

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)		
5MHz	19975	1712.5	QPSK	1	0	23.17	22.5±1	0.5		
				1	49	23.17	22.5±1	0.5		
				1	99	23.1	22.5±1	0.5		
				12	0	22.12	22.5±1	0.5		
				12	24	22.12	22.5±1	0.5		
				12	49	22.13	22.5±1	0.5		
			16QAM	25	0	22.07	22.5±1	0.5		
				1	0	22.18	21.5±1	1.5		
				1	49	22.21	21.5±1	1.5		
				1	99	22.19	21.5±1	1.5		
				12	0	21.13	21.5±1	1.5		
				12	24	21.15	21.5±1	1.5		
			20175	1732.5	QPSK	12	49	21.2	21.5±1	1.5
						25	0	21.07	21.5±1	1.5
						1	0	23.12	22.5±1	0.5
						1	49	22.8	22.5±1	0.5
						1	99	23	22.5±1	0.5
						12	0	22.03	22.5±1	0.5
	16QAM	12			24	22.02	22.5±1	0.5		
		12			49	22.03	22.5±1	0.5		
		25			0	21.99	22.5±1	0.5		
		1			0	22.39	21.5±1	1.5		
		1			49	22.38	21.5±1	1.5		
		1			99	22.31	21.5±1	1.5		
	20375	1752.5			QPSK	12	0	21.08	21.5±1	1.5
						12	24	21.05	21.5±1	1.5
						12	49	21.03	21.5±1	1.5
						25	0	20.96	21.5±1	1.5
						1	0	23.01	22.5±1	0.5
						1	49	22.84	22.5±1	0.5
			16QAM	1	99	22.87	22.5±1	0.5		
				12	0	21.96	22.5±1	0.5		
				12	24	21.9	22.5±1	0.5		
				12	49	21.92	22.5±1	0.5		
				25	0	21.87	22.5±1	0.5		
				1	0	21.91	21.5±1	1.5		
16QAM			1	49	21.9	21.5±1	1.5			
			1	99	21.85	21.5±1	1.5			
			12	0	20.95	21.5±1	1.5			
			12	24	20.91	21.5±1	1.5			
			12	49	20.94	21.5±1	1.5			
			25	0	20.8	21.5±1	1.5			

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)
10MHz	20000	1715	QPSK	1	0	23.17	23.0±1	0
				1	49	23.35	23.0±1	0
				1	99	23.12	23.0±1	0
				25	0	23.02	23.0±1	0
				25	24	23.12	23.0±1	0
				25	49	23.36	23.0±1	0
				50	0	23.34	23.0±1	0
			16QAM	1	0	23.01	23.0±1	0
				1	49	23.36	23.0±1	0
				1	99	23.34	23.0±1	0
				25	0	23.47	23.0±1	0
				25	24	23.39	23.0±1	0
				25	49	23.45	23.0±1	0
				50	0	23.69	23.0±1	0
	20175	1732.5	QPSK	1	0	23.12	23.0±1	0
				1	49	22.8	23.0±1	0
				1	99	22.61	23.0±1	0
				25	0	22.96	23.0±1	0
				25	24	22.86	23.0±1	0
				25	49	22.97	23.0±1	0
				50	0	22.94	23.0±1	0
			16QAM	1	0	22.23	21.5±1	1.5
				1	49	22.13	21.5±1	1.5
				1	99	22.02	21.5±1	1.5
				25	0	20.93	21.5±1	1.5
				25	24	20.9	21.5±1	1.5
				25	49	20.91	21.5±1	1.5
				50	0	20.9	21.5±1	1.5
	20350	1750	QPSK	1	0	22.72	22.0±1	1.0
				1	49	22.52	22.0±1	1.0
1				99	22.8	22.0±1	1.0	
25				0	21.93	22.0±1	1.0	
25				24	21.87	22.0±1	1.0	
25				49	21.86	22.0±1	1.0	
50				0	21.9	22.0±1	1.0	
16QAM			1	0	21.73	21.5±1	1.5	
			1	49	21.56	21.5±1	1.5	
			1	99	21.75	21.5±1	1.5	
			25	0	20.95	21.5±1	1.5	
			25	24	20.92	21.5±1	1.5	
			25	49	20.92	21.5±1	1.5	
			50	0	20.89	21.5±1	1.5	

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)
15MHz	20025	1717.5	QPSK	1	0	23.26	22.5±1	0.5
				1	49	23.18	22.5±1	0.5
				1	99	23.26	22.5±1	0.5
				36	0	22.29	22.5±1	0.5
				36	24	22.24	22.5±1	0.5
				36	49	22.27	22.5±1	0.5
				75	0	22.3	22.5±1	0.5
			16QAM	1	0	21.93	21.5±1	1.5
				1	49	21.97	21.5±1	1.5
				1	99	22.01	21.5±1	1.5
				36	0	21.18	21.5±1	1.5
				36	24	21.19	21.5±1	1.5
				36	49	21.19	21.5±1	1.5
				75	0	21.23	21.5±1	1.5
	20175	1732.5	QPSK	1	0	23.2	22.5±1	0.5
				1	49	22.77	22.5±1	0.5
				1	99	22.63	22.5±1	0.5
				36	0	22.19	22.5±1	0.5
				36	24	22.17	22.5±1	0.5
				36	49	22.14	22.5±1	0.5
				75	0	22.24	22.5±1	0.5
			16QAM	1	0	22.33	21.5±1	1.5
				1	49	22.16	21.5±1	1.5
				1	99	22.06	21.5±1	1.5
				36	0	21.11	21.5±1	1.5
				36	24	21.08	21.5±1	1.5
				36	49	21.08	21.5±1	1.5
				75	0	21.09	21.5±1	1.5
	20325	1747.5	QPSK	1	0	22.96	22.5±1	0.5
				1	49	22.69	22.5±1	0.5
1				99	23	22.5±1	0.5	
36				0	22.11	22.5±1	0.5	
36				24	21.91	22.5±1	0.5	
36				49	21.91	22.5±1	0.5	
75				0	22.01	22.5±1	0.5	
16QAM			1	0	22.14	21.5±1	1.5	
			1	49	21.9	21.5±1	1.5	
			1	99	22.14	21.5±1	1.5	
			36	0	21.07	21.5±1	1.5	
			36	24	20.94	21.5±1	1.5	
			36	49	20.93	21.5±1	1.5	
			75	0	21.04	21.5±1	1.5	

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)
20MHz	20050	1720	QPSK	1	0	23.17	23.0±1	0
				1	49	23.09	23.0±1	0
				1	99	23.03	23.0±1	0
				50	0	22.16	23.0±1	0
				50	24	22.16	23.0±1	0
				50	49	22.16	23.0±1	0
				100	0	22.17	23.0±1	0
			16QAM	1	0	22.54	22.0±1	1.0
				1	49	22.53	22.0±1	1.0
				1	99	22.57	22.0±1	1.0
				50	0	21.18	22.0±1	1.0
				50	24	21.19	22.0±1	1.0
				50	49	21.17	22.0±1	1.0
				100	0	21.18	22.0±1	1.0
	20175	1732.5	QPSK	1	0	23.17	23.0±1	0
				1	49	23.43	23.0±1	0
				1	99	23.36	23.0±1	0
				50	0	22.74	23.0±1	0
				50	24	22.99	23.0±1	0
				50	49	22.56	23.0±1	0
				100	0	22.32	23.0±1	0
			16QAM	1	0	22.42	21.5±1	1.5
				1	49	22.13	21.5±1	1.5
				1	99	22.09	21.5±1	1.5
				50	0	21.01	21.5±1	1.5
				50	24	20.91	21.5±1	1.5
				50	49	20.93	21.5±1	1.5
				100	0	20.94	21.5±1	1.5
	20300	1745	QPSK	1	0	22.9	22.0±1	1.0
				1	49	22.67	22.0±1	1.0
1				99	22.93	22.0±1	1.0	
50				0	22.03	22.0±1	1.0	
50				24	21.99	22.0±1	1.0	
50				49	21.96	22.0±1	1.0	
100				0	22.01	22.0±1	1.0	
16QAM			1	0	22.16	21.5±1	1.5	
			1	49	21.98	21.5±1	1.5	
			1	99	22.22	21.5±1	1.5	
			50	0	20.93	21.5±1	1.5	
			50	24	20.92	21.5±1	1.5	
			50	49	20.92	21.5±1	1.5	
			100	0	20.96	21.5±1	1.5	

LTE Band 7:

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)
5MHz	20775	2502.5	QPSK	1	0	23.7	23.0±1	0
				1	49	23.45	23.0±1	0
				1	99	23.45	23.0±1	0
				12	0	22.33	23.0±1	0
				12	24	22.32	23.0±1	0
				12	49	22.3	23.0±1	0
				25	0	22.19	23.0±1	0
			16QAM	1	0	22.73	22.0±1	1.0
				1	49	22.73	22.0±1	1.0
				1	99	22.75	22.0±1	1.0
				12	0	21.43	22.0±1	1.0
				12	24	21.41	22.0±1	1.0
				12	49	21.42	22.0±1	1.0
				25	0	21.31	22.0±1	1.0
	21100	2535	QPSK	1	0	23.22	23.0±1	0
				1	49	23.14	23.0±1	0
				1	99	23.15	23.0±1	0
				12	0	22.15	23.0±1	0
				12	24	22.11	23.0±1	0
				12	49	22.48	23.0±1	0
				25	0	22.31	23.0±1	0
			16QAM	1	0	21.39	21.0±1	2.0
				1	49	21.42	21.0±1	2.0
				1	99	21.49	21.0±1	2.0
				12	0	20.52	21.0±1	2.0
				12	24	20.52	21.0±1	2.0
				12	49	20.54	21.0±1	2.0
				25	0	20.4	21.0±1	2.0
	21425	2567.5	QPSK	1	0	22.42	22.0±1	1.0
				1	49	22.38	22.0±1	1.0
1				99	22.38	22.0±1	1.0	
12				0	21.25	22.0±1	1.0	
12				24	21.26	22.0±1	1.0	
12				49	21.27	22.0±1	1.0	
25				0	21.22	22.0±1	1.0	
16QAM			1	0	21.33	21.0±1	2.0	
			1	49	21.34	21.0±1	2.0	
			1	99	21.52	21.0±1	2.0	
			12	0	20.54	21.0±1	2.0	
			12	24	20.2	21.0±1	2.0	
			12	49	20.35	21.0±1	2.0	
			25	0	20.16	21.0±1	2.0	

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)
10MHz	20800	2505	QPSK	1	0	23.07	23.0±1	0
				1	49	23.25	23.0±1	0
				1	99	23.36	23.0±1	0
				25	0	23.32	23.0±1	0
				25	24	23.12	23.0±1	0
				25	49	23.32	23.0±1	0
				50	0	23.36	23.0±1	0
			16QAM	1	0	23.14	23.0±1	0
				1	49	23.69	23.0±1	0
				1	99	23.35	23.0±1	0
				25	0	23.36	23.0±1	0
				25	24	23.14	23.0±1	0
				25	49	23.58	23.0±1	0
				50	0	23.58	23.0±1	0
	21100	2535	QPSK	1	0	22.78	22.0±1	1.0
				1	49	22.53	22.0±1	1.0
				1	99	22.56	22.0±1	1.0
				25	0	21.52	22.0±1	1.0
				25	24	21.45	22.0±1	1.0
				25	49	21.46	22.0±1	1.0
				50	0	21.5	22.0±1	1.0
			16QAM	1	0	21.77	21.0±1	2.0
				1	49	21.71	21.0±1	2.0
				1	99	21.74	21.0±1	2.0
				25	0	20.52	21.0±1	2.0
				25	24	20.52	21.0±1	2.0
				25	49	20.51	21.0±1	2.0
				50	0	20.55	21.0±1	2.0
	21400	2565	QPSK	1	0	22.35	22.0±1	1.0
				1	49	22.34	22.0±1	1.0
1				99	22.3	22.0±1	1.0	
25				0	21.27	22.0±1	1.0	
25				24	21.25	22.0±1	1.0	
25				49	21.24	22.0±1	1.0	
50				0	21.28	22.0±1	1.0	
16QAM			1	0	21.21	21.0±1	2.0	
			1	49	21.17	21.0±1	2.0	
			1	99	21.13	21.0±1	2.0	
			25	0	20.32	21.0±1	2.0	
			25	24	20.3	21.0±1	2.0	
			25	49	20.32	21.0±1	2.0	
			50	0	20.29	21.0±1	2.0	

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)
15MHz	20825	2507.5	QPSK	1	0	23.03	22.5±1	0.5
				1	49	23.02	22.5±1	0.5
				1	99	22.96	22.5±1	0.5
				36	0	22.07	22.5±1	0.5
				36	24	22.02	22.5±1	0.5
				36	49	22.06	22.5±1	0.5
				75	0	22.09	22.5±1	0.5
			16QAM	1	0	21.7	21.0±1	2.0
				1	49	21.65	21.0±1	2.0
				1	99	21.54	21.0±1	2.0
				36	0	20.89	21.0±1	2.0
				36	24	20.89	21.0±1	2.0
				36	49	20.81	21.0±1	2.0
				75	0	20.9	21.0±1	2.0
	21100	2535	QPSK	1	0	22.88	22.0±1	1.0
				1	49	22.64	22.0±1	1.0
				1	99	22.57	22.0±1	1.0
				36	0	21.8	22.0±1	1.0
				36	24	21.68	22.0±1	1.0
				36	49	21.66	22.0±1	1.0
				75	0	21.74	22.0±1	1.0
			16QAM	1	0	21.87	21.0±1	2.0
				1	49	21.74	21.0±1	2.0
				1	99	21.78	21.0±1	2.0
				36	0	20.67	21.0±1	2.0
				36	24	20.58	21.0±1	2.0
				36	49	20.59	21.0±1	2.0
				75	0	20.63	21.0±1	2.0
	21375	2562.5	QPSK	1	0	22.49	22.0±1	1.0
				1	49	22.41	22.0±1	1.0
1				99	22.4	22.0±1	1.0	
36				0	21.44	22.0±1	1.0	
36				24	21.4	22.0±1	1.0	
36				49	21.37	22.0±1	1.0	
75				0	21.4	22.0±1	1.0	
16QAM			1	0	21.5	21.0±1	2.0	
			1	49	21.37	21.0±1	2.0	
			1	99	21.39	21.0±1	2.0	
			36	0	20.31	21.0±1	2.0	
			36	24	20.26	21.0±1	2.0	
			36	49	20.23	21.0±1	2.0	
			75	0	20.31	21.0±1	2.0	

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)
20MHz	20850	2510	QPSK	1	0	23.06	23.0±1	0
				1	49	23.35	23.0±1	0
				1	99	23.36	23.0±1	0
				50	0	22.93	23.0±1	0
				50	24	22.83	23.0±1	0
				50	49	22.83	23.0±1	0
				100	0	22.86	23.0±1	0
			16QAM	1	0	22.37	22.0±1	1.0
				1	49	22.25	22.0±1	1.0
				1	99	22.28	22.0±1	1.0
				50	0	22.8	22.0±1	1.0
				50	24	22.68	22.0±1	1.0
				50	49	22.69	22.0±1	1.0
				100	0	22.75	22.0±1	1.0
	21100	2535	QPSK	1	0	23.19	23.0±1	0
				1	49	23.47	23.0±1	0
				1	99	23.51	23.0±1	0
				50	0	22.67	23.0±1	0
				50	24	22.54	23.0±1	0
				50	49	22.56	23.0±1	0
				100	0	22.59	23.0±1	0
			16QAM	1	0	21.91	21.0±1	2.0
				1	49	21.76	21.0±1	2.0
				1	99	21.84	21.0±1	2.0
				50	0	20.64	21.0±1	2.0
				50	24	20.56	21.0±1	2.0
				50	49	20.57	21.0±1	2.0
				100	0	20.56	21.0±1	2.0
	21350	2560	QPSK	1	0	22.46	22.0±1	1.0
				1	49	22.37	22.0±1	1.0
1				99	22.36	22.0±1	1.0	
50				0	21.32	22.0±1	1.0	
50				24	21.22	22.0±1	1.0	
50				49	21.24	22.0±1	1.0	
100				0	21.27	22.0±1	1.0	
16QAM			1	0	21.64	21.0±1	2.0	
			1	49	21.44	21.0±1	2.0	
			1	99	21.49	21.0±1	2.0	
			50	0	20.25	21.0±1	2.0	
			50	24	20.18	21.0±1	2.0	
			50	49	20.21	21.0±1	2.0	
			100	0	20.26	21.0±1	2.0	

LTE Band 17:

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)
5MHz	23755	706.5	QPSK	1	0	23.91	23.0±1	0
				1	49	23.94	23.0±1	0
				1	99	23.91	23.0±1	0
				12	0	22.75	23.0±1	0
				12	24	22.82	23.0±1	0
				12	49	22.82	23.0±1	0
				25	0	22.79	23.0±1	0
			16QAM	1	0	23.28	22.5±1	0.5
				1	49	23.24	22.5±1	0.5
				1	99	23.22	22.5±1	0.5
				12	0	21.98	22.5±1	0.5
				12	24	21.94	22.5±1	0.5
				12	49	21.98	22.5±1	0.5
				25	0	21.86	22.5±1	0.5
	23790	710	QPSK	1	0	23.71	23.0±1	0
				1	49	23.85	23.0±1	0
				1	99	23.83	23.0±1	0
				12	0	22.88	23.0±1	0
				12	24	22.81	23.0±1	0
				12	49	22.82	23.0±1	0
				25	0	22.78	23.0±1	0
			16QAM	1	0	22.96	22.0±1	1.0
				1	49	22.93	22.0±1	1.0
				1	99	22.9	22.0±1	1.0
				12	0	21.97	22.0±1	1.0
				12	24	21.96	22.0±1	1.0
				12	49	21.97	22.0±1	1.0
25				0	21.87	22.0±1	1.0	
23825	713.5	QPSK	1	0	23.85	23.0±1	0	
			1	49	23.82	23.0±1	0	
			1	99	23.8	23.0±1	0	
			12	0	22.87	23.0±1	0	
			12	24	22.8	23.0±1	0	
			12	49	22.76	23.0±1	0	
			25	0	22.76	23.0±1	0	
		16QAM	1	0	23.39	22.5±1	0.5	
			1	49	23.17	22.5±1	0.5	
			1	99	23.01	22.5±1	0.5	
			12	0	22.04	22.5±1	0.5	
			12	24	21.92	22.5±1	0.5	
			12	49	21.82	22.5±1	0.5	
			25	0	21.83	22.5±1	0.5	

BW(MHz)	Ch	Freq(MHz)	Mode	UL RB Allocation	UL RB Offset	Average Power (dbm)	Tune up limited(dBm)	MPR (dB)
10MHz	23780	709	QPSK	1	0	23.54	23.0±1	0
				1	49	23.36	23.0±1	0
				1	99	23.12	23.0±1	0
				25	0	23.23	23.0±1	0
				25	24	23.36	23.0±1	0
				25	49	23.45	23.0±1	0
				50	0	23.56	23.0±1	0
			16QAM	1	0	23.47	23.0±1	0
				1	49	23.56	23.0±1	0
				1	99	23.56	23.0±1	0
				25	0	23.45	23.0±1	0
				25	24	23.58	23.0±1	0
				25	49	23.45	23.0±1	0
				50	0	23.47	23.0±1	0
	23790	710	QPSK	1	0	23.99	23.0±1	0
				1	49	23.83	23.0±1	0
				1	99	23.85	23.0±1	0
				25	0	23.33	23.0±1	0
				25	24	23.48	23.0±1	0
				25	49	23.78	23.0±1	0
				50	0	23.25	23.0±1	0
			16QAM	1	0	23.14	22.5±1	0.5
				1	49	23.15	22.5±1	0.5
				1	99	22.92	22.5±1	0.5
				25	0	21.87	22.5±1	0.5
				25	24	21.89	22.5±1	0.5
				25	49	21.85	22.5±1	0.5
				50	0	21.86	22.5±1	0.5
	23800	711	QPSK	1	0	23.91	23.0±1	0
				1	49	23.78	23.0±1	0
1				99	23.76	23.0±1	0	
25				0	22.82	22.0±1	1.0	
25				24	22.76	22.0±1	1.0	
25				49	22.74	22.0±1	1.0	
50				0	22.8	22.0±1	1.0	
16QAM			1	0	22.74	22.0±1	1.0	
			1	49	22.81	22.0±1	1.0	
			1	99	22.47	22.0±1	1.0	
			25	0	21.94	22.0±1	1.0	
			25	24	21.93	22.0±1	1.0	
			25	49	21.84	22.0±1	1.0	
			50	0	21.86	22.0±1	1.0	

WIFI Mode (2.4G)

Mode	Channel number	Frequency (MHz)	Data rate(Mbps)	Average Output Power(dBm)	Average Tune up limited(dBm)
802.11b	1	2412	1	9.10	8.5±1
	6	2437	1	9.22	8.5±1
	11	2462	1	9.19	8.5±1
802.11g	1	2412	6	9.11	8.5±1
	6	2437	6	9.37	8.5±1
	11	2462	6	9.44	8.5±1
802.11n(HT20)	1	2412	MCS0	9.18	8.5±1
	6	2437	MCS0	9.47	8.5±1
	11	2462	MCS0	9.08	8.5±1
802.11n(HT40)	3	2422	MCS0	9.18	8.5±1
	6	2437	MCS0	9.39	8.5±1
	9	2452	MCS0	9.44	8.5±1

Bluetooth Measurement Result

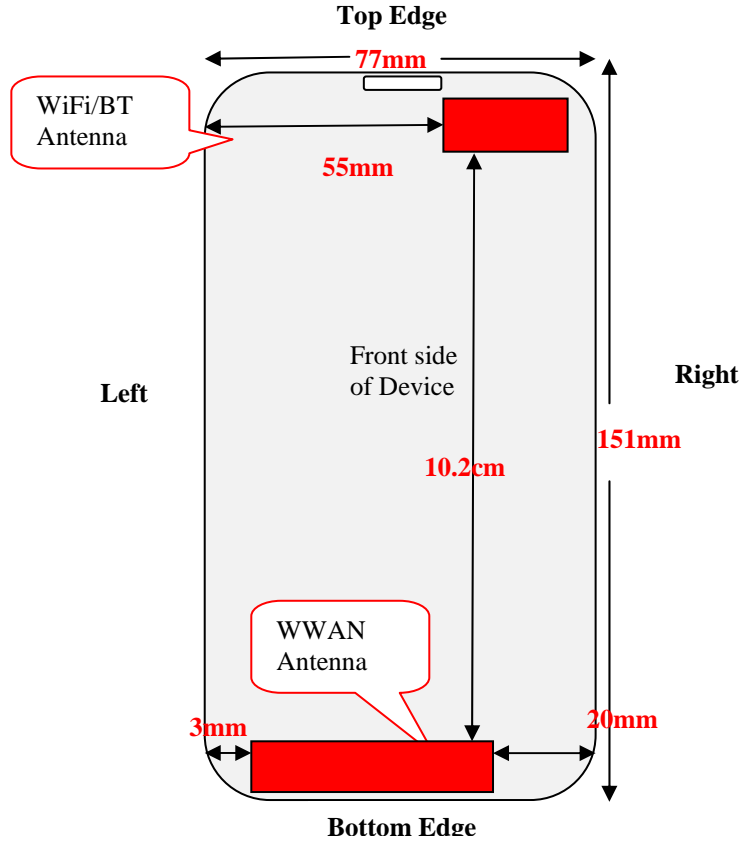
Mode	Frequency (MHz)	Output Power(dBm)	Tune up limited(dBm)
GFSK	2402	5.44	5.0±1
	2441	5.12	5.0±1
	2480	5.28	5.0±1
π/4DQPSK	2402	4.53	5.0±1
	2441	4.54	5.0±1
	2480	4.56	5.0±1
8DPSK	2402	4.89	5.0±1
	2441	4.84	5.0±1
	2480	4.87	5.0±1

BLE Measurement Result

Channel number	Frequency (MHz)	Output Power(dBm)	Tune up limited(dBm)
0	2402	-4.60	-5.5±1
19	2440	-5.20	-5.5±1
39	2480	-6.30	-5.5±1

12 EXPOSURE CONDITIONS CONSIDERATION

EUT antenna location:



Test position consideration:

Distance of EUT antenna-to-edge/surface(mm), Test distance:10mm						
Antennas	Back side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
WWAN	1	5	3	20	134	2
WLAN	1	5	55	3	4	118
Bluetooth	1	5	55	3	4	118

Test distance:10mm						
Antennas	Back side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
WWAN	YES	YES	YES	YES	NO	YES
WLAN	NO	NO	NO	NO	NO	NO
Bluetooth	NO	NO	NO	NO	NO	NO

Note:

1. Head/Body-worn/Hotspot mode SAR assessments are required.
2. Referring to KDB 941225 D06v02r01, when the overall device length and width are $\geq 9\text{cm} * 5\text{cm}$, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.
3. Per KDB 447498 D01v06, for handsets the test separation distance is determined by the smallest distance between the outer surface of the device and the user, which is 0 mm for head SAR, 10 mm for hotspot SAR, and 10 mm for body-worn SAR.

RF Exposure Mobile Phone-GQ3028, FCC ID: SW9-GQ3028**Standard Requirement:**

According to §15.247 (i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{(GHz)}}}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,¹⁶ where

- $f_{\text{(GHz)}}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation¹⁷
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Routine SAR evaluation refers to that specifically required by § 2.1093, using measurements or computer simulation. When routine SAR evaluation is not required, portable transmitters with output power greater than the applicable low threshold require SAR evaluation to qualify for TCB approval.

$$\text{Exclusion Thresholds} = P\sqrt{F} / D$$

P= Maximum turn-up power in mW

F= Channel frequency in GHz

D= Minimum test separation distance in mm

Test Distance (5mm)

Mode	MAX Power (dBm)	Tune Up Power (dBm)	Max Tune Up Power (dBm)	Max Tune Up Power (mW)	Exclusion Thresholds	Limit
WIF	9.47	8.5±1	9.5	8.91	2.782	3
Bluetooth	5.44	5.0±1	6.0	3.98	1.234	3
BLE	-4.60	-5.5±1	-4.5	0.35	0.108	3

Test Distance (10mm)

Mode	MAX Power (dBm)	Tune Up Power (dBm)	Max Tune Up Power (dBm)	Max Tune Up Power (mW)	Exclusion Thresholds	Limit
WIF	9.47	8.5±1	9.5	8.91	1.391	3
Bluetooth	5.44	5.0±1	6.0	3.98	0.617	3
BLE	-4.60	-5.5±1	-4.5	0.35	0.054	3

Result: Compliance

No SAR measurement is required.

13 SAR TEST RESULTS

Test Condition:

1. SAR Measurement
The distance between the EUT and the antenna of the emulator is more than 50 cm and the output power radiated from the emulator antenna is at least 30 dB less than the output power of EUT.
2. Environmental Conditions

Temperature	23°C
Relative Humidity	57%
Atmospheric Pressure	1019mbar
3. Test Date : Jul 22,2016-Jul 23,2016
Tested By : Damon Wang

Generally Test Procedures:

1. Establish communication link between EUT and base station emulation by air link.
2. Place the EUT in the selected test position. (Cheek, tilt or flat)
3. Perform SAR testing at middle or highest output power channel under the selected test mode. If the measured 1-g SAR is ≤ 0.8 W/kg, then testing for the other channel will not be performed.
4. When SAR is < 0.8 W/kg, no repeated SAR measurement is required

For WCDMA test:

1. KDB941225 D01-Body SAR is not required for HSDPA when the average output of each RF channel with HSDPA active is less than 0.25dB higher than measured without HSDPA using 12.2kbps RMC or the maximum SAR for 12.2kbps RMC $< 75\%$ of the SAR limit.
2. KDB941225 D01-Body SAR is not required for handset with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than 0.25dB higher than that measure without HSUPA/HSDPA using 12.2kbps RMC AND THE maximum SAR for 12.2kbps RMC is $< 75\%$ of the SAR limit

For LTE test:

1. According to FCC KDB 941225 D05v02r05:
 - a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
 - i. The required channel and offset combination with the highest maximum output power is required for SAR.
 - ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
 - iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
 - b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
 - c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
 - d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to $\frac{1}{2}$ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is < 1.45 W/kg.
 - e. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

SAR Summary Test Result:**Table 5: SAR Values of GSM 850MHz Band**

Test Positions		Channel		Test Mode	Power(dBm)		SAR 1g(W/Kg), Limit(1.6W/kg)		Plot No.
		CH.	MHz		Maximum Turn-up Power(dBm)	Measured output power(dBm)	Measured SAR 1g(W/kg)	Scaled SAR 1g(W/kg)	
Right Head	Cheek	190	836.6	Voice call	33	32.81	0.137	0.14	--
	Tilt	190	836.6	Voice call	33	32.81	0.085	0.09	--
Left Head	Cheek	190	836.6	Voice call	33	32.81	0.213	0.22	1
	Tilt	190	836.6	Voice call	33	32.81	0.133	0.14	--
Body-worn (10mm Separation)	Front side	190	836.6	Voice call	33	32.81	0.241	0.25	--
	Back side	190	836.6	Voice call	33	32.81	0.281	0.29	2
Data Mode (10mm Separation)	Front side	190	836.6	GPRS 4 slots	30	29.31	0.375	0.44	--
	Back side	190	836.6	GPRS 4 slots	30	29.31	0.552	0.65	3
	Right EDGE	190	836.6	GPRS 4 slots	30	29.31	0.104	0.12	--
	Left EDGE	190	836.6	GPRS 4 slots	30	29.31	0.158	0.19	--
	Bottom EDGE	190	836.6	GPRS 4 slots	30	29.31	0.336	0.39	--

Table 6: SAR Values of GSM 1900MHz Band

Test Positions		Channel		Test Mode	Power(dBm)		SAR 1g(W/Kg), Limit(1.6W/kg)		Plot No.
		CH.	MHz		Maximum Turn-up Power(dBm)	Measured output power(dBm)	Measured SAR 1g(W/kg)	Scaled SAR 1g(W/kg)	
Right Head	Cheek	810	1909.8	Voice call	30	29.81	0.171	0.18	--
	Tilt	810	1909.8	Voice call	30	29.81	0.115	0.12	--
Left Head	Cheek	810	1909.8	Voice call	30	29.81	0.252	0.26	4
	Tilt	810	1909.8	Voice call	30	29.81	0.181	0.19	--
Body-worn (10mm Separation)	Front side	810	1909.8	Voice call	30	29.81	0.205	0.21	--
	Back side	810	1909.8	Voice call	30	29.81	0.354	0.37	5
Data Mode (10mm Separation)	Front side	810	1909.8	GPRS 4 slots	28	27.65	0.368	0.40	--
	Back side	810	1909.8	GPRS 4 slots	28	27.65	0.524	0.57	--
	Right EDGE	810	1909.8	GPRS 4 slots	28	27.65	0.163	0.18	--
	Left EDGE	810	1909.8	GPRS 4 slots	28	27.65	0.204	0.22	--
	Bottom EDGE	810	1909.8	GPRS 4 slots	28	27.65	0.591	0.64	6

Table 7: SAR Values of WCDMA BAND IV

Test Positions		Channel		Test Mode	Power(dBm)		SAR 1g(W/Kg), Limit(1.6W/kg)		Plot No.
		CH.	MHz		Maximum Turn-up Power(dBm)	Measured output power(dBm)	Measured SAR 1g(W/kg)	Scaled SAR 1g(W/kg)	
Right Head	Cheek	1413	1732.6	RMC 12.2kbps	23	22.71	0.168	0.18	--
	Tilt	1413	1732.6	RMC 12.2kbps	23	22.71	0.120	0.13	--
Left Head	Cheek	1413	1732.6	RMC 12.2kbps	23	22.71	0.195	0.21	7
	Tilt	1413	1732.6	RMC 12.2kbps	23	22.71	0.138	0.15	--
Body-worn (10mm Separation)	Front side	1413	1732.6	RMC 12.2kbps	23	22.71	0.187	0.20	--
	Back side	1413	1732.6	RMC 12.2kbps	23	22.71	0.292	0.31	8
Data Mode (10mm Separation)	Front side	1413	1732.6	RMC 12.2kbps	23	22.71	0.187	0.20	--
	Back side	1413	1732.6	RMC 12.2kbps	23	22.71	0.292	0.31	8
	Right EDGE	1413	1732.6	RMC 12.2kbps	23	22.71	0.076	0.08	--
	Left EDGE	1413	1732.6	RMC 12.2kbps	23	22.71	0.094	0.10	--
	Bottom EDGE	1413	1732.6	RMC 12.2kbps	23	22.71	0.159	0.17	--

Table 8: SAR Values of WCDMA BAND II

Test Positions		Channel		Test Mode	Power(dBm)		SAR 1g(W/Kg), Limit(1.6W/kg)		Plot No.
		CH.	MHz		Maximum Turn-up Power(dBm)	Measured output power(dBm)	Measured SAR 1g(W/kg)	Scaled SAR 1g(W/kg)	
Right Head	Cheek	9400	1880	RMC 12.2kbps	23	22.60	0.188	0.21	--
	Tilt	9400	1880	RMC 12.2kbps	23	22.60	0.137	0.15	--
Left Head	Cheek	9400	1880	RMC 12.2kbps	23	22.60	0.405	0.44	9
	Tilt	9400	1880	RMC 12.2kbps	23	22.60	0.284	0.31	--
Body-worn (10mm Separation)	Front side	9400	1880	RMC 12.2kbps	23	22.60	0.392	0.43	--
	Back side	9400	1880	RMC 12.2kbps	23	22.60	0.513	0.56	10
Data Mode (10mm Separation)	Front side	9400	1880	RMC 12.2kbps	23	22.60	0.392	0.43	--
	Back side	9400	1880	RMC 12.2kbps	23	22.60	0.513	0.56	10
	Right EDGE	9400	1880	RMC 12.2kbps	23	22.60	0.158	0.17	--
	Left EDGE	9400	1880	RMC 12.2kbps	23	22.60	0.213	0.23	--
	Bottom EDGE	9400	1880	RMC 12.2kbps	23	22.60	0.506	0.55	--

