

APPROVAL SHEET

Customer Name	Quanta Computer Inc.		
Date	2023/03/21		
ODM P/N	DQ6415G0100	OEM P/N	81EAB415.G01
Description	LI7 CS, LTE MAIN, P-SENSOR, CS, LTE SKU, ANTENNA, EAB4-Q1		
Version	3	Doc. Version	3

Provided By Wistron NeWeb Corp.	Reviewed By Wistron NeWeb Corp.	Approved By Customer Company
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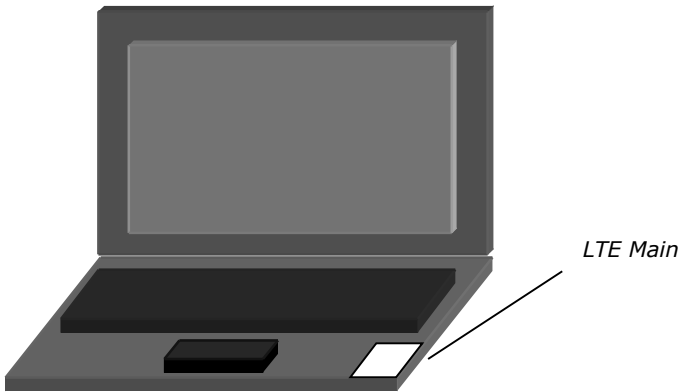
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1. Introduction

Antenna for LI7 System
LTE Antenna



MAIN Antenna						
Location	Right LTE Main					
Antenna Information		Cable Information				
Function	Type	Category	Connector	Diameter	Length	Color
LTE Main	PIFA	Low Loss	NGFF	1.13 mm	279 mm	White
Antenna Photo	A photograph of the physical antenna component. It is a small, rectangular, black printed circuit board (PCB) with various electronic components and a white cable attached. The antenna is placed on a blue surface next to a black ruler with white markings. The ruler shows measurements in millimeters (0 to 100) and centimeters (0 to 10). The antenna's length is approximately 100 mm.					

2. Revision History :

Date	Version	Change Description
2023/03/14	1	New release
2023/03/17	2	Add Band 7 、 30 、 38 & 41 data
2023/03/21	3	Add Band 14 & 71 data

3. Product Specification

3.1 Antenna Design Specification

3.1.1 VSWR

Frequency	698~960MHz	1710~2170MHz	2200~2690MHz
VSWR	<4.5	<3.5	<3.5

3.1.2 Average Gain and Peak Gain

	Band	Operator	TX/RX	(MHz)	Average Gain	Peak Gain
NA	LTE12	AT&T/TMO	TX	699	-4.5	<3
				708	-4.5	
				716	-4.5	
			RX	729	-4.5	
				738	-4.5	
				746	-4.5	
	LTE 700MHz US (band 17)	AT&T/Verizon/TMO	TX	704	-4.5	
				710	-4.5	
				716	-4.5	
			RX	734	-4.5	
				740	-4.5	
				746	-4.5	
	LTE28	Telstra	TX	703	-4	
				725	-4	
				748	-4	

			RX	758	-5.5	
				780	-5.5	
				803	-5.5	
	LTE 700MHz US (band 13)/ LTE 13	Verizon	TX	777	-4.5	
				782	-4.5	
				787	-4.5	
			RX	746	-4.5	
				751	-4.5	
				756	-4.5	
	LTE 26	Sprint	TX	814	-3.5	
				831	-3.5	
				849	-3.5	
			RX	859	-5.5	
				876	-5.5	
				894	-5.5	
	LTE 29	AT&T	TX			
			RX	717	-5.5	
				722	-5.5	
				728	-5.5	
	800/ LTE 5/UMTS5	AT&T/Verizon	TX	824	-2.8	
				836	-2.8	
				849	-2.8	
			RX	869	-4.5	
				880	-4.5	
				894	-4.5	
	AW S / LT F.4	AT &T/ Veri	TX	1710	-2.8	

			RX	1732	-2.8
				1755	-2.8
				2110	-3.5
				2132	-3.5
				2155	-3.5
	GPS		RX	1573	
				1577	
	GNSS		RX	1596	
				1607	
	1900 /LTE 2/UMTS2	AT&T/Verizon/TMO	TX	1850	-2.8
				1880	-2.8
				1910	-2.8
			RX	1930	-4
				1960	-4
				1990	-4
	LTE30	AT&T	TX	2305	-2.8
				2310	-2.8
				2315	-2.8
			RX	2350	-4
				2355	-4
				2360	-4
	LTE41	Sprint	TX/RX	2496	-2.8
				2593	-2.8
				2690	-2.8
	LTE7	Canada	TX	2500	-3.5
				2535	-3.5
				2570	-3.5
			RX	2620	-4

EU				2655	-4
				2690	-4
	900/UMTS8	Vodafone	TX	880	-4
				900	-4
				915	-4
			RX	925	-5
				940	-5
				960	-5
	1800/ EU(LTE3)	Vodafone	TX	1710	-3.5
				1750	-3.5
				1785	-3.5
			RX	1805	-4
				1840	-4
				1880	-4
	LTE Band 13	Verizon	TX	777	-4.5
				782	-4.5
				787	-4.5
			RX	746	-4.5
				751	-4.5
				756	-4.5
	LTE 800 MHz EU (band 20)	Vodafone	TX	832	-3.5
				847	-3.5
				862	-3.5
			RX	791	-4.5
				806	-4.5
				821	-4.5
	UMTS1	Vodafone	TX	1920	-3.5
				1950	-3.5

			RX	1980	-3.5
				2110	-4.5
				2140	-4.5
				2170	-4.5
	LTE 2.5 G EU EU (band 7)	Vodafone	TX	2500	-3.5
				2535	-3.5
				2570	-3.5
			RX	2620	-4
				2655	-4
				2690	-4
	CN	Band 41	TX/RX	2496	-2.8
				2596	-2.8
				2696	-2.8
JP	UMTS19/LTE19	Docomo	TX	830	-3.5
				832	-3.5
				845	-3.5
			RX	875	-5.5
				880	-5.5
				890	-5.5
	LTEB18/WCDMA B18		TX	815	-4.5
				830	-4.5
			RX	860	-5.5
				875	-5.5
	900/UMTS8	Docomo	TX	880	-4
				900	-4
				915	-4
			RX	925	-5
				940	-5

	LTE1	Docomo	TX	960	-5
				1920	-3.5
				1950	-3.5
				1980	-3.5
			RX	2110	-4.5
				2140	-4.5
				2170	-4.5
	1800/ EU(LTE3)	Vodafone	TX	1710	-3.5
				1750	-3.5
				1785	-3.5
			RX	1805	-4
				1840	-4
				1880	-4
LAA	AWS / LTE US (band 4)	AT&T/Verizon	TX	1710	-2.8
				1732	-2.8
				1755	-2.8
			RX	2110	-3.5
				2132	-3.5
				2155	-3.5
	LTE 66		TX	1710	-2.8
				1745	-2.8
				1780	-2.8
			RX	2110	-4
				2155	-4
				2200	-4
	1900 /LTE2	AT&T/Verizon	TX	1850	-2.8
				1880	-2.8
				1910	-2.8

			RX	1930	-4	
				1960	-4	
				1990	-4	
	LTE1/UMTS1	Vodafone	TX	1920	-3.5	
				1950	-3.5	
				1980	-3.5	
			RX	2110	-4.5	
				2140	-4.5	
				2170	-4.5	
	LTE7	Canada	TX	2500	-3.5	
				2535	-3.5	
				2570	-3.5	
			RX	2620	-4	
				2655	-4	
				2690	-4	
	Band 41		TX/RX	2496	-2.8	
				2593	-2.8	
				2690	-2.8	
	LTEB48 /49		TX/RX	3550	-4	
				3625	-4	
				3700	-4	

* The above specification is for design stage. Considering the assay tolerance of antenna and notebook in mass production, the deviation ± 0.5 dBi should be considered in the same time for production stage.



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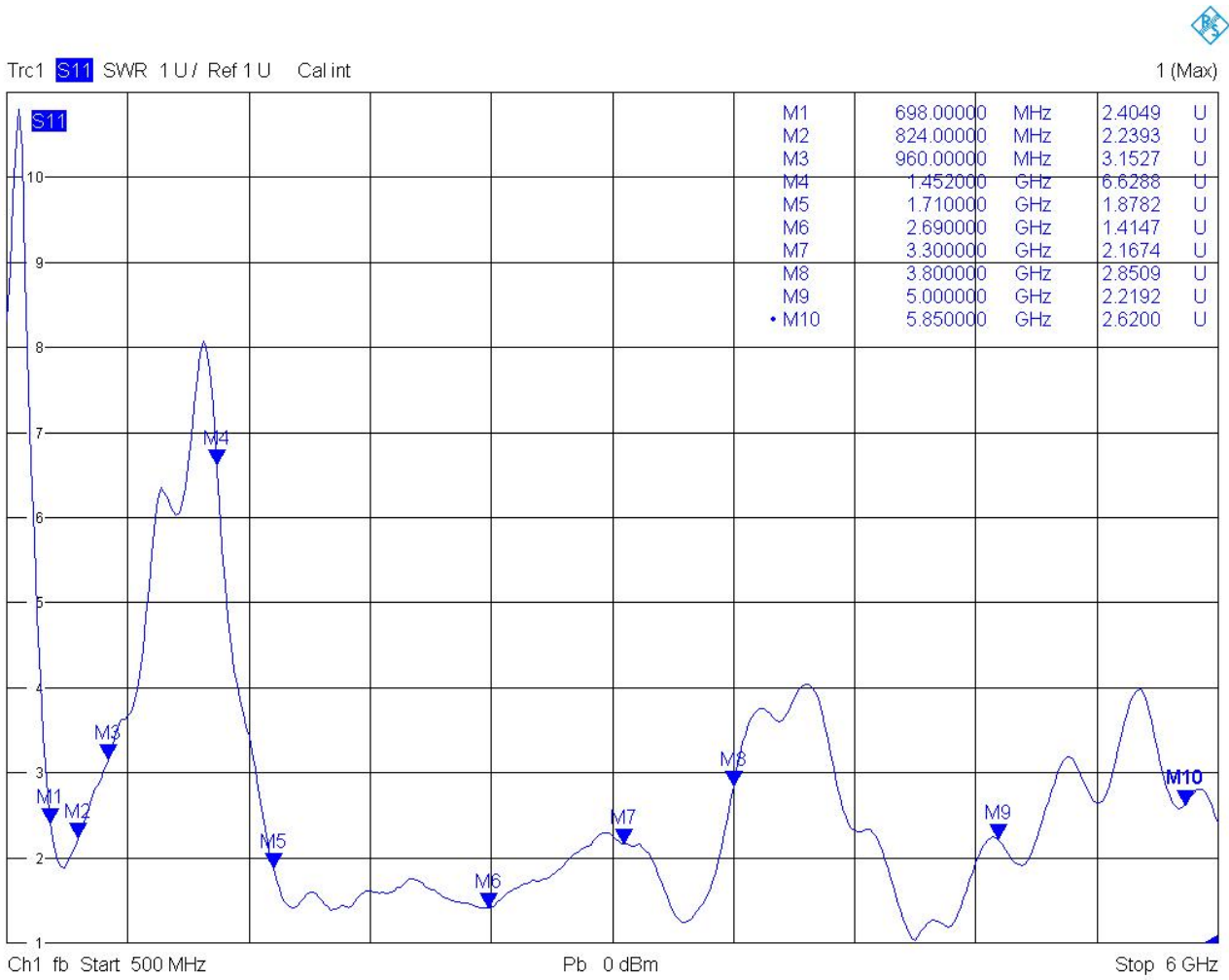
3.2 Mechanical Specification

See the attached drawing.

WNC drawing

4. Antenna Performance

4.1 VSWR



4.2 Peak Gain and Average Gain

4.2.1 Peak Gain

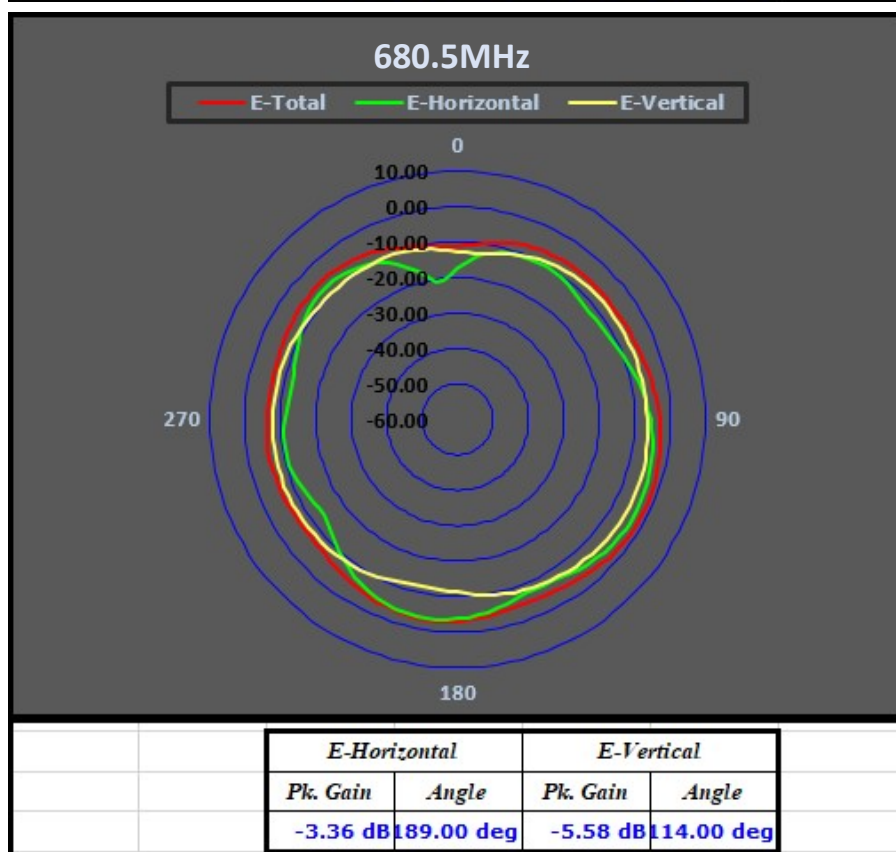
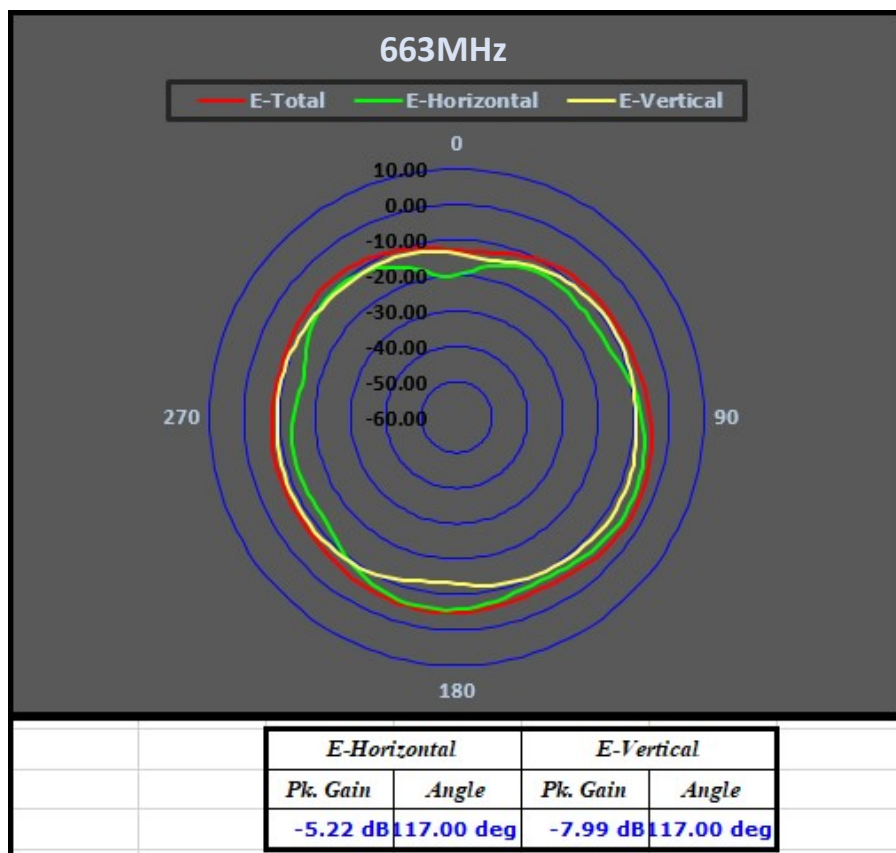
Main		
Frequency (MHz)	H	V
699	-1.12	-4.78
707	-0.34	-4.41
716	-0.41	-3.20
777	-0.30	-3.74
782	-0.57	-4.07
787	-0.51	-4.41
824	-0.95	-4.98
836	-1.14	-5.24
849	-1.60	-5.26
1710	0.54	-11.43
1730	0.43	-11.17
1745	0.88	-9.92
1755	0.59	-9.69
1780	-0.69	-10.01
1850	0.16	-7.52
1880	0.55	-7.37
1910	0.25	-6.11
2305	0.74	-7.03
2310	0.64	-7.26
2315	0.74	-7.38
2350	0.32	-8.01
2355	0.50	-8.02
2360	0.86	-8.03
2496	1.17	-8.32
2500	1.04	-8.13
2535	1.21	-6.62
2570	2.95	-4.91
2593	2.16	-4.37
2595	2.92	-4.54
2620	2.99	-3.87
2655	2.32	-3.99
2690	2.69	-4.30
3550	0.99	-7.47
3625	1.27	-7.13
3700	1.51	-7.08

