

## Regulatory WWAN Antenna Information

Platform information						
Brand	ODM	Platform model name	Platform type (ex: regular NB, convertible PC, AIO...etc)			*SAR minimum separation (mm)
HP Inc.	Quanta Corporation	TPN-Q273	Convertible PC			2.4
Antenna information						Maximum Peak gain
Vendor	Type	Antenna Part number (Ant5 TX/RX)	Antenna Part number (Ant6 RX)	Antenna Part number (Ant7 RX)	Antenna Part number (Ant8 TX/RX)	703MHz (Choice TX high peak gain)
1	PIFA	DNQTA249000 (81ELA215.G30)	DNQTA249000 (81ELA215.G29)	DNQTA249000 (81ELA215.G30)	DNQTA249000 (81ELA215.G29)	0.8 dBi
Module information						
Model	Form factor and suffixes ( NGW/ HMW AND AN/ NB/ BN....)					
Kavalan	Fibocom FM350-GL WWAN 4x4 5G NR radio module					

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1. **Applicable test methods**

ETS-Lindgren AMS-8500 system is 3D fully anechoic chamber, it is applied to the “Conical Cut test method”, the detail description is described as below.

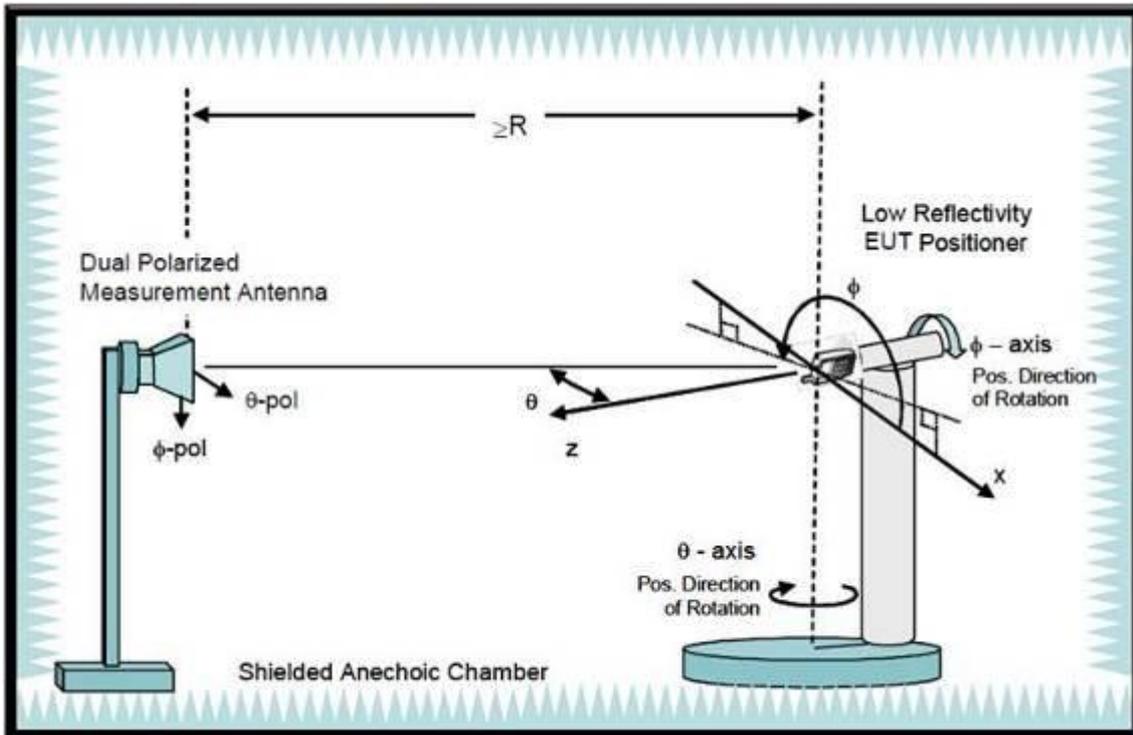
The Conical Cut method requires the ability of the Measurement Antenna to be physically rotated in the theta plane (overhead) of the EUT for implementations using a single Measurement Antenna, Eleven conical cuts are required to capture data at every 15 degrees from the EUT, with the top (0 degrees) and bottom (180 degrees) cuts not being measured. Typically, the EUT will remain affixed to a turntable during the entire measurement process. The Measurement Antenna will be positioned at a starting theta angle. The EUT will then be rotated around the full 360 degrees of phi rotation. The Measurement Antenna will then be positioned at the next theta angle, and the process repeated.

		$\theta$ -Axis	$\Phi$ -Axis
Passive	Step size	15°~165° step: 15°	0°~345° step: 15°
	N / M (Points)	12	24

2. **Test & System Description**

a. Test setup

Typical Setup for ETS-Lindgren AMS-8500:



b. Equipment list

Equipment Description	Manufacturer	Identification no.	Current calibration date	Next calibration date
Network analyzer	Agilent	E5071C	2022/01/07	2023/01/06
Measurement software	ETS-Lindgren	EMQuest	N/A	N/A
Multi axis positioning system(MAPSTM)	ETS-Lindgren	EMCO 2115	N/A	N/A
Multi axis positioning system(MAPSTM)	ETS-Lindgren	EMCO 2110	N/A	N/A
MAPSTM controller	ETS-Lindgren	EMCO 2090	N/A	N/A
Horn antenna	ETS-Lindgren	3164-10	N/A	N/A

3. Setup photo



## Antenna Sample / Antenna Data Requirements for worldwide regulatory approval

Section	Description of Required OEM / ODM Antenna Information	US / IC	EU	Japan	Taiwan	S.Korea
1A	Part Number for Antenna Assembly	Required	Required	Required	Required	Required
1B	Antenna Manufacturer Name	Required	Required	Required	Required	Required
1C	Description of Antenna Type	Required	N/A	N/A	N/A	N/A
1D	Tx antenna Gain (Peak Gain W/ cable loss) *	Required	Required	Required	Required	Required
2	Dimensioned Photographs and Drawings of Tx and Rx antennas	Required	Required	Required	Required	Required
3	Radiation patterns of antennas loaded in the host platform.	N/A	Required	Required	Required	N/A
4	Platform model name / number - correlated to antenna manufacturer and antenna part number	Required	Required	Desired	Required	Desired
5	Photograph(s) or Drawings showing location of antennas in platform. (S. Korea requires photographs of antennas for approval submission). Taiwan requires pictures of each antenna type shown in the system.	Required	Required	Desired	Required (Photos)	Required (Photos)
6	Mech. drawings / photos with dimensions of antenna locations and distance from end-user (For evaluation of SAR testing requirement).	Required	N/A	N/A	N/A	N/A
7	Photograph(s) or Drawings showing the location of all antennas (WLAN, other) and distance between those transmitting antennas. Information will be used to evaluate whether co-location testing is required.	Required	N/A	N/A	N/A	N/A
8	Local representative contact information for LMA/ PARS process.	Required	N/A	N/A	N/A	N/A

## Antenna Information

### Section 1. Antenna Assembly Specifications

Communication System	Band	Frequency(MHz) from low to high spectrum		1A Part Number for Antenna Assembly	1B Antenna Manufacturer	1C Description of Antenna Type	1D Tx Antenna Gain (dBi) Ant5
WCDMA/ LTE/5G NR FR1	1	1920	1980	Ant5 : 81ELA215.G30	1	PIFA	-0.36
WCDMA/ LTE/5G NR FR1	2	1850	1910				-0.26
LTE/5G NR FR1	3	1710	1785				-1.33
WCDMA/ LTE	4	1710	1755				-0.86
WCDMA/ LTE/5G NR FR1	5	824	849				-2.67
LTE/5G NR FR1	7	2500	2570				-0.05
WCDMA/ LTE/5G NR FR1	8	880	915				-2.90
LTE	12	699	716				-0.26
LTE	13	777	787				-0.70
LTE	14	788	798				-1.21
LTE	17	704	716				-4.92
LTE	18	815	830				-1.94
LTE	19	830	845				-2.78
LTE/5G NR FR1	20	832	862				-3.00
LTE/5G NR FR1	25	1850	1915				-0.33
LTE	26	814	849				-2.67
LTE/5G NR FR1	28	703	748				0.80
LTE/5G NR FR1	30	2305	2315				-0.21
LTE	34	2010	2025				-1.05
LTE/5G NR FR1	38	2570	2620				-0.19
LTE	39	1880	1920				-0.38
LTE/5G NR FR1	40	2300	2400				-0.14
LTE/5G NR FR1	41	2496	2690				-0.18
LTE	42	3400	3600				-1.32
LTE	43	3600	3800				-1.86
LTE/5G NR FR1	48	3550	3700				-2.06
LTE/5G NR FR1	66	1710	1780				-1.33
5G NR FR1	77	3300	4200				-2.55
5G NR FR1	78	3300	3800				-2.34
5G NR FR1	79	4400	5000				-2.27

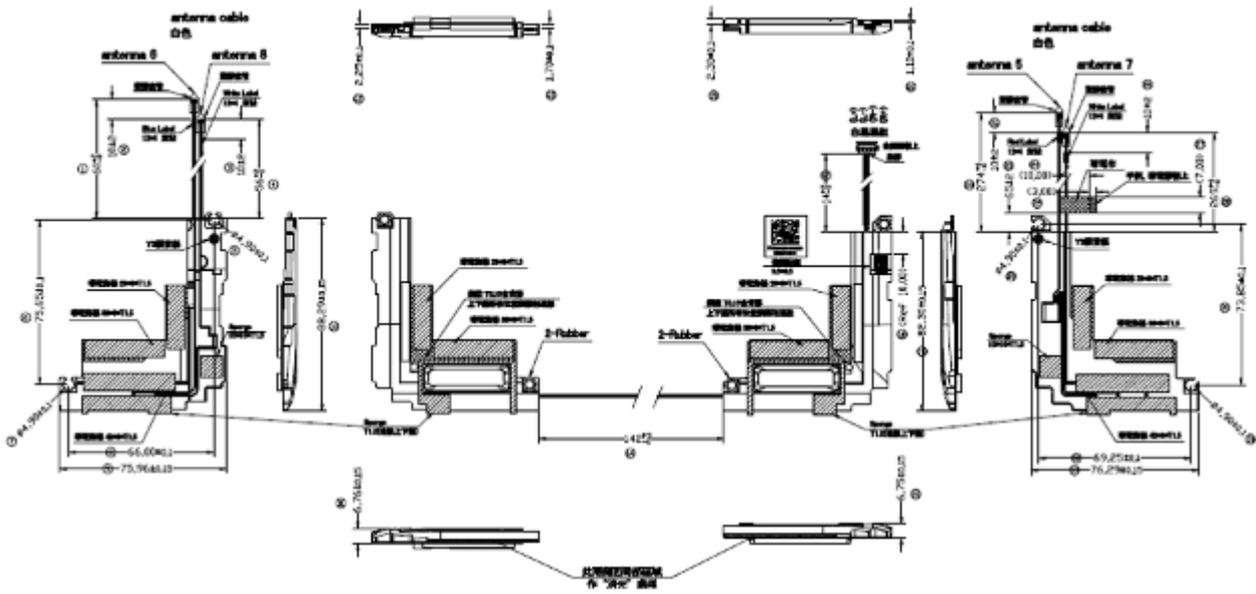
Communication System	Band	Frequency(MHz) from low to high spectrum		1A Part Number for Antenna Assembly	1B Antenna Manufacturer	1C Description of Antenna Type	1D Tx Antenna Gain (dBi) Ant8
5G NR FR1	1	1920	1980	Ant8 : 81ELA215.G29	1	PIFA	0.37
5G NR FR1	2	1850	1910				0.00
5G NR FR1	3	1710	1785				-0.87
5G NR FR1	7	2500	2570				-0.11
5G NR FR1	25	1850	1915				-0.02
5G NR FR1	30	2305	2315				-0.34
5G NR FR1	38	2570	2620				-0.14
5G NR FR1	40	2300	2400				-0.31
5G NR FR1	41	2496	2690				-0.15
5G NR FR1	48	3550	2700				0.59
5G NR FR1	66	1710	1780				-0.87
5G NR FR1	77	3300	4200				1.53
5G NR FR1	78	3300	3800				-0.40
5G NR FR1	79	4400	5000				-0.43

- Antenna Peak Gain required being test in system basis.

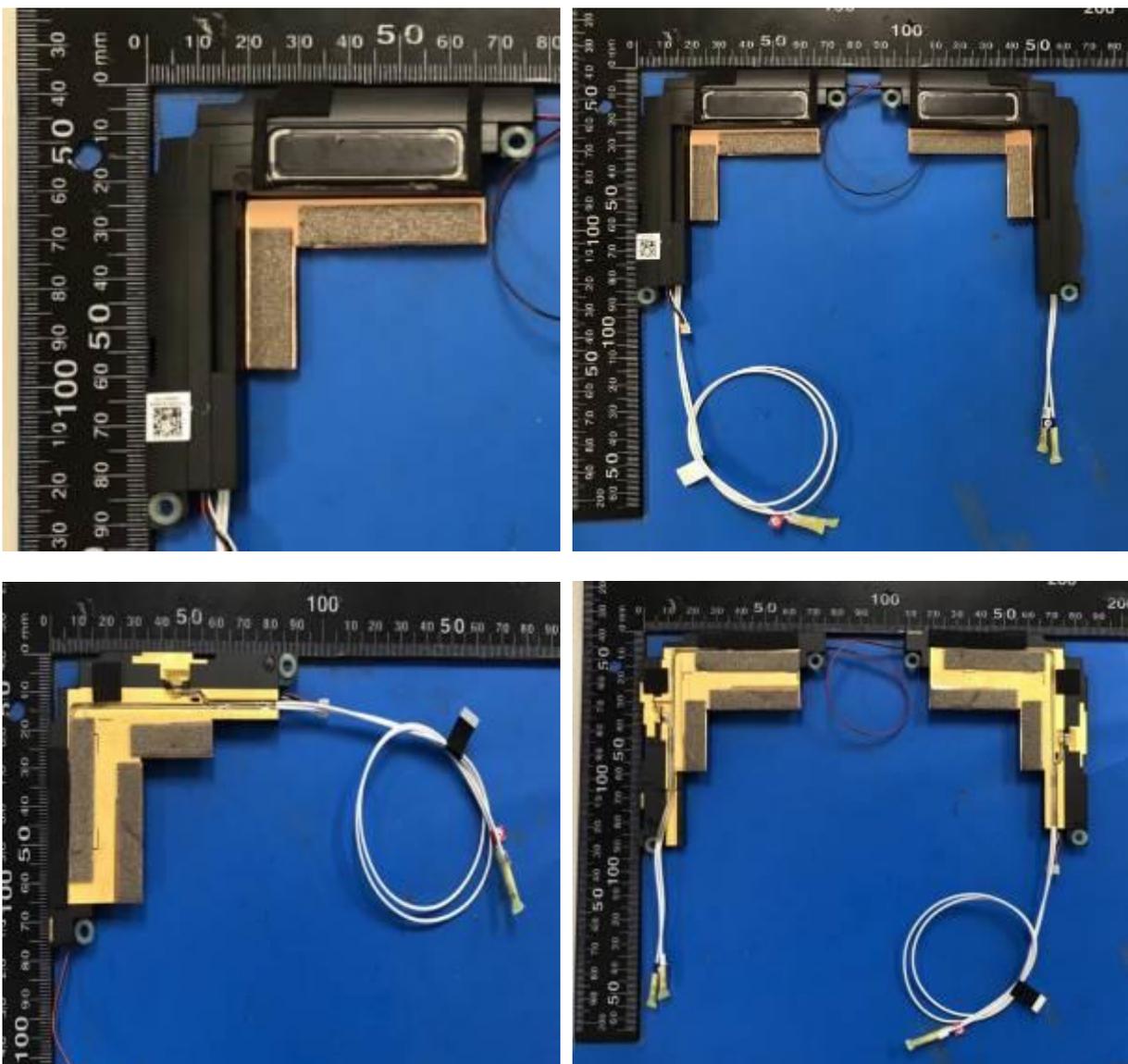
## Section 2. Dimensioned Photos or Drawings of Antennas

	Ant supplier	Part number	Drawing	Photo
Ant5	81ELA215.G30	3603400224B1	V	V
Ant6	81ELA215.G29	3603400222B1	V	V
Ant7	81ELA215.G30	3603400224B1	V	V
Ant8	81ELA215.G29	3603400222B1	V	V

Ant5 Dimensioned Drawing:  
Example



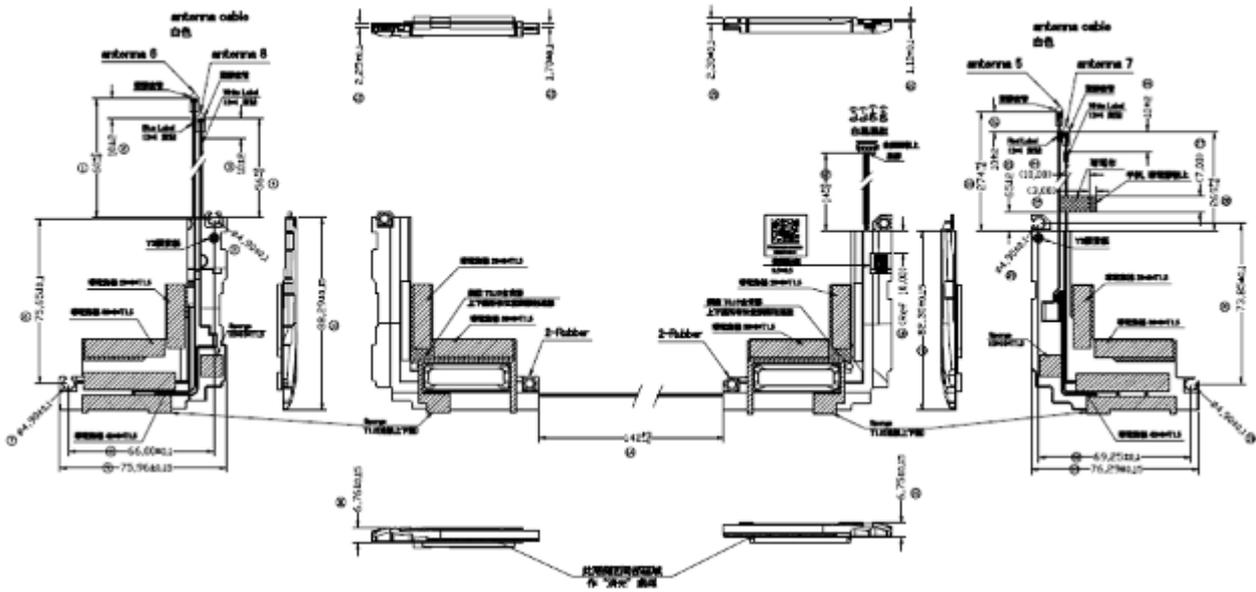
Ant5 Photo:  
Example



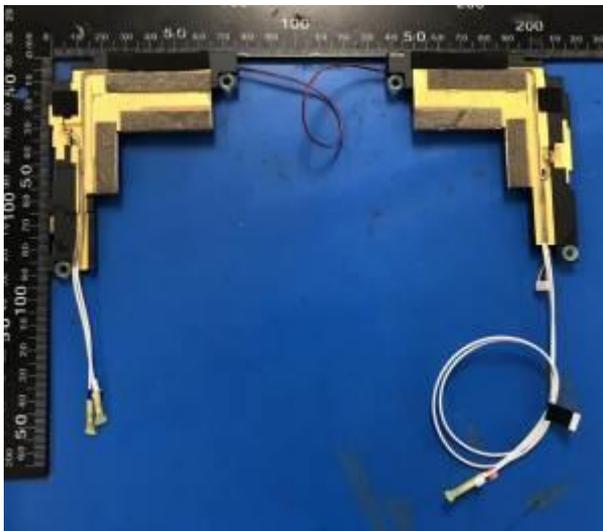
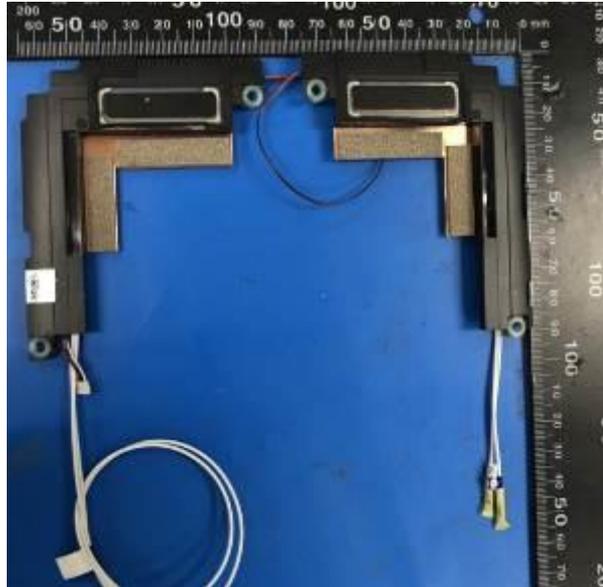




