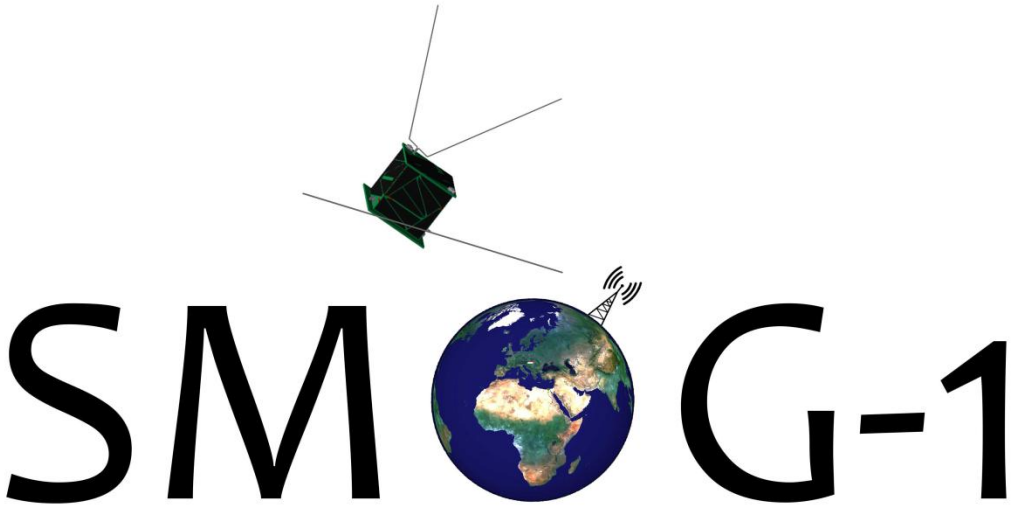
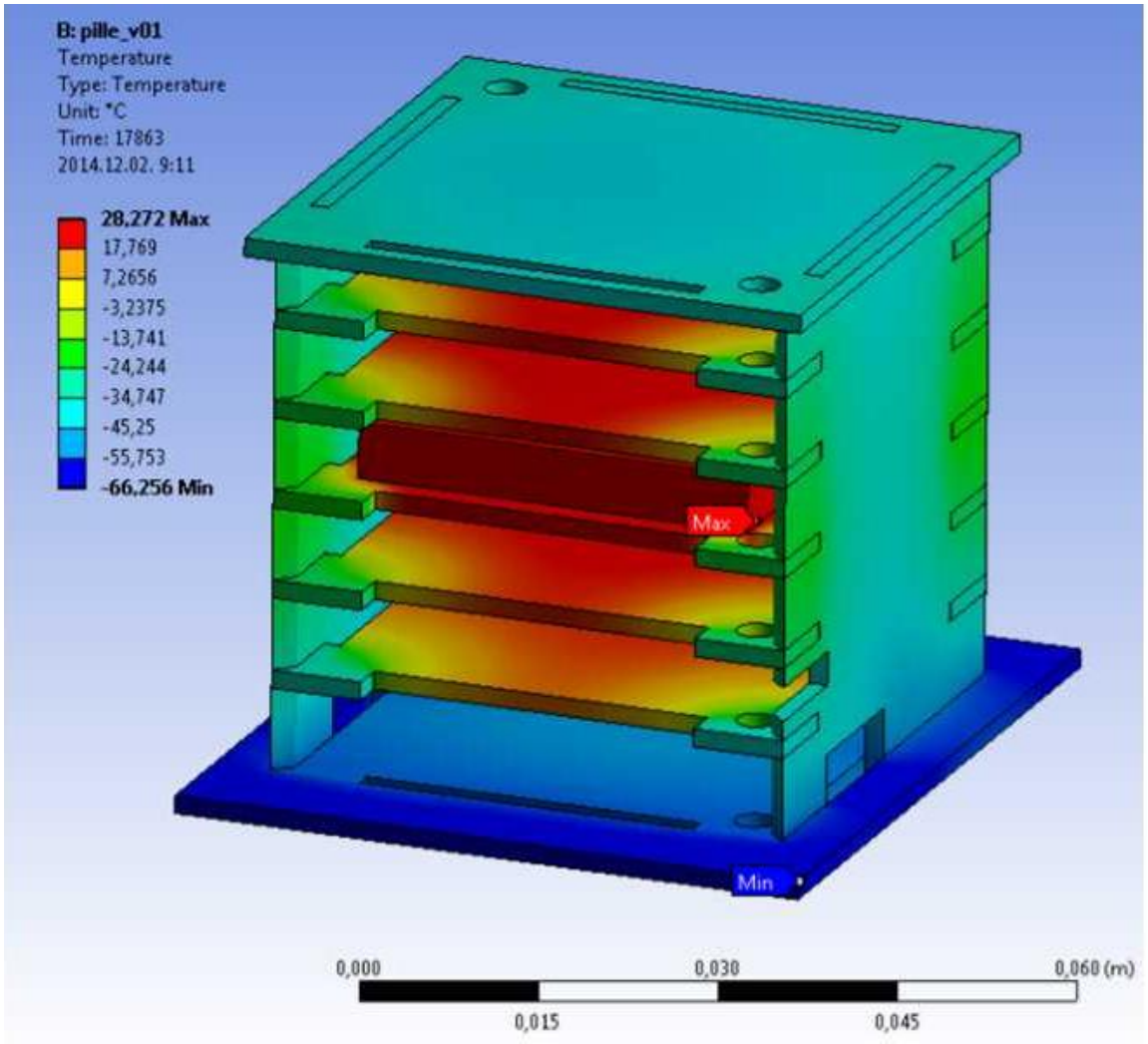


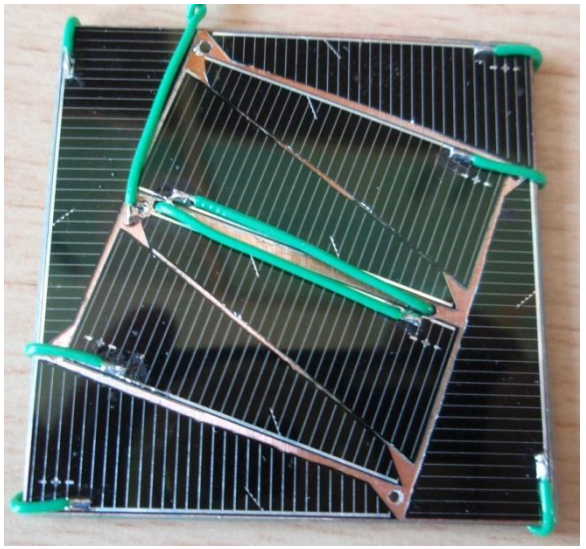
The Spectrum Monitoring System of Smog-1 Satellite

Levente Dudás, László Szűcs, Dr. András Gschwindt
dudas@mht.bme.hu, gnd.bme.hu
Budapest University of Technology and Economics
Dept. of Broadband Infocommunications and Electromagnetic Theory

