

# 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

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

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This report may be copied in full. The results in this report apply only to the sample(s) tested.

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Registered in England and Wales. Company number: 2117901

**RFI GLOBAL SERVICES LTD**

**TEST REPORT**

**S.No. RFI/RPTE1/RP48407JD06A**

**Page: 2 of 56**

**Issue Date: 01 December 2006**

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

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

---

## **Table of Contents**

|                                                         |    |
|---------------------------------------------------------|----|
| 1. Client Information .....                             | 4  |
| 2. Equipment Under Test (EUT) .....                     | 5  |
| 3. Test Specification .....                             | 9  |
| 4. Deviations from the Test Specification .....         | 10 |
| 5. Operation of the EUT during Testing .....            | 11 |
| 6. Summary of Test Results .....                        | 12 |
| 7. Measurements, Examinations and Derived Results ..... | 13 |
| 8. Measurement Uncertainty .....                        | 41 |
| 9. Measurement Methods .....                            | 42 |
| Appendix 1. Test Equipment Used .....                   | 51 |
| Appendix 2. Test Configuration Drawings .....           | 53 |

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

---

## **1. Client Information**

|                      |                                             |
|----------------------|---------------------------------------------|
| <b>Company Name:</b> | Engineering & Security Srl                  |
| <b>Address:</b>      | Via Gropallo, 10/5<br>16122 Genova<br>Italy |
| <b>Contact Name:</b> | Mr G Olive                                  |

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

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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              |

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

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## **2.2. Accessories**

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

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

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

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

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

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

---

### **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.

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

## 2.5. Additional Information Related to Testing

|                                 |                                                                                    |                |                         |
|---------------------------------|------------------------------------------------------------------------------------|----------------|-------------------------|
| Power Supply Requirement:       | DC Supply of 3.6 Li-ion Battery.<br>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.

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

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### **3. Test Specification**

|            |                                                                                                                                                         |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference: | FCC Part 15.247: 2005 Subpart C                                                                                                                         |
| Title:     | Code of Federal Regulations, Part 15.247 (47CFR15)<br>(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.

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

---

#### **4. Deviations from the Test Specification**

There were no deviations from the test specification.

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

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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.

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

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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

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

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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.

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

## **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:**

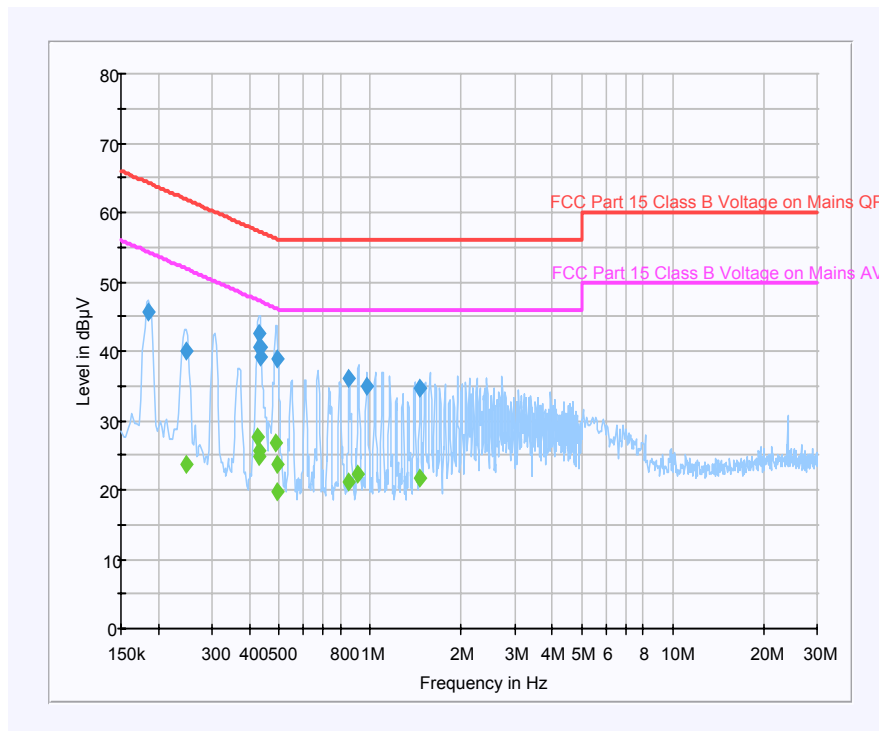
#### **Quasi-Peak Detector Measurements on Live and Neutral Lines**

| Frequency (MHz) | Line | Level (dB $\mu$ V) | Limit (dB $\mu$ 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 $\mu$ V) | Limit (dB $\mu$ 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 |

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

**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.*

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

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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.

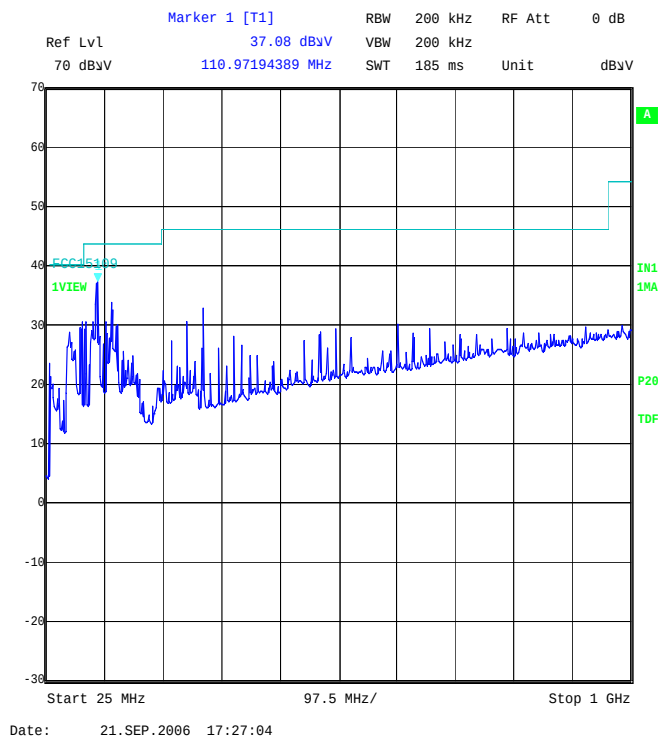
Tests were performed to identify the maximum receiver or standby radiated emission levels.

