higher if a larger licence area is offered for certain low power licences. (For example, a 100m radius licence could be approximately 4 times more expensive than a 50m radius licence.) This approach will reduce the administrative burden for tracking multiple licences for slightly larger localised broadband deployments.

Question 6: *(Section 4) Are there potential uses that may not be enabled by our proposals? Please give reasons supported by evidence for yourviews.*

MSI believes that certain industrial and enterprise private or localised broadband systems will need to support mobile coverage over larger areas (e.g., a shipping yard, a railway yard, etc.), and that medium power licences will be needed to effectively cover these areas (see also Question 7 response below).

Question 7: *(Section 4) Do you agree with our proposal to limit the locations in which medium power licences are available? Please give reasons supported by evidence for your views.*

MSI supports medium power licences for any areas where incumbent interference is not a concern, at least in some portion of the shared (e.g., 3.8 GHz) bands. Since user equipment is limited to low power levels (e.g., 23 dBm), and will operate in close proximity (typically within 1 km) of even medium power base stations, MSI believes that mobile operation should be allowed in such cases. Importantly, typical user equipment such as smartphones traditionally have highly lossy internal antennas (on the order of -8 dBi) that limit harmful emissions. Furthermore, mobile user equipment will not transmit unless it can receive a satisfactory signal from the base station. Therefore, MSI believes that mobile operations can be supported in a portion of the band in certain areas, without the risk of harmful interference.

Question 8*: (Section 4) Do you have other comments on our proposed new licence for the three shared access bands?*

MSI supports the transfer of licences as Ofcom has proposed in the Consultation, and concurrent transfer of rights to two or more parties. MSI also supports the partial transfer of licences in at least 10 MHz blocks in the 3.8-4.2 GHz band.

Question 9: *(Section 4) Do you agree that our standard approach to non-technical licence conditions is appropriate? Please give reasons supported by evidence for your views.*

MSI agrees that the proposed conditions are appropriate.

Question 10: *(Section 4) Are you aware of any issues regarding numbering resources and Mobile Network Codes raised by our proposals which we have not considered here?*

The number of available Mobile Network Codes (MNC) is not currently in short supply. However, in anticipation of potential growth in private and localized licensees operating their own network codes, one possible solution to expand MNC codes might

be to extend the MNC length from 2 to 3 digits or request from the ITU an additional Mobile Country Codes (MCC).

for numbering blocks assignment, we propose considering smaller blocks for private mobile systems with, for example, 5,000 to 10,000 numbers per block instead of 100,000. The 100,000 numbers block assignments would continue to be applicable for commercially operating Mobile Network Operators/Mobile Virtual Network Operators (MNOs/MVNOs).

Question 11: *(Section 5) Do you agree with the proposed technical licence conditions for the three shared access bands? Please give reasons supported by evidence for your views.*

MSI strongly supports shared access to the 3.8-4.2 GHz bands, and believes the technical means are available to protect incumbents while providing valuable localised broadband services. The use of TDD systems in the band is reasonable, and supported by available (4G) and developing (5G) radio technologies. For low power systems, we would prefer to see maximum EIRP levels increased to 30 dBm/10 MHz (per sector) to allow more efficient coverage of large factories and warehouses. For medium power systems, we support maximum EIRP levels up to 43 dBm/10 MHz (per sector, slightly higher than proposed). These higher power levels may necessarily impact spectral availability in the shared bands (to maintain incumbent protection), but should be allowed to provide deployment flexibility in areas that can accommodate the somewhat higher transmission levels.

In addition to the 23 dBm proposed power levels for terminals stations, MSI would recommends that a higher power class be allowed for fixed customer premise equipment (CPE), which typically utilizes high gain highly directional antennas to close the link to the base station (with power control), while also minimizing radiated interference due to the highly directional pattern. This type of equipment is common in fixed wireless access (FWA) systems. If necessary, these higher EIRP CPEs can be individually coordinated through Ofcom.

Similarly, MSI supports the Ofcom position for not artificially restricting the height limit for medium power base stations and indoor equipment, but would prefer to see the outdoor low power base station antenna height limit be raised to 15 meters above ground level (AGL), as signals at these high frequencies are greatly attenuated by even gently rolling terrain features and other clutter (as many propagation models predict and field measurements confirm). MSI also supports frame alignment of TDD technologies, but do not believe that frame structure restrictions are necessary, as other means (such as sub-frame conflict aware scheduling) are available to alleviate these interference issues. TDD frame configuration flexibility is especially important for certain use cases that may need higher uplink capability, such as in systems deploying remote video links (e.g., used in remote robotics and security applications).

