



Framework for the Authorisation of Standalone Ancillary Terrestrial Component (ATC) Systems

Maintenance History		
Date	Change Details	Version
18 th December 2023	Consultative document published for the first of two rounds of public consultation	0.1
25 th July 2024	Consultative document published for the second of two rounds of public consultation	0.2
11 th December 2024	Approved version	1.0

© Telecommunications Authority of Trinidad and Tobago 2024

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means or stored in any retrieval system of any nature without the prior written permission of the Telecommunications Authority of Trinidad and Tobago, except for permitted fair dealing under the Copyright Act of Trinidad and Tobago Chapter 82:80 or in accordance with any permission granted by the Authority in respect of photocopying and/or reprographic reproduction. Full acknowledgement of author and source must be given when citing this publication.

This document may be cited as: Telecommunications Authority of Trinidad and Tobago (TATT 2024) *Framework for the Authorisation of Standalone Ancillary Terrestrial Component (ATC) Systems*. (December 2024) Barataria, Trinidad and Tobago.

Table of Contents

1	Introduction	1
1.1	Background.....	1
1.2	Purpose.....	2
1.3	Objectives	2
1.4	Scope.....	2
1.5	Relevant Legislation	3
1.6	Other Relevant Documentation.....	4
1.7	Review Cycle	5
1.8	Consultation Process	5
2	Global Authorisation of ATC Systems	7
2.1	Federal Communications Commission (FCC), USA	7
2.2	Innovation, Science and Economic Development Canada (ISED), Canada	8
2.3	Botswana Communications Regulatory Authority (BOCRA), Botswana	9
2.4	National Telecommunications Agency (Anatel), Brazil	9
2.5	Secretariat of State for Telecommunications and Digital Infrastructures, Spain	10
2.6	Other Administrations.....	10
3	Authorisation of Standalone ATC Systems in Trinidad and Tobago	11
3.1	Low-Power ATC Operation.....	11
3.2	Requirement for MSS Authorisation	12
3.3	ATC Systems Licences, Fees and Annual Reporting	12
3.4	Technical Operating Parameters for ATC Systems	13
	References	15
	Appendix I: Licensing Conditions for the Low-Power Ancillary Terrestrial Component (ATC) Spectrum Licence (ISED 2020)	17

Abbreviations

ATC	ancillary terrestrial component
CDMA	code division multiple access
CGC	complementary ground component
EIRP	equivalent isotropically radiated power
FCC	Federal Communications Commission
GMPCS	global mobile personal communications by satellite
ISED	Innovation, Science and Economic Development Canada
ITU	International Telecommunication Union
LTE	long-term evolution
MSS	mobile-satellite service
NOS	network operating system
TDD	time division duplex
TTFAT	Trinidad and Tobago Frequency Allocation Table

1 Introduction

1.1 Background

Ancillary Terrestrial Component (ATC) technology refers to the set of terrestrial facilities licensed to the operator of a mobile-satellite service (MSS) system for the provision of terrestrial communications, reusing frequencies assigned for its MSS operations¹. According to Article 1.25 of the International Telecommunication Union's (ITU) Radio Regulations, MSS is a radio-communications service:

- (i) between mobile earth stations and one or more space stations, or between space stations used by this service.

- (ii) between mobile earth stations by means of one or more space stations.

MSS facilitates two-way voice and data communication for global users, including in remote locations, using handhelds or laptop-size terminal units. However, MSS is affected by the attenuation caused by shadowing in urban areas and within houses and buildings. Conventional ATC systems enable MSS operators to integrate terrestrial services into their satellite networks using their assigned frequencies, to augment coverage in areas where their satellite signals are largely unavailable. Contemporary ATC systems provide standalone wireless connectivity, where standalone refers to providing communications separate from the MSS and not limited to improving the MSS services offerings.

The Telecommunications Authority of Trinidad and Tobago (the Authority) has noted the authorisation of ATC systems in other jurisdictions for low-power private networks in the frequency band 2483.5–2500 MHz. This frequency band has been allocated for MSS in the Trinidad and Tobago Frequency Allocation Table (TTFAT).

Through this document, *Framework for the Authorisation of Standalone Ancillary Terrestrial Component (ATC) Systems* (the Framework), the Authority presents its approach for authorisation of requests to deploy ATC systems over 16.5 MHz of MSS spectrum in the 2.4 GHz S-band (2483.5–2500 MHz), to support private small cell and enterprise networks.

