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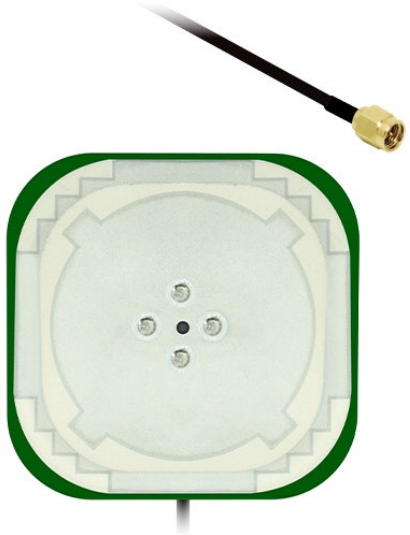
Enabling Industrial IoT

Echo 50

Embedded Active High Accuracy Multi-Constellation GNSS Antenna with LNA for L1, L2, L5 & L6



General Description

The Echo 50 is an active high-precision GNSS antenna designed for exceptional multi-constellation performance across all GPS, GLONASS, BeiDou, Galileo, NavIC, and QZSS bands.

Integrated with a high-quality low noise amplifier, it delivers enhanced sensitivity and ensures reliable reception in challenging environments. With wideband support and low axial ratio, it enables sub-meter positional accuracy, and when paired with RTK corrections, centimetre-level precision is achievable.

Exceptional axial ratio, high gain, and pattern stability are achieved through the use of two orthogonal feeds in each patch, merged via a hybrid coupler. This ensures that the antenna delivers solid GNSS performance in challenging reception environments.

Supplied with a 0.1 m cable and SMAM, I-PEX MHF1, or MHF4 connector as standard, customised options are also available for high-volume orders.

Key Features

- Covers all major GNSS bands worldwide, improving accuracy, reducing multipath errors, and increasing satellite availability.
- Active design with integrated LNA giving 23 ± 2 dB gain and ≤ 1.5 dB noise figure.
- Low VSWR across all bands (1.42 – 1.97), minimising signal loss.
- Axial ratio as low as 0.02 dB at zenith for excellent circular polarisation.
- Peak RHCP gain up to 27.19 dBiC for strong signal lock.
- Compact embedded form for easy integration.

Additional Considerations

- Results shown are based on anechoic chamber test in free space with 0.1M Cable and an SMA Male connector
- Magnetic mount and adhesive mount outdoor options with plastic enclosure available through customisation

Typical Applications

- Land and hydrographic surveying
- Precision agriculture and machine guidance
- UAV photogrammetry and aerial mapping
- Autonomous vehicle navigation and control
- Geotechnical and structural monitoring

E Embedded | GPS Position | GNSS GLONASS | GNSS BEIDOU | GNSS GALILEO | GNSS NavIC | GNSS QZSS | LNA Active | RHCP

Registered in England No. 08405712
VAT Registration No. GB163 04 0349

Download Latest Edition

ANTENNA TEST LAB Verified™

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Electrical Specifications

Impedance:	50 Ω
Polarisation:	RHCP
Frequency Range:	1176.45 – 1602 MHz
Supported Bands:	GPS L1/L2/L5, Galileo E1/E5a/E5b/E6, GLONASS L1/L2/L3, BeiDou B1/B2/B3, NavIC L5/L6, QZSS L1/L2/L5
Axial Ratio:	≤ 3 dB
VSWR:	≤ 2.0
Ground Plane Independent:	Yes
Horizontal Coverage Angle:	360°
LNA Gain:	23 ± 2 dB
Noise Figure:	≤ 1.5 dB
Supply Voltage:	3 – 12 V DC
Current Consumption:	≤ 50 mA

Environmental Specifications

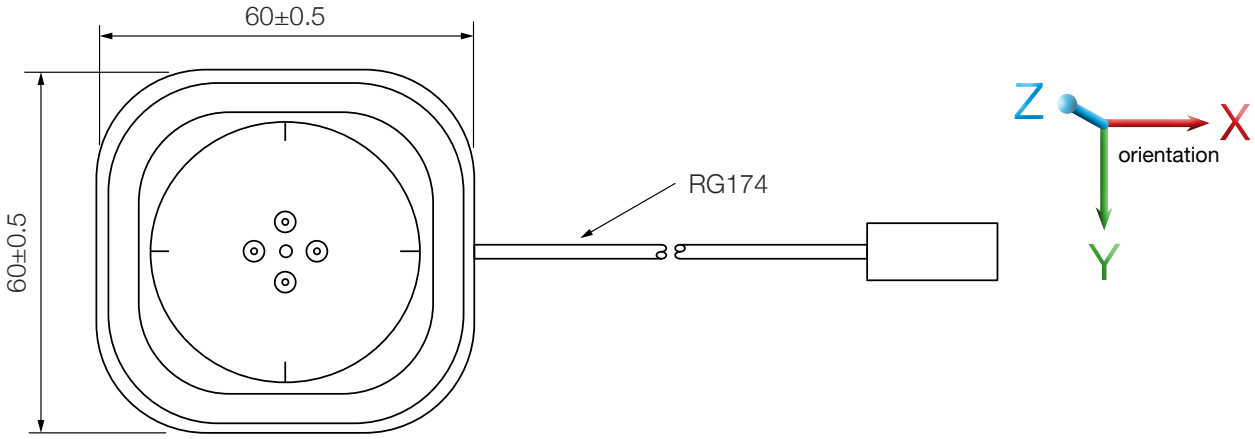
Operational Temperature Range:	-40 to +85 °C
Storage Temperature Range:	-40 to +85 °C
Humidity:	Up to 95% RH

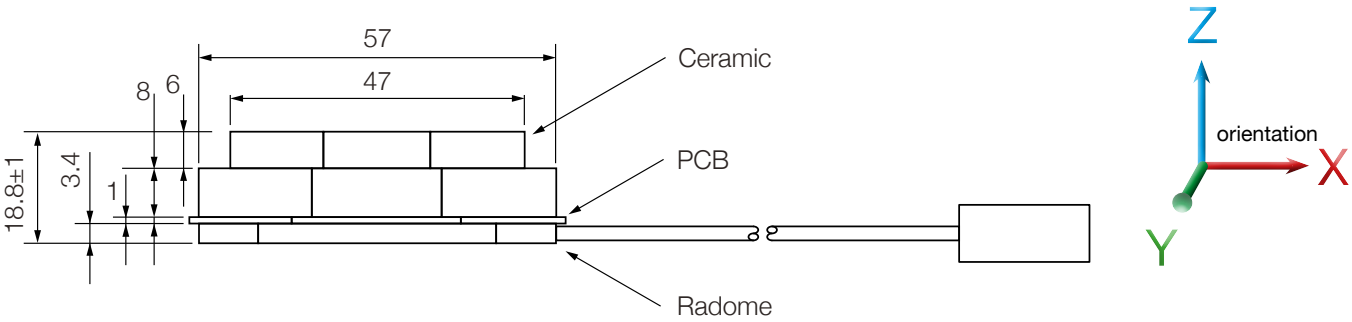
Mechanical Specifications

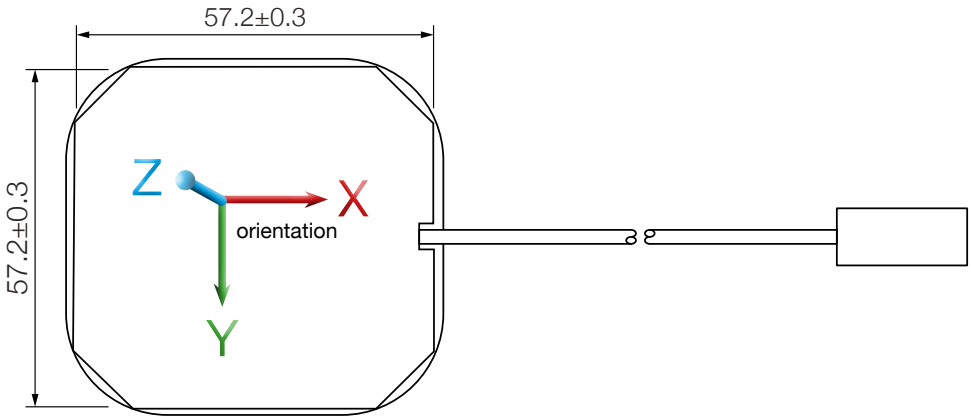
Dimension:	60 × 60 × 18.8 mm
Weight:	52 g
Connector:	SMAM / I-PEX MHF1 / I-PEX MHF4 (other custom options available for high-volume orders)
Cable:	RG174 (For SMA Variants) / OD 1.13 mini coax (for I-PEX connectors)
Mounting Methods:	Embedded (Magnetic & Adhesive options available on request)

Dimensional Drawing

Unit: mm







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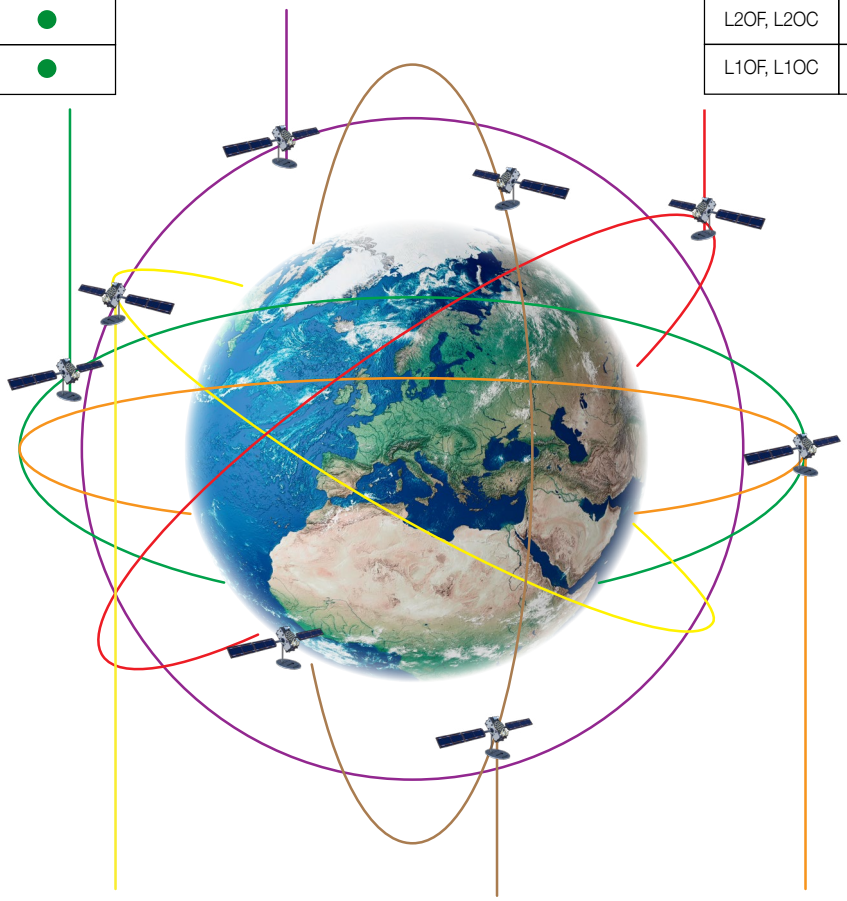
Spectrum Coverage

