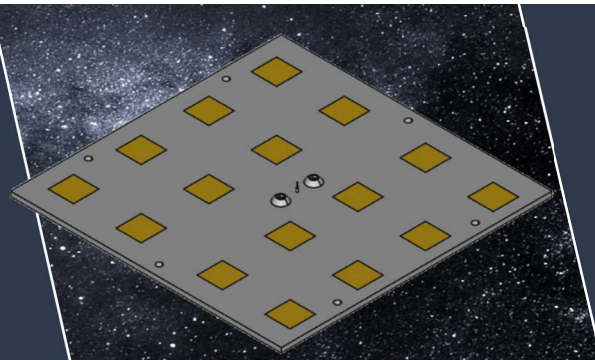


X-Band Patch Antenna with SMA Interface Control Document

- 4x4 Patch Antenna with SMA
- 100 x 100 mm, 8.0 – 8.45 GHz

HIGHLIGHTS

- Circular polarization (RHCP)
- TRL 9 for basic design
- High gain 18 dBi
- Compatible with 1U CubeSats
- Robust design



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

With circular polarization, the antenna provides a robust 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 an RF connector, a robust SMA female connector (manufactured by RADIAL) is used. A proper mounting of the antenna can be provided by 6 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, TRL 9 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 frequency range:
8.0 – 8.45 GHz

RF bandwidth Tx:
450 MHz

**Maximum gain:
(main direction)**
18dBi

Polarization:
RHCP

Connector type:
SMA (f)

Beam width:
 $\pm 9^\circ \times \pm 9^\circ$

RF power input:
< 2W

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

VSWR:
< 2 for freq. range

Impedance:
50 Ω

Type:
4x4 Patch

Mass:
≈ 40 grams

**Outer dimensions
(x/y/z, w/o connector):**
100 x 100 x 1.8 mm³

Document Information

Action	Name / Signature	Company	Date
Prepared by	BBH Bharath Vikram Bhatt	IQ spacecom	2024-02-16
Checked by	KJÄ Klaus Jäckel, SPI Stefan Pirwitz	IQ spacecom	2024-02-20
Authorized by	MRE Mathias Reibe	IQ spacecom	2024-02-20

Issue	Date	Page and/or paragraph affected	Change description	Responsible
00	2024-02-16		Initial issue	Author
01	2024-04-12	Key Specifications	Data sheet design updated, frequency range to 8.0 – 8.45GHz	SPI
02	2025-06-19		Change of title and text	TSO
03	2026-04-17		Updated wording	JML
04	2026-06-25	1	Updated wording	TMA

