

## SPECIFICATION

Part No. : **PA.22A**

Product Name : **Dielectric PIFA Antenna**

Description : Tri-band - 880~960 MHz, 1710~1990 MHz, 0dB Gain  
Size: 29.8mm\*6mm\*5mm  
**RoHS Compliant**



## 1. Scope

This specification is for a Tri-band GSM miniature PIFA (Dielectric Planar Inverted-F Type Antenna) (DPA™) Antenna for internal SMT mounting.

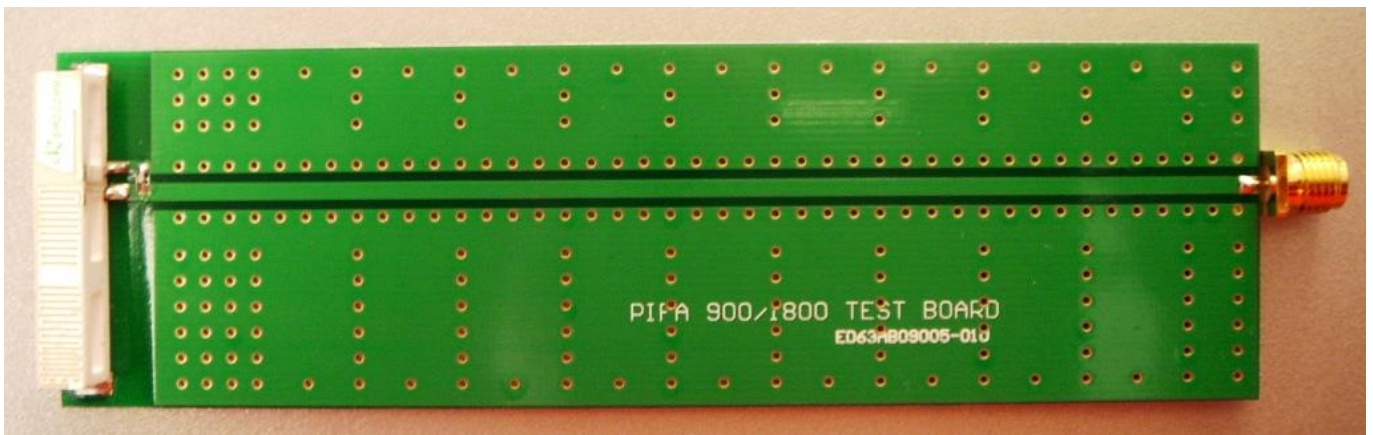
Note: The antenna also shows a response at 850MHz which means the antenna can also be defined on quad-band, depending on the target specification for the device itself.

## 2. Electrical Specifications

The antenna has the electrical characteristics given in Table 1 under the Taoglas standard installation conditions as shown in the Evaluation Board (Figure

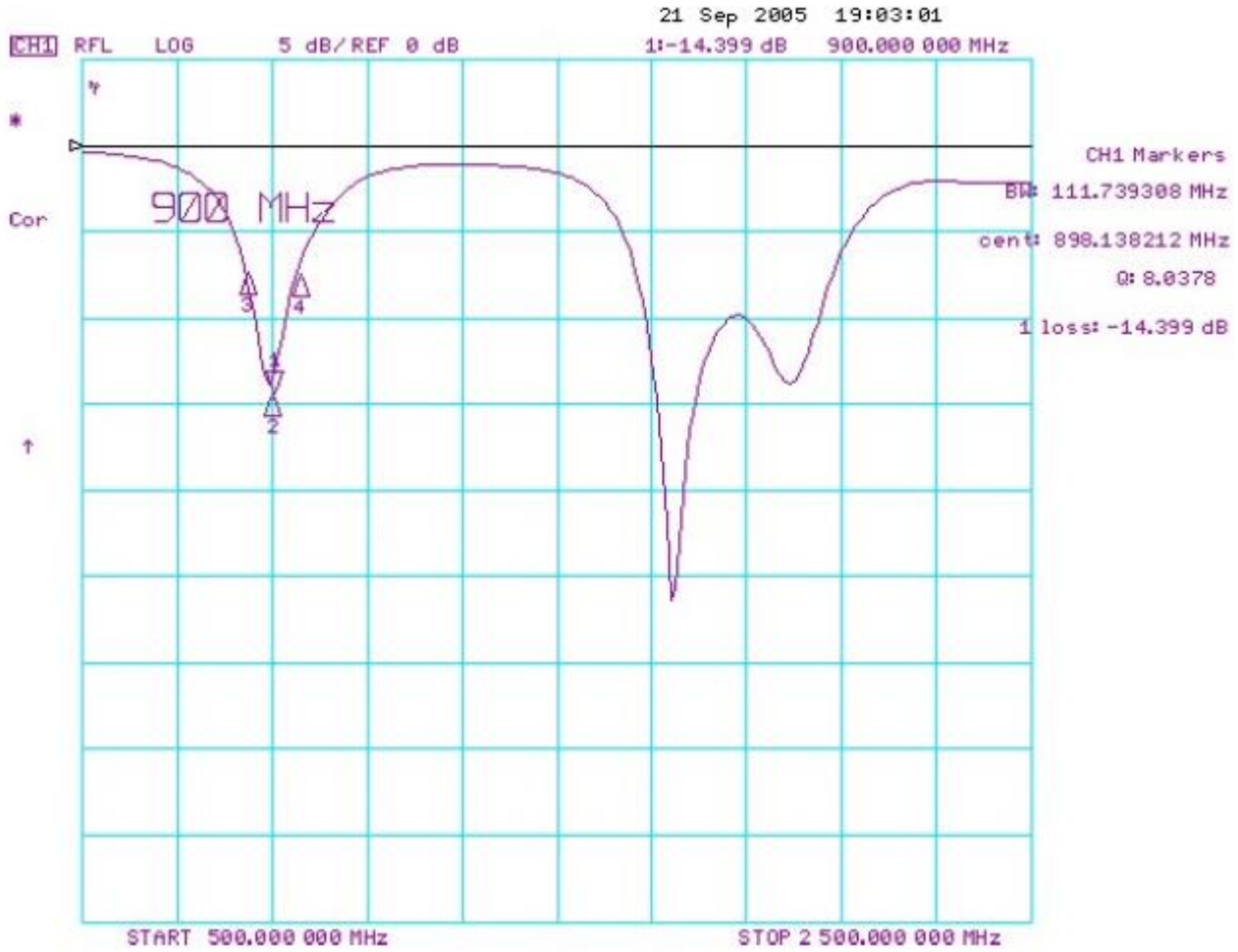
No.	Parameter	Specification
1	Frequency	880~960 MHz , 1710~1990 MHz
2	Dimensions	29.8*6.0*5.0 mm
3	Impedance	50 Ω
4	VSWR	2.5 max (depends on environment)
5	Polarization	Linear
6	Operating Temperature	-40~85°C
7	Termination	Ag (Environmentally Friendly Lead-Free)

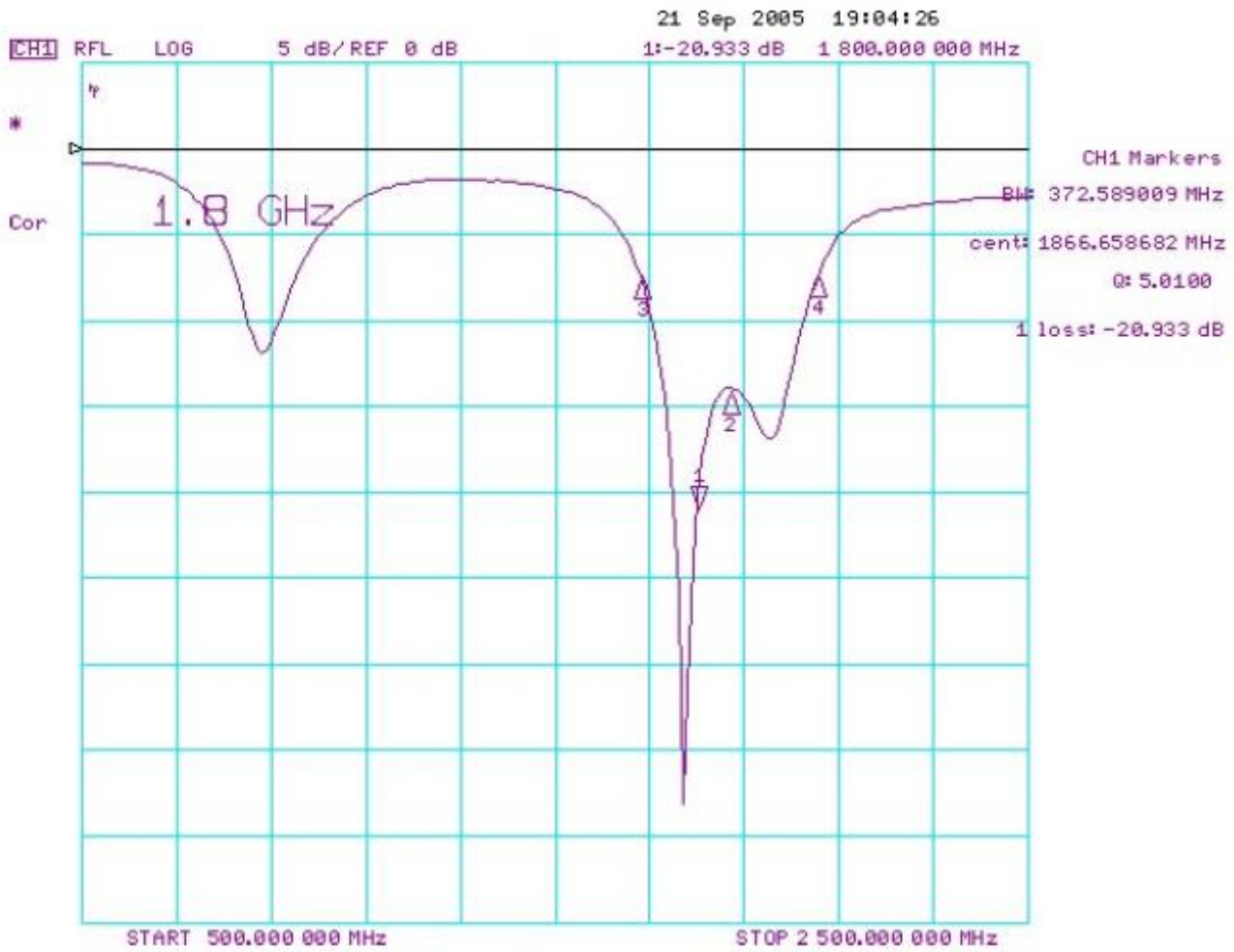
\*Data is measured on Taoglas Evaluation Board (reference ground plane) pictured below





