5.1 PHANTOM & THE MUSCLE EQUIVALENT TISSUE

5.2 Phantom

The phantom is an anatomically-shaped homogeneous torso model filled with a liquid simulating muscle tissue. The phantom is placed at 0 degrees (horizontal position) with the torso placed on the EUT (see Fig. 5). The phantom is made of a shell of fiberglass 1.5mm. thick (giving the worst case SAR value absorbed by muscle tissue and the skull bones) and the EUT supported by a non-metallic (delrin) material*. Similar phantoms have been used to simulate human head/muscle modelling studies[6][7].

5.3 Muscle Simulating Mixture Characterization

The muscle mixture consists of a viscous gel using hydroxethylcellullose (HEC) gelling agent and saline solution (see Table 1). Preservation with a bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the muscle. The mixture characterizations used for the muscle tissue simulating liquid are according to the data by C. Gabriel and G. Hartsgrove [9].

MUSCLE MIXTURE %	FREQUENCY 1850-1910 MHz
WATER	40.4
SUGAR	58.0
SALT	0.5
BACTERIACIDE	0.1
HEC	1.0

Table 1. Composition of the Muscle Tissue Equivalent Matter

* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations [8]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

6.1 SYSTEM SPECIFICATIONS

6.2 Robotic System Specifications

Specifications

POSITIONER:	IDX Robot with 6 axis
Repeatability:	0.002 in.
Accuracy:	0.004 in.

Data Acquisition

Processor:	Pentium PRO CPU
Clock Speed:	200 MHz
Operating System:	Windows NT
Data Card:	National Instruments Analog Card
Software:	IDX Flexware
AMPLIFIER GAIN:	Adjustable 20 - 40, high isolation between channels
Connecting Lines:	High Impedance 4.5 kohm/foot
Sample Rate:	6000

E-Field Probe	**E-Probe #1**	**E-Probe #2**
Probe Offset:	2.5 mm	2.5 mm
Frequency Band:	150 - 2200 MHz	150 - 2200 MHz
Conversion Factor:	0.601 (800-880MHz)	0.79 (800-880MHz)
Conversion Factor:	1.20 (1850-1910MHz)	1.20 (1850-1910MHz)
Dynamic Response:	2 μW/g - 10 mW/g	2 μW/g - 10 mW/g
Input:	2.2 meg	2.2 meg
Isotropicity:	± 0.5 dB	± 0.5 dB
Resolution:	0.1 cm^3	0.1 cm^3

Phantom	**Phantom #1 (Left)**	**Phantom #2 (Right)**
Phantoms:	Homogenous	Homogenous
Shell Material:	Fiberglass	Fiberglass
Thickness:	1 - 1.5 mm	1 - 1.5 mm
Head:	with Left ear	with Right ear

Muscle Tissue Equivalent	**800-850 MHz**	**1850-1910 MHz**
Dielectric Constant: ε	56.2	52.0
Conductivity: σ	0.95	1.85

11.1 TEST DATA SUMMARY

Ambient TEMPERATURE (°C) 22
Relative HUMIDITY (%) 53
Atmospheric PRESSURE (kPa) 92

Mixture Type: Muscle

Dielectric Constant: 52.0

Conductivity: 1.85 S/m

Closest Distance (between E-Probe & EUT Antenna): 2.0 cm

Measurement Results

FREQUENCY		Modulation	POWER (W)*	Antenna Position	SAR (W/kg) or (mW/g)
MHz	Ch.				
1851.25	25	CDMA	0.214	OUT	1.1821
1880.00	600	CDMA	0.214	OUT	1.1041
1908.75	1175	CDMA	0.214	OUT	1.1182
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak (Muscle) Uncontrolled Exposure/General Population					**1.6 W/kg (mW/g)**

NOTES:
1. The test data reported are the worst-case SAR value with the antenna-phantom setup in a normal operating position. All modes of operation were investigated and the worst-case are reported.
2. Battery condition is fully charged for all readings.
3. Power measured: ☐ Conducted ☒ EIRP ☐ ERP

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PCTEST SEAL