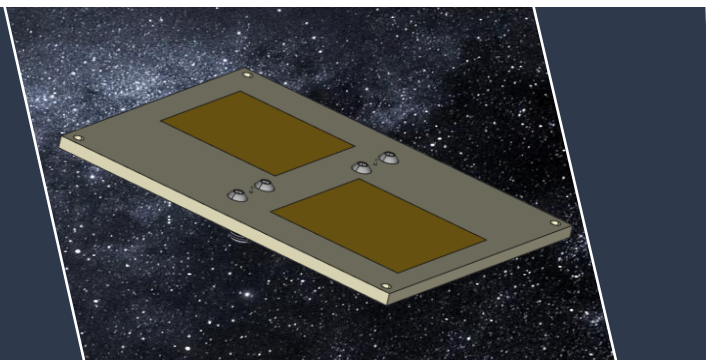


S Band Patch Antenna with SMA Interface Control Document

- Dual Patch Antenna with SMA
- 80 x 100 mm, 2067 MHz / 2245 MHz

HIGHLIGHTS

- Circular polarization (RHCP)
- TRL 9 for basic design
- Flight Heritage TRL9 for basic design since 2017
- Compatible to 1U CubeSat
- Robust design and application



This **COTS antenna** is designed for small satellite applications to realize simultaneous satellite-to-ground and ground-to-satellite 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.

Due to individual Rx and Tx patches, a substantial RF isolation could be achieved thus reducing the requirements for duplex filter application.

As RF connectors, connectors of type SMA (manufacturer RADIALL) are used. Upon re-quest and after detailed negotiation, suitable RF feeder cables could be provided optionally.

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:
2.245 GHz

RF power input:
< 2W

Mass:
≈ 62 grams

RF bandwidth Tx:
50 MHz

VSWR:
< 2 (over RF BW)

Type:
Dual patch

Rx center frequency:
2.067 GHz

Impedance:
50 Ω

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

RF bandwidth Rx:
50 MHz

Polarization:
RHCP

Outer dimensions
(x/y/z, w/o connector):
80 x 100 x 3.4 mm³

Maximum gain:
(main direction)
7 dBi

Beam width:
±40° x ±40°

Connector type:
SMA (f)

Document Information

Action	Name / Signature	Company	Date
Prepared by	SPI Stefan Pirwitz	IQ spacecom	2020-08-04
Checked by	AWE Andreas Weiland	IQ spacecom	2020-08-05
Authorized by	MRE Mathias Reibe	IQ spacecom	2020-08-06

Issue	Date	Page and/or paragraph affected	Change description	Responsible
00	2020-08-06		Initial issue	Author
01	2020-11-12		Update Images	Author SPI
02	2021-09-09		Update telephone number	SPI
03	2021-11-29		Update Company Name & Address	SPI
04	2023-01-20		Add marking for TX-connector	SPI
05	2023-08-15		updating Tolerance for z-dimension	SPI
06	2024-02-26		Data sheet design updated	TSO
07	2025-07-22		Surface finish	AWE
08	2026-04-21		Updated wording	JML