Table 9: SAR Values of LTE BAND 2 , 20MHz , QPSK

Test Mode	Test Positions		Channel		Power(dBm)		MPR (dB)	SAR 1g(W/Kg), Limit(1.6W/kg)		Plot No.
			CH.	MHz	Maximum Turn-up Power(dBm)	Measured output power(dBm)		Measured SAR 1g(W/kg)	Scaled SAR 1g(W/kg)	
1RB #49	Right Head	Cheek	18900	1880	24	23.11	0	0.494	0.61	--
		Tilt	18900	1880	24	23.11	0	0.327	0.40	--
	Left Head	Cheek	18900	1880	24	23.11	0	0.715	0.88	11
		Tilt	18900	1880	24	23.11	0	0.564	0.69	--
	Body-worn (10mm Separation)	Front side	18900	1880	24	23.11	0	0.486	0.60	--
		Back side	18900	1880	24	23.11	0	0.689	0.85	12
	Data Mode (10mm Separation)	Front side	18900	1880	24	23.11	0	0.486	0.60	--
		Back side	18900	1880	24	23.11	0	0.689	0.85	--
		Right EDGE	18900	1880	24	23.11	0	0.259	0.32	--
		Left EDGE	18900	1880	24	23.11	0	0.247	0.30	--
		Bottom EDGE	18900	1880	24	23.11	0	0.796	0.98	13
	50%RB #24	Right Head	Cheek	18900	1880	24	23.17	0	0.357	0.43
Tilt			18900	1880	24	23.17	0	0.208	0.25	--
Left Head		Cheek	18900	1880	24	23.17	0	0.532	0.64	--
		Tilt	18900	1880	24	23.17	0	0.374	0.45	--
Body-worn (10mm Separation)		Front side	18900	1880	24	23.17	0	0.429	0.52	--
		Back side	18900	1880	24	23.17	0	0.553	0.67	--
Data Mode (10mm Separation)		Front side	18900	1880	24	23.17	0	0.429	0.52	--
		Back side	18900	1880	24	23.17	0	0.553	0.67	--
		Right EDGE	18900	1880	24	23.17	0	0.176	0.21	--
		Left EDGE	18900	1880	24	23.17	0	0.202	0.24	--
		Bottom EDGE	18900	1880	24	23.17	0	0.631	0.76	--

Table 10: SAR Values of LTE BAND 4 , 20MHz ,QPSK

Test Mode	Test Positions		Channel		Power(dBm)		MPR (dB)	SAR 1g(W/Kg), Limit(1.6W/kg)		Plot No.	
			CH.	MHz	Maximum Turn-up Power(dBm)	Measured output power(dBm)		Measured SAR 1g(W/kg)	Scaled SAR 1g(W/kg)		
1RB #49	Right Head	Cheek	20175	1732.5	24	23.43	0	0.509	0.58	--	
		Tilt	20175	1732.5	24	23.43	0	0.372	0.42	--	
	Left Head	Cheek	20175	1732.5	24	23.43	0	0.675	0.77	14	
		Tilt	20175	1732.5	24	23.43	0	0.483	0.55	--	
	Body-worn (10mm Separation)	Front side	20175	1732.5	24	23.43	0	0.657	0.75	--	
		Back side	20050	1720	24	23.09	0	0.893	1.10	--	
		Back side	20175	1732.5	24	23.43	0	1.048	1.19	15	
		Back side	20175	1732.5	24	23.43	0	1.021	1.16	--	
		Back side	20300	1745	23	22.67	1	0.957	1.03	--	
	Data Mode (10mm Separation)	Front side	20175	1732.5	24	23.43	0	0.657	0.75	--	
		Back side	20050	1720	24	23.09	0	0.893	1.10	--	
		Back side	20175	1732.5	24	23.43	0	1.048	1.19	15	
		Back side	20175	1732.5	24	23.43	0	1.021	1.16	--	
		Back side	20300	1745	23	22.67	1	0.957	1.03	--	
		Right EDGE	20175	1732.5	24	23.43	0	0.354	0.40	--	
		Left EDGE	20175	1732.5	24	23.43	0	0.386	0.44	--	
	Bottom EDGE	20175	1732.5	24	23.43	0	0.785	0.90	--		
	50%RB #24	Right Head	Cheek	20175	1732.5	24	22.99	0	0.347	0.44	--
			Tilt	20175	1732.5	24	22.99	0	0.261	0.33	--
		Left Head	Cheek	20175	1732.5	24	22.99	0	0.456	0.58	--
Tilt			20175	1732.5	24	22.99	0	0.312	0.39	--	
Body-worn (10mm Separation)		Front side	20175	1732.5	24	22.99	0	0.531	0.67	--	
		Back side	20175	1732.5	24	22.99	0	0.774	0.98	--	
Data Mode (10mm Separation)		Front side	20175	1732.5	24	22.99	0	0.531	0.67	--	
		Back side	20175	1732.5	24	22.99	0	0.774	0.98	--	
		Right EDGE	20175	1732.5	24	22.99	0	0.158	0.20	--	
		Left EDGE	20175	1732.5	24	22.99	0	0.177	0.22	--	
		Bottom EDGE	20175	1732.5	24	22.99	0	0.632	0.80	--	

Table 11: SAR Values of LTE BAND 7 , 20MHz ,QPSK

Test Mode	Test Positions		Channel		Power(dBm)		MPR (dB)	SAR 1g(W/Kg), Limit(1.6W/kg)		Plot No.
			CH.	MHz	Maximum Turn-up Power(dBm)	Measured output power(dBm)		Measured SAR 1g(W/kg)	Scaled SAR 1g(W/kg)	
1RB #49	Right Head	Cheek	21100	2535	24	23.47	0	0.158	0.18	--
		Tilt	21100	2535	24	23.47	0	0.129	0.15	--
	Left Head	Cheek	21100	2535	24	23.47	0	0.442	0.50	16
		Tilt	21100	2535	24	23.47	0	0.283	0.32	--
	Body-worn (10mm Separation)	Front side	21100	2535	24	23.47	0	0.554	0.63	--
		Back side	21100	2535	24	23.47	0	0.798	0.90	17
	Data Mode (10mm Separation)	Front side	21100	2535	24	23.47	0	0.554	0.63	--
		Back side	21100	2535	24	23.47	0	0.798	0.90	17
		Right EDGE	21100	2535	24	23.47	0	0.152	0.17	--
		Left EDGE	21100	2535	24	23.47	0	0.104	0.12	--
		Bottom EDGE	21100	2535	24	23.47	0	0.736	0.83	--
	50%RB #24	Right Head	Cheek	21100	2535	24	22.54	0	0.133	0.19
Tilt			21100	2535	24	22.54	0	0.095	0.13	--
Left Head		Cheek	21100	2535	24	22.54	0	0.278	0.39	--
		Tilt	21100	2535	24	22.54	0	0.126	0.18	--
Body-worn (10mm Separation)		Front side	21100	2535	24	22.54	0	0.378	0.53	--
		Back side	21100	2535	24	22.54	0	0.517	0.72	--
Data Mode (10mm Separation)		Front side	21100	2535	24	22.54	0	0.378	0.53	--
		Back side	21100	2535	24	22.54	0	0.517	0.72	--
		Right EDGE	21100	2535	24	22.54	0	0.116	0.16	--
		Left EDGE	21100	2535	24	22.54	0	0.088	0.12	--
	Bottom EDGE	21100	2535	24	22.54	0	0.495	0.69	--	

Table 12: SAR Values of LTE BAND 17 , 10MHz ,QPSK

Test Mode	Test Positions		Channel		Power(dBm)		MPR (dB)	SAR 1g(W/Kg), Limit(1.6W/kg)		Plot No.
			CH.	MHz	Maximum Turn-up Power(dBm)	Measured output power(dBm)		Measured SAR 1g(W/kg)	Scaled SAR 1g(W/kg)	
1RB #49	Right Head	Cheek	23790	710	24	23.83	0	0.040	0.04	--
		Tilt	23790	710	24	23.83	0	0.021	0.02	--
	Left Head	Cheek	23790	710	24	23.83	0	0.051	0.05	18
		Tilt	23790	710	24	23.83	0	0.033	0.03	--
	Body-worn (10mm Separation)	Front side	23790	710	24	23.83	0	0.078	0.08	--
		Back side	23790	710	24	23.83	0	0.105	0.11	19
	Data Mode (10mm Separation)	Front side	23790	710	24	23.83	0	0.078	0.08	--
		Back side	23790	710	24	23.83	0	0.105	0.11	19
		Right EDGE	23790	710	24	23.83	0	0.016	0.02	--
		Left EDGE	23790	710	24	23.83	0	0.011	0.01	--
		Bottom EDGE	23790	710	24	23.83	0	0.030	0.03	--
	25%RB #24	Right Head	Cheek	23790	710	24	23.48	0	0.035	0.04
Tilt			23790	710	24	23.48	0	0.017	0.02	--
Left Head		Cheek	23790	710	24	23.48	0	0.039	0.04	--
		Tilt	23790	710	24	23.48	0	0.020	0.02	--
Body-worn (10mm Separation)		Front side	23790	710	24	23.48	0	0.053	0.06	--
		Back side	23790	710	24	23.48	0	0.082	0.09	--
Data Mode (10mm Separation)		Front side	23790	710	24	23.48	0	0.053	0.06	--
		Back side	23790	710	24	23.48	0	0.082	0.09	--
		Right EDGE	23790	710	24	23.48	0	0.008	0.01	--
		Left EDGE	23790	710	24	23.48	0	0.007	0.01	--
		Bottom EDGE	23790	710	24	23.48	0	0.026	0.03	--

- Note:**1. KDB941225 D01-Body SAR is not required for HSDPA when the average output of each RF channel with HSDPA active is less than 0.25dB higher than measured without HSDPA using 12.2kbps RMC or the maximum SAR for 12.2kbps RMC<75% of the SAR limit.
2. KDB941225 D01-Body SAR is not required for handset with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than 0.25dB higher than that measure without HSUPA/HSDPA using 12.2kbps RMC AND THE maximum SAR for 12.2kbps RMC is<75% of the SAR limit

Measurement variability consideration

According to KDB 865664 D01v01r04 section 2.8.1, repeated measurements are required following the procedures as below:

1. Repeated measurement is not required when the original highest measured SAR is < 0.80W/kg; steps 2) through 4) do not apply.
2. When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4. Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

Repeated SAR:

Band	Position	Channel	Mode	measured SAR(W/kg)				
				Original	1st Repeated		2nd Repeated	
					Value	Ratio	Value	Ratio
LTE BAND 4	Body Back side	20175	1RB #49	1.048	1.021	1.03	NA	NA

Simultaneous Transmission SAR Analysis.

List of Mode for Simultaneous Multi-band Transmission:

No.	Configurations	Head SAR	Body-worn SAR	Hotspot SAR
1	GSM(Voice) + WLAN 2.4GHz(Data)	Yes	Yes	-
2	GPRS (Data) + WLAN 2.4GHz(Data)	-	-	Yes
3	GSM(Voice) + Bluetooth(Data)	Yes	Yes	-
4	GPRS (Data) + Bluetooth(Data)	-	-	Yes
5	WCDMA (Voice) + WLAN 2.4GHz(Data)	Yes	Yes	-
6	WCDMA (Data) + WLAN 2.4GHz(Data)	-	-	Yes
7	WCDMA (Voice) + Bluetooth(Data)	Yes	Yes	-
8	WCDMA (Data) + Bluetooth(Data)	-	-	Yes
9	LTE (Date) + WLAN 2.4GHz(Data)	Yes	Yes	Yes
10	LTE (Date) + Bluetooth(Data)	Yes	Yes	Yes

Remark:

- GSM and WCDMA share the same antenna, and cannot transmit simultaneously.
 - EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network single condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate Simultaneous at any moment
 - WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. According to the KDB 447498 D01 v06, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
 $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$ for test separation distances $\leq 50 \text{ mm}$;
 where $x = 7.5$ for 1-g SAR, and $x = 18.75$ for 10-g SAR.
 For simultaneous transmission analysis, WIFI/Bluetooth SAR is estimated per KDB 447498 D01 v06 as below:

WIFI:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	X	SAR(1g) 5mm	SAR(1g) 10mm
9.5	8.91	5/10	2.437	7.5	0.37	0.19

Bluetooth:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	X	SAR(1g) 5mm	SAR(1g) 10mm
6.0	3.98	5/10	2.402	7.5	0.16	0.08

- The maximum SAR summation is calculated based on the same configuration and test position

Head SAR**WWAN and WLAN (2.4GHz)**

Position	WWAN (maximum)		WLAN	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Left Cheek	GSM850	0.22	0.37	0.59
Left Cheek	GSM1900	0.26	0.37	0.63
Left Cheek	WCDMA Band IV	0.21	0.37	0.58
Left Cheek	WCDMA Band II	0.44	0.37	0.81
Left Cheek	LTE BAND 2(1RB)	0.88	0.37	1.25
Left Cheek	LTE BAND 4(1RB)	0.77	0.37	1.14
Left Cheek	LTE BAND 7(1RB)	0.50	0.37	0.87
Left Cheek	LTE BAND 17(1RB)	0.05	0.37	0.42

WWAN and BT

Position	WWAN (maximum)		WLAN	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Left Cheek	GSM850	0.22	0.16	0.38
Left Cheek	GSM1900	0.26	0.16	0.42
Left Cheek	WCDMA Band IV	0.21	0.16	0.37
Left Cheek	WCDMA Band II	0.44	0.16	0.60
Left Cheek	LTE BAND 2(1RB)	0.88	0.16	1.04
Left Cheek	LTE BAND 4(1RB)	0.77	0.16	0.93
Left Cheek	LTE BAND 7(1RB)	0.50	0.16	0.66
Left Cheek	LTE BAND 17(1RB)	0.05	0.16	0.21

Remark: WIFI/BT the 1g SAR value is not being captured by the measurement system, the 1g-SAR value is conservatively used for simultaneous transmission analysis.

Body-worn SAR

WWAN and WLAN (2.4GHz)

Position	WWAN (maximum)		WLAN(10mm)	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	GSM850	0.29	0.19	0.48
Back	GSM1900	0.37	0.19	0.56
Back	WCDMA Band IV	0.31	0.19	0.50
Back	WCDMA Band II	0.56	0.19	0.75
Back	LTE BAND 2(1RB)	0.85	0.19	1.04
Back	LTE BAND 4(1RB)	1.19	0.19	1.38
Back	LTE BAND 7(1RB)	0.90	0.19	1.09
Back	LTE BAND 17(1RB)	0.11	0.19	0.30

WWAN and BT

Position	WWAN (maximum)		WLAN(10mm)	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	GSM850	0.29	0.08	0.37
Back	GSM1900	0.37	0.08	0.45
Back	WCDMA Band IV	0.31	0.08	0.39
Back	WCDMA Band II	0.56	0.08	0.64
Back	LTE BAND 2(1RB)	0.85	0.08	0.93
Back	LTE BAND 4(1RB)	1.19	0.08	1.27
Back	LTE BAND 7(1RB)	0.90	0.08	0.98
Back	LTE BAND 17(1RB)	0.11	0.08	0.19

Remark: WIFI/BT the 1g SAR value is not being captured by the measurement system, the 1g-SAR value is conservatively used for simultaneous transmission analysis.

Hotspot SAR

WWAN and WLAN (2.4GHz)

Position	WWAN (maximum)		WLAN(10mm)	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	GSM850	0.65	0.19	0.84
Bottom side	GSM1900	0.64	0.19	0.83
Back	WCDMA Band IV	0.31	0.19	0.50
Back	WCDMA Band II	0.56	0.19	0.75
Bottom side	LTE BAND 2(1RB)	0.98	0.19	1.17
Back	LTE BAND 4(50RB)	1.19	0.19	1.38
Back	LTE BAND 7(1RB)	0.90	0.19	1.09
Back	LTE BAND 17(1RB)	0.11	0.19	0.30

WWAN and BT

Position	WWAN (maximum)		WLAN(10mm)	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	GSM850	0.65	0.08	0.73
Bottom side	GSM1900	0.64	0.08	0.72
Back	WCDMA Band IV	0.31	0.08	0.39
Back	WCDMA Band II	0.56	0.08	0.64
Bottom side	LTE BAND 2(1RB)	0.98	0.08	1.06
Back	LTE BAND 4(50RB)	1.19	0.08	1.27
Back	LTE BAND 7(1RB)	0.90	0.08	0.98
Back	LTE BAND 17(1RB)	0.11	0.08	0.19

Remark: WIFI/BT the 1g SAR value is not being captured by the measurement system, the 1g-SAR value is conservatively used for simultaneous transmission analysis.

