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# Application Note no.007

Patch Antenna Series

GPS Linear Patch Antenna

LA1575MS4G-110-11S

Prepared	Checked	Approved
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## Application Note

## Linear GPS Patch Antenna – LA1575MS4G-110-11S

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Revision History: 2009-06-16 Rev.A0

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# LA1575MS4G-110-11S Application Note

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## Applications

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

## Features

- Good Efficiency
- Low profile and compact size(20.5x 6.2 x 4mm)
- Low cost
- Lead free soldering compatible
- RoHS compliant
- Tray packing

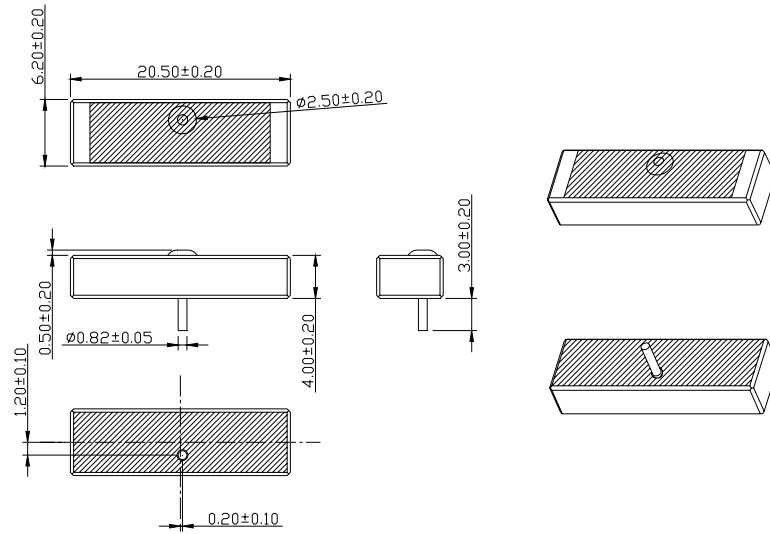
## Electrical Characteristics

Electrical Specification*	
Center Frequency	1575.42MHz
Frequency Range	1573.5MHz~1577MHz (S11 ≤ -10dB)*
Polarization	Linear
Ref. Impedance	50 ohm
Peak Gain	-0.3 dBi (typ.)@1575.42MHz
Efficiency [%]/[dB]	36.4% / -4.4 dBi (typ.)@1575.42MHz
Size	20.5mm x 6.2mm x 4mm

\* Electrical characteristic depends on INPAQ evaluation board with no matching circuit.

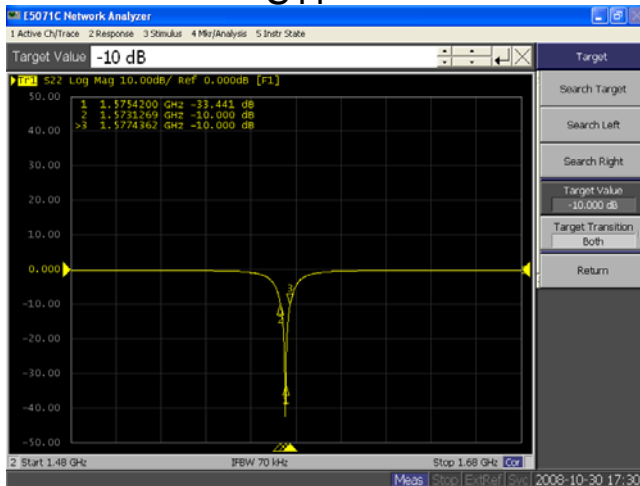
\* The dimension of evaluation board is 30 x 10 mm.

