

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'

To: FCC Part 15.247: 2004 (Subpart C)

Test Report Serial No:
RFI/MPTE1/RP47077JD03A

**This Test Report Is Issued Under The Authority
Of Andrew Brown, Operations Manager:**

A handwritten signature in black ink, appearing to read 'Andrew Brown'.

Tested By: Michael Derby

A handwritten signature in blue ink, appearing to read 'Michael Derby'.

Checked By: Nigel Davison

A handwritten signature in black ink, appearing to read 'Nigel Davison'.

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Test Dates: 25 April to 2005 to 18 May 2005

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Registered in England and Wales. Company number: 2117901

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To: 'The Intelligent Bluetooth Serial Module, Version II'
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1. Client Information

Company Name:	Ezurio Limited
Address:	126 Colindale Avenue London NW9 5HD
Contact Name:	Mr S. Yitayew

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2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification of Equipment Under Test (EUT)

Brand Name:	Ezurio Limited
Model Name or Number:	"The Intelligent Bluetooth Serial Module, Version II"
Unique Type Identification:	None Stated
Serial Number:	Sample Number 4, 00809864FF03
Hardware Version:	TRBLU23-00100, Rev.2
Software Version:	Not stated
FCC ID Number:	PI401B
Country of Manufacture:	Not stated
Date of Receipt:	22 April 2005
Note:	EUT, with integral antenna

An additional version of the EUT was supplied to RFI with the antenna removed and an antenna port connector instead. This unit was used for conducted antenna port measurements.

Brand Name:	Ezurio Limited
Model Name or Number:	"The Intelligent Bluetooth Serial Module, Version II"
Unique Type Identification:	None Stated
Serial Number:	Sample Number 2, 00809864FF01
Hardware Version:	TRBLU23-00100, Rev.2
Software Version:	Not stated
FCC ID Number:	PI401B
Country of Manufacture:	Not stated
Date of Receipt:	22 April 2005
Note:	Version with an antenna port connector

2.2. Description of EUT

The equipment under test was a fully integrated Class 1 Bluetooth Module.

2.3. Modifications Incorporated in EUT

For the purpose of this testing, the EUT had a temporary 5-pin connector added. This was part of a USB cable, which allowed connection to a laptop for controlling the EUT test mode.

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2.4. Additional Information Related to Testing

Power Supply Requirement:	The EUT has an on-board regulator, supplying 3.3 V DC to the module. For the purpose of this test, the EUT received its supply from the controlling laptop, via the USB cable.		
Intended Operating Environment:	Residential, Commercial and Light Industry		
Equipment Category:	Short Range (Low Power), Bluetooth.		
Type of Unit:	Base Station (Fixed Use), Mobile and Portable.		
Measured Channel Separation:	1.002004 MHz		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Receive Frequency Range:	2402 MHz to 2480 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Measured Output Power, Radiated:	+3.3 dBm		

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2.5. Port Identification

Port	Description	Type/Length	Applicable
1	5 Pin Connector	0.5m USB	N/A

2.6. Support Equipment

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

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	Latitude C840
Serial Number:	CN-03J010-12961-2AQ-5411
Cable Length and Type:	0.5m, Shielded USB
Connected to Port:	5 Pin Connector on EUT

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3. Test Results

Reference:	FCC Part 15.247: 2004 Subpart C
Title:	Code of Federal Regulations, Part 15.247 (47CFR15) (Intentional Radiators operating within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz)

3.1. 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.

3.2. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

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4. Deviations from the Test Specification

There were no deviations from the requirements of the test specification.

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5. Operation of the EUT during Testing

5.1. Operating Modes

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

The EUT was controlled using BlueTest software. Transmit and Receive mode tests were performed with the EUT hopping on bottom middle or top channels, or hopping over all channels, as per the specific requirements of each test case.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

The EUT was tested as a module.

For the purpose of controlling the EUT, it was connected via USB cable to a controlling laptop.

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6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliance Status
Idle Mode AC Conducted Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.109	Antenna	Complied
Transmitter AC Conducted Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.207	AC Mains	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)	Antenna Terminal	Complied
Transmitter Carrier Frequency Separation	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)	Antenna Terminal	Complied
Transmitter Average Time of Occupancy	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)(iii)	Antenna Terminal	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: 2004 Section 15.247(b)(1)	Antenna	Complied
Transmitter Conducted Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.247 (d)	Antenna Terminal	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: 2004 Sections 15.247(d) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Conducted Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.247(d)	Antenna Terminals	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2004 Sections 15.247(d) & 15.209(a)	Antenna	Complied

6.1. 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, England.

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7. Measurements, Examinations and Derived Results

7.1. 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 8 for details of measurement uncertainties.

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7.2. Test Results

7.2.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107

The EUT was configured for ac conducted emission measurements, as described in section 9 of this report.

Tests were performed to identify the maximum emission levels present on the ac mains line of the EUT.

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.16876	Neutral	50.19	65.02	14.83	Complied
0.19792	Live	48.16	63.70	15.54	Complied
0.41749	Neutral	44.02	57.50	13.48	Complied
0.48010	Neutral	45.19	56.34	11.15	Complied
0.58266	Neutral	43.87	56.00	12.13	Complied
0.64240	Neutral	44.30	56.00	11.70	Complied
0.65166	Neutral	42.98	56.00	13.02	Complied
0.67499	Live	44.15	56.00	11.85	Complied
0.83673	Neutral	43.46	56.00	12.54	Complied
0.92143	Neutral	43.77	56.00	12.23	Complied

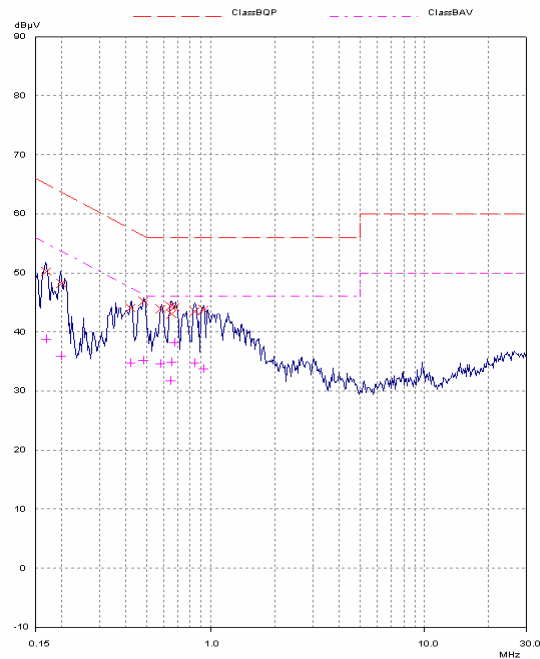
Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.16876	Live	38.81	55.02	16.21	Complied
0.19792	Neutral	35.82	53.70	17.88	Complied
0.41749	Live	34.70	47.50	12.80	Complied
0.48010	Neutral	35.09	46.34	11.25	Complied
0.58266	Live	34.55	46.00	11.45	Complied
0.64240	Neutral	31.71	46.00	14.29	Complied
0.65166	Live	34.83	46.00	11.17	Complied
0.67499	Neutral	38.23	46.00	7.77	Complied
0.83673	Neutral	34.75	46.00	11.25	Complied
0.92143	Neutral	33.69	46.00	12.31	Complied

Note: This test was performed on the ac supply of the controlling laptop, with the EUT connected.

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Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)



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

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7.2.2. Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

The EUT was configured for radiated emission testing, as described in section 9 of this report.

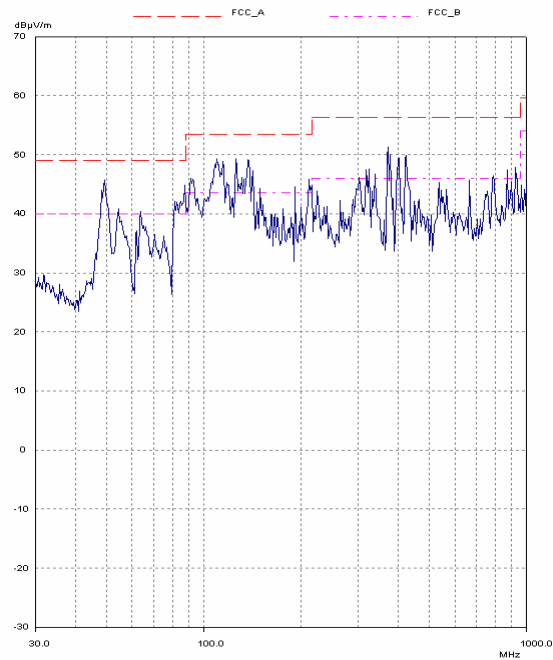
Tests were performed to identify the maximum receiver or standby radiated emission levels.

Results:

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
54.217	Vert.	25.1	40.0	14.9	Complied
61.445	Vert.	17.1	40.0	22.9	Complied
89.921	Vert.	30.3	43.5	13.2	Complied
109.374	Vert.	28.8	43.5	14.7	Complied
114.874	Vert.	32.3	43.5	11.2	Complied
126.421	Vert.	26.0	43.5	17.5	Complied
136.846	Vert.	26.1	43.5	17.4	Complied
141.874	Vert.	25.9	43.5	17.6	Complied
192.001	Horiz.	32.2	43.5	11.3	Complied
216.000	Horiz.	36.6	43.5	6.9	Complied
300.407	Vert.	26.1	46.0	19.9	Complied
316.824	Vert.	26.8	46.0	19.2	Complied
324.087	Horiz.	30.2	46.0	15.8	Complied
376.208	Horiz.	34.8	46.0	11.2	Complied
399.669	Vert.	29.7	46.0	16.3	Complied
426.048	Vert.	30.4	46.0	15.6	Complied
538.245	Horiz.	37.0	46.0	9.0	Complied
667.271	Vert.	41.2	46.0	4.8	Complied
786.465	Vert.	41.4	46.0	4.6	Complied
867.243	Vert.	40.0	46.0	6.0	Complied
920.016	Horiz.	41.0	46.0	5.0	Complied

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Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz) (Continued)



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

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7.2.3. Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 12.5 GHz)

Results:

Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
1.198	Vert.	20.1	20.8	6.7	47.6	74.0	26.4	Complied
1.600	Vert.	21.2	20.9	7.8	49.9	74.0	24.1	Complied
1.605	Vert.	20.0	20.9	7.8	48.7	74.0	25.3	Complied
1.615	Vert.	19.8	21.0	7.8	48.6	74.0	25.4	Complied
1.619	Vert.	20.9	21.0	7.8	49.7	74.0	24.3	Complied
1.652	Vert.	25.3	21.2	7.9	54.4	74.0	19.6	Complied
2.002	Vert.	18.4	20.7	8.7	47.8	74.0	26.2	Complied
2.024	Vert.	18.6	20.7	8.7	48.0	74.0	26.0	Complied
2.478	Horiz.	22.3	21.1	10.0	53.4	74.0	20.6	Complied

Highest Average Level:

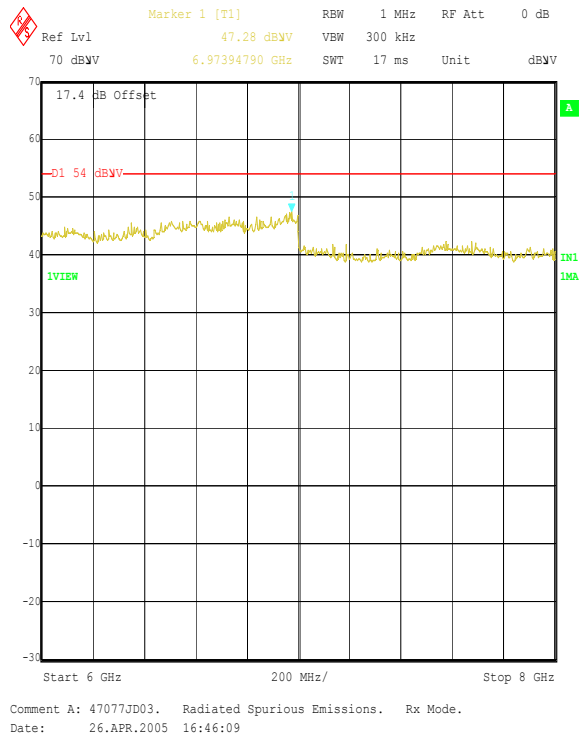
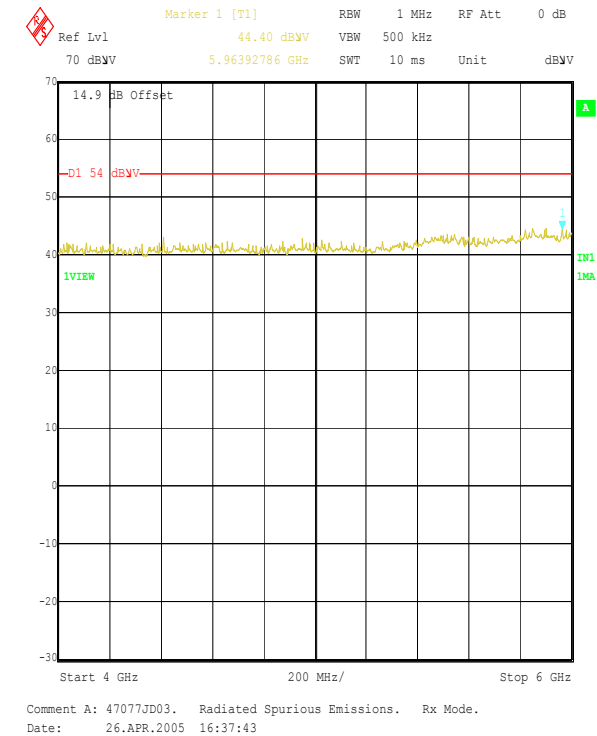
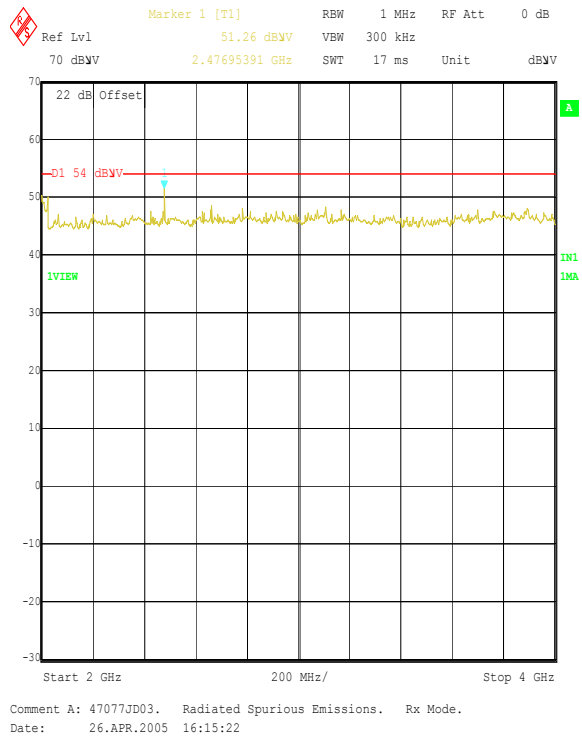
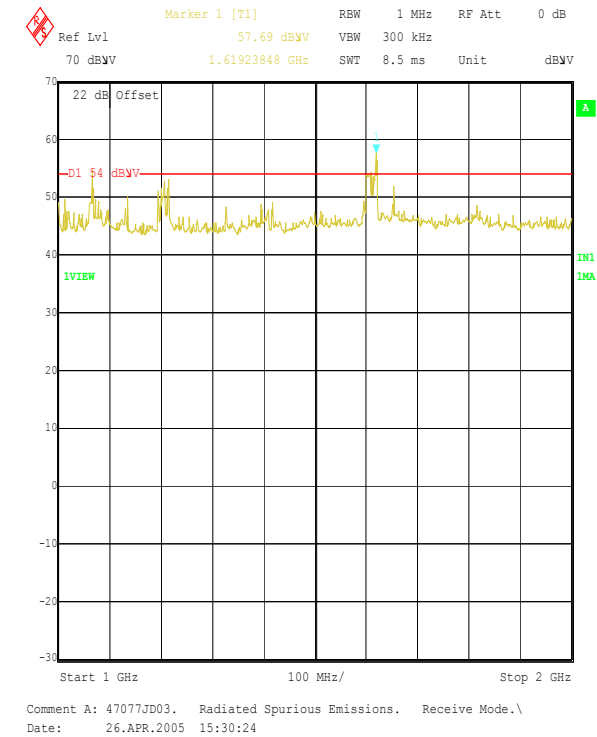
Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
1.198	Vert.	9.9	20.8	6.7	37.4	54.0	16.6	Complied
1.600	Vert.	6.8	20.9	7.8	35.5	54.0	18.5	Complied
1.605	Vert.	2.1	20.9	7.8	30.8	54.0	23.2	Complied
1.615	Vert.	2.0	21.0	7.8	30.8	54.0	23.2	Complied
1.619	Vert.	0.9	21.0	7.8	29.7	54.0	24.3	Complied
1.652	Vert.	21.8	21.2	7.9	50.9	54.0	3.1	Complied
2.002	Vert.	7.8	20.7	8.7	37.2	54.0	16.8	Complied
2.024	Vert.	9.5	20.7	8.7	38.9	54.0	15.1	Complied
2.478	Horiz.	18.9	21.1	10.0	50.0	54.0	4.0	Complied