14 SAR MEASUREMENT REFERENCES

References

1. **FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”**
2. **IEEE Std. C95.1-2005, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz”, 2005**
3. **IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices:Measurement Techniques”, June 2013**
4. **IEC 62209-2, “Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices—Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate(SAR) for wireless communication devices used in close proximity to the human body(frequency range of 30MHz to 6GHz)”, April 2010**
5. **FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 23th, 2015**
6. **FCC KDB 941225 D01 v03r01, “3G SAR Measurement Procedures”, Oct 23th, 2015**
7. **FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 16th, 2015**
8. **FCC KDB 941225 D06 v02r01, “SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities”, Oct 23th, 2015**
9. **FCC KDB865664 D01 v01r04, “SAR Measurement Requirements 100MHz to 6GHz”, Aug 7th, 2015**
10. **FCC KDB865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations ”, Oct 23th”, 2015**
11. **FCC KDB648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 23th”, 2015**
12. **FCC KDB 248227 D01 v01r02, SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters, Oct 23th, 2015.**

Maximum SAR measurement Plots

Plot 1: GSM850MHz, Middle channel (Left Head , Cheek)

Product Description: Mobile Phone

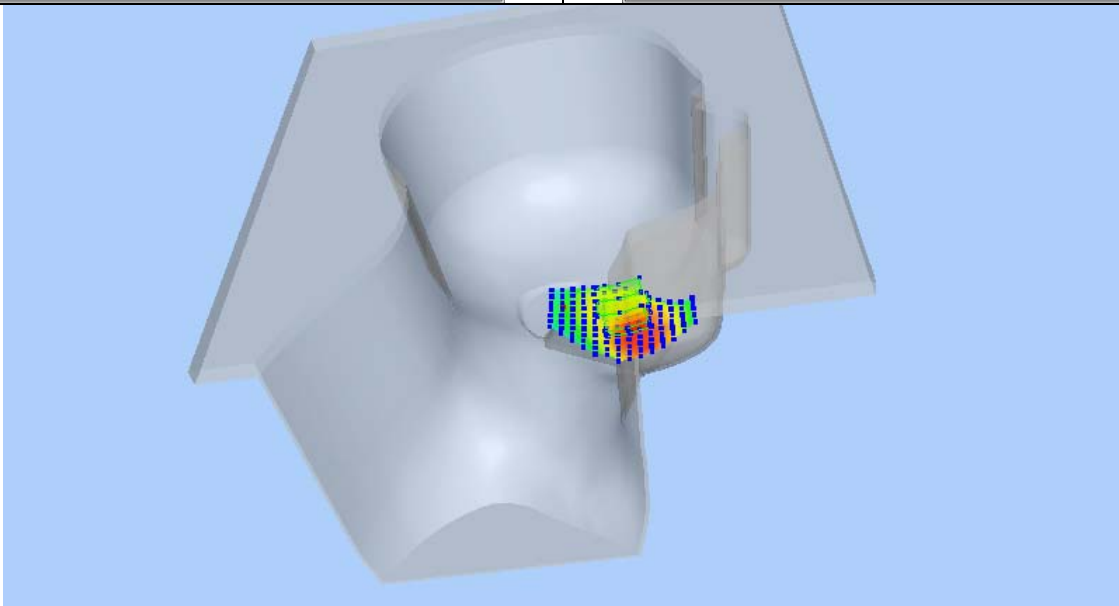
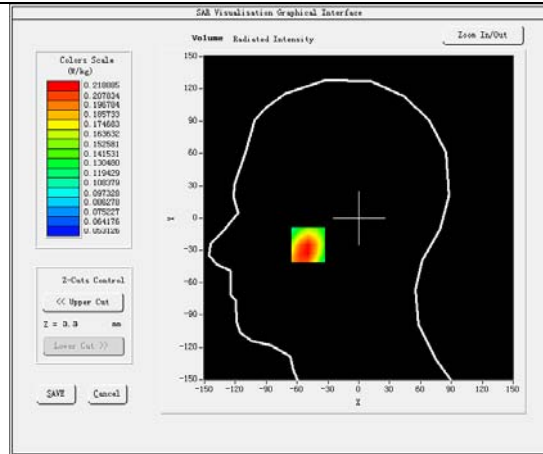
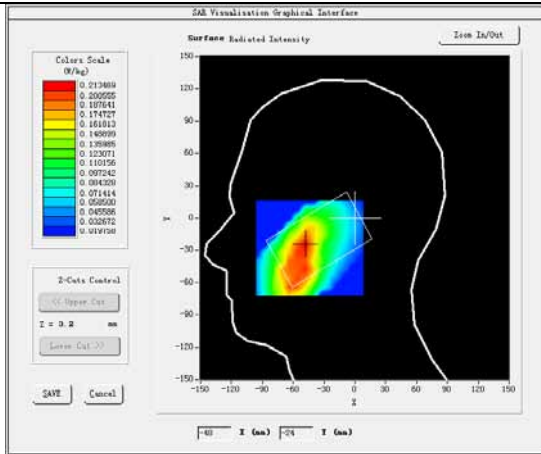
Model: GQ3028

Test Date: Jul 22, 2016

Medium(liquid type)	HSL_850
Frequency (MHz)	836.60000
Relative permittivity (real part)	41.33
Conductivity (S/m)	0.91
Signal	GSM (Duty cycle: 1:8)
E-Field Probe	SN 07/15 EP249
Conversion Factor	5.26
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7, dx=8mm dy=8mm dz=5mm
Variation (%)	1.12
SAR 10g (W/Kg)	0.157397
SAR 1g (W/Kg)	0.213194

SURFACE SAR

VOLUME SAR



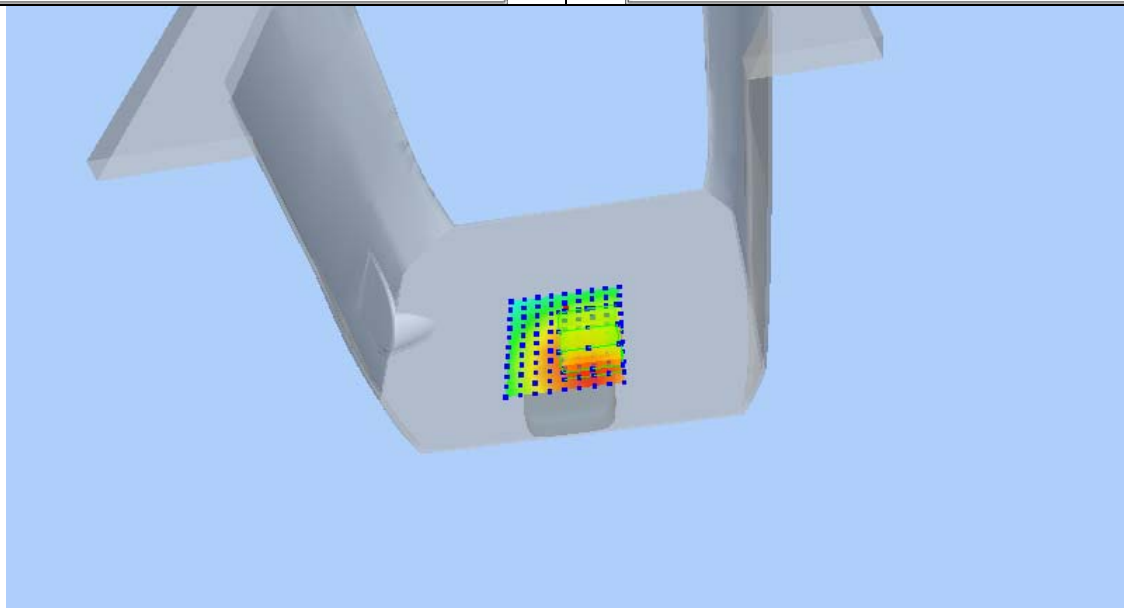
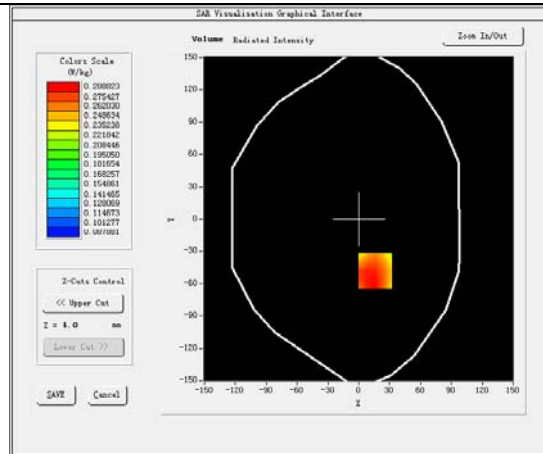
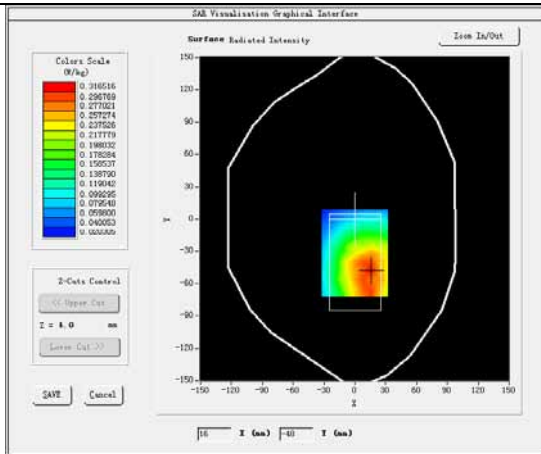
Plot 2: GSM850MHz, Middle channel (Body-worn, Back Surface)

Product Description: Mobile Phone

Model: GQ3028

Test Date: Jul 22, 2016

Medium(liquid type)	MSL_850
Frequency (MHz)	836.60000
Relative permittivity (real part)	55.44
Conductivity (S/m)	0.98
Signal	GSM (Duty cycle: 1:8)
E-Field Probe	SN 07/15 EP249
Conversion Factor	5.46
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7, dx=8mm dy=8mm dz=5mm
Variation (%)	-0.68
SAR 10g (W/Kg)	0.219548
SAR 1g (W/Kg)	0.280832
SURFACE SAR	VOLUME SAR



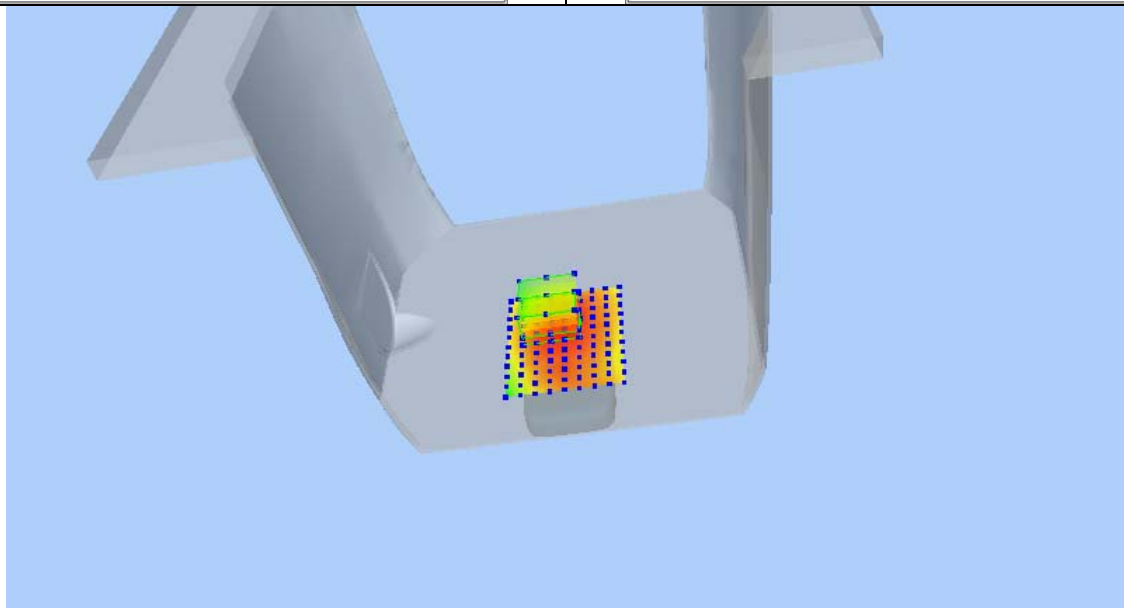
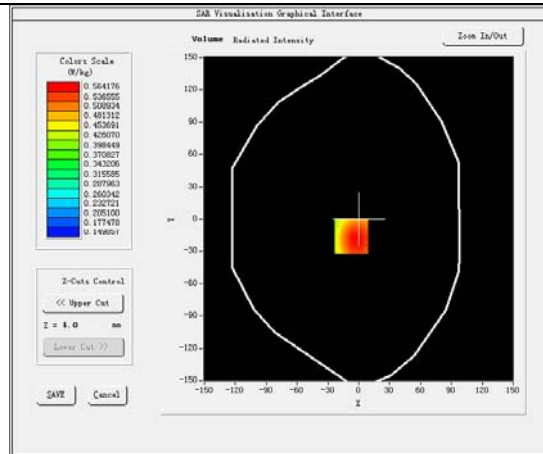
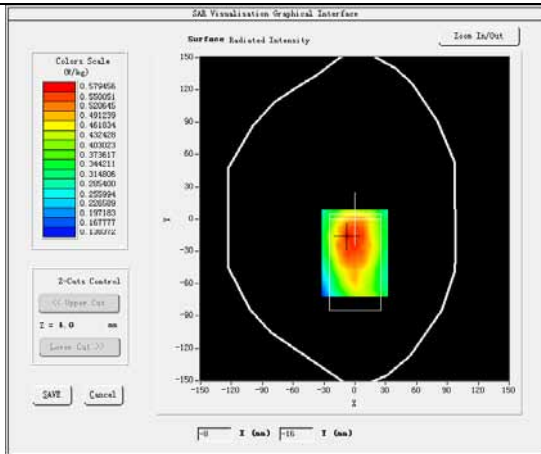
Plot 3: GPRS850MHz, Middle channel (Hotspot, Back Surface)

Product Description: Mobile Phone

Model: GQ3028

Test Date: Jul 22, 2016

Medium(liquid type)	MSL_850
Frequency (MHz)	836.60000
Relative permittivity (real part)	55.44
Conductivity (S/m)	0.98
Signal	GPRS (Duty cycle: 1:2)
E-Field Probe	SN 07/15 EP249
Conversion Factor	5.46
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7, dx=8mm dy=8mm dz=5mm
Variation (%)	3.18
SAR 10g (W/Kg)	0.432845
SAR 1g (W/Kg)	0.551990
SURFACE SAR	VOLUME SAR



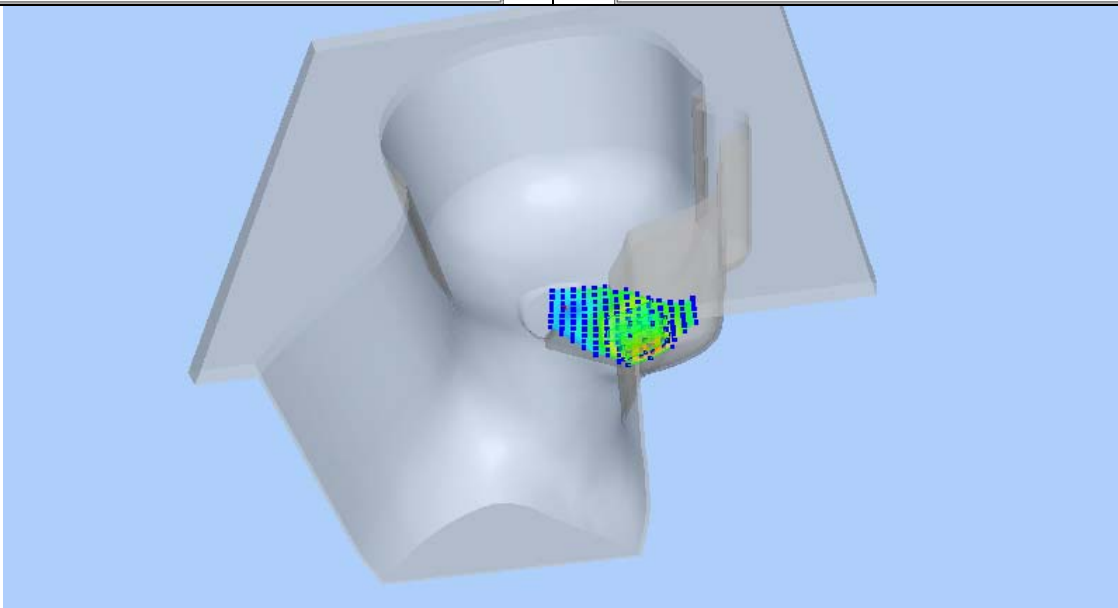
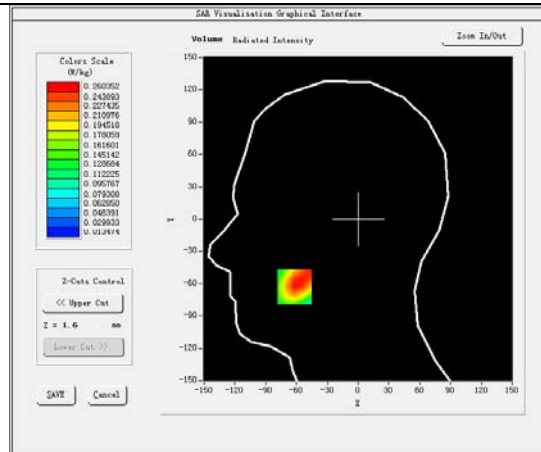
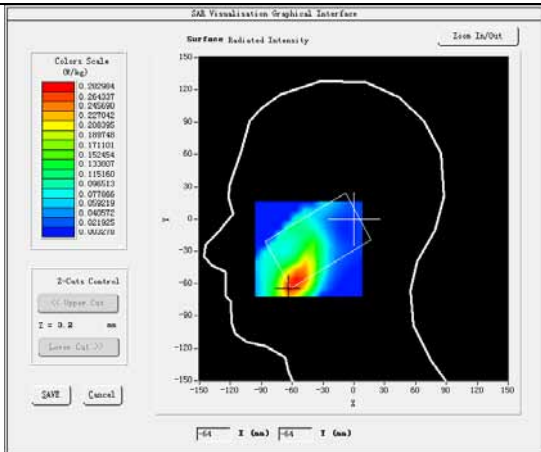
Plot 4: GSM1900, Middle channel (Left Head Cheek)

