NOKIA MOBILE PHONES
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June 19, 2001

Federal Communications Commission,
Authorization & Evaluation Division,
7435 Oakland Mills Road
Columbia, MD. 21046

Attention: Equipment Authorization Branch

We hereby certify that the transceiver FCC ID: LJPNSB-8 complies with ANSI/IEEE C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

Compliance was determined by testing appropriate parameters according to standard.

NOKIA MOBILE PHONES

G. Meissner

Georg Meissner
Product Program Manager
PC Site Oulu

SAR Compliance Test Report

Test report no.:	Not numbered	**Date of report:**	5-Jul-2001
Number of pages:	22	**Contact person:**	Olli Kautio
		Responsible test engineer:	Olli Kautio

Testing laboratory:	Nokia Mobile Phones Elektroniikkatie 10 P.O. Box 50 FIN-90571 OULU Finland Tel.+358-10-5051 Fax.+358-10-505 7222	**Client:**	Nokia Mobile Phones Elektroniikkatie 10 P.O. Box 50 FIN-90571 OULU Finland Tel.+358-10-5051 Fax.+358-10-505 7222

Tested devices:	**LJPNSB-8,** **CSM-10, CSL-18, CSH-3, CBU-3**
Supplement reports:	-
Testing has been carried out in accordance with:	ANSI/IEEE Std C95.1-1992 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz ANSI/IEEE Std C95.3-1992 IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields-RF and Microwave
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at PC Site Oulu
Test results:	**The tested device complies with the requirements in respect of all parameters subject to the test.** The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.

Date and signatures: 5-Jul-2001

For the contents:

Olli Kautio

Olli Kautio
Senior Engineering Manager

Miia Nurkkala

Miia Nurkkala
Test Engineer

CONTENTS

1. SUMMARY FOR SAR TEST REPORT

Date of receipt	19-Jun-2001
Date of test	22-Jun-2001, 25-Jun-2001
Contact person	Olli Kautio
Test plan referred to	
Phone with IMEI, HW, SW and DUT numbers	IMEI: 001004/10/035072/8 HW: 0101, SW: V3.71, DUT: A190601/26
Accessories used in testing	Battery BLB-2
Notes	
Document code	DTX02760-EN
Responsible test engineer	Olli Kautio
Measurement performed by	Miia Nurkkala

1.1 Maximum Results Found during SAR Evaluation

The equipment is deemed to fulfil the requirements if the measured values are less than or equal to the limit.

1.1.1 Head Configuration

Ch / *f* [MHz]	Position	Limit [mW/g]	Measured [mW/g]	Result
512/1850.2	Tilted	1.6	1.05	PASSED

1.1.2 Body Worn Configuration

Ch / *f* [MHz]	Accessory	Limit [mW/g]	Measured [mW/g]	Result
661/1880.0	CBU-3	1.6	1.10	PASSED

1.1.3 Measurement Uncertainty

Combined Uncertainty (Assessment & Source)	**± 12.2%**
Extended Uncertainty (k=2) 95.5%	**± 24%**

2. DESCRIPTION OF TESTED DEVICE

FCC ID	LJPNSB-8
Modes of Operation	GSM1900
Modulation Mode(s)	Gaussian Minimum Shift Keying
Duty Cycle(s) (=1/ Crest Factor)	1/8
Transmitter Frequency Range	1850.2 - 1909.8MHz

2.1 Picture of Phone

2.2 Description of the Antenna

LJPNSB-8 has an internal integrated antenna.

2.3 Battery Options

BLB-2 is the only one battery option available for tested device.

2.4 Body Worn Accessories

Following body worn accessories are available for LJPNSB-8:

- Carrying Case CSM-10
- Carrying Case CSL-18

- Leather Case CBU-3

- Leather Case CSH-3

3. TEST CONDITIONS

3.1 Environment

Ambient temperature (°C).	22 ± 1
Tissue simulating liquid temperature (°C).	22 ± 0.5

3.2 Test Signal, Frequencies, and Output Power

The phone was put into operation by using a radio tester. Communication between the phone and the tester was established by air link.

In all operating bands the measurements were performed on lowest, middle and highest channels.

The phone was set to maximum power level during the all tests and at the beginning of the each test the battery was fully charged. Power output was measured by FCC accredited test laboratory, M. Flom Associates Inc. The same unit is used in SAR testing.

4. DESCRIPTION OF THE TEST EQUIPMENT

The measurements were performed with an automated near-field scanning system, DASY3, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland.

Test Equipment	Serial Number	Due Date
DASY3 DAE V1	371	10/01
E-field Probe ET3DV6	1379	02/02
Dipole Validation Kit, D1900V2	511	02/03

Additional equipment needed in validation

Test Equipment	Model	Serial Number	Due Date
Signal Generator	R&S SMIQ 03B	10012	02/02
Amplifier	Amplifier Research 5S1G4	27573	-
Power Meter	R&S NRT	835065/049	05/02
Power Sensor	R&S NRT-Z44	835374/021	05/02
Thermometer	D09416	1505985462	-
Vector Network Analyzer	Anritsu 37347A	992604	02/02
Transmission Line Dielectric Probe	Damaskos T1500	-	-

4.1 System Accuracy Verification

The probes are calibrated annually by the manufacturer. Dielectric parameters of the simulating liquids are measured by using a Damaskos Inc. transmission line model T1500 and Anritsu 37347A vector network analyzer.

The SAR measurements were validated on the same day as the measurement of the DUT by using the dipole validation kit. Power level of 250 mW was supplied to the dipole antenna placed under the flat section of the generic twin phantom. The validation result is in the table below and printout of the validation test is shown in Appendix A. All the measured parameters were within the specification.

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters ε_r	Dielectric Parameters σ [S/m]	Temp [°C]
1900	Measured	10.2	38.9	1.43	22
	Reference Result	10.7	39.2	1.47	N/A
1900	Measured	10.2	51.6	1.50	22
	Reference Result	10.6	53.5	1.46	N/A

4.2 Head Tissue Simulant

The composition of the brain tissue simulating liquid for 1900MHz is

44.92% 2-(2-butoxyethoxy) Ethanol
54.90% De-Ionized Water
0.18% Salt

f [MHz]	Description	Dielectric Parameters ε_r	Dielectric Parameters σ [S/m]	Temp [°C]
1900	Measured	38.9	1.43	22
	Recommended Values	40.0	1.40	22

Recommended values are adopted from IEEE 1528-Draft 6.1 "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques".

