RFI monitoring at Yebes Observatory

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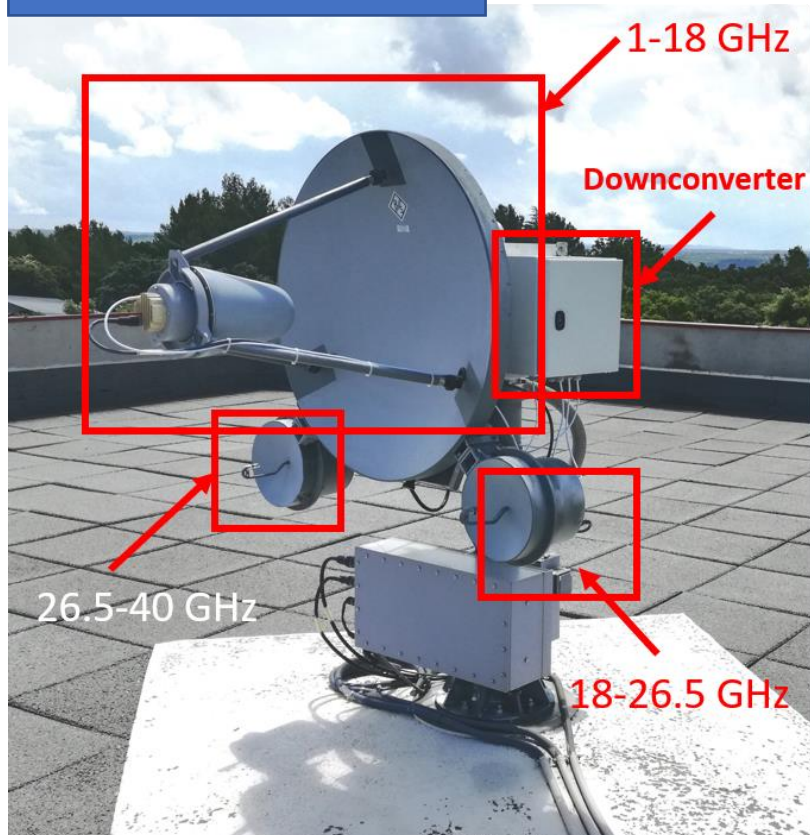08/02/2022

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- RFI measurements

- RFI permanent system results

- Future improvements

- Actions

RFI measurement systems

1-40 GHz

1-18 GHz

Downconverter

26.5-40 GHz

18-26.5 GHz

Permanent RFI system
Yebes (Spain)

1-26.5 GHz

Portable RFI system
Santa María (Azores, Portugal), Gran Canaria
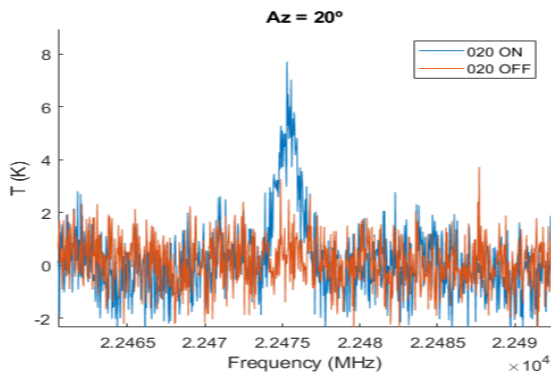(Spain)

