Rev. 2.1, 05/2023

VARISCITE LTD.

2.4GHz mFlexPIFA ANTENNA

Variscite PN: VAC-ANT_2_4_FlexPIFA

LSR PN: mFlexPIFA 001-0030

VARISCITE LTD.

VAC-ANT_2_4_FlexPIFA Datasheet

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1. Ordering Info

Table 1: Ordering information

Order Number	Description
001-0030	mFlexPIFA – 2.4 GHz embedded metal FlexPIFA antenna, 100 mm cable length w/U.FL connector

2. Key Features

- Designed to be installed directly on metal
- Can be installed on different conductive surfaces and thicknesses
- Can be installed on flat or curved surfaces
- Quick and easy Installation
- Adhesive holds to surface during humidity exposure and hot/cold cycles
- RoHS compliant

3. Specification

Table 2: mFlexPIFA specifications

Specification	Value
Peak Gain	+2 dBi
Average Gain	>-4.2 dBi
Impedance	50 ohms
Type	Flexible Planar Inverted F Antenna (FlexPIFA)
Polarization	Linear
VSWR	≤ 3.0:1, 2400 - 2480 MHz
Frequency	2400 - 2480 MHz
Weight	1.8 g
Size	25.4 mm × 23.4 mm × 2.5 mm
Antenna Color	Clear Yellow
Adhesive	3M 100MP
Operating Temp	-40°C to +85°C
Connector Height	U.FL: 2.5 mm maximum
Connector Height	MHF4L: 1.7 mm maximum

4. Physical Dimensions

NOTE

All measurements are in millimetres (mm).

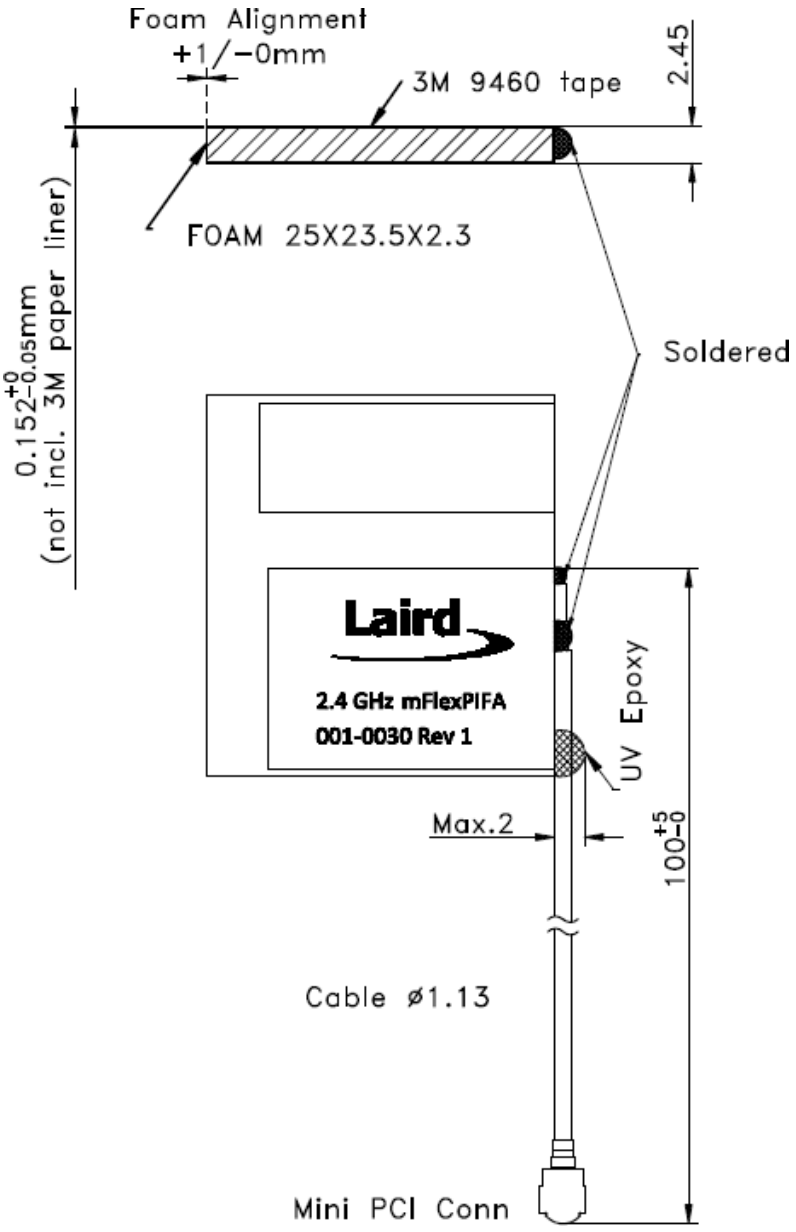

Figure 1: Physical dimensions

5. Test Setup

Antenna measurements such as VSWR are measured with an Agilent E5071C Vector Network Analyzer. Radiation patterns are measured with a CMT Planar 804/1 Vector Network Analyzer in a Howland Company 3100 Chamber equivalent. Phase Center is 9 inches above the Phi positioner.

Flat surface measurements are done with the antenna centered on a 100 x 100 mm, 0.35 mm thick brass plate. Curved surface measurements are taken by placing the antenna on a curved surface made of 0.35 mm thick brass.