Note(s):

1. 1.652 GHz and 2.478 GHz were proved to be from the receiver, which was active on the top channel for this test.

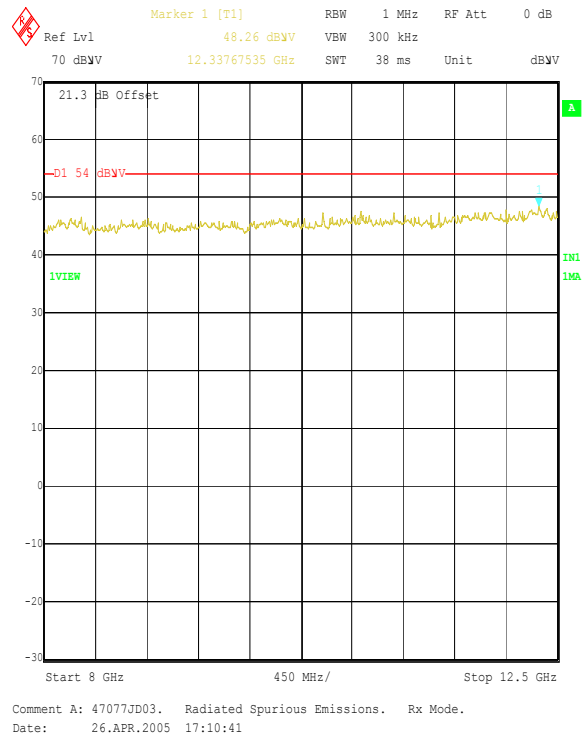
Test of: Ezurio Limited
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Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 12.5 GHz) (Continued)



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Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 12.5 GHz) (Continued)



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

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7.2.4. Transmitter AC Conducted Spurious Emissions: Section 15.207

The EUT was configured for ac conducted emission measurements, as described in section 9 of this report.

Tests were performed to identify the maximum emission levels present on the ac mains line of the EUT.

Results: Top Channel

Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.16755	Neutral	50.70	65.08	14.38	Complied
0.19648	Neutral	48.14	63.76	15.62	Complied
0.36721	Live	43.36	58.56	15.20	Complied
0.41909	Live	43.36	57.47	14.11	Complied
0.48534	Neutral	45.24	56.25	11.01	Complied
0.58214	Neutral	43.69	56.00	12.31	Complied
0.64640	Live	43.39	56.00	12.61	Complied
0.74356	Neutral	42.40	56.00	13.60	Complied
0.84637	Live	41.33	56.00	14.67	Complied
0.90485	Neutral	42.83	56.00	13.17	Complied
0.96024	Neutral	43.19	56.00	12.81	Complied
1.05516	Live	42.30	56.00	13.70	Complied

Note: This test was performed on the ac supply of the controlling laptop, with the EUT connected.

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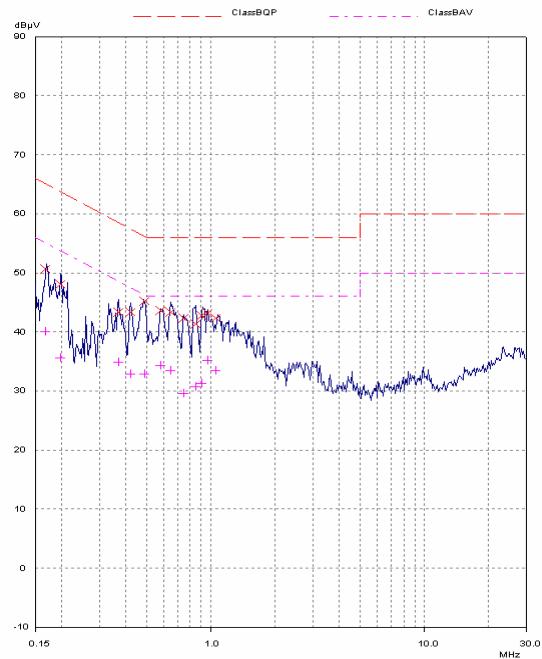
Transmitter AC Conducted Spurious Emissions: Section 15.207 (Continued)**Average Detector Measurements on Live and Neutral Lines**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.16755	Live	40.04	55.08	15.04	Complied
0.19648	Live	35.59	53.76	18.17	Complied
0.36721	Neutral	34.91	48.56	13.65	Complied
0.41909	Live	32.85	47.47	14.62	Complied
0.48534	Neutral	32.80	46.25	13.45	Complied
0.58214	Live	34.27	46.00	11.73	Complied
0.64640	Live	33.41	46.00	12.59	Complied
0.74356	Live	29.55	46.00	16.45	Complied
0.84637	Live	30.77	46.00	15.23	Complied
0.90485	Neutral	31.25	46.00	14.75	Complied
0.96024	Live	35.19	46.00	10.81	Complied
1.05516	Live	33.46	46.00	12.54	Complied

Note: This test was performed on the ac supply of the controlling laptop, with the EUT connected.

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Transmitter AC Conducted Spurious Emissions: Section 15.207 (Continued)



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

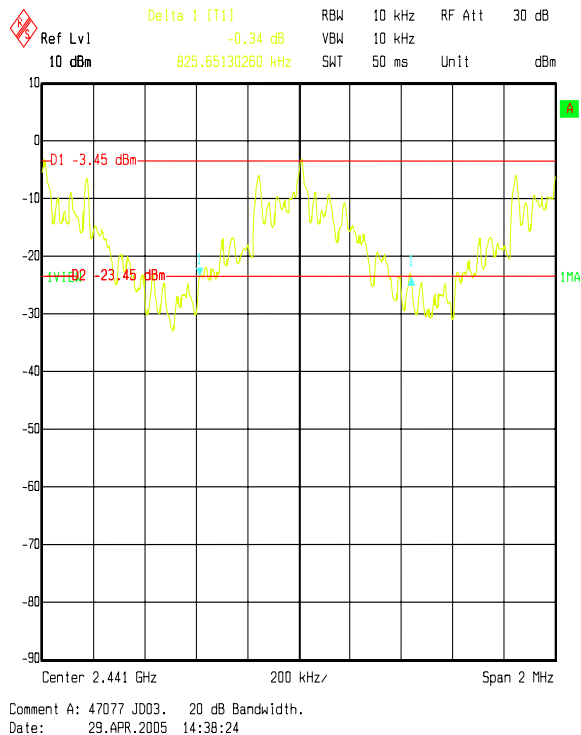
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7.2.5. Transmitter 20 dB Bandwidth: Section 15.247(a)(1)

The EUT was configured for 20 dB bandwidth measurements, as described in section 9 of this report.
The test was performed to identify the 20 dB bandwidth.

Results:

Transmitter 20 dB Bandwidth (kHz)	Limit (kHz)
825.651303	None specified



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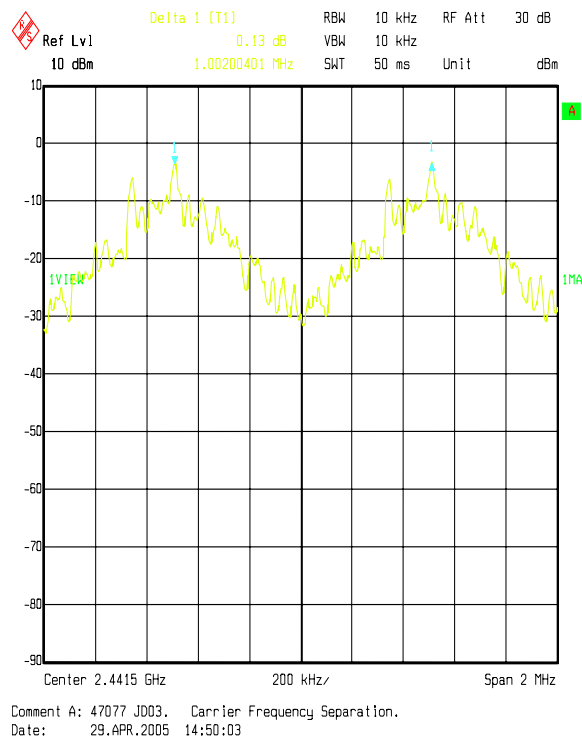
7.2.6. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)

The EUT was configured for carrier frequency separation measurements, as described in section 9 of this report.

The test was performed to identify the carrier frequency separation.

Results:

Transmitter Carrier Frequency Separation (kHz)	Limit (> 20 dB or $\frac{2}{3}$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.00401	550.434202	451.569808	Complied



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7.2.7. Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii)

The EUT was configured for average time of occupancy measurements, as described in section 9 of this report.

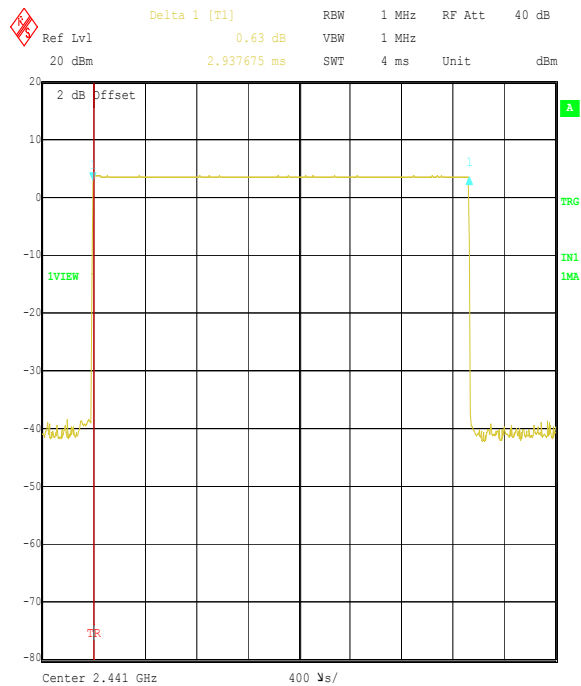
Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.

Results:

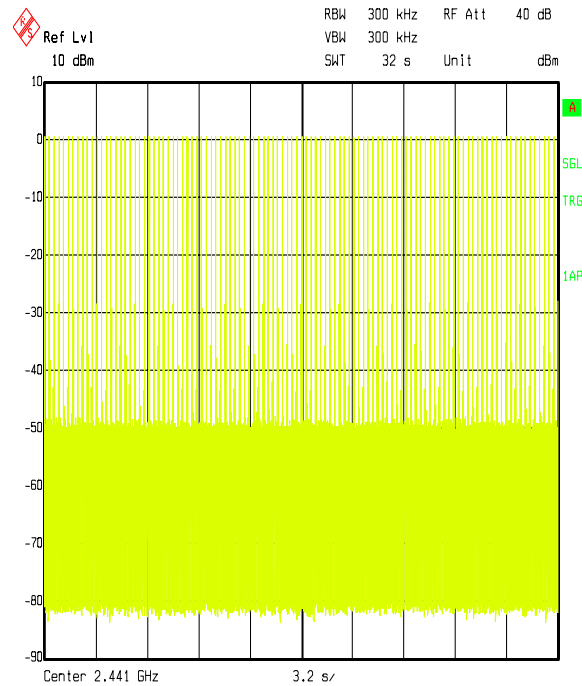
Emission Width (µs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2937.675	108	0.3172689	0.4	0.0827311	Complied

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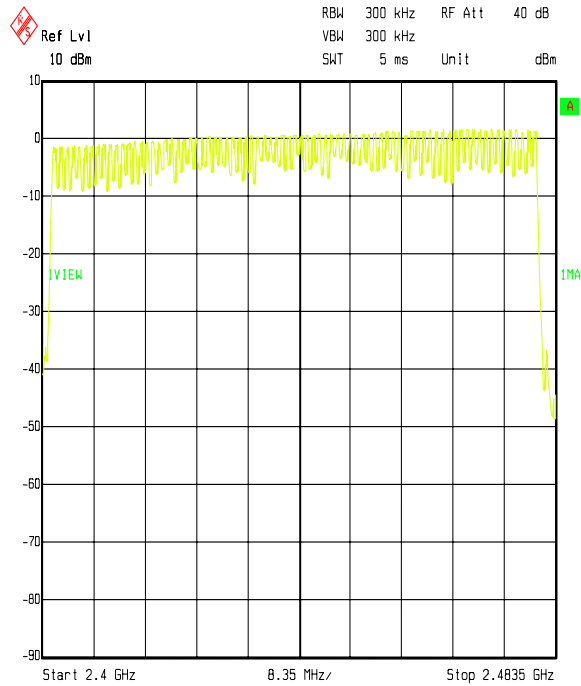
Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii) (Continued)



Comment A: 47077 JD03. Time of Occupancy.
Date: 29.APR.2005 16:53:06



Comment A: 47077JD02. Time of occupancy. No. of hops in 32 secs.
Date: 17.MAY 2005 10:32:57



Comment A: 47077JD02. Total number of hopped channels, 79.
Date: 17.MAY 2005 10:36:29

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

7.2.8. Transmitter Maximum Peak Output Power: Section 15.247(b)(1)

The EUT was configured for transmitter peak output power measurements, as described in section 9 of this report.