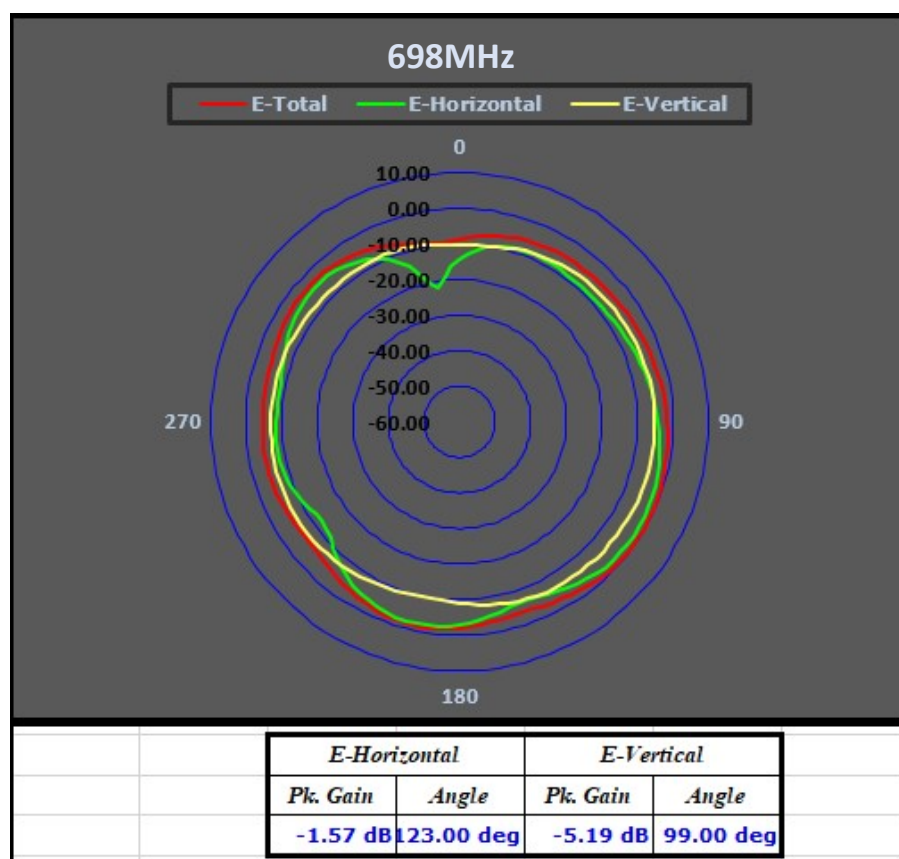
Frequency (MHz)	H	V
663	-5.22	-7.99
680.5	-3.36	-5.58
698	-1.57	-5.19
788	-0.22	-4.15
793	-0.40	-4.58
798	-0.22	-5.13

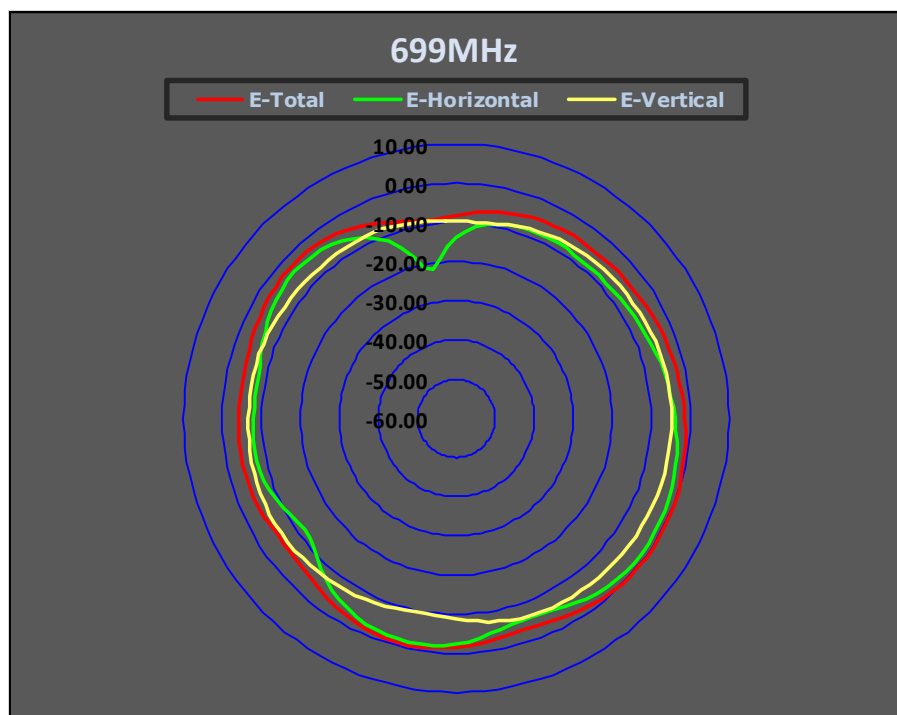
4.2.2 Average Gain

LTE Band 26 Sprint	TX	814	-2.67
		831	-3.03
		849	-3.46
		859	-3.45
		876	-3.60
	RX	894	-4.09
		824	-3.02
		836	-3.20
		849	-3.46
		869	-3.68
LTE Band 5 AT & T / VzW / EU	TX	880	-3.81
		894	-4.09
		815	-2.70
		830	-2.99
		860	-3.45
	RX	875	-3.54
		830	-2.99
		837.5	-3.20
		845	-3.46
		875	-3.54
LTE Band 18/W AB19	TX	882.5	-3.80
		890	-4.25
		880	-3.81
		900	-3.90
		915	-3.94
	RX	925	-3.78
		940	-3.87
		960	-3.86
		699	-3.15
		707	-2.61
LTE Band 12 AT & T	TX	717	-2.31
		729	-2.04
		737	-1.89
		746	-2.47
		832	-3.08
	RX	847	-3.48
		862	-3.51
		791	-2.67
		806	-2.74
		821	-2.95
LTE Band 20 EU	TX	832	-3.08
		847	-3.48
		862	-3.51
		791	-2.67
		806	-2.74
	RX	821	-2.95
		832	-3.08
		847	-3.48
		862	-3.51
		791	-2.67
LTE Band 13 Verizon	TX	777	-2.78
		782	-2.73
		787	-2.66
		746	-2.47
		751	-2.50
	RX	756	-2.57
		788	-2.34
		793	-2.36
		798	-2.13
		758	-2.36
LTE Band 14 AT & T	TX	763	-2.41
		768	-2.30
		703	-2.87
		725.5	-2.00
		748	-2.06
	RX	758	-2.36
		780.5	-2.34
		803	-2.63
		#N/A	
		#N/A	
LTE Band 28 Telstra	TX	717	-2.31
		722.5	-2.15
		728	-2.03
		1452	-12.18
		1463	-11.60
	RX	1474	-10.62
		1920	-2.80
		1950	-2.57
		1980	-2.92
		2110	-2.97
LTE Band 29 AT & T	TX	2140	-2.80
		2170	-2.44
		1850	-3.16
		1883	-2.71
		1915	-2.82
	RX	1930	-2.79
		1963	-2.85
		1995	-3.14
		#N/A	
		#N/A	
LTE Band 32	TX	1452	-12.18
		1463	-11.60
		1474	-10.62
		1920	-2.80
		1950	-2.57
	RX	1980	-2.92
		2110	-2.97
		2140	-2.80
		2170	-2.44
		1850	-3.16
LTE Band 1 EU	TX	1883	-2.71
		1915	-2.82
		1930	-2.79
		1963	-2.85
		1995	-3.14
	RX	1883	-2.71
		1915	-2.82
		1930	-2.79
		1963	-2.85
		1995	-3.14
LTE Band 25 Sprint	TX	1850	-3.16
		1880	-2.75
		1910	-2.82
		1930	-2.79
		1960	-2.79
	RX	1990	-2.92
		1710	-3.46
		1755	-3.13
		1785	-3.22
		1805	-3.01
LTE Band 2 / UMTS 2 AT & T / VzW	TX	1840	-3.11
		1880	-2.75
		1710	-3.46
		1747.5	-2.99
		1785	-3.22
	RX	1805	-3.01
		1842.5	-3.12
		1880	-2.75
		1749.9	-3.12
		1767.4	-3.34
LTE Band 3 EU	TX	1784.9	-3.22
		1844.9	-3.13
		1862.4	-2.90
		1879.9	-2.75
		1710	-3.46
	RX	1745	-3.06
		1780	-3.45
		2110	-2.97
		2155	-2.70
		2200	-2.46
LTE Band 66 AT & T	TX	1710	-3.46
		1730	-3.38
		1755	-3.13
		2110	-2.97
		2130	-2.52
	RX	2155	-2.70
		1880	-2.75
		1900	-2.82
		1920	-2.80
		1880	-2.75
LTE Band 4 AT & T / VzW	TX	1880	-2.75
		1900	-2.82
		1920	-2.80
		1880	-2.75
		1900	-2.82
	RX	1920	-2.80
		1880	-2.75
		1900	-2.82
		1920	-2.80
		1880	-2.75
LTE Band 39 AT & T	TX	1880	-2.75
		1900	-2.82
		1920	-2.80
		1880	-2.75
		1900	-2.82
	RX	1920	-2.80
		1880	-2.75
		1900	-2.82
		1920	-2.80
		1880	-2.75
LTE Band 71 AT & T	TX	663	-6.39
		680.5	-4.95
		698	-3.58
		617	-8.73
		634.5	-7.86
	RX	652	-6.90
		788	-2.34
		793	-2.36
		798	-2.13
		758	-2.36
LTE Band 14 AT & T	TX	763	-2.41
		768	-2.30
		2500	-3.77
		2535	-3.54
		2570	-3.11
	RX	2620	-2.92
		2655	-2.71
		2690	-2.47
		2305	-3.52
		2310	-3.59
LTE Band 7 EU	TX	2315	-3.55
		2350	-3.95
		2355	-3.78
		2360	-3.60
		2010	-3.16
	RX	2018	-2.82
		2025	-2.02
		2300	-3.57
		2350	-3.95
		2400	-3.44
LTE Band 30 AT & T	TX	2496	-3.73
		2593	-2.60
		2690	-2.47
		2570	-3.11
		2595	-2.74
	RX	2620	-2.92
		3550	-3.16
		3625	-3.34
		3700	-3.77
		3700	-3.77
LTE Band 34 AT & T	TX	2010	-3.16
		2018	-2.82
		2025	-2.02
		2300	-3.57
		2350	-3.95
	RX	2400	-3.44
		2496	-3.73
		2593	-2.60
		2690	-2.47
		2570	-3.11
LTE Band 41 AT & T	TX	2595	-2.74
		2620	-2.92
		3550	-3.16
		3625	-3.34
		3700	-3.77
	RX	3700	-3.77
		3550	-3.16
		3625	-3.34
		3700	-3.77
		3700	-3.77
LTE Band 48 /49	TX	3550	-3.16
		3625	-3.34
		3700	-3.77
		3700	-3.77
		3700	-3.77
	RX	3700	-3.77
		3550	-3.16
		3625	-3.34
		3700	-3.77
		3700	-3.77