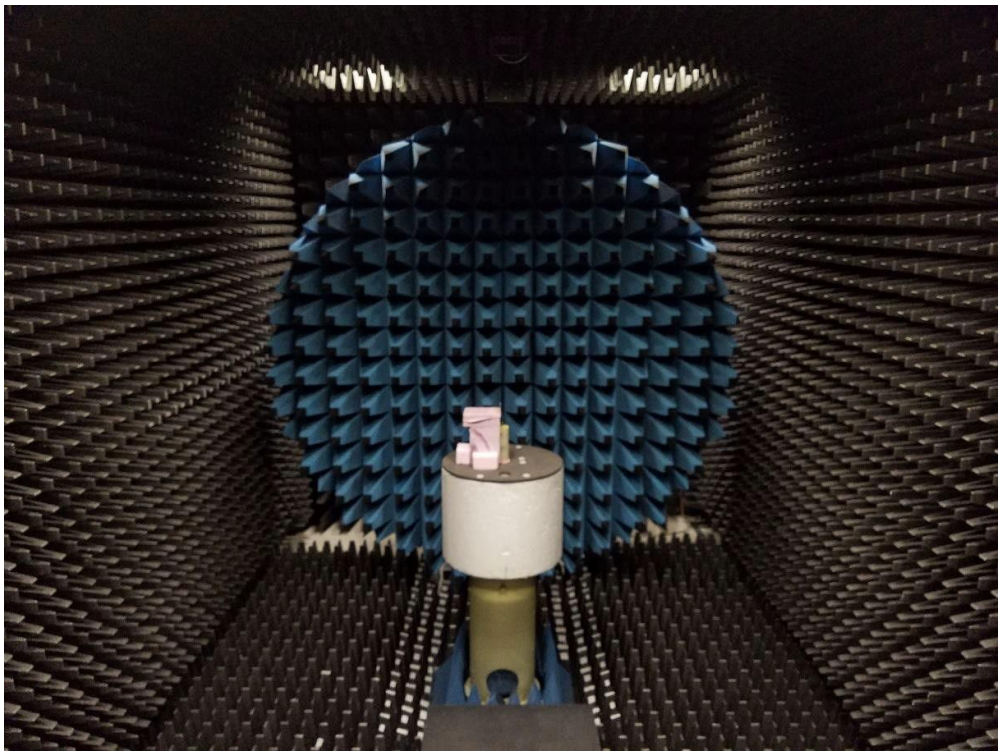

Figure 2 Antenna Chamber

6. Flat Surface Antenna Measurements

6.1 Return Loss

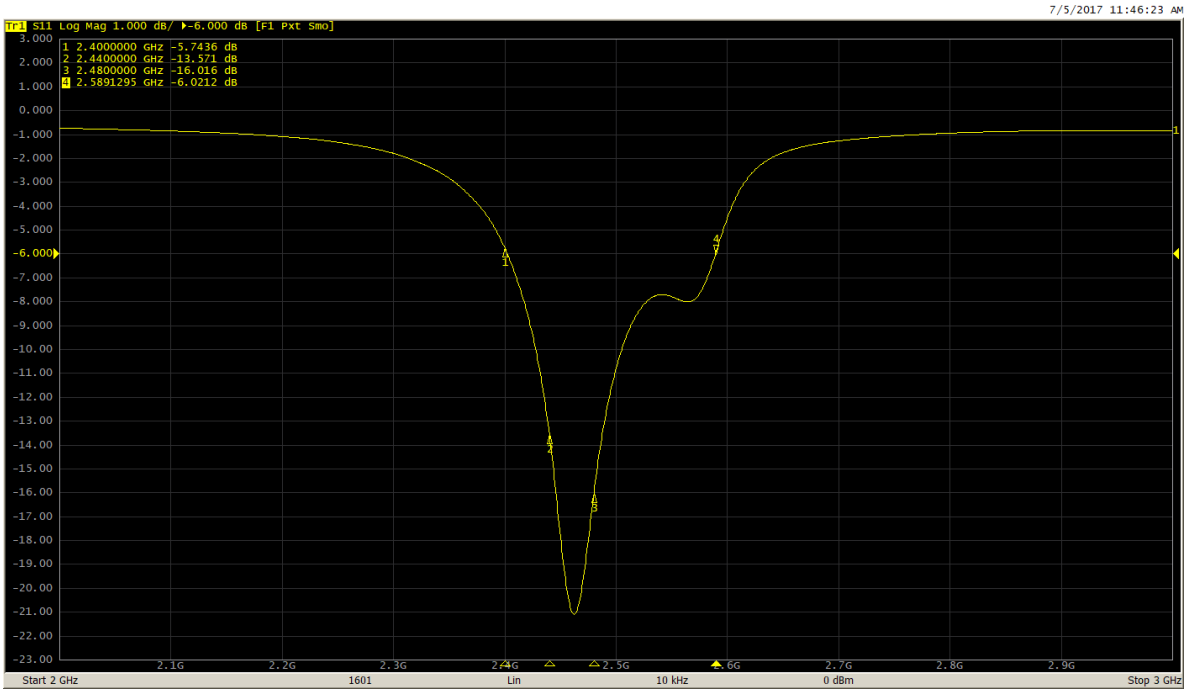

Figure 3: Return loss measured on a 0.35 mm thick, 100 x 100 mm brass plate

7. Flat Surface Antenna Radiation Performance

7.1 Antenna Setup

The mFlexPIFA is centered on a 100 x 100 mm brass plate.