GPS		
Band	**Frequency**	**Use Indicator**
L5	1176.45	●
L2	1227.6	●
L1	1575.42	●

NavIC		
Band	**Frequency**	**Use Indicator**
L5	1176.45	●

GLONASS		
Band	**Frequency**	**Use Indicator**
L3OC	1202.025	●
L2OF, L2OC	1246	●
L1OF, L1OC	1602	●



Galileo		
Band	**Frequency**	**Use Indicator**
E5a	1176.45	●
E5b	1207.14	●
E6-I, E6-Q	1278.75	●
E1-I, E1-Q	1575.42	●

BeiDou		
Band	**Frequency**	**Use Indicator**
B2a	1176.45	●
B2I, B2b	1207.14	●
B3I	1268.52	●
B1I	1561.098	●
B1C	1575.42	●

QZSS		
Band	**Frequency**	**Use Indicator**
L5	1176.45	●
L2	1227.6	●
L6	1278.75	●
L1	1575.42	●

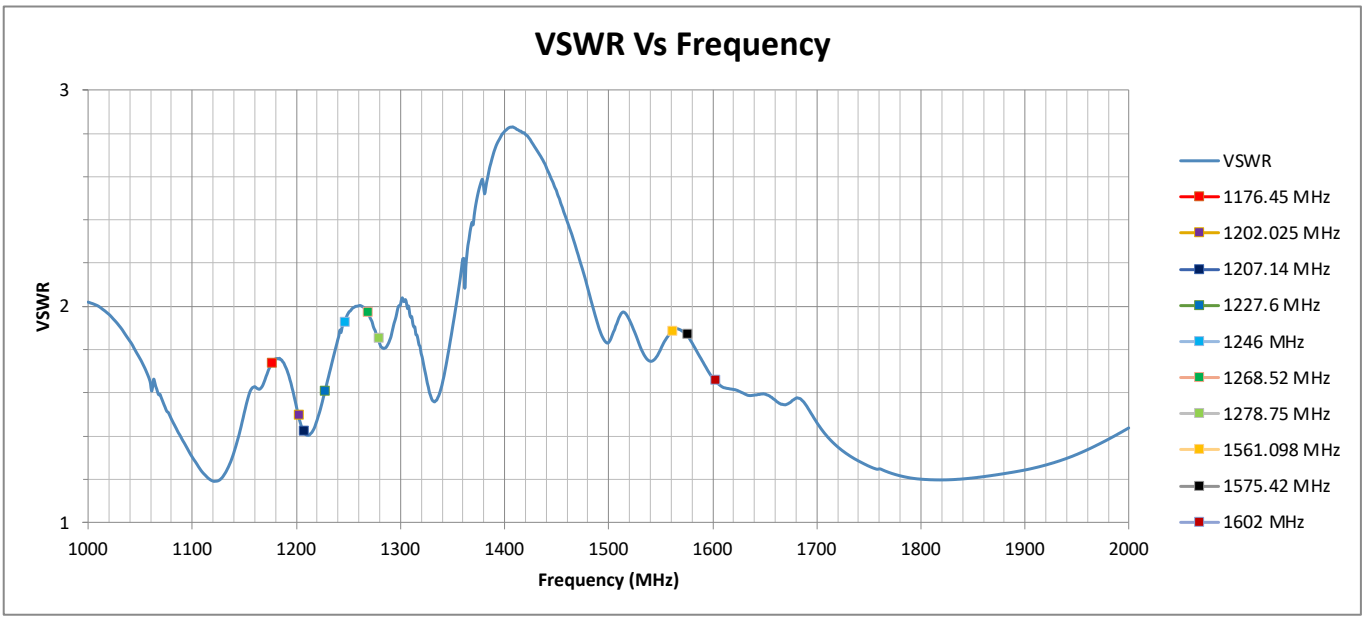
● Suitable band ● Adequate band in good signal conditions ● Likely to be unsuitable

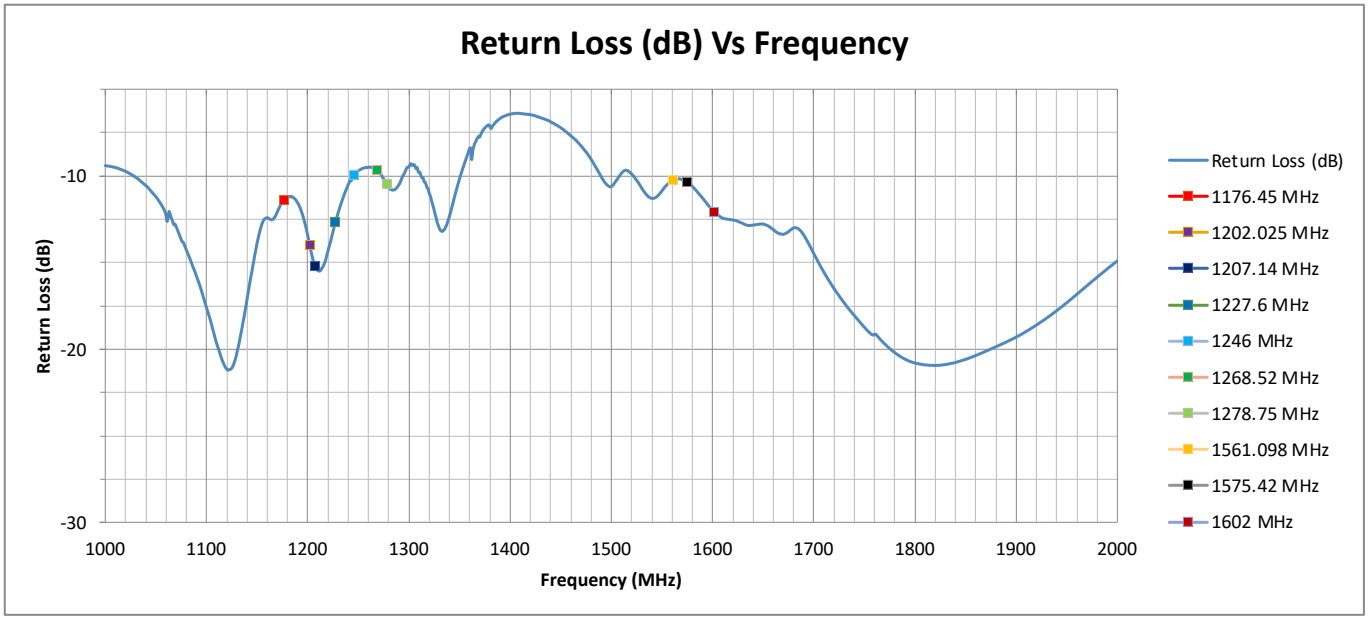
GNSS Standards Band Support

	Electrical Interface		Spherical RF Measurements			
Centre Frequency (MHz)	VSWR	Return Loss (dB)	Average RHCP Gain (dBiC)	Peak RHCP Gain (dBiC)	Median Axial Ratio (dB)	Minimum Axial Ratio (dB)
1176.45 (L5)	1.7368	-11.3978	18.15	24.72	3.58	0.10
1202.025 (L30C)	1.4968	-14.0248	18.89	25.68	2.54	0.02
1207.14 (E5B)	1.4203	-15.2060	18.99	25.86	2.68	0.06
1227.6 (L2)	1.6072	-12.6584	18.45	25.64	3.14	0.08
1246 (L20F/C)	1.9272	-9.9856	17.80	25.57	3.87	0.27
1268.52 (B3I)	1.9718	-9.7088	15.41	24.10	4.72	0.16
1278.75 (E6-I/Q)	1.8501	-10.5077	13.88	23.25	4.83	0.14
1561.098 (B1I)	1.8853	-10.2618	19.90	27.19	3.17	0.15
1575.42 (L1)	1.8675	-10.3847	18.45	26.40	2.64	0.03
1602 (L10F/C)	1.6583	-12.1233	17.97	26.12	1.74	0.07

	Top hemisphere RF Measurements				Zenith RF Measurements	
Centre Frequency (MHz)	Average RHCP Gain (dBiC)	Peak RHCP Gain (dBiC)	Median Axial Ratio (dB)	Minimum Axial Ratio (dB)	RHCP Gain at Zenith (dBiC)	Axial Ratio at Zenith (dB)
1176.45 (L5)	23.45	24.72	1.88	0.10	24.51	1.23
1202.025 (L30C)	24.53	25.68	1.14	0.02	25.51	0.55
1207.14 (E5B)	24.67	25.86	1.19	0.06	25.72	0.45
1227.6 (L2)	24.05	25.64	1.85	0.08	25.64	0.68
1246 (L20F/C)	23.42	25.57	2.44	0.27	25.57	1.00
1268.52 (B3I)	21.05	24.10	2.93	0.16	24.06	1.97
1278.75 (E6-I/Q)	19.58	23.25	2.90	0.14	23.04	1.94
1561.098 (B1I)	25.34	27.19	0.83	0.15	26.92	0.45
1575.42 (L1)	24.21	26.40	0.92	0.03	26.14	0.34
1602 (L10F/C)	23.97	26.12	0.88	0.07	25.34	0.80

