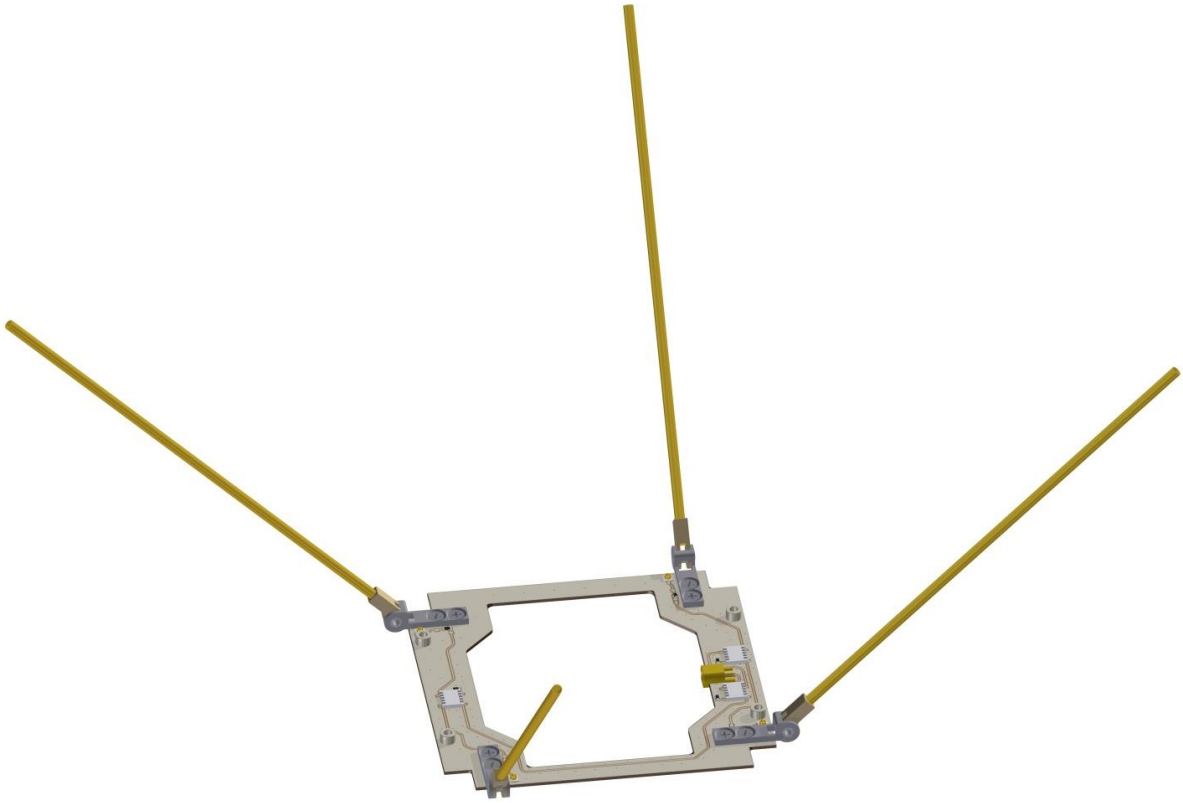

NanoCom
ANT430

Datasheet

70 cm band Omnidirectional UHF CubeSat antenna

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Product name: NanoCom ANT430

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Approved by: MVE

Approval date: 18-06-2020

Confidentiality Notice

1 Table of Contents

2 Overview

A reliable antenna is paramount for safe operations of a satellite. The GomSpace NanoCom ANT430 (ANT430) antenna for the 70 cm band is a deployable, 400 or 435 MHz, omnidirectional, canted turnstile antenna system with rigid antenna elements, which eliminates the risk of antenna deformation while stowed.

The turnstile antenna system consists of four monopole aerials combined in a phasing network in order to form a single circular polarized antenna. The antenna radiation pattern is close to omnidirectional and there are no blind spots, which can cause fading with tumbling satellites.

