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October 7, 2021

Executive Director Spectrum Affairs
Telecommunications and Digital Government Regulatory Authority (TDRA)
P.O. Box 26662
Abu Dhabi, UAE

Re: Future outlook for wireless services and spectrum utilization

Dear Sir/Madam,

The Dynamic Spectrum Alliance (DSA)[1] respectfully submits these comments in response to TDRA's Consultation, "Future outlook for wireless services and spectrum utilization" (the Consultation), which seeks input on frequency spectrum allocations/assignments in the UHF, 3.8-4.2 GHz, and 6 GHz frequency bands. DSA welcomes TDRA's interest in making spectrum available for new wireless broadband services. We believe that providing new spectrum access options will benefit competition, create conditions for innovation, and spur more rapid deployments of 5G networks and services.

DSA appreciates the opportunity to participate in the consultation and to present our views and comments. We are available to discuss these comments and provide any additional information.

Respectfully submitted,

Martha SUAREZ
President
Dynamic Spectrum Alliance

[1] 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. Our membership spans multinationals, small-and medium-sized enterprises, as well as academic, research and other organizations from around the world all working to create innovative solutions that will benefit consumers and businesses alike by making spectrum abundant through dynamic spectrum sharing. A full list of DSA members is available on the DSA's website at www.dynamicspectrumalliance.org/members

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DSA COMMENTS

A. Introduction

DSA recommends that telecommunications regulators worldwide take a balanced approach between licensed, unlicensed, and lightly licensed when allocating spectrum to wireless broadband services. An unbalanced approach may have the unintended consequence of creating an artificial scarcity, which could, in turn, increase the cost of broadband access. DSA believes that licensed and unlicensed spectrum bands will both play important and complementary roles in the delivery of advanced 5G services and that coordinated shared spectrum should be considered in spectrum planning. As part of spectrum planning, DSA also supports spectrum sharing that will lead to the more efficient utilization of spectrum and foster innovation and affordable connectivity for all. The opportunities made possible by spectrum sharing go beyond the economy, facilitating the evolution of the ecosystem as the potential for new use cases expands and large-scale applications are realized.

In the whitepaper entitled "Automated Frequency Coordination - An established tool for modern spectrum management,"[2] the DSA makes the case that the use of databases to coordinate spectrum assignments has evolved significantly since its first introduction, but at its heart, it is nothing new. The basic steps are the same as in a manual coordination process or where a regulator assesses the opportunities for local licensing on a case-by-case basis. However, what is new includes:

(1) Surging consumer demand for wireless connectivity and hence the need to intensively share underutilized frequency bands;

(2) Significant improvements in the computation power to efficiently and rapidly run advanced propagation analysis and coordinate devices and users in near real-time; and

[2] http://dynamicspectrumalliance.org/wp-content/uploads/2019/03/DSA_DB-Report_Final_03122019.pdf

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(3) More agile wireless equipment that can interact directly with dynamic frequency coordination databases.

There is no question that today we have the technical ability to automate frequency coordination and thereby lower transaction costs, use spectrum more efficiently, speed time-to-market for new services, protect incumbents from interference with greater certainty, and generally expand the supply of wireless connectivity that is fast becoming, like electricity, a critical input for most other industries and economic activity. Increasing spectrum access by a wide range of new users, including vertical sectors, will result in increased and more rapid deployment of new networks and services. The introduction of new licensing options supported by automated dynamic spectrum sharing technology is the best path to support such deployments.

B. Background on Spectrum Sharing in the 3.55-3.70 GHz Band in the United States

The DSA would like to highlight some real applications that have been developed in the United States as a result of the commercial deployment of the 3.5 GHz Citizens Broadband Radio Service (CBRS) authorized by the Federal Communications Commission (FCC) in January 2020 – a major milestone for automated spectrum sharing.

Under the CBRS regulatory framework, the spectrum access system (SAS) coordinates CBRS frequency use and manages coexistence among the three tiers of access: 1) incumbent (e.g., navy radar and commercial fixed satellite services), 2) priority access licensed (PAL), and 3) general authorized access (GAA). The environmental sensing capability (ESC) network detects incumbent naval radar use of the band and alerts the SAS to move new terrestrial commercial operations to non-interfering channels. The SAS also interfaces with the FCC's Universal Licensing System (ULS) to obtain information about Fixed Satellite Service (FSS) incumbents and grandfathered fixed wireless systems. Using this information, the SAS is able to calculate aggregate interference from new commercial users to incumbents and enforce protection of these systems. In the twenty months of commercial operational experience, no incumbents have reported interference from new CBRS users, demonstrating the effectiveness of SAS management of the band.

