# TEST REPORT

Your Ref:

Date: 07 Sep 2005

Our Ref: 56S050746/01



DID: +65-6885 1459

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
FCC Parts 15B & C : 2005
OF A
**DVD/CD PLAYER WITH AV RECEIVER**
**[ Model : E61TAUD ]**
**[ FCC ID : RFAAND5061TA ]**

| | |
|---|---|
| **TEST FACILITY** | Telecoms & EMC, Testing Group, PSB Corporation Pte Ltd<br>1 Science Park Drive, Singapore 118221 |
| **FCC REG. NO.** | 90937 (3m & 10m OATS)<br>99142 (10m Anechoic Chamber)<br>871638 (5m Anechoic Chamber)<br>325572 (10m Anechoic Chamber) |
| **IND. CANADA REG. NO.** | IC 4257 (10m Anechoic Chamber) |
| **PREPARED FOR** | Eastech Electronics (Taiwan) Inc<br>13/F , No.99.Sec.1 ,Nankan Road, Luchu shiang,<br>Taoyuan Hsien, Taiwan , R.O.C<br><br>Tel : 886-3-3116686 Fax : 886-3-3116687 |
| **JOB NUMBER** | 56S050746 |
| **TEST PERIOD** | 24 Aug 2005 – 01 Sep 2005 |

**PREPARED BY**

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Associate Engineer

**APPROVED BY**

Lim Cher Hwee
Product manager

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LA-2001-0212-A
LA-2001-0213-F
LA-2001-0214-E
LA-2001-0215-B
LA-2001-0216-G
LA-2001-0217-G

The results reported herein have been performed in accordance with the laboratory's terms of accreditation under the Singapore Accreditation Council - Singapore Laboratory Accreditation Scheme. Tests marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our laboratory.

The product was tested in accordance with the customer's specifications.

**Test Results Summary**

| Test Standard | Description | Pass / Fail |
|---|---|---|
| FCC Part 15: 2005 | | |
| 15.107(a), 15.207 | Conducted Emissions | Pass |
| 15.109(a), 15.205, 15.209 | Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement) | Pass |
| 15.247(a)(1) | Carrier Frequency Separation | Pass |
| | Spectrum Bandwidth (20dB Bandwidth Measurement) | Pass |
| 15.247(a)(1)(iii) | Number of Hopping Frequencies | Pass |
| | Average Frequency Dwell Time | Pass |
| 15.247(b)(1) | Maximum Peak Power | Pass |
| 15.247(d) | RF Conducted Spurious Emissions | Pass |
| 15.247(d) | Band Edge Compliance | Pass |
| 15.247(e) | Peak Power Spectral Density | Pass |
| 1.1310 | Maximum Permissible Exposure | Pass |
| 15.35(c) | Duty Cycle Factor Computation | Refer to pages 65 and 66 for details |

**Notes**

1. Three channels as listed below, which respectively represent the lower, middle and upper channels of the equipment under test (EUT) were chosen and tested. For each channel, the EUT was configured to operate in the test mode.

| Transmit Channel | Frequency (GHz) |
|---|---|
| Channel 1 | 2.403 |
| Channel 39 | 2.441 |
| Channel 78 | 2.480 |

2. All the measurements in section 15.247 were done based on conducted measurements.

3. The EUT is a Class B device when in non-transmitting state and meets the FCC Part15B Class B requirements.

4. For radiated emissions test, the EUT was tested with the RF antenna port terminated with a 75Ω terminator as the measured RF antenna power was less than 2nW.

**Modifications**

The EUT was brought to compliance to Conducted Emissions test removing a capacitor (C1007) from the AV receiver.

| | | |
|---|---|---|
| Description | : | The Equipment Under Test (EUT) is **a DVD / CD Player with AV Receiver**. The EUT consists of following units:<br>- 1 x AV receiver<br>- 1 x DVD / CD player<br>- 2 x front speakers (left and right)<br>- 1 x center speaker<br>- 1 x subwoofer (wireless transceiver)<br>- 1 x wireless rear speaker (wireless transceiver) |
| Manufacturer | : | Eastech Electronics ( Taiwan ) INC<br>13/F , No.99.Sec.1 ,Nankan Road, Luchu shiang,<br>Taoyuan Hsien, Taiwan , R.O.C |
| Model Number | : | E61TAUD |
| FCC ID | : | RFAAND5061TA (for subwoofer and wireless speaker) |
| Serial Number | : | E33510025 |
| Microprocessor | : | Refer to manufacturers' user manual / operating manual. |
| Operating / Transmitting Frequency | : | 2.400GHz to 2.480GHz |
| Clock / Oscillator Frequency | : | Refer to manufacturers' user manual / operating manual. |
| Modulation | : | Gaussian Frequency Shift Keying (GFSK) with BT = 0.5 |
| Port / Connectors | : | Refer to manufacturers' user manual / operating manual. |
| Rated Input Power | : | 110VAC 60Hz (AV receiver)<br>110VAC 60Hz (DVD / CD player)<br>110VAC 60Hz (Subwoofer)<br>110VAC 60Hz (Wireless rear speaker) |
| Accessories | : | Nil |

| **Equipment Description** (Including Brand Name) | **Model, Serial & FCC ID Number** | **Cable Description** (List Length, Type & Purpose) |
|---|---|---|
| Toshiba 14” TV | M/N: 14NX1<br>S/N: 40C03286<br>FCC ID: Verification | 1.80 m unshielded power cable<br>1.00 m RCA cable |

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| FCC Part 15 |
| --- |
| **1. Conducted Emissions**<br>**2. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)**<br>**3. Spectrum Bandwidth (20dB Bandwidth Measurement)**<br>**4. Maximum Peak Power**<br>**5. RF Conducted Spurious Emissions**<br>**6. Peak Power Spectral Density**<br>**7. Maximum Permissible Exposure**<br>**8. Duty Cycle Factor Computation** |
| The EUT was exercised by operating in maximum continuous transmission with frequency hopping off, i.e transmitting at lower, middle and upper channels respectively at one time. |
| **FCC Part 15** |
| **1. Carrier Frequency Separation**<br>**2. Number of Hopping Frequencies**<br>**3. Average Frequency Dwell Time**<br>**4. Band Edge Compliance** |
| The EUT was exercised by operating in maximum continuous transmission with frequency hopping on. |

## FCC Parts 15.107(a) and 15.207 Conducted Emission Limits

| Frequency Range | Limit Values (dBµV) | |
|---|---|---|
| (MHz) | Quasi-peak (QP) | Average (AV) |
| 0.15 - 0.5 | 66 – 56 * | 56 – 46 * |
| 0.5 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |
| * Decreasing linearly with the logarithm of the frequency | | |

## FCC Parts 15.107(a) and 15.207 Conducted Emission Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| Schaffner EMI Receiver – SCR1 | SCR3501 | 238 | 28 Oct 2005 |
| Agilent EMC Analyzer – SA6 | E7403A | US41160166 | 25 May 2006 |
| Schaffner Four-Line V-Network | NNB42 | 04-10057 | 20 May 2006 |

## FCC Parts 15.107(a) and 15.207 Conducted Emission Test Setup

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50Ω/50µH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another LISN.

## FCC Parts 15.107(a) and 15.207 Conducted Emission Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10kHz. Both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line.

### Sample Calculation Example

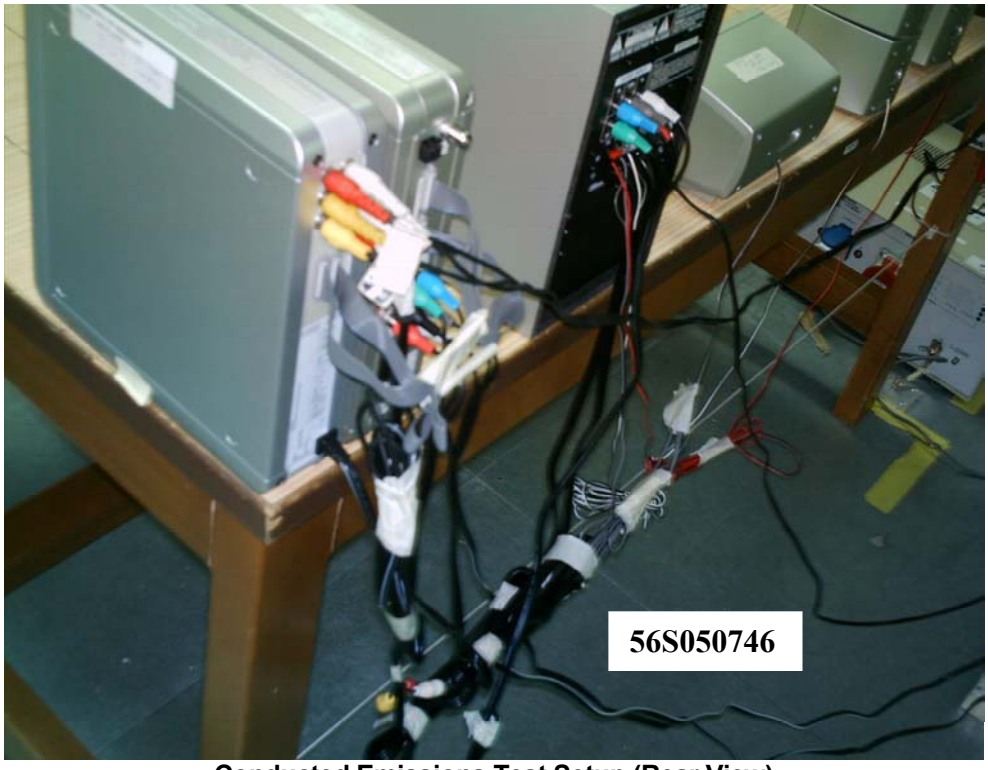
At 20 MHz Q-P limit (Class B) = 100 µV = 60.0 dBµV

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.2 dB

Q-P reading obtained directly from EMI Receiver = 40.0 dBµV
(Calibrated for system losses)

Therefore, Q-P margin = 40.0 - 60.0 = -20.0 i.e. **20.0 dB below Q-P limit**


**Conducted Emissions Test Setup (Front View)**




**Conducted Emissions Test Setup (Rear View)**

**FCC Parts 15.107(a) and 15.207 Conducted Emission Results**

| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| Line Under Test | AC Mains | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Thor Wen Lei / Lim Guan Leong |

**Subwoofer**

| Frequency (MHz) | Q-P Value (dBμV) | Q-P Margin (dB) | AV Value (dBμV) | AV Margin (dB) | Line | Channel |
|---|---|---|---|---|---|---|
| 0.1565 | 58.8 | -6.8 | 30.9 | -24.7 | Neutral | 39 |
| 0.2087 | 57.8 | -5.5 | 31.9 | -21.4 | Neutral | 39 |
| 0.2435 | 56.8 | -5.2 | 31.4 | -20.6 | Neutral | 39 |
| 0.3162 | 55.2 | -4.6 | 27.8 | -22.0 | Neutral | 39 |
| 0.3846 | 53.1 | -5.1 | 33.3 | -14.9 | Neutral | 39 |
| 0.4048 | 49.6 | -8.2 | 23.2 | -24.6 | Live | 39 |

**Wireless Rear Speaker**

| Frequency (MHz) | Q-P Value (dBμV) | Q-P Margin (dB) | AV Value (dBμV) | AV Margin (dB) | Line | Channel |
|---|---|---|---|---|---|---|
| 0.1640 | 53.2 | -12.2 | 26.2 | -29.2 | Live | 39 |
| 0.1803 | 52.7 | -11.9 | 25.8 | -28.8 | Live | 39 |
| 0.2182 | 51.5 | -11.5 | 32.2 | -20.8 | Live | 39 |
| 0.2665 | 50.8 | -10.5 | 24.2 | -27.1 | Live | 39 |
| 0.3297 | 50.0 | -9.6 | 23.7 | -25.9 | Live | 39 |
| 0.4024 | 45.1 | -12.8 | 20.3 | -27.6 | Neutral | 39 |

**AV Receiver**

| Frequency (MHz) | Q-P Value (dBμV) | Q-P Margin (dB) | AV Value (dBμV) | AV Margin (dB) | Line | Channel |
|---|---|---|---|---|---|---|
| 0.6010 | 45.9 | -10.1 | 35.5 | -10.5 | Neutral | 39 |
| 0.9636 | 46.0 | -10.0 | 33.7 | -12.3 | Neutral | 39 |
| 1.4412 | 47.5 | -8.5 | 31.5 | -14.5 | Neutral | 39 |
| 1.3438 | 45.8 | -10.2 | 32.5 | -13.5 | Neutral | 39 |
| 1.8066 | 51.8 | -4.2 | 34.5 | -11.5 | Neutral | 39 |
| 7.8402 | 51.5 | -8.5 | 49.0 | -1.0 | Live | 39 |

**DVD / CD Player**

| Frequency (MHz) | Q-P Value (dBμV) | Q-P Margin (dB) | AV Value (dBμV) | AV Margin (dB) | Line | Channel |
|---|---|---|---|---|---|---|
| 0.1862 | 52.2 | -12.1 | 28.3 | -26.0 | Live | 39 |
| 0.4872 | 43.1 | -13.2 | 33.1 | -13.2 | Neutral | 39 |
| 0.5982 | 44.5 | -11.5 | 33.2 | -12.8 | Neutral | 39 |
| 0.9631 | 45.0 | -11.0 | 34.0 | -12.0 | Neutral | 39 |
| 1.4412 | 45.6 | -10.4 | 31.3 | -14.7 | Neutral | 39 |
| 1.8130 | 51.6 | -4.4 | 34.2 | -11.8 | Neutral | 39 |

Notes:

1. All possible modes of operation were investigated from 150kHz to 30MHz. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   9kHz - 30MHz
   RBW: 10kHz VBW: 30kHz
4. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±2.4dB.

**FCC Part 15.205 Restricted Bands**

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | Above 38.6 |
| 13.36 - 13.41 | | | |

**FCC Parts 15.109(a) and 15.209 Radiated Emission Limits**

| Frequency Range (MHz) | Quasi-Peak Limit Values (dBµV/m) @ 3m |
|---|---|
| 30 - 88 | 40.0 |
| 88 - 216 | 43.5 |
| 216 - 960 | 46.0 |
| Above 960 | 54.0* |
| * Above 1GHz, average detector was used. A peak limit of 20dB above the average limit does apply. | |

**FCC Parts 15.109(a) and 15.209 Radiated Emission Test Instrumentation**

| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| R&S Test Receiver (20Hz-26.5GHz) – ESMI2 | ESMI | 829214/006<br>829550/001 | 18 Apr 2006 |
| HP Preamplifier (for ESMI2, 0.01-3GHz) – PA6 | 87405A | 3950M00353 | 02 Aug 2006 |
| MITEQ Preamplifier (0.1-26.5GHz) – PA3 | NSP2650-N | 592346 | 01 Apr 2006 |
| Schaffner Bilog Antenna – BL9 | CBL6143 | 5045 | 13 May 2006 |
| EMCO Horn Antenna – H1 | 3115 | 9901-5671 | 19 May 2006 |
| Bandstop Filter (2.4-2.5 GHz) | BRM50701 | 017 | 13 Nov 2005 |

**FCC Parts 15.109(a) and 15.209 Radiated Emission Test Setup**

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

**FCC Parts 15.109(a) and 15.209 Radiated Emission Test Method**

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which attitude and equipment arrangement produces such emissions.
3. The test was carried out at the selected frequency points obtained from the prescan in step 2. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
4. A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point that above 1GHz, both Peak and Average measurements were carried out.
5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured.
6. The frequency range covered was from 30MHz to 10$^{th}$ harmonics of the EUT fundamental frequency, using the Bi-log antenna for frequencies from 30MHz up to 3GHz, and the Horn antenna above 3GHz.

**Sample Calculation Example**

At 300 MHz Q-P limit (Class B) = 200 μV/m = 46.0 dBμV/m

Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB

Q-P reading obtained directly from EMI Receiver = 40.0 dBμV/m
(Calibrated level including antenna factors & cable losses)

Therefore, Q-P margin = 40.0 - 46.0 = -6.0 i.e. **6 dB below Q-P limit**


**Radiated Emissions Test Setup (Front View)**


**Radiated Emissions Test Setup (Rear View)**

**FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results**

| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| Test Distance | 3m | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Thor Wen Lei / Johnsen Tia / Anthony Toh |

Spurious Emissions ranging from 30MHz – 1GHz (all units except wireless rear speaker)

| Frequency (MHz) | Q-P Value (dBμV/m) | Q-P Margin (dB) | Azimuth (Degrees) | Height (cm) | Polarisation (H/V) | Channel |
|---|---|---|---|---|---|---|
| 31.9822 | 22.3 | -17.7 | 112 | 100 | V | 39 |
| 107.9769 | 38.3 | -4.7 | 180 | 100 | V | 39 |
| 171.9797 | 36.8 | -6.7 | 311 | 112 | V | 39 |
| 184.3371 | 29.0 | -14.5 | 321 | 107 | V | 39 |
| 196.6196 | 38.2 | -5.3 | 180 | 144 | H | 39 |
| 245.6216 | 36.3 | -9.7 | 207 | 100 | H | 39 |

Spurious Emissions above 1GHz (all units except wireless rear speaker)

| Frequency (GHz) | Peak Value (dBμV/m) | Average Value (dBμV/m) | Average Margin (dB) | Azimuth (Degrees) | Height (cm) | Pol (H/V) | Channel |
|---|---|---|---|---|---|---|---|
| 7.3231 | 47.5 | 45.4 | -8.6 | 124 | 100 | H | 39 |

Spurious Emissions ranging from 30MHz – 1GHz (wireless rear speaker)

| Frequency (MHz) | Q-P Value (dBμV/m) | Q-P Margin (dB) | Azimuth (Degrees) | Height (cm) | Polarisation (H/V) | Channel |
|---|---|---|---|---|---|---|
| 257.9999 | 33.7 | -12.3 | 189 | 101 | H | 39 |
| 552.9828 | 40.0 | -6.0 | 96 | 118 | H | 39 |
| 589.9575 | 42.8 | -3.2 | 160 | 98 | H | 39 |
| 671.9817 | 35.1 | -10.9 | 76 | 158 | H | 39 |
| 703.9693 | 35.0 | -11.0 | 76 | 147 | H | 39 |

Spurious Emissions above 1GHz (wireless rear speaker)

| Frequency (GHz) | Peak Value (dBμV/m) | Average Value (dBμV/m) | Average Margin (dB) | Azimuth (Degrees) | Height (cm) | Pol (H/V) | Channel |
|---|---|---|---|---|---|---|---|
| 1.5794 | 43.6 | 28.4 | -25.6 | 150 | 100 | V | 39 |
| 1.6199 | 31.0 | 15.8 | -38.2 | 17 | 101 | V | 39 |

Notes:

1. All possible modes of operation were investigated. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. The average margin indicates the margin of the measured peak value below the average limit.
3. Quasi-peak measurement was used for frequency measurement up to 1GHz. Average and peak measurements were used for emissions above 1GHz. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
4. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
5. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   30MHz - 1GHz
   RBW: 120kHz VBW: 1MHz
   >1GHz
   RBW: 1MHz VBW: 1MHz
6. The upper frequency of radiated emission investigations was according to requirements stated in Section 15.33(a) for intentional radiators & Section 15.33(b) for unintentional radiators.
7. The channel in the table refers to the transmit channel of the EUT.
8. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz (QP only @ 3m & 10m) is ±4.3dB (for EUTs < 0.5m X 0.5m X 0.5m).

## FCC Part 15.247(a)(1) Carrier Frequency Separation Limits

The EUT shows compliance to the requirements of this section, which states the adjacent carrier frequencies must be separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, the EUT may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW (21dBm).

## FCC Part 15.247(a)(1) Carrier Frequency Separation Test Instrumentation

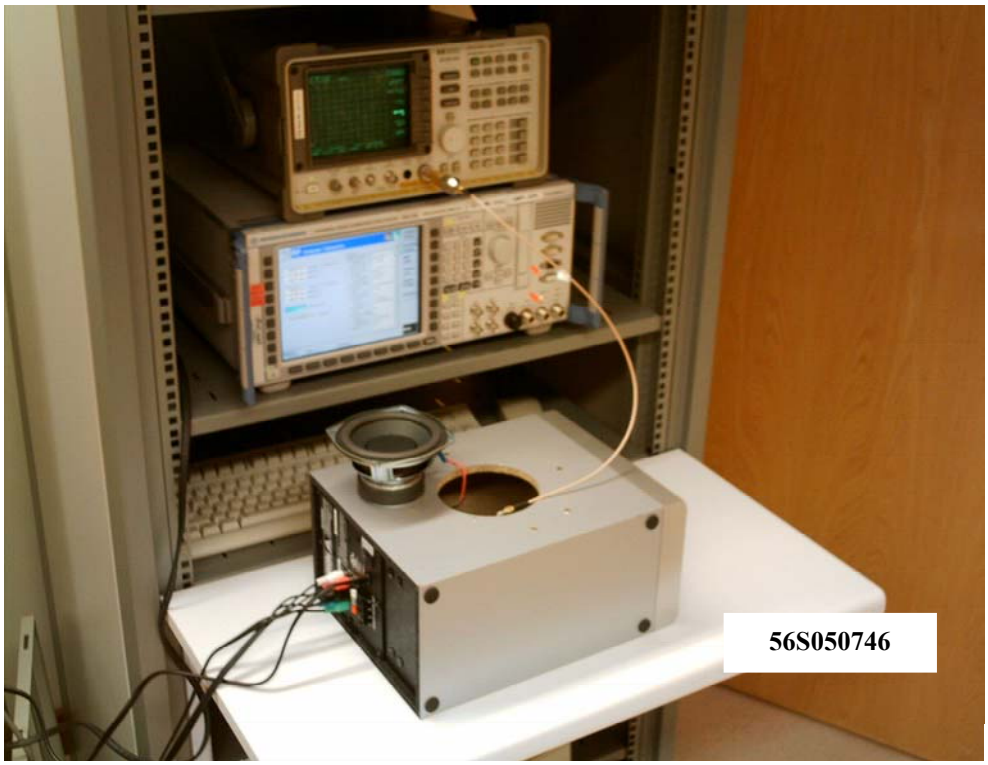
| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| HP Spectrum Analyzer – SA10 | 8564E | 3846A01433 | 27 Apr 2006 |

## FCC Part 15.247(a)(1) Carrier Frequency Separation Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 100kHz.
5. All other supporting equipment were powered separately from another filtered mains.

## FCC Part 15.247(a)(1) Carrier Frequency Separation Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with frequency hopping sequence on.
2. The start and stop frequencies of the spectrum analyser were set to 2.401GHz and 2.404GHz.
3. The spectrum analyser was set to max hold to capture the two adjacent transmitting frequencies within the span. The signal capturing was continuous until no further signals were detected.
4. The carrier frequency separation of the two adjacent transmitting / operating frequency was measured by finding the carrier frequency difference between the two adjacent channels.
5. The steps 2 to 4 were repeated with the following start and stop frequencies settings:
   a. 2.439GHz to 2.442GHz
   b. 2.440GHz to 2.443GHz
   c. 2.478GHz to 2.481GHz




**Carrier Frequency Separation Test Setup**

**FCC Part 15C (15.247(a)(1)) Carrier Frequency Separation Results**

| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| Attached Plots | 1 - 3 (Subwoofer)<br>4 - 6 (Wireless Rear Speaker) | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Thor Wen Lei |

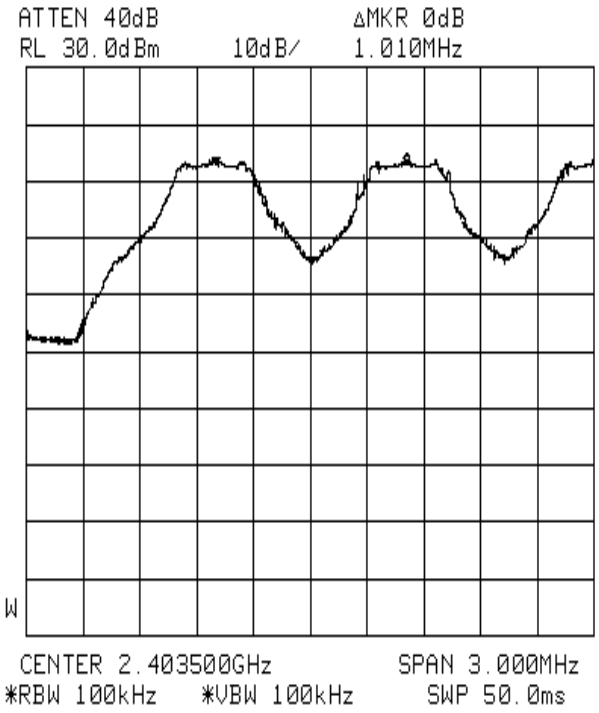
**Subwoofer**

| Adjacent Channels | Channel Separation (MHz) |
|---|---|
| 1 and 2 (2.403GHz and 2.404GHz) | 1.010 |
| 38 and 39 (2.440GHz and 2.441GHz) | 1.015 |
| 77 and 78 (2.479GHz and 2.480GHz) | 1.020 |

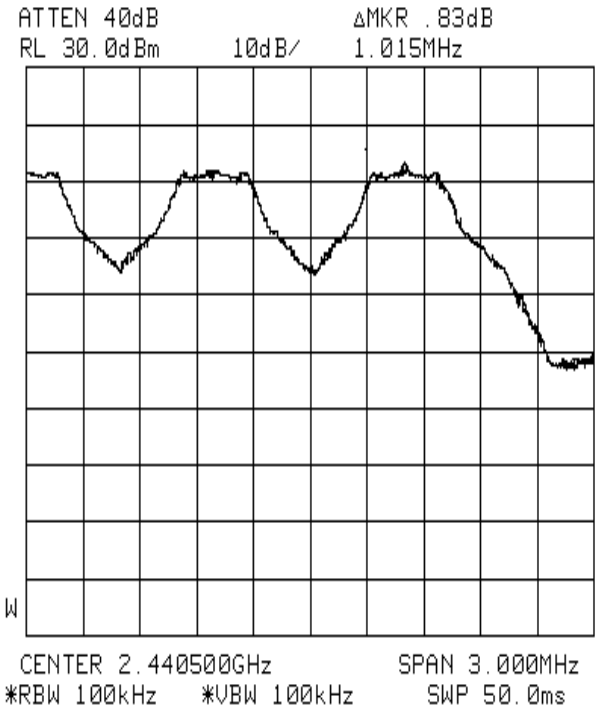
**Wireless Rear Speaker**

| Adjacent Channels | Channel Separation (MHz) |
|---|---|
| 1 and 2 (2.403GHz and 2.404GHz) | 1.015 |
| 38 and 39 (2.440GHz and 2.441GHz) | 1.015 |
| 77 and 78 (2.479GHz and 2.480GHz) | 1.015 |