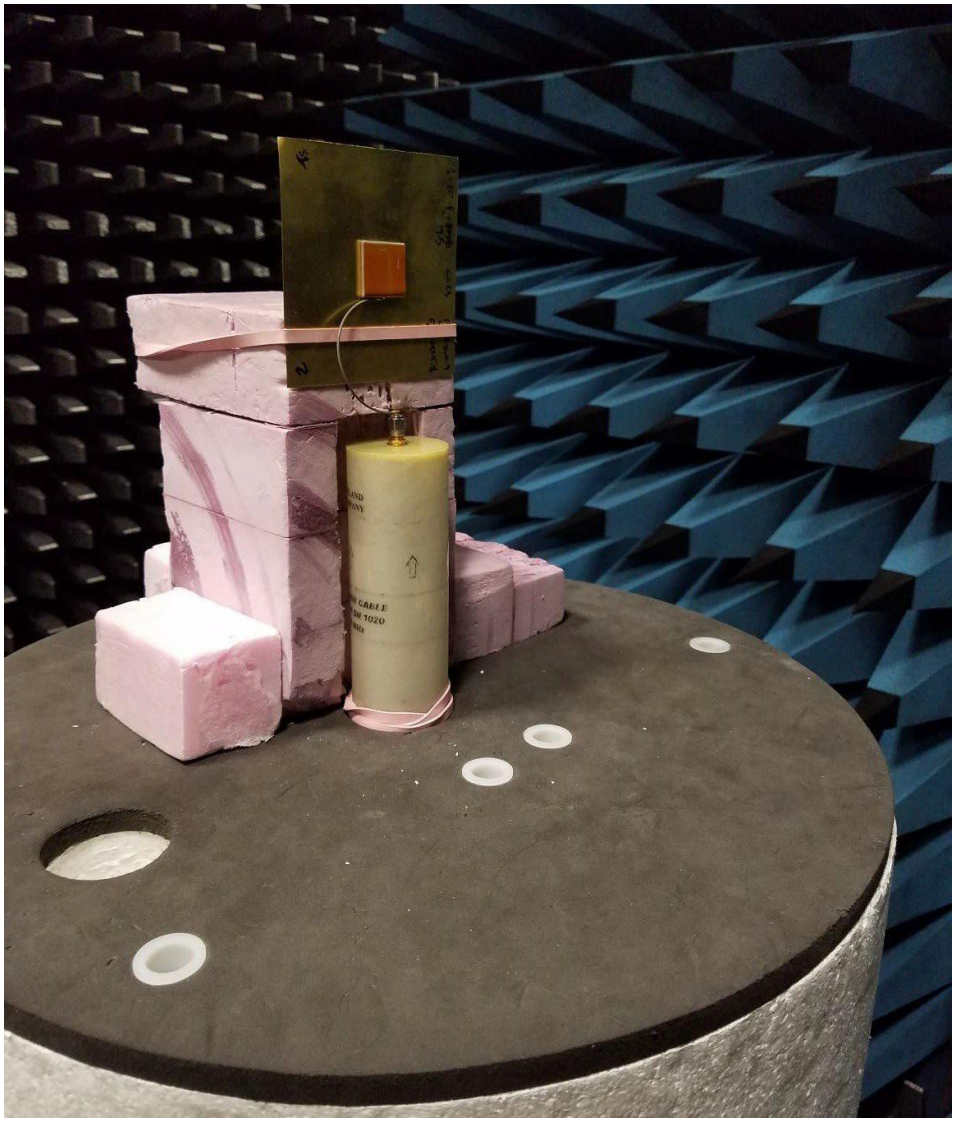

Figure 4: Flat surface setup

7.2 Results – Flat Surface

7.2.1 2400 MHz

Azimuthal Conical Cuts at 2400 MHz

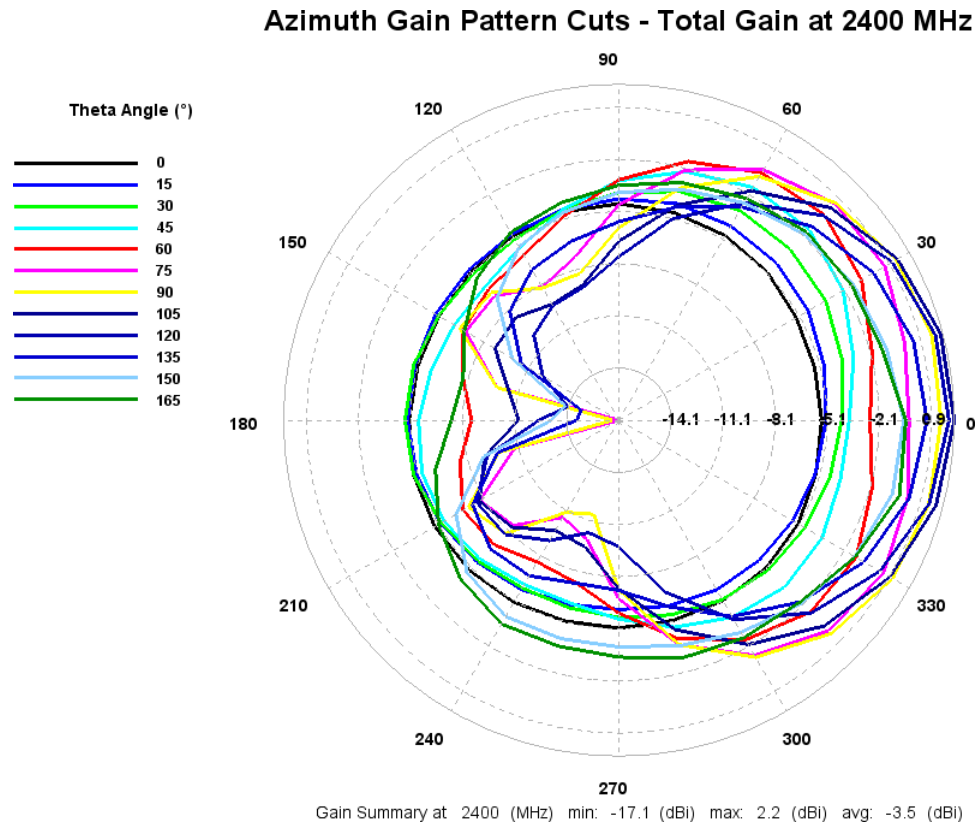

Figure 5: Total gain pattern – 2400 MHz

3D Plots at 2400 MHz

