Your response

Question	Your response
Introduction	The Dynamic Spectrum Alliance (DSA) appreciates the opportunity to provide comments to Ofcom's *UK preparations for the World Radiocommunication Conference 2023 (WRC-23): UK provisional views and positions for WRC-23*. The DSA is a global, cross-industry, not for profit organization advocating for laws, regulations, and economic best practices that will lead to more efficient utilization of spectrum, fostering innovation and affordable connectivity for all. We advocate for policies that promote unlicensed and dynamic access to spectrum to unleash economic growth and innovation. Additionally, we advocate for a variety of technologies that allow spectrum sharing enhancing broadband access.[1] The DSA's comments are limited to select WRC23 Agenda Items.
Question 1: Do you agree with the prioritisation of the agenda items, as shown in Annex 5, and if not why?	Confidential? – N With one exception, the DSA agrees with Ofcom's prioritization of WRC-23 agenda items. The DSA believe that Agenda Item 8 should be elevated from LOW to MEDIUM. Agenda Item 8 is "*to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution 26.*" However, the text in Resolution 26 also allows an administration to add its name to a footnote in certain circumstances. Increasing global harmonization is not one of the listed circumstances as the mere act of adding a country name to an existing footnote achieves this by default.

[1] Our membership spans multinationals, small-and medium-sized enterprises, as well as academic, research and other organizations from around the world. A full list of DSA members is available on the DSA's website at www.dynamicspectrumalliance.org/members.

	Some degree of vigilance is required to ensure that the accepted rationale for administrations to add themselves to an existing footnote is consistent with the text and intent of Resolution 26. Thus, the DSA recommendation is that Agenda Item 8 be elevated from a LOW to MEDIUM priority.
Question 3a: Do you agree that the UK interest in the bands 3 600-3 800 MHz and 3 300-3 400 MHz in Region 2 (North & South Americas) should be limited to any impacts on UK operational use in those areas?	Confidential? – N Within Region 2, the United States is studying whether the 3100-3450 MHz frequency range can be shared between federal and nonfederal users. The U.S. federal use includes a variety of military radars. When the studies are completed and the results are made public, it will become clear whether the entire 3100-3450 MHz band, or portions of the band such as 3300-3400 MHz, can be shared between federal and non-federal users and if so, under what technical and operational conditions. It may be that spectrum sharing is possible at EIRP levels corresponding to lower-power 'local licensing' pioneered in the United Kingdom or in the Citizens Broadband Radio Service pioneered in the United States utilizing a cloud-based spectrum management system rather than at higher-power levels of typical IMT systems. Local licensing-like scenarios within an administration require a primary mobile service allocation but do not necessarily require an IMT identification. The DSA agrees that U.K. interest in these bands should be limited to any impacts on U.K. operational use in those areas.

Question 3b: Do you agree that the UK should maintain its objections to changes to the regulatory environment for the band 3300-3400 MHz (in Region 1, Europe, Africa, Middle East), noting UK has interests in use of radar for both ground and airborne operations?	Confidential? – N Based on its response to Question 3a, the DSA believes that some form of spectrum sharing may be possible between government and non-government users in the 3300-3400 MHz band at EIRP levels commensurate with the U.K.'s local licensing regime. This will likely require the use of a cloud-based, automated spectrum management system. Assuming that many of the radars in use in the United States in that 3300-3400 MHz range are also used in countries located north of the 30º parallel north, the DSA envisions an opportunity for future spectrum sharing in the
	United Kingdom and other countries above the 30º parallel north within this band. A primary or secondary spectrum allocation to the mobile service would support light licensing, or possibly operations authorized nationally under RR 4.4. Thus, an IMT identification is not necessary. The DSA agrees that the United Kingdom should maintain its objections to an IMT identification for the band 3300-3400 MHz in Region 1.