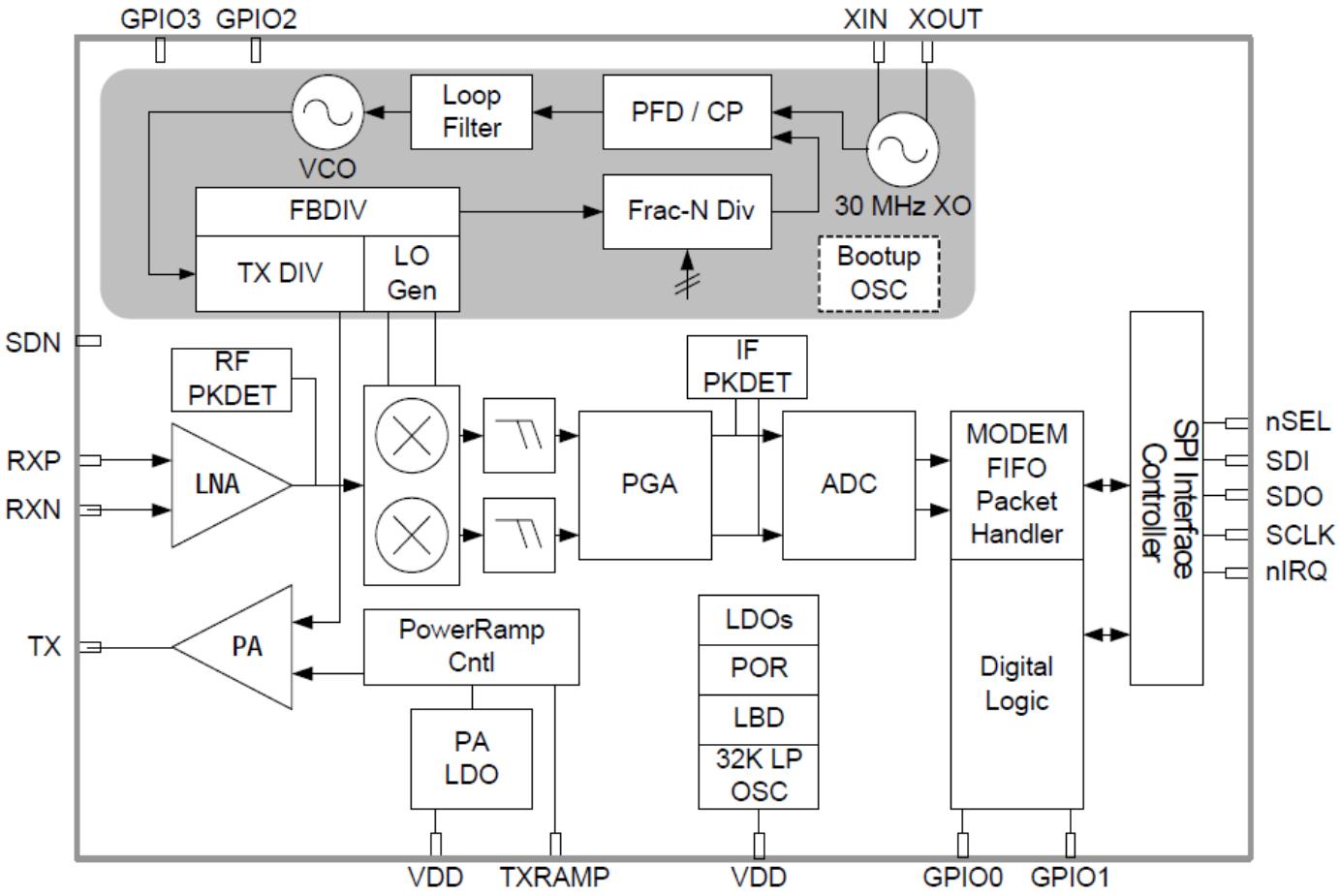
PocketQube Class Satellite



- 5 x 5 x 5 cm
- 175 g
- 300 mW DC
- 100 mW RF
- Vacuum
- -40..+80 C
- 28 g (70 g) acceleration