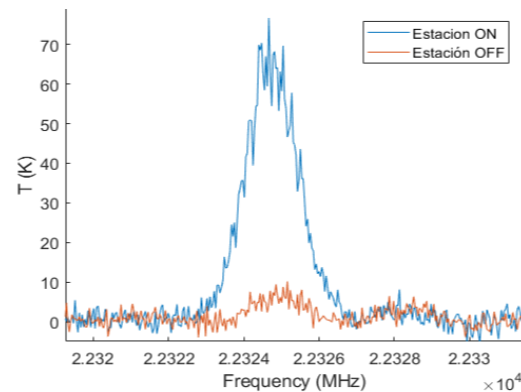72-90 GHz

Radioastronomy telescopes

RFI measurements

- **RFI** measurements with **RT-40m Ka-band**:
  - ➢ Some radiolinks at RAS frequency allocation were detected and removed.
  - ➢ Working with the "*Jefatura Provincial de Inspección de Telecomunucaciones*"
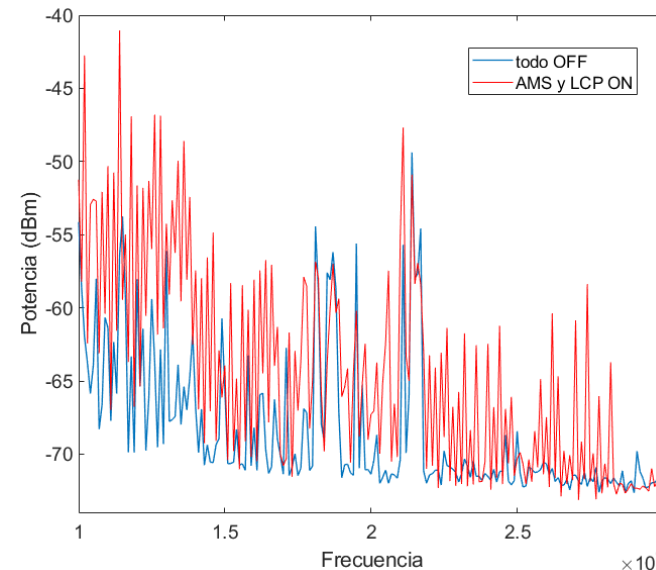 - ➢ Powered-off radiolinks: Muduex (30km), Iriepal, Yebes (2km)….

22,475 GHz (from Muduex, 20º az.)   **22,325 GHz (from Yebes, 303º az.)**
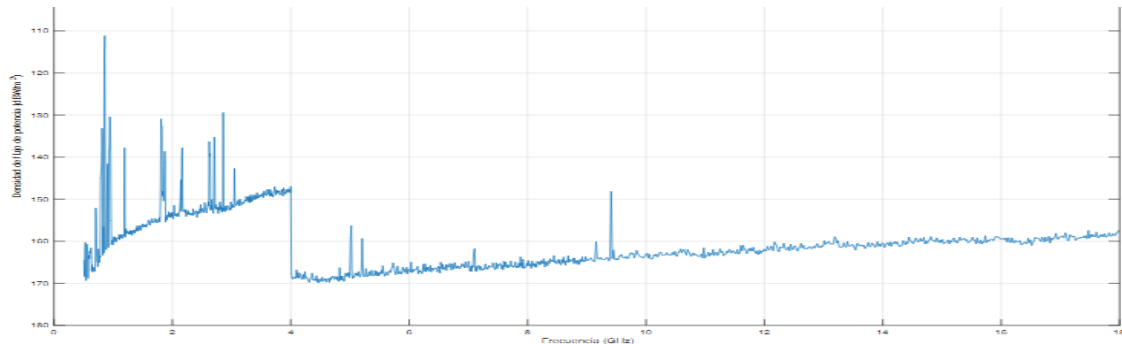

