

The background features a large, light blue watermark of the International Telecommunication Union (ITU) logo. It consists of a globe with a satellite in orbit, and the letters 'ITU' are prominently displayed in the center.

# Frequency Registration for Small Satellite Missions

**United Nations/South Africa Symposium on Basic Space Technology  
"Small Satellite Missions for Scientific and Technological Advancement"  
Stellenbosch, South Africa, 11 - 15 December 2017**

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# Agenda

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- **ITU in brief**
  - **Background of Radio Regulations**
  - **Filing procedure for NGSO small satellites**
  - **Satellite services and frequency allocations relevant to small satellites**
  - **Data items required for small satellite filings**
  - **Capture of information and submission to the ITU**
  - **Cost recovery**
  - **WRC-15 and WRC-19**
-

**ITU in brief**

**ITU**



# ITU in Brief

- Founded on 17 May 1865
- ITU (International Telecommunication Union) is the United Nations specialized agency for information and communication technologies – ICTs
- ITU is headquartered in Geneva, Switzerland, and has twelve regional and area offices around the world.
- Founded on the principle of international cooperation between governments (Member States) and the private sector (Sector Members, Associates and Academia), ITU is the premier global forum through which parties work towards consensus on a wide range of issues affecting the future direction of the ICT industry.
- <http://www.itu.int>



*Meet us*

## WHO ARE WE?

### *Our numbers*

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193

MEMBER  
STATES



700

PRIVATE SECTOR  
ORGANIZATIONS



70

ACADEMIA  
MEMBERS



# Structure



**Radiocommunications**  
**- regulations**  
**- standards**



**Standardization**

**Development**





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# Radio Regulations





# ITU Radio Regulations

## ITU Radio Regulations (RR)

- Part of the ITU Administrative Regulations and Instruments complementing the provisions of the ITU Constitution (CS) and Convention (CV), which govern the use of telecommunications
- *Legal treaty - bindings on all Member states*
- Principles of use of orbit/spectrum
- Define the rights and obligations of Member States in respect of the use of these resources
- Allocation of frequency bands and services
- Procedures and Plans
- Updated every 3-4 years by the World Radiocommunication Conference (WRC)

## Are we obliged to apply the ITU Radio Regulations?

- Ratification of the ITU Convention (CV) implies acceptance of the ITU Radio Regulations



# Radio Regulations

The **ITU Radio Regulations (RR)** incorporates the decisions of the World Radiocommunication Conferences (**WRC**), including all Articles, Appendices, Resolutions, Recommendations and ITU-R Recommendations incorporated by reference.



- **Two main concepts:**

- Frequency block **allocations** to defined radio services (**Table** - Article 5)
- Mandatory or voluntary **regulatory procedures** (Coordination, Plan, Notification) and Recording in the Master International Frequency Register (**MIFR**) that are adapted to the frequency allocation structure

## Control of Interference

### 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 N-GSO

(EPFD = aggregate equivalent power flux-density)

### REGULATORY PROTECTION

e.g. No. 22.2: Non-GSO to protect GSO (FSS and BSS)

### COORDINATION

between Administrations to ensure **interference-free** operations conditions



# Radio Regulations

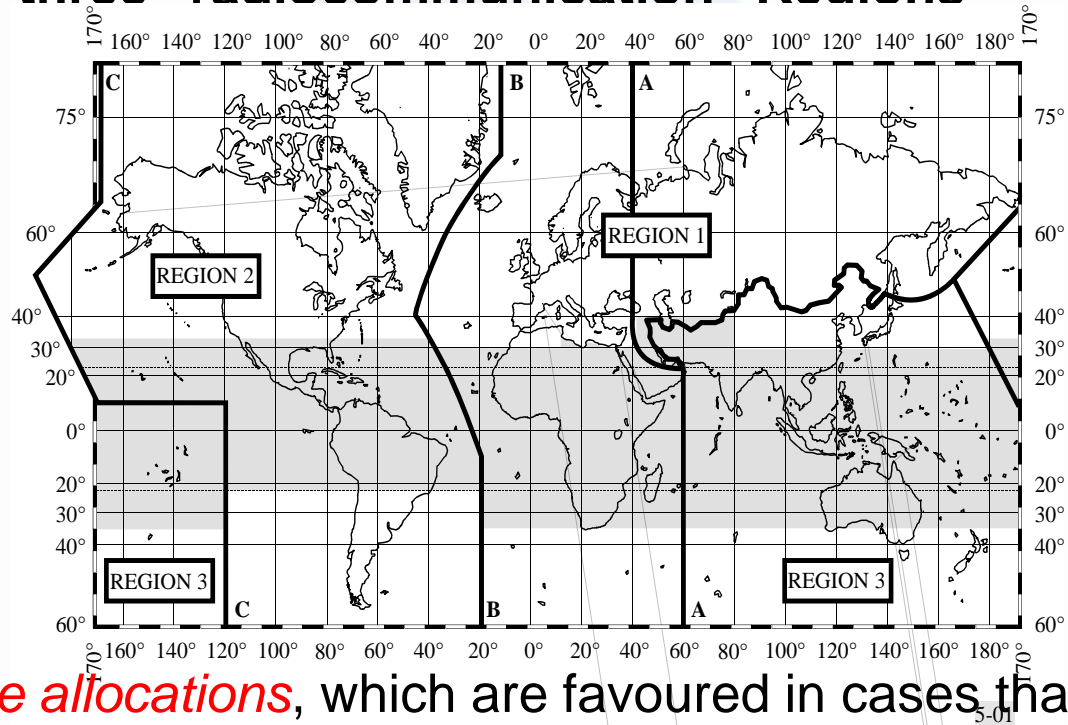
– useful sections for small satellite missions

