




TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Engineering & Security Srl
BlueAudio V3, Intercom

To: FCC Part 15.247: 2005 (Subpart C)

Test Report Serial No:
RFI/RPTE1/RP48407JD06A

<p>This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager:</p> 	
<p>Tested By: Steven Wong</p>  <p>pp</p>	<p>Checked By: Michael Derby</p> 
<p>Report Copy No: PDF01</p>	
<p>Issue Date: 01 December 2006</p>	<p>Test Dates: 14 September 2006 to 26 September 2006</p>

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RFI GLOBAL SERVICES LTD

TEST REPORT

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1. Client Information

Company Name:	Engineering & Security Srl
Address:	Via Gropallo, 10/5 16122 Genova Italy
Contact Name:	Mr G Olive

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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)

Description:	Intercom
Brand Name:	STILO NOLAN NCOM BLUETOOTH KIT
Model Name or Number:	BlueAudio V3
Unique Type Identification:	None Stated
Serial Number:	None Stated
Hardware Version:	V3.2
Software Version:	V3.1
FCC ID Number:	TOTBT01
Country of Manufacture:	Italy
Date of Receipt:	14 September 2006

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2.2. Accessories

The following accessories were supplied with the EUT, as were these details:

Description:	AC Charger
Brand Name:	None stated
Model Name or Number:	Caricabatt0001
Serial Number:	Not Applicable
Cable Length and Type:	>1.0m, 2 core
Connected to Port:	DC Input

Description:	Microphone
Brand Name:	None stated
Model Name or Number:	Miccablat0002
Serial Number:	None stated
Cable Length and Type:	200mm, Audio cable
Connected to Port:	Audio Input

Description:	Audio Cable
Brand Name:	None stated
Model Name or Number:	None stated
Serial Number:	None stated
Cable Length and Type:	3.5mm Jack 200mm, Audio cable
Connected to Port:	Intercom Audio Input Port

Description:	Audio Cable
Brand Name:	None stated
Model Name or Number:	None stated
Serial Number:	None stated
Cable Length and Type:	2.5mm Jack 200mm, Audio cable
Connected to Port:	Intercom Audio Output Port

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2.3. Description of EUT

The equipment under test is a BlueAudio intercom for helmet application. In the intercom operating mode, a *Bluetooth* audio connection is used without following any type of profile. At the same time the BlueAudio is able to communicate with a cellular phone using either the Headset or the Handsfree profile fixed at the pairing time.

2.4. Modifications Incorporated in EUT

During the course of testing the EUT was not modified.

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2.5. Additional Information Related to Testing

Power Supply Requirement:	DC Supply of 3.6 Li-ion Battery. AC Charger, Nominal 115 V, 60 Hz.		
Intended Operating Environment:	Residential, Commercial, Light Industry and Other within <i>Bluetooth</i> Coverage		
Equipment Category:	<i>Bluetooth</i> Technology		
Type of Unit:	Portable (Standalone battery powered device)		
Transmit Frequency Range:	2402 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 to 2480 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Maximum Power Output (EIRP)	0.3 dBm (Measured)		

2.6. Port Identification

Port	Description
1	Audio Input Port
2	Intercom Audio Input Port
3	Intercom Audio Output Port
4	DC Input Port

2.7. Support Equipment

No support equipment was used to exercise the EUT during testing.

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3. Test Specification

Reference:	FCC Part 15.247: 2005 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/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

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 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:

For all transmit mode measurements, the Bluetooth test mode was active and set to transmit on top, middle and bottom channels and hopping on all channels as necessary with the longest data packet size.

Receiver mode measurements were performed with the EUT set to receive mode only.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

The EUT was configured with the audio input and output port terminated. The EUT is also connected to the external 10V AC mains supply via the AC charger.

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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)	Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	Section 15.109	Antenna	Complied
Transmitter AC Conducted Emissions (150 kHz to 30 MHz)	Section 15.207	AC Mains	Complied
Transmitter 20 dB Bandwidth	Section 15.247(a)(1)	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)(1)	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

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.

FCC Site Registration Number: 90895

IC Site Registration Number: 3485

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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:

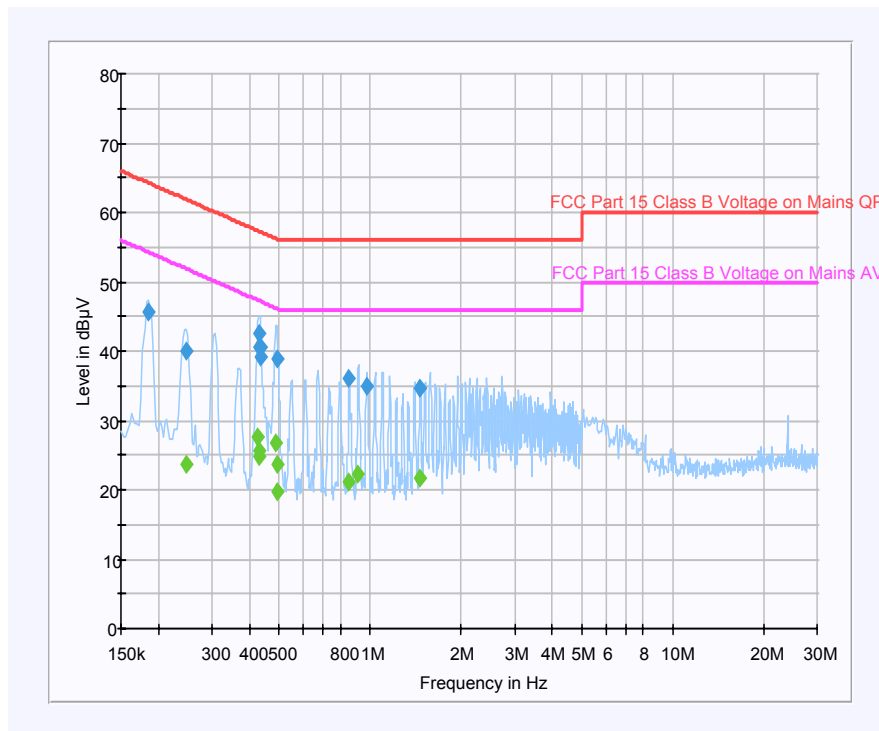
Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.184466	Live	45.6	64.3	18.7	Complied
0.246158	Live	39.9	61.9	22.0	Complied
0.428477	Live	42.4	57.3	14.9	Complied
0.431002	Live	40.4	57.2	16.8	Complied
0.431549	Live	40.5	57.2	16.7	Complied
0.432445	Live	39.2	57.2	18.0	Complied
0.491603	Live	38.9	57.2	17.2	Complied
0.851127	Live	36.0	56.1	20.0	Complied
0.974548	Live	35.0	56.0	21.0	Complied
1.459198	Live	34.7	56.0	21.3	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.247021	Live	23.7	51.9	28.2	Complied
0.423504	Live	27.7	47.4	19.7	Complied
0.430281	Live	25.6	47.2	21.6	Complied
0.430874	Live	24.8	47.2	22.4	Complied
0.488718	Live	26.7	46.2	19.5	Complied
0.491243	Live	23.7	46.1	22.4	Complied
0.493763	Live	19.8	46.1	26.3	Complied
0.848478	Live	21.0	46.0	25.0	Complied
0.912970	Live	22.2	46.0	23.8	Complied
1.459920	Live	21.7	46.0	24.8	Complied

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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

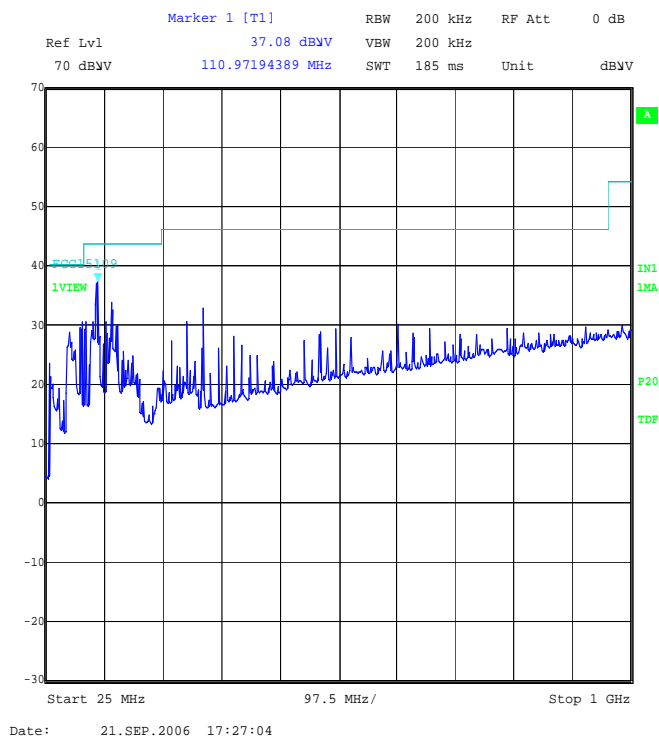
The EUT was configured as for radiated emission testing as described in section 9 of this report.

