



APPENDIX J

: ANTENNA SPECIFICATION

Mobile Station Over the Air Passive Performance

EUT	
Test Date	Thu 02/Feb/2023 11:03:29
Event Status	
Serial Number	
Hardware Version	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14						
Frequency [MHz]	2405	2410	2420	2430	2440	2450	2460	2470	2480	5000	5500	6000	6500	7000						
Efficiency [dB]	-4.90	-5.03	-5.12	-5.19	-5.33	-5.46	-5.53	-5.80	-5.94											
Efficiency [%]	32.34	31.40	30.79	30.24	29.29	28.41	27.97	26.31	25.49											
TRG [dB]	-4.90	-5.03	-5.12	-5.19	-5.33	-5.46	-5.53	-5.80	-5.94											
TRG _θ [dB]	-5.97	-6.11	-6.23	-6.33	-6.50	-6.57	-6.73	-7.01	-7.16											
Gain _{θ Peak} [dB]	-0.87	-0.96	-1.02	-1.01	-1.07	-1.06	-1.22	-1.54	-1.73											
Gain _{θ Min} [dB]	-34.54	-32.55	-31.60	-31.18	-31.30	-30.99	-32.23	-33.61	-31.81											
TRG _φ [dB]	-11.53	-11.62	-11.57	-11.56	-11.62	-11.93	-11.72	-11.94	-12.03											
Gain _{φ Peak} [dB]	-6.25	-6.33	-6.10	-5.81	-5.90	-6.17	-6.09	-6.29	-6.41											
Gain _{φ Min} [dB]	-34.91	-36.32	-37.22	-39.60	-40.66	-47.60	-39.91	-35.41	-37.38											
UHRG [dB]	-9.87	-10.03	-10.04	-10.11	-10.20	-10.30	-10.36	-10.56	-10.66											
UHRG/TRG [%]	31.89	31.65	32.15	32.28	32.63	32.87	32.91	33.39	33.69											
H-Plane	-6.78	-7.03	-7.20	-7.36	-7.58	-7.70	-7.73	-7.76	-7.79											
E1-Plane, AVG [dB]	-6.66	-6.78	-6.88	-6.94	-7.09	-7.15	-7.29	-7.60	-7.75											
E2-Plane, AVG [dB]	-7.00	-7.12	-7.24	-7.35	-7.50	-7.55	-7.70	-7.92	-8.08											
Peak Gain [dB]	-0.55	-0.58	-0.67	-0.65	-0.74	-0.89	-0.92	-1.23	-1.35											
Directivity [dB]	4.35	4.45	4.45	4.54	4.59	4.58	4.61	4.57	4.59											
Minimum Gain [dB]	-24.75	-25.16	-25.53	-25.29	-24.87	-24.13	-23.18	-22.34	-21.37											
Test Condition	FS																			
Antenna Type																				

FS=Free Space, BHR=Beside Head Right Side, BHL=Beside Head Left Side, HR=Hand Right, HL=Hand Left, BHHR=Beside Head and Hand Right Side, BHHL=Beside Head and Hand Left Side, NB=Notebook

Average Efficiency	-5.36 dB,	29.14 %
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Comment

Efficiency(Theta-Polarization and Phi-Polarization)

2405MHz Efficiency

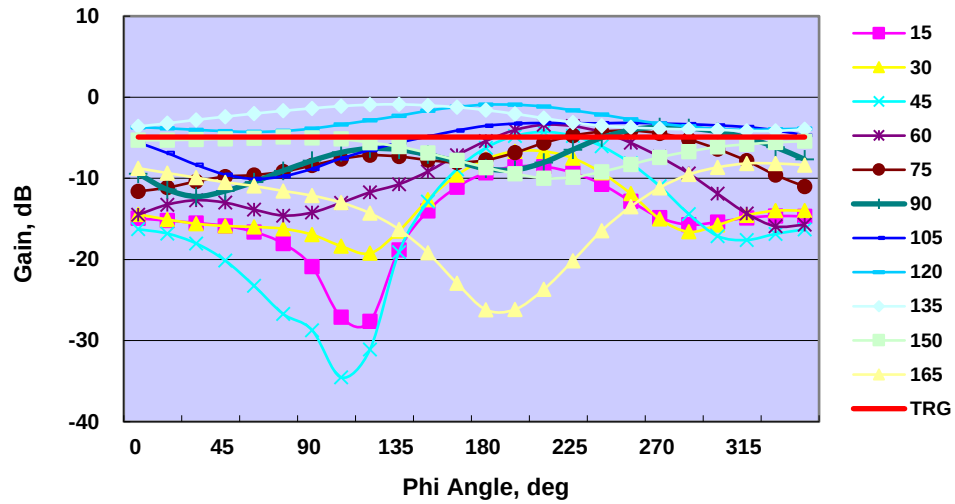
EUT		Frequency	2405	MHz	Comment	Antenna Matching	
IMEI		Antenna Type				Type	
Test Date	Thu 02/Feb/2023 11:03:29					Z1	
Test Condition	FS					Z2	
Tester						Z3	

Theta-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\theta \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0	-12.81						-17.08						-13.19						-18.64						
15	-14.93	-15.21	-15.49	-15.86	-16.60	-18.03	-20.89	-27.11	-27.62	-18.82	-14.00	-11.08	-9.33	-8.56	-8.55	-9.30	-10.72	-12.83	-14.84	-15.72	-15.38	-14.86	-14.63	-14.69	
30	-14.43	-15.07	-15.59	-15.87	-15.98	-16.21	-16.93	-18.35	-19.23	-16.48	-12.63	-9.59	-7.63	-6.66	-6.66	-7.51	-9.32	-11.89	-15.01	-16.59	-15.75	-14.57	-13.98	-13.98	
45	-16.27	-16.80	-18.02	-20.12	-23.25	-26.71	-28.71	-34.54	-31.08	-19.08	-12.88	-8.86	-6.23	-4.77	-4.27	-4.76	-6.05	-8.14	-10.98	-14.39	-17.11	-17.60	-16.84	-16.30	
60	-14.47	-13.24	-12.69	-12.99	-13.85	-14.58	-14.21	-13.01	-11.71	-10.72	-9.15	-7.15	-5.39	-4.04	-3.39	-3.56	-4.29	-5.62	-7.35	-9.40	-11.89	-14.33	-15.91	-15.72	
75	-11.60	-11.14	-10.38	-9.78	-9.59	-9.17	-8.41	-7.60	-7.15	-7.30	-7.74	-8.04	-7.75	-6.84	-5.63	-4.73	-4.23	-4.10	-4.45	-5.21	-6.39	-7.83	-9.59	-10.99	
90	-9.42	-11.37	-12.23	-11.56	-10.44	-9.06	-7.82	-6.80	-6.32	-6.45	-7.08	-7.93	-8.80	-8.95	-8.03	-6.46	-4.98	-4.04	-3.65	-3.79	-4.24	-4.99	-6.15	-7.65	
105	-5.57	-6.87	-8.33	-9.53	-10.06	-9.74	-8.82	-7.54	-6.51	-5.59	-4.84	-4.10	-3.52	-3.25	-3.17	-3.19	-3.21	-3.14	-3.24	-3.32	-3.47	-3.67	-4.07	-4.69	
120	-3.69	-3.83	-4.01	-4.18	-4.27	-4.16	-3.86	-3.37	-2.84	-2.29	-1.65	-1.20	-0.91	-0.92	-1.14	-1.61	-2.13	-2.73	-3.24	-3.60	-3.92	-4.01	-3.95	-3.86	
135	-3.60	-3.21	-2.78	-2.39	-2.01	-1.67	-1.36	-1.09	-0.92	-0.87	-1.01	-1.22	-1.59	-2.04	-2.58	-3.10	-3.50	-3.72	-3.87	-3.95	-4.01	-4.15	-4.15	-3.95	
150	-5.30	-5.28	-5.22	-5.11	-5.04	-4.89	-5.00	-5.14	-5.60	-6.07	-6.87	-7.76	-8.66	-9.42	-9.98	-9.85	-9.19	-8.29	-7.40	-6.69	-6.12	-5.80	-5.56	-5.41	
165	-8.74	-9.34	-9.91	-10.48	-10.94	-11.55	-12.12	-12.98	-14.30	-16.29	-19.18	-22.93	-26.19	-26.17	-23.68	-20.16	-16.44	-13.48	-11.15	-9.52	-8.64	-8.16	-8.16	-8.35	
180	-13.46						-21.23						-13.83						-20.17						

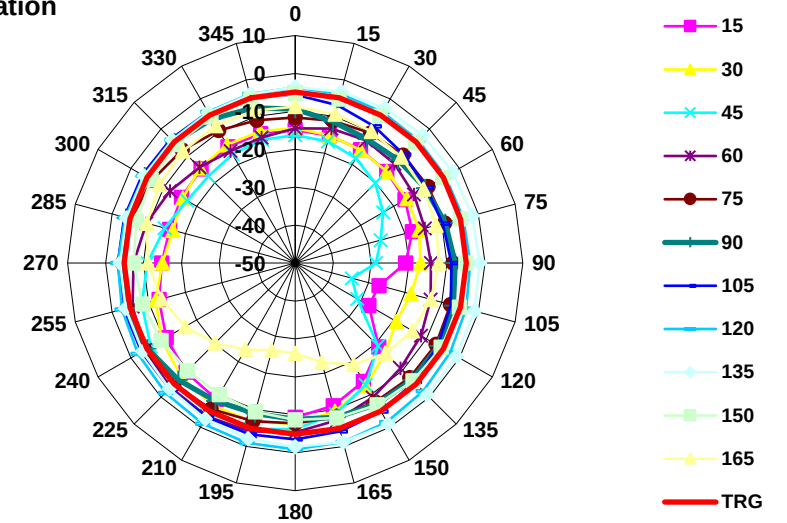
Phi-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\theta \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-20.57	-22.33	-22.99	-21.48	-18.61	-15.87	-13.76	-12.23	-11.27	-11.00	-11.72	-13.54	-17.08	-25.50	-26.90	-17.69	-14.04	-12.31	-11.74	-12.15	-12.97	-14.44	-16.40	-18.51	
30	-22.41	-27.00	-34.90	-31.10	-23.49	-18.56	-15.08	-12.49	-10.57	-9.70	-9.59	-10.34	-12.26	-15.09	-16.84	-14.85	-12.52	-11.22	-10.98	-11.46	-12.52	-14.16	-16.30	-18.99	
45	-20.45	-21.24	-21.40	-21.76	-23.84	-29.16	-23.22	-16.18	-11.89	-9.35	-7.96	-7.69	-8.42	-10.45	-13.31	-15.08	-14.04	-12.65	-12.13	-12.46	-13.51	-15.11	-17.04	-18.92	
60	-12.92	-14.10	-15.53	-16.40	-16.75	-17.61	-19.36	-18.50	-14.19	-10.41	-8.11	-6.95	-6.85	-7.78	-9.56	-11.74	-13.47	-14.12	-14.00	-13.62	-13.23	-12.81	-12.47	-12.43	
75	-8.43	-9.55	-11.06	-11.79	-11.73	-11.97	-13.46	-17.02	-20.69	-15.35	-10.88	-8.30	-7.25	-7.18	-7.80	-9.16	-11.32	-14.13	-16.35	-15.08	-12.29	-9.94	-8.62	-8.14	
90	-6.49	-7.34	-8.38	-9.20	-9.64	-10.10	-11.65	-14.76	-21.75	-28.96	-16.54	-11.86	-9.18	-7.80	-6.97	-7.19	-8.57	-11.46	-17.15	-21.63	-14.44	-10.25	-7.86	-6.70	
105	-6.25	-6.63	-7.39	-8.27	-9.06	-9.96	-11.42	-13.86	-17.90	-26.58	-26.18	-16.84	-12.12	-9.21	-7.58	-7.29	-8.23	-10.74	-16.07	-30.60	-16.74	-11.20	-8.16	-6.73	
120	-7.08	-6.99	-7.51	-8.50	-9.62	-11.19	-12.70	-14.75	-17.57	-22.37	-34.78	-21.51	-14.94	-11.46	-9.56	-9.03	-9.81	-12.06	-16.83	-27.99	-18.25	-12.32	-9.33	-7.74	
135	-10.73	-10.73	-11.53	-12.71	-13.94	-15.25	-16.67	-18.31	-20.48	-24.12	-34.91	-26.99	-18.58	-14.16	-11.43	-10.16	-9.98	-11.16	-13.89	-19.28	-25.33	-17.72	-13.43	-11.41	
150	-11.80	-10.64	-10.20	-10.32	-10.79	-11.59	-12.53	-13.51	-14.32	-15.19	-16.76	-20.02	-28.18	-27.13	-18.75	-15.14	-13.50	-13.31	-14.46	-17.39	-23.53	-25.67	-17.99	-14.00	
165	-21.82	-19.49	-18.40	-18.20	-18.65	-19.55	-20.39	-20.81	-20.97	-21.60	-23.10	-24.07	-21.37	-17.48	-14.56	-12.63	-11.68	-11.45	-12.18	-13.67	-16.06	-19.70	-24.58	-25.31	
180																									

Total Radiated Gain and Efficiency	-4.903 dB	32.340 %	Theta	-5.967 dB	Phi	-11.529 dB
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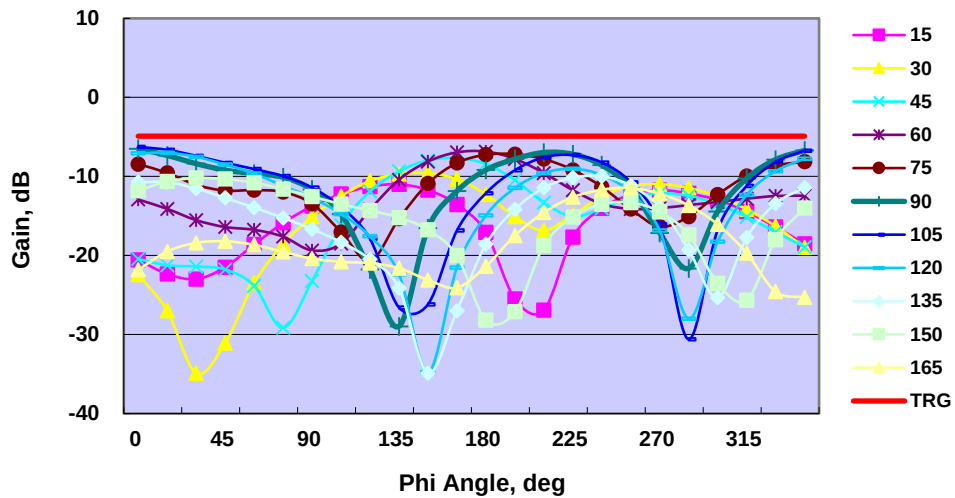
Theta-Polarization Gain



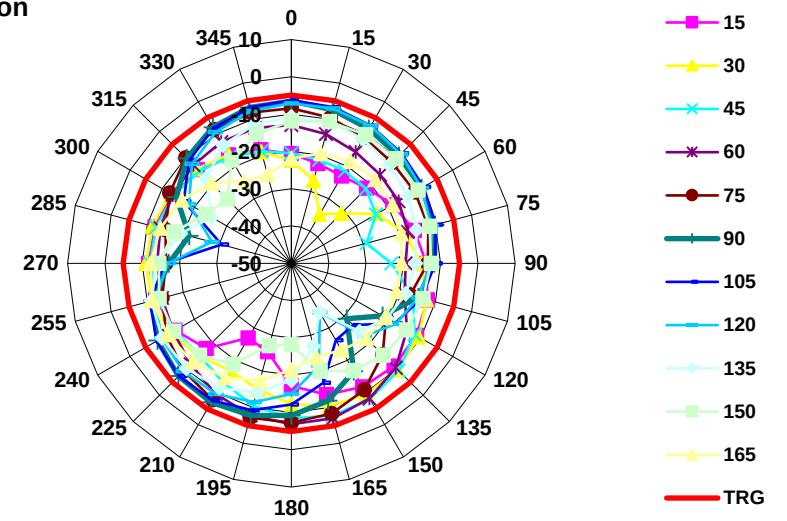
Theta-Polarization Gain



Phi-Polarization Gain



Phi-Polarization Gain

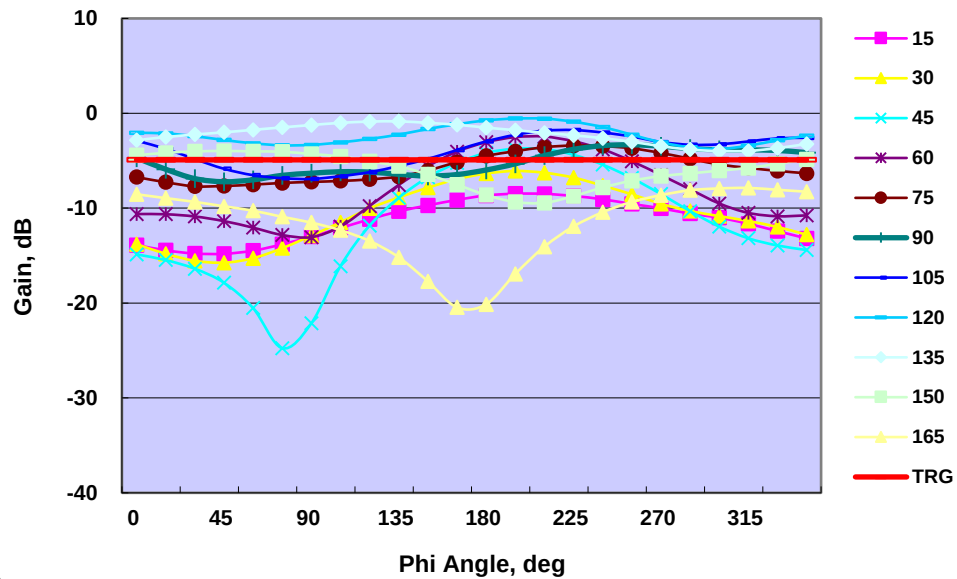


Total Radiated Gain and Efficiency -4.903 dB 32.340 %

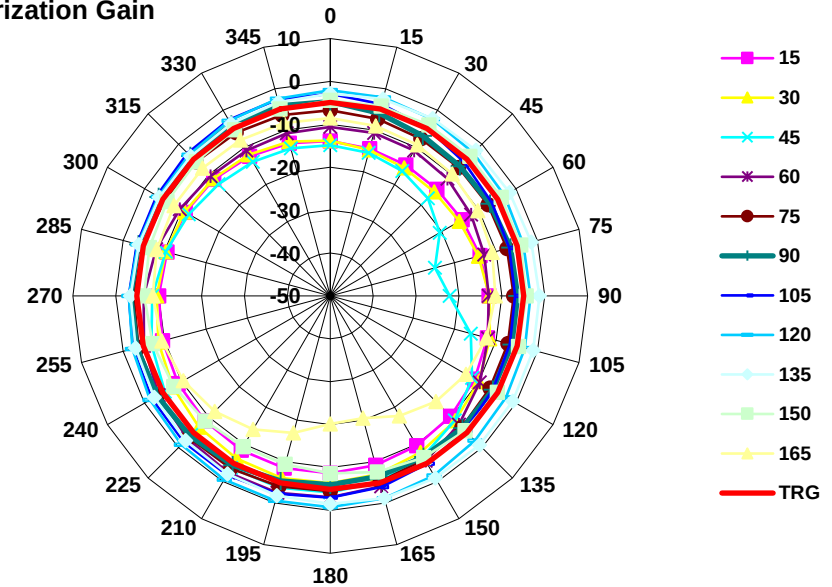
Theta -5.967 dB Phi -11.529 dB

θ_N (deg)	Theta-Polarization + Phi-Polarization Gain(dB)																								$\sum EIRP_{\theta} \times \sin\theta_i$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-13.88	-14.44	-14.78	-14.81	-14.48	-13.81	-12.99	-12.09	-11.17	-10.34	-9.70	-9.13	-8.66	-8.47	-8.49	-8.71	-9.06	-9.55	-10.01	-10.57	-11.00	-11.63	-12.42	-13.18	
30	-13.79	-14.80	-15.54	-15.74	-15.27	-14.22	-12.90	-11.49	-10.02	-8.87	-7.84	-6.94	-6.34	-6.08	-6.26	-6.77	-7.62	-8.53	-9.53	-10.30	-10.83	-11.35	-11.98	-12.79	
45	-14.87	-15.47	-16.38	-17.85	-20.52	-24.75	-22.14	-16.12	-11.84	-8.91	-6.75	-5.23	-4.18	-3.73	-3.76	-4.37	-5.41	-6.82	-8.51	-10.31	-11.94	-13.17	-13.93	-14.41	
60	-10.62	-10.64	-10.87	-11.36	-12.05	-12.83	-13.05	-11.93	-9.77	-7.55	-5.59	-4.04	-3.05	-2.51	-2.45	-2.95	-3.79	-5.05	-6.50	-8.01	-9.50	-10.49	-10.85	-10.76	
75	-6.72	-7.26	-7.70	-7.66	-7.52	-7.34	-7.23	-7.13	-6.96	-6.67	-6.02	-5.16	-4.48	-4.00	-3.57	-3.39	-3.45	-3.69	-4.18	-4.78	-5.40	-5.75	-6.07	-6.32	
90	-4.70	-5.89	-6.88	-7.21	-7.01	-6.54	-6.32	-6.16	-6.20	-6.43	-6.61	-6.45	-5.98	-5.33	-4.46	-3.80	-3.40	-3.32	-3.46	-3.72	-3.84	-3.86	-3.91	-4.14	
105	-2.89	-3.74	-4.82	-5.84	-6.52	-6.84	-6.92	-6.63	-6.21	-5.56	-4.81	-3.87	-2.96	-2.27	-1.83	-1.76	-2.02	-2.44	-3.02	-3.31	-3.27	-2.96	-2.64	-2.58	
120	-2.05	-2.12	-2.41	-2.81	-3.16	-3.37	-3.33	-3.06	-2.70	-2.25	-1.65	-1.16	-0.74	-0.55	-0.56	-0.89	-1.45	-2.25	-3.05	-3.58	-3.76	-3.41	-2.84	-2.37	
135	-2.83	-2.50	-2.24	-2.00	-1.74	-1.48	-1.23	-1.01	-0.87	-0.85	-1.01	-1.21	-1.50	-1.78	-2.05	-2.32	-2.62	-3.00	-3.46	-3.82	-3.98	-3.96	-3.67	-3.23	
150	-4.42	-4.17	-4.02	-3.97	-4.02	-4.05	-4.29	-4.55	-5.05	-5.57	-6.45	-7.51	-8.61	-9.35	-9.44	-8.72	-7.82	-7.10	-6.62	-6.34	-6.04	-5.76	-5.32	-4.85	
165	-8.53	-8.94	-9.33	-9.80	-10.26	-10.91	-11.52	-12.32	-13.45	-15.17	-17.70	-20.45	-20.13	-16.93	-14.06	-11.92	-10.43	-9.34	-8.62	-8.11	-7.92	-7.87	-8.06	-8.26	
180																									

Theta-Polarization + Phi-Polarization Gain



Theta-Polarization + Phi-Polarization Gain



Total Radiated Gain and Efficiency -4.903 dB 32.340 %

Theta -5.967 dB Phi -11.529 dB

2-D Gain and 3-D Plots

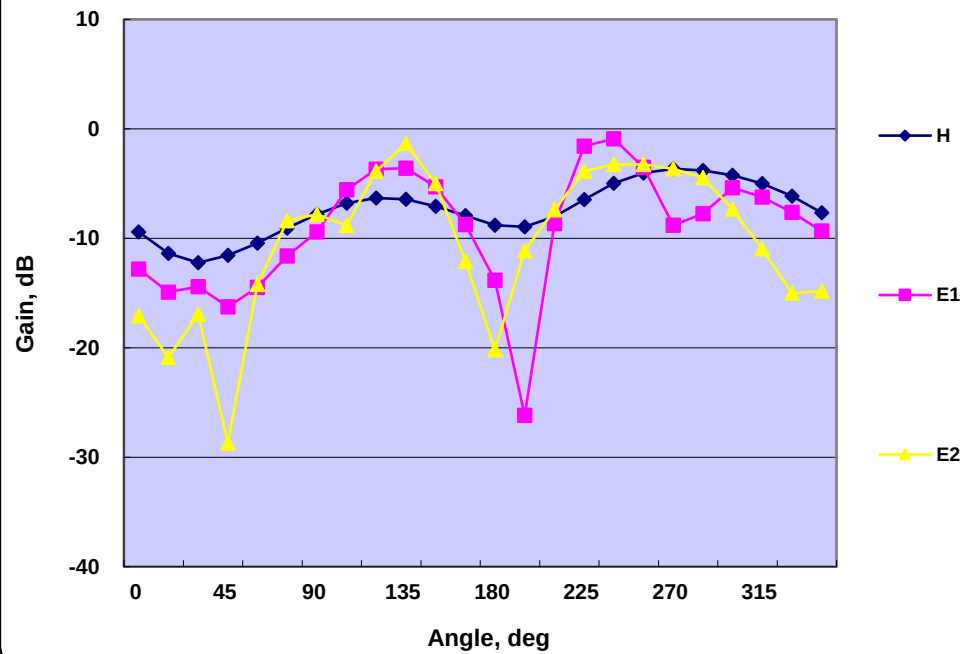
2405MHz Efficiency

2-D Plots

	0	15	30	45	60	75	90	105	120	135	150	165
H	-9.42	-11.37	-12.23	-11.56	-10.44	-9.06	-7.82	-6.80	-6.32	-6.45	-7.08	-7.93
E1	-12.81	-14.93	-14.43	-16.27	-14.47	-11.60	-9.42	-5.57	-3.69	-3.60	-5.30	-8.74
E2	-17.08	-20.89	-16.93	-28.71	-14.21	-8.41	-7.82	-8.82	-3.86	-1.36	-5.00	-12.12
	180	195	210	225	240	255	270	285	300	315	330	345
H	-8.80	-8.95	-8.03	-6.46	-4.98	-4.04	-3.65	-3.79	-4.24	-4.99	-6.15	-7.65
E1	-13.83	-26.19	-8.66	-1.59	-0.91	-3.52	-8.80	-7.75	-5.39	-6.23	-7.63	-9.33
E2	-20.17	-11.15	-7.40	-3.87	-3.24	-3.24	-3.65	-4.45	-7.35	-10.98	-15.01	-14.84

Average H -6.78 dB E1 -6.66 dB E2 -7 dB

2-D Gain(H, E1, E2)



3-D Plots

Peak Gain	-0.55 dB,	$\theta = 120$ deg,	$\phi = 195$ deg
Min Gain	-24.75 dB,	$\theta = 45$ deg,	$\phi = 75$ deg

Total Radiated Gain and Efficiency -4.903 dB 32.340 %

Theta -5.967 dB Phi -11.529 dB

Efficiency(Theta-Polarization and Phi-Polarization)

