Preliminary noise measurements campaign carried out by HUMSAT-D during 2014

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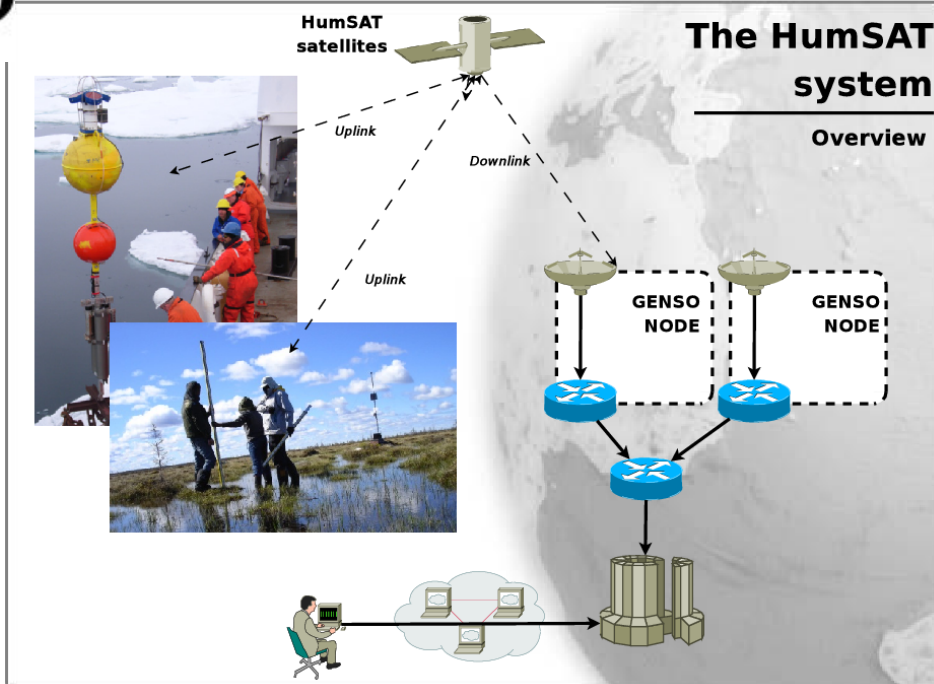
The Humsat System