Product Description: Mobile Phone

Model: GQ3028

Test Date: Jul 23,2016

Medium(liquid type)	HSL_1900
Frequency (MHz)	1880.0000
Relative permittivity (real part)	41.04
Conductivity (S/m)	1.41
Signal	GSM (Duty cycle: 1:8)
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.95
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-4.72
SAR 10g (W/Kg)	0.151126
SAR 1g (W/Kg)	0.251588
SURFACE SAR	VOLUME SAR



Plot 5: GSM1900, Middle channel (Body-worn, Back Surface)

Product Description: Mobile Phone

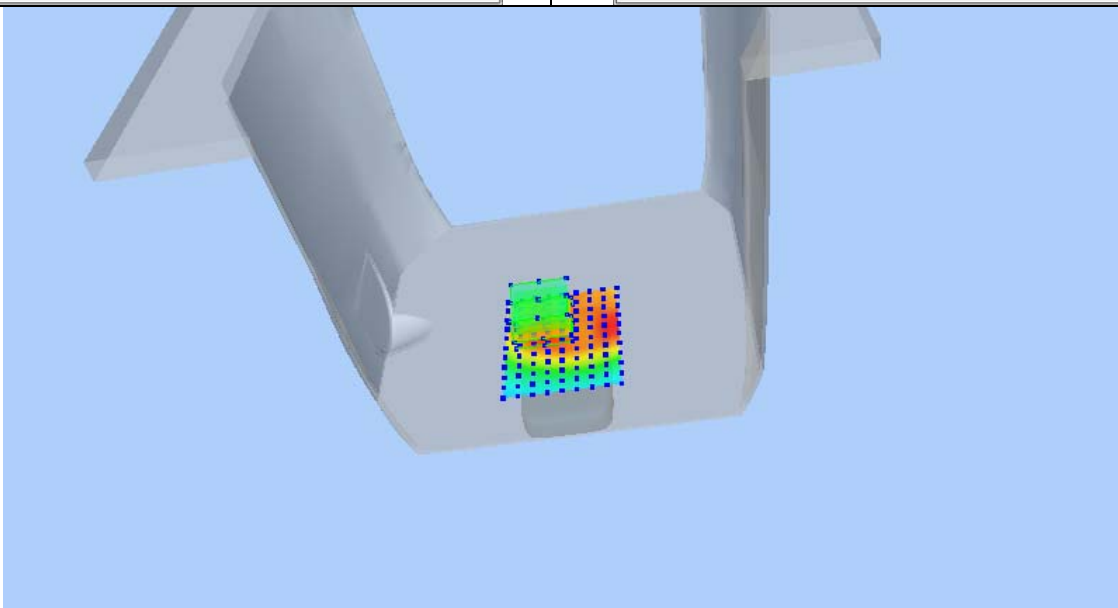
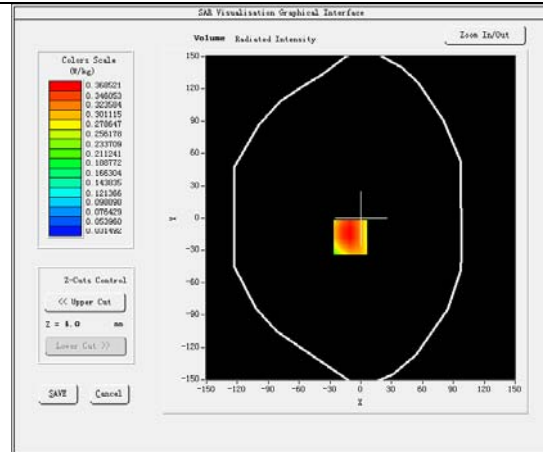
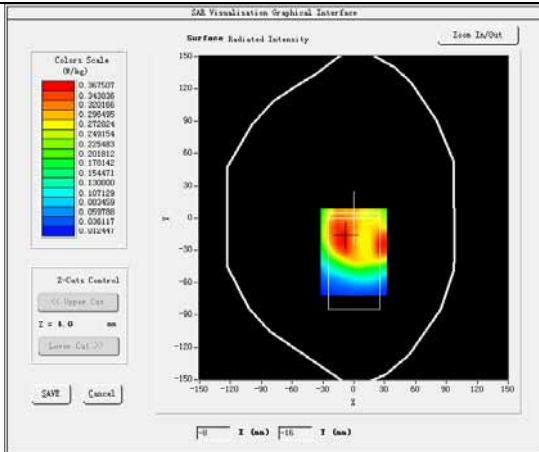
Model: GQ3028

Test Date: Jul 23,2016

Medium(liquid type)	MSL_1900
Frequency (MHz)	1880.0000
Relative permittivity (real part)	53.51
Conductivity (S/m)	1.50
Signal	GSM (Duty cycle: 1:8)
E-Field Probe	SN 07/15 EP249
Conversion Factor	5.05
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	2.25
SAR 10g (W/Kg)	0.221603
SAR 1g (W/Kg)	0.354418

SURFACE SAR

VOLUME SAR



Plot 6: GPRS1900, Middle channel (Hotspot, Bottom Edge)

Product Description: Mobile Phone

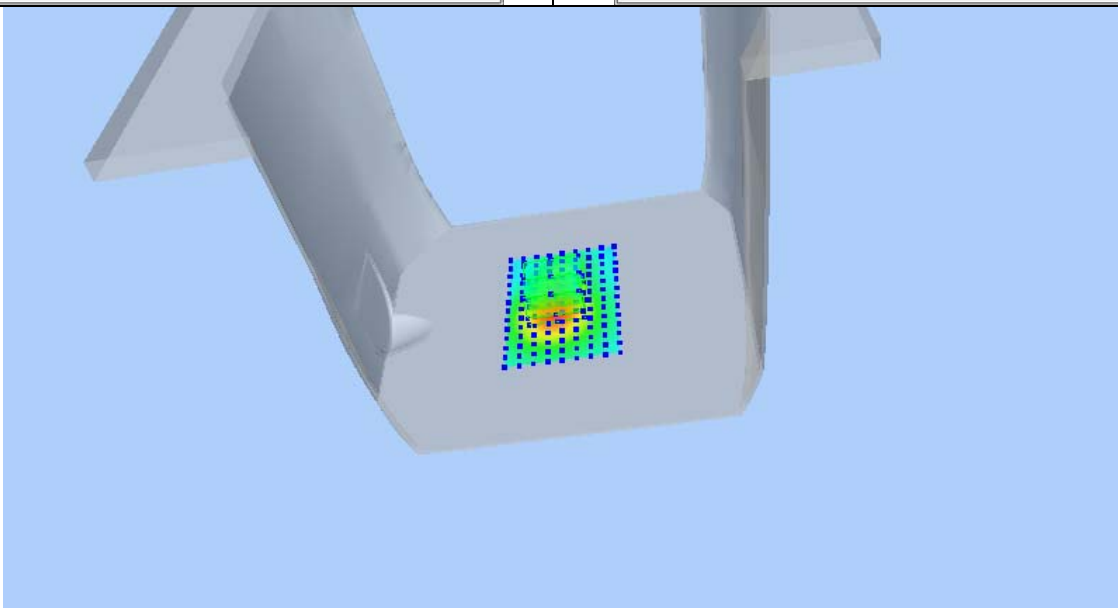
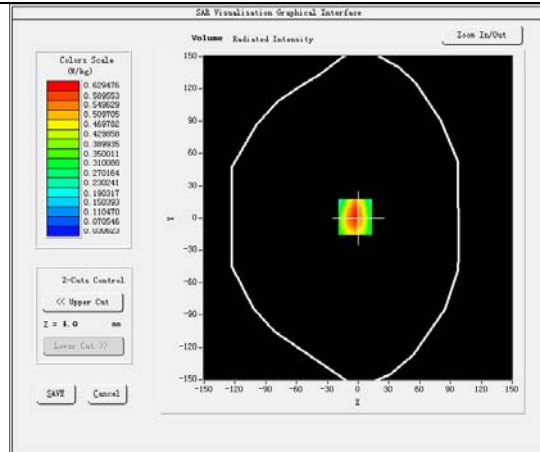
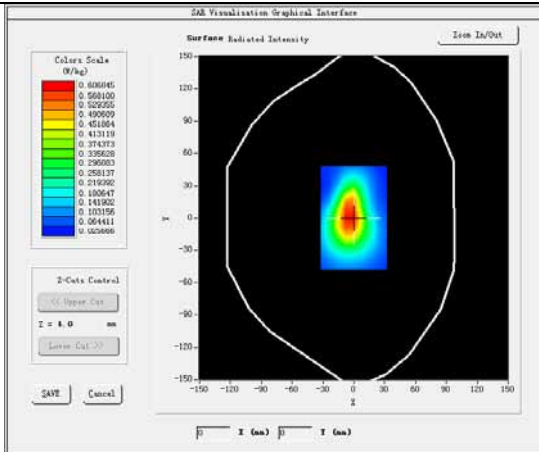
Model: GQ3028

Test Date: Jul 23,2016

Medium(liquid type)	MSL_1900
Frequency (MHz)	1880.0000
Relative permittivity (real part)	53.51
Conductivity (S/m)	1.50
Signal	GPRS (Duty cycle: 1:2)
E-Field Probe	SN 07/15 EP249
Conversion Factor	5.05
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-1.90
SAR 10g (W/Kg)	0.330132
SAR 1g (W/Kg)	0.590735

SURFACE SAR

VOLUME SAR



Plot 7: WCDMA BAND IV, Middle channel (Left Head Cheek)

Product Description: Mobile Phone

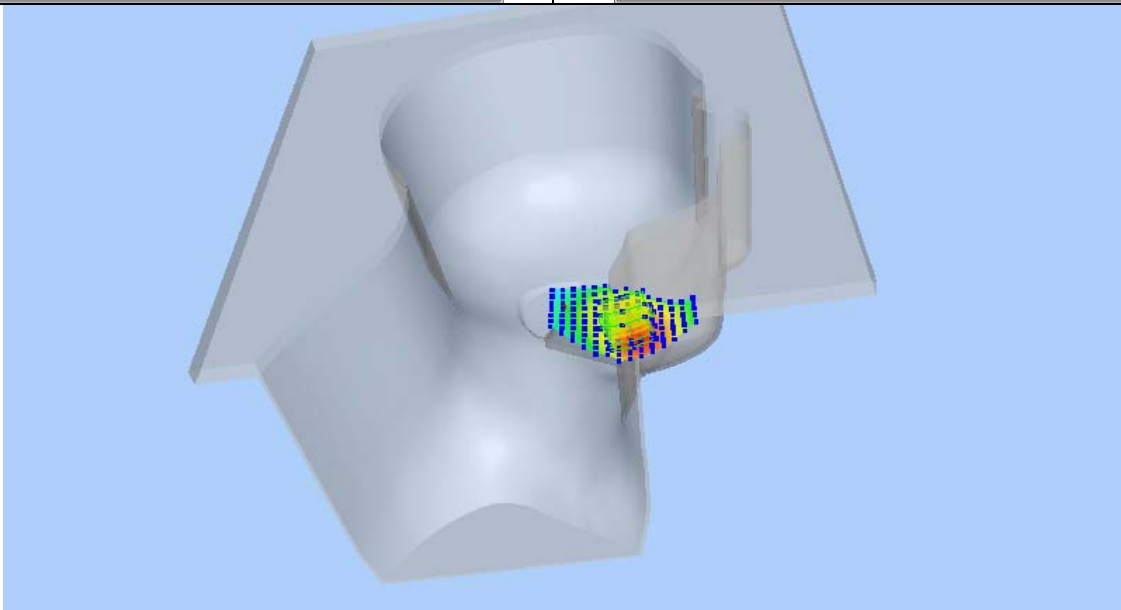
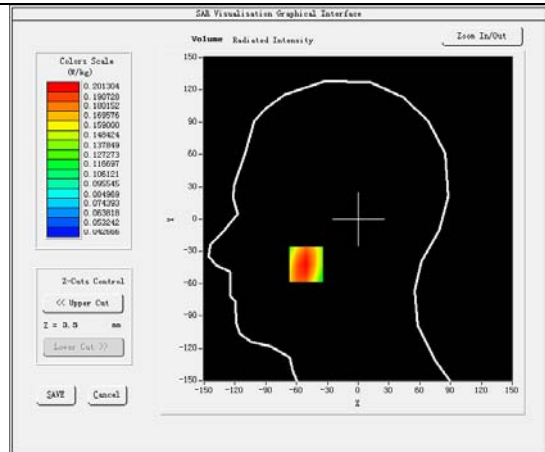
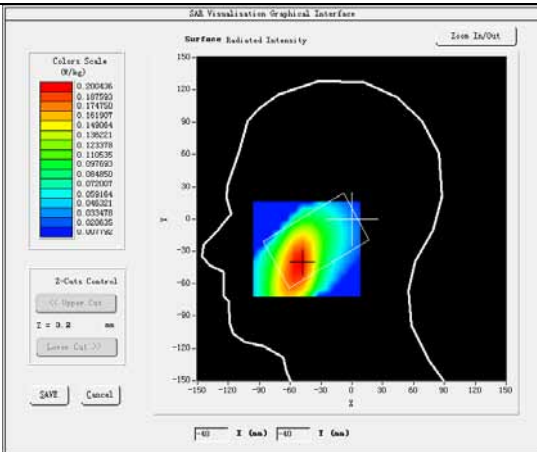
Model: GQ3028

Test Date: Jul 23,2016

Medium(liquid type)	HSL_1800
Frequency (MHz)	1732.600
Relative permittivity (real part)	40.51
Conductivity (S/m)	1.39
Signal	WCDMA (Duty cycle: 1:1)
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.23
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.65
SAR 10g (W/Kg)	0.148234
SAR 1g (W/Kg)	0.194532

SURFACE SAR

VOLUME SAR



Plot 8: WCDMA BAND IV, Middle channel (Body-worn/Hotspot, Back Surface)

Product Description: Mobile Phone

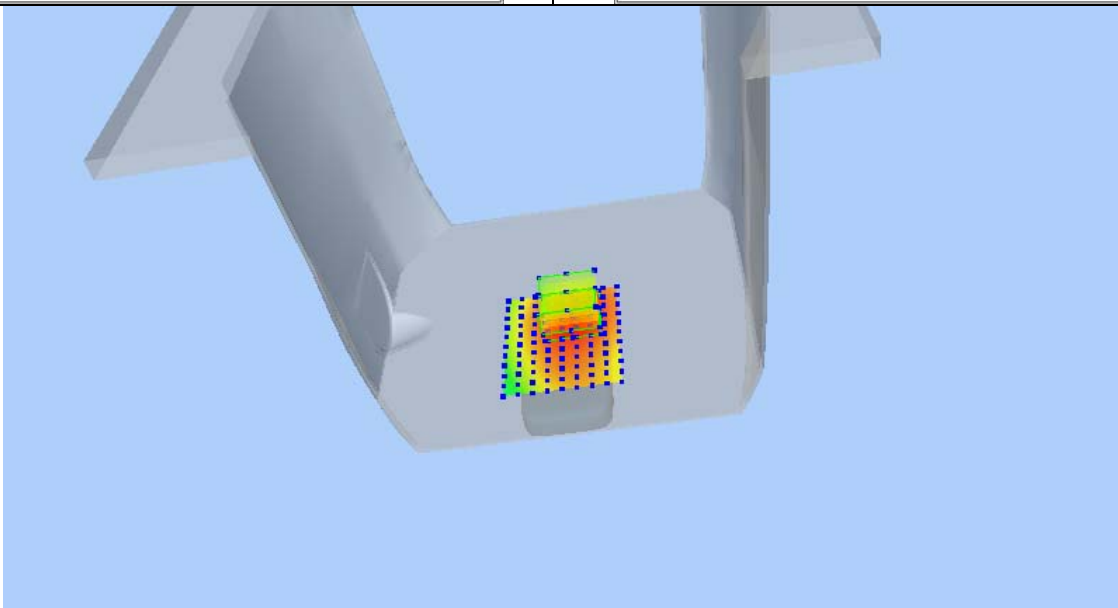
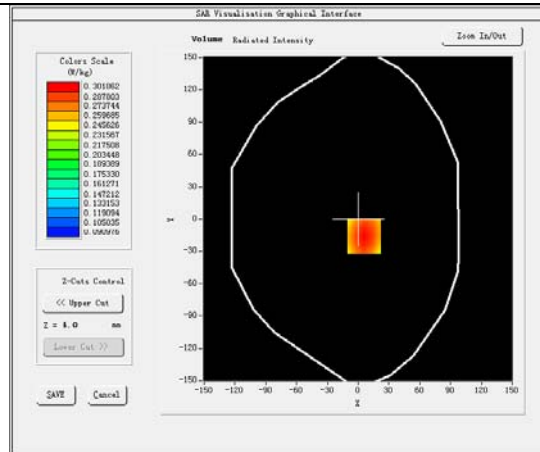
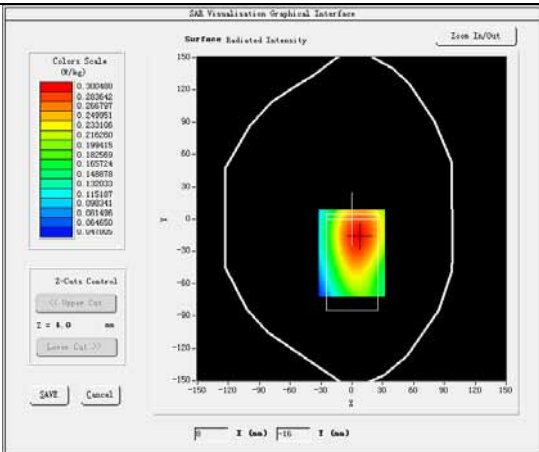
Model: GQ3028