2410MHz Efficiency

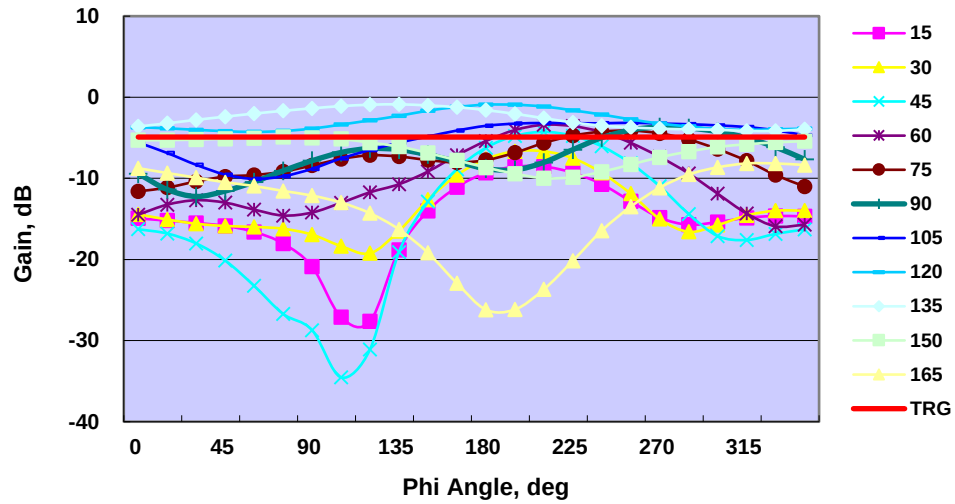
EUT		Frequency	2410	MHz	Comment		Antenna Matching	
IMEI		Antenna Type					Type	
Test Date	Thu 02/Feb/2023 11:03:29						Z1	
Test Condition	FS						Z2	
Tester							Z3	

Theta-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\theta \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0	-13.05						-17.04						-13.52						-18.65						
15	-15.27	-15.53	-15.76	-16.06	-16.71	-18.05	-20.78	-26.94	-28.99	-19.35	-14.34	-11.34	-9.63	-8.72	-8.71	-9.37	-10.93	-13.00	-14.78	-15.51	-15.19	-14.80	-14.74	-14.94	
30	-14.40	-15.20	-15.82	-16.17	-16.31	-16.53	-17.15	-18.45	-19.12	-16.36	-12.51	-9.39	-7.58	-6.66	-6.66	-7.53	-9.37	-11.91	-14.84	-15.96	-15.10	-14.10	-13.68	-13.82	
45	-16.34	-16.95	-18.29	-20.40	-23.53	-26.47	-27.83	-32.29	-32.55	-19.42	-13.04	-8.77	-6.23	-4.78	-4.36	-4.78	-6.14	-8.27	-11.06	-14.54	-16.99	-17.20	-16.54	-16.15	
60	-14.59	-13.36	-12.88	-13.16	-14.02	-14.82	-14.47	-13.29	-12.14	-10.72	-9.22	-7.26	-5.38	-4.02	-3.48	-3.60	-4.44	-5.82	-7.56	-9.79	-12.22	-14.64	-16.12	-15.86	
75	-11.86	-11.44	-10.35	-9.93	-9.79	-9.43	-8.62	-7.86	-7.48	-7.41	-7.86	-8.30	-7.92	-6.87	-5.80	-5.00	-4.45	-4.38	-4.75	-5.54	-6.77	-8.26	-10.13	-11.44	
90	-9.98	-11.76	-12.38	-11.71	-10.78	-9.31	-7.97	-7.02	-6.68	-6.75	-7.35	-8.31	-9.22	-9.40	-8.38	-6.66	-5.21	-4.19	-3.78	-3.88	-4.43	-5.24	-6.45	-8.06	
105	-5.84	-7.19	-8.68	-10.04	-10.65	-10.25	-9.19	-7.88	-6.79	-5.86	-5.05	-4.25	-3.66	-3.36	-3.25	-3.26	-3.27	-3.26	-3.24	-3.38	-3.59	-3.85	-4.27	-4.89	
120	-3.96	-4.10	-4.24	-4.43	-4.55	-4.42	-4.13	-3.65	-3.03	-2.38	-1.81	-1.30	-1.04	-0.97	-1.19	-1.71	-2.22	-2.83	-3.40	-3.81	-4.08	-4.22	-4.21	-4.07	
135	-3.62	-3.27	-2.84	-2.50	-2.10	-1.77	-1.44	-1.15	-1.00	-0.96	-1.06	-1.26	-1.62	-2.05	-2.59	-3.13	-3.54	-3.80	-3.99	-4.05	-4.09	-4.26	-4.26	-4.10	
150	-5.44	-5.26	-5.23	-5.11	-5.00	-4.88	-5.02	-5.26	-5.61	-6.11	-6.87	-7.68	-8.54	-9.43	-9.87	-9.69	-9.15	-8.22	-7.32	-6.70	-6.19	-5.83	-5.55	-5.41	
165	-8.71	-9.34	-9.91	-10.41	-11.10	-11.56	-12.17	-13.07	-14.38	-16.35	-19.12	-22.70	-25.56	-25.52	-23.14	-19.88	-16.34	-13.42	-11.17	-9.57	-8.72	-8.12	-8.20	-8.40	
180	-13.59						-21.41						-13.79						-20.74						

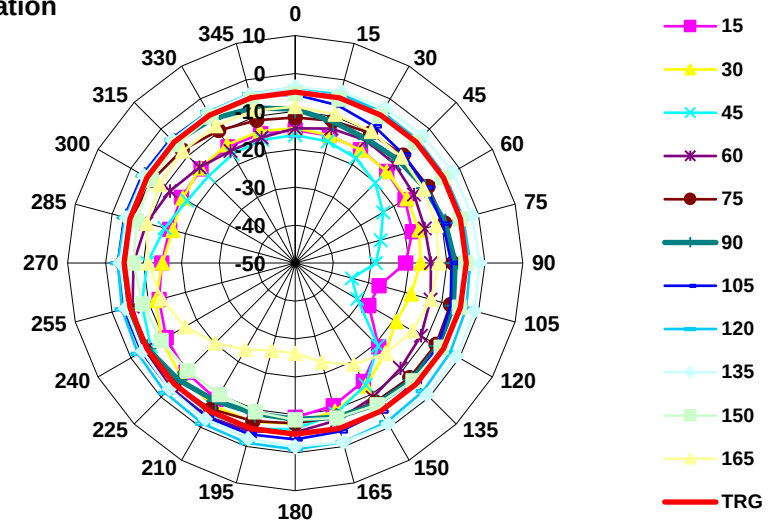
Phi-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\theta \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-20.04	-21.55	-22.41	-21.38	-18.75	-16.03	-13.91	-12.41	-11.28	-11.20	-11.99	-13.74	-17.30	-25.46	-26.70	-17.85	-14.25	-12.57	-12.06	-12.38	-13.34	-14.80	-16.59	-18.38	
30	-22.43	-26.89	-33.54	-30.54	-23.40	-18.61	-15.17	-12.67	-10.77	-9.88	-9.86	-10.63	-12.69	-15.69	-17.16	-14.78	-12.41	-11.23	-10.98	-11.51	-12.68	-14.38	-16.54	-19.24	
45	-21.14	-21.81	-21.76	-21.98	-24.25	-30.99	-23.77	-16.37	-12.05	-9.41	-8.18	-7.85	-8.74	-10.81	-13.56	-15.14	-13.94	-12.59	-12.10	-12.49	-13.62	-15.33	-17.43	-19.48	
60	-13.34	-14.46	-15.84	-16.63	-16.97	-17.91	-19.90	-19.05	-14.40	-10.63	-8.24	-7.11	-6.98	-7.99	-9.85	-11.87	-13.56	-14.19	-14.10	-13.82	-13.48	-13.14	-12.83	-12.82	
75	-8.52	-9.70	-11.13	-12.07	-12.00	-12.26	-13.79	-17.44	-20.83	-15.17	-10.77	-8.35	-7.34	-7.15	-7.95	-9.29	-11.41	-14.39	-16.59	-15.19	-12.40	-10.22	-8.74	-8.18	
90	-6.74	-7.34	-8.42	-9.35	-9.70	-10.35	-12.01	-15.17	-22.66	-27.23	-16.09	-11.66	-9.33	-7.65	-7.02	-7.24	-8.61	-11.57	-17.28	-21.47	-14.42	-10.33	-7.95	-6.81	
105	-6.33	-6.61	-7.30	-8.27	-9.05	-9.89	-11.56	-14.11	-18.34	-27.88	-25.31	-16.53	-12.01	-9.20	-7.68	-7.36	-8.38	-10.71	-16.23	-28.98	-16.51	-11.05	-8.27	-6.77	
120	-6.97	-7.02	-7.64	-8.53	-9.68	-10.98	-12.85	-14.93	-17.85	-22.95	-36.32	-21.08	-14.78	-11.24	-9.50	-8.97	-9.83	-12.27	-17.17	-29.56	-18.11	-12.24	-9.40	-7.81	
135	-10.67	-10.77	-11.44	-12.65	-13.90	-15.21	-16.61	-18.24	-20.45	-24.13	-34.56	-26.66	-18.50	-14.18	-11.47	-10.10	-10.03	-11.08	-14.00	-19.47	-25.53	-17.71	-13.39	-11.34	
150	-11.80	-10.78	-10.19	-10.34	-10.77	-11.56	-12.50	-13.52	-14.48	-15.53	-17.19	-20.60	-29.09	-26.90	-18.79	-15.23	-13.63	-13.48	-14.70	-17.75	-24.38	-25.60	-17.82	-13.94	
165	-21.97	-19.51	-18.41	-18.15	-18.57	-19.53	-20.55	-21.17	-21.54	-22.26	-23.78	-24.59	-21.45	-17.55	-14.62	-12.72	-11.71	-11.52	-12.27	-13.70	-16.14	-19.89	-25.17	-25.85	
180																									

Total Radiated Gain and Efficiency	-5.030 dB	31.405 %	Theta	-6.107 dB	Phi	-11.615 dB
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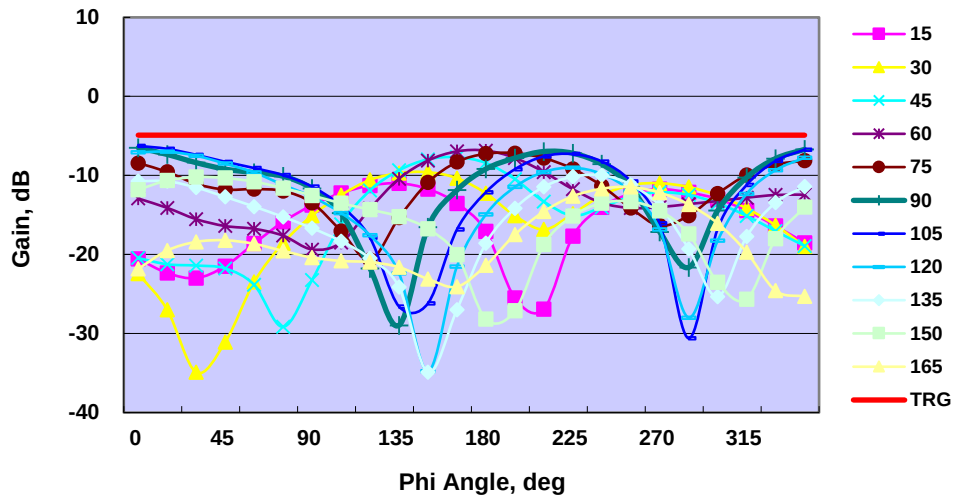
Theta-Polarization Gain



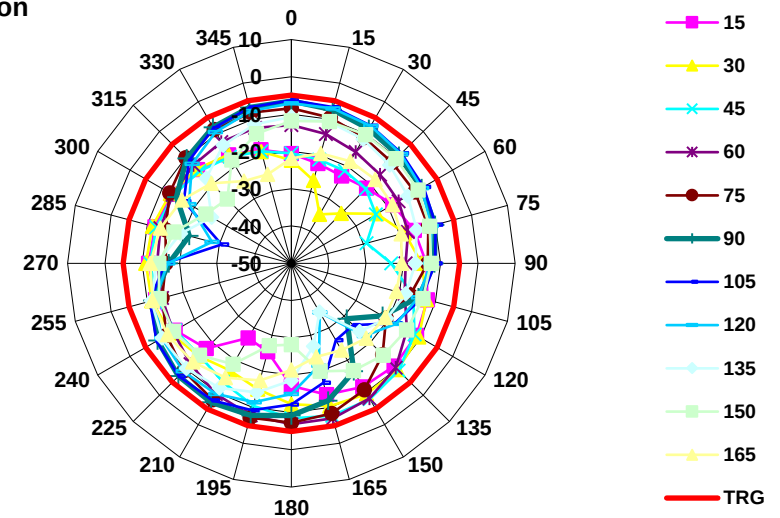
Theta-Polarization Gain



Phi-Polarization Gain



Phi-Polarization Gain

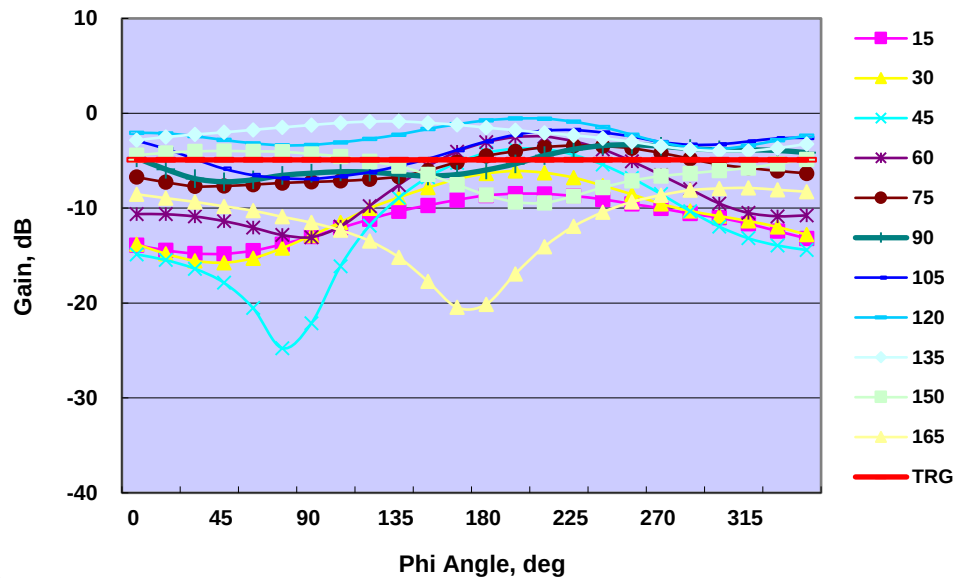


Total Radiated Gain and Efficiency -5.030 dB 31.405 %

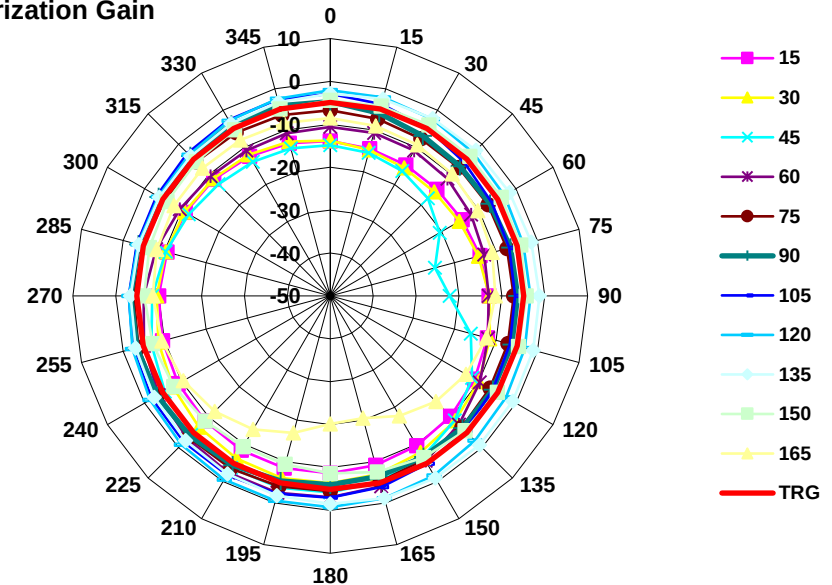
Theta -6.107 dB Phi -11.615 dB

θ_N (deg)	Theta-Polarization + Phi-Polarization Gain(dB)																								$\sum EIRP_{\theta} \times \sin\theta_i$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-14.02	-14.56	-14.91	-14.94	-14.60	-13.91	-13.10	-12.26	-11.21	-10.58	-10.00	-9.37	-8.94	-8.63	-8.64	-8.79	-9.27	-9.77	-10.20	-10.66	-11.16	-11.79	-12.56	-13.32	
30	-13.77	-14.92	-15.75	-16.01	-15.53	-14.44	-13.04	-11.65	-10.18	-9.00	-7.98	-6.96	-6.41	-6.15	-6.29	-6.78	-7.62	-8.55	-9.48	-10.18	-10.71	-11.23	-11.87	-12.72	
45	-15.10	-15.72	-16.68	-18.11	-20.86	-25.16	-22.33	-16.26	-12.01	-9.00	-6.95	-5.28	-4.30	-3.81	-3.87	-4.40	-5.47	-6.90	-8.54	-10.38	-11.98	-13.15	-13.95	-14.49	
60	-10.91	-10.86	-11.10	-11.55	-12.24	-13.09	-13.38	-12.27	-10.11	-7.66	-5.69	-4.17	-3.10	-2.56	-2.58	-3.00	-3.94	-5.23	-6.69	-8.34	-9.79	-10.82	-11.16	-11.07	
75	-6.87	-7.47	-7.71	-7.86	-7.75	-7.61	-7.47	-7.41	-7.28	-6.74	-6.07	-5.31	-4.61	-4.00	-3.73	-3.63	-3.65	-3.97	-4.47	-5.09	-5.72	-6.12	-6.37	-6.50	
90	-5.05	-6.00	-6.95	-7.36	-7.20	-6.79	-6.53	-6.40	-6.57	-6.71	-6.81	-6.66	-6.26	-5.43	-4.64	-3.93	-3.58	-3.46	-3.59	-3.81	-4.02	-4.07	-4.13	-4.38	
105	-3.07	-3.88	-4.93	-6.06	-6.77	-7.06	-7.20	-6.95	-6.50	-5.83	-5.01	-4.00	-3.07	-2.35	-1.91	-1.83	-2.10	-2.54	-3.03	-3.37	-3.37	-3.09	-2.81	-2.72	
120	-2.20	-2.31	-2.61	-3.00	-3.39	-3.55	-3.58	-3.34	-2.89	-2.34	-1.81	-1.25	-0.86	-0.58	-0.59	-0.96	-1.53	-2.36	-3.22	-3.80	-3.91	-3.58	-3.06	-2.54	
135	-2.84	-2.56	-2.28	-2.10	-1.82	-1.58	-1.31	-1.07	-0.95	-0.94	-1.06	-1.25	-1.53	-1.79	-2.06	-2.33	-2.66	-3.06	-3.58	-3.93	-4.06	-4.07	-3.76	-3.35	
150	-4.54	-4.19	-4.03	-3.97	-3.98	-4.04	-4.31	-4.66	-5.08	-5.64	-6.48	-7.46	-8.50	-9.35	-9.35	-8.62	-7.83	-7.09	-6.59	-6.37	-6.12	-5.78	-5.30	-4.84	
165	-8.51	-8.94	-9.34	-9.73	-10.38	-10.92	-11.58	-12.44	-13.62	-15.36	-17.84	-20.53	-20.03	-16.91	-14.05	-11.96	-10.42	-9.36	-8.67	-8.15	-8.00	-7.84	-8.11	-8.32	
180																									

Theta-Polarization + Phi-Polarization Gain



Theta-Polarization + Phi-Polarization Gain



Total Radiated Gain and Efficiency -5.030 dB 31.405 %

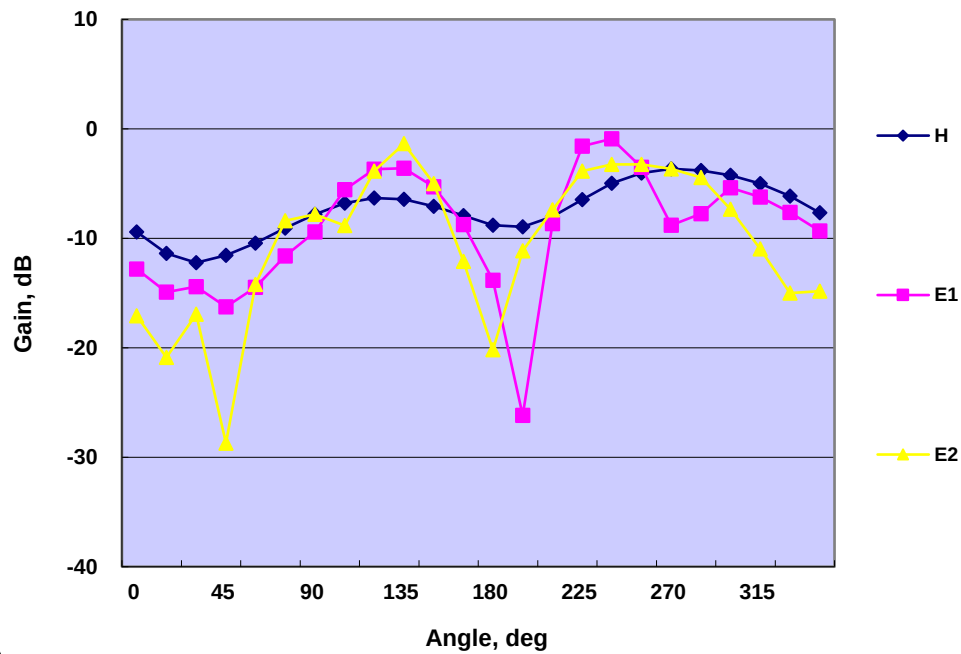
Theta -6.107 dB Phi -11.615 dB

2-D Plots

	0	15	30	45	60	75	90	105	120	135	150	165
H	-9.98	-11.76	-12.38	-11.71	-10.78	-9.31	-7.97	-7.02	-6.68	-6.75	-7.35	-8.31
E1	-13.05	-15.27	-14.40	-16.34	-14.59	-11.86	-9.98	-5.84	-3.96	-3.62	-5.44	-8.71
E2	-17.04	-20.78	-17.15	-27.83	-14.47	-8.62	-7.97	-9.19	-4.13	-1.44	-5.02	-12.17
	180	195	210	225	240	255	270	285	300	315	330	345
H	-9.22	-9.40	-8.38	-6.66	-5.21	-4.19	-3.78	-3.88	-4.43	-5.24	-6.45	-8.06
E1	-13.79	-25.56	-8.54	-1.62	-1.04	-3.66	-9.22	-7.92	-5.38	-6.23	-7.58	-9.63
E2	-20.74	-11.17	-7.32	-3.99	-3.40	-3.24	-3.78	-4.75	-7.56	-11.06	-14.84	-14.78

Average H -7.03 dB E1 -6.78 dB E2 -7.12 dB

2-D Gain(H, E1, E2)



3-D Plots

Peak Gain	-0.58 dB,	$\theta = 120$ deg,	$\phi = 195$ deg
Min Gain	-25.16 dB,	$\theta = 45$ deg,	$\phi = 75$ deg

Total Radiated Gain and Efficiency -5.030 dB 31.405 %

Theta -6.107 dB Phi -11.615 dB

Efficiency(Theta-Polarization and Phi-Polarization)

2420MHz Efficiency

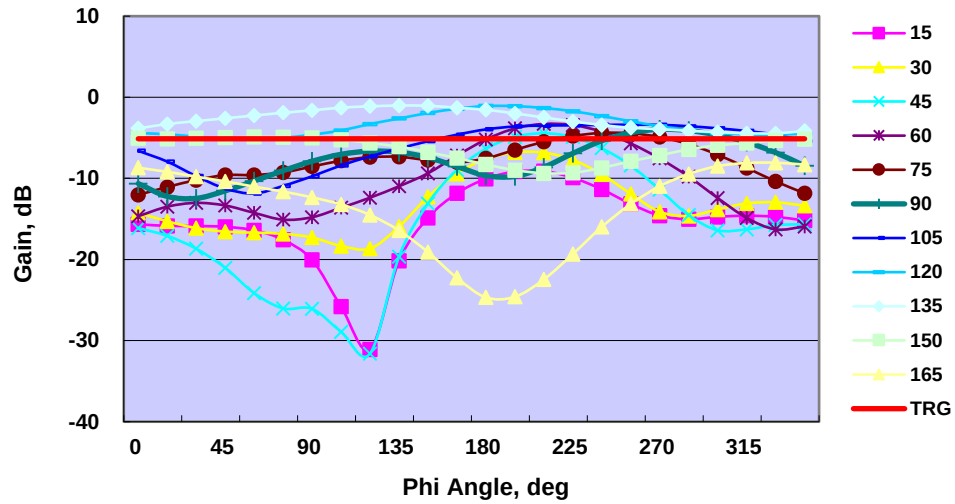
EUT		Frequency	2420	MHz	Comment		Antenna Matching	
IMEI		Antenna Type					Type	
Test Date	Thu 02/Feb/2023 11:03:29						Z1	
Test Condition	FS						Z2	
Tester							Z3	

Theta-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\theta \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0	-13.42						-16.94						-13.96						-18.21						
15	-15.65	-15.86	-15.87	-15.97	-16.40	-17.57	-20.06	-25.81	-31.11	-20.17	-14.87	-11.85	-10.06	-9.17	-9.11	-9.92	-11.35	-13.15	-14.59	-15.03	-14.74	-14.60	-14.74	-15.20	
30	-14.23	-15.29	-16.13	-16.56	-16.69	-16.83	-17.29	-18.33	-18.66	-15.95	-12.27	-9.41	-7.61	-6.80	-6.83	-7.72	-9.50	-11.91	-14.12	-14.63	-13.83	-13.09	-12.95	-13.37	
45	-16.12	-17.09	-18.67	-21.02	-24.14	-26.03	-26.08	-28.92	-31.60	-19.65	-13.11	-8.94	-6.35	-4.88	-4.45	-4.90	-6.29	-8.42	-11.40	-14.53	-16.40	-16.28	-15.76	-15.65	
60	-14.66	-13.49	-13.02	-13.34	-14.25	-15.09	-14.79	-13.62	-12.38	-10.97	-9.37	-7.19	-5.21	-3.84	-3.29	-3.42	-4.25	-5.69	-7.55	-9.78	-12.42	-14.87	-16.29	-15.95	
75	-12.03	-11.07	-10.20	-9.60	-9.58	-9.27	-8.54	-7.82	-7.38	-7.34	-7.75	-8.02	-7.53	-6.49	-5.49	-4.78	-4.39	-4.44	-4.90	-5.78	-7.08	-8.70	-10.37	-11.84	
90	-10.64	-12.22	-12.46	-11.54	-10.32	-9.05	-7.89	-7.03	-6.64	-6.77	-7.42	-8.54	-9.66	-9.75	-8.62	-6.92	-5.36	-4.37	-3.95	-4.10	-4.66	-5.53	-6.82	-8.45	
105	-6.60	-7.93	-9.72	-11.25	-11.87	-10.93	-9.74	-8.40	-7.30	-6.32	-5.42	-4.61	-3.96	-3.60	-3.49	-3.46	-3.41	-3.38	-3.40	-3.57	-3.83	-4.16	-4.61	-5.40	
120	-4.42	-4.56	-4.86	-5.07	-5.19	-5.00	-4.61	-4.09	-3.30	-2.62	-1.94	-1.41	-1.08	-1.09	-1.33	-1.72	-2.31	-2.96	-3.57	-4.06	-4.40	-4.58	-4.60	-4.49	
135	-3.84	-3.30	-2.94	-2.59	-2.25	-1.91	-1.61	-1.28	-1.12	-1.02	-1.05	-1.29	-1.55	-1.99	-2.49	-2.98	-3.42	-3.76	-3.93	-4.13	-4.29	-4.44	-4.44	-4.16	
150	-5.06	-5.11	-5.03	-4.97	-4.89	-4.92	-5.02	-5.23	-5.65	-6.08	-6.77	-7.50	-8.29	-8.98	-9.37	-9.31	-8.71	-7.88	-7.17	-6.41	-5.93	-5.64	-5.32	-5.17	
165	-8.69	-9.19	-9.79	-10.37	-11.02	-11.63	-12.34	-13.21	-14.51	-16.42	-19.09	-22.27	-24.68	-24.60	-22.46	-19.33	-15.98	-13.15	-10.96	-9.45	-8.49	-8.10	-8.07	-8.31	
180	-13.46						-21.19						-13.49						-21.72						