¹ FCC Report and Order, dated 23rd December 2016 in the matter of Terrestrial Use of the 2473- 2495 MHz Band for the Low-Power Mobile Broadband Networks

1.2 Purpose

The purpose of this Framework is to guide the authorisation of standalone ATC systems in Trinidad and Tobago within the 2.4 GHz S-band (2483.5–2500 MHz) spectrum allocated for MSS, based on defined technical and regulatory provisions. The authorisation of standalone ATC systems will enhance wireless connectivity in Trinidad and Tobago for private use.

1.3 Objectives

The Framework addresses:

1. the authorisation of standalone low-power ATC systems.
2. ATC licences, fees and annual reporting.
3. technical considerations for the authorisation of ATC.
4. measures needed to protect services that share the 2.4 GHz S-band with ATC systems.

1.4 Scope

This Framework presents the authorisation approach taken in other jurisdictions and specifies the key technical and regulatory requirements for the authorisation and operation of standalone ATC systems in the 2.4 GHz S-band in Trinidad and Tobago. This document forms part of the Authority's Spectrum Management Framework and serves to allow use of the radiofrequency spectrum in the S-band without causing harmful interference to services that use the same or adjacent bands. It provides guidance for the authorisation of ATC radiocommunications systems by the Authority under its existing legislation, regulations and procedures.

It does not address the authorisation of MSS in Trinidad and Tobago, the provision of public mobile telecommunications services in this band using ATC systems, or the operation of ATC systems in other MSS bands.

1.5 Relevant Legislation

The following sections of the Telecommunications Act, Chap. 47:31 (the Act) inform this document:

Section 18 (1):

Subject to the provisions of this Act, the Authority may exercise such functions and powers as are imposed on it by this Act and in particular –

- (i) plan, supervise, regulate and manage the use of the radio frequency spectrum, including –
 - (i) the licensing and registration of radio frequencies and call signs to be used by all stations operating in Trinidad and Tobago or on any ship, aircraft, or other vessel or satellite registered in Trinidad and Tobago;
 - (ii) the allocation, assignment and reallocation or reassignment of frequency bands where necessary;

- (o) test and certify telecommunications equipment, subject to section 48(3), to ensure compliance with —
 - (i) international standards; and
 - (ii) environmental health and safety standards, including electro-magnetic radiation and emissions.

Section 36 (1):

Subject to subsection (2), no person shall –

- a) establish, operate or use a radio-communication service;
- b) install, operate or use any radio transmitting equipment; or
- c) establish, operate or use any radio-communication service on board any ship, aircraft, or other vessel in the territorial waters or territorial airspace of Trinidad and Tobago, other than a ship of war or a military aircraft or satellite registered in Trinidad and Tobago,

without a licence granted by the Authority.

Section 41:

- (1) 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.

- (2) The Authority shall develop a spectrum plan in order to regulate the use of the spectrum.
- (3) The National Spectrum Plan shall be made available to the public in the manner prescribed by the Authority.
- (4) The National Spectrum Plan shall state how the spectrum shall be used and the procedures for licensing frequency bands.
- (5) The procedures referred to in subsection (4) may include, but are not limited to -
 - (a) procedures for licensing frequency bands by auction;
 - (b) procedures for licensing frequency bands by tender;
 - (c) procedures for licensing frequency bands at a fixed price; or
 - (d) procedures for licensing frequency bands on stated criteria.

Section 42:

- (1) Subject to subsection (2), the Authority may, in accordance with the spectrum plan allocate and re-allocate frequency bands.
- (2) In the allocation or assignment and re-allocation or reassignment of frequency bands by the Authority priority shall be given to the needs of the State in respect of matters of national security.

1.6 Other Relevant Documentation

Other relevant policies, plans and regulations, currently in effect, to be read along with this document, include:

1. *The Trinidad and Tobago Frequency Allocation Table (8.3 kHz–3000 GHz) (TTFAT)*
2. *Spectrum Management Framework*
3. *Spectrum Plan for the Accommodation of Broadband Wireless Access Services*
4. *Maximum Permissible Exposure Limits for Radio Frequency Radiation in Trinidad and Tobago*
5. *Schedule of Devices Eligible for Use Under a Class Licence*
6. *Telecommunications Fees Methodology*

These documents can be found on the Authority's website, www.tatt.org.tt

1.7 Review Cycle

To keep pace with technological advancements, taking into account suggestions for modification submitted by stakeholders or members of the public, the Authority will review this document every four years, in consultation with stakeholders, to ensure that it is guided by updated policies and objectives. This Framework may also be reviewed at any earlier time, at the discretion of the Authority, based on proposals for modification submitted by stakeholders or members of the public or changes in international regulations.