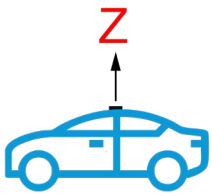
Electrical

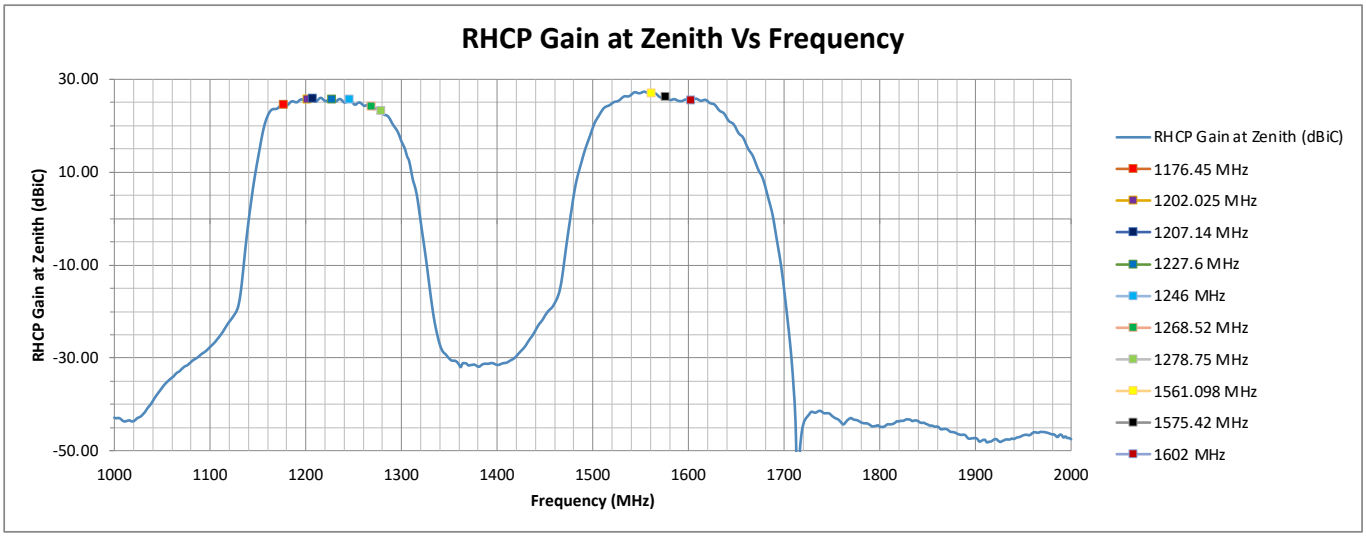

VSWR Vs Frequency
VSWR
3
2
1
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
Frequency (MHz)
VSWR
1176.45 MHz
1202.025 MHz
1207.14 MHz
1227.6 MHz
1246 MHz
1268.52 MHz
1278.75 MHz
1561.098 MHz
1575.42 MHz
1602 MHz

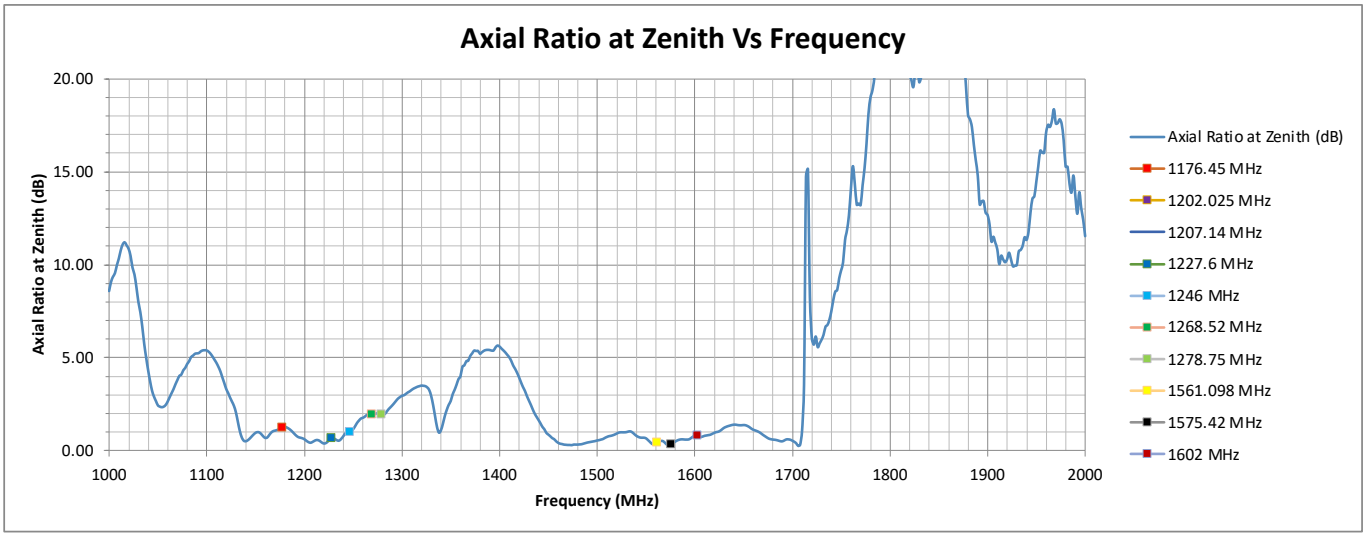

Return Loss (dB) Vs Frequency
Return Loss (dB)
-10
-20
-30
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
Frequency (MHz)
Return Loss (dB)
1176.45 MHz
1202.025 MHz
1207.14 MHz
1227.6 MHz
1246 MHz
1268.52 MHz
1278.75 MHz
1561.098 MHz
1575.42 MHz
1602 MHz

RF Zenith

This page presents the RHCP Gain at Zenith and the Axial Ratio at Zenith as a function of frequency. These measurements indicate how well the antenna performs when receiving signals directly from satellites overhead (zenith direction). A higher RHCP gain ensures strong signal reception, while a lower axial ratio signifies better polarization purity for optimal GNSS performance.







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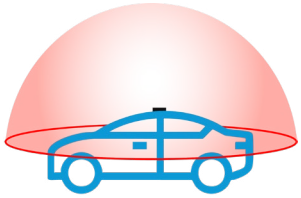
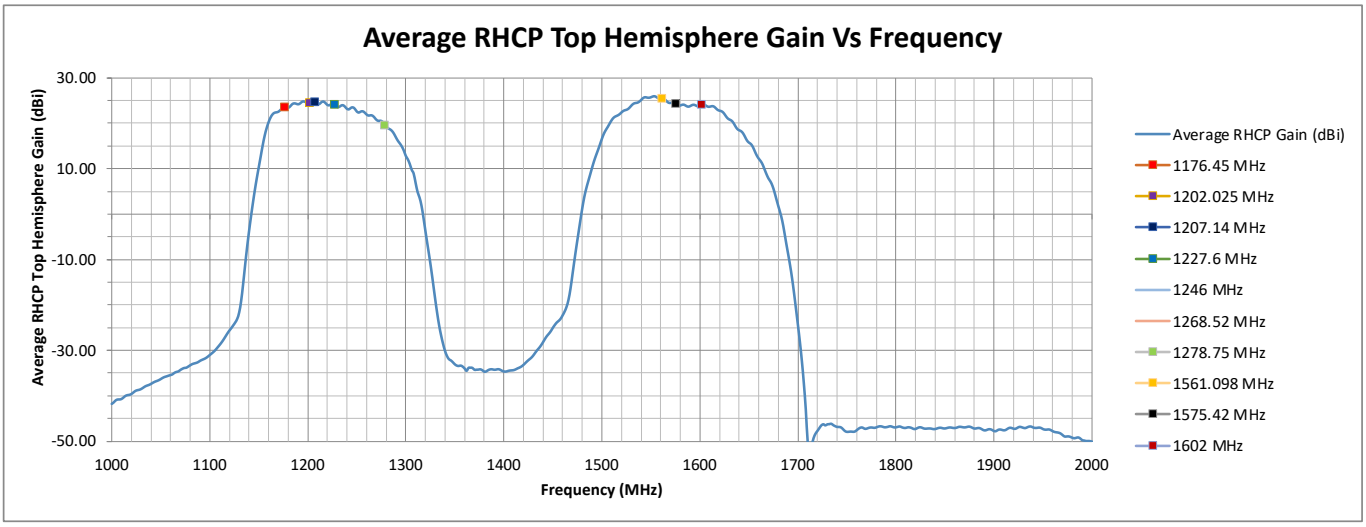
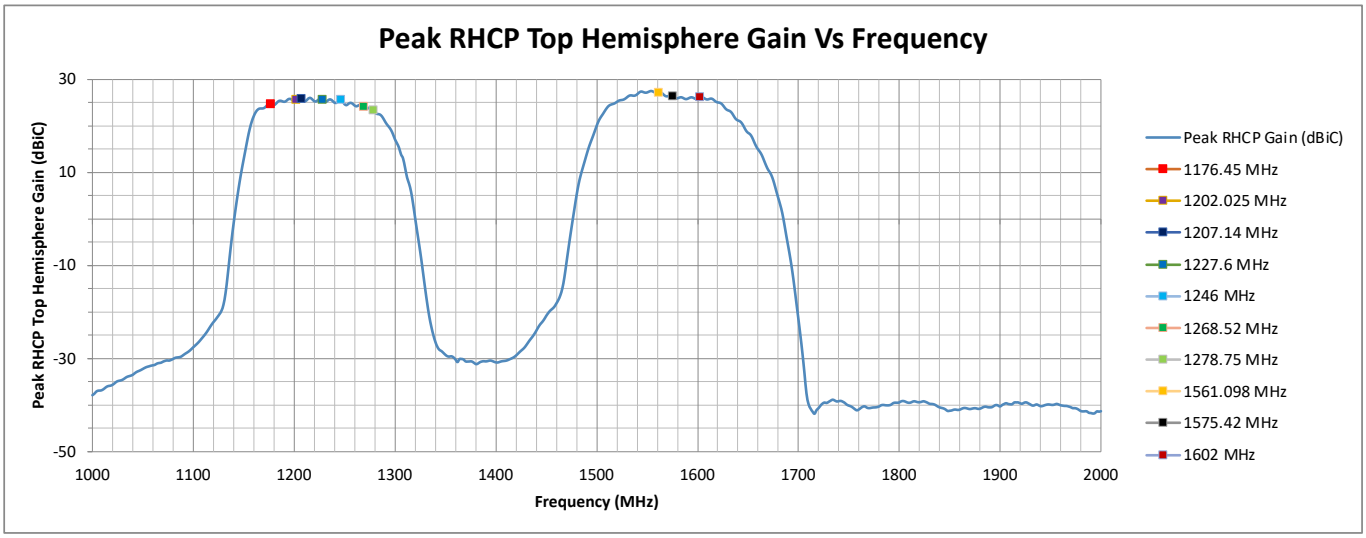
RF Top Hemisphere

The graphs on this page showcase the Average and Peak RHCP Gain in the Top Hemisphere. These measurements assess how effectively the antenna receives signals from satellites positioned in the upper half of the sky. Strong RHCP gain in this region is critical for reliable GNSS reception, especially in environments where satellites may not always be directly overhead.