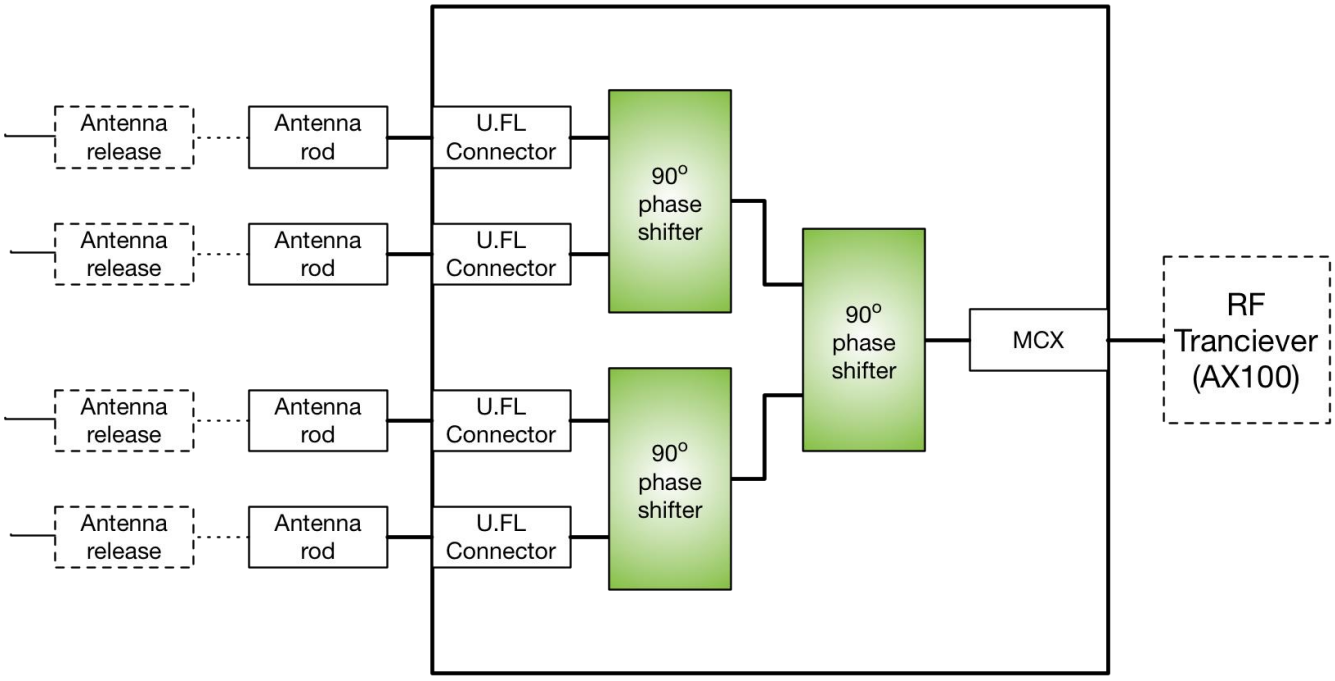
The antennas are compatible with the 1U, 2U or 3U ISIS CubeSat structures and can be mounted on either the top or bottom of the structure.

The antenna PCB is designed to be the least obstructive to any top or bottom mounted payload or panels. It has a low profile that allows a solar panel to be mounted on top, and a large aperture in the center suited for a protruding camera lens, propulsion hardware or similar.

2.1 Highlighted Features

- Omnidirectional Canted Turnstile CubeSat Antenna
- Optional frequency range: 400MHz ±5MHz or 435MHz ±5MHz
- Gain: 1.6 dBi to -1 dBi
- Rigid antenna tubes (no risk of antenna deformation while stowed)
- Matched to 50 Ω
- PCB material: Glass/Polyamide
- IPC-A-610 Class 3 assembly

2.2 Block Diagram



3 Connector

A 50 Ω MCX connector is used to connect to a radio.

4 RF Characteristics

4.1 Polarization

The antenna is circular polarized when seen from top (left hand) and bottom (right hand).

4.2 Radiation Pattern

The antenna is designed with the goal of avoiding dead spots in the radiation pattern making it close to omnidirectional. The actual gain characteristics depend on the shape of the spacecraft and its deployables.

4.2.1 2U Cubesat Version

For a uniform 2U Cubesat the simulated total gain is listed below.

Highest gain (1.4 dBi) is along the long (Z) axis of the Cubesat with lower gains (0.6 to -0.3 dBi) along the X- and Y-axes.