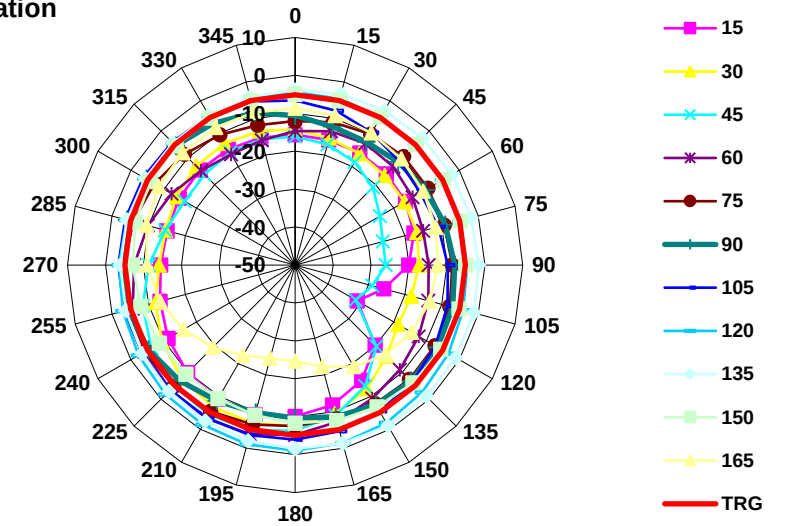
Phi-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\phi \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-18.73	-19.95	-21.22	-21.12	-19.01	-16.35	-14.17	-12.63	-11.80	-11.62	-12.20	-13.95	-17.43	-25.13	-26.32	-18.04	-14.52	-12.91	-12.43	-12.82	-13.74	-15.08	-16.47	-17.68	
30	-22.46	-26.12	-30.59	-29.20	-23.21	-18.57	-15.21	-12.73	-10.99	-10.14	-10.13	-11.11	-13.38	-16.80	-17.70	-14.51	-12.08	-11.02	-10.80	-11.55	-12.79	-14.58	-16.83	-19.47	
45	-22.33	-22.82	-22.43	-22.48	-24.84	-35.13	-24.17	-16.41	-12.12	-9.46	-8.12	-7.87	-8.71	-10.91	-13.97	-15.13	-13.61	-12.23	-11.86	-12.37	-13.65	-15.61	-18.01	-20.43	
60	-13.87	-14.98	-16.19	-16.78	-17.12	-18.41	-21.10	-19.92	-14.55	-10.52	-8.12	-6.94	-6.98	-8.05	-9.78	-11.86	-13.48	-14.09	-14.09	-13.96	-13.83	-13.65	-13.44	-13.41	
75	-8.87	-10.04	-11.75	-12.43	-12.22	-12.43	-14.03	-17.89	-20.80	-14.79	-10.49	-8.01	-6.96	-7.04	-7.66	-9.13	-11.29	-14.54	-16.98	-15.46	-12.60	-10.42	-9.05	-8.43	
90	-6.63	-7.33	-8.52	-9.56	-10.07	-10.73	-12.21	-15.58	-23.85	-24.75	-15.26	-11.14	-8.72	-7.43	-6.84	-7.13	-8.60	-11.60	-17.22	-21.10	-14.32	-10.25	-7.93	-6.76	
105	-6.10	-6.41	-7.16	-8.18	-9.16	-10.14	-11.77	-14.36	-18.91	-30.29	-23.80	-15.89	-11.60	-8.87	-7.53	-7.29	-8.34	-10.97	-16.26	-26.66	-15.93	-10.64	-7.91	-6.51	
120	-6.69	-6.81	-7.36	-8.35	-9.67	-11.21	-13.03	-15.17	-18.28	-23.92	-37.22	-20.19	-14.26	-10.99	-9.28	-9.05	-9.93	-12.37	-17.57	-32.40	-17.62	-11.88	-8.93	-7.40	
135	-10.34	-10.51	-11.28	-12.37	-13.59	-14.91	-16.33	-17.96	-20.10	-23.75	-32.46	-25.67	-18.12	-13.96	-11.50	-10.30	-10.20	-11.33	-14.05	-19.76	-26.42	-17.55	-13.20	-11.12	
150	-11.65	-10.54	-9.99	-10.03	-10.40	-11.07	-12.13	-13.30	-14.57	-15.97	-17.94	-21.67	-30.95	-25.85	-18.58	-15.24	-13.78	-13.71	-15.07	-18.47	-26.30	-25.04	-17.36	-13.67	
165	-21.86	-19.30	-18.09	-17.72	-18.06	-18.96	-20.10	-21.23	-22.11	-23.32	-25.24	-25.58	-21.62	-17.47	-14.50	-12.62	-11.65	-11.48	-12.11	-13.59	-16.06	-19.99	-25.91	-26.32	
180																									

Total Radiated Gain and Efficiency	-5.117 dB	30.785 %	Theta	-6.232 dB	Phi	-11.567 dB
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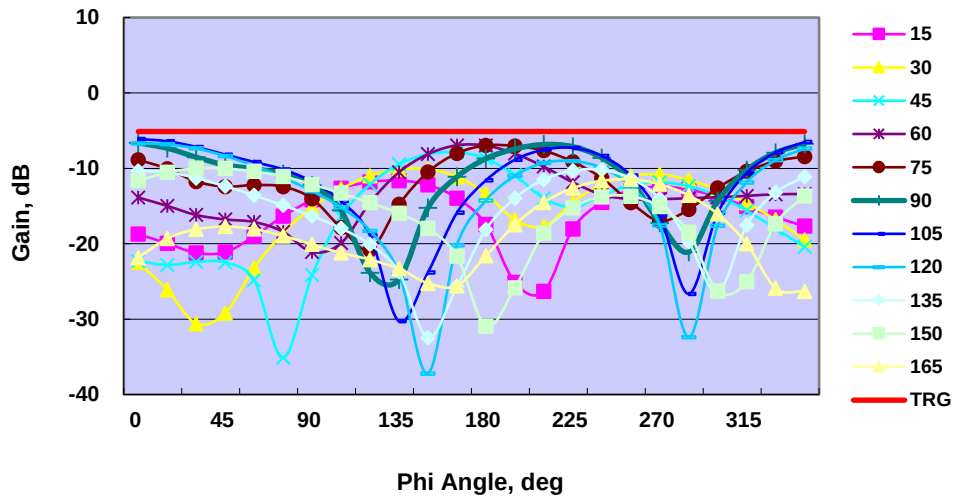
Theta-Polarization Gain



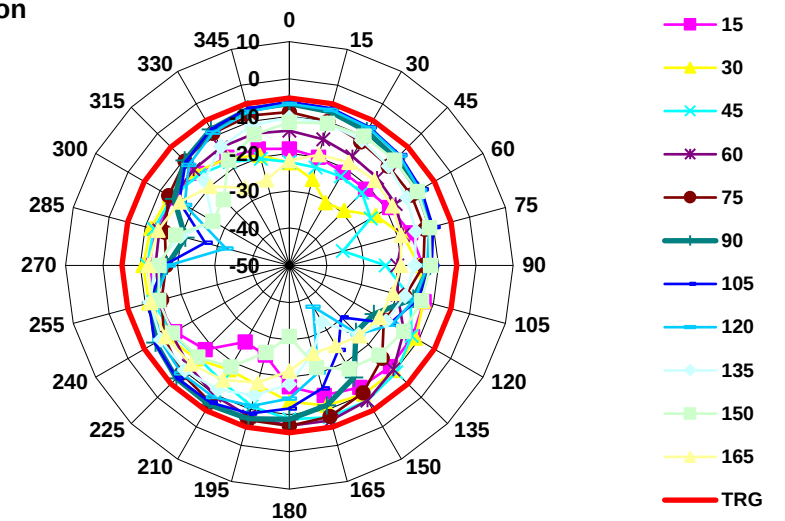
Theta-Polarization Gain



Phi-Polarization Gain



Phi-Polarization Gain

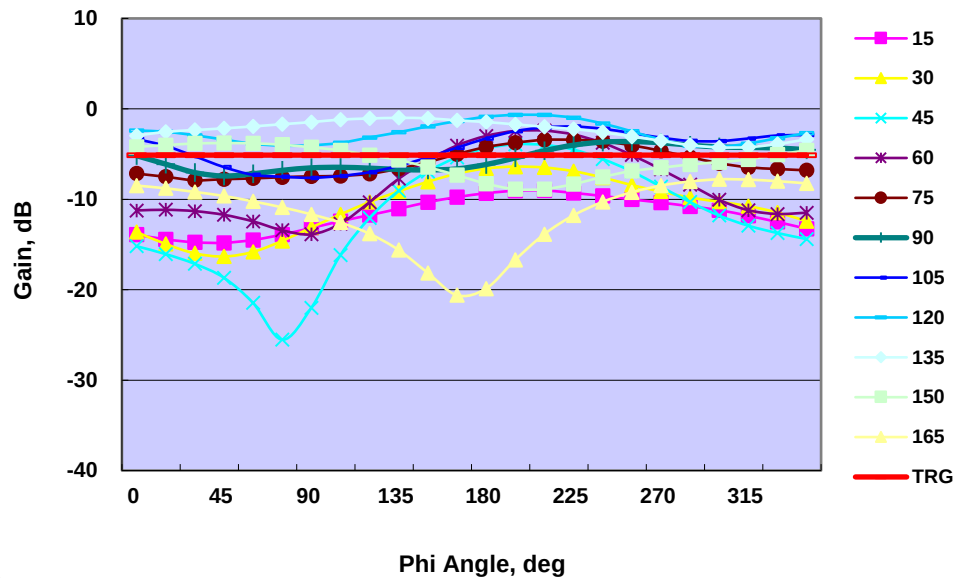


Total Radiated Gain and Efficiency -5.117 dB 30.785 %

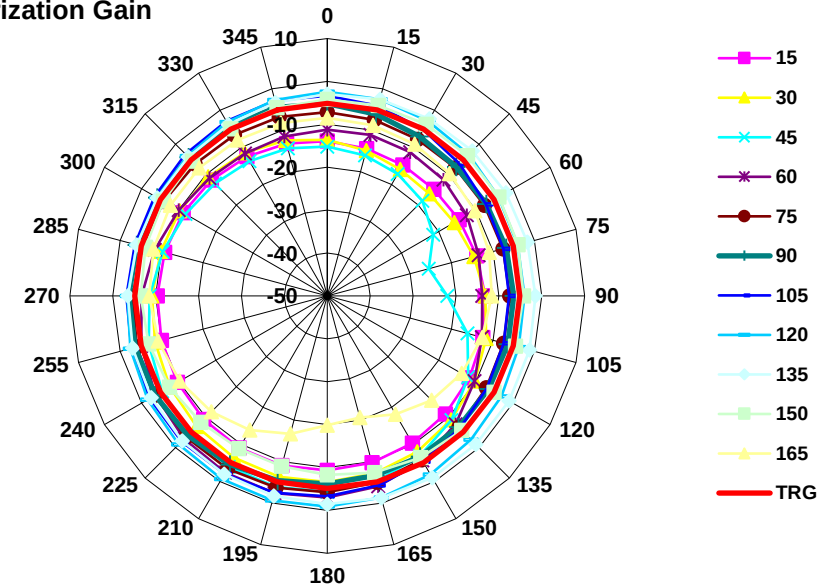
Theta -6.232 dB Phi -11.567 dB

θ_N (deg)	Theta-Polarization + Phi-Polarization Gain(dB)																								$\sum EIRP_{\theta} \times \sin\theta_i$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-13.91	-14.43	-14.76	-14.81	-14.50	-13.91	-13.17	-12.43	-11.75	-11.05	-10.32	-9.76	-9.33	-9.06	-9.03	-9.30	-9.64	-10.02	-10.37	-10.78	-11.20	-11.82	-12.51	-13.26	
30	-13.62	-14.95	-15.98	-16.33	-15.82	-14.60	-13.12	-11.67	-10.30	-9.13	-8.06	-7.17	-6.59	-6.39	-6.49	-6.89	-7.59	-8.43	-9.14	-9.81	-10.27	-10.76	-11.46	-12.42	
45	-15.19	-16.06	-17.14	-18.68	-21.47	-25.53	-22.01	-16.17	-12.07	-9.06	-6.92	-5.36	-4.36	-3.91	-3.99	-4.51	-5.55	-6.91	-8.61	-10.31	-11.80	-12.92	-13.73	-14.40	
60	-11.24	-11.16	-11.31	-11.72	-12.44	-13.43	-13.88	-12.71	-10.32	-7.73	-5.69	-4.05	-3.00	-2.44	-2.41	-2.84	-3.76	-5.10	-6.68	-8.38	-10.06	-11.21	-11.62	-11.49	
75	-7.16	-7.51	-7.90	-7.78	-7.69	-7.56	-7.46	-7.41	-7.19	-6.62	-5.90	-5.00	-4.23	-3.75	-3.43	-3.42	-3.58	-4.04	-4.64	-5.34	-6.01	-6.47	-6.65	-6.80	
90	-5.18	-6.11	-7.05	-7.43	-7.18	-6.80	-6.52	-6.46	-6.56	-6.70	-6.76	-6.64	-6.15	-5.43	-4.63	-4.01	-3.67	-3.62	-3.75	-4.01	-4.21	-4.27	-4.33	-4.51	
105	-3.33	-4.09	-5.24	-6.44	-7.30	-7.51	-7.63	-7.42	-7.01	-6.30	-5.36	-4.30	-3.27	-2.47	-2.05	-1.96	-2.20	-2.68	-3.18	-3.55	-3.57	-3.28	-2.94	-2.91	
120	-2.40	-2.53	-2.92	-3.40	-3.87	-4.07	-4.03	-3.76	-3.16	-2.59	-1.94	-1.35	-0.88	-0.67	-0.68	-0.98	-1.62	-2.49	-3.40	-4.05	-4.20	-3.84	-3.24	-2.70	
135	-2.96	-2.54	-2.35	-2.16	-1.94	-1.70	-1.47	-1.19	-1.07	-1.00	-1.05	-1.27	-1.46	-1.72	-1.98	-2.24	-2.59	-3.06	-3.53	-4.01	-4.26	-4.23	-3.90	-3.36	
150	-4.20	-4.02	-3.83	-3.79	-3.81	-3.98	-4.25	-4.60	-5.13	-5.66	-6.45	-7.34	-8.27	-8.89	-8.88	-8.32	-7.53	-6.87	-6.52	-6.15	-5.89	-5.59	-5.06	-4.60	
165	-8.49	-8.79	-9.19	-9.64	-10.24	-10.89	-11.67	-12.57	-13.81	-15.61	-18.15	-20.61	-19.88	-16.70	-13.86	-11.78	-10.29	-9.22	-8.49	-8.03	-7.79	-7.83	-8.00	-8.24	
180																									

Theta-Polarization + Phi-Polarization Gain



Theta-Polarization + Phi-Polarization Gain



Total Radiated Gain and Efficiency -5.117 dB 30.785 %

Theta -6.232 dB Phi -11.567 dB

2-D Gain and 3-D Plots

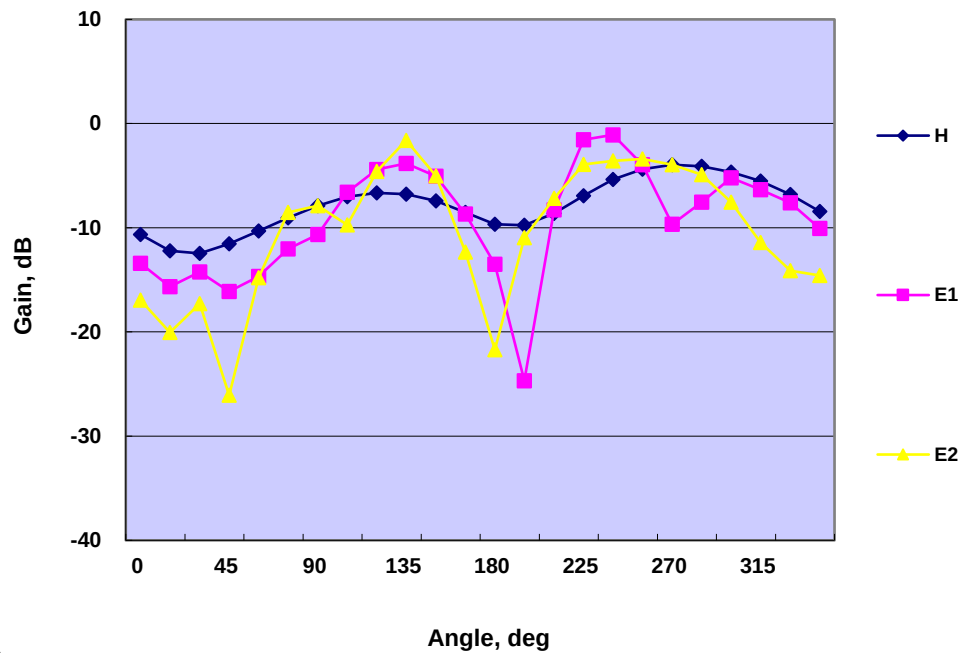
2420MHz Efficiency

2-D Plots

	0	15	30	45	60	75	90	105	120	135	150	165
H	-10.64	-12.22	-12.46	-11.54	-10.32	-9.05	-7.89	-7.03	-6.64	-6.77	-7.42	-8.54
E1	-13.42	-15.65	-14.23	-16.12	-14.66	-12.03	-10.64	-6.60	-4.42	-3.84	-5.06	-8.69
E2	-16.94	-20.06	-17.29	-26.08	-14.79	-8.54	-7.89	-9.74	-4.61	-1.61	-5.02	-12.34
	180	195	210	225	240	255	270	285	300	315	330	345
H	-9.66	-9.75	-8.62	-6.92	-5.36	-4.37	-3.95	-4.10	-4.66	-5.53	-6.82	-8.45
E1	-13.49	-24.68	-8.29	-1.55	-1.08	-3.96	-9.66	-7.53	-5.21	-6.35	-7.61	-10.06
E2	-21.72	-10.96	-7.17	-3.93	-3.57	-3.40	-3.95	-4.90	-7.55	-11.40	-14.12	-14.59

Average H -7.2 dB E1 -6.88 dB E2 -7.24 dB

2-D Gain(H, E1, E2)



3-D Plots

Peak Gain	-0.67 dB,	$\theta = 120$ deg,	$\phi = 195$ deg
Min Gain	-25.53 dB,	$\theta = 45$ deg,	$\phi = 75$ deg

Total Radiated Gain and Efficiency -5.117 dB 30.785 %

Theta -6.232 dB Phi -11.567 dB

Efficiency(Theta-Polarization and Phi-Polarization)

2430MHz Efficiency

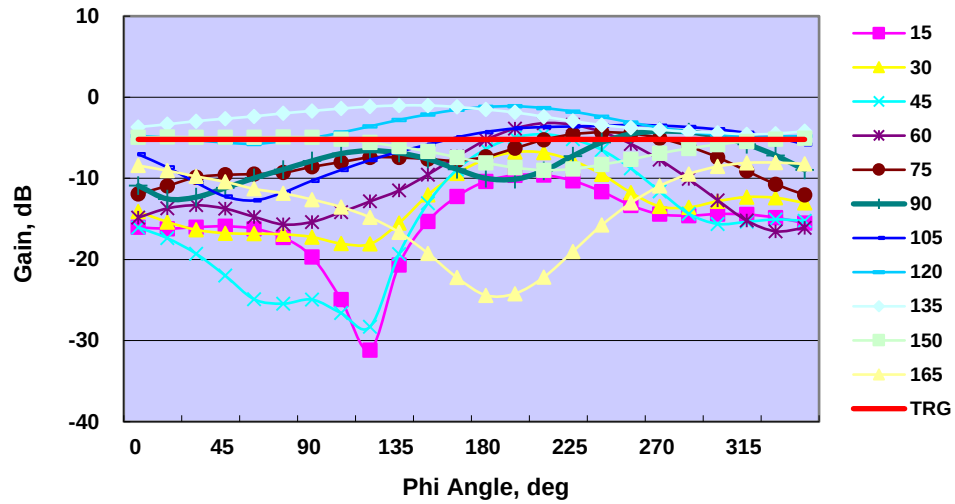
EUT		Frequency	2430	MHz	Comment		Antenna Matching	
IMEI		Antenna Type					Type	
Test Date	Thu 02/Feb/2023 11:03:29						Z1	
Test Condition	FS						Z2	
Tester							Z3	

Theta-Polarization Gain(dB)																								
θ_N (deg)	φ_M (deg)																							
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345
0	-14.10						-17.32						-14.25						-17.62					
15	-16.03	-16.20	-16.01	-15.91	-16.20	-17.28	-19.69	-24.94	-31.18	-20.66	-15.30	-12.23	-10.36	-9.62	-9.59	-10.30	-11.63	-13.32	-14.41	-14.60	-14.39	-14.44	-14.84	-15.51
30	-14.08	-15.37	-16.34	-16.76	-16.82	-16.89	-17.23	-18.04	-18.09	-15.51	-12.04	-9.40	-7.63	-6.76	-6.83	-7.81	-9.50	-11.75	-13.46	-13.58	-12.81	-12.30	-12.39	-13.02
45	-16.04	-17.37	-19.29	-21.98	-24.90	-25.45	-24.95	-26.61	-28.29	-19.34	-13.05	-8.92	-6.38	-4.96	-4.56	-5.16	-6.49	-8.75	-11.59	-14.35	-15.61	-15.36	-15.06	-15.24
60	-14.83	-13.70	-13.31	-13.73	-14.74	-15.68	-15.37	-14.18	-12.84	-11.49	-9.53	-7.31	-5.26	-3.86	-3.19	-3.39	-4.27	-5.74	-7.70	-10.08	-12.69	-15.20	-16.52	-16.11
75	-11.93	-10.93	-9.87	-9.56	-9.48	-9.29	-8.58	-7.99	-7.42	-7.42	-7.62	-7.82	-7.34	-6.29	-5.23	-4.56	-4.31	-4.46	-5.03	-6.06	-7.40	-9.08	-10.72	-12.02
90	-10.90	-12.53	-12.31	-11.18	-9.96	-8.91	-7.84	-6.94	-6.58	-6.86	-7.62	-8.87	-9.99	-10.10	-9.07	-7.24	-5.55	-4.52	-4.19	-4.29	-4.83	-5.78	-7.17	-8.95
105	-7.03	-8.63	-10.52	-12.23	-12.72	-11.74	-10.28	-8.97	-7.75	-6.72	-5.83	-4.94	-4.28	-3.84	-3.67	-3.60	-3.52	-3.41	-3.49	-3.67	-3.96	-4.39	-4.96	-5.79
120	-4.78	-4.94	-5.28	-5.59	-5.75	-5.42	-5.01	-4.35	-3.58	-2.79	-2.11	-1.54	-1.19	-1.10	-1.33	-1.76	-2.41	-3.10	-3.74	-4.24	-4.62	-4.86	-4.82	-4.79
135	-3.67	-3.33	-2.94	-2.64	-2.35	-1.98	-1.68	-1.39	-1.15	-1.01	-1.01	-1.20	-1.51	-1.87	-2.39	-2.93	-3.43	-3.74	-4.00	-4.25	-4.37	-4.57	-4.49	-4.18
150	-4.94	-4.89	-4.93	-4.94	-4.94	-4.91	-4.94	-5.17	-5.57	-6.09	-6.67	-7.40	-8.09	-8.68	-8.99	-8.84	-8.30	-7.67	-6.92	-6.31	-5.82	-5.43	-5.16	-5.03
165	-8.42	-9.04	-9.76	-10.42	-11.29	-11.84	-12.61	-13.53	-14.81	-16.65	-19.25	-22.23	-24.41	-24.21	-22.18	-19.02	-15.76	-13.03	-10.94	-9.46	-8.53	-8.09	-8.05	-8.22
180	-13.26						-20.73						-13.34						-22.62					

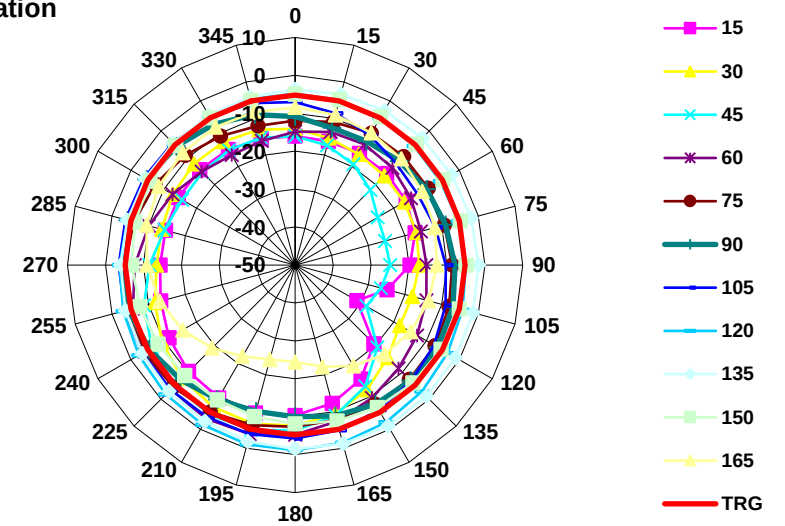
Phi-Polarization Gain(dB)																								
θ_N (deg)	φ_M (deg)																							
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345
0																								
15	-17.50	-18.69	-20.33	-21.33	-19.66	-16.94	-14.60	-13.00	-12.10	-11.89	-12.51	-14.23	-17.71	-25.13	-25.95	-18.26	-14.81	-13.26	-12.83	-13.20	-14.08	-15.19	-16.13	-16.80
30	-21.94	-24.67	-28.15	-28.37	-23.42	-18.81	-15.41	-12.93	-11.33	-10.38	-10.38	-11.54	-14.09	-17.97	-18.25	-14.40	-11.91	-10.82	-10.80	-11.59	-12.97	-14.86	-17.10	-19.54
45	-23.86	-24.21	-23.29	-23.04	-25.45	-39.60	-24.16	-16.42	-12.15	-9.52	-8.15	-7.95	-8.83	-11.17	-14.34	-15.33	-13.47	-12.10	-11.76	-12.38	-13.83	-16.04	-18.89	-21.82
60	-14.47	-15.49	-16.57	-17.04	-17.44	-19.02	-22.29	-20.39	-14.46	-10.49	-8.04	-6.93	-6.99	-8.03	-9.81	-11.89	-13.42	-14.04	-14.18	-14.23	-14.31	-14.27	-14.12	-14.08
75	-9.34	-10.46	-12.09	-12.59	-12.21	-12.43	-14.16	-18.28	-21.01	-14.50	-10.17	-7.83	-6.81	-6.77	-7.52	-8.98	-11.23	-14.51	-17.29	-15.97	-13.01	-10.77	-9.36	-8.75
90	-6.68	-7.54	-8.82	-9.75	-10.17	-10.76	-12.27	-15.71	-24.40	-23.34	-14.67	-10.75	-8.59	-7.26	-6.67	-7.11	-8.48	-11.60	-17.17	-21.06	-14.35	-10.23	-7.97	-6.85
105	-5.81	-6.22	-7.09	-8.29	-9.29	-10.36	-11.98	-14.66	-19.55	-33.57	-22.64	-15.40	-11.35	-8.73	-7.35	-7.21	-8.34	-11.04	-16.41	-25.13	-15.46	-10.39	-7.68	-6.29
120	-6.48	-6.65	-7.38	-8.48	-9.68	-11.46	-13.28	-15.45	-18.64	-24.73	-35.90	-19.59	-13.90	-10.72	-9.19	-8.77	-9.90	-12.42	-17.88	-34.84	-17.23	-11.64	-8.84	-7.29
135	-10.10	-10.20	-11.00	-12.06	-13.31	-14.68	-16.11	-17.70	-19.69	-22.86	-29.64	-25.48	-18.04	-13.92	-11.54	-10.37	-10.27	-11.41	-14.23	-20.37	-28.12	-17.44	-12.98	-10.85
150	-11.43	-10.47	-9.94	-9.92	-10.34	-10.87	-11.88	-13.18	-14.64	-16.37	-18.72	-22.99	-32.81	-24.76	-18.39	-15.37	-14.03	-14.11	-15.75	-19.60	-29.83	-23.82	-16.80	-13.38
165	-21.24	-18.78	-17.53	-17.09	-17.33	-18.13	-19.30	-20.63	-22.05	-24.02	-27.00	-27.24	-21.98	-17.54	-14.57	-12.65	-11.66	-11.50	-12.13	-13.63	-16.22	-20.34	-26.79	-26.10
180																								

