SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

Temperature:	21-24 ℃
Relative Humidity:	50-53 %
ATM Pressure:	1001-1002 mbar

Testing was performed by Wilson Chen on 2015-09-23

GSM 850:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-3.661	32.29	32.40	1.026	0.305	0.313	/
	848.8	GSM	/	/	/	/	/	/	/
Left Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	4.153	32.29	32.40	1.026	0.21	0.215	/
	848.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	824.2	GSM	-4.434	32.30	32.40	1.023	0.32	0.327	/
	836.6	GSM	-0.971	32.29	32.40	1.026	0.371	**0.381**	**1#**
	848.8	GSM	-1.812	32.26	32.40	1.033	0.301	0.311	/
Right Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-1.353	32.29	32.40	1.026	0.187	0.192	/
	848.8	GSM	/	/	/	/	/	/	/
Body-Back-Headset (10mm)	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	1.875	32.29	32.40	1.026	0.301	0.309	/
	848.8	GSM	/	/	/	/	/	/	/

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The EUT transmit and receive through the same GSM antenna while testing SAR.
3. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
4. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.

PCS Band:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1850.2	GSM	-0.748	28.88	28.90	1.005	0.187	0.188	/
	1880	GSM	-4.143	28.50	28.90	1.096	0.201	0.220	/
	1909.8	GSM	-3.143	28.09	29.00	1.233	0.223	**0.275**	**2#**
Left Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880	GSM	0.301	28.50	28.90	1.096	0.102	0.112	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	1850.2	GSM	/	/	/	/	/	/	/
	1880	GSM	-3.235	28.50	28.90	1.096	0.195	0.214	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880	GSM	1.358	28.50	28.90	1.096	0.099	0.109	/
	1909.8	GSM	/	/	/	/	/	/	/
Body-Back-Headset (10mm)	1850.2	GSM	/	/	/	/	/	/	/
	1880	GSM	1.947	28.50	28.90	1.096	0.15	0.164	/
	1909.8	GSM	/	/	/	/	/	/	/

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The EUT transmit and receive through the same GSM antenna while testing SAR.
3. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
4. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.

WCDMA 850 Band:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	826.4	RMC	0.206	22.58	22.60	1.005	0.09	0.090	/
	836.6	RMC	0.765	22.37	22.60	1.054	0.1	**0.105**	**3#**
	846.6	RMC	3.192	21.71	22.60	1.227	0.081	0.099	/
Left Head Tilt	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-2.751	22.37	22.60	1.054	0.062	0.065	/
	846.6	RMC	/	/	/	/	/	/	/
Right Head Cheek	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-3.055	22.37	22.60	1.054	0.097	0.102	/
	846.6	RMC	/	/	/	/	/	/	/
Right Head Tilt	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	1.262	22.37	22.60	1.054	0.053	0.056	/
	846.6	RMC	/	/	/	/	/	/	/

WCDMA 1900 Band:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1852.4	RMC	-0.151	22.64	22.70	1.014	0.347	**0.352**	**4#**
	1880	RMC	0.808	22.53	22.70	1.040	0.253	0.263	/
	1907.6	RMC	2.811	22.45	22.70	1.059	0.236	0.250	/
Left Head Tilt	1852.4	RMC	/	/	/	/	/	/	/
	1880	RMC	-2.469	22.53	22.70	1.040	0.159	0.165	/
	1907.6	RMC	/	/	/	/	/	/	/
Right Head Cheek	1852.4	RMC	/	/	/	/	/	/	/
	1880	RMC	4.948	22.53	22.70	1.040	0.235	0.244	/
	1907.6	RMC	/	/	/	/	/	/	/
Right Head Tilt	1852.4	RMC	/	/	/	/	/	/	/
	1880	RMC	-1.950	22.53	22.70	1.040	0.147	0.153	/
	1907.6	RMC	/	/	/	/	/	/	/

Note:

1. When the 1-g SAR is≤ 0.8W/Kg, testing for other channels are optional.
2. The EUT transmit and receive through the same antenna while testing SAR.
3. The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement Channel) Configured in Test Loop Model.
4. KDB 941225 D01-Body SAR is not required for HSDPA/HSUPA/HSPA+/DC-HSPA when the maximum average output of each RF channel is less than ¼ dB higher than measured 12.2kbps RMC or the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.

5. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

LTE Band 2:

EUT Position	Frequency (MHz)	Bandwith（MHz）	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1860	20	1RB, Offset=49	/	/	/	/	/	/	/
	1880	20	1RB, Offset=49	/	/	/	/	/	/	/
	1900	20	1RB, Offset=49	-2.527	22.31	22.40	1.021	0.251	**0.256**	**5#**
	1900	20	50%RB, Offset=0	-1.584	22.16	22.40	1.057	0.215	0.227	/
Left Head Tilt	1860	20	1RB, Offset=49	/	/	/	/	/	/	/
	1880	20	1RB, Offset=49	/	/	/	/	/	/	/
	1900	20	1RB, Offset=49	-3.843	22.31	22.40	1.021	0.137	0.140	/
	1900	20	50%RB, Offset=0	-0.816	22.16	22.40	1.057	0.105	0.111	
Right Head Cheek	1860	20	1RB, Offset=49	/	/	/	/	/	/	/
	1880	20	1RB, Offset=49	/	/	/	/	/	/	/
	1900	20	1RB, Offset=49	4.985	22.31	22.40	1.021	0.237	0.242	/
	1900	20	50%RB, Offset=0	3.766	22.16	22.40	1.057	0.211	0.223	
Right Head Tilt	1860	20	1RB, Offset=49	/	/	/	/	/	/	/
	1880	20	1RB, Offset=49	/	/	/	/	/	/	/
	1900	20	1RB, Offset=49	-4.022	22.31	22.40	1.021	0.108	0.110	/
	1900	20	50%RB, Offset=0	3.389	22.16	22.40	1.057	0.073	0.077	/

LTE Band 4:

EUT Position	Frequency (MHz)	Bandwith（MHz）	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1720	20	1RB, Offset=0	/	/	/	/	/	/	/
	1732.5	20	1RB, Offset=0	/	/	/	/	/	/	/
	1745	20	1RB, Offset=0	-1.214	21.60	21.70	1.023	0.357	**0.365**	**6#**
	1745	20	50%RB, Offset=24	4.260	21.27	21.70	1.104	0.307	0.339	/
Left Head Tilt	1720	20	1RB, Offset=0	/	/	/	/	/	/	/
	1732.5	20	1RB, Offset=0	/	/	/	/	/	/	/
	1745	20	1RB, Offset=0	2.687	21.60	21.70	1.023	0.206	0.211	/
	1745	20	50%RB, Offset=24	-4.572	21.27	21.70	1.104	0.175	0.193	
Right Head Cheek	1720	20	1RB, Offset=0	/	/	/	/	/	/	/
	1732.5	20	1RB, Offset=0	/	/	/	/	/	/	/
	1745	20	1RB, Offset=0	-3.360	21.60	21.70	1.023	0.322	0.330	/
	1745	20	50%RB, Offset=24	-4.222	21.27	21.70	1.104	0.273	0.301	/
Right Head Tilt	1720	20	1RB, Offset=0	/	/	/	/	/	/	/
	1732.5	20	1RB, Offset=0	/	/	/	/	/	/	/
	1745	20	1RB, Offset=0	4.358	21.60	21.70	1.023	0.221	0.226	/
	1745	20	50%RB, Offset=24	-2.958	21.27	21.70	1.104	0.192	0.212	/

LTE Band 7:

EUT Position	Frequency (MHz)	Bandwith（MHz）	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	2510	20	1RB, Offset=0	/	/	/	/	/	/	/
	2535	20	1RB, Offset=0	2.836	22.15	22.20	1.012	0.107	0.108	/
	2560	20	1RB, Offset=0	/	/	/	/	/	/	/
	2560	20	50%RB, Offset=24	-2.558	21.47	22.20	1.183	0.068	0.080	/
Left Head Tilt	2510	20	1RB, Offset=0	/	/	/	/	/	/	/
	2535	20	1RB, Offset=0	-3.516	22.15	22.20	1.012	0.065	0.066	/
	2560	20	1RB, Offset=0	/	/	/	/	/	/	/
	2560	20	50%RB, Offset=24	1.389	21.47	22.20	1.183	0.051	0.060	/
Right Head Cheek	2510	20	1RB, Offset=0	/	/	/	/	/	/	/
	2535	20	1RB, Offset=0	2.755	22.15	22.20	1.012	0.113	**0.114**	**7#**
	2560	20	1RB, Offset=0	/	/	/	/	/	/	/
	2560	20	50%RB, Offset=24	-1.765	21.47	22.20	1.183	0.072	0.085	/
Right Head Tilt	2510	20	1RB, Offset=0	/	/	/	/	/	/	/
	2535	20	1RB, Offset=0	3.580	22.15	22.20	1.012	0.054	0.055	/
	2560	20	1RB, Offset=0	/	/	/	/	/	/	/
	2560	20	50%RB, Offset=24	4.195	21.47	22.20	1.183	0.045	0.053	/

LTE Band 17:

EUT Position	Frequency (MHz)	Bandwith（MHz）	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	709	10	1RB, Offset=49	/	/	/	/	/	/	/
	710	10	1RB, Offset=49	/	/	/	/	/	/	/
	711	10	1RB, Offset=49	1.015	21.86	21.90	1.009	0.131	0.132	/
	710	10	50%RB, Offset=0	-3.854	21.82	21.90	1.019	0.117	0.119	/
Left Head Tilt	709	10	1RB, Offset=49	/	/	/	/	/	/	/
	710	10	1RB, Offset=49	/	/	/	/	/	/	/
	711	10	1RB, Offset=49	3.403	21.86	21.90	1.009	0.082	0.083	/
	710	10	50%RB, Offset=0	3.450	21.82	21.90	1.019	0.061	0.062	/
Right Head Cheek	709	10	1RB, Offset=49	/	/	/	/	/	/	/
	710	10	1RB, Offset=49	/	/	/	/	/	/	/
	711	10	1RB, Offset=49	-1.576	21.86	21.90	1.009	0.14	**0.141**	**8#**
	710	10	50%RB, Offset=0	-3.125	21.82	21.90	1.019	0.121	0.123	/
Right Head Tilt	709	10	1RB, Offset=49	/	/	/	/	/	/	/
	710	10	1RB, Offset=49	/	/	/	/	/	/	/
	711	10	1RB, Offset=49	4.943	21.86	21.90	1.009	0.079	0.080	/
	710	10	50%RB, Offset=0	0.236	21.82	21.90	1.019	0.059	0.060	/

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.

2. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
3. KDB941225D05- SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg
4. KDB941225D05- For QPSK with 100% RB allocation, when the reported SAR measured for the Highest output power channel is <1.45 W/kg, tests for the remaining required test channels are optional.
5.KDB941225D05- For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.
6. KDB941225D05- Start with the largest channel bandwidth (20M) and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offset the upper edge, middle and lower edge of each required test channel.
7. Worst case SAR for 50% RB allocation is selected to be tested.

Mobile Hot-Spot Test Result

The DUT is capable of functioning as a Wi-Fi to Cellular Mobile hotspot. Additional SAR testing was performed according to KDB 941225 D06. Testing was performed with a separation of 1cm between the DUT and the flat phantom. The DUT was positioned for SAR tests with the front and back surfaces facing the phantom, and also with the edges facing the phantom in which the transmitting antenna is <2.5 cm from the edge. Each transmit band was utilized for SAR testing. The tested mode has been selected within each band that exhibits the highest time average output power.

Hot spot-GPRS (Frequency Band: 850)

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	-2.584	28.87	29.10	1.054	0.511	**0.539**	**9#**
	848.8	GPRS	/	/	/	/	/	/	/
Body-Left (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	1.816	28.87	29.10	1.054	0.387	0.408	/
	848.8	GPRS	/	/	/	/	/	/	/
Body-Right (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	-3.707	28.87	29.10	1.054	0.272	0.287	/
	848.8	GPRS	/	/	/	/	/	/	/
Body-Bottom (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	-0.958	28.87	29.10	1.054	0.337	0.355	/
	848.8	GPRS	/	/	/	/	/	/	/

Note:
1 .When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. According to IEEE 1528-2013, the middle channel is required to be tested first.
3. KDB 447498D01- When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.
2. The EUT is a Capability Class B mobile phone which can be attached to both GPRS and GSM services.
3. The Multi-slot Classes of EUT is Class12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 3DL+2UL is the worst case.
4. The EUT transmit and receive through the same GSM antenna while testing SAR.
5. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tole rance limit according to the power applied to the individual channels tested to determine compliance.

Hot spot-GPRS (Frequency Band: 1900)

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880.0	GPRS	0.615	25.38	25.40	1.005	0.527	**0.529**	**10#**
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Left (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880.0	GPRS	0.835	25.38	25.40	1.005	0.339	0.341	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Right (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880.0	GPRS	-0.356	25.38	25.40	1.005	0.217	0.218	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Bottom (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880.0	GPRS	-2.400	25.38	25.40	1.005	0.352	0.354	/
	1909.8	GPRS	/	/	/	/	/	/	/

Note:

1 .When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. According to IEEE 1528-2013, the middle channel is required to be tested first.
3. KDB 447498D01- When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.
4. The EUT is a Capability Class B mobile phone which can be attached to both GPRS and GSM services.
5. The Multi-slot Classes of EUT is Class12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 1DL+4UL is the worst case.
6. The EUT transmit and receive through the same GSM antenna while testing SAR.
7. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tole rance limit according to the power applied to the individual channels tested to determine compliance.

