Test Report No. 7191015046-EEC11/01
dated 04 Oct 2011

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 15B & C : 2011
OF AN
WIRELESS SLOT CARD
[Model : SB1310]
[FCC ID : IBAAVGSB1310]

TEST FACILITY	TÜV SÜD PSB Pte Ltd, Electrical & Electronics Centre (EEC), Product Services, No. 1 Science Park Drive, Singapore 118221 TÜV SÜD PSB Pte Ltd, Electrical & Electronics Centre (EEC), Product Services, 13 Internatonal Business Park #01-01, Singapore 60993
FCC REG. NO.	99142 (3m and 10m Semi-Anechoic Chamber, Science Park) 160581 (3m and 10m Semi-Anechoic Chamber, International Business Park)
IND. CANADA REG. NO.	2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park) 2932N-1 (10m Semi-Anechoic Chamber, International Business Park)
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QUOTATION NUMBER	219135581
JOB NUMBER	7191015046
TEST PERIOD	03 Aug 2011 – 03 Oct 2011

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LA-2007-0385-E
LA-2007-0386-C
LA-2010-0464-D

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
47 CFR FCC Part 15: 2011		
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)(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	Refer to page 49 for details
15.35(c)	Duty Cycle Factor Computation	Not Applicable *See Note 6

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 2	2.405
Channel 20	2.441
Channel 38	2.477

2. All the measurements were done based on conducted method except
   - Transmitter Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)
   - Band Edge Compliance (Radiated)

3. The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.

4. All test measurement procedures are according to ANSI C63.4: 2003.

5. The maximum measured RF power (peak) of the Equipment Under Test is -0.47dBm.

6. The Equipment Under Test (EUT) was configured to continuous transmit & continuous receive mode.

Modifications

No modifications were made.

PRODUCT DESCRIPTION

Description	:	The Equipment Under Test (EUT) is a **WIRELESS SLOT CARD.**
Manufacturer	:	Creative Technology Ltd 31 International Business Park Creative Resource Singapore 609921
Model Number	:	SB1310
FCC ID	:	IBAAVGSB1310
Serial Number	:	Nil
Microprocessor	:	AV7300
Operating / Transmitting Frequency	:	2.405GHz (lower channel) to 2.477GHz (upper channel) 38 channels.
Clock / Oscillator Frequency	:	16MHz
Modulation	:	PI / Quadrature Phase Shift Keying (4QPSK)
Antenna Gain	:	0.5 dBi
Port / Connectors	:	Refer to manufacturer's user manual / operating manual.
Rated Input Power	:	110V 60Hz
Accessories	:	Refer to manufacturer's user manual / operating manual.

SUPPORTING DESCRIPTION DESCRIPTION

Equipment Description (Including Brand Name)	**Model, Serial & FCC ID Number**	**Cable Description (List Length, Type & Purpose)**
Dell Laptop	M/N: PP25L S/N: CN-0U8042-70166-7B2-00I3 FCC ID: Nil	2.00m unshielded power cable
Dell Laptop Power Adapter	M/N: LA65NS2-00 S/N: PA-1650-02DW FCC ID: Nil	2.00m unshielded power cable
HP Printer	M/N: CB8970A-002 S/N: MY082CK14C FCC ID: Nil	2.00m unshielded power cable 2.00m USB cable
HP Printer Power Adapter	M/N: 0957-2271 S/N: H053GH200801L FCC ID: Nil	2.00m unshielded power cable
Wireless Headset	M/N: TACTIC 3D ALPHA S/N: NA FCC ID: Nil	Nil
Wired Headset	M/N: TACTIC 3D ALPHA S/N: H1GH0120037R00007M FCC ID: Nil	1.50m audio cable
Creative MP3 Player	M/N: MRF85866 S/N: AMS: PMC-07000011 FCC ID: Nil	1.50m audio cable
Apple 1GB iPOD	M/N: Nil S/N: 6U608V3YUPR FCC ID: Nil	Nil

EUT OPERATING CONDITIONS

47 CFR FCC Part 15
1. Conducted Emissions **2. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)** **3. Spectrum Bandwidth (6dB Bandwidth Measurement)** **4. Maximum Peak Power** **5. RF Conducted Spurious Emissions** **6. Band Edge Compliance (Conducted)** **7. Band Edge Compliance (Radiated)** **8. Peak Power Spectral Density** **9. Maximum Permissible Exposure**
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.

CONDUCTED EMISSION TEST

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Limits

Frequency Range (MHz)	Limit Values (dBµV)	
	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		

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

Instrument	Model	S/No	Cal Due Date
Rohde & Schwarz EMI Test Receiver (9kHz-3GHz)	ESCI	100477	24 Sep 2011
Schaffner LISN 2-Line V-Network (EUT) (9kHz-30MHz)	NNB41	04/10152	14 Sep 2011
Schaffner LISN 2-Line V-Network (9kHz-30MHz)	NNB41	04/10151	14 Sep 2011

CONDUCTED EMISSION TEST

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

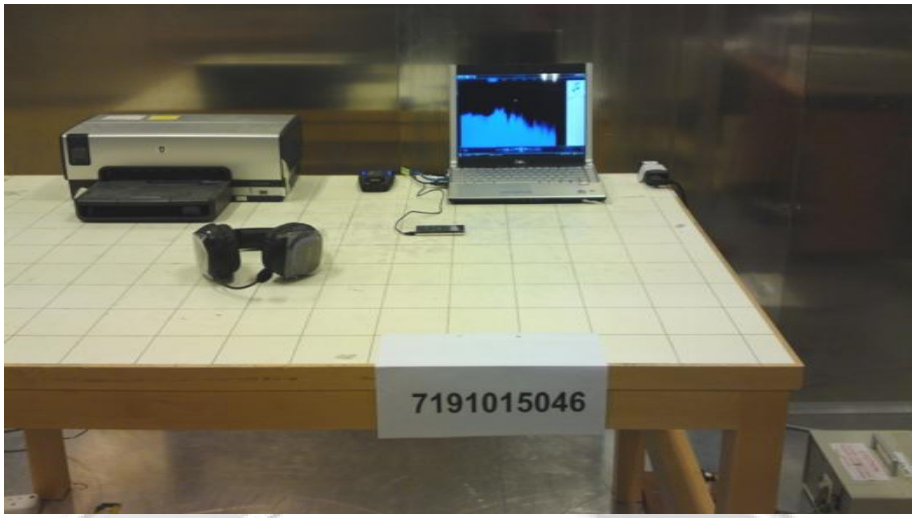
1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the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

47 CFR 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 9kHz. 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) = 1000 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)

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Results

Test Input Power	110V 60Hz (via connected host)	Temperature	24°C
Line Under Test	AC Mains	Relative Humidity	58%
		Atmospheric Pressure	1030mbar
		Tested By	Jason Lai

Frequency (MHz)	Q-P Value (dBµV)	Q-P Limit (dBµV)	Q-P Margin (dB)	AV Value (dBµV)	AV Limit (dBµV)	AV Margin (dB)	Line	Channel
0.1662	44.5	65.2	-20.7	23.5	55.2	-31.7	Neutral	38
0.1808	53.4	64.4	-11.0	38.2	54.4	-16.2	Live	38
0.2054	40.1	63.4	-23.3	18.9	53.4	-34.5	Live	38
0.2344	39.4	62.3	-22.9	22.0	52.3	-30.3	Live	38
0.3007	38.2	60.2	-22.0	21.2	50.2	-29.0	Live	38
0.3579	33.8	58.8	-25.0	17.0	48.8	-31.8	Live	38

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: 9kHz 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 is ±2.2dB.

47 CFR 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									

47 CFR 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.	

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

Instrument	Model	S/No	Cal Due Date
Rohde & Schwarz EMI Test Receiver (20Hz - 7GHz)	ESI	100015	05 Jul 2012
TDK RF Solutions Hybrid Log Periodic Antenna (30MHz-3GHz)	HLP-3003C	130238	19 Mar 2012
TDK RF Solution Horn Antenna (1GHz-18GHz)	HRN-0118	130256	15 Mar 2012
Sonoma Preamplifier (9kHz – 1GHz)	310N	270640	08 Sep 2012
Toyo MicroWave Preamplifier (1GHz - 18GHz)	TPA0188-36	1005	24 Jun 2012
Micro-Tronics Bluetooth Notch Filter (Stopband 2.4 - 2.5GHz)	BRM50701-02	007	13 Aug 2012
ETS Horn Antenna(18GHz-40GHz)(Ref)	3116	0004-2474	19 Apr 2012
Toyo Preamplifier (26.5GHz-40GHz)	HAP26-40W	00000005	19 Apr 2012

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

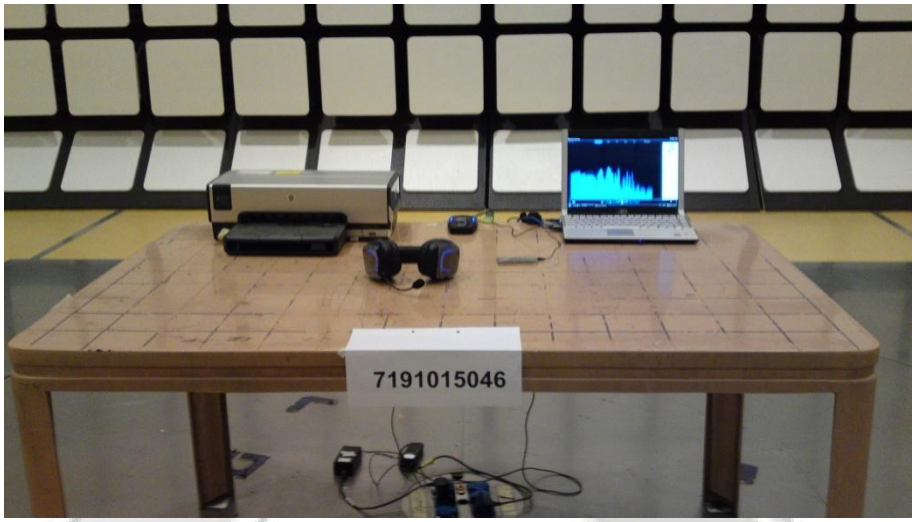
1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The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

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

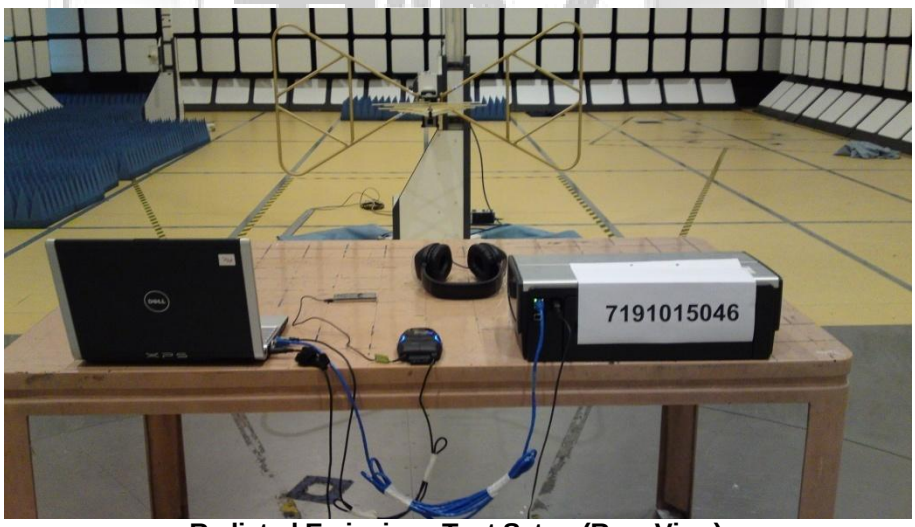
1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude 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 10th 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 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)

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

Test Input Power	110V 60Hz (via connected host)	Temperature	25°C
Test Distance	3m	Relative Humidity	55%
Antenna	1 (Worst Antenna)	Atmospheric Pressure	1035mbar
		Tested By	Jason Lai

Spurious Emissions ranging from 30MHz – 1GHz (Channel 38)

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Limit (dBµV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)
34.6940	27.3	40.0	-12.7	117	100	V
56.4630	32.8	40.0	-7.2	111	100	V
671.9820	39.5	46.0	-6.5	123	100	H
768.0650	36.6	46.0	-9.4	335	100	V
897.2110	23.1	46.0	-22.9	323	100	H
999.1440	28.2	54.0	-25.8	357	117	H

Spurious Emissions above 1GHz-25GHz (Channel 2)