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- **Article 1 Definitions**
- **Article 5 Table of Frequency Allocations**
- **Article 9 and 11 Procedures for the advance publication (API), coordination and notification**
- **Article 21/22 Power limits**
- **Article 25 Amateur and Amateur-satellite service**
- **Appendix 1 Classification of emissions**
- **Appendix 4 Data required for satellite filings**

# ART 5 frequency allocations - 1

- **No. 5.2 - For the allocation of frequencies the world has been divided into three “radiocommunication” Regions**



- **Exclusive allocations**, which are favoured in cases that involve *broad international use of equipment*
- **Shared frequency allocations**, which are applied to maximize the use of the available spectrum when *two or more radiocommunication services can effectively utilize the same frequency band*

# ART 5 frequency allocations - 2



- **A *shared* frequency band can be allocated to more than one service (*PRIMARY* or *secondary*), either on a worldwide or Regional basis**
- **No. 5.28 - Stations of a *secondary* service:**
  - **5.29** - *shall not cause harmful interference* to stations of *PRIMARY* services to which frequencies are already assigned or to which frequencies may be assigned at a later date;
  - **5.30** – *can not claim protection from* harmful interference from stations of a *PRIMARY* service to which frequencies are already assigned or may be assigned at a later date;
  - **5.31** - *can claim protection*, however, from harmful interference from stations of the same or other *secondary* service(s) to which frequencies may be assigned at a later date.
- **A *footnote* to a frequency band or service *may include a restriction* on the service or services concerned**
  - For example:
    - *to operate in a particular country(ies) or service area*
    - *not causing harmful interference to another service*
    - *not claiming protection from another service*

# Example page of Table of frequency allocations



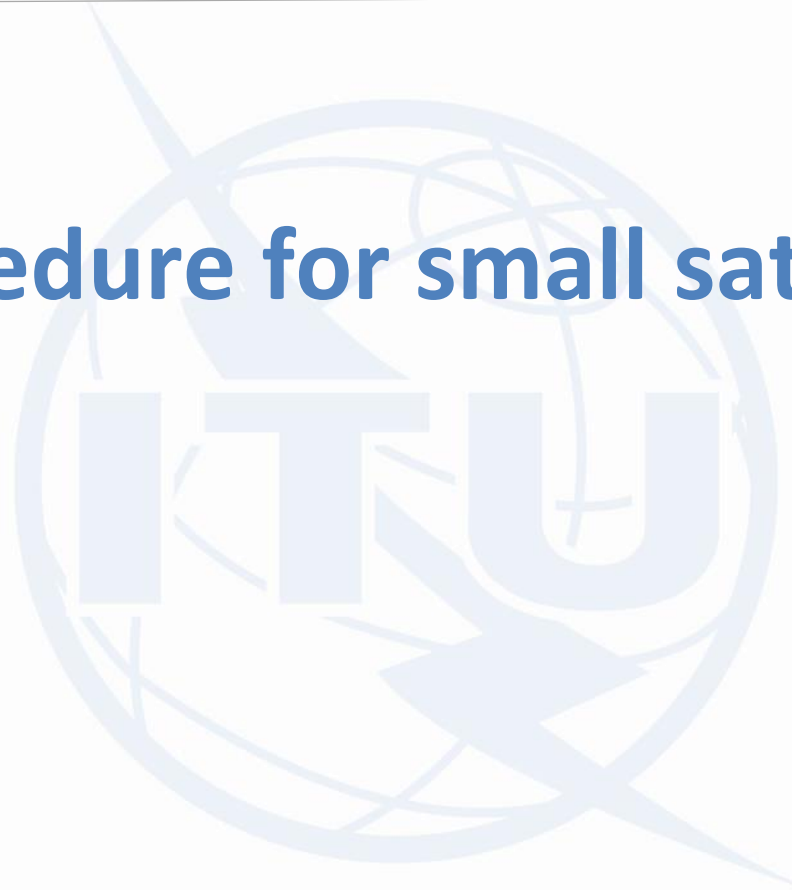
## 335.4-410 MHz

Allocation to services		
Region 1	Region 2	Region 3
335.4-387	FIXED MOBILE 5.254	
387-390	FIXED MOBILE Mobile-satellite (space-to-Earth) 5.208A 5.208B 5.254 5.255	
390-399.9	FIXED MOBILE 5.254	
399.9-400.05	MOBILE-SATELLITE (Earth-to-space) 5.209 5.220	
400.05-400.15	STANDARD FREQUENCY AND TIME SIGNAL- SATELLITE (400.1 MHz) 5.261 5.262	
400.15-401	METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) 5.263 Space operation (space-to-Earth) 5.262 5.264	

