FlexDipole 863-928 MHz

Flexible Dipole Antenna

Datasheet

1 Features and Benefits

- Quick and easy installation
- Adhesive holds to surface during humidity exposure and hot/cold cycles
- RoHS-compliant
- Can be installed in the following ways:
  - On different non-conductive surfaces and thicknesses
  - On flat or semi-curved surfaces

Specifications		
Frequency (MHz)	863-870	902-928
Peak Gain (dBi)	+1.9	+2.4
Average Efficiency (dB)	> -1.9	> -1.4
VSWR (MHz)	< 3.0:1	< 3.0:1
Impedance (Ω)	50	
Polarization	Linear	

Mechanical Specifications		
Antenna Type	Flexible Planar Dipole Antenna (FlexDIPOLE)	
Dimensions – mm (inches)	75.8 x 13.75 x 0.1 (2.98 x 0.54 x 0.004)	
Weight – g (oz.)	0.78 (0.028)	
Color	Clear yellow	
Adhesive	3M 100MP	
Connector Mating Height (max) – mm	MHF1 (U.FL)	2.5
	MHF4L	1.4

Environmental Specifications	
Operating Temperature – °C (°F)	-40 to +85°C (-40 to +185°F)
Material Substance Compliance	RoHS

2 Configuration

Part Number	Cable Length	Connector
EFH8631A3S-10MHF1	100 mm	MHF1
EFH8631A3S-10MH4L	100 mm	MHF4L

Notes: Specifications are based on the 100mm cable length, standard antenna version with MHF1 / U.FL connector. Varying the cable length or type or connector will cause variations in these antenna specifications.

Antenna is DC short at the feed, so end-user applications should ensure AC coupling/DC block at the RF output, if required.

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3 Mechanical Drawing

3.1 Physical Dimensions (in mm) of the EFH8631A with a 100 mm Long Cable

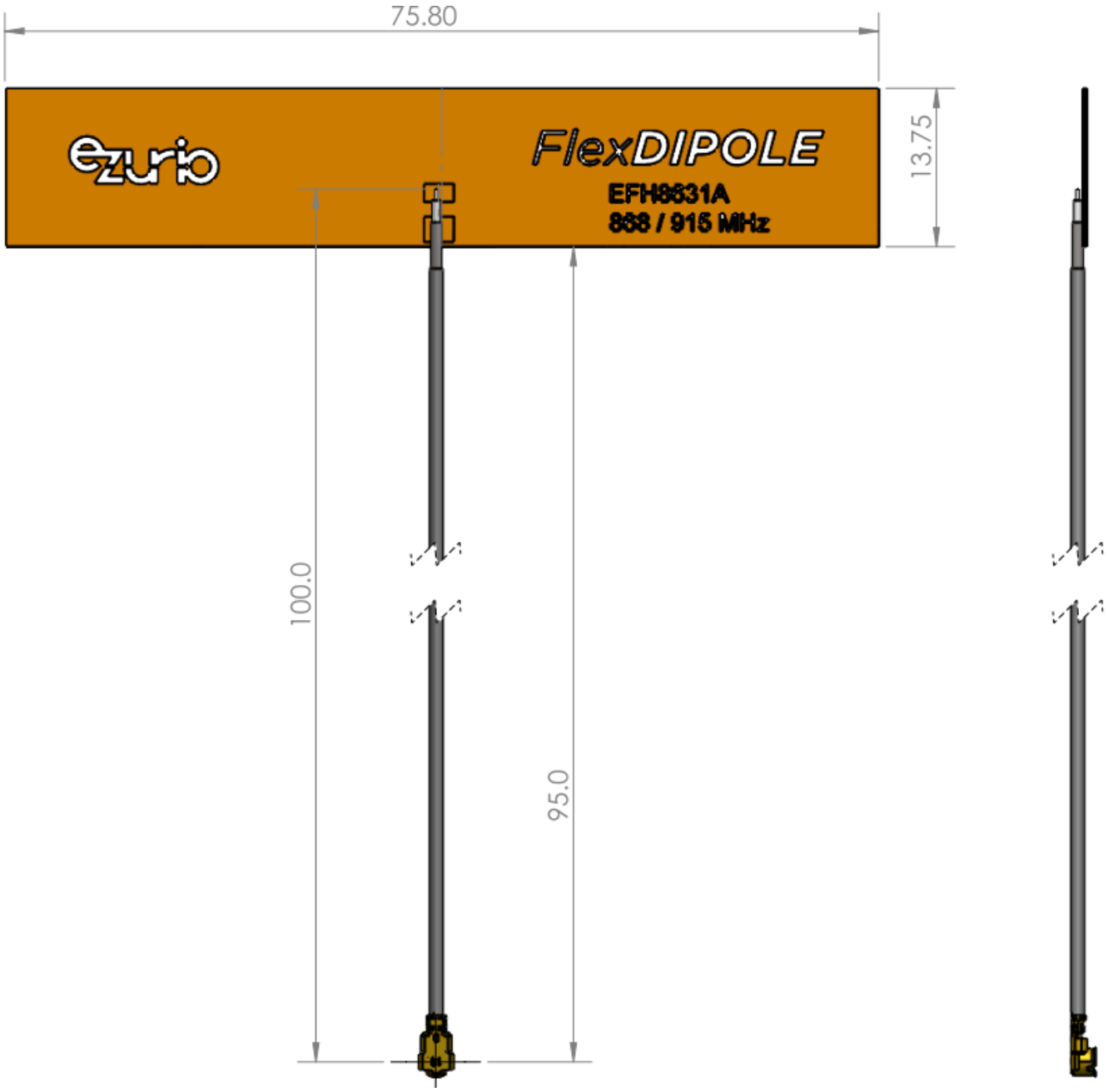

Figure 1: FlexDIPOLE mechanical drawing of EFH8631A Antenna

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4 Flat Surface Antenna measurements

Flat surface measurements were performed with the antenna centered on a 2.1 mm-thick plate of polycarbonate in free space.