- **RFI** measurements in receivers' room at the **40-m RT:**
  - ➢ Closed vertex
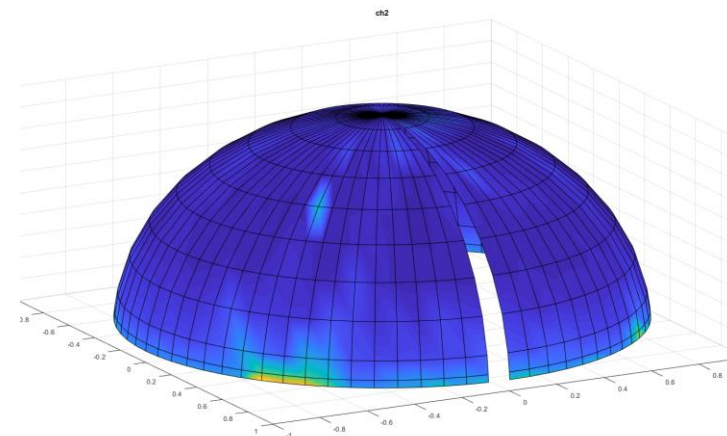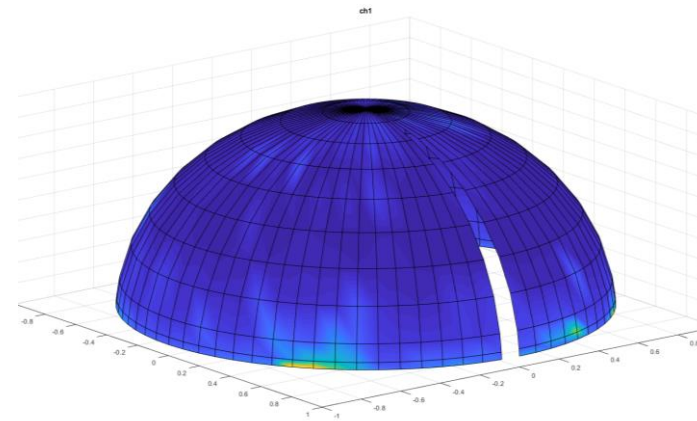 - ➢ Measurement setup: Antenna + preamplifier

Since LCP is switched off some channels for IVS observations started to be useful !
(previously 2 channels were always discarded). NOW just 1 of them.