4.3 Muscle Tissue Simulant

The composition of the muscle tissue simulating liquid for 1900 MHz is

69.05% De-Ionized Water
30.7% Diethylene Glycol Monobutyl Ether
0.25% Salt

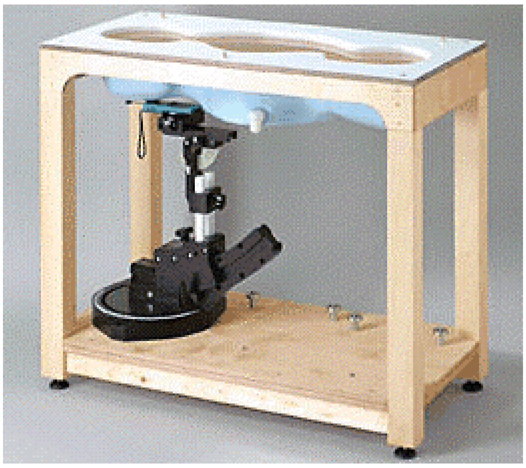
f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ε_r	σ [S/m]	
1900	Measured	51.6	1.50	22
	Recommended Values	54.3	1.45	22

Recommended values are adopted from FCC Tissue Dielectric Properties web page at http:// www.fcc.gov/fcc-bin/dielec.sh

4.4 Phantoms

"Generic Twin Phantom", manufactured by SPEAG, was used in the measurement. First phantom was filled with 1900 MHz head tissue simulating liquid. Then with 1900 MHz muscle tissue-simulating liquid, for body worn accessory testing.

The thickness of phantom shell is 2 mm except for the ear, where a 4 mm ear spacer provides a 6 mm spacing from the tissue boundary.



5. DESCRIPTION OF THE TEST PROCEDURE

5.1 Test Positions

5.1.1 Against Phantom Head

Measurements were made on both the "left hand" and "right hand" side of the phantom.

The phone was positioned against phantom according to IEEE 1528-Draft 6.1 "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques". This draft of IEEE Standard Document defines "cheek" position as follows:

1) Ready the handset for talk operation, if necessary. For example, for handsets with a flip piece, open the flip.
2) Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width w_t of the handset at the level of the acoustic output (point A on Figures 5.1a and 5.1b), and the midpoint of the width w_b of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 5.1a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 5.1b), especially for clamshell handsets, handsets with flip pieces, and other irregularly shaped handsets.
3) Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 5.2), such that the plane defined by the vertical center line and the horizontal center line is in a plane approximately parallel to the sagittal plane of the phantom.
4) Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear.
5) While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is the plane normal to MB ("*mouth-back*") - NF ("*neck-front*") including the line MB (reference plane).
6) ("*We are unable to follow instructions in this paragraph (6) until the SAM phantom is available.*") Rotate the phone around the vertical centerline until the phone (horizontal line) is symmetrical with respect to the line NF.
7) While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, rotate the handset about the line NF until any point on the handset is in contact with the cheek of the phantom.

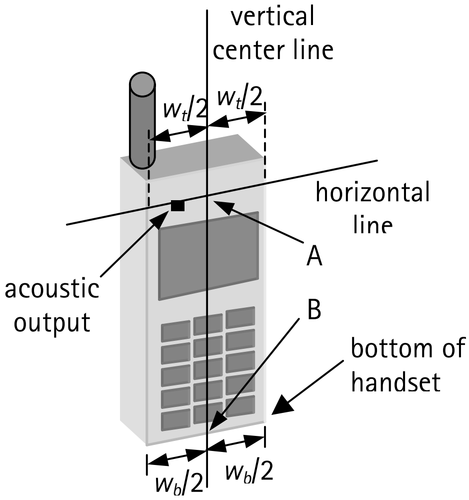


Figure 5.1a – Handset vertical and horizontal reference lines – fixed case

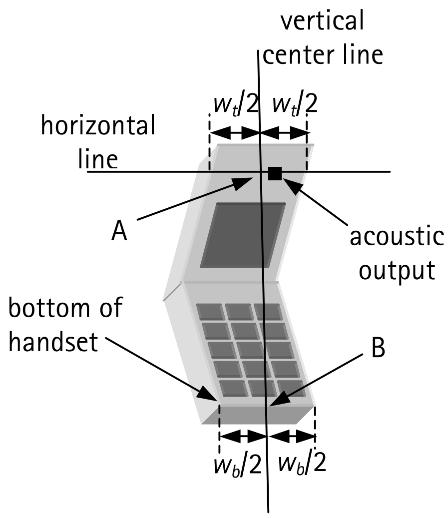


Figure 5.1b – Handset vertical and horizontal reference lines – "clam-shell"

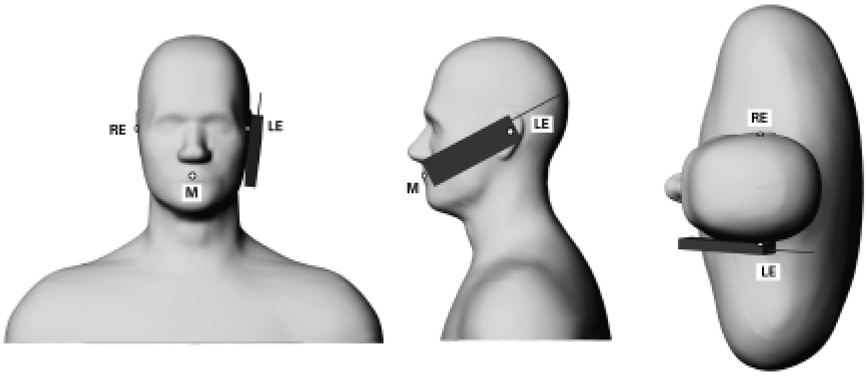


Figure 5.2 - "Cheek" position

The same draft document defines "tilted position" as

1) Repeat steps 1 to 7 of 5.4.1 ("*in this document 5.1.1*") to place the device in the "cheek position."
2) While maintaining the device in the reference plane (described above) and pivoting against the ear, move the device outward away from the mouth by an angle of 15degrees, or until the antenna touches the phantom.

