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**AGENDA ITEM 1.6
PRELIMINARY VIEWS FOR WRC-19
(Item on the Agenda: 3.1 (SGT-3))
(Document submitted by the Coordinator)**

SGT-3 – Satellite services

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Agenda item 1.6: *to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution 159 (WRC-15)*

BACKGROUND

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Article 22 of the Radio Regulations contains provisions to ensure compatibility of non-GSO FSS operations with GSO networks for the 14/11 GHz and 30/20 GHz bands. Among these provisions are uplink and downlink equivalent power flux density (epfd \uparrow and epfd \downarrow) limits to protect GSO networks from unacceptable interference pursuant to RR No. 22.2. These measures contribute to provide a well-defined regulatory framework for non-GSO systems operating in the 14/11 and 30/20 GHz frequency bands. There are currently no regulatory provisions for sharing between non-GSO systems and GSO networks in the 50/40 GHz frequency bands.

To address these issues, WRC-15 established agenda item 1.6 and associated Resolution **159 (WRC-15)** for WRC-19: “to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution 159 (WRC-15)” which invites the ITU-R membership to contribute to “Studies of technical, operational issues and regulatory provisions for non-GSO fixed-satellite services satellite systems in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space).”

Resolution **159 (WRC-15)** discusses the development of new technologies in the Fixed Satellite Service (FSS) in frequency bands above 30 GHz that would allow for the provision of high-capacity and low-cost communications in all parts of the world, especially in remote and isolated areas. This Resolution considers that satellite constellations in both geostationary-satellite orbits (GSO) and non-geostationary-satellite orbits (NGSO) would allow for the implementation of these new technologies in the FSS bands and that the Radio Regulations should enable the introduction of such technologies to ensure efficient use of the radio spectrum.

Resolution **159 (WRC-15)** *resolves* to invite the ITU-R to conduct and complete in time for WRC-19 studies on the regulatory provisions to enable the operation of NGSO FSS satellite systems in the above mentioned frequency bands, including sharing studies with GSO, EESS, and RAS:

Non-GSO FSS systems in the 50/40 GHz band ~~could allow for the delivery of~~ ~~can be utilized to unlock a new and promising source of~~ global broadband communications. Recent advances in satellite design, launch service capabilities and user terminal technology make it feasible to provide global satellite broadband services. Thanks to these recent technological advances, next-generation non-GSO satellite systems are currently being developed. These systems can greatly enhance the efficient use of existing FSS spectrum by using next-generation satellite and earth station technology. The benefits of such non-GSO satellite systems include providing worldwide connectivity and high-quality communication services to users in all geographic settings, be they urban, rural or remote, and offer tools for definitively addressing the longstanding broadband gap. Developing a regulatory framework in the 50/40 GHz band will provide regulatory certainty to allow non-GSO satellite systems to efficiently operate in these existing FSS frequency bands, while protecting GSO and other existing services.

ISSUES

- What are the appropriate efd limits and regulatory provisions to be adopted to ensure the protection of GSO FSS space and Earth stations?
- What is the appropriate regulatory approach to be adopted to address sharing between NGSO FSS space stations?
- Should Resolution **750** (Rev. WRC-15) be modified to include limits or recommended maximum levels for unwanted emissions to protect EESS (passive) in the bands 36-37 GHz and 50.2-50.4 GHz from the NGSO FSS system operating in the adjacent bands?
- What approach should be retained to ensure the protection of RAS stations in the frequency bands 42.5-43.5 GHz, 48.94-49.04 GHz and 51.4-54.25 GHz from NGSO FSS operating in the adjacent bands?

Preliminary results of studies on the protection of EESS (passive) systems in the 36-37 GHz and 50.2-50.4 GHz frequency bands

Preliminary studies, in accordance with **Resolution 159 (WRC-15)** have been submitted to WP4A on the compatibility between non-GSO FSS systems operating in the bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space).

For the bands, 37.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) studies were carried out between non-GSO FSS systems and EESS (passive) systems operating in the frequency bands 36-37 GHz and 50.2-50.4 GHz. Studies were also undertaken for EESS (passive) systems operating in the 50.2-50.4 GHz frequency band.

A number of ITU-R Recommendations and Reports have been considered in these studies as they provide details on technical and operational characteristics of EESS (passive) sensors, bands of operation and protection criteria. In particular, ITU-R Recommendation RS.1861 and ITU-R Recommendation RS.2017 provide technical and operational characteristics of EESS (passive) services and interference criteria for satellite passive remote sensing in various bands, respectively. As well, Table 1-1 of Resolution 750 (REV.WRC-15) provides limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band 50.2-50.4 GHz.

One study undertaken for EESS (passive) systems operating in the 36-37 GHz frequency band has shown that the protection criteria for these systems are not exceeded for various deployment scenarios of LEO and MEO non-GSO FSS systems.

Several studies were undertaken to determine the impacts of service and gateway links for various LEO and MEO non-GSO systems operating in the bands 48.2-50.2 GHz and 50.4-51.4 GHz on EESS (passive) systems operating in the 50.2-50.4 GHz frequency band. The impacts of both gateways and service links were modelled. These studies have shown that the protection criteria for the EESS (passive) systems are exceeded but that the implementation of mitigation measures such as guard bands limited the levels of unwanted emissions in the band 50.2-50.4 GHz.

More studies will be carried out within WP4A to better ascertain the sharing conditions for various types of non-GSO FSS systems. ~~In addition~~As well, additional mitigation measures could be studied to

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ascertain whether compatibility can be achieved between EESS (passive) and non-GSO FSS systems in the 50 GHz range.

Preliminary studies on compatibility between non-GSO FSS and GSO FSS systems

Preliminary studies have been submitted to WP4A on the compatibility between non-GSO FSS and GSO FSS systems operating in the bands under consideration for this agenda item. These studies consider the impact of non-GSO with regards to GSO protection criteria. In these initial studies that have been submitted to WP4A regarding this topic, it was found that the operation of non-GSO systems does not exceed the protection requirements of GSO FSS networks.

Preliminary studies on compatibility between non-GSO FSS systems

A study on sharing conditions between non-GSO FSS systems operating in the frequency bands 37.5-42.5 GHz (space-to-Earth) and 47.2-48.9 GHz (limited to feeder links only), 48.9-50.2 GHz and 50.4-51.4 GHz (all Earth-to-space) was submitted to WP4A. This study examined the effectiveness of two mitigation techniques (orbital angle avoidance and earth station site diversity). The results of the study showed that modest avoidance angles and earth station site diversity were effective mitigation techniques, allowing for compatibility between the non-GSO FSS systems studied.

PRELIMINARY VIEW

CAN

Canada supports the studies under Resolution 159 (WRC-15) to develop a regulatory framework for new non-GSO FSS satellite systems.

For the band 36-37 GHz: Canada is of the view that based on the results of studies, EESS (passive) systems operating in the 36- 37 GHz band and non-GSO FSS systems are compatible and no regulatory measures are required to address the compatibility between these two services.

For the band 50.2-50.4 GHz: Canada is of the view that based on the results of studies, mitigation techniques and/or regulatory measures may be required to ensure compatibility between EESS (passive) systems operating in the band 50.2-50.4 GHz and non-GSO FSS systems.

Canada is of the view that the use of the bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by non-GSO FSS systems should be subject to coordination procedures under No. **9.12**.

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USA

The United States supports studies under WRC-19 Agenda Item 1.6 regarding the development of a regulatory framework for non-GSO satellite systems in the existing FSS allocations in the 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) frequency bands under the terms of Resolution 159 (WRC-15) and to take appropriate action based on the results of these studies.