Attachment A

Radiation Hazard Analysis and Description of New Mobile Earth Terminal

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Report On

Maximum Permissible Exposure Evaluation for
Hughes Network Systems
Land Portable Terminal Model 9202

OET Bulletin 65 Edition 97-01 including Supplement C

Report No. SC1102725F July 2011

TÜV SÜD America Inc., 10040 Mesa Rim Road, San Diego, CA 92121
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REPORT ON	Maximum Permissible Exposure Evaluation for Hughes Network Systems Land Portable Terminal
TEST REPORT NUMBER	SC1102725F
	July 2011
PREPARED FOR	Hughes Network Systems 9605 Scranton Road, Suite 500, San Diego, CA 92121
PREPARED BY	Ferdinand S. Custodio **Name** Title: EMC/Wireless Test Engineer
APPROVED BY	Chip R. Fleury **Name** Authorized Signatory
DATED	July 18, 2011

CONTENTS

SECTION 1

REPORT SUMMARY

Maximum Permissible Exposure Evaluation for
Hughes Network Systems
Land Portable Terminal

1.1 INTRODUCTION

The information contained in this report is intended to show compliance of Hughes Network Systems Land Portable Terminal to the requirements of OET Bulletin 65 Edition 97-01 including Supplement C.

Objective	To perform verification to determine the Equipment Under Test's (EUT's) compliance with FCC §1.1307 Subpart I.
Manufacturer	Hughes Network Systems
FCC ID Number	K3YHNS9202
Model Number(s)	Model 9202
Serial Number(s)	004401-64-001017-5
Number of Samples Tested	1
Test Specification/Issue/Date	OET Bulletin 65 Edition 97-01 including Supplement C (June 2001)
Start of Test	July 18, 2011
Finish of Test	July 18, 2011
Name of Engineer(s)	Ferdinand S. Custodio
Related Document(s)	• Report No: SC1102725A (Part 25 Test Report) • Report No: SC1102725B (Part 15.247 Test Report) • Hughes 9202 User Guide Revision 0.2 (15 July 2011)

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with OET Bulletin 65 Edition 97-01 including Supplement C is shown below.

CFR Part	Description of Antenna Evaluated	Evaluation Type	Result
FCC Part 15.247	2.5dBi WLAN antenna (built-in with satellite antenna)	Calculated	Compliant
FCC Part 25	L-Band 12 dB Transportable Satellite antenna	Measured	Compliant

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Hughes Network Systems Land Portable Terminal as shown in the photograph below. The GPS antenna port and the external satellite antenna port will not be available on the final production units.

Equipment Under Test

1.3.2 EUT General Description

The Hughes 9202 Land Portable terminal operates as an Inmarsat BGAN Class 2 satellite terminal providing packet data and voice communications over Inmarsat's BGAN (Broadband Global Area Network) constellation of three geo-stationary I-4 satellites - *see Figure 2*. The 9202 terminal will also operate with Inmarsat's new Alphasat I-XL extended L-band satellite when launched in 2012. The Alphasat I-XL satellite will operate in parallel with the I-4 satellites, with its coverage centered over Africa and providing additional coverage to Europe, the Middle-East and parts of Asia.

Each I-4 satellite broadcasts: (i) a single Global beam which broadcasts system information; (ii) 19 Regional beams which are used for access control; (iii) around 200 Narrow beams used for data.

- The forward link (from the satellite) is TDM, L-band 1525 to 1559 MHz.
- The return link (to the satellite) is TDMA, L-band 1626.5 to 1660.5 MHz.

The Alphasat I-XL satellite will provide an extended frequency range operating capability:

- Forward: 1518 to 1559 MHz, and
- Return: 1626.5 to 1660.5 MHz, and 1668 to 1675 MHz (there is a gap between 1660.5 and 1668).

The channel plan is controlled by the network which tells the terminal which channel to use. Channels are up to 200 KHz wide and each 200 KHz sub-band can be assigned to one terminal or shared between multiple terminals. The system includes closed loop power control, and the terminal also includes power control to maintain Tx power within ± 1dB. The Tx power EIRP is 15.1dBW. The Hughes 9202 Land Portable terminal has an internal satellite antenna with a gain of 12dBi.

