



World Radiocommunication Seminar 2016

Harmful Interference to Space Services

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Topics



- 1 ITU Role in preventing and resolving Harmful Interference**
- 2 Overview of Procedures and main provisions applicable to Space Services**
- 3 The Current Situation, Statistics and Typical Cases of harmful interference reported to BR**
- 4 ITU actions to combat Harmful Interference to Space Services**
- 5 Summary and Key Messages**



Radiocommunication Sector



Main Strategic Goal → To ensure Interference-Free Operation

Why ?

- To Maximize Quality and Availability of Service
- To Prevent loss of investment, customers and revenue by minimizing unusable satellite capacity due to interference
- To guarantee a Successful Mission

How ?

193 Member States
+700 Sectors members,
Associates, Academia

- I. International Regulations (CS, CV, RR)
- II. Global Standards & Guidelines
- III. Assistance to administrations



ITU Measures



Preventive:

- Study Groups Activities
 - Compatibility Studies
 - Development of Recommendations, Reports and Handbooks

- Radiocommunication Assembly
- World Radiocommunication Conference

- Coordination and Notification of Satellite Networks and Earth Stations, Application of the Radio Regulations
 - Provides International Recognition and Protection

Corrective:

- Art. 15 and Appendix 10 to RR + ITU-R SM. 2181:
 - To report a case of Harmful Interference to Radiocomm. Bureau

- Radio Regulations Board's Decisions



Overview of key provisions in the RR:



- Art. 5: Table of Frequency Allocations
- Art. 9: Coordination Procedure of satellite networks
- Art. 11: Notification Procedure of satellite networks
- AP 30, AP30A, AP30B: BSS and FSS plans
- Art.21: Sharing Scenario between Space and Terrestrial systems
(limits on PFD , eirp, minimum elevation angle, etc)
- Art.22: Sharing scenario between GSO, NGSO
(limits on epdf , station keeping, pointing accuracy,
off-axis eirp density on Earth Stations)
- Art. 15: Procedure in case of Harmful Interference
- Art. 13.2: Request for assistance in case of Harmful Interference (HI)
- Art. 13.6: BR request Adms clarifications about recorded assignments
- Art. 16: International Monitoring
- Art. 18: Licensing - Identification of Stations
- AP 10 and Report ITU-R SM.2181 (submission of information)
- And more...

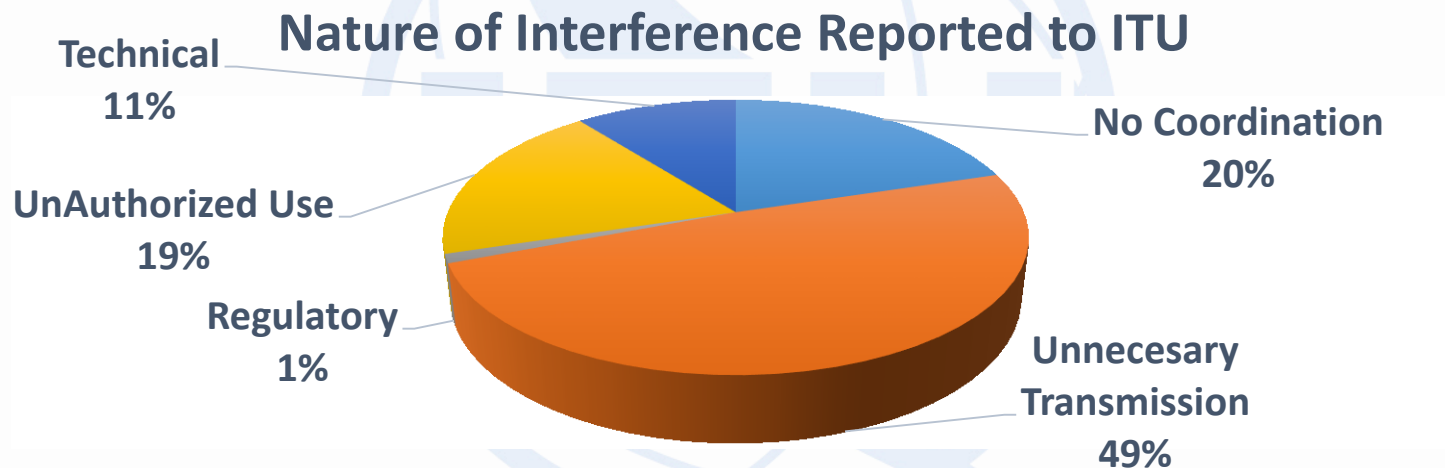




The Current Situation

Statistics on Harmful Interference:

Satellite Capacity free of Harmful Interference reported to BR = 99.97 %



- ❑ Statistics are based on Information and Statements provided by Notifying Administrations Reporting the Cases to the Bureau
- ❑ One Case of Harmful Interference Reported to BR may involve several short or long time occurrences.



