

Appendix I: Decisions on Recommendations (DORs) Matrix from the First Round of Public Consultation on the *Framework for Fifth Generation (5G) Public Mobile Telecommunications Networks (July 2022)*

The following summarises the comments and recommendations received from the first round of public consultation on the *Framework for Fifth Generation (5G) Public Mobile Telecommunications Networks* (the Framework) which took place from July 01, 2022 to August 12, 2022. The decisions made by the Telecommunications Authority of Trinidad and Tobago (the Authority) have been incorporated in the revised version (ver. 0.2) of the Framework, where applicable. The Authority wishes to express its thanks for all comments and recommendations received from the following stakeholders:

1. Telecommunications Services of Trinidad and Tobago (TSTT) Limited
2. 5G Americas
3. Digicel (Trinidad & Tobago) Limited (Digicel)
4. Viasat

Item	Stakeholder	Policy Section	Comments	Recommendations	TATT's Decision
1	TSTT	General	Telecommunications Services of Trinidad and Tobago Limited ("TSTT") appreciates that the Telecommunications Authority of Trinidad and Tobago ("the Authority") has given operators the opportunity to comment on these matters. It should be noted that TSTT's comments on this document do not preclude TSTT from making further comments in the future.		The Authority acknowledges the appreciation expressed by Telecommunications Services of Trinidad and Tobago Limited (TSTT) for the opportunity to comment on the Framework, and its position relating to future comments.
2	TSTT	Introduction	TSTT notes that in the introduction the Authority has made explicit reference to sums of money generated by the auction of 5G spectrum in parts of the world, implying that the purpose of such auctions is primarily revenue raising, The Authority ought not to consider that as an objective as it advances policy positions on 5G. Instead, the Authority should be giving serious consideration as to how it will incentivize Concessionaires to invest in 5G networks, particularly having regard to the challenges facing the telecoms sector in Trinidad and Tobago. As the Authority is well aware from data published in its own Annual Market Reports, switched voice minutes both Fixed and Mobile have been decreasing significantly over the years, with the resulting decline in revenue. According to the Authority's own Report, between 2009 and 2020, the telecommunications industry in Trinidad and Tobago has changed dramatically. Locally, over that period fixed calls have declined from 550 million calls per annum to 200 million calls per annum or a 64% decline. Between 2019 and 2020 alone fixed voice calls declined by 26.1% from 265 million calls to 196 million	TSTT recommends that the Authority considers zero spectrum fees for the first 5 years of a Spectrum Licence for 5G spectrum or at least a significant discount off of spectrum fees during the term of the requisite Spectrum Licence.	The Authority's objectives for advancing policy position on 5G are not for raising revenue but are in keeping with section 41 (1) of the Telecommunications Act, Chap. 47:31 (the Act), which states: "The Authority shall regulate the use of the spectrum in order to promote the economic and orderly utilisation of frequencies for the operation of all means of telecommunications and to recover the cost incurred in the management of the spectrum." In light of the above, the Authority does not agree with TSTT's recommendation given the demand demonstrated for this spectrum and the benefits expected from its use. The Authority acknowledges TSTT's observations as it relates to the changes in the telecommunications sector in Trinidad and Tobago.

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			<p>calls, while on the mobile side for that same period mobile voice calls declined by 13.1%. This decline in switched voice calling not only applies to local calls but also to international incoming and international outgoing calling. Between fiscal year 2020 (March 2020) and 2021 (March 2021) TSTT alone experienced 53 % decline in International Incoming calling as well as a 40% decline in international outgoing calling. This trend in the use of calling applications and its impact which started long before the pandemic, was only further exacerbated and accelerated by Covid 19. It is therefore not surprising that the overall telecommunications sector declined in 2020. According to the Authority's 2020 Annual Market Report, the telecommunications sector generated TT\$3.86 billion, a decline in the sector revenue of TT\$240 million or 5.9% from the prior year.</p>		
3	TSTT	2. Key Characteristics of 5G Mobile Technologies	<p>The Authority is advised that the stated peak data rate of 20Gbits DL and 10Gbits UL is only possible with a combination of bands, including the mmWave, and a large number of sites.</p> <p>Also, the stated peak data rate is not reasonable to be the minimum requirement for 5G networks in Trinidad and Tobago for the first phase of deployment which will use the 2.5GHz and 3.5GHz bands.</p> <p>Furthermore, the requirements outlined in this section should explicitly state which band will be used to achieve such.</p> <p>The peak data rate (downlink and uplink) should be determined by the specific band and carrier bandwidth assigned to each existing operator. As a result, the parameters listed below will change:</p> <ol style="list-style-type: none"> 1. Peak data rate (downlink and uplink) 2. User experienced data rate (downlink and uplink) 3. Spectral efficiency 4. Bandwidth 	<p>TSTT recommends that the band and carrier bandwidth be stated as the main parameters to determine the peak data rate. It is also recommended that the Authority allocates at least 100 MHz bandwidth in the 2.5GHz and 3.5GHz bands (Mid-bands) and 1GHz in the 6 GHz (Higher bands) for each operator.</p>	<p>The peak data rate requirements are specified by the International Telecommunication Union (ITU) Report ITU-R M.2410-0, 2017 which do acknowledge that a minimum quantum of bandwidth will be necessary to achieve such a requirement.</p> <p>The <i>Spectrum Plan for the Accommodation of Public Mobile Telecommunications Service (PMTS spectrum plan)</i> identifies the frequency ranges and bandwidth that will be allocated for the provision of public mobile telecommunications services, in accordance with market and sector interests.</p> <p>In the 2022/2023 financial year, the PMTS spectrum plan shall be revised and consulted upon, in accordance with the <i>Procedures for Consultation in the Telecommunications Sectors of Trinidad and Tobago (version 7.0, 2021)</i> (Consultation Procedures). TSTT's recommendation of the spectrum to be allocated for mobile services shall be addressed in the revised PMTS spectrum plan.</p>

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			<p>The peak data rate for example should explicitly state the bandwidths and other parameters considered. See the following link https://tools.pedroc.co.uk/5g-speed/ for an example of mapping.</p> <p>For instance, when using the 3.5GHz Band, with a 100 carrier bandwidth with the other set parameters it is estimated that peak data rates of 2Gbits DL and 100Mbits UL can be achieved.</p> <p>The other parameters would also be affected as a result. E.g.</p> <ul style="list-style-type: none"> • User experienced data rate (downlink and uplink) – 5% of the peak data rate • Spectral efficiency = channel throughput/channel bandwidth (bit/s/Hz) <p>The Authority is also advised that while the same values for Latency are recommended by the International Telecommunication Union and the International Mobile Telecommunications (“IMT”) of 4ms for eMBB, 1ms for URLLC and 20ms for the control plane, it should be clearly stated that these are the targets for the network level.</p>	<p>TSTT recommends that the Authority clearly states that the Latency values listed are the targets for the network level.</p>	<p>As stated in section 2, the key requirements including the latency values are the minimum technical performance of International Mobile Telecommunications 2020 (IMT-2020) candidate radio interface technologies. These requirements are in keeping with the International Telecommunication Union (ITU) Report ITU-R M.2410-0, 2017.</p>
4	TSTT	3.4 Network Security	<p>TSTT notes that there was no explicit mention of Network Function Virtualization (“NFV”) which is a new technology in 5G networks that offers benefits for telecoms operators in terms of flexibility, scalability and network management. NFV, however, also introduces new security challenges that should be addressed. The challenges associated with this can be broadly classified under seven (7) categories:</p> <ol style="list-style-type: none"> 1. Virtualisation or containerisation; 2. Orchestration and management; 3. Administration and access control; 4. New and legacy technologies; 5. Adoption of open source or Commercial Off the Shelf (COTS); 6. Supply chain; and 7. Lawful interception (LI). 	<p>TSTT suggests that Network Function Virtualization be included in this document and the security challenges addressed</p>	<p>As indicated in the Scope which has been added for clarification, the Framework for Fifth Generation (5G) Public Mobile Telecommunications Networks (the Framework) captures the appropriate policies, regulations, spectrum plans and procedures pertinent to the deployment of 5G in Trinidad and Tobago. Network Function Virtualization (NFV) does not fall within the scope of the Framework.</p> <p>If required to provide any guidance to the industry, set rules or establish standards in relation to NFV, the Authority shall do so in consultation with the industry in a subsequent regulatory instrument.</p>

