RTK-ANT-0022 PIFA measurement report

Jeany Ling

May 18, 2023

Copyright © 2010 Realtek Semiconductor Corp.

High Performance · Low Power

RTK-ANT-0022 PIFA measurement report

- **Report History**

Test Items	Test Date	Test Engineer
S-Parameter measurement	2021.12.20	Jeany
Radiation patterns measurement	2022.01.27	Jeany

Copyright © 2010 Realtek Semiconductor Corp.

High Performance · Low Power

RTK-ANT-0022 PIFA measurement report

- **Antenna Specifications**

Category	Specifications	
Frequency	2400-2480MHz	5150-7125MHz
Peak gain	3.4dBi	5.0dBi
Antenna brand	REALTEK	
Part number	RTK-ANT-0022	
Antenna type	PIFA	
Polarization	Linear	
Impedance	50Ω	
Dimensions	35 x 7 x 6 mm^3	
Connector	IPEX MHF4	
Cable	Φ1.37 L: 300mm	

Copyright © 2010 Realtek Semiconductor Corp.

High Performance · Low Power

RTK-ANT-0022 PIFA measurement report

- **Equipment List**

Equipment Description	Manufacturer	Identification no.	Current calibration date	Next calibration date
EMC Analyzer	Agilent	E7405A	2021/12/21	2023/12/20
Signal generator	Agilent	E8257D	2021/01/21	2023/01/20
Microwave system amplifier	Keysight	83017A	2022/03/17	2023/03/16
Power supply	Keysight	87421A	N/A	N/A
Position controller	Chance Most	CM100	N/A	N/A
Horn antenna	ETS-Lindgren	3117	N/A	N/A

Copyright © 2010 Realtek Semiconductor Corp.

High Performance · Low Power

RTK-ANT-0022 PIFA measurement report

- **Test Software**

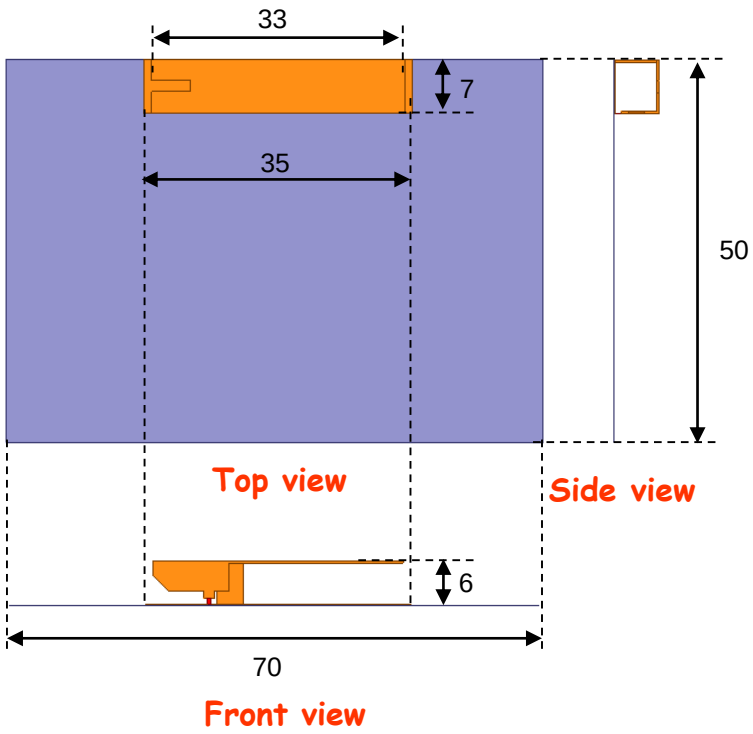
Description	Manufacturer	Identification no.
Measurement software	REALTEK	Radiation plotter v3.0

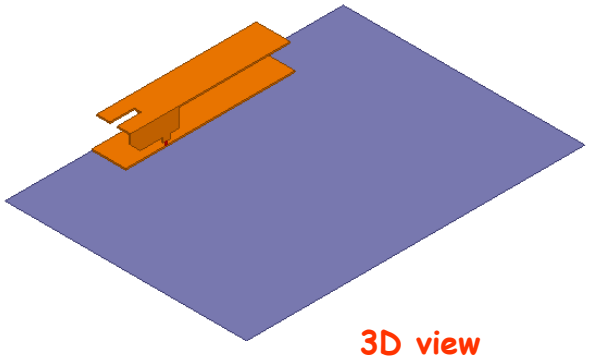
Copyright © 2010 Realtek Semiconductor Corp.

High Performance · Low Power

RTK-ANT-0022 PIFA measurement report

- **Antenna Structure**





Unit: mm

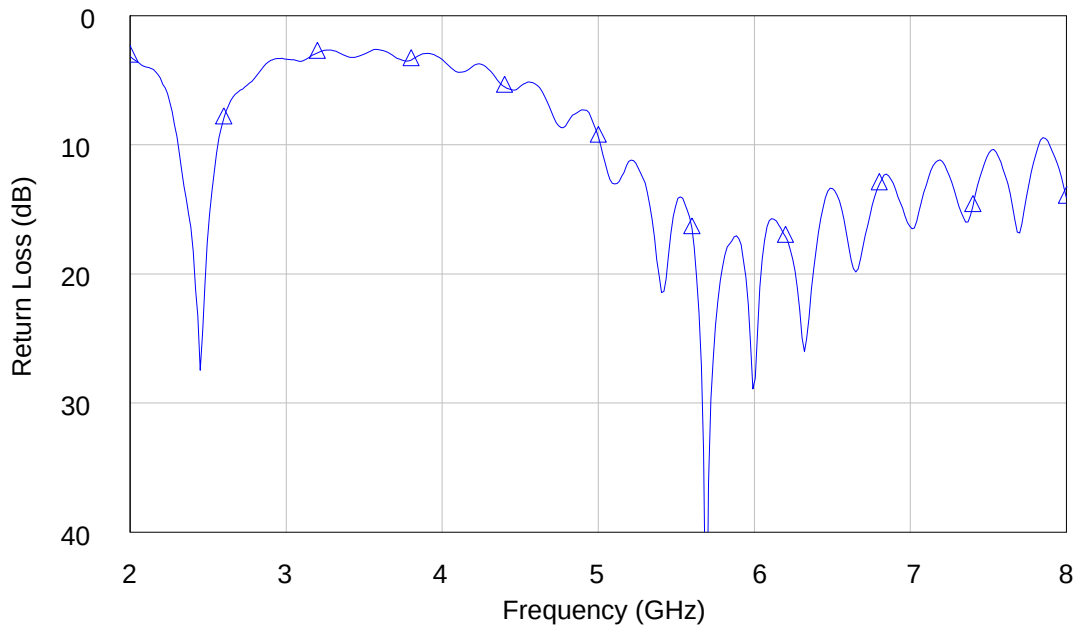
Copyright © 2010 Realtek Semiconductor Corp.