Mechanical Dimensions

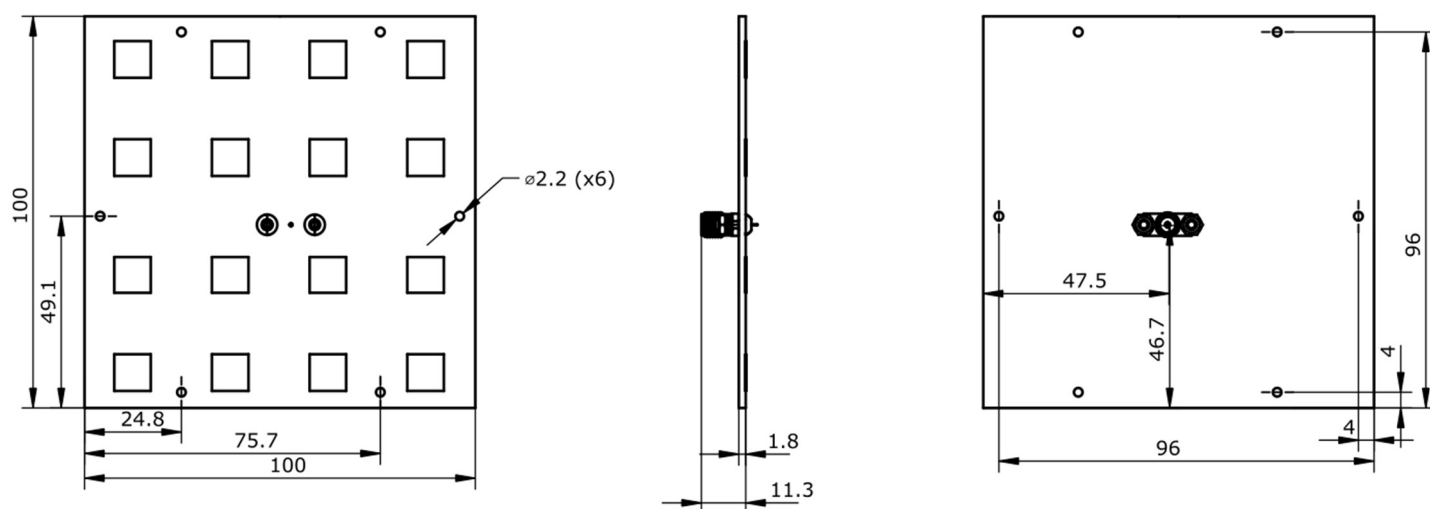


Figure 1: Mechanical dimensions and position of RF connector. All tolerances for all mechanical dimensions are $\pm 0.1\text{mm}$, for connector $\pm 0.5\text{mm}$ and high (z-dimension) $\pm 10\%$. These are based on manufacturing tolerances by the PCB manufacturer.