The return link (to the satellite) bearer types available are described in *Figure 1.*

Bearer Type	Modulation Type	Channel Spacing	Burst Length
R20T05Q	QPSK	22.22 KHz	20 ms
R5T1X	16-QAM	44.44 KHz	5 ms
R20T1X	16-QAM	44.44 KHz	20 ms
R20T1Q	QPSK	44.44 KHz	20 ms
R5T2X	16-QAM	88.88 KHz	5 ms
R20T2X	16-QAM	88.88 KHz	20 ms
R5T2Q	QPSK	88.88 KHz	5 ms
R20T2Q	QPSK	88.88 KHz	20 ms
R5T4.5X	16-QAM	200 KHz	5 ms
R20T4.5X	16-QAM	200 KHz	20 ms
R5T4.5Q	QPSK	200 KHz	5 ms
R20T4.5Q	QPSK	200 KHz	20 ms

Figure 1. Return Link Bearer Types

The Hughes 9202 Land Portable terminal is designed as a portable unit. It will operate either from its internal rechargeable Li-Ion battery pack, or from the supplied AC/DC adapter. User connectivity is provided by single Ethernet, ISDN, and POTS ports, and Wi-Fi via an internal 802.11b WLAN card and antenna, The Ethernet port and Wi-Fi access provide connection to a computer or wireless device to allow setup and monitoring actions to be performed. The ISDN and POTS port on the 9202 terminal are for connection to an ISDN telephone handset, and POTS telephone handset or Fax; they do not connect to a Telco line, the connection is made over the satellite.

An integrated SIM carrier enables a user to insert a SIM card to gain access to authorized Inmarsat services. An internal GPS receiver in the terminal provides location information.

To establish a connection with the Inmarsat BGAN network, the user determines the satellite's position from a GPS fix provided by the terminal. The user then points the terminal with its internal satellite antenna to the satellite's position, assisted by audio tones and LCD indicators to determine optimal signal strength. Once locked on, the terminal will register with the BGAN network and communications can proceed. Network connectivity is illustrated in Figure 3.

