Application Note no.015

Chip Antenna Series

Bluetooth \ WLAN Chip Antenna

ACA-2012-A1-CC-S

Prepared	Checked	Approved

Application Note

Bluetooth \ WLAN Chip Antenna – ACA-2012-A1-CC-S

Revision History: 2010-04-09 Rev.A0

Previous Version :

Page	Subjects (major changes since last revision)	Version
All	Make up all document	A0

ACA-2012-A1-CC-S Application Note

Catalog

Applications

This antenna is designed for Bluetooth\WLAN application and it's suitable for cellular phones, PDA, notebook, navigator, and all devices which have Bluetooth\WLAN function.

Features

- Omni-directional radiation
- High Efficiency
- Low profile and compact size(2.0 x 1.2 x 0.55mm)
- Low cost
- Lead free soldering compatible
- RoHS compliant
- Tape and reel packing

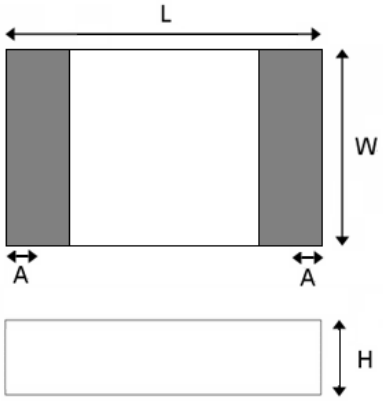
Electrical Characteristics

ITEM	SPECIFICATION
Frequency Band	2400MHz～2483MHz
VSWR	Less than 4
Polarization	Linear
*Peak Gain	1.72 dBi Typ.
*Peak Efficiency	72.3% Typ.
Impedance	50Ω Typ.

* Test condition: Test board size 110*55 mm

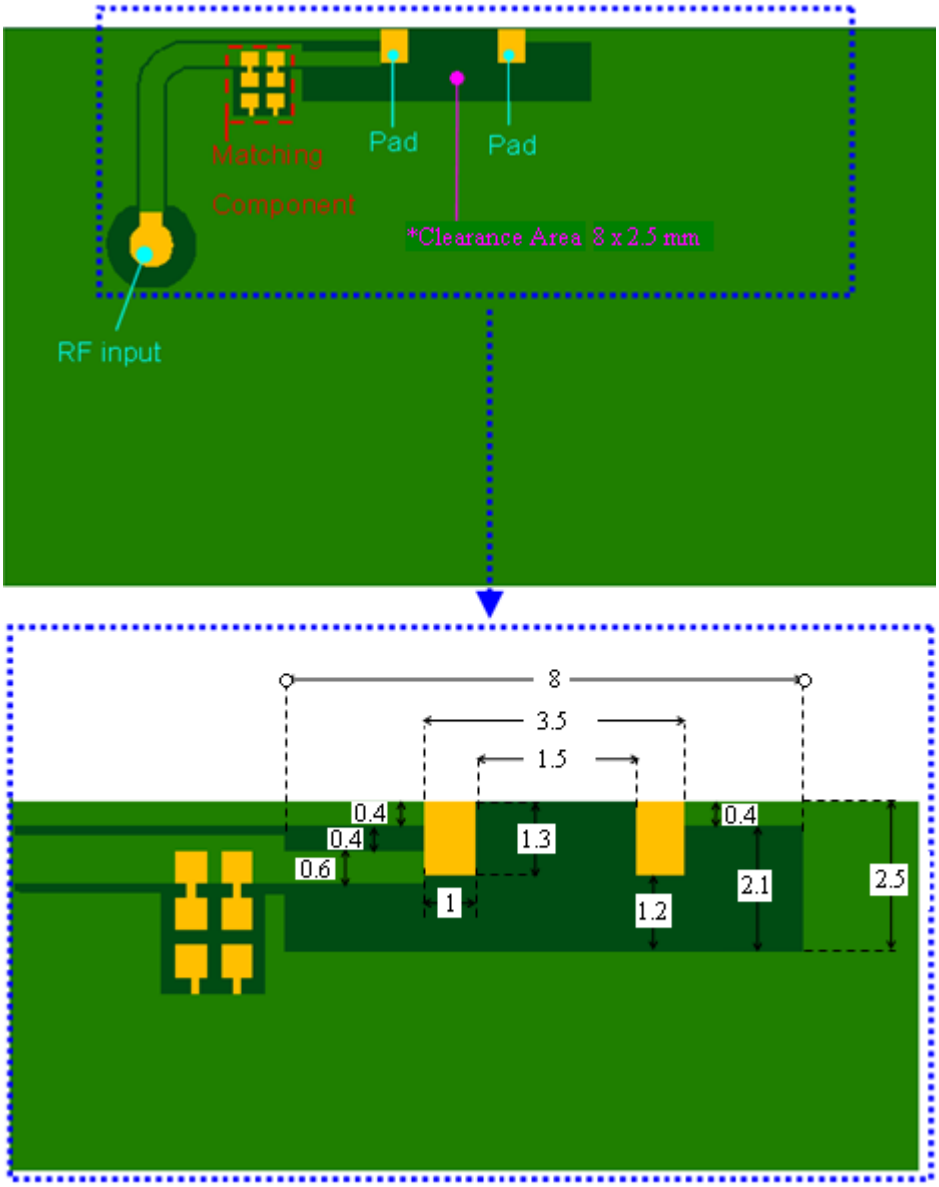
Matching circuit: Pi matching circuit will be required

Antenna Dimension



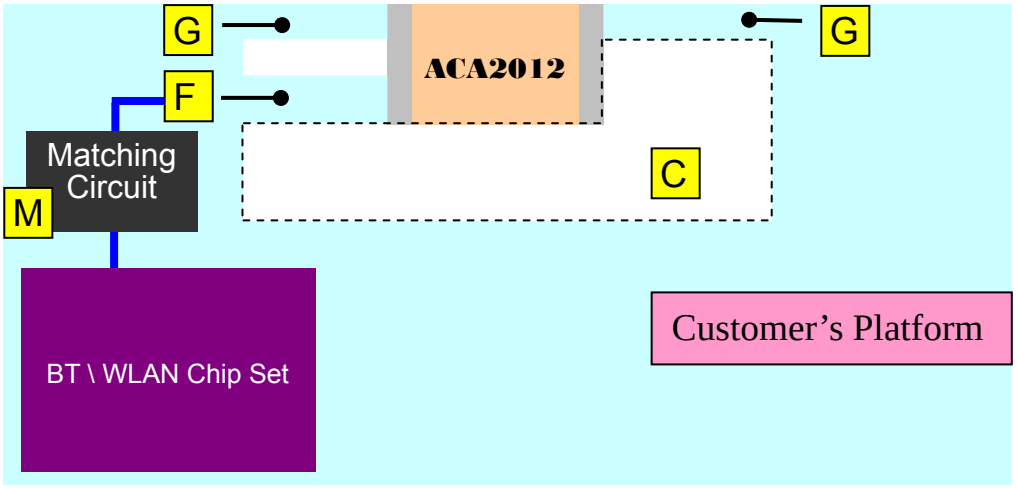
Chip Antenna	L	W	H	A
ACA2012	2.0±0.3	1.2±0.3	0.55±0.2	0.4±0.25

Recommended PCB layout (unit: mm)



***Clearance 8mm × 2.5mm：All metallization should be removed from all PCB layers.**

Layout Description



F. Feeding Pad

The signal from system must feed into the feeding pad.