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New commercial users in the CBRS band have multiple options for accessing this 150 MHz of spectrum:

a) Acquisition of a PAL in the FCC's 2020 CBRS auction where use-or-share rights for county-based licenses were offered;

b) Use of the GAA tier, which does not require an individual license to operate, but does require use of certified equipment and connectivity to a SAS to receive a spectrum grant for operations with a particular transmit power and antenna orientation at a specific location and height; or

c) Leased rights from a PAL license holder.

Based on the type of device (fixed or personal/ portable) and its coordinates, information about the transmitter's location and operating parameters, and the technical rules the regulator puts in place to protect incumbents and/or adjacent users from harmful interference, the SAS calculation engine determines the list of available channels at the PAL's and/or GAA's device location and its maximum permissible radiated power. As described above, the SAS not only coordinates protection of incumbent users from new commercial operations, but also manages the assignment of frequencies to PAL and GAA users, protection of PAL operations, and co-existence among GAA users to maximize spectrum efficiency and provide deterministic access for all users. The automated SAS process provides near real-time management of the CBRS band, speeding time-to-market while minimizing uncertainty and administrative burdens.

Through this automation of shared spectrum, a whole host of private wireless network opportunities, from smart energy to smart city, have emerged. From business to leisure, hundreds of smart office, airport and stadium private networks have been deployed using CBRS as the result of having access to spectrum without the need for an individual license. In fact, only a year and a half after receiving authorization for commercial operations, over 170,000 CBRS cell sites have been deployed across the United States with the vast majority of them using the GAA tier. Examples of such deployments include:

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A. Retail

The American Dream Entertainment and Retail Complex in New Jersey has implemented CBRS to cover the entire 3 million square foot venue, servicing over 40 million annual visitors and more than 450 stores. Beyond the mall itself, CBRS has also been used for traffic and parking management, assessing approximately 33,000 parking spaces. Equipping security cameras, digital signage and other systems for both internal and external mall operations, CBRS has proved essential for supporting and enabling interesting such new use cases. This type of infrastructure deployment has proven to be faster and more economic than traditional fixed infrastructure, offering reliable and simple, yet effective means of connectivity.

B. Airport

In Dallas, CBRS has transformed airport communication systems, bringing airport staff and management connections onto the CBRS spectrum. Such deterministic spectrum access is critical in emergency scenarios to cater to higher power requirements and improve coverage. This network supports critical airport communications and coexists with a robust Wi-Fi network.

C. Sport stadium

Angel Stadium in Anaheim, California has adopted CBRS capabilities to support its internal communications, lightening the load on the Wi-Fi system, similar to what Dallas airport has achieved. Since the full commercial deployment of CBRS, they have also been working as a neutral host provider, offering Mobile Network Operators (MNOs) support in managing signal traffic for customers attending events. By not only supporting internal connectivity for both staff and customers but extending this service for the reinforcement of existing MNOs, CBRS has presented the opportunity to eliminate barriers and limitations, providing full, flexible coverage whenever it is needed – even when roaming.

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D. Rural connectivity

Fixed Wireless Access providers, also known as Wireless Internet Service Providers (WISPs), are able to harness the newly available CBRS spectrum, tripling the amount of spectrum previously available to them. WISPs, which typically operate in rural areas and have been using this part of the CBRS band for the past 12-15 years, are transitioning older WiMAX and proprietary systems to the new CBRS rules and LTE equipment to expand their reach and improve their service offerings.

As we reflect on the use cases developing across the United States, it is clear that CBRS has revolutionized the ways in which spectrum is utilized to improve connectivity across a diverse number of vertical sectors.[3] DSA believes that adopting a similar spectrum sharing model in UAE will enable more users, including verticals, to access scarce and valuable spectrum resources, leading to lower-costs, lower barriers to entry, and most effective allocation for innovative businesses. This, in turn, enables and encourages competition and innovation by existing service providers as well as new entrants.