## Antenna Dimension (unit:mm)

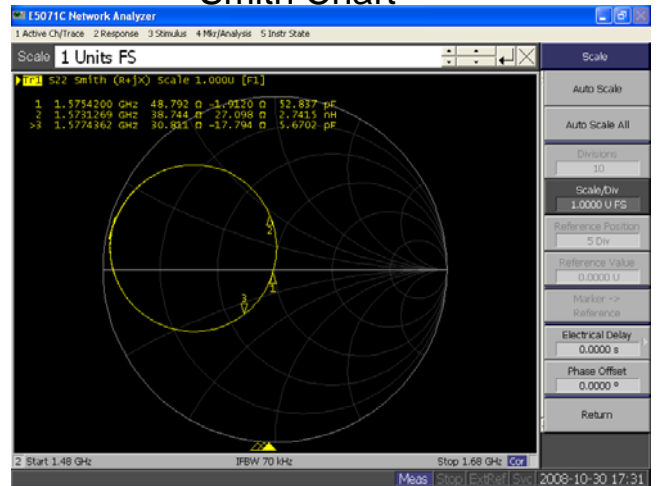


## Typical Return Loss S11 / Smith Chart

S11

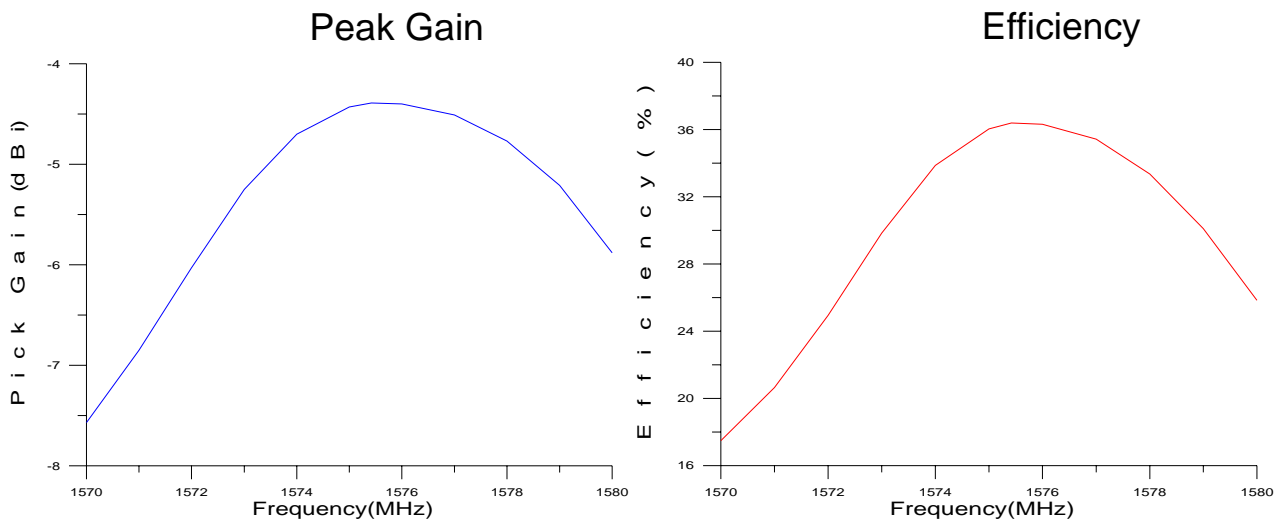


Smith Chart



Frequency	S11
1575.42 MHz	-33.44dB
1573.12 MHz	-10.00dB
1577.43 MHz	-10.00dB

## Free Space Peak Gain and Efficiency

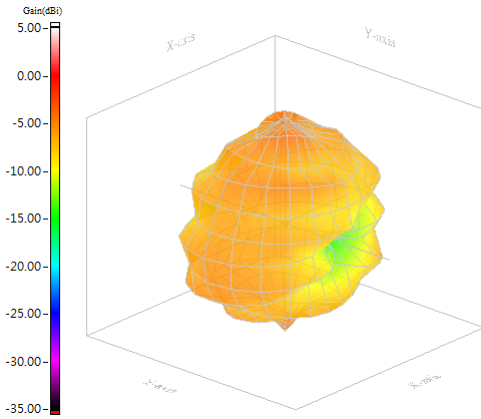


Frequency	Peak Gain	Efficiency
1570.00MHz	-7.57dBi	17.49%
1575.42MHz	-4.39dBi	36.39%
1580.00MHz	-5.88dBi	25.84%

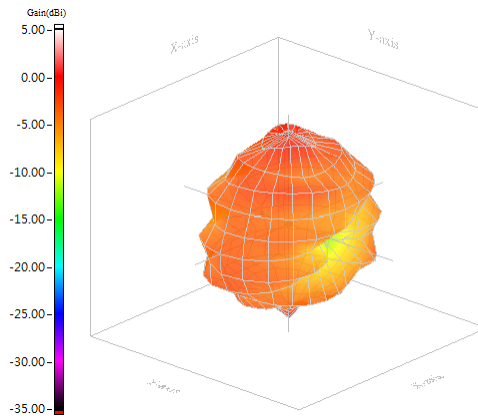
# Typical Free Space Radiation Pattern

## 3D Radiation Pattern

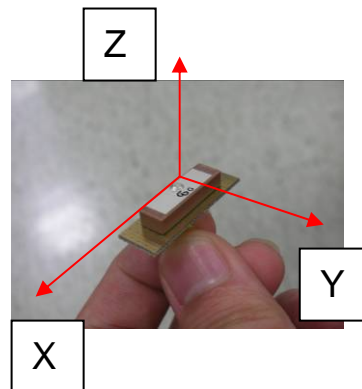
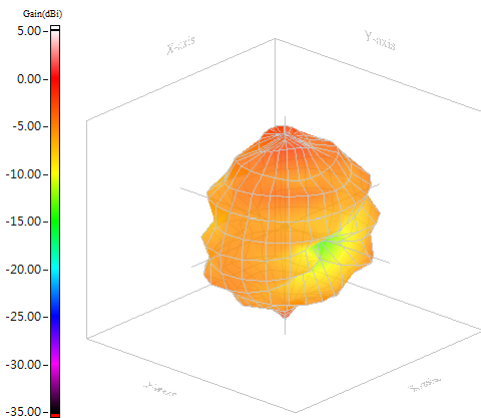
1570MHz