G. Ground Pad

This pad must connect to ground plane of PCB.

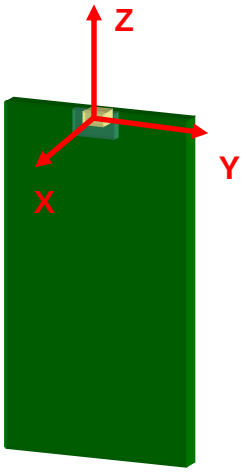
C. Clearance Area

To achieve antenna performance, the clearance area is necessary and all metallization should be removed from all PCB layers.

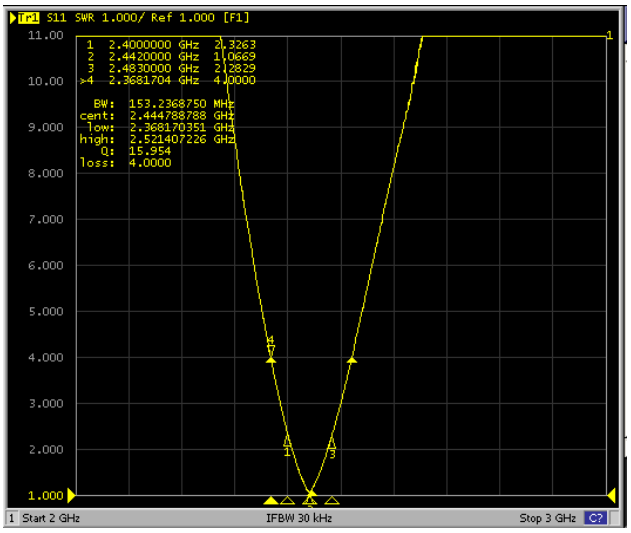
M. Matching Circuit

Please keep the pads for PI-matching circuit to reduce return loss and shift the band to meet Bluetooth application.

Performance on Middle of Short Side



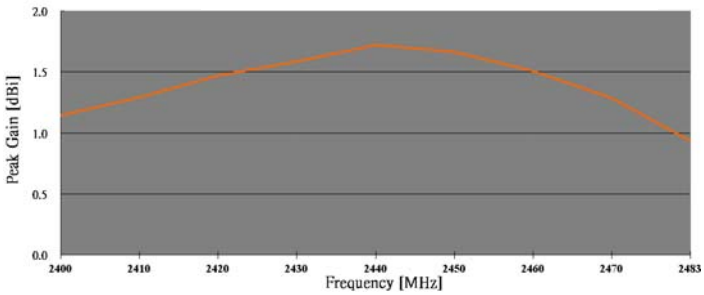
Typical VSWR



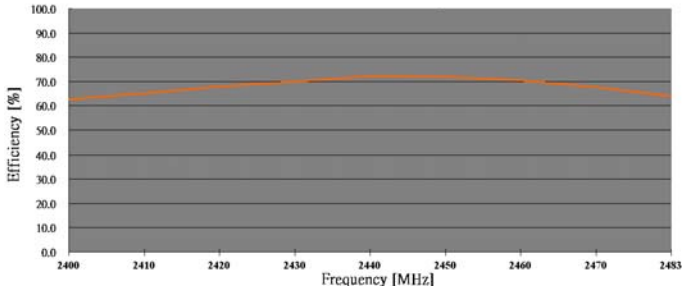
Frequency	VSWR
2400 MHz	2.33
2442 MHz	1.07
2483 MHz	2.28

Typical Free Space Peak Gain and Efficiency

Antenna Peak Gain



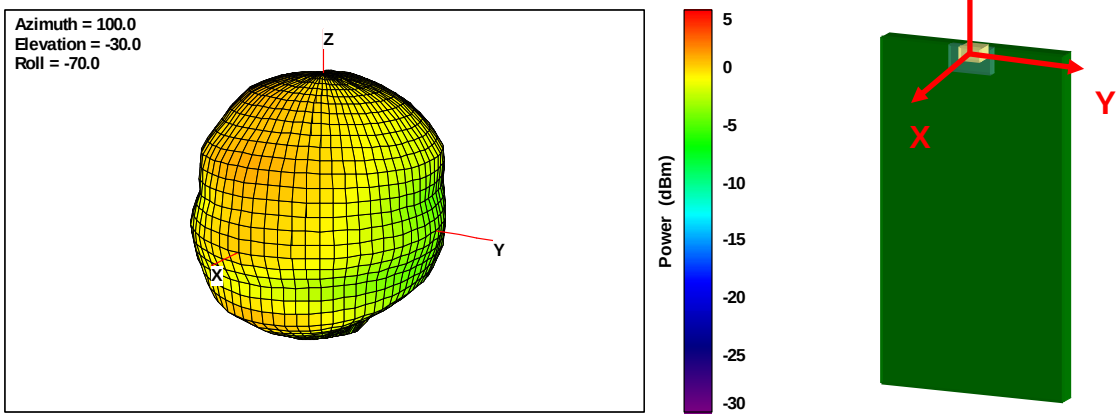
Radiation Efficiency



Frequency	Peak Gain(dBi)	Efficiency(%)
2400 MHz	1.14	62.61
2442 MHz	1.72	72.30
2483 MHz	0.94	63.88

