Your response

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Question 1: Do you have any comments on the coexistence analysis we have carried out?	Confidential? – N The coexistence analysis supports making more spectrum in the 1.4 GHz band available for mobile services based on CEPT studies undertaken during the 2015-2019 timeframe. The mobile services in question are understood to mean terrestrial mobile services using IMT technology. However, there were still many unresolved questions at the time, and the CEPT studies have since been overtaken by recent events in ITU, namely: 1) completion of joint studies in WPs 4C & 5D work on draft new Recommendation ITU-R M.[REC.MSS & IMT L-BAND COMPATIBILITY]) & draft new Report ITU-R M.[REP.MSS & IMT L-BAND COMPATIBILITY] (now out for approval); 2) decision of WRC-23 to recommend the inclusion of an item, No. 1.13, on the agenda of WRC-27 to cover studies on possible new allocations to the mobile-satellite service for direct connectivity between space stations and IMT user equipment to complement terrestrial IMT network coverage. The CEPT studies focussed on blocking of MSS terminal operation (i.e., loss of terminal sensitivity through input overload and compression), and proposals to introduce a future terminal with greater immunity to high levels emissions below 1518 MHz. In contrast, little attention was given to the effects of high levels of spurious and out-of-band emissions from IMT equipment above 1518 MHz – a circumstance that cannot be mitigated by better MSS immunity characteristics, and would inevitably reduce the utility of spectrum above 1518 MHz for MSS applications. The studies prior to WRC-12 and WRC-15 identified numerous examples of how high levels of spurious and out-of-band emissions would compromise the use of spectrum adjacent to candidate IMT bands without providing for an adequate guard band. Owing to the high levels of these emissions

	(which are admitted to be significant, and maybe more precisely described as excessive or aggressive), guard bands of at least 5 MHz should have been considered – a solution that has been rejected in the present case on account of the limited amount of spectrum in the 1492-1518 range for terrestrial IMT use. Better uses of the band 1492-1518 MHz could be to: ● expand resources for WiFi, which is under threat from rising contention from an increasing range of applications in the 2.45 GHz ISM band, ranging from drone use to wireless power transmission at at a distance; ● extend the present over-stretched MSS resources for satellite downlinks, either for IMT use, as per the provisional WRC-27 agenda item 1.3, or for other satellite personal communication solutions. The overall conclusion here is that the measures proposed would not prevent considerable damage to the viability of mobile satellite communication services for land, sea and aeronautical applications in the adjacent frequency bands above 1518 MHz, and ignore the possibilities for more effective and less contentious use of the band 1492-1518 MHz in support of a wider choice in the provision electronic communications. The advertised intention of the coexistence analysis is to create zones, within which the PFD from IMT base stations would be limited to values that are estimated to avoid loss of sensitivity (blocking) in the reception of satellite service downlinks in the range 1518-1559 MHz. However well this might be managed, it remains the case that blocking is not the only threat to the operation of MSS services. The excessive unwanted emissions from IMT base stations risk sterilizing a swathe of spectrum above 1518 MHz – a circumstance that has received less attention in the present analysis, even though such loss of spectrum would reduce the capabilities and viability of the present satellite service providers. Moreover, loss of spectrum resources would limit access to spectrum for new entrants providing general mobile satellite communications and with the capability to provide specialized satellite

