

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Nextlink.To A/S
Invisio G5 *Bluetooth* Headset

To: FCC Part 15.247: 2006 (Subpart C)

Test Report Serial No:
RFI/RPTE1/RP49291JD10A

This Test Report Is Issued Under The Authority
Of Michael Derby, Radio Performance Group Leader:



Checked By: Michael Derby	Issued To: Nextlink.To A/S Stamholmen 157 Hvidovre DK - 2650 Denmark
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Executive Summary

RFI Global Services Ltd (RFI) was commissioned to perform an independent series of conformance tests to assess compliance with FCC Part 15.247: 2006 (Subpart C)

Summary of Results

Range of Measurements	Clause Reference	Port Type	Compliance Status	
Idle Mode Radiated Spurious Emissions	Section 15.109	Antenna	Complied	
Transmitter 20 dB Bandwidth	Section 2.1049	Antenna	Complied	
Transmitter Carrier Frequency Separation	Section 15.247(a)(1)	Antenna	Complied	
Transmitter Average Time of Occupancy	Section 15.247(a)(1)(iii)	Antenna	Complied	
Transmitter Maximum Peak Output Power	Section 15.247(b)(3)	Antenna	Complied	
Transmitter Radiated Emissions	Sections 15.247(d) & 15.209(a)	Antenna	Complied	
Transmitter Band Edge Radiated Emissions	Sections 15.247(d) & 15.209(a)	Antenna	Complied	

Note: The EUT powered down when placed on charge using the AC charger; therefore AC Conducted emission tests were not performed on the EUT.

Key to Compliance Colours used in this report:

Colour	Definition
Green	Compliant
Yellow	Indeterminate*
Red	Not compliant

* Indeterminate because the measurements were within measurement uncertainty.

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1. Equipment Under Test (EUT)

The following information (with the exception of the date of receipt) has been supplied by the customer:

1.1. Description of EUT

The equipment under test is a *Bluetooth* headset.

1.2. Identification of Equipment Under Test (EUT)

Description:	<i>Bluetooth</i> Headset
Brand Name:	INVISIO
Model Name or Number:	G5
Serial Number:	None stated
Hardware Version Number:	1.0
Software Version Number:	1.08
FCC ID Number:	QNY101
Country of Manufacture:	Denmark
Date of Receipt:	24 July 2007

1.3. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

1.4. Support Equipment

The following support equipment was used to exercise the EUT during testing.

Description:	<i>Bluetooth</i> Test Set
Brand Name:	Anritsu
Model Name or Number:	MT8852A
Serial Number:	6K00001529 (RFI Asset No. M1149)
Cable Length and Type:	1.5m Utiflex
Connected to Port:	RF In/out (Air Link)

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1.5. Additional Information Related to Testing

Intended Operating Environment:	Commercial and Residential		
Equipment Category:	Bluetooth		
Type of Unit:	Portable (Standalone battery powered device)		
Power Supply Requirement:	Internal battery supply of 3.7V (nominal)		
Maximum Power Output (EIRP):	-10.8 dBm (measured)		
Occupied Bandwidth:	921.844 kHz		
Transmit Frequency Range:	2402 to 2480 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480
Receive Frequency Range:	2402 to 2480 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480

1.6. Port Identification

Port	Description
1	Charger

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2. Test Specification, Methods and Procedures

2.1. Test Specification

Reference:	FCC Part 15.247: 2006 Subpart C
Title:	Code of Federal Regulations, Part 15.247 (47CFR15) (Intentional Radiators operating within the band 2400 MHz to 2483.5 MHz)

2.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2003)

Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)

Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)

Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)

Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

DA00-705 (2000)

Title: Filing and Frequency Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

2.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above.

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3. Deviations from the Test Specification

There were no deviations from the test specification.

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4. Operation and Configuration of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated.

For transmitter tests, the EUT was set to transmit on bottom, middle, top channels and hopping over all channels, as required per test case.

For receiver tests, the EUT was set to a receive-only mode.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration, unless otherwise stated.

Standalone powered by an internal battery and set to communicate over wireless link with a *Bluetooth* test set.

The EUT powers down when placed on charge, therefore no testing was performed with the EUT connected to the AC Charger.

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5. Measurements, Examinations and Derived Results

5.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 6 for details of measurement uncertainties.

5.2. Location of Tests

All the measurements described in this report were performed at the premises of RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, UK.

FCC Site Registration Number: 90895

IC Site Registration Number: 3485

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5.3. Test Results

Idle Mode Radiated Spurious Emissions

Temperature (°C):	15	Relative Humidity (%):	70
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Results:

Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
149.985000	Vertical	24.4	43.5	19.1	Complied

Note(s):

1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore the highest peak noise floor reading of the system is was measured and is shown in the table above.

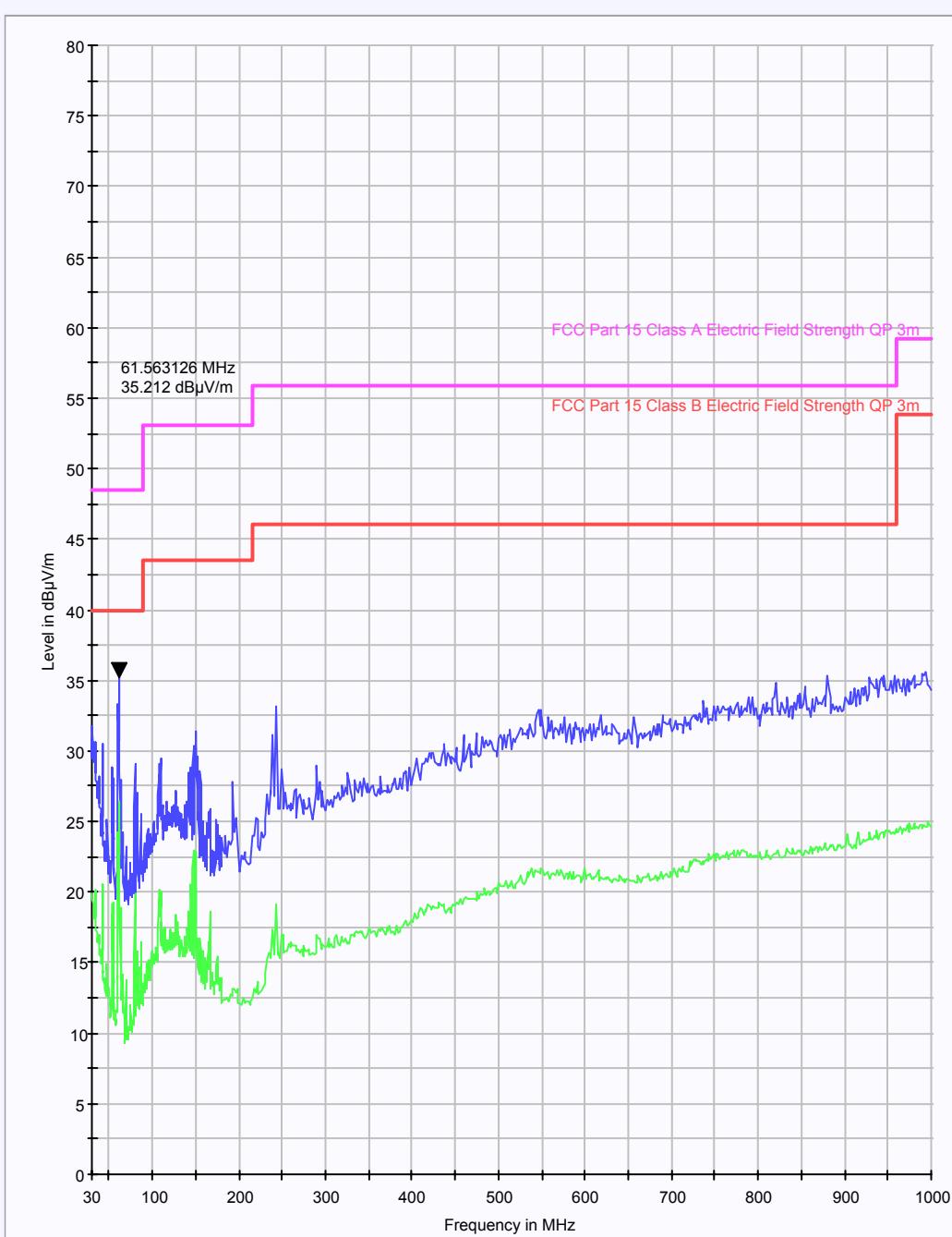
Test Equipment Used:

A1037, A259, A276, C151, C160, C340, C348, C460, C468, M024, M044, M1263, M173, S201, S212

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Idle Mode Radiated Spurious Emissions (Continued)

Graph(s):



This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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Idle Mode Radiated Spurious Emissions (Continued)

Temperature (°C):	15	Relative Humidity (%):	70
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Results:

Electric Field Strength Measurements (Frequency Range: 1 GHz to 12.5 GHz)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
12.178356	Vertical	40.4	1.6	42.0	54.0	12.0	Complied

Note(s):

1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the system was measured and is shown in the table above. The peak level is shown compared to the average limit.

