

**Test Report No. S09EEC01737/03**  
dated 09 Aug 2009



PSB Singapore

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH  
FCC Parts 15B & C : 2008  
OF A  
**MONITORING HANDHELD DEVICE**  
[ Model : BU10 ]  
[ FCC ID : VDQBU10 ]

**Choose certainty.  
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**TEST FACILITY** TÜV SÜD PSB Pte Ltd,  
Electrical & Electronics Centre (EEC), Product Services,  
1 Science Park Drive, Singapore 118221

**FCC REG. NO.** 90937 (3m & 10m OATS)  
99142 (10m Semi-Anechoic Chamber)  
871638 (3m Semi-Anechoic Chamber)  
325572 (10m Semi-Anechoic Chamber)

**IND. CANADA REG. NO.** 29321-1 (3m and 10m Semi-Anechoic Chambers)

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**QUOTATION NUMBER** Q09EEC00646

**JOB NUMBER** S09EEC01737

**TEST PERIOD** 15 Jul 2009 – 07 Aug 2009

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LA-2007-0380-A-1  
LA-2007-0381-F  
LA-2007-0382-B  
LA-2007-0383-G  
LA-2007-0384-G  
LA-2007-0385-E  
LA-2007-0386-C

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/Calibrations marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our laboratory.



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**TEST SUMMARY**

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

**Test Results Summary**

Test Standard	Description	Pass / Fail
FCC Part 15: 2008		
15.107(a), 15.207	Conducted Emissions	Not Applicable *See Note 5
15.109(a), 15.205, 15.209	Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)	Pass
15.247(a)(2)	Spectrum Bandwidth (6dB Bandwidth Measurement)	Pass
15.247(b)(3)	Maximum Peak Power	Pass
15.247(d)	RF Conducted Spurious Emissions	Pass
15.247(d)	Band Edge Compliance (Conducted)	Pass
15.247(d)	Band Edge Compliance (Radiated)	Pass
15.247(e)	Peak Power Spectral Density	Pass
1.1310	Maximum Permissible Exposure	Not Applicable *See Note 7
15.35(c)	Duty Cycle Factor Computation	Refer to page 39 for details



**TEST SUMMARY**

**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.

<u>Transmit Channel</u>	<u>Frequency (MHz)</u>
Channel 0	2.405
Channel 7	2.440
Channel 14	2.475

2. All the measurements in section 15.247 except Band Edge Compliance (Radiated) test 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. All test measurement procedures are according to ANSI C63.4: 2003.
5. The Equipment Under Test (EUT) is a battery operated device and contains no provision for public utility connections.
6. The EUT was tested using fully charged batteries with DC voltage of 3.0V.
7. The Equipment Under Test (EUT) is a handheld device. Please refer toTUV SUD PSB's issued report, S09EEC01737/05 for Specific Absorption Rate (SAR) measurement results.

**Modifications**

No modifications were made.



**PRODUCT DESCRIPTION**

Description : The Equipment Under Test (EUT) is a **Monitoring Handheld Device**. It is a device used by custodian to monitor the location of children.

Manufacturer : Daviscomms (Malaysia) Sdn Bhd  
Plot 18, Lorong Perusahaan Maju 1, Kawasan Perusahaan Perai 4,  
13600 Perai, Malaysia

Model Number : BU10

FCC ID : VDQBU10

Serial Number : Nil

Microprocessor : TI 8051MCU

Operating / Transmitting Frequency : 2.405GHz – 2.475GHz

Clock / Oscillator Frequency : 32MHz, 32.768kHz

Modulation : Direct Sequence Spread Spectrum (DSSS)

Antenna Gain : 5.0dBi (Directional Antenna)  
-1.6dBi (Omni Antenna)

Port / Connectors : Nil

Rated Input Power : 3.0Vdc

Accessories : Nil



**SUPPORTING DESCRIPTION DESCRIPTION**

<b>Equipment Description (Including Brand Name)</b>	<b>Model, Serial &amp; FCC ID Number</b>	<b>Cable Description (List Length, Type &amp; Purpose)</b>
Agilent DC Power Supply	M/N: E3620 S/N: Nil FCC ID: Nil	1.50m DC cable



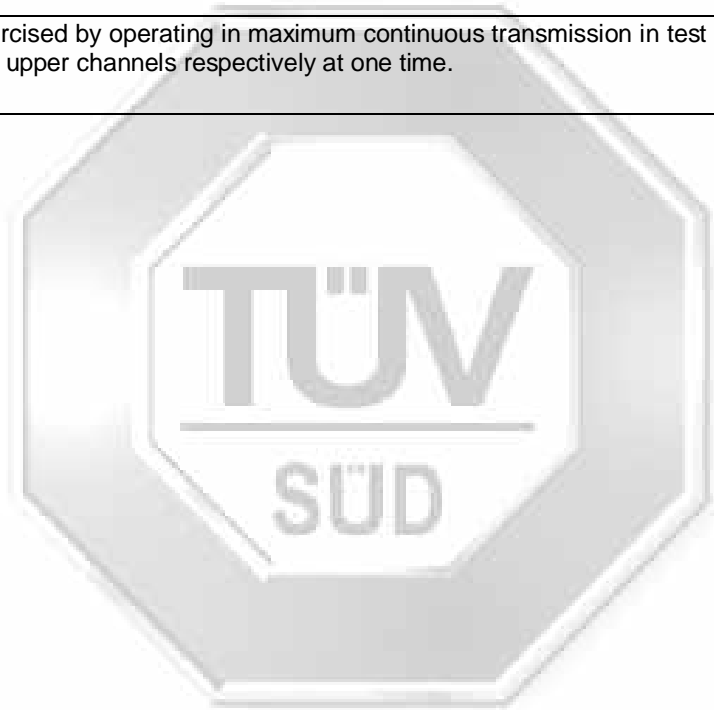


**EUT OPERATING CONDITIONS**

**FCC Part 15**

1. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)
2. Spectrum Bandwidth (6dB Bandwidth Measurement)
3. Maximum Peak Power
4. RF Conducted Spurious Emissions
5. Band Edge Compliance (Conducted)
6. Band Edge Compliance (Radiated)
7. Peak Power Spectral Density
8. Duty Cycle Factor Computation

The EUT was exercised by operating in maximum continuous transmission in test mode, i.e transmitting at lower, middle and upper channels respectively at one time.



**RADIATED EMISSION TEST**

**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 829550/001	27 May 2010
Teseq Preamplifier (PA16)	LNA6018	70214	06 Oct 2009
Agilent Preamplifier (PA7)	87405B	10020	04 Feb 2010
Schaffner Bilog Antenna – BL4	CBL6112B	2593	13 May 2010
EMCO Horn Antenna- H2	3115	9403-4250	13 May 2010
Micro Bandstop Filter (2.4-2.5 GHz)	BRM50701	017	13 Aug 2010





**RADIATED EMISSION TEST**

**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 altitude 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<sup>th</sup> harmonics of the EUT fundamental frequency, using the Bi-log antenna for frequencies from 30MHz up to 1GHz, and the Horn antenna above 1GHz.

**Sample Calculation Example**

At 300 MHz	Q-P limit (Class B) = 200 $\mu$ V/m = 46.0 dB $\mu$ V/m
Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB	
Q-P reading obtained directly from EMI Receiver = 40.0 dB $\mu$ V/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 EMISSION TEST**



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



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



**RADIATED EMISSION TEST**

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

Test Input Power	3Vdc	Temperature	24°C
Test Distance	3m	Relative Humidity	57%
		Atmospheric Pressure	1030mbar
		Tested By	Lucas Beh

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dB $\mu$ V/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)	Channel
33.2660	28.2	-11.8	45	300	H	14
50.6830	24.4	-15.6	131	100	V	14
67.0110	14.0	-26.0	126	200	V	14
98.5790	16.0	-27.5	45	200	V	14
289.0760	20.1	-25.9	210	100	H	14
320.6440	18.8	-27.2	49	100	H	14

Spurious Emissions above 1GHz

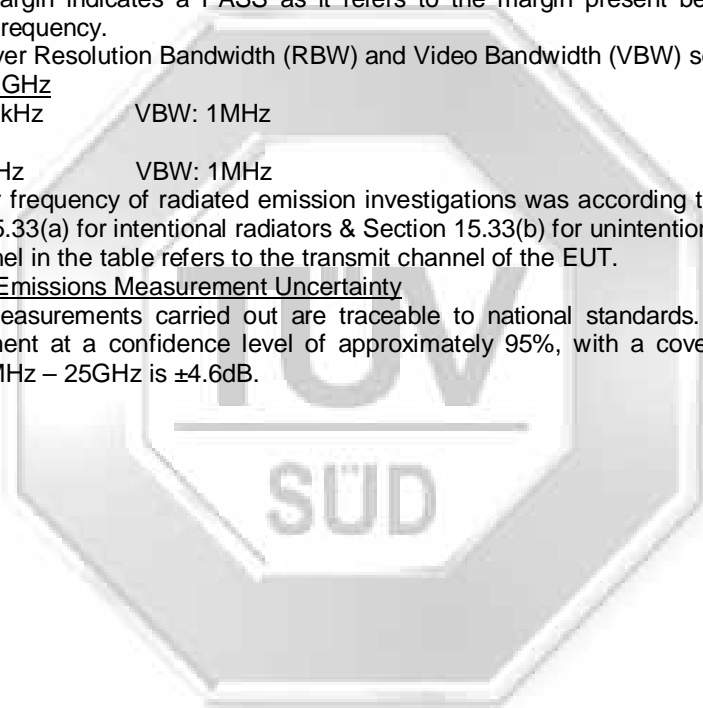
Frequency (GHz)	Peak Value (dB $\mu$ V/m)	Average Value (dB $\mu$ V/m)	Average Margin (dB)	Azimuth (Degrees)	Height (cm)	Pol (H/V)	Channel
4.9844	56.4	18.0	-36.0	211	100	V	0
4.9477	68.0	29.6	-24.4	118	100	H	14
7.3185	63.8	25.4	-28.6	247	100	V	7
7.4233	58.6	20.2	-33.8	200	100	H	14
9.90146	59.1	20.7	-33.3	201	100	H	14
--	--	--	--	--	--	--	--



**RADIATED EMISSION TEST**

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 antenna gain is the highest antenna gain of the EUT (base).
3. "--" indicates no emissions were found and shows compliance to the limits.
4. 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.
5. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
6. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
30MHz - 1GHz  
RBW: 120kHz      VBW: 1MHz  
>1GHz  
RBW: 1MHz      VBW: 1MHz
7. 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.
8. The channel in the table refers to the transmit channel of the EUT.
9. 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 is  $\pm 4.6\text{dB}$ .



**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Limits**

The EUT shows compliance to the requirements of this section, which states that the minimum bandwidth of the EUT employing digital modulation techniques shall be at least 500kHz.

**FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
Agilent EMC Analyzer (9kHz-26.5GHz)	E7405A	US40240195	20 Jan 2010

**FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB 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 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

**FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB 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 at Channel 0 (2.405GHz).
2. The center frequency of the spectrum analyser was set to the transmitting frequency with the frequency span wide enough to capture the 6dB 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 6dB 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 6dB 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 7 (2.440GHz) and Channel 14 (2.475GHz) respectively.



**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**



**Spectrum Bandwidth (6dB Bandwidth Measurement) Test Setup**

**FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Results**

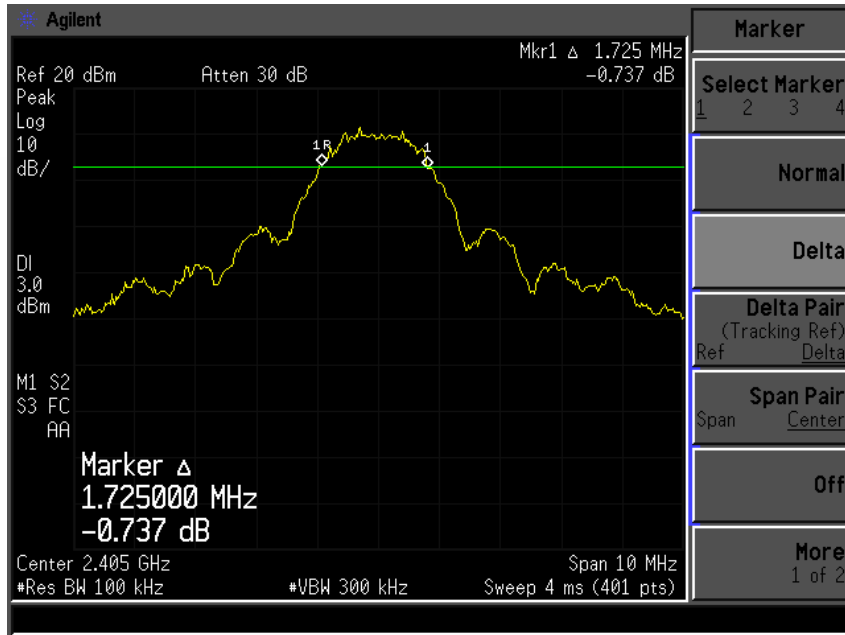
Test Input Power	3Vdc	Temperature	22°C
Attached Plots	1 - 4	Relative Humidity	54%
		Atmospheric Pressure	1030mbar
		Tested By	Anthony Toh

Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)
0	2.405	1.725
7	2.440	1.637
14	2.475	1.612

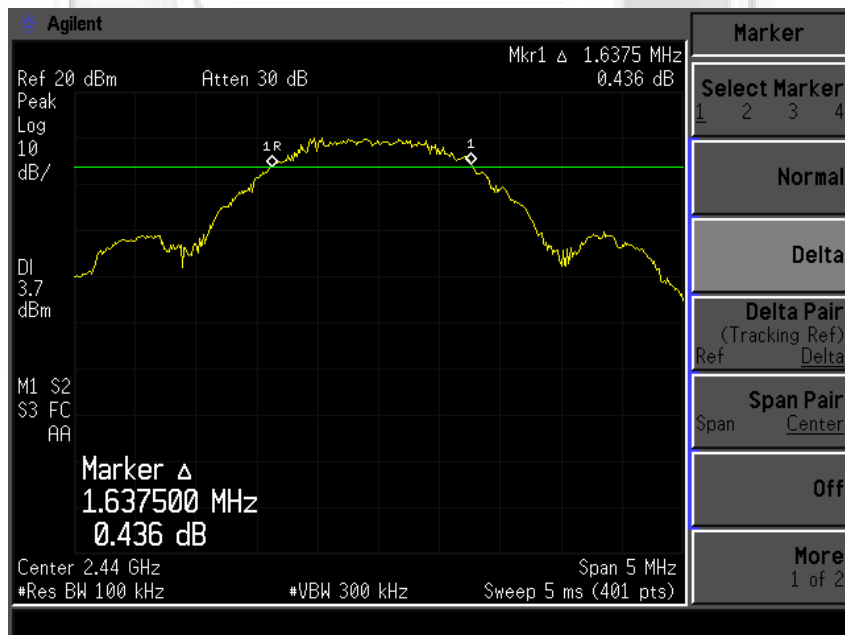


**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots**



Plot 1 - Channel 0

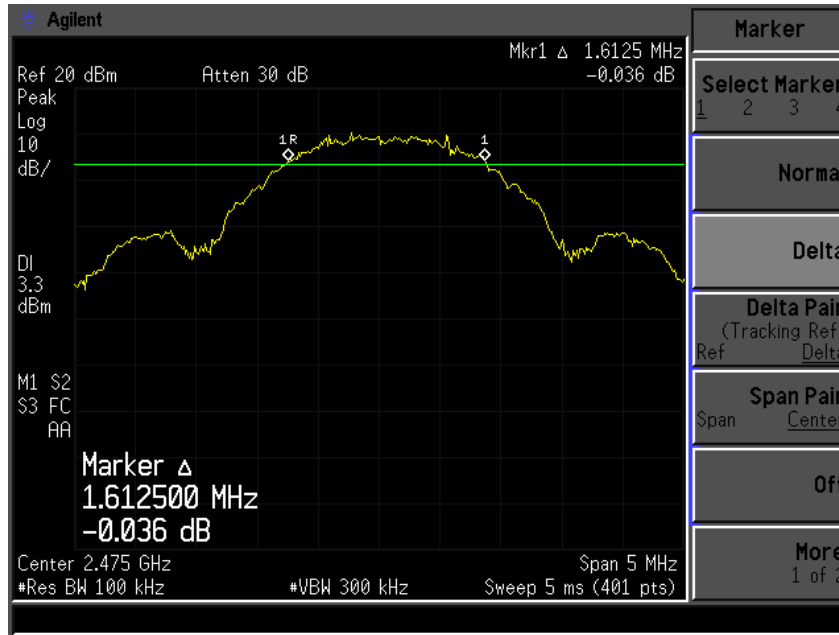


Plot 2 - Channel 7



**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots**



Plot 3 - Channel 14





**MAXIMUM PEAK POWER TEST**

**FCC Part 15.247(b)(3) Maximum Peak Power Limits**

The EUT shows compliance to the requirements of this section, which states the maximum peak power of the EUT employing digital modulation shall not exceed 1W (30dBm).

**FCC Part 15.247(b)(3) Maximum Peak Power Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
R&S Universal Radio Communication Tester	CMU 200	838114/002	21 Jul 2010

**FCC Part 15.247(b)(3) 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)(3) 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 at Channel 0 (2.405GHz).
2. The maximum peak power of the transmitting frequency was detected and recorded.
3. The Equivalent Isotropic Radiated Power (EIRP) of the EUT was computed by adding its antenna gain to the measured maximum peak power.
4. The steps 2 to 3 were repeated with the transmitting frequency was set to Channel 7 (2.440GHz) and Channel 14 (2.475GHz) respectively.

**MAXIMUM PEAK POWER TEST**



**Maximum Peak Power Test Setup**

**FCC Part 15.247(b)(3) Maximum Peak Power Results**

Test Input Power	3Vdc	Temperature	22°C
Antenna Gain	5.0dB <sub>i</sub> *See Note 1	Relative Humidity	54%
		Atmospheric Pressure	1030mbar
		Tested By	Zechs Ng Chee Siong

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Maximum EIRP (W)	Limit (W)
0	2.4050	0.0089	0.0282	1.0
7	2.4400	0.0089	0.0282	1.0
14	2.4750	0.0081	0.0257	1.0

Notes

1. The antenna gain is the highest antenna gain of the EUT.
2. 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.



**RF CONDUCTED SPURIOUS EMISSIONS TEST**

**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
Agilent EMC Analyzer (9kHz-26.5GHz)	E7405A	US40240195	20 Jan 2010

**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 0 (2.405GHz).
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 7 (2.440GHz) and Channel 14 (2.475GHz) respectively.

**RF CONDUCTED SPURIOUS EMISSIONS TEST**



**RF Conducted Spurious Emissions Test Setup**

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

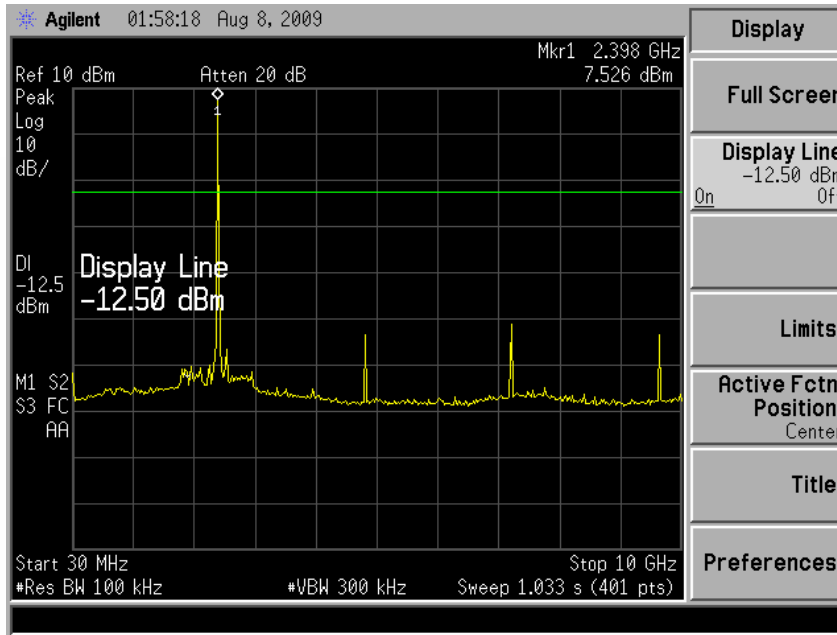
Test Input Power	3Vdc	Temperature	22°C
Attached Plots	4 - 9	Relative Humidity	54%
		Atmospheric Pressure	1030mbar
		Tested By	Zechs Ng Chee Siong

