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Registration of Radio Astronomy Stations

Tomas Gergely

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Allocations

- An Allocation (to RA or any other service) in the International/National Table Does NOT Provide Protection from Interference by Itself (except, possibly, for those bands covered by RR 5.340- All emissions prohibited…!)
- Allocations Provide a Framework for Protection
- The International Allocations May Be (And For Convenience Generally Are) Implemented by Each Country Individually
- BUT...There Is No Obligation to Do So - Each Country Retains Sovereign Rights Regarding Spectrum Use Within Its Borders –There Is No Requirement to Conform to the International Allocations
- Administrations Can Provide Protection to Observatories Through Regulatory Action Other Than Frequency Allocation (e.g. Quiet or Coordination Zones)

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So Why Register ?

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Registration Provides

- International Recognition –The ITU and the Radio Engineering Community Doesn't "Know" That Your Observatory Exists Until It Is Registered (Don't Assume That If You Operate the World's Largest Dish, Everyone Knows About It, Much Less That Everyone Is Mindful of It's Sensitivity!)
- In the Case of Some Bands, Used by Non-Geostationary Satellite Systems, a Commitment by the Registering Administration To Comply With Aggregate (Unwanted Emission) Power Flux-Density Limits in a Neighboring Radio Astronomy Band, at **Registered** Observatory Sites
- A Mechanism to Initiate Resolution In Case Harmful Interference Occurs (to a Telescope located in Country A from Transmitters of, or Satellites Registered by, Country B). Much More Difficult To Do So for Unregistered Telescopes

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In Terms of the Radio Regulations:

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International Regulations
Registration, rights and examination

- 8.1 The international rights and obligations of administrations in respect of their own and other administrations frequency assignments shall be derived from the recording of those assignments in the Master International Frequency Register (MIFR) ...
- 8.3 Any frequency assignment recorded in the Master Register with a favorable finding (operating under a radio astronomy allocation) under *11.31* shall have the right to international recognition. ...this right means that other administrations shall take it into account when making their own assignments in order to avoid harmful interference.
- 11.30 Each notice shall be examined:
- 11.31 a) With respect to its conformity with the Table of Allocations and other provisions of these Regulations....
- 11.31.2 The other provisions shall be identified and included in the Rules of Procedure (RoP).

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International Regulations
Radio Astronomy Stations

- 8.4 Non- conforming assignments *(observations outside a radio astronomy band)* are recorded for information purposes (only) IF the registering Administration states that it will be operated in accordance with RR 4.4
- 11.12 Any frequency to be used for reception by a particular radio astronomy station may be notified if it is desired that such data be included in the Master Register
- 11.31.3 Notices relating to radio astronomy stations are examined with respect to 1.31 only *(does it operate in a radio astronomy band or not?)*

BUT

- 4.4 Administrations...shall not assign to a station any frequency in derogation of either the Table of Frequency Allocation...or the other provisions of these Regulations, except on the express condition that such station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with ...these Regulations.

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International Regulations
In Case of Harmful Interference..

- **15.25** Administrations shall cooperate in the detection and elimination of harmful interference, employing where appropriate the facilities described in Article 16 (monitoring), and the procedures detailed in this section

BUT

- **4.6** For the purpose of resolving cases of harmful interference, the radio astronomy service shall be treated as a radiocommunication service. However, protection from services in other bands shall be afforded the radio astronomy service only to the extent that such services are afforded protection from each other.

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Data Requirements for Notification of Radio Astronomy Assignments

- Data requirements for registration of radio observatories are listed in Appendix 4, Annex 2 of the RR, along with those necessary for registration of Earth stations.
- Annex 2B provides a quick look table of the necessary parameters.
- WRC action is necessary to change these parameters!
- Be sure to use the latest version of the RR (currently 2012)

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Data Required

- Name of the Radio Observatory
- Country or geographical area where it is located
- Notifying Administration
- Geographical coordinates
  - > Latitude and Longitude in (DD/MM/SS, to 10th of min accuracy)
- Date on which use of frequency begins
- Azimuth range in which the telescope operates
- Operating Agency and its address
- Antenna type, dimensions, and effective area A_{eff}
- Center frequency of band observed
- Bandwidth (in kHz)
- T_{sys} (K) referred to the output of the antenna
- Observation Class (A/B)
- Single Dish (or closely connected array) or VLBI dish?
- The minimum elevation angles (θ_{min}) of the antenna's main beam axis from the horizontal plane

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A Practical Issue

- **Receivers Are Seldom Confined to RA Bands**
  - > Assume That You Want to Register Your L-Band Receiver, That Covers the 1200-1700 MHz Range
- **Because Protection is Due in RA Bands Only, Registering the Entire 1200-1700 MHz Band Will Result in an Unfavorable Finding (No Protection)**
- **Registration Should Be Done Piecemeal:**
  - > 1200-1350 MHz – Covered by RR 4.4 (Information only)
  - > 1350-1400 MHz – Covered by RR 5.149
  - > 1400-1427 MHz – Exclusive Passive Allocation
  - > 1427- 1610.6 MHz – Covered by RR 4.4 (Information only)
  - > 1610.6-1613.8 MHz – Primary Shared Allocation,
  - > 1613.8-1660 MHz - Covered by RR 4.4 (Information only)
  - > 1660-1670 MHz Primary, Shared RR 5.149
  - > 1670-1700 MHz Covered by RR 4.4 (Information only)

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Compliance With Aggregate Power Flux-Density Limits

Administrations Registering Non-Geostationary Satellite Systems With the ITU Must Certify That They Comply With the Rec. ITU-R RA.769 levels

NGSO Service	NGSO BAND	RAS BAND	Footnote
FSS	15.43 –15.63 GHz	15.35-15.4 GHz	5.511A
RNSS	5010-5030 MHz	4990-5000 MHz	5.443B
FSS	41.5-42.5 GHz	42.5-43.5 GHz	5.551G

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Registered Stations

- **RAS stations registered with the ITU-R are included in: *List VIII A – List of Stations in the Space Radiocommunication Services and in the Radio Astronomy Service.***
- **Publication of the list is mandated by RR 20.13§ 9**
- **Available from the ITU-R at:**
  http://www.itu.int/pub/R-SP-LN/en
- **Lists of radio observatories (not necessarily registered with the ITU are maintained by:**
  - CORF: http://sites.nationalacademies.org/BPA/BPA_059065
  - CRAF: http://www.craf.eu/raobs.htm
  - RAFCAP: http://www.atnf.csiro.au/rafcap/AP_RT.htm

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- Since Radio Astronomy stations Do Not Cause interference, Registration is Not Mandatory, But Is Highly Recommended
- Registration With the ITU MUST Be Done in a Set Format by National Administrations (by the Recognized Regulatory Agency)
- Some Administrations Allow/Encourage Registration of Radio Astronomy Stations at the National Level