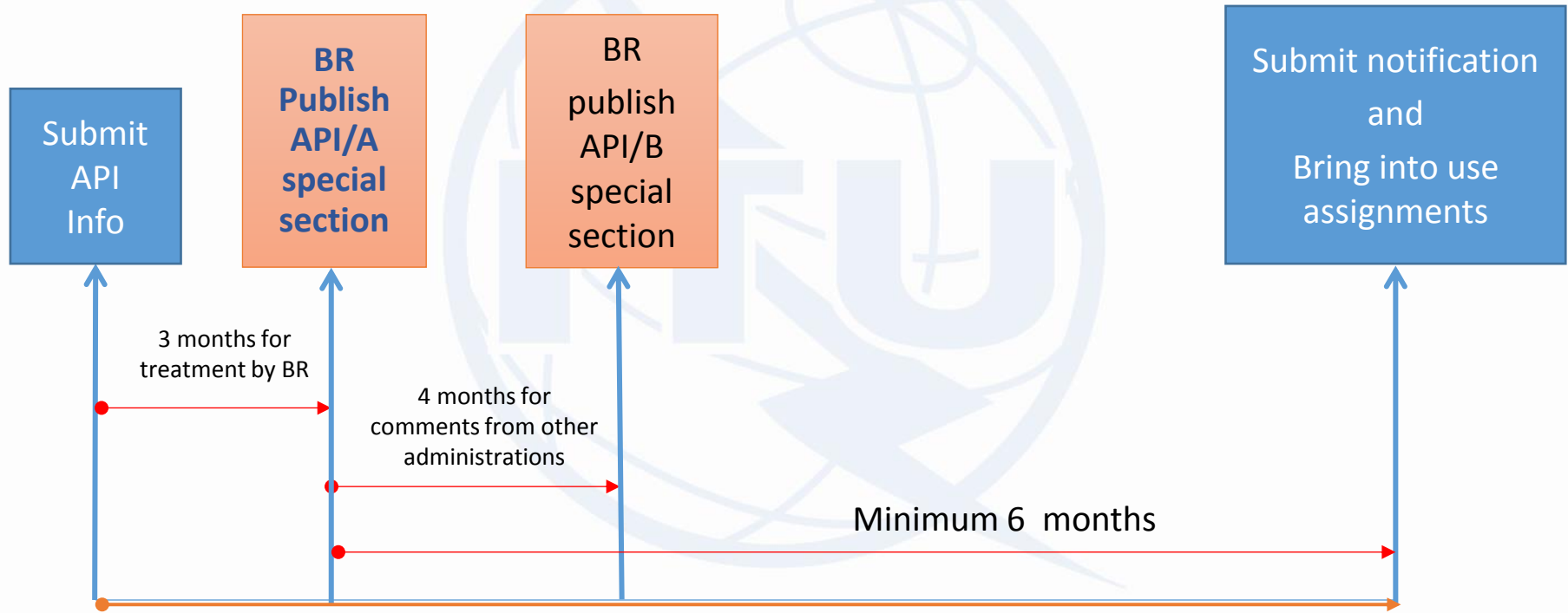


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# Filing procedure for small satellites



# Timeline for satellite networks not subject to coordination



**MIN 9 MONTHS, MAX 7 YEARS!**



# Advance Publication Information (API)

- API is a mandatory procedure for all satellite network not subject to coordination procedure
- Small satellites usually make use of frequency bands that are not subject to coordination
  - To know whether a frequency band is subject to coordination, read the footnotes in the Table of Frequency Allocations
  - Examples of footnote indicating coordination is required:
    - *5.364 The use of the band 1 610-1 626.5 MHz by the mobile-satellite service (Earth-to-space) and by the radiodetermination-satellite service (Earth-to-space) is subject to coordination under No. 9.11A. (For coordination under No. 9.11A, see also Rule of Procedure)*
    - *5.286 The band 449.75-450.25 MHz may be used for the space operation service (Earth-to-space) and the space research service (Earth-to-space), subject to agreement obtained under No. 9.21.*
- For such systems not subject to coordination, the provisions of Article 9, Sub-Section IA (API on satellite networks that are not subject to coordination procedure under Section II), are applicable.
- Although not subject to coordination, there is a commenting procedure and resolutions of difficulties specified under No.9.3

# Regulatory procedures for comments and resolution of difficulties



## ➤ **Commenting procedures**

- Comments to an API/A should be submitted within 4 months of API (No.9.3)
- Comments to be captured using SPACECOM (**RES-55**)
- The Bureau publishes the list of administrations which have sent comments in an API/B special section

## ➤ **Resolution of difficulties**

- Both administrations shall endeavour to cooperate in joint efforts to resolve any difficulties and shall exchange any additional relevant information that may be available
- *Either party can request for the assistance of the Radiocommunication Bureau (No.9.3)*
- In case of difficulties, the administration responsible for the planned satellite network shall explore all possible means to resolve the difficulties without considering the possibility of adjustment to networks of other administrations
- If no such means can be found, it may request the other administrations to explore all possible means to meet its requirements.
- The administrations concerned shall make every possible effort to resolve the difficulties by means of mutually acceptable adjustments to their networks.

