## TITLE

# 868/915MHZ ISM STAND ALONE ANTENNA

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# 865/915MHZ ISM STAND ALONE ANTENNA

## 1.0 SCOPE

This specification describes the antenna application and surrounding. The information in this document is for reference and benchmark purposes only. The user is responsible for validating antenna RF performance based on the user's actual implementation.

Antenna illustrations in this document are generic representations. They are not intended to be an image of any antenna listed in the scope.

## 2.0 PRODUCT DESCRIPTION

### 2.1 PRODUCT NAME AND SERIES NUMBER (S)

Product name: 865/915MHz ISM Stand Alone Antenna

Series Number: 105262

### 2.2 DESCRIPTION

Series 105262 is a ISM standard alone antenna for 868/915 MHz applications, including LoRa, Neul, SigFox, Z-Wave, Zigbee and others. This antenna is made from poly flexible material with size 79*10*0.1mm, and has double-sided adhesive tape for easy "peel and stick" mounting. This balanced antenna with ground plane independent design offers various cable length options for ease of integration into various devices.

### 2.3 PRODUCT STRUCTURE INFORMATION

Please refer to PS-1052620100 for full information.

MOLEX ANTENNA 3D VIEW

## 3.0 APPLICABLE DOCUMENTS

| DOCUMENT | NUMBER | DESCRIPTION |
|---|---|---|
| Sale Drawing (SD) | SD-1052620001 | Mechanical Dimension of the product |
| Product Specification (PS) | PS-1052620001 | Product Specification |
| Packing Drawing (PK) | PK-1052620001 | Product packaging specifications |

## 4.0 ANTENNA PERFORMANCE

### 4.1 RF TEST CONDITIONS

All measurements are done of the antenna mounted on a PC/ABS material block of 2mm thickness with VNA Agilent 5071C and Over-The-Air (OTA) chamber. All measurements in this document are done with the part No.1052620001 with a cable length of 100mm.

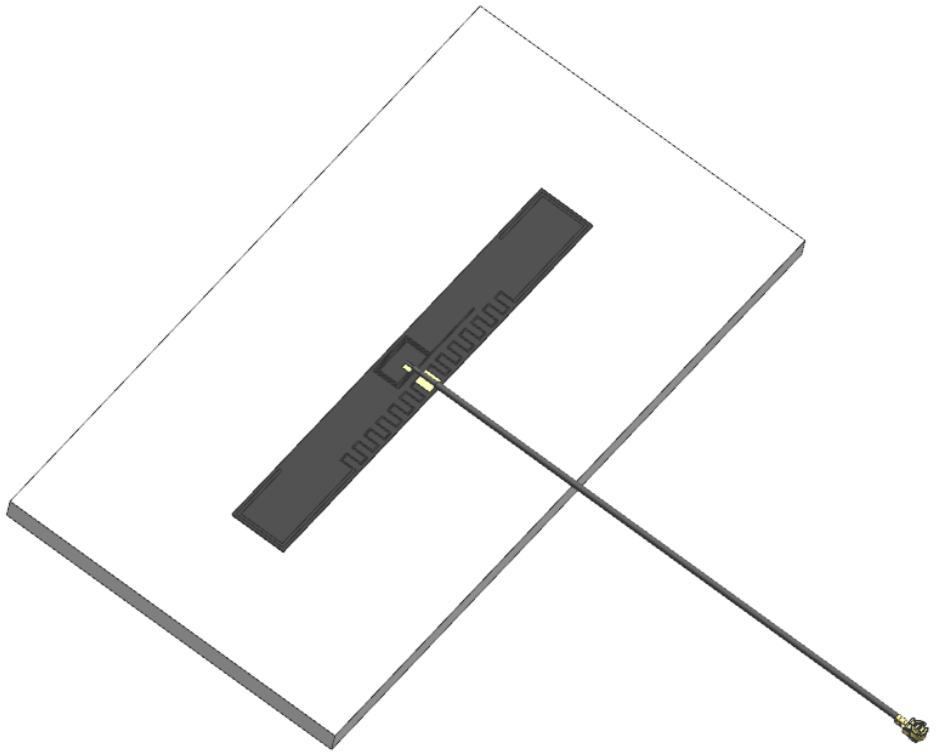

**FIGURE4.1.1 ANTENNA LOADED WITH PC/ABS BLOCK OF 2MM THICKNESS**


**FIGURE4.1.2 ANTENNA LOADED WITH PC/ABS BLOCK OF 2MM THICKNESS TESTED WITH VNA E5071C**

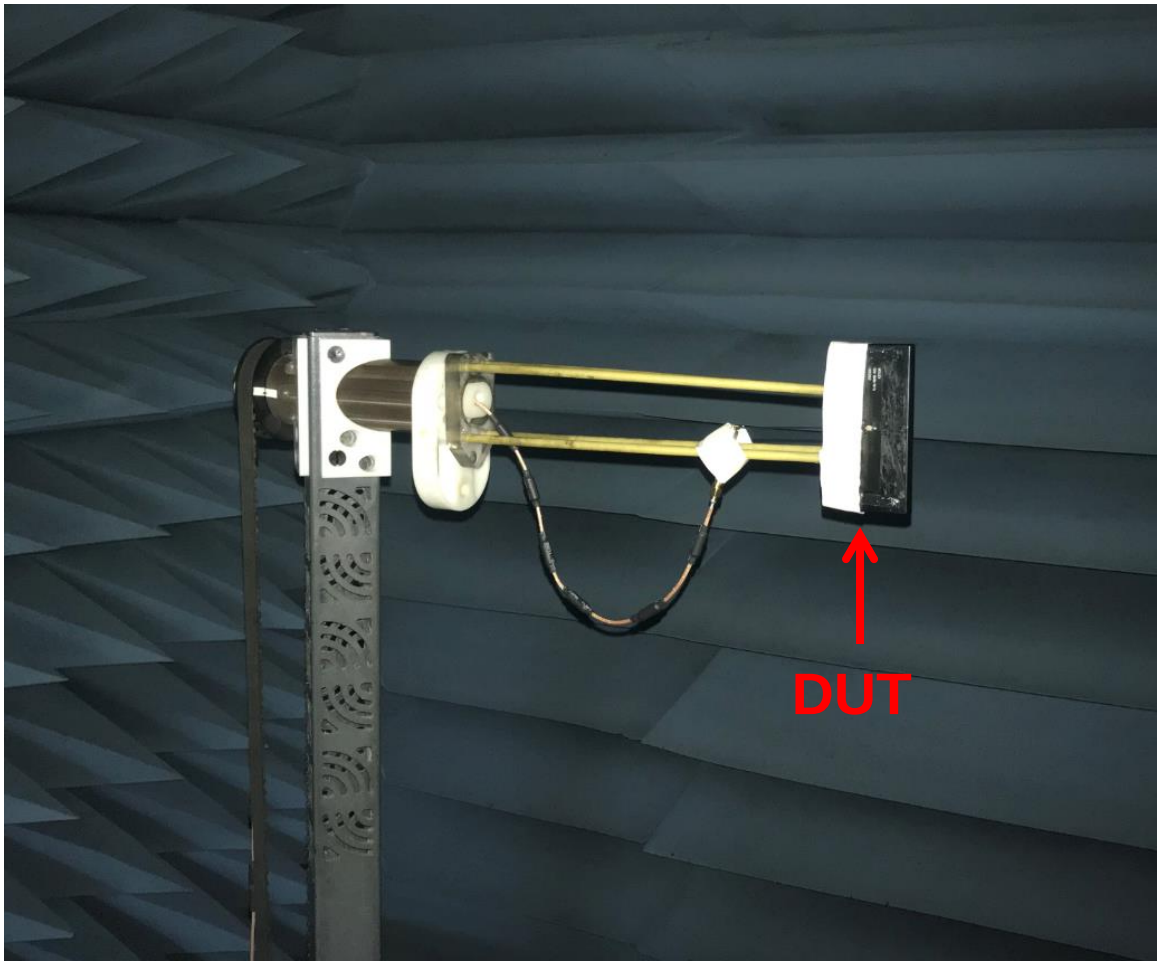


**FIGURE4.1.3 ANTENNA LOADED WITH PC/ABS BLOCK OF 2MM THICKNESS TESTED IN OTA CHAMBER**

### 4.2 ANTENNA PERFORMANCE

| DESCRIPTION | EQUIPMENT | REQUIREMENT (CABLE LENGTH:100MM) | |
|---|---|---|---|
| Frequency Range | VNA E5071C | 868-870MHz | 902-928MHz |
| Return Loss | VNA E5071C | < -6 dB | |
| Peak Gain (Max) | OTA Chamber | 0.4 dBi | 1.6 dBi |
| Average Total Efficiency | OTA Chamber | >55% | >65% |
| Polarization | OTA Chamber | Linear | |
| Input Impedance | VNA E5071C | 50 Ohms | |

Note that the above antenna performance is measured with just the antenna mounted on a PC/ABS block to similar a free-space condition. When implement into the system, the frequency resonant might be off-tune due to the loading of surrounding components especially metal plane. This off-tune can be compensated through matching. Although module manufacturers specify a peak gain limit, it is based on free-space conditions. The peak gain will be degraded by 1 to 2dBi in the actual implementation as the radiation pattern will change due to the surround components. As such, during selection of antenna, you can select one with high peak gain to compensate for the loss. Molex can offer assistant to choose the best location and best tuning in-order to meet this peak gain requirement.

### 4.3 RETURN LOSS PLOT

All measurements in this document are done with cable length of 100mm.

