



AFRICAN TELECOMMUNICATIONS UNION  
L'UNION AFRICAINE DES TÉLÉCOMMUNICATIONS



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## ITU and African Advanced Level Telecommunications Institute

### Online Training course outline

Title	Emerging non-Geostationary (non-GSO) satellite systems
Modalities	Online Instructor-led
Description	The course aims to provide an exposure to ITU's regulatory process with special emphasis on non-GSO systems and their applications, including introduction to WRC-23 issues/agenda items dealing with non-GSOs. The course shall also include, data-capture/antenna diagrams/validation and focus on non-GSO filing preparation - API, Coordination and Notification.
Dates	14 <sup>th</sup> November – 9 <sup>th</sup> December 2022
Duration	4 weeks
Registration deadline	7 <sup>th</sup> November 2022
Training fees	Sponsored Course by ATU
Course code	22OI500126AFR-E-D

## 1. LEARNING OBJECTIVES

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Based on ITU's Radio Regulations, the course objectives are to provide training in:

- ITU's regulatory process with special emphasis on non-GSO systems and their applications, including introduction to WRC-23 issues/agenda items dealing with non-GSOs. The course shall also include, data-capture/antenna diagrams/validation and focus on non-GSO filing preparation API, Coordination and Notification
- The UN's Outer Space Treaty (OST) and registration of space objects
- API, Coordination and Notification of non-GSO satellite systems;
- Submission of non-GSO satellite systems and networks subject to RR Article 9 coordination;
- Data-capture/antenna diagrams/validation and focus on non-GSO filing preparation;
- EPFD and non-GSO Interference Analysis for regulation;
- Comparison of Low Earth Orbit Satellite systems for various space services including <<large>> Constellation Systems to Provide Global Broadband connection;
- Technical presentation on non-GSO constellation;
- WRC-23 agenda items and issues dealing with non-GSO systems;
- Orbit Spectrum regulatory challenges relating to small satellite Missions;
- Applications of non-GSO satellite systems – ESIMs (Earth Station in Motion), IoT (Internet of Things); EES (active and passive space sensors), RNSS
- Space Debris and collision issues

## 2. LEARNING OUTCOMES

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ITU's Radio Regulations, *inter-alia*, deal with relevant regulatory procedures for Non-GSO systems and the purpose of this course is to provide familiarity with these procedures, more so, in the light ITU satellite filings that are increasingly focussed on non-GSO systems.

## 3. TARGET POPULATION

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The course is in general designed for an audience that deal with telecommunication organizations and concerned particularly with space radiocommunication services. For initiating ITU filings for satellite systems and taking further steps towards coordination, notification and registration of frequency assignments to space systems with the ITU Radiocommunication Bureau, his course shall provide details and procedures.

## 4. ENTRY REQUIREMENTS

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As a prerequisite, the audience of this course is expected to be from an engineering or technical background familiar with the principles of satellite communication. Familiarity with ITU's Radio Regulations and some background about how satellite notices are dealt with by the ITU, would be an advantage.

## 5. TUTORS/INSTRUCTORS

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NAME OF TUTOR(S)/INSTRUCTOR(S)	CONTACT DETAILS
Mr. Attila MATAS	Email: <a href="mailto:am@orbitspectrum.ch">am@orbitspectrum.ch</a> Tel: +41 (79) 599 1426
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## 6. TRAINING COURSE CONTENTS

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### 5.1 API, Coordination and Notification procedures related to non-GSO satellite systems

*Brief Description:* Detailed presentation related to the API, Coordination and Notification regulatory procedures applicable to the Non-GSO satellite systems

### 5.2 Submission of non-GSO satellite systems and networks subject to RR Article 9 (Coordination procedures)

*Brief Description:* Presentation of applicable regulatory rules and ITU Rules of Procedures (RoP) applicable to the submission of non-GSO satellite systems subject to RR Article 9 – Coordination procedures to the Bureau.

### 5.3 Data and antenna diagrams capture /validation and focus on non-GSO filing preparation

*Brief Description:* Detailed presentation related to the preparation of data (AP4 and GIMS) for the Coordination and Notification satellite filings using BRsoft

### 5.4 EPFD and NGSO Interference Analysis for regulation

*Brief Description:* A brief description of ITU-R Recommendation S.1503 that deals with Functional description to be used in developing software tools for determining conformity of non-geostationary-satellite orbit fixed-satellite service systems or networks with limits contained in Article 22 of the Radio Regulations

### 5.5 Comparison of Low Earth Orbit Satellite systems for various space services

*Brief Description:* An overview of LEO Satellite systems that cover various space services identified in Article 1 of ITU's Radio Regulations.

