ITU RADIO REGULATIONS

related to

SMALL SATELLITE

Earth Stations (TA)

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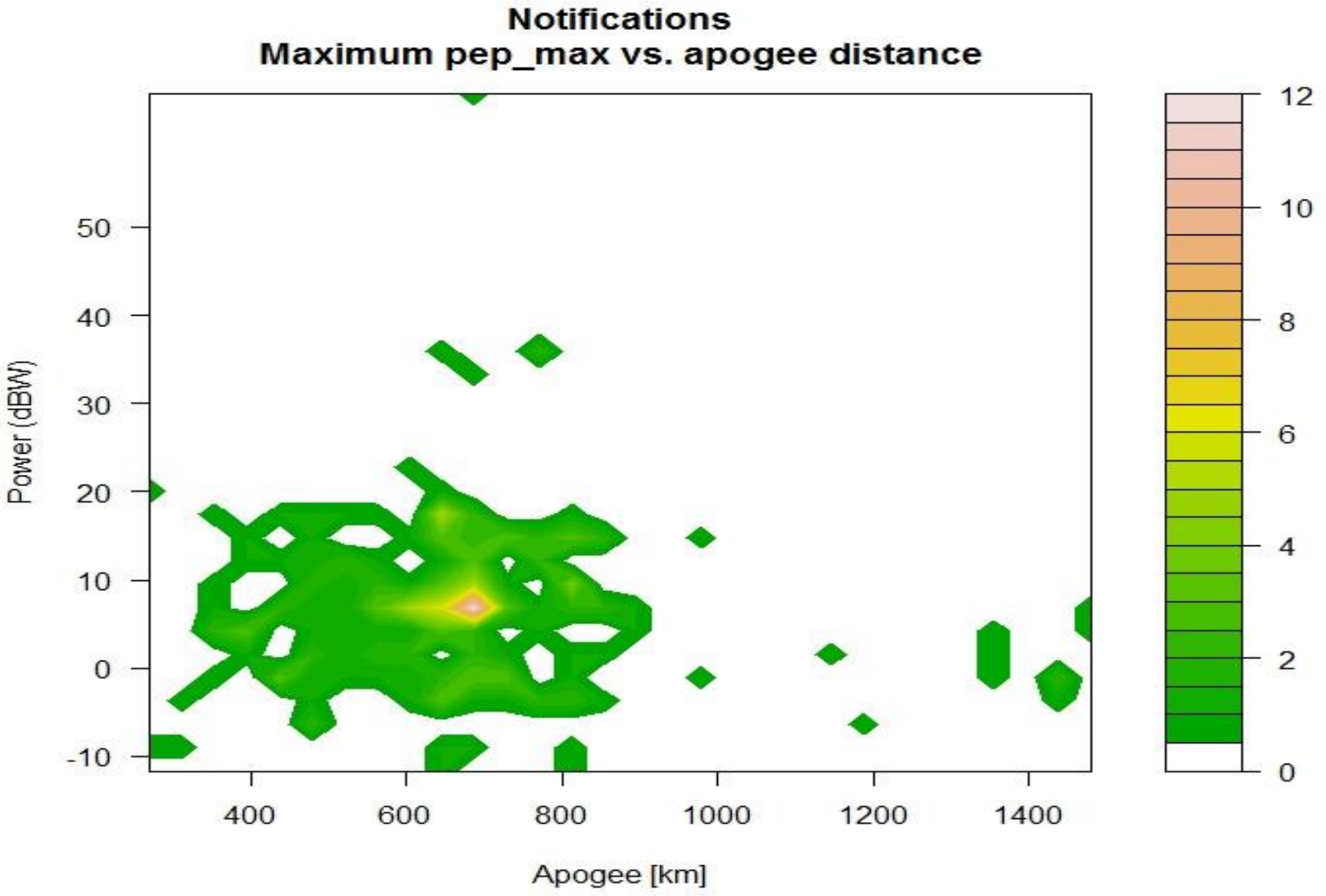
Small satellites - plot of the maximum peak power (pep_max) against the satellite apogee value