Radio Transceiver & Spectrum Monitor

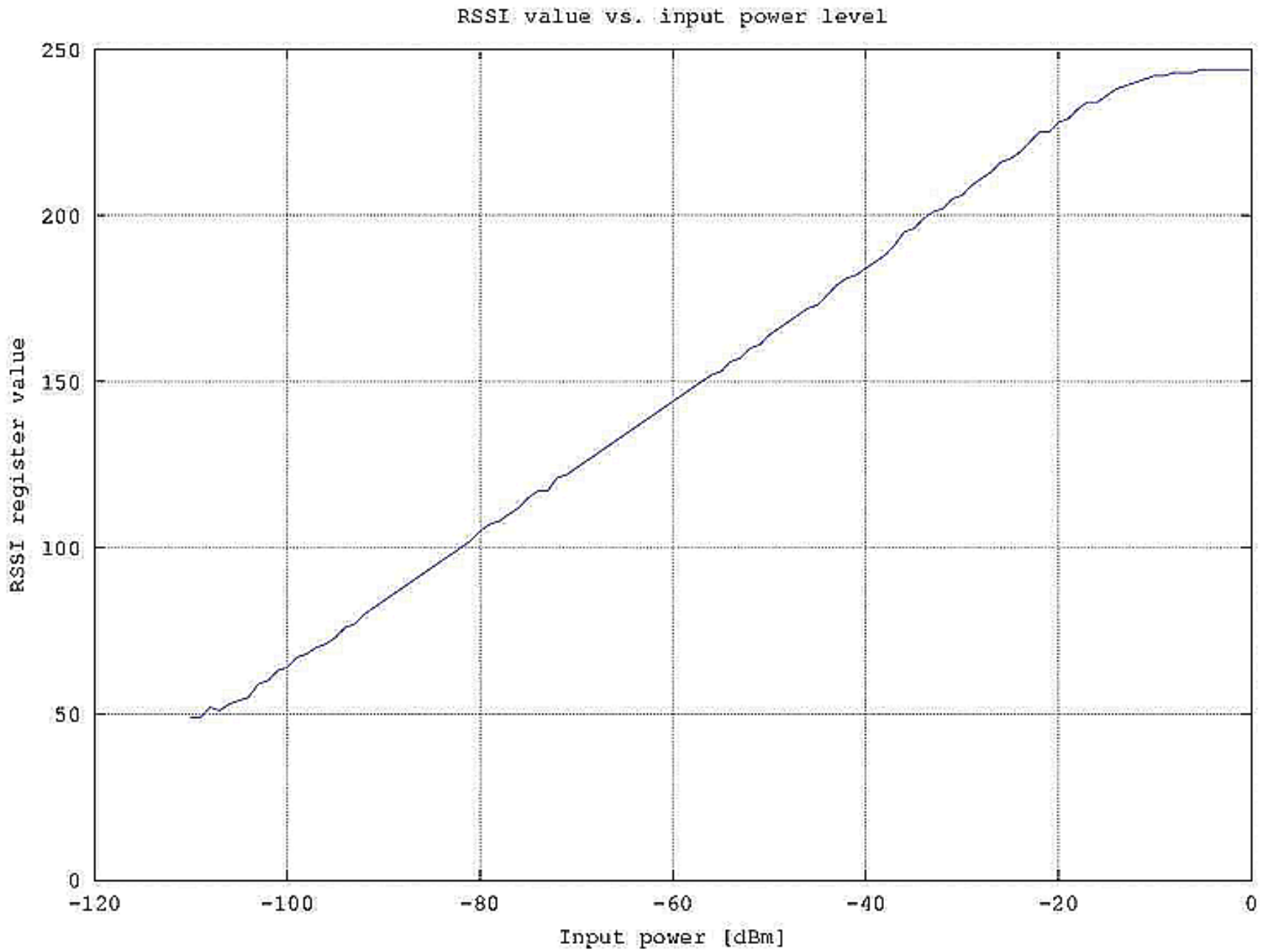


- 100 mW RF
- 40% PAE

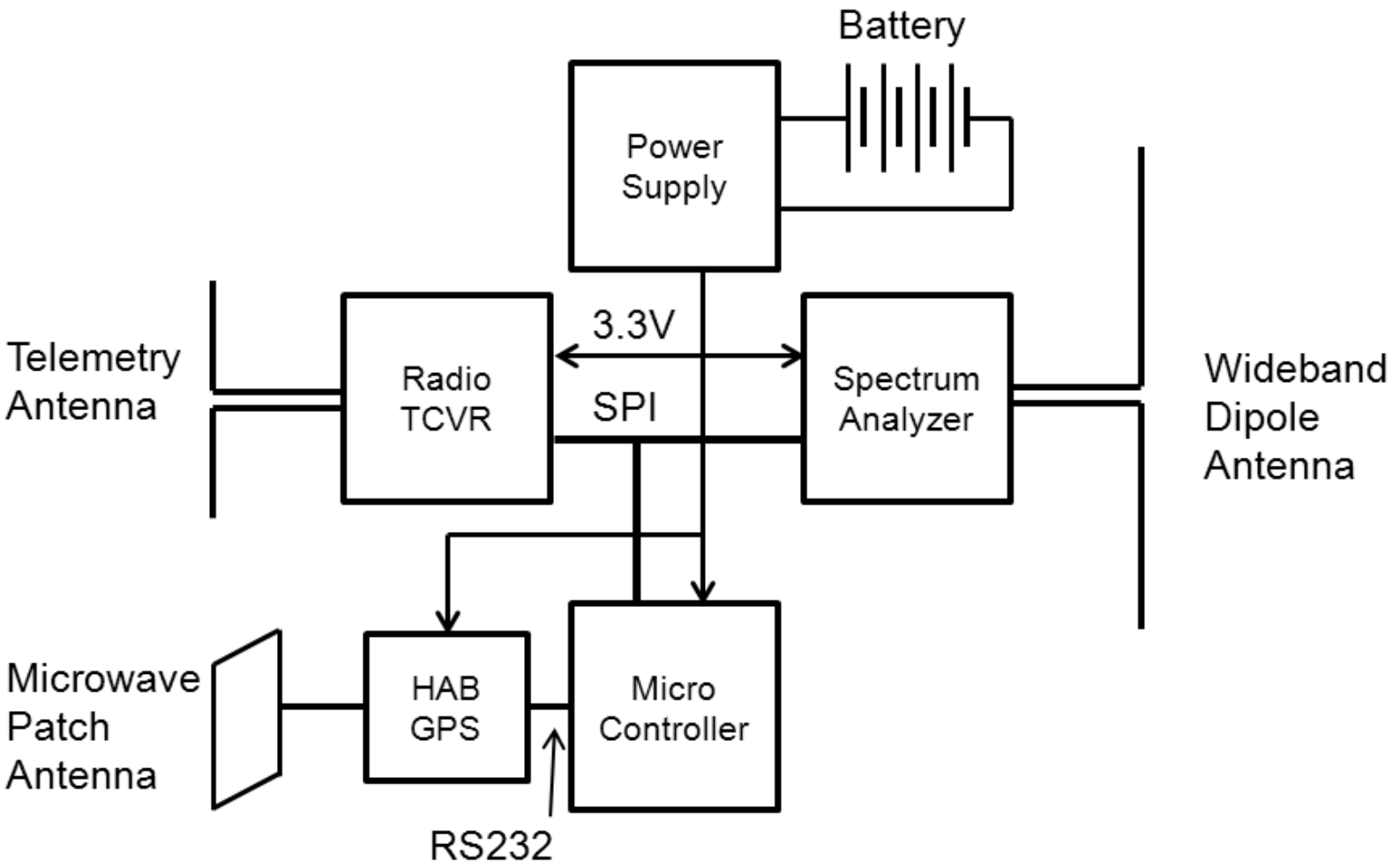
- CW
- 2-GMSK

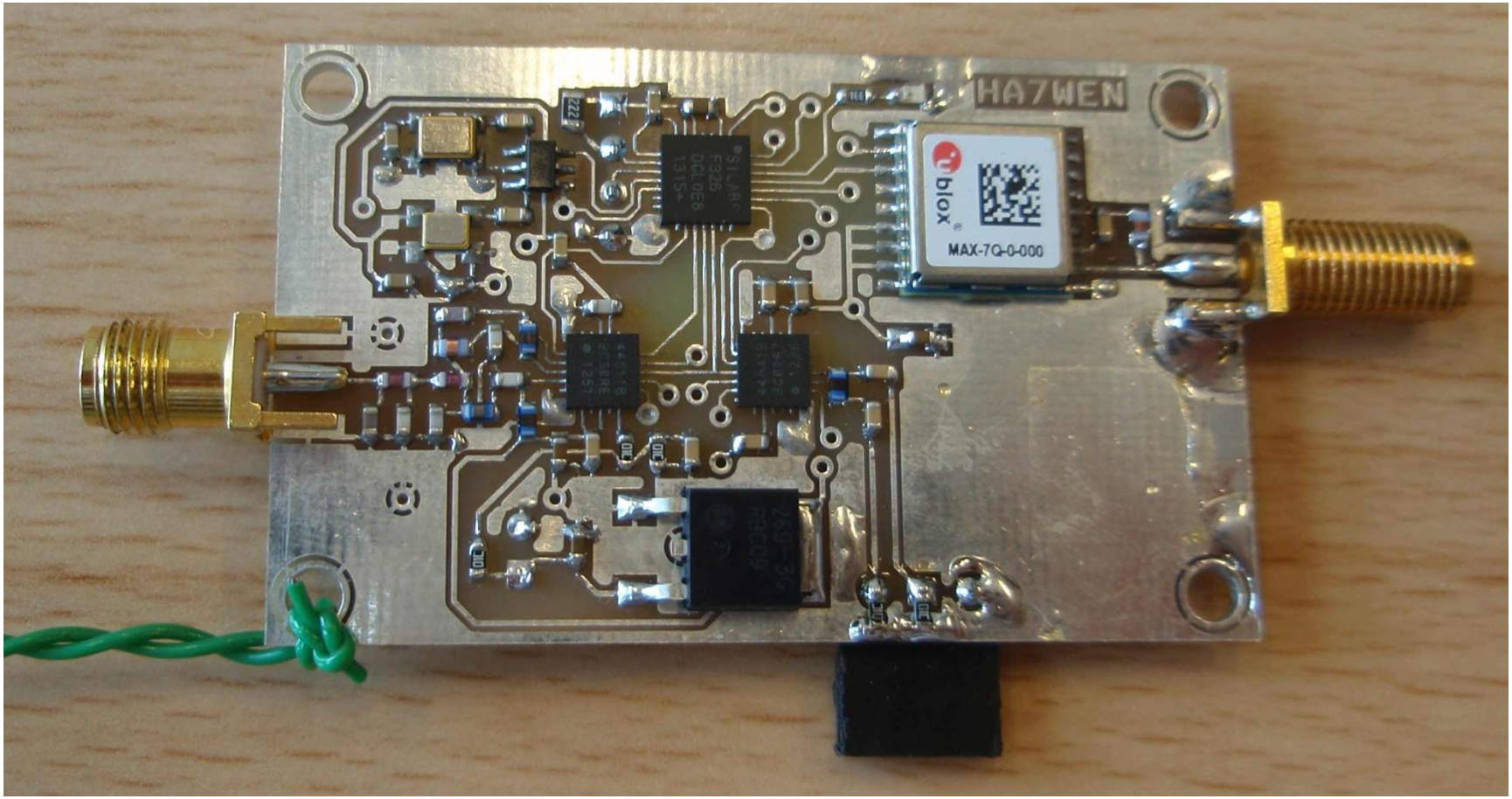
- > 5kbps

- Automated & remote controlled ground station – Masat-1

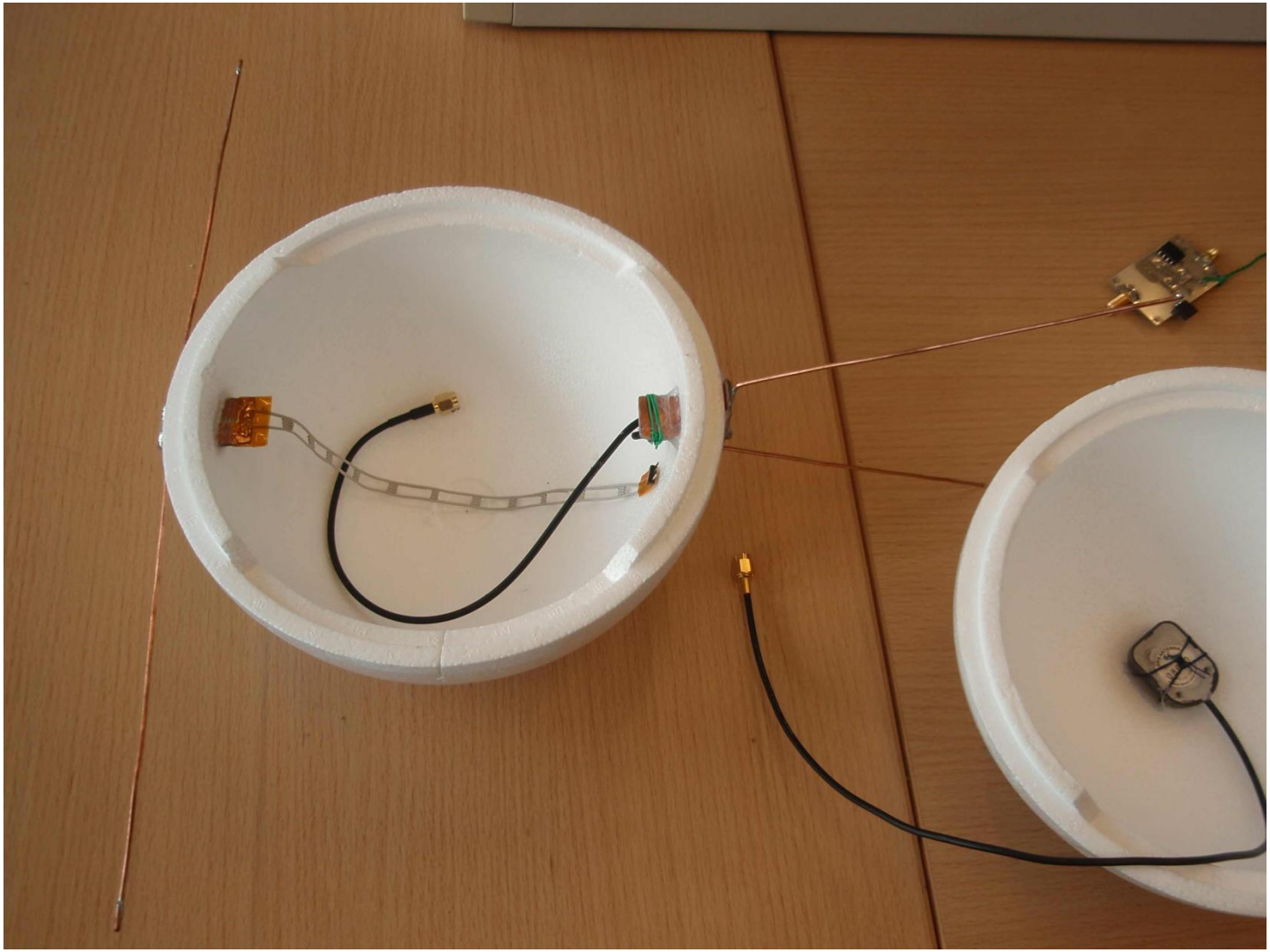

RSSI value vs. input power level
RSSI register value
250
200
150
100
50
0
-120
-100
-80
-60
-40
-20
0
Input power [dBm]