C. Unlicensed Sharing in the 6 GHz Band

Another important example of innovative spectrum sharing is the 6 GHz Band, where the FCC and many other regulators worldwide are enabling license-exempt WLAN/RLAN use on a shared basis with incumbent services. DSA recommends that regulators pursue the following approach to the 6 GHz Band, which will also be important for meeting the connectivity needs of verticals:

[3] Other examples of CBRS deployments can be found here: >https://www.lightreading.com/5g/charter-to-start-first-cbrs-market-buildout-in-2021/d/d-id/769456?itc=lrnewsletter_cabledaily<; >https://www.telecompetitor.com/wisps-get-cbrs-range-as-great-as-six-miles-at-100-mbps-speeds/<; >https://ongoalliance.org/news/watch-communications-and-bec-technologies-partner-to-expand-rural-internet-access/<; >https://www.fiercewireless.com/wireless/wispa-cbrs-a-good-guide-for-3-45-3-55-ghz<; https://enterpriseiotinsights.com/20210714/channels/news/las-vegas-deploys-largest-private-municipal-lte-network-in-45-days?utm_campaign=RCR%20Newsletter&utm_medium=email&_hsmi=140455124&_hsenc=p2ANqtz-8_naAz8kuWAD4MfCsNIO_UI-BHN_Tmp_iZplCd7CyjjErXRYqqzuw2clkX7aZjVjvO_rXC6x2qLT514s778wtgZli-kkEvx9mmlXvfu-4IsAQOaUM&utm_content=140455124&utm_source=hs_email.

(1) Dedicate the entire 1200 MHz (5925-7125 MHz) of the 6 GHz Band for license-exempt use, taking advantage of the full potential of this band; and (

2) Authorize the three categories of license-exempt devices:

(i) Very Low Power (VLP) devices

(ii) Low Power Indoor (LPI) devices, and

(iii) Standard Power (SP) devices that can operate both outdoors and indoors under the coordination of an automated database system, known as the Automated Frequency Coordinator (AFC).

By every measure, the demand for spectrum for WLAN/RLAN use continues to grow unabated, driven largely by mobile video and other bandwidth intensive applications. WLAN/RLANs have many unique uses in residential and enterprise settings, but they also support licensed use through mobile network offload. In fact, "Wi-Fi" offloading has increased with each generation of mobile wireless service. According to the Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017– 2022 White Paper, Wi-Fi offloading has increased from 30 percent of the traffic for 2G phones to 40 percent of the traffic on 3G phones, 59 percent of the traffic on 4G phones, and is expected to transport 71 percent of the traffic on 5G phones.

D. DSA Comments on TDRA's Questions

a. 470–694 MHz

Question 1:	What is the current status of Broadcast over IMT (i.e. 5G) Maturity? what is the timeline expected for adopting related standards?
Question 2:	What is the status of DTV market consumer viewership in UAE as compared to other platforms (Streaming, Cable TV, Satellite, etc.)?
Question 3:	If Broadcast over IMT (i.e. 5G) successful? Please provide examples of practical deployments around the world with details.

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Question 4:	What is the future development roadmap for Digital Wireless Microphones using 5G
Question 5:	What is the future development roadmap for other PMSE equipment (e.g. in-ear monitor using 5G) in this frequency band?
Question 6:	Is it technically feasible for both IMT and PMSE applications to co-exist in the same band? If yes, what is the best method to do that?
Question 7:	What are the suggested alternative frequency bands for PMSE services if this frequency band vacated and allocated to IMT?
Question 8:	Status of 5G for car entertainment applications in this Band?
Question 9:	What is the predicted future global change of use for this frequency band and the related timeline?
Question 10:	What are the recent projected Timeline for standards and devices (i.e. Chipsets, Equipment, handsets, etc.) availability in this band?
Question 11:	What are the technical challenges for future IMT use especially if neighboring countries still using Co-Channel for DTV?
Question 12:	Should UAE take a leadership role in identifying this frequency range as IMT for future use? and Why?
Question 13:	Which part of the band would be most suitable for IMT deployment if a phased approach is used for re-farming? What are the proposed IMT channeling arrangement for this band (e.g 3GPP band n71 for the frequency range 617-652/663-698 MHz)?

DSA Response. As TRDA considers options for introducing new broadband services into the UHF band, the DSA recommends that TDRA consider allowing lightly licensed white spaces devices to operate at locations where UHF band TV frequencies are not in use by licensed services, while protecting primary users from receiving harmful interference. Lightly licensed TV white space (TVWS) devices will allow for the provision of affordable broadband and Internet access in unserved and underserved areas within UAE, and support various use cases, including broadband data, Internet of Things (IoT), Super Wi-Fi, Emergency communications, and community networks. The UHF band has excellent propagation characteristics that make it particularly

attractive for delivering communications services over long distances, coping with variations in terrain, as well as providing coverage into and within buildings. Type approved and authorized TVWS devices could be deployed by Wireless Internet Service Providers (WISPs) to provide Internet connectivity in underserved areas, including for schools and libraries. The DSA supports increasing shared spectrum use in TVWS for cost-effective broadband deployment and is convinced that Internet access will increase digital inclusion. Moreover, we believe that spectrum sharing is fundamental to a modern spectrum policy framework and that the introduction of TVWS in the 470–694 MHz band is consistent with the global spectrum management trend in increased spectrum sharing, and comparable with the majority of the TVWS regulatory frameworks that have been adopted in other countries such as the United States, the United Kingdom, Canada, South Africa, Ghana, Mozambique, and Uganda.