	communication services to the maritime and aeronautical sectors. Uppermost, the looming danger is that the introduction of terrestrial IMT services will destabilise the provision of recognized mobile satellite services (RMSS) in the Global Maritime Distress and Safety System (GMDSS) by the current providers, create barriers on new providers, and frustrate competition. It should be noted that both the current RMSS providers, Inmarsat and Iridium, have built their supporting MSS services over land, sea and air as founding signatories to the Memorandum of Understanding on Global Mobile Personal Communications (GMPCS) initiated in 1997 under the auspices of the ITU. The two main concerns with the present proposals are that the coexistence analysis: 1) concentrates on expecting changes to the long-established satellite terminal equipment performance standards, ostensibly to reduce blocking effects on terminals, though without assessing the timing, feasibility and costs associated with such changes, the implications of diverging from internationally harmonized standards for terminals covered by internationally mandated carriage requirements on ships and aircraft, and the impact on commercially important land-based terminals; 2) fails to elaborate to a useful extent on the other interference mechanism widely acknowledged to characterize IMT equipment, namely that of high levels of spurious and out-of-band emissions into adjacent bands, that could completely preclude (see Note 1 to Table A1-1 of draft new Recommendation ITU-R M.[REC.MSS & IMT L-BAND COMPATIBILITY]) the use of the extension band 1518-1525 MHz for satellite communications (NB: the extension band that was promoted by UK and Europe at WRC-03, as being necessary to obviate congestion and provide the widest possible penetration of advanced multi-functional mobile satellite communication services – services that now support the provision both of essential and cost-free safety communications for seafarers).

Question 2: Do you have any comments on the proposed sizes and implementation methods for the PFD limited and coordination zones, both individually and as hybrid options?	Confidential? – N The locations and sizes of the zones have been determined according to the limited objectives of the coexistence studies in trying to limit blocking of MSS terminals through setting zones over which the signal strength from IMT base stations should not block reception of the MSS downlinks. The expectation is that future generations of MSS terminals will exhibit greater immunity to such high intensity signals. However, this proposed solution glosses over the reality that the present generation of MSS terminals conforms to internationally mandated and harmonised performance standards for terminals fitted on ships and aircraft – standards that were perfectly adequate when the carriage requirements were mandated. Several international and regional organizations, including IMO, ICAO, IMSO and EUROCONTROL, have advised that the proposed replacement programme would be a lengthy, inconvenient, and costly exercise. In respect of the size and location of the zones themselves, the proposals fail to appreciate the extent to which sea and air traffic needs to have a clear path for navigation to and from ports and airports over which communications must be maintained. Recent unfortunate events involving the disappearance of aircraft show that essential communications are not limited to voice communications and that monitoring real-time flight engineering data throughout flights is becoming an essential tool in analysing accidents. The studies so far have not addressed the extent to which flight data communications should be protected during take-off and landing, meaning that thought should be given to protecting either the entire Instrument Landing System volume, or Aerodrome Traffic Zones, rather just the aerodrome ramps. It can also be noted that there are many more UK aerodromes licensed under CAA regulations than considered in the analysis. As regards sea traffic, there are many more areas around the coast, and on the approaches to ports via river estuaries and waterways, than have been considered in the analysis, where communications must be maintained. Indeed,

	impending developments such as autonomous ships make it essential that the whole coastline should be protected. This would also allow greater flexibility and economy in providing for the safe navigation of shipping through moving towards satellite communications only, as per the example of Australia – a GMDSS A3 Sea Area. Moreover, it has to be expected that the control and monitoring of autonomous ships would need at least two independent means of robust satellite communications. It is therefore premature to risk closing off access to already limited MSS spectrum while there are important requirements for maritime satellite communications in view – developments that were in their infancy when the ECC Reports 263 and 299 were finalised.
Question 3: Do you consider that PDF limited/coordination zones defined using complex polygons would make deployment of this spectrum for mobile more complex than zones which are defined by simple shapes?	Confidential? – N As regards determining the extent of protected areas around coasts and into ports, it is typically the case that propagation paths will be rolling terrain, sloping down to the sea or flattish, meaning that there is no need to over-complicate the consideration of hexagon coverage cells and propagation models. The approach of the ITU-R P.452-16 should therefore be satisfactory for modelling UHF and L-band propagation if pursuing the proposal for PFD / coordination zones, especially as current practice does not seem to place a priority on limiting coverage out to sea. This is evident from the extensive cellphone coverage over the North Sea and English Channel reported by Cobham Ltd to the *ECC PT1 Correspondence Group on L-Band* in March 2018, along with precise IMT coverage plots. This was submitted in order to refute the claim in ECC Report 263 that seawards IMT coverage is neither desired nor significant. The extent of coverage is also evident in present day news reports on rescue efforts in the English Channel However, the PFD / coordination zones are only intended to address MSS terminal blocking in Phase 1 and would do nothing to alleviate the effects of high levels of spurious and out-of-band emissions degrading MSS use above 1518 MHz after easing the PFD restrictions in Phase 2.