Experimental Model of Smog-1

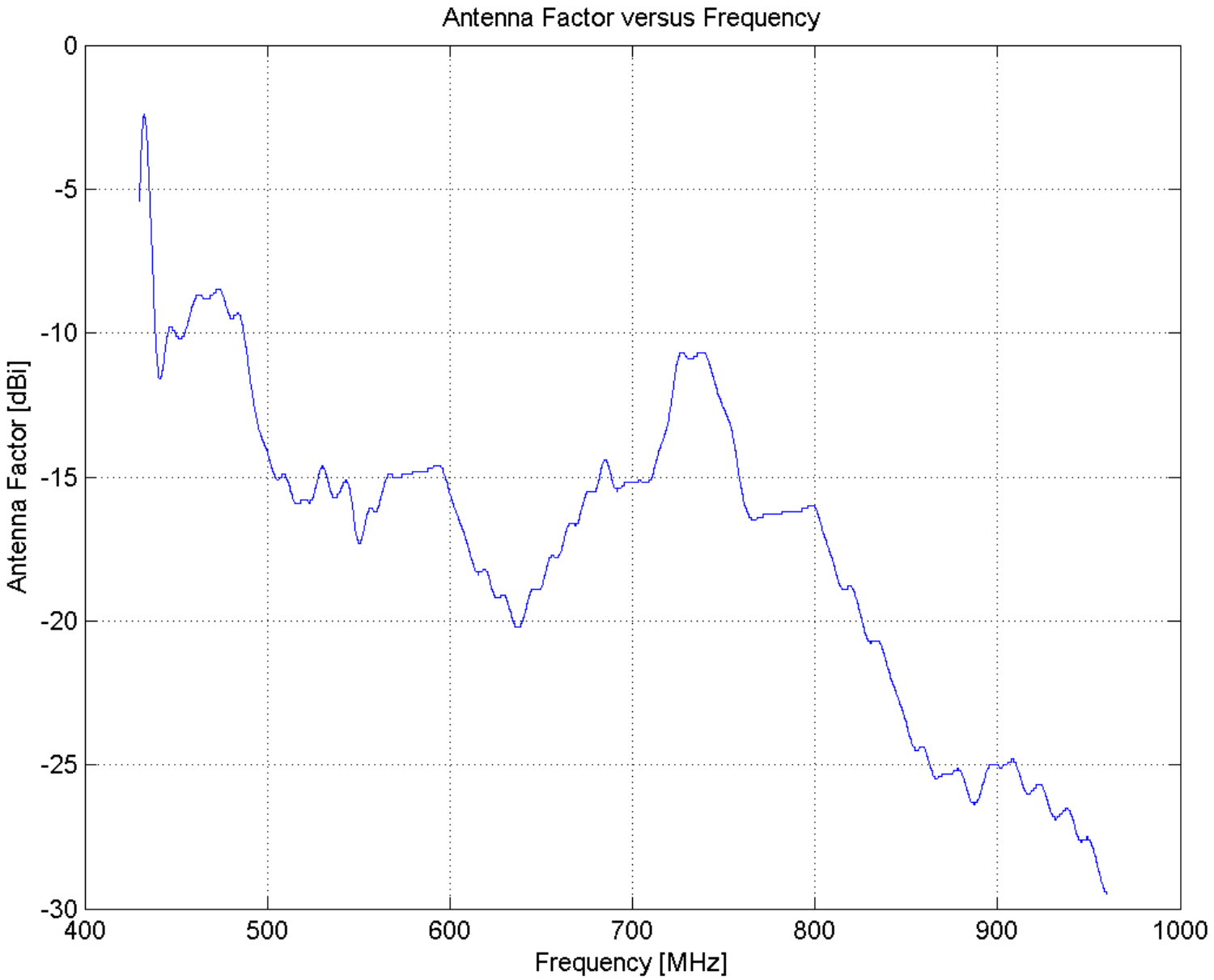



HA7WEN
blox
MAX-7Q-0-000

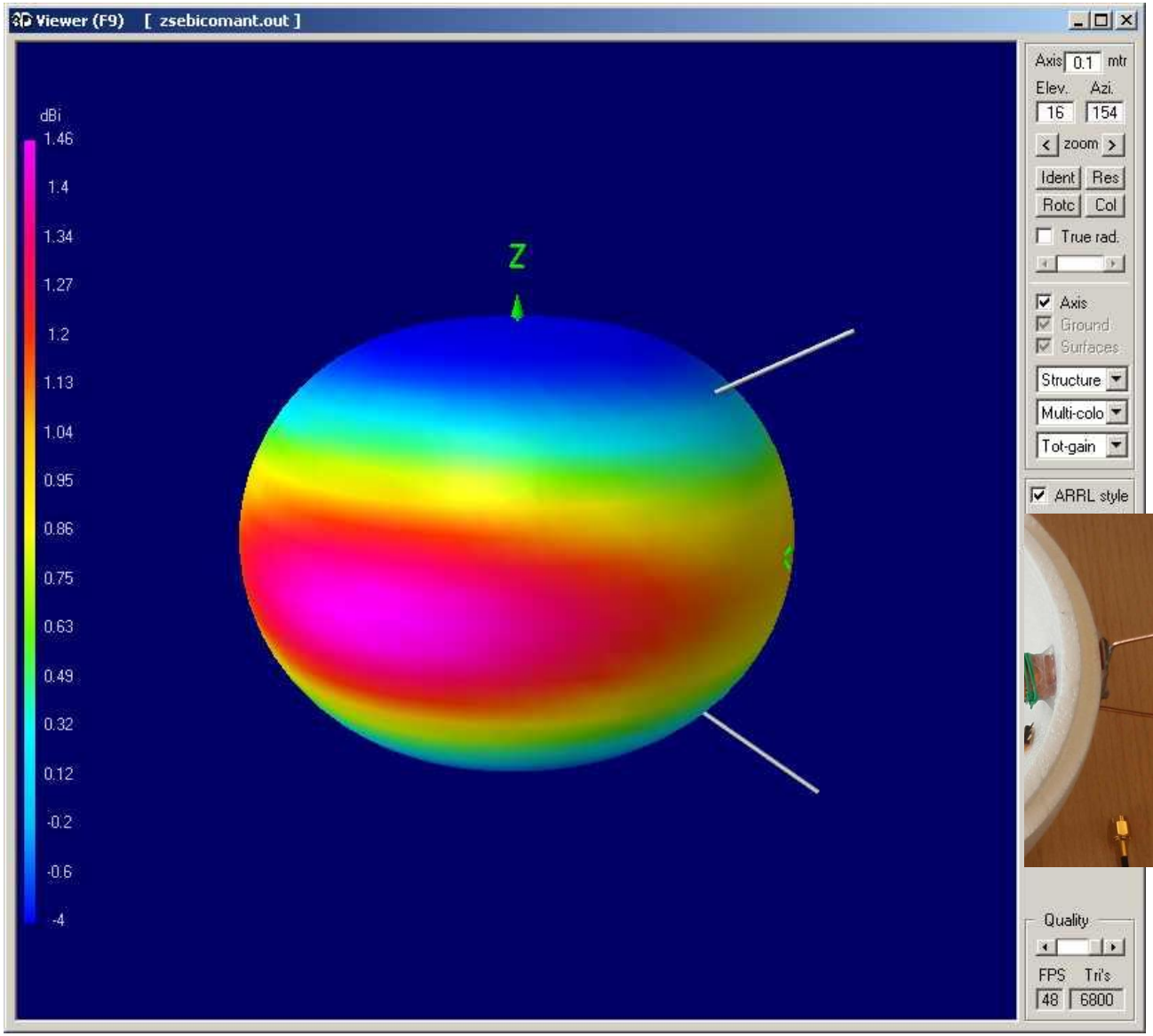
Antennas



Wideband Dipole


Antenna Factor versus Frequency
Antenna Factor [dBi]
0
-5
-10
-15
-20
-25
-30
400
500
600
700
800
900
1000
Frequency [MHz]