Ant8 Dimensioned Drawing:



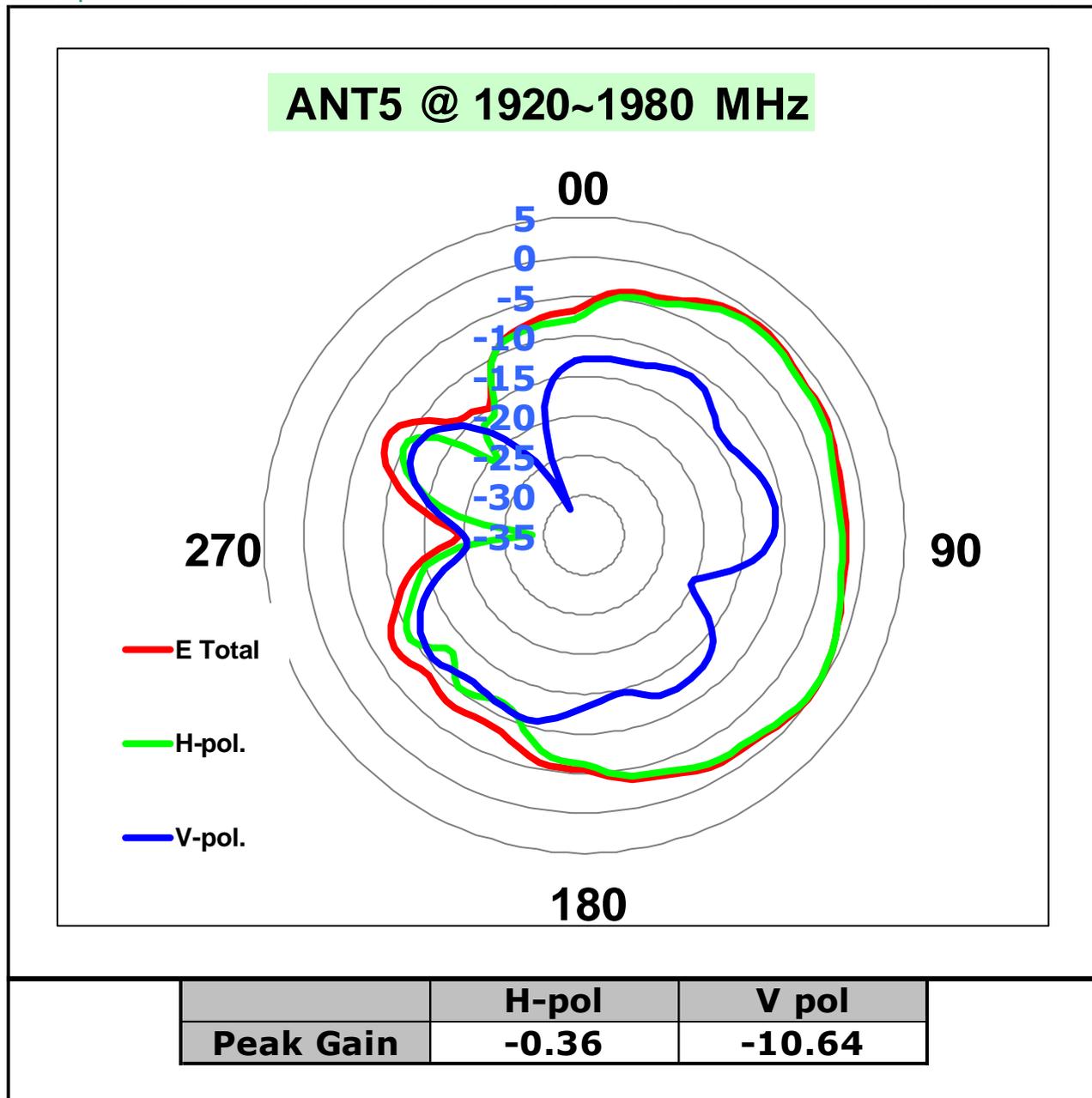
Ant8 Photo:



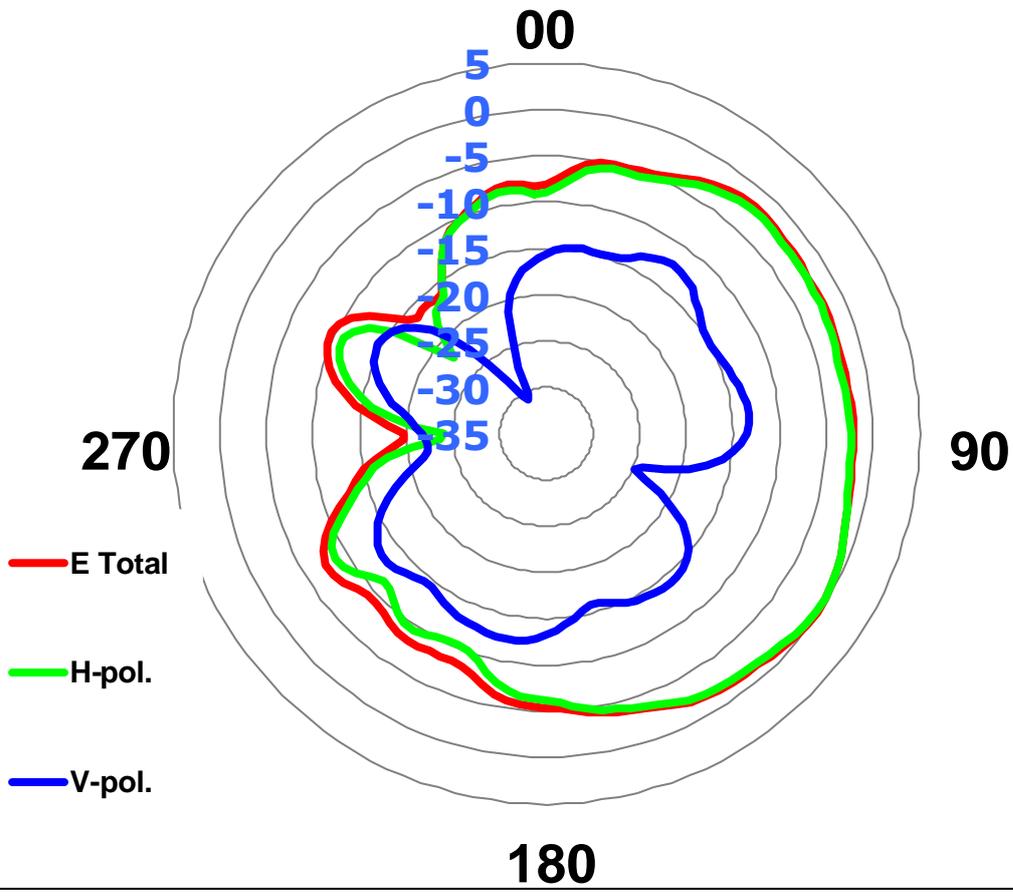
**Section 3. Radiation characteristics of antennae Loaded in Host Platform**

- The listed frequency 2D radiation pattern is required
- **Ant5:**

**Example**

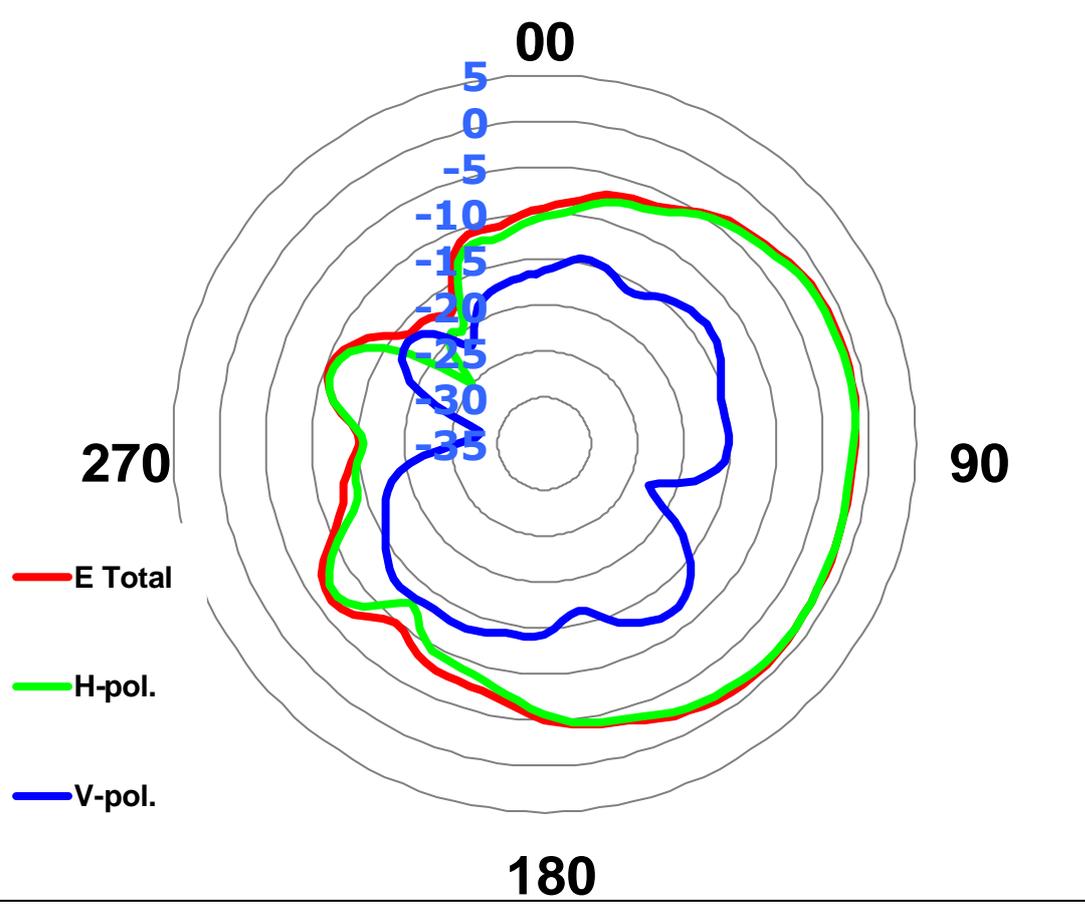


**ANT5 @ 1850~1910 MHz**



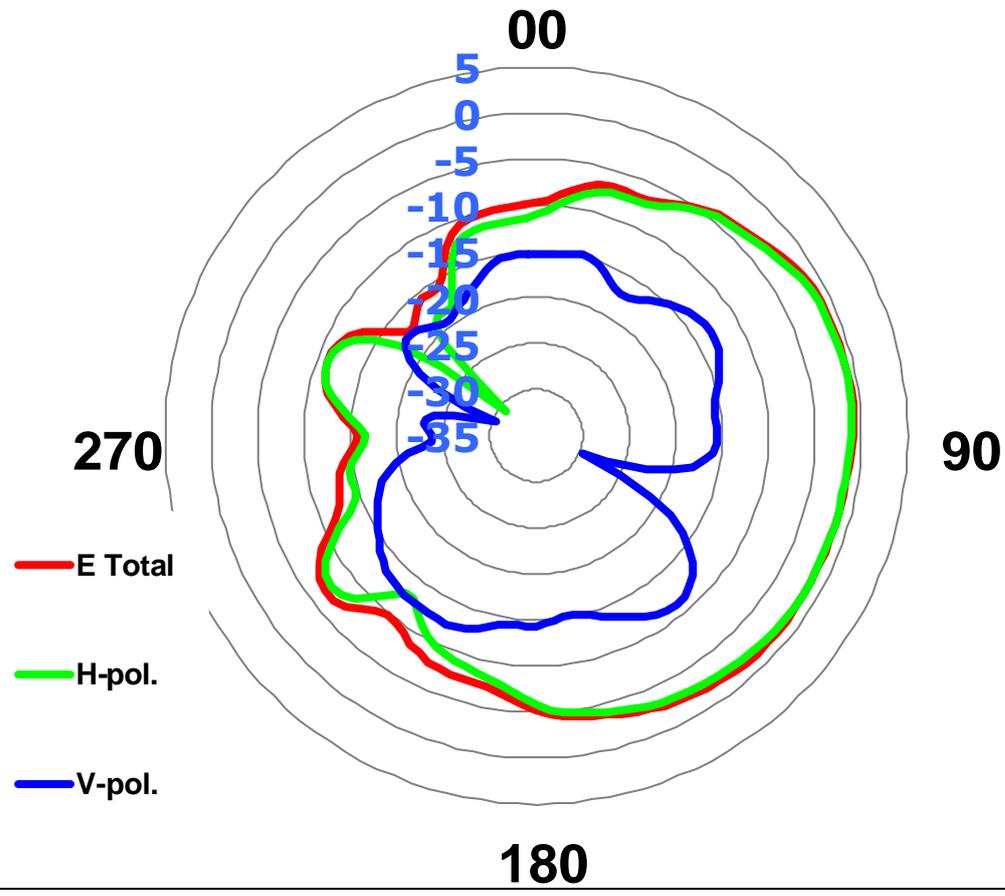
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.26</b>	<b>-12.30</b>

**ANT5 @ 1710~1785 MHz**



	H-pol	V pol
<b>Peak Gain</b>	<b>-1.33</b>	<b>-12.13</b>

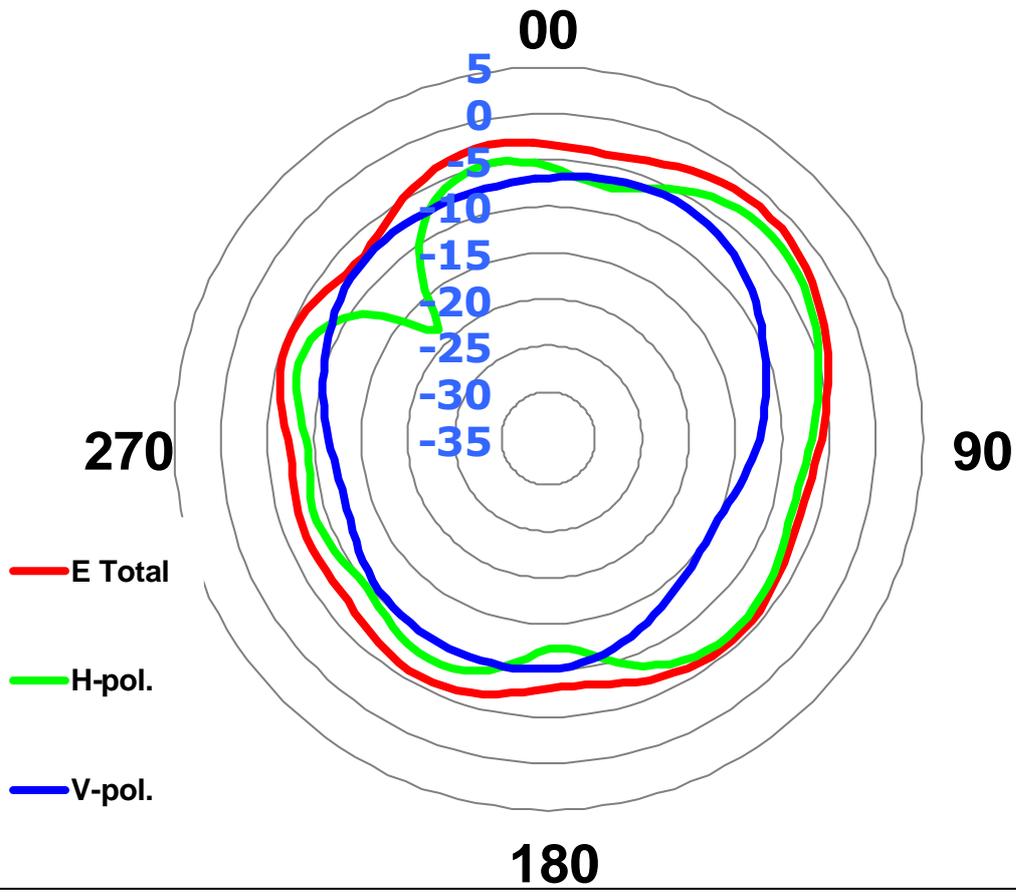
**ANT5 @ 1710~1755 MHz**



	H-pol	V pol
<b>Peak Gain</b>	<b>-0.86</b>	<b>-11.23</b>

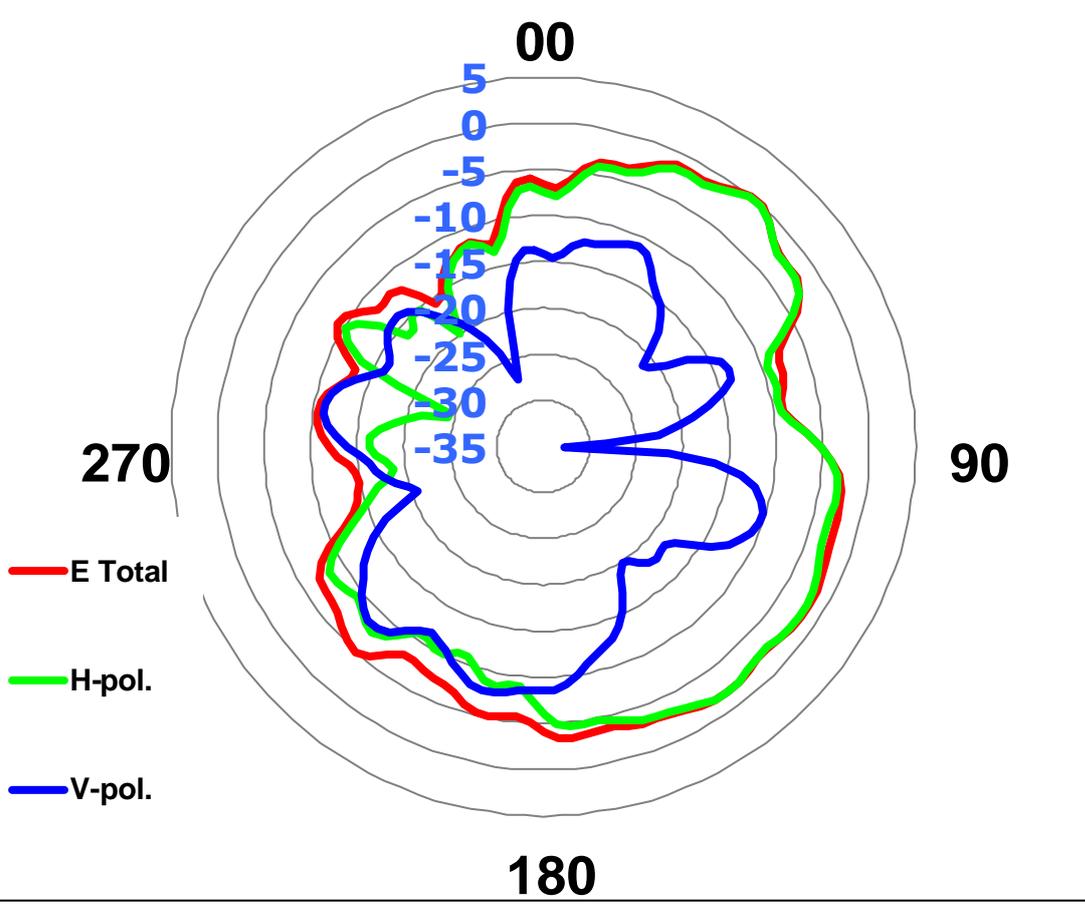
C

**ANT5 @ 824~849 MHz**



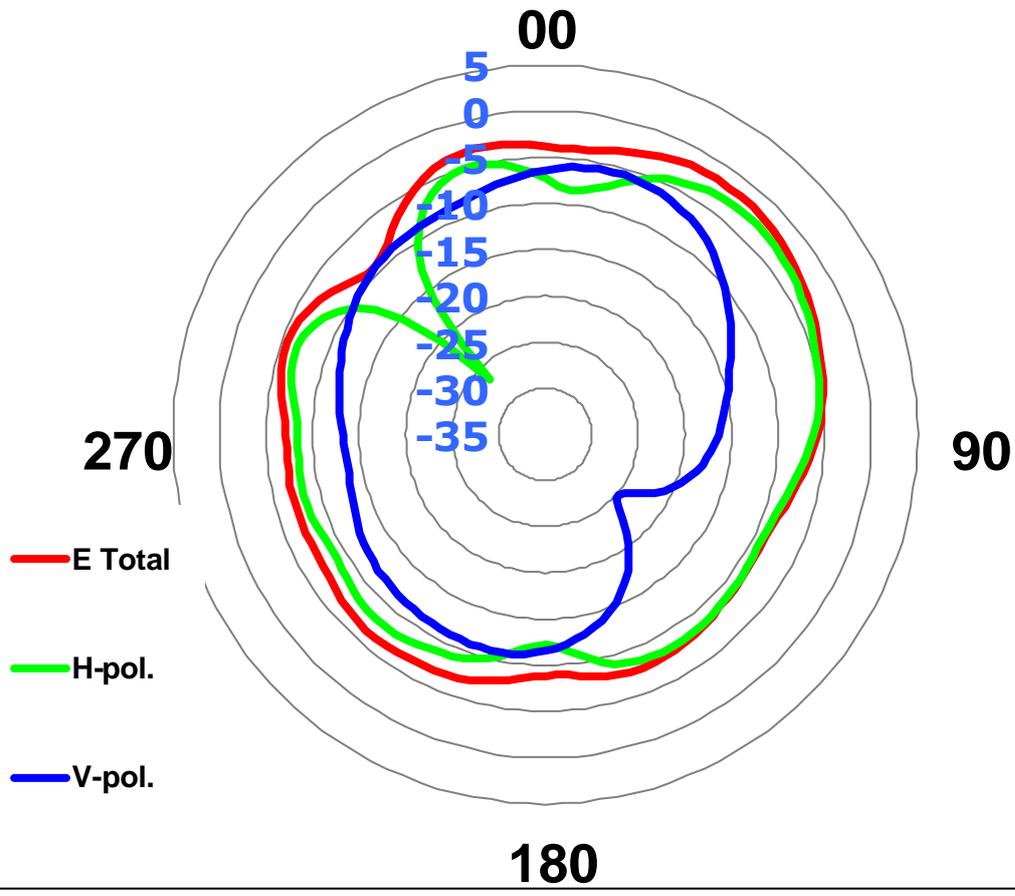
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<b>Peak Gain</b>	<b>-2.67</b>	<b>-6.03</b>

