UltraTech
Group of Labs

June 22, 2001

FEDERAL COMMUNICATIONS COMMISSION
7435 Oakland Mills Road
Columbia, MD 21046
USA

Subject: **Verification Testing in accordance with SAR (Specific Absorption Rate) requirements using guidelines established in:**

IEEE C95.1-1991,
FCC OET Bulletin 65 (Supplement C)
Industry Canada RSS-102 (Issue 1)
ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2000 (No. 1)

Product: **PRISM 2.5 PCMCIA**
Model: **ISL37300P**

Dear Sir/Madam

The product sample has been tested in accordance with **SAR (Specific Absorption Rate) requirements using guidelines established in IEEE C95.1-1991, FCC OET Bulletin 65 (Supplement C), Industry Canada RSS-102 (Issue 1)and ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2000 (No. 1),** and the results and observation were recorded in the engineering report, Our File No.: CLS-061-SAR

Enclosed you will find a copy of the engineering report. If you have any queries, please do not hesitate to contact us.

Yours truly,

Tri Minh Luu, P.Eng
Vice President - Engineering

Encl.

3000 Bristol Circle,
Oakville, Ontario, Canada
L6H 6G4

Telephone (905) 829-1570
Facsimile (905) 829-8050

CERTIFICATE OF COMPLIANCE

June 22, 2001

Intersil Corp.
Rembrandtlaan 1a
3723 BG Bilthove,, Netherlands, MD 21046

File No.: CLS-061-SAR

NOT TRANSFERABLE

This Verification Certificate is hereby issued to the named GRANTEE and is VALID ONLY for the equipment identified hereon for use under the rules and regulations listed below:

GRANTEE'S NAME:	**INTERSIL CORP.**
PRODUCT UNDER TEST:	**PRISM 2.5 PCMCIA**
MODEL NO.:	**ISL37300P**
FCC ID:	**OSZ37300PC**
OPERATING FREQUENCY RANGE:	**2,412 ~ 2,462 MHz**
NOMINAL RF OUTPUT POWER:	**45.7 mW_{pk}**
MAXIMUM S.A.R.:	**< 0.01 W/Kg**

APPLICABLE STANDARDS: **SAR (Specific Absorption Rate) requirements using guidelines established in IEEE C95.1-1991, FCC OET Bulletin 65 (Supplement C), Industry Canada RSS-102 (Issue 1) and ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2001 (No. 1)**

- Assessed by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia), VCCI (Japan)
- Accredited by Industry Canada (Canada) under ACC-LAB (Europe/Canada MRA and APEC/Canada MRA)
- Recognized/Listed by FCC (USA)
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST Technology (NIST)*

Approved by: Tri M. Luu, P.Eng.
V.P. – Engineering

UltraTech

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ENGINEERING TEST REPORT

PRISM 2.5 PCMCIA
Model No.: ISL37300P

Tested For

INTESIL CORP
Rembrandtlaan 1a
3723 BG Bilthoven, Nethelands

In Accordance With

SAR (Specific Absorption Rate) Requirements
using guidelines established in IEEE C95.1-1991,
FCC OET Bulletin 65 (Supplement C),
Industry Canada RSS-102 (Issue 1) and
ACA Radiocommunications (Electromagnetic Radiation – Human Exposure)
Amendment Standard 2001 (No. 1)

UltraTech's File No.: CLS-061-SAR

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: June 22, 2001	
Report Prepared by: JaeWook Choi Issued Date: June 22, 2001	Tested by: JaeWook Choi, SAR Engineer Test Dates: February 12, 2001

The results in this Test Report apply only to the sample(s) tested, which has been randomly selected.

UltraTech

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	SAR (Specific Absorption Rate) Requirements IEEE C95.1-1991, FCC OET Bulletin 65 (Supplement C) Industry Canada RSS-102 (Issue 1). ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2001 (No. 1)
Title	Safety Levels with respect to human exposure to Radio Frequency Electromagnetic Fields Guideline for Evaluating the Environmental Effects of Radio Frequency Radiation
Purpose of Test:	To show compliance with Federal regulated SAR requirements in Canada and the US.
Method of Measurements:	IEEE C95.1-1991, FCC OET Bulletin 65 (Supplement C) and Industry Canada RSS-102(Issue 1)
Exposure Category	[X] General population, uncontrolled exposure [ ] Occupational, controlled exposure

1.2. REFERENCES

The methods and procedures used for the measurements contained in this report are details in the following reference standards:

Publications	**Year**	**Title**
Industry Canada RSS102	1999	"Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields"
ACA	2001	ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2001 (No. 1)
NCRP Report No.86	1986	"Biological Effects and Exposure Criteria for radio Frequency Electromagnetic Fields"
FCC OET Bulletin 65	1997	"Evaluating Compliance with FCC Guidelines for Human Exposure to radio Frequency Fields"
ANSI/IEEE C95.3	1992	"Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave"
ANSI/IEEE C95.1	1992	"Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz"
AS/NZS 2722.1	1998	Interim Australian/New Zealand Standard. "Radiofrequency fields, Part 1:Maximum exposure levels – 3kHz to 300GHz "

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT AND MANUFACTURER INFORMATION

APPLICANT:	
Name:	INTERSIL CORP.
Address:	Rembrandtlaan 1a 3723 BG Bilthoven, Netherlands
Contact Person:	Mr. Derick Sariredjo Phone : +31-30-225-9742 Mobile : +31-62-732-8048 FAX : +31-30-229-6061

MANUFACTURER:	
Name:	INTERSIL CORP.
Address:	2401 Palm Bay RD. NE Palm Bay, Florida USA 32905

2.2. DEVICE UNDER TEST (EUT) DESCRIPTION

The following information is supplied by the applicant.