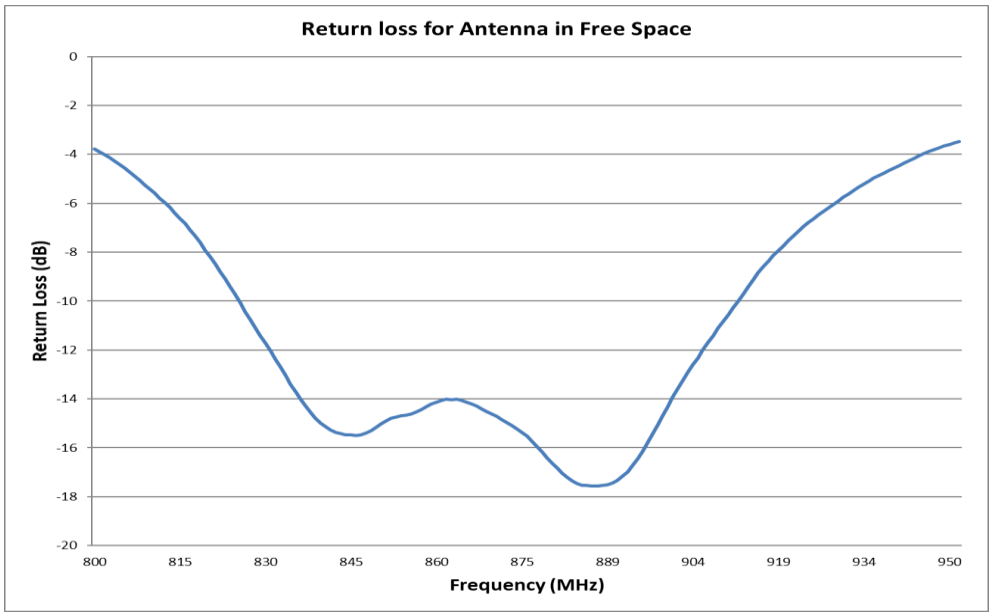


**FIGURE 4.3.1 RETURN LOSS OF ANTENNA IN FREE SPACE WITH**

### 4.4 EFFICIENCY PLOT

All measurements in this document are done with cable length of 100mm.

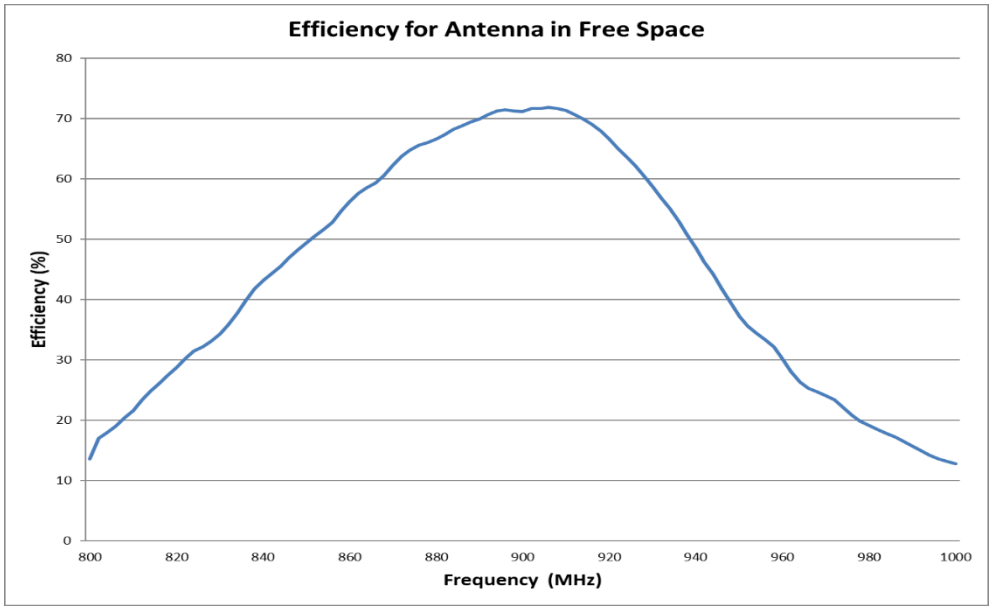


**FIGURE 4.4.1 EFFICIENCY OF ANTENNA IN FREE SPACE**

### 4.5 2D RADIATION PATTERN

All measurements in this document are done with cable length of 100mm.

