

# SPECIFICATION

Part No.	:	<b>FXP72.07.0053A</b>
Product Name	:	FXP72 Freedom 2.4GHz Series Ground Coupled Antenna
Feature	:	4dBi Gain IPEX MHFI Connector (U.FL compatible) 53 mm Cable 31 x 31 x 0.1 mm RoHS Compliant



## 1. Introduction

The FXP72 Freedom 2.4GHz Antenna works on WiFi, ZigBee, Bluetooth and ISM band at 2.4GHz. This antenna has been designed with a specific characteristic of having a ground coupling effect in between the antenna and the device's board, suitable for those devices where there is no clearance in between the enclosure and the board, keeping the antenna performance. The Antenna can be placed above or below of the device's board, but leaving the radiated elements of the antenna free of metal. This design can work on different thickness and plastic materials. We have selected a piece of ABS plastic with 1.5 mm of thickness for testing.

Many module manufacturers specify peak gain limits for any antennas that are to be connected to that module. Those peak gain limits are based on free-space conditions. In practice, the peak gain of an antenna tested in free-space can degrade by at least 1 or 2dBi when put inside a device. So ideally you should go for a slightly higher peak gain antenna than mentioned on the module specification to compensate for this effect, giving you better performance.

Upon testing of any of our antennas with your device and a selection of appropriate layout, integration technique, or cable, Taoglas can make sure any of our antennas' peak gain will be below the peak gain limits. Taoglas can then issue a specification and/or report for the selected antenna in your device that will clearly show it complying with the peak gain limits, so you can be assured you are meeting regulatory requirements for that module.



For example, a module manufacturer may state that the antenna must have less than 2dBi peak gain, but you don't need to select an embedded antenna that has a peak gain of less than 2dBi in free-space. This will give you a less optimized solution. It is better to go for a slightly higher free-space peak gain of 3dBi or more if available. Once that antenna gets integrated into your device, performance will degrade below this 2dBi peak gain due to the effects of GND plane, surrounding components, and device housing. To ensure antenna performance contact Taoglas for testing services. Choosing a Taoglas antenna with a higher peak gain than what is specified by the module manufacturer and enlisting our help will ensure you are getting the best performance possible without exceeding the peak gain limits.