Tests were performed to identify the transmitter maximum peak output power (EIRP) of the EUT.

Results:

DC Powered Device

Channel	Input Voltage (DC)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	3.06 V	0.9	2.0	2.9	30.0	27.1	Complied
Bottom	5.30 V	0.9	2.0	2.9	30.0	27.1	Complied
Bottom	8.05 V	0.9	2.0	2.9	30.0	27.1	Complied
Middle	3.06 V	2.2	2.0	4.2	30.0	25.8	Complied
Middle	5.30 V	2.2	2.0	4.2	30.0	25.8	Complied
Middle	8.05 V	2.2	2.0	4.2	30.0	25.8	Complied
Top	3.06 V	2.2	2.0	4.2	30.0	25.8	Complied
Top	5.30 V	2.2	2.0	4.2	30.0	25.8	Complied
Top	8.05 V	2.2	2.0	4.2	30.0	25.8	Complied

Note(s):

1. As per the requirements of Public Notice DA 00-705, the stated antenna gain of the EUT (2 dBi), when added to the highest (worst case) measured conducted peak output power of 2.2 dBm (from the table above) gives a de facto EIRP of 4.2 dBm. This is in compliance with the requirements of Section 15.247(b) (1) for de facto EIRP limitation i.e. 1 Watt (30 dBm).
 2. This test was performed using the Conducted test method, on the EUT with an antenna port.
-

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

7.2.9. Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1)

The EUT was configured for transmitter peak output power measurements as described in Section 9 of this report.

Tests were performed to identify the transmitter maximum peak output power (EIRP) of the EUT.

Results:

DC Powered Devices

Channel	Input Voltage (AC)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5.30 V	+0.2	30.0	29.8	Complied
Middle	5.30 V	+3.0	30.0	27.0	Complied
Top	5.30 V	+3.3	30.0	26.7	Complied

Note(s):

1. This test was performed using the Radiated test method, on the EUT with an integral antenna.
 2. Since these tests were performed radiated; the EUT antenna gain is encompassed in the final result and not separately measurable.
 3. As reported on the previous page, tests at the extremes of input voltage were performed on the EUT with an antenna port connector, demonstrating the EUT performance under such conditions.
-

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

7.2.10. Transmitter Conducted Emissions: Section 15.247(d)

The EUT was configured for transmitter conducted emission measurements, as described in section 9 of this report.

Tests were performed to identify the maximum transmitter conducted emission levels.

The limit lines shown in the plots are set to a level 20 dB below the measured, highest, fundamental peak power, with a 100 kHz bandwidth.

Results:

Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
4805.611	-41.8	-42.7	-20.0	22.7	Complied

Middle Channel

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
4877.756	-42.8	-45.0	-20.0	25.0	Complied

Top Channel

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
4961.924	-44.8	-47.0	-20.0	27.0	Complied

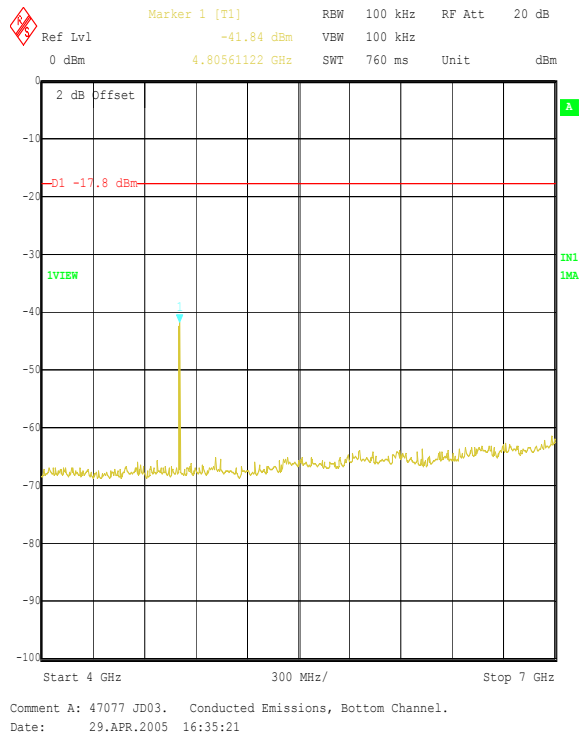
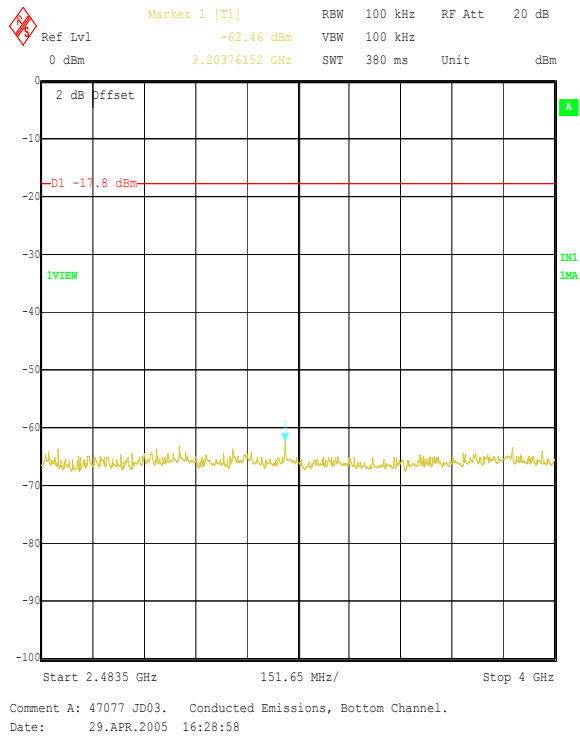
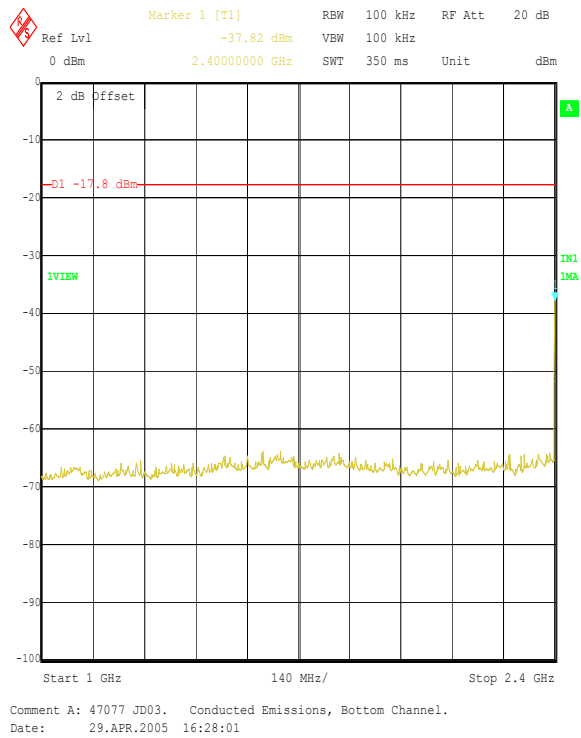
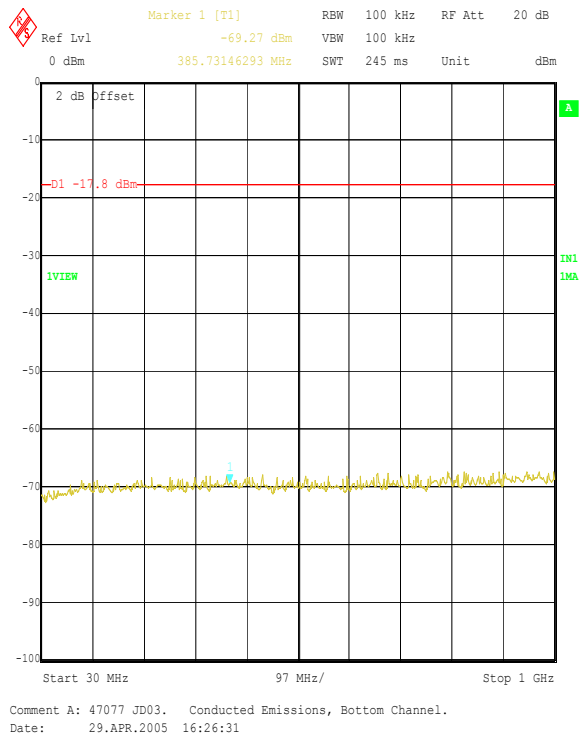
Hopping Channel

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
4811.623	-40.9	-43.1	-20.0	23.1	Complied

Note: This test was performed using the Conducted test method, on the EUT with an antenna port.

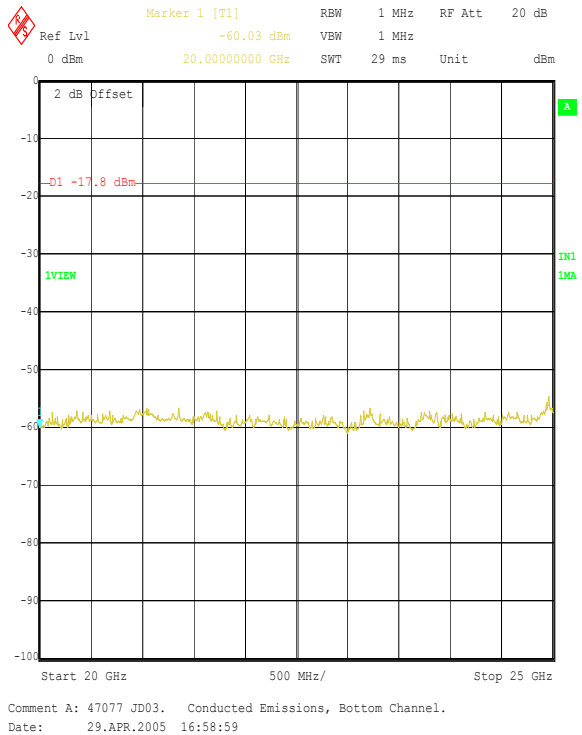
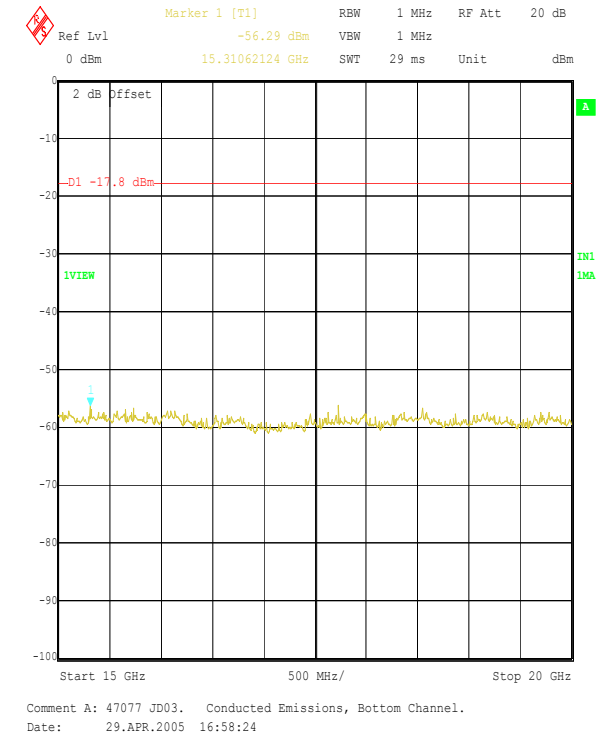
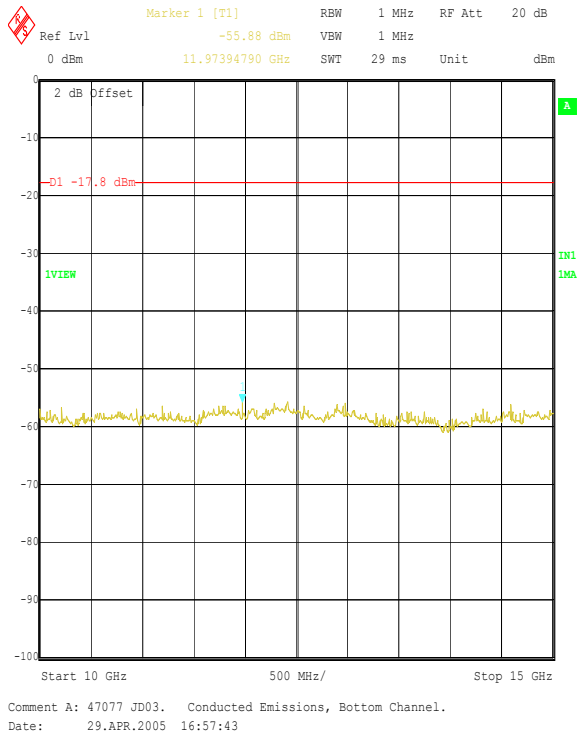
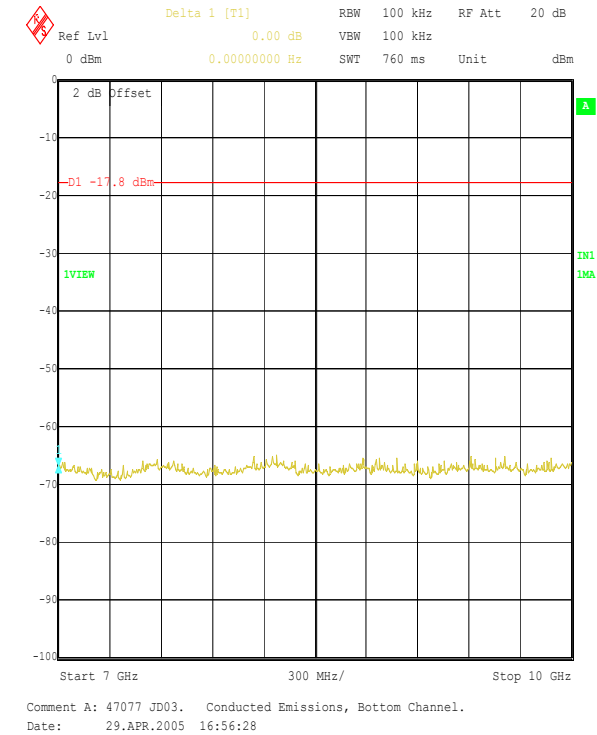
Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Conducted Emissions: Section 15.247(d) (Continued)