4.1 VSWR

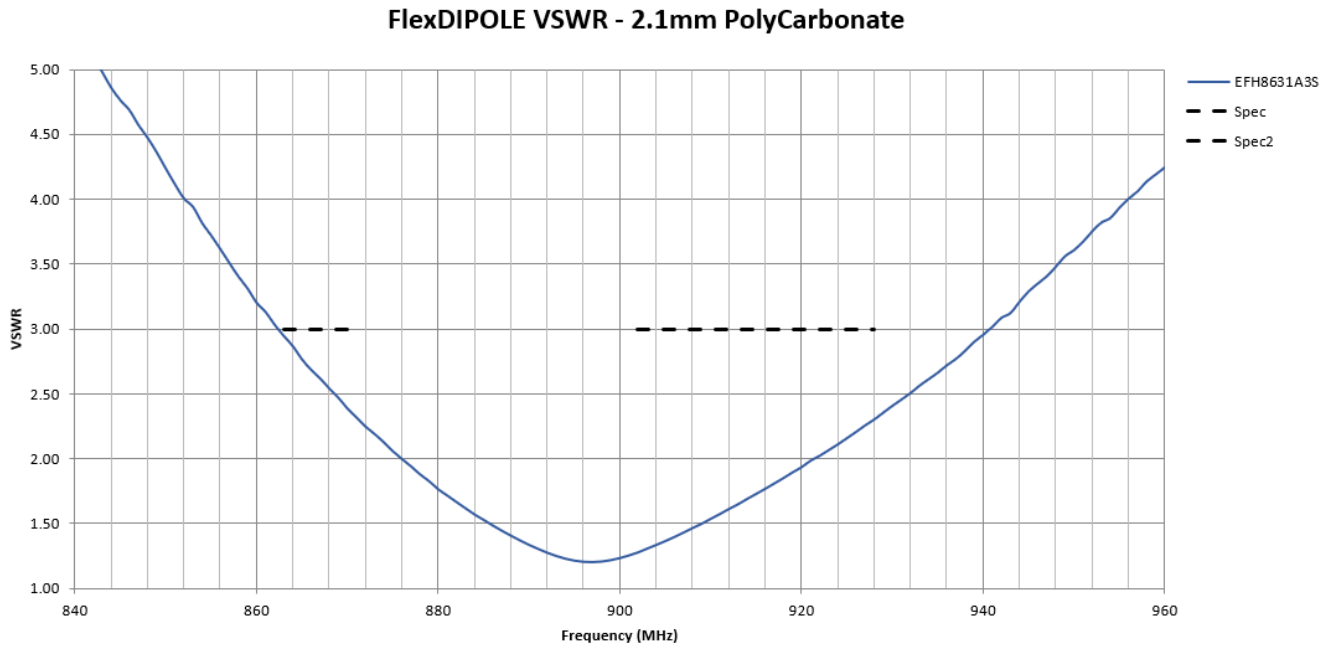

Figure 2: Antenna VSWR measured on a 2.1 mm-thick plate of polycarbonate

4.2 Return Loss

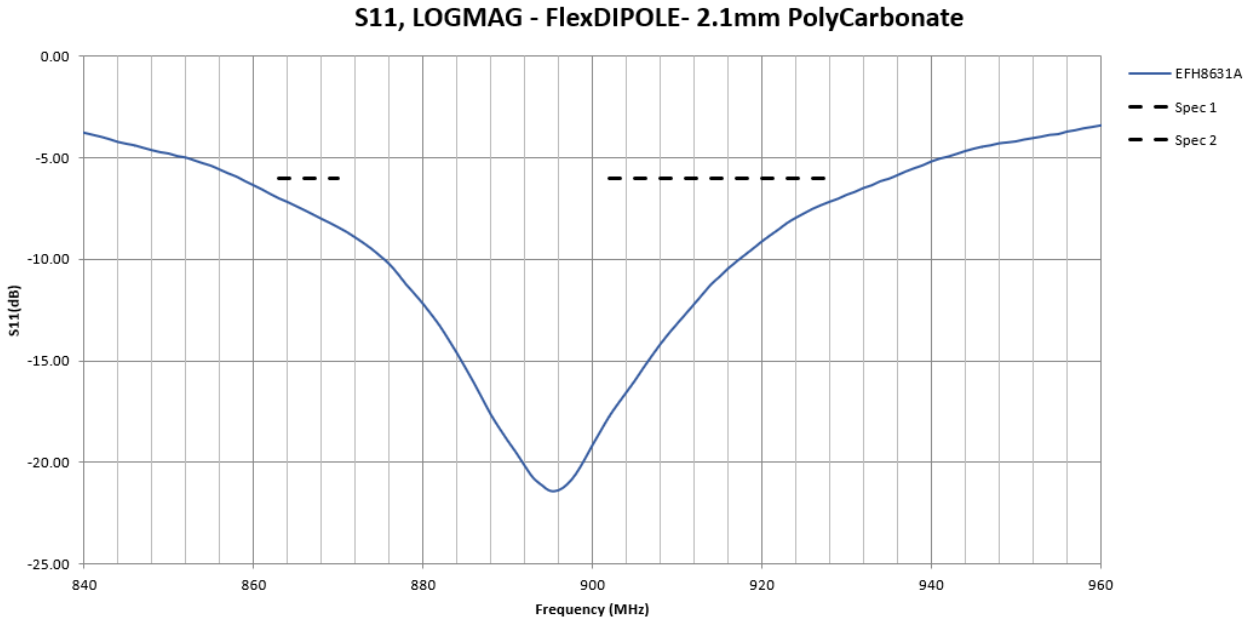

Figure 3: Antenna Return Loss measured on a 2.1 mm-thick plate of polycarbonate

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5 Antenna Chamber Test Setup

Antenna measurements such as VSWR and S11 were measured with an Agilent E5071C vector network analyzer. Radiation patterns were measured with a Rohde & Schwarz ZNB8-4PORT vector network analyzer in a Howland Company 3100 chamber equivalent. Phase center is nine inches above the Phi positioner.