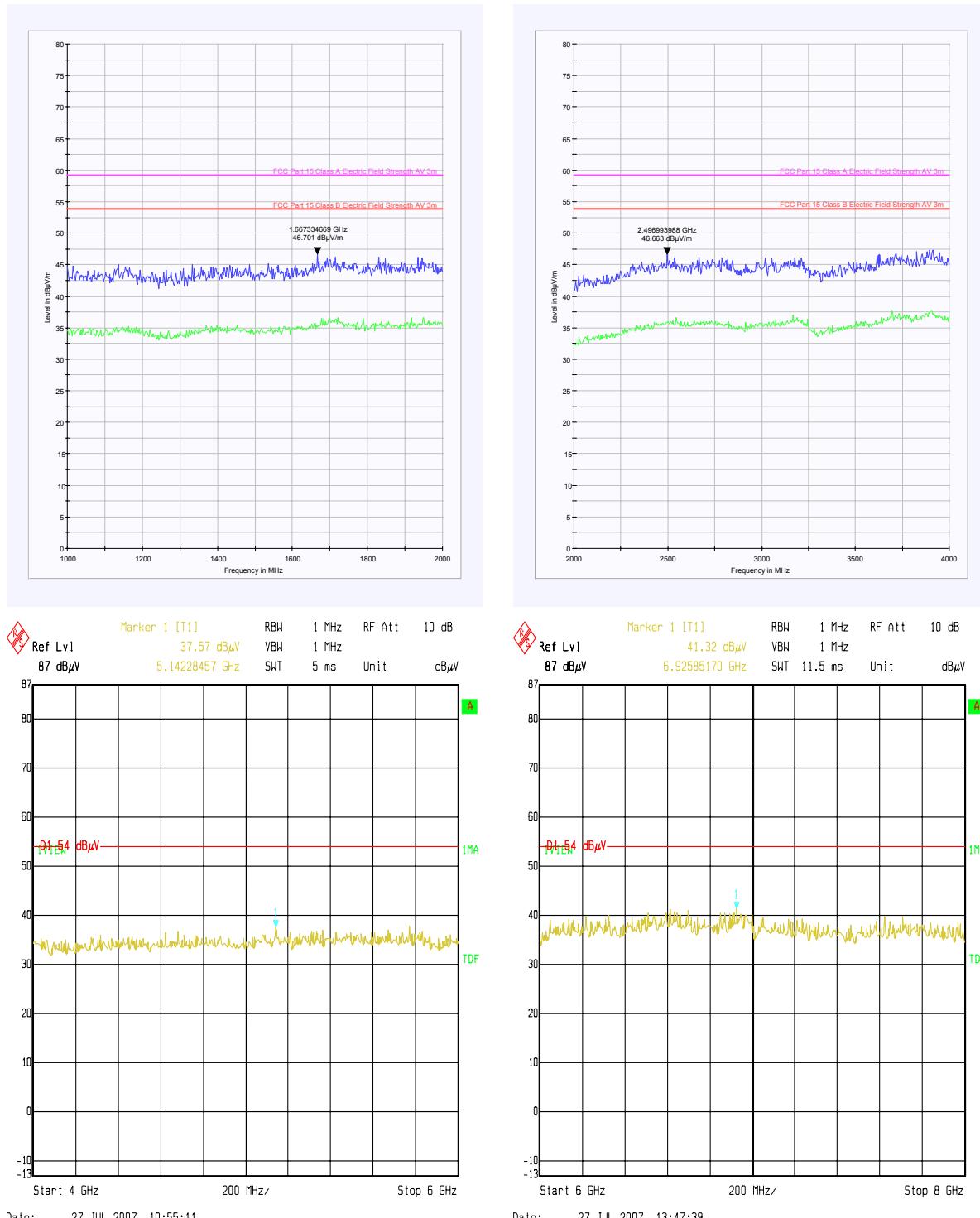
Test Equipment Used:

A028, A1037, A1362, A1534, A253, A254, A255, C1165, C1167, C151, C160, C348, M1242, M1263, S202, S212

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Idle Mode Radiated Spurious Emissions (Continued)

Graph(s):

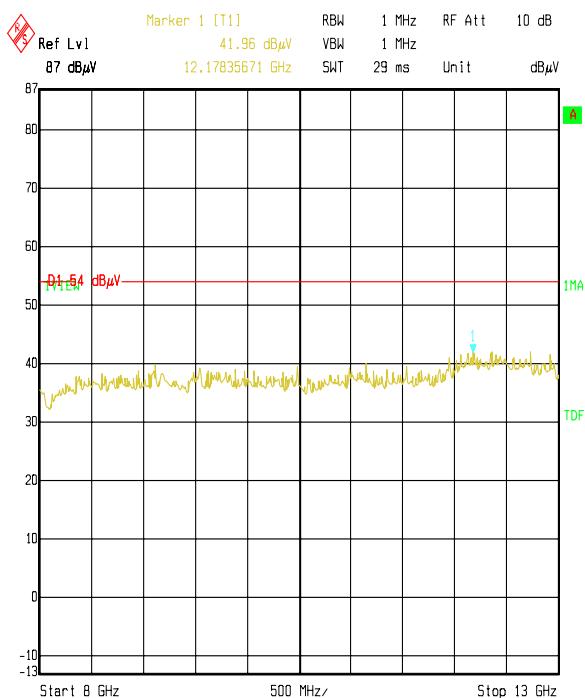


These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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Idle Mode Radiated Spurious Emissions (Continued)

Graph(s):



Date: 27.JUL.2007 14:02:29

This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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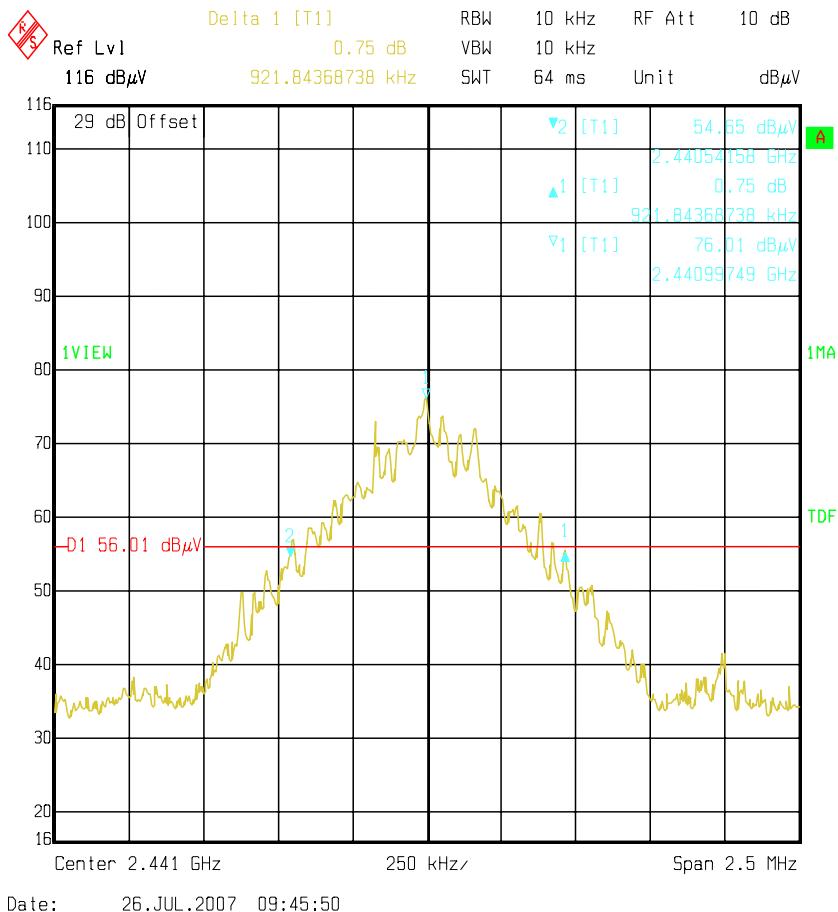
Transmitter 20 dB Bandwidth

Temperature (°C):	16	Relative Humidity (%):	90
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Results:

Transmitter 20 dB Bandwidth (kHz)	Limit (kHz)
921.843687	None specified

Graph(s):



Test Equipment Used:

A031, C1167, M1242, S202

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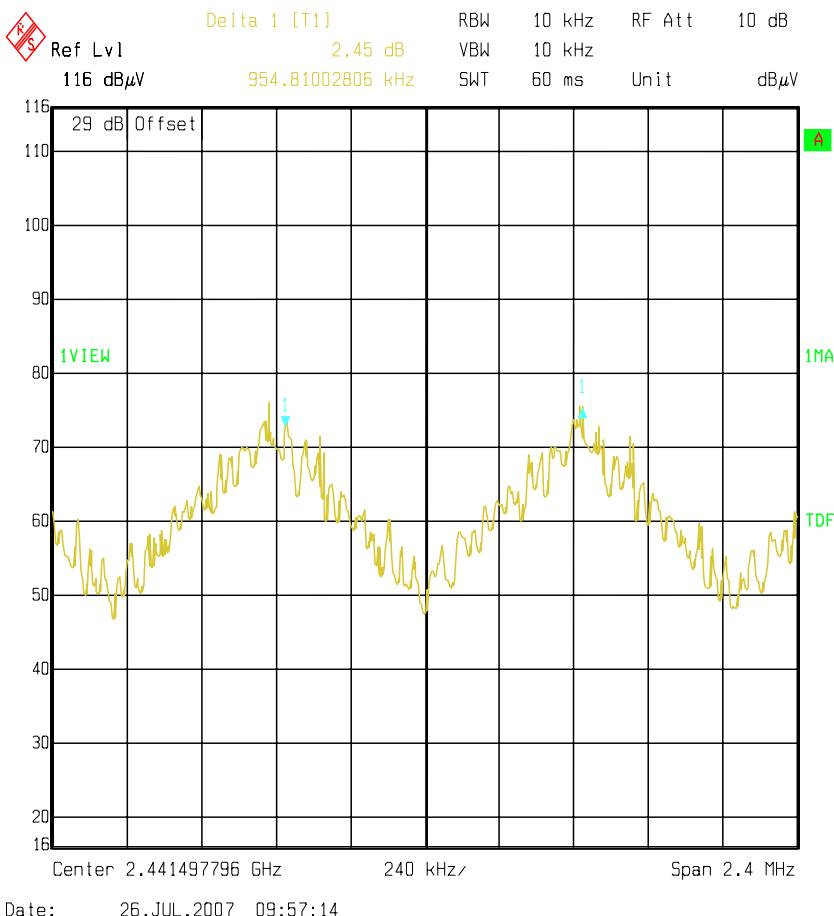
Transmitter Carrier Frequency Separation

Temperature (°C):	16	Relative Humidity (%):	90
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Results:

Transmitter Carrier Frequency Separation (kHz)	Limit (2/3 of 20 dB BW) (kHz)	Margin (kHz)	Compliance Status
954.810028	614.562458	340.24757	Complied

Graph(s):



Test Equipment Used:

A031, C1167, M1242, S202

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Transmitter Average Time of Occupancy

Temperature (°C):	16	Relative Humidity (%):	90
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Results:

Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Compliance Status
2925.852	72	0.210	0.4	0.190	Complied

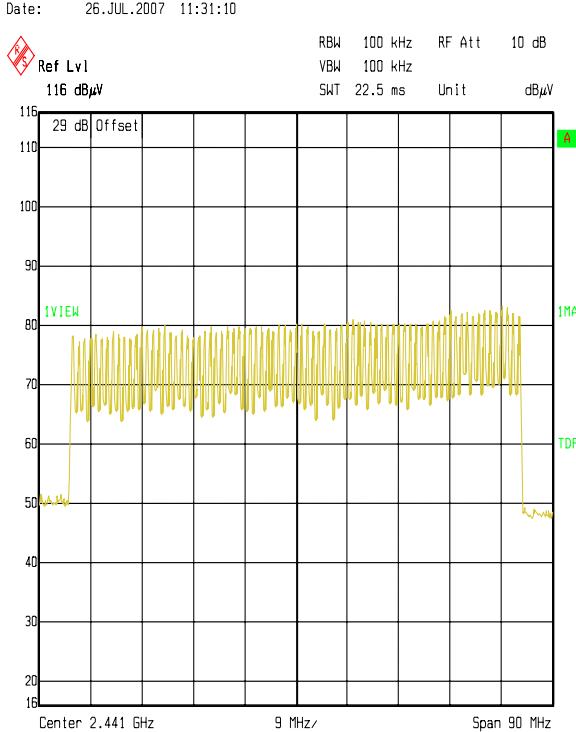
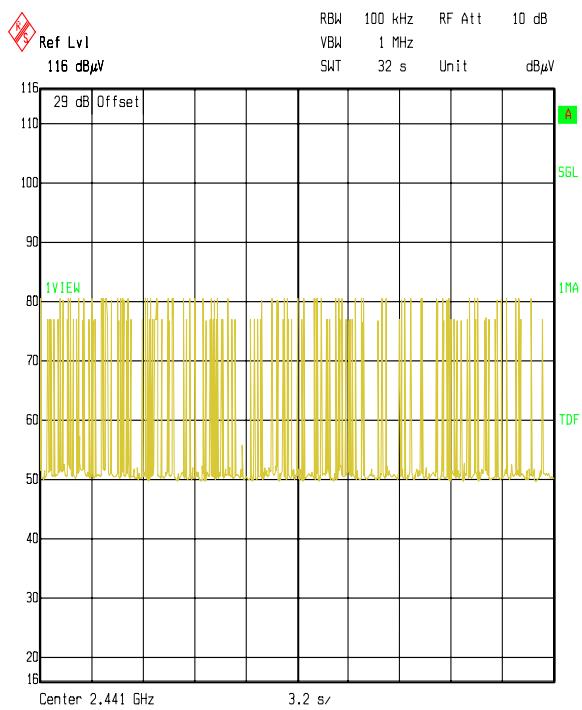
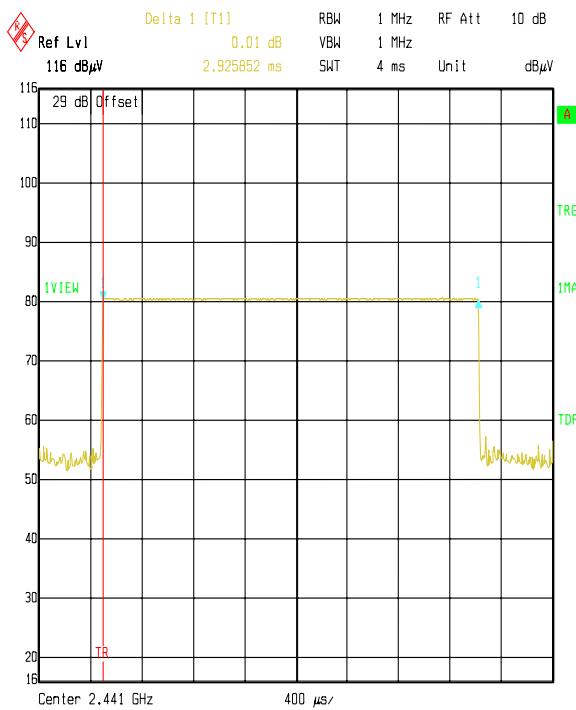
Test Equipment Used:

A031, C1167, M1242, S202

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Transmitter Average Time of Occupancy (Continued)

Graph(s):



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Transmitter Maximum Peak Output Power: (EIRP)

Temperature (°C):	16	Relative Humidity (%):	90
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Results:

Battery Powered Devices

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Compliance Status
Bottom	-14.8	30.0	44.8	Complied
Middle	-13.4	30.0	43.4	Complied
Top	-10.8	30.0	40.8	Complied

Note(s):

1. These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable.

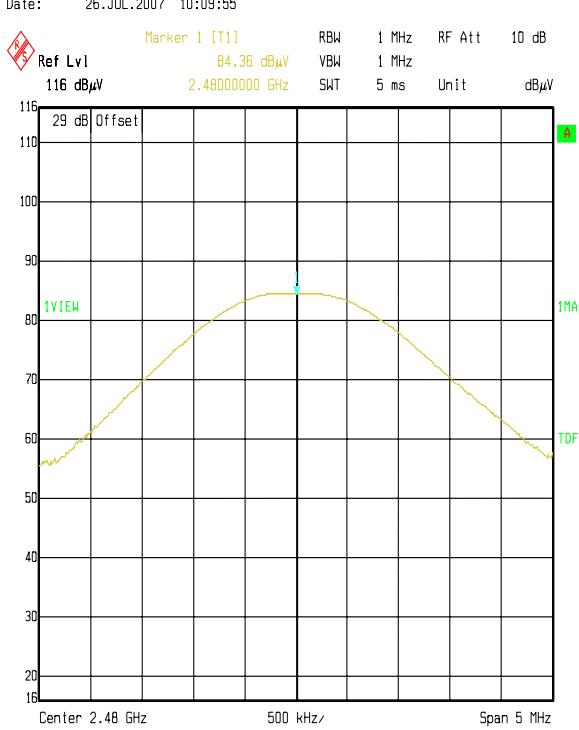
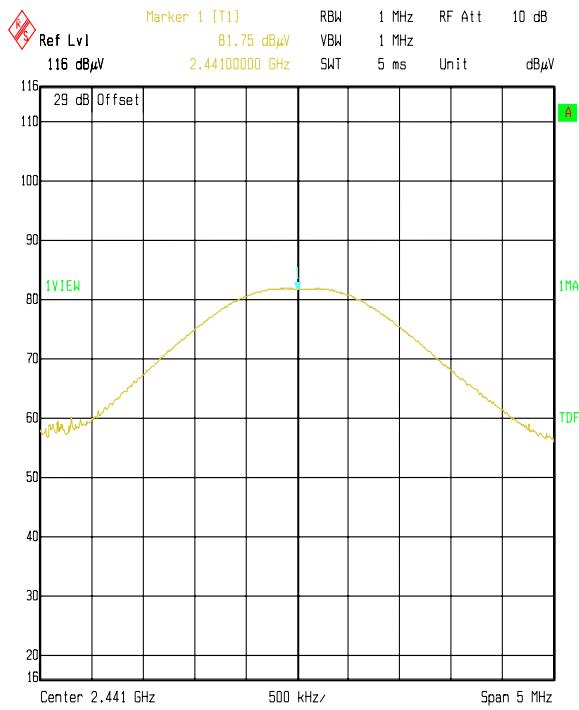
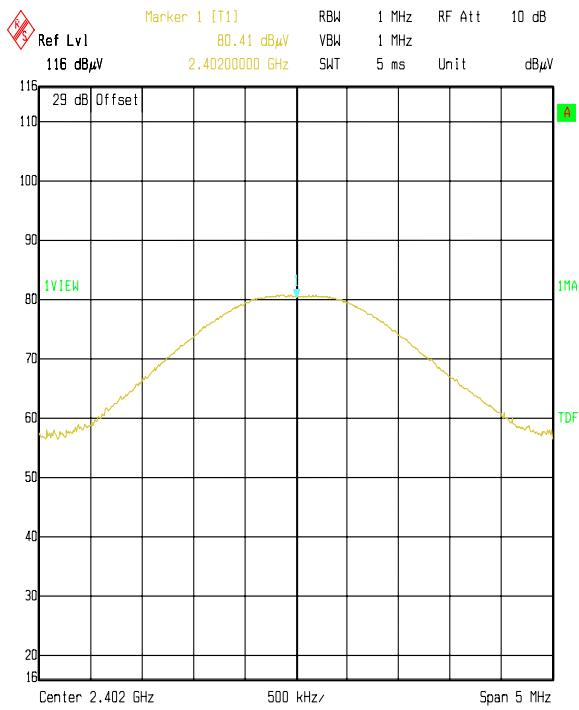
Test Equipment Used:

A031, C1167, M1242, S202

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Transmitter Maximum Peak Output Power: (EIRP) (Continued)

Graph(s):



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Transmitter Radiated Emissions

Temperature (°C):	19	Relative Humidity (%):	50
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Results:

**Electric Field Strength Measurements: 30 MHz to 1000 MHz
(emissions outside the restricted bands)**

Top Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Compliance Status
79.900	Vertical	29.5	64.4	34.9	Complied
286.813	Vertical	26.0	64.4	38.4	Complied
428.136	Vertical	30.8	64.4	33.6	Complied

Note(s):

1. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.

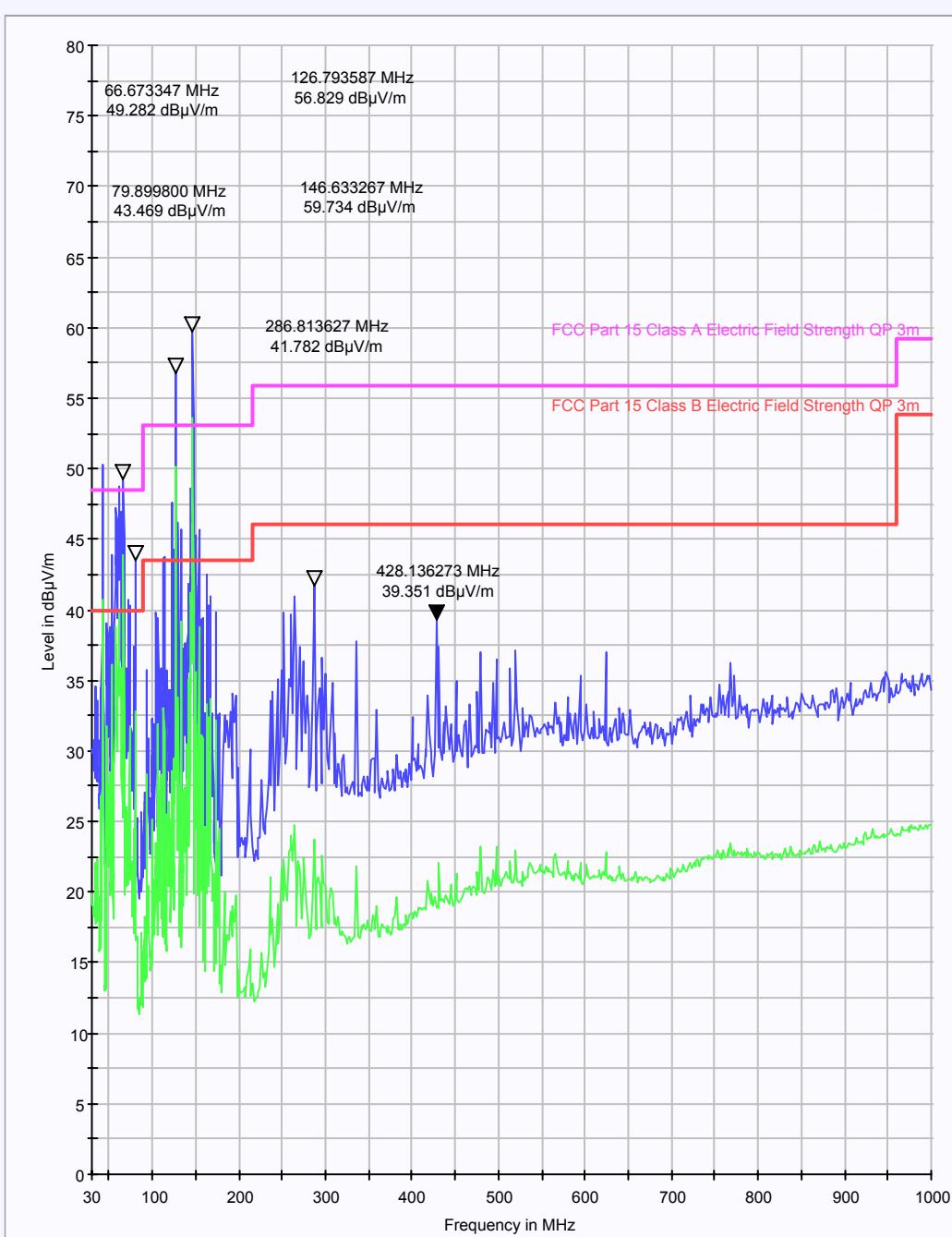
Test Equipment Used:

A1037, A259, A276, C151, C160, C340, C348, C460, C468, M024, M044, M1263, M173, S201, S212

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Transmitter Radiated Emissions (Continued)

Graph(s):



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Transmitter Radiated Emissions (Continued)

Temperature (°C):	19	Relative Humidity (%):	50
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Results:

Electric Field Strength Measurements (Frequency Range: 1 GHz to 25 GHz)
(emissions occurring in the restricted bands)

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
4.803982	Vertical	48.3	-3.2	45.1	74.0	28.9	Complied

Highest Average Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
4.803982	Vertical	39.2	-3.2	36.0	54.0	18.0	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
4.882294	Vertical	48.6	-3.6	45.0	74.0	29.0	Complied

Highest Average Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
4.882294	Vertical	40.2	-3.6	36.6	54.0	17.4	Complied

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Transmitter Radiated Emissions (Continued)**Results:****Highest Peak Level: Top Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
4.959825	Vertical	46.9	-3.7	43.2	74.0	30.8	Complied

Highest Average Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
4.959825	Vertical	37.6	-3.7	33.9	54.0	20.1	Complied

Highest Peak Level: Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
4.847695	Vertical	48.5	-3.5	45.0	74.0	29.0	Complied

Highest Average Level: Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
4.847695	Vertical	32.3	-3.5	28.8	54.0	25.2	Complied

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Transmitter Radiated Emissions (Continued)

Temperature (°C):	19	Relative Humidity (%):	50
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Results:

Electric Field Strength Measurements (Frequency Range: 1 GHz to 25 GHz)
(emissions outside the restricted bands)

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Compliance Status
1.652223	Horizontal	47.8	-7.1	40.7	60.4	19.7	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Compliance Status
1.662353	Horizontal	46.0	-7.0	39.0	61.8	22.8	Complied

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Compliance Status
1.654027	Horizontal	48.8	-7.1	41.7	64.4	22.7	Complied

Highest Peak Level: Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Compliance Status
1.650740	Horizontal	49.0	-7.1	41.9	64.4	22.5	Complied