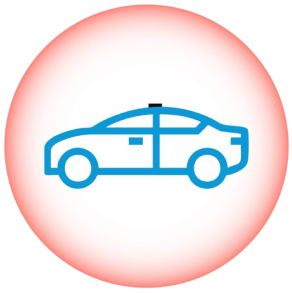


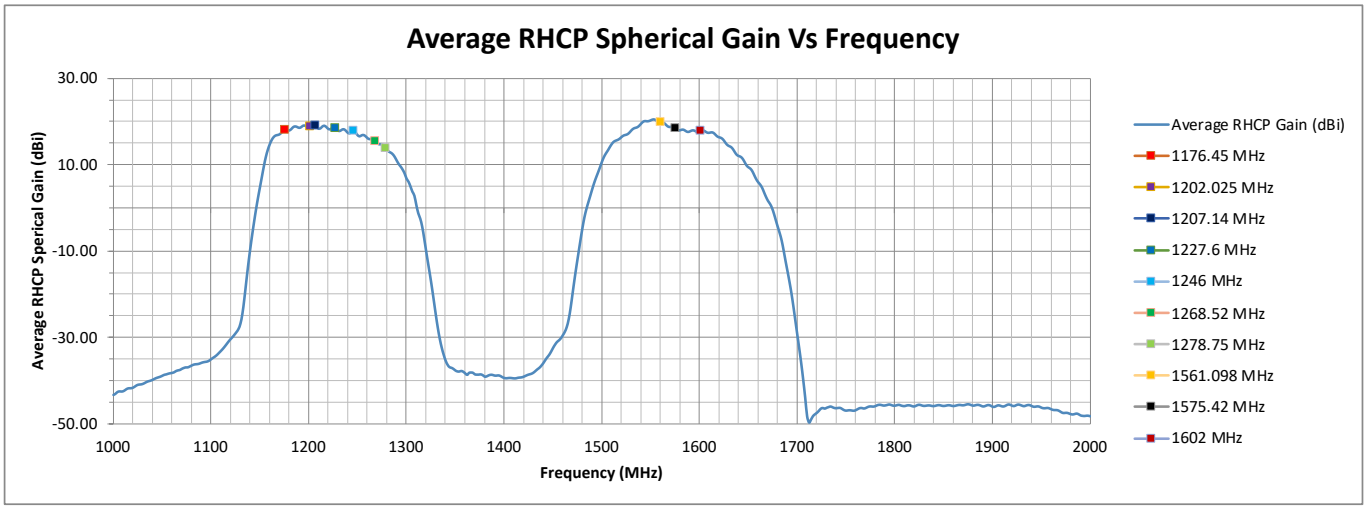


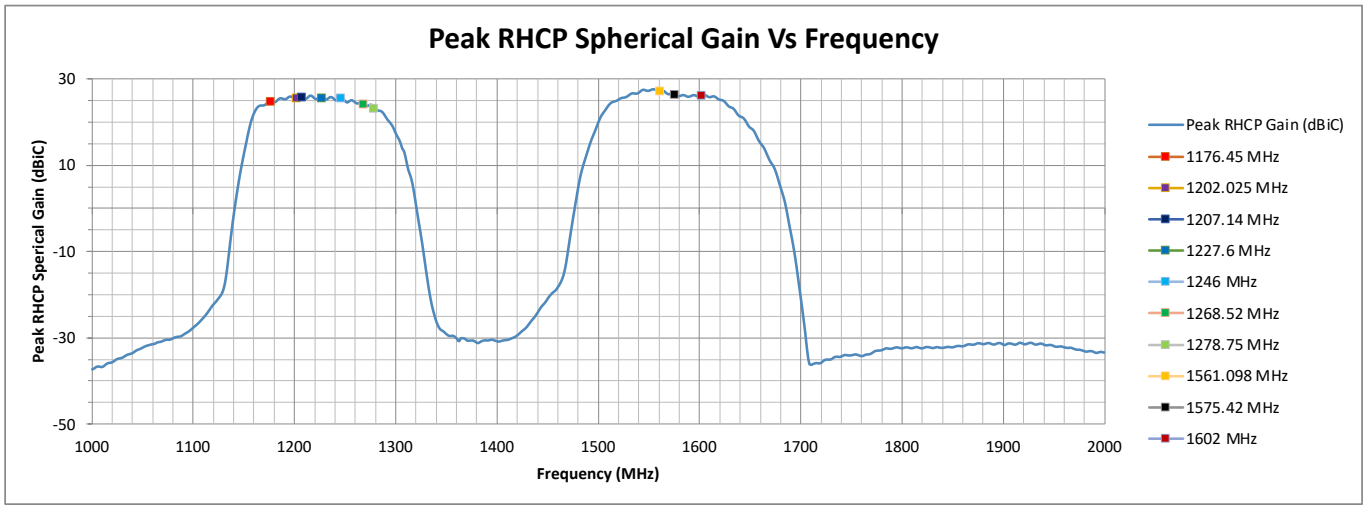


RF Spherical

This page displays the Average and Peak RHCP Gain across the entire spherical coverage of the antenna. These metrics provide a comprehensive view of the antenna's ability to receive signals from satellites at all elevations and directions. Consistently high gain across the sphere ensures strong and stable GNSS reception in a variety of operating conditions.







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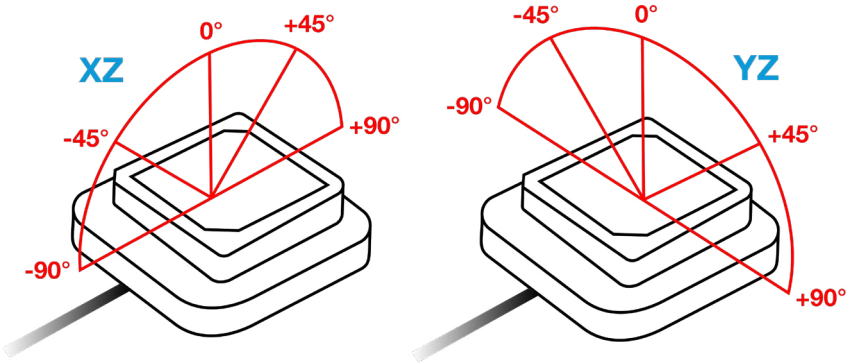
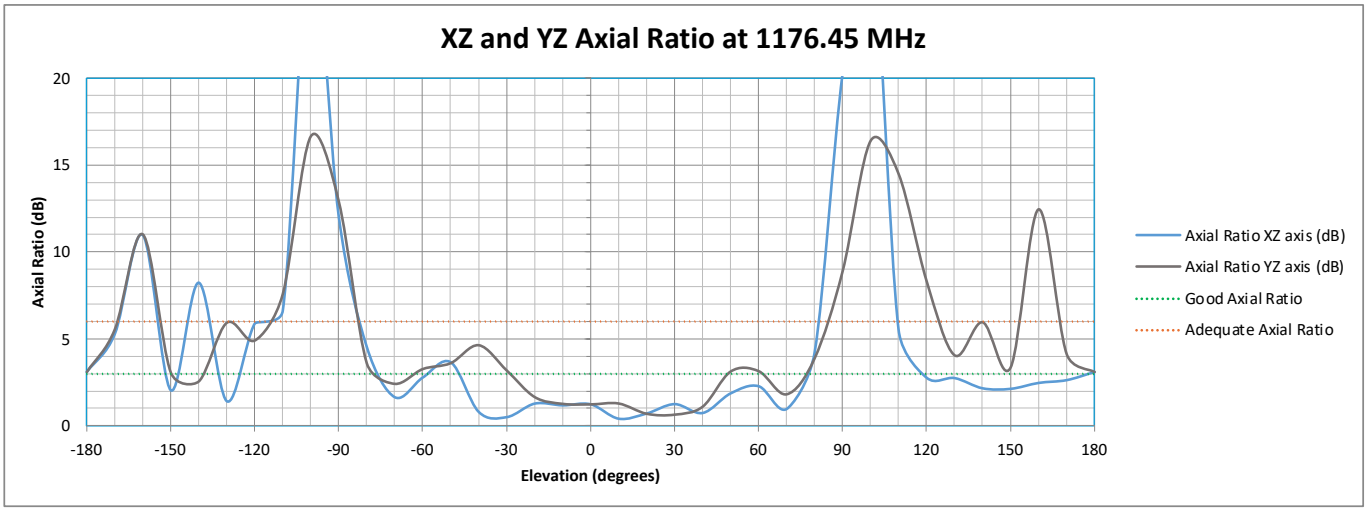
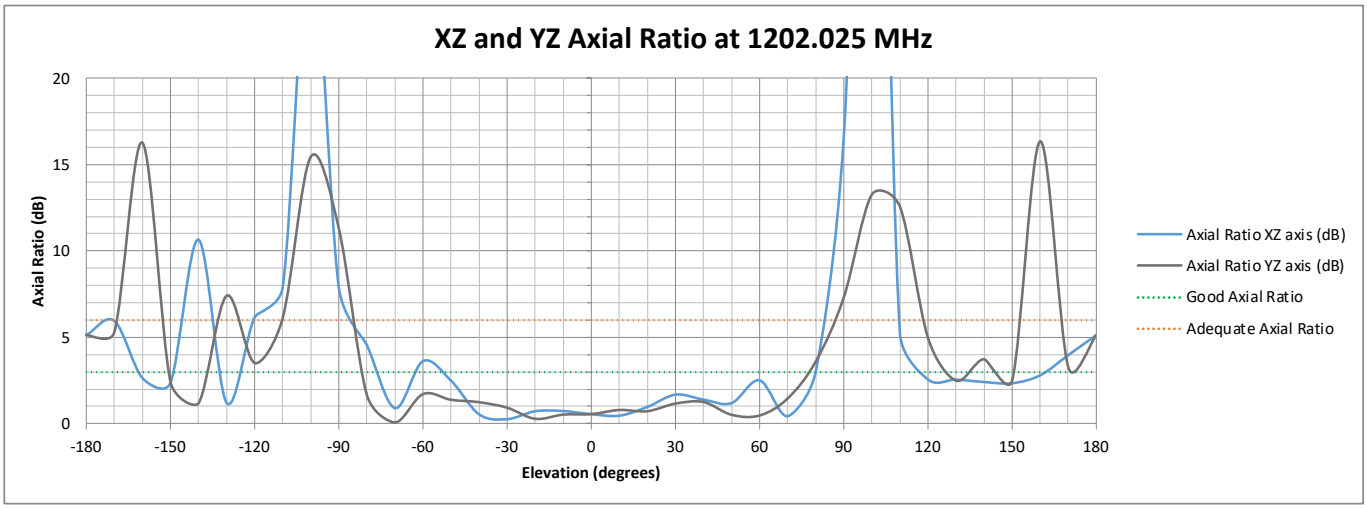
ZX and YZ Plane Axial Ratio Plots (Zenith is at 0 degrees)