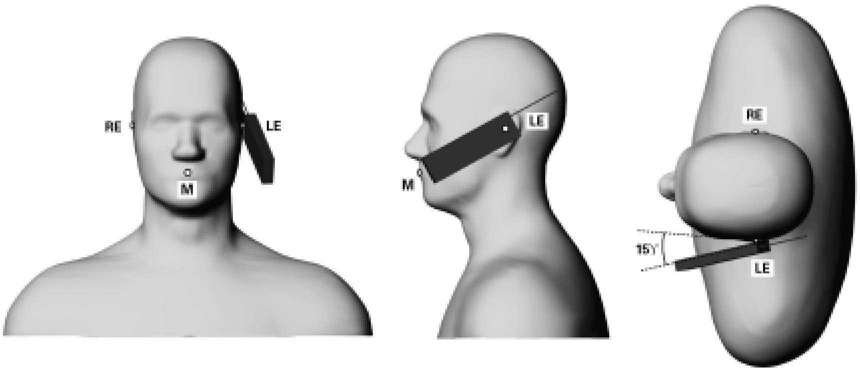


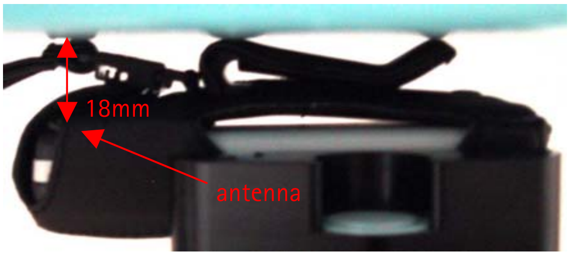
Figure 5.3 - "Tilted" position

Since LJPNSB-8 has a fixed case, the reference lines are defined in figure 5.1a.

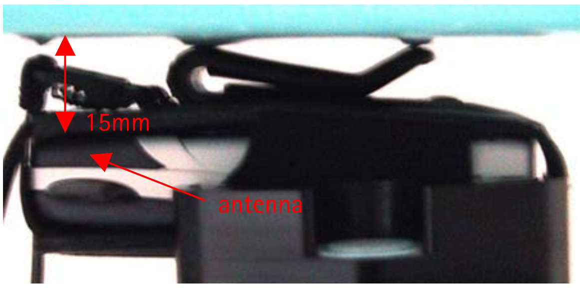
5.1.2 Body Worn Configuration

All body worn accessories listed in section 2.4 were tested for the FCC RF exposure compliance. The phone was positioned into carrying case and placed below of the flat phantom.

Carrying Case CSM-10

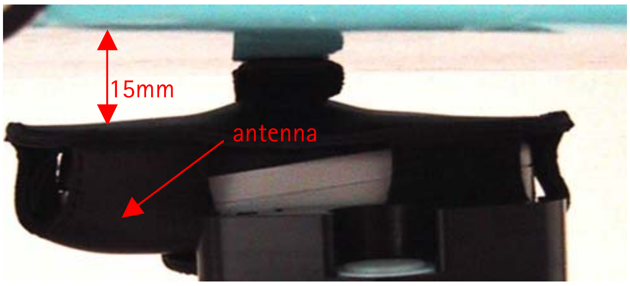


Carrying Case CSL-18



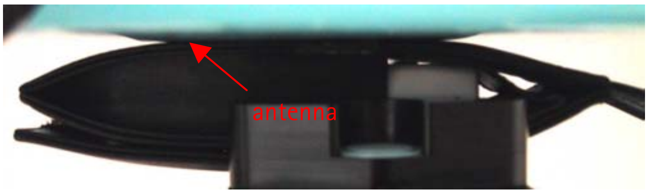
LJPNSB-8 can be positioned into CSM-10 and CSL-18 only one way, because both carrying cases have opening for display and keypad.

Leather Case CSH-3



CSH-3 has opening for bottom connector. The connector opening is design so that headset can be connected in to LJPNSB-8 only if antenna is facing away from the body.

Leather Case CBU-3



5.2 Scan Procedures

First coarse scans are used for quick determination of the field distribution. Next a cube scan, 5x5x7 mm, is performed around the highest E-field value to determine the averaged SAR-distribution over 1g.

5.3 SAR Averaging Methods

The maximum SAR value is averaged over its volume using interpolation and extrapolation.

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot" -condition [W. Gander, Computermathematik, p. 141-150] (x, y and z -directions) [Numerical Recipes in C, Second Edition, p 123].

The extrapolation is based on least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 30 mm in all z-axis, polynomials of order four are calculated. This polynomial is then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1mm from one another.

6. MEASUREMENT UNCERTAINTY

6.1 Description of Individual Measurement Uncertainty

6.1.1 Assessment Uncertainty

Uncertainty description	**Error**	**Distrib.**	**Weight**	**St. Dev.**
Probe Uncertainty				
- Axial Isotropy	± 0.2 dB	U-shape	0.5	± 2.4%
- Spherical Isotropy	± 0.4 dB	U-shape	0.5	± 4.8%
- Isotropy from Gradient	± 0.5 dB	U-shape	0	
- Spatial Resolution	± 0.5 %	Normal	1	± 0.5%
- Linearity Error	± 0.2 dB	Rectang.	1	± 2.7%
- Calibration Error	± 3.6 %	Normal	1	± 3.6%
Evaluation Uncertainty				
- Data Acquisition Error	± 1%	Rectang.	1	± 0.6%
- ELF and RF Disturbances	± 0.25%	Normal	1	± 0.25%
- Dielectric Parameters	± 10%	Rectang.	1	± 5.8%
Spatial Peak SAR Evaluation Uncertainty				
- Extrapolation	± 3%	Normal	1	± 3%
- Probe Positioning Error	± 0.1mm	Normal	1	± 1%
- Cube - Orientation/Integration	± 3%	Normal	1	± 3%
- Cube Shape Inaccuracies	± 2%	Rectang.	1	± 1.2%
Total Measurement Uncertainty				**± 10.2%**

6.1.2 Source Uncertainty

Uncertainty description	**Error**	**Distrib.**	**Weight**	**St. Dev.**
- Device Positioning	± 6%	Normal	1	± 6%
- Laboratory Setup	± 3%	Normal	1	± 3%
Total Source Uncertainty				**± 6.7%**

6.1.3 Combined Uncertainty

Uncertainty description	**Uncertainty**
- Total Assessment Uncertainty	± 10.2%
- Total Source Uncertainty	± 6.7%
Combined Uncertainty (Assessment & Source)	± 12.2%
Extended Uncertainty (k=2)	**± 24%**

7. RESULTS

Corresponding SAR distribution printouts of maximum results are shown in Appendix B.