# Notification for recording in the Master Register



- **What assignments should be notified (No.11.2)?**
  - Any frequency assignments of transmitting and receiving earth and space stations
    - *Capable of causing harmful interference; or*
    - *Used for international radiocommunication; or*
    - *Seeking to obtain international recognition; or*
    - *Non conforming assignment seeking to be recorded for information purposes only*
    - .....
- **Information received for notification will first be published in Part I-S as an acknowledgement for the receipt of the data,**
- **The notification will be examined in detailed and given a finding, which will be published in a Part 2-S if the finding is favourable, and a Part 3-S if the finding is unfavourable**



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# Satellite services and allocations relevant to small satellite





# Typical services for small satellites

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- **Amateur-Satellite Service**
- **Space Operation Service**
- **Earth Exploration-Satellite Service**
- **Space Research-Satellite Service**
- **Meteorological-Satellite Service**
- **Others**

# Amateur Satellite Service – Frequency allocations



Frequency band	Service	Type of allocation
28-29.7 MHz	Amateur-Satellite Service	Primary
144-146 MHz	Amateur-Satellite Service	Primary
435-438 MHz	Amateur-Satellite Service	Secondary (No.5.282)
1260 – 1270 MHz	Amateur-Satellite Service (E-S)	Secondary (No.5.282)
2400 – 2450 MHz	Amateur-Satellite Service	Secondary (No.5.282)
3400 – 3410 MHz	Amateur-Satellite Service	Secondary (No.5.282)
5650 – 5670 MHz	Amateur-Satellite Service (E-S)	Secondary (No.5.282)
5830 – 5850 MHz	Amateur-Satellite Service (S-E)	Secondary
.....		

For more details and the conditions for the usage of these bands, please refer to Article 5 of the Radio Regulations.



# Amateur satellite service

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- **API must be submitted to ITU before coordinating frequency with IARU.**
  - **Note that frequency assignments in notification must be covered by frequency bands in API, therefore avoid submitting a very narrow frequency band at the API, in case there is a change needed during the comments/consultation process.**
  - **No. 25.11 - Administrations authorizing space stations in the amateur satellite service shall ensure that sufficient earth command stations are established before launch to ensure that any harmful interference caused by emissions from a station in the amateur-satellite service can be terminated immediately**
  - **Amateur-satellite service is exempted from cost recovery fee**
-



# Notification of earth stations in the amateur-satellite service

- **No.11.14 Frequency assignments to earth stations in the amateur-satellite service is not required to be notified for recording in the MIFR**
  
- **Resolution 642 - relating to bringing into use of earth stations in the amateur-satellite service**
  - When an administration wishes to publish info for the earth station,
  - Step 1
    - *It may communicate to the BR all or part of the information listed in Appendix 4*
    - *BR will publish in a special section of a BRIFIC*
    - *Comments to be communicated within a period of 4 months*
  - Step 2
    - *It may notify under Nos. 11.2 to 11.8 all or part of the info listed in Appendix 4*
    - *BR shall record it in a special list*
  - Information shall include at least the characteristics of a typical amateur earth station in the amateur-satellite service having the facility to transmit signals to the space station to initiate, modify, or terminate the functions of the space station



# Earth exploration-satellite service (EESS) - Frequency usage



## ➤ **Satellite bus links for TT&C**

- The primary functions – telemetry, tracking, and command (TT&C) are operations functions associated with the satellite bus. The satellite bus provides the necessary support functions for the operation of the instruments (payload).
- The allocations near 2 GHz for the EESS provide reliable, weather independent links for Earth exploration satellites.

## ➤ **Sensor data downlink**

- The transmission of sensor data to earth station, either directly or indirectly via a data relay satellite, is carried through the satellite bus and its data handling system. This data link will be called the science data or EESS data downlink.

## ➤ **Typically, the satellite bus links require relatively low bandwidths as they support a data rate of about 1 Mbit/s and often much less, while the science data rates typically are in the order of a hundred Mbit/s.**

# Frequency allocations for EESS usable for TT&C



Frequency band	Service	Type of allocation
401-403 MHz	EESS (E-S)	Primary
401-402 MHz	SOS (S-E)	Primary
1427 – 1429 MHz	SOS (E-S)	Primary
2025 – 2110 MHz	EESS (E-S, S-S) SOS (S-E, S-S)	Primary
2200 – 2290 MHz	EESS(S-E, S-S) SOS( S-E, S-S)	Primary
8025 – 8400	EESS (S-E)	Primary
13.75 – 14 GHz	EESS	Secondary
.....		