Trade Name	INTERSIL CORP.
Type/Model Number	PRISM 2.5 PCMCIA / ISL37300P
Serial Number	008
Type of Equipment	Direct Sequence Spread Spectrum Transmitters
Frequency of Operation	2,412 MHz– 2,462 MHz
Rated RF Power	45.7 mW_{pk}
Antenna Type	Integral (the antenna component is soldered onto the radio printed circuit board and located inside the enclosure)
External Power Supply	DC power from host laptop
Primary User Functions of EUT:	Provide data communication through air

2.3. LIST OF EUT'S ACCESSORIES:

N/A

2.4. SPECIAL CHANGES ON THE EUT'S HARDWARE/SOFTWARE FOR TESTING PURPOSES

None

2.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Laptop
Brand name:	Dell Latitude CSX
Model Number:	PMP
Serial Number:	TW-03018R-12800-OAD-1349

Ancillary Equipment # 2	
Description:	AC Adaptor
Brand name:	Dell
Model Number:	ADP-70EB
Serial Number:	09364U

Ancillary Equipment # 3	
Description:	Printer
Brand name:	Epson Etylus 800
Model Number:	P780B
Serial Number:	1QY1048139
Connected to EUT's Port:	DB25

Ancillary Equipment # 4	
Description:	Mouse
Brand name:	Microsoft
Model Number:	PS2
Serial Number:	TW63403246
Connected to EUT's Port:	PS2

Ancillary Equipment # 5	
Description:	Monitor
Brand name:	IBM P70
Model Number:	6554-673
Serial Number:	21-11252
Connected to EUT's Port:	DB15

2.6. GENERAL TEST CONFIGURATIONS

2.6.1. Equipment Configuration

Power and signal distribution, grounding, interconnecting cabling and physical placement of equipment of a test system shall simulate the typical application and usage in so far as is practicable, and shall be in accordance with the relevant product specifications of the manufacturer.

The configuration that tends to maximize the EUT's emission or minimize its immunity is not usually intuitively obvious and in most instances selection will involve some trial and error testing. For example, interface cables may be moved or equipment re-orientated during initial stages of testing and the effects on the results observed.

Only configurations within the range of positions likely to occur in normal use need to be considered.

The configuration selected shall be fully detailed and documented in the test report, together with the justification for selecting that particular configuration.

2.6.2. Exercising Equipment

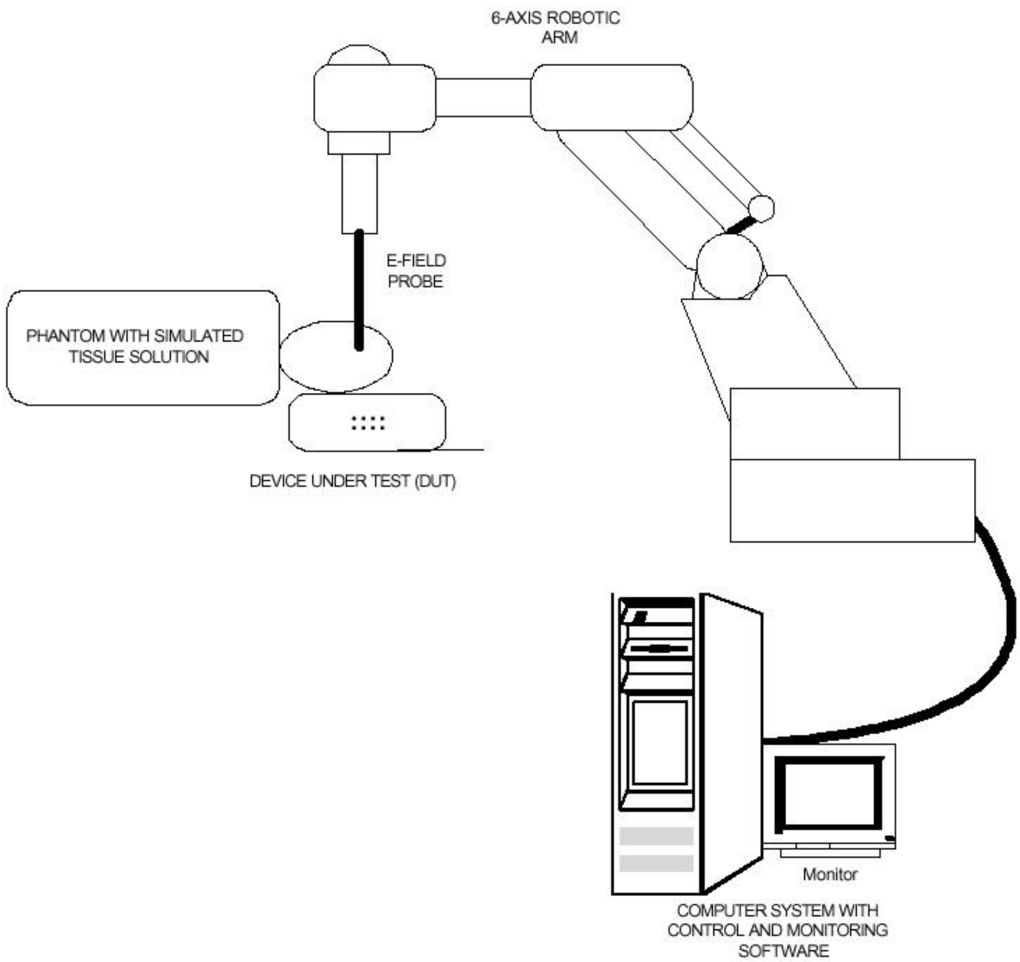
The exercising equipment and other auxiliary equipment shall be sufficiently decoupled from the EUT so that the performance of such equipment does not significantly influence the test results.