1575MHz



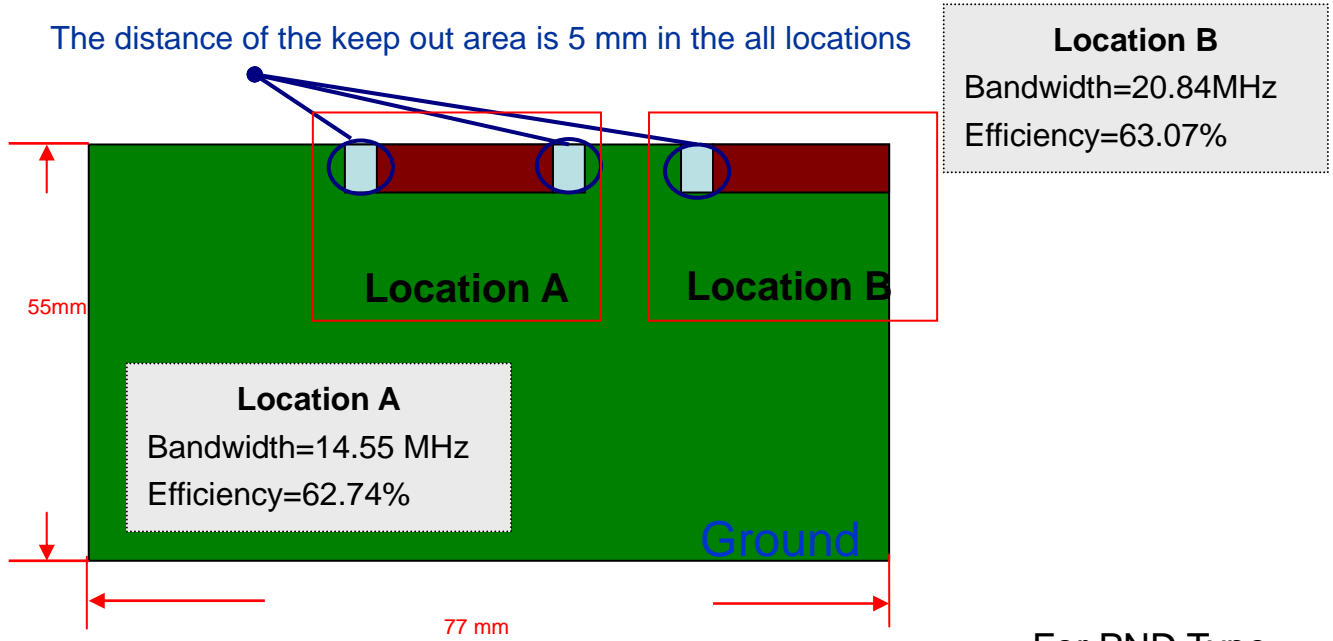
1580MHz



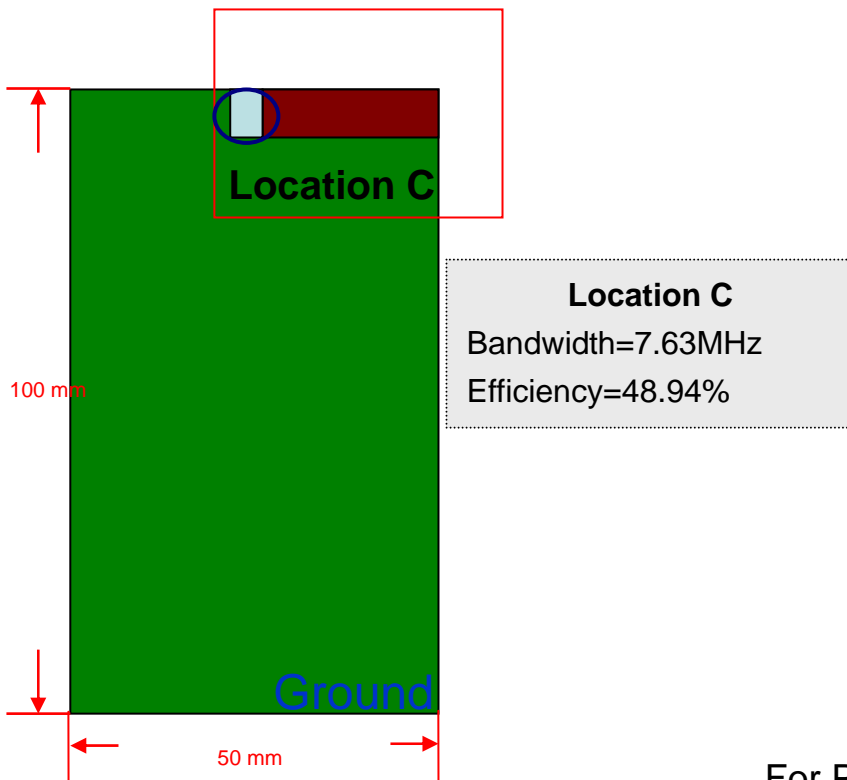
## The Efficiency and Bandwidth for Different Position

\* The electrical characteristic depends on 77 x 55 mm and 50 x 100 mm evaluation board.