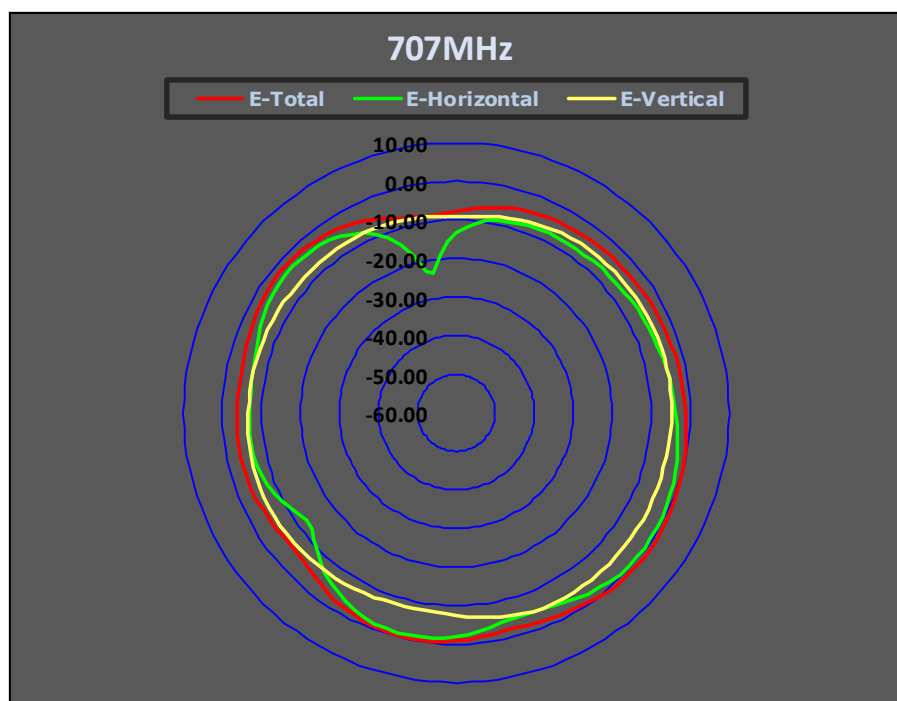
4.3 Radiation Pattern



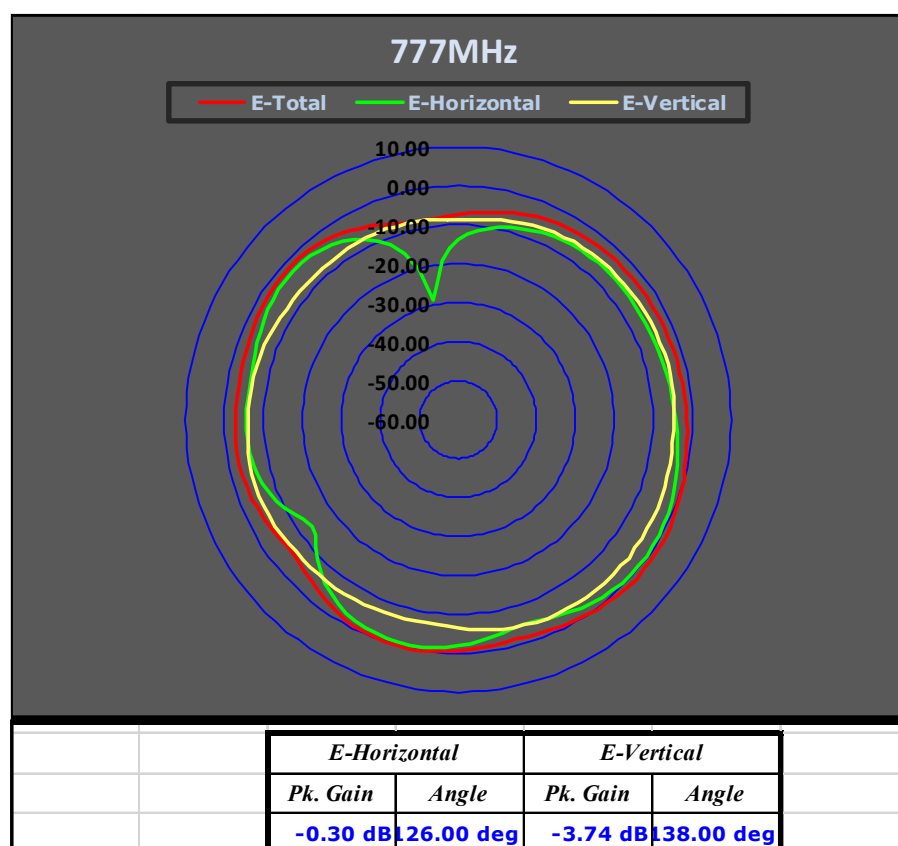
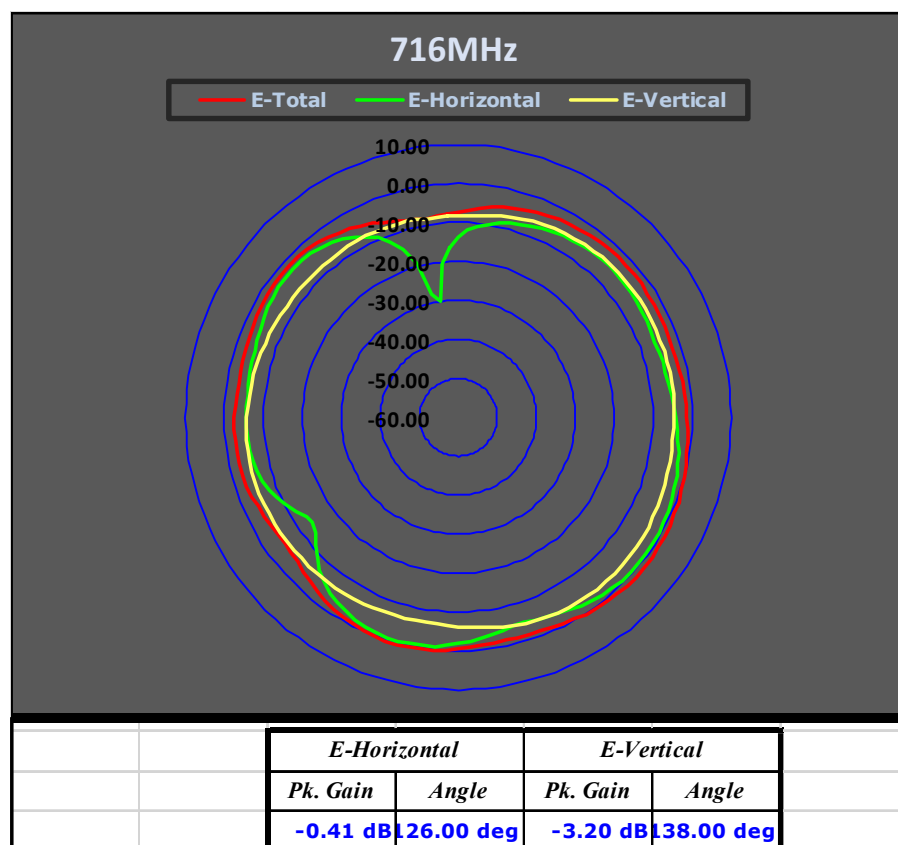


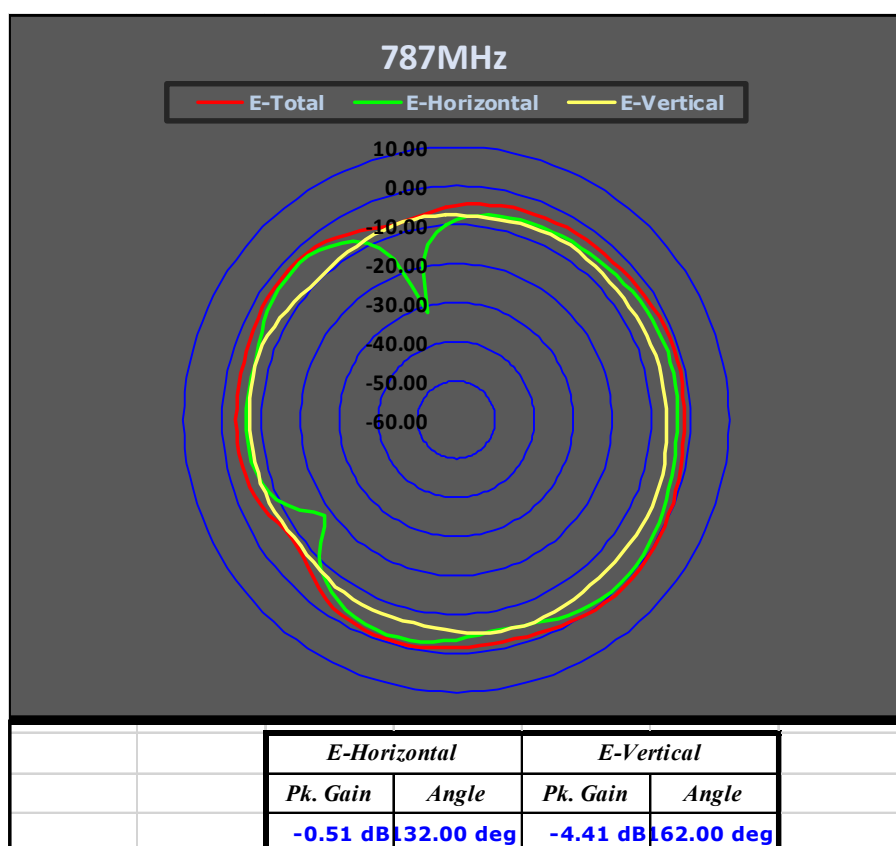
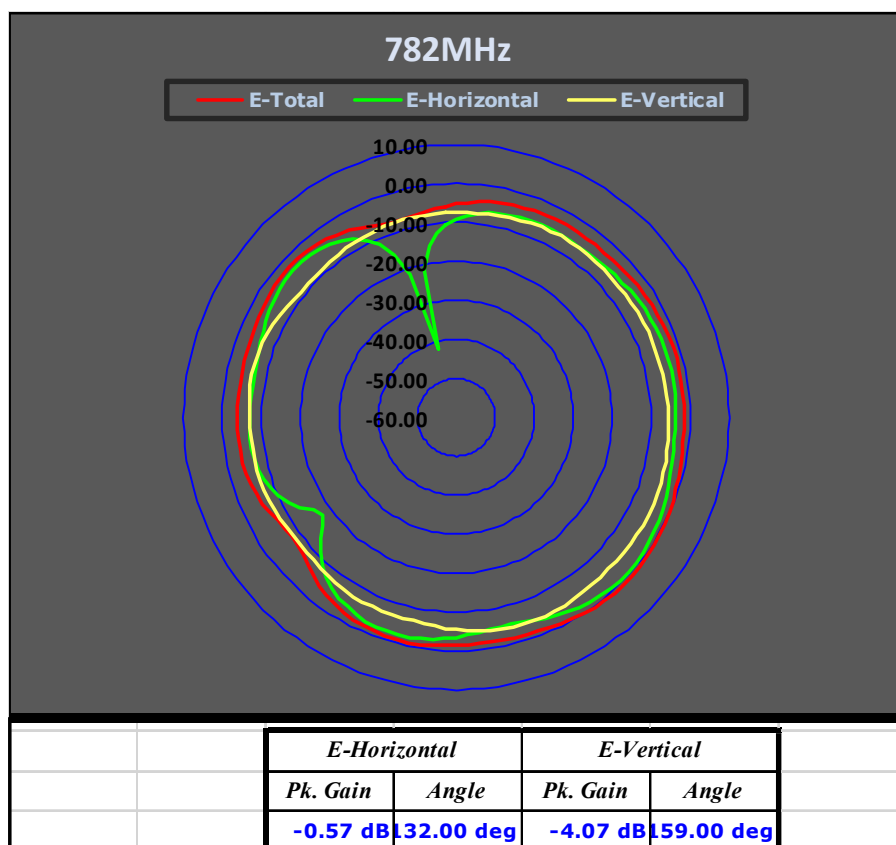


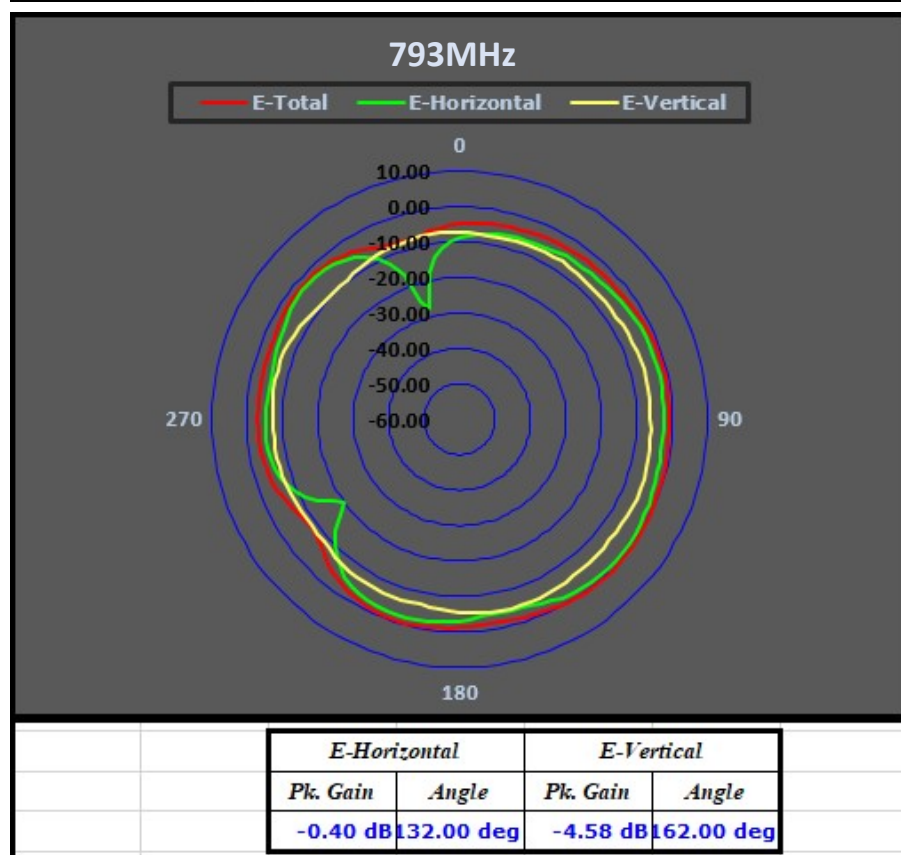
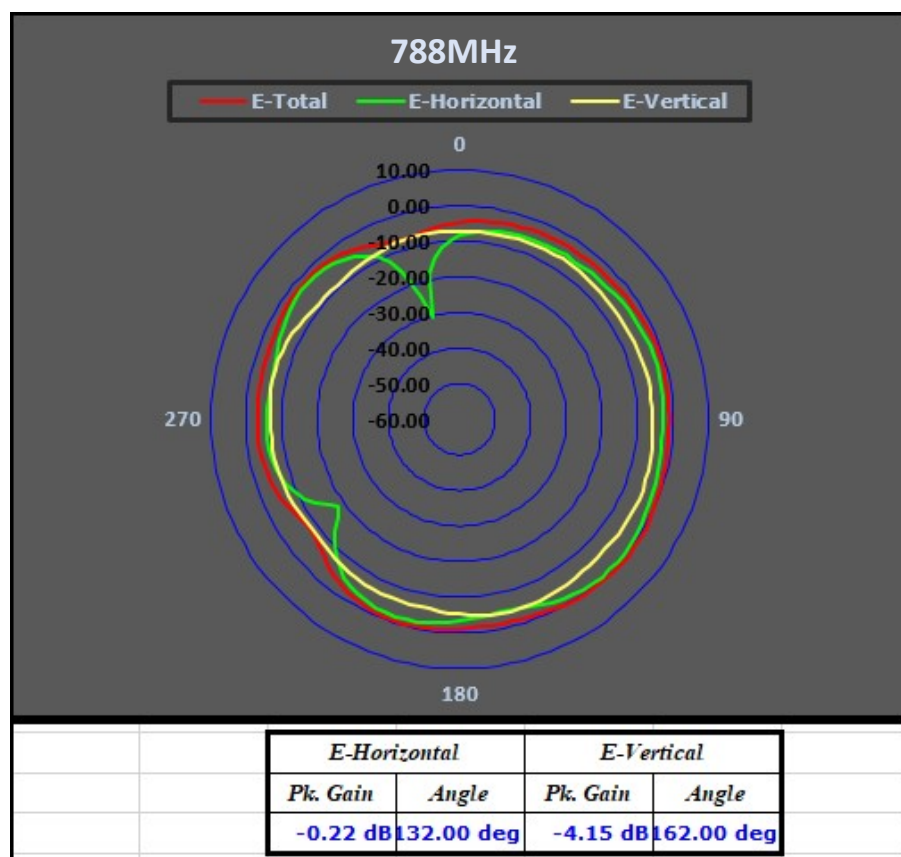
<i>E-Horizontal</i>		<i>E-Vertical</i>	
<i>Pk. Gain</i>	<i>Angle</i>	<i>Pk. Gain</i>	<i>Angle</i>
-1.12 dB	123.00 deg	-4.78 dB	99.00 deg