For more details and the conditions for the usage of these bands, please refer to Article 5 of the Radio Regulations.

# Frequency allocations for EESS downlink usage



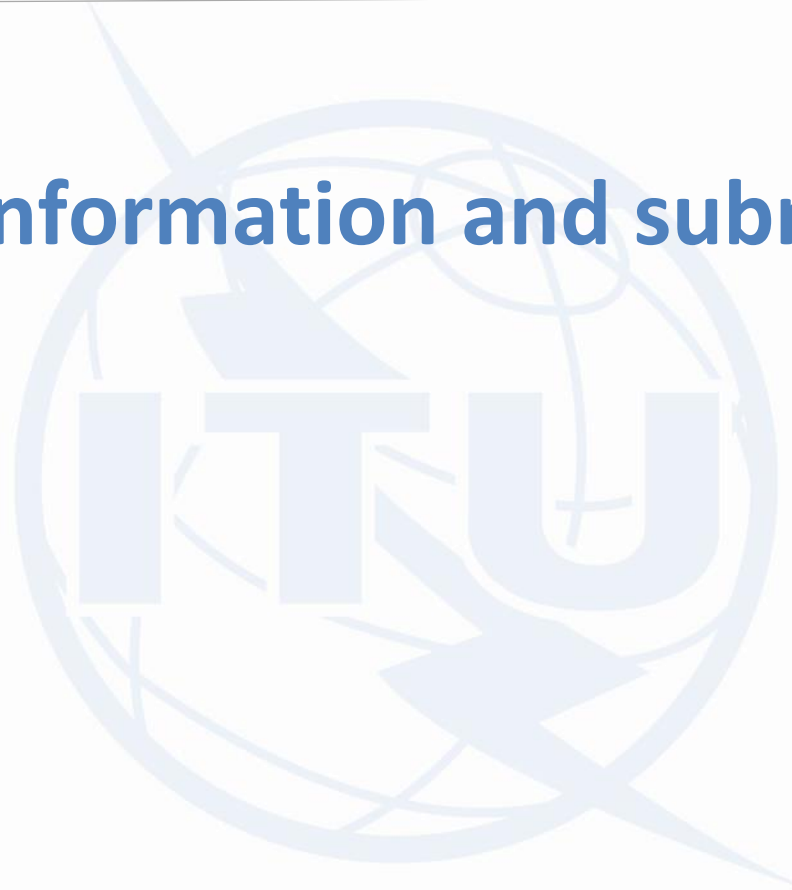
Frequency band	Service	Type of allocation
460-470 MHz	EESS (S-E)	Secondary
1690 – 1710 MHz	EESS (S-E)	Secondary
2200 – 2290 MHz	EESS (S-E)	Primary
8025 - 8400 MHz	EESS (S-E)	Primary
.....		

For more details and the conditions for the usage of these bands, please refer to Article 5 of the Radio Regulations.



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# Capture of information and submission to the ITU



# Information required for filing



- Specified in Appendix 4 of the Radio Regulations, including:
  - Satellite name, responsible administration
  - Orbital characteristics
  - Antenna beam characteristics
  - Frequency band
  - Service Areas
  - Power levels/designation of emissions etc.
  - Earth stations
  - Etc....
- **All submissions should be in BR software Spacecap compatible format (Resolution-55)**



## ➤ Sensors specific information

- Active Sensors
  - *Transmit beam*
    - Mean peak power and mean power density
    - Pulse length and pulse repetition frequency
  - *Receive beam*
    - Receiver noise bandwidth
    - Noise temperature at output of signal processor
- Passive sensors
  - Observed bandwidth
  - Sensitivity
- To capture sensor information in Spacecap, go to Beam tab, check the box “Beam has Sensors”
- Class of stations – E1, E2, E3, E4 (consult the Preface)

# Appendix 4 - example

AP4-64

Items in Appendix	<p><i>C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA</i></p>
<b>C.1</b>	<b>FREQUENCY RANGE</b>
C.1.a	the lower limit of the frequency range within which the carriers and the bandwidth of the emission will be located for each Earth-to-space or space-to-Earth service area, or for each space-to-space relay
C.1.b	the upper limit of the frequency range within which the carriers and the bandwidth of the emission will be located for each Earth-to-space or space-to-Earth service area, or for each space-to-space relay
<b>C.2</b>	<b>ASSIGNED FREQUENCY (FREQUENCIES)</b>
C.2.a.1	<p>the assigned frequency (frequencies), as defined in No. 1.148</p> <ul style="list-style-type: none"> <li>– in kHz up to 28 000 kHz inclusive</li> <li>– in MHz above 28 000 kHz to 10 500 MHz inclusive</li> <li>– in GHz above 10 500 MHz</li> </ul> <p>If the basic characteristics are identical, with the exception of the assigned frequency, a list of frequency assignments may be provided</p> <p style="padding-left: 20px;">In the case of advance publication, required only for active sensors</p> <p style="padding-left: 20px;">In the case of geostationary and non-geostationary satellite networks, required for all space applications</p>

