# Exhibit A

Radiation Hazard Analysis of Hughes 9502

**Nemko USA, Inc.**
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# ASSESSMENT TEST REPORT

| | |
|---|---|
| Report Number: | 2012 01192228 ETSI2 |
| Project Number: | 10215500 |
| Nex Number: | 192288 |
| Applicant: | HUGHES NETWORK SYSTEMS<br>9605 SCRANTON ROAD SUITE 500<br>San Diego, CA 92121 |
| Equipment Under Test (EUT): | MACHINE-TO-MACHINE (M2M) TERMINAL |
| Model: | 9502 |
| In Accordance With: | EN 62311 (2008-01) |
| Tested By: | Nemko USA Inc.<br>2210 Faraday Avenue, Suite 150<br>Carlsbad, CA 92008 |
| Authorized By: | Alan Laudani, EMC/RF Test Engineer |
| Date: | JANUARY 31, 2012 |
| Total Number of Pages: | 13 |

# TABLE OF CONTENTS



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## Section1: Summary of Test Results

General

The assessment summary is as follows:

| | |
|---|---|
| Apparatus Assessed: | Machine-to-Machine (M2M) Terminal |
| Model: | 9502 |
| Specification: | EN 62311 (2008-01) |
| Date Received in Laboratory: | December 16, 2011 |
| Compliance Status: | Complies |
| Exclusions: | None |
| Non-compliances: | None |

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1.1 Report Release History

| REVISION | DATE | COMMENTS |
|---|---|---|
| - | JANUARY 31, 2012 | Prepared By: Alan Laudani |
| - | JANUARY 31, 2012 | Initial Release: Alan Laudani |

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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TESTED BY:_____ Date: JANUARY 31, 2012
Alan Laudani, EMC Test Engineer

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# Section 2: Equipment Under Test

## 2.1 Samples Submitted for Assessment

The following sample of the equipment has been submitted for type assessment:

| Sample No. | Description | Serial No. |
|---|---|---|
| 9502 | MACHINE-TO-MACHINE (M2M) TERMINAL | NONE |

## 2.2 Theory of Operation

The 9502 is a Machine-to-Machine (M2M) Terminal. The 9502 comprises of a Transmitter in the frequency range 1631.8 MHz to 1660.2 MHz and 1668.3 MHz to 1674.5 MHz.

The Hughes 9502 is a machine-to-machine (M2M) terminal for use in unmanned environments enabling packet data (e.g. oil pipeline telemetry) to be sent over Inmarsat's BGAN (Broadband Global Area Network) constellation of three geo-stationary I-4 satellites which cover the globe – see Figure 2. The 9502 will also operate with Inmarsat's new Alphasat I-XL extended L-band (XL) satellite when launched in 2013. The Hughes 9502 terminal operates as an Inmarsat BGAN Class 2 terminal.

The Hughes 9502 terminal consists of an indoor unit (IDU) and an external passive antenna. A 10 meter RF cable is provided for connection between the antenna and IDU. Connectivity is provided by single Ethernet and USB ports. A remote terminal (e.g. with sensor interfaces) will send bursts of data to the 9502 IDU via the Ethernet port; the data will then be sent over the air via a BGAN satellite link. Only packet data service is allowed. The USB 1.1 port is provided for configuration of the terminal via a PC.

An integrated SIM carrier enables the insertion of a customer-provided SIM card to gain access to authorized Inmarsat services. A GPS receiver in the terminal provides location information. An external customer provided GPS receiver can alternatively be connected to the 9502 IDU via the RS-232 port.
Each Inmarsat satellite broadcasts: a single Global beam which broadcasts system information; 19 Regional beams which are used for access control; and around 200 Narrow beams which are used for data. The forward link (from the satellite) is TDM, L-band and XL-band of 1518 – 1559 MHz. The return link (to the satellite) is TDMA, L-band 1626.5 – 1660.5 MHz. and XL-band 1668.0 – 1675.0 MHz .

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

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2.3 Technical Specifications of the EUT

| | |
|---|---|
| Manufacturer: | Hughes Network Systems |
| Operating Frequency: | 1631.800 to 1660.200 MHz in the 1626 to 1661 MHz band |
| | 1668.300 to 1674.500 MHz in the 1667.3 to 1675.7 MHz band |
| Rated Power: | 46.75 dBm Satellite uplink |
| Antenna gain: | 12 dBi |
| Intended Use: | MACHINE-TO-MACHINE (M2M) TERMINAL |
| Power Source: | 12 and 24 VDC |

# Section 3: Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

EN 62311 January 2008 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

3.3 Test Environment

All tests were performed under the following environmental conditions (Normal Condition):

| | |
|---|---|
| Temperature range | 16-24 $^{o}$C |
| Humidity range | 38-82% |
| Pressure range | 102.0 – 102.3 kPa |
| Power supply range | 12 VDC |

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# Section 4: Observations

## 4.1 Modifications Performed During Assessment

No modifications were necessary to conclude these tests.

## 4.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

## 4.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

## 4.4 Test Deleted

No Tests were deleted from this assessment.

