U-NII-3	149/153/157/161/165 **49/55/61/63/62**	149/153/157/161/165 Lower power	151/159 Lower power	149/153/157/161/165 Lower power	151/159 Lower power	155 Lower power

- The **bold numbers** is the maximum output measured power (mW).
- Channels with measured maximum power within 0.25dB are considered to have the same measured output. Channels selected for initial test configuration are highlighted in yellow.

Table 14.4-7: Maximum output power measured of WLAN antenna, for the applicable OFDM configurations according to the default power measurement procedures for selection initial test configurations - Normal Power MIMO

802.11 mode	**a**	**n**		**ac**		
BW(MHz)	**20**	**20**	**40**	**20**	**40**	**80**
U-NII-1	36/40/44/48 **109/116/120/106**	36/40/44/48 Lower power	38/46 Lower power	36/40/44/48 Lower power	38/46 Lower power	42 Lower power
U-NII-2A	52/56/60/64 **107/97/95/93**	52/56/60/64 Lower power	54/62 Lower power	52/56/60/64 Lower power	54/62 Lower power	58 Lower power
U-NII-2C	100/104/108/112 **94/92/86/90** 116/120/124/128 **91/100/105/112** 132/136/140/144 **108/101/96/95**	100/104/108/112 116/132/136/140 Lower power	102/110/134 Lower power	100/104/108/112 116/132/136/140 Lower power	102/110/134 Lower power	106 Lower power
U-NII-3	149/153/157/161/165 **98/103/107/112/110**	149/153/157/161/165 Lower power	151/159 Lower power	149/153/157/161/165 Lower power	151/159 Lower power	155 Lower power

- The **bold numbers** is the maximum output measured power (mW).
- Channels with measured maximum power within 0.25dB are considered to have the same measured output. Channels selected for initial test configuration are highlighted in yellow.

Table 14.4-8: Maximum output power measured of WLAN antenna, for the applicable OFDM configurations according to the default power measurement procedures for selection initial test configurations - Low Power SISO antenna5

802.11 mode	**a**	**n**		**ac**		
BW(MHz)	**20**	**20**	**40**	**20**	**40**	**80**
U-NII-1	36/40/44/48 **24/27/29/28**	36/40/44/48 Lower power	38/46 Lower power	36/40/44/48 Lower power	38/46 Lower power	42 Lower power
U-NII-2A	52/56/60/64 **25/22/22/21**	52/56/60/64 Lower power	54/62 Lower power	52/56/60/64 Lower power	54/62 Lower power	58 Lower power
U-NII-2C	100/104/108/112 **22/25/24/23** 116/120/124/128	100/104/108/112 116/132/136/140 Lower power	102/110/134 Lower power	100/104/108/112 116/132/136/	102/110/134 Lower power	106 Lower power

	23/23/24/26 132/136/140/144 **30/29/26/24**			140 Lower power		
U-NII-3	149/153/157/161/165 **22/25/30/31/30**	149/153/157/161/165 Lower power	151/159 Lower power	149/153/157/161/165 Lower power	151/159 Lower power	155 Lower power

- The **bold numbers** is the maximum output measured power (mW).
- Channels with measured maximum power within 0.25dB are considered to have the same measured output. Channels selected for initial test configuration are highlighted in yellow.

Table 14.4-9: Maximum output power measured of WLAN antenna, for the applicable OFDM configurations according to the default power measurement procedures for selection initial test configurations - Low Power MIMO

802.11 mode	**a**	**n**		**ac**		
BW(MHz)	**20**	**20**	**40**	**20**	**40**	**80**
U-NII-1	36/40/44/48 **49/54/57/55**	36/40/44/48 Lower power	38/46 Lower power	36/40/44/48 Lower power	38/46 Lower power	42 Lower power
U-NII-2A	52/56/60/64 **50/44/43/43**	52/56/60/64 Lower power	54/62 Lower power	52/56/60/64 Lower power	54/62 Lower power	58 Lower power
U-NII-2C	100/104/108/112 **45/50/49/47** 116/120/124/128 **46/47/48/51** 132/136/140/144 **59/58/52/48**	100/104/108/112 116/132/136/140 Lower power	102/110/134 Lower power	100/104/108/112 116/132/136/140 Lower power	102/110/134 Lower power	106 Lower power
U-NII-3	149/153/157/161/165 **46/50/56/58/52**	149/153/157/161/165 Lower power	151/159 Lower power	149/153/157/161/165 Lower power	151/159 Lower power	155 Lower power

- The **bold numbers** is the maximum output measured power (mW).
- Channels with measured maximum power within 0.25dB are considered to have the same measured output. Channels selected for initial test configuration are highlighted in yellow.

Table 14.4-10: Reported SAR of initial test configuration for Normal Power SISO antenna5 Head

802.11 mode	**a**	**n**		**ac**		
BW(MHz)	**20**	**20**	**40**	**20**	**40**	**80**
U-NII-1	36/40/44/48 UNII-2A exclusion applied	36/40/44/48	38/46	36/40/44/48	38/46	42
U-NII-2A	52/56/60/64 **0.06**	52/56/60/64	54/62	52/56/60/64	54/62	58
U-NII-2C	100/104/108/112/116/120/124	100/104/108/112	102/110/118/	100/104/108/112	102/110	106

	/128/132/136/140/144 **0.08**	116/132/136/140	126/134	116/132/136/140	/134	
U-NII-3	149/153/157/161/165 **0.03**	149/153/157/161/ 165	151/159	149/153/157/161 /165	151/159	155
Highest measured output power channel tested initially are in yellow highlight. The tune up of UNII-1 is less than UNII-2A. SAR is measured for UNII-2A band first. Adjusted SAR of UNII-2A band is ≤ 1.2 W/kg. SAR is not required for UNII-1 band.						

Table 14.4-11: Reported SAR of initial test configuration for Normal Power SISO antenna5 Body

802.11 mode	a	n		ac		
BW(MHz)	**20**	**20**	**40**	**20**	**40**	**80**
U-NII-1	36/40/44/48 UNII-2A exclusion applied	36/40/44/48	38/46	36/40/44/48	38/46	42
U-NII-2A	52/56/60/64 **0.59**	52/56/60/64	54/62	52/56/60/64	54/62	58
U-NII-2C	100/104/108/112/116/120/124 /128/132/136/140/144 **0.91**	100/104/108/112 116/132/136/140	102/110/118/ 126/134	100/104/108/112 116/132/136/140	102/110 /134	106
U-NII-3	149/153/157/161/165 **0.39**	149/153/157/161/ 165	151/159	149/153/157/161 /165	151/159	155
Highest measured output power channel tested initially are in yellow highlight. The tune up of UNII-1 is less than UNII-2A. SAR is measured for UNII-2A band first. Adjusted SAR of UNII-2A band is ≤ 1.2 W/kg. SAR is not required for UNII-1 band.						

Table 14.4-12: Reported SAR of initial test configuration for Normal Power SISO antenna5 Body

802.11 mode	a	n		ac		
BW(MHz)	**20**	**20**	**40**	**20**	**40**	**80**
U-NII-2C	100/104/108/112/116/120/124 /128/132/136/140/144 **1.06**	100/104/108/112 116/132/136/140	102/110/118/ 126/134	100/104/108/112 116/132/136/140	102/110 /134	106
Highest measured output power channel tested initially are in green highlight. The tune up of UNII-1 is less than UNII-2A. SAR is measured for UNII-2A band first. Adjusted SAR of UNII-2A band is ≤ 1.2 W/kg. SAR is not required for UNII-1 band.						

Table 14.4-13: Reported SAR of initial test configuration for Normal Power MIMO Head

802.11 mode	a	n		ac		
BW(MHz)	20	20	40	20	40	80
U-NII-1	36/40/44/48 UNII-2A exclusion applied	36/40/44/48	38/46	36/40/44/48	38/46	42
U-NII-2A	52/56/60/64 **0.60**	52/56/60/64	54/62	52/56/60/64	54/62	58
U-NII-2C	100/104/108/112/116/120/124 /128/132/136/140/144 **0.11**	100/104/108/112 116/132/136/140	102/110/118/ 126/134	100/104/108/112 116/132/136/140	102/110 /134	106
U-NII-3	149/153/157/161/165 **0.05**	149/153/157/161/ 165	151/159	149/153/157/161 /165	151/159	155
Highest measured output power channel tested initially are in yellow highlight. The tune up of UNII-1 is less than UNII-2A. SAR is measured for UNII-2A band first. Adjusted SAR of UNII-2A band is ≤ 1.2 W/kg. SAR is not required for UNII-1 band.						

Table 14.4-14: Reported SAR of initial test configuration for Normal Power MIMO Body

802.11 mode	a	n		ac		
BW(MHz)	20	20	40	20	40	80
U-NII-1	36/40/44/48 UNII-2A exclusion applied	36/40/44/48	38/46	36/40/44/48	38/46	42
U-NII-2A	52/56/60/64 **0.51**	52/56/60/64	54/62	52/56/60/64	54/62	58
U-NII-2C	100/104/108/112/116/120/124 /128/132/136/140/144 **0.89**	100/104/108/112 116/132/136/140	102/110/118/ 126/134	100/104/108/112 116/132/136/140	102/110 /134	106
U-NII-3	149/153/157/161/165 **0.34**	149/153/157/161/ 165	151/159	149/153/157/161 /165	151/159	155
Highest measured output power channel tested initially are in yellow highlight. The tune up of UNII-1 is less than UNII-2A. SAR is measured for UNII-2A band first. Adjusted SAR of UNII-2A band is ≤ 1.2 W/kg. SAR is not required for UNII-1 band.						

Table 14.4-15: Reported SAR of initial test configuration for Normal Power MIMO Body

802.11 mode	a	n		ac		
BW(MHz)	20	20	40	20	40	80
U-NII-2C	100/104/108/112/116/120/124 /128/132/136/140/144 **1.08**	100/104/108/112 116/132/136/140	102/110/118/ 126/134	100/104/108/112 116/132/136/140	102/110 /134	106
Highest measured output power channel tested initially are in green highlight. The tune up of UNII-1 is less than UNII-2A. SAR is measured for UNII-2A band first. Adjusted SAR of UNII-2A band is						

≤ 1.2 W/kg. SAR is not required for UNII-1 band.

Table 14.4-16: Reported SAR of initial test configuration for Low Power SISO antenna5 Body

802.11 mode	a	n		ac		
BW(MHz)	20	20	40	20	40	80
U-NII-1	36/40/44/48 UNII-2A exclusion applied	36/40/44/48	38/46	36/40/44/48	38/46	42
U-NII-2A	52/56/60/64 **0.35**	52/56/60/64	54/62	52/56/60/64	54/62	58
U-NII-2C	100/104/108/112/116/120/124 /128/132/136/140/144 **0.48**	100/104/108/112 116/132/136/140	102/110/118/ 126/134	100/104/108/112 116/132/136/140	102/110 /134	106
U-NII-3	149/153/157/161/165 **0.21**	149/153/157/161/ 165	151/159	149/153/157/161 /165	151/159	155
Highest measured output power channel tested initially are in yellow highlight. The tune up of UNII-1 is less than UNII-2A. SAR is measured for UNII-2A band first. Adjusted SAR of UNII-2A band is ≤ 1.2 W/kg. SAR is not required for UNII-1 band.						

Table 14.4-17: Reported SAR of initial test configuration for Low Power MIMO Body

802.11 mode	a	n		ac		
BW(MHz)	20	20	40	20	40	80
U-NII-1	36/40/44/48 UNII-2A exclusion applied	36/40/44/48	38/46	36/40/44/48	38/46	42
U-NII-2A	52/56/60/64 **0.33**	52/56/60/64	54/62	52/56/60/64	54/62	58
U-NII-2C	100/104/108/112/116/120/124 /128/132/136/140/144 **0.47**	100/104/108/112 116/132/136/140	102/110/118/ 126/134	100/104/108/112 116/132/136/140	102/110 /134	106
U-NII-3	149/153/157/161/165 **0.17**	149/153/157/161/ 165	151/159	149/153/157/161 /165	151/159	155
Highest measured output power channel tested initially are in yellow highlight. The tune up of UNII-1 is less than UNII-2A. SAR is measured for UNII-2A band first. Adjusted SAR of UNII-2A band is ≤ 1.2 W/kg. SAR is not required for UNII-1 band.						

Table 14.4-18: SAR Values (WLAN - Normal Power SISO antenna5 Head)

Frequency MHz	Frequency Ch.	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
52	5260	Left	Touch	/	17.55	18.00	0.015	**0.02**	0.053	**0.06**	0.13
52	5260	Left	Tilt	/	17.55	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/
52	5260	Right	Touch	/	17.55	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/
52	5260	Right	Tilt	/	17.55	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/
128	5640	Left	Touch	Fig.21	17.55	18.00	0.019	**0.02**	0.071	**0.08**	0.03
128	5640	Left	Tilt	/	17.55	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/
128	5640	Right	Touch	/	17.55	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/
128	5640	Right	Tilt	/	17.55	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/
161	5805	Left	Touch	/	17.97	18.00	0.012	**0.01**	0.032	**0.03**	/
161	5805	Left	Tilt	/	17.97	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/
161	5805	Right	Touch	/	17.97	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/
161	5805	Right	Tilt	/	17.97	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/

Table 14.4-19: SAR Values (WLAN - Normal Power SISO antenna5 Body)

Frequency MHz	Frequency Ch.	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
52	5260	Front	/	17.55	18.00	0.011	**0.01**	0.031	**0.03**	0.05
52	5260	Rear	/	17.55	18.00	0.175	**0.19**	0.534	**0.59**	0.08
52	5260	Right	/	17.55	18.00	0.081	**0.09**	0.204	**0.23**	0.12
52	5260	Top	/	17.55	18.00	0.02	**0.02**	0.043	**0.05**	0.05
128	5640	Front	/	17.55	18.00	<0.01	**<0.01**	<0.01	**<0.01**	/
128	5640	Rear	/	17.55	18.00	0.336	**0.37**	0.82	**0.91**	-0.02
132	5660	Rear	Fig.22	17.55	18.00	0.389	**0.43**	0.955	**1.06**	0.10
128	5640	Right	/	17.55	18.00	0.152	**0.17**	0.373	**0.41**	-0.06
128	5640	Top	/	17.55	18.00	0.03	**0.03**	0.064	**0.07**	0.03
161	5805	Front	/	17.97	18.00	0.009	**0.01**	0.023	**0.02**	0.06
161	5805	Rear	/	17.97	18.00	0.149	**0.15**	0.389	**0.39**	0.10
161	5805	Right	/	17.97	18.00	0.069	**0.07**	0.149	**0.15**	-0.12
161	5805	Top	/	17.97	18.00	0.017	**0.02**	0.031	**0.03**	0.05

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.4-20: SAR Values (WLAN - Normal Power MIMO Head)

Frequency MHz	Frequency Ch.	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
52	5260	Left	Touch	Fig.23	20.28	20.50	0.175	**0.18**	0.566	**0.60**	0.13
52	5260	Left	Tilt	/	20.28	20.50	0.155	**0.16**	0.516	**0.54**	0.04
52	5260	Right	Touch	/	20.28	20.50	0.090	**0.09**	0.304	**0.32**	0.12

52	5260	Right	Tilt	/	20.28	20.50	0.093	**0.10**	0.312	**0.33**	0.11
128	5640	Left	Touch	/	20.50	21.00	0.031	**0.03**	0.102	**0.11**	-0.04
128	5640	Left	Tilt	/	20.50	21.00	0.023	**0.03**	0.044	**0.05**	0.04
128	5640	Right	Touch	/	20.50	21.00	0.028	**0.03**	0.009	**0.01**	-0.10
128	5640	Right	Tilt	/	20.50	21.00	0.024	**0.03**	0.046	**0.05**	-0.02
161	5805	Left	Touch	/	20.50	21.00	0.024	**0.03**	0.046	**0.05**	-0.02
161	5805	Left	Tilt	/	20.50	20.50	<0.01	**<0.01**	<0.01	**<0.01**	0.05
161	5805	Right	Touch	/	20.50	20.50	<0.01	**<0.01**	<0.01	**<0.01**	-0.03
161	5805	Right	Tilt	/	20.50	20.50	<0.01	**<0.01**	<0.01	**<0.01**	0.09

Table 14.4-21: SAR Values (WLAN - Normal Power MIMO Body)

Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
52	5260	Front	/	20.28	20.50	0.03	**0.03**	0.08	**0.08**	-0.15
52	5260	Rear	/	20.28	20.50	0.156	**0.16**	0.487	**0.51**	-0.13
52	5260	Right	/	20.28	20.50	0.079	**0.08**	0.187	**0.20**	-0.15
52	5260	Top	/	20.28	20.50	0.051	**0.05**	0.12	**0.13**	0.04
128	5640	Front	/	20.50	21.00	0.138	**0.15**	0.033	**0.04**	-0.02
128	5640	Rear	/	20.50	21.00	0.331	**0.37**	0.795	**0.89**	0.07
132	5660	Rear	Fig.24	20.35	21.00	0.379	**0.44**	0.928	**1.08**	0.08
128	5640	Right	/	20.50	21.00	0.859	**0.96**	0.19	**0.21**	-0.02
128	5640	Top	/	20.50	21.00	0.444	**0.50**	0.092	**0.10**	-0.12
161	5805	Front	/	20.50	20.50	0.055	**0.06**	0.014	**0.01**	0.03
161	5805	Rear	/	20.50	20.50	0.131	**0.13**	0.335	**0.34**	-0.13
161	5805	Right	/	20.50	20.50	0.34	**0.34**	0.08	**0.08**	0.1
161	5805	Top	/	20.50	20.50	0.176	**0.18**	0.039	**0.04**	-0.08

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.4-22: SAR Values (WLAN - Low Power SISO antenna5 Body)

Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
52	5260	Front	/	13.97	14.50	0.006	**0.01**	0.018	**0.02**	0.05
52	5260	Rear	/	13.97	14.50	0.0994	**0.11**	0.309	**0.35**	0.11
52	5260	Right	/	13.97	14.50	0.046	**0.05**	0.118	**0.13**	0.07
52	5260	Top	/	13.97	14.50	0.011	**0.01**	0.025	**0.03**	-0.02
132	5660	Front	/	14.72	15.00	<0.01	<0.01	<0.01	<0.01	/
132	5660	Rear	/	14.72	15.00	0.18	**0.19**	0.447	**0.48**	-0.02
132	5660	Right	/	14.72	15.00	0.114	**0.12**	0.28	**0.30**	0.1
132	5660	Top	/	14.72	15.00	0.022	**0.02**	0.048	**0.05**	-0.06
161	5805	Front	/	14.89	15.00	0.005	**0.01**	0.012	**0.01**	0.06
161	5805	Rear	/	14.89	15.00	0.0774	**0.08**	0.204	**0.21**	0.07

161	5805	Right	/	14.89	15.00	0.036	**0.04**	0.078	**0.08**	-0.12
161	5805	Top	/	14.89	15.00	0.009	**0.01**	0.016	**0.02**	0.05

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.4-23: SAR Values (WLAN - Normal Power MIMO Body)

Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
52	5260	Front	/	16.96	17.50	0.022	**0.02**	0.048	**0.05**	-0.11
52	5260	Rear	/	16.96	17.50	0.114	**0.13**	0.291	**0.33**	0.05
52	5260	Right	/	16.96	17.50	0.058	**0.07**	0.112	**0.13**	0.03
52	5260	Top	/	16.96	17.50	0.037	**0.04**	0.072	**0.08**	0.02
132	5660	Front	/	17.73	18.00	0.109	**0.12**	0.026	**0.03**	-0.13
132	5660	Rear	/	17.73	18.00	0.181	**0.19**	0.444	**0.47**	0.06
132	5660	Right	/	17.73	18.00	0.677	**0.72**	0.149	**0.16**	0.03
132	5660	Top	/	17.73	18.00	0.35	**0.37**	0.072	**0.08**	0.07
161	5805	Front	/	17.66	18.00	0.027	**0.03**	0.007	**0.01**	0.11
161	5805	Rear	/	17.66	18.00	0.0649	**0.07**	0.159	**0.17**	-0.08
161	5805	Right	/	17.66	18.00	0.168	**0.18**	0.038	**0.04**	0.02
161	5805	Top	/	17.66	18.00	0.087	**0.09**	0.019	**0.02**	-0.06

Note1: The distance between the EUT and the phantom bottom is 10mm.