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

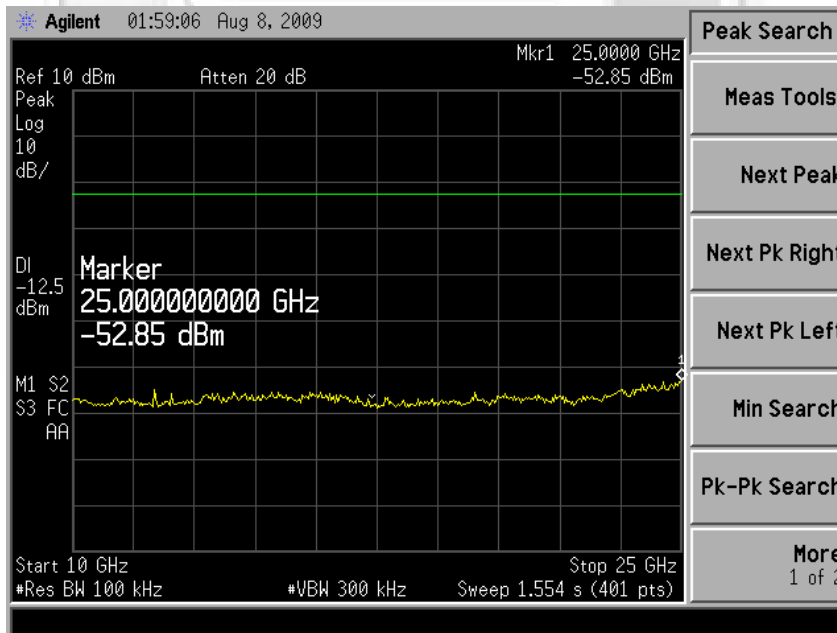


RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots



Plot 4 – Channel 0

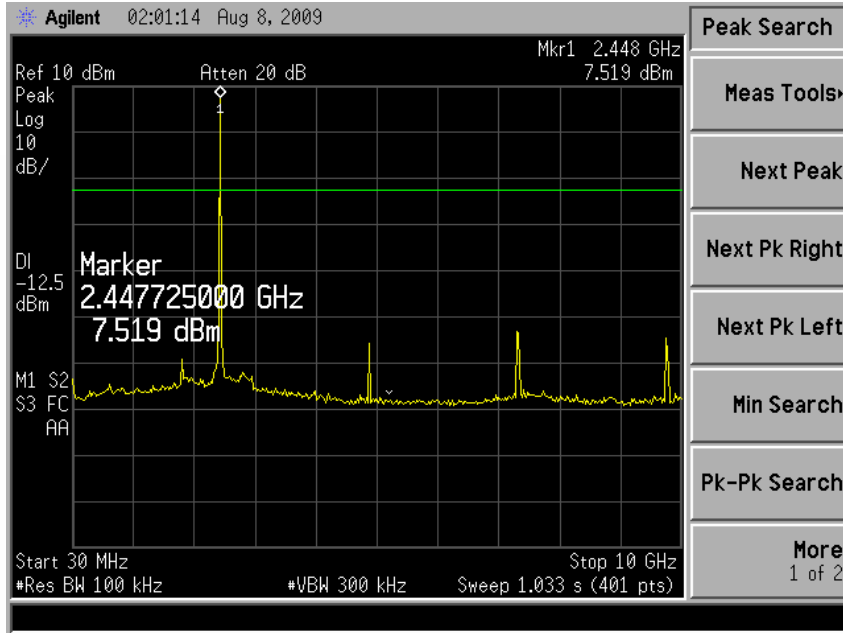


Plot 5 – Channel 0

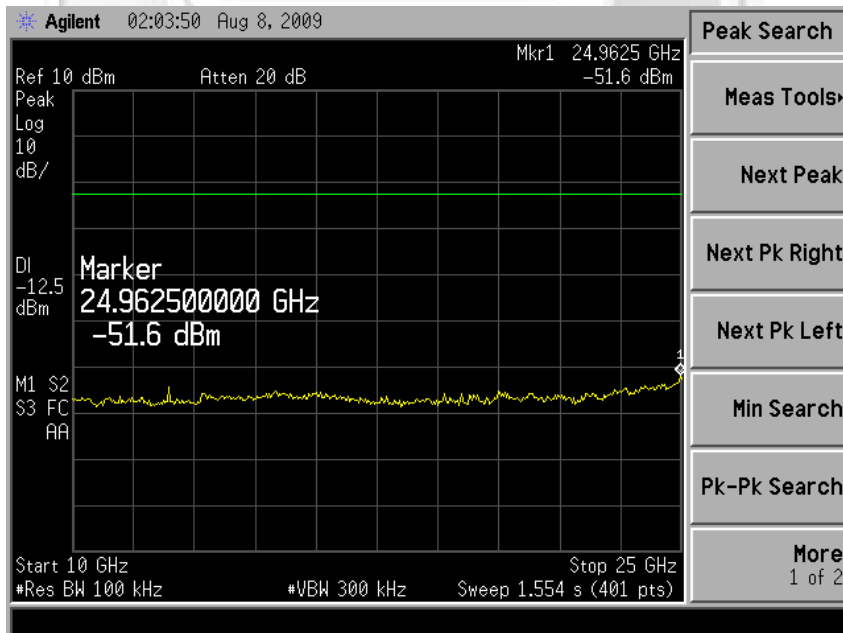


RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots (Base)



Plot 6 – Channel 7

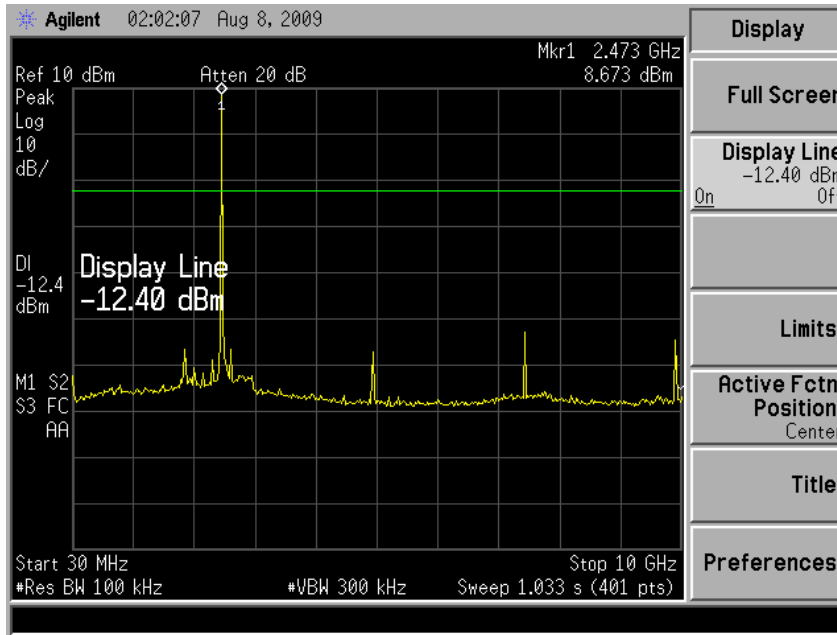


Plot 7 – Channel 7

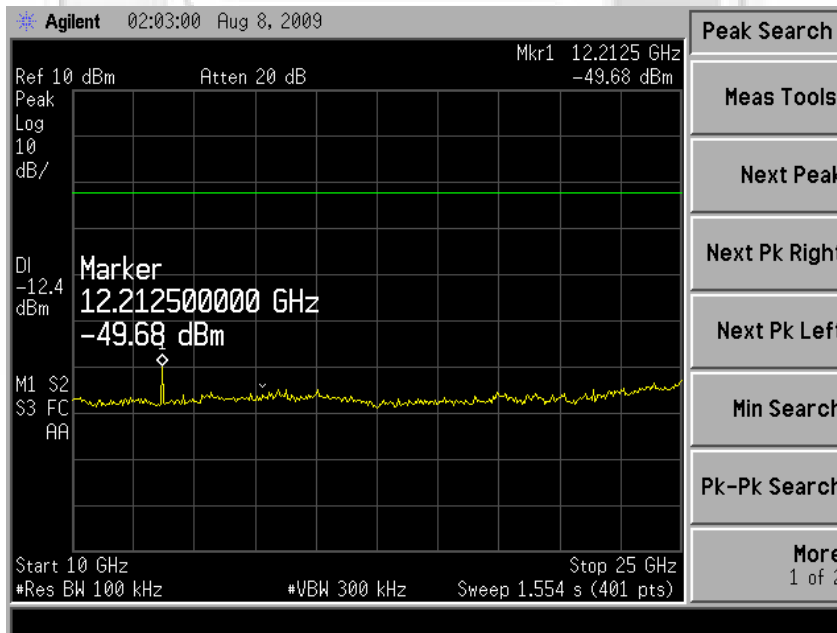


RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots (Base)



Plot 8 – Channel 14



Plot 9 – Channel 14

**BAND EDGE COMPLIANCE (CONDUCTED) TEST**

**FCC Part 15.247(d) Band Edge Compliance (Conducted) 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 (Conducted) Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
Agilent EMC Analyzer (9kHz-26.5GHz)	E7405A	US40240195	20 Jan 2010

**FCC Part 15.247(d) Band Edge Compliance (Conducted) 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 (Conducted) 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.
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 (CONDUCTED) TEST**



**Band Edge Compliance (Conducted) Test Setup**

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

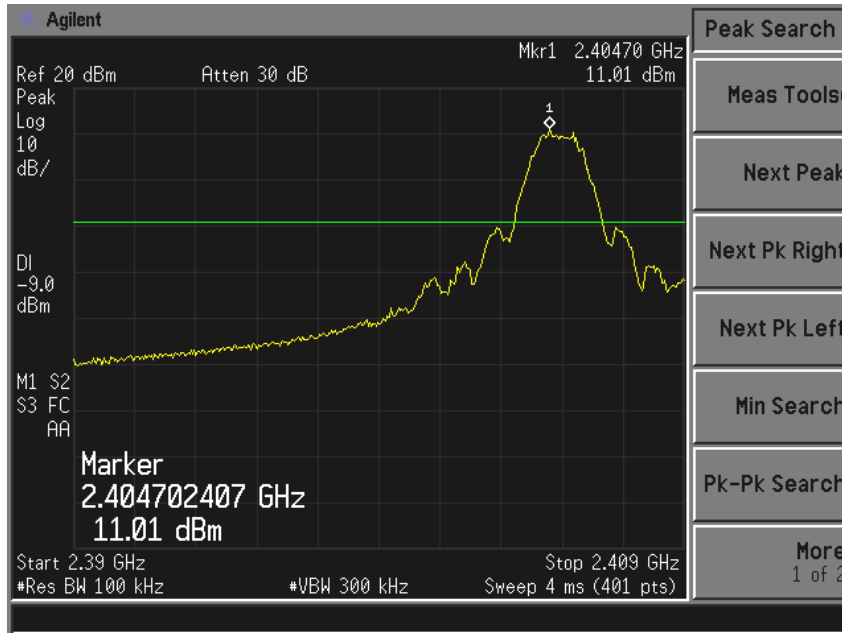
Test Input Power	3Vdc	Temperature	22°C
Attached Plots	10 - 11	Relative Humidity	54%
		Atmospheric Pressure	1030mbar
		Tested By	Anthony Toh