Question 3c: What is your view on the use of 6425-7025 & 7025-7125 MHz, and what evidence do you have to support this view? How does that inform your views on a IMT identification in these bands?	Confidential? – N While technically two separate decisions, the DSA believes that the 6425-7025 MHz and 7025-7125 MHz frequency band should not be identified for IMT at WRC-23 and further, that it should be made available for licenseexempt Wireless Access Systems / Radio Local Area Networks (WAS/RLAN) applications such as Wi-Fi as soon as practicable. Low Power Indoor and Very Low Power WiFi devices can share the band with incumbents, while an IMT identification will lead to the band being cleared of incumbents. Wi-Fi can share the 6425-7025 and 70257125 MHz bands with Fixed Service (FS) and Fixed Satellite Service (FSS) operations, while IMT cannot share the band with incumbent services except at low power levels that have limited commercial utility. Ofcom may recall that WRC-15 considered whether indoor IMT small cells could coexist with incumbent users in the 5925-6425 MHz band. The answer was a resounding no. FSS and FS are incumbents in both the 5925-6425 MHz and 6425-7125 MHz frequency ranges. Wi-Fi operations can share these frequency bands with FS and FSS stations because license-exempt operations must protect incumbents from receiving harmful interference. Conversely, if frequency bands were identified for high-power IMT services, sharing with other primary services would be required, but based on studies submitted by the satellite stakeholders to ITU working party

	5D (WP 5D), it does not appear it to be possible without imposing additional regulatory or technical constraints on those services, as well as on services in adjacent bands. The selling point at WRC-19 for studying the 6425-7125 MHz frequency range for a possible IMT identification in ITU Region 1 at WRC-23 was for broadband access to close the digital divide in certain Region 1 sub-regions, where high-power transmissions would be necessary. Paragraph 4.2.9 states that, "Ofcom is currently of the view that, based on current technologies, it seems unlikely that IMT services, at relatively high power, could operate in the band with incumbent satellite services..." In addition to current technologies, the DSA would also like Ofcom to consider adding the phrase 'current propagation models' to the sentence, because clearly one way of changing an expected outcome is to change the underlying assumptions and propagation models in such a way so to obtain the desired outcome. History has shown that, outside of the millimetre-wave bands, an IMT identification at a WRC sends a strong signal to National Regulatory Agencies (NRAs) that a given band should be licensed for IMT and that NRAs should initiate plans to clear and relocate existing commercial (and potentially government) users currently operating in the band. The band clearing and FS station relocation process in the 6425-7125 MHz frequency range would take years to complete principally, disrupt incumbent operations, and cost Region 1 governments funds in excess of what can be expected from auction proceeds for essentially a band that provides limited geographic coverage, but is ideal for capacity and local access. As Ofcom points out in paragraph 4.2.13, "Ofcom anticipates that existing mobile spectrum holdings and spectrum already planned for release are likely to be broadly sufficient to meet future demand to 2030, if MNOs pursue a number of strategies including network densification."

	If Ofcom’s assessment is correct and MNOs do

not have a need for this additional 5G spectrum up through 2030, it puts into question the need for WRC-23 to identify this frequency range for IMT.

As Ofcom recounts in the consultation document, "Whilst European countries, including the UK, did not propose an IMT agenda item for WRC-23 these proposals were agreed by the Conference in 2019." This includes the study of the 6425-7025 MHz and the 70257125 MHz bands in Region 1 for a possible IMT identification. For much of the last decade, the IMT community has advised governments globally that it is essential to make available 100 MHz per operator in the 3 GHz band to support 5G needs as well as spectrum in the millimetre waves bands. Administrations did not identify any portion of the 6 GHz as a pioneer band for 5G, and the IMT community did not even mention the 6 GHz band for their 5G needs.