Total Radiated Gain and Efficiency	-5.194 dB	30.239 %	Theta	-6.334 dB	Phi	-11.563 dB
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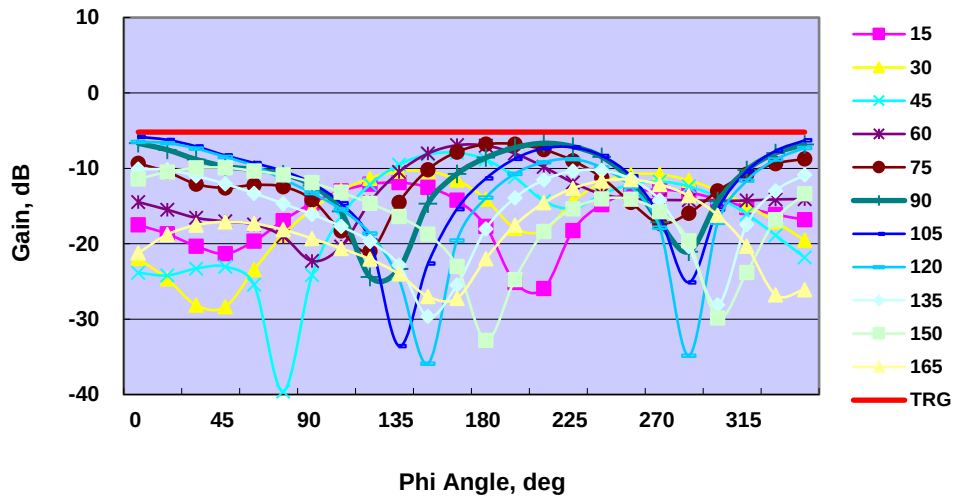
Theta-Polarization Gain



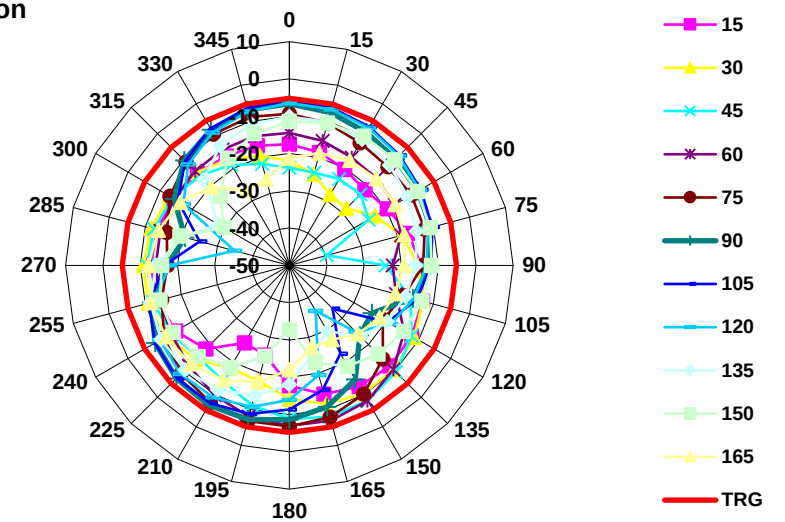
Theta-Polarization Gain



Phi-Polarization Gain



Phi-Polarization Gain

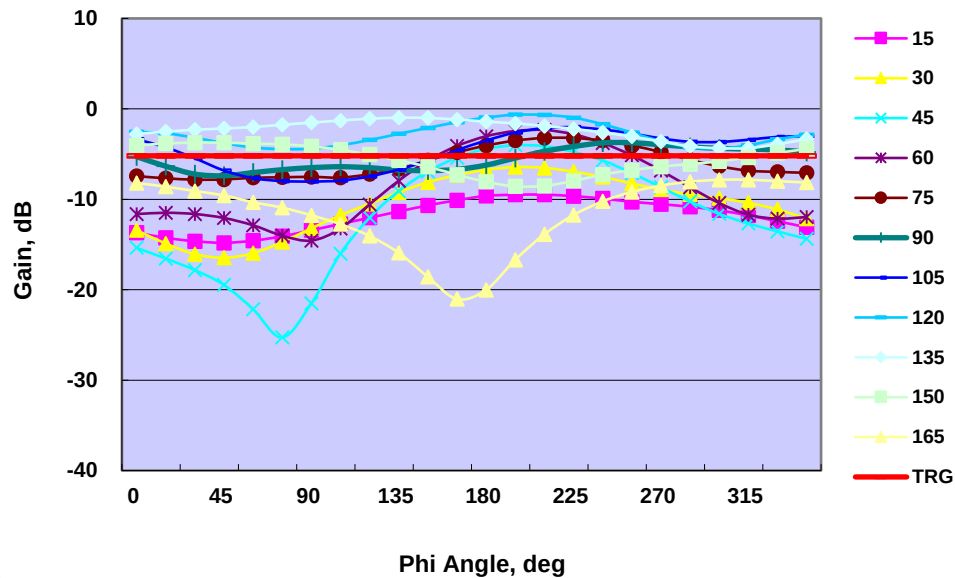


Total Radiated Gain and Efficiency -5.194 dB 30.239 %

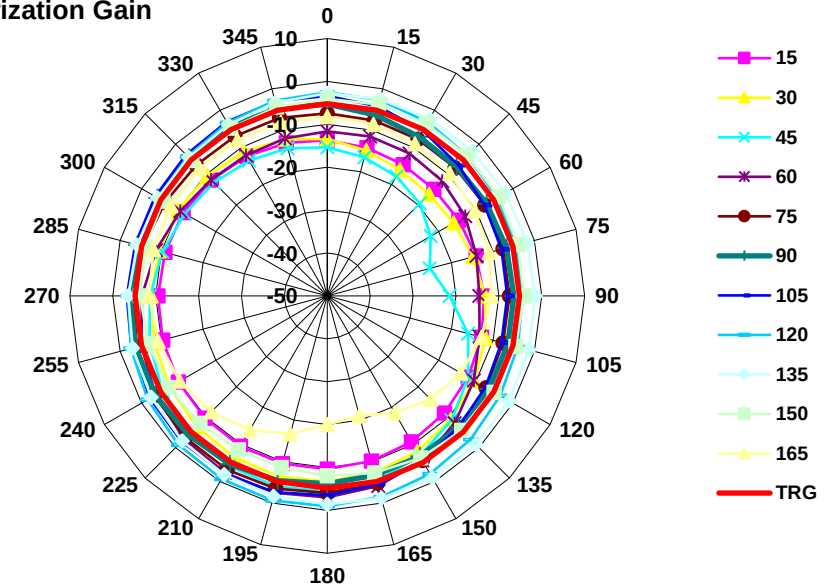
Theta -6.334 dB Phi -11.563 dB

θ_N (deg)	Theta-Polarization + Phi-Polarization Gain(dB)																								$\sum EIRP_{\theta} \times \sin\theta_i$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-13.69	-14.26	-14.64	-14.81	-14.58	-14.10	-13.43	-12.73	-12.05	-11.35	-10.67	-10.11	-9.63	-9.50	-9.49	-9.66	-9.92	-10.28	-10.54	-10.83	-11.22	-11.79	-12.43	-13.10	
30	-13.42	-14.89	-16.06	-16.47	-15.96	-14.73	-13.22	-11.76	-10.50	-9.22	-8.12	-7.33	-6.75	-6.44	-6.53	-6.95	-7.53	-8.25	-8.92	-9.46	-9.88	-10.38	-11.13	-12.15	
45	-15.38	-16.55	-17.83	-19.47	-22.16	-25.29	-21.53	-16.02	-12.05	-9.09	-6.93	-5.40	-4.42	-4.03	-4.13	-4.76	-5.70	-7.10	-8.66	-10.24	-11.62	-12.68	-13.56	-14.38	
60	-11.64	-11.49	-11.63	-12.07	-12.87	-14.03	-14.57	-13.25	-10.56	-7.95	-5.71	-4.11	-3.03	-2.45	-2.33	-2.82	-3.77	-5.14	-6.82	-8.67	-10.41	-11.70	-12.15	-11.97	
75	-7.43	-7.68	-7.83	-7.81	-7.62	-7.57	-7.52	-7.60	-7.23	-6.64	-5.70	-4.81	-4.06	-3.51	-3.22	-3.22	-3.51	-4.05	-4.78	-5.64	-6.35	-6.83	-6.98	-7.07	
90	-5.29	-6.34	-7.21	-7.40	-7.05	-6.73	-6.50	-6.40	-6.51	-6.76	-6.84	-6.70	-6.22	-5.44	-4.70	-4.16	-3.76	-3.74	-3.98	-4.20	-4.37	-4.45	-4.54	-4.76	
105	-3.37	-4.25	-5.46	-6.82	-7.66	-7.99	-8.04	-7.93	-7.47	-6.71	-5.74	-4.57	-3.50	-2.62	-2.12	-2.03	-2.28	-2.72	-3.27	-3.64	-3.66	-3.42	-3.10	-3.02	
120	-2.54	-2.70	-3.19	-3.79	-4.27	-4.45	-4.41	-4.03	-3.45	-2.76	-2.11	-1.47	-0.96	-0.65	-0.67	-0.97	-1.70	-2.62	-3.58	-4.24	-4.39	-4.03	-3.37	-2.85	
135	-2.78	-2.52	-2.31	-2.17	-2.02	-1.75	-1.53	-1.29	-1.09	-0.98	-1.00	-1.18	-1.41	-1.61	-1.89	-2.21	-2.61	-3.05	-3.61	-4.15	-4.35	-4.35	-3.91	-3.33	
150	-4.06	-3.83	-3.74	-3.74	-3.84	-3.93	-4.14	-4.53	-5.06	-5.70	-6.41	-7.28	-8.08	-8.57	-8.52	-7.97	-7.27	-6.78	-6.39	-6.11	-5.80	-5.37	-4.87	-4.44	
165	-8.20	-8.60	-9.09	-9.57	-10.32	-10.92	-11.77	-12.76	-14.06	-15.92	-18.58	-21.04	-20.02	-16.69	-13.88	-11.75	-10.23	-9.19	-8.48	-8.05	-7.85	-7.84	-7.99	-8.15	
180																									

Theta-Polarization + Phi-Polarization Gain



Theta-Polarization + Phi-Polarization Gain



Total Radiated Gain and Efficiency

-5.194 dB

30.239 %

Theta

-6.334 dB

Phi

-11.563 dB

2-D Gain and 3-D Plots

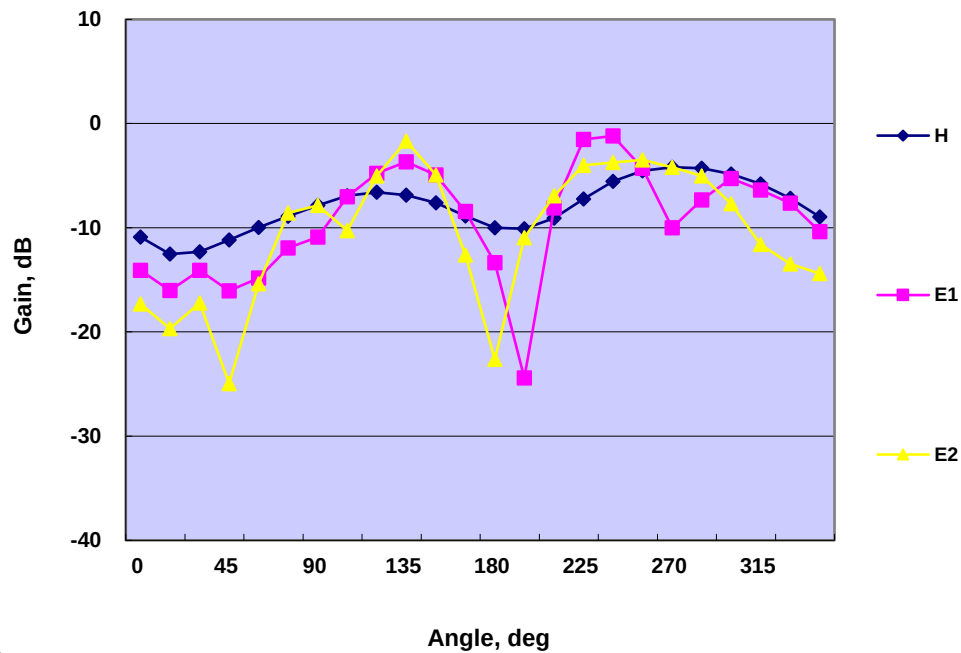
2430MHz Efficiency

2-D Plots

	0	15	30	45	60	75	90	105	120	135	150	165
H	-10.90	-12.53	-12.31	-11.18	-9.96	-8.91	-7.84	-6.94	-6.58	-6.86	-7.62	-8.87
E1	-14.10	-16.03	-14.08	-16.04	-14.83	-11.93	-10.90	-7.03	-4.78	-3.67	-4.94	-8.42
E2	-17.32	-19.69	-17.23	-24.95	-15.37	-8.58	-7.84	-10.28	-5.01	-1.68	-4.94	-12.61
	180	195	210	225	240	255	270	285	300	315	330	345
H	-9.99	-10.10	-9.07	-7.24	-5.55	-4.52	-4.19	-4.29	-4.83	-5.78	-7.17	-8.95
E1	-13.34	-24.41	-8.09	-1.51	-1.19	-4.28	-9.99	-7.34	-5.26	-6.38	-7.63	-10.36
E2	-22.62	-10.94	-6.92	-4.00	-3.74	-3.49	-4.19	-5.03	-7.70	-11.59	-13.46	-14.41

Average H -7.36 dB E1 -6.94 dB E2 -7.35 dB

2-D Gain(H, E1, E2)



3-D Plots

Peak Gain	-0.65 dB,	$\theta = 120$ deg,	$\phi = 195$ deg
Min Gain	-25.29 dB,	$\theta = 45$ deg,	$\phi = 75$ deg

Total Radiated Gain and Efficiency -5.194 dB 30.239 %

Theta -6.334 dB Phi -11.563 dB

Efficiency(Theta-Polarization and Phi-Polarization)

2440MHz Efficiency

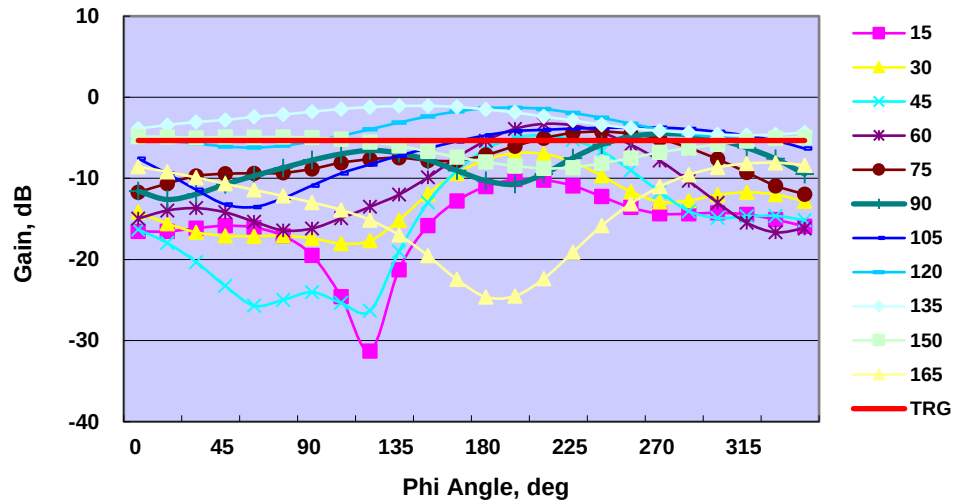
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IMEI		Antenna Type				Type	
Test Date	Thu 02/Feb/2023 11:03:29					Z1	
Test Condition	FS					Z2	
Tester						Z3	

Theta-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\theta \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0	-14.91						-17.80						-14.58						-17.29						
15	-16.53	-16.55	-16.14	-15.84	-16.05	-17.09	-19.49	-24.58	-31.30	-21.25	-15.83	-12.79	-10.99	-10.15	-10.20	-10.91	-12.25	-13.59	-14.35	-14.37	-14.24	-14.44	-15.08	-15.92	
30	-14.14	-15.57	-16.65	-17.08	-17.11	-17.09	-17.37	-18.04	-17.69	-15.14	-11.92	-9.39	-7.72	-6.89	-6.99	-7.95	-9.68	-11.63	-12.89	-12.74	-12.03	-11.72	-11.99	-12.82	
45	-16.30	-17.96	-20.32	-23.26	-25.69	-24.99	-24.04	-25.35	-26.31	-19.02	-12.98	-9.06	-6.41	-5.02	-4.69	-5.26	-6.65	-9.01	-11.66	-14.03	-14.89	-14.68	-14.62	-15.14	
60	-14.95	-13.96	-13.67	-14.18	-15.33	-16.41	-16.18	-14.91	-13.51	-12.00	-9.88	-7.41	-5.35	-3.89	-3.28	-3.46	-4.36	-5.84	-7.80	-10.31	-13.01	-15.46	-16.65	-16.16	
75	-11.70	-10.64	-9.71	-9.42	-9.38	-9.32	-8.83	-8.07	-7.64	-7.45	-7.80	-7.81	-7.12	-6.02	-5.04	-4.39	-4.23	-4.49	-5.12	-6.23	-7.63	-9.26	-10.91	-11.96	
90	-11.57	-12.60	-11.95	-10.75	-9.68	-8.71	-7.75	-6.99	-6.55	-6.87	-7.73	-9.04	-10.29	-10.70	-9.45	-7.49	-5.84	-4.85	-4.49	-4.61	-5.21	-6.22	-7.59	-9.46	
105	-7.57	-9.40	-11.41	-13.21	-13.53	-12.44	-10.88	-9.38	-8.28	-7.20	-6.29	-5.43	-4.69	-4.17	-4.02	-3.86	-3.78	-3.73	-3.74	-3.92	-4.26	-4.72	-5.35	-6.32	
120	-5.14	-5.36	-5.70	-6.06	-6.21	-5.97	-5.44	-4.76	-3.94	-3.12	-2.36	-1.75	-1.35	-1.28	-1.44	-1.94	-2.53	-3.26	-3.94	-4.53	-4.92	-5.18	-5.25	-5.13	
135	-3.87	-3.43	-3.05	-2.80	-2.41	-2.12	-1.78	-1.44	-1.21	-1.08	-1.07	-1.19	-1.50	-1.87	-2.38	-2.85	-3.39	-3.80	-4.13	-4.32	-4.58	-4.67	-4.59	-4.33	
150	-4.84	-4.88	-4.99	-4.88	-4.93	-4.88	-4.98	-5.18	-5.53	-6.00	-6.68	-7.37	-7.98	-8.47	-8.77	-8.66	-8.11	-7.51	-6.78	-6.29	-5.79	-5.41	-5.05	-4.93	
165	-8.56	-9.19	-9.89	-10.67	-11.42	-12.17	-12.97	-13.87	-15.14	-16.97	-19.53	-22.47	-24.62	-24.51	-22.36	-19.11	-15.82	-13.12	-11.02	-9.56	-8.64	-8.17	-8.07	-8.35	
180	-13.15						-20.43						-13.23						-23.35						

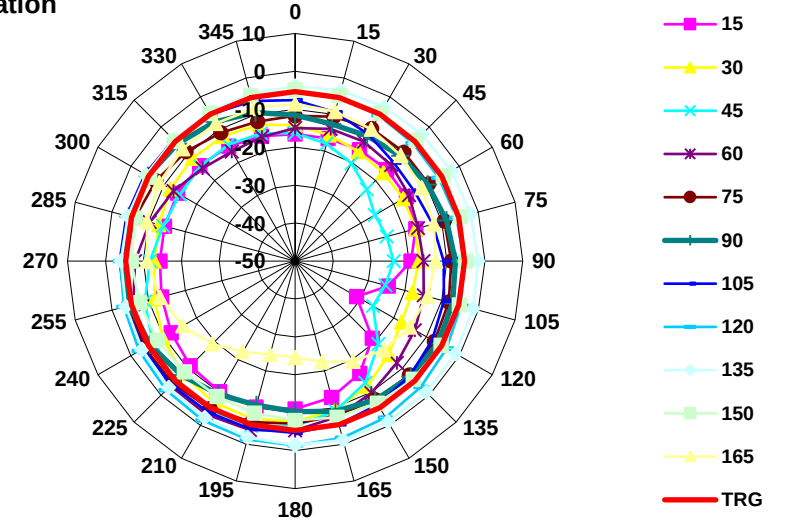
Phi-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\phi \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-16.63	-17.92	-20.03	-21.94	-20.71	-17.67	-15.11	-13.44	-12.48	-12.27	-12.90	-14.62	-18.15	-25.51	-25.63	-18.39	-15.09	-13.61	-13.24	-13.64	-14.41	-15.19	-15.68	-15.98	
30	-21.23	-23.33	-26.37	-28.12	-23.87	-19.18	-15.67	-13.16	-11.50	-10.69	-10.73	-11.98	-14.76	-19.27	-18.89	-14.46	-11.90	-10.83	-10.90	-11.77	-13.23	-15.17	-17.34	-19.39	
45	-25.98	-25.78	-24.10	-23.43	-25.71	-40.66	-24.45	-16.60	-12.27	-9.73	-8.33	-8.01	-9.01	-11.25	-14.61	-15.66	-13.62	-12.18	-11.90	-12.65	-14.34	-16.89	-20.20	-23.72	
60	-15.21	-16.14	-17.05	-17.39	-17.77	-19.58	-23.30	-20.53	-14.35	-10.33	-8.00	-6.87	-6.88	-8.00	-9.77	-11.93	-13.34	-14.00	-14.30	-14.59	-14.89	-15.02	-14.91	-14.86	
75	-9.65	-10.94	-12.32	-12.57	-12.15	-12.46	-14.35	-18.84	-21.27	-14.28	-10.04	-7.70	-6.65	-6.65	-7.39	-8.75	-11.05	-14.27	-17.43	-16.57	-13.60	-11.25	-9.87	-9.42	
90	-6.99	-7.78	-8.99	-9.92	-10.23	-10.65	-12.33	-15.92	-25.10	-22.40	-14.25	-10.46	-8.30	-7.17	-6.66	-6.97	-8.50	-11.58	-17.17	-21.24	-14.57	-10.38	-8.15	-7.05	
105	-5.90	-6.24	-7.25	-8.45	-9.51	-10.71	-12.22	-15.00	-20.36	-39.50	-21.27	-14.86	-11.12	-8.68	-7.36	-7.26	-8.44	-11.17	-16.63	-24.26	-15.15	-10.22	-7.70	-6.30	
120	-6.59	-6.59	-7.31	-8.47	-9.93	-11.79	-13.66	-15.81	-19.05	-25.50	-33.64	-19.15	-13.65	-10.58	-9.01	-8.76	-9.86	-12.46	-18.06	-37.91	-17.03	-11.50	-8.65	-7.14	
135	-9.94	-9.93	-10.67	-11.89	-13.24	-14.65	-16.08	-17.62	-19.39	-22.20	-27.77	-25.61	-18.26	-14.03	-11.62	-10.43	-10.41	-11.56	-14.49	-21.14	-29.44	-17.17	-12.70	-10.62	
150	-11.32	-10.37	-9.88	-9.92	-10.18	-10.79	-11.84	-13.10	-14.71	-16.68	-19.41	-24.21	-33.53	-23.89	-18.32	-15.54	-14.43	-14.72	-16.64	-21.31	-38.02	-22.21	-16.13	-13.09	
165	-20.70	-18.24	-17.01	-16.52	-16.67	-17.35	-18.47	-19.88	-21.63	-24.18	-28.84	-29.63	-22.47	-17.74	-14.70	-12.80	-11.81	-11.65	-12.33	-13.88	-16.59	-21.09	-27.99	-25.35	
180																									

Total Radiated Gain and Efficiency	-5.332 dB	29.293 %	Theta	-6.496 dB	Phi	-11.622 dB
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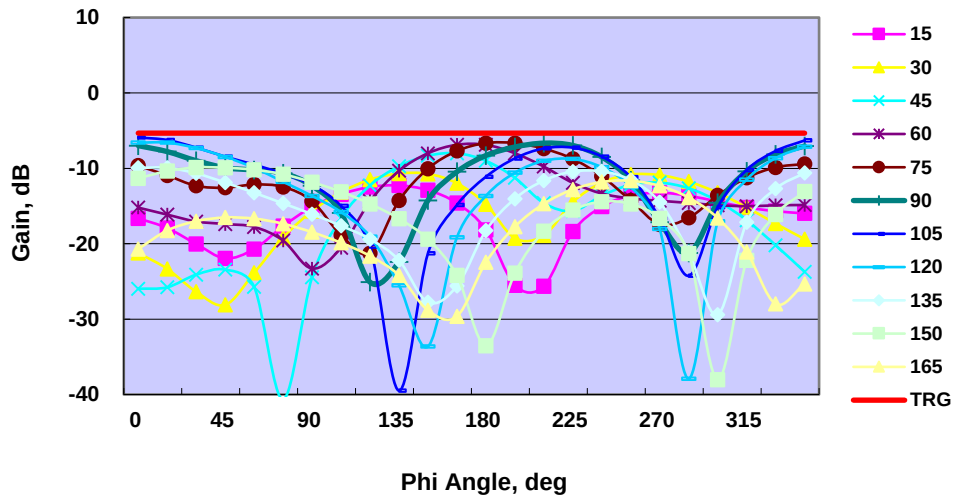
Theta-Polarization Gain