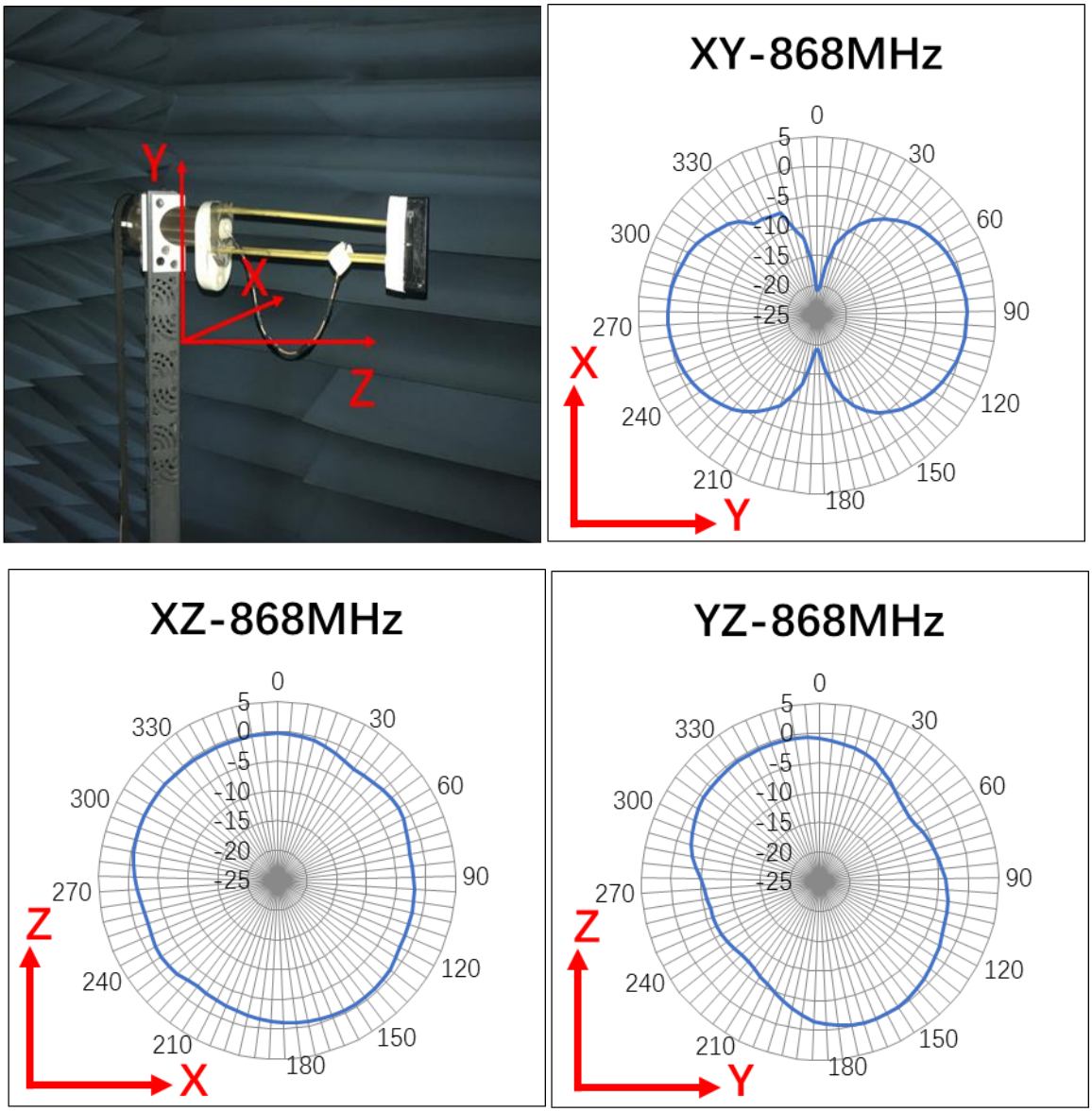


**FIGURE 4.5.1 2D RADIATION PATTERN OF ANTENNA AT 868MHZ IN FREE SPACE**

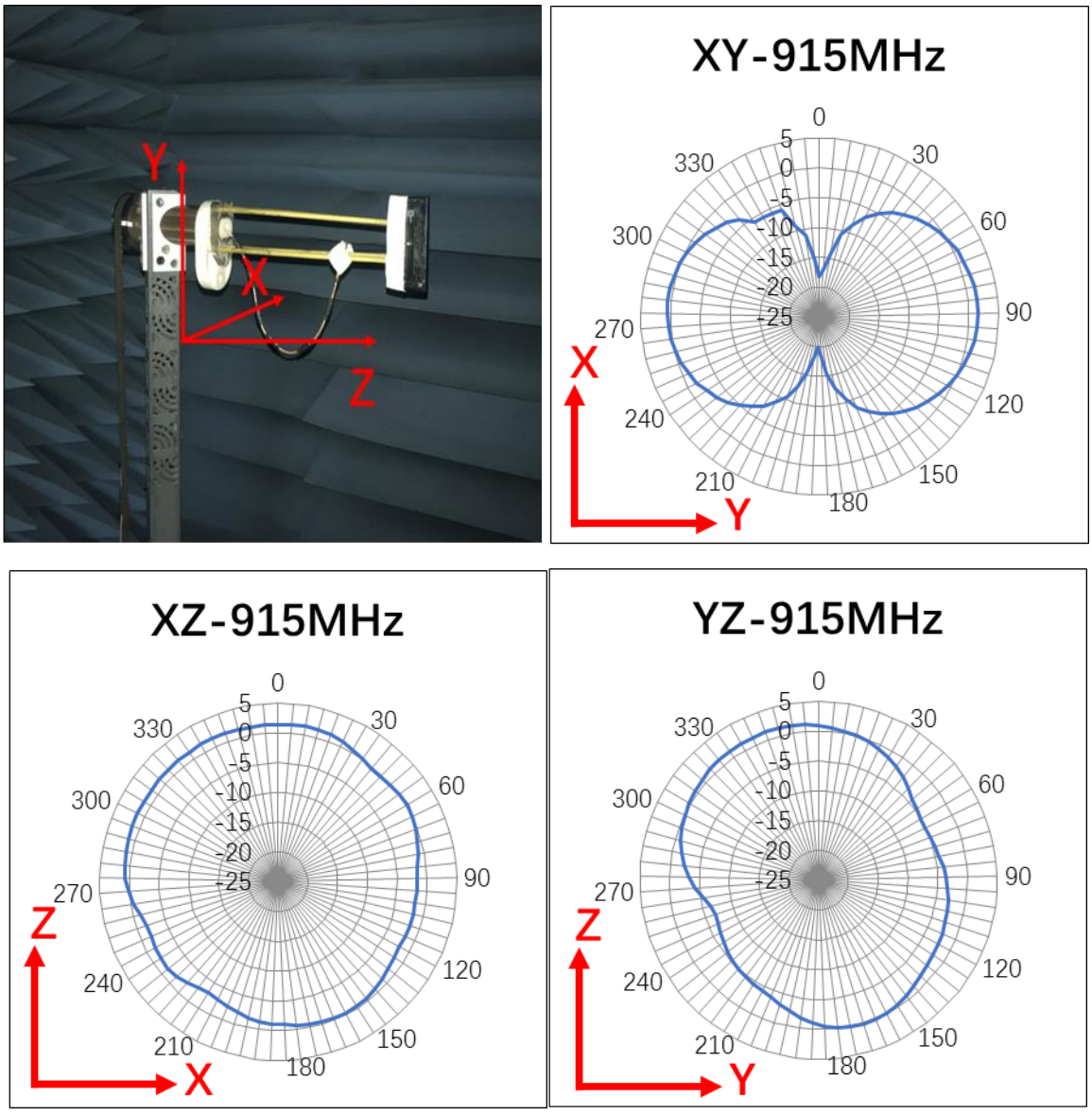


**FIGURE 4.5.2 2D RADIATION PATTERN OF ANTENNA AT 915MHZ IN FREE SPACE**

### 4.6 3D RADIATION PATTERN

All measurements in this document are done with cable length of 100mm.

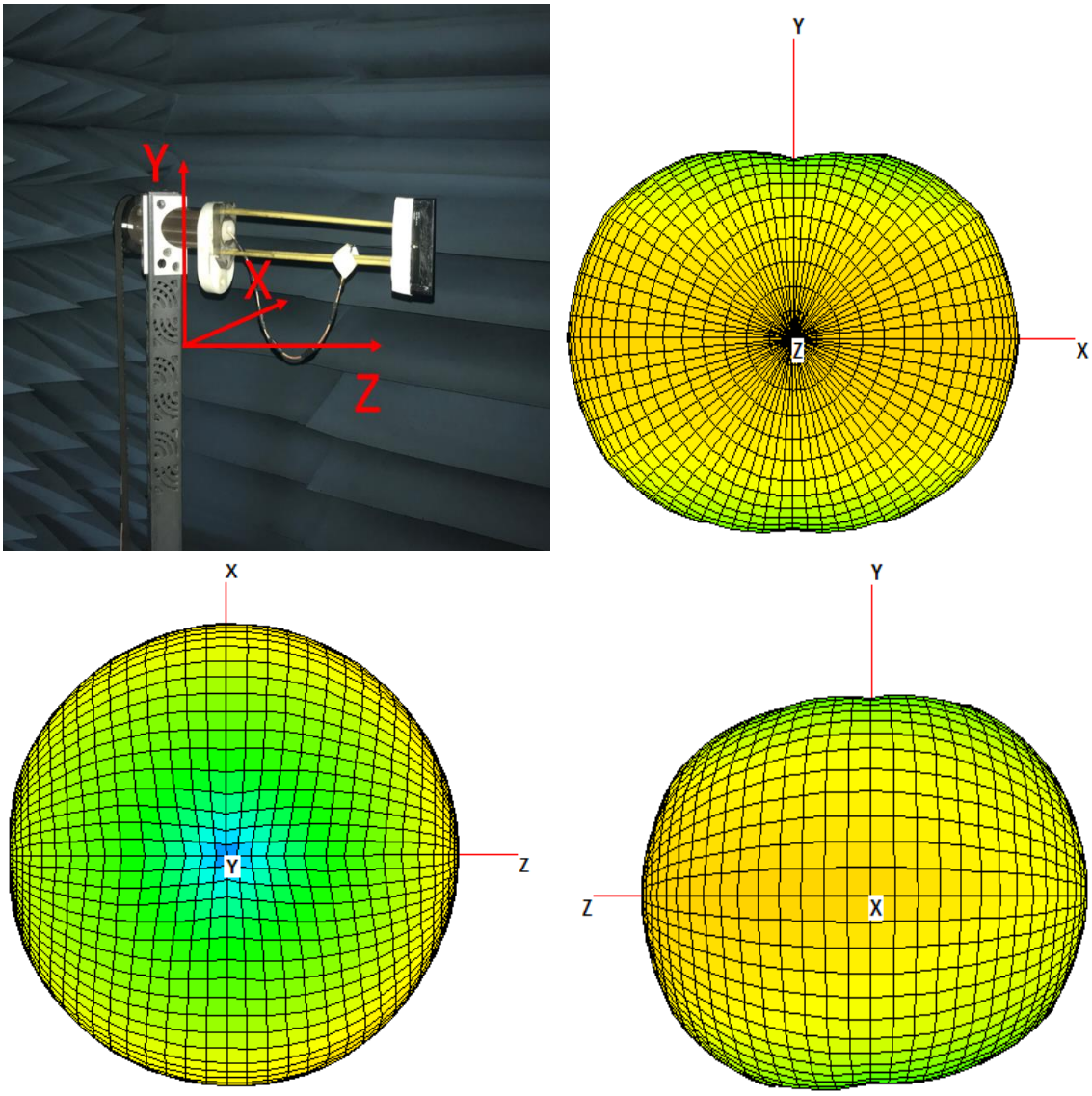


**FIGURE 4.6.1 3D RADIATION PATTERN OF ANTENNA AT 868MHZ IN FREE SPACE**

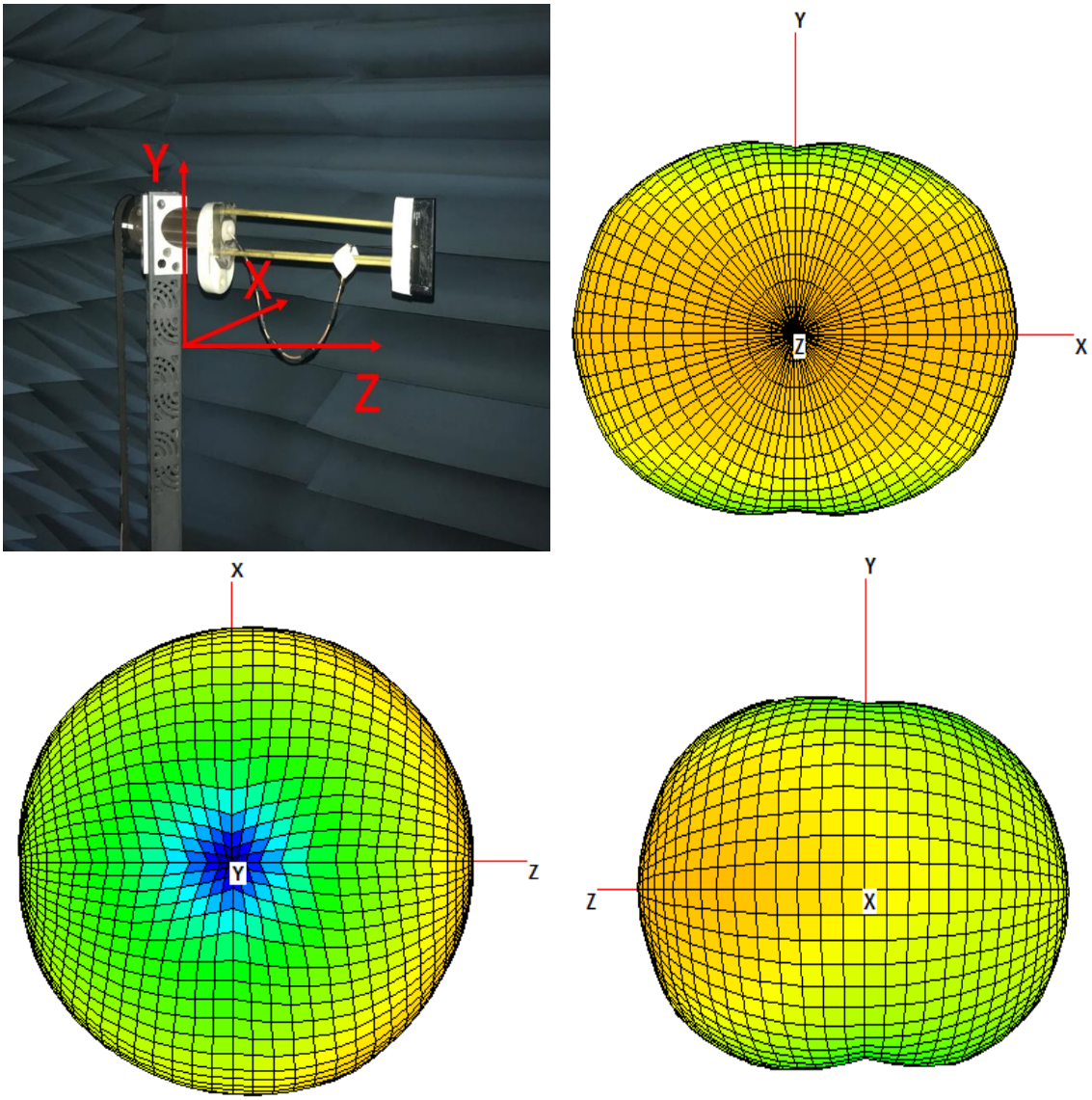


**FIGURE 4.6.2 3D RADIATION PATTERN OF ANTENNA AT 915MHZ IN FREE SPACE**

## 5.0 ASSEMBLY GUIDELINE

The flex antenna comes with an adhesive 3M 9077 for assemble onto the plastic wall of the system. The surface should be smooth with Ra<1.6um, and need to clean the surface before sticking this product. The antenna cannot be placed on a metallic surface.

