Submission of API for satellite networks not subject to coordination

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- Databases
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Where to go for submission?

E-Submission of satellite network filings
available at https://www.itu.int/ITU-R/go/space-submission
telefax or mail is **not** required
recorded on the **actual date of receipt**

E-Communication system
available at https://www.itu.int/ITU-R/go/space-communications
generally used for response of BR communications
for comments which don’t require SpaceCom mdb files
for correspondences between administrations

**Telefax and E-mail**  BRmail@itu.int
recorded as received on the **actual date of receipt**
generally used for correspondence or response of BR communication
telefax is not recommended

**Postal Mail**
recorded on the **first working day**
following the period of closure
(not recommended)

RES 55, RES 907/908 (Rev.WRC-15); RoP (Edition of 2017 Rev.2); CR/464 (2020)
What should you do to make your API notice for satellite networks receivable?
What is **receivable**?

Submit in correct formats!
API or CRC?

- **API** is a mandatory procedure for all satellite network not subject to coordination procedure under section I of Article 9.

- **CRC** is a mandatory procedure for all satellite network subject to coordination procedure under section II of Article 9.

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:
- **No. 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)
- **No. 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.
In order to establish a formal date of receipt for the purpose of treatment of the submissions, the Bureau shall examine inter alia the completeness and correctness of the information submitted by administrations.

Where a notice received by the Bureau does not contain all of the mandatory information as defined in Annex 2 of Appendix 4 or appropriate reason for any omissions, the Bureau shall regard the notice as incomplete. The Bureau shall immediately inform the administration and seek the information not provided.

Further processing of the notice by the Bureau will remain in abeyance and a formal date of receipt will not be established until the missing information is received. The formal date of receipt will be the date of receipt of the missing information.
Rules concerning Receivability

30 days to respond with complete info within the scope of Bureau’s enquiry

Rules concerning the Receivability of forms of notice generally applicable to all notified assignments submitted to the Radiocommunication Bureau in application of the Radio Regulatory Procedures

Part A1 | Receivability | page 1 | rev. 2

Rules concerning Receivability

Response

- **within the scope with complete info by due date** of Bureau’s enquiry
  → retain **original** date of receipt

- **Not within** the scope of Bureau’s enquiry, or **out of due date**
  → establish **new** date of receipt

• Missing any mandatory information required under **AP4**
  ➢ will be returned to the Administration

• Frequency bands subject to **AP30/30A/30B** procedures
  ➢ will be returned to the Administration

• Wrong format
  ➢ will be returned to the Administration

Withdrawal within **15 days** possible without cost recovery fee
Appendix 4

Use the latest BR software V9.0

Notice Database

Cross validation

Diagram Database

Check completeness and correctness to establish a formal date of receipt

CR/464 only GIMS mdb format shall be receivable under RES 55 (WRC-19).

RoP (Edition of 2017 Rev.2); RES 55, RES 908 (Rev.WRC-15); CR/464(2020)
Graphical Data in GIMS MDB

CR/464 (2020) only GIMS mdb format shall be receivable under RES 55 (WRC-19).
Graphical Data for API
To capture diagrams as images in Gims

• mandatory information concerning
  -- the co-polar antenna radiation pattern (item B.3.c.1 of Appendix 4) for the space station antenna and
  -- the measured co-polar antenna radiation pattern or the co-polar reference radiation pattern for the
    associated Earth stations (item C.10.d.5.a of Appendix 4)

have to be provided either

  with pattern ids in the notice database or
  with diagrams in the Gims database

  ➔ Gain values must be provided for all off-axis angles (0 to ±180°)
  ➔ Diagrams must be marked with the correct header elements