Harmful Interference Reported to BR



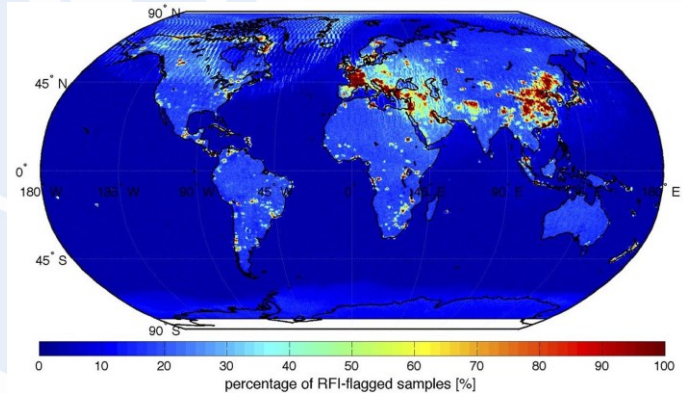
From 2011 to 2016

Affected Services:

FSS, BSS, MSS, EESS, RNSS

Affected Freq. Ranges:

- 1.2 GHz
- 1.5 / 1.6 GHz
- 2.2 GHz
- 3/4, 5/6 GHz
- 10-14 GHz
- 17/18 GHz



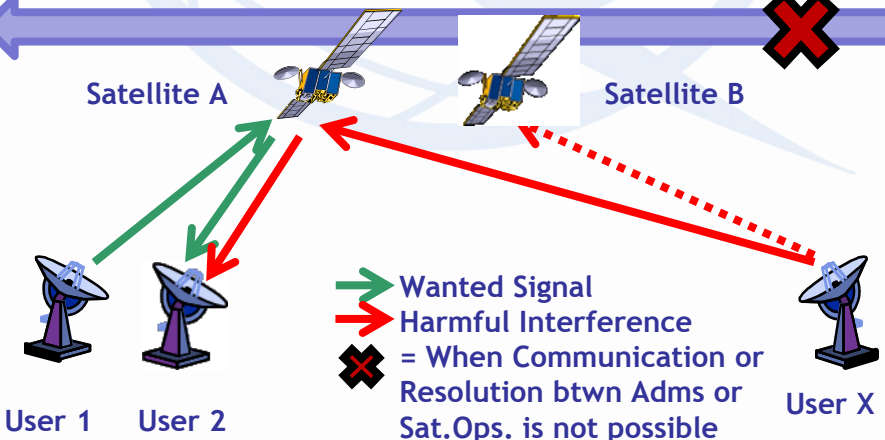
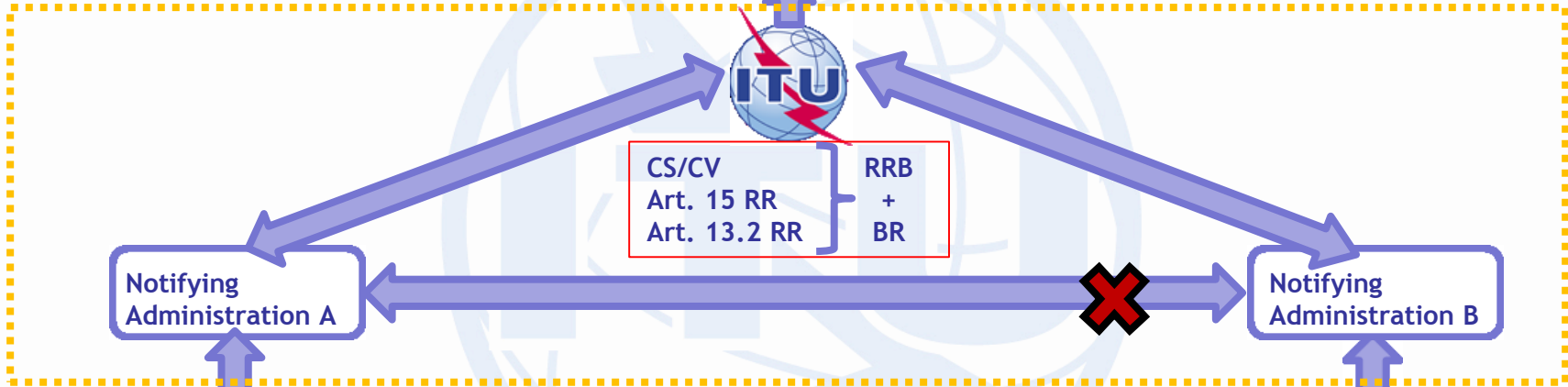
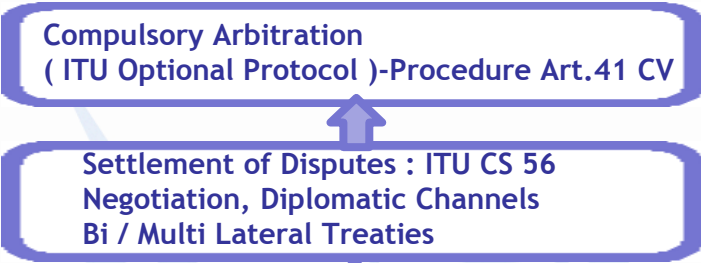


