Huawei Response

To Ofcom Public Consultation document:

"Public Sector Spectrum Release (PSSR):

Technical coexistence issues for the

2.3 and 3.4 GHz award"

INTRODUCTION

Huawei welcomes the opportunity to provide feedback on this very important consultation. Ofcom has performed a very detailed and concise appraisal of the technical coexistence issues being faced by the release of these 2 bands, which is greatly appreciated. Huawei's specific responses to the questions raised by Ofcom are show in the following pages.

HUAWEI RECOMMENDATIONS

Huawei appreciates that radio spectrum is a major asset to the UK, providing a critical input to a wide range of services, and how to secure the optimal use of this scarce asset is the primary consideration when awarding new spectrum licences. In the respect of the forthcoming award of 190 MHz of spectrum in the 2.3 and 3.4 GHz bands, aiming to address the exponential data growth raised predominately by dramatically increasing usage of smartphones, Huawei would like to suggest some proposals for Ofcom's consideration.

Firstly, from this year onwards, technology improvements should be taken fully into account, because advanced technologies such as LTE-Advanced will improve spectrum efficiency and ensure best user experience. For this reason, licensing wide spectrum for use, typically in no less than 40 MHz blocks, is appropriate so as to utilize carrier aggregation technology (one key feature of LTE-Advanced) to provide super fast speeds. It is expected that carrier aggregation in one band is becoming matured and end-to-end 4 carrier aggregation (up to 80 MHz) will be on the market around mid-2015, fully meeting the UK's demands. Furthermore, given that the 2.3 and 3.4 GHz bands will be using TDD technology, full synchronization amongst MFCNs is becoming universally adopted around the world, thus maximizing spectrum efficiency and reducing network rollout costs (no need for customized equipment). Operators in China, India and Nigeria have chosen the full synchronization path, with operators in Hong Kong and the Philippines expected to follow. Also, Regulators' policies are beginning to promote/enforce a common synchronized approach with China being a prime example.

Over the next decade, demand for more uses of spectrum is likely to grow, sustaining the need to adopt more spectrally efficient technologies. The main objective of Ofcom's spectrum management strategy is to secure optimal use of spectrum in the UK i.e. the use that delivers the greatest value to UK citizens and consumers. Licensing spectrum in large blocks (at least 40 MHz need in one block in both the 2.3 and 3.4 GHz bands) and full synchronization amongst MFCNs are the two essential and critical approaches to reach this goal.

Huawei recognizes that the assignment of a 40MHz block would mean having only one operator in the 2.3 GHz band. While competition will in any case be ensured through the frequency availabilities in other bands (including the spectrum in the 3.4 GHz band that is being made available in parallel), in order to ensure competition within the same 2.3 GHz band, Ofcom should work on the availability of the remaining 50MHz in the 2.3 GHz band via the LSA regulatory tool.

In addition to our responses to the questions raised by OFCOM, Huawei would also like to make some proposals regarding small cells, the details of which are shown in the Appendix at the end of this consultation response.

CONSULTATION QUESTION

Question 4.1: Do you agree with our proposal to conduct a market led award through an auction process for licensed use of the 2.3 and 3.4 GHz bands? If not, please provide evidence to counter this proposal.

FEEDBACK

Huawei supports a market led award through an auction process provided that the block size suggestions for the 2.3 and 3.4 GHz bands given in our recommendations above are followed.

CONSULTATION QUESTION

Question 4.2: Do you agree that we should not offer arrangements for aggregate bidding for low power use for these release bands? If you believe we should make such arrangements, please provide supporting evidence.

FEEDBACK

Huawei supports the Ofcom recommendation that low power use for these bands should not be offered. One main reason is that high power use in the 2.3 and 3.4 GHz bands is universally adopted by other countries and the UK could enjoy the economies of scale. Furthermore, not limiting power use will ensure network coverage and provide a better user experience.

CONSULTATION QUESTION

Question 6.1: Do you have evidence to challenge our methodology and assumptions, which show the number of Wi-Fi routers likely to be affected by LTE interference is low?

FEEDBACK

Firstly, Huawei supports the conclusion that the overall impact of potential LTE interference is very small.

