



International Telecommunication Union (ITU)

The practical Steps to File a Satellite Network at ITU

Presentation to UNOOSA Access to Space to All webinar
11 November 2020

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Overview

- Why do we need regulations for spectrum and orbits ?
- Steps to File a Satellite Network to ITU



Why do we need regulations for radio frequency spectrum and satellite orbits ?



IS SPACE BIG ENOUGH ?

Risk of Signal Interference During Operation





1. Harmonize global spectrum to create economies of scale, roaming and interoperability

3. Creating certainty requires consensus: time, efforts and patience

Intergovernmental Treaty

PURPOSE

2. Create regulatory certainty for a multi-trillion dollars industry playing an increasingly important role in the development of our societies

TODAY

More than 2000 pages of Radio Regulations

39 Conferences since 1906 - 40 Services - 8.3kHz to 3'000GHz



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CONTROL OF INTERFERENCE



RADIO REGULATIONS

5 Mechanisms

ALLOCATION

Frequency separation of stations of different services

POWER LIMITS

PFD to protect TERR services / EIRP to protect SPACE services / EPFD to protect GSO from Non-GSO

COORDINATION

between Administrations to ensure interference-free operations conditions, **when sharing orbit/spectrum**

RECORDING

In the **Master International Frequency Register (MIFR)**
International recognition of right to use spectrum/orbit

MONITORING

International monitoring system



Steps to File a Satellite Network to ITU?