Questions or concerns regarding the maintenance of this document may be directed to the Authority via email at policy@tatt.org.tt.

1.8 Consultation Process

In accordance with its *Procedures for Consultation in the Telecommunications and Broadcasting Sectors of Trinidad and Tobago* (ver. 7.0, 2021) (Consultation Procedures), the Authority sought the views and opinions of stakeholders and the general public regarding the proposals made herein. Consideration was given to the comments and recommendations made during the consultation process, and the document was revised accordingly.

In December 2023, version 0.1 of the Framework was released for the first of two rounds of public consultation for a period of six weeks, which was extended for a further three weeks, ending 16th February 2024. The following modifications were made to the Framework based on the comments received from the consultation:

1. Section 1.1 on Background was revised to provide clarity on the difference between conventional ATC and standalone ATC.
2. The Purpose, subsection 1.2; Objectives, subsection 1.3; and Scope, subsection 1.4 were updated.
3. Subsection 2.6, Other Administrations, was added to highlight other jurisdictions that authorised ATC.
4. A new policy statement (#2) was added to preclude the deployment of standalone, low-power ATC systems to support standard public commercial mobile services.
5. Subsection 3.2 was revised for clarity.

6. Subsection 3.2, MSS Conditions for the Authorisation of ATC Systems, was added, as this is a requirement for the authorisation of ATC systems.

In August 2024, the Framework was issued for the second of two rounds of public consultation for four weeks, which was extended by a further four weeks, ending 27th September, 2024. The decisions on recommendations (DORs) matrix for the second round of consultation is attached as Appendix I. In finalising the Framework (version 1.0), the following modifications were made based on the feedback from the consultation:

1. Section 3.3 was amended to reference the discount methodology of the Authority's *Telecommunications Fees Methodology*.
2. Section 3.4 was amended to include references to the Band n53 specification.

2 Global Authorisation of ATC Systems

Historically, ATC systems have been recognised as terrestrial communications network infrastructure that complements and operates as part of an integrated MSS system² to enhance the availability of the satellite offering. The terrestrial component, or fixed base station, of an integrated MSS is controlled by the satellite resource and network management system of the satellite operator and uses the same authorised frequency band as the associated MSS component.

ATC applications have evolved significantly since their introduction as an integrated part of an MSS offering. Newer, standalone, data-focused ATC applications have emerged that support Internet of Things (IoT) applications, and the deployment of small cells in mobile networks and private long-term evolution (LTE) networks in the same frequency bands as satellite systems. Standalone ATC systems refer to ATC systems that operate separately from MSS in terms of service offerings and operation, and are not being solely used to augment the services delivered by satellite. Notwithstanding the independence of these newer standalone applications, they are still referred to as ATC due to the reuse of the frequencies of the MSS system and the requirement for coordination with the MSS system to mitigate harmful interference.

Since the adoption of rules in various jurisdictions allowing for the introduction of ATC systems in MSS spectrum, ATC operations have been restricted to a portion of the Big LEO³ bands⁴, to protect co-channel and adjacent-channel licensees from harmful interference. ATC operations cannot share spectrum with other terrestrial services and are not entitled to interference coordination with broadband wireless access (BWA) services. As such, sufficient separation between ATC services and primary BWA operations in the adjacent spectrum is maintained. The approaches adopted by various administrations in authorising ATC systems are reviewed in the following sections.

2.1 Federal Communications Commission (FCC), USA

In 2003, the Federal Communications Commission (FCC) adopted its *ATC Report and Order*, permitting MSS licensees to seek authorisation to implement ATC systems for integration into MSS networks for public and private services. In the Big LEO bands, the FCC limited traditional ATC operations to 1610–1615.5 MHz, 1621.35–1626.5 MHz in the L-band, and 2492.5–2498

² The term “integrated MSS system” refers to an MSS offering that uses ATC systems to augment its performance.

³ Low Earth orbit (LEO), as the name suggests, is an orbit that is relatively close to Earth’s surface. It is normally at an altitude of less than 1000 km but could be as low as 160 km above Earth – which is low compared to other orbits, but still very far above Earth’s surface.