Frequency (MHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dBµV/m)	Average Value (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Azimuth (Degrees)	Height (cm)	Pol (H/V)
1108.2000	35.2	74.0	-38.8	22.2	54.0	-31.8	216	100	V
2921.3000	44.4	74.0	-29.6	31.4	54.0	-22.6	129	140	V
5113.5000	51.3	74.0	-22.7	37.9	54.0	-16.1	99	261	V
5975.5000	52.0	74.0	-22.0	39.1	54.0	-14.9	39	100	V
6401.5000	52.0	74.0	-22.0	38.4	54.0	-15.6	186	190	V
6933.3000	57.5	74.0	-16.5	45.1	54.0	-8.9	280	100	V

Spurious Emissions above 1GHz-25GHz (Channel 20)

Frequency (MHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dBµV/m)	Average Value (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Azimuth (Degrees)	Height (cm)	Pol (H/V)
1286.9000	35.6	74.0	-38.4	23.5	54.0	-30.5	79	111	V
1593.1710	45.8	74.0	-28.2	24.2	54.0	-29.8	108	100	H
2898.2000	44.1	74.0	-29.9	31.3	54.0	-22.7	152	145	V
5094.7700	51.2	74.0	-22.8	38.4	54.0	-15.6	110	100	H
5558.7000	53.5	74.0	-20.5	40.9	54.0	-13.1	232	200	V
6935.7000	58.7	74.0	-15.3	45.0	54.0	-9.0	76	149	H

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

Spurious Emissions above 1GHz-25GHz (Channel 38)

Frequency (MHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dBµV/m)	Average Value (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Azimuth (Degrees)	Height (cm)	Pol (H/V)
1665.5000	45.8	74.0	-28.2	25.9	54.0	-28.1	100	100	V
1844.1000	43.8	74.0	-30.2	29.3	54.0	-24.7	279	123	V
1999.3000	59.3	74.0	-14.7	29.0	54.0	-25.0	266	100	V
2093.2000	43.4	74.0	-30.6	28.4	54.0	-25.6	47	153	V
3000.3000	45.6	74.0	-28.4	37.1	54.0	-16.9	203	100	V
4951.9000	47.4	74.0	-26.6	40.8	54.0	-13.2	265	100	V

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. 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.
3. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
4. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   30MHz - 1GHz
   RBW: 120kHz VBW: 1MHz
   >1GHz
   RBW: 1MHz VBW: 1MHz
5. 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.
6. The channel in the table refers to the transmit channel of the EUT.
7. 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 ±4.0dB.

SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

47 CFR 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.

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

Instrument	Model	S/No	Cal Due Date
Agilent PSA Series Spectrum Analyzer (3Hz - 26.5GHz)	E4440A	MY45304764	10 Aug 2012

47 CFR 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.

47 CFR 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 2 (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 20 (2.441GHz) and Channel 38 (2.477GHz) respectively.

Spectrum Bandwidth (6dB Bandwidth Measurement) Test Setup

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

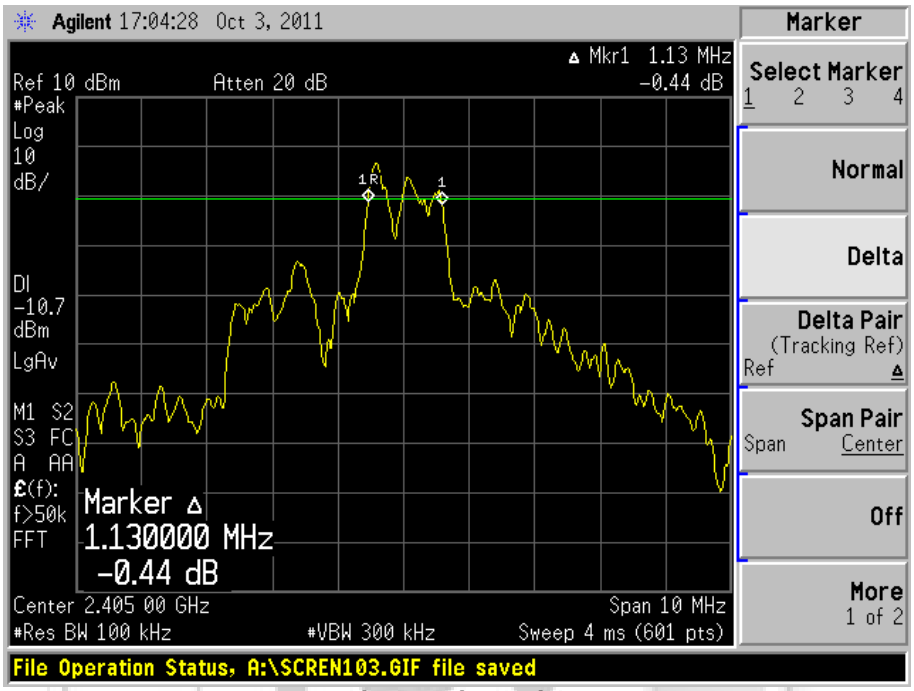
Test Input Power	110V 60Hz (via connected host)	Temperature	24°C
Attached Plots	1 - 3	Relative Humidity	58%
Antenna	0	Atmospheric Pressure	1030mbar
		Tested By	Dylan Lin

Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)
2	2.405	1.13
20	2.441	1.08
38	2.477	1.03

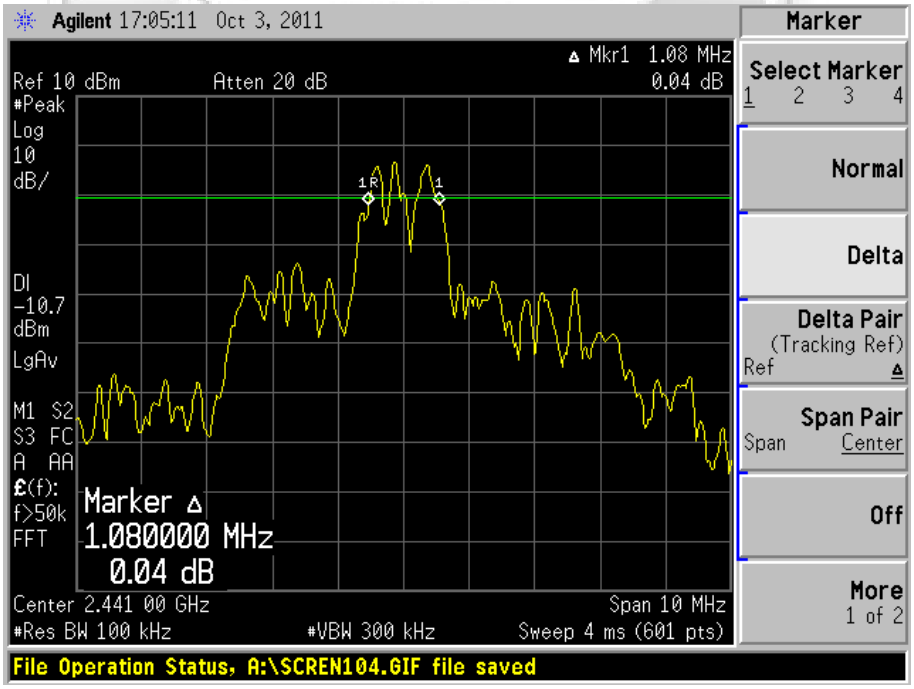
Test Input Power	110V 60Hz	Temperature	24°C
Attached Plots	4 - 6	Relative Humidity	58%
Antenna	1	Atmospheric Pressure	1030mbar
		Tested By	Dylan Lin

Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)
2	2.405	1.08
20	2.441	1.08
38	2.477	1.12

Spectrum Bandwidth (6dB Bandwidth Measurement) Plots (Antenna 0)

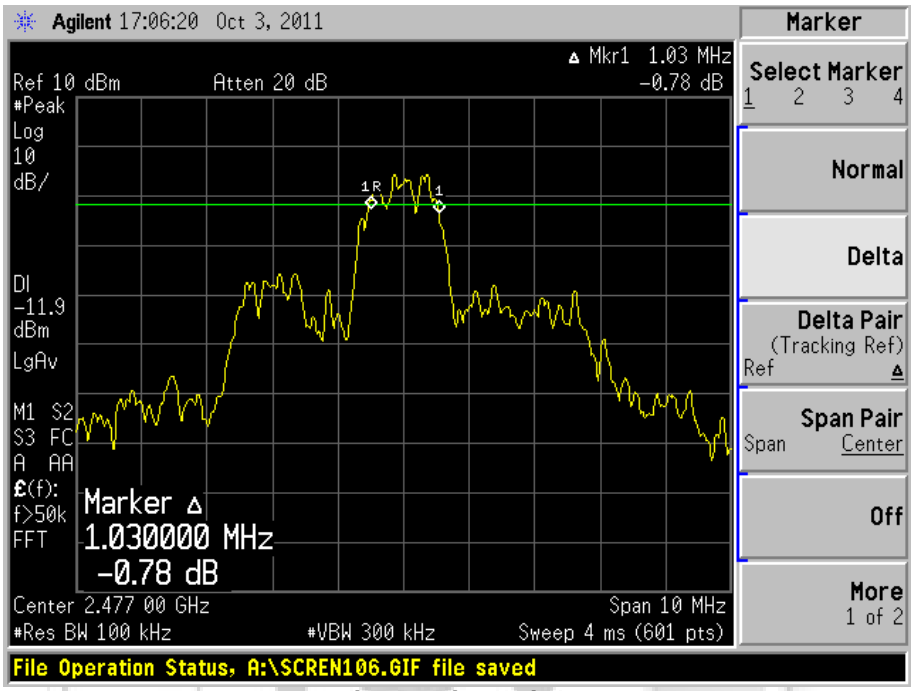


Plot 1 - Channel 2



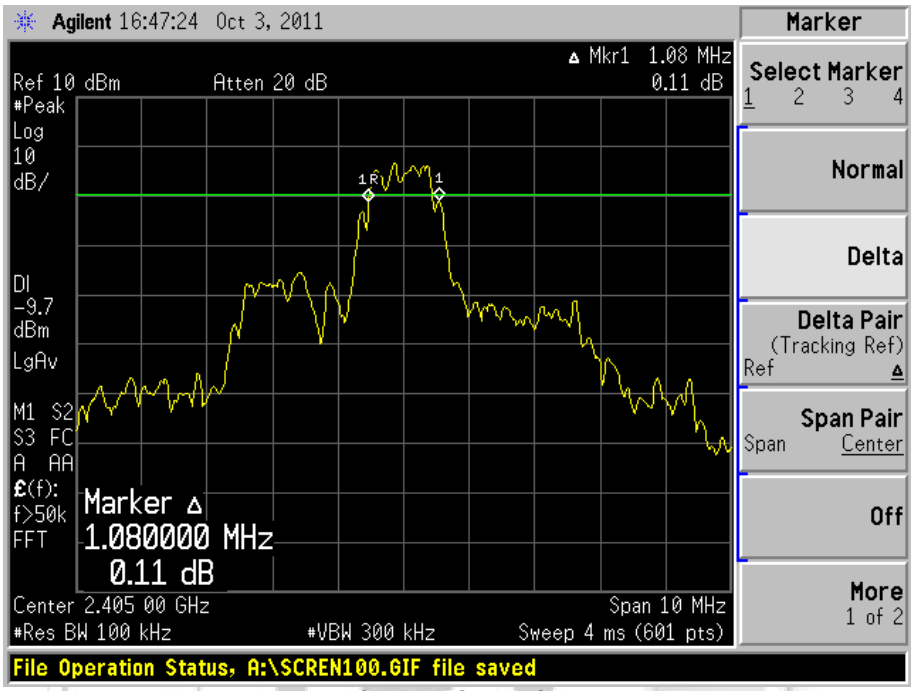
Plot 2 - Channel 20

Spectrum Bandwidth (6dB Bandwidth Measurement) Plots (Antenna 0)