**Carrier Frequency Separation Plots - Subwoofer**

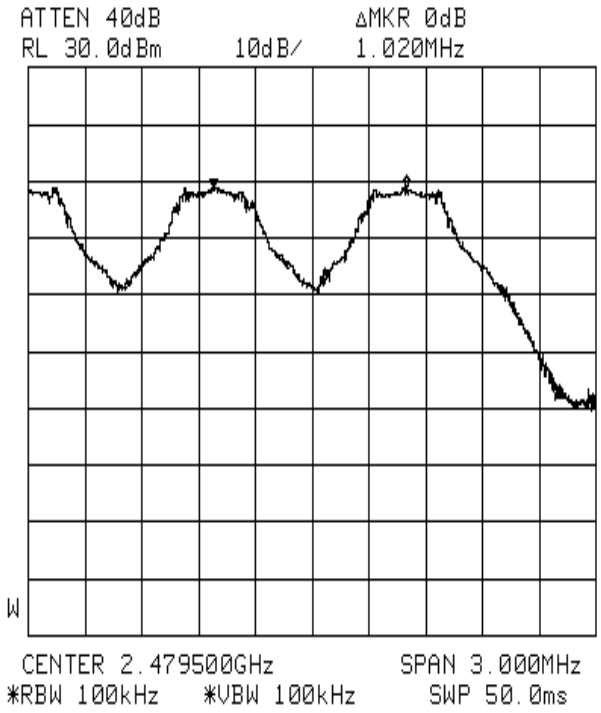



**Plot 1 - Channels 1 and 2 Separation**



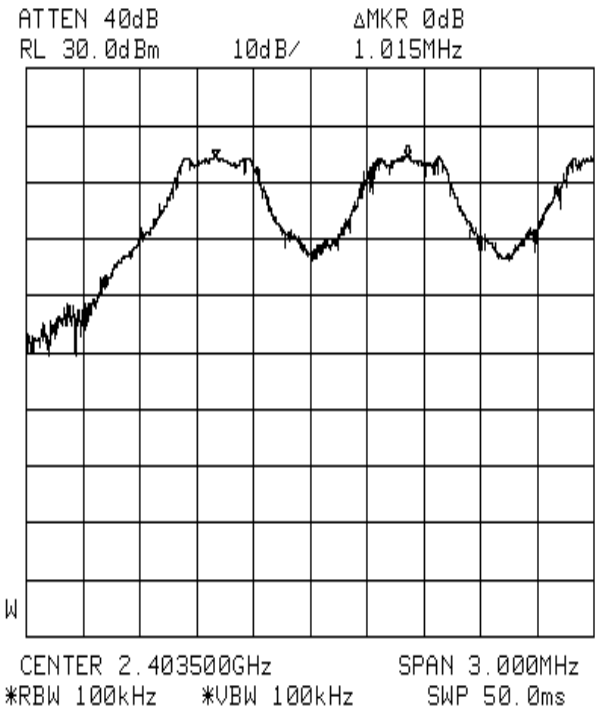

**Plot 2 – Channels 38 and 39 Separation**

**Carrier Frequency Separation Plots - Subwoofer**

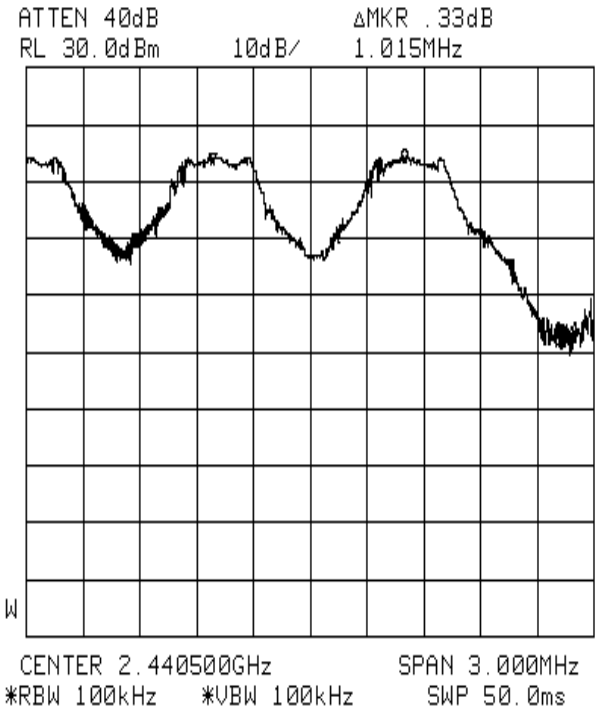



**Plot 3 - Channels 77 and 78 Separation**

**Carrier Frequency Separation Plots - Wireless Rear Speaker**

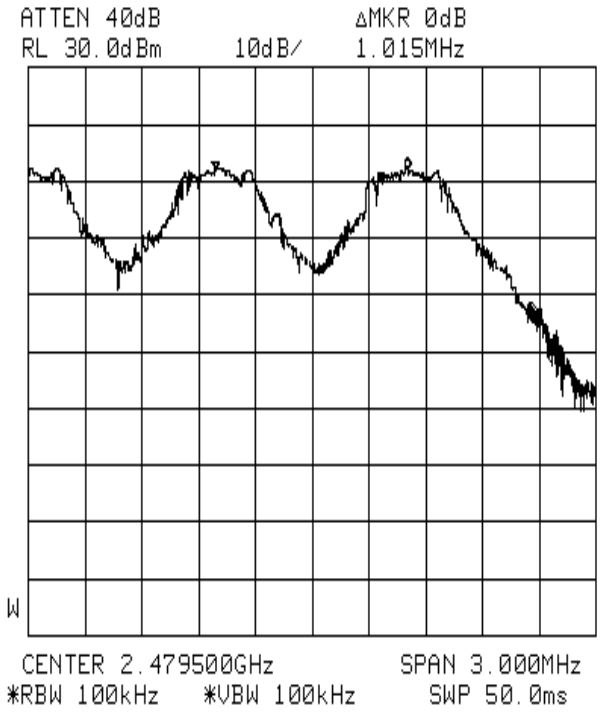



**Plot 4 - Channels 1 and 2 Separation**




**Plot 5 – Channels 38 and 39 Separation**

**Carrier Frequency Separation Plots - Wireless Rear Speaker**




**Plot 6 - Channels 77 and 78 Separation**

## SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

### FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Limits

The EUT shows compliance to the requirements of this section, which states that the 20dB bandwidth of the hopping channel shall be the channel frequency separation by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

### FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Test Instrumentation

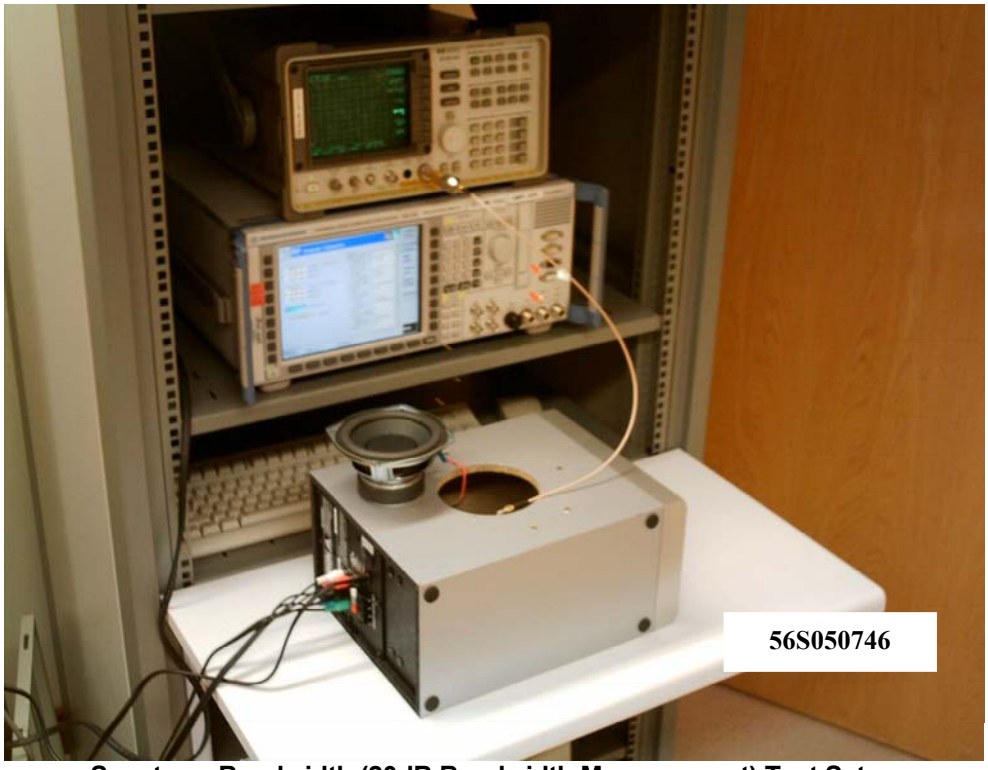
| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| HP Spectrum Analyzer – SA10 | 8564E | 3846A01433 | 27 Apr 2006 |

### FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 10kHz and 30kHz.
5. All other supporting equipment were powered separately from another filtered mains.

### FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at Channel 1 (2.403GHz).
2. The center frequency of the spectrum analyser was set to the transmitting frequency with the frequency span wide enough to capture the 20dB bandwidth of the transmitting frequency.
3. The spectrum analyser was set to max hold to capture the transmitting frequency. The signal capturing was continuous until no further changes were observed.
4. The peak of the transmitting frequency was detected with the marker peak function of the spectrum analyser. The frequencies below the 20dB peak frequency at lower ($f_L$) and upper ($f_H$) sides of the transmitting frequency were marked and measured by using the marker-delta function of the spectrum analyser.
5. The 20dB bandwidth of the transmitting frequency is the frequency difference between the marked lower and upper frequencies, $| f_H - f_L |$.
6. The steps 2 to 5 were repeated with the transmitting frequency was set to Channel 39 (2.441GHz) and Channel 78 (2.480GHz) respectively.




**Spectrum Bandwidth (20dB Bandwidth Measurement) Test Setup**

**FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Results**

| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| Attached Plots | 7 - 9 (Subwoofer)<br>10 - 12 (Wireless Rear Speaker) | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Thor Wen Lei |

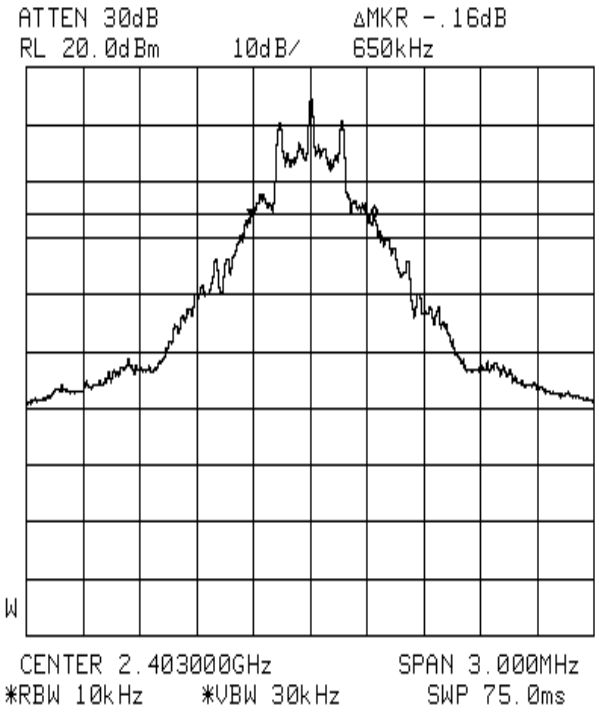
**Subwoofer**

| Channel | Channel Frequency (GHz) | 20dB Bandwidth (MHz) |
|---|---|---|
| 1 | 2.403 | 0.650 |
| 39 | 2.441 | 0.665 |
| 78 | 2.480 | 0.635 |

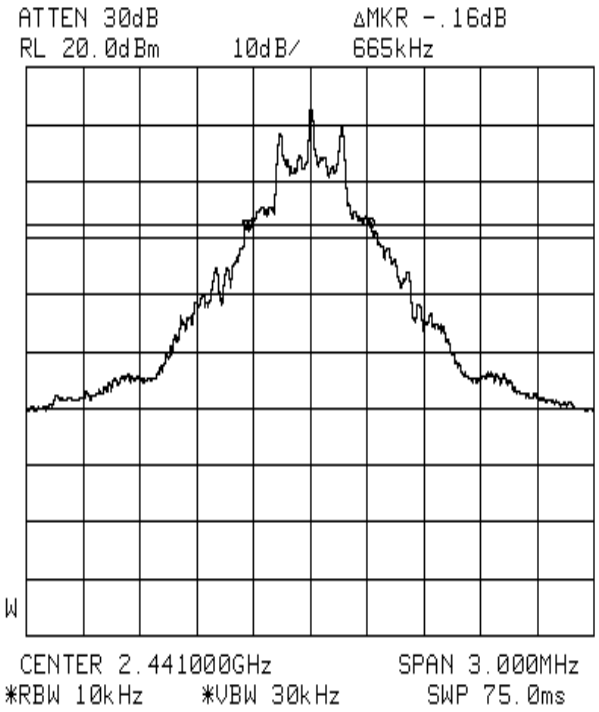
**Wireless Rear Speaker**

| Channel | Channel Frequency (GHz) | 20dB Bandwidth (MHz) |
|---|---|---|
| 1 | 2.403 | 0.645 |
| 39 | 2.441 | 0.675 |
| 78 | 2.480 | 0.655 |

**Spectrum Bandwidth (20dB Bandwidth Measurement) Plots - Subwoofer**

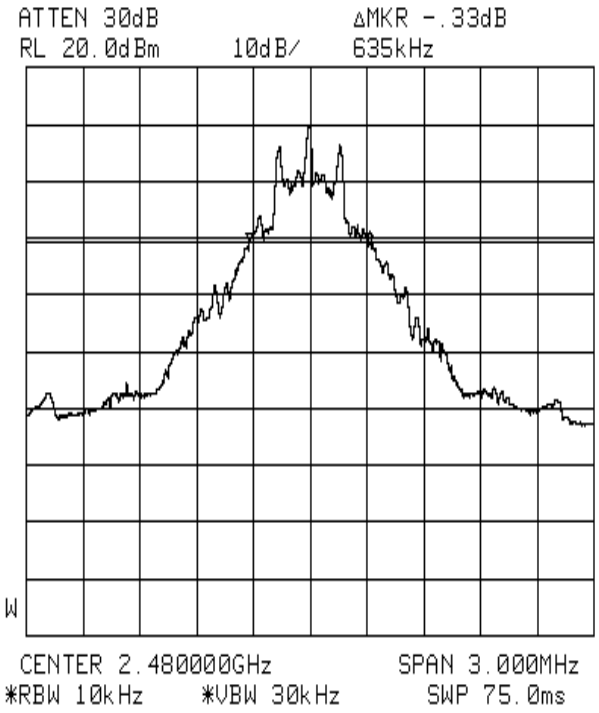



**Plot 7 – Channel 1**



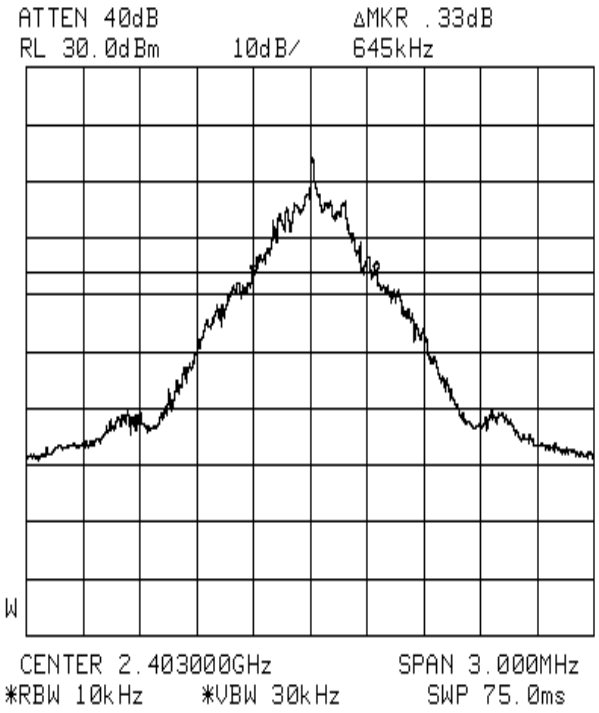

**Plot 8 – Channel 39**

**Spectrum Bandwidth (20dB Bandwidth Measurement) Plots - Subwoofer**

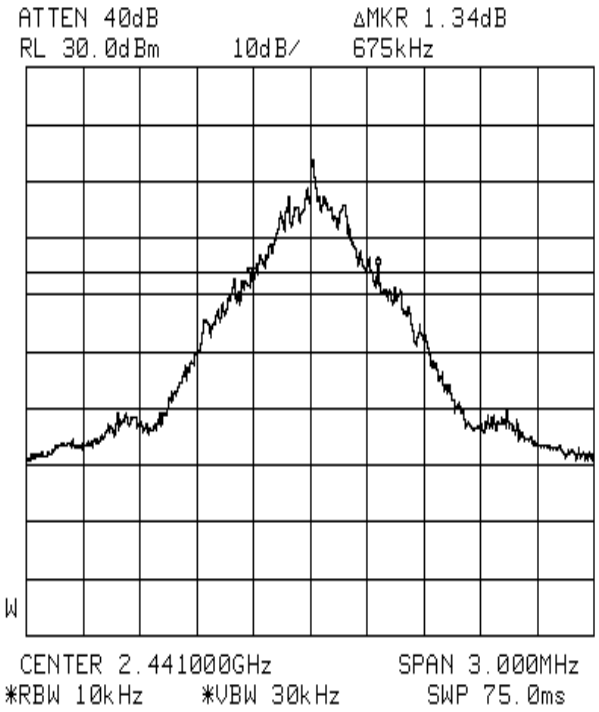



**Plot 9 – Channel 78**

**Spectrum Bandwidth (20dB Bandwidth Measurement) Plots - Wireless Rear Speaker**

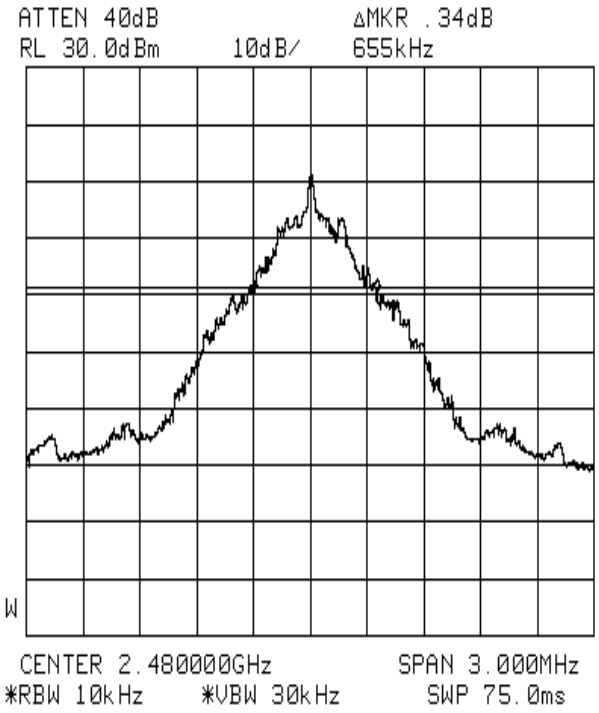



**Plot 10 – Channel 1**




**Plot 11 – Channel 39**

**Spectrum Bandwidth (20dB Bandwidth Measurement) Plots - Wireless Speaker**




**Plot 12 – Channel 78**

## FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Limits

The EUT shows compliance to the requirements of this section, which states the EUT shall use at least 15 channels.

## FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Test Instrumentation

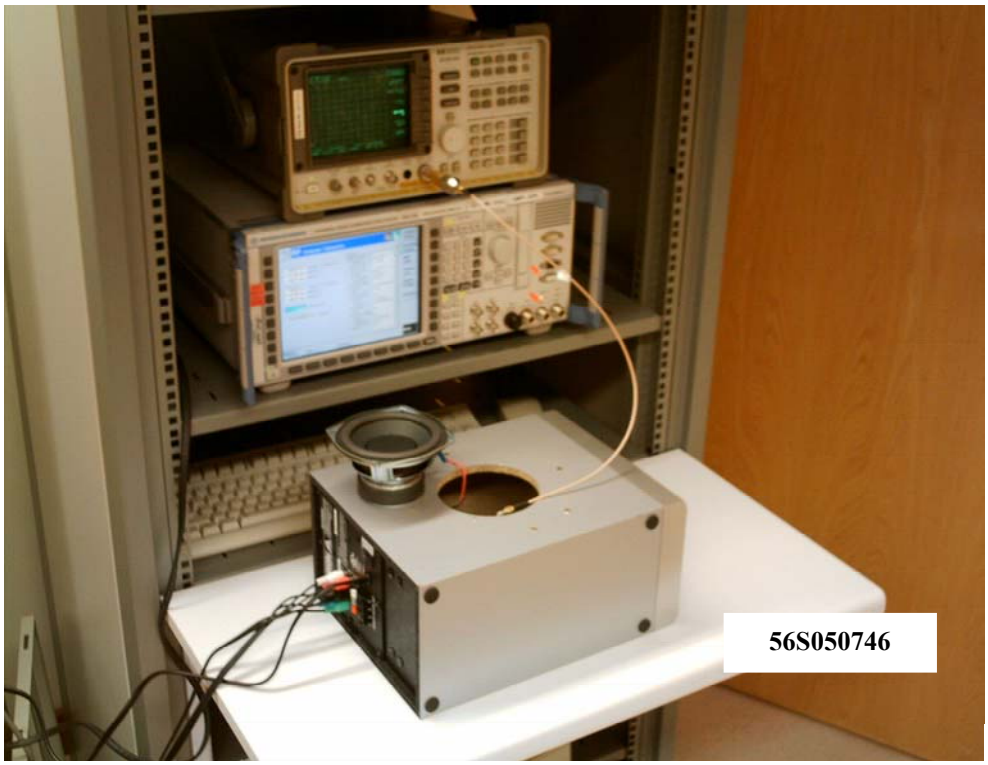
| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| HP Spectrum Analyzer – SA10 | 8564E | 3846A01433 | 27 Apr 2006 |

## FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 300kHz and 1000kHz.
5. All other supporting equipment were powered separately from another filtered mains.

## FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with frequency hopping sequence on.
2. The start and stop frequencies of the spectrum analyser were set to 2.40GHz and 2.421GHz.
3. The spectrum analyser was set to max hold to capture all the transmitting frequencies within the span. The signal capturing was continuous until all the transmitting frequencies were captured and no further signals were detected.
4. The numbers of transmitting frequencies were counted and recorded.
5. The steps 2 to 4 were repeated with the following start and stop frequencies settings:
   a. 2.420GHz to 2.441GHz
   b. 2.440GHz to 2.461GHz
   c. 2.460GHz to 2.4835GHz
6. The total number of hopping frequencies is the sum of the number of the hopping frequencies found for each span.




**Number of Hopping Frequencies Test Setup**

**FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Results**

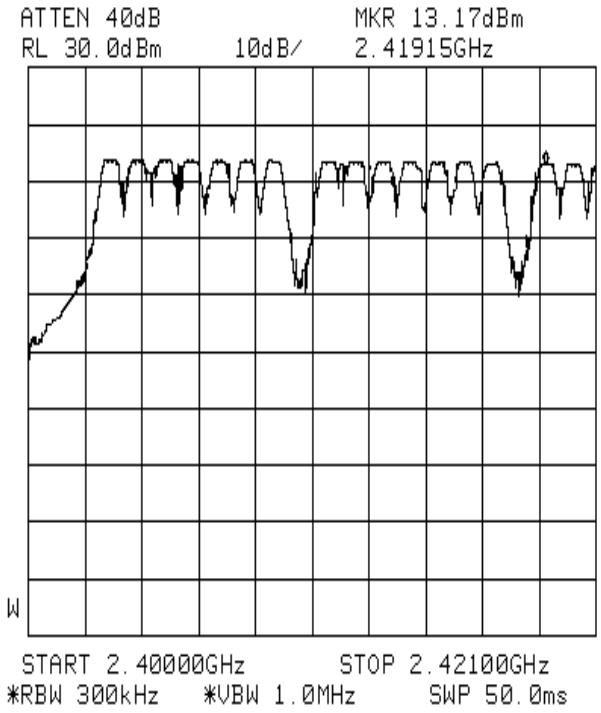
| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| Attached Plots | 13 - 16 (Subwoofer)<br>17 - 20 (Wireless Rear Speaker) | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Thor Wen Lei |

The EUT was found to have 69 hopping frequencies for both subwoofer and wireless rear speaker. Please refer to the attached plots.