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			<p>For these challenges, some best practice recommendations are as follows:</p> <table border="1" data-bbox="857 435 1703 1090"> <tr> <td>Security monitoring and filtering</td> <td>Zero trust</td> </tr> <tr> <td>Apply hardening policies</td> <td>Defence-in-depth</td> </tr> <tr> <td>NVF image validation and protection</td> <td>Secure third-party hosting environments</td> </tr> <tr> <td>Hardware security</td> <td>Security segmentation and isolation between network functions</td> </tr> <tr> <td>Hypervisor protection</td> <td>Centralized log auditing</td> </tr> <tr> <td>VNF protection</td> <td>Vulnerability handling and patch management</td> </tr> <tr> <td>SDN security management</td> <td>Incident management</td> </tr> <tr> <td>OSS/BSS protection</td> <td>Cryptography</td> </tr> <tr> <td>Strong password policy</td> <td></td> </tr> </table> <p>Please refer to NFV Security in 5G Challenges and Best Practices Report (February 2022) by ENISA for additional information.</p>	Security monitoring and filtering	Zero trust	Apply hardening policies	Defence-in-depth	NVF image validation and protection	Secure third-party hosting environments	Hardware security	Security segmentation and isolation between network functions	Hypervisor protection	Centralized log auditing	VNF protection	Vulnerability handling and patch management	SDN security management	Incident management	OSS/BSS protection	Cryptography	Strong password policy			
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Strong password policy																							
5	TSTT	3.5.2.4 Unlicensed Spectrum and 3.5.3.4 Unlicensed Spectrum	<p>TSTT suggests that emphasis be placed on using the upper 6GHz band for the 5G Advanced Era since it is the next phase of 5G (outside of mmWave).</p> <p>Also, a balanced approach is needed for licensed and unlicensed spectrum use in the 6GHz band. The upper 6GHz (6425-7125 MHz) should be reserved for IMT licensed use, this is important because it is the last remaining mid-band. This band (6GHz) can provide performance comparable to the C-Band (3.5GHz) with balanced coverage and capacity. When compared to the high band (e.g., mmWave), the 6GHz band will enable the deployment of more cost-effective networks.</p>	TSTT recommends that the upper 6GHz (6425-7125 MHz) be reserved for IMT licensed use.	<p>The Authority is formulating its position on the use of the 6 GHz band.</p> <p>The World Radiocommunication Conference (WRC) process and an IMT identification are crucial to the development of the 6 GHz band. The IMT identification for the upper 6 GHz band in Region 1 shall be completed during WRC-23, and if approved, will act as a development trigger to support that process and provide a globally available ecosystem. The Authority has updated section 6.3 to inform stakeholders of its current position on the upper 6 GHz band.</p>																		

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			It should be noted that 6GHz is used for 5G Advanced which is the Mobile industry's consensus. Also, the World Radiocommunication Conference in 2023 will provide the opportunity to harmonise the upper 6GHz band (6425-7125 MHz) for IMT across large parts of the planet and help develop the ecosystem.		
6	TSTT	6. Policies, Regulations, Plan and Procedures Pertinent to 5G	<p>The Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services (TATT 2017) and the Spectrum Plan for the Accommodation of Broadband Wireless Access Services (TATT 2008) should be revised to ensure that the spectrum range is in alignment with the band and bandwidth used for the minimum requirements in Section 2. It should allow for more than one carrier with 100MHz carrier bandwidth, (continuous spectrum assignment) in the relevant bands.</p> <p>Further, the bandwidth range recommended for the bands under consideration is as follows:</p> <ul style="list-style-type: none"> • 3.5GHz - at least 100MHz continuous carrier bandwidth. • 2.5GHz - at least 100MHz continuous new carrier bandwidth. <p>(This would cover the existing 4G and new 5G).</p>	The Authority to revise the Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services (TATT 2017) and the Spectrum Plan for the Accommodation of Broadband Wireless Access Services (TATT 2008) to ensure that the spectrum range is in alignment with the band and bandwidth used for the minimum requirements in Section 2.	<p>The Authority agrees with the recommendation; however, a revision of the PMTS spectrum plan has been planned for the 2022/2023 financial year to align the frequency bands in keeping with the 5G Framework.</p> <p>In the 2023/2024 financial year, the <i>Spectrum Plan for the Accommodation of Broadband Wireless Access Services (BWA spectrum plan)</i> shall be revised and consulted upon, in accordance with the Consultation Procedures.</p> <p>As it relates to TSTT's comments on the recommended bandwidth for the bands under consideration for 5G, the Authority shall engage stakeholders on the proposed bandwidth in the revised PMTS and BWS spectrum plans in accordance with its Consultation Procedures.</p>
7	5G Americas	General	<p>5G Americas is¹ grateful to the Telecommunications Authority of Trinidad and Tobago (TATT) for the opportunity to present our comments on the current state of public policies for mobile services in Trinidad and Tobago.</p> <p>The comments expressed by 5G Americas are based upon the following publications²:</p> <ul style="list-style-type: none"> • "Fixed Wireless Access with 5G Networks". November 2021. 		The Authority acknowledges the appreciation expressed by 5G Americas for the opportunity to comment on the Framework and its position based upon related publications, such as the <i>Fixed Wireless Access with 5G Networks, November 2021</i> .

¹ 5G Americas is a telecommunications industry association that advocates for the promotion and development of a favorable ecosystem for mobile broadband technologies in the Americas. To achieve this, we are committed to working with government agencies, regulatory bodies, international telecommunications standard development organizations, and other global wireless technology stakeholders throughout the Americas to promote and share knowledge for the successful implementation of mobile broadband technologies, including the allocation of spectrum for mobile services and the development of coherent, fair, and effective regulatory policies.