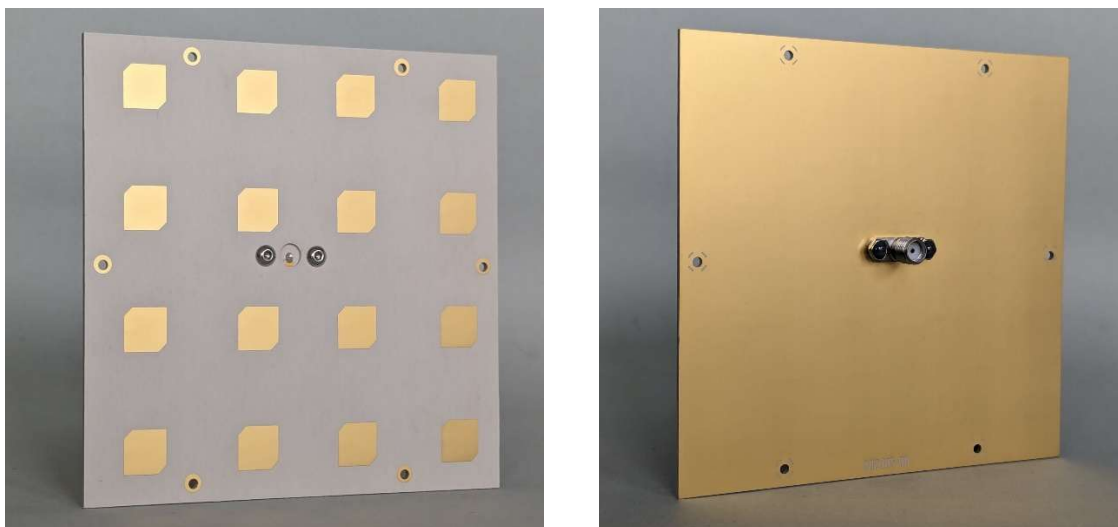


Figure 2: Antenna realization

Simulated Data

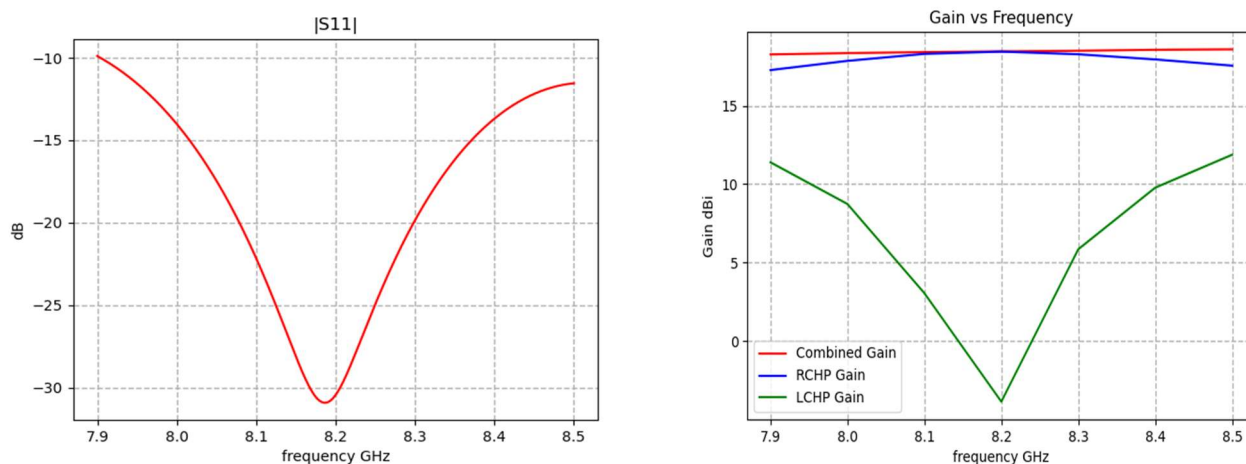


Figure 3: Simulation results of impedance matching (S11, gain over frequency)