Question 4: Do you have any other suggestions for how we might make the 1492-1517 MHz block available for mobile while protecting satellite use of the adjacent band?	Confidential? – N The concentration on terrestrial mobile communications could be considered to have become a mantra after demands for more spectrum at every WRC over a period coming up to 3 decades now. During the studies for WRC-15, it was estimated that between 70 to 90% of smartphone surfing was static and indoors – estimates that were not challenged to any extent. In contrast, applications in mobile satellite communications do focus on mobile platforms on land, at sea and in the air, often isolated from other options, or for ensuring access for emergency communications. It is therefore a matter of concern that the present proposals for the use of the band 1492-1518 MHz have progressed so far despite the twofold threats to MSS services in the bands above 1518 MHz: 1) Blocking of MSS terminals from high level emissions from terrestrial IMT base stations; 2) High levels of spurious and out-of-band emissions from IMT equipment that can sterilize a swathe of spectrum above 1518 MHz, which is in-band for MSS downlinks and could not be alleviated by any measures aimed at improving the blocking immunity of MSS terminals. Both interference mechanisms would degrade the usefulness of MSS spectrum above 1518 MHz and thus compromise commercial MSS operations. MSS operators have come to rely on full access to the 1.5 GHz spectrum resources, including the band extension from 1518 to 1525 MHz made at WRC-03 in order to alleviate the severe congestion already then present. The need for the band extension was supported by Europe, notably by the UK, and was welcomed as *"... an alternative means to supply mobile communication services to customers, on the basis of* ***realistic market projections***" It remains essential to retain the utility of the extension band in order to maintain the viability of MSS operations in a competitive environment, thereby supporting essential communication infrastructure for maritime and aeronautical communications, particularly those services provided free of charge for the safety of seafarers.

	Since WRC-03, MSS operators have made full use of the band extension, introducing many technological advances, e.g., digital technology and use of dynamically assigned spot beams, such as the IP-based Broadband Global Area Network (BGAN) services provided by Inmarsat. BGAN was designed to make optimal use of the spectrum resources in the 1.5 GHz portion of L-Band. In addition to a host of commercial applications in mobile communications over land, sea and air, BGAN has proved especially useful for emergency communications following natural and man-made disasters. The loss of spectrum above 1518 MHz on account of terminal blocking and high levels of spurious and out-of-band emissions would therefore compromise the viability of 1.5/1.6 GHz MSS services to the detriment of user demand and commercial imperatives. Lack of spectrum for L-band MSS services has been a long-standing problem and sterilisation of the existing resources would create severe problems for Inmarsat and other MSS operators, which already have to share the available spectrum – meaning that any loss of spectrum access will, at the least: ● freeze MSS services and coverage in time, ● lead to reduced competition in the provision of electronic communication services; and ● frustrate the settled expectations of users. As such, serious consideration should be given to alternative uses of the 1492-1518 MHz band. A simple solution, with hindsight, would have been to avoid these present concerns and promote a further extension of the MSS band for consideration at a WRC in order to expand satellite communications for all mobile applications over land, sea and air. That opportunity is now passed, but assuming that there is a genuine need for yet more resources for IMT, the use for satellite delivery of IMT connectivity in the 1492-1518 MHz band should be considered under the newly adopted agenda item 1.13 for WRC-27, since coexistence between two space-to-earth services may be more achievable than that between a heavyweight terrestrial service and a sensitive satellite downlink.