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

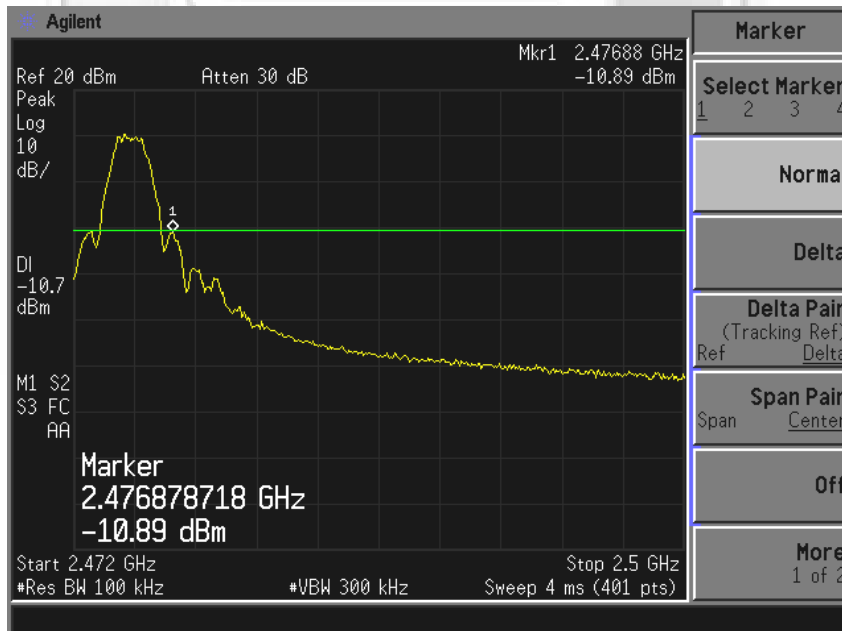


**BAND EDGE COMPLIANCE (CONDUCTED) TEST**

**Band Edge Compliance (Conducted) Plots**



**Plot 10 – Lower Band Edge at 2.4000GHz**



**Plot 11 – Upper Band Edge at 2.4835GHz**

## **BAND EDGE COMPLIANCE (RADIATED) TEST**

### **FCC Part 15.247(d) Band Edge Compliance (Radiated) 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. In addition, radiated emissions which fall in the restricted bands shall comply to the radiated emission limits specified in 15.209.

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

<b>Instrument</b>	<b>Model</b>	<b>S/No</b>	<b>Cal Due Date</b>
R&S Test Receiver (20Hz–26.5GHz) – ESMI2	ESMI	829214/006 829550/001	27 May 2010
Teseq Preamplifier (PA16)	LNA6018	70214	06 Oct 2009
EMCO Horn Antenna- H2	3115	9403-4250	13 May 2010

### **FCC Part 15.247(d) Band Edge Compliance (Radiated) 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 resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz to show compliance of spurious at band edges are at least 20dB below the carriers. For restricted band spurious at band edges, peak and average measurement plots were taken using the following setting:
  - a. Peak Plot:  
RBW = VBW = 1MHz
  - b. Average Plot  
RBW = 1MHz, VBW = 10Hz
4. All other supporting equipment were powered separately from another filtered mains.

### **FCC Part 15.247(d) Band Edge Compliance (Radiated) 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.
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 (RADIATED) TEST**



**Band Edge Compliance (Radiated) Test Setup**

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

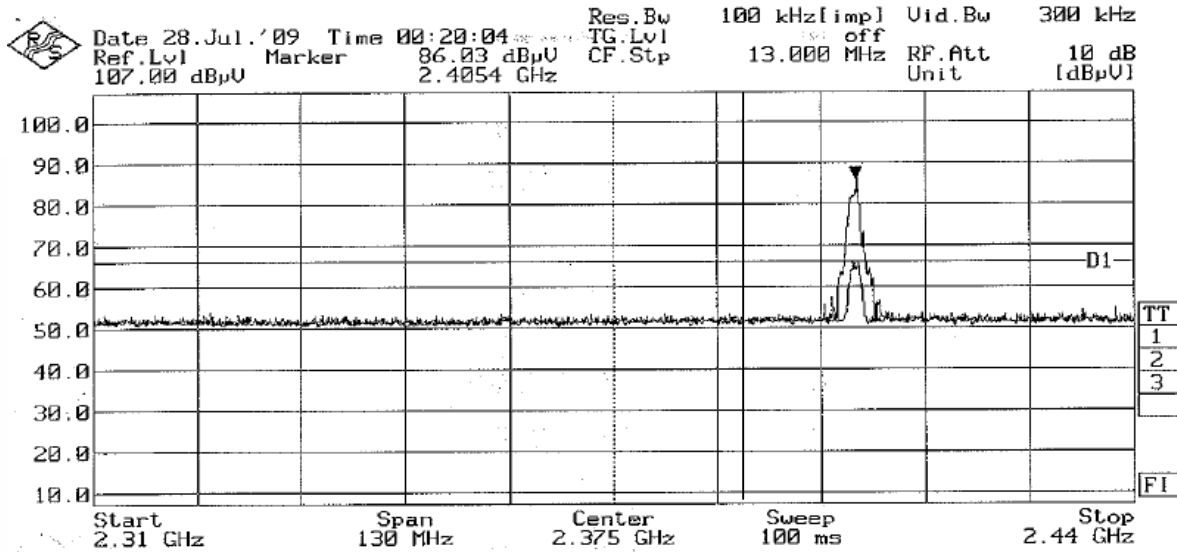
Test Input Power	3Vdc	Temperature	24°C
Attached Plots	12 - 23	Relative Humidity	57%
		Atmospheric Pressure	1030mbar
		Tested By	Zechs Ng

