



NanoCom ANT430

Datasheet

70 cm band Omnidirectional UHF CubeSat antenna

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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, 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
- Frequency range 435 ± 5 MHz
- Gain: 1.6 dBi to -1 dBi
- Rigid antenna tubes (no risk of antenna deformation while stowed)
- Matched to 50Ω
- PCB material: Glass/Polyamide
- IPC-A-610 Class 3 assembly

2.2 Functional Description

2.2.1 Frequency

The antenna is tuned to work in the frequency range of 435 ± 5 MHz.

2.2.2 Polarization

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

2.2.3 Gain

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. For a uniform 2U CubeSat the simulated gain is shown 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.

Below is a plot of the measured 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 gain relates well to the simulated gain with a range of 1.6 to -1 dBi.

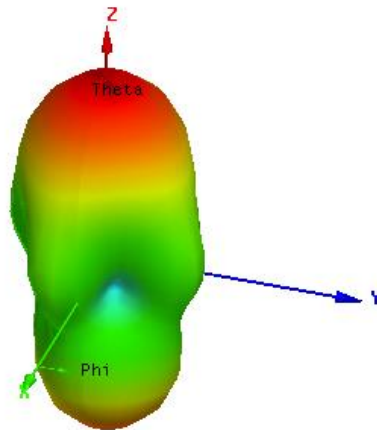
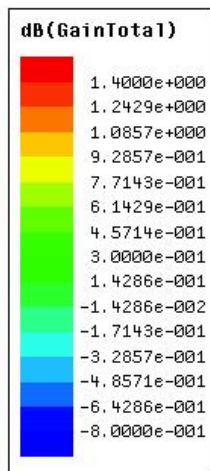


Figure 1 Measured gain

Figure 2 CAD of GOMX-1

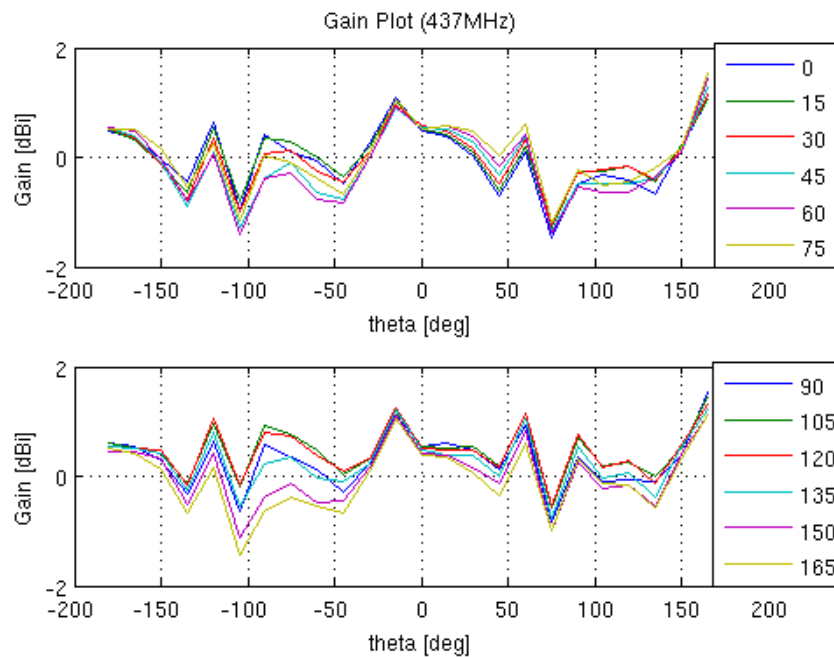


Figure 3 UHF antenna gain measured on GOMX-1. (Measurements performed by Molex Antenna Unit Denmark)

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.

2.2.4 1U 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 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.