Hot Spot-WCDMA 850 Band

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-1.852	22.37	22.6	1.054	0.139	**0.147**	**11#**
	846.6	RMC	/	/	/	/	/	/	/
Body-Left (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	2.283	22.37	22.6	1.054	0.079	0.083	/
	846.6	RMC	/	/	/	/	/	/	/
Body-Right (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	4.743	22.37	22.6	1.054	0.033	0.035	/
	846.6	RMC	/	/	/	/	/	/	/
Body-Bottom (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-0.723	22.37	22.6	1.054	0.05	0.053	/
	846.6	RMC	/	/	/	/	/	/	/

Hot Spot-WCDMA 1900 Band

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	2.108	22.53	22.7	1.040	0.679	**0.706**	**12#**
	1907.6	RMC	/	/	/	/	/	/	/
Body-Left (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	4.308	22.53	22.7	1.040	0.427	0.444	/
	1907.6	RMC	/	/	/	/	/	/	/
Body-Right (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	1.320	22.53	22.7	1.040	0.316	0.329	/
	1907.6	RMC	/	/	/	/	/	/	/
Body-Bottom (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	-0.549	22.53	22.7	1.040	0.311	0.323	/
	1907.6	RMC	/	/	/	/	/	/	/

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. According to IEEE 1528-2013, the middle channel is required to be tested first.
3. KDB 447498D01- When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.
4. The default test configuration is to measure SA R with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (refere nce measurement Channel) Configured in Test Loop Model.
5. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tole rance limit according to the power applied to the individual channels tested to determine compliance.

Hot Spot-LTE Band 2

EUT Position	Frequency (MHz)	Bandwith（MHz）	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1860	20	1RB, Offset=49	/	/	/	/	/	/	/
	1880	20	1RB, Offset=49	/	/	/	/	/	/	/
	1900	20	1RB, Offset=49	1.700	22.31	22.4	1.021	0.701	**0.716**	**13#**
	1900	20	50%RB, Offset=0	-1.059	22.16	22.4	1.057	0.617	0.652	/
Body-Left (10mm)	1860	20	1RB, Offset=49	/	/	/	/	/	/	/
	1880	20	1RB, Offset=49	/	/	/	/	/	/	/
	1900	20	1RB, Offset=49	4.925	22.31	22.4	1.021	0.477	0.487	/
	1900	20	50%RB, Offset=0	-0.179	22.16	22.4	1.057	0.376	0.397	/
Body-Right (10mm)	1860	20	1RB, Offset=49	/	/	/	/	/	/	/
	1880	20	1RB, Offset=49	/	/	/	/	/	/	/
	1900	20	1RB, Offset=49	-0.557	22.31	22.4	1.021	0.351	0.358	/
	1900	20	50%RB, Offset=0	2.935	22.16	22.4	1.057	0.299	0.316	/
Body-Bottom (10mm)	1860	20	1RB, Offset=49	/	/	/	/	/	/	/
	1880	20	1RB, Offset=49	/	/	/	/	/	/	/
	1900	20	1RB, Offset=49	1.280	22.31	22.4	1.021	0.425	0.434	/
	1900	20	50%RB, Offset=0	-3.972	22.16	22.4	1.057	0.376	0.397	/

Hot Spot-LTE Band 4

EUT Position	Frequency (MHz)	Bandwith（MHz）	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1720	20	1RB, Offset=0	2.561	21.54	21.7	1.038	0.816	0.847	/
	1732.5	20	1RB, Offset=0	3.150	21.48	21.7	1.052	0.979	1.030	/
	1745	20	1RB, Offset=0	-0.380	21.60	21.7	1.023	1.012	**1.036**	**14#**
	1745	20	50%RB, Offset=24	4.309	21.27	21.7	1.104	0.725	0.800	/
Body-Left (10mm)	1720	20	1RB, Offset=0	/	/	/	/	/	/	/
	1732.5	20	1RB, Offset=0	/	/	/	/	/	/	/
	1745	20	1RB, Offset=0	-4.348	21.60	21.7	1.023	0.686	0.702	/
	1745	20	50%RB, Offset=24	-3.626	21.27	21.7	1.104	0.525	0.580	/
Body-Right (10mm)	1720	20	1RB, Offset=0	/	/	/	/	/	/	/
	1732.5	20	1RB, Offset=0	/	/	/	/	/	/	/
	1745	20	1RB, Offset=0	-1.772	21.60	21.7	1.023	0.572	0.585	/
	1745	20	50%RB, Offset=24	2.601	21.27	21.7	1.104	0.357	0.394	/
Body-Bottom (10mm)	1720	20	1RB, Offset=0	/	/	/	/	/	/	/
	1732.5	20	1RB, Offset=0	/	/	/	/	/	/	/
	1745	20	1RB, Offset=0	4.309	21.60	21.7	1.023	0.65	0.665	/
	1745	20	50%RB, Offset=24	0.036	21.27	21.7	1.104	0.542	0.598	/

Hot Spot-LTE Band 7

EUT Position	Frequency (MHz)	Bandwith（MHz）	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	2510	20	1RB, Offset=0	/	/	/	/	/	/	/
	2535	20	1RB, Offset=0	-1.370	22.15	22.2	1.012	0.241	**0.244**	**15#**
	2560	20	1RB, Offset=0	/	/	/	/	/	/	/
	2560	20	50%RB,Offset=24	-4.056	21.47	22.2	1.183	0.215	0.254	/
Body-Left (10mm)	2510	20	1RB, Offset=0	/	/	/	/	/	/	/
	2535	20	1RB, Offset=0	-4.724	22.15	22.2	1.012	0.144	0.146	/
	2560	20	1RB, Offset=0	/	/	/	/	/	/	/
	2560	20	50%RB,Offset=24	-4.981	21.47	22.2	1.183	0.1	0.118	/
Body-Right (10mm)	2510	20	1RB, Offset=0	/	/	/	/	/	/	/
	2535	20	1RB, Offset=0	-2.020	22.15	22.2	1.012	0.154	0.156	/
	2560	20	1RB, Offset=0	/	/	/	/	/	/	/
	2560	20	50%RB,Offset=24	-1.459	21.47	22.2	1.183	0.123	0.146	/
Body-Bottom (10mm)	2510	20	1RB, Offset=0	/	/	/	/	/	/	/
	2535	20	1RB, Offset=0	-1.529	22.15	22.2	1.012	0.184	0.186	/
	2560	20	1RB, Offset=0	/	/	/	/	/	/	/
	2560	20	50%RB,Offset=24	3.549	21.47	22.2	1.183	0.162	0.192	/

Hot Spot-LTE Band 17

EUT Position	Frequency (MHz)	Bandwith（MHz）	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	709	10	1RB, Offset=49	/	/	/	/	/	/	/
	710	10	1RB, Offset=49	/	/	/	/	/	/	/
	711	10	1RB, Offset=49	1.794	21.86	21.9	1.009	0.225	**0.227**	**16#**
	710	10	50%RB, Offset=0	1.260	21.82	21.9	1.019	0.177	0.180	/
Body-Left (10mm)	709	10	1RB, Offset=49	/	/	/	/	/	/	/
	710	10	1RB, Offset=49	/	/	/	/	/	/	/
	711	10	1RB, Offset=49	4.452	21.86	21.9	1.009	0.161	0.162	/
	710	10	50%RB, Offset=0	4.946	21.82	21.9	1.019	0.125	0.127	/
Body-Right (10mm)	709	10	1RB, Offset=49	/	/	/	/	/	/	/
	710	10	1RB, Offset=49	/	/	/	/	/	/	/
	711	10	1RB, Offset=49	-3.385	21.86	21.9	1.009	0.151	0.152	/
	710	10	50%RB, Offset=0	2.657	21.82	21.9	1.019	0.132	0.134	/
Body-Bottom (10mm)	709	10	1RB, Offset=49	/	/	/	/	/	/	/
	710	10	1RB, Offset=49	/	/	/	/	/	/	/
	711	10	1RB, Offset=49	2.628	21.86	21.9	1.009	0.111	0.112	/
	710	10	50%RB, Offset=0	0.137	21.82	21.9	1.019	0.088	0.090	/

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
3. KDB941225D05- SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg
4. KDB941225D05- For QPSK with 100% RB allocation, when the reported SAR measured for the Highest output power channel is <1.45 W/kg, tests for the remaining required test channels are optional.
5. KDB941225D05- For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.
6. KDB941225D05- Start with the largest channel bandwidth (20M) and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offset the upper edge, middle and lower edge of each required test channel.
7. Worst case SAR for 50% RB allocation is selected to be tested.

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

BT& Wi-Fi and LTE&GSM&3G Antennas Location:

Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities			Antennas Distance (mm)
Transmitter Combination	Simultaneous?	Hotspot?	
GSM + WCDMA	×	×	0
GSM + LTE	×	×	0
GSM + Bluetooth	√	×	85
GSM + Wi-Fi	√	√	85
WCDMA + LTE	×	×	0
WCDMA + Bluetooth	√	×	85
WCDMA + Wi-Fi	√	√	85
LTE+ Bluetooth	√	×	85
LTE+ Wi-Fi	√	√	85

Standalone SAR test exclusion considerations

Head Position:

Mode	Frequency (MHz)	P_{avg} (dBm)	P_{avg} (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
Wi-Fi	2462	9.70	9.333	0	2.9	3.0	Yes
Bluetooth	2480	-1.70	0.676	0	0.2	3.0	Yes

Body Position:

Mode	Frequency (MHz)	P_{avg} (dBm)	P_{avg} (Mw)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
Wi-Fi	2462	9.70	9.333	10.00	1.5	3.0	Yes
Bluetooth	2480	-1.70	0.676	10.00	0.1	3.0	Yes

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:
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Standalone SAR estimation:

Mode	Frequency (GHz)	Distance (mm)	P_{avg} (dBm)	P_{avg} (mW)	Estimated $_{1-g}$ (W/kg)
BT Head	2.48	0	-1.70	0.676	0.028
BT Body	2.48	10	-1.70	0.676	0.014
Wi-Fi Head	2.462	0	9.70	9.333	0.391
Wi-Fi Body	2.462	10	9.70	9.333	0.195

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:
[(*max. power of channel, including* ***tune-up tolerance****, mW*)/(*min. test separation distance,mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm;
where *x* = 7.5 for 1-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion

Simultaneous SAR test exclusion considerations:

GSM with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	BT	< 1.6W/kg
GSM 850	Left Head Cheek	0.313	0.028	0.341
	Left Head Tilt	0.215	0.028	0.243
	Right Head Cheek	0.381	0.028	0.409
	Right Head Tilt	0.192	0.028	0.220
	Body–Headset-Back	0.309	0.014	0.323
PCS 1900	Left Head Cheek	0.275	0.028	0.303
	Left Head Tilt	0.112	0.028	0.140
	Right Head Cheek	0.214	0.028	0.242
	Right Head Tilt	0.109	0.028	0.137
	Body–Headset-Back	0.164	0.014	0.178

WCDMA with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		WCDMA	BT	< 1.6W/kg
WCDMA 850	Left Head Cheek	0.105	0.028	0.133
	Left Head Tilt	0.065	0.028	0.093
	Right Head Cheek	0.102	0.028	0.130
	Right Head Tilt	0.056	0.028	0.084
WCDMA 1900	Left Head Cheek	0.352	0.028	0.380
	Left Head Tilt	0.165	0.028	0.193
	Right Head Cheek	0.244	0.028	0.272
	Right Head Tilt	0.153	0.028	0.181

LTE with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		LTE	BT	< 1.6W/kg
LTE Band 2	Left Head Cheek	0.256	0.028	0.284
	Left Head Tilt	0.140	0.028	0.168
	Right Head Cheek	0.242	0.028	0.270
	Right Head Tilt	0.110	0.028	0.138
LTE Band 4	Left Head Cheek	0.365	0.028	0.393
	Left Head Tilt	0.211	0.028	0.239
	Right Head Cheek	0.330	0.028	0.358
	Right Head Tilt	0.226	0.028	0.254
LTE Band 7	Left Head Cheek	0.108	0.028	0.136
	Left Head Tilt	0.066	0.028	0.094
	Right Head Cheek	0.114	0.028	0.142
	Right Head Tilt	0.055	0.028	0.083
LTE Band 17	Left Head Cheek	0.132	0.028	0.160
	Left Head Tilt	0.083	0.028	0.111
	Right Head Cheek	0.141	0.028	0.169
	Right Head Tilt	0.080	0.028	0.108