7.1 Head Configuration

Mode	Channel/ *f* [MHz]	EIRP Power [dBm]	SAR, averaged over 1g [mW/g]			
			Left-hand		Right-hand	
			Cheek	Tilted	Cheek	Tilted
GSM 1900	512/1850.20	31.1	0.81	0.85	0.92	**1.05**
	661/1880.00	30.5	0.71	0.74	0.77	0.95
	810/1909.80	30.8	0.67	0.72	0.71	0.87

7.2 Body Worn Configuration

Mode	Channel/ *f* [MHz]	EIRP Power [dBm]	SAR, averaged over 1g [mW/g]			
			CSM-10	CSL-18	CSH-3	CBU-3
GSM 1900	512/1850.20	31.1	**0.38**	0.35	**0.19**	1.05
	661/1880.00	30.5	0.35	**0.38**	0.18	**1.10**
	810/1909.80	30.8	0.34	0.36	0.15	1.04

APPENDIX A.

Validation Test Printouts

Dipole 1900 MHz

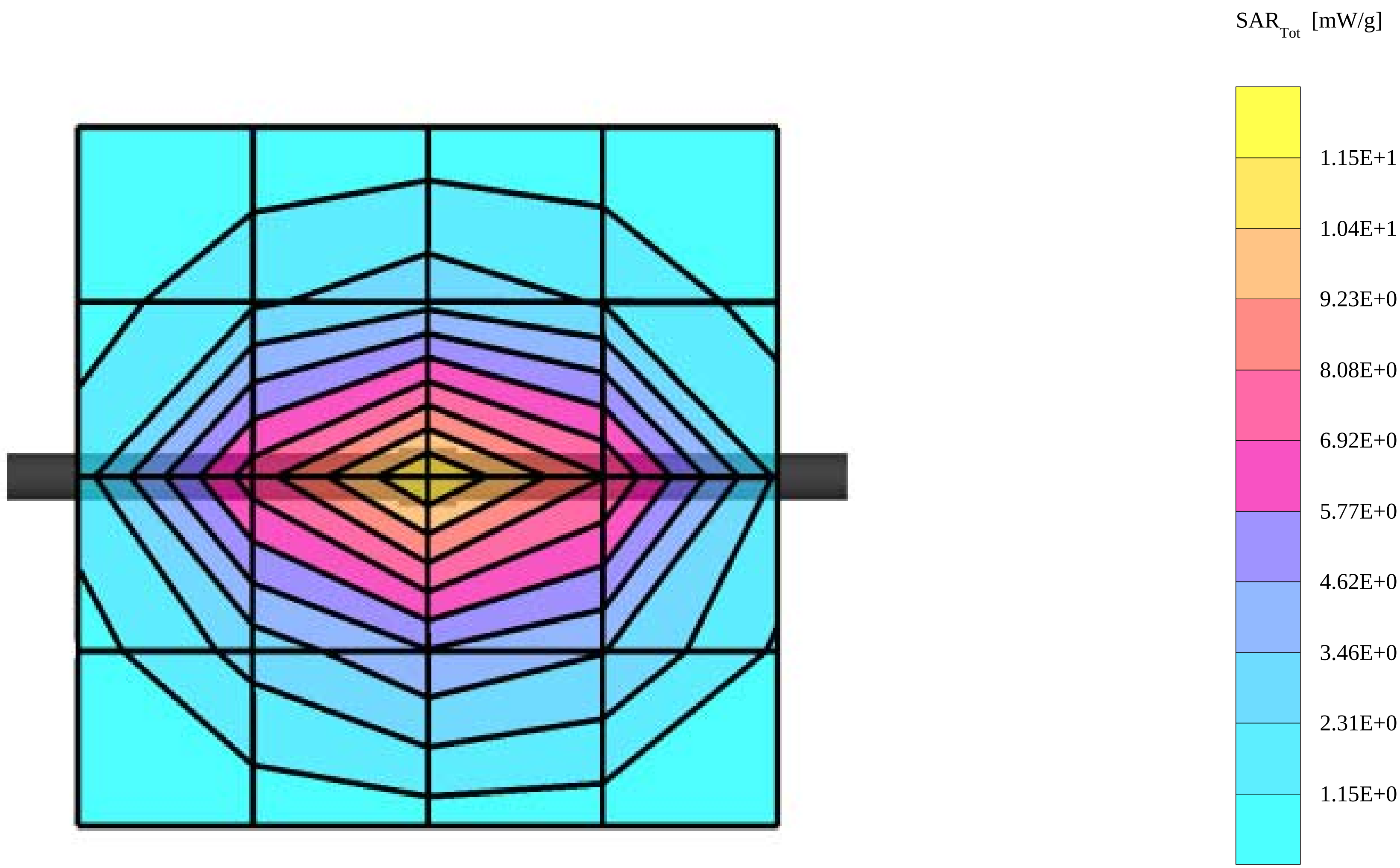
Generic Twin 2 new; Flat

Probe: ET3DV6 - SN1379; ConvF(5.33,5.33,5.33); Crest factor: 1.0; Brain 1900 MHz SCC34: σ = 1.43 mho/m ε = 38.9 ρ = 1.00 g/cm^3

Cubes (2): Peak: 19.3 mW/g ± 0.05 dB, SAR (1g): 10.2 mW/g ± 0.05 dB, SAR (10g): 5.21 mW/g ± 0.05 dB,

Penetration depth: 8.1 (7.6, 9.0) [mm]