The distance of the keep out area is 5 mm in the all locations



For PND Type

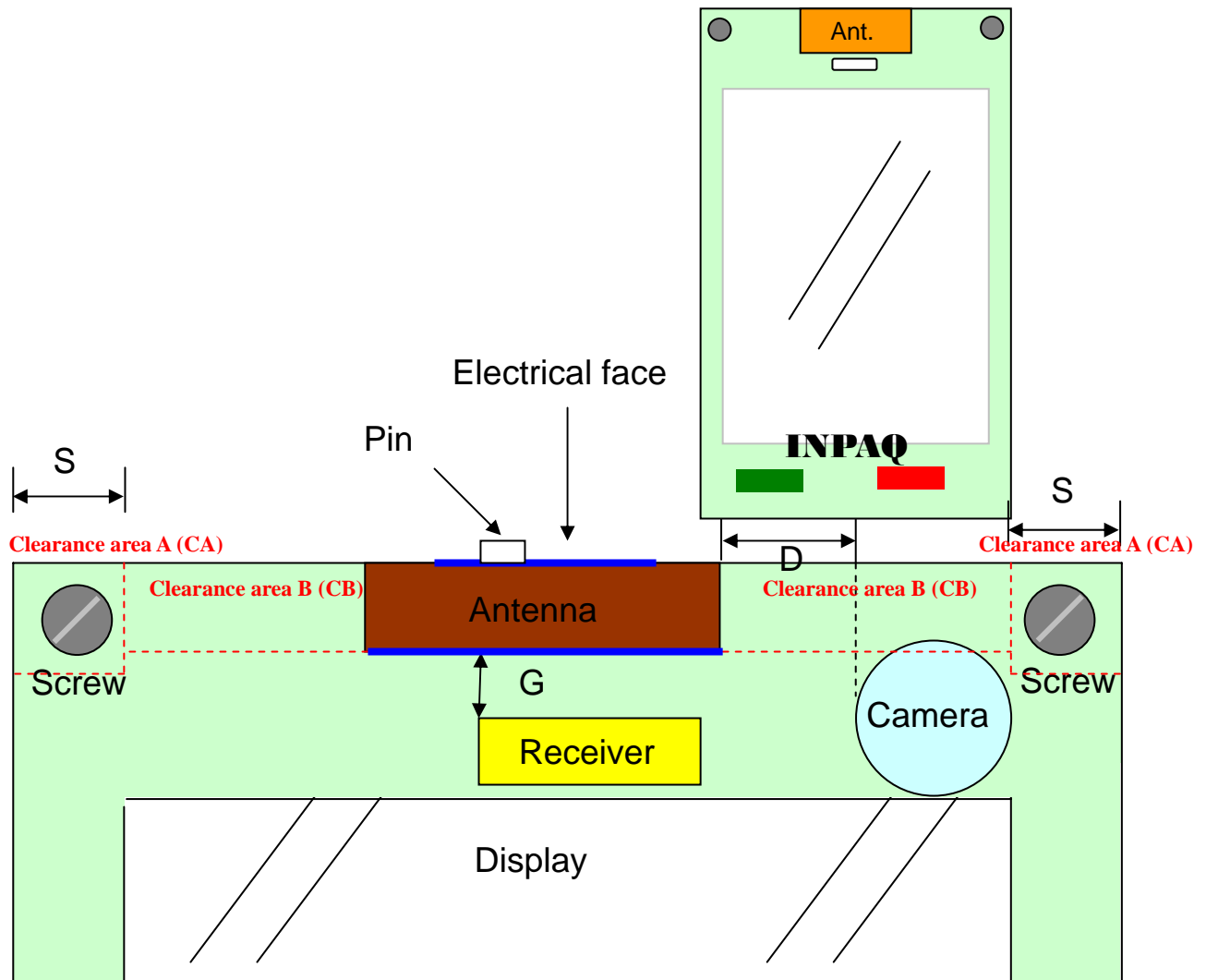


For Phone Type

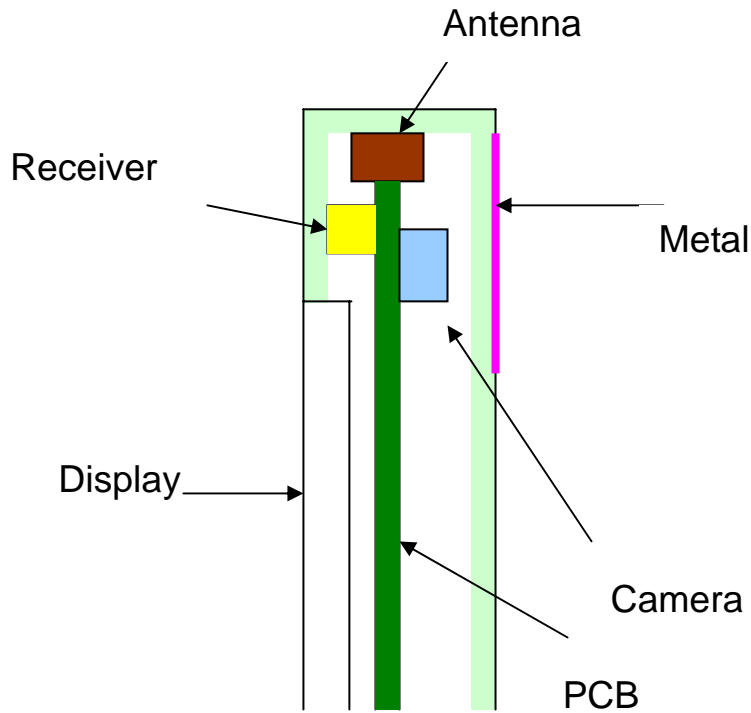


## Mobile Phone Applications

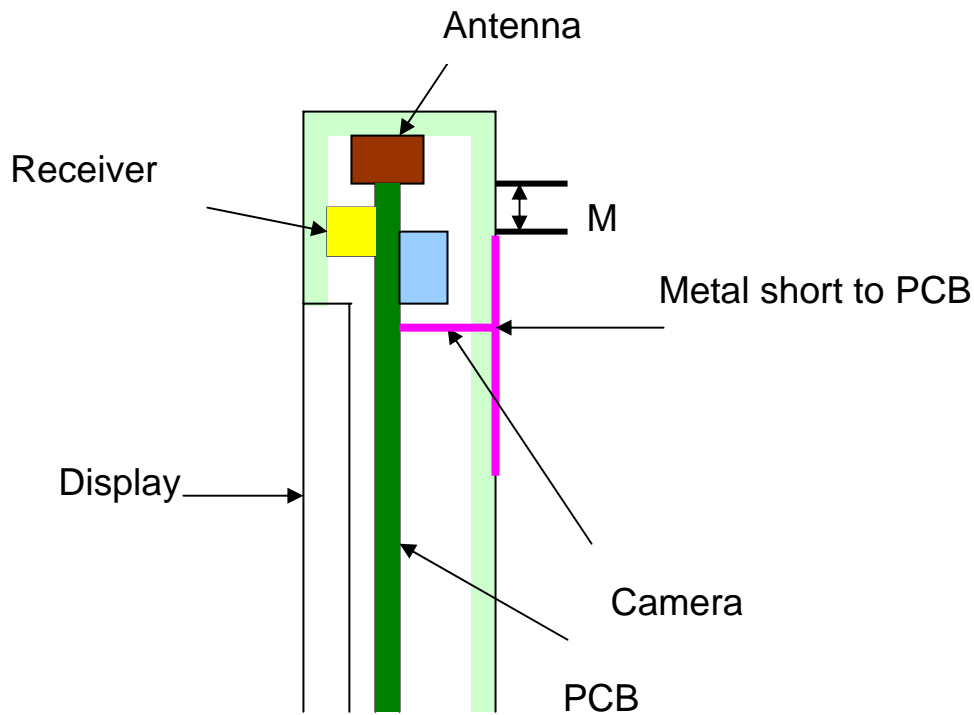
- For the mobile phone applications. We move the antenna to top edge of PCB as showed as follow picture.



Symbol	Suggested Distance	Remark
S	$\geq$ Screw Range	The length of Clearance area A. The metal around the screw must be removed.
D	$\geq$ 10mm	The distance between antenna and Camera(or shielding case)edge
G	$\geq$ 5mm	The distance between antenna and Receiver edge
CA	$\geq$ Screw Range	The clearance area around the screw. The metal around the screw must be removed.
CB	$\geq$ 5*5 mm <sup>2</sup>	The area around the antenna.



In this picture, the metal is divided with PCB ground. This situation will not decrease the antenna performance. If the metal short to PCB ground and close to antenna, the antenna performance will be decreased.



If the metal short to PCB, we will suggest the M distance under the antenna and M larger than 10 mm.

