Table 10.5.2 Test Reduction Table – LTE

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 2 1850-1910 MHz	Back	18700	20 MHz	QPSK	50	0	Reduced[7]
		18900					Tested
		19100					Reduced[7]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	49	Reduced[7]
		18900					Tested
		19100					Reduced[7]
		18700				99	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700		16QAM	50	25	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				99	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Top	18700	20 MHz	QPSK	50	25	Tested
		18900					Tested
		19100					Tested
		18700			100	0	Reduced[1]
		18900					Tested
		19100					Reduced[1]
		18700			1	0	Tested
		18900					Tested
		19100					Tested
		18700				99	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700		16QAM	50	25	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				99	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	All remaining sides						Reduced[6]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.
Reduced[7]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 2 1850-1910 MHz	Left	18700	20 MHz	QPSK	50	0	Reduced[7]
		18900					Tested
		19100					Reduced[7]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	49	Reduced[7]
		18900					Tested
		19100					Reduced[7]
		18700				99	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700		16QAM	50	25	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				99	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	All remaining sides						Reduced[6]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.
Reduced[7]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 66 1710-1780 MHz	Back	132072	20 MHz	QPSK	50	25	Reduced[7]
		132322					Tested
		132572					Reduced[7]
		132072			100	0	Reduced[1]
		132322					Reduced[1]
		132572					Reduced[1]
		132072			1	49	Reduced[7]
		132322					Tested
		132572					Reduced[7]
		132072				99	Reduced[2]
		132322					Reduced[2]
		132572					Reduced[2]
		132072		16QAM	50	25	Reduced[3]
		132322					Reduced[3]
		132572					Reduced[3]
		132072			100	0	Reduced[1]
		132322					Reduced[1]
		132572					Reduced[1]
		132072			1	49	Reduced[4]
		132322					Reduced[4]
		132572					Reduced[4]
		132072				99	Reduced[4]
		132322					Reduced[4]
		132572					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Top	132072	20 MHz	QPSK	50	25	Reduced[7]
		132322					Tested
		132572					Reduced[7]
		132072			100	0	Reduced[1]
		132322					Tested
		132572					Reduced[1]
		132072			1	0	Tested
		132322					Tested
		132572					Tested
		132072				99	Reduced[2]
		132322					Reduced[2]
		132572					Reduced[2]
		132072		16QAM	50	25	Reduced[3]
		132322					Reduced[3]
		132572					Reduced[3]
		132072			100	0	Reduced[1]
		132322					Reduced[1]
		132572					Reduced[1]
		132072			1	0	Reduced[4]
		132322					Reduced[4]
		132572					Reduced[4]
		132072				99	Reduced[4]
		132322					Reduced[4]
		132572					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	All remaining sides						Reduced[6]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.
Reduced[7]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 66 1710-1780 MHz	Left	132072	20 MHz	QPSK	50	25	Reduced[7]
		132322					Tested
		132572					Reduced[7]
		132072			100	0	Reduced[1]
		132322					Reduced[1]
		132572					Reduced[1]
		132072			1	49	Reduced[7]
		132322					Tested
		132572					Reduced[7]
		132072				99	Reduced[2]
		132322					Reduced[2]
		132572					Reduced[2]
		132072		16QAM	50	25	Reduced[3]
		132322					Reduced[3]
		132572					Reduced[3]
		132072			100	0	Reduced[1]
		132322					Reduced[1]
		132572					Reduced[1]
		132072			1	49	Reduced[4]
		132322					Reduced[4]
		132572					Reduced[4]
		132072				99	Reduced[4]
		132322					Reduced[4]
		132572					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
		All remaining sides					Reduced[6]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.
Reduced[7]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 26 814-849 MHz	Back	26740	15 MHz	QPSK	25	12	Reduced[7]
		26865					Tested
		26990					Reduced[7]
		26740			50	0	Reduced[1]
		26865					Reduced[1]
		26990					Reduced[1]
		26740			1	0	Reduced[7]
		26865					Tested
		26990					Reduced[7]
		26740				24	Reduced[2]
		26865					Reduced[2]
		26990					Reduced[2]
		26740		16QAM	25	12	Reduced[3]
		26865					Reduced[3]
		26990					Reduced[3]
		26740			50	0	Reduced[1]
		26865					Reduced[1]
		26990					Reduced[1]
		26740			1	0	Reduced[4]
		26865					Reduced[4]
		26990					Reduced[4]
		26740				24	Reduced[4]
		26865					Reduced[4]
		26990					Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	Top	26740	15 MHz	QPSK	25	12	Reduced[7]
		26865					Tested
		26990					Reduced[7]
		26740			50	0	Reduced[1]
		26865					Reduced[1]
		26990					Reduced[1]
		26740			1	0	Reduced[7]
		26865					Tested
		26990					Reduced[7]
		26740				24	Reduced[2]
		26865					Reduced[2]
		26990					Reduced[2]
		26740		16QAM	25	12	Reduced[3]
		26865					Reduced[3]
		26990					Reduced[3]
		26740			50	0	Reduced[1]
		26865					Reduced[1]
		26990					Reduced[1]
		26740			1	0	Reduced[4]
		26865					Reduced[4]
		26990					Reduced[4]
		26740				24	Reduced[4]
		26865					Reduced[4]
		26990					Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	All remaining sides						Reduced[7]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.
Reduced[7] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 26 814-849 MHz	Left	26740	15 MHz	QPSK	25	12	Reduced[7]
		26865					Tested
		26990					Reduced[7]
		26740			50	0	Reduced[1]
		26865					Reduced[1]
		26990					Reduced[1]
		26740			1	0	Reduced[7]
		26865					Tested
		26990					Reduced[7]
		26740				24	Reduced[2]
		26865					Reduced[2]
		26990					Reduced[2]
		26740		16QAM	25	12	Reduced[3]
		26865					Reduced[3]
		26990					Reduced[3]
		26740			50	0	Reduced[1]
		26865					Reduced[1]
		26990					Reduced[1]
		26740			1	0	Reduced[4]
		26865					Reduced[4]
		26990					Reduced[4]
		26740				24	Reduced[4]
		26865					Reduced[4]
		26990					Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
		All remaining sides					Reduced[7]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.
Reduced[7] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 13 777-787 MHz	Back	23095	10 MHz	QPSK	25	12	Tested
		23095			50	0	Reduced[1]
		23095			1	0	Tested
		23095				24	Reduced[2]
		23095		16QAM	25	12	Reduced[3]
		23095			50	0	Reduced[1]
		23095			1	0	Reduced[4]
		23095				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	Top	23095	10 MHz	QPSK	25	12	Tested
		23095			50	0	Tested
		23095			1	0	Tested
		23095				24	Reduced[2]
		23095		16QAM	25	12	Reduced[3]
		23095			50	0	Reduced[1]
		23095			1	0	Reduced[4]
		23095				24	Reduced[4]
		All lower bandwidths (5 MHz)					
	Left	23095	10 MHz	QPSK	25	12	Tested
		23095			50	0	Reduced[1]
		23095			1	0	Tested
		23095				24	Reduced[2]
		23095		16QAM	25	12	Reduced[3]
		23095			50	0	Reduced[1]
		23095			1	0	Reduced[4]
		23095				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	All remaining sides						Reduced[7]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Reduced[7] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.

Closest Distance to Left: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 12 699-716 MHz	Back	23060	10 MHz	QPSK	25	12	Reduced[7]
		23095					Tested
		23129					Reduced[7]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23129					Reduced[1]
		23060			1	12	Reduced[7]
		23095					Tested
		23129					Reduced[7]
		23060				24	Reduced[2]
		23095					Reduced[2]
		23129					Reduced[2]
		23060		16QAM	25	12	Reduced[3]
		23095					Reduced[3]
		23129					Reduced[3]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23129					Reduced[1]
		23060			1	0	Reduced[4]
		23095					Reduced[4]
		23129					Reduced[4]
		23060				24	Reduced[4]
		23095					Reduced[4]
		23129					Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	Top	23060	10 MHz	QPSK	25	12	Reduced[7]
		23095					Tested
		23129					Reduced[7]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23129					Reduced[1]
		23060			1	24	Reduced[7]
		23095					Tested
		23129					Reduced[7]
		23060				49	Reduced[2]
		23095					Reduced[2]
		23129					Reduced[2]
		23060		16QAM	25	12	Reduced[3]
		23095					Reduced[3]
		23129					Reduced[3]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23129					Reduced[1]
		23060			1	0	Reduced[4]
		23095					Reduced[4]
		23129					Reduced[4]
		23060				24	Reduced[4]
		23095					Reduced[4]
		23129					Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	All remaining sides						Reduced[7]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.
Reduced[7] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 12 699-716 MHz	Left	23060	10 MHz	QPSK	25	12	Reduced[7]
		23095					Tested
		23129					Reduced[7]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23129					Reduced[1]
		23060			1	12	Reduced[7]
		23095					Tested
		23129					Reduced[7]
		23060				24	Reduced[2]
		23095					Reduced[2]
		23129					Reduced[2]
		23060		16QAM	25	12	Reduced[3]
		23095					Reduced[3]
		23129					Reduced[3]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23129					Reduced[1]
		23060			1	0	Reduced[4]
		23095					Reduced[4]
		23129					Reduced[4]
		23060				24	Reduced[4]
		23095					Reduced[4]
		23129					Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
		All remaining sides					Reduced[7]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.
Reduced[7] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 30 2305-2315 MHz	Back	27710	10 MHz	QPSK	25	12	Tested
		27710			50	0	Reduced[1]
		27710			1	0	Tested
		27710				24	Reduced[2]
		27710		16QAM	25	12	Reduced[3]
		27710			50	0	Reduced[1]
		27710			1	0	Reduced[4]
		27710				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	Top	27710	10 MHz	QPSK	25	12	Tested
		27710			50	0	Tested
		27710			1	0	Tested
		27710				24	Reduced[2]
		27710		16QAM	25	12	Reduced[3]
		27710			50	0	Reduced[1]
		27710			1	0	Reduced[4]
		27710				24	Reduced[4]
		All lower bandwidths (5 MHz)					
	Left	27710	10 MHz	QPSK	25	12	Tested
		27710			50	0	Reduced[1]
		27710			1	0	Tested
		27710				24	Reduced[2]
		27710		16QAM	25	12	Reduced[3]
		27710			50	0	Reduced[1]
		27710			1	0	Reduced[4]
		27710				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	All remaining sides						Reduced[7]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Reduced[7] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.

Closest Distance to Left: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 7 2500-2570 MHz	Back	20850	20 MHz	QPSK	50	0	Reduced[7]
		21100					Tested
		21350					Reduced[7]
		20850			100	0	Reduced[1]
		21100					Reduced[1]
		21350					Reduced[1]
		20850			1	49	Reduced[7]
		21100					Tested
		21350					Reduced[7]
		20850				99	Reduced[2]
		21100					Reduced[2]
		21350					Reduced[2]
		20850		16QAM	50	25	Reduced[3]
		21100					Reduced[3]
		21350					Reduced[3]
		20850			100	0	Reduced[1]
		21100					Reduced[1]
		21350					Reduced[1]
		20850			1	49	Reduced[4]
		21100					Reduced[4]
		21350					Reduced[4]
		20850				99	Reduced[4]
		21100					Reduced[4]
		21350					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Top	20850	20 MHz	QPSK	50	25	Tested
		21100					Tested
		21350					Tested
		20850			100	0	Reduced[1]
		21100					Tested
		21350					Reduced[1]
		20850			1	49	Tested
		21100					Tested
		21350					Tested
		20850				99	Reduced[2]
		21100					Reduced[2]
		21350					Reduced[2]
		20850		16QAM	50	25	Reduced[3]
		21100					Reduced[3]
		21350					Reduced[3]
		20850			100	0	Reduced[1]
		21100					Reduced[1]
		21350					Reduced[1]
		20850			1	49	Reduced[4]
		21100					Reduced[4]
		21350					Reduced[4]
		20850				99	Reduced[4]
		21100					Reduced[4]
		21350					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	All remaining sides						Reduced[6]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.
Reduced[7] – If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 7 2500-2570 MHz	Left	20850	20 MHz	QPSK	50	0	Reduced[7]
		21100					Tested
		21350					Reduced[7]
		20850			100	0	Reduced[1]
		21100					Reduced[1]
		21350					Reduced[1]
		20850			1	49	Reduced[7]
		21100					Tested
		21350					Reduced[7]
		20850				99	Reduced[2]
		21100					Reduced[2]
		21350					Reduced[2]
		20850		16QAM	50	25	Reduced[3]
		21100					Reduced[3]
		21350					Reduced[3]
		20850			100	0	Reduced[1]
		21100					Reduced[1]
		21350					Reduced[1]
		20850			1	49	Reduced[4]
		21100					Reduced[4]
		21350					Reduced[4]
		20850				99	Reduced[4]
		21100					Reduced[4]
		21350					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	All remaining sides						Reduced[6]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.
Reduced[7] – If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 41 2496-2690 MHz	Back	39750	20 MHz	QPSK	50	0	Reduced[7]
		40135					Reduced[7]
		40620					Tested
		41105					Reduced[7]
		41490					Reduced[7]
		39750			100	0	Reduced[1]
		40135					Reduced[1]
		40620					Reduced[1]
		41105					Reduced[1]
		41490					Reduced[1]
		39750			1	49	Reduced[7]
		40135					Reduced[7]
		40620					Tested
		41105					Reduced[7]
		41490					Reduced[7]
		39750				99	Reduced[2]
		40135					Reduced[2]
		40620					Reduced[2]
		41105					Reduced[2]
		41490					Reduced[2]
		39750		16QAM	50	25	Reduced[3]
		40135					Reduced[3]
		40620					Reduced[3]
		41105					Reduced[3]
		41490					Reduced[3]
		39750			100	0	Reduced[1]
		40135					Reduced[1]
		40620					Reduced[1]
		41105					Reduced[1]
		41490					Reduced[1]
		39750			1	49	Reduced[4]
		40135					Reduced[4]
		40620					Reduced[4]
		41105					Reduced[4]
		41490					Reduced[4]
		39750				99	Reduced[4]
		40135					Reduced[4]
		40620					Reduced[4]
		41105					Reduced[4]
		41490					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
		All remaining sides					Reduced[6]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.
Reduced[7] – If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 41 2496-2690 MHz	Top	39750	20 MHz	QPSK	50	0	Reduced[7]
		40135					Reduced[7]
		40620					Tested
		41105					Reduced[7]
		41490					Reduced[7]
		39750			100	0	Reduced[1]
		40135					Reduced[1]
		40620					Tested
		41105					Reduced[1]
		41490					Reduced[1]
		39750			1	49	Tested
		40135					Tested
		40620					Tested
		41105					Tested
		41490					Tested
		39750				99	Reduced[2]
		40135					Reduced[2]
		40620					Reduced[2]
		41105					Reduced[2]
		41490					Reduced[2]
		39750		16QAM	50	25	Reduced[3]
		40135					Reduced[3]
		40620					Reduced[3]
		41105					Reduced[3]
		41490					Reduced[3]
		39750			100	0	Reduced[1]
		40135					Reduced[1]
		40620					Reduced[1]
		41105					Reduced[1]
		41490					Reduced[1]
		39750			1	49	Reduced[4]
		40135					Reduced[4]
		40620					Reduced[4]
		41105					Reduced[4]
		41490					Reduced[4]
		39750				99	Reduced[4]
		40135					Reduced[4]
		40620					Reduced[4]
		41105					Reduced[4]
		41490					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	All remaining sides						Reduced[6]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.
Reduced[7] – If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

Band/ Frequency (MHz)	Side	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 41 2496-2690 MHz	Left	39750	20 MHz	QPSK	50	0	Reduced[7]
		40135					Reduced[7]
		40620					Tested
		41105					Reduced[7]
		41490					Reduced[7]
		39750			100	0	Reduced[1]
		40135					Reduced[1]
		40620					Reduced[1]
		41105					Reduced[1]
		41490					Reduced[1]
		39750			1	49	Reduced[7]
		40135					Reduced[7]
		40620					Tested
		41105					Reduced[7]
		41490					Reduced[7]
		39750				99	Reduced[2]
		40135					Reduced[2]
		40620					Reduced[2]
		41105					Reduced[2]
		41490					Reduced[2]
		39750		16QAM	50	25	Reduced[3]
		40135					Reduced[3]
		40620					Reduced[3]
		41105					Reduced[3]
		41490					Reduced[3]
		39750			100	0	Reduced[1]
		40135					Reduced[1]
		40620					Reduced[1]
		41105					Reduced[1]
		41490					Reduced[1]
		39750			1	49	Reduced[4]
		40135					Reduced[4]
		40620					Reduced[4]
		41105					Reduced[4]
		41490					Reduced[4]
		39750				99	Reduced[4]
		40135					Reduced[4]
		40620					Reduced[4]
		41105					Reduced[4]
		41490					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	All remaining sides						Reduced[6]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 3) A) I) page 4.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 3) B) I) page 4.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) A) I) page 4.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 4) B) I) page 5.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 5) B) I) page 5.
Reduced[6] – When the antenna is more than 25 mm from a side, the test can be reduced per KDB447498 D01 v06 section 4.3.1 1) page 11. See below for calculations.
Reduced[7] – If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 page 4 footnote 2.

Closest Distance to right: 236.0 mm
Closest Distance to Bottom: 204 mm

Both sides are greater than 20 cm. Therefore, both are excluded from SAR testing.

SAR Data Summary – 750 MHz Body – LTE Band 12

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.					(dBm)		
0 mm	-----	Back	707.5	23095	10 MHz/QPSK	1	0	0	18.6	0.452	0.50
	-----		707.5	23095	10 MHz/QPSK	25	12	1	17.3	0.365	0.43
	-----	Top	704.0	23060	10 MHz/QPSK	1	0	0	18.7	0.685	0.73
	1		707.5	23095	10 MHz/QPSK	1	0	0	18.6	0.757	0.83
	-----		711.0	23129	10 MHz/QPSK	1	0	0	18.6	0.702	0.77
	-----		707.5	23095	10 MHz/QPSK	25	12	1	17.3	0.637	0.75
	-----		711.0	23129	10 MHz/QPSK	50	0	1	17.6	0.572	0.63
	-----	Left	707.5	23095	10 MHz/QPSK	1	0	0	18.6	0.511	0.56
	-----		707.5	23095	10 MHz/QPSK	25	0	1	17.3	0.437	0.51
	-----	Repeat	707.5	23095	10 MHz/QPSK	1	0	0	18.6	0.736	0.81

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

Note: LTE Band 17 is fully within the frequency bands of Band 12. Therefore, Band 17 was not tested for this report.

SAR Data Summary – 750 MHz Body – LTE Band 13

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power (dBm)	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.							
0 mm	-----	Back	782.0	23230	10 MHz/QPSK	1	0	0	19.0	0.652	0.82
	-----		782.0	23230	10 MHz/QPSK	25	12	1	18.1	0.513	0.63
	2	Top	782.0	23230	10 MHz/QPSK	1	0	0	19.0	0.905	1.14
	-----		782.0	23230	10 MHz/QPSK	25	12	1	18.1	0.833	1.03
	-----		782.0	23230	10 MHz/QPSK	50	0	1	18.4	0.772	0.89
	-----	Left	782.0	23230	10 MHz/QPSK	1	0	0	19.0	0.722	0.91
	-----		782.0	23230	10 MHz/QPSK	25	0	1	18.1	0.615	0.76
	-----	Repeat	782.0	23230	10 MHz/QPSK	1	0	0	19.0	0.886	1.12

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – 835 MHz Body - WCDMA

MEASUREMENT RESULTS

Gap	Plot	Frequency		Modulation	Position	End Power	RMC	Test Set Up	Measured SAR	Reported SAR
		MHz	Ch.			(dBm)			(W/kg)	(W/kg)
0 mm	----	836.6	4183	WCDMA	Back	20.01	12.2 kbps	Test Loop 1	0.266	0.30
	3	836.6	4183	WCDMA	Top	20.01	12.2 kbps	Test Loop 1	0.589	0.66
	----	836.6	4183	WCDMA	Left	20.01	12.2 kbps	Test Loop 1	0.346	0.39
						Body 1.6 W/kg (mW/g) averaged over 1 gram				

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – 835 MHz Body – LTE Bands 26

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR	Reported SAR
			MHz	Ch.					(dBm)	(W/kg)	(W/kg)
0 mm	-----	Back	831.5	26865	15 MHz/QPSK	1	0	0	19.6	0.372	0.46
	-----		831.5	26865	15 MHz/QPSK	25	0	1	18.9	0.218	0.25
	-----	Top	821.5	24765	15 MHz/QPSK	1	0	0	19.7	0.641	0.77
	4		831.5	26865	15 MHz/QPSK	1	0	0	19.6	0.689	0.85
	-----		841.5	26995	15 MHz/QPSK	1	0	0	19.6	0.638	0.79
	-----		831.5	26865	15 MHz/QPSK	25	0	1	18.9	0.564	0.65
	-----		831.5	26865	15 MHz/QPSK	50	0	1	18.7	0.497	0.60
	-----	Left	831.5	26865	15 MHz/QPSK	1	0	0	19.6	0.476	0.59
	-----		831.5	26865	15 MHz/QPSK	25	0	1	18.9	0.392	0.45

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

Note: LTE Band 5 is fully within the frequency bands of Band 26. Therefore, Band 5 was not tested for this report.

SAR Data Summary – 1750 MHz Body - WCDMA

MEASUREMENT RESULTS

Gap	Plot	Frequency		Rev Level/ Modulation	Position	End Power	RMC	Test Set Up	Measured SAR	Reported SAR
		MHz	Ch.			(dBm)			(W/kg)	(W/kg)
0 mm	----	1732.6	1413	WCDMA	Back	17.81	12.2 kbps	Test Loop 1	0.765	0.80
	----	1712.4	1312	WCDMA	Top	17.71	12.2 kbps	Test Loop 1	1.02	1.09
	5	1732.6	1413	WCDMA		17.81	12.2 kbps	Test Loop 1	1.08	1.13
	----	1752.6	1513	WCDMA		17.70	12.2 kbps	Test Loop 1	1.03	1.10
	----	1712.4	1312	WCDMA	Left	17.71	12.2 kbps	Test Loop 1	0.836	0.89
	----	1732.6	1413	WCDMA		17.81	12.2 kbps	Test Loop 1	0.941	0.98
	----	1752.6	1513	WCDMA		17.70	12.2 kbps	Test Loop 1	0.845	0.91
	----	1732.6	1413	WCDMA	Repeat	17.81	12.2 kbps	Test Loop 1	1.06	1.11
						Body 1.6 W/kg (mW/g) averaged over 1 gram				

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – 1750 MHz Body – LTE Band 66

MEASUREMENT RESULTS											
Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power (dBm)	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.							
0 mm	-----	Back	1745.0	132322	20 MHz/QPSK	1	0	0	17.5	0.522	0.59
	-----		1745.0	132322	20 MHz/QPSK	50	0	1	16.4	0.439	0.50
	-----	Top	1720.0	132072	20 MHz/QPSK	1	0	0	17.1	0.806	0.99
	6		1745.0	132322	20 MHz/QPSK	1	0	0	17.5	0.945	1.06
	-----		1770.0	132571	20 MHz/QPSK	1	0	0	17.2	0.817	0.98
	-----		1745.0	132322	20 MHz/QPSK	50	0	1	16.4	0.687	0.79
	-----		1745.0	132322	20 MHz/QPSK	100	0	1	16.6	0.658	0.72
	-----	Left	1745.0	132322	20 MHz/QPSK	1	0	0	17.5	0.665	0.75
	-----		1745.0	132322	20 MHz/QPSK	50	0	1	16.4	0.591	0.68
	-----	Repeated	1745.0	132322	20 MHz/QPSK	1	0	0	17.5	0.921	1.03

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

Note: LTE Band 4 is fully within the frequency bands of Band 66. Therefore, Band 4 was not tested for this report.

SAR Data Summary – 1900 MHz Body - WCDMA

MEASUREMENT RESULTS

Gap	Plot	Frequency		Rev Level/ Modulation	Position	End Power	RMC	Test Set Up	Measured SAR	Reported SAR
		MHz	Ch.			(dBm)			(W/kg)	(W/kg)
0 mm	----	1880.0	9400	WCDMA	Back	16.97	12.2 kbps	Test Loop 1	0.522	0.53
	----	1852.4	9262	WCDMA	Top	16.92	12.2 kbps	Test Loop 1	0.978	1.00
	7	1880.0	9400	WCDMA		16.97	12.2 kbps	Test Loop 1	1.11	1.12
	----	1907.6	9538	WCDMA		16.95	12.2 kbps	Test Loop 1	1.01	1.02
	----	1880.0	9400	WCDMA	Left	16.97	12.2 kbps	Test Loop 1	0.730	0.74
	----	1880.0	9400	WCDMA	Repeat	16.97	12.2 kbps	Test Loop 1	1.10	1.11
						Body 1.6 W/kg (mW/g) averaged over 1 gram				

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – 1900 MHz Body – LTE Band 2

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR	Reported SAR
			MHz	Ch.					(dBm)	(W/kg)	(W/kg)
0 mm	-----	Back	1880.0	18900	20 MHz/QPSK	1	0	0	16.2	0.503	0.61
	-----		1880.0	18900	20 MHz/QPSK	50	0	1	15.1	0.427	0.53
	-----	Top	1860.0	18700	20 MHz/QPSK	1	0	0	16.6	0.822	0.90
	8		1880.0	18900	20 MHz/QPSK	1	0	0	16.2	0.948	1.14
	-----		1900.0	19100	20 MHz/QPSK	1	0	0	16.0	0.841	1.06
	-----		1860.0	18700	20 MHz/QPSK	50	0	1	15.5	0.745	0.84
	-----		1880.0	18900	20 MHz/QPSK	50	0	1	15.1	0.803	0.99
	-----		1900.0	19100	20 MHz/QPSK	50	0	1	15.3	0.762	0.90
	-----		1880.0	18900	20 MHz/QPSK	100	0	1	15.3	0.695	0.82
	-----	Left	1880.0	18900	20 MHz/QPSK	1	0	0	16.2	0.697	0.84
	-----		1880.0	18900	20 MHz/QPSK	50	0	1	15.1	0.556	0.68
	-----	Repeated	1880.0	18900	20 MHz/QPSK	1	0	0	16.2	0.924	1.11

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – 2300 MHz Body – LTE Band 30

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power (dBm)	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.							
0 mm	-----	Back	2310	27710	10 MHz/QPSK	1	0	0	16.3	0.437	0.51
	-----		2310	27710	10 MHz/QPSK	25	12	1	15.1	0.329	0.41
	9	Top	2310	27710	10 MHz/QPSK	1	0	0	16.3	0.742	0.87
	-----		2310	27710	10 MHz/QPSK	25	12	1	15.1	0.627	0.77
	-----		2310	27710	10 MHz/QPSK	50	0	1	15.6	0.522	0.57
	-----	Left	2310	27710	10 MHz/QPSK	1	0	0	16.3	0.503	0.59
	-----		2310	27710	10 MHz/QPSK	25	12	1	15.1	0.416	0.51
	-----	Repeat	2310	27710	10 MHz/QPSK	1	0	0	16.3	0.729	0.86

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – 2500 MHz Body – LTE Band 7

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR	Reported SAR
			MHz	Ch.					(dBm)	(W/kg)	(W/kg)
0 mm	-----	Back	2535.0	21100	20 MHz/QPSK	1	0	0	16.2	0.522	0.63
	-----		2535.0	21100	20 MHz/QPSK	50	0	0	15.2	0.411	0.49
	-----	Top	2507.5	20850	20 MHz/QPSK	1	0	0	16.5	0.804	0.90
	10		2535.0	21100	20 MHz/QPSK	1	0	0	16.2	0.923	1.11
	-----		2562.5	21350	20 MHz/QPSK	1	0	0	16.5	0.857	0.96
	-----		2507.5	20850	20 MHz/QPSK	50	0	0	15.7	0.713	0.76
	-----		2535.0	21100	20 MHz/QPSK	50	0	0	15.2	0.772	0.93
	-----		2562.5	21350	20 MHz/QPSK	50	0	0	15.6	0.749	0.82
	-----		2535.0	21100	20 MHz/QPSK	100	0	0	15.2	0.704	0.85
	-----	Left	2535.0	21100	20 MHz/QPSK	1	0	0	16.2	0.652	0.78
	-----		2535.0	21100	20 MHz/QPSK	50	0	0	15.2	0.503	0.60
	-----	Repeat	2535.0	21100	20 MHz/QPSK	1	0	0	16.2	0.901	1.08

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary –LTE Bands 41

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR	Reported SAR
			MHz	Ch.					(dBm)	(W/kg)	(W/kg)
0 mm	-----	Back	2593.0	40620	20 MHz/QPSK	1	0	0	17.7	0.498	0.60
	-----		2593.0	40620	20 MHz/QPSK	50	0	1	17.0	0.375	0.42
	-----	Top	2506.0	39750	20 MHz/QPSK	1	0	0	17.8	0.783	0.92
	-----		2549.5	40185	20 MHz/QPSK	1	0	0	18.1	0.822	0.90
	11		2593.0	40620	20 MHz/QPSK	1	0	0	17.7	0.896	1.08
	-----		2636.5	41055	20 MHz/QPSK	1	0	0	18.2	0.836	0.90
	-----		2680.0	41490	20 MHz/QPSK	1	0	0	17.7	0.829	1.00
	-----		2593.0	40620	20 MHz/QPSK	50	0	1	17.0	0.821	0.92
	-----		2593.0	40620	20 MHz/QPSK	100	0	1	16.6	0.697	0.86
	-----	Left	2593.0	40620	20 MHz/QPSK	1	0	0	17.7	0.645	0.78
	-----		2593.0	40620	20 MHz/QPSK	50	0	1	17.0	0.562	0.63
	-----	Repeated	2593.0	40620	20 MHz/QPSK	1	0	0	17.7	0.877	1.05

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

LTE TDD testing is performed using the SAR test guidance provided in FCC KDB 941225 D05 v02r05 clause 5.4. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05 v02r05. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4. A duty cycle of 1:1.58 is the highest duty cycle achievable which was used for testing Band 41.