GSM with Wi-Fi:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	Wi-Fi	< 1.6W/kg
GSM 850	Left Head Cheek	0.313	0.391	0.704
	Left Head Tilt	0.215	0.391	0.606
	Right Head Cheek	0.381	0.391	**0.772**
	Right Head Tilt	0.192	0.391	0.583
	Body–Headset-Back	0.309	0.195	0.504
PCS 1900	Left Head Cheek	0.275	0.391	0.666
	Left Head Tilt	0.112	0.391	0.503
	Right Head Cheek	0.214	0.391	0.605
	Right Head Tilt	0.109	0.391	0.500
	Body–Headset-Back	0.164	0.195	0.359

WCDMA with Wi-Fi:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		WCDMA	Wi-Fi	< 1.6W/kg
WCDMA 850	Left Head Cheek	0.105	0.391	0.496
	Left Head Tilt	0.065	0.391	0.456
	Right Head Cheek	0.102	0.391	0.493
	Right Head Tilt	0.056	0.391	0.447
WCDMA 1900	Left Head Cheek	0.352	0.391	0.743
	Left Head Tilt	0.165	0.391	0.556
	Right Head Cheek	0.244	0.391	0.635
	Right Head Tilt	0.153	0.391	0.544

LTE with Wi-Fi:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		LTE	Wi-Fi	< 1.6W/kg
LTE Band 2	Left Head Cheek	0.256	0.391	0.647
	Left Head Tilt	0.140	0.391	0.531
	Right Head Cheek	0.242	0.391	0.633
	Right Head Tilt	0.110	0.391	0.501
LTE Band 4	Left Head Cheek	0.365	0.391	0.756
	Left Head Tilt	0.211	0.391	0.602
	Right Head Cheek	0.330	0.391	0.721
	Right Head Tilt	0.226	0.391	0.617
LTE Band 7	Left Head Cheek	0.108	0.391	0.499
	Left Head Tilt	0.066	0.391	0.457
	Right Head Cheek	0.114	0.391	0.505
	Right Head Tilt	0.055	0.391	0.446
LTE Band 17	Left Head Cheek	0.132	0.391	0.523
	Left Head Tilt	0.083	0.391	0.474
	Right Head Cheek	0.141	0.391	0.532
	Right Head Tilt	0.080	0.391	0.471

Conclusion:

ΣSAR < 1.6 W/kg therefore simultaneous transmission SAR with Volume Scans is **not** required.

Evaluations for Simultaneous SAR, BT+GSM/3G/4G					
Test Position	Body-Back (1.0cm)	Body-Left (1.0cm)	Body-Right (1.0cm)	Body-Bottom (1.0cm)	Body-Top (1.0cm)
Mode	Stand Alone 1-g SAR (W/Kg)				
GPRS 850	0.539	0.408	0.287	0.355	/
GPRS 1900	0.529	0.341	0.218	0.354	/
WCDMA 850	0.147	0.083	0.035	0.053	/
WCDMA 1900	0.706	0.444	0.329	0.323	/
LTE Band 2	0.716	0.487	0.358	0.434	/
LTE Band 4	1.036	0.702	0.585	0.665	/
LTE Band 7	0.244	0.146	0.156	0.192	/
LTE Band 17	0.227	0.162	0.152	0.112	/
BT	0.014	0.014	/	/	0.014
	∑ 1-g SAR(W/Kg)				
GPRS 850 + BT	0.553	0.422	/	/	/
GPRS 1900 + BT	0.543	0.355	/	/	/
WCDMA 850 + BT	0.161	0.097	/	/	/
WCDMA 1900+ BT	0.720	0.458	/	/	/
LTE Band 2+ BT	0.730	0.501	/	/	/
LTE Band 4+ BT	1.050	0.716	/	/	/
LTE Band 7+ BT	0.258	0.160	/	/	/
LTE Band 17+ BT	0.241	0.176	/	/	/

Evaluations for Simultaneous SAR, Mobile Hot Spot Positions					
Test Position	Body-Back (1.0cm)	Body-Left (1.0cm)	Body-Right (1.0cm)	Body-Bottom (1.0cm)	Body-Top (1.0cm)
Mode	Stand Alone 1-g SAR (W/Kg)				
GPRS 850	0.539	0.408	0.287	0.355	/
GPRS 1900	0.529	0.341	0.218	0.354	/
WCDMA 850	0.147	0.083	0.035	0.053	/
WCDMA 1900	0.706	0.444	0.329	0.323	/
LTE Band 2	0.716	0.487	0.358	0.434	/
LTE Band 4	1.036	0.702	0.585	0.665	/
LTE Band 7	0.244	0.146	0.156	0.192	/
LTE Band 17	0.227	0.162	0.152	0.112	/
Wi-Fi	0.195	0.195	/	/	0.196
	∑ 1-g SAR(W/Kg)				
GPRS 850 + Wi-Fi	0.734	0.603	/	/	/
GPRS 1900 + Wi-Fi	0.724	0.536	/	/	/
WCDMA 850 + Wi-Fi	0.342	0.278	/	/	/
WCDMA 1900+ Wi-Fi	0.901	0.639	/	/	/
LTE Band 2+ Wi-Fi	0.911	0.682	/	/	/
LTE Band 4+ Wi-Fi	**1.231**	0.897	/	/	/
LTE Band 7+ Wi-Fi	0.439	0.341	/	/	/
LTE Band 17+ Wi-Fi	0.422	0.357	/	/	/

Note:

If the sum of the 1g SAR measured for the simultaneously transmitting antennas is less than the SAR limit, SAR measurement for simultaneous transmission is not required.

SAR Plots (Summary of the Highest SAR Values)

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Right Head Cheek (836.6 MHz Middle Channel)

Measurement Data

Test mode	: GSM
Crest Factor	: 8
Scan Type	: Complete
Area Scan	: 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan	: 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start	: 0.103 W/kg
Power Drift-Finish	: 0.102 W/kg
Power Drift (%)	: -0.971

Tissue Data

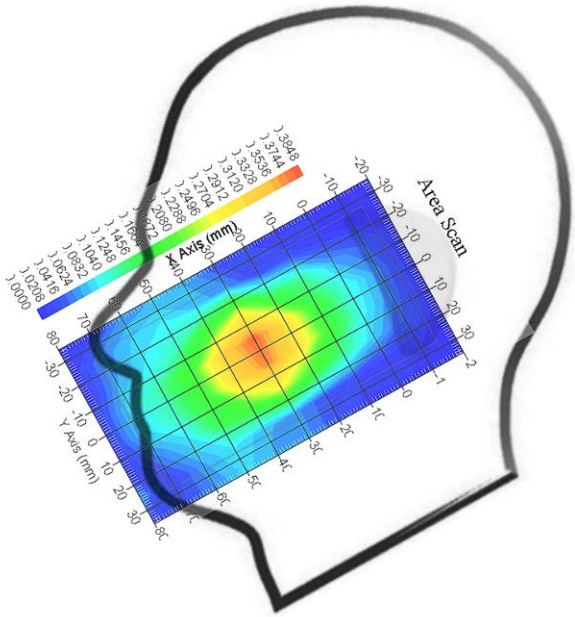
Type	: Head
Frequency	: 836.6 MHz
Epsilon	: 41.07 F/m
Sigma	: 0.92 S/m
Density	: 1000.00 kg/cu. m

Probe Data

Serial No.	: 500-00283
Frequency Band	: 835
Duty Cycle Factor	: 8
Conversion Factor	: 5.9
Probe Sensitivity	: 1.20 1.20 1.20 µV/(V/m)2
Compression Point	: 95.00 mV
Offset	: 1.56 mm

1 gram SAR value	: 0.371 W/kg
10 gram SAR value	: 0.255 W/kg
Area Scan Peak SAR	: 0.383 W/kg
Zoom Scan Peak SAR	: 0.525 W/kg

Plot 1#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Left Head Cheek(1909.8 MHz High Channel)

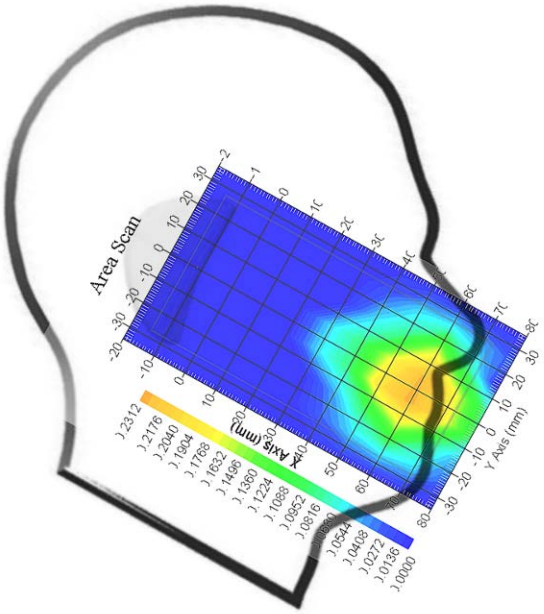
Measurement Data
Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.007 W/kg
Power Drift-Finish : 0.007 W/kg
Power Drift (%) : -3.143

Tissue Data
Type : Head
Frequency : 1909.8 MHz
Epsilon : 39.62 F/m
Sigma : 1.42 S/m
Density : 1000.00 kg/cu. M

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 8
Conversion Factor : 4.8
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.223 W/kg
10 gram SAR value : 0.137 W/kg
Area Scan Peak SAR : 0.230 W/kg
Zoom Scan Peak SAR : 0.382 W/kg

Plot 2#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

WCDMA850; Left Head Cheek (836.6 MHz Middle Channel)

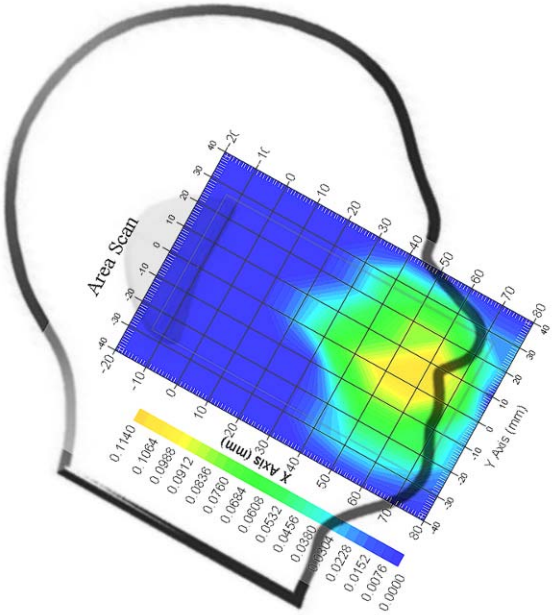
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.009 W/kg
Power Drift-Finish : 0.009 W/kg
Power Drift (%) : 0.765

Tissue Data
Type : Head
Frequency : 836.6 MHz
Epsilon : 41.07 F/m
Sigma : 0.92 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 835
Duty Cycle Factor : 1
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.100 W/kg
10 gram SAR value : 0.076 W/kg
Area Scan Peak SAR : 0.113 W/kg
Zoom Scan Peak SAR : 0.215 W/kg

Plot 3#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

WCDMA 1900; Left Head Cheek (1850.2 MHz Low Channel)

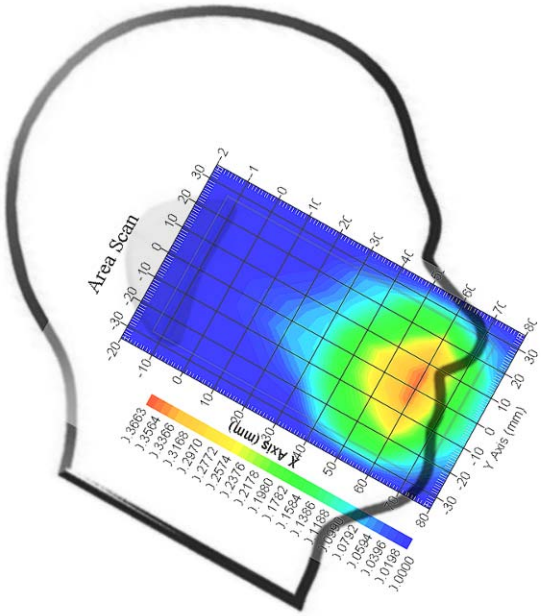
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.009 W/kg
Power Drift-Finish : 0.009 W/kg
Power Drift (%) : -0.151

Tissue Data
Type : Head
Frequency : 1850.2 MHz
Epsilon : 39.73 F/m
Sigma : 1.38 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 1
Conversion Factor : 4.8
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.347 W/kg
10 gram SAR value : 0.196 W/kg
Area Scan Peak SAR : 0.355 W/kg
Zoom Scan Peak SAR : 0.493 W/kg

Plot 4#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band2; Left-Head-Cheek (1900 MHz High Channel);

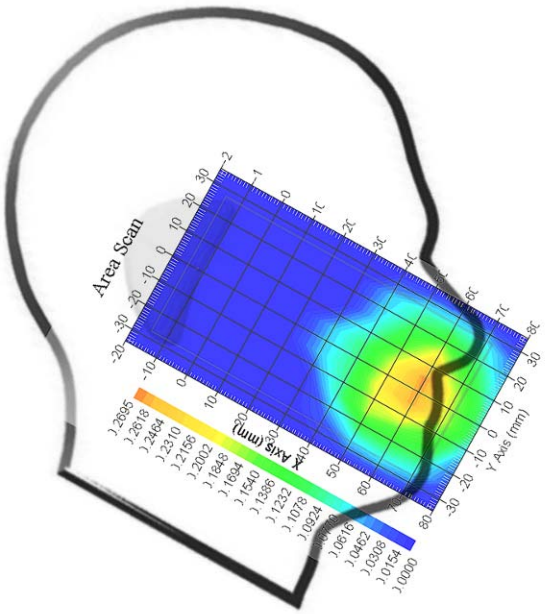
Measurement Data
Test mode : RB1
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.007 W/kg
Power Drift-Finish : 0.007 W/kg
Power Drift (%) : -2.527