## PND Applications

- For the PND or Navigator applications, GPS antenna usually place at the long side of PCB. To make the device thinner, it usually cut a part of PCB to put the battery in it and result in a shorter PCB than mobile phone application. In order to increase the performance of GPS antenna, we suggest to keep some part of PCB to make it look as L-shape as Figure A. We suggest keep the panel away from ground plane at least 3mm in distance as Figure B.

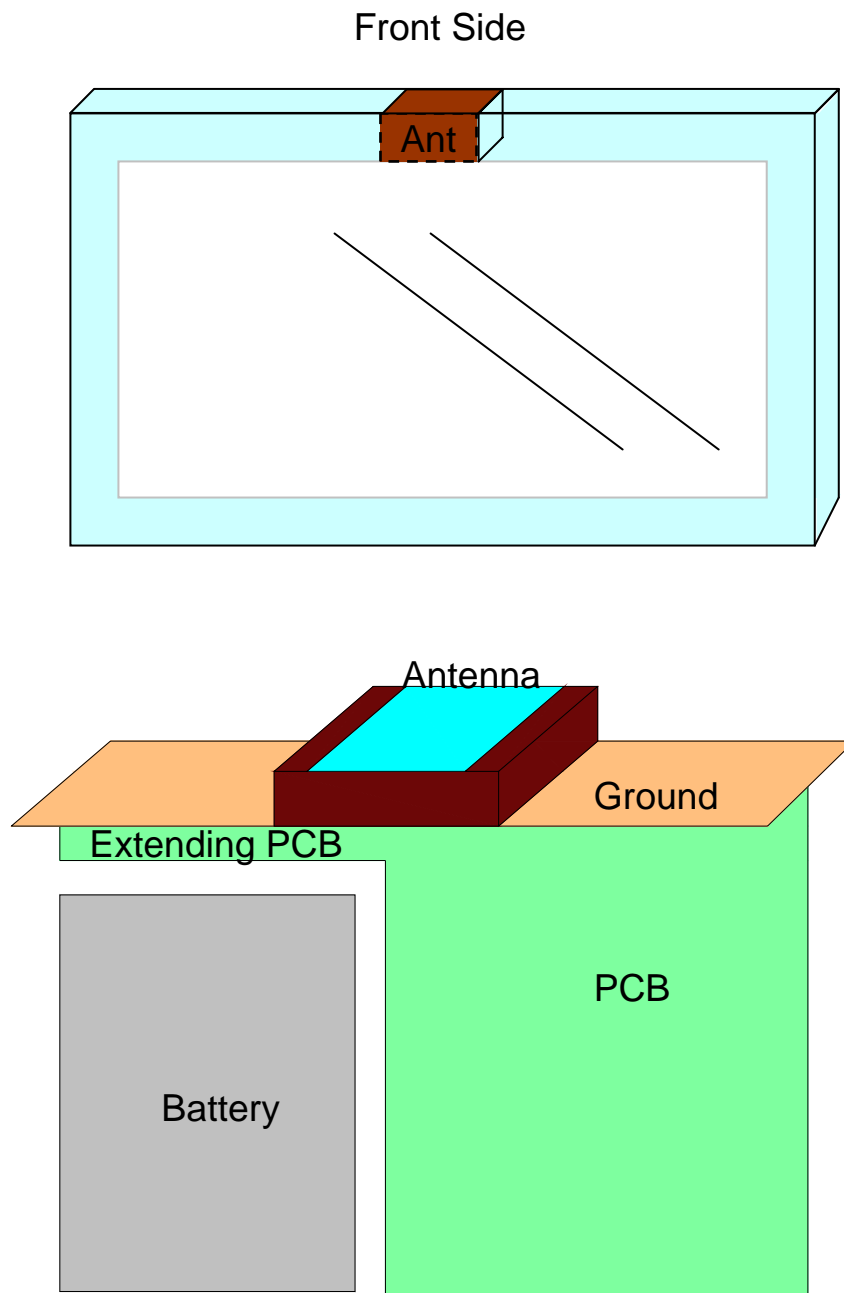


Figure A. Make the extending PCB to get the better performance

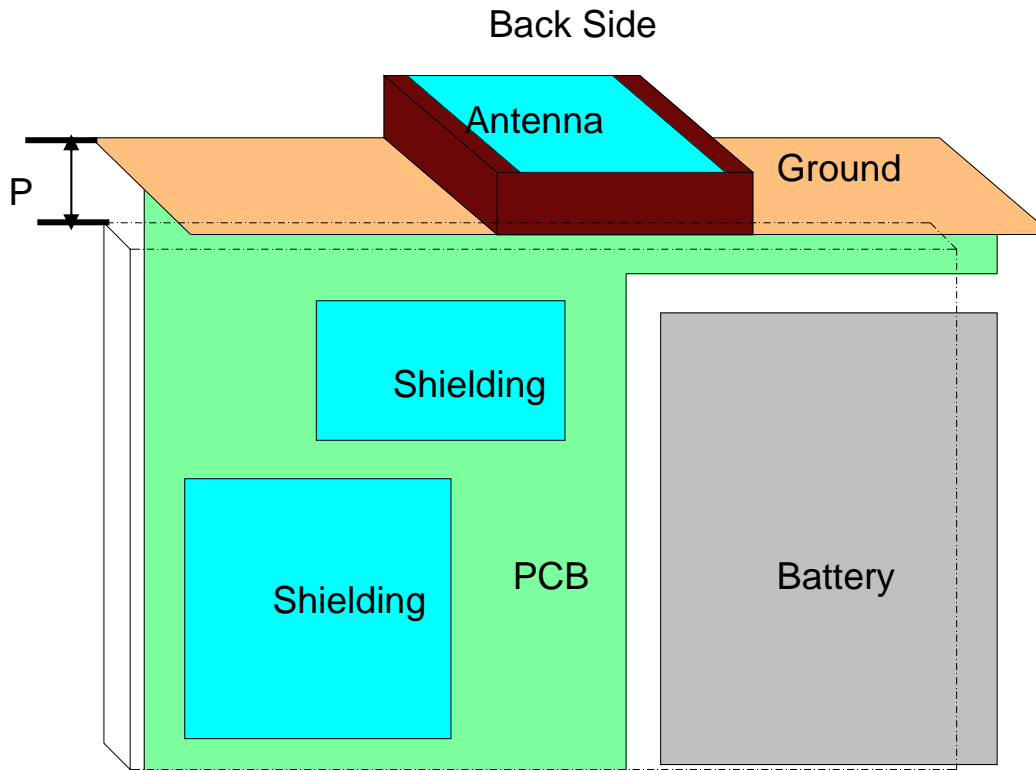
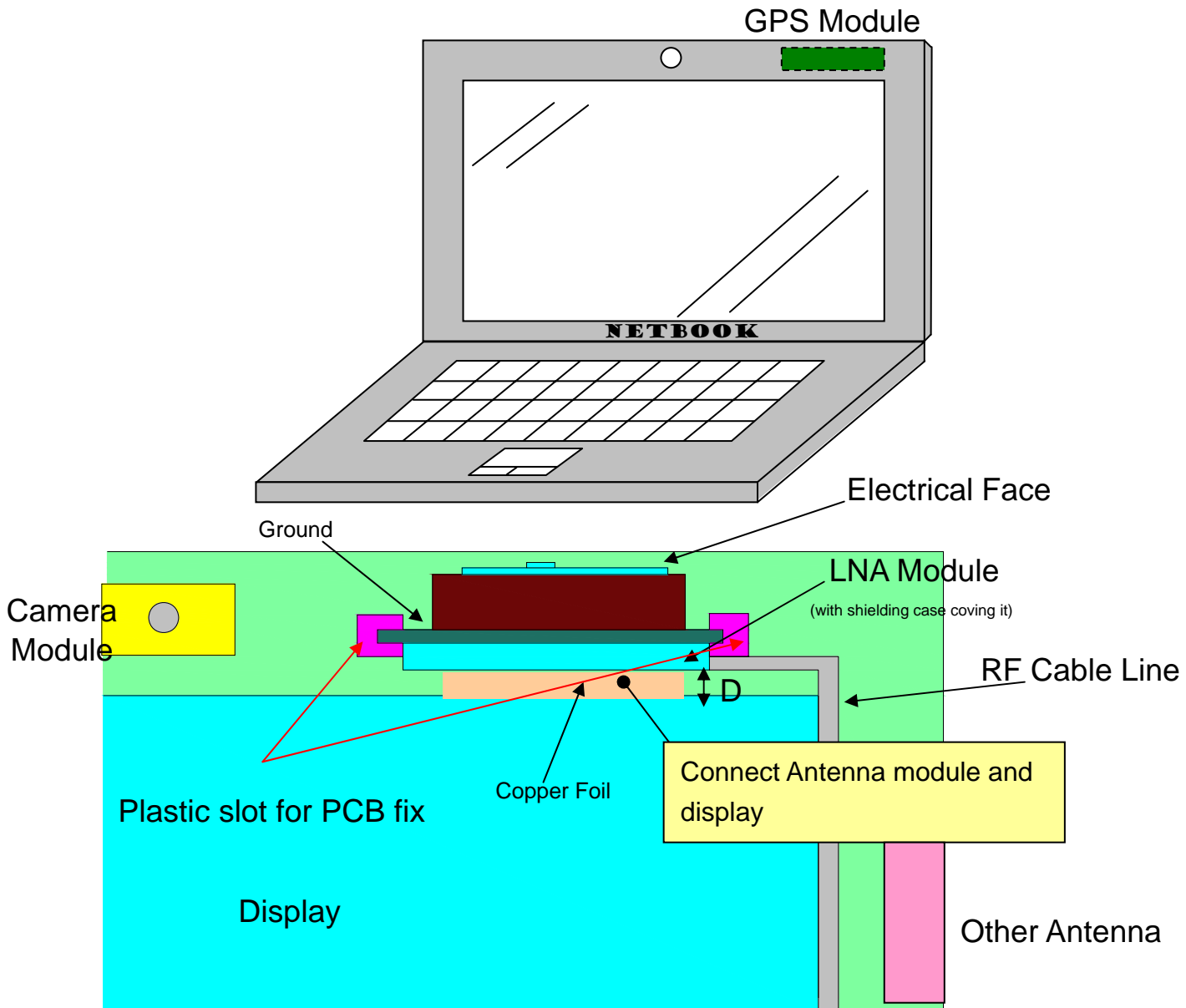