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

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

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
108.707	Vertical	18.0	43.5	25.5	Complied
120.671	Vertical	17.5	43.5	26.0	Complied
124.940	Vertical	23.0	43.5	20.5	Complied
135.020	Vertical	27.0	43.5	16.5	Complied
285.998	Vertical	30.0	46.0	16.0	Complied
480.992	Vertical	27.0	46.0	19.0	Complied
559.008	Vertical	34.0	46.0	12.0	Complied

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Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)

Note: 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: Section 15.109 (Continued)**Results:****Electric Field Strength Measurements (Frequency Range: 1 to 12.5 GHz)****Highest Peak Level:**

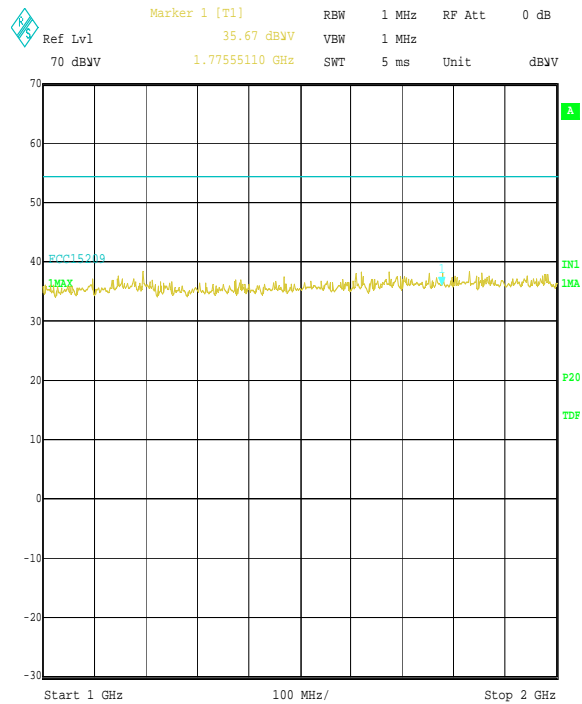
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3.695271	Vertical	49.3	-10.2	39.1	54.0	14.9	Complied

Note(s):

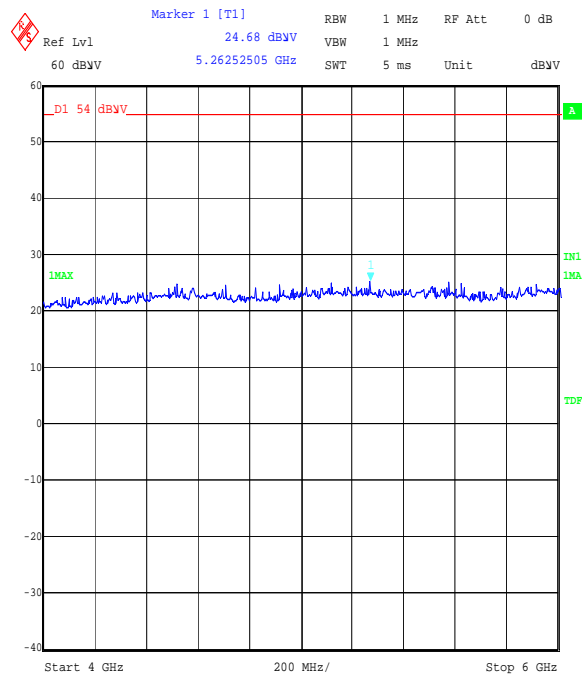
1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.
2. The emission at 10.687 GHz shown in the 8 to 12.5 GHz was confirmed to be an ambient emission from the background. Therefore, no further measurement was performed on this frequency.

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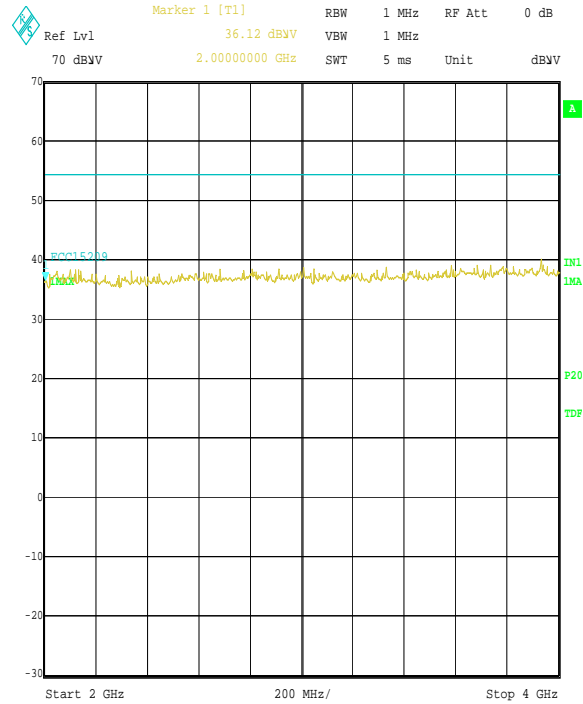
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



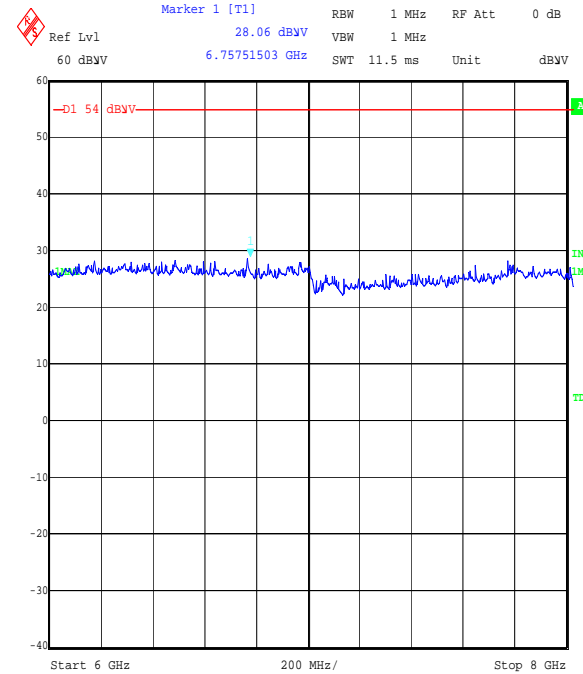
Date: 14.SEP.2006 16:33:02



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Emissions
Comment A: 48407JD01 Operating in Receive Mode.
Date: 15.SEP.2006 10:54:29



Date: 14.SEP.2006 16:19:34

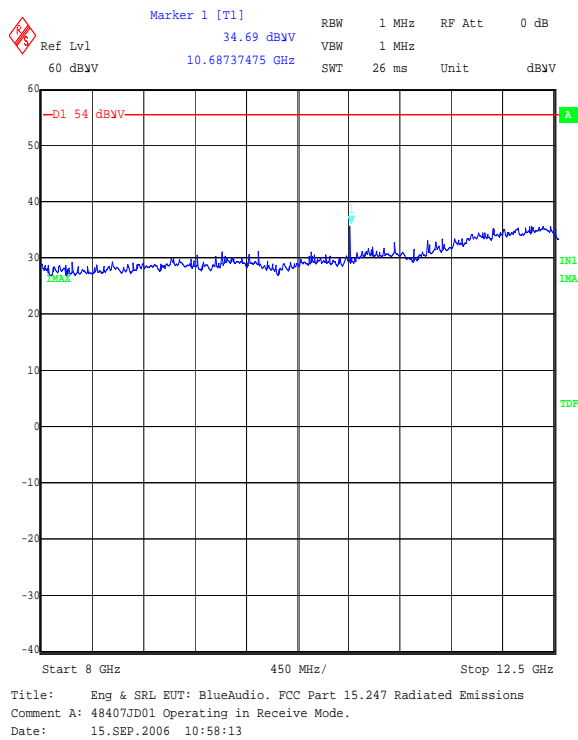


Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Emissions
Comment A: 48407JD01 Operating in Receive Mode.
Date: 15.SEP.2006 10:52:11