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

| Frequency (MHz) | Antenna Polarity | Q-P Level (dB $\mu$ V/m) | Limit (dB $\mu$ 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 |

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

### 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.

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

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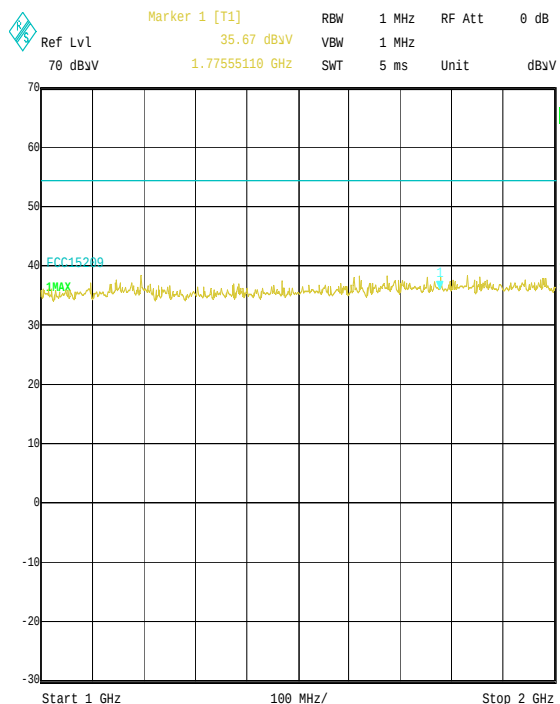
**Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)****Results:****Electric Field Strength Measurements (Frequency Range: 1 to 12.5 GHz)****Highest Peak Level:**

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

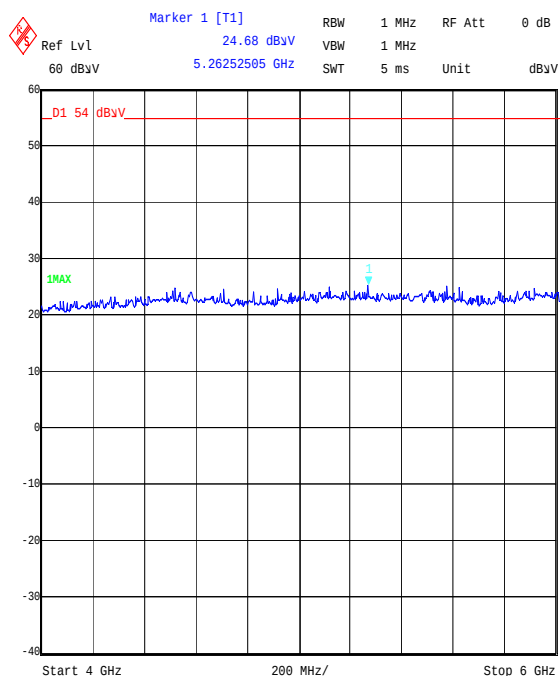
**Note(s):**

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.

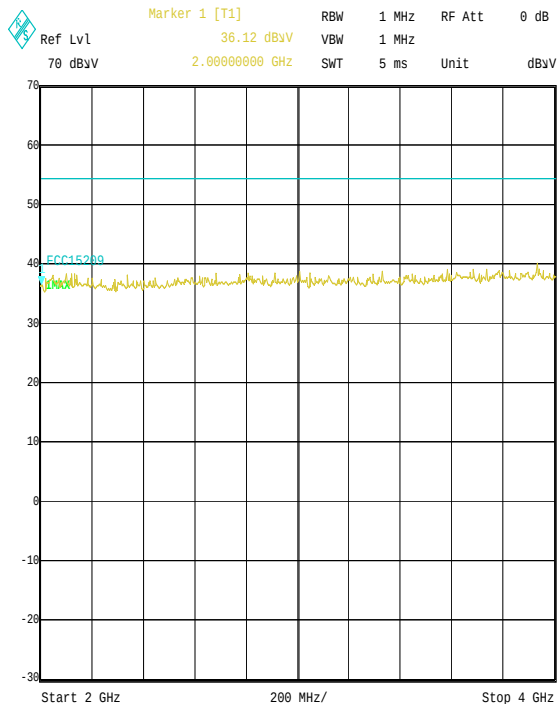
Test of: Engineering & Security Srl  
BlueAudio V3, Intercom  
To: FCC Part 15.247: 2005 (Subpart C)

**Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)**

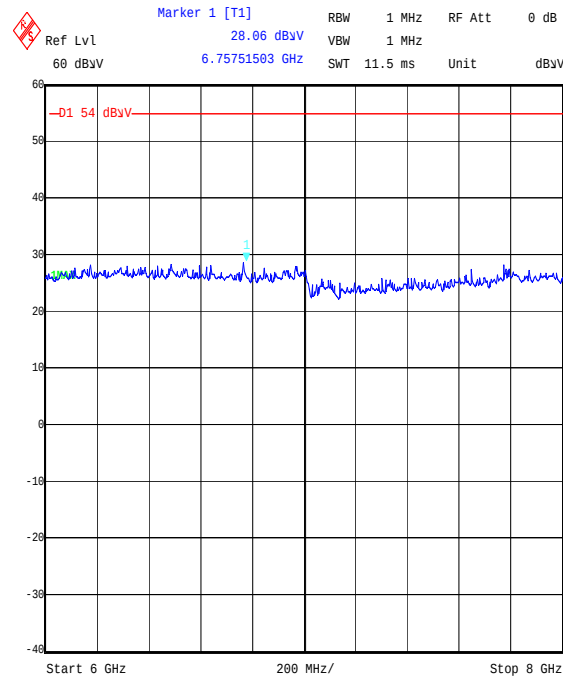
Date: 14.SEP.2006 16:33:02



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.

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

Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Emissions  
 Comment A: 48407JD01 Operating in Receive Mode.  
 Date: 15.SEP.2006 10:58:13

*Note: This plot is a pre-scan 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)

### **7.2.3. 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 |

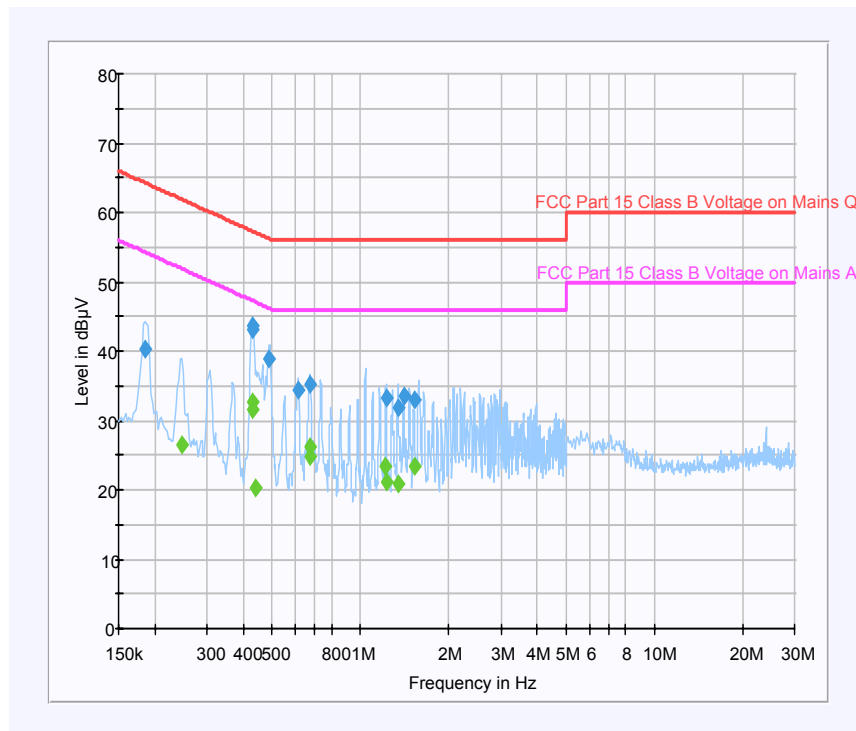
#### **Average Detector Measurements on Live and Neutral Lines**

