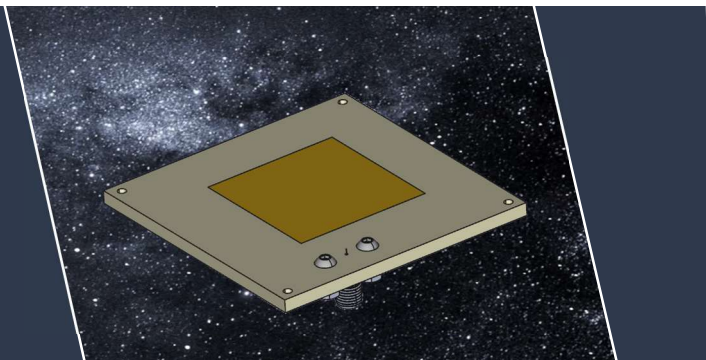


S Band Patch Antenna with SMA Interface Control Document

- Single Patch Antenna with SMA
- 70 x 70 mm, 2263 MHz

HIGHLIGHTS

- Circular polarization (RHCP)
- TRL 9 for basic design
- Flight Heritage since 2017
- Compatible to 1U CubeSat
- Robust design



This **COTS antenna** is designed for small satellite applications to realize satellite-to-ground radio links.

With circular polarization, the antenna provides a robust antenna solution regarding the steering accuracy to the ground station antenna and in case of a randomly rotation of wave polarization plane by refracts of the ionosphere.

As RF connectors, robust connectors of type SMA female (manufacturer RADIALL) are used. A proper mounting of the antenna can be provided by 4 screws.

The antenna backside shall be grounded properly to the satellite chassis.

As dielectric, ROGERS™ laminate for space applications is used. Patches and conductors are copper with gold surface finish.

With the basic design, TRL9 has been achieved with various successful LEO missions.

FEATURES

- Flight grade tested design
- Patch antenna design matched to customer specific frequencies
- Short delivery time

KEY SPECIFICATIONS

Tx center frequency:
2.263 GHz

RF bandwidth Tx:
50 MHz

**Maximum gain:
(main direction)**
6dBi

Polarization:
RHCP

Connector type:
SMA (f)

Beam width:
 $\pm 40^\circ \times \pm 40^\circ$

RF power input:
< 2W

**Temperature range:
(operationally)**
-30°C ... +60°C

VSWR:
< 1.25 center freq.
< 1.8 for freq. range

Impedance:
50 Ω

Type:
Single Patch

Mass:
≈ 39 grams (single)

**Outer dimensions
(x/y/z, w/o connector):**
70 x 70 x 3.4 mm³

Document Information

Action	Name / Signature	Company	Date
Prepared by	SPI Stefan Pirwitz	IQ spacecom	2022-03-23
Checked by	BBH Bharath Vikram Bhatt	IQ spacecom	2022-03-23
Authorized by	MRE Mathias Reibe	IQ spacecom	2022-03-23

Issue	Date	Page and/or paragraph affected	Change description	Responsible
00	2015-01-15		Initial issue	Author SPI
01	2016-06-20		Add accurate antenna pattern	SPI
02	2022-03-23		Update Company Name & Address, Design, total Mass	SPI
03	2024-03-22		Data sheet design updated	TSO
04	2026-04-24		Updated wording	JML
05	2026-06-25	1	Updated wording	TMA

Mechanical Dimensions

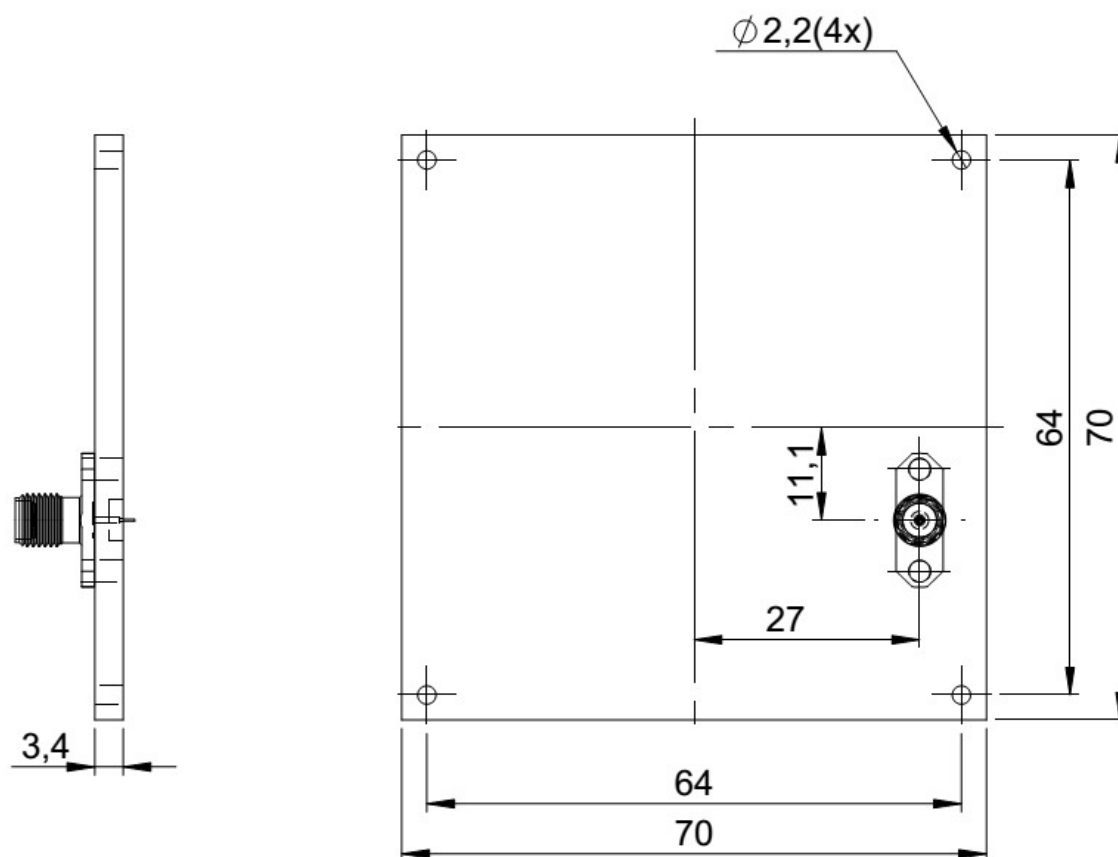


Figure 1: Mechanical dimensions and positions of RF connectors. All tolerances for all mechanical dimensions are $\pm 0.1\text{mm}$, for connector $\pm 0.5\text{mm}$ and high (z-dimension) $\pm 10\%$. These are based on manufacturing tolerances by the PCB manufacturer.