• Please follow the guide on how to capture the diagrams for API as shown in the website below

  https://www.itu.int/en/ITU-R/space/Pages/API.aspx
Kindly submit the appropriate diagrams, or indicate the antenna pattern IDs by selecting from the Antenna Pattern Library (APL) available at the webpage:

https://www.itu.int/en/ITU-R/software/Pages/ant-pattern.aspx

### Eg. Earth Station **co-polar** Antenna Radiation Patterns

<table>
<thead>
<tr>
<th>AP7</th>
<th>APERR_012V01</th>
<th>Appendix 7 Earth station antenna pattern for the determination of the co-polar area around an earth station in frequency bands between 100 MHz and 105 GHz.</th>
<th>Receiving</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Transmitting</td>
<td>75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-directional</th>
<th>APEND_099V01</th>
<th>Non-directional earth station antenna pattern.</th>
<th>Receiving</th>
<th>607</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Transmitting</td>
<td>608</td>
</tr>
</tbody>
</table>

### Eg. Space Station **co-polar** Antenna Radiation Patterns

<table>
<thead>
<tr>
<th>Non-directional</th>
<th>APSND_499V01</th>
<th>Non-directional space station antenna pattern.</th>
<th>Receiving</th>
<th>610</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Transmitting</td>
<td>609</td>
</tr>
</tbody>
</table>

See more details from the webpage
To capture images in GIMs for API

- To be captured for all transmitting / receiving beams and Earth stations that do not contain an antenna pattern ID in the SNS mdb
- To check that all diagrams are there, and with all the correct keys and labels with cross-validation tool

Please follow the guide in the website below

https://www.itu.int/en/ITU-R/space/Pages/API.aspx
Notice Database

BRsoft V9.0

Appendix 4

No fatal error

Cross validation
### Specific tips for API

- **New mandatory info for all NGSO API not subject to coordination:**

<table>
<thead>
<tr>
<th>AP4 item</th>
<th>Description</th>
<th>Key word</th>
<th>Type of response</th>
<th>Where can be provided?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1.g</td>
<td>indicator showing that the non-GSO satellite system is planned to be operated in accordance with Resolution 32 (WRC-19)</td>
<td>SDM</td>
<td>Y/N</td>
<td>SpaceCap v. 9.0 (Notice TAB)</td>
</tr>
<tr>
<td>A.4.b.1.a</td>
<td>indicator of whether the non-geostationary-satellite system represents a “constellation”, where the term “<strong>constellation</strong>” describes a satellite system, for which the relative distribution of the orbital planes and satellites is defined</td>
<td><strong>Constellation</strong></td>
<td>Y/N</td>
<td>SpaceCap v. 9.0 (Notice TAB)</td>
</tr>
<tr>
<td>A.4.b.4.m</td>
<td>indicator of whether the space station uses sun-synchronous orbit or not</td>
<td><strong>Sun-synchronous</strong></td>
<td>Y/N</td>
<td>SpaceCap v. 9.0 (Orbital info 1/3 TAB)</td>
</tr>
</tbody>
</table>
Notice Information_SpaceCap
### Specific tips for API

- **If Constellation indicator = Y:**

**Item A.4.b.1.a :**

<table>
<thead>
<tr>
<th>AP4 item</th>
<th>Description</th>
<th>Key word</th>
<th>Where can be provided?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.4.b.4.h</td>
<td>the initial phase angle ($\omega_i$) of the i-th satellite in its orbital plane at reference time $t = 0$, measured from the point of the ascending node ($0^\circ \leq \omega_i &lt; 360^\circ$)</td>
<td>Initial Phase angle</td>
<td>SpaceCap v. 9.0 (Orbital info 2/3 TAB)</td>
</tr>
<tr>
<td>A.4.b.4.i</td>
<td>the argument of perigee ($\omega_p$), measured in the orbital plane, in the direction of motion, from the ascending node to the perigee ($0^\circ \leq \omega_p &lt; 360^\circ$)</td>
<td>Argument of Perigee</td>
<td>SpaceCap v. 9.0 (Orbital info 2/3 TAB)</td>
</tr>
<tr>
<td>A.4.b.4.j</td>
<td>the longitude of the ascending node ($\theta_j$) for the j-th orbital plane, measured counter-clockwise in the equatorial plane from the Greenwich meridian to the point where the satellite orbit makes its South-to-North crossing of the equatorial plane ($0^\circ \leq \theta_j &lt; 360^\circ$)</td>
<td>LAN</td>
<td>SpaceCap v. 9.0 (Orbital info 3/3 TAB)</td>
</tr>
</tbody>
</table>
• Items A4b4h, A4b4i, A4b4j: required when Constellation indicator = Y
• Item A4b4i Argument of the Perigee: required only when Apogee ≠ Perigee
Items A4b4h, A4b4i, A4b4j, required when Constellation indicator = Y
### Orbital Information 1_SpaceCap

