

Table 14-14 LTE700-FDD14 #1 Body

LTE700-FDD14 #1 Body								
Ambient Temperature: 22.5				Liquid Temperature: 22.3				
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			23330	23330	23330	23330	23330	23330
			L	M	H	L	M	H
10MHz QPSK1RB	Tune-up		24.00	24.00	24.00	Scaling factor*		
	Measured Power [dBm]		23.08	23.54	0.00	1.24	1.11	251.19
	Front	1g SAR		0.11			0.12	
		10g SAR		0.086			0.10	
		Deviation		0.06			0.06	
	Rear	1g SAR		0.209			0.23	
		10g SAR		0.162			0.18	
		Deviation		-0.02			-0.02	
	Left edge	1g SAR		0.104			0.12	
		10g SAR		0.071			0.08	
		Deviation		0.04			0.04	
	Right edge	1g SAR		0.093			0.10	
		10g SAR		0.063			0.07	
		Deviation		0.01			0.01	
	Bottom edge	1g SAR		0.048			0.05	
10g SAR			0.038			0.04		
Deviation			-0.05			-0.05		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			23330	23330	23330	23330	23330	23330
			L	H	H			
10MHz QPSK50% RB	Tune-up		23.00	23.00	23.00	Scaling factor*		
	Measured Power [dBm]		22.32	0.00	0.00	1.17	199.53	199.53
	Front	1g SAR	0.085			0.10		
		10g SAR	0.066			0.08		
		Deviation	0.03			0.03		
	Rear	1g SAR	0.162			0.19		
		10g SAR	0.126			0.15		
		Deviation	0.09			0.09		
	Left edge	1g SAR	0.108			0.13		
		10g SAR	0.075			0.09		
		Deviation	0.06			0.06		
	Right edge	1g SAR	0.079			0.09		
		10g SAR	0.054			0.06		
		Deviation	0.01			0.01		
	Bottom edge	1g SAR	0.038			0.04		
10g SAR		0.033			0.04			
Deviation		-0.02			-0.02			

Table 14-15 LTE2300-FDD30 #1 Head

LTE2300-FDD30 #1 Head				
Ambient Temperature:		22.5		Liquid Temperature:
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]	Reported SAR [W/kg]
			27710	27710
			M	M
10MHz QPSK1RB	Tune-up		23.50	Scaling factor*
	Measured Power [dBm]		23.32	1.04
	Left Cheek	1g SAR	0.085	0.09
		10g SAR	0.049	0.05
		Deviation	0.06	0.06
	Left Tilt	1g SAR	0.066	0.07
		10g SAR	0.037	0.04
		Deviation	-0.01	-0.01
	Right Cheek	1g SAR	0.14	0.15
		10g SAR	0.076	0.08
		Deviation	0.04	0.04
	Right Tilt	1g SAR	0.092	0.10
		10g SAR	0.052	0.05
		Deviation	-0.09	-0.09
TRUE	Device orientation	SAR measurement	Measured SAR [W/kg]	Reported SAR [W/kg]
			27710	27710
			M	M
10MHz QPSK50% RB	Tune-up		22.50	Scaling factor*
	Measured Power [dBm]		22.08	1.10
	Left Cheek	1g SAR	0.068	0.07
		10g SAR	0.04	0.04
		Deviation	-0.04	-0.04
	Left Tilt	1g SAR	0.05	0.06
		10g SAR	0.03	0.03
		Deviation	0.03	0.03
	Right Cheek	1g SAR	0.114	0.13
		10g SAR	0.062	0.07
		Deviation	0.01	0.01
	Right Tilt	1g SAR	0.078	0.09
		10g SAR	0.046	0.05
		Deviation	0.07	0.07

Table 14-16 LTE2300-FDD30 #1 Body

LTE2300-FDD30 #1 Body				
Ambient Temperature:		22.5		Liquid Temperature:
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]	Reported SAR [W/kg]
			27710	27710
			M	M
10MHz QPSK1RB	Tune-up		23.50	Scaling factor*
	Measured Power [dBm]		23.32	1.04
	Front	1g SAR	0.428	0.45
		10g SAR	0.209	0.22
		Deviation	-0.12	-0.12
	Rear	1g SAR	0.681	0.71
		10g SAR	0.318	0.33
		Deviation	0.08	0.08
	Left edge	1g SAR	0.134	0.14
		10g SAR	0.074	0.08
		Deviation	0.03	0.03
	Right edge	1g SAR	0.186	0.19
		10g SAR	0.102	0.11
		Deviation	0.06	0.06
	Bottom edge	1g SAR	0.722	0.75
10g SAR		0.339	0.35	
Deviation		-0.01	-0.01	
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]	Reported SAR [W/kg]
			27710	27710
			M	M
10MHz QPSK50% RB	Tune-up		22.50	Scaling factor*
	Measured Power [dBm]		22.08	1.10
	Front	1g SAR	0.35	0.39
		10g SAR	0.172	0.19
		Deviation	-0.07	-0.07
	Rear	1g SAR	0.627	0.69
		10g SAR	0.289	0.32
		Deviation	0.03	0.03
	Left edge	1g SAR	0.11	0.12
		10g SAR	0.056	0.06
		Deviation	0.03	0.03
	Right edge	1g SAR	0.159	0.17
		10g SAR	0.086	0.09
		Deviation	0.02	0.02
	Bottom edge	1g SAR	0.645	0.71
10g SAR		0.304	0.33	
Deviation		0.06	0.06	