² 5G Americas' publications are available on <https://brechacero.com/white-papers/> and <https://www.5gamericas.org/white-papers/>

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			<ul style="list-style-type: none"> • “Implementación de redes 5G en América Latina: recomendaciones para fomentar su despliegue”. October 2021. • “Mercado secundario de espectro en América Latina”. June 2022. • “Panorama del espectro de bandas medias para redes móviles en América Latina”. June 2022. • “Bandas de ondas milimétricas (mmWave) para 5G en América Latina y el Caribe”. May 2022. • “Mid-band Spectrum & the Coexistence with Radio Altimeters”. July 2021. 		
8	5G Americas	6.2 – Spectrum Plan for Accommodation of Public Mobile Telecommunications Services (PMTS)	5G Americas agrees with the proposal to review the four millimeter wave ranges (mmWave) listed in the item number 6.2 and suggest considering additional mmWave capacity in the 66 – 71 GHz band (identified for IMT – WRC 2019) and the 28 GHz band (27.5 – 28.35 GHz, standardized as band n261). In the Americas, the 28 GHz band is licensed for mobile services in the United States, Puerto Rico, the US Virgin Islands and Uruguay, while regulators in Costa Rica, Panama and Peru study the feasibility of the band for IMT systems.		<p>The Authority thanks 5G Americas for its comments and agrees in principle with its suggestions. The 66 – 77 GHz millimetre wave (mmWave) band shall be included in the discussion of bands for network capacity.</p> <p>The 28 GHz band (27.5 – 28.35 GHz, standardized as band n261) is not currently under consideration for IMT in Trinidad and Tobago because of ITU allocations for satellite broadband services. The Authority plans to consider the mmWave bands that have been allocated to region 2 for IMT.</p>
9	5G Americas	Policy Statement 3 - The 3.7 – 4.2 GHz range is not under consideration for inclusion in the 5G Framework at this time, due to the risk of adverse effects on radio altimeters when operating in the 5G C-Band.	<p>Mid-band spectrum is helping networks operators deploy 5G around the world along thanks to new assignments in ranges including 3.3 – 4.2 GHz (3GPP band n77), 3.3 – 3.8 GHz (3GPP band n78) and 4.4 – 5.0 GHz (3GPP band n79). Some authorities have defined precautionary regulations considering the operation of aeronautical radio altimeters in the 4.2 – 4.4 GHz band. In the United States, some regulations were defined for mobile networks in a portion of the C-Band (3.7 GHz) and a 220 MHz guard band was deemed sufficient.</p> <p>Japan licensed spectrum in the 3.6 – 4.1 GHz and 4.5 – 4.6 GHz bands for mobile services on a national basis and only some restrictions were issued to operations in the upper 100 MHz, along with a prohibition to install base stations within 100 – 200 meters around the approach route on airports (approximately 1 kilometer of separation). South Korea licensed spectrum of the 3,410 – 3,700 MHz band in 2018 and is planning to assign blocks in the 3.7 – 4.0 GHz range for 5G,</p>		<p>The Authority notes the suggestions of 5G Americas and agrees in principle with the points made on the mid-band spectrum, its role in helping operators deploy 5G around the world and the need for further analysis and consultation on the 3.7 – 4.2 GHz band. The 3.3 - 3.4 GHz band will be considered for mobile and fixed services that can use 5G.</p> <p>Currently, the 3.7 – 4.2 GHz band accommodates television receive-only (TVRO) and C-Band VSAT systems, and therefore coexistence with these systems will need to be factored for the deployment of 5G services in this band, as well as ensuring no harmful interference is caused to altimeters in the adjacent 4.2 – 4.4 GHz band.</p> <p>Notwithstanding the above, further analysis of the 3.7 – 4.2 GHz band shall be conducted during the revision of</p>

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			<p>considering a guard band of 200 MHz considering radio altimeter operations in the 4.2 – 4.4 GHz band.</p> <p>The United Kingdom allocated the 3.8 – 4.2 GHz band for local licenses of low and mid-power operations without restrictions to height and location of antennas. The Spectrum Committee of the European Commission reported on Meeting 74 (RSC#74) that no safety risks were identified regarding the operation of 5G sites and aeronautical radio altimeters.</p> <p>Considering the international references on 5G and radio altimeters coexistence, the proposal to exclude the 3.7 – 4.2 GHz band from 5G consideration would establish a larger restriction in Trinidad and Tobago to mid-band spectrum access. 5G Americas suggests considering a further analysis and a specific consultation on the matter. Any restrictions deemed necessary for 5G and radio altimeter coexistence should be based in evidence (tests, studies) to avoid regulations that can complicate 5G network rollouts and/or increase network costs.</p>		<p>the PMTS and BWA spectrum plans. The Authority shall consider international references on 5G and radio altimeters coexistence, the current states of the 3.7 – 4.2 GHz band in Trinidad and Tobago and all other factors.</p> <p>The consideration of the 3.7 – 4.2 GHz band shall be included in the PMTS and BWA spectrum plans which shall be consulted upon in keeping with the Consultation Procedures.</p>
10	5G Americas	Policy Statements 4 and 5 - Additional mid-band spectrum in the 3.4–3.7 GHz range will be allocated to PMTS with spectrum caps to be determined; An additional 5MHz x 2 in the 850MHz band and 25MHz x 2 in the AWS Band will be allocated for IMT, to be used by PMTS operators.	<p>IMT spectrum in sub-6 GHz bands is relevant to increase network capacity in the short term. Mid-band spectrum is significant for 5G because of the higher bandwidth some bands can provide while allowing superior propagation compared to mmWave spectrum. Currently, 5G networks are being deployed in the 3.3 – 3.8 GHz band in various countries and more mid-band spectrum for IMT is being studied in the whole 3.3 – 4.2 GHz range, and the 4.9 GHz band. 5G Americas suggests considering the 3.3 – 3.8 GHz in 5G spectrum planning and a further analysis on the feasibility of the 3.3 – 4.2 GHz band as potential IMT capacity for future networks.</p> <p>5G Americas applauds TATT's proposal to increase the availability of spectrum in the 850 MHz and AWS bands and suggests considering an analysis of other sub-6 GHz ranges to determine the availability of additional frequencies. Other sub-6 GHz ranges that could be considered as capacity for 5G are the 600 MHz and the "L-Band" (1418 – 1527 MHz).</p>		<p>The Authority agrees in principle with the points made on the mid-band spectrum, its significance for 5G due to the higher bandwidth that some mid-bands can provide while allowing superior propagation compared to the mmWave spectrum. The 3.3 – 3.7 GHz band shall be allocated for 5G and the 3.7 to 4.2 GHz band shall be analysed in the future for its suitability for 5G.</p> <p>Other sub-6 GHz ranges such as the 600 MHz band shall be analysed and consulted upon to determine availability and suitability for 5G in Trinidad and Tobago. Currently, the 600 MHz band is unavailable but is expected to become available when this framework is reviewed.</p>