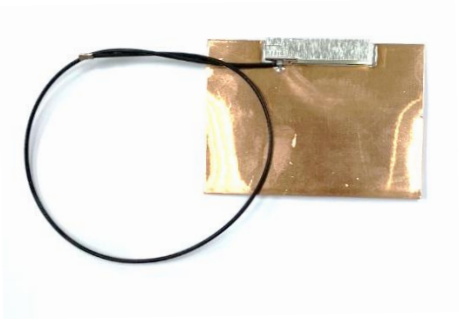
High Performance · Low Power

RTK-ANT-0022 PIFA measurement report

- **Return Loss**

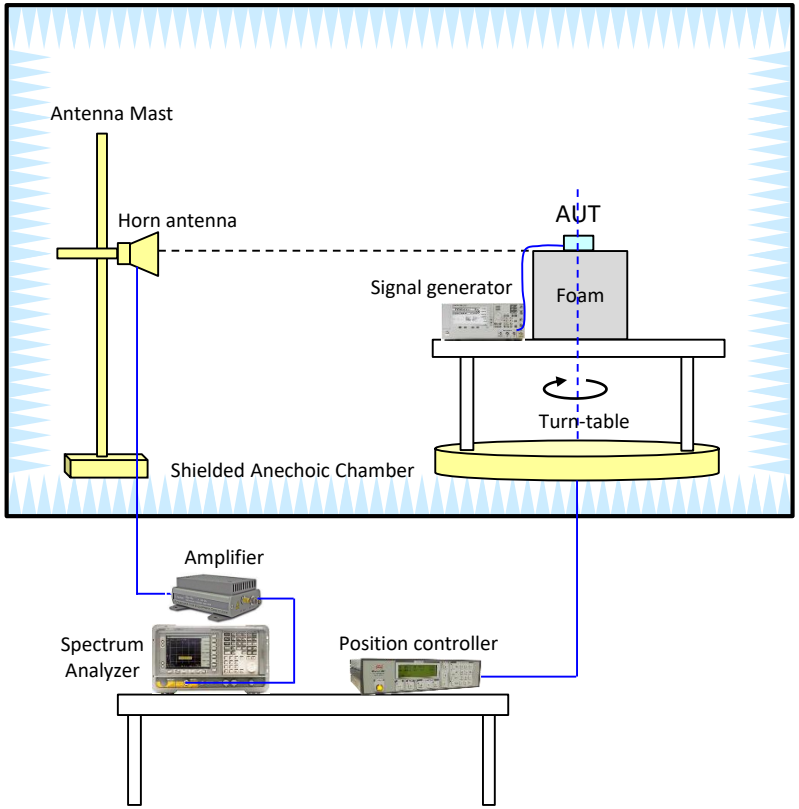
10-dB BW	2.30 ~ 2.56 GHz	5.01 ~ 7.85 GHz





RTK-ANT-0022 PIFA measurement report

- **Test procedure**
  - The AUT was placed upon a turn-table above a foam.
  - At each frequency, the AUT was rotated 360°.
  - Rotated AUT to each test plane (xy-plane, yz-plane and xz-plane).
  - Measurements were performed for both horizontal and vertical polarization.

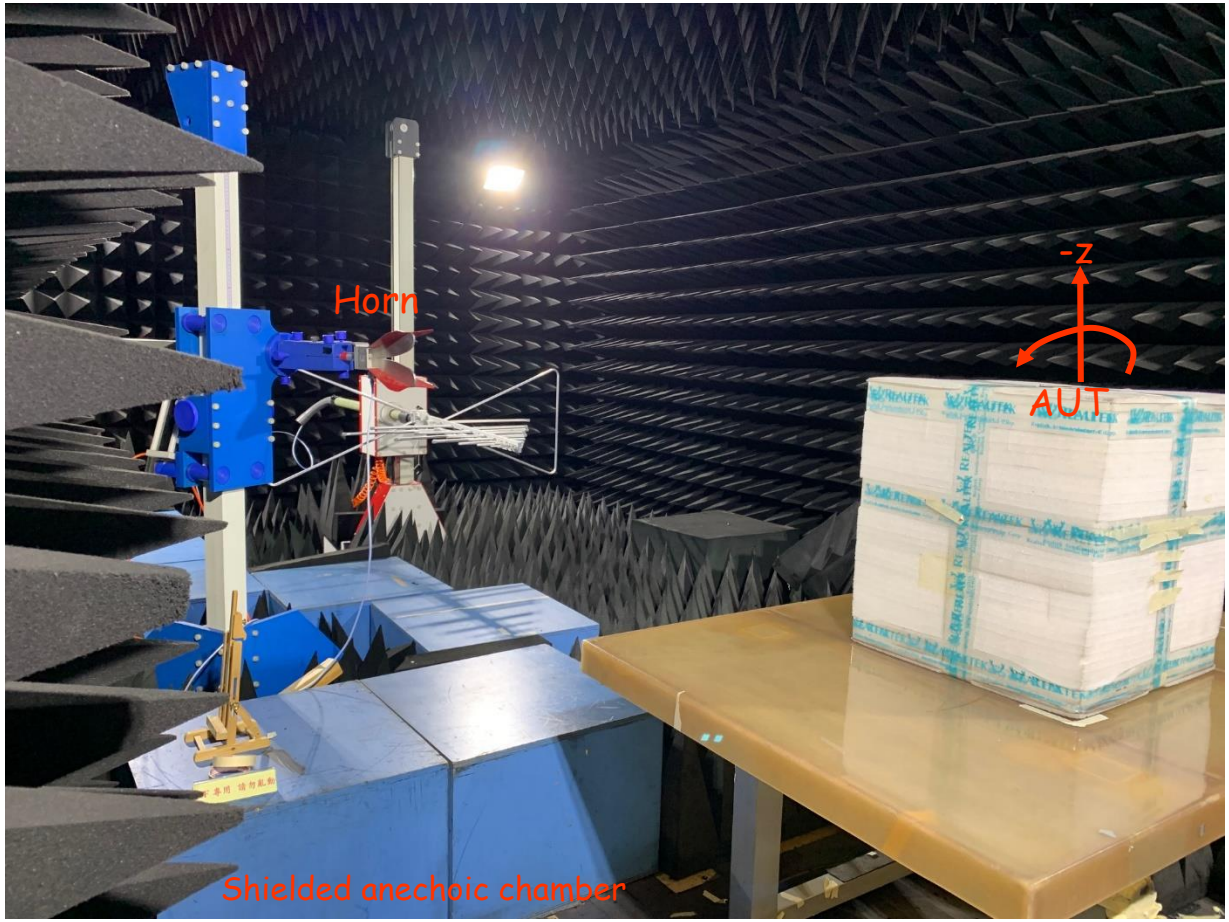


RTK-ANT-0022 PIFA measurement report

- **Applicable test method**
  - The individual antenna gain was measured as indicated in this report.
  - Here is a 2D radiation pattern measurement method.
  - The Horn antenna is first fixed for horizontal polarization.
  - The AUT will then be rotated 360 degree of phi rotation.
  - Capture measured data with 4-degree step angle from the Horn antenna.
  - The Horn antenna will then be changed for vertical polarization measurement, and the process repeated.
  - Change the AUT position to XY-plane, YZ-plane and XZ-plane placement.