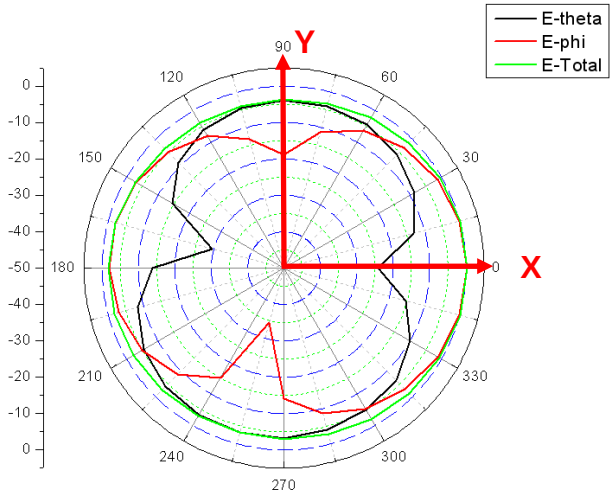
Typical Free Space 3D Radiation Pattern

2442 MHz

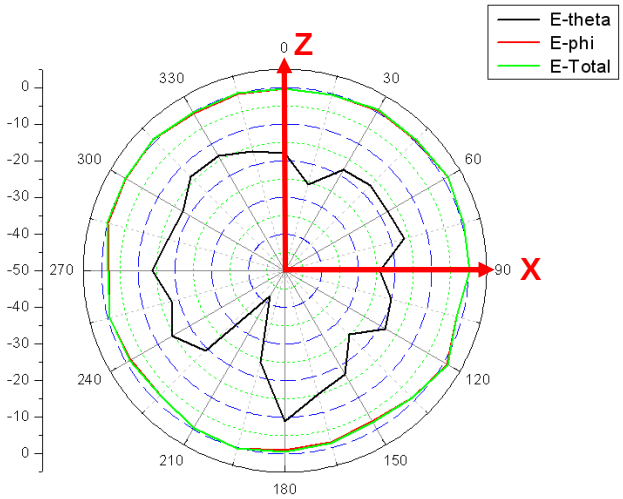


Typical Free Space 2D Radiation Pattern

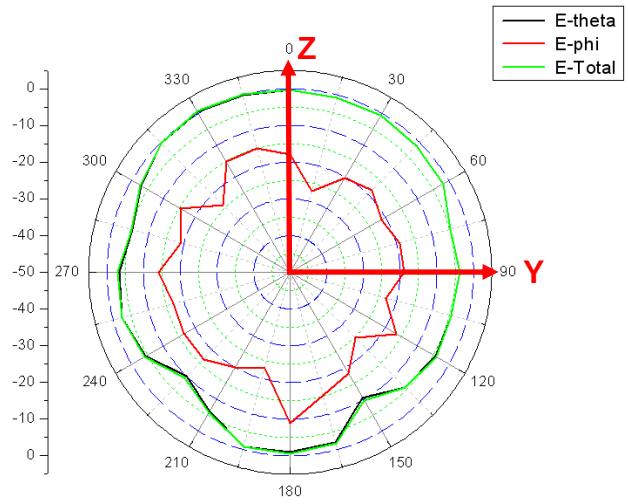
X-Y Plane 2442 MHz

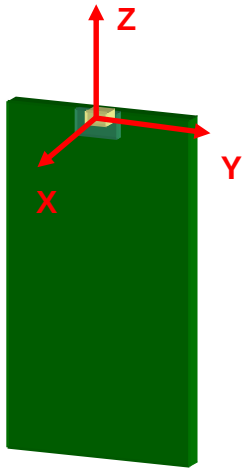


X-Z Plane 2442 MHz



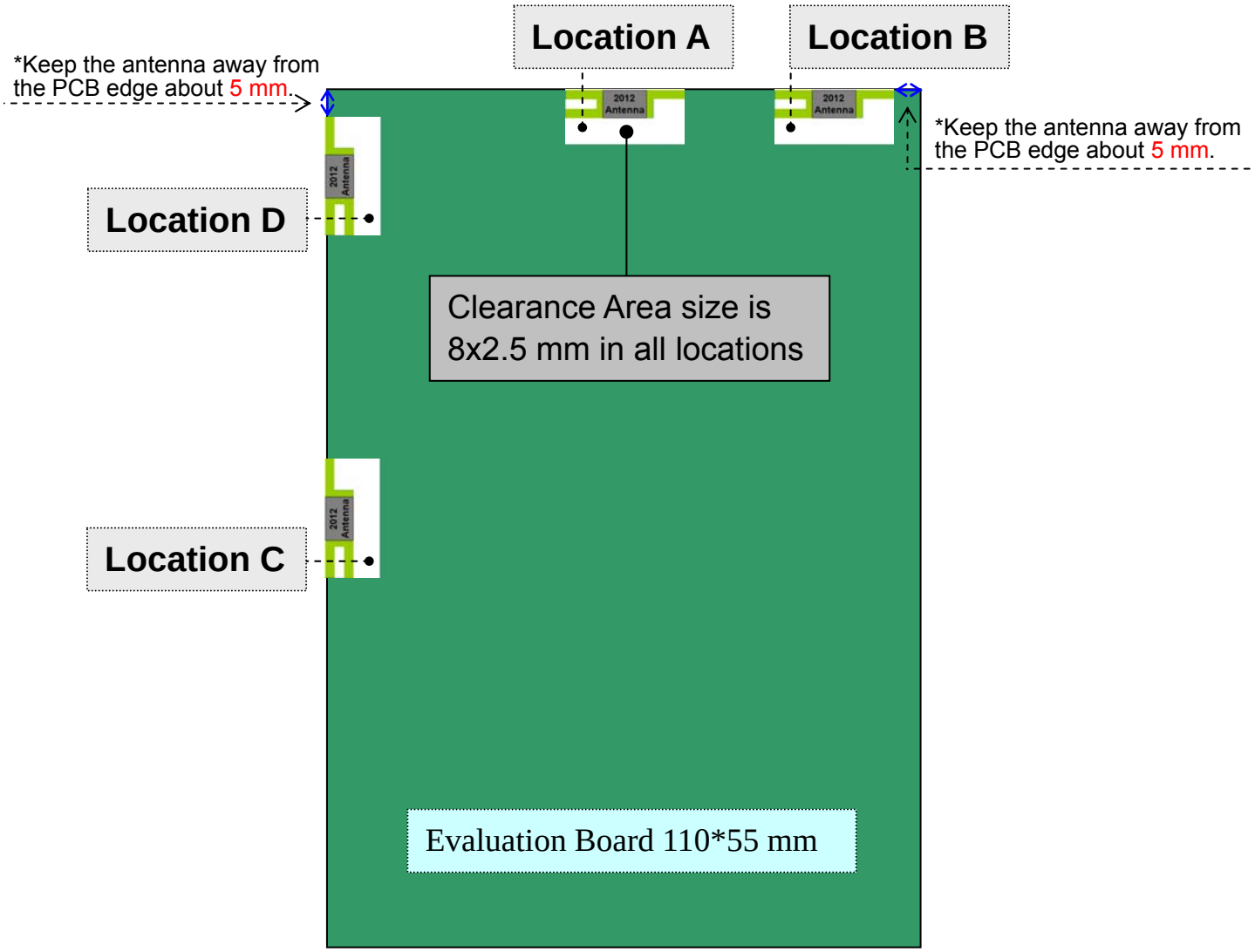
Y-Z Plane 2442 MHz





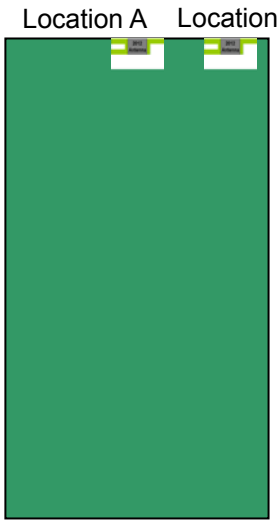
The Efficiency and Bandwidth for Different Location

* All electrical characteristic depend on INPAQ 110 x 55 mm evaluation board with matching circuit.