Note: LTE Band 38 is fully within the frequency bands of Band 41. Therefore, Band 38 was not tested for this report.

SAR Data Summary – 2450 MHz Body 802.11b & BT

MEASUREMENT RESULTS

Plot	Gap	Antenna	Position	Frequency		Modulation	Antenna	End Power	Measured SAR	Reported SAR
				MHz	Ch.			(dBm)	(W/kg)	(W/kg)
-----	0 mm	Inpaq	Back	2437	6	DSSS	Main	18.50	0.176	0.18
-----				2437	6	DSSS	Aux	18.50	0.198	0.20
-----			Top	2437	6	DSSS	Main	18.50	0.598	0.60
-----				2462	11	DSSS		18.50	0.500	0.50
12				2437	6	DSSS	Aux	18.50	0.659	0.66
-----				2462	11	DSSS		18.50	0.584	0.58
-----			Back	2440	39	GFSK	Aux	11.47	0.0227	0.02
-----			Top	2440	39	GFSK		11.47	0.0823	0.08

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP
2. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
3. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
4. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
5. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – 5250 MHz Body 802.11a

MEASUREMENT RESULTS										
Plot	**Gap**	**Antenna**	**Position**	**Frequency**		**Modulation**	**Antenna**	**End Power**	**Measured SAR (W/kg)**	**Reported SAR (W/kg)**
				MHz	**Ch.**			**(dBm)**		
-----	0 mm	Inpaq	Back	5220	44	OFDM	Main	17.00	0.342	0.34
-----				5300	60	OFDM		15.50	0.236	0.24
-----				5220	44	OFDM	Aux	17.00	0.264	0.26
-----				5300	60	OFDM		15.50	0.221	0.22
-----			Top	5200	40	OFDM	Main	17.00	0.698	0.70
-----				5220	44	OFDM		17.00	0.672	0.67
-----				5280	56	OFDM		15.50	0.658	0.66
-----				5300	60	OFDM		15.50	0.614	0.61
13				5200	40	OFDM	Aux	17.00	0.754	0.75
-----				5220	44	OFDM		17.00	0.750	0.75
-----				5280	56	OFDM		15.50	0.701	0.70
-----				5300	60	OFDM		15.50	0.687	0.69
-----			Repeated	5200	40	OFDM	Aux	17.00	0.739	0.74
						Body 1.6 W/kg (mW/g) averaged over 1 gram				

1. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP
2. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
3. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
4. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
5. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – 5600 MHz Body 802.11a

MEASUREMENT RESULTS										
Plot	**Gap**	**Antenna**	**Position**	**Frequency**		**Modulation**	**Antenna**	**End Power**	**Measured SAR**	**Reported SAR**
				MHz	**Ch.**			**(dBm)**	**(W/kg)**	**(W/kg)**
-----	0 mm	Inpaq	Back	5580	116	OFDM	Main	15.50	0.437	0.44
-----				5620	124	OFDM		15.50	0.499	0.50
-----				5580	116	OFDM	Aux	15.50	0.455	0.46
-----				5620	124	OFDM		15.50	0.481	0.48
-----			Top	5580	116	OFDM	Main	15.50	0.984	0.98
-----				5620	124	OFDM		15.50	0.983	0.98
-----				5580	116	OFDM	Aux	15.50	1.14	1.14
14				5620	124	OFDM		15.50	1.19	1.19
-----			Repeated	5620	124	OFDM	Aux	15.50	1.17	1.17

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP
2. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
3. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
4. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
5. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – 5800 MHz Body 802.11a

MEASUREMENT RESULTS

Plot	Gap	Antenna	Position	Frequency		Modulation	Antenna	End Power	Measured SAR (W/kg)	Reported SAR (W/kg)
				MHz	Ch.			(dBm)		
-----	0 mm	Inpaq	Back	5785	157	OFDM	Main	15.50	0.299	0.30
-----				5785	157	OFDM	Aux	15.50	0.275	0.28
-----			Top	5785	157	OFDM	Main	15.50	0.848	0.85
-----				5825	165	OFDM		15.50	0.876	0.88
-----				5785	157	OFDM	Aux	15.50	1.11	1.11
15				5825	165	OFDM		15.50	1.13	1.13
-----			Repeated	5825	165	OFDM	Aux	15.50	1.12	1.12

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP
2. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
3. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
4. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
5. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – Simultaneous Evaluation

MEASUREMENT RESULTS – WWAN-WiFi (Main)

Position	Frequency		Maxima			Frequency		Maxima			SAR_1	SAR_2	SAR Total
	MHz	Ch.	X	Y	Z	MHz	Ch.	X	Y	Z			
Back	5620	124	100.20	88.80	2.76	782	23230	112.81	-107.99	-0.72	0.48	0.82	1.30
Top	5620	124	-1.00	87.20	0.56	782	23230	4.92	-136.90	-2.37	1.19	1.14	2.33

Body
1.6 W/kg (mW/g)
averaged over 1 gram

Top – 224.20 mm SPLSR=0.02 See Plot 1 Below

Simultaneous Separation Ratio Calculation

$(SAR_1 + SAR_2)^{1.5}/R_i \leq 0.04$ rounded to two digits

MEASUREMENT RESULTS – WWAN-WiFi (Aux)

Position	Frequency		Maxima			Frequency		Maxima			SAR_1	SAR_2	SAR Total
	MHz	Ch.	X	Y	Z	MHz	Ch.	X	Y	Z			
Back	5620	124	116.0	-94.00	3.27	782	23230	112.81	-107.99	-0.72	0.50	0.82	1.32
Top	5620	124	0.80	-65.55	1.25	782	23230	4.92	-136.90	-2.37	0.98	1.14	2.12

Body
1.6 W/kg (mW/g)
averaged over 1 gram

Top – 71.56 mm SPLSR=0.04 See Plot 2 Below

Simultaneous Separation Ratio Calculation

$(SAR_1 + SAR_2)^{1.5}/R_i \leq 0.04$ rounded to two digits

MEASUREMENT RESULTS – BT

Frequency		Modulation	Frequency		Modulation	SAR_1	SAR_2	SAR Total
MHz	Ch.		MHz	Ch.				
2437	6	DSSS	2440	39	GFSK	0.60	0.08	0.68
5200	40	OFDM	2440	39	GFSK	0.70	0.08	0.78
5580	116	OFDM	2440	39	GFSK	0.98	0.08	1.06
5825	165	OFDM	2440	39	GFSK	0.88	0.08	0.96

Body
1.6 W/kg (mW/g)
averaged over 1 gram

The sum of the two transmitters is less than the limit; therefore, the simultaneous transmission meets the requirements of KDB447498 D01 v06 section 4.3.2 page 11.

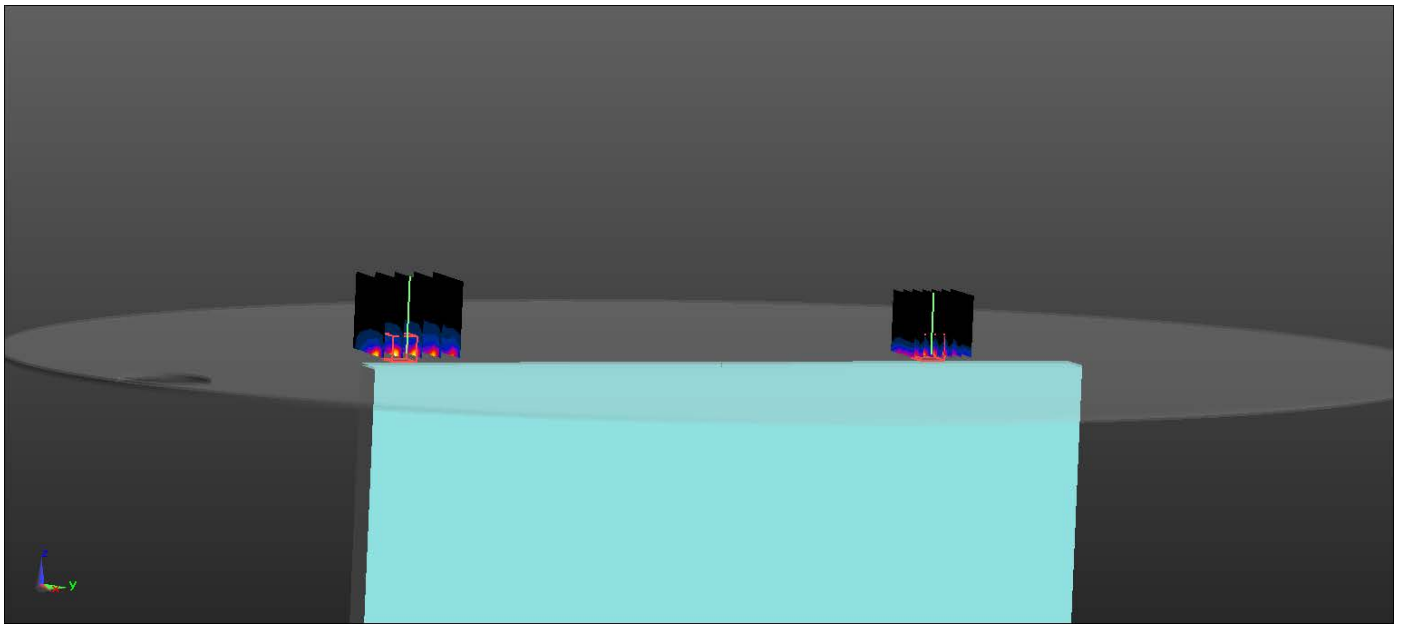
MEASUREMENT RESULTS – WiFi (Main)-WiFi (Aux)													
Position	**Frequency**		**Maxima**			**Frequency**		**Maxima**			**SAR_1**	**SAR_2**	**SAR Total**
	MHz	**Ch.**	**X**	**Y**	**Z**	**MHz**	**Ch.**	**X**	**Y**	**Z**			
Back	5280	56	100.20	88.80	2.76	5620	124	116.0	-94.00	3.27	0.48	0.50	0.98
Top	5620	124	-1.00	87.20	0.56	5620	124	0.80	-65.55	1.25	1.19	0.98	2.17
											Body **1.6 W/kg (mW/g)** averaged over 1 gram		

Top – 152.76 mm SPLSR=0.02 See Plot 3 Below

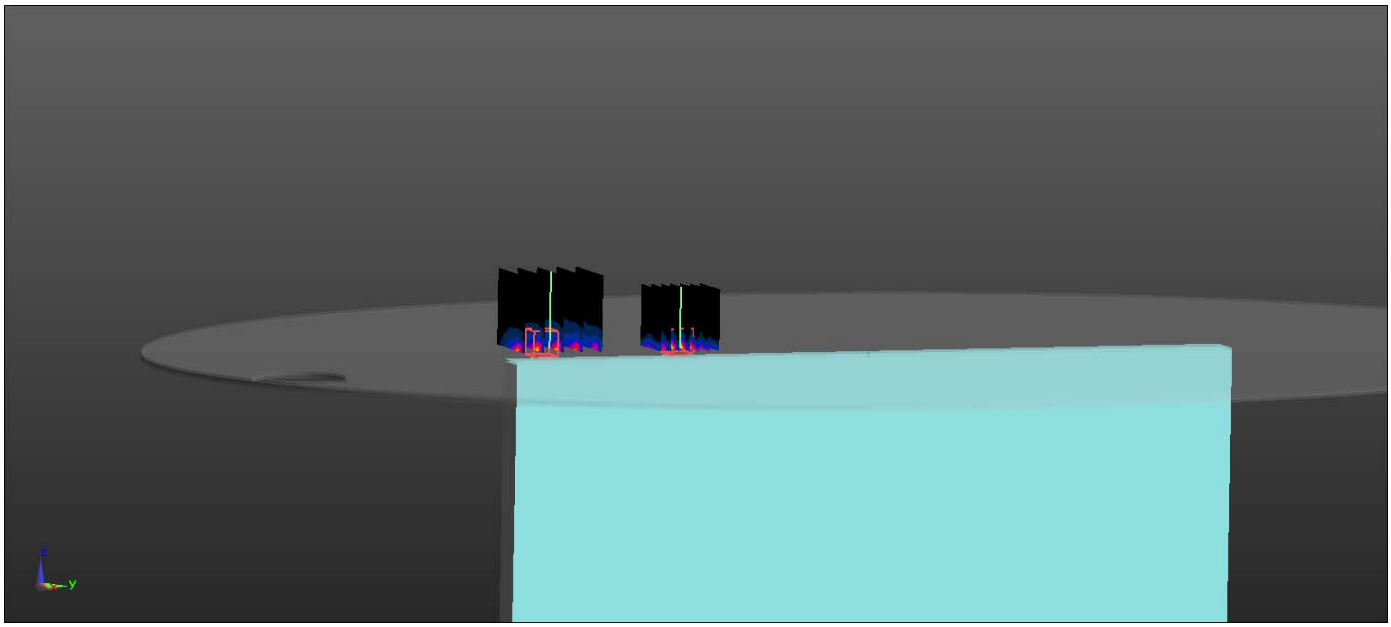
Simultaneous Separation Ratio Calculation

$(SAR_1 + SAR_2)^{1.5}/R_i \leq 0.04$ rounded to two digits

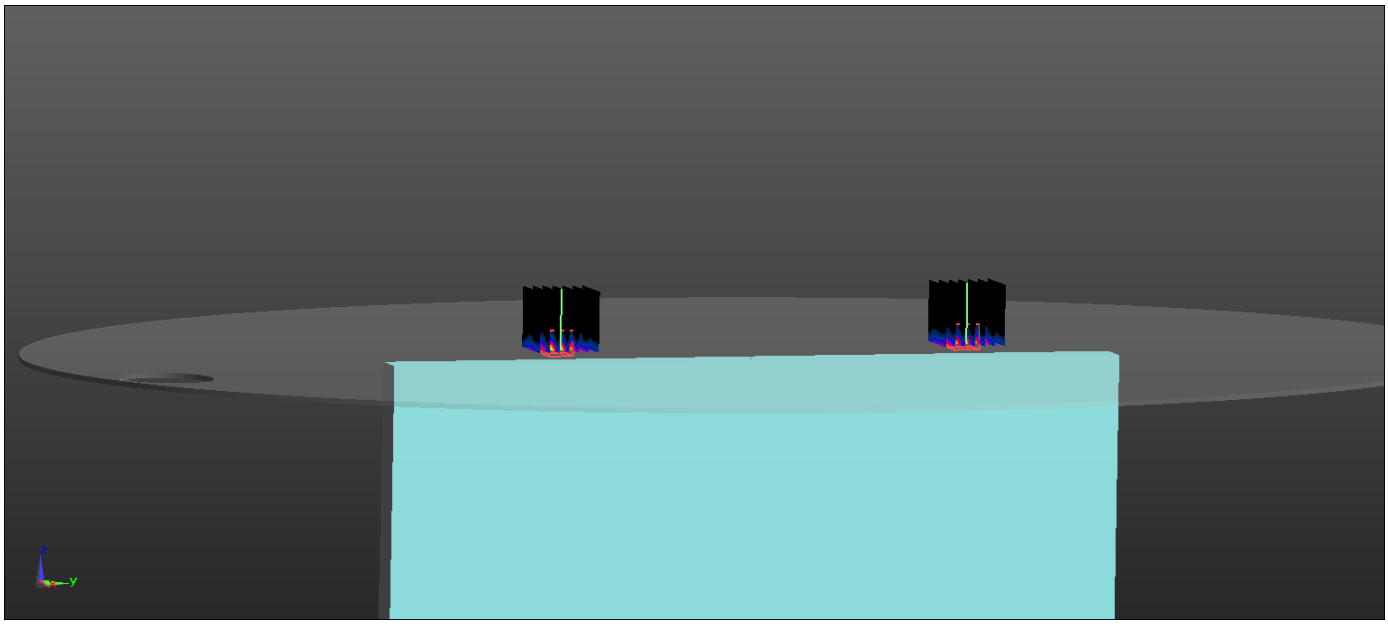
Plot 1



Plot 2



Plot 3



11. Test Equipment List

Table 11.1 Equipment Specifications

Type	Calibration Due Date	Calibration Done Date	Serial Number
Staubli Robot TX60L	N/A	N/A	F07/55M6A1/A/01
Measurement Controller CS8c	N/A	N/A	1012
ELI4 Flat Phantom	N/A	N/A	1065
ELI5 Flat Phantom	N/A	N/A	2037
Device Holder	N/A	N/A	N/A
Data Acquisition Electronics 4	08/10/2019	08/10/2018	759
Data Acquisition Electronics 4	04/16/2020	04/16/2019	1416
SPEAG E-Field Probe EX3DV4	04/24/2020	04/24/2019	3662
SPEAG E-Field Probe EX3DV4	06/03/2020	06/03/2019	7531
Speag Validation Dipole D750V2	07/13/2019	07/13/2018	1016
Speag Validation Dipole D835V2	07/13/2019	07/13/2018	4d089
Speag Validation Dipole D1750V2	07/20/2019	07/20/2018	1018
Speag Validation Dipole D1900V2	07/13/2019	07/13/2018	5d116
Speag Validation Dipole D2300V2	08/20/2019	08/20/2018	1060
Speag Validation Dipole D2550V2	07/12/2019	07/12/2018	1003
Speag Validation Dipole D2450V2	07/12/2019	07/12/2018	829
Speag Validation Dipole D5GHzV2	07/19/2019	07/19/2018	1085
Agilent N1911A Power Meter	04/27/2020	04/27/2019	GB45100254
Agilent N1922A Power Sensor	04/27/2020	04/27/2019	MY45240464
Advantest R3261A Spectrum Analyzer	03/25/2020	03/25/2019	31720068
Agilent (HP) 8350B Signal Generator	03/20/2020	03/20/2019	2749A10226
Agilent (HP) 83525A RF Plug-In	03/20/2020	03/20/2019	2647A01172
Agilent (HP) 8753C Vector Network Analyzer	03/20/2020	03/20/2019	3135A01724
Agilent (HP) 85047A S-Parameter Test Set	03/20/2020	03/20/2019	2904A00595
Agilent (HP) 8960 Base Station Sim.	03/19/2020	03/19/2019	MY48360364
Anritsu MT8820C	01/26/2020	01/26/2019	6201176199
Aprel Dielectric Probe Assembly	N/A	N/A	0011
Body Equivalent Matter (750 MHz)	N/A	N/A	N/A
Body Equivalent Matter (835 MHz)	N/A	N/A	N/A
Body Equivalent Matter (1750 MHz)	N/A	N/A	N/A
Body Equivalent Matter (1900 MHz)	N/A	N/A	N/A
Body Equivalent Matter (2300 MHz)	N/A	N/A	N/A
Body Equivalent Matter (2550 MHz)	N/A	N/A	N/A
Body Equivalent Matter (2450 MHz)	N/A	N/A	N/A
Body Equivalent Matter (5 GHz)	N/A	N/A	N/A

12. Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC/IC. These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all parameters subject to the test. The test results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body is a very complex phenomena that depends on the mass, shape, and size of the body; the orientation of the body with respect to the field vectors; and, the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

13. References

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation, August 1996

[2] ANSI/IEEE C95.1 – 1992, American National Standard Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300kHz to 100GHz, New York: IEEE, 1992.

[3] ANSI/IEEE C95.3 – 1992, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, 1992.

[4] International Electrotechnical Commission, IEC 62209-2 (Edition 1.0), Human Exposure to radio frequency fields from hand-held and body mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), March 2010.

[5] IEEE Standard 1528 – 2013, IEEE Recommended Practice for Determining the Peak-Spatial Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques, June 2013.

[6] Industry Canada, RSS – 102 Issue 5, Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), March 2015.

[7] Health Canada, Safety Code 6, Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz, 2009.

Appendix A – System Validation Plots and Data

```
************************************************************
Test Result for UIM Dielectric Parameter
Wed 19/Jun/2019
Freq   Frequency(GHz)
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
************************************************************
Freq         FCC_eB FCC_sB Test_e Test_s
0.7000       55.73  0.96   55.33  0.96
0.7040       55.714 0.96   55.318 0.964*
0.7075       55.70  0.96   55.308 0.968*
0.7100       55.69  0.96   55.30  0.97
0.7110       55.686 0.96   55.297 0.97*
0.7200       55.65  0.96   55.27  0.97
0.7300       55.61  0.96   55.24  0.98
0.7400       55.57  0.96   55.21  0.98
0.7500       55.53  0.96   55.18  0.98
0.7600       55.49  0.96   55.15  0.99
0.7700       55.45  0.96   55.11  0.99
0.7800       55.41  0.97   55.07  0.99
0.7820       55.404 0.97   55.062 0.99*
0.7900       55.38  0.97   55.03  0.99
0.8000       55.34  0.97   54.99  1.00

* value interpolated

************************************************************
Test Result for UIM Dielectric Parameter
Thu 20/Jun/2019
Freq   Frequency(GHz)
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
************************************************************
Freq         FCC_eB FCC_sB Test_e Test_s
0.8050       55.32  0.97   56.12  0.97
0.8150       55.28  0.97   56.07  0.99
0.8190       55.264 0.97   56.05  0.99*
0.8250       55.24  0.97   56.02  0.99
0.8264       55.234 0.97   56.014 0.991*
0.8290       55.224 0.97   56.004 0.994*
0.8315       55.214 0.97   55.994 0.997*
0.8350       55.20  0.97   55.98  1.00
0.8365       55.196 0.972  55.973 1.00*
0.8366       55.195 0.972  55.972 1.00*
0.8440       55.173 0.979  55.935 1.00*
0.8450       55.17  0.98   55.93  1.00
0.8466       55.165 0.982  55.927 1.002*
0.8550       55.14  0.99   55.91  1.01
0.8650       55.11  1.01   55.87  1.02
0.8750       55.08  1.02   55.85  1.03
0.8850       55.05  1.03   55.80  1.04
0.8950       55.02  1.04   55.77  1.05

* value interpolated
```

```
************************************************************
Test Result for UIM Dielectric Parameter
Thu 20/Jun/2019
Freq   Frequency(GHz)
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
************************************************************
Freq         FCC_eB FCC_sB Test_e Test_s
1.7100       53.53  1.47   53.04  1.47
1.7124       53.525 1.47   53.033 1.472*
1.7200       53.51  1.47   53.01  1.48
1.7300       53.48  1.48   52.87  1.49
1.7325       53.475 1.48   52.865 1.493*
1.7326       53.475 1.48   52.865 1.493*
1.7400       53.46  1.48   52.85  1.50
1.7450       53.445 1.485  52.83  1.505*
1.7500       53.43  1.49   52.81  1.51
1.7526       53.425 1.49   52.805 1.513*
1.7600       53.41  1.49   52.79  1.52
1.7700       53.38  1.50   52.76  1.53
1.7800       53.35  1.51   52.72  1.54

* value interpolated


************************************************************
Test Result for UIM Dielectric Parameter
Fri 21/Jun/2019
Freq   Frequency(GHz)
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
************************************************************
Freq         FCC_eB FCC_sB Test_e Test_s
1.8400       53.30  1.52   52.19  1.53
1.8500       53.30  1.52   52.18  1.54
1.8524       53.30  1.52   52.173 1.54*
1.8600       53.30  1.52   52.15  1.54
1.8700       53.30  1.52   52.14  1.55
1.8800       53.30  1.52   52.10  1.55
1.8900       53.30  1.52   52.07  1.55
1.9000       53.30  1.52   52.07  1.55
1.9076       53.30  1.52   52.032 1.558*
1.9100       53.30  1.52   52.02  1.56
1.9200       53.30  1.52   52.00  1.56

* value interpolated
```

```
************************************************************
Test Result for UIM Dielectric Parameter
Mon 17/Jun/2019
Freq   Frequency(GHz)
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
************************************************************
Freq         FCC_eB FCC_sB Test_e Test_s
2.2900       52.91  1.80   52.31  1.81
2.3000       52.90  1.81   52.29  1.82
2.3100       52.89  1.82   52.27  1.83
2.3200       52.87  1.83   52.25  1.84
2.3300       52.86  1.84   52.24  1.85
2.3400       52.85  1.84   52.22  1.86
2.3500       52.83  1.85   52.20  1.87


************************************************************
Test Result for UIM Dielectric Parameter
Mon 17/Jun/2019
Freq   Frequency(GHz)
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
************************************************************
Freq         FCC_eB FCC_sB Test_e Test_s
2.4900       52.65  2.01   52.22  2.03
2.5000       52.64  2.02   52.20  2.04
2.5060       52.628 2.032  52.182 2.052*
2.5100       52.62  2.04   52.17  2.06
2.5200       52.61  2.05   52.14  2.08
2.5300       52.60  2.06   52.12  2.10
2.5350       52.595 2.07   52.115 2.11*
2.5400       52.59  2.08   52.11  2.12
2.5495       52.571 2.09   52.091 2.13*
2.5500       52.57  2.09   52.09  2.13
2.5600       52.56  2.11   52.07  2.15
2.5700       52.55  2.12   52.05  2.17
2.5800       52.53  2.13   52.04  2.18
2.5900       52.52  2.15   52.01  2.20
2.5930       52.517 2.153  52.007 2.206*
2.5950       52.515 2.155  52.005 2.21*
2.6000       52.51  2.16   52.00  2.22
2.6100       52.50  2.18   51.97  2.23
2.6200       52.48  2.19   51.95  2.26
2.6300       52.47  2.21   51.94  2.28
2.6365       52.464 2.217  51.927 2.293*
2.6400       52.46  2.22   51.92  2.30
2.6500       52.45  2.23   51.91  2.31
2.6600       52.43  2.25   51.89  2.33
2.6700       52.42  2.26   51.87  2.35
2.6800       52.41  2.28   51.85  2.36
2.6900       52.39  2.29   51.82  2.38
2.7000       52.38  2.30   51.81  2.39
2.8000       52.37  2.31   51.79  2.40

* value interpolated
```

```
**********************************************************
Test Result for UIM Dielectric Parameter
Wed 19/Jun/2019
Freq   Frequency(GHz)
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
**********************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
2.4100	52.75	1.91	52.71	1.92
2.4120	52.742	1.918	52.706	1.922*
2.4200	52.74	1.92	52.69	1.93
2.4300	52.73	1.93	52.68	1.94
2.4370	52.716	1.937	52.666	1.947*
2.4400	52.71	1.94	52.66	1.95
2.4500	52.70	1.95	52.64	1.96
2.4600	52.69	1.96	52.63	1.98
2.4620	52.687	1.963	52.626	1.982*
2.4700	52.67	1.98	52.61	1.99
2.4800	52.66	1.99	52.60	2.00

* value interpolated

```
**********************************************************
Test Result for UIM Dielectric Parameter
Tue 18/Jun/2019
Freq   Frequency(GHz)
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
**********************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
5.1000	49.15	5.18	49.08	5.20
5.1200	49.12	5.21	49.05	5.22
5.1400	49.10	5.23	49.02	5.24
5.1600	49.07	5.25	48.99	5.26
5.1800	49.04	5.28	48.96	5.28
5.2000	49.01	5.30	48.93	5.30
5.2100	49.00	5.31	48.915	5.31*
5.2200	48.99	5.32	48.90	5.32
5.2400	48.96	5.35	48.97	5.34
5.2500	48.945	5.36	48.955	5.35*
5.2600	48.93	5.37	48.94	5.36
5.2800	48.91	5.39	48.91	5.38
5.2900	48.895	5.405	48.895	5.395*
5.3000	48.88	5.42	48.88	5.41
5.3200	48.85	5.44	48.85	5.43
5.3400	48.82	5.46	48.82	5.45
5.3600	48.80	5.49	48.79	5.47
5.3800	48.77	5.51	48.76	5.49
5.4000	48.74	5.53	48.73	5.51
5.4200	48.72	5.56	48.70	5.53
5.4400	48.69	5.58	48.67	5.56
5.4600	48.66	5.60	48.64	5.58
5.4800	48.63	5.63	48.61	5.60
5.5000	48.61	5.65	48.58	5.62
5.5200	48.58	5.67	48.55	5.65
5.5400	48.55	5.70	48.52	5.67
5.5600	48.53	5.72	48.49	5.69
5.5800	48.50	5.74	48.46	5.71
5.6000	48.47	5.77	48.43	5.74
5.6100	48.455	5.78	48.415	5.75*
5.6200	48.44	5.79	48.40	5.76
5.6400	48.42	5.81	48.37	5.78
5.6600	48.39	5.84	48.34	5.81
5.6800	48.36	5.86	48.31	5.83
5.7000	48.34	5.88	48.28	5.85
5.7200	48.31	5.91	48.25	5.88
5.7400	48.28	5.93	48.22	5.90
5.7450	48.273	5.935	48.213	5.905*
5.7500	48.265	5.94	48.205	5.91*
5.7600	48.25	5.95	48.19	5.92
5.7750	48.235	5.973	48.168	5.943*
5.7800	48.23	5.98	48.16	5.95
5.7850	48.223	5.985	48.153	5.955*
5.8000	48.20	6.00	48.13	5.97
5.8200	48.17	6.02	48.10	5.99
5.8250	48.165	6.028	48.093	5.998*
5.8400	48.15	6.05	48.07	6.02