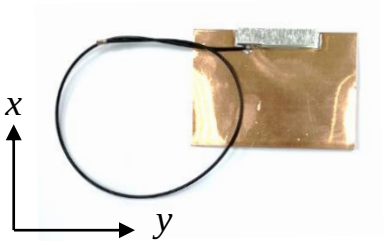
RTK-ANT-0022 PIFA measurement report

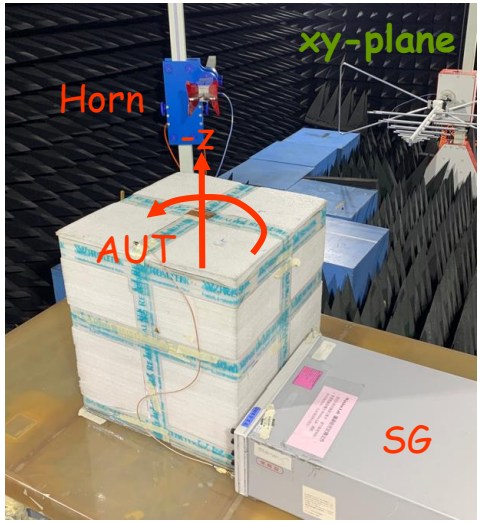
- **Test Setup Photo**

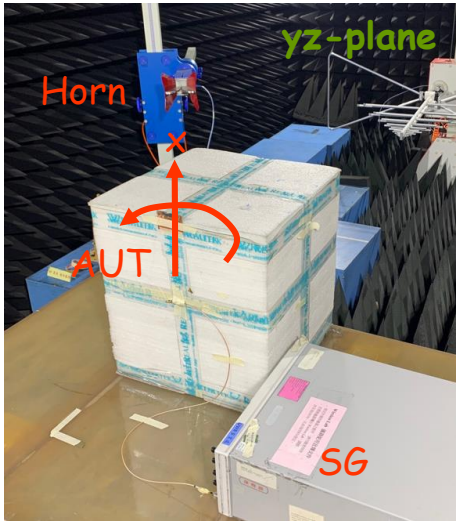


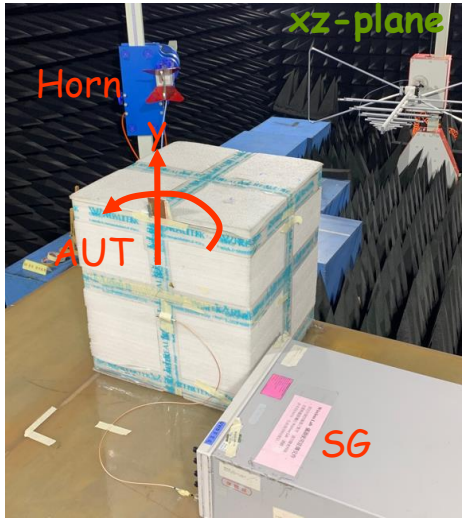
RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns**
  - Frequency : 2400MHz, 2450MHz, 2480MHz,
    5150MHz, 5250MHz, 5350MHz, 5470MHz, 5725MHz, 5850MHz, 5895MHz,
    5925MHz, 6425MHz, 6525MHz, 6875MHz and 7125MHz
  - Test plane : xy-plane, xz-plane and yz-plane
  - Input power : SG 0dBm
  - Place: RTK 4F chamber
  - Horn h: horizontal polarization
  - Horn v: vertical polarization







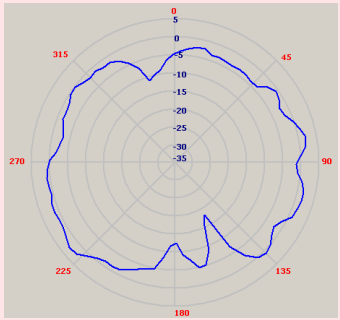


RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 2400 MHz**

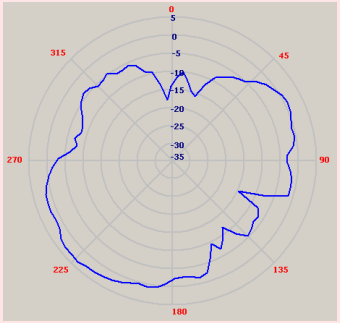
horizontal

xy-plane



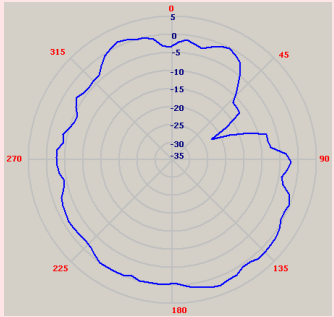
Pol.	Peak	avg.
h	+2.5	-1.6

yz-plane



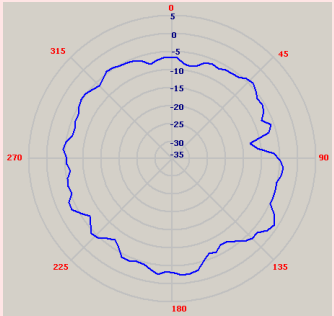
Pol.	peak	avg.
h	+3.4	-2.2

xz-plane

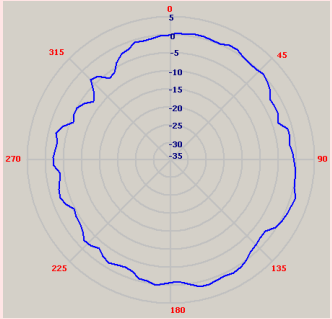


Pol.	peak	avg.
h	+2.2	-1.7

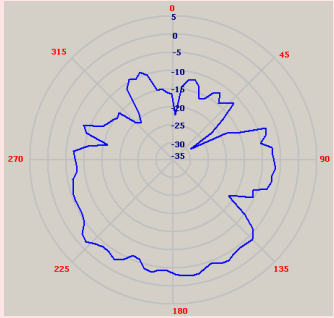
vertical



Pol.	peak	avg.
v	-1.2	-5.3



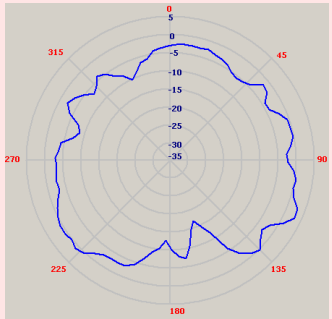
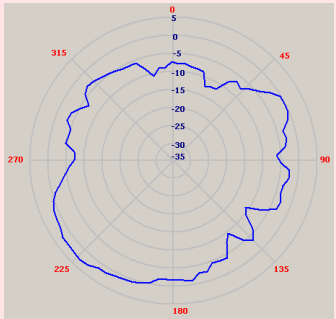
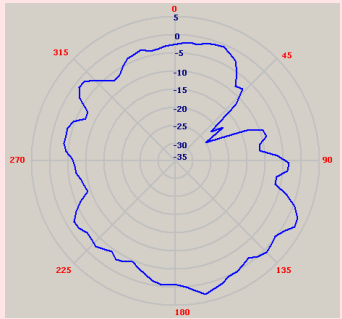
Pol.	peak	avg.
v	+1.9	-1.4



Pol.	peak	avg.
v	-2.0	-7.2

RTK-ANT-0022 PIFA measurement report

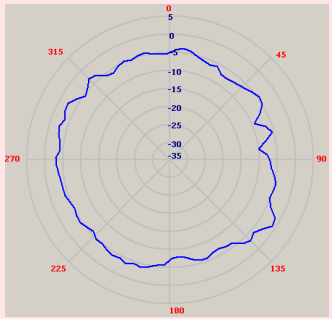
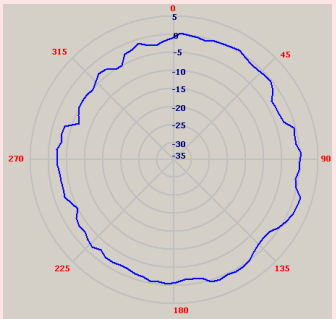
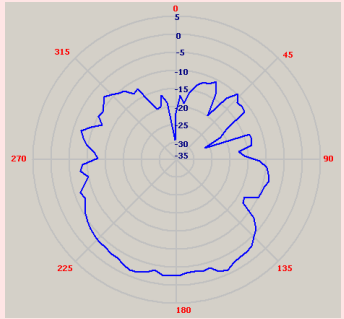
- **Radiation Patterns – 2450 MHz**