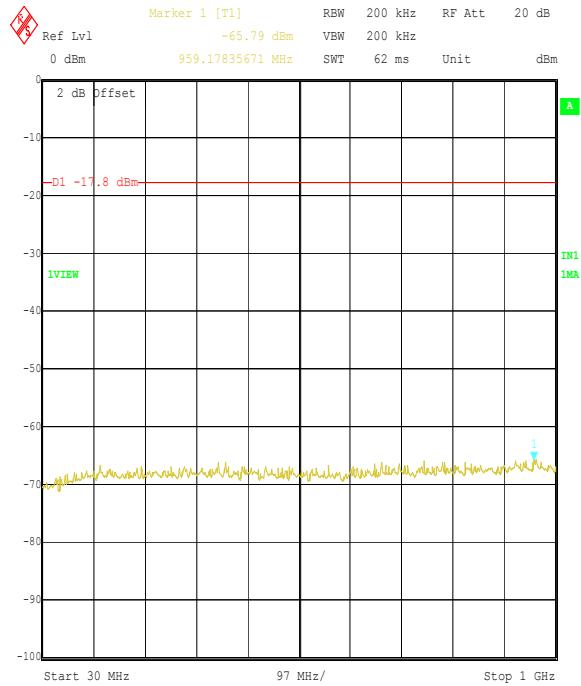
Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Conducted Emissions: Section 15.247(d) (Continued)

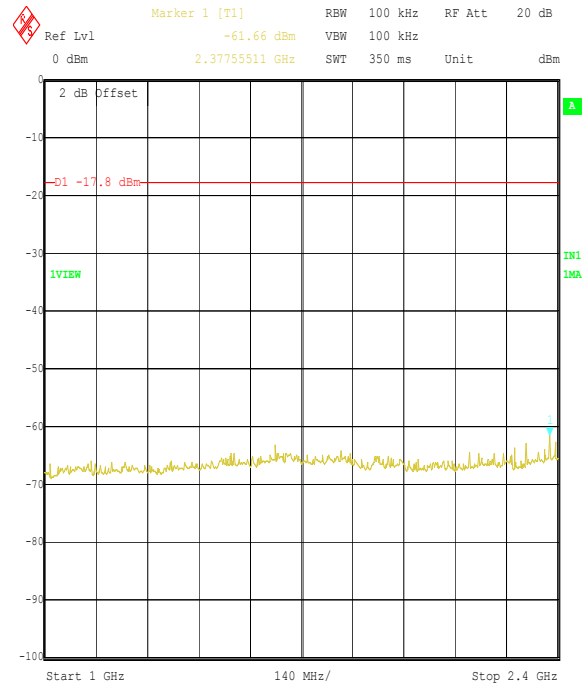


Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

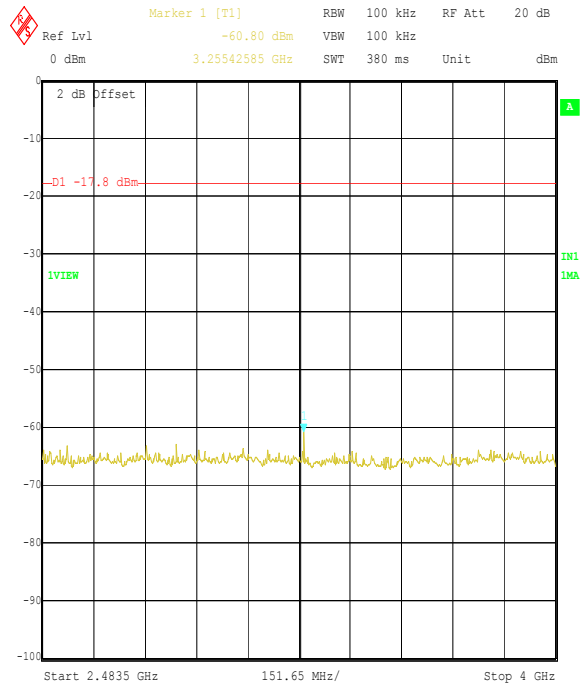
Transmitter Conducted Emissions: Section 15.247(d) (Continued)



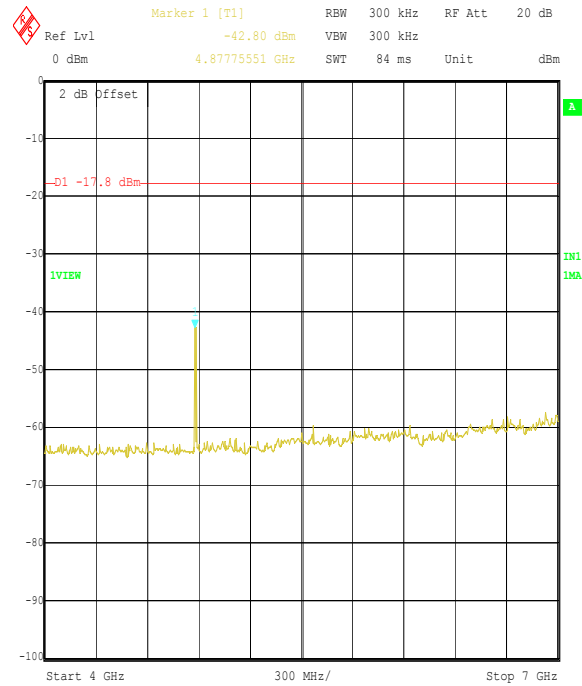
Comment A: 47077 JD03. Conducted Emissions, Middle Channel.
Date: 29.APR.2005 17:00:17



Comment A: 47077 JD03. Conducted Emissions, Middle Channel.
Date: 29.APR.2005 17:01:25



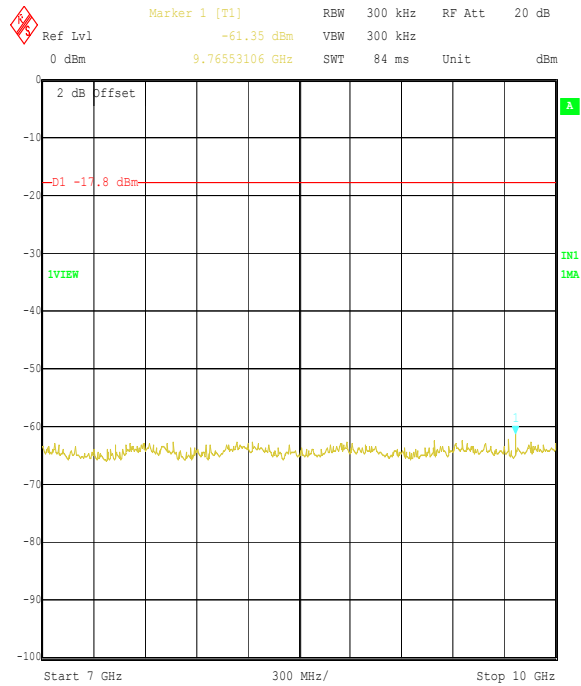
Comment A: 47077 JD03. Conducted Emissions, Middle Channel.
Date: 29.APR.2005 17:02:26



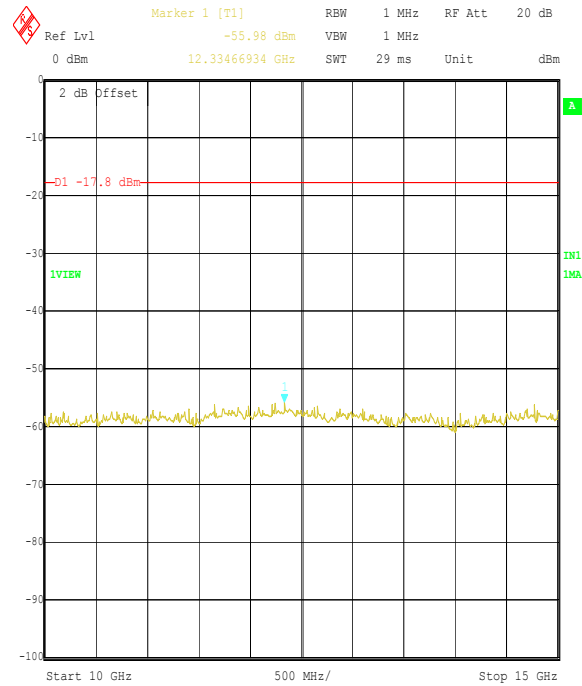
Comment A: 47077 JD03. Conducted Emissions, Middle Channel.
Date: 29.APR.2005 17:03:10

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

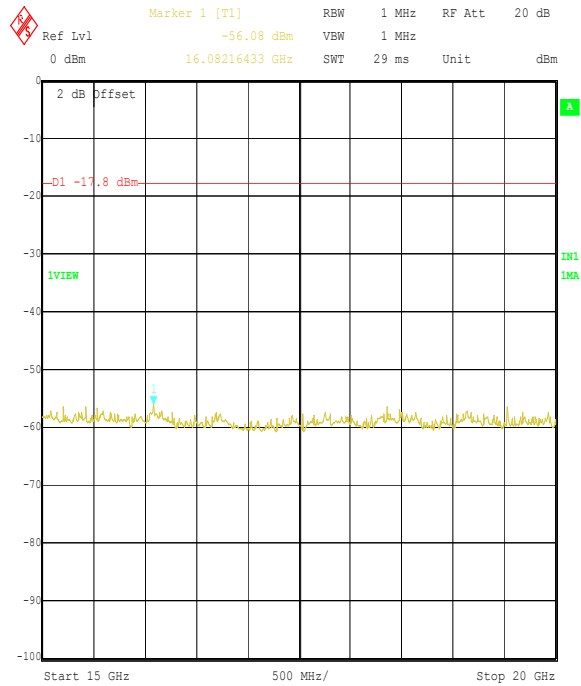
Transmitter Conducted Emissions: Section 15.247(d) (Continued)



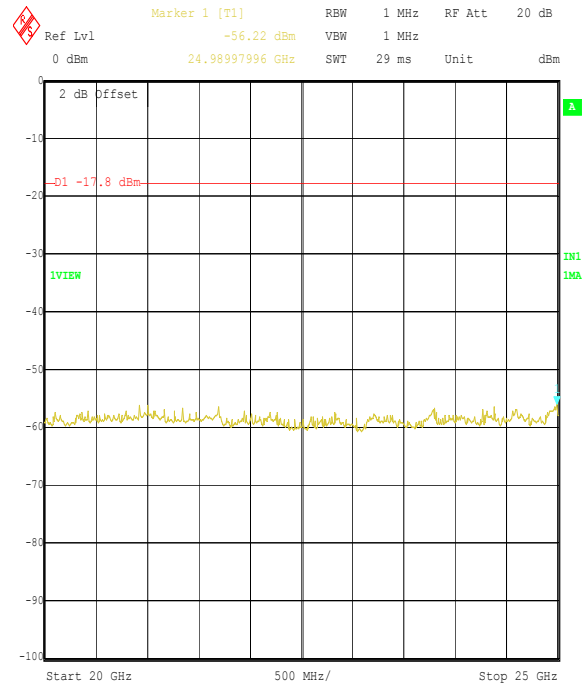
Comment A: 47077 JD03. Conducted Emissions, Middle Channel.
Date: 29.APR.2005 17:10:33



Comment A: 47077 JD03. Conducted Emissions, Middle Channel.
Date: 29.APR.2005 17:11:25



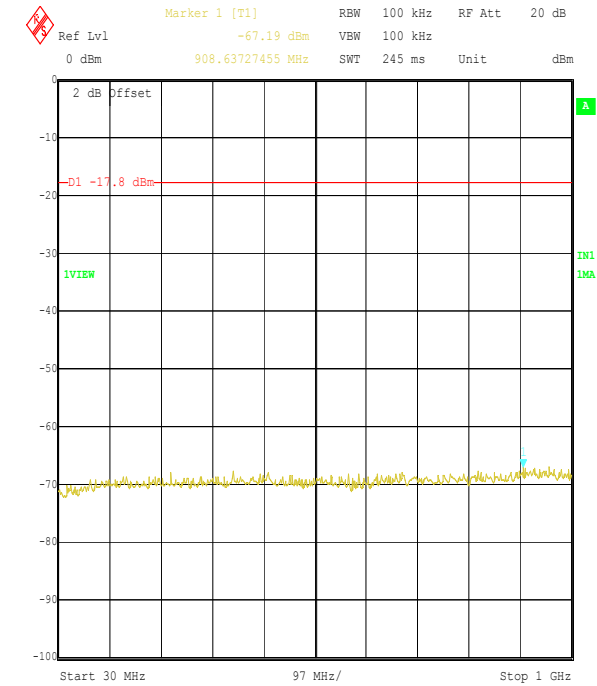
Comment A: 47077 JD03. Conducted Emissions, Middle Channel.
Date: 29.APR.2005 17:12:11



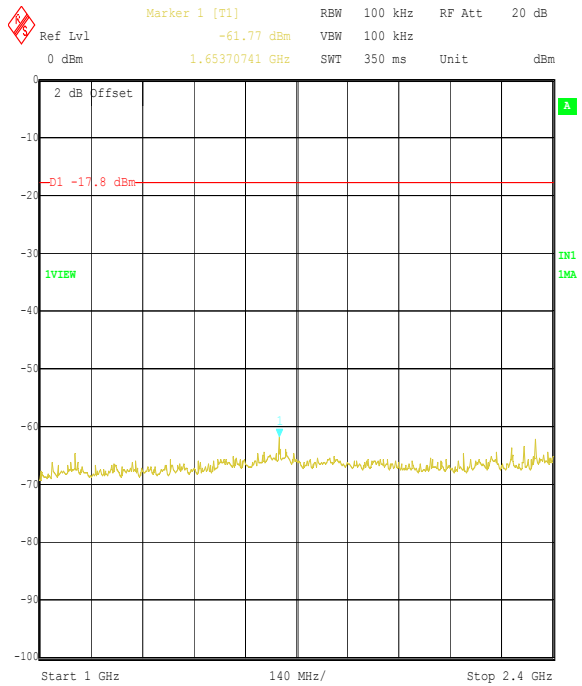
Comment A: 47077 JD03. Conducted Emissions, Middle Channel.
Date: 29.APR.2005 17:12:54

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

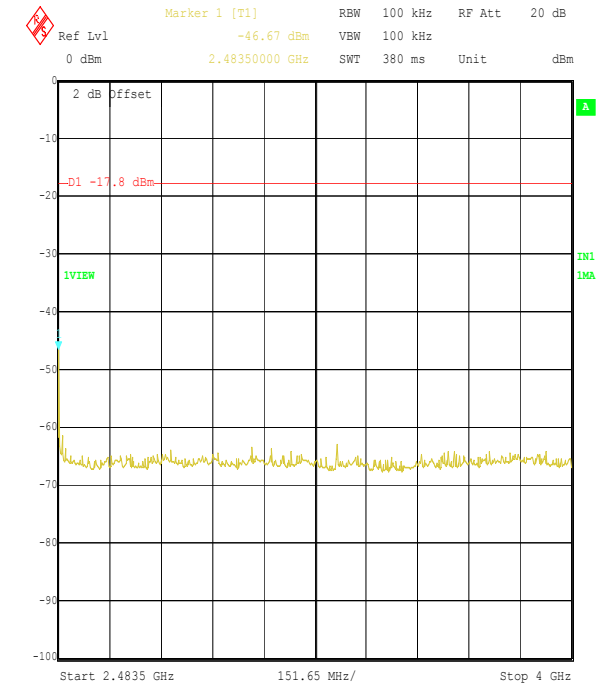
Transmitter Conducted Emissions: Section 15.247(d) (Continued)