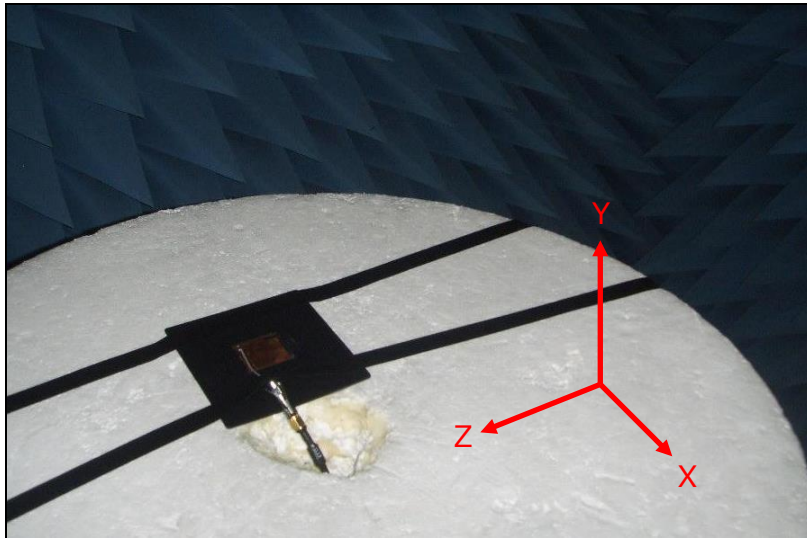
## 2. Specifications

ELECTRICAL				
Communication System	Bluetooth	WiFi	ZigBee	2.4GHz ISM
	2401-2480	2412-2462	2410-2480	2400-2483.5
Efficiency	70%			
Gain	5dBi			
Free Space Peak Gain	-0.5dBi			
Return Loss	-14dB			
Impedance	50 Ohms			
VSWR	≤2.0:1			
Polarization	Linear			
Power Handled	5 W			
MECHANICAL				
Dimensions	31 X 31 X 0.08 mm			
Weight	1.2 g			
Connector	MHFI (U.FL Compatible)			
Cable Standard	Mini-Coax 1.13 mm			
Cable Length and color	53 mm, Black			
ENVIRONMENTAL				
Operation Temperature	-40 °C ~ +85 °C			
Storage Temperature	-40 °C ~ +85 °C			
RoHS Compliant	Yes			
Adhesive	3M 467			

## 3. Antenna Characteristics

### 3.1. Test Setup

A Satimo SG24 3D Scan System with Anechoic Chamber.



**Figure 1.** Satimo System.

Agilent 8753ES Vector Network Analyzer.

