



HAMTV Ground Segment



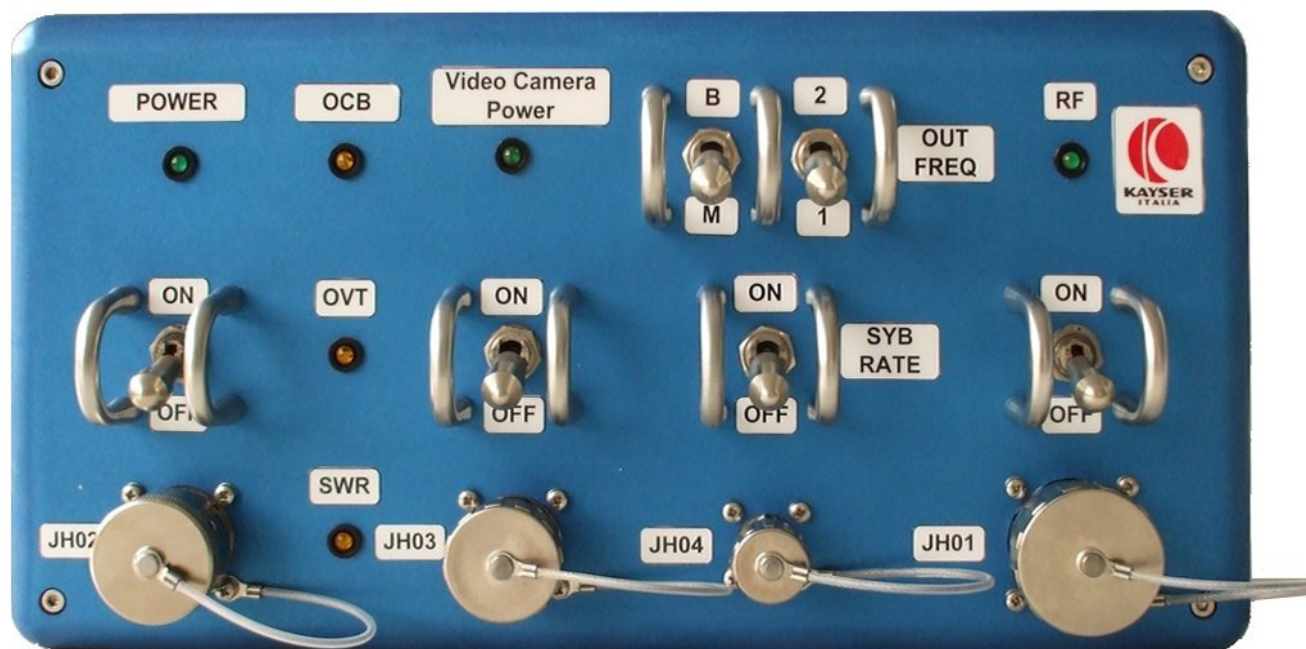
Ground Segment

HAMTV standard

Florence HamFest – April 12, 2014

HAMTV Ground Segment

HamTV transmitter



www.kayser.it/index.php/exploration-2/ham-tv

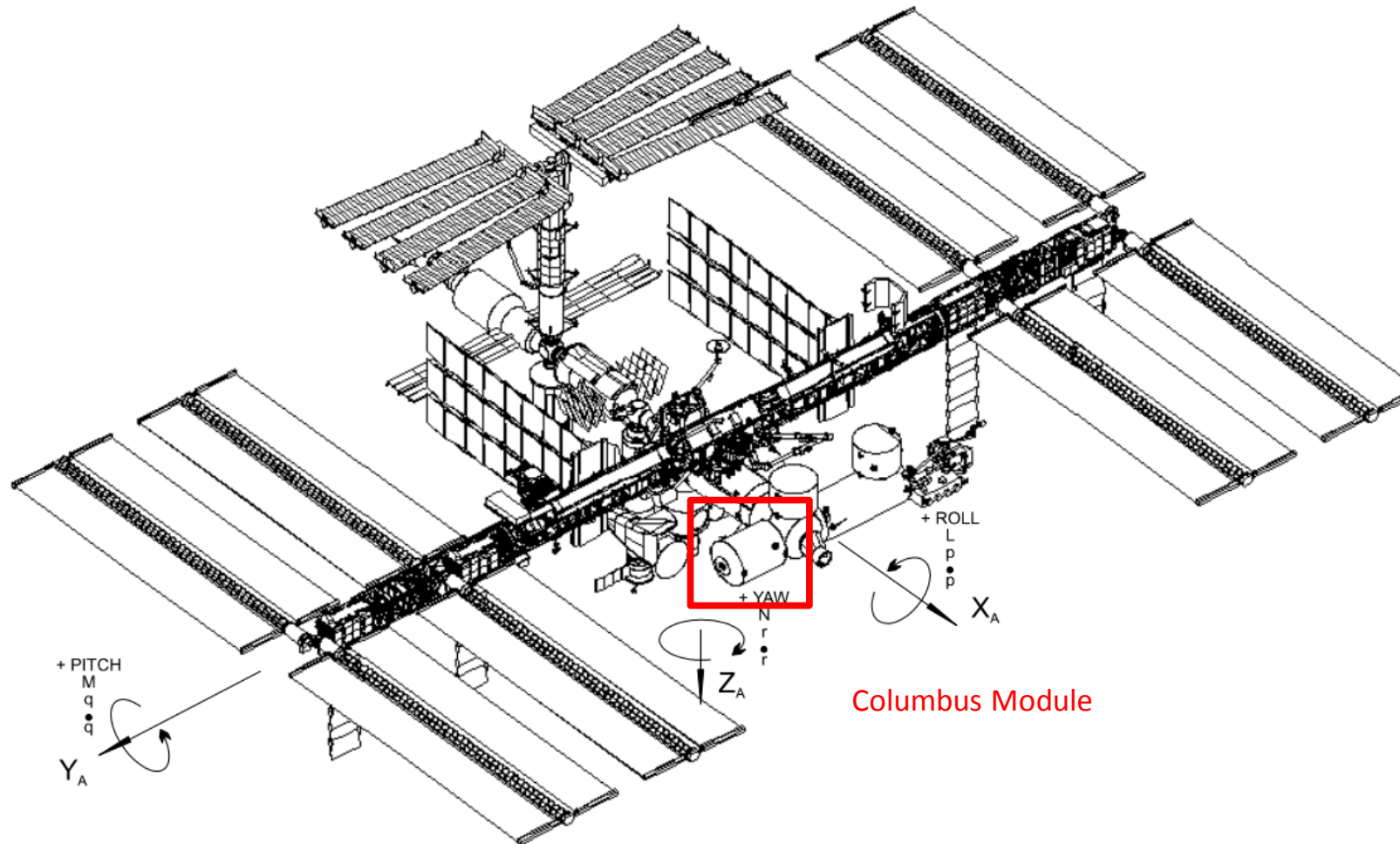


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“Space Station Reference Coordinate Systems” – ISS Program – Revision F – 2001 – NASA - JSC



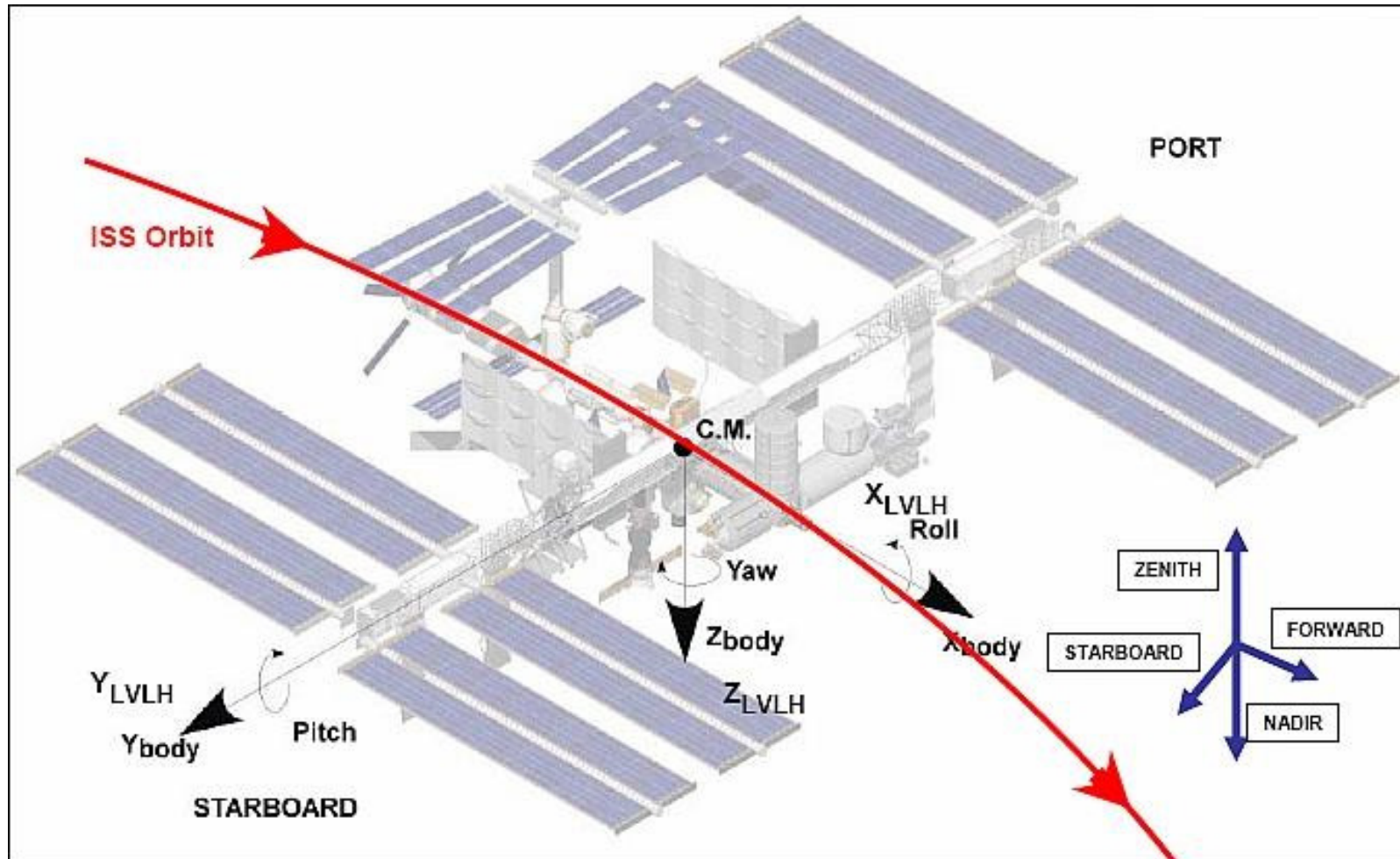


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<https://directory.eoportal.org/web/eoportal/satellite-missions/i/iss-columbus>