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11	5G Americas	Policy Statement 6 - Frequency allocations, licensing approaches and frequency assignment plans for any additional bands allocated to accommodate 5G fixed wireless access will be added to the BWA spectrum plan.	<p>5G networks can provide more broadband options through fixed-wireless access (FWA) and according to a forecast by ABI Researched cited in 5G Americas' white paper "Fixed Wireless Access with 5G Networks" 5G FWA is the broadband technology with more growth potential towards 2026 and is expected to surpass 58 million global subscribers by then. Also, 5G FWA can have positive effects in rural and urban areas by providing a new option for broadband access based in reliable and secure infrastructure, and an alternative to other type of fixed (wired) networks in rural locations.</p> <p>5G FWA services can benefit from mid-band and mmWave spectrum by leveraging the higher bandwidth for "last mile" connectivity and Integrated Access Backhaul (IAB), a functionality that enables a self-backhauling alternative for networks over mmWave spectrum. These aspects of 5G FWA require access to sufficient harmonized spectrum and avoid the exclusion of valuable spectrum resources (3.3 – 4.2 GHz and mmWave spectrum). 5G Americas suggests considering an approach towards 5G FWA that enables spectrum license holders to flexibly allocate part of their spectrum portfolio to fixed-wireless services according to technical and financial feasibility.</p>		<p>The Authority acknowledges the information provided for Fixed Wireless Access (FWA) with a 5G network and will consider the same in the revision of the PMTS and BWA spectrum plans.</p> <p>The authorisation of 5G FWA by enabling spectrum license holders the flexibility to allocate part of their spectrum portfolio to fixed-wireless services according to technical and financial feasibility shall be analysed in keeping with the Authority's regulatory instruments associated with the authorisation of spectrum for the provision of FWA and other services.</p>
12	5G Americas	Policy Statement 7 - The bands identified for mobile 5G in the PMTS spectrum plan under policy statement 4 will be removed from the BWA spectrum plan.	5G Americas suggest considering the inclusion of the 3.7 – 4.2 GHz band in the PMTS spectrum plan. See previous comments to Item 6.2 and Policy Statement 3.		<p>The Authority agrees in principle with the points made for further analysis and consultation on the 3.7 – 4.2 GHz band. The 3.7 to 4.2 GHz band shall be analysed in the future for its suitability for 5G.</p> <p>The Authority shall consider international references on 5G and radio altimeters coexistence, the current states of the 3.7 to 4.2 GHz band in Trinidad and Tobago and all other factors before making an informed decision which shall be reflected in the revised PMTS and BWA spectrum plans.</p>
13	5G Americas	Policy Statement 8 - This spectrum caps for the 2.5 GHz and 3.5 GHz bands will be	5G Americas suggests considering a cap that allows between 80 and 100 MHz of continuous spectrum in the 3.5 GHz band by license holder to promote a more efficient use of spectrum for 5G networks		The Authority agrees and shall consider such in the revision of the PMTS and BWA spectrum plans.

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		increased by at least 25MHz, to allow more spectrum to existing operators.			
14	5G Americas	Policy Statement 12 - The Authority will oversee the deployment of all radio-communications sites by developing a Position Paper on the Regulation and Administration of Telecommunications Sites for operators and the general public. This Paper will address issues such as utility colocations, picocells, lamp sites, rooftop sites, small cells and road reserve sites, and will be subject to consultation, in keeping with the Procedures for Consultation in the Telecommunications and Broadcasting Sectors of Trinidad and Tobago.	5G Americas welcomes the proposal and public policies consistent with achieving more densified mobile networks. 5G Americas suggests considering the incorporation an analysis of current barriers to infrastructure deployment and possible solutions to allow not only the rollout of more base stations (including small cells) but also of more fiber infrastructure. 5G Americas also suggests including best practices in infrastructure authorizations (positive administrative silence, single window for authorizations).		The Authority agrees with the suggestion to include best practices in infrastructure authorizations (positive administrative silence, single window for authorizations). As outlined in policy statement 13, <i>the Authority will oversee the deployment of all radio-communications sites by developing a Position Paper on the Regulation and Administration of Telecommunications Sites for operators and the general public. This Paper will address issues such as utility colocations, picocells, lamp sites, rooftop sites, small cells and road reserve sites, and will be subject to consultation, in keeping with the Procedures for Consultation in the Telecommunications and Broadcasting Sectors of Trinidad and Tobago.</i>
15	5G Americas	Policy Statement 14 - The Authority may use auctions, direct assignments and/or price methodologies for	5G Americas is respectful of the TATT's attributions to determine spectrum assignment mechanisms and suggests considering procedures that promote transparency, legal certainty, and participation. The consultation of the terms and conditions of new		The Authority agrees with the suggestion to consider spectrum assignment mechanisms that promote transparency, legal certainty, and participation; such mechanisms shall be considered in the revision of the relevant spectrum plans. Terms and conditions of new

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		<p>the pricing of spectrum for 5G, with the requisite consideration of the availability of information and data, economic value, efficient allocation of spectrum resources and other relevant and reasonable factors. The current Fees Regulations allows for the use of auctions to determine the licence fee for 5G.</p>	<p>spectrum public offers can help the authorities design assignment mechanisms that incentivize participation.</p> <p>5G Americas suggests considering the benefits of licensing more spectrum for mobile services with procedures that allow the license holders to exchange spectrum payments for coverage goals and/or projects aimed to reduce the digital divide. In Latin America, Colombia's Law 1978/2019 authorized non-economic components for spectrum tenders, and in 2019 the Government auctioned the 700 MHz with a mechanism that required an economic and coverage bid. In 2022, the Colombian Government extended spectrum licenses (1.9 GHz) that includes payments with coverage goals. In 2021, the 5G Tender in Brazil licensed new spectrum and less of the 10% of the total spectrum value will be collected in the form of spectrum fees. Most of the spectrum value will be paid by license holders with coverage goals and connectivity projects for the Government and public schools. Spectrum valuation could also take into account the differences between rural and urban network deployments to adjust the spectrum value and reflect fairer methodologies.</p>		<p>spectrum offerings that required consultation, shall be consulted upon in accordance with the Consultation Procedure.</p> <p>The information provided on spectrum assignment mechanisms used by the administrations of Colombia and Brazil is appreciated and will be considered by the Authority during the revision of the concession document and other regulatory instruments associated with the authorisation of spectrum for the provision of IMT and other services.</p> <p>The inclusion of a mechanism that required an economic and coverage bid shall also be considered. As stated in policy statement 14, <i>the Authority may use auctions, direct assignments and/or price methodologies for the pricing of spectrum for 5G, with the requisite consideration of the availability of information and data, economic value, efficient allocation of spectrum resources and other relevant and reasonable factors. The current Fees Regulations allows for the use of auctions to determine the licence fee for 5G</i></p>
16	Digicel	Introductory Comments	<p>Digicel commends the Authority for its work on the policy considerations surrounding 5G, as this remains critical to the economic development of our country, To this end, Digicel is pleased to participate in these discussions, but it is our position that there is no sustainable business case for investment in this technology in the foreseeable future. As it stands, Digicel has made significant investments in our existing network in order to meet the voracious demand for data occasioned by apps such as Facebook and Instagram, for which we have received minimal return on investment.</p>	<p>The Authority needs to take steps to regulate big tech companies that earn billions of dollars off of local networks without contributing to the costs of such infrastructure.</p>	<p>The Authority acknowledges the appreciation expressed by Digicel (Trinidad & Tobago) Limited (Digicel) for the opportunity to comment on the Framework, and its position that there is no sustainable business case for investment in 5G technology in the foreseeable future.</p> <p>The Authority has taken steps to address this matter via a <i>Consultative Framework for Over-The-Top (OTT) Services in Trinidad and Tobago</i> which has been issued for the first of two rounds of consultation. This Framework presents the Authority's proposed strategies and recommendations to address OTT services accessed in Trinidad and Tobago.</p>