According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. The scaled reported SAR is presented as below.

Table 14.4-24: SAR Values (WLAN - Normal Power SISO antenna5 Head) - Scaled Reported SAR

Frequency		Side	Test Position	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)
MHz	Ch.						
5640	128	Left	Touch	99.01%	100%	**0.08**	**0.08**

Table 14.4-25: SAR Values (WLAN - Normal Power SISO antenna5 Body) – Scaled Reported SAR

Frequency		Test Position	D (mm)	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)
MHz	Ch.						
5660	132	Rear	10	98.68%	100%	**1.06**	**1.07**

Table 14.4-26: SAR Values (WLAN - Normal Power MIMO Head) - Scaled Reported SAR

Frequency		Side	Test Position	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)
MHz	Ch.						
5260	52	Left	Touch	99.02%	100%	**0.60**	**0.61**

Table 14.4-27: SAR Values (WLAN - Normal Power MIMO Body) – Scaled Reported SAR

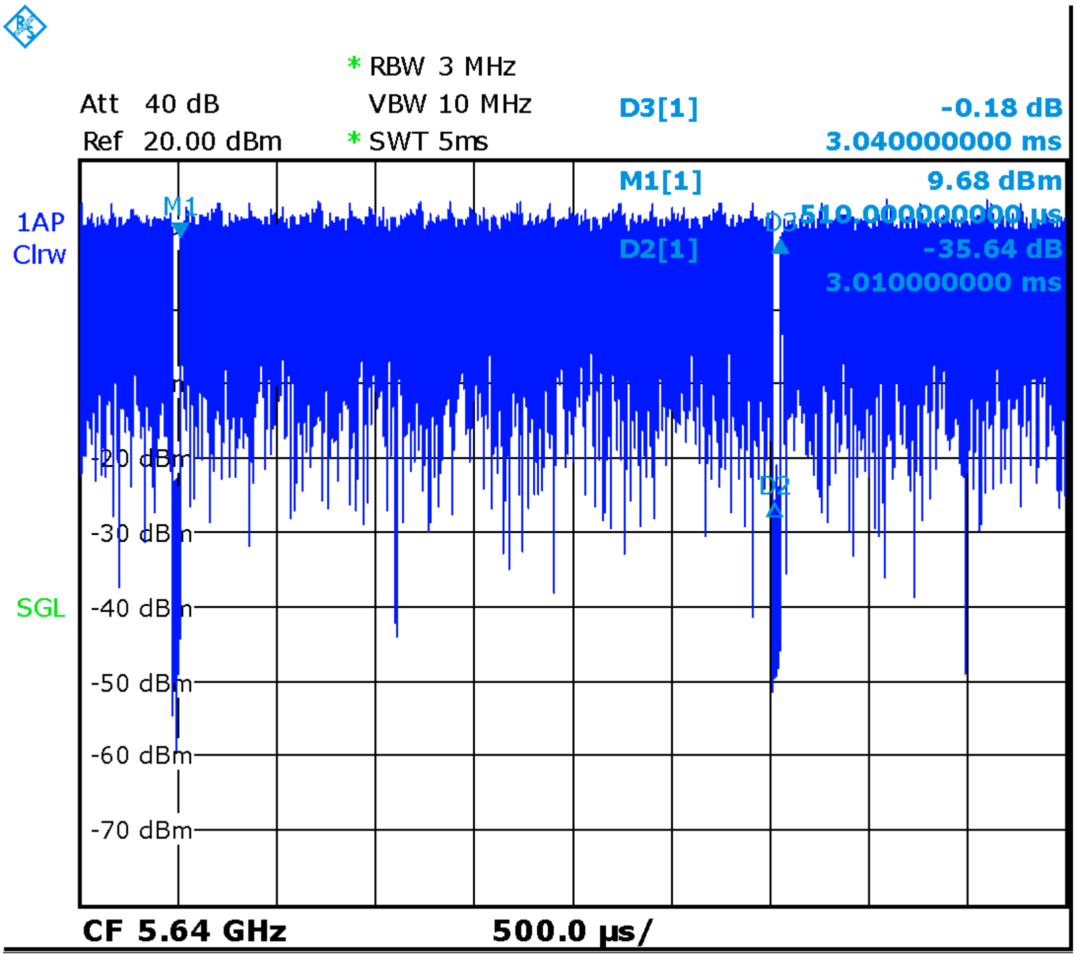
Frequency		Test Position	D (mm)	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)
MHz	Ch.						
5660	132	Rear	10	98.68%	100%	**1.08**	**1.09**

Table 14.4-28: SAR Values (WLAN - Low Power SISO antenna5 Body) – Scaled Reported SAR

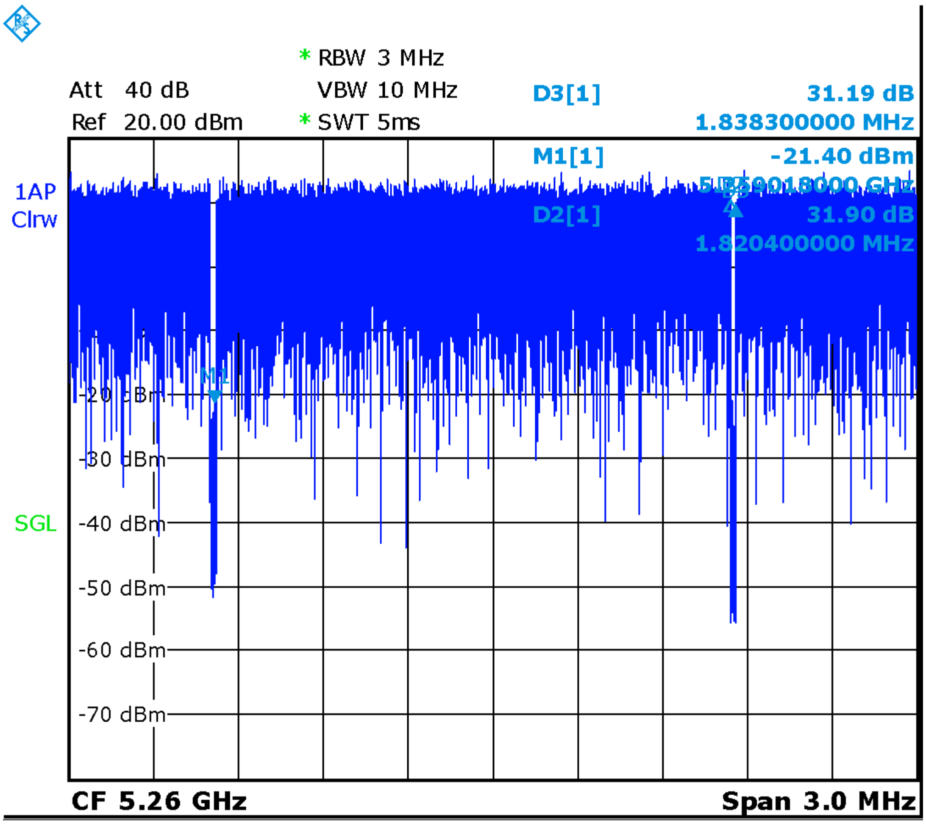
Frequency		Test Position	D (mm)	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)
MHz	Ch.						
5660	132	Rear	10	98.68%	100%	**0.48**	**0.49**

Table 14.4-29: SAR Values (WLAN - Low Power MIMO Body) – Scaled Reported SAR

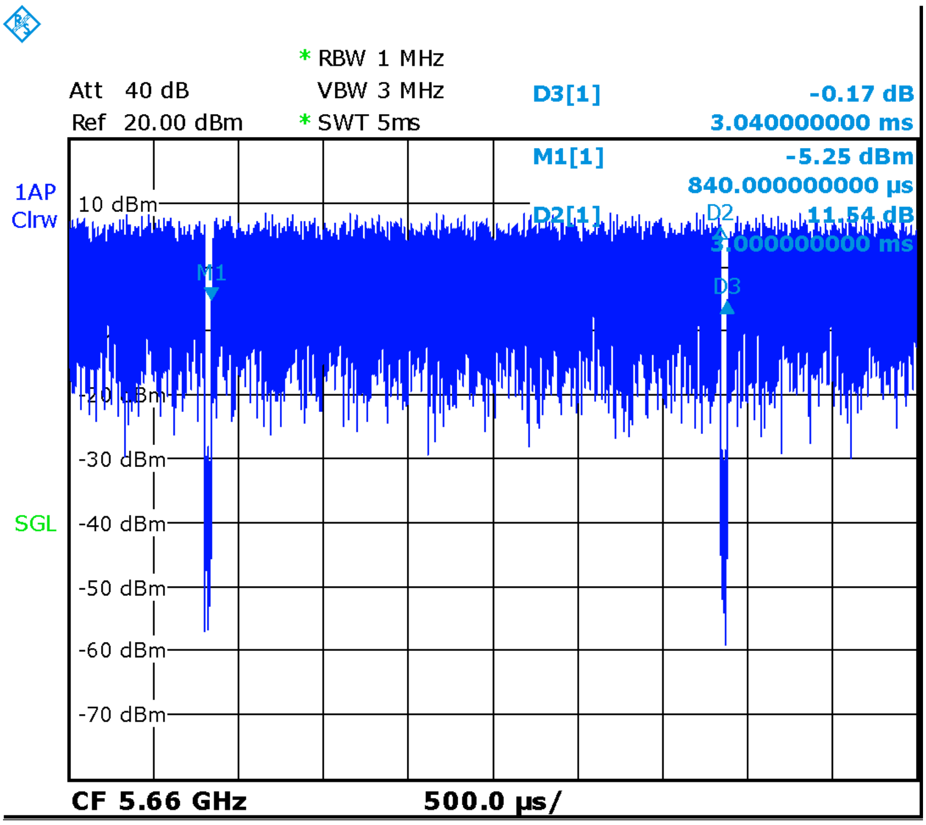
Frequency		Test Position	D (mm)	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)
MHz	Ch.						
5660	132	Rear	10	98.68%	100%	**0.47**	**0.48**



Picture 14.3 The plot of duty factor for Normal Power SISO antenna5 Head



Picture 14.4 The plot of duty factor for Normal Power MIMO Head



Picture 14.5 The plot of duty factor for body

14.5 SAR results for Fast BT

Table 15.5-1: SAR Values (Bluetooth - Head)

Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
Ch.	MHz										
78	2480	Left	Touch	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/
78	2480	Left	Tilt	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/
78	2480	Right	Touch	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/
78	2480	Right	Tilt	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/

Table 15.5-2: SAR Values (Bluetooth - Body)

Ambient Temperature: 22.2 ℃ Liquid Temperature: 22 ℃										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
Ch	MHz									
78	2480	Front	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/
78	2480	Rear	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/
78	2480	Left	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/
78	2480	Right	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/
78	2480	Bottom	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/
78	2480	Top	/	14.05	14.5	< 0.01	**< 0.01**	< 0.01	**< 0.01**	/

Note1: The distance between the EUT and the phantom bottom is 10mm

15 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps2) 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 ≥ 1.45W/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.

Table 15.1: SAR Measurement Variability for Body W1700 (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz						
1513	1752.6	Left	10	0.922	0.903	1.02	/

Table 15.2: SAR Measurement Variability for Head W1900 (1g)

Frequency		Side	Test Position	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz						
9538	1907.6	Right	Cheek	0.812	0.801	1.01	/

Table 15.3: SAR Measurement Variability for Body W1900 (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz						
9538	1907.6	Left	10	0.93	0.907	1.03	/

Table 15.4: SAR Measurement Variability for Body LTE B41 (1g)

Frequency		Mode	Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz							
41055	2636.5	50RB_Mid	Rear	10	0.801	0.774	1.03	/

Table 15.5: SAR Measurement Variability for Normal Power SISO antenna1 Body 5G (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz						
132	5660	Rear	10	0.955	0.934	1.02	/

Table 15.6: SAR Measurement Variability for Normal Power MIMO Body 5G (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz						
132	5660	Rear	10	0.928	0.903	1.03	/

16 Measurement Uncertainty

16.1 Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.0	N	1	1	1	6.0	6.0	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	N	1	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521

Combined standard uncertainty	$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						9.55	9.43	257
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$						19.1	18.9	

16.2 Measurement Uncertainty for Normal SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.55	N	1	1	1	6.55	6.55	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	∞
13	Post-processing	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞

	(target)									
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c^{'}=\sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						10.7	10.6	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						21.4	21.1	

16.3 Measurement Uncertainty for Fast SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.0	N	1	1	1	6.0	6.0	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. Restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
14	Fast SAR z-Approximation	B	7.0	R	$\sqrt{3}$	1	1	4.0	4.0	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
18	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞

19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
20	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						10.4	10.3	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						20.8	20.6	

16.4 Measurement Uncertainty for Fast SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.55	N	1	1	1	6.55	6.55	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. Restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
14	Fast SAR z-Approximation	B	14.0	R	$\sqrt{3}$	1	1	8.1	8.1	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71

16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
18	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
20	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c^{'} = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						13.5	13.4	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						27.0	26.8	

17 MAIN TEST INSTRUMENTS

Table 17.1: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	N5239A	MY55491241	June 10, 2019	One year
02	Power meter	NRP2	106277	September 4, 2019	One year
03	Power sensor	NRP8S	104291		
04	Signal Generator	E4438C	MG3700A	June 18, 2019	One Year
05	Amplifier	60S1G4	0331848	No Calibration Requested	
07	BTS	CMW500	166370	June 27, 2019	One year
08	E-field Probe	SPEAG EX3DV4	7307	May 24, 2019	One year
09	DAE	SPEAG DAE4	777	January 8, 2020	One year
10	Dipole Validation Kit	SPEAG D835V2	4d069	July 18,2019	One year
11	Dipole Validation Kit	SPEAG D1750V2	1003	July 16,2019	One year
12	Dipole Validation Kit	SPEAG D1900V2	5d101	July 17,2019	One year
13	Dipole Validation Kit	SPEAG D2450V2	853	July 17,2019	One year
15	Dipole Validation Kit	SPEAG D2600V2	1012	July 17,2019	One year
16	Dipole Validation Kit	SPEAG D5GHzV2	1060	July 22, 2019	One year

END OF REPORT BODY

ANNEX A Graph Results

GSM850_CH190 Right Tilt

Date: 5/16/2020

Electronics: DAE4 Sn777

Medium: head 835 MHz

Medium parameters used: f = 836.6; σ = 0.894 mho/m; εr = 41.34; ρ = 1000 kg/m^3

Ambient Temperature: 22.5^{o}C, Liquid Temperature: 22.3^{o}C

Communication System: GSM850 836.6 Duty Cycle: 1:8.3

Probe: EX3DV4 – SN7307 ConvF(10.45,10.45,10.45)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.895 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.82 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.482 W/kg; SAR(10 g) = 0.257 W/kg
Maximum value of SAR (measured) = points W/kg

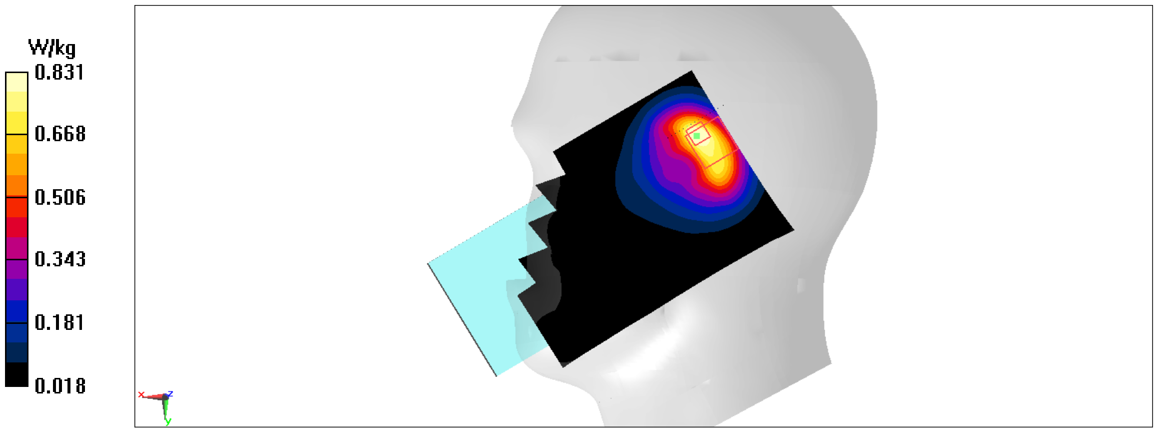


Fig A.1

GSM850_CH251 Rear
Date: 5/16/2020
Electronics: DAE4 Sn777
Medium: head 835 MHz
Medium parameters used: f = 848.8; σ = 0.905 mho/m; εr = 41.32; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: GSM850 848.8 Duty Cycle: 1:4
Probe: EX3DV4 – SN7307 ConvF(10.45,10.45,10.45)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.462 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.52 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.679 W/kg
SAR(1 g) = 0.375 W/kg; SAR(10 g) = 0.213 W/kg
Maximum value of SAR (measured) = points W/kg

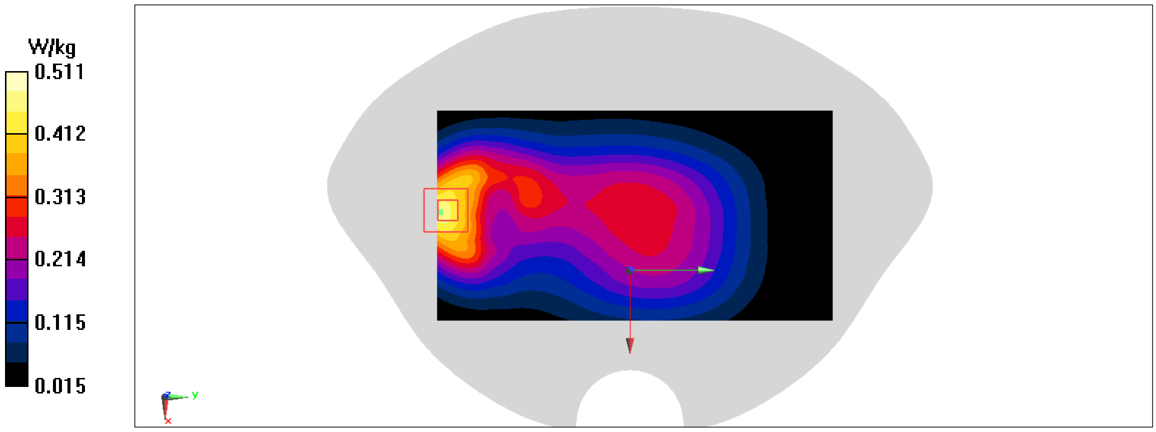


Fig A.2

PCS1900_CH810 Right Cheek

Date: 5/18/2020

Electronics: DAE4 Sn777

Medium: head 1900 MHz

Medium parameters used: f = 1909.8; σ = 1.41 mho/m; εr = 40.53; ρ = 1000 kg/m^3

Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C

Communication System: PCS1900 1909.8 Duty Cycle: 1:8.3

Probe: EX3DV4 – SN7307 ConvF(8.56,8.56,8.56)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.23 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.742 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 1.4 W/kg
SAR(1 g) = 0.694 W/kg; SAR(10 g) = 0.34 W/kg
Maximum value of SAR (measured) = points W/kg