Note: 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: Section 15.109 (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. 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:

Quasi-Peak Detector Measurements on Live and Neutral Lines

Top Channel

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.185359	Live	40.2	64.2	24.0	Complied
0.427756	Live	43.6	57.3	13.7	Complied
0.428296	Live	43.1	57.3	14.2	Complied
0.488176	Live	39.0	56.2	17.2	Complied
0.611002	Live	34.4	56.0	21.6	Complied
0.669619	Live	35.2	56.0	20.8	Complied
1.220080	Live	33.3	56.0	22.7	Complied
1.343627	Live	31.8	56.0	24.2	Complied
1.400622	Live	33.6	56.0	22.4	Complied
1.521242	Live	33.1	56.0	22.9	Complied

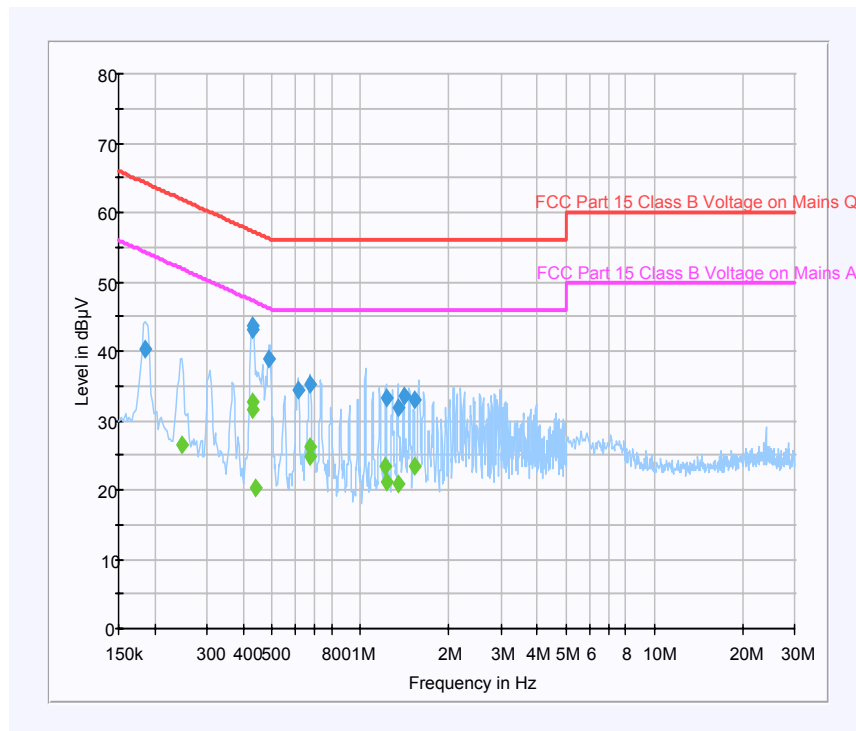
Average Detector Measurements on Live and Neutral Lines

Top Channel

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.245727	Live	26.6	51.9	25.3	Complied
0.428477	Live	32.6	47.3	14.7	Complied
0.429018	Live	31.7	47.3	15.6	Complied
0.441282	Live	20.2	47.0	26.8	Complied
0.670340	Live	26.3	46.0	19.7	Complied
0.671603	Live	24.8	46.0	21.2	Complied
1.218097	Live	23.5	46.0	22.5	Complied
1.220080	Live	21.1	46.0	24.9	Complied
1.342906	Live	20.9	46.0	25.1	Complied
1.519078	Live	23.4	46.0	22.6	Complied

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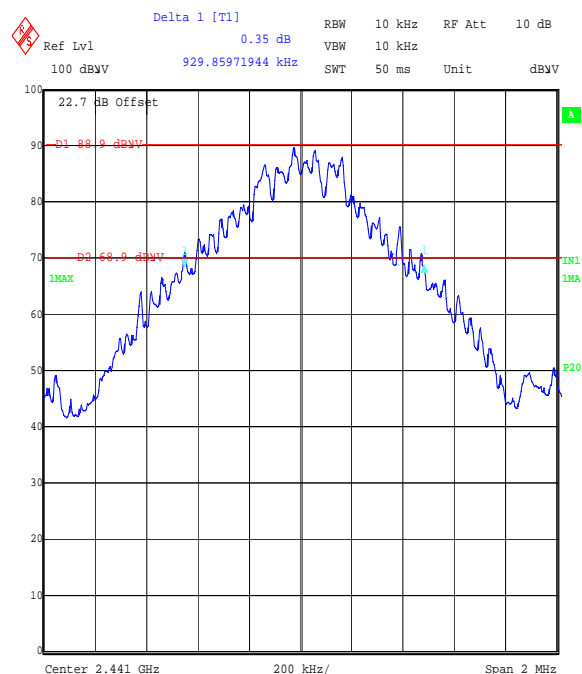
7.2.4. Transmitter 20 dB Bandwidth: Section 15.247(a)(1)

The EUT was configured for 20 dB bandwidth measurements, as described in section 9 of this report.

Tests were performed to identify the 20 dB bandwidth.

Results:

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



Title: Eng & SRL EUT: BlueAudio, FCC Part 15.247 20dB Bandwidth
Comment A: 48407JD01 Operating in Middle Channel.
Date: 15.SEP.2006 12:44:50

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7.2.5. 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.

Tests were performed to identify the carrier frequency separation.

Results:

Transmitter Carrier Frequency Separation (kHz)	Limit ($> \frac{2}{3}$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.004	619.907	382.097	Complied



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Carrier Separation
Comment A: 48407JD01 Operating in Hopping on All Channels.
Date: 15.SEP.2006 12:48:57

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7.2.6. 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.

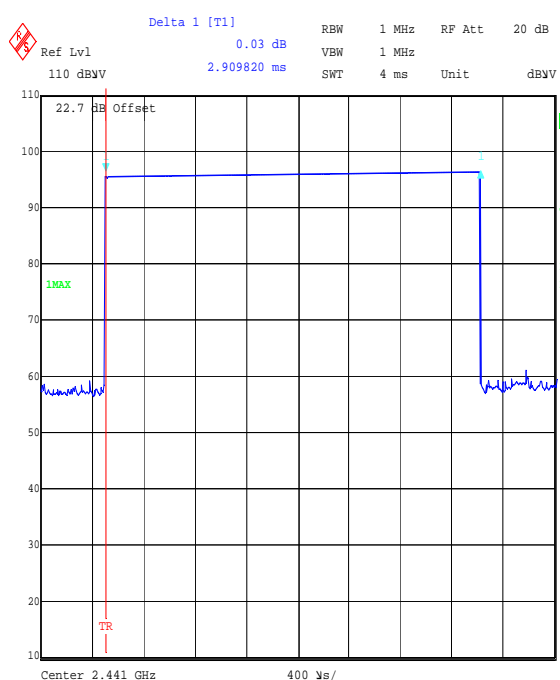
Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.