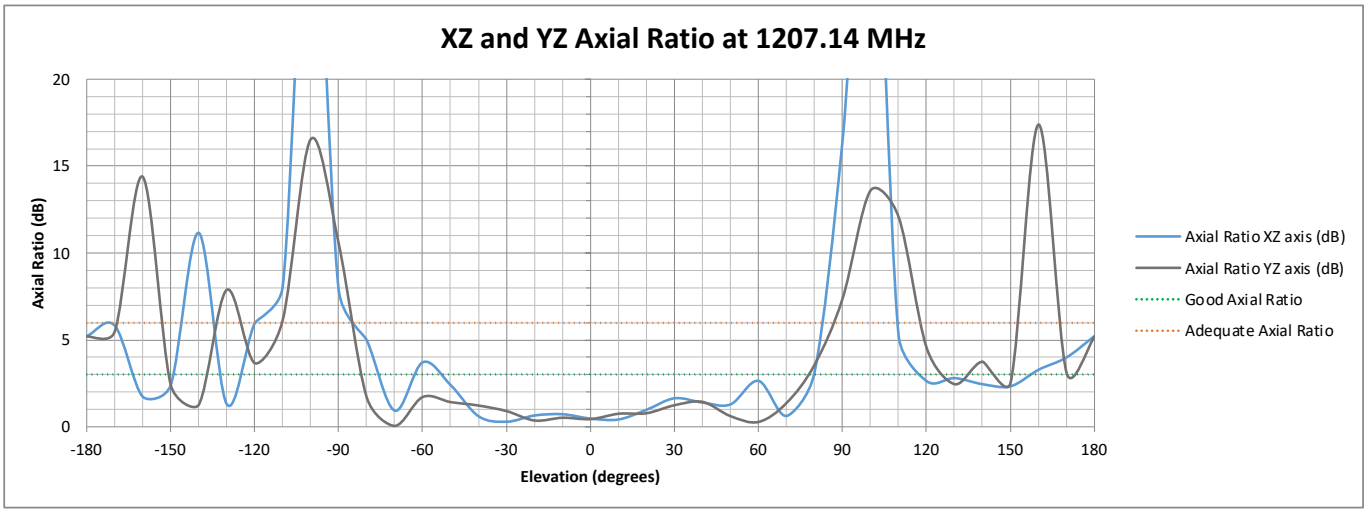
This page shows how well the antenna maintains circular polarisation at different elevation angles.

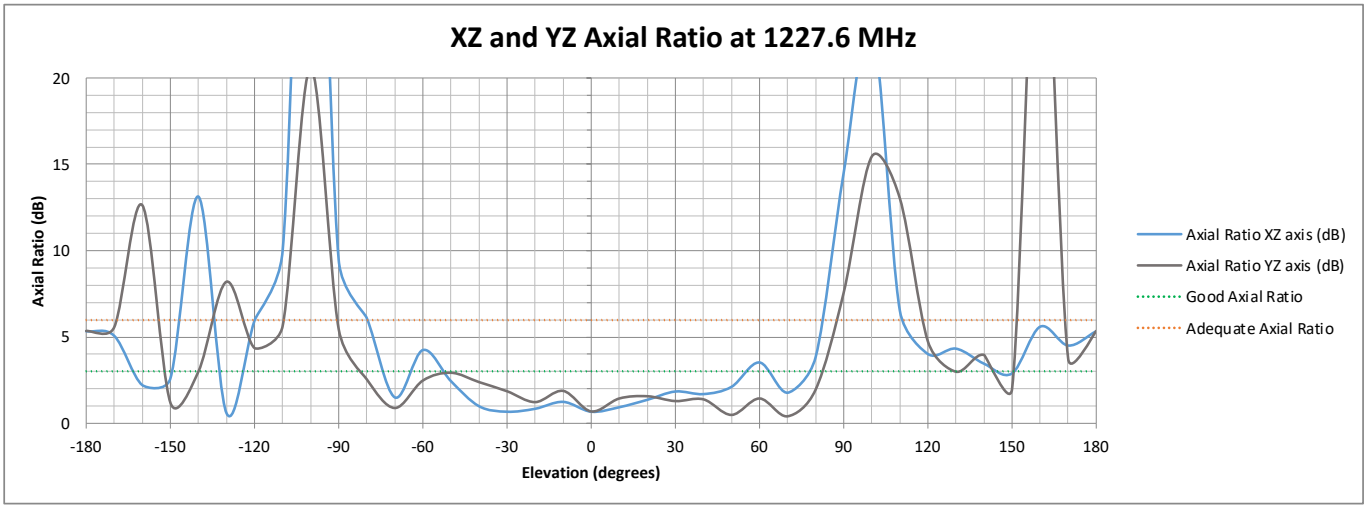
A lower axial ratio ensures better GNSS signal reception, especially at low elevations, which is crucial for applications requiring strong performance in obstructed environments or wide-angle satellite visibility.