##### **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 |

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

### 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.

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

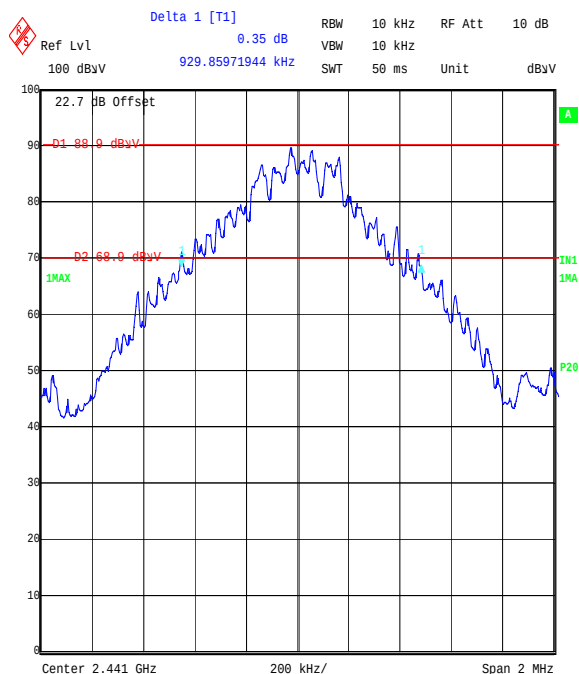
#### 7.2.4. Transmitter 20 dB Bandwidth: Section 15.247(a)(1)

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

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

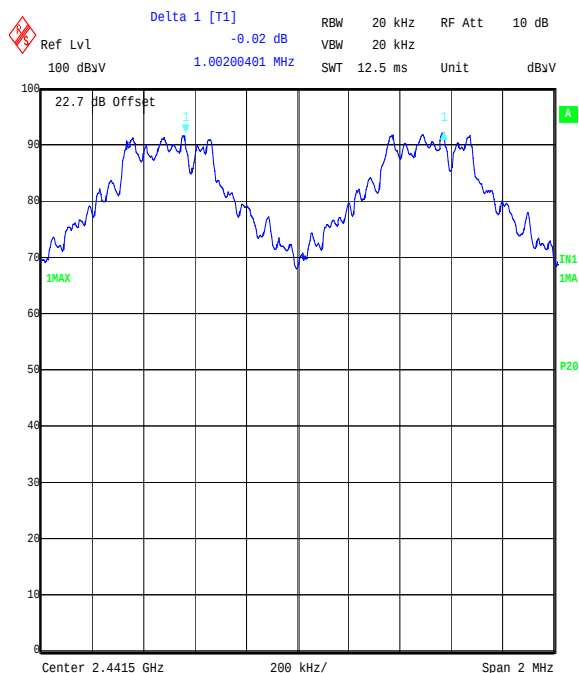
### 7.2.5. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)

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<br>Frequency Separation<br>(kHz) | Limit<br>( $> \frac{2}{3}$ of 20 dB BW)<br>(kHz) | Margin<br>(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

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

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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.

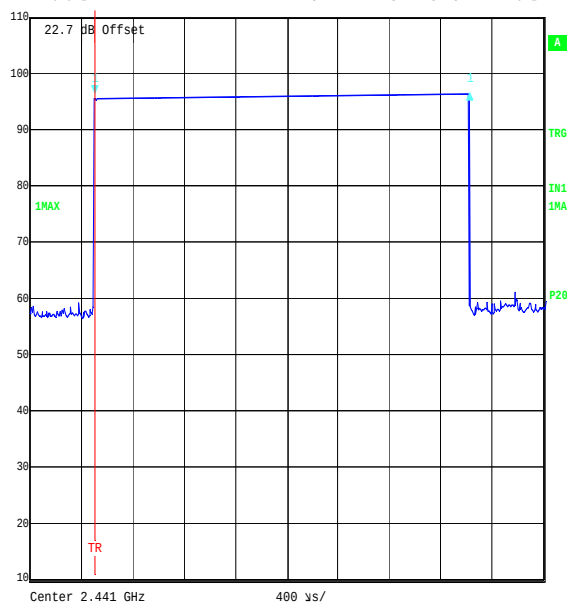
**Results:**

| 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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BlueAudio V3, Intercom  
To: FCC Part 15.247: 2005 (Subpart C)

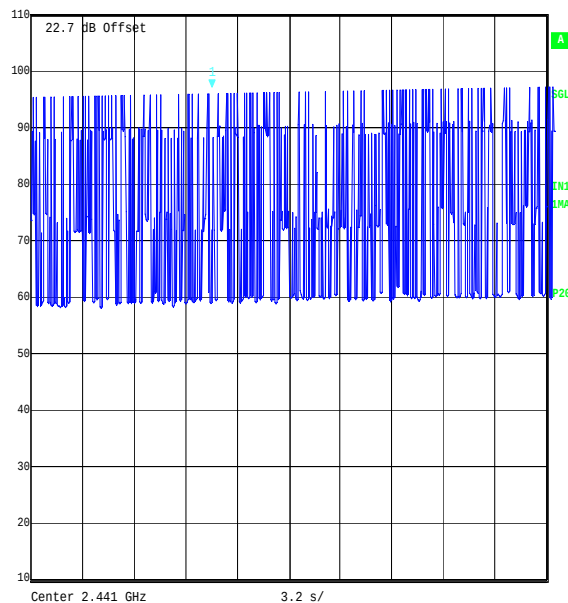
**Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii) (Continued)**

Delta 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 0.03 dB  
110 dBV 2.909820 ms VBW 1 MHz  
SWT 4 ms Unit dBV