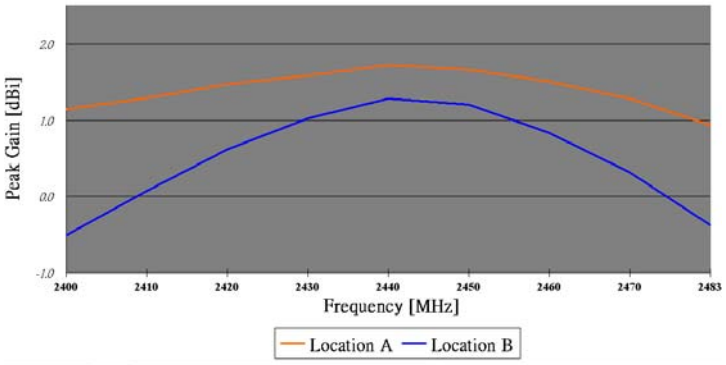


Locations / Test Item			Short side		Long side	
			A	B	C	D
Bandwidth (MHz) VSWR< 4			153	92	106	90
Gain	Linear (dBi)	Peak	1.72	1.28	1.14	2.08
		Avg.	-1.41	-2.21	-1.95	-3.00
Efficiency	Linear (%)		72.3	60.1	63.86	51.22

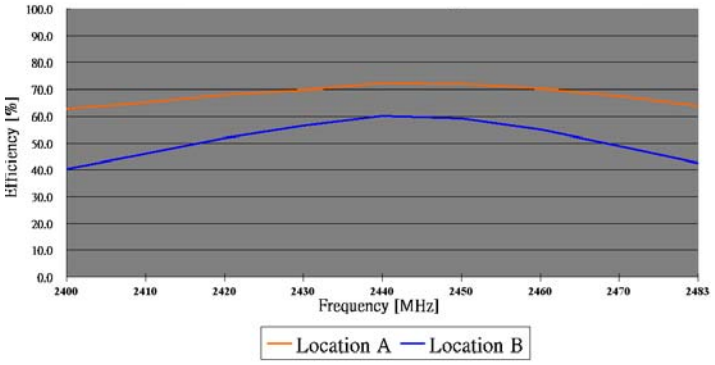
Peak Gain and Efficiency on Short Side



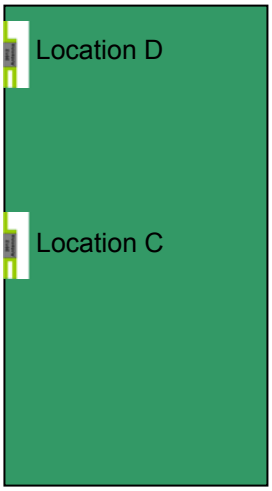
Antenna Peak Gain



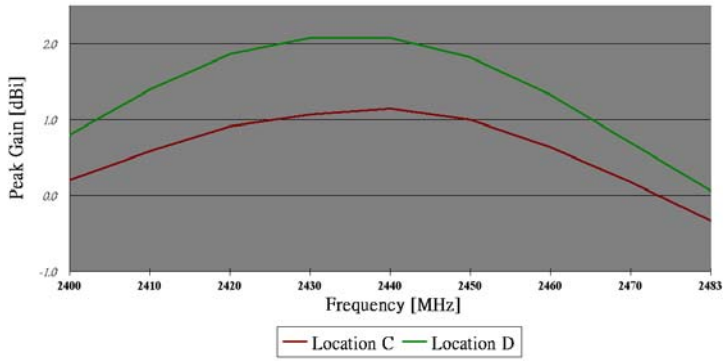
Radiation Efficiency



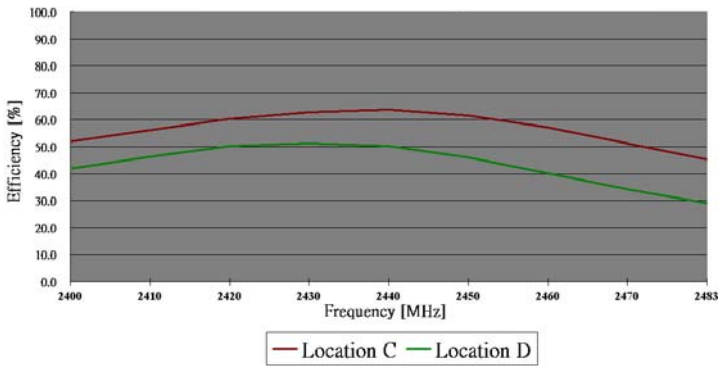
Peak Gain and Efficiency on Long Side



Antenna Peak Gain

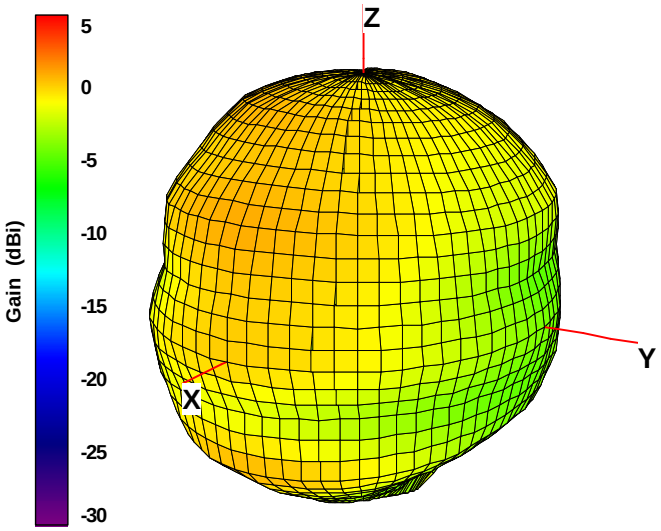


Radiation Efficiency

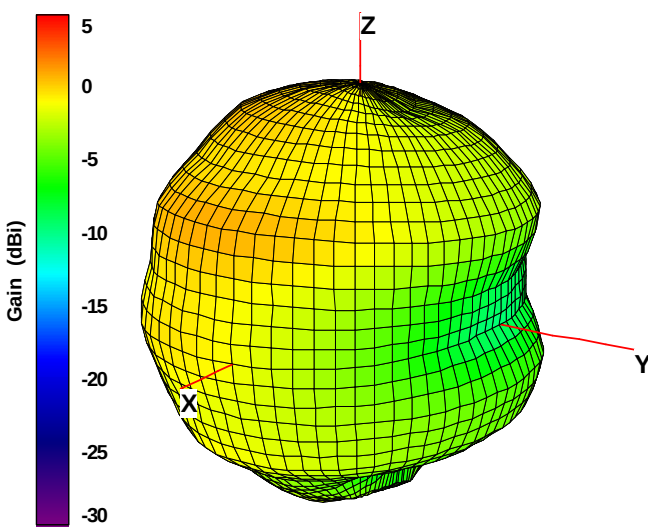


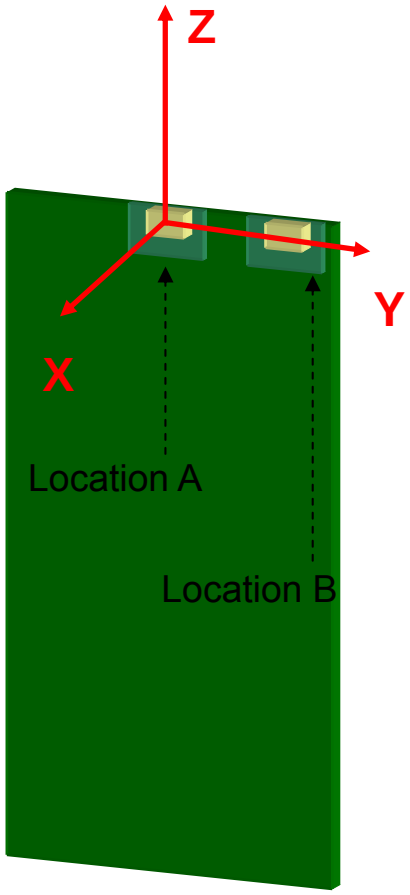
3D Gain Pattern on Short Side

Location A	2442 MHz



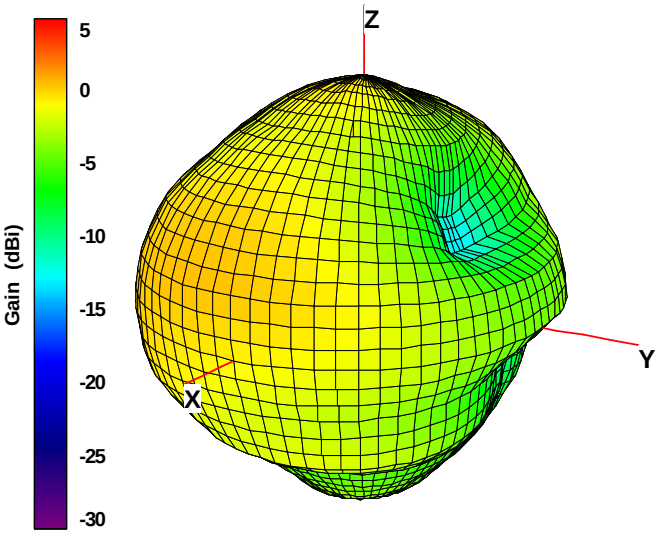
Location B	2442 MHz



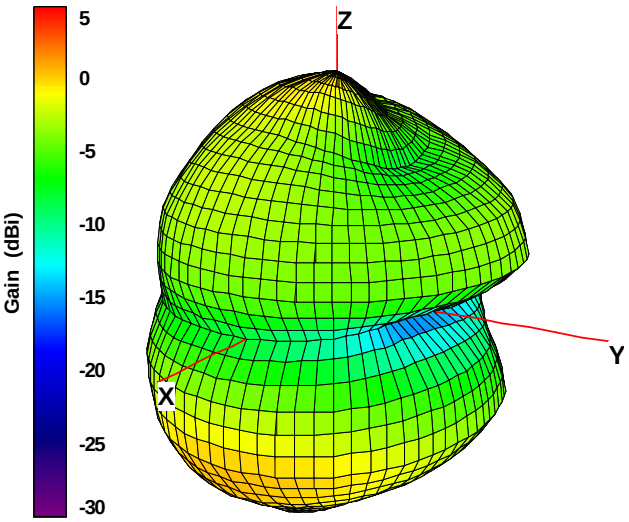


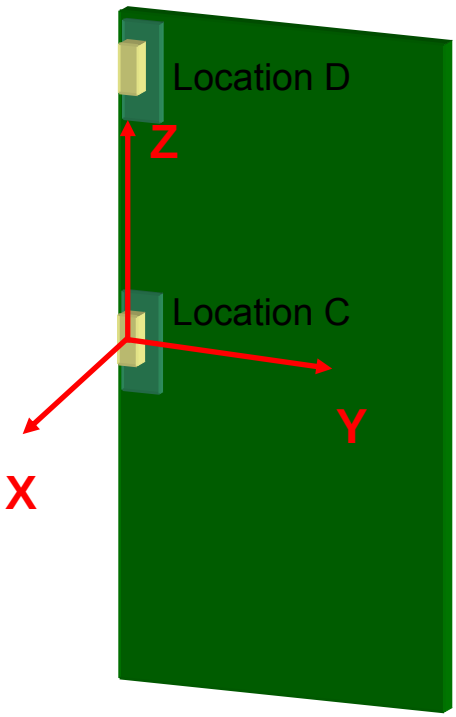
3D Gain Pattern on Long Side