	xy-plane	yz-plane	xz-plane
horizontal			

Pol.	Peak	avg.
h	+3.0	-2.9

Pol.	peak	avg.
h	+2.8	-2.7

Pol.	peak	avg.
h	+2.7	-2.7

vertical			

Pol.	peak	avg.
v	-1.1	-5.0

Pol.	peak	avg.
v	+1.5	-1.6

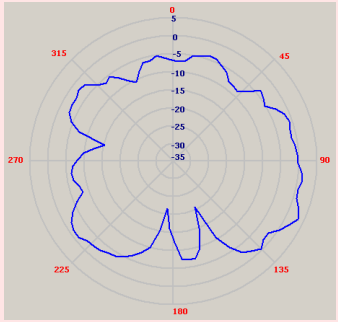
Pol.	peak	avg.
v	-1.3	-7.0

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 2480 MHz**

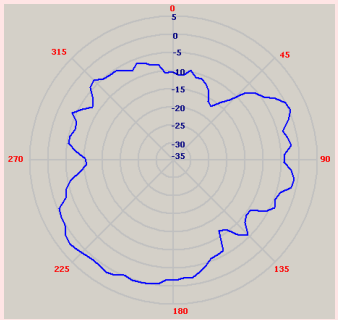
horizontal

xy-plane



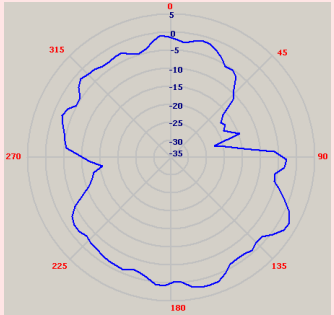
Pol.	Peak	avg.
h	+3.1	-3.7

yz-plane



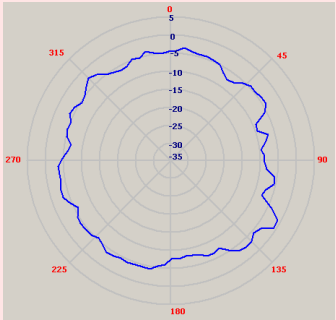
Pol.	peak	avg.
h	+1.9	-3.6

xz-plane

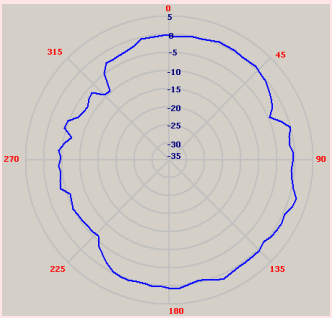


Pol.	peak	avg.
h	+2.5	-2.6

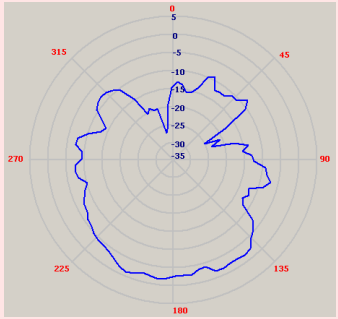
vertical



Pol.	peak	avg.
v	-1.0	-5.0



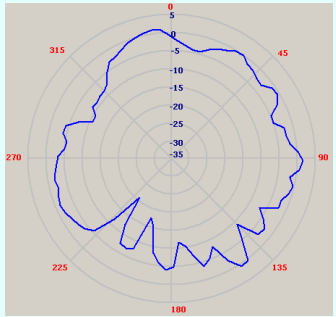
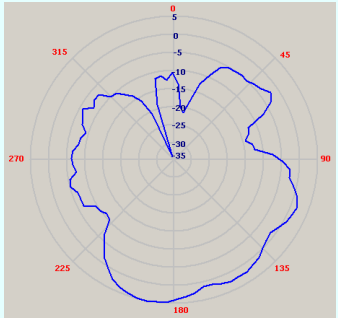
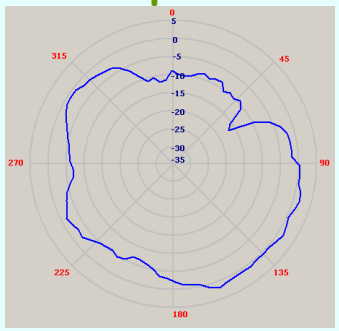
Pol.	peak	avg.
v	+1.1	-1.4



Pol.	peak	avg.
v	-1.3	-6.9

RTK-ANT-0022 PIFA measurement report

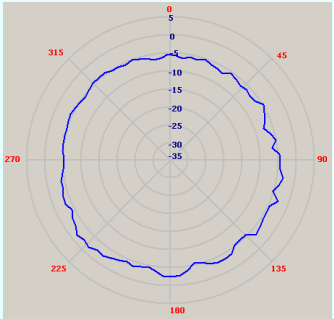
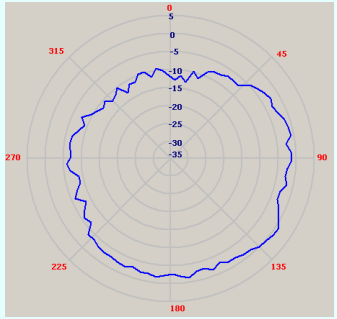
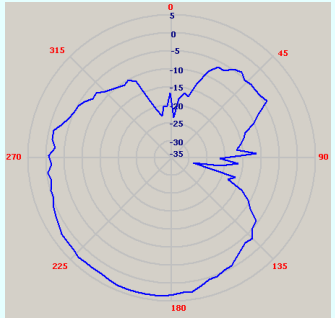
- **Radiation Patterns – 5150 MHz**

	xy-plane	yz-plane	xz-plane
horizontal			

Pol.	Peak	avg.
h	+1.5	-3.2

Pol.	peak	avg.
h	+4.9	-1.9

Pol.	peak	avg.
h	+1.7	-2.8

vertical			

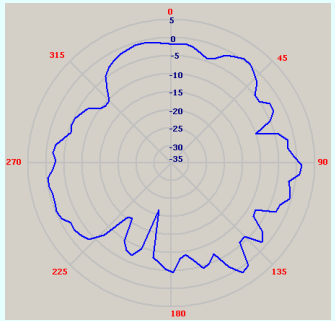
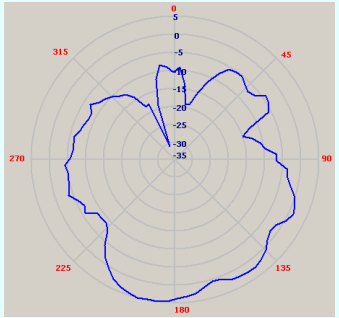
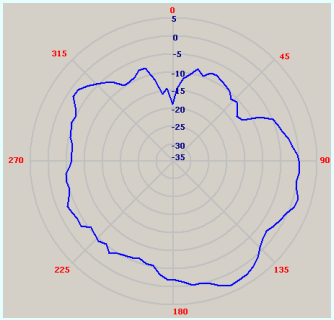
Pol.	peak	avg.
v	-1.8	-4.7

Pol.	peak	avg.
v	+0.7	-4.2

Pol.	peak	avg.
v	+3.5	-1.9

RTK-ANT-0022 PIFA measurement report

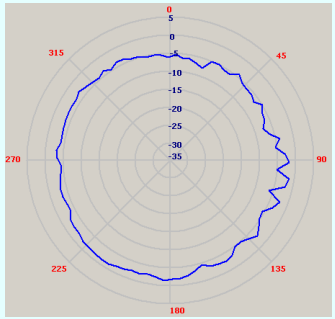
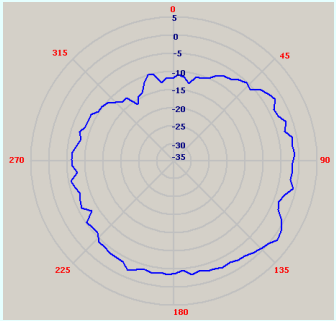
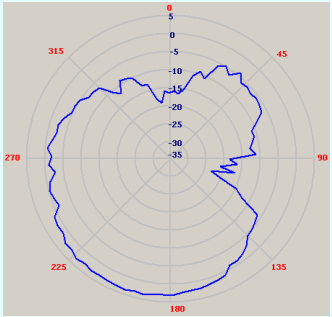
- **Radiation Patterns – 5250 MHz**