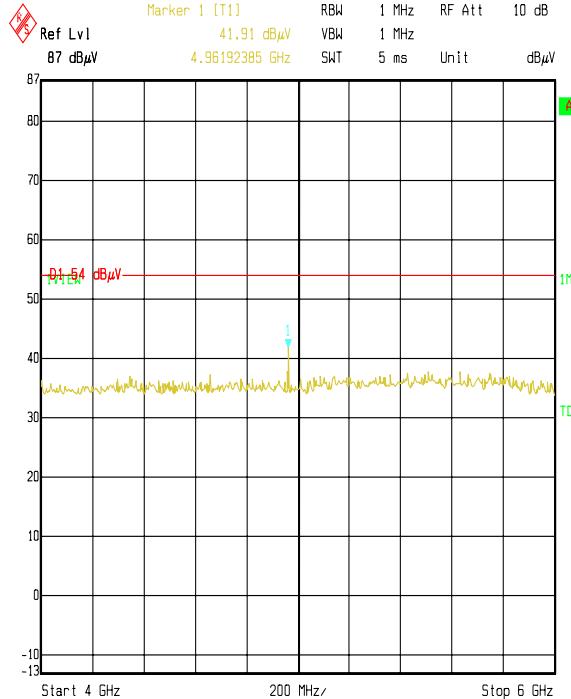
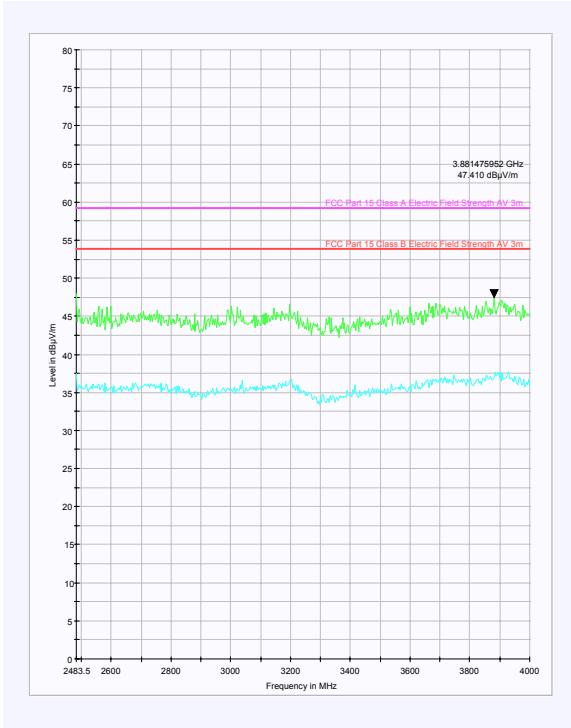
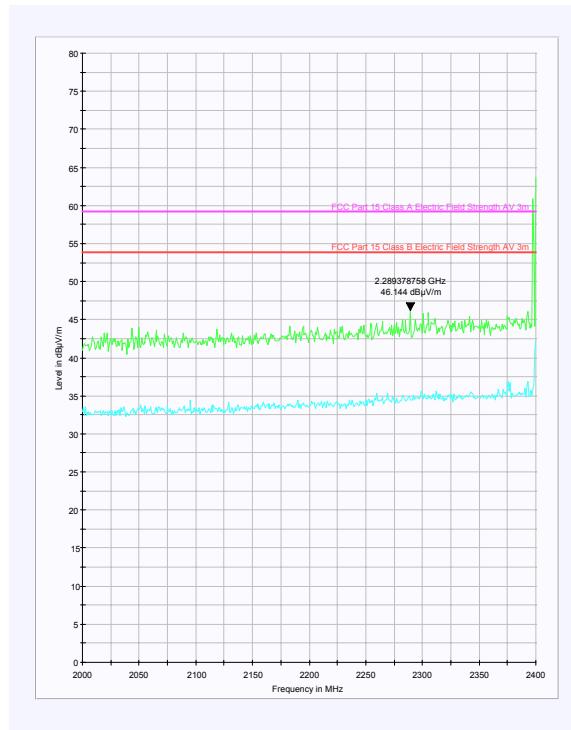
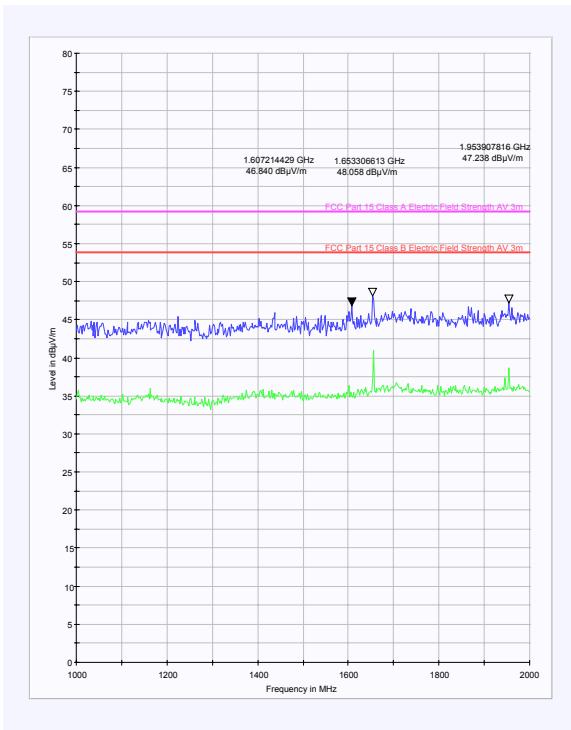
Test Equipment Used:

A028, A1037, A1362, A1534, A253, A254, A255, A256, A436, C1153, C1154, C1165, C1167, C151, C160, C348, M1242, M1263, S202, S212

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Transmitter Radiated Emissions (Continued)

Graph(s):



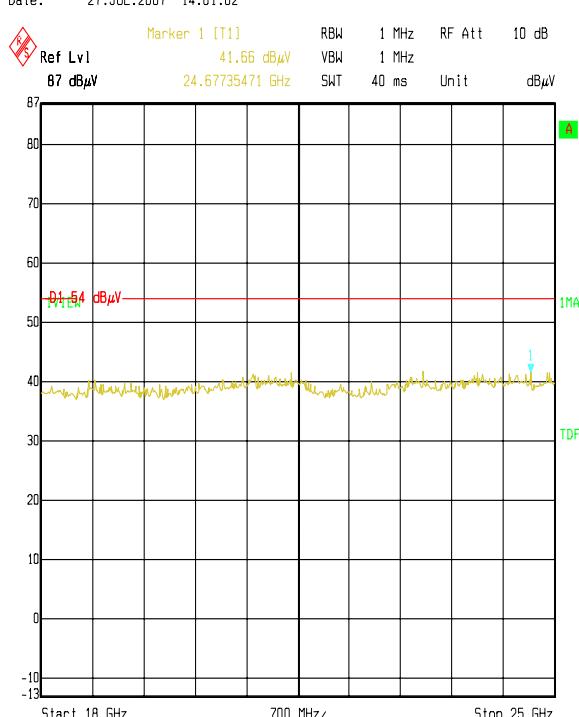
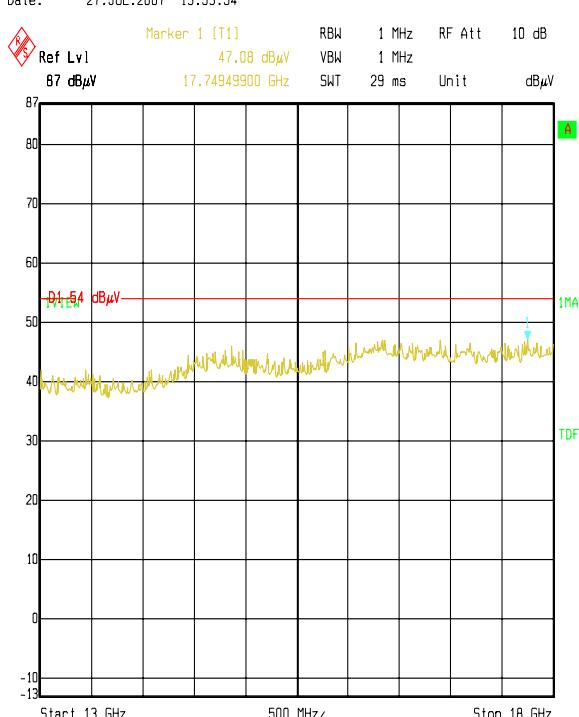
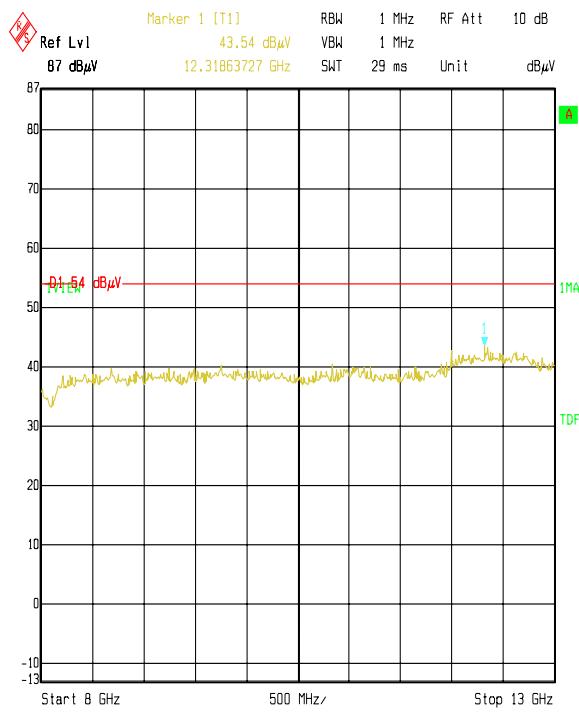
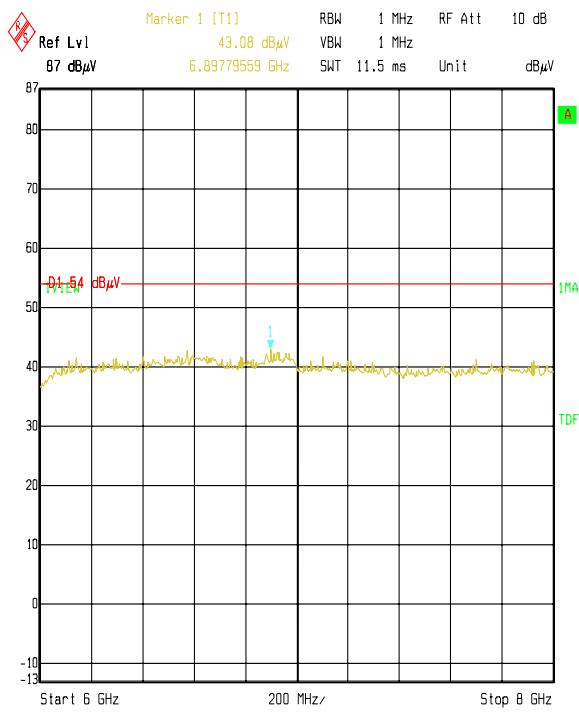
Date: 27.JUL.2007 11:02:03