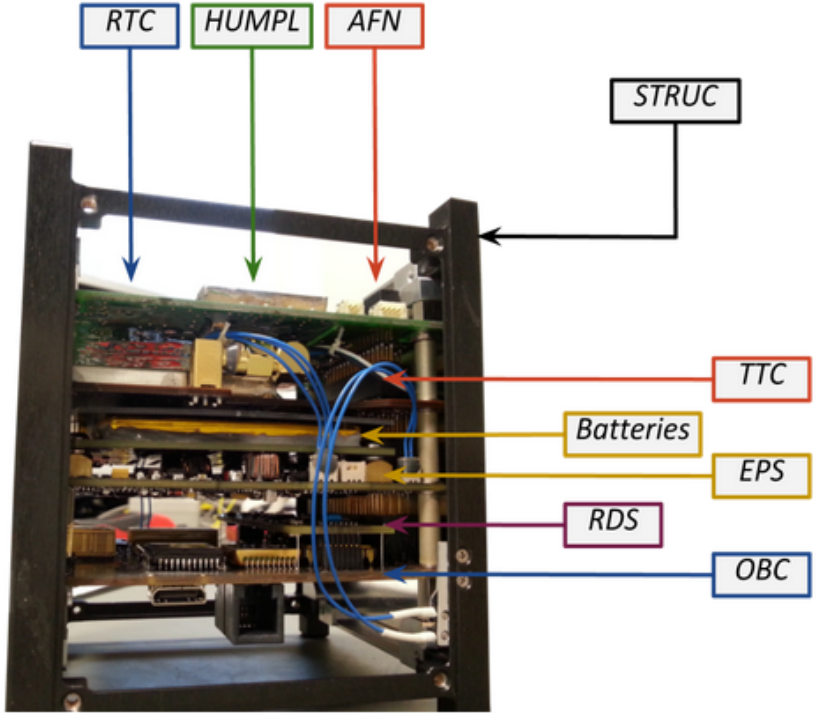
Universidade Vigo

esa

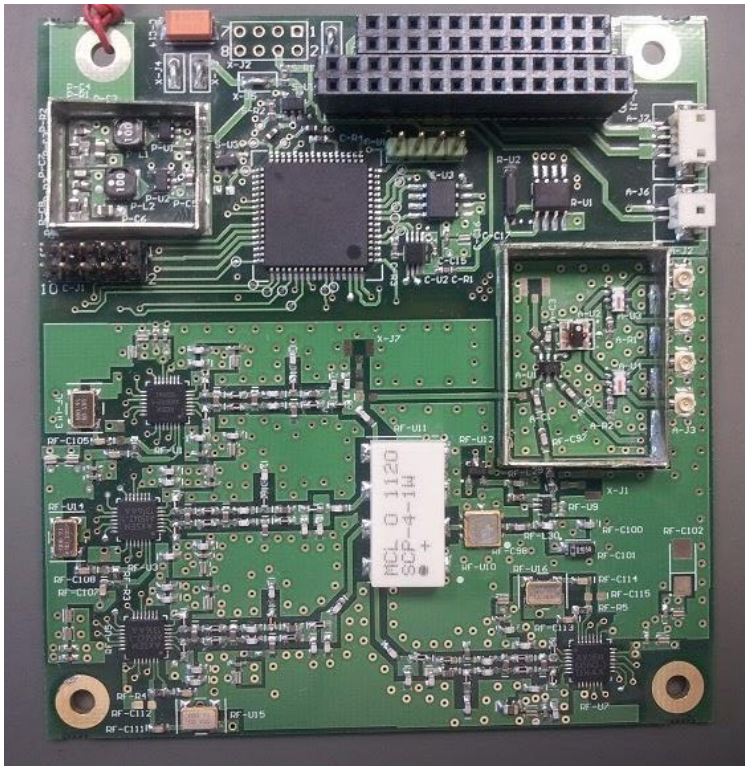
UNOOSA

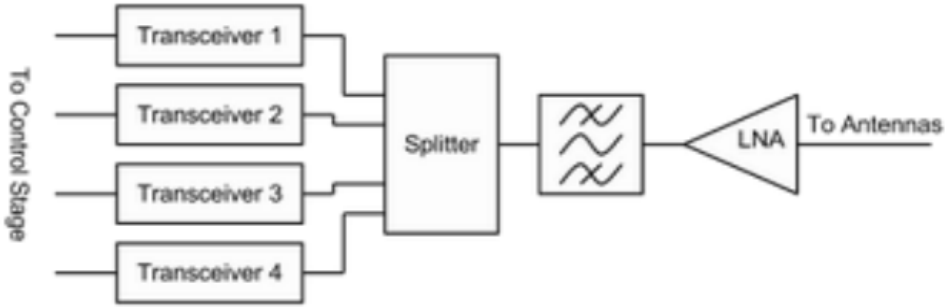


Humsat-D



Humsat Payload (HUMPL)





HUMPL Operation (I)

Main objectives:

1. Test payload performance.
2. Study the communication channel behaviour.

Two phases planned:

1. In orbit test.
2. Complete operation.

HUMPL Operation (II)

In orbit test

December 3, 2013: First operation**.**

Tests planned for in orbit test phase:

- Noise measurements at different points.
- Carrier power measurements where terminals are installed.
- Performance tests with different configurations.

Interference detection

During the in orbit test phase an unexpected interference was measured.

Several tests were performed to identify the source and nature of the interference.

Interference Measurements

Tests campaigns

Different tests campaigns were performed:

- Different latitudes and frequencies.
- Different locations and frequencies.
- Interference attenuation.
- Interference continuity.