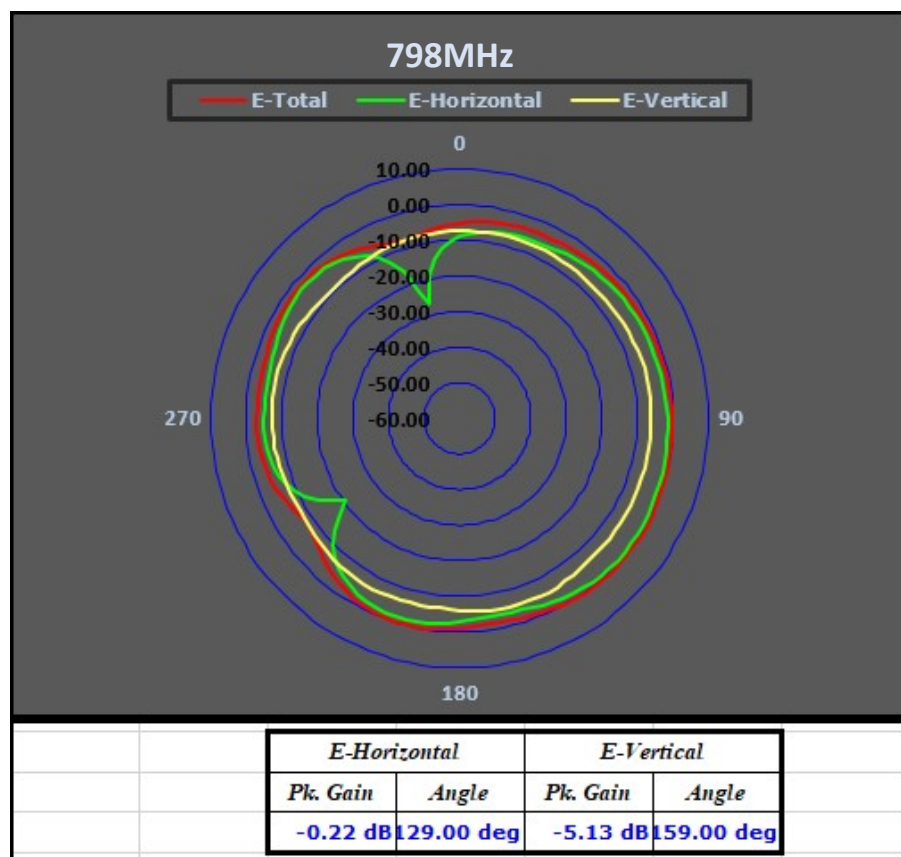


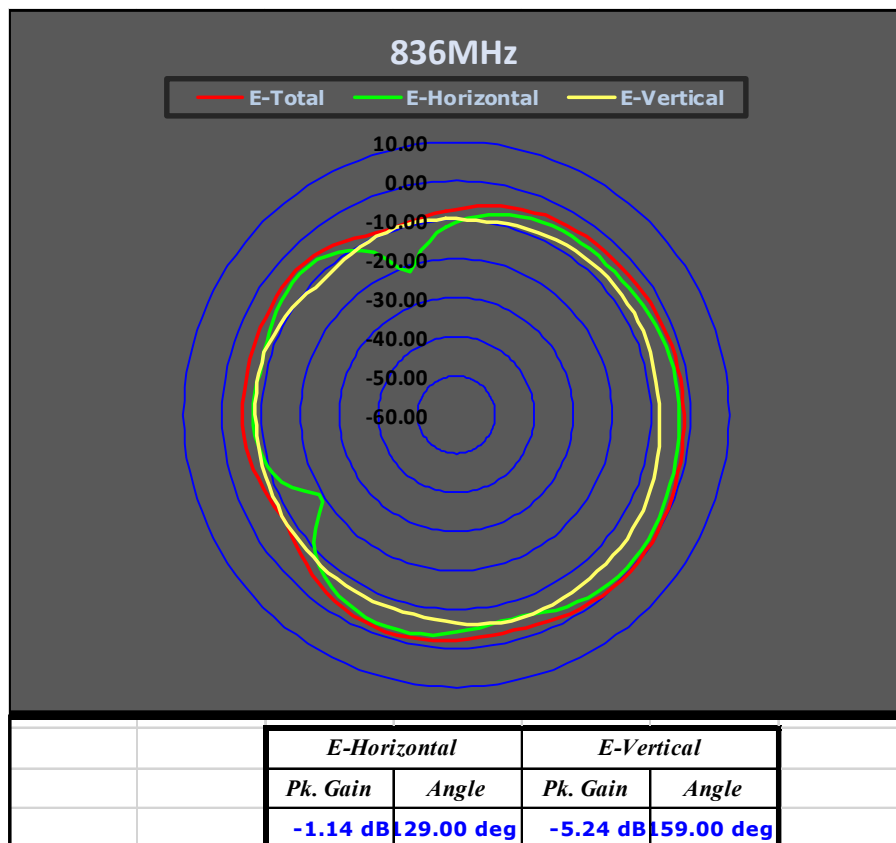
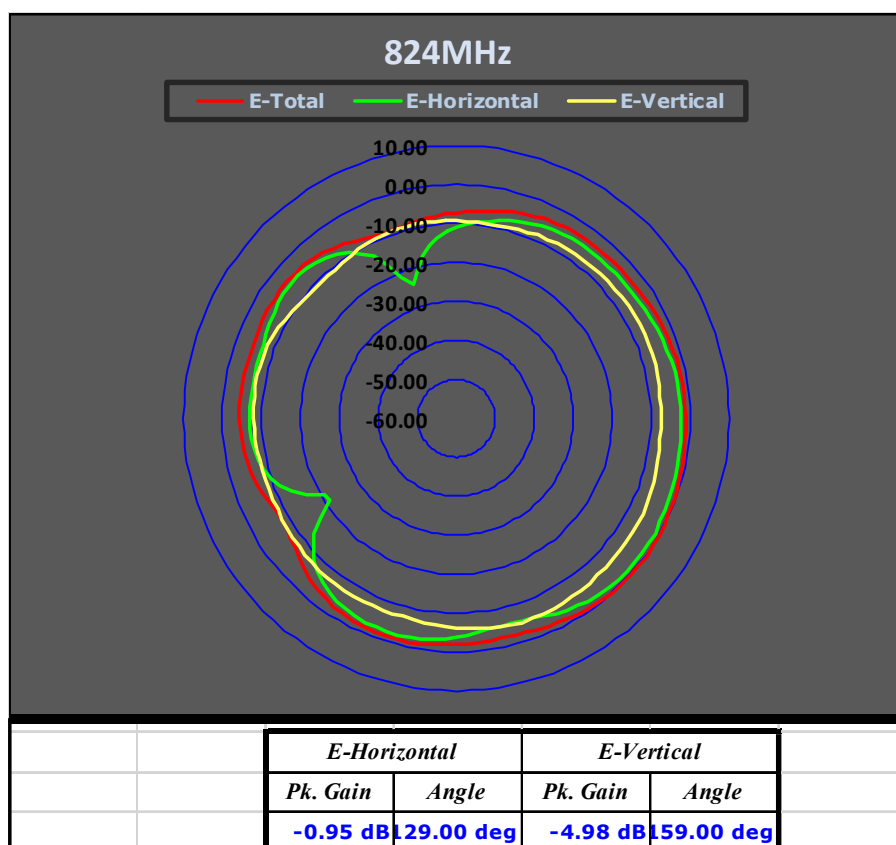
<i>E-Horizontal</i>		<i>E-Vertical</i>	
<i>Pk. Gain</i>	<i>Angle</i>	<i>Pk. Gain</i>	<i>Angle</i>
-0.34 dB	126.00 deg	-4.41 dB	144.00 deg

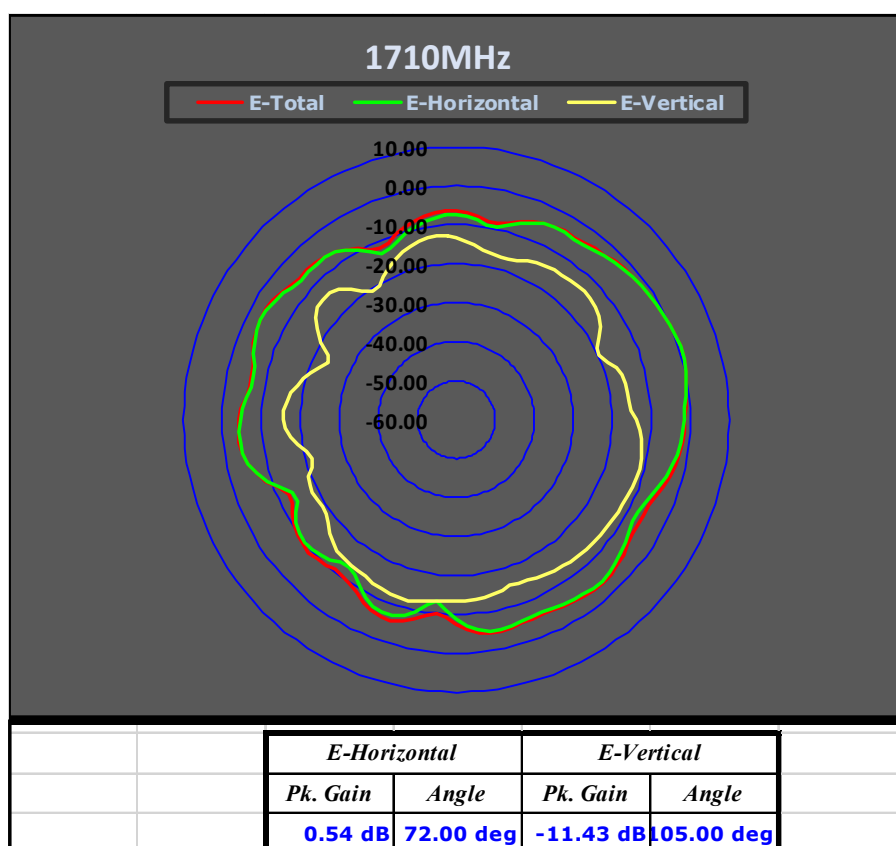
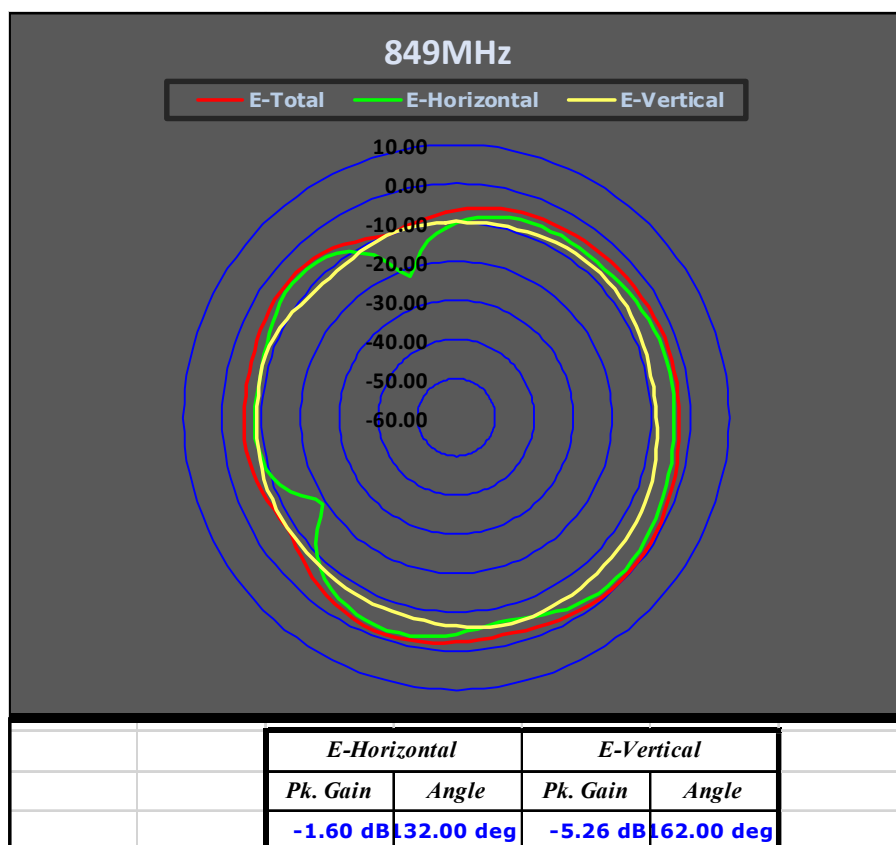