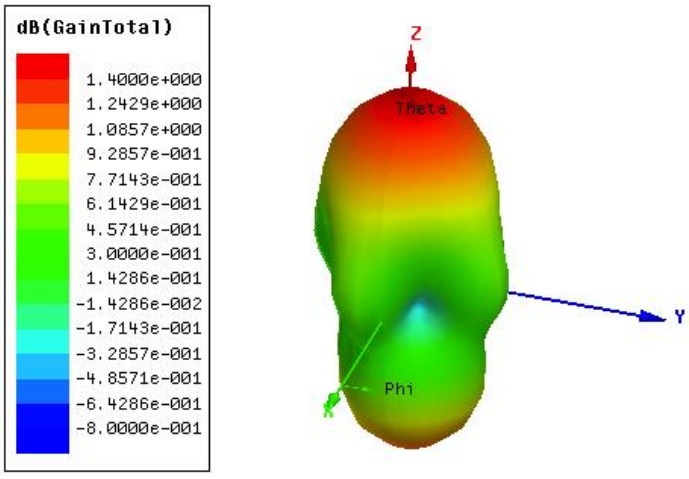


Figure 2 HFSS simulated radiation pattern 2U CubeSat

Figure 1 CAD of GOMX-1

Below is a plot of the measured total gain for a specific satellite with the antenna. The satellite (GOMX-1) is a 2U CubeSat with two antennas; a deployed helical antenna in one end and the ANT430 in the other end. Each line indicates a phi angle and it can be seen that the measured total gain relates well to the simulated total gain with a range of 1.6 to -1.5 dBi.

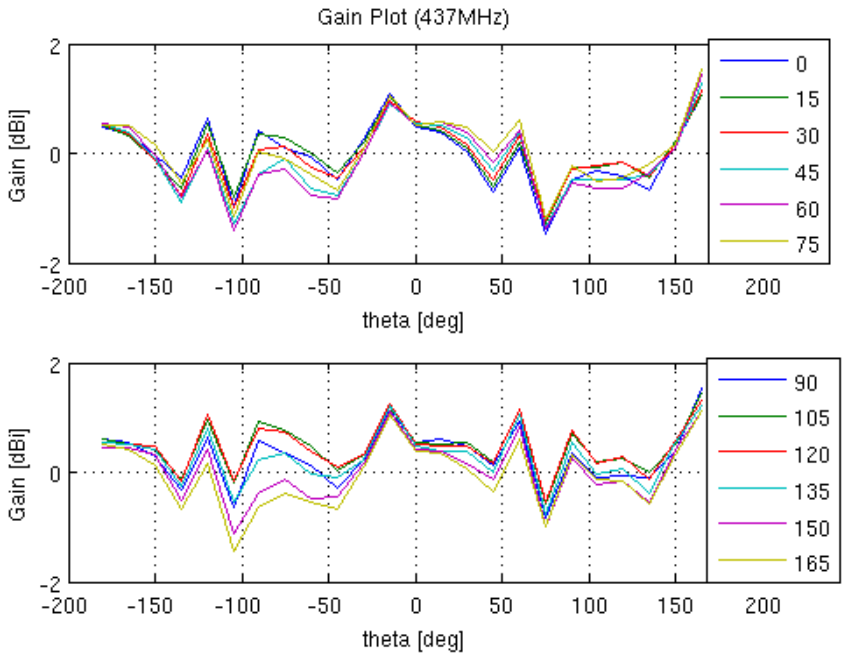


Figure 3 UHF antenna gain measured on GOMX-1. (Measurements performed by Molex Antenna Unit Denmark)

If you are in doubt that the shape of your satellite or deployables will affect the gain of the antenna, GomSpace can provide simulated gain plots for your specific satellite at a reasonable cost.

4.2.2 1U Cubesat Version

When fitted to a 1U CubeSat structure the antenna tubes are physically shortened to fit the smaller structure. This alters the gain and performance of the antenna slightly. The total gain is shown below with a slightly higher gain along the z-axis and smaller gain along the X- and Y-axis. A 10% higher loss compared to the full size antenna setup should be expected.