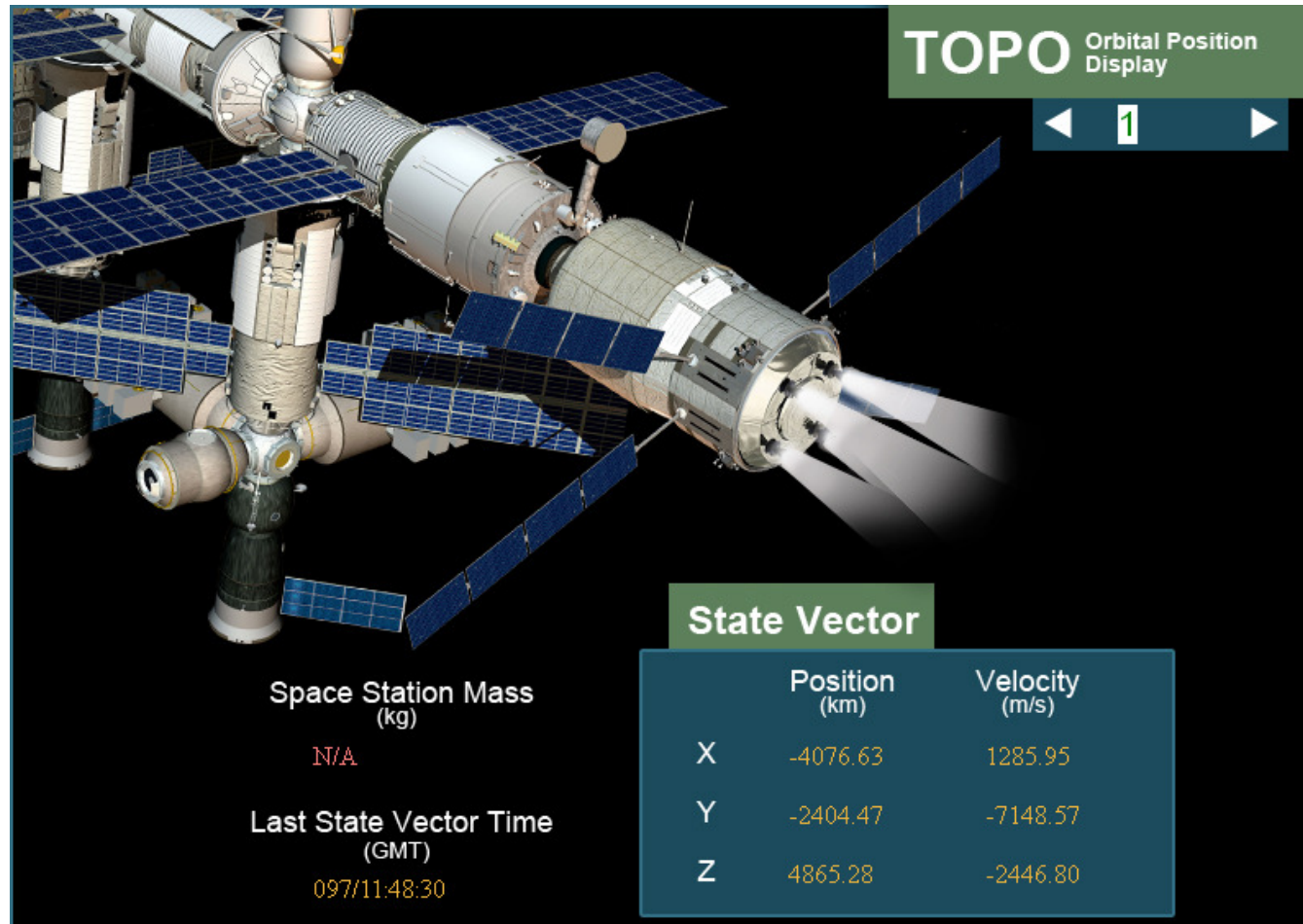


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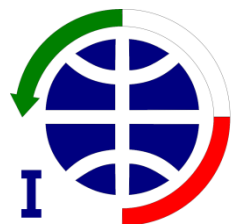
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Trajectory Operations Officer - TOPO



<http://spacestationlive.nasa.gov/displays/topoDisplay1.html>

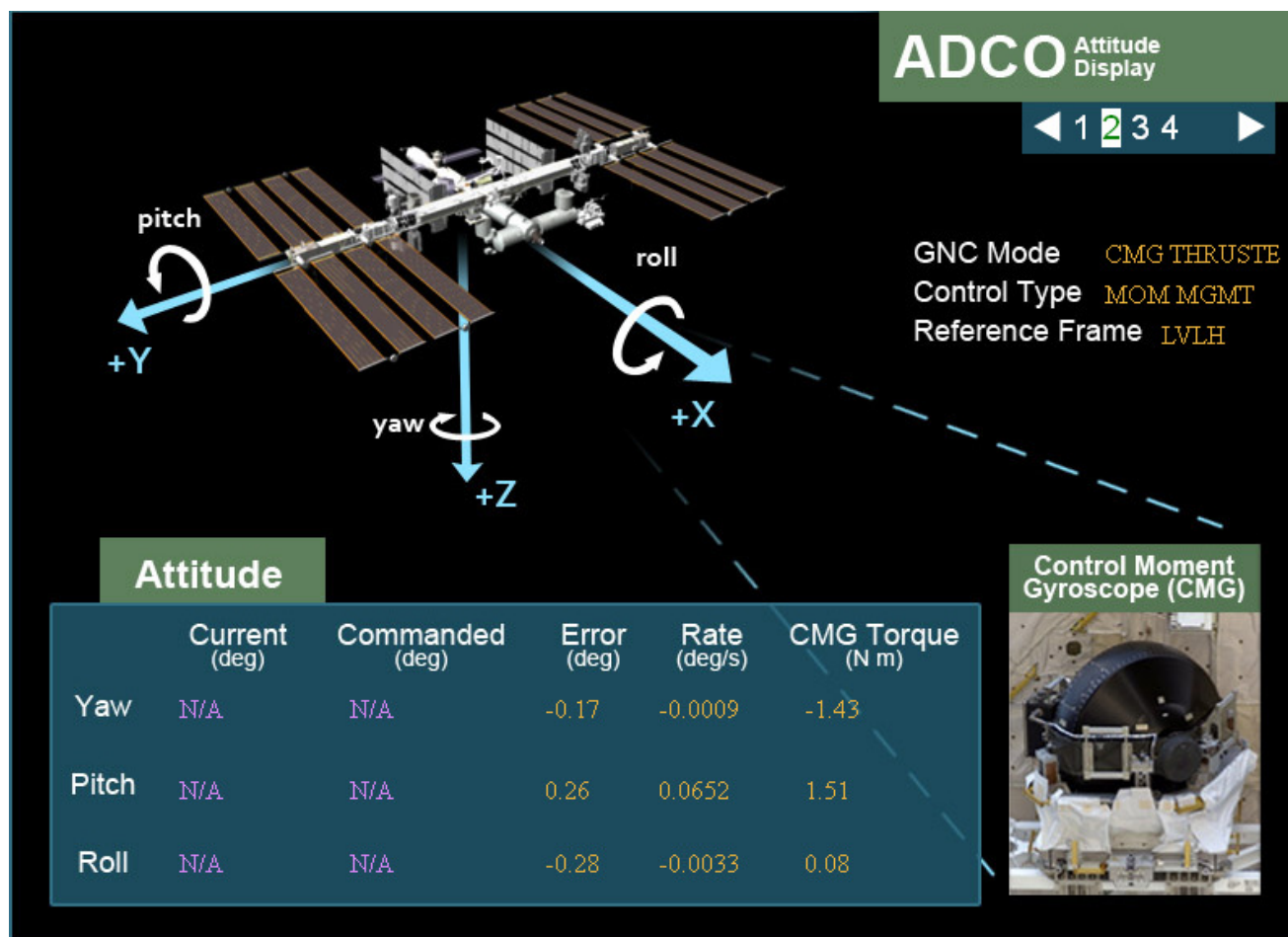


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Attitude Determination and Control Officer - ADCO



<http://spacestationlive.nasa.gov/displays/adcoDisplay2.html>

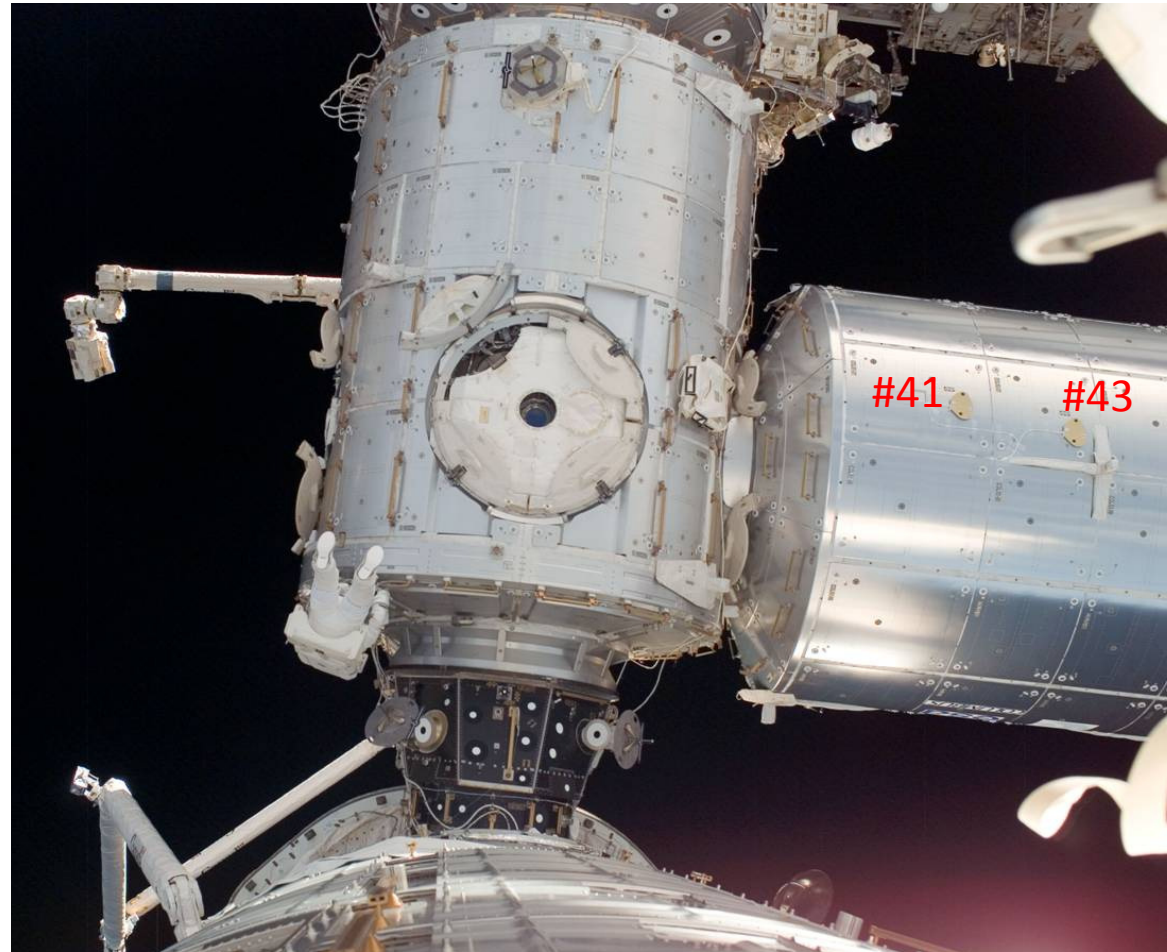


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ARISS Patch Antennas #41 & #43 – Columbus Module - ISS