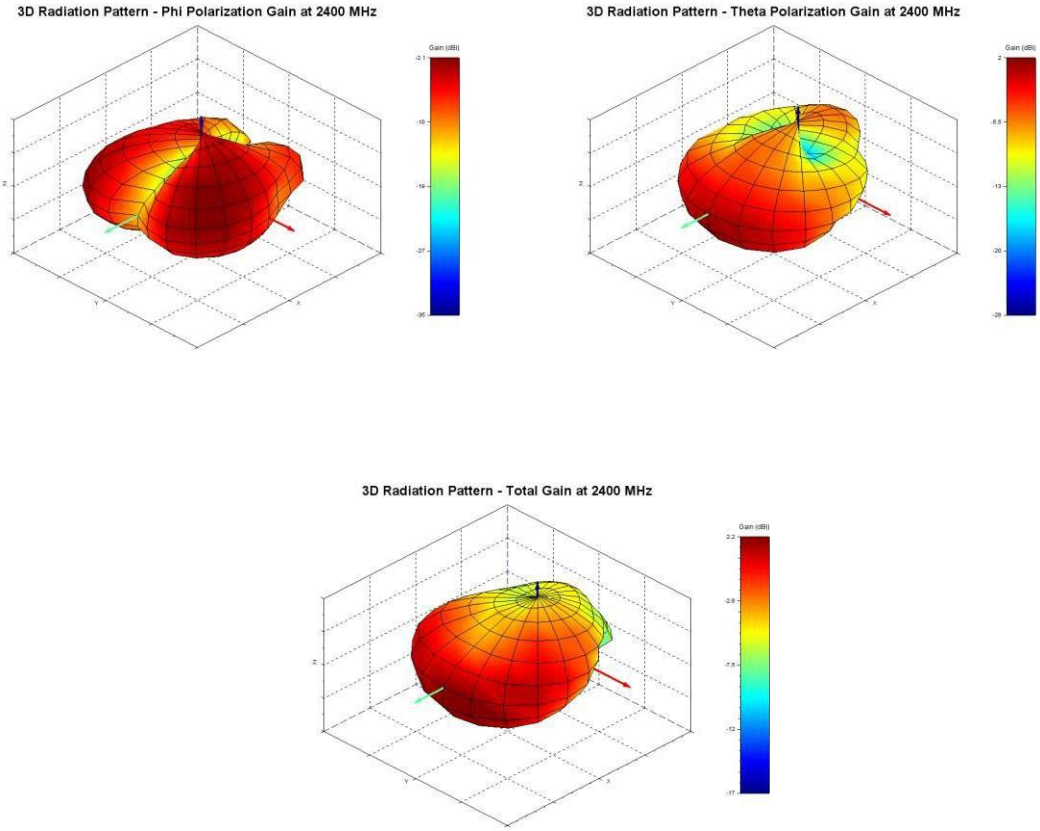

Figure 6: Phi, theta, and total gain plots – 2400 MHz

7.2.2 2440 MHz

Azimuthal Conical Cuts at 2440 MHz

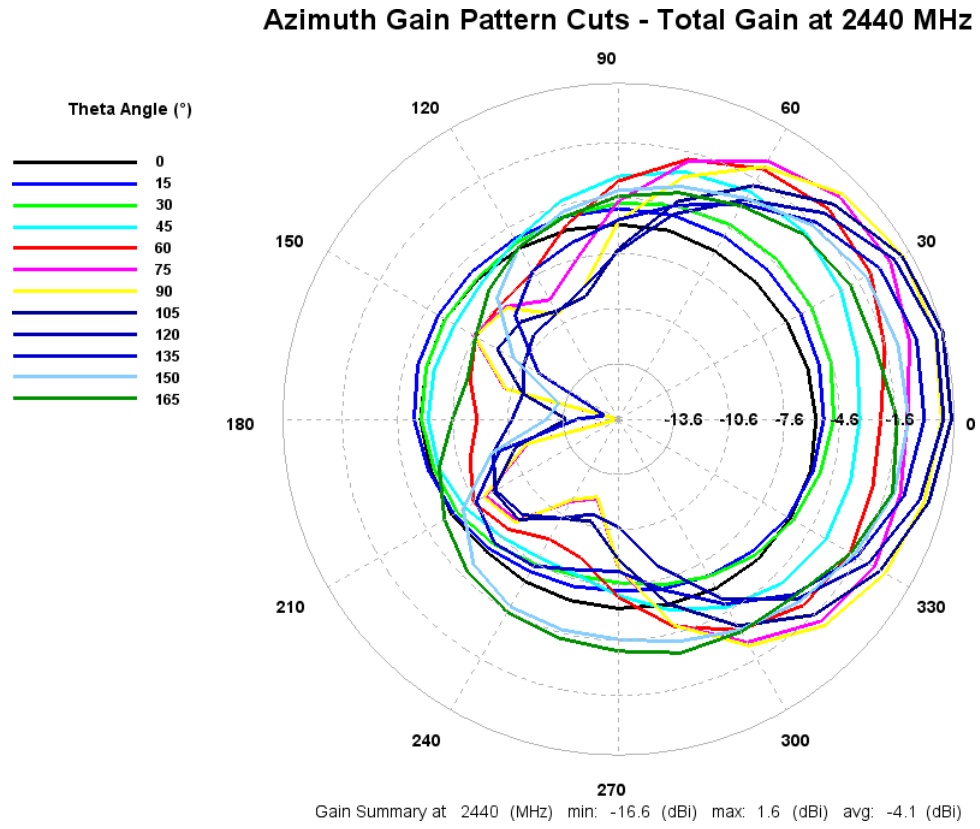

Figure 7: Total gain pattern – 2440 MHz

3D Plots at 2440 MHz