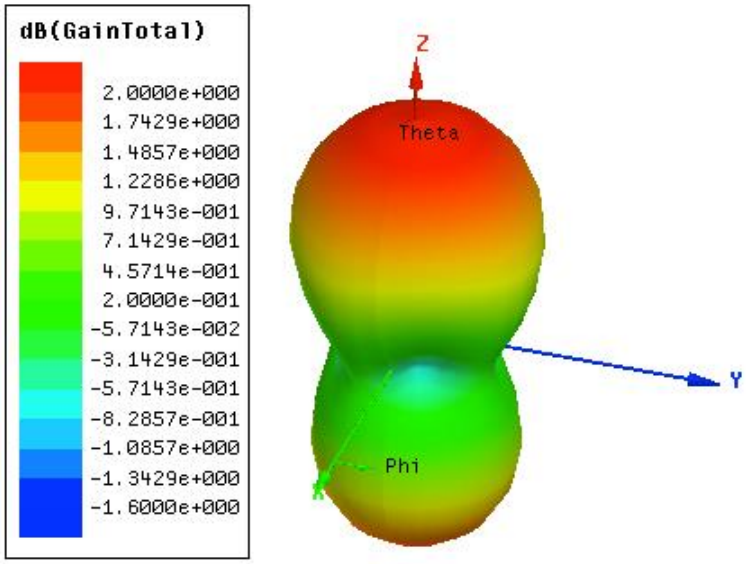


Figure 4 HFSS Simulated radiation pattern 1U CubeSat

5 Absolute Maximum Ratings

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the ANT430. Exposure to absolute maximum rating conditions for extended periods may affect the reliability.

For mounted PCB's check the individual products datasheet.

Symbol	Description	Min.	Max.	Unit
T	Temperature	-40	85	°C

6 Antenna Characteristics

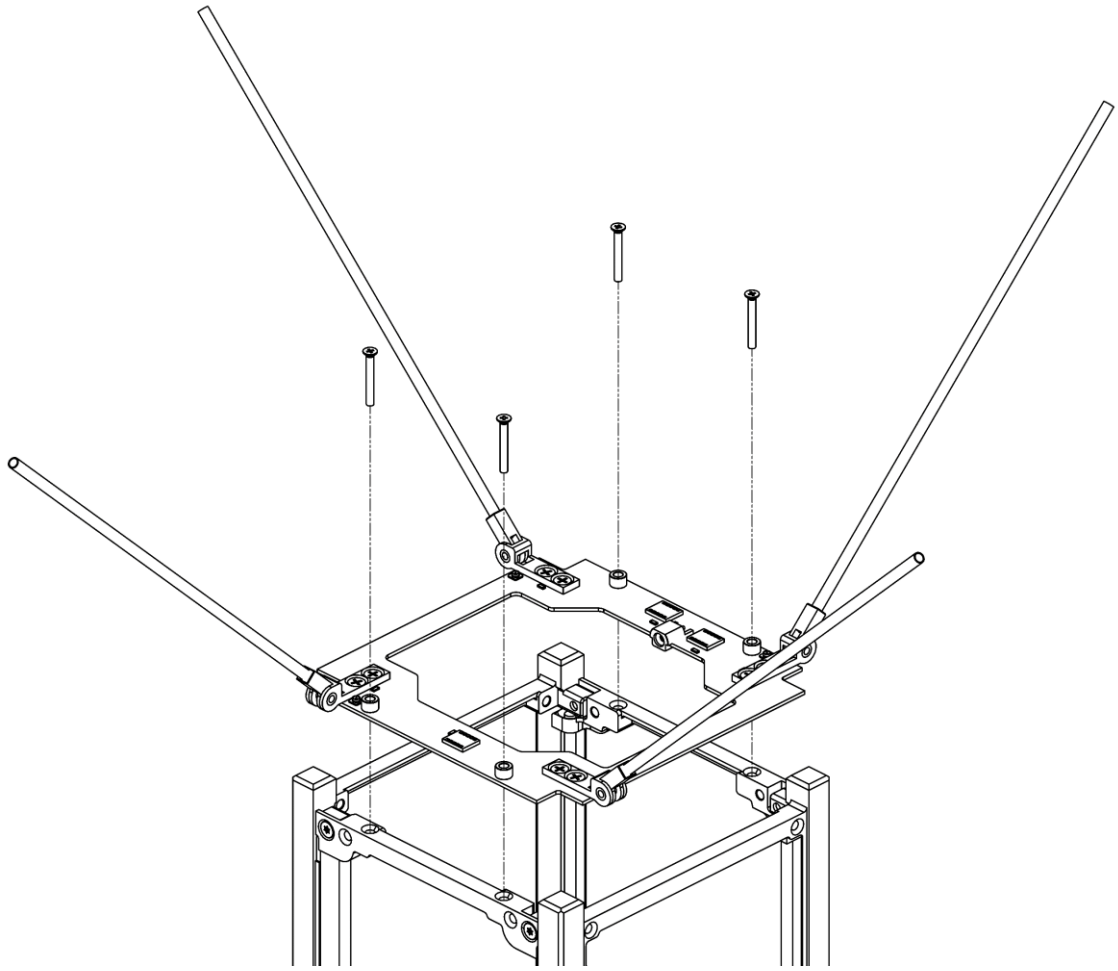
Parameter	Condition	Min.	Typ.	Max.	Unit
RF impedance	Deployed		50		Ω
Input RF power	-			10	W
VSWR at matching point	Individual antenna		1.1	1.15	
VSWR at feed point	-		1.2	1.3	
Antenna system insertion loss	at 400 or 435 MHz, depending on purchased option	0.7	1.0	1.6	dB
Bandwidth	at 400 or 435 MHz, depending on purchased option		10		MHz