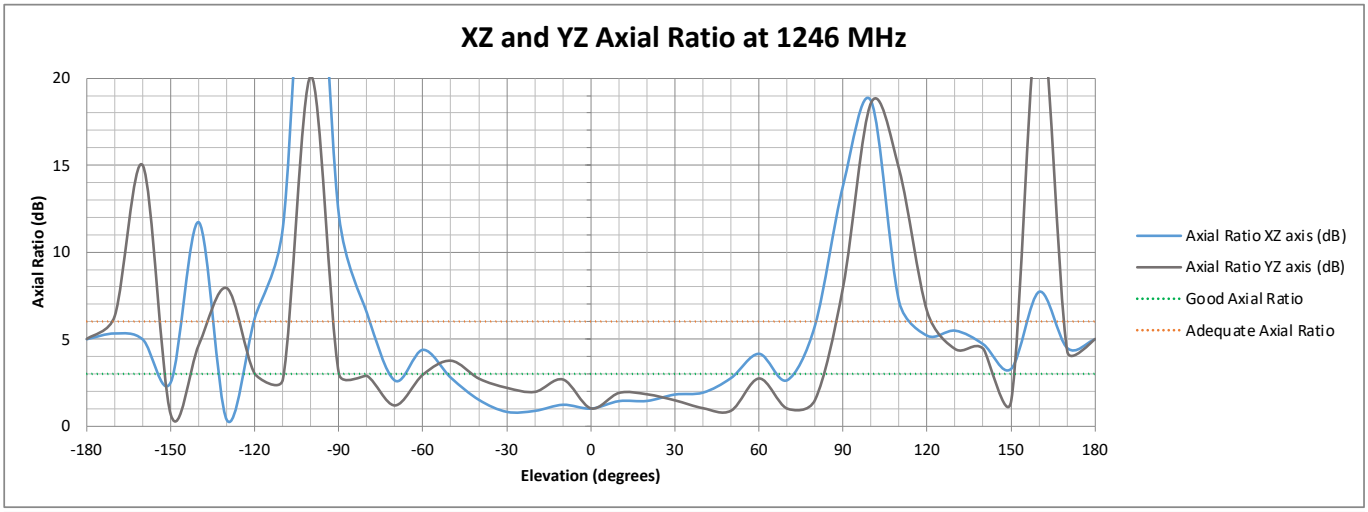


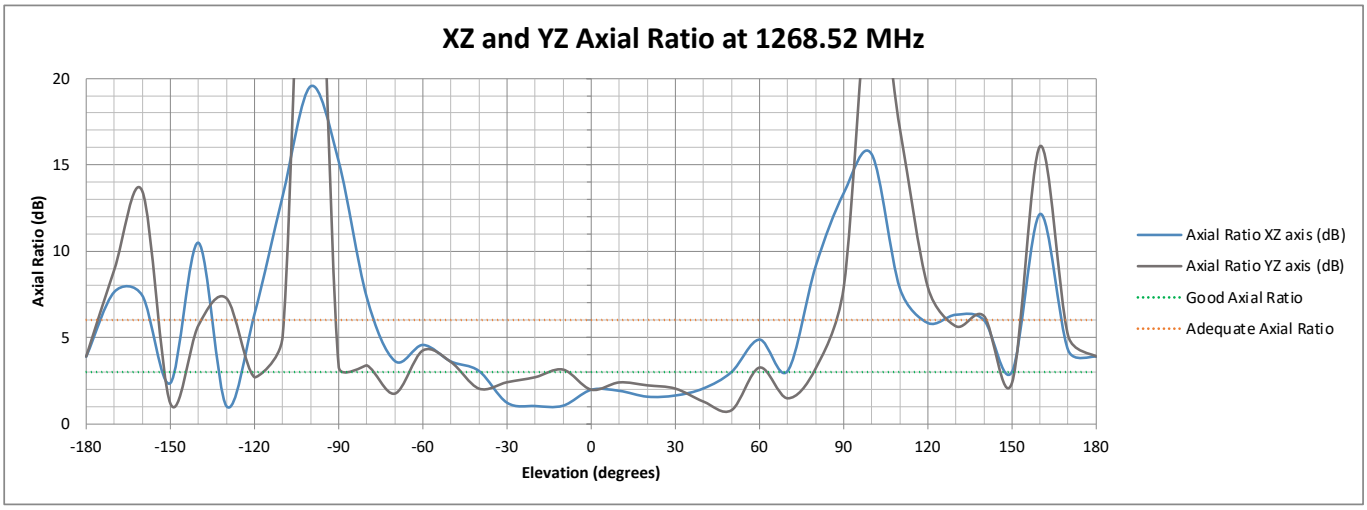


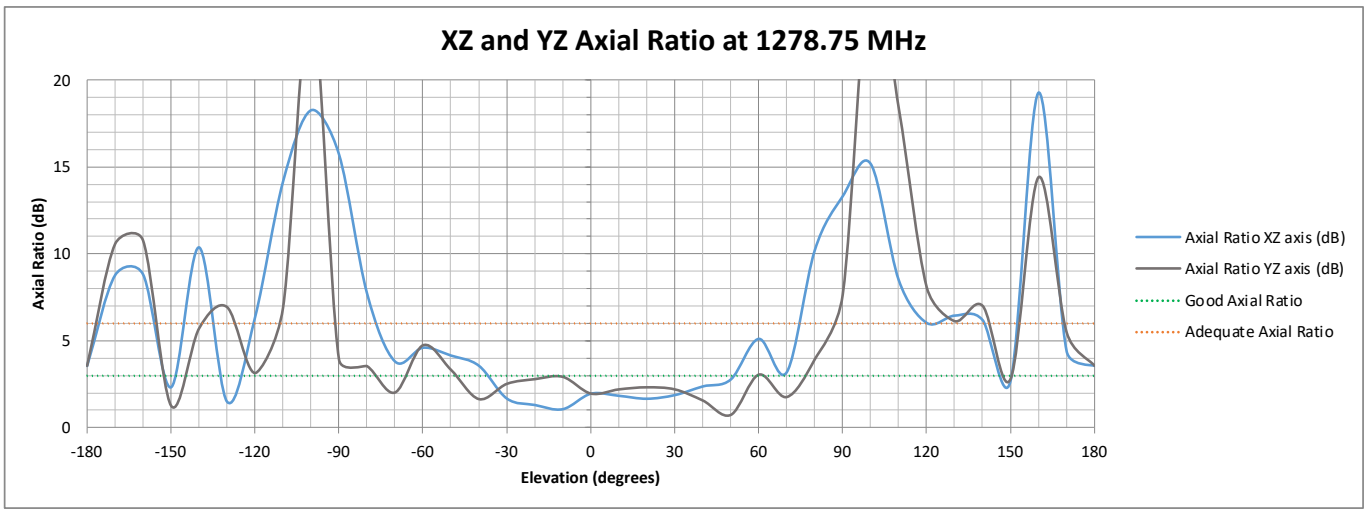


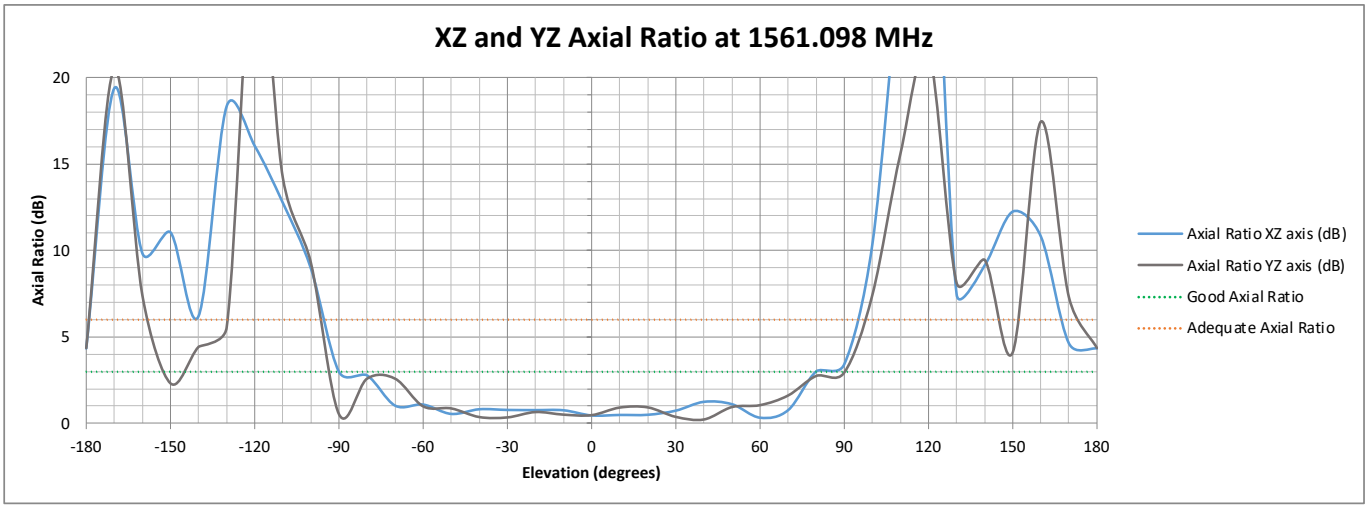

XZ and YZ Axial Ratio at 1207.14 MHz
Axial Ratio (dB)
20
15
10
5
0
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Elevation (degrees)
Axial Ratio XZ axis (dB)
Axial Ratio YZ axis (dB)
Good Axial Ratio
Adequate Axial Ratio

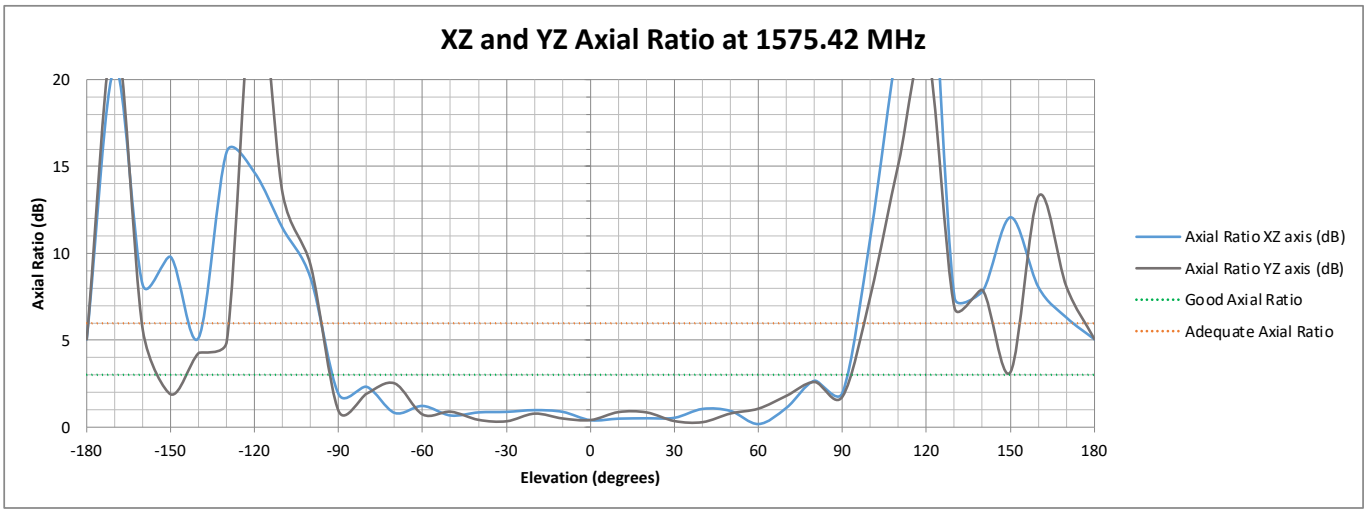

XZ and YZ Axial Ratio at 1227.6 MHz
Axial Ratio (dB)
20
15
10
5
0
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Elevation (degrees)
Axial Ratio XZ axis (dB)
Axial Ratio YZ axis (dB)
Good Axial Ratio
Adequate Axial Ratio

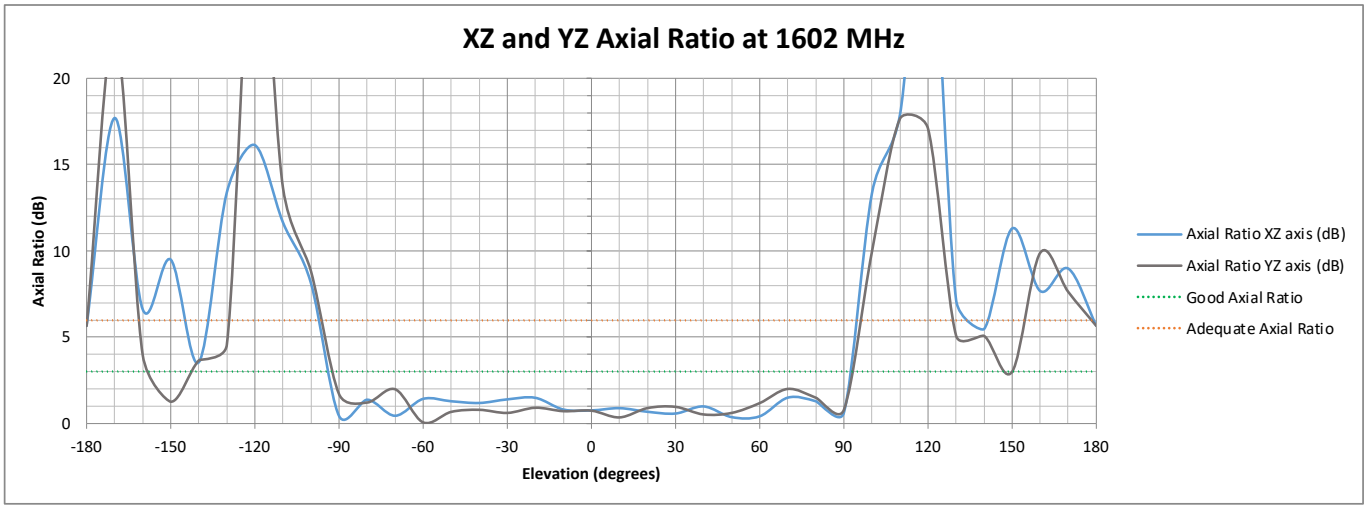

XZ and YZ Axial Ratio at 1246 MHz
Axial Ratio (dB)
20
15
10
5
0
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Elevation (degrees)
Axial Ratio XZ axis (dB)
Axial Ratio YZ axis (dB)
Good Axial Ratio
Adequate Axial Ratio


XZ and YZ Axial Ratio at 1268.52 MHz
Axial Ratio (dB)
20
15
10
5
0
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Elevation (degrees)
Axial Ratio XZ axis (dB)
Axial Ratio YZ axis (dB)
Good Axial Ratio
Adequate Axial Ratio