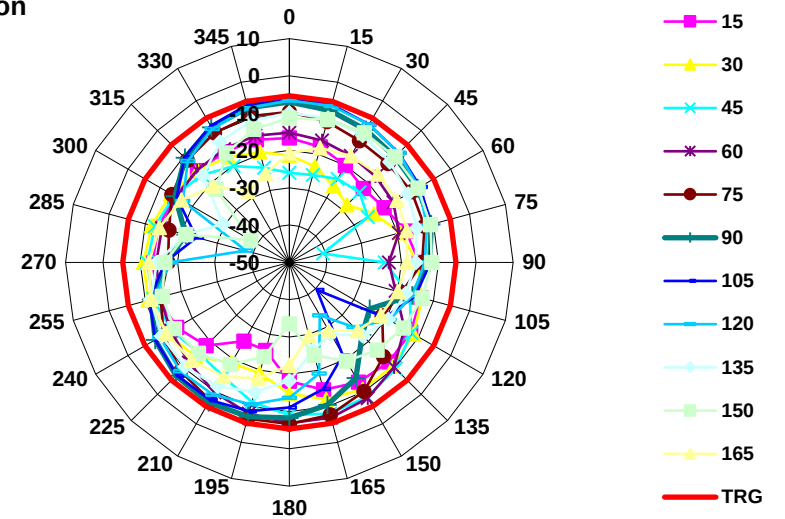
Theta-Polarization Gain



Phi-Polarization Gain



Phi-Polarization Gain

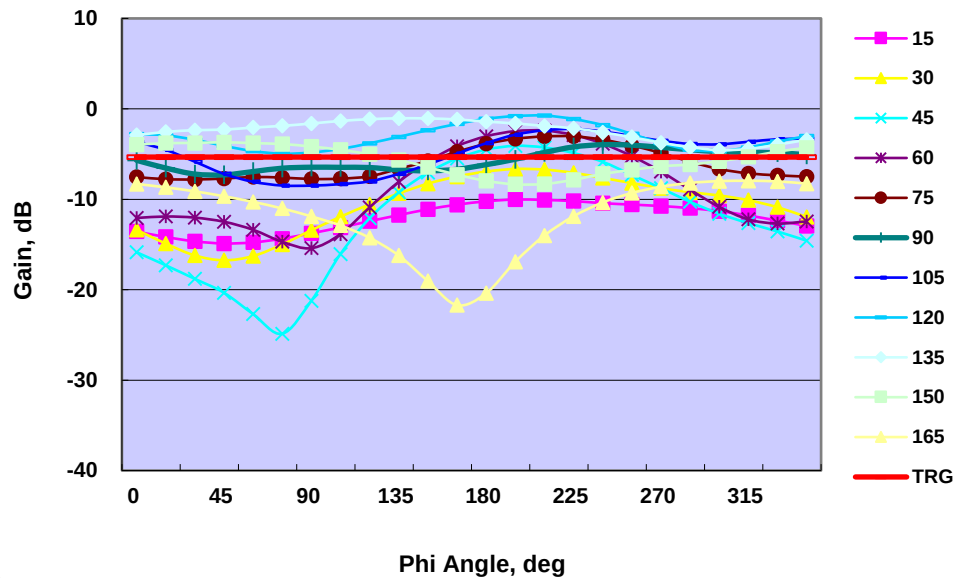


Total Radiated Gain and Efficiency -5.332 dB 29.293 %

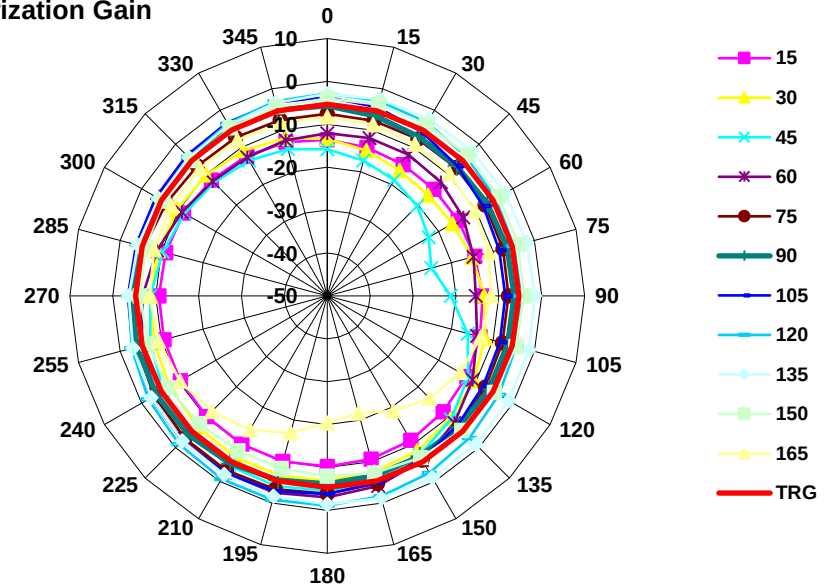
Theta -6.496 dB Phi -11.622 dB

θ_N (deg)	Theta-Polarization + Phi-Polarization Gain(dB)																								$\sum EIRP_{\theta} \times \sin\theta_i$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-13.57	-14.17	-14.65	-14.89	-14.77	-14.36	-13.76	-13.12	-12.42	-11.75	-11.11	-10.60	-10.23	-10.03	-10.08	-10.20	-10.43	-10.59	-10.75	-10.98	-11.31	-11.79	-12.36	-12.94	
30	-13.36	-14.90	-16.21	-16.75	-16.28	-15.00	-13.43	-11.94	-10.56	-9.36	-8.27	-7.48	-6.94	-6.65	-6.72	-7.07	-7.64	-8.20	-8.77	-9.22	-9.58	-10.10	-10.88	-11.96	
45	-15.86	-17.30	-18.80	-20.33	-22.69	-24.87	-21.23	-16.06	-12.10	-9.25	-7.05	-5.49	-4.51	-4.09	-4.27	-4.88	-5.85	-7.30	-8.77	-10.28	-11.60	-12.64	-13.56	-14.58	
60	-12.07	-11.90	-12.03	-12.48	-13.37	-14.70	-15.41	-13.86	-10.90	-8.07	-5.83	-4.12	-3.04	-2.47	-2.40	-2.88	-3.84	-5.22	-6.92	-8.93	-10.84	-12.22	-12.68	-12.45	
75	-7.54	-7.78	-7.81	-7.71	-7.54	-7.60	-7.76	-7.72	-7.46	-6.63	-5.77	-4.74	-3.87	-3.31	-3.05	-3.03	-3.41	-4.06	-4.87	-5.85	-6.65	-7.13	-7.35	-7.50	
90	-5.69	-6.54	-7.21	-7.30	-6.94	-6.56	-6.45	-6.47	-6.49	-6.75	-6.86	-6.68	-6.17	-5.58	-4.82	-4.21	-3.96	-4.01	-4.26	-4.52	-4.73	-4.81	-4.85	-5.08	
105	-3.64	-4.53	-5.84	-7.20	-8.06	-8.48	-8.49	-8.33	-8.02	-7.20	-6.15	-4.96	-3.80	-2.85	-2.37	-2.23	-2.50	-3.01	-3.52	-3.88	-3.92	-3.64	-3.36	-3.30	
120	-2.79	-2.92	-3.42	-4.09	-4.67	-4.96	-4.83	-4.43	-3.81	-3.09	-2.36	-1.67	-1.10	-0.80	-0.74	-1.12	-1.79	-2.77	-3.77	-4.53	-4.66	-4.27	-3.62	-3.01	
135	-2.91	-2.55	-2.36	-2.30	-2.07	-1.88	-1.62	-1.34	-1.14	-1.05	-1.06	-1.17	-1.41	-1.61	-1.89	-2.15	-2.60	-3.13	-3.75	-4.23	-4.57	-4.43	-3.97	-3.41	
150	-3.96	-3.80	-3.77	-3.70	-3.80	-3.89	-4.17	-4.53	-5.03	-5.64	-6.45	-7.28	-7.97	-8.35	-8.31	-7.85	-7.20	-6.75	-6.35	-6.16	-5.79	-5.32	-4.72	-4.31	
165	-8.30	-8.68	-9.12	-9.67	-10.29	-11.02	-11.89	-12.90	-14.26	-16.21	-19.05	-21.71	-20.40	-16.91	-14.01	-11.89	-10.36	-9.31	-8.62	-8.19	-7.99	-7.95	-8.03	-8.26	
180																									

Theta-Polarization + Phi-Polarization Gain



Theta-Polarization + Phi-Polarization Gain



Total Radiated Gain and Efficiency -5.332 dB 29.293 %

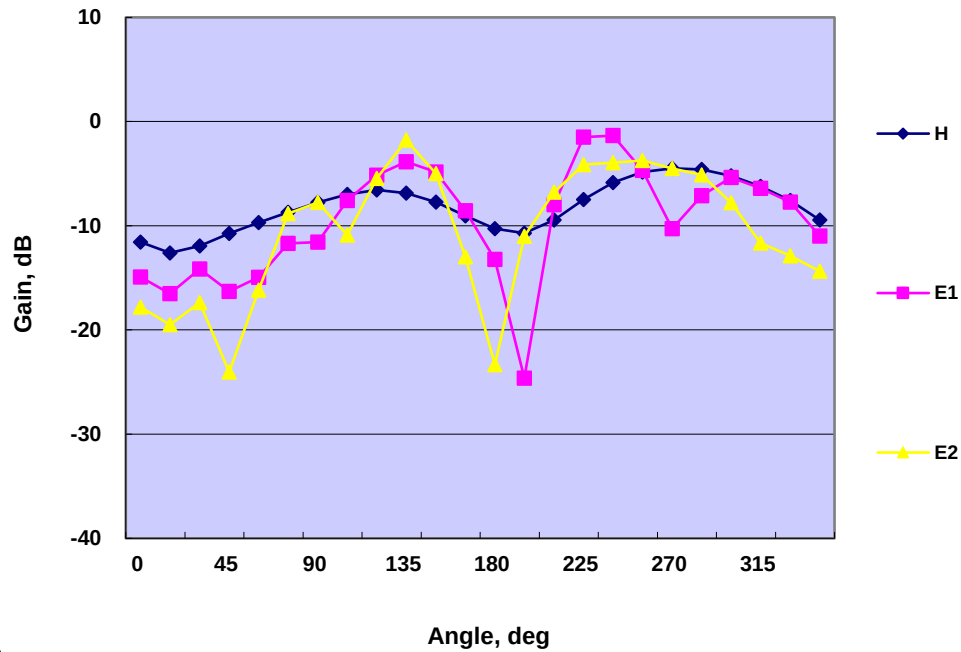
Theta -6.496 dB Phi -11.622 dB

2-D Plots

	0	15	30	45	60	75	90	105	120	135	150	165
H	-11.57	-12.60	-11.95	-10.75	-9.68	-8.71	-7.75	-6.99	-6.55	-6.87	-7.73	-9.04
E1	-14.91	-16.53	-14.14	-16.30	-14.95	-11.70	-11.57	-7.57	-5.14	-3.87	-4.84	-8.56
E2	-17.80	-19.49	-17.37	-24.04	-16.18	-8.83	-7.75	-10.88	-5.44	-1.78	-4.98	-12.97
	180	195	210	225	240	255	270	285	300	315	330	345
H	-10.29	-10.70	-9.45	-7.49	-5.84	-4.85	-4.49	-4.61	-5.21	-6.22	-7.59	-9.46
E1	-13.23	-24.62	-7.98	-1.50	-1.35	-4.69	-10.29	-7.12	-5.35	-6.41	-7.72	-10.99
E2	-23.35	-11.02	-6.78	-4.13	-3.94	-3.74	-4.49	-5.12	-7.80	-11.66	-12.89	-14.35

Average H -7.58 dB E1 -7.09 dB E2 -7.5 dB

2-D Gain(H, E1, E2)



3-D Plots

Peak Gain	-0.74 dB,	$\theta = 120$ deg,	$\phi = 210$ deg
Min Gain	-24.87 dB,	$\theta = 45$ deg,	$\phi = 75$ deg

Total Radiated Gain and Efficiency -5.332 dB 29.293 %

Theta -6.496 dB Phi -11.622 dB

Efficiency(Theta-Polarization and Phi-Polarization)

2450MHz Efficiency

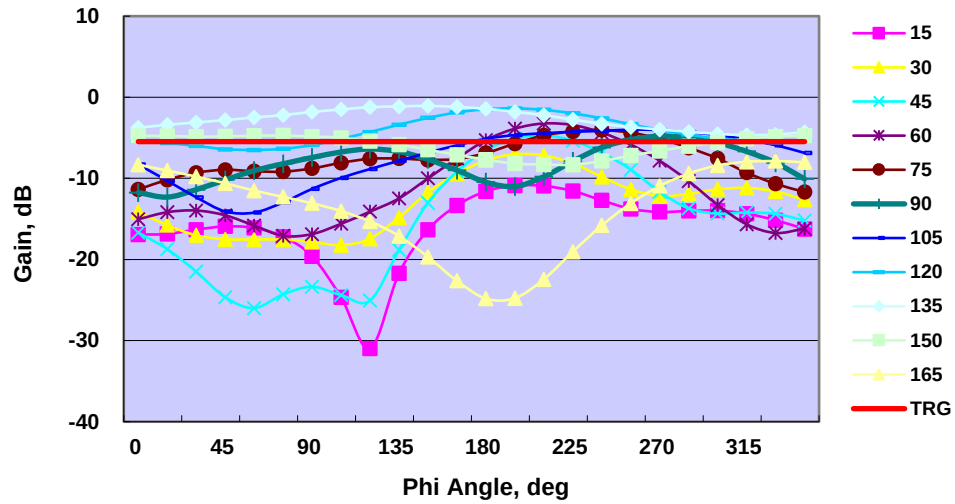
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IMEI		Antenna Type					Type	
Test Date	Thu 02/Feb/2023 11:03:29						Z1	
Test Condition	FS						Z2	
Tester							Z3	

Theta-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\theta \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0	-15.78						-18.07						-14.90						-17.03						
15	-16.92	-16.86	-16.32	-15.92	-16.11	-17.19	-19.60	-24.67	-30.99	-21.71	-16.34	-13.34	-11.59	-10.88	-10.93	-11.55	-12.71	-13.76	-14.14	-14.02	-13.97	-14.35	-15.16	-16.24	
30	-14.13	-15.76	-17.02	-17.50	-17.54	-17.54	-17.84	-18.23	-17.44	-14.82	-11.73	-9.44	-7.78	-7.03	-7.18	-8.15	-9.81	-11.35	-12.20	-11.91	-11.34	-11.18	-11.61	-12.64	
45	-16.68	-18.72	-21.50	-24.65	-25.99	-24.31	-23.36	-24.39	-25.06	-18.84	-13.01	-9.17	-6.52	-5.10	-4.70	-5.36	-6.83	-8.92	-11.66	-13.70	-14.34	-14.21	-14.38	-15.19	
60	-15.04	-14.17	-13.96	-14.55	-15.82	-17.08	-16.87	-15.60	-14.10	-12.47	-10.00	-7.55	-5.29	-3.87	-3.23	-3.43	-4.36	-5.83	-7.83	-10.34	-13.28	-15.66	-16.73	-16.20	
75	-11.37	-10.17	-9.30	-8.94	-9.12	-9.17	-8.77	-8.08	-7.58	-7.55	-7.72	-7.61	-6.88	-5.71	-4.70	-4.21	-4.04	-4.37	-5.11	-6.22	-7.55	-9.29	-10.67	-11.68	
90	-11.75	-12.31	-11.39	-10.19	-9.05	-8.20	-7.43	-6.75	-6.38	-6.70	-7.66	-8.99	-10.47	-10.99	-9.79	-7.88	-6.19	-5.22	-4.79	-4.99	-5.60	-6.68	-8.08	-10.07	
105	-8.29	-10.28	-12.33	-14.07	-14.22	-12.96	-11.30	-9.94	-8.85	-7.83	-6.83	-5.92	-5.11	-4.66	-4.44	-4.25	-4.15	-3.99	-4.05	-4.31	-4.66	-5.22	-5.91	-6.86	
120	-5.44	-5.65	-5.99	-6.41	-6.49	-6.36	-5.89	-5.13	-4.28	-3.38	-2.54	-1.87	-1.47	-1.36	-1.55	-1.98	-2.60	-3.33	-4.03	-4.59	-5.11	-5.30	-5.43	-5.38	
135	-3.76	-3.39	-3.10	-2.81	-2.49	-2.20	-1.80	-1.50	-1.22	-1.13	-1.06	-1.20	-1.42	-1.80	-2.21	-2.76	-3.27	-3.67	-3.97	-4.25	-4.52	-4.65	-4.60	-4.28	
150	-4.76	-4.77	-4.86	-4.81	-4.75	-4.71	-4.84	-4.99	-5.41	-5.83	-6.47	-7.09	-7.69	-8.18	-8.28	-8.32	-7.87	-7.19	-6.61	-6.02	-5.58	-5.11	-4.84	-4.74	
165	-8.32	-9.03	-9.78	-10.60	-11.51	-12.28	-13.07	-14.03	-15.30	-17.11	-19.68	-22.63	-24.83	-24.77	-22.44	-19.04	-15.80	-13.08	-10.93	-9.40	-8.40	-7.96	-7.87	-8.01	
180	-12.93						-20.49						-13.07						-23.23						

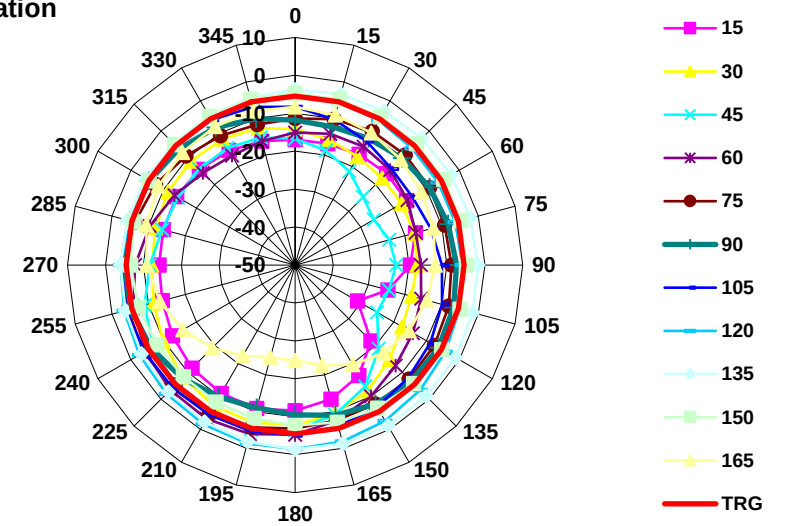
Phi-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\phi \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-16.27	-17.74	-20.32	-23.09	-22.04	-18.49	-15.75	-14.01	-13.08	-12.93	-13.56	-15.33	-18.91	-26.19	-25.43	-18.81	-15.64	-14.25	-13.98	-14.36	-14.98	-15.40	-15.52	-15.66	
30	-20.66	-22.48	-25.47	-28.11	-24.60	-19.78	-16.17	-13.61	-11.94	-11.16	-11.23	-12.61	-15.63	-20.81	-19.76	-14.90	-12.31	-11.37	-11.46	-12.37	-13.92	-15.88	-17.85	-19.41	
45	-29.08	-27.37	-24.75	-23.66	-25.69	-38.02	-25.31	-17.23	-12.81	-10.04	-8.64	-8.29	-9.14	-11.62	-14.99	-16.18	-14.18	-12.74	-12.55	-13.45	-15.36	-18.31	-22.28	-26.63	
60	-16.31	-17.18	-17.89	-17.99	-18.23	-20.13	-24.23	-20.97	-14.59	-10.37	-7.97	-6.93	-6.96	-8.13	-10.16	-12.27	-13.61	-14.25	-14.73	-15.26	-15.80	-16.15	-16.12	-16.03	
75	-10.49	-11.59	-12.83	-12.90	-12.46	-12.90	-15.02	-19.97	-21.79	-14.35	-9.82	-7.64	-6.71	-6.78	-7.69	-9.12	-11.17	-14.33	-17.75	-17.53	-14.58	-12.21	-10.48	-9.99	
90	-7.26	-8.14	-9.40	-10.35	-10.66	-11.11	-12.74	-16.52	-26.42	-21.70	-14.12	-10.49	-8.45	-7.26	-6.99	-7.41	-8.97	-11.79	-17.35	-21.88	-15.19	-10.80	-8.46	-7.40	
105	-6.17	-6.50	-7.56	-8.78	-10.01	-11.16	-12.70	-15.56	-21.30	-47.60	-20.51	-14.68	-11.20	-8.89	-7.72	-7.73	-8.91	-11.59	-17.08	-24.21	-15.35	-10.41	-7.84	-6.49	
120	-6.67	-6.69	-7.48	-8.76	-10.50	-12.40	-14.27	-16.47	-19.77	-26.66	-31.68	-19.07	-13.75	-10.74	-9.39	-9.28	-10.40	-12.90	-18.72	-38.67	-17.04	-11.64	-8.58	-7.24	
135	-9.69	-9.92	-10.80	-12.17	-13.61	-15.04	-16.48	-17.96	-19.69	-22.32	-27.37	-26.14	-18.79	-14.44	-12.00	-11.03	-10.94	-12.09	-15.14	-22.34	-29.38	-17.03	-12.72	-10.64	
150	-11.47	-10.34	-10.00	-10.01	-10.24	-10.98	-12.11	-13.37	-15.03	-17.17	-20.17	-25.55	-33.93	-23.70	-18.60	-16.16	-15.24	-15.80	-18.14	-24.00	-38.44	-20.86	-15.73	-13.06	
165	-20.32	-18.01	-16.80	-16.37	-16.45	-17.03	-18.10	-19.43	-21.20	-24.09	-30.24	-33.56	-23.16	-18.11	-15.06	-13.22	-12.30	-12.18	-12.88	-14.53	-17.39	-22.24	-29.10	-24.77	
180																									

Total Radiated Gain and Efficiency	-5.465 dB	28.414 %	Theta	-6.574 dB	Phi	-11.934 dB
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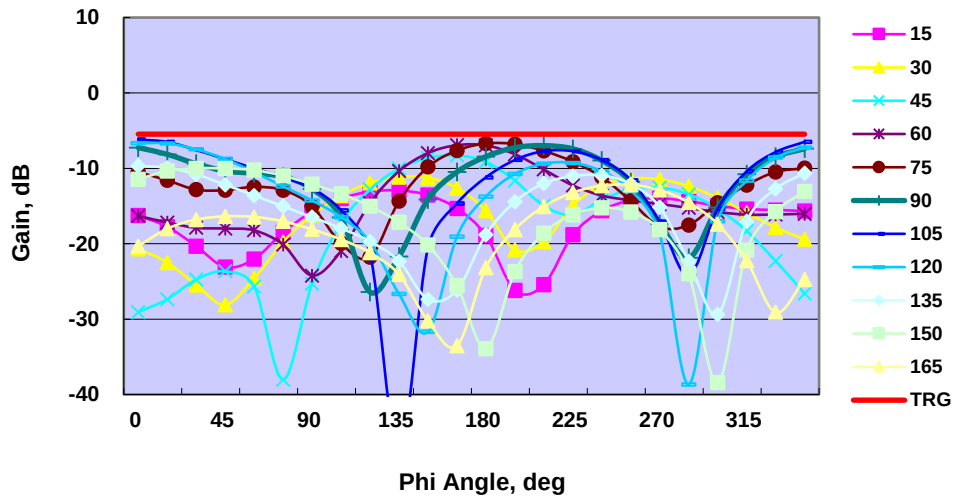
Theta-Polarization Gain