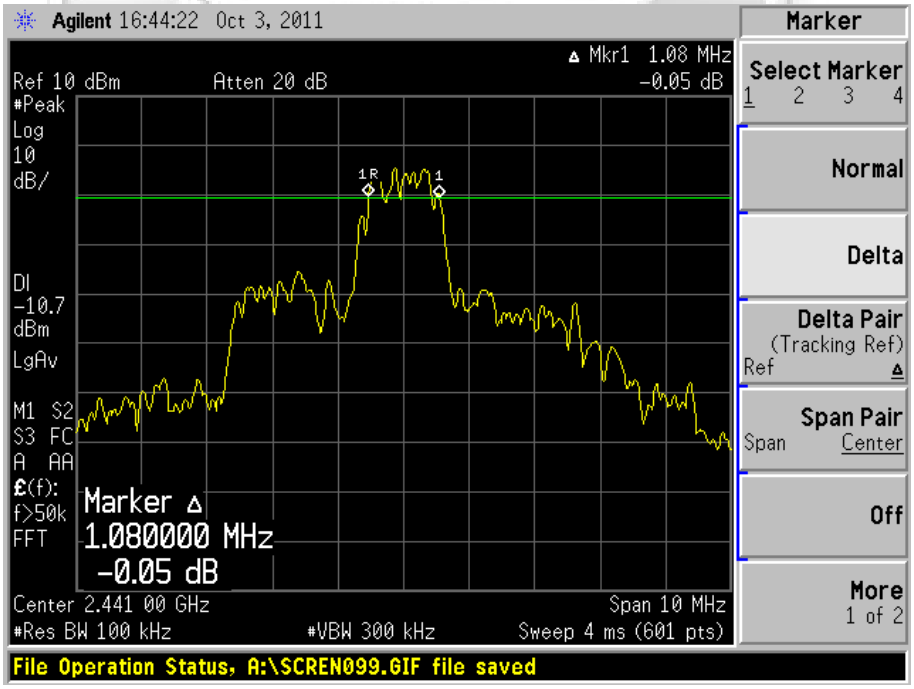


Plot 3 - Channel 38

Spectrum Bandwidth (6dB Bandwidth Measurement) Plots (Antenna 1)

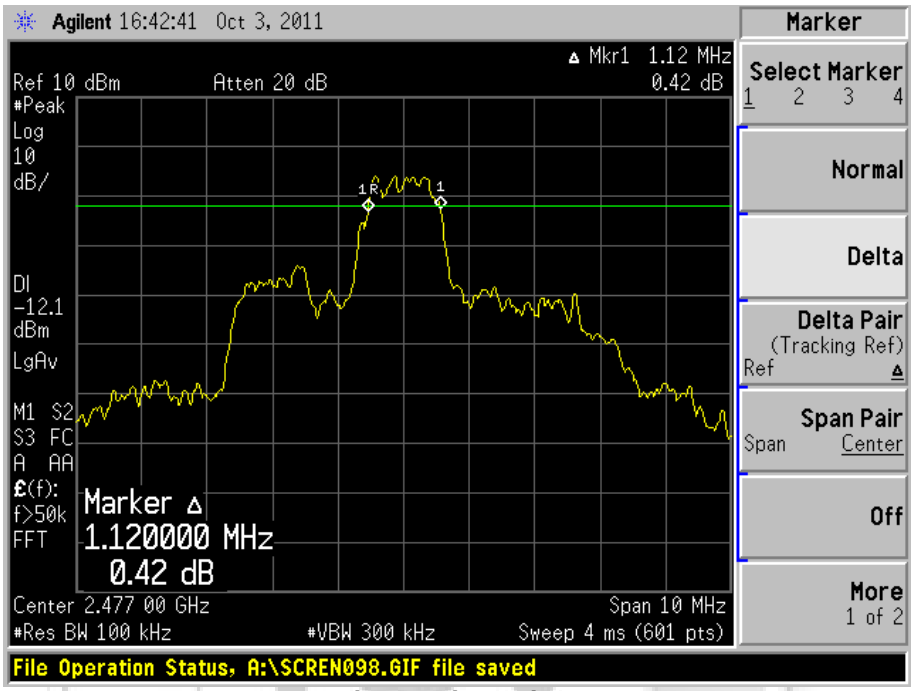


Plot 4 - Channel 2



Plot 5 - Channel 20

Spectrum Bandwidth (6dB Bandwidth Measurement) Plots (Antenna 1)



Plot 6 - Channel 38

47 CFR 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).

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

Instrument	Model	S/No	Cal Due Date
Agilent Power Meter	E4416A	GB412790618	11 Jan 2012
Agilent Power Sensor	8485D	MY40190219	11 Jan 2012
Agilent 30dB Reference Attentuator	11708A	MY410902A	11 Jan 2012

47 CFR 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 Power Meter via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another filtered mains.

47 CFR 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 2 (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 20 (2.441GHz) and Channel 38 (2.477GHz) respectively.

Maximum Peak Power Test Setup

47 CFR FCC Part 15.247(b)(3) Maximum Peak Power Results

Test Input Power	110V 60Hz (via connected host)	Temperature	23°C
Antenna Gain	0.5dBi	Relative Humidity	60%
Antenna	0	Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Maximum EIRP (W)	Limit (W)
2	2.405	0.0008	0.0009	1.0
20	2.441	0.0005	0.0006	1.0
38	2.477	0.0006	0.0007	1.0

Test Input Power	110V 60Hz (via connected host)	Temperature	23°C
Antenna Gain	0.5dBi	Relative Humidity	60%
Antenna	1	Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Maximum EIRP (W)	Limit (W)
2	2.405	0.0008	0.0009	1.0
20	2.441	0.0006	0.0007	1.0
38	2.477	0.0006	0.0007	1.0

47 CFR 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.

47 CFR FCC Part 15.247(d) RF Conducted Spurious Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent PSA Series Spectrum Analyzer (3Hz - 26.5GHz)	E4440A	MY45304764	10 Aug 2012

47 CFR 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.

47 CFR 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 2 (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 20 (2.441GHz) and Channel 38 (2.477GHz) respectively.

RF Conducted Spurious Emissions Test Setup

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions Results

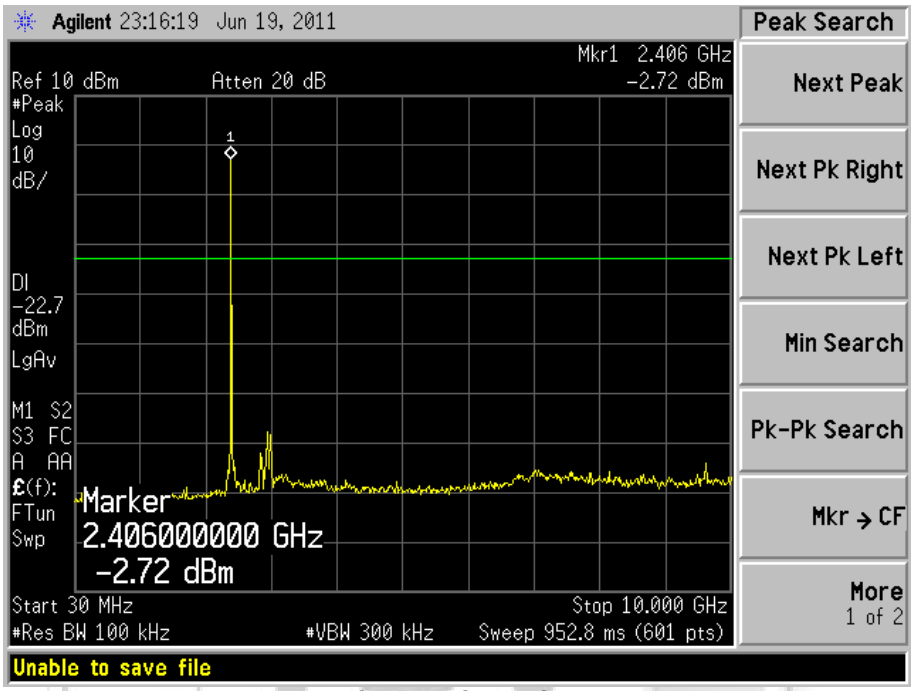
Test Input Power	110V 60Hz (via connected host)	Temperature	24°C
Attached Plots	7 - 12	Relative Humidity	58%
Antenna	0	Atmospheric Pressure	1030mbar
		Tested By	Dylan Lin

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

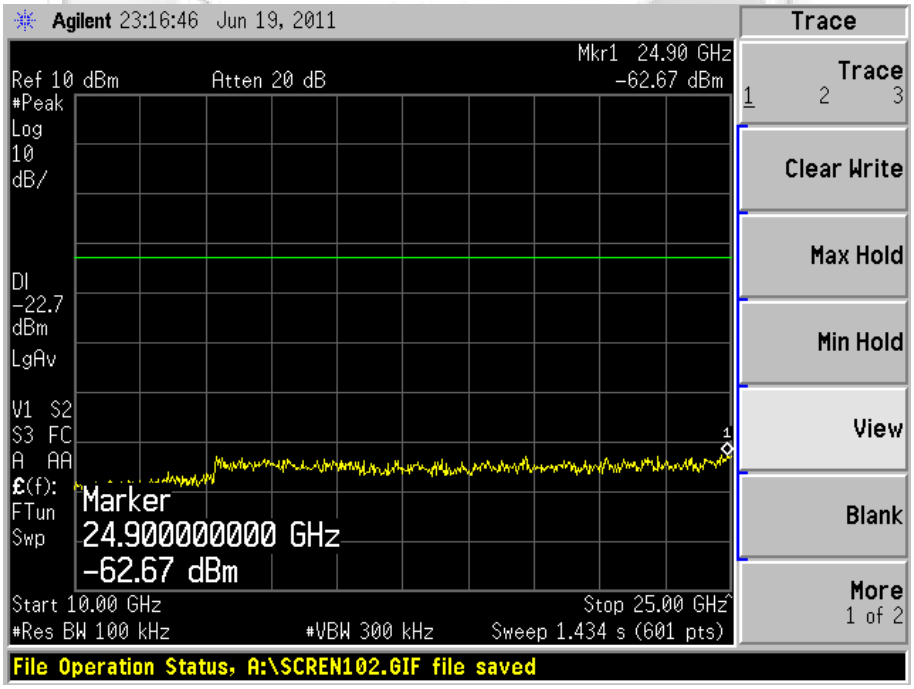
Test Input Power	110V 60Hz (via connected host)	Temperature	24°C
Attached Plots	13 - 18	Relative Humidity	58%
Antenna	1	Atmospheric Pressure	1030mbar
		Tested By	Dylan Lin

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

RF Conducted Spurious Emissions Plots (Antenna 0)

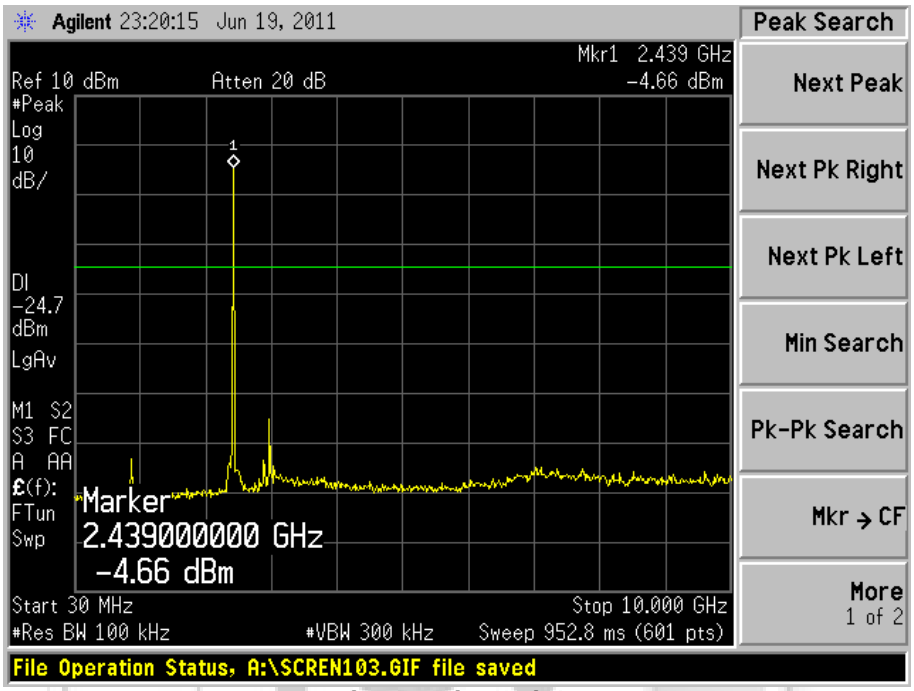


Plot 7 – Channel 2

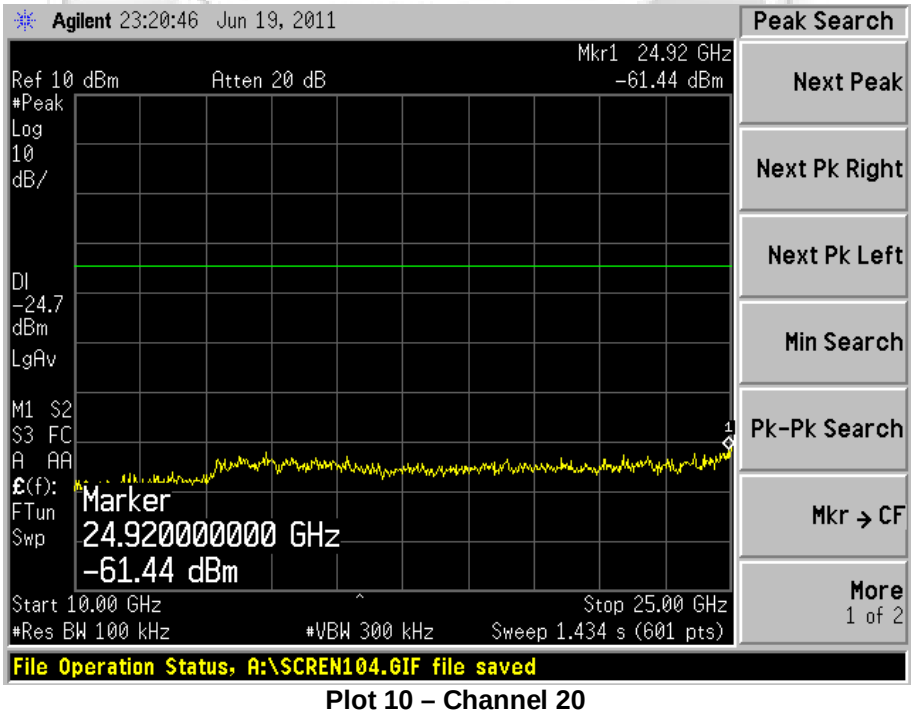


Plot 8 – Channel 2

RF Conducted Spurious Emissions Plots (Antenna 0)