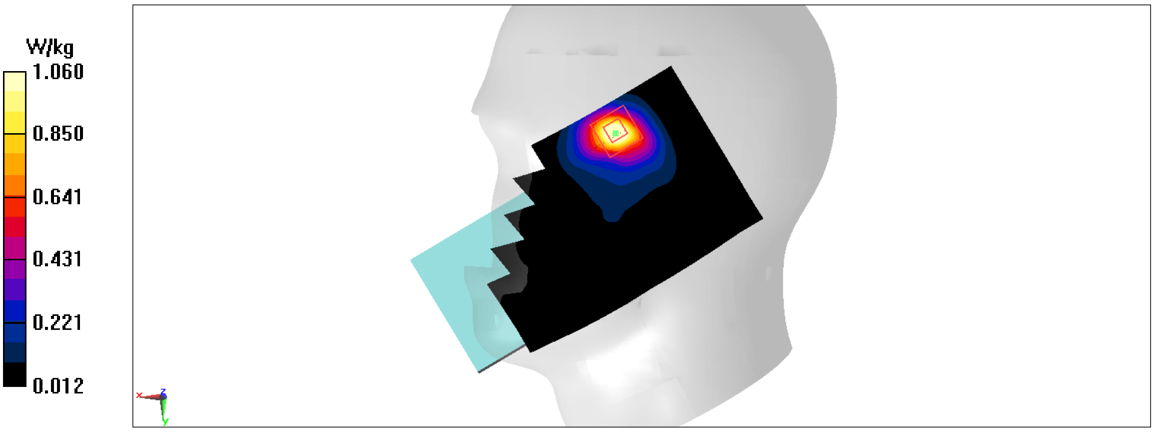


Fig A.3

PCS1900_CH810 Left
Date: 5/18/2020
Electronics: DAE4 Sn777
Medium: head 1900 MHz
Medium parameters used: f = 1909.8; σ = 1.41 mho/m; εr = 40.53; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: PCS1900 1909.8 Duty Cycle: 1:4
Probe: EX3DV4 – SN7307 ConvF(8.56,8.56,8.56)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.816 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.521 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 0.978 W/kg
SAR(1 g) = 0.514 W/kg; SAR(10 g) = 0.258 W/kg
Maximum value of SAR (measured) = points W/kg

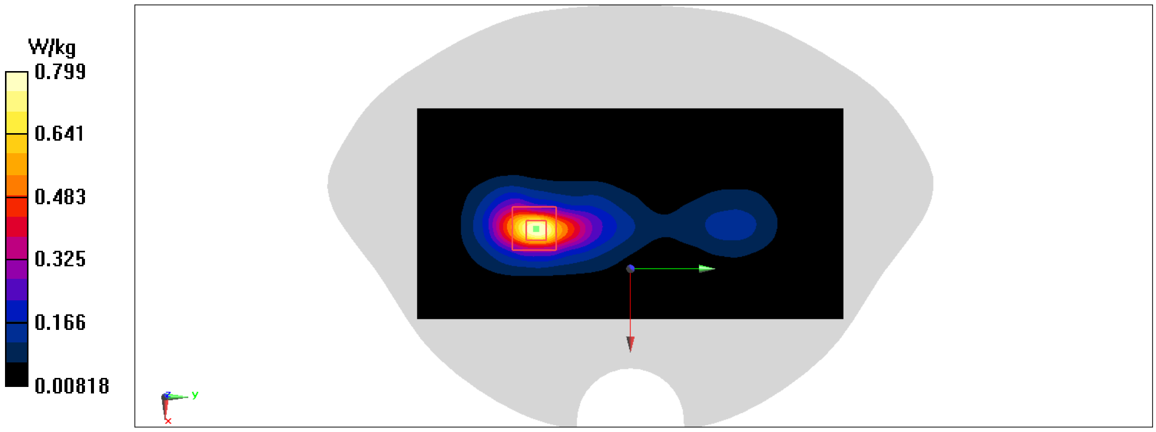


Fig A.4

WCDMA1900-BII_CH9538 Right Cheek
Date: 5/18/2020
Electronics: DAE4 Sn777
Medium: head 1900 MHz
Medium parameters used: f = 1907.6; σ = 1.408 mho/m; εr = 40.53; ρ = 1000 kg/m^3
Ambient Temperature: 22.5^{o}C, Liquid Temperature: 22.3^{o}C
Communication System: WCDMA1900-BII 1907.6 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(8.56,8.56,8.56)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.47 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.094 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.65 W/kg
SAR(1 g) = 0.812 W/kg; SAR(10 g) = 0.402 W/kg
Maximum value of SAR (measured) = points W/kg

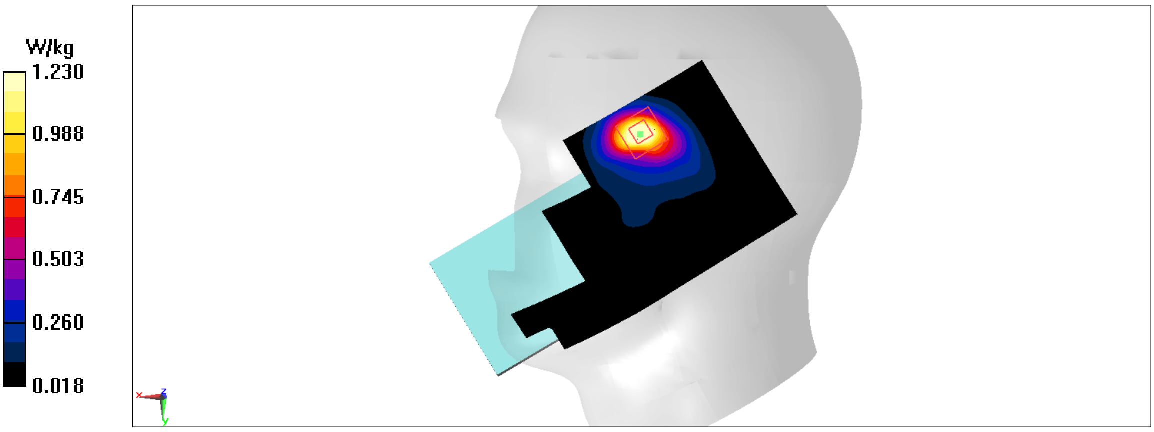


Fig A.5

WCDMA1900-BII_CH9538 Left
Date: 5/18/2020
Electronics: DAE4 Sn777
Medium: head 1900 MHz
Medium parameters used: f = 1907.6; σ = 1.408 mho/m; εr = 40.53; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WCDMA1900-BII 1907.6 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(8.56,8.56,8.56)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.37 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.73 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.82 W/kg
SAR(1 g) = 0.93 W/kg; SAR(10 g) = 0.461 W/kg
Maximum value of SAR (measured) = points W/kg

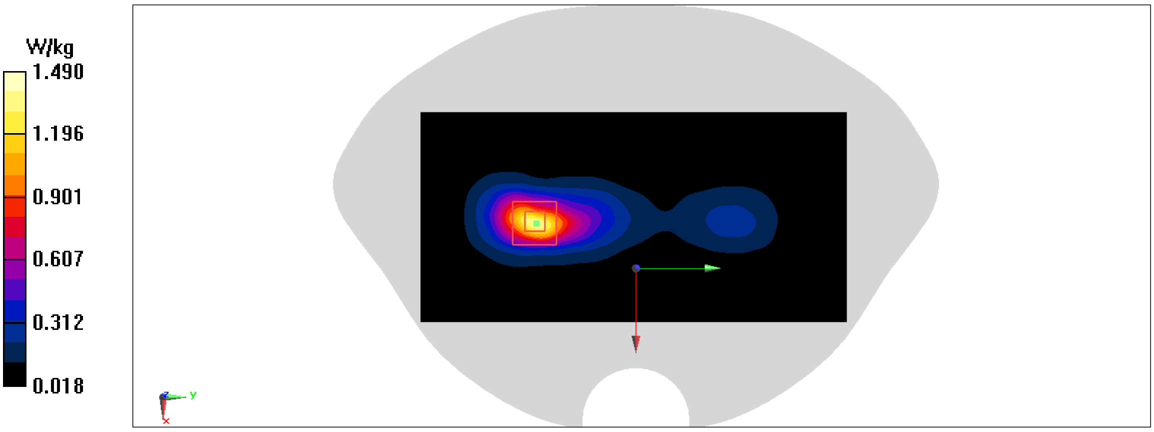


Fig A.6

WCDMA1700-BIV_CH1412 Right Cheek
Date: 5/17/2020
Electronics: DAE4 Sn777
Medium: head 1750 MHz
Medium parameters used: f = 1732.4; σ = 1.357 mho/m; εr = 40.68; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC,   Liquid Temperature: 22.3ºC
Communication System: WCDMA1700-BIV 1732.4 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(8.86,8.86,8.86)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.3 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.05 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 0.76 W/kg; SAR(10 g) = 0.379 W/kg
Maximum value of SAR (measured) = points W/kg

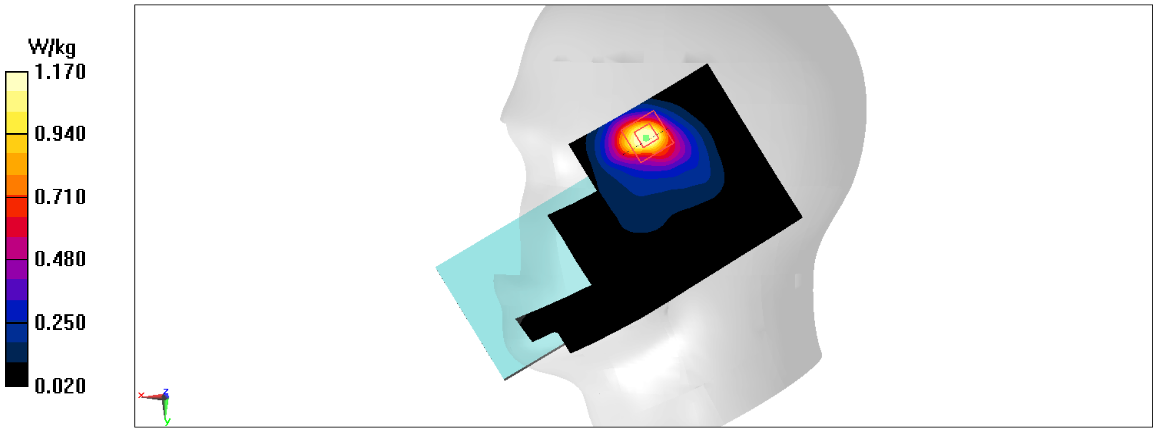


Fig A.7

WCDMA1700-BIV_CH1513 Left
Date: 5/17/2020
Electronics: DAE4 Sn777
Medium: head 1750 MHz
Medium parameters used: f = 1752.6; σ = 1.377 mho/m; εr = 40.66; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WCDMA1700-BIV 1752.6 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(8.86,8.86,8.86)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.36 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.89 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.79 W/kg
SAR(1 g) = 0.922 W/kg; SAR(10 g) = 0.463 W/kg
Maximum value of SAR (measured) = points W/kg

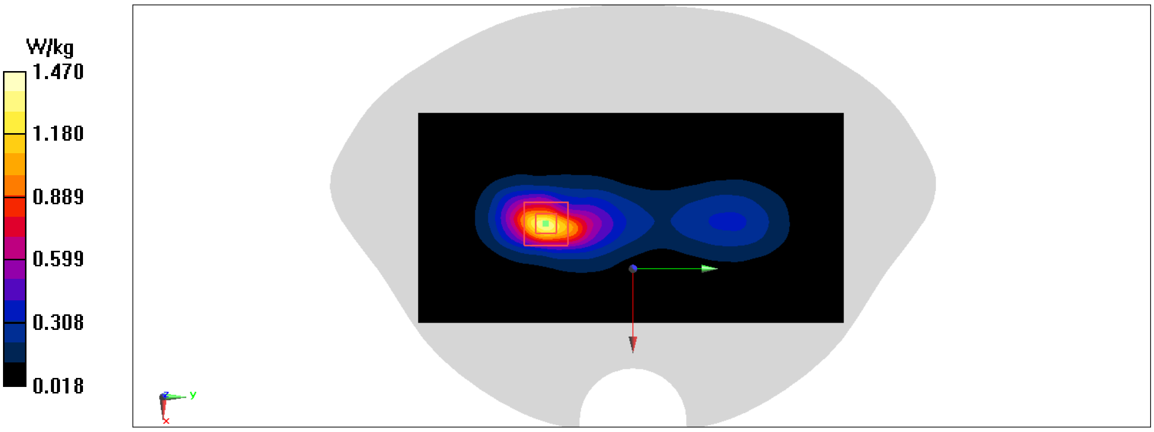


Fig A.8

WCDMA850-BV_CH4183 Right Tilt
Date: 5/16/2020
Electronics: DAE4 Sn777
Medium: head 835 MHz
Medium parameters used: f = 836.6; σ = 0.894 mho/m; εr = 41.34; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WCDMA850-BV 836.6 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(10.45,10.45,10.45)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.759 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.39 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.87 W/kg
SAR(1 g) = 0.737 W/kg; SAR(10 g) = 0.384 W/kg
Maximum value of SAR (measured) = points W/kg

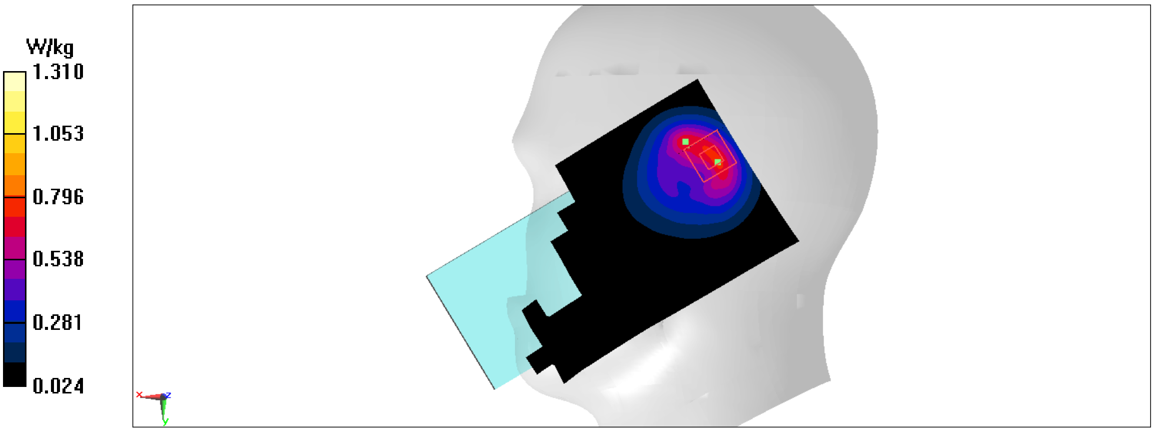


Fig A.9

WCDMA850-BV_CH4183 Rear
Date: 5/16/2020
Electronics: DAE4 Sn777
Medium: head 835 MHz
Medium parameters used: f = 836.6; σ = 0.894 mho/m; εr = 41.34; ρ = 1000 kg/m^3
Ambient Temperature: 22.5^{o}C, Liquid Temperature: 22.3^{o}C
Communication System: WCDMA850-BV 836.6 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(10.45,10.45,10.45)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.658 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.39 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.902 W/kg
SAR(1 g) = 0.496 W/kg; SAR(10 g) = 0.28 W/kg
Maximum value of SAR (measured) = points W/kg

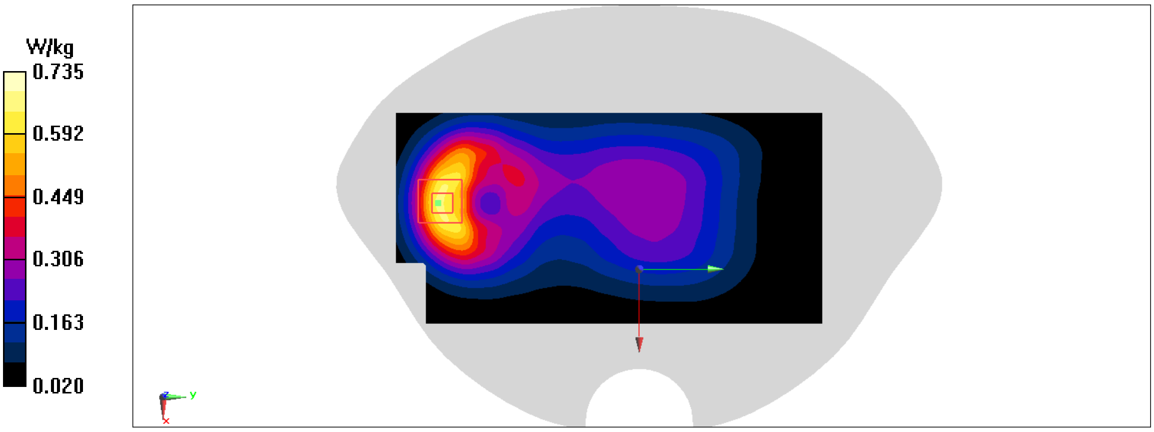


Fig A.10

LTE850-FDD5_CH20450 Right Tilt
Date: 5/16/2020
Electronics: DAE4 Sn777
Medium: head 835 MHz
Medium parameters used: f = 829 MHz; σ = 0.886 mho/m; εr = 41.35; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: LTE850-FDD5 829 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(10.45,10.45,10.45)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.2 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 28.93 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.78 W/kg
SAR(1 g) = 0.69 W/kg; SAR(10 g) = 0.349 W/kg
Maximum value of SAR (measured) = points W/kg

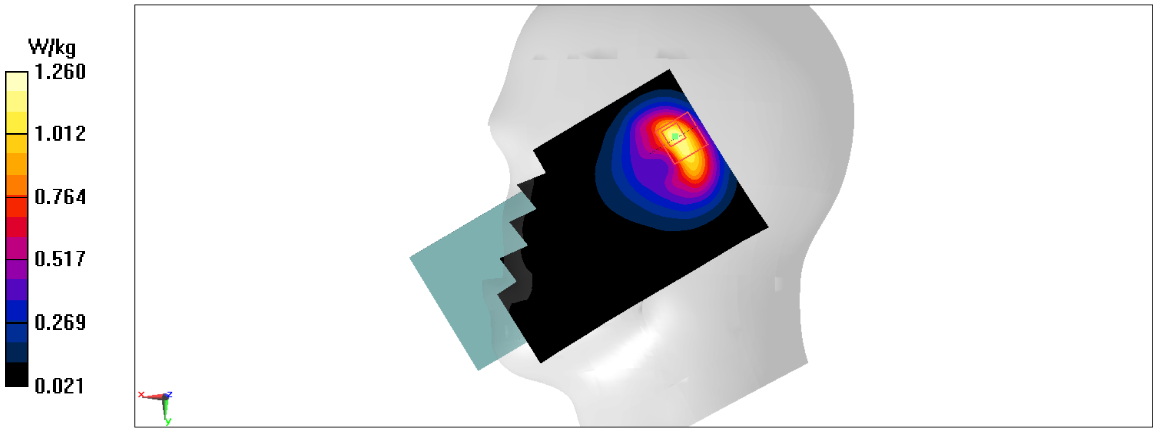


Fig A.11

LTE850-FDD5_CH20450 Rear
Date: 5/16/2020
Electronics: DAE4 Sn777
Medium: head 835 MHz
Medium parameters used: f = 829 MHz; σ = 0.886 mho/m; εr = 41.35; ρ = 1000 kg/m^3
Ambient Temperature: 22.5^{o}C, Liquid Temperature: 22.3^{o}C
Communication System: LTE850-FDD5 829 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(10.45,10.45,10.45)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.575 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.54 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 0.755 W/kg
SAR(1 g) = 0.415 W/kg; SAR(10 g) = 0.236 W/kg
Maximum value of SAR (measured) = points W/kg

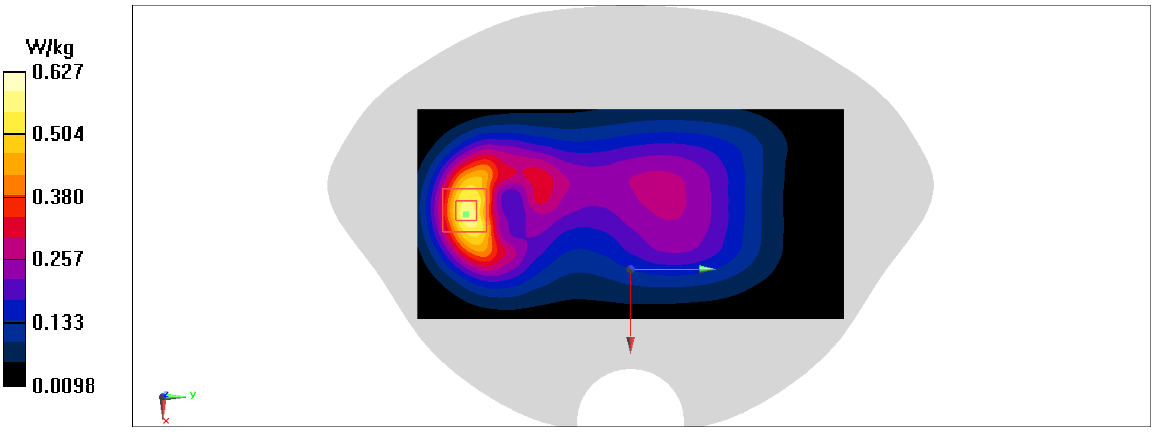


Fig A.12

LTE2500-FDD7_CH21350 Right Cheek
Date: 5/20/2020
Electronics: DAE4 Sn777
Medium: head 2600 MHz
Medium parameters used: f = 2560 MHz; σ = 1.899 mho/m; εr = 39.17; ρ = 1000 kg/m^3
Ambient Temperature: 22.5^{o}C, Liquid Temperature: 22.3^{o}C
Communication System: LTE2500-FDD7 2560 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.65,7.65,7.65)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.72 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.121 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.448 W/kg; SAR(10 g) = 0.197 W/kg
Maximum value of SAR (measured) = points W/kg