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17	Digicel	2 -Key Characteristics of 5G Mobile Technologies All KPI points	<p>With reference to TATT DOR response to Digicel's question:</p> <p><i>More key performance indicators (KPIs) related to spectrum allocation, coverage obligations, quality of service and subscriber penetration will be specified in documents such as Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services, which shall be consulted upon, in keeping with the Procedures for Consultation in the Telecommunications Sector of Trinidad and Tobago (Version 7.0, 2021).</i></p> <p>Does TATT have a timeframe for the consultation phase for the Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services?</p>	<p>TATT to provide a road map time plan for the "Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services" document.</p> <p>TATT to include the above document as a point of KPI reference for 5G Framework.</p>	<p>In the 2022/2023 financial year, the PMTS spectrum plan shall be revised and consulted upon, in accordance with the Consultation Procedures.</p> <p>Under Section 6,2 of the revised Framework, the Authority states that the Spectrum Plan for PMTS will be revised in 2023.</p>
18	Digicel	3.1 Coverage Obligations	<p>With reference to TATT's DORs response to Digicel's question:</p> <p><i>Coverage obligations and subscriber penetration for mobile and fixed wireless concessions are based on the type of network and not the technology deployed and would not be affected by the introduction of 5G technologies. The coverage obligations will be specified in the concession documents.</i></p> <p>TATT's response doesn't seem aligned with the section since the reference was made to Italy which had specific 5G obligations for coverage and not technology neutral. If it is not a 5G obligation then Digicel recommends the references be amended to suit Trinidad and Tobago requirements.</p>	<p>TATT to clarify if there is a 5G coverage obligation for Trinidad and Tobago.</p> <p>Remove references that are not applicable to TATT's position on coverage obligations.</p>	<p>Coverage obligations are specified in the concession document. As stated in the DORs from the pre-consultation meeting, coverage obligations and subscriber penetration for mobile and fixed wireless services are based on the type of network deployed and are not technology specific. The introduction of 5G technologies may aid certain operators to meet their coverage obligations in an affordable manner.</p> <p>The Authority does not agree with Digicel's Recommendation, as this section provides research information on coverage obligations adopted in other jurisdictions as part of the introduction of 5G and should be considered when planning for 5G in Trinidad and Tobago. Since this section does not reflect the Authority's policy position on the matter, the Authority does not believe it must be removed.</p>
19	Digicel		Does TATT have any plans to allow 5G in the C-band 3.3GHz to 3.7GHz (N77)?	TATT to advise if this portion of the C-band is available for 5G services.	The Authority confirms the 3.3 to 3.7 GHz band will be made available for the provision of fixed and mobile services using 5G technology. However, the Authority remains technology neutral when identifying frequency bands for services, and therefore, does not identify bands for specific technologies.

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20	Digicel	5.Valuation Methods and Pricing Models	<p>With reference to Digicel's question: What spectrum allocation method will TATT be adopting?</p> <p>TATTs response was: <i>Spectrum usage techniques such as frequency division duplex (FDD) or time division duplex (TDD) and spectrum allocation methods will be specified in the Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services.</i></p> <p>Digicel's question was with reference to the 5G spectrum allocation method, how will the valuation and distribution to concessionaires be done?</p>	TATT to advise on their strategy for valuation and allocation of 5G spectrum to concessionaires.	<p>The Authority envisions its strategy to be based on Policy statement 14 which states: "14. The Authority may use auctions, direct assignments and/or price methodologies for the pricing of spectrum for 5G, with the requisite consideration of the availability of information and data, economic value, efficient allocation of spectrum resources and other relevant and reasonable factors. The current Fees Regulations allows for the use of auctions to determine the licence fee for 5G."</p> <p>Regarding spectrum allocation, the PMTS spectrum plan will be revised to identify the bands and bandwidth available to concessionaires to accommodate 5G technology.</p>
21	Digicel	6.5 Maximum Permissible Exposure Limits for Radio Frequency Radiation (RFR) in Trinidad and Tobago	<p>The Authority has indicated that the maximum permissible exposure Limits within the document, Maximum Permissible Exposure Limits for Radio Frequency Radiation in Trinidad and Tobago, shall be revised in 2022 to the 2020 ICNIRP guidelines.</p> <p>It is submitted that this change requires the document to undergo consultation.</p>	T A TT to confirm that the revision of the document entitled Maximum Permissible Exposure Limits for Radio Frequency Radiation in Trinidad and Tobago shall undergo 2 rounds of consultation	The document <i>Maximum Permissible Exposure Limits for Radio Frequency Radiation in Trinidad and Tobago</i> shall be revised and undergo 2 rounds of consultation, in accordance with the Authority's Consultation Procedures.
22	Digicel		TATT has indicated that a Position Paper on the Regulation and Administration of Telecommunications sites is forthcoming. When will this be issued and how many rounds of consultation will be facilitated?	TATT to confirm the time frame for the issuance of the Position Paper on the Regulation and Administration of Telecommunications Sites as well as that said document will undergo a minimum of 2 rounds of consultation.	The <i>Position Paper on the Regulation and Administration of Telecommunications Sites</i> shall be drafted in the period 2023/2024 and undergo 2 rounds of consultation, in accordance with the Authority's Consultation Procedures.
23	Digicel		<p>TATT has indicated that the document, Position and Procedures in Respect of Non-Objections for Applications to Town and Country Planning Division for Site Approval of Telecommunications Structures, outlines the role of Town and Country Planning Division (TCPD) and specifies procedures with respect to non-objection for applications to TCPD for their approval of telecommunications structures, which will be adhered to for 5G</p> <p>This document was last revised in 2007.</p>	TATT should submit this document for consultations so as to ensure it is fit for purpose in today's times as almost 2 decades have passed since it was created.	<p>As stated in the DOR for the pre-consultation: "The Authority will create a procedure for operators and the general public titled <i>Position Paper for the Regulation and Administration of Telecommunications Structures not subject to the Tower Non-Objection Process</i>. This document will be drafted in the 2023/2024 financial year and will address concerns raised around but not limited to utility colocations, lamp sites, small cells and road reserve sites. The document will be consulted upon, in keeping</p>

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					with the <i>Procedures for Consultation in the Telecommunications Sectors of Trinidad and Tobago (version 7.0, 2021).</i> ”
24	Digicel	6.8 The Telecommunications (Fees) Regulations, 2006	TATT has outlined the different options available to it in the legal and regulatory framework for the establishment of licence fees for 5G spectrum but no details are provided on the considerations it will employ in assessing the viability of each option	TATT needs to be transparent in how it arrives at licence fees for the 5G spectrum. It is not enough to list the factors it will take into consideration. The sector is entitled to a detailed justification of any decision taken on the choice of methodology as the burden of fees is borne by operators.	The Authority appreciates Digicel’s interest in this matter. Whether spectrum is awarded by direct assignment, auction or otherwise will be based on the current fee methodology for spectrum and the demand for spectrum for 5G and shall be included in the revised PMTS and BWA spectrum plans which shall be consulted upon in 2023 and 2024 respectively, in accordance with the Consultation Procedures.
25	Viasat	Section 3.5 Spectrum Requirements	<p>Viasat appreciates the opportunity to provide the Telecommunications Authority of Trinidad and Tobago (TATT) with comments on TATT’s Consultative Document on the Framework for Fifth Generation (5G) Public Mobile Telecommunications Networks (Consultation). The Consultation states that “5G requires a significant of mobile spectrum across low, mid and high ranges, in order to deliver widespread coverage and support all use cases.”¹ While TATT is not currently considering the 27.5-29.5 GHz (28 GHz) band for suitability for terrestrial IMT/5G, Viasat submits these comments to ensure that TATT takes into account the critical satellite services that are provided in the Ka-band, especially the 28 GHz portion of the Ka-band, and urges TATT to preserve these bands for satellite services and not to identify these frequency bands in the future for terrestrial IMT/5G, including IMT/5G private mobile services, in Trinidad and Tobago.</p> <p>Viasat respectfully explains that:</p> <ul style="list-style-type: none"> • the services Viasat and other satellite operators provide today are expanding for the future and rely on the 28 GHz band and other core satellite bands; • the ITU has repeatedly validated the 28 GHz band for satellite services and rejected several attempts to identify the 28 GHz band for terrestrial IMT/5G; 	<p>Viasat respectfully recommends that, in identifying spectrum for terrestrial IMT/5G, TATT should not deviate from the ITU determinations and international trends regarding the continued use of the 28 GHz band for satellite broadband services -services on which billions of U.S. dollars have been, and continue to be, invested. Instead, TATT should retain the 28 GHz band for satellite broadband services and identify other, separate spectrum for terrestrial IMT/5G.</p> <p>As noted in our comments, the 28 GHz band was specifically excluded from consideration at the ITU for terrestrial IMT/5G use with the overwhelming majority of countries continuing to reserve the 28 GHz band for a growing number satellite-based fixed and mobile broadband</p>	<p>The Authority acknowledges the appreciation expressed by Viasat for the opportunity to comment on the Framework and its positions expressed.</p> <p>The Authority notes the recommendation of Viasat, agrees in principle with the points made on the importance of the 28 GHz band for satellite services and shall maintain this band for satellite services.</p> <p>The 28 GHz band is not currently under consideration for IMT in Trinidad and Tobago.</p> <p>Harmonising the Trinidad and Tobago Frequency Allocation Table (TTFAT) with the ITU Table of Frequency Allocation, supporting economies of scale and delivering affordable solutions to consumers are all vital considerations in the Authority’s decision-making process. The 28 GHz band is not currently under consideration for IMT in Trinidad and Tobago.</p>