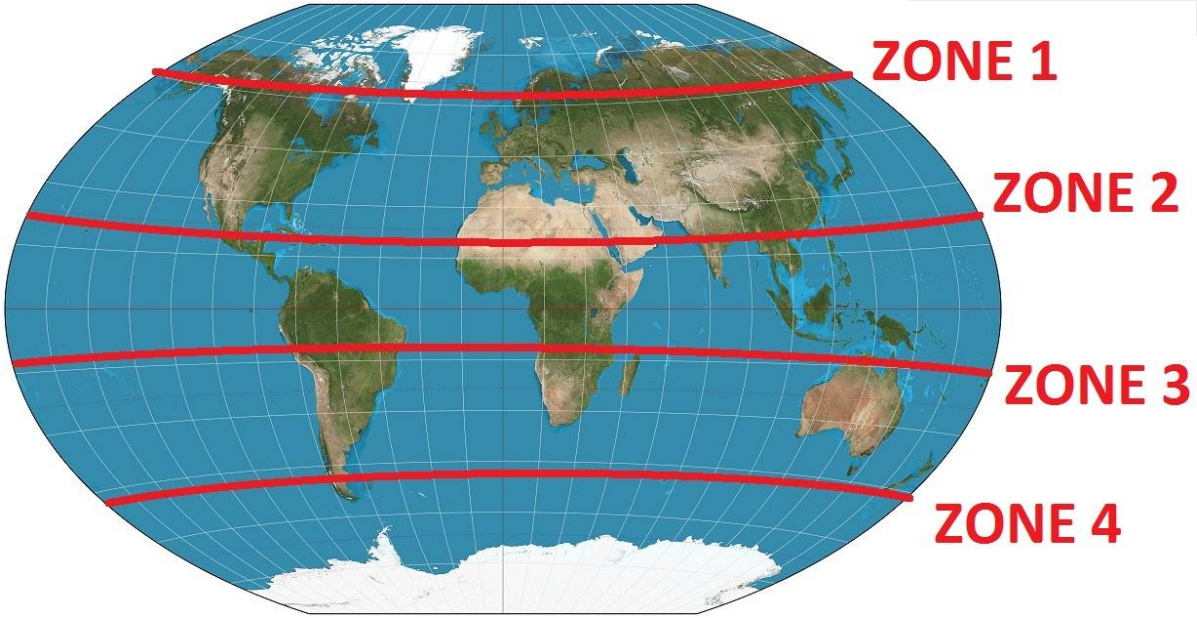
Interference Measurements

Methodology

1. The HUMPL is configured to measure power level.
2. The 4 transceivers are operated in parallel.
3. The test is performed during a specific time and frequency.
4. The HUMPL returns two result values per transceiver:
    a. Maximum power received during the test.
    b. Frequency stability of the signal received.

Interference Measurement

Different latitudes and frequencies (I)

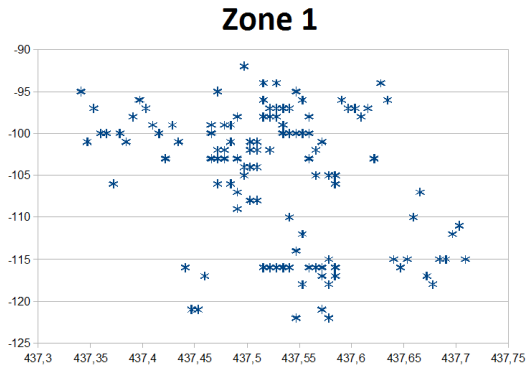


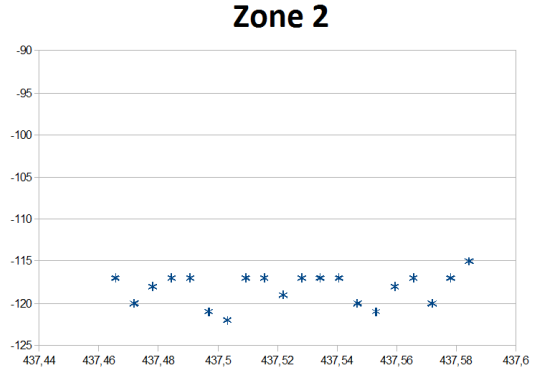
UHF Amateur band: 437,350 MHz to 437,700 MHz