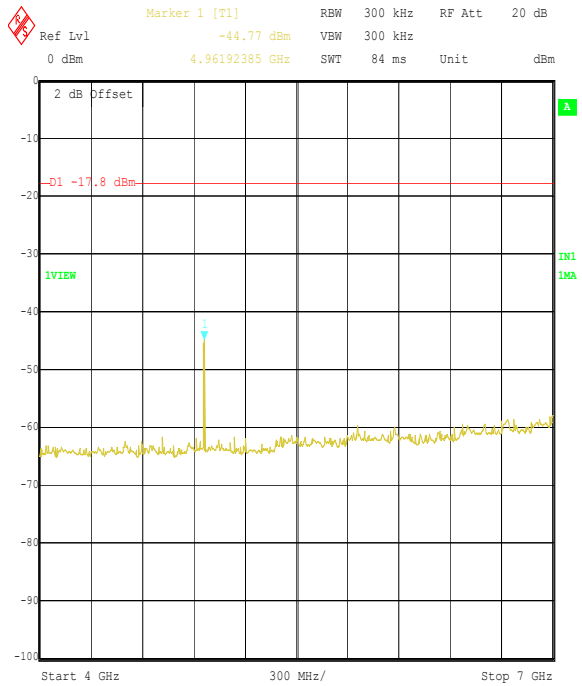
Comment A: 47077 JD03. Conducted Emissions, Top Channel.
Date: 29.APR.2005 17:14:57



Comment A: 47077 JD03. Conducted Emissions, Top Channel.
Date: 29.APR.2005 17:15:42



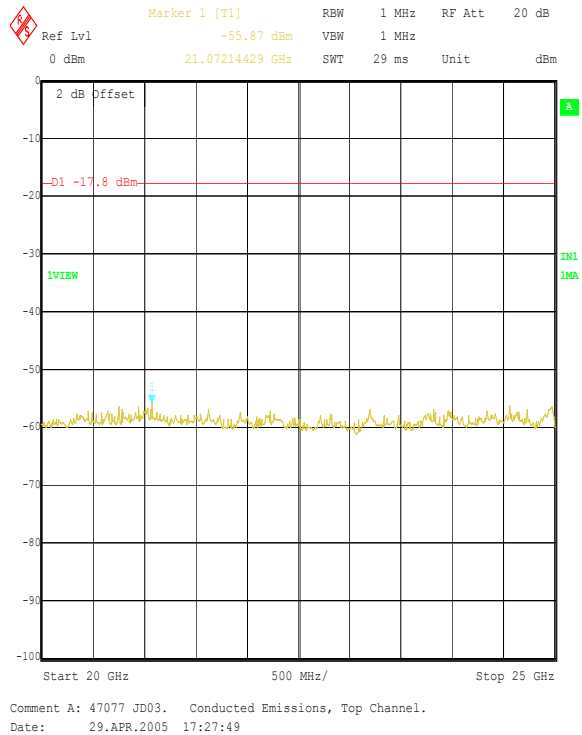
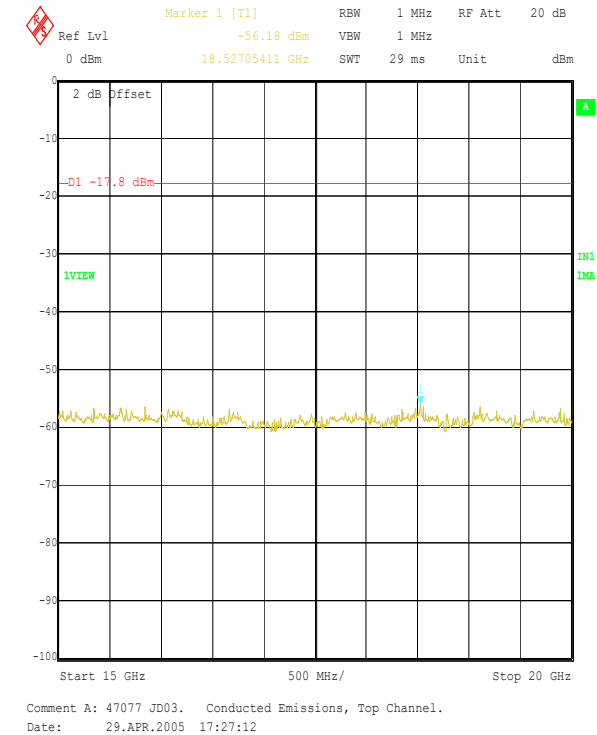
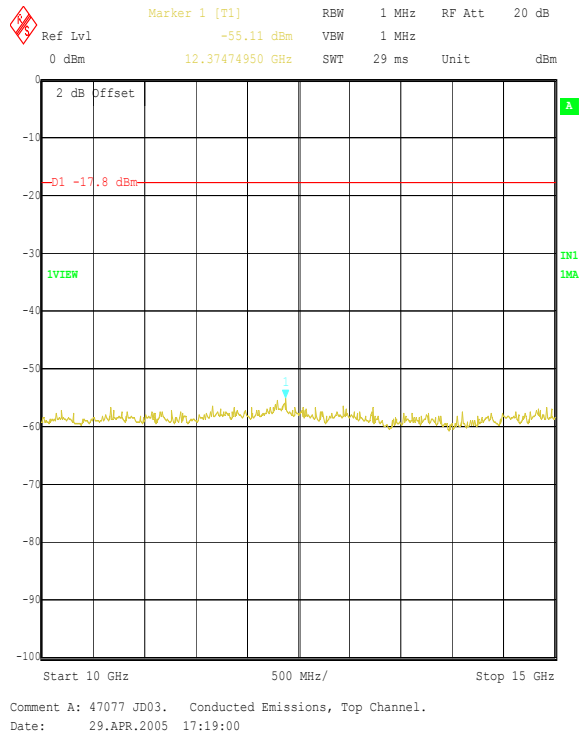
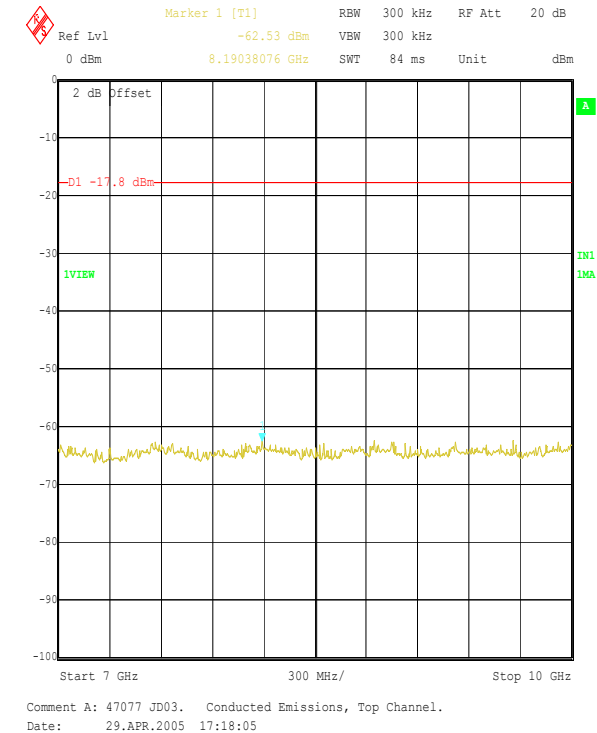
Comment A: 47077 JD03. Conducted Emissions, Top Channel.
Date: 29.APR.2005 17:16:22



Comment A: 47077 JD03. Conducted Emissions, Top Channel.
Date: 29.APR.2005 17:17:03

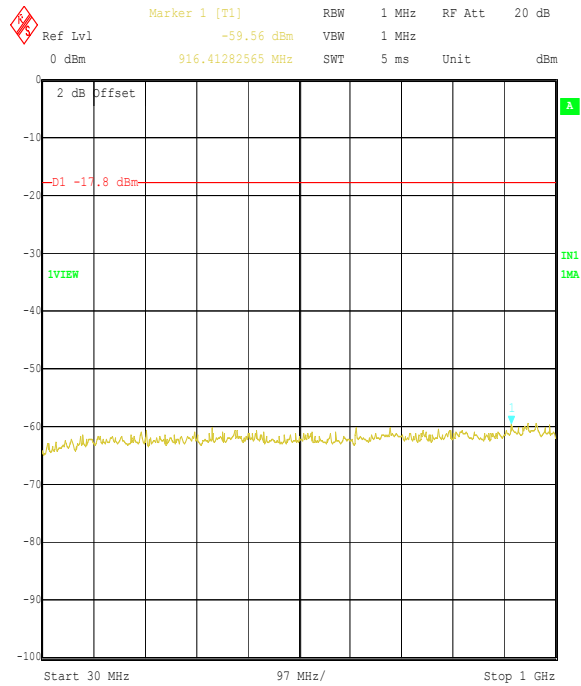
Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Conducted Emissions: Section 15.247(d) (Continued)

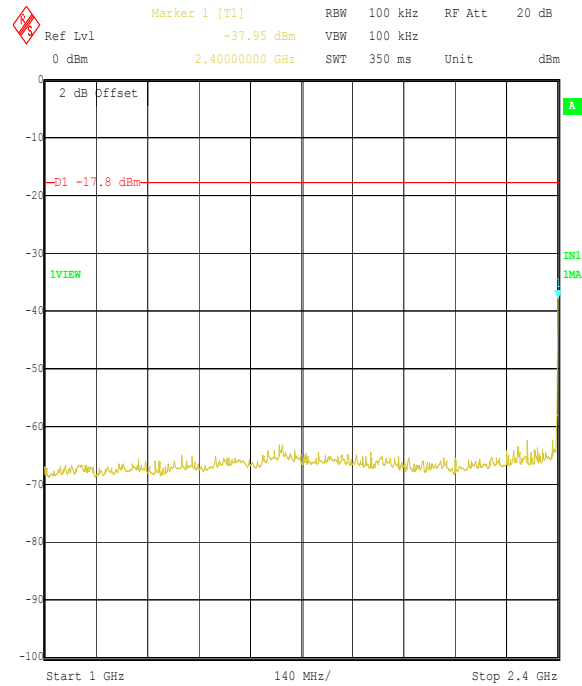


Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

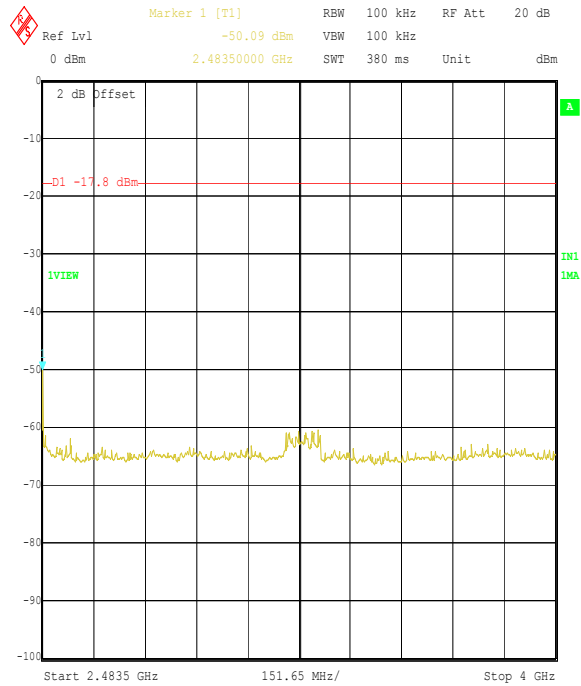
Transmitter Conducted Emissions: Section 15.247(d) (Continued)



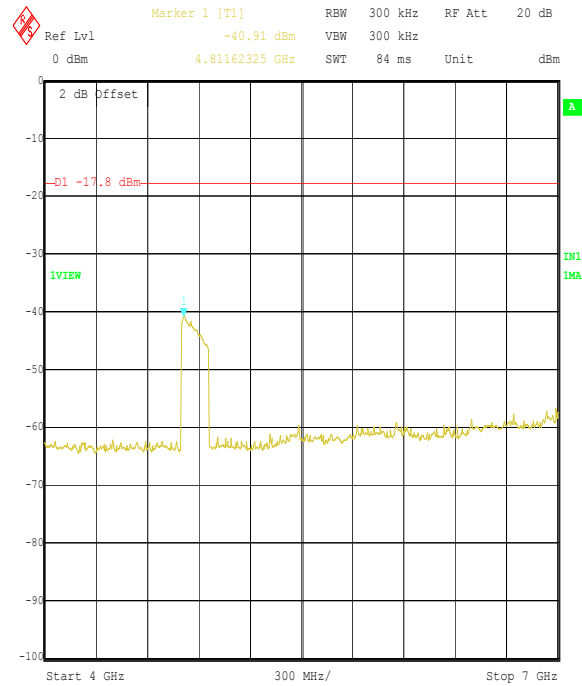
Comment A: 47077 JD03. Conducted Emissions, Hopping.
Date: 29.APR.2005 17:29:01



Comment A: 47077 JD03. Conducted Emissions, Hopping.
Date: 29.APR.2005 17:30:01



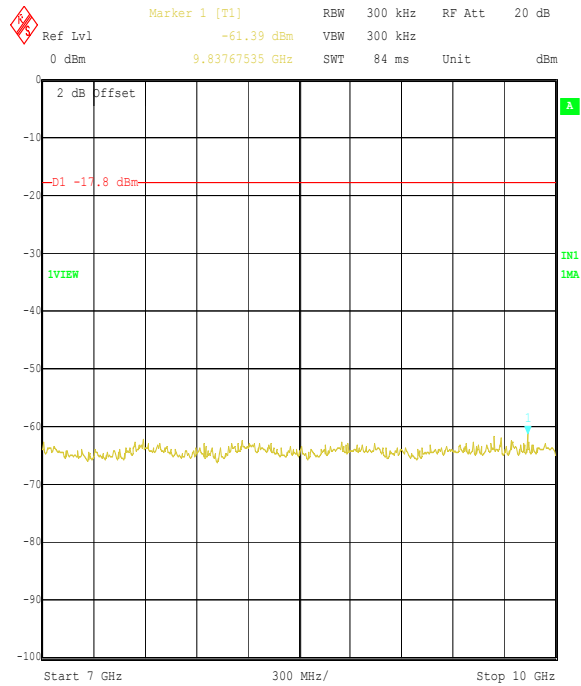
Comment A: 47077 JD03. Conducted Emissions, Hopping.
Date: 29.APR.2005 17:31:40