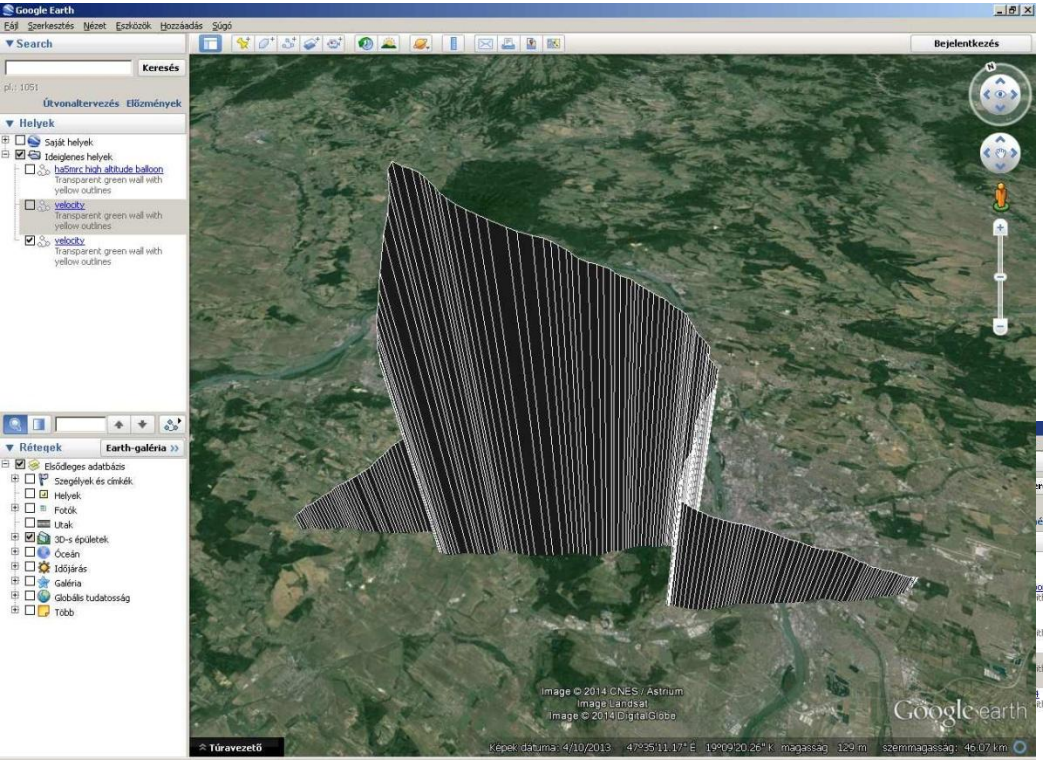
Transceiver Antenna Pattern



- 437 MHz
- S_{11} < 20 dB @ 50 Ohm
- 6 dB fluctuation

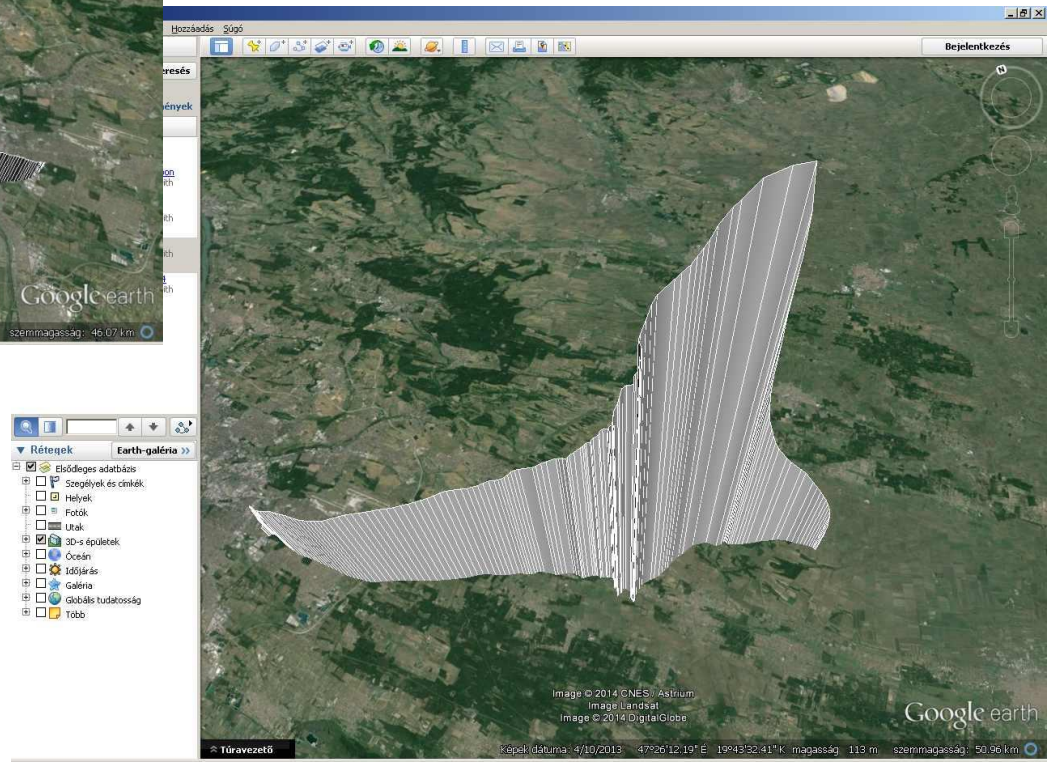
Meteorological Balloon Flights