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			<ul style="list-style-type: none"> the ITU has identified vast amounts of spectrum in other bands (outside of the 28 GHz band) for terrestrial IMT/5G; and the ITU has also developed technical and operational requirements for terrestrial IMT/5G operating in the 26 GHz band that protect satellite receivers operating in the 28 GHz band. <p>Viasat is a leading global provider of broadband communications solutions, both space-based and terrestrial, and is the operator of Ka-band spacecraft.</p> <p>Today, Viasat's services connect over 150 million devices per year on airplanes and hundreds of thousands of homes and businesses.</p> <p>Viasat's satellite technology is extensively used to serve a wide range of satellite broadband applications over the <i>entire</i> Ka-band (<i>i.e.</i>, 27.5 – 31 GHz/17.7- 21.2 GHz), in urban, suburban and rural locations alike, and via earth stations in motion (ESIM), providing broadband for air and sea vessels as well as land-based users, such as emergency response vehicles, buses, and trains. Viasat's technology is also vital to the Defense sector, with applications in "anywhere, anytime" assured communications, instant access to Intelligence, Surveillance, Reconnaissance (ISR) video, maps, voice, and data.</p> <p>Viasat is currently constructing and expects to begin launching its global ViaSat-3 network in 2022. ViaSat-3 class design represents the next leap forward in broadband satellite capabilities, with unprecedented capacity, service speed and flexibility for a satellite platform and users at fixed locations and on the move. With over 1 Tbit/s of capacity, this satellite will offer over three orders of magnitude the throughput of the ViaSat-2 satellite, launched in 2017. In addition, the ViaSat-3 class design supports even more individual users with up to 1 Gbit/s service. For these reasons, the capabilities and capacity afforded by the ViaSat-3 class design are truly transformative and will revolutionize the availability and coverage of broadband services delivered to homes and businesses for both fixed and mobile applications, including in Trinidad and Tobago.</p> <p>Satellite Broadband Services Rely on Access to the 28 GHz Band. In order to provide these services, satellite broadband operators require access to the entire 28 GHz band unconstrained by the introduction of terrestrial IMT/5G.</p>	<p>uses. This would ensure that the Trinidad and Tobago Table of Allocations is as harmonized as possible with the ITU and the global markets, driving economies of scale and delivering affordable solutions to consumers.</p> <p>Viasat, as with many satellite operators, provides broadband services in the adjacent 28 GHz frequency band. As such, Viasat is concerned about potential out-of-band emissions from the 26 GHz band by terrestrial IMT/5G systems into the 28 GHz band. Increases in power by terrestrial IMT/5G systems in the 26 GHz band could increase terrestrial IMT/5G out-of-band emissions into the 28 GHz band. Increased out-of-band emissions in the 26 GHz band could adversely affect the interference environment in the 28 GHz band by interfering with the ability of satellite receivers on spacecraft in space to receive signals from earth stations in their networks. Therefore, Viasat respectfully requests that TATT limit out-of-band emissions from terrestrial IMT/5G operations in the 26 GHz band to protect satellite-powered broadband service in the adjacent 28 GHz band. At a minimum, terrestrial IMT/5G stations should be required to comply with out-of-band domain and spurious domain emission limits in the frequencies above 27.5 GHz as described in Recommendations ITU-R SM. 1541-6 and ITU-R SM. 239. Viasat also requests that TATT ensure that the aggregate level of terrestrial IMT/5G out-of-band emissions from the 26 GHz band into</p>	<p>The Authority acknowledges the concerns of Viasat and agrees in principle with the points made about potential out-of-band emissions from the 26 GHz band by terrestrial IMT/5G systems into the 28 GHz band due to power increases. Recognising the work done at WRC-19 as well as the work done by the various study groups, the Authority has considered and taken onboard Recommendations ITU-R SM. 1541-6 and ITU-R SM. 239 and Resolution 242 (WRC- 19) in identifying the 26 GHz band for IMT/5G systems.</p> <p>The Authority shall take into consideration the recommendations of Viasat and agrees to limit out-of-band emissions from terrestrial IMT/5G operations in all authorised bands to protect adjacent services. Recommendations ITU-R SM. 1541-6 and ITU-R SM. 239 have been considered and will be taken onboard.</p>