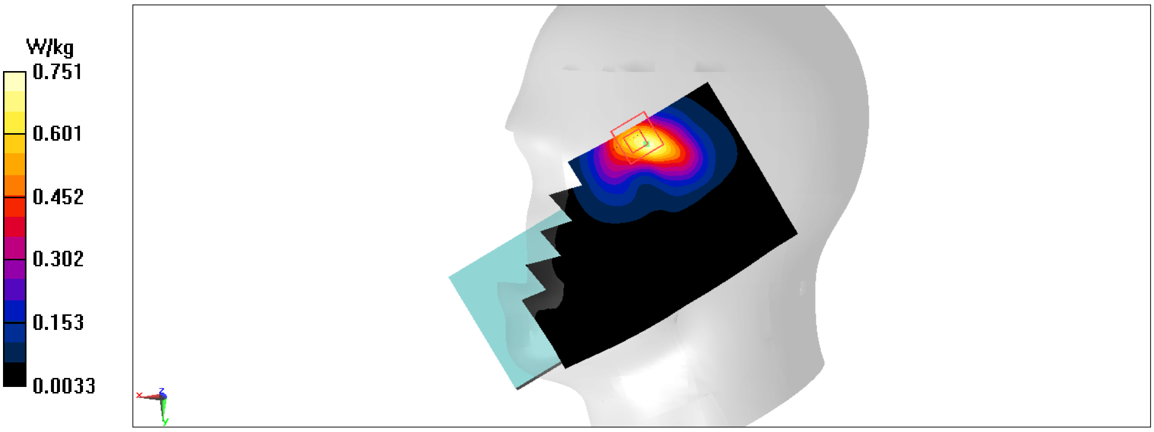


Fig A.13

LTE2500-FDD7_CH21350 Rear
Date: 5/20/2020
Electronics: DAE4 Sn777
Medium: head 2600 MHz
Medium parameters used: f = 2560 MHz; σ = 1.899 mho/m; εr = 39.17; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: LTE2500-FDD7 2560 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.65,7.65,7.65)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.846 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.365 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.15 W/kg
SAR(1 g) = 0.541 W/kg; SAR(10 g) = 0.24 W/kg
Maximum value of SAR (measured) = points W/kg

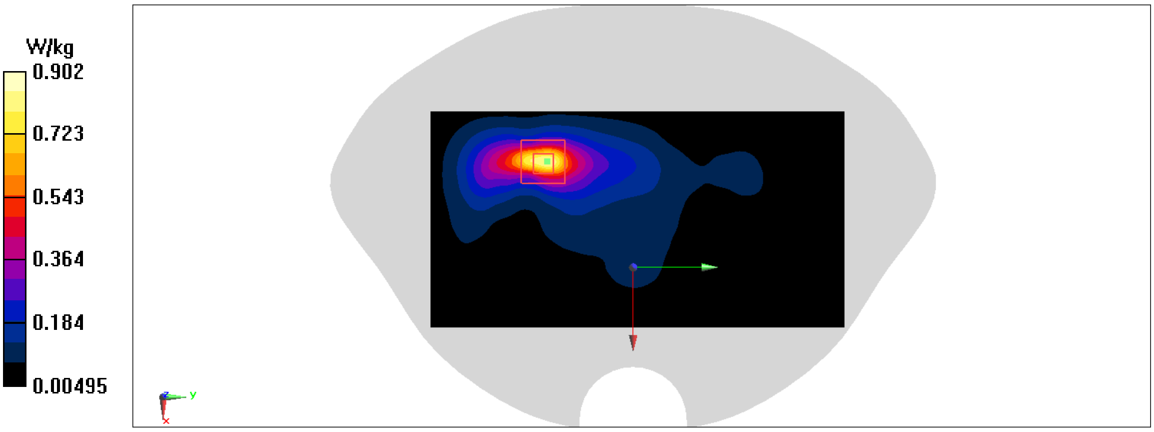


Fig A.14

LTE2500-TDD41_CH41055 Right Cheek
Date: 5/20/2020
Electronics: DAE4 Sn777
Medium: head 2600 MHz
Medium parameters used: f = 2636.5; σ = 1.973 mho/m; εr = 39.09; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: LTE2500-TDD41 2636.5 Duty Cycle: 1:1.58
Probe: EX3DV4 – SN7307 ConvF(7.65,7.65,7.65)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.345 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.717 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.874 W/kg
SAR(1 g) = 0.354 W/kg; SAR(10 g) = 0.152 W/kg
Maximum value of SAR (measured) = points W/kg

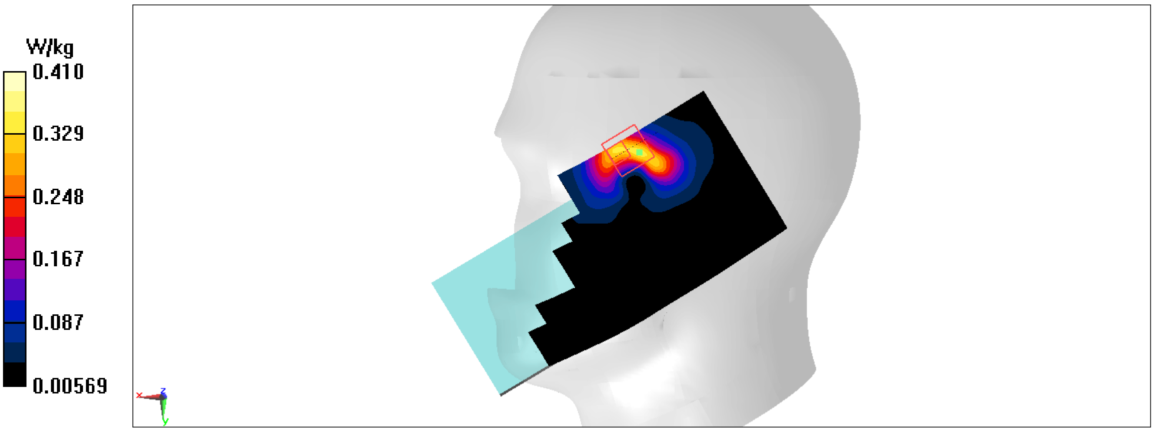


Fig A.15

LTE2500-TDD41_CH41055 Rear
Date: 5/20/2020
Electronics: DAE4 Sn777
Medium: head 2600 MHz
Medium parameters used: f = 2636.5; σ = 1.973 mho/m; εr = 39.09; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC,   Liquid Temperature: 22.3ºC
Communication System: LTE2500-TDD41 2636.5 Duty Cycle: 1:1.58
Probe: EX3DV4 – SN7307 ConvF(7.65,7.65,7.65)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.41 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.731 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 1.8 W/kg
SAR(1 g) = 0.801 W/kg; SAR(10 g) = 0.326 W/kg
Maximum value of SAR (measured) = points W/kg

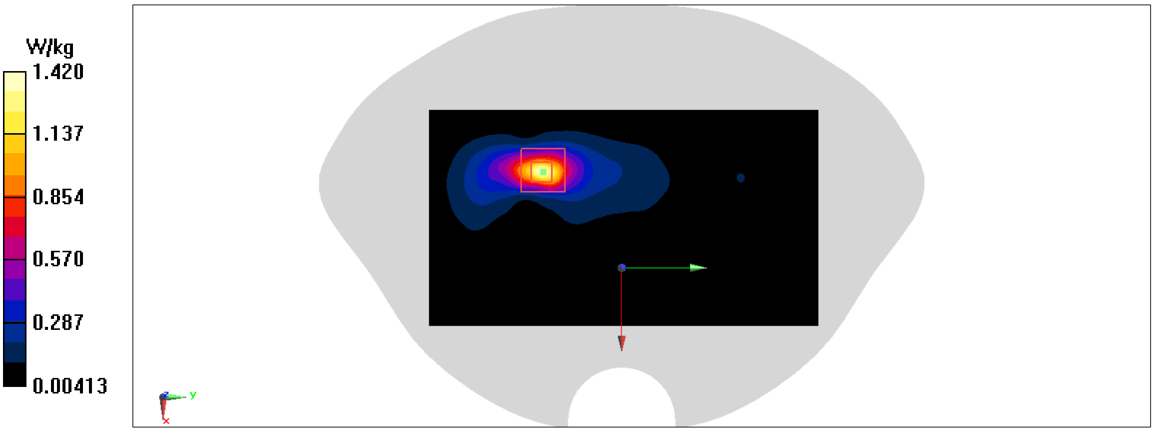


Fig A.16

WLAN2450_CH11 Left Tilt
Date: 5/19/2020
Electronics: DAE4 Sn777
Medium: head 2450 MHz
Medium parameters used: f = 2462; σ = 1.788 mho/m; εr = 38.42; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WLAN2450 2462 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.83,7.83,7.83)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.337 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.03 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.404 W/kg
SAR(1 g) = 0.18 W/kg; SAR(10 g) = 0.08 W/kg
Maximum value of SAR (measured) = points W/kg

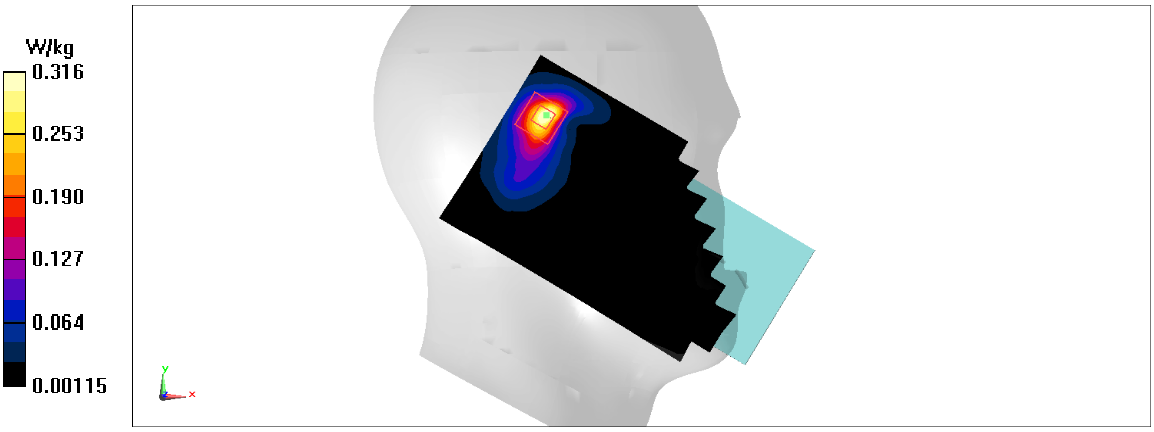


Fig A.17

WLAN2450_CH11 Rear
Date: 5/19/2020
Electronics: DAE4 Sn777
Medium: head 2450 MHz
Medium parameters used: f = 2462; σ = 1.788 mho/m; εr = 38.42; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WLAN2450 2462 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.83,7.83,7.83)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.483 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.465 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.64 W/kg
SAR(1 g) = 0.289 W/kg; SAR(10 g) = 0.118 W/kg
Maximum value of SAR (measured) = points W/kg

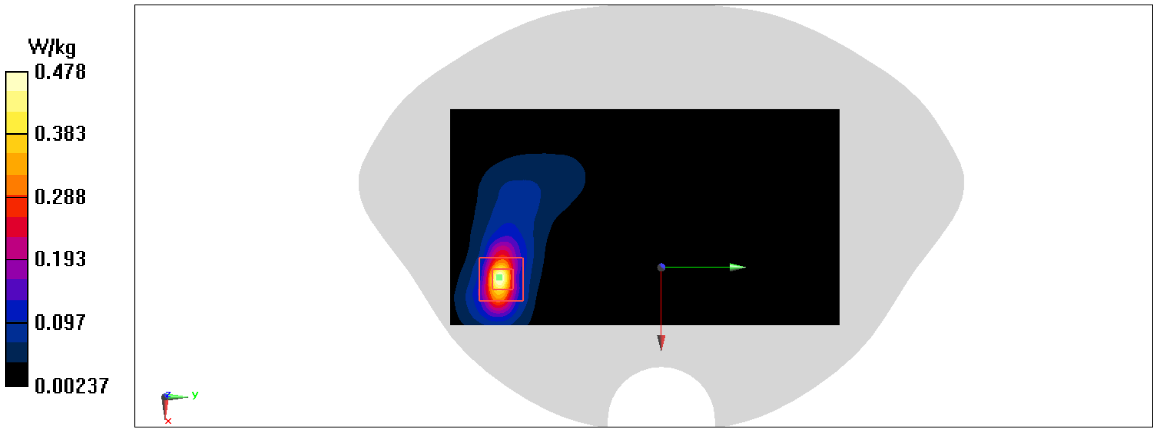


Fig A.18

WLAN2450_CH11 Left Cheek
Date: 5/19/2020
Electronics: DAE4 Sn777
Medium: head 2450 MHz
Medium parameters used: f = 2462; σ = 1.788 mho/m; εr = 38.42; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WLAN2450 2462 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.83,7.83,7.83)

Area Scan (101x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.973 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.989 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.572 W/kg; SAR(10 g) = 0.253 W/kg
Maximum value of SAR (measured) = 1.06 W/kg

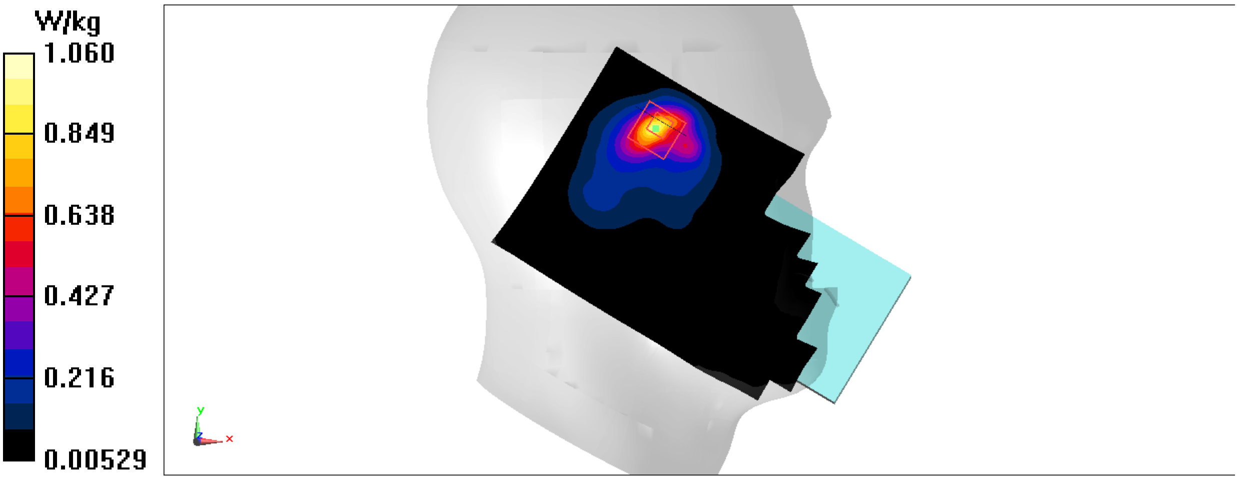


Fig A.19

WLAN2450_CH11 Rear
Date: 5/19/2020
Electronics: DAE4 Sn777
Medium: head 2450 MHz
Medium parameters used: f = 2462; σ = 1.788 mho/m; εr = 38.42; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WLAN2450 2462 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.83,7.83,7.83)

Configuration/Rear 5.5M 18dB MIMO 10mm/Area Scan (91x171x1):
Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.457 W/kg

Configuration/Rear 5.5M 18dB MIMO 10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.833 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.715 W/kg
SAR(1 g) = 0.340 W/kg; SAR(10 g) = 0.157 W/kg
Maximum value of SAR (measured) = 0.579 W/kg

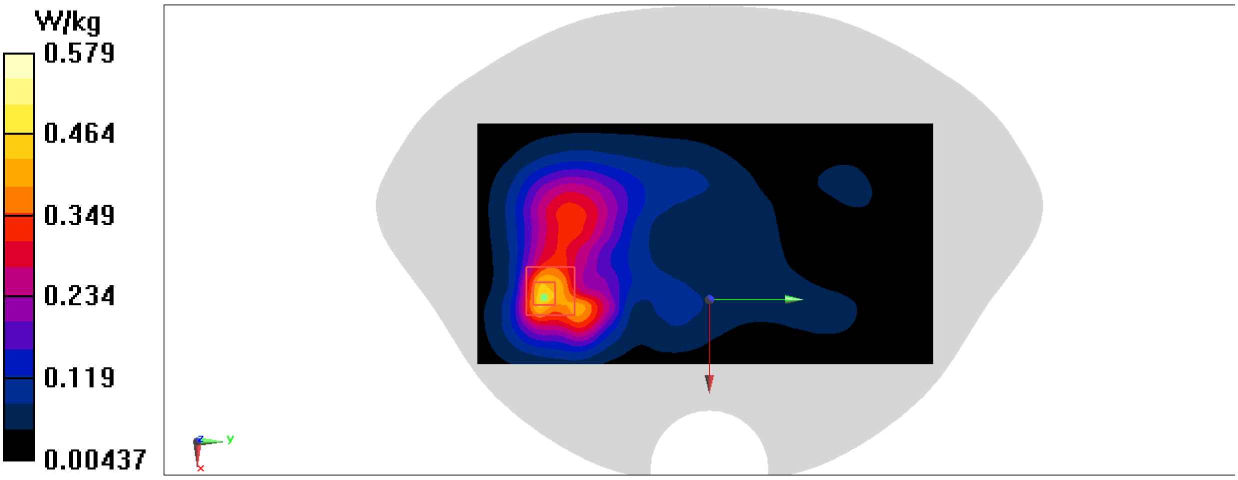


Fig A.20

WLAN5G_CH128 Left Cheek
Date: 5/22/2020
Electronics: DAE4 Sn777
Medium: head 5600 MHz
Medium parameters used: f = 5640; σ = 5.11 mho/m; εr = 35.48; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WLAN5G 5640 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(5.12,5.12,5.12)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.202 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.95 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.905 W/kg
SAR(1 g) = 0.071 W/kg; SAR(10 g) = 0.019 W/kg
Maximum value of SAR (measured) = points W/kg

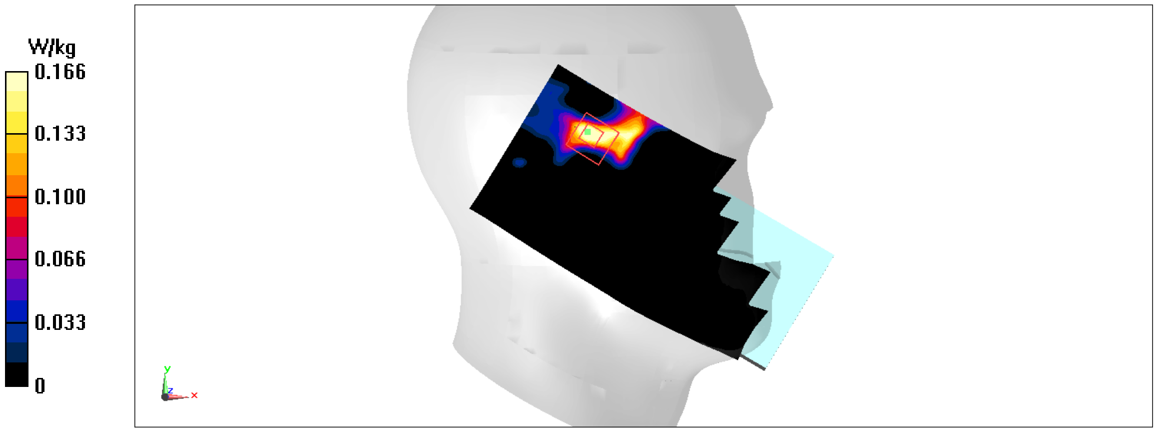


Fig A.21

WLAN5G_CH132 Rear
Date: 5/22/2020
Electronics: DAE4 Sn777
Medium: head 5600 MHz
Medium parameters used: f = 5660; σ = 5.13 mho/m; εr = 35.46; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WLAN5G 5660 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(5.12,5.12,5.12)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.18 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.143 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 3.45 W/kg
SAR(1 g) = 0.955 W/kg; SAR(10 g) = 0.389 W/kg
Maximum value of SAR (measured) = points W/kg