2.7. SPECIFIC OPERATING CONDITIONS

Not specified.

2.8. BLOCK DIAGRAM OF TEST SETUP

The EUT was configured as normal intended use. The following block diagram shows the equipment arrangement during tests:



3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4 June 22, 2001
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vhk.ultratech@sympatico.ca, Website: http://www.ultratech-labs.com

EXHIBIT 3. SUMMARY OF TEST RESULTS

3.1. LOCATION OF TESTS

All of the measurements described in this report were performed at UltraTech Group of Labs located in:

3000 Bristol Circle, Oakville, Ontario, Canada.

3.2. APPLICABILITY & SUMMARY OF SAR RESULTS

The peak spatial - average SAR measured was found to be under the sensitivity of our SAR system (less than 0.01 W/kg).

SAR Limits	Test Requirements	Compliance (Yes/No)
General population/Uncontrolled exposure 0.08W/kg whole body average and spatial peak SAR of 1.6W/kg, averaged over 1gram of tissue Hands, wrist, feet and ankles have a peak SAR not to exceed 4 W/kg, averaged over 10 grams of tissue.	Requirements using guidelines established in IEEE C95.1-1991 FCC OET Bulletin 65 (Supplement C) Industry Canada RSS-102 (Issue 1). ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2001 (No. 1)	Yes
Occupational/Controlled Exposure 0.4W/kg whole body average and spatial peak SAR of 8W/kg, averaged over 1gram of tissue Hands, wrist, feet and ankles have a peak SAR not to exceed 20 W/kg, averaged over 10 grams of tissue.	Requirements using guidelines established in IEEE C95.1-1991 FCC OET Bulletin 65 (Supplement C), Industry Canada RSS-102 (Issue 1) ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2001 (No. 1)	N/A

EXHIBIT 4. MEASUREMENTS, EXAMINATIONS & TEST DATA

4.1. TEST SETUP

EUT Information		Condition	
Radio Type	DSSS Transmitter	Robot Type	6 Axis
Model Number	ISL37300P	Scan Type	SAR
Serial Number	003	Measured Field	E
Frequency Band (MHz)	2412 – 2462	Phantom Type	Open Back Full Body
Frequency Tested (MHz)	2412, 2437, 2462	Phantom Position	Waist
Nominal Output Power (mW $_{pk}$)	45.7	Room Temperature	22 ± 1 °C
Antenna Type	Integral		
Signal Type	DSSS		
Duty Cycle	100 %		

Type of Tissue	Muscle		
Target Frequency (MHz)	2450		
Target Dielectric Constant	47.0		
Target Conductivity (S/m)	2.17		
Composition (by weight)	DI Water (72.22 %) Alcohol (27.78 %)		
Measured Dielectric Constant	53.29		
Measured Conductivity (S/m)‡	2.10		
Probe Name	UT-ETR-0200-1		
Probe Orientation	Isotropic		
Probe Offset (mm)	2.25		
Sensor Factor	10.8		
Conversion Factor	2.4260		
Calibration Date (MM/DD/YY)	12/07/99		