7 Physical Characteristics

Description	Value	Unit
Total mass of ANT430	30	g
Mass of one antenna rod for 2U and 3U satellites	1.5	g
Mass of one antenna rod for 1U satellites	1.0	g
Size of PCB for 1U satellites	98 x 98	mm
Length of antenna rod from hinge to tip	163	mm
Length of antenna rod from hinge to tip for 1U satellites	110	mm

8 Integration

To assemble the ANT430 on a structure, use four M2.5 screws. Tighten with 0.65 Nm torque.



9 Antenna Deployment

All four antenna elements are individually mounted on torsion-spring loaded hinges which, when released, rotate the antenna elements to an angle of 45 degrees above the PCB. The spring is only tensioned to approximately half its safe rating in stowed mode, and it is thus safe to keep the antennas stowed indefinitely without effecting the reliable deployment.

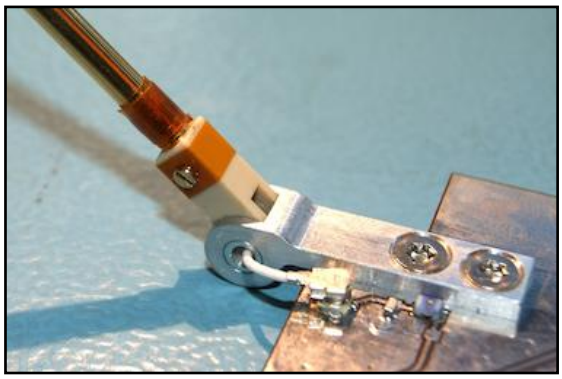


Figure 5 Antenna hinge

Parameter	Condition	Min.	Typ.	Max.	Unit
Spring Torque	Deployed	-	8	-	Nmm
	Stowed	-	22	-	Nmm
Resonance frequency	at 435 MHz	30	40	50	Hz

NOTE: There is NO deployment system included in the antenna system. Please inquire on *info@gomspace.com* for availability and pricing of deployment systems.

9.1 Active Antenna Deployment

The ANT430 is, with it springs, designed for active deployment. By folding down the rods along the side and tying them to a deployment mechanism. Usually a burn resistor burns through a wire tying down the antenna, and releases them.