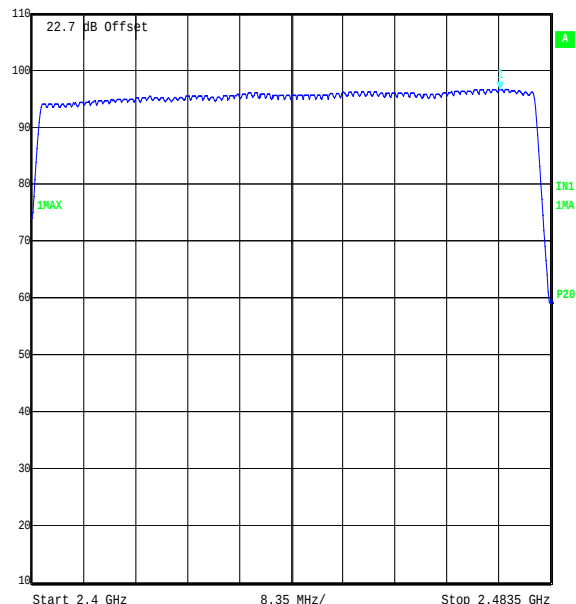
Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Emission Width  
Comment A: 48407JD01 Operating in Hopping on All Channels.  
Date: 15.SEP.2006 12:51:12

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 95.20 dBV  
110 dBV 10.837675 s VBW 1 MHz  
SWT 32 s Unit dBV



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

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 95.91 dBV  
110 dBV 2.47496593 GHz VBW 1 MHz  
SWT 5 ms Unit dBV



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

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

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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<br>(dBm) | Limit<br>(dBm) | Margin<br>(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 |

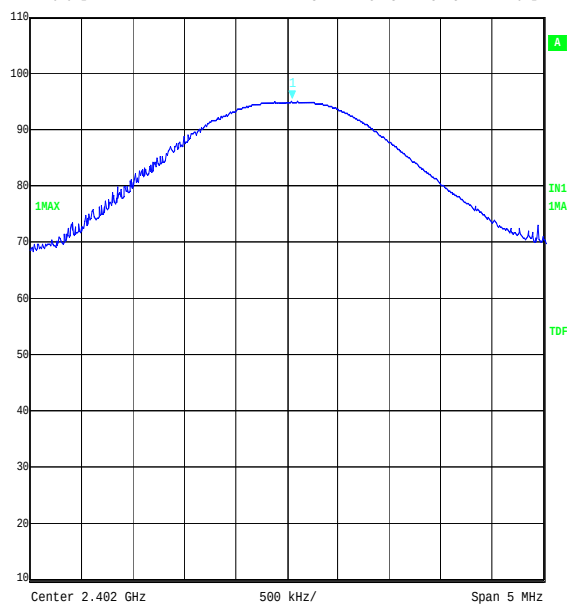
**Note(s):**

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

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BlueAudio V3, Intercom  
To: FCC Part 15.247: 2005 (Subpart C)

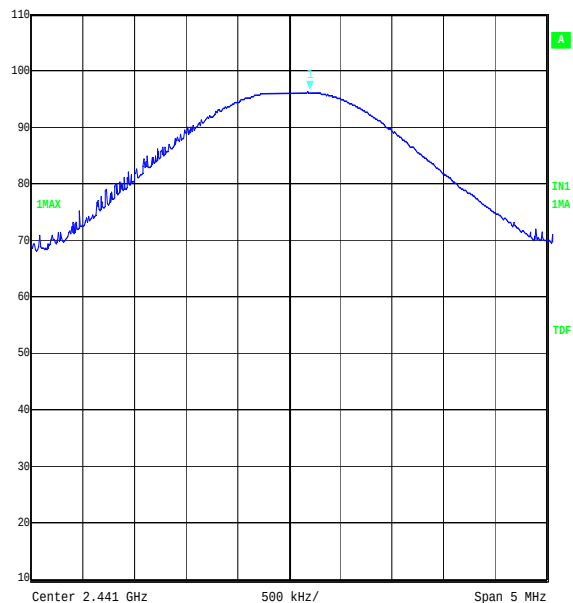
**Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1) (Continued)**

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



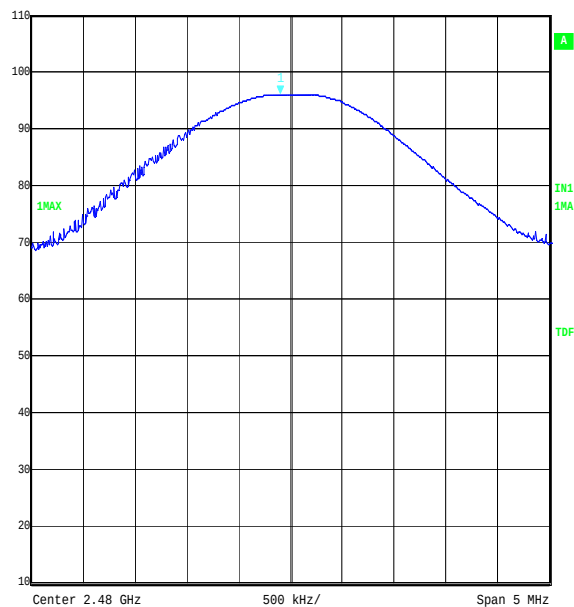
Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 EIRP  
Comment A: 48407JD01 Operating in Bottom Channel.  
Date: 15.SEP.2006 12:25:35

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



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 dB $\mu$ V  
110 dB $\mu$ V  
2.47988477 GHz  
RBW 1 MHz RF Att 20 dB  
VBW 1 MHz  
SWT 5 ms Unit dB $\mu$ V



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

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

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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<br>(MHz) | Antenna<br>Polarity | Q-P Level<br>(dB $\mu$ V/m) | Limit<br>(dB $\mu$ V/m) | Margin<br>(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)

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**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.

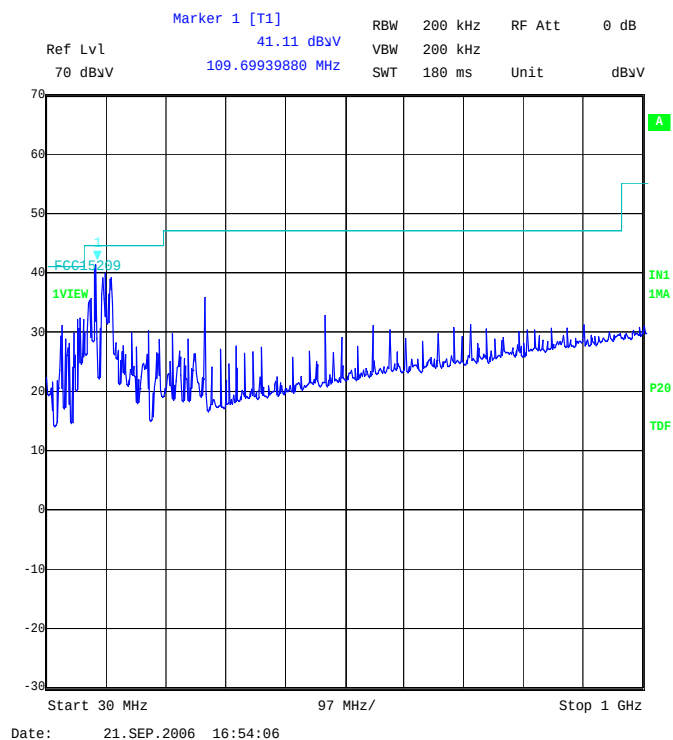
**Results:****Electric Field Strength Measurements: 30 MHz to 1000 MHz  
(emissions outside the restricted bands)****Top Channel**

| Frequency<br>(MHz) | Antenna<br>Polarity | Peak Level<br>(dB $\mu$ V/m) | -20 dBc Limit<br>(dB $\mu$ V/m) | Margin<br>(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.