**ANT5 @ 2500~2570 MHz**



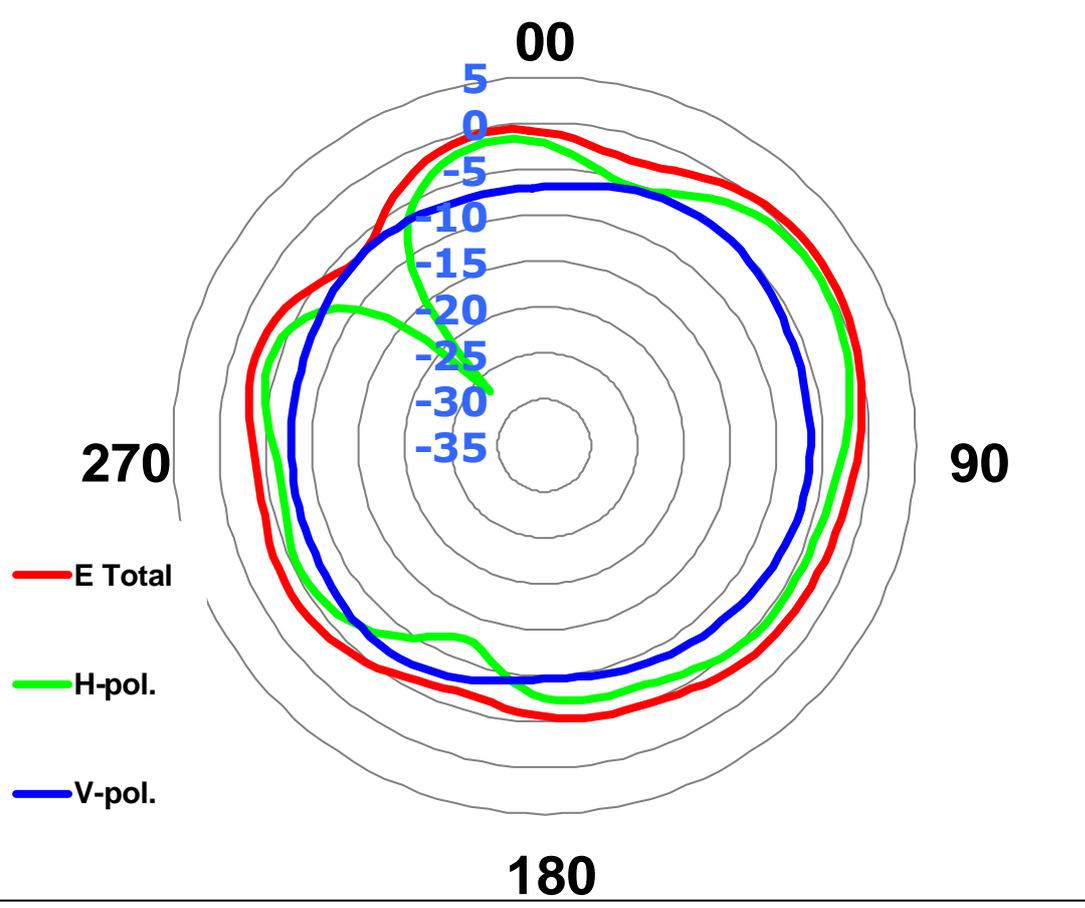
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.05</b>	<b>-7.79</b>

### ANT5 @ 880~915 MHz



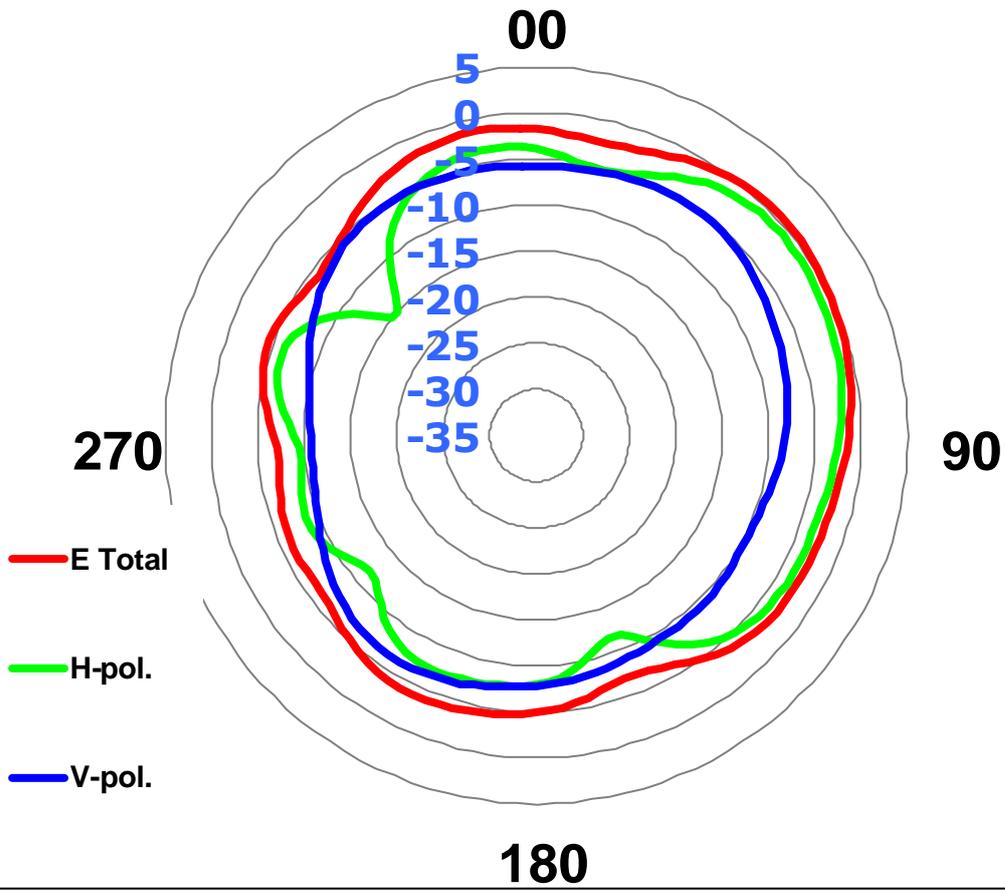
	H-pol	V pol
Peak Gain	-2.90	-5.68

**ANT5 @ 699~716 MHz**



	H-pol	V pol
<b>Peak Gain</b>	<b>-0.26</b>	<b>-5.05</b>

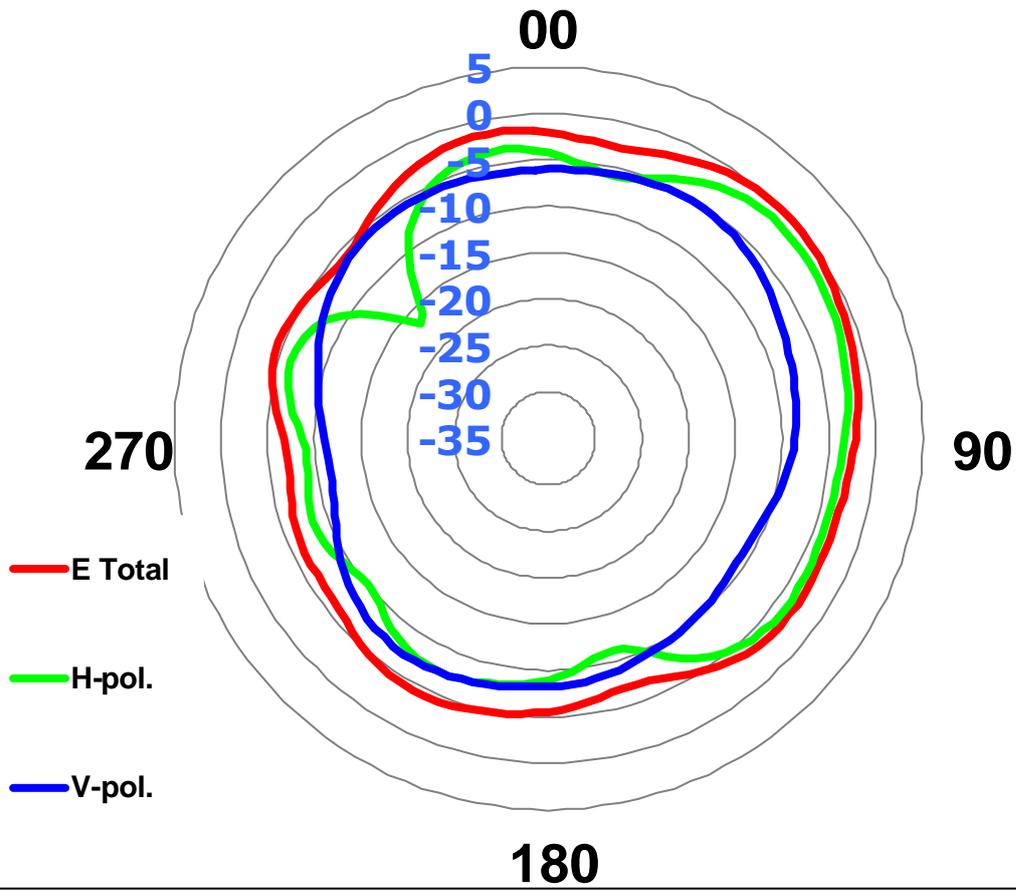
**ANT5 @ 777~787 MHz**



- E Total
- H-pol.
- V-pol.

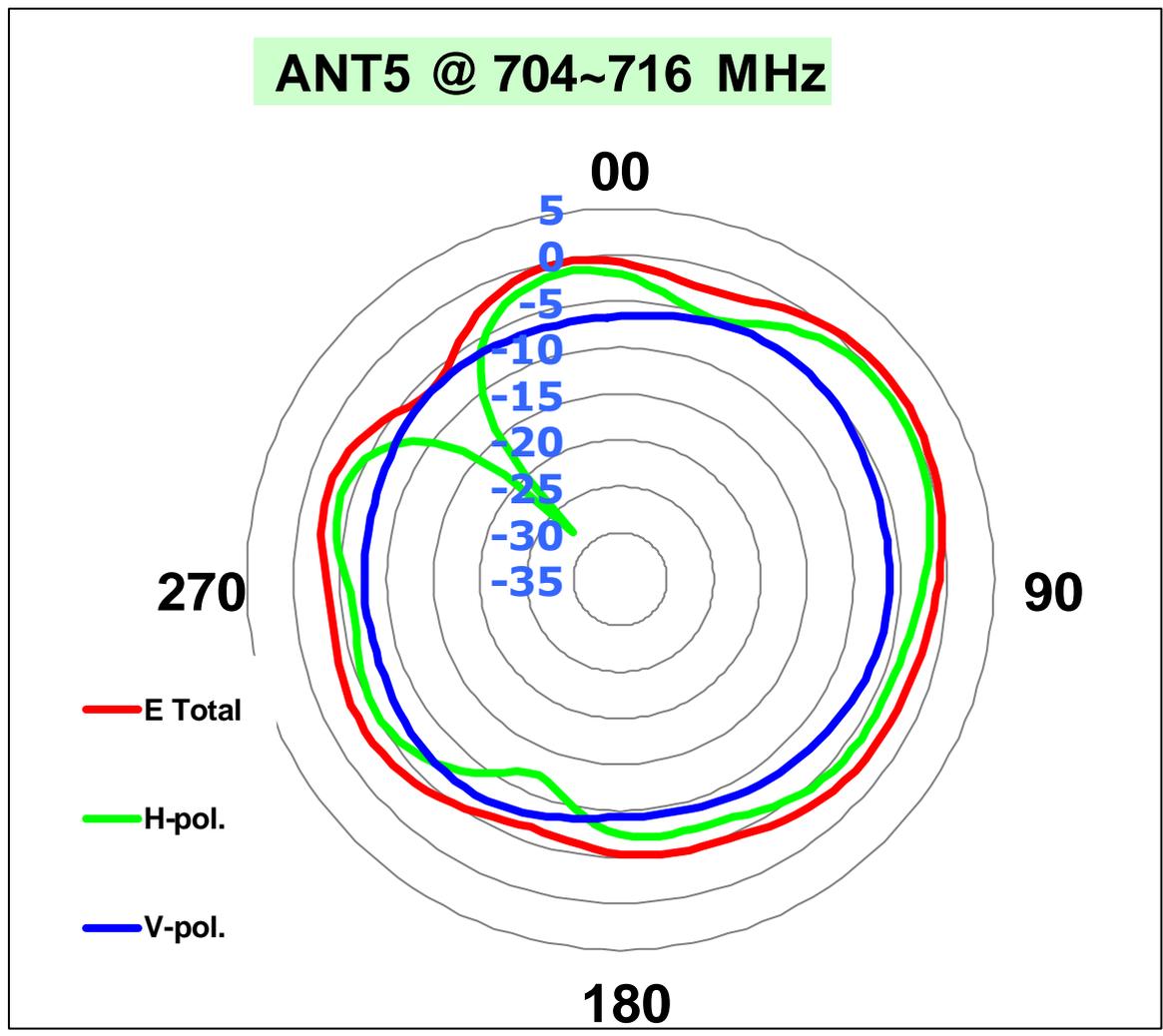
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.70</b>	<b>-4.98</b>

**ANT5 @ 788~798 MHz**



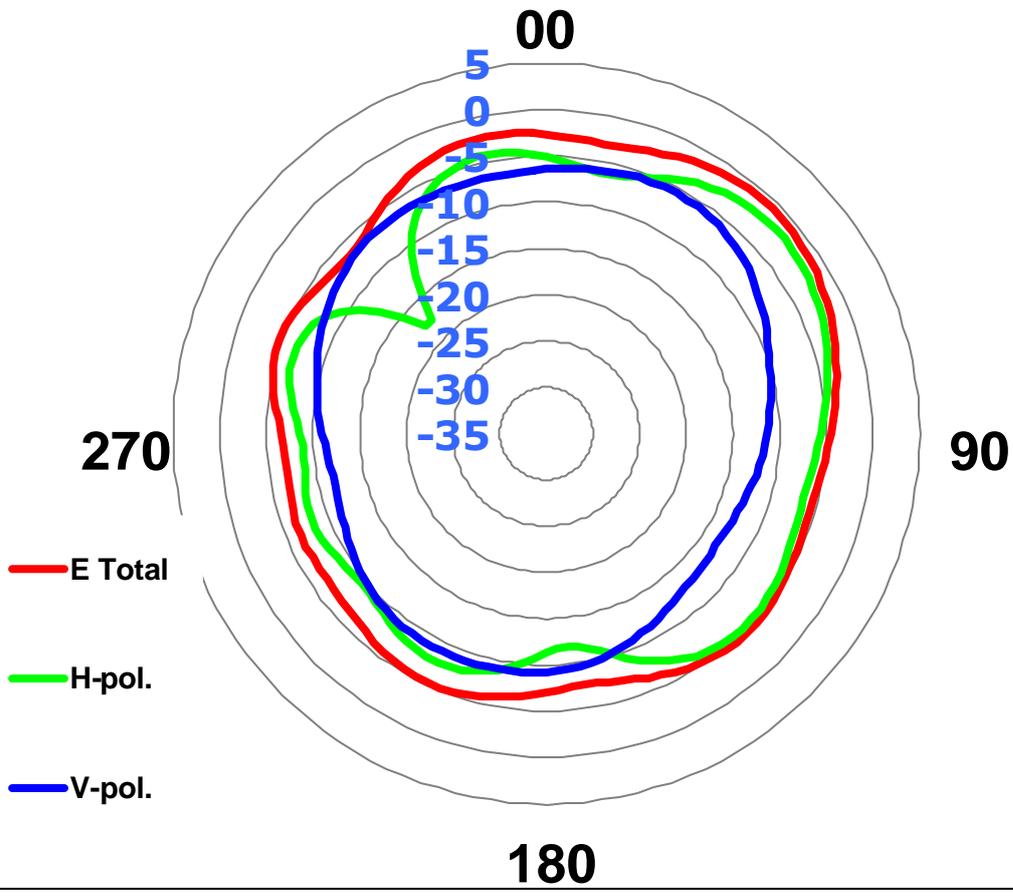
	H-pol	V pol
<b>Peak Gain</b>	<b>-1.21</b>	<b>-5.15</b>

### ANT5 @ 704~716 MHz



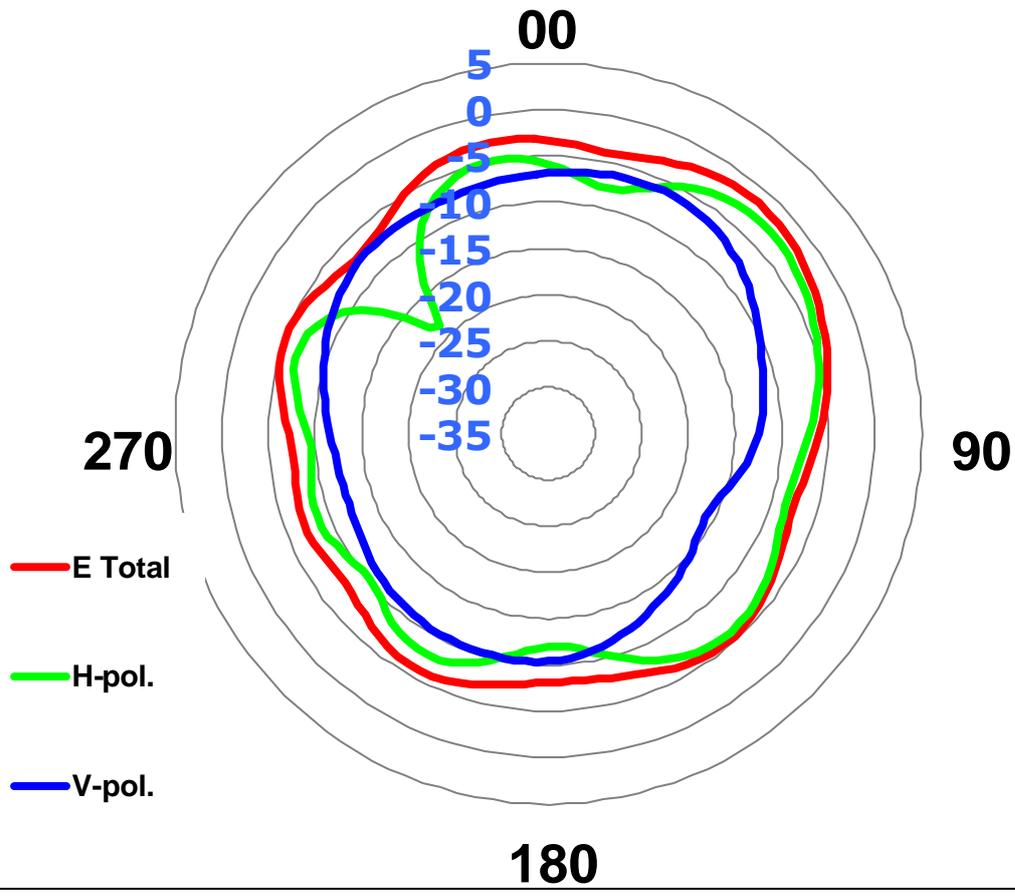
	H-pol	V pol
Peak Gain	-0.05	-4.92

**ANT5 @ 815~830 MHz**



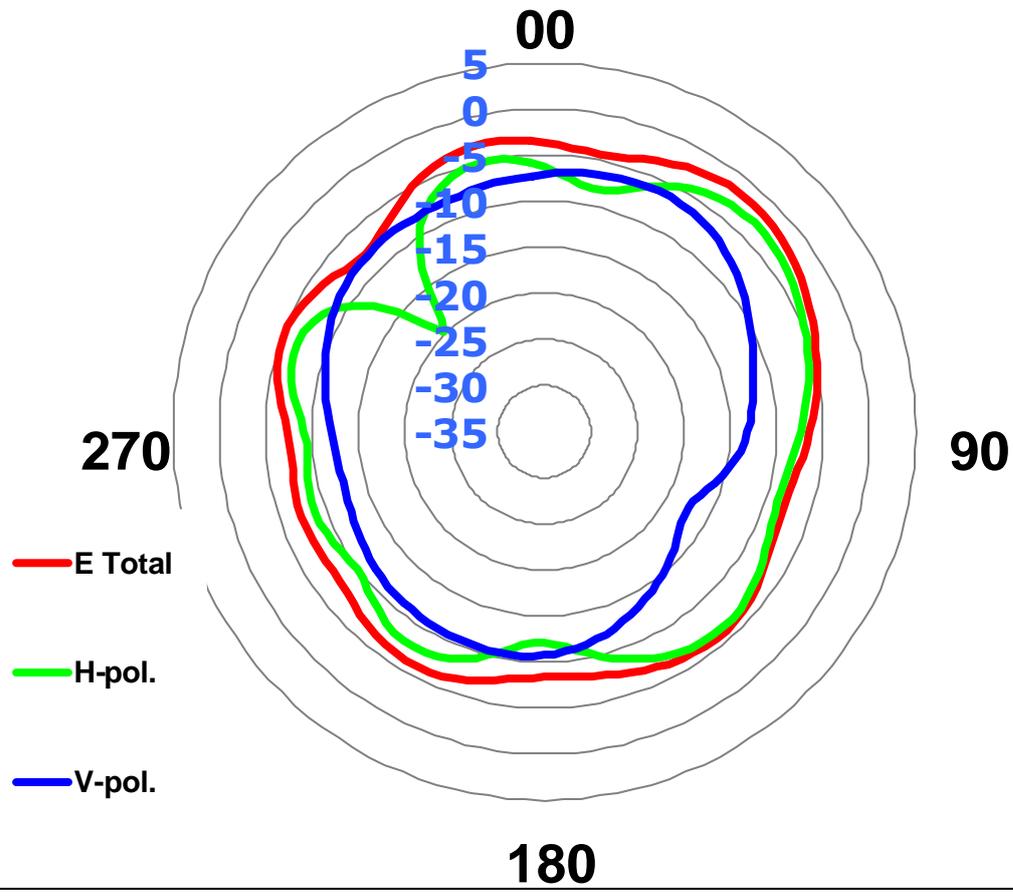
	H-pol	V pol
<b>Peak Gain</b>	<b>-1.94</b>	<b>-5.52</b>