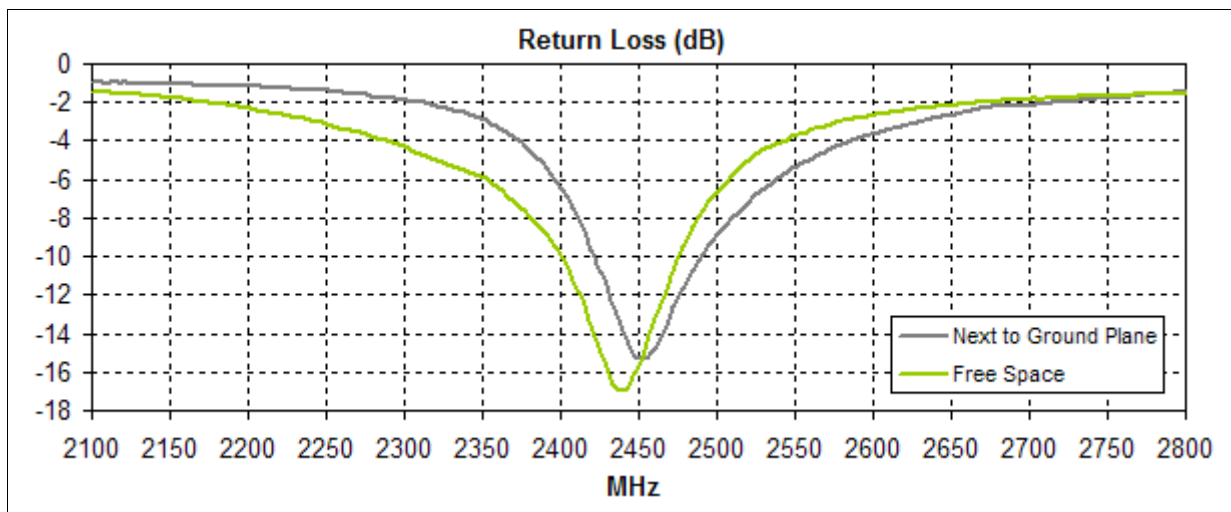


**Figure 2.** Network Analyzer.

### 3.2. Antenna Parameters

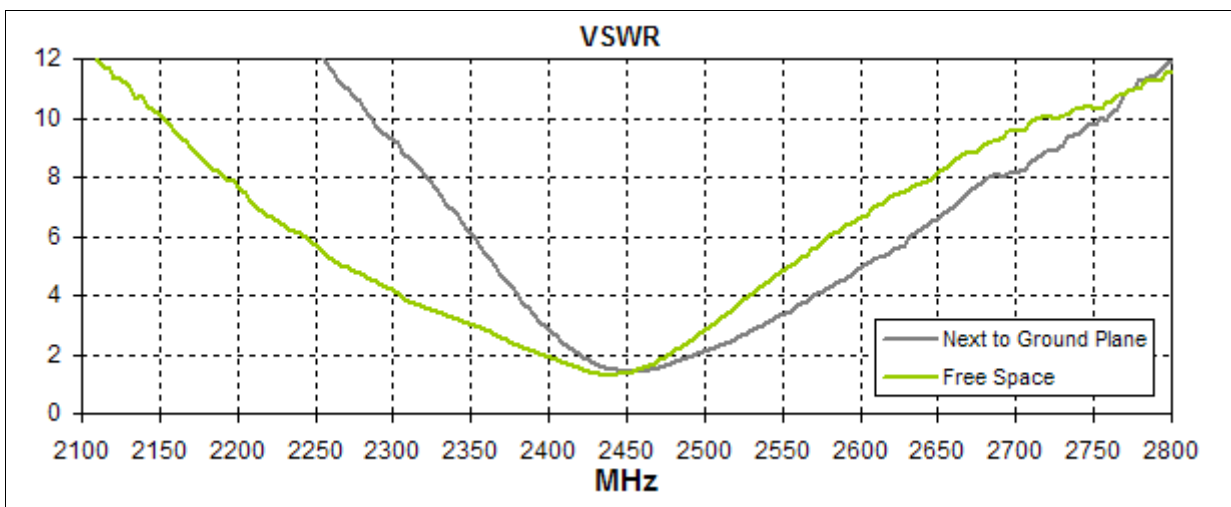
The next antenna parameter graphs like Return Loss, Smith Chart and VSWR were measured in the Agilent 8753ES Vector Network Analyzer. The Gain, Efficiency and Radiation Patterns were measured in the reliable Satimo 3D Scan System.

### 3.3. Return Loss



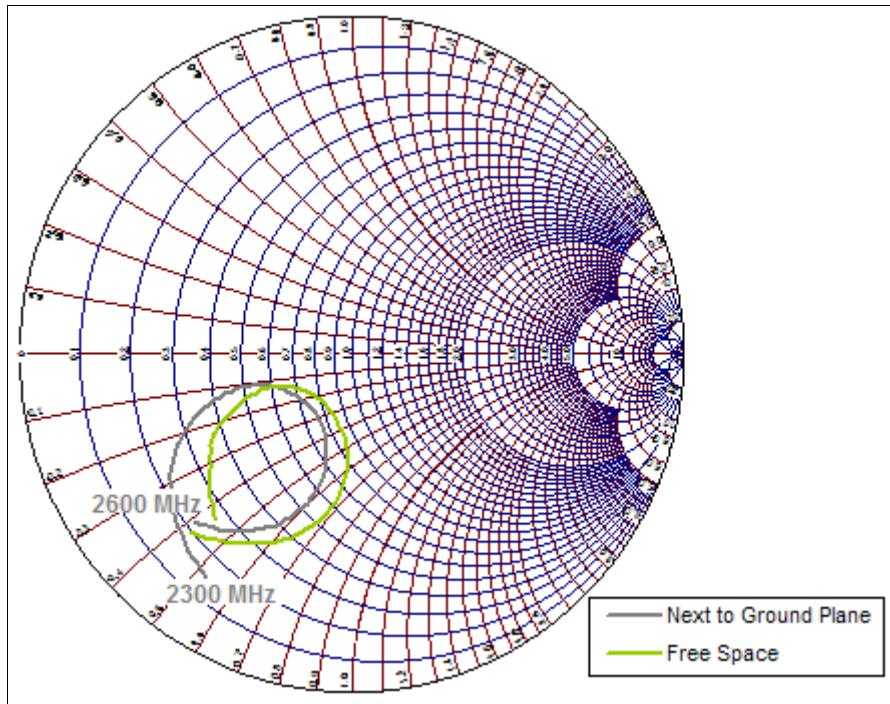
**Figure 3.** Return Loss for the FXP72 Antenna.