Tissue Data
Type : Head
Frequency : 1900 MHz
Epsilon : 39.70 F/m
Sigma : 1.42 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 1
Conversion Factor : 4.8
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.251 W/kg
10 gram SAR value : 0.171 W/kg
Area Scan Peak SAR : 0.265 W/kg
Zoom Scan Peak SAR : 0.550 W/kg

Plot 5#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band4; Left-Head-Cheek (1745 MHz High Channel);

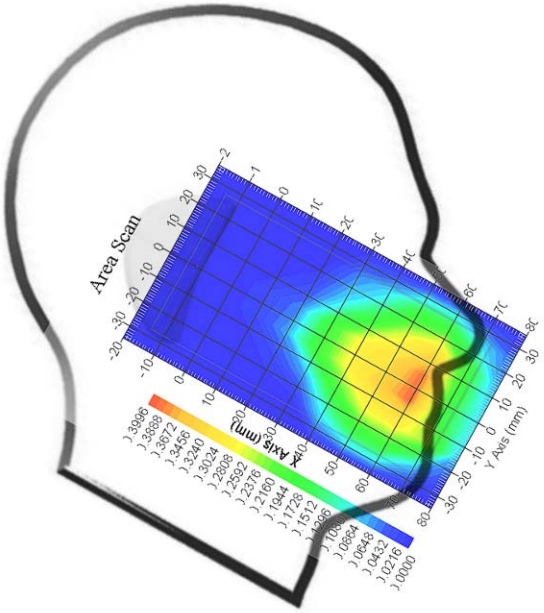
Measurement Data
Test mode : RB1
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.005 W/kg
Power Drift-Finish : 0.005 W/kg
Power Drift (%) : -1.214

Tissue Data
Type : Head
Frequency : 1745 MHz
Epsilon : 39.46 F/m
Sigma : 1.40 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.4
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.357 W/kg
10 gram SAR value : 0.250 W/kg
Area Scan Peak SAR : 0.385 W/kg
Zoom Scan Peak SAR : 0.520 W/kg

Plot 6#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band7; Right-Head-Cheek (2535 MHz Middle Channel);

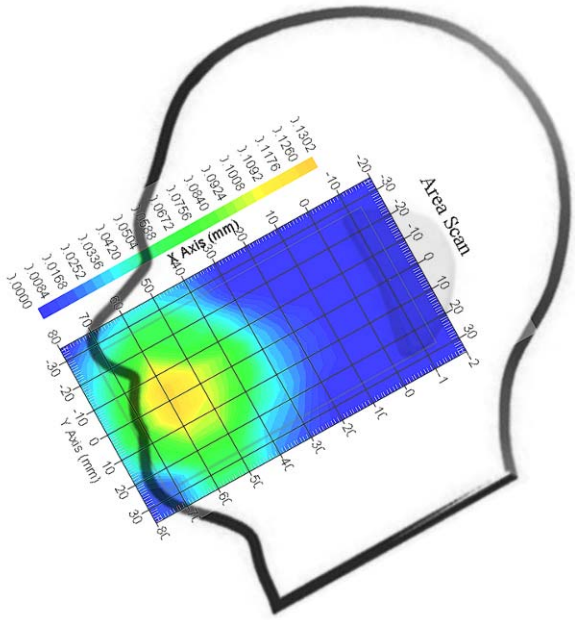
Measurement Data
Test mode : RB1
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.004 W/kg
Power Drift-Finish : 0.004 W/kg
Power Drift (%) : 2.755

Tissue Data
Type : Head
Frequency : 2535 MHz
Epsilon : 39.68 F/m
Sigma : 1.87 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 2450
Duty Cycle Factor : 1
Conversion Factor : 4.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.113 W/kg
10 gram SAR value : 0.061 W/kg
Area Scan Peak SAR : 0.126 W/kg
Zoom Scan Peak SAR : 0.277 W/kg

Plot 7#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band17; Right-Head-Cheek (711 MHz High Channel);

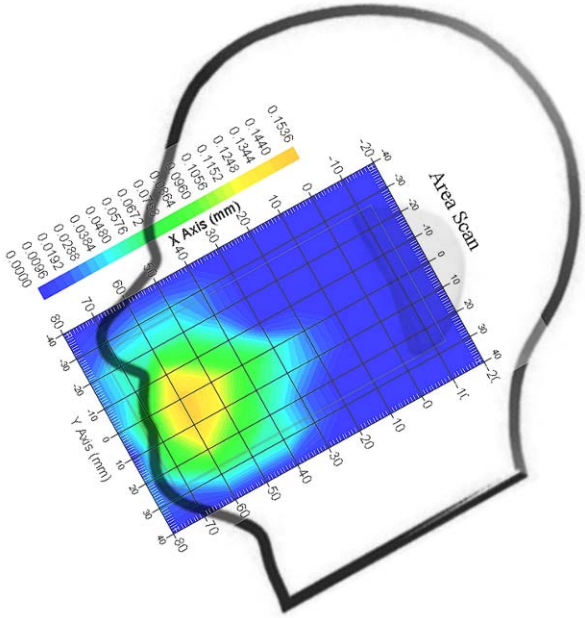
Measurement Data
Test mode : RB1
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.001 W/kg
Power Drift-Finish : 0.001 W/kg
Power Drift (%) : -1.576

Tissue Data
Type : Head
Frequency : 711 MHz
Epsilon : 42.09 F/m
Sigma : 0.85 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 750
Duty Cycle Factor : 1
Conversion Factor : 6.0
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.140 W/kg
10 gram SAR value : 0.091 W/kg
Area Scan Peak SAR : 0.150 W/kg
Zoom Scan Peak SAR : 0.255 W/kg

Plot 8#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Body-worn-Back (836.6 MHz Middle Channel)

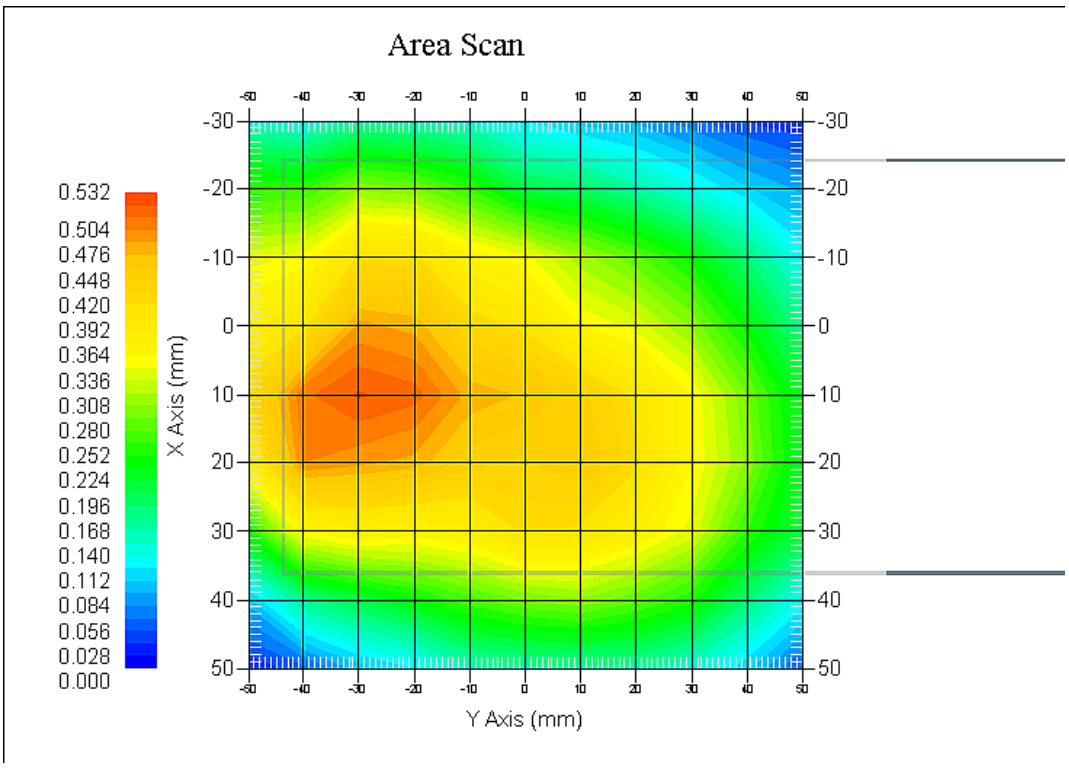
Measurement Data
Test mode : GPRS
Crest Factor : 4
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.387 W/kg
Power Drift-Finish : 0.377 W/kg
Power Drift (%) : -2.584

Tissue Data
Type : Body
Frequency : 836.6 MHz
Epsilon : 53.77 F/m
Sigma : 0.96 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 835
Duty Cycle Factor : 4
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.511 W/kg
10 gram SAR value : 0.292 W/kg
Area Scan Peak SAR : 0.526 W/kg
Zoom Scan Peak SAR : 0.868 W/kg

Plot 9#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Body-worn-Back (1880 MHz Middle Channel)

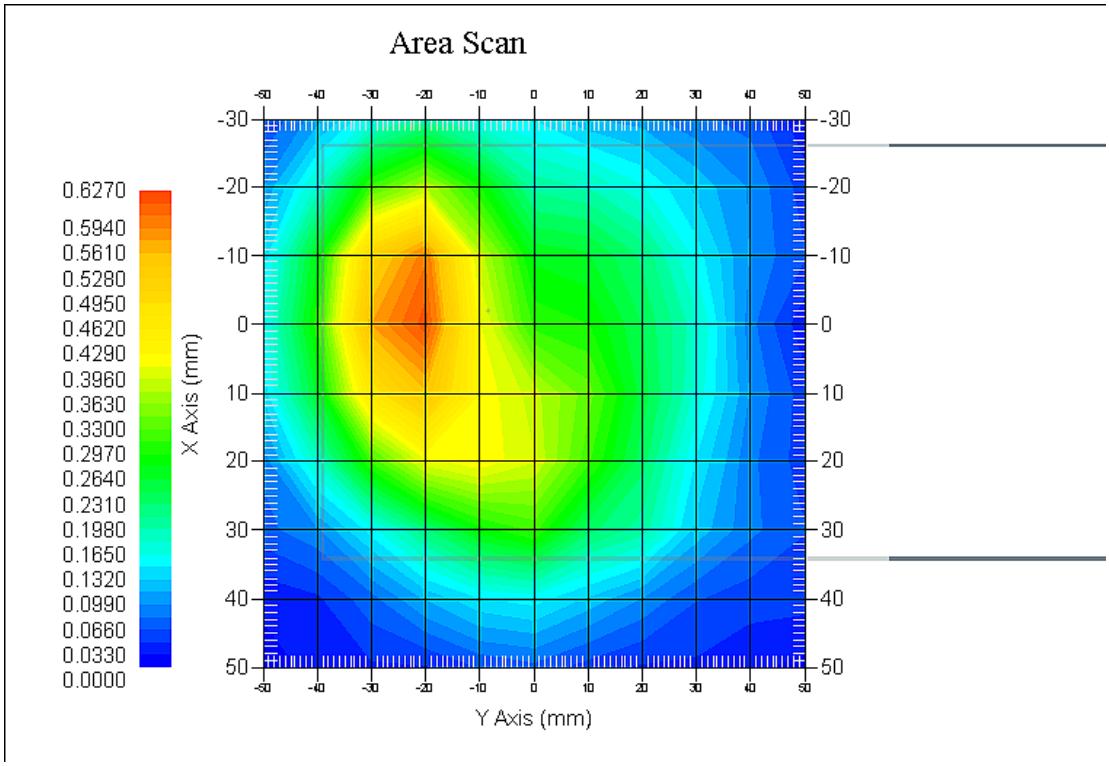
Measurement Data
Test mode : GPRS
Crest Factor : 2
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.325 W/kg
Power Drift-Finish : 0.327 W/kg
Power Drift (%) : 0.615

Tissue Data
Type : Body
Frequency : 1880 MHz
Epsilon : 51.78 F/m
Sigma : 1.52 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 2
Conversion Factor : 4.5
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.527 W/kg
10 gram SAR value : 0.326 W/kg
Area Scan Peak SAR : 0.610 W/kg
Zoom Scan Peak SAR : 0.855 W/kg

Plot 10#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

WCDMA850; Body-Worn-Back (836.6 MHz Middle Channel)