**Mechanisms of the Radio Regulations (RR) and
the ITU Radiocommunication Bureau (BR)**





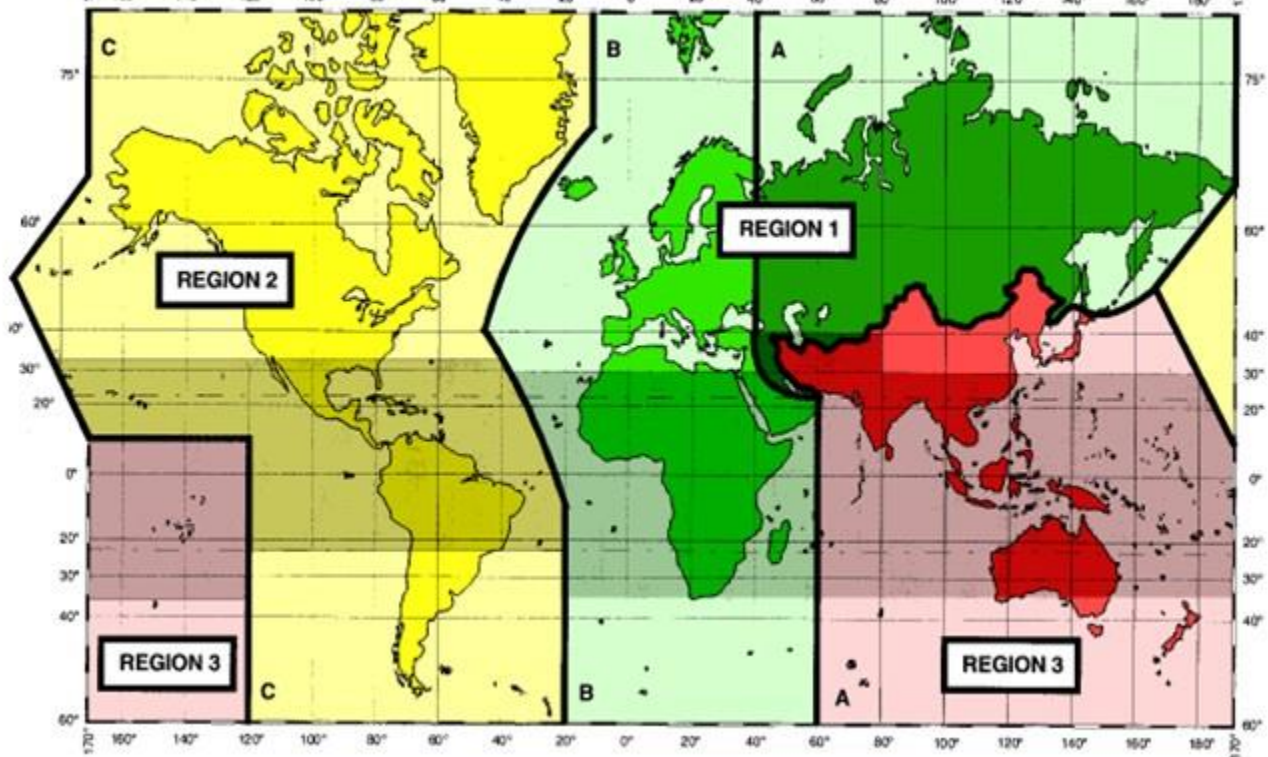
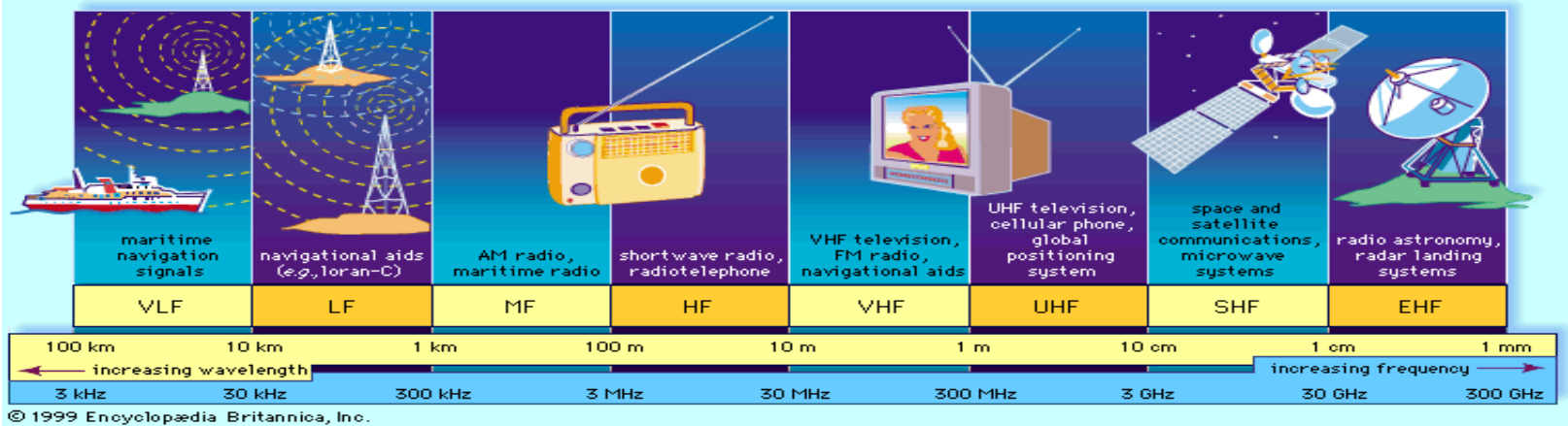
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**CONTROL OF
INTERFERENCE**

RADIO REGULATIONS

STEP 1 :
Identifying
Service, Frequency, Region
In the Table of ALLOCATION

Allocations = Services + Frequencies + Regions



UNOOSA Access to Space to All – webinar 2020 – ITU

RR ARTICLE 5

Table of Frequency Allocations

Allocation to services			
Region 1	Region 2	Region 3	
17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	17.7-17.8 FIXED FIXED-SATELLITE (space-to-Earth) 5.517 (Earth-to-space) 5.516 BROADCASTING-SATELLITE Mobile 5.515	17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	
	17.8-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE 5.519		
	18.1-18.4 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B (Earth-to-space) 5.520 MOBILE 5.519 5.521		