### 3.4. VSWR



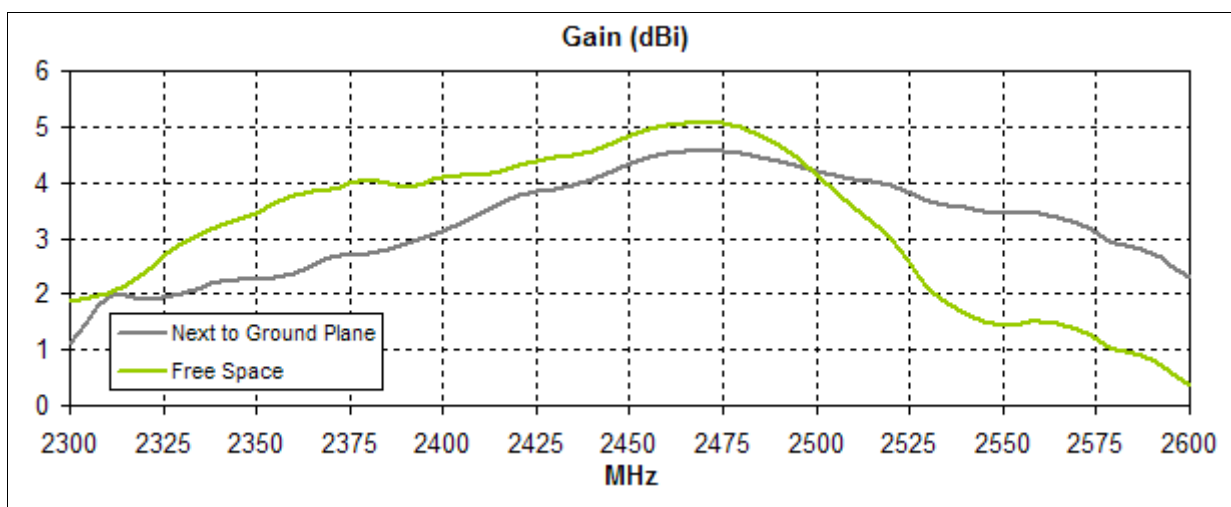
**Figure 4.** VSWR for the FXP72 Antenna.

### 3.5. Smith Chart



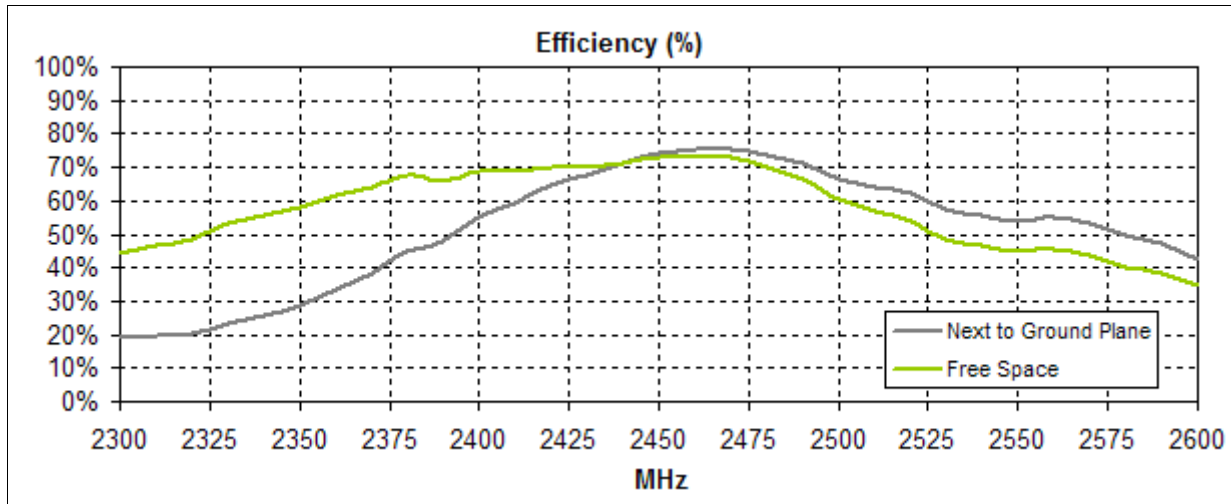
**Figure 5.** Smith Chart for the FXP72 Antenna.