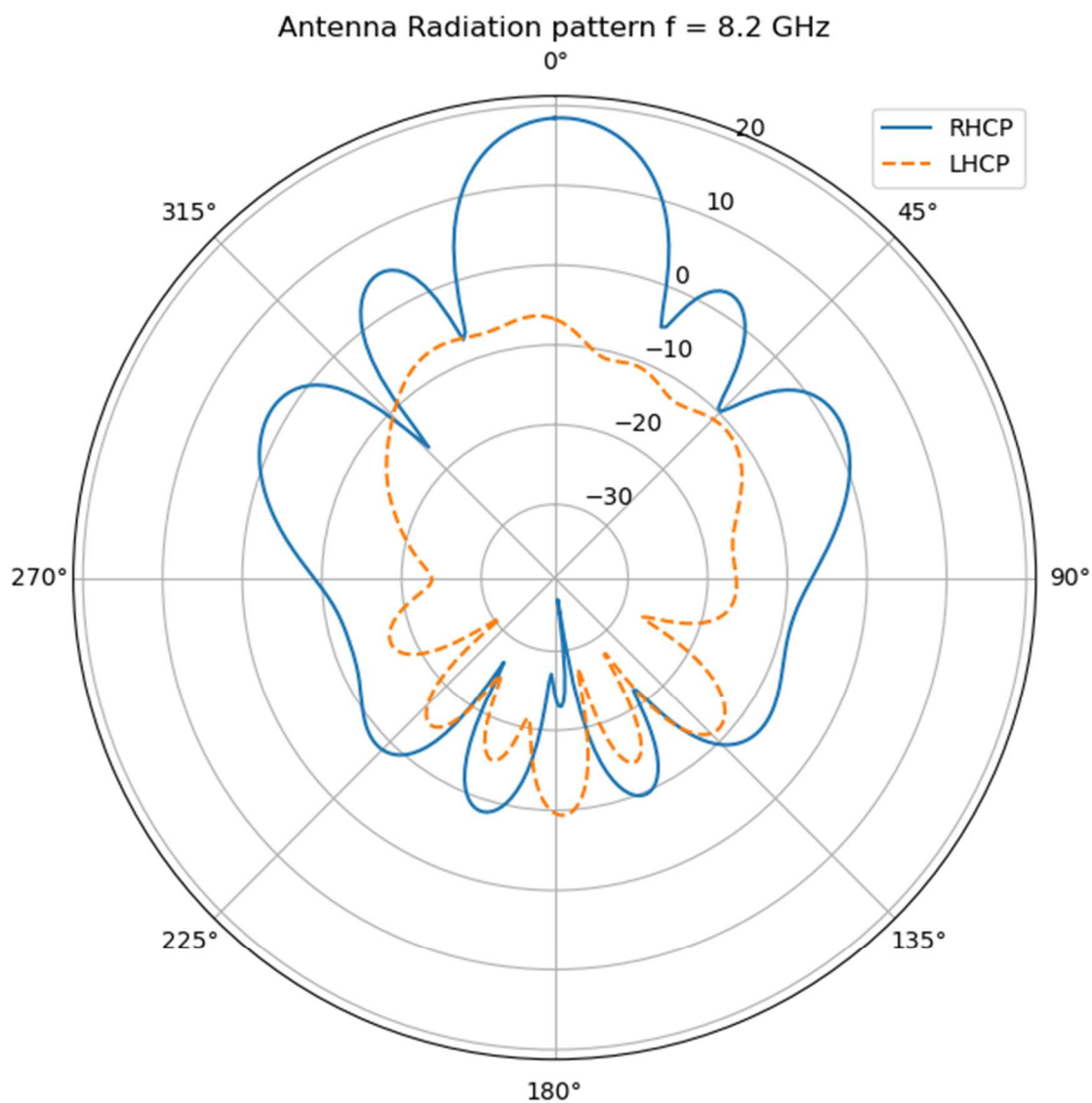


Figure 4: Simulation results of antenna pattern $\Phi = 0^\circ$, RHC vs LHC

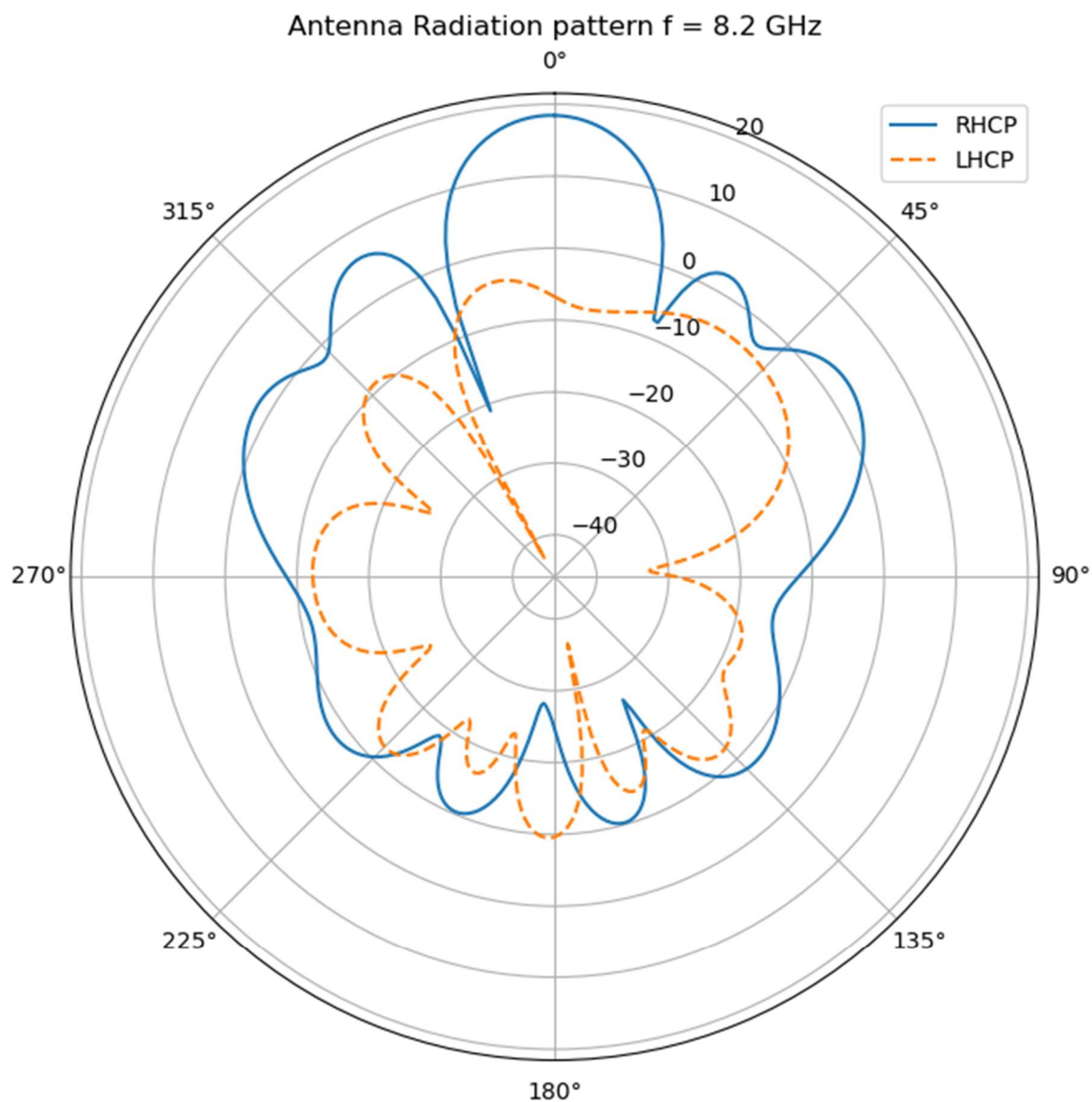


Figure 5: Simulation results of antenna pattern $\Phi = 90^\circ$, RHC vs LHC