Table 14-17 LTE1700-FDD66 #1 Head

LTE1700-FDD66 #1 Head								
Ambient Temperature: 22.5				Liquid Temperature: 22.3				
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			132572	132322	132072	132572	132322	132072
			M	M	M	M	M	M
20MHz QPSK1RB	Tune-up		23.00	23.00	23.00	Scaling factor*		
	Measured Power [dBm]		21.83	22.13	22.00	1.31	1.22	1.26
	Left Cheek	1g SAR		0.117			0.14	
		10g SAR		0.082			0.10	
		Deviation		0.09			0.09	
	Left Tilt	1g SAR		0.109			0.13	
		10g SAR		0.063			0.08	
		Deviation		0.03			0.03	
	Right Cheek	1g SAR		0.17			0.21	
		10g SAR		0.107			0.13	
		Deviation		-0.02			-0.02	
	Right Tilt	1g SAR		0.115			0.14	
		10g SAR		0.069			0.08	
		Deviation		-0.01			-0.01	
	TRUE	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]	
132572				132322	132072	132572	132322	132072
L				L	L	L	L	L
20MHz QPSK50% RB	Tune-up		22.00	22.00	22.00	Scaling factor*		
	Measured Power [dBm]		20.69	20.95	20.98	1.35	1.27	1.26
	Left Cheek	1g SAR			0.084			0.11
		10g SAR			0.054			0.07
		Deviation			-0.06			-0.06
	Left Tilt	1g SAR			0.078			0.10
		10g SAR			0.045			0.06
		Deviation			0.03			0.03
	Right Cheek	1g SAR			0.164			0.21
		10g SAR			0.101			0.13
		Deviation			0.08			0.08
	Right Tilt	1g SAR			0.069			0.09
		10g SAR			0.041			0.05
		Deviation			0.05			0.05

Table 14-18 LTE1700-FDD66 #1 Body

LTE1700-FDD66 #1 Body									
Ambient Temperature:			22.5			Liquid Temperature:			22.3
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			132572	132322	132072	132572	132322	132072	
			M	M	M	M	M	M	
20MHz QPSK1RB	Tune-up		23.00	23.00	23.00	Scaling factor*			
	Measured Power [dBm]		21.83	22.13	22.00	1.31	1.22	1.26	
	Front	1g SAR		0.529			0.65		
		10g SAR		0.283			0.35		
		Deviation		0.06			0.06		
	Rear	1g SAR		0.608			0.74		
		10g SAR		0.314			0.38		
		Deviation		-0.05			-0.05		
	Left edge	1g SAR		0.263			0.32		
		10g SAR		0.137			0.17		
		Deviation		-0.01			-0.01		
	Right edge	1g SAR		0.125			0.15		
		10g SAR		0.074			0.09		
		Deviation		0.05			0.05		
	Bottom edge	1g SAR		0.493			0.60		
10g SAR			0.269			0.33			
Deviation			0.03			0.03			
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			132572	132322	132072	132572	132322	132072	
			L	L	L				
20MHz QPSK50% RB	Tune-up		22.00	22.00	22.00	Scaling factor*			
	Measured Power [dBm]		20.69	20.95	20.98	1.35	1.27	1.26	
	Front	1g SAR			0.391			0.49	
		10g SAR			0.242			0.31	
		Deviation			-0.07			-0.07	
	Rear	1g SAR			0.365			0.46	
		10g SAR			0.172			0.22	
		Deviation			-0.01			-0.01	
	Left edge	1g SAR			0.141			0.18	
		10g SAR			0.071			0.09	
		Deviation			0.04			0.04	
	Right edge	1g SAR			0.07			0.09	
		10g SAR			0.042			0.05	
		Deviation			0.02			0.02	
	Bottom edge	1g SAR			0.327			0.41	
10g SAR				0.186			0.24		
Deviation				0.03			0.03		



14.2 Full SAR

Test Band	Channel	Frequency	Tune-Up	Measured Power	Test Position	Measured 10g SAR	Measured 1g SAR	Reported 10g SAR	Reported 1g SAR	Power Drift	Figure
WCDMA1900-BII	9400	1880 MHz	23.5	22.56	Left Cheek	0.062	0.106	0.08	0.13	0.06	Fig A.1
WCDMA1900-BII	9262	1852.4 MHz	23.5	22.31	Bottom edge	0.266	0.461	0.35	0.61	-0.01	Fig A.2
WCDMA1700-BIV	1513	1752.6 MHz	23	21.97	Right Cheek	0.175	0.274	0.22	0.35	-0.16	Fig A.3
WCDMA1700-BIV	1513	1752.6 MHz	23	21.97	Rear	0.258	0.474	0.33	0.60	-0.17	Fig A.4
WCDMA850-BV	4233	846.6 MHz	24	23.03	Left Cheek	0.283	0.377	0.35	0.47	-0.01	Fig A.5
WCDMA850-BV	4233	846.6 MHz	24	23.03	Rear	0.347	0.453	0.43	0.57	-0.05	Fig A.6
LTE1900-FDD2	19100	1900 MHz	23	22.84	Right Cheek	0.146	0.243	0.15	0.25	0.03	Fig A.7
LTE1900-FDD2	19100	1900 MHz	23	22.84	Bottom edge	0.251	0.446	0.26	0.46	0.02	Fig A.8
LTE850-FDD5	20525	836.5 MHz	23.5	22.91	Left Cheek	0.202	0.269	0.23	0.31	0.1	Fig A.9
LTE850-FDD5	20525	836.5 MHz	23.5	22.91	Rear	0.166	0.374	0.19	0.43	0.01	Fig A.10
LTE700-FDD12	23095	707.5 MHz	23.8	23.38	Left Cheek	0.039	0.051	0.04	0.06	-0.07	Fig A.11
LTE700-FDD12	23095	707.5 MHz	23.8	23.38	Front	0.044	0.055	0.05	0.06	0.13	Fig A.12
LTE700-FDD14	23330	793 MHz	24	23.54	Left Cheek	0.088	0.116	0.10	0.13	0.15	Fig A.13
LTE700-FDD14	23330	793 MHz	24	23.54	Rear	0.162	0.209	0.18	0.23	-0.02	Fig A.14
LTE2300-FDD30	27710	2310 MHz	23.5	23.32	Right Cheek	0.076	0.14	0.08	0.15	0.04	Fig A.15
LTE2300-FDD30	27710	2310 MHz	23.5	23.32	Bottom edge	0.339	0.722	0.35	0.75	-0.01	Fig A.16
LTE1700-FDD66	132322	1745 MHz	23	22.13	Right Cheek	0.107	0.17	0.13	0.21	-0.02	Fig A.17
LTE1700-FDD66	132322	1745 MHz	23	22.13	Rear	0.314	0.608	0.38	0.74	-0.05	Fig A.18
WLAN2450	6	2437	20.5	20.04	Left Cheek	0.24	0.496	0.27	0.55	0.02	Fig A.19
WLAN2450	6	2437	20.5	20.04	Rear	0.106	0.211	0.12	0.23	0.08	Fig A.20