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)**

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)**

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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ 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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ 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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ 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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|------------------------|-----------------------------|----------------------|-------------|----------|
| 4.882145        | Vertical         | 50.3                        | -7.9                   | 42.4                        | 54.0                 | 11.6        | Complied |

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)****Highest Peak Level: Top Channel**

| Frequency (GHz) | Antenna Polarity | Detector Level (dB $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ 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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ 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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ 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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|------------------------|-----------------------------|----------------------|-------------|----------|
| 4.873934        | Vertical         | 50.6                        | -8.0                   | 42.6                        | 54.0                 | 11.4        | Complied |

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)**

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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | -20 dBc Limit (dB $\mu$ 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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | -20 dBc Limit (dB $\mu$ 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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | -20 dBc Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|------------------------|-----------------------------|------------------------------|-------------|----------|
| 9.919875        | Horizontal       | 41.7                        | -1.3                   | 40.4                        | 75.5                         | 35.1        | Complied |

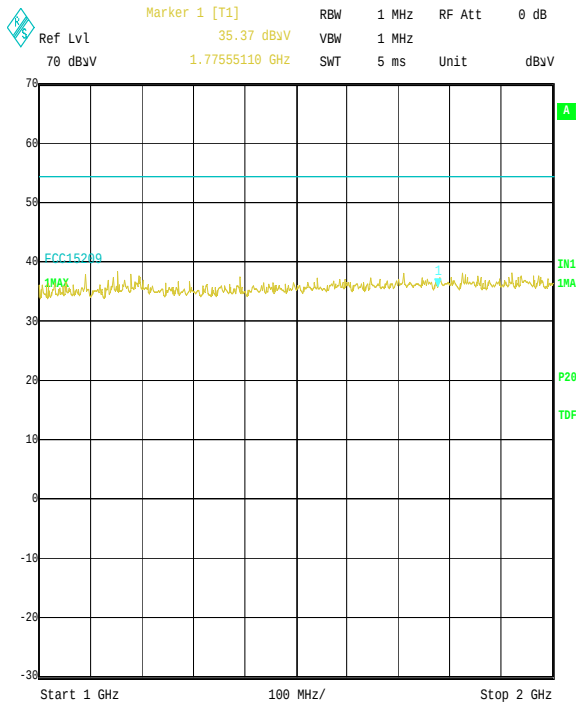
#### **Highest Peak Level: Hopping Mode**

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

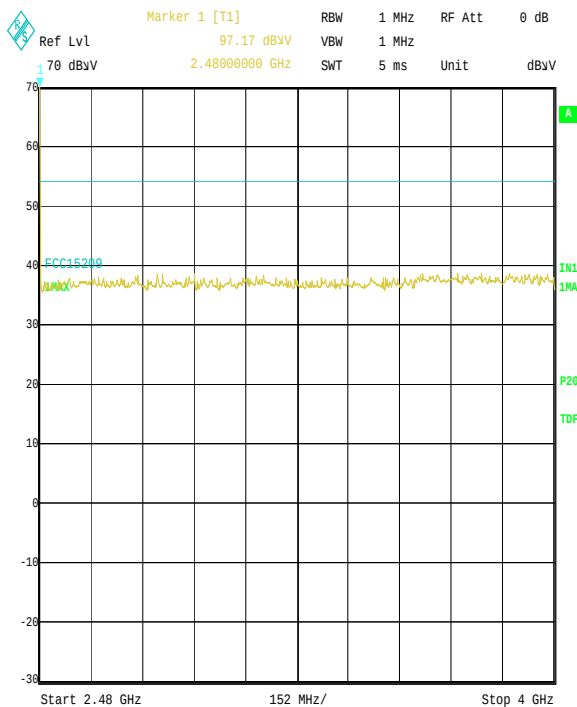
### **Note(s):**

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.

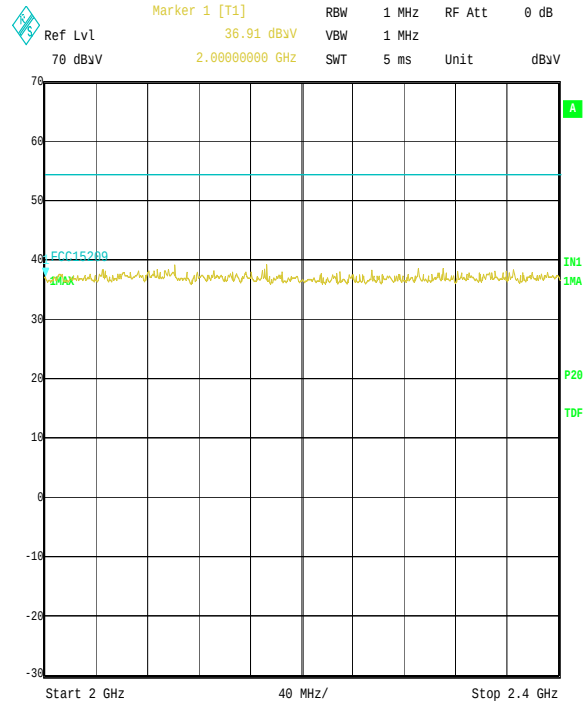
Test of: Engineering & Security Srl  
BlueAudio V3, Intercom  
To: FCC Part 15.247: 2005 (Subpart C)