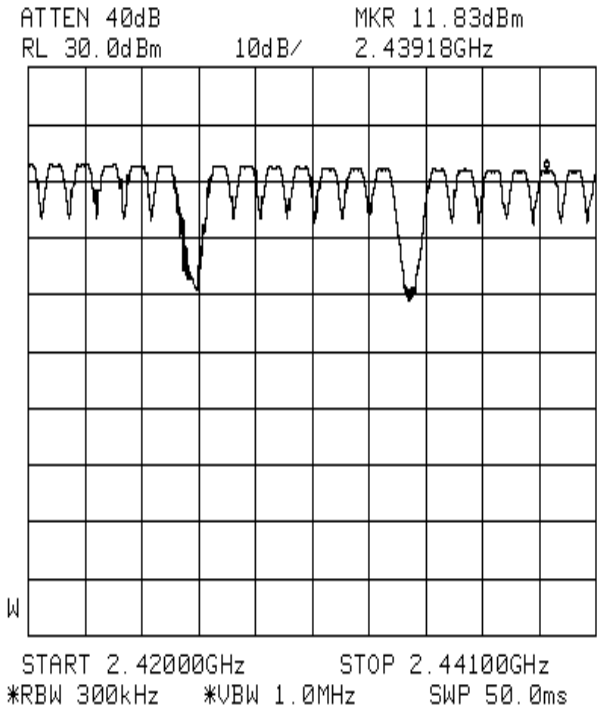
Note:

1. Channels 0, 8, 16, 24, 32, 40, 48, 56, 64, 72 are not in used.

**Number Of Hopping Frequencies Plots - Subwoofer**

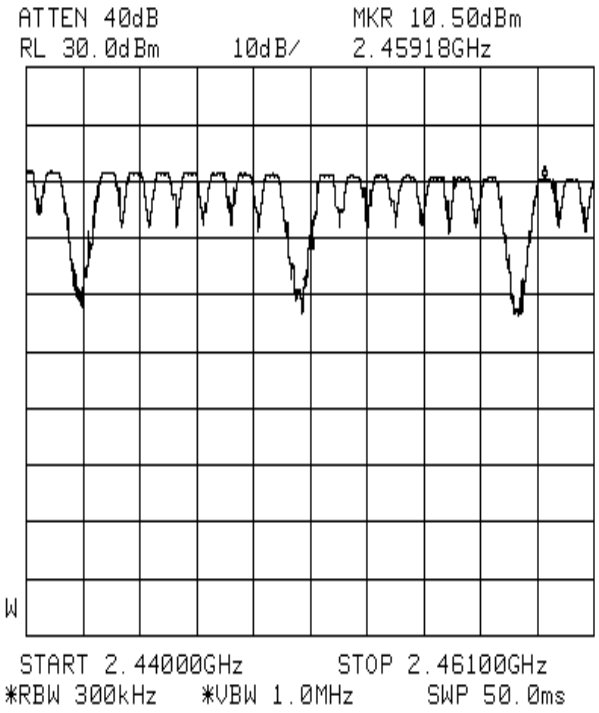



**Plot 13 - Channels 1 to 18**

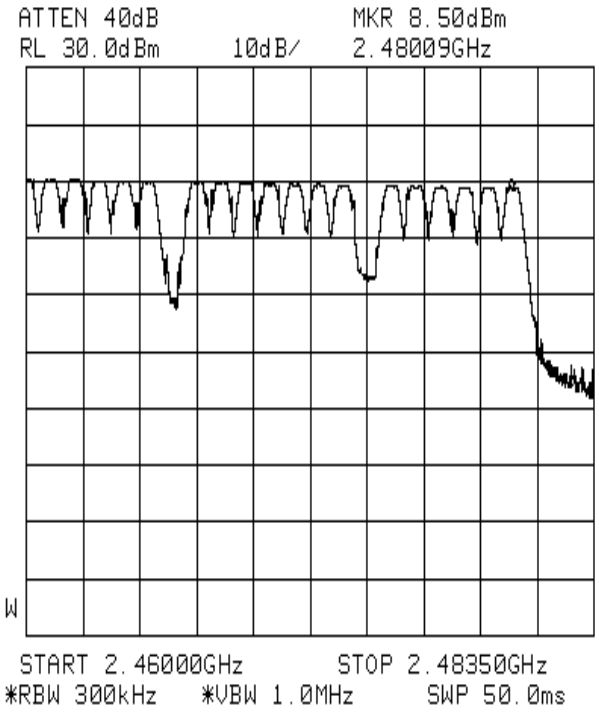



**Plot 14 - Channels 19 to 38**

**Number Of Hopping Frequencies Plots - Subwoofer**

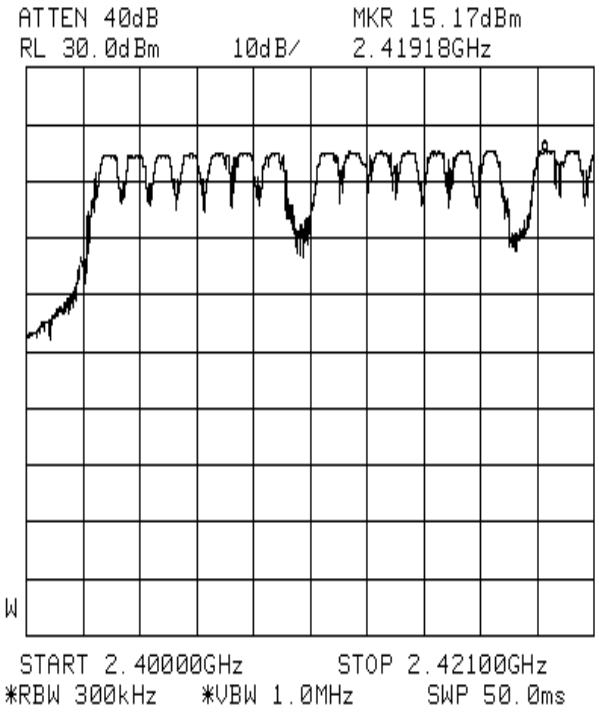



**Plot 15 - Channels 39 to 58**

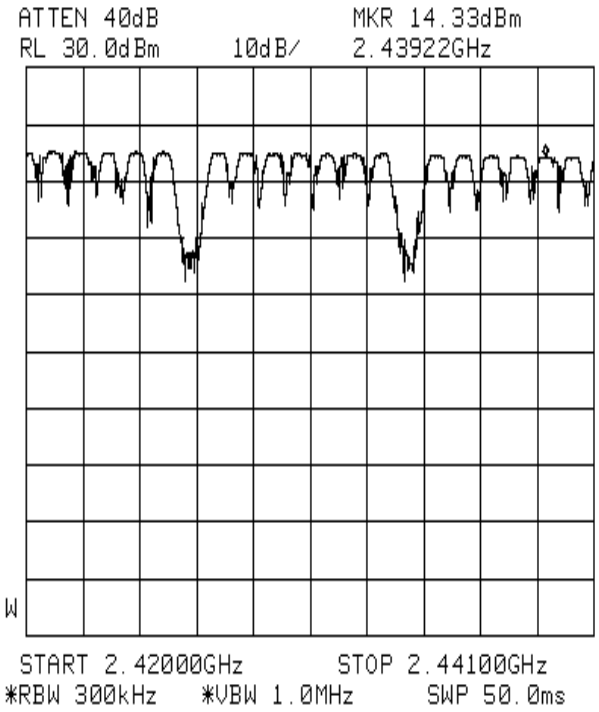



**Plot 16 - Channels 59 to 78**

**Number Of Hopping Frequencies Plots - Wireless Rear Speaker**

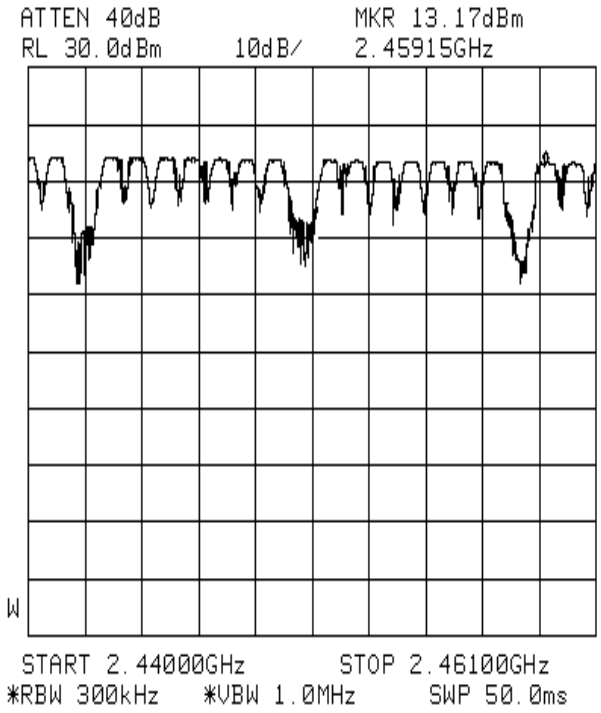



**Plot 17 - Channels 1 to 18**

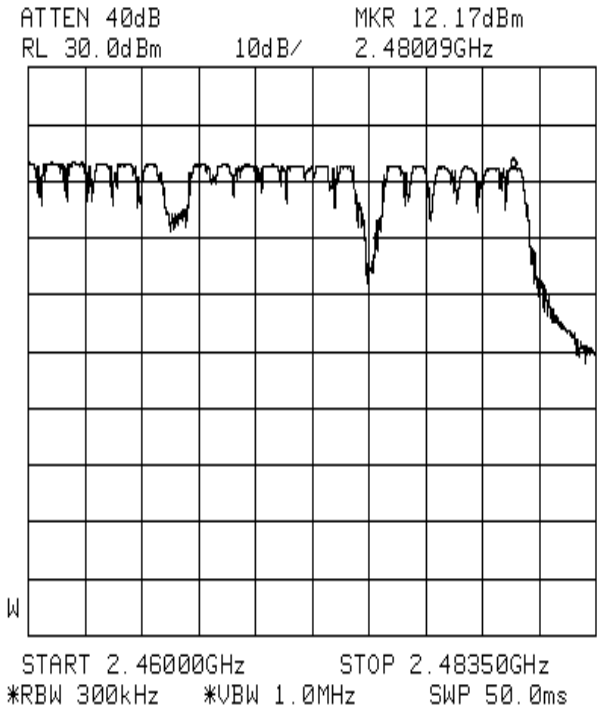



**Plot 18 - Channels 19 to 38**

**Number Of Hopping Frequencies Plots - Wireless Rear Speaker**




**Plot 19 - Channels 39 to 58**




**Plot 20 - Channels 59 to 78**

## FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Time Limits

The EUT shows compliance to the requirements of this section, which states the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

## FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Time Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| HP Spectrum Analyzer – SA10 | 8564E | 3846A01433 | 27 Apr 2006 |

## FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 1MHz and 3MHz.
5. All other supporting equipment were powered separately from another filtered mains.

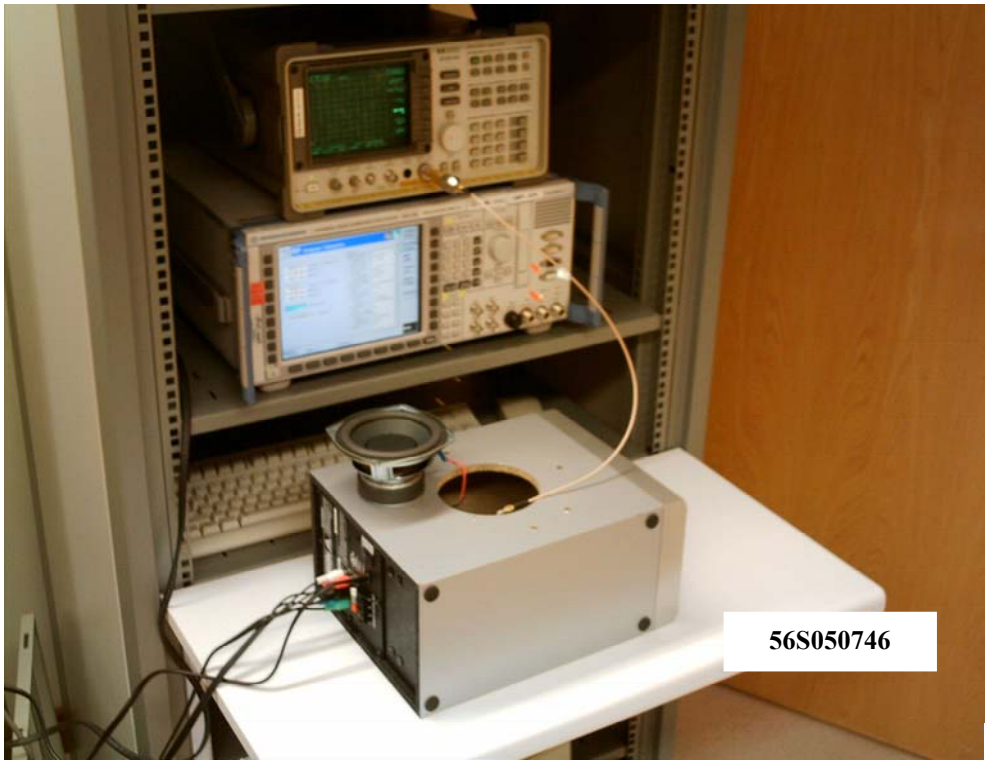
## FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with frequency hopping sequence on.
2. The center frequency of the spectrum analyser was set to 2.403GHz with zero frequency span (spectrum analyser acts as an oscilloscope).
3. The sweep time of the spectrum analyser was adjusted until a stable signal can be seen on the spectrum analyser.
4. The duration (dwell time) of a packet was measured using the marker-delta function of the spectrum analyser. The average dwell time of the transmitting frequency was computed as below:

   Average Frequency Dwell Time = [ measured time slot length x hopping rate / number of hopping channels] x [ 0.4 x number of hopping channels ]

   where EUT hopping rate = 400 hops/s
   Number of EUT hopping channels = 78 channels

5. The steps 2 to 4 were repeated with the center frequency of the spectrum analyser were set to 2.441GHz and 2.480GHz respectively.




**Average Frequency Dwell Time Test Setup**

**FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Time Results**

| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| Attached Plots | 21 - 23 (Subwoofer)<br>24 - 26 (Wireless Rear Speaker) | Relative Humidity | 55% |
| Hopping Rate | 400 hops / s | Atmospheric Pressure | 1030mbar |
| Number of Hopping Channels | 69 channels | Tested By | Thor Wen Lei |

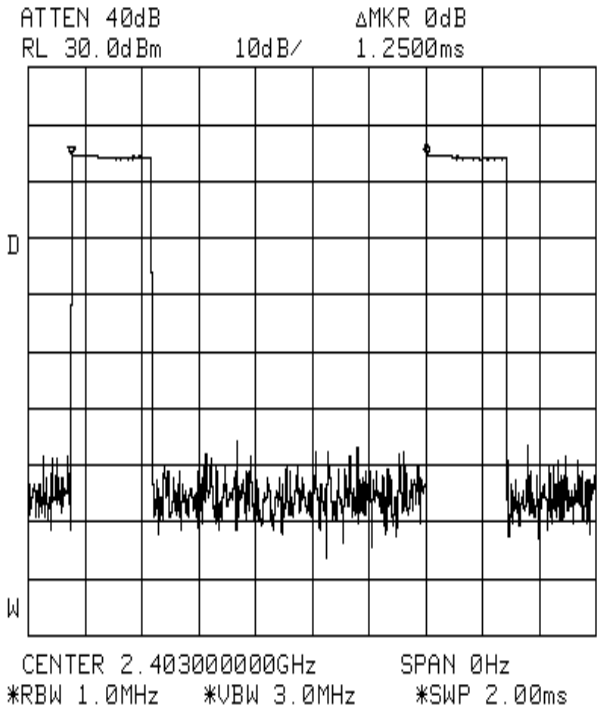
**Subwoofer**

| Channel | Channel Frequency (GHz) | Measured Time Slot Length (ms) | Average Frequency Dwell Time (s) | Average Occupancy Limit (s) |
|---|---|---|---|---|
| 1 | 2.403 | 1.25 | 0.2 | 0.4 |
| 39 | 2.441 | 1.25 | 0.2 | 0.4 |
| 78 | 2.480 | 1.25 | 0.2 | 0.4 |

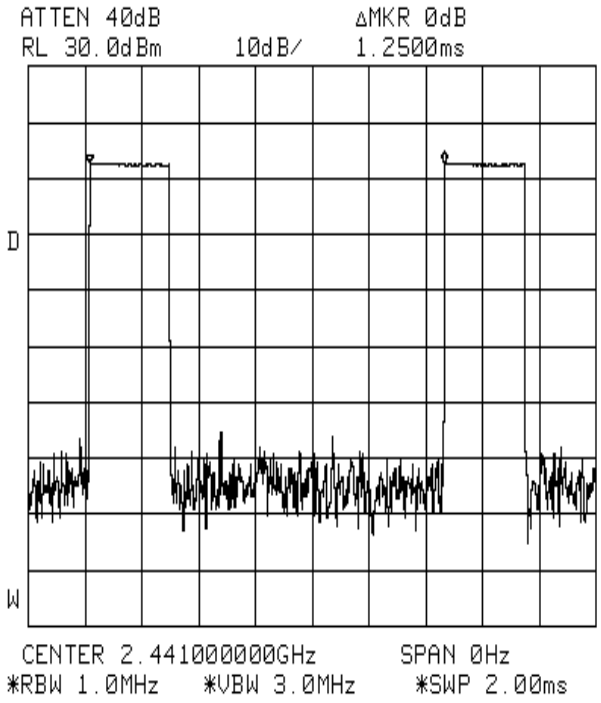
**Wireless Rear Speaker**

| Channel | Channel Frequency (GHz) | Measured Time Slot Length (ms) | Average Frequency Dwell Time (s) | Average Occupancy Limit (s) |
|---|---|---|---|---|
| 1 | 2.403 | 2.50 | 0.4 | 0.4 |
| 39 | 2.441 | 2.50 | 0.4 | 0.4 |
| 78 | 2.480 | 2.50 | 0.4 | 0.4 |

**Average Frequency Dwell Time Plots - Subwoofer**

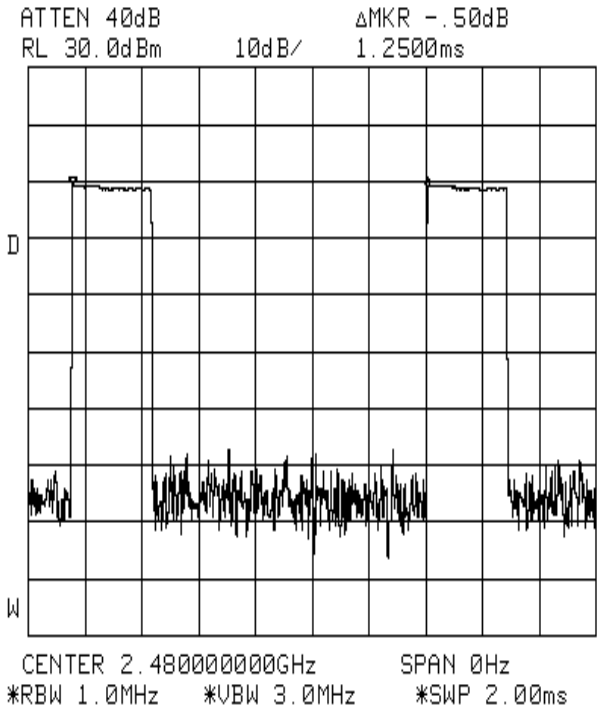



**Plot 21 – Channel 1**



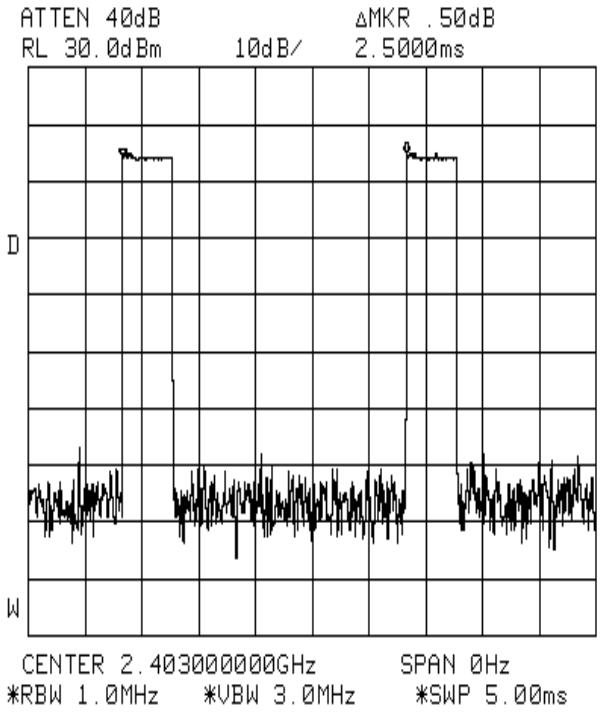

**Plot 22 – Channel 39**

**Average Frequency Dwell Time Plots - Subwoofer**

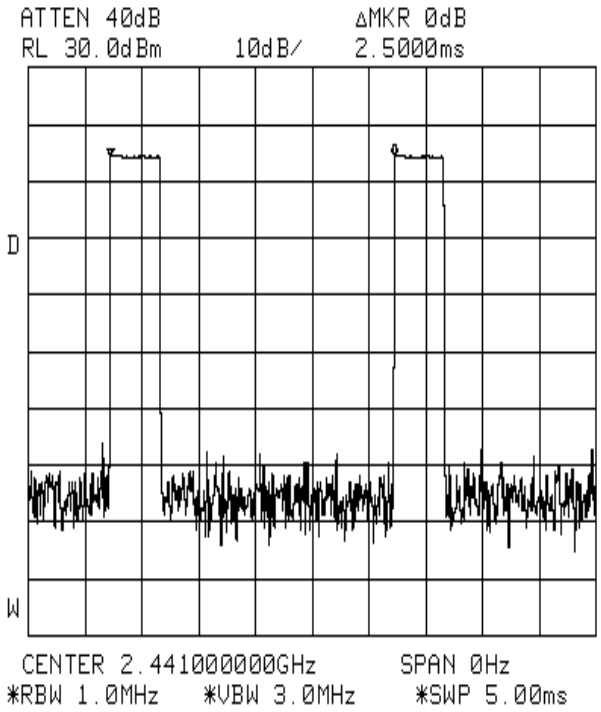



**Plot 23 – Channel 78**

**Average Frequency Dwell Time Plots - Wireless Rear Speaker**

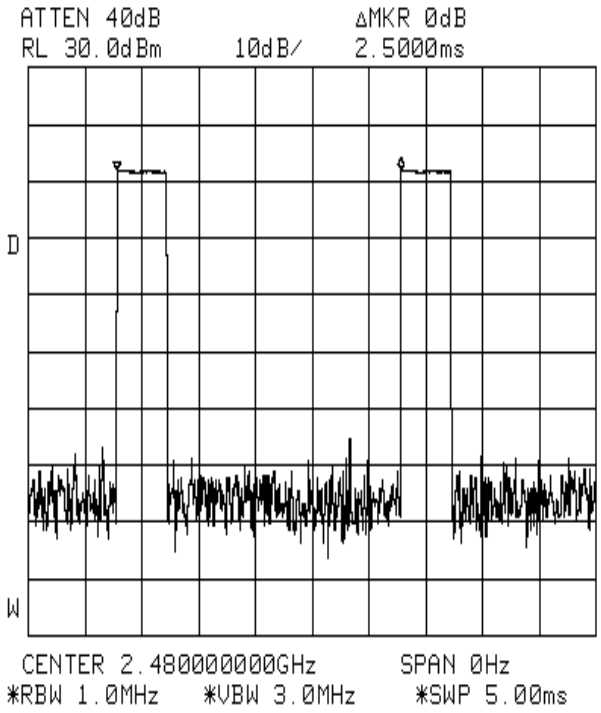



**Plot 24 – Channel 1**




**Plot 25 – Channel 39**

**Average Frequency Dwell Time Plots - Wireless Rear Speaker**




**Plot 26 – Channel 78**

## FCC Part 15.247(b)(1) Maximum Peak Power Limits

The EUT shows compliance to the requirements of this section, which states the EUT employing at least 75 non-overlapping hopping channels shall not exceed 1W (30dBm). For the EUT employs other frequency hopping systems, the peak power shall not greater than 0.125W (21dBm).

## FCC Part 15.247(b)(1) Maximum Peak Power Test Instrumentation

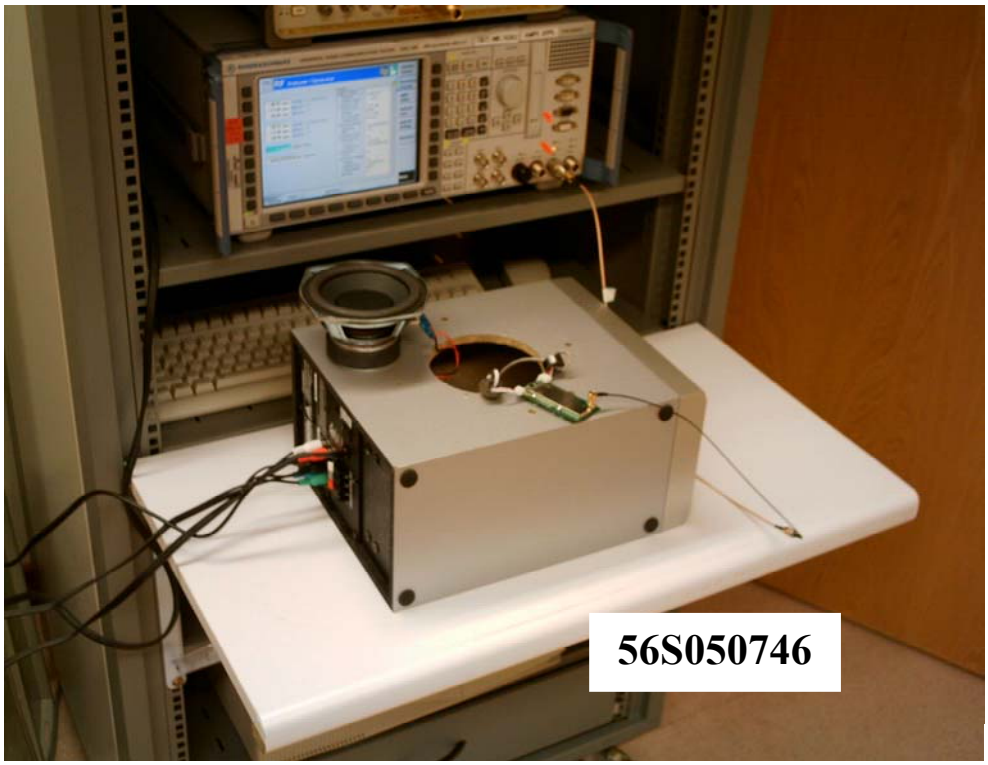
| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| R&S Universal Radio Communication Tester | CMU 200 | 837587/068 | 23 Mar 2006 |

## FCC Part 15.247(b)(1) Maximum Peak Power Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the Universal Radio Communication Tester, which set into power analyser mode via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another filtered mains.

## FCC Part 15.247(b)(1) Maximum Peak Power Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at Channel 1 (2.403GHz).
2. The maximum peak power of the transmitting frequency was detected and recorded.
3. The step 2 was repeated with the transmitting frequency was set to Channel 39 (2.441GHz) and Channel 78 (2.480GHz) respectively.




**Maximum Peak Power Test Setup**

**FCC Part 15.247(b)(1) Maximum Peak Power Results**

| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| | | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Anthony Toh |

**Subwoofer**

| Channel | Channel Frequency (GHz) | Maximum Peak Power (W) | Limit (W) |
|---|---|---|---|
| 1 | 2.403 | 0.0288 | 0.125 |
| 39 | 2.441 | 0.0239 | 0.125 |
| 78 | 2.480 | 0.0158 | 0.125 |

**Wireless Rear Speaker**

| Channel | Channel Frequency (GHz) | Maximum Peak Power (W) | Limit (W) |
|---|---|---|---|
| 1 | 2.403 | 0.0263 | 0.125 |
| 39 | 2.441 | 0.0229 | 0.125 |
| 78 | 2.480 | 0.0165 | 0.125 |

Notes:

1. Power analyser of Universal Radio Communication Tester was used for power measurement with peak detection as mode of measurement. The power analyser mode supports a wideband power measurement ranging from 100kHz to 2700MHz.

## FCC Part 15.247(d) RF Conducted Spurious Emissions Limits

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

## FCC Part 15.247(d) RF Conducted Spurious Test Instrumentation

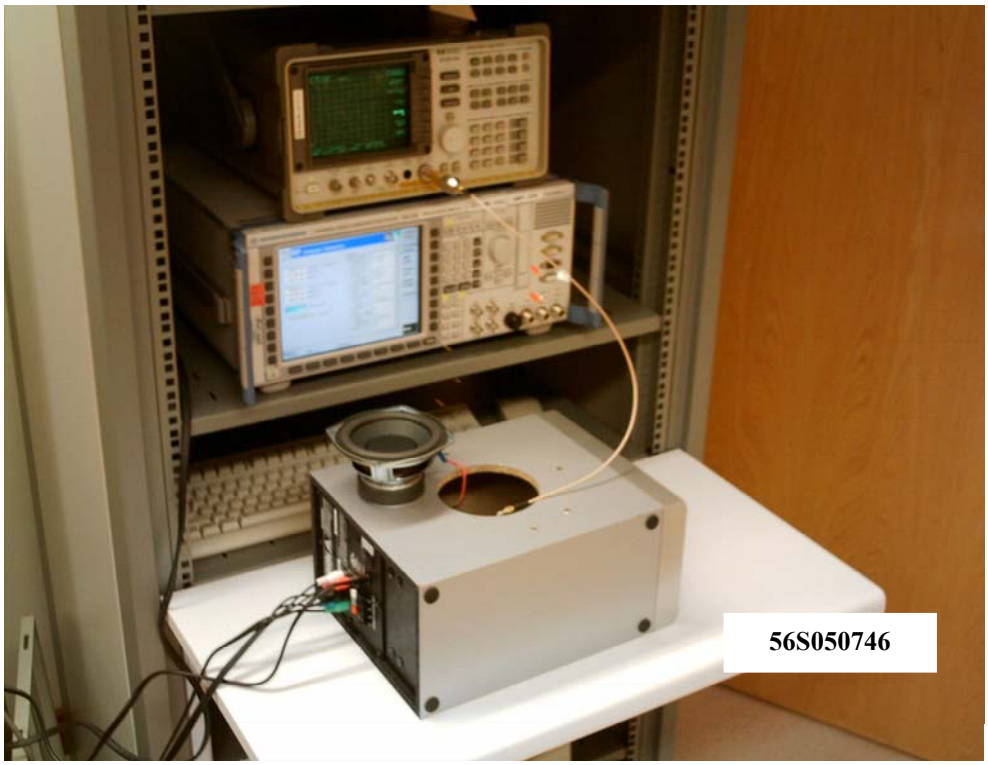
| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| HP Spectrum Analyzer – SA10 | 8564E | 3846A01433 | 27 Apr 2006 |

## FCC Part 15.247(d) RF Conducted Spurious Emissions Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

## FCC Part 15.247(d) RF Conducted Spurious Emissions Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at Channel 1 (2.403GHz).
2. The start and stop frequencies of the spectrum analyser were set to 30MHz and 10GHz.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with frequency span was set from 10GHz to 25GHz.
5. The steps 2 to 4 were repeated with the transmitting frequency was set to Channel 39 (2.441GHz) and Channel 78 (2.480GHz) respectively.