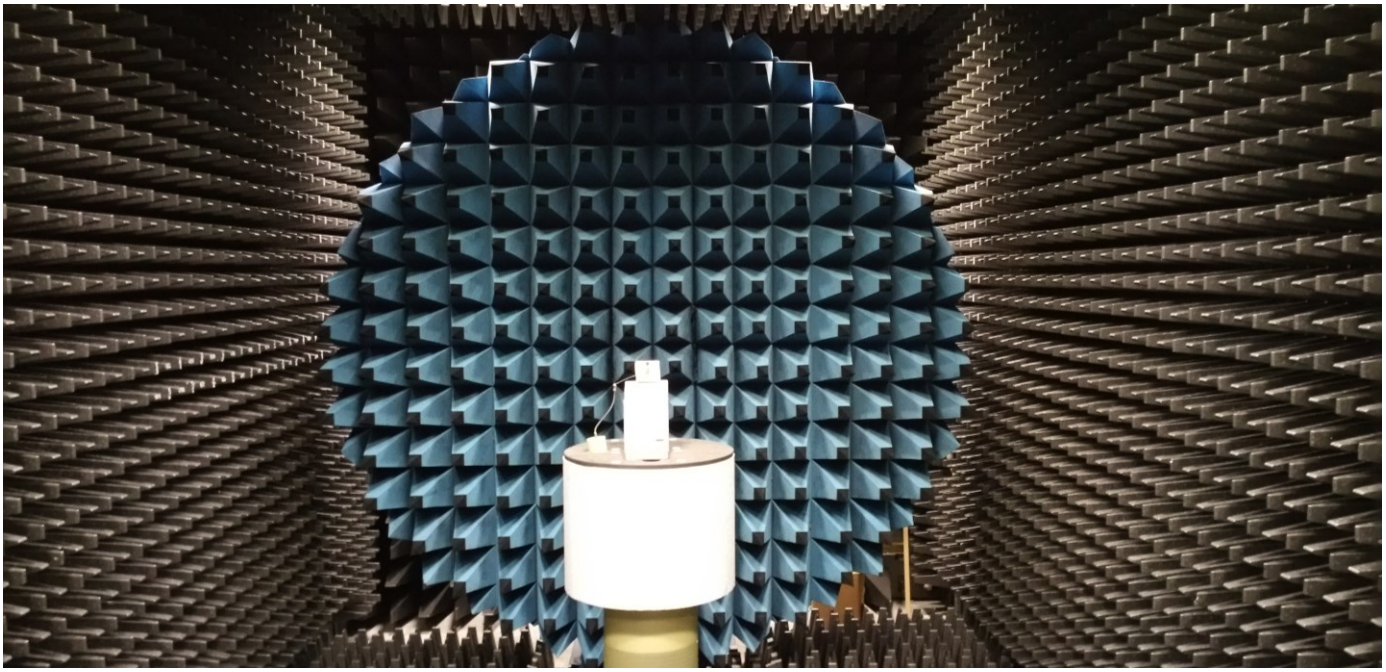

Figure 4: Howland Company 3100 Antenna chamber

6 Antenna Radiation Performance

6.1 FlexDIPOLE centered on a 2.1 mm-thick plate of polycarbonate

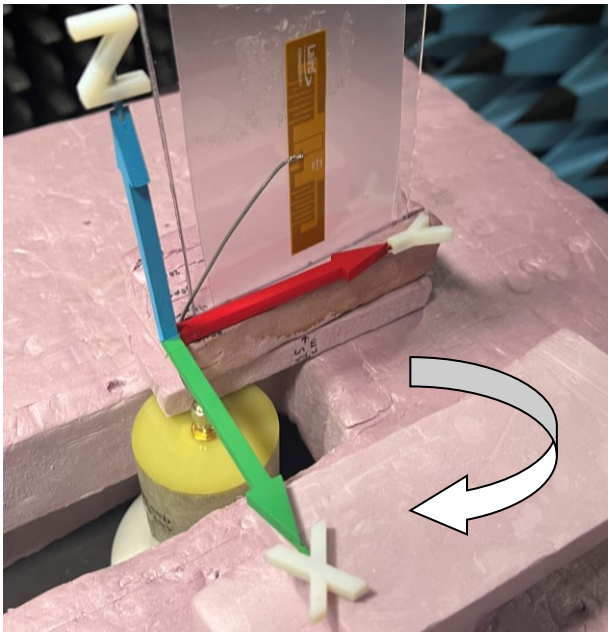

Figure 5: Flat surface setup

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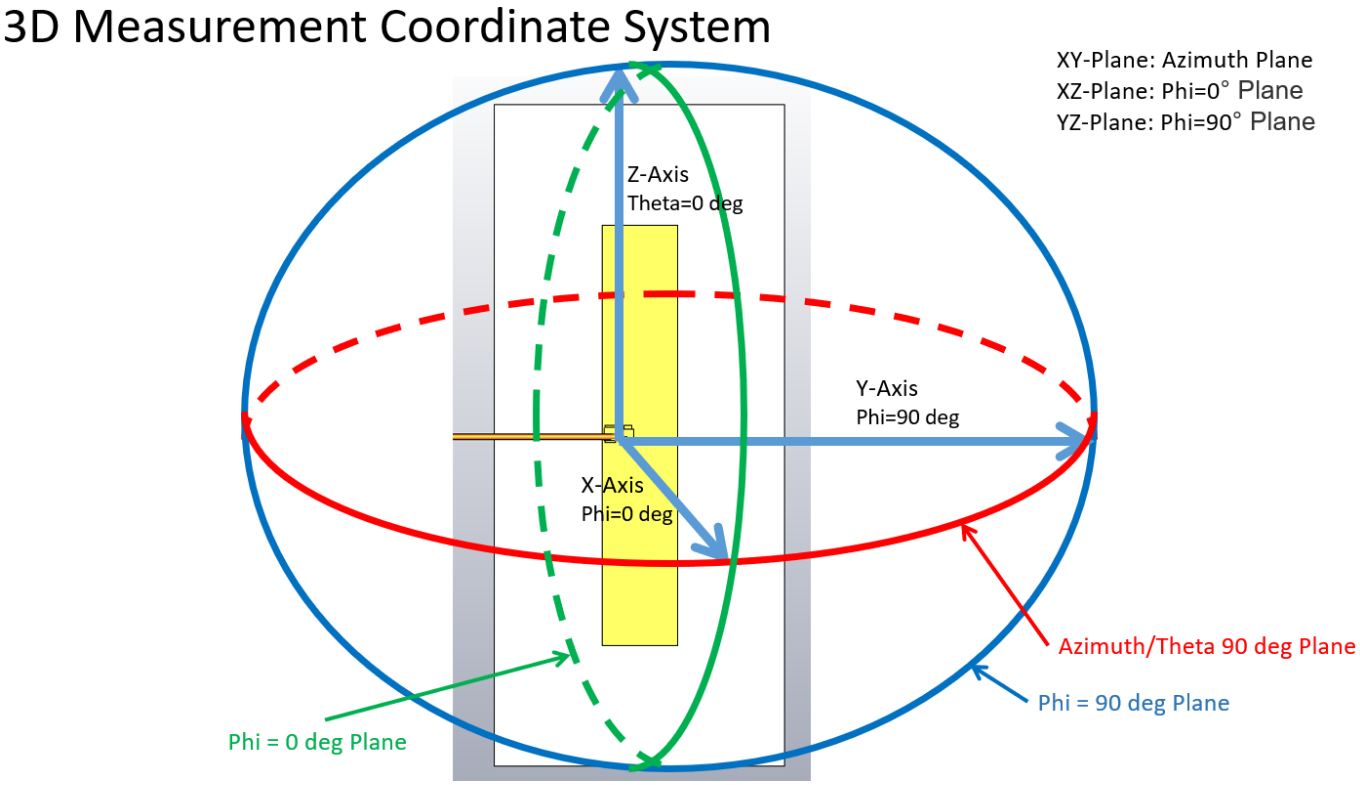
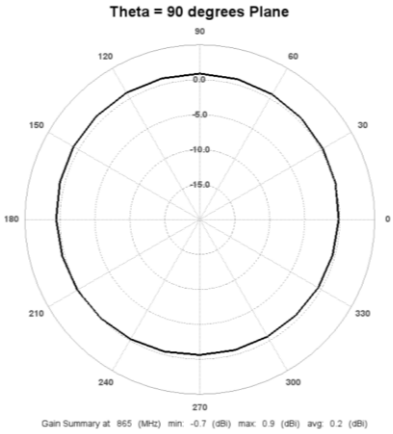
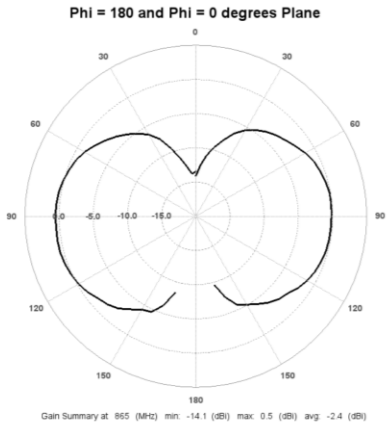