	Another use for the band could be to support IP based communications over WiFi, both for home networking and for outdoor use in distributing high data rate content to users in public and private places, as per the current studies in ITU-T Study Group 9 (see draft new Technical Report ITU-T TR.WiFiTV). Degradation of WiFi delivery is becoming more and more prevalent in the 2.45 GHz ISM band, which is commonly used for WiFi on a non-protected basis- This is because of rapidly increasing congestion and contention from a wide variety of radio applications now making use of this deregulated ISM band, ranging from IoT, drone control and remote powering /charging by wireless power transmission.
Question 5: What are your views on the timescales for relaxing the PFD limits and coordination restrictions?	Confidential? – N In response to consideration of ECC Report 299, IMO advised CEPT in 2018 and 2020 that the timescales envisaged for relaxing the PFD limits were not realistic in respect of Inmarsat GMDSS terminals fitted on board ships:, noting that: "*A special regulatory measure would be required at IMO to enforce MSS terminal replacement. The process required includes revision of design specifications; IMO performance standards and related testing standards (e.g. IEC, ETSI, etc.); design and development of compliant equipment by manufacturers; type approval; product roll-out; procurement and installation across the worldwide fleet*". As such, IMO considered that "*the example timescale of 7 years is too short to be achievable, given the process required*". In respect of replacing existing equipment fit, the exercise would also be costly, inconvenient and wasteful. ICAO has made similar comments in respect of aircraft carriage requirements, noting that a natural replacement cycle for aeronautical equipment is typically 25 years. Regarding the development of ECC Report 299 and the risk of interference to satellite communications above 1518 MHz, the following reservation was made to the 61st session of ECC PT1 (January 2019) by Eurocontrol, IMSO, Turksat and Inmarsat: "*The consultation process regarding Report 299 has failed to act on the advice of concerned administrations and specialized organizations concerning the risk and*

	consequences of interference to satellite communication services in L-band used by ships and aircrafts. In particular, the opinions expressed during the meeting regarding the Turkish and Italian administrations' concerns and the comments formally submitted during the public consultation by Italy, Turksat from Turkey, Eurocontrol, IMSO, ICAO, ESA, Inmarsat, IATA, A4E, EUROCAE, in addition to Lufthansa and ASRI, have not been taken onboard of the ECC Report 299". Further to this, IMSO provided an comprehensive information document (ECC(19)INFO 01) to the 50th session of the ECC (March, 2019) expanding on this reservation and providing more detail on the difficulties that would be encountered if devoting the 1492-1518 MHz band to terrestrial IMT use – information that is still relevant to the present questions Q1 to Q5.
Question 6: Do you have any initial views on how the coordination we are proposing should be carried out? In particular, do you consider this should be conducted by Ofcom or the licensee?	Confidential? – N Essential that coordination should be carried out by the responsible independent public body (Ofcom) given the potential adverse impact on the communication services provided by L-band satellite operators. It has to be understood that these are not limited to specific uses having a safety dimension but also include the commercial operations that support the provision of recognized mobile satellite services in the GMDSS. This is especially important as the GMDSS was founded on the expectation that the provision of communication over satellites would ensure that all phases of forestalling and managing emergencies at sea could be handled without being compromised by the technical and operational vagaries of terrestrial communications.
Question 7: Do you have any views on the potential impact of our proposed options, including impacts on specific groups of persons or more general impacts?	Confidential? – N Further to the response at Q6, the appreciation of the capabilities of satellite communications was a key factor in the initiative started in the 1970s to modernize how responses to emergencies at sea, and the provision of maritime safety information to warn seafarers of impending threats to the safety navigation, should be carried out. These considerations led eventually to the establishment of the GMDSS.