These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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Transmitter Radiated Emissions (Continued)

Graph(s):



These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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Transmitter Band Edge Radiated Emissions

Temperature (°C):	16	Relative Humidity (%):	90
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Results:

Electric Field Strength Measurements

Peak Power Level Hopping Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
2.4000	Vertical	55.1	-6.5	48.6	60.4	11.8	Complied
2.4835	Vertical	62.5	-8.0	54.5	74.0	19.5	Complied

Average Power Level Hopping Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
2.4835	Vertical	52.1	-8.0	44.1	54.0	9.9	Complied

Note(s):

1. The band edge at 2400 MHz is not in a restricted band; therefore the limit is -20 dBc of the carrier in a 100 kHz bandwidth.
2. The band edge at 2483.5 MHz is in a restricted band; therefore the limit is as per FCC 15.209.

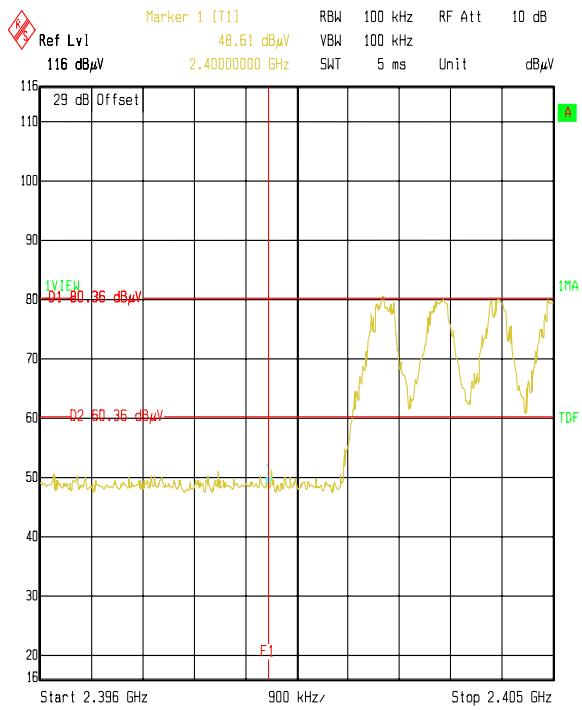
Test Equipment Used:

A031, C1167, M1242, S202

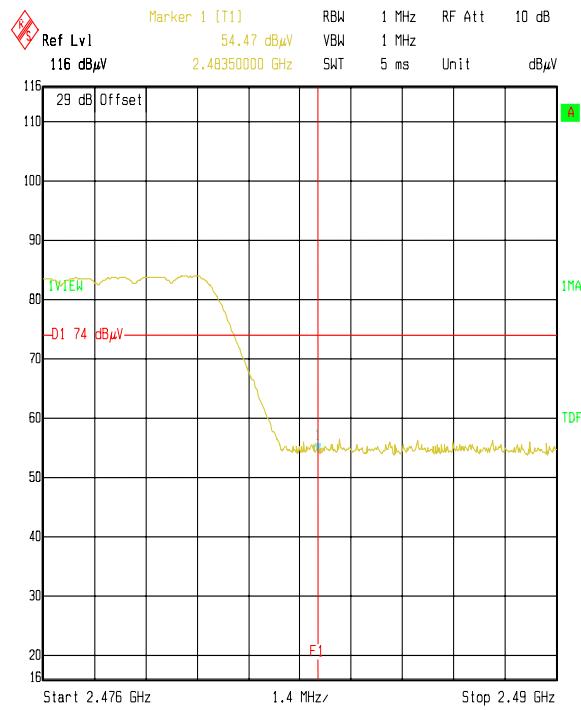
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Transmitter Band Edge Radiated Emissions (Continued)

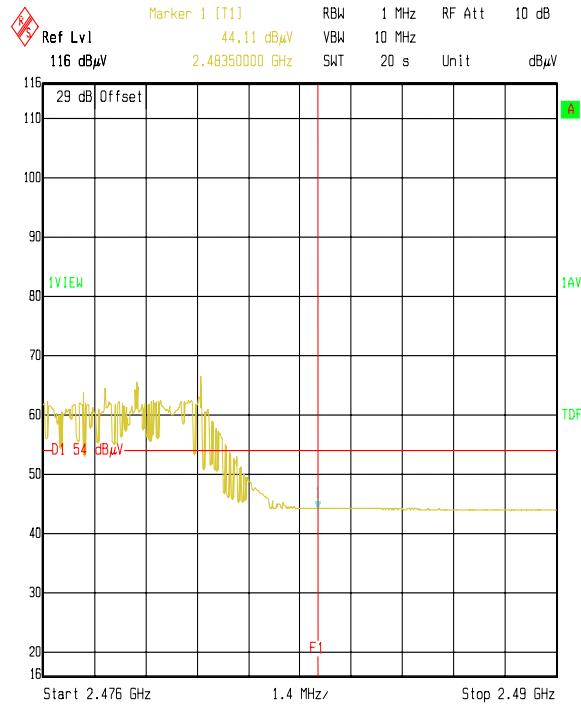
Graph(s):



Date: 26.JUL.2007 10:42:50



Date: 26.JUL.2007 10:46:33



Date: 26.JUL.2007 11:10:31

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Transmitter Band Edge Radiated Emissions (Continued)

Temperature (°C):	16	Relative Humidity (%):	90
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Results:

Peak Power Level Static Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
2.4000	Vertical	54.3	-6.5	47.8	60.4	12.6	Complied
2.4835	Vertical	62.8	-8.0	54.8	74.0	19.2	Complied

Average Power Level Static Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Compliance Status
2.4835	Vertical	52.1	-8.0	44.1	54.0	9.9	Complied

Note(s):

1. The band edge at 2400 MHz is not in a restricted band; therefore the limit is -20 dBc of the carrier in a 100 kHz bandwidth.
2. The band edge at 2483.5 MHz is in a restricted band; therefore the limit is as per FCC 15.209.

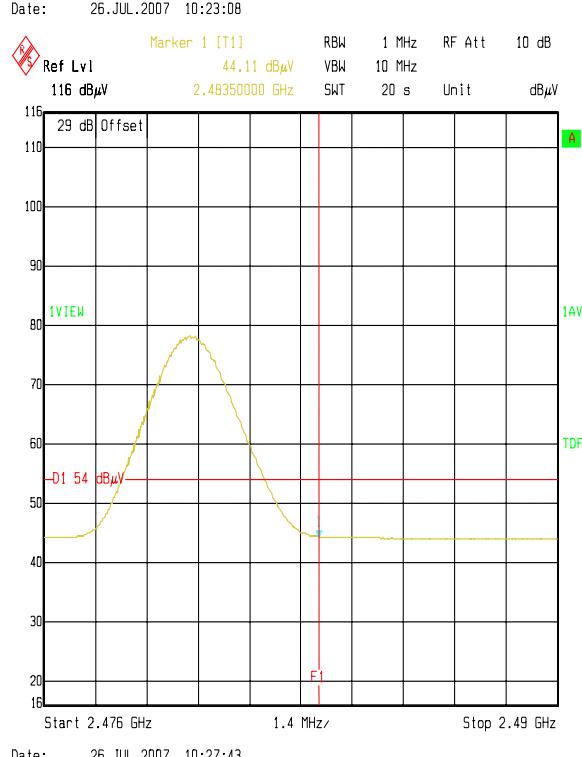
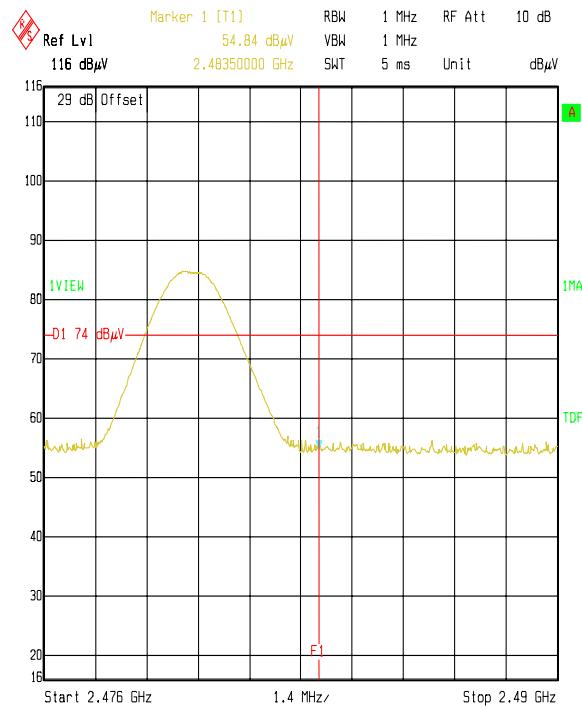
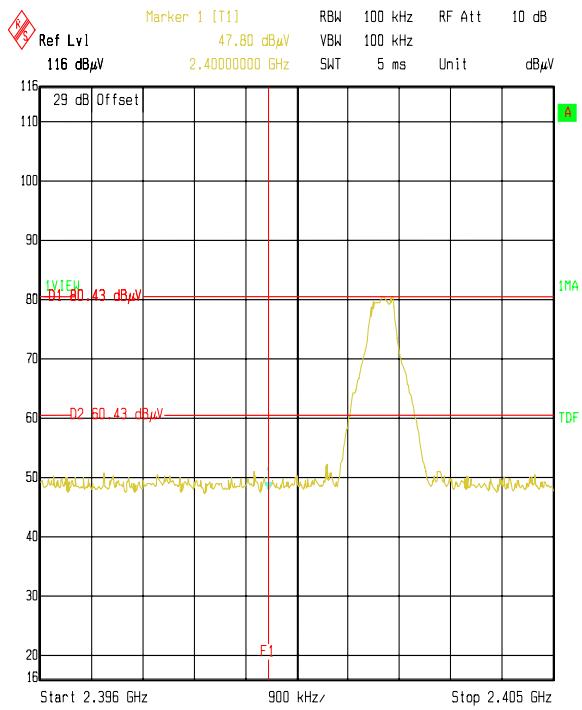
Test Equipment Used:

A031, C1167, M1242, S202

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Transmitter Band Edge Radiated Emissions (Continued)

Graph(s):



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6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Transmitter Maximum Peak Output Power	Not Applicable	95%	±2.94 dB
Transmitter Carrier Frequency Separation	Not Applicable	95%	±11.4 ppm
Transmitter Average Time of Occupancy	Not Applicable	95%	±0.3 ns
20 dB Bandwidth	Not Applicable	95%	± 11.4 ppm
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±4.64 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

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7. Measurement Methods

7.1. Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans, graphs were produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. Any emission within 20 dB of the limit were then measured on the open area test site, except in cases where the noise floor was within 20 dB of the limit, in these cases the highest point of the noise floor was measured.

Where an emission fell inside a restricted band, measurements were made at the appropriate test distance using a measuring receiver with a quasi peak detector for measurements below 1000 MHz and an average and peak detector for measurements above 1000 MHz. A peak detector was used for all other measurements.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2003 Clause 5.4.

All measurements on the open area test site were performed using broadband antennas in both vertical and horizontal polarisations.

On the open area test site, at each frequency where a signal was to be measured, the trace was maximised by rotating a turntable through 360°. The angle at which the maximum signal was observed was locked out. For frequencies below 1000 MHz the test antenna was varied in height between 1 m and 4 m in order to further maximise the target emission.

For frequencies above 1000 MHz where a horn antenna was used, height searching was performed to locate the optimal height of the horn with respect to the EUT. At this point the horn was locked off and the turntable was again rotated through 360° to maximise the target signal. It should be noted that the received signal from the EUT would diminish very quickly after it exits the beam width of the horn antenna, for this reason it may not be necessary to fully height search with the horn antennas.

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Radiated Emissions (Continued)

At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

Scans were performed to the upper frequency limits as stated in section 15.33.

The final field strength was determined as the indicated level in dB μ V plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	Initial Scan	Final Measurements <1 GHz	Final Measurements ≥1 GHz
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak / Average
Mode:	Max Hold	Not applicable	Max Hold
Bandwidth:	(120 kHz <1 GHz) (1 MHz ≥1 GHz)	120 kHz	1 MHz
Amplitude Range:	100 dB	100 dB	100 dB
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

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7.2. Carrier Frequency Separation / 20 dB Bandwidth

The EUT and spectrum analyser was configured for radiated measurements, and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine the bandwidth and separation of each transmission channel the measurement analyser was configured to measure two adjacent channels whilst the EUT was in hopping mode. The spectrum analyser was configured with a resolution bandwidth and video bandwidth greater than 1% of the frequency span.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak points on the two adjacent channels were noted and the separation between them recorded.

To determine the occupied bandwidth, a resolution bandwidth of 10 kHz was used, which is greater than 1% of the 20 dB bandwidth. A video bandwidth of at least the same value was used.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20 dB below the peak level.

The bandwidth was determined at the points where the 20 dB reference line intercepted the power envelope of the emission.

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7.3. Average Time of Occupancy

The EUT and spectrum analyser was configured for radiated measurements, and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

First the maximum packet length was determined on the centre channel.

The measurement analyser was configured to the time domain mode by setting the span to zero with a sweep time sufficiently wide enough to measure one pulse.

The EUT was configured to operate in normal mode of operation. The pulse width of one transmission was then recorded. The measurement analyser was then configured in zero span (in the time domain) and the sweep time was set to 32 seconds (the closest allowable setting to 31.6 seconds). This 32 second period was determined by multiplying the number of channels the device operates over (79) by 0.4 seconds.

The number of transmissions within this period was noted and multiplied by the pulse width recorded earlier. This gives the maximum occupancy over 31.6 seconds.

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7.4. Peak Output Power

The EUT and spectrum analyser were configured for conducted antenna port measurements and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

Prior to testing being performed a suitable RF attenuator and cable was calibrated for the required frequencies. For each frequency to be measured, the calibrated level of the attenuator and cable were entered as an offset into a spectrum analyser to compensate for the measurement set up.

To determine the transmitter output power, the EUT was operated at maximum power and a result was obtained from the spectrum analyser using peak detector and trace Max Hold.

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7.5. Equivalent Isotropic Radiated Power (EIRP)

EIRP measurements were performed in accordance with the standard, against appropriate limits.

The EIRP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2003 Clause 5.4. The transmitter was fitted with an integral antenna; therefore all radiated tests were performed with the unit operating into the integral antenna.

The level of the EIRP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal polarity. The EUT was oriented in the X plane. The test antenna was then raised and lowered until a maximum peak was observed. The turntable was then rotated through 360 degrees and the maximum peak reading obtained. The height search was then repeated to take into consideration the new angular position of the turntable. The maximum reading observed was then recorded. This procedure was then repeated with the EUT oriented in the Y and Z planes. The highest reading taken in all 3 planes was recorded. The entire procedure was then repeated with the test antenna set in the vertical polarity.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a horn antenna. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

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Equivalent Isotropic Radiated Power (EIRP) (Continued)

Circumstances where the signal generator could not produce the desired a power substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The EIRP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated EIRP to obtain the substituted EUT EIRP.

Delta (dB) = EUT – SG

Where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

EIRP SG= Signal Generator Level - Cable Loss + Antenna Gain

The EUT EIRP is calculated as:

EIRP EUT = EIRP SG + Delta.

The test equipment settings for EIRP measurements were as follows:

Receiver Function	Setting
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Sweep Time:	Coupled

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7.6. Band Edge Compliance of RF Radiated Emissions

The EUT and spectrum analyser were configured as for radiated measurements and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine band edge compliance, the analyser resolution bandwidth was set to $\geq 1\%$ of the analyser span. The video bandwidth was set to be \geq to the resolution bandwidth. The sweep was set to auto and the detector to peak. The trace was set to max hold and a trace was produced.

A plot of the lower band edge of the allocated frequency band was produced. A marker was set to the level of the highest in band emission with a limit line set to 20 dB below this. The marker was then placed on the highest out of band emission (the specification states that either the band edge level must be measured or the highest out of band emission, whichever is the greater). The plots show that the highest out of band emission complies with the -20 dBc limit.

The above procedure was then repeated for the upper band edge except that, as the upper band edge fell on a restricted band edge (as defined in section 15.205(a)), the limit for the restricted band was applied instead of the -20 dBc limit, i.e. the general limits defined in section 15.209(a).

Final measurements were performed on the worst-case configuration as described in Part 15.31(i).

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Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A028	Horn Antenna	Eaton	91888-2	304	08 Jun 2006	36
A031	Horn Antenna	Eaton	91889-2	557	08 Jun 2006	36
A1037	Bilog Antenna	Chase EMC Ltd	CBL6112B	2413	20 Sep 2006	12
A1534	Preamplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A253	Horn Antenna	Flann Microwave	12240-20	128	17 Nov 2006	36
A254	Horn Antenna	Flann Microwave	14240-20	139	17 Nov 2006	36
A255	Horn Antenna	Flann Microwave	16240-20	519	17 Nov 2006	36
A256	Horn Antenna	Flann Microwave	18240-20	400	17 Nov 2006	36
A259	Bilog Antenna	Chase	CBL6111	1513	13 Mar 2007	12
A276	OATS Positioning Controller	Rohde & Schwarz	HCC		Calibration not required	-
A436	Horn Antenna	Flann	20240-20	330	24 Apr 2006	36
C1153	Cable	The Workhorse	WHU26-3636-060	None	05 Jun 2007	12
C1154	Cable	The Workhorse	WHU26-3636-060	None	05 Jun 2007	12
C1165	Cable	Rosenberger Micro-Coax	FA210A102 0007070	43189-1	05 Jun 2007	12
C1167	Cable	Rosenberger Micro-Coax	FA210A103 0007070	43190-01	05 Jun 2007	12
C151	Cable	Rosenberger	UFA210A-1-1181-70x70	None	Calibrated before use	-

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Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
C160	Cable	Rosenberger	UFA210A-1-1181-70x70	None	Calibrated before use	-
C340	Cable	Andrews	None	None	25 May 2007	12
C348	Cable	Rosenberger	UFA210A-1-1181-70x70	2993	Calibrated before use	-
C460	Cable	Rosenberger	UFA210A-1-1182-704704	98H0304	Calibrated before use	-
C468	Cable	Rosenberger	UFA210A-1-3937-504504	98L0440	Calibrated before use	-
M024	Spectrum Monitor	Rohde & Schwarz	EZM	873 952/006	Calibrated before use	-
M044	Receiver	Rohde & Schwarz	ESVP	891 845/026	06 Mar 2007	12
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986_022	08 Sep 2006	12
M1263	EMI Test Receiver	Rohde & Schwarz	ESIB7	100265	25 Jan 2007	12
M173	Site Controller	R.H.Electrical Services	RH351	3510020	Calibration not required	-
S201	OATS	RFI	1		25 May 2007	12
S202	OATS	RFI	2	S202-15011990	17 Nov 2006	12
S212	Screened Room	RFI	12		Not Calibrated	-

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule. All equipment was within calibration at the time of the test.