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

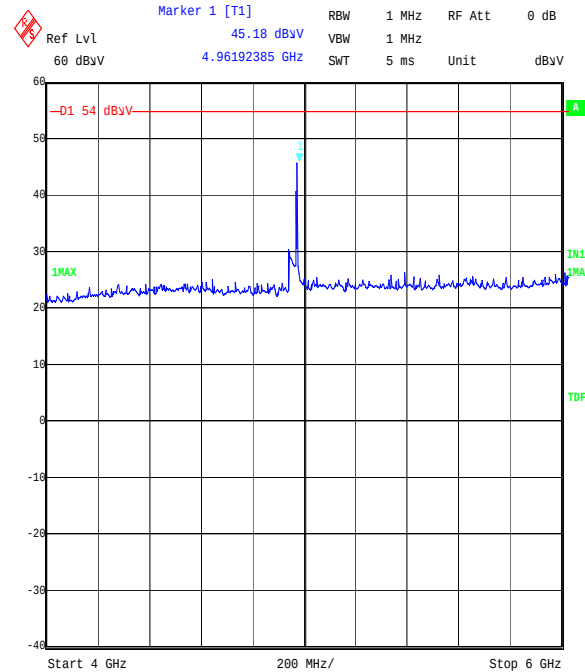
Date: 14.SEP.2006 16:31:45



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



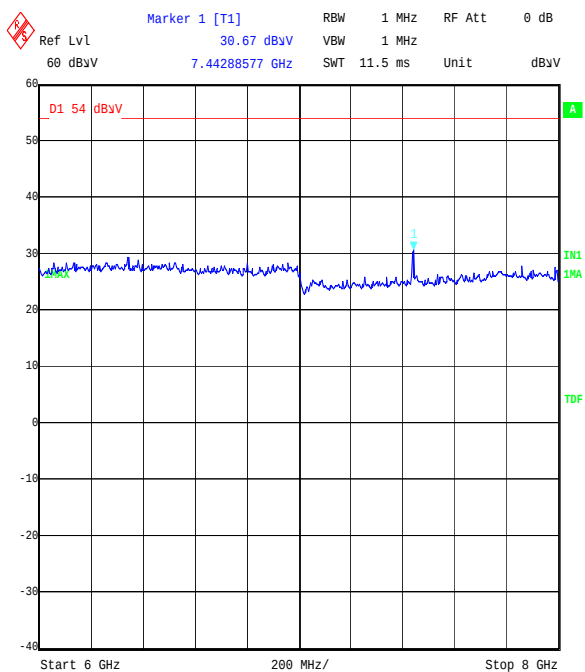
Date: 14.SEP.2006 16:21:38



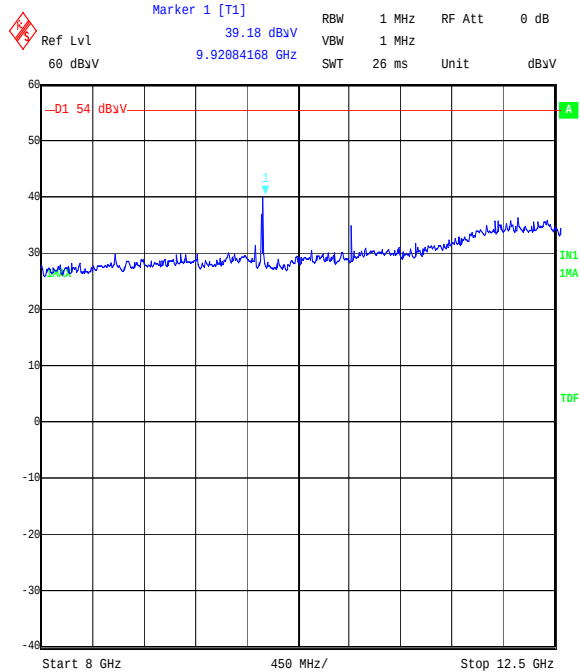
Title: Eng & SRL EUT: BlueAudio, FCC Part 15.247 Radiated Emissions  
Comment A: 48407JD01 Operating in Top Channel.  
Date: 15.SEP.2006 10:34:51

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

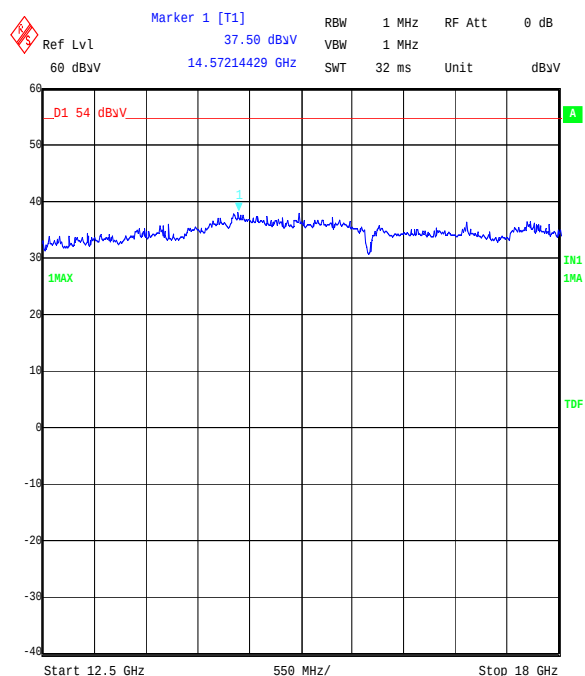
Test of: Engineering & Security Srl  
BlueAudio V3, Intercom  
To: FCC Part 15.247: 2005 (Subpart C)

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

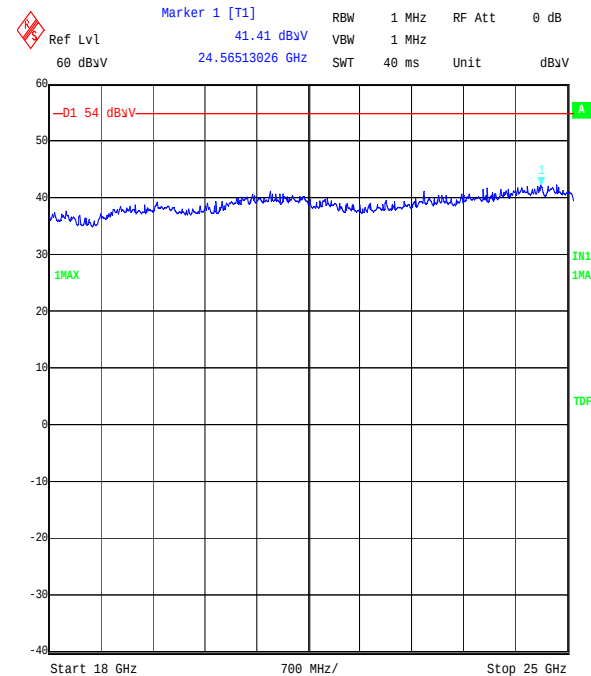
Title: Eng & SRL EUT: BlueAudio. FCC Part 15.247 Radiated Emissions  
Comment A: 48407JD01 Operating in Top Channel.  
Date: 15.SEP.2006 10:51:11



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)

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**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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ 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:**

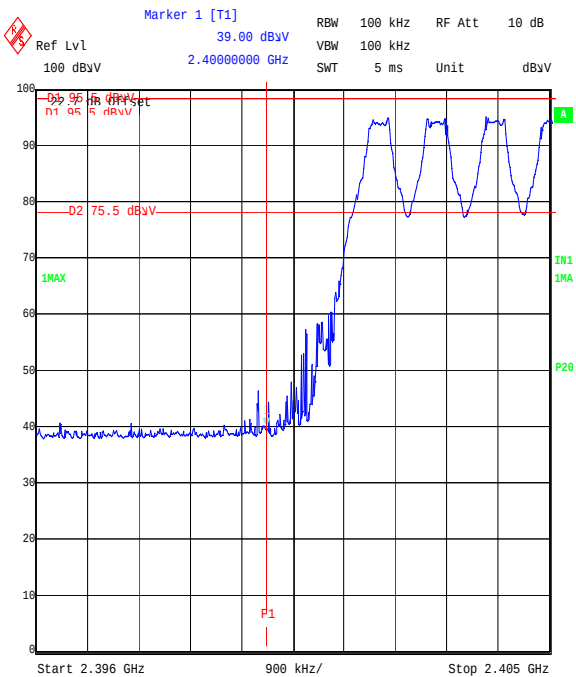
| Frequency (GHz) | Antenna Polarity | Detector Level (dB $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|------------------------|-----------------------------|----------------------|-------------|----------|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