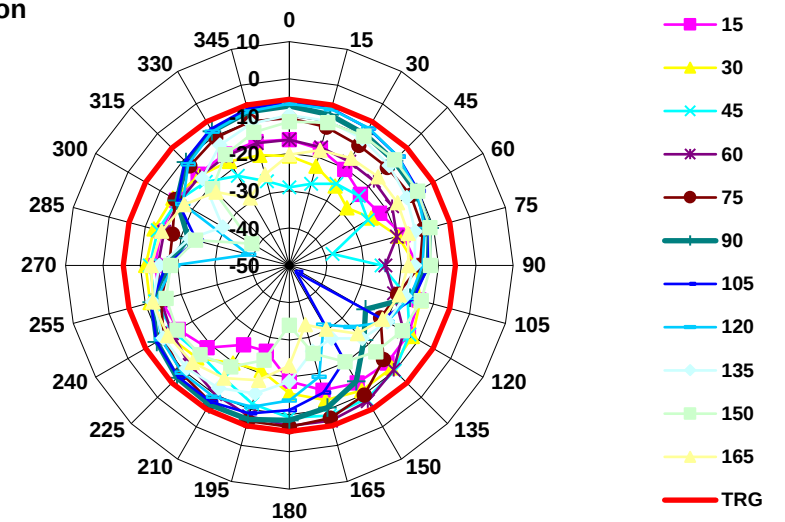
Theta-Polarization Gain



Phi-Polarization Gain



Phi-Polarization Gain

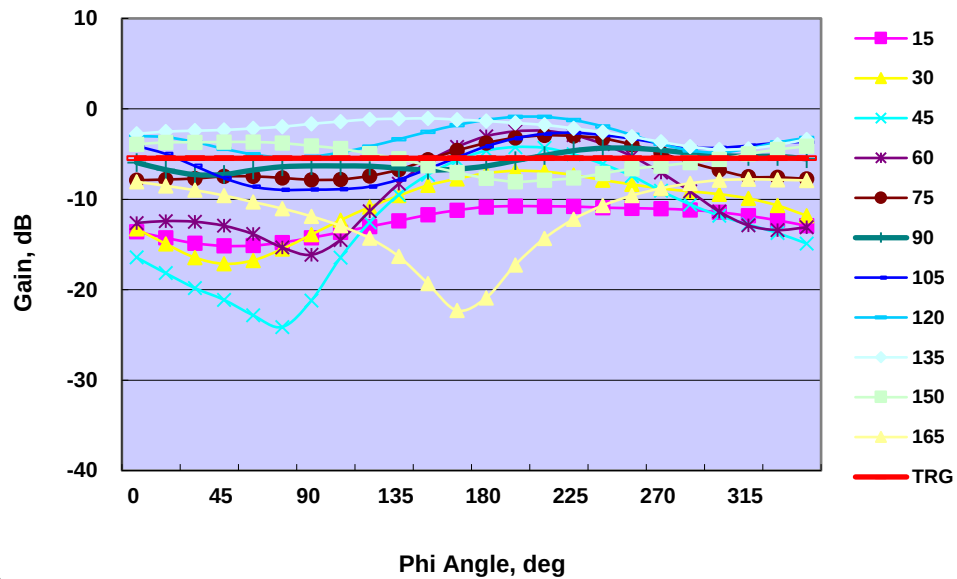


Total Radiated Gain and Efficiency -5.465 dB 28.414 %

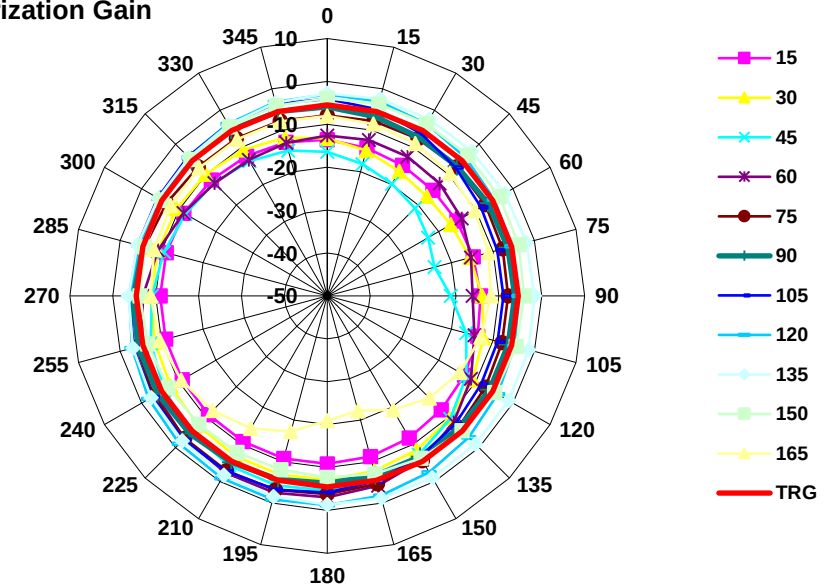
Theta -6.574 dB Phi -11.934 dB

Theta-Polarization + Phi-Polarization Gain(dB)																										
θ_N (deg)	φ_M (deg)																									ΣE_{iRP_θ} $\times \sin\theta_i$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345		
0																										
15	-13.57	-14.27	-14.86	-15.16	-15.12	-14.78	-14.25	-13.65	-13.01	-12.39	-11.72	-11.21	-10.85	-10.75	-10.78	-10.80	-10.92	-10.99	-11.05	-11.18	-11.44	-11.83	-12.33	-12.93		
30	-13.26	-14.92	-16.44	-17.14	-16.76	-15.51	-13.91	-12.32	-10.86	-9.61	-8.46	-7.73	-7.12	-6.85	-6.95	-7.32	-7.87	-8.35	-8.80	-9.12	-9.43	-9.91	-10.68	-11.81		
45	-16.44	-18.16	-19.82	-21.12	-22.83	-24.13	-21.22	-16.47	-12.56	-9.50	-7.29	-5.70	-4.63	-4.23	-4.31	-5.01	-6.10	-7.41	-9.07	-10.56	-11.81	-12.78	-13.73	-14.89		
60	-12.62	-12.41	-12.48	-12.93	-13.85	-15.33	-16.14	-14.49	-11.33	-8.28	-5.86	-4.22	-3.03	-2.49	-2.43	-2.90	-3.87	-5.25	-7.02	-9.13	-11.35	-12.89	-13.40	-13.10		
75	-7.90	-7.81	-7.71	-7.47	-7.47	-7.64	-7.85	-7.81	-7.42	-6.73	-5.63	-4.61	-3.78	-3.20	-2.93	-2.99	-3.27	-3.95	-4.88	-5.91	-6.76	-7.50	-7.56	-7.74		
90	-5.94	-6.73	-7.27	-7.26	-6.77	-6.41	-6.31	-6.31	-6.34	-6.56	-6.78	-6.67	-6.33	-5.73	-5.16	-4.63	-4.35	-4.36	-4.56	-4.90	-5.15	-5.26	-5.26	-5.52		
105	-4.09	-4.98	-6.31	-7.65	-8.61	-8.96	-8.93	-8.89	-8.61	-7.83	-6.65	-5.38	-4.15	-3.27	-2.77	-2.64	-2.90	-3.29	-3.84	-4.27	-4.30	-4.07	-3.76	-3.66		
120	-3.00	-3.13	-3.66	-4.42	-5.04	-5.39	-5.30	-4.82	-4.16	-3.36	-2.53	-1.79	-1.22	-0.89	-0.89	-1.24	-1.93	-2.88	-3.88	-4.59	-4.84	-4.39	-3.72	-3.20		
135	-2.77	-2.52	-2.42	-2.33	-2.17	-1.98	-1.65	-1.40	-1.16	-1.10	-1.05	-1.19	-1.34	-1.57	-1.78	-2.16	-2.58	-3.09	-3.65	-4.18	-4.51	-4.41	-3.98	-3.38		
150	-3.92	-3.71	-3.70	-3.66	-3.67	-3.79	-4.09	-4.40	-4.96	-5.52	-6.29	-7.03	-7.68	-8.06	-7.89	-7.66	-7.14	-6.63	-6.31	-5.95	-5.58	-5.00	-4.50	-4.14		
165	-8.05	-8.51	-8.99	-9.58	-10.30	-11.03	-11.88	-12.93	-14.31	-16.32	-19.31	-22.29	-20.90	-17.26	-14.33	-12.21	-10.70	-9.60	-8.79	-8.24	-7.88	-7.80	-7.84	-7.92		
180																										

Theta-Polarization + Phi-Polarization Gain



Theta-Polarization + Phi-Polarization Gain



Total Radiated Gain and Efficiency

-5.465 dB

28.414 %

Theta

-6.574 dB

Phi

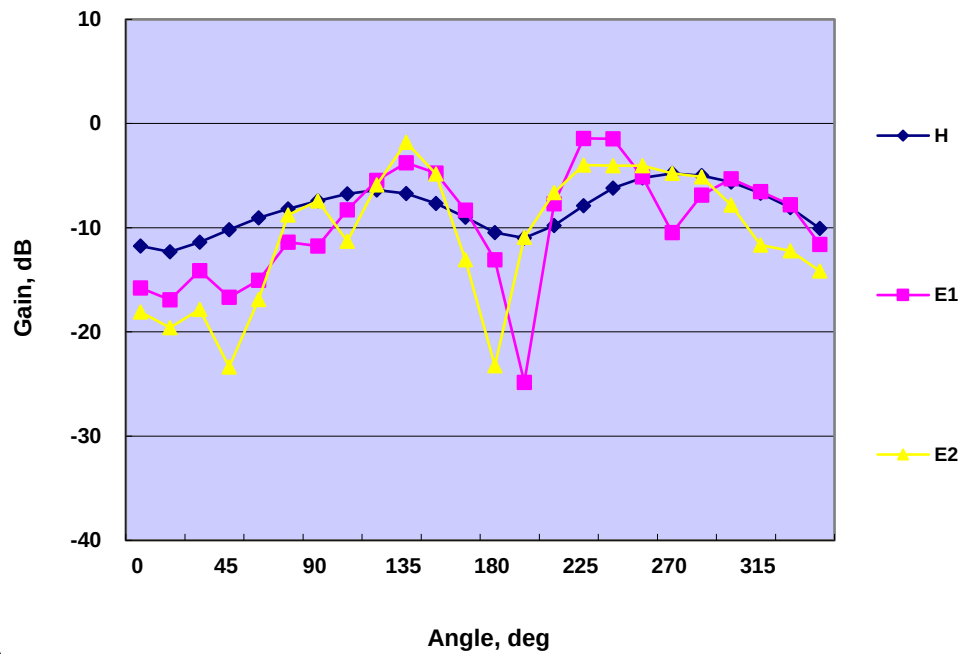
-11.934 dB

2-D Plots

	0	15	30	45	60	75	90	105	120	135	150	165
H	-11.75	-12.31	-11.39	-10.19	-9.05	-8.20	-7.43	-6.75	-6.38	-6.70	-7.66	-8.99
E1	-15.78	-16.92	-14.13	-16.68	-15.04	-11.37	-11.75	-8.29	-5.44	-3.76	-4.76	-8.32
E2	-18.07	-19.60	-17.84	-23.36	-16.87	-8.77	-7.43	-11.30	-5.89	-1.80	-4.84	-13.07
	180	195	210	225	240	255	270	285	300	315	330	345
H	-10.47	-10.99	-9.79	-7.88	-6.19	-5.22	-4.79	-4.99	-5.60	-6.68	-8.08	-10.07
E1	-13.07	-24.83	-7.69	-1.42	-1.47	-5.11	-10.47	-6.88	-5.29	-6.52	-7.78	-11.59
E2	-23.23	-10.93	-6.61	-3.97	-4.03	-4.05	-4.79	-5.11	-7.83	-11.66	-12.20	-14.14

Average H -7.7 dB E1 -7.15 dB E2 -7.55 dB

2-D Gain(H, E1, E2)



3-D Plots

Peak Gain	-0.89 dB,	$\theta = 120$ deg,	$\phi = 195$ deg
Min Gain	-24.13 dB,	$\theta = 45$ deg,	$\phi = 75$ deg

Total Radiated Gain and Efficiency -5.465 dB 28.414 %

Theta -6.574 dB Phi -11.934 dB

Efficiency(Theta-Polarization and Phi-Polarization)

2460MHz Efficiency

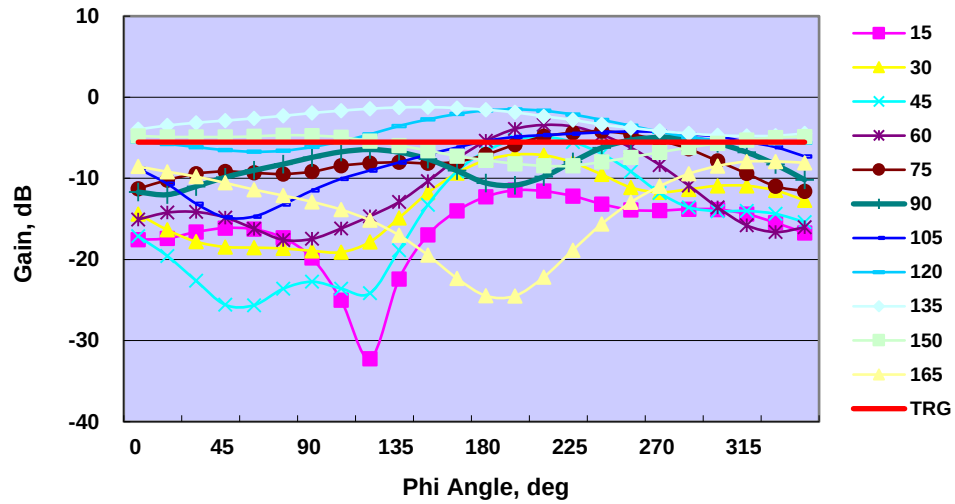
EUT		Frequency	2460	MHz	Comment				Antenna Matching		
IMEI		Antenna Type							Type		
Test Date	Thu 02/Feb/2023 11:03:29								Z1		
Test Condition	FS								Z2		
Tester									Z3		

Theta-Polarization Gain(dB)																									
θ_N (deg)	ϕ_M (deg)																								$\sum EiRP_\theta \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0	-16.54						-18.00					-15.37						-17.08							
15	-17.56	-17.40	-16.61	-16.12	-16.27	-17.34	-19.82	-25.01	-32.23	-22.43	-16.98	-14.02	-12.26	-11.46	-11.57	-12.18	-13.16	-13.88	-13.97	-13.79	-13.83	-14.39	-15.47	-16.72	
30	-14.40	-16.34	-17.81	-18.45	-18.54	-18.64	-18.93	-19.10	-17.83	-14.89	-11.77	-9.35	-7.75	-7.07	-7.14	-8.04	-9.52	-11.12	-11.71	-11.35	-10.91	-10.91	-11.49	-12.70	
45	-17.14	-19.56	-22.63	-25.58	-25.63	-23.61	-22.74	-23.58	-24.16	-18.86	-13.24	-9.14	-6.64	-5.23	-4.88	-5.52	-6.98	-9.14	-11.79	-13.56	-14.04	-14.01	-14.38	-15.38	
60	-15.06	-14.22	-14.14	-14.82	-16.20	-17.58	-17.46	-16.18	-14.66	-12.91	-10.35	-7.59	-5.38	-3.91	-3.41	-3.60	-4.62	-6.21	-8.35	-10.88	-13.58	-15.79	-16.62	-16.03	
75	-11.27	-10.21	-9.42	-9.14	-9.32	-9.46	-9.17	-8.45	-8.12	-8.02	-8.14	-7.95	-7.07	-5.84	-4.83	-4.36	-4.18	-4.57	-5.31	-6.37	-7.86	-9.40	-10.98	-11.58	
90	-11.69	-12.01	-10.99	-9.86	-9.00	-8.25	-7.41	-6.73	-6.44	-6.77	-7.62	-9.05	-10.57	-10.84	-9.79	-7.95	-6.23	-5.28	-4.94	-5.06	-5.68	-6.77	-8.30	-10.17	
105	-8.78	-10.67	-13.12	-14.80	-14.70	-13.21	-11.49	-10.06	-9.02	-8.03	-7.06	-6.19	-5.39	-4.89	-4.67	-4.49	-4.32	-4.22	-4.27	-4.56	-4.84	-5.49	-6.15	-7.28	
120	-5.48	-5.76	-6.14	-6.52	-6.72	-6.60	-6.13	-5.44	-4.56	-3.54	-2.73	-2.06	-1.62	-1.49	-1.66	-2.12	-2.79	-3.50	-4.25	-4.89	-5.31	-5.66	-5.64	-5.60	
135	-3.96	-3.48	-3.14	-2.87	-2.60	-2.29	-1.94	-1.65	-1.41	-1.25	-1.22	-1.32	-1.54	-1.86	-2.35	-2.79	-3.37	-3.77	-4.16	-4.46	-4.69	-4.77	-4.75	-4.46	
150	-4.76	-4.89	-4.89	-4.90	-4.82	-4.68	-4.72	-4.92	-5.41	-5.94	-6.57	-7.25	-7.76	-8.19	-8.46	-8.45	-7.97	-7.40	-6.77	-6.21	-5.67	-5.27	-4.96	-4.87	
165	-8.53	-9.18	-9.78	-10.55	-11.39	-12.11	-12.89	-13.85	-15.17	-17.01	-19.47	-22.32	-24.48	-24.49	-22.16	-18.85	-15.61	-12.95	-10.96	-9.44	-8.47	-7.93	-7.91	-8.07	
180	-12.76						-21.19						-13.01						-22.64						

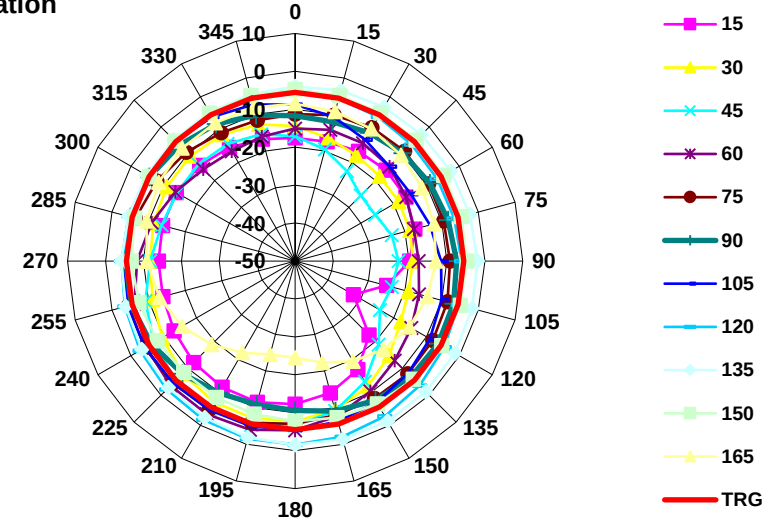
Phi-Polarization Gain(dB)																									
θ_N (deg)	ϕ_M (deg)																								$\sum EiRP_\phi \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-15.60	-17.23	-20.08	-23.49	-22.33	-18.43	-15.63	-13.91	-13.00	-12.86	-13.55	-15.35	-18.99	-25.99	-24.55	-18.48	-15.54	-14.32	-14.12	-14.48	-14.88	-14.96	-14.83	-14.92	
30	-19.54	-21.20	-24.30	-27.73	-24.59	-19.65	-15.98	-13.40	-11.73	-10.92	-10.98	-12.55	-15.85	-21.87	-19.94	-14.72	-12.14	-11.26	-11.47	-12.52	-14.16	-16.11	-17.73	-18.66	
45	-29.43	-27.17	-24.33	-23.11	-24.84	-33.47	-25.09	-17.07	-12.72	-9.86	-8.38	-8.07	-9.10	-11.44	-14.71	-15.95	-14.12	-12.79	-12.70	-13.75	-15.88	-19.22	-23.56	-28.05	
60	-16.77	-17.57	-18.03	-17.79	-17.98	-20.00	-24.81	-20.88	-14.25	-10.15	-7.76	-6.75	-6.89	-8.06	-10.13	-11.99	-13.31	-13.96	-14.51	-15.23	-16.05	-16.61	-16.71	-16.58	
75	-10.41	-11.49	-12.72	-12.69	-12.31	-12.87	-15.24	-20.74	-21.29	-13.79	-9.68	-7.49	-6.61	-6.73	-7.51	-8.85	-10.79	-13.81	-17.29	-17.77	-15.03	-12.58	-10.82	-10.27	
90	-7.28	-7.91	-8.89	-9.54	-9.80	-10.69	-12.53	-16.53	-27.21	-20.59	-13.41	-9.91	-8.14	-7.15	-6.65	-7.01	-8.38	-11.34	-16.71	-21.91	-15.36	-11.07	-8.64	-7.55	
105	-6.09	-6.32	-7.23	-8.35	-9.43	-10.70	-12.45	-15.40	-21.44	-39.91	-19.49	-14.02	-10.73	-8.72	-7.37	-7.31	-8.39	-11.24	-16.65	-23.49	-15.13	-10.41	-7.86	-6.42	
120	-6.34	-6.54	-7.39	-8.64	-10.20	-12.34	-14.20	-16.43	-19.87	-27.10	-29.81	-18.45	-13.32	-10.32	-8.98	-8.61	-9.79	-12.72	-18.64	-36.91	-16.58	-11.28	-8.57	-7.12	
135	-9.46	-9.79	-10.65	-11.94	-13.35	-14.74	-16.11	-17.61	-19.43	-22.11	-26.77	-25.67	-18.49	-14.15	-11.68	-10.33	-10.41	-11.97	-15.14	-22.79	-27.65	-16.34	-12.17	-10.23	
150	-11.00	-10.23	-9.79	-9.84	-9.99	-10.77	-11.71	-12.95	-14.58	-16.83	-20.09	-25.96	-33.73	-23.01	-18.31	-16.11	-15.47	-16.31	-19.17	-26.78	-29.52	-19.05	-14.74	-12.38	
165	-19.35	-17.22	-16.12	-15.65	-15.75	-16.30	-17.28	-18.57	-20.33	-23.15	-29.85	-35.93	-22.85	-17.71	-14.71	-12.94	-12.08	-12.04	-12.83	-14.59	-17.65	-22.95	-29.13	-23.42	
180																									

Total Radiated Gain and Efficiency	-5.533 dB	27.972 %	Theta	-6.727 dB	Phi	-11.724 dB
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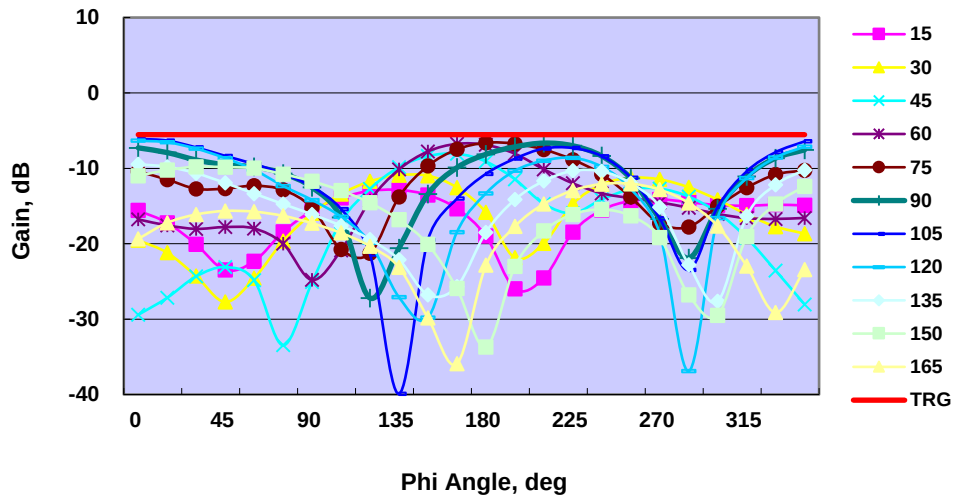
Theta-Polarization Gain



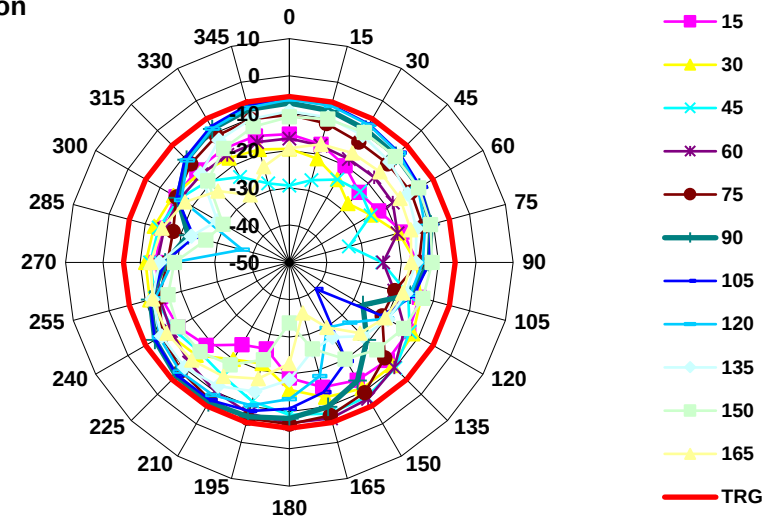
Theta-Polarization Gain



Phi-Polarization Gain



Phi-Polarization Gain



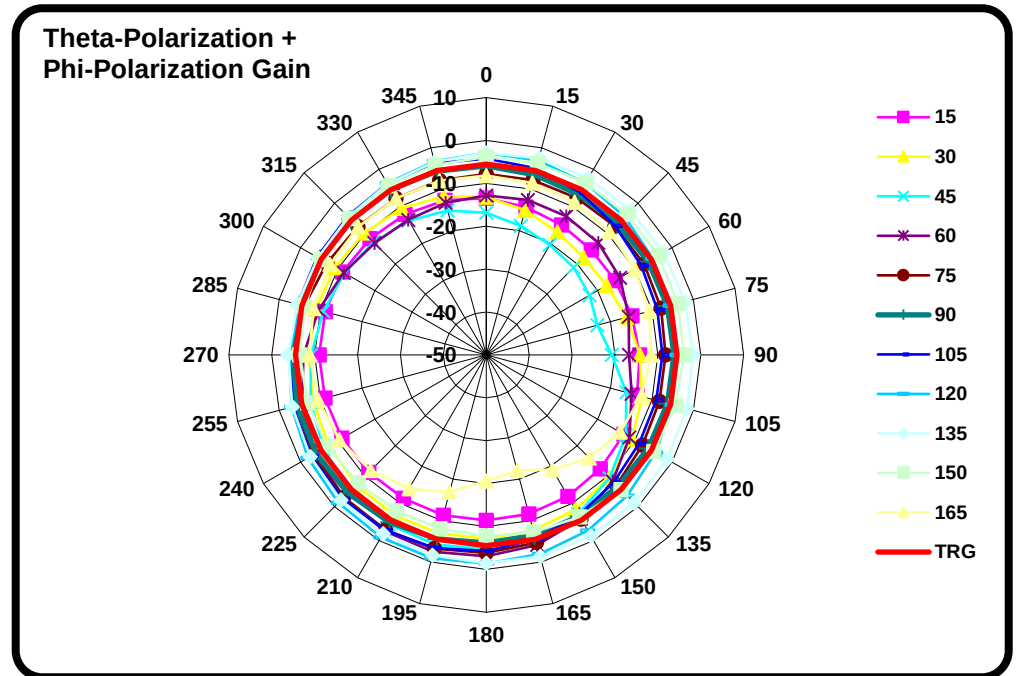
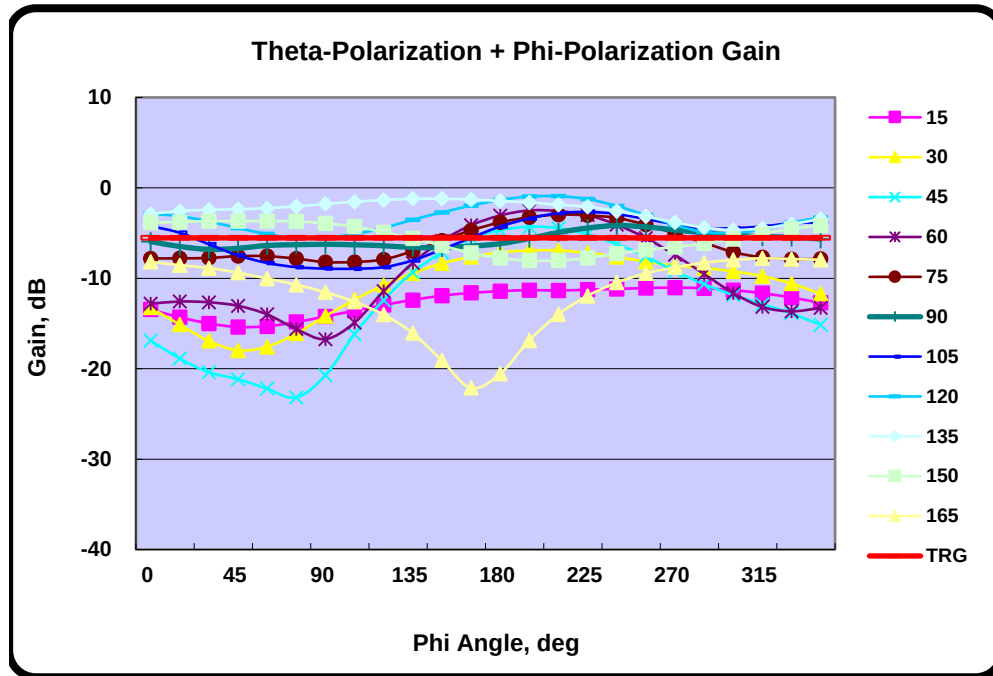
Total Radiated Gain and Efficiency -5.533 dB 27.972 %

Theta -6.727 dB Phi -11.724 dB

Efficiency(Theta-Polarization + Phi-Polarization)