http://www.ariss-eu.org/Columbus_in_Space.jpg

-- HamTV Ground Segment -- Amsat-Italia @ Florence HamFest April 12, 2014

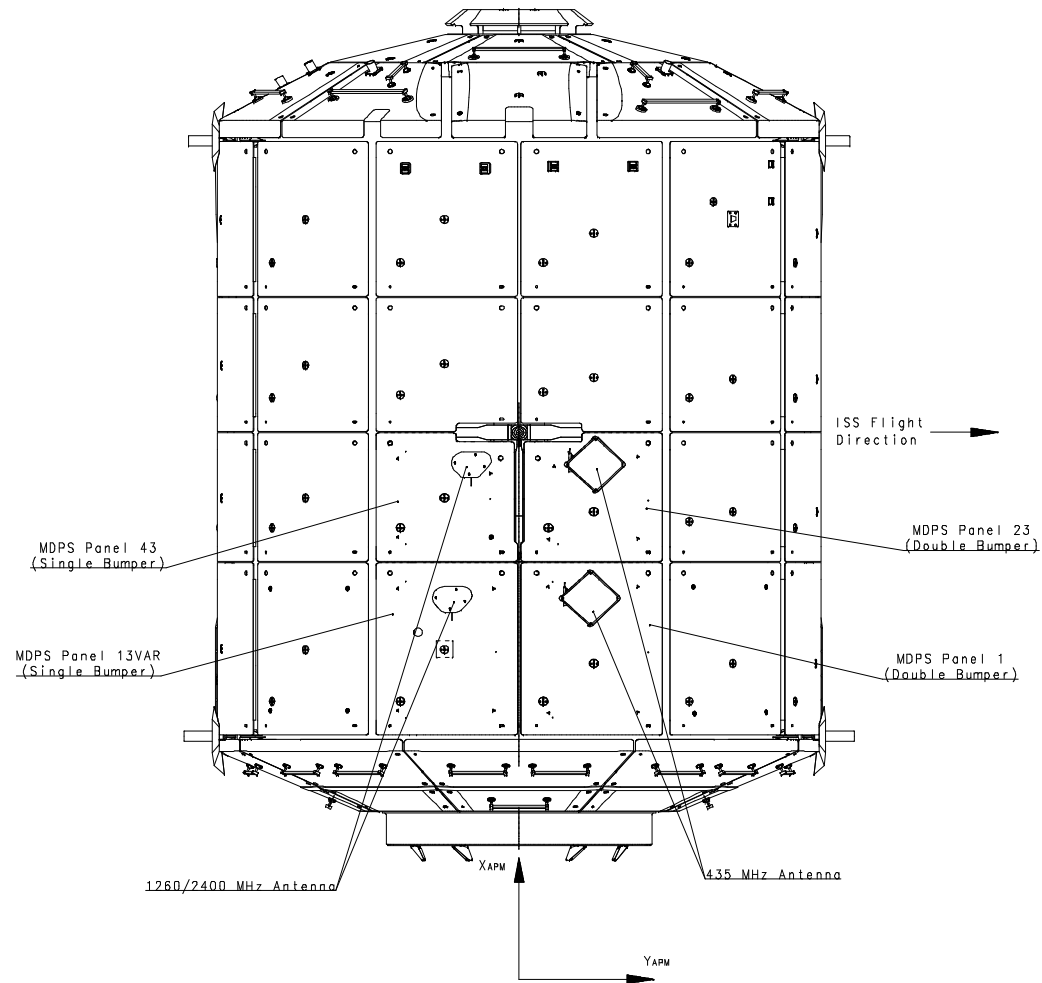


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ARISS Patch Antennas 41 & 43 – Columbus Module - ISS



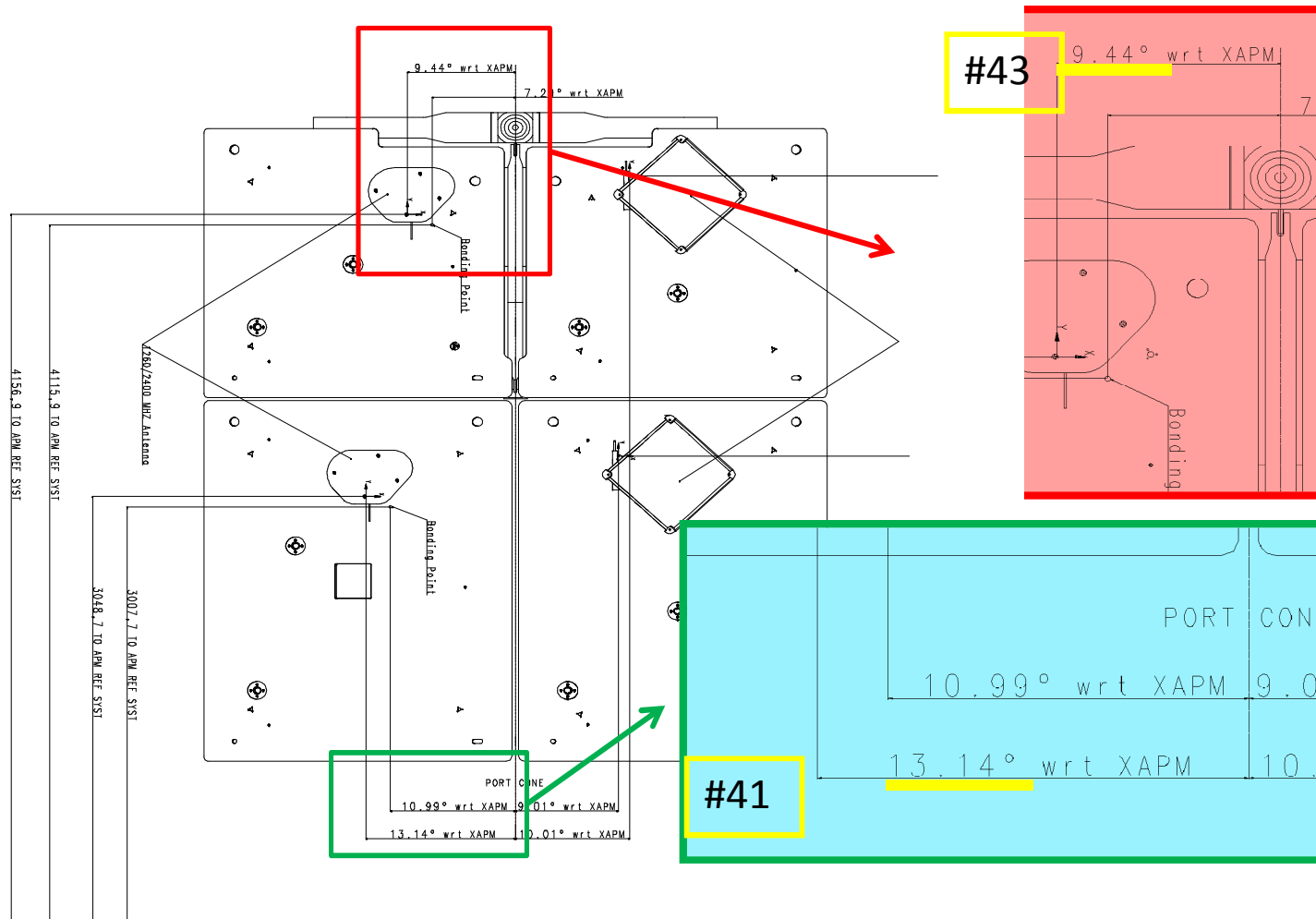


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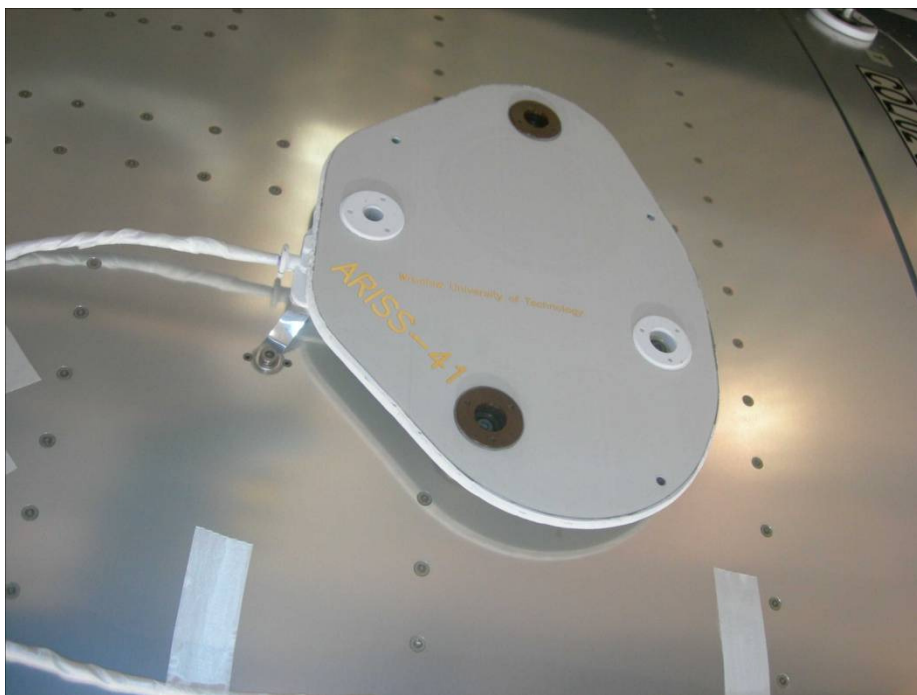
ARRISS Patch Antennas 41 & 43 – Columbus Module - ISS



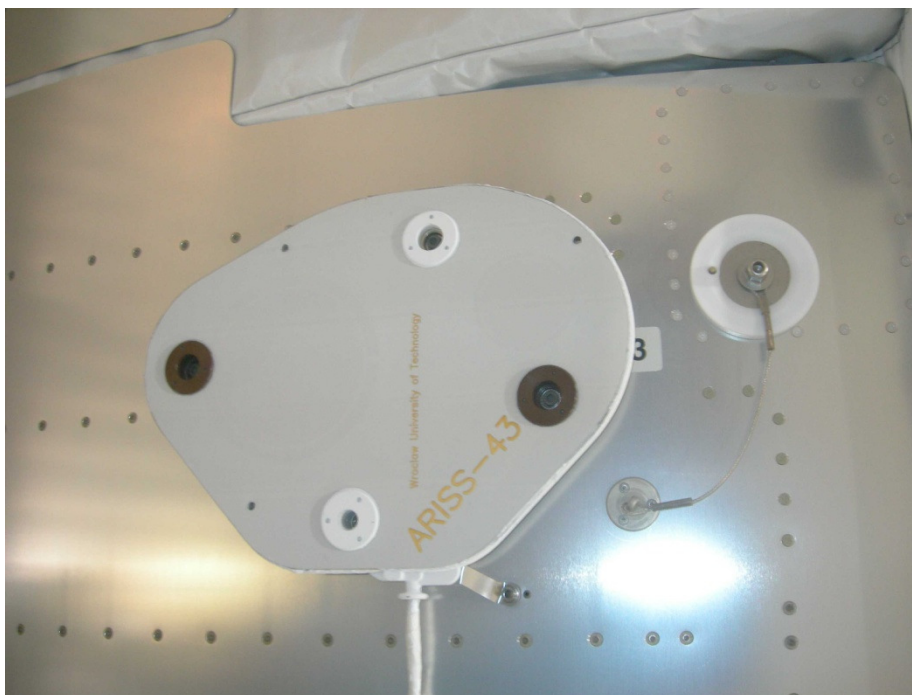
t April 12, 2014

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ARISS Patch Antennas 41 & 43 – Columbus Module - ISS



http://www.ariss-eu.org/ARISS_41_Front.JPG



http://www.ariss-eu.org/ARISS_43_Front.JPG



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HAMTV Standard GS

Antenna	1.2 m Offset Dish
Feed	LHCP Helix
Preamplifier/Down Converter	Kuhne KU LNC-25
RF Coax Cable	LMR-400
Set Top Box / PC Card	Megasat HD 800 / TechnoTrend S2-3200