Mechanical Dimensions

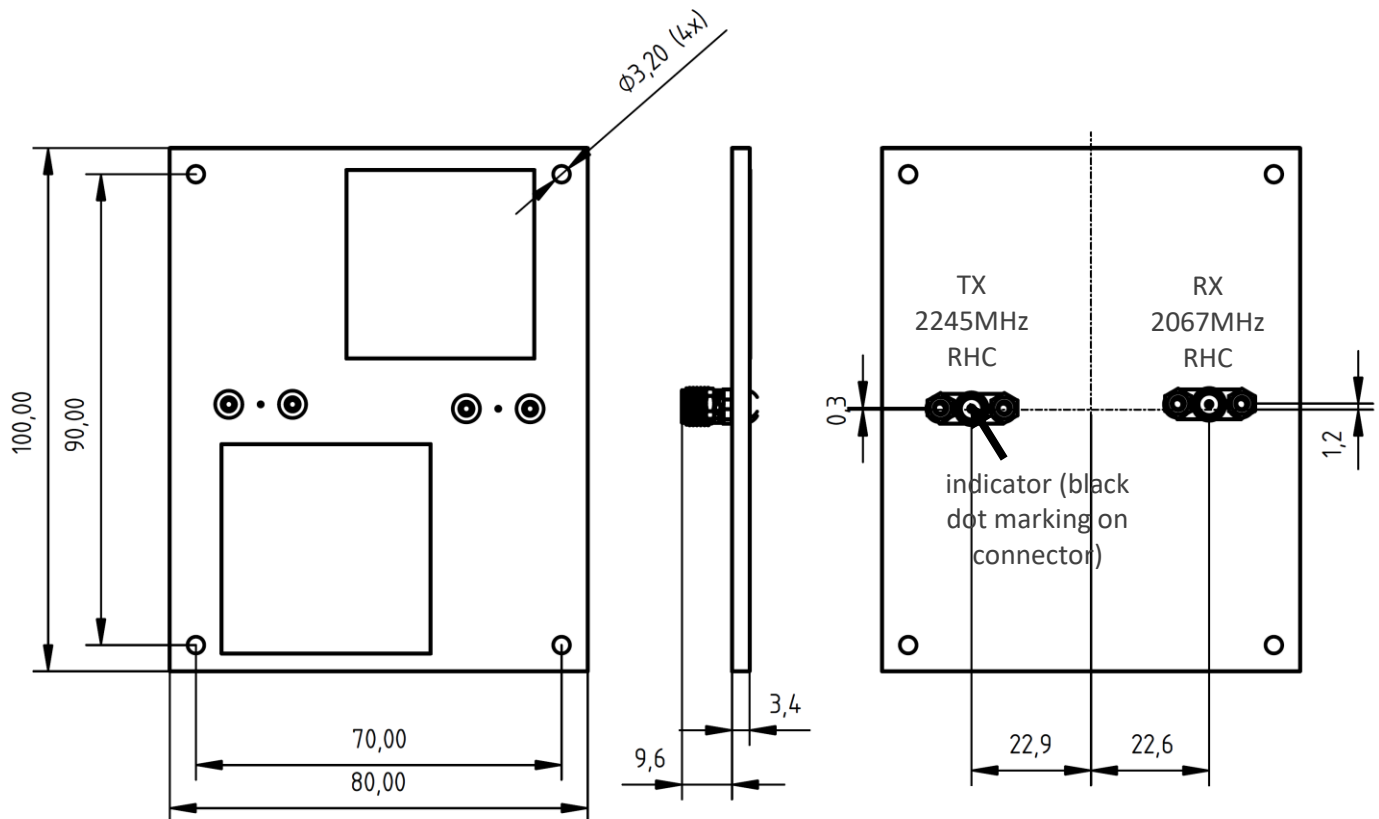


Figure 1: Mechanical dimensions and positions of RF connectors. All tolerances for all mechanical dimensions are $\pm 0.1\text{mm}$, for connector $\pm 0.5\text{mm}$ and high (z-dimension) $\pm 10\%$. These are based on manufacturing tolerances by the PCB manufacturer.