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

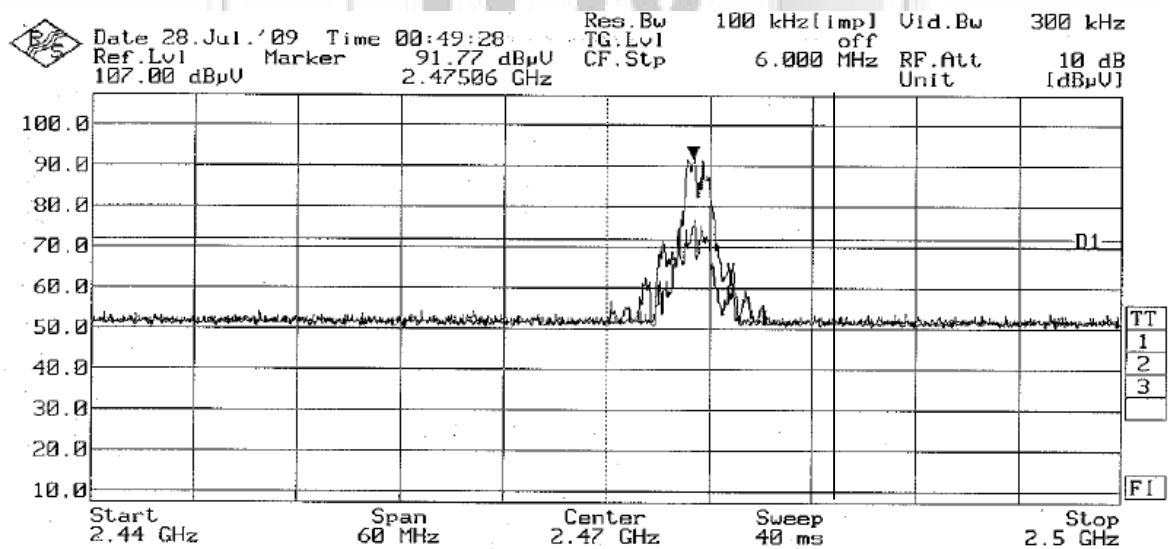


**BAND EDGE COMPLIANCE (RADIATED) TEST**

**Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge) – Omni Antenna**



**Plot 12 – Lower Band Edge at 2.4000GHz**

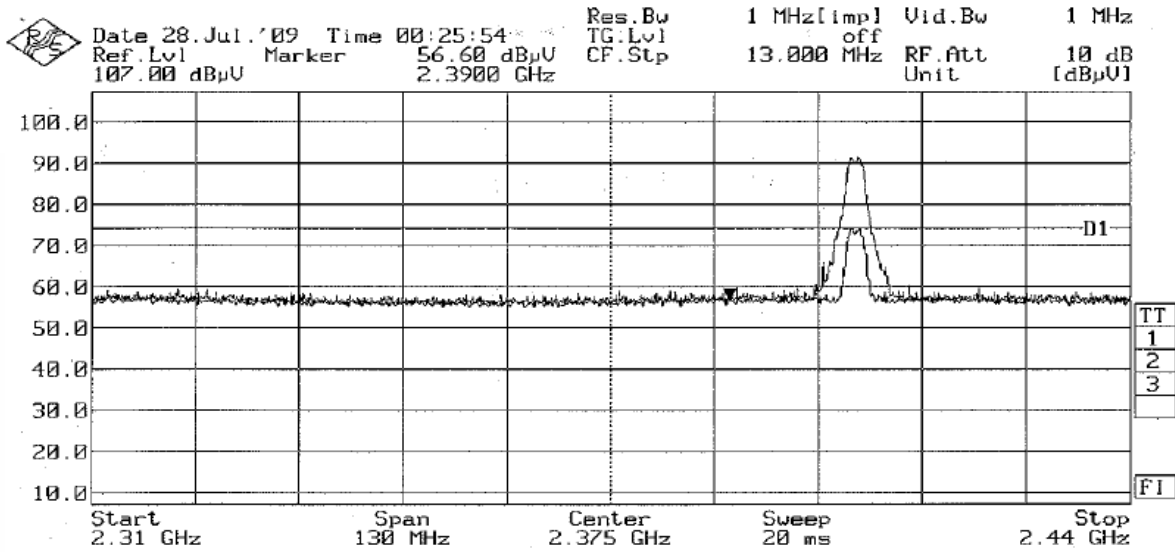


**Plot 13 – Upper Band Edge at 2.4835GHz**

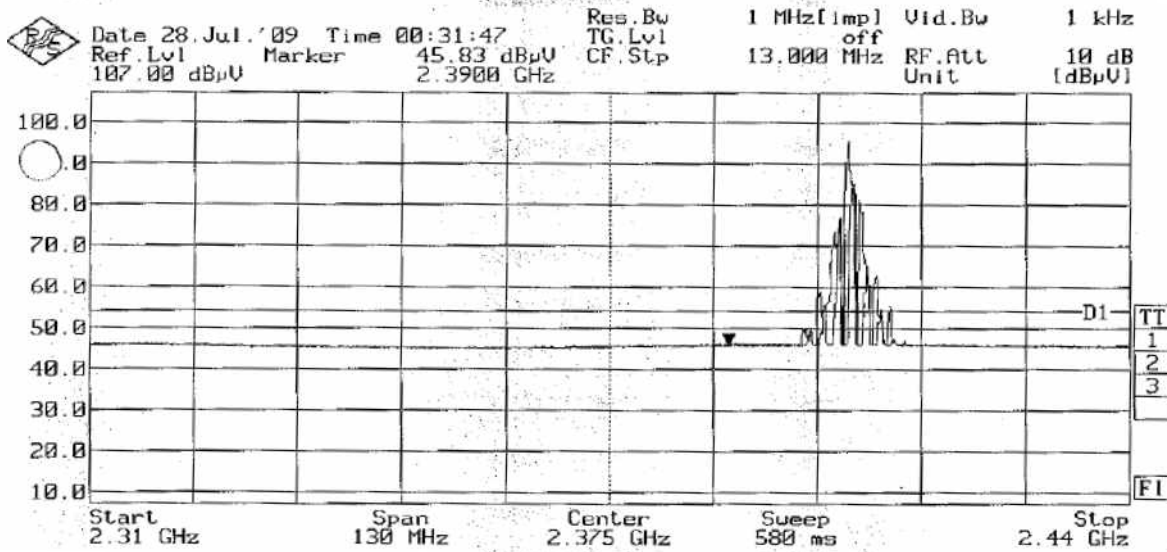


**BAND EDGE COMPLIANCE (RADIATED) TEST**

**Band Edge Compliance (Radiated) Plots (Restricted Band) – Omni Antenna**



**Plot 14 – Peak Plot at Lower Band Edge at 2.4000GHz**

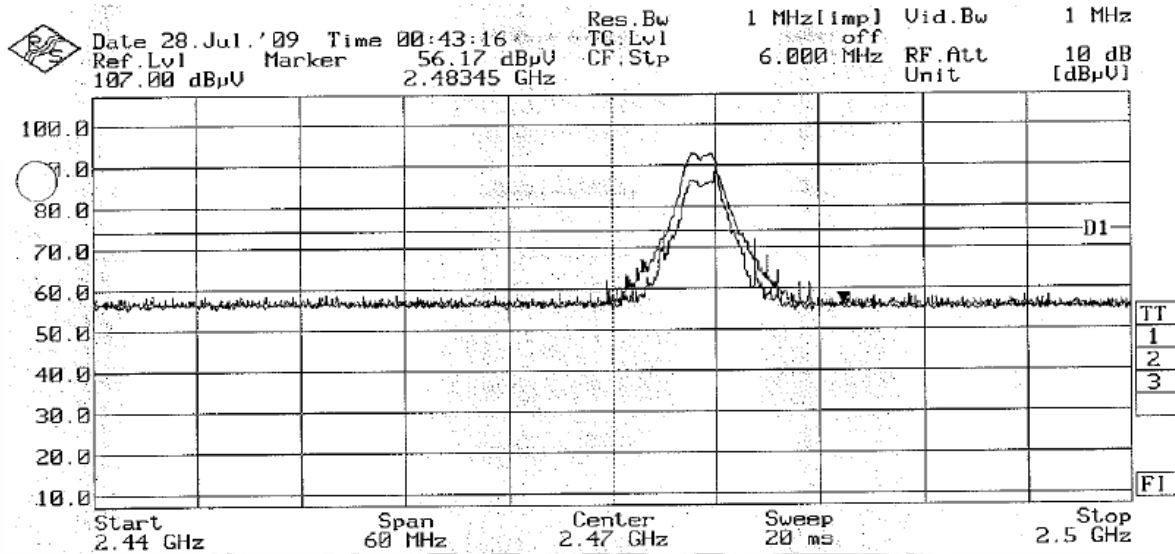


**Plot 15 – Average Plot at Lower Band Edge at 2.4000GHz**

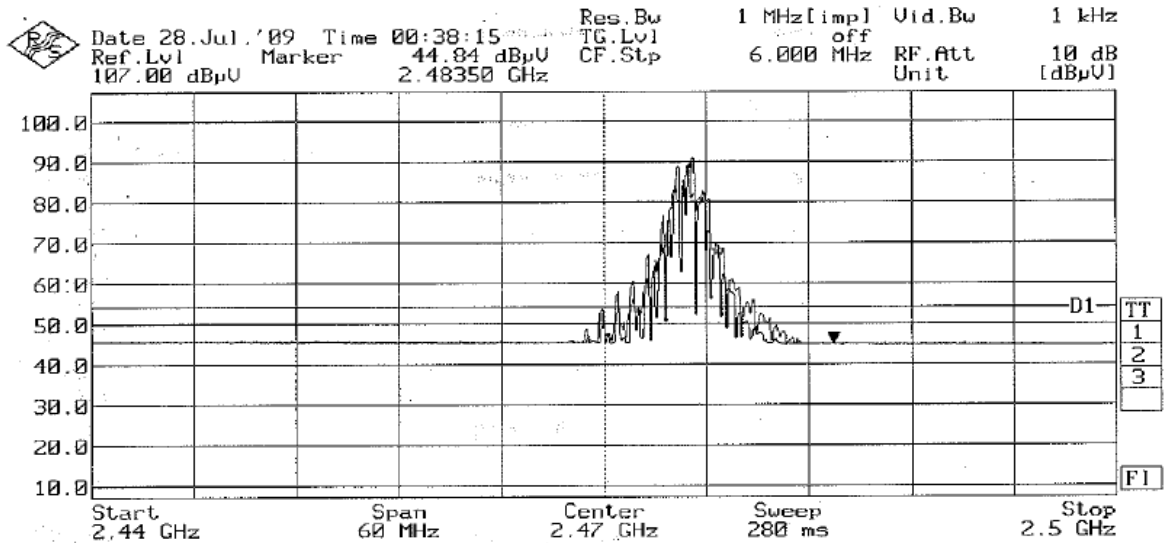


**BAND EDGE COMPLIANCE (RADIATED) TEST**

**Band Edge Compliance (Radiated) Plots (Restricted Band) – Omni Antenna**



**Plot 16 – Peak Plot at Upper Band Edge at 2.4835GHz**




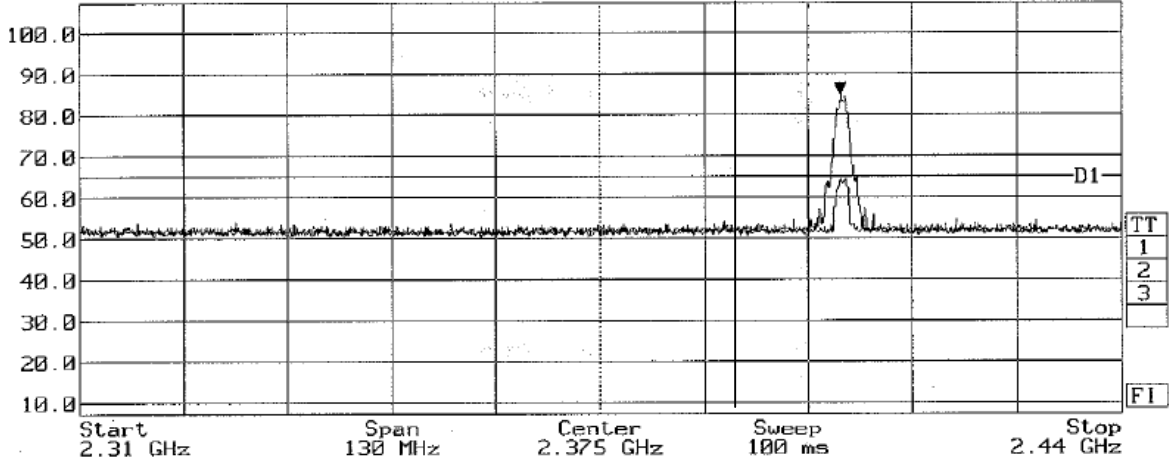
**Plot 17 – Average Plot at Upper Band Edge at 2.4835GHz**




**BAND EDGE COMPLIANCE (RADIATED) TEST**

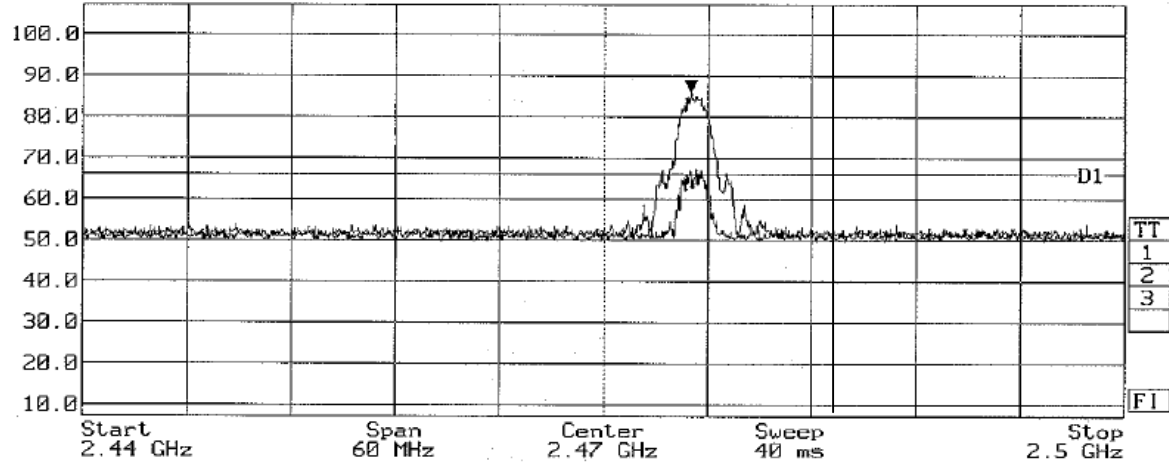
**Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge) – Directional Antenna**


 Date 28.Jul.'09 Time 00:14:37 Res.Bw 100 kHz[imp] Vid.Bw 300 kHz  
 Ref.Lvl 107.00 dBµV Marker 84.91 dBµV TG.Lvl off  
 CF.Stp 13.000 MHz RF.Att 10 dB Unit [dBµV]



**Plot 18 – Lower Band Edge at 2.4000GHz**


 Date 27.Jul.'09 Time 23:45:47 Res.Bw 100 kHz[imp] Vid.Bw 300 kHz  
 Ref.Lvl 107.00 dBµV Marker 86.08 dBµV TG.Lvl off  
 CF.Stp 6.000 MHz RF.Att 10 dB Unit [dBµV]