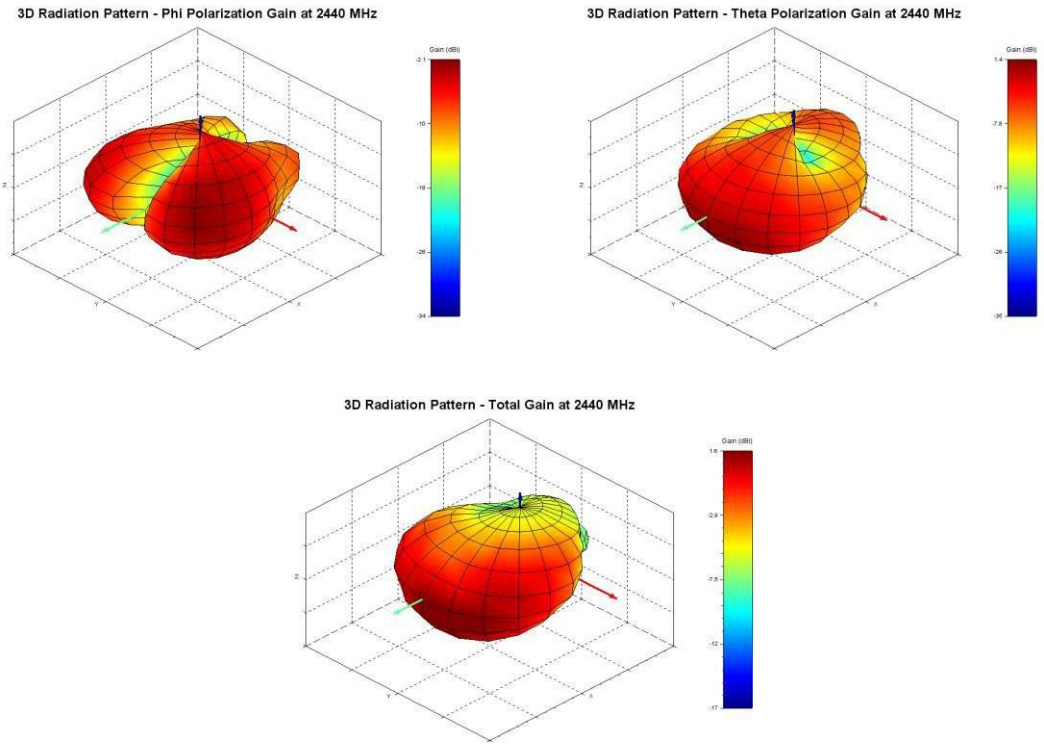

Figure 8: Phi, theta, and total gain plots – 2440 MHz

7.2.3 2480 MHz

Azimuthal Conical Cuts at 2480 MHz

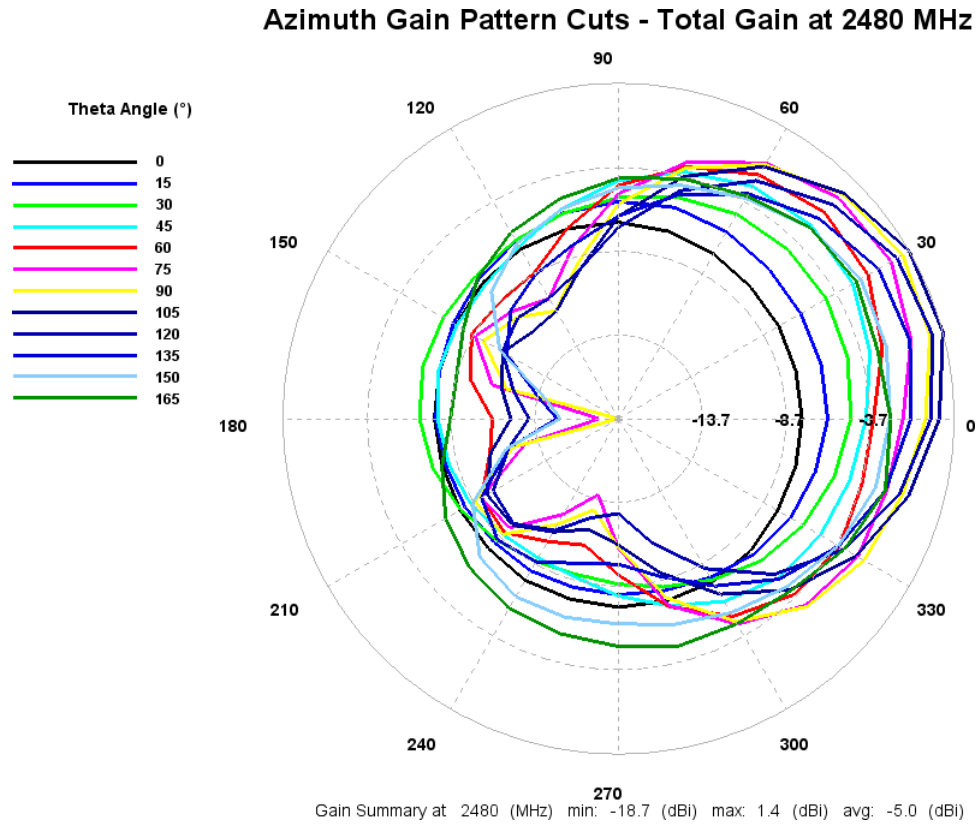

Figure 9: Total gain pattern – 2480 MHz

3D Plots at 2480 MHz