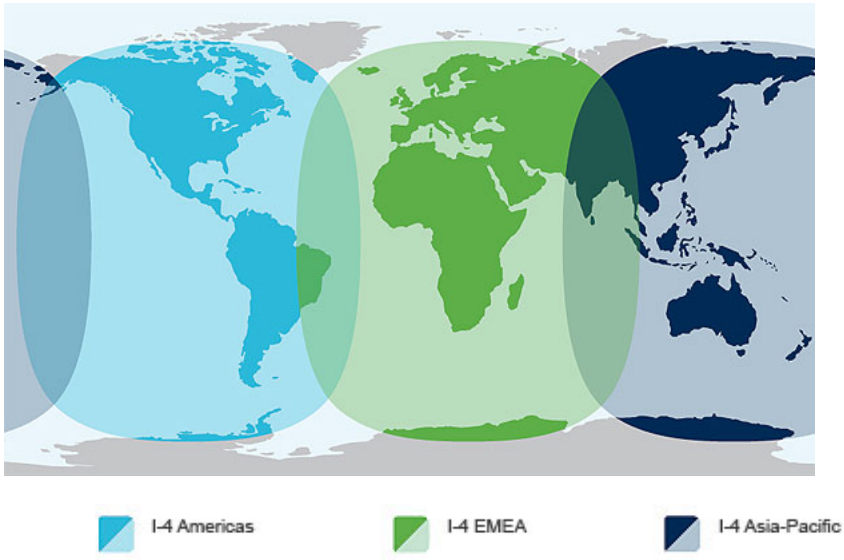


Figure 2. Inmarsat BGAN Global Coverage Map with I-4 Satellites

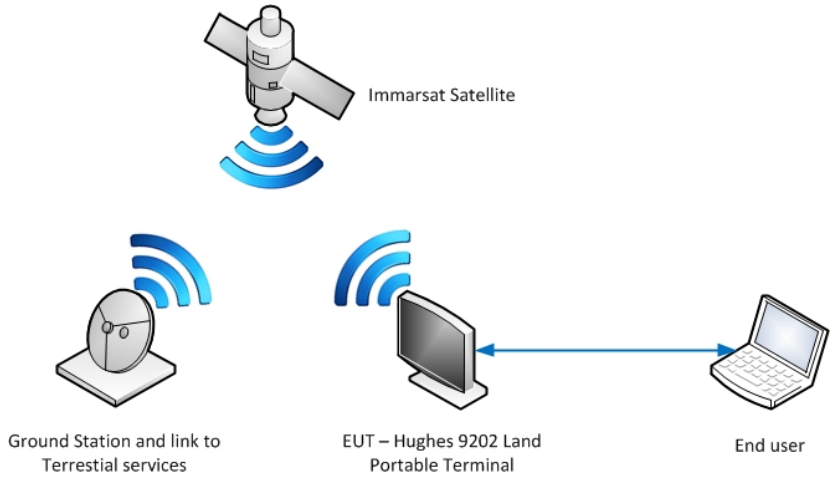


Figure 3. Network Connectivity

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description for Measured Evaluation

Test Configuration	Description
	Stand-alone testing. Transmitting at max. power, worst case channel/modulation.

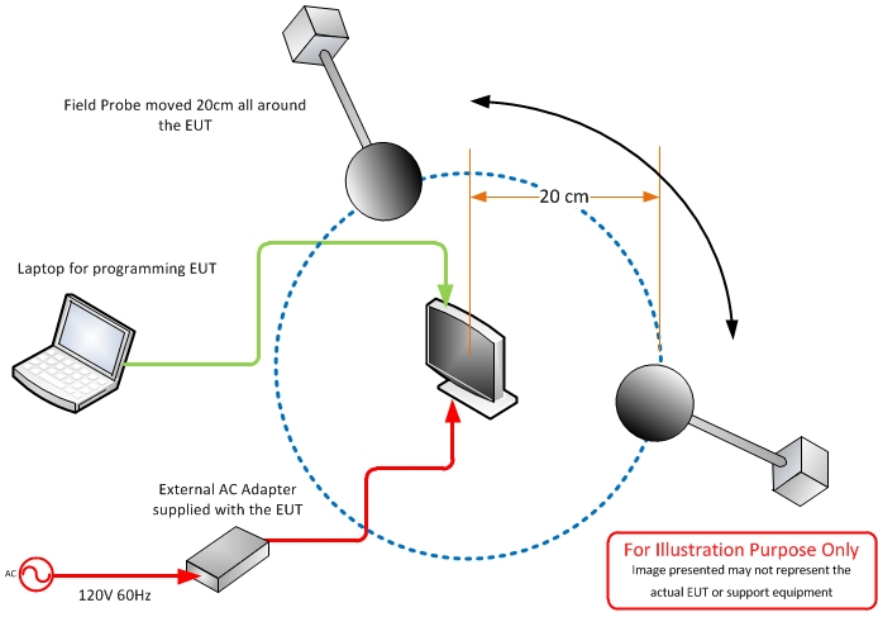
1.4.2 EUT Exercise Software

"Perl Command" software provided by the client was used to exercise the EUT. A file containing commands to change channels and modulation was also provided. Worst case channel and modulation used during evaluation. Base from Report No: SC1102725A, worst case channel is High Channel (1660.200 MHz) with R20T1X (QAM, 44.44 kHz channel spacing, 20ms burst length) modulation.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Toshiba	Laptop	Model Satellite Pro 4600 SN91685670PU
Toshiba	Laptop External PSU	Model PA3049U-1ACA SN0184957G
Logitech	Mouse for Laptop	Model M-CAA42 SNLZA21203529
-	CAT6 (Laptop to EUT)	2.1m unshielded RJ45 connector

1.4.4 Simplified Test Configuration Diagram for Measured Evaluation



1.5 REQUIREMENTS FROM THE STANDARD

As stated in the FCC rules, mobile and portable transmitting devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services (PCS), the Satellite Communications Services, the General Wireless Communications Service, the Wireless Communications Service, the Maritime Services (ship earth stations only) and Specialized Mobile Radio Service authorized, respectively, under Part 22 (Subpart H), Part 24, Part 25, Part 26, Part 27, Part 80, and Part 90 of the FCC rules are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. Portable devices operating in the Wireless Medical Telemetry Service (WMTS) and the Medical Implant Communications Service (MICS), authorized under Subparts H and I of Part 95 are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. Unlicensed PCS, U-NII and millimeter wave devices authorized under Part 15 of FCC rules are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. All other mobile and portable devices are categorically excluded from routine environmental evaluation for RF exposure.