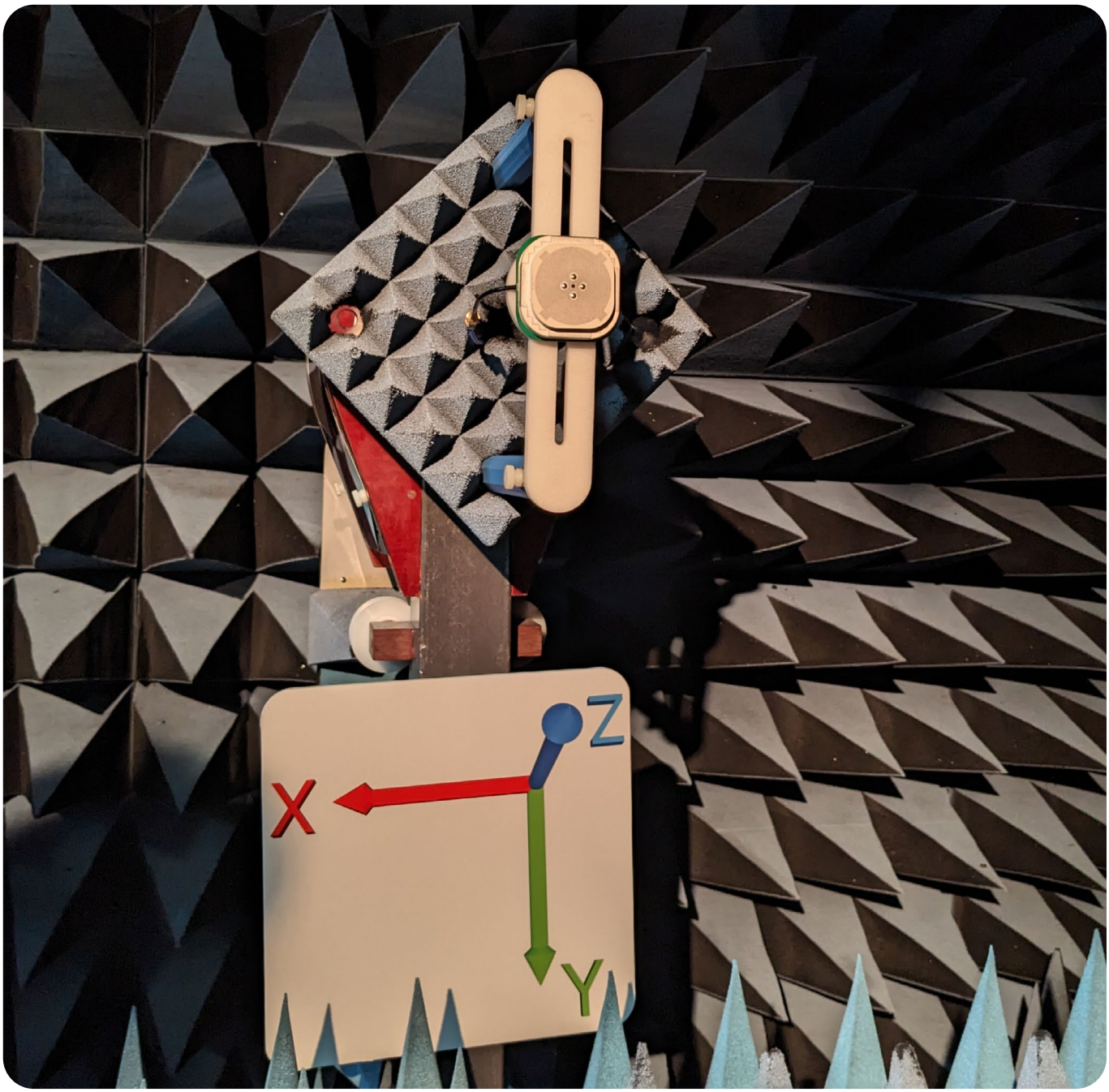

XZ and YZ Axial Ratio at 1278.75 MHz
Axial Ratio (dB)
20
15
10
5
0
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Elevation (degrees)
Axial Ratio XZ axis (dB)
Axial Ratio YZ axis (dB)
Good Axial Ratio
Adequate Axial Ratio


XZ and YZ Axial Ratio at 1561.098 MHz
Axial Ratio (dB)
20
15
10
5
0
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Elevation (degrees)
Axial Ratio XZ axis (dB)
Axial Ratio YZ axis (dB)
Good Axial Ratio
Adequate Axial Ratio


XZ and YZ Axial Ratio at 1575.42 MHz
Axial Ratio (dB)
20
15
10
5
0
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Elevation (degrees)
Axial Ratio XZ axis (dB)
Axial Ratio YZ axis (dB)
Good Axial Ratio
Adequate Axial Ratio


XZ and YZ Axial Ratio at 1602 MHz
Axial Ratio (dB)
20
15
10
5
0
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Elevation (degrees)
Axial Ratio XZ axis (dB)
Axial Ratio YZ axis (dB)
Good Axial Ratio
Adequate Axial Ratio

Test Setup (in freespace)



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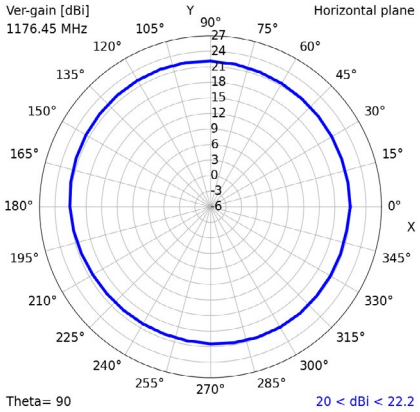
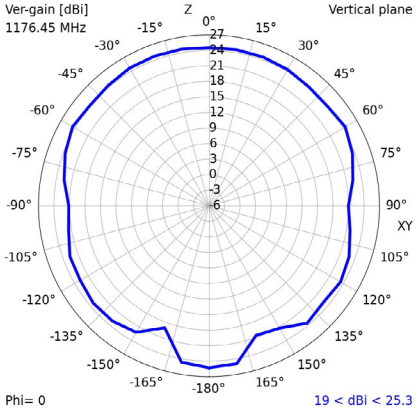
2D Radiation Plots

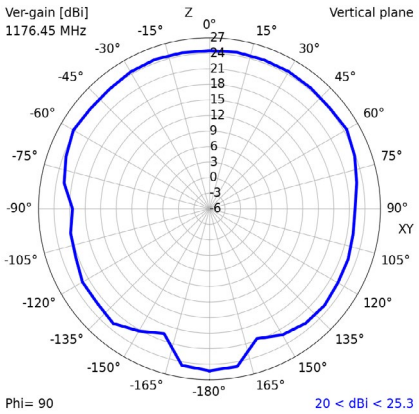
1176.45 MHz XY



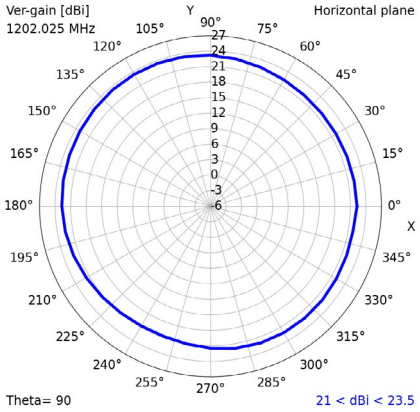
XZ



YZ



1202.025 MHz XY



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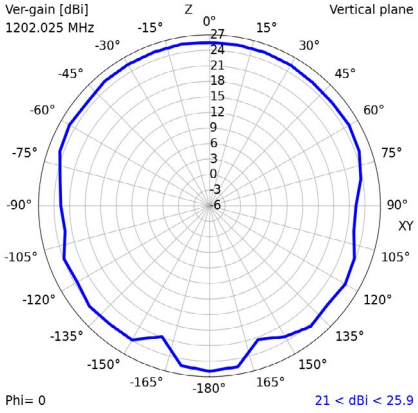

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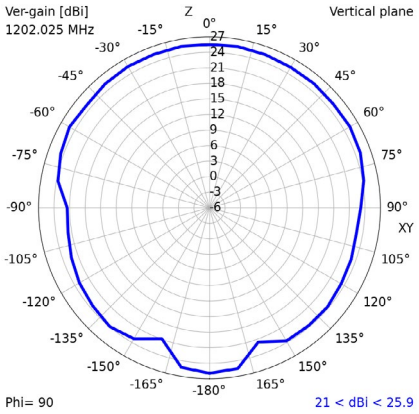
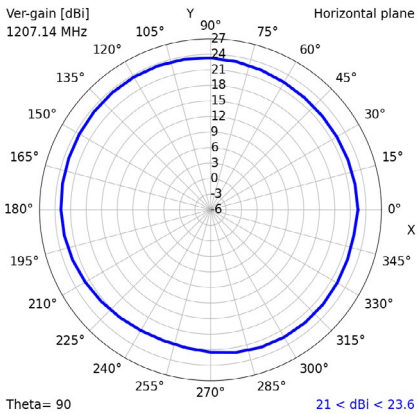


1207.14 MHz XY



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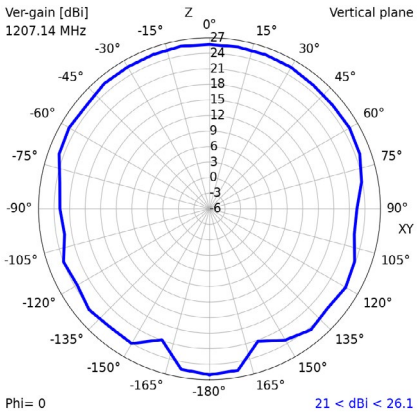

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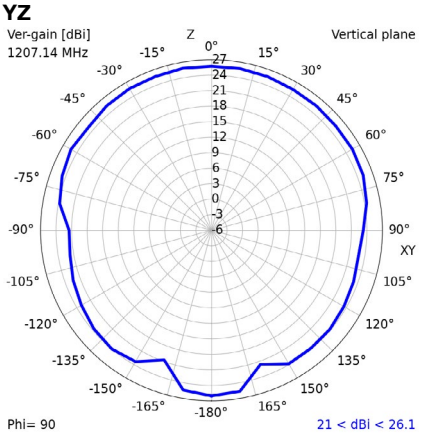

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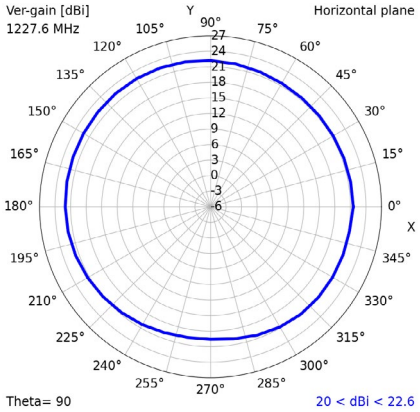
Echo 50

Embedded Active High Accuracy Multi-Constellation GNSS Antenna with LNA for L1, L2, L5 & L6

2D Radiation Plots

1227.6 MHz XY



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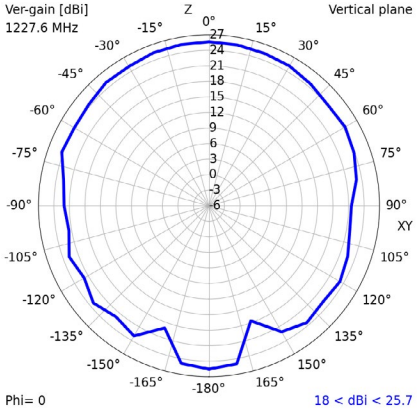

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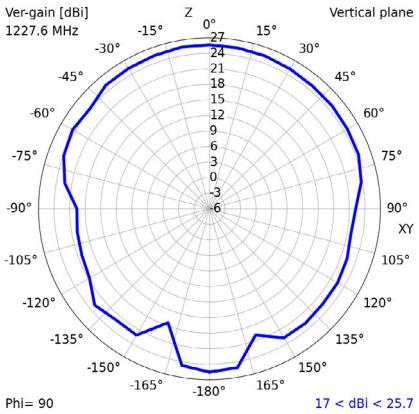
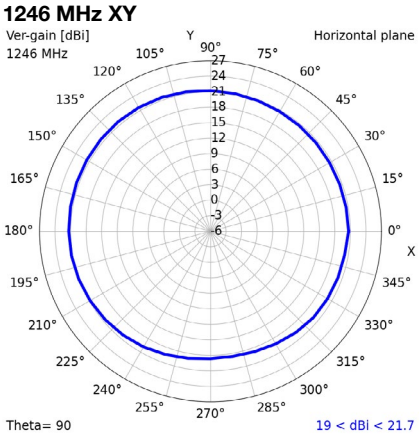