b. 3800–4200 MHz

Question 1:	What are the elements of technical coordination activity/ies need to be carried out between/with the existing services/assignments in the band?
Question 2:	Provide your views on possible opportunities for alternative use on these frequencies since specific frequencies/channels within the band are used at specific locations in the UAE.
Question 3:	What are the potential regulatory approaches and highlights tools that could potentially facilitate spectrum sharing in this band? (i.e. Indoor only, power levels, Private networks, etc.)
Question 4:	What are the requirements for regional harmonized use of this frequency band including the intense sharing aspect?
Question 5:	What are the sharing options if the new wireless services are allowed indoor deployment?
Question 6:	What are the most recent updates on the Timeline for standards and devices roadmap (i.e. Chipsets, Equipment, handsets, etc.)
Question 7:	What are the technical challenges for IMT use and the co-existence with FSS?

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Question 8:	Should UAE implement agile frequency management/assignment or database oriented systems/methods? If yes, what are the technical proposals for those methods/systems to be considered?

DSA Response. As TDRA considers options for introducing new terrestrial wireless broadband services in the 3800-4200 MHz band, the DSA encourages TDRA to leverage commercially available automated sharing technology, which will enable new IMT systems to begin operations in this band while also protecting incumbent FSS users. Automated sharing system will enable TDRA to encourage more users to leverage shared spectrum, maximize spectrum efficiency where it may be possible to authorize multiple users to operate on an overlapping and shared basis, and create more operational flexibility for new users to access spectrum for both indoor and outdoor use cases.

In addition to implementing automated shared access technology, DSA recommends that TDRA consider a tiered licensing approach where incumbents, such as FSS operators, are in the top tier, while new entrants are in one or more lower tiers and may operate so long as they protect the top tier. Such a tiered approach could be adopted as follows:

> Tier 1 – Incumbent users. Users operating in the band that have the highest priority in accessing spectrum. Their access must be guaranteed at all times during their operation so their radio equipment does not need to be aware of other operations sharing the band.
>
> Tier 2 – Licensed new users. New entrant users that require a degree of certainty in accessing spectrum. In order to ensure that the band can be shared with this tier of new users, it is fundamental that the operation of incumbent services is well understood (for example, they operate only in certain areas) and is predictable (for example, they operate at certain times or there is a way to know when spectrum needs to be vacated). If such information is not accurate enough or it is not available, then access to the band for Tier 2 users might be greatly reduced or not possible at all.

> Tier 3 – Opportunistic users. New entrant users that can access spectrum on an unlicensed or licensed by rule basis. These users may not need access to spectrum over a larger geographic area and/or are operating indoors or on a campus or may be operating in more remote areas where spectrum usage will not be as competitive. In many cases, such networks are deployed in very remote areas where spectrum is largely unused and the risk of interference to higher tier users is negligible. There might be other cases where there is sufficient spectrum available and the envisioned applications allow QoS flexibility, for example because the band would mainly be used to provide additional capacity to networks using other anchor frequencies. In such cases, it is conceivable to have a third tier of users with minimal regulatory barriers and no need for interference protection from other Tier 3 users.

It is also possible to combine a tiered licensing approach with streamlined secondary market rights. For example, the new license conditions might include the right for the license holder to lease the spectrum to other users – whether on a geographic basis (partitioning) or by sub-dividing the spectrum (disaggregating). Such a secondary market can drive innovation, allow new technology to be deployed by leased spectrum users, and support various sectors, such as enterprise networks and industrial uses.

Additionally, DSA recommends that TDRA consider implementing a "use-it-or-share-it" policy for licensed spectrum. Conceptually, use-it-or-share-it rules authorize opportunistic access to licensed spectrum that is locally unused or underutilized. Until the spectrum is actually put to use in a local area, it should be available for non-interfering use by networks and devices. Licensees lose no rights whatsoever. In 2016 the FCC authorized opportunistic access by GAA users to unused PAL spectrum in the CBRS band. Opportunistic use of unused PAL spectrum is controlled by the SAS, which requires that GAA users must periodically check with the database to renew permission to continue operating. This is one of the key reasons for the success of CBRS.