⁴ The term “Big LEO bands” refers to the 1.6–2.4 GHz bands. In general, the Big LEO MSS systems rely on uplinks within the 1610–1626.5 MHz band and downlinks in the 2483.5–2500 MHz band.

MHz in the S-band, and to the specific frequencies authorised for use by MSS licensees. Subsequently, in 2004, the FCC shifted the S-band ATC block to 2487.5–2493 MHz to ensure that ATC spectrum band would not overlap with the fixed and mobile services allocation in the 2495–2500 MHz band.

Globalstar holds a space station licence for its 1.6–2.4 GHz MSS system, providing voice and data services in the United States and abroad via non-geostationary orbit satellites. In 2006, subject to conditions, the International Bureau of the FCC assigned the 1610–1615.5 MHz frequency band for traditional ATC mobile terminal transmission, and the 2487.5–2493 MHz band for ATC base station transmission.

In a report and order released in April 2008, the FCC proposed to modify the licence issued for ATC systems, to expand the spectrum assigned for traditional ATC operation to the 1610–1617.775 MHz and 2483.5–2495 MHz bands, for a total ATC spectrum bandwidth of 19.275 MHz (FCC, 2008). ATC authorisation was subsequently modified to allow operation in those wider frequency bands. The FCC concluded that ATC is not feasible in the L-band spectrum shared by Globalstar and Iridium at 1617.775–1618.725 MHz, and that ATC cannot share spectrum with co-primary fixed and mobile services in the 2495–2500 MHz segment of the S-band.

In its 2016 Report and Order FCC 16-181, the FCC modified the rules for the operation of ATC systems for the sole MSS system in the Big LEO S-band. The rule changes adopted therein removed the existing ATC “gating” criteria, thereby enabling the FCC to authorise the deployment of terrestrial low-power broadband private networks using licensed spectrum in the 2483.5–2495 MHz band. On 8th August 2017, it was officially announced that the FCC had issued licences authorising terrestrial low-power broadband services over satellite spectrum in that band.

2.2 Innovation, Science and Economic Development Canada (ISED), Canada

In an application to ISED dated April 2019, Globalstar Canada requested authorisation to provide ATC mobile services in the 2483.5–2500 MHz frequency range independent of its MSS offering. It also requested that ISED modify certain requirements and adopt operational requirements and technical rules similar to those identified by the FCC in its 2016 Report and Order FCC 16-181. Adopting these rules and operational requirements would allow for the provision of low-power ancillary terrestrial mobile services using its licensed MSS spectrum. Globalstar Canada stated its commitment to continue providing MSS with its second-generation satellite system, noting that the ATC system is ancillary to MSS. ATC systems provide an opportunity to make more efficient use of primary MSS spectrum, through the coordinated deployment of both satellite and terrestrial services.

In its report in 2020, *Decision on Globalstar Canada's Application for Ancillary Terrestrial Component (ATC) Authority in the 2.4 GHz Band (2483.5–2500 MHz)*, 2020, ISED noted that the rules in the 2004 ATC policy (RP-023) had been developed based on the situation at the time, among them the status of ATC as an integral part of MSS and the expected use of dual-mode terminals. While some of the rules for the 2 GHz band were removed in 2014, they remained applicable to the 2.4 GHz band. In its decision, ISED stated that the ATC systems proposed would operate at low power to support small cell private applications and would preclude the deployment of standard commercial mobile services. The low-power ATC use allows both MSS and terrestrial systems to thrive in the band in a complementary manner without harmful interference.

Given the evolution of ATC since 2004, in November 2020, ISED granted authorisation for low-power ATC operations, with the following decisions:

1. ISED will grant authorization to operate only low-power ATC systems in the 2.4 GHz band, through a licence with a set of technical, policy and licence conditions as outlined in its Decision.
2. The licensee must comply on an ongoing basis with all principles outlined in the ATC policy (RP-023), including the requirement to maintain MSS, except for the following:
 - a) ISED will remove the dual-mode user equipment requirement in the 2.4 GHz band, and
 - b) ISED will allow the deployment of a stand-alone, low-power ATC system in the 2.4 GHz band subject to the conditions in its Decision.