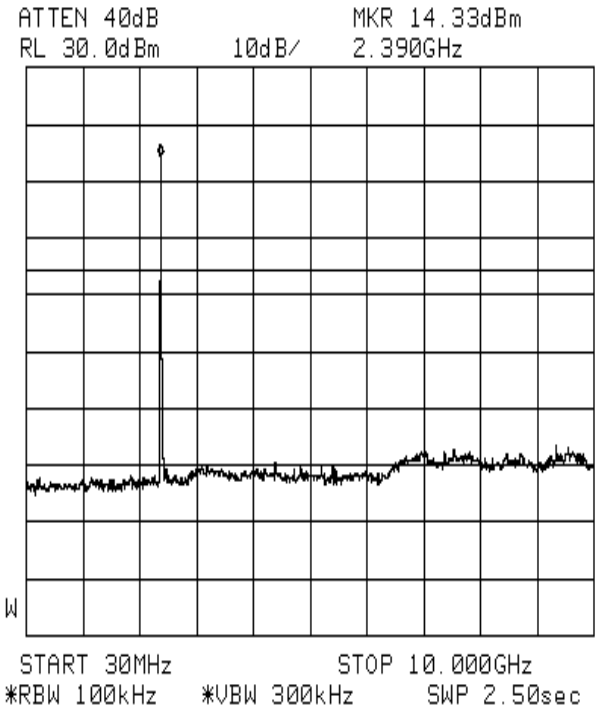

**RF Conducted Spurious Emissions Test Setup**

**FCC Part 15.247(d) RF Conducted Spurious Emissions Results**

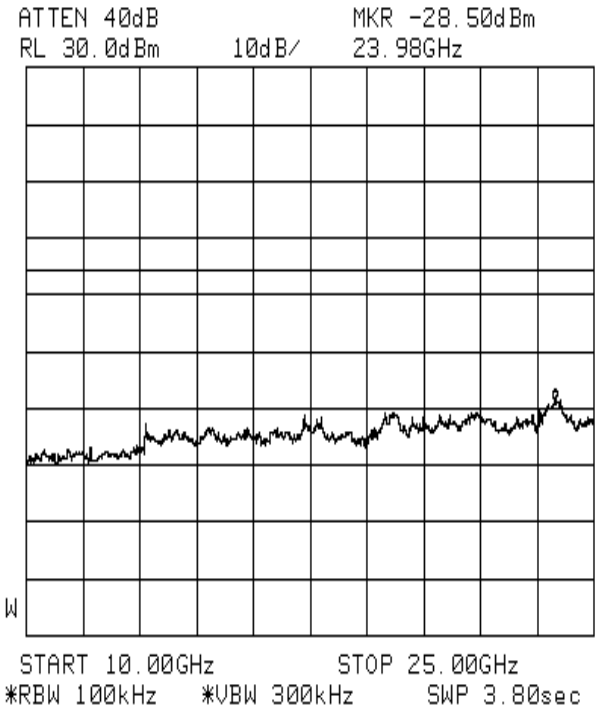
| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| Attached Plots | 27 - 32 (Subwoofer)<br>33 - 38 (Wireless Rear Speaker) | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Thor Wen Lei |

All spurious signals found were below the specified limit. Please refer to the attached plots.

**RF Conducted Spurious Emissions Plots - Subwoofer**

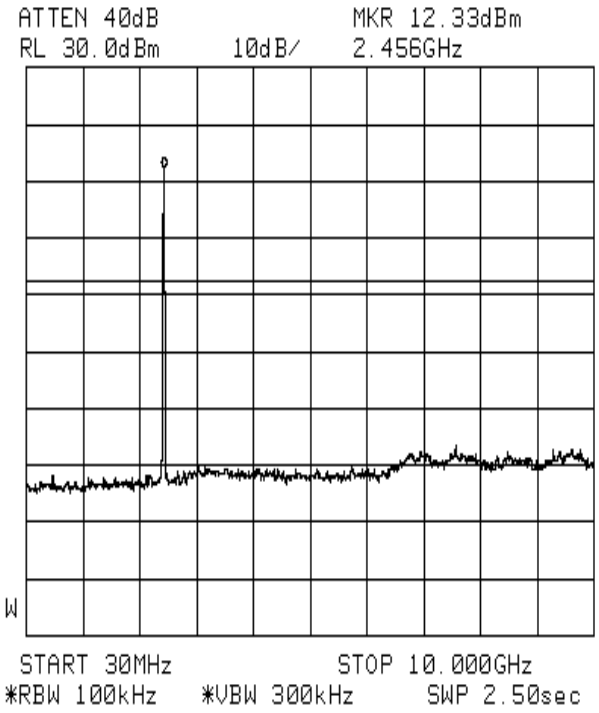



**Plot 27 – Channel 1**

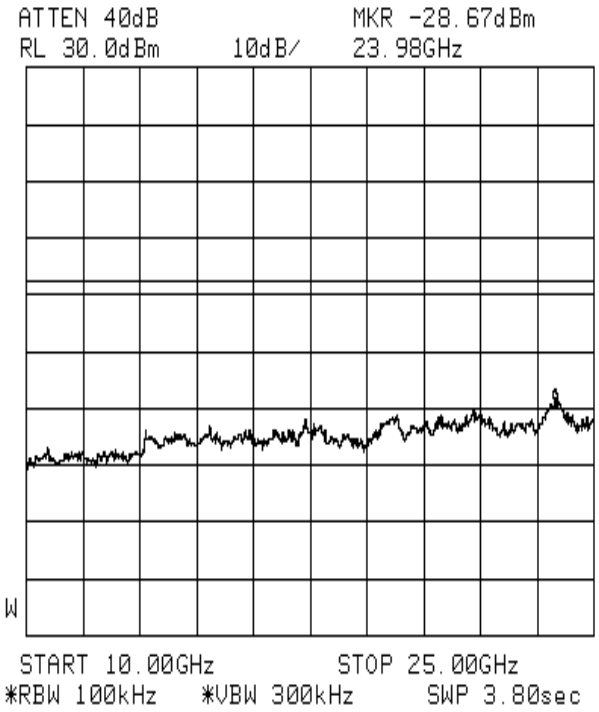



**Plot 28 – Channel 1**

**RF Conducted Spurious Emissions Plots - Subwoofer**

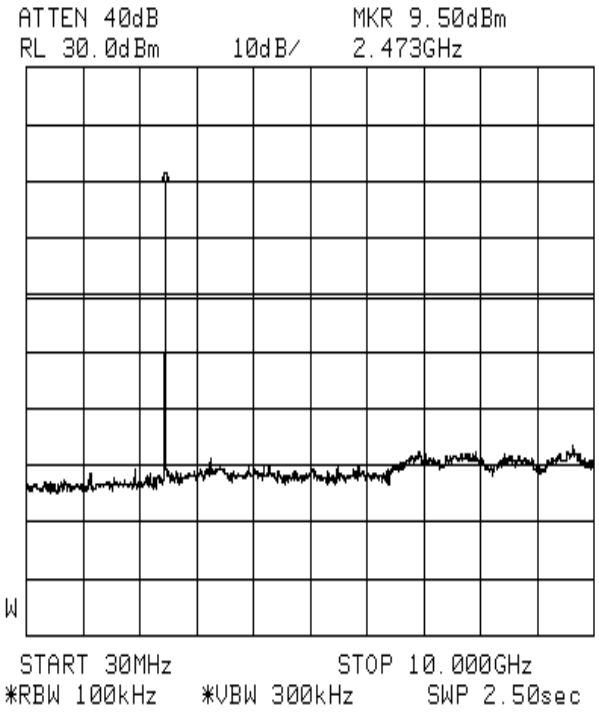



**Plot 29 – Channel 39**

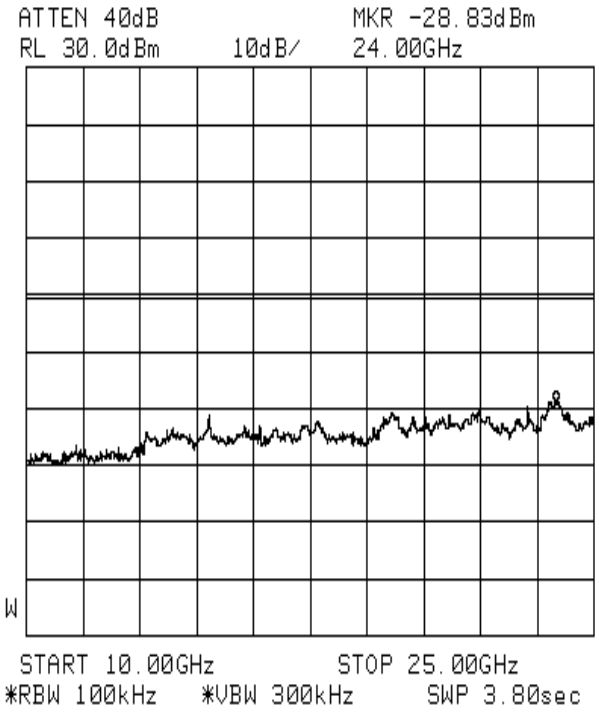



**Plot 30 – Channel 39**

**RF Conducted Spurious Emissions Plots - Subwoofer**

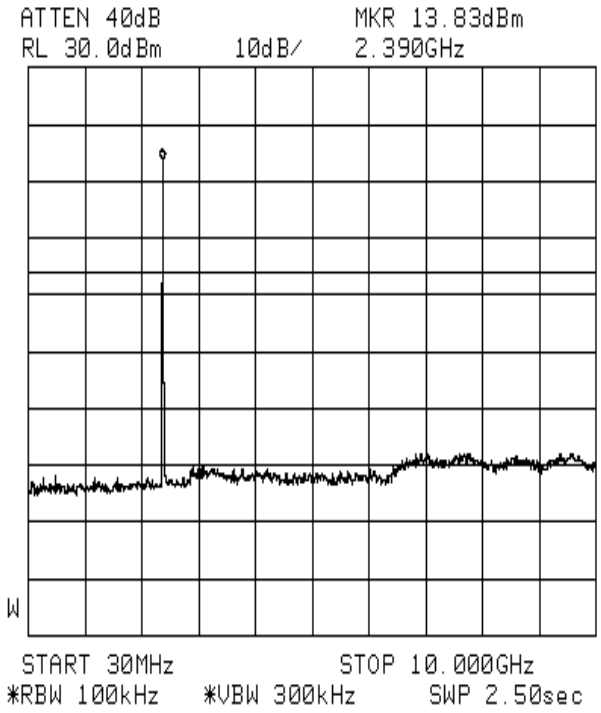



**Plot 31 – Channel 78**

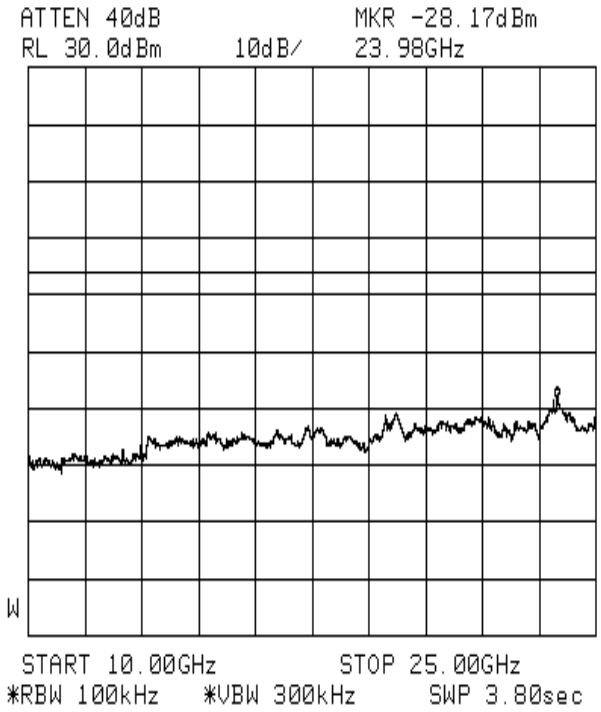



**Plot 32 – Channel 78**

**RF Conducted Spurious Emissions Plots - Wireless Rear Speaker**

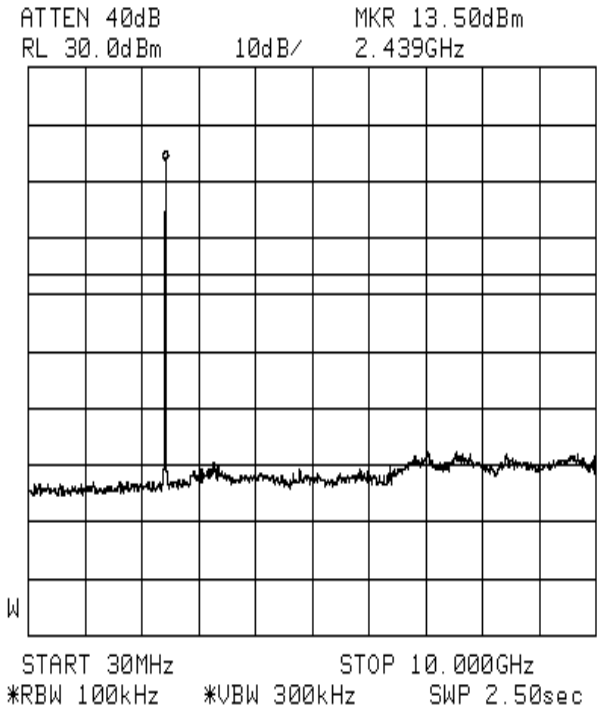



**Plot 33 – Channel 1**

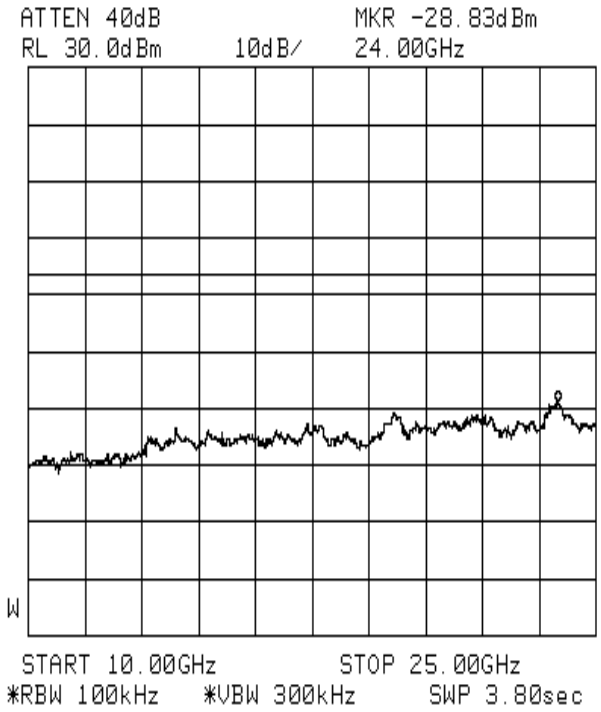



**Plot 34 – Channel 1**

**RF Conducted Spurious Emissions Plots - Wireless Rear Speaker**

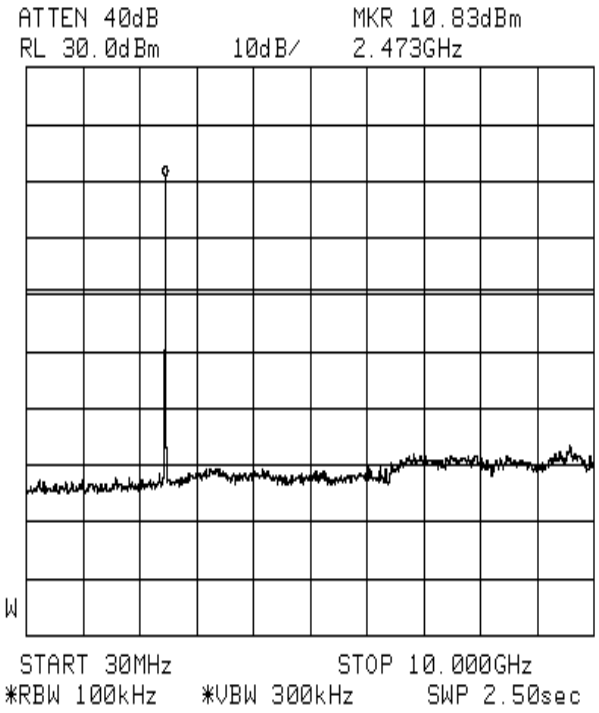



**Plot 35 – Channel 39**

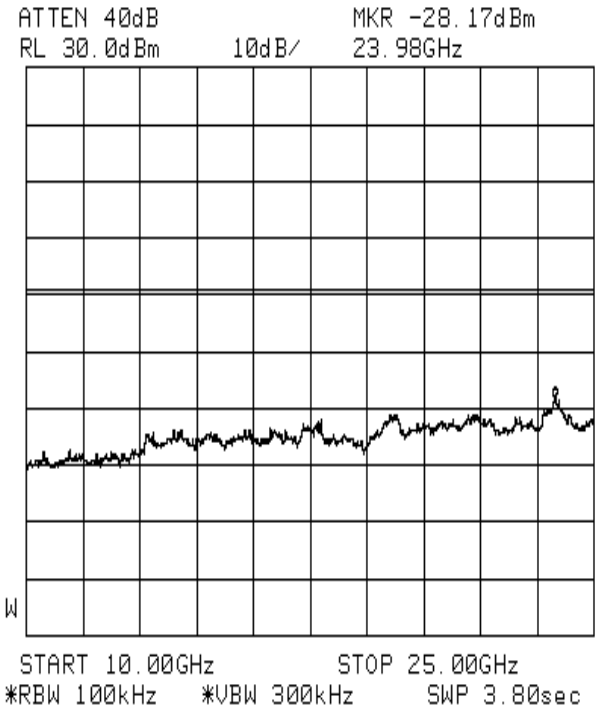



**Plot 36 – Channel 39**

**RF Conducted Spurious Emissions Plots - Wireless Rear Speaker**




**Plot 37 – Channel 78**




**Plot 38 – Channel 78**

## FCC Part 15.247(d) Band Edge Compliance Limits

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

## FCC Part 15.247(d) Band Edge Compliance Test Instrumentation

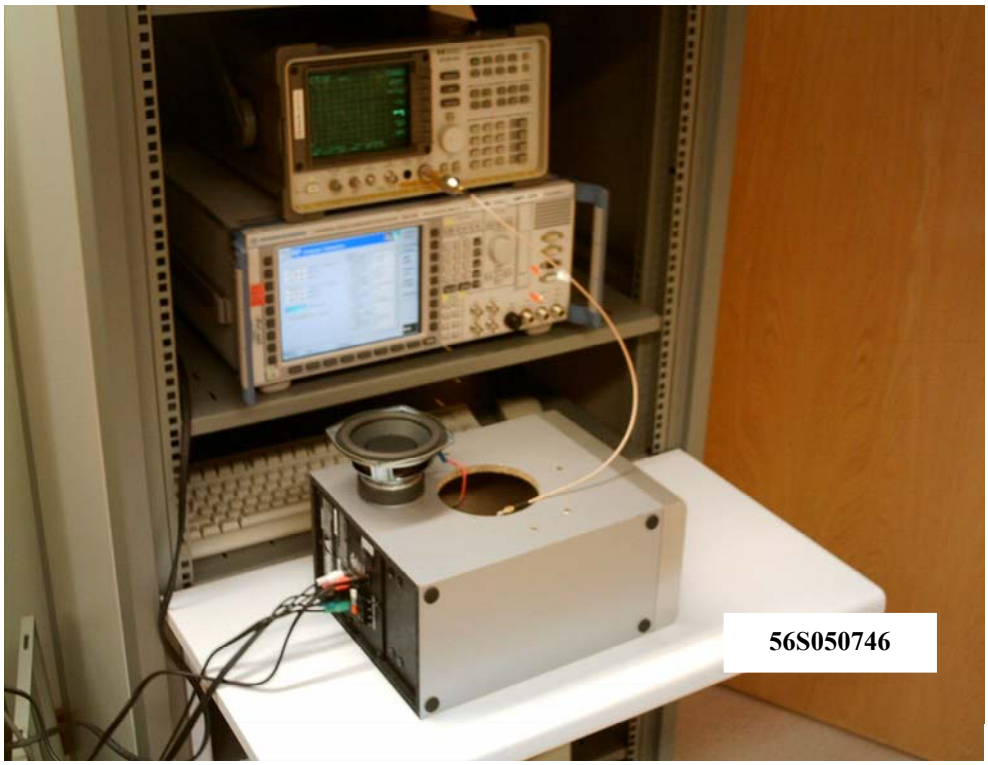
| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| HP Spectrum Analyzer – SA10 | 8564E | 3846A01433 | 27 Apr 2006 |

## FCC Part 15.247(d) Band Edge Compliance Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

## FCC Part 15.247(d) Band Edge Compliance Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with frequency hopping sequence on.
2. The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.



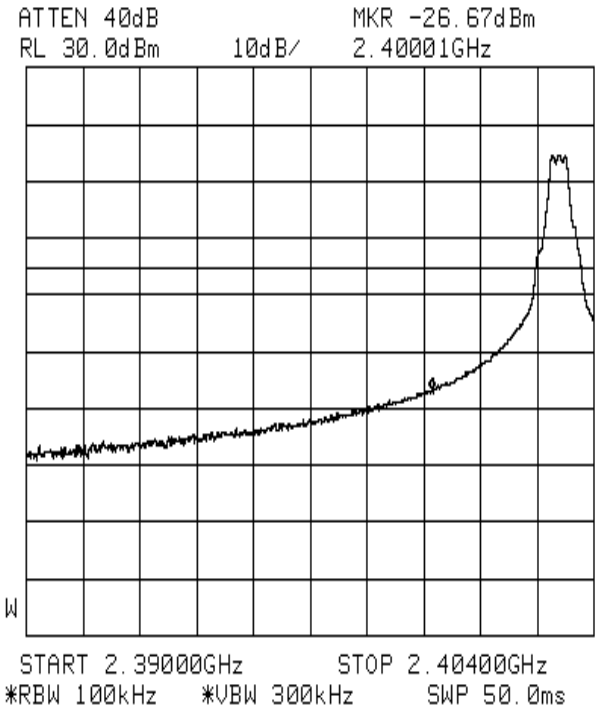

**Band Edge Compliance Test Setup**

**FCC Part 15.247(d) Band Edge Compliance Results**

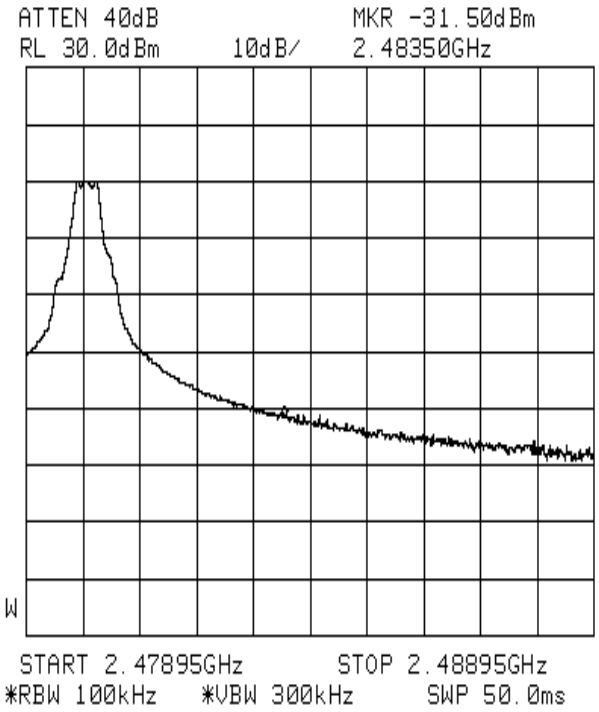
| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| Attached Plots | 39 - 40 (Subwoofer)<br>41 - 42 (Wireless Rear Speaker) | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Thor wen Lei |

No significant signal was found and they were below the specified limit.

**Band Edge Compliance Plots - Subwoofer**

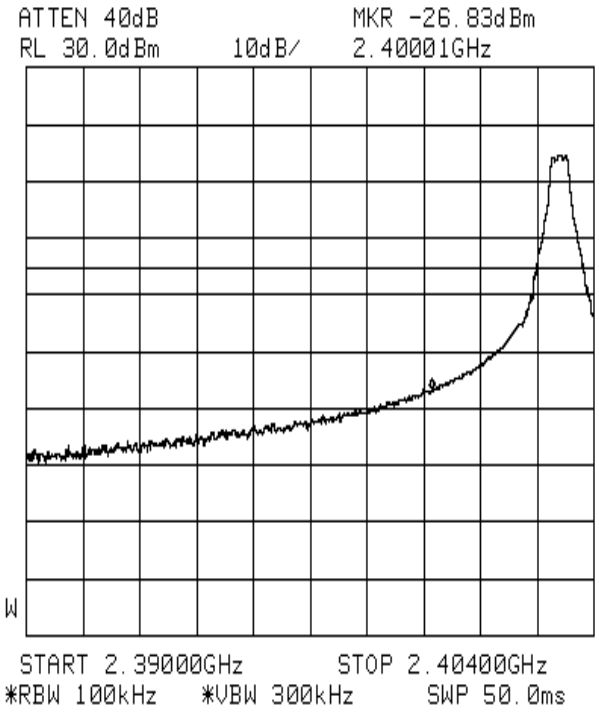



**Plot 39 – Lower Band Edge at 2.4000GHz**

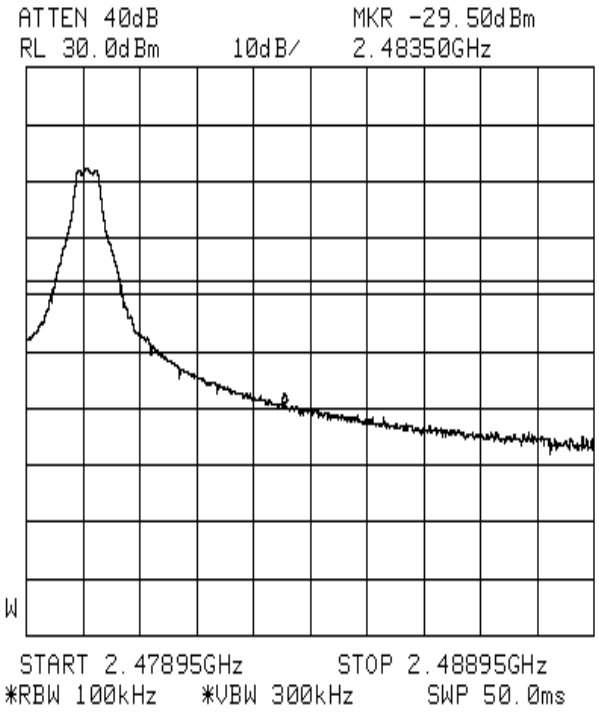



**Plot 40 – Upper Band Edge at 2.4835GHz**

**Band Edge Compliance Plots - Wireless Rear Speaker**




**Plot 41 – Lower Band Edge at 2.4000GHz**




**Plot 42 – Upper Band Edge at 2.4835GHz**

## FCC Part 15.247(e) Peak Power Spectral Density Limits

The EUT shows compliance to the requirements of this section, which states the peak power spectral density conducted from the intentional radiator (EUT) to the antenna shall not be greater than 8dBm (6.3mW) in any 3kHz band during any time interval of continuous transmission.