## 2.1 S11 Response Curve





***Radiation patterns also available (measured in free space and on evaluation board)***

## 2.2 Gain and Efficiency

GSM900

	<b>Frequency (MHz)</b>	<b>Peak Gain (dBi)</b>	<b>Efficiency (%)</b>
TX	880.2	-3.65	21.09
	890.2	-2.73	26.25
	902.4	-2.28	31.23
	914.8	-2.04	35.24
RX	925.2	-1.96	37.02
	935.2	-2.54	33.33
	947.4	-2.96	31.17
	959.8	-3.16	29.47

GSM1800

	<b>Frequency (MHz)</b>	<b>Peak Gain (dBi)</b>	<b>Efficiency (%)</b>
TX	<b>1710.2</b>	<b>2.28</b>	<b>60.63</b>
	<b>1747.6</b>	<b>2.35</b>	<b>61.53</b>
	<b>1784.8</b>	<b>2.58</b>	<b>60.77</b>
RX	<b>1805.2</b>	<b>2.32</b>	<b>56.67</b>
	<b>1842.6</b>	<b>2.43</b>	<b>56.31</b>
	<b>1879.8</b>	<b>2.59</b>	<b>58.69</b>

GSM1900

	<b>Frequency (MHz)</b>	<b>Peak Gain (dBi)</b>	<b>Efficiency (%)</b>
TX	<b>1850.2</b>	<b>2.48</b>	<b>56.95</b>
	<b>1880.0</b>	<b>2.60</b>	<b>58.75</b>
	<b>1909.8</b>	<b>2.12</b>	<b>52.79</b>
RX	<b>1930.2</b>	<b>2.01</b>	<b>52.02</b>
	<b>1960.0</b>	<b>1.31</b>	<b>47.26</b>
	<b>1989.8</b>	<b>0.30</b>	<b>38.62</b>

GSM900

	Frequency (GHz)	Plane	Average Gain (dBi)
TX	880.2	XY plane	-7.133
		YZ plane	-9.766
		XZ plane	-6.101
	890.2	XY plane	-5.968
		YZ plane	-8.845
		XZ plane	-5.126
	902.4	XY plane	-4.898
		YZ plane	-8.892
		XZ plane	-4.350
914.8	XY plane	-4.077	
	YZ plane	-7.477	
	XZ plane	-3.865	
RX	925.2	XY plane	-3.599
		YZ plane	-7.202
		XZ plane	-3.732
	935.2	XY plane	-3.802
		YZ plane	-7.648
		XZ plane	-4.290
	947.4	XY plane	-3.788
		YZ plane	-7.843
		XZ plane	-4.579
	959.8	XY plane	-3.801
		YZ plane	-7.913
		XZ plane	-5.187

GSM1800

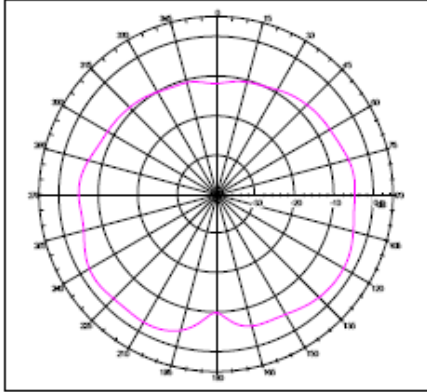
	Frequency (GHz)	Plane	Average Gain (dBi)
TX	1710.2	XY plane	-2.648
		YZ plane	-4.661
		XZ plane	-1.687
	1747.6	XY plane	-2.529
		YZ plane	-4.696
		XZ plane	-1.207
	1784.8	XY plane	-2.685
		YZ plane	-4.687
		XZ plane	-0.888
RX	1805.2	XY plane	-3.193
		YZ plane	-4.911
		XZ plane	-1.105
	1842.6	XY plane	-3.468
		YZ plane	-4.753
		XZ plane	-1.145
	1879.8	XY plane	-3.745
		YZ plane	-4.131
		XZ plane	-1.430

GSM1900

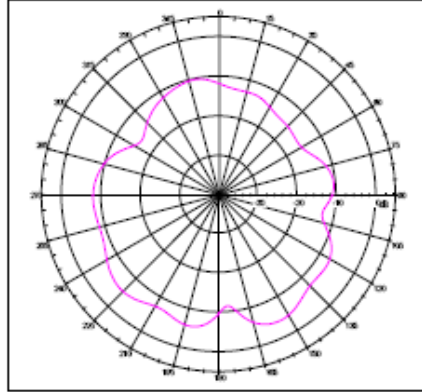
	Frequency (GHz)	Plane	Average Gain (dBi)
TX	1850.2	XY plane	-3.511
		YZ plane	-4.649
		XZ plane	-1.147
	1880.0	XY plane	-3.746
		YZ plane	-4.124
		XZ plane	-1.435
	1909.8	XY plane	-4.683
		YZ plane	-4.228
		XZ plane	-2.525
RX	1930.2	XY plane	-5.539
		YZ plane	-4.270
		XZ plane	-3.257
	1960.0	XY plane	-6.444
		YZ plane	-4.441
		XZ plane	-4.126
	1989.8	XY plane	-8.068
		YZ plane	-5.359
		XZ plane	-5.477

**GSM900**  
**Frequency :880.2 MHz**

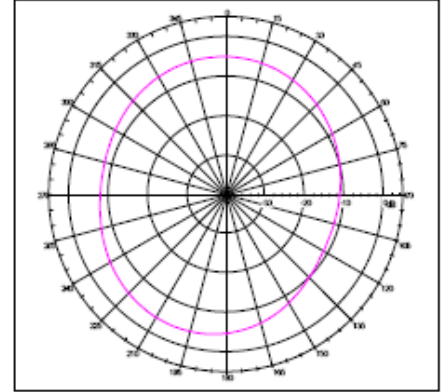
Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)  
Gain=-3.65 dBi; Total Radiating Efficiency: 21.05% @880.20 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=-3.65 dBi; Total Radiating Efficiency: 21.05% @880.20 GHz

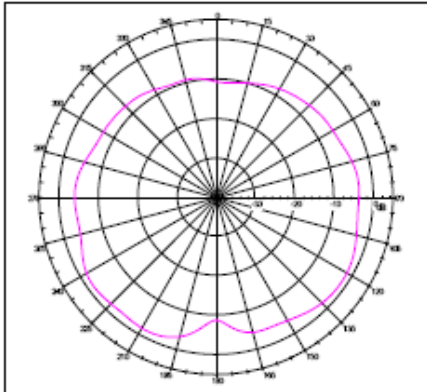


Far-field Power Distribution on X-Y Plane  
Gain=-3.65 dBi; Total Radiating Efficiency: 21.05% @880.20 GHz

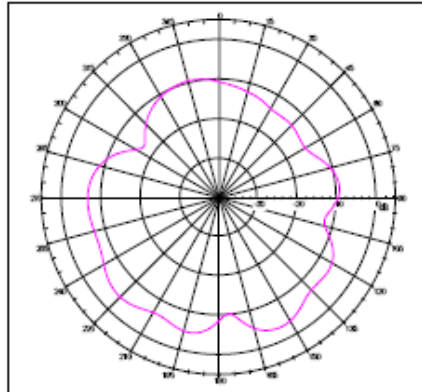


**Frequency :890.2 MHz**

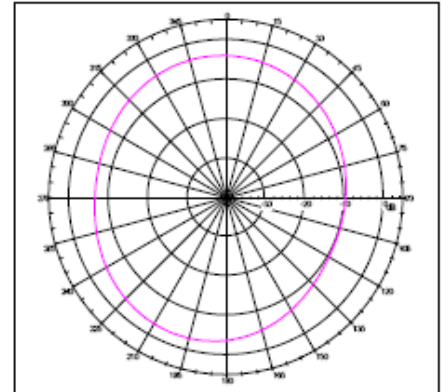
Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)  
Gain=-2.73 dBi; Total Radiating Efficiency: 26.25% @890.20 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=-2.73 dBi; Total Radiating Efficiency: 26.25% @890.20 GHz

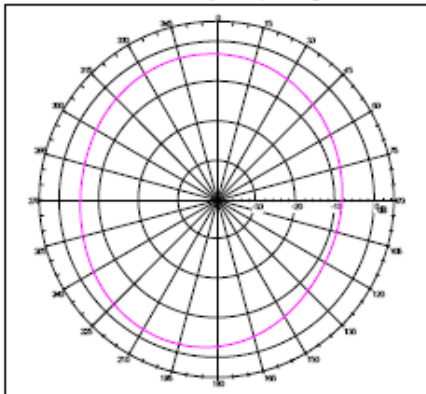


Far-field Power Distribution on X-Y Plane  
Gain=-2.73 dBi; Total Radiating Efficiency: 26.25% @890.20 GHz

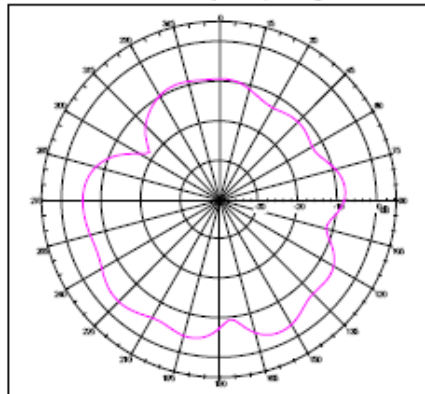


**Frequency :902.4MHz**

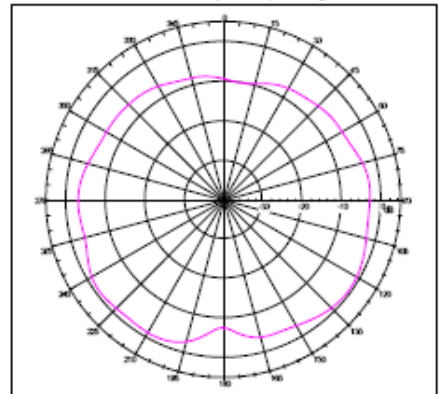
Far-field Power Distribution on X-Y Plane  
Gain=-2.28 dBi; Total Radiating Efficiency: 31.23% @902.40 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=-2.28 dBi; Total Radiating Efficiency: 31.23% @902.40 GHz