Figure 2: Antenna realization

Simulated Data

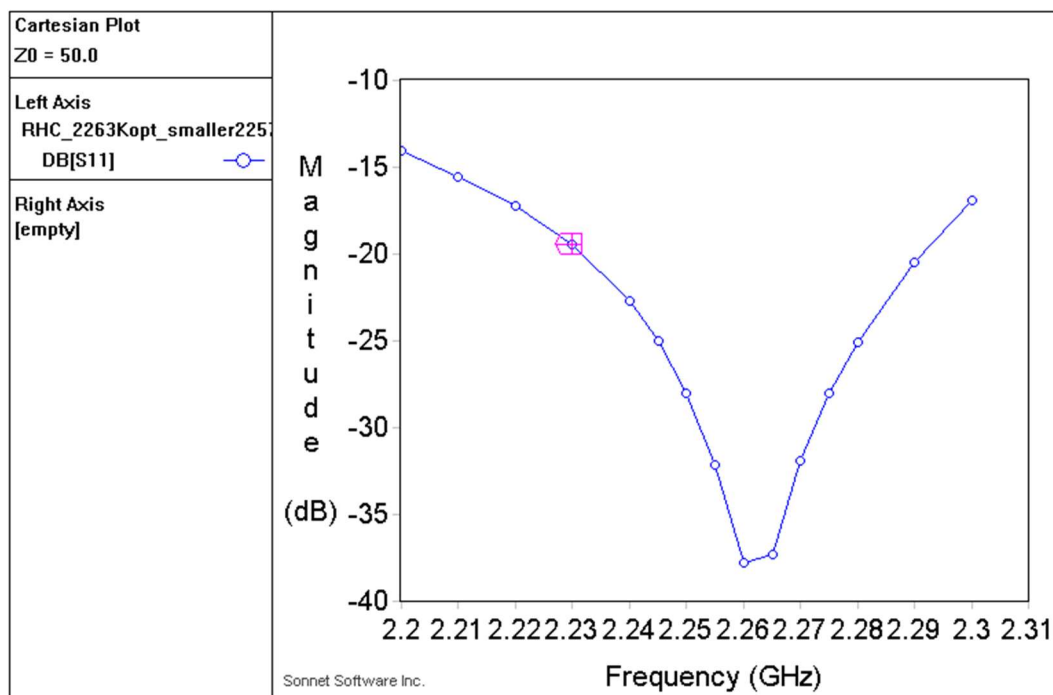


Figure 3: Simulation results of impedance matching (S11, blue)