## FCC Part 15.247(e) Peak Power Spectral Density Test Instrumentation

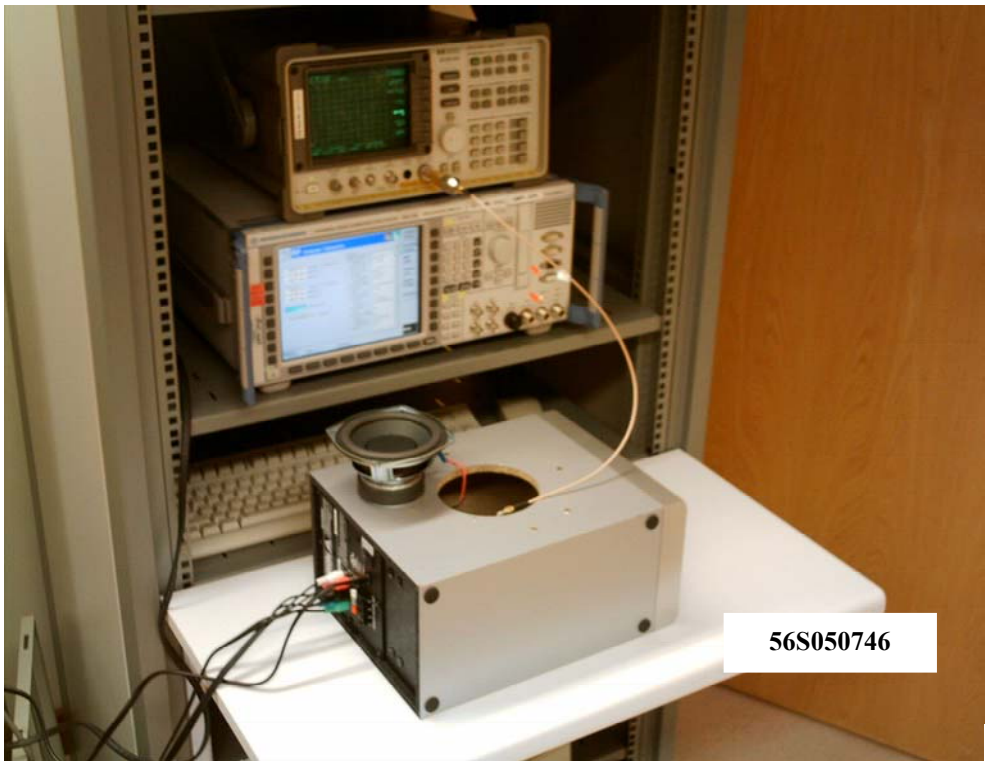
| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| HP Spectrum Analyzer – SA10 | 8564E | 3846A01433 | 27 Apr 2006 |

## FCC Part 15.247(e) Peak Power Spectral Density Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 3kHz and 10kHz.
5. All other supporting equipment were powered separately from another filtered mains.

## FCC Part 15.247(e) Peak Power Spectral Density Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at Channel 1 (2.403GHz).
2. The sweep time of the spectrum analyser was set to the value of the ratio of the frequency span divided by the RBW.
3. The peak power density of the transmitting frequency was detected and recorded.
4. The step 3 was repeated with the transmitting frequency was set to Channel 39 (2.411GHz) and Channel 78 (2.480GHz) respectively.




**Peak Power Spectral Density Test Setup**

**FCC Part 15.247(e) Peak Power Spectral Density Results**

| | | | |
|---|---|---|---|
| Test Input Power | 110V 60Hz | Temperature | 23°C |
| Attached Plots | 43 - 45 (Subwoofer)<br>46 - 48 (Wireless Rear Speaker) | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Anthony Toh |

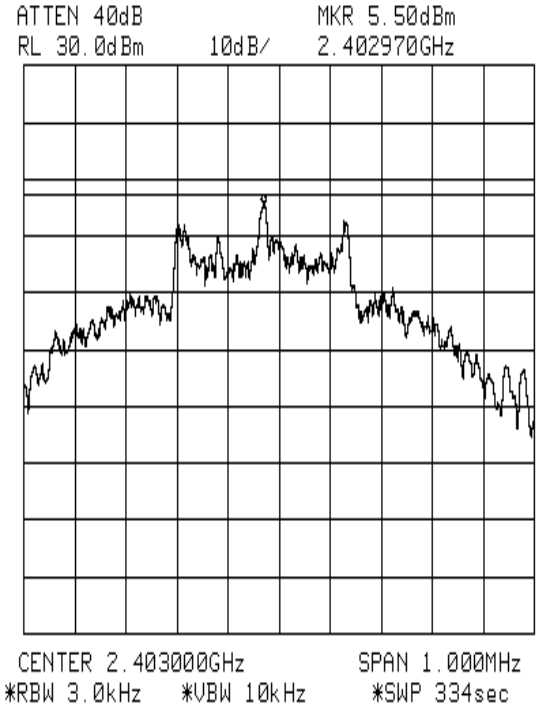
**Subwoofer**

| Channel | Channel Frequency (GHz) | Peak Power Spectral Density (mW) | Limit (mW) |
|---|---|---|---|
| 1 | 2.403 | 3.5481 | 6.3 |
| 39 | 2.441 | 3.0408 | 6.3 |
| 78 | 2.480 | 1.9186 | 6.3 |

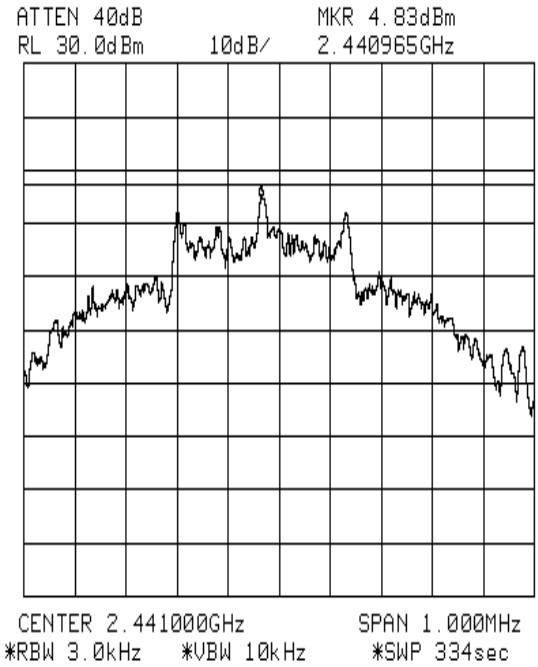
**Wireless Rear Speaker**

| Channel | Channel Frequency (GHz) | Peak Power Spectral Density (mW) | Limit (mW) |
|---|---|---|---|
| 1 | 2.403 | 4.1399 | 6.3 |
| 39 | 2.441 | 3.9810 | 6.3 |
| 78 | 2.480 | 2.0749 | 6.3 |

**Peak Power Spectral Density Plots - Subwoofer**

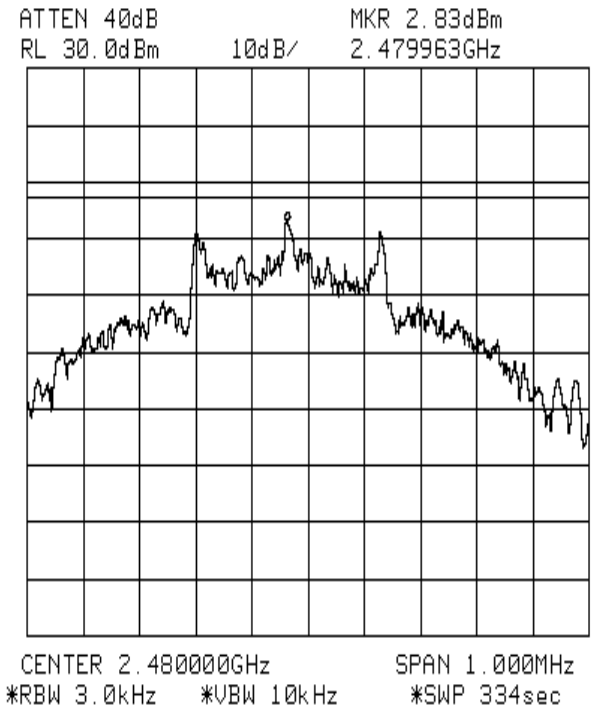



**Plot 43 – Channel 1**



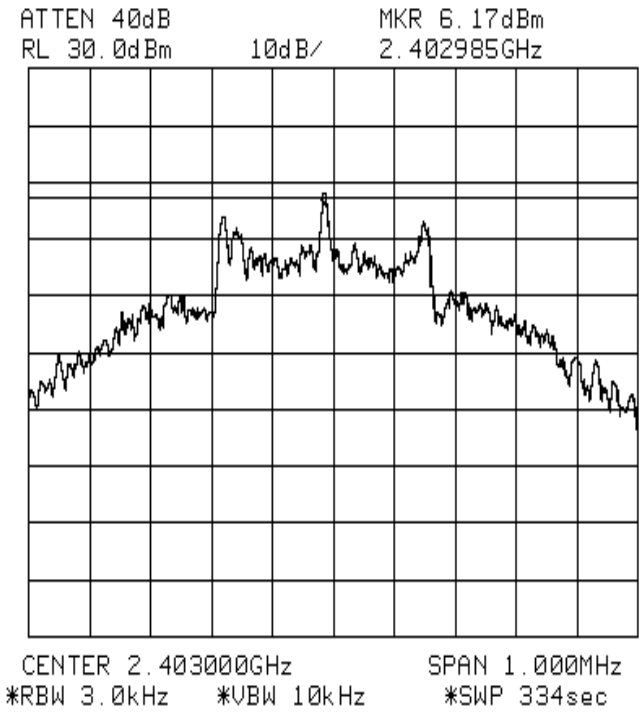

**Plot 44 – Channel 39**

**Peak Power Spectral Density Plots - Subwoofer**

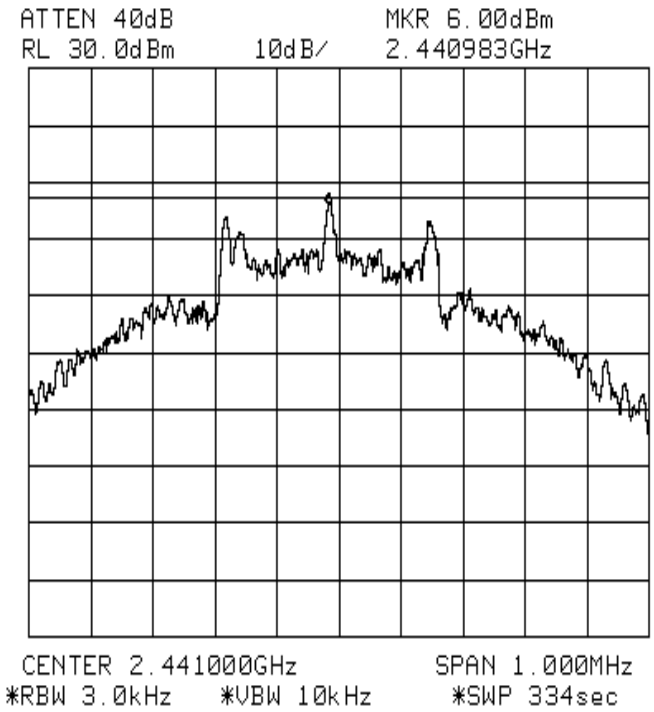



**Plot 45 – Channel 78**

**Peak Power Spectral Density Plots - Wireless Rear Speaker**

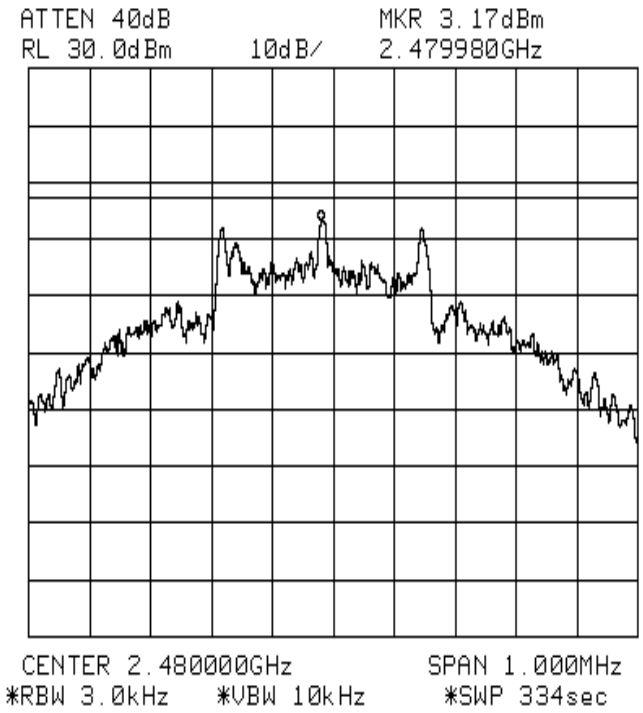



**Plot 46 – Channel 1**




**Plot 47 – Channel 39**

**Peak Power Spectral Density Plots - Wireless Rear Speaker**




**Plot 48 – Channel 78**

## FCC Part 1.1310 Maximum Permissible Exposure (MPE) Limits

The EUT shows compliance to the requirements of this section, which states the MPE limits for general population / uncontrolled exposure are as shown below:

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density ($mW/cm^2$) | Average Time (min) |
|---|---|---|---|---|
| 0.3 - 1.34 | 614 | 1.63 | 100 Note 2 | 30 |
| 1.34 - 30 | 824 / f | 2.19 / f | 180 / $f^2$ Note 2 | 30 |
| 30 - 300 | 27.5 | 0.073 | 0.2 | 30 |
| 300 - 1500 | - | - | f / 1500 | 30 |
| 1500 - 100000 | - | - | 1.0 | 30 |
| Notes | | | | |
| 1. f = frequency in MHz | | | | |
| 2. Plane wave equivalent power density | | | | |

## FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---|---|---|---|
| PMM 8053 Portable Field Meter | 8053 | 0220J10308 | 03 Feb 2006 |
| PMM Electric and Magnetic Field Analyzer | EP-330 | 1010J10302 | 03 Feb 2006 |

## FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Setup

1. The EUT and supporting equipment were set up as shown on the setup photo.
2. The relevant field probe was positioned at least 20cm away from the EUT and supporting equipment boundary.

## FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was first carried out at one of the positions / sides of the EUT.
3. Power density measurement ($mW/cm^2$) was made using the field meter set to the required averaging time.
4. Steps 2 and 3 were repeated for the next position and its associate EUT operating mode, until all possible positions and modes were measured.

### Sample Calculation Example

At 2400 MHz, limit = 1.0 $mW/cm^2$

Power density reading obtained directly from field meter = 0.3 $mW/cm^2$ averaged over the required 30 minutes.

Therefore, margin = 0.3 – 1.0 = -0.7 $mW/cm^2$ i.e. **0.7 $mW/cm^2$ below limit**

**Maximum Permissible Exposure (MPE) Test Setup**

**FCC Part 1.1310 Maximum Permissible Exposure (MPE) Results**

| | | | |
|---|---|---|---|
| Test Input Power | 110V 50Hz | Temperature | 23°C |
| Test Distance | 20cm | Relative Humidity | 55% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Thor Wen Lei |

**Subwoofer**

| Channel | Channel Frequency (GHz) | Power Density Value ($mW/cm^2$) | Margin ($mW/cm^2$) | Averaging Time (min) | Limit ($mW/cm^2$) |
|---|---|---|---|---|---|
| 1 | 2.403 | 0.0008 | -0.9992 | 30 | 1.0 |
| 39 | 2.441 | 0.0009 | -0.9991 | 30 | 1.0 |
| 78 | 2.480 | 0.0002 | -0.9998 | 30 | 1.0 |

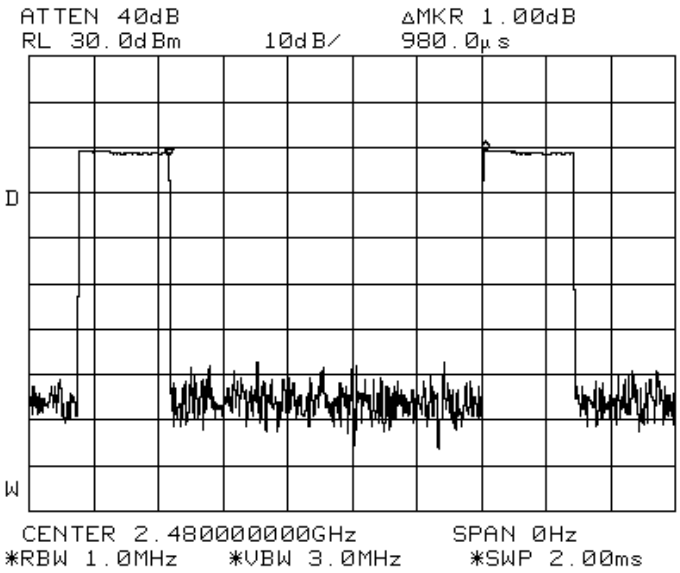
**Wireless Rear Speaker**

| Channel | Channel Frequency (GHz) | Power Density Value ($mW/cm^2$) | Margin ($mW/cm^2$) | Averaging Time (min) | Limit ($mW/cm^2$) |
|---|---|---|---|---|---|
| 1 | 2.403 | 0.0031 | -0.9969 | 30 | 1.0 |
| 39 | 2.441 | 0.0047 | -0.9953 | 30 | 1.0 |
| 78 | 2.480 | 0.0030 | -0.9970 | 30 | 1.0 |

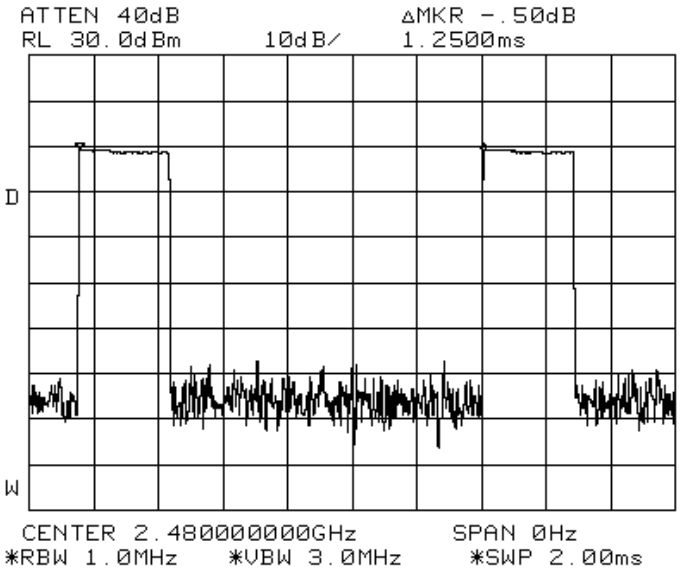
Notes:

1. All possible modes of operation were investigated. Only the worst case highest radiation levels were measured. Measurements were taken at the required averaging time. All other radiation levels were relatively insignificant.
2 A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3 Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 0.1MHz – 3GHz is ±15% .

**FCC Part 15.35(c) Duty Cycle Correction Factor - Subwoofer**



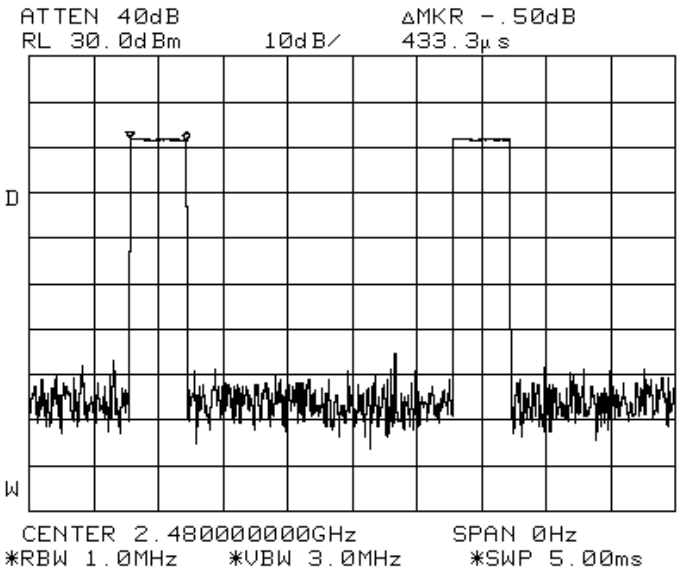

**On Time**



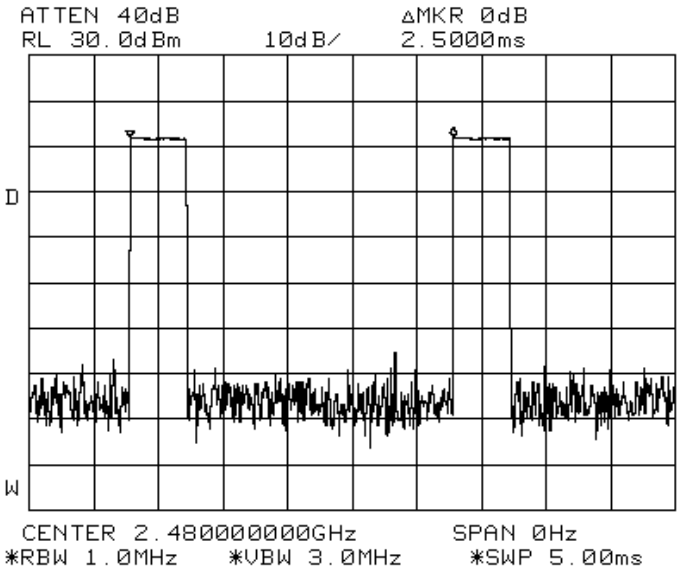

**Period**

Duty Cycle Factor (worst- case) = 20 log [Total On time / Period]
= 20 log [(0.980 / 1.250)]
= **-2.1dB**

**FCC Part 15.35(c) Duty Cycle Correction Factor - Wireless Rear Speaker**




**On Time**




**Period**

Duty Cycle Factor (worst- case) = 20 log [Total On time / Period]
= 20 log [(0.4333 / 2.500)]
= **-15.2dB**

**This Report is issued under the following conditions:**

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2. Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required, shall be clearly indicated and additional fee paid for, by the Client.

3. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that PSB Corporation approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that PSB Corporation in any way "guarantees" the later performance of the product/equipment.

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May 2005

# ANNEX A

# EUT PHOTOGRAPHS / DIAGRAMS

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

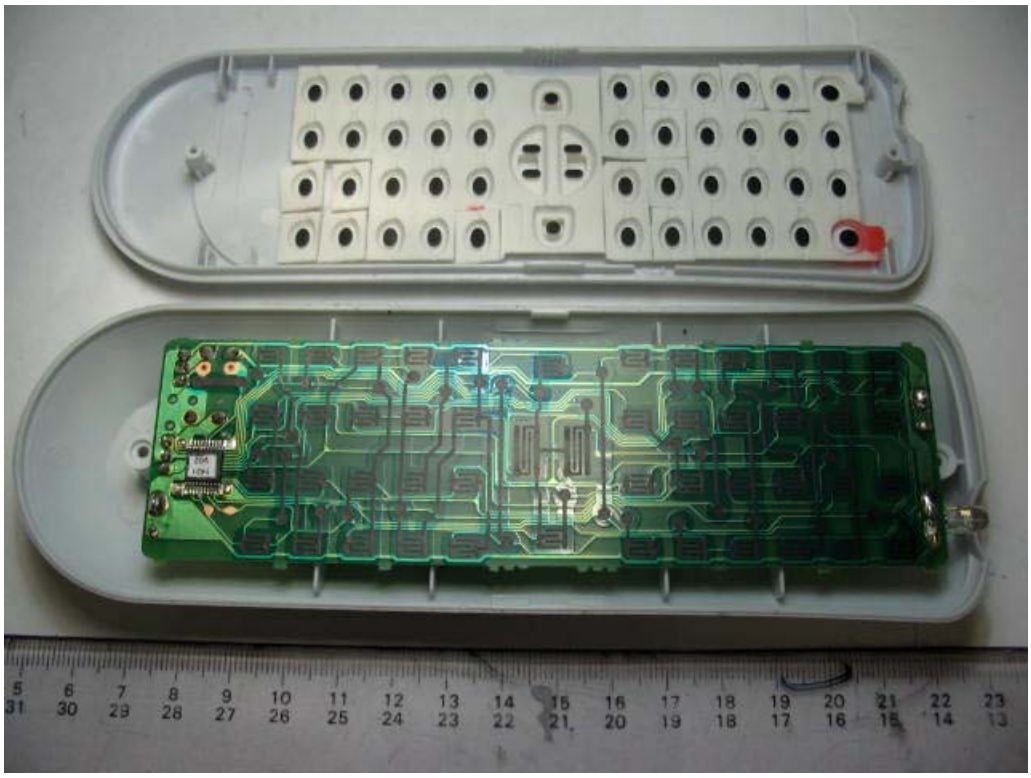
**EUT PHOTOGRAPHS FOR REMOTE CONTROLLER**

**Front View**

**Rear View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

**INTERNAL PHOTOGRAPHS FOR REMOTE CONTROLLER**



**Internal View**

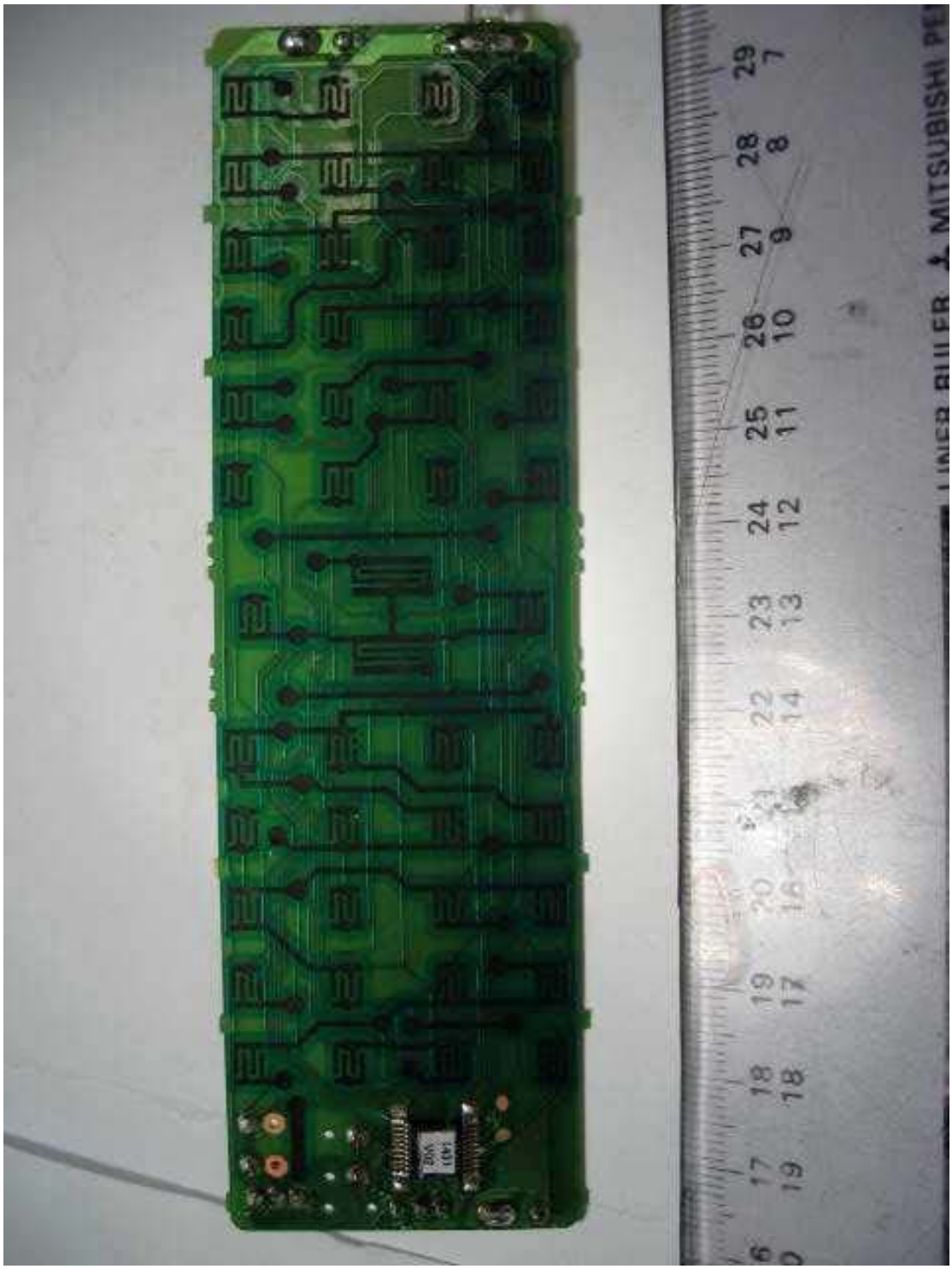
## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