### ANT5 @ 830~845 MHz



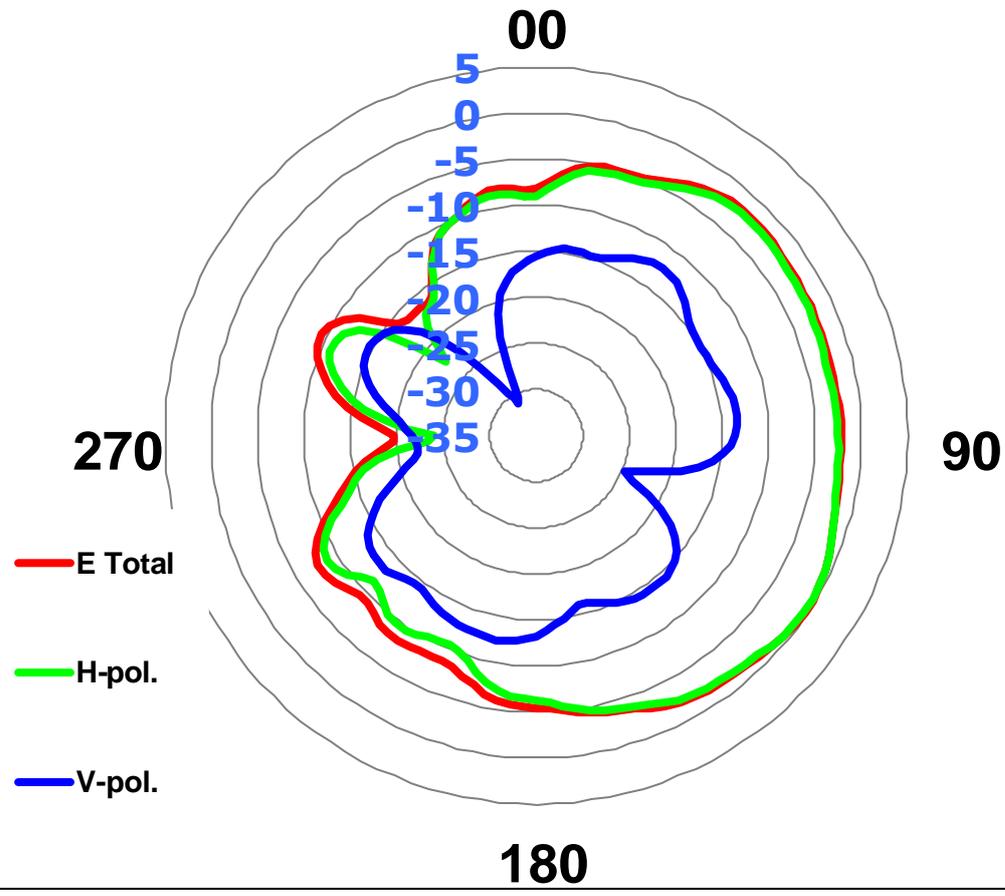
	H-pol	V pol
<b>Peak Gain</b>	<b>-2.78</b>	<b>-6.05</b>

**ANT5 @ 832~862 MHz**



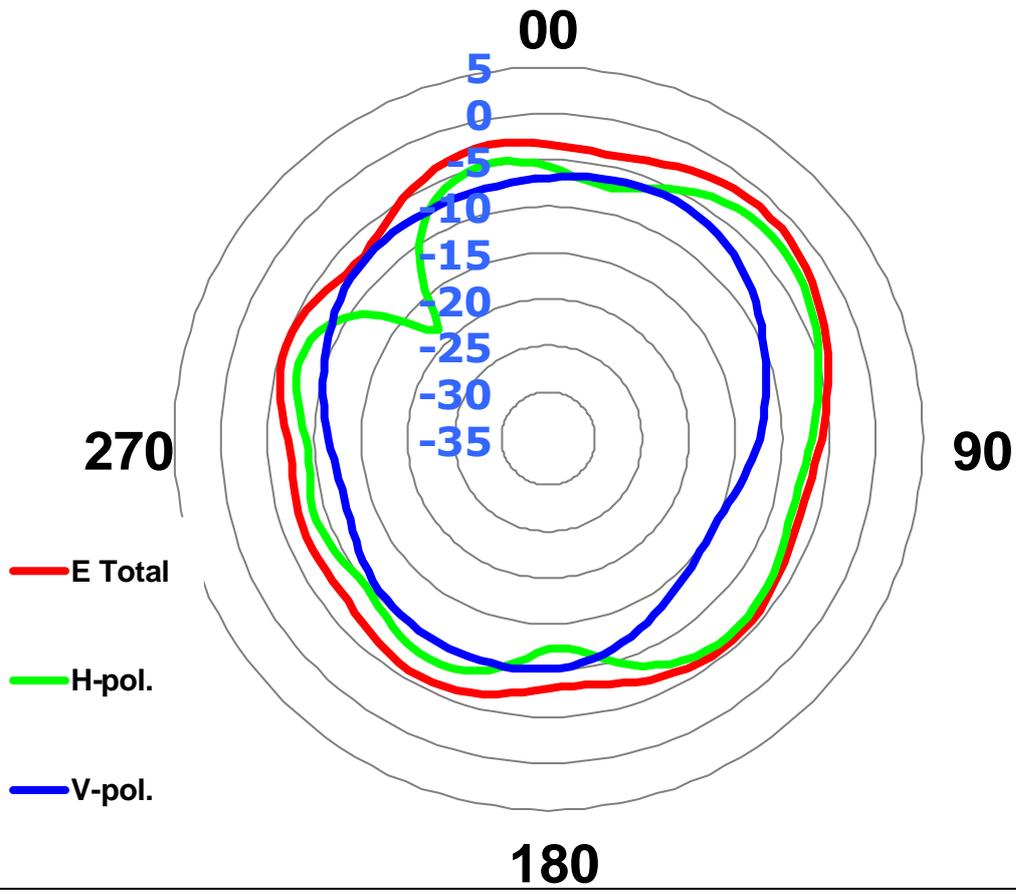
	H-pol	V pol
<b>Peak Gain</b>	<b>-3.00</b>	<b>-6.17</b>

**ANT5 @ 1850~1915 MHz**



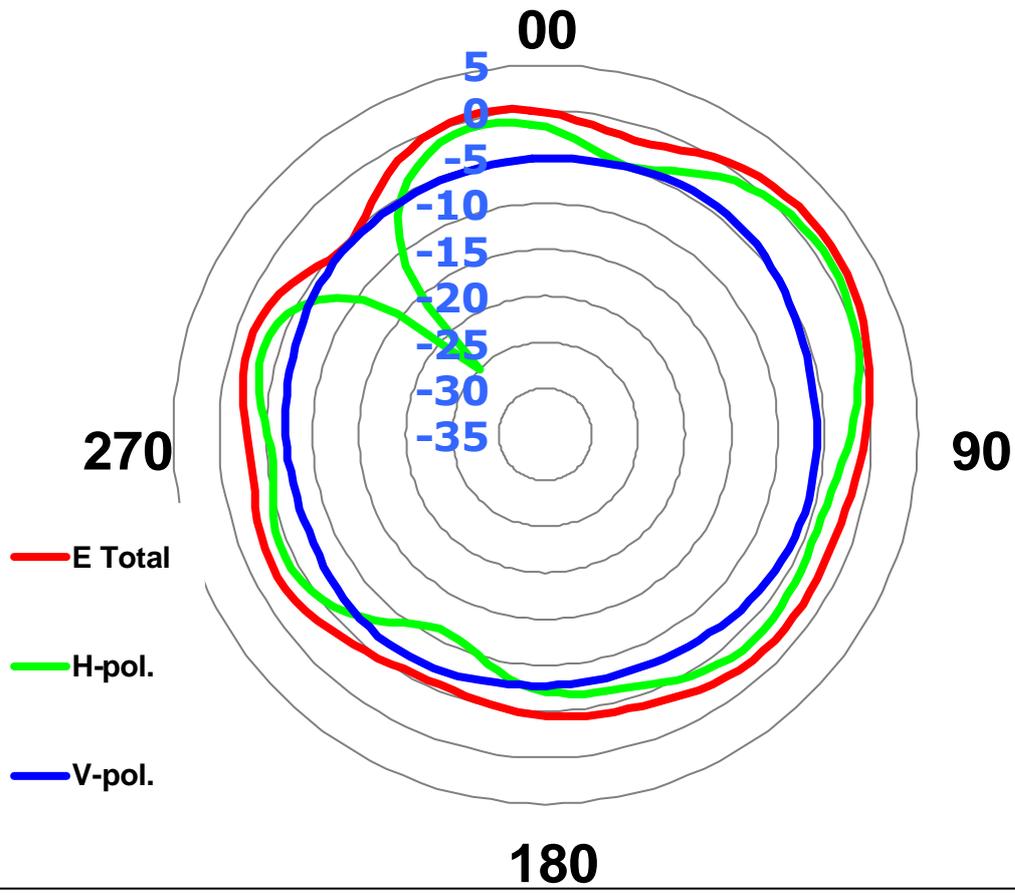
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.33</b>	<b>-12.27</b>

**ANT5 @ 814~849 MHz**



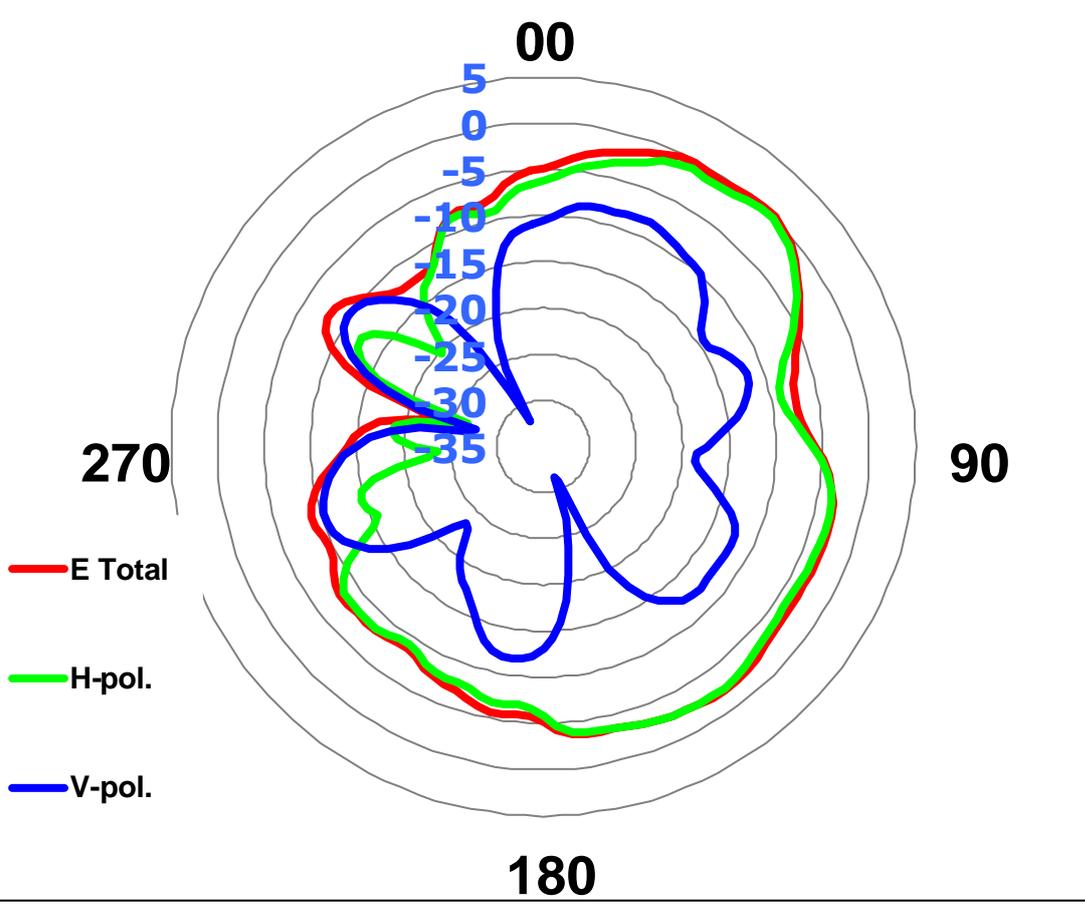
	H-pol	V pol
<b>Peak Gain</b>	<b>-2.67</b>	<b>-6.03</b>

### ANT5 @ 703~748 MHz



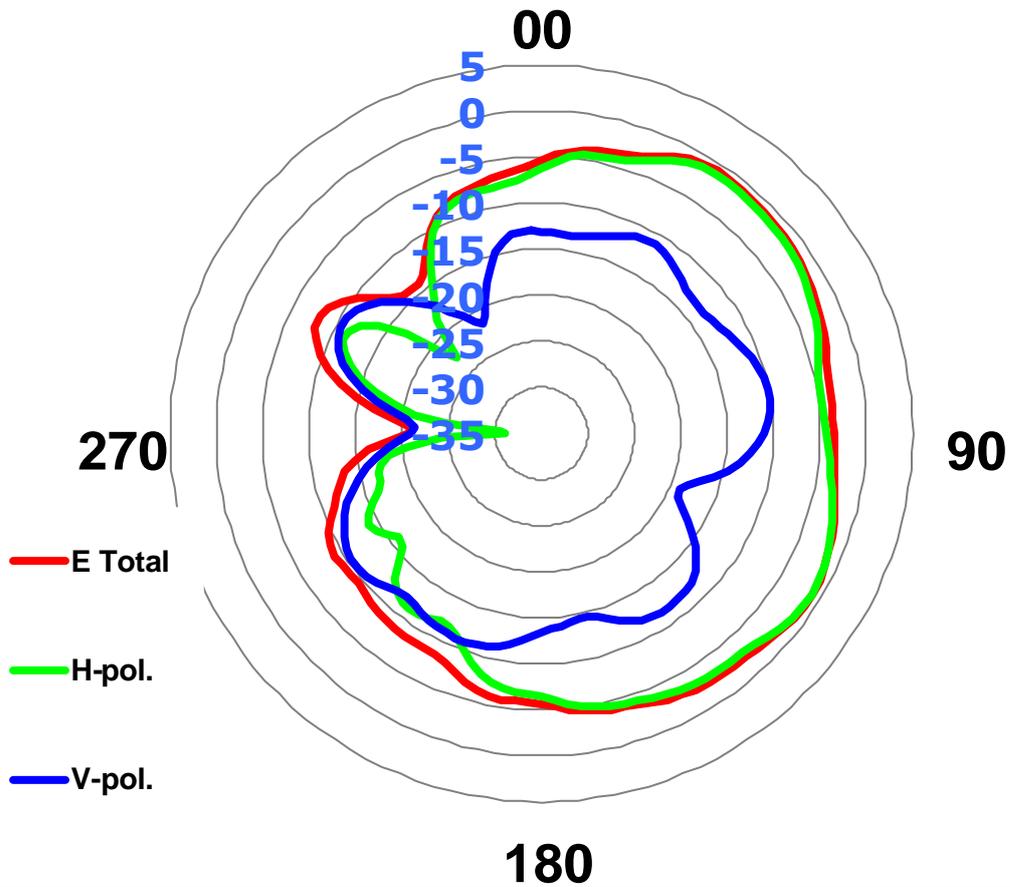
	H-pol	V pol
<b>Peak Gain</b>	<b>0.80</b>	<b>-4.17</b>

**ANT5 @ 2305~2315 MHz**



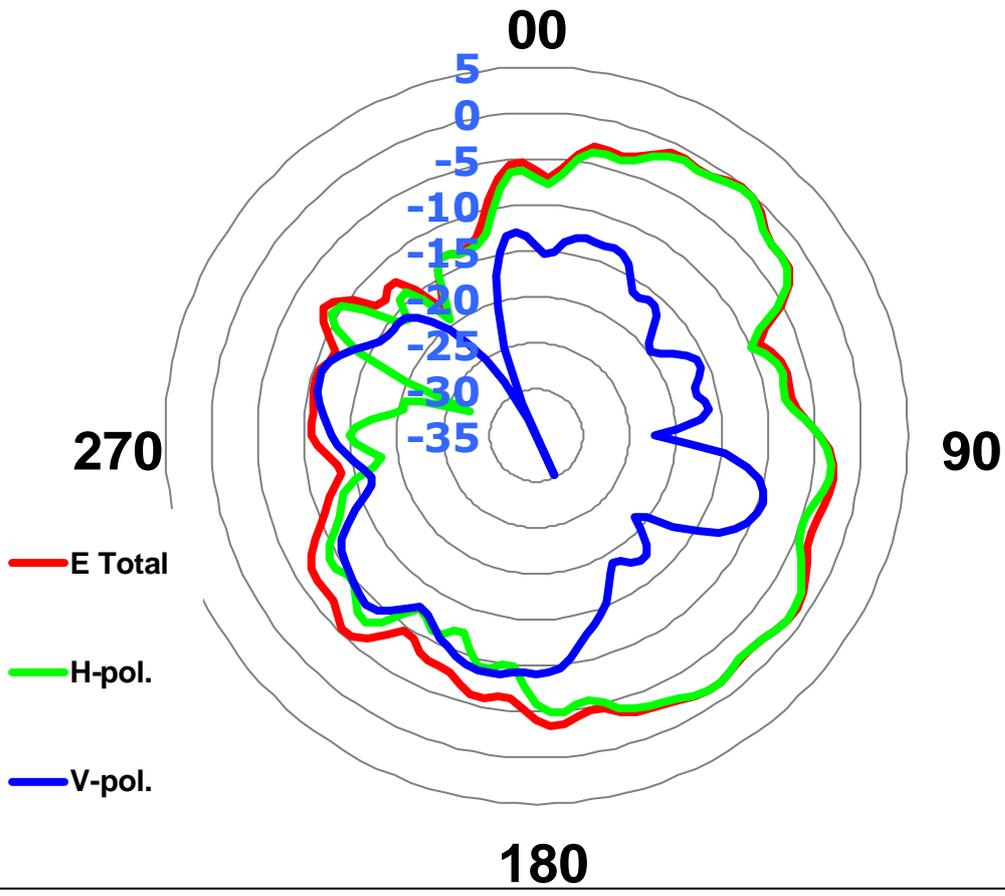
	<b>H-pol</b>	<b>V pol</b>
<b>Peak Gain</b>	<b>-0.21</b>	<b>-8.17</b>