‡ Appendix III: Tissue Calibration

4.2. PHOTOGRAPH OF EUT

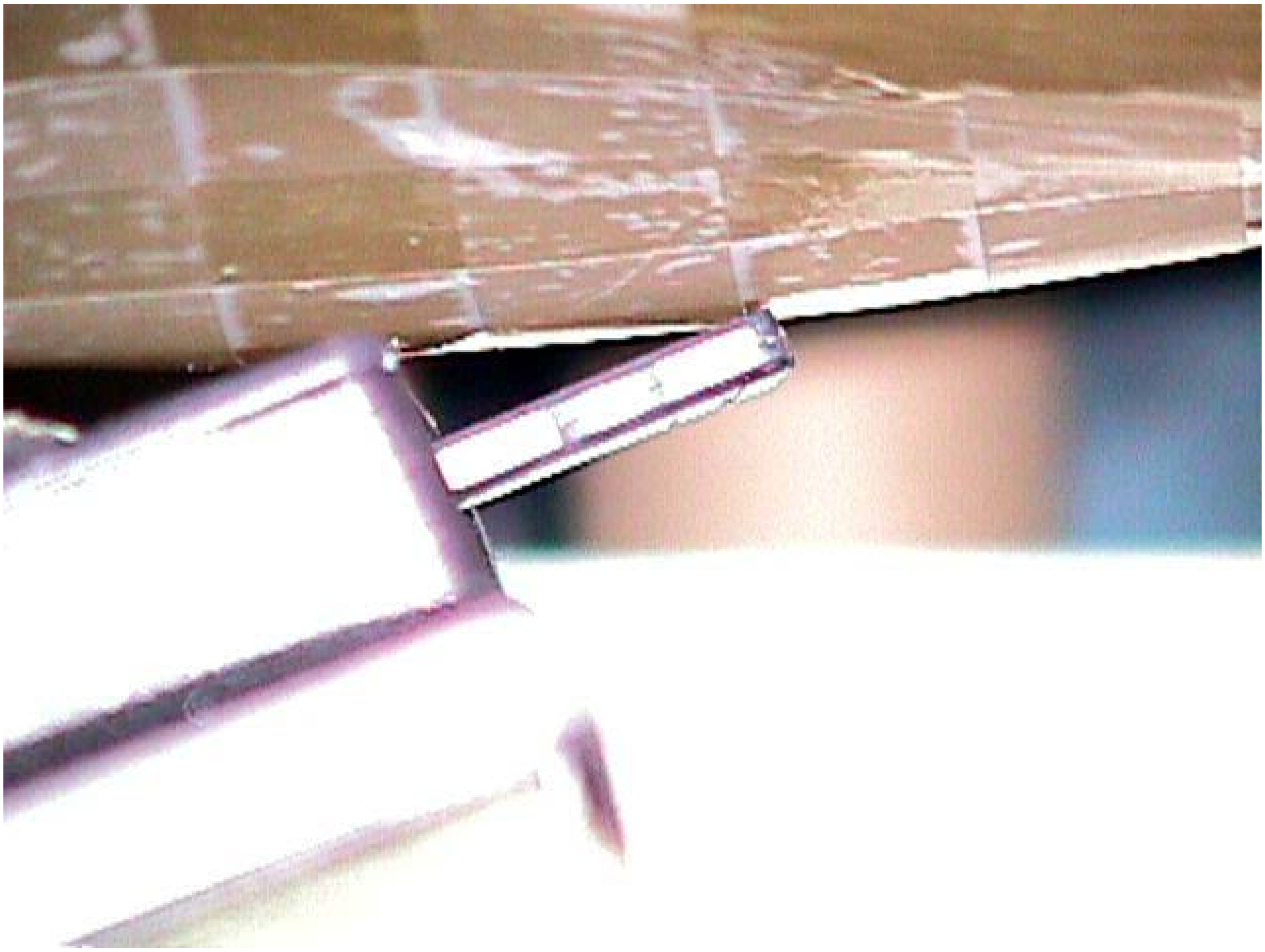
4.3. PHOTOGRAPHS OF THE TEST CONFIGURATION

4.3.1. Photographs on the waist position

< Overview – Tip of the EUT in contact with the phantom and the display of the laptop inward to the phantom >

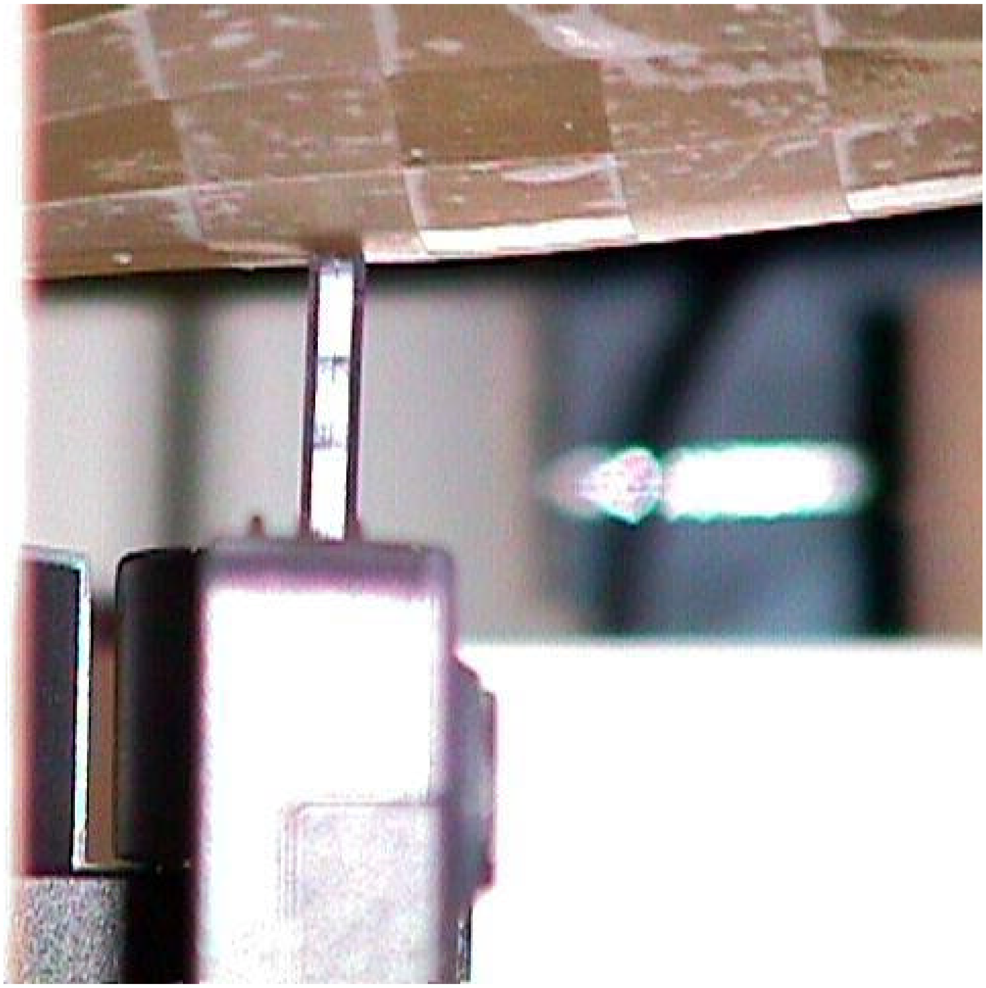
< Close-up view – Tip of the EUT in contact with the phantom and the display of the laptop inward to the phantom >