# Appendix 4 – example (2)



AP4-65

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 2A 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
									C.1	
X	X	X						X	C.1.a	
X	X	X						X	C.1.b	
									C.2	
									C.2.a.1	
		+	+	+	X	X	X	+		



# How to capture these information



- Make use of Spacecap for capturing information onto an electronic notice (resulting file is in mdb format)
- For NGSO satellite networks, antenna patterns of satellite and earth station can be submitted as a pattern <http://www.itu.int/en/ITU-R/software/Pages/ant-pattern.aspx> , or by describing them with equations, or submitted in graphical format in JPEG or PDF files
- Can add descriptions in PDF or Word format to supplement the information submitted in Spacecap

- The latest version of BR software for capture and validation of space notices are available from the ITU website (<http://www.itu.int/ITU-R/go/space-software/en>)
- They are also available with the BR IFIC DVD
- For convenience of workshop participants, the latest version of these software have been included in the USB key.
- The software needed for the preparation of satellite filings are:
  - SAM, Spacecap, SpaceVal, SpacePub
- Administrator privilege is required to install these software.

# API, Coordination and Notification software tools

<b>BR space software</b>	<b>Description</b>
<b>Spacecap</b>	PC-based software for electronic capture of <b>AP4</b> forms of notices for API, CR or Notification
<b>Spaceval</b>	PC-based software for validating electronic notices captured by the SpaceCap software
<b>BRSIS Spaceqry</b>	PC-based software package which allows the query/access to the Bureau's Space Radiocommunication Stations database
<b>Spacepub</b>	PC-based software utility for printing satellite networks / earth stations data

# Spacecap for API



The screenshot displays the SpaceCapture V6 software interface. The main window is titled "Forms of Notice Advance Publication" and contains several input fields and sections:

- Notice Id:** 1
- Advance Publication:** (text field)
- Date:** DD.MM.YYYY 01.09.2011
- Administration:** AUS (dropdown)
- A1f1. Notifying Administration:** AUS (dropdown)
- A1f3. Intergovernmental Satellite System:** (dropdown)
- A1f2. Notice submitted on behalf of these administrations:** (text field with + and x buttons)
- Notice intended for:** Add (selected), Mod, Sup
- BR Identification No. of the Satellite Network to be Modified:** (text field)
- Radio Network:**  GeoStationary Satellite Network,  Non GeoStationary Satellite Network
- A1a. Identity of the Satellite Network:** SMALLSAT (dropdown)
- A4. Orbital Information:**
  - A4b1. Number of Orbital Planes:** 1
  - A4b2. Reference body:** (T) Earth (dropdown)
  - A4b3a. Nbr of Satellites to NH:** (text field)
  - A4b3b. Nbr of Satellites to SH:** (text field)
  - A4b4. Orbital Plane Information:** (button)
- Section II Article 9:**  Subject to coordination,  Not Subject to coordination,  Both
- List of Available Beams:**
  - Beam UL\_ST
  - Beam DL\_BC
  - Beam DL\_ST
- More...** (button)

The status bar at the bottom shows: Current DB : C:\\_DB\\_NOTIFICATIONS\FOR GRAZ\SMALLSAT.mdb, 11:04, 01.09.2011

# Spacecap for Notification



The screenshot displays the SpaceCapture V6 software interface. The main window is titled "NonGeoStationary Notice: 2". The interface includes a menu bar (File, Edit, Tools, View, Window, Help) and a toolbar with various icons. A red circle highlights the "CR/NOTIF" button in the toolbar. Below the toolbar, there are tabs for "Notice", "Station", "Beam", and "Attachments". The "Notice" tab is active, showing a form with the following fields and options:

- Notice Id: 2
- AP4/II and AP4/III (Appendix 4 - Annex 2A)
- 01.09.2011
- Status: 01
- Notice submitted under:
  - No. 11.2 Notification** [  First Notification  Resubmission ]
  - No. 9.6 Coordination**  No. 9.11A Applies
  - No. 9.7A Specific Receive GSD FSS Earth stn Coordination**
  - No. 9.17 Coordination amongst Administrations**
  - RR1488 Notification
  - RR1060 Request for Coordination  R545 Applies
  - RR1107 Request for Coordination
  - RR1610 Agreement Under Art. 14
- Date: DD.MM.YYYY 01.09.2011
- Administration Serial Nbr: [ ]
- A1f1. Notifying Administration: AUS
- A1f2. Notice submitted on behalf of these administrations: [ ]
- A1f3. Intergovernmental Satellite System: [ ]
- Notice intended for:
  - Addition
  - Modification
  - Suppression
- BR Identification No. of Station to be modified/suppressed: [ ]
- Type of Satellite Network or Earth Station:
  - GeoStationary Satellite Network
  - NonGeoStationary Satellite Network**
  - Specific Earth Station
  - Typical Earth Station

At the bottom of the window, the status bar shows: "Current DB : C:\\_DB\\_NOTIFICATIONS\FOR GRAZ\SMALLSAT.mdb Notice is intended for an Add 11:15".