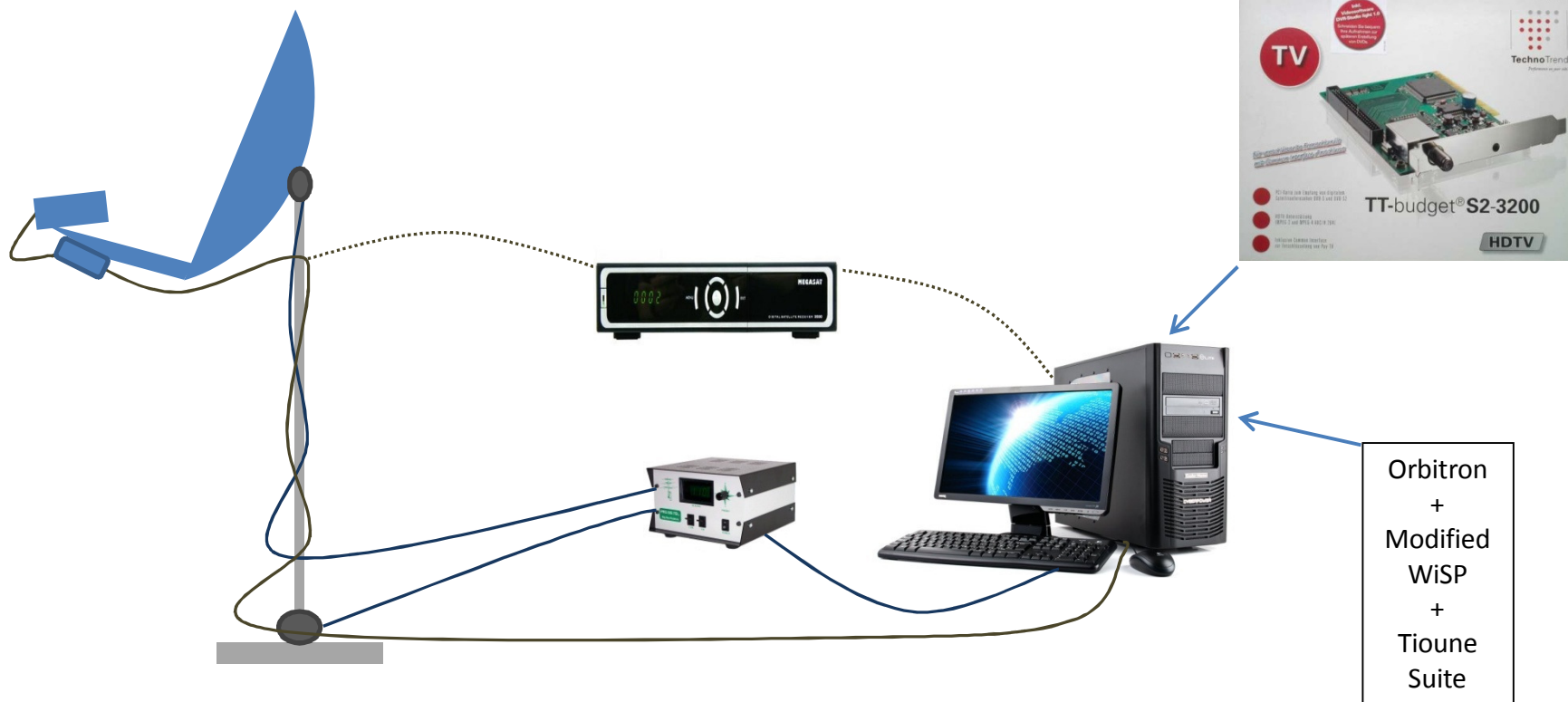
Each Ground Station will operate as a receive-only (R/O) terminal i.e. the station can receive, demodulate and record data transmitted in the S-band (2360 - 2450 MHz). The antenna used for data reception consists of an offset focus system with azimuth and elevation mount; it is capable of program controlled operation, however manual capability as backup solution is foreseen as well.



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HAMTV Standard GS



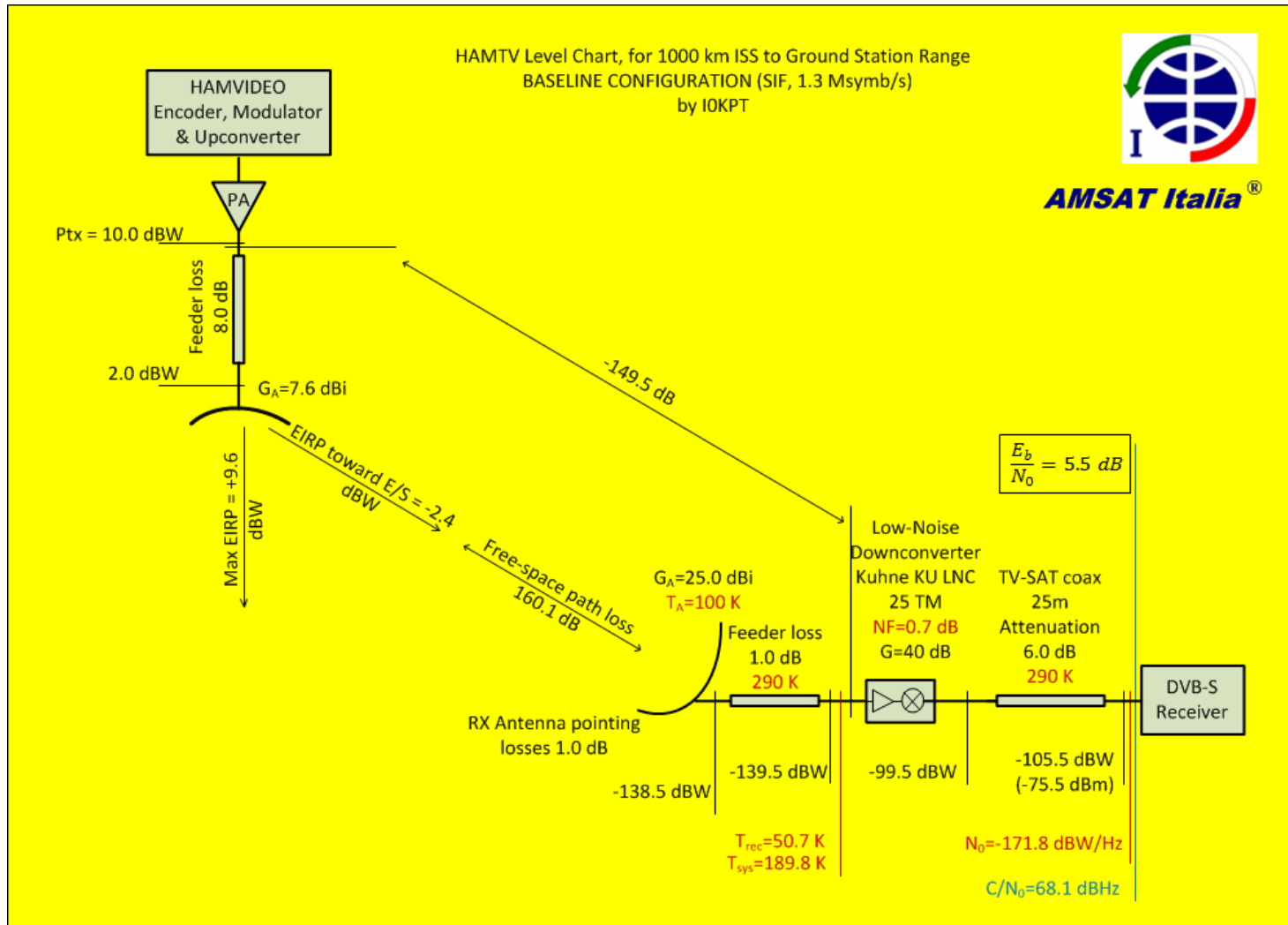


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Level Chart for HAMTV



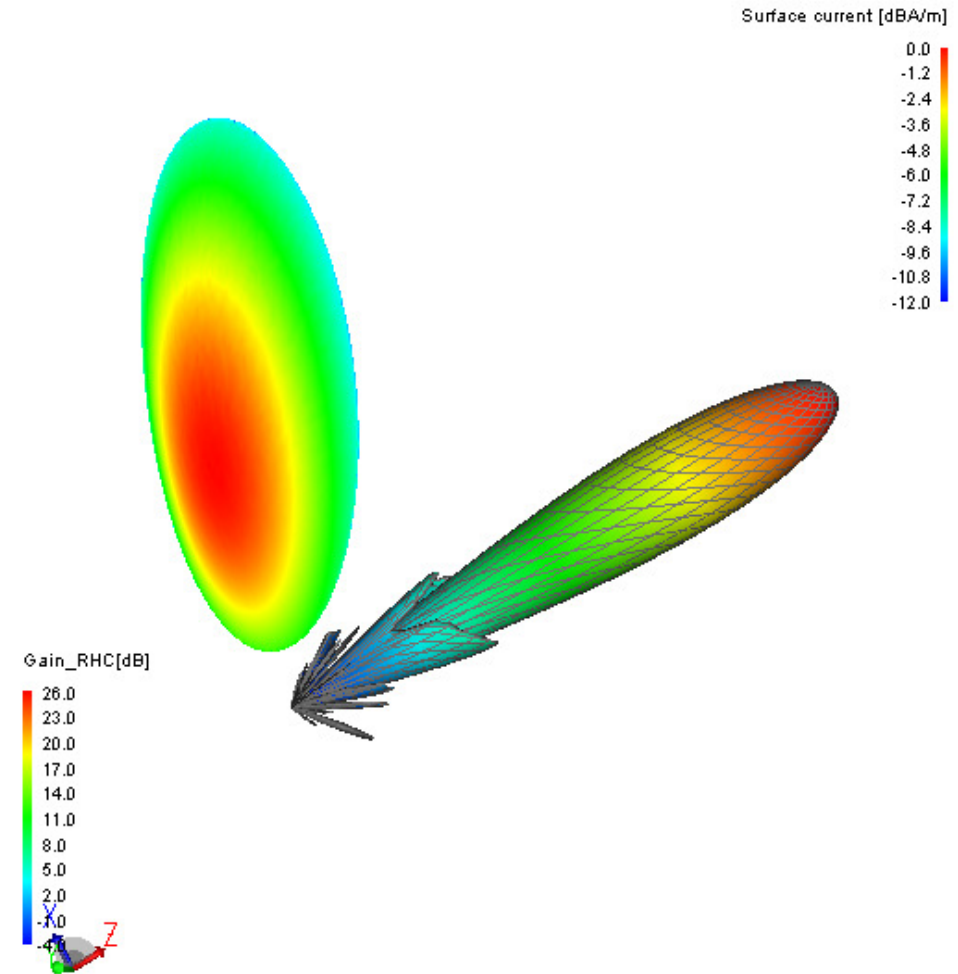


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HamTV Standard Station: 1.2m Offset Dish [25dBi]