2.3 Botswana Communications Regulatory Authority (BOCRA), Botswana

In 2017, the Botswana Communications Regulatory Authority (BOCRA) granted the authority for a MSS licensee to use 16.5 MHz of S-band spectrum at 2483.5–2500 MHz for terrestrial mobile broadband (public or private) services, in partnership with licensed operators in Botswana. With this approval, Botswana became the first country outside of the US to approve terrestrial S-band authority for a MSS licensee and the first country to approve the authority over 16.5 MHz of S-band spectrum at 2.4 GHz. BOCRA stated that the terrestrial network operations will be based on the deployment of LTE small cell low-power networks that will operate in its dedicated spectrum.

2.4 National Telecommunications Agency (Anatel), Brazil

In 2020, the National Telecommunications Agency of Brazil (Anatel) had authorised deployment of ATC services in the 2.4 GHz band. The authorisation corresponds to 3GPP's band 53

specification and supports the ecosystem of devices and infrastructure available. Considering the feedback received from public consultation, published in the Official Gazette on 15th July 2020, Anatel approved the technical and operational requirements for the use of the 2485–2495 MHz band by stations in the private limited service (SLP) and authorised the operation of low power SLP systems.

2.5 Secretariat of State for Telecommunications and Digital Infrastructures, Spain

On 30th August 2021, the Secretary of State for Telecommunications and Digital Infrastructures received a request for authorisation to deploy an auxiliary terrestrial network, which is effectively ATC infrastructure, in the 2483.5–2495 MHz band, that enhances the MSS authorised in the same band. Considering the established Decision 626/2008/EC of the European Parliament and other applicable laws and regulations, the Secretariat of State granted a concession for the private use of the 2483.5–2495 MHz band for a ground auxiliary network as complementary to the MSS. This authorisation only enables the enhancement of the availability and quality of the public MSS and is not intended to support independent communication.

2.6 Other Administrations

The following administrations have also authorised the operation of ATC systems in the S-band (2483.5–2495 MHz) for the provision of *private* low-power terrestrial LTE services in the oil and gas sector, mining sector, agricultural, industrial and conservation operations:

1. The Independent Communications Authority of the Republic of South Africa (ICASA)
2. The Autorité de Régulation des Communications Électroniques et des Postes (ARCEP) of Gabon
3. The Instituto Nacional das Comunicações de Moçambique (INCM) of Mozambique
4. The Communications Authority of Kenya
5. The Rwanda Space Agency and the Rwanda Utilities Regulatory Authority of Rwanda
6. The Communications Regulatory Authority of Namibia

3 Authorisation of Standalone ATC Systems in Trinidad and Tobago

Conditions for authorisation to operate standalone ATC systems using spectrum in the 2.4 GHz band (2483.5–2500 MHz) shall include the following:

1. Low-power ATC operation
2. Requirement for MSS authorisation
3. ATC systems licences, fees and annual reporting
4. Technical operating parameters for ATC systems

3.1 Low-power ATC Operation

ATC systems can be used primarily to support the private small cell enterprise networks often requested by business and commercial customers, such as those in mining, oil and gas, port management, utilities and manufacturing. The Authority also notes the benefits of ATC applications for providing capacity to support the deployment of additional services such as IoT and fifth generation (5G) telecommunications services.

Guided by the authorisation approaches taken by the administrations outlined in section 2, the Authority can accommodate low-power ATC service in the 2483.5–2495 MHz band in Trinidad and Tobago. The use of spectrum in the 2483.5–2495 MHz band would allow the offering of high-capacity ATC services, while ensuring that sufficient separation between BWA (2496–2690 MHz) operations and ATC services in the adjacent spectrum is maintained.

ATC systems can operate at low power to support small cell applications, which precludes the deployment of standard public commercial mobile services. Low-power ATC systems allow both MSS and terrestrial systems to thrive in the same band in a complementary manner (ISED 2020).

Policy Statements on the Authorisation of ATC Systems (Low-power ATC operation)

- 1. The Authority shall authorise the deployment of standalone, low-power ATC systems in Trinidad and Tobago for private or closed user group use in the 2483.5–2495 MHz band.*
- 2. Standalone, low-power ATC systems in this band shall not be deployed to provide public telecommunications services.*

3.2 Requirement for MSS Authorisation

As ATC systems can be offered concurrently with MSS, to ensure such systems do not cause harmful interference to MSS, authorisation for ATC operation is conditional on licensees having MSS authorisation from a recognised ITU administration, as the MSS satellite footprint covers Trinidad and Tobago, based on the Authority's register of coordination requests.