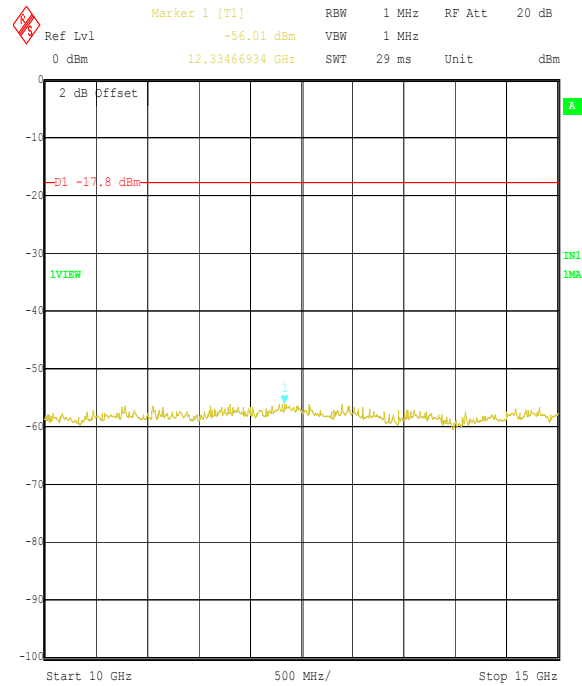
Comment A: 47077 JD03. Conducted Emissions, Hopping.
Date: 29.APR.2005 17:32:45

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

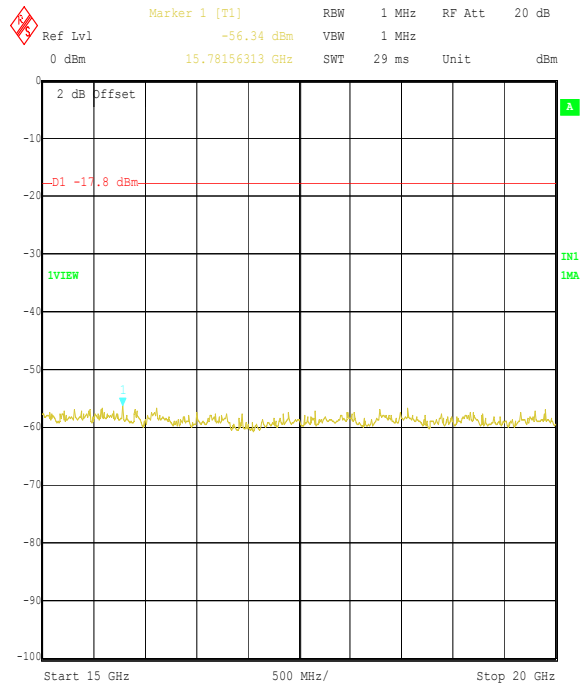
Transmitter Conducted Emissions: Section 15.247(d) (Continued)



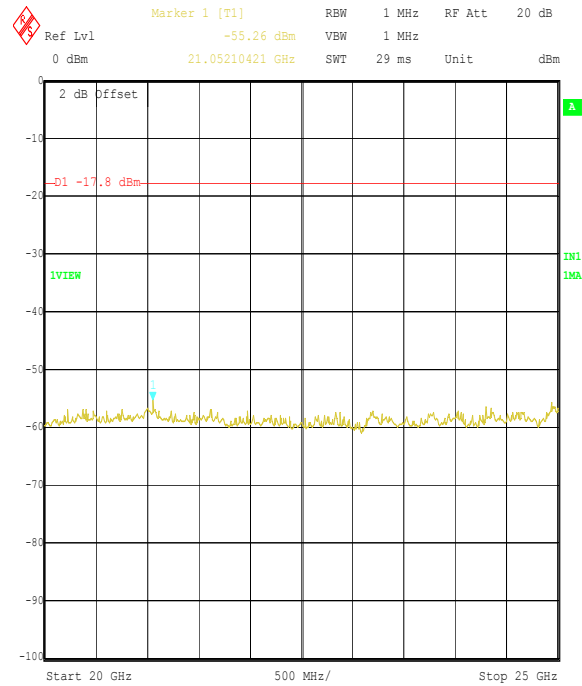
Comment A: 47077 JD03. Conducted Emissions, Hopping.
Date: 29.APR.2005 17:33:25



Comment A: 47077 JD03. Conducted Emissions, Hopping.
Date: 29.APR.2005 17:34:21



Comment A: 47077 JD03. Conducted Emissions, Hopping.
Date: 29.APR.2005 17:34:58



Comment A: 47077 JD03. Conducted Emissions, Hopping.
Date: 29.APR.2005 17:35:39

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

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

7.2.11. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements: 30 to 1000 MHz (emissions occurring in the restricted bands)

The EUT was configured for radiated emission testing as described in section 9 of this report. Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

Top Channel

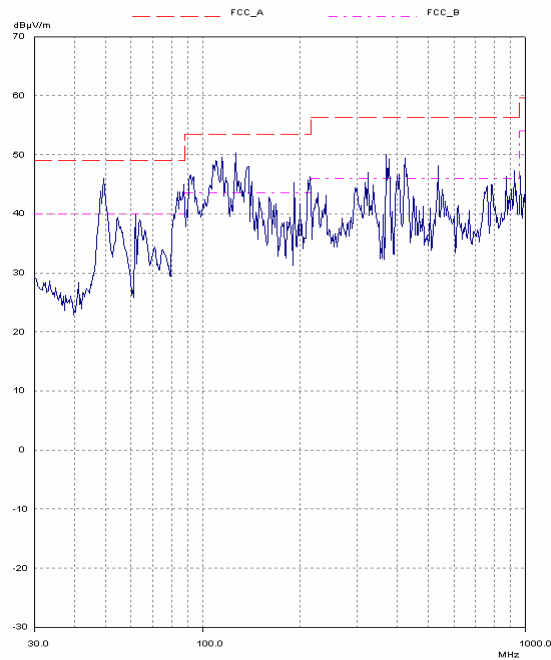
Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
108.101	Vert.	28.2	43.5	15.3	Complied
109.374	Vert.	28.8	43.5	14.7	Complied
114.874	Vert.	32.3	43.5	11.2	Complied
117.573	Vert.	29.7	43.5	13.8	Complied
126.421	Vert.	26.0	43.5	17.5	Complied
136.846	Vert.	26.1	43.5	17.4	Complied
324.087	Horiz.	30.2	46.0	15.8	Complied

Note(s):

1. The preliminary scans below 1 GHz showed similar emission levels irrespective of EUT channel selection, therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
-

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

7.2.12. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements: 30 to 1000 MHz (emissions occurring in the restricted bands) (Continued)



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

Test of: Ezurio Limited
 'The Intelligent Bluetooth Serial Module, Version II'
 To: FCC Part 15.247: 2004 (Subpart C)

7.2.13. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 25.0 GHz) (emissions occurring in the restricted bands)

The EUT was configured for radiated emission testing, as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.804	Horiz.	44.9	24.2	1.3	70.4	74.0	3.6	Complied

Highest Average Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.804	Horiz.	21.1	24.2	1.3	46.6	54.0	7.4	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.882	Vert.	42.0	24.2	1.3	67.5	74.0	6.5	Complied

Highest Average Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.882	Vert.	18.2	24.2	1.3	43.7	54.0	10.3	Complied

Test of: Ezurio Limited
 'The Intelligent Bluetooth Serial Module, Version II'
 To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 25.0 GHz) (emissions occurring in the restricted bands) (Continued)

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.960	Vert.	40.0	24.2	1.3	65.5	74.0	8.5	Complied

Highest Average Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.960	Vert.	16.2	24.2	1.3	41.7	54.0	12.3	Complied

Highest Peak Level: Hopping Mode

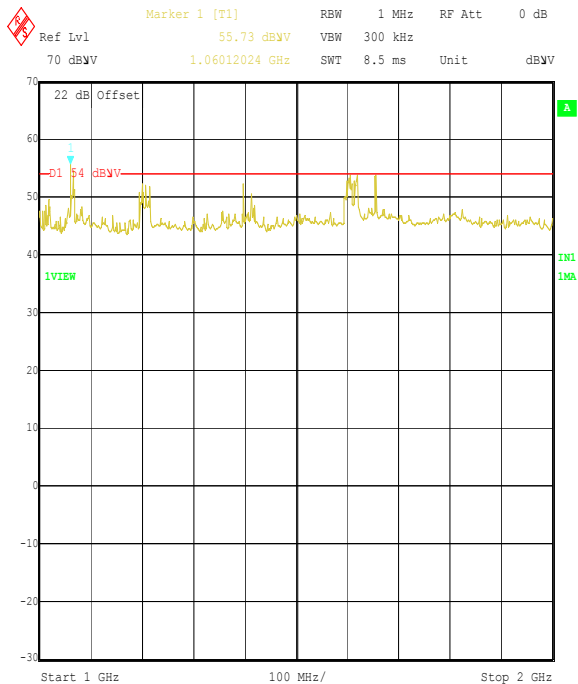
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.816	Horiz.	45.2	24.2	1.3	70.7	74.0	3.3	Complied

Highest Average Level: Hopping Mode

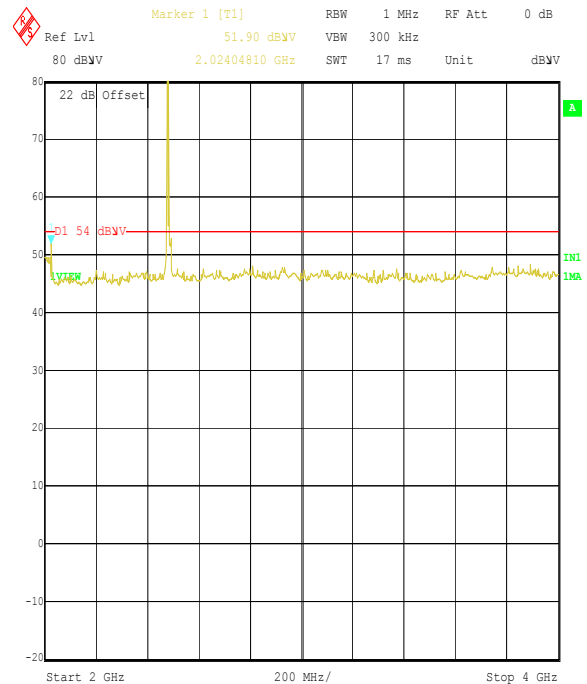
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.816	Horiz.	10.1	24.2	1.3	35.6	54.0	18.4	Complied

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

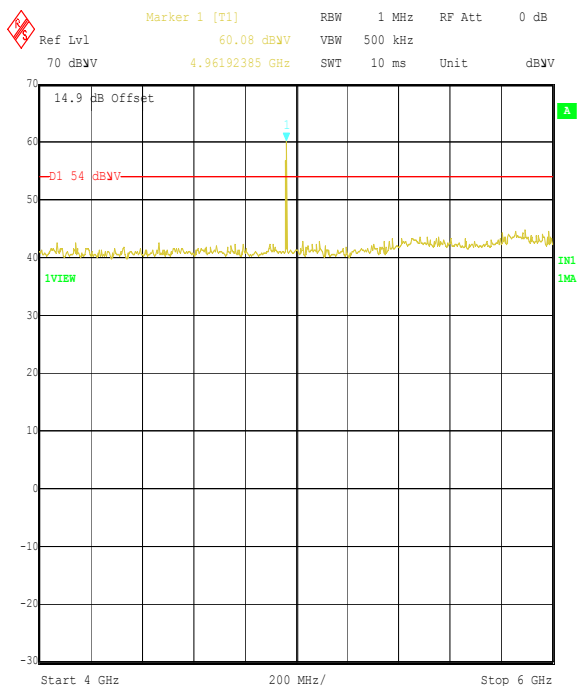
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 25.0 GHz) (emissions occurring in the restricted bands) (Continued)



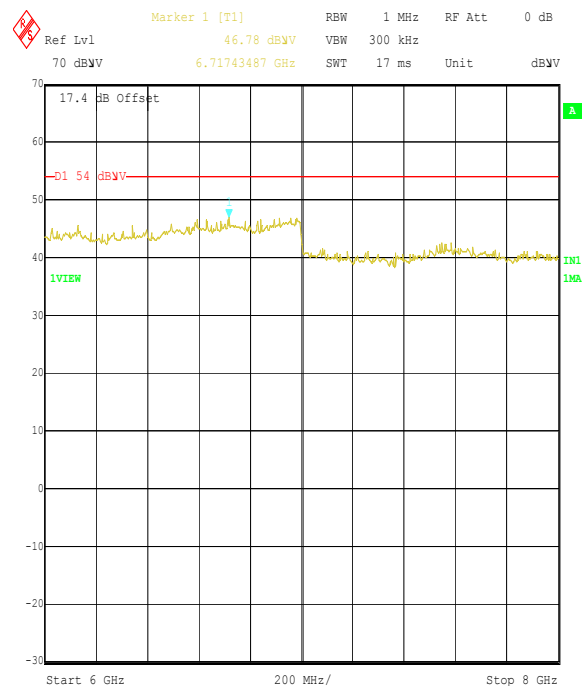
Comment A: 47077JD03. Radiated Spurious Emissions. Tx Mode.
Date: 26.APR.2005 16:05:31



Comment A: 47077JD03. Radiated Spurious Emissions. Tx Mode.
Date: 26.APR.2005 16:13:22



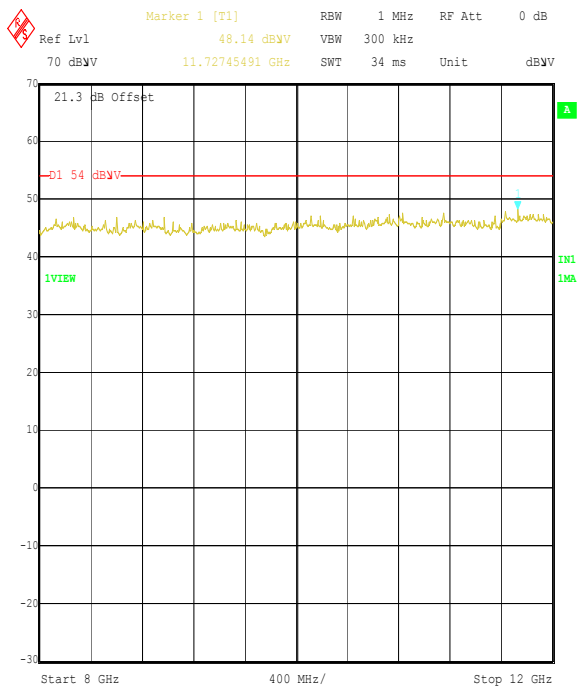
Comment A: 47077JD03. Radiated Spurious Emissions. Tx Mode.
Date: 26.APR.2005 16:41:01