	xy-plane	yz-plane	xz-plane
horizontal			

Pol.	Peak	avg.
h	+1.2	-3.1

Pol.	peak	avg.
h	+4.8	-2.0

Pol.	peak	avg.
h	+3.0	-3.2

vertical			

Pol.	peak	avg.
v	-1.5	-3.9

Pol.	peak	avg.
v	+1.1	-4.5

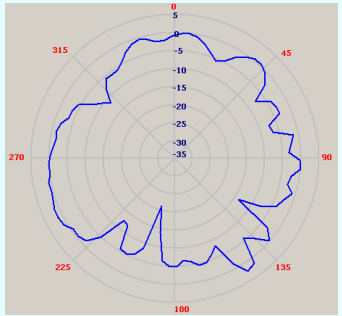
Pol.	peak	avg.
v	+3.5	-1.9

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 5350 MHz**

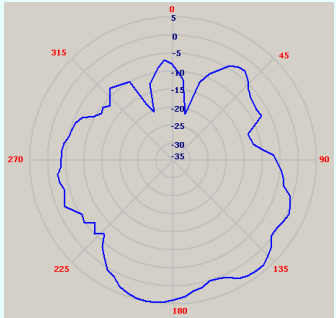
horizontal

xy-plane



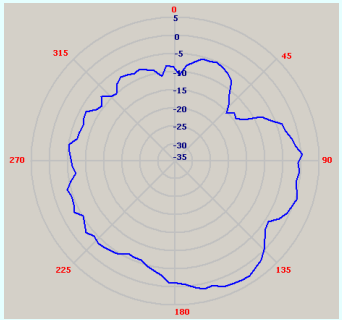
Pol.	Peak	avg.
h	+2.1	-2.6

yz-plane



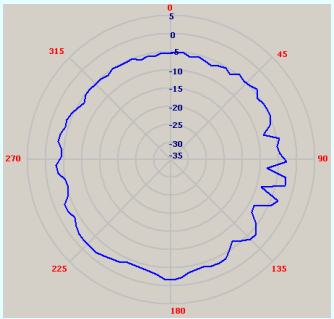
Pol.	peak	avg.
h	+4.7	-1.8

xz-plane

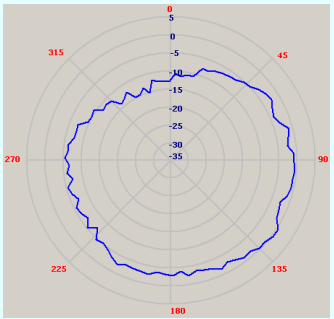


Pol.	peak	avg.
h	+2.9	-3.3

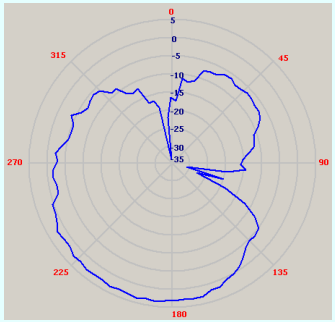
vertical



Pol.	peak	avg.
v	-1.8	-4.4



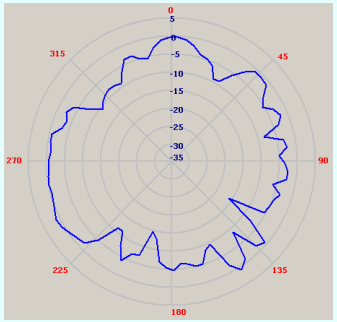
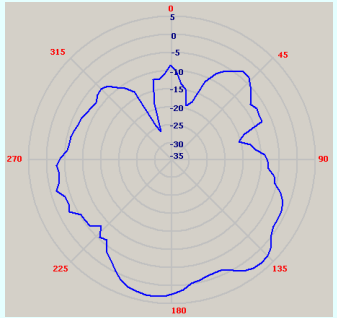
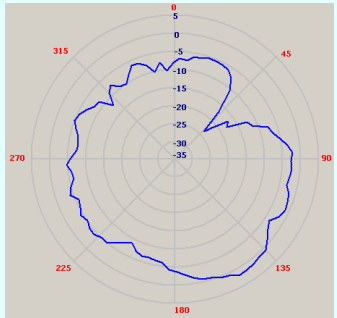
Pol.	peak	avg.
v	+0.4	-4.4



Pol.	peak	avg.
v	+3.5	-2.0

RTK-ANT-0022 PIFA measurement report

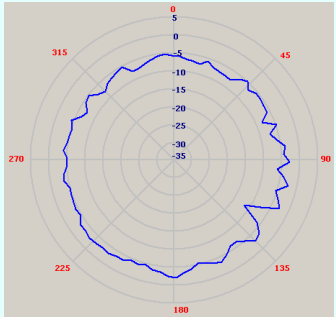
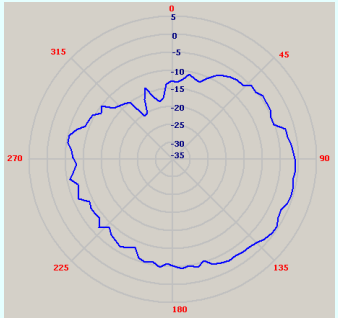
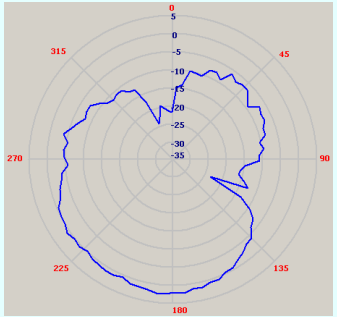
- **Radiation Patterns – 5470 MHz**