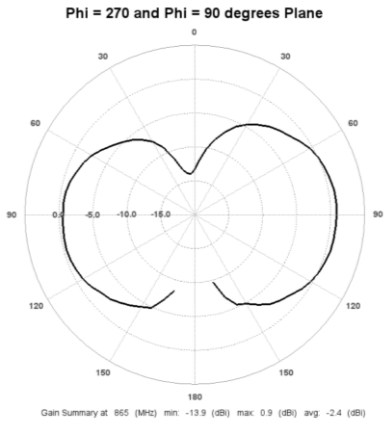
Figure 6: 3D Measurement Coordinate System for 2D & 3D Gain Patterns

6.2 Radiation Patterns – 2D Plots

6.2.1 2D Plots at 865 MHz







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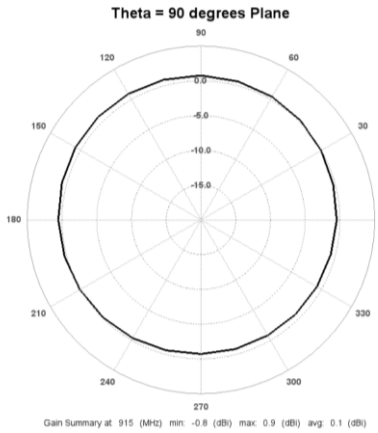
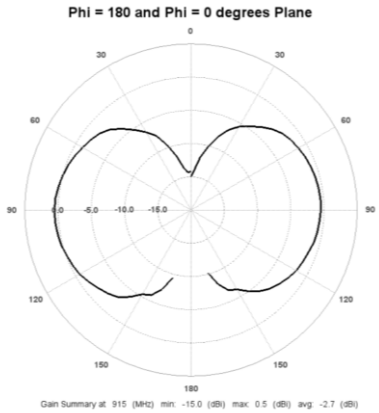
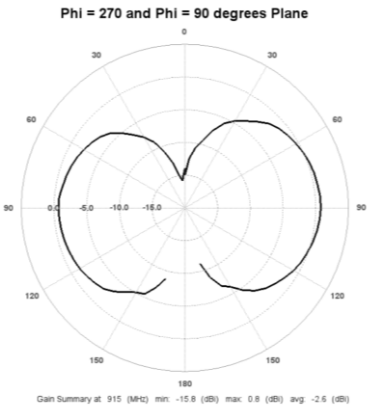
6.2.2 2D Plots at 915 MHz







6.3 Radiation Patterns – 3D Plots

6.3.1 3D Plots at 865 MHz

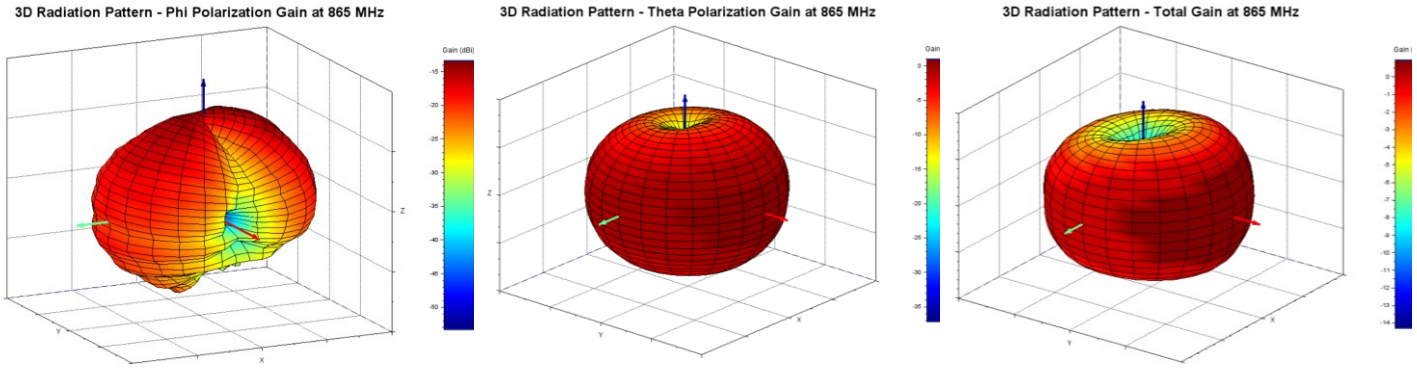


Figure 7: Phi polarization, Theta polarization and, and total gain plots – 865 MHz

6.3.2 3D Plots at 915 MHz

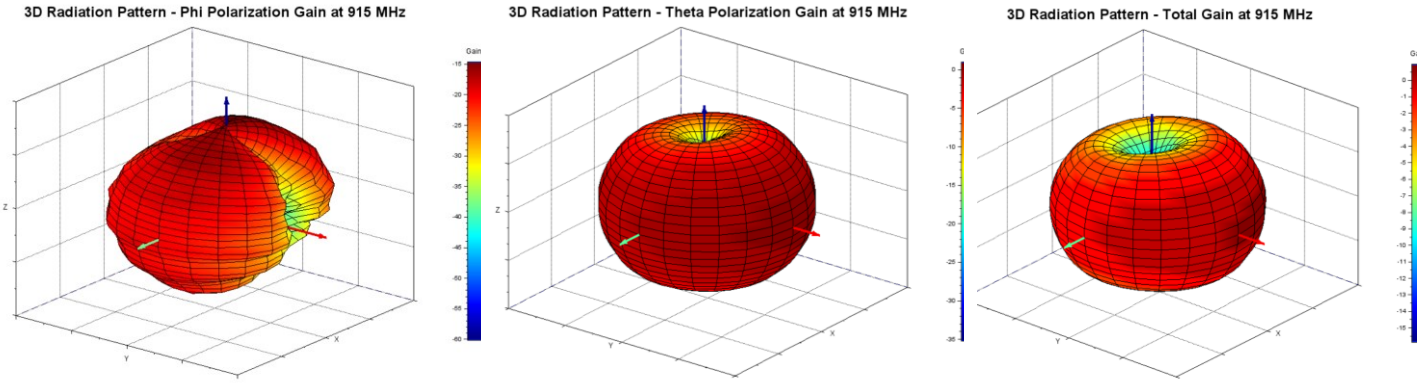


Figure 8: Phi polarization, Theta polarization and, and total gain plots – 915 MHz