MOBILE DEVICES

The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091. For purposes of RF exposure evaluation, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. In this context, the term "fixed location" means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Examples of mobile devices, as defined above, would include cellular and PCS mobile telephones, other radio devices that use vehicle-mounted antennas and certain other transportable transmitting devices. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. These devices are normally evaluated for exposure potential with the MPE limits given in Appendix A. Mobile devices may also be evaluated with respect to the SAR limits given in Appendix A for RF exposure compliance, but in such cases it is usually simpler and more cost-effective to evaluate compliance with respect to MPE limits based on field strength or power density.

PORTABLE DEVICES

The FCC rules for evaluating portable devices for RF exposure compliance are contained in 47 CFR §2.1093. For purposes of RF exposure evaluation, a portable device is defined as a transmitting device designed to be used with any part of its radiating structure in direct contact with the user’s body or within 20 centimeters of the body of a user or bystanders under normal operating conditions. This category of devices would include hand-held cellular and PCS telephones that incorporate the radiating antenna into the hand-piece and wireless transmitters that are carried next to the body. Portable devices are evaluated with respect to SAR limits for RF exposure.6 The applicable SAR limit for portable transmitters used by consumers is 1.6 watts/kg, which is averaged over any one gram of tissue defined as a tissue volume in the shape of a cube.

EXPOSURE CATEGORIES

With respect to field strength, power density and SAR requirements, both the 1992 ANSI/IEEE standard and the NCRP exposure criteria (See References [1] and [30]), upon which the FCC guidelines are based, recommend limits with respect to both occupational/controlled and general population/uncontrolled exposures. The compliance requirements for each category are based on a person's awareness and ability to exercise control over his or her exposure.

OCCUPATIONAL / CONTROLLED EXPOSURE

In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.

GENERAL POPULATION / UNCONTROLLED EXPOSURE

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.7 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: 004401-64-001017-5		
N/A		

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.8 TEST FACILITY

1.8.1 FCC – Registration No.: US5281

TUV SUD America Inc. (San Diego), a §2.498 listed test firm operates the EMC Laboratory registered under Sony Electronics Inc. Product Quality Division EMC. This laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is US5281.

1.8.2 Industry Canada (IC) Registration No.: 3067A

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego), has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.

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SECTION 2

TEST DETAILS

Maximum Permissible Exposure Evaluation for
Hughes Network Systems
Land Portable Terminal

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2.1 PREDICTION OF MPE AT A GIVEN DISTANCE

2.1.1 Specification Reference

OET Bulletin 65 Edition 97-01 including Supplement C

2.1.2 Limit Applicable

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Electric Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $[E]^2$,$[H]^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

*f = frequency in MHz *Plane-wave equivalent power density*

NOTE : The averaging time for General Population/Uncontrolled exposure to fixed transmitters is not applicable for mobile and portable transmitters. See 47 CFR §§2.1091 and 2.1093 on source-based time-averaging requirements for mobile and portable transmitters.

2.1.3 Equipment Evaluated

Serial No: 004401-64-001017-5

2.1.4 Date of Evaluation

July 14, 2011

2.1.5 Additional Observations

- This is MPE evaluation of the WLAN card integrated with the EUT.
- Variables used with the calculation are based from Report No: SC1102725B (Part 15.247 Test Report).
- Prediction distance is 20 cm.
- EUT is defined as a mobile device with exposure category of general population/uncontrolled exposure.

2.1.6 Test Results

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = Power Density
P = Power Input To The Antenna
G = Power Gain Of The Antenna In The Direction Of Interest Relative To Isotropic
R = Distance To The Center Of Radiation Of The Antenna

Maximum peak output power at antenna input terminal:	11.83	(dBm)
Maximum peak output power at antenna input terminal:	15.24	(mW)
Antenna gain(typical):	2.5	(dBi)
Maximum antenna gain:	1.778	(numeric)
Prediction distance:	20	(cm)
Sourse Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm^2)
Power density at prediction frequency:	0.0054	(mW/cm^2)
Power density at prediction frequency:	0.054	(W/m^2)
Margin of Compliance:	22.6	(dB)
Minimum Distance:	1.468	(cm)

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2.2 MPE EVALUATION USING FIELD PROBE

2.2.1 Specification Reference

OET Bulletin 65 Edition 97-01 including Supplement C

2.2.2 Limit Applicable

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Electric Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $[E]^2$,$[H]^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

*f = frequency in MHz *Plane-wave equivalent power density*

NOTE : The averaging time for General Population/Uncontrolled exposure to fixed transmitters is not applicable for mobile and portable transmitters. See 47 CFR §§2.1091 and 2.1093 on source-based time-averaging requirements for mobile and portable transmitters.