## 4.5 Additional Observations

There were no additional observations made during this assessment.

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# Section 5: Results Summary

This section contains the following:

EN 62311:2008
Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

The column headed "Required" indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant
Y Yes: Mandatory i.e. the apparatus shall conform to these test.
N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

## 5.1 Test Results

| EUT | Test Description | Required | Result |
|---|---|---|---|
| 9502 | Prediction of Worst Maximum Potential for Exposure | Y | Pass |

## 5.2 Measurement Uncertainty

Test Conditions:

| | | | |
|---|---|---|---|
| Sample Number: | 9502 | Temperature: | |
| Date: | January 15, 2012 | Humidity: | |
| Modification State: | Low, Mid and High Channel | Tester: | AAL |
| | | Laboratory: | |

Measurement Uncertainty Calculations:

| | Contribution | Probability Distribution Type | Probability Distribution $x_i$ | Standard Uncertainty $u(x_i)$ | $[u(x_i)]^2$ |
|---|---|---|---|---|---|
| 1 | Power Meter | Rectangular | 0.30 | 0.17 | 0.03 |
| 2 | Cable | Rectangular | 0.50 | 0.29 | 0.08 |
| 3 | EUT Setup | Rectangular | 1.00 | 0.58 | 0.33 |
| | | | Combined Uncertainty ($u_c$): | | 0.67 |
| | | | Coverage Factor (k): | | 2 |
| | | | Expanded Uncertainty: | | 1.34 |

5.3 Limits

| Frequency range | E-field strength (V/m) | H-field strength (A/m) | B-field ( $\mu$ T) | Equivalent plane wave power density Seq (W/m2) |
|---|---|---|---|---|
| 0-1Hz | - | $3.2\times10^4$ | $4\times10^4$ | - |
| 1-8Hz | 1000 | $3.2\times10^4/f^2$ | $4\times104/f^2$ | - |
| 8-25Hz | 1000 | 4000/f | 5000/f | - |
| 0.025Hz-0.8kHz | 250/f | 4/f | 5/f | - |
| 0.8-3kHz | 250/f | 5 | 6.25 | - |
| 3-150kHz | 87 | 5 | 6.25 | - |
| 0.15-1MHz | 87 | 0.73/f | 0.92/f | - |
| 1-10MHz | $87/f^{1/2}$ | 0.73/f | 0.92/f | - |
| 10-400MHz | 28 | 0.073 | 0.092 | 2 |
| 400-2000MHz | $1.375\ f^{1/2}$ | $0.0037\ f^{1/2}$ | $0.0046f^{1/2}$ | f/200 |
| 2-300GHz | 61 | 0.16 | 0.2 | 10 |

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## 2.4 Satellite Uplink Output Power

From Nemko Report Number: 2012 01192288 ETSIW

Sub-Band 1

Bearer Type R20T05Q QPSK (22.22kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1631.800 | 32.57 | 12 | 44.57 | 14.57 |
| 1643.500 | 32.04 | 12 | 44.04 | 14.04 |
| 1660.200 | 32.07 | 12 | 44.07 | 14.07 |

Bearer Type R20T4.5Q QPSK (200kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1631.800 | 33.10 | 12 | 45.10 | 15.10 |
| 1643.500 | 32.49 | 12 | 44.49 | 14.49 |
| 1660.200 | 32.42 | 12 | 44.42 | 14.42 |

Bearer Type R20T2X QAM (88.88kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1631.800 | 33.89 | 12 | 45.89 | 15.89 |
| 1643.500 | 32.73 | 12 | 44.73 | 14.73 |
| 1660.200 | 32.98 | 12 | 44.98 | 14.98 |

Bearer Type R20T4.5X QAM (200kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1631.800 | 34.07 | 12 | 44.07 | 14.07 |
| 1643.500 | 33.10 | 12 | 45.10 | 15.10 |
| 1660.200 | 33.04 | 12 | 45.04 | 15.04 |

Bearer Type R20T1Q QPSK (44.44kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1631.800 | 32.78 | 12 | 44.78 | 14.78 |
| 1643.500 | 32.97 | 12 | 44.97 | 14.97 |
| 1660.200 | 32.84 | 12 | 44.84 | 14.84 |

Bearer Type R20T2Q QPSK (88.88kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1631.800 | 32.68 | 12 | 44.68 | 14.68 |
| 1643.500 | 32.98 | 12 | 44.98 | 14.98 |
| 1660.200 | 33.03 | 12 | 45.03 | 15.03 |

Bearer Type R20T1X QAM (44.44kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1631.800 | 34.30 | 12 | 46.30 | 16.30 |
| 1643.500 | 34.42 | 12 | 46.42 | 16.42 |
| 1660.200 | 34.75 | 12 | 46.75 | 16.75 |

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Sub Band 2

Bearer Type R20T05Q QPSK (22.22kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1668.300 | 33.32 | 12 | 45.32 | 15.32 |
| 1674.700 | 32.20 | 12 | 44.20 | 14.20 |