Schema of Actions in case of Harmful Interfer.



Country A

Country B



- Wanted Signal
- Harmful Interference
- = When Communication or Resolution btwn Adms or Sat.Ops. is not possible



How to Report a Case of Harmful Interference to ITU ?



Today

I. To submit Letter to BR :

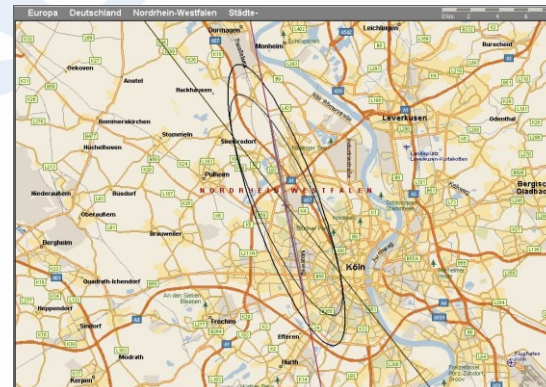
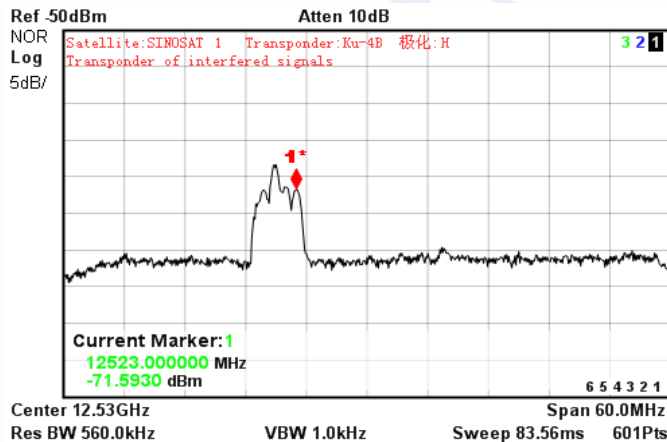
- - For BR Information, or
- - For BR Action, requesting Assistance under No 13.2 of Radio Regulations