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In addition, Huawei believes that more specific guidance for administrations is required in Annex 2 of the Draft ECC Decision "Harmonised technical and regulatory conditions for the use of the band 2300-2400 MHz for MFCN" to protect adjacent band WLAN services. After public consultation, the FM52 group had approved the draft ECC Decision about the 2300-2400MHz band. In this draft ECC Decision, there are some technical constraints about TDD LTE / WIFI RLAN compatibility. Please note the following technical parameters:

- **2390-2400 MHz:** The in-block e.i.r.p. limit shall not exceed 45 dBm/5MHz per antenna to protect systems above 2400 MHz.
- Additional baseline requirements above 2403 MHz – BS BEM out-of-band e.i.r.p. limits per antenna

BEM element	*BS e.i.r.p.*	*Power limit*
Additional baseline	*Pmax > 42 dBm*	*1 dBm/5 MHz*
Additional baseline	*24 dBm < Pmax ≤ 42 dBm*	*(Pmax -41) dBm/5 MHz*
Additional baseline	*Pmax ≤ 24 dBm*	*-17 dBm/5 MHz*

CONSULTATION QUESTION

Question 6.2: Do you have evidence to challenge our methodology and assumptions, which show the number of Wi-Fi client devices affected by LTE interference is low?

FEEDBACK

Please refer to our response to Question 6.1

CONSULTATION QUESTION

Question 6.3: Do you agree with our assessment of the available options for mitigation of interference to home networks?

FEEDBACK

Huawei agrees with Ofcom's assessment in regard of the available option for mitigation of interference to home networks.

CONSULTATION QUESTION

Question 6.4: Do you agree with our assessment of the available options for mitigation of interference to public networks (both indoor and outdoor)?

FEEDBACK

Huawei agrees with Ofcom's assessment in regard of the available option for mitigation of interference to public networks.

CONSULTATION QUESTION

Question 6.5: Do you agree with our assessment of the available options for mitigation of interference to Enterprise Networks?

FEEDBACK

Huawei agrees with Ofcom's assessment in regard of the available option for mitigation of interference to Enterprise Networks.

CONSULTATION QUESTION

Question 6.6: Do you agree with our conclusion that the impact to Wi-Fi is not of a significant nature and therefore no regulatory intervention is necessary? If not, can you provide evidence?

FEEDBACK

Huawei completely agrees with Ofcom that the potential impact to Wi-Fi caused by LTE interference is low and could be mitigated by various appropriate approaches.

CONSULTATION QUESTION

Question 7.1: Do you agree that we do not need to perform technical analysis on the applications in the middle of the band as set out in paragraph 7.7?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 7.2: Do you agree with our technical analysis in relation to Bluetooth devices operating in the 2.4 GHz band, and that no additional restrictions are required in order to protect these applications?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 7.3: Do you agree with our technical analysis in relation to ZigBee devices operating in the 2.4 GHz band and that no additional restrictions are required in order to protect these applications?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 7.4: Do you agree with our technical analysis in relation to video sender devices operating in the 2.4 GHz band and that no additional restrictions are required in order to protect these applications?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 7.5: Do you agree with our technical analysis in relation to radio microphones devices operating in the 2.4 GHz band and that no additional restrictions are required in order to protect these applications?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 7.6: Do you agree with our technical analysis in relation to short range devices operating in the 2.4 GHz band and that no additional restrictions are required in order to protect these applications?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 7.7: Do you agree with our technical analysis in relation to medical devices operating in the 2.4 GHz band and that no additional restrictions are required in order to protect these applications?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 7.8: Do you agree with our technical analysis in relation to emergency services use in the 2.4 GHz band and that no additional restrictions are required in order to protect these applications?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 7.9: Do you agree with our technical analysis in relation to hearing aids and assisted listening devices operating in the 2.4 GHz band and that no additional restrictions are required in order to protect these applications?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 8.1: Do you agree that the available mitigations address the potential shortfall of spectrum for PMSE at major events and that no additional regulatory intervention is necessary to protect PMSE in frequencies adjacent to the award bands?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 8.2: Do you agree that PMSE should have some continuing access to spectrum in the 3.4 GHz band until new services are rolled out in an area?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 8.3: Which option for the provision of information about the roll-out of new services is most the appropriate? Should the requirement to supply information apply only in designated locations?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 8.4: Do you agree that any continuing access should be limited to five years from the award of new 2.3 and 3.4 GHz licences?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 8.5: Do you agree with our assessment that there is little incremental benefit in on-going PMSE access to the 2.3 GHz award band?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 10.1: Do you agree with our proposal that no coordination procedure is necessary in respect to maritime radar?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 11.1: Do you agree with our proposal to require coordination procedures for the 3.4 GHz band - in order to protect of air traffic control radar - in line with those applied to the 2.6 GHz band?