### 3.6. Gain



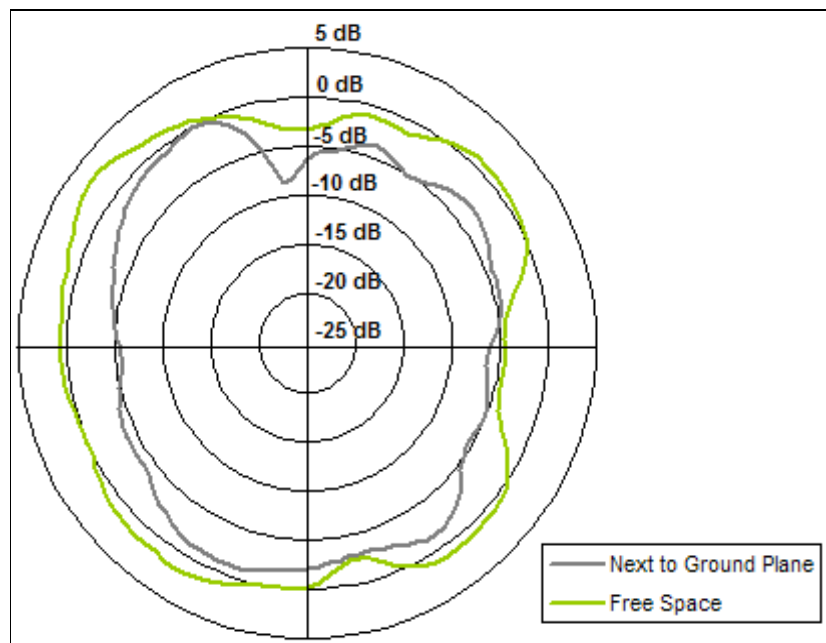
**Figure 6.** Gain for the FXP72 Antenna.

### 3.7. Efficiency



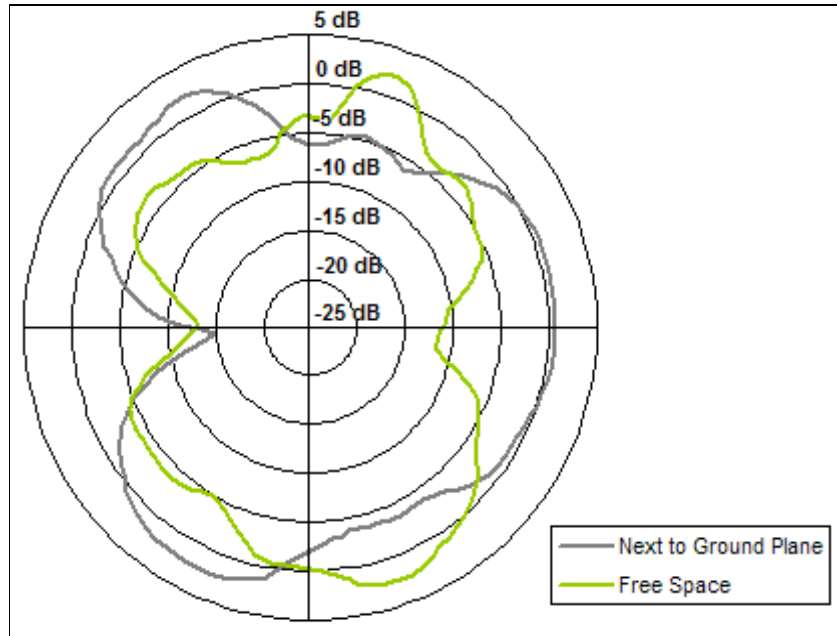
**Figure 7.** Efficiency for the FXP72 Antenna.