### ANT5 @ 2010~2025 MHz



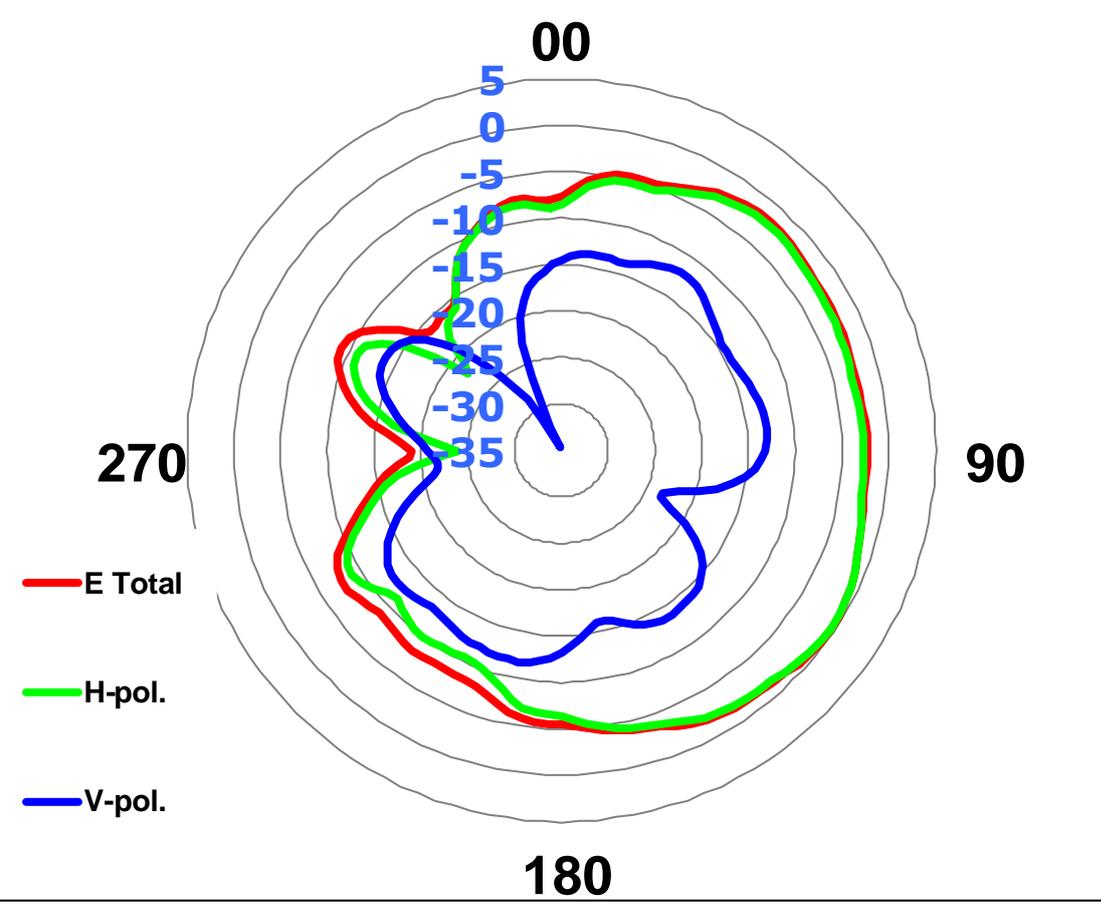
	H-pol	V pol
<b>Peak Gain</b>	<b>-1.05</b>	<b>-10.15</b>

**ANT5 @ 2570~2620 MHz**



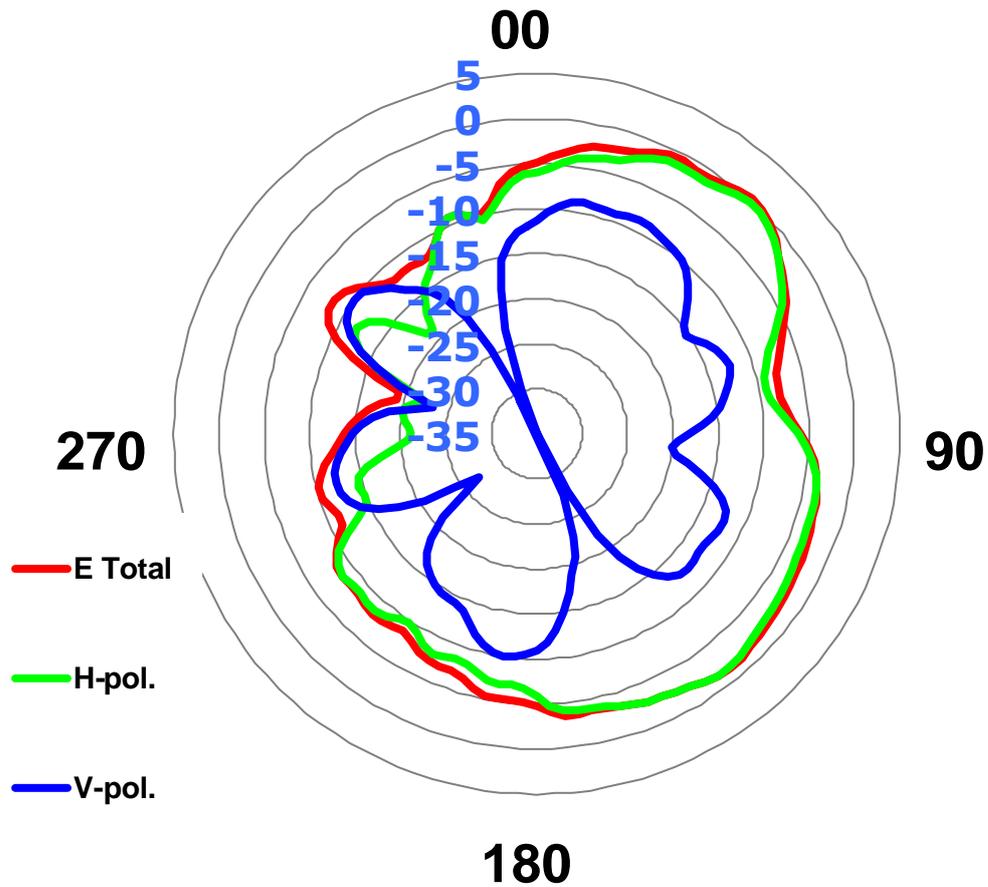
	<b>H-pol</b>	<b>V pol</b>
<b>Peak Gain</b>	<b>-0.19</b>	<b>-8.66</b>

**ANT5 @ 1880~1920 MHz**



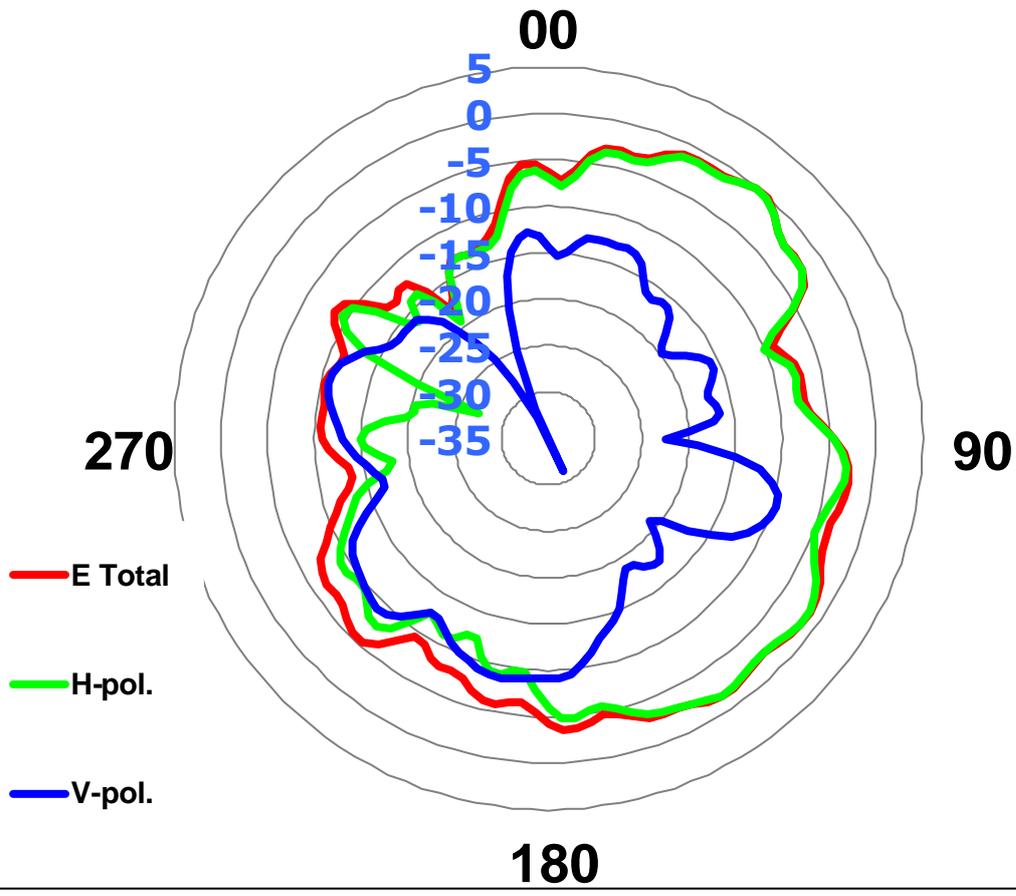
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.38</b>	<b>-11.80</b>

**ANT5 @ 2300~2400 MHz**



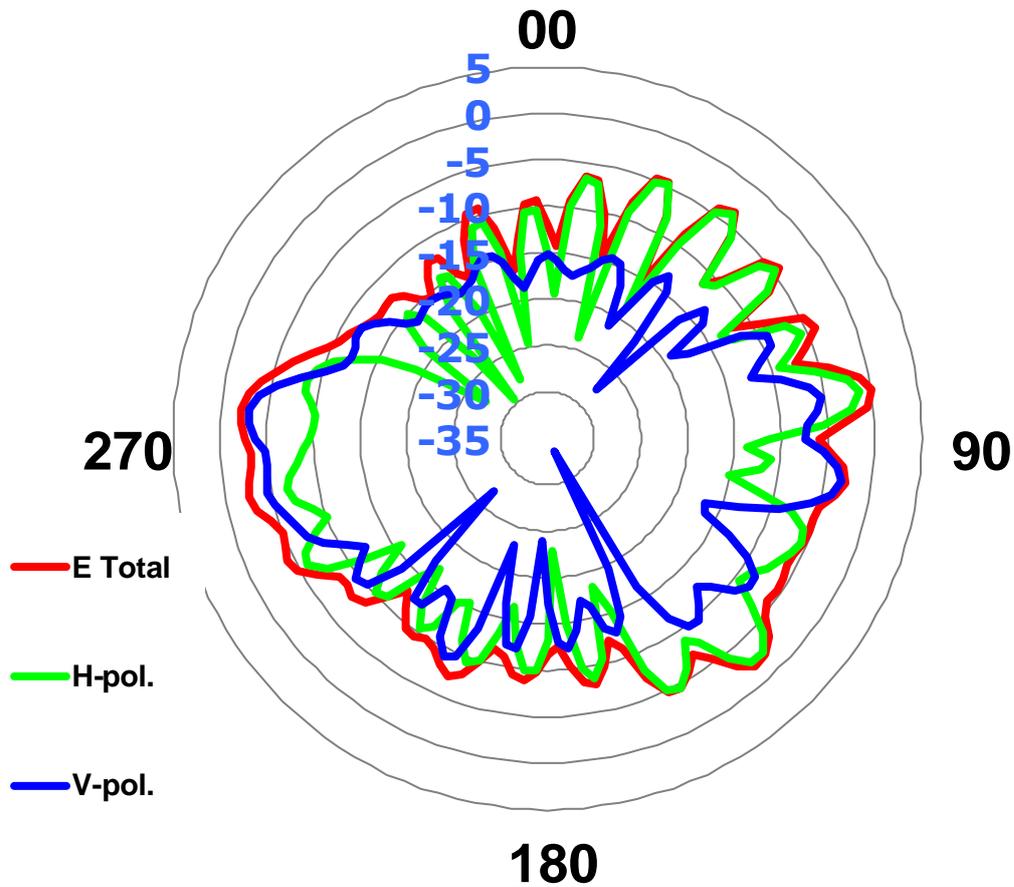
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.14</b>	<b>-8.69</b>