2460MHz Efficiency

Theta-Polarization + Phi-Polarization Gain(dB)																										
θ_N (deg)	φ_M (deg)																									$\sum EiRP_{\theta}$ $\times \sin\theta_i$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345		
0																										
15	-13.46	-14.30	-15.00	-15.39	-15.31	-14.84	-14.23	-13.59	-12.95	-12.41	-11.92	-11.62	-11.42	-11.31	-11.36	-11.27	-11.18	-11.08	-11.03	-11.11	-11.31	-11.66	-12.13	-12.72		
30	-13.24	-15.11	-16.93	-17.97	-17.58	-16.11	-14.20	-12.36	-10.78	-9.46	-8.35	-7.65	-7.12	-6.93	-6.92	-7.20	-7.63	-8.18	-8.58	-8.89	-9.23	-9.76	-10.56	-11.72		
45	-16.89	-18.87	-20.39	-21.16	-22.21	-23.18	-20.75	-16.19	-12.42	-9.35	-7.15	-5.56	-4.69	-4.30	-4.45	-5.14	-6.21	-7.58	-9.21	-10.64	-11.85	-12.87	-13.88	-15.15		
60	-12.82	-12.57	-12.65	-13.05	-13.99	-15.61	-16.73	-14.91	-11.44	-8.30	-5.85	-4.14	-3.06	-2.50	-2.57	-3.01	-4.07	-5.54	-7.41	-9.52	-11.63	-13.17	-13.65	-13.29		
75	-7.81	-7.79	-7.75	-7.55	-7.55	-7.83	-8.21	-8.20	-7.92	-7.00	-5.83	-4.70	-3.82	-3.25	-2.96	-3.04	-3.32	-4.08	-5.04	-6.07	-7.10	-7.69	-7.89	-7.87		
90	-5.94	-6.48	-6.80	-6.69	-6.37	-6.29	-6.25	-6.30	-6.40	-6.59	-6.60	-6.45	-6.18	-5.60	-4.93	-4.44	-4.16	-4.32	-4.66	-4.97	-5.24	-5.40	-5.46	-5.66		
105	-4.22	-4.96	-6.23	-7.46	-8.30	-8.77	-8.93	-8.95	-8.78	-8.03	-6.82	-5.53	-4.28	-3.39	-2.80	-2.66	-2.88	-3.43	-4.03	-4.50	-4.45	-4.28	-3.91	-3.82		
120	-2.88	-3.12	-3.71	-4.44	-5.11	-5.57	-5.50	-5.11	-4.43	-3.52	-2.72	-1.96	-1.34	-0.96	-0.92	-1.24	-2.00	-3.01	-4.09	-4.89	-5.00	-4.61	-3.85	-3.28		
135	-2.88	-2.57	-2.43	-2.36	-2.25	-2.05	-1.78	-1.54	-1.34	-1.21	-1.21	-1.30	-1.45	-1.61	-1.87	-2.09	-2.59	-3.16	-3.83	-4.40	-4.67	-4.48	-4.03	-3.44		
150	-3.83	-3.78	-3.67	-3.69	-3.67	-3.72	-3.93	-4.29	-4.91	-5.60	-6.38	-7.19	-7.75	-8.05	-8.03	-7.76	-7.26	-6.87	-6.53	-6.17	-5.65	-5.09	-4.53	-4.16		
165	-8.18	-8.55	-8.87	-9.38	-10.03	-10.71	-11.54	-12.59	-14.01	-16.06	-19.09	-22.13	-20.58	-16.88	-13.99	-11.95	-10.49	-9.46	-8.78	-8.28	-7.97	-7.80	-7.88	-7.95		
180																										



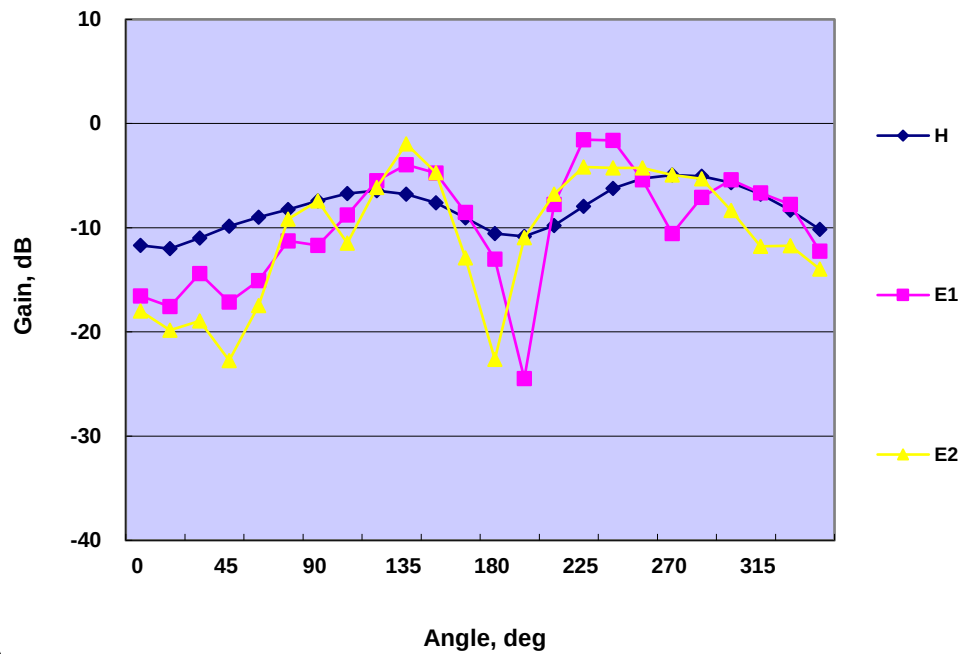
Total Radiated Gain and Efficiency	-5.533 dB	27.972 %	Theta	-6.727 dB	Phi	-11.724 dB
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2-D Plots

	0	15	30	45	60	75	90	105	120	135	150	165
H	-11.69	-12.01	-10.99	-9.86	-9.00	-8.25	-7.41	-6.73	-6.44	-6.77	-7.62	-9.05
E1	-16.54	-17.56	-14.40	-17.14	-15.06	-11.27	-11.69	-8.78	-5.48	-3.96	-4.76	-8.53
E2	-18.00	-19.82	-18.93	-22.74	-17.46	-9.17	-7.41	-11.49	-6.13	-1.94	-4.72	-12.89
	180	195	210	225	240	255	270	285	300	315	330	345
H	-10.57	-10.84	-9.79	-7.95	-6.23	-5.28	-4.94	-5.06	-5.68	-6.77	-8.30	-10.17
E1	-13.01	-24.48	-7.76	-1.54	-1.62	-5.39	-10.57	-7.07	-5.38	-6.64	-7.75	-12.26
E2	-22.64	-10.96	-6.77	-4.16	-4.25	-4.27	-4.94	-5.31	-8.35	-11.79	-11.71	-13.97

Average H -7.73 dB E1 -7.29 dB E2 -7.7 dB

2-D Gain(H, E1, E2)



3-D Plots

Peak Gain	-0.92 dB,	$\theta = 120$ deg,	$\phi = 210$ deg
Min Gain	-23.18 dB,	$\theta = 45$ deg,	$\phi = 75$ deg

Total Radiated Gain and Efficiency -5.533 dB 27.972 %

Theta -6.727 dB Phi -11.724 dB

Efficiency(Theta-Polarization and Phi-Polarization)

2470MHz Efficiency

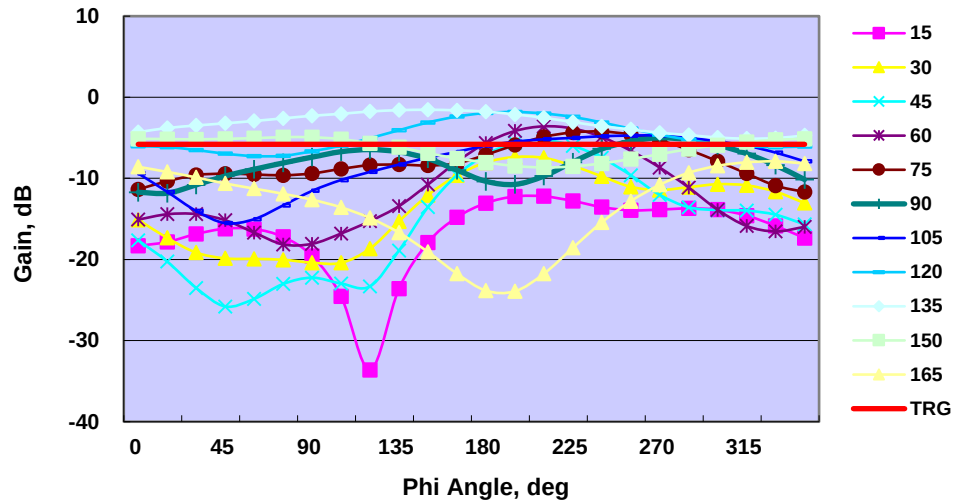
EUT		Frequency	2470	MHz	Comment		Antenna Matching	
IMEI		Antenna Type					Type	
Test Date	Thu 02/Feb/2023 11:03:29						Z1	
Test Condition	FS						Z2	
Tester							Z3	

Theta-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	$\sum EiRP_{\theta} \times \sin\theta_i$
0	-16.96						-17.57					-16.07						-17.15							
15	-18.32	-17.84	-16.86	-16.20	-16.24	-17.22	-19.57	-24.53	-33.61	-23.59	-17.90	-14.81	-13.05	-12.23	-12.21	-12.78	-13.54	-13.94	-13.85	-13.70	-13.86	-14.59	-15.86	-17.35	
30	-15.10	-17.34	-19.15	-19.86	-19.93	-20.03	-20.39	-20.42	-18.65	-15.29	-12.06	-9.64	-8.03	-7.37	-7.47	-8.45	-9.75	-11.04	-11.43	-11.08	-10.72	-10.86	-11.64	-13.04	
45	-17.63	-20.25	-23.51	-25.79	-24.86	-23.02	-22.24	-22.96	-23.31	-18.89	-13.54	-9.60	-7.09	-5.62	-5.26	-5.98	-7.47	-9.61	-12.03	-13.56	-13.91	-13.97	-14.48	-15.67	
60	-15.08	-14.42	-14.40	-15.16	-16.68	-18.14	-18.07	-16.80	-15.27	-13.42	-10.76	-7.95	-5.64	-4.16	-3.58	-3.85	-4.90	-6.59	-8.67	-11.13	-13.87	-15.87	-16.54	-15.98	
75	-11.35	-10.35	-9.59	-9.42	-9.51	-9.62	-9.39	-8.83	-8.36	-8.30	-8.41	-8.15	-7.09	-5.89	-4.88	-4.33	-4.22	-4.59	-5.30	-6.48	-7.89	-9.40	-10.90	-11.68	
90	-11.71	-11.82	-10.80	-9.71	-8.88	-8.10	-7.38	-6.71	-6.45	-6.73	-7.57	-8.98	-10.36	-10.74	-9.72	-7.99	-6.37	-5.42	-5.00	-5.23	-5.90	-6.95	-8.38	-10.14	
105	-9.39	-11.66	-14.01	-15.52	-15.03	-13.33	-11.54	-10.20	-9.21	-8.29	-7.45	-6.73	-5.96	-5.48	-5.18	-5.01	-4.80	-4.73	-4.71	-5.00	-5.45	-5.97	-6.82	-7.90	
120	-6.03	-6.14	-6.50	-6.96	-7.25	-7.22	-6.66	-5.96	-5.04	-4.06	-3.10	-2.38	-1.93	-1.81	-2.00	-2.42	-3.11	-3.87	-4.62	-5.22	-5.77	-6.04	-6.14	-6.07	
135	-4.30	-3.79	-3.48	-3.21	-2.92	-2.60	-2.28	-2.04	-1.75	-1.59	-1.54	-1.61	-1.77	-2.11	-2.53	-3.06	-3.57	-3.96	-4.38	-4.66	-4.96	-5.10	-5.03	-4.71	
150	-5.12	-5.15	-5.19	-5.12	-5.04	-4.92	-4.93	-5.16	-5.66	-6.17	-6.89	-7.54	-8.03	-8.48	-8.65	-8.53	-8.15	-7.62	-7.01	-6.39	-5.90	-5.51	-5.26	-5.11	
165	-8.57	-9.20	-9.88	-10.63	-11.26	-11.90	-12.63	-13.57	-14.89	-16.69	-19.07	-21.74	-23.84	-23.92	-21.76	-18.56	-15.42	-12.81	-10.79	-9.31	-8.45	-8.02	-7.90	-8.16	
180	-12.73						-22.02						-13.10						-22.13						

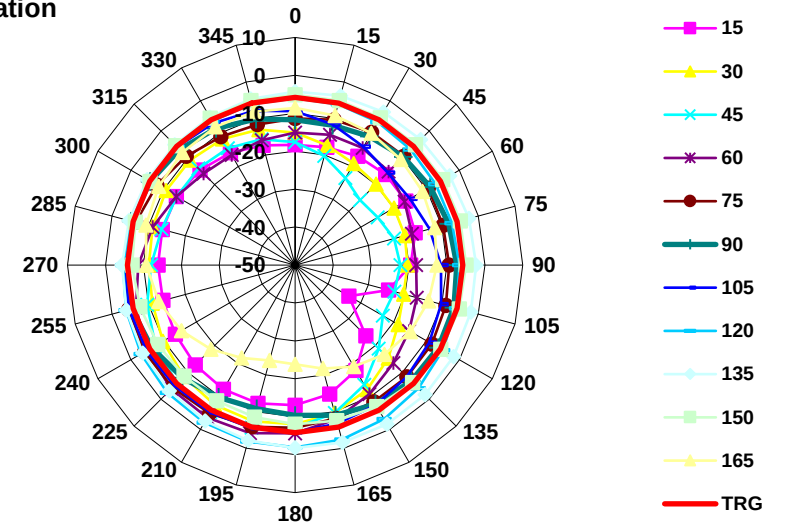
Phi-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	$\sum EiRP_{\theta} \times \sin\theta_i$
0																									
15	-15.46	-17.28	-20.33	-24.23	-22.92	-18.87	-15.97	-14.25	-13.36	-13.26	-13.96	-15.78	-19.47	-26.19	-24.22	-18.63	-15.90	-14.81	-14.71	-15.00	-15.14	-14.95	-14.63	-14.72	
30	-18.97	-20.62	-23.89	-27.98	-25.25	-20.15	-16.37	-13.73	-12.03	-11.20	-11.42	-12.91	-16.49	-23.53	-20.54	-14.96	-12.47	-11.66	-11.99	-13.18	-14.96	-16.74	-17.90	-18.32	
45	-28.46	-27.09	-24.48	-23.31	-24.86	-30.75	-24.27	-17.12	-12.94	-10.38	-8.89	-8.68	-9.52	-11.76	-14.87	-16.04	-14.45	-13.30	-13.35	-14.57	-16.92	-20.36	-24.71	-27.90	
60	-17.84	-18.58	-18.73	-18.17	-18.25	-20.44	-25.83	-21.08	-14.33	-10.37	-8.06	-6.94	-6.96	-8.11	-10.06	-12.08	-13.48	-14.24	-14.92	-15.84	-16.92	-17.70	-17.84	-17.72	
75	-11.28	-12.30	-13.17	-13.02	-12.66	-13.36	-15.94	-21.84	-20.92	-13.63	-9.59	-7.51	-6.52	-6.70	-7.41	-8.83	-10.91	-13.91	-17.48	-18.50	-15.97	-13.45	-11.81	-11.03	
90	-7.53	-8.33	-9.44	-10.01	-10.28	-10.94	-12.92	-17.15	-28.89	-20.05	-13.21	-9.85	-7.97	-7.05	-6.62	-6.97	-8.43	-11.34	-16.51	-22.16	-16.08	-11.62	-9.18	-7.93	
105	-6.29	-6.63	-7.55	-8.71	-9.86	-10.97	-12.70	-15.78	-22.12	-35.41	-19.02	-13.86	-10.76	-8.67	-7.49	-7.43	-8.65	-11.38	-16.59	-22.90	-15.34	-10.61	-8.01	-6.54	
120	-6.41	-6.66	-7.66	-9.15	-10.87	-12.66	-14.50	-16.79	-20.41	-28.16	-28.87	-18.44	-13.41	-10.45	-9.11	-8.91	-10.09	-12.93	-19.02	-34.60	-16.57	-11.35	-8.54	-7.10	
135	-9.66	-9.90	-10.84	-12.16	-13.48	-14.71	-16.02	-17.58	-19.56	-22.36	-26.90	-25.28	-18.51	-14.21	-11.81	-10.75	-10.89	-12.32	-15.68	-24.02	-25.91	-15.99	-12.07	-10.20	
150	-10.93	-10.32	-9.87	-9.90	-10.32	-10.82	-11.75	-12.89	-14.49	-16.75	-20.12	-26.53	-34.97	-23.14	-18.54	-16.55	-16.17	-17.36	-20.86	-30.75	-25.34	-17.82	-14.21	-12.14	
165	-19.10	-17.15	-16.08	-15.64	-15.73	-16.25	-17.15	-18.33	-20.01	-22.80	-28.75	-33.60	-22.64	-17.66	-14.76	-13.11	-12.31	-12.38	-13.27	-15.17	-18.48	-24.38	-30.04	-23.15	
180																									

Total Radiated Gain and Efficiency	-5.798 dB	26.312 %	Theta	-7.008 dB	Phi	-11.940 dB
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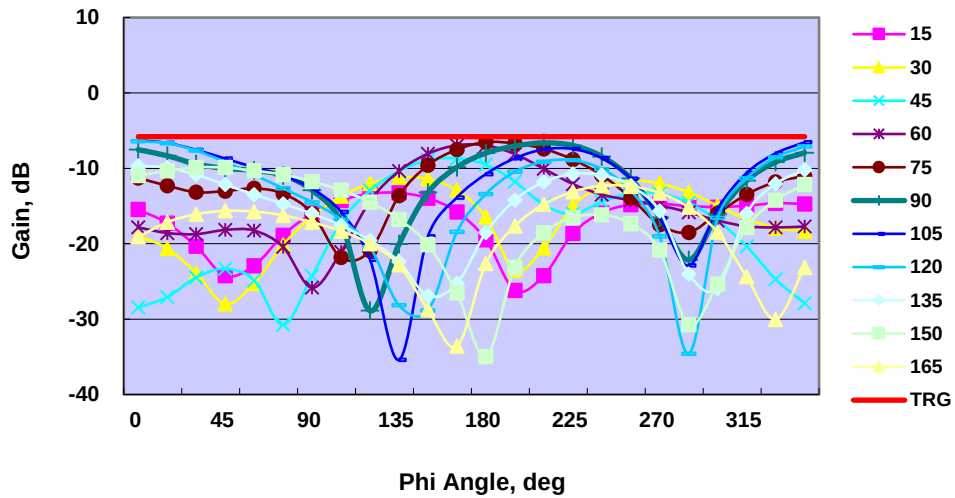
Theta-Polarization Gain



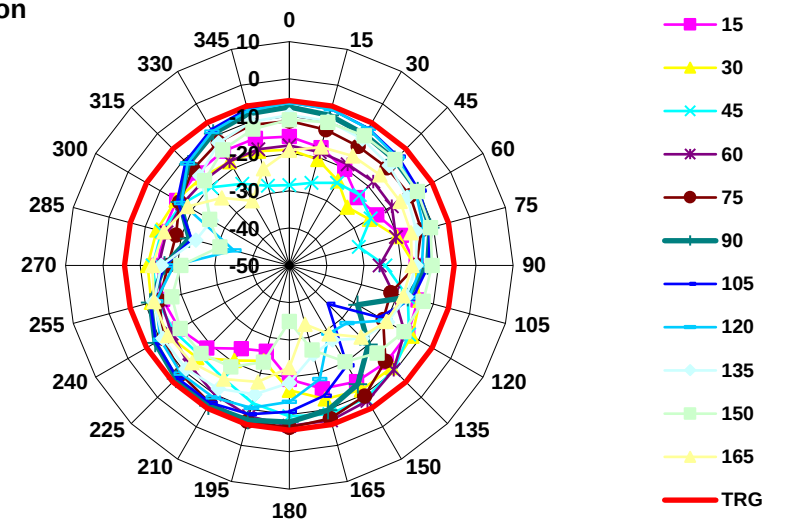
Theta-Polarization Gain



Phi-Polarization Gain



Phi-Polarization Gain



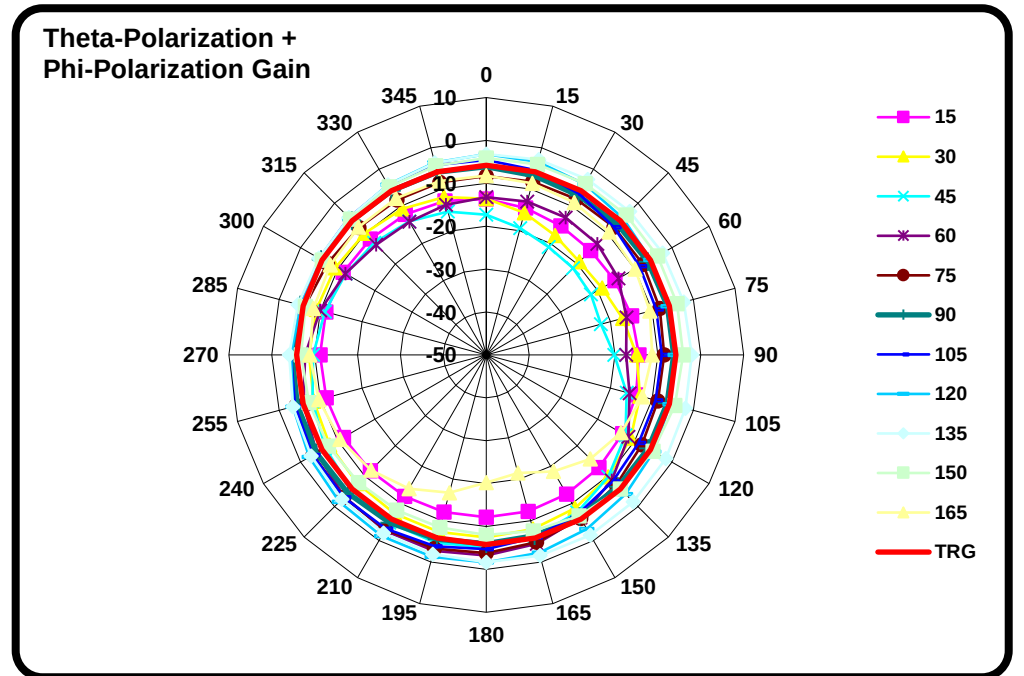
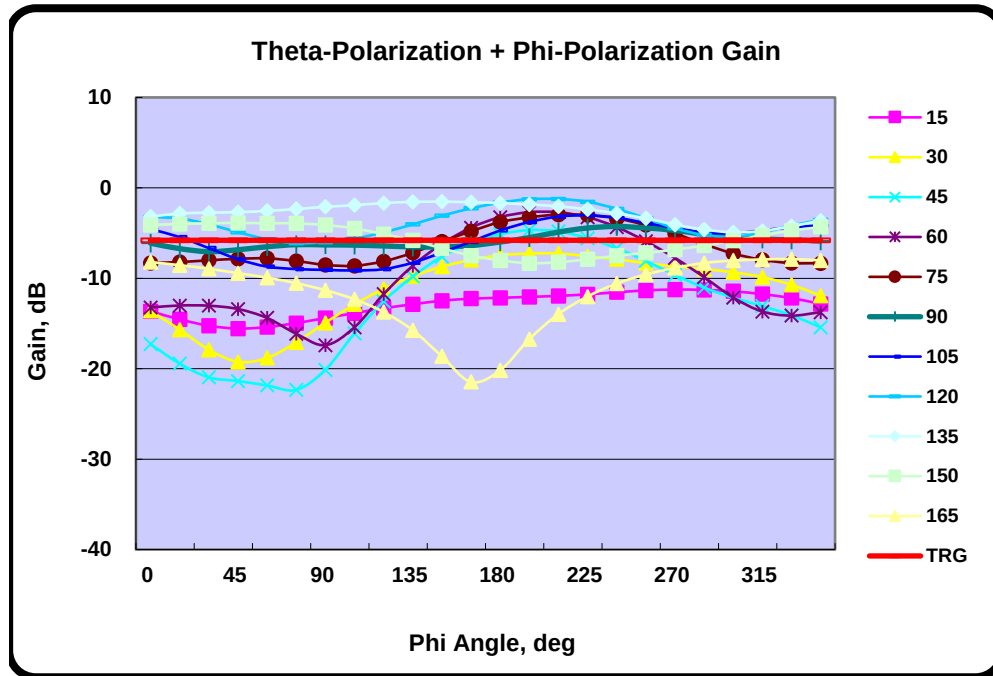
Total Radiated Gain and Efficiency -5.798 dB 26.312 %

Theta -7.008 dB Phi -11.940 dB

Efficiency(Theta-Polarization + Phi-Polarization)

2470MHz Efficiency

Theta-Polarization + Phi-Polarization Gain(dB)																										
θ_N (deg)	φ_M (deg)																									$\Sigma EiRP_{\theta}$ $\times \sin\theta_i$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345		
0																										
15	-13.65	-14.54	-15.25	-15.57	-15.40	-14.96	-14.40	-13.86	-13.32	-12.88	-12.49	-12.26	-12.16	-12.06	-11.94	-11.78	-11.55	-11.34	-11.25	-11.29	-11.44	-11.76	-12.19	-12.83		
30	-13.61	-15.67	-17.89	-19.24	-18.81	-17.08	-14.92	-12.89	-11.17	-9.77	-8.72	-7.96	-7.45	-7.27	-7.26	-7.57	-7.89	-8.33	-8.69	-8.99	-9.33	-9.86	-10.72	-11.91		
45	-17.29	-19.43	-20.96	-21.37	-21.85	-22.34	-20.13	-16.11	-12.56	-9.81	-7.61	-6.11	-5.13	-4.67	-4.81	-5.57	-6.68	-8.06	-9.63	-11.03	-12.15	-13.07	-14.09	-15.42		
60	-13.23	-13.01	-13.04	-13.40	-14.38	-16.13	-17.40	-15.42	-11.76	-8.62	-6.19	-4.41	-3.24	-2.69	-2.70	-3.24	-4.34	-5.90	-7.75	-9.87	-12.12	-13.68	-14.13	-13.75		
75	-8.30	-8.21	-8.01	-7.85	-7.80	-8.09	-8.52	-8.62	-8.13	-7.18	-5.95	-4.81	-3.79	-3.27	-2.95	-3.01	-3.38	-4.11	-5.04	-6.22	-7.26	-7.96	-8.32	-8.33		
90	-6.13	-6.72	-7.06	-6.85	-6.51	-6.28	-6.31	-6.33	-6.43	-6.53	-6.52	-6.38	-5.99	-5.50	-4.89	-4.44	-4.27	-4.43	-4.70	-5.14	-5.50	-5.68	-5.75	-5.89		
105	-4.56	-5.44	-6.67	-7.89	-8.71	-8.98	-9.07	-9.14	-8.99	-8.28	-7.16	-5.96	-4.72	-3.78	-3.17	-3.04	-3.30	-3.88	-4.44	-4.93	-5.03	-4.69	-4.36	-4.16		
120	-3.21	-3.38	-4.03	-4.91	-5.68	-6.13	-6.00	-5.62	-4.92	-4.04	-3.09	-2.27	-1.63	-1.25	-1.23	-1.54	-2.32	-3.36	-4.47	-5.21	-5.42	-4.92	-4.17	-3.54		
135	-3.19	-2.84	-2.75	-2.69	-2.55	-2.34	-2.10	-1.92	-1.68	-1.55	-1.53	-1.59	-1.68	-1.85	-2.05	-2.38	-2.83	-3.37	-4.07	-4.61	-4.93	-4.76	-4.25	-3.63		
150	-4.11	-4.00	-3.92	-3.87	-3.91	-3.93	-4.11	-4.48	-5.13	-5.81	-6.69	-7.49	-8.02	-8.33	-8.23	-7.89	-7.51	-7.18	-6.83	-6.37	-5.85	-5.26	-4.74	-4.32		
165	-8.20	-8.55	-8.95	-9.44	-9.93	-10.54	-11.32	-12.32	-13.73	-15.74	-18.63	-21.47	-20.19	-16.74	-13.97	-12.02	-10.58	-9.58	-8.85	-8.31	-8.04	-7.92	-7.87	-8.02		
180																										



Total Radiated Gain and Efficiency	-5.798 dB	26.312 %	Theta	-7.008 dB	Phi	-11.940 dB
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2-D Gain and 3-D Plots