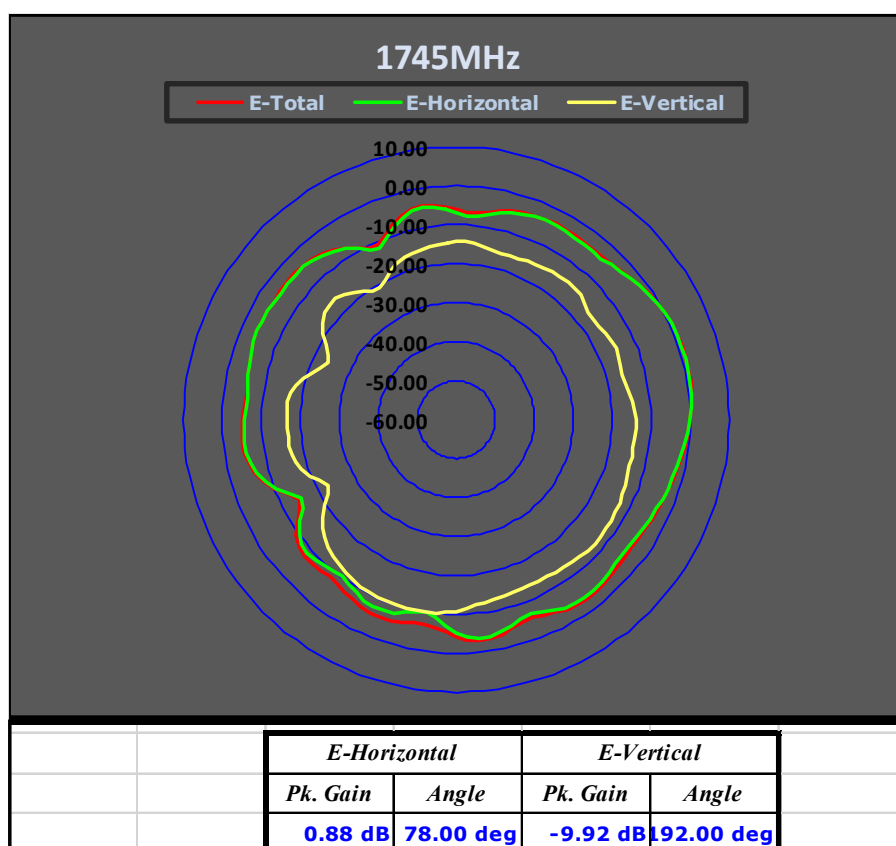
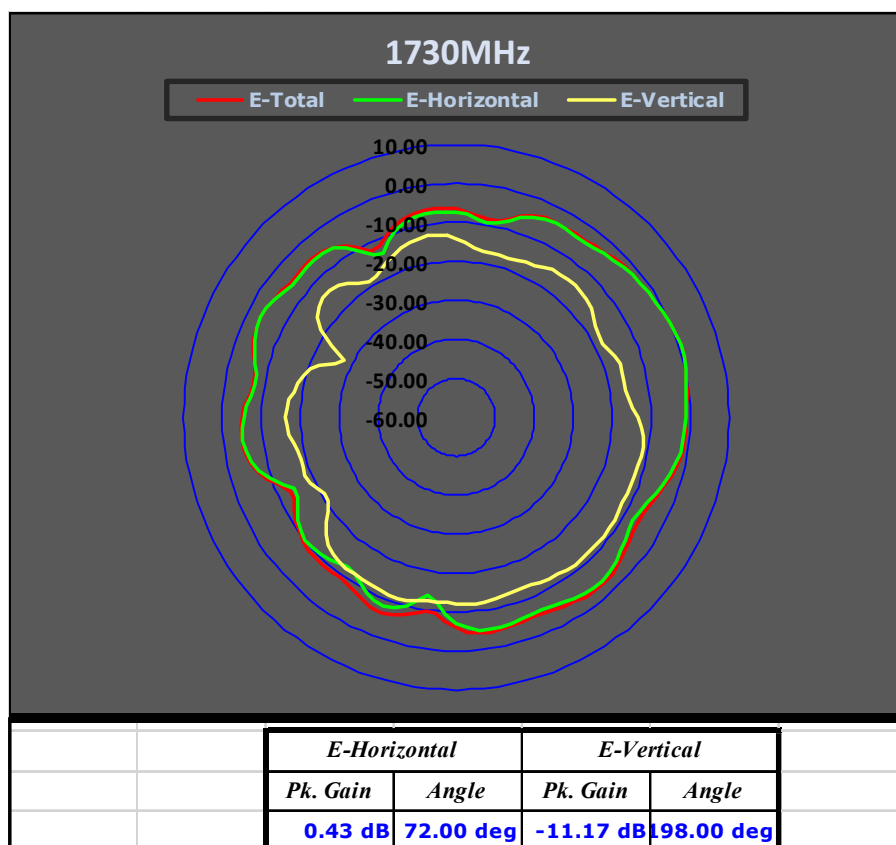


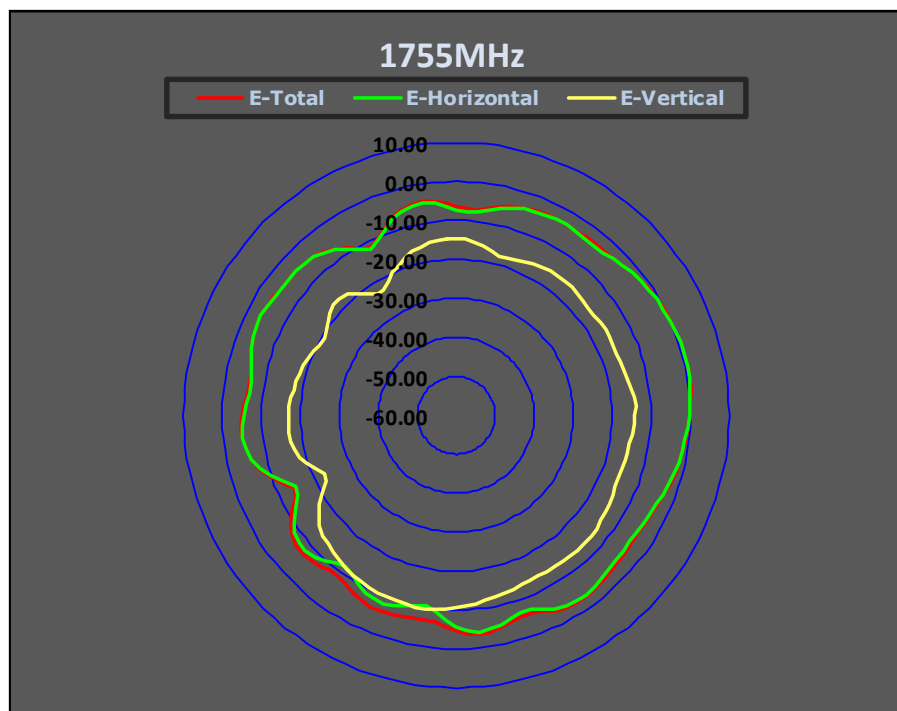




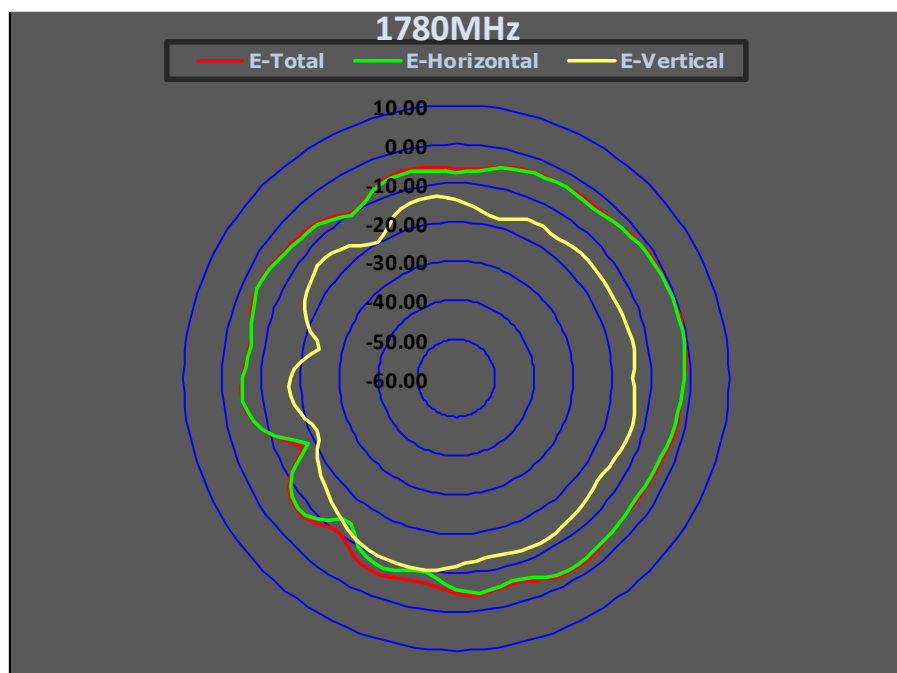




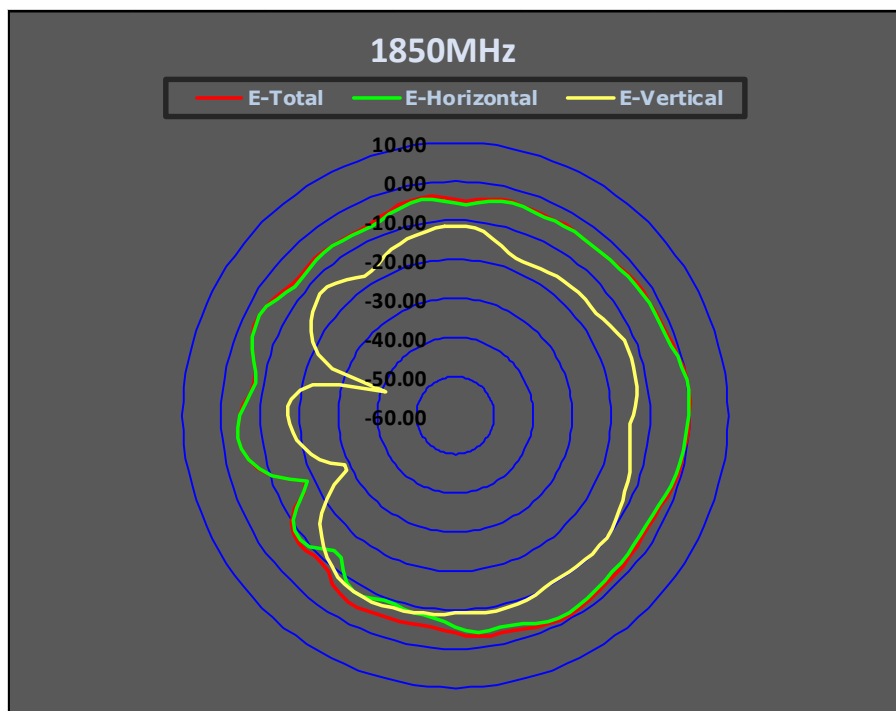




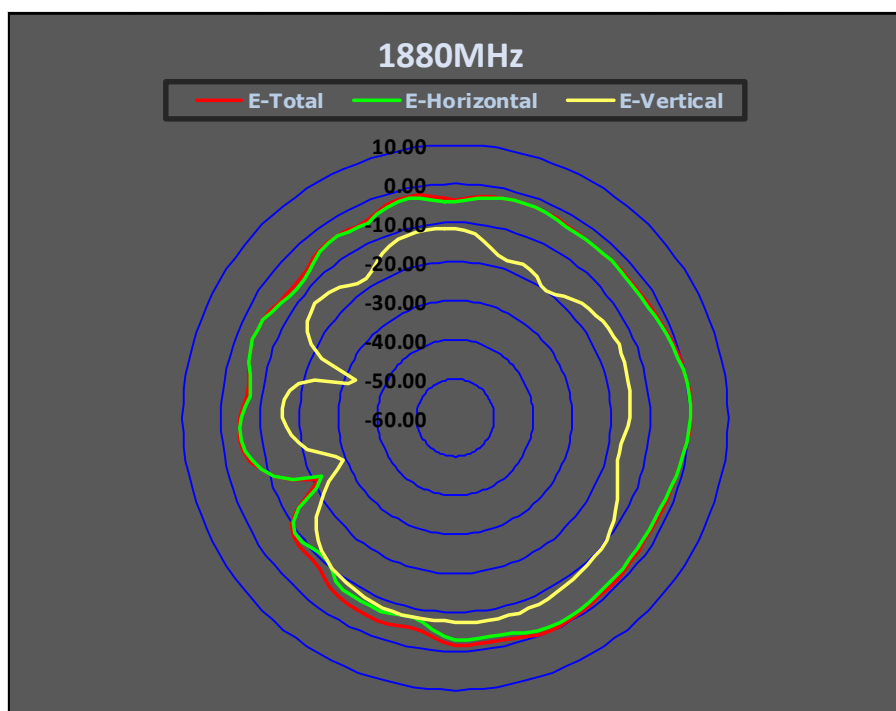
<i>E-Horizontal</i>		<i>E-Vertical</i>	
<i>Pk. Gain</i>	<i>Angle</i>	<i>Pk. Gain</i>	<i>Angle</i>
0.59 dB	78.00 deg	-9.69 dB	192.00 deg



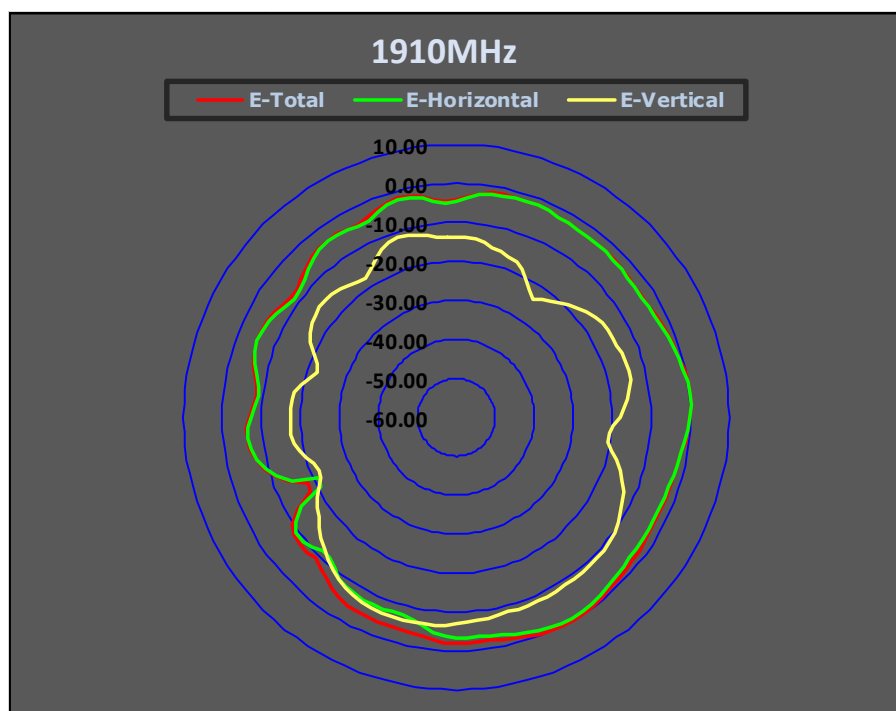
<i>E-Horizontal</i>		<i>E-Vertical</i>	
<i>Pk. Gain</i>	<i>Angle</i>	<i>Pk. Gain</i>	<i>Angle</i>
-0.69 dB	78.00 deg	-10.01 dB	195.00 deg