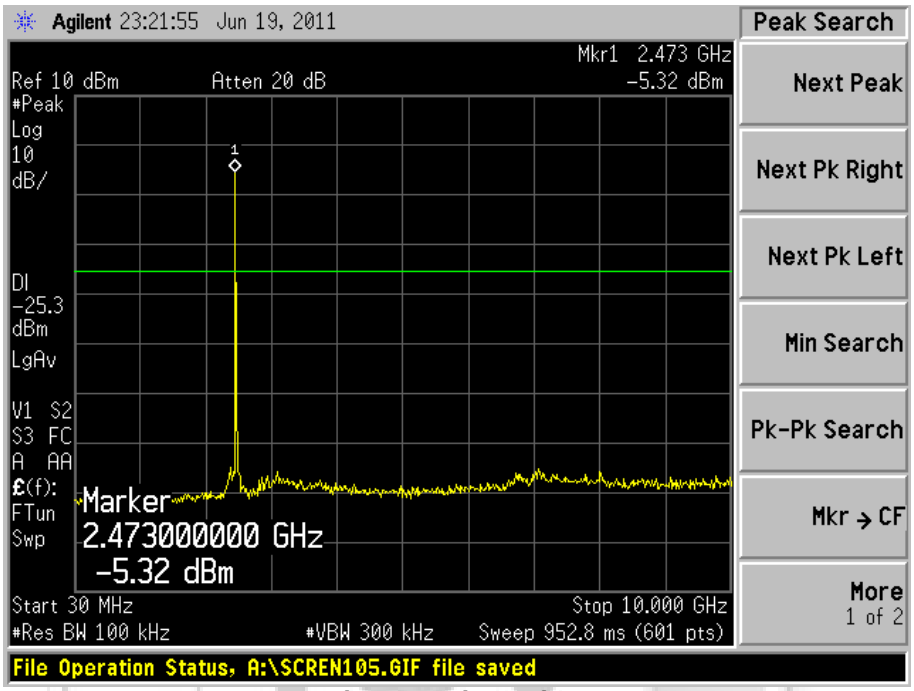


Plot 9 – Channel 20

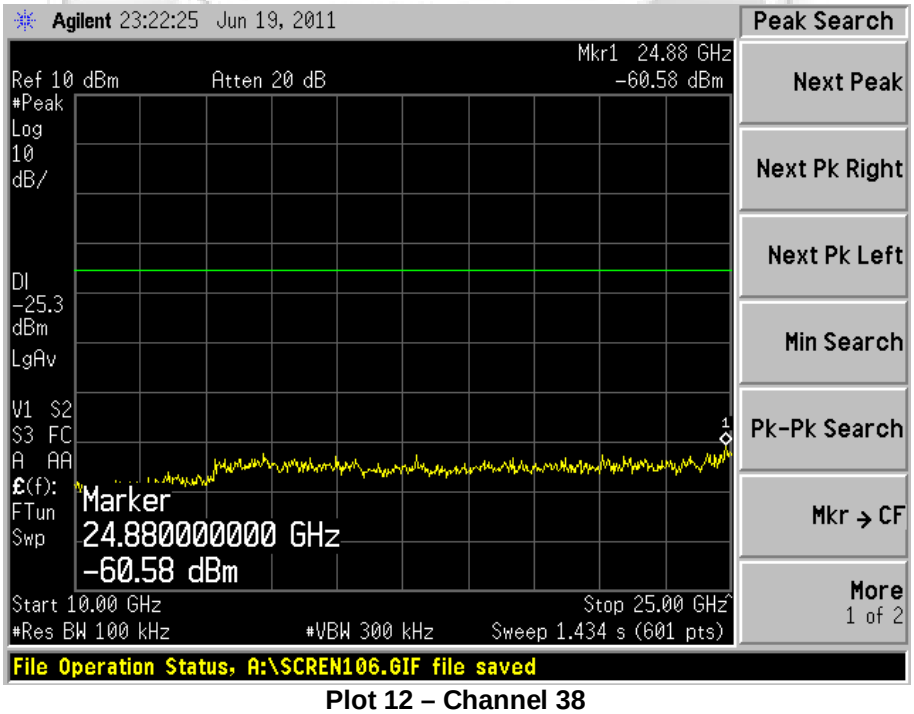


Plot 10 – Channel 20

RF Conducted Spurious Emissions Plots (Antenna 0)

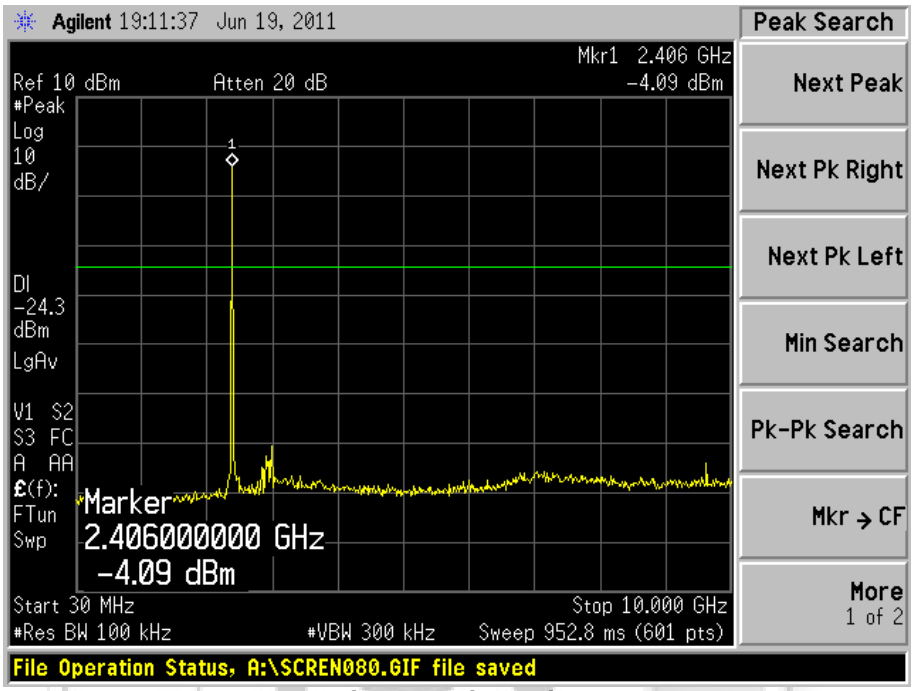


Plot 11 – Channel 38

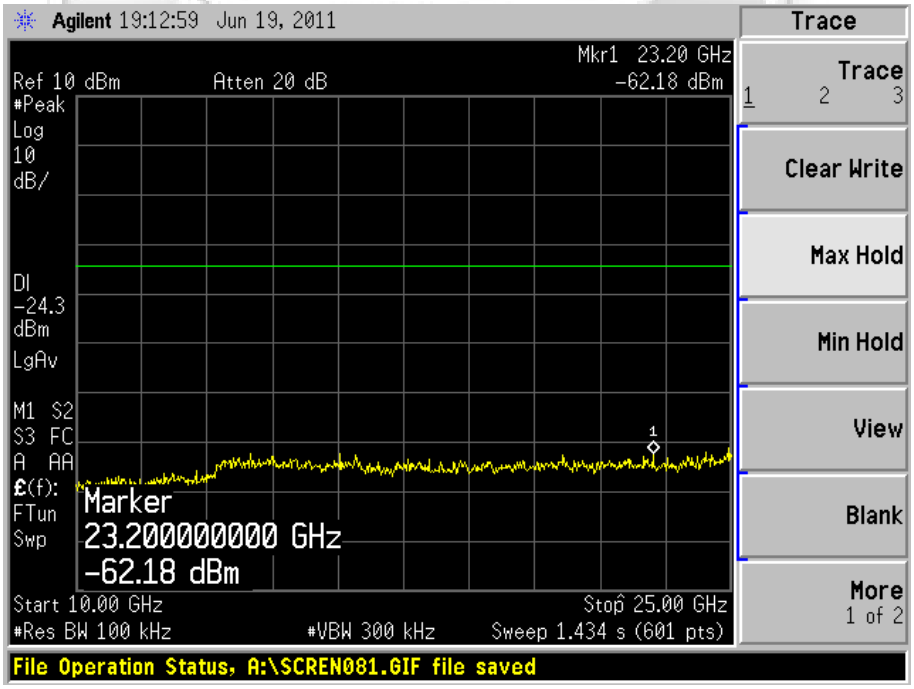


Plot 12 – Channel 38

RF Conducted Spurious Emissions Plots (Antenna 1)

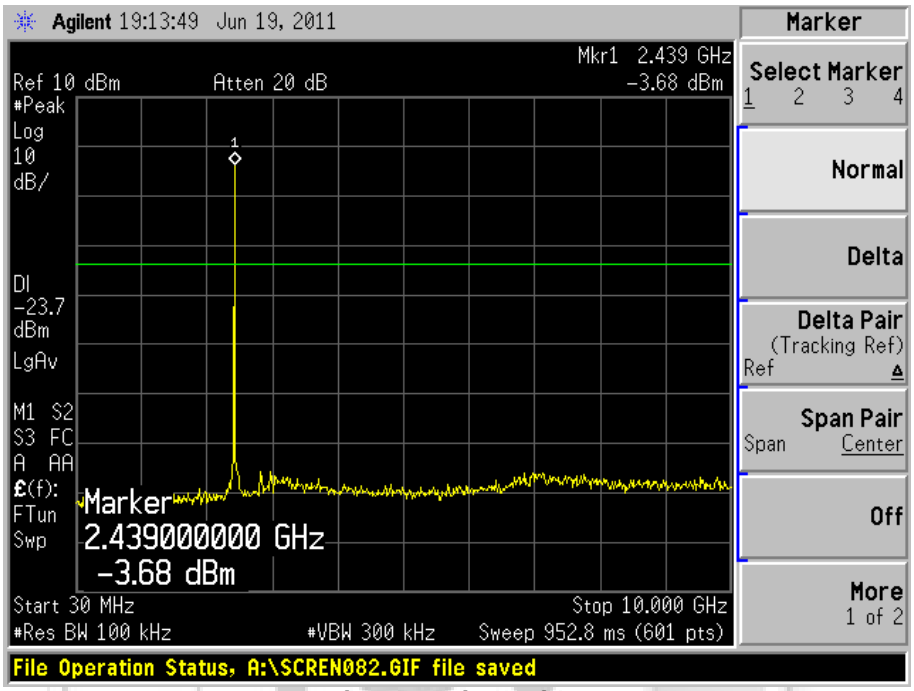


Plot 13 – Channel 2

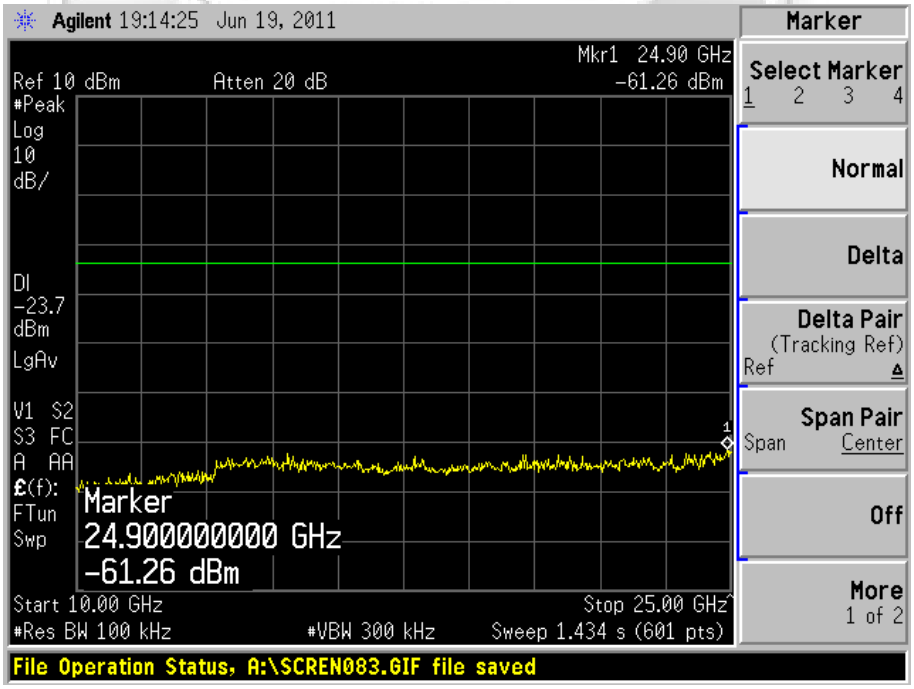


Plot 14 – Channel 2

RF Conducted Spurious Emissions Plots (Antenna 1)