### 3.8. Radiation Patterns

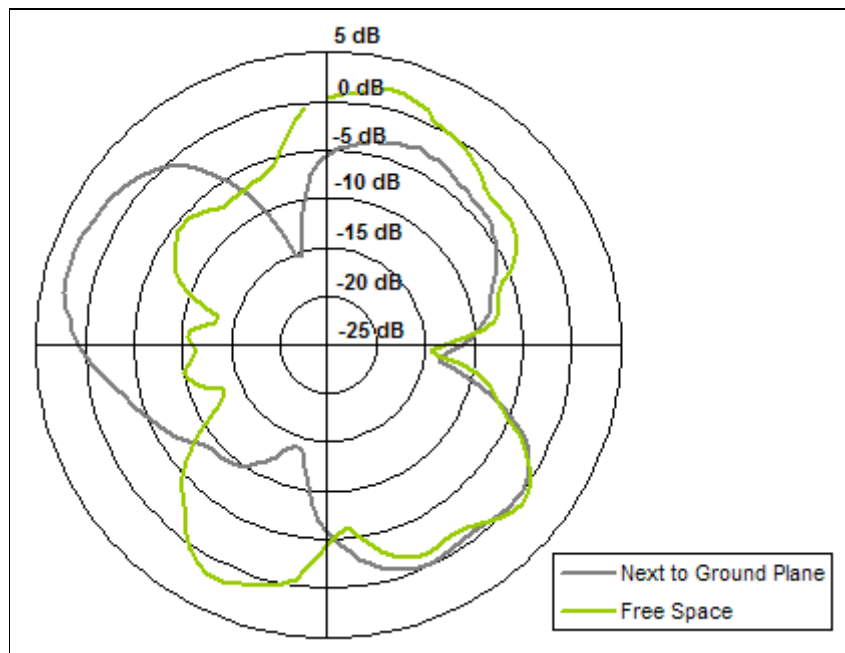


**Figure 8.** Radiation pattern XZ Plane at 2.44 GHz, Figure 1 as reference.



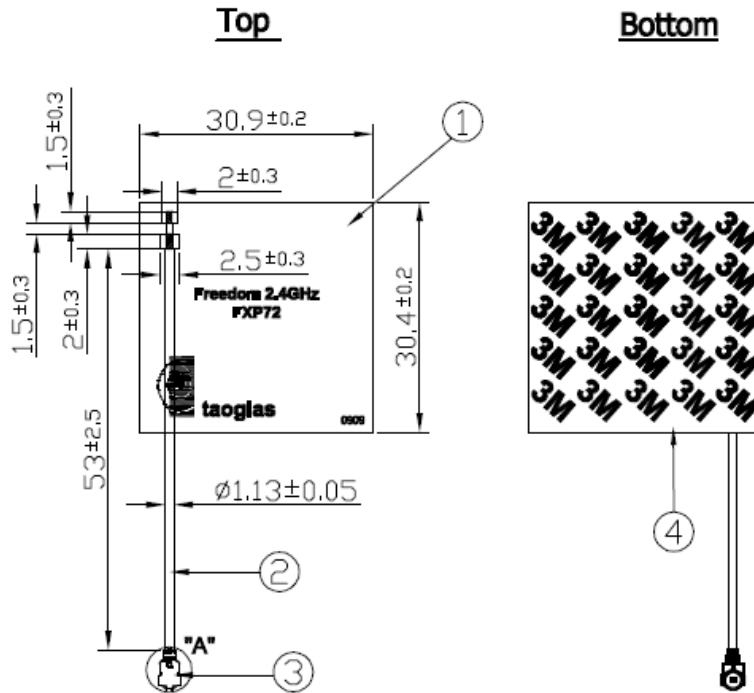


**Figure 9.** Radiation pattern XY Plane at 2.44 GHz, Figure 1 as reference.

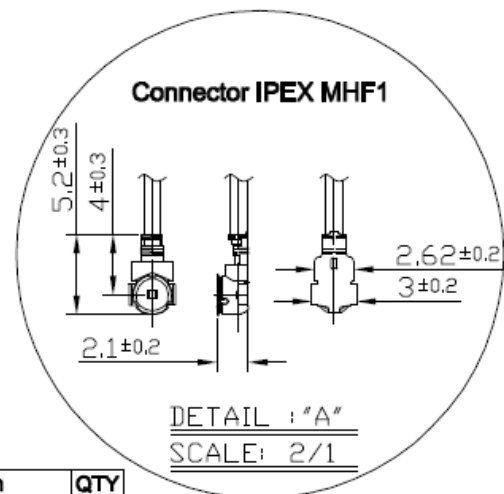


**Figure 10.** Radiation pattern YZ plane at 2.44 GHz, Figure 1 as reference.

## 4. Mechanical Drawings (Unit: mm)



All material must be RoHS compliant.  
Open/Short QC , VSWR required.

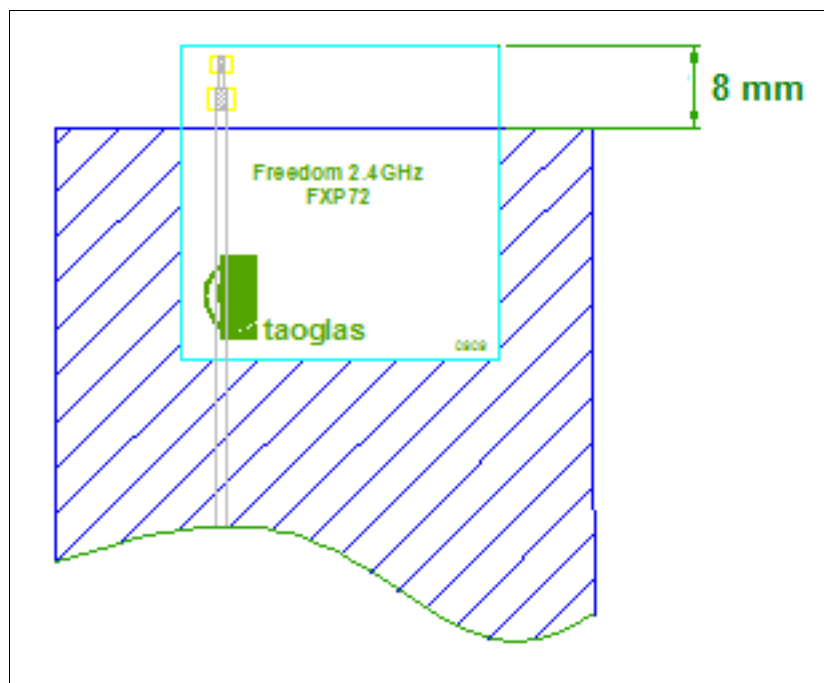