< Overview – Tip of the EUT in contact with the phantom and the display of the laptop outward from the phantom >



< Close-up view – Tip of the EUT in contact with the phantom and the display of the laptop outward from the phantom >

< Overview – EUT normal to and in contact with the phantom >



< Close-up view – EUT normal to and in contact with the phantom >

4.4. MAXIMUM FIELD LOCATION*

The peak spatial - average SAR measured was found to be under the sensitivity of our SAR system (less than 0.01 W/kg).

4.5. PEAK SPATIAL-AVERAGE SAR MEASURED

The peak spatial - average SAR measured was found to be under the sensitivity of our SAR system (less than 0.01 W/kg).

4.6. SAR MEASUREMENT DATA

EUT Positioning	Frequency (MHz)	SAR (W/Kg)	EUT Configuration
Waist	2,412	< 0.01	Tip of the EUT in contact with the phantom and the display of the laptop inward to the phantom
	2,437	< 0.01	
	2,462	< 0.01	
	2,412	< 0.01	Tip of the EUT in contact with the phantom and the display of the laptop outward from the phantom
	2,437	< 0.01	
	2,462	< 0.01	
	2,412	< 0.01	EUT normal to and in contact with the phantom
	2,437	< 0.01	
	2,462	< 0.01	

* **Refer to 4.5 & 4.6**

EXHIBIT 5. SAR SYSTEM CONFIGURATION & TEST METHODOLOGY

5.1. MEASUREMENT SYSTEM SPECIFICATIONS

Positioning Equipment	Probe
Type : 3D Near Field Scanner Location Repeatability : 0.1mm Speed 180 °/sec AC motors	Sensor : E-Field Spatial Resolution : 0.1 cm^3 Isotropic Response : ± 0.25 dB Dynamic Range : 2 μW/g to 100 mW/g
Computer	**Phantom**
Type : 166 MHz Pentium Memory : 32 Meg. RAM Operating System : Windows NT Monitor : 17" SVGA	Tissue : Simulated Tissue with electrical characteristics similar to those of the human at normal body temperature. Shell : Fiberglass human shell shaped (1.5 mm thick)

5.2. TEST PROCEDURES

In the SAR measurement, the positioning of the probes must be performed with sufficient accuracy to obtain repeatable measurements in the presence of rapid spatial attenuation phenomena. The accurate positioning of the E-field probe is accomplished by using a high precision robot. The robot can be taught to position the probe sensor following a specific pattern of points. In a first sweep, the sensor is positioned as close as possible to the interface, with the sensor enclosure touching the inside of the fiberglass shell. The SAR is measured on a grid of points, which covers the curved surface of the phantom in an area larger than the size of the EUT. After the initial scan, a high- resolution grid is used to locate the absolute maximum measured energy point. At this location, attenuation versus depth scan will be accomplished by the measurement system to calculate the SAR value.

5.3. PHANTOM

The phantom used in the evaluation of the RF exposure of the user of the wireless device is a clear fiberglass enclosure 1.5 mm thick, shaped like a human head or body and filled with a mixture simulating the dielectric characteristics of the brain, muscle or other types of human tissue. The maximum width of the cranial model is 17 cm, the cephalic index is 0.7 and the crown circumference of the cranial model is 61 cm. The ear is 6 mm above the outer surface of the shell.

5.4. SIMULATED TISSUE

Simulated Tissue: Suggested in a paper by George Hartsgrove and colleagues in University of Ottawa Ref.: Bioelectromagnetics 8:29-36 (1987)

Ingredient	Quantity
Water	40.4 %
Sugar	56.0 %
Salt	2.5 %
HEC	1.0 %
Bactericide	0.1 %

Table. Example of composition of simulated tissue.

This simulated tissue is mainly composed of water, sugar and salt. At higher frequencies, in order to achieve the proper conductivity, the solution does not contain salt. Also, at these frequencies, D.I. water and alcohol is preferred.

Tissue Density : Approximately 1.25 g/cm^3

5.4.1. Preparation

We determine the volume needs and carefully measure all components. A clean container is used were the ingredients will be mixed. A stirring paddle and a hand drill is used to stir the mixture. First we heat the DI water to about 40 ^{o}C to help the ingredients to dissolve and then we pour the salt and the bactericide. We stir until all the ingredients are completely dissolved. We continue stirring slowly while adding the sugar. We avoid high RPM from the mixing device to prevent air bubbles in the mixture. Later on, we add the HEC to maintain the solution homogeneous. Mixing time is approximately 30 to 40 min.