PRIMARY

Secondary

Footnotes

- **Exclusive allocations** for broad international use of equipment (harmonization)
- **Shared frequency allocations** to maximize the use of spectrum (optimization)

SHARING ORBIT/SPECTRUM RESOURCE

1. COORDINATION Non-Plan APPROACH

- First come, first served
- Priority to Rational, Efficient, Economical Use
- Rights acquired through coordination with administrations concerning actual usage
- Dense/irregular orbital distribution of space stations

2. PLANNING APPROACH

- A priori Plans for future use by all countries - Member States
- Priority to Equitable Access
- Rights acquired during a Planning process at a WRC
- Predetermined orbital position & frequency spectrum
- Congestion of GSO
- Additional use possible



International Recognition to use orbit/spectrum
Registration of the Satellite Network Notice
in the **Master Register** (MIFR)



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**CONTROL OF
INTERFERENCE**

RADIO REGULATIONS

STEP 2 : CHARACTERISTICS of the Satellite Network to submit in the filing to ITU

RR Appendix 4 data submission

Regulatory and technical data – antennas...

BR Space software SpaceCap, SpaceVal, e-submission system

Graphical data – gain contours, Service areas...

BR Space software GIMS, e-submission system

Items in Appendix	<i>B - CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2.A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
B.1	IDENTIFICATION AND DIRECTION OF THE SATELLITE ANTENNA BEAM										B.1	
B.1.a	the designation of the satellite antenna beam For an earth station, the designation of the satellite antenna beam of the associated space station			X	X	X	X	X	X	X	B.1.a	
B.1.b	an indicator showing whether the antenna beam, under B.1.a, is fixed or whether it is steerable and / or reconfigurable			X	X	X		X	X	X	B.1.b	
B.2	TRANSMISSION / RECEPTION INDICATOR FOR THE BEAM OF THE SPACE STATION OR THE ASSOCIATED SPACE STATION			X	X	X	+ ¹			X	B.2	
B.2bis	CONTINUOUS/NON-CONTINUOUS TRANSMISSION INDICATOR FOR THE BEAM OF THE SPACE STATION										B.2bis	
B.2bis.a	an indicator specifying whether the space station only transmits when visible from the notified service area In the case of advance publication, required only for frequency assignments of a non-geostationary satellite transmitting beam In the case of notification or coordination of a non-geostationary-satellite network, required only for frequency assignments of a non-geostationary satellite transmitting beam of a satellite network not subject to Nos. 22.5C, 22.5D or 22.5F			+		+					B.2bis.a	
B.2bis.b	in case of non-continuous transmission in item B.2bis.a, the minimum elevation angle above which transmissions occur when the space station is visible from the notified service area In the case of notification or coordination of a non-geostationary-satellite network, only for frequency assignments of a non-geostationary satellite transmitting beam of a satellite network not subject to Nos. 22.5C, 22.5D or 22.5F			O		O					B.2bis.b	
B.3	SPACE STATION ANTENNA CHARACTERISTICS										B.3	
B.3.a	For each space station antenna:										B.3.a	
B.3.a.1	the maximum co-polar isotropic gain, in dBi Where a steerable beam (see No. 1.191) is used, if the effective boresight area (see No. 1.175) is identical with the global service area, the maximum antenna gain, in dBi, is applicable to all points on the Earth's visible surface			X	X	X		X	X	X	B.3.a.1	
B.3.a.2	if a non-elliptical beam, the maximum cross-polar isotropic antenna gain, in dBi							+	+		B.3.a.2	



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**CONTROL OF
INTERFERENCE**

RADIO REGULATIONS

**STEP 3 : Examination if
POWER LIMITS respected**

“Hard Power limits” and “findings”

Power Limits and Power Flux Density (PFD) Masks
to protect Terrestrial Services

Equivalent Isotropically Radiated Power (EIRP) limits
to protect Space Services

EPFD to protect GSO from non-GSO

BR Space software GIMS, GIBC, MSpace... RR Articles 21, 22...