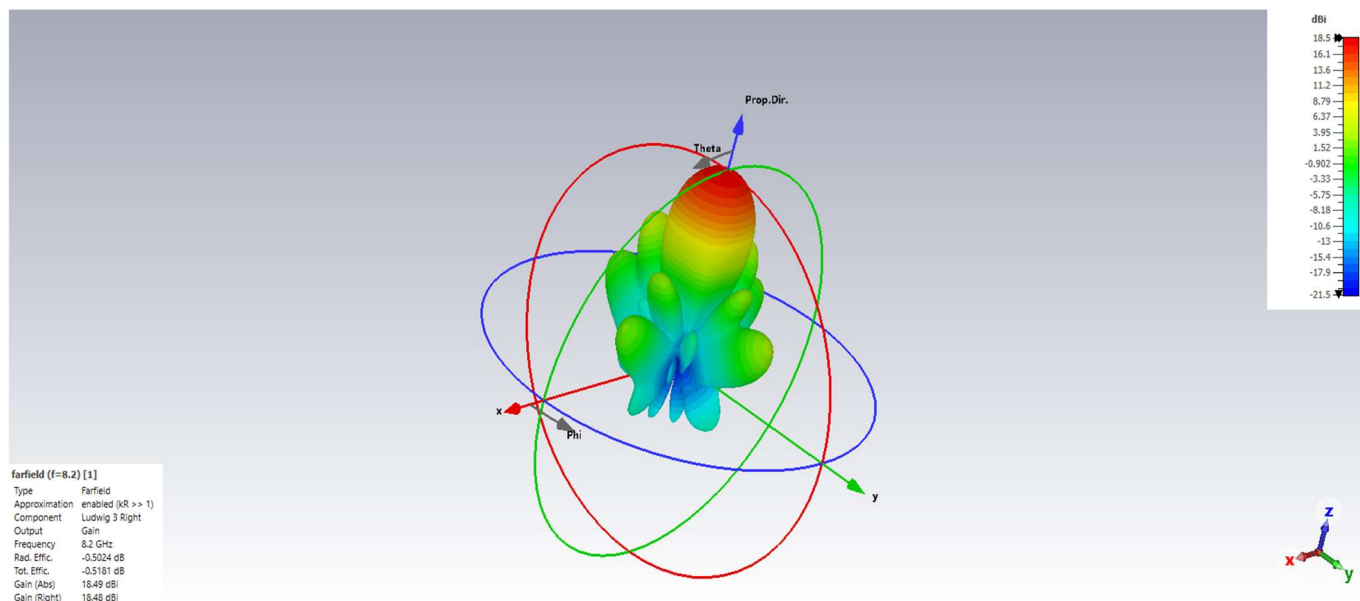


Figure 6: Simulation results of antenna 3D pattern

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 6 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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