14.3 WLAN Evaluation

According to the KDB248227 D01, SAR is measured for 802.11b DSSS using the initial test position procedure.

Note1: When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest estimated 1-g SAR conditions determined by area scans, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg.

Note2: For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Note3: 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.

Table 14-19 WLAN2450 #1 Head Fast SAR

WLAN2450 #1 Head Fast SAR								
Ambient Temperature: 22.5				Liquid Temperature: 22.3				
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			11 2462 MHz	6 2437 MHz	1 2412 MHz	11	6	1
802.11b 1Mbps	Tune up		20.5	20.5	20.5	Scaling factor*		
	Slot Average Power [dBm]		19.09	20.04	19.00	1.38	1.11	1.41
	Left Cheek	1g Fast SAR		0.493			0.55	
		10g SAR		0.247			0.27	
		Deviation		0.02			0.02	
	Left Tilt	1g Fast SAR		0.401			0.45	
		10g SAR		0.19			0.21	
		Deviation		-0.06			-0.06	
	Right Cheek	1g Fast SAR		0.256			0.28	
		10g SAR		0.143			0.16	
		Deviation		0.04			0.04	
	Right Tilt	1g Fast SAR		0.228			0.25	
		10g SAR		0.118			0.13	
		Deviation		0.01			0.01	

Table 14-20 WLAN2450 #1 Head Full SAR

WLAN2450 #1 Head Full SAR								
Ambient Temperature: 22.5				Liquid Temperature: 22.3				
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			11 2462 MHz	6 2437 MHz	1 2412 MHz	11	6	1
802.11b 1Mbps	Tune up		20.5	20.5	20.5	Scaling factor*		
	Slot Average Power [dBm]		19.09	20.04	19.00	1.38	1.11	1.41
	Left Cheek	1g Full SAR		0.496			0.55	
		10g SAR		0.24			0.27	
		Deviation		0.02			0.02	
	Left Tilt	1g Full SAR		0.404			0.45	
		10g SAR		0.187			0.21	
		Deviation		-0.06			-0.06	

Table 14-21 WLAN2450 #1 Body Fast SAR

WLAN2450 #1 Body Fast SAR								
Ambient Temperature: 22.5				Liquid Temperature: 22.3				
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			11 2462 MHz	6 2437 MHz	1 2412 MHz	11	6	1
802.11b 1Mbps	Tune up		20.5	20.5	20.5	Scaling factor*		
	Slot Average Power [dBm]		19.09	20.04	19.00	1.38	1.11	1.41
	Front	1g Fast SAR		0.12			0.13	
		10g SAR		0.065			0.07	
		Deviation		0.06			0.06	
	Rear	1g Fast SAR		0.2			0.22	
		10g SAR		0.103			0.11	
		Deviation		0.08			0.08	
	Top edge	1g Fast SAR		0.085			0.09	
		10g SAR		0.041			0.05	
		Deviation		-0.01			-0.01	
	Right edge	1g Fast SAR		0.174			0.19	
		10g SAR		0.09			0.10	
		Deviation		-0.04			-0.04	

Table 14-22 WLAN2450 #1 Body Full SAR

WLAN2450 #1 Body Full SAR								
Ambient Temperature: 22.5				Liquid Temperature: 22.3				
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			11 2462 MHz	6 2437 MHz	1 2412 MHz	11	6	1
802.11b 1Mbps	Tune up		20.5	20.5	20.5	Scaling factor*		
	Slot Average Power [dBm]		19.09	20.04	19.00	1.38	1.11	1.41
	Rear	1g Full SAR		0.211			0.23	
		10g SAR		0.106			0.12	
Deviation			0.08			0.08		