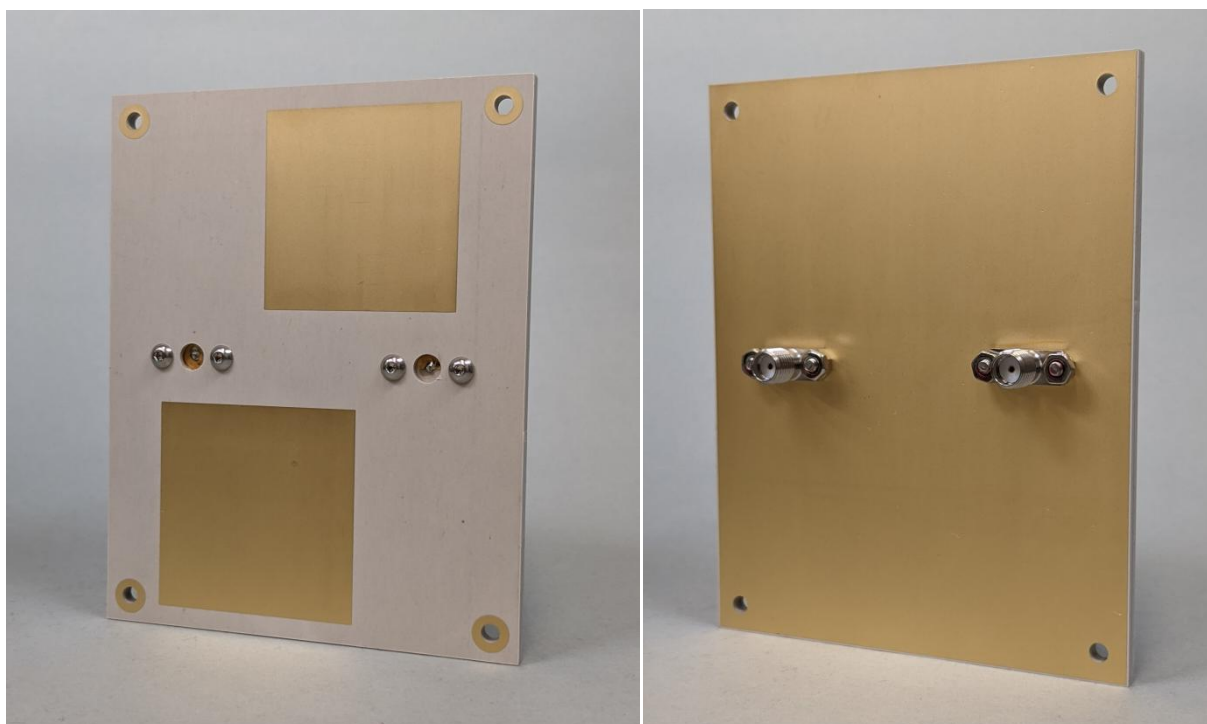


Figure 2: Antenna (smaller Tx patch is upper right side, bigger Rx patch is lower left side)