Finally, MSI supports expanding access to the 1.8 GHz band to a wider range of users. Though the available spectrum is limited to approximately 3+3 MHz, many industrial IoT and smart city applications can be well supported by this band. MSI also supports improving access to the upper 10 MHz portion of the 2.3 GHz band for higher capacity broadband systems. For the 2.3 GHz band, MSI also supports the somewhat higher power levels and antenna height limits proposed above for the 3.8 - 4.2 GHz band.

Question 12: *(Section 5) Are there other uses that these bands could enable which could not be facilitated by the proposed technical licence conditions? Please give reasons supported by evidence for your views.*

MSI recommends that medium power licences be allowed to service mobile devices, for the reasons mentioned above. Medium power base stations will be able to more efficiently serve enterprise and industrial needs in slightly larger areas (e.g., shipping ports, rail yards, etc.). Even at the proposed medium power licence levels, MSI does not expect such base station signals to propagate very far (i.e., they will generally be limited to 2.5 km or less at modest antenna heights, in realistic terrain and clutter conditions).

Question 13: *(Section 5) Do you agree with our proposed coordination parameters and methodology? Please give reasons supported by evidence for your views.*

MSI generally agrees with the fundamental coordination approach that Ofcom has proposed. The optional use of antenna pattern data for incumbent protection from localised broadband equipment emissions is highly recommended, since it will more accurately model interference and further increase spectrum utilization efficiency. Similarly, the antenna patterns of incumbents (e.g., fixed satellite or fixed service receivers, etc.) should also be considered to more accurately model received interference levels. MSI further believes that a slightly higher median building penetration loss of 15 dB can be utilized in interference computations (especially above 2.3 GHz). In addition, in most cases the emissions from indoor devices will need to penetrate several walls before reaching outside. The reliance on existing interference protection criteria for incumbents is appropriate and fair to both incumbents and new entrants. Furthermore, MSI supports the use of propagation models with 50m or higher terrain and clutter resolution (as higher resolution should improve the accuracy of the modelling and improve spectrum utilization). Actual antenna heights should be utilized wherever possible.

Question 14: *(Section 5) What is your view on the potential use of equipment with adaptive antenna technology (AAS) in the 3.8-4.2 GHz band? What additional considerations would we need to take into account in the technical conditions and*

coordination methodology to support this technology and to ensure that incumbent users remain protected?

MSI offers no comment on this question.

Question 15: *(Section 5) Do you agree with our proposal not to assign spectrum to new users in the 3800-3805 MHz band and the 4195-4200 MHz band?*

MSI agrees that the Ofcom proposal for 5 MHz guard bands is reasonable and appropriately sized.

Question 16*: (Section 6) Do you agree with our fee proposal for the new shared access licence? Please give reasons supported by evidence for your views.*

The proposed fee structure is reasonable, and will encourage investment in the band. MSI believes that new users should be limited to holding a reasonable amount of spectrum (e.g., 40 MHz within 3.8-4.2 GHz band) in areas where interest in local licences is high.

Question 17: *(Section 7) Do you agree with our proposal to change the approach to authorising existing CSA licensees in the 1800 MHz shared spectrum? Please give reasons supported by evidence for your views.*

Ofcom's existing Concurrent Spectrum Access (CSA) licensees should be authorized in the 1800 MHz shared spectrum band under the new licensing approach.

Question 18: *(Section 8) Do you agree with our proposal for the Local Access licence? Please give reasons supported by evidence for your views.*

MSI supports reasonable and carefully coordinated Localised Access to unused areas of MNO licences. MSI appreciates Ofcom's goals of increasing overall spectrum utilization, and providing localised secondary access to spectrum. However, extreme care must be taken for any bands or spectrum holdings by MNOs that support mission critical public safety or critical infrastructure applications, which must maintain rights for rapid deployment into unused licenced spectrum (e.g., for emergencies and natural disasters), and be carefully protected.

Question 19: *(Section 8) Do you have any other comments on our proposal?*

MSI believes that the proposed approach will accelerate localised or private localised broadband deployments, and encourage 5G technology usage by numerous entities. Local Access licences may also encourage licence holders to proactively lease out their spectrum for other uses in order to realize economic benefits.

Question 20: *(Section 8) What information should Ofcom consider providing for potential applicants in the future and why would this be of use?*

Spectral availability information for the various bands would be helpful to identify underutilized spectral resources. This information can be geographically coarse in nature, to protect sensitive deployment details, and should be anonymised wherever possible.

Question 21: *(Section 8) Do you agree with our proposal to have a defined licence period and do you have any comments on the proposed licence term of three years?*

MSI believes that a three year (or more) nominal Local Access licence term is reasonable for these applications, and there should be a reasonable expectation of licence renewal for deployed systems.