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			<p>Ka-band spectrum “powers” Viasat satellite broadband services that:</p> <ul style="list-style-type: none"> • Can offer users speeds of up to 1 Gbit/s • Can be deployed to a given location almost immediately through a small antenna that can be mobile, transportable, or fixed in place, depending on end-user requirements. • Are extendable to anyone near that satellite antenna by using a wireless hot spot to distribute the satellite connection to a smartphone or a tablet, and whether to entire communities or everyone on an airplane, ship, train or bus. • Meet needs that no other technology now addresses, or will address, including: <ul style="list-style-type: none"> ○ Connecting otherwise unserved and underserved families, communities, and small businesses around the world, many of whom are located in pockets of heavily populated areas; ○ Connecting widely dispersed government facilities; ○ Connecting passengers and crew on trains, buses, ferries, ships and aircraft; ○ Supporting emergency responders, national defence and security; ○ Providing digital transformation solutions to energy, mining, aviation, and maritime enterprises; ○ Supporting the efficient management and operation of widely dispersed industry assets, including oil drilling sites, renewable energy generation plants, and IoT networks for smart cities; ○ Enabling disaster recovery and relief operations; and ○ Providing always-available global communications capabilities. • Further important policy goals, such as enabling telemedicine and connecting healthcare facilities, facilitating precision farming, monitoring critical infrastructure, extending access to education and libraries, supporting the development of e-commerce, access to banking, and the creation of new jobs. <p>The ITU Has Recognized That the Introduction of Terrestrial IMT/5G Should Not Constrain 28 GHz Satellite Broadband Services.</p> <p>ITU adopted Resolution 238 (WRC-15) to identify candidate bands for designation for terrestrial IMT/5G, and also to guide the process for any decision to actually designate a candidate band for terrestrial 5G. The ITU specifically rejected identification of the 28 GHz band as a candidate band for ITU/5G and Resolution 238 (WRC-15) did not identify the 28 GHz band for study of terrestrial IMT/5G in the 28 GHz band, nor was the 28 GHz band considered for terrestrial</p>	<p>the adjacent 28 GHz band does not cause interference to satellite receivers in the 28 GHz band.</p> <p>In addition to the out-of-band emissions that may be generated by terrestrial IMT/5G deployment on the ground, Viasat is also concerned about the deployment of unmanned aircraft in the 26 GHz band because the terrestrial IMT/5G base station antennas pointed upwards to communicate with the unmanned aircraft could transmit signals towards satellite receivers in space and increase out-of-band emissions in the adjacent 28 GHz band. Viasat urges TATT to ensure that Resolution 242 (WRC-19) 26 GHz band out-of-band limits and pointing requirements are applied to terrestrial IMT/5G operations in order to protect 28 GHz satellite receivers in space.</p> <p>Viasat has supported the study and development of reasonable operating parameters for terrestrial IMT/5G in the 26 GHz band throughout the ITU WRC-19 process. Viasat urges TATT to conform domestic implementation of terrestrial IMT/5G to the operating parameters decided in Resolution 242 (WRC- 19). Among several items, Viasat emphasizes the importance of the portion of Resolution 242 (WRC-19) that requires that terrestrial IMT/5G base stations within the 26 GHz frequency band with high power operations (e.i.r.p. per beam exceeding 30 dBW/200 MHz) not point their antenna beams upward and maintain a minimum separation angle of ≥ 7.5 degrees from the geostationary orbit. Viasat urges</p>	<p>The authorisation of unmanned aircraft shall be in keeping with relevant ITU-R recommendations, resolutions and international best practices.</p> <p>The Authority agrees in principle with the recommendation to conform domestic implementation of terrestrial IMT/5G to the operating parameters outlined in Resolution 242 (WRC- 19). The Authority shall adopt all technical limits based on the resolution applicable to the specific frequency band to which terrestrial IMT/5G is authorised to operate in Trinidad and Tobago.</p>

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			<p>IMT/5G at WRC-19. Resolution 238 (WRC-15) reinforces the basis for protecting continued access to the 28 GHz band for existing and evolving satellite broadband services. Resolution 238 (WRC-15) acknowledged:</p> <ul style="list-style-type: none"> The identification of frequency bands allocated to mobile service for terrestrial IMT/5G may change the sharing situation regarding applications of services to which those frequency bands are already allocated (such as the Fixed Satellite Service); The need for existing services to be protected and allowed to continue to develop must be taken into account when considering frequency bands for possible additional allocations to any service, including terrestrial IMT/5G; Any identification of frequency bands for terrestrial IMT/5G should take into account the use of bands by other services and the evolving needs of these services; and Any identification of a band for terrestrial IMT/5G service should not impose any additional regulatory or technical constraints imposed on services to which the band is currently allocated on a primary basis.² <p>Terrestrial IMT/5G Incompatibility with Existing Satellite Use of the 28 GHz Band.</p> <p>The incompatibility of terrestrial 5G with satellite broadband services in the same spectrum band has been studied a number of times. The conclusion is the same: terrestrial IMT/5G systems proposed are incompatible with satellite broadband.</p> <p>TATT correctly recognizes that “the 24 GHz, 26 GHz and 40 GHz bands have had the most international support and momentum.”³ In connection with evaluating the 24.25-27.5 GHz (26 GHz) band that was identified by Resolution 238 (WRC-15) and ultimately designated by WRC-19 for terrestrial IMT/5G:</p> <ul style="list-style-type: none"> One ITU study concluded that co-existence between terrestrial IMT/5G and widely deployed satellite user 	<p>TATT to adopt these technical limitations on terrestrial IMT/5G base stations as outlined in Resolution 242 (WRC-19) to protect critical satellite broadband services operating in the 28 GHz band.</p> <p>Viasat urges TATT to retain the existing satellite status in the 28 GHz band while finding other suitable terrestrial IMT/5G spectrum in separate bands and apply the domestic operating parameters necessary to protect satellite receivers in the 28 GHz band from IMT/5G operations in the 26 GHz band.</p>	<p>The Authority notes the recommendation of Viasat, agrees with retaining the satellite status for the 28 GHz band, and shall consider Viasat’s recommendations in the revision and consultation of the PMTS and BWA Spectrum plans.</p> <p>The Authority notes the comments of Viasat on the incompatibility of IMT/5G with existing satellite services in the 28 GHz band, and advises that the 28 GHz band is not currently under consideration for IMT in Trinidad and Tobago.</p> <p>The Authority agrees in principle with the comment and shall incorporate Resolution 238 (WRC-15) and the ITU</p>

³ Consultation at 19. January 2023

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			<p>terminals is not practicable.⁴</p> <ul style="list-style-type: none"> Another ITU study concluded: “For the case of ubiquitous deployment of small FSS earth stations, sharing between IMT/5G and the FSS is not practicable within the same geographical areas, particularly as it is not feasible to individually coordinate large numbers of ubiquitous earth stations, nor is it even possible to determine a coordination contour around ubiquitous earth stations.”⁵ <p>While these studies involved the 26 GHz band, which is not heavily used by today’s satellite broadband user terminals, the conclusions about terrestrial IMT/5G’s incompatibility with widely deployed satellite services nevertheless are significant and understate the problem of potentially introducing terrestrial IMT/5G into the 28 GHz band. As noted above, in contrast with the 26 GHz band, the 28 GHz band is used intensively today for communications by satellite broadband user terminals.</p> <p>As previously stated, the issue of terrestrial IMT/5G compatibility with satellite broadband in the 28 GHz band was not studied at the ITU. Both WRC- 15 and WRC-19 declined to initiate any studies associated with the possible introduction of terrestrial IMT/5G in the 28 GHz band because of existing satellite broadband use, and the international consensus to expand satellite broadband in the 28 GHz band.</p> <p>In sum, the terrestrial IMT/5G systems simply are not being designed to be compatible with the existing and widespread satellite use of the same spectrum.</p> <p>Notably, these studies may understate the incompatibility of terrestrial IMT/5G with satellite use of the 28 GHz band, because in its separate 3GPP standards process, the terrestrial IMT/5G industry is defining terrestrial IMT/5G technologies that operate at very different parameters (such as power levels and antenna pointing) than those they otherwise have identified as relevant to the ITU studies.⁶</p>		<p>studies on the co-existence between terrestrial IMT/5G and satellite services in the revision and consultation of the PMTS and BWA Spectrum plans.</p>

⁴ See ITU Document 5-1 478-E Attachment 3 to Annex 3 to Task Group 5/1 Chairman’s Report (20 Sept. 2018), *Sharing and Compatibility of the FSS and IMT Operating in the 24.25-27.5 GHz Frequency Range* at p. 211.

⁵ *Id.* at p. 266.

⁶ See e.g., 3GPP TS 38.104 V15.2.0 (2018-06).