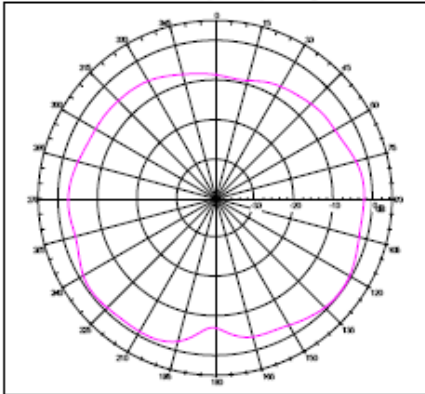
Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)  
Gain=-2.28 dBi; Total Radiating Efficiency: 31.23% @902.40 GHz



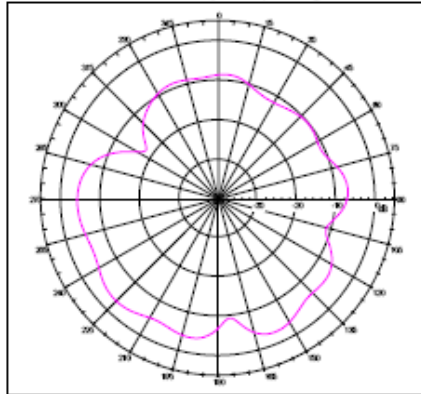


### Frequency :914.8MHz

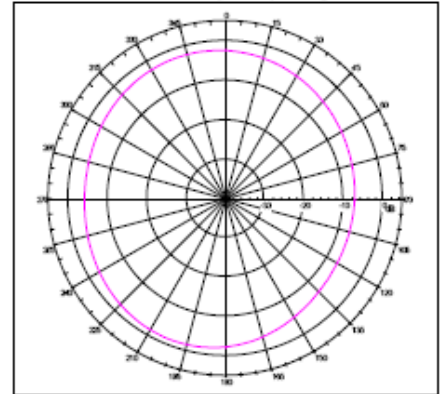
Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)  
Gain=-2.04 dBi, Total Radiating Efficiency: 35.24% @914.80 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=-2.04 dBi, Total Radiating Efficiency: 35.24% @914.80 GHz

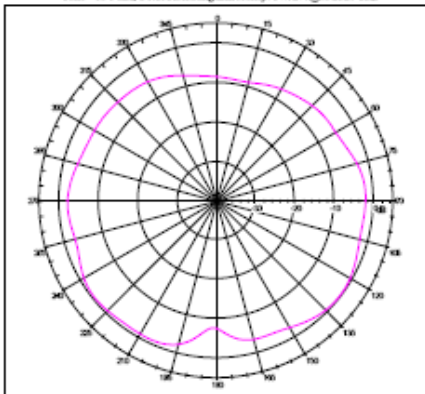


Far-field Power Distribution on X-Y Plane  
Gain=-2.04 dBi, Total Radiating Efficiency: 35.24% @914.80 GHz

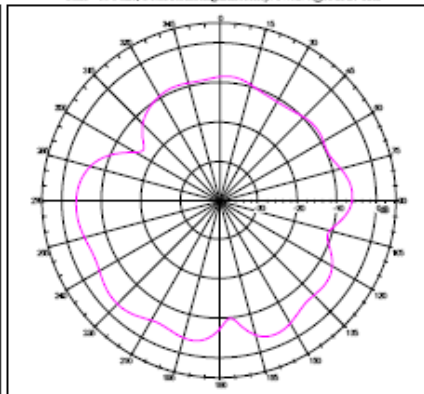


### Frequency :925.2MHz

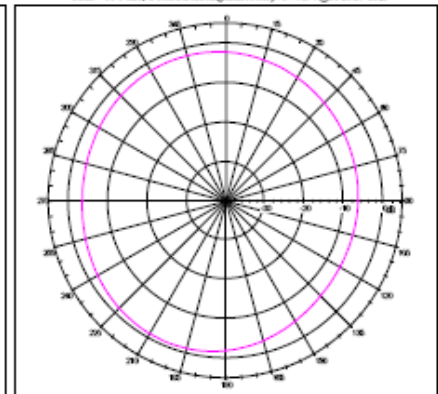
Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)  
Gain=-1.96 dBi, Total Radiating Efficiency: 37.02% @925.20 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=-1.96 dBi, Total Radiating Efficiency: 37.02% @925.20 GHz

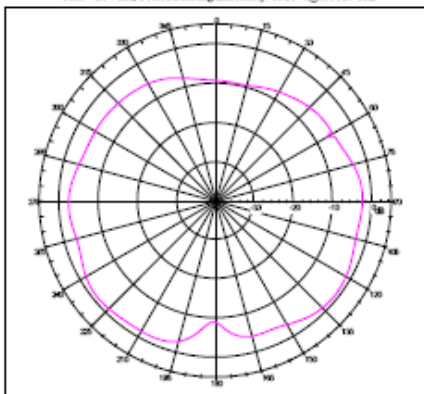


Far-field Power Distribution on X-Y Plane  
Gain=-1.96 dBi, Total Radiating Efficiency: 37.02% @925.20 GHz

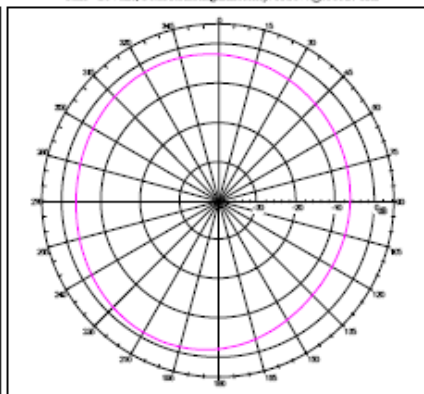


### Frequency :935.2MHz

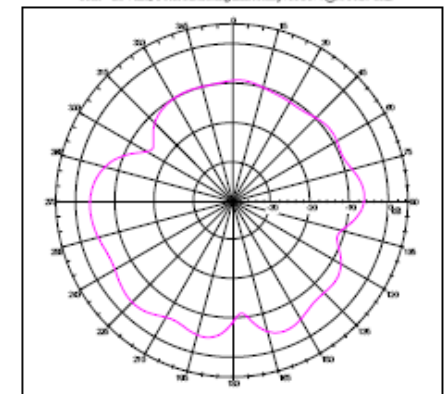
Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)  
Gain=-2.54 dBi, Total Radiating Efficiency: 33.33% @935.20 GHz



Far-field Power Distribution on X-Y Plane  
Gain=-2.54 dBi, Total Radiating Efficiency: 33.33% @935.20 GHz

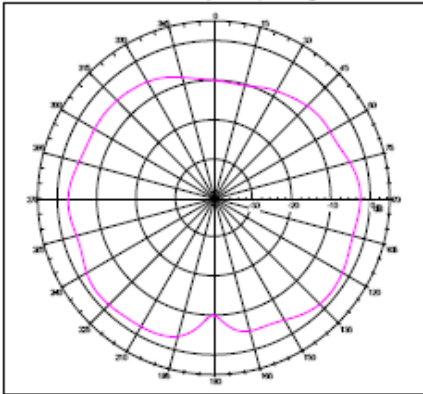


Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=-2.54 dBi, Total Radiating Efficiency: 33.33% @935.20 GHz

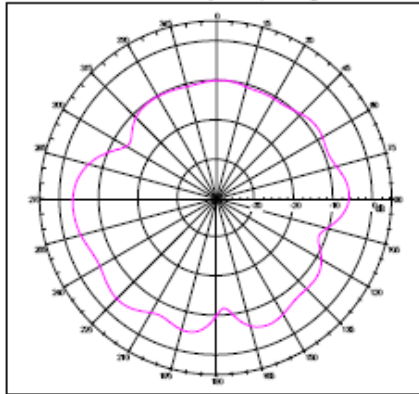


### Frequency :947.4MHz

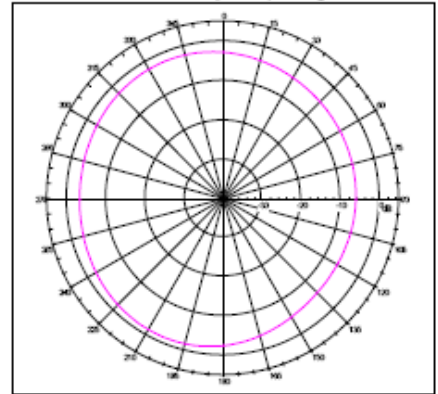
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
Gain=-2.96 dB; Total Radiating Efficiency: 31.17% @947.40 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=-2.96 dB; Total Radiating Efficiency: 31.17% @947.40 GHz

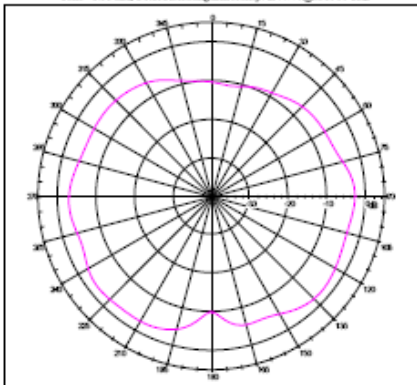


Far-field Power Distribution on X-Y Plane  
Gain=-2.96 dB; Total Radiating Efficiency: 31.17% @947.40 GHz

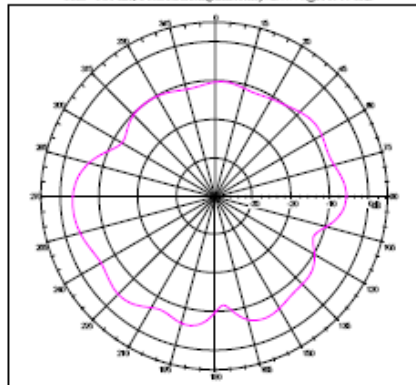


### Frequency :959.8MHz

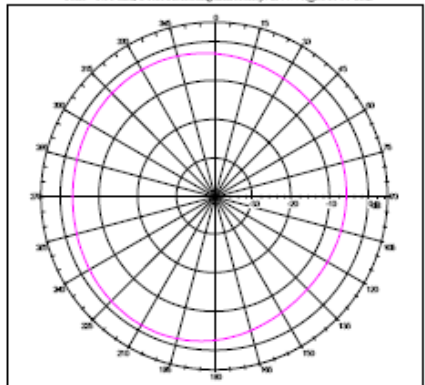
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
Gain=-3.16 dB; Total Radiating Efficiency: 29.47% @959.80 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=-3.16 dB; Total Radiating Efficiency: 29.47% @959.80 GHz