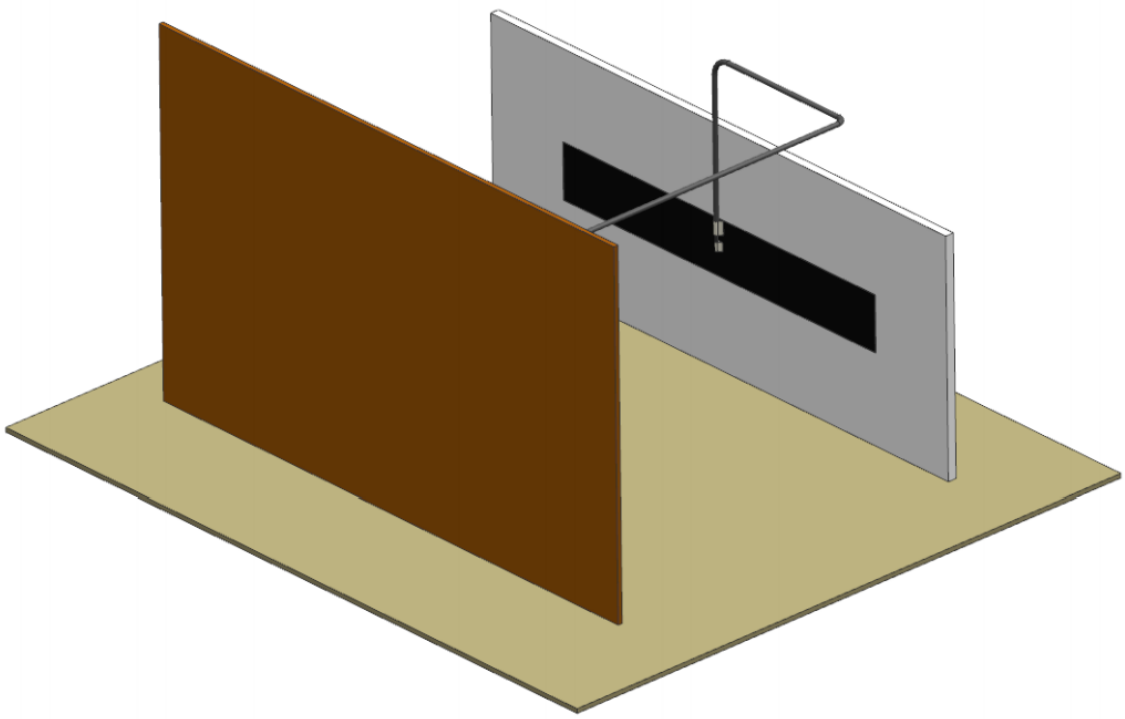

**FIGURE 5.1 ASSEMBLY GUIDELINE**

During the assembly of the antenna in a device, the cable needs to be positioned away from the antenna flex to achieve best performance. The cable must be away from the pattern at least 5mm as shown in figure 5.2. If the cable crosses into the antenna flex, the antenna performance will be degraded.

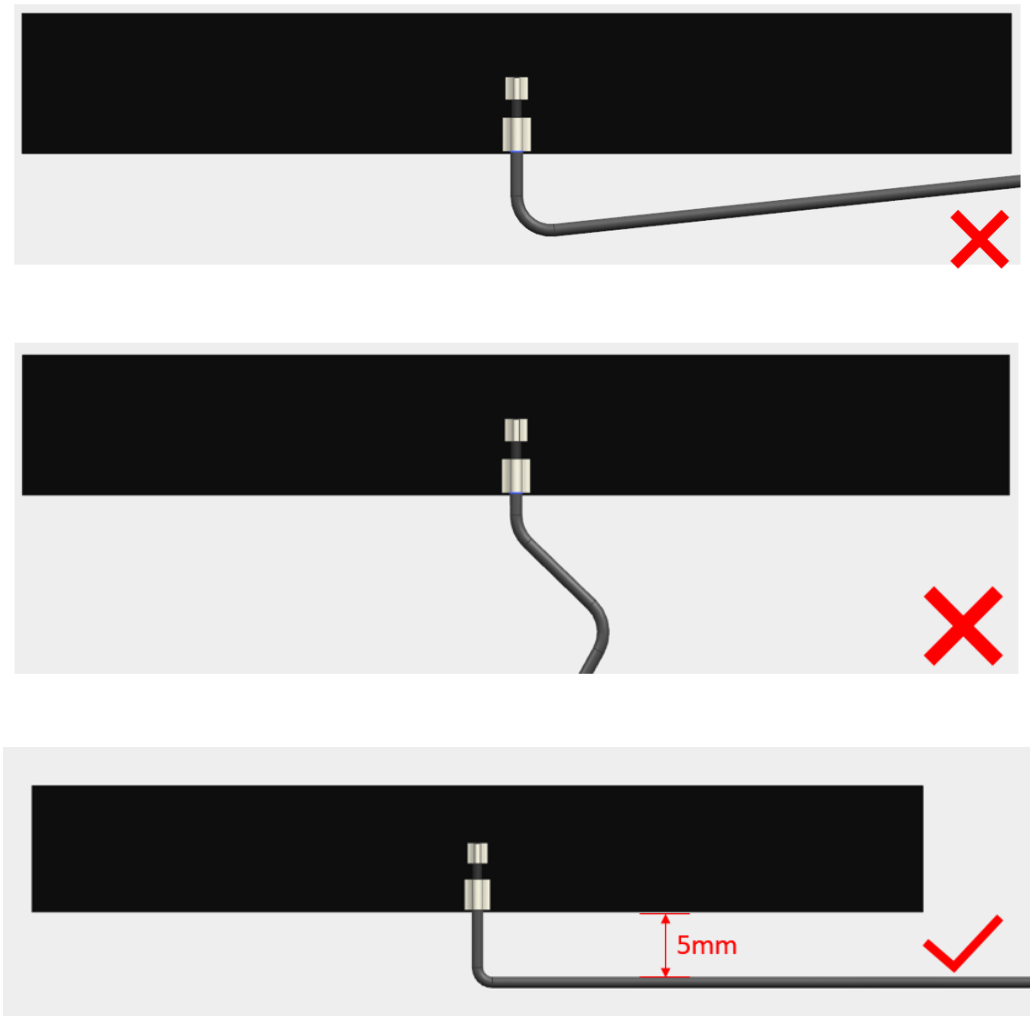


**FIGURE 5.2 CABLE BENDING**

## 6.0 THE ANTENNA PERFORMANCE VARIATION WITH CABLE LENGTH

### 6.0.1 CABLE LOSS

| ITEM | DESCRIPTION | TEST CONDITION | REQUIREMENT |
|---|---|---|---|
| 6.0.1.1 | Frequency Range | 500MHz~1GHz | 500MHz~1GHz |
| 6.0.1.2 | Attenuation | 1m cable measured by VNA5071C | ≤1.8dB/m |

### 6.0.2 CABLE LENGTH AFFECT THE ANTENNA PERFORMANCE

Balance antenna resonance is insensitive by cable length, but the cable loss will affect the total efficiency. Refer to 6.0.1

### 6.0.3 FOR EXAMPLE

Base on the 100mm cable performance, we can mostly compute the 300mm cable's.

| | 100mm cable | | | 300mm cable | |
|---|---|---|---|---|---|
| Frequency (MHz) | Efficiency (dB) | Efficiency (%) | cable loss | Efficiency (dB) | Efficiency (%) |
| | X | | X-LOSS=Y | Y | |
| 868 | -2.18 | 60.58 | 0.2m*1.8dB/m | -2.54 | 55.76 |
| 870 | -2.06 | 62.27 | | -2.42 | 57.32 |
| 902 | -1.45 | 71.66 | | -1.81 | 65.96 |
| 904 | -1.44 | 71.70 | | -1.80 | 66.00 |
| 906 | -1.44 | 71.86 | | -1.80 | 66.14 |
| 908 | -1.45 | 71.62 | | -1.81 | 65.92 |
| 910 | -1.47 | 71.31 | | -1.83 | 65.64 |
| 912 | -1.51 | 70.63 | | -1.87 | 65.01 |
| 914 | -1.55 | 69.94 | | -1.91 | 64.37 |
| 916 | -1.61 | 69.04 | | -1.97 | 63.55 |
| 918 | -1.68 | 67.94 | | -2.04 | 62.54 |
| 920 | -1.76 | 66.61 | | -2.12 | 61.31 |
| 922 | -1.87 | 64.99 | | -2.23 | 59.82 |
| 924 | -1.96 | 63.66 | | -2.32 | 58.60 |
| 926 | -2.06 | 62.18 | | -2.42 | 57.23 |
| 928 | -2.18 | 60.59 | | -2.54 | 55.77 |
| 868 | -2.18 | 60.58 | | -2.54 | 55.76 |

## 7.0 RF PERFORMANCE AS A FUNCTION OF IMPLEMENTATION

### 7.1 ANTENNA RF PERFORMANCE AS A FUNCTION OF DIFFERENT LOCATIONS WITH PARALLEL PLANE GROUND

Four locations with parallel plane ground have been evaluated and these locations are shown in figure 7.1. The plane ground size is 90mm*90mm and we move the plane ground to four locations for each test. The antenna performance is better with larger distance between antenna and parallel plane ground at high band. The minimum distance between antenna and plane ground is recommended to be 20mm to achieve acceptable RF performance.