**Note(s):**

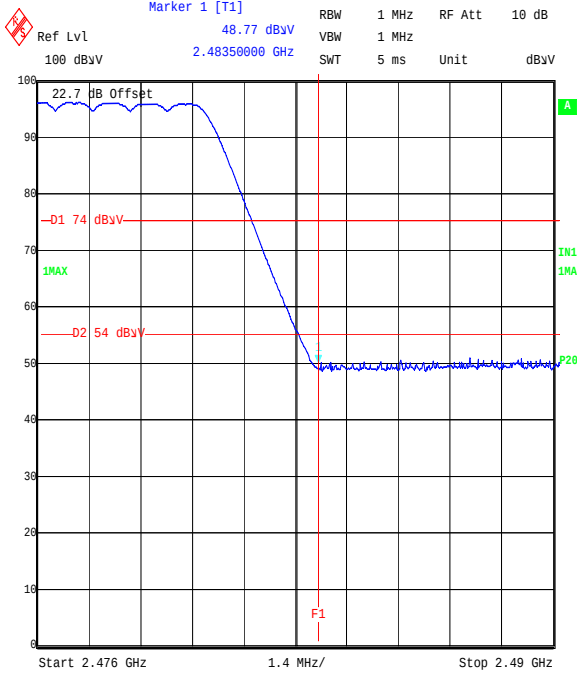
1. \*-20 dBc limit

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)

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**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 $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ 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:**

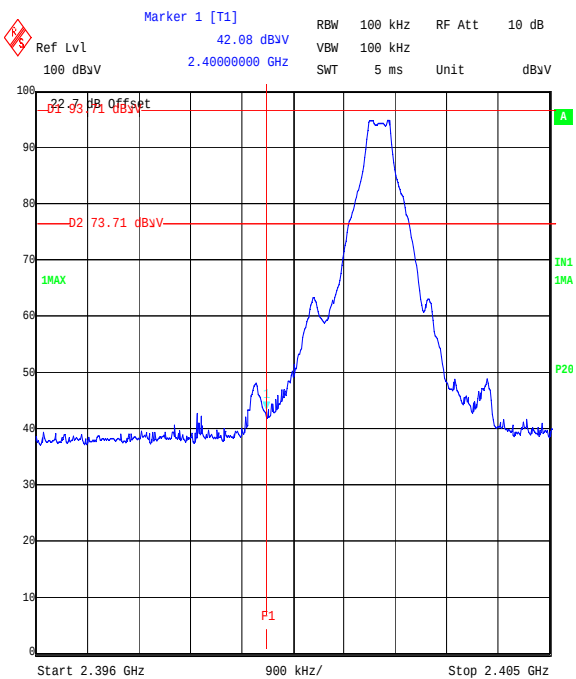
| Frequency (GHz) | Antenna Polarity | Detector Level (dB $\mu$ V) | Transducer Factor (dB) | Actual Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Result   |
|-----------------|------------------|-----------------------------|------------------------|-----------------------------|----------------------|-------------|----------|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

**Note(s):**

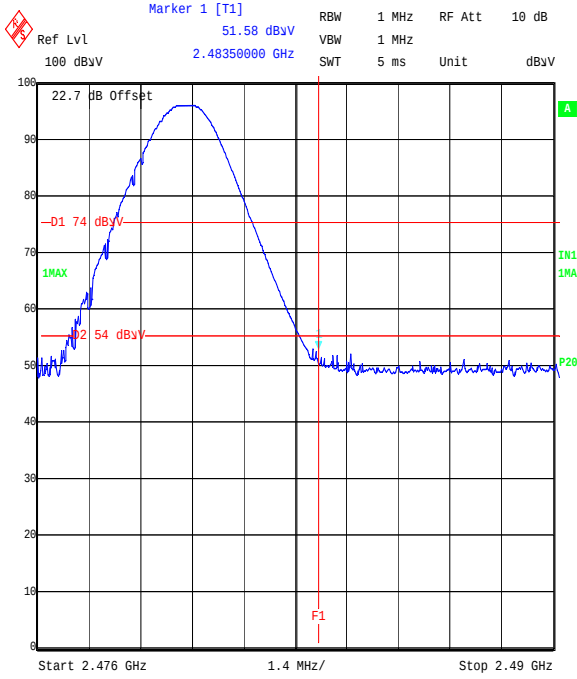
1. \*-20 dBc limit

Test of: Engineering & Security Srl  
BlueAudio V3, Intercom  
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 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)

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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%                  | ±3.72 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.

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

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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             |

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

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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.

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

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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 $\mu$ V plus cable loss and antenna factor.

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

| Receiver Function | Initial Scan                       | Final Measurements<br><1 GHz | Final Measurements<br>≥1 GHz |
|-------------------|------------------------------------|------------------------------|------------------------------|
| Detector Type:    | Peak                               | Quasi-Peak (CISPR)           | Peak / Average               |
| Mode:             | Max Hold                           | Not applicable               | Max Hold                     |
| Bandwidth:        | (120 kHz <1 GHz)<br>(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               |

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

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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)

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

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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.

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

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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.

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

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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:-

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

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

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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        |

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

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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).