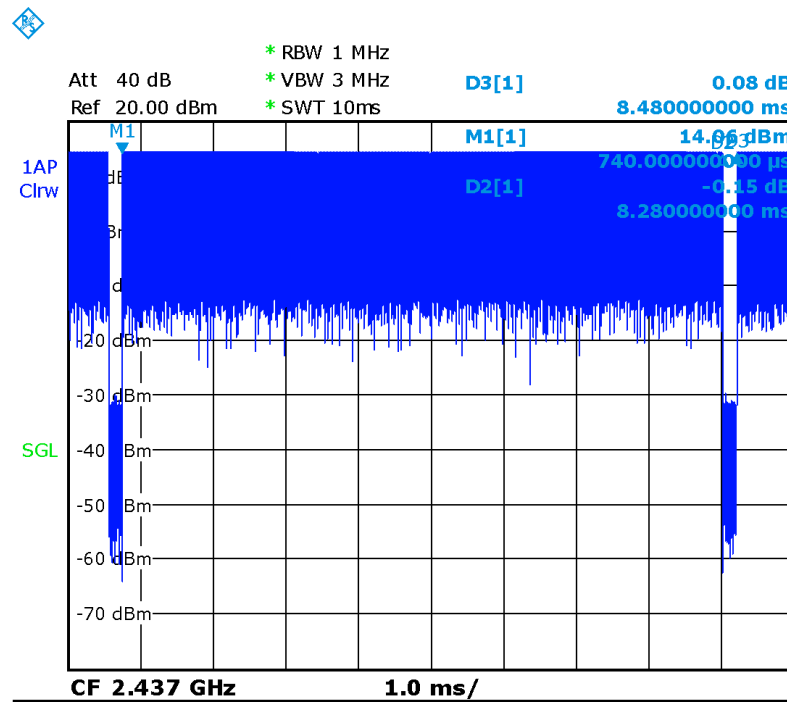
According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. The scaled reported SAR is presented as below

Frequency		Test Position	Actual duty factor	maximum duty factor	Reported SAR(1g)(W/kg)	Scaled reported SAR(1g)(W/kg)	Figure
MHz	Ch.						
2437	6	Left Cheek	97.64%	100%	0.55	0.56	Fig.19

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

Frequency		Test Position	Actual duty factor	maximum duty factor	Reported SAR(1g)(W/kg)	Scaled reported SAR(1g)(W/kg)	Figure
MHz	Ch.						
2437	6	Rear	97.64%	100%	0.23	0.24	Fig.20

SAR is not required for OFDM because the 802.11b adjusted SAR ≤ 1.2 W/kg.



Picture 14.1 Duty factor plot

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

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	RF ambient 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	RF ambient 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	RF ambient 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	E5071C	MY46110673	January 24, 2018	One year
02	Power meter	NRVD	102083	November 01,2017	One year
03	Power sensor	NRV-Z5	100542		
04	Signal Generator	E4438C	MY49070393	January 02,2018	One Year
05	Amplifier	60S1G4	0331848	No Calibration Requested	
06	BTS	CMW500	159889	December 20, 2017	One year
07	E-field Probe	SPEAG EX3DV4	7464	September 12,2017	One year
08	DAE	SPEAG DAE4	1525	October 02, 2017	One year
09	Dipole Validation Kit	SPEAG D750V3	1017	July 19,2017	One year
10	Dipole Validation Kit	SPEAG D835V2	4d069	July 19,2017	One year
11	Dipole Validation Kit	SPEAG D1750V2	1003	July 21,2017	One year
12	Dipole Validation Kit	SPEAG D1900V2	5d101	July 26,2017	One year
13	Dipole Validation Kit	SPEAG D2300V2	1018	July 21,2017	One year
14	Dipole Validation Kit	SPEAG D2450V2	853	July 21,2017	One year

END OF REPORT BODY

ANNEX A Graph Results

WCDMA1900-BII_CH9400 Left Cheek

Date: 4/26/2018

Electronics: DAE4 Sn1525

Medium: head 1900 MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.371$ mho/m; $\epsilon_r = 39.57$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA1900-BII 1880 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(8.39,8.39,8.39)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.128 W/kg

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

Reference Value = 5.001 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.177 W/kg

SAR(1 g) = 0.106 W/kg; SAR(10 g) = 0.062 W/kg

Maximum value of SAR (measured) = 0.117 W/kg

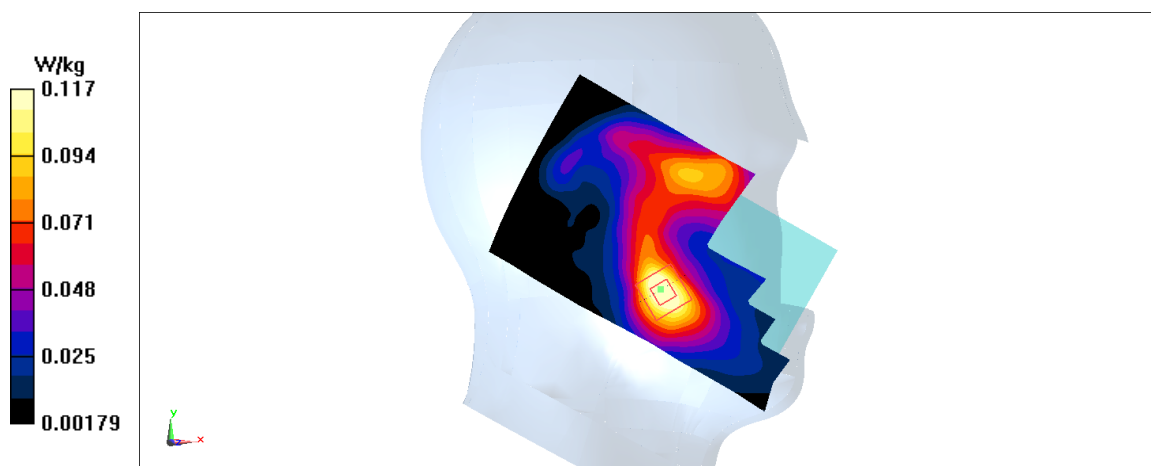


Fig A.1

WCDMA1900-BII_CH9262 Bottom edge

Date: 4/26/2018

Electronics: DAE4 Sn1525

Medium: body 1900 MHz

Medium parameters used: $f = 1852.4$ MHz; $\sigma = 1.49$ mho/m; $\epsilon_r = 53.25$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA1900-BII 1852.4 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(8.32,8.32,8.32)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.552 W/kg