RFI measurements

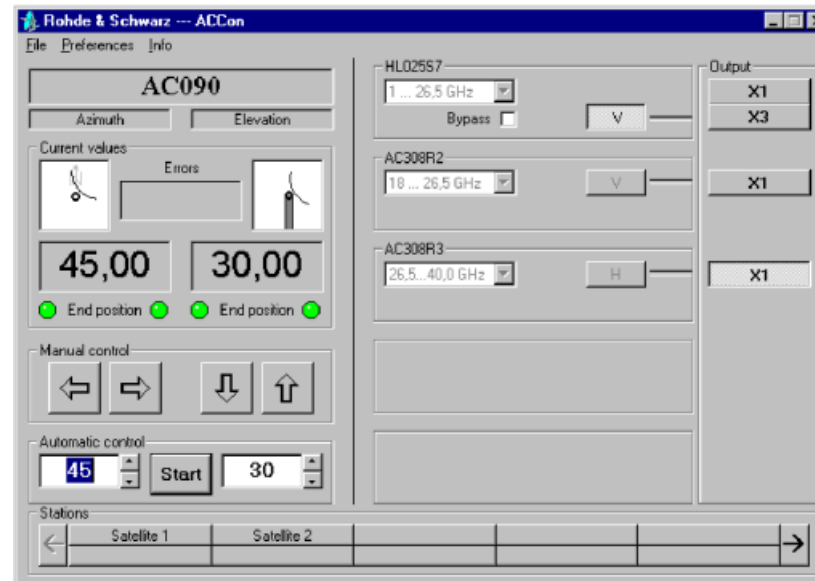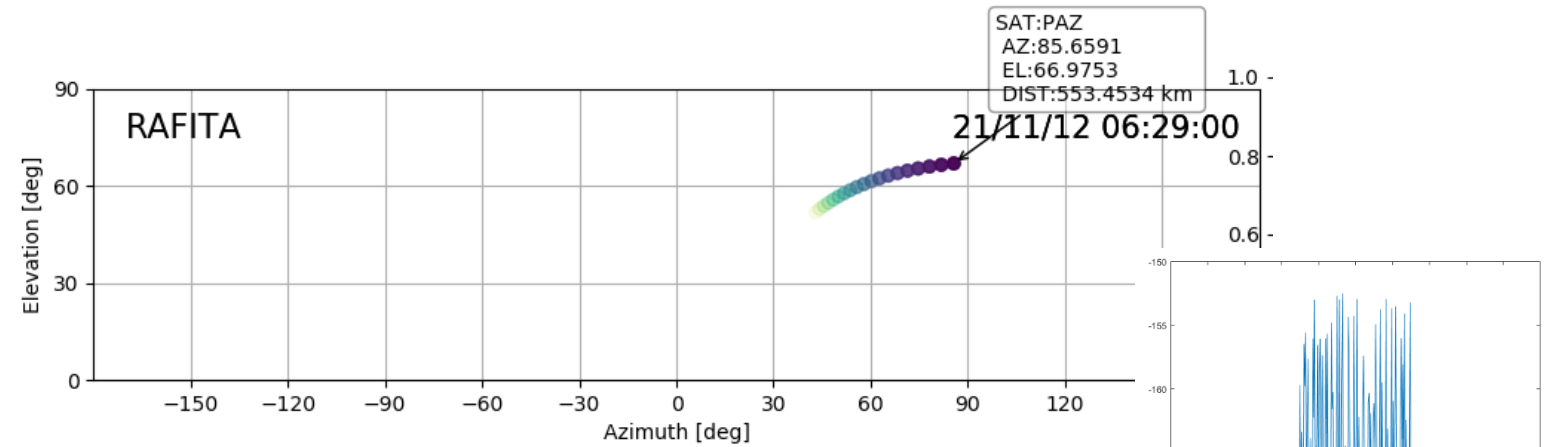- **RFI** measurements for new VGOS RT in Gran Canaria (RAEGE project):
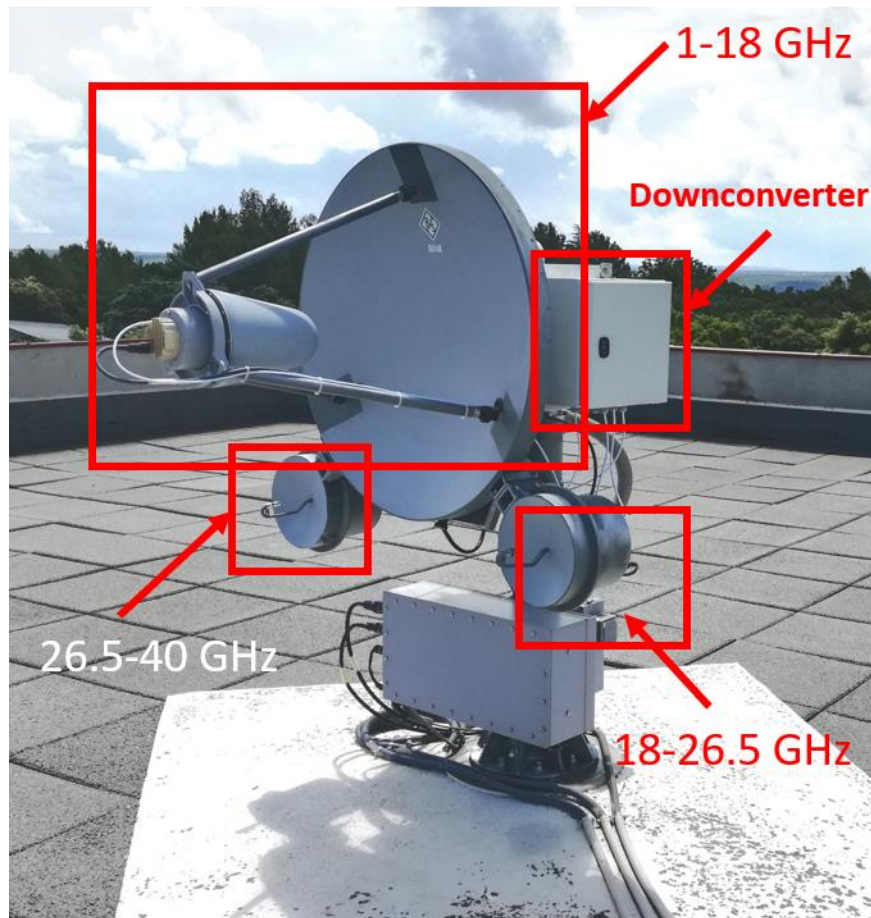