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6.4 Efficiency

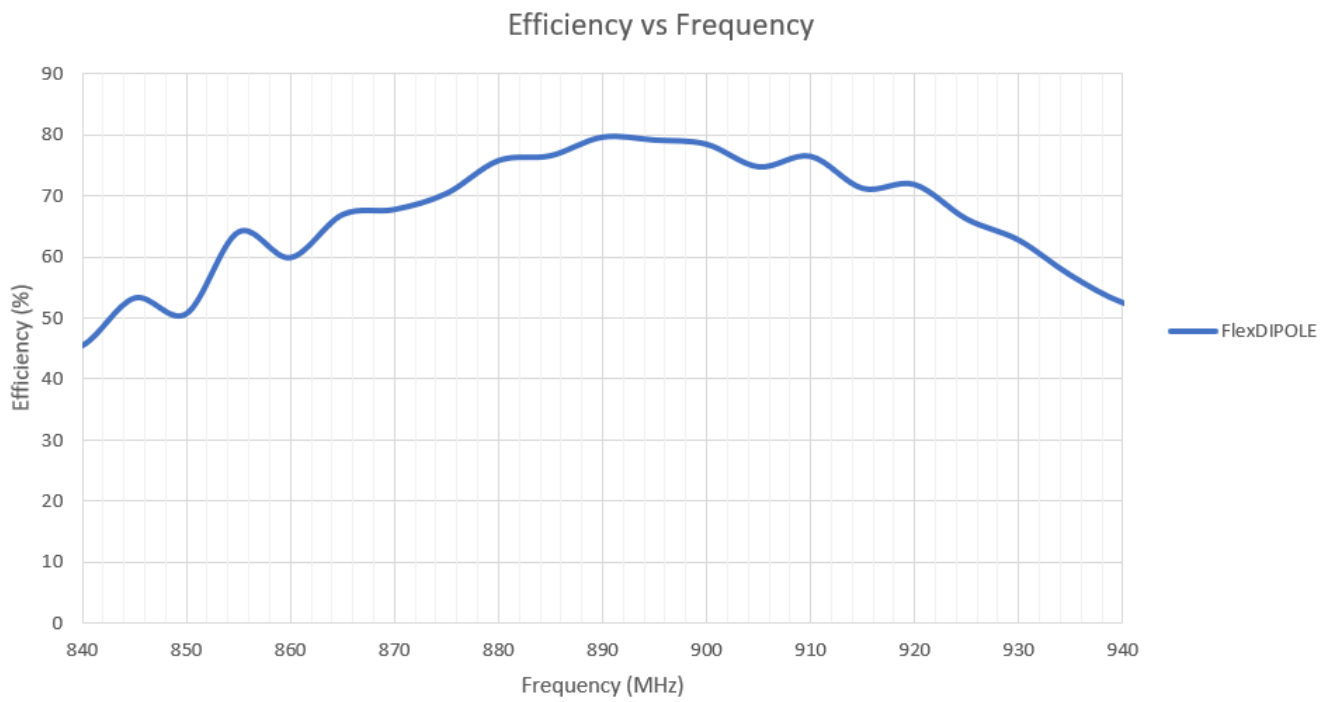

Figure 9: Antenna Efficiency measured on a 2.1 mm-thick plate of polycarbonate

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6.5 Antenna Gain

Total Gain vs Frequency (as per IEEE definition)

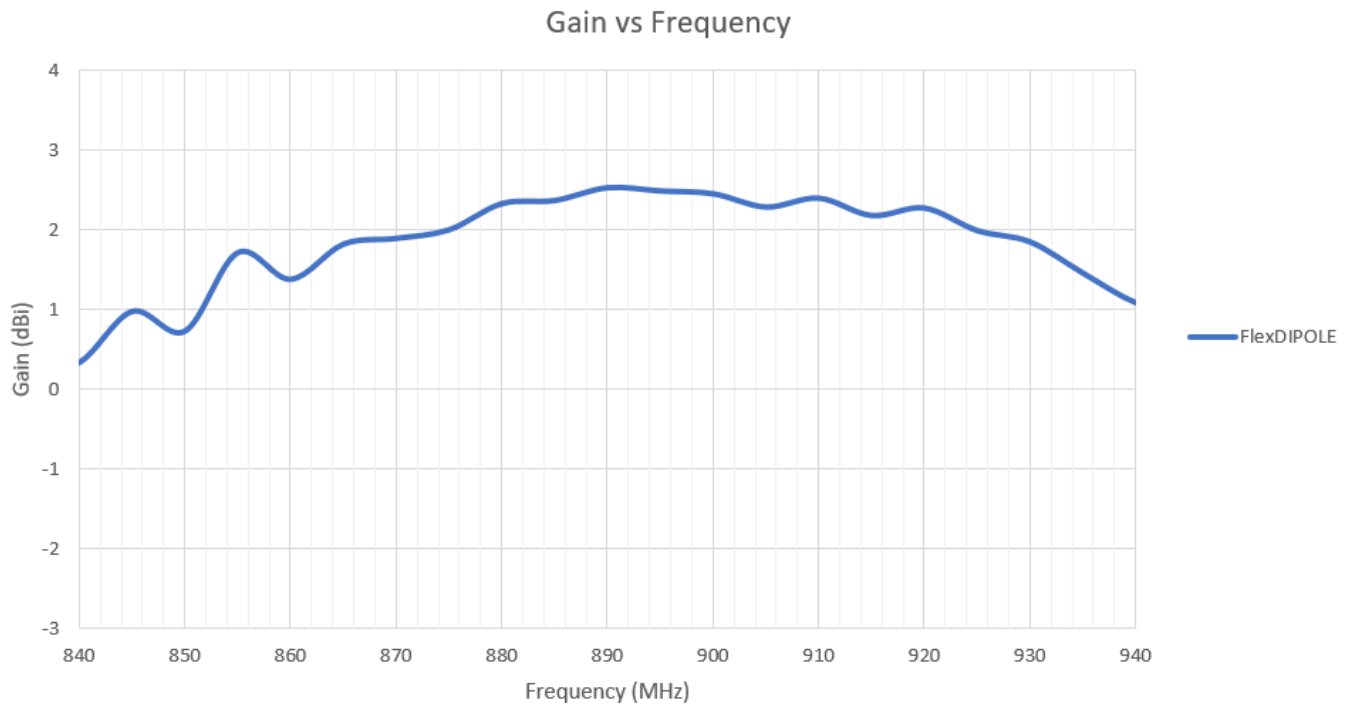

Figure 10: Total Gain vs Frequency, calculated as per the IEEE definition, summing the partial gains from two orthogonal polarizations.