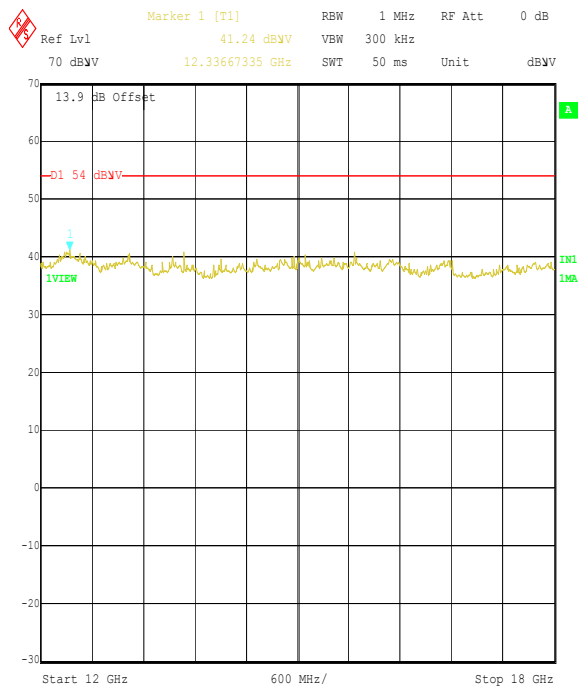
Comment A: 47077JD03. Radiated Spurious Emissions. Tx Mode.
Date: 26.APR.2005 16:45:09

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

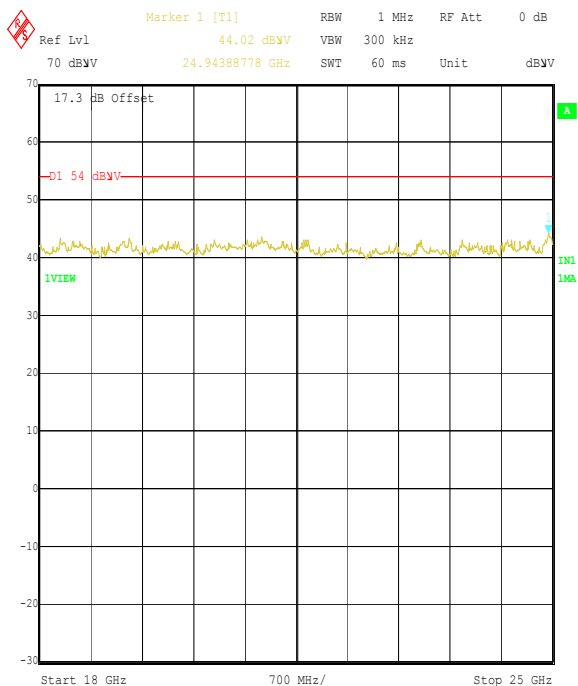
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 25.0 GHz) (emissions occurring in the restricted bands) (Continued)



Comment A: 47077JD03. Radiated Spurious Emissions. Tx Mode.
Date: 26.APR.2005 17:12:05



Comment A: 47077JD03. Radiated Spurious Emissions. Tx Mode.
Date: 26.APR.2005 17:23:59



Comment A: 47077JD03. Radiated Spurious Emissions. Tx Mode.
Date: 26.APR.2005 17:26:46

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

Test of: Ezurio Limited
'The Intelligent Bluetooth Serial Module, Version II'
To: FCC Part 15.247: 2004 (Subpart C)

7.2.14. Transmitter Band Edge Conducted Emissions: Section 15.247(d)

The EUT was configured for transmitter conducted emissions measurements, as described in section 9 of this report.

Tests were performed to identify the maximum conducted band edge emission levels.

The limit lines shown in the hopping mode plots are set to a level 20 dB below the measured fundamental peak power, of the highest power level, contained within the band, in a 100 kHz bandwidth.

The limit lines shown in the static mode plots are set to a level 20 dB below the measured fundamental peak power, of the channels closest to the lower and upper band edge, in a 100 kHz bandwidth.

Results:**Peak Power Level Hopping Mode:**

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
2400.0	-36.6	-36.3	-20.0	16.3	Complied
2483.5	-46.1	-47.4	-20.0	27.4	Complied

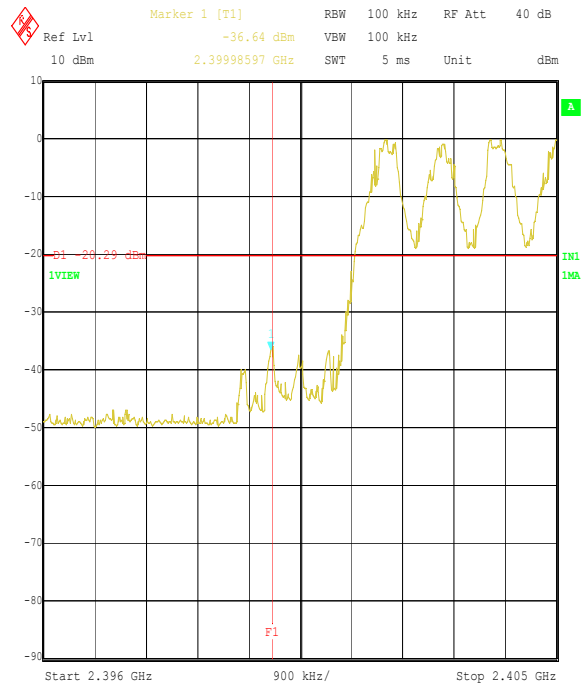
Peak Power Level Static Mode:

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
2400.0	-34.6	-34.4	-20.0	14.4	Complied
2483.5	-44.1	-45.4	-20.0	25.4	Complied

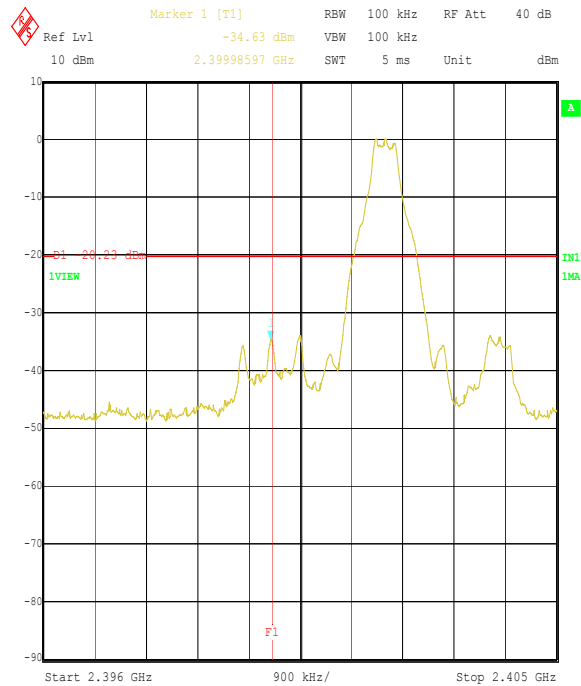
Note: This test was performed using the Conducted test method, on the EUT with an antenna port.

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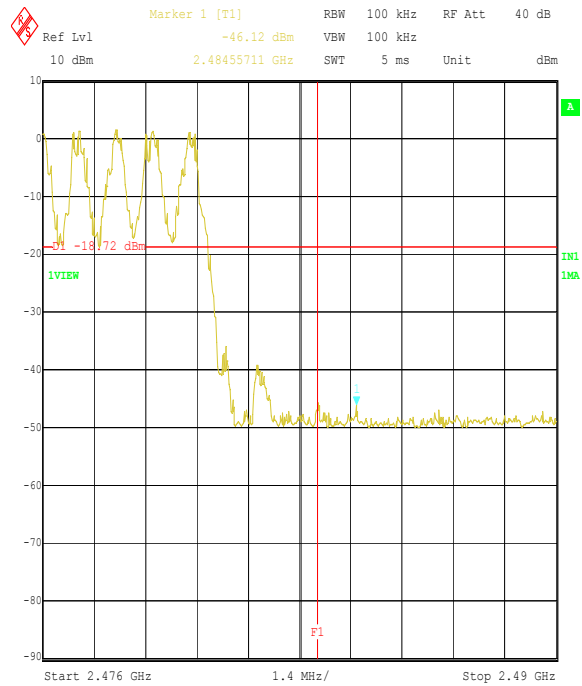
Transmitter Band Edge Conducted Emissions: Section 15.247(d) (Continued)



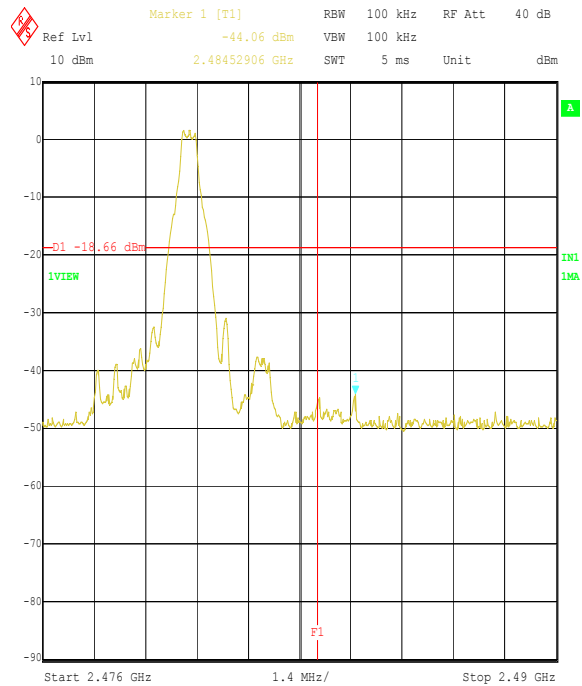
Comment A: 47077 JD03. Conducted Band Edge, Bottom Channel, Hopping.
Date: 4.MAY.2005 09:27:26



Comment A: 47077 JD03. Conducted Band Edge, Bottom Channel.
Date: 4.MAY.2005 09:39:22



Comment A: 47077 JD03. Conducted Band Edge, Top Channel, Hopping.
Date: 4.MAY.2005 09:44:19



Comment A: 47077 JD03. Conducted Band Edge, Top Channel.
Date: 4.MAY.2005 09:42:01

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7.2.15. Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) - Electric Field Strength Measurements

The EUT was configured for band edge compliance of radiated emission measurements, as described in section 9 of this report.

Tests were performed to identify the maximum radiated band edge emissions.

Results:

Peak Power Level Hopping Mode:

Frequency (<Hz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400.0	Vert.	33.6	20.6	6.3	60.5	76.6*	16.1	Complied
2483.5	Vert.	30.0	20.6	6.3	56.9	74.0	17.1	Complied

Average Power Level Hopping Mode:

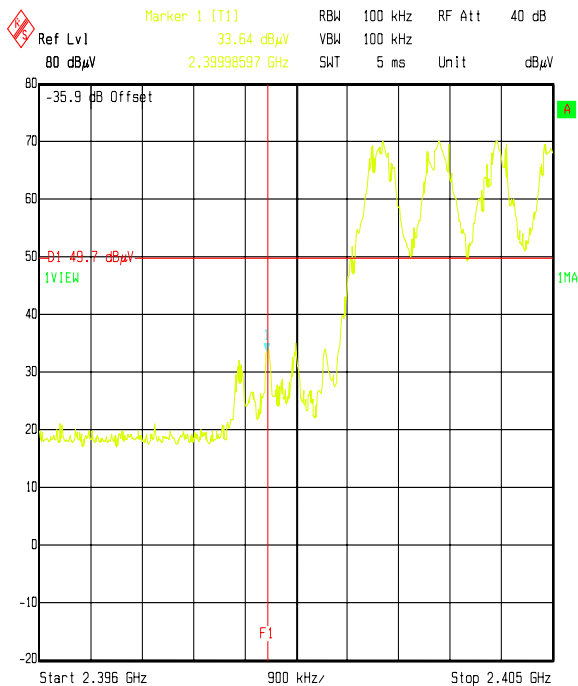
Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	Vert.	13.9	20.6	6.3	40.8	54.0	13.2	Complied

Note(s):

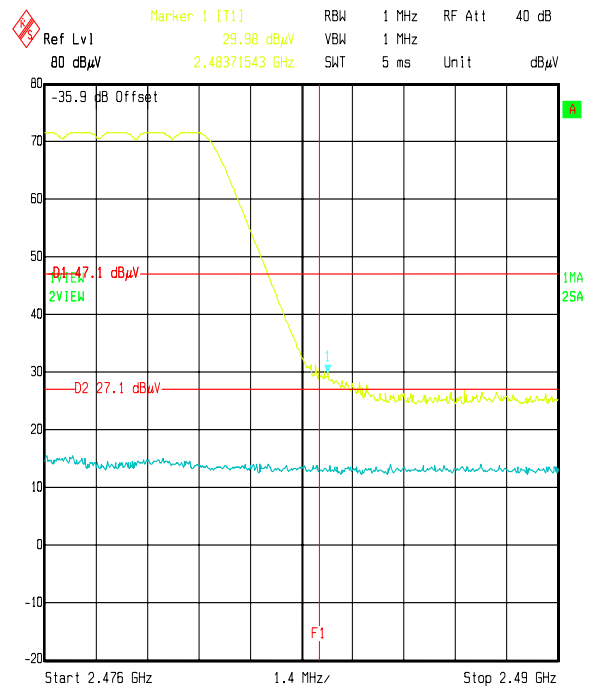
1. *-20 dBc limit.
 2. This test was performed using the Radiated test method, on the EUT with an integral antenna.
-

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Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) - Electric Field Strength Measurements (Continued)



Comment A: 47077 JD03. Lower Band Edge Emissions.
 Date: 29.APR.2005 15:36:01



Comment A: 47077 JD03. Upper Band Edge Emissions.
 Date: 29.APR.2005 15:40:49

Note 1: An additional +26.9 dB offset should be applied to these plots, to show the corrected levels.

Note 2: On the Upper Band Edge plot, the green trace shows the peak level and the blue trace shows the average level.

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7.2.16. Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a)

The EUT was configured for band edge compliance of radiated emission measurements as described in section 9 of this report.

Tests were performed to identify the average radiated band edge emissions.