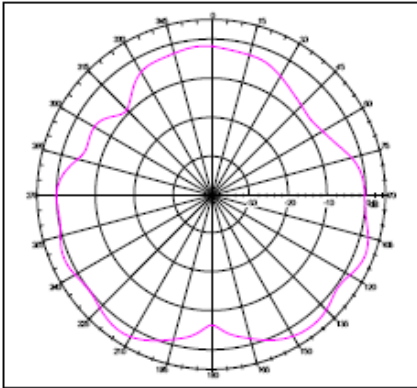


Far-field Power Distribution on X-Y Plane  
Gain=-3.16 dB; Total Radiating Efficiency: 29.47% @959.80 GHz

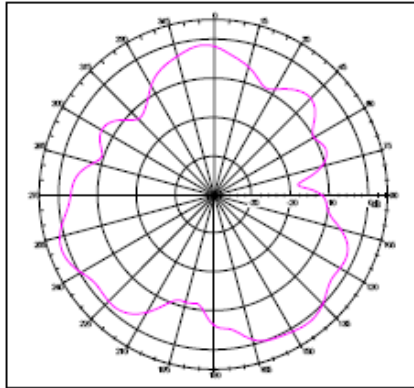


**GSM1800**  
**Frequency :1710.2 MHz**

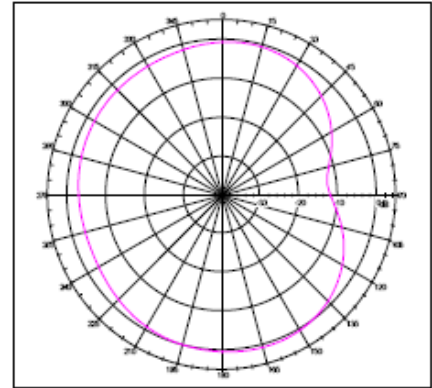
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
 Gain=228 dBi; Total Radiating Efficiency: 60.6% @ 71020 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
 Gain=228 dBi; Total Radiating Efficiency: 60.6% @ 71020 GHz

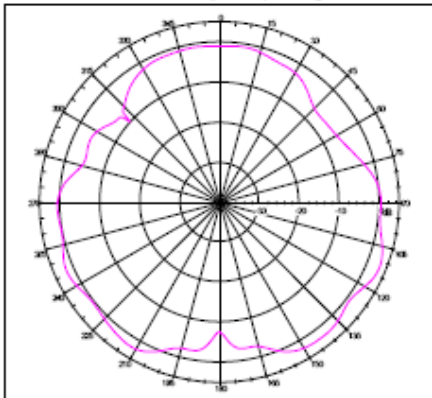


Far-field Power Distribution on X-Y Plane  
 Gain=228 dBi; Total Radiating Efficiency: 60.6% @ 71020 GHz

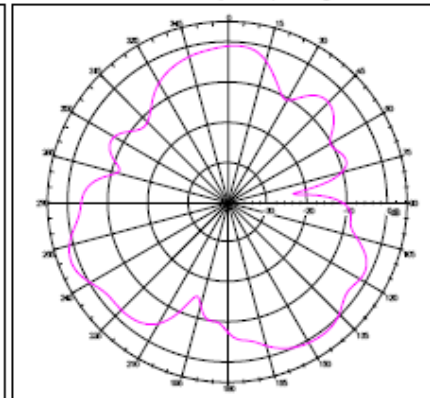


**Frequency :1747.6 MHz**

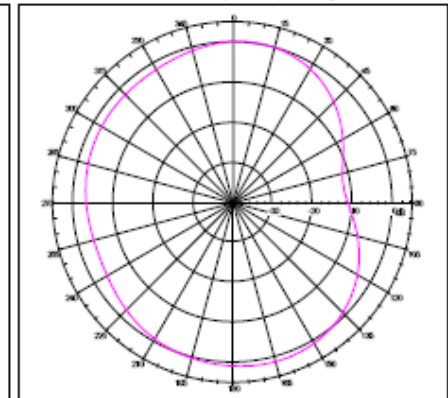
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
 Gain=235 dBi; Total Radiating Efficiency: 61.5% @ 74760 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
 Gain=235 dBi; Total Radiating Efficiency: 61.5% @ 74760 GHz

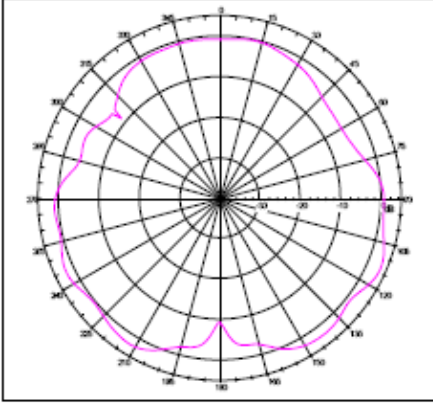


Far-field Power Distribution on X-Y Plane  
 Gain=235 dBi; Total Radiating Efficiency: 61.5% @ 74760 GHz

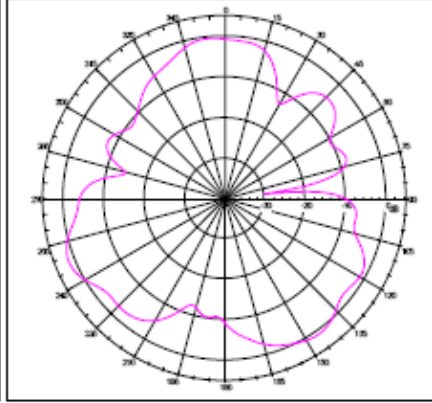


**Frequency :1784.8 MHz**

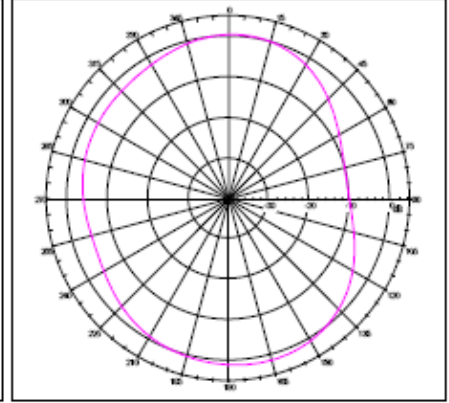
Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)  
Gain=2.58 dBi, Total Radiating Efficiency: 60.77% @ 70400 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=2.58 dBi, Total Radiating Efficiency: 60.77% @ 70400 GHz

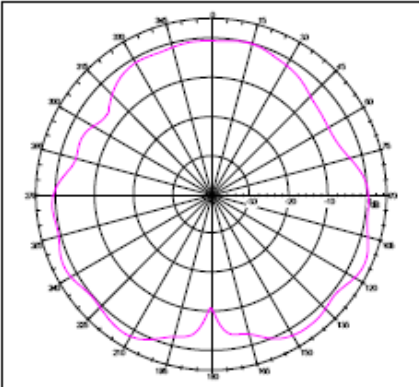


Far-field Power Distribution on X-Y Plane  
Gain=2.58 dBi, Total Radiating Efficiency: 60.77% @ 70400 GHz

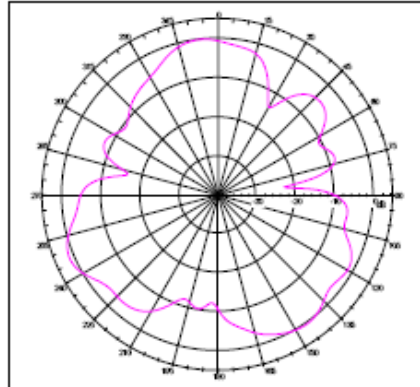


**Frequency :1805.2 MHz**

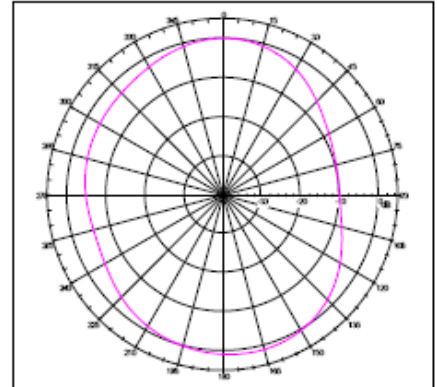
Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)  
Gain=2.32 dBi, Total Radiating Efficiency: 56.67% @ 80620 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=2.32 dBi, Total Radiating Efficiency: 56.67% @ 80620 GHz

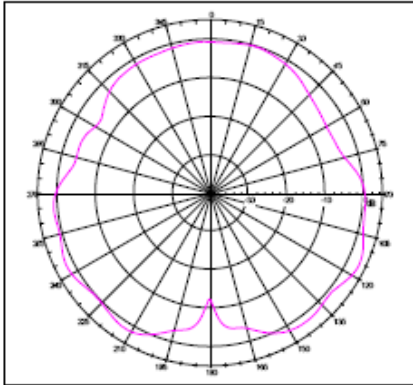


Far-field Power Distribution on X-Y Plane  
Gain=2.32 dBi, Total Radiating Efficiency: 56.67% @ 80620 GHz

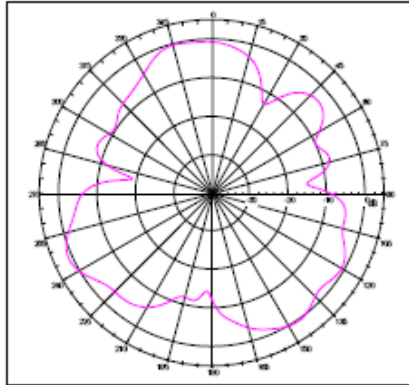


### Frequency :1842.6 MHz

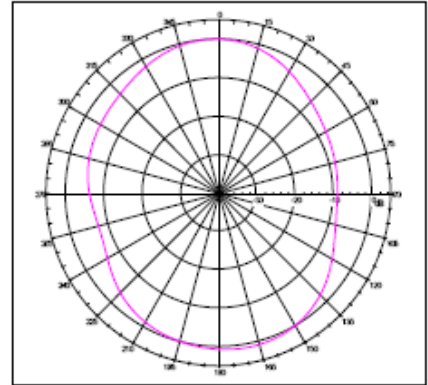
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
Gain=2.42-dB, Total Radiating Efficiency: 56.31% @ 1842.6 MHz