Test Date: Jul 23,2016

Medium(liquid type)	MSL_1800
Frequency (MHz)	1732.6.000
Relative permittivity (real part)	53.85
Conductivity (S/m)	1.50
Signal	WCDMA (Duty cycle: 1:1)
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.37
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.15
SAR 10g (W/Kg)	0.226568
SAR 1g (W/Kg)	0.292472

SURFACE SAR

VOLUME SAR



Plot 9: WCDMA BAND II , Middle channel (Left Head Cheek)

Product Description: Mobile Phone

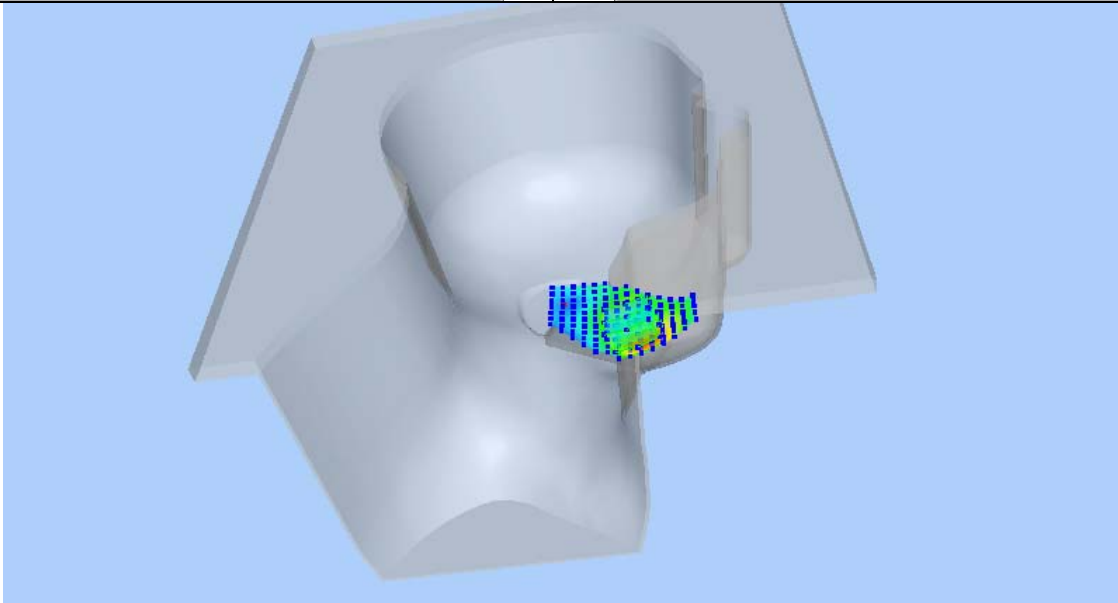
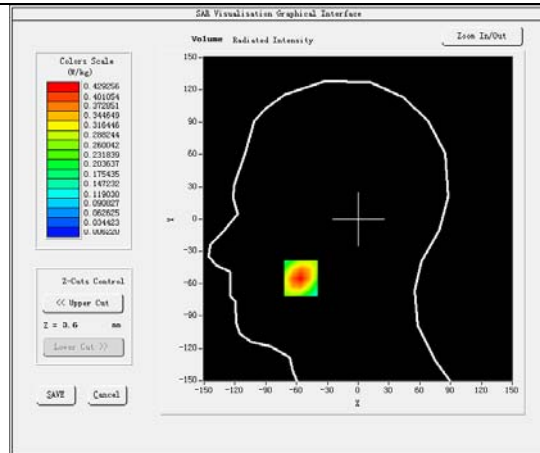
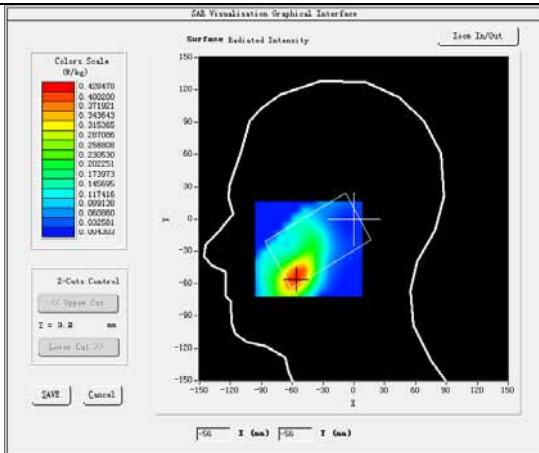
Model: GQ3028

Test Date: Jul 23,2016

Medium(liquid type)	HSL_1900
Frequency (MHz)	1880.0000
Relative permittivity (real part)	41.04
Conductivity (S/m)	1.41
Signal	WCDMA(Duty cycle: 1:1)
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.95
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-4.14
SAR 10g (W/Kg)	0.203145
SAR 1g (W/Kg)	0.405245

SURFACE SAR

VOLUME SAR



Plot 10: WCDMA BAND II , Middle channel (Body-worn/Hotspot, Back Surface)

Product Description: Mobile Phone

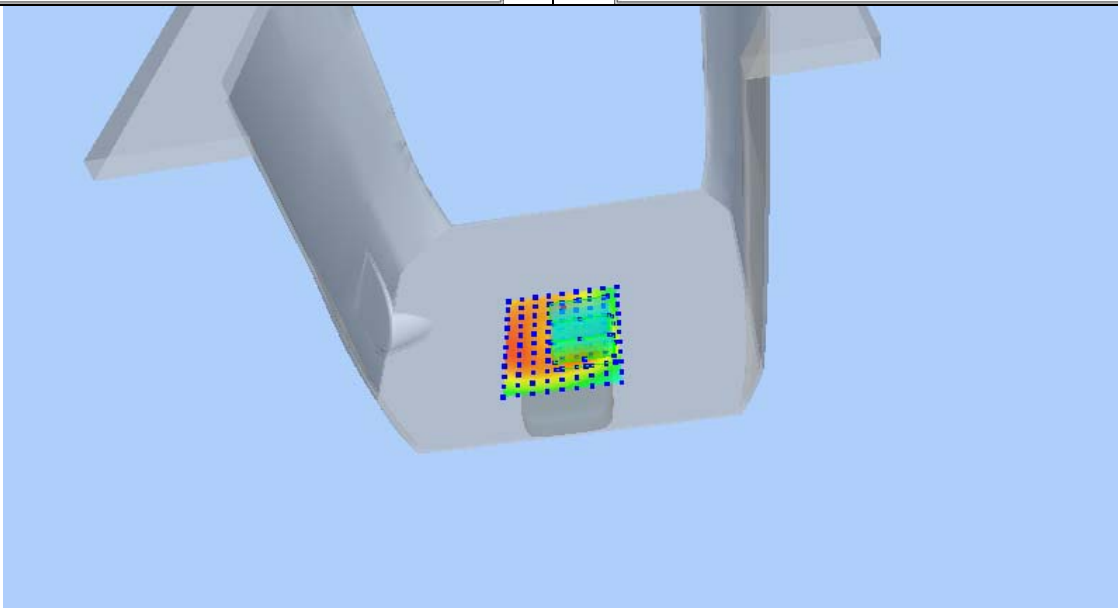
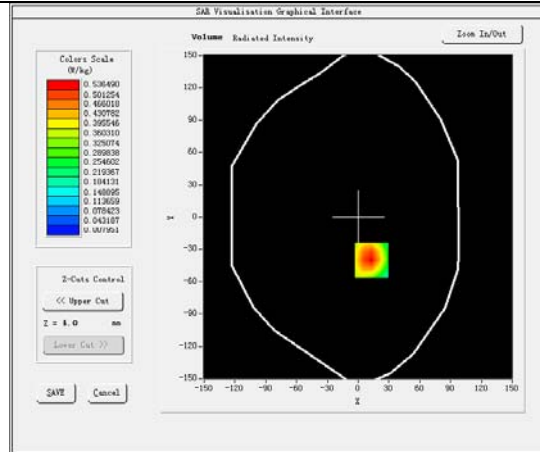
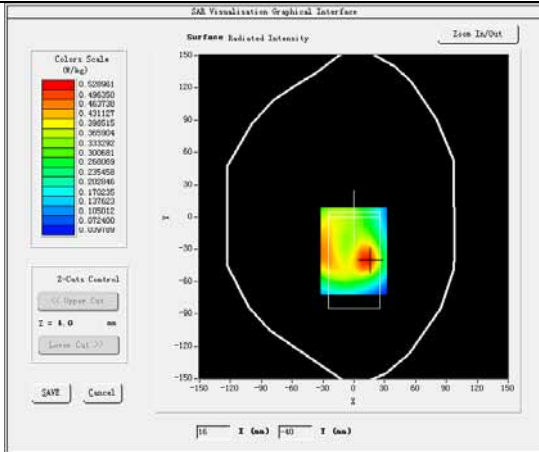
Model: GQ3028

Test Date: Jul 23,2016

Medium(liquid type)	MSL_1900
Frequency (MHz)	1880.0000
Relative permittivity (real part)	53.51
Conductivity (S/m)	1.50
Signal	WCDMA(Duty cycle: 1:1)
E-Field Probe	SN 07/15 EP249
Conversion Factor	5.05
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.30
SAR 10g (W/Kg)	0.253511
SAR 1g (W/Kg)	0.513232

SURFACE SAR

VOLUME SAR



Plot 11:LTE BAND2, Middle channel (Left Head Cheek)

Product Description:Mobile Phone

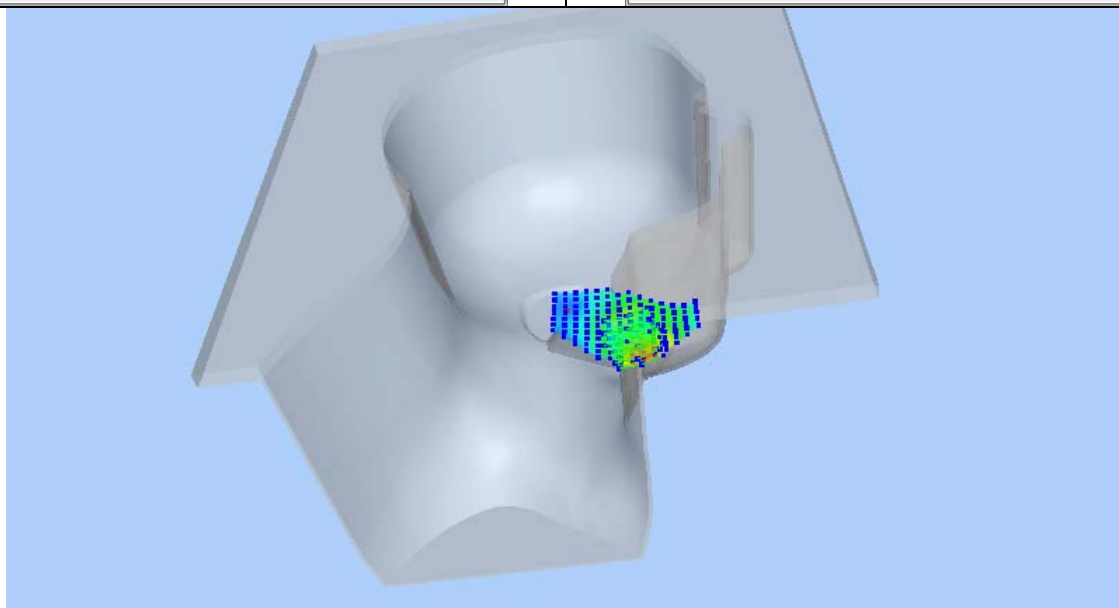
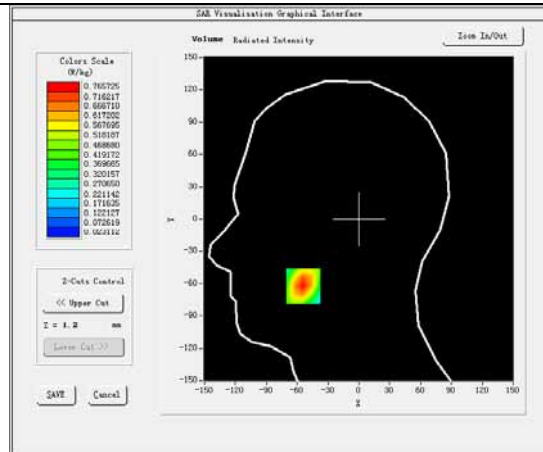
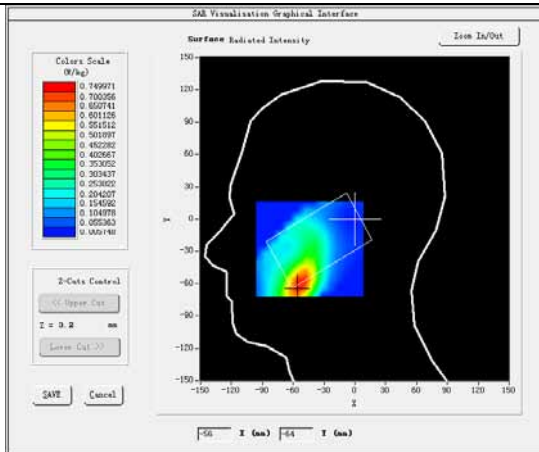
Model: GQ3028

Test Date: Jul 25,2016

Medium(liquid type)	HSL_1900
Frequency (MHz)	1880.0000
Relative permittivity (real part)	41.04
Conductivity (S/m)	1.41
Signal	Duty cycle: 1:1
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.95
Bandwidth(MHz)	20
RB Allocation	1
RB Offset	49
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.80
SAR 10g (W/Kg)	0.408123
SAR 1g (W/Kg)	0.715324

SURFACE SAR

VOLUME SAR



Plot 12:LTE BAND2, Middle channel (Body-worn, Back Surface)

Product Description:Mobile Phone

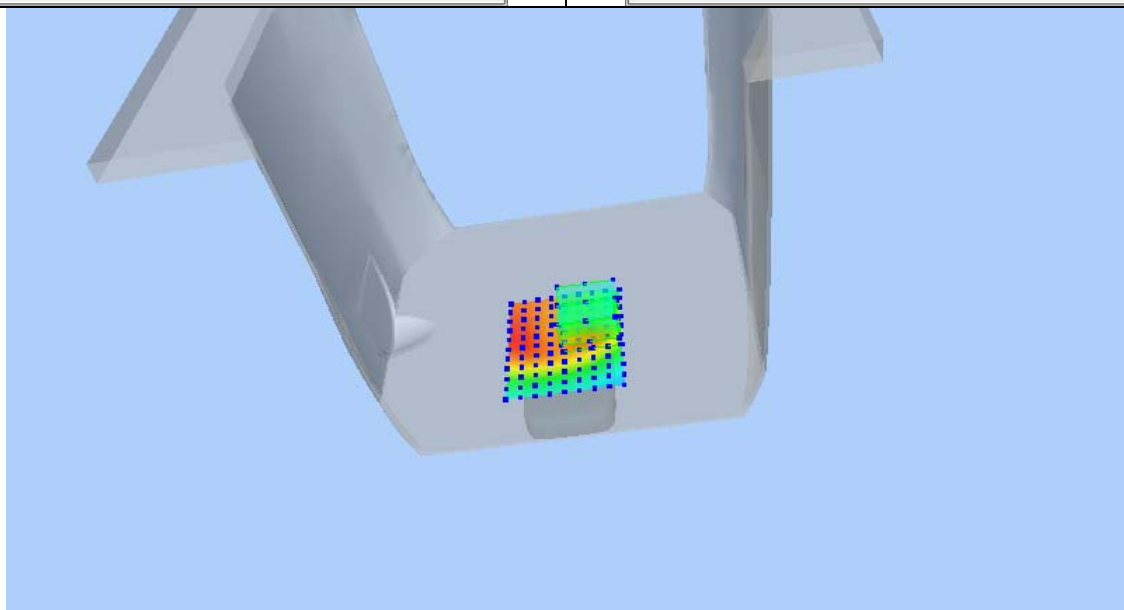
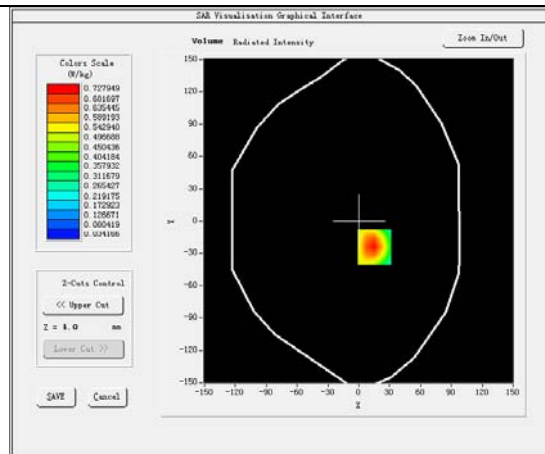
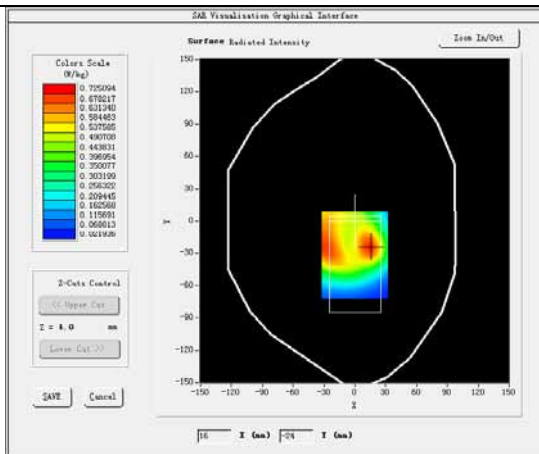
Model: GQ3028