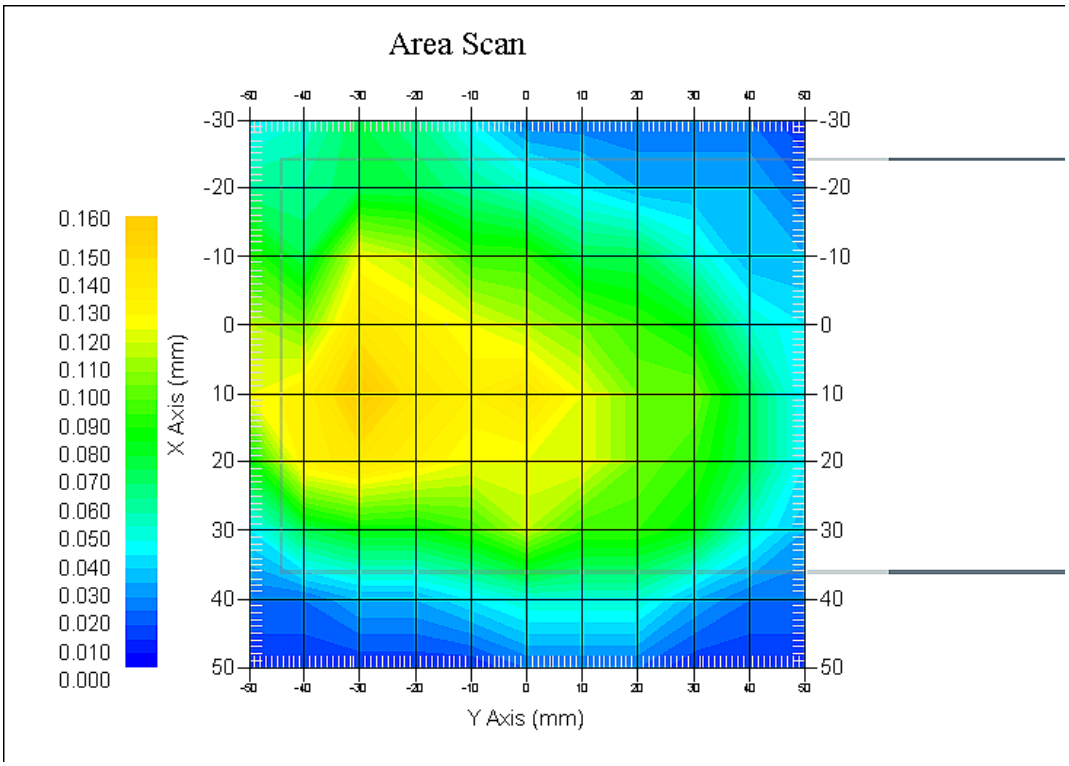
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.108 W/kg
Power Drift-Finish : 0.106 W/kg
Power Drift (%) : -1.852

Tissue Data
Type : Body
Frequency : 836.6 MHz
Epsilon : 53.77 F/m
Sigma : 0.96 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 835
Duty Cycle Factor : 1
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.139 W/kg
10 gram SAR value : 0.088 W/kg
Area Scan Peak SAR : 0.154 W/kg
Zoom Scan Peak SAR : 0.322 W/kg

Plot 11#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

WCDMA1900; Body-Worn-Back (1880 MHz Middle Channel)

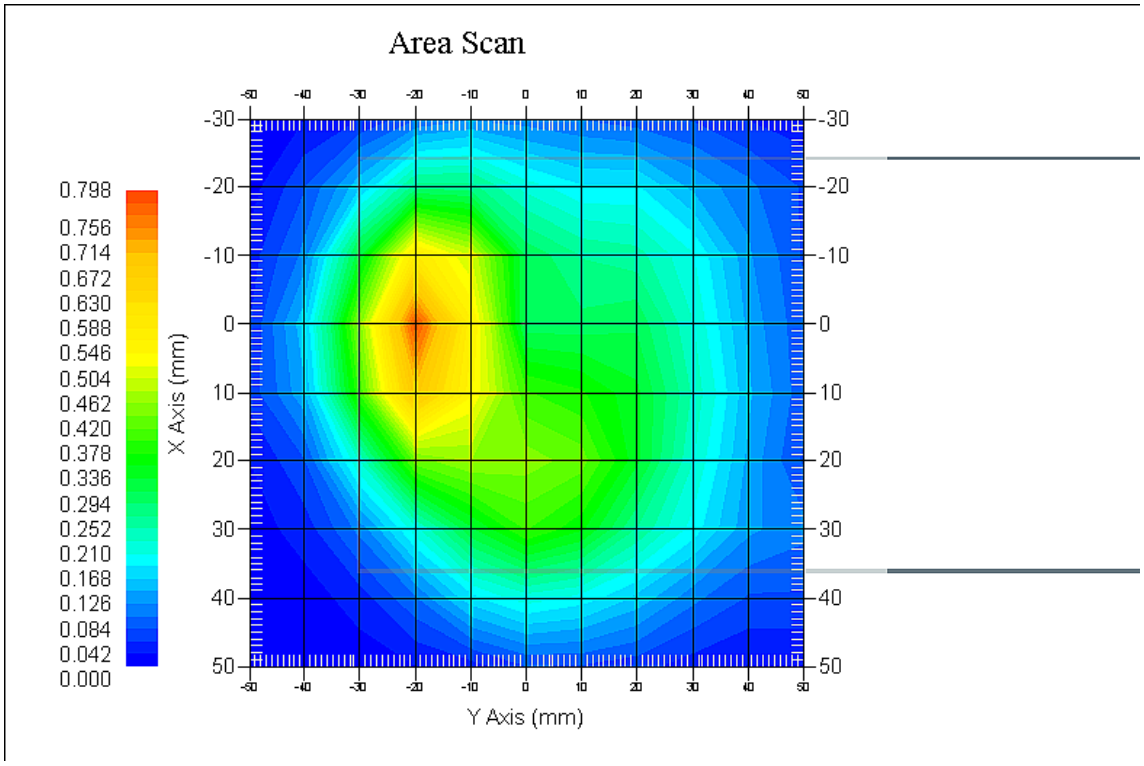
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.332 W/kg
Power Drift-Finish : 0.339 W/kg
Power Drift (%) : 2.108

Tissue Data
Type : Body
Frequency : 1880.0 MHz
Epsilon : 51.78 F/m
Sigma : 1.52 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 1
Conversion Factor : 4.8
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.679 W/kg
10 gram SAR value : 0.351 W/kg
Area Scan Peak SAR : 0.772 W/kg
Zoom Scan Peak SAR : 1.220 W/kg

Plot 12#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band2; Body-Worn-Back (1900 MHz High Channel);

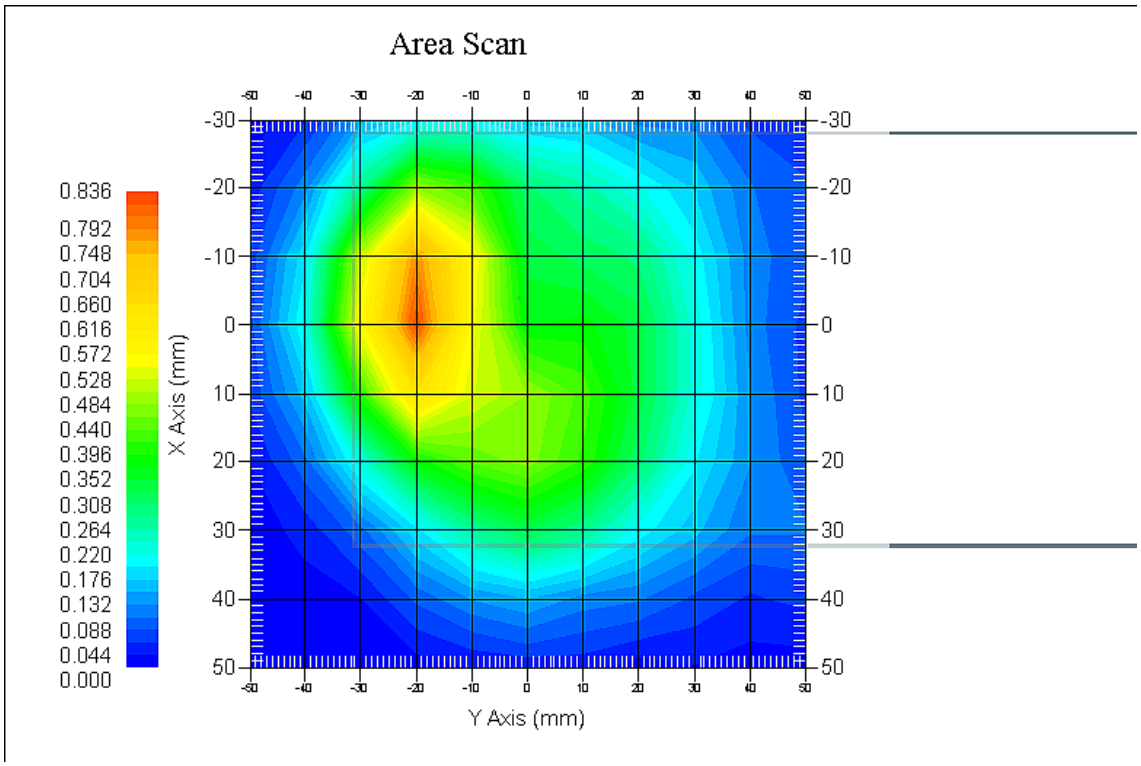
Measurement Data
Test mode : 1RB
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.353 W/kg
Power Drift-Finish : 0.359 W/kg
Power Drift (%) : 1.700

Tissue Data
Type : Body
Frequency : 1900 MHz
Epsilon : 52.05 F/m
Sigma : 1.52 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 1
Conversion Factor : 4.5
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.701 W/kg
10 gram SAR value : 0.415 W/kg
Area Scan Peak SAR : 0.830 W/kg
Zoom Scan Peak SAR : 1.268 W/kg

Plot 13#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band4; Body-Worn-Back (1745 MHz High Channel);

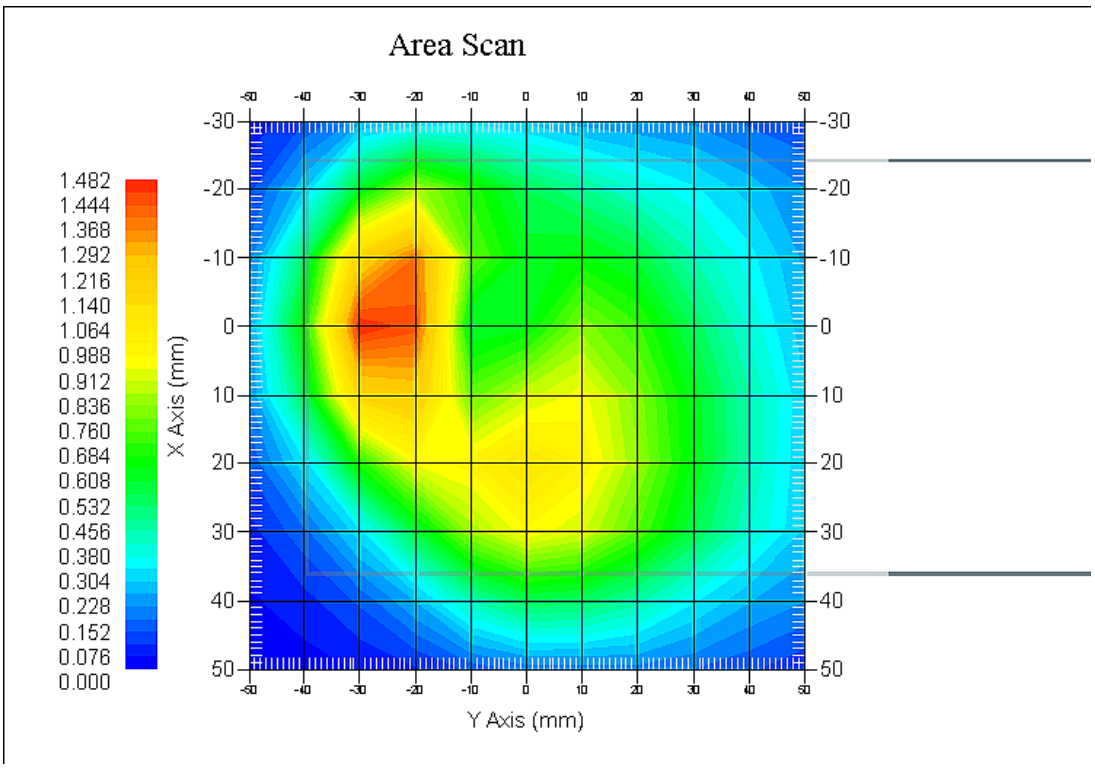
Measurement Data
Test mode : 1RB
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.527 W/kg
Power Drift-Finish : 0.525 W/kg
Power Drift (%) : -0.380

Tissue Data
Type : Body
Frequency : 1745 MHz
Epsilon : 51.85 F/m
Sigma : 1.52 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.3
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 1.012 W/kg
10 gram SAR value : 0.777 W/kg
Area Scan Peak SAR : 1.325 W/kg
Zoom Scan Peak SAR : 1.820 W/kg

Plot 14#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band7; Body-Worn-Back (2535 MHz Middle Channel);