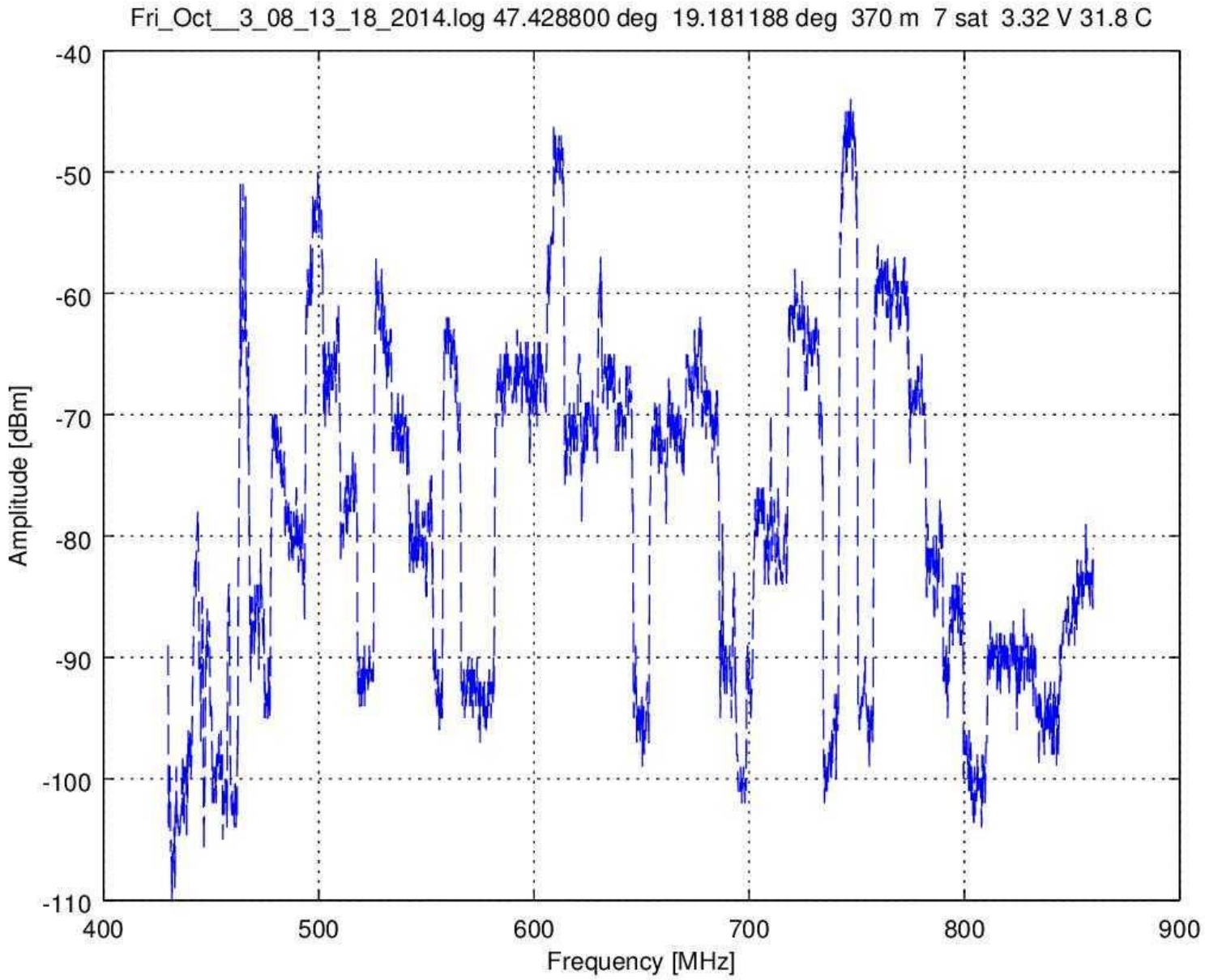
Balloon Routes

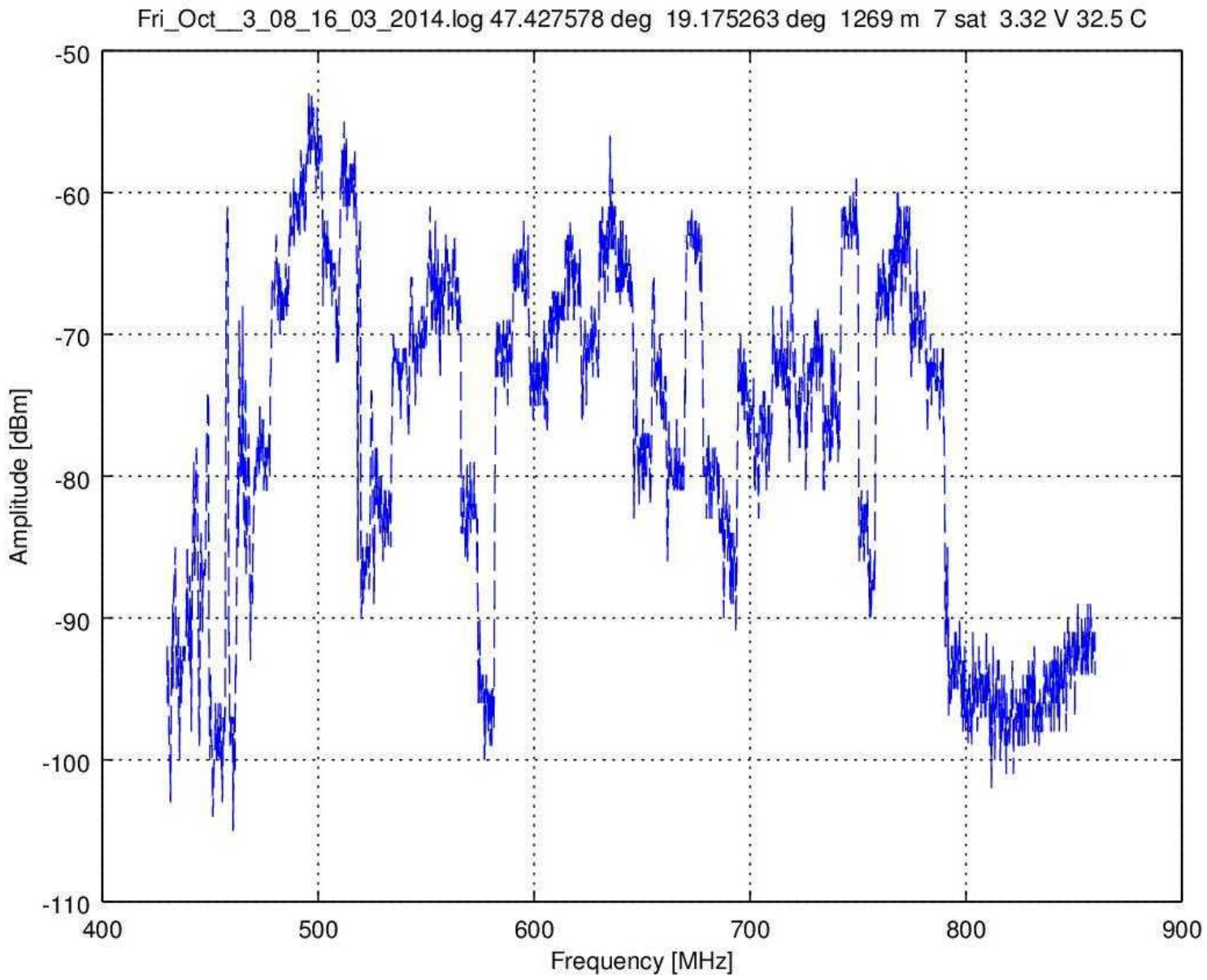


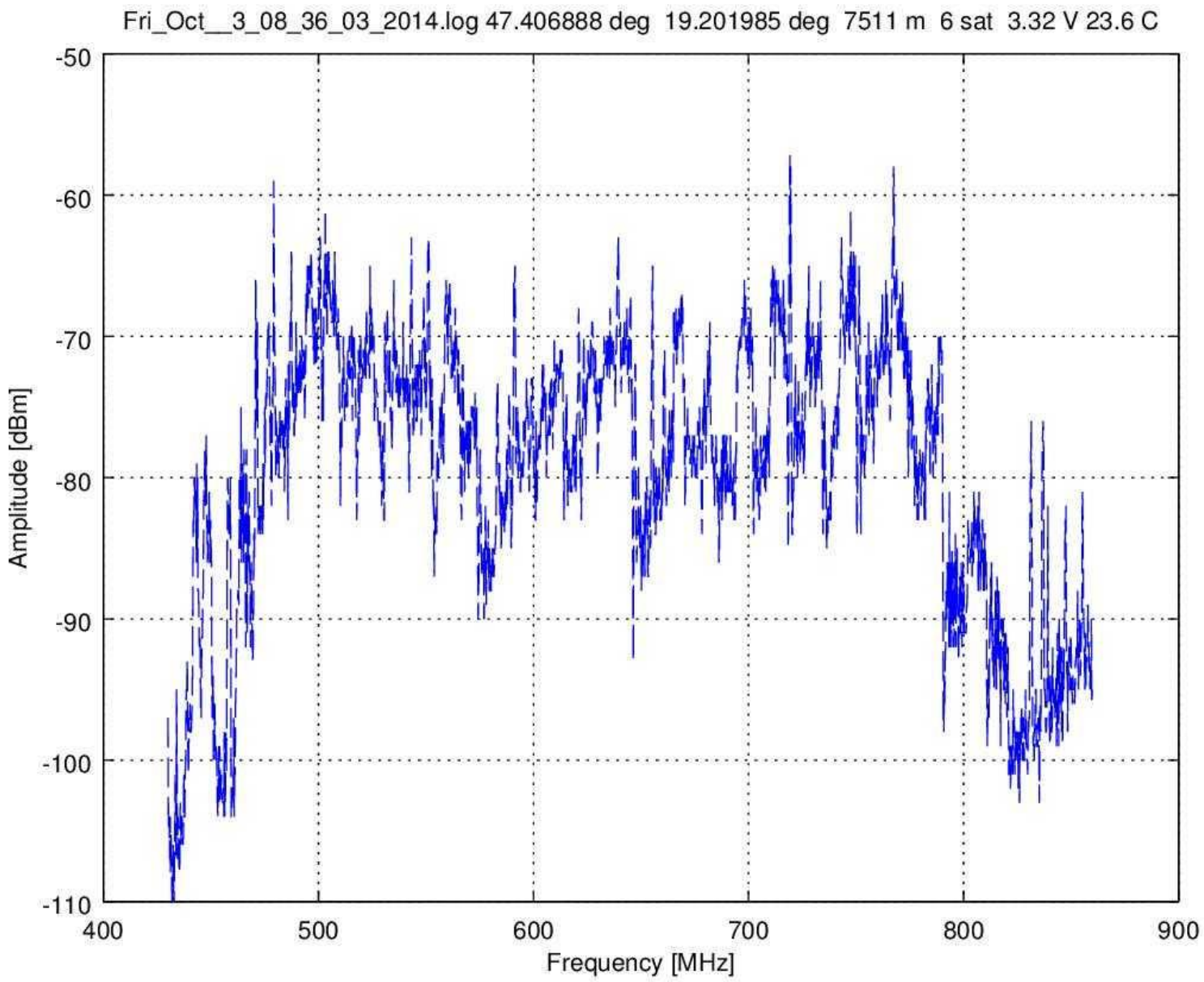
30724 m

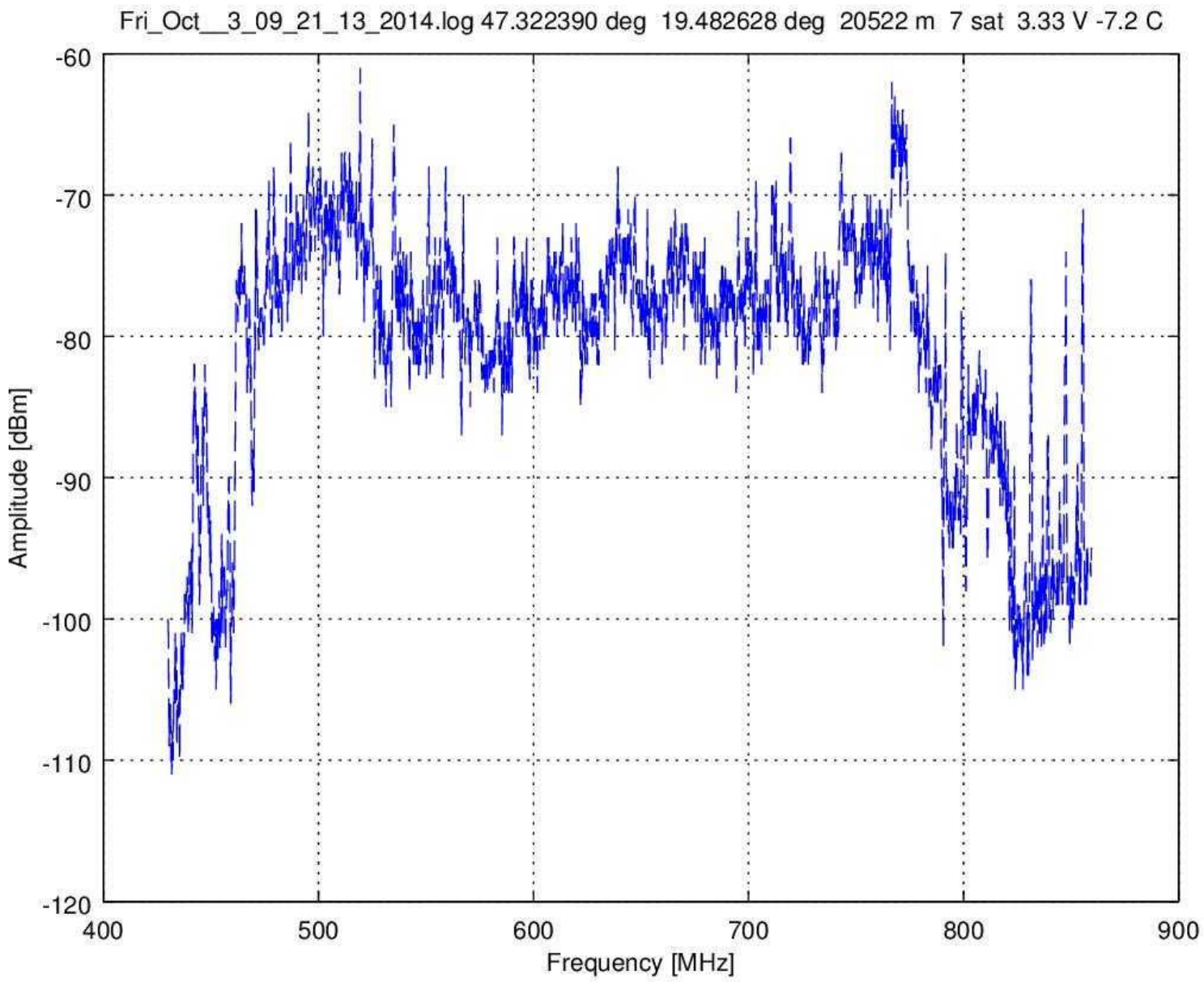
34265 m

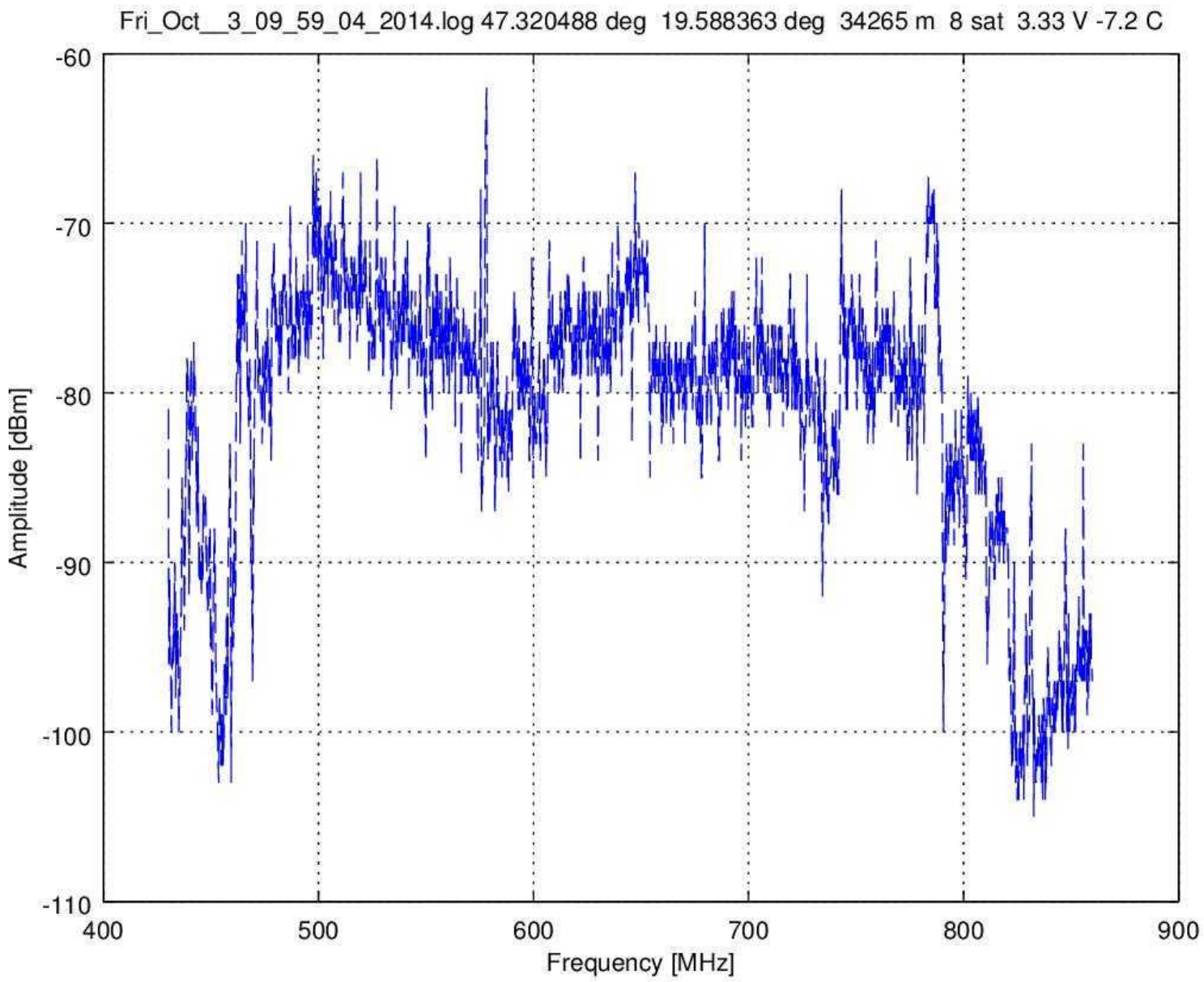