#### A4b. Orbital Information for each Orbital Plane, where the Earth is the reference body

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>98.2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>38</td>
<td>700.00</td>
<td>0</td>
<td>700.00</td>
<td>0</td>
<td>700.00</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Details

**Mandatory**:
- 4d. Apogee
- 4e. Perigee

**Optional**:
- 4f. Minimum Altitude
- 4f. Min Alt exp
- 4m. Space station use: sun-synchronous orbit
- 4n. Local time reference
- 4h. Local time HH:mm:ss

**A/D**:
- Yes or No
- None or n/a
2 In the No. 11.31 examinations, notices concerned with space operation functions will be considered in conformity with the Table of Frequency Allocations (favourable Finding) in the case where the assigned frequency (and the assigned frequency band) lies in a frequency band allocated to the:

- space operation service, or
- the main service in which the space station is operating (e.g. FSS, BSS, MSS).

3 In the case where the assigned frequency concerning space operation functions, lies in a frequency band allocated to a service in which the space station has no operating function, the No. 11.31 finding will be unfavourable.
For the frequency band which is allocated to the space operation service, should capture ET as service.

For the frequency band which is not allocated to the space operation service, should capture ED, EK or ER as space operation functions, plus other main satellite service.

For notice where there is only space operation functions, should include ET as the main service.
Non-allocated bands not recommended

- It is not encouraged to use bands that are not allocated to the service.
- If administration wish to do so, please request for **No. 4.4**
  - checkbox at the group tab via SpaceCap should be checked
- Administration should ensure that
  - It has determined that it will **not cause harmful interference** into the stations of other administrations operating in conformity with the Radio Regulations;
  - It has **identified measures to avoid harmful interference** and to **immediately eliminate** such in case of a complaint.
- When notifying the use of frequency assignments to be operated under **No. 4.4**, the notifying Administration shall provide a **confirmation as mentioned above**.
Modification of characteristics

• According to Nos. 9.2, amendments to the information that requires 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 for any change in characteristics including orbital characteristics, service area (adding earth stations) etc.
  • This will provide 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, other administrations can submit comments following the Part I-S (No.11.28.1).
Modification of characteristics

- For MOD, it’s recommended to clone from the target from SRS mdb, it will automatically capture the action codes for beams/groups and target group id’s, remove those beams/groups not concerned by the modification.
- Pay more attention of all action codes for Notice, Beams, Groups, Earth stations etc.
- For MOD beam: indicate if any of diagrams has been modified vs. the original notice.
- For MOD group: indicate the target group IDs previously published and the action codes for all groups and for all associated Earth stations via SpaceCap.
- Pay more attention for the associated Earth stations, remove those Earth stations not concerned by the modification, capture manually the action codes (add, mod, sup) for all Earth stations.
For MOD, export your target database from SRS mdb first.
In your individual database, use “clone” to create the MOD.
Using the “Clone” function via SpaceCap, action codes and target group IDs are captured automatically.
After the “Clone”, you can remove beams/group, modify action codes, or rename beam to have a new one, then modify the detail characteristics.
To capture a new beam, you need to go to the Beam tab first, then, click Edit menu, select New Beam from the drop-down list.
To create a new group

1. Limit to 4 class of stations

2. If you need more for the same freq bands, create new groups
• XVE is used for GSO
• For NGSO, please use XAA or XAX
  See preface for more details
• Once you have captured XAA, please do not add other country code, because they are included
• Don’t use the remarks here, if so wish, provide in notes
In Emissions tab

Once you click the “Group” tab, the “Emissions” tab will then appear. Pay more attention to the “Carrier Frequencies” button.