### 5.6 Technical presentation on <<large>> non-GSO constellation to provide global broadband connection

*Brief Description:* Non-GSO orbit and orbital parameters description, difference between the LEO, MEO and GEO orbits, including a brief description of large non-GSO FSS constellations – a curtain raiser for emerging non-GSO satellite systems.

### 5.7 WRC-23 agenda items and issues dealing with Non-GSO networks

*Brief Description:* Identification of WRC-23 agenda Items dealing with Non-GSO satellite networks and an update on the progress made in carrying out compatibility and co-existence studies with other radio services that may be impacted.

### 5.8 Application of Non-GSO Satellite networks – ESIMs (Earth Station in Motion) and IoT (Internet of Things); EEES (active and passive space sensors), RNSS (radio navigation satellite service)

*Brief Description:* The issue of Non-GSO ESIMs (Earth Station in Motion) has been under discussion and for the three components of ESIMs – Land, Aeronautical and Maritime there are compatibility studies and PFD masks that have been developed. A description of ESIM and the PFD mask and how the ESIM ITU filings are going to be analysed by the ITU/BR, shall be presented. The contents of this

presentation shall also include IoT (Internet of Things), EEES (Earth Exploration Satellite Service) – active and passive sensors and RNSS (Radio Navigation Satellite Service).

### 5.9 Orbit Spectrum regulatory challenges relating to small satellite Missions

*Brief Description:* Presentation of regulatory provisions and ITU-R Recommendations applicable to the small satellite missions, applicable frequency bands/services with a special focus on the use of the bands allocated to the amateur-satellite service.

### 5.10 The UN’s Outer Space Treaty (OST) and registration of space objects

*Brief Description:* Presentation of the UN’s OST – rights and obligations of states when launching space objects and doing space activities. Registration of space objects at the UN OOSA space registry.

### 5.11 Space Debris and Collision Issues

*Brief Description:* The space around Earth is littered with roughly 9,000 metric tonnes of debris, according to Nasa. After 65 years of space flight, derelict spacecraft, spent rocket stages, hardware released during missions, exploded motors and more are zooming uncontrollably around earth at speeds of 25,000 km an hour. The launch of thousands of near Earth satellites as part of ‘Large’ Non-GSO satellite constellations has only aggravated the problem. A presentation on the space debris issues and the steps being considered to ‘flag’ and resolve the issue.

## 7. METHODOLOGY (Didactic approach)

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Power Point Presentations shall be made by the instructors to introduce and explain the finer points of the subject matter. Necessary references shall be provided to the relevant provisions of ITU’s Radio Regulations and other publications of the Radiocommunication Bureau/ Space Services Department. ITU/BR software packages shall be demonstrated. These packages have been developed in-house at the ITU/Radiocommunication Bureau. Focus shall be to explain the relevant procedures associated with the title of the subject matter i.e. Satellite coordination and filing.

There would be group exercises using the ITU/BR/SSD Web page. Methods to query ITU database shall be explained besides, data capture, use of validation software and other software packages to calculate the PFD (Power Flux Density) on the Earth’s surface and to check it with the limits of Article 21. Methods to use Appendix 5 for illustrating conditions of satellite coordination shall be explained and there would be exercises and quizzes to illustrate the concept. There shall be other exercises related to various subject matters described above in the Training Course Schedule.

## 8. TRAINING COURSE SCHEDULE

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Week	Session Topic	Exercises
Week 1	API, Coordination and Notification procedures related to non-GSO satellite systems subject to RR Article 9 Coordination	Data and antenna diagrams capture /validation and focus on non-GSO filing preparation
Week 2	Comparison of Low Earth Orbit Satellite systems for various space services	BRsoft - EPFD and NGSO Interference Analysis tools

	Technical presentation on <<large>> non-GSO constellation to provide global broadband connection	
Week 3	WRC-23 agenda items and issues dealing with Non-GSO networks  Application of non-GSO Satellite networks – ESIMs (Earth Station in Motion) and IoT (Internet of Things) ; EEES (active and passive space sensors), RNSS (radio navigation space service)	BRsoft – SpaceCom – ADM comments on the BR IFIC - CR/C Special section publication
Week 4	Orbit Spectrum regulatory challenges relating to small satellite Missions  The UN’s Outer Space Treaty (OST) and registration of space objects  Space Debris and Collision Issues	Complete data preparation – API and Notification - small satellite filing in the bands allocated to the amateur-satellite service

## 9. EVALUATION AND GRADING

The evaluation is based on:

- Attendance (16%)
- Participation in Forums (20%)
- Quizzes/Exercises (64%)

The candidate is required to score **at least 60%** to get ITU Certificate.

## 10. TRAINING COURSE COORDINATION

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