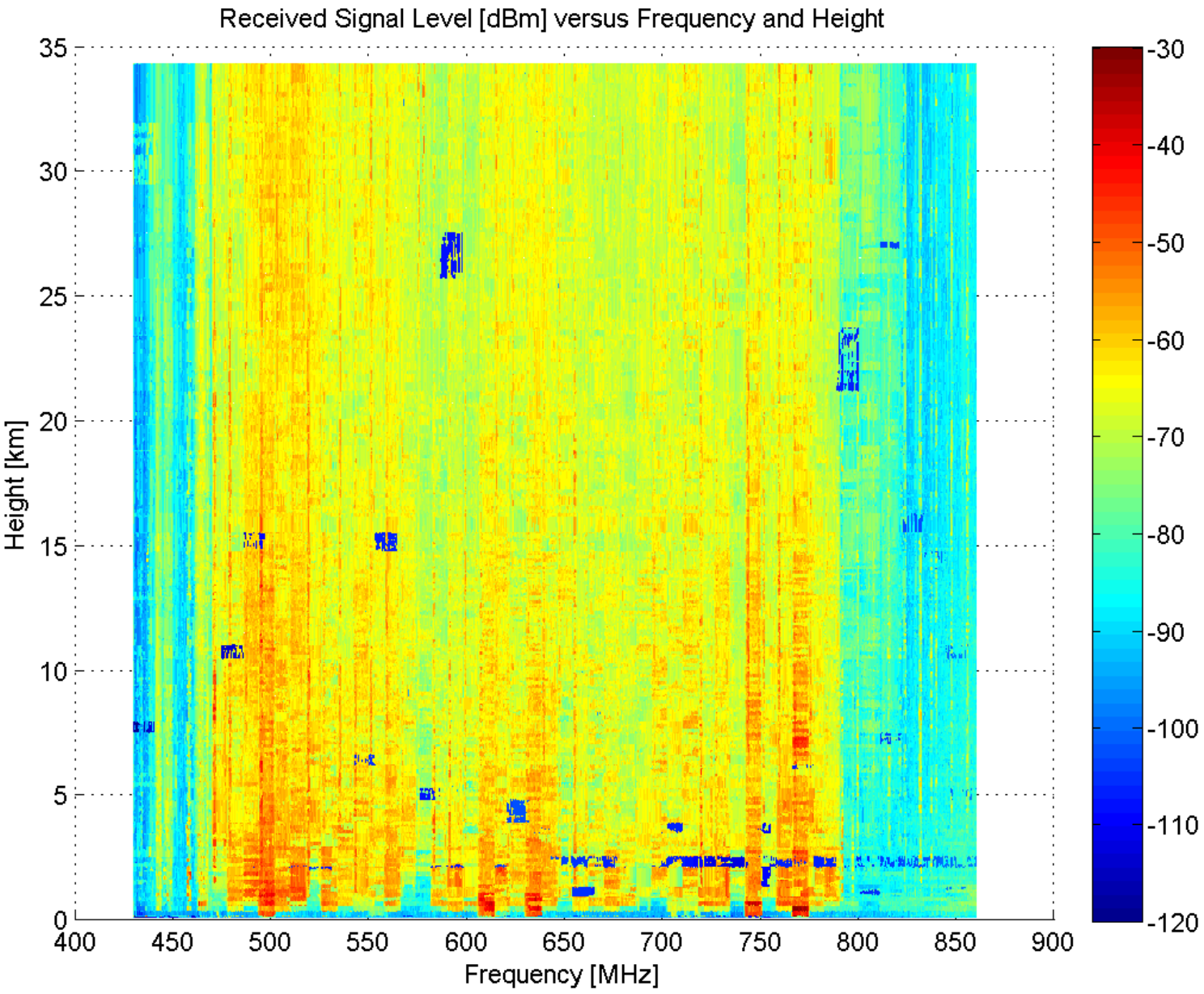

Fri_Oct__3_08_13_18_2014.log 47.428800 deg 19.181188 deg 370 m 7 sat 3.32 V 31.8 C
Amplitude [dBm]
-40
-50
-60
-70
-80
-90
-100
-110
400
500
600
700
800
900
Frequency [MHz]