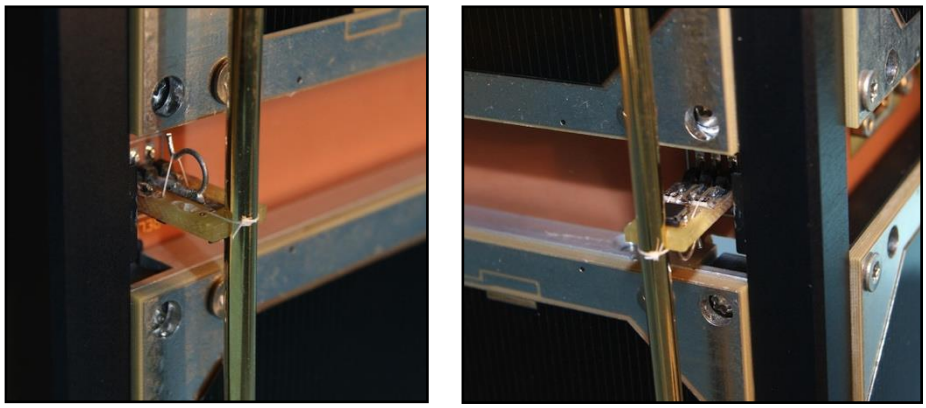
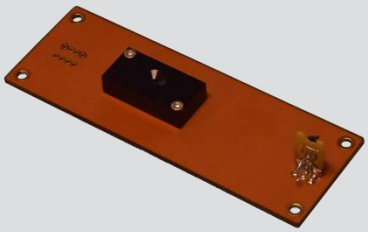
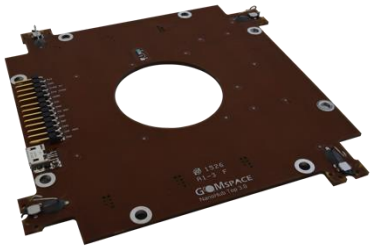


Figure 6 Photos of the antenna tied to a deployment mechanism

9.2 Antenna Deployment with GomSpace Products

GomSpace has several products with a deployment mechanism:

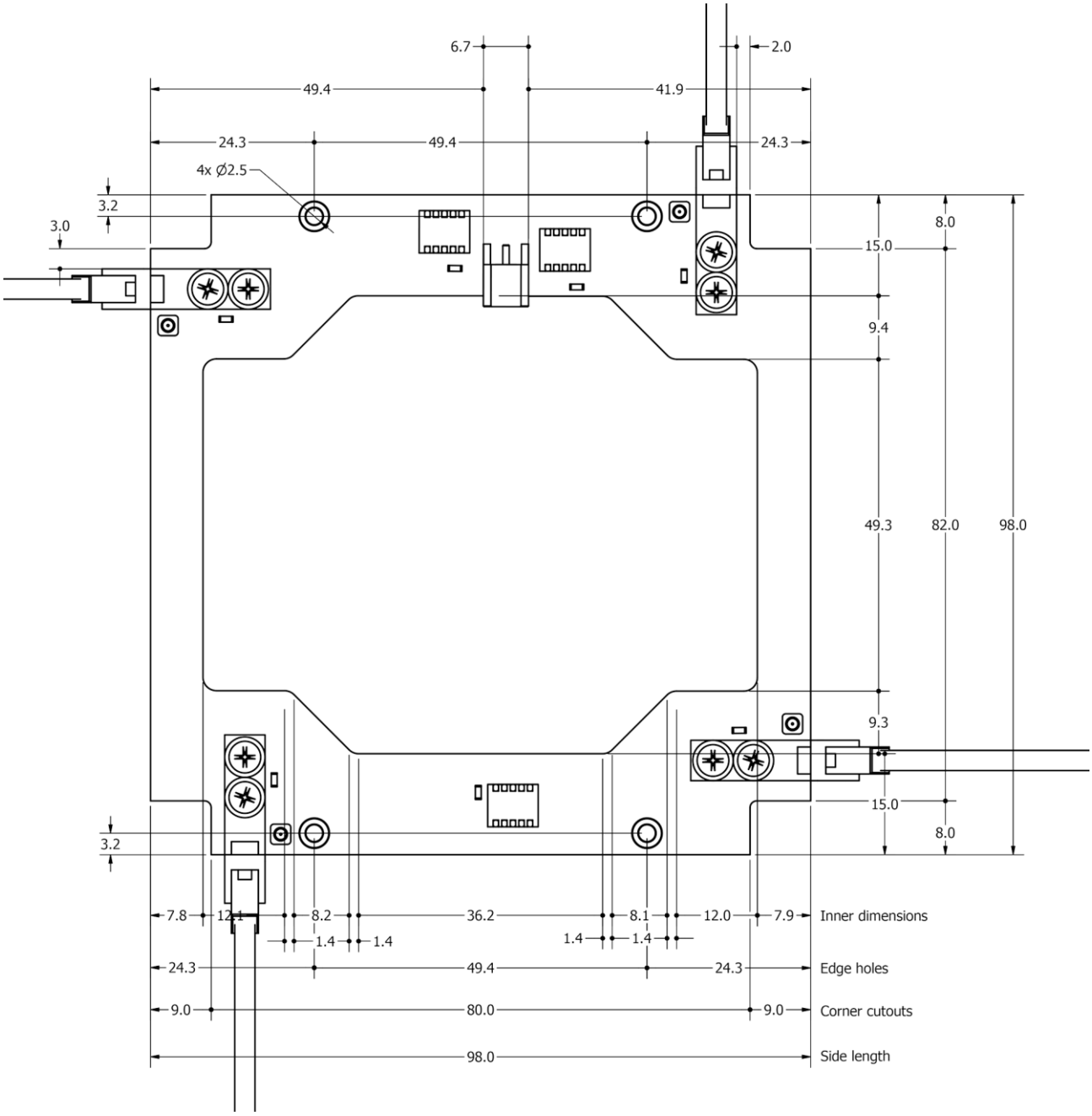
Name	Used in	Picture
NanoUtil Interstage GSSB	2U and 3U satellites	 With Fine Sun Sensor in the middle and antenna release to the right.
NanoUtil Top GSSB	1U satellites	 Integrated at the top or bottom of a 1U CubeSat, opposite the ANT430