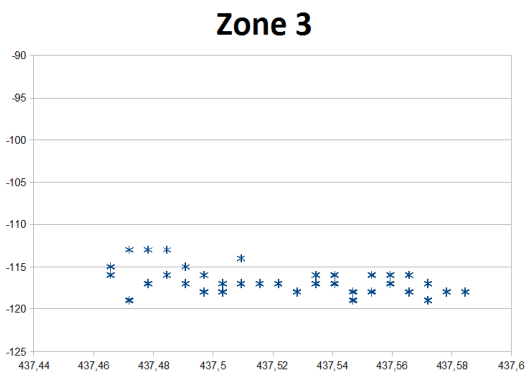
Interference Measurement

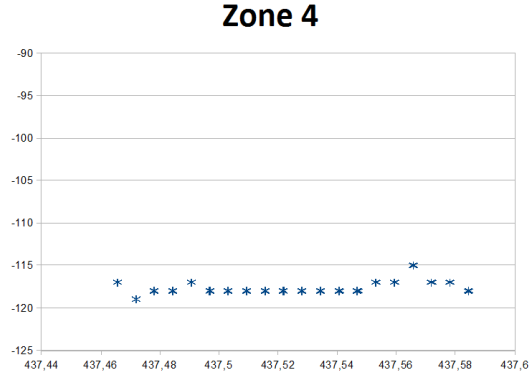
Different latitudes and frequencies (II)

Power received (dBm)





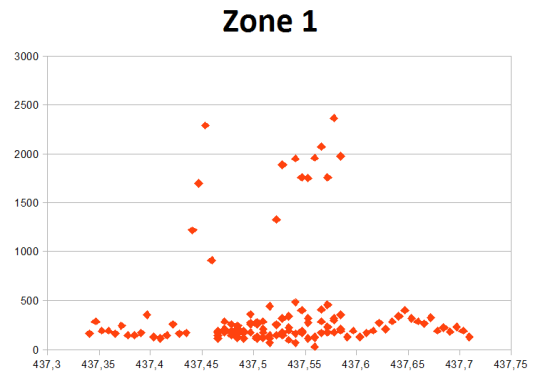


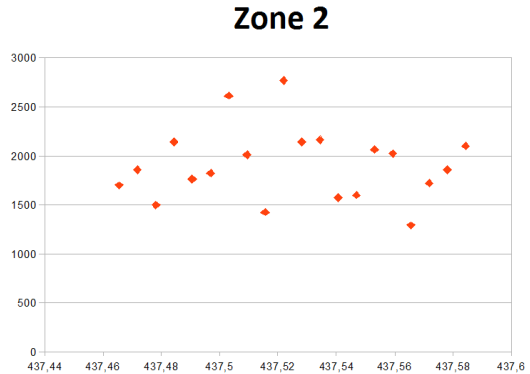


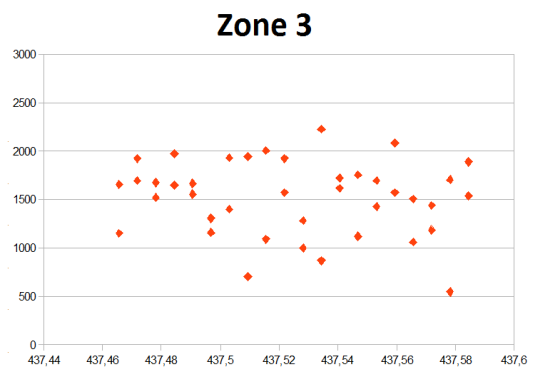
Interference Measurement

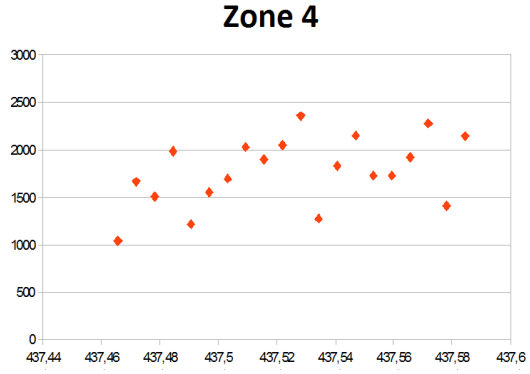
Different latitudes and frequencies (III)