Please specify carrier frequencies for each emission here.
Please select the designation of Emissions from the left-side list one by one, in order to capture the carrier frequencies for each Emission.

Make sure the carrier frequencies with the BW concerned are within the frequency range for the same group.
Frequency Range

Please respect the allocation under RR Art 5

- Check allocation table under Art 5
- One group one frequency range
- Please clone the group to have different frequency range
- The units are described here in accordance with the RR
- For MOD, avoid bands overlapping partially with previously submitted or published bands
### Associated Earth Station

#### Forms of Notice Advance Publication

<table>
<thead>
<tr>
<th>Notice</th>
<th>Beam</th>
<th>Group</th>
<th>Emissions</th>
<th>Frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assoc Earth Station</td>
<td>Assoc Space Station</td>
<td>Group</td>
<td>Attachments</td>
<td></td>
</tr>
</tbody>
</table>

**Notice Id:** 2  
**Beam Id:** BEAM3 R  
**Group Id:** 120697010

**C10b1. Associated Earth Station Name:** ITUSTEST ES-1

**C10d. Antenna Characteristics**

<table>
<thead>
<tr>
<th>Maximum Isotropic Gain</th>
<th>Beamwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.4 +/- dBi</td>
<td>38 Degrees</td>
</tr>
</tbody>
</table>

**Antenna Radiation Pattern**

- C10d5a1. Co-polar 
- C10d5a2. Diagram attached. See Attachment no.: 1
To capture a new Earth station, you need to go to the Assoc Earth Station tab first, then, click the Edit menu, select New Assoc Earth Station from the drop-down list.
For space-to-space service:

- You can select the space station name from the drop-down list, you can type in also as you wish.
- Make sure the associated space station name is the satellite network name submitted or published by the BR, which is not the commercial name of the satellite network or system.
- Make sure the beam name are the same name submitted or published for the associated space station.
- Otherwise, such group will be given unfavorable finding at the notification stage.
Cross_Validation via SpaceCap
Run **Cross Validation** via BRSIS
Validation

Selected task: Validation

- Version: 9.0.0.7 (what's new?)
- Description: Validate electronic submissions
- Contact: sandrine.moret@itu.int
- Validation Rules: Satellites, Earth Stations, Plans

Selected database: ITUTEST_API.mdb

- Ingres Production
- Ingres Development

Start
Quit
Cross Validation via BRSIS

Graphical data cross validation

 ITU internal options

[API check] [Run SRSFix] [Partial merge option]
Check Cross Validation Report

- Make sure that **validation completed**
- Make sure there is **no fatal error**
- If there is, fix before submitting
- Seek other’s support to fix further
- If really can not fix, ask your administration to explain in the cover letter or notes for your submission
To sum up:

-- Capture both notice database and diagram/Gims database

-- Run Cross Validation

Notice Database

Diagram Database

Appendix 4

Use the latest BR software V9.0

Check completeness and correctness to establish a formal date of receipt

CR/464 only GIMS mdb format shall be receivable under RES 55 (WRC-19).

RoP (Edition of 2017 Rev.2); RES 55, RES 908 (Rev.WRC-15); CR/464 (2020)
Reply to the Bureau for clarification

• Administrations sometimes need to send revised mdb files
• To avoid these being treated as a modification with a new date of receipt, do not upload them like a new submission
• Please submit in e-Submissions system using “others” category, and attach a letter to explain that it is a reply to the Bureau’s enquiry
  https://www.itu.int/ITU-R/go/space-submission
• It is also possible to send the replies by e-mail to the BRmail@itu.int
• As from 23 October 2019, the e-Communications system enable exchange of correspondence and other information between Administrations and the Bureau, as well as between Administrations (see CR/447, 450)
  https://www.itu.int/ITU-R/go/space-communications
Free online ITU-R Publications