Far-field Power Distribution on YZ Plane(H-Plane of L3 Pol Sense)  
Gain=2.42-dB, Total Radiating Efficiency: 56.31% @ 1842.6 MHz

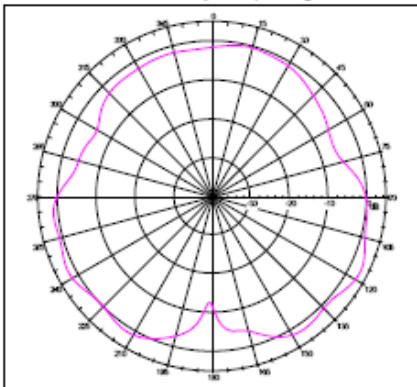


Far-field Power Distribution on X-Y Plane  
Gain=2.42-dB, Total Radiating Efficiency: 56.31% @ 1842.6 MHz

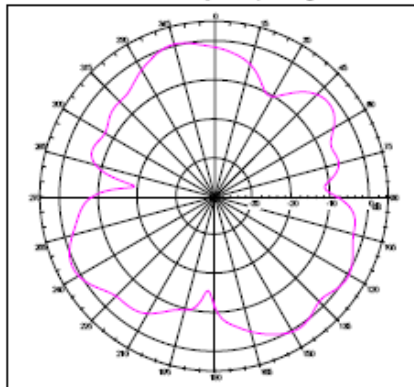


### Frequency :1879.8 MHz

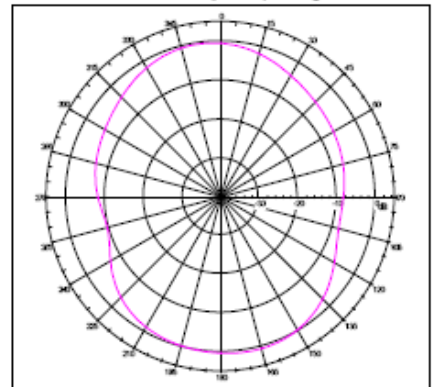
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
Gain=2.59-dB, Total Radiating Efficiency: 51.69% @ 1879.8 MHz



Far-field Power Distribution on YZ Plane(H-Plane of L3 Pol Sense)  
Gain=2.59-dB, Total Radiating Efficiency: 51.69% @ 1879.8 MHz



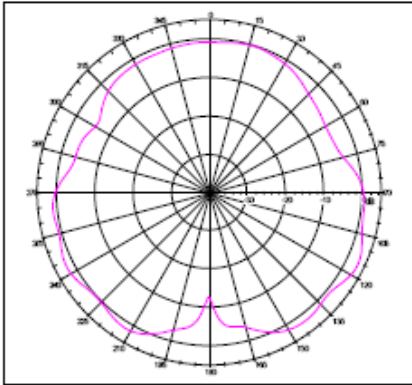
Far-field Power Distribution on X-Y Plane  
Gain=2.59-dB, Total Radiating Efficiency: 51.69% @ 1879.8 MHz



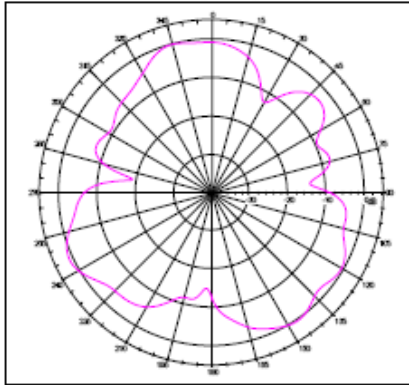
## GSM1900

### Frequency :1850.2 MHz

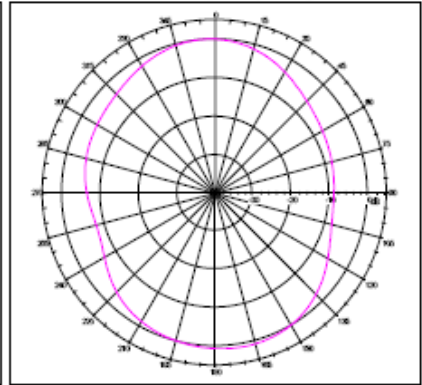
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
Gain=2.48 dBi, Total Radiating Efficiency: 56.99% @ 18500 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=2.48 dBi, Total Radiating Efficiency: 56.99% @ 18500 GHz

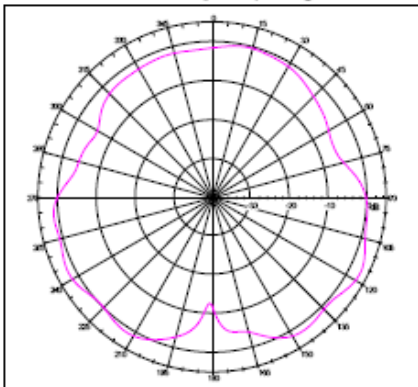


Far-field Power Distribution on X-Y Plane  
Gain=2.48 dBi, Total Radiating Efficiency: 56.99% @ 18500 GHz

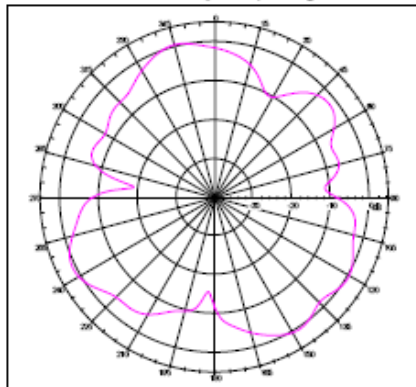


### Frequency :1880.0 MHz

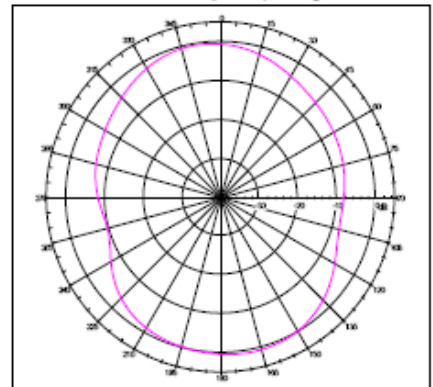
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
Gain=2.60 dBi, Total Radiating Efficiency: 58.75% @ 18800 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=2.60 dBi, Total Radiating Efficiency: 58.75% @ 18800 GHz

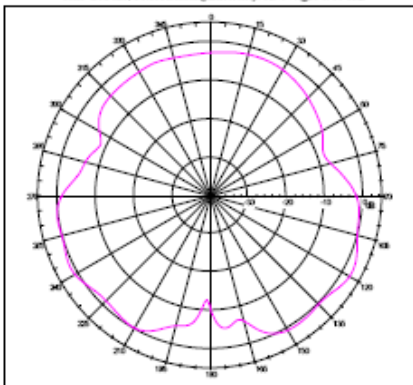


Far-field Power Distribution on X-Y Plane  
Gain=2.60 dBi, Total Radiating Efficiency: 58.75% @ 18800 GHz

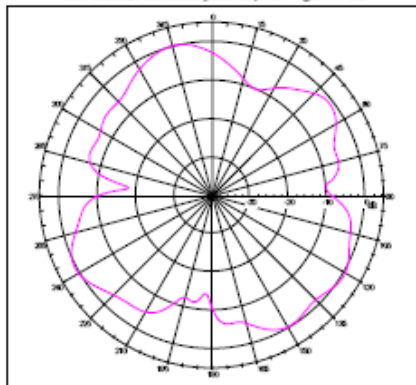


### Frequency :1909.8 MHz

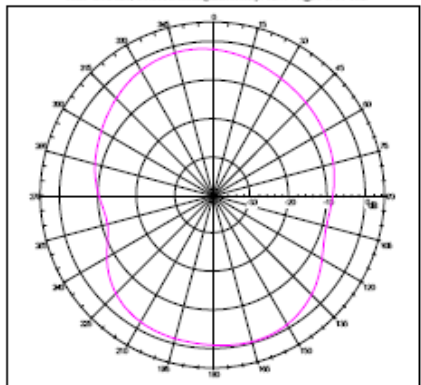
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
Gain=2.12 dBi, Total Radiating Efficiency: 52.79% @ 19090 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=2.12 dBi, Total Radiating Efficiency: 52.79% @ 19090 GHz

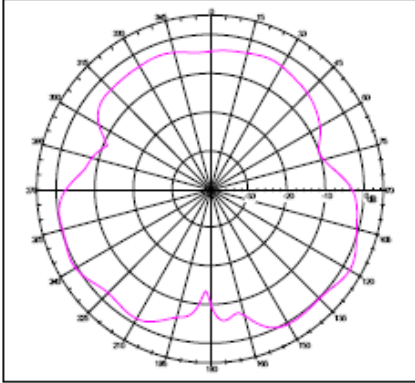


Far-field Power Distribution on X-Y Plane  
Gain=2.12 dBi, Total Radiating Efficiency: 52.79% @ 19090 GHz

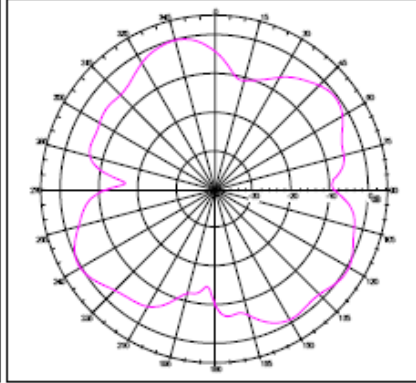


### Frequency : 1930.2 MHz

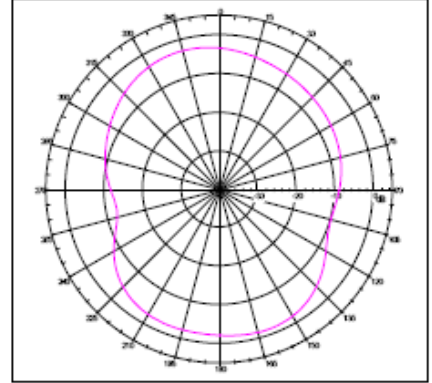
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
Gain=1.80 dBi, Total Radiating Efficiency: 50.11% @ 50000 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=1.80 dBi, Total Radiating Efficiency: 50.11% @ 50000 GHz