**ANT5 @ 2496~2690 MHz**



	H-pol	V pol
<b>Peak Gain</b>	<b>-0.18</b>	<b>-8.66</b>

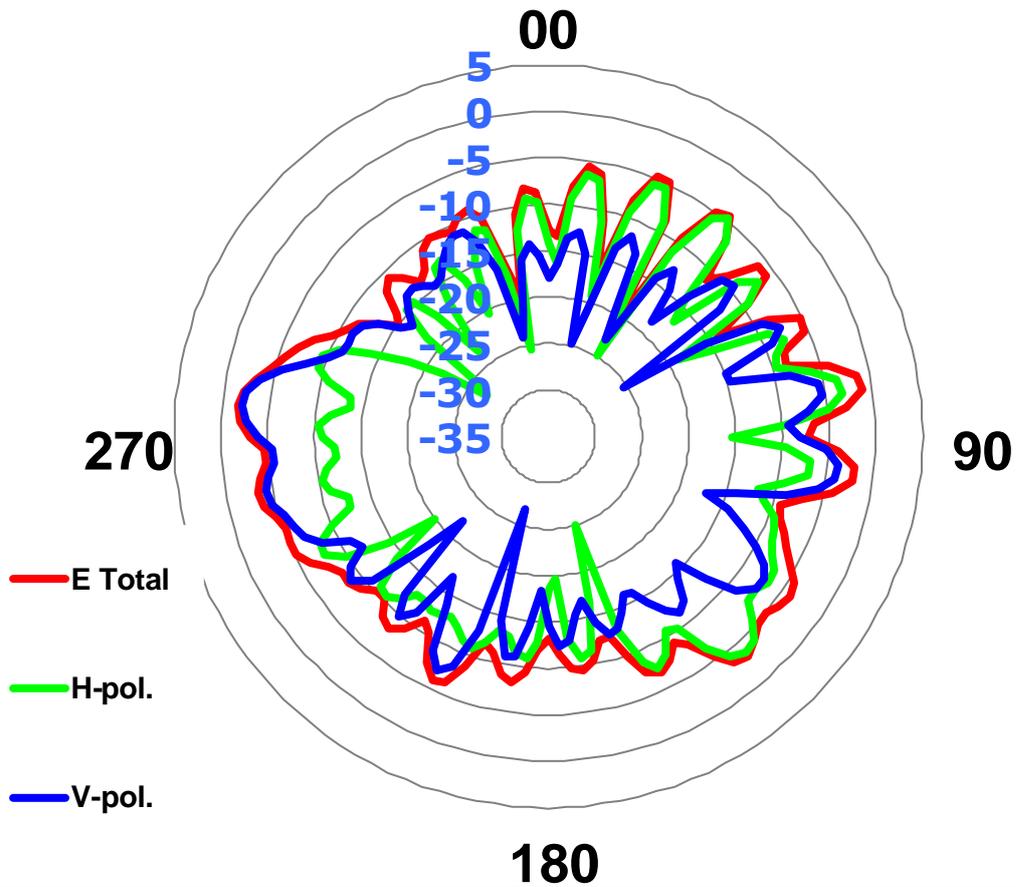
**ANT5 @ 3400~3600 MHz**



	H-pol	V pol
<b>Peak Gain</b>	<b>-1.32</b>	<b>-3.02</b>



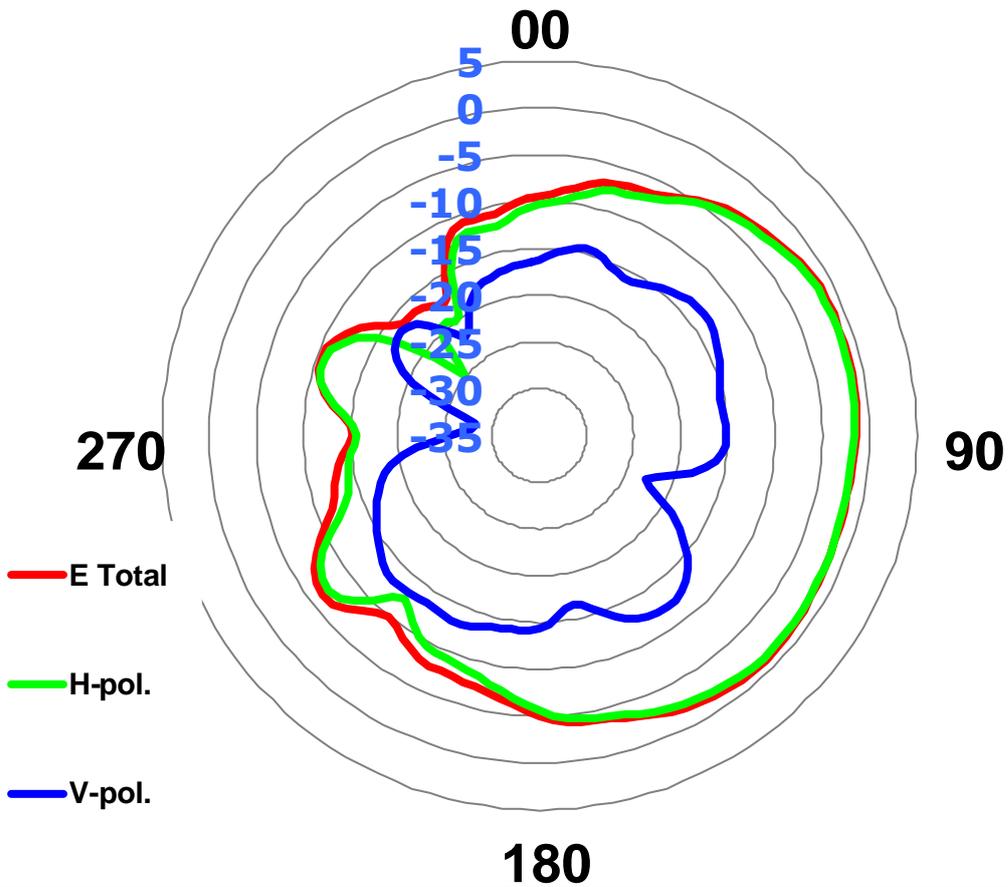
### ANT5 @ 3550~2700 MHz



	H-pol	V pol
<b>Peak Gain</b>	<b>-3.16</b>	<b>-2.06</b>

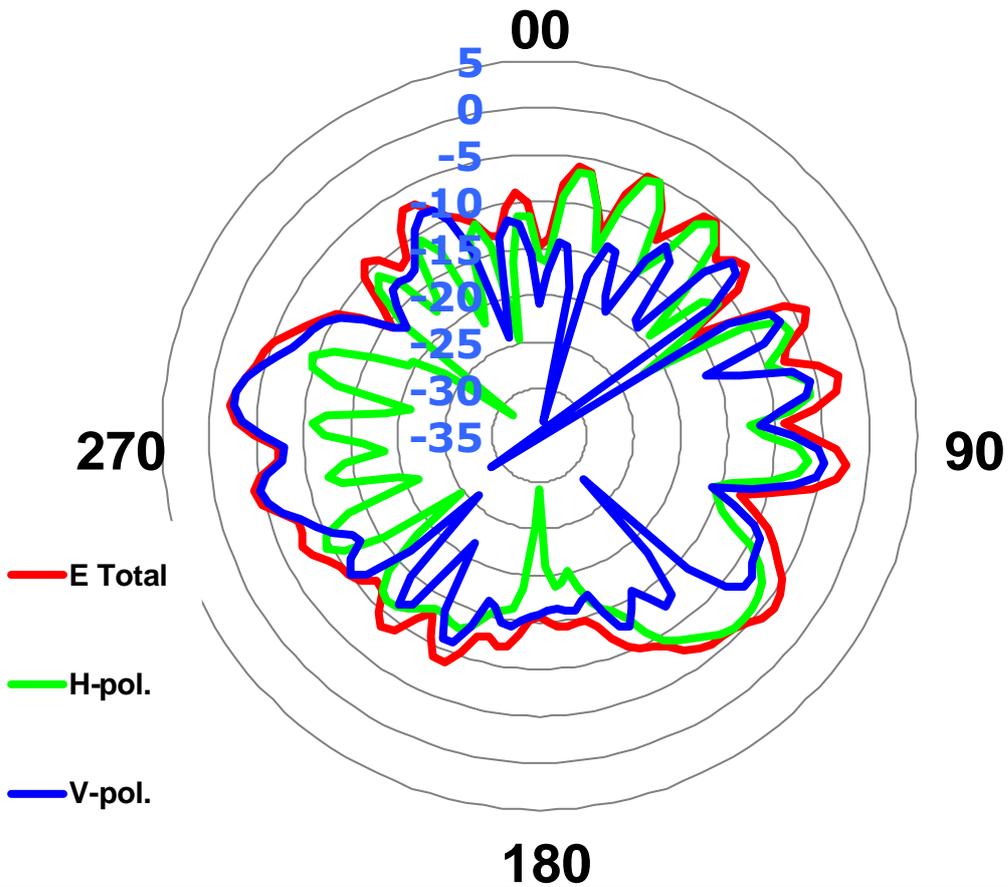
C

**ANT5 @ 1710~1780 MHz**



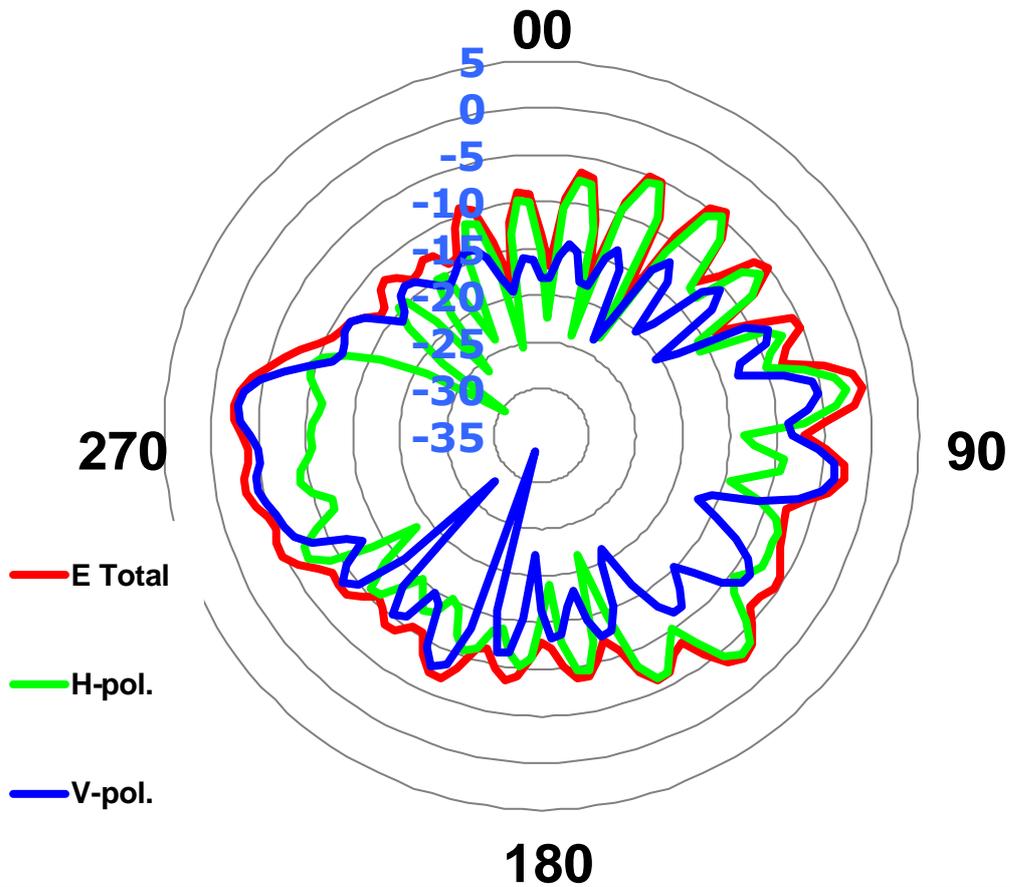
	H-pol	V pol
<b>Peak Gain</b>	<b>-1.33</b>	<b>-12.13</b>

**ANT5 @ 3300~4200 MHz**



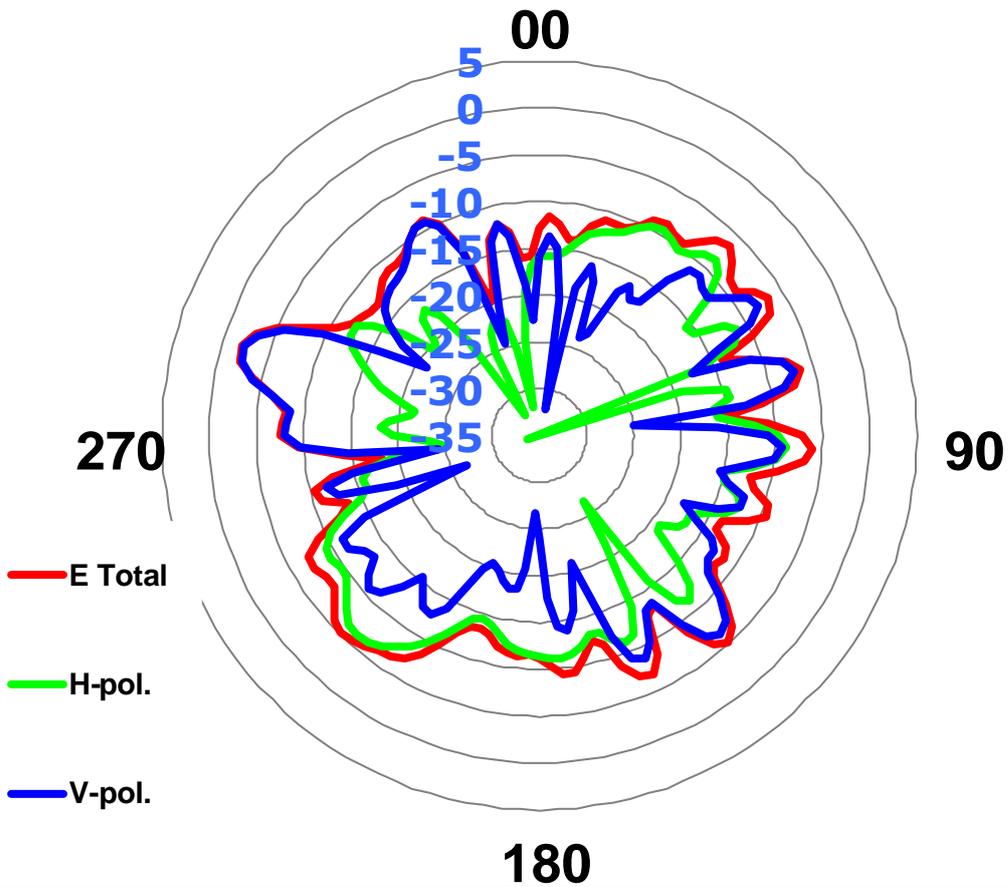
	H-pol	V pol
<b>Peak Gain</b>	<b>-5.21</b>	<b>-2.55</b>