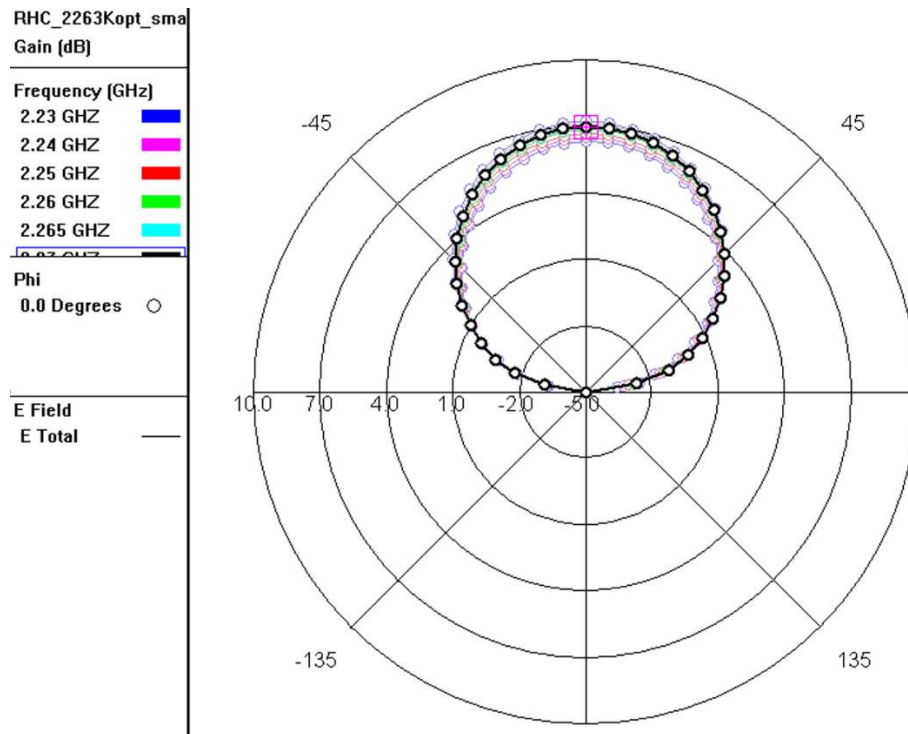


Figure 4: Simulation results of antenna pattern 0°, RHC

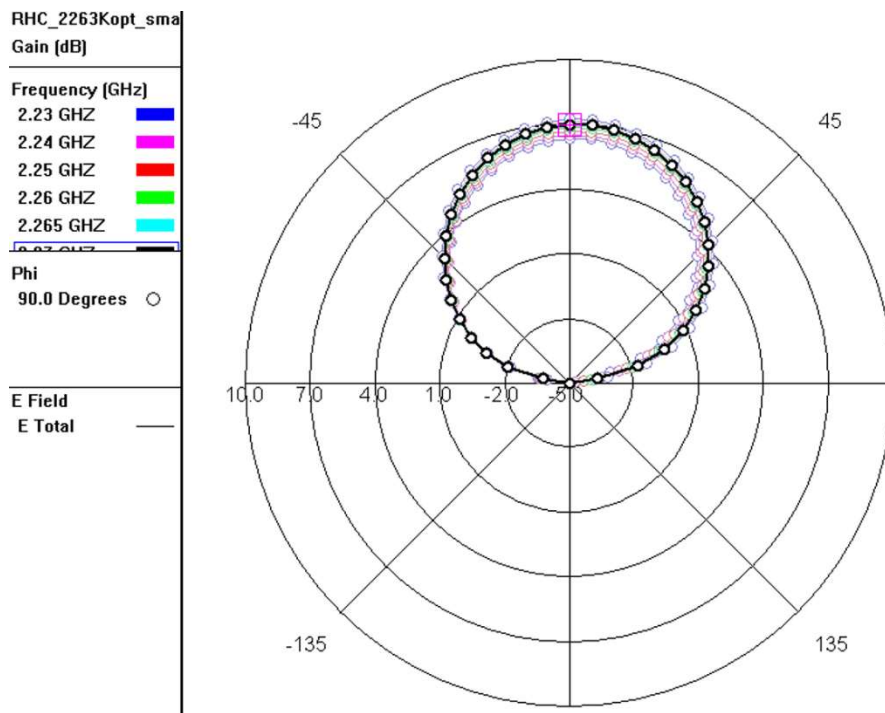


Figure 5: Simulation results of antenna pattern, 90° RHC

RHC_2263Kopt_sma
Gain [dBi]

Frequency [GHz]
2.23 GHz
2.24 GHz
2.25 GHz
2.26 GHz
2.265 GHz

Phi
90.0 Degrees ○
0.0 Degrees □

E Field
E RHP —
E LHP —

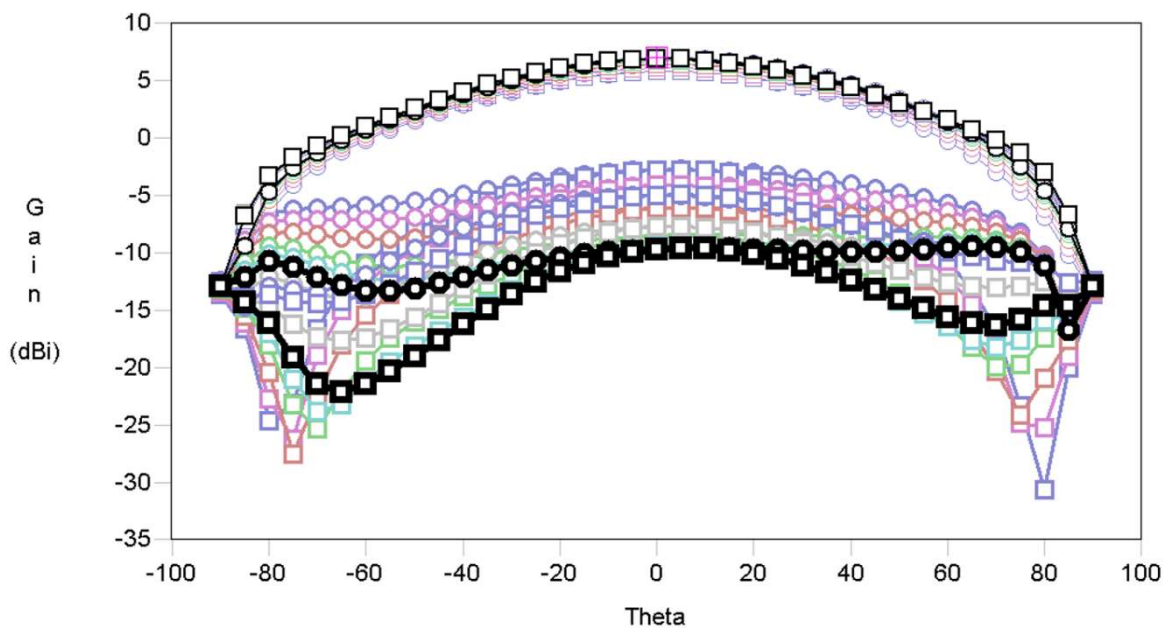


Figure 6: antenna 0 and 90 degree RHC vs. LHC (dB)

Measured Data (typical)

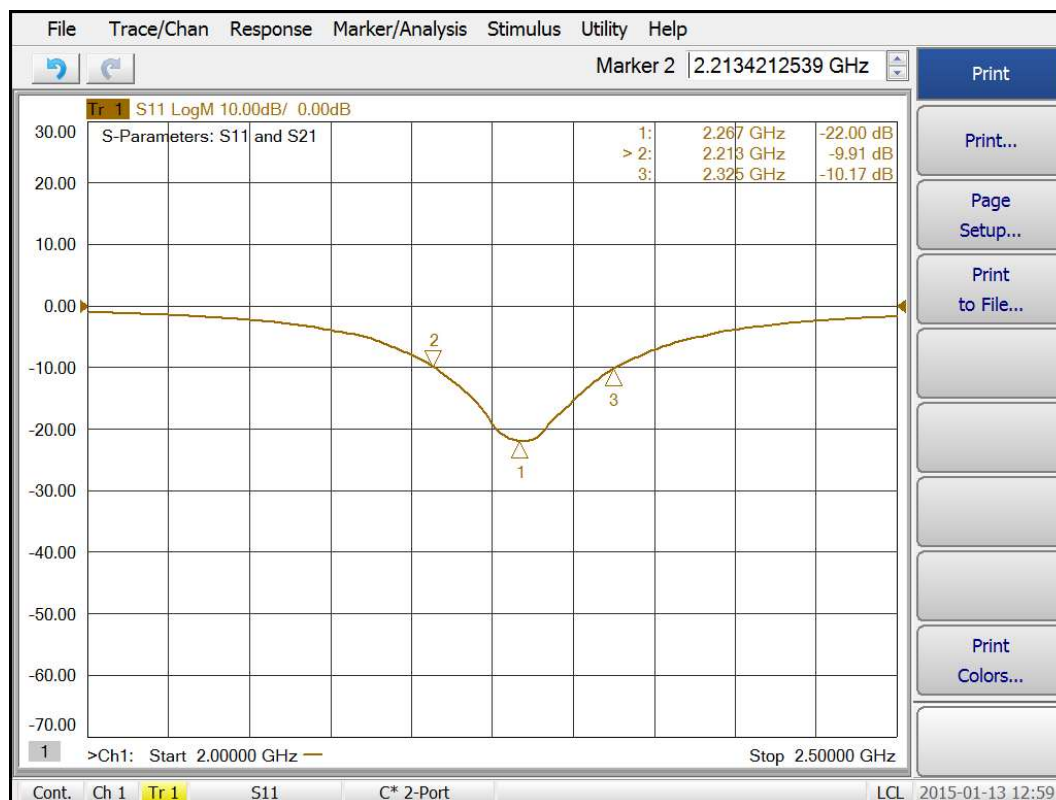


Figure 7: typical Return Loss (dB)