ATC authorisation shall be valid until the end of the term of the related MSS authorisation, the discontinuation of the MSS service, or the expiration of an ATC spectrum licence, whichever comes first.

Policy Statement on the Authorisation of ATC Systems (MSS Authorisation requirement)

3. ATC authorisation shall be conditional upon applicants having valid MSS authorisation from a recognised ITU administration and an MSS service footprint that covers Trinidad and Tobago. Authorisation would be valid until the end of the term of the related MSS authorisation, the discontinuation of the MSS service, or the expiration of an ATC station licence, whichever comes first.

3.3 ATC Systems Licences, Fees and Annual Reporting

ISED, as per its 2020 report, *Decision on Globalstar Canada's Application for Ancillary Terrestrial Component (ATC) Authority in the 2.4 GHz Band (2483.5–2500 MHz)*, issues spectrum licences for ATC systems which are subject to spectrum licence fees. Since ISED has not yet established fees specifically for spectrum licences for ATC systems, as an interim measure, it proposed site-specific radio station licences and associated fees prior to the deployment of each installation.

In requesting information and consulting with other administrations, the Authority is mindful that any fundamental changes or differences from FCC or ISED authorisation could substantially delay the provision of services in Trinidad and Tobago. Therefore, the Authority shall adopt a licensing approach that is consistent with those of the FCC and ISED and falls within its legislative regime.

In the absence of defined spectrum licence fees for ATC systems, a point-to-multipoint station licence shall be issued for the operation of low-power ATC services for each base station and will be subject to spectrum fees, in keeping with the *Telecommunications (Fees) Regulations, 2006*. The Authority's discount methodology for frequency reuse, in accordance with its published *Telecommunications Fees Methodology*, will be applied based on the principle of spectrum

efficiency. The licence shall have an annual reporting requirement that would oblige ATC operators to provide summary information on the number and locations of base stations operating. Failure by the licensee to fulfil this requirement may result in penalties that would be defined in the licence being enforced.

The use of the 2483.5–2500 MHz band for ATC operation is not identified in a footnote in the TTFAT. In keeping with its Consultation Procedures, the Authority shall update the TTFAT to include a footnote to permit standalone ATC operations in the 2.4 GHz S-band, in conjunction with the operation of MSS systems, subject to the Authority’s rules for ATC systems and all other applicable conditions and provisions of the global MSS authorisation.

Policy Statements on the Authorisation of ATC Systems (Licence fees and annual reporting)

- 4. The Authority shall issue a point-to-multipoint station licence for the operation of an ATC base station, which shall be subject to licence fees, in keeping with the Telecommunications (Fees) Regulations, 2006 and the Telecommunications Fees Methodology.*
- 5. An ATC point-to-multipoint station licence shall have an annual reporting requirement that would oblige ATC licensees to provide summary information on the number and locations of base stations operating.*
- 6. The Authority shall update the TTFAT, in keeping with its Consultation Procedures, to include a footnote to permit standalone ATC operations in the 2.4 GHz S-band, in conjunction with the operation of MSS covering Trinidad and Tobago.*

3.4 Technical Operating Parameters for ATC Systems

ATC authorisation in the 2.4 GHz S-band has been granted under US rules (FCC §25.149(a)(2)(iii)) and the 3GPP Band 53 specification, both of which only cover the 2483.5–2495 MHz band. The Authority shall align ATC authorisation in Trinidad and Tobago with the standalone ATC ecosystem, which meets the 3GPP Band 53 and Band n53 specifications and adheres to the relevant US rules. This also addresses concerns regarding potential adjacent band interference. While MSS is allocated in the 2483.5–2500 MHz band in the TTFAT, low-power ATC operations shall be restricted to 11.5 MHz of MSS spectrum, in accordance with the 3GPP Band 53 specification (2483.5–2495 MHz).

In Trinidad and Tobago, BWA systems are allocated spectrum above 2496 MHz, providing a 1 MHz guard band between ATC systems (2483.5–2495 MHz) and BWA systems (2496–2690

MHz), but spectrum assignment for BWA systems commences at 2500 MHz. The Authority notes that ATC operations cannot share spectrum with other terrestrial services and that frequency separation is necessary to ensure compatibility between ATC and BWA systems. Notwithstanding the separation requirements, a full 5 MHz frequency separation may not be warranted, given the low-power operation of ATC systems.