Frequency stability







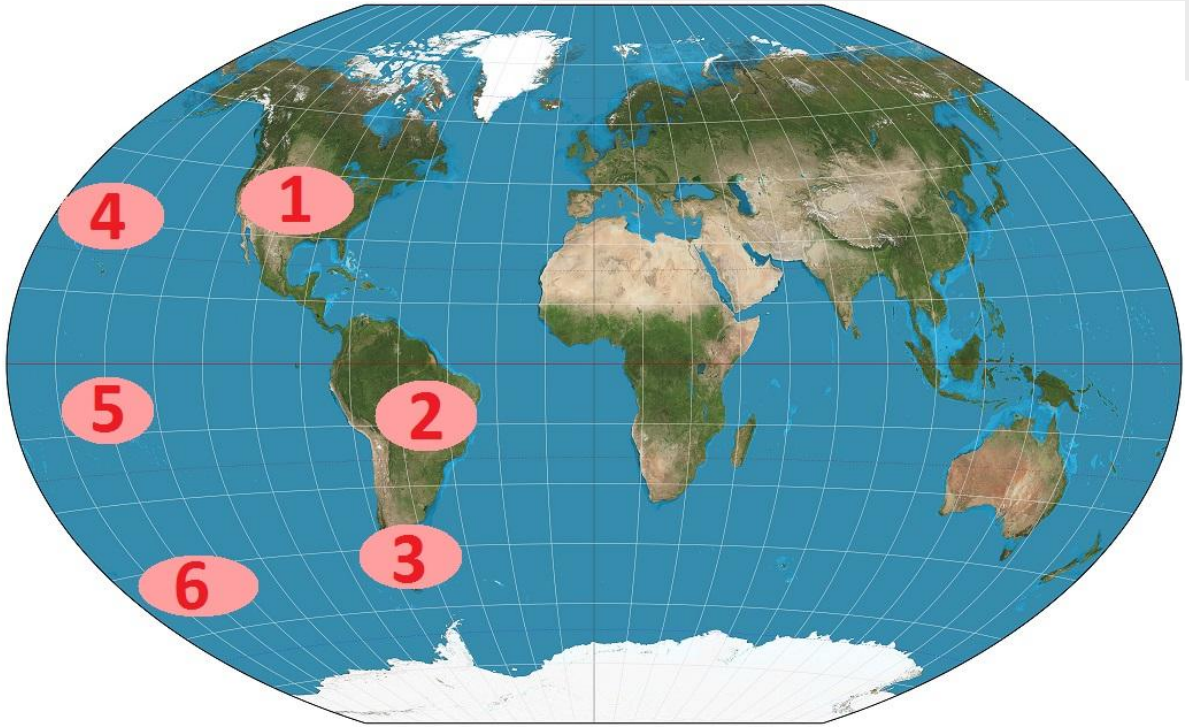


Interference Measurement

Different locations and frequencies (I)