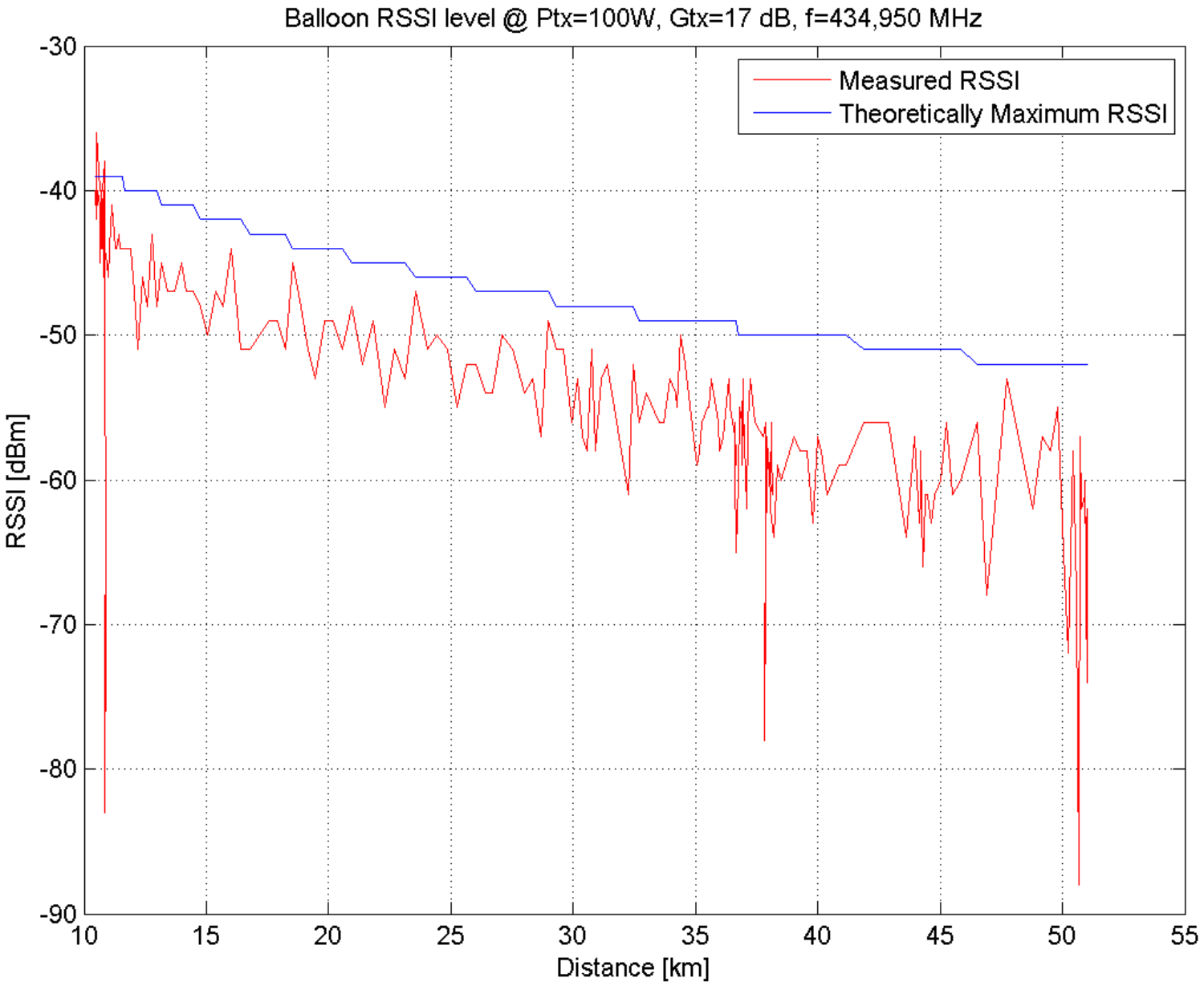

Fri_Oct__3_08_16_03_2014.log 47.427578 deg 19.175263 deg 1269 m 7 sat 3.32 V 32.5 C
-50
-60
-70
-80
-90
-100
-110
Amplitude [dBm]
400
500
600
700
800
900
Frequency [MHz]


Fri_Oct__3_08_36_03_2014.log 47.406888 deg 19.201985 deg 7511 m 6 sat 3.32 V 23.6 C
-50
-60
-70
-80
-90
-100
-110
Amplitude [dBm]
400
500
600
700
800
900
Frequency [MHz]

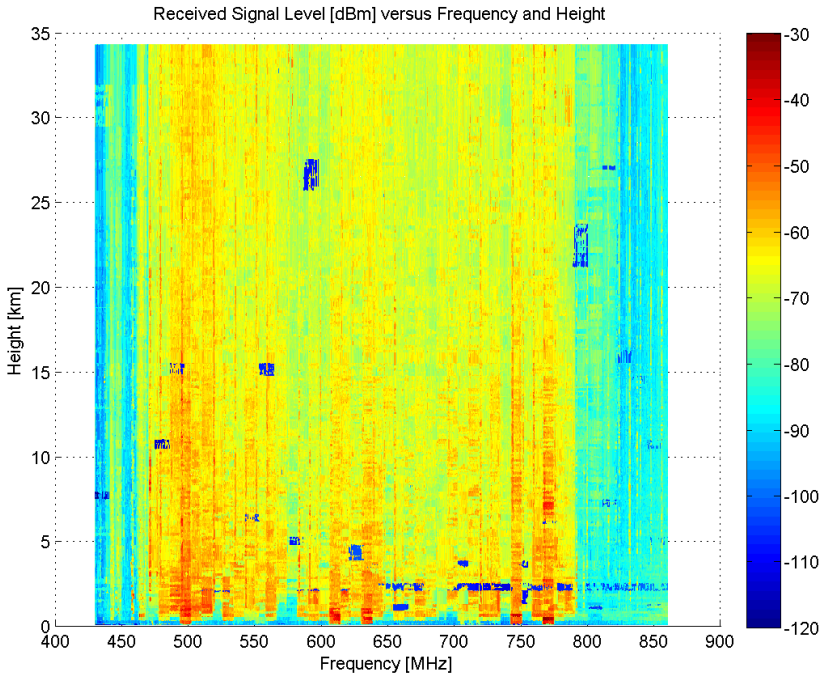

Fri_Oct__3_09_21_13_2014.log 47.322390 deg 19.482628 deg 20522 m 7 sat 3.33 V -7.2 C
-60
-70
-80
-90
-100
-110
-120
Amplitude [dBm]
400
500
600
700
800
900
Frequency [MHz]

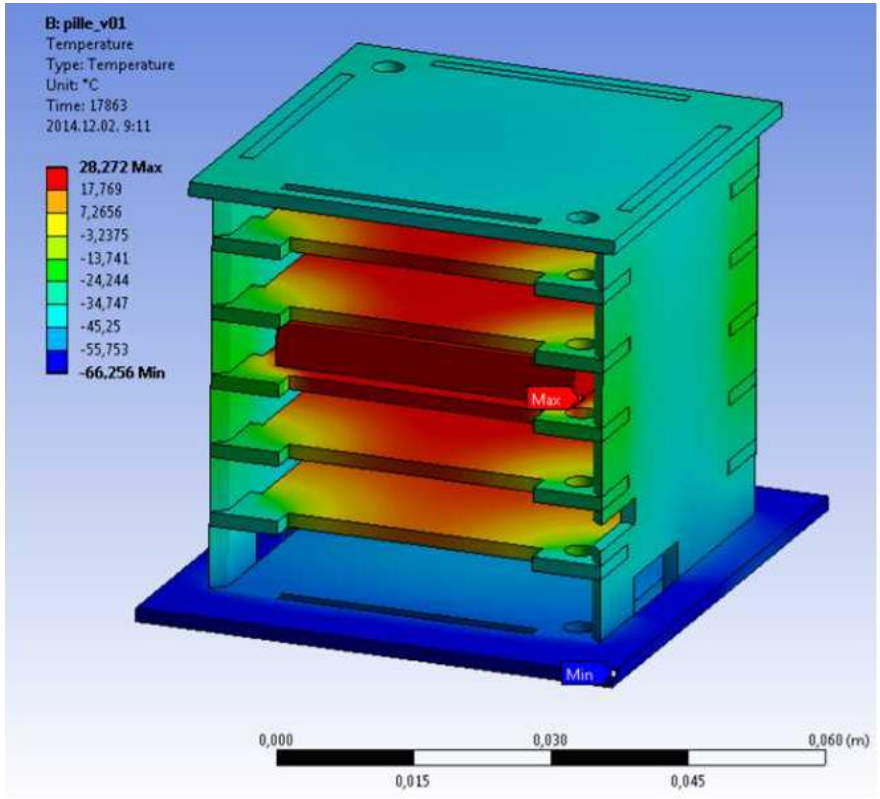

Fri_Oct__3_09_59_04_2014.log 47.320488 deg 19.588363 deg 34265 m 8 sat 3.33 V -7.2 C
-60
-70
-80
-90
-100
-110
Amplitude [dBm]
400
500
600
700
800
900
Frequency [MHz]


Received Signal Level [dBm] versus Frequency and Height
Height [km]
0
5
10
15
20
25
30
35
400
450
500
550
600
650
700
750
800
850
900
Frequency [MHz]
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120


Balloon RSSI level @ Ptx=100W, Gtx=17 dB, f=434,950 MHz
Measured RSSI
Theoretically Maximum RSSI
RSSI [dBm]
-30
-40
-50
-60
-70
-80
-90
10
15
20
25
30
35
40
45
50
55
Distance [km]

SMOG-1


Received Signal Level [dBm] versus Frequency and Height
Height [km]
Frequency [MHz]
35
30
25
20
15
10
5
0
400
450
500
550
600
650
700
750
800
850
900
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120


B: pille_v01
Temperature
Type: Temperature
Unit: °C
Time: 17863
2014.12.02. 9:11
28,272 Max
17,769
7,2656
-3,2375
-13,741
-24,244
-34,747
-45,25
-55,753
-66,256 Min
Max
Min
0,000
0,030
0,060 (m)
0,015
0,045