Results:

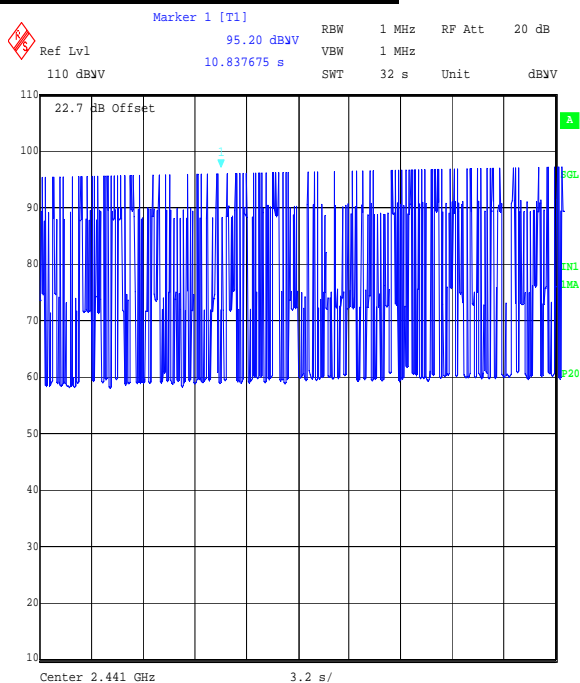
Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2909.820	111	0.323	0.4	0.077	Complied

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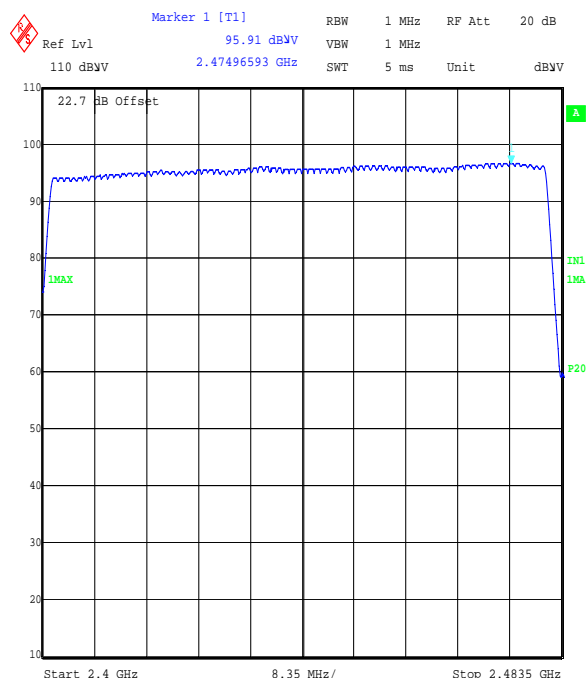
Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii) (Continued)



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Emission Width
Comment A: 48407JD01 Operating in Hopping on All Channels.
Date: 15.SEP.2006 12:51:12



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 No. of Hops in 32s
Comment A: 48407JD01 Operating in Hopping on All Channels.
Date: 15.SEP.2006 12:58:01



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Hopping Channels
Comment A: 48407JD01 Operating in Hopping on All Channels.
Date: 15-SEP-2006 13:01:20

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7.2.7. 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:**Battery Powered Devices**

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	-1.1	30.0	31.1	Complied
Middle	0.1	30.0	29.9	Complied
Top	0.3	30.0	29.7	Complied

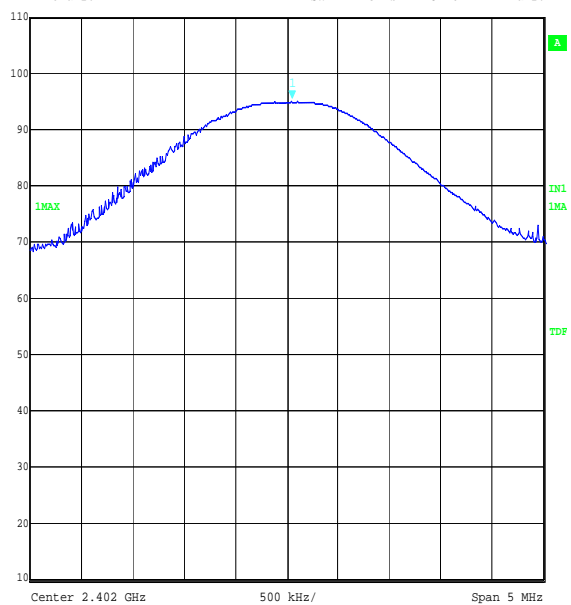
Note(s):

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

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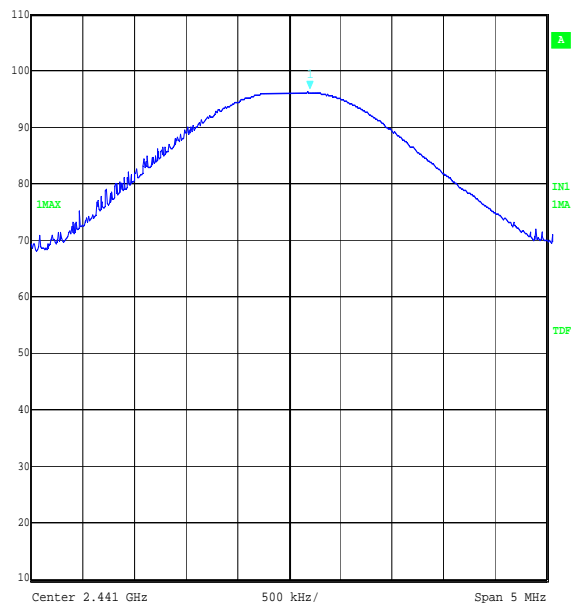
Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1) (Continued)

Marker 1 [T1]
Ref Lvl 94.09 dBV
110 dBV 2.40203507 GHz
RBW 1 MHz RF Att 20 dB
VBW 1 MHz
SWT 5 ms Unit dBV



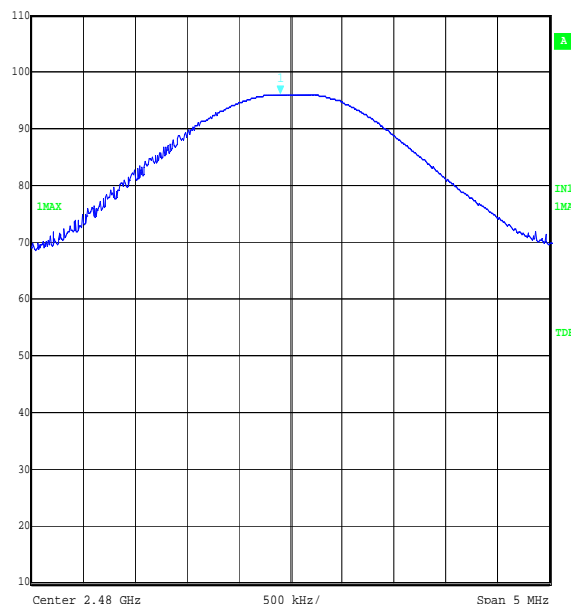
Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 EIRP
Comment A: 48407JD01 Operating in Bottom Channel.
Date: 15.SEP.2006 12:25:35

Marker 1 [T1]
Ref Lvl 95.29 dBV
110 dBV 2.44115531 GHz
RBW 1 MHz RF Att 20 dB
VBW 1 MHz
SWT 5 ms Unit dBV



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 EIRP
Comment A: 48407JD01 Operating in Middle Channel.
Date: 15.SEP.2006 12:24:40

Marker 1 [T1]
Ref Lvl 95.50 dBV
110 dBV 2.47988477 GHz
RBW 1 MHz RF Att 20 dB
VBW 1 MHz
SWT 5 ms Unit dBV



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 EIRP
Comment A: 48407JD01 Operating in Top Channel.
Date: 15.SEP.2006 12:23:14

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7.2.8. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a)

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:**Electric Field Strength Measurements: 30 MHz to 1000 MHz
(emissions occurring in the restricted bands)****Top Channel**

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
109.118	Vertical	15.0	43.5	28.5	Complied
137.415	Vertical	13.0	43.5	30.5	Complied
611.022	Vertical	36.0	46.0	10.0	Complied

Note(s):

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

Test of: Engineering & Security Srl
BlueAudio V3, Intercom
To: FCC Part 15.247: 2005 (Subpart C)

7.2.9. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a)

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.