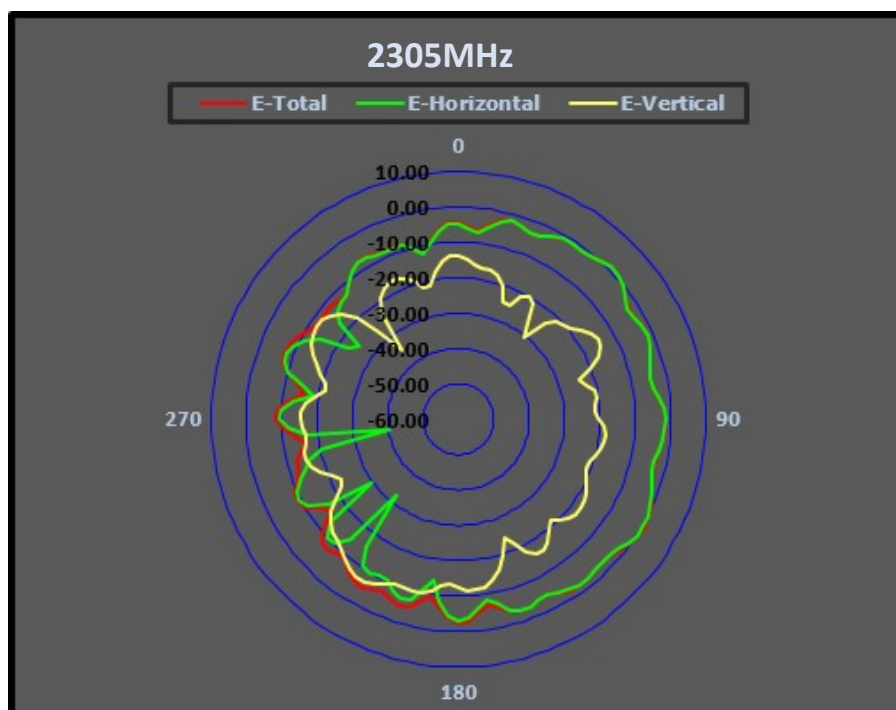
E-Horizontal		E-Vertical	
Pk. Gain	Angle	Pk. Gain	Angle
0.16 dB	84.00 deg	-7.52 dB	207.00 deg



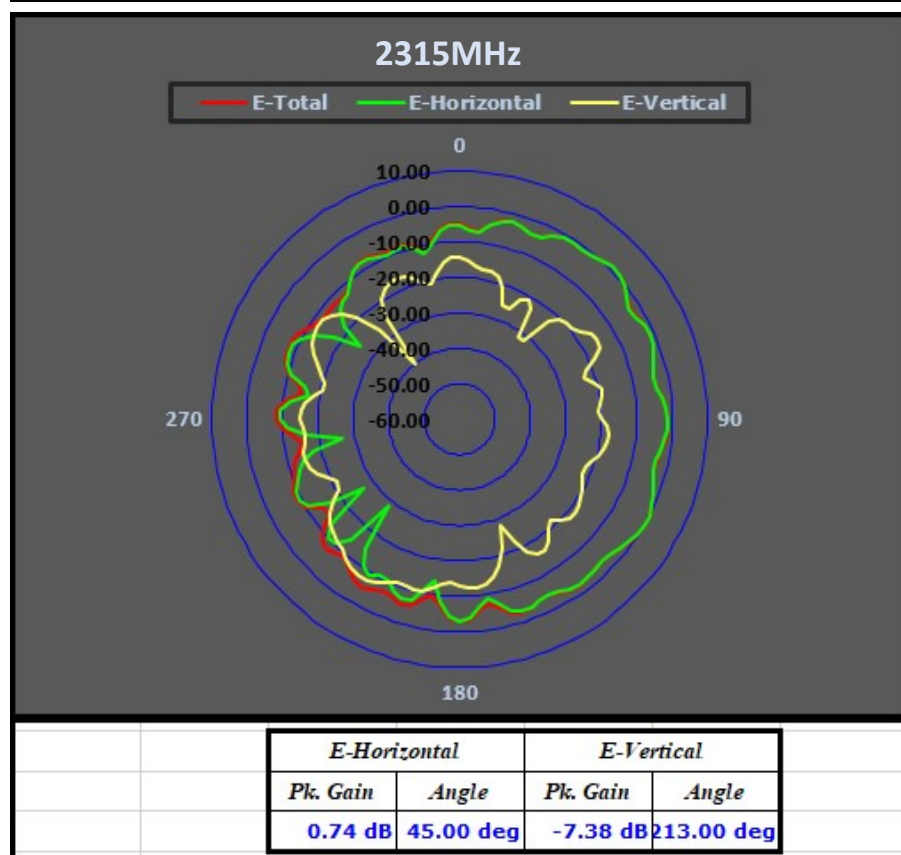
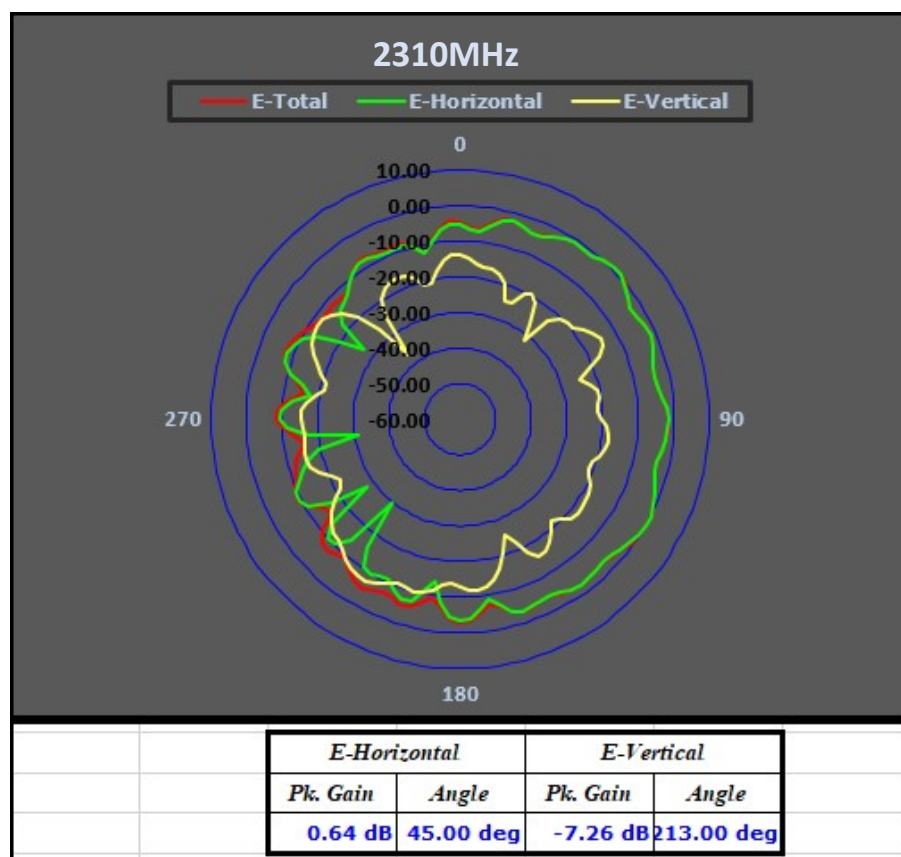
E-Horizontal		E-Vertical	
Pk. Gain	Angle	Pk. Gain	Angle
0.55 dB	87.00 deg	-7.37 dB	165.00 deg

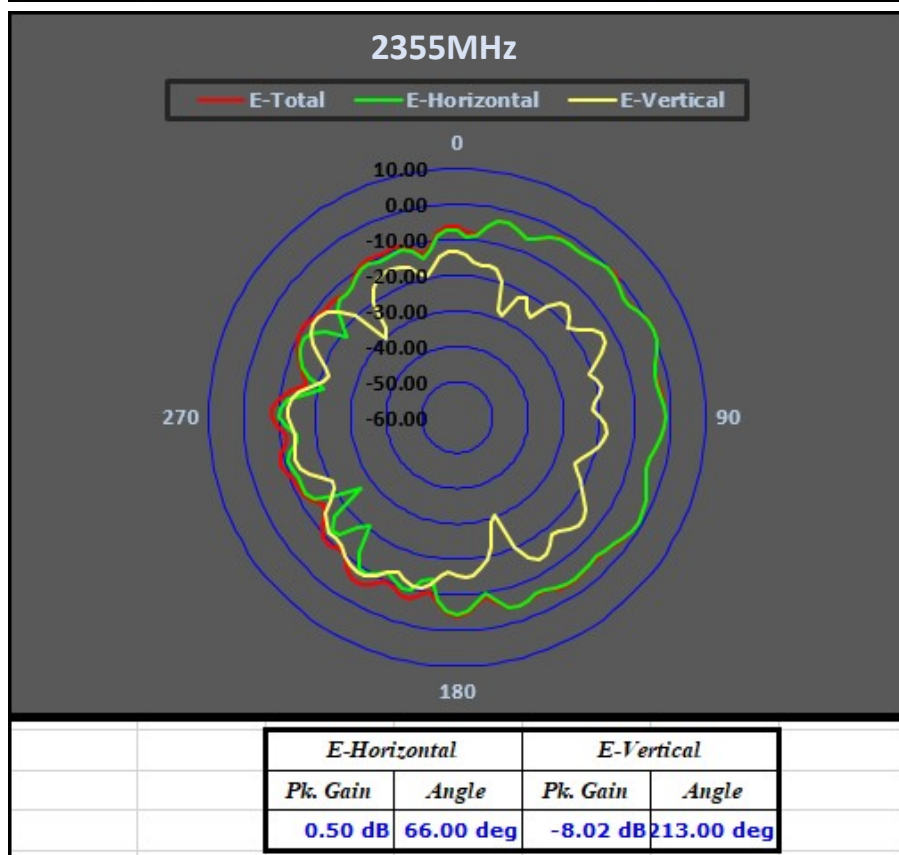
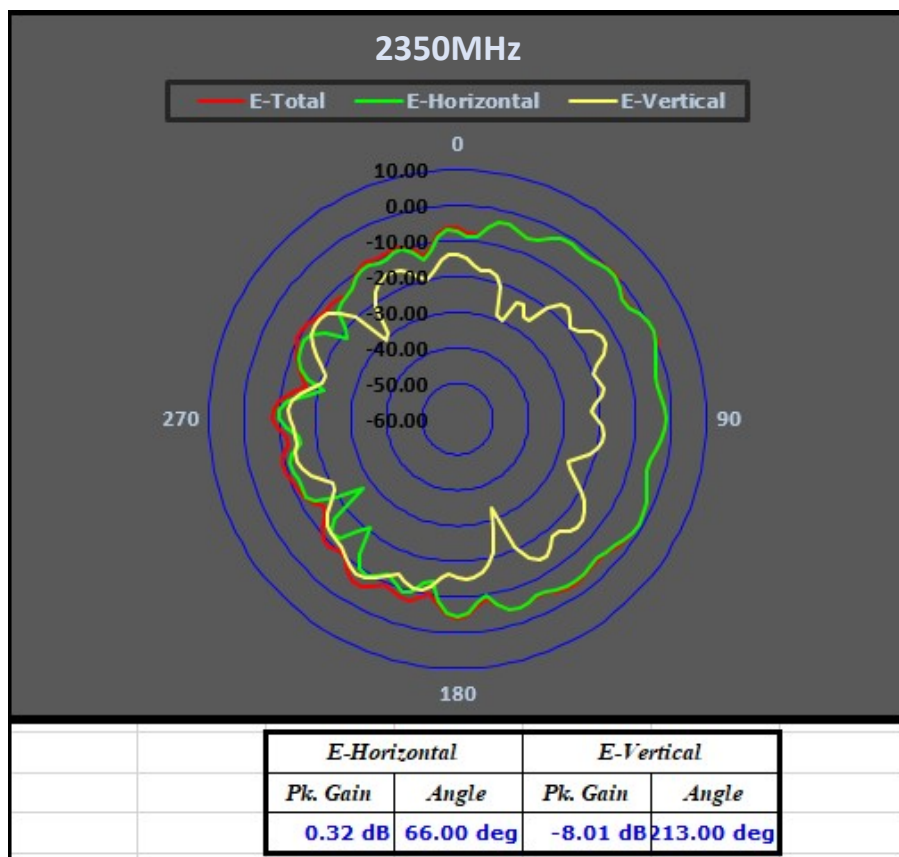


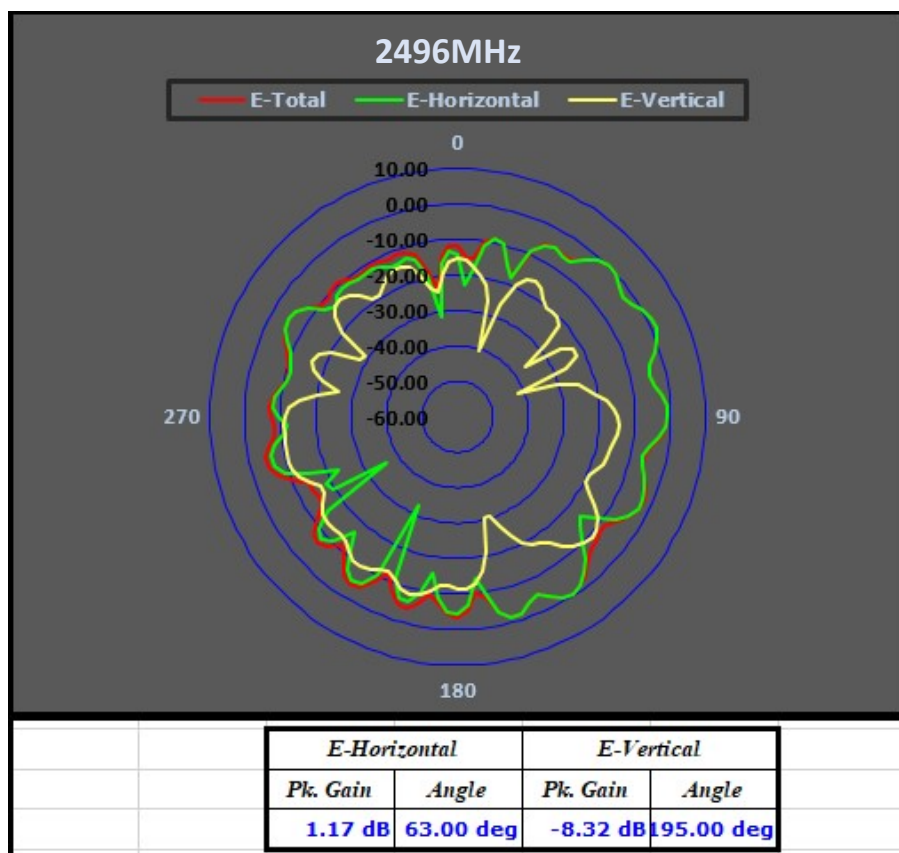
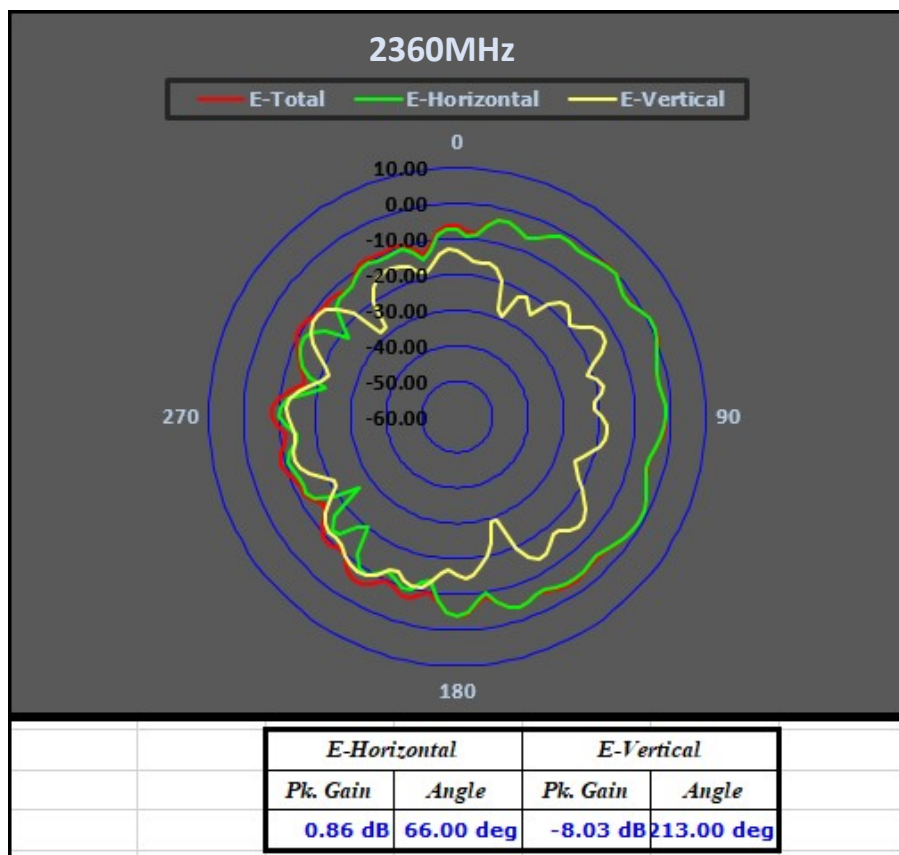
E-Horizontal		E-Vertical	
Pk. Gain	Angle	Pk. Gain	Angle
0.25 dB	87.00 deg	-6.11 dB	98.00 deg