HUMPL Band:
437,525 MHz

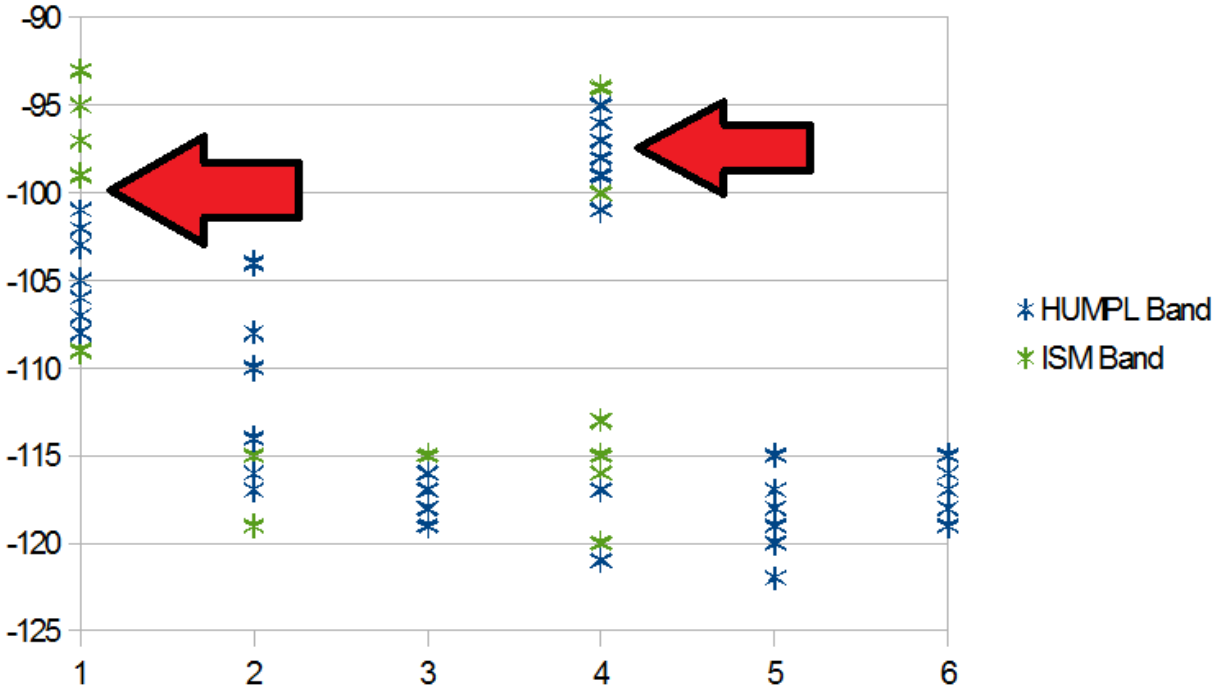
ISM Band:
434,525 MHz



Interference Measurement

Different locations and frequencies (II)

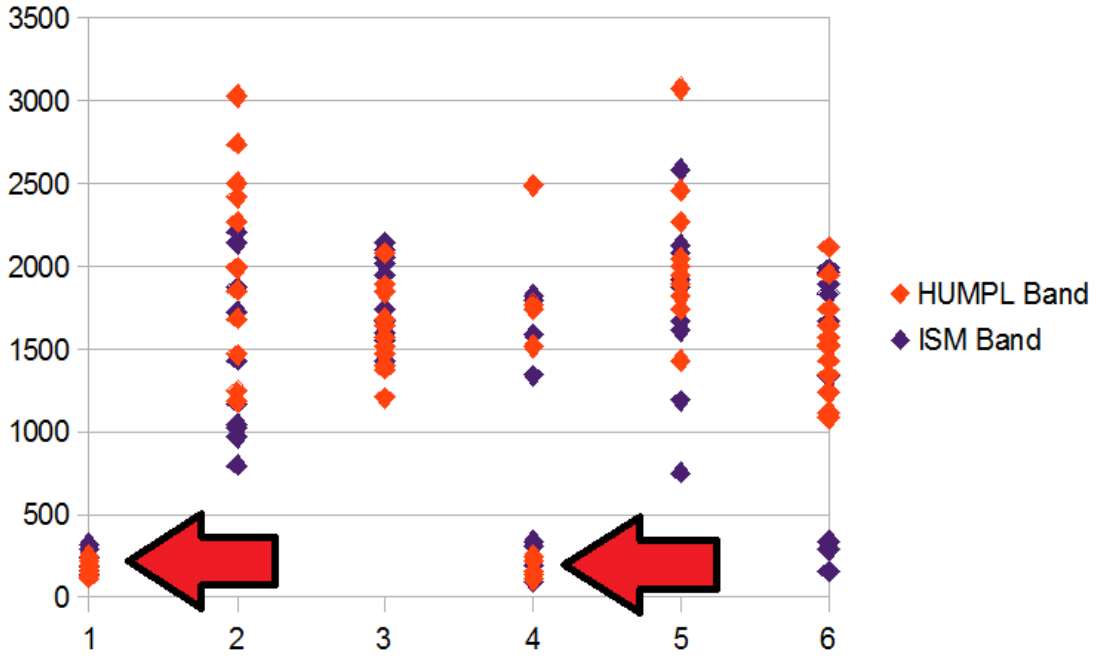
Power received (dBm)