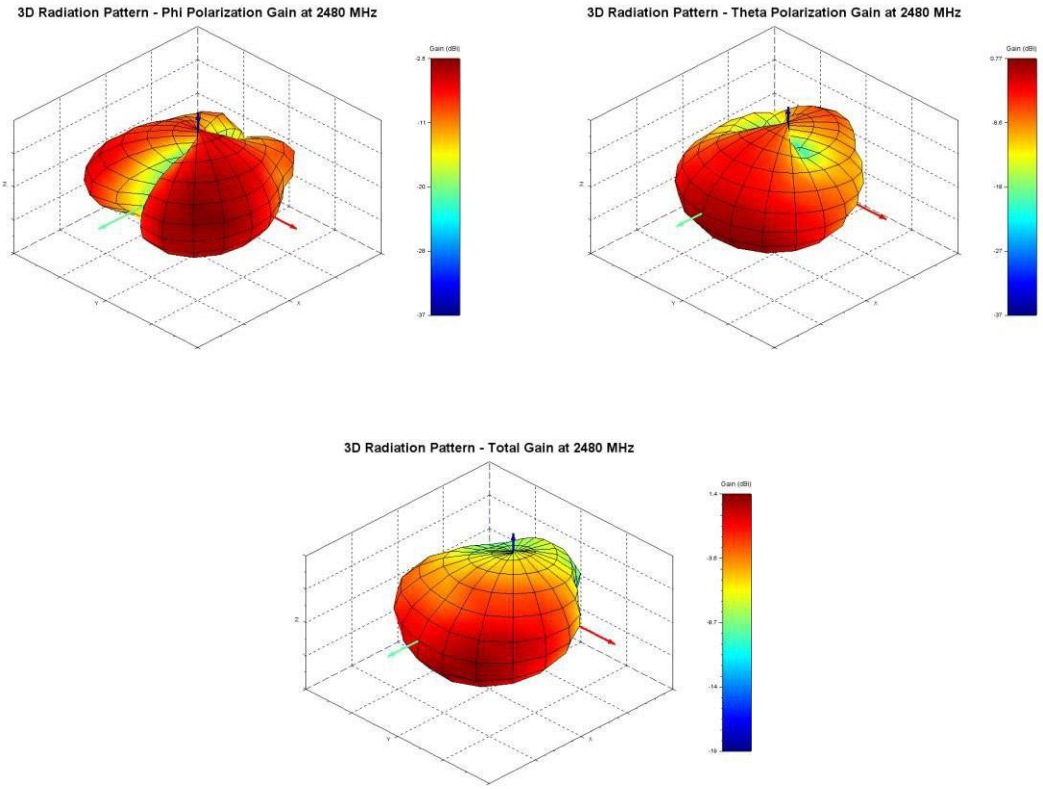

Figure 10: Phi, theta, and total gain plots – 2480 MHz

8. Curved Surface Antenna Radiation Performance

8.1 Antenna Setup

The mFlexPIFA is placed on the outside of a 60-mm outer diameter metal tube.