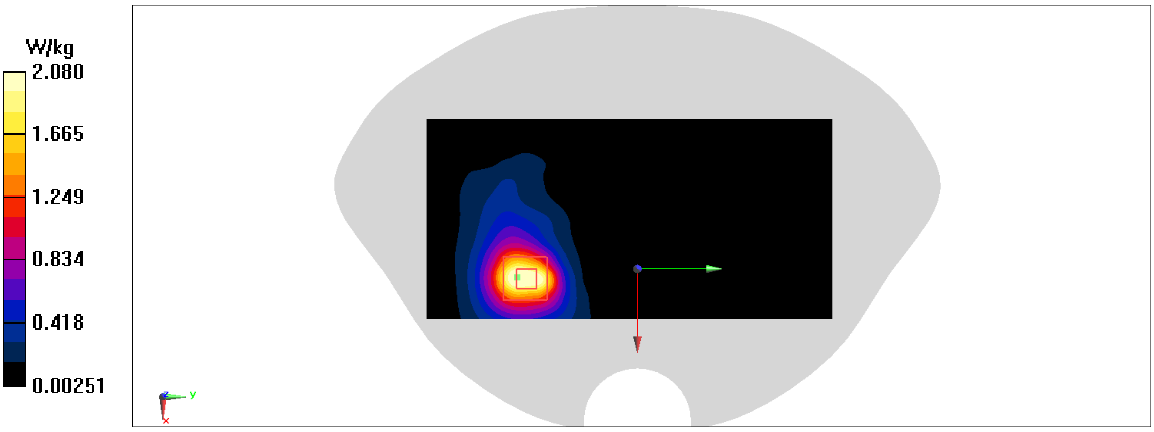


Fig A.22

WLAN5G_CH52 Left Cheek
Date: 5/21/2020
Electronics: DAE4 Sn777
Medium: head 5250 MHz
Medium parameters used: f = 5260; σ = 4.756 mho/m; εr = 35.36; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC, Liquid Temperature: 22.3ºC
Communication System: WLAN5G 5260 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(5.61,5.61,5.61)

Area Scan (101x201x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.34 W/kg

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 4.092 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 2.14 W/kg
SAR(1 g) = 0.566 W/kg; SAR(10 g) = 0.175 W/kg
Maximum value of SAR (measured) = 1.37 W/kg

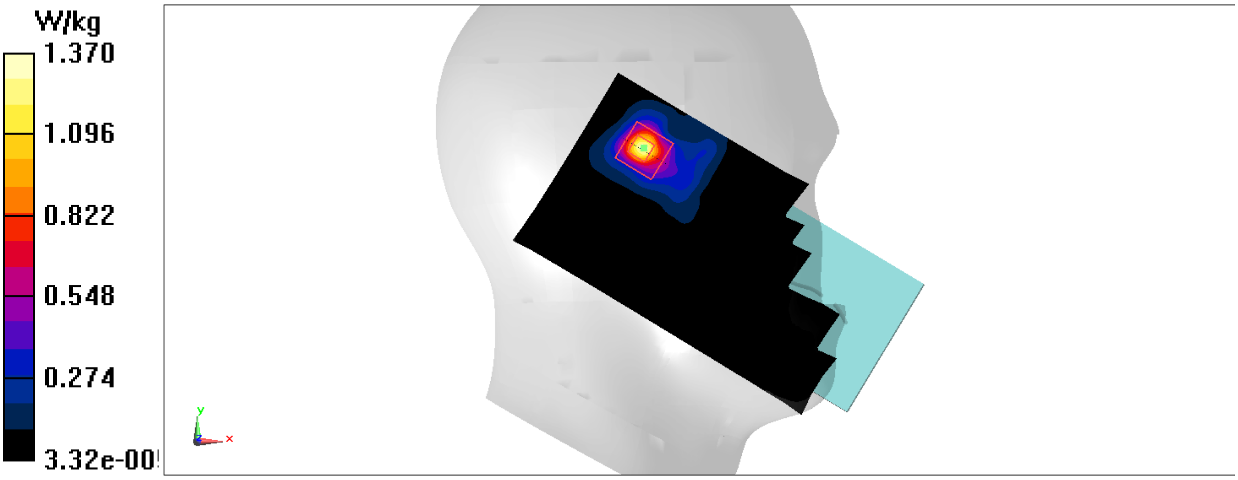


Fig A.23

WLAN5G_CH132 Rear
Date: 5/22/2020
Electronics: DAE4 Sn777
Medium: head 5600 MHz
Medium parameters used: f = 5660; σ = 5.13 mho/m; εr = 35.46; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WLAN5G 5660 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(5.12,5.12,5.12)

Area Scan (101x201x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.10 W/kg

Zoom Scan (9x10x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.222 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 3.40 W/kg
SAR(1 g) = 0.928 W/kg; SAR(10 g) = 0.379 W/kg
Maximum value of SAR (measured) = 2.04 W/kg

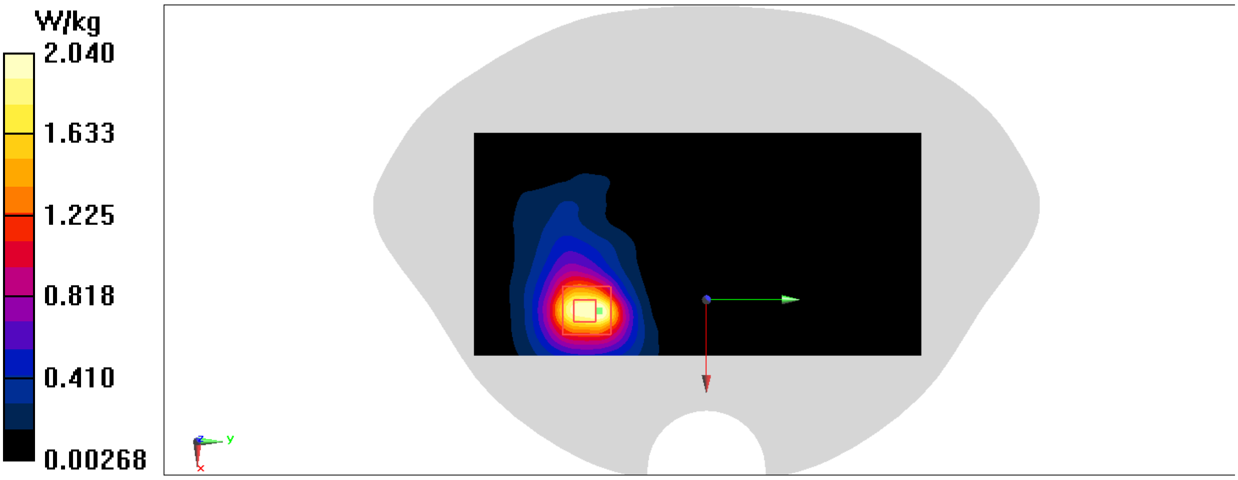


Fig A.24

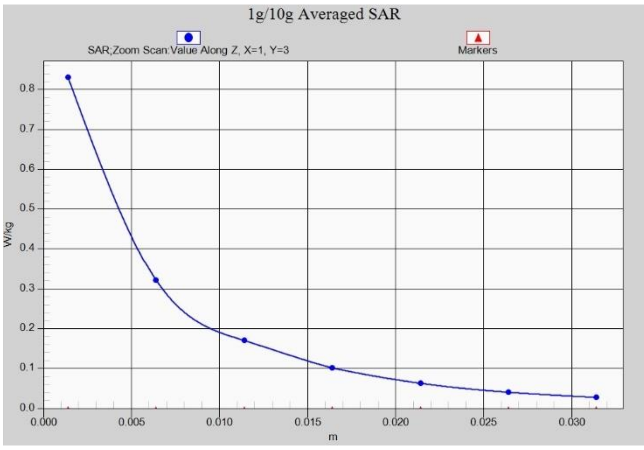


Fig. 1-1 Z-Scan at power reference point (850 MHz)

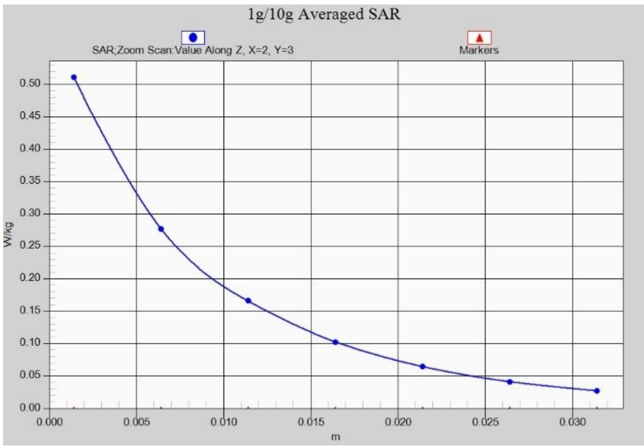


Fig. 1-2 Z-Scan at power reference point (850 MHz)

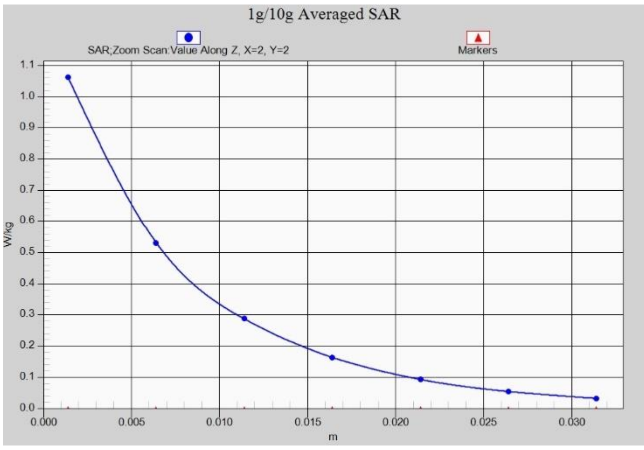


Fig. 1-3 Z-Scan at power reference point (1900 MHz)

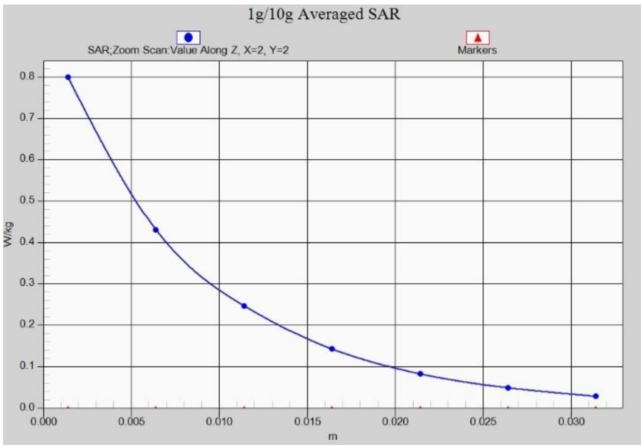


Fig. 1-4 Z-Scan at power reference point (1900 MHz)

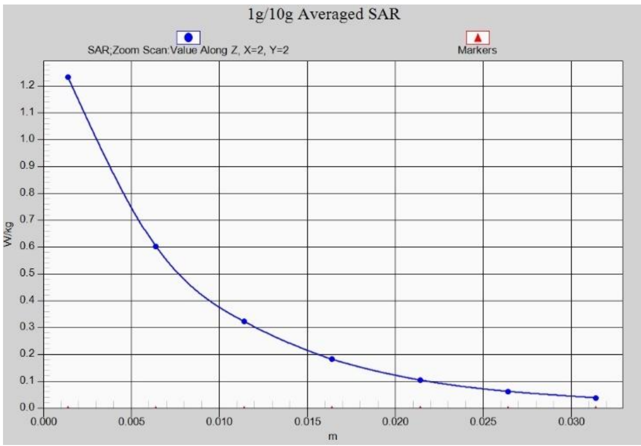


Fig. 1-5 Z-Scan at power reference point (WCDMA1900)

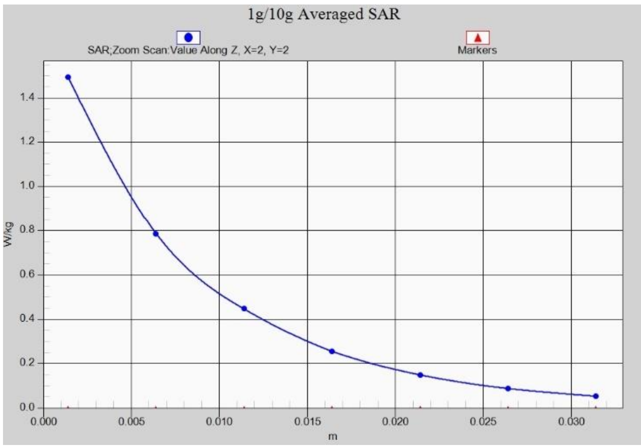


Fig. 1-6 Z-Scan at power reference point (WCDMA1900)

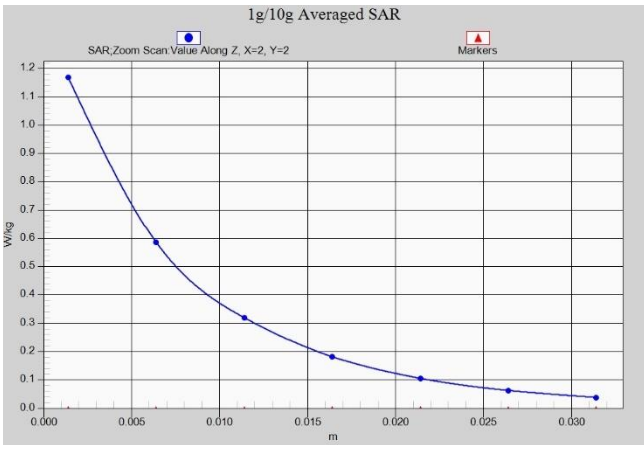


Fig. 1-7　Z-Scan at power reference point (WCDMA1700)

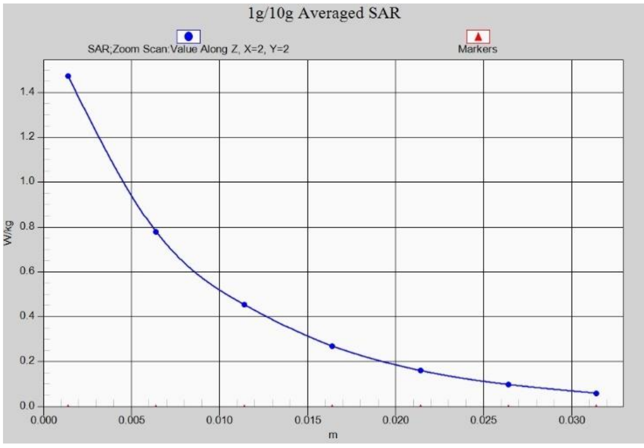


Fig. 1-8　Z-Scan at power reference point (WCDMA1700)

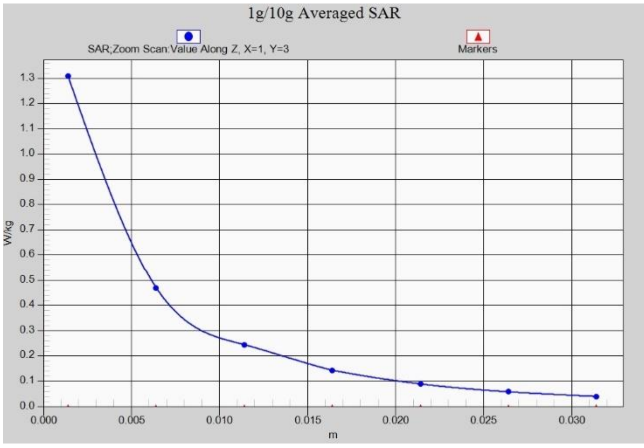


Fig. 1-9　Z-Scan at power reference point (WCDMA850)

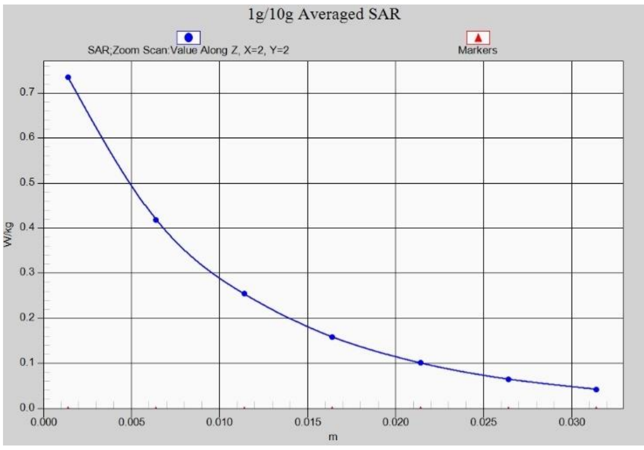


Fig. 1-10 Z-Scan at power reference point (WCDMA850)

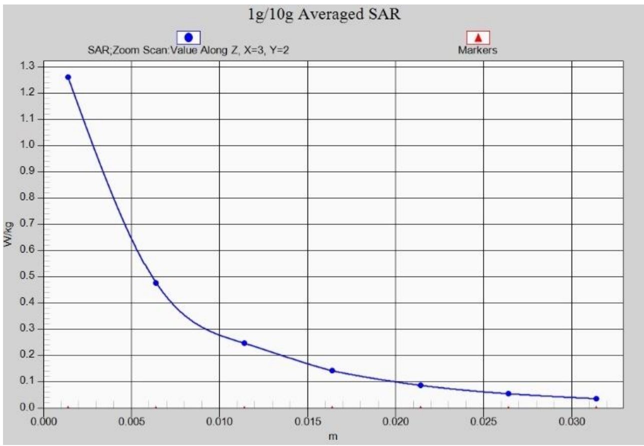


Fig. 1-11 Z-Scan at power reference point (LTE Band5)

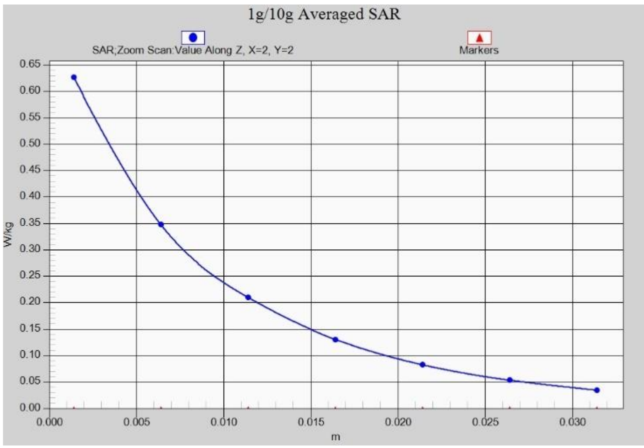


Fig. 1-12 Z-Scan at power reference point (LTE Band5)

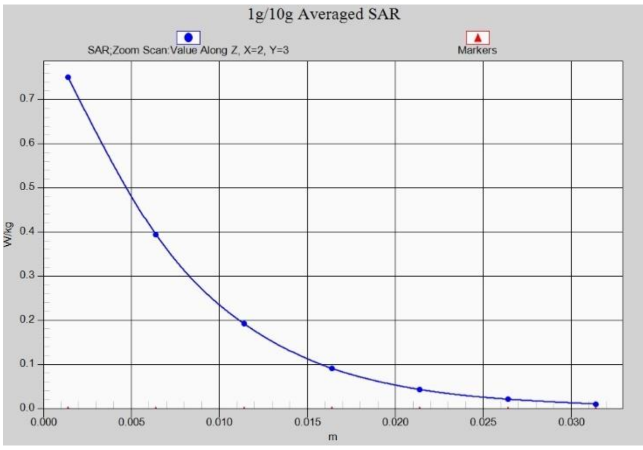


Fig. 1-13 Z-Scan at power reference point (LTE Band7)