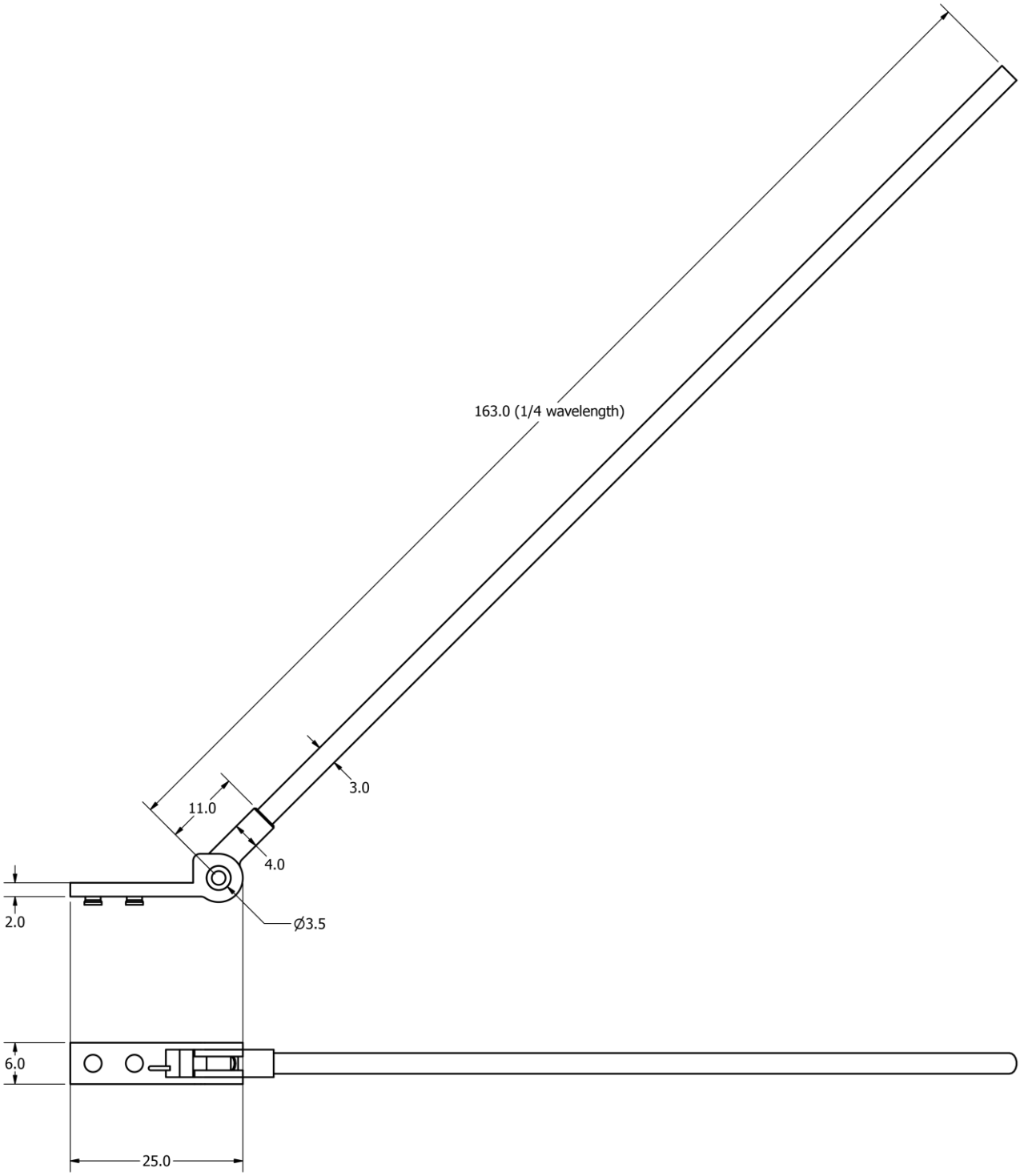
See the individual product datasheet for more detail.