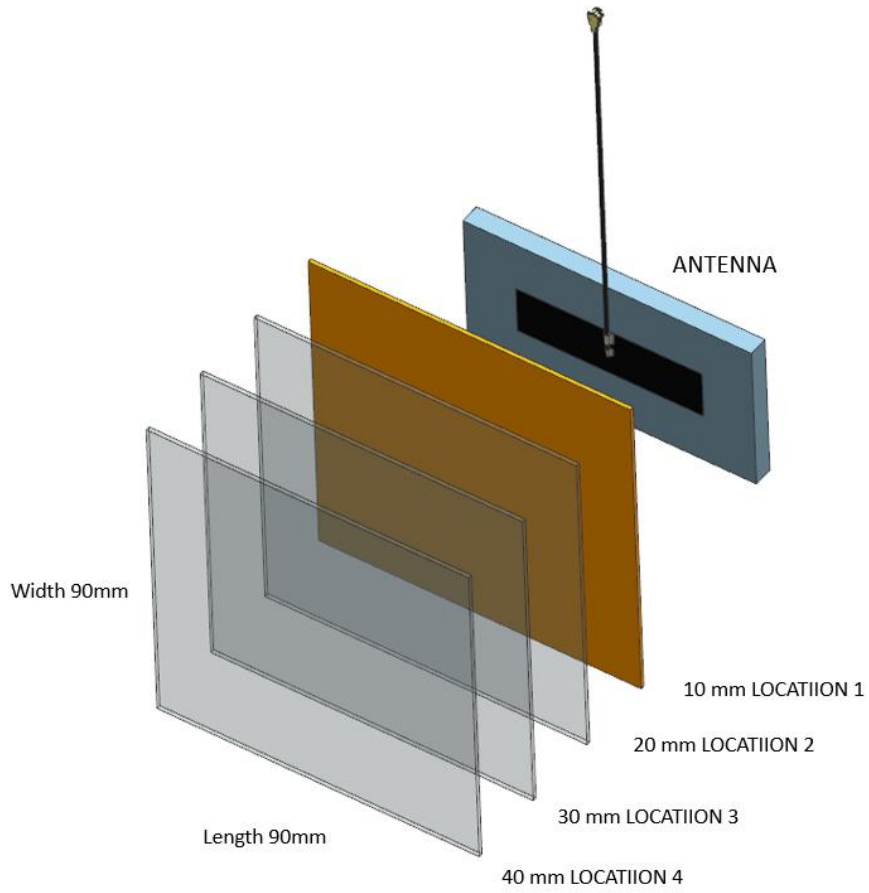


**FIGURE 7.1 FOUR LOCATIONS WITH PARALLEL PLANE GROUND**

Ground Size: 90mm*90mm;
Location 1: Distance between antenna and plane ground is about 10mm;
Location 2: Distance between antenna and plane ground is about 20mm;
Location 3: Distance between antenna and plane ground is about 30mm;
Location 4: Distance between antenna and plane ground is about 40mm.

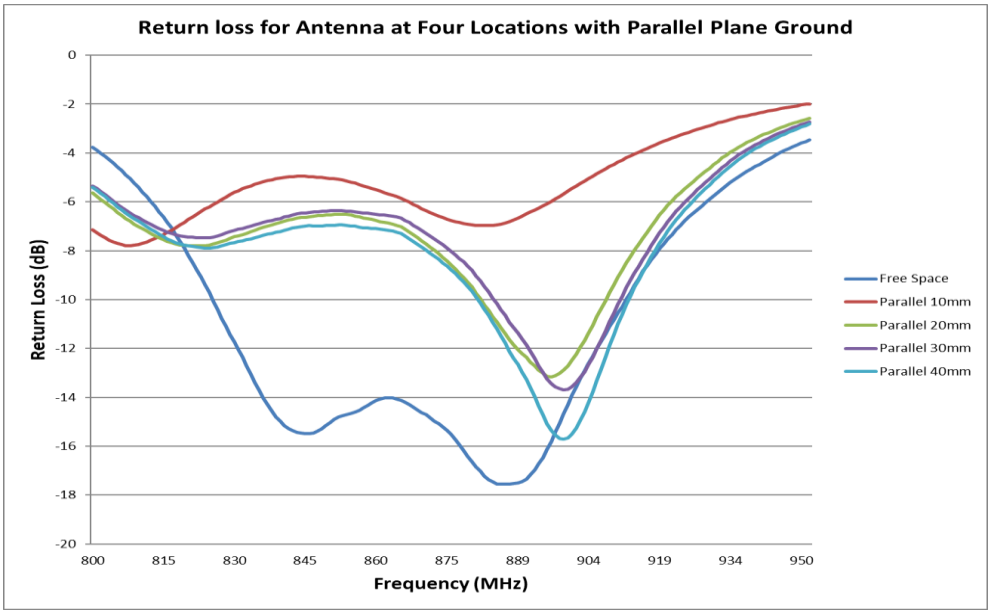


**FIGURE 7.1.1 RETURN LOSS OF ANTENNA AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND**

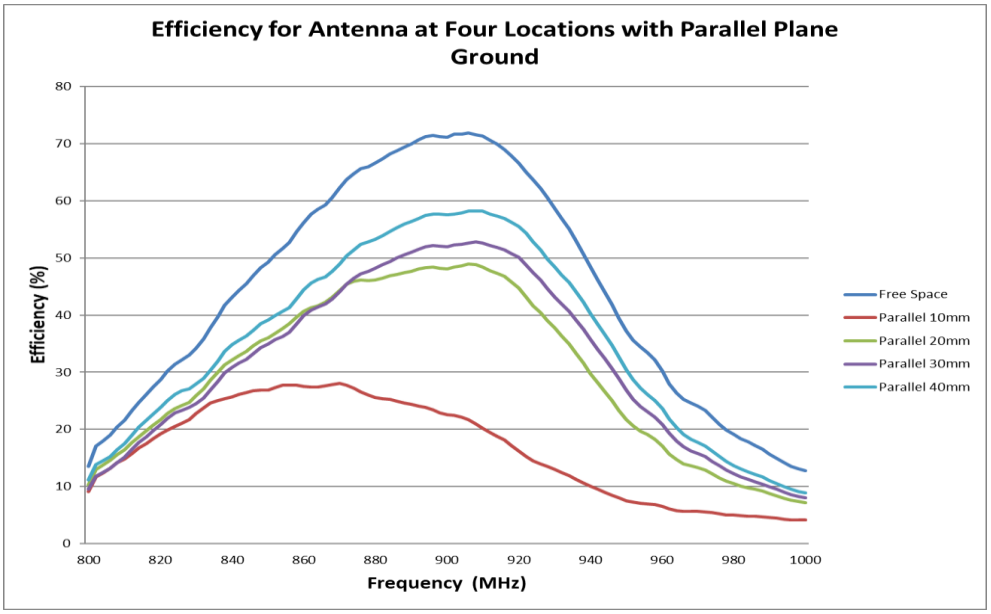


**FIGURE 7.1.2 EFFICIENCY OF ANTENNA AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND**

### 7.2 ANTENNA RF PERFORMANCE AS A FUNCTION OF DIFFERENT LOCATIONS WITH VERTICAL PLANE GROUND

Four locations with vertical plane ground have been evaluated and these locations are shown in figure 7.2. The plane ground size is 90mm*90mm and we move the plane ground to four locations for each test. The distance between antenna and vertical plane ground affect the antenna performance slightly. We still suggest the minimum distance between antenna and plane ground is recommended to be 10mm.

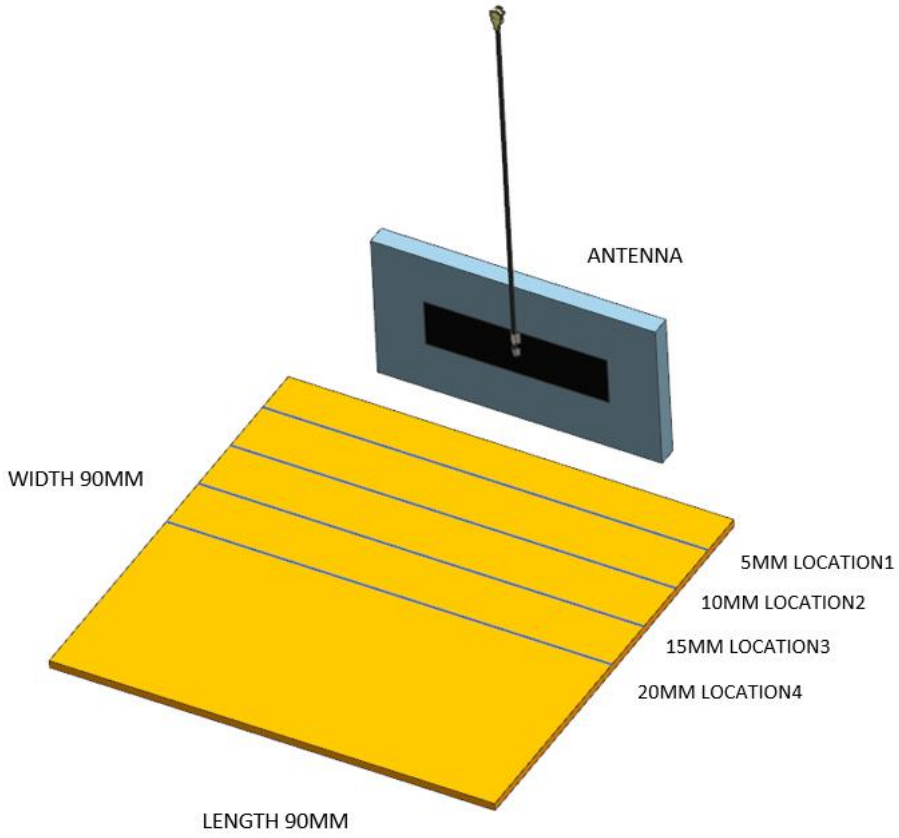


**FIGURE 7.2 FOUR LOCATIONS WITH VERTICAL PLANE GROUND**

Ground Size: 90mm*90mm;
Location 1: Distance between antenna and plane ground is about 5mm;
Location 2: Distance between antenna and plane ground is about 10mm;
Location 3: Distance between antenna and plane ground is about 15mm;
Location 4: Distance between antenna and plane ground is about 20mm.