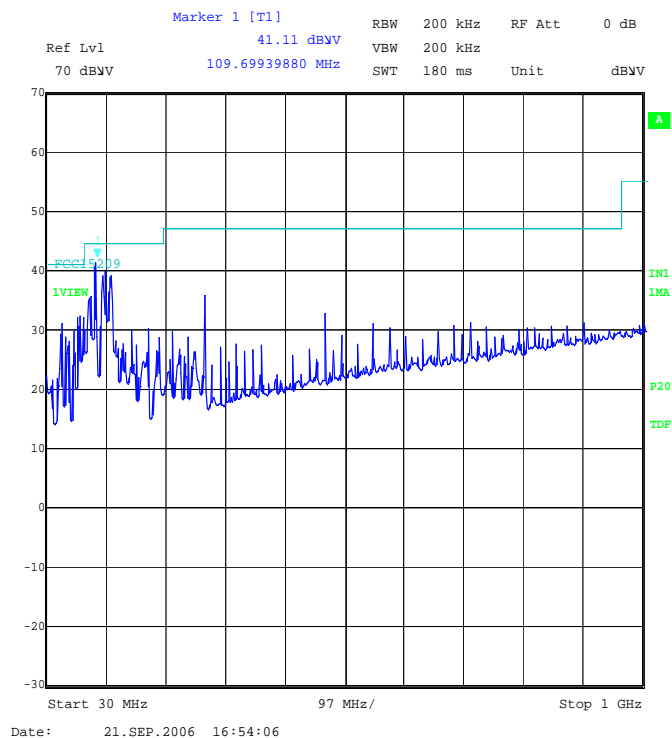
Results:**Electric Field Strength Measurements: 30 MHz to 1000 MHz
(emissions outside the restricted bands)****Top Channel**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
286.032	Vertical	30.0	75.5	45.5	Complied
337.996	Vertical	22.0	75.5	53.5	Complied
481.022	Vertical	36.0	75.5	39.5	Complied

Note(s):

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

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BlueAudio V3, Intercom
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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

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

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BlueAudio V3, Intercom
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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

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:**Electric Field Strength Measurements (Frequency Range: 1 to 25.0 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)	Result
4.803965	Vertical	55.7	-8.3	47.4	74.0	26.6	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)	Result
4.803965	Vertical	33.6	-8.3	41.9	54.0	12.1	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)	Result
4.882145	Vertical	55.4	-7.9	47.5	74.0	26.5	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)	Result
4.882145	Vertical	50.3	-7.9	42.4	54.0	11.6	Complied

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BlueAudio V3, Intercom
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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)**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)	Result
4.959734	Vertical	53.3	-7.6	45.7	74.0	28.3	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)	Result
4.959734	Vertical	48.6	-7.6	41.0	54.0	13.0	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)	Result
4.873934	Vertical	55.5	-8.0	47.5	74.0	26.5	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)	Result
4.873934	Vertical	50.6	-8.0	42.6	54.0	11.4	Complied

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BlueAudio V3, Intercom
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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

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:

Electric Field Strength Measurements (Frequency Range: 1 GHz to 25.0 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)	Result
9.608135	Horizontal	38.7	-1.0	37.7	73.7	36.0	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
9.764075	Horizontal	41.4	-1.0	40.4	75.3	34.9	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)	Result
9.919875	Horizontal	41.7	-1.3	40.4	75.5	35.1	Complied

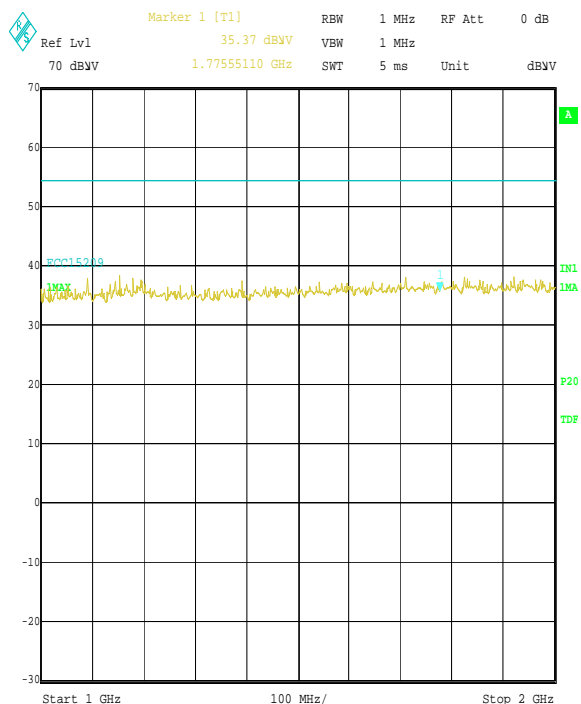
Highest Peak Level: Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
9.907921	Horizontal	41.7	-1.3	40.4	75.5	35.1	Complied

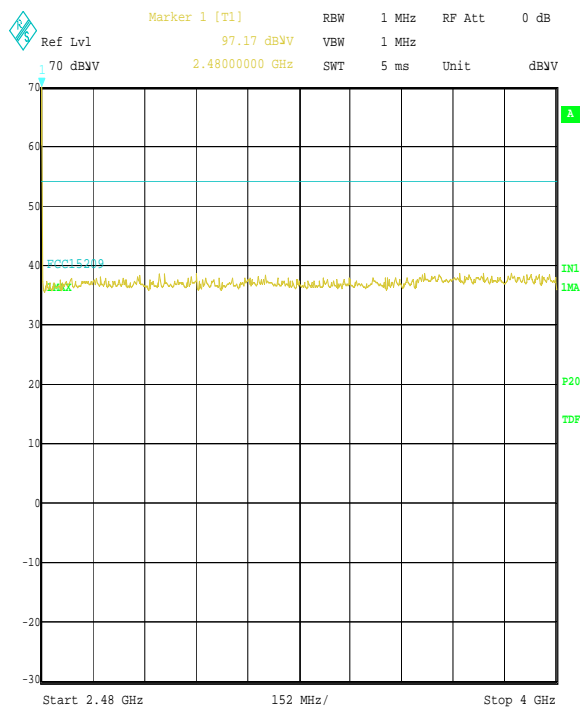
Note(s):

1. The emission at 10.687 GHz shown in the 8 GHz to 12.5 GHz was confirmed to be an ambient emission from the background. Therefore, no further measurement was performed on this frequency.

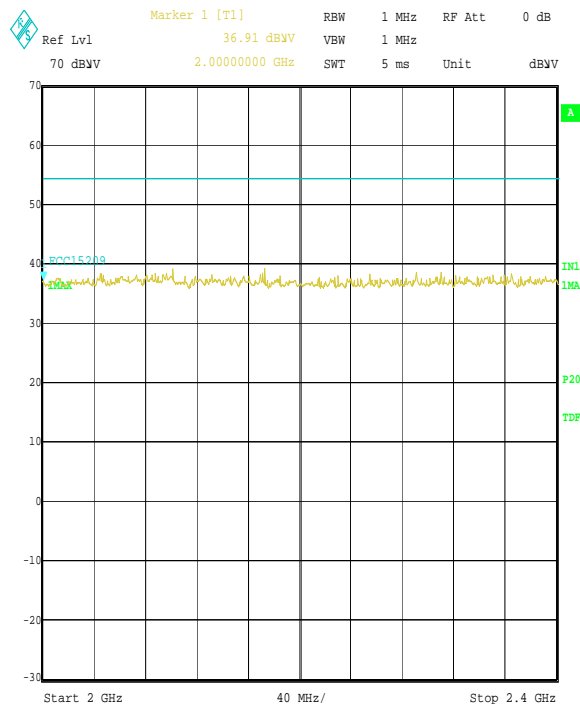
Test of: Engineering & Security Srl
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To: FCC Part 15.247: 2005 (Subpart C)