* value interpolated

RF Exposure Lab

Plot 1

DUT: Dipole 750 MHz D750V3; Type: D750V3; Serial: D750V3 - SN:1016

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: MSL750; Medium parameters used: f = 750 MHz; σ = 0.98 S/m; ε_r = 55.18; ρ = 1000 kg/m^3
Phantom section: Flat Section

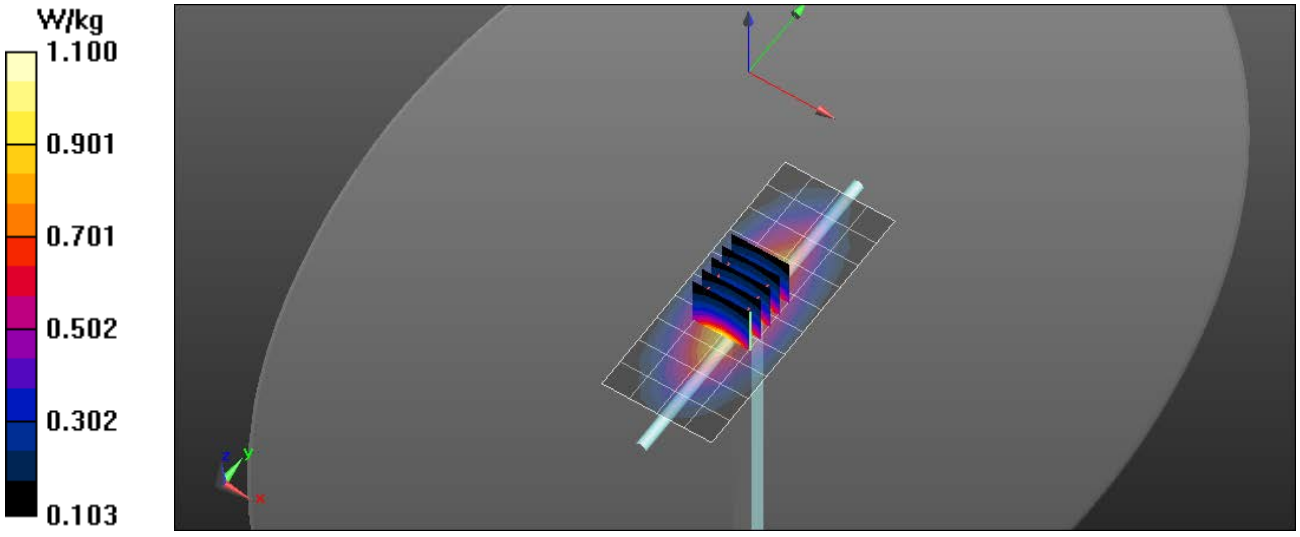
Test Date: Date: 6/19/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

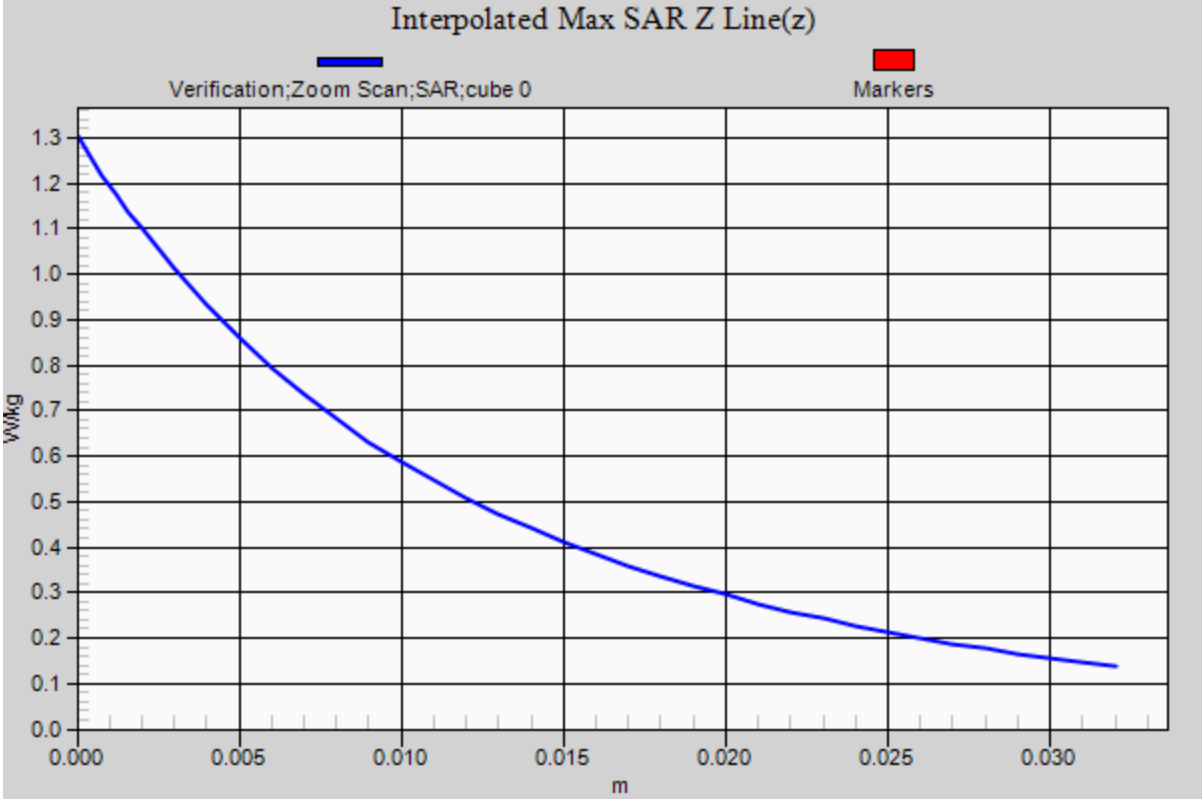
Probe: EX3DV4 - SN3662; ConvF(9.55, 9.55, 9.55); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

750 MHz/Verification/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.06 W/kg

750 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.743 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.28 W/kg
P_{in}= 100 mW
SAR(1 g) = 0.861 W/kg; SAR(10 g) = 0.562 W/kg
Maximum value of SAR (measured) = 1.09 W/kg





RF Exposure Lab

Plot 2

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:4d089

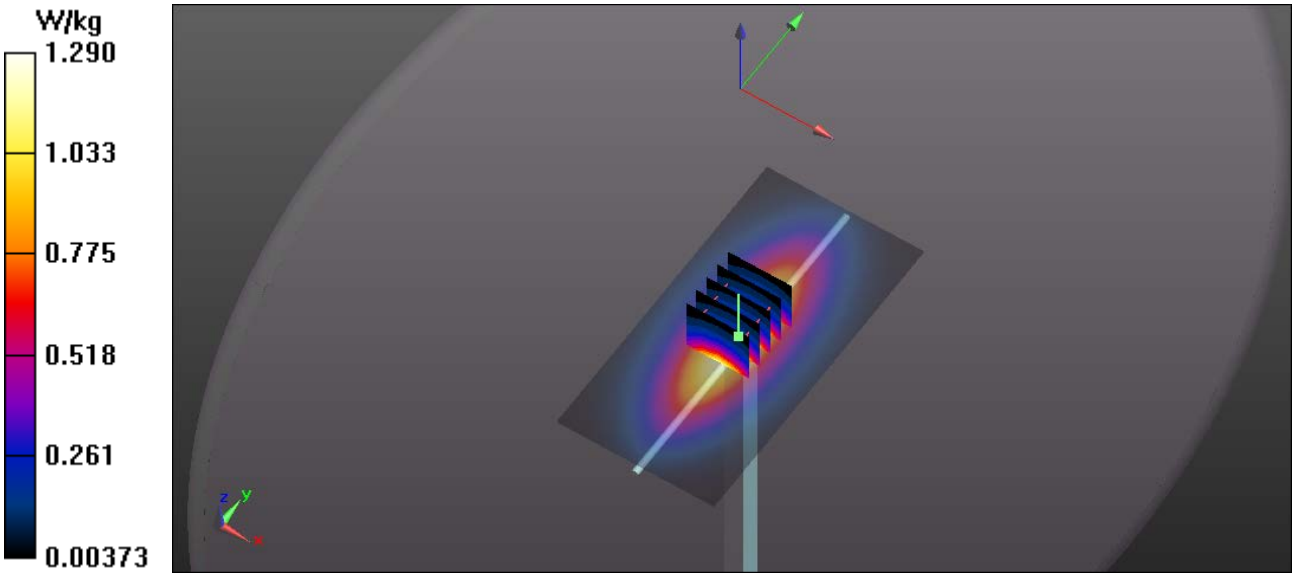
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used: f = 835 MHz; σ = 1 S/m; ε_r = 55.98; ρ = 1000 kg/m^3
Phantom section: Flat Section

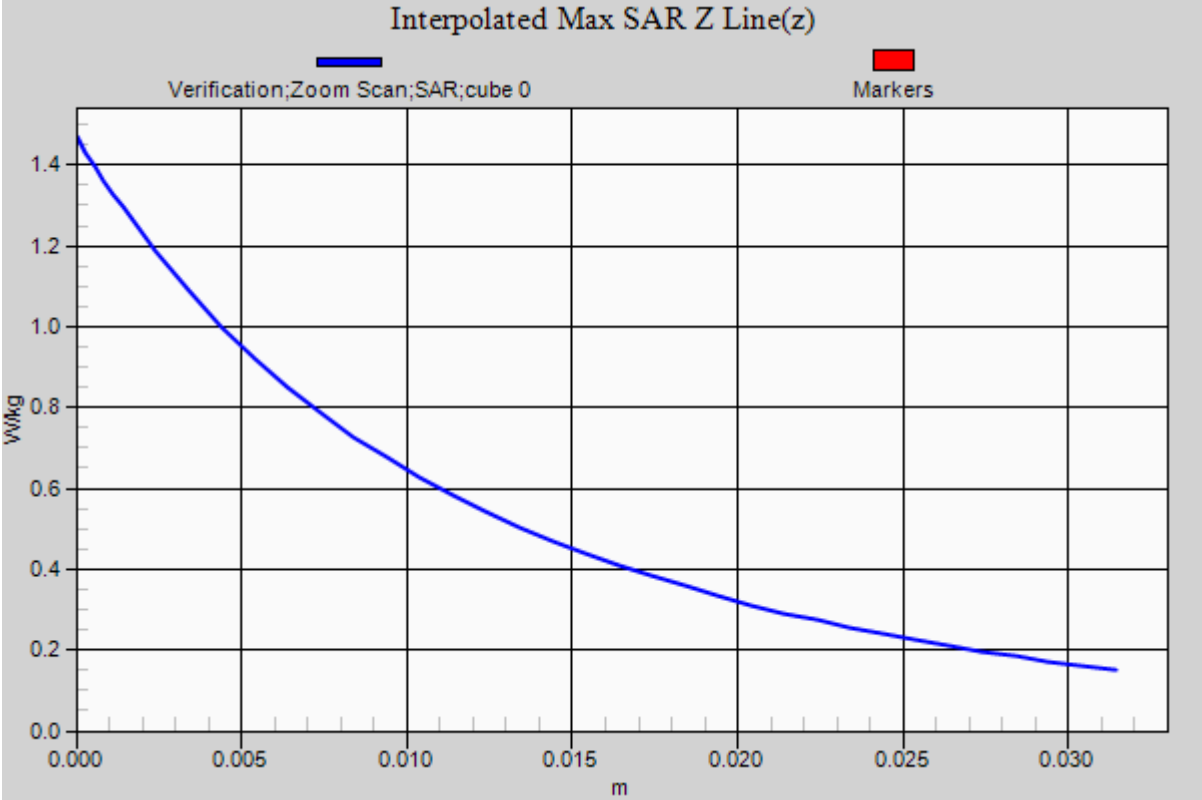
Test Date: Date: 6/20/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3662; ConvF(9.34, 9.34, 9.34); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

835 MHz Body/Verification/Area Scan (81x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.27 W/kg

835 MHz Body/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 55.321 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.49 W/kg
P_{in}= 100 mW
SAR(1 g) = 0.959 W/kg; SAR(10 g) = 0.635 W/kg
Maximum value of SAR (measured) = 1.30 W/kg





RF Exposure Lab

Plot 3

DUT: Dipole 1750 MHz D1750V2; Type: D1750V2; Serial: D1750V2 - SN:1018

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: MSL1750; Medium parameters used: f = 1750 MHz; σ = 1.51 S/m; ε_r = 52.81; ρ = 1000 kg/m^3
Phantom section: Flat Section

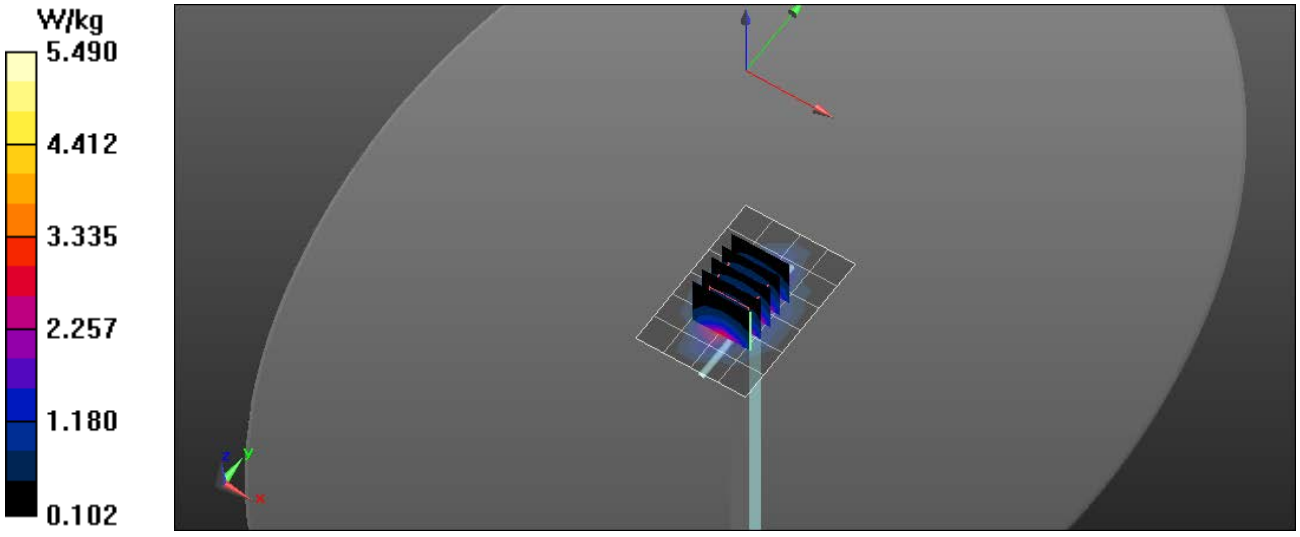
Test Date: Date: 6/20/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

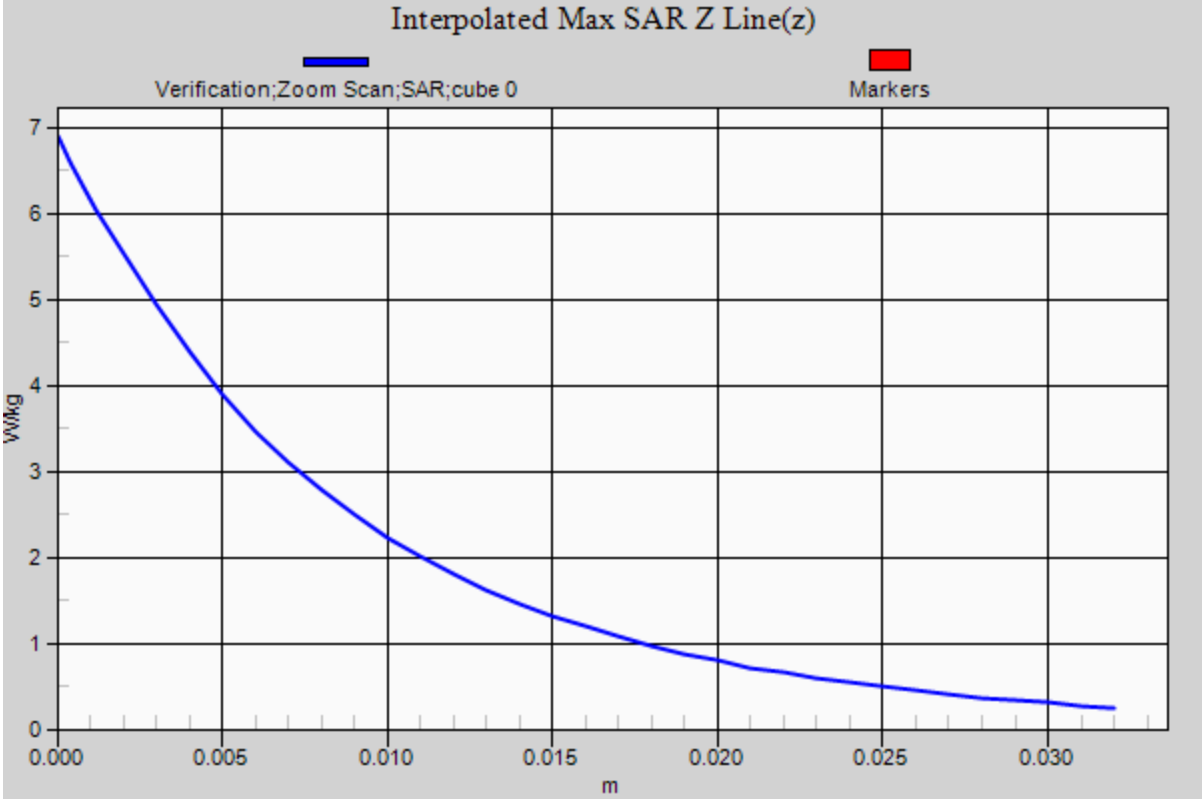
Probe: EX3DV4 - SN3662; ConvF(7.95, 7.95, 7.95); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1750 MHz/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.29 W/kg

1750 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.566 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 6.82 W/kg
P_{in}= 100 mW
SAR(1 g) = 3.69 W/kg; SAR(10 g) = 2.01 W/kg
Maximum value of SAR (measured) = 5.46 W/kg





RF Exposure Lab

Plot 4

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d116

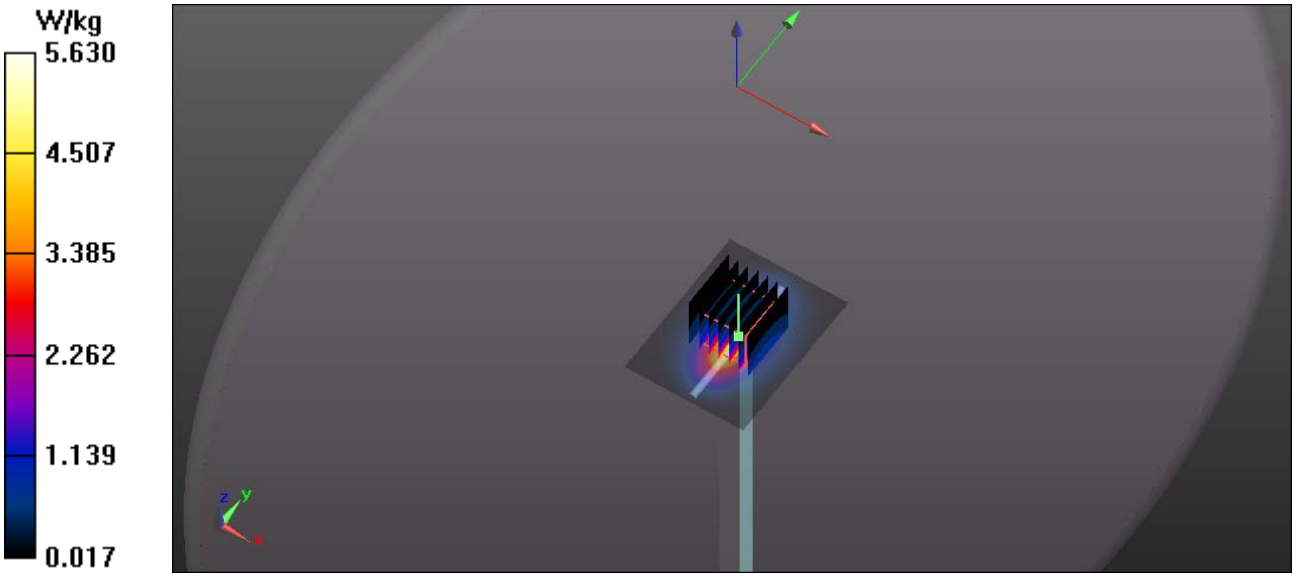
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used: f = 1900 MHz; σ = 1.55 S/m; ε_r = 52.07; ρ = 1000 kg/m^3
Phantom section: Flat Section

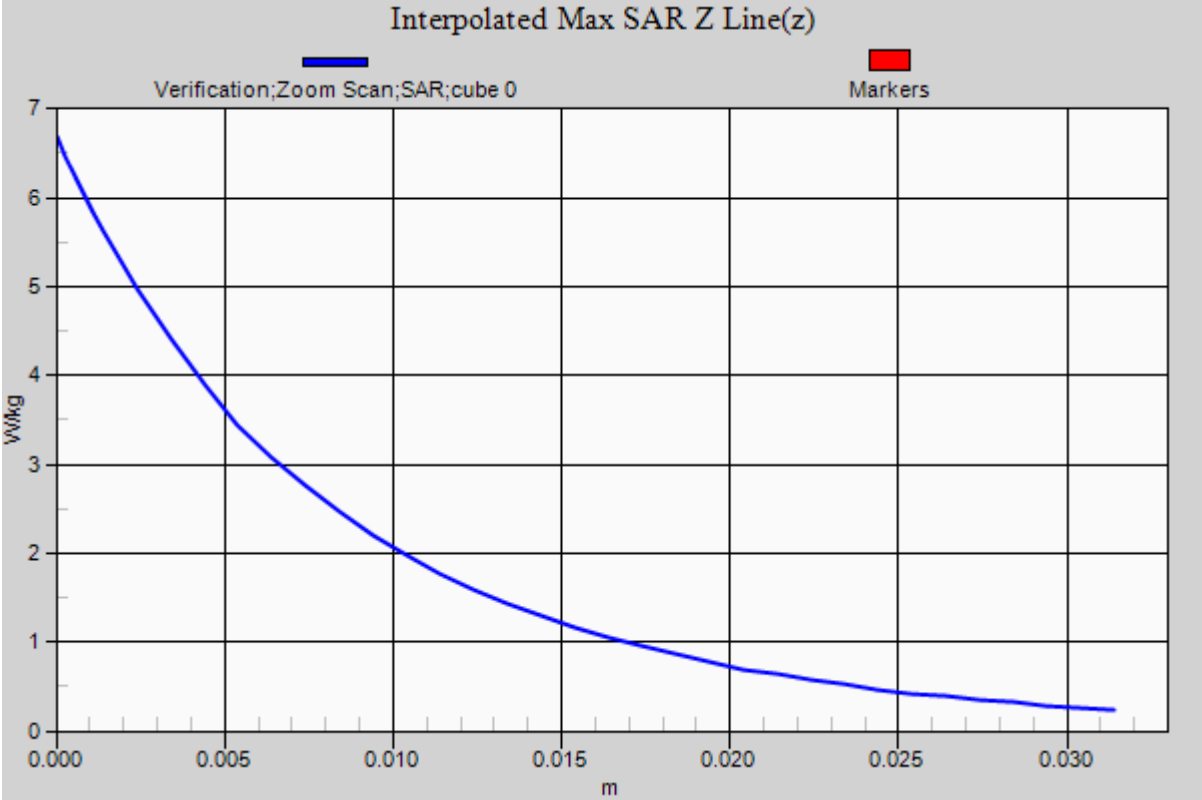
Test Date: Date: 6/21/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3662; ConvF(7.69, 7.69, 7.69); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1900 MHz Body/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 5.61 W/kg

1900 MHz Body/Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.597 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 6.65 W/kg
P_{in}= 100 mW
SAR(1 g) = 4.01 W/kg; SAR(10 g) = 1.94 W/kg
Maximum value of SAR (measured) = 5.62 W/kg





RF Exposure Lab

Plot 5

DUT: Dipole 2300 MHz D2300V2; Type: D2300V2; Serial: D2300V2 - SN:1060

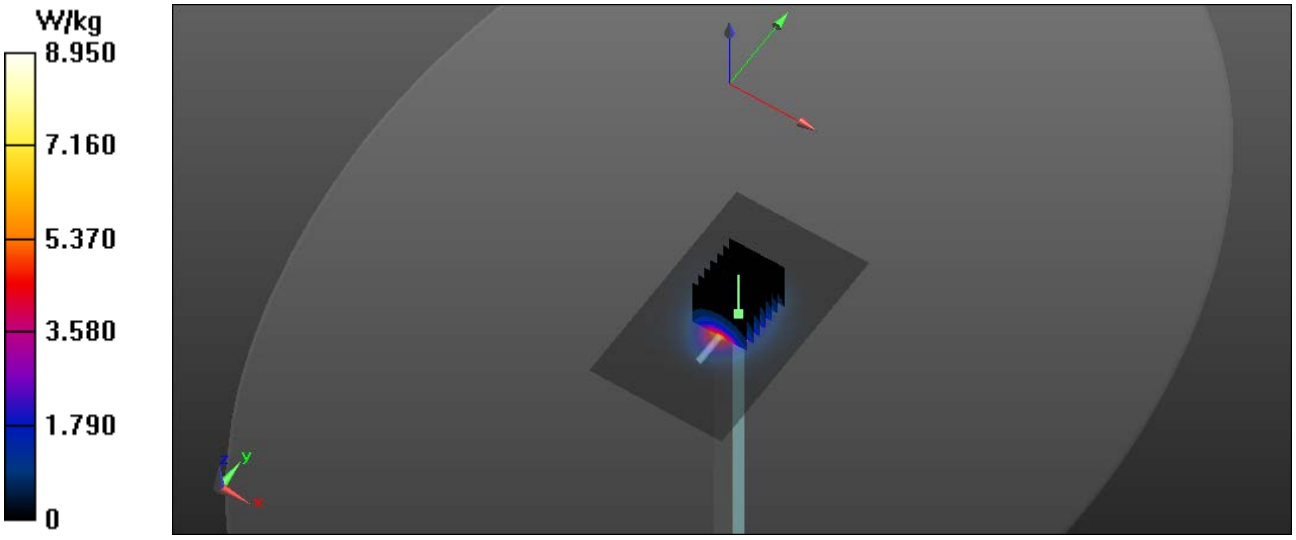
Communication System: CW; Frequency: 2300 MHz; Duty Cycle: 1:1
Medium: MSL2300; Medium parameters used: f = 2300 MHz; σ = 1.82 S/m; ε_r = 52.29; ρ = 1000 kg/m^3
Phantom section: Flat Section

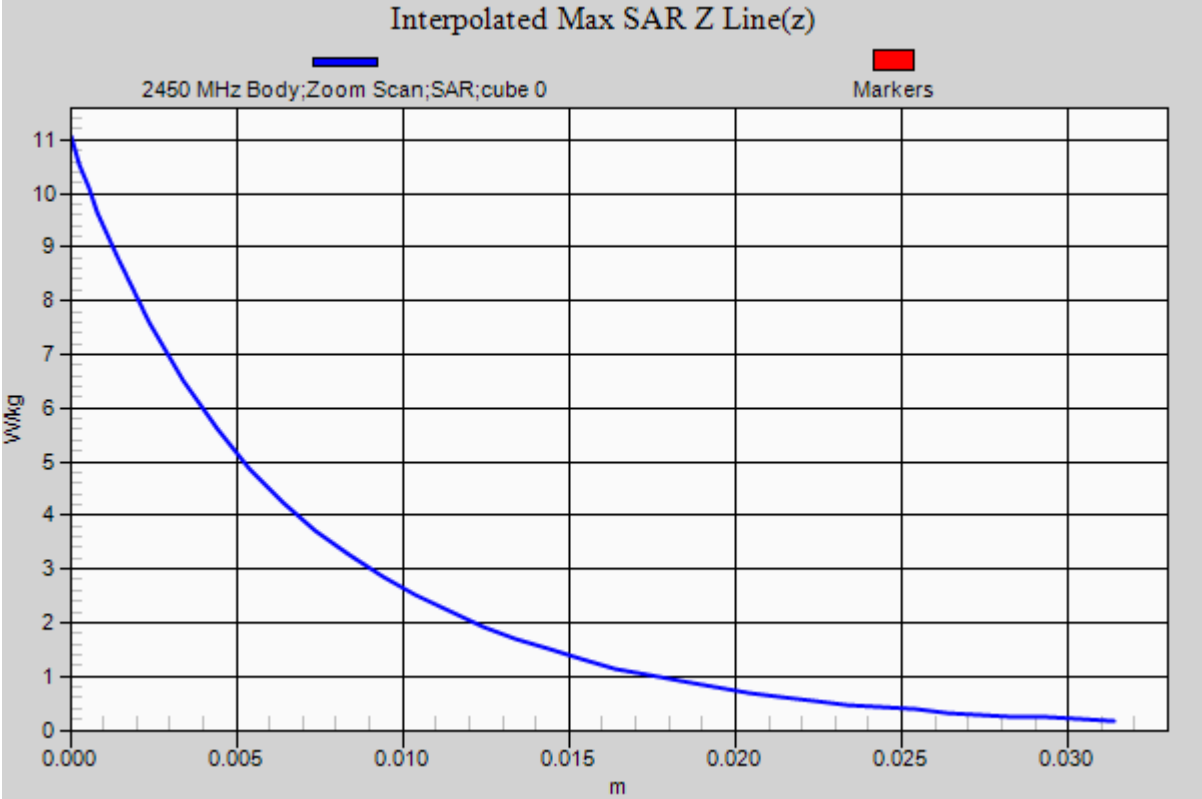
Test Date: Date: 6/17/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3662; ConvF(7.43, 7.43, 7.43); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