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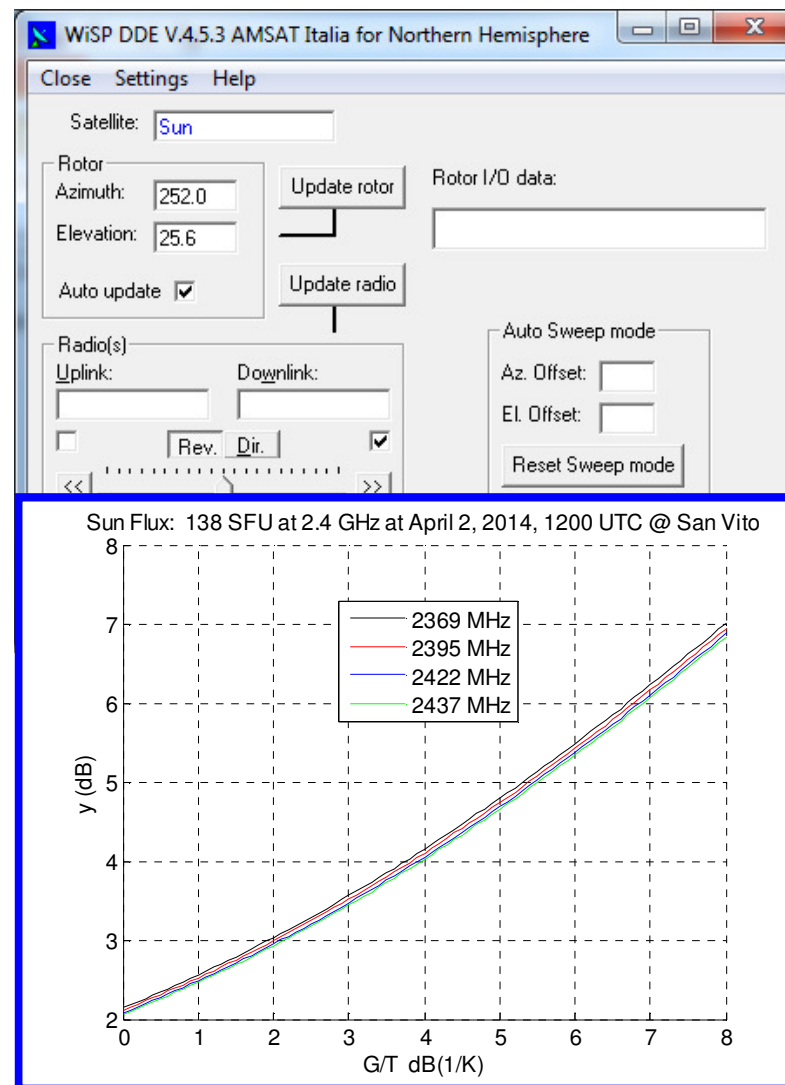
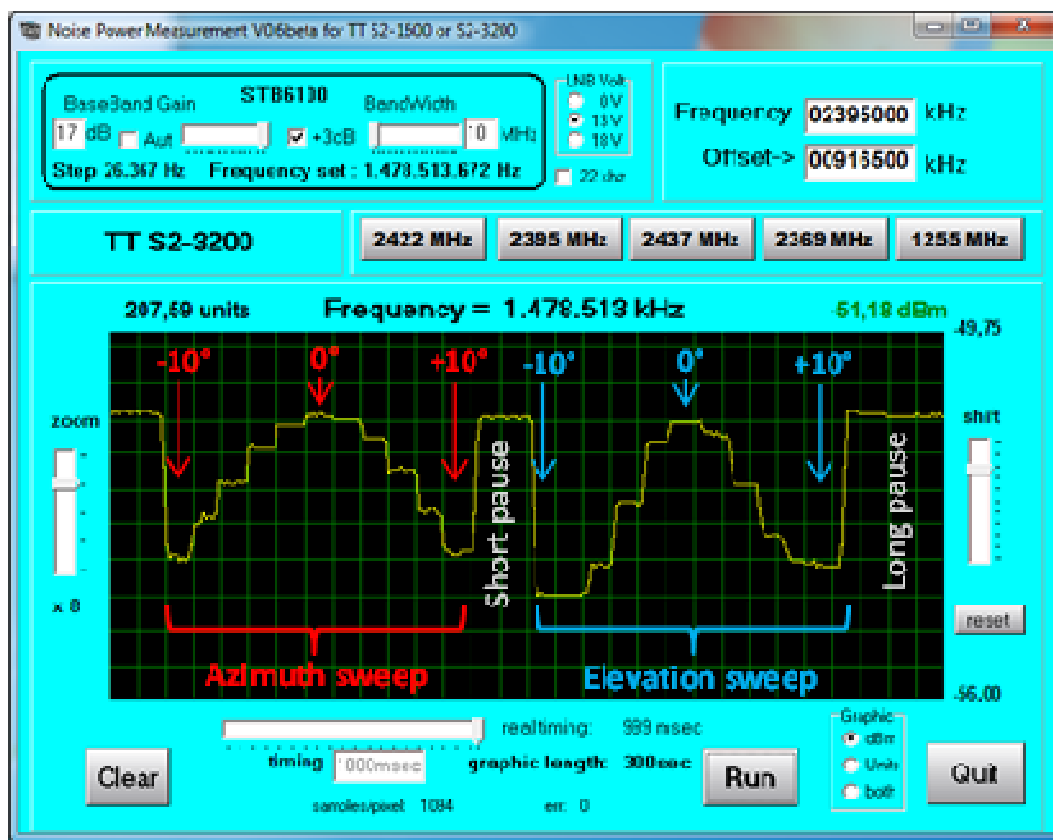
HamTV Ground Station Test @ K.I. - Livorno



-- HamTV Ground Segment -- Amsat-Italia @ Florence HamFest April 12, 2014

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G/T measurement and Rotator setup

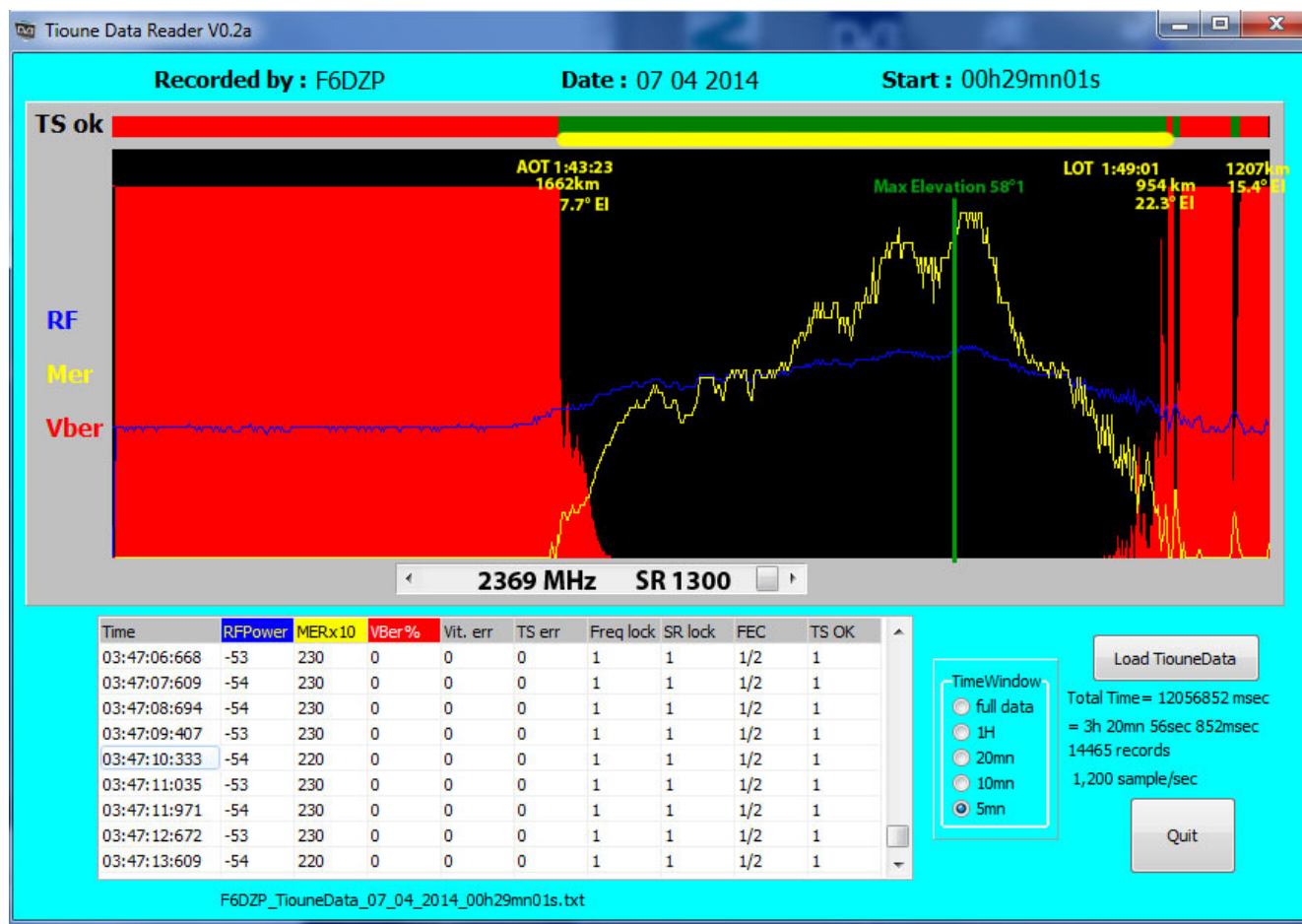




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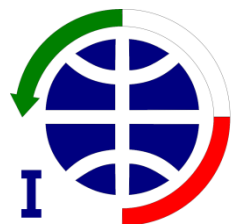


HamTV standard Ground Station Receiving HamTV



F6DZP has developed Tioune SW suite to monitor and manage Techno Trend Boards S1600 and S3200.

Tioune Data Reader is part of the SW suite.

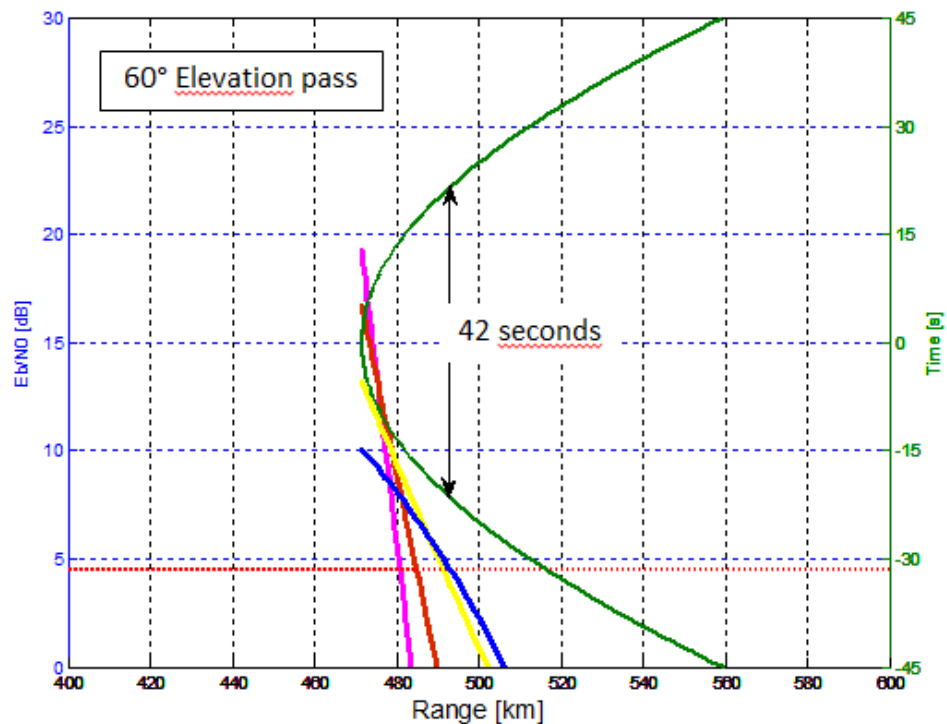


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Different Antenna solutions



The blue tick curve shows the E_b/N_0 vs. Range for the 16-turn helix described in this document.

The yellow, brown and violet E_b/N_0 curves refer to paraboloidal dish antennas with diameter of 0.4, 0.6 and 0.8 meter, respectively.