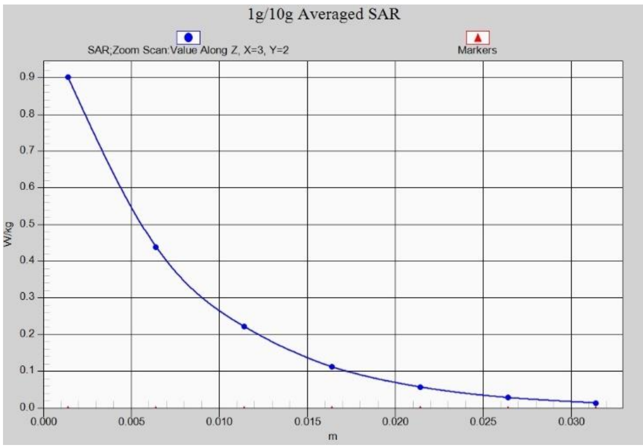


Fig. 1-14 Z-Scan at power reference point (LTE Band7)

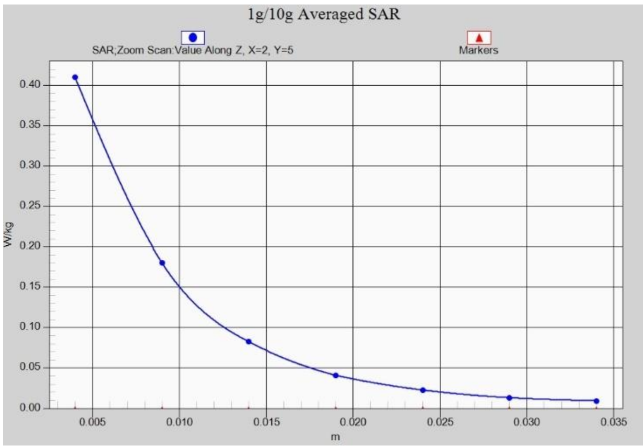


Fig. 1-15 Z-Scan at power reference point (LTE Band41)

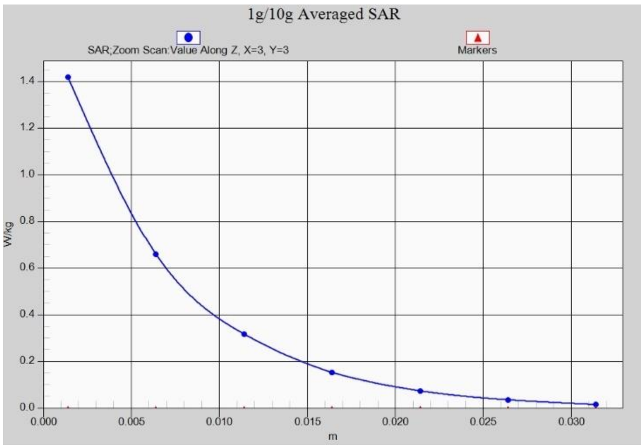


Fig. 1-16 Z-Scan at power reference point (LTE Band41)

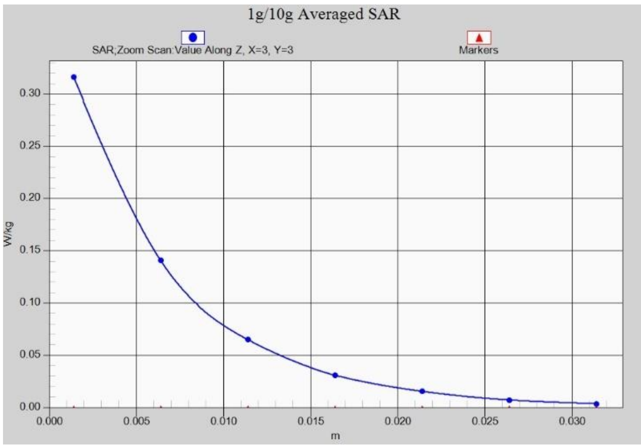


Fig. 1-17 Z-Scan at power reference point (wifi2450)

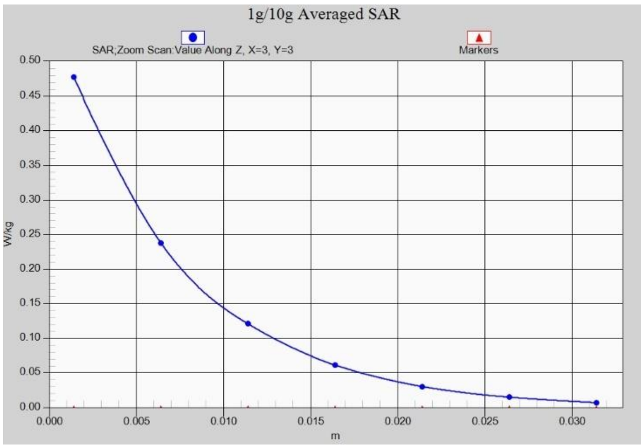


Fig. 1-18 Z-Scan at power reference point (wifi2450)

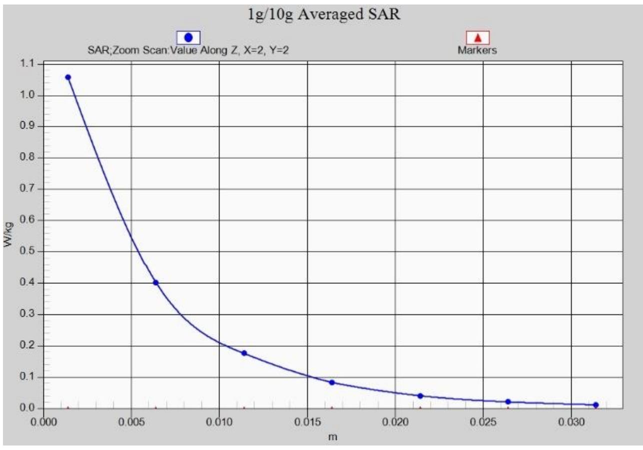


Fig. 1-19 Z-Scan at power reference point (wifi2450)

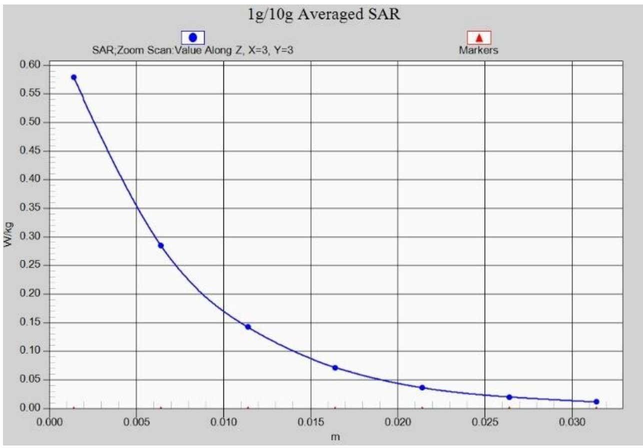


Fig. 1-20 Z-Scan at power reference point (wifi2450)

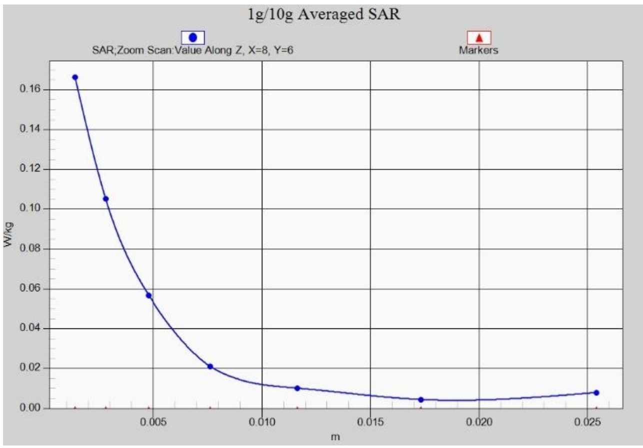


Fig. 1-21 Z-Scan at power reference point (wifi5G)

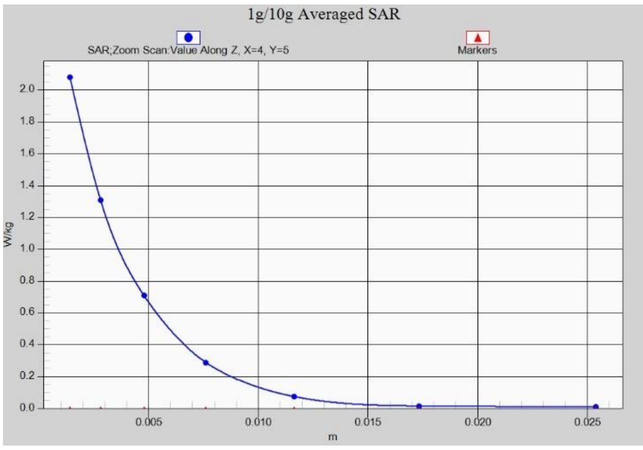


Fig. 1-22 Z-Scan at power reference point (wifi5G)

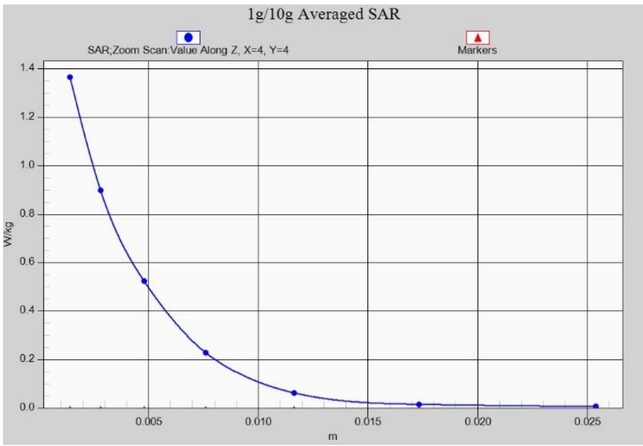


Fig. 1-23 Z-Scan at power reference point (wifi5G)

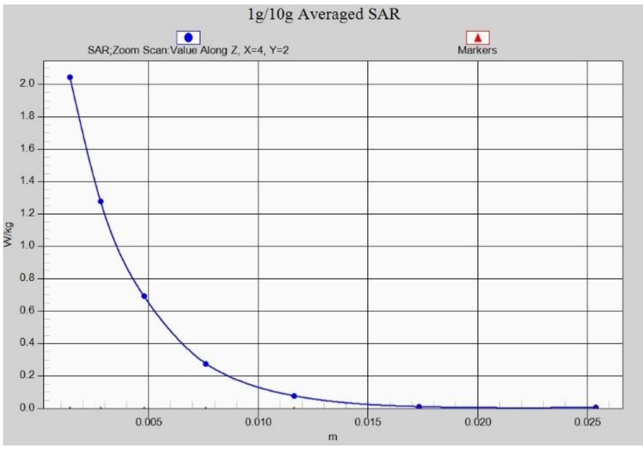


Fig. 1-24 Z-Scan at power reference point (wifi5G)

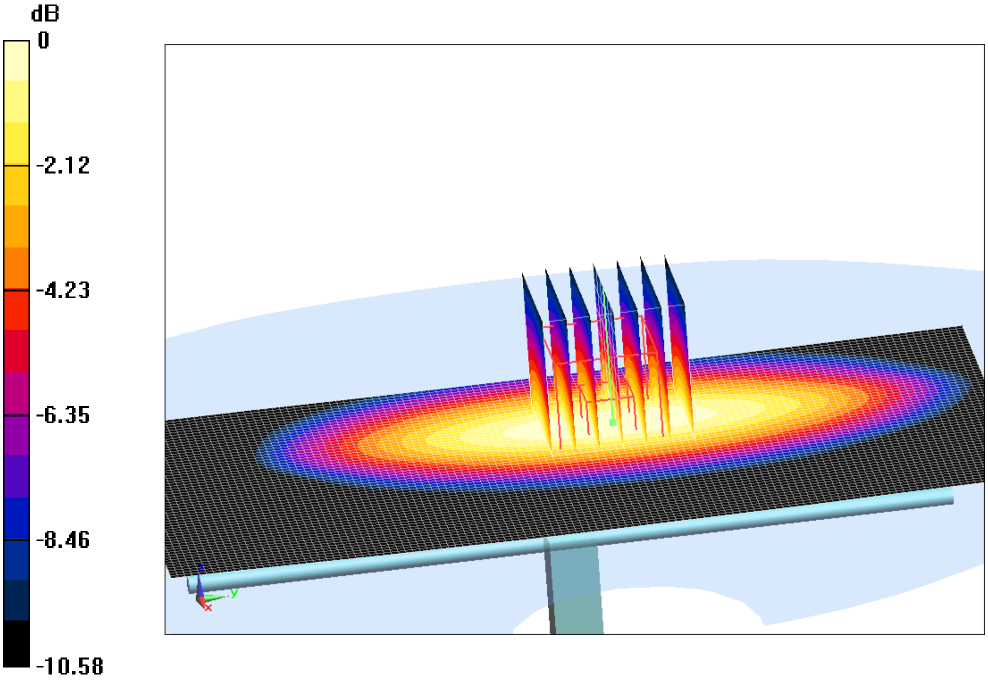
ANNEX B System Verification Results

835 MHz

Date: 5/16/2020
Electronics: DAE4 Sn777
Medium: Head 835 MHz
Medium parameters used: f = 835 MHz; σ =0.892 mho/m; ε_r = 41.34; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C Liquid Temperature: 22.3°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(10.45,10.45,10.45)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 64.09 V/m; Power Drift = -0.08
Fast SAR: SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (interpolated) = 3.11 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =64.09 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 3.56 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dB W/kg

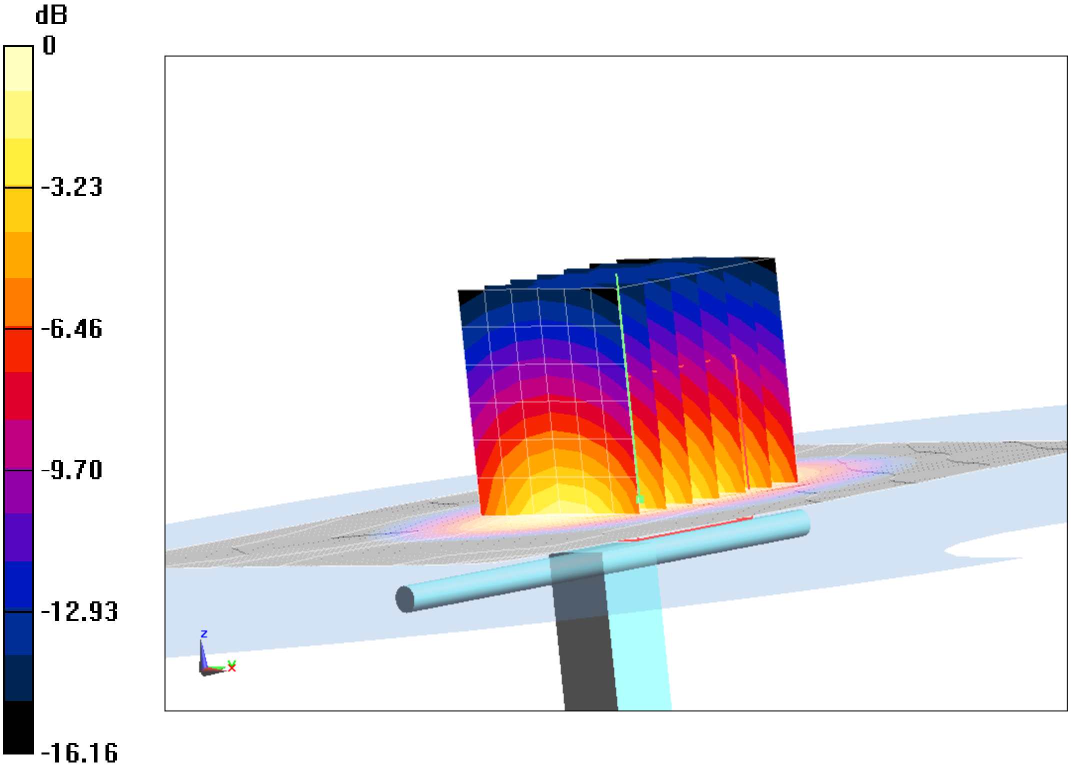
Fig.B.1 validation 835 MHz 250mW

1750 MHz

Date: 5/17/2020
Electronics: DAE4 Sn777
Medium: Head 1750 MHz
Medium parameters used: f = 1750 MHz; σ =1.374 mho/m; ε_r = 40.66; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC Liquid Temperature: 22.3ºC
Communication System: CW Frequency: 1750 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(8.86,8.86,8.86)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 105.84 V/m; Power Drift = -0.05
Fast SAR: SAR(1 g) = 9.07 W/kg; SAR(10 g) = 4.77 W/kg
Maximum value of SAR (interpolated) = 14.29 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =105.84 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 16.53 W/kg
SAR(1 g) = 9.29 W/kg; SAR(10 g) = 4.85 W/kg
Maximum value of SAR (measured) = 13.75 W/kg



0 dB = 13.75 W/kg = 11.38 dB W/kg

Fig.B.2 validation 1750 MHz 250mW

1900 MHz

Date: 5/18/2020
Electronics: DAE4 Sn777
Medium: Head 1900 MHz
Medium parameters used: f = 1900 MHz; σ =1.4 mho/m; ε_r = 40.54; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC Liquid Temperature: 22.3ºC
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(8.56,8.56,8.56)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 107.08 V/m; Power Drift = -0.02

Fast SAR: SAR(1 g) = 9.81 W/kg; SAR(10 g) = 5.2 W/kg

Maximum value of SAR (interpolated) = 15.43 W/kg

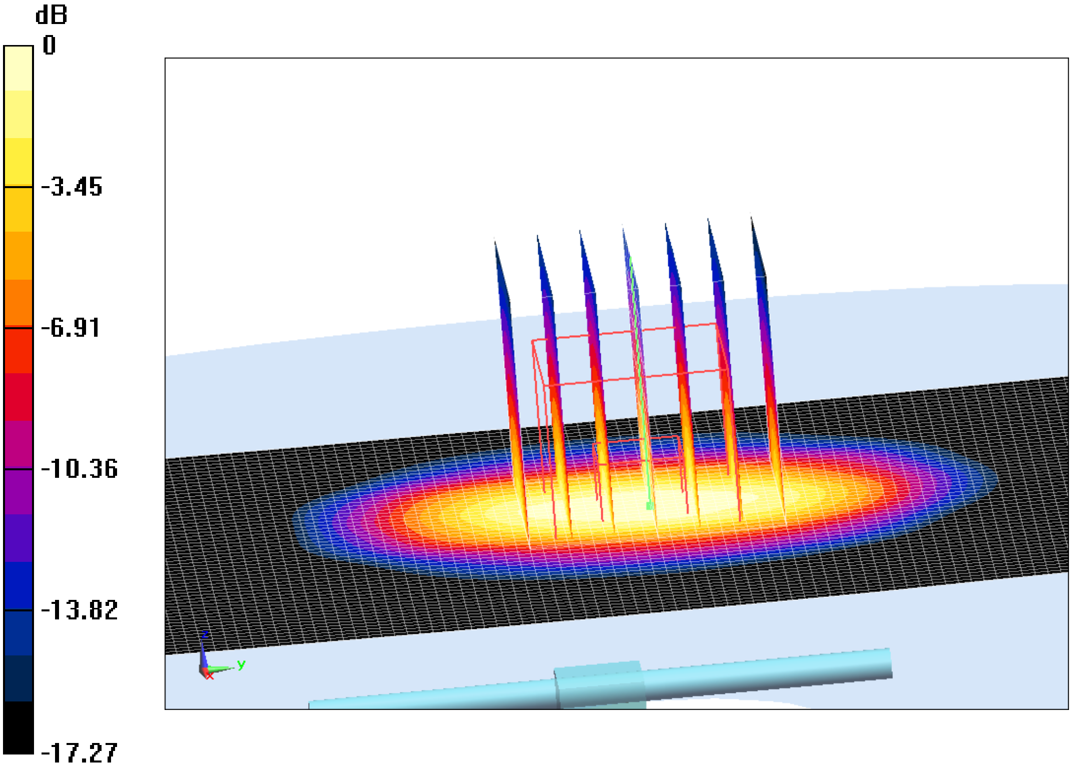
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =107.08 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 17.68 W/kg