Peak Gain from Theta and Phi Polarization vs Frequency

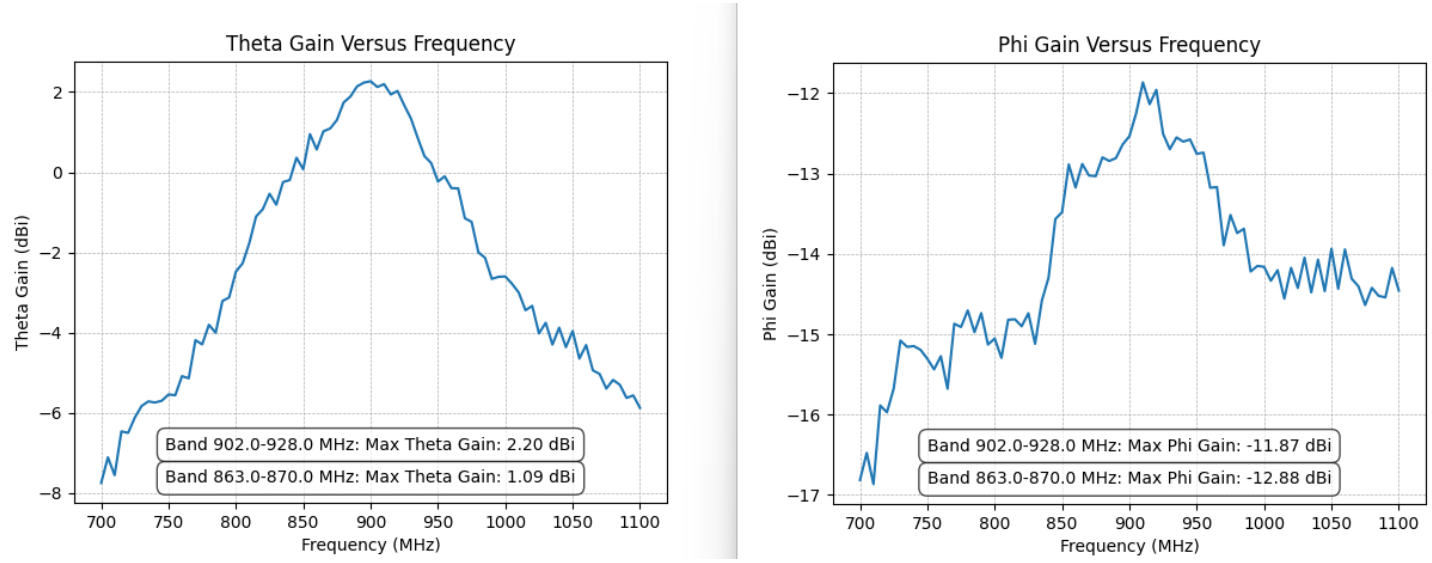

Figure 11: Peak Theta Polarization Gain and Phi Polarization Gain vs Frequency, measured on a 2.1mm-thick plate of polycarbonate.

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7 Antenna Placement & Keep Out Region

7.1 Antenna Placement

The FlexDIPOLE is designed to be attached to dielectric surfaces encountered in plastic packaging of wireless communications devices. The nominal attachment surface used in its design and characterization is a 120 mm x 70 mm, 2.1-millimeter thick, Polycarbonate sheet.

The VSWR of the FlexDIPOLE is stated below for the following materials and thicknesses **outside** of the design specification:

FlexDIPOLE			
Material	thickness(mm)	Max VSWR (868MHz)	Max VSWR (915MHz)
Polycarbonate	1.6	3.2	1.9
Polycarbonate	3.1	2.4	2.1
Polycarbonate	6.1	1.4	3.9
ABS	1.6	3.2	2.1
ABS	3.3	1.6	3.6
Nylon	0.8	4.5	2.1
Nylon	1.6	2.8	2.0
Nylon	2.5	1.3	4.3
Acrylic	1.5	3.7	1.6
Acrylic	3.0	1.7	3.1
Delrin	1.6	2.2	2.5
Delrin	3.1	1.3	4.5
FR4	1.6	1.7	6.0
PETG	1.4	3.1	2.0
PETG	2.8	1.4	4.2
Polypropylene	1.6	4.9	2.3
Polypropylene	3.2	1.5	5.3
Polyetherimide	1.6	2.5	2.8
Polyetherimide	3.3	1.5	5.3
Curved OD - 127mm	2.1	2.2	2.9
Curved ID -203mm	2.1	1.8	3.0

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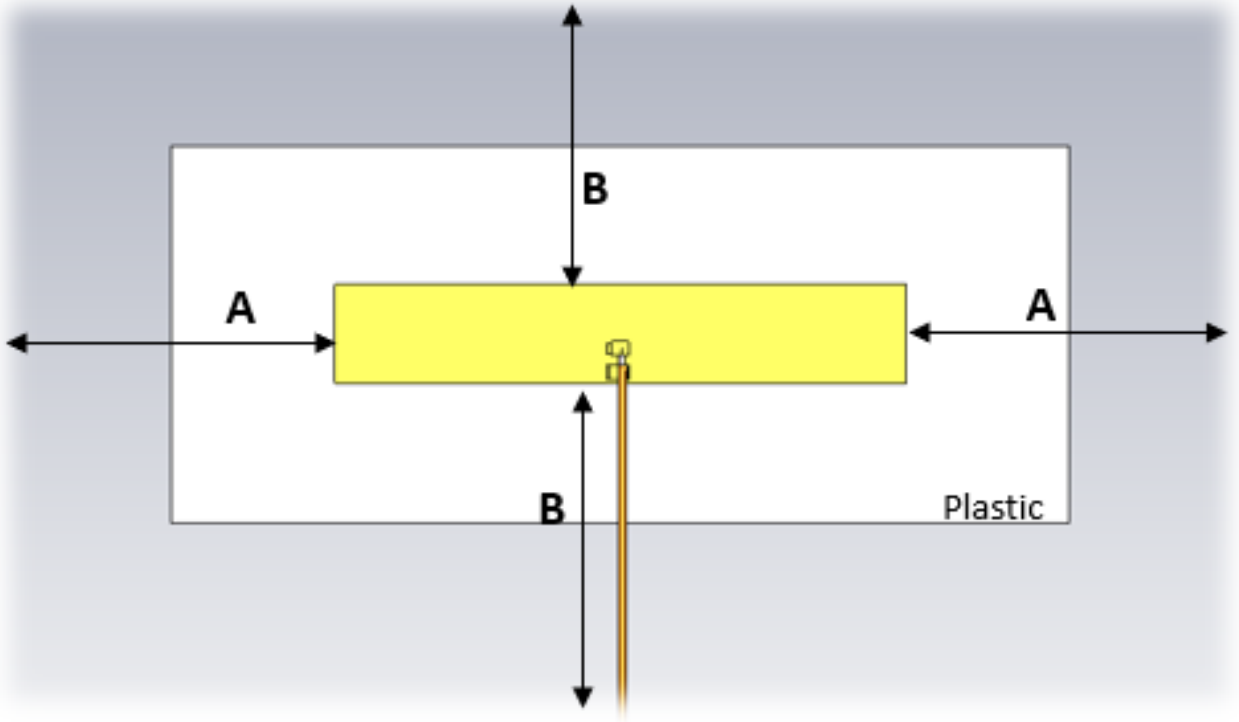
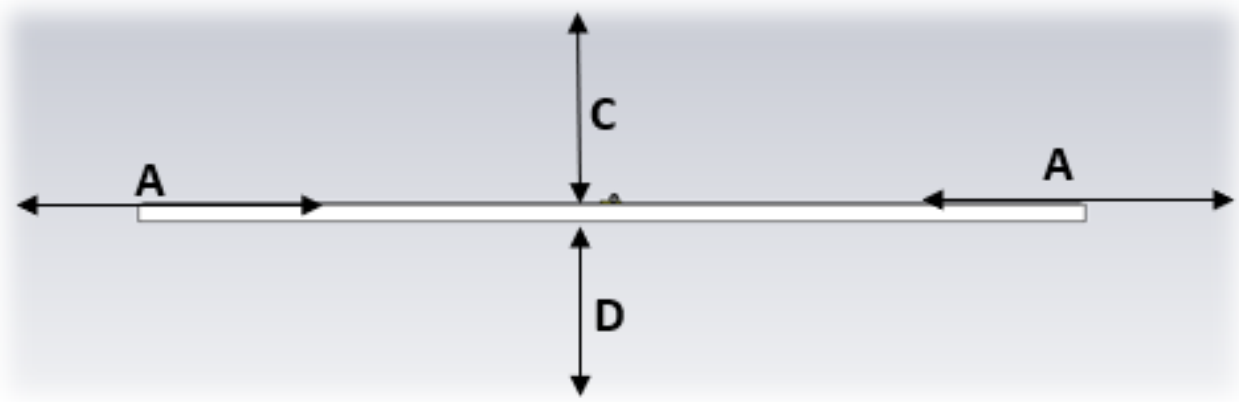
7.2 Recommended Antenna Conductive Material Keep Out Region