Body Verification/2300 MHz/Area Scan (61x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 8.95 W/kg

Body Verification/2300 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.945 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 11.05 W/kg
P_{in}= 100 mW
SAR(1 g) = 4.79 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 8.92 W/kg





RF Exposure Lab

Plot 6

DUT: Dipole 2550 MHz D2550V2; Type: D2550V2; Serial: D2550V2 - SN:1003

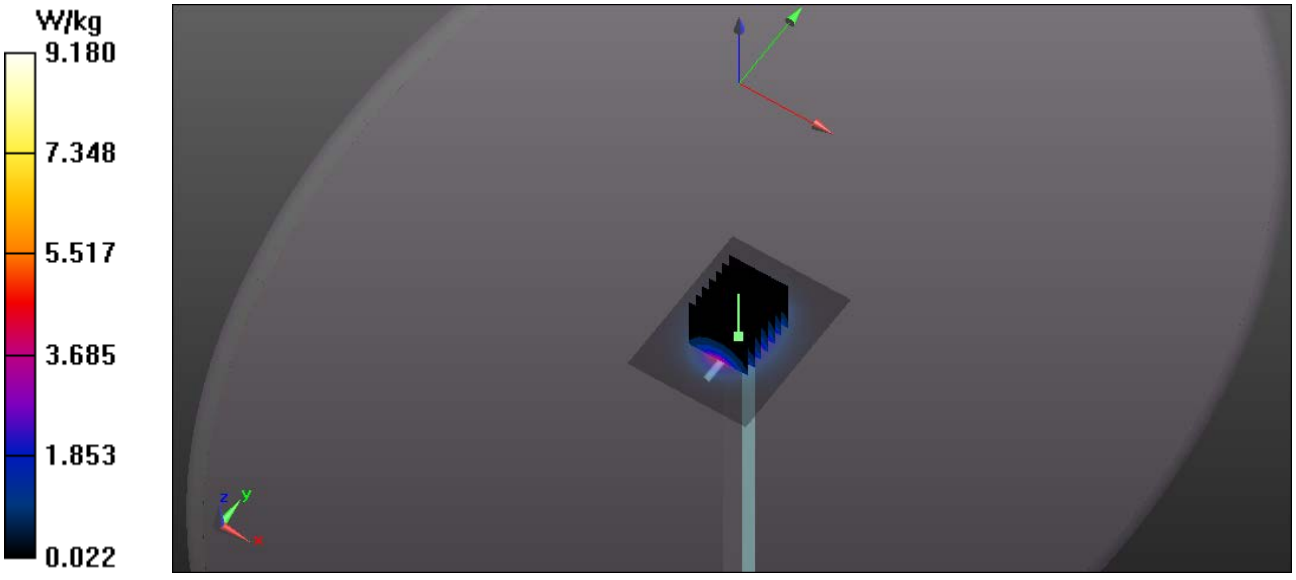
Communication System: CW; Frequency: 2550 MHz; Duty Cycle: 1:1
Medium: MSL2600; Medium parameters used: f = 2550 MHz; σ = 2.13 S/m; ε_r = 52.09; ρ = 1000 kg/m^3
Phantom section: Flat Section

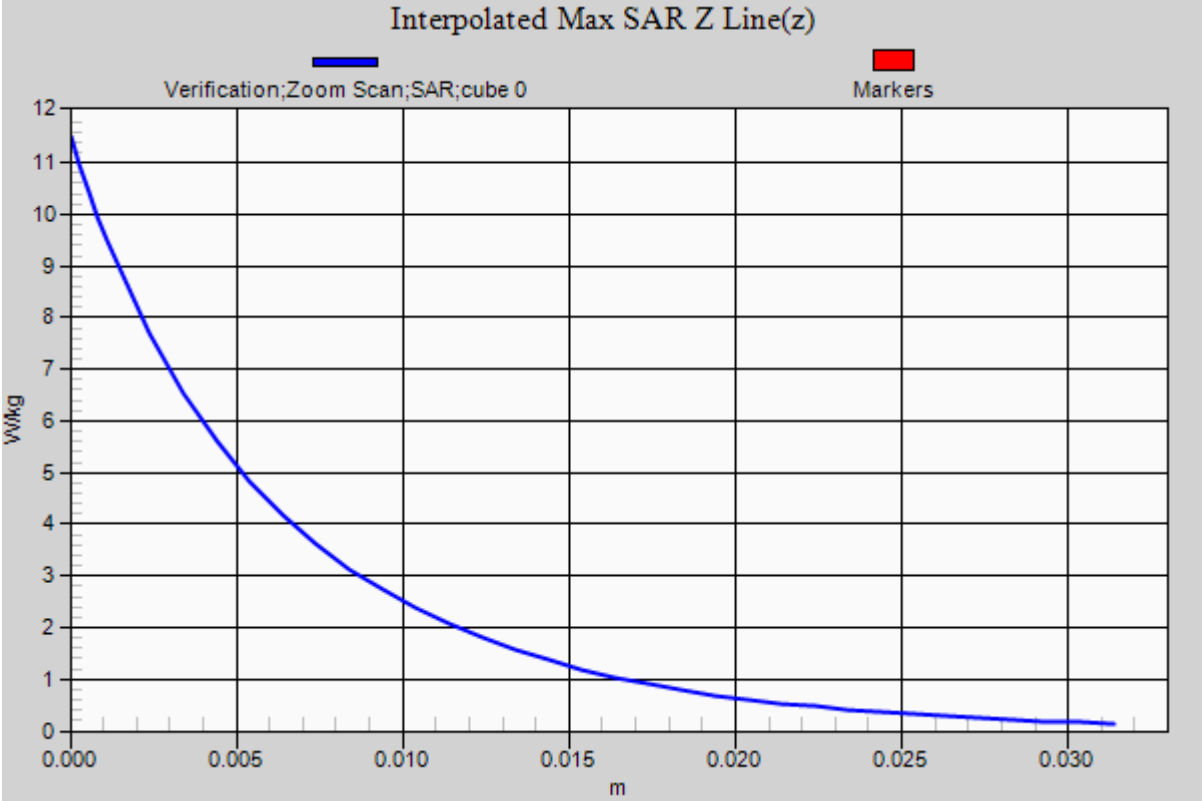
Test Date: Date: 6/17/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3662; ConvF(7.12, 7.12, 7.12); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

2550 MHz Body/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 9.02 W/kg

2550 MHz Body/Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.369 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 11.1 W/kg
P_{in}= 100 mW
SAR(1 g) = 5.31 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 9.12 W/kg





RF Exposure Lab

Plot 7

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN: 829

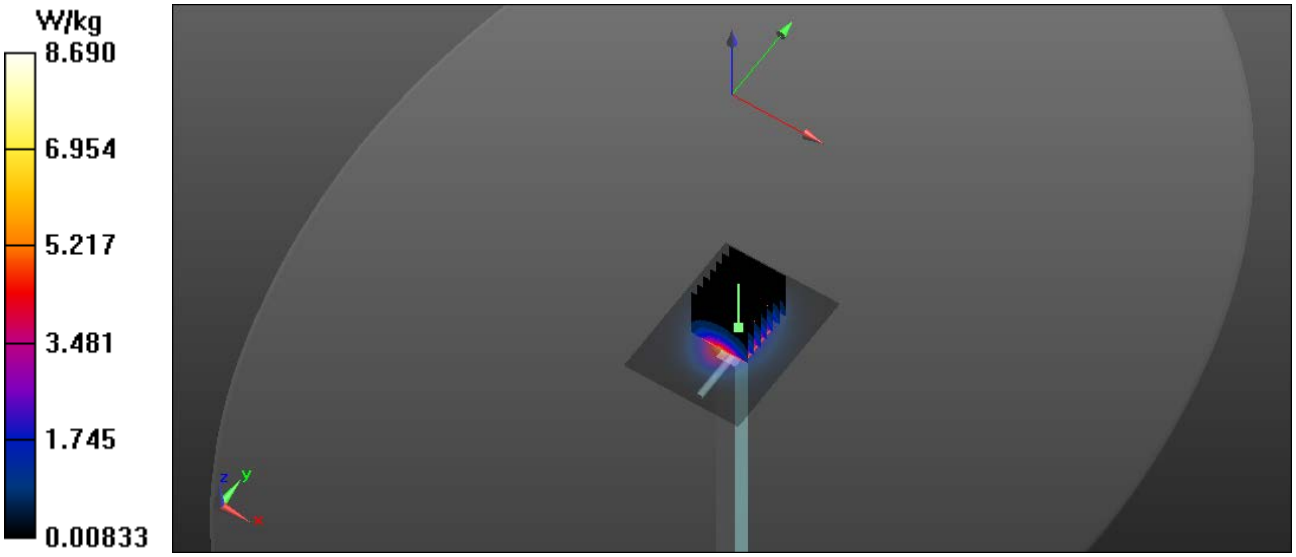
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL2450; Medium parameters used: f = 2450 MHz; σ = 1.96 S/m; ε_r = 52.64; ρ = 1000 kg/m^3
Phantom section: Flat Section

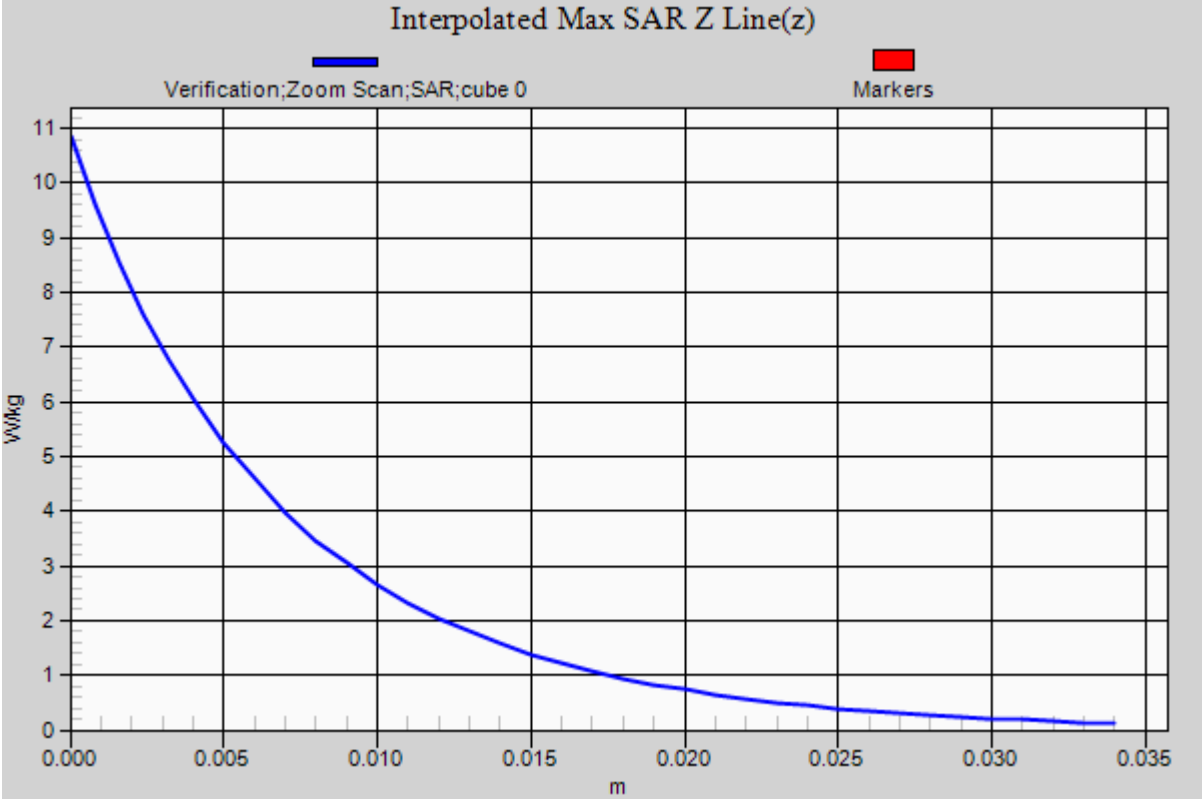
Test Date: Date: 6/19/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN7531; ConvF(7.62, 7.62, 7.62); Calibrated: 6/3/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/20/2018
Phantom: ELI v4.0; Type: QDOVA002AA; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

2450 MHz Body/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 8.68 W/kg

2450 MHz Body/Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.751 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 10.7 W/kg
P_{IN}=100 mW
SAR(1 g) = 5.18 W/kg; SAR(10 g) = 2.4 W/kg
Maximum value of SAR (measured) = 5.91 W/kg





RF Exposure Lab

Plot 8

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1085

Communication System: CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: MSL 3-6 GHz; Medium parameters used (interpolated): f = 5250 MHz; σ = 5.35 S/m; ε_r = 48.955; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/18/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN7531; ConvF(4.52, 4.52, 4.52); Calibrated: 6/3/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/20/2018
Phantom: ELI v4.0; Type: QDOVA002AA; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

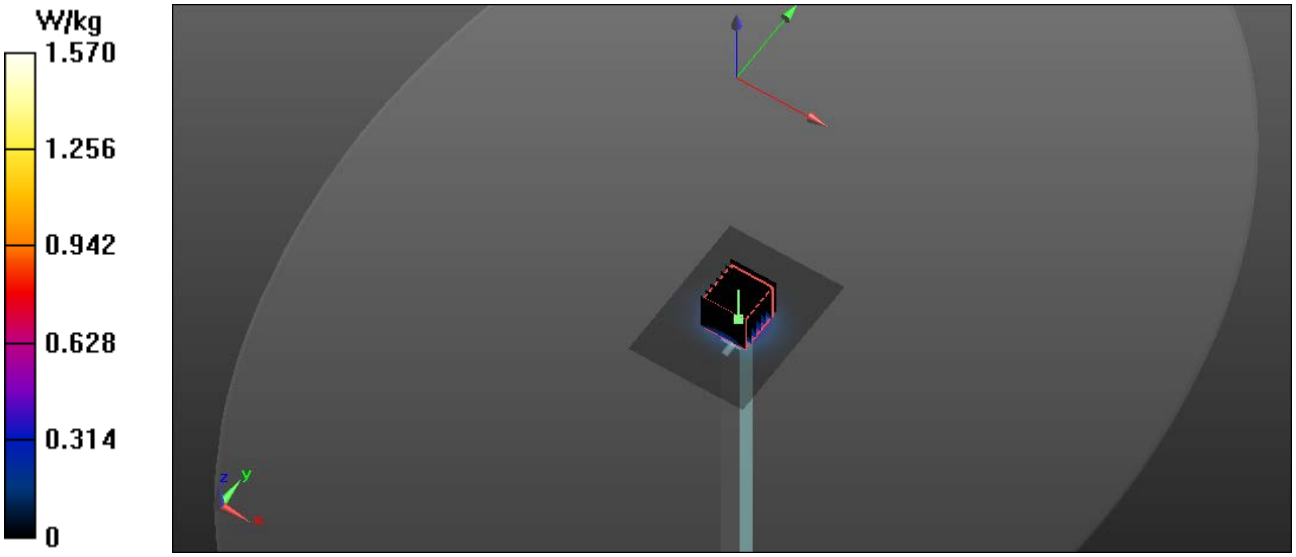
Procedure Notes:

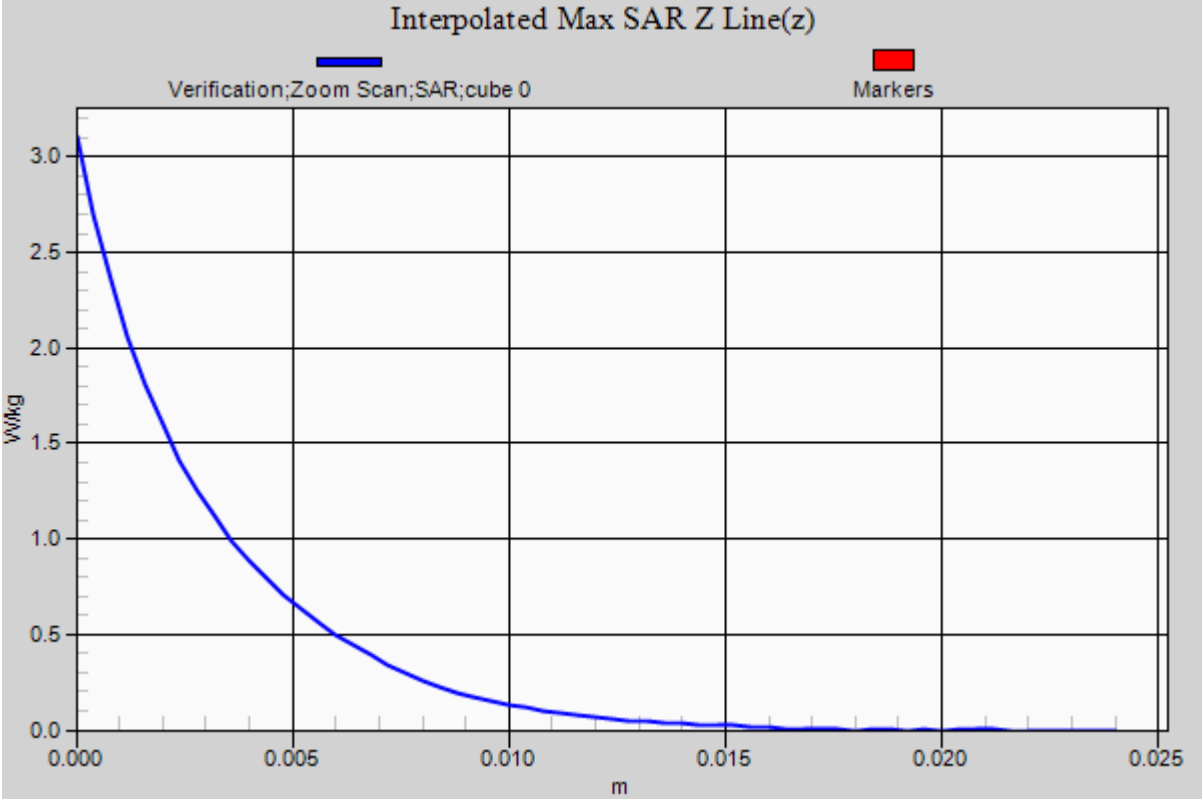
5250 MHz Body/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.55 W/kg

5250 MHz Body/Verification/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 55.759 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.09 W/kg
P_{IN}=10 mW
SAR(1 g) = 0.776 W/kg; SAR(10 g) = 0.225 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.58 W/kg





RF Exposure Lab

Plot 9

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1085

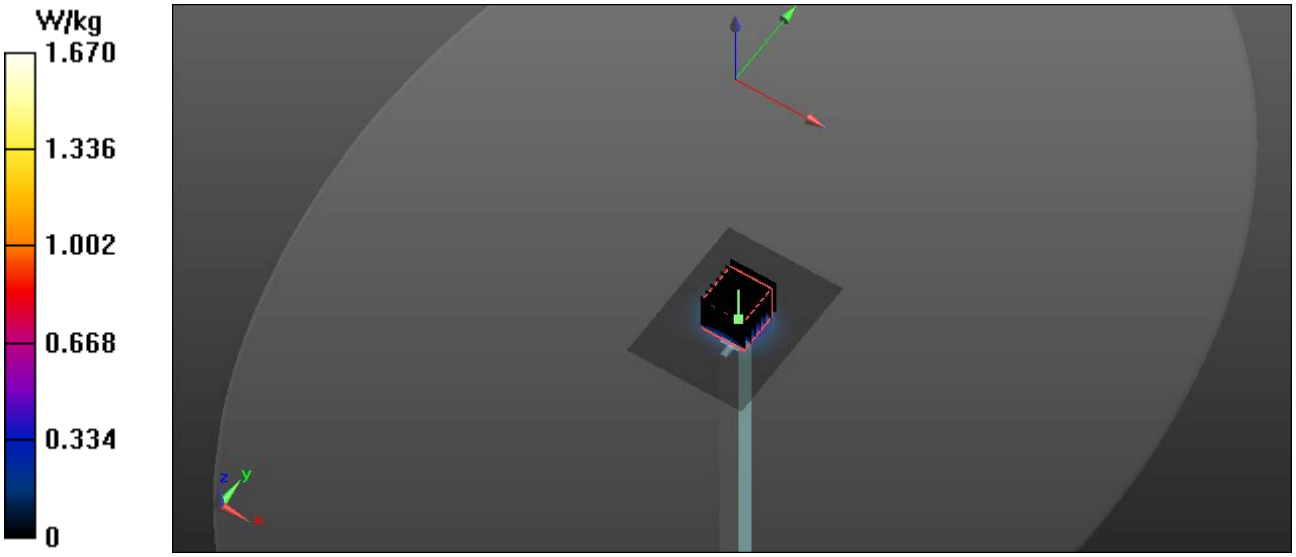
Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: MSL 3-6 GHz; Medium parameters used: f = 5600 MHz; σ = 5.74 S/m; ε_r = 48.43; ρ = 1000 kg/m^3
Phantom section: Flat Section

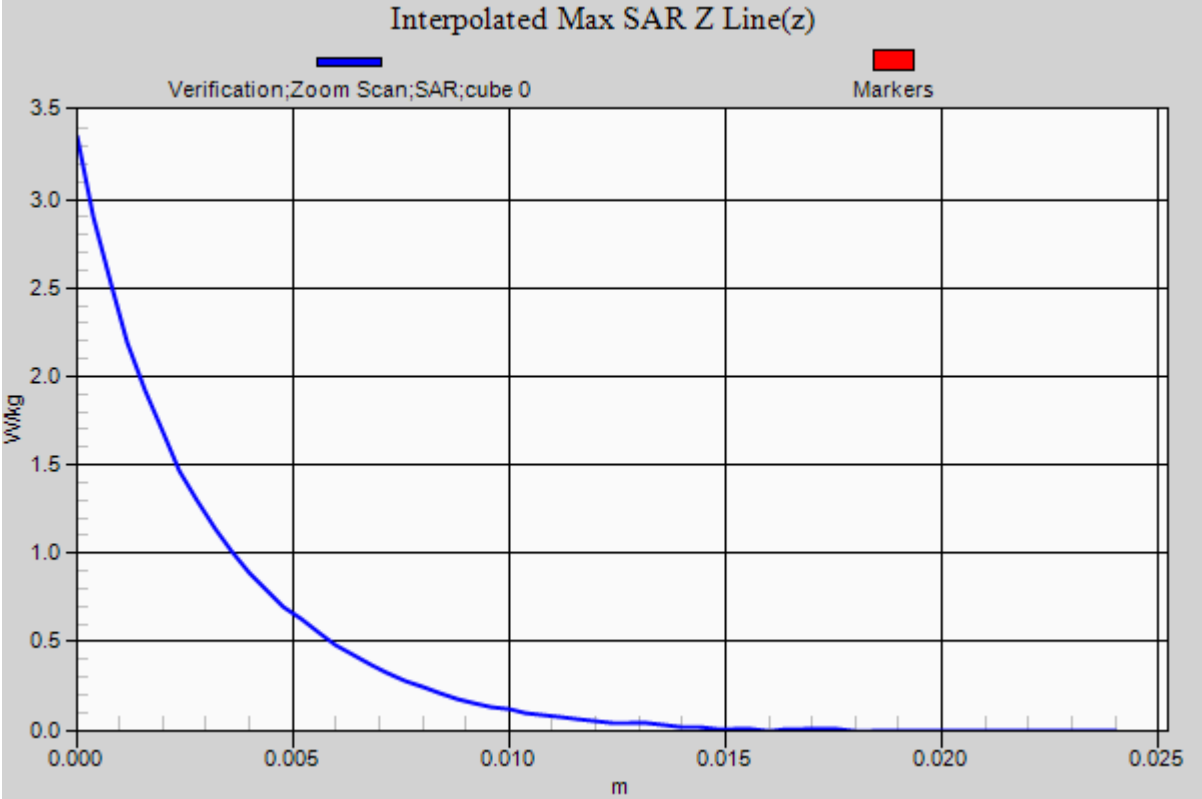
Test Date: Date: 6/18/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN7531; ConvF(4.01, 4.01, 4.01); Calibrated: 6/3/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/20/2018
Phantom: ELI v4.0; Type: QDOVA002AA; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

5600 MHz Body/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.68 W/kg

5600 MHz Body/Verification/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 55.852 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.37 W/kg
P_{IN}=10 mW
SAR(1 g) = 0.791 W/kg; SAR(10 g) = 0.218 W/kg
Maximum value of SAR (measured) = 1.71 W/kg





RF Exposure Lab

Plot 10

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1085

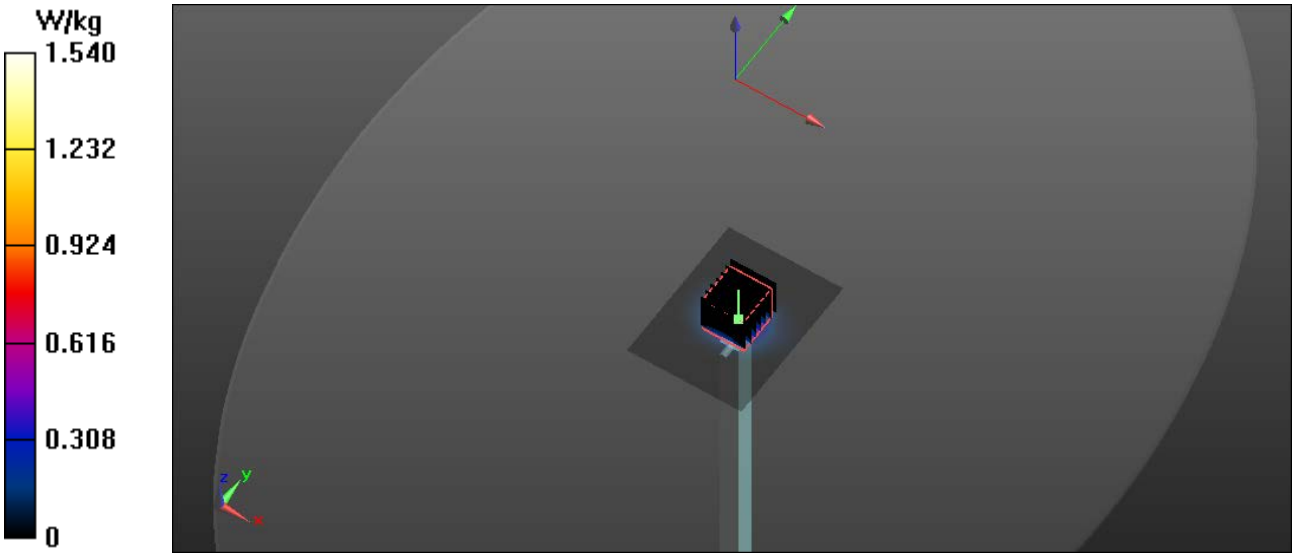
Communication System: CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: MSL 3-6 GHz; Medium parameters used (interpolated): f = 5750 MHz; σ = 5.91 S/m; ε_r = 48.205; ρ = 1000 kg/m^3
Phantom section: Flat Section

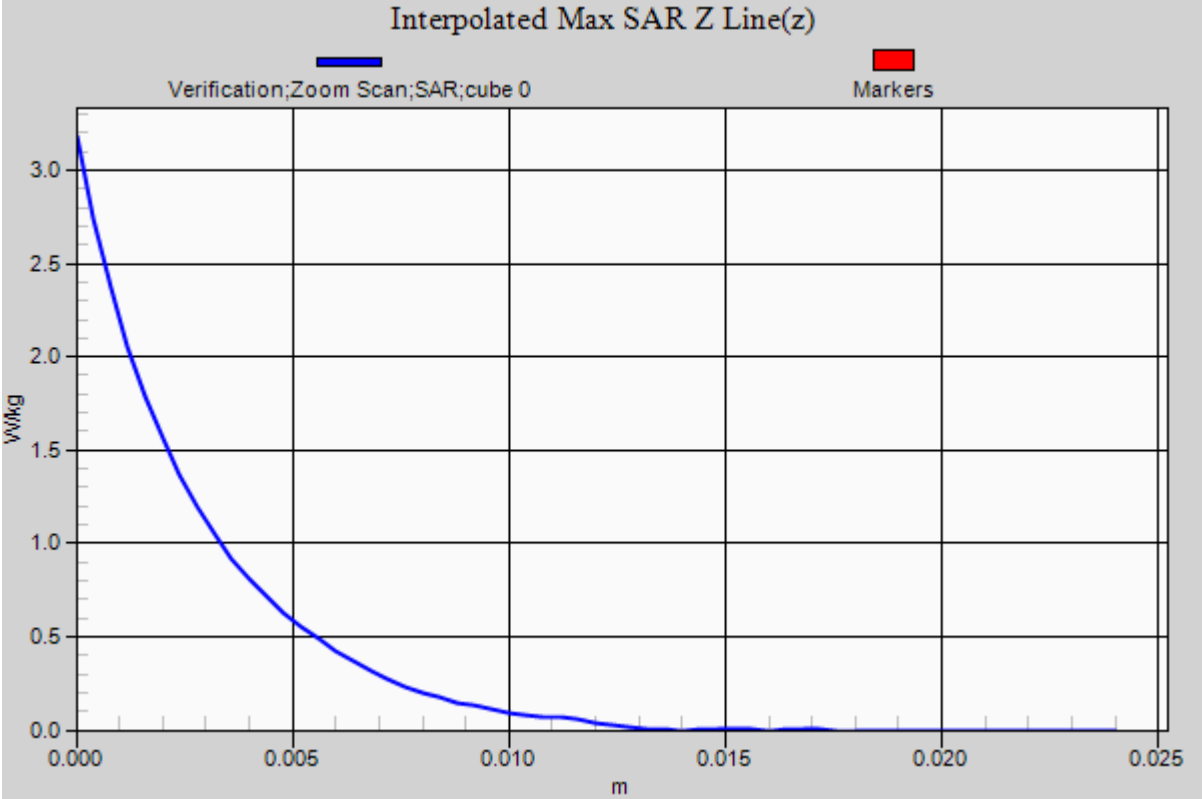
Test Date: Date: 6/18/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN7531; ConvF(4.08, 4.08, 4.08); Calibrated: 6/3/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/20/2018
Phantom: ELI v4.0; Type: QDOVA002AA; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