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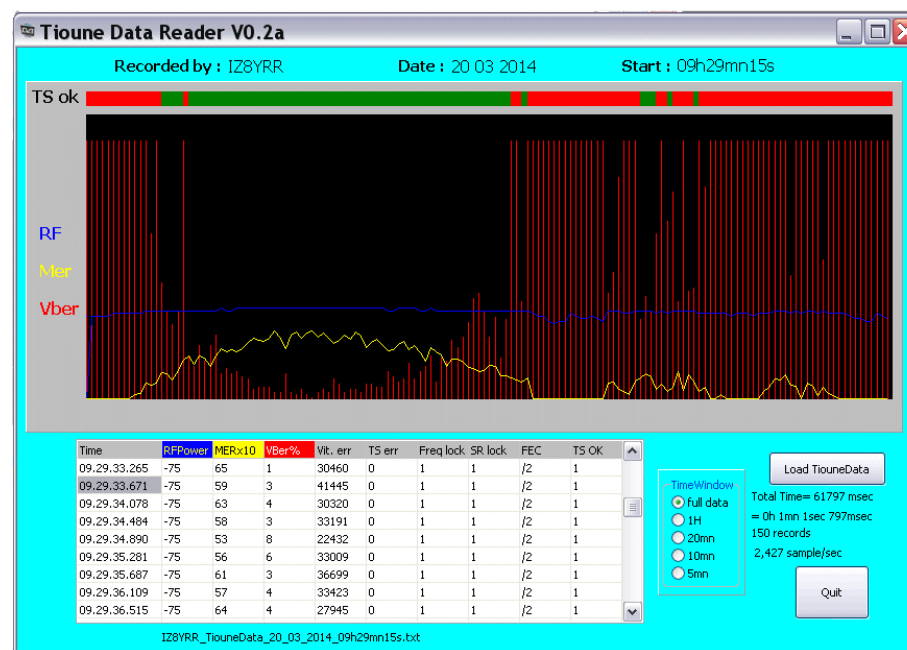
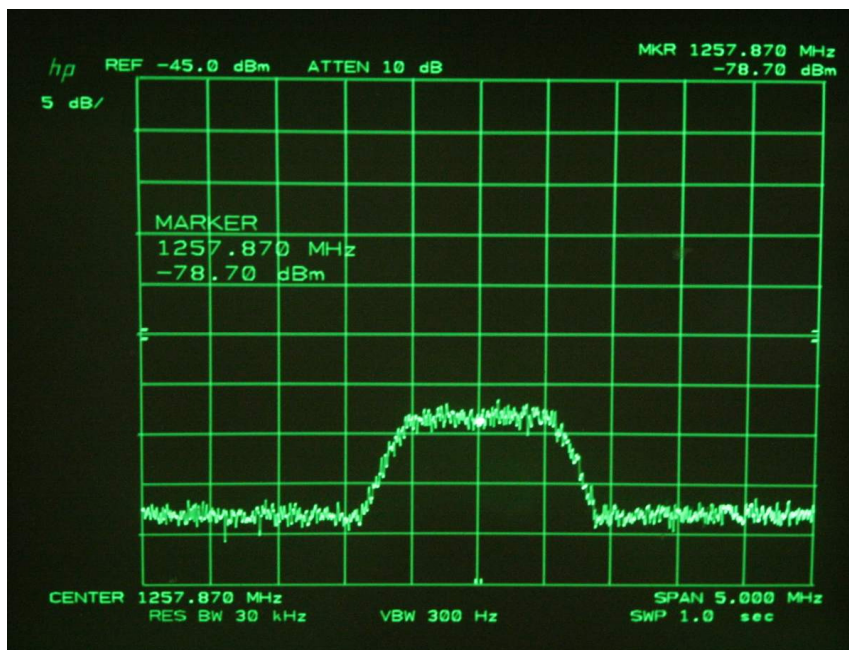


Fixed Helix Antenna – Tested by IZ8YRR



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Fixed Helix Antenna



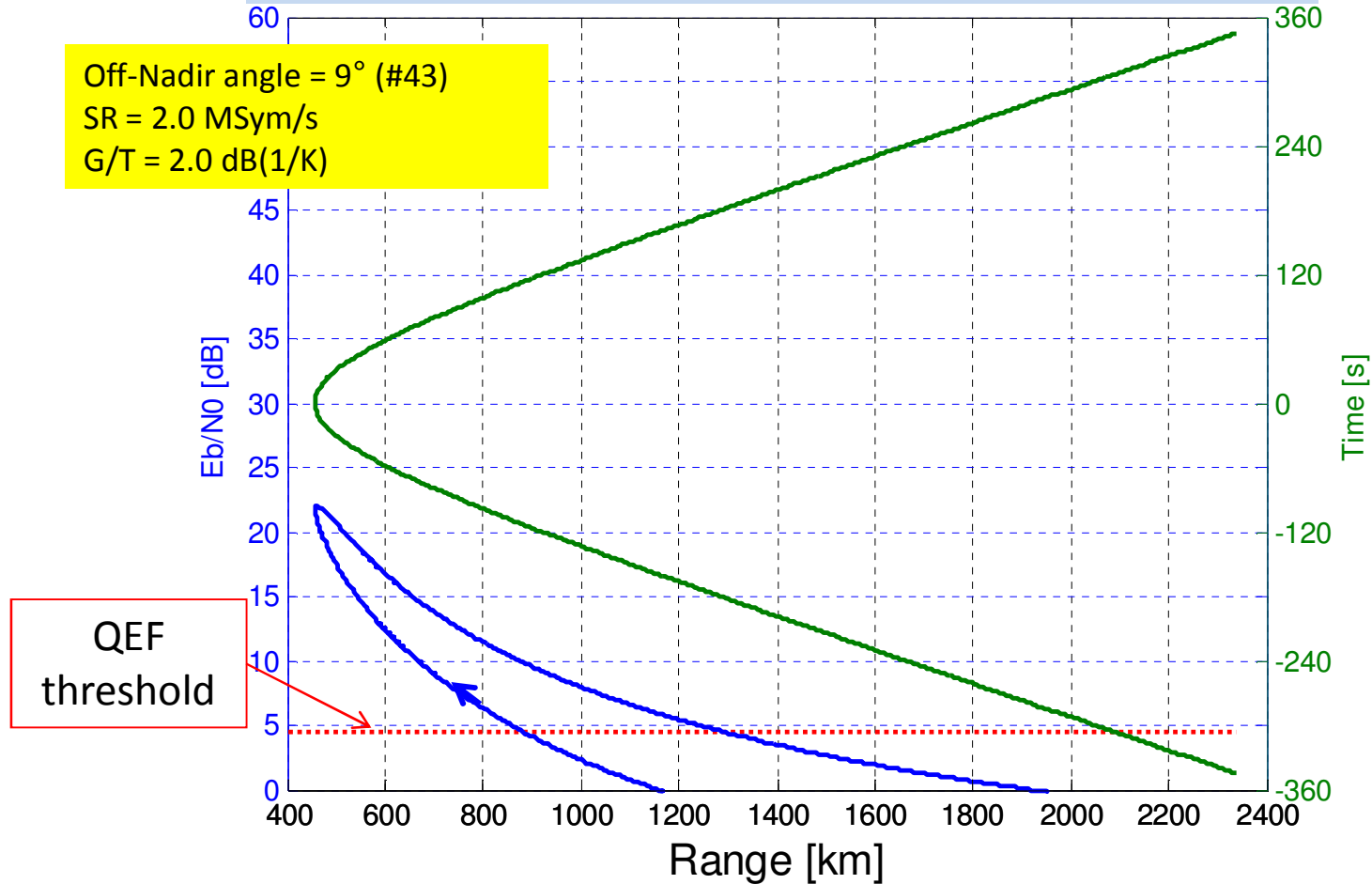


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Effects of the onboard antenna Off-Nadir Angle
for a pass with Max Elevation = 64°



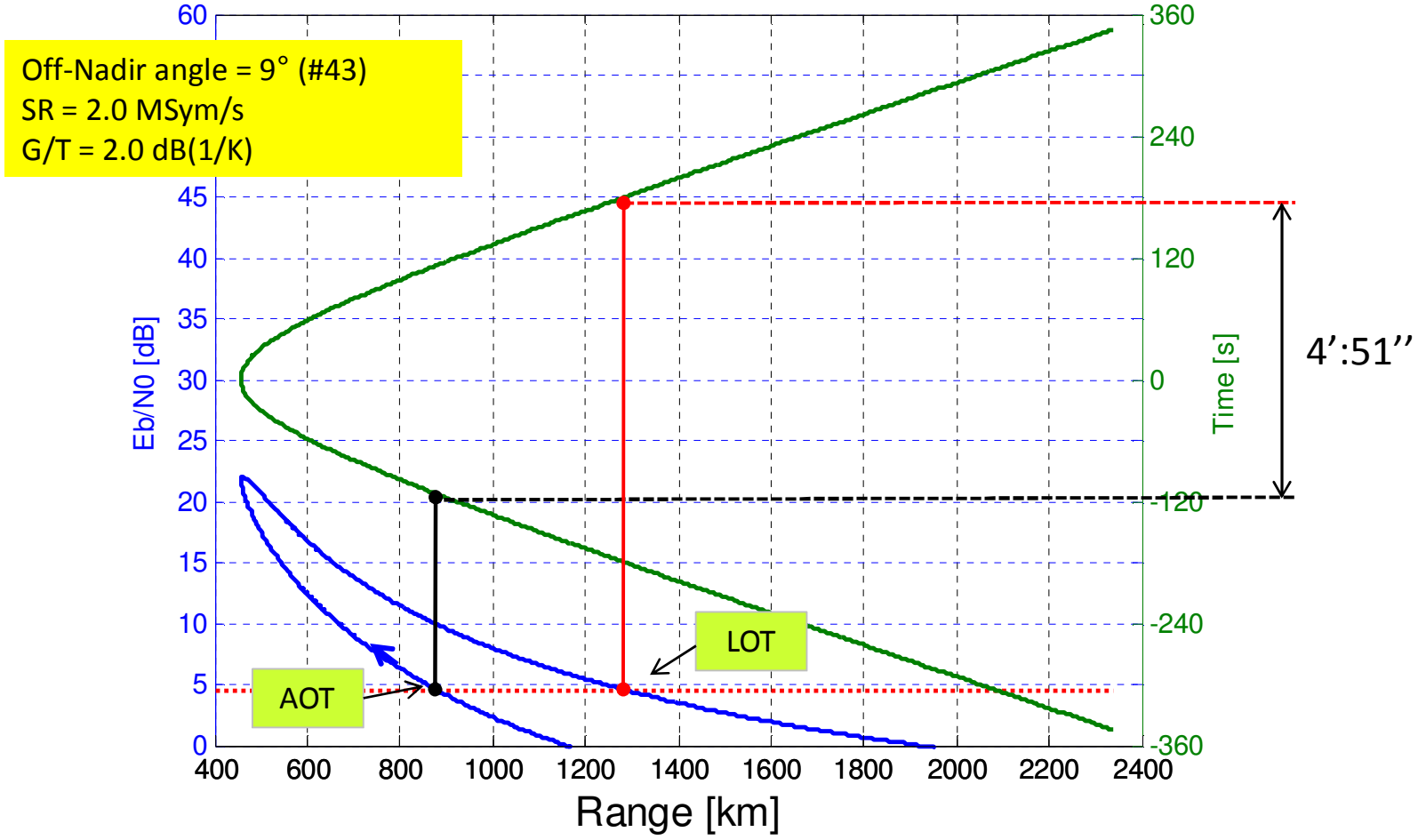


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Effects of the onboard antenna Off-Nadir Angle for a pass with Max Elevation = 64°