Figure 11: Convex curve setup

8.2 Results – Curved Surface

8.2.1 2440 MHz

Azimuthal Conical Cuts at 2440 MHz

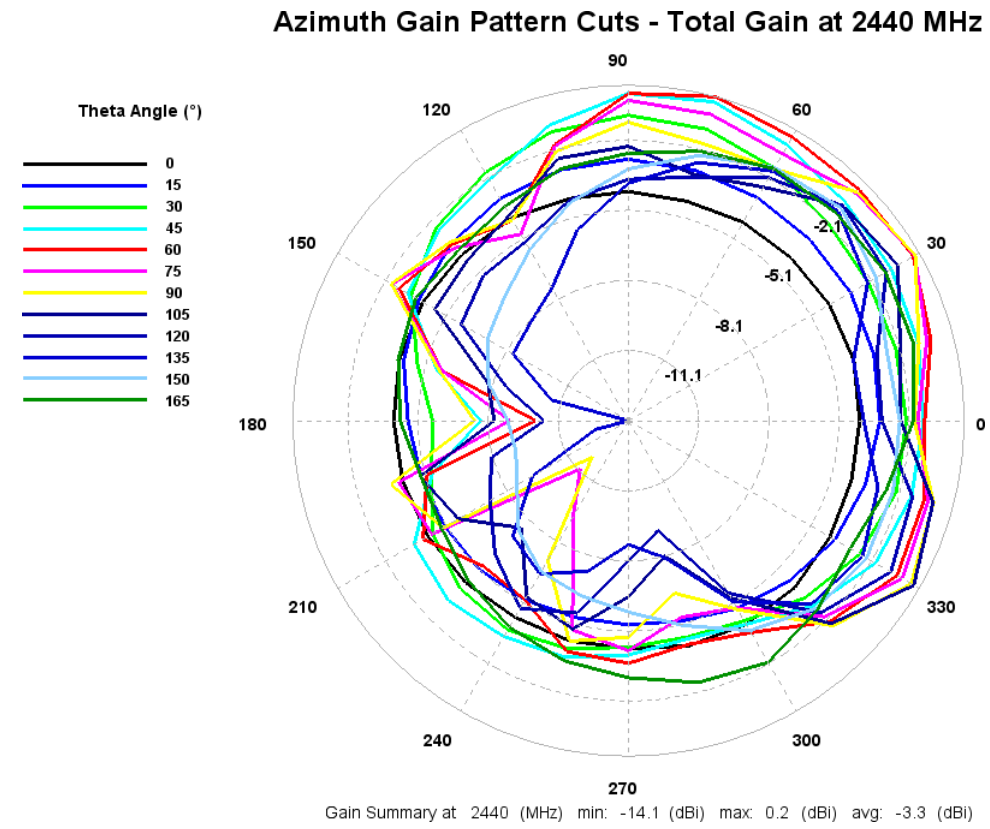

Figure 12: Total gain pattern – 2440 MHz

3D Plots at 2440 MHz

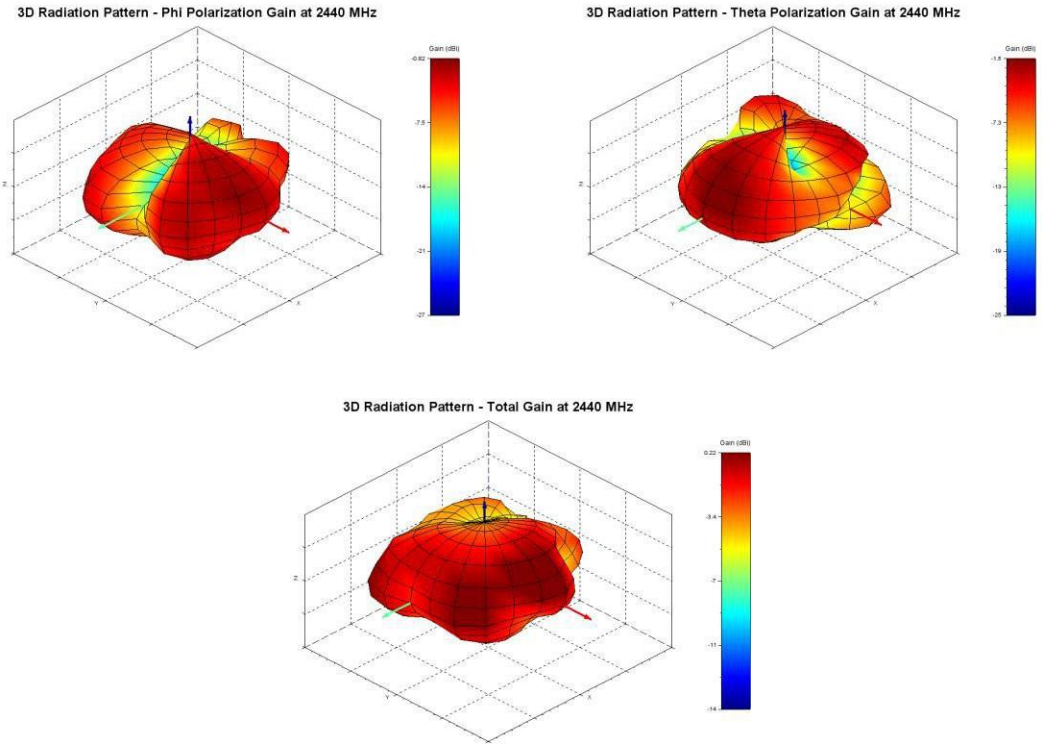

Figure 13: Phi, theta, and total gain plots – 2440 MHz

9. Optimal Installation Guide

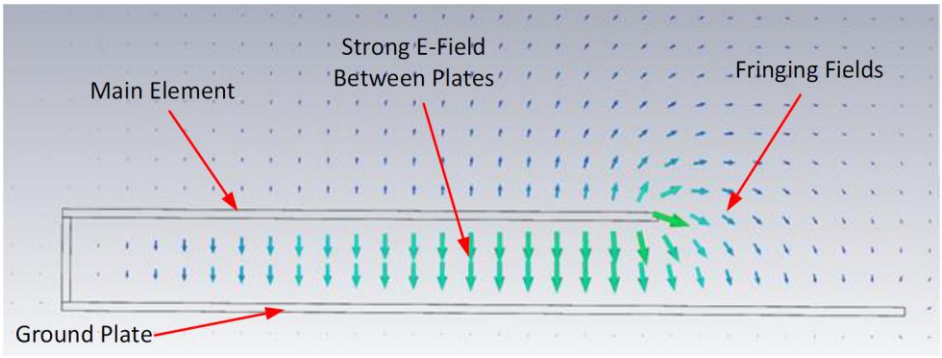

Figure 14: E-field radiation from the FlexPIFA. Taken from CST simulation

Keep the main element clear of any non-metal objects (such as plastics) on top of it by at least three millimeters (see Figure 15).