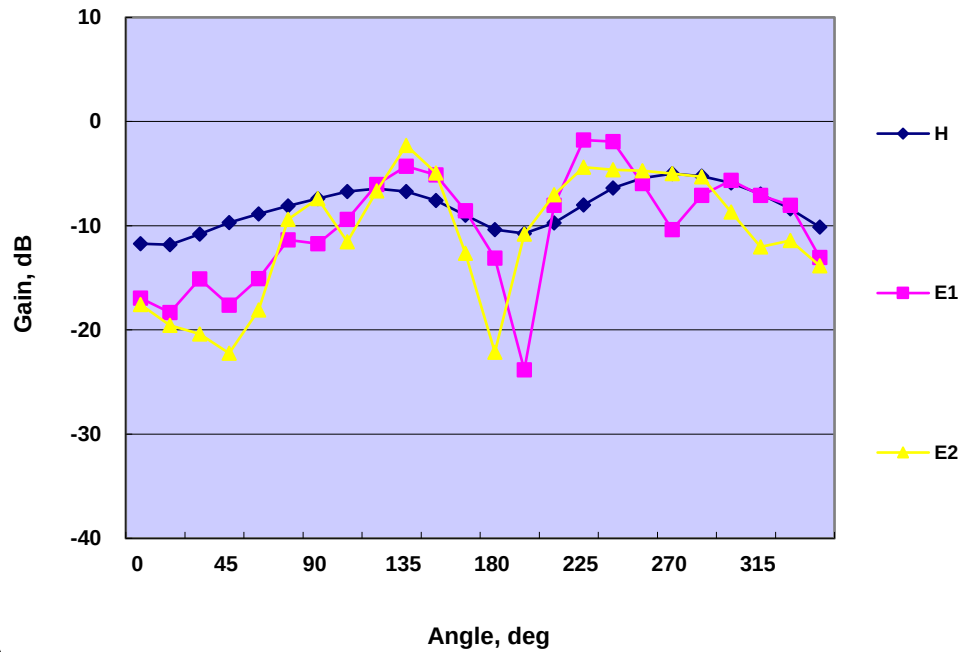
2470MHz Efficiency

2-D Plots

	0	15	30	45	60	75	90	105	120	135	150	165
H	-11.71	-11.82	-10.80	-9.71	-8.88	-8.10	-7.38	-6.71	-6.45	-6.73	-7.57	-8.98
E1	-16.96	-18.32	-15.10	-17.63	-15.08	-11.35	-11.71	-9.39	-6.03	-4.30	-5.12	-8.57
E2	-17.57	-19.57	-20.39	-22.24	-18.07	-9.39	-7.38	-11.54	-6.66	-2.28	-4.93	-12.63
	180	195	210	225	240	255	270	285	300	315	330	345
H	-10.36	-10.74	-9.72	-7.99	-6.37	-5.42	-5.00	-5.23	-5.90	-6.95	-8.38	-10.14
E1	-13.10	-23.84	-8.03	-1.77	-1.93	-5.96	-10.36	-7.09	-5.64	-7.09	-8.03	-13.05
E2	-22.13	-10.79	-7.01	-4.38	-4.62	-4.71	-5.00	-5.30	-8.67	-12.03	-11.43	-13.85

Average H -7.76 dB E1 -7.6 dB E2 -7.92 dB

2-D Gain(H, E1, E2)



3-D Plots

Peak Gain	-1.23 dB,	$\theta = 120$ deg,	$\phi = 210$ deg
Min Gain	-22.34 dB,	$\theta = 45$ deg,	$\phi = 75$ deg

Total Radiated Gain and Efficiency -5.798 dB 26.312 %

Theta -7.008 dB Phi -11.940 dB

Efficiency(Theta-Polarization and Phi-Polarization)

2480MHz Efficiency

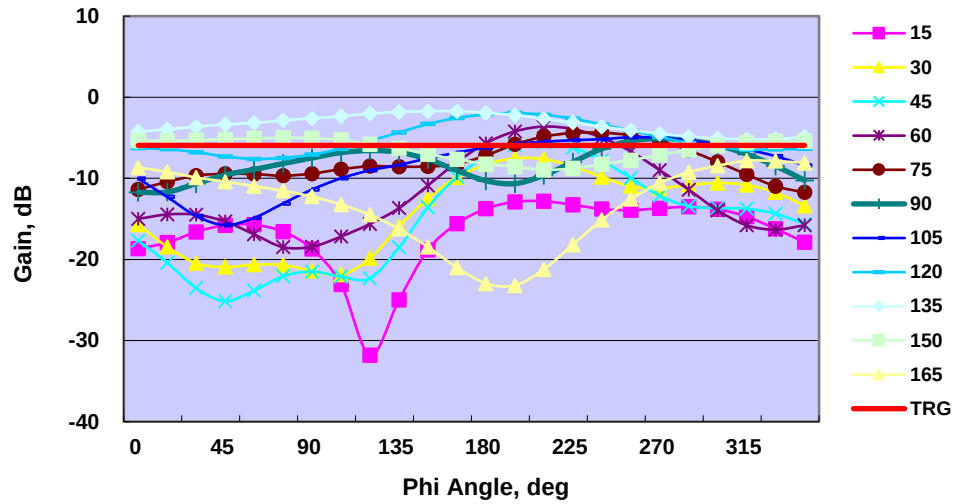
EUT		Frequency	2480	MHz	Comment		Antenna Matching	
IMEI		Antenna Type					Type	
Test Date	Thu 02/Feb/2023 11:03:29						Z1	
Test Condition	FS						Z2	
Tester							Z3	

Theta-Polarization Gain(dB)																										
θ_N (deg)	φ_M (deg)																									$\Sigma EIRP_\theta$ $\times \sin\theta$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345		
0	-17.01						-17.20						-16.75						-17.20							
15	-18.65	-17.93	-16.60	-15.78	-15.72	-16.58	-18.70	-23.07	-31.81	-24.98	-18.81	-15.59	-13.75	-12.89	-12.81	-13.25	-13.77	-13.93	-13.68	-13.51	-13.79	-14.72	-16.20	-17.89		
30	-15.70	-18.42	-20.46	-20.93	-20.64	-20.68	-21.39	-21.88	-19.85	-15.95	-12.47	-9.85	-8.30	-7.54	-7.62	-8.53	-9.81	-10.98	-11.20	-10.81	-10.56	-10.80	-11.73	-13.37		
45	-17.68	-20.39	-23.53	-25.13	-23.84	-22.07	-21.49	-22.11	-22.33	-18.52	-13.59	-9.82	-7.32	-5.91	-5.57	-6.19	-7.80	-9.93	-12.15	-13.42	-13.67	-13.75	-14.35	-15.62		
60	-14.99	-14.45	-14.47	-15.32	-16.90	-18.48	-18.42	-17.17	-15.62	-13.67	-10.87	-7.99	-5.66	-4.21	-3.61	-3.92	-4.97	-6.67	-8.99	-11.39	-13.94	-15.78	-16.32	-15.78		
75	-11.38	-10.43	-9.65	-9.43	-9.47	-9.68	-9.41	-8.87	-8.50	-8.55	-8.54	-8.24	-7.17	-5.81	-4.85	-4.40	-4.37	-4.68	-5.38	-6.54	-7.98	-9.52	-10.97	-11.73		
90	-11.71	-11.69	-10.64	-9.57	-8.90	-8.17	-7.48	-6.82	-6.57	-6.77	-7.64	-9.03	-10.29	-10.65	-9.62	-7.99	-6.35	-5.39	-5.08	-5.32	-5.91	-7.01	-8.47	-10.24		
105	-10.02	-12.29	-14.63	-15.76	-14.87	-13.09	-11.37	-9.99	-9.00	-8.34	-7.52	-6.83	-6.18	-5.73	-5.49	-5.29	-5.17	-4.93	-5.00	-5.32	-5.80	-6.43	-7.26	-8.40		
120	-6.29	-6.40	-6.77	-7.30	-7.61	-7.48	-7.08	-6.35	-5.36	-4.34	-3.29	-2.56	-2.10	-1.95	-2.16	-2.63	-3.35	-4.11	-4.90	-5.62	-6.11	-6.48	-6.41	-6.37		
135	-4.23	-3.95	-3.63	-3.34	-3.17	-2.84	-2.60	-2.33	-2.02	-1.81	-1.73	-1.73	-1.93	-2.20	-2.66	-3.13	-3.62	-4.08	-4.48	-4.84	-5.07	-5.16	-5.18	-4.85		
150	-5.36	-5.37	-5.30	-5.19	-5.09	-4.99	-5.05	-5.24	-5.79	-6.27	-7.02	-7.64	-8.23	-8.55	-8.95	-8.76	-8.25	-7.76	-7.10	-6.52	-5.95	-5.60	-5.45	-5.44		
165	-8.66	-9.20	-9.90	-10.40	-10.95	-11.54	-12.25	-13.22	-14.49	-16.23	-18.46	-20.99	-22.95	-23.20	-21.21	-18.18	-15.12	-12.56	-10.58	-9.23	-8.44	-7.82	-7.87	-8.08		
180	-12.70						-22.39						-12.94						-21.76							

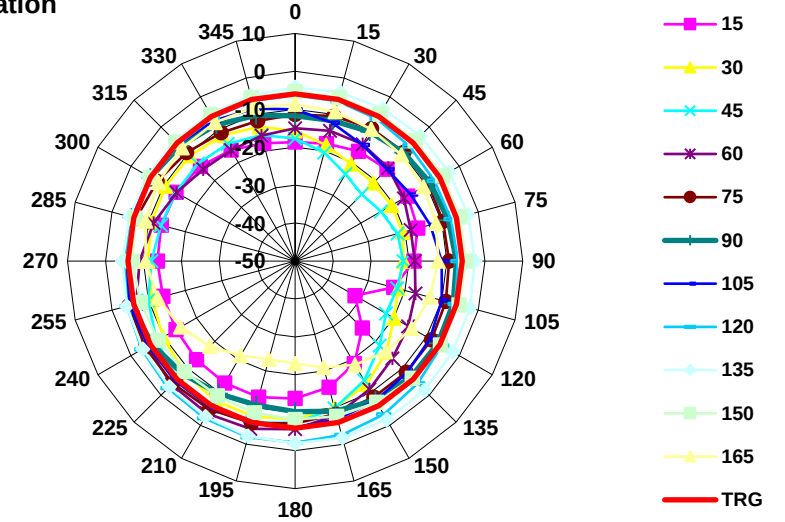
Phi-Polarization Gain(dB)																									
θ_N (deg)	φ_M (deg)																								$\sum EiRP_\phi \times \sin\theta_i$
0	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-15.32	-17.15	-20.42	-24.62	-23.36	-19.08	-16.17	-14.41	-13.55	-13.47	-14.23	-16.12	-19.83	-26.35	-23.91	-18.63	-16.08	-15.14	-15.07	-15.23	-15.16	-14.72	-14.36	-14.44	
30	-18.33	-20.12	-23.52	-28.22	-25.95	-20.58	-16.77	-14.03	-12.29	-11.42	-11.57	-13.09	-16.81	-25.00	-21.04	-15.15	-12.66	-11.96	-12.41	-13.76	-15.59	-17.10	-17.69	-17.76	
45	-27.58	-27.25	-25.00	-23.73	-25.00	-29.17	-23.50	-16.97	-12.99	-10.52	-9.13	-8.88	-9.85	-12.03	-15.03	-15.98	-14.55	-13.60	-13.84	-15.23	-17.77	-21.33	-25.19	-26.97	
60	-19.16	-19.64	-19.30	-18.40	-18.39	-20.64	-26.41	-21.19	-14.40	-10.48	-8.09	-7.02	-7.03	-8.05	-9.99	-11.92	-13.39	-14.36	-15.32	-16.52	-17.91	-19.05	-19.31	-19.09	
75	-11.81	-12.72	-13.46	-13.18	-12.84	-13.64	-16.39	-22.38	-20.32	-13.39	-9.47	-7.41	-6.47	-6.62	-7.37	-8.67	-10.80	-13.80	-17.54	-19.22	-16.79	-14.21	-12.46	-11.65	
90	-7.95	-8.54	-9.42	-10.02	-10.26	-11.15	-13.28	-17.77	-30.57	-19.40	-12.97	-9.71	-7.94	-7.01	-6.67	-6.96	-8.35	-11.26	-16.13	-21.82	-16.54	-12.02	-9.60	-8.29	
105	-6.41	-6.56	-7.53	-8.69	-9.82	-11.03	-12.90	-16.17	-23.03	-32.22	-18.41	-13.53	-10.63	-8.62	-7.54	-7.53	-8.65	-11.37	-16.35	-21.83	-15.26	-10.67	-8.15	-6.71	
120	-6.70	-6.88	-7.85	-9.32	-11.01	-12.72	-14.61	-17.03	-20.84	-29.52	-28.24	-18.37	-13.49	-10.57	-9.04	-8.91	-10.19	-13.13	-19.34	-30.67	-16.16	-11.13	-8.51	-7.20	
135	-9.78	-10.04	-10.95	-12.25	-13.46	-14.54	-15.80	-17.44	-19.58	-22.53	-27.06	-24.98	-18.45	-14.26	-11.87	-10.83	-11.07	-12.62	-16.21	-25.44	-24.24	-15.48	-11.80	-10.08	
150	-10.71	-10.13	-9.89	-9.93	-10.28	-10.87	-11.65	-12.73	-14.28	-16.48	-19.95	-26.38	-37.38	-23.46	-18.84	-16.88	-16.69	-18.23	-22.47	-32.15	-22.67	-16.82	-13.66	-11.82	
165	-19.22	-17.20	-16.19	-15.78	-15.85	-16.27	-17.01	-18.09	-19.65	-22.17	-27.23	-29.71	-21.95	-17.34	-14.59	-13.02	-12.36	-12.49	-13.47	-15.52	-19.09	-25.74	-31.56	-23.16	
180																									

Total Radiated Gain and Efficiency	-5.937 dB	25.487 %	Theta	-7.163 dB	Phi	-12.026 dB
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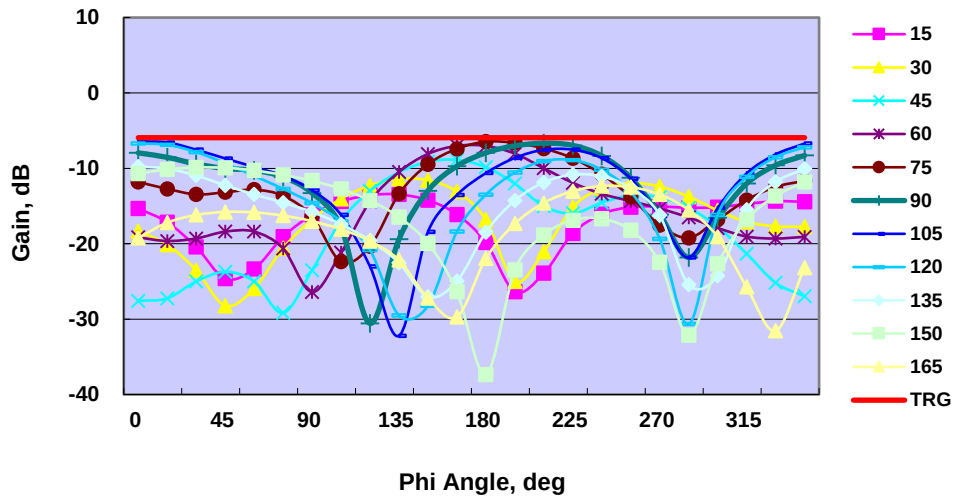
Theta-Polarization Gain



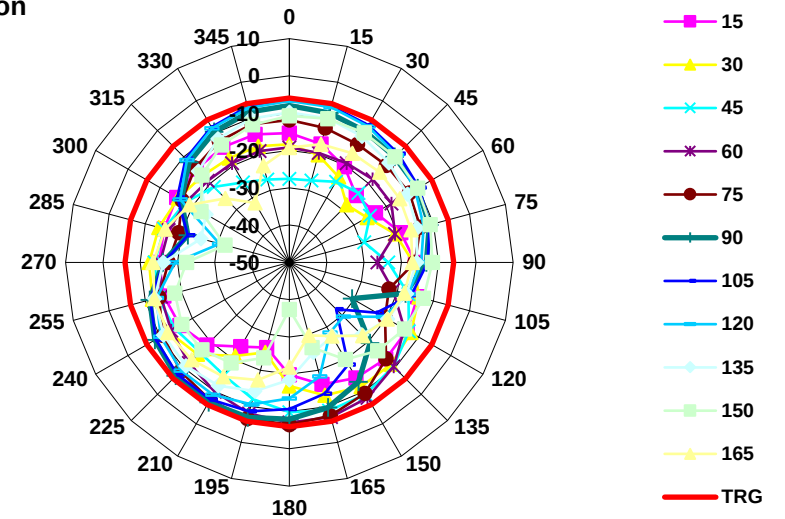
Theta-Polarization Gain



Phi-Polarization Gain



Phi-Polarization Gain

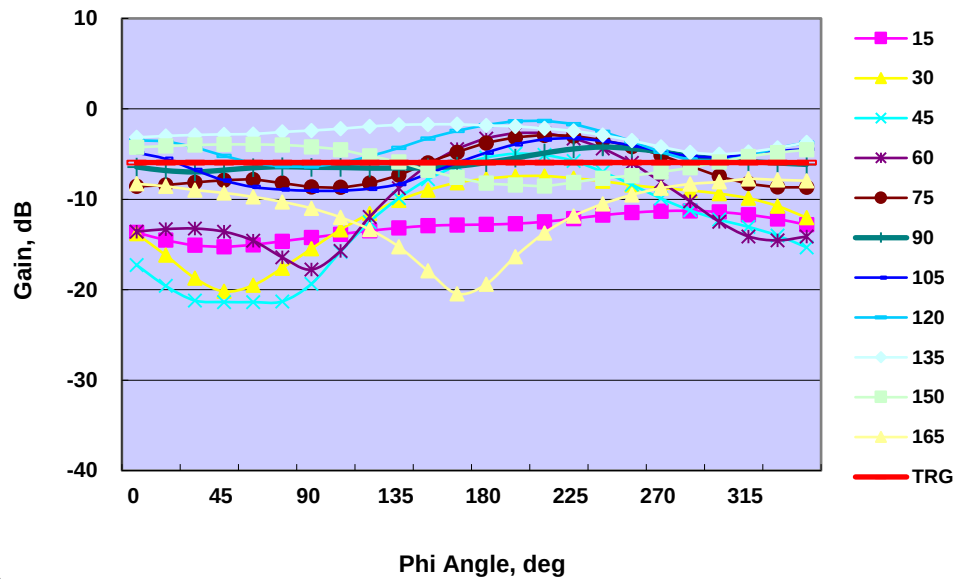


Total Radiated Gain and Efficiency -5.937 dB 25.487 %

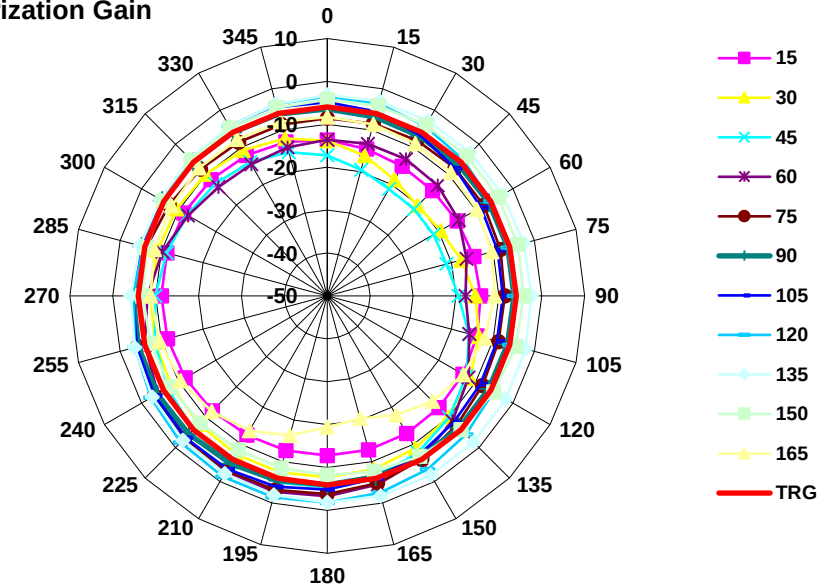
Theta -7.163 dB Phi -12.026 dB

θ_N (deg)	Theta-Polarization + Phi-Polarization Gain(dB)																								$\sum EIRP_{\theta} \times \sin\theta_i$
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
0																									
15	-13.66	-14.51	-15.09	-15.25	-15.03	-14.64	-14.24	-13.86	-13.49	-13.17	-12.93	-12.84	-12.79	-12.70	-12.49	-12.14	-11.76	-11.48	-11.31	-11.28	-11.41	-11.71	-12.17	-12.82	
30	-13.81	-16.18	-18.72	-20.19	-19.52	-17.62	-15.48	-13.37	-11.59	-10.11	-8.99	-8.16	-7.73	-7.46	-7.43	-7.67	-7.99	-8.43	-8.75	-9.03	-9.37	-9.89	-10.75	-12.02	
45	-17.26	-19.58	-21.19	-21.36	-21.37	-21.30	-19.37	-15.81	-12.51	-9.88	-7.80	-6.31	-5.39	-4.96	-5.10	-5.76	-6.97	-8.38	-9.90	-11.22	-12.24	-13.05	-14.01	-15.31	
60	-13.58	-13.30	-13.24	-13.58	-14.57	-16.42	-17.78	-15.72	-11.96	-8.78	-6.25	-4.47	-3.28	-2.71	-2.71	-3.28	-4.39	-5.99	-8.08	-10.23	-12.48	-14.10	-14.55	-14.12	
75	-8.58	-8.42	-8.14	-7.90	-7.83	-8.21	-8.62	-8.68	-8.22	-7.32	-5.97	-4.79	-3.80	-3.19	-2.92	-3.02	-3.48	-4.18	-5.12	-6.31	-7.44	-8.25	-8.64	-8.68	
90	-6.42	-6.83	-6.98	-6.78	-6.52	-6.40	-6.47	-6.48	-6.55	-6.54	-6.52	-6.35	-5.95	-5.45	-4.89	-4.43	-4.23	-4.39	-4.75	-5.22	-5.55	-5.82	-5.99	-6.15	
105	-4.84	-5.53	-6.76	-7.91	-8.64	-8.93	-9.06	-9.05	-8.83	-8.32	-7.18	-5.99	-4.85	-3.93	-3.38	-3.26	-3.56	-4.04	-4.69	-5.22	-5.33	-5.04	-4.67	-4.46	
120	-3.48	-3.62	-4.27	-5.18	-5.98	-6.34	-6.37	-5.99	-5.24	-4.33	-3.28	-2.45	-1.80	-1.39	-1.35	-1.71	-2.53	-3.60	-4.75	-5.61	-5.70	-5.20	-4.32	-3.75	
135	-3.16	-2.99	-2.89	-2.81	-2.78	-2.56	-2.40	-2.20	-1.94	-1.77	-1.72	-1.71	-1.83	-1.94	-2.17	-2.45	-2.90	-3.51	-4.20	-4.80	-5.02	-4.77	-4.32	-3.71	
150	-4.25	-4.12	-4.00	-3.93	-3.94	-3.99	-4.19	-4.53	-5.21	-5.87	-6.80	-7.58	-8.22	-8.41	-8.53	-8.14	-7.67	-7.39	-6.98	-6.51	-5.86	-5.28	-4.84	-4.54	
165	-8.29	-8.56	-8.98	-9.29	-9.73	-10.28	-11.00	-12.00	-13.33	-15.24	-17.92	-20.44	-19.41	-16.34	-13.73	-11.86	-10.51	-9.51	-8.78	-8.31	-8.08	-7.75	-7.85	-7.95	
180																									

Theta-Polarization + Phi-Polarization Gain



Theta-Polarization + Phi-Polarization Gain



Total Radiated Gain and Efficiency

-5.937 dB

25.487 %

Theta

-7.163 dB

Phi

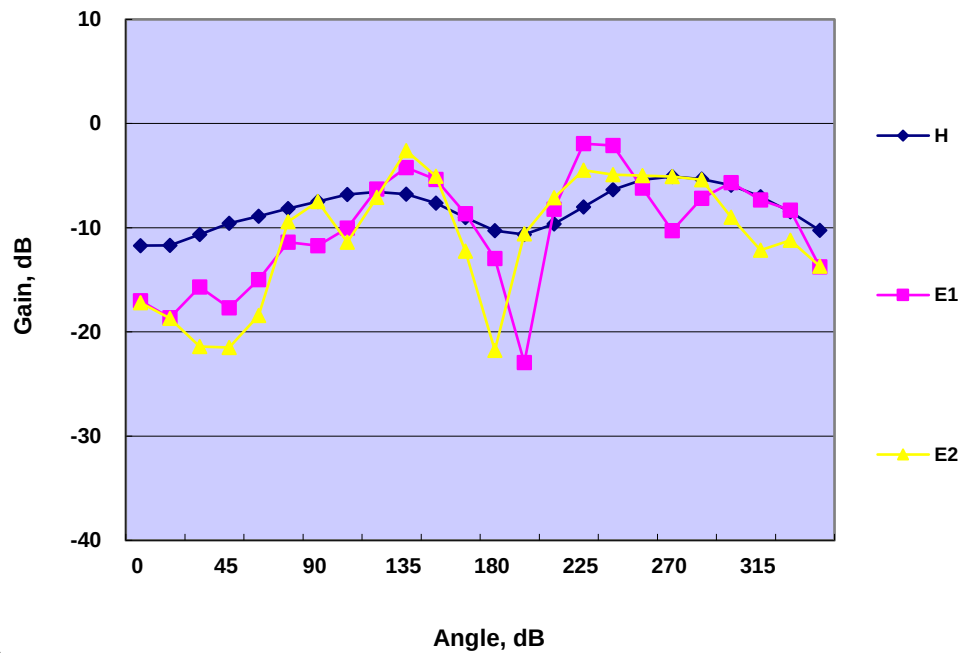
-12.026 dB

2-D Plots

	0	15	30	45	60	75	90	105	120	135	150	165
H	-11.71	-11.69	-10.64	-9.57	-8.90	-8.17	-7.48	-6.82	-6.57	-6.77	-7.64	-9.03
E1	-17.01	-18.65	-15.70	-17.68	-14.99	-11.38	-11.71	-10.02	-6.29	-4.23	-5.36	-8.66
E2	-17.20	-18.70	-21.39	-21.49	-18.42	-9.41	-7.48	-11.37	-7.08	-2.60	-5.05	-12.25
	180	195	210	225	240	255	270	285	300	315	330	345
H	-10.29	-10.65	-9.62	-7.99	-6.35	-5.39	-5.08	-5.32	-5.91	-7.01	-8.47	-10.24
E1	-12.94	-22.95	-8.23	-1.93	-2.10	-6.18	-10.29	-7.17	-5.66	-7.32	-8.30	-13.75
E2	-21.76	-10.58	-7.10	-4.48	-4.90	-5.00	-5.08	-5.38	-8.99	-12.15	-11.20	-13.68

Average H -7.79 dB E1 -7.75 dB E2 -8.08 dB

2-D Gain(H, E1, E2)



3-D Plots

Peak Gain	-1.35 dB,	$\theta = 120$ deg,	$\phi = 210$ deg
Min Gain	-21.37 dB,	$\theta = 45$ deg,	$\phi = 60$ deg

Total Radiated Gain and Efficiency -5.937 dB 25.487 %

Theta -7.163 dB Phi -12.026 dB