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			<p>Separate and apart from those issues is the risk of aggregate terrestrial IMT/5G interference from any terrestrial IMT/5G transmissions in the 28 GHz band into satellite receivers in space (which are designed to receive 28 GHz uplink signals from satellite user terminals). This issue has not been studied at the ITU in the context of today's broadband satellites, because, again, the ITU did not even consider designating the 28 GHz band for terrestrial 5G.</p> <p>Vast Amounts of Spectrum are Available for Terrestrial 5G Outside of the 28 GHz Band.</p> <p>The ITU has proposed many other bands for terrestrial 5G use, including the 26 GHz band. Viasat supports the proposed use of 26 GHz, instead of 28 GHz, for terrestrial IMT/5G. In fact, the vast majority of countries around the world are designating the 26 GHz band for terrestrial IMT/5G, implementing the ITU designation of this band for terrestrial IMT/5G.</p> <p>Viasat believes that if TATT considers new mmWave spectrum for terrestrial IMT/5G it should award the 26 GHz band for these services. This is consistent with the decision of WRC-19, which harmonized the band's allocation for terrestrial IMT/5G, as well as international studies concluding that the 3.25 gigahertz of spectrum available in the 26 GHz band is sufficient to accommodate multiple terrestrial IMT/5G operators.⁷</p> <p>As studies have shown, when properly designed and operated, terrestrial 5G equipment can be manufactured to be compatible with adjacent 24 GHz Earth Exploration Satellite Services (EESS). Notably, this was resolved at the WRC- 19 in designating the 26 GHz band for terrestrial 5G.</p> <p>In conclusion, the 28 GHz band was specifically excluded from consideration at the ITU for terrestrial IMT/5G use with the overwhelming majority of countries continuing to reserve the 28 GHz band for satellite-based fixed and mobile broadband use. As such, the spectrum that TATT identifies for terrestrial ITU/5G should not deviate from the ITU determinations and</p>		<p>The Authority notes the comments of Viasat about possible interference from terrestrial IMT/5G and the lack of ITU compatibility studies in the 28 GHz and advises that the 28 GHz band is not currently under consideration for terrestrial IMT in Trinidad and Tobago.</p> <p>The Authority notes Viasat's support for the harmonised use of the 26 GHz band for terrestrial IMT/5G and agrees with and shall continue to support the harmonisation effort for region 2.</p> <p>The Authority notes the recommendation of Viasat and agrees in principle with the points made on the importance of the 28 GHz band for satellite services and the need to</p>

⁷ See ITU Press Release, WRC-19 identifies additional frequency bands for 5G, Nov. 22, 2019 (“While identifying the frequency bands 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 and 66-71 GHz for the deployment of 5G networks, WRC-19 also took measures to ensure an appropriate protection of the Earth Exploration Satellite Services, including meteorological and other passive services in adjacent bands. In total, 17.25 GHz of spectrum has been identified for IMT by the Conference, in comparison with 1.9 GHz of bandwidth available before WRC-19. Out of this number, 14.75 GHz of spectrum has been harmonized worldwide, reaching 85% of global harmonization.”) <https://news.itu.int/wrc-19-agrees-to-identify-new-frequency-bands-for-5g/>.

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			<p>national trends regarding continued use of the 28 GHz band for satellite broadband services—services on which billions of U.S. dollars have been, and continue to be, invested. Instead, TATT should retain the 28 GHz band for satellite broadband services and identify other, separate spectrum for terrestrial IMT/5G. In addition, Viasat urges TATT to implement appropriate conditions on IMT/5G operations in the 26 GHz band to protect satellite receivers in the 28 GHz band.</p> <p>Here again, the ITU's WRC-19 has paved the way with the mmWave allocation, and appropriate operating conditions, for terrestrial IMT/5G across the 26 GHz band, along with an additional 14.25 GHz of mmWave band spectrum.</p>		<p>harmonise the bands proposed for terrestrial IMT/5G with the ITU determination and national trends. The Authority shall continue to support the harmonisation effort for terrestrial IMT/5G bands across region 2</p>
26		<p>Section 6.2 Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services (PMTS)</p>	<p>Vast Amounts of Spectrum are Available for Terrestrial 5G Outside of the 28 GHz Band.</p> <p>The Consultation asserts that “based on the frequency ranges identified for consideration by ITU for IMT/5G services (ITU 2019)”,⁸ TATT will review the following bands for their suitability for 5G: 24.25 – 27.5 GHz, 37 – 43.5 GHz, 45.5 – 47 GHz and 47.2-48.2 GHz.</p> <p>As recognized by TATT, the ITU has proposed many other bands for terrestrial IMT/5G use, including the 26 GHz band. Viasat supports the proposed use of 26 GHz, instead of 28 GHz, for terrestrial IMT/5G. In fact, the vast majority of countries around the world are identifying the 26 GHz band for terrestrial IMT/5G, implementing the ITU designation of this band for terrestrial IMT/5G.</p> <p>Viasat believes that if TATT considers new mmWave spectrum for terrestrial IMT/5G it should award the 26 GHz band for these services. This is consistent with the decision of WRC-19, which harmonized the band's allocation for terrestrial IMT/5G, as well as international studies concluding that the 3.25 gigahertz of spectrum available in the</p>	<p>Viasat believes that if TATT considers new mmWave spectrum for terrestrial IMT/5G it should award the 26 GHz band for these services. This is consistent with the decision of WRC-19, which harmonized the band's allocation for terrestrial IMT/5G, as well as international studies concluding that the 3.25 gigahertz of spectrum available in the 26 GHz band is sufficient to accommodate multiple terrestrial IMT/5G operators.</p>	<p>The Authority notes the recommendation of Viasat and agrees in principle with the points made for the harmonised use of the 26 GHz band for terrestrial IMT/5G, consistent with the decision of WRC-19. In keeping with the decisions of WRC-19, the Authority shall continue to support the harmonisation effort for the 26 GHz band for region 2.</p>

⁸ Consultation at p. 31.

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			<p>26 GHz band is sufficient to accommodate multiple terrestrial IMT/5G operators.⁹</p> <p>Over 120 countries (a rising number that includes Europe, China, India, Brazil, Australia, Russia, Mexico and Nigeria) have expressed their intention to follow the WRC decisions and preserve the 28 GHz band for satellite broadband services and accommodate IMT/5G technology in other globally harmonized bands, including over 17 gigahertz of separate mmWave spectrum made available by WRC-19 for IMT/5G, particularly the full 26 GHz band.</p> <p>As studies have shown, when properly designed and operated, terrestrial IMT/5G equipment can be manufactured to be compatible with adjacent 24 GHz Earth Exploration Satellite Services (EESS). Notably, this was resolved at the WRC-19 in designating the 26 GHz band for IMT/5G.</p>		

⁹ See ITU Press Release, WRC-19 identifies additional frequency bands for 5G, Nov. 22, 2019 (“While identifying the frequency bands 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 and 66-71 GHz for the deployment of 5G networks, WRC-19 also took measures to ensure an appropriate protection of the Earth Exploration Satellite Services, including meteorological and other passive services in adjacent bands. In total, 17.25 GHz of spectrum has been identified for IMT by the Conference, in comparison with 1.9 GHz of bandwidth available before WRC-19. Out of this number, 14.75 GHz of spectrum has been harmonized worldwide, reaching 85% of global harmonization.”) <https://news.itu.int/wrc-19-agrees-to-identify-new-frequency-bands-for-5g/>.