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

Reference Value = 17.63 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.787 W/kg

SAR(1 g) = 0.461 W/kg; SAR(10 g) = 0.266 W/kg

Maximum value of SAR (measured) = 0.525 W/kg

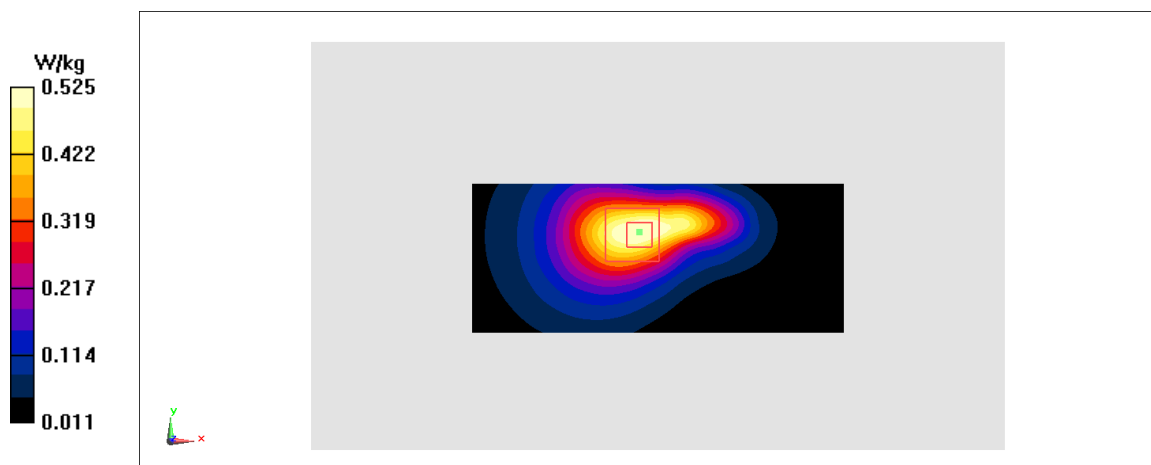


Fig A.2

WCDMA1700-BIV_CH1513 Right Cheek

Date: 4/25/2018

Electronics: DAE4 Sn1525

Medium: head 1750 MHz

Medium parameters used: $f = 1752.6$ MHz; $\sigma = 1.383$ mho/m; $\epsilon_r = 40.68$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA1700-BIV 1752.6 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(8.70,8.70,8.70)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.339 W/kg

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

Reference Value = 6.865 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 0.405 W/kg

SAR(1 g) = 0.274 W/kg; SAR(10 g) = 0.175 W/kg

Maximum value of SAR (measured) = 0.297 W/kg

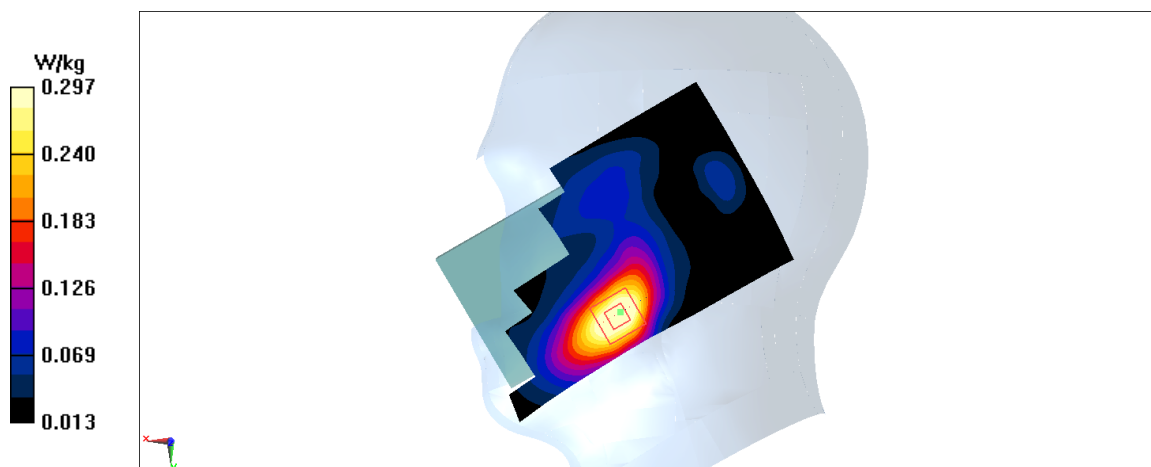


Fig A.3

WCDMA1700-BIV_CH1513 Rear

Date: 4/25/2018

Electronics: DAE4 Sn1525

Medium: body 1750 MHz

Medium parameters used: $f = 1752.6$ MHz; $\sigma = 1.517$ mho/m; $\epsilon_r = 53.22$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA1700-BIV 1752.6 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(8.60,8.60,8.60)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.629 W/kg