5800 MHz Body/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.54 W/kg

5800 MHz Body/Verification/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 55.812 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.19 W/kg
P_{IN}=10 mW
SAR(1 g) = 0.766 W/kg; SAR(10 g) = 0.219 W/kg
Maximum value of SAR (measured) = 1.57 W/kg





Appendix B – SAR Test Data Plots

RF Exposure Lab

Plot 1

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: MSL750; Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.968 S/m; ε_r = 55.308; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/19/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(9.57, 9.57, 9.57); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

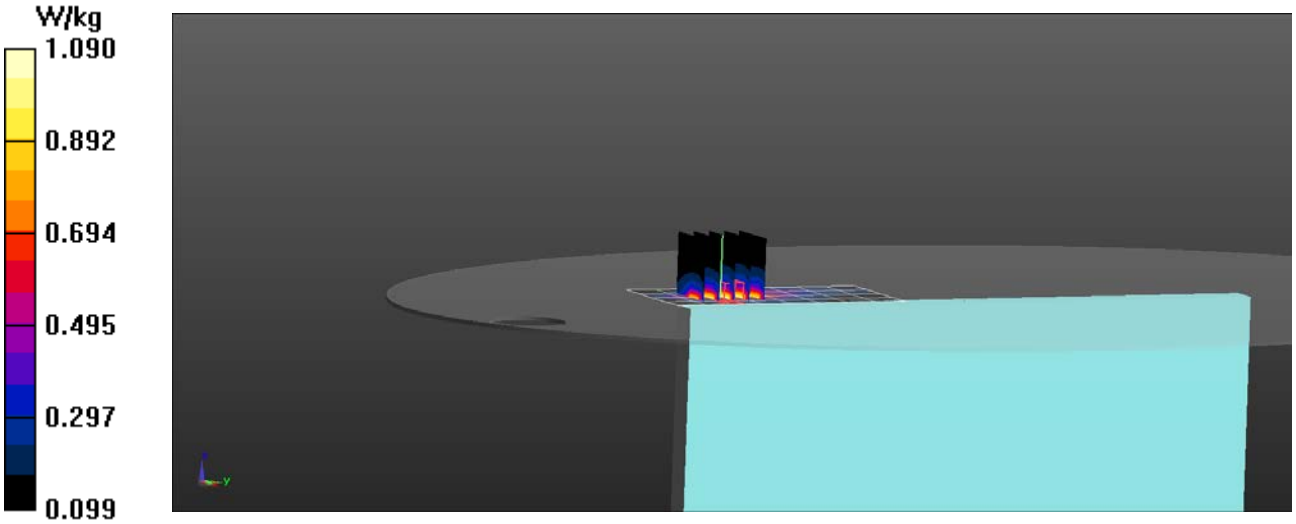
Procedure Notes:

750 MHz B12 LTE/Top Mid 1 RB 24 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.18 W/kg

750 MHz B12 LTE/Top Mid 1 RB 24 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.485 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.905 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.09 W/kg



RF Exposure Lab

Plot 2

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 782 MHz; Duty Cycle: 1:1
Medium: MSL750; Medium parameters used (interpolated): f = 782 MHz; σ = 0.99 S/m; ε_r = 55.062; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/19/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(9.57, 9.57, 9.57); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

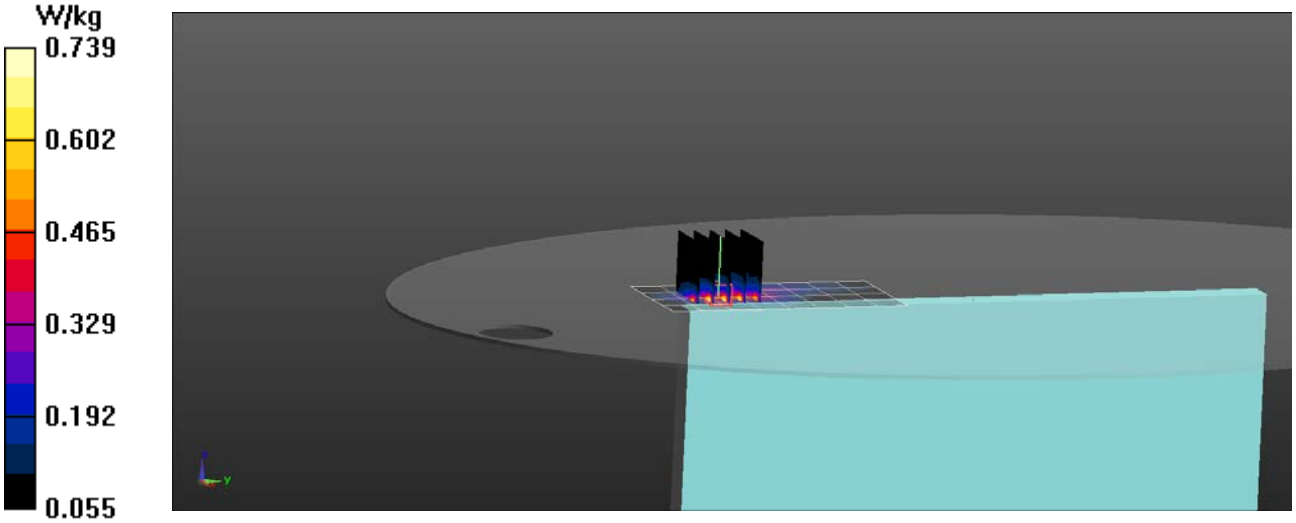
Procedure Notes:

750 MHz B13 LTE/Top Mid 1 RB 24 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.921 W/kg

750 MHz B13 LTE/Top Mid 1 RB 24 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.2470 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.06 W/kg
SAR(1 g) = 0.757 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.739 W/kg



RF Exposure Lab

Plot 3

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: UMTS (WCDMA); Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used (interpolated): f = 836.6 MHz; σ = 1 S/m; ε_r = 55.972; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/20/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(9.34, 9.34, 9.34); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

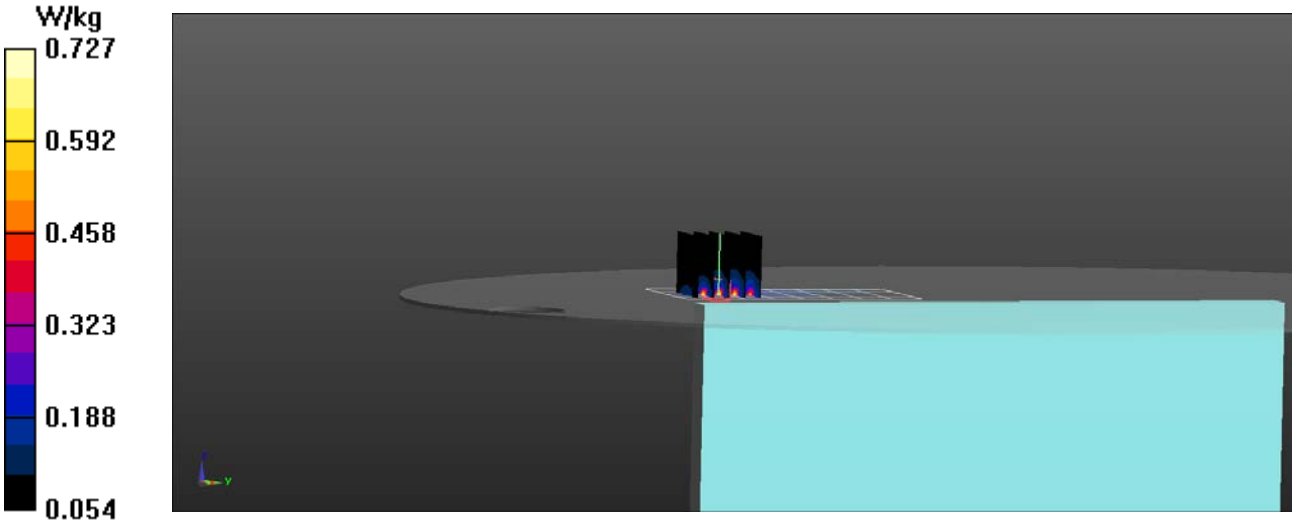
Procedure Notes:

835 MHz WCDMA/Top Mid/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.709 W/kg

835 MHz WCDMA/Top Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.443 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.843 W/kg
SAR(1 g) = 0.589 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.727 W/kg



RF Exposure Lab

Plot 4

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 15 MHz, QPSK); Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used (interpolated): f = 831.5 MHz; σ = 0.997 S/m; ε_r = 55.994; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/20/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(9.34, 9.34, 9.34); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

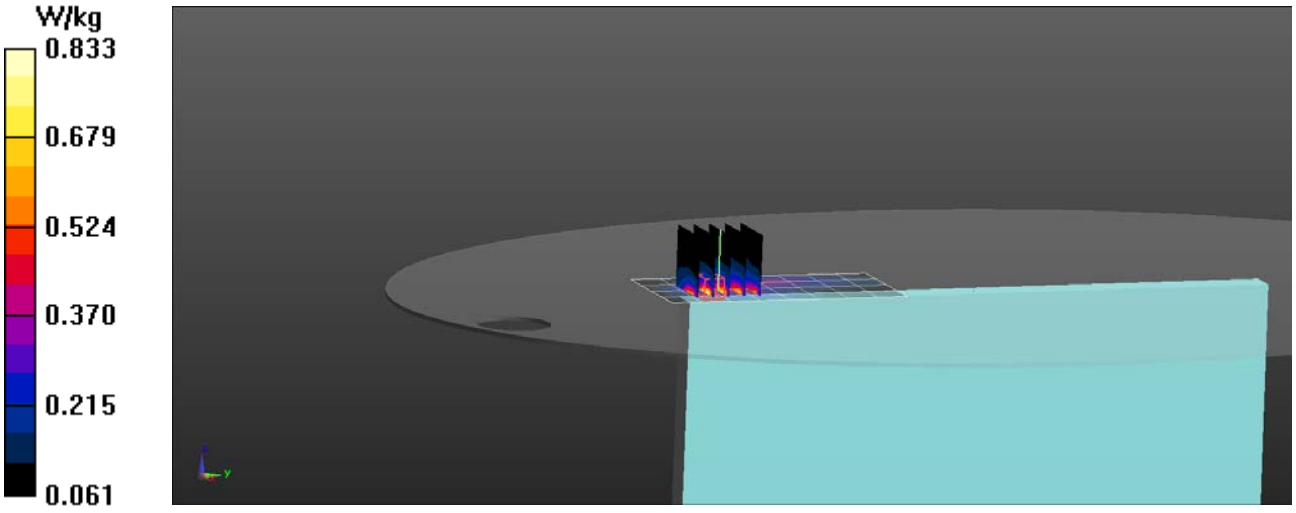
Procedure Notes:

835 MHz B26 LTE/Top Mid 1 RB 37 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.800 W/kg

835 MHz B26 LTE/Top Mid 1 RB 37 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.480 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.951 W/kg
SAR(1 g) = 0.689 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.833 W/kg



RF Exposure Lab

Plot 5

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: UMTS (WCDMA); Frequency: 1732.6 MHz; Duty Cycle: 1:1
Medium: MSL1750; Medium parameters used (interpolated): f = 1732.6 MHz; σ = 1.493 S/m; ε_r = 52.865; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/21/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.95, 7.95, 7.95); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

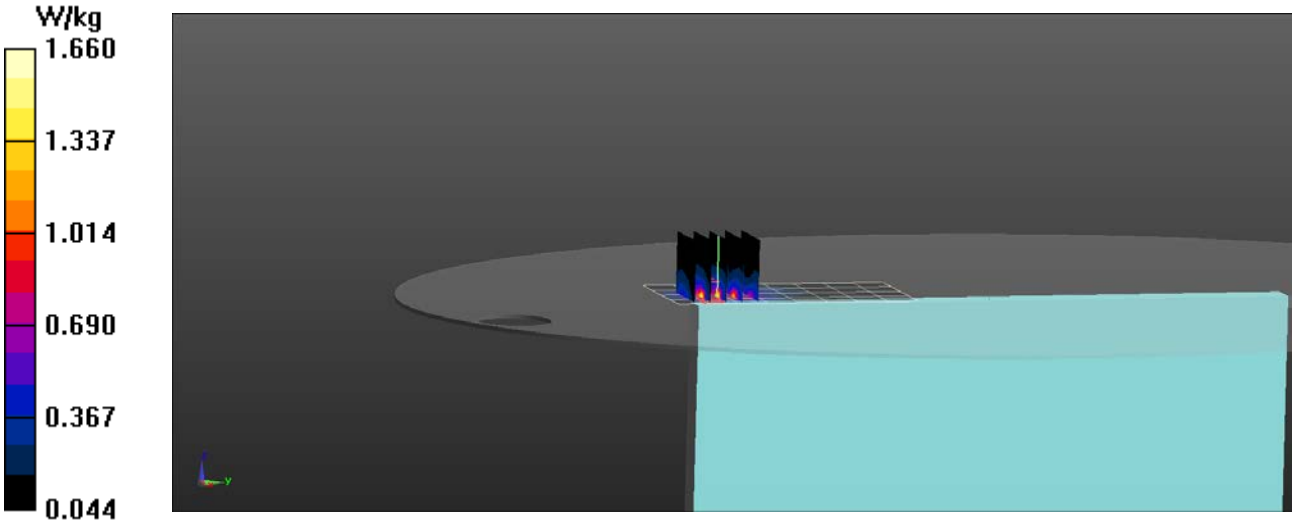
Procedure Notes:

1750 MHz WCDMA/Top Mid/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.73 W/kg

1750 MHz WCDMA/Top Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.3130 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.07 W/kg
SAR(1 g) = 1.08 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.66 W/kg



RF Exposure Lab

Plot 6

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1745 MHz; Duty Cycle: 1:1
Medium: MSL1750; Medium parameters used (interpolated): f = 1745 MHz; σ = 1.505 S/m; ε_r = 52.83; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/20/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.95, 7.95, 7.95); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

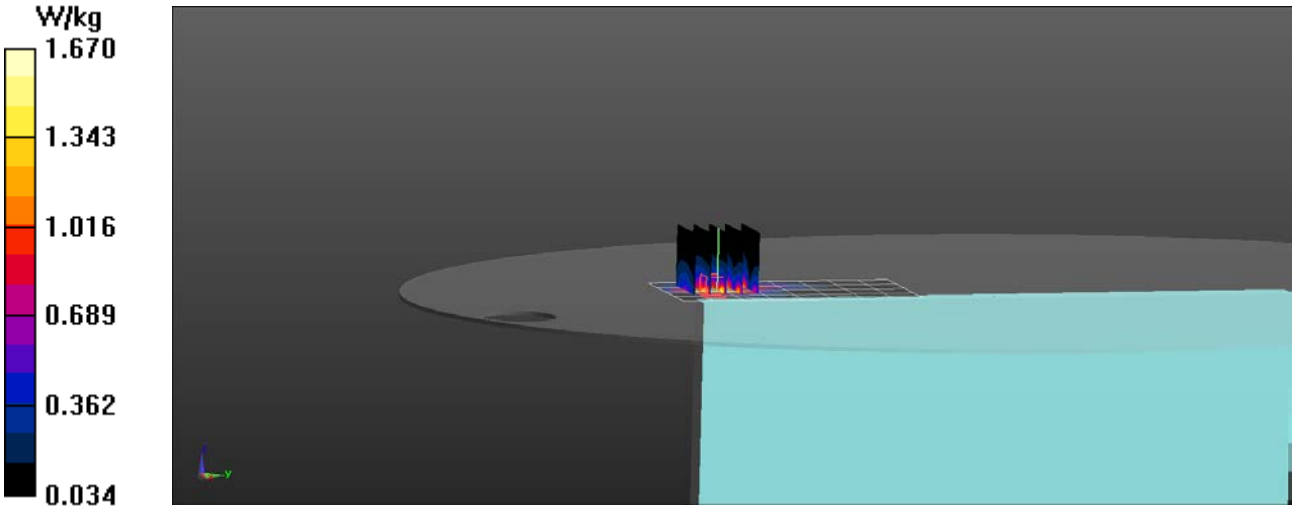
Procedure Notes:

1750 MHz B66 LTE/Top Mid 1 RB 49 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.53 W/kg

1750 MHz B66 LTE/Top Mid 1 RB 49 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.09 W/kg
SAR(1 g) = 0.945 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.67 W/kg



RF Exposure Lab

Plot 7

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: UMTS (WCDMA); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used: f = 1880 MHz; σ = 1.55 S/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

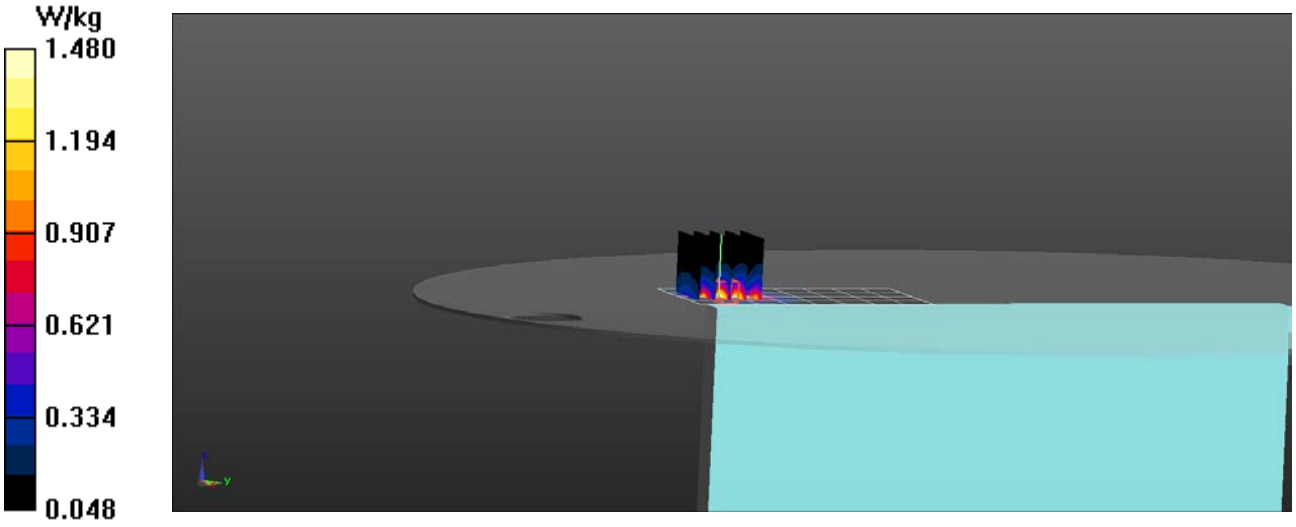
Test Date: Date: 6/21/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.69, 7.69, 7.69); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1900 MHz WCDMA/Top Mid/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.38 W/kg

1900 MHz WCDMA/Top Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.6270 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.83 W/kg
SAR(1 g) = 1.11 W/kg
Maximum value of SAR (measured) = 1.48 W/kg



RF Exposure Lab

Plot 8

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used: f = 1880 MHz; σ = 1.55 S/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

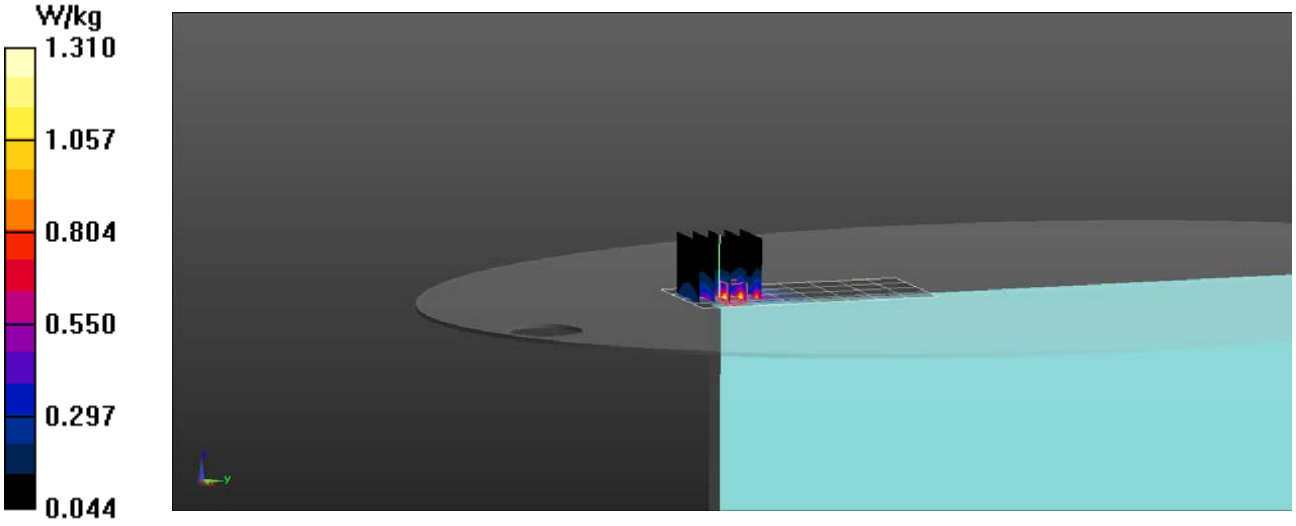
Test Date: Date: 6/21/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.69, 7.69, 7.69); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1900 MHz B2 LTE/Top Mid 1 RB 49 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.04 W/kg

1900 MHz B2 LTE/Top Mid 1 RB 49 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.63 W/kg
SAR(1 g) = 0.948 W/kg
Maximum value of SAR (measured) = 1.31 W/kg



RF Exposure Lab

Plot 9

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 2310 MHz; Duty Cycle: 1:1
Medium: MSL2300; Medium parameters used: f = 2310 MHz; σ = 1.83 S/m; ε_r = 52.27; ρ = 1000 kg/m^3
Phantom section: Flat Section

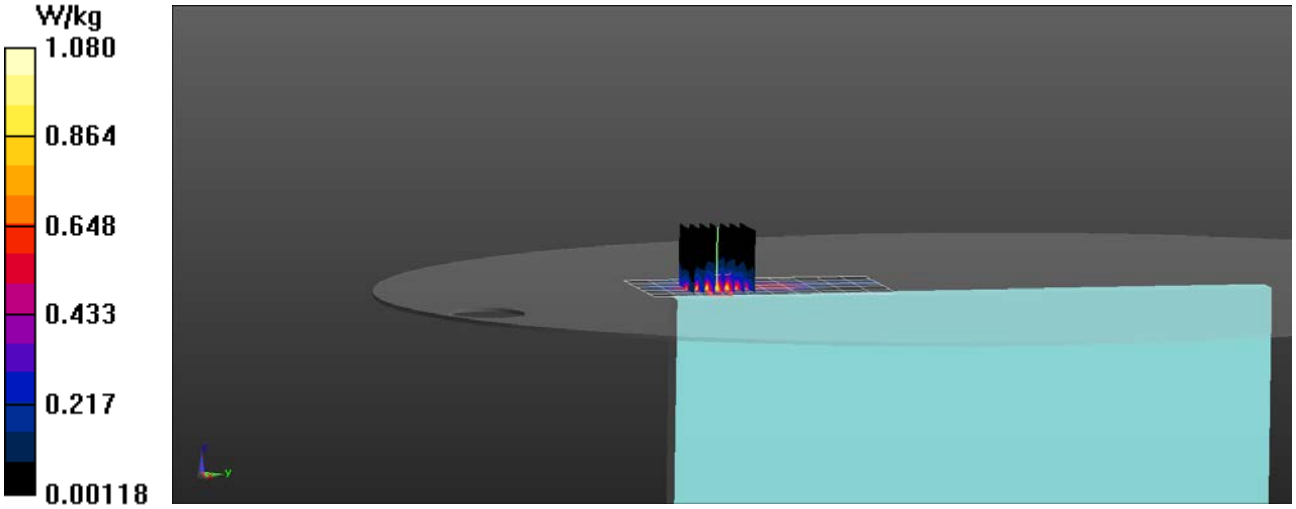
Test Date: Date: 6/17/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.43, 7.43, 7.43); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

2300 MHz B30 LTE/Top Mid 1 RB 24 Offset/Area Scan (6x11x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 1.05 W/kg

2300 MHz B30 LTE/Top Mid 1 RB 24 Offset/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.701 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.41 W/kg
SAR(1 g) = 0.742 W/kg
Maximum value of SAR (measured) = 1.08 W/kg



RF Exposure Lab

Plot 10

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 2535 MHz; Duty Cycle: 1:1
Medium: MSL2550; Medium parameters used (interpolated): f = 2535 MHz; σ = 2.11 S/m; ε_r = 52.115; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/17/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.12, 7.12, 7.12); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

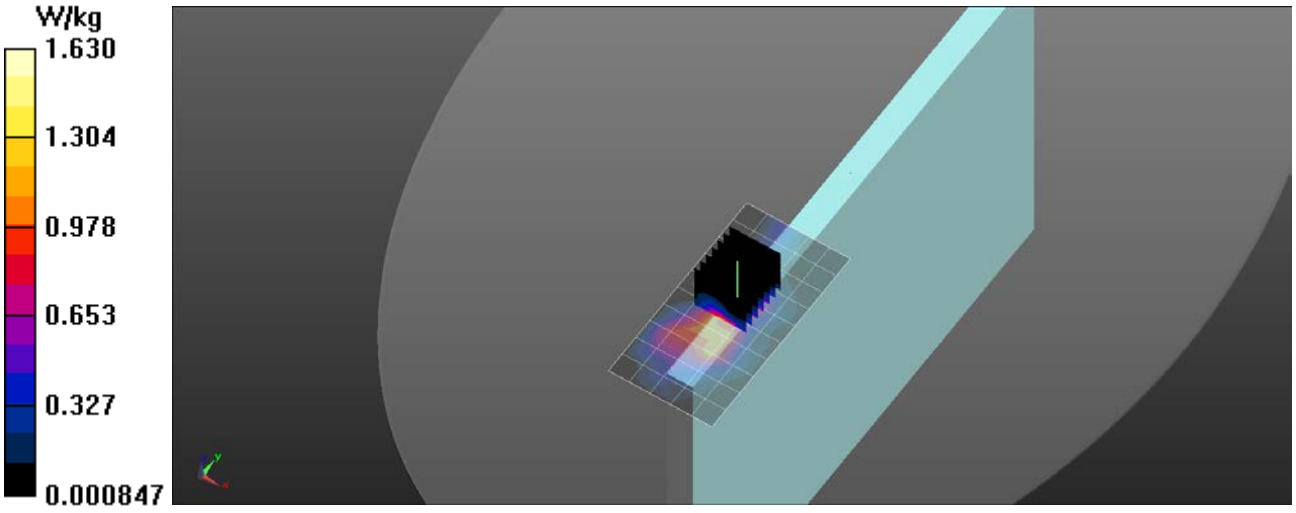
Procedure Notes:

2600 MHz B7 LTE/Top Mid 1 RB 49 Offset/Area Scan (6x11x1): Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.48 W/kg

2600 MHz B7 LTE/Top Mid 1 RB 49 Offset/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.475 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.20 W/kg
SAR(1 g) = 0.923 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.63 W/kg



RF Exposure Lab

Plot 11

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 2593 MHz; Duty Cycle: 1:1
Medium: MSL2550; Medium parameters used (extrapolated): f = 2593 MHz; σ = 2.206 S/m; ε_r = 52.007; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/18/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.12, 7.12, 7.12); Calibrated: 4/24/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/16/2019
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

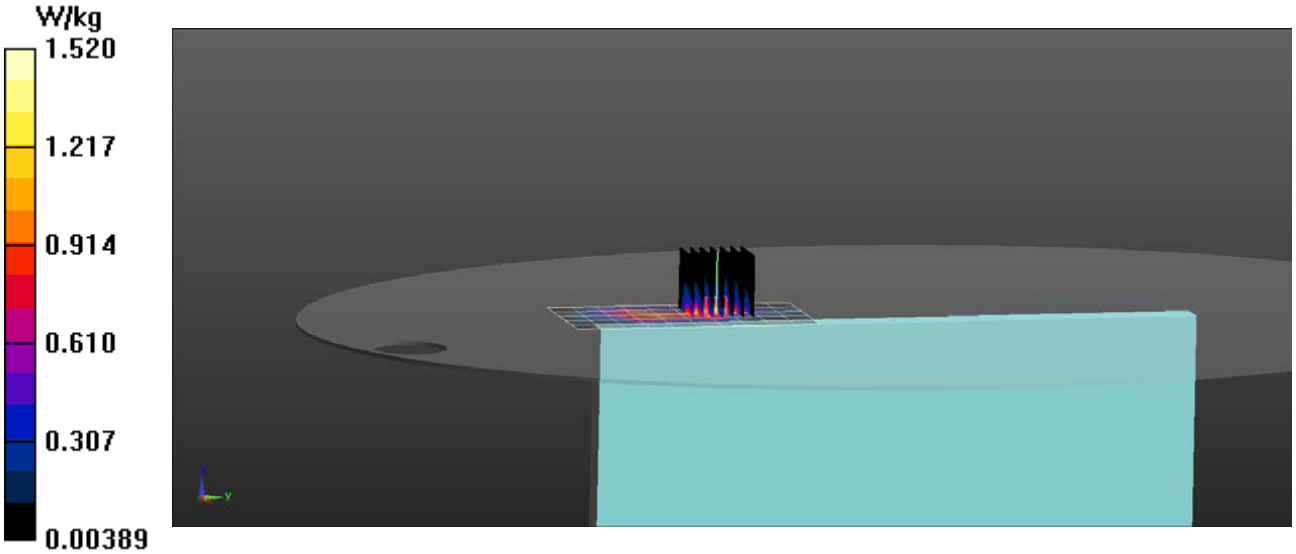
Procedure Notes:

2500 MHz B41 LTE/Top Mid 1 RB 49 Offset/Area Scan (6x11x1): Measurement grid: dx=12mm, dy=12mm

Info: Extrapolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.20 W/kg

2500 MHz B41 LTE/Top Mid 1 RB 49 Offset/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 2.24 W/kg
SAR(1 g) = 0.896 W/kg

Info: Extrapolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.52 W/kg



RF Exposure Lab

Plot 12

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: WiFi 802.11b (DSSS, 1 Mbps); Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: MSL2450; Medium parameters used (interpolated): f = 2437 MHz; σ = 1.947 S/m; ε_r = 52.666; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/19/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(7.62, 7.62, 7.62); Calibrated: 6/3/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/20/2018
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

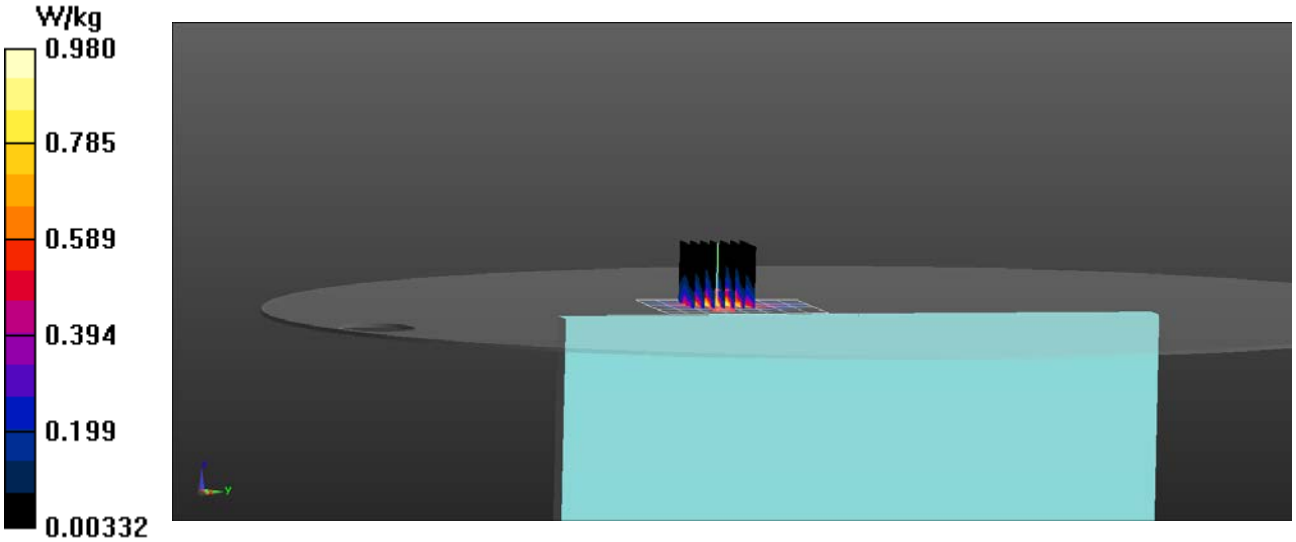
Procedure Notes:

2450 MHz Inpaq/Tablet Top Tx2 Mid/Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.862 W/kg

2450 MHz Inpaq/Tablet Top Tx2 Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.557 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.45 W/kg
SAR(1 g) = 0.659 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.980 W/kg



RF Exposure Lab

Plot 13

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: WiFi 802.11a (OFDM, 6 Mbps); Frequency: 5200 MHz; Duty Cycle: 1:1
Medium: MSL 3-6 GHz; Medium parameters used: f = 5200 MHz; σ = 5.3 S/m; ε_r = 48.93; ρ = 1000 kg/m^3
Phantom section: Flat Section

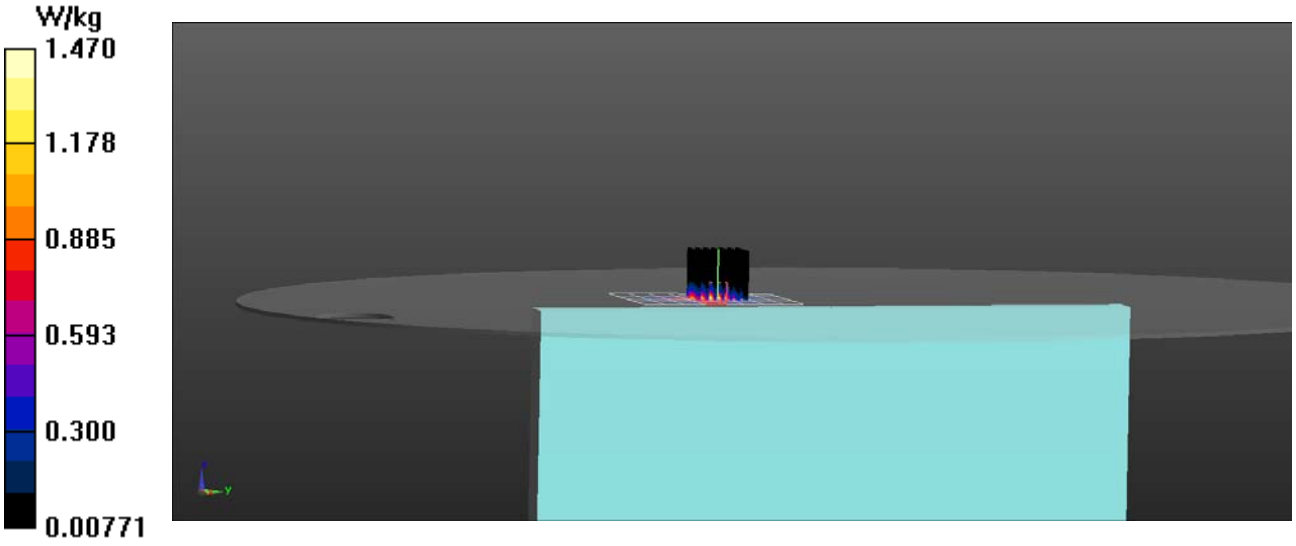
Test Date: Date: 6/18/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(4.52, 4.52, 4.52); Calibrated: 6/3/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/20/2018
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

5200 MHz Inpaq/Tablet Top Tx2 40/Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.31 W/kg

5200 MHz Inpaq/Tablet Top Tx2 40/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.789 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.75 W/kg
SAR(1 g) = 0.754 W/kg
Maximum value of SAR (measured) = 1.47 W/kg



RF Exposure Lab

Plot 14

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: WiFi 802.11a (OFDM, 6 Mbps); Frequency: 5620 MHz; Duty Cycle: 1:1
Medium: MSL 3-6 GHz; Medium parameters used: f = 5620 MHz; σ = 5.76 S/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

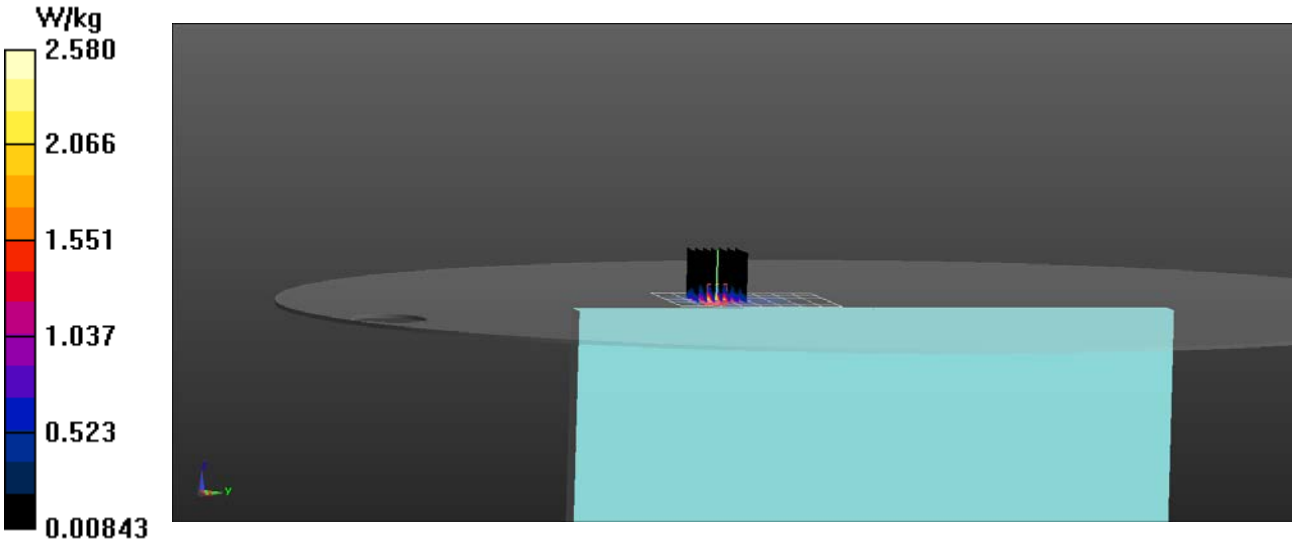
Test Date: Date: 6/18/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(4.01, 4.01, 4.01); Calibrated: 6/3/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/20/2018
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

5600 MHz Inpaq/Tablet Top Tx2 124/Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.87 W/kg

5600 MHz Inpaq/Tablet Top Tx2 124/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.125 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 5.47 W/kg
SAR(1 g) = 1.19 W/kg
Maximum value of SAR (measured) = 2.58 W/kg



RF Exposure Lab

Plot 15

DUT: HSN-Q20C; Type: Tablet PC; Serial: Eng 1

Communication System: WiFi 802.11a (OFDM, 6 Mbps); Frequency: 5825 MHz; Duty Cycle: 1:1
Medium: MSL 3-6 GHz; Medium parameters used (interpolated): f = 5825 MHz; σ = 5.998 S/m; ε_r = 48.093; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/18/2019; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(4.08, 4.08, 4.08); Calibrated: 6/3/2019;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/20/2018
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

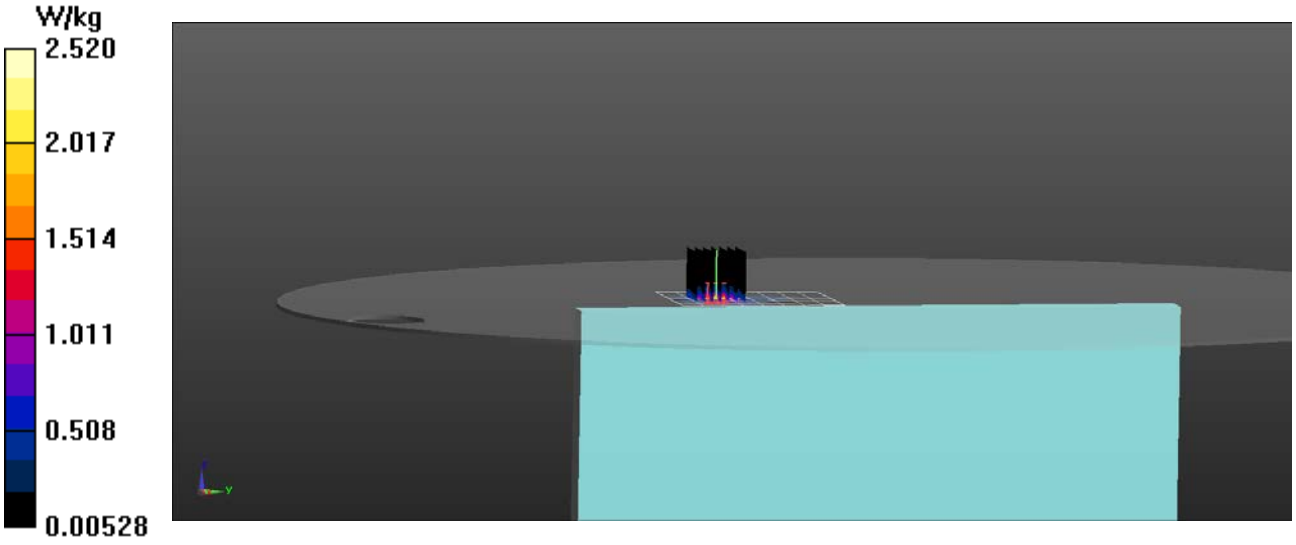
Procedure Notes:

5800 MHz Inpaq/Tablet Top Tx2 165/Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.20 W/kg

5800 MHz Inpaq/Tablet Top Tx2 165/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 1.467 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 5.92 W/kg
SAR(1 g) = 1.13 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.52 W/kg



Appendix D – Probe Calibration Data Sheets

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 RF Exposure Lab

Certificate No: EX3-3662_Apr19

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3662

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

Calibration date: April 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:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 25, 2019

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
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) **Accreditation No.: SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

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., $\vartheta = 0$ 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 $\vartheta = 0$ ($f \leq 900$ 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 $f \leq 800$ 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:3662

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.43	0.45	0.50	± 10.1 %
DCP (mV)[B]	100.7	100.3	97.0	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	157.7	±1.9 %	± 4.7 %
		Y	0.0	0.0	1.0		152.9		
		Y	0.0	0.0	1.0		153.2		

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:3662

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-22.4
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:3662

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)
750	41.9	0.89	9.57	9.57	9.57	0.49	0.80	± 12.0 %
900	41.5	0.97	9.12	9.12	9.12	0.51	0.80	± 12.0 %
1750	40.1	1.37	8.23	8.23	8.23	0.38	0.85	± 12.0 %
1900	40.0	1.40	7.90	7.90	7.90	0.37	0.85	± 12.0 %
2300	39.5	1.67	7.50	7.50	7.50	0.39	0.85	± 12.0 %
2450	39.2	1.80	7.33	7.33	7.33	0.41	0.84	± 12.0 %
2600	39.0	1.96	7.21	7.21	7.21	0.42	0.85	± 12.0 %
3500	37.9	2.91	7.07	7.07	7.07	0.30	1.20	± 13.1 %
3700	37.7	3.12	6.92	6.92	6.92	0.35	1.25	± 13.1 %
5250	35.9	4.71	5.05	5.05	5.05	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.81	4.81	4.81	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.90	4.90	4.90	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.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3662

Calibration Parameter Determined in Body Tissue Simulating Media

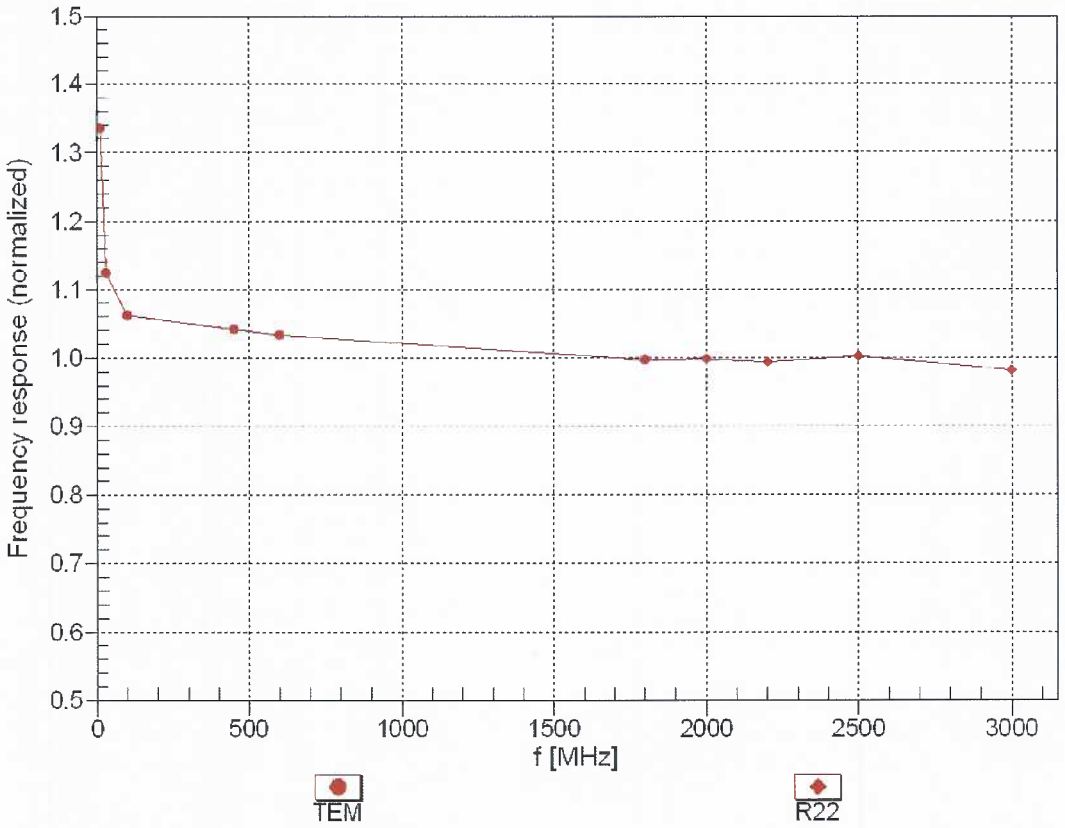
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	55.5	0.96	9.55	9.55	9.55	0.47	0.80	± 12.0 %
900	55.0	1.05	9.34	9.34	9.34	0.45	0.80	± 12.0 %
1750	53.4	1.49	7.95	7.95	7.95	0.40	0.85	± 12.0 %
1900	53.3	1.52	7.69	7.69	7.69	0.43	0.84	± 12.0 %
2300	52.9	1.81	7.43	7.43	7.43	0.40	0.86	± 12.0 %
2450	52.7	1.95	7.36	7.36	7.36	0.40	0.85	± 12.0 %
2600	52.5	2.16	7.12	7.12	7.12	0.22	0.97	± 12.0 %
3500	51.3	3.31	6.83	6.83	6.83	0.30	1.25	± 13.1 %
3700	51.0	3.55	6.52	6.52	6.52	0.35	1.25	± 13.1 %
5250	48.9	5.36	4.30	4.30	4.30	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.87	3.87	3.87	0.50	1.90	± 13.1 %
5750	48.3	5.94	4.07	4.07	4.07	0.50	1.90	± 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.

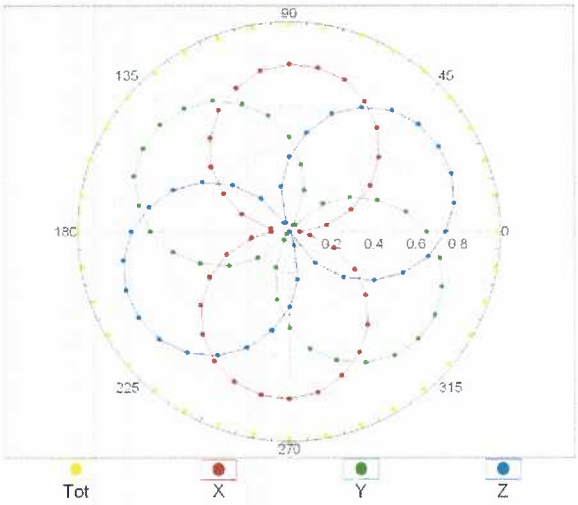
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



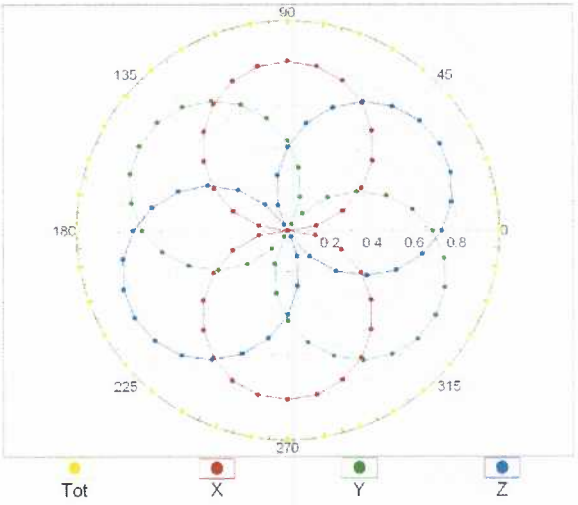
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

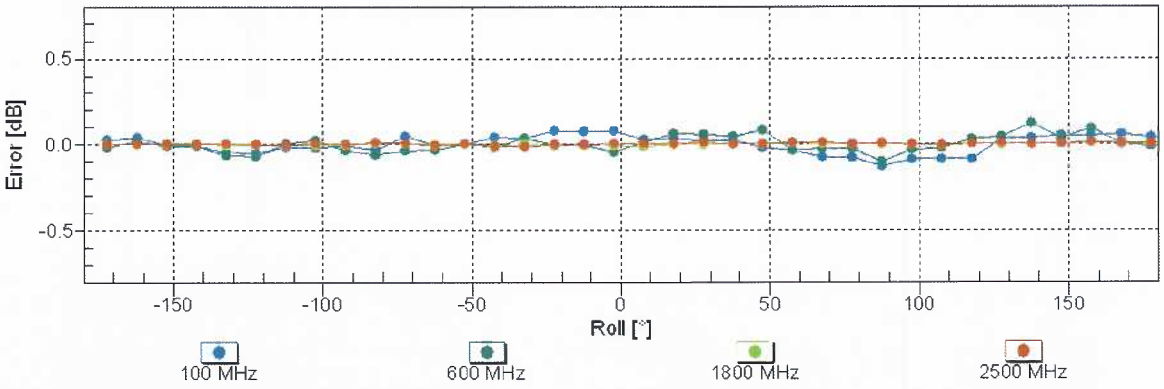
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



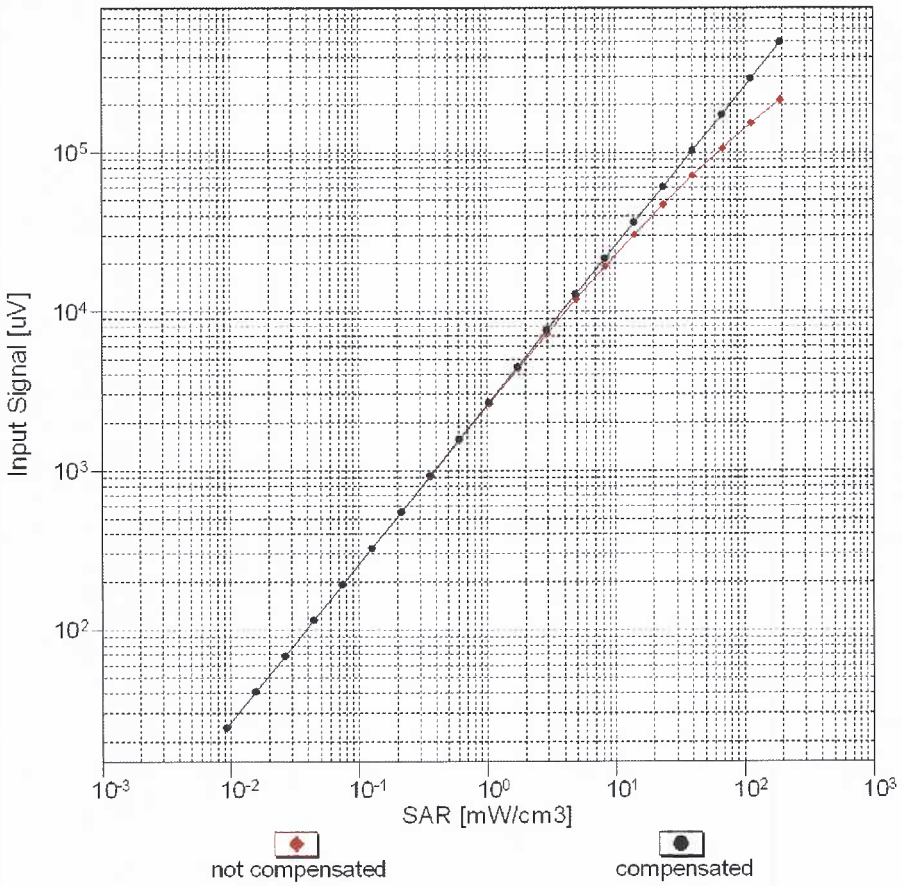
f=1800 MHz,R22

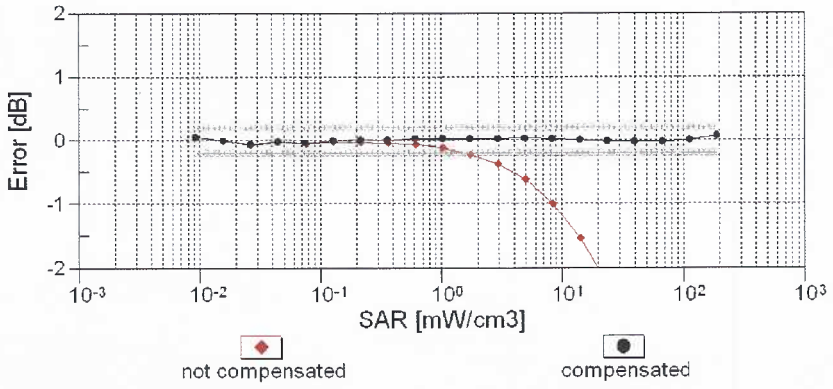




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)

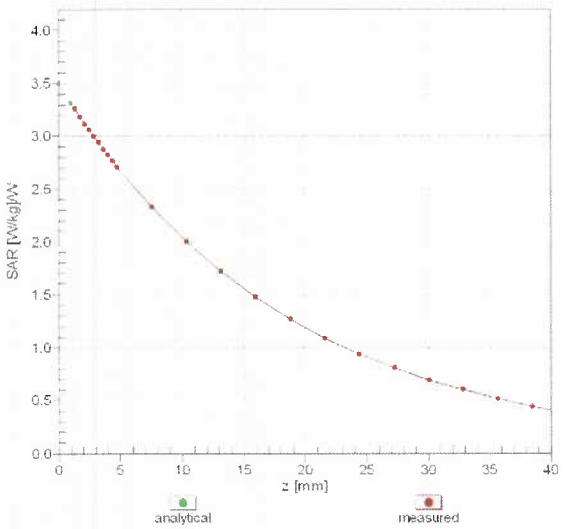




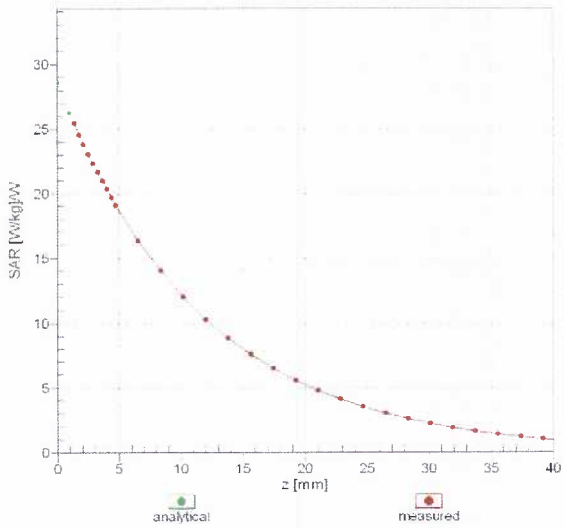
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

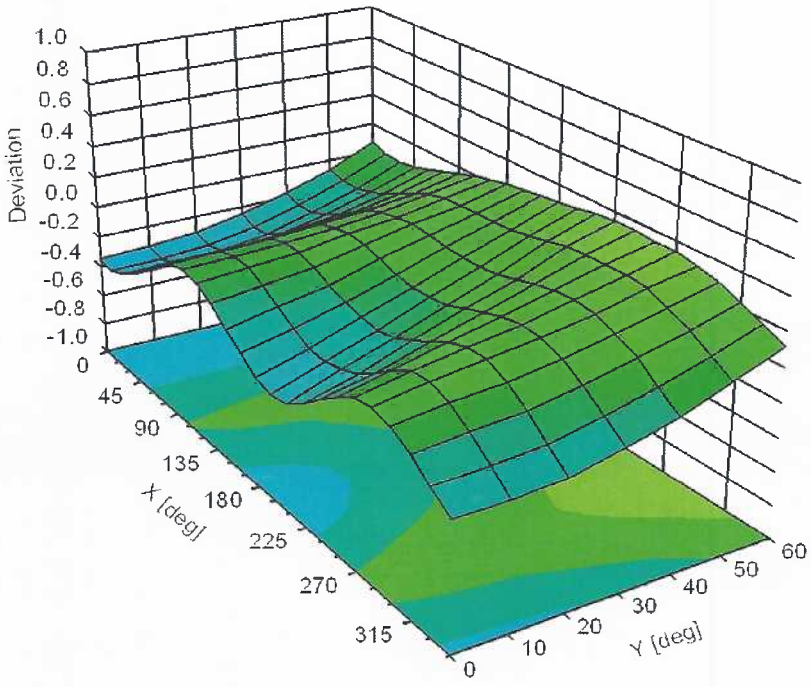


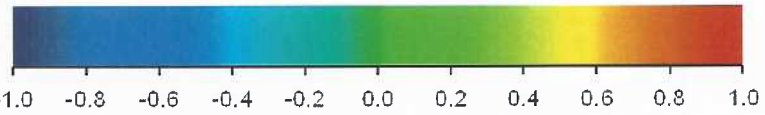
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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
S 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 RF Exposure Lab