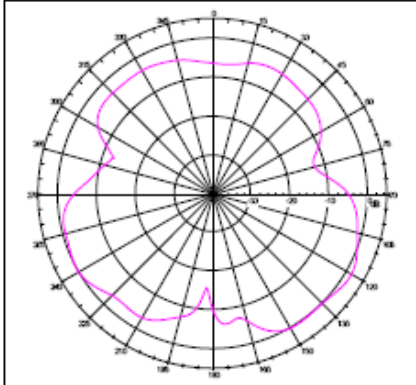


Far-field Power Distribution on X-Y Plane  
Gain=1.80 dBi, Total Radiating Efficiency: 50.11% @ 50000 GHz

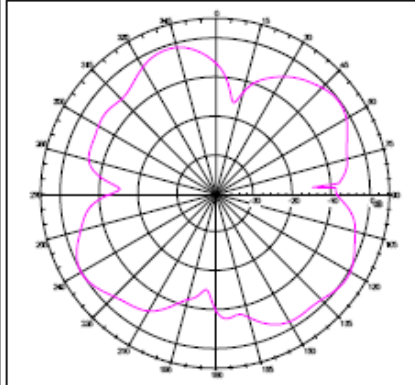


### Frequency : 1960.0 MHz

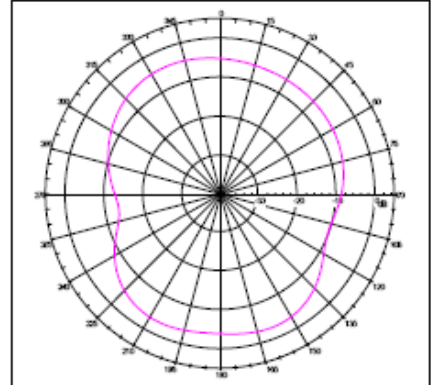
Far-field Power Distribution on XZ Plane(E-Plane of L3 Pol Sense)  
Gain=1.31 dBi, Total Radiating Efficiency: 47.26% @ 50000 GHz



Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=1.31 dBi, Total Radiating Efficiency: 47.26% @ 50000 GHz

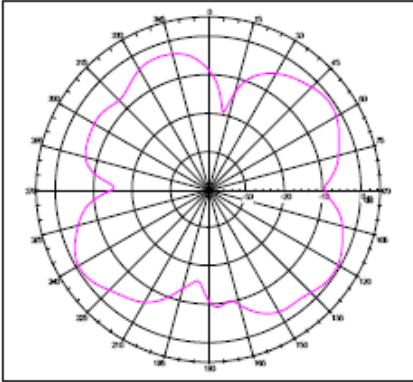


Far-field Power Distribution on X-Y Plane  
Gain=1.31 dBi, Total Radiating Efficiency: 47.26% @ 50000 GHz

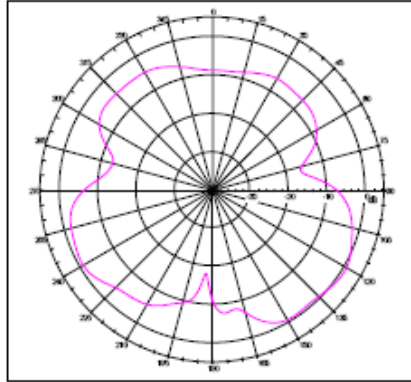


**Frequency : 1989.8 MHz**

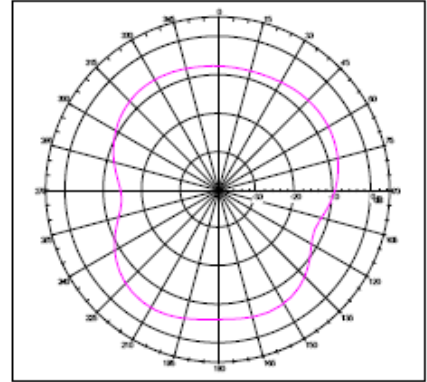
Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)  
Gain=0.30 dBi; Total Radiating Efficiency: 36.62% @ 1989.8 MHz



Re-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)  
Gain=0.30 dBi; Total Radiating Efficiency: 38.62% @ 1989.8 MHz



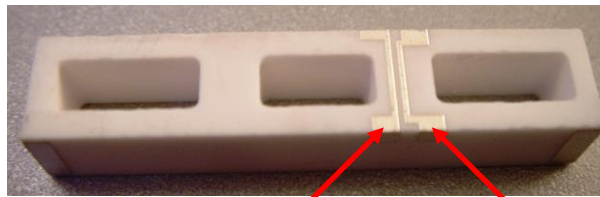
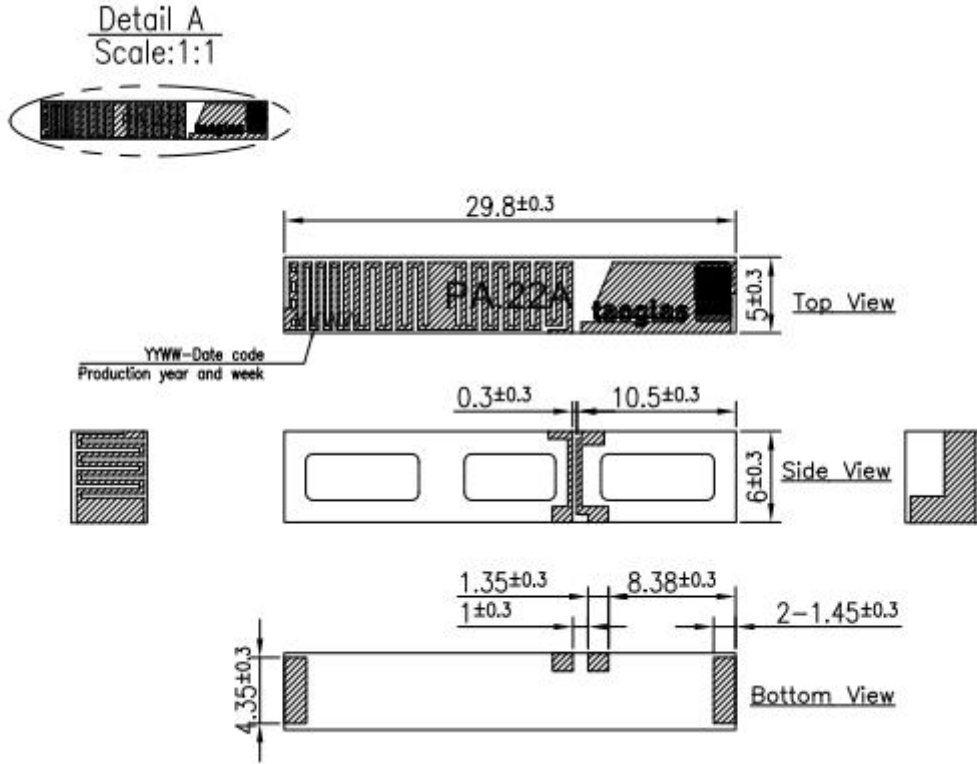
Far-field Power Distribution on X-Y Plane  
Gain=0.30 dBi; Total Radiating Efficiency: 36.62% @ 1989.8 MHz





### 3. Mechanical Dimensions

#### 3.1 PA.22 Antenna



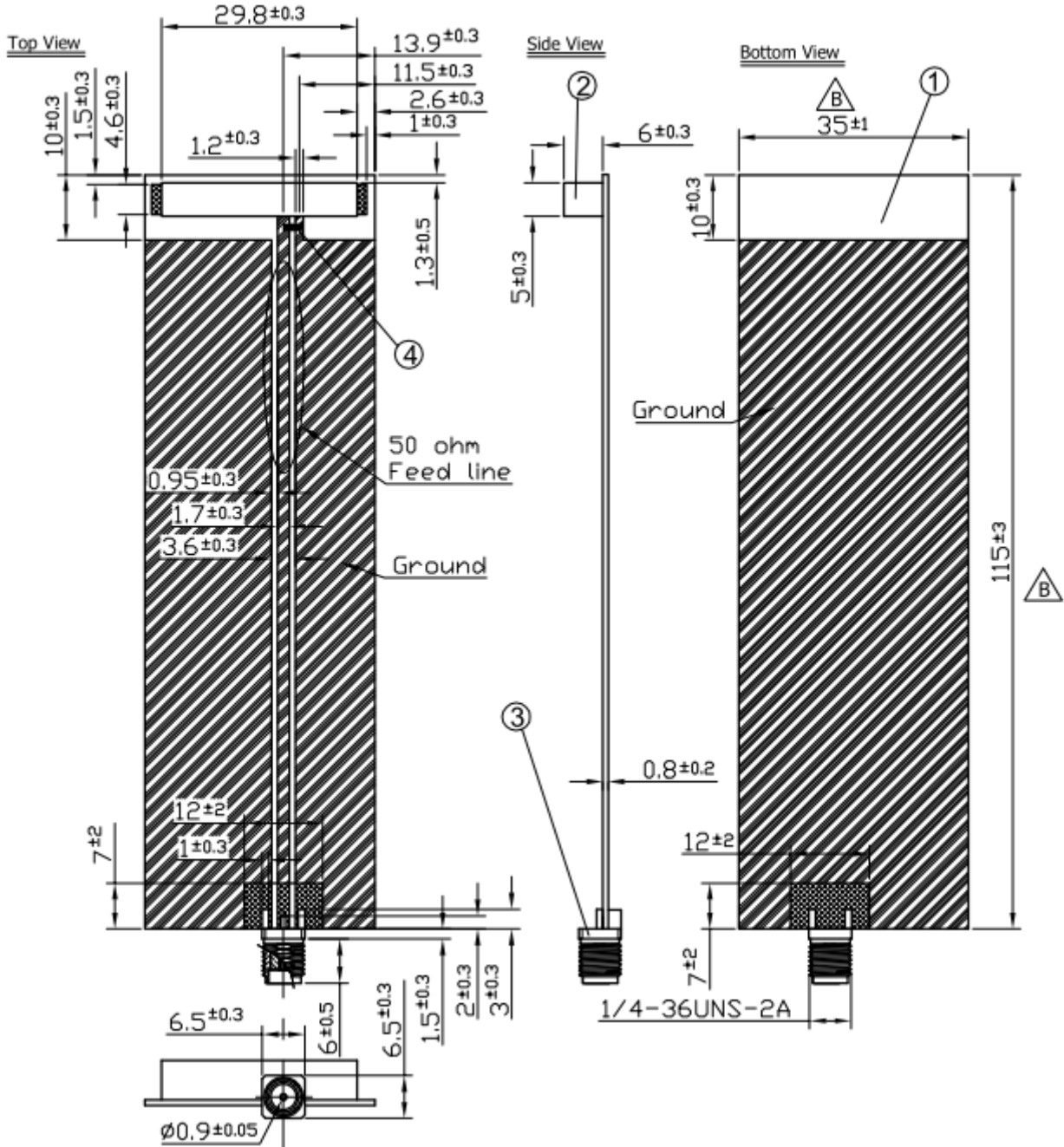
feed to module

to ground






solder pads  
(mechanical only)