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

Reference Value = 10.95 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 0.819 W/kg

SAR(1 g) = 0.474 W/kg; SAR(10 g) = 0.258 W/kg

Maximum value of SAR (measured) = 0.537 W/kg

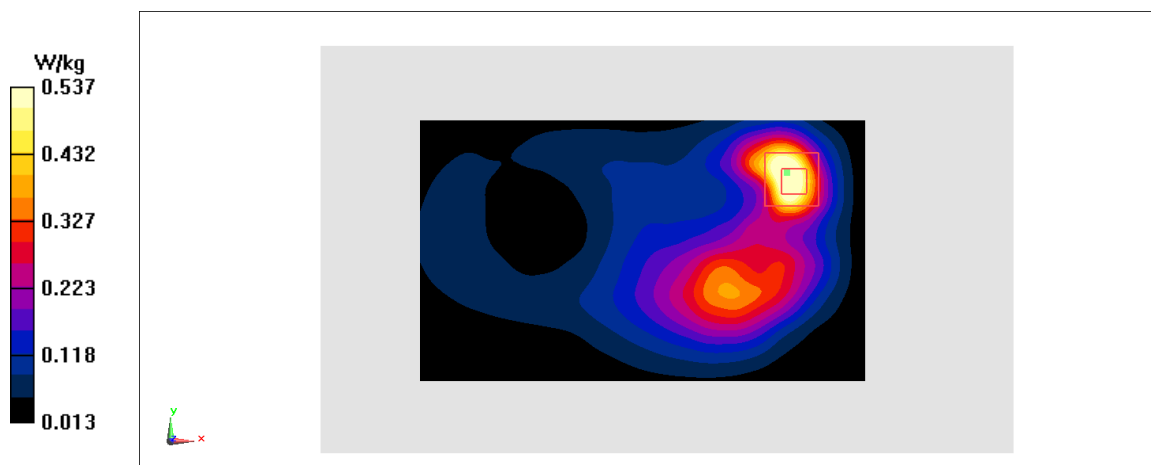


Fig A.4

WCDMA850-BV_CH4233 Left Cheek

Date: 4/24/2018

Electronics: DAE4 Sn1525

Medium: head 835 MHz

Medium parameters used: $f = 846.6$ MHz; $\sigma = 0.912$ mho/m; $\epsilon_r = 41.59$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA850-BV 846.6 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(10.28,10.28,10.28)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.425 W/kg

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

Reference Value = 6.2 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.49 W/kg

SAR(1 g) = 0.377 W/kg; SAR(10 g) = 0.283 W/kg

Maximum value of SAR (measured) = 0.397 W/kg

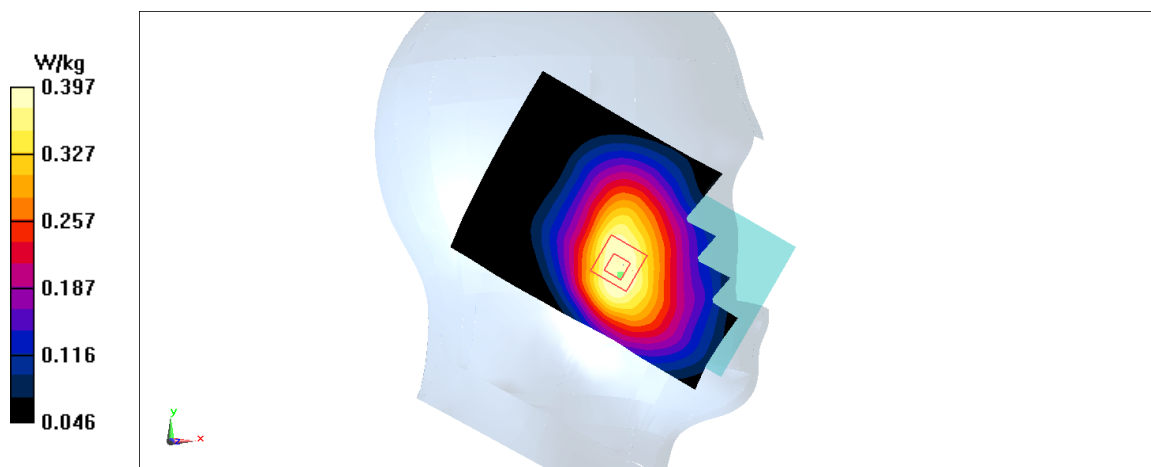


Fig A.5

WCDMA850-BV_CH4233 Rear

Date: 4/24/2018

Electronics: DAE4 Sn1525

Medium: body 835 MHz

Medium parameters used: $f = 846.6$ MHz; $\sigma = 0.999$ mho/m; $\epsilon_r = 56.09$; $\rho = 1000$ kg/m³

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

Communication System: WCDMA850-BV 846.6 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(10.21,10.21,10.21)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.513 W/kg

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

Reference Value = 21.93 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.571 W/kg