5.5. MEASUREMENT OF ELECTRICAL CHARACTERISTICS OF SIMULATED TISSUE

1) Network Analyzer HP8753C or others

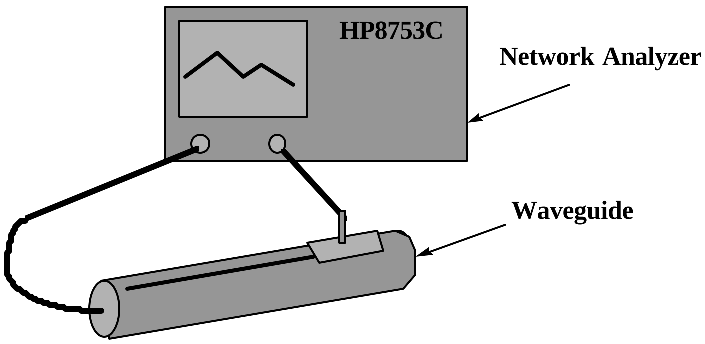
2) Slotted Coaxial Waveguide

5.5.1. Description of the slotted coaxial waveguide

The cylindrical waveguide is constructed with copper tube of about 30 to 40 cm of length, generally 12.5 mm diameter, with connectors at both ends. Inside of this tube, a conductive rod about 6.3 mm is coaxial supported by the two ends connectors (radiator). A slot 3 mm wide start at the beginning of the tube to almost the two third of the tube length. The outer edge of the slotted tube is marked in centimeters (10 to 12) every 1 centimeter, 0.5 if higher frequencies. A saddle piece containing the sampling probe is inserted in the slot so the tip of the probe is close but not in contact with the inner conductor (radiator).

To measure the electrical characteristics of the liquid simulated tissue, we fill the coaxial waveguide, select CW frequency and measure amplitude and phase with the Network Analyzer for every point in the slot (typically 11). An effort is made to keep the results dielectric constant and conductivity within 5 % of published data.

Electrical Characteristics Measurement Setup



$$c = 3 \cdot 10^8 \ m/s$$

$$A = \frac{\Delta A}{20} \ln_{10} \frac{1}{m}$$

$$\theta = \frac{\Delta\Theta \cdot 2\pi}{360}$$

$$\lambda = \frac{c}{f} \cdot \frac{100}{2.54} \text{inches}$$

$$\varepsilon_{re} = \frac{(A^2 + \theta^2) \cdot \lambda^2}{4\pi^2}$$

$$\theta' = \left| \frac{|A| \cdot \lambda}{4\pi \sqrt{\varepsilon_{re}}} \right|$$

$$S = \tan(2\theta')$$

$$\varepsilon_r = \frac{\varepsilon_{re}}{\sqrt{(1 + S^2)}}$$

$$\sigma = S \cdot 2\pi \cdot f \cdot 8.854 \cdot 10^{12} \cdot \varepsilon_r \ (S/m)$$

where;

ΔA is the amplitude attenuation in dB

$\Delta\theta$ is the phase change in degrees for 5 cm of wave propagation in the slotted line

f is the frequency of interest in Hz

5.6. SYSTEM DESCRIPTION

The measurement system consists of an E-field probe, instrumentation amplifiers, RF transparent cable connecting the amplifiers to the computer, the robotics arm with its extension and proximity sensors, a phantom with simulated tissue and a radio holder to support the device under test. The E-field probe is a three channel device used to measure RF electric fields in the near vicinity of the source. The three sensors are mutually orthogonal positioned dipoles, and are constructed over a quartz substrate. Located in the center of the dipole is a Schottky diode. High impedance lines are connecting the sensor to the amplifier and then optically linked to the computer. The probe has an isotropic response and is transparent to the RF fields.

Calibration is performed by two steps:

1) Determination of free space E-field from amplified probe outputs in a test RF field. This calibration is performed in a TEM cell when the frequency is below 1 GHz and in a waveguide or some other methodologies above 1 GHz. For the free space calibration, we place the probe in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. This reading equate to 1mW/cm^2 if that power density is available in the correspondent cavity.

2) Correlation of the measured free space E-field, to temperature rise in a dielectric medium. E-field temperature correlation calibration is performed in a planar phantom filled with the appropriate simulated tissue.

For temperature correlation calibration, a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe. First, the location of the maximum E-field close to the phantom's inner surface is determined as a function of power into the RF source; in this case, a dipole. Then, the E-field probe is moved sideways so that the temperature probe, while affixed to the E-field probe is placed at the previous location of the E-field probe. Finally, temperature changes for 30 seconds exposure at the same RF power levels used for the E-field measurement are recorded. The following equation relates SAR to initial temperature slope:

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

where:
Δt = exposure time (30 seconds),
C = heat capacity of tissue (brain or muscle),
ΔT = temperature increase due to RF exposure.

The heat capacity used for brain simulated tissue is 2.7 joules/^{0}C/g and 3.0 joules/^{0}C/g for muscle.

SAR is proportional to T / t, the initial rate of tissue heating, before thermal diffusion takes place. Now, it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E-field;

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

where:
σ = Simulated tissue conductivity,

ρ = Tissue density (1.25 g/cm^3 for simulated tissue)

5.7. DATA EXTRAPOLATION (CURVE FITTING)

There is a distance from the center of the sensor (diode) to the end of the protective tube called ‘probe offset’. To compensate we use an exponential curve fitting method to obtain the peak surface value from the voltages measured at the distance from the inner surface of the phantom. At the point where the highest voltage was recorded, the field is measured as close as possible to the phantom’s surface and every 1mm along the ` Z ` axis for a distance of 50 mm. The appropriate exponential curve is obtained from all the points measured and used to define an exponential decay of the energy density versus depth.

