ASIA-PACIFIC TELECOMMUNITY

The 28th Meeting of the APT Wireless Group (AWG-28)

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ITU-APT Foundation of India (IAFI) [1]

Framework for new APT Report "KA-BAND BAND SATELLITE SYSTEMS FOR USE IN THE ASIA PACIFIC REGION AND CONSIDERATIONS FOR DEVELOPMENT OF NATIONAL FREQUENCY PLANS"

Background

At the 27th meeting, a proposal for a new study on Ka-band satellite systems for use in the Asia Pacific region was received and there were extensive discussions on this issue. The meeting had agreed to start, as a first step, study on the scope of the document primarily as an information gathering activity on existing and planned Ka-band satellite systems and services provided in the APT region.

In this regard, AWG-27 had developed a draft framework of the proposed draft new APT Report to facilitate future contribution to the next AWG meeting with additional notes to each section to provide guidelines to the context of information under these sections. The meeting agreed for the framework to be annexed to TG-MSA Work Plan (AWG-27/TMP-29Rev.1). AWG-27 also encouraged members to provide their contribution towards these topics at the next meeting.

Discussions

There has been an increasing need for broadband satellite communications in recent years to provide high speed connectivity needs of users which remain unconnected. Fixed Satellite Service allocations in the Ku (11/14 GHz) and Ka-bands (18/28 GHz) are widely used for satellite communications for provision of broadband services to homes, vehicles, airplanes and ships.

Ka band is a critical frequency band for both GSO and NGSO satellites as these satellites provide high speed broadband data services using smaller size antennas. The Ka band satellite frequency is ideal for satellite internet service in both urban and rural environments for residential users as well as for small and medium sized companies. Today's very high throughput Ka band satellites allow affordable and ubiquitous connectivity to fixed and mobile user terminals, including at very high speeds (e.g., 100 Mbits/s and higher).

Proposal

This contribution proposes further updates to the "Framework for new apt report "ka-band

[1] ITU-APT Foundation of India (IAFI) is a new Affiliate member of APT. Details of IAFI can be seen at itu-apt.org

band satellite systems for use in the Asia pacific region and considerations for development of national frequency plans" contained in AWG/TMP-28 in the attachment.

FRAMEWORK FOR NEW APT REPORT "KA-BAND BAND SATELLITE SYSTEMS FOR USE IN THE ASIA PACIFIC REGION AND CONSIDERATIONS FOR DEVELOPMENT OF NATIONAL FREQUENCY PLANS"

1. Introduction

[to include mention of APT Report 70 for context]

Satellite Communications have changed from analogue communication in the 1980s to digital communication at present, and its throughput has evolved from several kbps to over 100 Mbps. Until recently, satellite communications have been using lower frequencies such as L band and C band, but in recent years satellite communications services using Ku and Ka band are becoming the mainstream Frequency bands due to smaller sizes of the terminal antennae and higher capacity. Ku and Ka bands, used by both GSO and NGSO satellite systems are expected be the main bands to provide satellite connectivity for various applications.

There has been an increasing need for broadband satellite communications in recent years to provide high speed connectivity needs of users which remain unconnected. Fixed Satellite Service allocations in the Ku (11/14 GHz) and Ka-bands (18/28 GHz) are widely used for satellite communications for provision of broadband services to homes, vehicles, airplanes and ships.

Ka band is a critical frequency band for both GSO and NGSO satellites as these satellites provide high speed broadband data services using smaller size antennas. The Ka band satellite frequency is ideal for satellite internet service in both urban and rural environments for residential users as well as for small and medium sized companies. Today's very high throughput Ka band satellites allow affordable and ubiquitous connectivity to fixed and mobile user terminals, including at very high speeds (e.g., 100 Mbits/s and higher).

In addition, following the decisions of WRC-15 and WRC-19, Ka band satellites are also being increasingly used for meeting the mobile communication needs of users. These services have user terminals called earth stations in motion (ESIM) for communicating with geostationary (GSO) or non-geostationary (NGSO) satellites as an application of the Fixed-Satellite Service (FSS). Many administrations have already deployed and authorized ESIM throughout the Ka band.