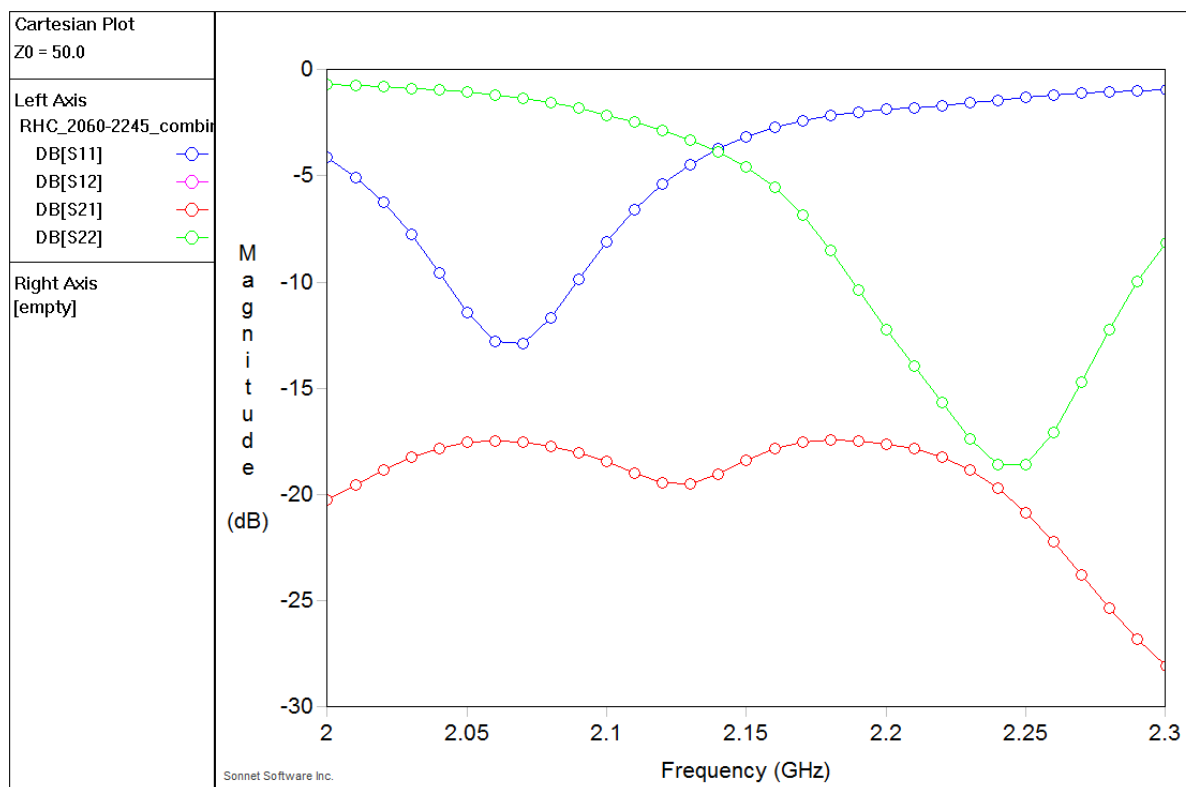


Figure 3: Simulation results of impedance matching (Tx port, S22, green and Rx port, S11, blue) as well as Rx-Tx isolation (Tx-Rx port, S21, red)

RHC_2060-2245_	
Gain (dB)	
Frequency (GHz)	
2.04 GHZ	■
2.05 GHZ	■
2.06 GHZ	■
2.07 GHZ	■
2.08 GHZ	■
2.09 GHZ	■
2.1 GHZ	■
Phi	
0.0 Degrees	
E Field	
E RHP	—
E LHP	—

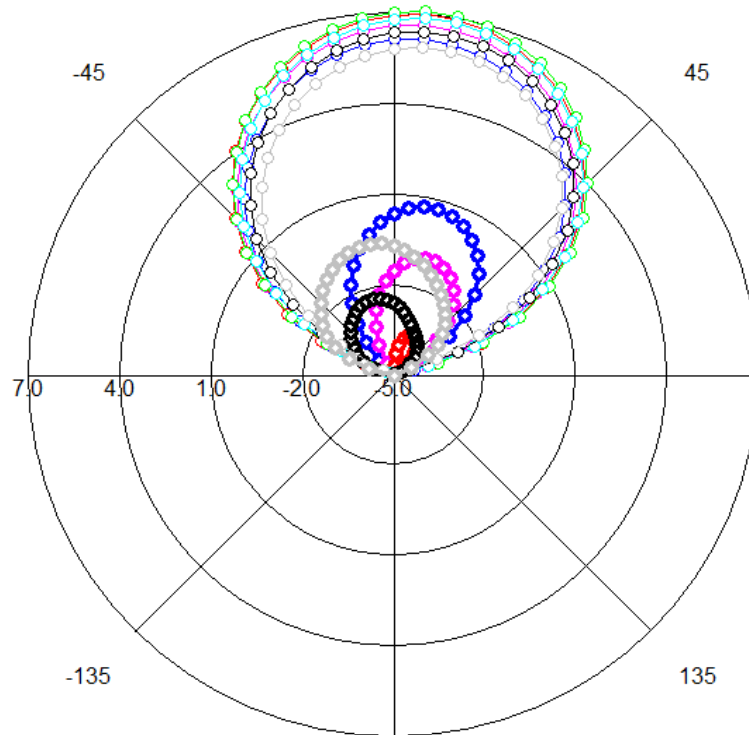


Figure 4: Simulation results of Rx antenna pattern 0°, RHC vs. LHC (bold)