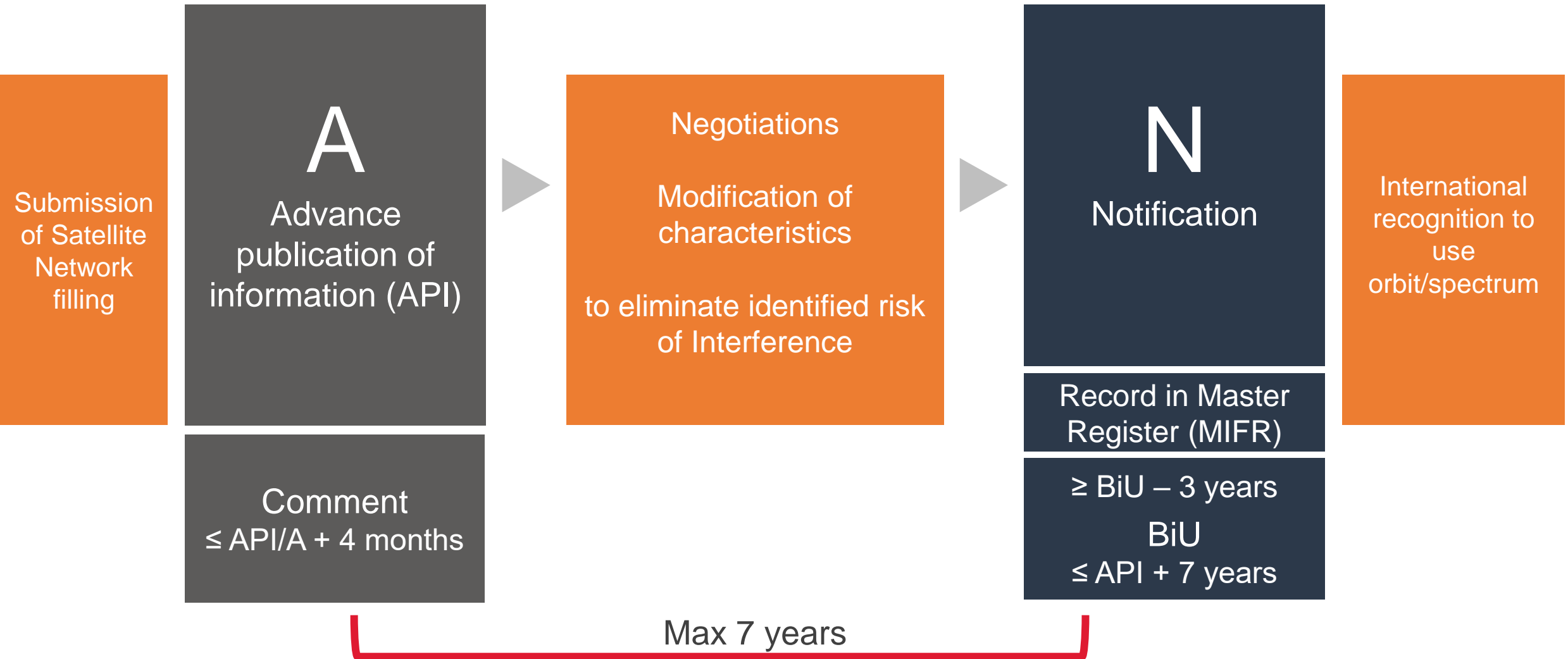
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**CONTROL OF
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RADIO REGULATIONS

**STEP 4 : SHARING
orbit/spectrum
Series of bilateral
negotiations to prevent
harmful interference**

Non-Plan Procedures for satellites not subject to coordination (RR Volume 1 Articles 9 and 11)



Key issues about successful negotiations

Many filings to consider

- time consuming within regulatory deadlines
- technical challenge to ensure operation