Powerdrift: 0.01 dB



Dipole 1900 MHz

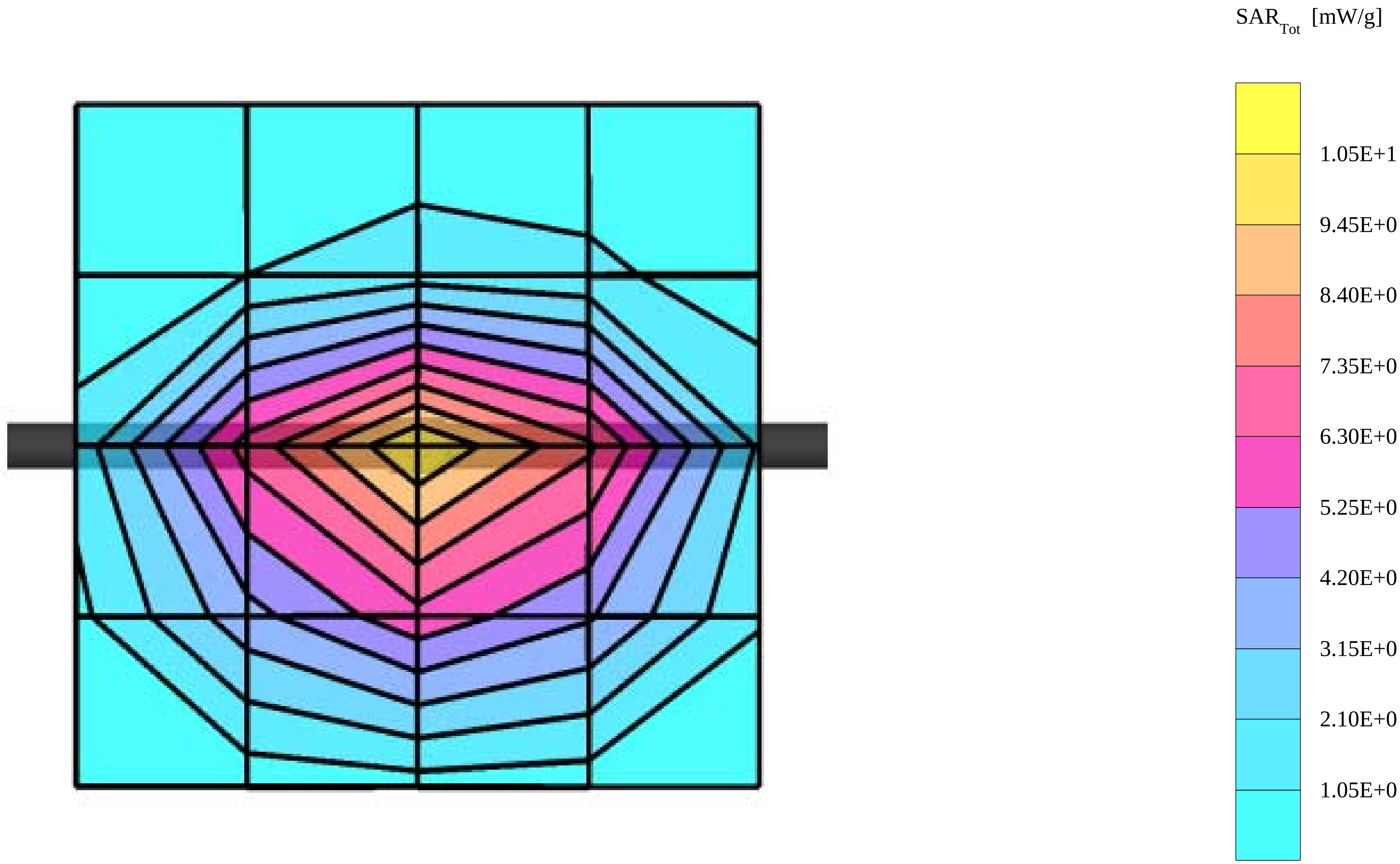
Generic Twin 2 new; Flat

Probe: ET3DV6 - SN1379; ConvF(4.88,4.88,4.88); Crest factor: 1.0;   Muscle 1900 MHz: σ = 1.50 mho/m ε = 51.6 ρ = 1.00 g/cm^3

Cubes (2): Peak: 18.9 mW/g ± 0.07 dB, SAR (1g): 10.2 mW/g ± 0.07 dB, SAR (10g): 5.36 mW/g ± 0.05 dB,

Penetration depth: 8.8 (8.0, 10.1) [mm]