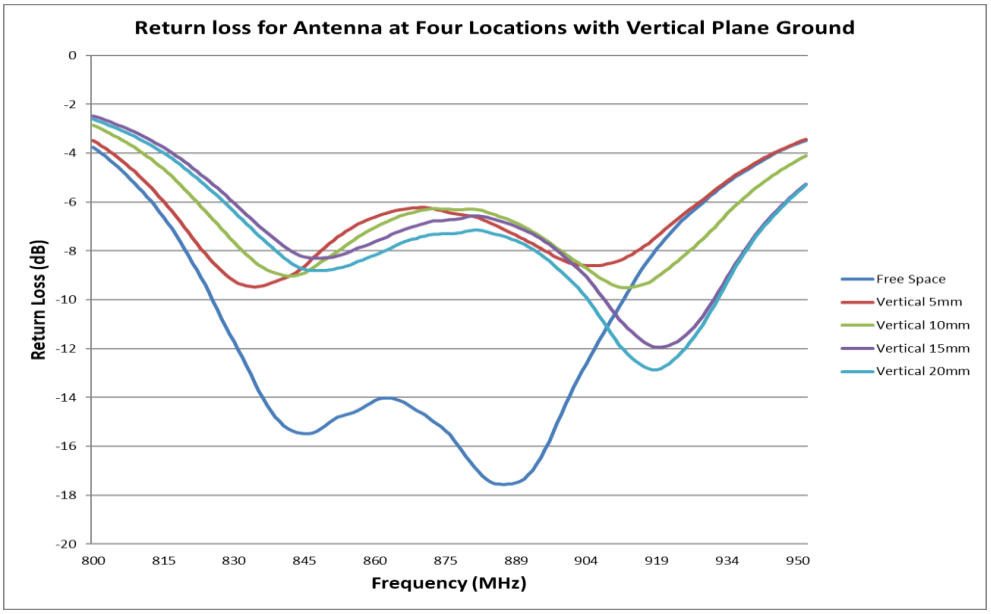


**FIGURE 7.2.1 RETURN LOSS OF ANTENNA AT FOUR LOCATIONS WITH VERTICAL PLANE GROUND**

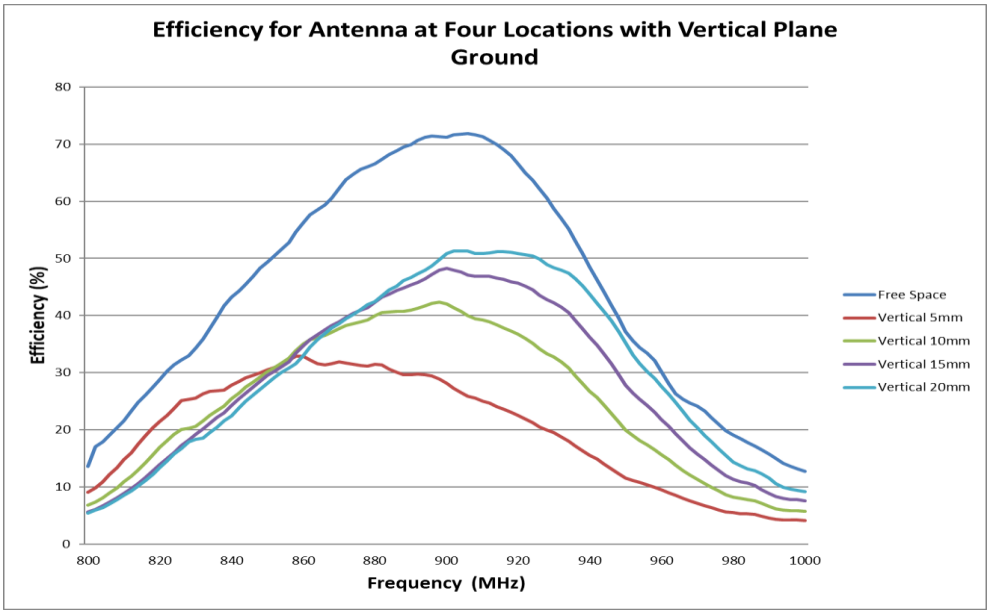


**FIGURE 7.2.2 EFFICIENCY OF ANTENNA AT FOUR LOCATIONS WITH VERTICAL PLANE GROUND**

### 7.3 ANTENNA RF PERFORMANCE AS A FUNCTION OF DIFFERENT DISTANCES WITH PARALLEL PLANE GROUND

Four locations with the parallel plane ground have been evaluated and these locations are shown in figure 7.3. The plane ground size is 90mm*90mm and we move the plane ground to four locations for each test. The distance between the antenna and the parallel plane ground affect the antenna performance slightly. We still suggest the minimum distance between the antenna and the plane ground is recommended to be 15mm.

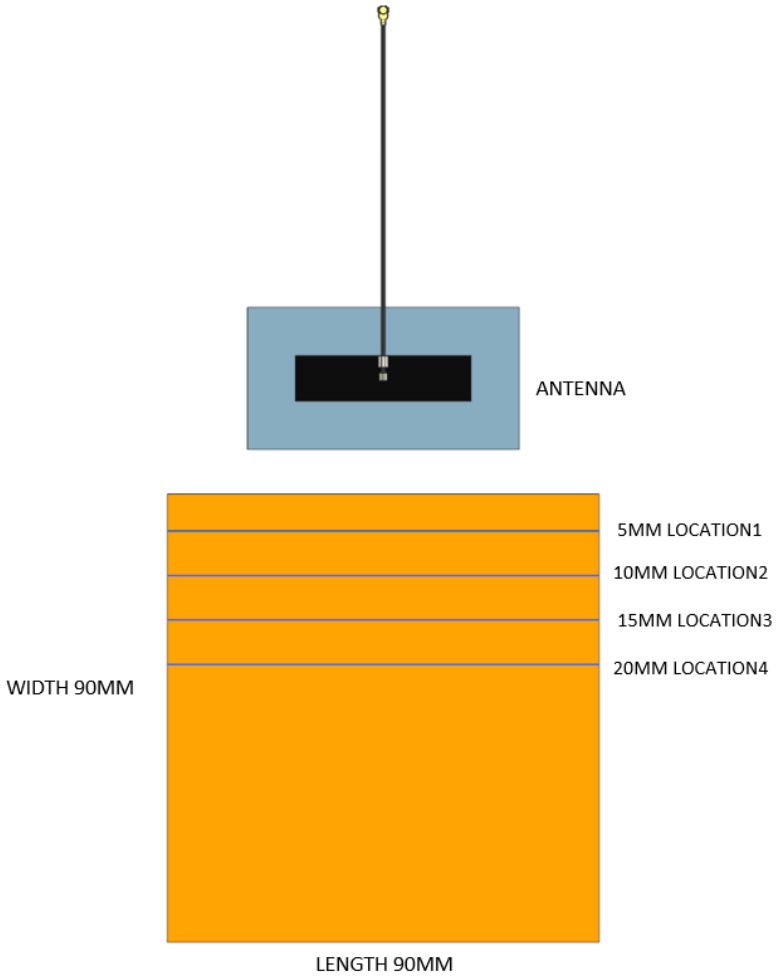


**FIGURE 7.3 FOUR LOCATIONS WITH PARALLEL PLANE GROUND**

Ground Size: 90mm*90mm;
Location 1: Distance between antenna and plane ground is about 5mm;
Location 2: Distance between antenna and plane ground is about 10mm;
Location 3: Distance between antenna and plane ground is about 15mm;
Location 4: Distance between antenna and plane ground is about 20mm.