Test Date: Jul 25,2016

Medium(liquid type)	MSL_1900
Frequency (MHz)	1880.0000
Relative permittivity (real part)	53.51
Conductivity (S/m)	1.50
Signal	Duty cycle: 1:1
E-Field Probe	SN 07/15 EP249
Conversion Factor	5.05
Bandwidth(MHz)	20
RB Allocation	1
RB Offset	49
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-1.72
SAR 10g (W/Kg)	0.379812
SAR 1g (W/Kg)	0.688609

SURFACE SAR

VOLUME SAR



Plot 13:LTE BAND2, Middle channel (Hotspot, Bottom Edge)

Product Description:Mobile Phone

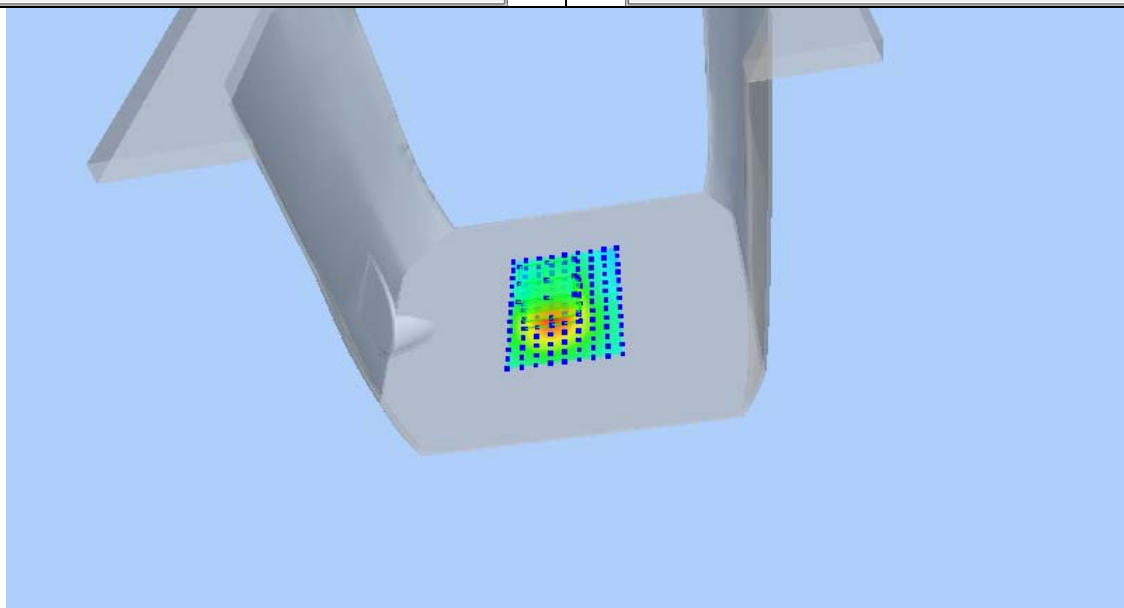
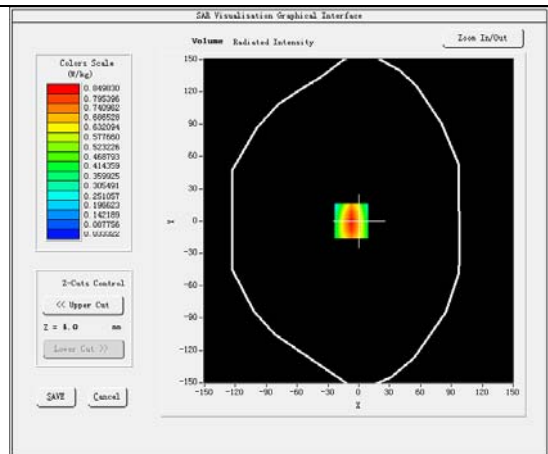
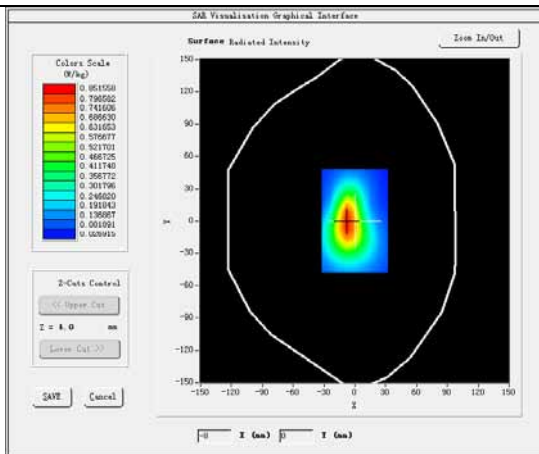
Model: GQ3028

Test Date: Jul 25,2016

Medium(liquid type)	MSL_1900
Frequency (MHz)	1880.0000
Relative permittivity (real part)	53.51
Conductivity (S/m)	1.50
Signal	Duty cycle: 1:1
E-Field Probe	SN 07/15 EP249
Conversion Factor	5.05
Bandwidth(MHz)	20
RB Allocation	1
RB Offset	49
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.16
SAR 10g (W/Kg)	0.436097
SAR 1g (W/Kg)	0.795864

SURFACE SAR

VOLUME SAR



Plot 14:LTE BAND4, Middle channel (Left Head Cheek)

Product Description:Mobile Phone

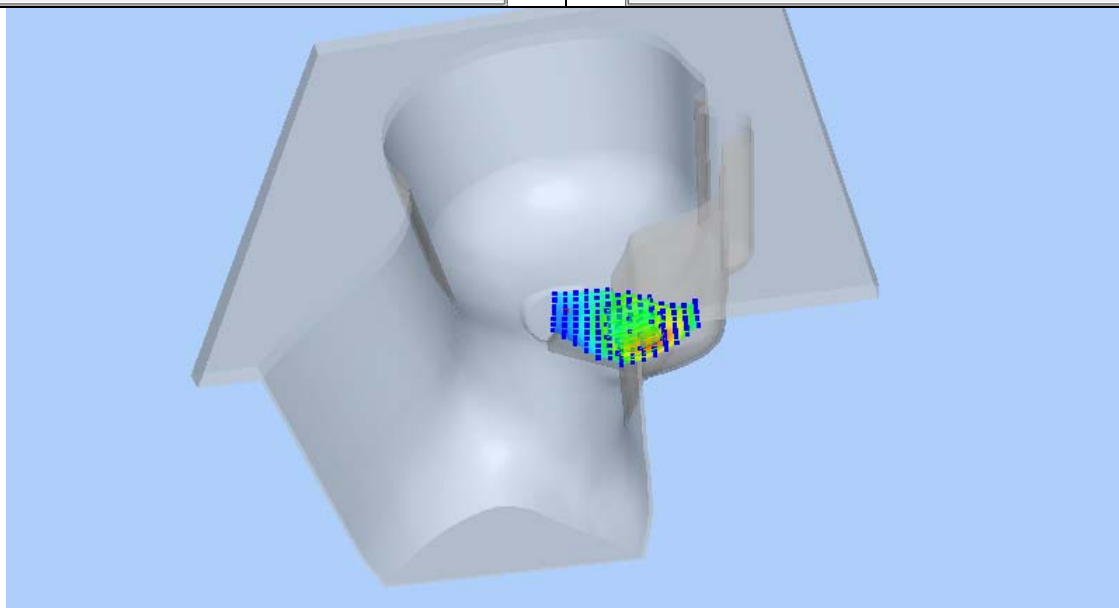
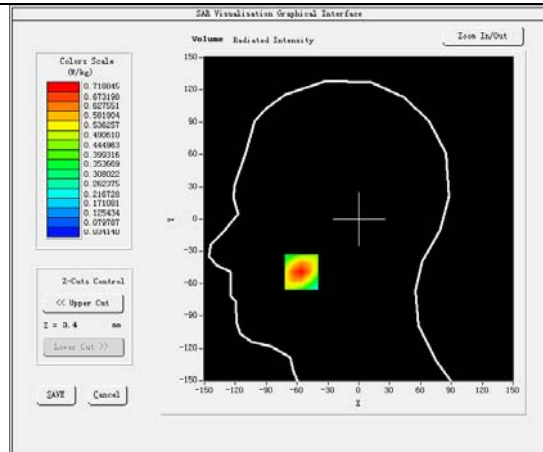
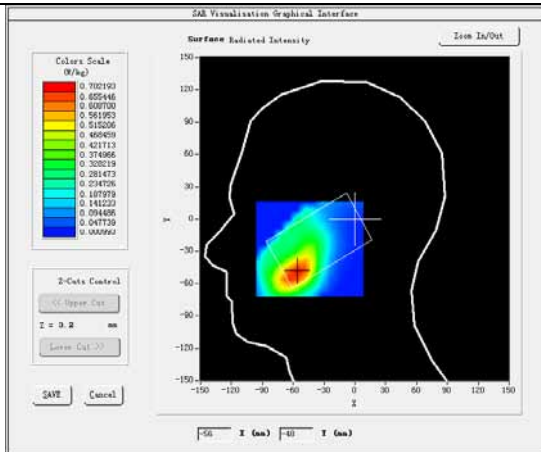
Model: GQ3028

Test Date: Jul 25,2016

Medium(liquid type)	HSL_1800
Frequency (MHz)	1732.5000
Relative permittivity (real part)	40.51
Conductivity (S/m)	1.39
Signal	Duty cycle: 1:1
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.23
Bandwidth(MHz)	20
RB Allocation	1
RB Offset	49
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-3.49
SAR 10g (W/Kg)	0.396573
SAR 1g (W/Kg)	0.674756

SURFACE SAR

VOLUME SAR



Plot 15:LTE BAND4, Middle channel (Body-worn/Hotspot, Back Surface)

Product Description:Mobile Phone

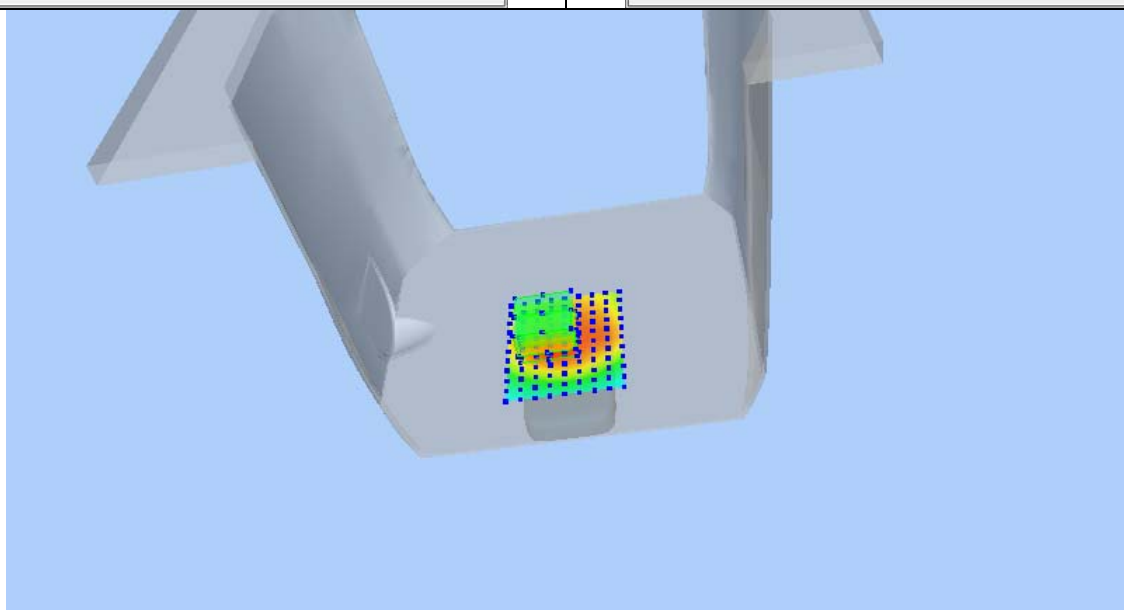
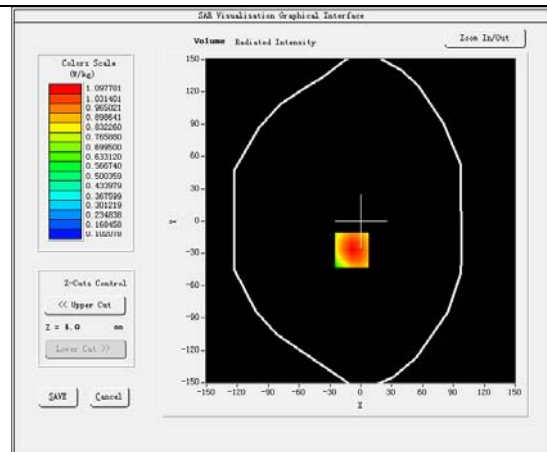
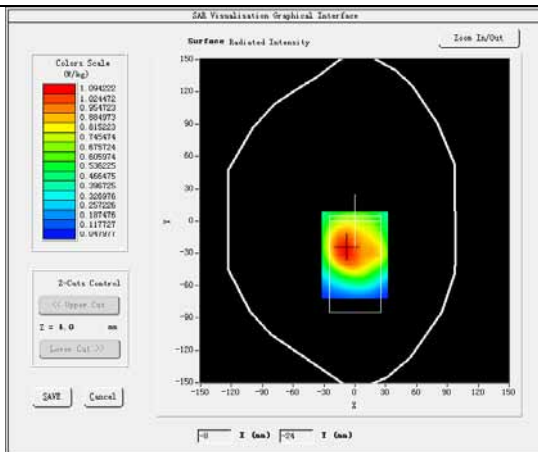
Model: GQ3028

Test Date: Jul 25,2016

Medium(liquid type)	MSL_1800
Frequency (MHz)	1732.5000
Relative permittivity (real part)	53.85
Conductivity (S/m)	1.50
Signal	Duty cycle: 1:1
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.37
Bandwidth(MHz)	20
RB Allocation	1
RB Offset	49
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.91
SAR 10g (W/Kg)	0.658818
SAR 1g (W/Kg)	1.048347

SURFACE SAR

VOLUME SAR



Plot 16:LTE BAND7, Middle channel (Left Head Cheek)

Product Description:Mobile Phone

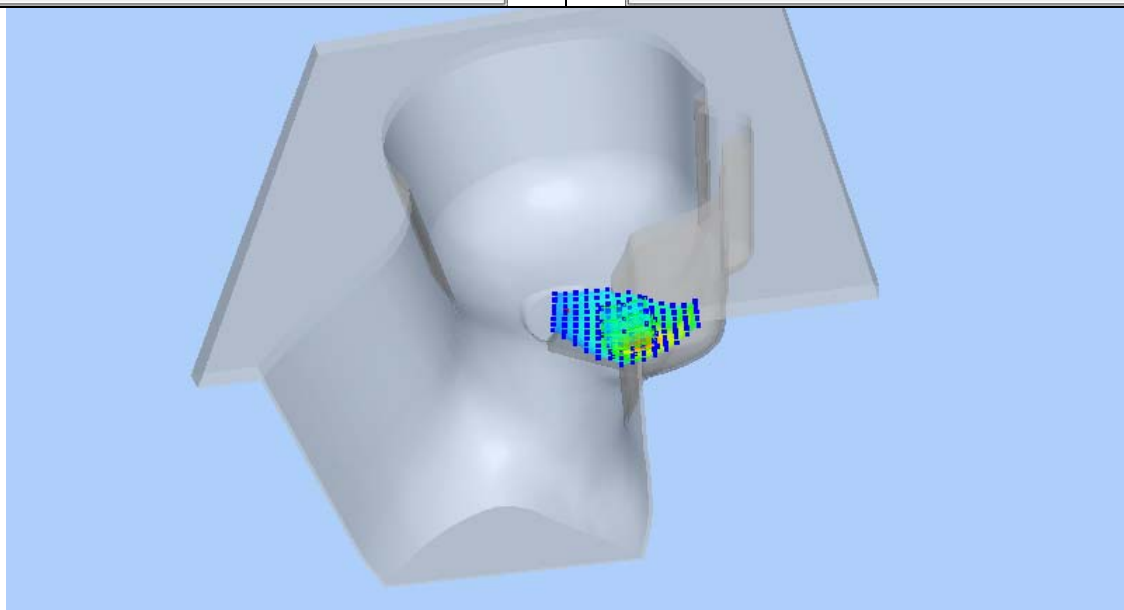
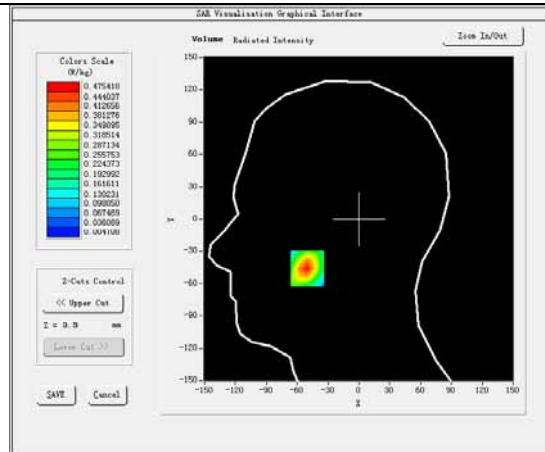
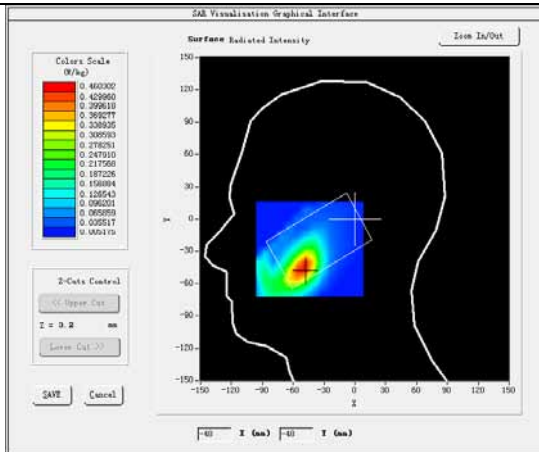
Model: GQ3028