## Before you submit....

- Run Spaceval to ensure that there are no fatal errors
- If there are fatal errors, try to correct them before submission.
- If you are unable to get rid of the fatal errors, you can describe them in the cover letter of your submission, the Bureau will provide assistance to address the errors
- Make sure that all required antenna patterns are provided, either by pattern id, formula or diagrams.
- Change extension of .mdb to .itu if there is a problem with your email server
- *Satellite filings must be submitted by the Administration.*

# Other things to note



- Filing should be sent by email to [BRMAIL@ITU.INT](mailto:BRMAIL@ITU.INT)
- Filing must be confirmed by a fax or letter from an Administration within 7 days
  - Fax no.:+41 22 730 5785 (several lines)
- All mail must be sent to the following address:  
Radiocommunication Bureau, ITU  
Place des Nations, CH-1211 Geneva 20  
Switzerland
- If a notice does not contain all of the mandatory information as defined in the AP 4 of the RR, further processing of the notice will remain in abeyance and a date of receipt will not be established until the missing information is received
- If all mandatory data have been submitted and further clarification is required concerning the correctness of the mandatory data, the Bureau shall request the ADM to provide the clarification within 30 days
- If the information is received within the 30 days period, the original date of receipt is retained, otherwise, a new date of receipt will be established



# Modification of characteristics

- **According to No.9.2, changes for NGSO filing that requires a new API are:**
  - Additional frequency band;
  - Modification of the direction of transmission.
  - Modification of reference body;
  
- **However, it is a good practice to submit a modification to the API any change in characteristics including orbital characteristics, service area (adding earth stations) etc.**
  
- **This will allow other administrations/operators the chance to submit comments before the modifications are notified for recording in the Master Register.**
  
- **If during the notification, there are other changes in characteristics from the information published in API/A, other administrations can submit comments following the Part 1-S (No.11.28.1).**





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# Cost recovery



- **Cost recovery framework is defined in Council Decision 482**
- **Filings for amateur-satellite service is exempt from cost recovery fee**
- **All other services are subject to cost recovery fee**
- **For satellite networks not subject to coordination**
  - API – flat fee of 570 CHF
  - Notification – flat fee of 7030 CHF
- **Modification charged with flat fee just like a new filing**
- **Notification of Earth stations are not chargeable**
- **Each Administration has one free filing per year**
- **In the event of non-payment by the due date, the filing will be cancelled (RR9.2B.1 and A.11.6). However the invoice continue to be payable for the Administration**
  - Note also ROP relating to late payment
- **<http://www.itu.int/ITU-R/go/space-cost-recovery/en>**



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# WRC-15 and WRC-19



# ITU Radiocommunication Assembly (RA) Resolution ITU-R 68

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## ➤ *invites administrations*

- to inform their national entities involved in the development, manufacturing, operation and launch of small satellites, in particular of those satellites whose mass is less than 100 kg (such as nanosatellites and picosatellites), about the applicable ITU and national regulatory provisions for the coordination, notification and use of orbital resources (i.e. orbits and frequencies);
  - to encourage their national entities aiming to launch and deploy in outer space the satellites mentioned above to initiate the relevant ITU registration procedures as soon as possible before the launch of the satellite,
-

- **WRC-15 Agenda Item 9.1.8 - Regulatory aspects for nano- and picosatellites;**
  - WRC-12 adopted Resolution 757 (WRC-12) *Regulatory aspects for nanosatellites and picosatellites.*
  - This issue was studied in ITU-R WP-7B between 2012-2015, which came up with 2 reports:
    - *ITU-R Report ITU-R SA.2312 - Characteristics, definitions and spectrum requirements of nanosatellites and picosatellites, as well as systems composed of such satellites; and*
    - *ITU-R Report ITU-R SA.2348 - Current practice and procedures for notifying space networks currently applicable to nanosatellites and picosatellites;*
  - Conclusion was that there was no need for special regulatory arrangements for nano and picosatellites
- **WRC-15 Decision – Suppression of Resolution 757**