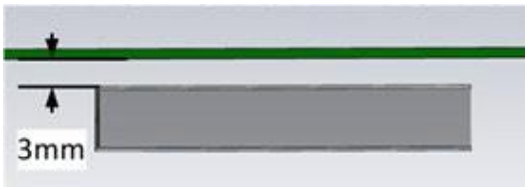

Figure 15: Top clearance

Similarly, keep the two long sides of the mFlexPIFA clear of any non-metal objects by at least two millimeters (see Figure 16). For metal objects, the top side of the mFlex should be kept clear by at least two millimeters and the bottom side of the mFlex at least 12 millimeters (see Figure 17). Images below are based on the 2.4GHz FlexPIFA (Laird PN: 001-0014) and used for reference only.

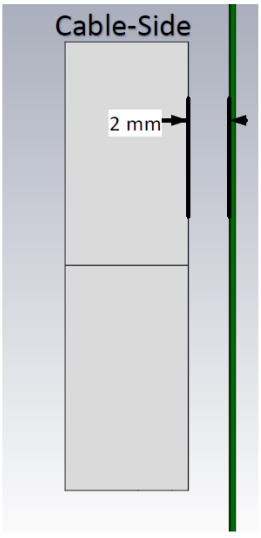

Figure 16: Non-metal side clearance (Top View)

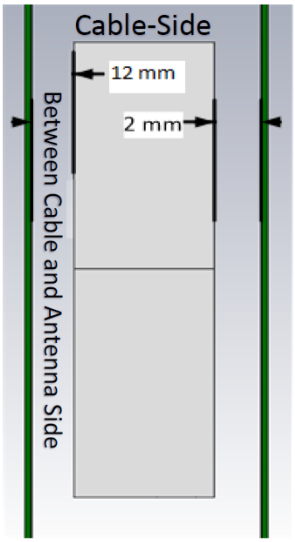

Figure 17: Metal side clearance (Top View

A one-millimeter clearance should be observed from the ground wall to any non-metal object (Figure 18). A 15-millimeter clearance should be observed for metal objects (Figure 19).

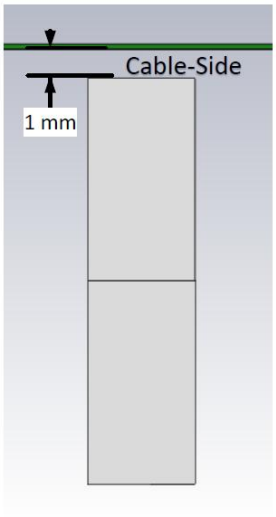

Figure 18: Non-metal ground wall clearance

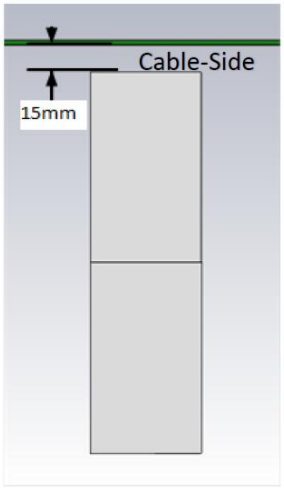

Figure 19: Metal ground wall clearance

Important! Mounting the mFlexPIFA in a situation that does not allow for these clearance recommendations may change the gain characteristics stated in the datasheet, which could impact overall range of the wireless system.

The ideal material for the mFlexPIFA to be mounted on (for maximum performance) is brass. However, as previously mentioned, the mFlexPIFA can tolerate other metallic surfaces and thicknesses and still radiate effectively. Depending on the type of material, the mFlexPIFA may be detuned.

The coaxial cable feeding the mFlexPIFA should be routed away from the antenna. Do not run the coaxial cable over the top of the mFlexPIFA or near the tip of the main element. The cable should be routed perpendicular to the side of the mFlexPIFA (this is the way the cable comes assembled) or away from the ground wall. These options are shown in Figure 20.

Perpendicular to the Side	Away from the Ground Wall

Figure 20: Recommended cable routing	

As with any antenna, do not place objects near the antenna (except as described in the next section). Other objects, such as an LCD display, placed near the antenna may not affect its tuning but can distort the radiation pattern. Materials that absorb electromagnetic fields should be kept away from the antenna to maximize performance.

The following are some common things to keep in mind when placing the antenna:

- Wire routing
- Speakers – These generate magnetic fields
- Battery location
- Proximity to human body
- Display screen – These absorb radiation

9.1 Flex Limits of the mFlexPIFA

One of the unique features of the mFlexPIFA is its ability to flex. However, due to the adhesive, there are limits to how much the antenna can be flexed and still remain secured to the device. The mFlexPIFA should not be flexed in a convex position with a radius less than 60 millimeters. Going smaller than this may result in the antenna peeling off the surface over time. Should a tighter radius of curvature be required, we recommend that you contact Laird/LSR Design Services for assistance.

Figure 21: Convex mounted

We do not recommend mounting the mFlexPIFA in a metal-enclosed concave position. In this scenario, the limiting factor is performance. The ground plate of the antenna is pressed closer to the main element. The fringing fields developing off the end of the element are responsible for most of the radiation. In a concave position, the fringing fields are adversely affected and gain suffers. This can also potentially create a Faraday's cage and cancel most of the RF radiation from the antenna.

If a concave position is required, we recommend that you contact Laird/LSR Design Services for assistance.

Note: The mFlexPIFA is not designed to be twisted or crumpled. The adhesive back should lay flush with the surface on which it is mounted.

10. Product Revision History

Rev 1: Initial Production Realse

11. Contacting Laird

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