	Name	Part No.	Material	Finish	QTY
①	FXP72 PCB		FPCB 0.1t	Black	1
②	1.13 Coaxial Cable		FEP	Black	1
③	IPEX MHF1		Brass	Gold	1
④	Double-Sided Adhesive		3M 467	Brown Liner	1

## 5. Mounting Guidelines

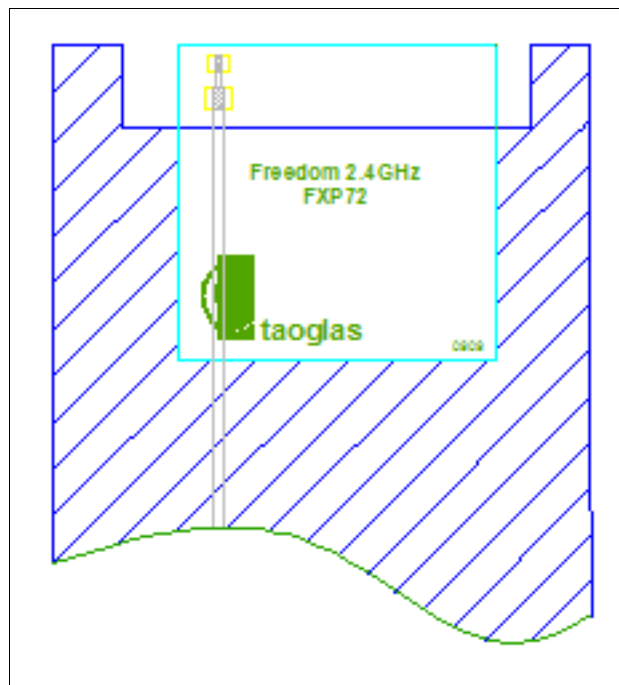
This versatile antenna design is suitable for cases where there is not enough space for a thicker antenna. FXP72 can be right next to the device main board. This antenna uses the device main board as a ground plane through a capacitive coupling effect and keeping antenna characteristics.