Certificate No: EX3-7531_Jun19

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:7531

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: June 3, 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	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 3, 2019

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., $\vartheta = 0$ 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 $\vartheta = 0$ ($f \leq 900$ 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 $f \leq 800$ 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:7531

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.39	0.47	0.39	± 10.1 %
DCP (mV)[B]	97.9	95.2	100.9	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Max dev.	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	139.8	±3.5 %	± 4.7 %
		Y	0.0	0.0	1.0		132.9		
		Y	0.0	0.0	1.0		137.4		

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:7531

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	6.4
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:7531

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)
150	52.3	0.76	13.01	13.01	13.01	0.00	1.00	± 13.3 %
220	49.0	0.81	12.68	12.68	12.68	0.00	1.00	± 13.3 %
300	45.3	0.87	12.23	12.23	12.23	0.06	1.30	± 13.3 %
450	43.5	0.87	11.43	11.43	11.43	0.13	1.30	± 13.3 %
600	42.7	0.88	10.58	10.58	10.58	0.03	1.30	± 13.3 %
1450	40.5	1.20	8.85	8.85	8.85	0.38	0.80	± 12.0 %
1640	40.2	1.31	8.71	8.71	8.71	0.28	0.91	± 12.0 %
2450	39.2	1.80	7.58	7.58	7.58	0.28	0.96	± 12.0 %
5250	35.9	4.71	5.24	5.24	5.24	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.69	4.69	4.69	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.78	4.78	4.78	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.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7531

Calibration Parameter Determined in Body 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)
150	61.9	0.80	12.57	12.57	12.57	0.00	1.00	± 13.3 %
220	60.2	0.86	12.08	12.08	12.08	0.00	1.00	± 13.3 %
300	58.2	0.92	11.64	11.64	11.64	0.03	1.20	± 13.3 %
450	56.7	0.94	11.18	11.18	11.18	0.09	1.20	± 13.3 %
600	56.1	0.95	10.55	10.55	10.55	0.08	1.20	± 13.3 %
1640	53.7	1.42	8.53	8.53	8.53	0.26	0.99	± 12.0 %
2450	52.7	1.95	7.62	7.62	7.62	0.28	0.95	± 12.0 %
5250	48.9	5.36	4.52	4.52	4.52	0.50	1.90	± 13.1 %
5600	48.5	5.77	4.01	4.01	4.01	0.50	1.90	± 13.1 %
5750	48.3	5.94	4.08	4.08	4.08	0.50	1.90	± 13.1 %

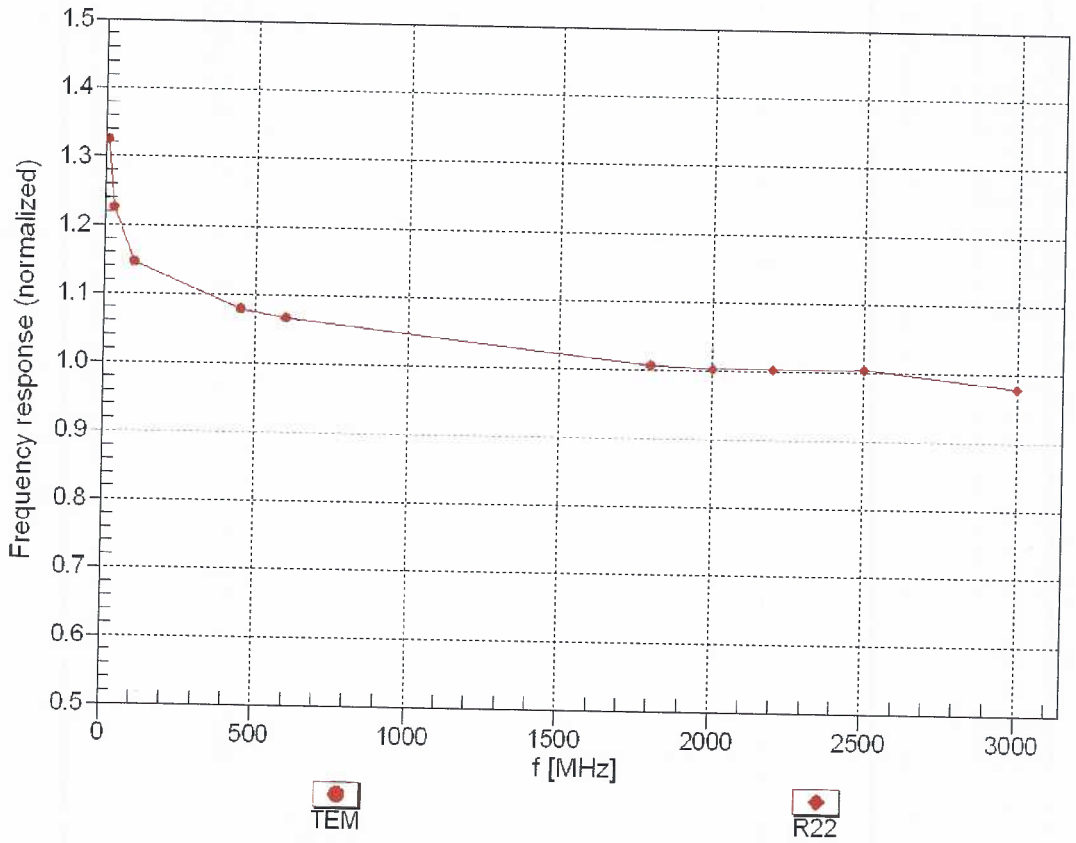
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz 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.

Frequency Response of E-Field

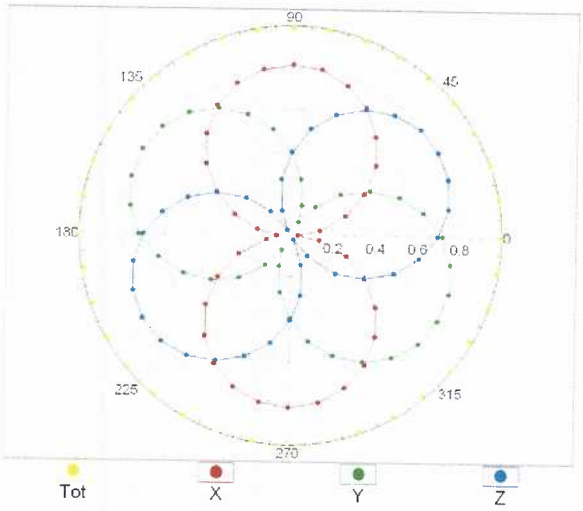
(TEM-Cell:ifi110 EXX, Waveguide: R22)



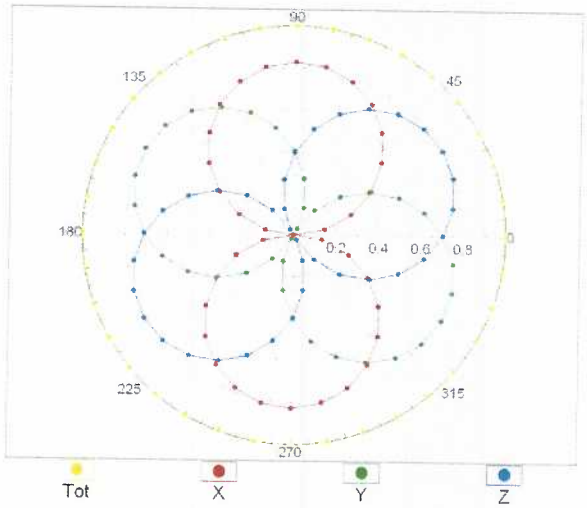
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

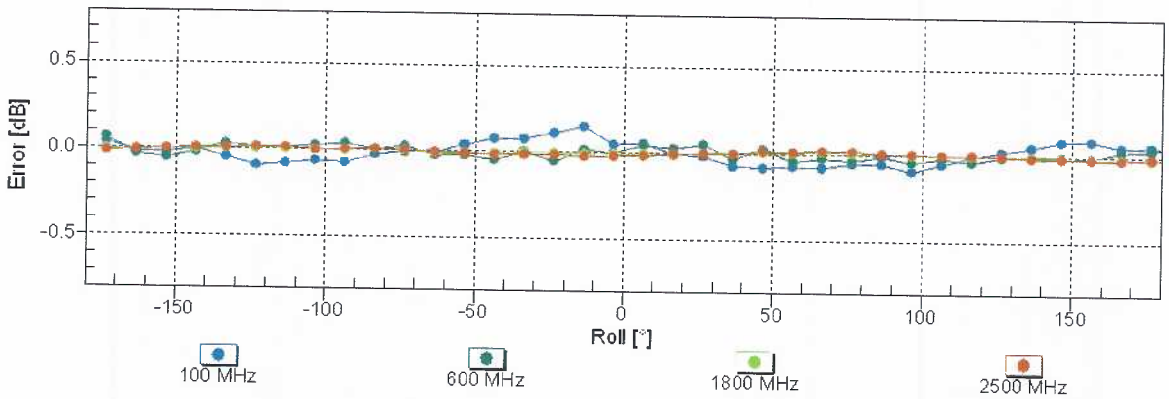
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

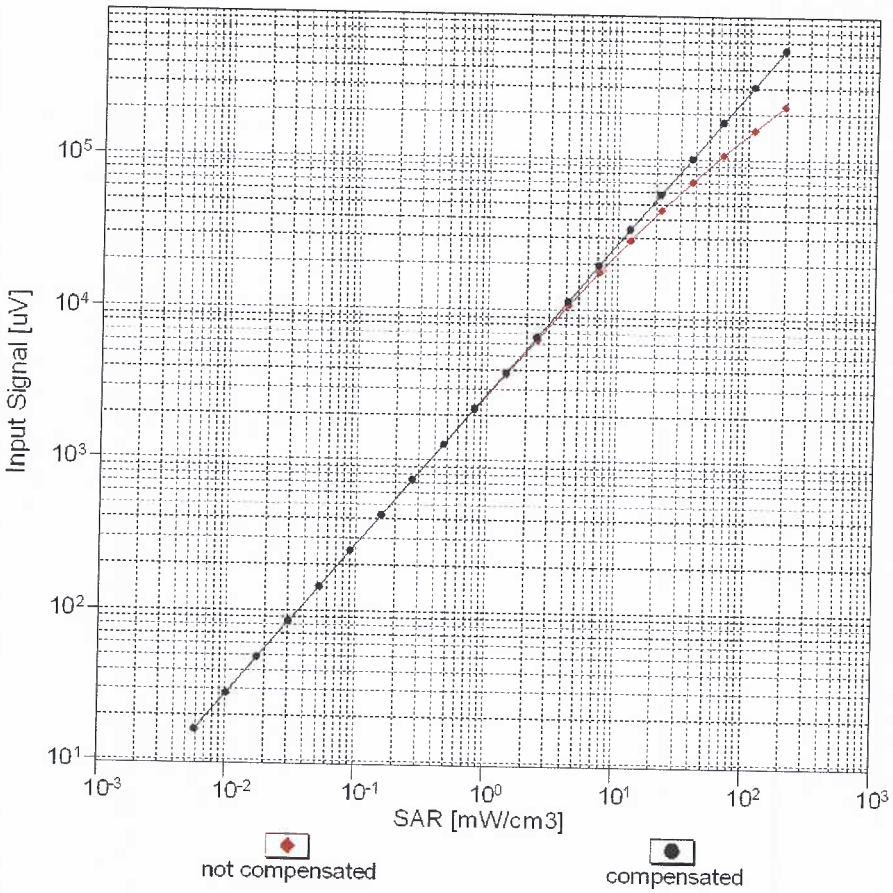


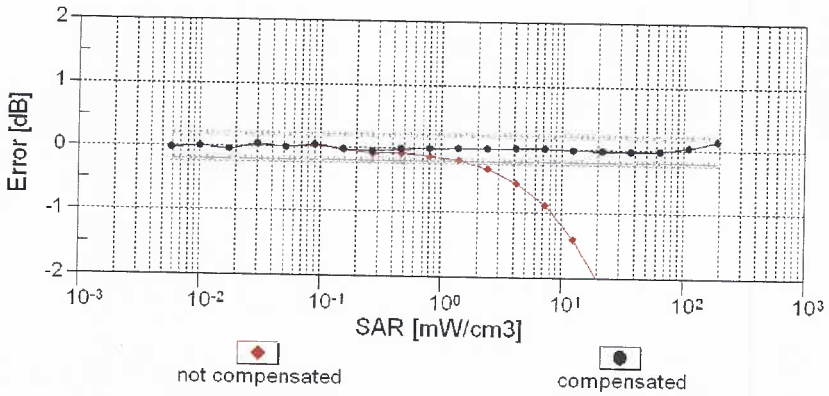


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

(TEM cell , f_{eval}= 1900 MHz)

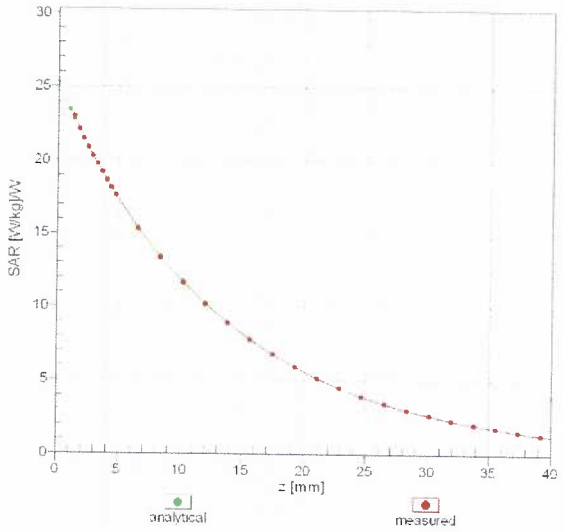




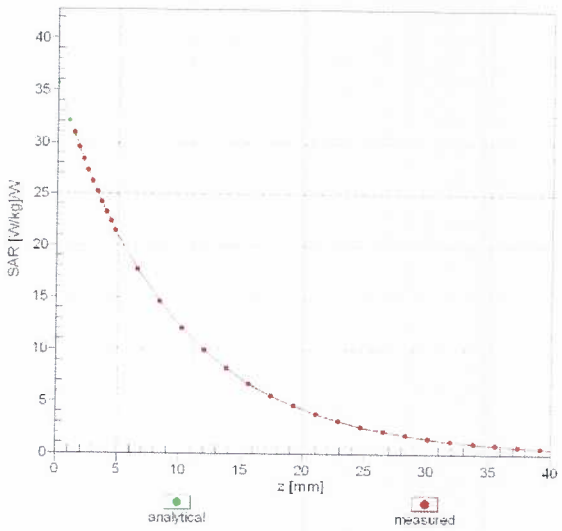
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 1640 MHz,WGLS R22 (H_convF)

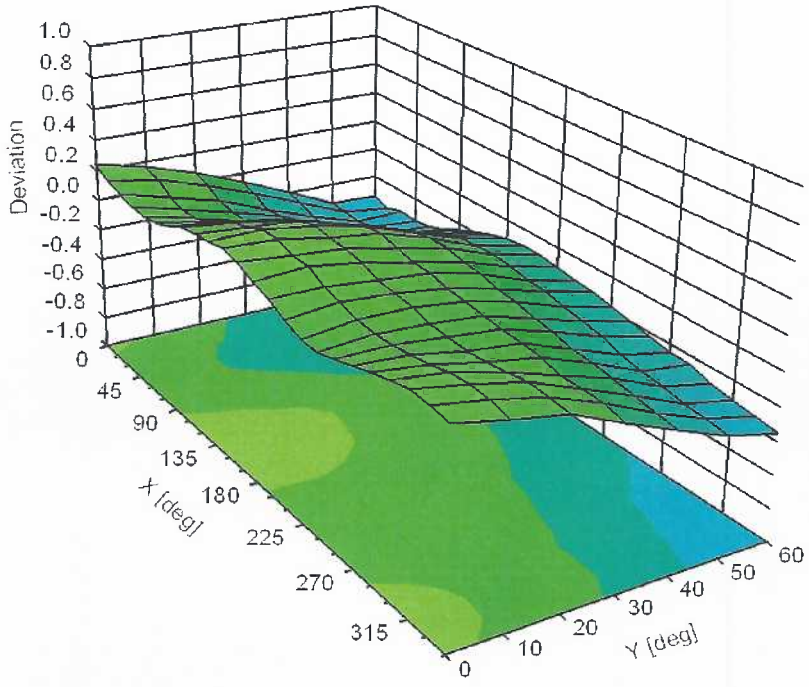


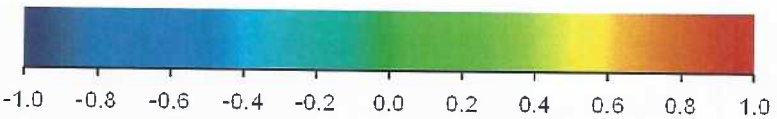
f = 2450 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Appendix E – Dipole Calibration Data Sheets

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 RF Exposure Lab

Certificate No: D750V3-1016_Jul18

CALIBRATION CERTIFICATE

Object: D750V3 - SN:1016

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: July 13, 2018

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	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 16, 2018

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
S 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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.23 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.38 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.3 ± 6 %	0.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.55 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.64 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.4 Ω + 0.0 jΩ
Return Loss	- 29.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8 Ω - 2.6 jΩ
Return Loss	- 30.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.038 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 22, 2010

DASY5 Validation Report for Head TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1016

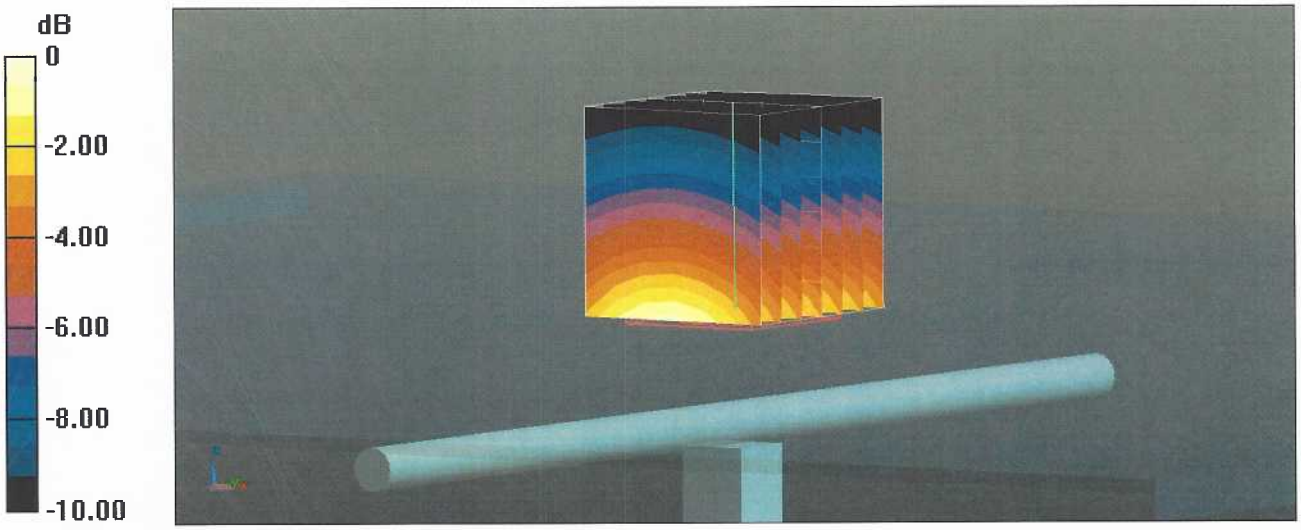
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.89 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22) @ 750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

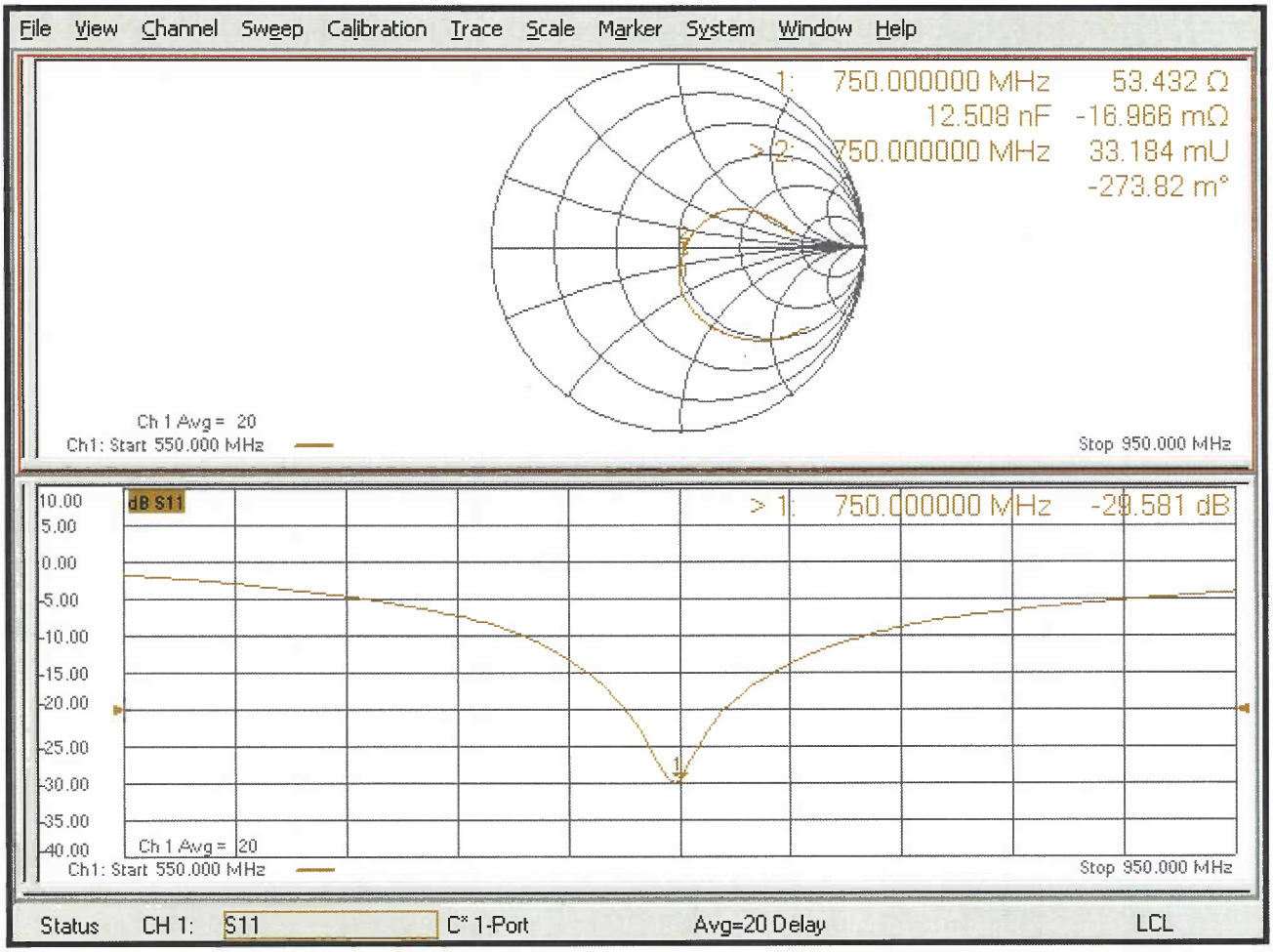
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.03 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.10 W/kg
SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.35 W/kg
Maximum value of SAR (measured) = 2.76 W/kg



0 dB = 2.76 W/kg = 4.41 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1016

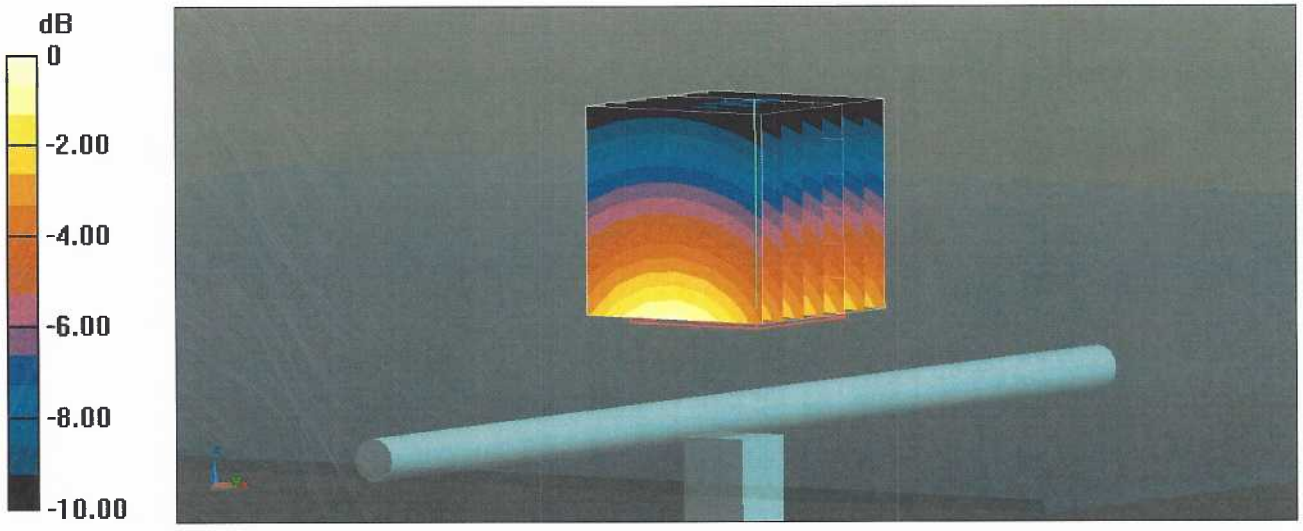
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 55.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19) @ 750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

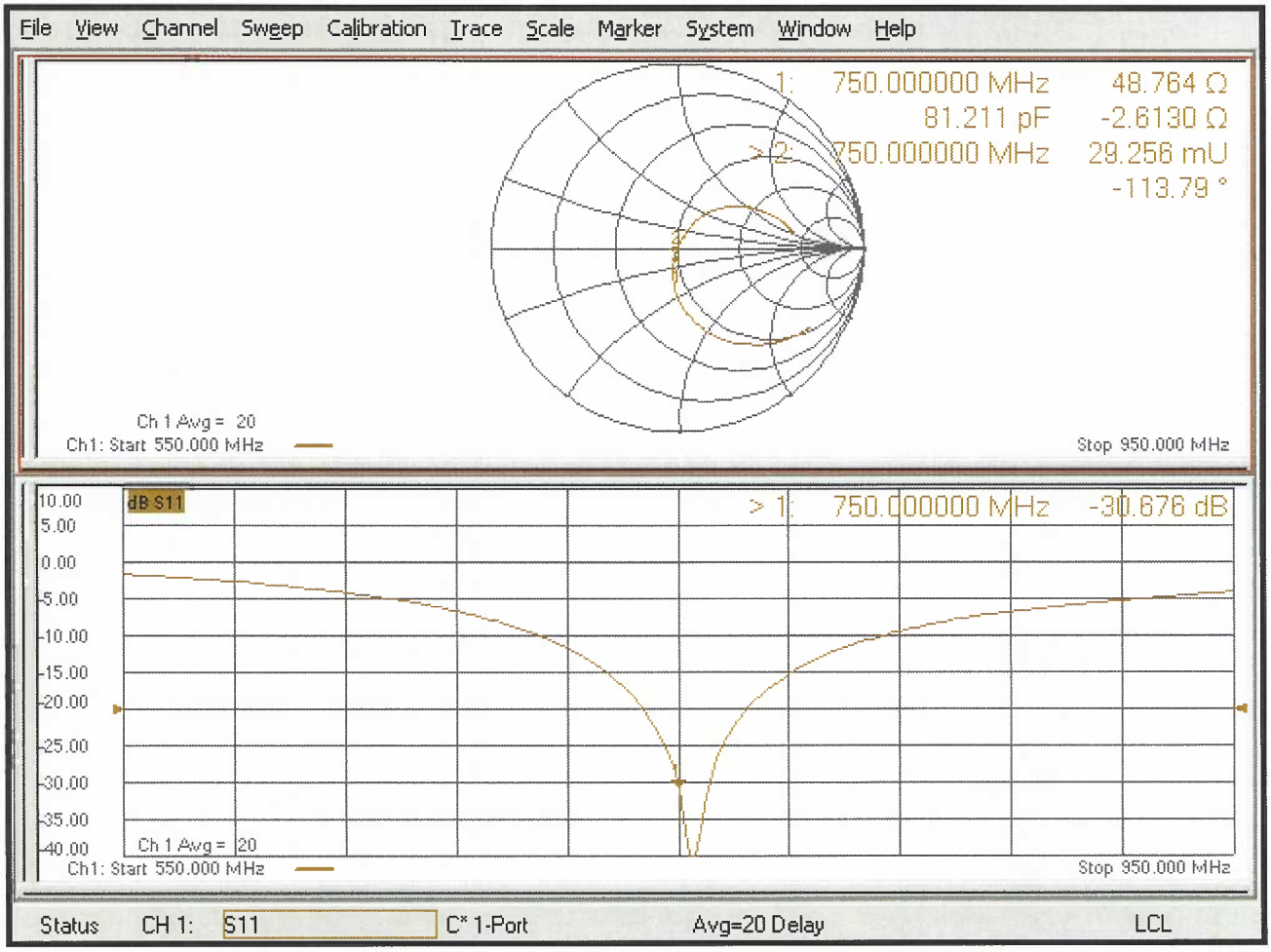
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.68 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.18 W/kg
SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.41 W/kg
Maximum value of SAR (measured) = 2.84 W/kg