	xy-plane	yz-plane	xz-plane
horizontal			

Pol.	Peak	avg.
h	+0.9	-3.5

Pol.	peak	avg.
h	+3.2	-3.0

Pol.	peak	avg.
h	+1.8	-4.5

vertical			

Pol.	peak	avg.
v	-2.2	-5.1

Pol.	peak	avg.
v	-0.6	-5.4

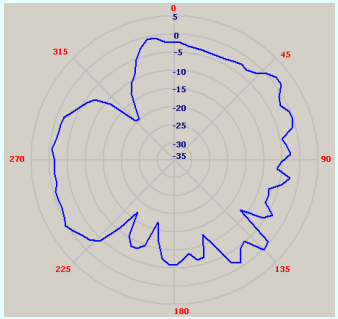
Pol.	peak	avg.
v	+2.3	-3.4

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 5725 MHz**

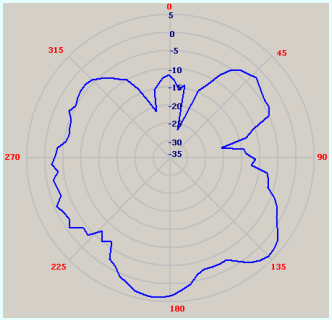
horizontal

xy-plane



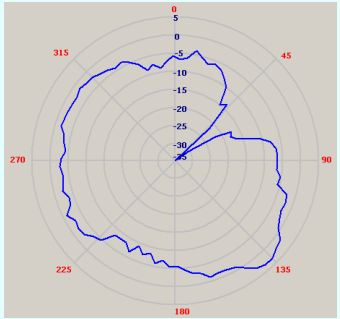
Pol.	Peak	avg.
h	+1.2	-3.4

yz-plane



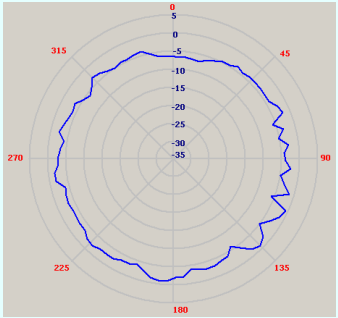
Pol.	peak	avg.
h	+3.9	-2.5

xz-plane

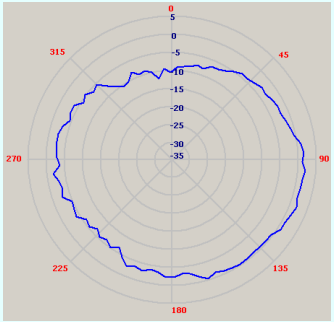


Pol.	peak	avg.
h	+3.2	-3.7

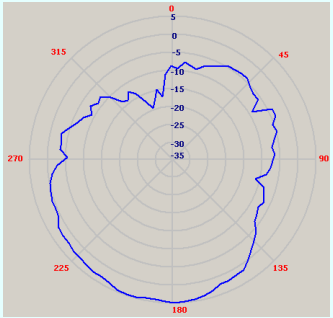
vertical



Pol.	peak	avg.
v	-0.9	-3.7



Pol.	peak	avg.
v	+1.9	-2.8



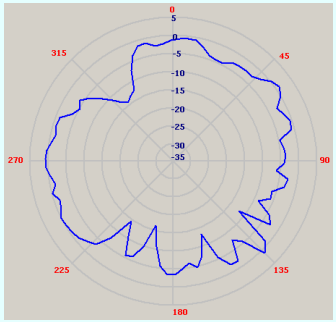
Pol.	peak	avg.
v	+4.8	-1.0

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 5850 MHz**

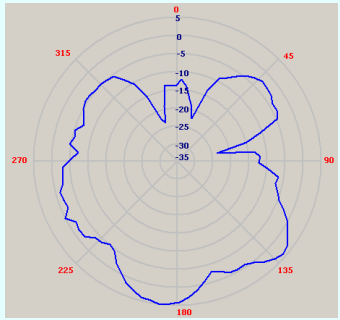
horizontal

xy-plane



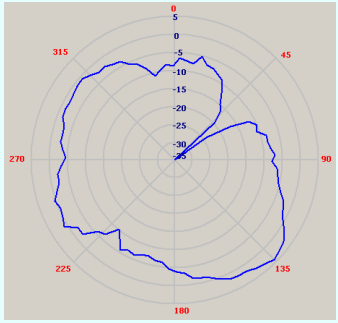
Pol.	Peak	avg.
h	+0.9	-3.1

yz-plane



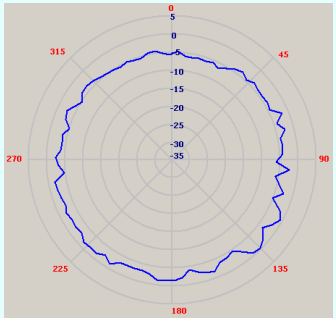
Pol.	peak	avg.
h	+4.8	-2.1

xz-plane

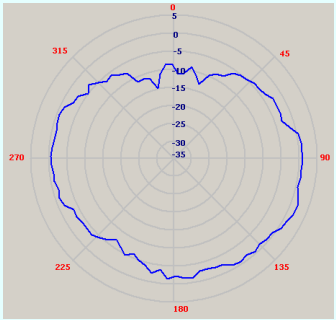


Pol.	peak	avg.
h	+3.9	-2.9

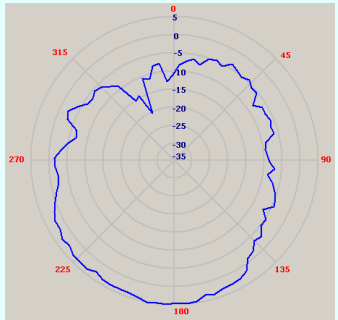
vertical



Pol.	peak	avg.
v	-0.5	-3.5



Pol.	peak	avg.
v	+1.8	-2.7



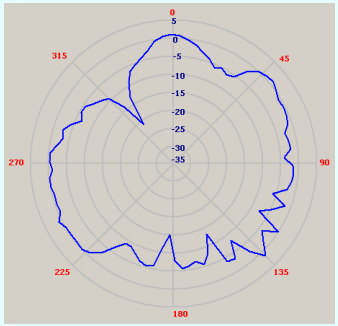
Pol.	peak	avg.
v	+5.0	-0.7

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 5895 MHz**

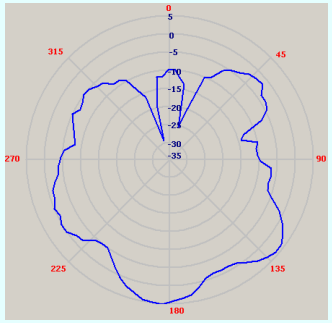
horizontal

xy-plane



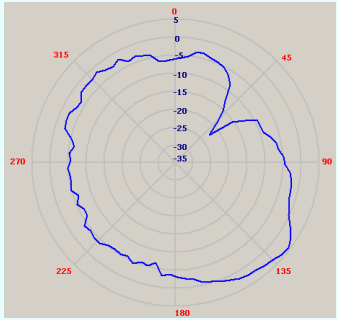
Pol.	Peak	avg.
h	+1.3	-2.8

yz-plane



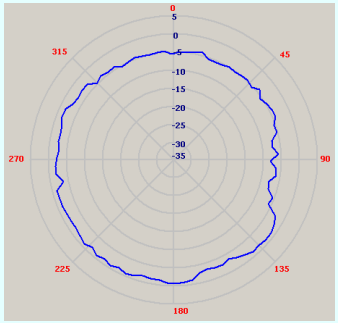
Pol.	peak	avg.
h	+5.0	-1.8

xz-plane

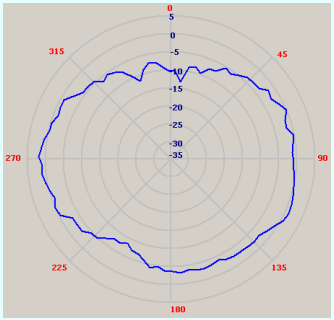


Pol.	peak	avg.
h	+4.2	-2.7

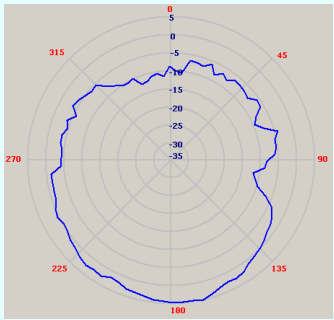
vertical



Pol.	peak	avg.
v	-0.8	-3.2



Pol.	peak	avg.
v	+1.6	-2.7



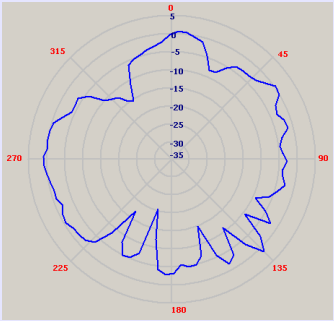