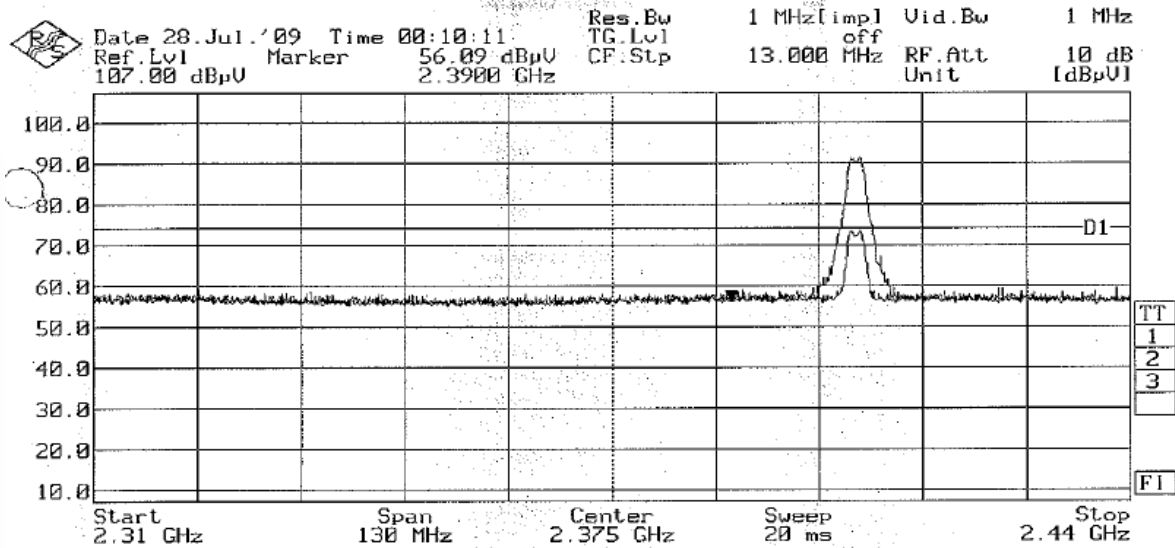
**Plot 19 – Upper Band Edge at 2.4835GHz**



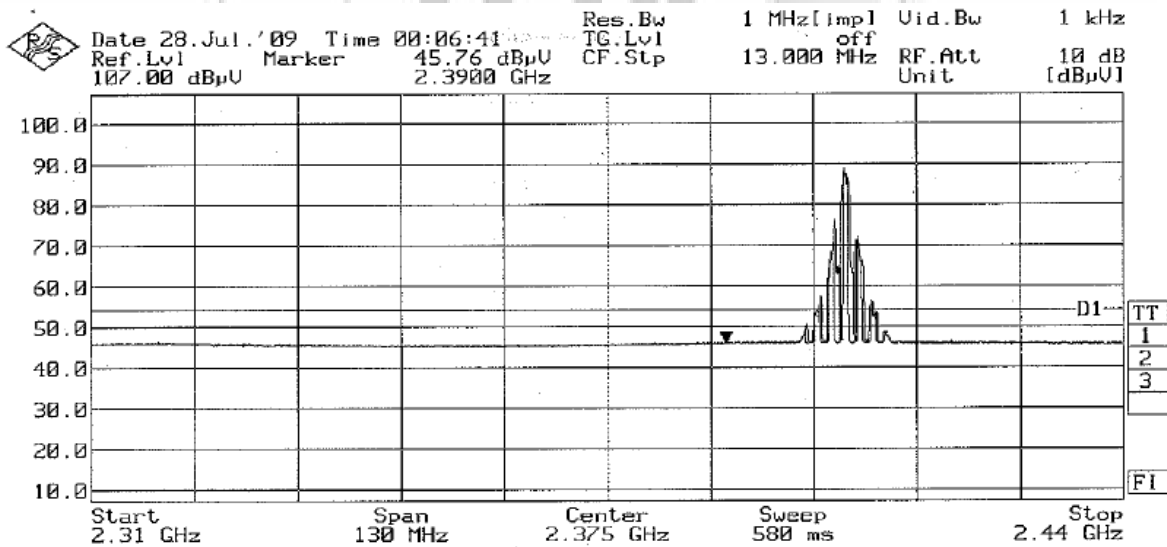


**BAND EDGE COMPLIANCE (RADIATED) TEST**

**Band Edge Compliance (Radiated) Plots (Restricted Band) – Directional Antenna**



**Plot 20 – Peak Plot at Lower Band Edge at 2.4000GHz**

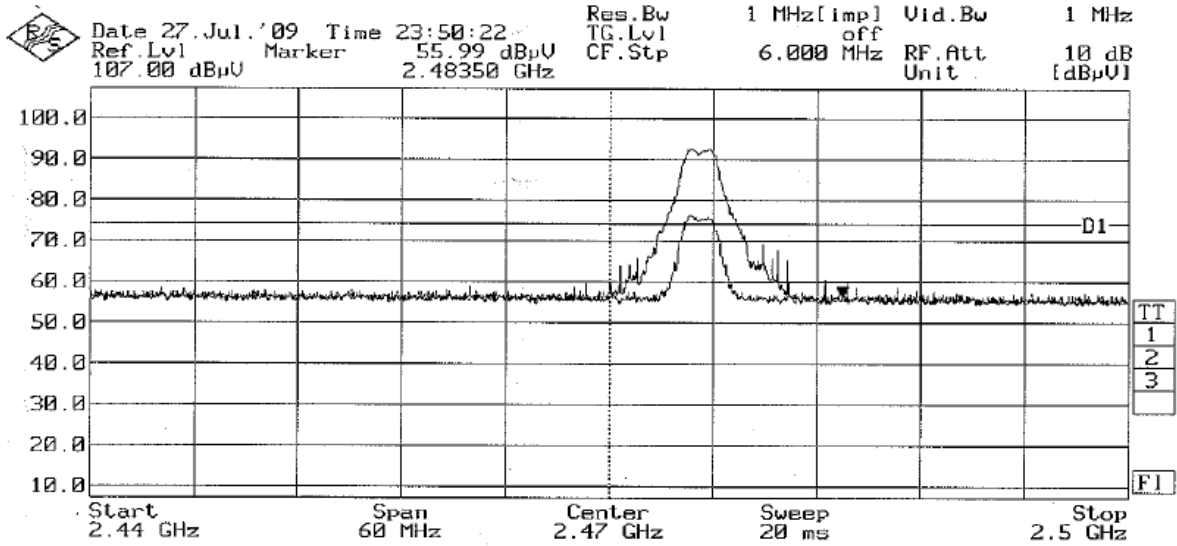


**Plot 21 – Average Plot at Lower Band Edge at 2.4000GHz**

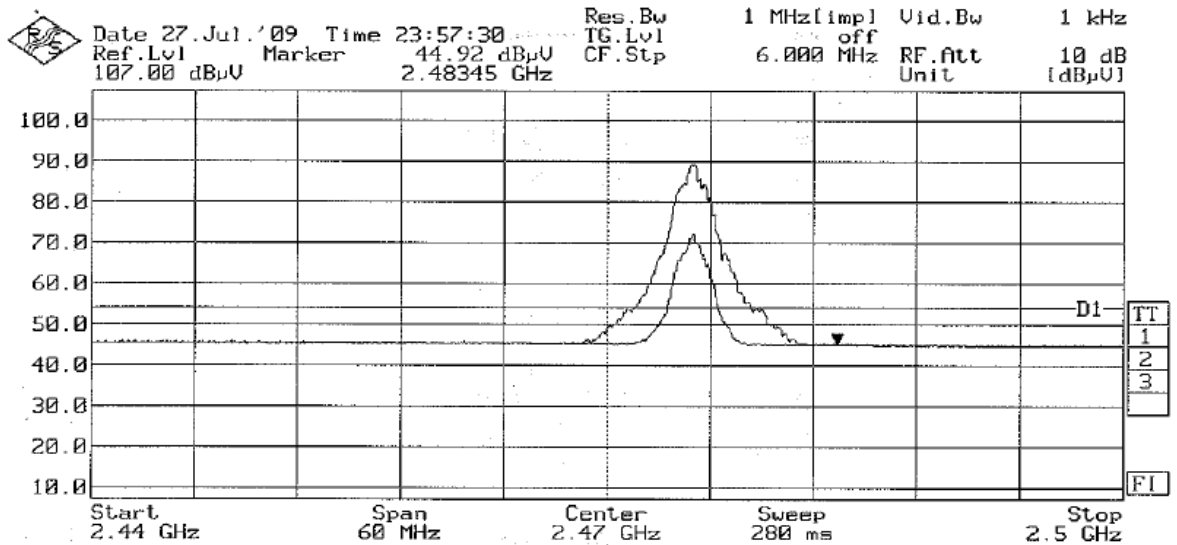


**BAND EDGE COMPLIANCE (RADIATED) TEST**

**Band Edge Compliance (Radiated) Plots (Restricted Band) – Directional Antenna**



**Plot 22 – Peak Plot at Upper Band Edge at 2.4835GHz**



**Plot 23 – Average Plot at Upper Band Edge at 2.4835GHz**



**PEAK POWER SPECTRAL DENSITY TEST**

**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
Agilent EMC Analyzer (9kHz-26.5GHz)	E7405A	US40240195	20 Jan 2010

**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 at Channel 0 (2.405GHz).
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 7 (2.440GHz) and Channel 14 (2.475GHz) respectively.

**PEAK POWER SPECTRAL DENSITY TEST**



**Peak Power Spectral Density Test Setup**

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

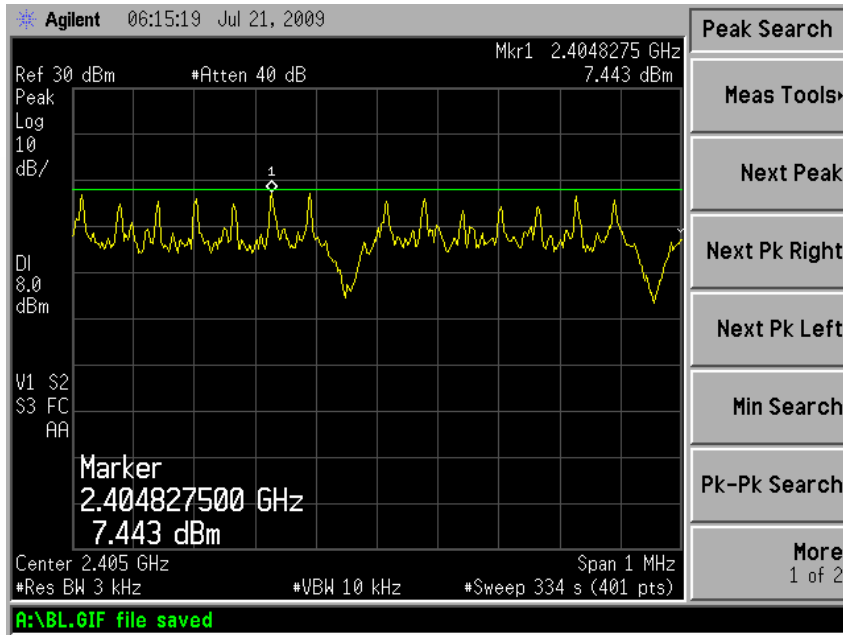
Test Input Power	3Vdc	Temperature	22°C
Attached Plots	24 - 26	Relative Humidity	54%
		Atmospheric Pressure	1030mbar
		Tested By	Anthony Toh

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)
0	2.4050	5.6	6.3
7	2.4400	5.3	6.3
14	2.4750	2.0	6.3