- RFI VGOS measurements with 13.2 m RT (Yebes):

To check if optical fiber saturates:

- RFI filter 3-12 GHz **prevents it** (some diode limiters broke when 2.1 GHz is not filtered)
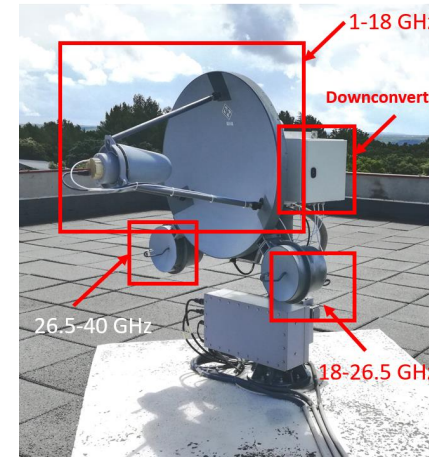
RFI permanent system

1-18 GHz

Downconverter

26.5-40 GHz

18-26.5 GHz

SAT:PAZ
AZ:85.6591
EL:66.9753
DIST:553.4534 km

21/11/12 06:29:00

RAFITA

Future implementation

Control software in Python

Satellite tracking in progress

RFI permanent system

1-18 GHz
Downconverter
26.5-40 GHz
18-26.5 GHz
Rooftop

36m low losses
coaxial cable

RF filters

Laboratory

➤ **Sky mapping** by remote control

- Make the setup (frequency, RBW, filters..) in the spectrum analyzer
- Antenna makes a sweep in **azimuth** and **elevation** collecting spectrum data every 1 min of integration in MAX HOLD mode. Total **325 'csv'files in 5h monitoring.**
- Data is post-processing to automatically detect RFI (no AI, just some statistics by the moment) with MATLAB sw.
- 2.5 to 12 GHz is covered by the moment
- The data should be calibrated in order to obtain the spectral flux integrated on the RFI data.