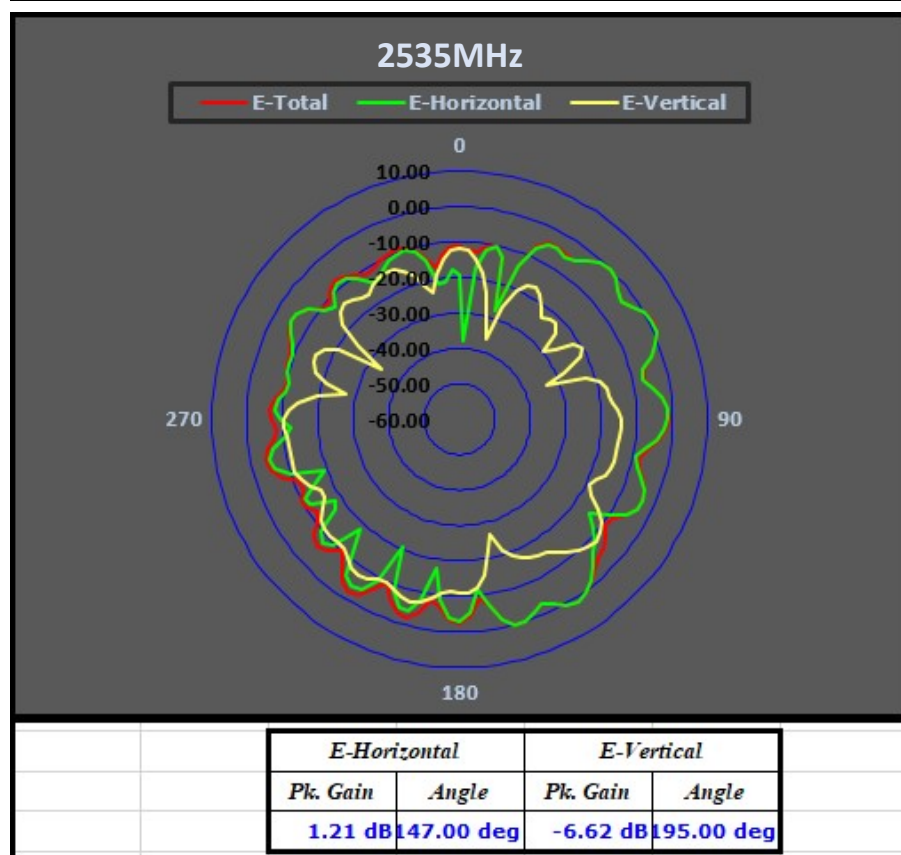
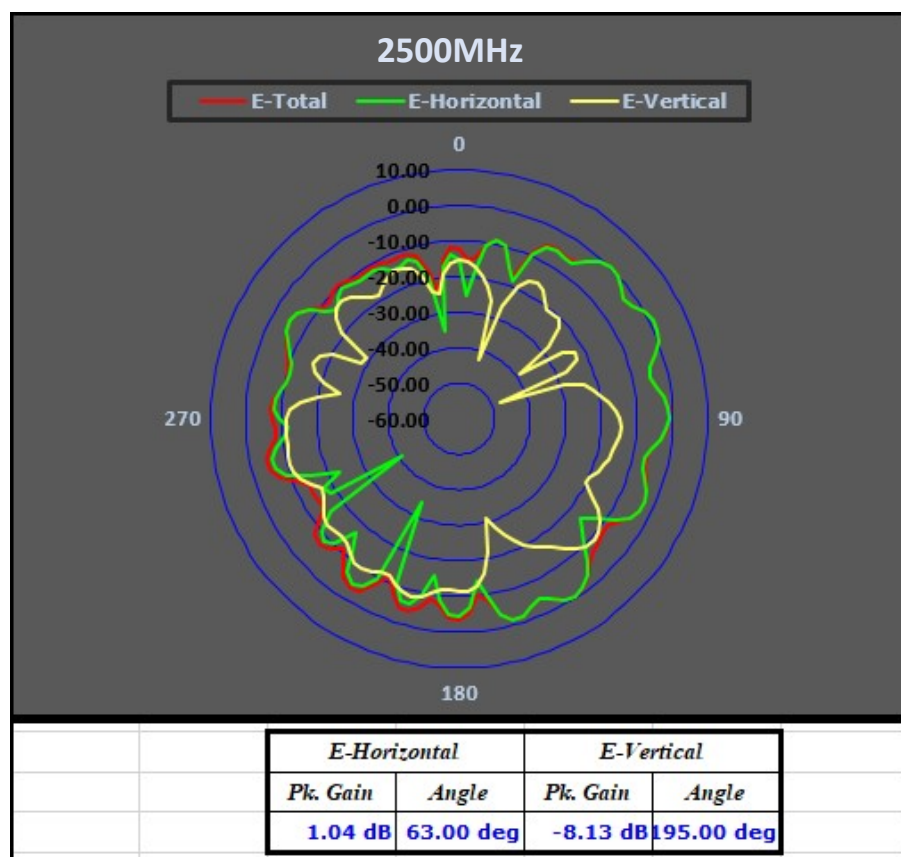


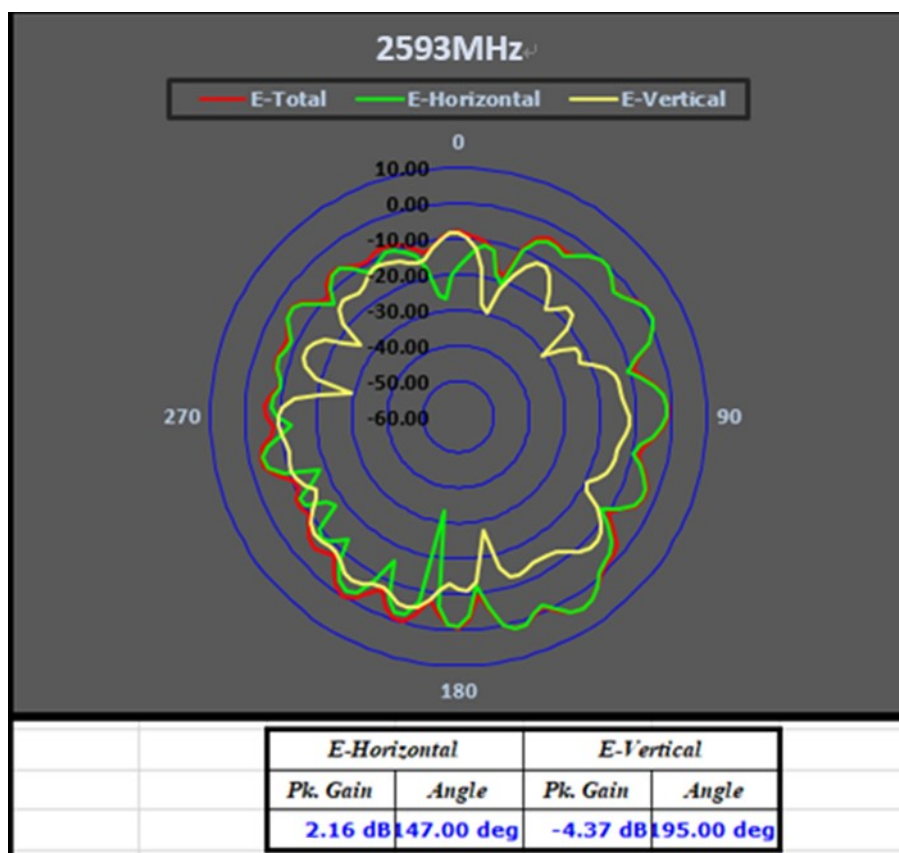
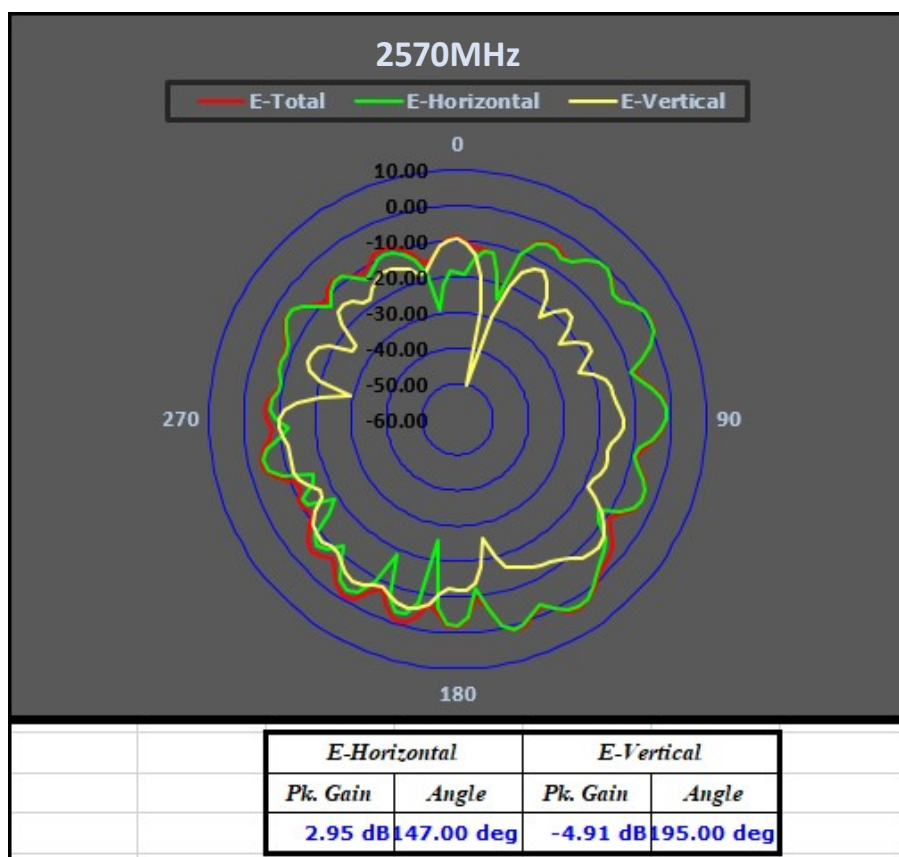
E-Horizontal		E-Vertical	
Pk. Gain	Angle	Pk. Gain	Angle
0.74 dB	45.00 deg	-7.03 dB	213.00 deg

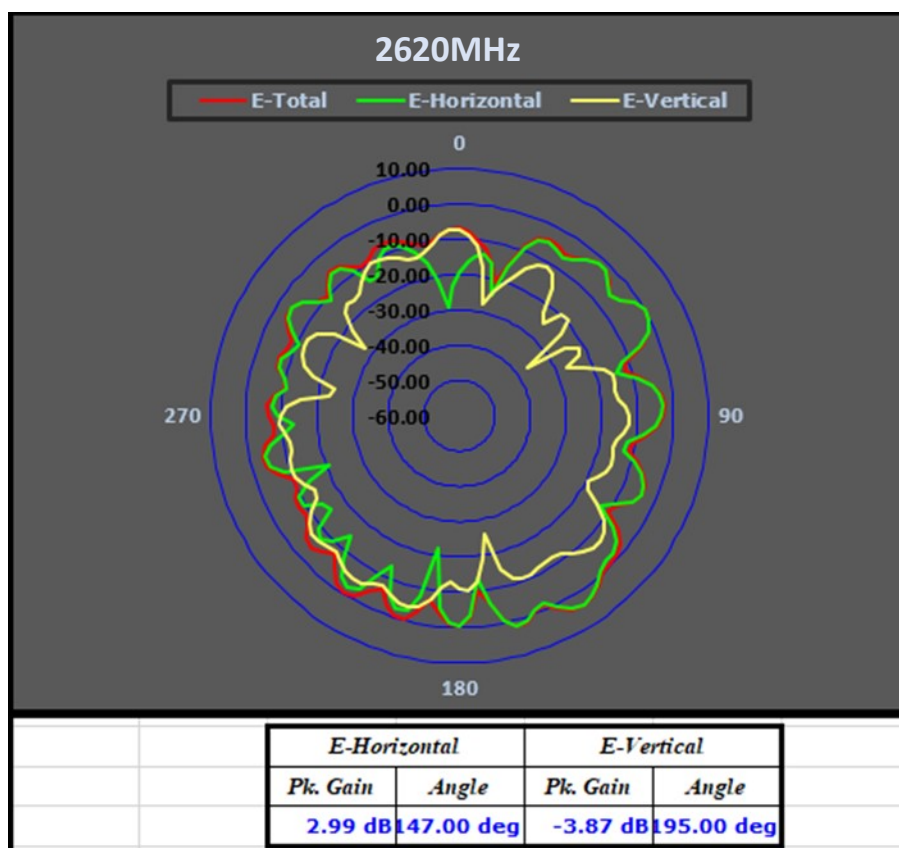
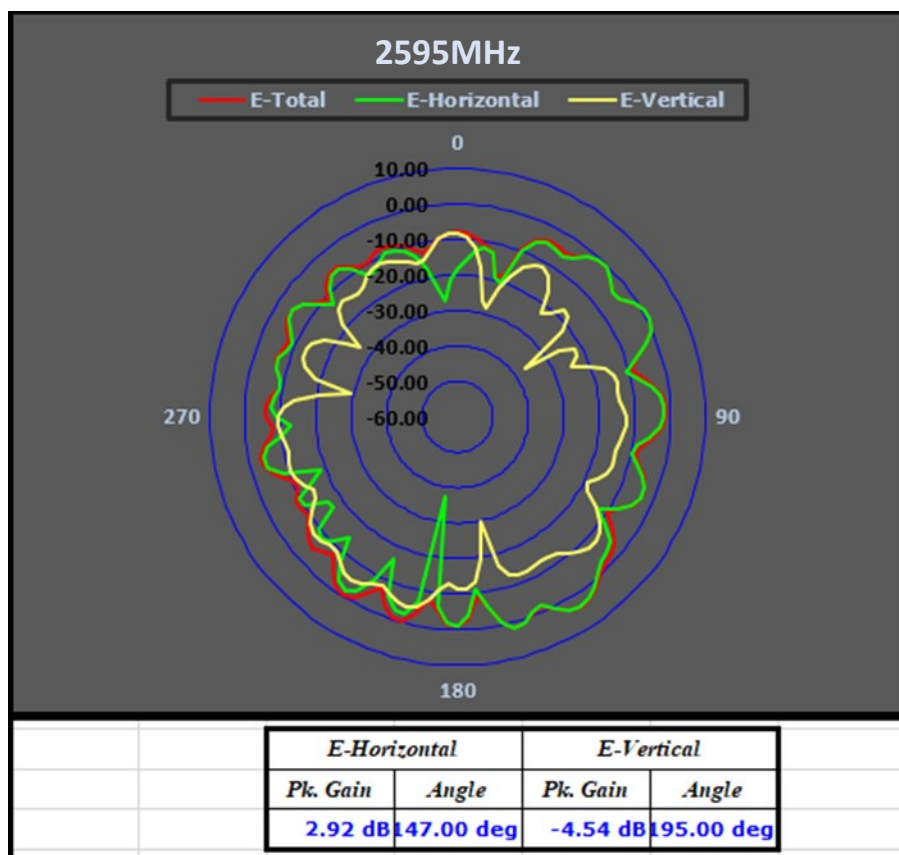