**PCB PHOTOGRAPHS FOR REMOTE CONTROLLER**


**Trace View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

**PCB PHOTOGRAPHS FOR REMOTE CONTROLLER**



**Component View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

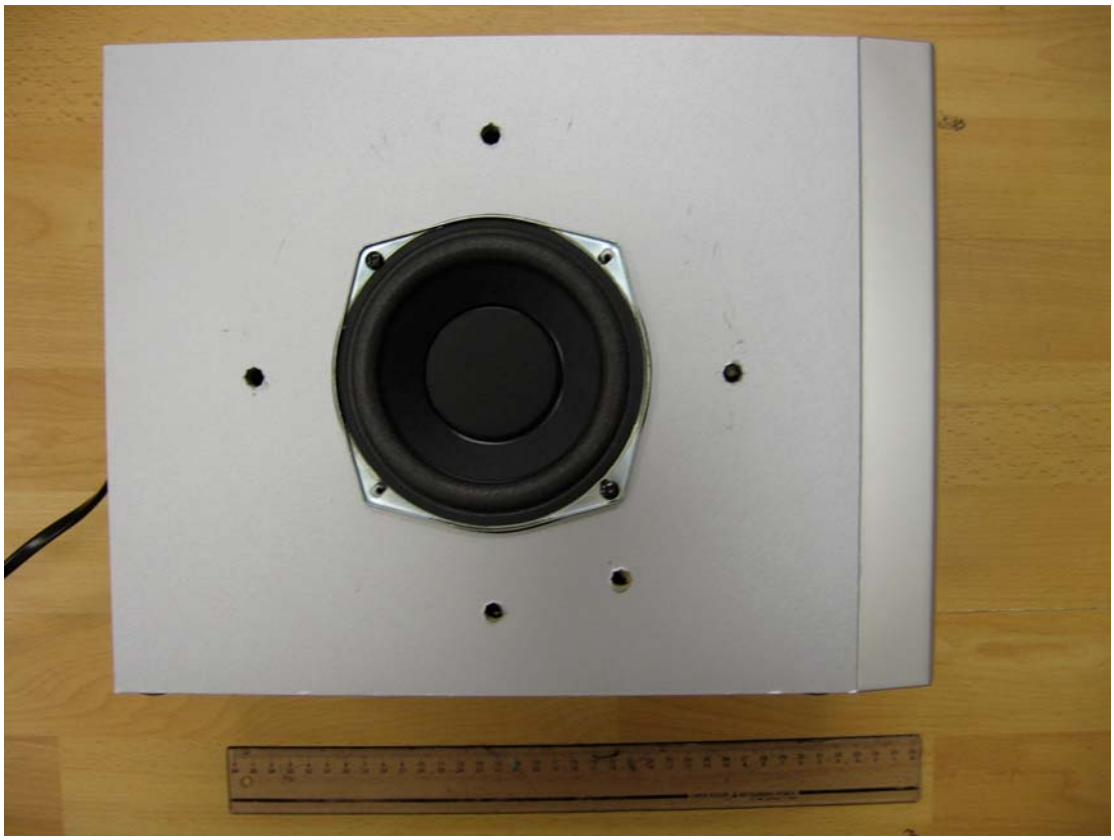
### EUT PHOTOGRAPHS FOR SUBWOOFER


**Front View**


**Rear View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

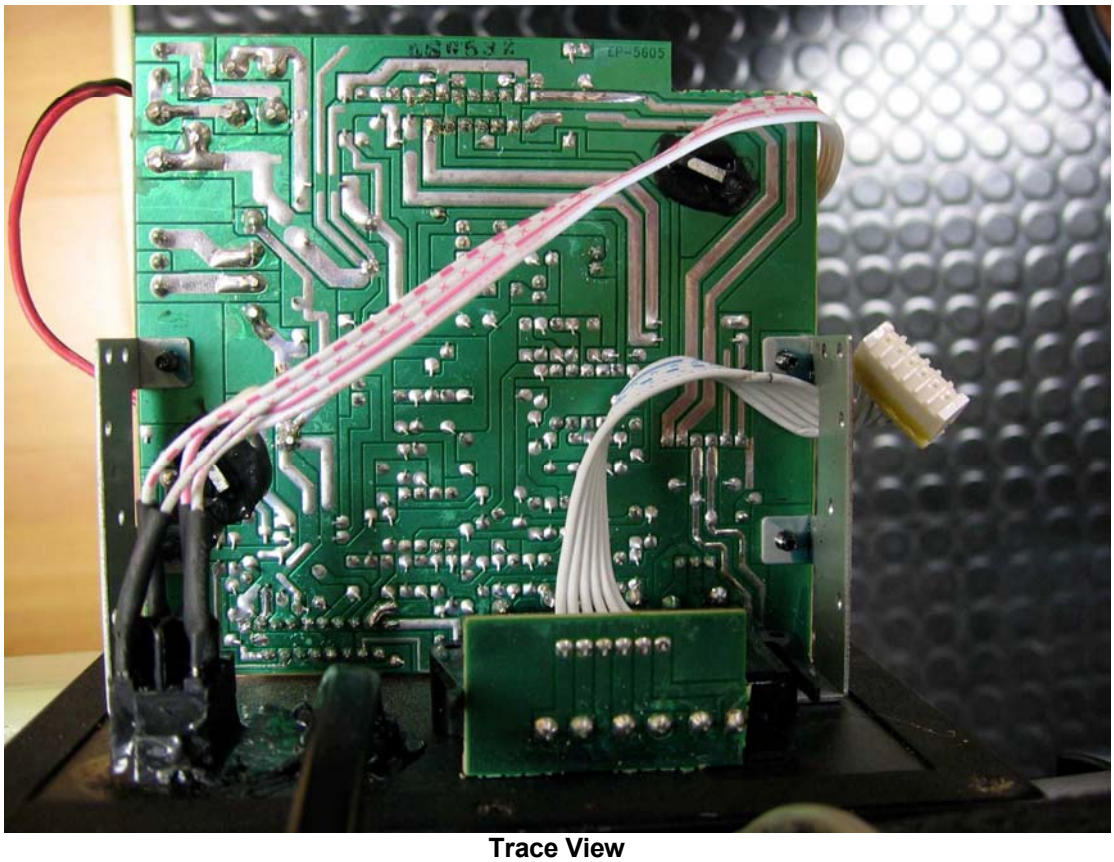
### EUT PHOTOGRAPHS FOR SUBWOOFER



**Side View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

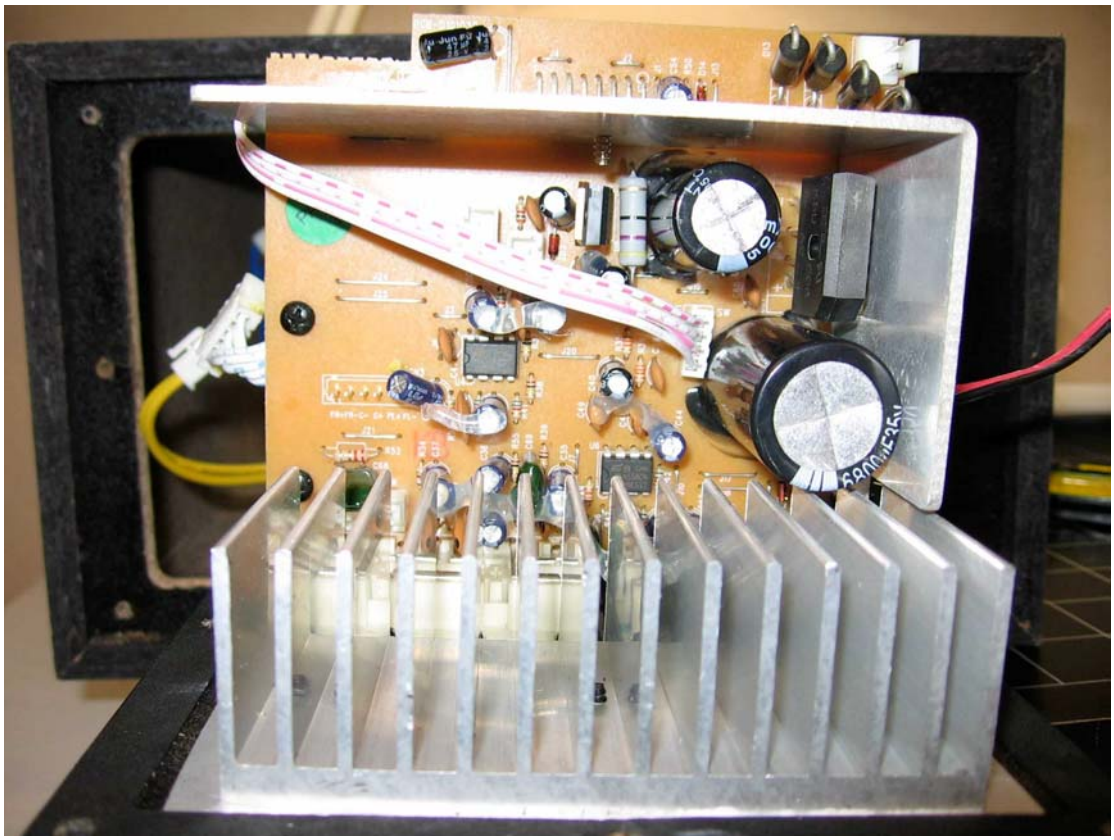
### PCB PHOTOGRAPHS FOR SUBWOOFER



**Trace View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

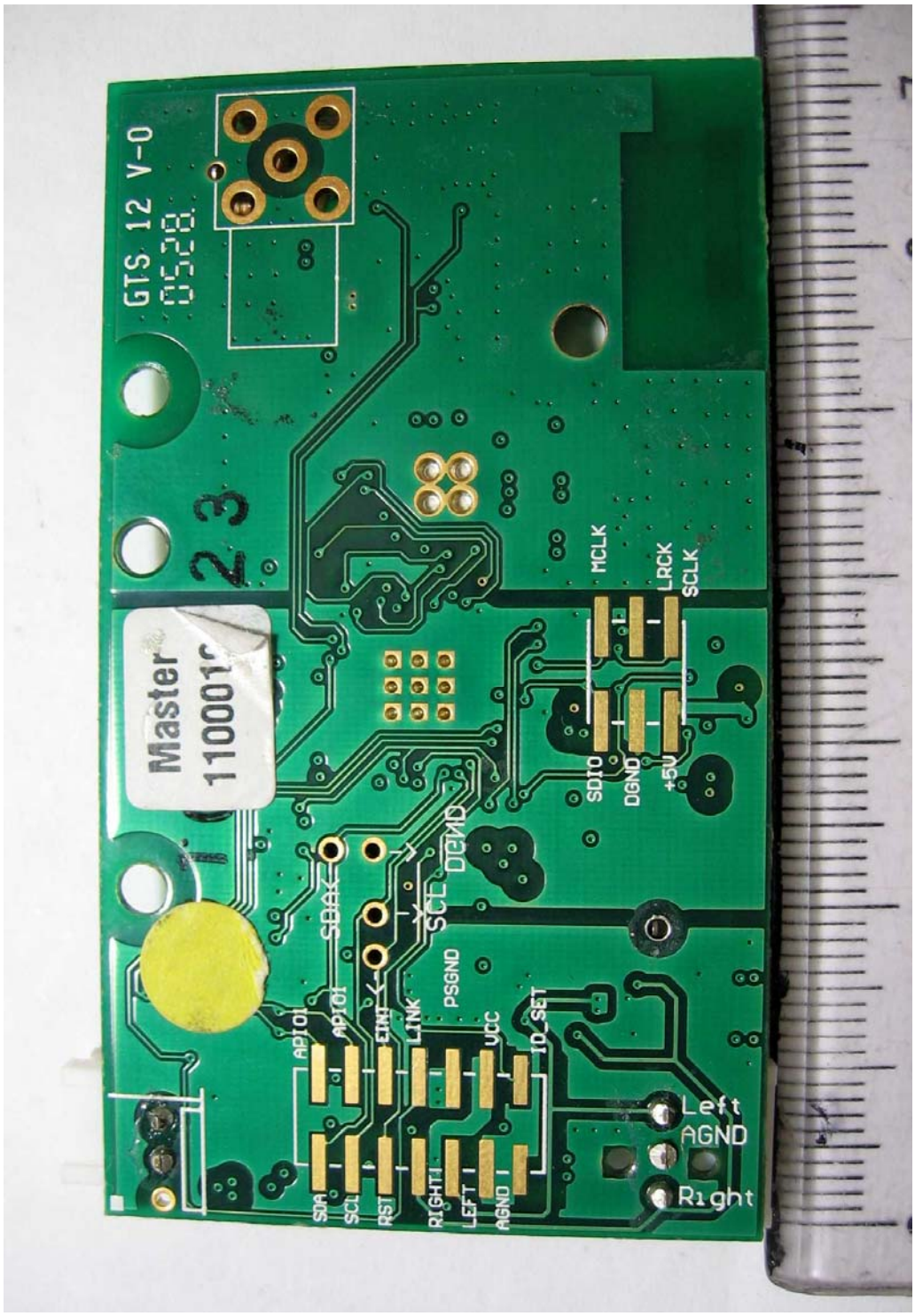
**PCB PHOTOGRAPHS FOR SUBWOOFER**



**Component View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

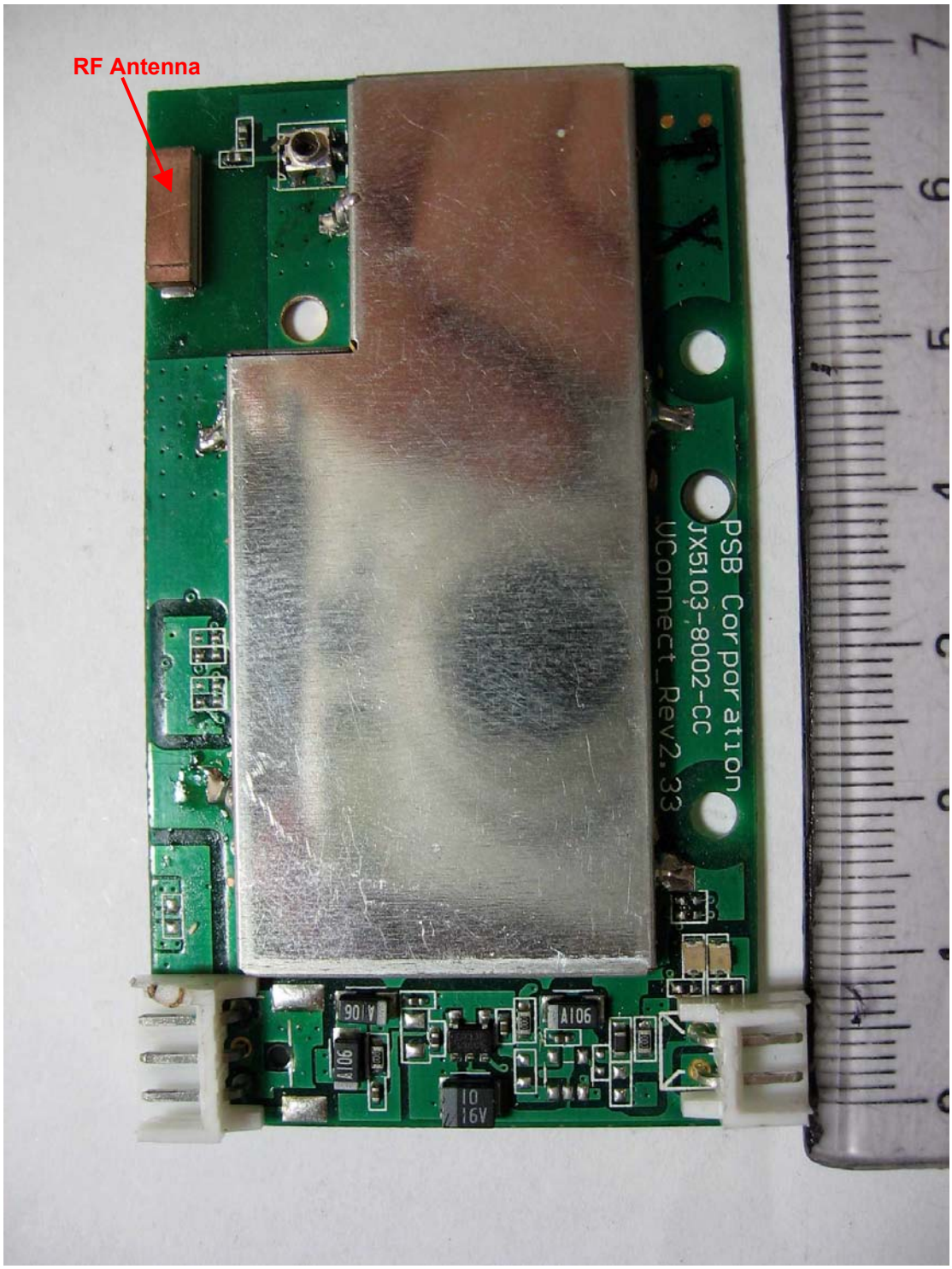
### PCB PHOTOGRAPHS FOR SUBWOOFER RF MODULE




**Trace View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

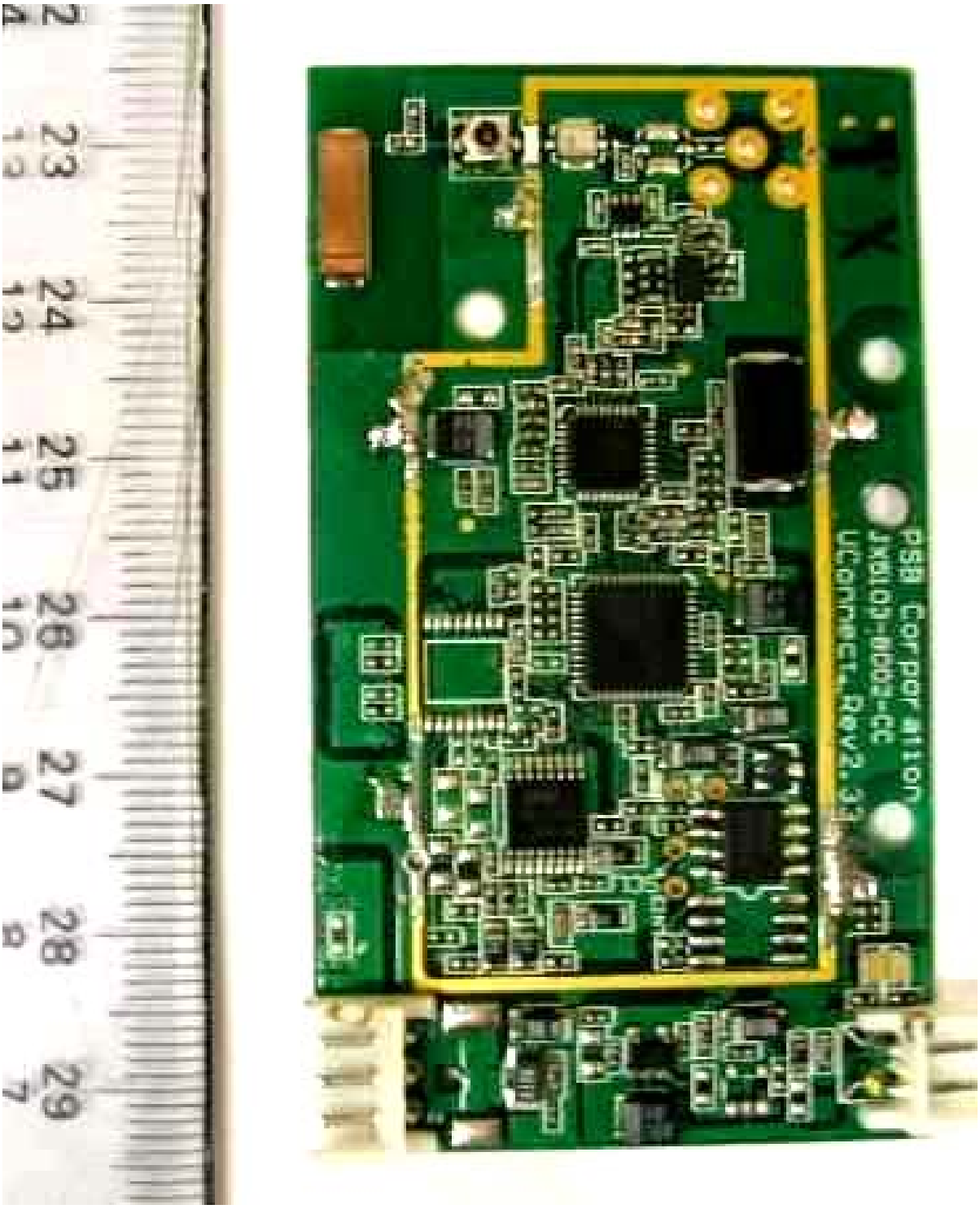
### PCB PHOTOGRAPHS FOR SUBWOOFER RF MODULE