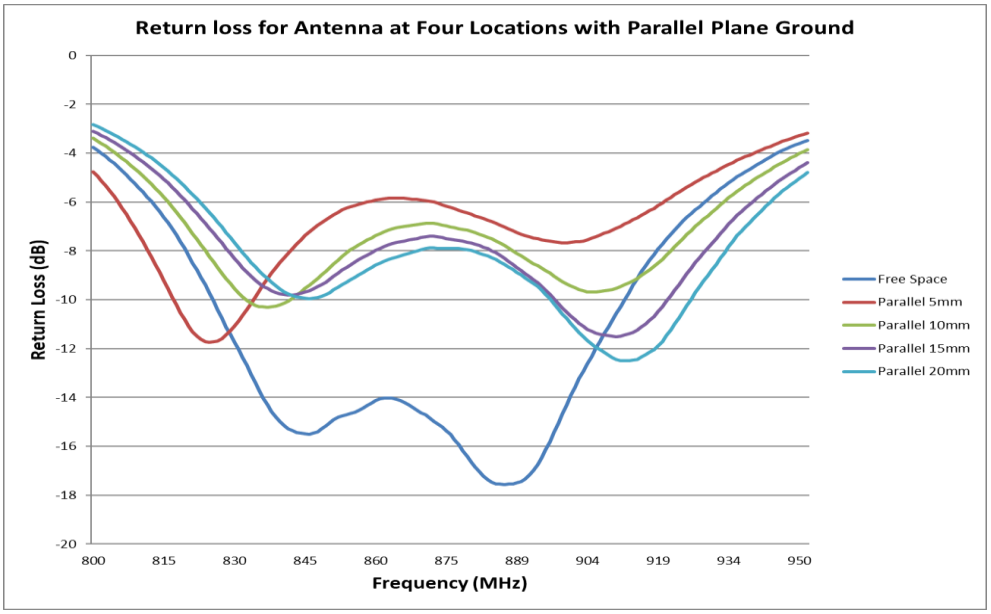


**FIGURE 7.3.1 RETURN LOSS OF ANTENNA AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND**

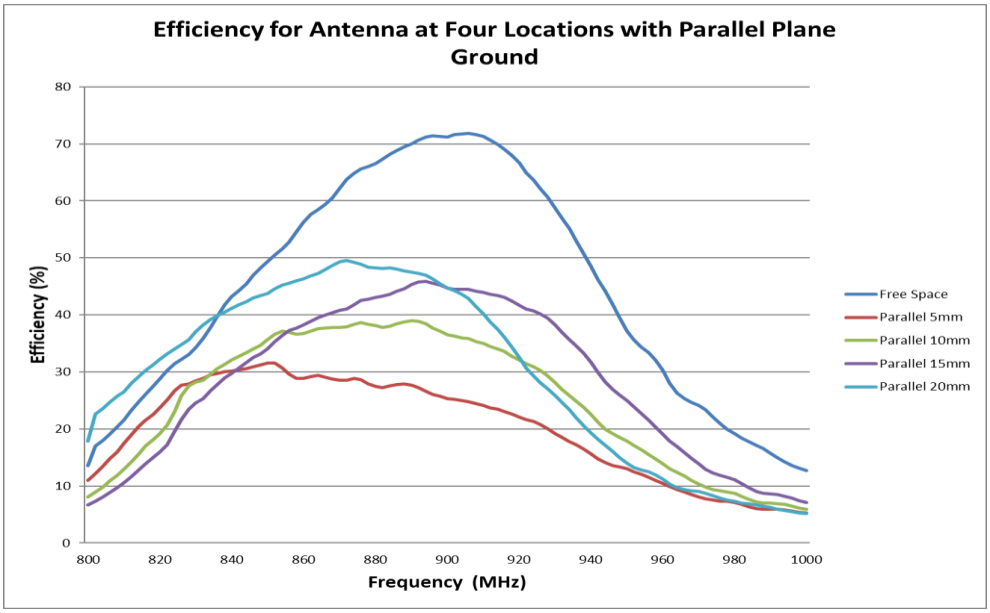


**FIGURE 7.3.2 EFFICIENCY OF ANTENNA AT FOUR LOCATIONS WITH PARALLEL PLANE GROUND**

**TITLE**

# 865/915MHZ ISM STAND ALONE ANTENNA

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Address: 2222 Wellington Court, Lisle, IL 60532, USA

# 824/915MHz ISM STAND ALONE ANTENNA

## 1.0 SCOPE

This Product Specification covers the mechanical, electrical and environmental performances specification for 865/915MHz ISM Stand Alone Antenna.

## 2.0 PRODUCT DESCRIPTION

### 2.1 PRODUCT NAME AND SERIES NUMBER (S)

Product name: 865/915MHz ISM Stand Alone Antenna

Series Number: 105262

### 2.2 DESCRIPTION

Series 105262 is a ISM standard alone antenna for 868/915 MHz applications, including LoRa, Neul, SigFox, Z-Wave, Zigbee and others. This antenna is made from poly flexible material with size 79*10*0.1mm, and has double-sided adhesive tape for easy “peel and stick” mounting. This balanced antenna with ground plane independent design offers various cable length options for ease of integration into various devices.

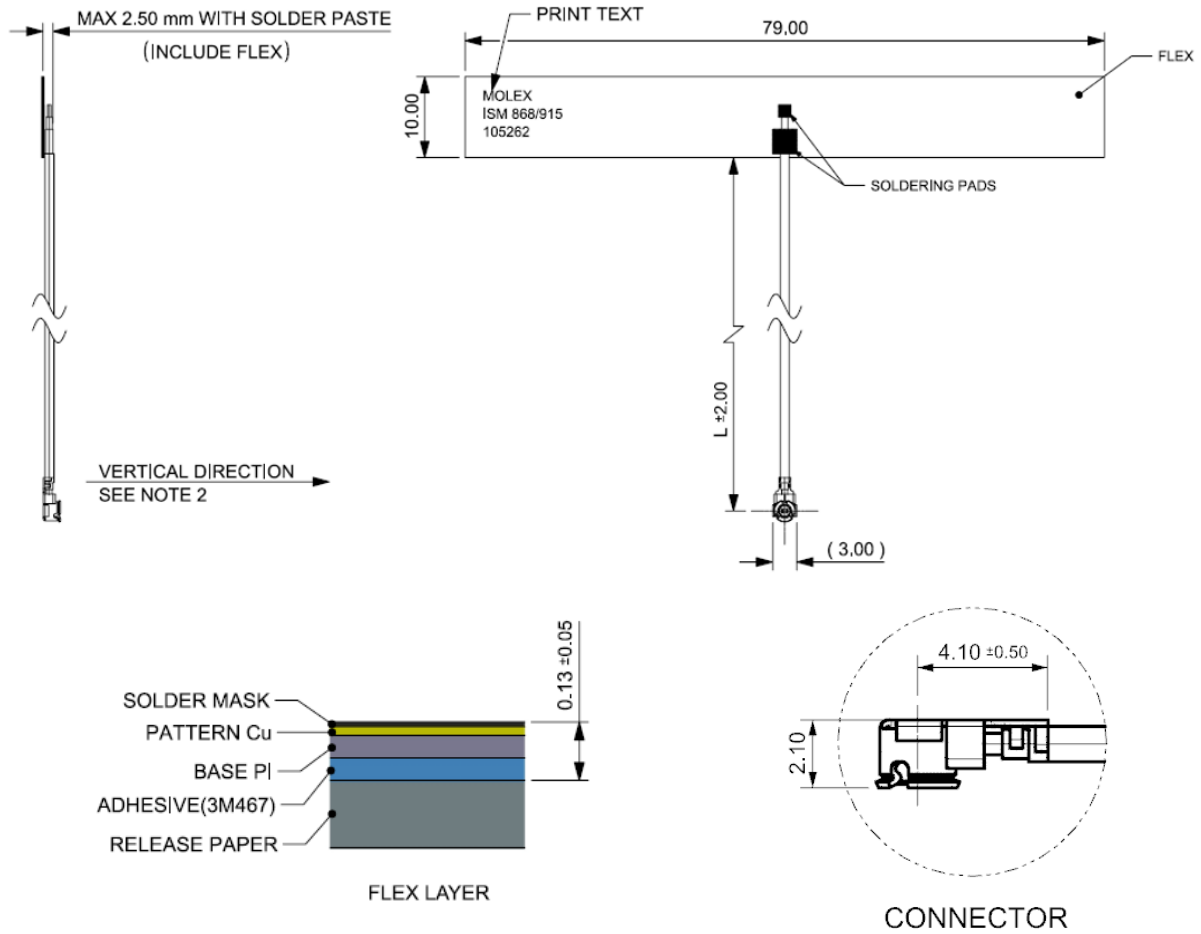
### 2.3 FEATURES

- 868/915MHz, Linear polarization
- Flex size:79x10x0.1mm
- MHF (U.FL compatible) connector
- Cable OD1.13mm,  3 standard length options (100/150/200mm)
- Cable and connector can be customized
- RoHS Compliant

MOLEX ANTENNA 3D VIEW

## 2.4 PRODUCT STRUCTURE INFORMATION

| P/N | 105262 Series |
|---|---|




| ITEM | MATERIAL NO. | CABLE LENGTH"L" |
|---|---|---|
| 1 | 1052620001 | 93.5 mm |
| 2 | 1052620002 | 143.5 mm |
| 3 | 1052620003 | 193.5 mm |

NOTE:
1. MATERIAL:FLEX SIZE:79*10 mm
   CABLE:∅1.13mm
   CONNECTOR:OD1.13 RF 2.5H U.FL CONNECTOR-PLUG GOLD PLATED
   (IPEX MHF-I COMPATIBLE)
2. CAN NOT LIFE UP CABLE IN VERTICAL DIRECTION
3. SOLDER MASK COVER:BLACK.
4. PRINT TEXT COLOR:WHITE.
5. ADHESIVE MATERIAL:3M-467 50um.
6. THE CONNECTOR WILL BE PROTECTED WITH A CAP

MECHANICAL STRUCTURE INFORMATION FOR 105262 SERIES

### 3.0 APPLICABLE DOCUMENTS

| Document | Number | Description |
|---|---|---|
| Sale Drawing(SD) | SD-1052620001 | Mechanical Dimension of the product |
| Application Guide(AS) | AS-1052620001 | Antenna Application and surrounding |
| Packing Drawing(PK) | PK-1052620001 | Product packaging specifications |