SAR(1 g) = 0.453 W/kg; SAR(10 g) = 0.347 W/kg

Maximum value of SAR (measured) = 0.475 W/kg

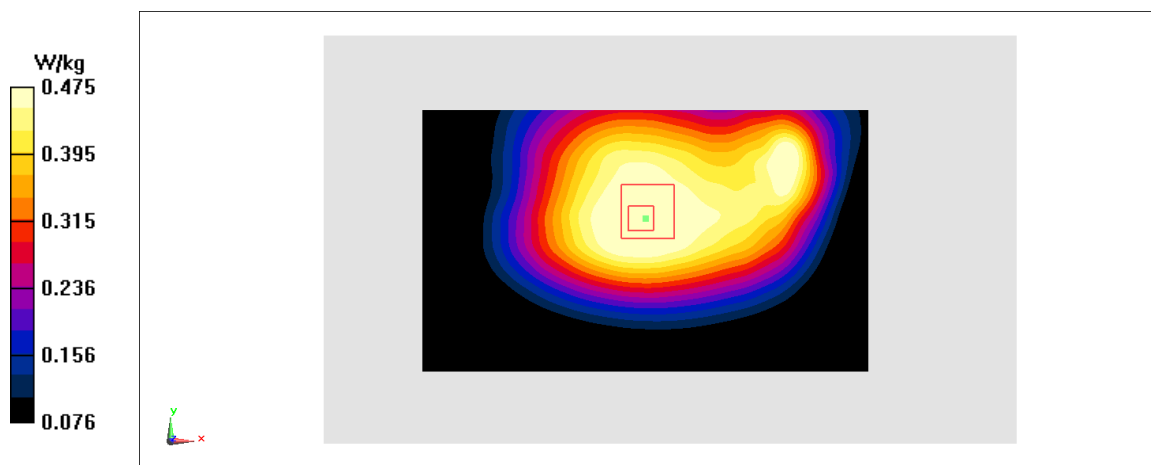


Fig A.6

LTE1900-FDD2_CH19100 Right Cheek

Date: 4/26/2018

Electronics: DAE4 Sn1525

Medium: head 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 39.55$; $\rho = 1000$ kg/m³

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

Communication System: LTE1900-FDD2 1900 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(8.39,8.39,8.39)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.304 W/kg

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

Reference Value = 3.887 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.378 W/kg

SAR(1 g) = 0.243 W/kg; SAR(10 g) = 0.146 W/kg

Maximum value of SAR (measured) = 0.264 W/kg

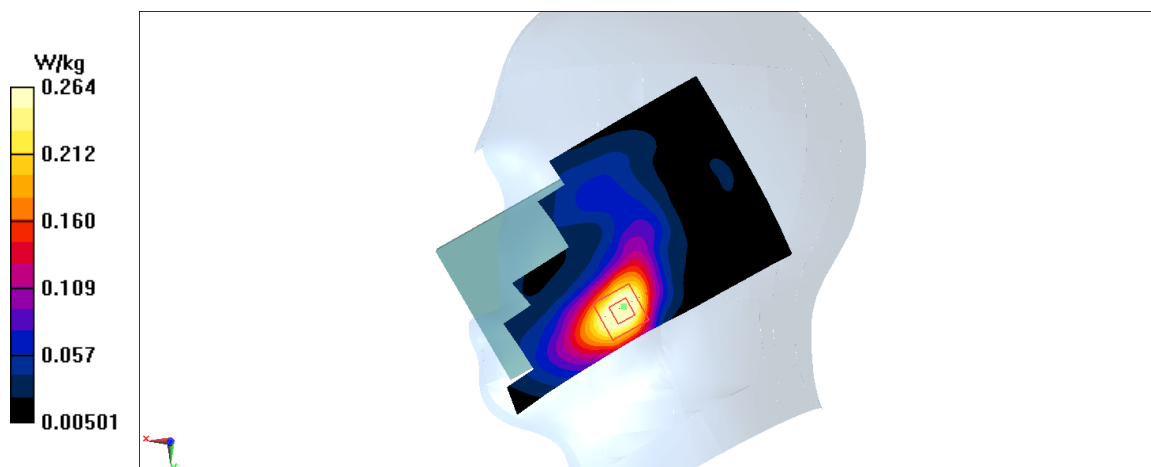


Fig A.7

LTE1900-FDD2_CH19100 Bottom edge

Date: 4/26/2018

Electronics: DAE4 Sn1525

Medium: body 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.536$ mho/m; $\epsilon_r = 53.19$; $\rho = 1000$ kg/m³

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

Communication System: LTE1900-FDD2 1900 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(8.32,8.32,8.32)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.527 W/kg

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

Reference Value = 16.71 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.757 W/kg