Powerdrift: -0.00 dB

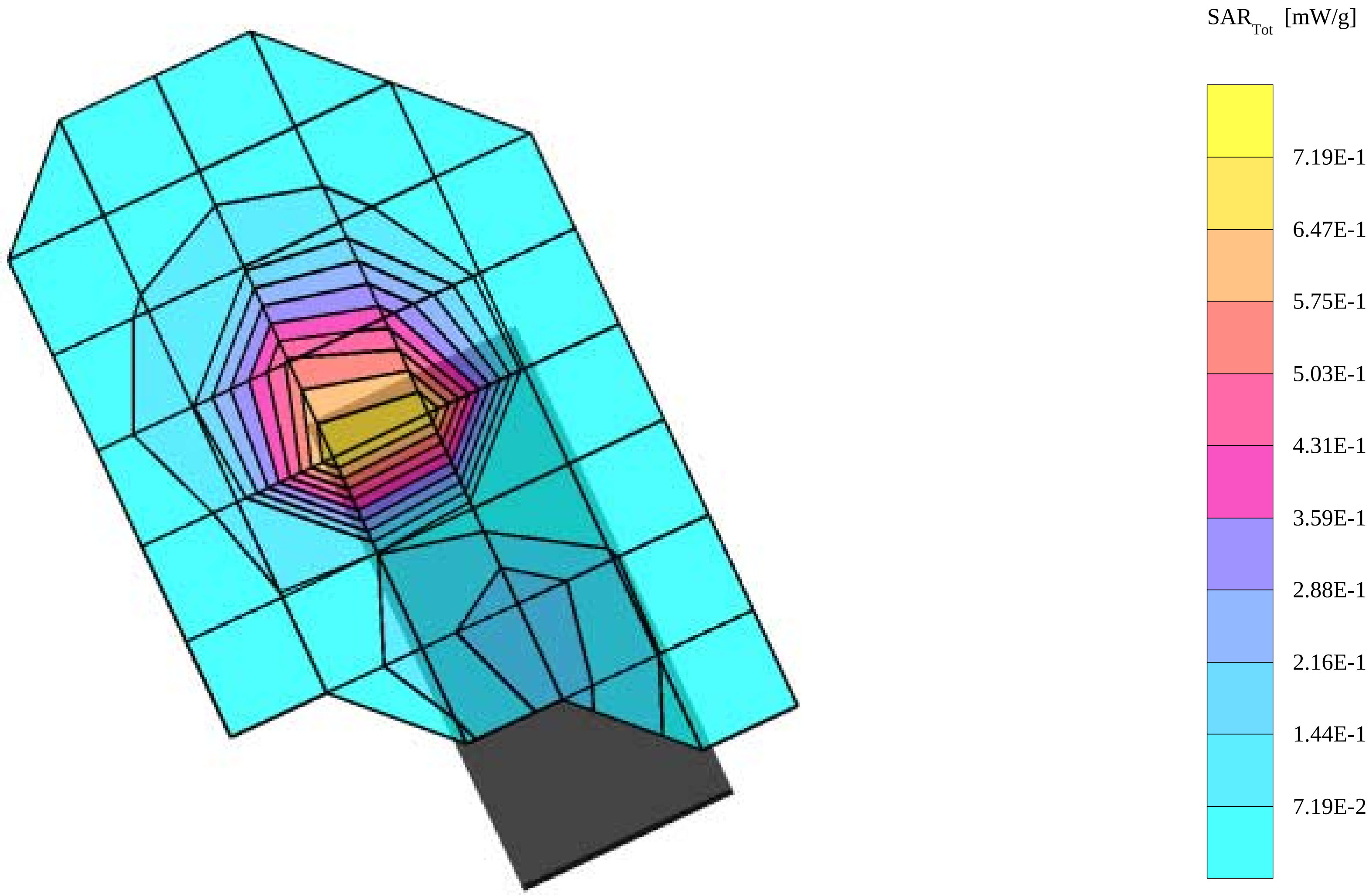


APPENDIX B.

SAR Distribution Printouts

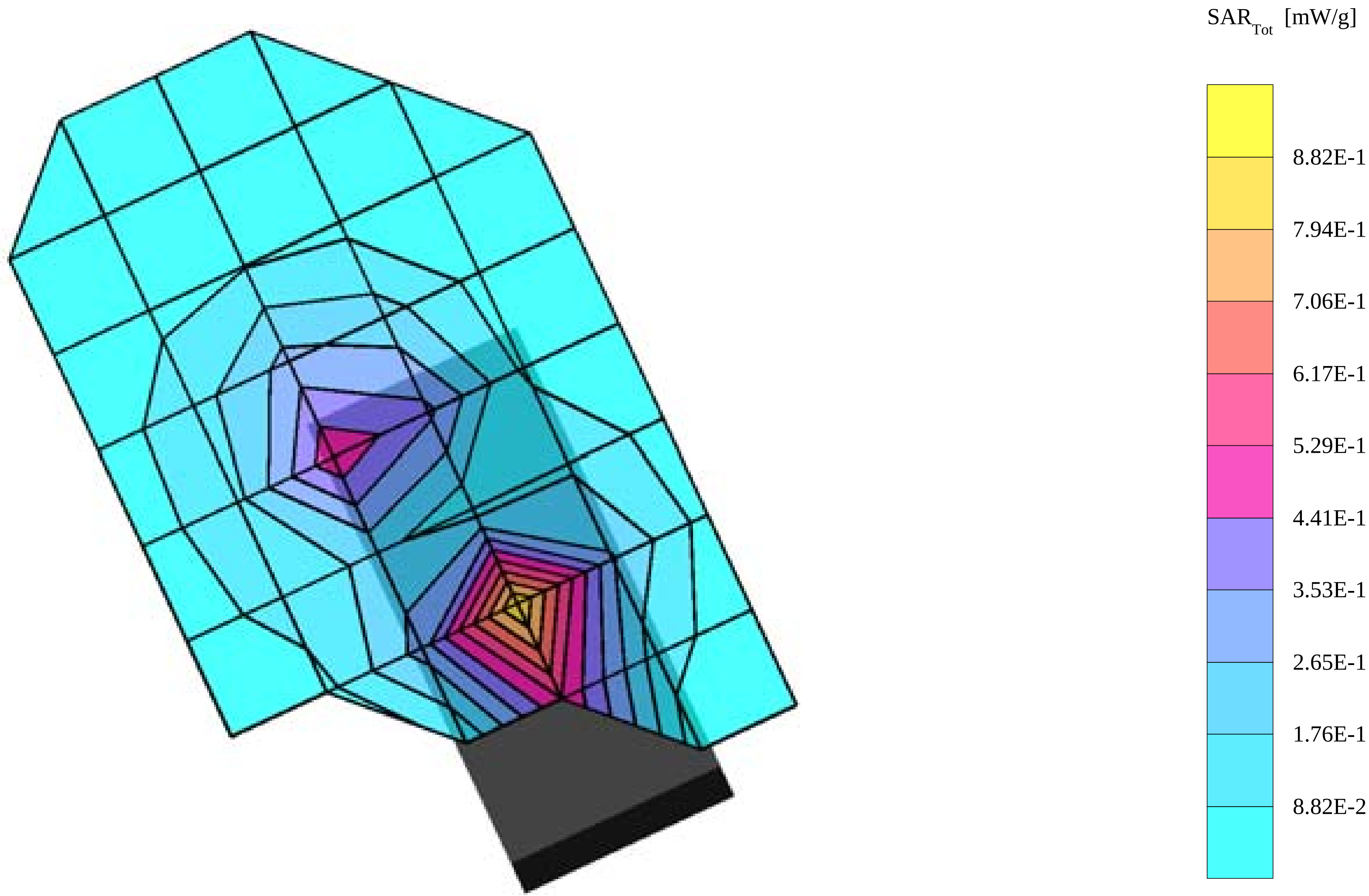
LJPNSB-8

Generic Twin 2 new Phantom; Right Hand Section; Position: Tilted ; Frequency: 1850 MHz
Probe: ET3DV6 - SN1379; ConvF(5.33,5.33,5.33); Crest factor: 8.0; Brain 1850 MHz SCC34: σ = 1.38 mho/m ε = 39.0 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 1.05 mW/g, SAR (10g): 0.559 mW/g,
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.00 dB