II. In both cases the information to be submitted is described in:

III. Appendix 10 to RR

IV. ITU-R Report 2181

V. If possible, Geolocation Information and Scan Plots



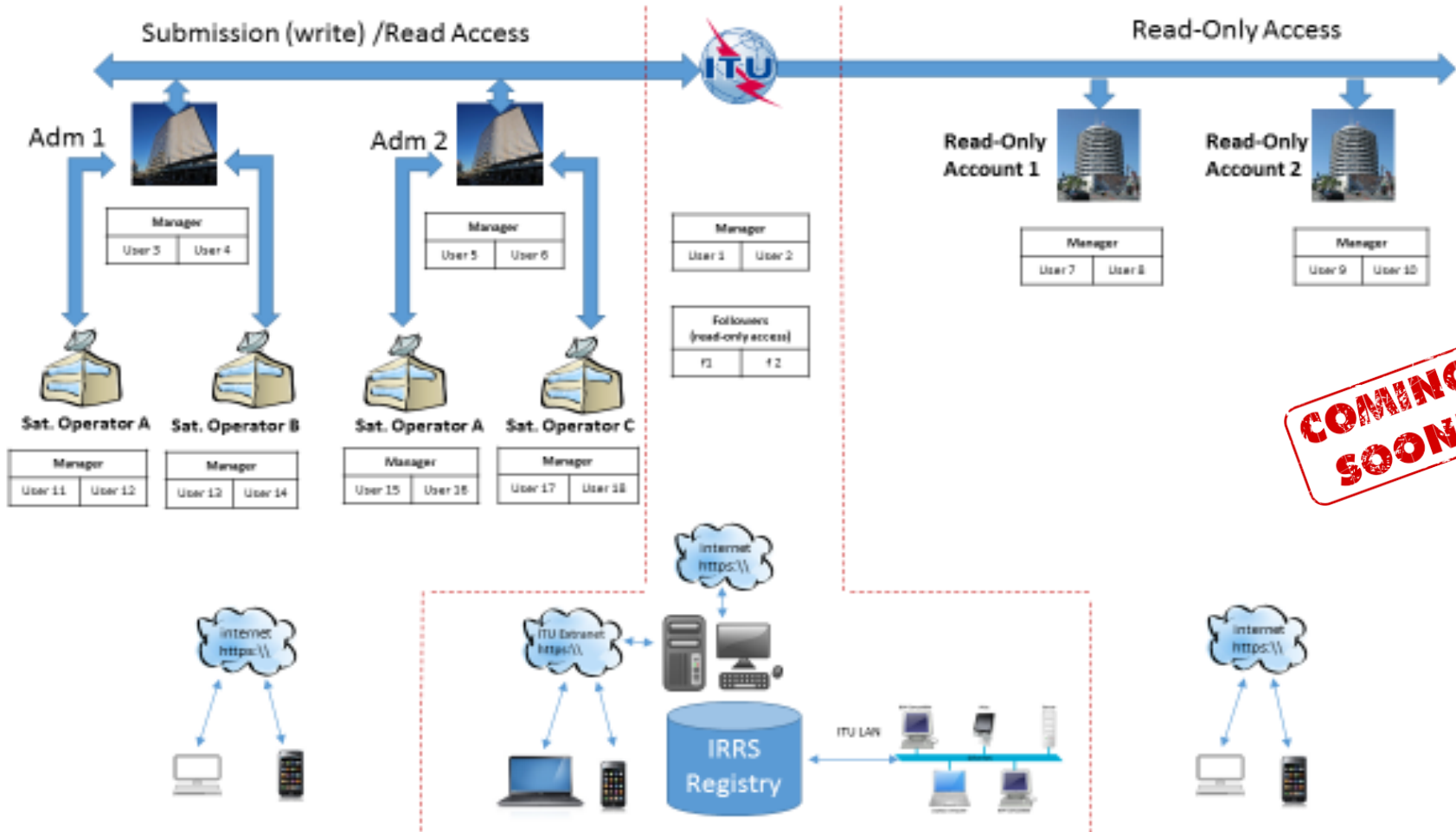


Satellite Interference Reporting and Resolution System (SIRRS)



193 Member States !

RES 186 PP-2014





SIRRS



Satellite Interference Reporting and Resolution System (SIRRS)

ciccoros
ARG
AdministrationManager

- Home
- Reports
- New report
- Users list
- Add user

Create New Interference Report

Report information

Ref. Administration:

Stations Causing Interference

Stations Interfered With

Interference Scenario:

Frequency Assignments

Upload documents

Letter from Affected Administration:

Interference Signal Geolocation Plot:

Interfered and Interfering Signal Scan Plots:

1) Station Causing Interference

2) Interference Scenario and Characteristics of Station Interfered with

3) Affected Frequency Assignment(s)

4) Upload Documents:
-Correspondences
-Scan Plot
-Geolocation Plot
-Info on Passive Sensors
-Other Forms, Graphs, Analysis, etc.



SIRRS



Satellite Interference Reporting and Resolution System (SIRRS)

ciccoros
ARG
AdministrationManager

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- Users list
- Add user

Create New Interference Report

Report information

Ref. Administration: ARG

Stations Causing Interference

Stations Interfered With

Interference Scenario:

Frequency Assignments

Upload documents

Letter from Affected Administration:*

Interference Signal Geolocation Plot:

Interfered and Interfering Signal Scan Plots:



+ Add Station Causing Interference

Characteristics

Station type: Space > Geo stationary Unknown

Name: BRASILSAT-B4

Class of Station [g]: EC

Location [h]

Orbital Longitude: -84 Unknown

Administration(s) having jurisdiction

B Unknown

Associated Itu Satellite Name(s) [a]

B-SAT-W Unknown

Measured Characteristics:

Frequencies [b]: 4.100 GHz

Class of Emission [c]: 3M00G7W

Bandwidth [d]: 3.1 MHz

Field Strength or Power Flux Density of Wanted carrier [e]: -150 dBW/Hz/m2

Polarization [f]: LHCP

Additional information

Date and Time (UTC) of Interference [b,s,e]: 01-12-2016 05:04 PM

Nature of interference [u]: Adjacent Satellite

Facility which made the above measurements [i,p]:



SIRRS



Satellite Interference Reporting and Resolution System (SIRRS)

ciccoros
ARG
AdministrationManager

- Home
- Reports
- New report**
- Users list
- Add user

Create New Interference Report

Report information

Ref. Administration: ARG

Stations Causing Interference

+ Add Station

Stations Interfered With

Interference Scenario:

- Uplink
- Downlink
- Radio Astronomy

Frequency Assignments

+ Add frequency assignment

Upload documents

Letter from Affected Administration:*

Browse... Upload

Interference Signal Geolocation Plot:

Browse... Upload

Interfered and Interfering Signal Scan Plots:

Browse... Upload

+ Add Station Interfered With

Characteristics

Station type: Geo-stationary satellite Non geo-stationary satellite

Name [I]: ARSAT-2

Associated Administration: ARG

Associated ITU Satellite Name: NAHUEL-F

Location [r]

Orbital Longitude: -81



Save Cancel

+ Add Station Interfered With

Characteristics

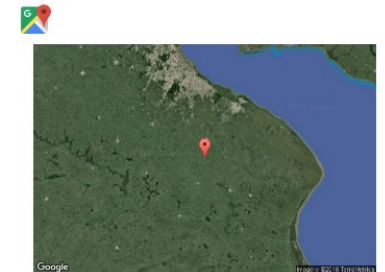
Name [g,t]: Buenos Aires

Associated Administration: ARG

Location [r]

Longitude: -58.2563

Latitude: -35.3256



Save Cancel

2



SIRRS



Satellite Interference Reporting and Resolution System (SIRRS) Administration Manager

Home Reports **New report** Users list Add user

Create New Interference Report

Report information
Ref. Administration: ARG

Stations Causing Interference
+ Add Station **3**

Stations Interfered With
Interference Scenario:
Uplink
Downlink
Radio Astronomy

Frequency Assignments
+ Add frequency assignment

Upload documents
Letter from Affected Administration:
Browse... **4**
Interference Signal Geolocation Plot:
Browse...
Interfered and Interfering Signal Scan Plots:
Browse...
Upload

+ Add Affected Frequency Assignment

Assigned frequency [h. l]: 4.110 GHz

Bandwidth [n]: 36 MHz

Polarization [w]: LHCP

Nature of Service: Fixed Satellite – FSS

Class of emission [m]: 36M0G7W

Field Strength or Power Flux Density of Wanted carrier [e]: -156 dbW/Hz/m2

Save Cancel

Open

System (C:) > Documents > SIRRS Project > Ejemplo

| Name | Date modified | Type |
|----------------------------------|------------------|----------------------|
| Passive Spaceborns | 29.11.2016 14:58 | File folder |
| Additional Info REP-SM.2181.docx | 22.02.2013 18:45 | Microsoft Word D... |
| Geolocation.pdf | 17.11.2016 15:13 | Adobe Acrobat D... |
| Letter.docx | 16.06.2015 12:23 | Microsoft Word D... |
| Report HI Passive Sensors.pdf | 17.11.2016 16:04 | Adobe Acrobat D... |
| Scan Plot.pdf | 17.11.2016 15:17 | Adobe Acrobat D... |
| Statistical Info 4 Analysis.xlsx | 20.02.2013 17:25 | Microsoft Excel W... |

File name: Letter.docx All Files Open Cancel



SIRRS



Summary of the Report

Requested Action

Notifications

- Inform administration(s) having jurisdiction
 - Inform the Bureau
 - ... for information
 - ... to request ITU Assistance
- *choose a reason otherwise the bureau will not be informed
- Add observers

Availability

- Authorize Public Access

Approve and Submit

Reject

Satellite Interference Reporting and Resolution System (SIRRS)
AdministrationMa

Home
Reports
New report
Users list
Add user

Drafts
Submitted reports
Reports implicated in
Public reports

Report
Reply 1

Stations Causing Interference

| | |
|--|-----------------------|
| StationId | 13 |
| Station type | Earth |
| Name | French Guiana |
| Class of Station | TC |
| Location | 5.000000, -53.000000 |
| Administrations | F |
| Measured frequencies | 14.100000 GHz |
| Class of Emission | 1M20G7W |
| Bandwidth | 1.200000 GHz |
| Field Strength or Power Flux Density of Wanted carrier | -65 dBm |
| Polarization | H |
| Facility which made the above measurements | -57.536900 -35.238900 |
| Date of interference | 15/11/2016 |
| Nature of interference | High Power CW Carrier |