2.2.3 Equipment Evaluated

Serial No: 004401-64-001017-5

2.2.4 Date of Evaluation

July 18, 2011

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions

Ambient Temperature	23°C
Relative Humidity	45%
ATM Pressure	1008 mbar

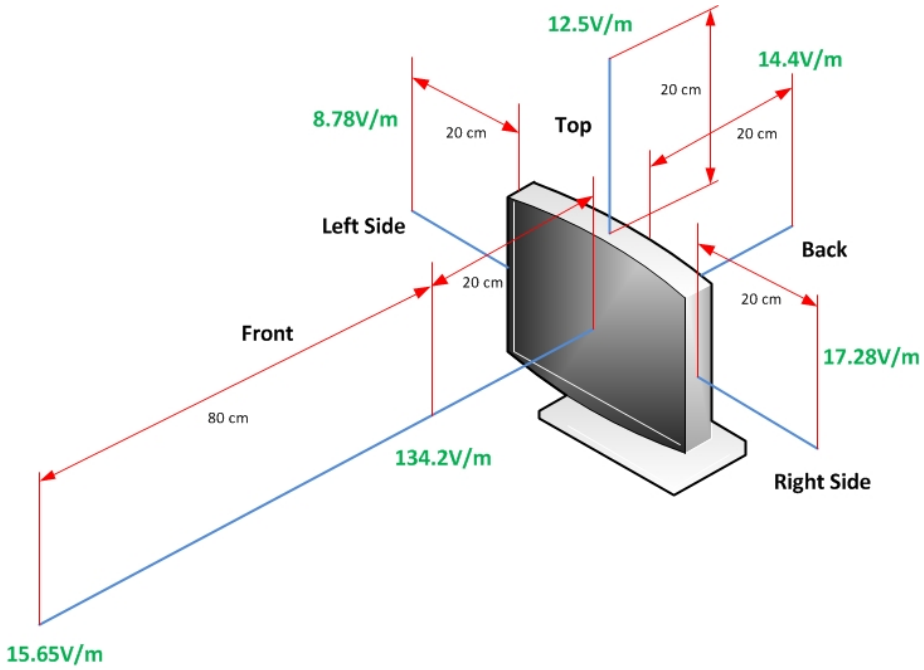
2.2.7 Additional Observations

- This is MPE evaluation of the L-Band 12 dB Transportable Satellite antenna.
- Only the worst case channel/modulation reported (High Channel R20T1X).

- Manufacturer recommended separation distance is 1 meter. The EUT was evaluated at 20cm except the front area of the antenna. evaluated @ 1 meter.
- Position of the field probe was maximized until maximum reading was recorded.
- EUT is defined as a mobile device with exposure category of general population/uncontrolled exposure.

2.2.8 Test Results

See attached diagram and table.



Location	Distance (cm)	Max. Reading (V/m)	Max. Reading (mW/cm^2)	Results
Front	20	134.2	4.78	See Note below
Front	100	15.65	0.06497	Complies with 1 mW/cm^2 limit
Left Side	20	8.78	0.02045	Complies with 1 mW/cm^2 limit
Right Side	20	17.28	0.07920	Complies with 1 mW/cm^2 limit
Top	20	12.5	0.04145	Complies with 1 mW/cm^2 limit
Back	20	14.4	0.05500	Complies with 1 mW/cm^2 limit

Note:
Minimum separation distance recommended by the manufacturer is 1 meter (page 47 of the user guide). Results @ 1 meter will be used for "front of antenna" evaluation. See statement under FCC Compliance of the user guide:

"To comply with FCC RF exposure requirements, this device must be operated with a minimum separation distance of one meter or more from a person's body. Other operating configurations should be avoided."