A general use-it-or-share-it authorization has a number of affirmative benefits. First, opportunistic access reduces spectrum warehousing in areas where the economics are least attractive for large

service providers. It might increase access for operators that are interested in deploying, but who lack needed spectrum access in that local area. Second, opportunistic access further encourages secondary market transactions by facilitating price discovery on both the supply and demand side. For licensees, it will both identify users interested in a potential lease or partition and provide information on the potential value (i.e., how much is my spectrum worth?). For users, opportunistic use is an opportunity to test the local market and to determine the value of a more secure, longer-term lease or partition agreement (i.e., how much am I willing to pay for spectrum?). Third, opportunistic access will lower barriers to entry for innovative new use cases by parties that at least initially either cannot afford or do not believe they need to pay for exclusive use and interference protection. The option to deploy, at least initially, without committing to the cost of a long-term lease or license could be particularly useful for small providers and industries.

E. 5925-7125 MHz

Question 1:	What are the elements of technical coordination activity/ies need to be carried out between/with the existing services/assignments in the band?
Question 2:	What the associated timeline for IMT development and related standards in this band?
Question 3:	What are the possible technical constraints on using this band or part of it for IMT, and which frequency range or Radio service would be more affected?
Question 4:	Is there any future consideration to be re-assessed for the usage of the band between existing use and future use? Please elaborate.
Question 5:	What are the requirements for global/regional harmonized use of this frequency band for IMT?
Question 6:	What are the challenges for global/regional harmonized use of this frequency band for WiFi especially given that WiFi7 will need more spectrum?

DSA Response. The DSA applauds TRDA for designating the lower 500 MHz spectrum of 6 GHz band for low power indoor Wi-Fi use under class authorization. However, we urge TDRA

to take the next step to dedicate the entire 1200 MHz of the 6 GHz Band for license-exempt use, taking advantage of the full potential of this band, and to authorize all three categories of license-exempt devices, namely:

(i) Very Low Power (VLP) devices

(ii) Low Power Indoor (LPI) devices, and

(iii) Standard Power (SP) devices that can operate both outdoors and indoors under the coordination of an automated database system, known as the Automated Frequency Coordinator (AFC).

The entire 1200 MHz of spectrum in the 6 GHz band is required to meet the projected demand for mid-band WLANs and other uses. It would also support future Wi-Fi 7 devices feature 320 MHz wide channels. Only one 320 MHz channel is possible if only the lower 500 MHz is made available for a WLAN use. Alternatively, three non-overlapping 320 MHz channels will be supported if the entire 1200 MHz of the 6 GHz band is made available for WLAN. Furthermore, DSA believes that the highest and best use for this band is for WLAN/RLAN devices, which are expected to carry offload from cellular 5G technologies (total data offload to unlicensed going from 74% to 79% in 2022).[4] This will lower the costs of network deployment for mobile operators and for edge investment by neutral host and third-party providers. Importantly, it will also lower costs for consumers.

By every measure, the demand for spectrum for RLAN use continues to grow unabated, driven largely by mobile video. RLANs have many unique uses in residential and enterprise settings but also support licensed use. In fact, "Wi-Fi" offloading has increased with each generation of mobile wireless service. According to the Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017–2022 White Paper, Wi-Fi offloading has increased from 30 percent of the traffic for 2G phones to 40 percent of the traffic on 3G phones, 59 percent of the traffic on 4G phones, and is expected to transport

[4] See Cisco Systems, Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017-2022.

71 percent of the traffic on 5G phones. Even an additional 500 MHz in the 6 GHz will not fully address this demand.

As broadband speeds to a residence continue to increase, a bottleneck is starting to appear in the link from the home's Wi-Fi access point to the user's Wi-Fi enabled device, especially in households where there are multiple Wi-Fi enabled devices in operation at the same time. This has become more evident globally during the time of the COVID pandemic. As parents work from home and children learn remotely, there are often multiple video conference applications open on multiple devices concurrently. This can amount to a considerable amount of RLAN bandwidth.

Making available the entire 6 GHz Band (5925-7125 GHz) for WLAN/RLAN devices, while also permitting VLP, LPI and Standard Power operations, provides TRDA with the opportunity to get front of this issue, support new applications, and lay the foundations for innovation.

F. Conclusion

DSA appreciates the opportunity to provide input on TDRA's inquiry regarding the introduction of new wireless broadband services in these three frequency ranges. We believe that the use of an automated sharing system can help TDRA to reach its policy goals of facilitating spectrum access by a variety of entities and use cases, fostering investment, and encouraging innovation, while also reducing administrative burdens on both TDRA and industry players.