Test Date: Jul 25,2016

Medium(liquid type)	HSL_2450
Frequency (MHz)	2535.0000
Relative permittivity (real part)	39.54
Conductivity (S/m)	1.79
Signal	Duty cycle: 1:1
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.32
Bandwidth(MHz)	20
RB Allocation	1
RB Offset	49
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.16
SAR 10g (W/Kg)	0.217090
SAR 1g (W/Kg)	0.442033

SURFACE SAR

VOLUME SAR



Plot 17:LTE BAND7, Middle channel (Body-worn/Hotspot, Back Surface)

Product Description:Mobile Phone

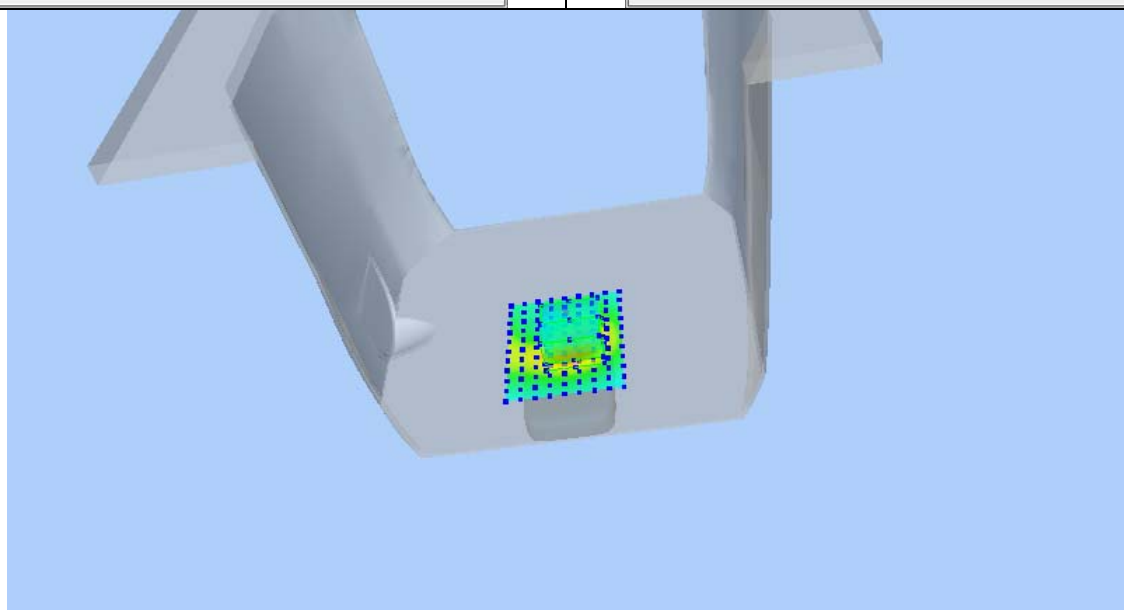
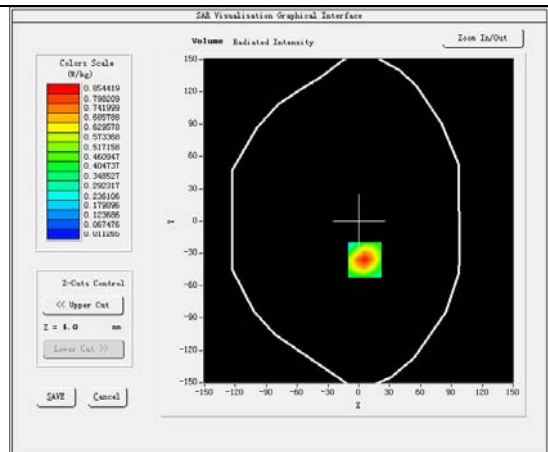
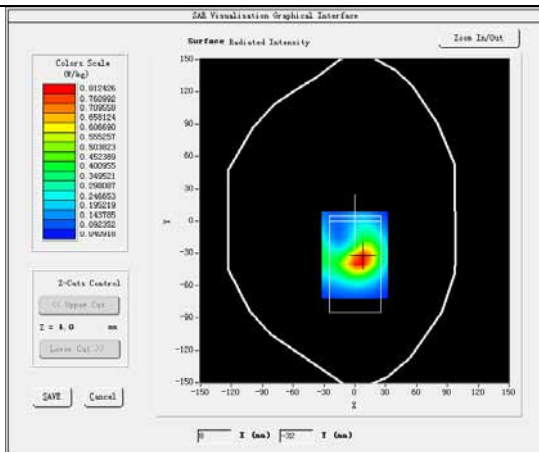
Model: GQ3028

Test Date: Jul 25,2016

Medium(liquid type)	MSL_2450
Frequency (MHz)	2535.0000
Relative permittivity (real part)	52.73
Conductivity (S/m)	1.94
Signal	Duty cycle: 1:1
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.49
Bandwidth(MHz)	20
RB Allocation	1
RB Offset	49
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.39
SAR 10g (W/Kg)	0.395091
SAR 1g (W/Kg)	0.797596

SURFACE SAR

VOLUME SAR



Plot 18:LTE BAND17, Middle channel (Left Head Cheek)

Product Description:Mobile Phone

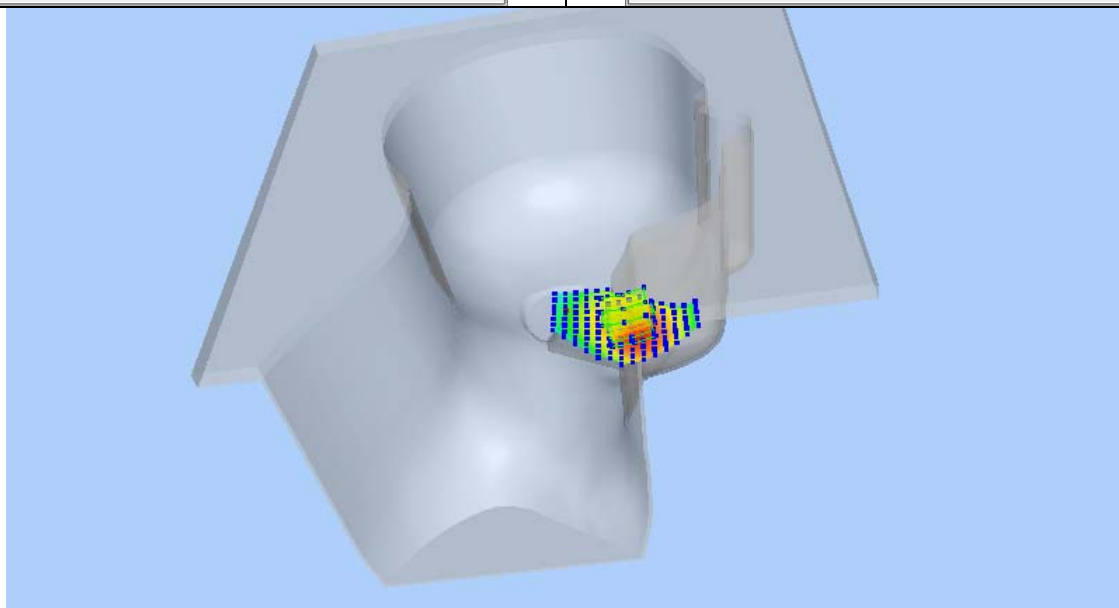
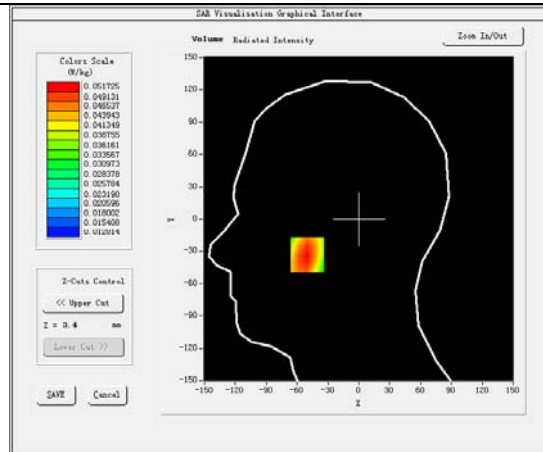
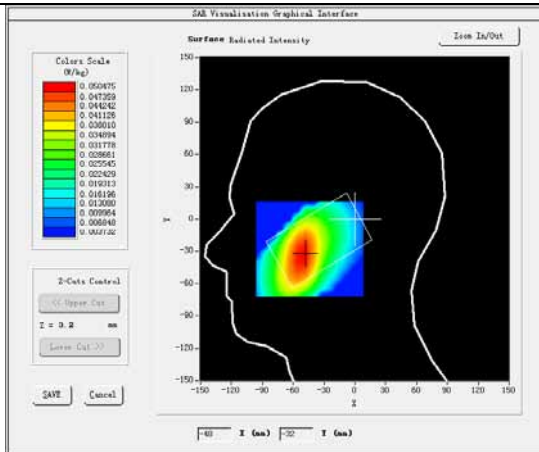
Model: GQ3028

Test Date: Jul 21,2016

Medium(liquid type)	HSL_750
Frequency (MHz)	710.0000
Relative permittivity (real part)	41.64
Conductivity (S/m)	0.89
Signal	Duty cycle: 1:1
E-Field Probe	SN 07/15 EP249
Conversion Factor	4.97
Bandwidth(MHz)	10
RB Allocation	1
RB Offset	49
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.43
SAR 10g (W/Kg)	0.038895
SAR 1g (W/Kg)	0.050973

SURFACE SAR

VOLUME SAR



Plot 19:LTE BAND17, Middle channel (Body-worn/Hotspot, Back Surface)

Product Description:Mobile Phone

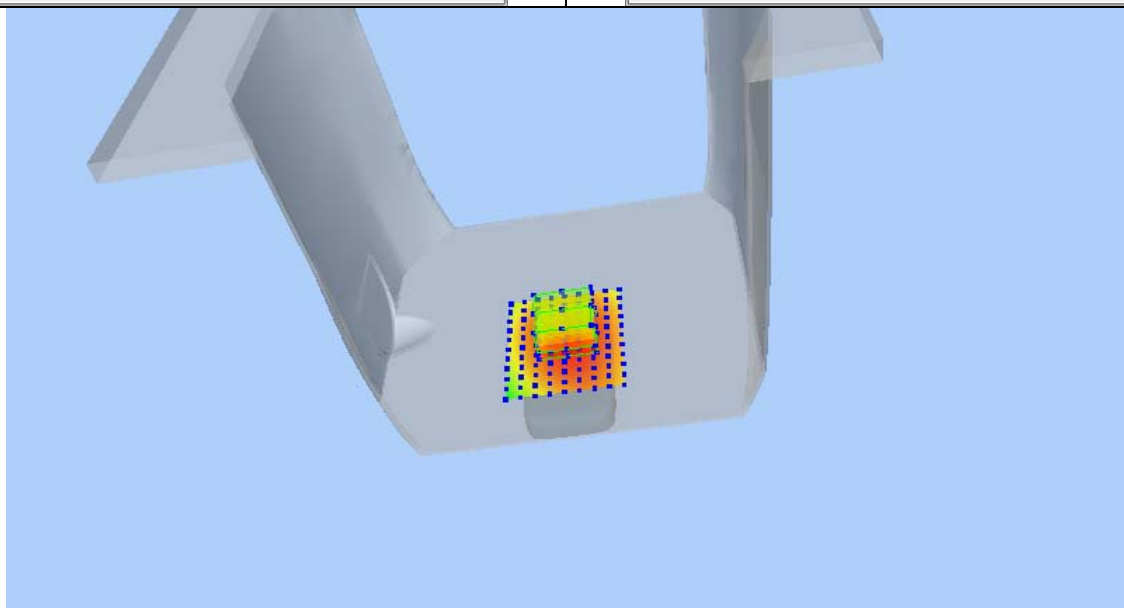
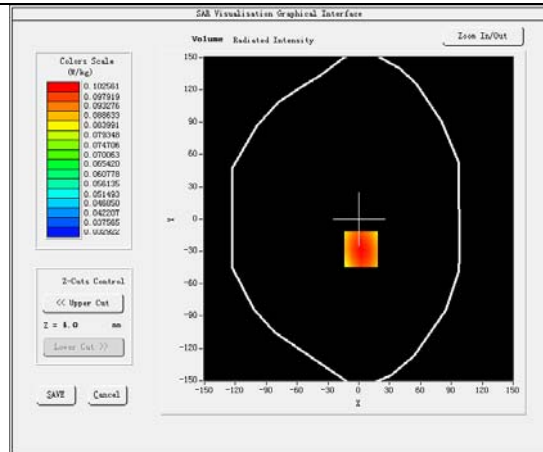
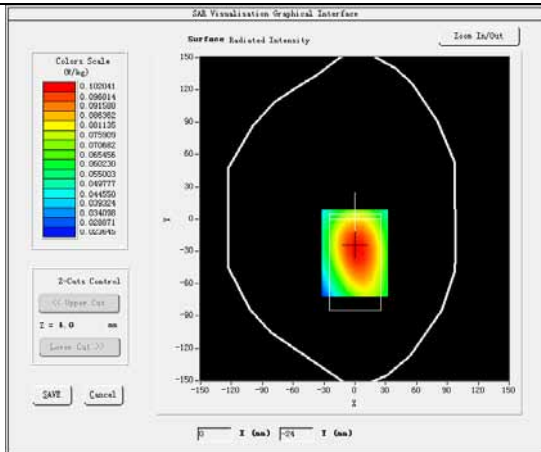
Model: GQ3028

Test Date: Jul 21,2016

Medium(liquid type)	MSL_750
Frequency (MHz)	710.0000
Relative permittivity (real part)	54.19
Conductivity (S/m)	0.98
Signal	Duty cycle: 1:1
E-Field Probe	SN 07/15 EP249
Conversion Factor	5.11
Bandwidth(MHz)	10
RB Allocation	1
RB Offset	49
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.29
SAR 10g (W/Kg)	0.079696
SAR 1g (W/Kg)	0.105028

SURFACE SAR

VOLUME SAR



15 Calibration reports-Probe



COMOSAR E-Field Probe Calibration Report

Ref : ACR.307.1.15.SATU.A

WALTEK SERVICES (SHENZHEN) CO., LTD
1/F., FUKANGTAI BUILDING, WEST BAIMA ROAD,
SONGGANG STREET
BAOAN DISTRICT, SHENZHEN GUANGDONG 518105,
CHINA
MVG COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: SN 07/15 EP249

Calibrated at MVG US
2105 Barrett Park Dr. - Kennesaw, GA 30144



Calibration Date: 10/19/2015

Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed in MVG USA using the CALISAR / CALIBAIR test bench, for use with a COMOSAR system only. All calibration results are traceable to national metrology institutions.



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.307.1.15.SATU.A

	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by :</i>	Jérôme LUC	Product Manager	11/3/2015	<i>JS</i>
<i>Checked by :</i>	Jérôme LUC	Product Manager	11/3/2015	<i>JS</i>
<i>Approved by :</i>	Kim RUTKOWSKI	Quality Manager	11/3/2015	<i>Kim Rutkowski</i>

	<i>Customer Name</i>
<i>Distribution :</i>	Waltek Services (Shenzhen) Co., Ltd

<i>Issue</i>	<i>Date</i>	<i>Modifications</i>
A	11/3/2015	Initial release

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.307.1.15.SATU.A

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE5
Serial Number	SN 07/15 EP249
Product Condition (new / used)	New
Frequency Range of Probe	0.7 GHz-3GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.178 MΩ Dipole 2: R2=0.179 MΩ Dipole 3: R3=0.167 MΩ

A yearly calibration interval is recommended.

2 PRODUCT DESCRIPTION**2.1 GENERAL INFORMATION**

MVG's COMOSAR E field Probes are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards.



Figure 1 – MVG COMOSAR Dosimetric E field Dipole

Probe Length	330 mm
Length of Individual Dipoles	4.5 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	5 mm
Distance between dipoles / probe extremity	2.7 mm

3 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their affect. All calibrations / measurements performed meet the fore mentioned standards.

3.1 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

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3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.

3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

3.4 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 - 360 degrees in 15 degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

3.5 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	ci	Standard Uncertainty (%)
Incident or forward power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Reflected power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Liquid conductivity	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Liquid permittivity	4.00%	Rectangular	$\sqrt{3}$	1	2.309%
Field homogeneity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Field probe positioning	5.00%	Rectangular	$\sqrt{3}$	1	2.887%

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