2.3 WORST CASE CO-LOCATED EXPOSURE CONDITIONS

2.3.1 Specification Reference

OET Bulletin 65 Edition 97-01 including Supplement C

2.3.2 Limit Applicable

The FCC's MPE limits vary with frequency. Therefore, in mixed or broadband RF fields where several sources and frequencies are involved, the fraction of the recommended limit (in terms of power density or square of the electric or magnetic field strength) incurred within each frequency interval should be determined, and the sum of all fractional contributions should not exceed 1.0, or 100% in terms of percentage.

2.3.3 Equipment Evaluated

Serial No: 004401-64-001017-5

2.3.4 Date of Evaluation

July 18, 2011

2.3.5 Test Results

Complies. See attached table.

Transmitter	Worst Case MPE (mW/cm^2)	Evaluation Distance (cm)	Limit (mW/cm^2)	MPE Ratio (MPE/MPE Limit)
Part 15 (WLAN)	0.00540	20	1	0.0054
Part 25 (Satellite)	0.07920	20	1	0.0792*
			Sum of the ratios (should be <1.0)	**0.0846**

Note: *For Part 25 MPE evaluation, worst case measurement was used.*

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SECTION 3

TEST EQUIPMENT USED

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3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
6507	Isotropic Field Monitor	FM2000	14929	Amplifier Research	No Calibration Required	
6688	Isotropic Field Probe	FP2080	24598	Amplifier Research	02/22/11	02/22/12

SECTION 4

PHOTOGRAPHS

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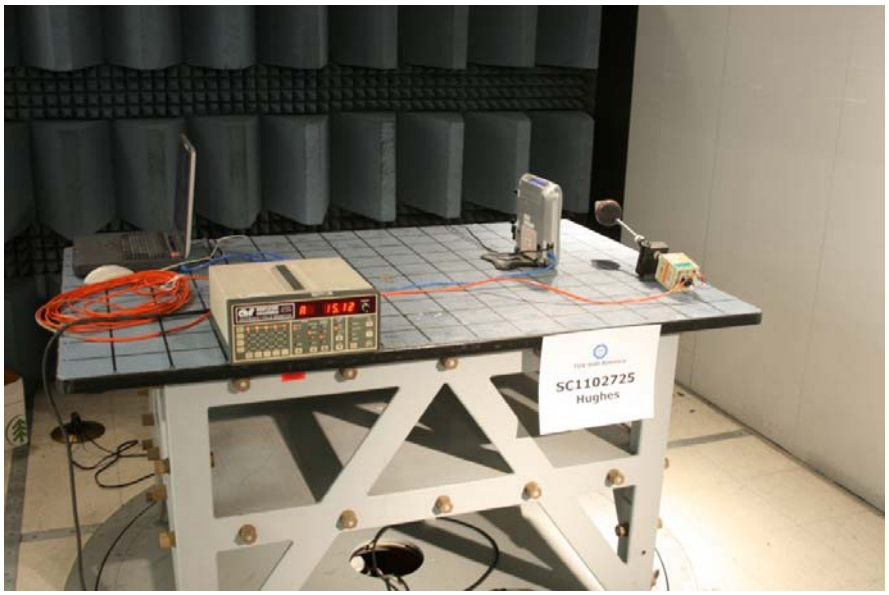
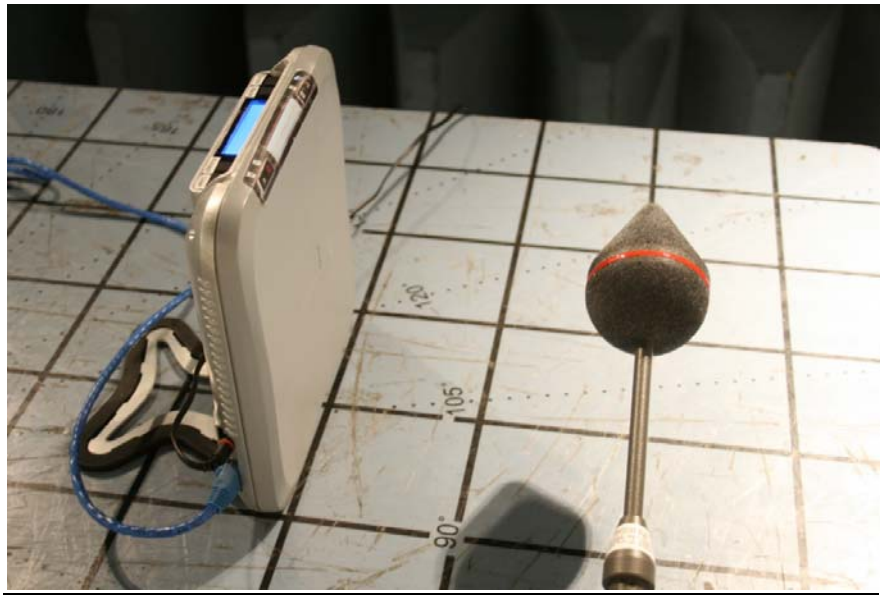
4.1 MPE EVALUATION TEST SETUP USING FIELD PROBE