Keep Out Region Distance (mm)			
A	B	C	D
10	20	30	30

Notes:

- Antenna is designed to be mounted on polycarbonate with a nominal thickness of 2.1mm
- Diagram is not to scale

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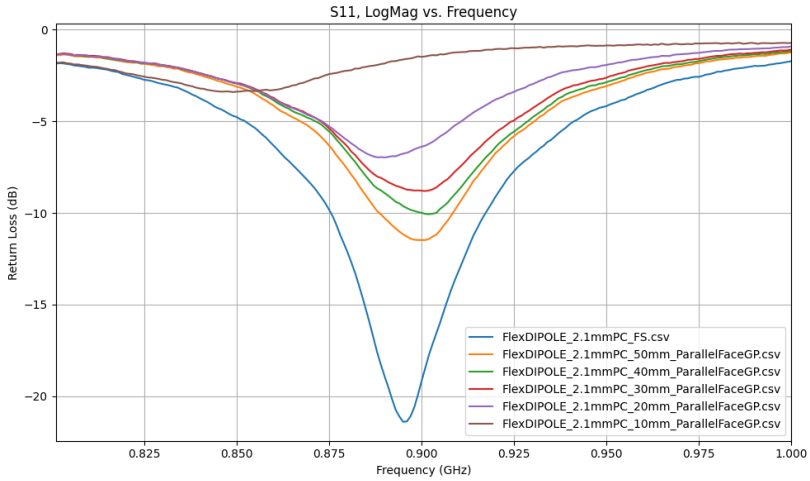
7.3 Antenna Performance as a Function of Ground Planes in Various Locations

7.3.1 Parallel Face Ground Plane

The dimensions of the ground plane utilized is 100mm x 90mm at a varying distance of 10mm – 50mm, compared to that of free-space measurement. A minimum distance of **30mm** between the ground plane and antenna is recommended for acceptable radiated performance.



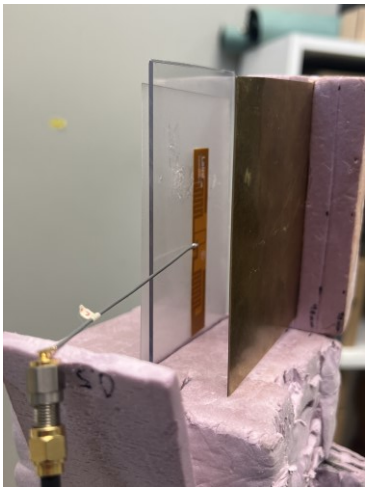


Figure 12: Return Loss measured on a 2.1 mm-thick sheet of polycarbonate with varying parallel face ground distances

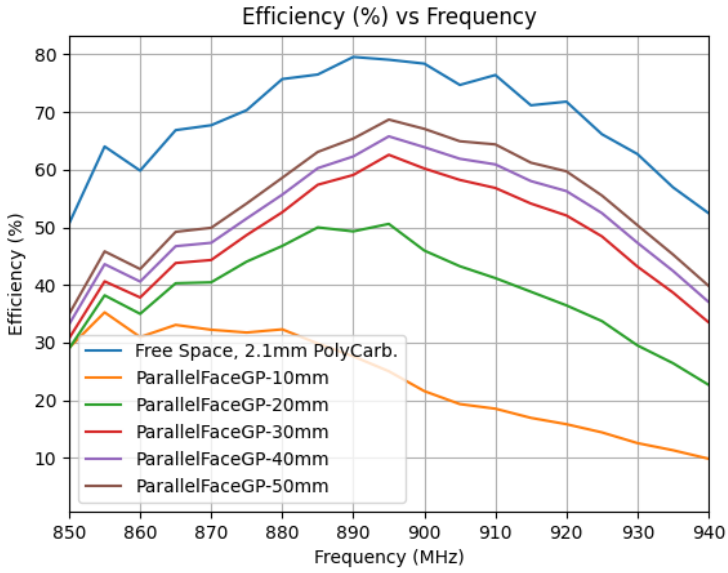


Figure 13: Efficiency measured on a 2.1 mm-thick sheet of polycarbonate with varying parallel face ground distances

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7.3.2 Parallel Edge Ground Plane

The dimensions of the ground plane utilized is 100mm x 90mm at a varying distance of 10mm – 50mm, compared to that of free-space measurement. A minimum distance of **20mm** between the ground plane and antenna is recommended for acceptable radiated performance.

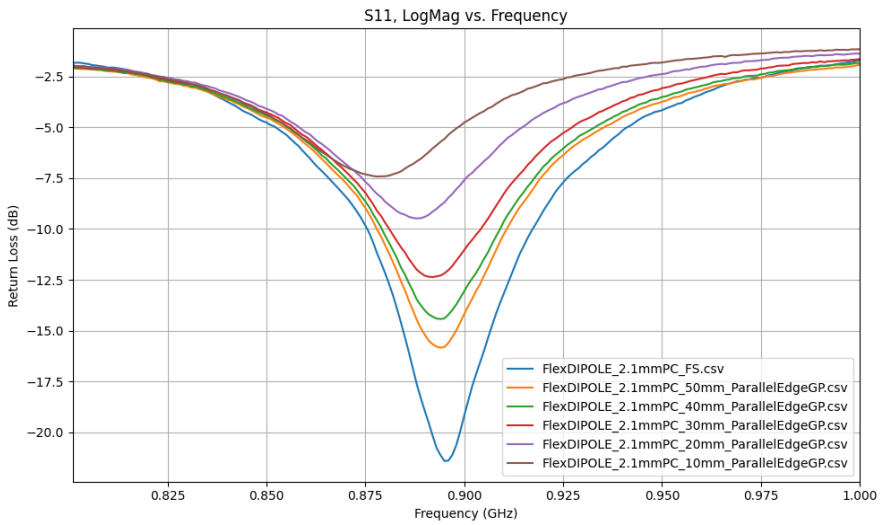

Figure 14: Return Loss measured on a 2.1 mm-thick sheet of polycarbonate with varying parallel edge ground distances

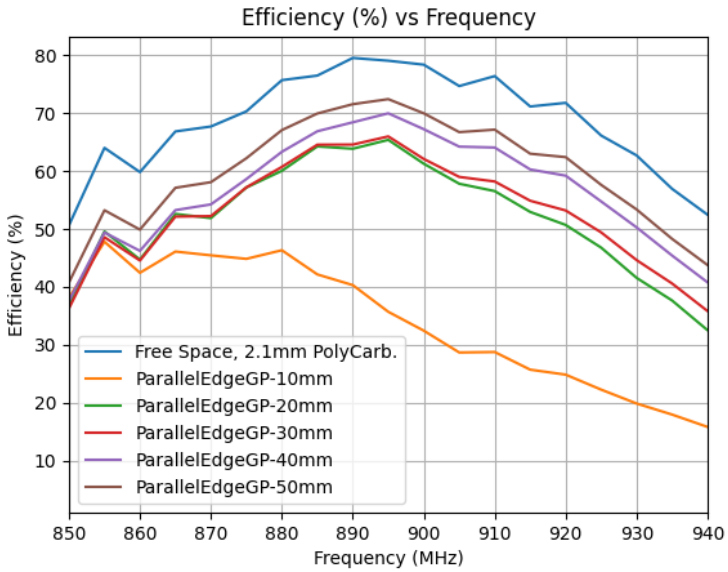

Figure 15: Efficiency measured on a 2.1 mm-thick sheet of polycarbonate with varying parallel edge ground distances