1246 MHz XY



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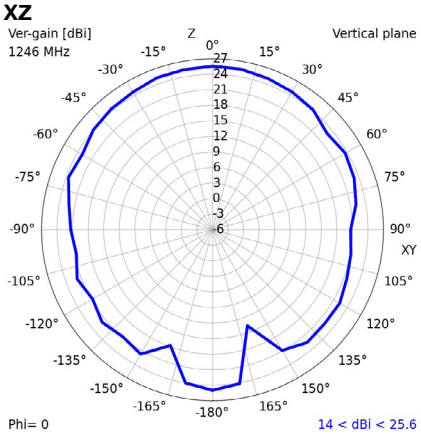

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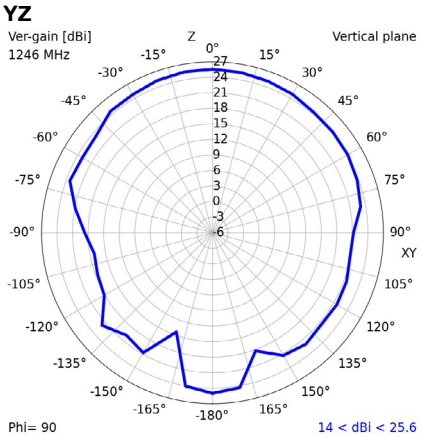
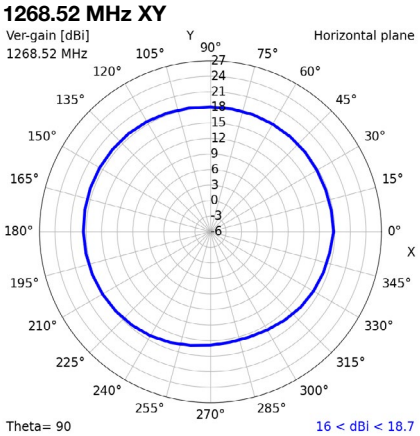


1268.52 MHz XY



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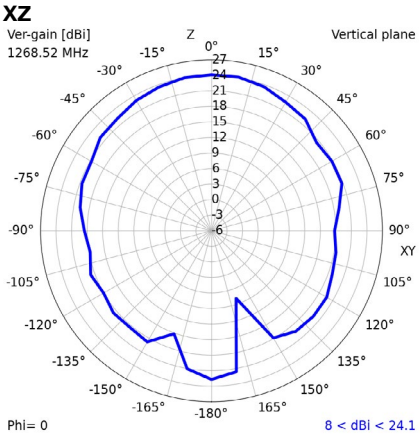

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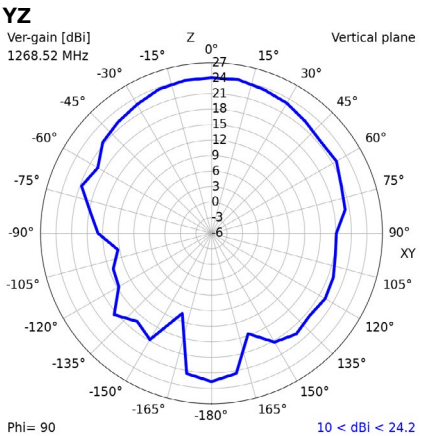

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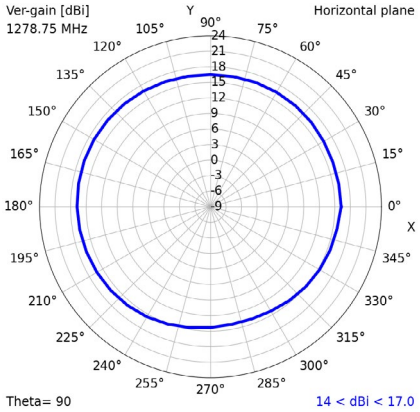
Embedded Active High Accuracy Multi-Constellation GNSS Antenna with LNA for L1, L2, L5 & L6

2D Radiation Plots

1278.75 MHz XY



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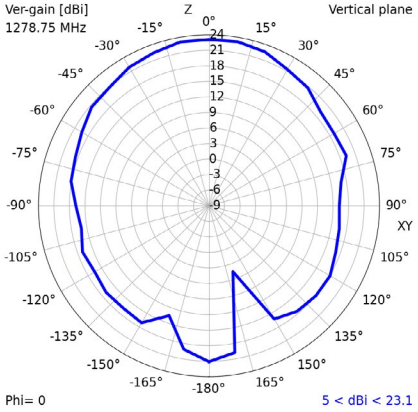

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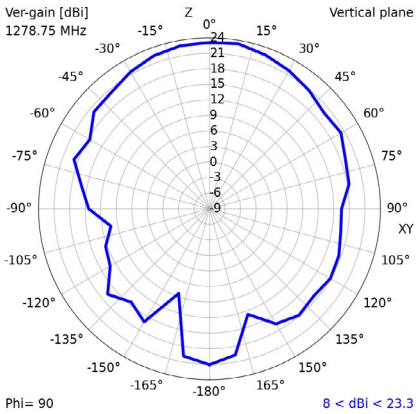
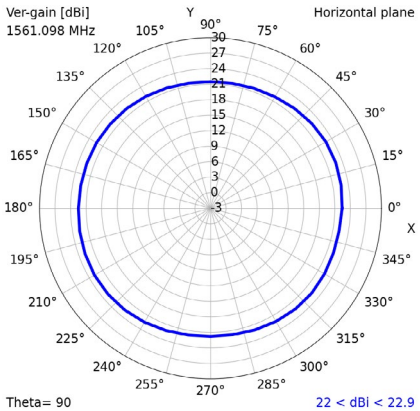


1561.098 MHz XY



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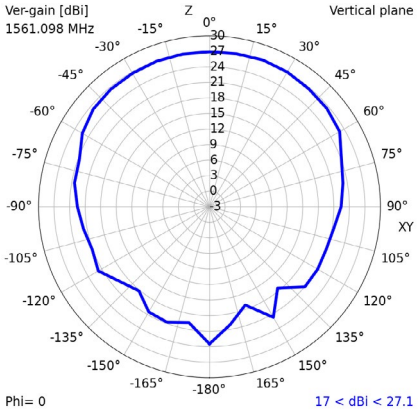

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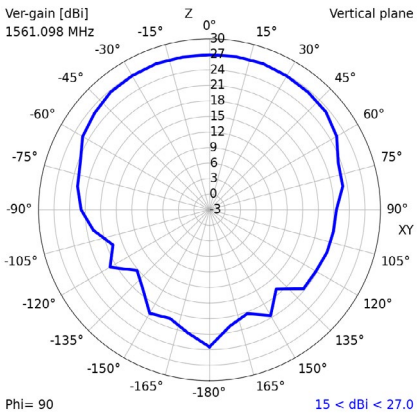
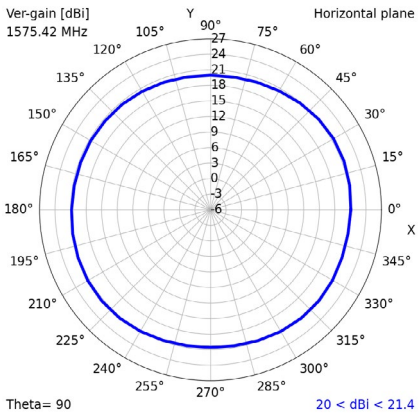


1575.42 MHz XY



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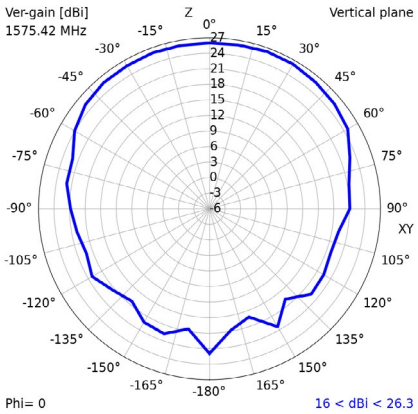

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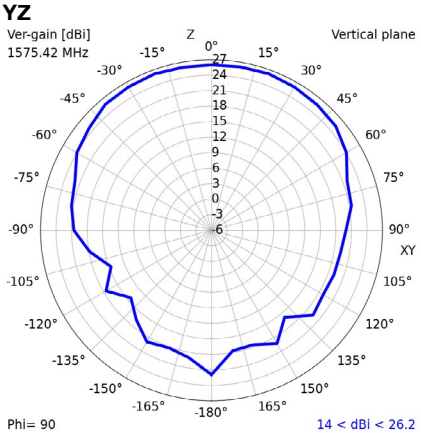

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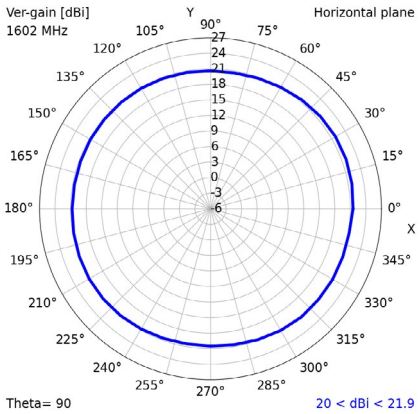
Echo 50

Embedded Active High Accuracy Multi-Constellation GNSS Antenna with LNA for L1, L2, L5 & L6

1602 MHz XY



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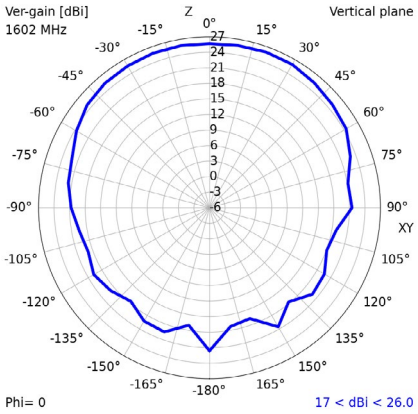

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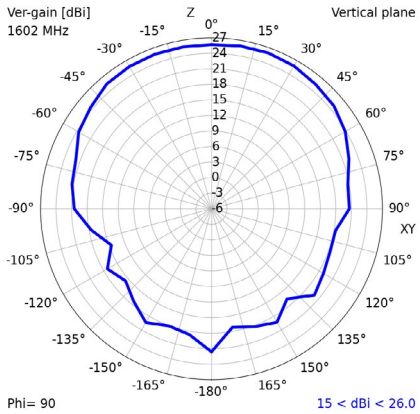

Ordering Details:

Part Number	Description
ECHO50/0.1M/SMAM/S/S/17	Embedded Active High Accuracy Multi-Constellation GNSS Antenna 0.1M Cable SMA Male Connector
ECHO50/0.1M/I-PEX/MHF1/S/17	Embedded Active High Accuracy Multi-Constellation GNSS Antenna 0.1M Cable I-PEX MHF1 Connector
ECHO50/0.1M/I-PEX/MHF4/S/17	Embedded Active High Accuracy Multi-Constellation GNSS Antenna 0.1M Cable I-PEX MHF4 Connector