FEEDBACK

Huawei fully agrees to ensure satisfactory on-going ATC/ATM (Air Traffic Control and Air Traffic Management) service operation when taking into account deploying new communication system on the 3.4 GHz award band. There is a possibility that high power communications networks operating in the 3.4 GHz band may cause interference to ATC/ATM services in the 2700 to 3100 MHz band. However, just what the radar manufacturers said described in the consultation document, according to a number of completed studies, the risk of harmful interference to ATC/ATM from communications transmissions operating at 3.4 GHz was less than the risk of interference from similar systems at 2.6 GHz. After all, over 300 MHz distance exists between the 3.4 GHz band and air traffic control radar, totally different from the 2.6 GHz scenario. Hence, it is a bit unreasonable to apply the same power flux density (pfd) per MHz across the band in the 3.4 GHz band as the 2.6 GHz band.

In order to protect air traffic control radar, a certain pfd level is a must for 3.5 GHz band but no need to be completely in line with the 2.6 GHz band. The RF filter operating in 3.5 GHz band could provide a better interference suppression capability, compared to 2.6 GHz band, due to a greater spectrum distance. Thus, considering a differently applied pfd level on 3.5 GHz award band is a necessity.

CONSULTATION QUESTION

Question 12.1: Do you agree that for mobile satellite services operating in the band between 2170 and 2200 MHz, coexistence with LTE operating in the award bands above 2.35 GHz is unlikely to be an interference problem?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 12.2: Do you agree that satellite services operating in the band 2483.5 MHz to 2500 MHz can co-exist with LTE operating in the award bands (i.e. 2350 to 2390 MHz and 3410 to 3590 MHz) and there is unlikely to be an interference problem?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 12.3: Do you agree with that for satellite services operating between 2200 and 2290 MHz, coexistence with LTE operating in the release bands is unlikely to be an interference problem?

FEEDBACK

Regarding the 2.3 GHz band, Report 172 states "In conclusion, BWS does not have any considerable negative impact on space to space service." For the Space Service in the Band 2200-2290 MHz (Space to Space) and in the conclusion for the "Interference from LTE TDD BS to deep space SRS earth stations", it is stated " It can be concluded that having a very sensitive Deep Space earth station receiver close to a broadband wireless system such as LTE TDD might require some mitigation techniques". Thus, for the both systems, the compatibility is good, with only some precautions required in the case of the SRS service.

CONSULTATION QUESTION

Question 12.4: Do you agree that for amateur satellite services operating between 2400 and 2450 MHz, coexistence with unwanted/out of band emissions of LTE operating in the release bands (the nearest release band is 2350 to 2390 MHz) is unlikely to be a greater problem than the current in-band interference from licence exempt and ISM uses?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 12.5: Do you agree with our preferred option to adopt our proposed mask with informal co-operation on a case-by-case basis if required?

FEEDBACK

No comment

CONSULTATION QUESTION

Question 13.1: Do you agree with our preference not to have a transitional region between blocks for licences in the 2.3 GHz band?

FEEDBACK

Huawei strongly agrees. Transitional regions should be avoided to maximize usable spectrum for mobile use

We note also that there are not transitional regions between blocks (but there is a transition region in the adjacent blocks) when there is synchronization between TDD networks. The small bandwidth available for the TDD LTE in the 2.3-2.4GHz band should be used efficiently, thus without transitional region between blocks.

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CONSULTATION QUESTION

Question 13.2: Do you agree with our preference not to have a transitional region between blocks for licences in the 3.4 GHz band?

FEEDBACK

Huawei strongly concurs. No transitional region in the 3.4GHz band will benefit end users, operators and regulators because more useable spectrum for mobile services is always welcomed by any stakeholder. It is also implied that synchronization between multiple operators is a must.

CONSULTATION QUESTION

Question 13.3: Do you agree with our preference to not require synchronisation between different networks in the frequency band?