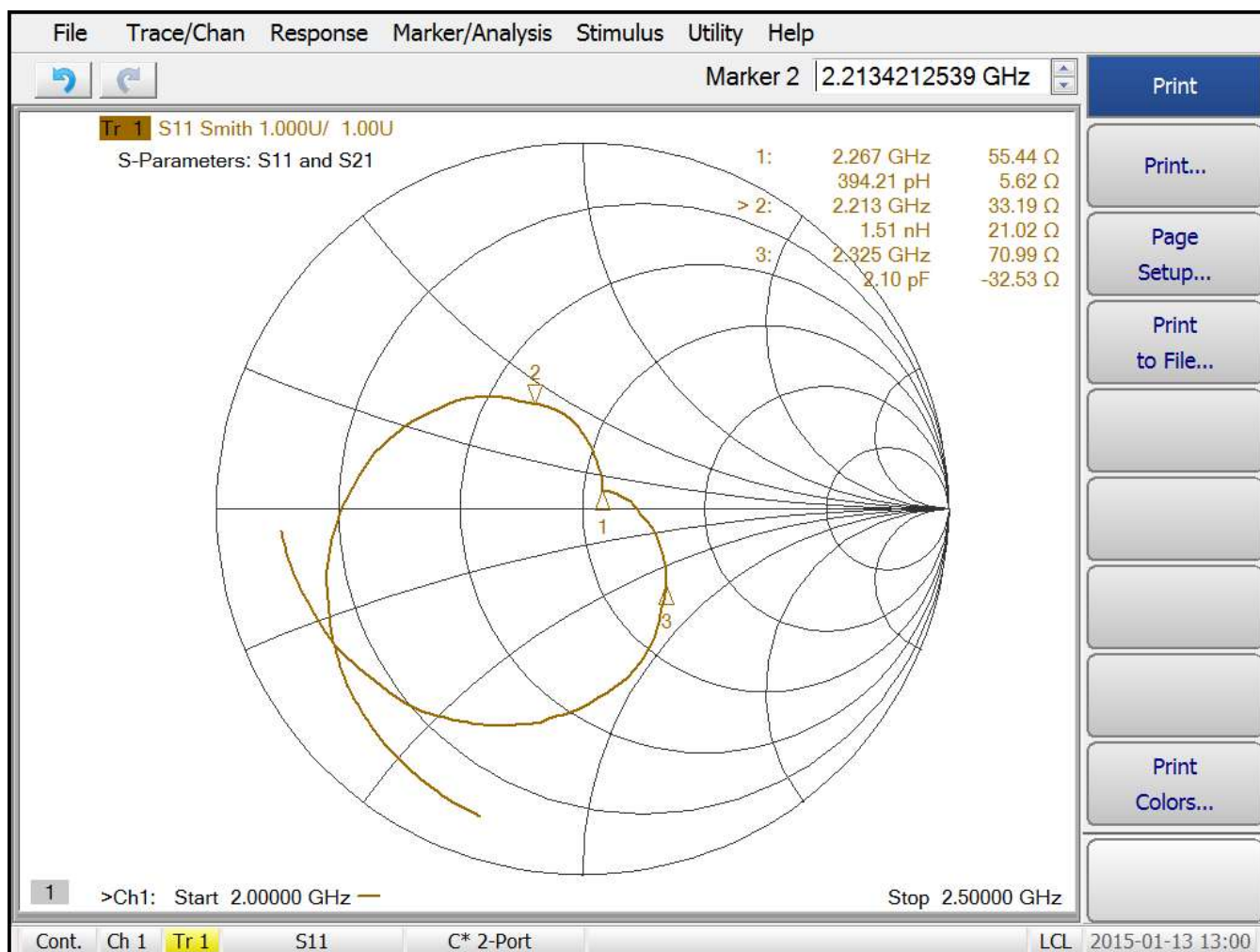


Figure 8: typical impedance Smith chart

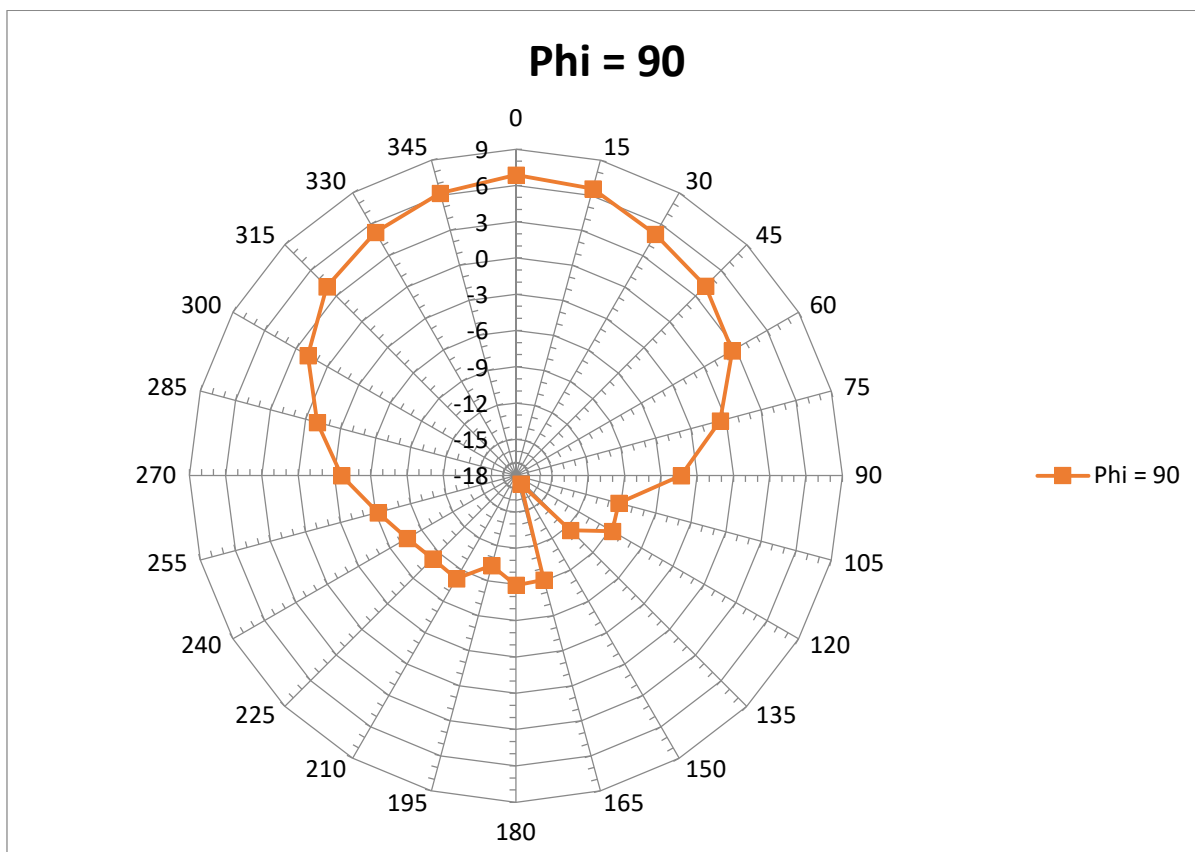


Figure 9: Antenna pattern E-field Horizontal 2250MHz

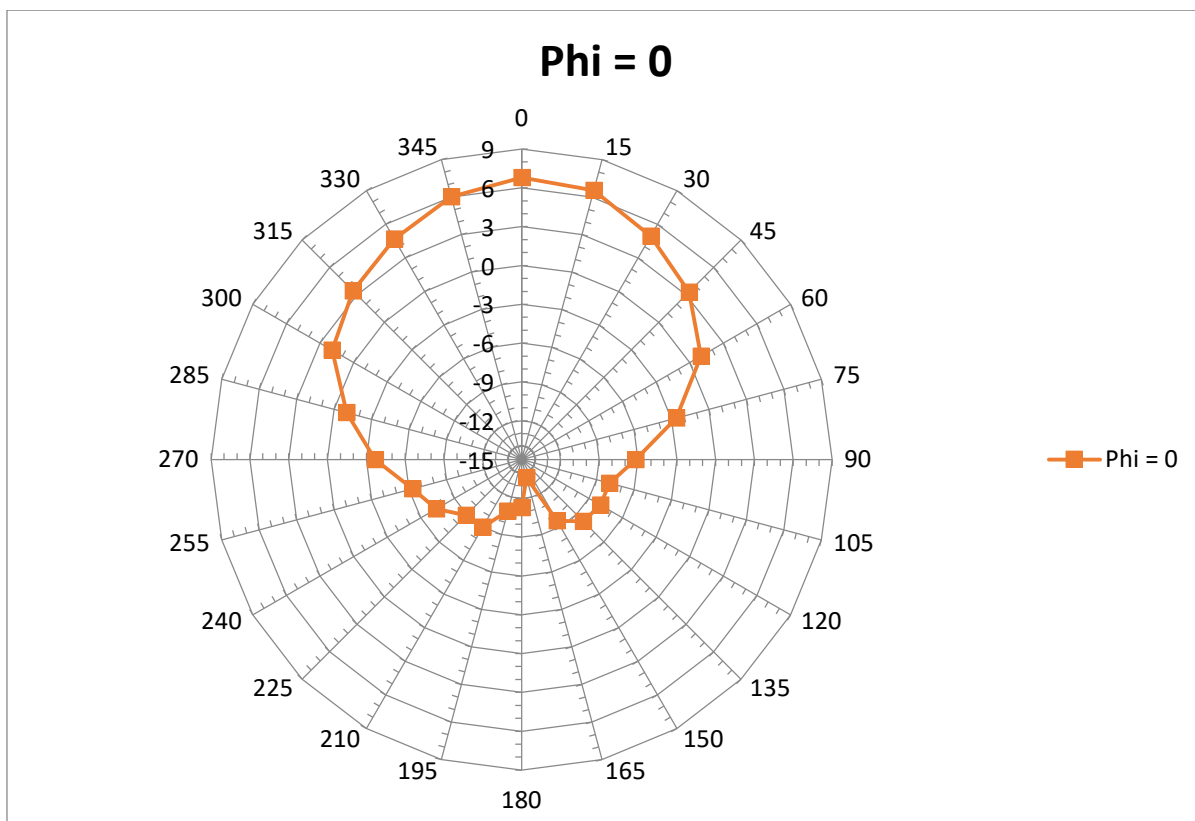


Figure 10: Antenna pattern E-field vertical 2250MHz

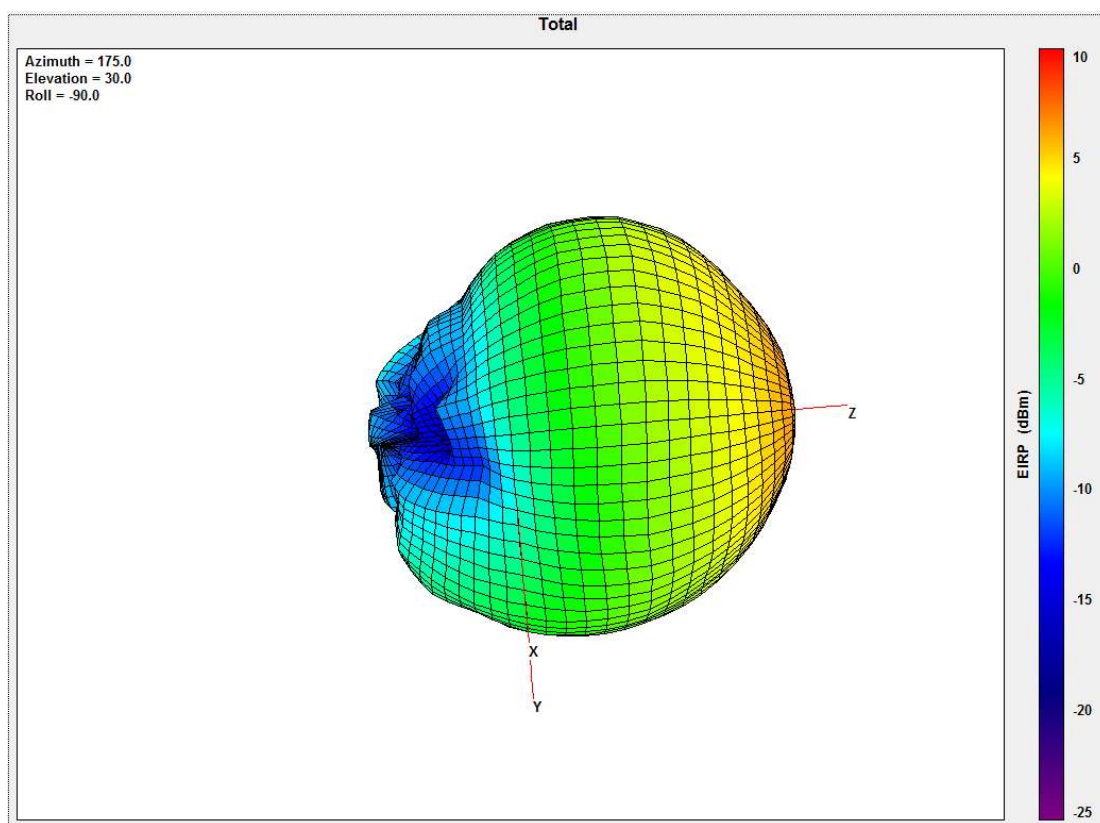


Figure 11: Antenna pattern 3D side view 2250MHz

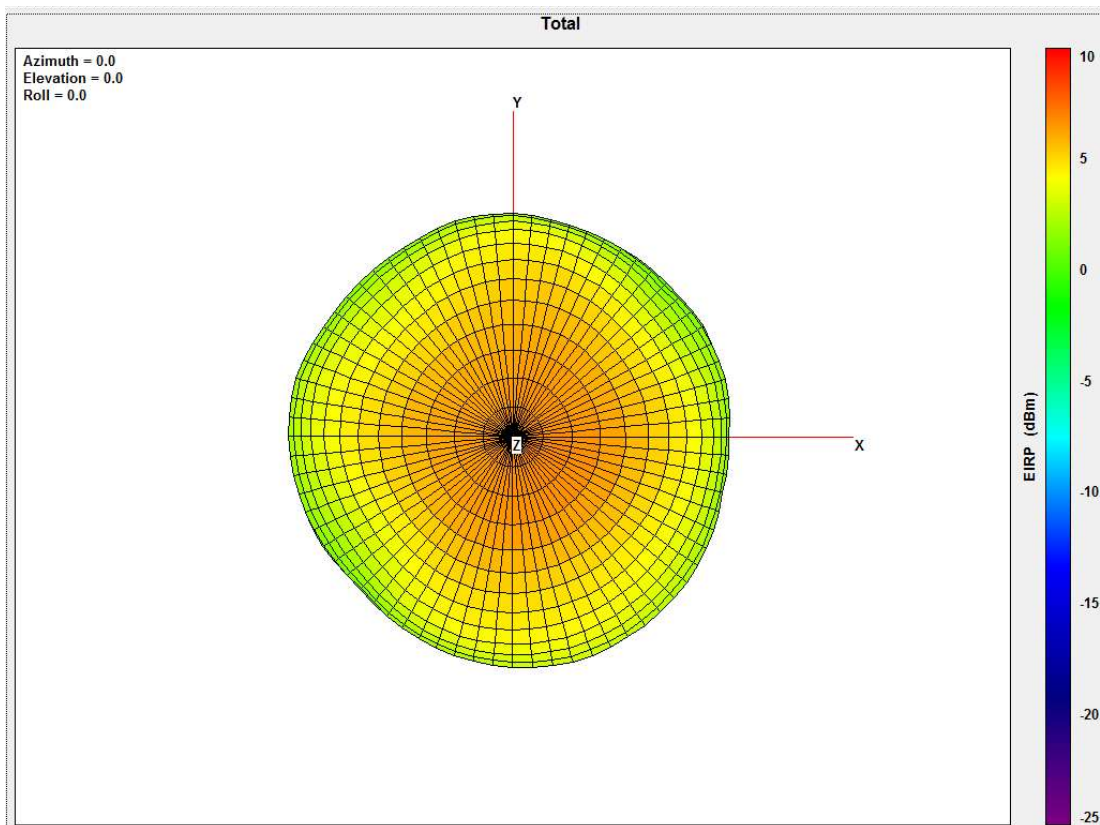