$$E(z) = E_0 \cdot e^{-z/\delta} \text{ (mV)}$$

5.8. INTERPOLATION AND GRAM AVERAGING

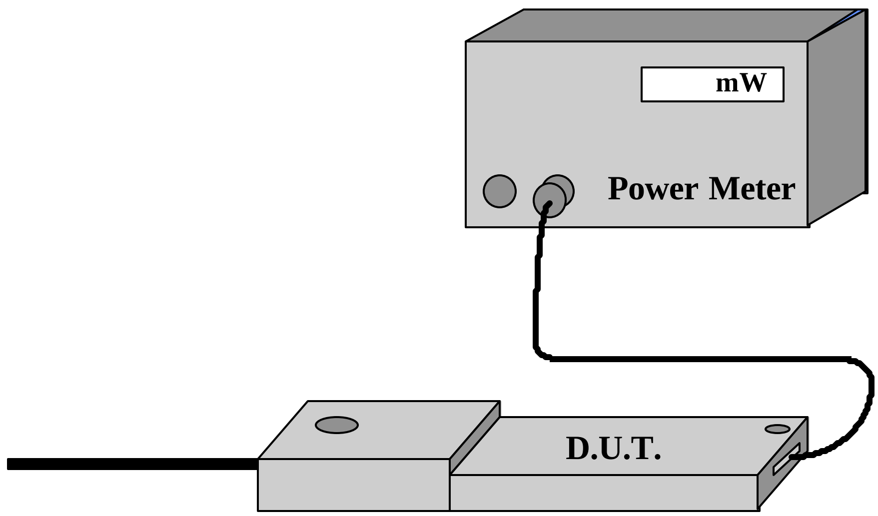
The voltage, (1 cm) above the phantoms surface (E_{tot} 1 cm), is needed to calculate the exposure over one gram of tissue. This SAR value that estimates the average over 1 gram of tissue, is obtained by taking the integral over 1 cm^2 surface of the measured field along the exponential decay curve of the energy density with depth.

$$SAR(mW/g) = \int_{v=1g} SAR(\bullet)dv = \int_{s=1cm^2}\int_0^{1cm} E(z)\cdot\frac{CF}{SensorFactor}dzds$$

5.9. POWER MEASUREMENT

When ever possible, a conducted power measurement is performed. To accomplish this, we utilize a fully charged battery, a calibrated power meter and a cable adapter provided by the manufacturer. The data of the cable and related circuit losses are also provided by the manufacturer. The power measurement is then performed across the operational band and the channel with the highest output power is recorded.

Power measurement is performed before and after the SAR to verify if the battery was delivering full power for the time of test. A difference in output power would determinate a need for battery replacement and repetition the SAR test.



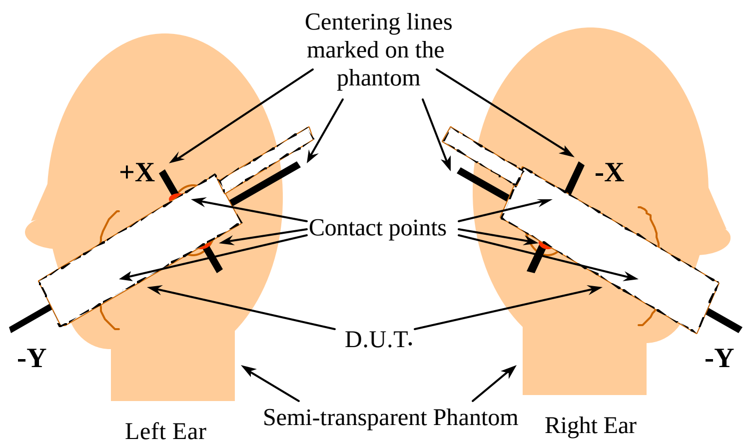
Measured Power Measured Power + Cable and Switching Mechanism Loss

5.10. POSITIONING OF EUT.

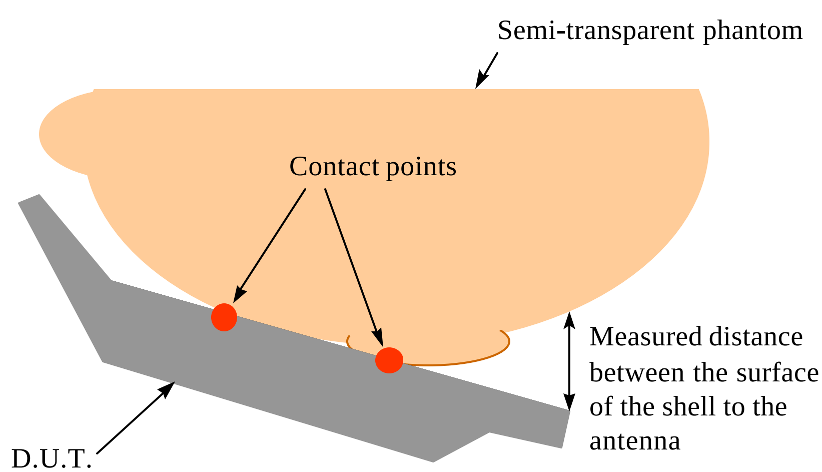
The clear fiberglass phantom shell has been previously marked with a highly visible line, so can easily be seen through the liquid simulated tissue. In the case of testing a G320/G420, this line is connecting the ear channel with the corner of the lips. The EUT is then placed by centering the speaker with the ear channel and the center of the radio width with the corner of the mouth. At the same time the surface of the EUT. is always in contact with the phantoms shell. Three points contact; two in the ear region and one on the chin in addition to the previously describe alignment will assure repeatability of the test.