FEEDBACK

Huawei strongly disagrees. We promote synchronization because it allows better spectrum efficiency and less expensive rollout, especially in co-location scenarios. Without synchronization, expensive RF filtering equipment must be placed on the aggressor side i.e. the one not benefitting of the business in the adjacent spectrum.

While selecting business models and independent synchronization is of value, we have seen from both India and China that the operating parties have only been able to move forward bringing service to the market by agreeing to synchronization, thus avoiding exorbitant costs. If one party single-handedly wanted to move forward while not agreeing on a synchronization pattern, that party could face one of two costly business mistakes:

a) post-rollout retrofitting with external filtering if the adjacent operator selects a different sync pattern

b) rollout with expensive filtering finding the competitor just waited for the first party to overspend on filtering and then rollout using the same sync pattern at a lesser cost.

These were real challenges in a game that has been played before between operators in India, resulting in the delay of LTE services to the Indian market. The 2 parties eventually agreed on a sync pattern and rollout commenced shortly after the agreement.

Huawei therefore proposes, that the administrations consult the concerned parties to define the best DL/UL ration before the auction (suggested 3DL:1UL or 2DL:2UL in TD-LTE terms).

Commercial examples of synchronization include:

China – Operators chose to synchronize in BC41 (2.6G) and BC40 (2.3G), DL/UL ratio is 3:1

India – Operators chose to synchronize in BC40 (2.3G) , DL/UL ratio is 3:1

Nigeria – Operators chose to synchronize in BC40 (2.3G) and BC42 (3.5G) , DL/UL ratio is 3:1

As mentioned in the 'Huawei Recommendations' section, China is an example of regulators' policies that are promoting / enforcing a common synchronization approach. The 2.6 GHz and 2.3 GHz bands have been assigned for multiple operators. According to RRB (Radio Regulatory Bureau)

policy, full synchronization is mandatory between multiple operators within the same band and no guard band is reserved.

CONSULTATION QUESTION

Question 13.4: Do you agree with our preference to include both the permissive (unsynchronised) and restrictive (synchronised) masks within the TLCs in the 2.3 GHz band?

FEEDBACK

Huawei is concerned by this issue. Only synchronized masks should be applied to allow a UK operator to ride the global BC40 eco system at low cost.

In addition, without synchronization it is necessary to put some restricted bands. However, the bandwidth for TDD LTE is quite small and the restricted bands are not an efficient use of the spectrum. Thus, the best option is the synchronization.

If there are some proposals to apply other masks, a private agreement could be drafted between concerned parties.

CONSULTATION QUESTION

Question 13.5: Do you agree with our preference to include both the permissive (unsynchronised) and restrictive (synchronised) masks within the TLCs in the 3.4 GHz band?

FEEDBACK

Huawei prefers only synchronized masks. From the effective use and global ecosystem development prospective point of view, synchronization should be the consensus. Ensuring guard band = 0 among TDD networks is the global trend.

CONSULTATION QUESTION

Question 13.6: Do you agree with our preference to not require synchronisation between different networks in the frequency band?

FEEDBACK

No response (This is a repeat of question 13.3)

CONSULTATION QUESTION

Question 13.7: Do you agree with our proposed maximum in band power limit for base stations in the 2.3 GHz band?

FEEDBACK

Huawei agrees

CONSULTATION QUESTION

Question 13.8: Do you agree with our proposed maximum in band power limit for user terminals in the 2.3 GHz band?

FEEDBACK

Huawei's proposals:

	2.3 GHz	
In block power limit	Mobile or nomadic Radio Equipment	Fixed or installed Radio Equipment
	Agree (Licence exempt)	32 dBm EIRP (Not licence exempt)

We highlight that, in the case of a power above 25dBm, the recommended trigger thresholds in the ECC Recommendation about the base station are applied to the fixed terminals.

CONSULTATION QUESTION

Question 13.9: Do you agree with our proposed maximum in band power limit for base stations in the 3.4 GHz band?

FEEDBACK

Huawei agrees

CONSULTATION QUESTION

Question 13.10: Do you agree with our proposed maximum in band power limit for user terminals in the 3.4 GHz band?