RHC_2060-2245_	
Gain (dB)	
Frequency (GHz)	
2.04 GHZ	■
2.05 GHZ	■
2.06 GHZ	■
2.07 GHZ	■
2.08 GHZ	■
2.09 GHZ	■
2.1 GHZ	■
Phi	
90.0 Degrees	
E Field	
E RHP	—
E LHP	—

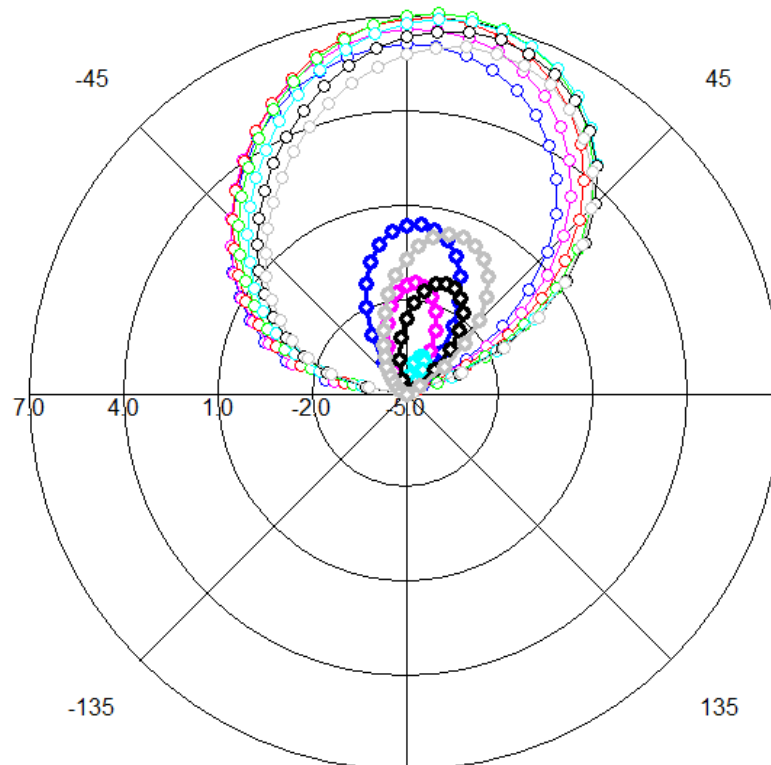


Figure 5: Simulation results of Rx antenna pattern, 90° RHC vs. LHC (bold)