**Component View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

**PCB PHOTOGRAPHS FOR SUBWOOFER RF MODULE (RF SHIELD REMOVED)**




**Component View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

### EUT PHOTOGRAPHS FOR CENTER SPEAKER


**Front View**

**Rear View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

### INTERNAL PHOTOGRAPHS FOR CENTER SPEAKER

**Internal View 1**


**Internal View 2**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

### EUT PHOTOGRAPHS FOR FRONT SPEAKER


**Front View**


**Rear View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

**INTERNAL PHOTOGRAPHS FOR FRONT SPEAKER**


**Internal View 1**


**Internal View 2**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

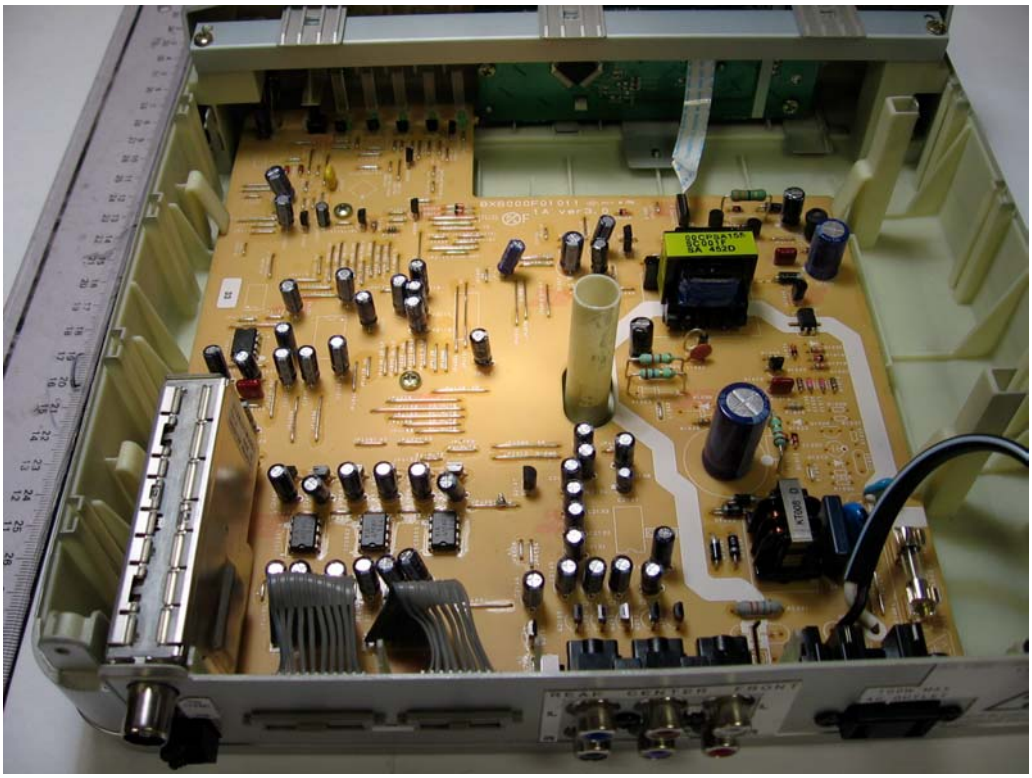
### EUT PHOTOGRAPHS FOR AV RECEIVER


**Front View**

**Rear View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

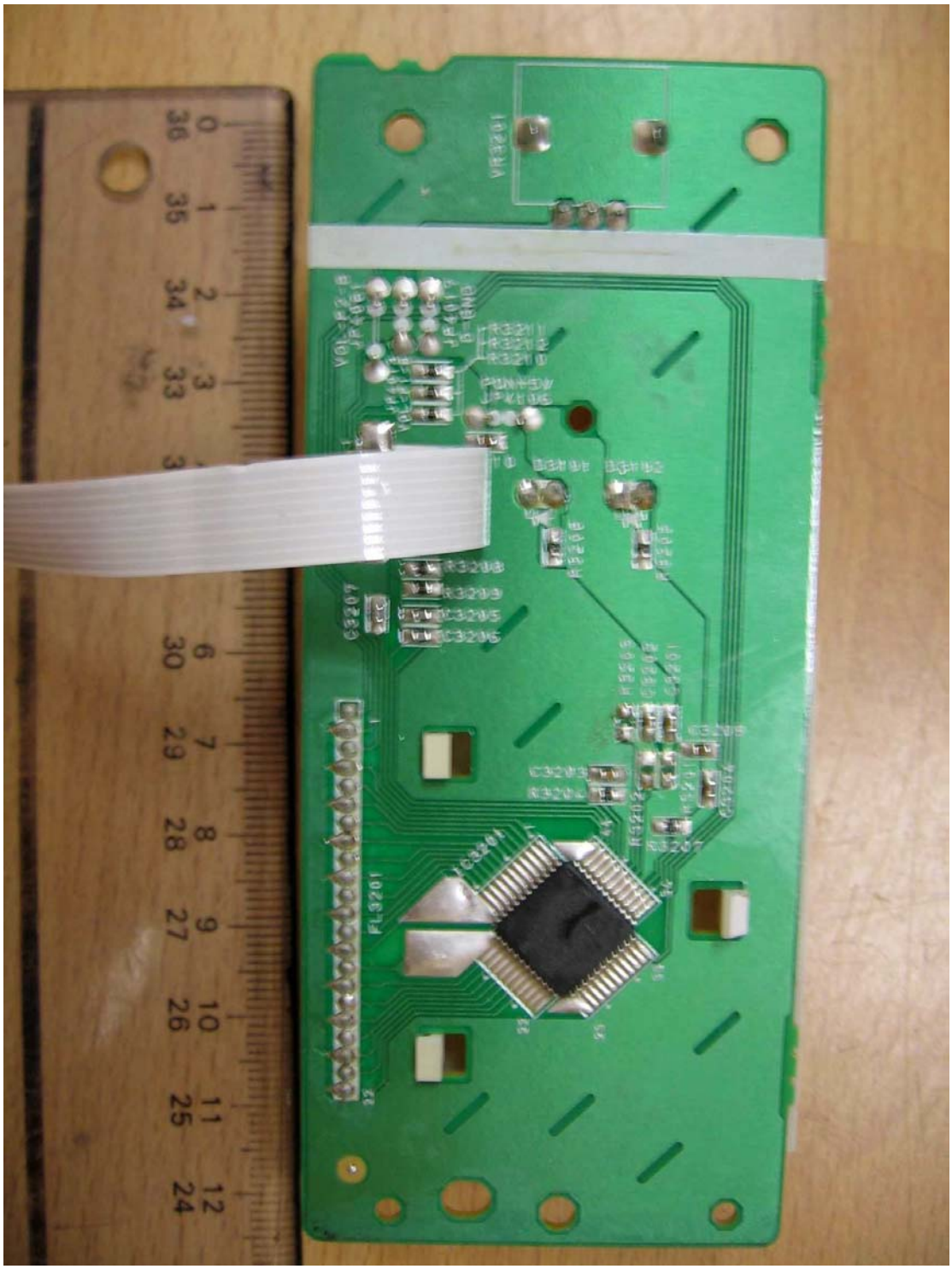
### EUT PHOTOGRAPHS FOR AV RECEIVER



**Internal View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

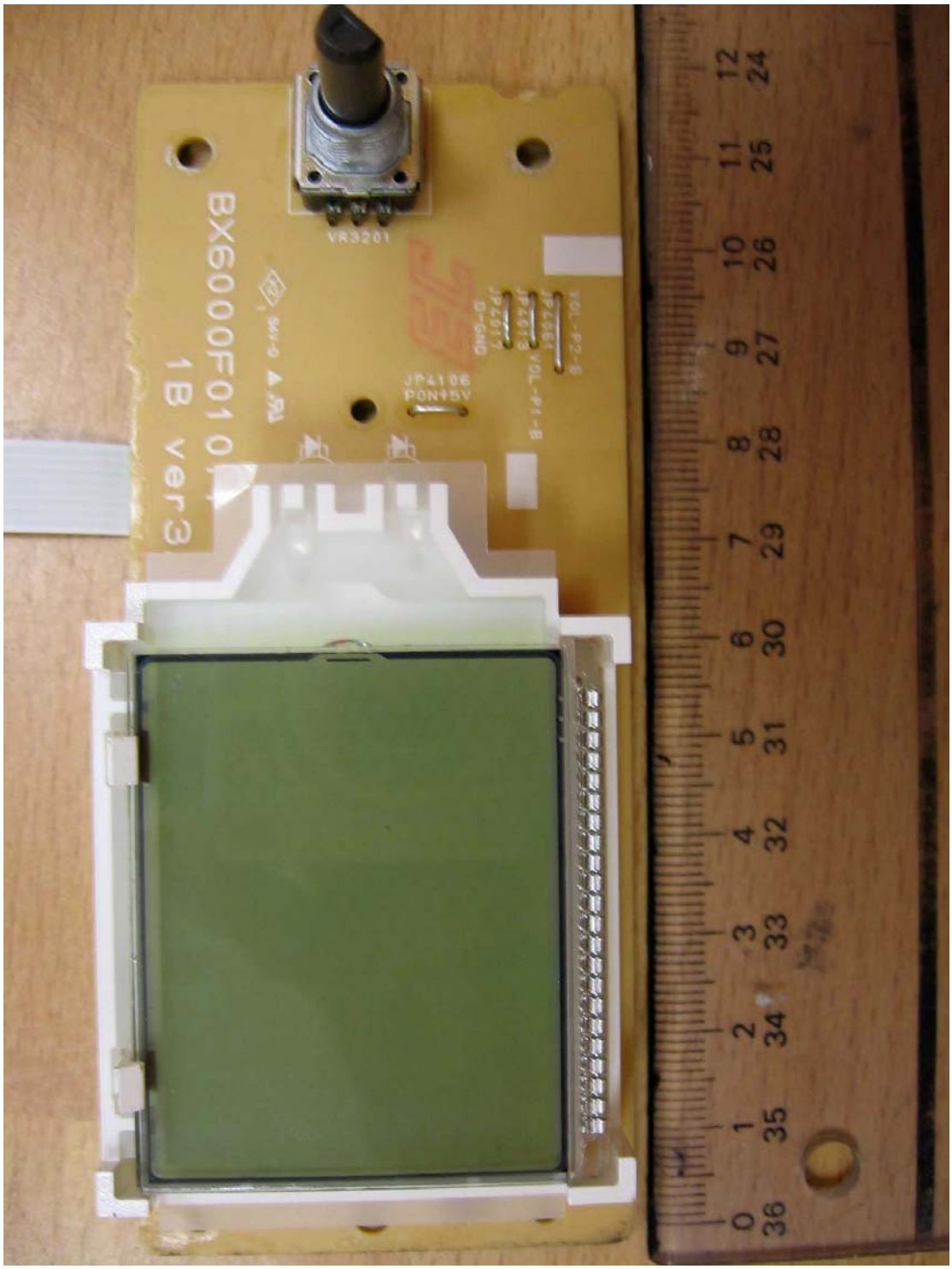
**PCB PHOTOGRAPHS FOR AV RECEIVER (LCD PORTION)**




**Trace View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

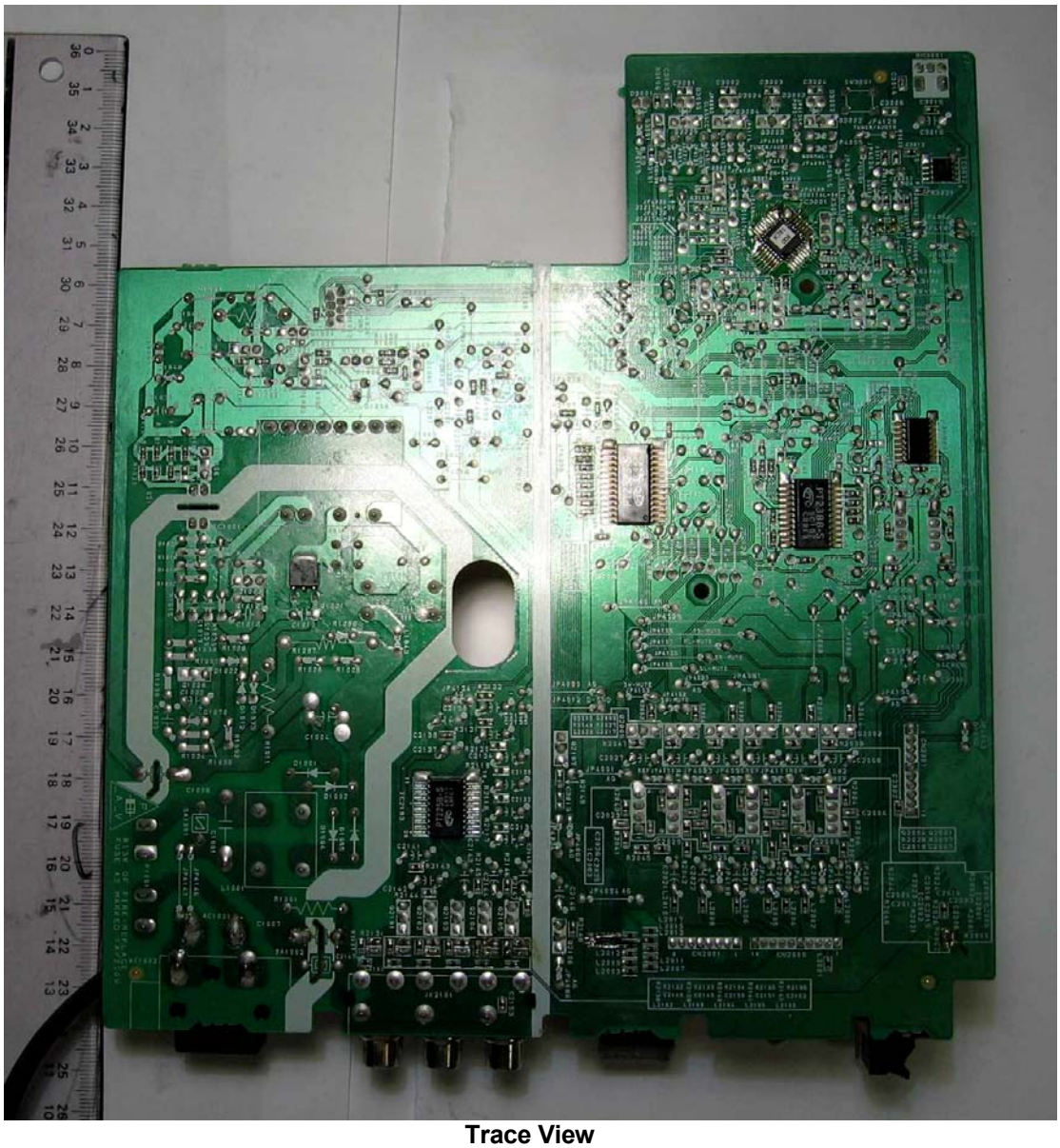
**PCB PHOTOGRAPHS FOR AV RECEIVER (LCD PORTION)**




**Component View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

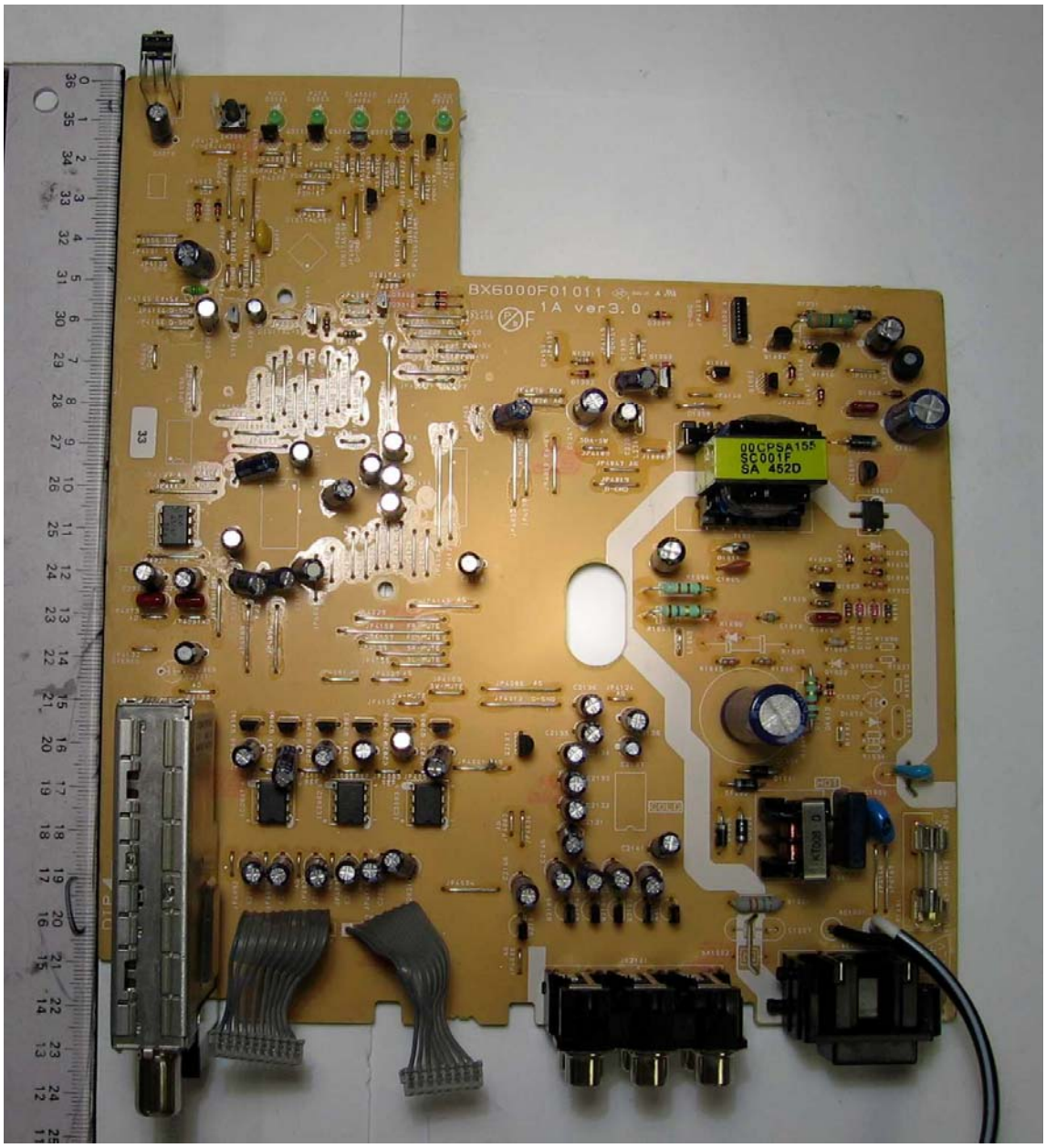
**PCB PHOTOGRAPHS FOR AV RECEIVER (MAIN BOARD)**



**Trace View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

### PCB PHOTOGRAPHS FOR AV RECEIVER (MAIN BOARD)




**Component View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

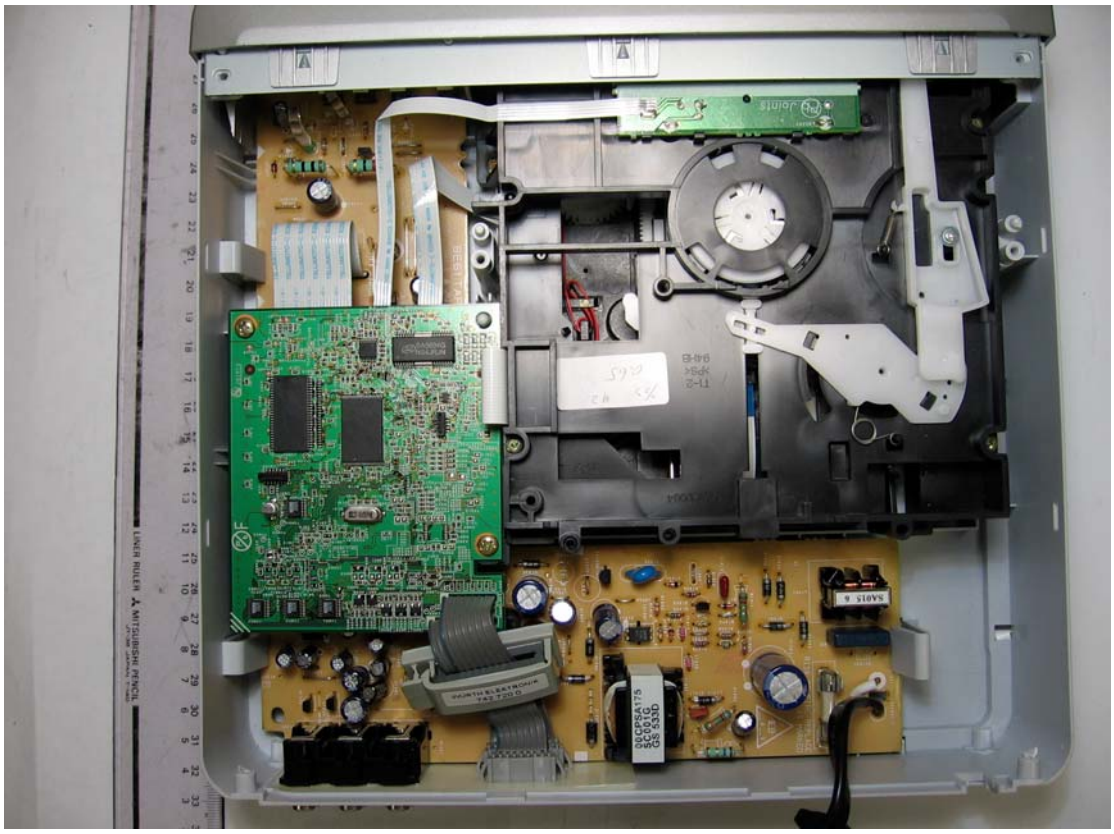
### EUT PHOTOGRAPHS FOR DVD / CD PLAYER


**Front View**

**Rear View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

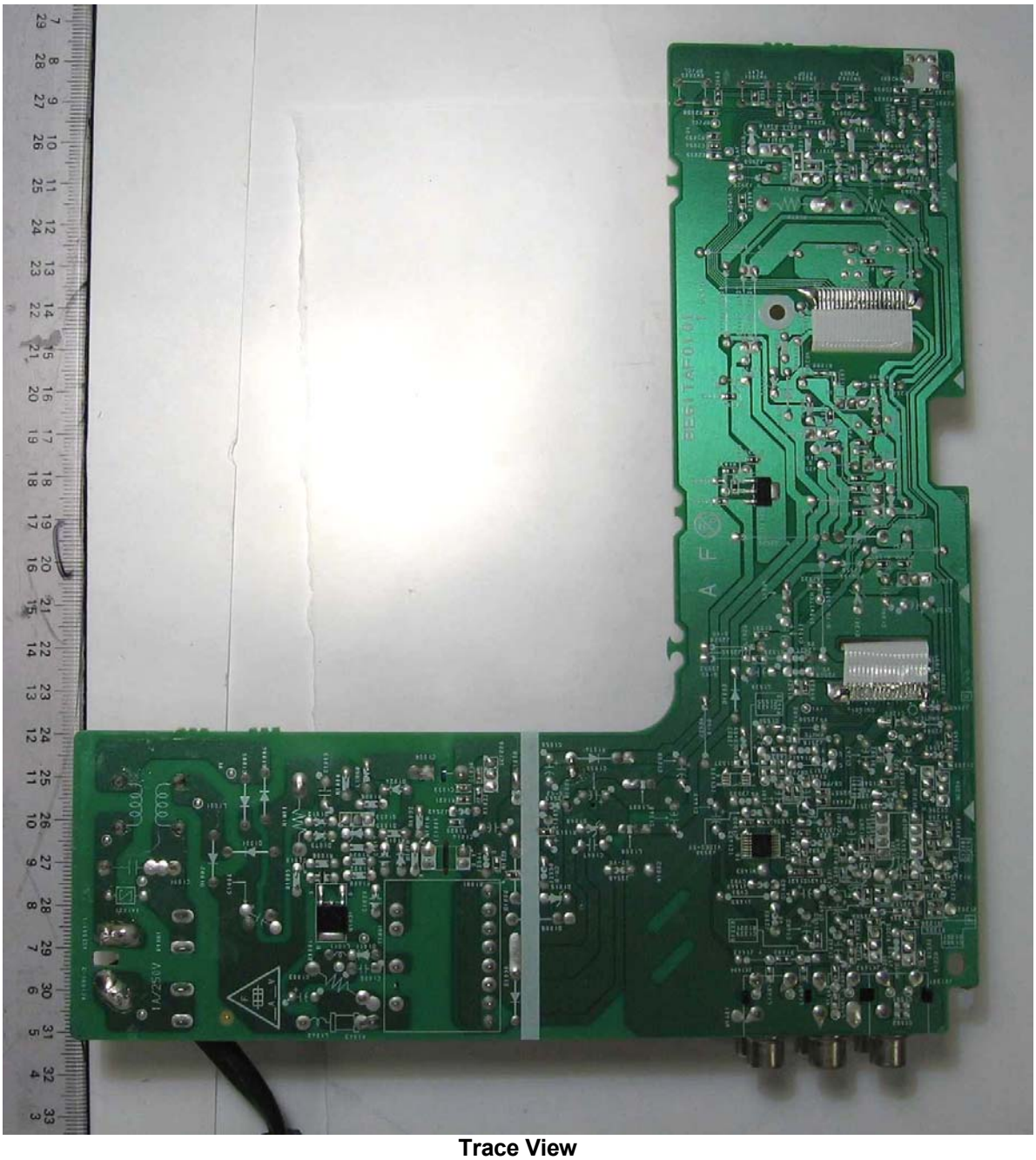
**INTERNAL PHOTOGRAPHS FOR DVD / CD PLAYER**