With the priority approach, filings may not be real

- "Paper" submissions
- Systems not in actual use



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**CONTROL OF
INTERFERENCE**

RADIO REGULATIONS

STEP 5 : Into the Master Register

International Recognition to use spectrum and orbit

Master Register – MIFR For Operation Free of Interference

>6'000

Number of satellite networks registered

Data Available

On line on the ITU-R website and in the BR IFICs

KEY POINTS TO REMEMBER

- **2 natural limited resources** to be globally shared and regulated:
orbit & radiofrequency spectrum
- **Legal framework:** ITU Constitution/Convention, **Radio Regulations**, Rules of Procedures, Recommendations
- **5 Steps to register satellite frequencies:**
 1. Identify radio service, frequencies and ITU Region in the Table of Frequency Allocation of the Radio Regulations
 2. Gather characteristics of the satellite network to be submitted in the filing to ITU
 3. Check if power limits and other regulatory limits are respected
 4. Share identified orbit/spectrum resources through bilateral negotiations aimed at preventing harmful interference to occur
 5. Send the final characteristics for entry into the ITU Master Register
- Never hesitate to contact the ITU Radiocommunication Bureau in case of doubts or questions:

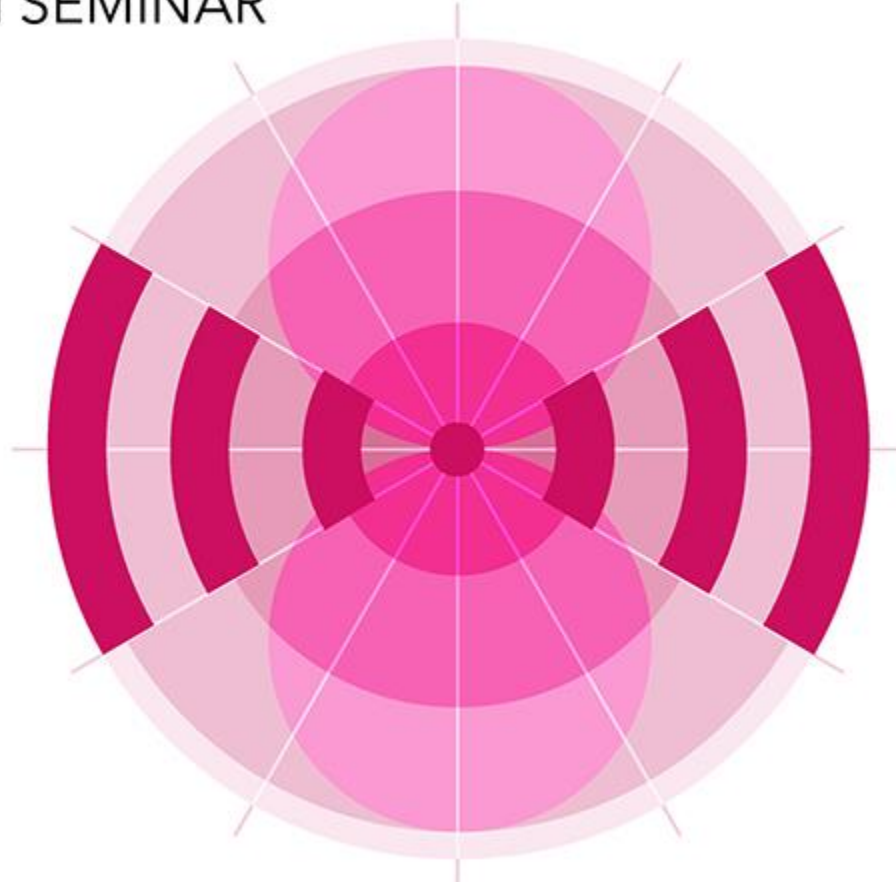


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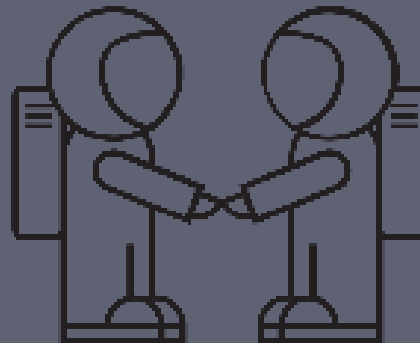
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ANNEXES