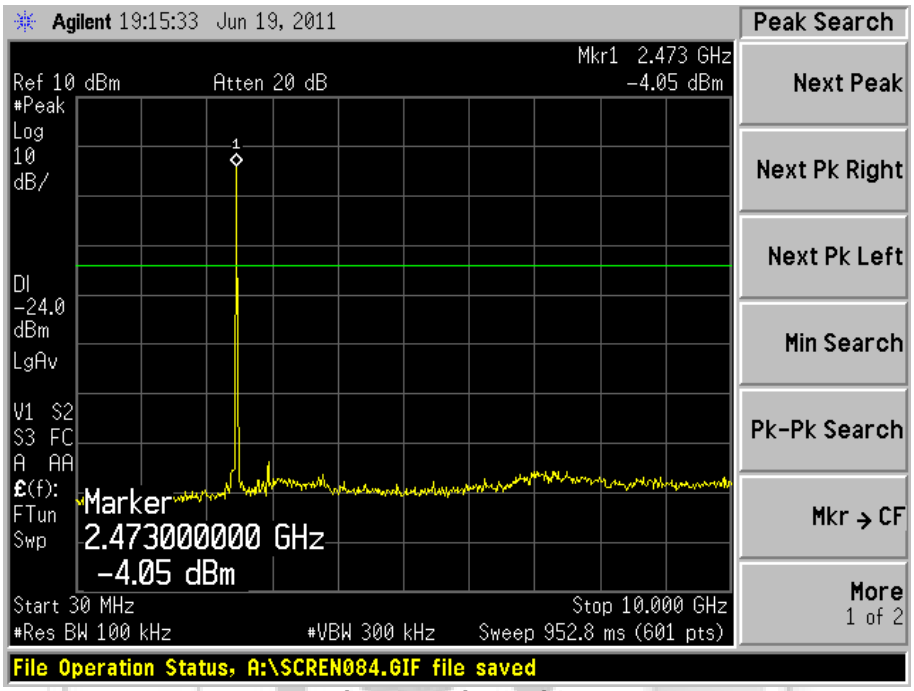


Plot 15 – Channel 20

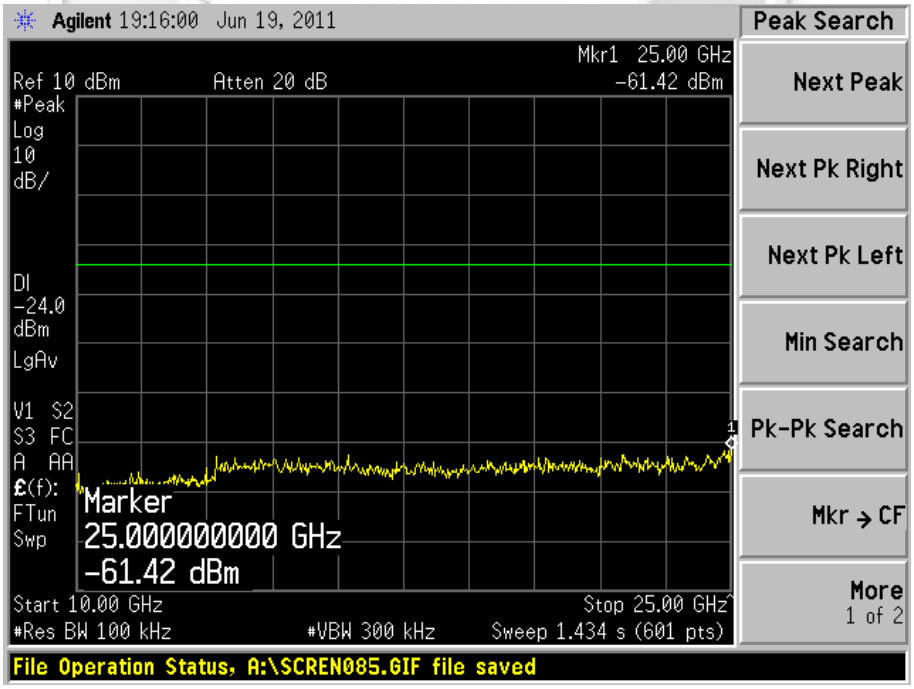


Plot 16 – Channel 20

RF Conducted Spurious Emissions Plots (Antenna 1)



Plot 17 – Channel 38



Plot 18 – Channel 38

BAND EDGE COMPLIANCE (CONDUCTED) TEST

47 CFR 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.

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

Instrument	Model	S/No	Cal Due Date
Agilent PSA Series Spectrum Analyzer (3Hz - 26.5GHz)	E4440A	MY45304764	10 Aug 2012

47 CFR 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.

47 CFR 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 Setup

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Results

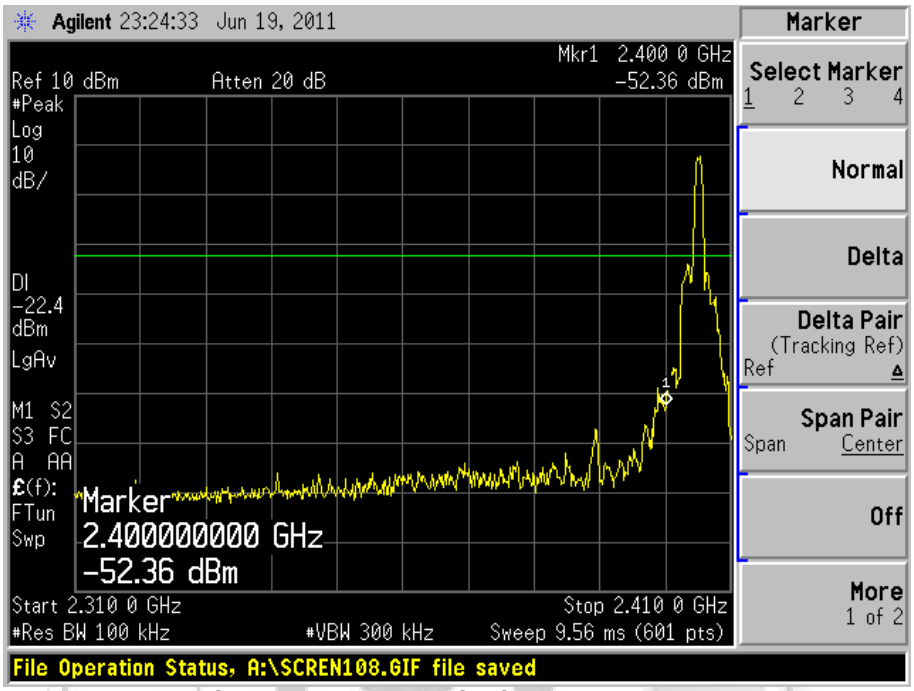
Test Input Power	110V 60Hz (via connected host)	Temperature	24°C
Attached Plots	19 - 20	Relative Humidity	58%
Antenna	0	Atmospheric Pressure	1030mbar
		Tested By	Dylan Lin

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

Test Input Power	110V 60Hz (via connected host)	Temperature	24°C
Attached Plots	21 - 22	Relative Humidity	58%
Antenna	1	Atmospheric Pressure	1030mbar
		Tested By	Dylan Lin

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

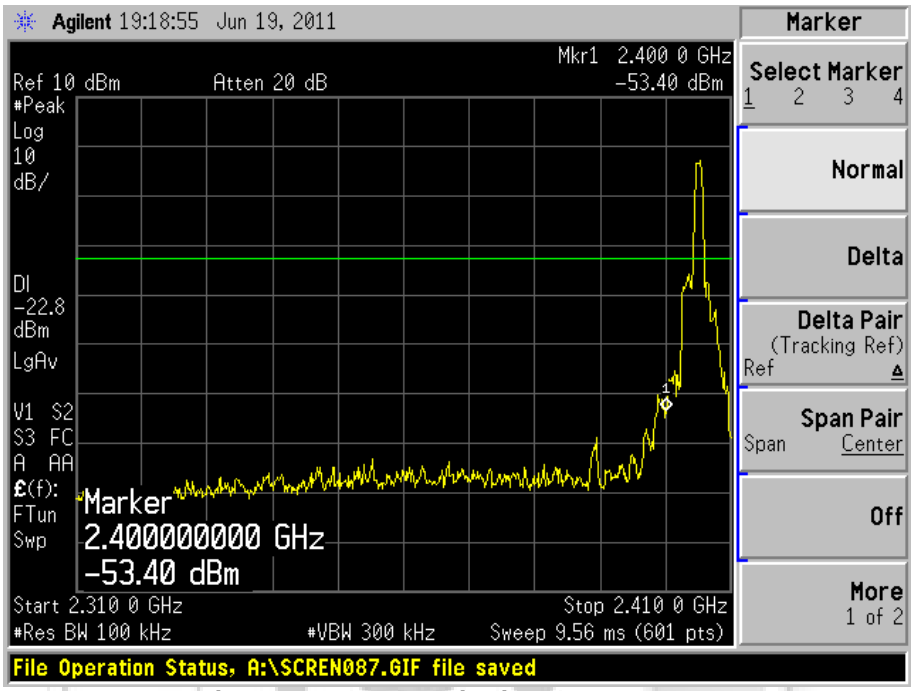
Band Edge Compliance (Conducted) Plots (Antenna 0)



Plot 19 – Lower Band Edge at 2.4000GHz

Plot 20 – Upper Band Edge at 2.4835GHz

Band Edge Compliance (Conducted) Plots (Antenna 1)



Plot 21 – Lower Band Edge at 2.4000GHz

Plot 22 – Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

47 CFR 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.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
R&S Test Receiver – ESI1	ESI40	100010	06 Jun 2012
EMCO Horn Antenna(1GHz-18GHz) – H15 (Ref)	3115	0003-6008	20 May 2012
Agilent Preamplifier(1GHz-26.5GHz) (PA18)	8449D	3008A02305	08 Oct 2011

47 CFR 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.

47 CFR 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 Setup

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Results

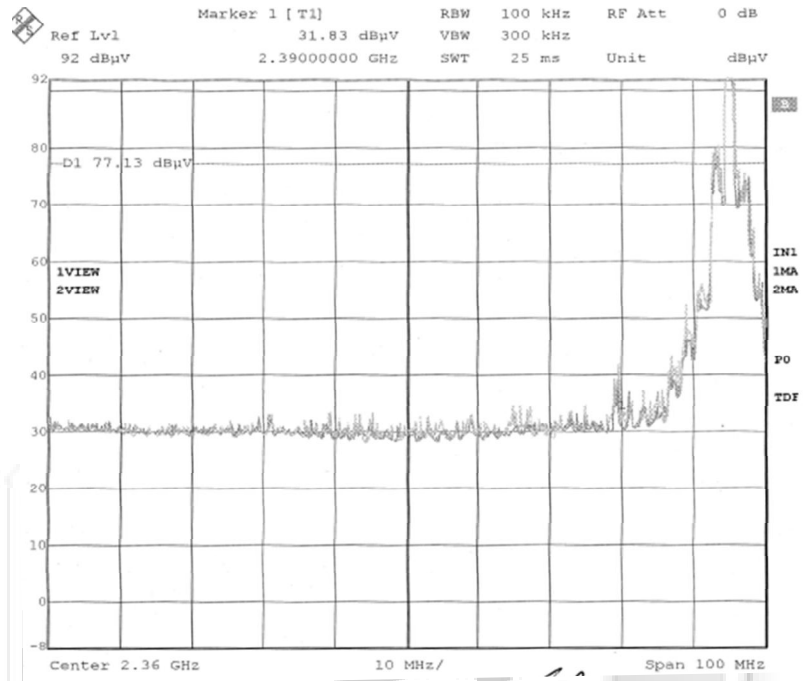
Test Input Power	110V 60Hz (via connected host)	Temperature	24°C
Attached Plots	23 - 28	Relative Humidity	58%
Antenna	1 (Worst Antenna)	Atmospheric Pressure	1030mbar
Worst Measuring Antenna Polarization	Vertical	Tested By	Zechs Ng