Location C	2442 MHz



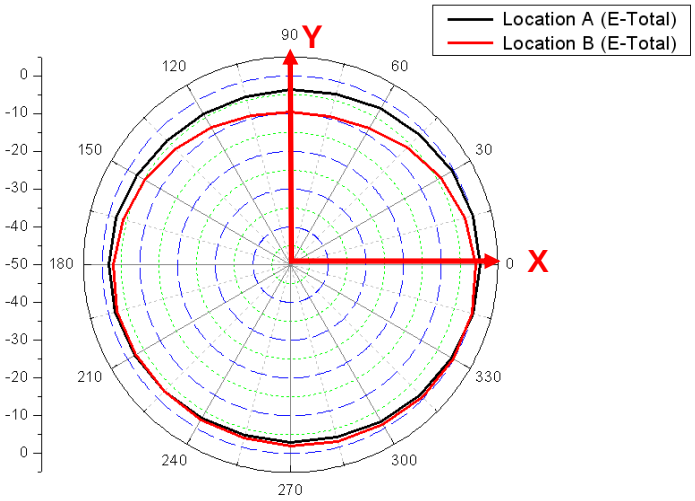
Location D	2442 MHz



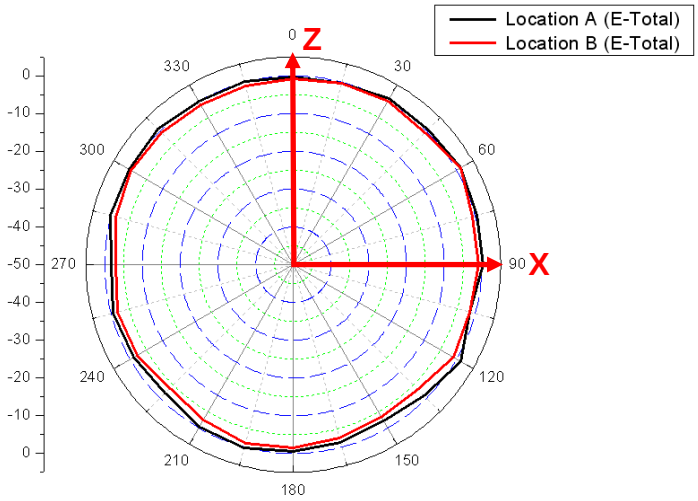


2D Gain Pattern on Short Side

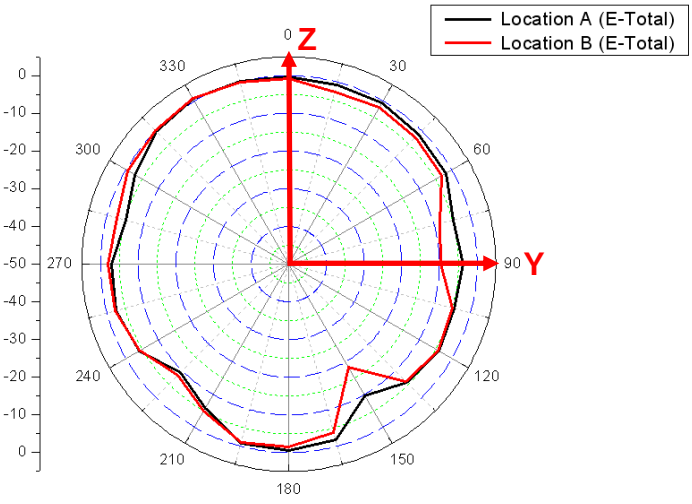
X-Y plane 2442 MHz

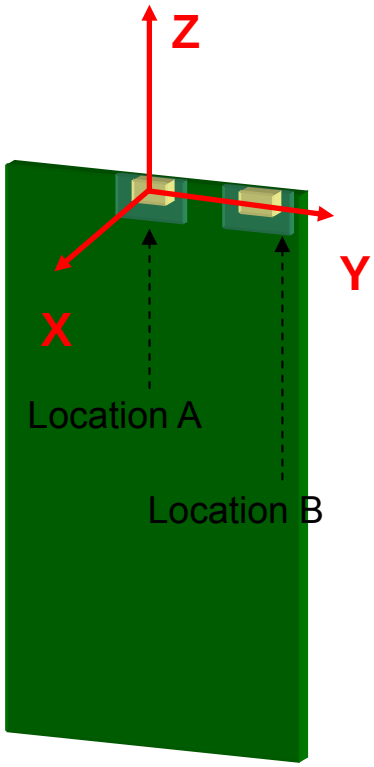


X-Z plane 2442 MHz



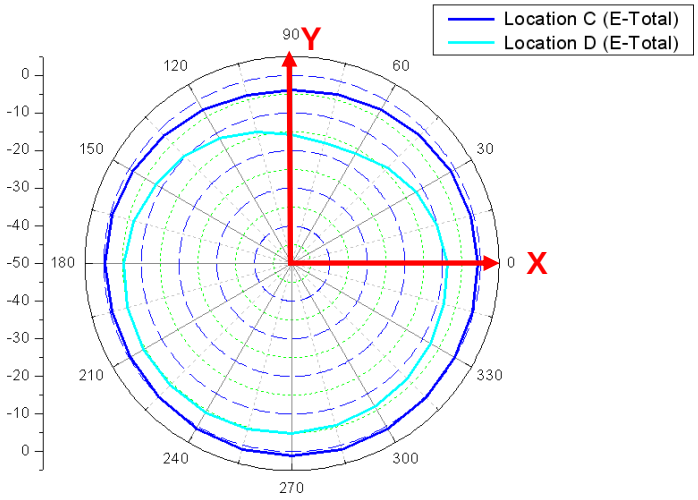
Y-Z plane 2442 MHz



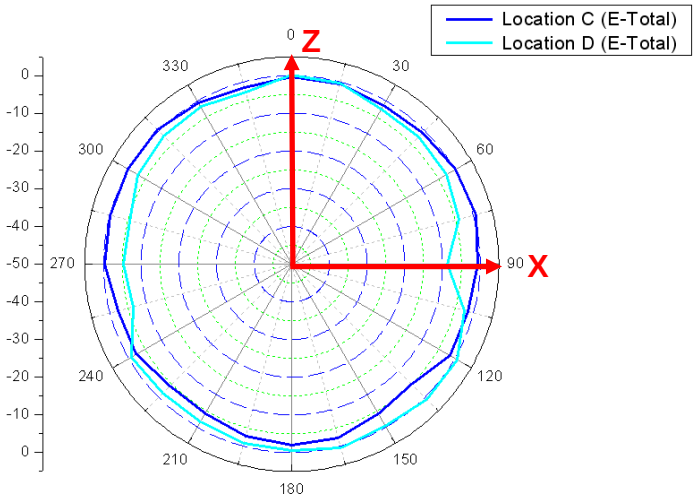


2D Gain Pattern on Long Side

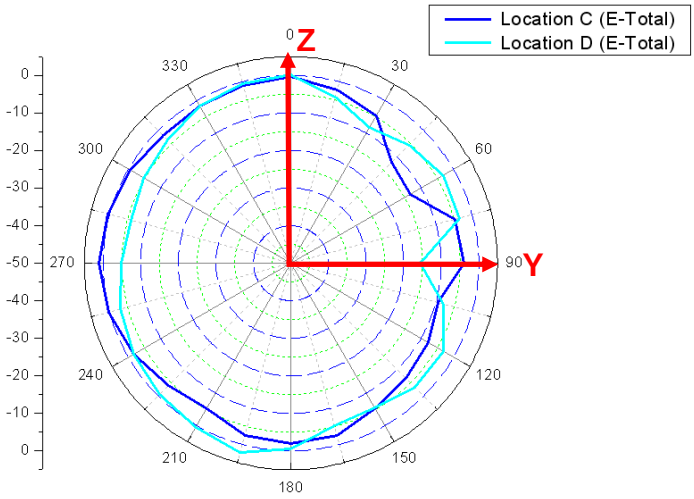
X-Y plane 2442 MHz

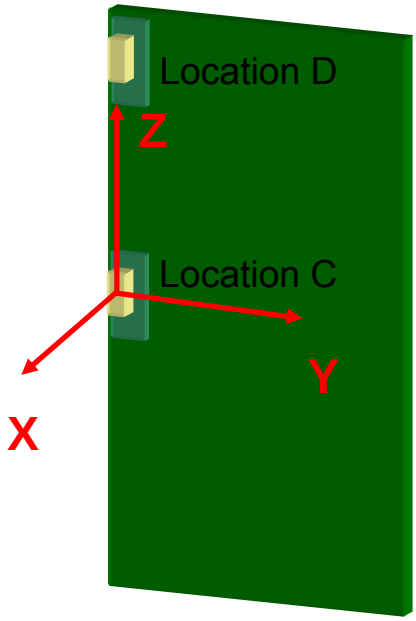


X-Z plane 2442 MHz



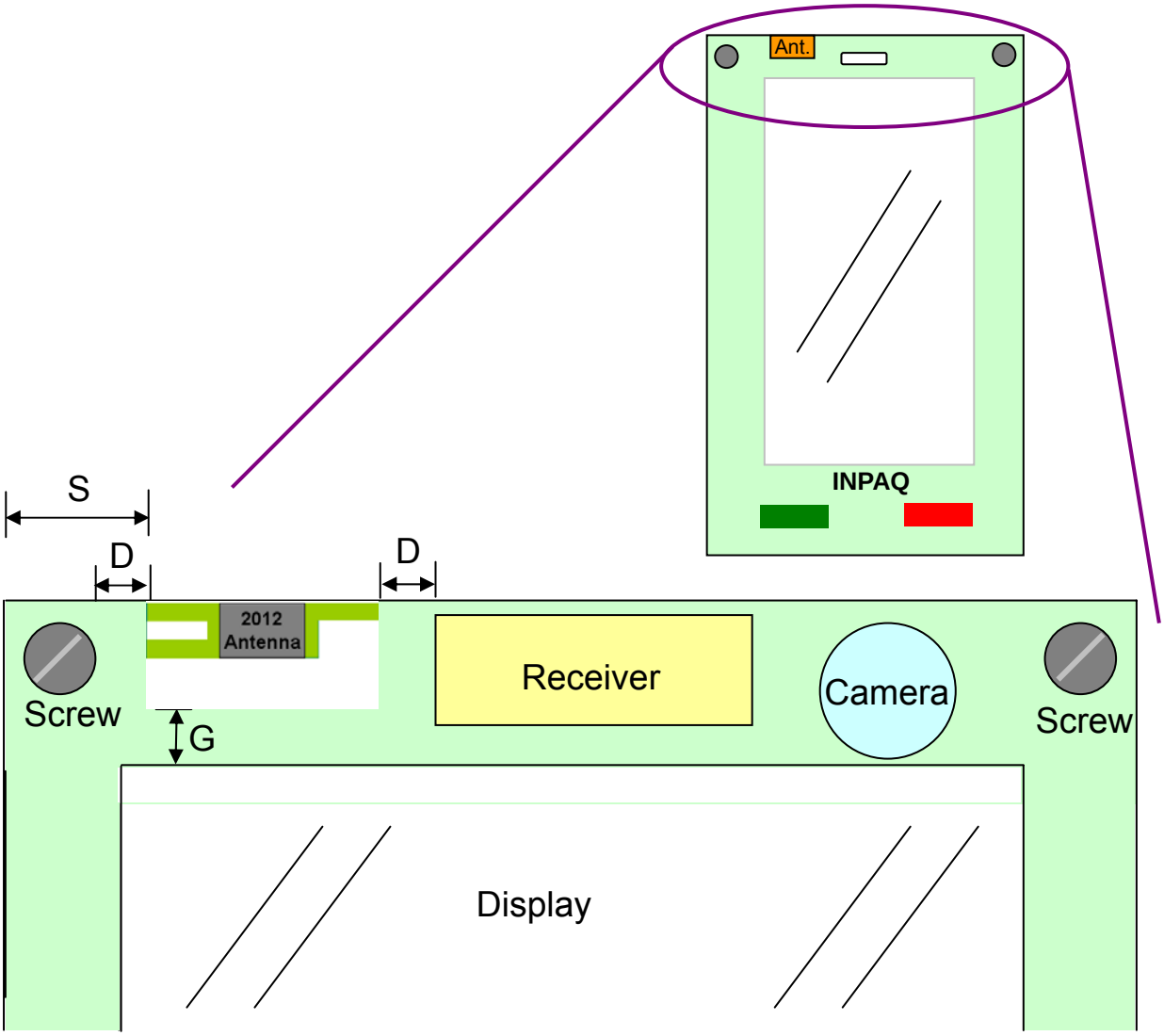
Y-Z plane 2442 MHz





Mobile Phone Applications

- For the mobile phone applications, the most of the key components are arranged along the long edge of the PCB, so there are no space to place our antenna. We move the antenna to top edge of PCB as showed as follow picture. And the impedance at top edge of PCB is smaller than it in long edge. If antenna is sitting at top of PCB edge, we will get narrower bandwidth and lower performance than in long edge of PCB. Then, we still get arranging antenna and components in a reasonable position.



Symbol	Suggested Distance	Remark
S	≧5mm	The distance between PCB edge and antenna edge
D	≧3mm	The distance between antenna and receiver(or shielding case)edge
G	≧3mm	The edge of display must keep away 3mm from antenna edge.

PND Applications

- For the PND applications, Bluetooth antenna usually place at the long edge of PCB. In order to make the device thinner, the PND PCB usually cut a part of PCB to put the battery in it but it will cause the PCB smaller than mobile phone application. In order to increase the performance of Bluetooth antenna, we suggest to keep some part of PCB to make it look as L-shape as Figure E. However, the distance between panel and PCB will affect the antenna performance, we suggest keep the panel away from antenna edge at least 3mm in distance as Figure F.