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

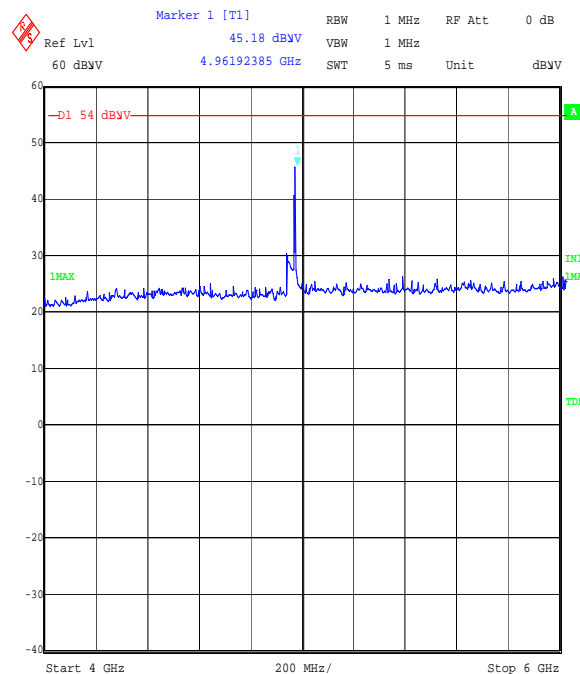
Date: 14.SEP.2006 16:31:45



Date: 14.SEP.2006 16:23:20



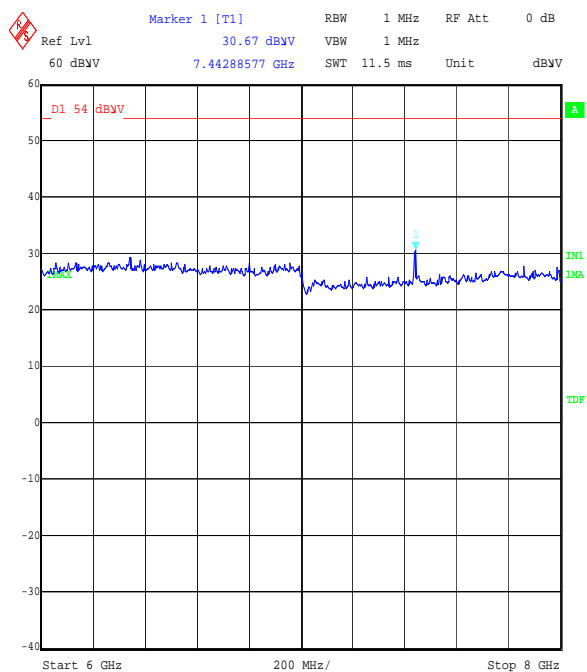
Date: 14.SEP.2006 16:21:38



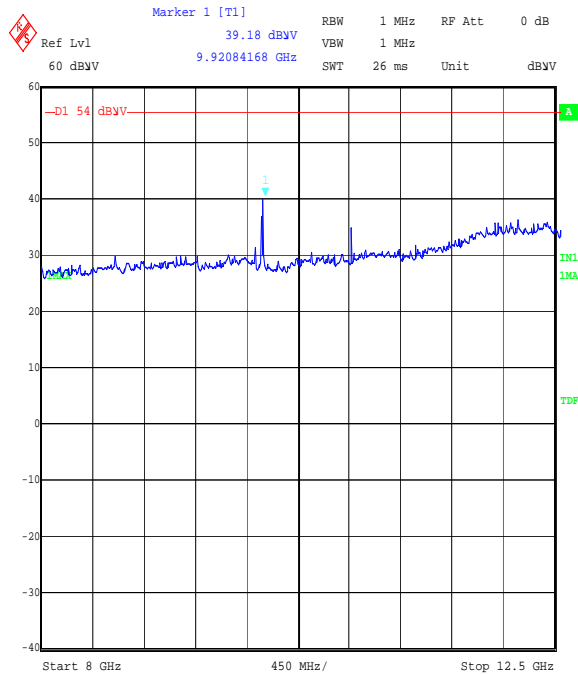
Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Emissions
Comment A: 48407JD01 Operating in Top Channel.
Date: 15.SEP.2006 10:34:51

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

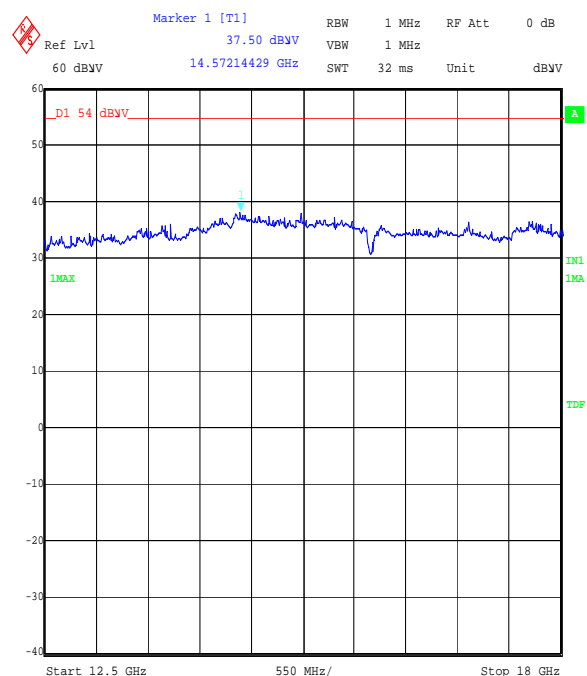
Test of: Engineering & Security Srl
BlueAudio V3, Intercom
To: FCC Part 15.247: 2005 (Subpart C)

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

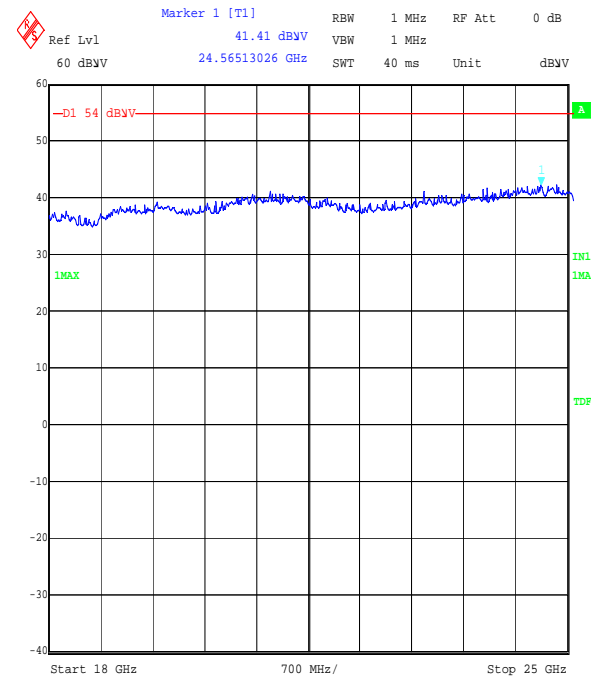
Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Emissions
Comment A: 48407JD01 Operating in Top Channel.
Date: 15.SEP.2006 10:51:11



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Emissions
Comment A: 48407JD01 Operating in Top Channel.
Date: 15.SEP.2006 11:02:52



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Emissions
Comment A: 48407JD01 Operating in Top Channel.
Date: 15.SEP.2006 11:12:59



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Emissions
Comment A: 48407JD01 Operating in Top Channel.
Date: 15.SEP.2006 11:15:46

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

Test of: Engineering & Security Srl
BlueAudio V3, Intercom
To: FCC Part 15.247: 2005 (Subpart C)

7.2.10. 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 maximum radiated band edge emissions.

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)	Result
2.4000	Horizontal	16.3	22.7	39.0	75.5*	36.5	Complied
2.4835	Horizontal	26.1	22.7	48.8	74.0	25.2	Complied

Average Power Level Hopping Mode:

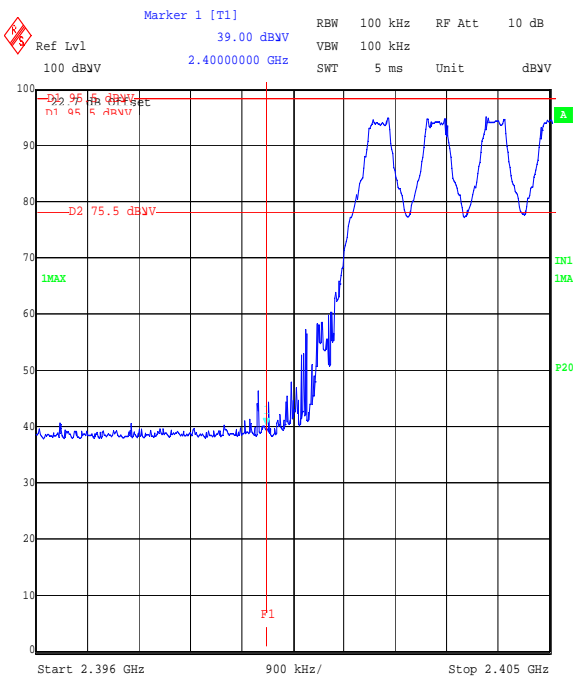
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2.4835	Horizontal	20.7	22.7	43.4	54.0	10.6	Complied