Stations Interfered With

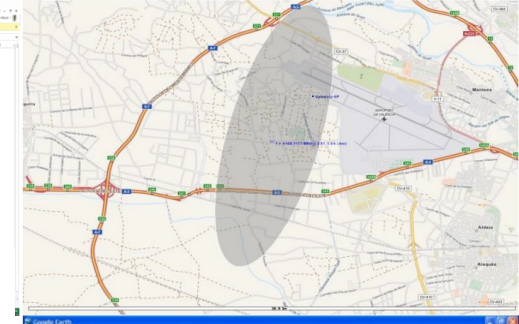
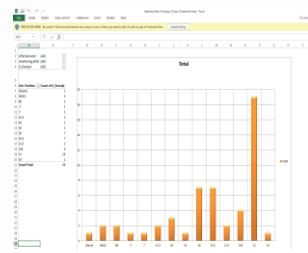
| | |
|-------------------|------------------------|
| Station type | Earth |
| Transmission type | TX |
| Name | Buenos Aires |
| Location | -36.500000, -65.200000 |
| Administration | ARG |

| | |
|----------------------------------|------------------------|
| Station type | Space > Geo stationary |
| Transmission type | RX |
| Name | Arsat-1 |
| Location | -71.800000 |
| Administration | ARG |
| Associated ITU name | NAHUEL-C |
| Associated Downlink Frequency | 11.710000 GHz |
| Associated Downlink Polarization | V |



Summary + Uploaded Documents and High Quality Images

SIRRS



Affected Frequency Assignments

| | |
|--------------------|---------------|
| Assigned frequency | 14.020000 GHz |
| Bandwidth | 36.000000 MHz |
| Polarization | H |
| Service | FSS |

Upload documents

| | |
|-----------|-------------------------------------|
| Title | Letter from Affected Administration |
| File name | Letter.docx |

| | |
|-----------------|--------------------------------------|
| Title | Interference Signal Geolocation Plot |
| Date of receipt | 17/11/2016 15:30:00 |
| File name | Geolocation.pdf |

| | |
|-----------------|--|
| Title | Interfered and Interfering Signal Scan Plots |
| Date of receipt | 17/11/2016 15:30:55 |
| File name | Scan Plot.pdf |

| | |
|-----------------|---|
| Title | Info on Passive Sensors and NGSO Orbits |
| Date of receipt | 17/11/2016 15:31:05 |
| File name | Report HI Passive Sensors.pdf |

| | |
|-----------------|----------------------------------|
| Title | Format Report 2181 |
| Description | Additional Info |
| Date of receipt | 17/11/2016 15:32:34 |
| File name | Additional Info REP-SM.2181.docx |

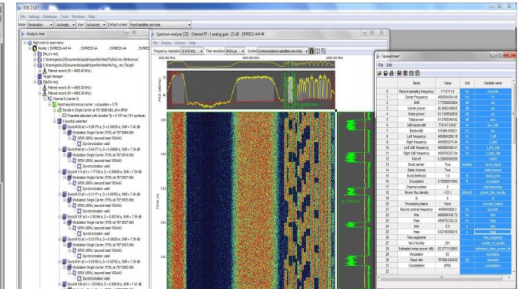
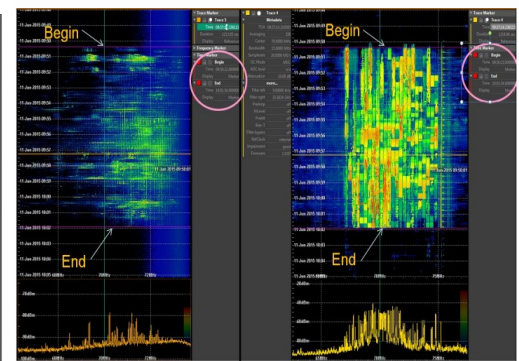
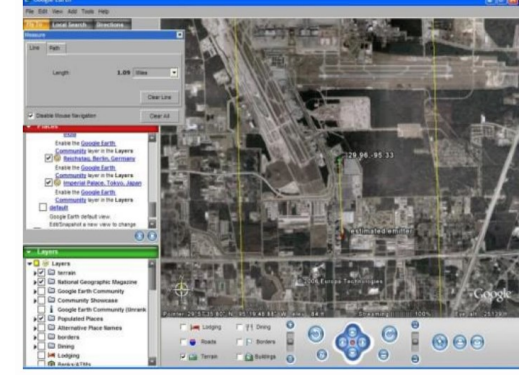
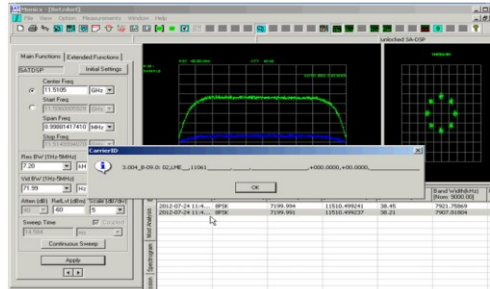
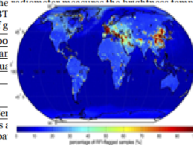
| | |
|-----------------|----------------------------------|
| Title | Statistical Info |
| Description | To be used for Analysis |
| Date of receipt | 17/11/2016 15:34:26 |
| File name | Statistical Info 4 Analysis.xlsx |