ITU-R has adopted Reports ITU-R S.2223 - Technical and operational requirements for GSO FSS earth stations on mobile platforms in bands from 17.3 to 30.0 GHz, ITU-R S.2357 - Technical and operational guidelines for earth stations on mobile platforms communicating with geostationary space stations in the FSS in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz and ITU-R S.2261 – Technical and operational requirements for earth stations on mobile platforms operating in NGSO FSS systems in the frequency bands from 17.3 to 19.3, 19.7 to 20.2, 27 to 29.1 and from 29.5 to 30.0 GHz.

For consumers, enterprise and government users, Ka band satellite communications is very versatile, and is designed to meet the most robust broadband needs of such users by cost-effectively providing high speeds and capacity connectivity. The smaller diameter antennas of Ka band systems allow satellite operators to develop high speed Broadband Internet services for end users anywhere.

APT Report 70 developed in 2017 provides a survey report of usage in this band.

2. Ka-band satellite system

[Descriptive information on Ka-band satellite systems in operation and proposed, including the services and applications provided and frequency bands covered, and technical and operational characteristics]

Ka band is currently being used for high-throughput satellite internet access in geostationary orbit (GEO) by the Inmarsat I-5 system and Kacific K-1 satellites. Other well-known Ka-band systems include Australia's nbnSkyMuster satellites and Viasat's ViaSat-1, and ViaSat-2 satellites that are on orbit today and the soon to be launched ViaSat-3 global constellation. Ka band is also being used or being planned for use by a number ofLow Earth Orbit (LEO) and Medium Earth Orbit (MEO) satellites such as those by the SpaceX Starlink, the Iridium Next, TelesatLEO and others including the SES O3b system. These high and very high throughput systems have spot beam technology that allows highly efficient spectrum reuse and substantial increases in throughput speeds and capacity annually, providing service to hundreds of millions of fixed and mobile devices.

In addition, there are several satellite systems both in GSO as well as NGSO configuration like GSAT series of Indian Satellites which have both Ku and Ka band capacities for providing high data rate broadband connectivity to users all over India especially in remote and sparsely inhabited areas including Islands to supplement terrestrial coverage and bridge the digital divide.

The Ka band connectivity will also support very high data rate applications for enterprise network and consumer broadband applications in the following configuration:

3. Sharing issues

[to refer to existing and relevant ITU studies where available related to sharing with terrestrial services and to describe the scope for sharing in general terms. It is not anticipated that new sharing studies will be needed.]

4. Options for national frequency plans

[to provide some guidance for APT administrations for development of national frequency plans for Ka-band]

4.1 The Fixed Satellite Service allocations in Ka-bands (18/28 GHz), which are widely used for satellite communications for affordable provision of high speed and capacity broadband services to hundreds of millions of devices annually in homes, airplanes and ships are critical. In addition, advancements in satellite technologies, includes the more recent NGSO systems which allow for very low-latency applications and can deliver quality and affordable broadband to everyone and everywhere. These satellite technologies will complement GSO and current ground-based services to fully support bridging the digital divide and providing broadband to all.

4.2 To provide some guidance for APT administrations for development of their national frequency plans for Ka-band, some examples of possible considerations are summarized below.

1. In order to meet the spectrum needs of Ka band FSS satellites, provisions need to be made by the APT administrations in their national frequency plans so that the use of

frequency bands 17.7-18.6 GHz, 18.8 –21.2 GHz (space-to-earth), 27.5 to 30.5 GHz (Earth-to- space)in the Fixed Satellite Service may be preserved for high throughput satellites, while protecting Fixed and Mobile Services in accordance with decisions of the ITU are WRC-15 and WRC-19 and the ITU Radio Regulations.

2. The frequency bands 17.7-20.2 GHz (space-to-Earth) and 27.5-30 GHz (Earth-to-space) may be used for ubiquitous fixed and mobile users, including ESIM on land pier-to-pier for maritime ships and gate-to-gate for aircrafts as per the applicable provisions of the Radio Regulations and or its Resolutions.

3. In the frequency bands 17.7-18.6 GHz (space-to-Earth), 18.8-20.2 GHz (space-to-Earth), 27.5-29.1GHz (Earth-to-space) and 29.5-30.0GHz (Earth-to-space), ESIMs may be used for operation with FSS non-geostationary satellites.