Pol.	peak	avg.
v	+4.9	-1.2

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 5925 MHz**

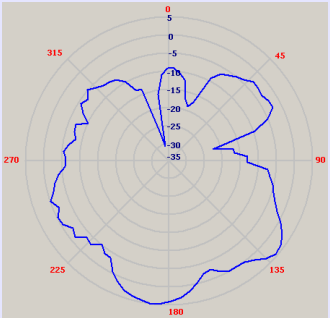
horizontal

xy-plane



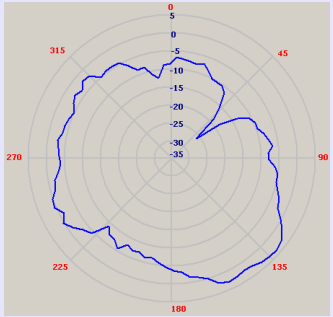
Pol.	Peak	avg.
h	+1.2	-3.2

yz-plane



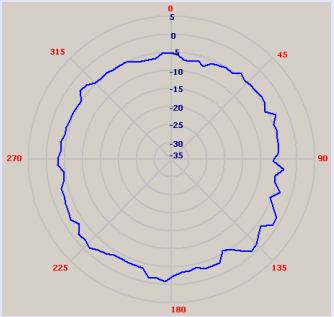
Pol.	peak	avg.
h	+4.8	-2.0

xz-plane

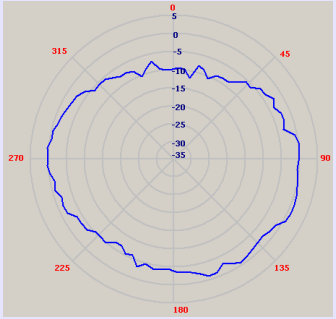


Pol.	peak	avg.
h	+3.8	-3.0

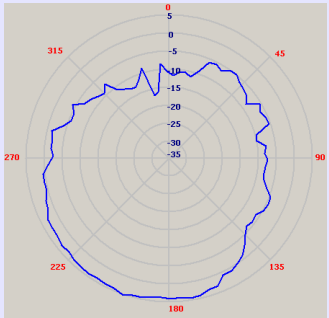
vertical



Pol.	peak	avg.
v	-1.0	-4.1



Pol.	peak	avg.
v	+0.8	-3.0



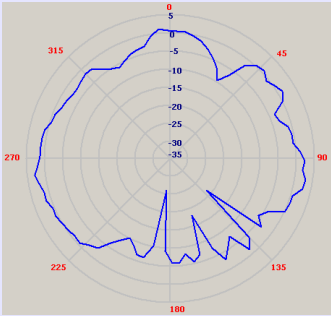
Pol.	peak	avg.
v	+4.9	-0.8

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 6425 MHz**

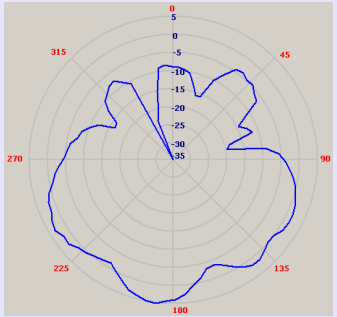
horizontal

xy-plane



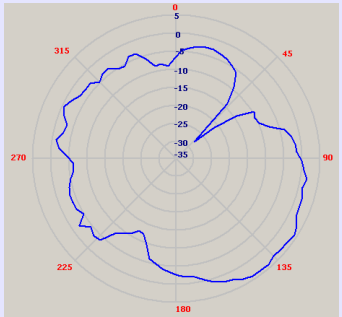
Pol.	Peak	avg.
h	+2.9	-1.6

yz-plane



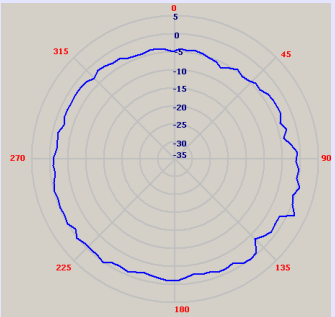
Pol.	peak	avg.
h	+4.9	-1.6

xz-plane

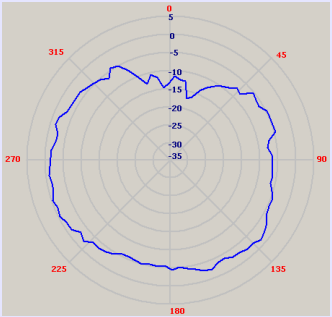


Pol.	peak	avg.
h	+4.0	-1.8

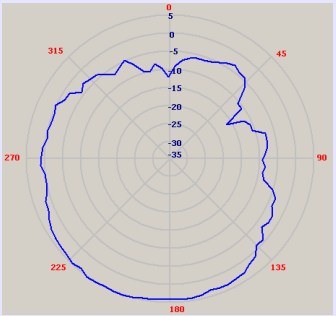
vertical



Pol.	peak	avg.
v	+1.7	-2.1



Pol.	peak	avg.
v	-0.6	-4.5



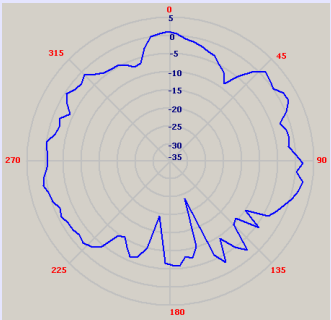
Pol.	peak	avg.
v	+5.0	-0.2

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 6525 MHz**

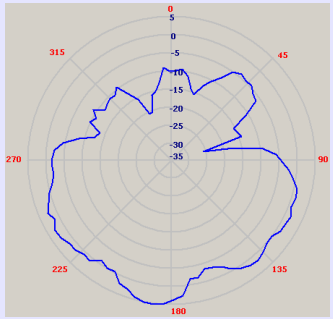
horizontal

xy-plane



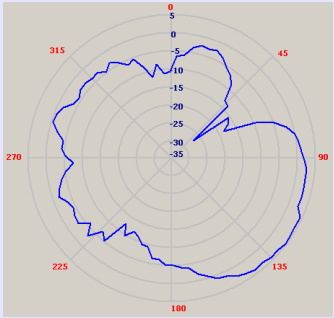
Pol.	Peak	avg.
h	+2.2	-2.2

yz-plane



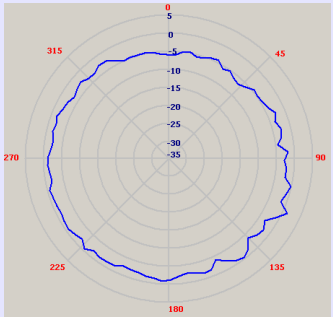
Pol.	peak	avg.
h	+4.9	-1.5

xz-plane

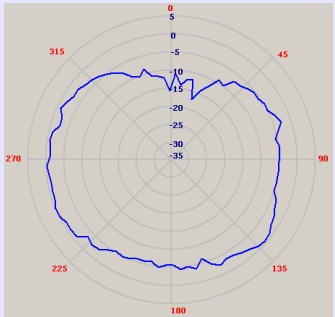


Pol.	peak	avg.
h	+4.5	-1.6

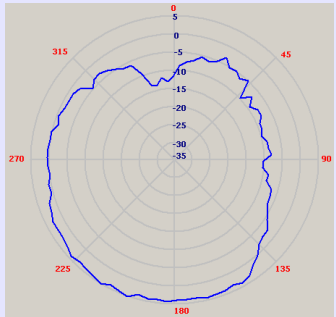
vertical



Pol.	peak	avg.
v	+1.1	-2.7



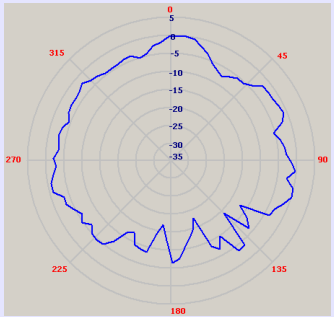
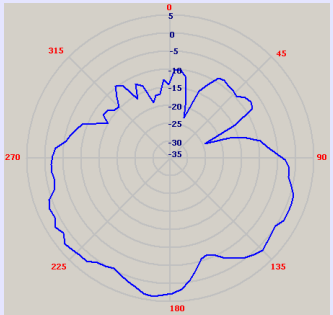
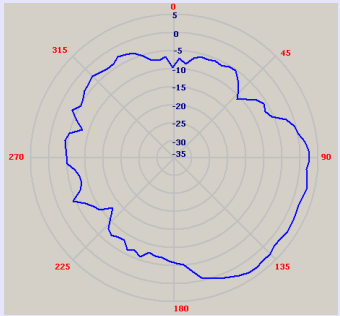
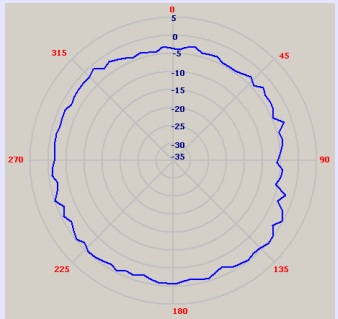
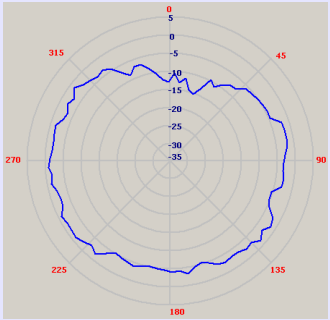
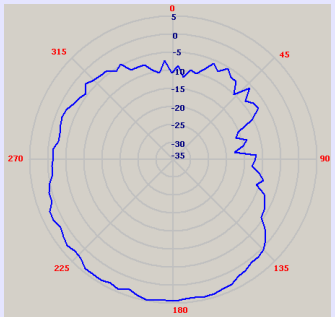
Pol.	peak	avg.
v	-0.2	-4.0