The only restriction for this design is the radiated elements of the antenna must be free of metal. In the next figure 12 is shown the minimum clearance necessary for the antenna and on Figure 13 the non-desired main board shape on the antenna section. The size of the ground plane used on the testing is 40X60 mm and was allocated as in figure 12.



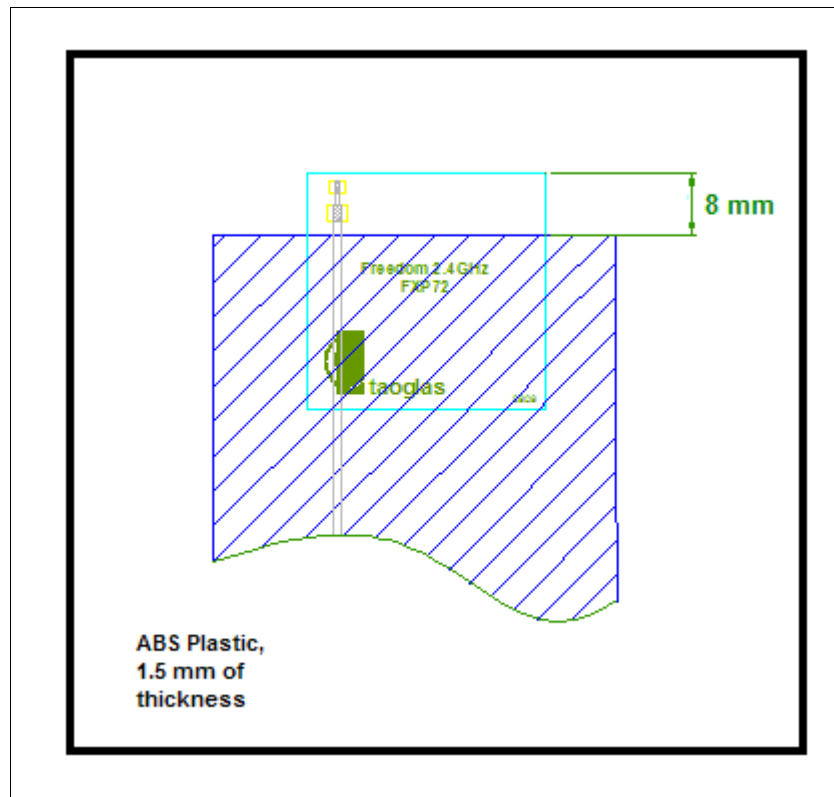
**Figure 12.** Mounting Guidelines.

The size and shape of the ground plane can change. The only restrictions to get maximum performance are that the antenna must be allocated along the shortest edge of the device board, and the ground plane on that edge must have a flat shape horizontally, in other words the ground plane can not come around of the antenna sides on that section. The next figure 13 shows a non desired ground plane environment.



**Figure 13.** Not recommend ground plane.

The size of the ground plane used on the testing had a dimension of 40X60 mm, see next figure 14. The antenna was placed in the center of one shortest edge. The antenna was in between the ABS plastic and ground plane, having a clearance of 8 mm. The Antenna was tested into the Satimo system chamber and with a network analyzer. The antenna was also tested on in free space, just the antenna stuck out on the ABS plastic of 1.5 mm of thickness.



**Figure 14.** Ground plane test set up.

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