Results:**Peak Power Level Static Mode:**

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400.0	Vert.	34.4	20.6	6.3	61.3	76.6*	15.3	Complied
2483.5	Vert.	32.5	20.6	6.3	59.4	74.0	14.6	Complied

Average Power Level Static Mode:

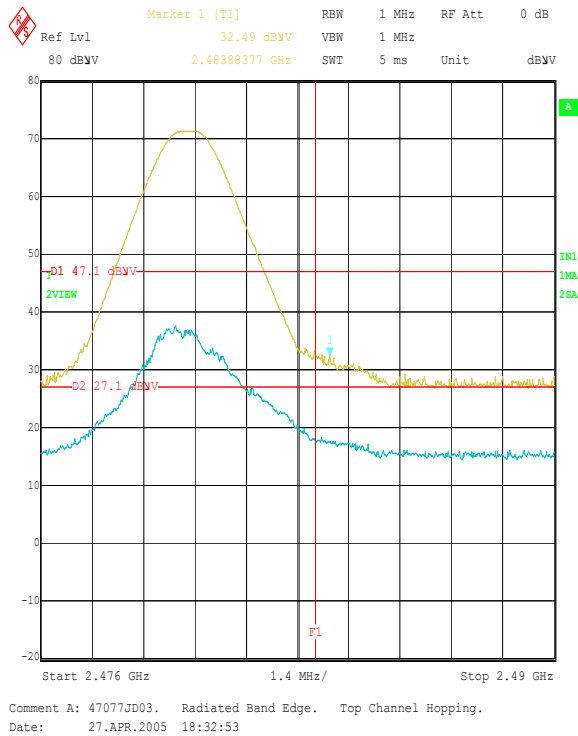
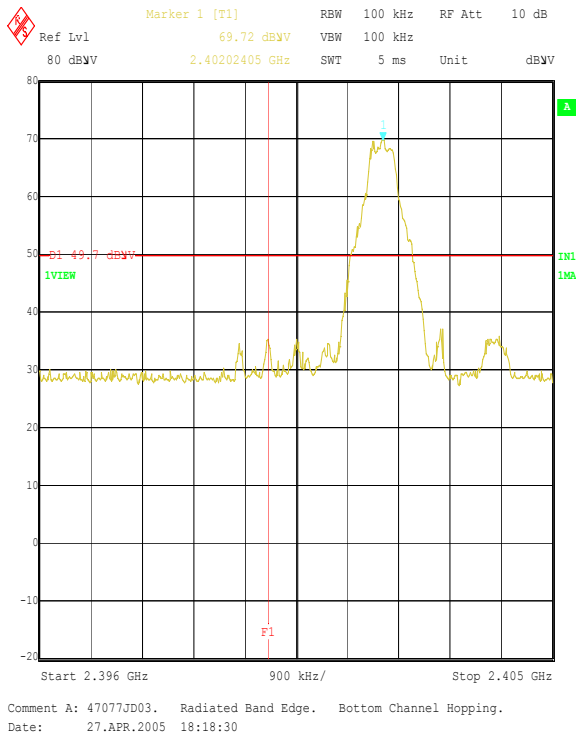
Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	Vert.	18.5	20.6	6.3	45.4	54.0	8.6	Complied

Note(s):

1. *-20 dBc limit.
 2. This test was performed using the Radiated test method, on the EUT with an integral antenna.
-

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Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)



Note 1: An additional +26.9 dB offset should be applied to these plots, to show the corrected levels.

Note 2: On the Upper Band Edge plot, the green trace shows the peak level and the blue trace shows the average level.

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8. 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
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	± 3.25 dB
Transmitter Maximum Peak Output Power, Conducted	Not applicable	95%	± 0.46 dB
Transmitter Maximum Peak Output Power, Radiated	Not applicable	95%	± 1.78 dB
Conducted Emissions Antenna Port	30 MHz to 40 GHz	95%	± 1.2 dB
Transmitter Carrier Frequency Separation	Not applicable	95%	± 0.01 ppm
Transmitter Average Time of Occupancy	Not applicable	95%	± 10 %
20 dB Bandwidth	Not applicable	95%	± 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	± 3.03 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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9. Measurement Methods

9.1. AC Mains Conducted Emissions

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

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with 110V 60 Hz ac mains supplied via a line impedance stabilisation network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

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

Receiver Function	Initial Scan	Final Measurements
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz	9 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	>1 s
Observation Time:	Not applicable	>15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

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9.2. 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 horns.

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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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9.3. Conducted Antenna Port Emissions

Conducted antenna port emissions measurements were performed using a 100 kHz bandwidth in accordance with the standard against the appropriate limits.

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

Initial measurements covering the entire measurement band in the form of swept scans were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which final measurements were necessary. To make the final measurements a peak detector was used in conjunction with the appropriate detector IF measuring bandwidth.

Repetitive scans were performed to allow for emissions with low repetition rates.

Scans were performed to the upper frequency limits as stated in 15.33(a)(1)

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9.4. Carrier Frequency Separation / 20 dB Bandwidth

The EUT and spectrum analyser was configured as for conducted antenna port 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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9.5. Average Time of Occupancy

The EUT and spectrum analyser was configured as for conducted antenna port 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 i.e. in the time domain and the sweep time was set to 32 seconds (the closest allowable setting to 31.6 seconds). This 31.6 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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9.6. Peak Output Power

The EUT and spectrum analyser were configured as 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, were 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 a wideband power meter.

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9.7. Effective 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 plane. 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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Effective 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.

$$\text{Delta (dB)} = \text{EUT} - \text{SG}$$

where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

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

The EUT EIRP is calculated as:

$$\text{EIRP EUT} = \text{EIRP SG} + \text{Delta.}$$

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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9.8. 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.
A027	Horn Antenna	Eaton	9188-2	301
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002
A1360	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1360-20112003
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519
A256	WG 18 Microwave Horn	Flann Microwave	18240-20	400
A259	Bilog Antenna	Chase	CBL6111	1513
A276	OATS Positioning Controller	Rohde & Schwarz	HCC	
A392	3 dB attenuator (9)	Suhner	6803.17.B	None
A428	WG 12 horn	Flann	12240-20	134
A436	WG 20 horn	Flann	20240-20	330
C1031	Coaxial Cable	Rosenberger	FA210B-1-010M-30X30	FA00C 7591
C1065	Rosenberger	Rosenberger	UFA210-1-7872	0985
C364	BNC Cable	Rosenberger	RG142	None
C453	Cable	Rosenberger	RG142XX-001-RFIB	C453-10081998
C461	Cable	Rosenberger	UFA210A-1-1182-704704	98H0305
C468	N-Type Coaxial Cable	Rosenberger	UFA210A-1-3937-504504	98L0440
C565	C565-N-3	Rosenberger	UFA 210A-1-1181-70x70	96 L 0703
C573	C573-N-N-2	Rosenberger	UFA210A-1-788-50x50	97E0936
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M028	FSB Spectrum Analyser	Rohde & Schwarz	FSB	860 001/009 (RF), 860 161/007 (Display)

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Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
M044	ESVP Receiver	Rohde & Schwarz	ESVP	891 845/026
M088	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:835862/018 RU:835387/006
M1122	Boonton Electronics	Boonton Electronics	57340	3297
M1123	Boonton	Boonton	4531	138201
M1124	Rohde & Schwarz	Rohde & Schwarz	ESIB26	100046K
M1132	RS	RS	212-124	05A03
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016
M128	Fluke 76 DVM	Fluke	76	65340273
M173	Turntable Controller	R.H.Electrical Services	RH351	3510020
M209	Thermo/hygro meter	RS Components	RS212-124	M209-RS212-124
S006	D.C. Power Supply	Rohde & Schwarz	NGPE 40/40	192.0332.41
S201	Site 1	RFI	1	
S212	Site 12	RFI	12	None
S202	Site 2	RFI	2	S202-15011990
S207	Site 7	RFI	7	05A03

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

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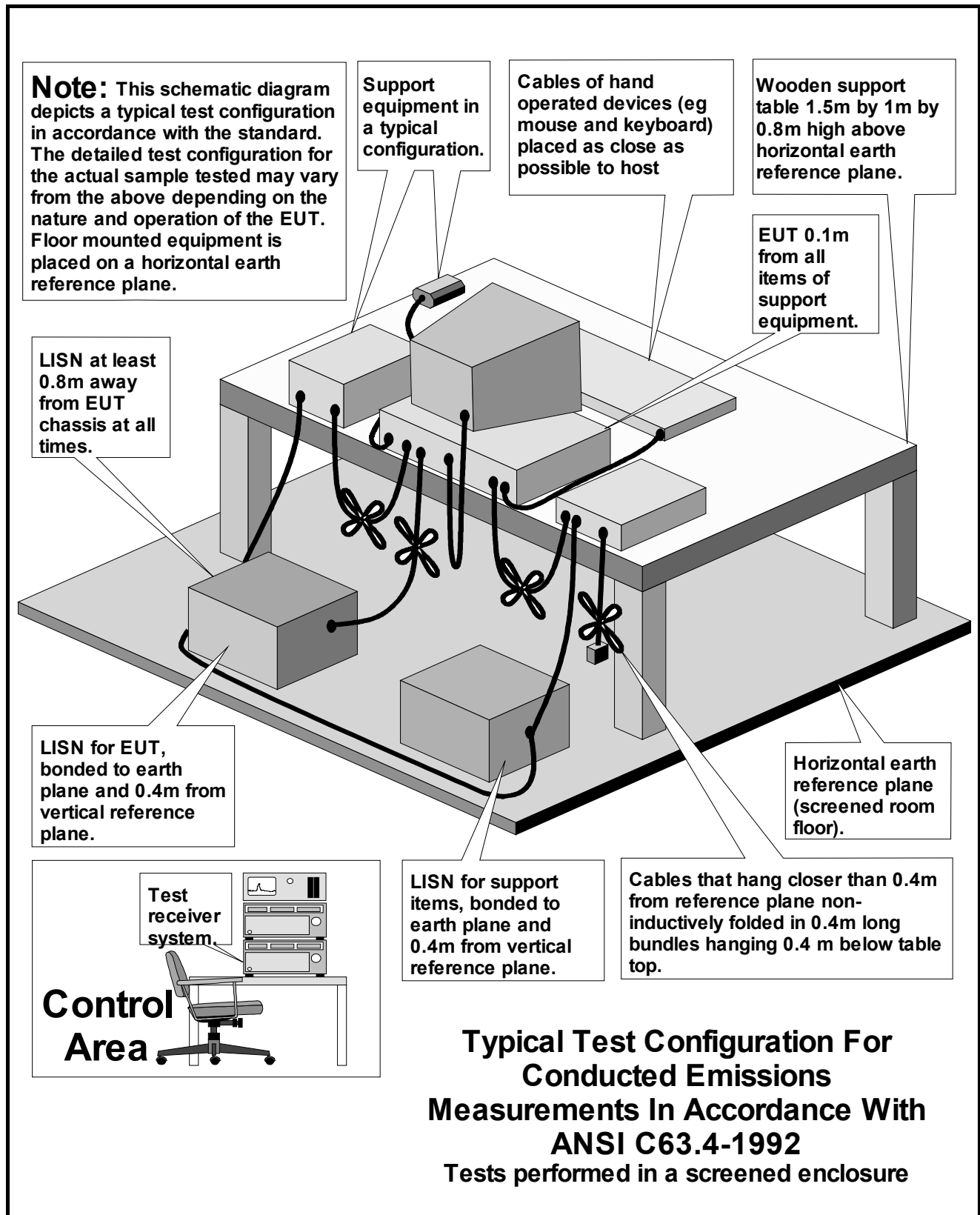
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\47077JD03\EMICON	Test configuration for measurement of conducted emissions.
DRG\47077JD03\EMIRAD	Test configuration for measurement of radiated emissions.

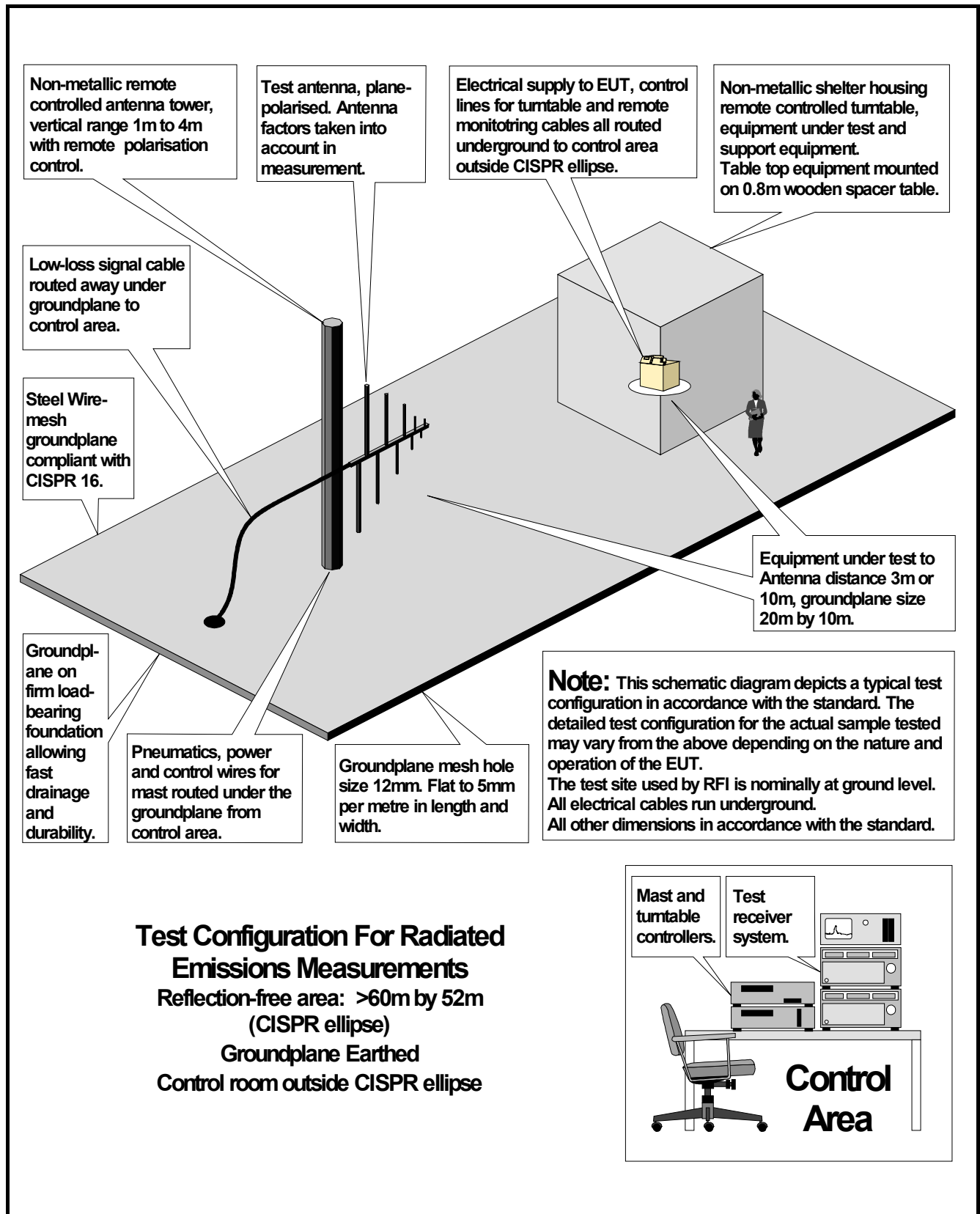
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DRG47077JD03\EMICON



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DRG\47077JD03\EMIRAD



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