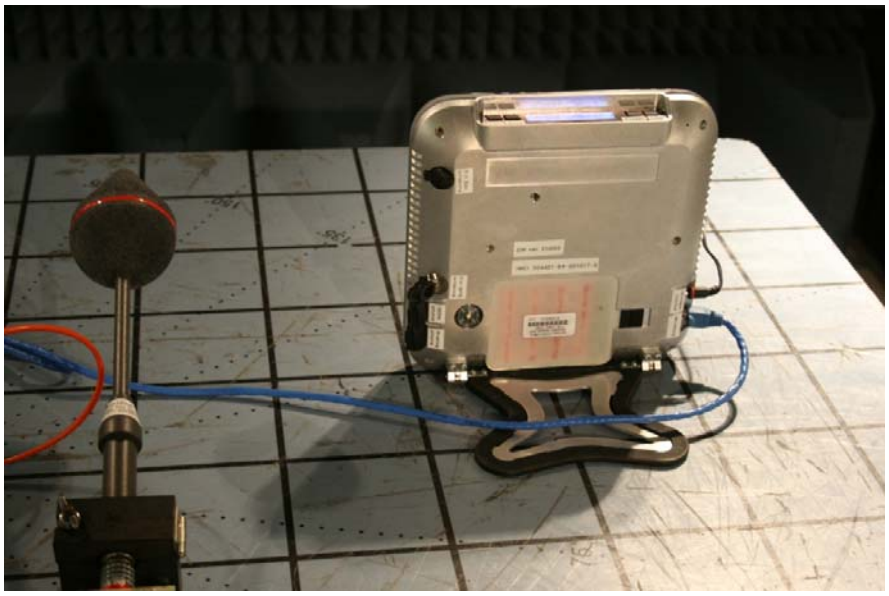
General Test Setup



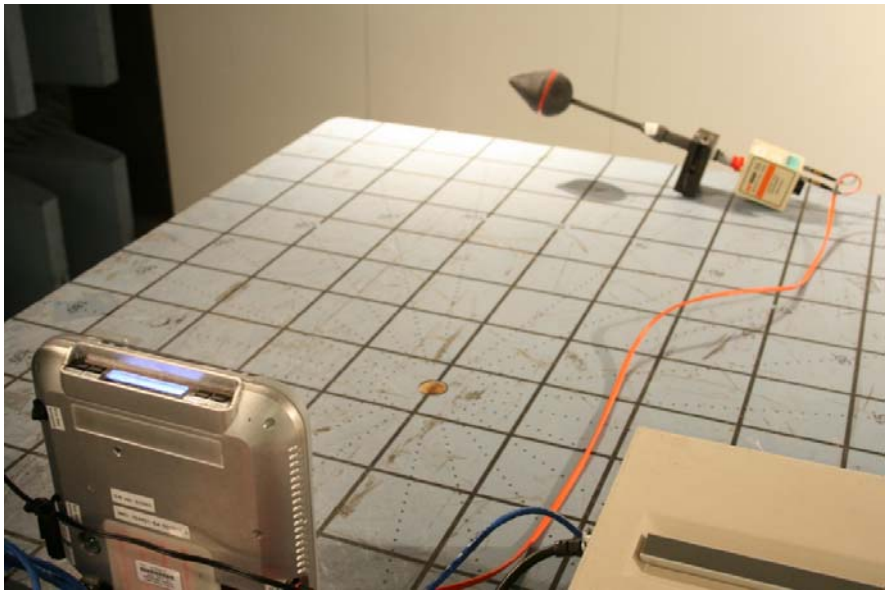
MPE evaluation (Front)

MPE evaluation (Back)

MPE evaluation (Left Side)



MPE evaluation (Right Side)



MPE evaluation (Front at 1 meter)

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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