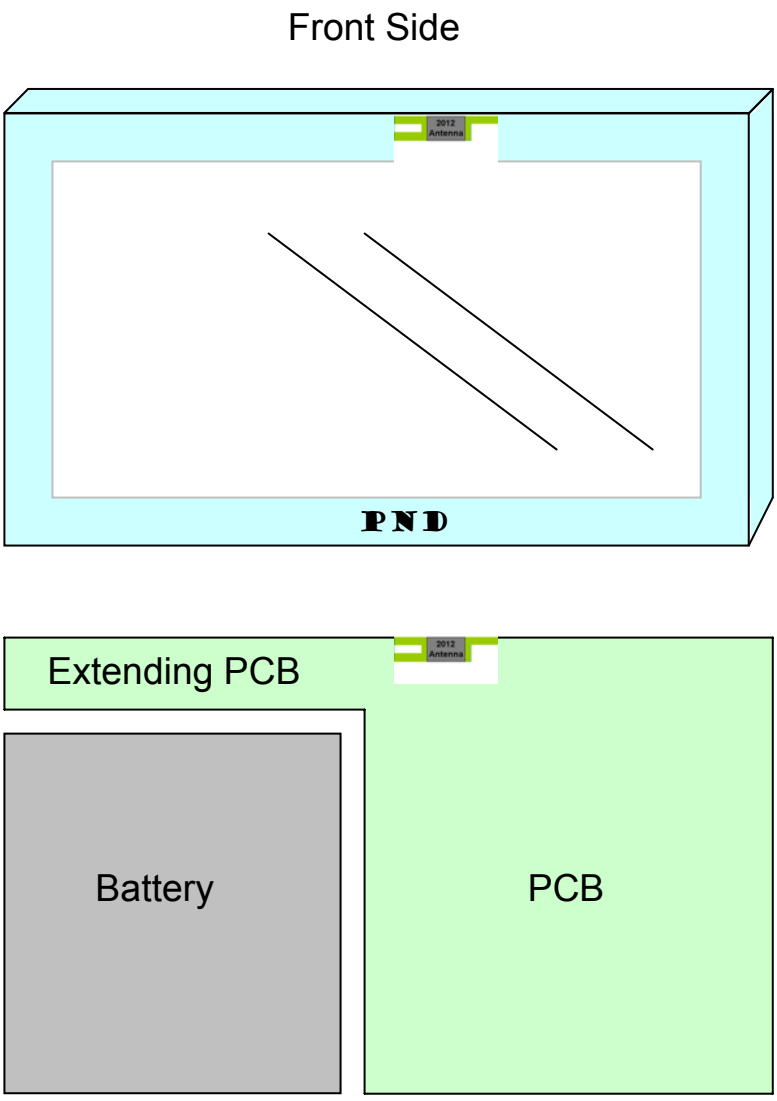


Figure E. Make the extending PCB to get the better performance

Back Side

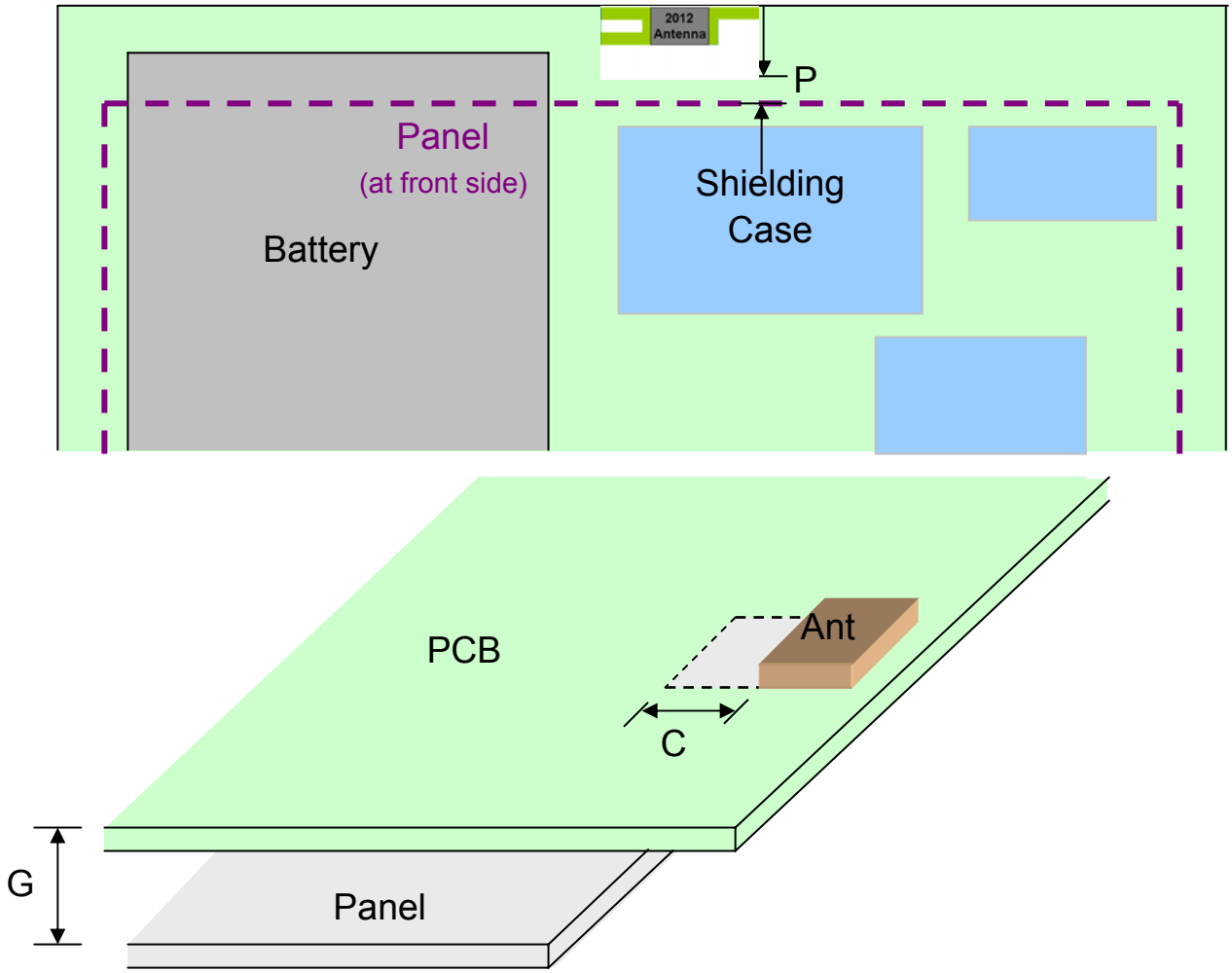
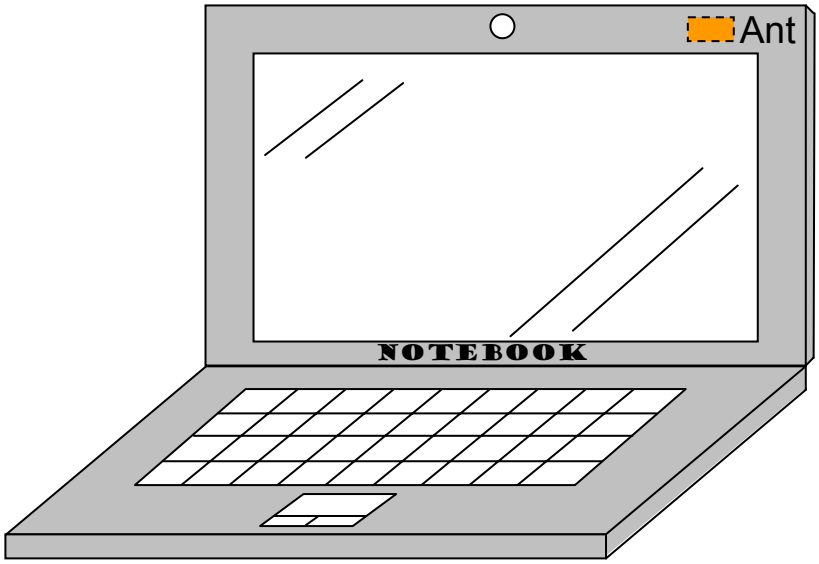


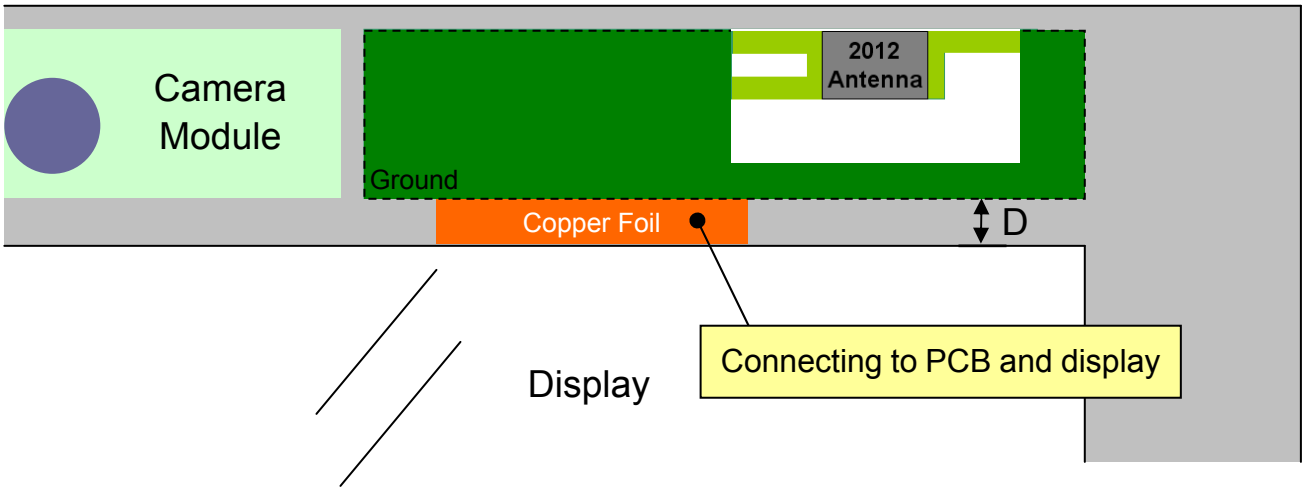
Figure F. Keep the panel away from the PCB more than 3mm.

Symbol	Suggested Distance	Remark
P	≧3mm	The edge of display must keep away 3mm from antenna edge.
C	≧3mm	The width of clearance area needs 3mm from antenna edge.
G	≧3mm	The distance between antenna and panel metal

Notebook Applications

- For the notebook applications, the space is too small to place a larger PCB. As we know, the smaller PCB we have, the worst antenna performance we get. In according to characteristic of this antenna, because the radiation efficiency depends on the size of the metal layer, so we can extend metal layer from PCB to panel by using copper foil. If the radiation plane can be extended to metal of panel, the PCB size will becomes a minor factor of antenna performance. In other word we can use smaller PCB to get the similar performance. By the way, the cable which connects from PCB to main board must fix along the edge of display and shorter cable will get the better performance due to its cable loss.





Symbol	Suggested Distance	Remark
D	≧3mm	The distance between antenna and the edge of panel.