For HAND HELD devices (push-to-talk), or any other type of wireless transmitters, the EUT. will be positioned as suggested by manufacturer operational manuals.

Positioning of the D.U.T.



Side View



5.11. SAR MEASUREMENT UNCERTAINTY

This uncertainty analysis covers the 3D-EMC Laboratory test procedure for Specific Absorption Rate (SAR) associated with wireless telephones and similar devices.

Standards Covered Are:

WGMTE 96/4 - Secretary SC211/B

FCC 96-326, ET Docket No. 93-62

Industry Canada RSS 102

ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2001 (No. 1)

The laboratory test procedure, and this uncertainty analysis, may be used to cover all standards above. It is based on test equipment and procedures specified by 3D-EMC Laboratories, Inc. located in Ft. Lauderdale, Florida.

Measurement Uncertainty:

Table I. Estimated SAR Measurement Uncertainty

Contribution	Error (±dB)	Probability Distribution	Type Evaluation	Standard Uncertainty (±dB)
A. Field Measurement Errors:		Rectangular	Type B	
Isotropy in Phantom BTS Liquid	0.8			0.46
Frequency Response	0.2			0.12
Linearity	0.2			0.12
Probe Calibration Error (rss)	0.7			0.40
EUTy Factor Variability	0.2			0.12
B. Spatial Peak SAR Errors:		Normal	Type A	
Extrapolation & Interpolation, and Position	0.2			0.20
Integration & Search Routine	0.1			0.10
Cube Shape	0.2			0.20
C. Additional Errors:		Rectangular	Type B	
Solution Variability (Worst-Case SAR)	0.21			0.12
D. Combined Standard Uncertainty, u_c:		Normal	-	0.52
E. Expanded Uncertainty, U:		Normal (k=2)	-	1.04
		95% Confidence	-	27.14%

APPENDIX I: PRESCAN TO DETERMINE THE WORST CASE TEST CONFIGURATION

AI.1 BODY WORN POSITION:

Test configurations with the different orientation

All available test configurations were used for the final peak spatial-average SAR evaluation

Equipment permutation investigated for each orientation

N/A

Comments on non-tested configurations

N/A

Photographs of the test setup for the prescan

N/A

APPENDIX II: WAIST SAR MEASUREMENTS

AII.1 TIP OF THE EUT IN CONTACT WITH THE PHANTOM AND THE DISPLAY OF THE LAPTOP INWARD TO THE PHANTOM

EUT Positioning	Frequency (MHz)	SAR (W/Kg)	EUT Configuration
Waist	2,412	< 0.01	Tip of the EUT in contact with the phantom and the display of the laptop inward to the phantom
	2,437	< 0.01	
	2,462	< 0.01	

AII.2 TIP OF THE EUT IN CONTACT WITH THE PHANTOM AND THE DISPLAY OF THE LAPTOP OUTWARD FROM THE PHANTOM

EUT Positioning	Frequency (MHz)	SAR (W/Kg)	EUT Configuration
Waist	2,412	< 0.01	Tip of the EUT in contact with the phantom and the display of the laptop outward from the phantom
	2,437	< 0.01	
	2,462	< 0.01	

AII.3 EUT NORMAL TO AND IN CONTACT WITH THE PHANTOM

EUT Positioning	Frequency (MHz)	SAR (W/Kg)	EUT Configuration
Waist	2,412	< 0.01	EUT normal to and in contact with the phantom
	2,437	< 0.01	
	2,462	< 0.01	

APPENDIX III: TISSUE CALIBRATION

Ultratech Group of Labs.
3000 Bristol Circle Road
Oakville, Ontario
Canada L6H 6G4

Phone (905) 829-1570
FAX (905) 829-8050
Email vhk.ultratech@sympatico.ca

Name: Jae

Date: 2/12/2001

Frequency: 2,450 MHz

Mixture: Muscle

Room Temp.: 21.5 ±1°C

# of Points: 11

Point Dist: 0.5 cm

Point	Amplitude	Phase
1	-39.40	7.40
2	-41.70	-104.00
3	-43.90	153.90
4	-46.20	41.50
5	-48.40	-57.50
6	-50.90	-171.80
7	-53.10	82.90
8	-55.60	-30.70
9	-58.10	-141.50
10	-60.30	106.50
11	-62.60	6.50

Composition

		weight	% by weight
Sucrose (98 %) ←	Sugar	0.0 g	0.00 %
	DI Water	39,704.5 g	72.22 %
2-(2-ButoxyEthoxy) Ethanol ←	Alcohol	15,273.5 g	27.78 %
Sodium Chloride (99+ %) ←	Salt	0.0 g	0.00 %
Hydroxyethyl Cellulose ←	HEC	0.0 g	0.00 %
	Bactericide	0.0 g	0.00 %
	1,2-propanediol	0.0 g	0.00 %
		0.0 g	0.00 %
		0.0 g	0.00 %
	Total	54,978.0 g	100.00 %

w(rad/sec)	1.539E+10
e_0(F/m)	8.854E-14
m(H/m)	1.257E-08
a_{avg}(Np/cm)	-0.53692
b_{avg}(rad/cm)	-3.78663

Results:		Target	Low Limit	High Limit	% Off Target
D. Const:	53.29	47.00	44.650	49.350	13.39
Conductivity:	2.10	2.17	2.062	2.279	-3.13