SAR(1 g) = 10.12 W/kg; SAR(10 g) = 5.1 W/kg

Maximum value of SAR (measured) = 14.77 W/kg



0 dB = 14.77 W/kg = 11.69 dB W/kg

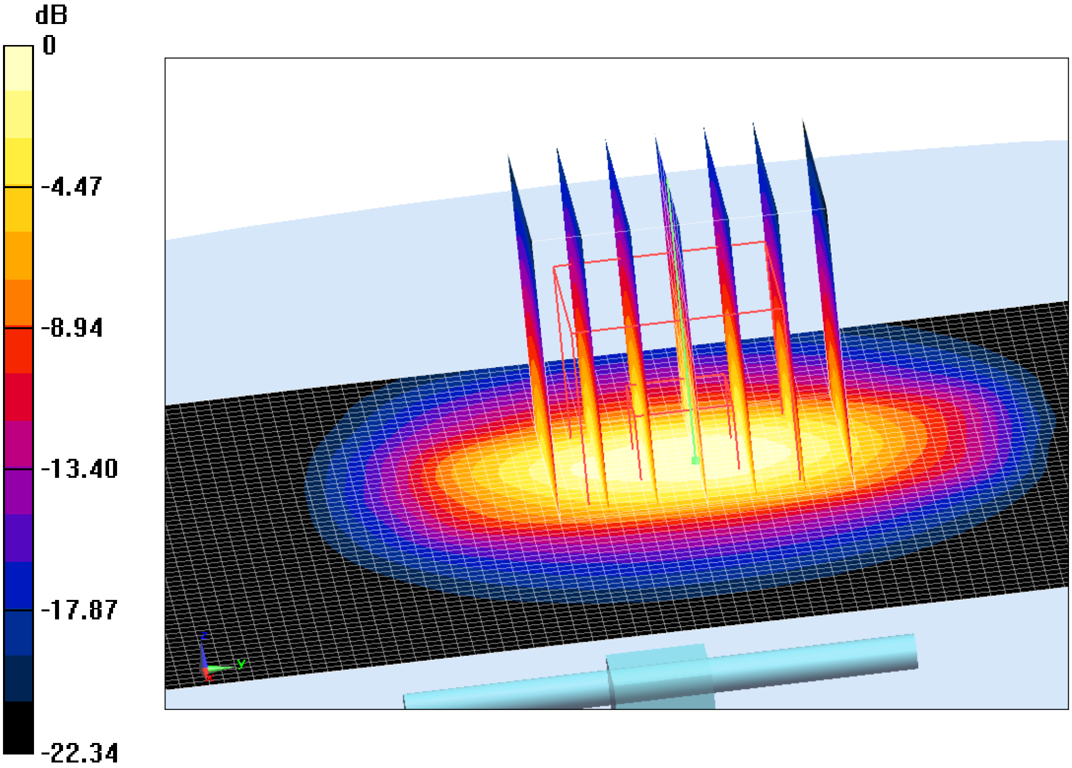
Fig.B.3 validation 1900 MHz 250mW

2450 MHz

Date: 5/19/2020
Electronics: DAE4 Sn777
Medium: Head 2450 MHz
Medium parameters used: f = 2450 MHz; σ =1.777 mho/m; ε_r = 38.43; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC Liquid Temperature: 22.3ºC
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.83,7.83,7.83)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 115.03 V/m; Power Drift = 0.1
Fast SAR: SAR(1 g) = 12.72 W/kg; SAR(10 g) = 5.94 W/kg
Maximum value of SAR (interpolated) = 21.96 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =115.03 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 25.78 W/kg
SAR(1 g) = 13.05 W/kg; SAR(10 g) = 6.01 W/kg
Maximum value of SAR (measured) = 21.55 W/kg



0 dB = 21.55 W/kg = 13.33 dB W/kg

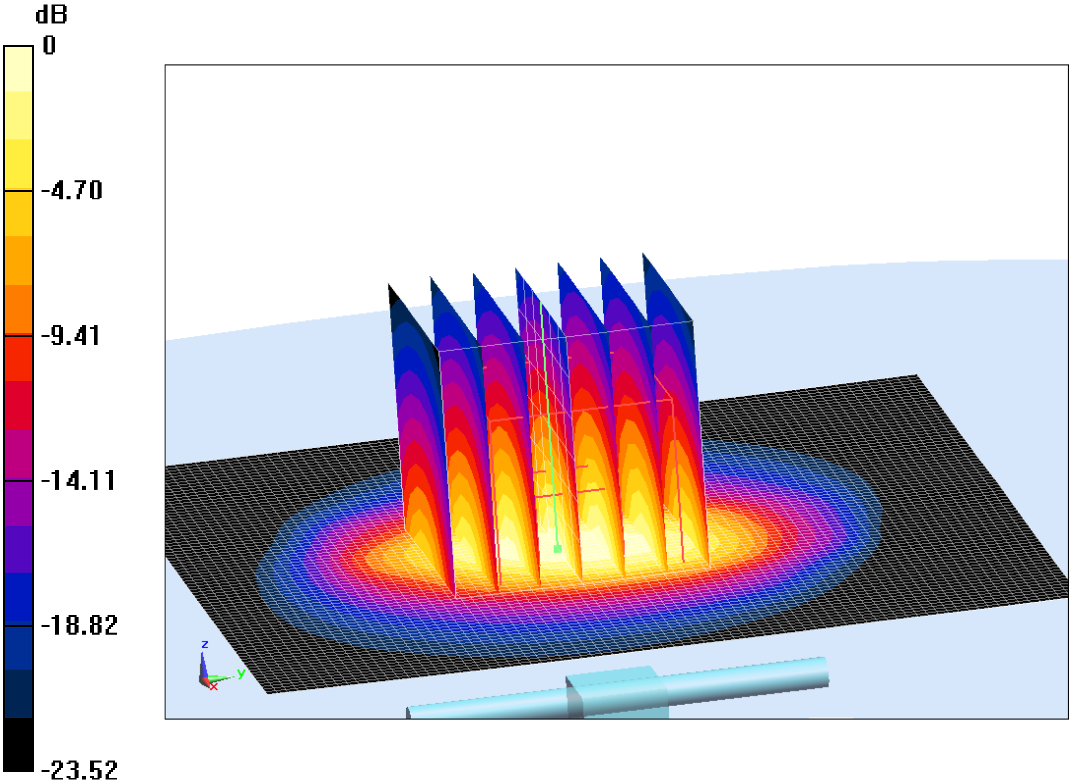
Fig.B.4 validation 2450 MHz 250mW

2600 MHz

Date: 5/20/2020
Electronics: DAE4 Sn777
Medium: Head 2600 MHz
Medium parameters used: f = 2600 MHz; σ =1.937 mho/m; ε_r = 39.12; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC Liquid Temperature: 22.3ºC
Communication System: CW Frequency: 2600 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.65,7.65,7.65)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 118.73 V/m; Power Drift = 0.01
Fast SAR: SAR(1 g) = 14.21 W/kg; SAR(10 g) = 6.4 W/kg
Maximum value of SAR (interpolated) = 24.32 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =118.73 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 28.85 W/kg
SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.4 W/kg
Maximum value of SAR (measured) = 23.69 W/kg



0 dB = 23.69 W/kg = 13.75 dB W/kg

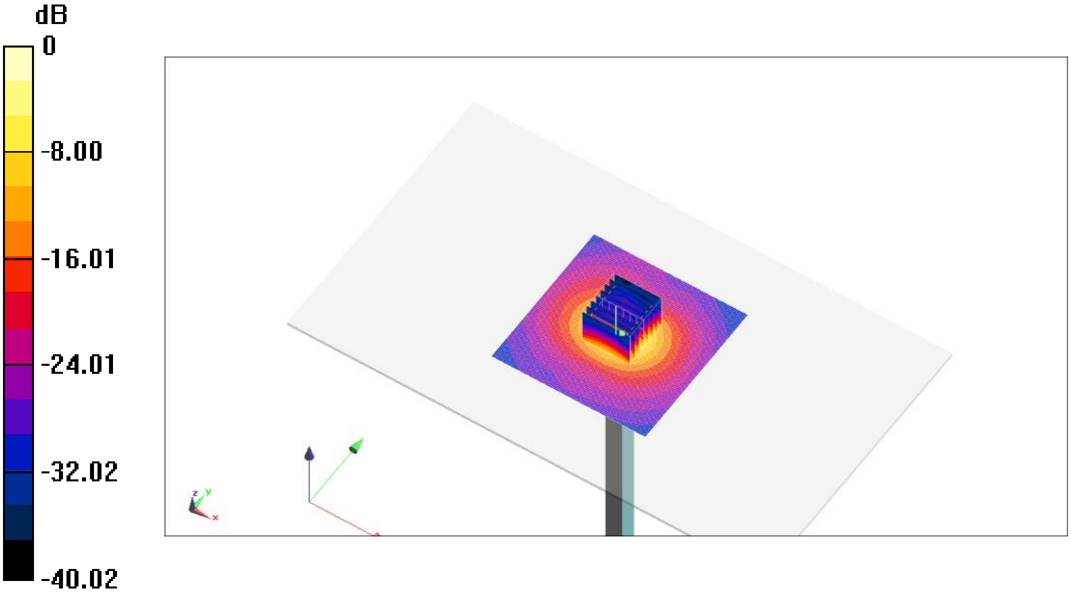
Fig.B.5 validation 2600 MHz 250mW

5250 MHz

Date: 5/21/2020
Electronics: DAE4 Sn777
Medium: Head 5250 MHz
Medium parameters used: f = 5250 MHz; σ =4.746 mho/m; ε_r = 35.37; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC Liquid Temperature: 22.3ºC
Communication System: CW Frequency: 5250 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(5.61,5.61,5.61)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.81 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =74.41 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 27.64 W/kg
SAR(1 g) = 20.28 W/kg; SAR(10 g) = 5.78 W/kg
Maximum value of SAR (measured) = 17.9 W/kg



0 dB = 17.9 W/kg = 12.53 dB W/kg

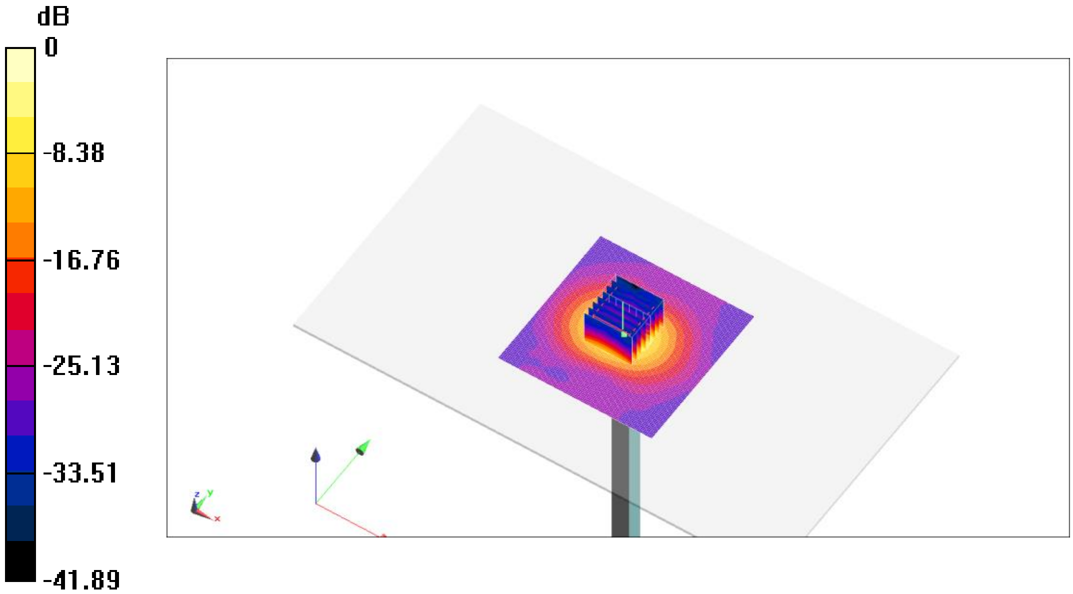
Fig.B.6 validation 5250 MHz 100mW

5600 MHz

Date: 5/22/2020
Electronics: DAE4 Sn777
Medium: Head 5600 MHz
Medium parameters used: f = 5600 MHz; σ =5.12 mho/m; ε_r = 36.1; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC Liquid Temperature: 22.3ºC
Communication System: CW Frequency: 5600 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(5.12,5.12,5.12)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 19.52 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =75.53 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 30.4 W/kg
SAR(1 g) = 20.93 W/kg; SAR(10 g) = 6.1 W/kg
Maximum value of SAR (measured) = 19.08 W/kg



0 dB = 19.08 W/kg = 12.81 dB W/kg

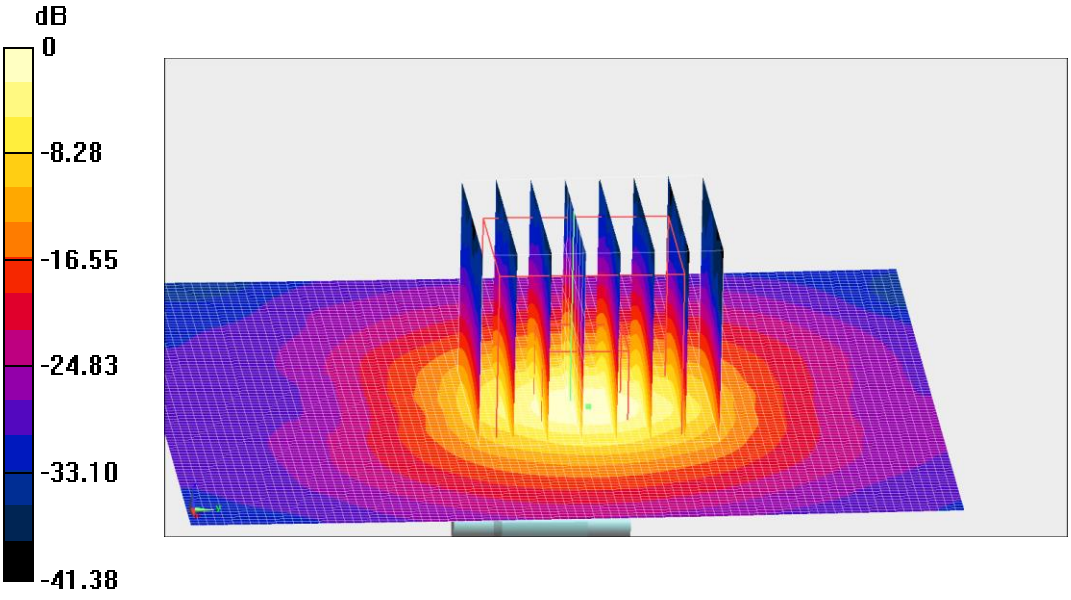
Fig.B.7 validation 5600 MHz 100mW

5750 MHz

Date: 5/23/2020
Electronics: DAE4 Sn777
Medium: Head 5750 MHz
Medium parameters used: f = 5750 MHz; σ =5.21 mho/m; ε_r = 35.36; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC Liquid Temperature: 22.3ºC
Communication System: CW Frequency: 5750 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(5.15,5.15,5.15)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 18.63 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =73.17 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 31.24 W/kg
SAR(1 g) = 20.04 W/kg; SAR(10 g) = 5.76 W/kg
Maximum value of SAR (measured) = 18.46 W/kg



0 dB = 18.46 W/kg = 12.66 dB W/kg

Fig.B.8 validation 5750 MHz 100mW

The SAR system verification must be required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR.

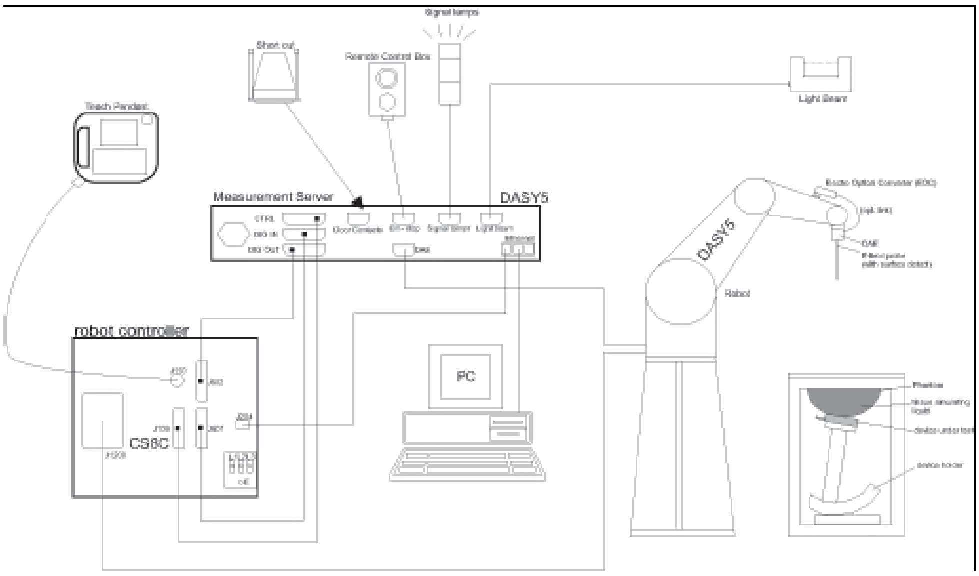
Table B.1 Comparison between area scan and zoom scan for system verification

Date	Band	Position	Area scan (1g)	Zoom scan (1g)	Drift (%)
2020-5-20	835	Head	2.41	2.47	-2.43
2020-5-21	1750	Head	9.07	9.29	-2.37
2020-5-22	1900	Head	9.81	10.12	-3.06
2020-5-23	2450	Head	12.72	13.05	-2.53
2020-5-24	2600	Head	14.21	13.9	2.23

ANNEX C SAR Measurement Setup

C.1 Measurement Set-up

The Dasy4 or DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Picture C.1SAR Lab Test Measurement Set-up

- A standard high precision 6-axis robot (StäubliTX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY4 or DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as
- warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

C.2 Dasy4 or DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 or DASY5 software reads the reflection durning a software approach and looks for the maximum using 2nd ord curve fitting. The approach is stopped at reaching the maximum.

Picture C.2Near-field Probe

Probe Specifications:

Model: ES3DV3, EX3DV4

Frequency 10MHz — 6.0GHz(EX3DV4)

Range: 10MHz — 4GHz(ES3DV3)

Calibration: In head and body simulating tissue at Frequencies from 835 up to 5800MHz

Linearity: ± 0.2 dB(30 MHz to 6 GHz) for EX3DV4

± 0.2 dB(30 MHz to 4 GHz) for ES3DV3

DynamicRange: 10 mW/kg — 100W/kg

Probe Length: 330 mm

Probe Tip

Length: 20 mm

Body Diameter: 12 mm

Tip Diameter: 2.5 mm (3.9 mm for ES3DV3)

Tip-Center: 1 mm (2.0mm for ES3DV3)

Application:SAR Dosimetry Testing

Compliance tests ofmobile phones

Dosimetry in strong gradient fields

Picture C.3E-field Probe

C.3 E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm^2.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

$$SAR = \frac{|E|^2 \cdot \sigma}{\rho}$$

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

C.4 Other Test Equipment

C.4.1 Data Acquisition Electronics(DAE)

The data acquisition electronics consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

PictureC.4: DAE

C.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90XL; DASY5: RX160L) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchron motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Picture C.5DASY 4

Picture C.6DASY 5

C.4.3 Measurement Server

The Measurement server is based on a PC/104 CPU broad with CPU (dasy4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128MB), RAM (DASY4: 64 MB, DASY5: 128MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O broad, which is directly connected to the PC/104 bus of the CPU broad.