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

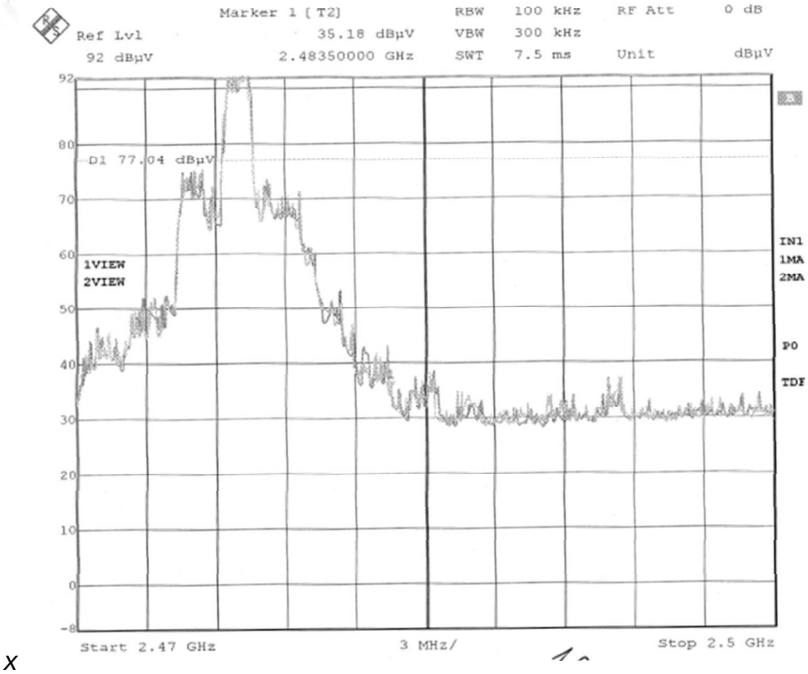
Notes

1. The measuring antenna was orientated in both vertical and horizontal polarization positions and the Max-Hold plots of both vertical and horizontal measuring antenna polarizations were documented in a single Band Edge Compliance plot.
2. The Equipment Under Test (EUT) was found to be in the worst band edge condition when the measuring antenna was orientated in a vertical polarization position.

Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge)



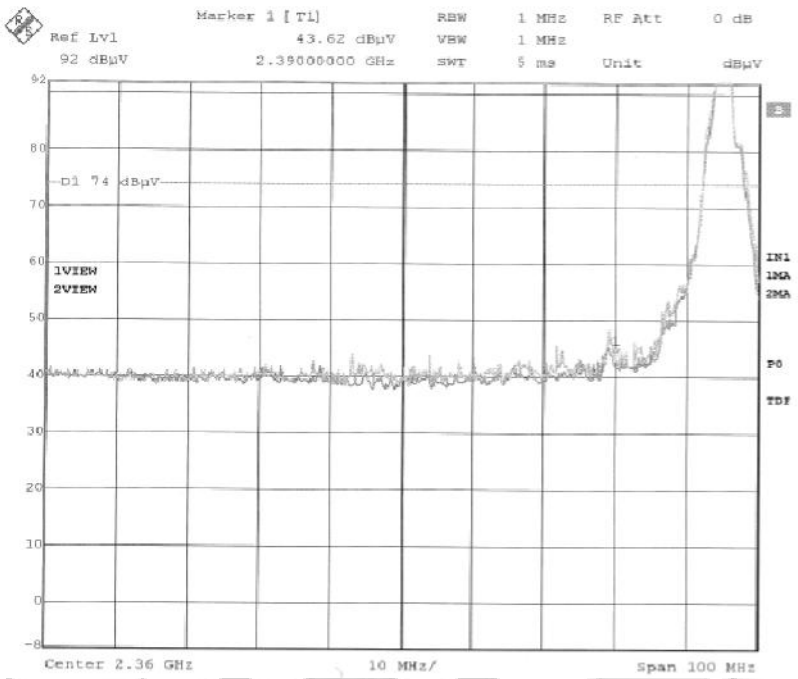
Plot 23 – Lower Band Edge at 2.4000GHz



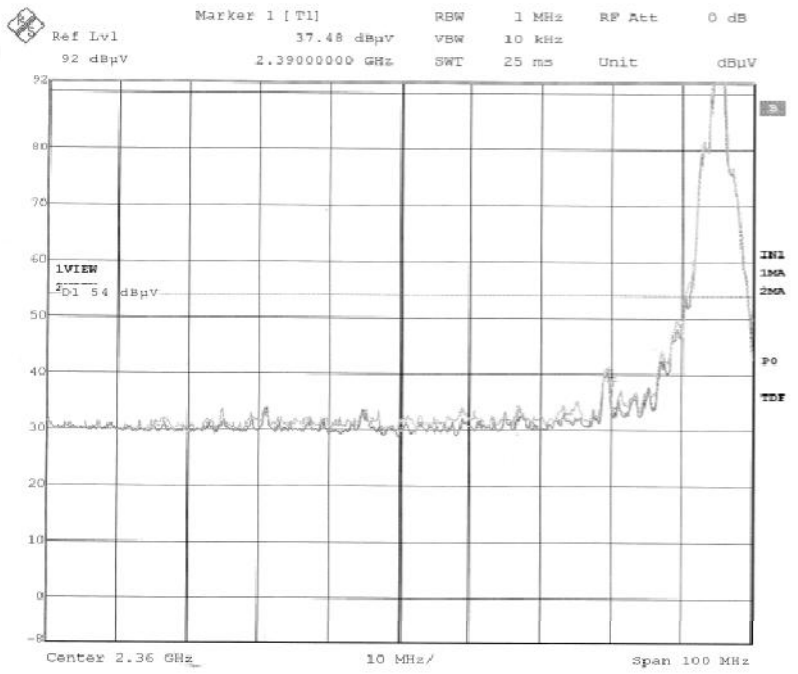
X

Plot 24 – Upper Band Edge at 2.4835GHz

Band Edge Compliance (Radiated) Plots (Restricted Band)

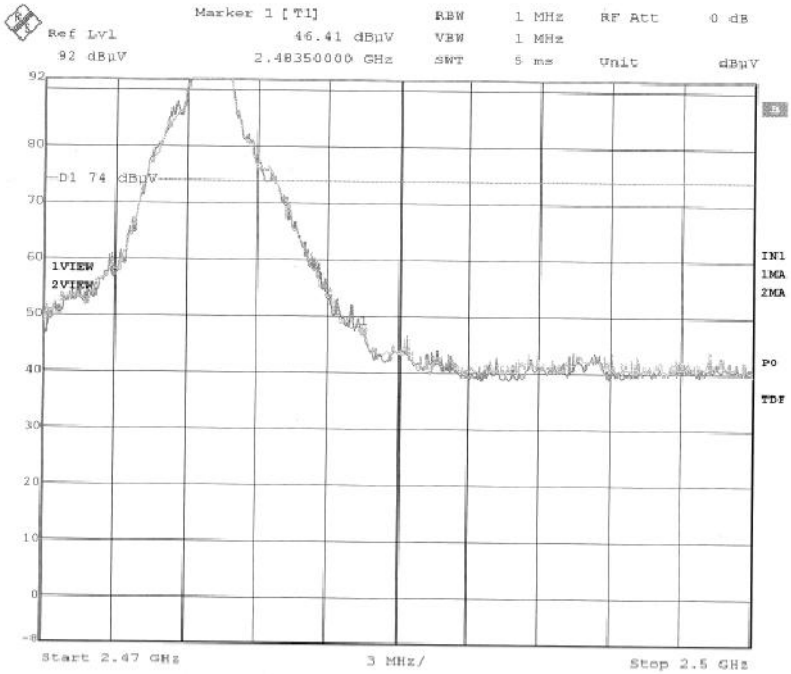


Plot 25 – Peak Plot at Lower Band Edge at 2.4000GHz

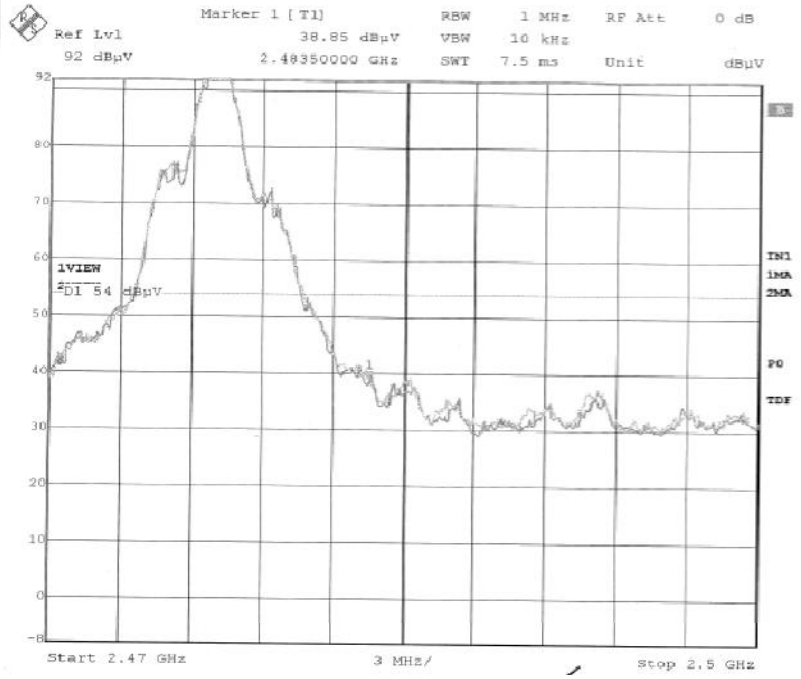


Plot 26 – Average Plot at Lower Band Edge at 2.4000GHz

Band Edge Compliance (Radiated) Plots (Restricted Band)



Plot 27 – Peak Plot at Upper Band Edge at 2.4835GHz



Plot 28 – Average Plot at Upper Band Edge at 2.4835GHz

47 CFR 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.

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

Instrument	Model	S/No	Cal Due Date
Agilent PSA Series Spectrum Analyzer (3Hz - 26.5GHz)	E4440A	MY45304764	10 Aug 2012

47 CFR 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.

47 CFR 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 2 (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 20 (2.441GHz) and Channel 38 (2.477GHz) respectively.

Peak Power Spectral Density Test Setup

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Results

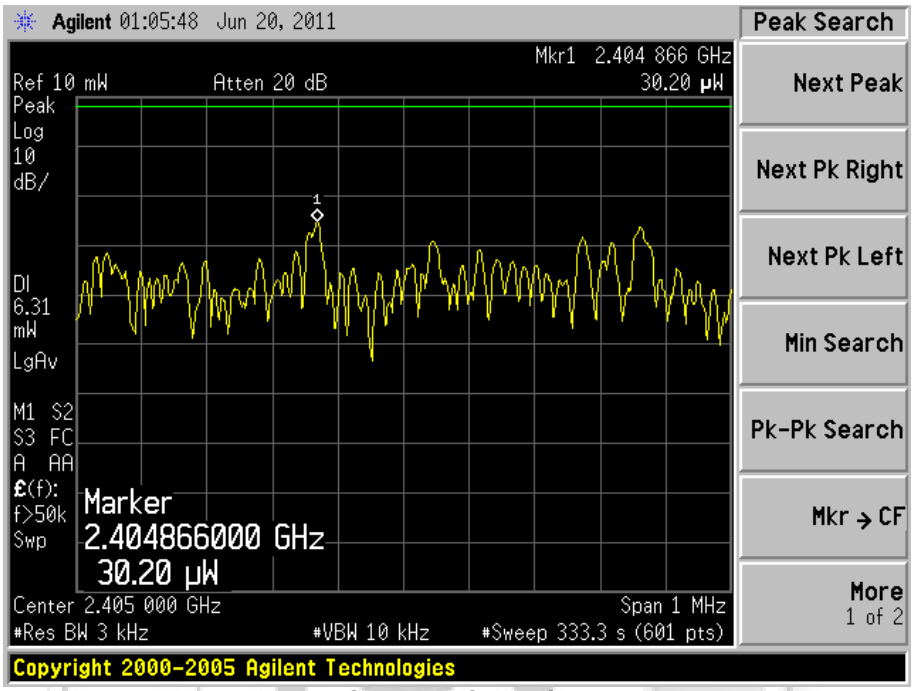
Test Input Power	110V 60Hz (via connected host)	Temperature	24°C
Attached Plots	29 - 31	Relative Humidity	58%
Antenna	0	Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)
2	2.405	0.0302	6.3
20	2.441	0.0171	6.3
38	2.477	0.0140	6.3