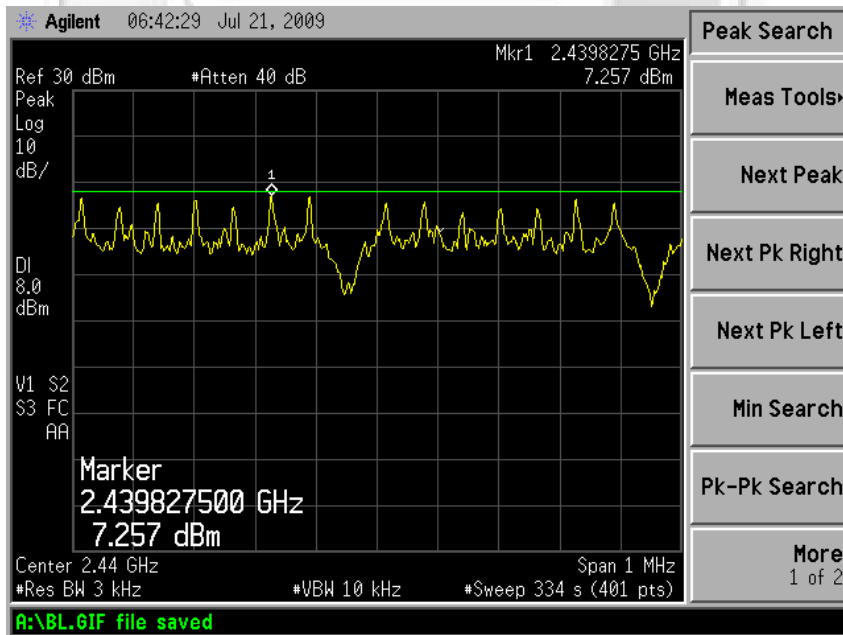


PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots



Plot 24 – Channel 0

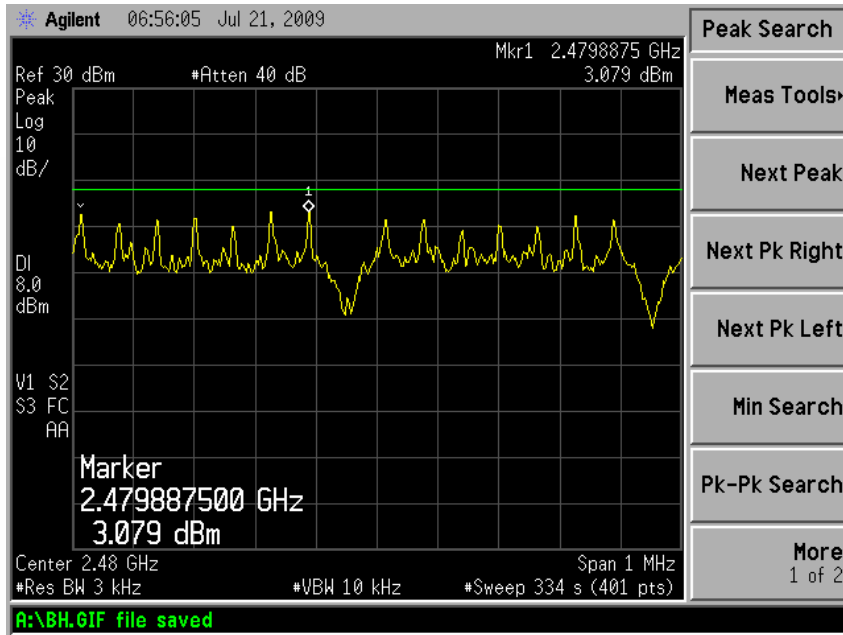


Plot 25 – Channel 7



**PEAK POWER SPECTRAL DENSITY TEST**

**Peak Power Spectral Density Plots**



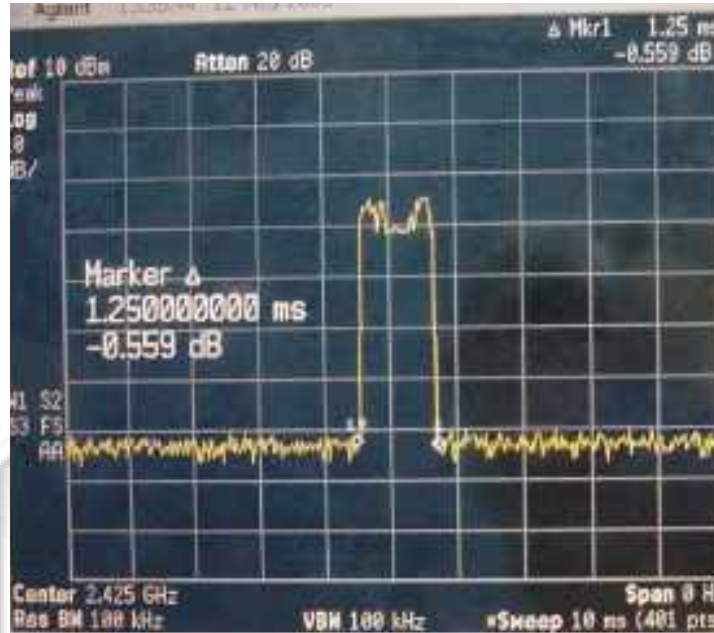
Plot 26 – Channel 14



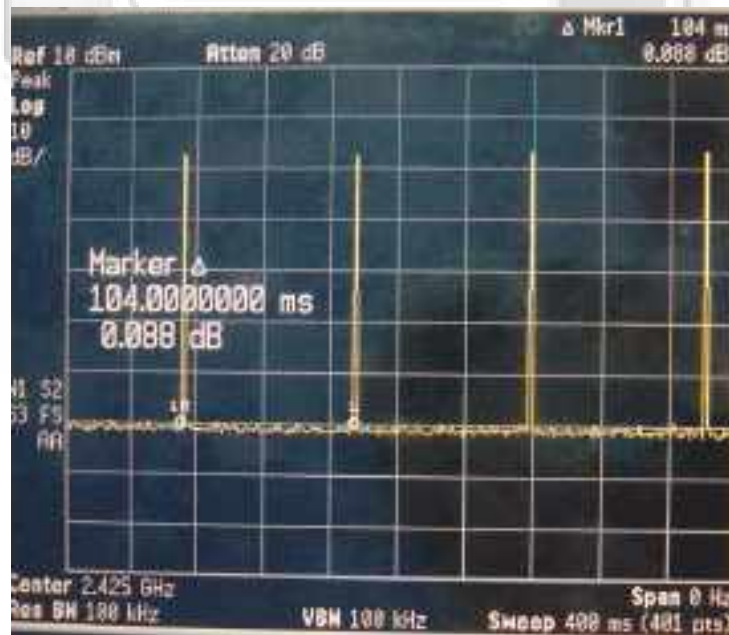


**DUTY CYCLE FACTOR COMPUTATION**

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



On Time



Period

Duty Cycle Factor (worst- case) =  $20 \log [\text{Total On time} / \text{Period}]$   
 =  $20 \log [(1.25 / 104)]$   
 = **-38.4dB**