FEEDBACK

Huawei's proposals:

	3.4 GHz	
In block power limit	Mobile or nomadic Radio Equipment	Fixed or installed Radio Equipment
	32 dBm TRP (Licence exempt)	45dBm/5 MHz EIRP (Not licence exempt)

CONSULTATION QUESTION

Question 14.1: Do you agree with our approach that it is not necessary to impose any guard bands or restricted blocks in order to manage the adjacencies between the incumbent UK Broadband and new users of spectrum to be awarded in the 3.4 GHz band?

FEEDBACK

Huawei agrees with Ofcom's approach that it is not necessary to impose guard bands or restricted blocks between operators. The application of band edge masks, with the type dependent on adjacent operators i.e. synchronized or not, will de–facto negate the need for guard bands or restricted blocks. If there was a guard band then the spectral efficiency and therefore the amount of spectrum which Ofcom could auction would be significantly reduced. This would also reduce the amount of spectrum available to operators for future expansion.

CONSULTATION QUESTION

Question 14.2: Do you agree with our approach to require UK Broadband to have the same coordination requirements as other users of the band?

FEEDBACK

Huawei believes that UK Broadband should not be treated any differently from the other new operators who purchase spectrum in the 3.4 GHz band. Obviously if UK Broadband is required to change allocated frequency within the band then adequate and proportional time and other appropriate provisions should be made to allow the frequency change to take place in a graceful and ordered process. Changing the allocated frequency so that UK Broadband has contiguous blocks does obviously allow Ofcom the opportunity to offer bidders large contiguous blocks in the rest of the band and enable spectrum efficiency.

Appendix

In addition to our responses to the questions raised by OFCOM, Huawei would also like to make some proposals regarding small cells. The details are shown below for your reference.

1. Baseline power limit

	Synchronized/ unsnchronized	Microcell	Picocell	Femtocell
Power limit		35dBm for 5, 10 and 20 MHz	24 dBm for 5, 10 and 20 MHz	20 dBm for 5, 10 and 20 MHz
2.3 GHz Baseline power limit	Synchronized	Min(PMax – 43, 13) dBm / 5 MHz EIRP per antenna	-15 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)	-19 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)
	Unsynchronized	1 dBm/5 MHz EIRP per cell (assume 9 dBi attenna gain)	-15 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)	-19 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)
3.5 GHz Baseline power limit	Synchronized	Min(PMax – 43, 13) dBm / 5 MHz EIRP per antenna	-15 dBm / 5 MHz EIRP per antenna(assume 4 dBi attenna gain)	-19 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)
	Unsynchronized	1 dBm/5 MHz EIRP per cell (assume 9 dBi attenna gain)	-15 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)	-19 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)

2. Transitional and other levels to protect MoD systems:

In short, Microcell should refer to Macro requirements set out in the consultation, however, Pico/ Femtocell should reconsider a new requirement due to different usage scenarios.

		Microcell	Pico	Femtocell
For TDD blocks the transitional region applies in case of synchronized adjacent blocks, and in-between adjacent TDD blocks that are separated by 5 or 10 MHz.	2.3 GHz: -5 to 0 MHz offset from lower block edge 0 to 5 MHz offset from upper block edge	Min(PMax – 40, 21) dBm / 5 MHz EIRP per antenna	-15 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)	-19 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)
	2.3 GHz: -10 to 5 MHz offset from lower block edge 5 to 10 MHz offset from upper block edge	Min(PMax – 43, 15) dBm / 5 MHz EIRP per antenna	-15 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)	-19 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)
	3.4 GHz: -5 to 0 MHz offset from lower block edge 0 to 5 MHz offset from upper block edge	Min(PMax – 40, 21) dBm / 5 MHz EIRP per antenna	-15 dBm / 5 MHz EIRP per antenna(assume 4 dBi attenna gain)	-19 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)
	3.4 GHz: -10 to 5 MHz offset from lower block edge 5 to 10 MHz offset from upper block edge	Min(PMax – 43, 15) dBm / 5 MHz EIRP per antenna	-15 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)	-19 dBm / 5 MHz EIRP per antenna (assume 4 dBi attenna gain)
Other levels to protect MoD systems	2.3 GHz	Below 2340: -36 dBm / 5 MHz	Below 2340: -30 dBm / 5 MHz	Below 2340: -33 dBm / 5 MHz
	3.4 GHz	Below 3400: -59dBm / MHz	Below 3400: -30 dBm / MHz	Below 3400: -33 dBm / MHz