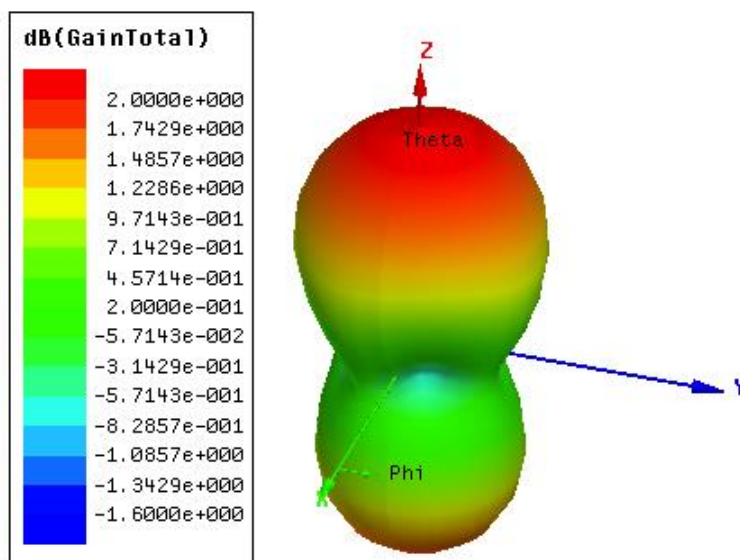


Figure 4 Measured gain

2.2.5 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.

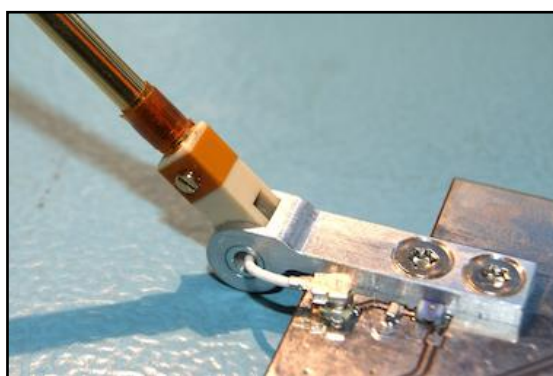


Figure 5 Antenna hinge

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.

2.2.5.1 Active Antenna Deployment

The ANT430 is, with its 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.

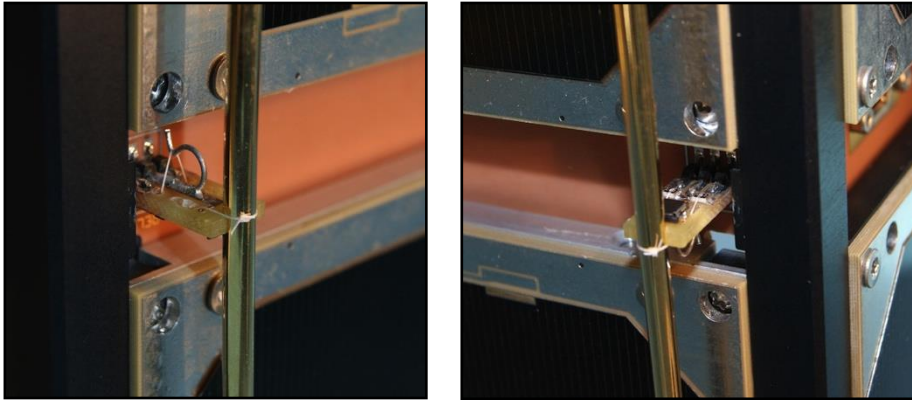
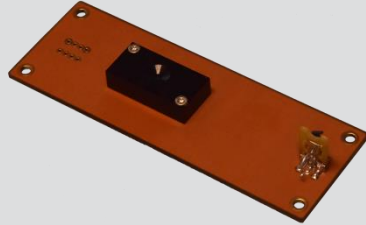
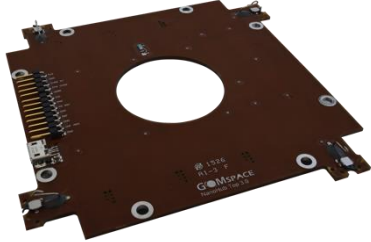


Figure 6 Photos of the antenna tied to a deployment mechanism

2.2.5.2 Active Antenna Deployment with GomSpace Products

GomSpace has several products with a deployment mechanism:

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

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.