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

## 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            |

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

**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.

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

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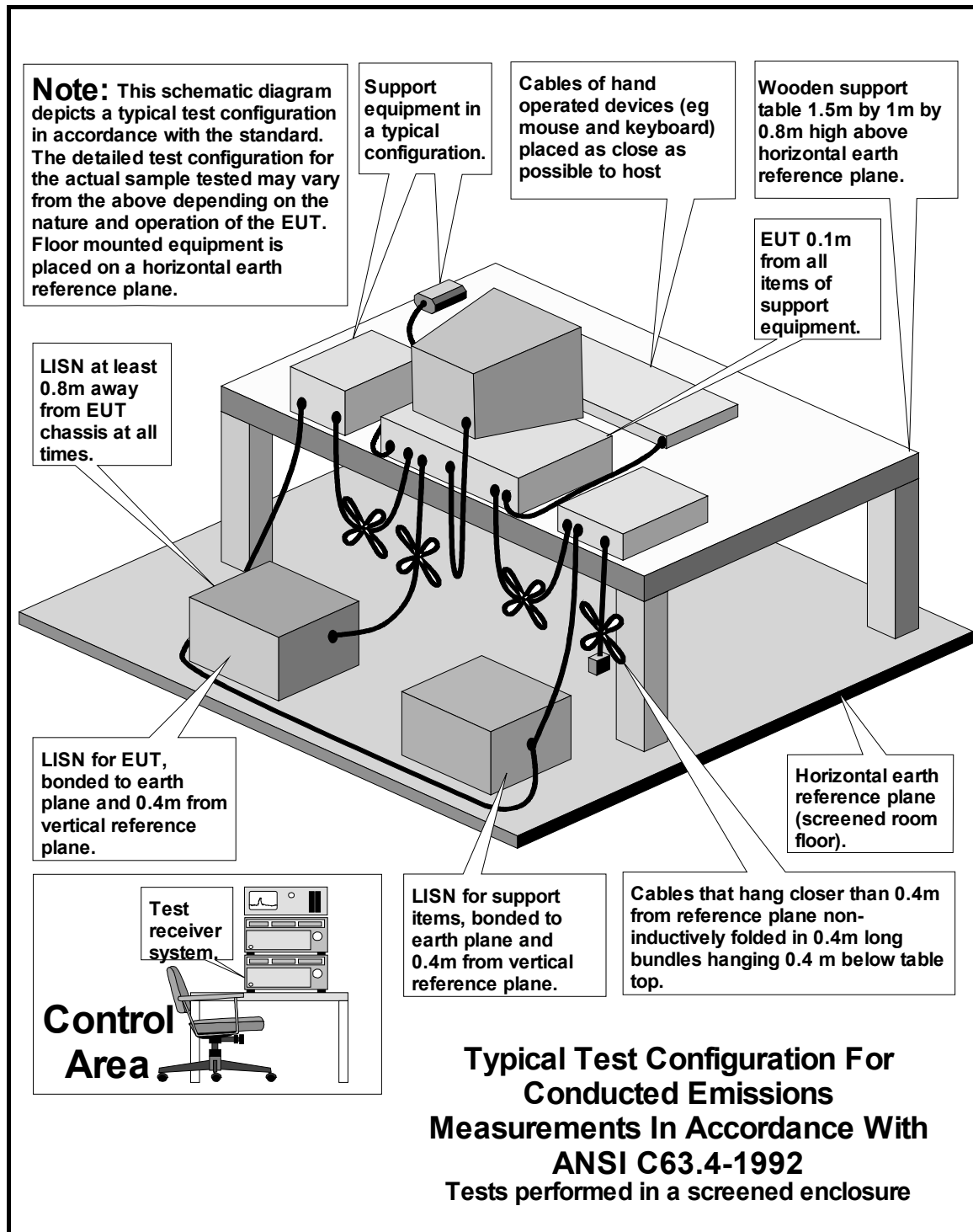
## **Appendix 2. Test Configuration Drawings**

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.  |

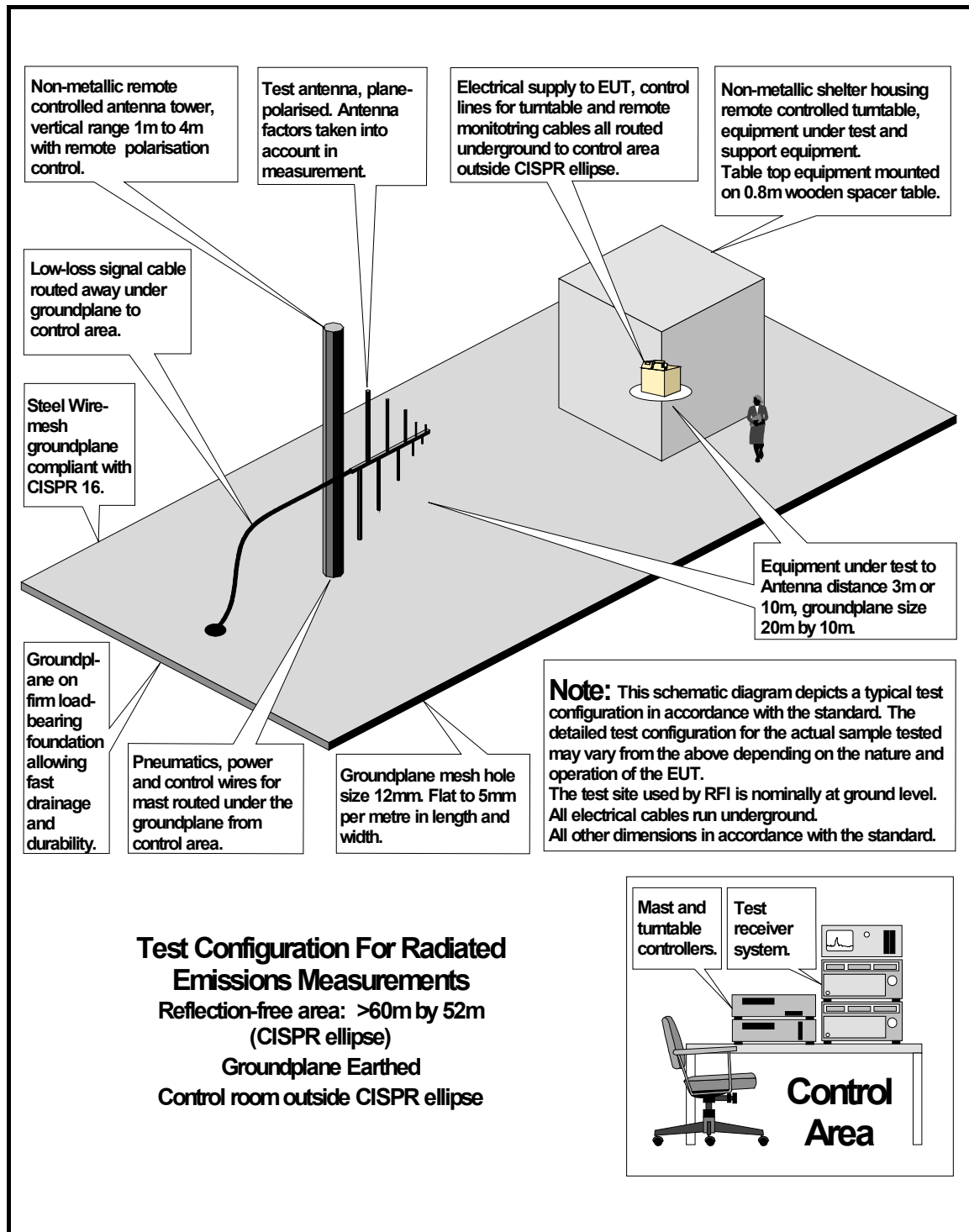
Test of: Engineering & Security Srl  
BlueAudio V3, Intercom  
To: FCC Part 15.247: 2005 (Subpart C)

DRG\48407JD01\EMICON



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

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

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