In 2019, GSMA, in a publication directed to operators about why they should care about 5G, stated the following:

> *"5G networks require access to spectrum in low, medium and high radio frequencies and in larger contiguous blocks than previous mobile generations require. Regulators that get as close as possible to assigning 100 MHz per operator in 5G mid-bands (e.g. 3.5 GHz) and 1GHz per operator in millimetre wave bands (e.g., 26GHz and 28GHz) will best support robust 5G services."*[2]

Notably, GSMA did not raise the 6 GHz band frequencies and failed to list the 6 GHz band in its exhaustive appendix of "5G New Radio Spectrum Bands." The IMT community's

[2] *THE 5G GUIDE: A Reference for Operators, GSMA Intelligence, published April 2019.*

	actions over the last decade on the 6 GHz band, or rather its inaction, speak far louder

	than GSMA's recent hyperbolic press release describing the allocation of 6 GHz for license-exempt use a "clear threat to 5G." Regulators and policymakers globally have gone to great lengths to provide the 3 GHz mid-band spectrum that the cellular industry has long said was the critical enabler for 5G. Regulators have also responded by making available high-band spectrum to the mobile industry, most of which lies fallow today. The IMT industry should act to meet its promises for 5G with the spectrum that has been made available, not to claim that 6 GHz licensed spectrum is suddenly critical to enable 5G operations. Such claims ring hollow. <u>There is a need for additional WAS/RLAN spectrum to meet the demonstrated demand for license-exempt Wi-Fi.</u> WAS/RLAN technologies are the cornerstone of gigabit connectivity in Europe. Today, as broadband speeds available to residential users are gradually increasing towards that goal, the link from a Wi-Fi access point to a user's Wi-Fi enabled device can develop into a bottleneck. It means that end users cannot benefit from such gigabit infrastructure without adequate local connectivity, which in turn means WAS/RLAN must resourced with an appropriate amount of spectrum. This is particularly apparent in households and enterprises where there are multiple users, each operating multiple Wi-Fi enabled devices at the same time. This trend became more evident globally during the time of the COVID pandemic. As parents worked from home and children studied remotely, there were often multiple video conference applications active on multiple devices concurrently. There is an insufficient amount of spectrum in the 5 GHz band in Europe to meet forecasted demand for licence-exempt Wi-Fi access as most sub-bands are either not available on a European-wide basis or come with significant restrictions attached to protect incumbents. Even the additional 480

	MHz recently opened in the 6 GHz band will not be

	able to fully satisfy the future demand for local wireless connectivity capacity and will not provide enough channels of 160 MHz or even 320 MHz of bandwidth that will be supported by the latest generations of Wi-Fi, namely Wi-Fi 6E and Wi-Fi 7, and that will be needed by innovative applications such as the Metaverse, augmented, virtual and mixed reality. In enterprise deployments, it is not only the very wide channels that are important, but the large number of channels 1200 MHz of spectrum will make available and the diversity of channel widths, which allows enterprises to allocate channels or groups of channels to applications and services, depending on their QoS requirements. In acknowledgment of this demand, Europe should open the 6425-7125 MHz band for technology-neutral licence-exempt use by Wi-Fi 6E, Wi-Fi 7, 5G NR-U that can share the band with other incumbent technologies. Currently, European mobile network operators greatly benefit from Wi-Fi's capacity to offload traffic from cellular mobile devices; if this capacity were not available, IMT/5G networks would be more costly, as mobile operators would need to deploy many more small cells in dense urban areas to offer gigabit throughput and provide adequate quality of service, and this would be to mobile users only. Because of the attenuation of signals from outdoor 5G base stations (building entry loss), 5G indoor coverage and performance would be severely limited. Providing 5G gigabit connectivity indoors would require the deployment of a completely new infrastructure, parallel to the existing Wi-Fi one which will be prohibitive from both a commercial and an environmental point of view. <u>The idea of IMT operating outdoors and WAS/RLAN (Wi-Fi) indoors is not workable.</u> Unfortunately, unlike IEEE standards-based devices such as Wi-Fi that incorporates a contention-based mechanism, 3GPP standards-based IMT devices are not designed