### ANT5 @ 3300~3800 MHz



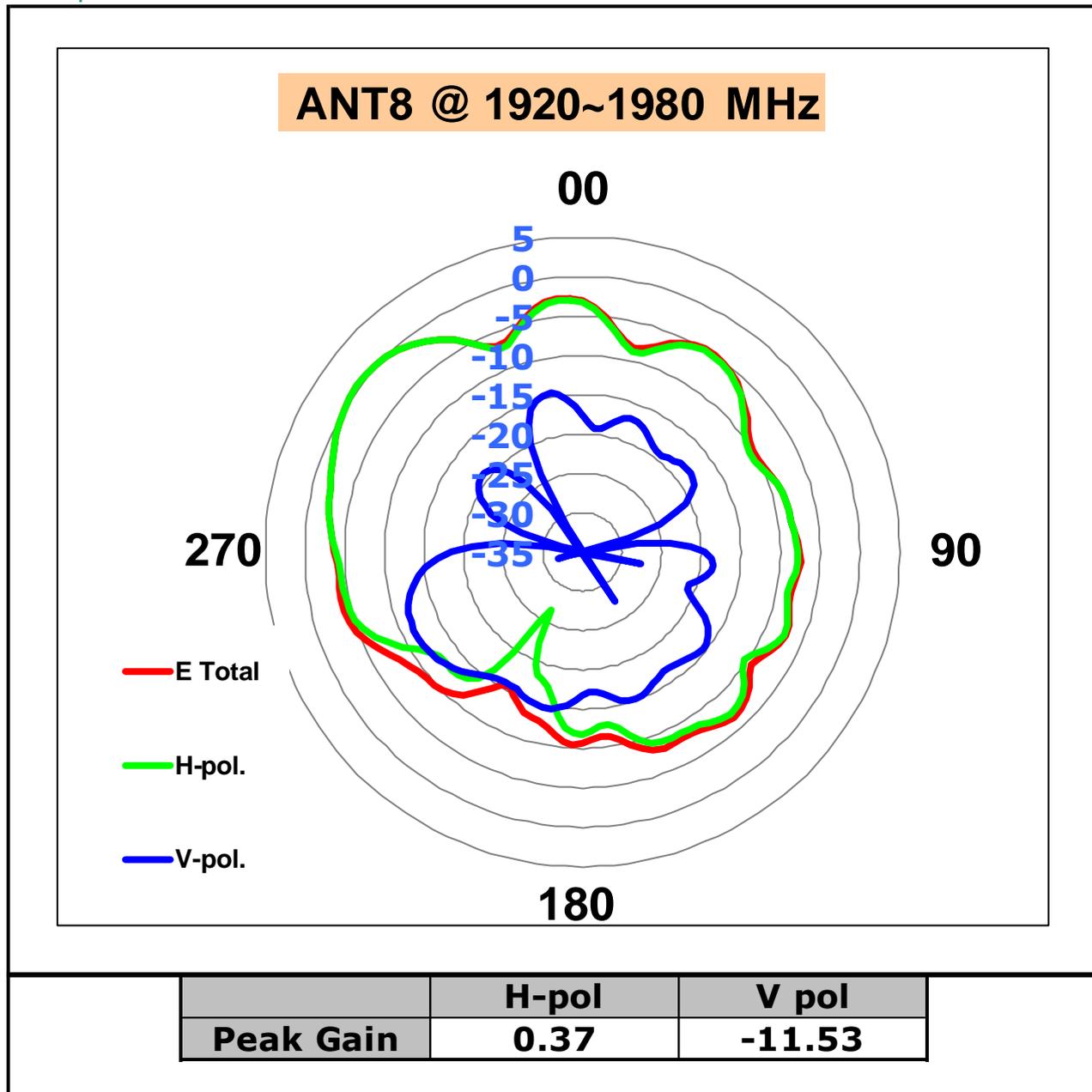
	H-pol	V pol
Peak Gain	-2.34	-2.75

### ANT5 @ 4400~5000 MHz

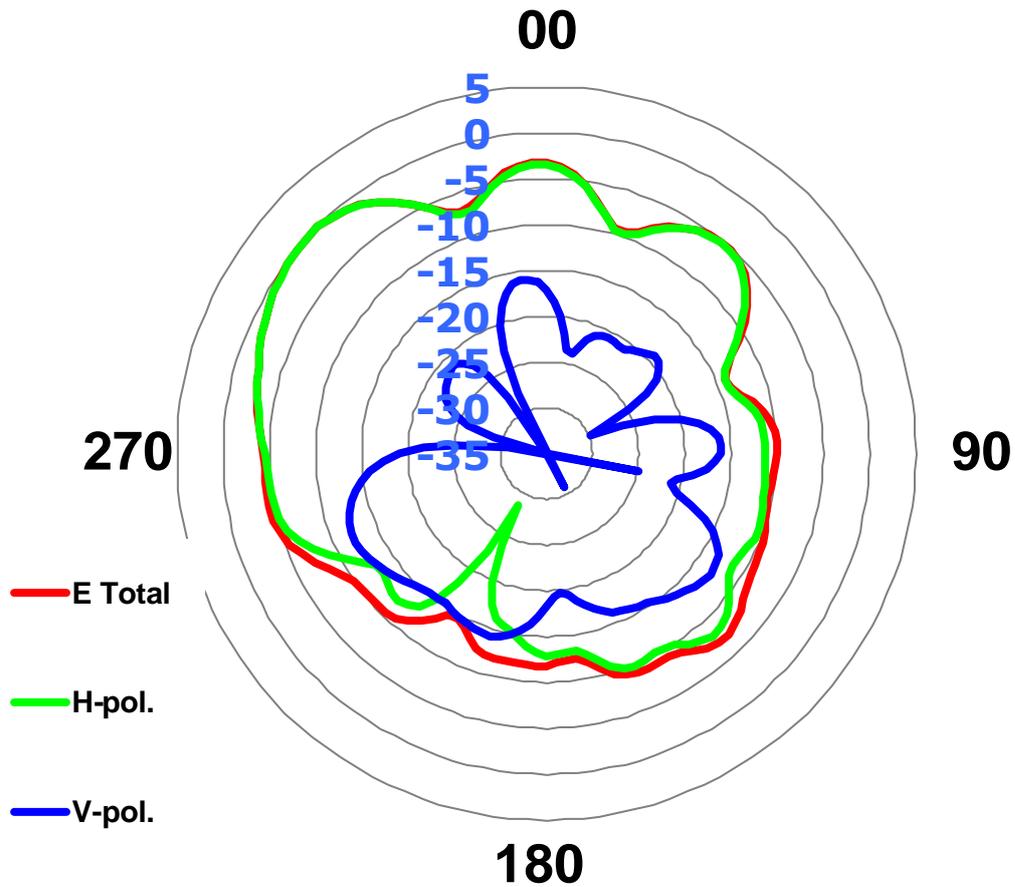


	H-pol	V pol
<b>Peak Gain</b>	<b>-6.25</b>	<b>-2.27</b>

• **Ant8:**  
Example

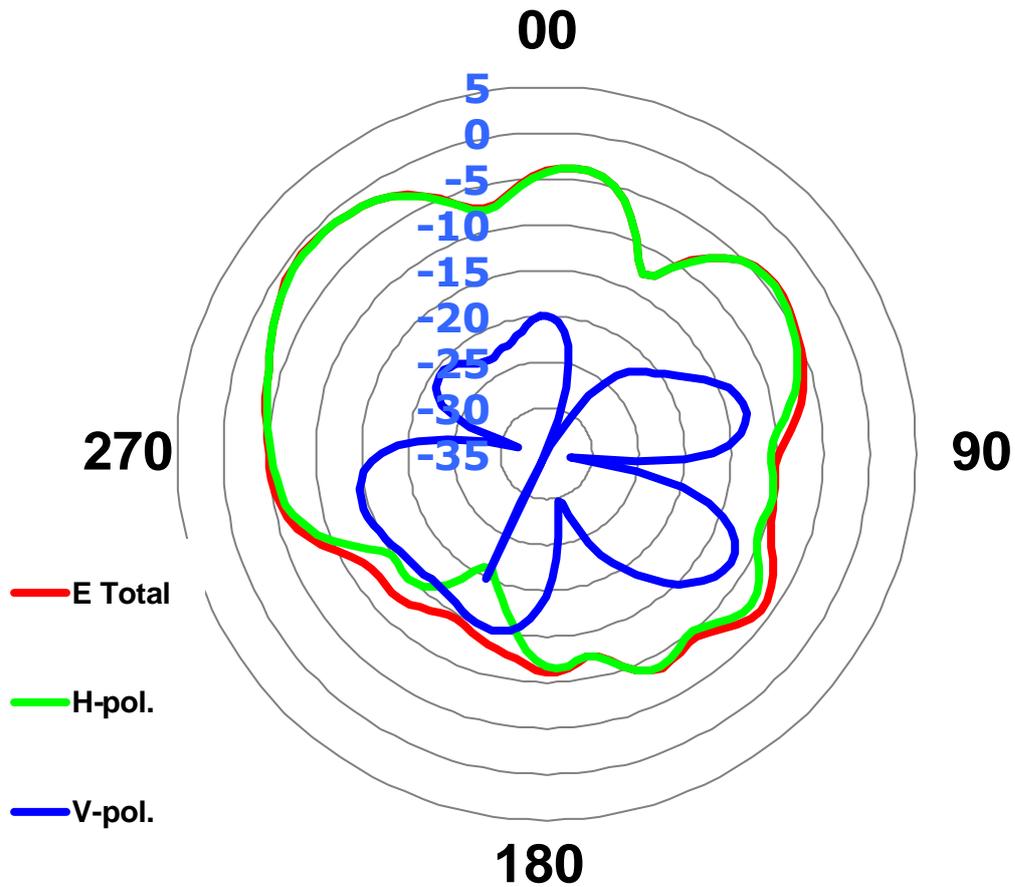


## ANT8 @ 1850~1910 MHz



	H-pol	V pol
<b>Peak Gain</b>	<b>0.00</b>	<b>-12.22</b>

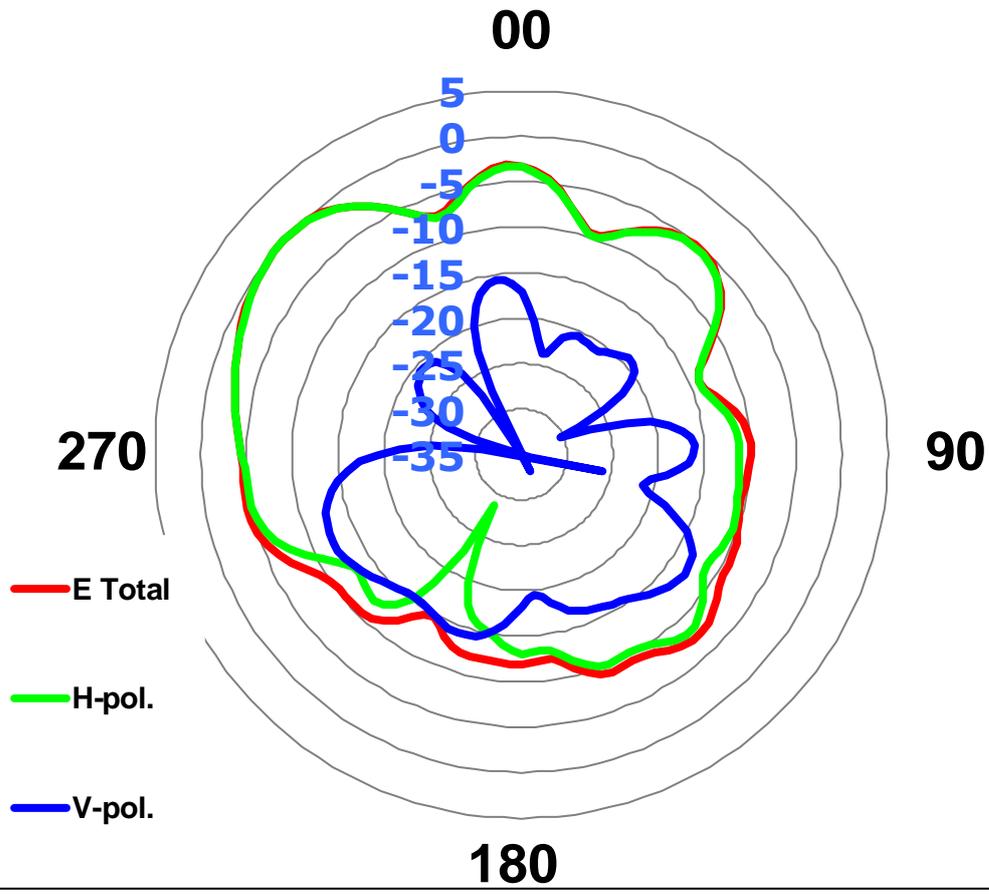
### ANT8 @ 1710~1785 MHz



	H-pol	V pol
Peak Gain	-0.87	-11.76

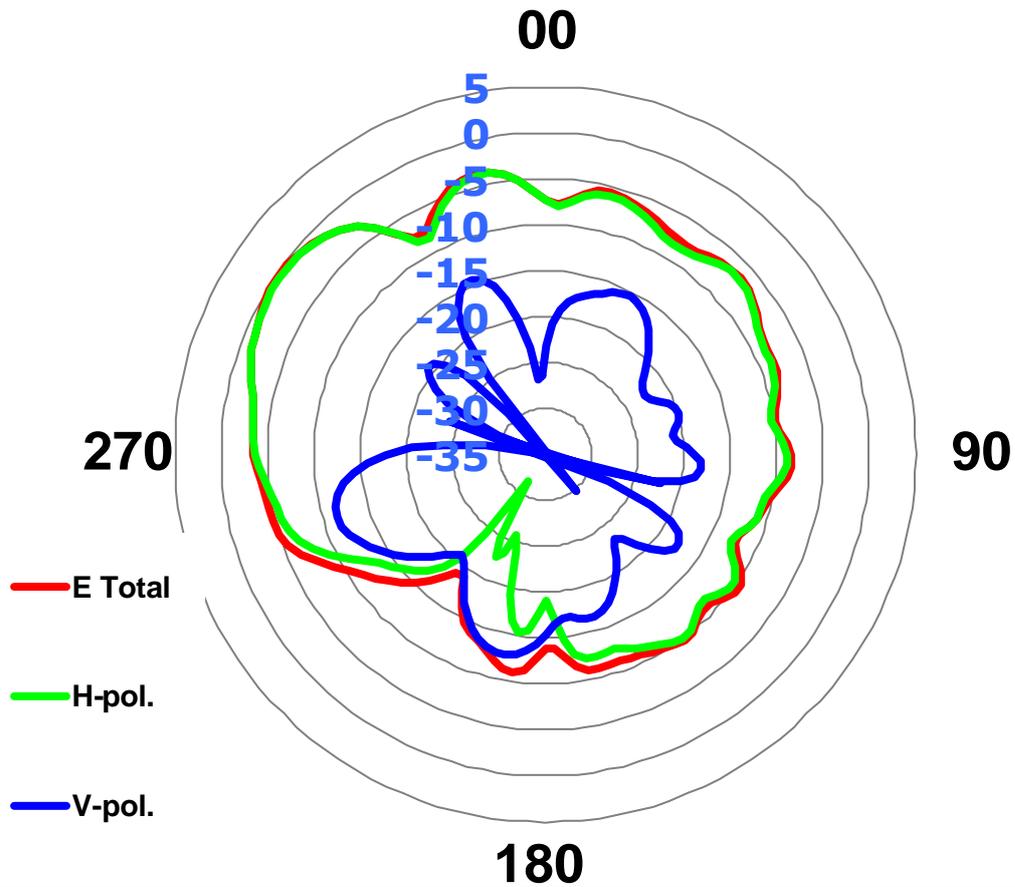


## ANT8 @ 1850~1915 MHz



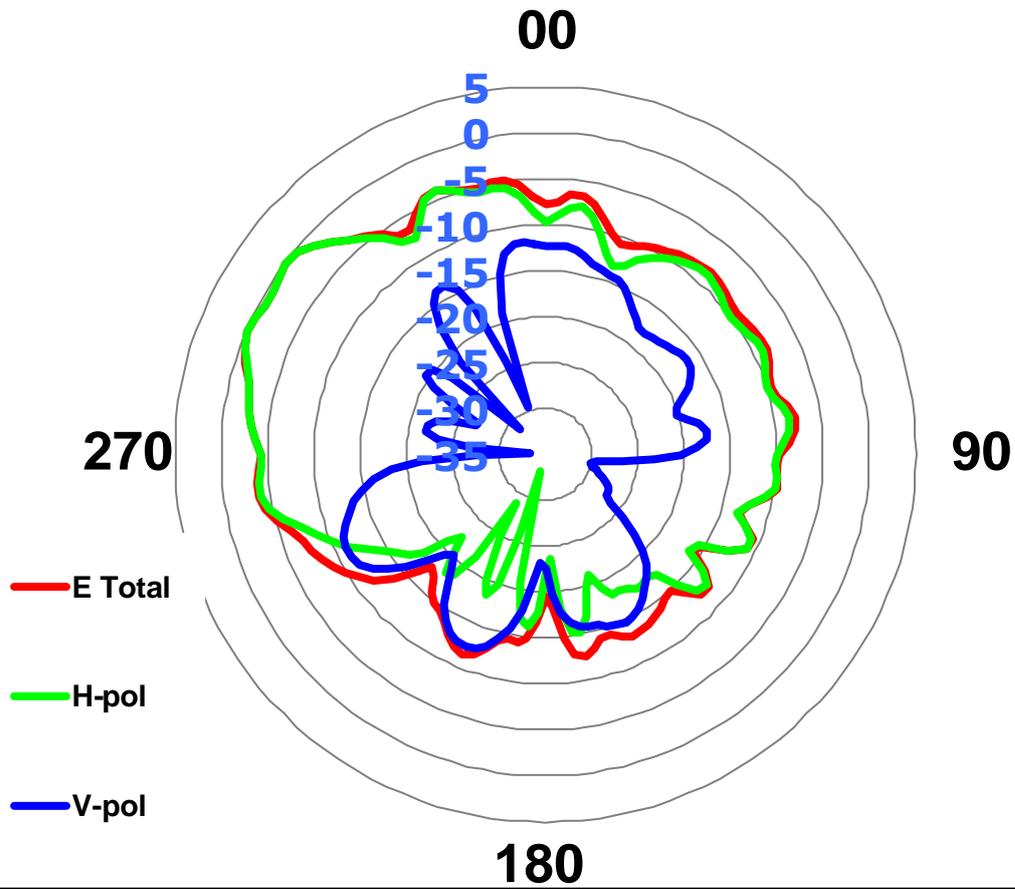
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.02</b>	<b>-12.26</b>

### ANT8 @ 2305~2315 MHz



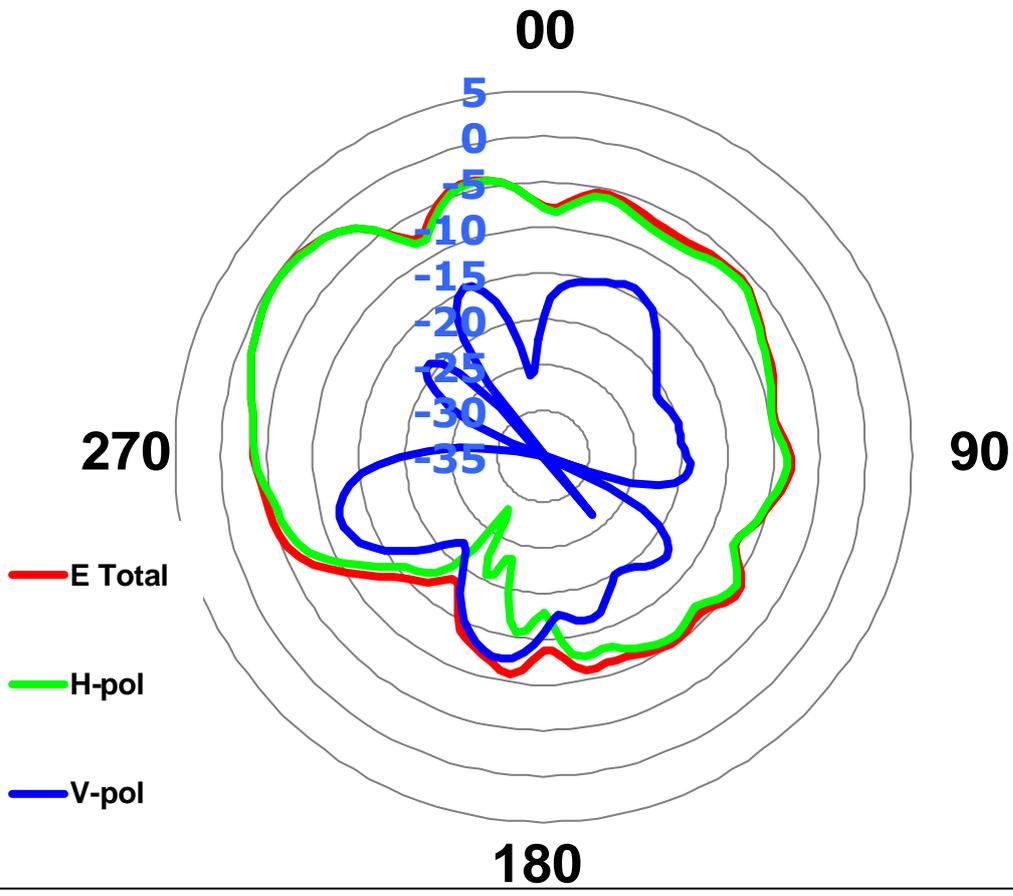
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.34</b>	<b>-11.52</b>

### ANT8 @ 2570~2620 MHz



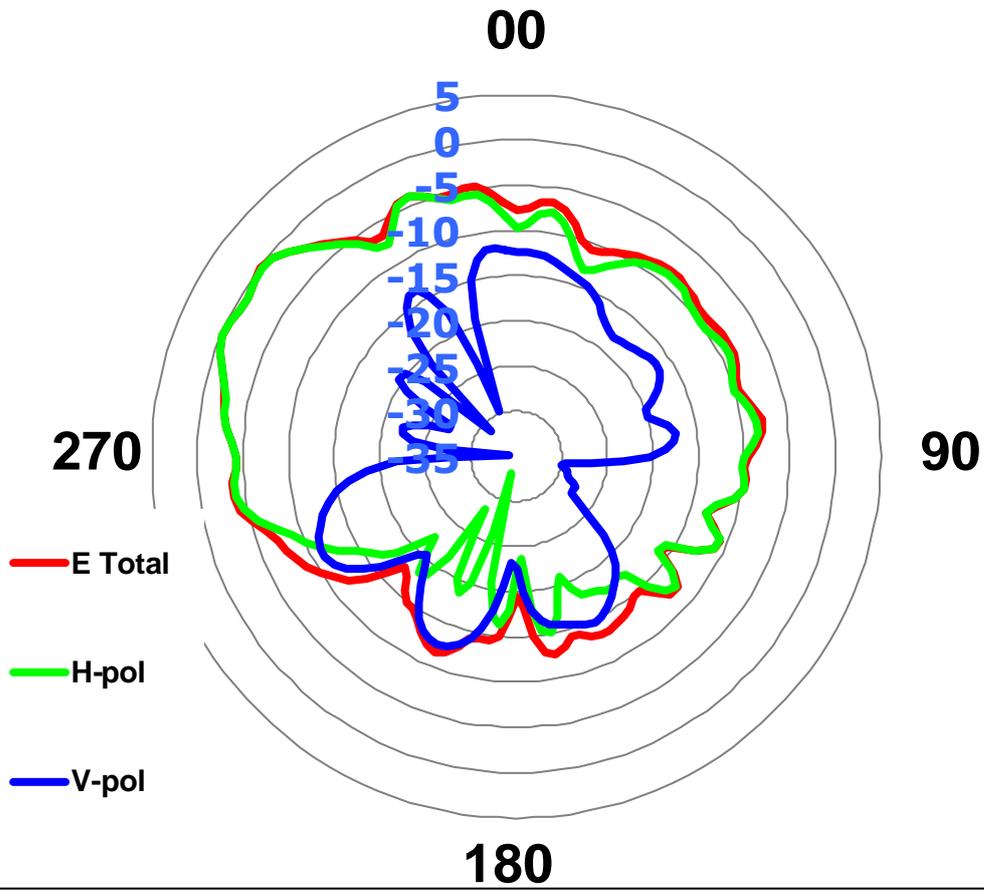
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.14</b>	<b>-11.18</b>

**ANT8 @ 2300~2400 MHz**



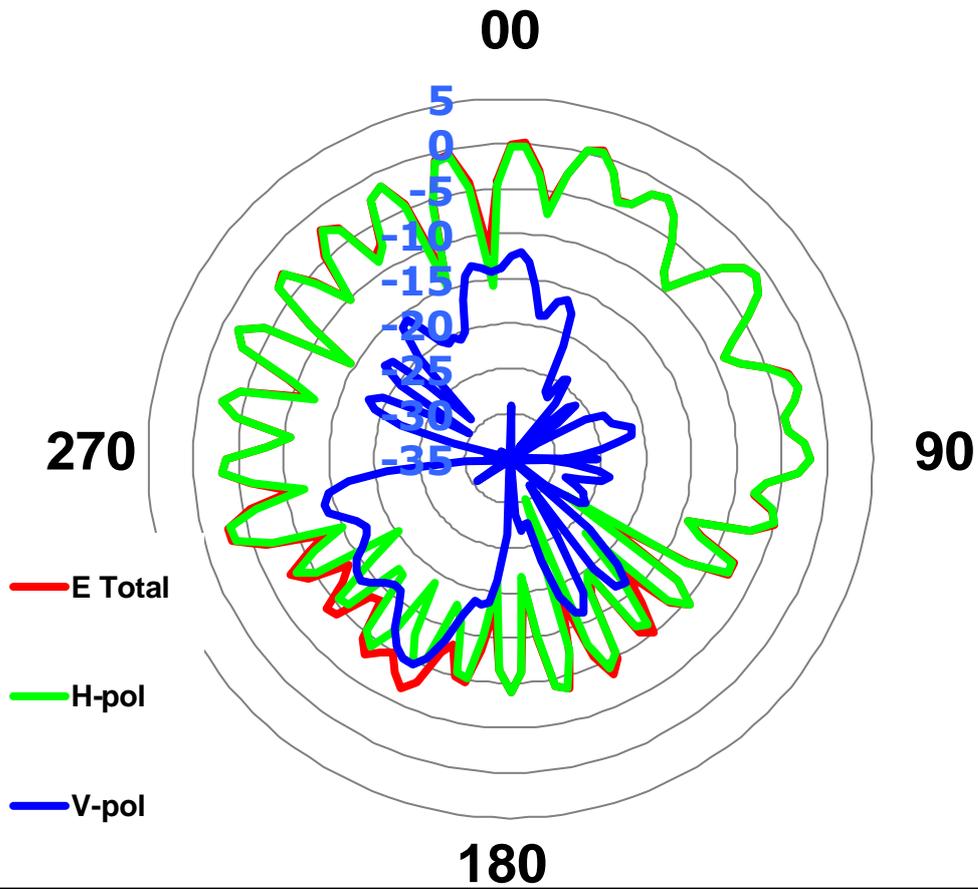
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.31</b>	<b>-11.96</b>

# ANT8 @ 2496~2690 MHz



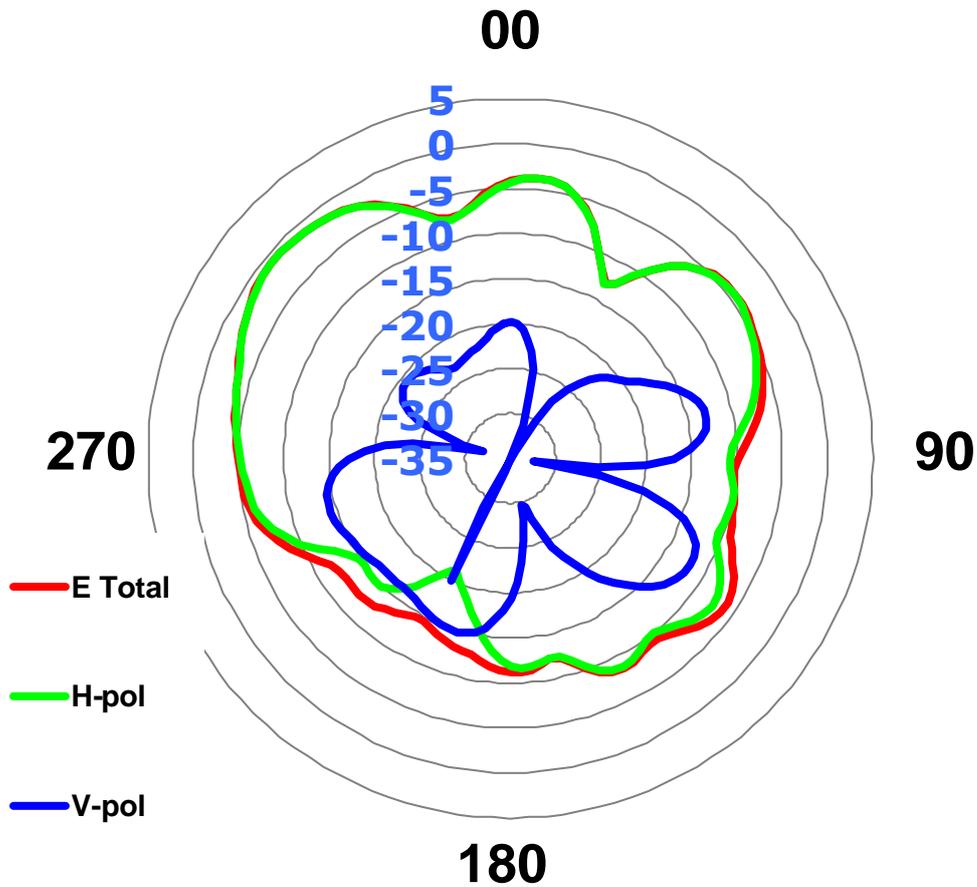
	H-pol	V pol
<b>Peak Gain</b>	<b>-0.15</b>	<b>-11.17</b>

**ANT8 @ 3550~3700 MHz**



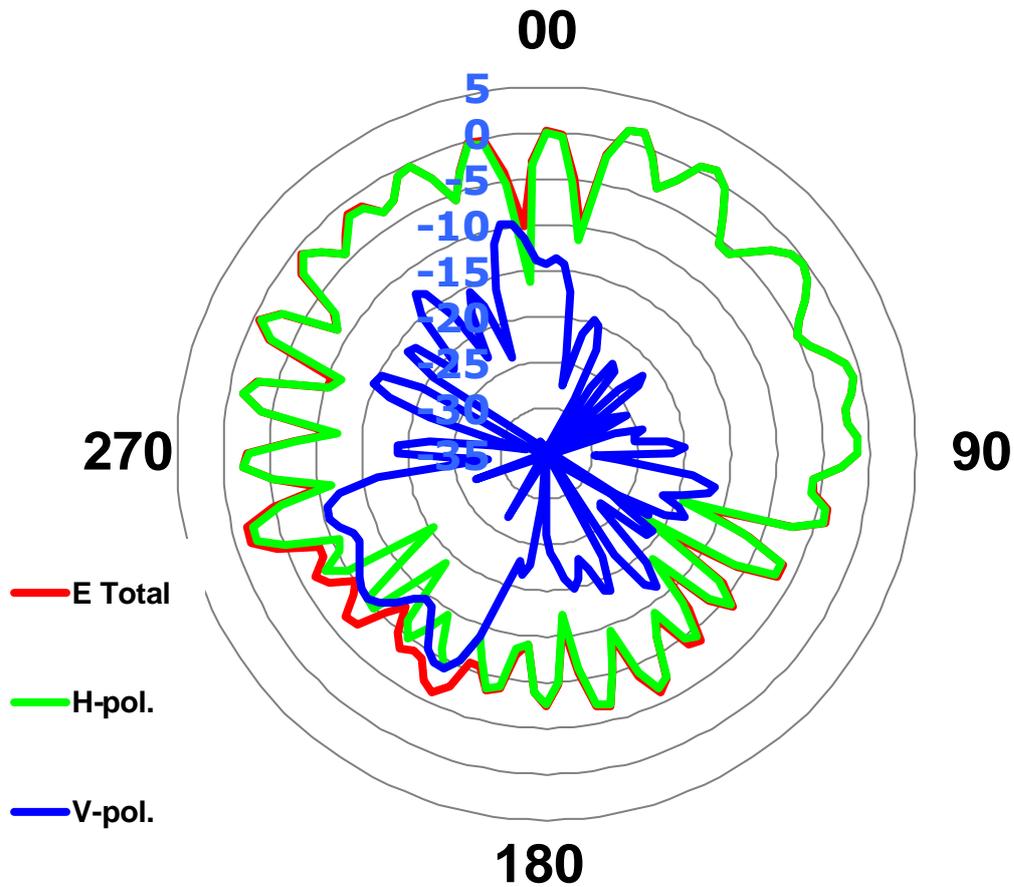
	H-pol	V pol
<b>Peak Gain</b>	<b>0.59</b>	<b>-9.63</b>