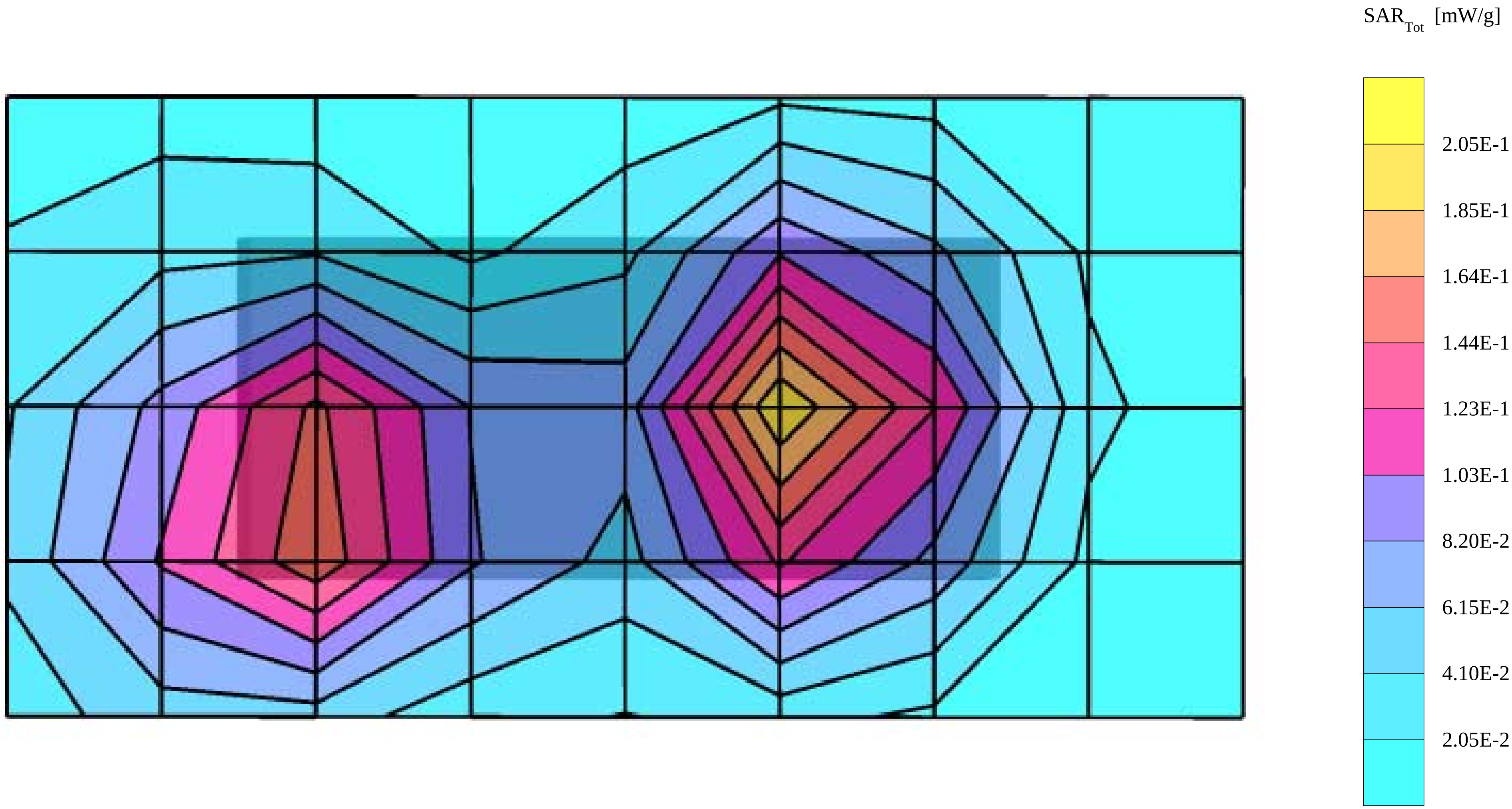
LJPNSB-8

Generic Twin 2 new Phantom; Right Hand Section; Position: Cheek; Frequency: 1850 MHz
Probe: ET3DV6 - SN1379; ConvF(5.33,5.33,5.33); Crest factor: 8.0; Brain 1850 MHz SCC34: σ = 1.38 mho/m ε_r = 39.0 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.923 mW/g, SAR (10g): 0.516 mW/g,
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.10 dB