	Although improvements had taken place to improve communication at sea since the Titanic disaster, the arrangements had remained rooted in self-help between luckily positioned ships , and then relying on the limited range of MF and VHF communications to enlist further assistance from shore-based authorities. After concerted development, managed through collaboration between IMO and ITU, and involving intense integration of new technologies, new operational procedures were developed giving shore-based authorities the definitive role in receiving and responding to alerts. Following these preparatory stages, the transition to the GMDSS started in 1992, and was completed by 1999. The key satellite systems compromising the GMDSS at its inception were the worldwide distress alerting system operated by the COSPAS-SARSAT organisation and the communication infrastructure provided by INMARSAT for carrying data and voice transmissions. This enabled the appropriate shore-based authorities around the world to be advised of any alerts and to organize the necessary search and rescue responses . Also, the global availability of satellite data communications enabled seafarers to be advised of any threats to their safety in a timely, efficient and resilient manner. As well as providing the essential communication services for the GMDSS since its inception, INMARSAT was instrumental in establishing the GMDSS through advising and educating the shipping industry on transitioning to satellite communications for all purposes involved in sea trading.
Question 8: Do you consider an auction would be an appropriate way to make the upper 1.4 GHz spectrum available for mobile use? If not, what other methods do you think Ofcom should consider for making this spectrum available for mobile use?	Confidential? – Y / N Auction processes became the preferred choice during the 1990s, notably led by CEPT administrations as a way of avoiding the vagaries of so-called “beauty contests” where interested parties would make all sorts of magnificent claims as to quality, experience and benefits that they could provide in providing the advertised services. Often these claims proved to be exaggerated and administrations came to prefer auctions as a way of at least proving that pockets were deep enough to achieve the expected contribution to national budgets, not

	to mention the actual advertised service. A related theme in CEPT considerations at the time was that, to achieve a healthy competitive environment, some 4 or 5 potential providers should participate in the provision of electronic communication services, and that by splitting the auction into several packets several operators would get a share of the spectrum resources and thereby offer competitive choices to consumers... in theory, anyway. However, recent experience in UK is showing a trend towards mergers and acquisitions between mobile service providers. One result has been that, during 2023, major providers felt emboldened to magically impose price increases at the same figure of 14%, pulled out of the hat at the same time... Wow!! Just like that!! (as the real magician Tommy Cooper might have said). A circumstance that might be thought of as indicating a magical degree of telepathy. A further consideration with auctions in general is that bidders may devise a strategy between themselves or leave the serious bidding to a single entity who will latter divi up the assets in a pre-agreed way with other interested parties for mutual benefit. Measures should therefore be in place to guard against subverting the auction process. However, auctions seem to be the only game in town.
Question 9: If you consider an auction is appropriate, do you have any initial views on whether a single round auction or a multiple round auction would be more appropriate?	Confidential? – N Further to the response at Q8, multiple auction rounds and split offerings should lead to a more competitive outcome, but nothing is certain. Auctions present some fascinating insights into human behaviour. It can be noted that there are alternatives to the "classical" auction process where the strike price achieved is actually the second from last price – the price that remains once only one of the competing bidders remains in the game.. In contrast, the "Dutch auction" starts at a very high indicative price and goes down until one of the interested parties is brave enough to jump in with the winning bid. But this also leaves the process open to manipulation.

Question 10: Do you have any views on the appropriate lot sizes for making this spectrum available?	Confidential? – Y / N Noting the comments above at Q9 and Q10, there has to be some scepticism that and equitable result beneficial to consumers will result whatever method is chosen.
Question 11: Do you have any views on the potential impact on consumers, citizens and/or other stakeholders of auctioning the spectrum or the different auction formats?	Confidential? – Y / N Noting the comments above at Q8, Q9, and Q10, and in particular the recent spate of mergers and acquisitions, there have to considerable doubts as to whether any particular course is certain to provide continuing benefits to consumers. Moreover, some previous auctions failed to achieve the expected results in the budget Red Book projections. This may indicate that repeated demands for more spectrum for IMT spectrum at every WRC are somewhat overblown.

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