TANZANIA COMMUNICATIONS REGULATORY AUTHORITY

GUIDELINES FOR PROVISION OF DIRECT TO MOBILE PHONE SATELLITE COMMUNICATION

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GUIDELINES FOR PROVISION OF DIRECT TO MOBILE PHONE SATELLITE COMMUNICATION

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List of abbreviations

D2D	Direct-to-Device
D2M	Direct to Mobile Phone
D2C	Direct to Cell
IMT	International Mobile Telecommunications
ITU	International Telecommunications Union
MNOs	Mobile Network Operators
MSS	Mobile Satellite Services
NTN	Non-Terrestrial Networks
SNOs	Satellite Network Operators
SMS	Short Messaging Service
TCRA	Tanzania Communications Regulatory Authority
TN	Terrestrial Networks
UE	User Terminal
WRC-27	World Radiocommunication Conference 2027

Definition of terms

Direct to mobile phone satellite communication	Transmission and reception of signal such as data from satellite directly to a mobile phones
Terrestrial network:	A network that operates on, or near the Earth's surface, using infrastructure like cell towers, fiber-optic cables, or wireless signals to provide communication services.
Space station:	A station located on an object that is beyond, the major portion of the Earth's atmosphere intended to provide communication services.

1. Citation

These Guidelines may be cited as Guidelines for Provision of Direct to Mobile Phone Satellite Communication, 2025.

2. Application

These guidelines shall apply to Satellite Network Operators (SNOs) and Mobile Network Operators (MNOs) seeking to establish a partnership for the provision of Direct to Mobile Phone satellite communication services, to complement terrestrial International Mobile Telecommunications (IMT) services.

3. Introduction

a) Satellite communication has historically played a crucial role in providing connectivity in areas beyond the reach of terrestrial networks. The evolution of satellite-based mobile communication is divided into three key phases:

(i) Legacy Direct-to-Phone Communication: MSS-Based Satellite Phones

In the early days of satellite communication, Mobile Satellite Services (MSS) were designed to provide connectivity using dedicated satellite phones. These systems operated in MSS frequency bands (such as L-band and S-band) and required specialized handsets equipped with high-gain antennas to establish direct links with satellites.

Some of the satellite providers, pioneers to this technology, offered voice, messaging, and limited data services primarily for government agencies, maritime, aviation, and remote users. However, these systems were not compatible with the standard IMT cellular phones, as they relied on MSS spectrum rather than the spectrum for terrestrial IMT.

(ii) Development of Satellite-to-Device Communication: Early IMT Compatibility

With advances in satellite technology, a new approach emerged, allowing satellites to communicate with standard IMT cellular phones, although with significant limitations. This capability was first demonstrated with text messaging services, where satellites could send and receive SMS directly to and from standard smartphones.

(iii) Recent Developments: Direct-to-Phone Using IMT Spectrum

Recent breakthroughs have enabled satellites to communicate directly with standard IMT cellular phones using IMT spectrum without modification. Unlike legacy MSS systems, these new solutions leverage existing terrestrial spectrum and standard mobile protocols, enabling voice, SMS, and even broadband services without requiring specialized satellite handsets.

This technology has been referred to by different names across regions, including Direct-to-Device (D2D); Direct to Mobile Phone (D2M); Direct to Cell (D2C); Direct-to-Phone; Space-Based Cellular Communication (*A term used to emphasize the integration of satellite networks with terrestrial cellular infrastructure*).

Currently, some SNOs are capable of offering Direct-to-Mobile phone services using IMT spectrum under **Article 4.4** of the International Telecommunication Union (**ITU) Radio Regulations**.

b) In recent years, the integration of Non-Terrestrial Networks (NTN) with Terrestrial Networks (TN) has gained significant traction worldwide. The advancement of satellite-based mobile communication, particularly Direct-to-Mobile Phone (D2M) services, has opened new opportunities for extending connectivity to rural and underserved areas.

c) Recognizing the rapid growth of satellite-based IMT communication, the ITU initiated efforts to develop a globally harmonized framework for integrating NTN with TN. The World Radiocommunication Conference 2027 (WRC-27) Agenda Item 1.13 is dedicated to studying the feasibility of using licensed terrestrial IMT bands for MSS to complement terrestrial coverage. The outcome of WRC-27 on Agenda Item 1.13 is crucial in shaping future regulations for NTN-TN integration worldwide.