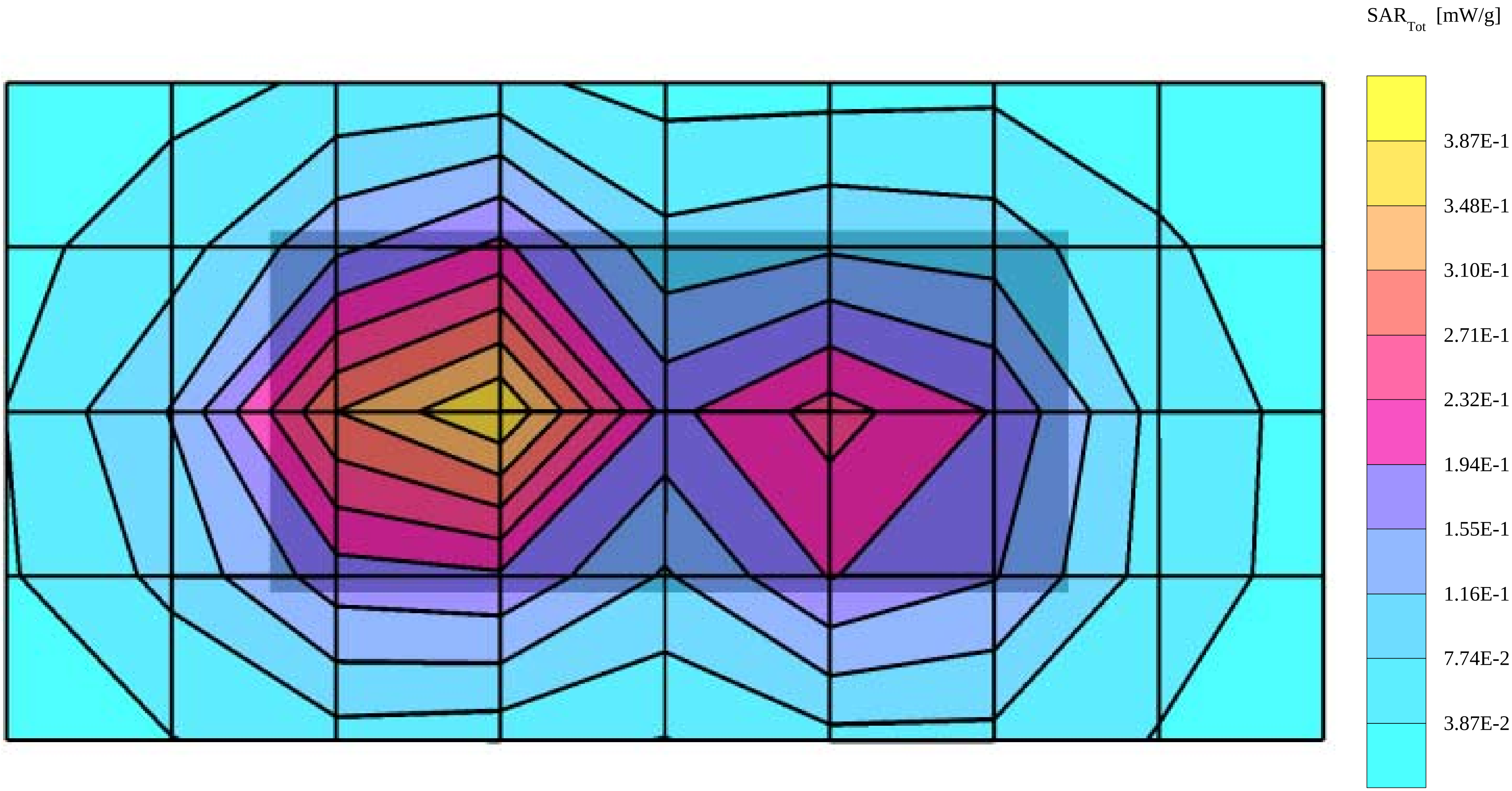
LJPNSB-8, CSH-3

Generic Twin 2 new Phantom; Flat Section; Position: body worn ; Frequency: 1850 MHz
Probe: ET3DV6 - SN1379; ConvF(4.88,4.88,4.88); Crest factor: 8.0; Muscle 1850MHz: σ = 1.48 mho/m ε = 51.7 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.189 mW/g, SAR (10g): 0.115 mW/g,
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.09 dB



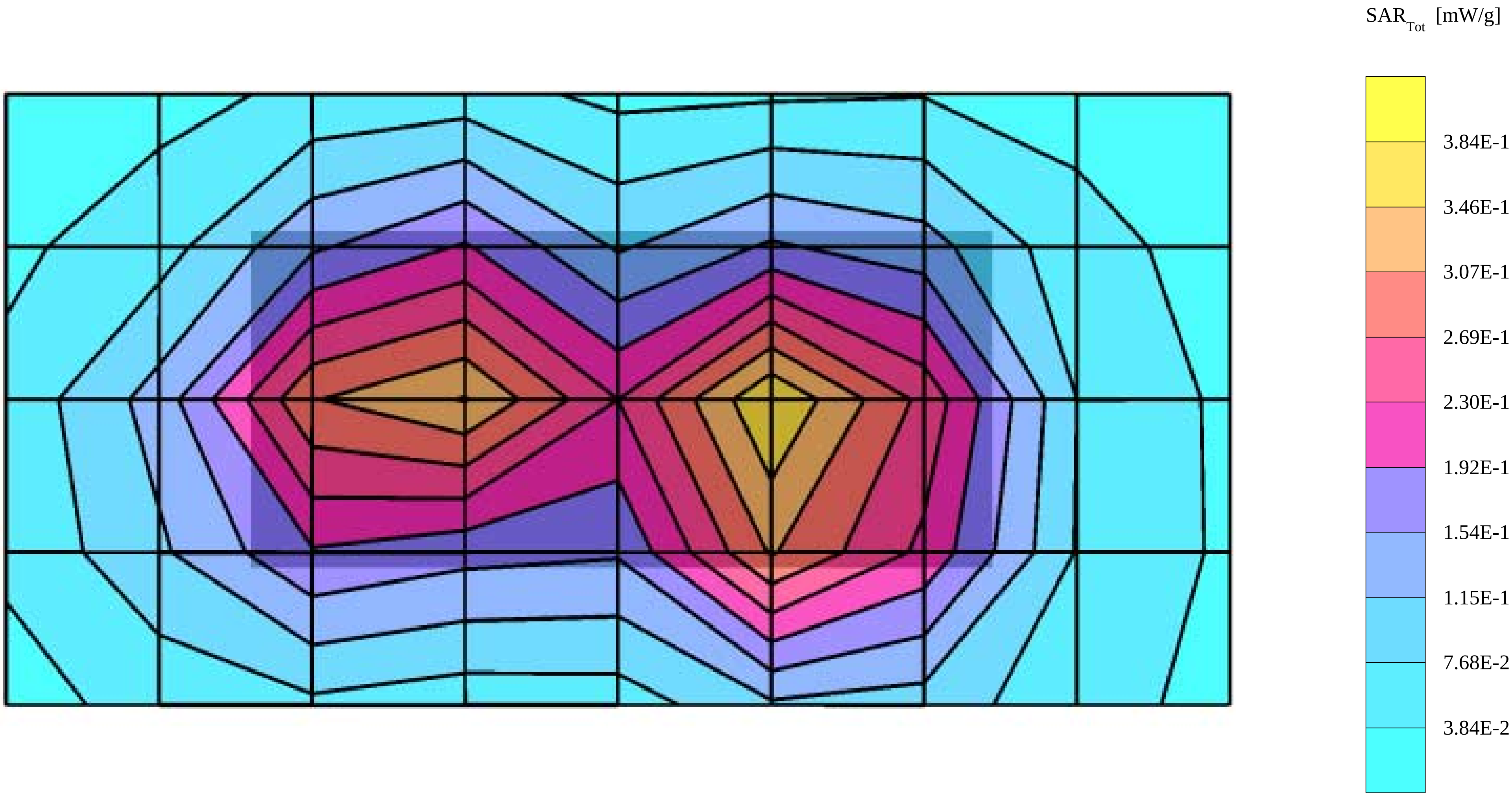
LJPNSB-8, CSL-18

Generic Twin 2 new Phantom; Flat Section; Position: body worn ; Frequency: 1880 MHz
Probe: ET3DV6 - SN1379; ConvF(4.88,4.88,4.88); Crest factor: 8.0; Muscle 1880MHz: σ = 1.48 mho/m ε = 51.7 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.376 mW/g, SAR (10g): 0.219 mW/g,
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.01 dB



LJPNSB-8, CSM-10

Generic Twin 2 new Phantom; Flat Section; Position: body worn; Frequency: 1850 MHz
Probe: ET3DV6 - SN1379; ConvF(4.88,4.88,4.88); Crest factor: 8.0; Muscle 1850MHz: σ = 1.48 mho/m ε = 51.7 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.380 mW/g, SAR (10g): 0.235 mW/g,
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.02 dB



LJPNSB-8, CBU-3

Generic Twin 2 new Phantom; Flat Section; Position: body worn; Frequency: 1880 MHz

Probe: ET3DV6 - SN1379; ConvF(4.88,4.88,4.88); Crest factor: 8.0; Muscle 1880MHz: σ = 1.48 mho/m ε = 51.7 ρ = 1.00 g/cm^3

Cube 5x5x7: SAR (1g): 1.10 mW/g, SAR (10g): 0.629 mW/g,

Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Powerdrift: -0.01 dB