### ANT8 @ 1710~1780 MHz



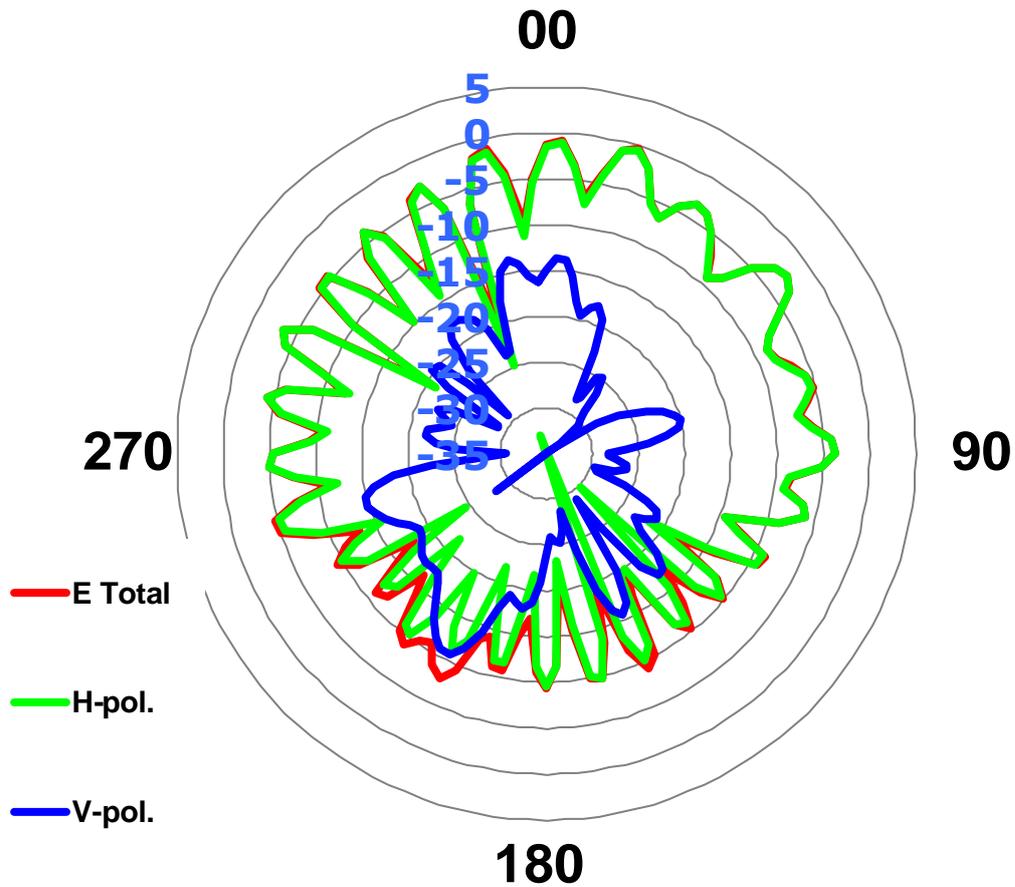
	H-pol	V pol
Peak Gain	-0.87	-11.76

**ANT8 @ 3300~4200 MHz**



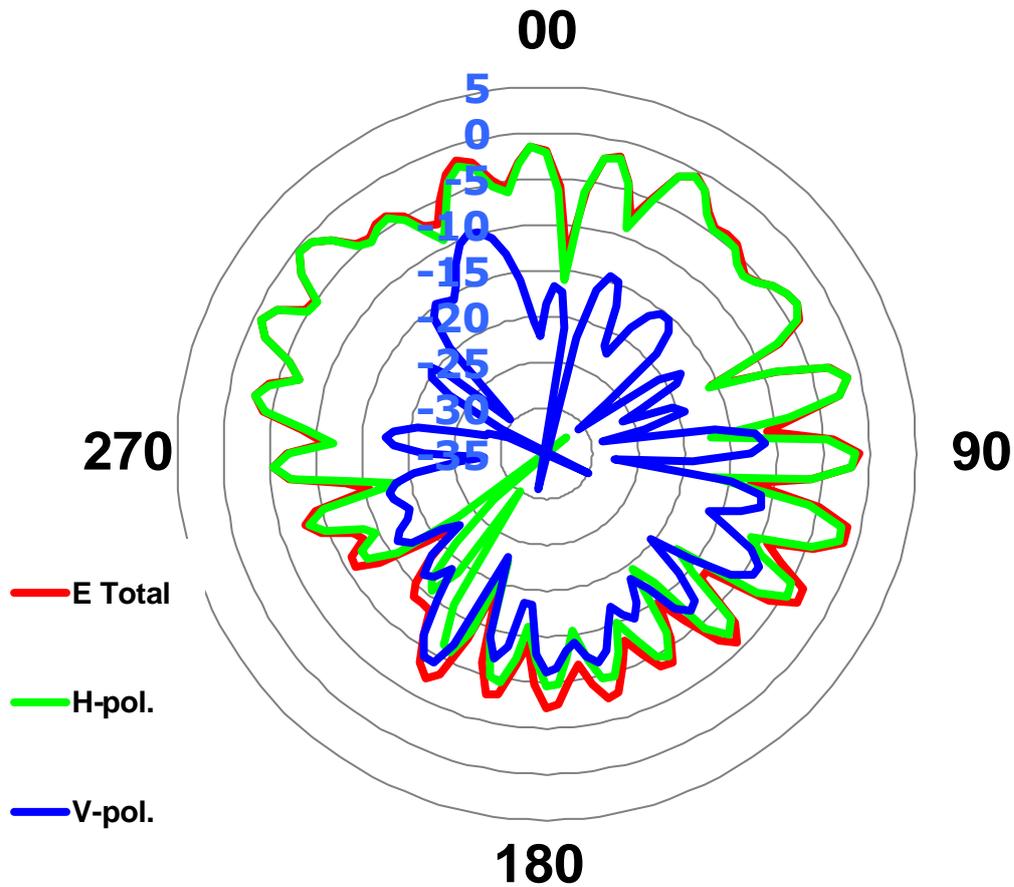
	H-pol	V pol
<b>Peak Gain</b>	<b>1.53</b>	<b>-9.07</b>

## ANT8 @ 3300~3800 MHz



	<b>H-pol</b>	<b>V pol</b>
<b>Peak Gain</b>	<b>-0.40</b>	<b>-10.72</b>

**ANT8 @ 4400~5000 MHz**

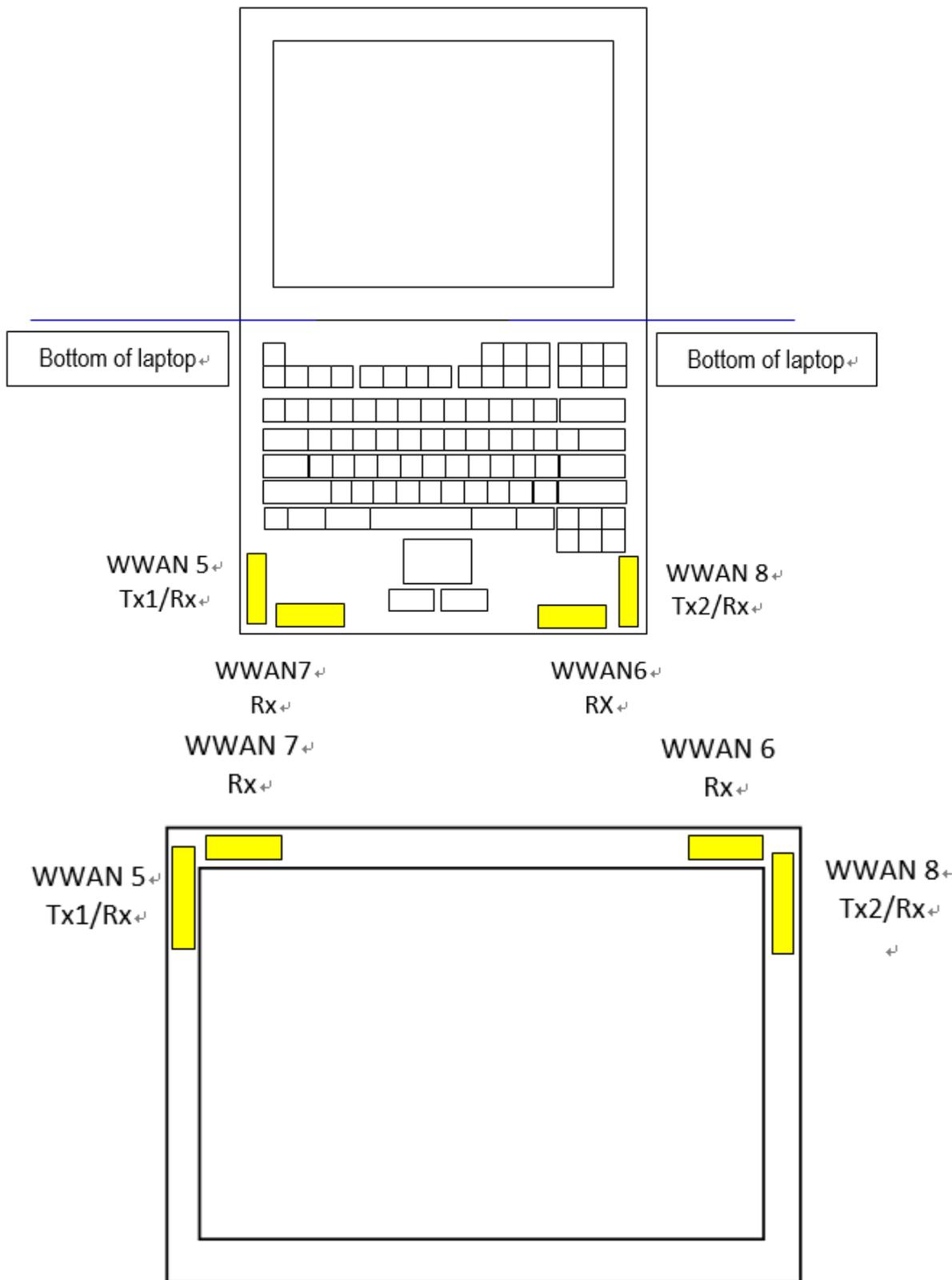


	H-pol	V pol
<b>Peak Gain</b>	<b>-0.43</b>	<b>-8.80</b>

## Section 4. Host Platform Information

OEM / ODM Host platform: Example (Quanta/Rainer 1.0) platform correlated to antenna data

### Rating Label Photo:

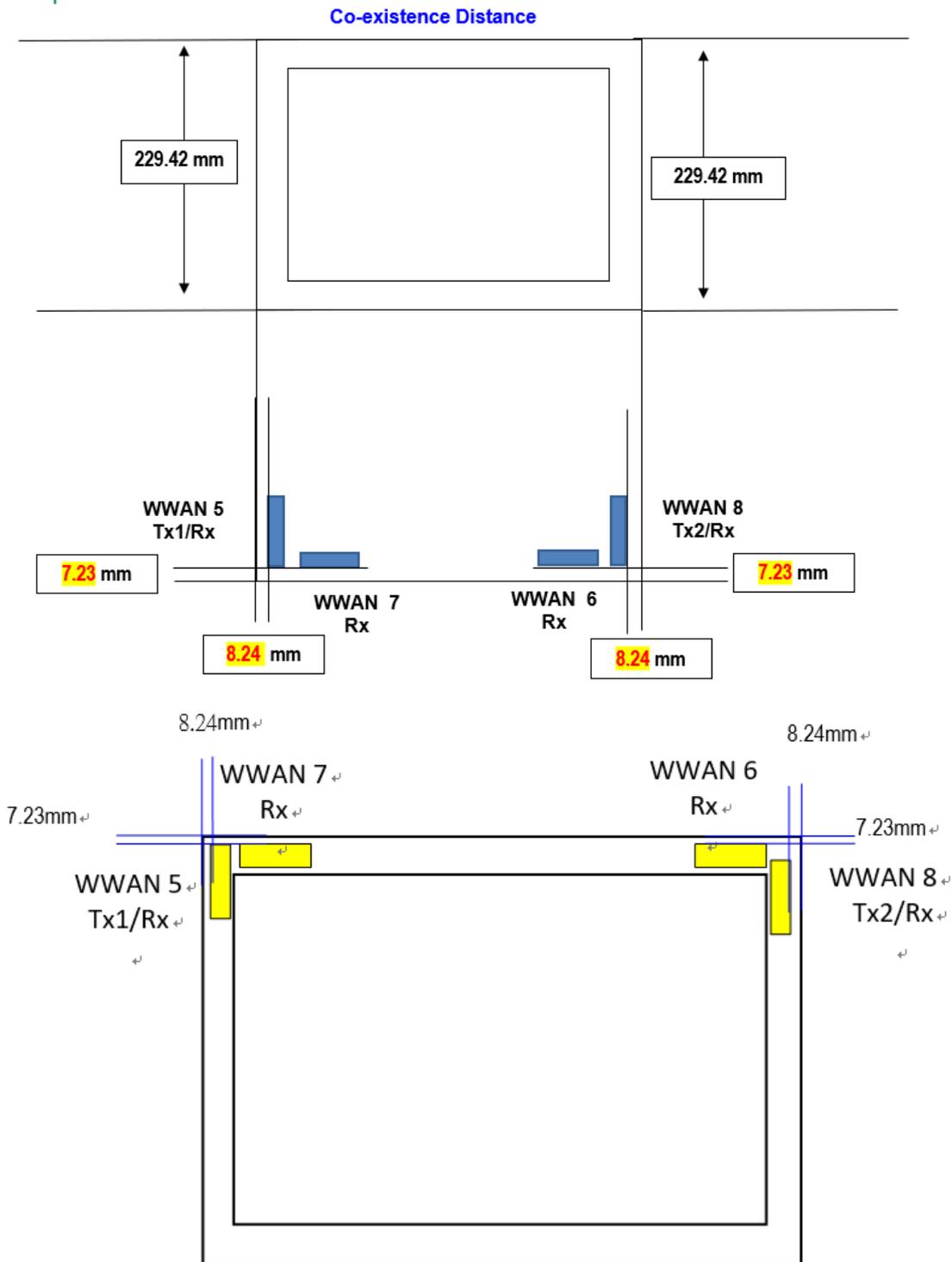




## Section 5. Antenna Host Platform Location Information

Include a **dimensioned photo(s) or dimensioned drawing(s)** of Ant5,Ant6,Ant7,Ant8 placements (measurements are not required for receive-only antenna).

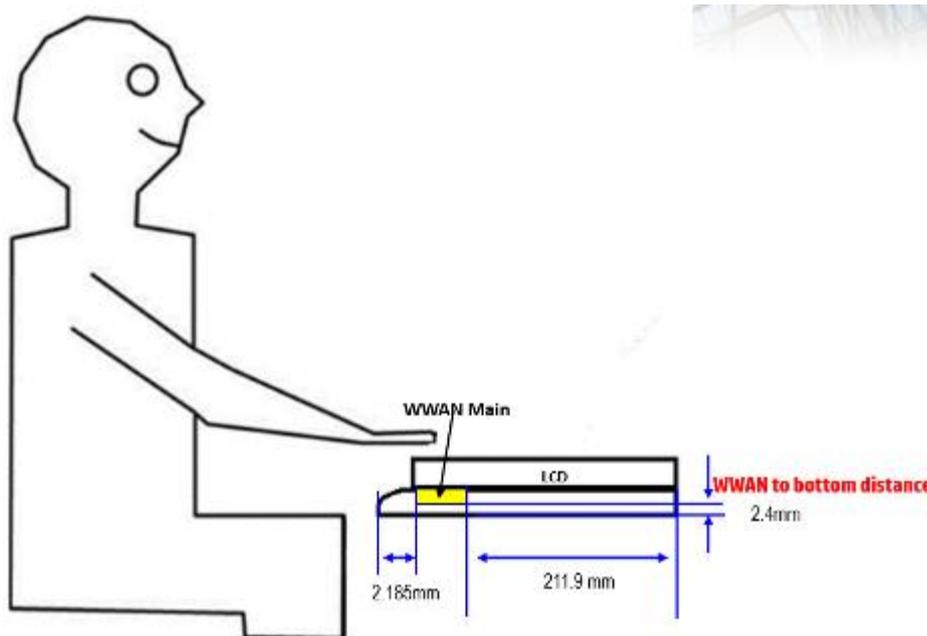
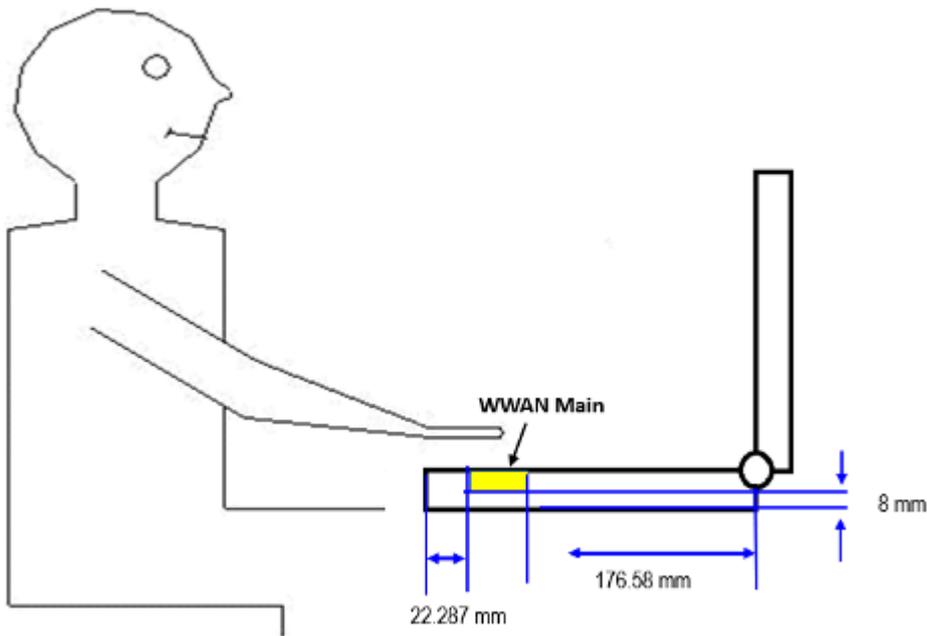
Any antenna that transmits must show dimensions to bottom of laptop. Provide a description of the materials that are used for supporting or surrounding transmit antennas; for example, non-conductive plastics vs. conductive coated plastic or metallic materials.  
Example:



## Section 6. Antenna dimensional information for SAR evaluation

Include a **dimensioned photo(s) or dimensioned drawing(s)** showing the distance (mm) between the transmit antennas and the user (excluding hands, wrist, feet, and ankle). For notebook/laptop hosts show lapheld position (example below). For tablet hosts show all orientations including lapheld, primary & secondary portrait, primary & secondary landscape positions. Include a description of any proximity sensors or power throttling implementations that limit or exclude use of any host orientation.

Example:

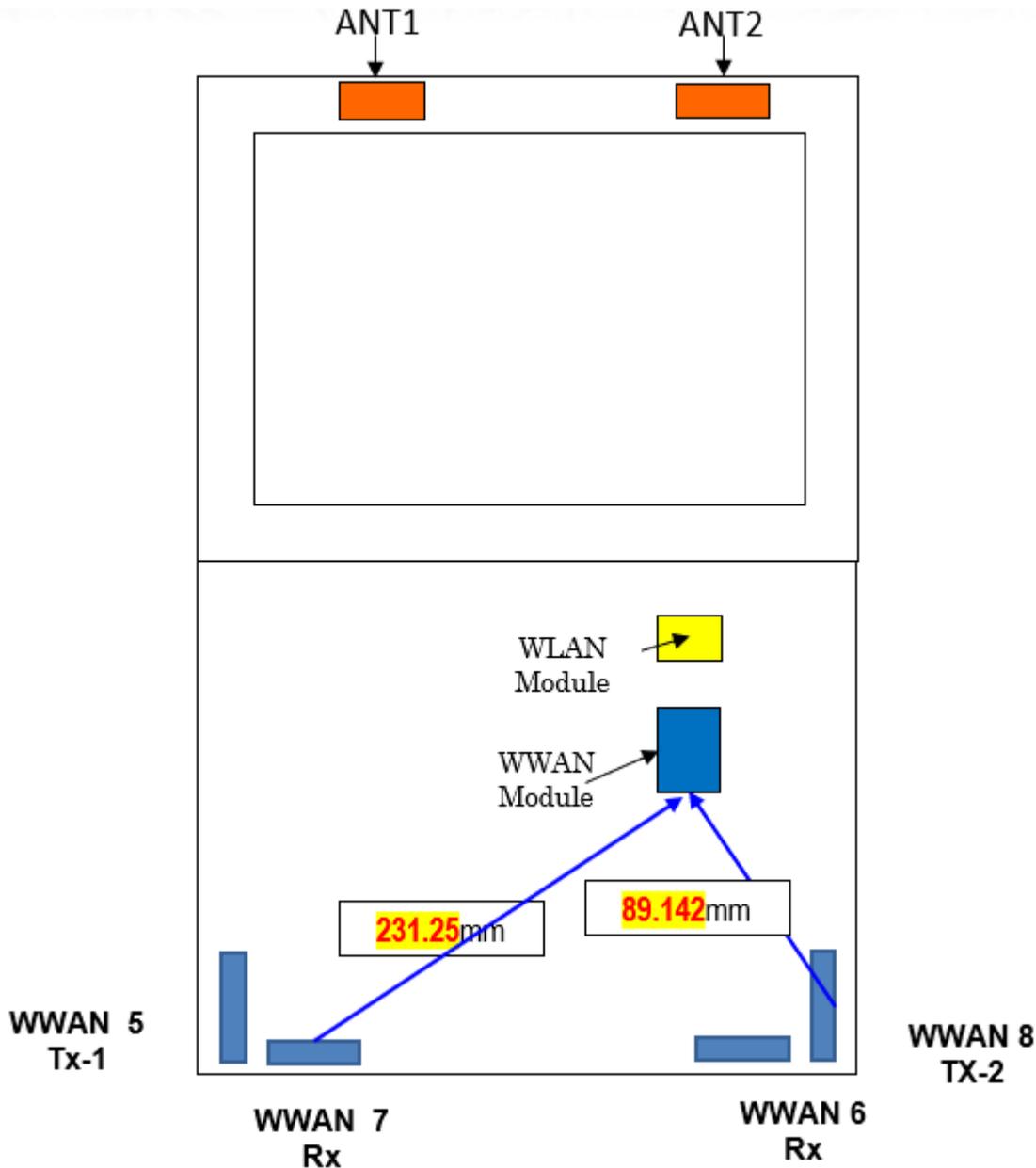


## Section 7. Diagram Example of Co-Location Antenna Separation

Include a **dimensioned photo or dimensioned drawing** showing the distance (mm) between **all WLAN transmit antennas** and other co-located radiator transmit antenna such as Bluetooth, WWAN,..

Example:

(Note: Due to the evolving rules regarding co-location, each platform will need to be reviewed on a case by case basis)



## Section 8. Local representative contact information

Local representative contact information is required for regulatory support for target countries below.

	Local company name	Contact name	Phone number	FAX Number	e-Mail Address	Notes
Argentina						
Azerbaijan						
Cambodia						
Indonesia						
Israel						
Malaysia						
Philippines						

<b>Singapore</b>						Telecommunication Equipment Dealer License Required
<b>South Africa</b>						
<b>USA, Canada</b>						
<b>Vietnam</b>						