Note(s):

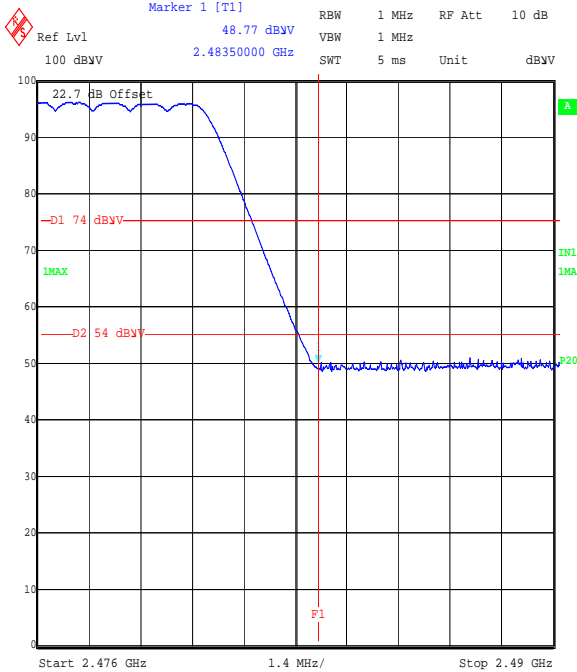
1. *-20 dBc limit

Test of: Engineering & Security Srl
BlueAudio V3, Intercom
To: FCC Part 15.247: 2005 (Subpart C)

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



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Band Edge
Comment A: 48407JD01 Operating in Hopping on All Channels.
Date: 15.SEP.2006 12:35:27



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Band Edge
Comment A: 48407JD01 Operating in Hopping on All Channels.
Date: 15.SEP.2006 12:37:16

Test of: Engineering & Security Srl
BlueAudio V3, Intercom
To: FCC Part 15.247: 2005 (Subpart C)

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

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 (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2.4000	Horizontal	19.4	22.7	42.1	73.7*	31.6	Complied
2.4835	Horizontal	28.9	22.7	51.6	74.0	22.4	Complied

Average Power Level Static Mode:

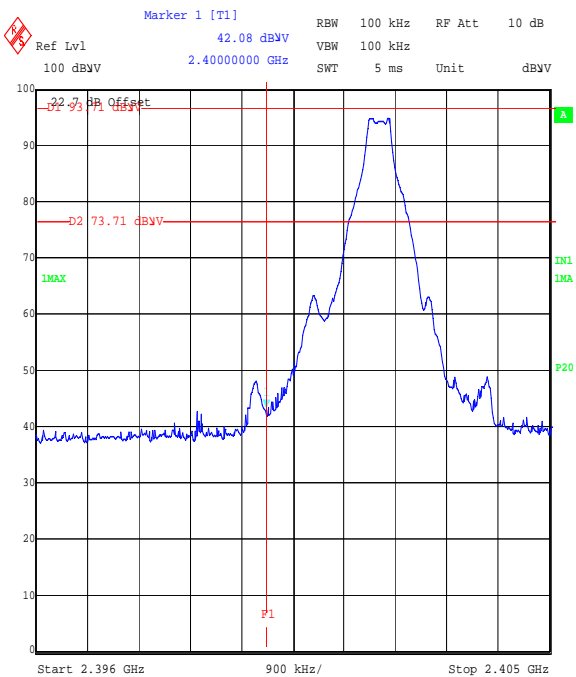
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2.4835	Horizontal	20.8	22.7	43.5	54.0	10.5	Complied

Note(s):

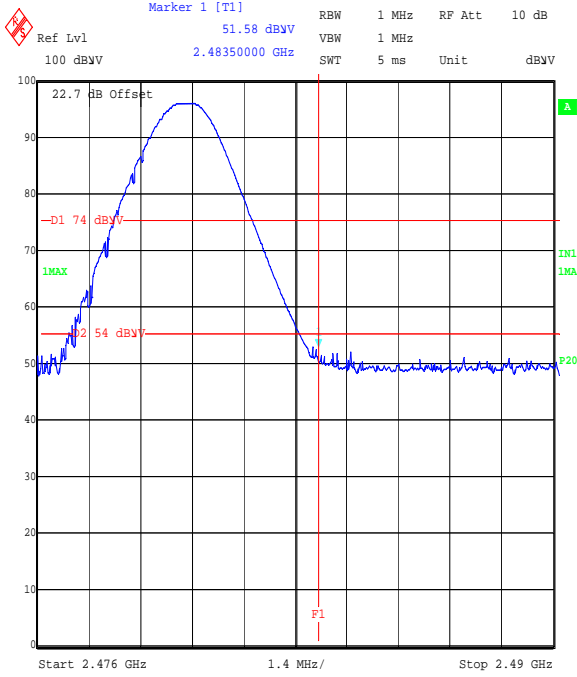
1. *-20 dBc limit

Test of: Engineering & Security Srl
BlueAudio V3, Intercom
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Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Band Edge
Comment A: 48407JD01 Operating in Bottom Channel.
Date: 15.SEP.2006 12:30:29



Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Band Edge
Comment A: 48407JD01 Operating in Top Channel.
Date: 15.SEP.2006 12:41:45

Test of: Engineering & Security Srl
BlueAudio V3, Intercom
To: FCC Part 15.247: 2005 (Subpart C)

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%	± 3.72 dB
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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BlueAudio V3, Intercom
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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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BlueAudio V3, Intercom
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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 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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BlueAudio V3, Intercom
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9.5. Average Time of Occupancy

The EUT and spectrum analyser was configured as 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 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. 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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BlueAudio V3, Intercom
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9.7. 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
A027	1-2 GHz Horn Antenna	Eaton	9188-2	301	8 Jun 06	36
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557	8 Jun 06	36
A1037	Bilog Antenna	Chase EMC Ltd	CBL6112B	2413	20 Sep 06	12
A1069	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	837469/012	31 Jan 06	12
A1307	N-Type Connector	Narda	370 BNM	0210	Cal before use	-
A1360	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1360-20112003	6 Sep 06	12
A1534	Preamplifier 1-26.5 GHz	Hewlett Packard	8449B OPT H02	3008A00405	16 Oct 06	12
A259	Bilog Antenna	Chase	CBL6111	1513	3 Mar 06	12
A392	3 dB attenuator	Suhner	6803.17.B	None	N/A	-
A427	WG 14 Microwave Horn Antenna	Flann	14240-20	150	16 Oct 06	36
A428	WG 12 Microwave Horn Antenna	Flann	12240-20	134	16 Oct 06	36
A430	WG 18 Microwave Horn Antenna	Flann	18240-20	425	16 Oct 06	36
A436	WG 20 Microwave Horn Antenna	Flann	20240-20	330	16 Oct 06	36
C1164	1.5m N-type Cable	Rosenberger Micro-Coax	FA210A10150 07070	43188-1	Cal before use	-
C1166	2m N-Type Cable	Rosenberger Micro-Coax	FA210A10200 07070	43189-02	Cal before use	-
C1167	3m N-Type Cable	Rosenberger Micro-Coax	FA210A10300 07070	43190-01	Cal before use	-
C151	Cable	Rosenberger	UFA210A-1-1181-70x70	None	01 Apr 06	12
C160	Cable	Rosenberger	UFA210A-1-1181-70x70	None	01 Apr 06	12
C347	Cable	Rosenberger	UFA210A-1-1181-70x70	3007	06 Sep 06	12
C348	Cable	Rosenberger	UFA210A-1-1181-70x70	2993	01 Apr 06	12
C363	BNC Cable	Rosenberger	RG142	None	01 Apr 06	12

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Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
C460	BNC Cable	Rosenberger	UFA210A-1-1182-704704	98H0304	06 Sep 06	12
C468	10m Cable	Rosenberger	UFA210A-1-3937-504504	98L0440	02 Apr 06	12
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008	N/A	N/A
M023	ESVP Receiver	Rohde & Schwarz	ESVP	872 991/027	10 Apr 06	12
M1124	ESIB Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	08 Sep 06	12
M1149	Bluetooth Test Set	Anritsu	MT8852A	6K00001529	N/A	-
M1263	EMI Test Receiver	Rohde & Schwarz	ESIB7	100265	12 Jan 06	12
S201	3m & 10m OATS	RFI	1	-	18 Jul 06	12
S202	3m OATS	RFI	2	S202-15011990	Cal before use	-
S212	Emissions Screened Room	RFI	12	-	Cal before use	-