	to share the spectrum. As a practical matter, the

	EIRP levels proposed for IMT base stations operating in the 6425 – 7125 MHz band for the most significant use case will overwhelm Wi-Fi receivers within range operating cochannel and on first adjacent channels, which in most instances will be located in residences. While, in theory, a politically satisfying solution could be that IMT technologies are limited to outdoor use in the band and WAS/RLAN are limited to indoor use, it is not practicable (e.g., mobile IMT UEs would not be permitted to avoid indoor use). IMT power levels would have to be reduced significantly. It is unclear how this would impact the utility of the proposed IMT use cases in the 6425 – 7125 MHz band. Even so, Wi-Fi devices are license-exempt devices, and as such cannot claim protection from harmful interference. <u>The LS Telecom study interim results indicate that it is more beneficial from both a technical and economic perspective to adopt RLAN for use in the 6425 – 7125 MHz Frequency Range</u> The DSA commissioned LS Telecom and Valdani Vicari & Associati (VVA) to better understand the socio-economic benefits of IMT versus RLAN technologies in the 6425 – 7125 MHz band in Europe. The study examined the following three scenarios that presents the technical and economic benefits of utilizing the 6425 – 7125 MHz: • Scenario 1: Licensed urban and suburban 5G use of 6425 – 7125 MHz band • Scenario 2: Local licensed 5G use of 6425 – 7125 MHz band • Scenario 3: RLAN use of 5 925 – 6425 MHz band versus using the entire 5 925 – 7125 MHz band In each scenario LS Telecom and VVA considered the technical benefits and made a comparison for utilizing the 6425 – 7125 MHz band. The specific technical benefits in this case include the Quality of Service (QoS), which is the ability to deliver a certain

	user throughput and capacity. This approach enabled a comparison to be made between existing 5G bands and 6425 – 7125 MHz for Scenarios 1 and 2. For example, the technical analysis examines the potential benefits, such as improvement in Quality of Service, when deploying the 6425 – 7125 MHz for wider area licensed 5G compared to existing 3.4-3.8 GHz services. In Scenario 3, LS Telecom and VVA examined the difference between capacity benefits of RLAN operation in 5 925 – 6425 MHz band versus access to the entire 5 925-7125 MHz band. The output from the technical analysis informs the costs and benefits of implementing each technology and authorization approach. The economic analysis comprises three primary areas to determine the costs and benefits of using the 6425 – 7125 MHz band across the different scenarios including: • **Investment quantification**: investment costs per scenario (cost of implementation using the technical study outputs e.g., number of cells, with additional references) for all 3 scenarios and find out what it enables in terms of applications. • **List of applications triggered per scenario**: based on a combination of technical and market factors, a Multi Criteria Analysis was developed to show the delta benefits of enabled connectivity for each of the scenarios. • **Investment QoS ratio**: a quantification of the overall investment cost vs. the updated QoS delivered for the three scenarios. The technical analysis has, in this interim version of the report, considered the use of small cells for the 6425 – 7125 MHz for the nationwide licensed IMT scenario. In the final report, LS Telecom and VVA will include an analysis of macrocells using the 6425 – 7125 MHz

band to deliver a combination of coverage and capacity that aligns with the 3.5 GHz band. The analysis will also consider the cost of upgrading existing 5G (3.5 GHz) macrocells across EU cities for a range of scenarios, under the assumption that the number of sites are fully upgraded over time.

The interim results of the study concluded that it is more beneficial from both a technical and economic perspective to adopt RLAN for use in 6425 - 7125 MHz band. The 6425 – 7125 MHz band can offer both technical and economic benefits across both IMT and RLAN technologies. However, when considering the technologies in the context of expected additional investment for deployment, notably for IMT and resulting additional benefits, LS Telecom and VVA found that the case for IMT use in the upper 6 GHz band does not look as strong when compared to use for RLAN.