- **ITU-R Radio Regulations 2020**
  [http://www.itu.int/pub/R-REG-RR/](http://www.itu.int/pub/R-REG-RR/)
- **ITU-R RoP**
- **ITU-R Recommendations**
  [http://www.itu.int/publ/R-REC/](http://www.itu.int/publ/R-REC/)
- **ITU-R Reports**
  [https://www.itu.int/pub/R-REP/](https://www.itu.int/pub/R-REP/)
- **ITU-R CR CIR**
  [https://www.itu.int/md/R00-CR-CIR/en](https://www.itu.int/md/R00-CR-CIR/en)
- **WRC-19 Final Acts**
Free online ITU-R Publications

• Latest BR Software
  • https://www.itu.int/ITU-R/go/space-software/en

• SNL online - basic reference info concerning space stations
  • https://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)
  • https://www.itu.int/sns/

• BR Space Service Support websites
  • https://www.itu.int/en/ITU-R/space
  • How to capture diagrams in Gims as images: https://www.itu.int/ITU-R/go/space-AdditionalDataUnderAP4/en
  • API support page: https://www.itu.int/en/ITU-R/space/Pages/API.aspx
Free online ITU-R Publications


• Handbook for amateur and amateur-satellite services

• Handbook for earth exploration satellite service

• Handbook for meteorological-satellite service

• Handbook for space research service

More on www.itu.int please
Annex 14 to Working Party 4A Chairman’s Report

Working document on Developing an ITU-R SMALL satellite handbook

An ITU-R handbook addressing various elements of small satellites, including nano- and pico satellites as well as other similar short-duration mission satellites in similar applicable situations, would be useful to administrations, satellite operators and service providers interested in operating or utilizing such satellites. The utility of such a handbook was noted in the conclusions of the 26th Radiocommunication Advisory Group Meeting in March 2019. See the Summary of Conclusions of the twenty-sixth Radiocommunication Advisory Group meeting (see Administrative Circular CA/246), Agenda Item 11. This document provides some information that WP 4A, in concert with other relevant ITU-R Working Parties and Study Groups, will be considering as it develops the handbook during the 2020-2023 ITU-R study cycle.

Background
# FORWRD

## 1 Introduction

1.1 Purpose of this Handbook

1.2 Historical perspectives on small satellite

1.3 Types of small satellite

1.4 Tutorial on small satellite system engineering aspects

## 2 Characteristics of small satellite systems

2.1 Space segment

2.1.1 Orbital types

2.1.2 Size/mass

2.1.3 Spacecraft subsystems

2.2 Earth segment

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3.1 Space operation service

3.2 Amateur-satellite service

3.2.1 Specific requirements for Amateur-satellite service in the Radio Regulations

3.2.2 Coordination with the International Amateur Radio Union

3.3 Remote sensing; Earth exploration-satellite service

3.4 Climate monitoring; Meteorological service

3.5 Space exploration and other space research service

3.6 Other services

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# Radio regulatory procedures for small satellite

4.1 Determination of whether a satellite network is subject to coordination under Section II of RR Article 9

4.2 Procedures for satellite networks not subject to coordination under Section II of RR Article 9

4.2.1 Submission of the Advance Publication Information

4.2.2 Commenting procedures and resolution of difficulties

4.2.3 Submission of the Notification for recording in the Master Register

4.2.4 Bringing into use of notified frequency assignments

4.2.5 Modifications to the characteristics of the satellite network

4.3 Brief description on procedures for satellite networks subject to coordination under Section II of RR Article 9

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5.2 Education missions

5.3 Experimental missions

5.4 Commercial missions

5.5 Earth-based, moon-based, inter-planetary or deep space missions

5.6 Short duration missions under Resolution 32 (WRC-19)

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# Launch considerations

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# Space debris mitigation

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# Current practice for satellite networks or systems

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