**Test Report No. S09EEC01737/03**  
**dated 09 Aug 2009**



PSB Singapore

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March 2009





EUT PHOTOGRAPHS / DIAGRAMS

ANNEX A

EUT PHOTOGRAPHS



Front View



Rear View

EUT PHOTOGRAPHS / DIAGRAMS

ANNEX A

EUT PHOTOGRAPHS

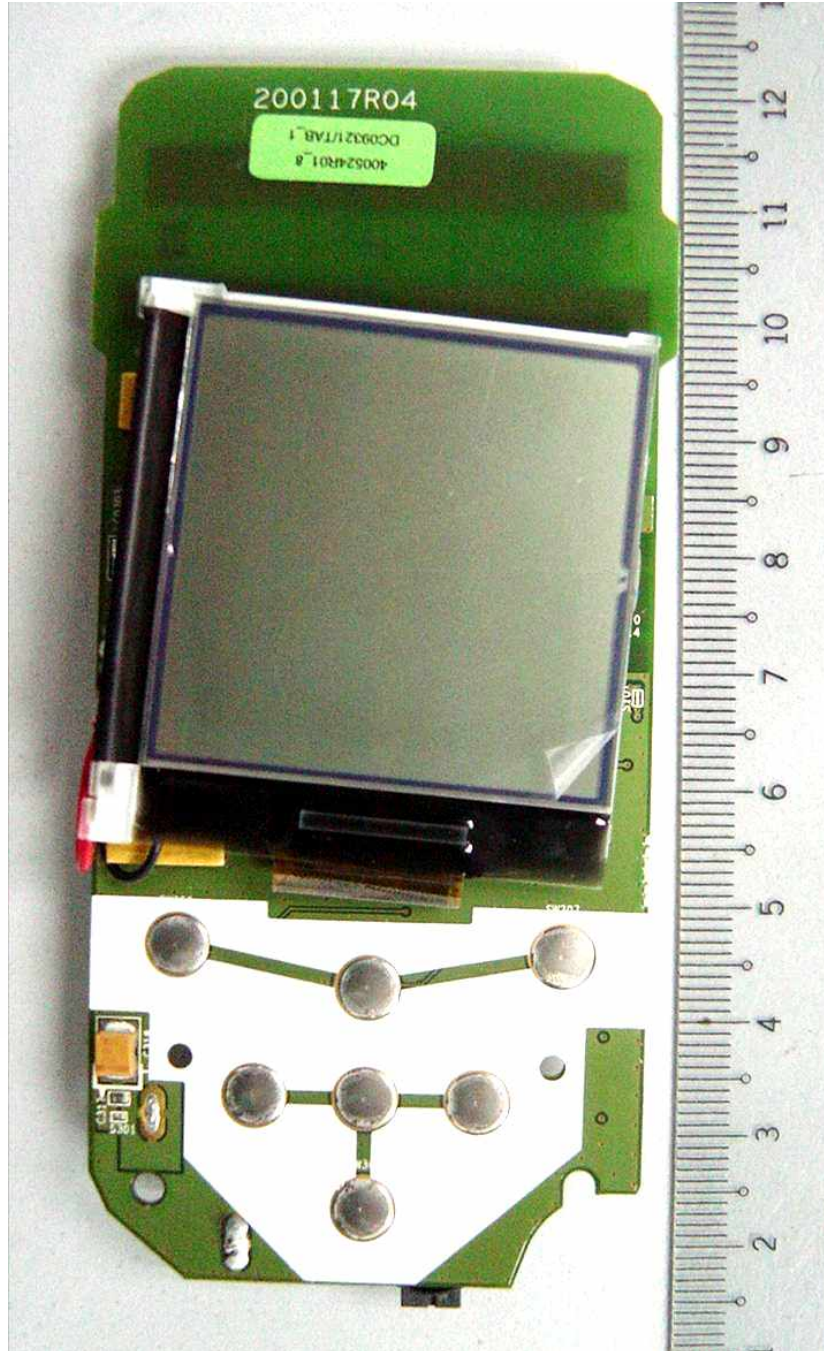


EUT Internal View

EUT PHOTOGRAPHS / DIAGRAMS

ANNEX A

EUT PHOTOGRAPHS

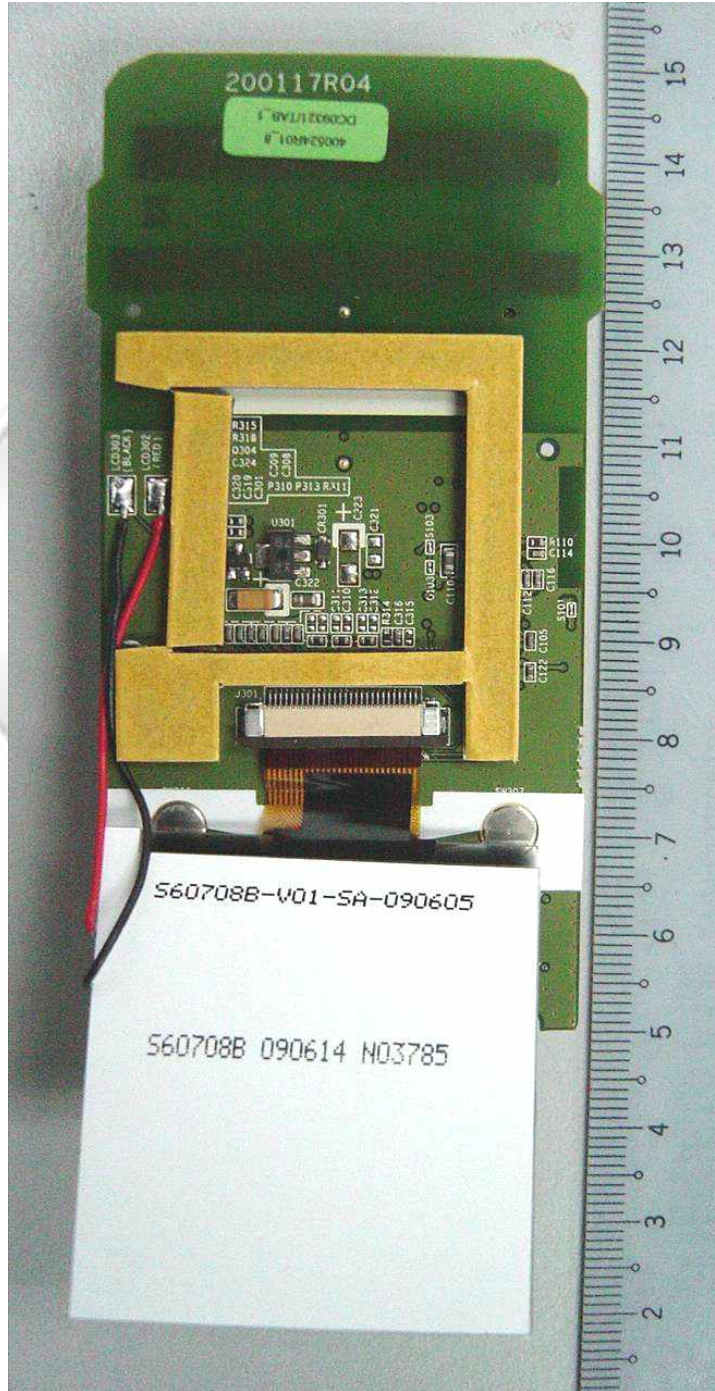


EUT PCB View 1 (with LCD)

EUT PHOTOGRAPHS / DIAGRAMS

ANNEX A

EUT PHOTOGRAPHS

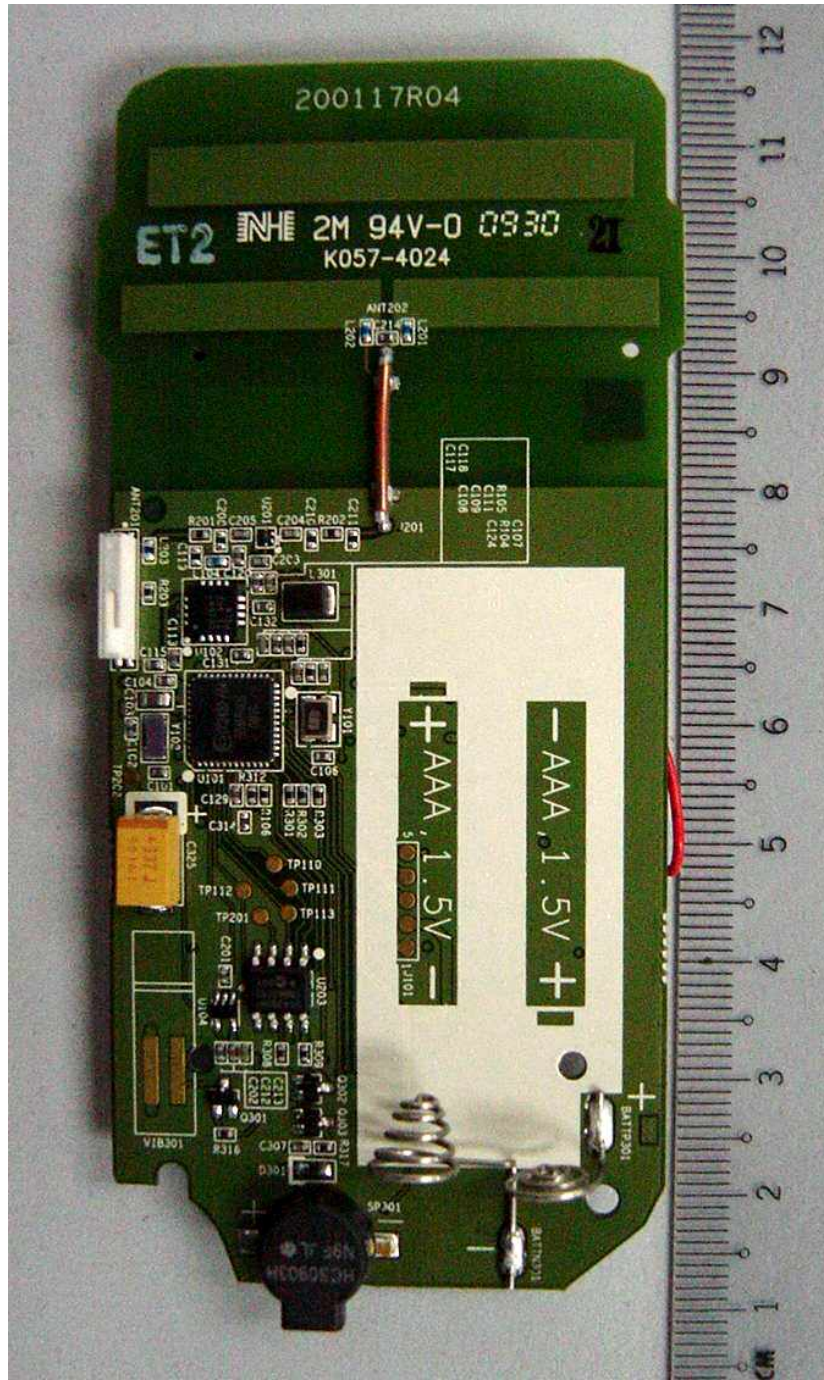


EUT PCB View 2 (with LCD Removed)

EUT PHOTOGRAPHS / DIAGRAMS

ANNEX A

EUT PHOTOGRAPHS



EUT PCB View 3



**FCC LABEL & POSITION**

**ANNEX B**

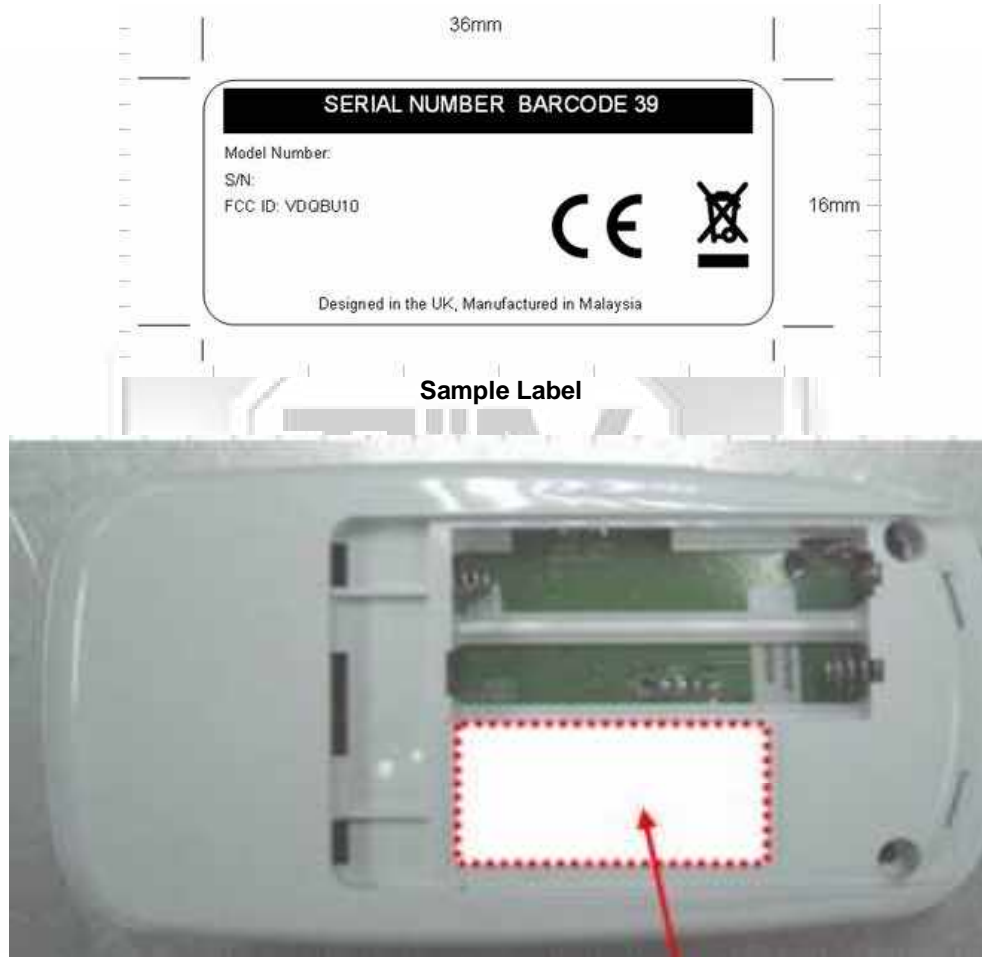


## FCC LABEL & POSITION

## 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.



Physical Location of FCC Label on EUT





**USER MANUAL TECHNICAL DESCRIPTION BLOCK  
& CIRCUIT DIAGRAM**

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**ANNEX C**