The Authority shall maintain the 5 MHz frequency separation until such time that relevant studies have determined the appropriate frequency separation that will ensure the coexistence of ATC and BWA systems. Further authorisation of ATC systems in the 2495–2500 MHz frequency range shall be considered when a wider time division duplex (TDD) channel is standardised by 3GPP. The Authority also notes that ATC systems may exist in other MSS frequency bands. As their deployment matures, the Authority shall consult with stakeholders on their authorisation in those bands.

The use of a network operating system (NOS) facilitates the deployment of standalone ATC systems without impacting MSS or other primary services in adjacent bands. For the purpose of interference mitigation, the Authority will require ATC licensees to operate a NOS, in accordance with the [FCC §25.149](#) rules, as well as ISED's [technical and operational requirements](#) for low-power ATC systems, which are attached as Appendix I.

Policy Statements on the Authorisation of ATC Systems (Technical Operating Parameters)

- 7. The Authority may authorise the deployment of standalone, low-power ATC systems in the 3GPP Band 53 and Band n53 specifications (2483.5–2495 MHz) for private or closed user group use, in keeping with the adopted FCC §25.149 rules and ISED's technical and operational requirements for low-power ATC systems.*
- 8. Further ATC authorisation in the 2.4 GHz S-band may be granted in the 2495–2500 MHz frequency band, should a wider TDD channel be standardised by 3GPP in the future.*
- 9. For the purpose of interference mitigation, the Authority shall require that ATC licensees operate a NOS, in accordance with the licensing conditions specified in Appendix I.*
- 10. ATC systems should neither cause harmful interference to, nor claim protection from, any MSS or other primary services operating in accordance with local and international regulations.*

References

- FCC. 2008. “Globalstar Licensee LLC Application for Modification of License for Operation of Ancillary Terrestrial Component Facilities.” ORDER AND AUTHORIZATION.
- FCC. 2007. *Satellite Ancillary Terrestrial Components*. Notice of Proposed Rule Making, FCC.
- FCC. 2017. “Terrestrial Use of the 2473-2495 MHz Band for Low-Power Ancillary Terrestrial Component of Mobile Satellite Service Systems.” Rule, 8814-8819. <https://www.federalregister.gov/documents/2017/01/31/2017-02027/terrestrial-use-of-the-2473-2495-mhz-band-for-low-power-mobile-broadband-networks-amendments-to>.
- FCC. 2016. *Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks; Amendments to Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems*. Commissioners Pai and O’Rielly. <https://docs.fcc.gov/public/attachments/FCC-16-181A1.pdf>.
- FCC. 2016. *Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks; Amendments to Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems*. Report and Order, FCC.
- Innovation, Science and Economic Development Canada. 2020. *Decision on Globalstar Canada’s Application for Ancillary Terrestrial Component (ATC) Authority in the 2.4 GHz Band (2483.5-2500 MHz)*. Documentation, ISED. <https://ised-isde.canada.ca/site/spectrum-management-telecommunications/sites/default/files/attachments/2022/SMSE-009-20-2020-11EN.pdf>.
- Inter-American Telecommunication Commission. 2020. *Mobile Satellite Services With A Complementary Ground Component In THE S BAND*. ECHOSTAR CORPORATION, OMNISPACE LLC. <https://www.oas.org/ext/en/main/oas/our-structure/agencies-and-entities/citel>.
- TATT. 2007. *Maximum Permissible Exposure Limits for Radio Frequency Radiation in Trinidad and Tobago*. TATT. www.tatt.org.tt.
- TATT. 2022. *Schedule of Devices Eligible for Use Under a Class Licence*. TATT. www.tatt.org.tt.
- TATT. 2022. *Spectrum Management Framework (Version 2.0)*. TATT. Tatt.org.tt.
- TATT. 2008. *Spectrum Plan for the Accommodation of Broadband Wireless Access Services*. TATT. www.tatt.org.tt.

TATT. 2014. *Standards and Guidelines for the Development of Reference Access Offer*. TATT. www.tatt.org.tt.

TATT. 2014. *Telecommunications (Access to Facilities) Regulations*. TATT. www.tatt.org.tt.

TATT. 2019. *Trinidad and Tobago Frequency Allocation Table*. Tatt.org.tt.