The summary of the interim results for each of the three scenarios is provided below:

- **Scenario 1** (National licensed wide area IMT) will require a large initial investment to reach a significant amount of the EU population, while effectively addressing limited use cases. The economic analysis has highlighted that around 30 percent of the EU population is living in core urban centres, covering around 1.2 percent of EU area. Providing IMT WAN connectivity in the 6425 – 7125 MHz band over such area will require nearly 2.5 million cells, for a total cost of nearly 73 billion EUR. When looking at user requirements from downstream sectors mentioned in the Digital Decade[3], it was hard to identify strong arguments supporting this scenario. Agriculture is the only sector, out of six, that will outperform

[3] Europe's Digital Decade: digital targets for 2030 | European Commission (europa.eu) (last accessed August 2022).

	other scenarios on the technical level of fitness. Few downstream applications using the 6425 – 7125 MHz band are expected to take place in an outdoor environment with urban area coverage requirements. When it comes to the effective impact of this scenario, in terms of additional throughput delivered to end-users, deploying such connectivity in the upper 6 GHz band will provide an added value to densely urbanised areas. It will indeed be possible to address the mobile connectivity needs of nearly two times more users within a given area, such as densely urbanised areas, since the deployment and user-demand threshold are expected to be met in such areas, compared to the baseline.

	• **Scenario 2** (Local licensed IMT) is expected to be deployed for sectors requiring localised additional connectivity (Construction, Healthcare, Manufacturing, Ports, Airports, etc.). The study identified 18,557 potential campus networks for deployment across the EU. Considering a variable number of cells depending on the area (e.g., an average of 8 cells for each campus in the healthcare sector), the study has conservatively estimated that the overall deployment cost will be around 12 billion EUR. Regarding downstream applications, Scenario 2 enables a wider range of applications across sectors compared to Scenario 1. Local IMT in the 6425 – 7125 MHz band will not meet the requirements of the public sector; however, it will offer a reliable solution for three out of six sectors mentioned in the Digital Decade (Construction, Healthcare, Manufacturing). The study has assessed that this scenario will not support additional users under the 6425 – 7125 MHz band compared to the baseline scenario in 3800-4200 MHz.

	• **Scenario 3** (RLAN/Wi-Fi 6E and 7) has been modelled based on three deployment scenarios. These scenarios, ranging from business as usual to extremely dense Wi-Fi penetration rates, has allowed an estimation of different developments in broadband subscriptions. The study has estimated that for domestic users, the cost of deployment will be based on the price of a new router for each subscription (a conservative approach since some routers could potentially be updated with a firmware update). From a downstream point of view, Scenario 3 enables a comparable, but still higher number of applications vis-à-vis Scenario 2 (Local IMT). It is very well suited for five, out of six, sectors mentioned in the Digital Decade.[4] Outdoor use of Wi-Fi in Agriculture scores lowest since most outdoor applications are not expected to rely on RLAN. The study has assessed that Wi-Fi 6E/7 deployment will cover from 3 to 4 times more users compared to currently deployed Wi-Fi. Whilst Agriculture is mainly an outdoor activity, the storage and processing of the crops often takes place indoors and mainly utilises Wi-Fi. There are many aspects of Agriculture currently being served by Wi-Fi and will continue to be, but the study concentrates mainly on outdoor activities that could conceivably be undertaken by both RLAN and IMT to attain a like-by-like comparison. The DSA believes that UK should support a No Change (NOC) position for WRC-23 AI 1.2 on 6 GHz, in keeping with its latest position as presented to ECC PT1 in late September 2022.

[4] The six sectors are Agriculture, Construction, Education, Public Services, Healthcare and Manufacturing.