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

Picture C.7 Server for DASY 4

Picture C.8 Server for DASY 5

C.4.4 Device Holder for Phantom

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

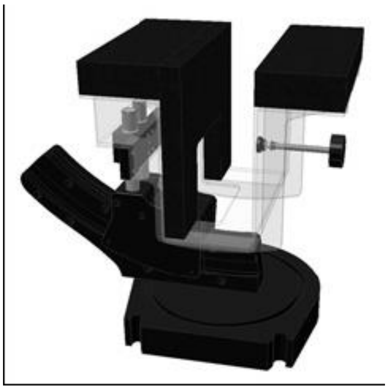
The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ =0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms.

Picture C.9-1: Device Holder



Picture C.9-2: Laptop Extension Kit

C.4.5 Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to

Represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

Shell Thickness: 2±0. 2 mm

Filling Volume: Approx. 25 liters

Dimensions: 810 x l000 x 500 mm (H x L x W)

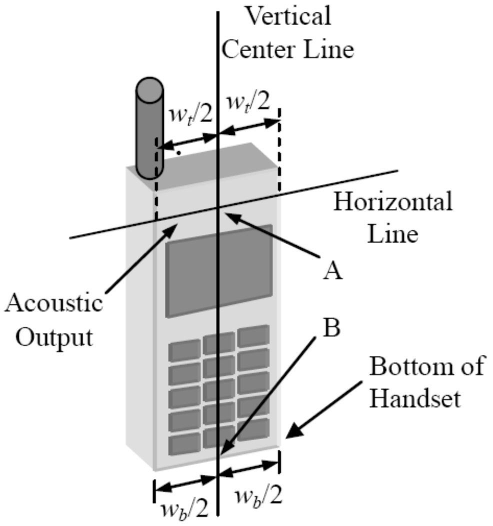
Available: Special

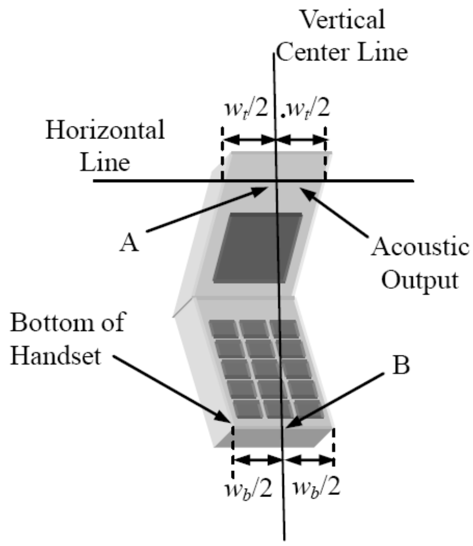
Picture C.10: SAM Twin Phantom

ANNEX D Position of the wireless device in relation to the phantom

D.1 General considerations

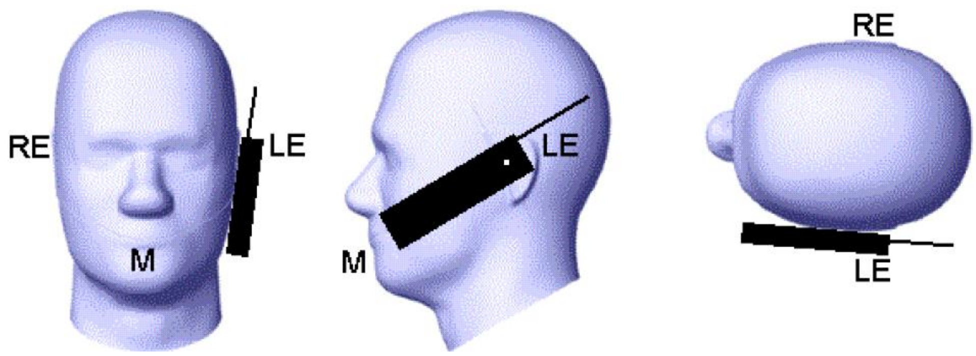
This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.



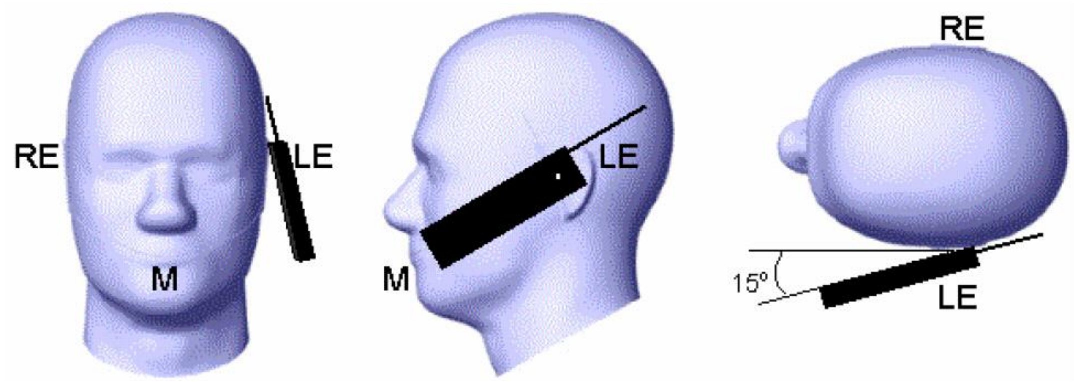


W_t	Width of the handset at the level of the acoustic
W_b	Width of the bottom of the handset
A	Midpoint of the width W_t of the handset at the level of the acoustic output
B	Midpoint of the width W_b of the bottom of the handset

Picture D.1-a Typical “fixed” case handset **Picture D.1-b Typical “clam-shell” case handset**



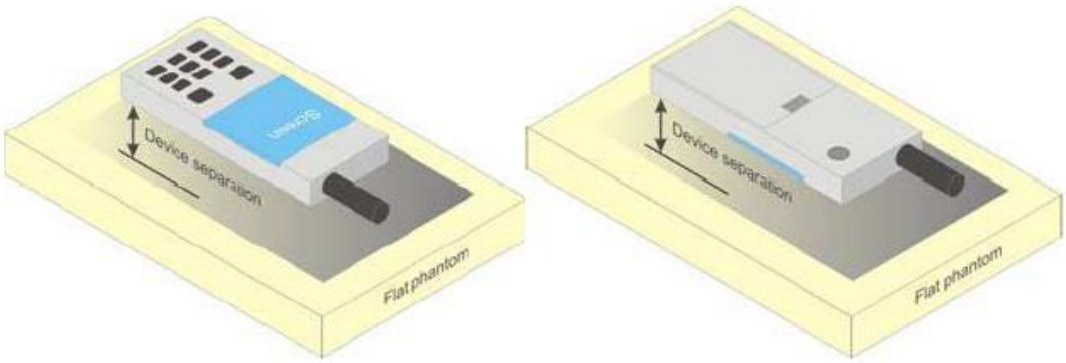
Picture D.2 Cheek position of the wireless device on the left side of SAM



Picture D.3 Tilt position of the wireless device on the left side of SAM

D.2 Body-worn device

A typical example of a body-worn device is a mobile phone, wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.

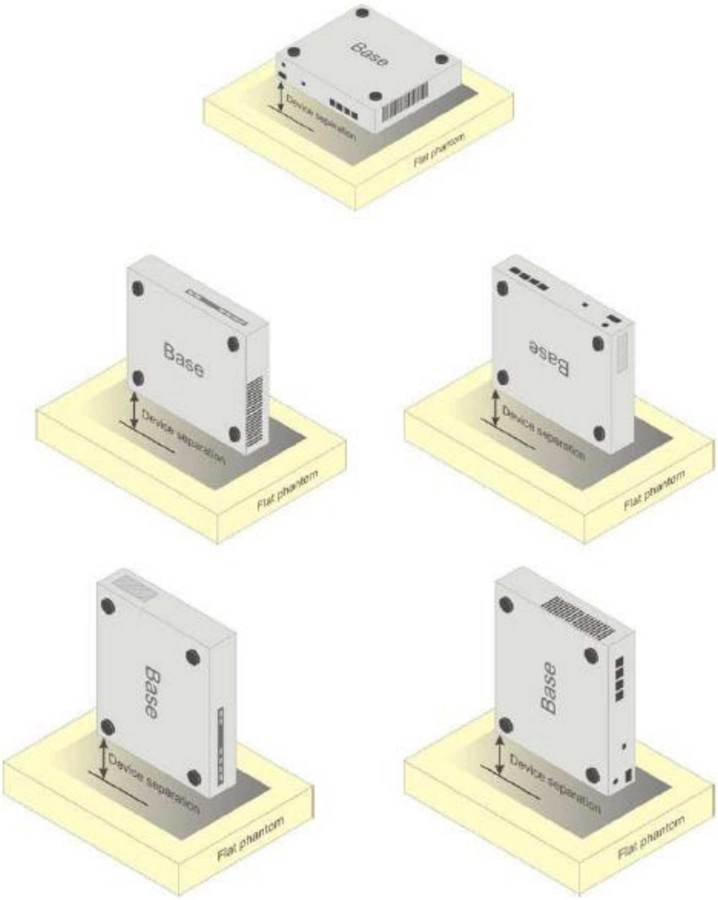


Picture D.4Test positions for body-worn devices

D.3 Desktop device

A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.

The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions, tests shall be performed for all antenna positions specified. Picture8.5 show positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.



Picture D.5 Test positions for desktop devices

D.4 DUT Setup Photos

Picture D.6

ANNEX E Equivalent Media Recipes

The liquid used for the frequency range of 800-3000 MHz consisted of water, sugar, salt, preventol, glycol monobutyl and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table E.1 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209.

TableE.1: Composition of the Tissue Equivalent Matter

Frequency (MHz)	835Head	835Body	1900 Head	1900 Body	2450 Head	2450 Body	5800 Head	5800 Body
Ingredients (% by weight)								
Water	41.45	52.5	55.242	69.91	58.79	72.60	65.53	65.53
Sugar	56.0	45.0	\	\	\	\	\	\
Salt	1.45	1.4	0.306	0.13	0.06	0.18	\	\
Preventol	0.1	0.1	\	\	\	\	\	\
Cellulose	1.0	1.0	\	\	\	\	\	\
Glycol Monobutyl	\	\	44.452	29.96	41.15	27.22	\	\
Diethylenglycol monohexylether	\	\	\	\	\	\	17.24	17.24
Triton X-100	\	\	\	\	\	\	17.24	17.24
Dielectric Parameters Target Value	ε=41.5 σ=0.90	ε=55.2 σ=0.97	ε=40.0 σ=1.40	ε=53.3 σ=1.52	ε=39.2 σ=1.80	ε=52.7 σ=1.95	ε=35.3 σ=5.27	ε=48.2 σ=6.00

Note: There are a little adjustment respectively for 750, 1750, 2600, 5200, 5300 and 5600 based on the recipe of closest frequency in table E.1.

ANNEX F System Validation

The SAR system must be validated against its performance specifications before it is deployed. When SAR probes, system components or software are changed, upgraded or recalibrated, these must be validated with the SAR system(s) that operates with such components.

Table F.1: System Validation for 7307

Probe SN.	Liquid name	Validation date	Frequency point	Status (OK or Not)
7307	Head 750MHz	June 14,2019	750 MHz	OK
7307	Head 850MHz	June 14,2019	835 MHz	OK
7307	Head 900MHz	June 14,2019	900 MHz	OK
7307	Head 1750MHz	June 14,2019	1750 MHz	OK
7307	Head 1810MHz	June 14,2019	1810 MHz	OK
7307	Head 1900MHz	June 15,2019	1900 MHz	OK
7307	Head 2000MHz	June 15,2019	2000 MHz	OK
7307	Head 2100MHz	June 15,2019	2100 MHz	OK
7307	Head 2300MHz	June 15,2019	2300 MHz	OK
7307	Head 2450MHz	June 15,2019	2450 MHz	OK
7307	Head 2600MHz	June 16,2019	2600 MHz	OK
7307	Head 3500MHz	June 16,2019	3500 MHz	OK
7307	Head 3700MHz	June 16,2019	3700 MHz	OK
7307	Head 5200MHz	June 16,2019	5250 MHz	OK
7307	Head 5500MHz	June 16,2019	5600 MHz	OK
7307	Head 5800MHz	June 16,2019	5800 MHz	OK
7307	Body 750MHz	June 16,2019	750 MHz	OK
7307	Body 850MHz	June 13,2019	835 MHz	OK
7307	Body 900MHz	June 13,2019	900 MHz	OK
7307	Body 1750MHz	June 13,2019	1750 MHz	OK
7307	Body 1810MHz	June 13,2019	1810 MHz	OK
7307	Body 1900MHz	June 13,2019	1900 MHz	OK
7307	Body 2000MHz	June 17,2019	2000 MHz	OK
7307	Body 2100MHz	June 17,2019	2100 MHz	OK
7307	Body 2300MHz	June 17,2019	2300 MHz	OK
7307	Body 2450MHz	June 17,2019	2450 MHz	OK
7307	Body 2600MHz	June 17,2019	2600 MHz	OK
7307	Body 3500MHz	June 12,2019	3500 MHz	OK
7307	Body 3700MHz	June 12,2019	3700 MHz	OK
7307	Body 5200MHz	June 12,2019	5250 MHz	OK
7307	Body 5500MHz	June 12,2019	5600 MHz	OK
7307	Body 5800MHz	June 12,2019	5800 MHz	OK

ANNEX G Probe Calibration Certificate

Probe 7307 Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **CTTL (Auden)**

Certificate No: **EX3-7307_May19/2**

CALIBRATION CERTIFICATE (Replacement of No: EX3-7307_May19)

Object: EX3DV4 - SN:7307

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v5, QA CAL-23.v5, QA CAL-25.v7
Calibration procedure for dosimetric E-field probes

Calibration date: May 24, 2019

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-19 (No. 217-02894)	Apr-20
DAE4	SN: 660	19-Dec-18 (No. DAE4-660_Dec18)	Dec-19
Reference Probe ES3DV2	SN: 3013	31-Dec-18 (No. ES3-3013_Dec18)	Dec-19
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: August 29, 2019

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-7307_May19/2 Page 1 of 20

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7307

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)^2)[A]	0.43	0.56	0.61	± 10.1 %
DCP (mV)[B]	102.1	99.1	102.7	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√µV	C	D dB	VR mV	Max dev.	Max Unc[E] (k=2)
0	CW	X	0.00	0.00	1.00	0.00	174.7	± 2.7 %	± 4.7 %
		Y	0.00	0.00	1.00		199.0		
		Z	0.00	0.00	1.00		181.2		
10352-AAA	Pulse Waveform (200Hz, 10%)	X	2.78	66.95	10.51	10.00	60.0	± 3.4 %	± 9.6 %
		Y	8.27	78.51	15.51		60.0		
		Z	6.37	75.82	14.32		60.0		
10353-AAA	Pulse Waveform (200Hz, 20%)	X	1.94	66.73	9.52	6.99	80.0	± 2.3 %	± 9.6 %
		Y	15.00	85.43	16.34		80.0		
		Z	15.00	84.89	16.05		80.0		
10354-AAA	Pulse Waveform (200Hz, 40%)	X	15.00	82.10	12.96	3.98	95.0	± 1.2 %	± 9.6 %
		Y	15.00	85.52	14.80		95.0		
		Z	15.00	87.52	16.05		95.0		
10355-AAA	Pulse Waveform (200Hz, 60%)	X	15.00	82.12	11.97	2.22	120.0	± 1.1 %	± 9.6 %
		Y	15.00	80.75	11.37		120.0		
		Z	15.00	91.49	16.77		120.0		
10387-AAA	QPSK Waveform, 1 MHz	X	0.49	60.00	6.70	0.00	150.0	± 2.8 %	± 9.6 %
		Y	0.51	60.00	6.52		150.0		
		Z	0.64	61.71	8.47		150.0		
10388-AAA	QPSK Waveform, 10 MHz	X	2.22	69.09	16.38	0.00	150.0	± 1.3 %	± 9.6 %
		Y	1.93	66.26	14.71		150.0		
		Z	2.36	69.67	16.64		150.0		
10396-AAA	64-QAM Waveform, 100 kHz	X	2.89	72.05	19.45	3.01	150.0	± 1.4 %	± 9.6 %
		Y	2.27	66.70	17.18		150.0		
		Z	3.00	72.32	19.69		150.0		
10399-AAA	64-QAM Waveform, 40 MHz	X	3.49	67.60	16.07	0.00	150.0	± 2.2 %	± 9.6 %
		Y	3.32	66.34	15.32		150.0		
		Z	3.45	67.29	15.94		150.0		
10414-AAA	WLAN CCDF, 64-QAM, 40MHz	X	4.76	66.03	15.76	0.00	150.0	± 4.1 %	± 9.6 %
		Y	4.66	65.25	15.33		150.0		
		Z	4.72	65.62	15.56		150.0		

Note: For details on UID parameters see Appendix

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7307

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	34.6	254.28	34.68	6.78	0.00	5.01	1.80	0.04	1.00
Y	37.0	283.14	36.99	6.23	0.12	5.06	0.00	0.34	1.01
Z	39.0	286.91	34.71	9.13	0.00	5.03	1.41	0.12	1.01

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	27.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7307

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
64	54.2	0.75	14.19	14.19	14.19	0.00	1.00	± 13.3 %
300	45.3	0.87	11.97	11.97	11.97	0.08	1.25	± 13.3 %
450	43.5	0.87	11.38	11.38	11.38	0.12	1.25	± 13.3 %
750	41.9	0.89	10.58	10.58	10.58	0.61	0.86	± 12.0 %
835	41.5	0.90	10.45	10.45	10.45	0.55	0.88	± 12.0 %
900	41.5	0.97	10.12	10.12	10.12	0.55	0.90	± 12.0 %
1450	40.5	1.20	9.07	9.07	9.07	0.35	0.80	± 12.0 %
1640	40.2	1.31	8.99	8.99	8.99	0.32	0.83	± 12.0 %
1750	40.1	1.37	8.86	8.86	8.86	0.31	0.85	± 12.0 %
1810	40.0	1.40	8.64	8.64	8.64	0.25	0.86	± 12.0 %
1900	40.0	1.40	8.56	8.56	8.56	0.25	0.86	± 12.0 %
2000	40.0	1.40	8.50	8.50	8.50	0.29	0.85	± 12.0 %
2100	39.8	1.49	8.47	8.47	8.47	0.24	0.85	± 12.0 %
2300	39.5	1.67	8.10	8.10	8.10	0.35	0.88	± 12.0 %
2450	39.2	1.80	7.83	7.83	7.83	0.36	0.90	± 12.0 %
2600	39.0	1.96	7.65	7.65	7.65	0.35	0.90	± 12.0 %
3300	38.2	2.71	7.35	7.35	7.35	0.30	1.30	± 13.1 %
3500	37.9	2.91	6.98	6.98	6.98	0.30	1.30	± 13.1 %
3700	37.7	3.12	6.71	6.71	6.71	0.30	1.30	± 13.1 %
3900	37.5	3.32	6.57	6.57	6.57	0.40	1.60	± 13.1 %
4100	37.2	3.53	6.45	6.45	6.45	0.40	1.60	± 13.1 %
4200	37.1	3.63	6.38	6.38	6.38	0.40	1.60	± 13.1 %
4400	36.9	3.84	6.36	6.36	6.36	0.40	1.70	± 13.1 %
4600	36.7	4.04	6.24	6.24	6.24	0.40	1.70	± 13.1 %
4800	36.4	4.25	6.15	6.15	6.15	0.40	1.70	± 13.1 %
4950	36.3	4.40	5.99	5.99	5.99	0.40	1.80	± 13.1 %
5200	36.0	4.66	5.71	5.71	5.71	0.40	1.80	± 13.1 %
5250	35.9	4.71	5.61	5.61	5.61	0.40	1.80	± 13.1 %
5300	35.9	4.76	5.48	5.48	5.48	0.40	1.80	± 13.1 %
5500	35.6	4.96	5.25	5.25	5.25	0.40	1.80	± 13.1 %
5600	35.5	5.07	5.12	5.12	5.12	0.40	1.80	± 13.1 %
5750	35.4	5.22	5.15	5.15	5.15	0.40	1.80	± 13.1 %
5800	35.3	5.27	5.02	5.02	5.02	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.