# WRC-19 Agenda item 1.7

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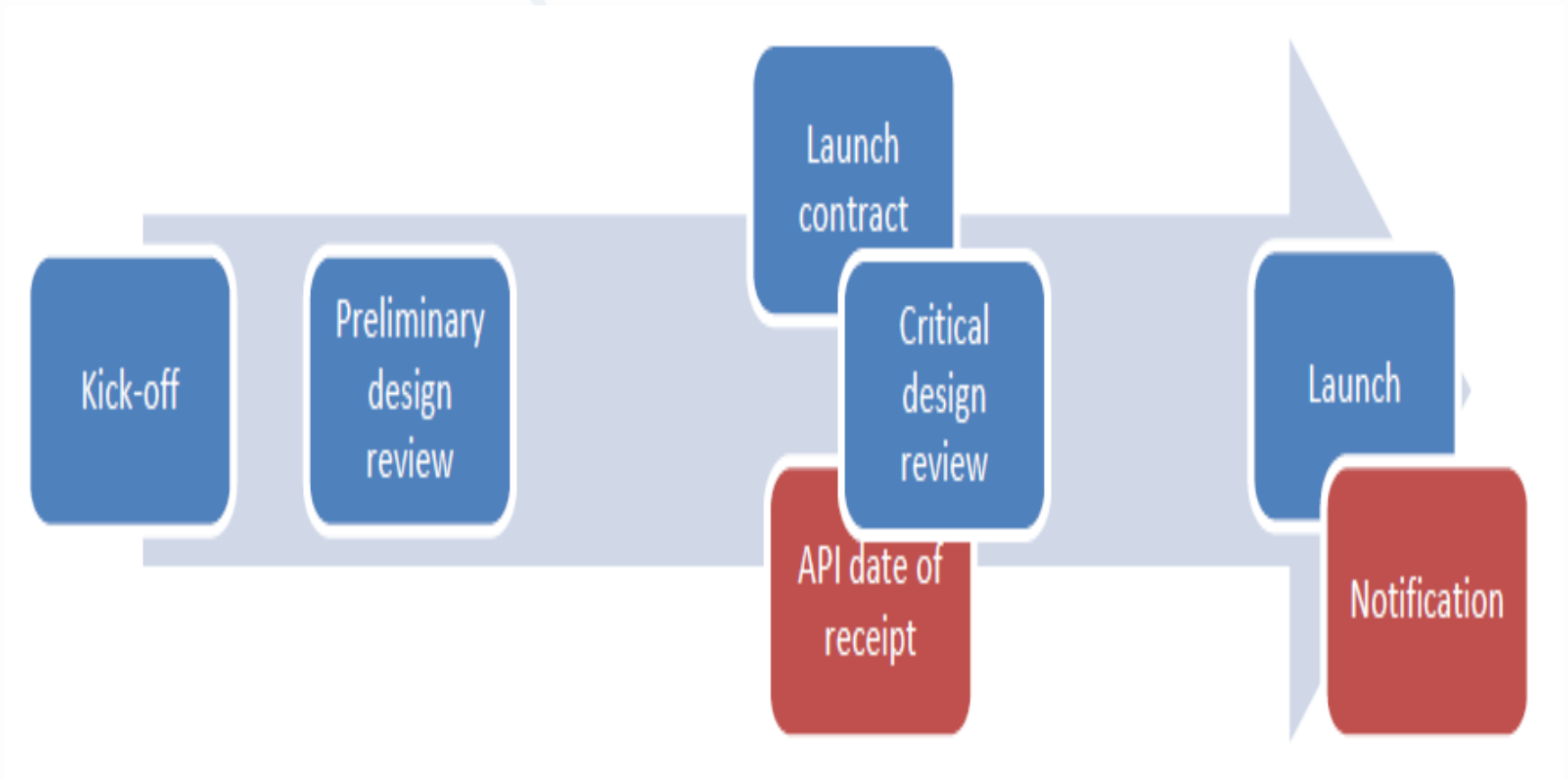
- **to study the spectrum needs for telemetry, tracking and command in the space operation service for non -GSO satellites with short duration missions, to assess the suitability of existing allocations to the space operation service and, if necessary, to consider new allocations, in accordance with Resolution 659 (WRC - 15)**

# Resolution 659 (WRC-15)



- ***Studies to accommodate requirements in the space operation service for non-geostationary satellites with short duration missions***
  - assess the suitability of using existing allocations for the space operations service below 1 GHz to accommodate the telemetry, tracking and command (TT&C) requirements for non-geostationary satellites with short duration missions, and if those allocations are determined to be unsuitable,
  - consider possible new allocations or an upgrade of the existing allocations to the SOS within the frequency ranges 150.05-174 MHz and 400.15-420 MHz while protecting the incumbent services, both in-band as well as in adjacent bands.
- **This study is being carried out in ITU-R WP-7B (<http://www.itu.int/en/ITU-R/study-groups/rsg7/rwp7b/Pages/default.aspx>) , and the results of the studies will be submitted for consideration by WRC-19 under Agenda item 1.7.**

# Typical Mission Design Timeline



***API should be submitted as early as possible!***





# For more information

- **BR space website**
  - <http://www.itu.int/en/ITU-R/space>
- **SNL online**
  - <http://www.itu.int/ITU-R/space/snl/index.html>
- **SNS online - TIES account required, need to be an ITU member (member state, ITU-R sector member, associate or academia)**
  - <http://www.itu.int/sns/>
- **Webpage on support for small satellite**
  - <http://www.itu.int/en/ITU-R/space/Pages/supportsmallsat.aspx>
- **Radio Regulations**
  - <http://www.itu.int/pub/R-REG-RR-2012>
- **Rules of Procedure**
- **ITU publications:**
  - Handbook for earth exploration satellite service
  - Handbook for amateur and amateur-satellite services



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**Thank you for your attention!**

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