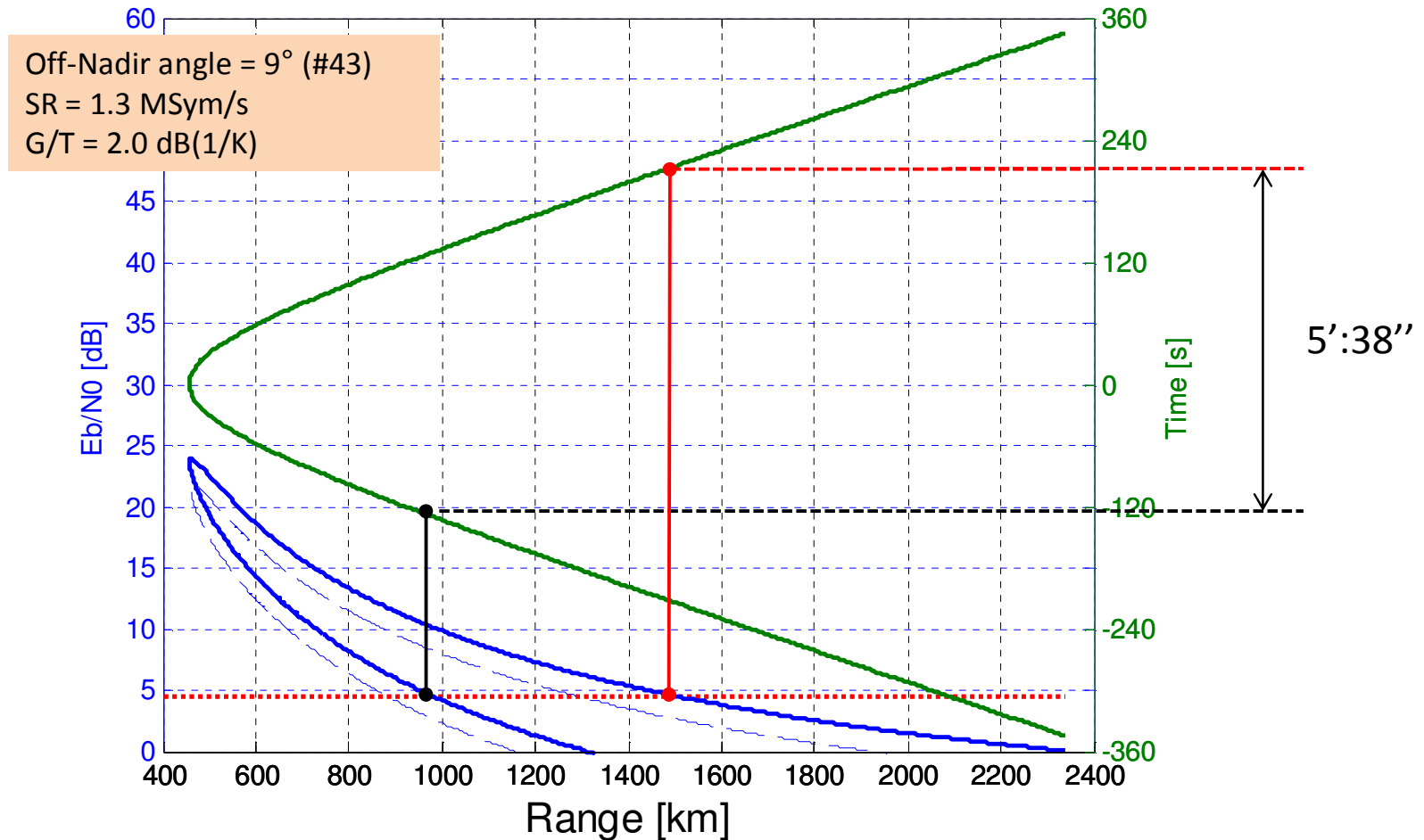


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Effects of the onboard antenna Off-Nadir Angle
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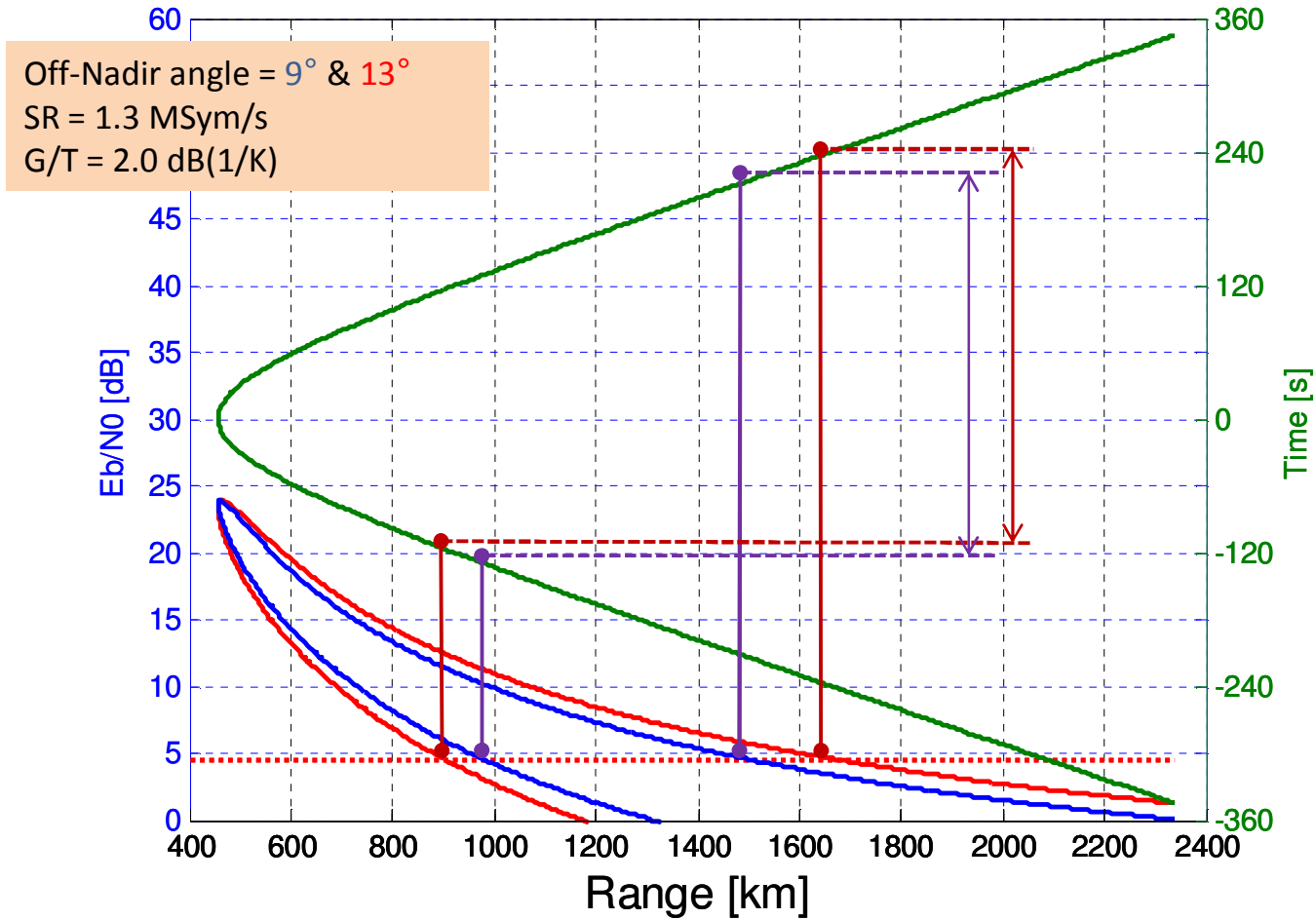


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Effects of the onboard antenna Off-Nadir Angle
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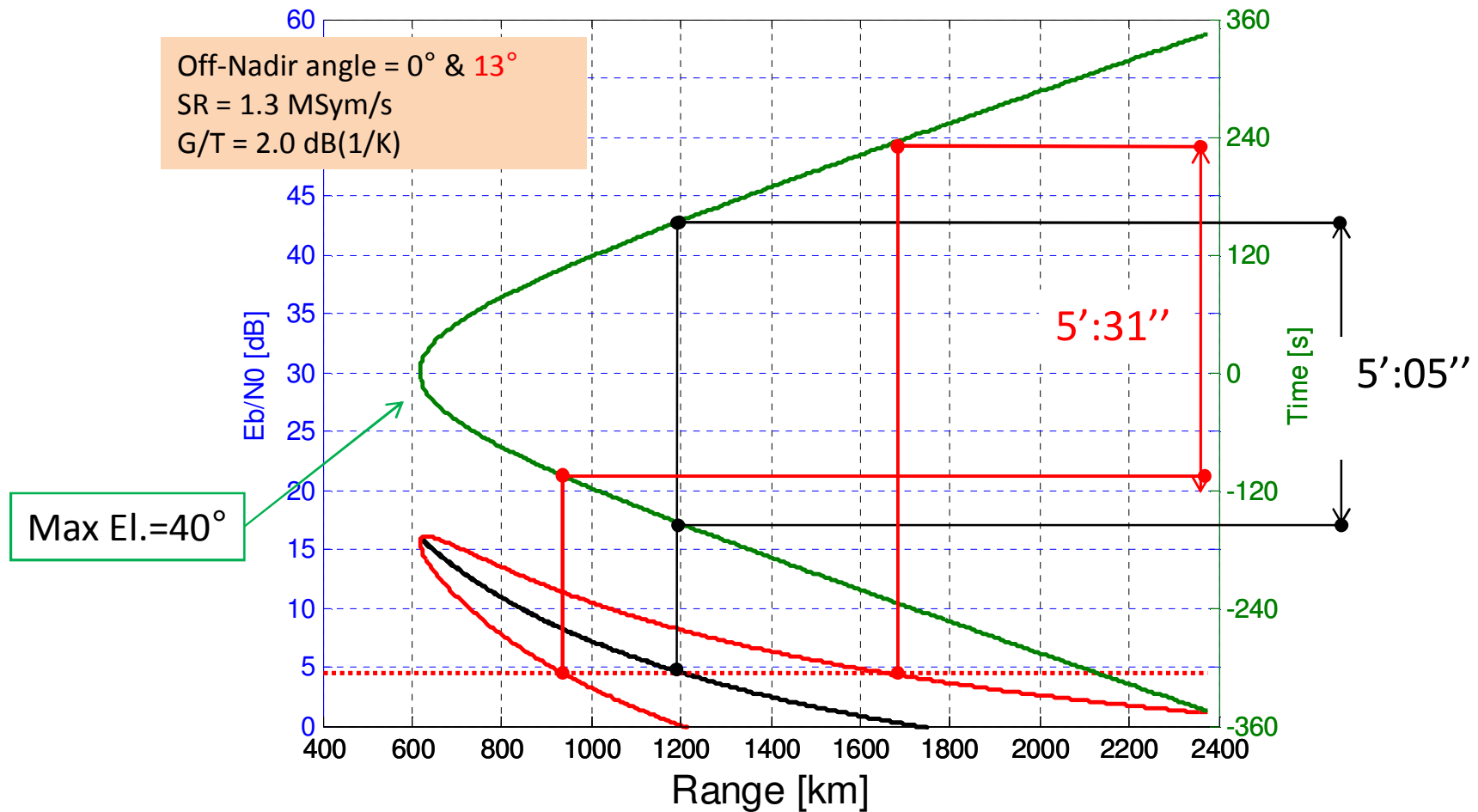


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Comparison between Nadir and Off-Nadir pointing antennas: **Best performances with Off-Nadir mounting, which exploits maximum gain at larger ranges.**





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The effects of the off-Nadir orientation of on-board ARISS-41 and ARISS-43 antennas

Conclusions

- Off-Nadir mounting increases link duration
- From this point of view the 13° (#41 TBC) is the best
- 13° offset antenna allows 4':31'' @ 2.0 MSym/s and 40° pass, using a HAMTV standard station. i.e. 1.2 m, G/T=2.0 dB(1/K)
- 13° offset antenna allows 5':31'' @ 1.3 MSym/s and 40° pass, using a HAMTV standard station. i.e. 1.2 m, G/T=2.0 dB(1/K)
- Higher passes allows longer duration, but impose stronger constrain on tracking (greater Az. Speed). A 64° pass allows 5':03'' and 5':52'' respectively.