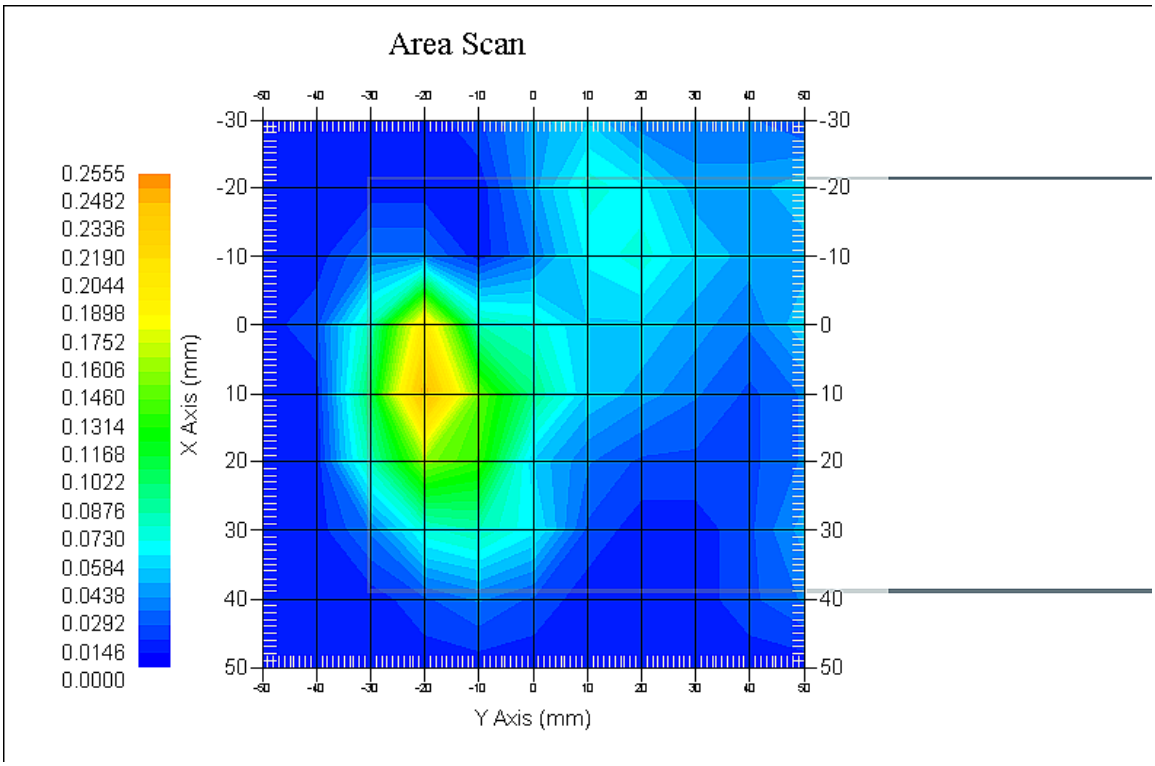
Measurement Data
Test mode : 1RB
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.073 W/kg
Power Drift-Finish : 0.072 W/kg
Power Drift (%) : -1.370

Tissue Data
Type : Body
Frequency : 2560 MHz
Epsilon : 51.90 F/m
Sigma : 2.10 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 2450
Duty Cycle Factor : 1
Conversion Factor : 4.3
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.241 W/kg
10 gram SAR value : 0.152 W/kg
Area Scan Peak SAR : 0.255 W/kg
Zoom Scan Peak SAR : 0.355 W/kg

Plot 15#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band17; Body-Worn-Back (711 MHz High Channel);

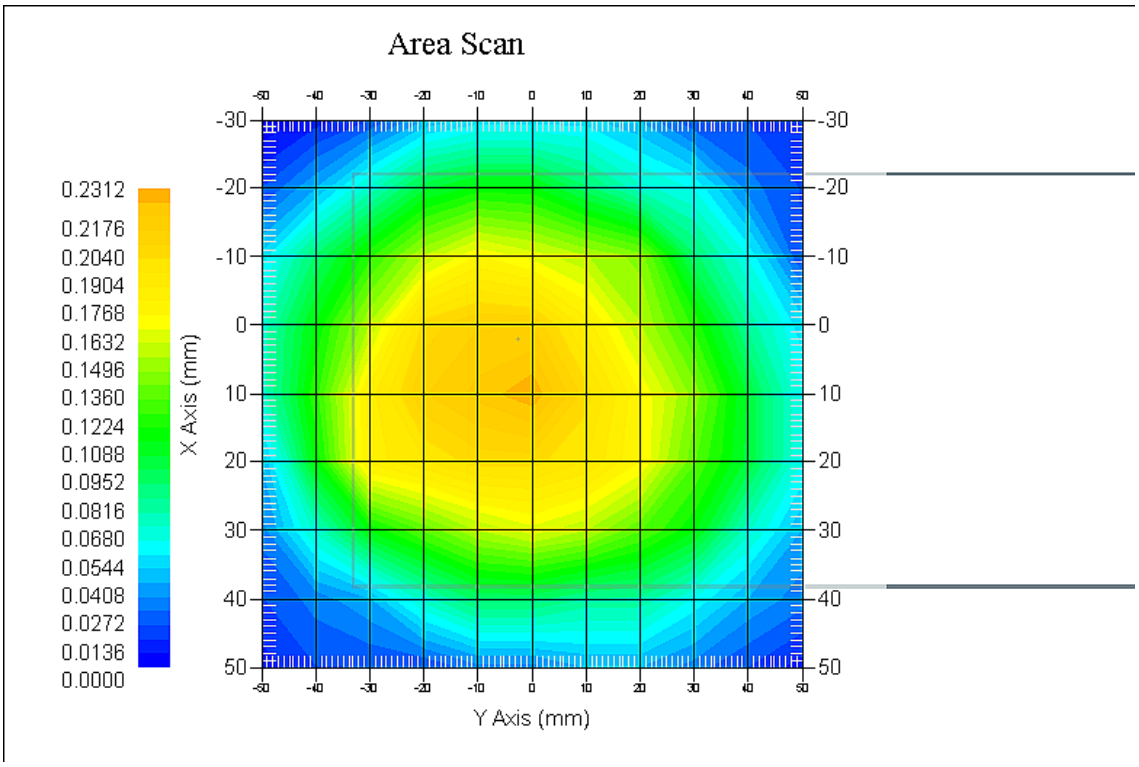
Measurement Data
Test mode : 1RB
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.223 W/kg
Power Drift-Finish : 0.227 W/kg
Power Drift (%) : 1.794

Tissue Data
Type : Body
Frequency : 711 MHz
Epsilon : 55.66 F/m
Sigma : 0.95 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 750
Duty Cycle Factor : 1
Conversion Factor : 5.5
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.225 W/kg
10 gram SAR value : 0.137 W/kg
Area Scan Peak SAR : 0.231 W/kg
Zoom Scan Peak SAR : 0.389 W/kg

Plot 16#



APPENDIX A MEASUREMENT UNCERTAINTY

According to **IEEE1528:2013**, the uncertainty budget has been determined for the Head SAR measurement system and is given in the following Table.

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	c_i^1 (1-g)	c_i^1 (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
Measurement System							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1\text{-cp})^{1/2}$	$(1\text{-cp})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	√cp	√cp	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition -Noise	0.6	rectangular	$\sqrt{3}$	1	1	0.3	0.3
RF Ambient Condition - Reflections	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech. Restrictions	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Test sample related							
Test sample positioning	2.0	normal	1	1	1	2.0	2.0
Device Holder Uncertainty	4.0	normal	1	1	1	6.215	6.215
Drift of Output Power	5.0	rectangular	$\sqrt{3}$	1	1	2.67	2.67
Phantom and Setup							
Phantom Uncertainty	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
SAR correction in permittivity and conductivity	1.2	normal	1	1	0.85	1.2	1.0
Liquid conductivity measurement	5.0	normal	1	0.78	0.71	3.9	3.6
Liquid permittivity measurement	5.0	normal	1	0.25	0.29	1.3	1.5
conductivity—temperature	1.1	rectangular	$\sqrt{3}$	0.78	0.71	0.5	0.5
permittivity—temperature	1.3	rectangular	$\sqrt{3}$	0.23	0.23	0.2	0.2
Combined Uncertainty		RSS				10.78	10.55
Expanded uncertainty (coverage factor=2)		Normal(k=2)				21.56	21.10

According to **IEC62209-2:2010**, the uncertainty budget has been determined for the Body SAR measurement system and is given in the following Table.

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	c_i^1 (1-g)	c_i^1 (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
Measurement System							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	1	1	1.5	1.5
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition -Noise	0.6	rectangular	$\sqrt{3}$	1	1	0.3	0.3
RF Ambient Condition - Reflections	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech. Restrictions	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Test sample related							
Test sample positioning	2.0	normal	1	1	1	2.0	2.0
Device Holder Uncertainty	4.0	normal	1	1	1	6.215	6.215
Drift of Output Power	5.0	rectangular	$\sqrt{3}$	1	1	2.67	2.67
Phantom and Setup							
Phantom Uncertainty	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
SAR correction in permittivity and conductivity	1.2	normal	1	1	0.84	1.2	1.0
Liquid conductivity measurement	5.0	normal	1	0.78	0.71	3.9	3.6
Liquid permittivity measurement	5.0	normal	1	0.23	0.26	1.3	1.5
conductivity—temperature	1.1	rectangular	$\sqrt{3}$	0.78	0.71	0.5	0.5
permittivity—temperature	1.3	rectangular	$\sqrt{3}$	0.23	0.26	0.2	0.2
Combined Uncertainty		RSS				9.58	9.49
Expanded uncertainty (coverage factor=2)		Normal(k=2)				19.16	18.98

APPENDIX B – PROBE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No.: PC-1598

Task No: BACL-5778

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe
Record of Calibration
Head and Body
Manufacturer: APREL Laboratories
Model No.: E-020
Serial No.: 500-00283

Calibration Procedure: D01-032-E020-V2, D22-012-Tissue, D28-002-Dipole
Project No: BACL-5745

Calibrated: 14th October 2014
Released on: 14th October 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: _____
Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr,
OTTAWA, ONTARIO
CANADA K2K 3J1

Division of APREL Lab.
TEL: (613) 435-8300
FAX: (613) 435-8306

NCL Calibration Laboratories
Division of APREL Inc.

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the references listed below. Calibration is performed using accepted methodologies as per the references listed below. Probes are calibrated for air, and tissue and the values reported are the results from the physical quantification of the probe through meteorgical practices.

Calibration Method

Probes are calibrated using the following methods.

<1000MHz
TEM Cell for sensitivity in air
Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz
Waveguide* method to determine sensitivity in air and tissue
*Waveguide is numerically (simulation) assessed to determine the field distribution and power

The boundary effect for the probe is assessed using a standard flat phantom where the probe output is compared against a numerically simulated series of data points

References

- IEEE Standard 1528
  IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- EN 62209-1
  Human Exposure to RF Fields from hand-held and body-mounted wireless communication devices - Human models. instrumentation, and procedures-Part 1: Procedure to measure the Specific Absorption Rate (SAR) for hand-held mobile wireless devices
- IEC 62209-2
  Human exposure to RF fields from hand-held and body-mounted wireless devices - Human models, instrumentation, and procedures - Part 2: specific absorption rate (SAR) for wireless communication devices (30 MHz - 6 GHz)
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

NCL Calibration Laboratories
Division of APREL Inc.

Conditions

Probe 500-00283 was a recalibration.

Ambient Temperature of the Laboratory:	22 °C +/- 1.5°C
Temperature of the Tissue:	21 °C +/- 1.5°C
Relative Humidity:	< 60%

Primary Measurement Standards

Instrument	**Serial Number**	**Cal due date**
Tektronix USB Power Meter	11C940	May 14, 2015
Signal Generator HP 83640B	3844A00689	Feb 12, 2015

Secondary Measurement Standards

Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Dan Brooks, Test Engineer

Page 3 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

NCL Calibration Laboratories
Division of APREL Inc.

Probe Summary

Probe Type:	E-Field Probe E020
Serial Number:	500-00283
Frequency:	As presented on page 5
Sensor Offset:	1.56
Sensor Length:	2.5
Tip Enclosure:	Composite*
Tip Diameter:	< 2.9 mm
Tip Length:	55 mm
Total Length:	289 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	1.2 μV/(V/m)^2
Channel Y:	1.2 μV/(V/m)^2
Channel Z:	1.2 μV/(V/m)^2
Diode Compression Point:	95 mV

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This page has been reviewed for content and attested to on Page 2 of this document.

NCL Calibration Laboratories
Division of APREL Inc.