### 4.0 GENERAL SPECIFICATION

| | |
|---|---|
| **Product name** | 865/915MHz ISM Stand Alone Antenna |
| **Part number** | 105262 Series |
| **Frequency** | 868/915 MHz |
| **Polarization** | Linear |
| **Operating with matching** | -40℃ to 85℃ |
| **Storage with matching** | -40℃ to 85℃ |
| **RF Power** | 2 Watts |
| **Impedance with matching** | 50 Ohms |
| **Antenna type** | **Monopole** |
| **Connector type** | Compatible MHF-1&U.FL |
| **User Implementation type** | Adhesive 3M467 |
| **Cable** | Ø1.13mm |
| **Cable length** | 100mm (Molex p/n:1052620001) |
| | 150mm (Molex p/n:1052620002) |
| | 200mm (Molex p/n:1052620003) |

## 5.0 ANTENNA SPECIFICATION.

### 5.1 ELECTRICAL REQUIREMENT

| 5.1.1 ELECTRICAL REQUIREMENTS FOR CABLE LENGHTH 100mm | | |
|---|---|---|
| P/N | 1052620001 | |
| Frequency Range | 868-870MHz | 902-928MHz |
| Peak Gain(Max) | 0.4 dBi | 1.6 dBi |
| Average Total efficiency | >55% | >65% |
| Return Loss | < -6 dB | |

| 5.1.2 ELECTRICAL REQUIREMENTS FOR CABLE LENGHTH 150mm | | |
|---|---|---|
| P/N | 1052620002 | |
| Frequency Range | 868-870MHz | 902-928MHz |
| Peak Gain(Max) | 0.3 dBi | 1.5 dBi |
| Average Total efficiency | >53% | >63% |
| Return Loss | < -6 dB | |

| 5.1.3 ELECTRICAL REQUIREMENTS FOR CABLE LENGHTH 200mm | | |
|---|---|---|
| P/N | 1052620003 | |
| Frequency Range | 868-870MHz | 902-928MHz |
| Peak Gain(Max) | 0.2 dBi | 1.4 dBi |
| Average Total efficiency | >52% | >62% |
| Return Loss | < -6 dB | |

Note that the above antenna performance is measured with just the antenna mounted on a PC/ABS block to similar a free-space condition. When implement into the system, the frequency resonant might be off-tune due to the loading of surrounding components especially metal plane. This off-tune can be compensated through matching. Although module manufacturers specify a peak gain limit, it is based on free-space conditions. The peak gain will be degraded by 1 to 2dBi in the actual implementation as the radiation pattern will change due to the surround components. As such, during selection of antenna, you can select one with high peak gain to compensate for the loss. Molex can offer assistant to choose the best location and best tuning in-order to meet this peak gain requirement.

### 5.2 CABLE LOSS

| DESCRIPTION | TEST CONDITION | REQUIREMENTS | |
|---|---|---|---|
| Frequency Range | 2.4GHz/5GHz | 2.0GHz~3.0GHz | 5.0GHz~6.0GHz |
| Attenuation | 1m cable measured by VNA5071C | ≤3.5dB/m | ≤5.5dB/m |

Balance antenna resonance is insensitive to cable's length, but the cable's loss will affect the total efficiency.

## 6.0 MECHANICAL SPECIFICATION

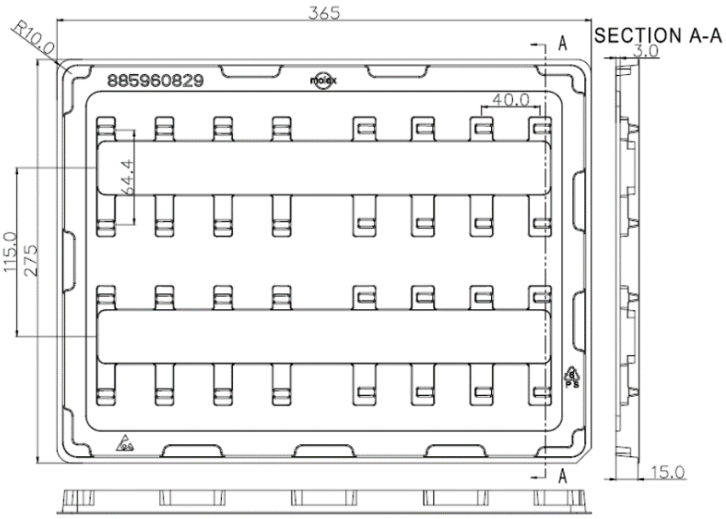
All measurements in this document are done with the part no.1052620001 for different cable length.

| DESCRIPTION | TEST CONDITION | TEST RESULT |
|---|---|---|
| Pull Test | 1. Test machine: Max intelligent load tester<br>2. Stick the flex antenna on a plastic board, pull cable in axial direction. | Pull force >8N |
| Un-mating force(connector) | Solder the receptacle connector to the test board, then place the board and plug on push-on/pull-off machine, and repeat mating and un-mating 30 cycles at a speed 25±3mm/min. along the mating axis. | Un-mating force: 0.5 kgf min |

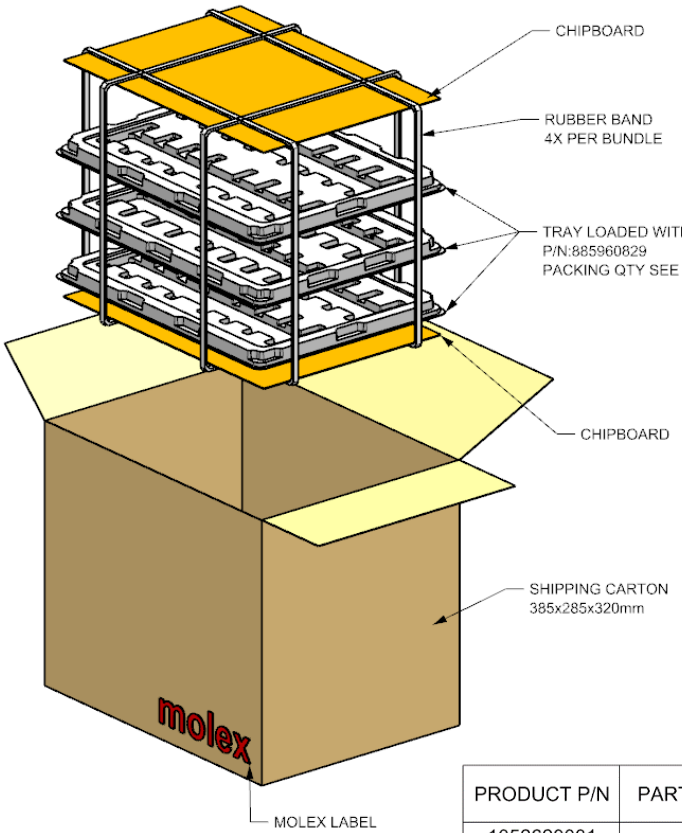
## 7.0 ENVIRONMENTAL SPECIFICATION

| DESCRIPTION | SPECIFICATION |
|---|---|
| Temperature /Humidity cycling | 1.The device under test is kept for 30 mins in an environment with a temperature of -40 ℃.<br>2. Kept for 4 Hours in an environment with a temperature of 85 degrees and a relative humidity of 95%.<br>3. Kept for 2 Hours in an environment with a temperature of 125 degrees and a relative humidity of 95%.<br>4. The cycle is repeated until a total of 40 cycles have been completed. Hereafter the conditions are stabilized at room temperature.<br>5. Parts meet antenna performance per section 5.0 before and after test.<br>6. No cosmetic problem (No soldering problem; No adhesion problem of glue.) |
| Temperature Shock | 1.The device under test at -40 ℃⇔125 ℃ by 100 cycles, Dwell of 30 mins, transition time between Dwell 30 secs (~ 61 mins / cycle) and each item should be measured after exposing them in normal temperature and humidity for 24 h.<br>2. Parts should meet RF spec before and after test.<br>3. No cosmetic problem（No soldering problem；No adhesion problem of glue）. |
| High Temperature | 1.Temperature:125℃, time:1008 hours<br>2.There is no substantial obstruction to air flow across and around the samples, and the samples are not touching each other<br>3. Parts should meet RF spec before and after test.<br>4. No cosmetic problem（No soldering problem；No adhesion problem of glue）. |
| Salt mist test | 1. The device under test is exposed to a spray of a 5% (by volume) resolution of NACL in water for 2 hours. Thereafter the device under test is left for 1 week in room temperature at a relative humidity of 95%. The cycle is repeated until a total of 2 cycles have been completed. Here after the conditions are stabilized at room temperature.<br>2. Parts should meet RF spec before and after test.<br>3. No visible corrosion. Discoloration accepted. |

## 8.0 PACKING




**TRAY**




NOTES:
1. STAPLES MUST BE USED TO SET UP CARTON CLOSURES MUST BE DONE WITH TAPE.
2. MARK CUSTOMER LABEL WITH PART UNMBER AND DATA CODE.
3. THIS PACKAGING SPECIFIACATION TO BE USED WITH ISM 868/915 MHz STAND ALONE ANTENNA (P/N:105262-0001, 105262-0002,105262-0003)

| PRODUCT P/N | PARTS PER TRAY | TOTAL TRAY PER CARTON | TOTAL PARTS PER SHIPPING CARTON |
|---|---|---|---|
| 1052620001 | 16 | 26+1 | 416 |
| 1052620002 | 16 | 26+1 | 416 |
| 1052620003 | 12 | 26+1 | 312 |

PACKAGING INFORMATION FOR 105262 SERIES

**9.0 CHANGED HISTORY**

| REV | DATE | DESCRIPTION |
|---|---|---|
| E | 2022/10/10 | Updated page 5 (Return ross <-10 changed to <-6) |