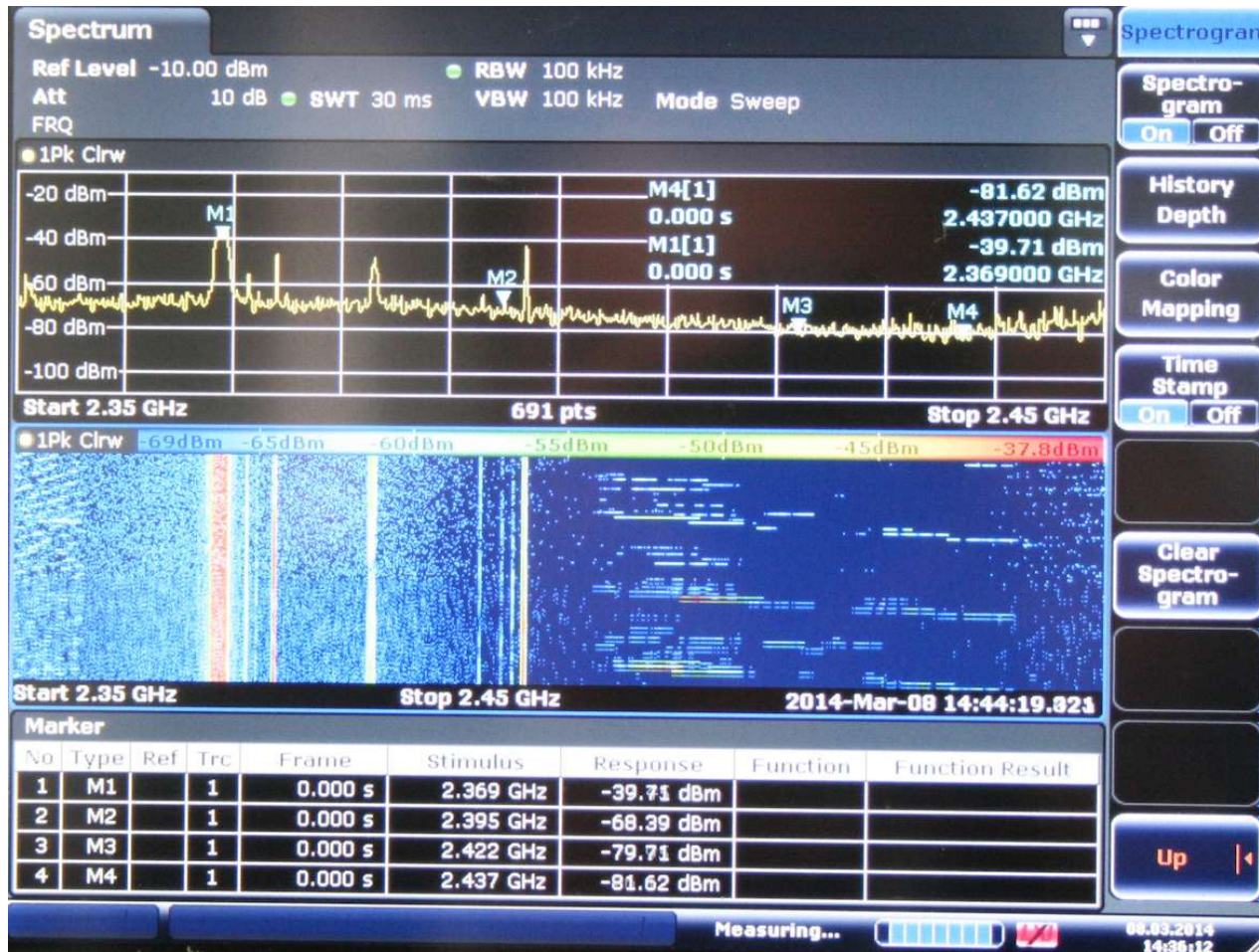


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Measured RF performances during commissioning step 1



Signal monitoring with the R&S FSV Spectrum Analyzer

Frequency: 2369 MHz @ M1
Symbol Rate: 1.3 MS/s
C/N > 30 dB



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Measured RF performances during commissioning

The screenshot displays a computer desktop with several windows. On the left, a VLC media player window shows a live video stream of a person in a space station. In the center, the 'Tutiuone DVB 3200' software interface is open, showing various receiver parameters. On the right, an 'Adobe Flash Media Live Encoder 3.2' window shows a similar video stream. The receiver interface includes sections for SR (kS), Freq (kHz), Symbolrate (kS), and various tuning and compensation settings.

Parameter	Value
SR (kS)	2000
Freq (kHz)	1478619
Symbolrate (kS)	2000
Power RF	-46 dBm
S/N MER	31.0 dB
Carrier Lock	ON
Synchro	ON
Fec 1/2	ON
IN channel	ON
OUT	ON

Live TV reception with the TT-3200 (Matera #1)

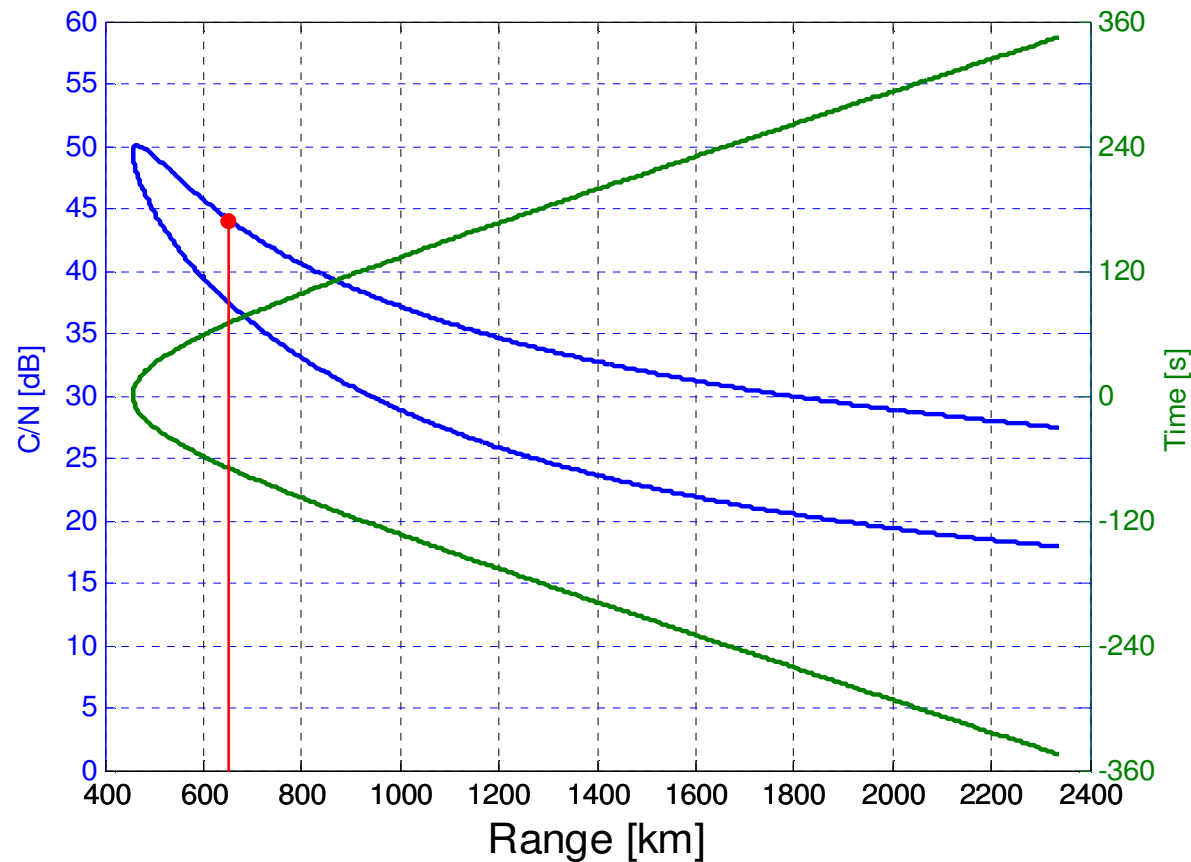
Frequency: 2395 MHz
Symbol Rate: 2 MS/s
MER: 31 dB

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Measured RF performances during commissioning

Our model prediction: commissioning step 2, 12:44:20 UTC, Matera station.
 C/N = 44.5 dB at 2.0 MSymb/s, Off-Nadir 9°, range 625 km, G/T=25.7 dB(1/K).



G/T of Matera RX was measured the day before using Cassiopeia A as a calibrated noise source



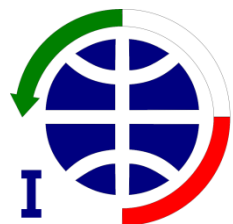
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Matera Laser Ranging Observatory facility (HamTV commissioning steps 1&2)



<http://ivs.nict.go.jp/mirror/publications/ar2012/nsmate/>

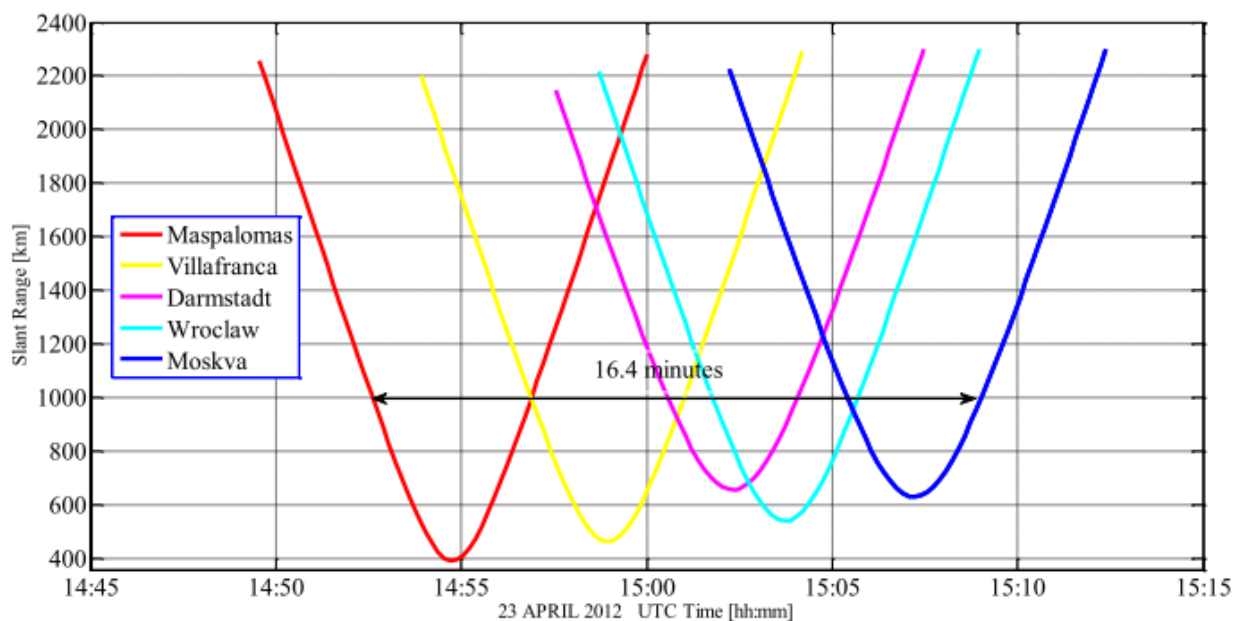


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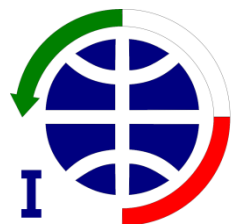
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One of the first proposed examples of chained stations
(from Document AMSAT Italy GSO R1.1, 13/04/ 2012)



Details of the contact of 23 April 2012 involving Maspalomas, Villafranca, Darmstadt, Wroclaw, Moskva chained E/S's, showing handover times at plot crossings.



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Chaining Groundstations

location of present ground stations in Europe (range 700 Km)





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The original presentation was given by

Amsat-Italia HamTV team

at the ARISS International Meeting in ESA ESTEC

April 3-5, 2014



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Thank you!

www.amsat.it

On behalf of Amsat-Italia

Fabio Azzarello – IZ5XRC@amsat.org