Pol.	peak	avg.
v	+5.0	-0.1

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 6875 MHz**

	xy-plane	yz-plane	xz-plane
horizontal			
vertical			

Pol.	Peak	avg.
h	+0.1	-4.0

Pol.	peak	avg.
h	+3.6	-2.2

Pol.	peak	avg.
h	+3.0	-2.3

Pol.	peak	avg.
v	+0.1	-2.3

Pol.	peak	avg.
v	-1.1	-3.9

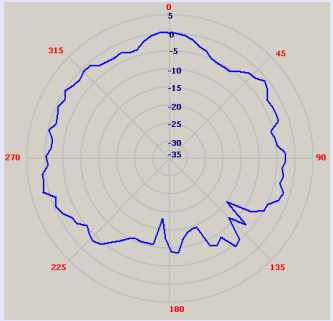
Pol.	peak	avg.
v	+4.6	-0.6

RTK-ANT-0022 PIFA measurement report

- **Radiation Patterns – 7125 MHz**

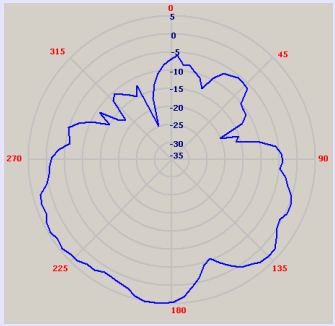
horizontal

xy-plane



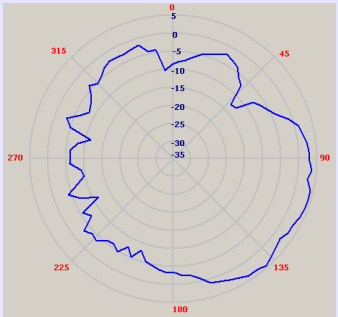
Pol.	Peak	avg.
h	+1.5	-3.3

yz-plane



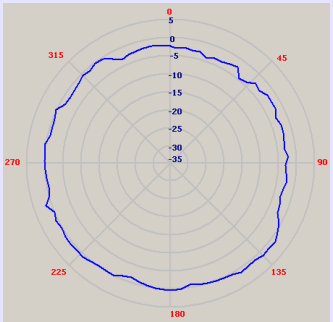
Pol.	peak	avg.
h	+4.9	-0.8

xz-plane

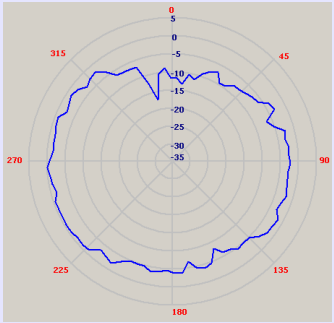


Pol.	peak	avg.
h	+4.2	-1.4

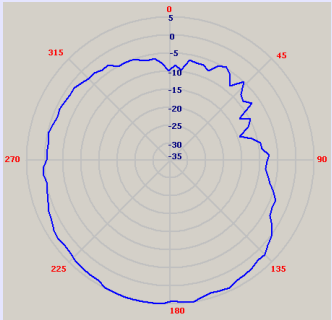
vertical



Pol.	peak	avg.
v	+1.4	-1.1



Pol.	peak	avg.
v	-0.3	-3.7



Pol.	peak	avg.
v	+5.0	-0.2

RTK-ANT-0022 PIFA measurement report

- **Antenna gain table**

Frequency (MHz)	Peak gain (dBi)	(θ, ϕ)
2400	+3.4	(253°, 90°)
2450	+3.0	(90°, 145°)
2480	+3.1	(90°, 145°)

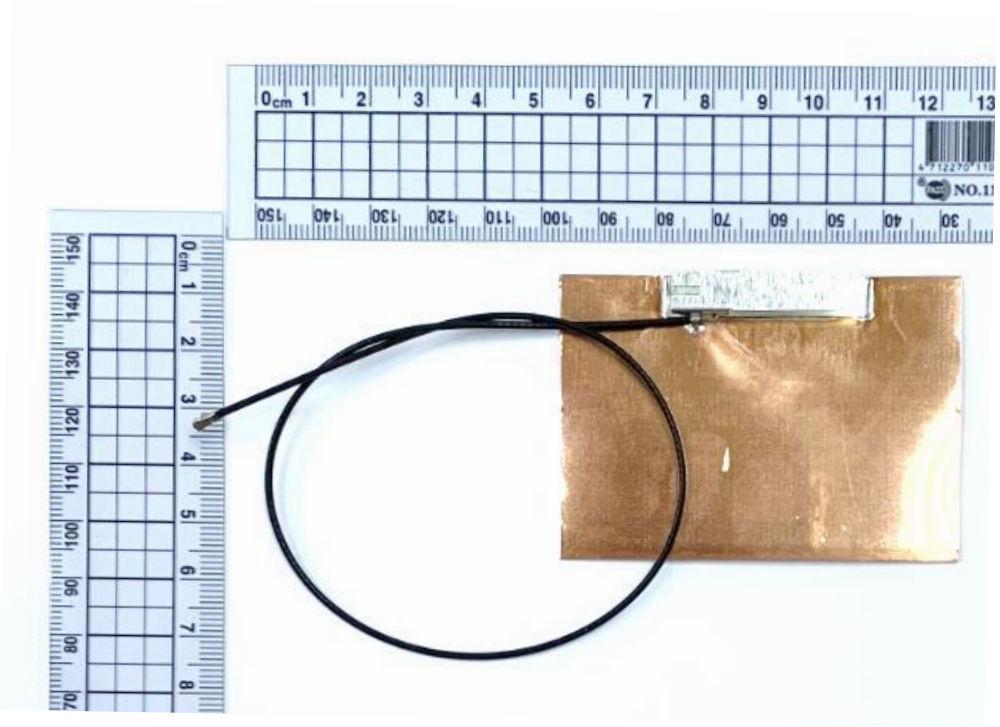
* XY-plane：Theta = 90°
  XZ-plane： Phi=0 °
  YZ-plane：Phi = 90 °

* The antenna gain values are used in EMC measurement, the EIRP and/or Conducted power are compliance all FCC requirements and not exceed the limit.

Frequency (MHz)	Peak gain (dBi)	(θ, ϕ)
5150	+4.9	(221°, 0°)
5250	+4.8	(225°, 0°)
5350	+4.7	(221°, 0°)
5470	+3.2	(221°, 0°)
5725	+4.8	(209°, 90°)
5850	+5.0	(221°, 90°)
5895	+5.0	(225°, 90°)
5925	+4.9	(229°, 90°)
6425	+5.0	(241°, 0°)
6525	+5.0	(229°, 0°)
6875	+4.6	(221°, 0°)
7125	+5.0	(225°, 0°)

RTK-ANT-0022 PIFA measurement report

- **Antenna photo**



* The antenna connector is IPEX MHF4, can be install in RF transmitters such as modular devices, the amount of antenna depend on the modular device's number of antenna connectors.