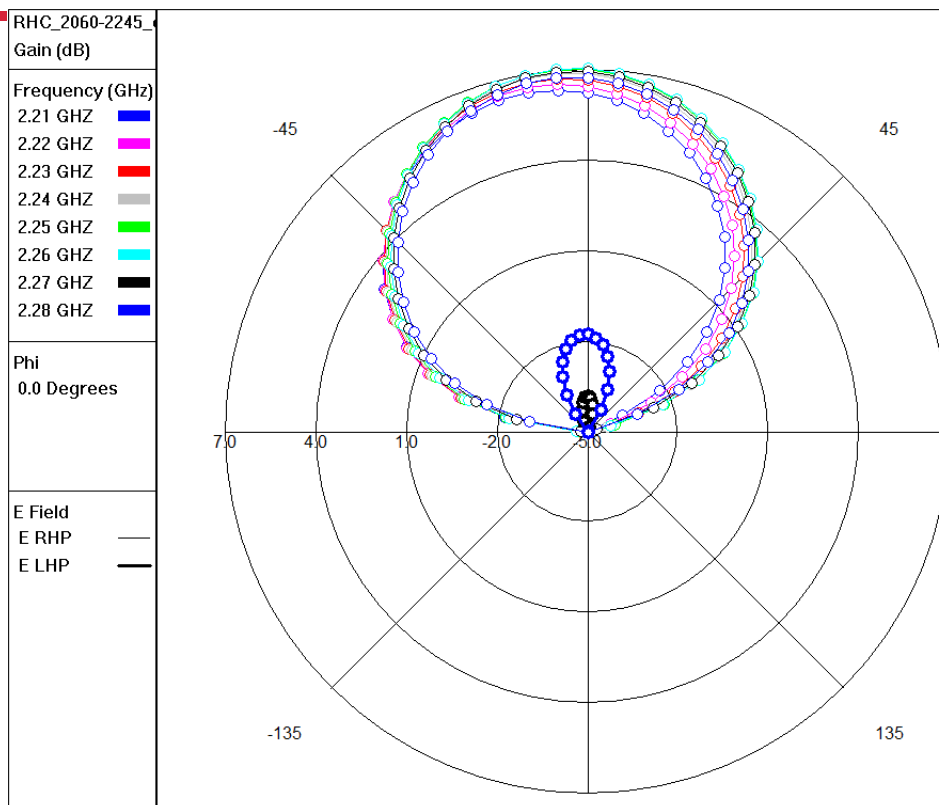


Figure 6: Simulation results of Tx antenna pattern, 0° RHC vs. LHC (bold)

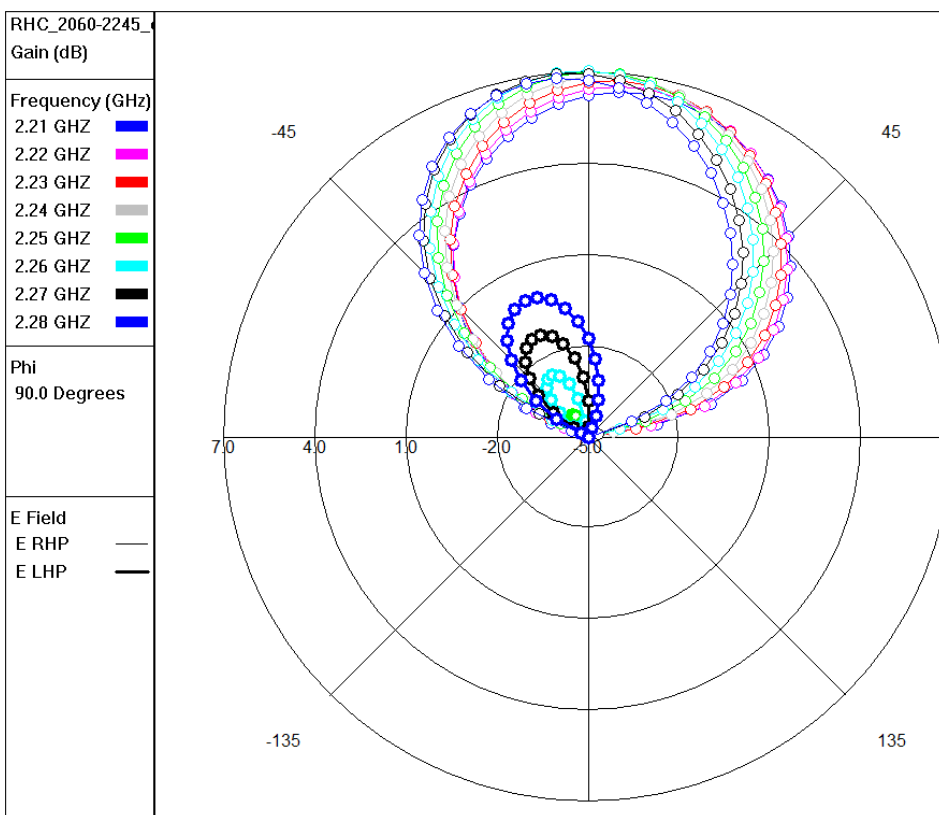


Figure 7: Simulation results of Tx antenna pattern, 90° RHC vs. LHC (bold)

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 shall 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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