d) Tanzania, like many other countries, recognizes the potential of Direct-to-Mobile Phone satellite communication in bridging the digital divide, especially in rural and underserved areas. In the light of growing interest from both MNOs and SNOs in

participating in this emerging technology, the Tanzania Communications Regulatory Authority (TCRA) developed these guidelines to facilitate the deployment of direct-to-phone services while ensuring protection of terrestrial IMT operations. These guidelines serve as a transitional framework pending the outcomes of ongoing studies under WRC-27 Agenda Item 1.13.

e) These guidelines have incorporated views of both SNOs and MNOs, gathering their perspectives, challenges, and technical considerations regarding the integration of NTN and TN services through a consultation aimed at understanding their views and perspectives. The consultations provided valuable insights into spectrum management, interference mitigation strategies, service quality expectations, and potential commercial models for collaboration between SNOs and MNOs, therefore informing the framework for spectrum access, authorization conditions, and compliance measures outlined in these guidelines.

4. Objective of the guidelines

The objective of these guidelines is to provide a structured framework for SNOs seeking authorization to offer Direct-to-Mobile Phone services in the United Republic of Tanzania to ensure efficient and fair use of the licensed IMT spectrum while protecting terrestrial IMT networks in the country and neighboring countries.

5. Scope

These guidelines cover the application requirements for the provision of direct to mobile phone satellite communication using licensed terrestrial IMT spectrum and the associated conditions.

6. Conditions for the provision of direct to mobile phone satellite services in Tanzania

Satellite Network Operators wishing to provide Direct to Mobile Phone satellite services in the United Republic of Tanzania:

6.1 Shall apply and obtain satellite landing rights for its space station in accordance with Regulation 4A (2) of the Electronic and Postal Communications (Licensing) (Amendment) Regulations, 2025.

6.2 Shall enter into a partnership arrangement with Licensed MNOs. The arrangement must clearly outline the technical and commercial terms.

6.3 Shall identify all possible interference scenarios with IMT services in the neighboring countries to Tanzania and provide clear mitigation strategies.

6.4 Shall submit quarterly the number of User Terminals (UEs) accessing IMT services directly from satellite, type of UE, and services (Voice, SMS and Data); and geographical distribution of UEs receiving IMT services directly from satellite to TCRA.

6.5 Shall report interference cases, resolutions, and any challenges encountered during resolution to TCRA

6.6 For the purpose of protecting the mobile service, including IMT terrestrial systems, in the territory of neighboring administrations, the equivalent power flux density (epfd) level at any place in the exclusion zone (i.e. a 15 km from the borderline inside Tanzania) shall not exceed the following limits:

(i) -114 dB(W/(m² · MHz)) for $0° < \theta \leq 90°$
(ii) $-136 + 0.21(\theta)^2$ dB(W/(m² · MHz)) for $0° \leq \theta \leq 8.3°$
(iii) $-121.8 + 0.08(\theta)$ dB(W/(m² · MHz)) for $8.3° < \theta \leq 90°$

(where θ is the angle of arrival of the incident wave above the local horizon, in degrees)

6.7 Shall not cause interference to other services nor shall claim protection from interference from other services.

6.8 The control and ownership of spectrum shall remain with MNOs.

7. Application requirement for provision of direct to mobile phone services from satellite

Satellite Network Operators (SNOs) and Mobile Network Operators (MNOs) intending to provide Direct-to-Mobile Phone satellite services to complement terrestrial International Mobile Telecommunications (IMT) coverage shall adhere to the following requirements:

7.1 Submit a joint application letter to the Tanzania Communications Regulatory Authority (TCRA), detailing, inter alia, the proposed network architecture, the radio frequency spectrum to be utilized, and the specific geographical areas targeted for the provision of Direct-to-Mobile Phone satellite services.

7.2 In cases involving the use of a foreign satellite, provide a valid certificate of landing rights authorization issued by TCRA.

7.3 Submit a duly executed partnership agreement outlining the commercial and technical terms governing the collaboration between the parties

7.4 Provide a comprehensive risk assessment report identifying potential sources of interference, along with proposed mitigation measures to ensure the integrity and reliability of both satellite and terrestrial IMT services.

8. Amendment

These guidelines shall be reviewed regularly to ensure continued relevance and accommodate developments in the communication sector.

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