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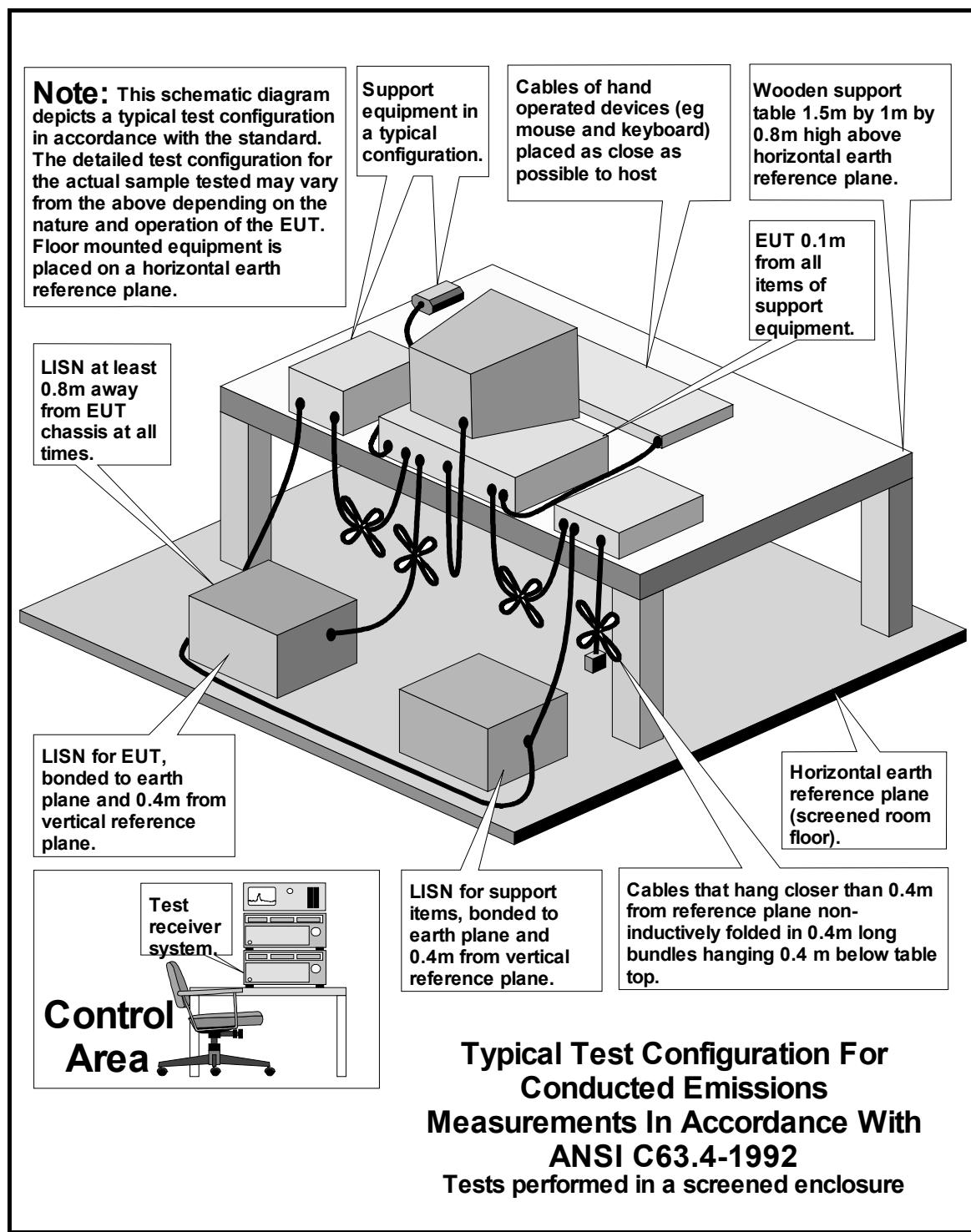
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\49291JD10\EMICON	Test configuration for measurement of conducted emissions.
DRG\49291JD10\EMIRAD	Test configuration for measurement of radiated emissions.

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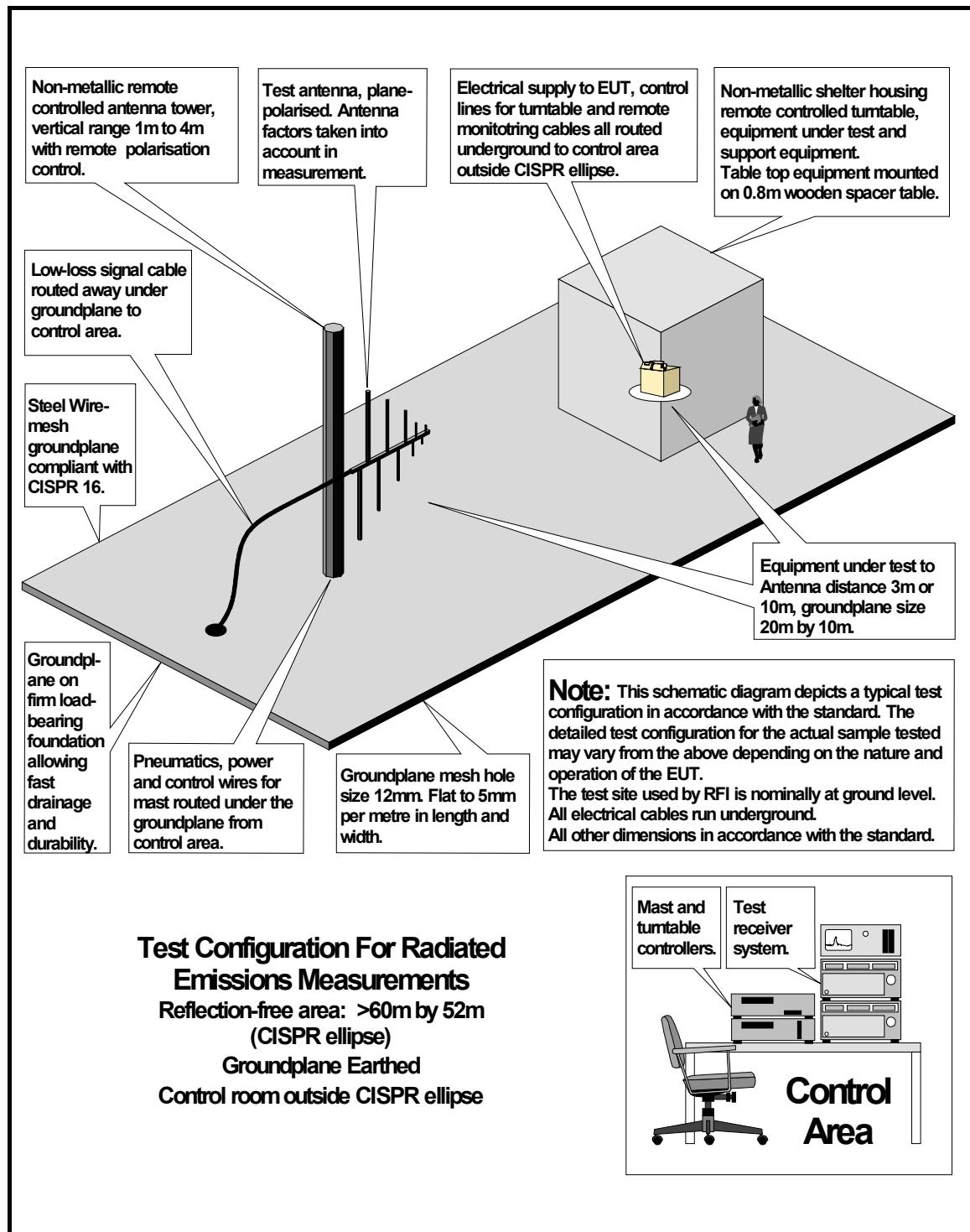
DRG\49291JD10\EMICON



Note: This diagram is also applicable for the latest version of ANSI C63.4-2003

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DRG\49291JD10\EMIRAD



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