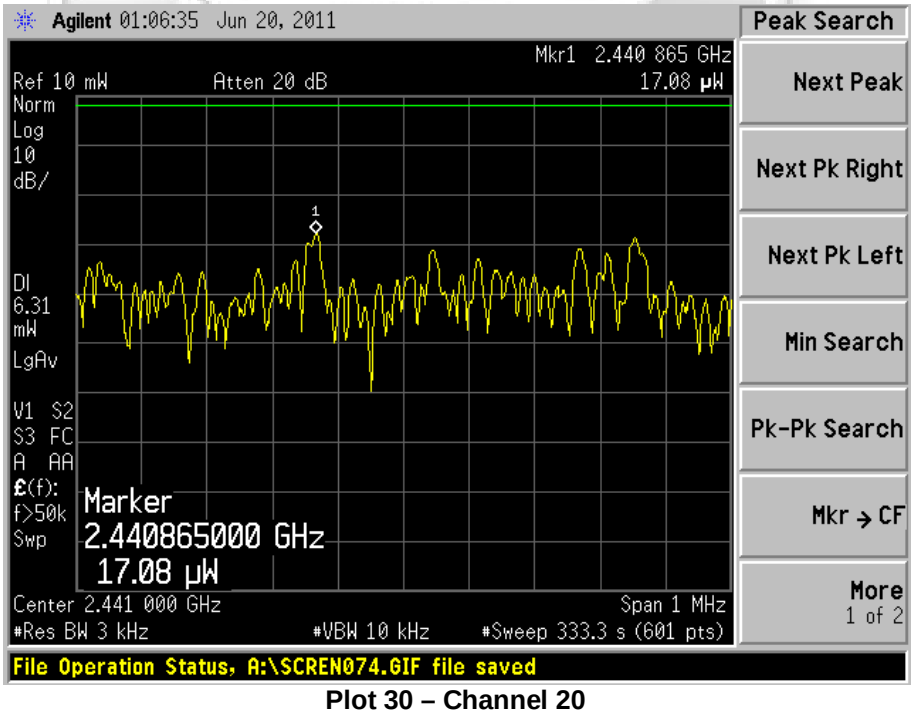
Test Input Power	110V 60Hz (via connected host)	Temperature	24°C
Attached Plots	32 - 34	Relative Humidity	58%
Antenna	1	Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)
2	2.405	0.0202	6.3
20	2.441	0.0196	6.3
38	2.477	0.0230	6.3

Peak Power Spectral Density Plots (Antenna 0)

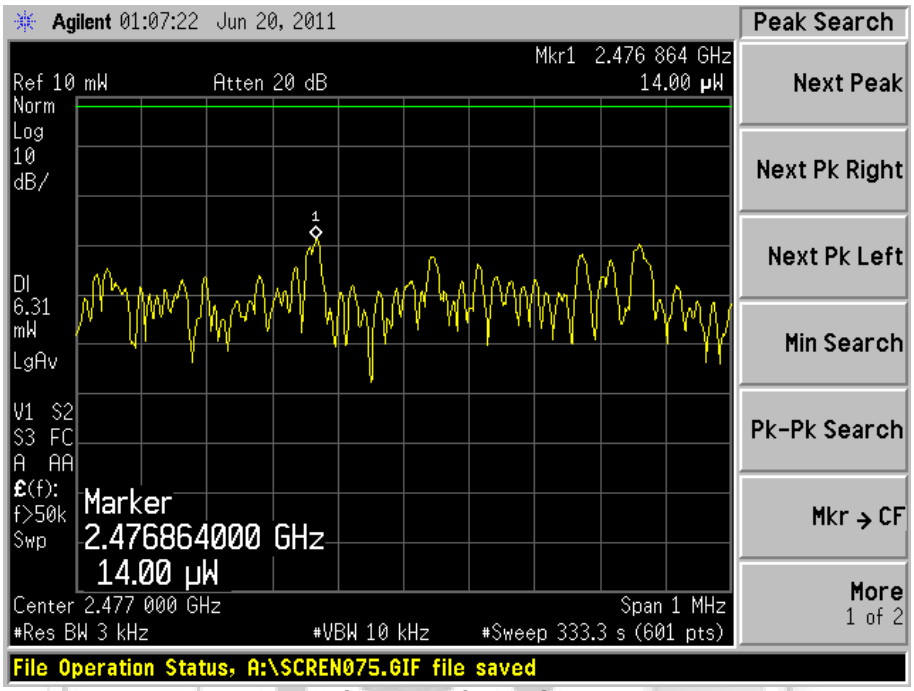


Plot 29 – Channel 2



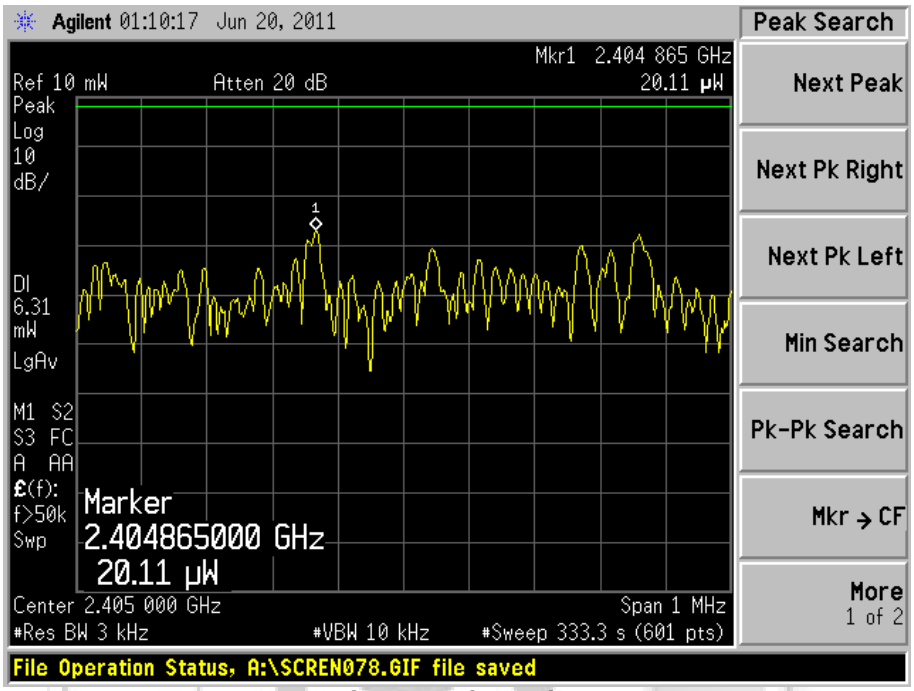
Plot 30 – Channel 20

Peak Power Spectral Density Plots (Antenna 0)

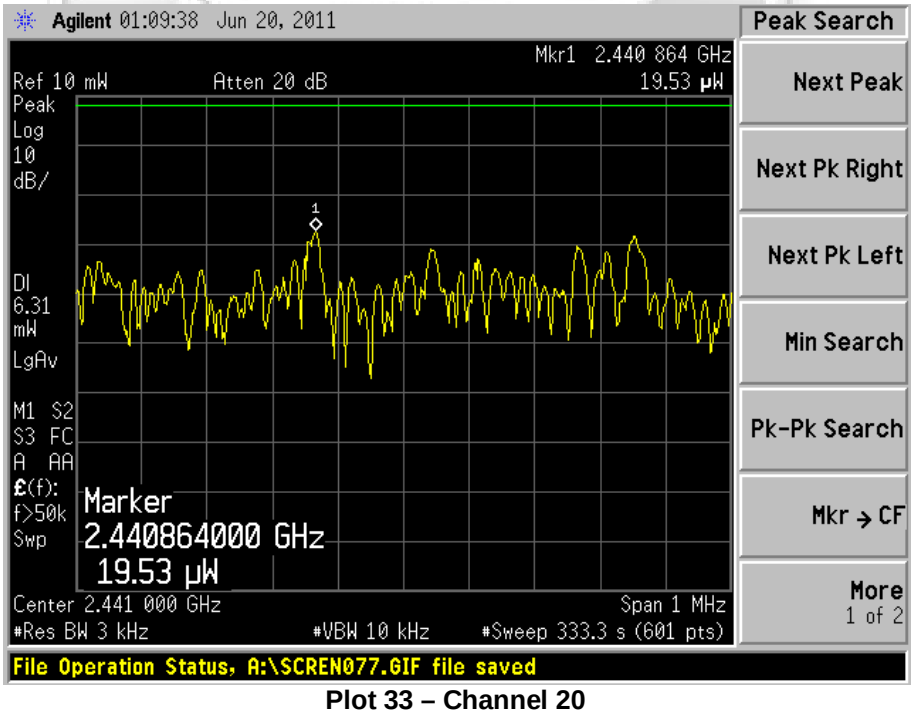


Plot 31 – Channel 38

Peak Power Spectral Density Plots (Antenna 1)

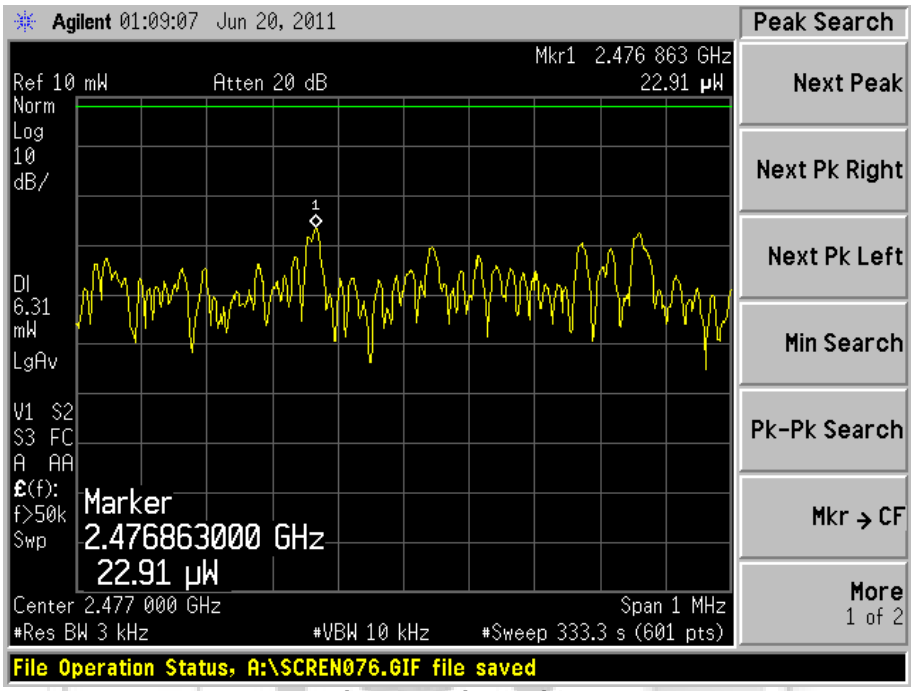


Plot 32 – Channel 2



Plot 33 – Channel 20

Peak Power Spectral Density Plots (Antenna 1)



Plot 34 – Channel 38

47 CFR 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				

47 CFR FCC Part 1.1310 Maximum Permissible Exposure Computation

The power density at 20cm distance was computed from the following formula:

$S = (30GP) / (377d^2)$

where S = Power density in W/m^2
P = 0.0008W
d = Test distance at 0.2m
G = Numerical isotropic gain, 1.13 (0.5dBi)

Substituting the relevant parameters into the formula:

$S = [(30GP) / 377d^2]$
$= 0.0423\ W/m^2$
$= 0.0043\ mW/cm^2$

∴ The power density of the EUT at 20cm distance is $0.0043mW/cm^2$ based on the above computation and found to be lower thant the power density limit of $1.0mW/cm^2$.

Please note that this Report is issued under the following terms :

1. 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 TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way "guarantees" the later performance of the product/equipment. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.

2. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD PSB therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

3. Nothing in this report shall be interpreted to mean that TÜV SÜD PSB has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.

4. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to TÜV SÜD PSB or to the report or results furnished by TÜV SÜD PSB in any advertisements or sales promotion.