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

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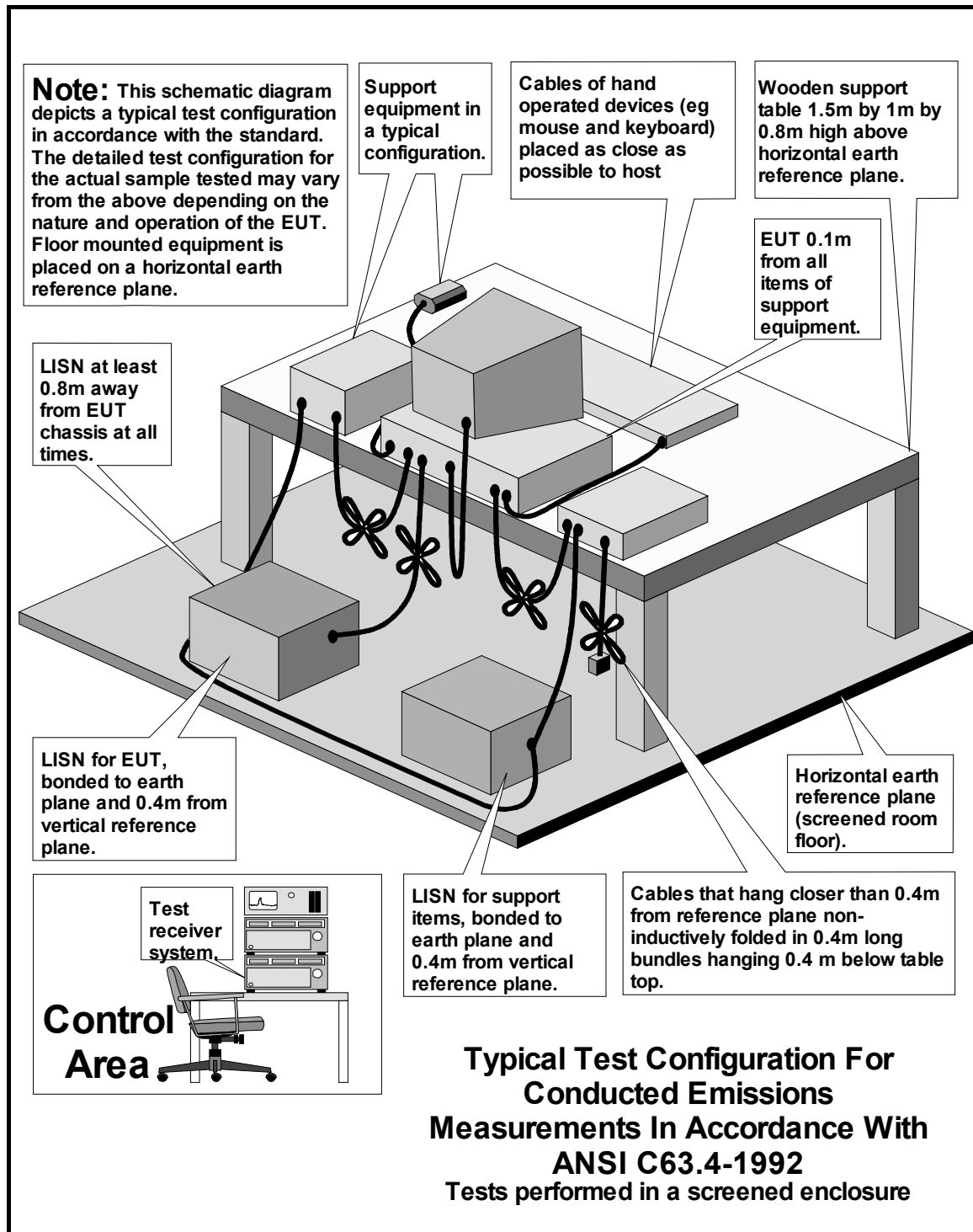
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\48407JD01\EMICON	Test configuration for measurement of conducted emissions.
DRG\48407JD01\EMIRAD	Test configuration for measurement of radiated emissions.

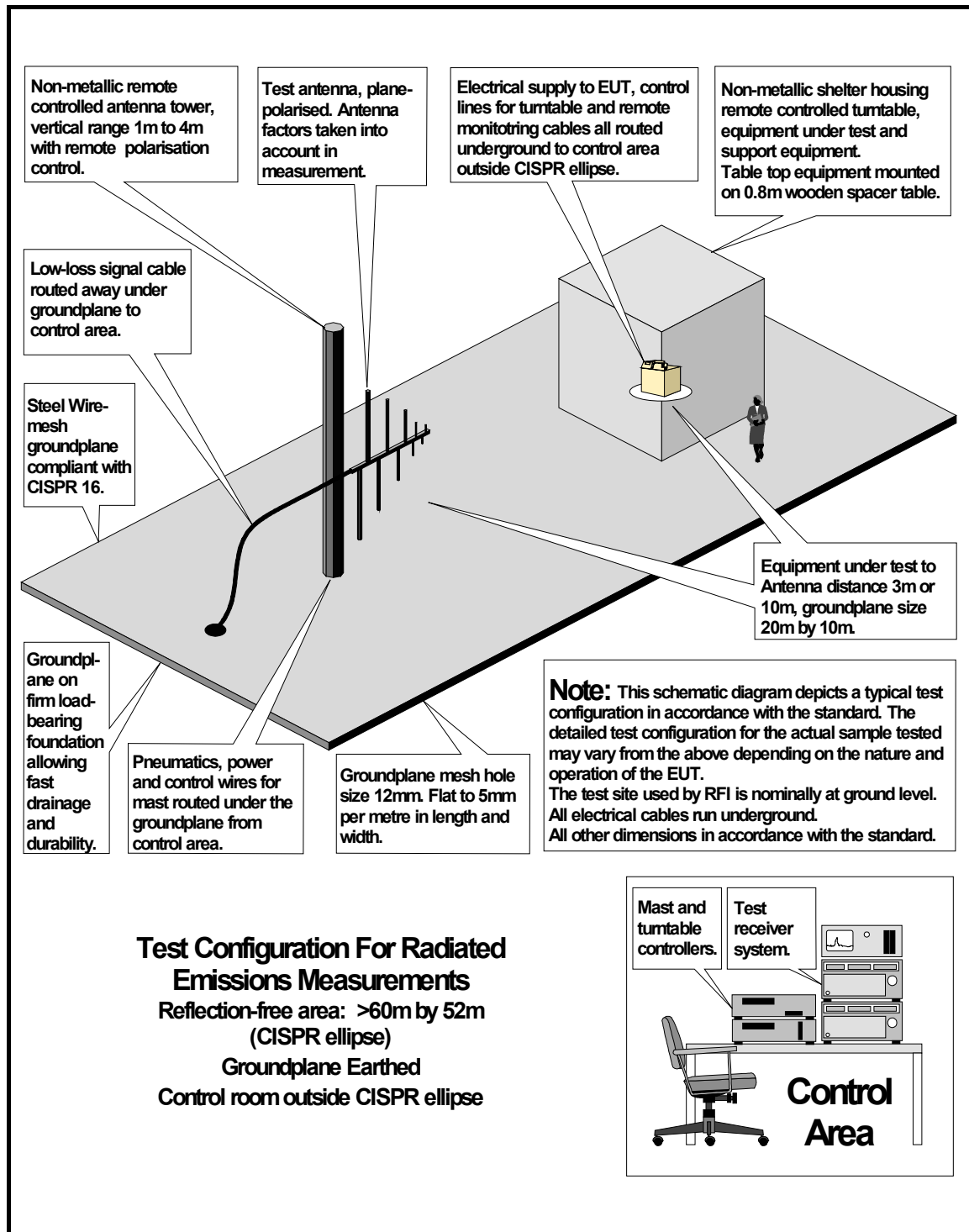
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DRG\48407JD01\EMICON



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DRG\48407JD01\EMIRAD



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