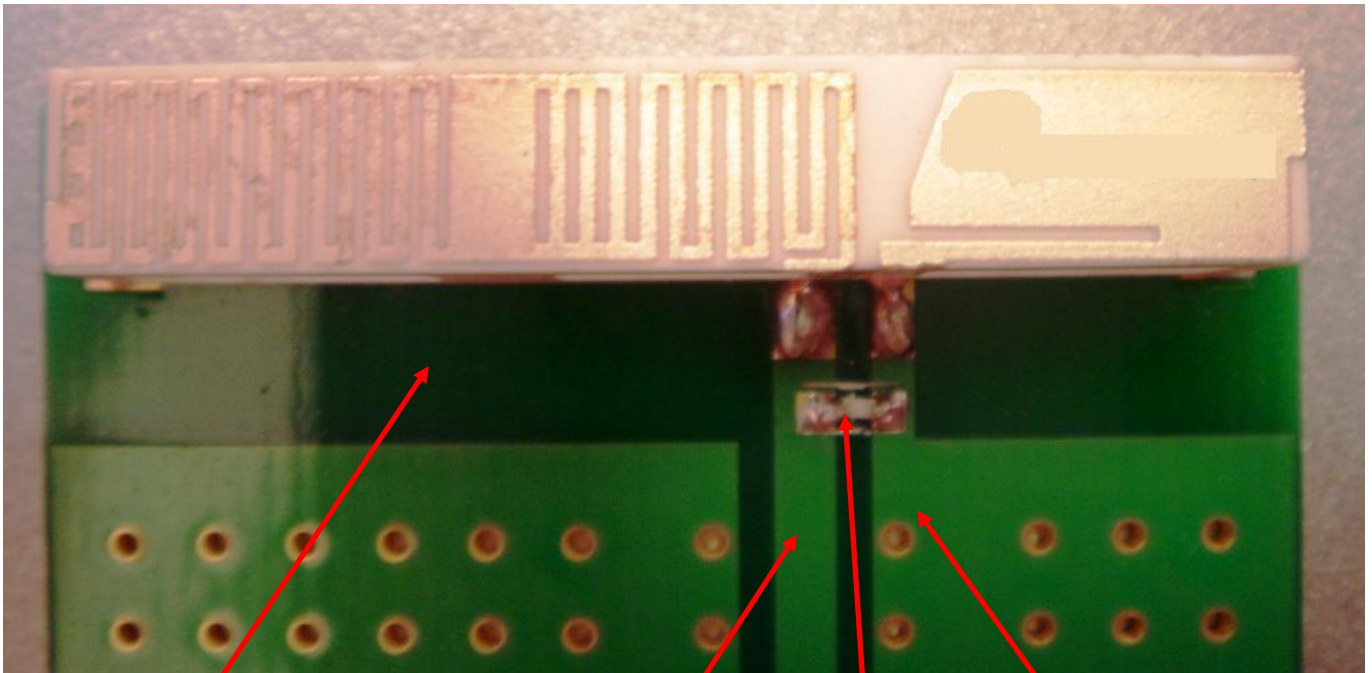
### 3.2 Evaluation board dimensions



Note:

1. Unique dimensioning according to your PCB inductor and capacitor values according to you specific device
2. Copper area 
3. Soldered area 
4. Clearance area 

### 3.3 Recommended layout (as per Taoglas evaluation board)



Non metal area  
6mm clearance ideally  
(minimum 4mm clearance)

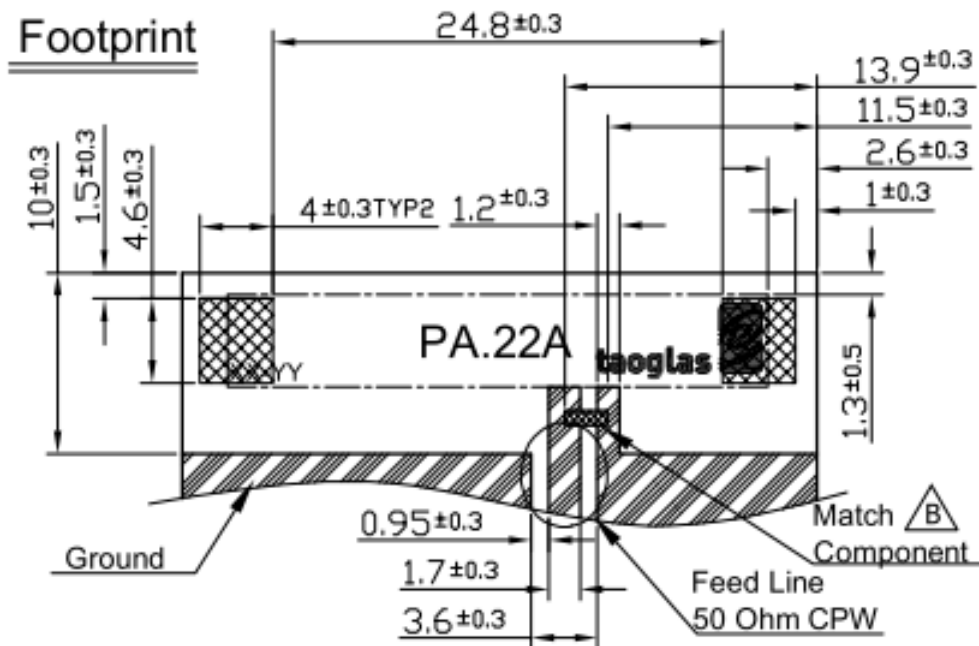
feed to module

4.7nH inductor  
For EVB only

to ground

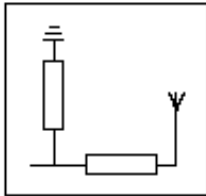


View from underneath board – note solder pads either side – laid out on non metal area  
Layout dimensions - Allow 6mm clearance all around if possible (minimum 4mm)

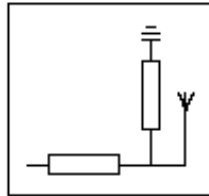


### 3.4 Recommended Transmission Line and Matching Network

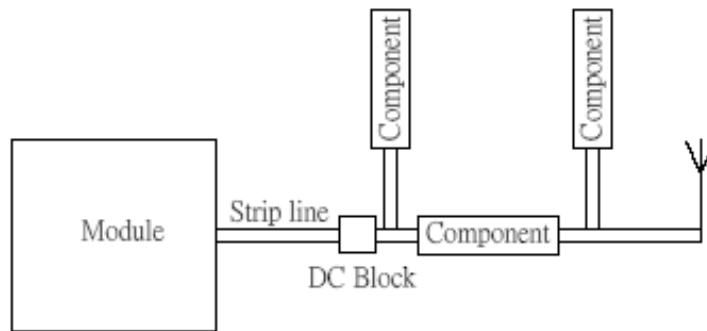
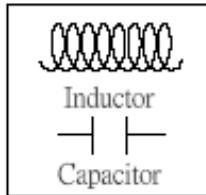
Typical config.1



Typical config.2



Component types

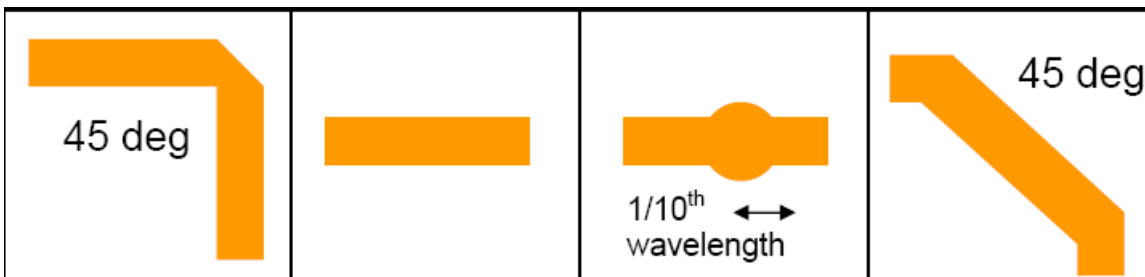


The matching network has to be individually designed using one,two or three components.