3 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

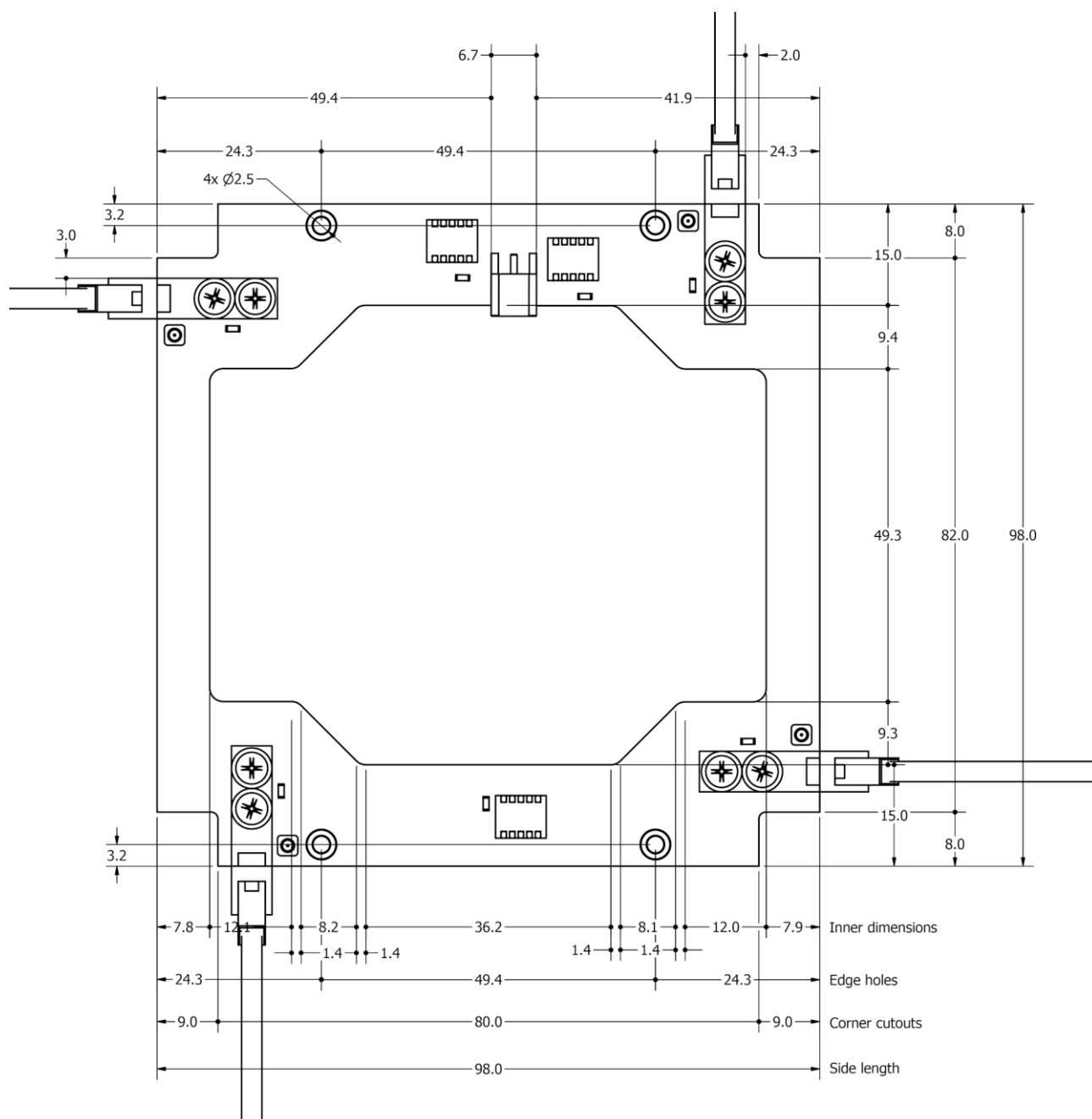
4 Antenna Characteristics

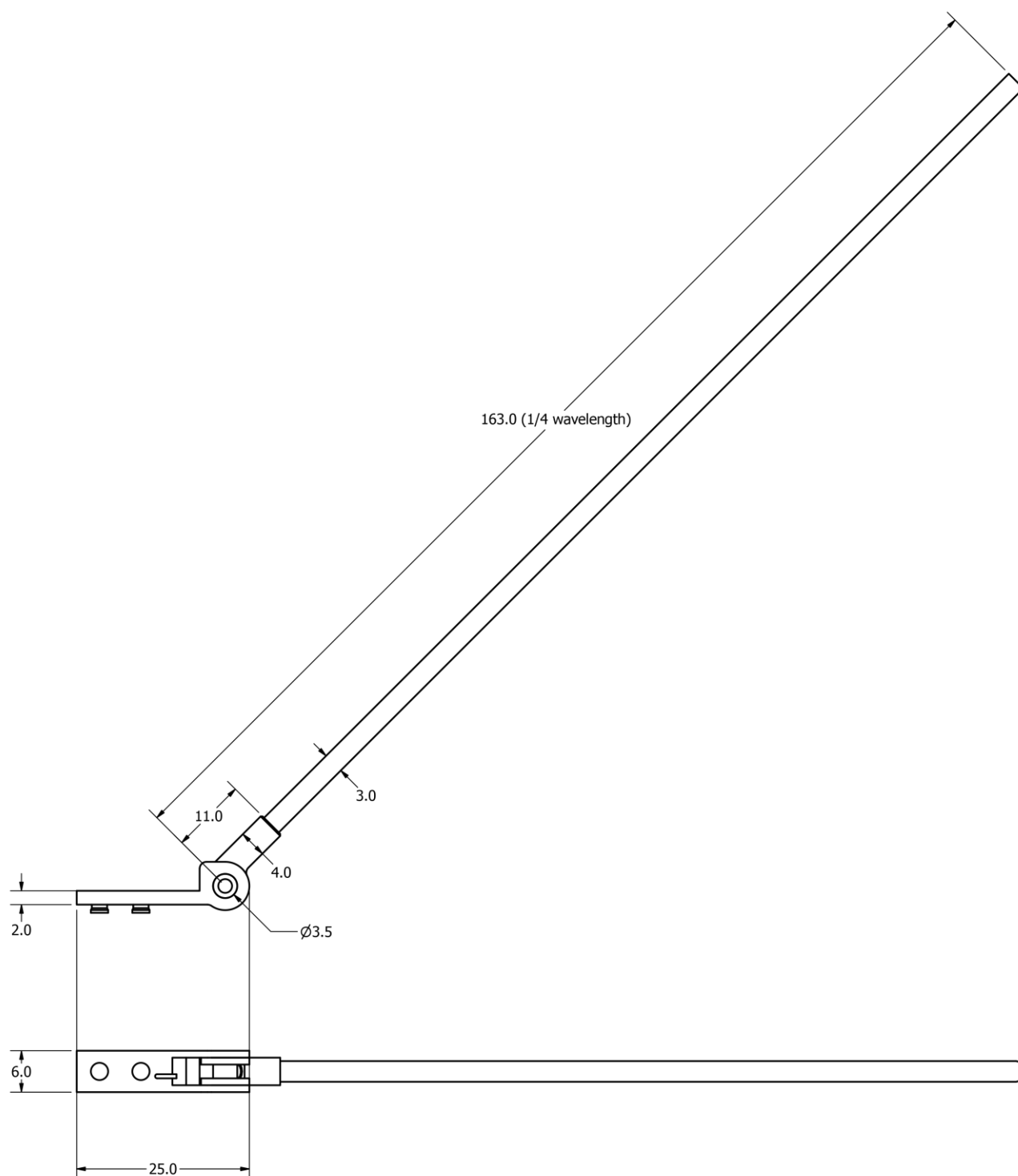
Parameter	Condition	Min.	Typ.	Max.	Unit
RF impedance	Deployed		50		Ω
Input RF power	-			10	W
VSWR at matching point	Individual antenna		1.1	1.15	
VSWR at feed point	-		1.2	1.3	
Antenna system insertion loss	at 435 MHz	0.7	1.0	1.6	dB
Frequency range	-	430	435	440	MHz
Bandwidth	at 435 MHz		5		MHz

5 Physical Characteristics

Description	Value	Unit
Total mass of ANT430	30	g
Mass of one antenna rod	1.5	g
Mass of one antenna rod	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

All dimensions are given in mm.





7 Disclaimer

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