SAR(1 g) = 0.446 W/kg; SAR(10 g) = 0.251 W/kg

Maximum value of SAR (measured) = 0.493 W/kg

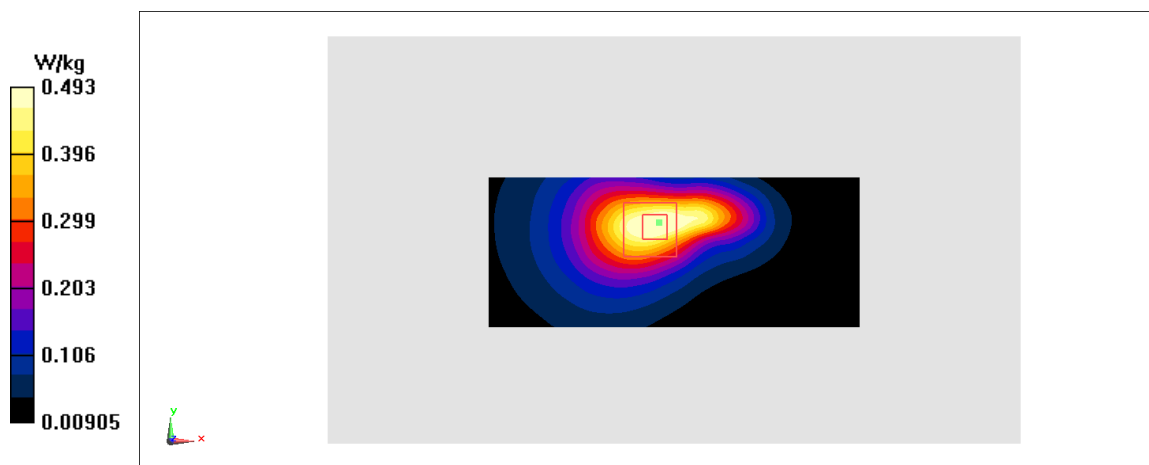


Fig A.8

LTE850-FDD5_CH20525 Left Cheek

Date: 4/24/2018

Electronics: DAE4 Sn1525

Medium: head 835 MHz

Medium parameters used: $f = 836.5$ MHz; $\sigma = 0.902$ mho/m; $\epsilon_r = 41.6$; $\rho = 1000$ kg/m³

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

Communication System: LTE850-FDD5 836.5 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(10.28,10.28,10.28)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.298 W/kg

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

Reference Value = 5.067 V/m; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 0.348 W/kg

SAR(1 g) = 0.269 W/kg; SAR(10 g) = 0.202 W/kg

Maximum value of SAR (measured) = 0.284 W/kg

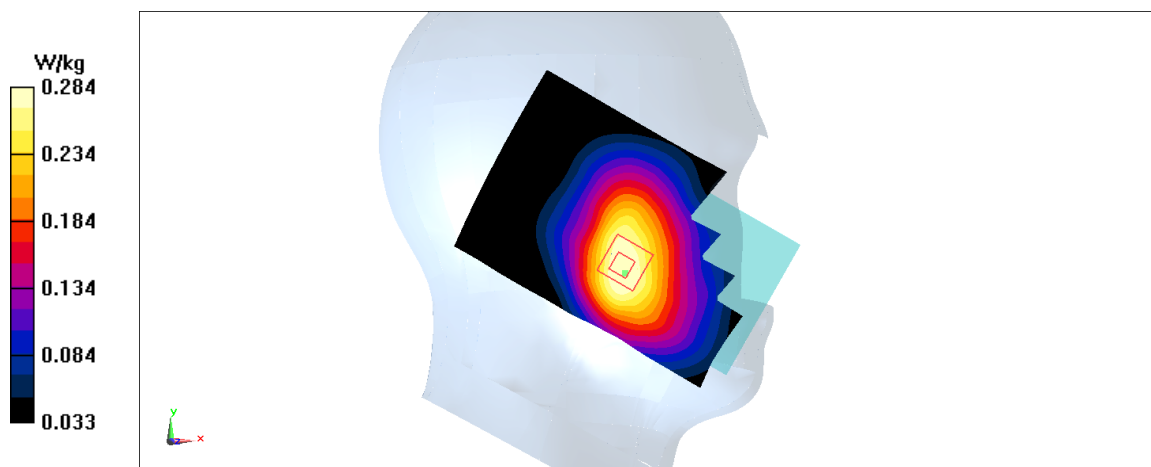


Fig A.9

LTE850-FDD5_CH20525 Rear

Date: 4/24/2018

Electronics: DAE4 Sn1525

Medium: body 835 MHz

Medium parameters used: $f = 836.5$ MHz; $\sigma = 0.989$ mho/m; $\epsilon_r = 56.1$; $\rho = 1000$ kg/m³

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

Communication System: LTE850-FDD5 836.5 MHz Duty Cycle: 1: 1

Probe: EX3DV4 – SN7464 ConvF(10.21,10.21,10.21)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.354 W/kg

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

Reference Value = 19.09 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.374 W/kg; SAR(10 g) = 0.166 W/kg

Maximum value of SAR (measured) = 0.331 W/kg

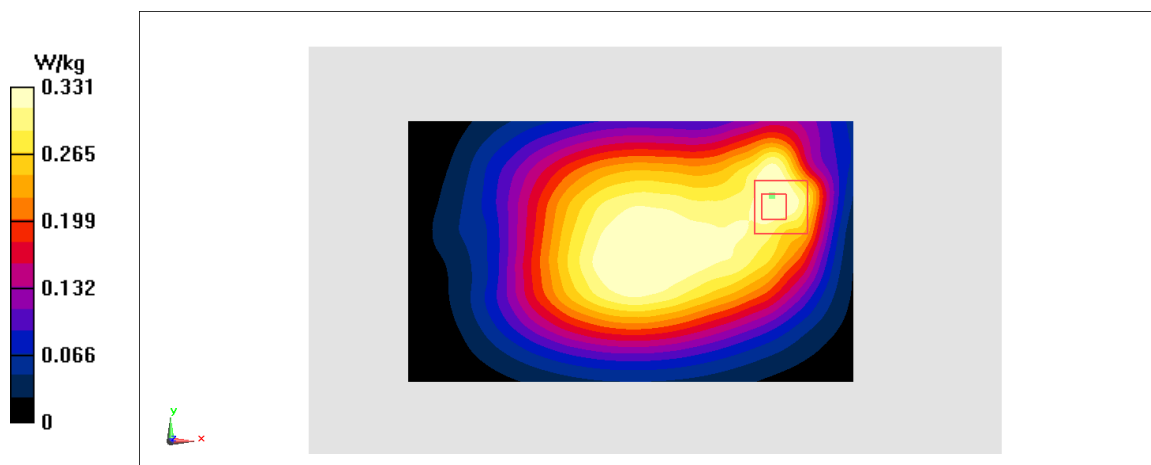


Fig A.10