Remarks

Please call Urgently to : +54 11 4585 2369. Thanks !

2. Particulars concerning the PASSIVE SENSOR experiencing the harmful interference

| | | |
|---------------------------------------|---|--|
| Satellite | Soil Moisture and Ocean Salinity (SMOS) satellite | |
| Mission description | SMOS is an Earth Observation mission lead by the European Space Agency (ESA) with participation of CNES (France) and CDTI (Spain). The main scientific objectives of SMOS are to perform global observations of soil moisture over land and sea-surface salinity over oceans. | |
| Mission website | http://www.esa.int/Our_Activities/Observing_the_Earth/SMOS | |
| Launch date | 2 November, 2009 | |
| Orbital data | Type | LEO sun-synchronous |
| | Mean altitude (km) | 728 |
| | LST at ascending node | 06:00 |
| | Inclination (deg) | 98.44deg |
| | Eccentricity | 0.001 |
| Repeat period, days | | 149-day repeat cycle with 3-day sub-cycle |
| Sensor information | Type | Passive microwave 2-D Interferometric radiometer using aperture synthesis. |
| | Swath (km) | 100 |
| | Spatial resolution (km) | Var |
| | Polarisation | Dual |
| Frequency of operation | 1400 – 1427 MHz | |
| Type of service | Earth Exploration Satellite Service | |
| Relevant ITU Radio-Regulations | RR No. 5.340 (All emissions ; Resolution 750 on the Compa active services) | |



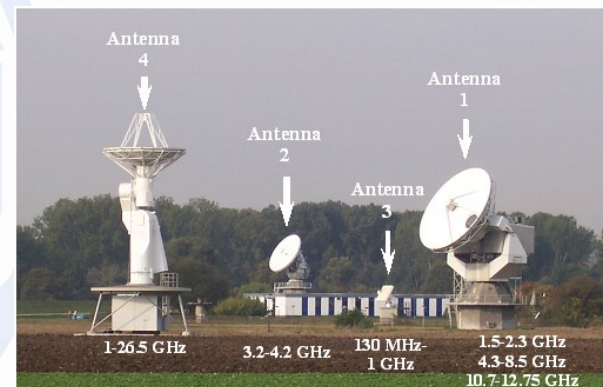


Extension of the International Monitoring System (IMS)



Recent Plenipotentiary Conference Resolution 186 (Busan, 2014) instructs the Director BR:

“1 to **promote access to information**, upon request by concerned Administrations, related to **satellite monitoring facilities**, to address cases of **harmful interference** in accordance with Article 15 of the Radio Regulations, through **Cooperation Agreements** referred to under invites the Council above within the budgetary limitations of the Union in order to implement the objectives of this Resolution”.



- Cooperation Agreement Signed with: *Germany, Pakistan, Vietnam, Belorussia*
- Under discussion: *Brazil, Ukraine, Russia, Japan, Kazakhstan, Korea*

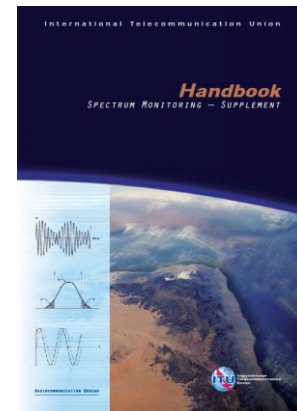


ITU-R Recommendations, Handbooks



Development of a **New Rec. on Access Procedures** for FSS Occasional Use, Transmissions to GSO Space Stations in 4/6 GHz and 11-12/13/14 GHz FSS Bands. (ITU-R S.2049, Dec. 2013)

This Recommendation is intended to provide some **easy-to-follow practices** to enable OU operators to transmit to geostationary space stations without interfering with other users on the target satellite or with users on any other nearby satellites.