Interference Measurement

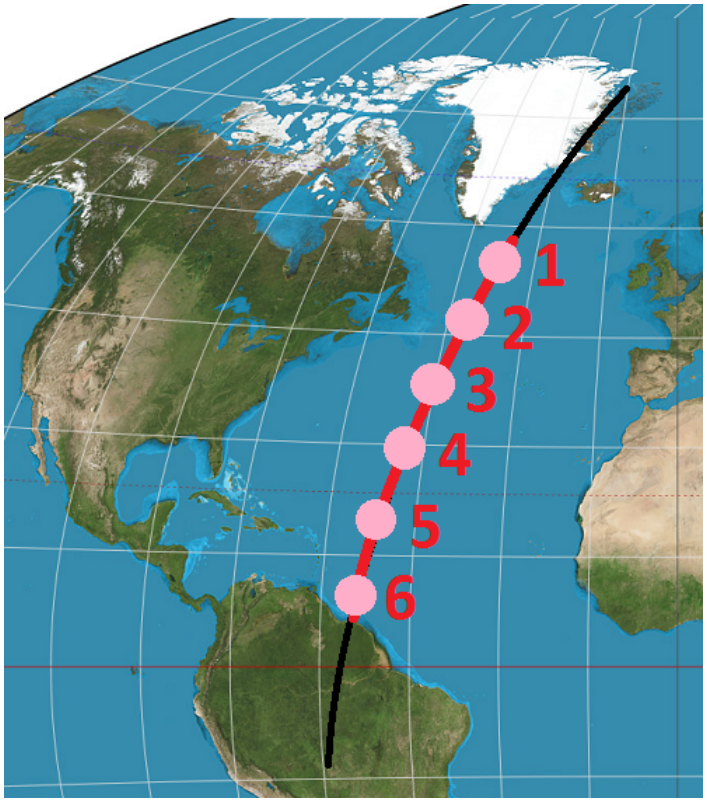
Different locations and frequencies (III)

Frequency stability



Interference Measurement

North Atlantic transition (I)



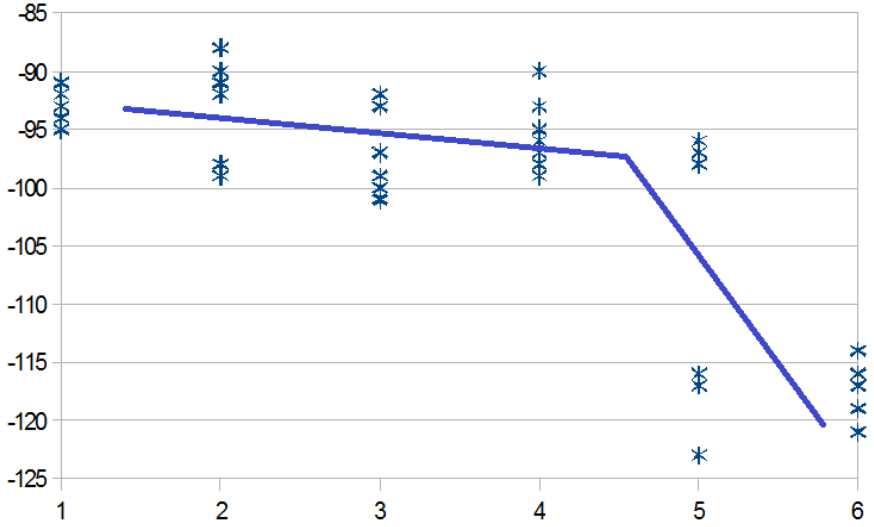
Objective: detect interference attenuation.

Result: the interference disappears abruptly.

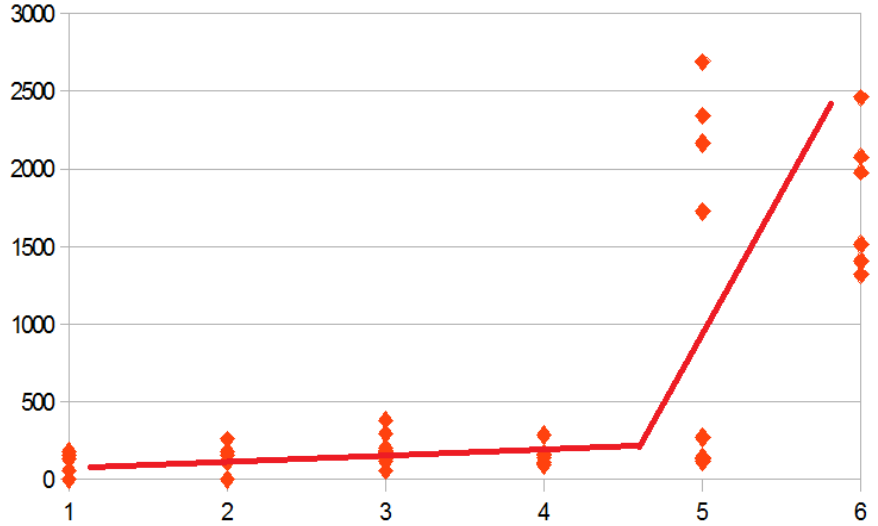
Interference Measurement

North Atlantic transition (II)