Bearer Type R20T1Q QPSK (44.44kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1668.300 | 34.19 | 12 | 46.19 | 16.19 |
| 1674.700 | 33.43 | 12 | 45.43 | 15.43 |

Bearer Type R20T2Q QPSK (88.88kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1668.300 | 34.21 | 12 | 46.21 | 16.21 |
| 1674.700 | 33.64 | 12 | 45.64 | 15.64 |

Bearer Type R20T4.5Q QPSK (200kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1668.300 | 34.31 | 12 | 46.31 | 16.31 |
| 1674.700 | 33.62 | 12 | 45.62 | 15.62 |

Bearer Type R20T1X QAM (44.44kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1668.300 | 34.05 | 12 | 46.05 | 16.05 |
| 1674.700 | 34.43 | 12 | 46.43 | 16.43 |

Bearer Type R20T4.5X QAM (200kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1668.300 | 34.16 | 12 | 46.16 | 16.16 |
| 1674.700 | 34.43 | 12 | 46.43 | 16.43 |

Bearer Type R20T2X QAM (88.88kHz Spacing)

| Frequency | Output Power (dBm) | Antenna Gain dBi | E.I.R.P (dBm) | E.I.R.P (dBW) |
|---|---|---|---|---|
| 1668.300 | 34.06 | 12 | 46.06 | 16.06 |
| 1674.700 | 34.41 | 12 | 46.41 | 16.41 |

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MPE computation:

Electric field (V/m) = square root (30 x Power(W) x Antenna Gain) divided by distance(m)

5.4 Prediction of Worst Maximum Potential for Exposure Model 9502, Sub bands 1 & 2:

| Frequency (MHz) | Peak Output Power (dBm) | Peak Output Power (W) | Antenna Gain (dB) | Antenna Gain (numeric) |
|---|---|---|---|---|
| 1660.200[1] | 34.75 | 2.98 | 12 | 15.85 |
| 1674.700[2] | 34.43 | 2.77 | 12 | 15.85 |

Limit = 1.375 x (frequency) $^{1/2}$
Limit = 1.375 x $(1660.2)^{1/2}$
Limit = 56.0 V/m

Distance that the EUT must be placed to comply (Direct RF focus): 0.587 m.

Use Limit in Field Strength
Solving for distance:

Distance = (5.5 * sqrt (Power in Watts *ant. gain) )/ Field Strength in V/m

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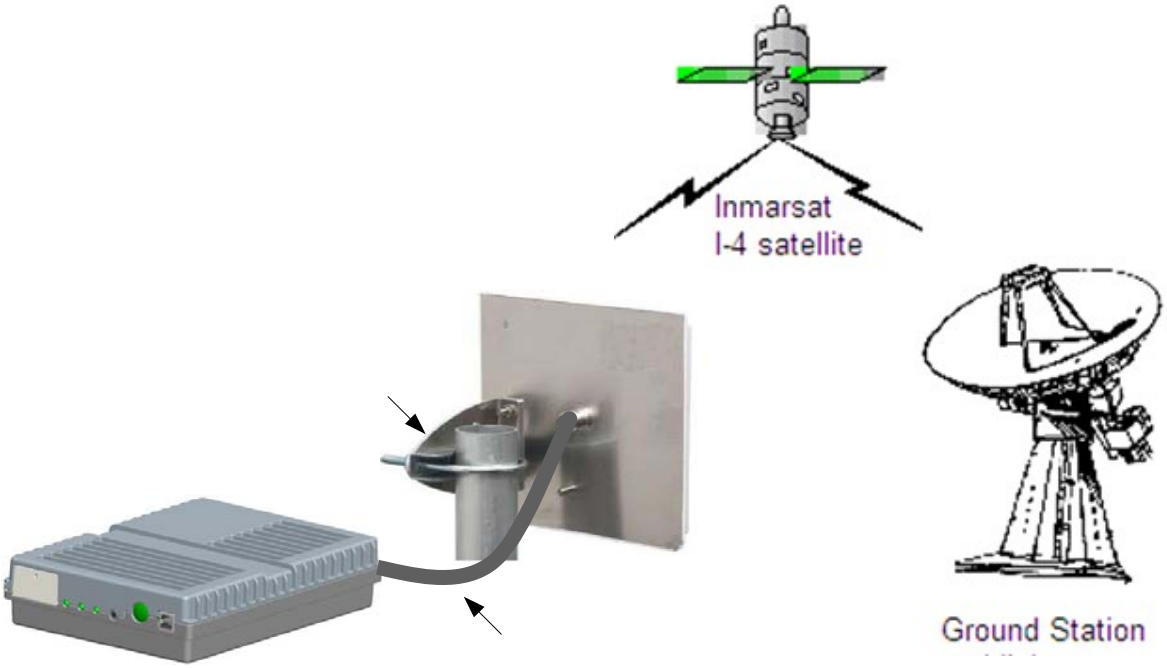
5.5 Physical Layout of intended use




9502 IDU Pole Mounted Antenna RF Cable

Observations:

Antenna mounted on post turned toward satellite.