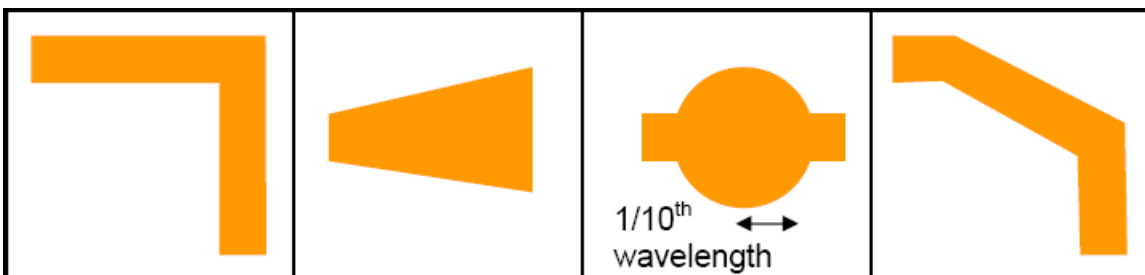
**Note: The PA.22 can be made "quad band" with appropriate matching circuit**

**Guidelines for routing RF when designing a PCB;**

**1) Good**



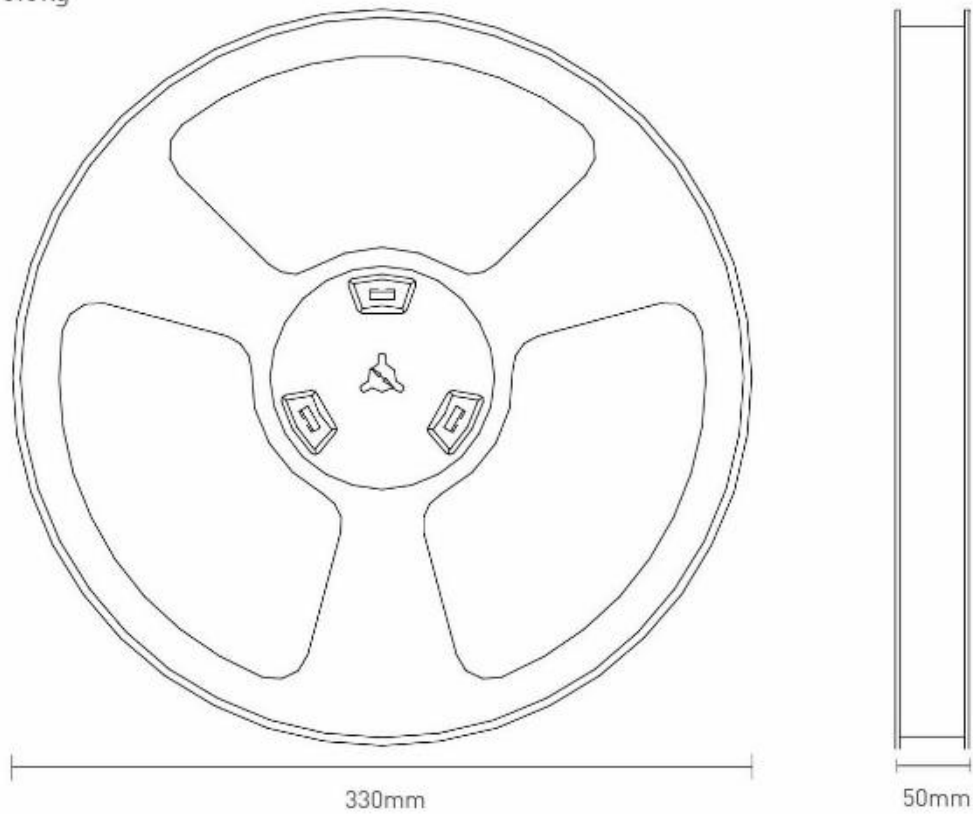
**2) Bad**



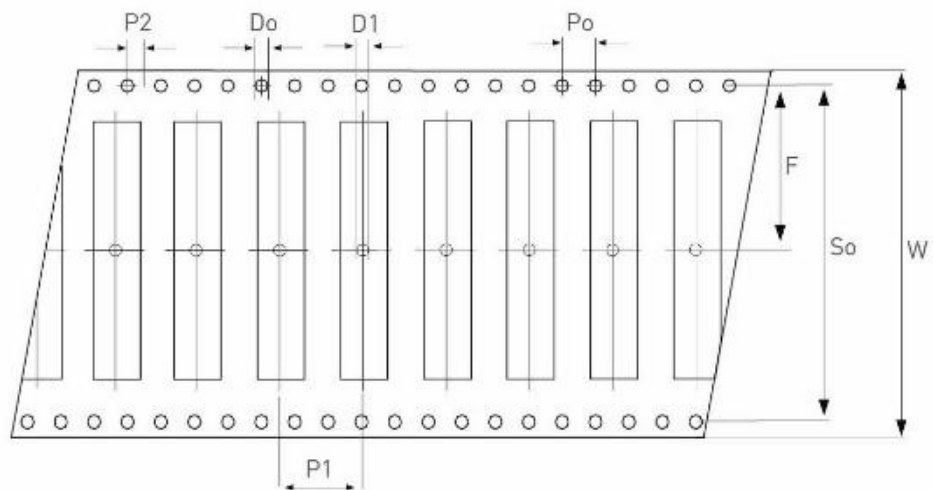


## 4. Packaging

450 pc PA.22.A  
1 reel per small inner box  
Dimensions - 330\*50mm  
Weight - 3.3kg

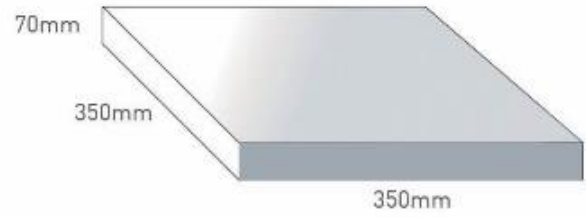


Symbol	Spec
Po	4.0 ± 0.10
P1	12.0 ± 0.10
P2	2.0 ± 0.15
Do	1.5
D1	2.0 (Min)
F	20.2 ± 0.10
So	40.4 ± 0.10
W	44.0 ± 0.30

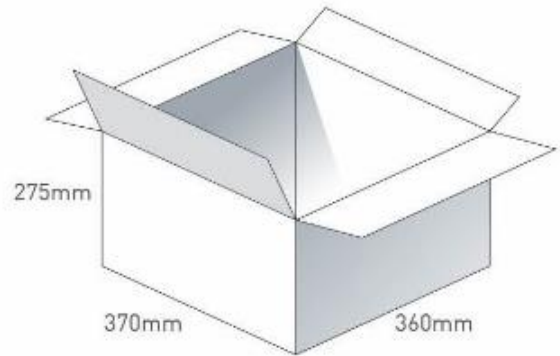




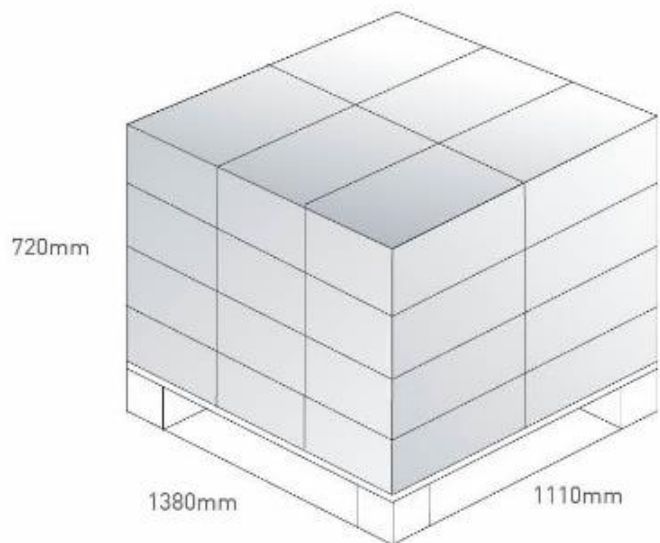
450 pc PA.22.A  
1 reel in small inner box  
Dimensions - 350\*350\*70  
Weight - 3.6Kg



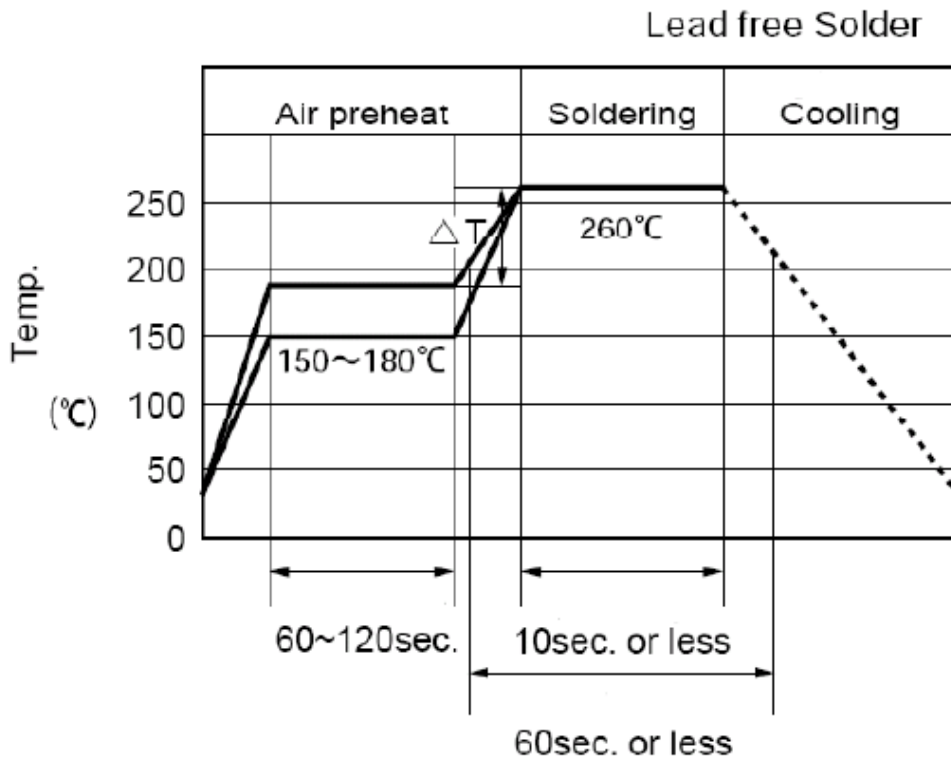
4 boxes / 1800 pcs in one carton  
Carton Dimensions - 370\*360\*275mm  
Weight -14.4Kg



Pallet Dimensions 1110\*720\*1380mm  
24 Cartons per Pallet  
6 Cartons per layer  
4 Layers



## 5. Recommended Reflow Temperature Profile



(1) Time shown in the above figures is measured from the point when chip surface reaches temperature.

(2) Temperature difference in high temperature part should be within 110°C.

(3) After soldering, do not force cool, allow the parts to cool gradually.

\*General attention to soldering:

- High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.
- for soldering, please refer to the soldering curves above. However, please keep exposure to temperatures exceeding 200°C to under 50 seconds.
- please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

Cleaning:

When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decrease in the adherence of the termination, we recommend that you use the conditions below.

Frequency: 40 kHz max. - Output power: 20W/liter -Cleaning time: 5minutes max.