Calibration for Tissue (Head H, Body B)

Frequency	Tissue Type	Measured Epsilon	Measured Sigma	Standard Uncertainty (%)	Calibration Frequency Range (MHz)	Conversion Factor
450 H	Head	43.59	0.86	3.5	±50	5.7
450 B	Body	56.74	0.94	3.5	±50	5.8
750 H	Head	42.98	0.92	3.5	±50	6.0
750 B	Body	43.05	0.93	3.5	±50	5.5
835 H	Head	43.42	0.94	3.5	±50	5.9
835 B	Body	55.77	1.01	3.5	±50	5.9
900 H	Head	41.87	1.06	3.5	±50	6.0
900 B	Body	55.62	1.05	3.5	±50	5.9
1450 H	Head	X	X	X	X	X
1450 B	Body	X	X	X	X	X
1500 H	Head	X	X	X	X	X
1500 B	Body	X	X	X	X	X
1640 H	Head	X	X	X	X	X
1640 B	Body	X	X	X	X	X
1750 H	Head	38.23	1.38	3.5	±75	5.4
1750 B	Body	52.86	1.54	3.5	±75	5.3
1800 H	Head	X	X	X	X	X
1800 B	Body	X	X	X	X	X
1900 H	Head	40.20	1.38	3.5	±75	4.8
1900 B	Body	52.63	1.46	3.5	±75	4.5
2000 H	Head	X	X	X	X	X
2000 B	Body	X	X	X	X	X
2100 H	Head	X	X	X	X	X
2100 B	Body	X	X	X	X	X
2300 H	Head	X	X	X	X	X
2300 B	Body	X	X	X	X	X
2450 H	Head	37.26	1.84	3.5	±75	4.9
2450B	Body	53.61	1.9	3.5	±75	4.3
3000 H	Head	X	X	X	X	X
3000 B	Body	X	X	X	X	X
3600 H	Head	37.49	3.16	3.5	±100	4.5
3600 B	Body	49.94	3.86	3.5	±100	4.0
5250 H	Head	35.51	4.78	3.5	±100	3.0
5250 B	Body	47.54	5.11	3.5	±100	2.8
5600 H	Head	36.05	5.15	3.5	±100	2.8
5600 B	Body	46.49	5.72	3.5	±100	2.2
5800 H	Head	45.99	6.01	3.5	±100	3.2
5800 B	Body	35.6	5.37	3.5	±100	2.5

Page 5 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2.1% for the distance between the tip of the probe and the tissue boundary, when less than 0.58mm.

Spatial Resolution:

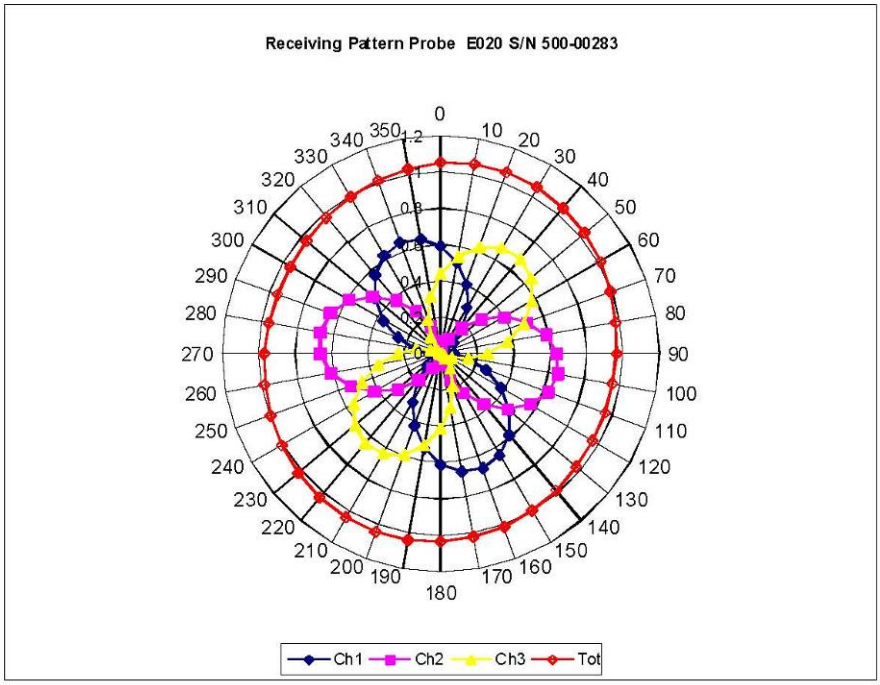
The spatial resolution uncertainty is less than 1.5% for 4.9mm diameter probe.
The spatial resolution uncertainty is less than 1.0% for 2.5mm diameter probe.

DAQ-PAQ Contribution

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

NCL Calibration Laboratories
Division of APREL Inc.

Receiving Pattern Air



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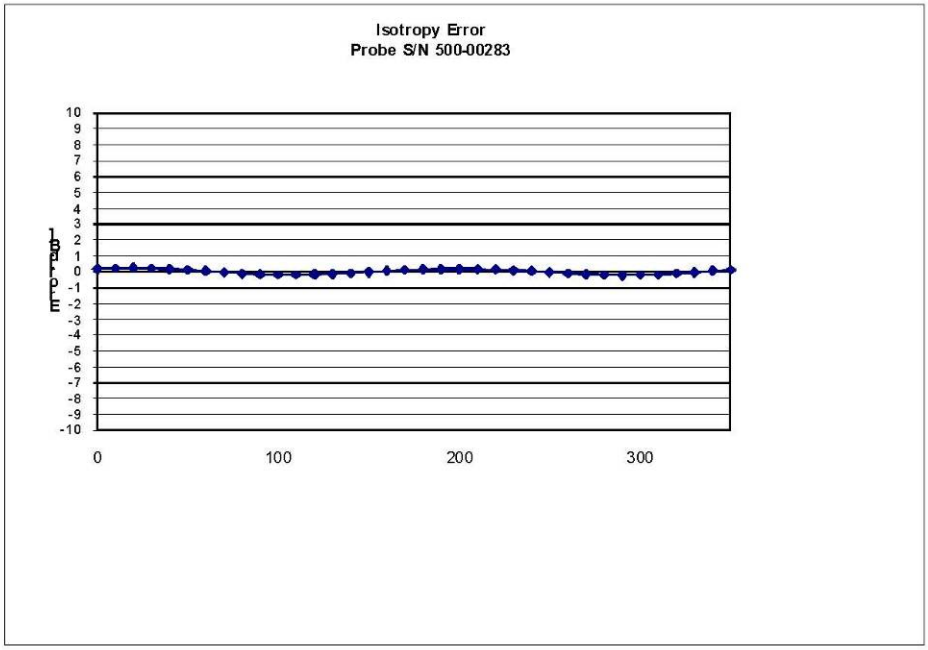
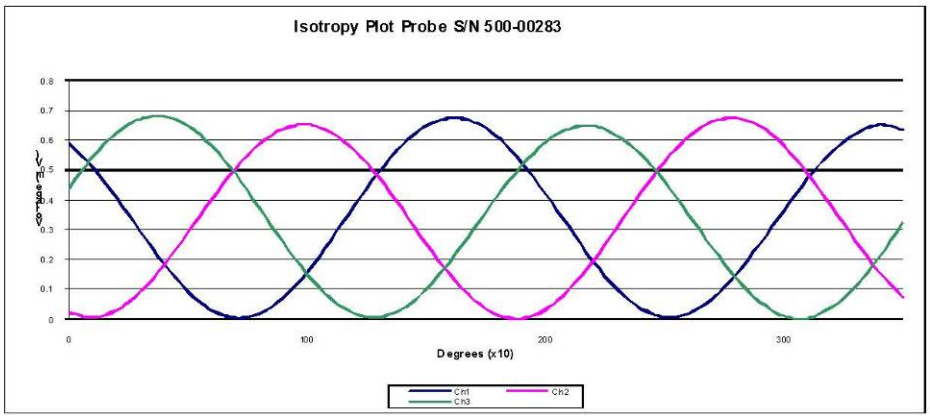
Isotropy Error Air





Isotropicity Tissue: 0.10 dB

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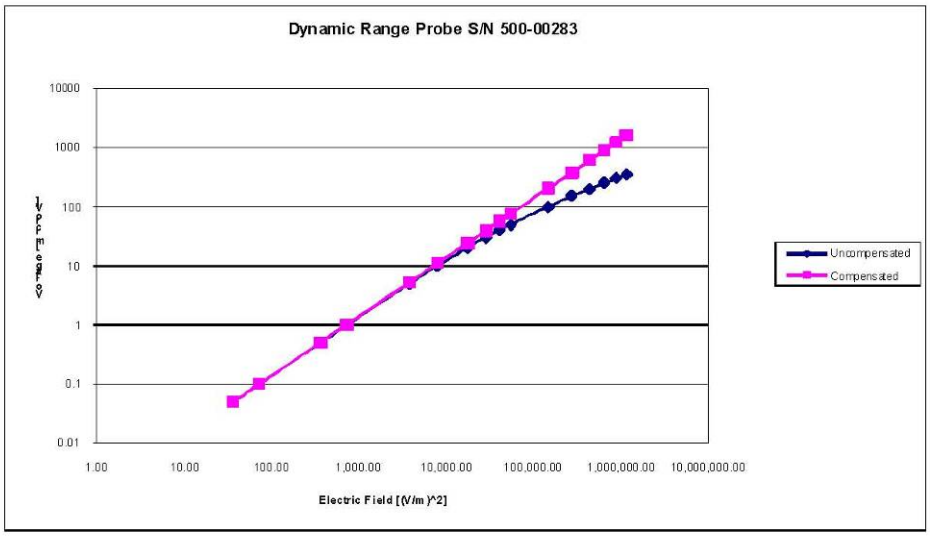
Dynamic Range



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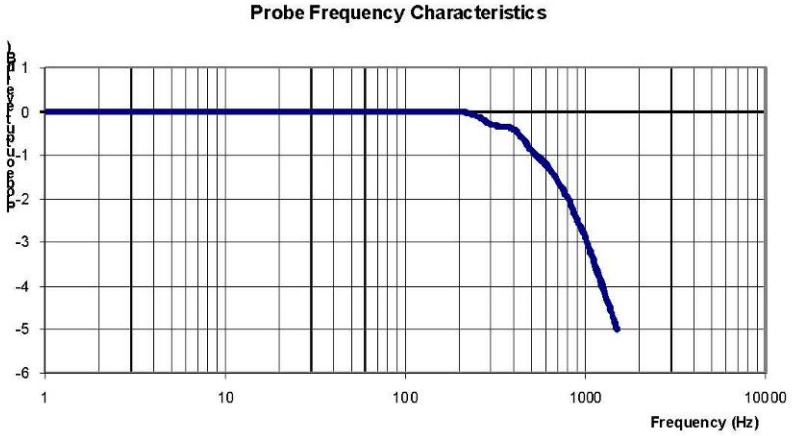
Video Bandwidth



Video Bandwidth at 500 Hz 1 dB
Video Bandwidth at 1.02 KHz: 3 dB

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2014.

Page 10 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

APPENDIX C DIPOLE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1532
Project Number: BACL-5745

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Validation Dipole

Manufacturer: APREL Laboratories
Part number: ALS-D-750-S-2
Frequency: 750 MHz
Serial No: 177-00505

Customer: BACL

Calibrated: 8th of October 2013
Released on: 8th of October 2013

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: _____
Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1

Division of APREL
TEL: (613) 435-8300
FAX: (613) 435-8306

NCL Calibration Laboratories
Division of APREL Laboratories.

Conditions

Dipole 177-00505 was a new calibration, removed from stock.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this device has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Dan Brooks, Test Engineer

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

Length: 180.2 mm
Height: 97.0 mm

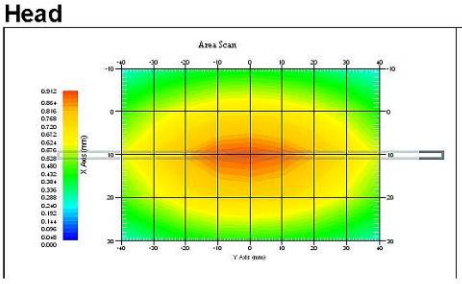
Electrical Calibration

Test	Result Head	Result Body
S11 R/L	-27.621 dB	-21.672 dB
SWR	1.106 U	1.201 U
Impedance	52.505 Ω	55.933 Ω

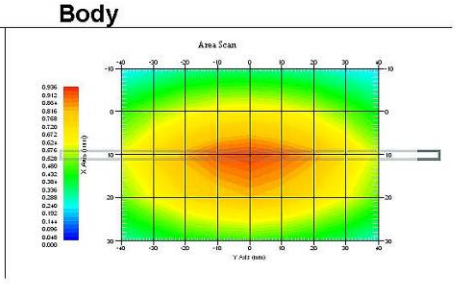
System Validation Results

Frequency 750 MHz	1 Gram	10 Gram
Head	8.5	54.0
Body	8.54	5.42

Head



Body



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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 177-00505. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 130 MHz to 26 GHz E-Field Probe Serial Number 2225.