The antenna element is tied to the deployment mechanism with burn wire. It is tied over redundant burn resistors and spring loaded to ensure a tight fit, even during vibrations. The deployment PCB's also includes a microswitch to sense deployment.

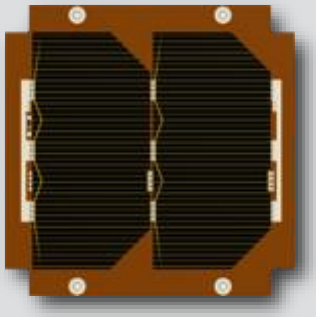
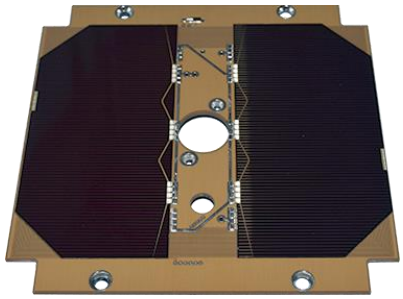
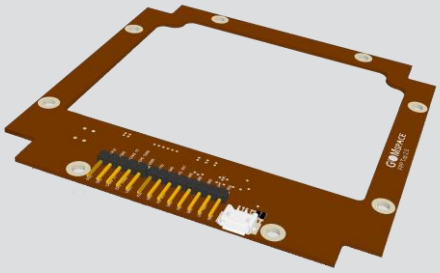
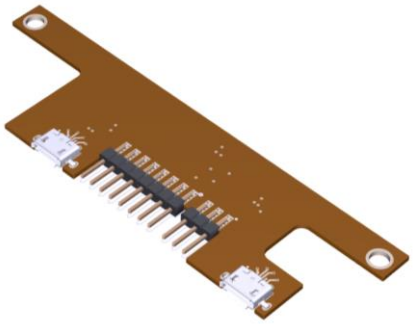
10 Mechanical Drawing

All dimensions are given in mm., the depictured ROD is for a 2U or 3U satellite.





11 Other GomSpace Products Designed to be used with ANT430

Name	Picture
NanoPower P110C Can be mounted on top the ANT430.	
NanoPower P110UC-SUN Can be mounted on top the ANT430.	
NanoUtil FPP Top Flight Preparation Panel which can be mounted between the ANT430 and a solar panel P110.	
NanoUtil FPP Top-S Flight Preparation Panel which can be mounted between the ANT430 and a solar panel P110. The option sheet makes it possible to order the NanoUtil FPP Top-S as an integral part of ANT430.	

View the individual datasheets for more information.

13 Disclaimer

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