0 dB = 2.84 W/kg = 4.53 dBW/kg

Impedance Measurement Plot for Body TSL



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
S 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 RF Exposure Lab

Certificate No: D835V2-4d089_Jul18

CALIBRATION CERTIFICATE

Object: D835V2 - SN:4d089

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: July 13, 2018

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	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 17, 2018

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
S 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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.7 ± 6 %	0.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.44 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.10 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.2 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.57 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.24 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.6 Ω - 3.3 jΩ
Return Loss	- 28.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.3 Ω - 5.3 jΩ
Return Loss	- 24.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 17, 2008

DASY5 Validation Report for Head TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d089

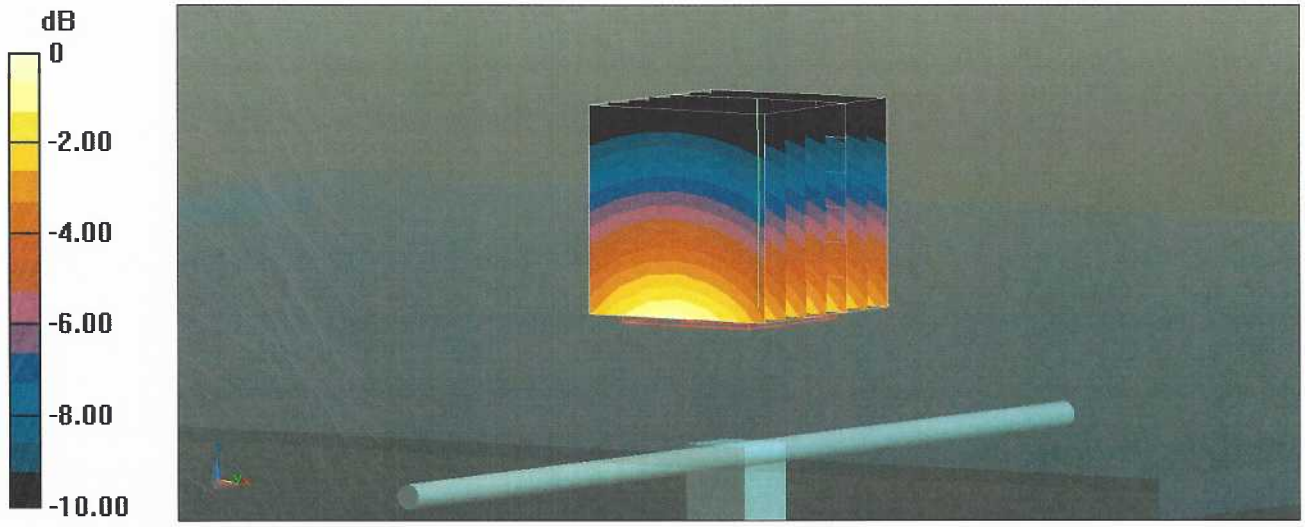
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

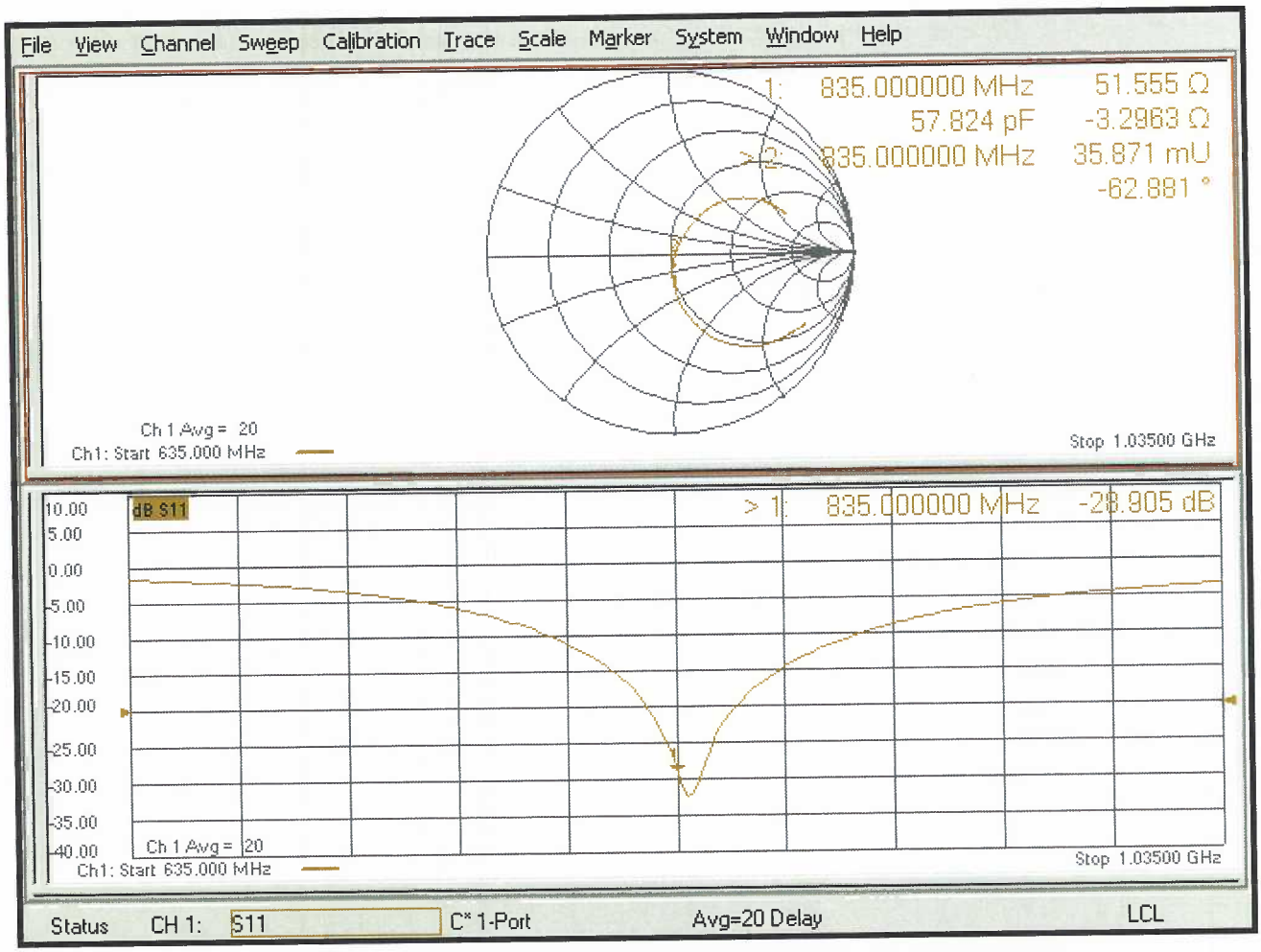
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.80 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.70 W/kg
SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 3.26 W/kg



0 dB = 3.26 W/kg = 5.13 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d089

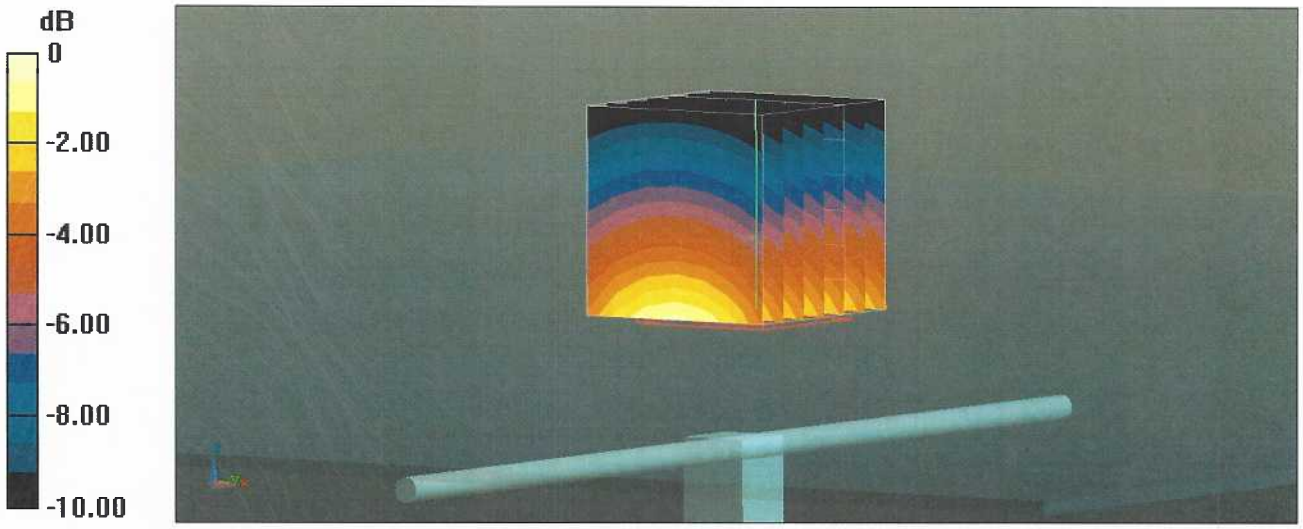
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

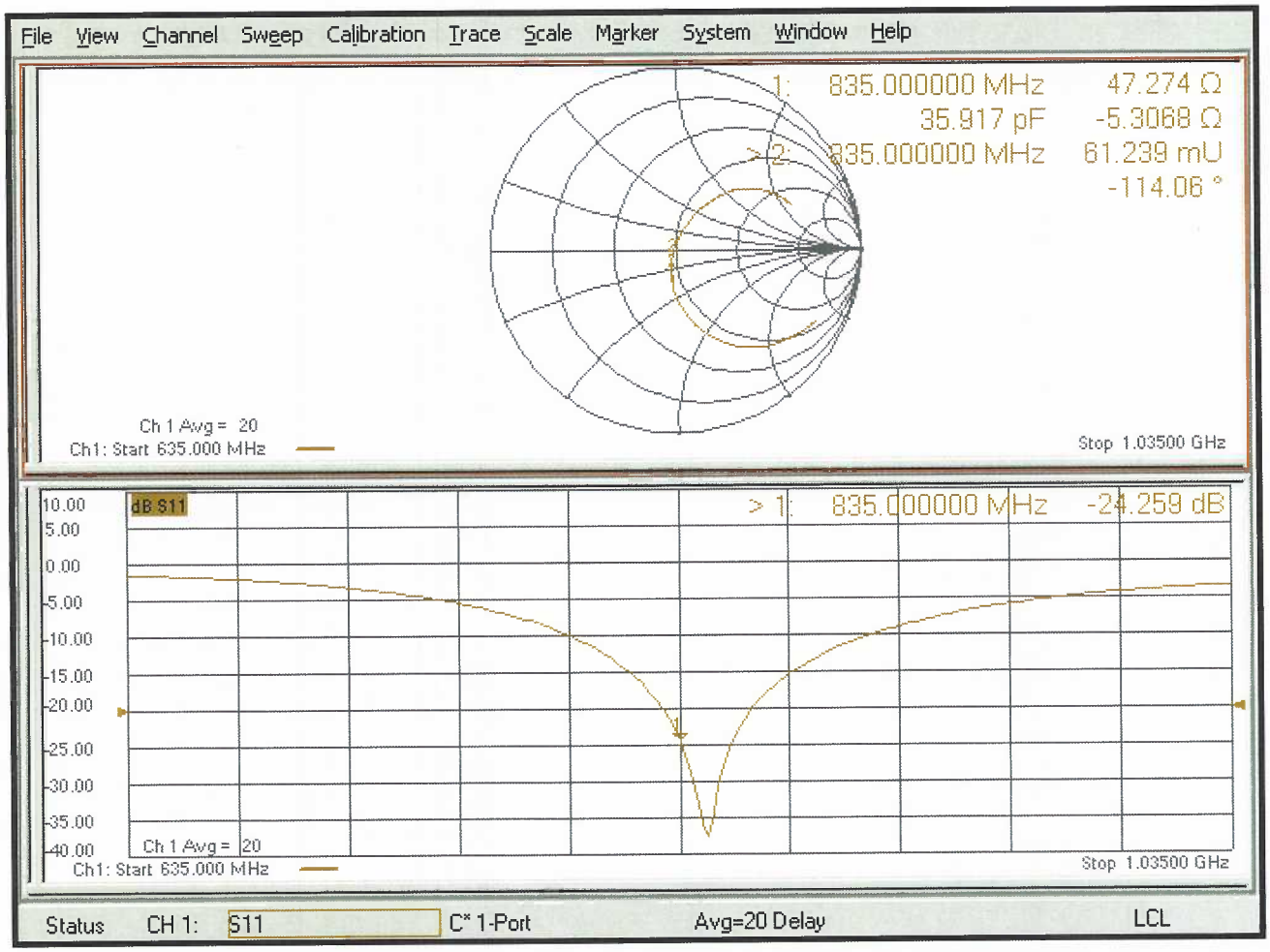
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.59 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.60 W/kg
SAR(1 g) = 2.43 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 3.22 W/kg



0 dB = 3.22 W/kg = 5.08 dBW/kg

Impedance Measurement Plot for Body TSL



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
S 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 RF Exposure Lab

Certificate No: D1750V2-1018_Jul18

CALIBRATION CERTIFICATE

Object: D1750V2 - SN:1018

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: July 20, 2018

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	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 20, 2018

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
S 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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.34 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	8.95 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.7 ± 6 %	1.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**36.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.80 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.4 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.4 Ω - 1.3 jΩ
Return Loss	- 36.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.2 Ω - 0.1 jΩ
Return Loss	- 25.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.221 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 11, 2009

DASY5 Validation Report for Head TSL

Date: 20.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1018

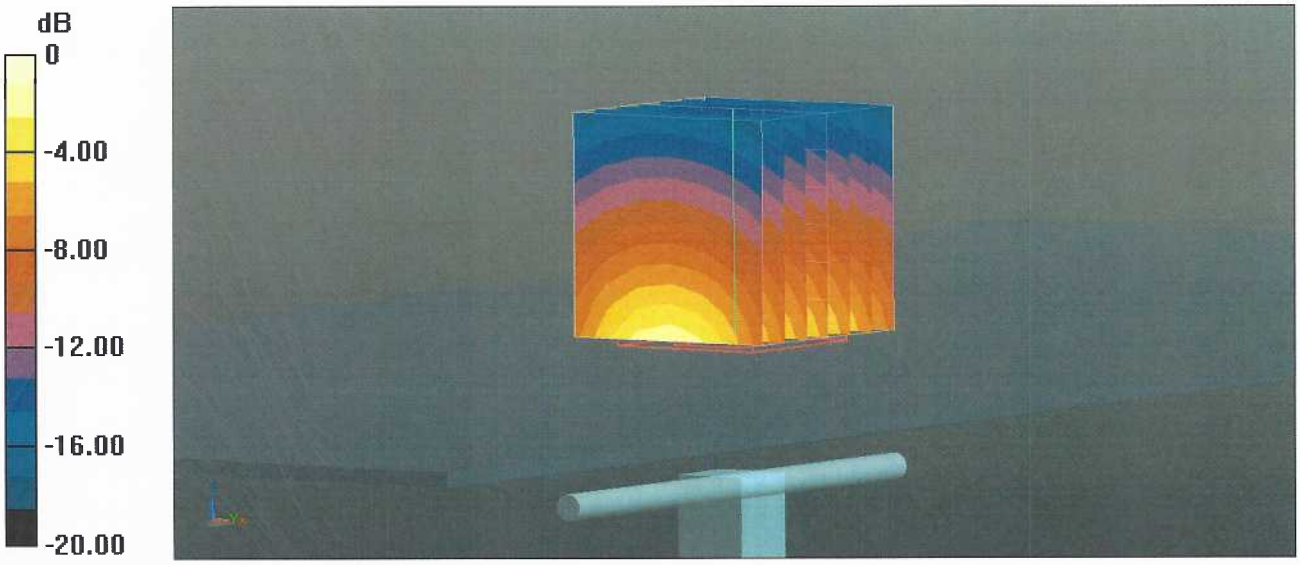
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.34 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

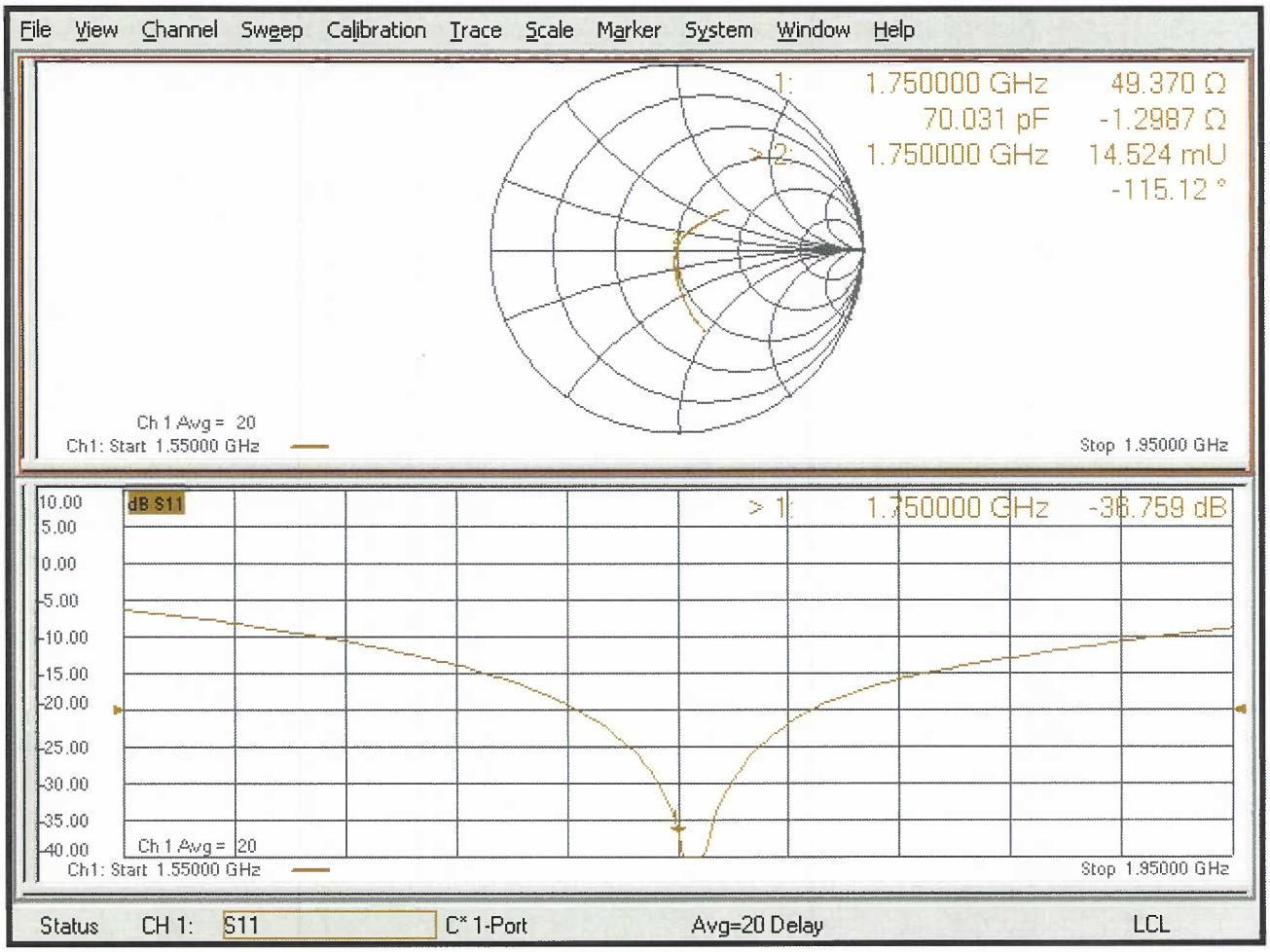
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.7 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 16.4 W/kg
SAR(1 g) = 8.95 W/kg; SAR(10 g) = 4.73 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1018

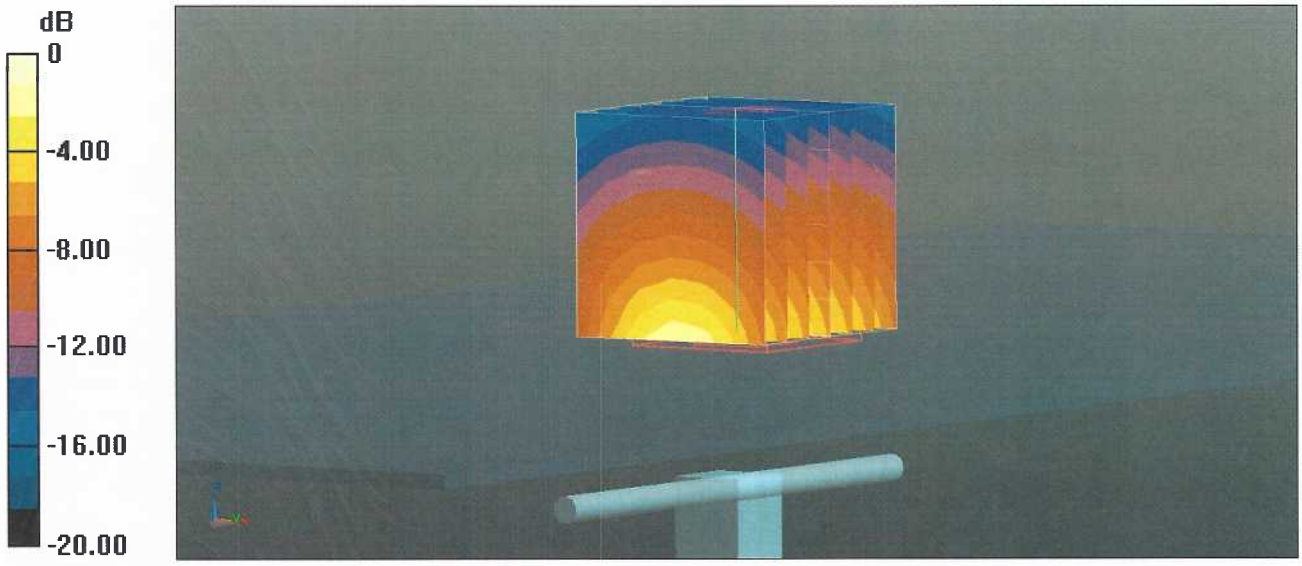
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.46 S/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.35, 8.35, 8.35) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

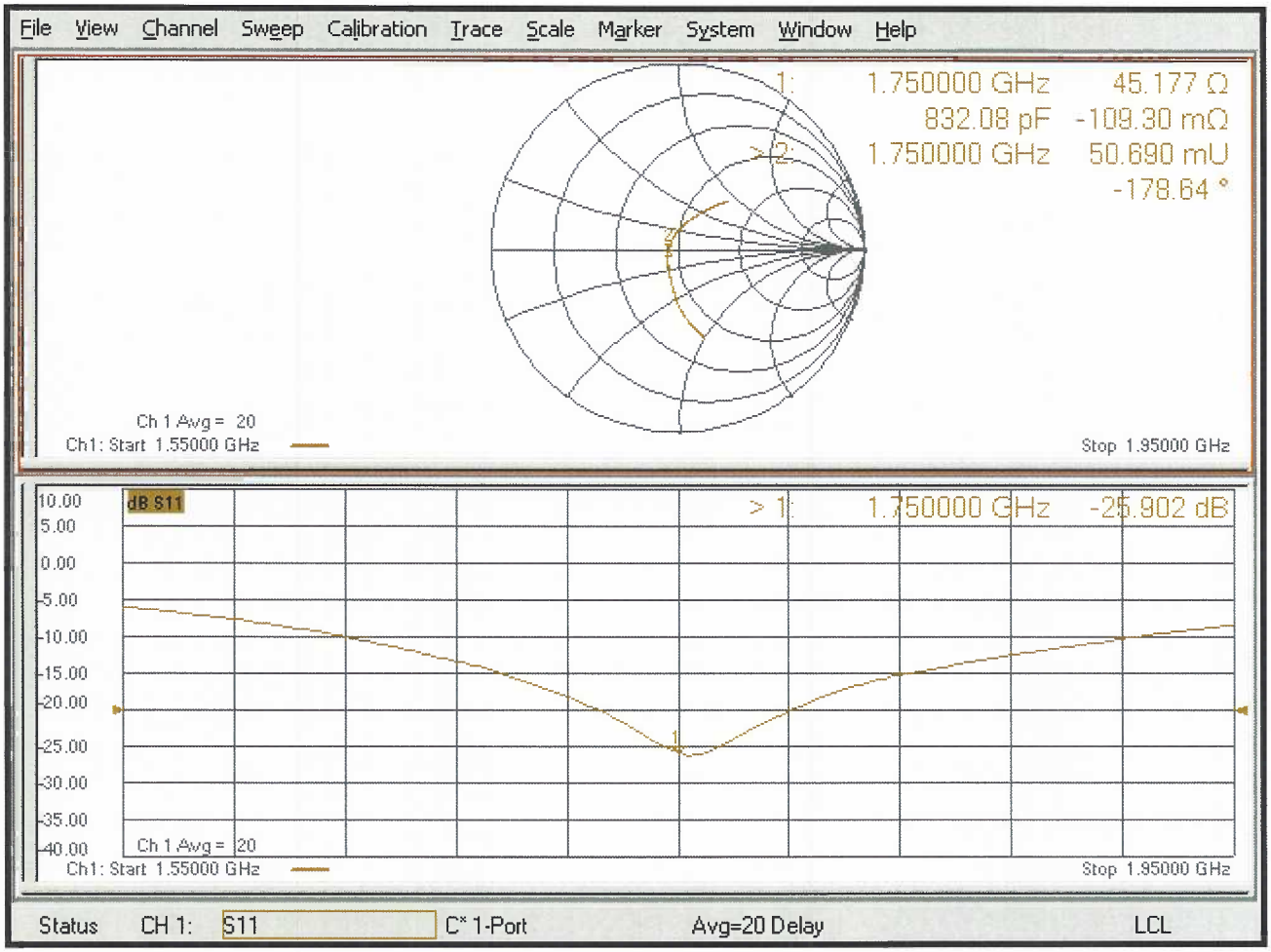
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.9 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 9 W/kg; SAR(10 g) = 4.8 W/kg
Maximum value of SAR (measured) = 13.4 W/kg



0 dB = 13.4 W/kg = 11.27 dBW/kg

Impedance Measurement Plot for Body TSL



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
S 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 RF Exposure Lab

Certificate No: D1900V2-5d116_Jul18

CALIBRATION CERTIFICATE

Object: D1900V2 - SN:5d116

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: July 13, 2018

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	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 16, 2018

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
S 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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.9 ± 6 %	1.34 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.4 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.3 ± 6 %	1.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.70 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.5 Ω + 5.0 jΩ
Return Loss	- 23.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.2 Ω + 8.3 jΩ
Return Loss	- 21.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 21, 2009

DASY5 Validation Report for Head TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d116

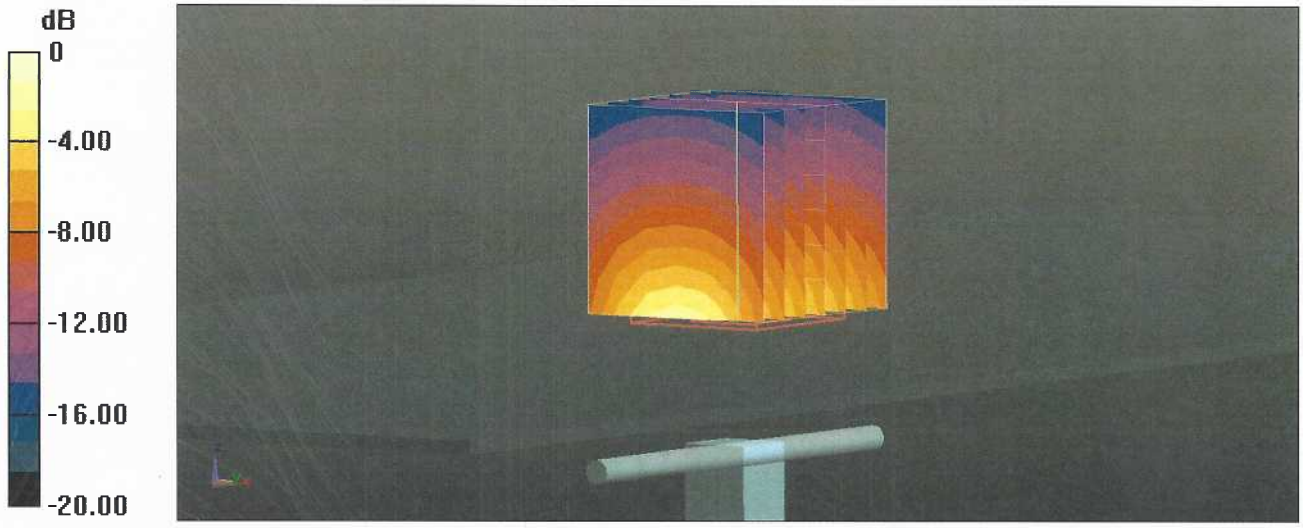
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.34 S/m; ε_r = 39.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 111.3 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 9.9 W/kg; SAR(10 g) = 5.27 W/kg
Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg

Impedance Measurement Plot for Head TSL