References

- SSI-TP-018-ALSAS Dipole Calibration Procedure
- SSI-TP-016 Tissue Calibration Procedure
- IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
- IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
- Part 1: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 300 MHz to 3 GHz)"
- IEC-62209 "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 hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

Conditions

Dipole 177-00505 was a new calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	20 °C +/- 0.5°C

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
180.0 mm	97.8 mm	180.2 mm	97.0 mm

Tissue Validation

Tissue 750MHz	Measured Head	Measured Body
Dielectric constant, ε_r	42.7	56.6
Conductivity, σ [S/m]	0.85	0.94

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

5

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

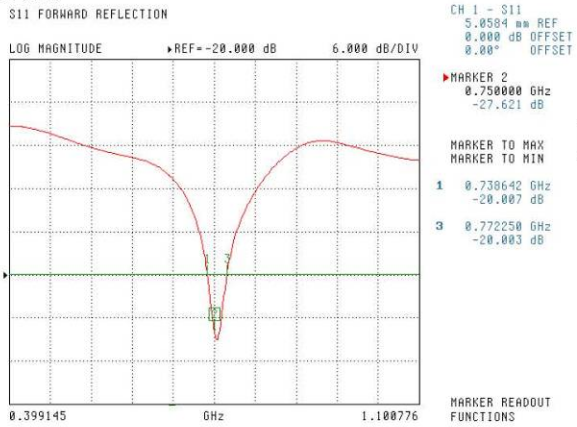
Electrical Calibration

Test	Result Head	Result Body
S11 R/L	-27.621 dB	-21.672 dB
SWR	1.106 U	1.201 U
Impedance	52.505 Ω	55.933 Ω

The Following Graphs are the results as displayed on the Vector Network Analyzer.

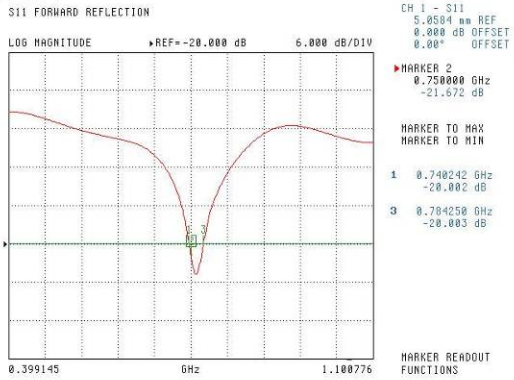
S11 Parameter Return Loss

HEAD



Frequency Range 738 MHz to 772 MHz

BODY



Frequency Range 740 MHz to 784 MHz

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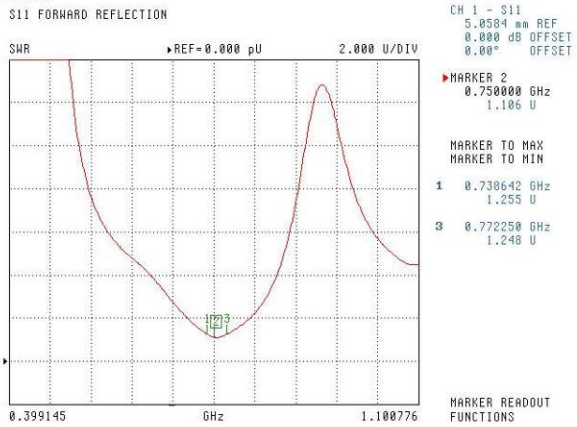
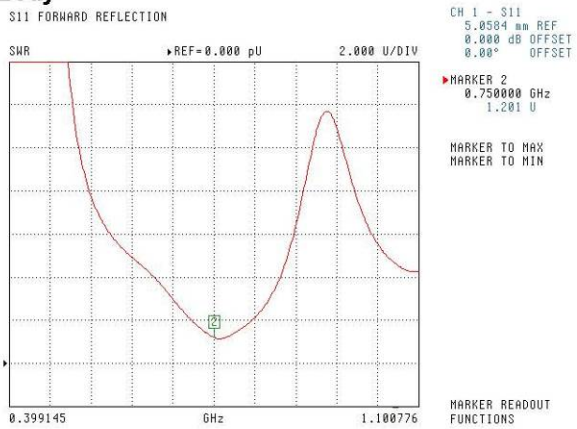
Division of APREL Laboratories.

SWR

Head



Body



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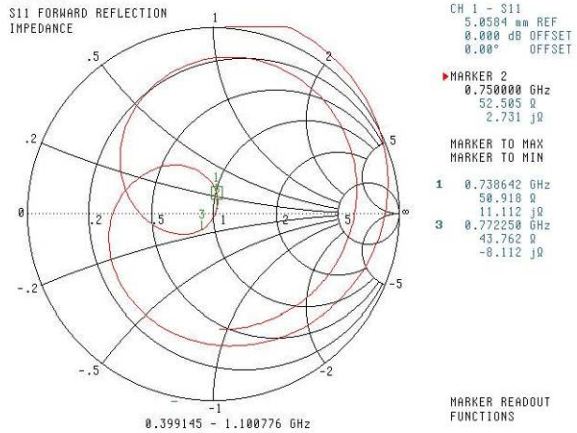
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



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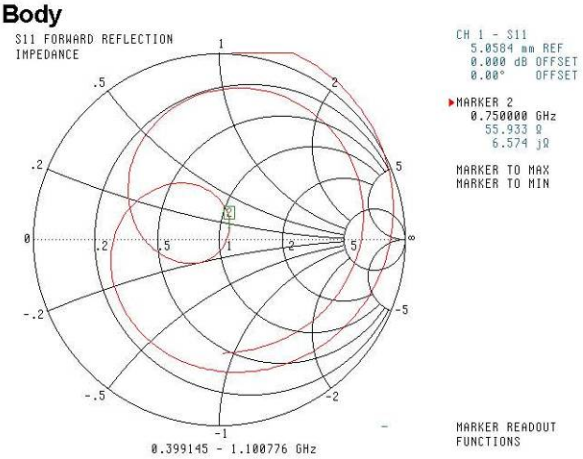


8

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2013.

This page has been reviewed for content and attested to by signature within this document.

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1599
Project Number: BAC-dipole-cal-5779

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Validation Dipole(Head and Body)

Manufacturer: APREL Laboratories
Part number: ALS-D-835-S-2
Frequency: 835 MHz
Serial No: 180-00558

Customer: Bay Area Compliance Laboratory (China)

Calibrated: 8th October 2014
Released on: 8th October 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: _____
Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES
Suite 102, 303 Terry Fox Dr.
Kanata, ONTARIO
CANADA K2K 3J1
Division of APREL Lab.
TEL: (613) 435-8300
FAX: (613)435-8306

NCL Calibration Laboratories
Division of APREL Laboratories.

Conditions

Dipole 180-00558 was received with a damaged connection for a re-calibration.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Maryna Nesterova Calibration Engineer

Primary Measurement Standards

Instrument	Serial Number	Cal due date
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

Length: 162.2 mm
Height: 89.4 mm

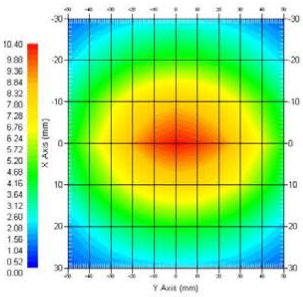
Electrical Specification

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	835 MHz	1.066 U	-30.344 dB	49.001 Ω
Body	835 MHz	1.089 U	-28.118 dB	53.117 Ω

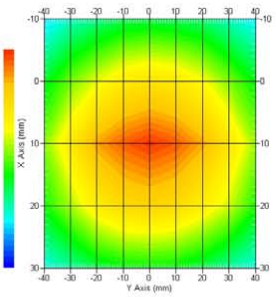
System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	835 MHz	9.773	6.174	14.713
Body	835 MHz	9.736	6.297	14.513

Body



Head



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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 180-00558. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 30 MHz to 6 GHz E-Field Probe Serial Number 225.

References

- IEC-62209 "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 hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

Conditions

Dipole 180-00558 was repaired prior to this calibration. The repair reliability depends upon correct usage of the dipole.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

4

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
161.0 mm	89.8 mm	162.2 mm	89.4 mm

Electrical Verification

Tissue Type	Return Loss:	SWR:	Impedance:
Head	-30.344 dB	1.066 U	49.001Ω
Body	-28.118 dB	1.089 U	53.117 Ω □

Tissue Validation

	Dielectric constant, ε_r	Conductivity, σ [S/m]
Head Tissue 835MHz	43.42	0.94
Body Tissue 835MHz	55.77	1.01

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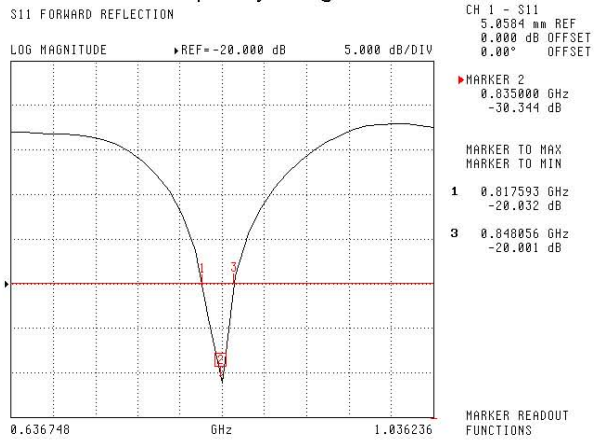
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

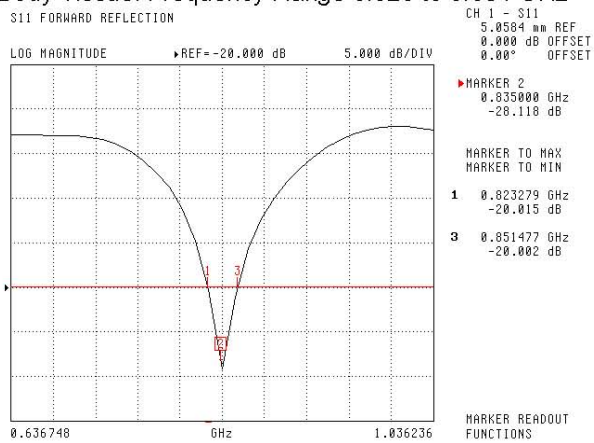
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head Tissue: Frequency Range 0.817 to 0.848 GHz



Body Tissue: Frequency Range 0.823 to 0.851 GHz



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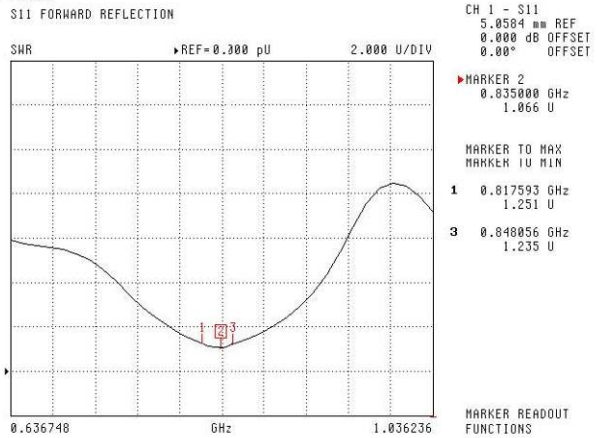
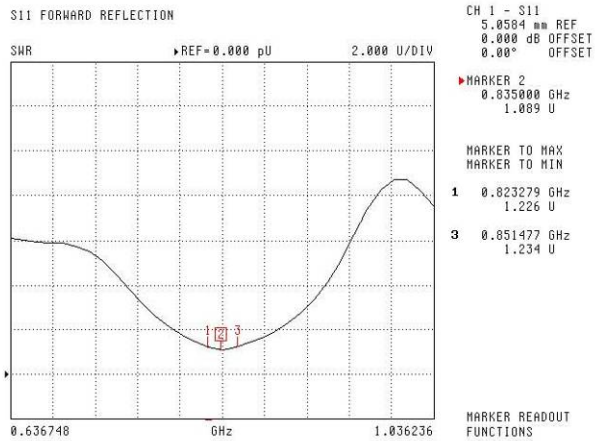
SWR

Head



Body



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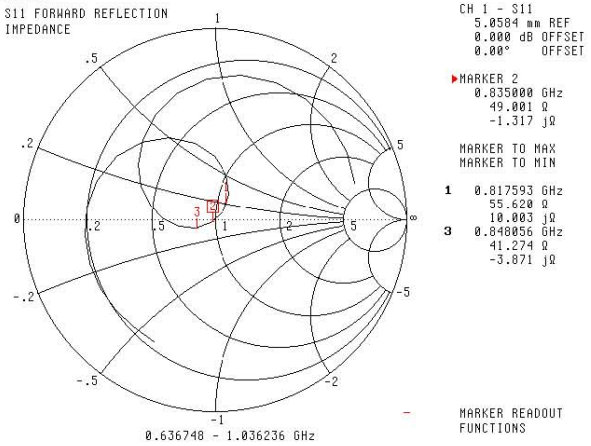
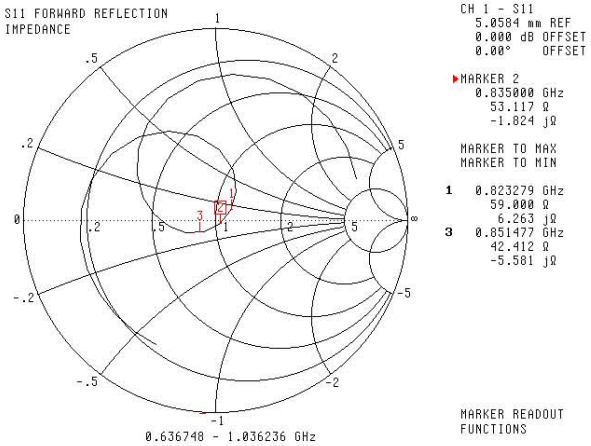
Smith Chart Dipole Impedance

Head



Body



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Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2014.

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