Question 6: Do you agree that a formal modification to the Radio Regulations is not needed for fixed service applications that use IMT technologies?	Confidential? – N The DSA agrees with Ofcom that a modification to the Radio Regulations identifying bands for fixed service applications that use IMT technology is unnecessary for the reasons given. Further, the DSA believes procedurally, that in general, urgent issues under Agenda Item 9 are not intended to modify the Radio Regulations.
Question 32: What changes to the Radio Regulations have you identified that would benefit from action at a WRC and why? Do you have any proposals regarding UK positions for future WRC agenda items or suggestions for other agenda items, needing changes to the Radio Regulations, that you would wish to see addressed by a future WRC?	Confidential? – N The DSA believes it would be premature for WRC-23 to approve any resolution that includes an agenda item to study bands to be identified for future 6G services in time for WRC-27. The 5G rollout is slower than anticipated for a number of reasons and potential 6G use cases are only now starting to be developed. It is hard to see how these potential 6G uses cases will be solidified, spectrum needs identified and vetted in time for administrations to make informed decisions on spectrum bands to study leading up to the WRC-27 conference. 6G services might end up being more focused on private networks (verticals) rather than public networks. Perhaps all the millimetre wave bands previously identified for 5G but lying fallow today get repackaged as 6G. It is unclear at this time. But regardless of whether the focus of 6G is on public or private networks, these spectrum bands will require a mobile allocation. The DSA suggests the goal for WRC-27 be to ensure that a mobile allocation is made for all potential 6G bands (where sharing and compatibility studies show it is feasible). By WRC-27, when the features and limitations of future 6G services will be better understood, studying mobile bands for possible IMT identification, if needed, can be completed in advance of WRC-31.

	The downside of identifying bands for IMT prior to fully understanding the requirements and market developments is that the bands may lie fallow for years, which can in turn have serious consequences for other users of these bands. For example, the EU put regulations in place for license-exempt Multi Gigabit Wireless Systems (MGWS) spanning the 57-71 GHz band prior to WRC-19, concurrent with the ITU-R studying the 66-71 GHz band for a potential IMT identification at WRC-19. Due to oxygen absorption, the two uppermost MGWS channels are the most attractive for certain use cases. The IMT identification for 66-71 GHz at WRC-23 (FN 5.559 AA) in all three ITU Regions has created significant uncertainty about the future of this band for MGWS. Even though both IMT and MGWS are applications of the mobile service and there is no priority between these applications in the Radio Regulations, they may not necessarily be treated equally by administrations because one is licensed (IMT) and one is licence-exempt. Although 'resolves 2' of Resolution 241 (WRC-19) says '*that administrations wishing to implement IMT in the frequency band 66-71 GHz, identified for IMT under the provisions in No. 5.559AA, which also wish to implement other applications of the mobile service, including other wireless access systems in the same frequency band, consider coexistence between IMT and these applications,"* the decision is ultimately left up to each individual administration. Further, the ITU-R was invited ("invites 2") "*to develop ITU-R Recommendations and/or Reports, as appropriate, to assist administrations in ensuring the efficient use of the frequency band through coexistence mechanisms between IMT and other applications of the mobile service, including other wireless access systems, as well as between the mobile service and other services.* Almost threeyears into the WRC cycles, no action has been taken, presumably because there is no IMT use envisioned any time soon to initiate

	the discussion about coexistence. The net result is that there is significant market uncertainty for manufacturers of MGMS systems and their potential customers developing use cases. The DSA is aware of the public discussion regarding studying the 7-24.25 GHs band inclusive and the studying large swaths of spectrum above 100 GHz as potential 6G bands. Our observation is that WRC-15 pursued studying as many spectrum bands as possible between 24.25 and 86 GHz for possible IMT identification in the millimetre wave range, before the features and limitations of the then future 5G service were understood. This led to contentious WRCs and years of confrontational meetings between affected services. And in the end, some may view the mobile industry as walking away from the majority of the millimetre wave bands, such as 6671 GHz, and focusing on the pioneer 3 GHz bands for 5G, leaving lots of market uncertainty for existing users of these bands in its wake. It is not a stretch to imagine the same dynamic being recreated at the WRC-23 for 6G.