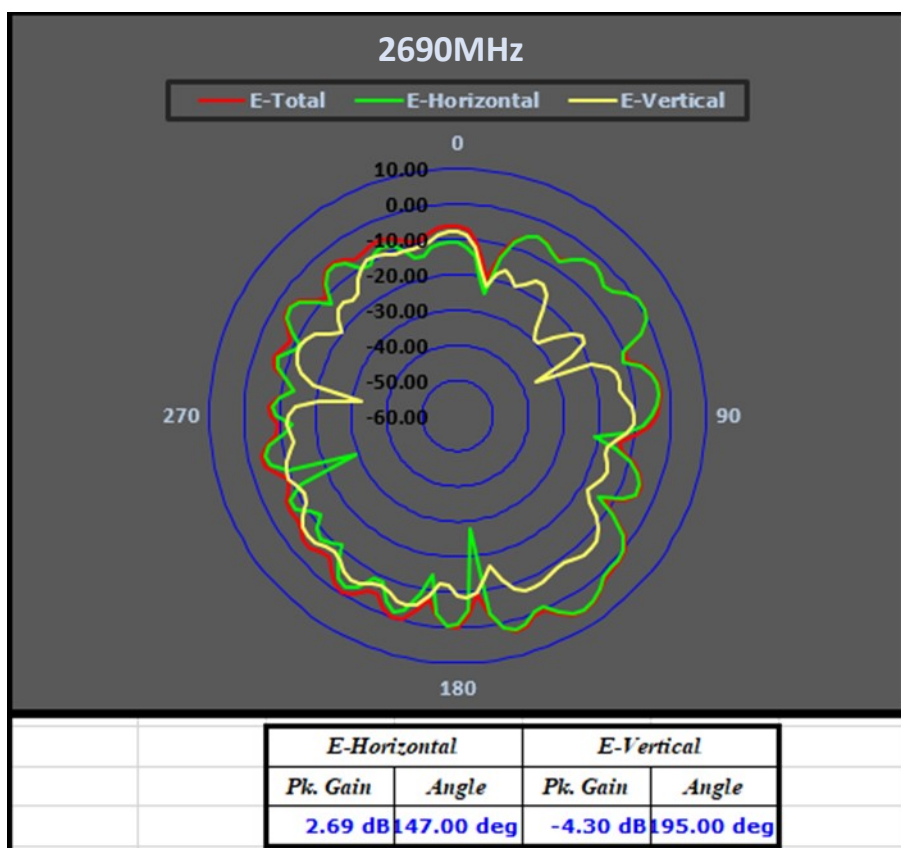
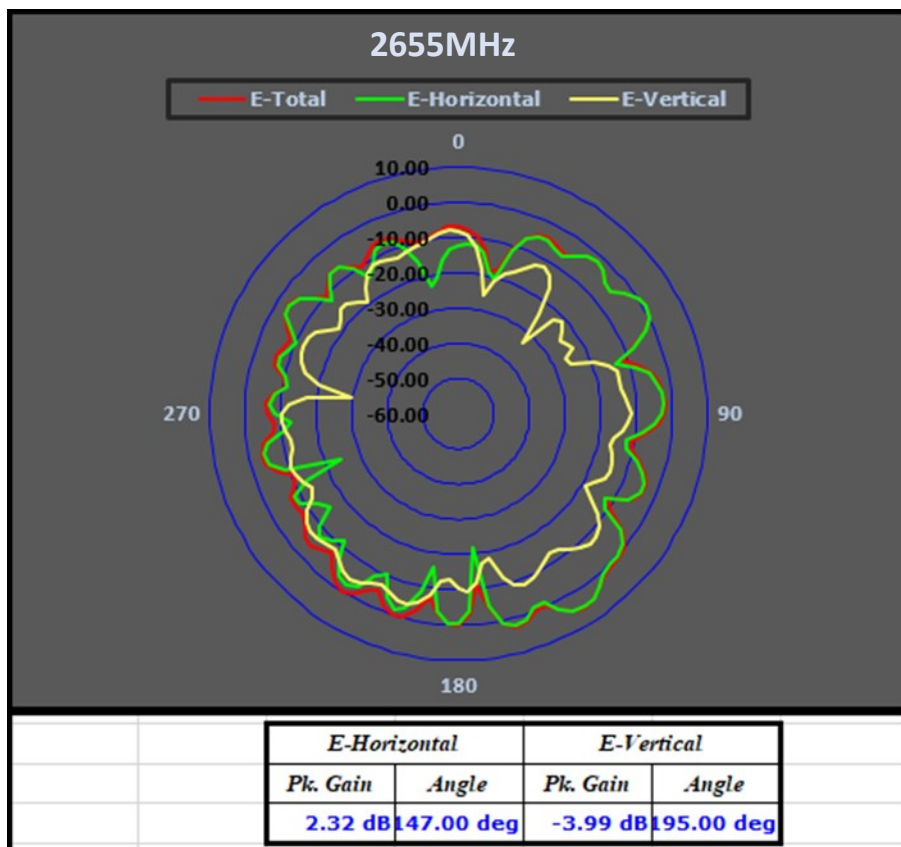


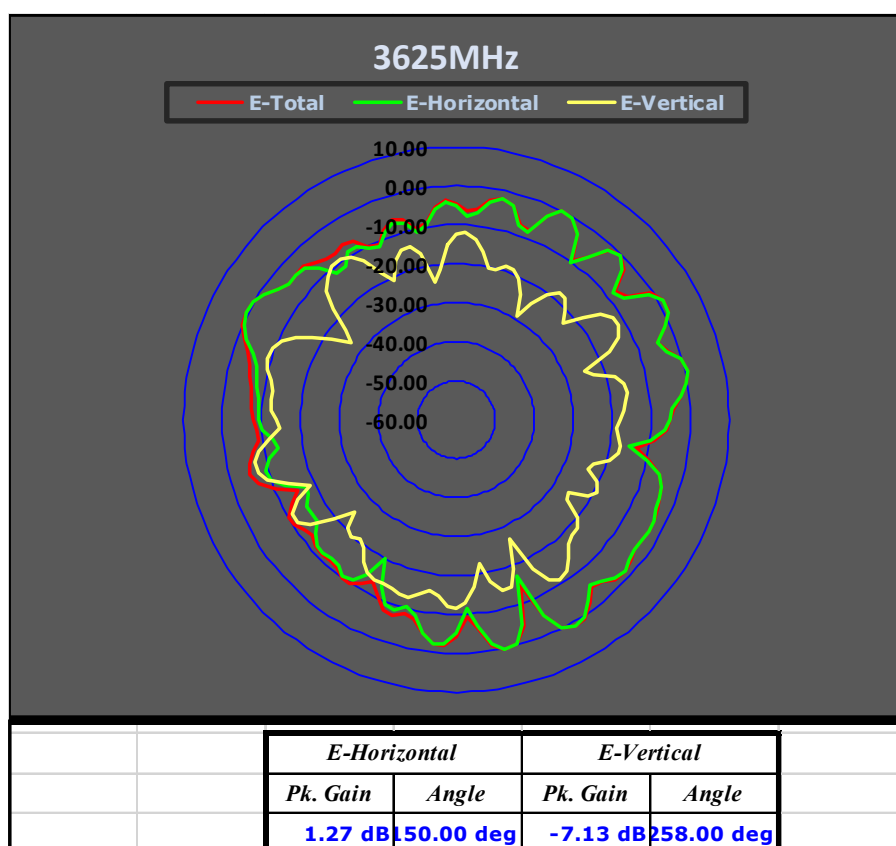
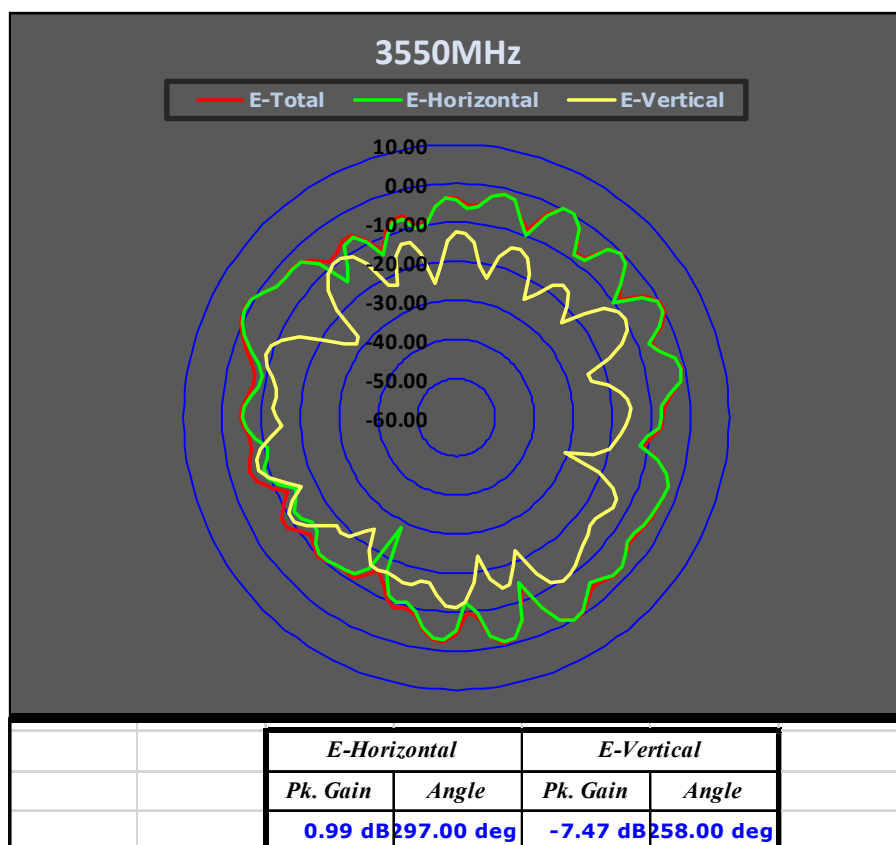


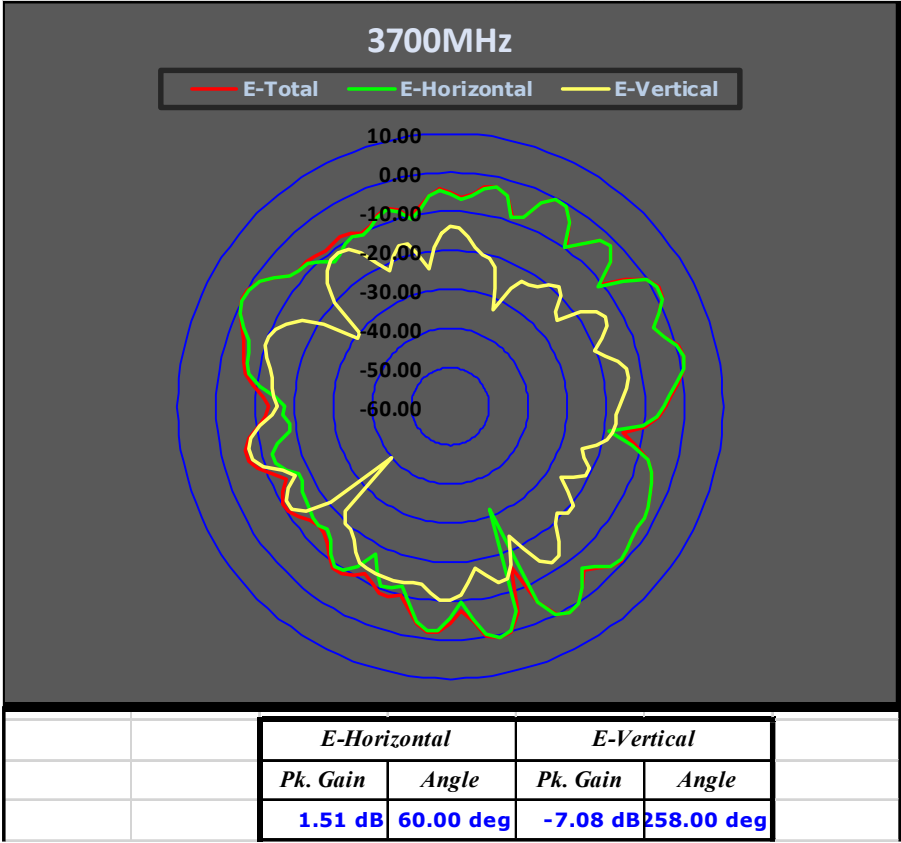












E-Horizontal		E-Vertical	
Pk. Gain	Angle	Pk. Gain	Angle
1.51 dB	60.00 deg	-7.08 dB	258.00 deg