Question 22: *(Section 8) Do you have any other comments on the proposed Local Access licence terms and conditions?*

MSI supports the concept that spectrum must be utilized within reasonable timeframe to avoid spectrum hoarding or inefficient use of the spectrum, and there should be a reasonable expectation of licence renewal for deployed systems.

Question 23: *(Section 8) Do you agree with our fee proposal for the new local access licence? Please give reasons supported by evidence for your views.*

MSI believes that the proposed fees for Local Access Licences seem reasonable.

Conclusion:

In summary, MSI strongly supports opening several spectrum bands for localised or private broadband systems. We believe the UK economy and population can benefit greatly from numerous new and innovative broadband systems, and that valuable limited spectral resources can be more efficiently utilized. The proposed localised license terms are reasonable, and will spur innovation and investment in localised or private broadband systems in the UK.

End of Responses

Annex

Consultation response form

Consultation title	Enabling opportunities for innovation
Full name	[✂]
Contact phone number	[✂]
Representing (delete as appropriate)	Organisation
Organisation name	Motorola Solutions UK Ltd

Confidentiality

We ask for your contact details along with your response so that we can engage with you on this consultation. For further information about how Ofcom handles your personal information and your corresponding rights, see Ofcom's General Privacy Statement.

Your details: We will keep your contact number and email address confidential. Is there anything else you want to keep confidential? Delete as appropriate.	No
Your response: Please indicate how much of your response you want to keep confidential. Delete as appropriate.	None
For confidential responses, can Ofcom publish a reference to the contents of your response?	Yes

Your response

Question	Your response
Question 1: (Section 3) Do you agree with our proposal for a single authorisation approach for new users to access the three shared access bands and that this will be	Confidential? – N Response in main section above.

coordinated by Ofcom and authorised through individual licensing on a per location, first come first served basis? Please give reasons supported by evidence for your views.	
Question 2: (Section 3) Are there other potential uses in the three shared access bands that we have not identified?	Confidential? – N Response in main section above.
Question 3: (Section 3) Do you have any other comments on our authorisation proposal for the three shared access bands?	Confidential? – N Response in main section above.
Question 4: (Section 3) What is your view on the status of equipment availability that could support DSA and how should DSA be implemented?	Confidential? – N Response in main section above.
Question 5: (Section 4) Do you agree with our proposal for the low power and medium power licence? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.
Question 6: (Section 4) Are there potential uses that may not be enabled by our proposals? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.
Question 7: (Section 4) Do you agree with our proposal to limit the locations in which medium power licences are available? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.
Question 8: (Section 4) Do you have other comments on our proposed new licence for the three shared access bands?	Confidential? – N Response in main section above.
Question 9: (Section 4) Do you agree that our standard approach to non-technical licence conditions is appropriate? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.

Question 10: (Section 4) Are you aware of any issues regarding numbering resources and Mobile Network Codes raised by our proposals which we have not considered here?	Confidential? – N Response in main section above.
Question 11: (Section 5) Do you agree with the proposed technical licence conditions for the three shared access bands? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.
Question 12: (Section 5) Are there other uses that these bands could enable which could not be facilitated by the proposed technical licence conditions? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.
Question 13: (Section 5) Do you agree with our proposed coordination parameters and methodology? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.
Question 14: (Section 5) What is your view on the potential use of equipment with adaptive antenna technology (AAS) in the 3.8-4.2 GHz band? What additional considerations would we need to take into account in the technical conditions and coordination methodology to support this technology and to ensure that incumbent users remain protected?	Confidential? – N Response in main section above.
Question 15: (Section 5) Do you agree with our proposal not to assign spectrum to new users in the 3800-3805 MHz band and the 4195-4200 MHz band?	Confidential? – N Response in main section above.
Question 16: (Section 6) Do you agree with our fee proposal for the new shared access licence? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.
Question 17: (Section 7) Do you agree with our proposal to change the approach to authorising existing CSA licensees in the 1800 MHz shared spectrum? Please give	Confidential? – N Response in main section above.

reasons supported by evidence for your views.	
Question 18: (Section 8) Do you agree with our proposal for the Local Access licence? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.
Question 19: (Section 8) Do you have any other comments on our proposal?	Confidential? – N Response in main section above.
Question 20: (Section 8) What information should Ofcom consider providing for potential applicants in the future and why would this be of use?	Confidential? – N Response in main section above.
Question 21: (Section 8) Do you agree with our proposal to have a defined licence period and do you have any comments on the proposed licence term of three years?	Confidential? – N Response in main section above.
Question 22: (Section 8) Do you have any other comments on the proposed Local Access licence terms and conditions?	Confidential? – N Response in main section above.
Question 23: (Section 8) Do you agree with our fee proposal for the new local access licence? Please give reasons supported by evidence for your views.	Confidential? – N Response in main section above.

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