Figure 12: Antenna pattern 3D front view 2250MHz

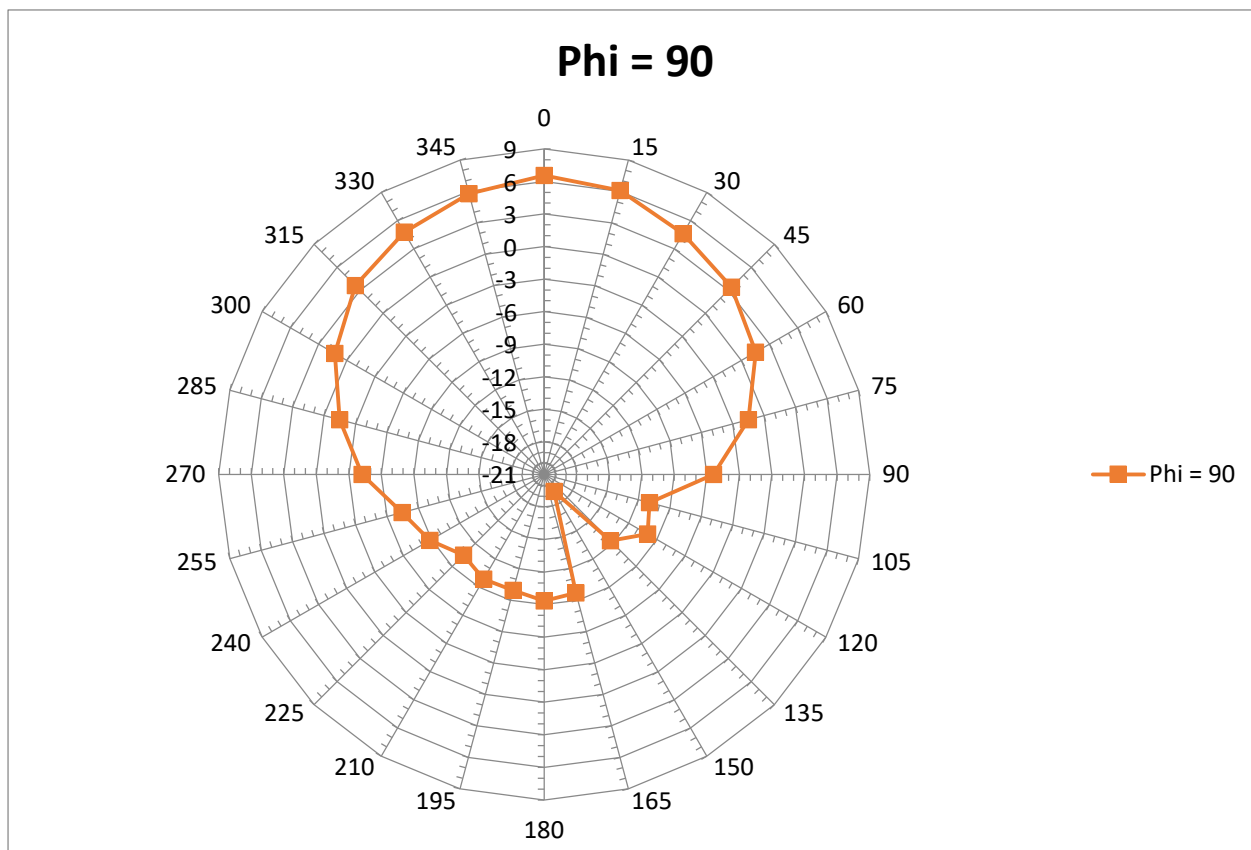


Figure 13: Antenna pattern E-field Horizontal 2263MHz

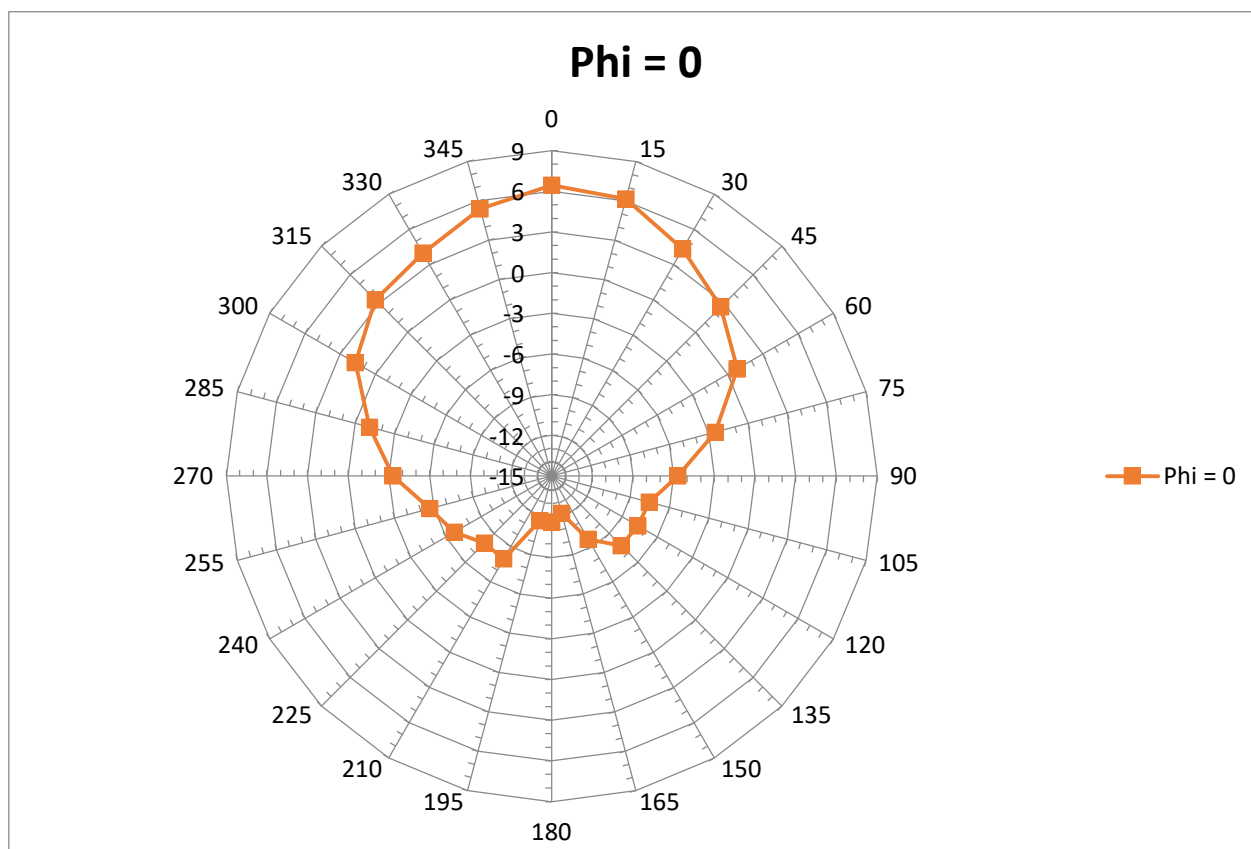


Figure 14: Antenna pattern E-field vertical 2250MHz

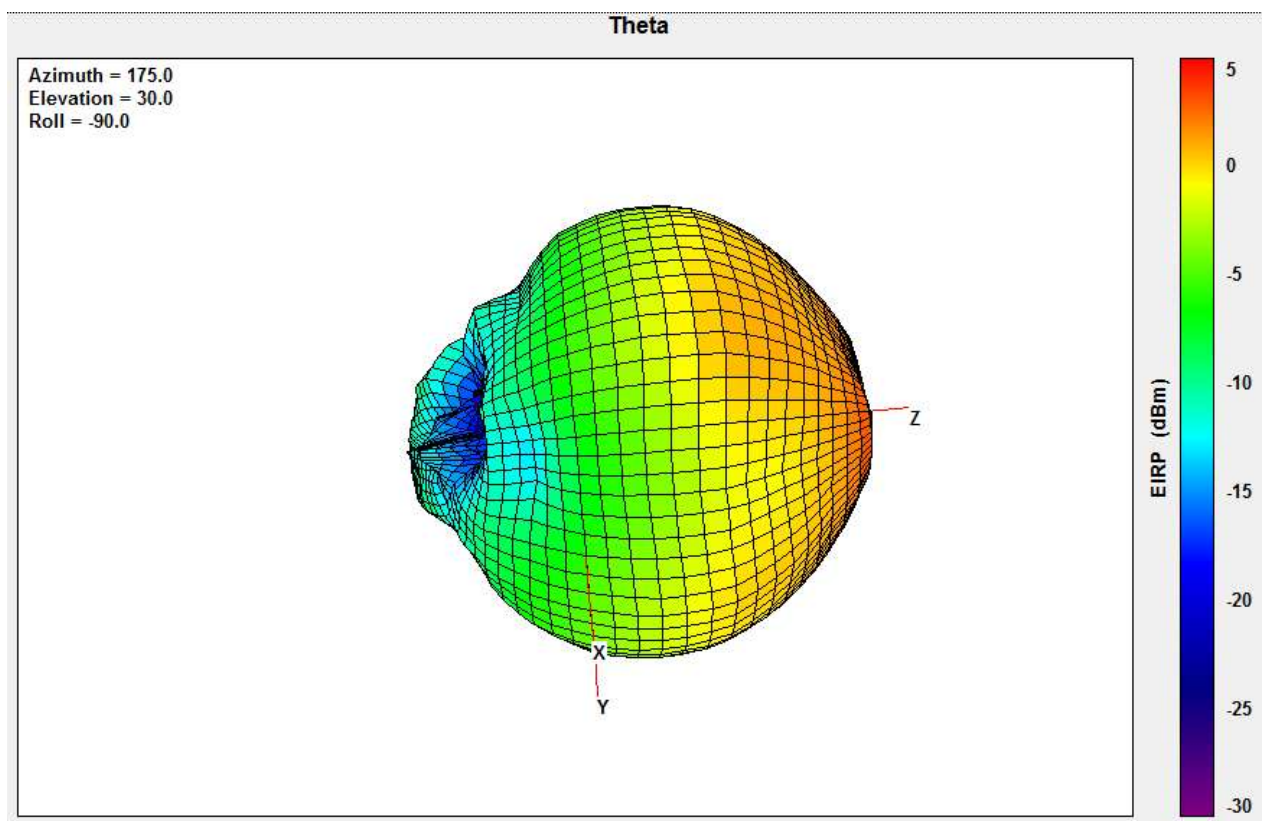


Figure 15: Antenna pattern 3D side view 2263MHz

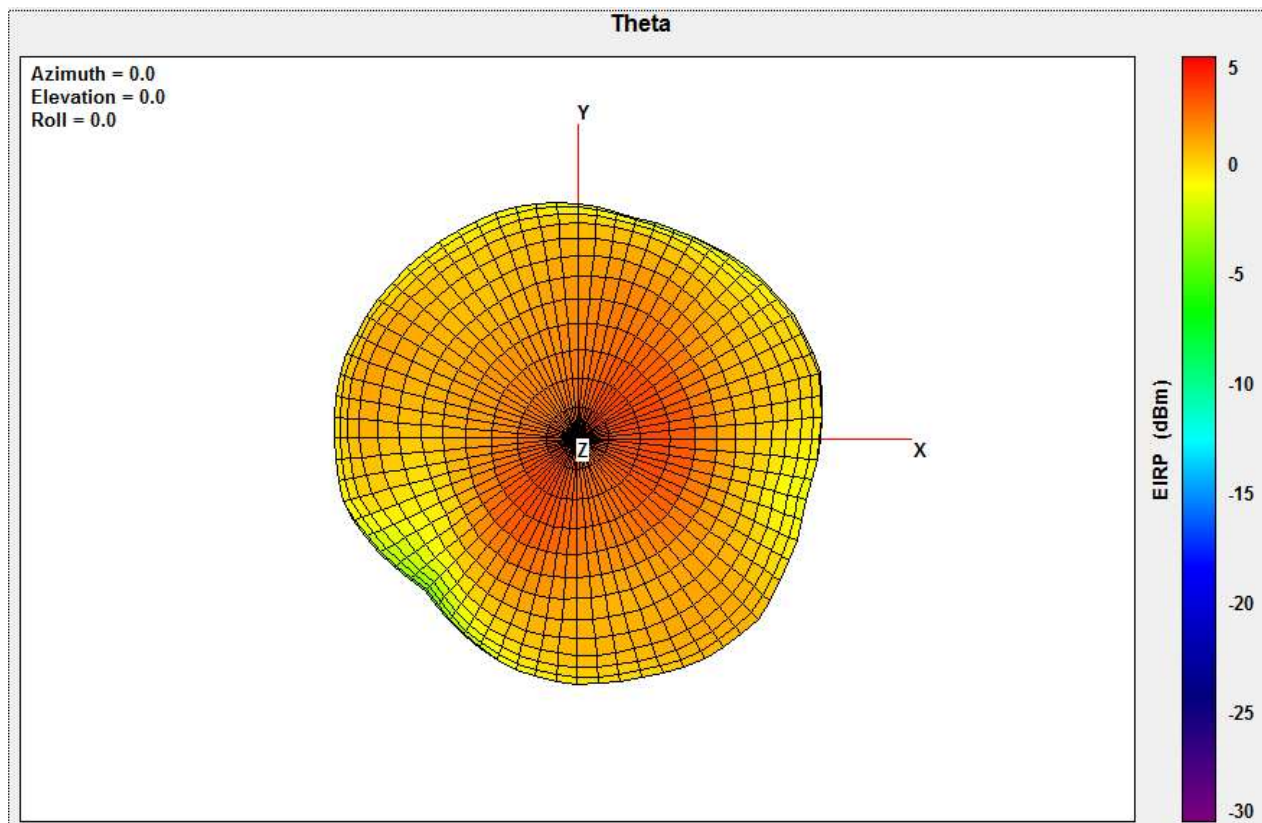


Figure 16: Antenna pattern 3D front view 2250MHz

Interfacing and Mounting Hints for the Antenna

Please use suitable screws and washers according to your specific requirements for mounting the antenna to the satellite chassis. Mounting of the antenna is by 4 of those screws and washers with positions as indicated in figure 1. Please ensure that the mounting area is plane.

A step file for the antenna could be provided on request.

CAUTION:



Although all external interfaces are protected against ESD, proper precautions and grounding must still be observed when handling the device. Antenna backside and outer conductors of RF connectors and feeders have electrical ground potential. They should be connected properly to satellite chassis (ground).

CAUTION:



When interfacing and operating the antennas with radio transmitters, generators or similar equipment, special care is required regarding a potential irregular radio wave radiation. Please ensure that maximum power ratings are kept. RF interfaces to be connected to the antenna ports should be free of DC.

Please make sure that no obstacles are arranged or mounted in beam direction of the antenna patches.

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