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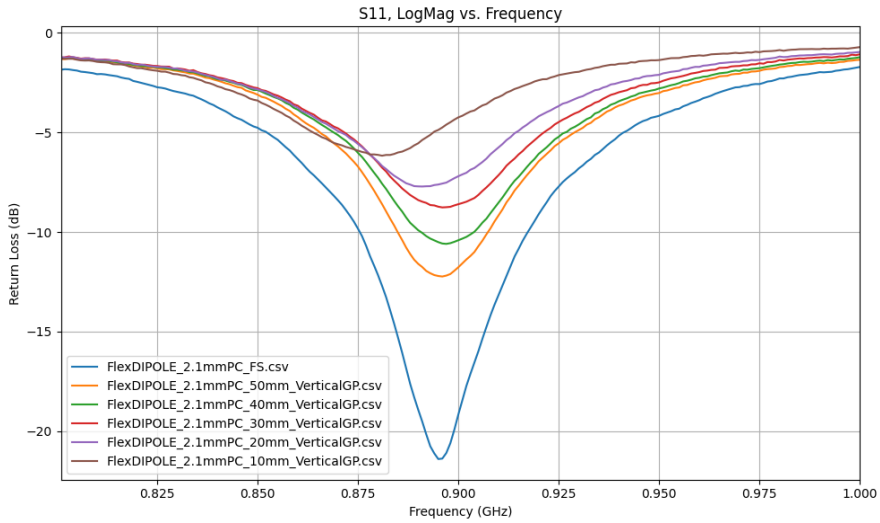
7.3.3 Vertical Edge Ground Plane

The dimensions of the ground plane utilized is 100mm x 90mm at a varying distance of 10mm – 50mm, compared to that of free-space measurement. A minimum distance of **20mm** between the ground plane and antenna is recommended for acceptable radiated performance.



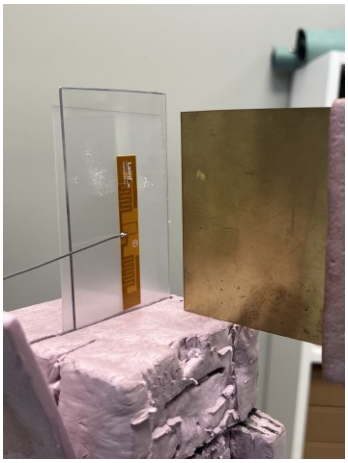


Figure 16: Return Loss measured on a 2.1 mm-thick sheet of polycarbonate with varying edge ground distances

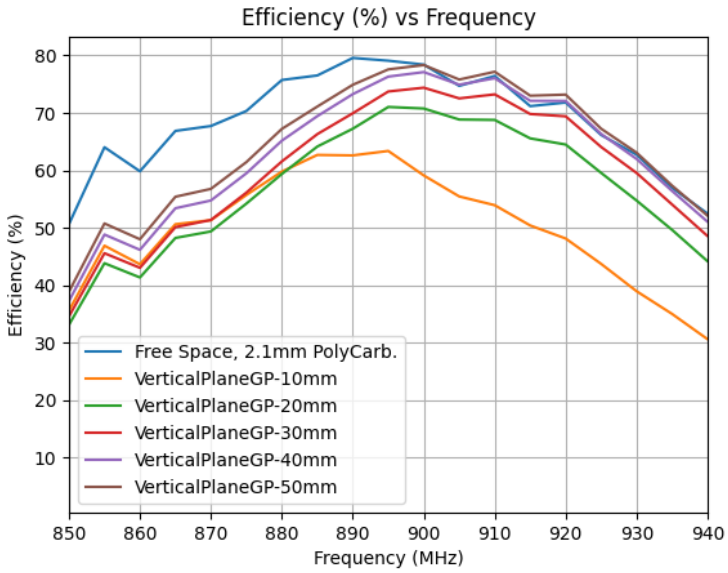


Figure 17: Efficiency measured on a 2.1 mm-thick sheet of polycarbonate with varying edge ground distances

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7.4 Recommended Cable Routing

The FlexDIPOLE cable needs to be routed away from the flex circuit in order to achieve optimal performance. The cable can be bent down as shown in the right image but must maintain >5mm distance and not cross over antenna, or performance will be degraded.

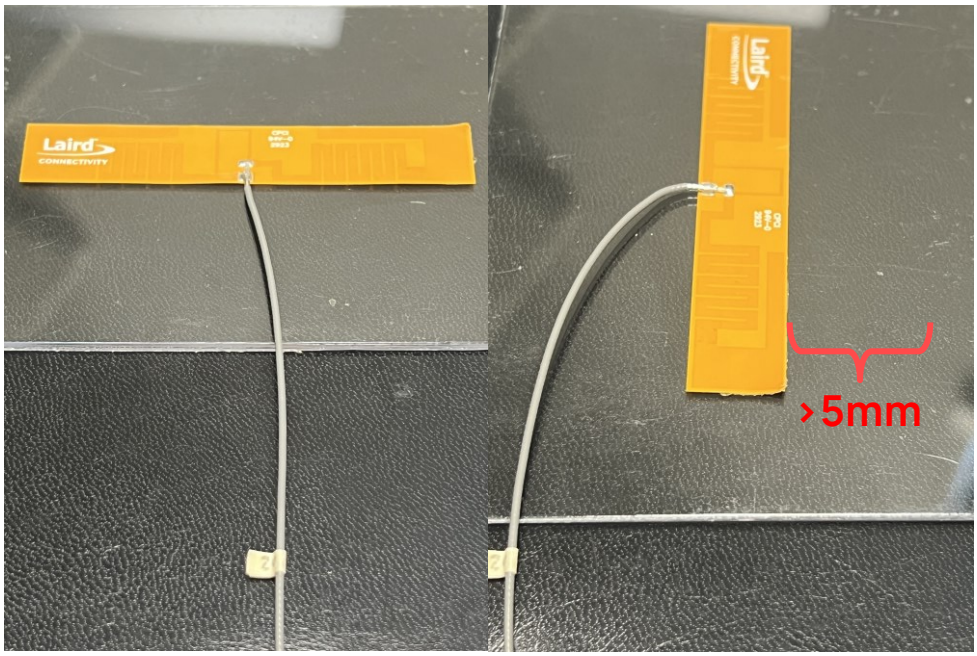

Figure 18: Recommended FlexDIPOLE cable routing for optimal performance

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8 Additional Information

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Phone	Americas: +1-800-492-2320 Europe: +44-1628-858-940 Hong Kong: +852-2762-4823
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