RFI permanent system
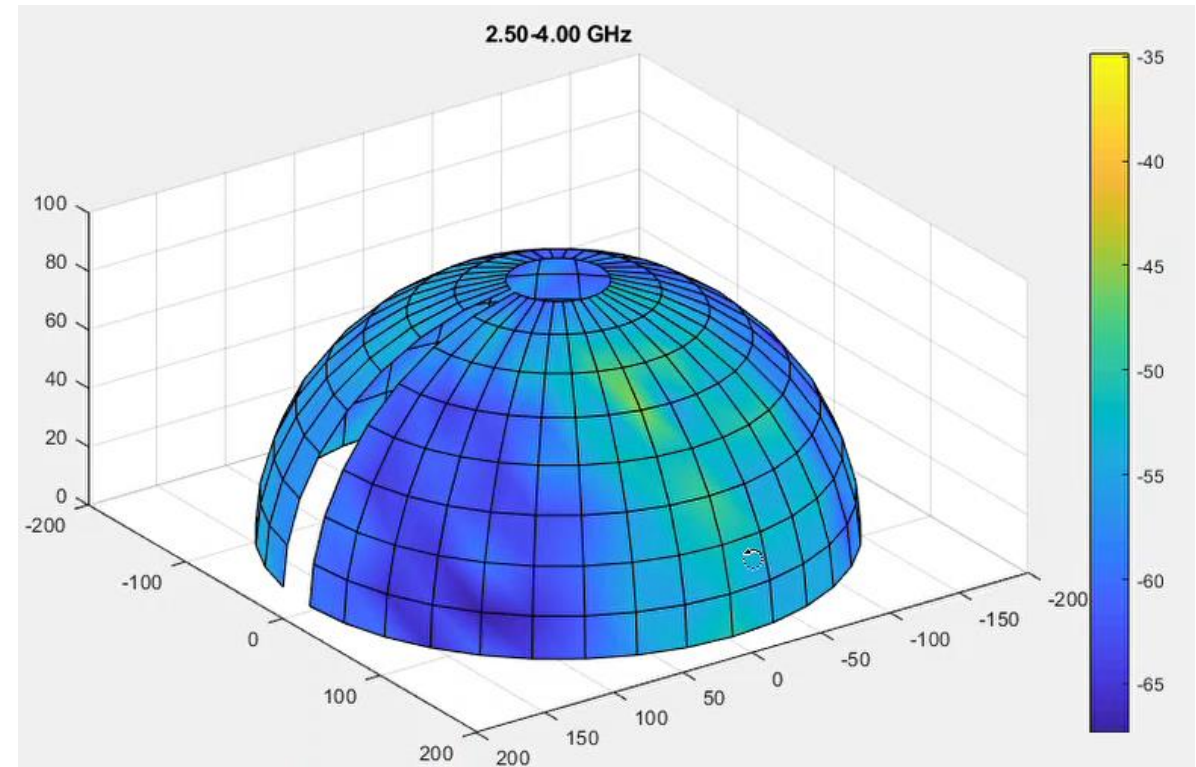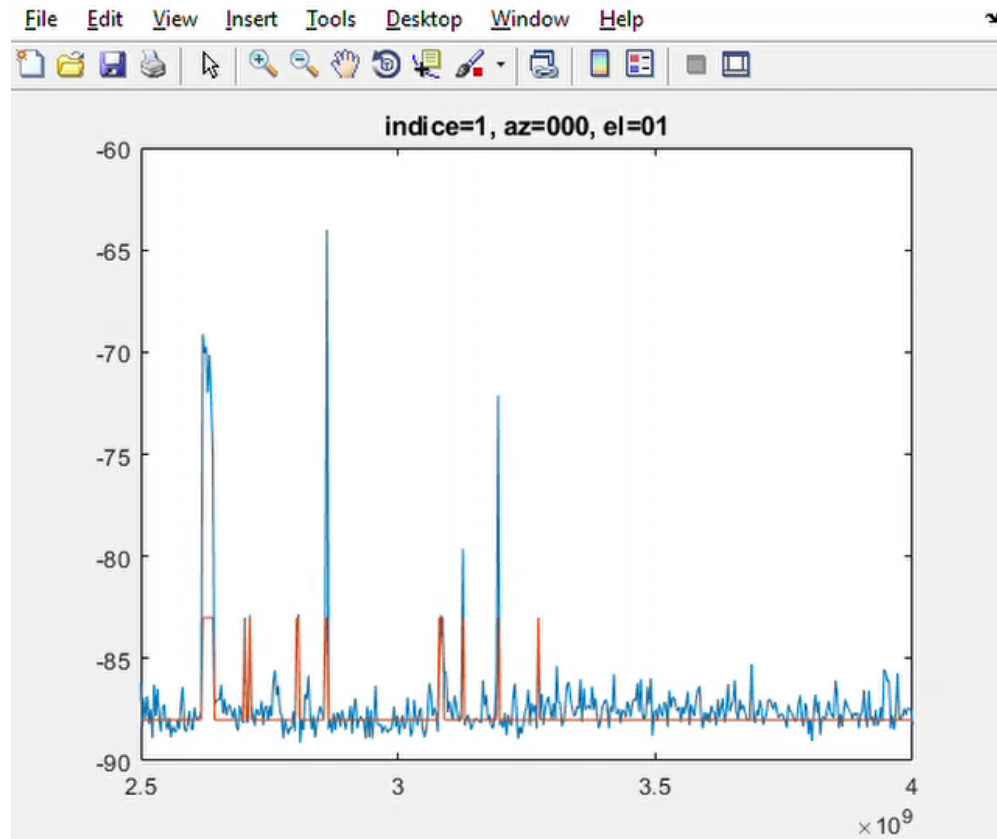
RFI permanent system
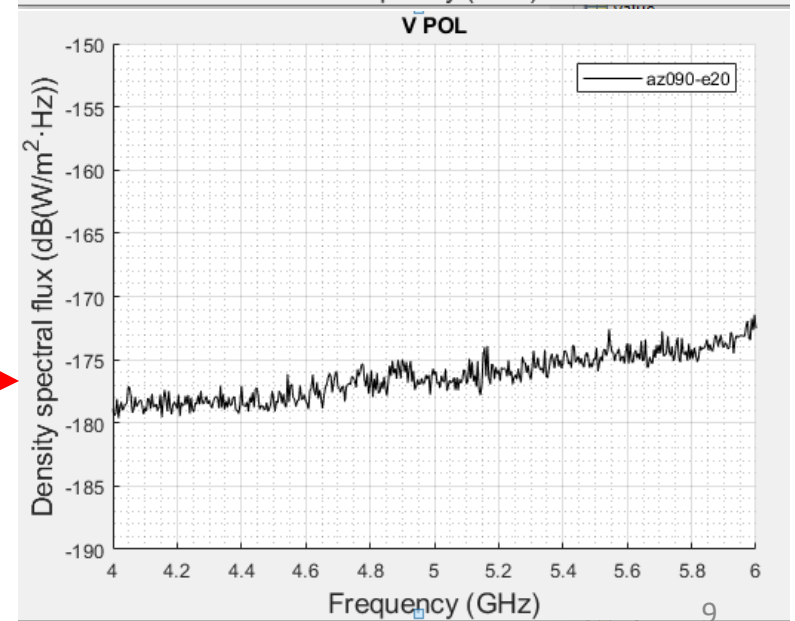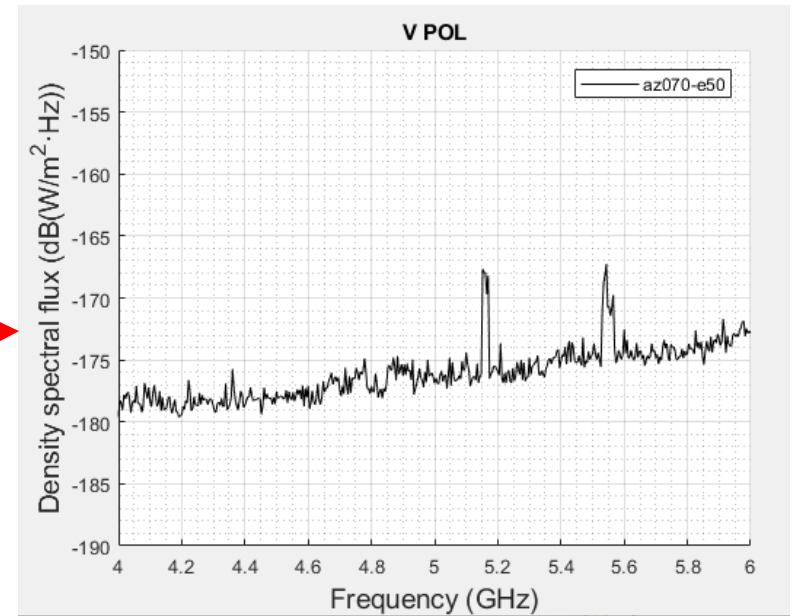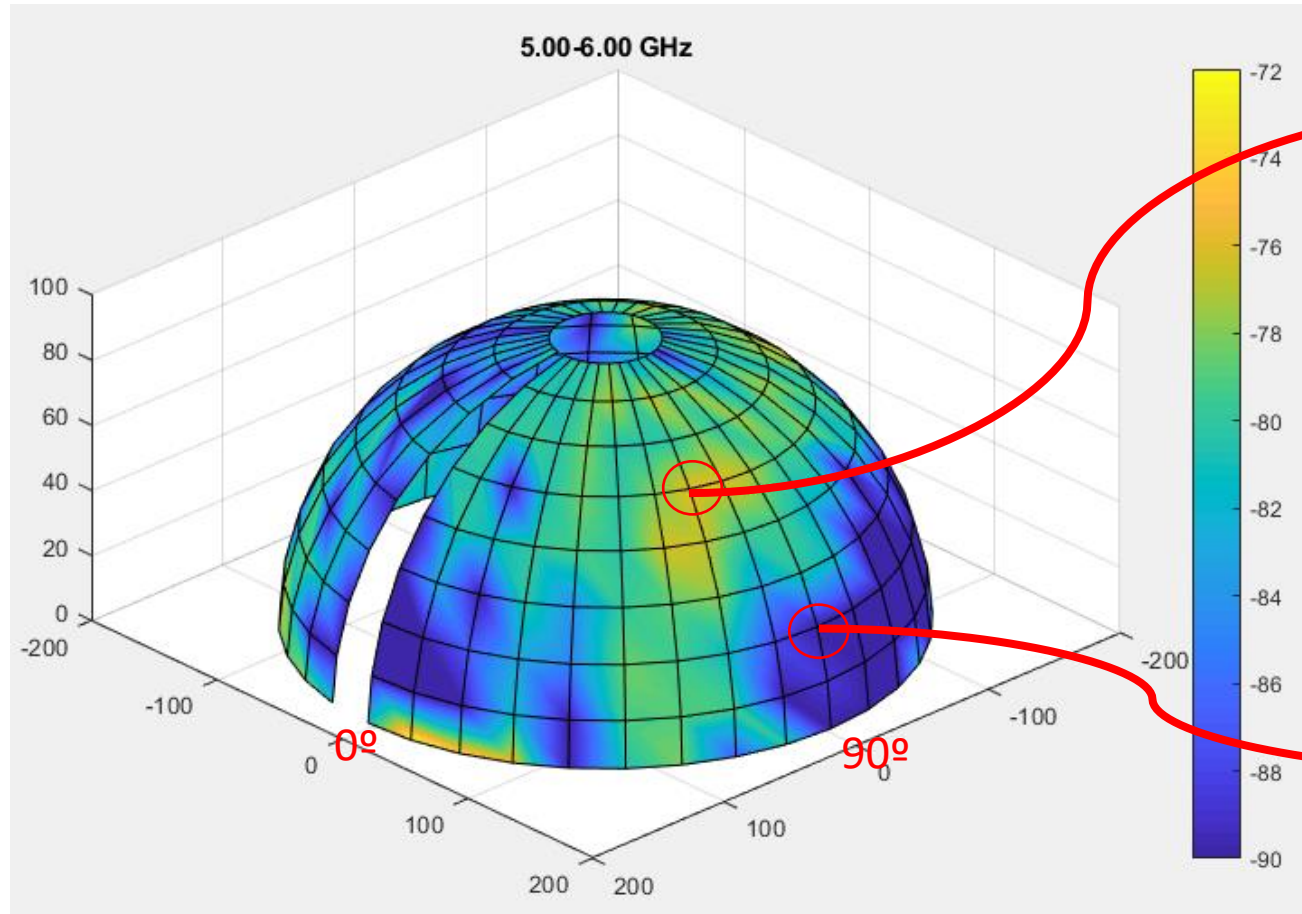
RFI results

➢This results could help us:

- To know where the RFI comes from

- To analyze the desired frequency range in more detail

- To know the worst case RFI integrated power level.

- To check if the amplifier is saturated from the RFI integrated power.

- To take actions:
  - Include some filters to avoid saturation
  - To design some HFS filter to be included in the cryostat.
  - To include some power limiters to avoid break the optical fiber.

Future improvements

- Further improve satellite tracking

- Improvements in automatic RFI detection

- Improvements on the control software of the antenna. Design a graphical interface.

Thanks for your attention