Power received (dBm)



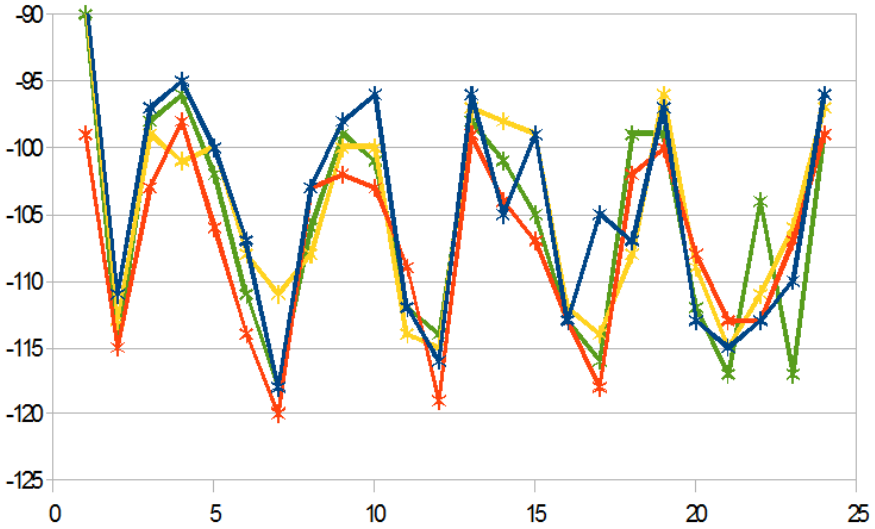
Frequency stability



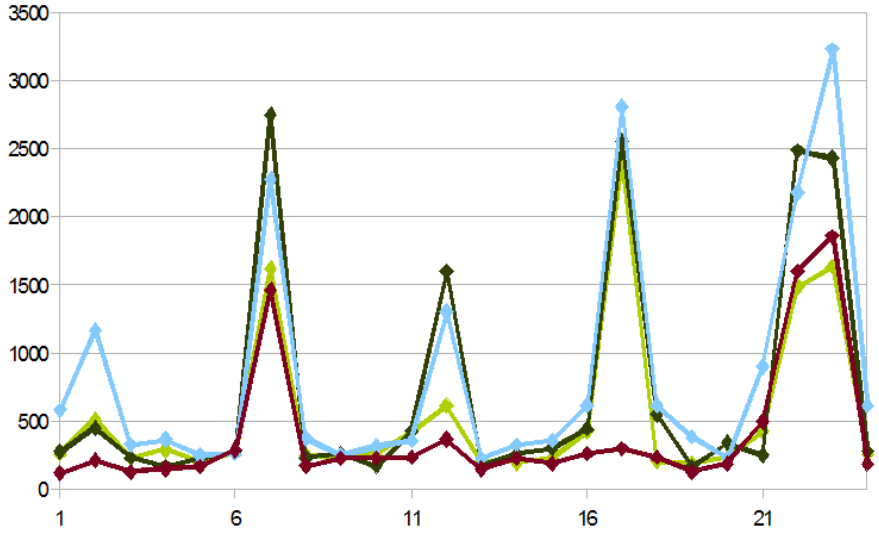
Interference Measurement

Pulsed or continuous?

Power received (dBm)



Frequency stability



Conclusions (I)

- A powerful interference was detected in 430 - 440 MHz band.
- It is detected in North hemisphere areas.
- It is generated by a pulsed source.
- New measurement campaigns must be planned with different satellites in order to discard internal contributions.

Conclusions (II)

Other studies provide similar results:

Busch, S., Bangert, P., Dombrovski, S., Schilling, K., *UWE-3, In-Orbit Performance and Lessons Learned of a Modular and Flexible Satellite Bus for Future Picosatellite Formations*

Thank you for your attention

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