5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

July 2011

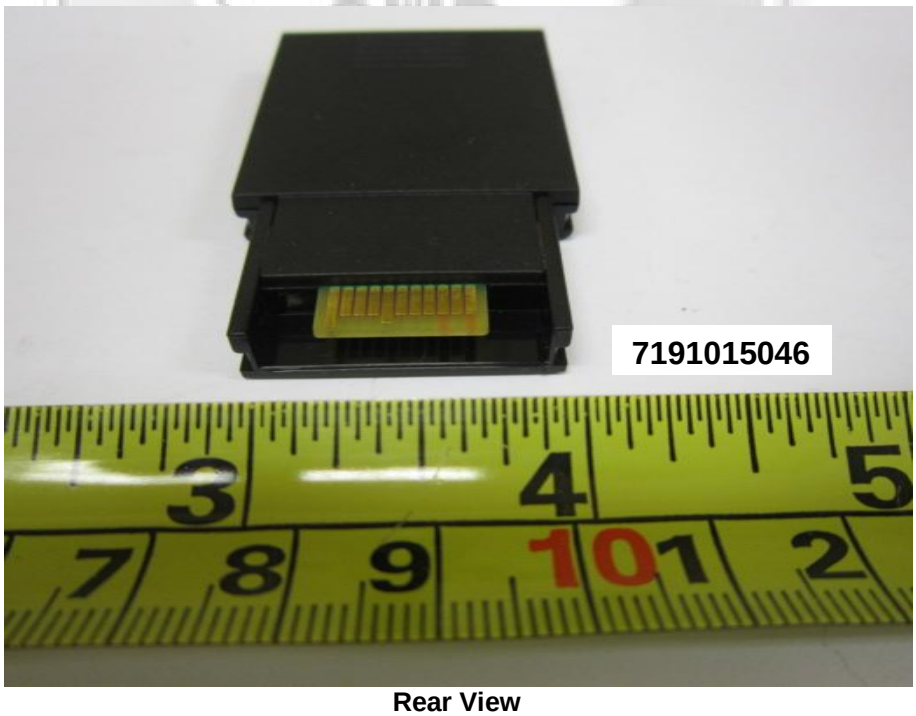
ANNEX A

EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

EUT PHOTOGRAPHS

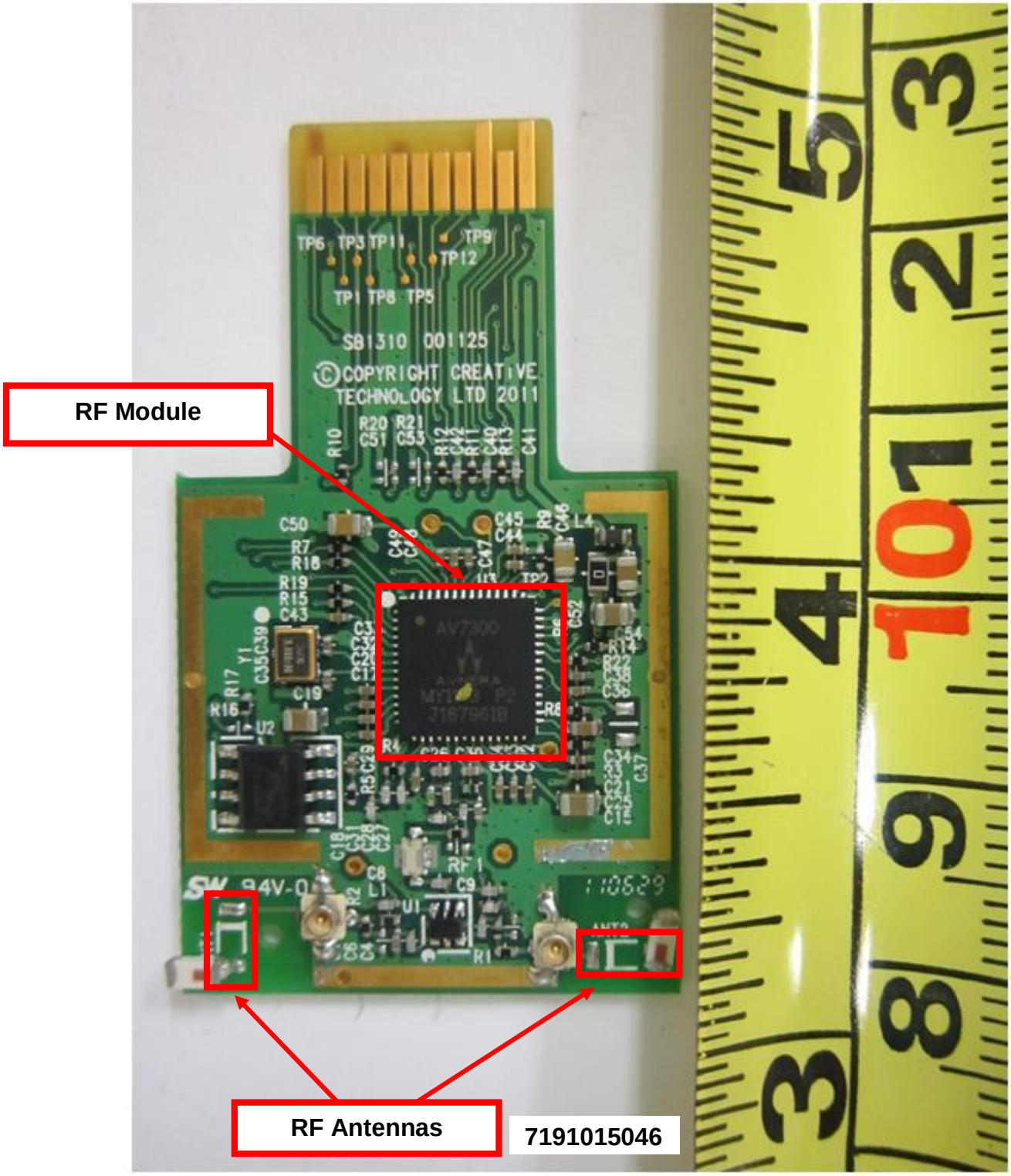
Front View



Rear View

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

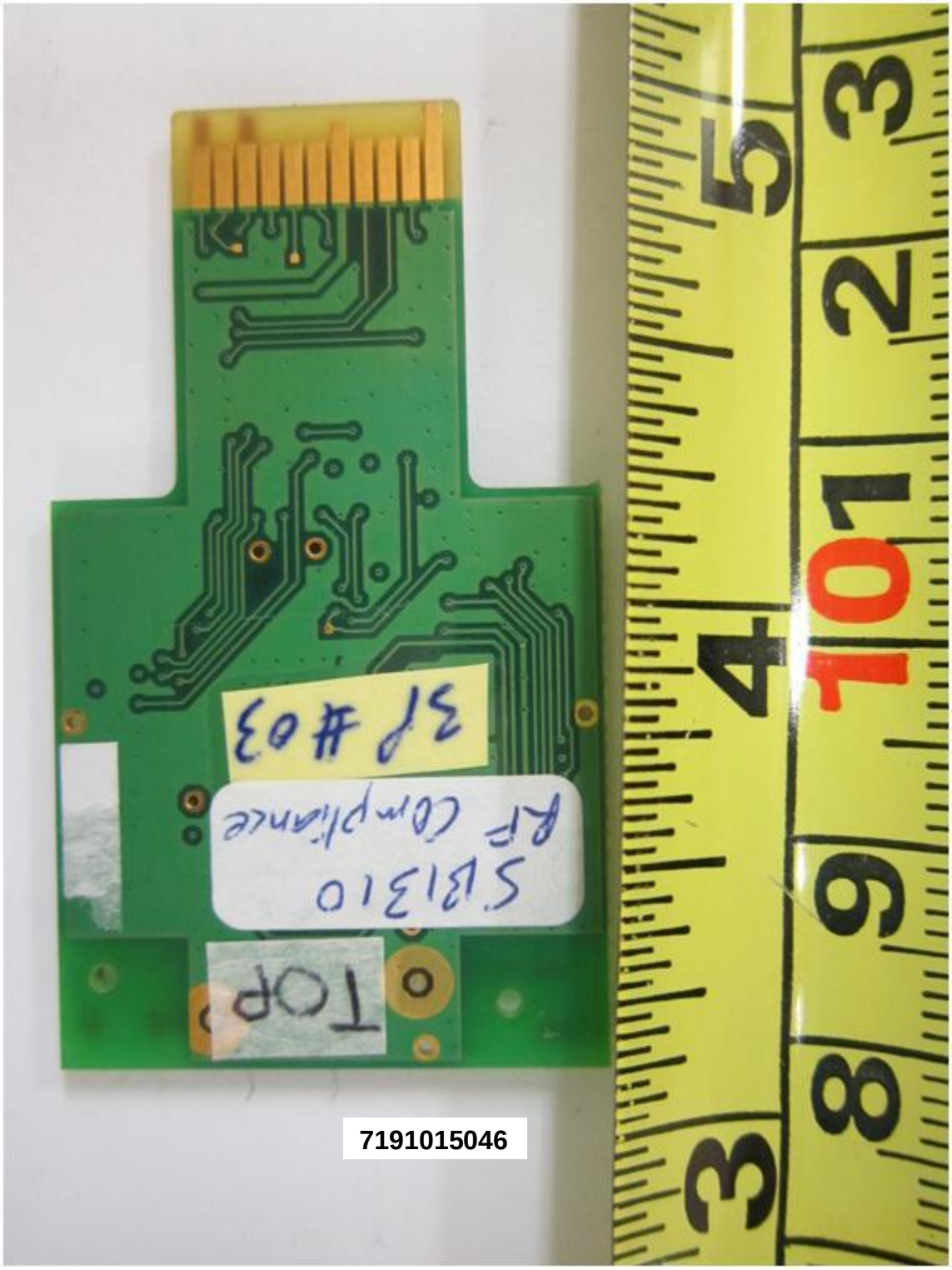
EUT PHOTOGRAPHS



RF Module Circuit with RF Shield Removed Component View

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

EUT PHOTOGRAPHS



RF Module Circuit with RF Shield Removed Trace View

ANNEX B

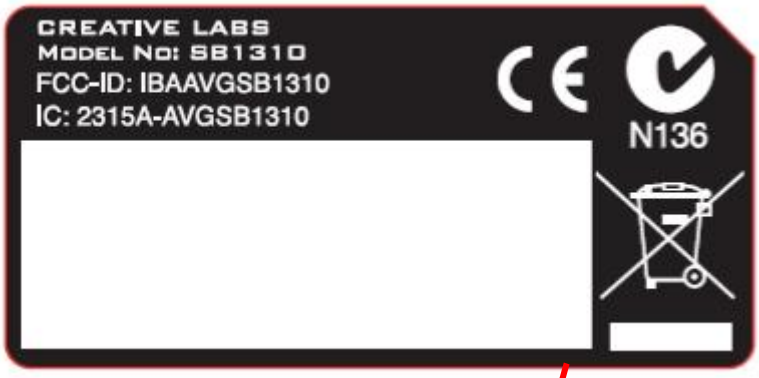
FCC LABEL & POSITION

PSB Singapore

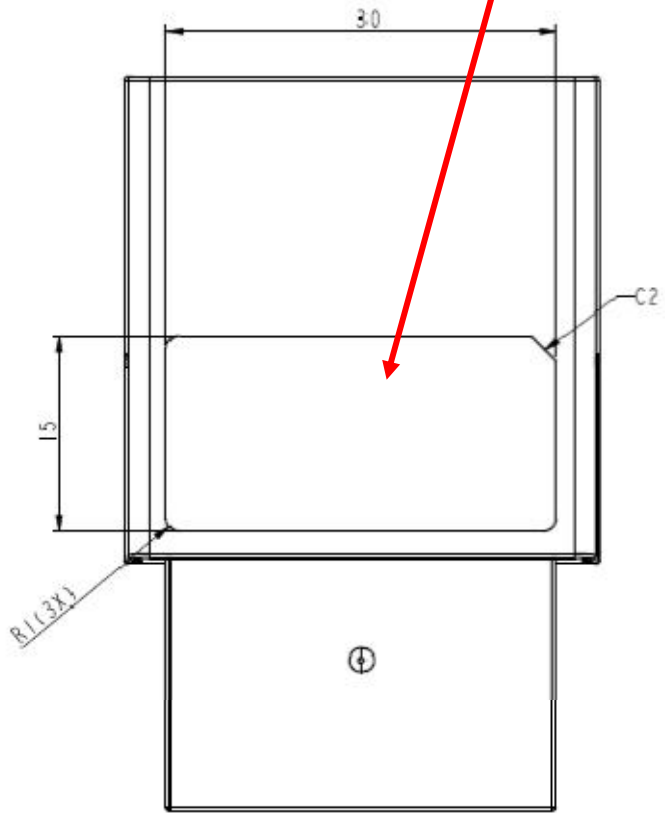
FCC LABEL & POSITION — ANNEX B

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 FCC Label on EUT

ANNEX C

USER MANUAL TECHNICAL DESCRIPTION BLOCK & CIRCUIT DIAGRAMS

(Please refer to manufacturer for details)