Appendix I: Licensing Conditions for the Low-Power Ancillary Terrestrial Component (ATC) Spectrum Licence (ISED 2020)

1. Technical and Operational Requirements

Specifically, the 2.4 GHz low-power ATC system must meet the following technical and operational requirements:

- a) The ATC equipment shall operate in the 2483.5–2495 MHz band only, unless otherwise authorised.
- b) The transmitted signal shall be digitally modulated.
- c) The 6 dB bandwidth⁵ shall be at least 500 kHz⁶.
- d) The output power of the fixed transmitter shall not exceed 0 dBW.
- e) The maximum equivalent isotropically radiated power (EIRP) shall not exceed 6 dBW.
- f) The equipment's maximum power spectral density conducted to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
- g) For the unwanted emissions below 2483.5 MHz, the ATC system's transmitter power, P (Watt), shall be attenuated by at least:
 - i. $40 + 10 \log(P)$ dB at the channel edge at 2483.5 MHz
 - ii. $43 + 10 \log(P)$ dB at 5 MHz from the channel edge
 - iii. $55 + 10 \log(P)$ dB at X MHz from the channel edge
where X is the greater of 6 MHz or the actual emission bandwidth.
- h) For the unwanted emissions above 2495 MHz, the ATC system's transmitter power, P (Watt), shall be attenuated by at least:
 - i. $43 + 10 \log(P)$ dB on all frequencies between the channel edge at 2495 MHz and X MHz from this channel edge

⁵ The "6 dB bandwidth" (ITU-R SM.328 (§ 1.8)) is defined as the width of a frequency band, such that, beyond its lower and upper limits, any discrete spectrum component or continuous spectral power density is at least 6 dB lower than a predetermined 0 dB reference level.

⁶ FCC §15.247 states that, for systems using digital modulation, the minimum 6 dB bandwidth shall be at least 500 kHz.

- ii. $55 + 10 \log(P)$ dB on all frequencies more than X MHz from this channel edge where X is the greater of 6 MHz or the actual emission bandwidth.
- i) Notwithstanding the above requirements, the EIRP density⁷ of the ATC system's unwanted emissions shall not exceed:
 - i. -44.1 dBW/30 kHz measured from the edge of the equipment channel bandwidth.
 - ii. -70 dBW/MHz for broadband emissions and -80 dBW/kHz for discrete emissions in the band 1559–1610 MHz.
- j) Compliance with these limits in i) may be based on the use of a measurement resolution bandwidth of at least 1% of the occupied bandwidth. If 1% of the occupied bandwidth is less than 1 MHz, the power measured shall be integrated over the required measurement bandwidth of 1 MHz.
- k) The 2.4 GHz low-power ATC system meeting the technical requirements in this section may operate in non-forward-band mode.
- l) The 2.4 GHz low-power ATC system meeting the technical requirements in this section is not required to use dual-mode⁸ user equipment.
- m) The ATC licensee shall utilise a network operating system (NOS) consisting of a network management system located at an operations centre or centres. The NOS shall have the technical capability to address and resolve interference issues relating to the licensee's network operations, by:
 - i. reducing operational power.
 - ii. adjusting operational frequencies.
 - iii. shutting off operations.
 - iv. any other appropriate means.

The NOS shall also have the ability to resolve interference from the terrestrial low-power network to the licensee's MSS operations, and to authorise access points to the network which, in turn, may authorise access to the network by end-user devices.

⁷ EIRP density is the amount of power that is radiated by a satellite in a given area, and it is a key factor in determining the quality of service that a satellite can provide (Marcin Frackiewicz, TS2 Space, 2023).

⁸ Dual mode allows for the use of handsets/user terminals that can communicate with the MSS network in the 1610–1615.5 MHz frequency band for mobile terminal transmission and the ATC network in the 2487.5–2493 MHz band for ATC base station transmission.

- n) All access points operating in the 2483.5–2495 MHz band shall only operate when authorised by the ATC licensee’s NOS, and all client devices operating in the 2483.5–2495 MHz band shall only operate when under the control of such access points.
- o) The ATC operation must not constrain the deployment of the MSS satellite networks associated with this licence.

2. Domestic and International Coordination

Where applicable, licensees must use their best efforts to enter into mutually acceptable agreements with other parties to facilitate the reasonable and timely development of their respective systems, and to coordinate with other licensed users in Trinidad and Tobago and internationally.

Licensees must comply with the obligations arising from current and future frequency coordination agreements between Trinidad and Tobago and other countries, and shall be required to provide information on, or take action to implement, these obligations, as indicated in any applicable spectrum plan.