Small satellite ground segment - 1

- In conformity with No. **25.11** of the RR, any amateur-satellite operator shall set up at least one TT&C earth station (**TA**) to ensure that *any harmful interference caused by emissions from its satellite can be terminated immediately* (No. **22.1**)

- **TA** TT&C station, have to be operated by an operator with a valid amateur license (duly authorized person) (Nos. **1.56** and **1.57** and **ART 25**) and callsign (**ART 19**)

Small satellite ground segment - 2

- TT&C station is a critical part of the amateur-satellite systems with technical and operational challenges

  - *visibility/access time (in-view window), of a satellite for a given Earth station is very short due to low orbit height and varies from approximately 10-15 minutes in the best case to no coverage at all for most of the 16 daily orbits*

Small satellite ground segment - 3

- Small satellite operators may improve this situation by setting up an Internet connected special dedicated network of numerous/multiple remote amateur-satellite Earth stations (ARS-ES) along its satellite track (instead of one amateur-satellite Earth station, waiting for downlink opportunities)

➢ *to increase a satellite availability,* and

➢ *to extend access time,* and

➢ practically **to have a global coverage (service area),** *capable to track and download telemetry or mission science data from the satellite at any place and any time if at least one "networked" ARS-ES can see (in-view-window) the satellite, in this case*

➢ *the satellite service area have to be notified as* ***XVE – VISIBLE EARTH***

Small satellite ground segment - 4

- In most cases the “networked” remote ARS-ES are
  - **outside of its satellite service area** and
  - ADM *very rarely* notify this “extended service area” in the satellite filing to the Bureau

  - This missing information may generate a *harmful interference situation* when the amateur-satellite is operating in the bands shared with other services (No. **5.282**) on a non-interference basis and the satellite is “active” (transmitting with a high power) *outside of its service area*

Small satellite ground segment - 5

- Administrations may authorize operation of these *specific* ARS-ES (**TA**),
  - Which can ***receive*** the telemetry or mission science data from ***any amateur-satellite*** and
  - Send this data *by Internet* to the particular amateur-satellite Mission Control Centre.
  - However, *to protect frequency assignments and gain international recognition* of such ARS-ES (**TA**) in application of Resolution **642** (WARC-97), administrations should under No. **11.2** ***Notify*** *these ARS-ES (**TA**) to the Bureau*
- In contrary, it's necessary to note that a *remote transmission (uplink) by Internet and remote utilisation of ARS-ES TT&C earth command station for transmission (uplink) is prohibited, unless the Administrations concerned authorize it*.
  (See Resolution **1** and ART **18**)

RES-642 **Relating to the bringing into use of earth stations in the amateur-satellite service**

- Procedures of Articles **9** and **11** are applicable to the amateur-satellite service (**ARS**)
- Characteristics of **TA** vary widely
- Space stations in the ARS are intended for multiple access by **TA** in all countries
- Coordination among ARS **TA** is without the need for formal procedures
- Burden of terminating any HI is placed on the ADM authorizing a space station in the ARS (No. **25.11)**

RES-642

- When an ADM intends to establish a satellite system in the ARS and wishes to publish information with respect to TA *it may*:

1. Communicate to the Bureau all or part of the information listed in APP **4**; the Bureau shall publish such information in a Special Section
2. Requesting comments to be communicated within a period of four months after the date of publication
3. Notify under Nos. **11.2** to **11.8** all or part of the information listed in APP **4**
4. The Bureau shall record it in a *special list*
5. This information shall include *at least the characteristics of a typical* **TA** having the facility to transmit signals to the space station to initiate, modify, or terminate the functions of the space station (No. **25.11**)

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Questions ?

International Telecommunication Union

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