Free Download:

<http://www.itu.int/rec/R-REC-S.2049-0-201312-l/en>

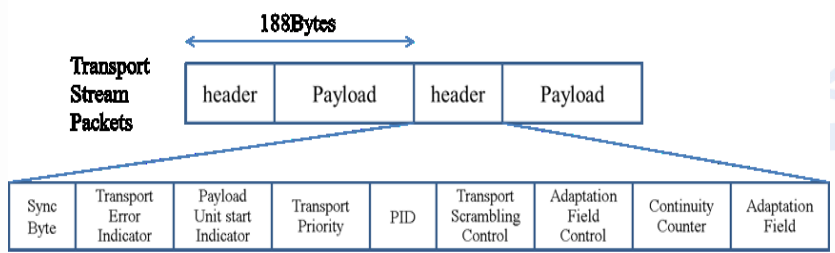


Development of a **New Recommendation on Carrier ID** (ITU-R S.2062-0. Sept.2014)

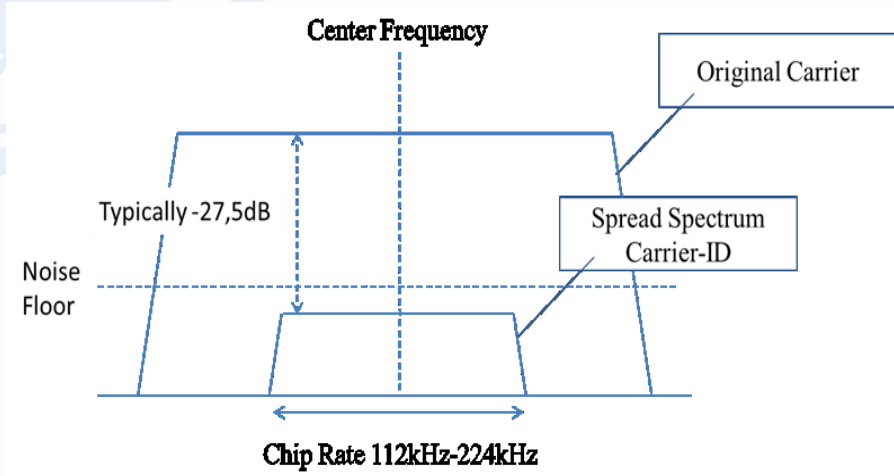
Objective: To facilitate rapid identification of an interference source and reduce the time required to clear the interference that occurs unintentionally.

2 Methods:

Network Information Table (NIT)



Spread Spectrum CID



Free Download

<http://www.itu.int/rec/R-REC-S.2062/en>



ITU-R Recommendations, Handbooks



Further Activities on going in:

WP-1C

Development of a Preliminary Draft New ITU-R Report on **Measurement Techniques and New Technologies for Satellite Monitoring**

Annex 9 to Doc.1C/169 (WP1C Chairman's Report) → <http://www.itu.int/md/R12-WP1C-C-0169/en>



WP-7C

Draft New Recommendation on **Detection and Resolution of radio frequency interference to Earth exploration-satellite service (passive) sensors**

Doc.7C/91 (WP7C Chairman's Report) → <http://www.itu.int/md/R15-WP7C-C-0091/en>



Further Actions taken by ITU



- I. To raise awareness of the impact of Harmful Interference to Space Services
- II. To disseminate information on Technical and Regulatory Solutions
- III. To Promote the exchange of experience, cooperation, and participation in related Fora.





Latest Symposium - Geneva, June' 16



ITU International Satellite Symposium 2016 Interference- Free Satellite Frequency Spectrum: Myth or Reality in 2016

- ✓ Latest technologies to mitigate and geolocate interference
- ✓ Space Monitoring
- ✓ Impact to Broadcasting and Science Services
- ✓ Cybersecurity, Radionavigation
- ✓ Regulations



Free download of documents → <http://www.itu.int/go/ITU-R/SISS-2016>



Summary and Key Messages:



- I. ITU plays a leading role to ensure interference-free operations of space services
- II. Member States' cooperation and exchange of information among parties is essential
- III. Only continuous synergistic actions by all sectors of Satellite Community can guarantee a minimum level of interference is kept.



World Radiocommunication Seminar'16



Thank You !