**Internal View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

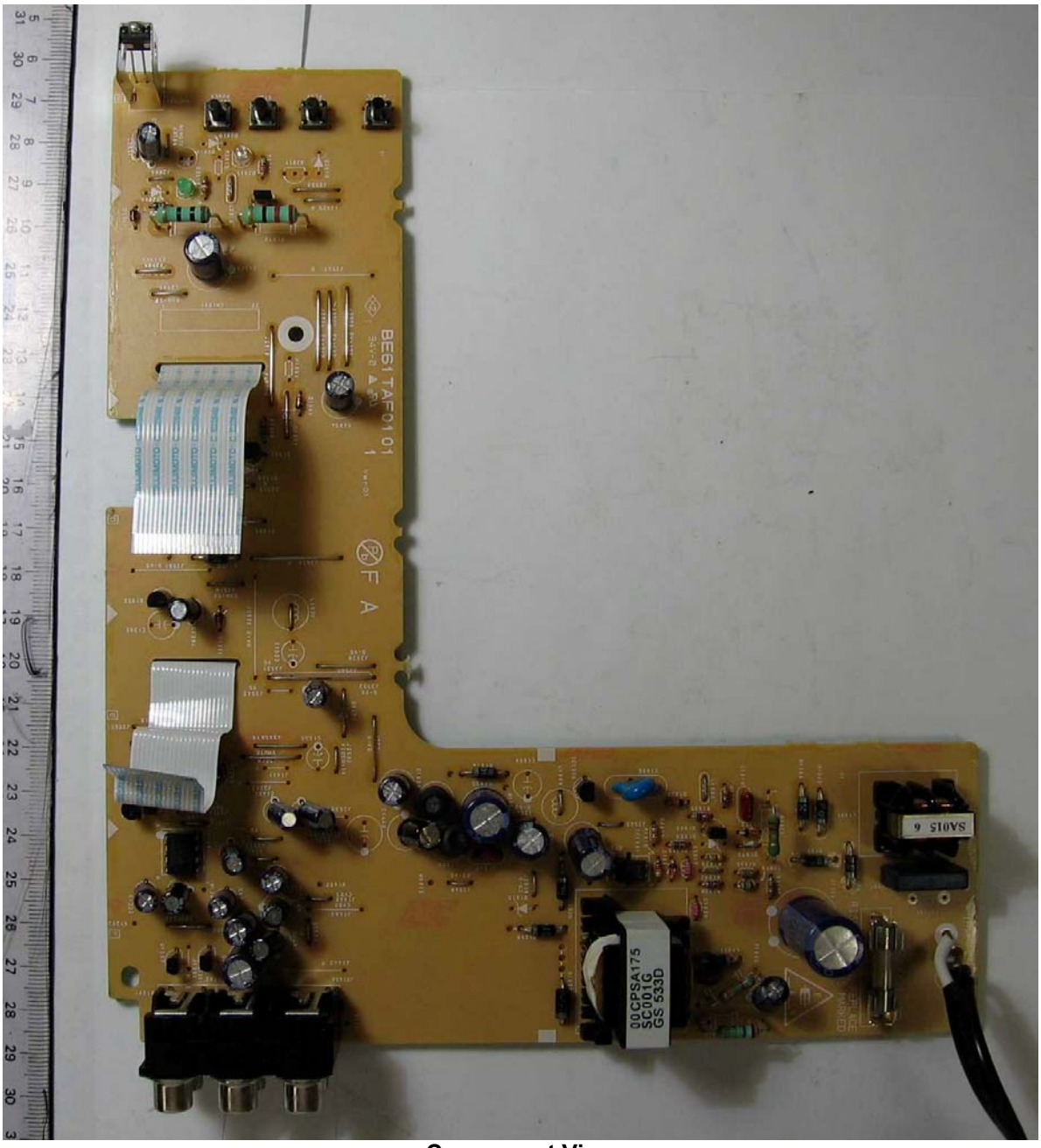
### PCB PHOTOGRAPHS FOR DVD / CD PLAYER



**Trace View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

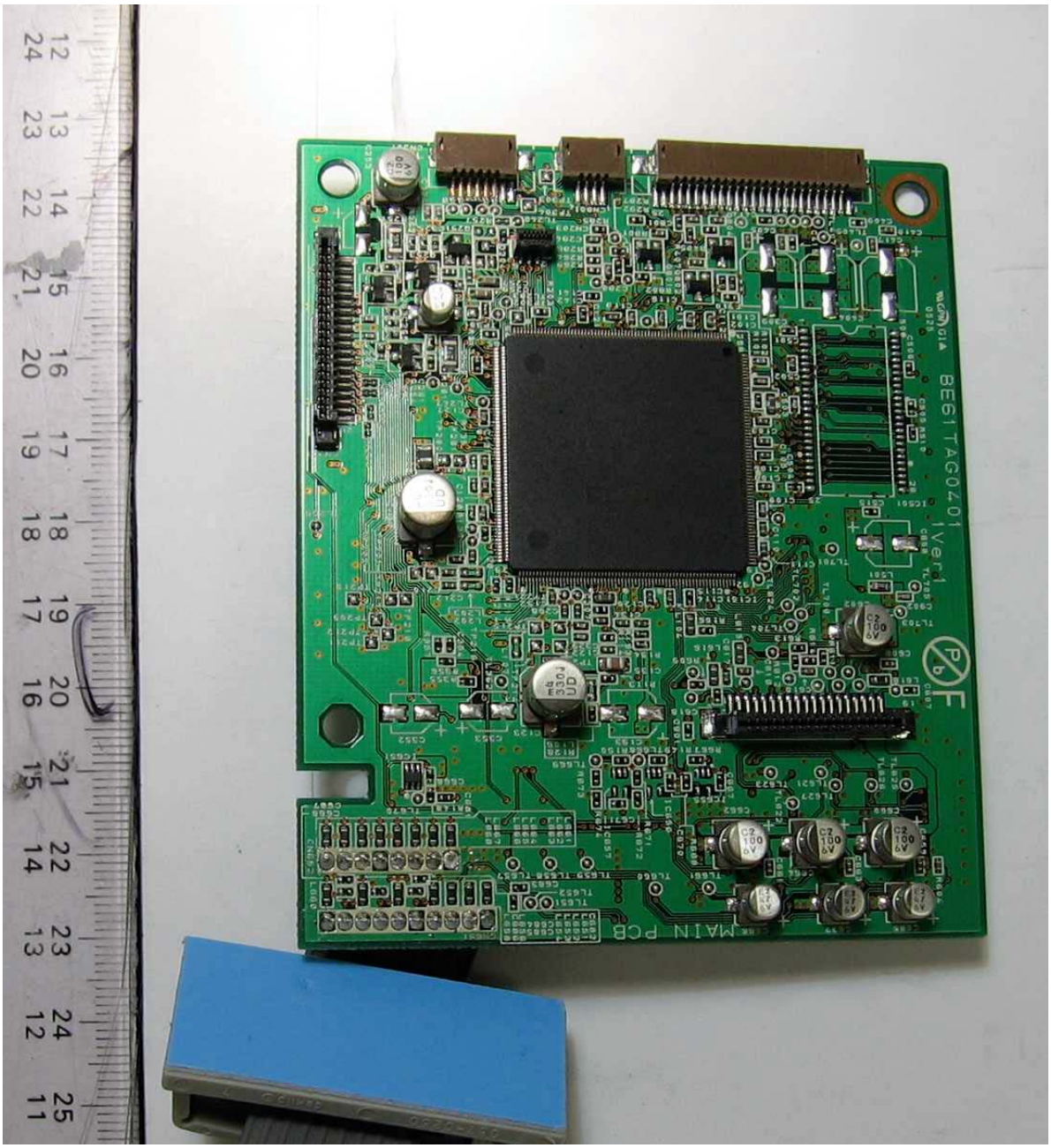
### PCB PHOTOGRAPHS FOR DVD / CD PLAYER




**Component View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

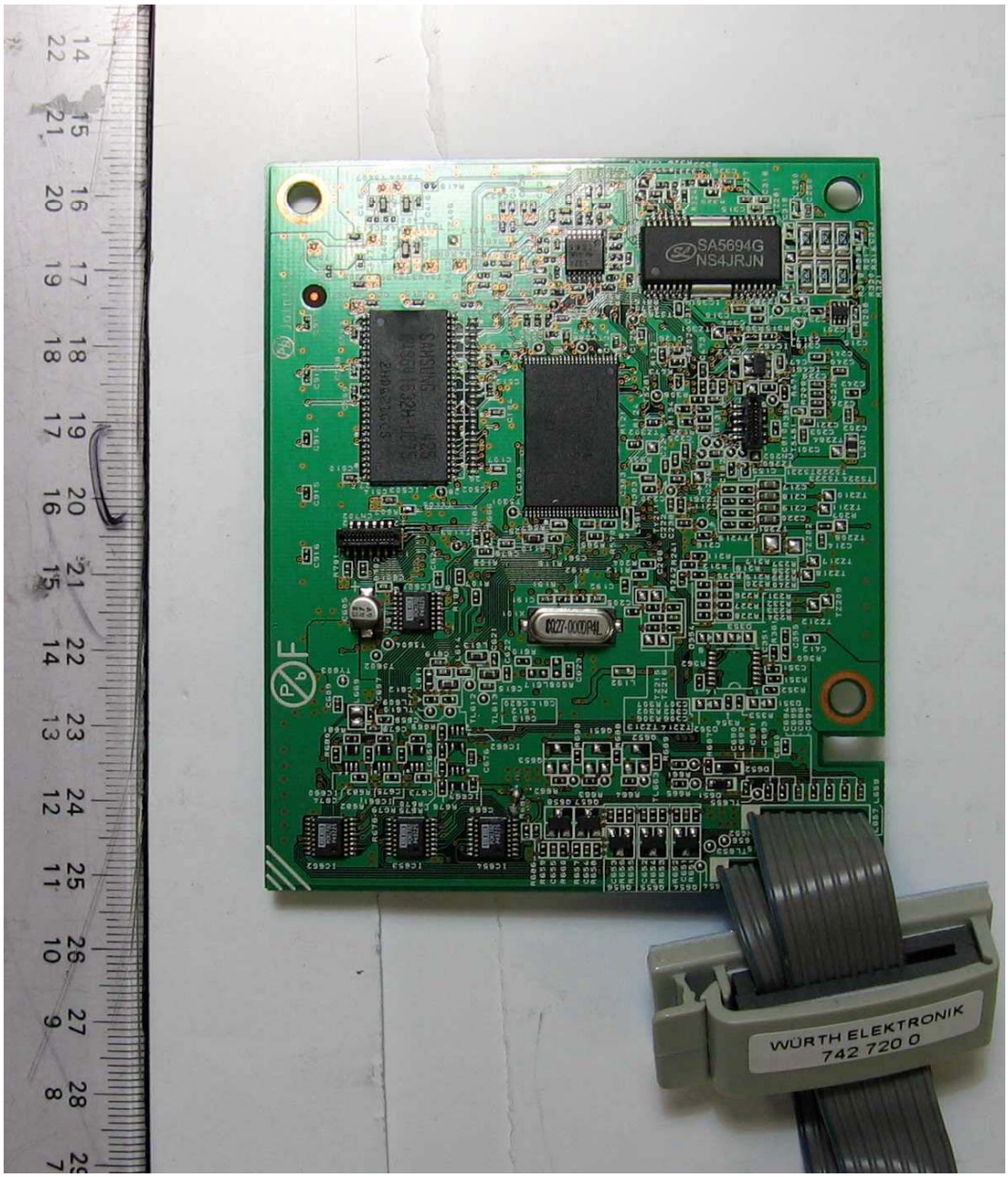
### PCB PHOTOGRAPHS FOR DVD / CD PLAYER




**Top View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

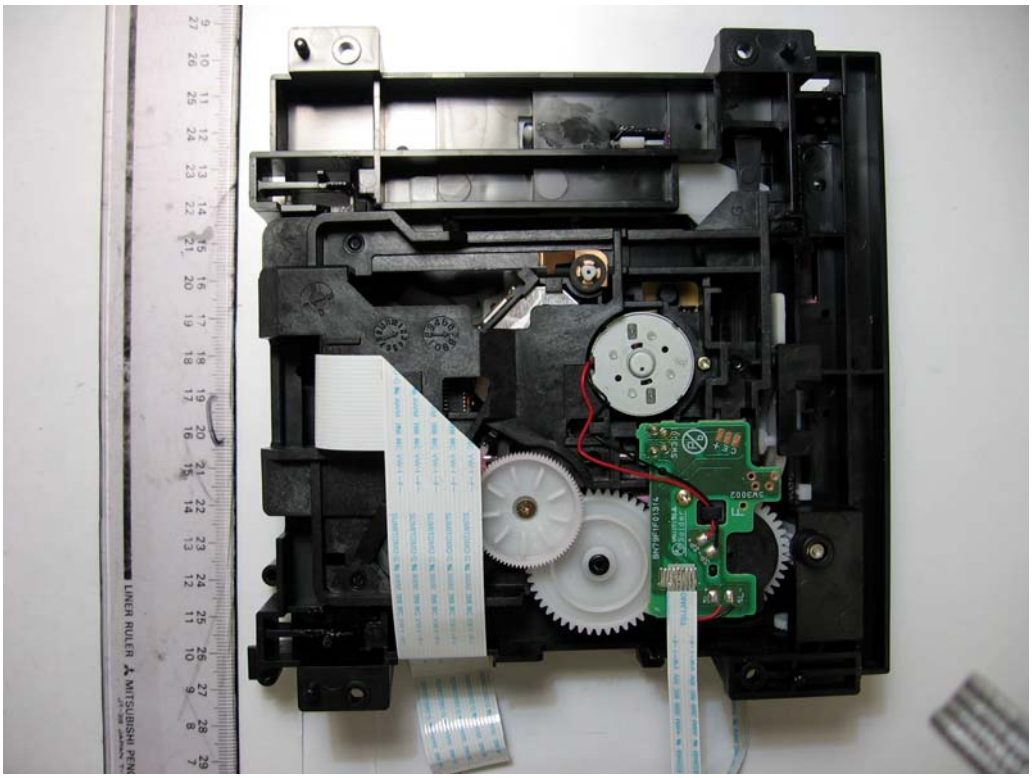
### PCB PHOTOGRAPHS FOR DVD / CD PLAYER



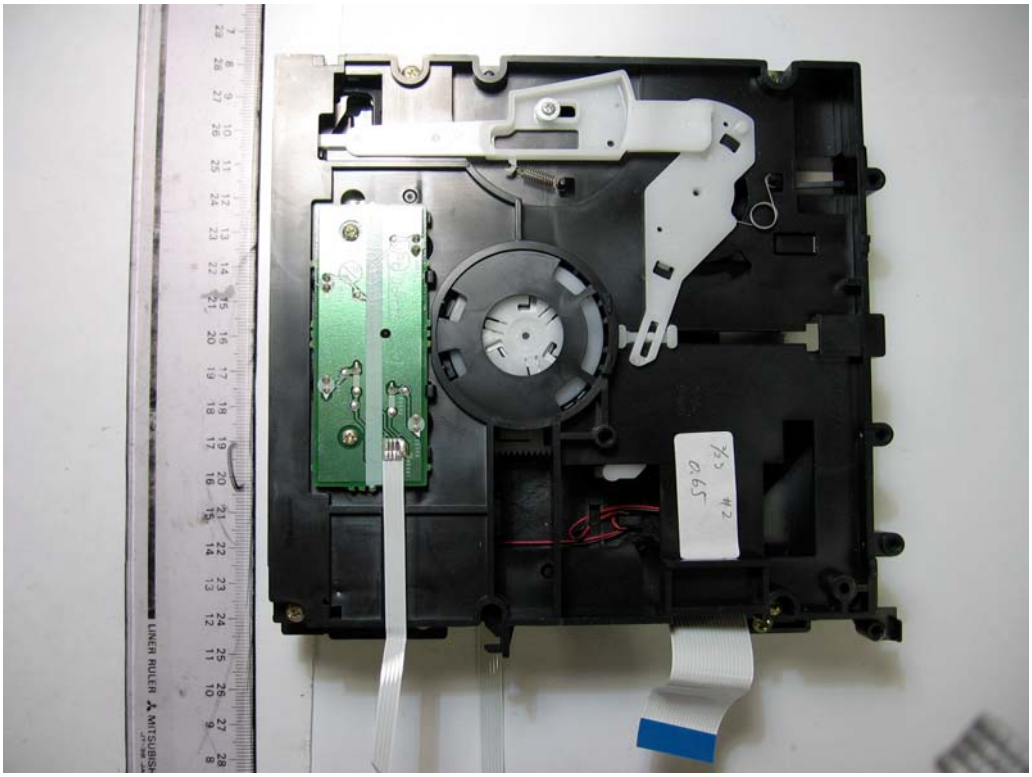

**Rear View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

### PHOTOGRAPHS FOR DVD / CD PLAYER (DVD DRIVE)



**Top View**



**Rear View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

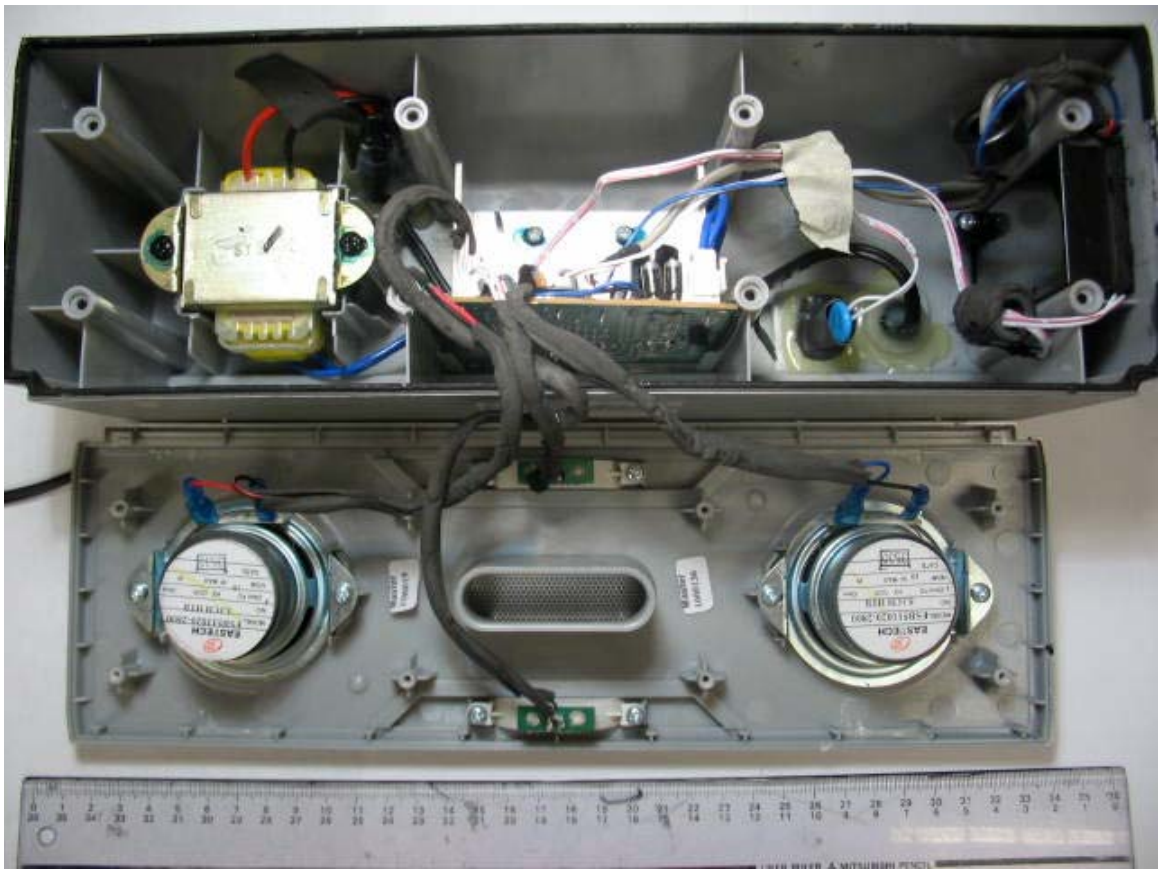
### EUT PHOTOGRAPHS FOR WIRELESS REAR SPEAKER


**Front View**

**Rear View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

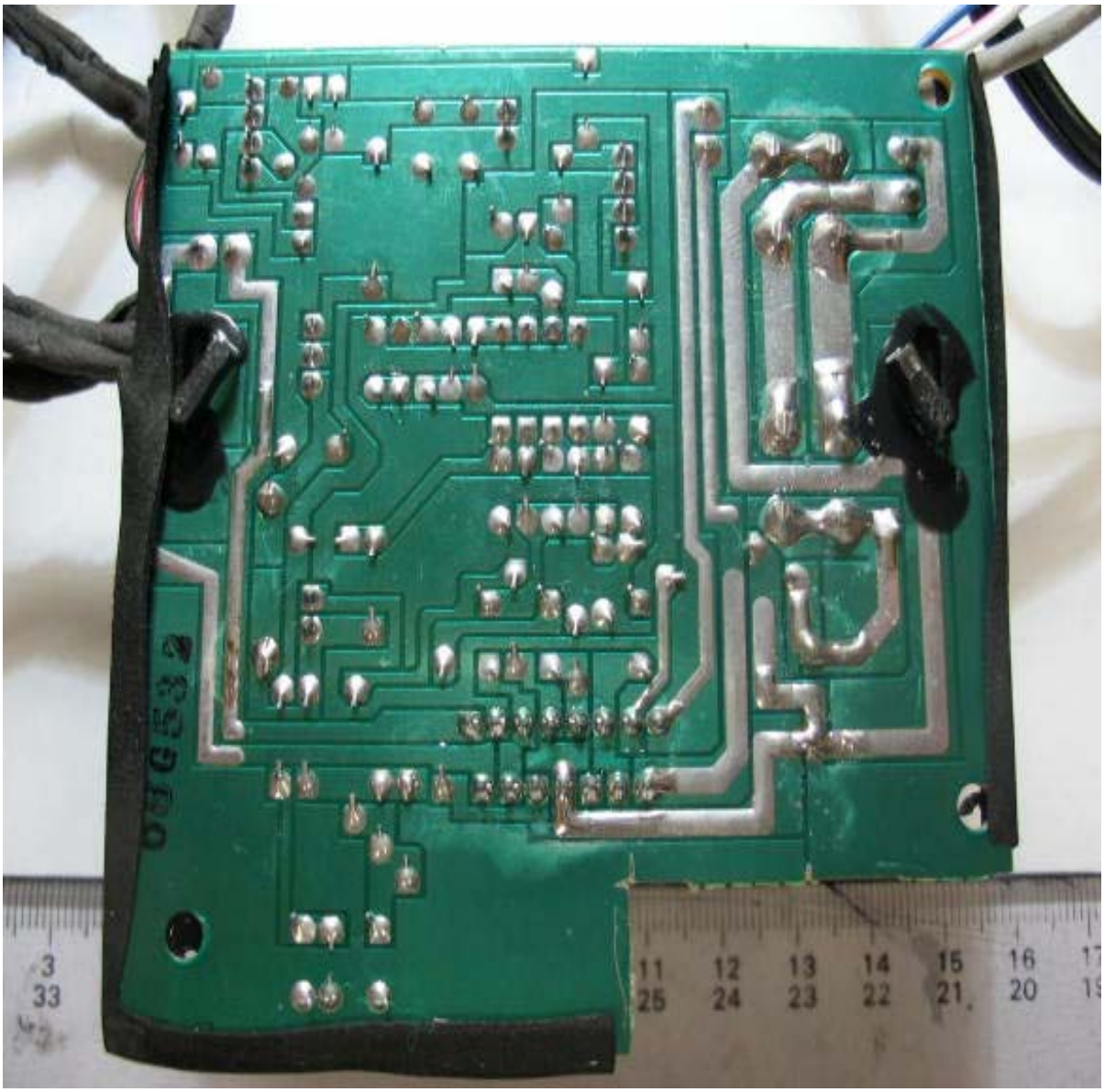
**INTERNAL PHOTOGRAPHS FOR WIRELESS REAR SPEAKER**



**Internal View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

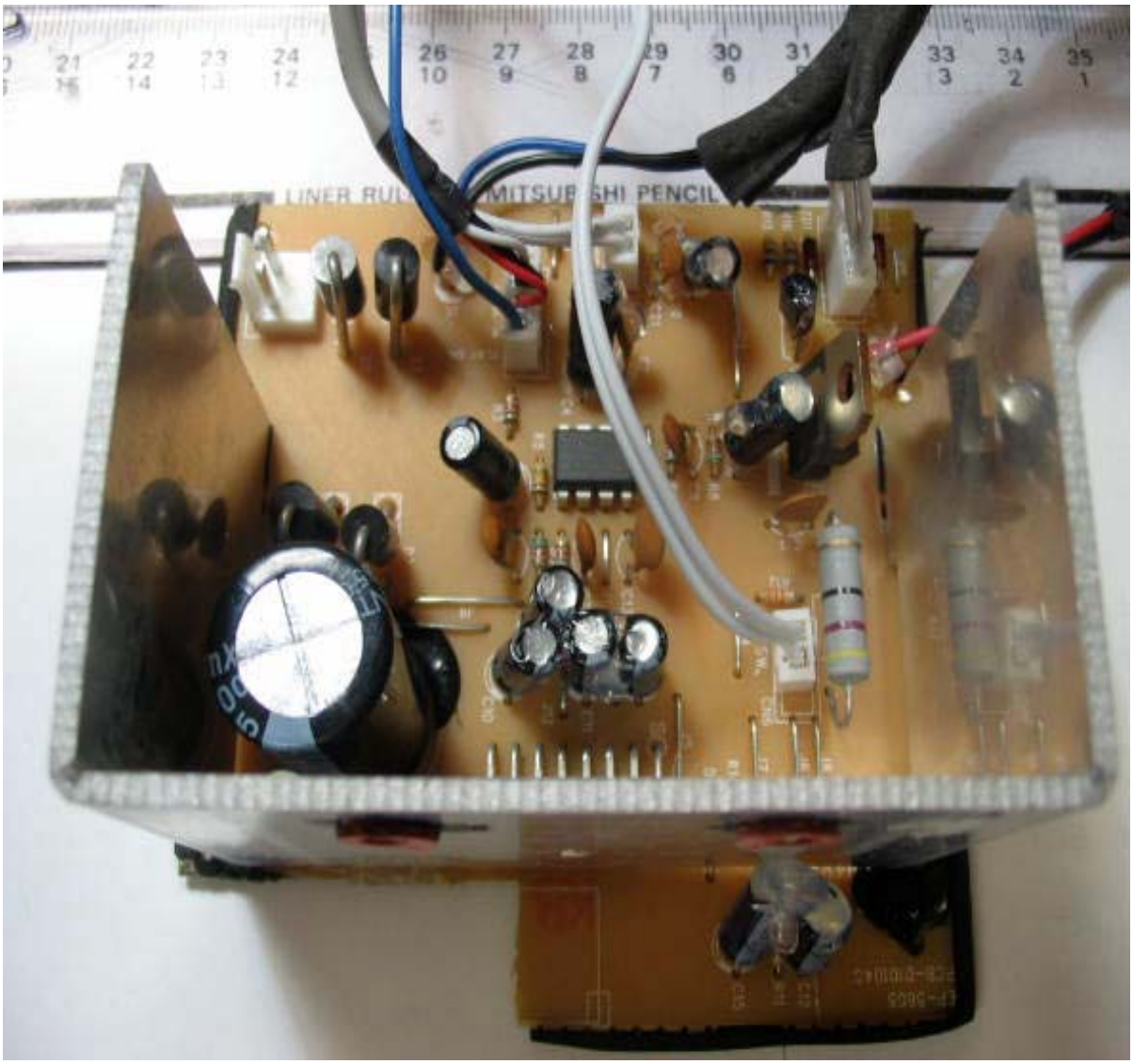
**PCB PHOTOGRAPHS FOR WIRELESS REAR SPEAKER**



**Trace View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

### PCB PHOTOGRAPHS FOR WIRELESS REAR SPEAKER



**Component View**

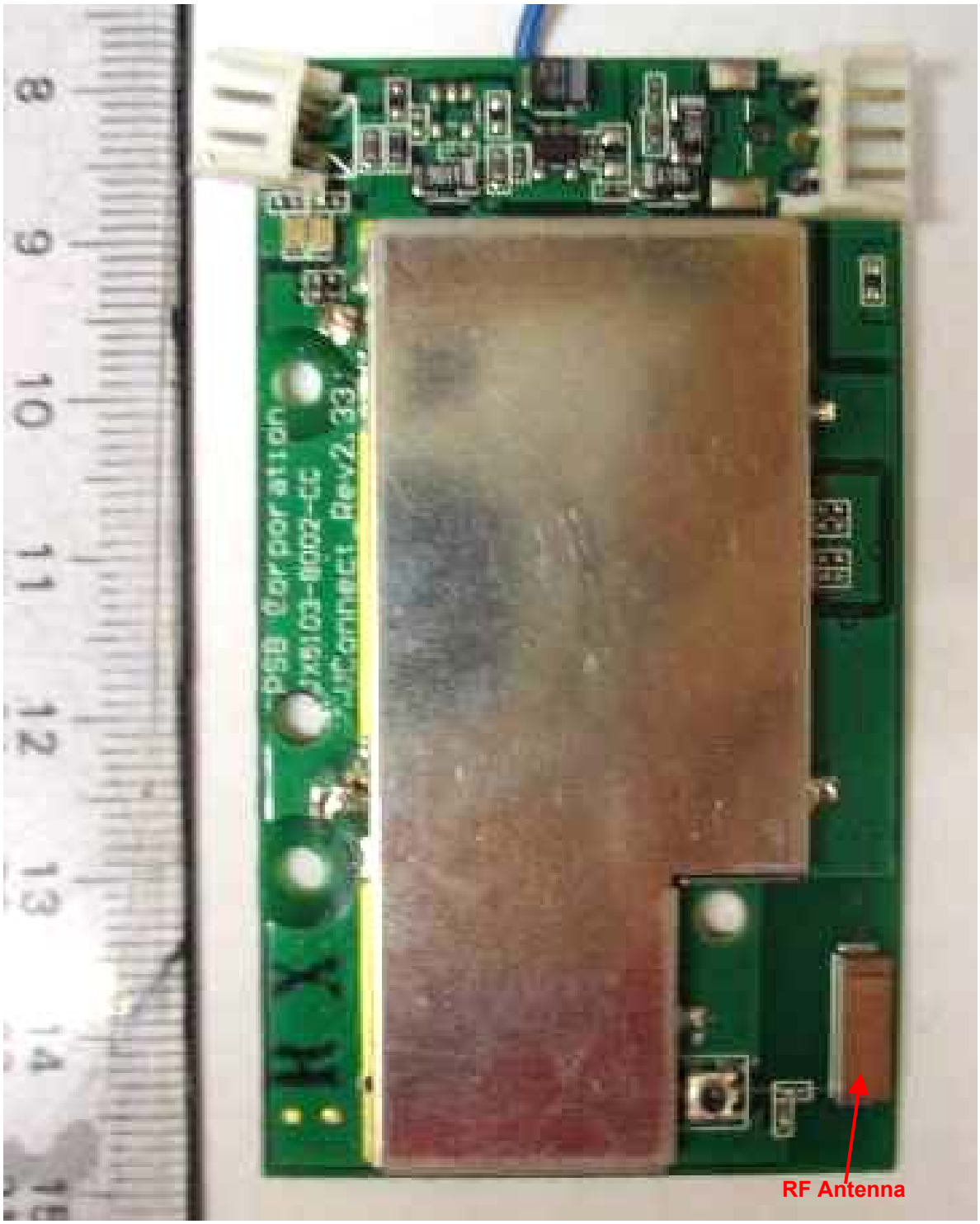
## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

**PCB PHOTOGRAPHS FOR WIRELESS REAR SPEAKER RF MODULE**


**Trace View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

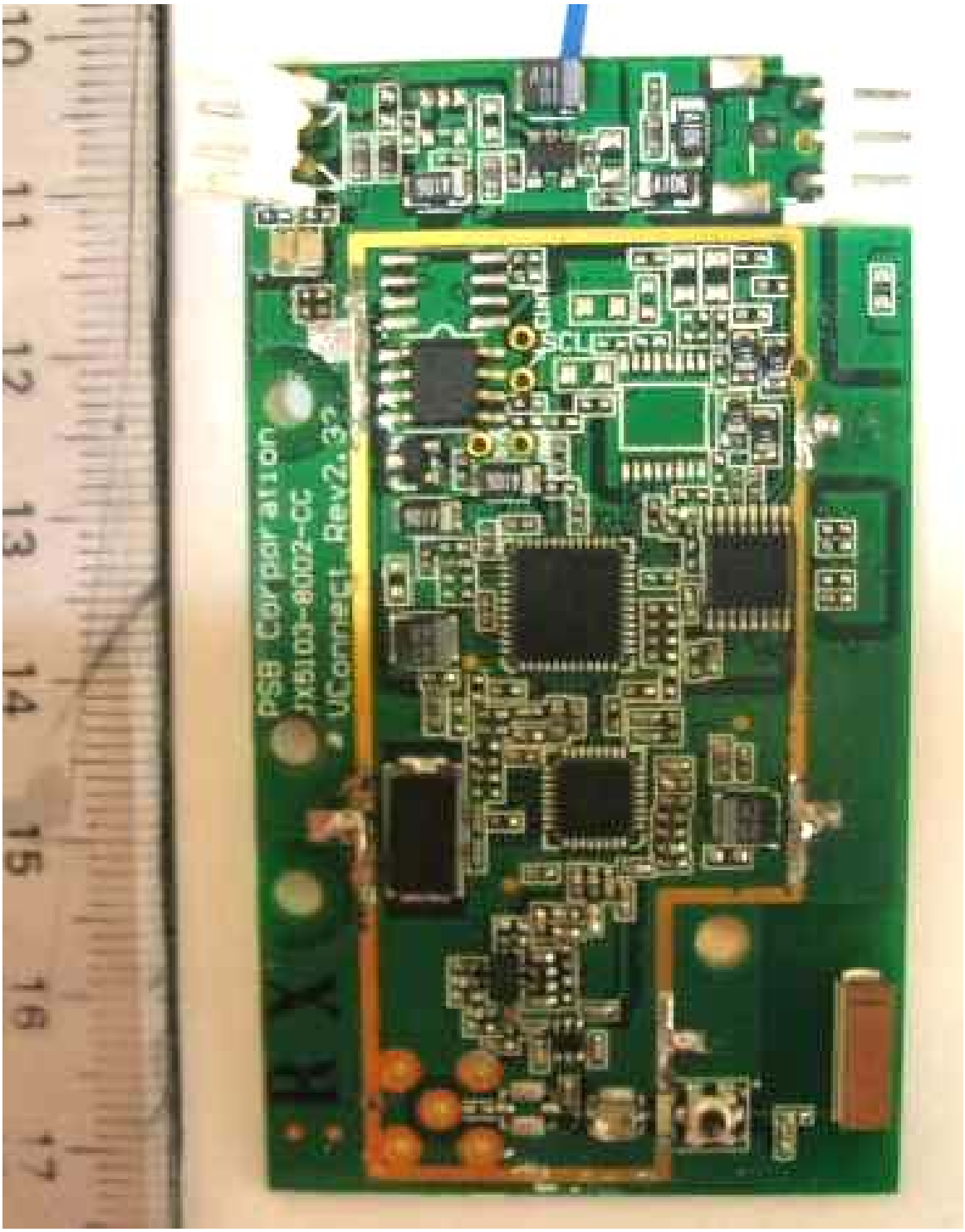
### PCB PHOTOGRAPHS FOR WIRELESS REAR SPEAKER RF MODULE




**Component View**

## EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

**PCB PHOTOGRAPHS FOR WIRELESS REAR SPEAKER RF MODULE (RF SHIELD REMOVED)**




**Component View**

# ANNEX B

# FCC LABEL & POSITION

## FCC LABEL & POSITION ANNEX B

Labelling requirements per Section 2.925 & 15.19

The label shown will be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.


**Sample Label**


**Physical Location of Label on EUT**

# ANNEX C

# USER MANUAL
# TECHNICAL DESCRIPTION
# BLOCK & CIRCUIT DIAGRAMS

(Please refer to manufacturer for details)