Abbreviations

- ITU: International Telecommunication Union
- RR: Radio Regulations
- MIFR: Master International Frequency Register
- WRC: World Radio Conference
- RRB: Radio Regulation Board
- GSO: Geostationary Orbit
- Non-GSO: Non- Geostationary Orbit
- LEO: Low Earth Orbit
- PFD: Power Flux Density
- EIRP: Equivalent Isotropic Radiation Power
- BR IFIC: Bureau Radiocommunication International Frequency Information Circular
- API: reference of a Special Section in the BR IFIC
- CR/C: reference of a Special Section in the BR IFIC
- ICT: Information, Communication and Technologies
- OOSA: Office of Outer Space Affairs

FREE ONLINE ACCESS

- The ITU Constitution
<http://www.itu.int/pub/S-CONF-PLEN>
- World Radiocommunication Conference (WRC)
<https://www.itu.int/en/ITU-R/conferences/wrc/Pages/default.aspx>
- ITU-Radio Regulations
<https://www.itu.int/en/history/Pages/RegulationsCollection.aspx>
- ITU-R Recommendations
<http://www.itu.int/publ/R-REC/en>
- Preface to the BR International Frequency Information Circular (Space services)
<https://www.itu.int/ITU-R/go/space-preface/en>

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ITU-R help & documents

- **Small Satellite Support**

- <https://www.itu.int/en/ITU-R/space/Pages/supportsmallsat.aspx>

- **BR space website**

- <https://www.itu.int/en/ITU-R/space>

- **SNL online** (*basic reference info concerning space stations*)

- <https://www.itu.int/ITU-R/go/space/snl/en>

- **SNS online**

- *TIES account required, need to be an ITU member (member state, ITU-R sector member, associate or academia)*

- <https://www.itu.int/sns/>

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ITU-R documents & events

➤ **ITU Radio Regulations @ 2020**

<https://www.itu.int/pub/R-REG-RR/>

➤ **ITU RoP** <https://www.itu.int/pub/R-REG-ROP/en>

➤ **ITU-R Preface** <https://www.itu.int/ITU-R/go/space-preface/en>

➤ **ITU-R Recommendations**

<https://www.itu.int/publ/R-REC/>

➤ **ITU-R Reports** <https://www.itu.int/pub/R-REP/>

➤ **WRC-19**

<https://www.itu.int/en/ITU-R/conferences/wrc/2019/>

➤ **CPM19-2**

<https://www.itu.int/en/ITU-R/study-groups/rcpm/Pages/cpm-19.aspx#>

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ITU-R Publications

<https://www.itu.int/en/publications/ITU-R/Pages/default.aspx>

- **Handbook for Small Satellites** (Developed in partnership between UNOOSA and ITU BR)

<https://www.itu.int/en/ITU-R/space/Documents/Handout-on-Small-SatellitesE.pdf>

- **Handbook for amateur and amateur-satellite services**

<https://www.itu.int/en/publications/ITU-R/pages/publications.aspx?parent=R-HDB-52-2014&media=electronic>

- **Handbook for earth exploration satellite service**

<https://www.itu.int/en/publications/ITU-R/pages/publications.aspx?parent=R-HDB-56-2011&media=electronic>

- **Handbook for meteorological-satellite service**

<https://www.itu.int/en/publications/ITU-R/Pages/publications.aspx?lang=en&media=electronic&parent=R-HDB-45-2017>

- **Handbook for space research service**

<https://www.itu.int/en/publications/ITU-R/pages/publications.aspx?parent=R-HDB-43-2013&media=electronic>