Figure B. Keep the panel away from the antenna ground more than 3mm.

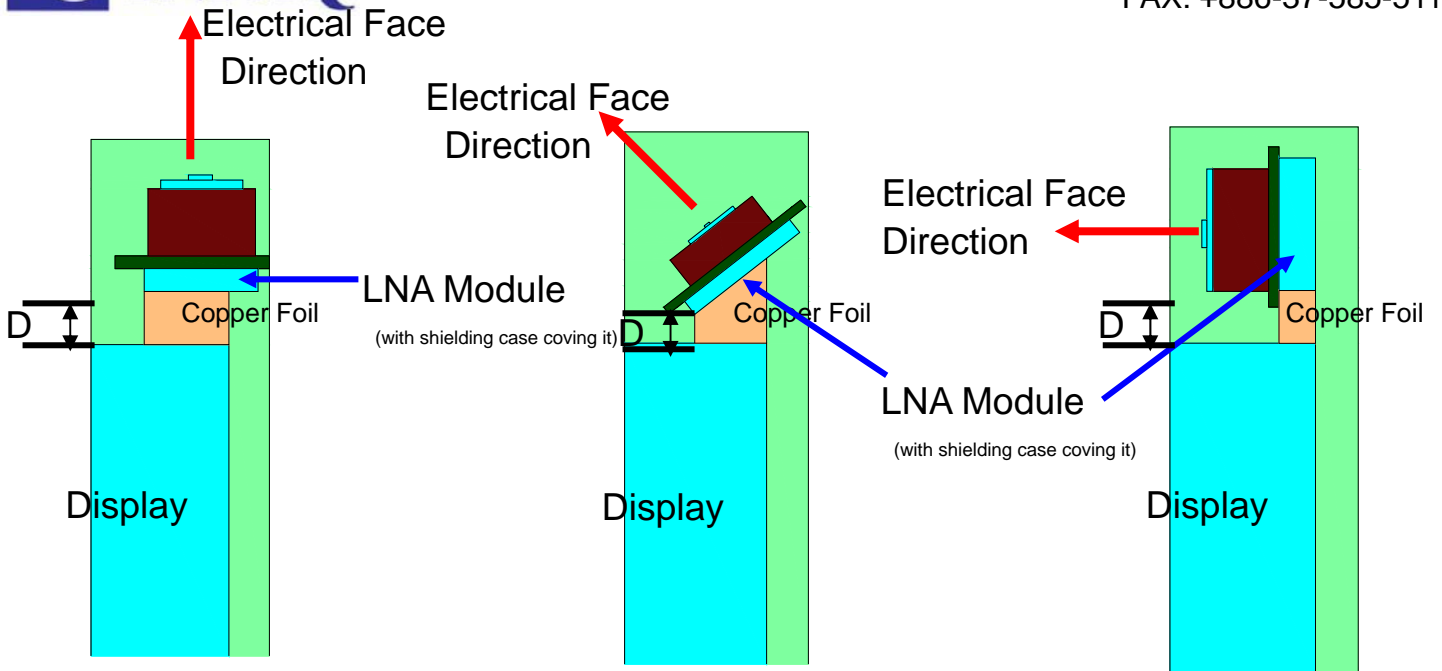
Symbol	Suggested Distance	Remark
P	$\geq 3\text{mm}$	The edge of display must keep away 3mm from ground plane.

## Notebook Applications

- For the notebook applications, the space is too small to place a large PCB on the panel. We can use smaller PCB and narrower width patch antenna on the panel. When we install this GPS module, the patch antenna electrical face to the sky will have the best performance. Because there are many antennas around the device, we must notice the isolation of all the antennas. 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	$\geq 3\text{mm}$	The distance between GPS Module and the edge of panel.



Performance Best

Performance middle

Performance worst

Symbol	Suggested Distance	Remark
D	$\geq 3\text{mm}$	The distance between GPS Module and the edge of panel.

## Contact Information

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