Test Report No. 7191046193-EEC12/03
dated 27 Nov 2012

PSB Singapore

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 15B & C : 2011
OF A
COMPACT STEREO SYSTEM
[Model : SC-HC58]
[FCC ID : ACJ-11NR1301]

TEST FACILITY	TÜV SÜD PSB Pte Ltd, Electrical & Electronics Centre (EEC), Product Services, No. 1 Science Park Drive, Singapore 118221.
FCC REG. NO.	99142 (3m and 10m Semi-Anechoic Chamber, Science Park)
IND. CANADA REG. NO.	2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park)
PREPARED FOR	Panasonic AVC Networks Singapore 202 Bedok South Avenue 1 Singapore 469332 Tel : +65 6240 1891 Fax : +65 6245 8804
QUOTATION NUMBER	219161453
JOB NUMBER	7191046193
TEST PERIOD	31 Oct – 14 Nov 2012

PREPARED BY

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Lim Cher Hwee
Assistance Vice President

TÜV SÜD PSB

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LA-2007-0380-A
LA-2007-0381-F
LA-2007-0382-B
LA-2007-0383-G
LA-2007-0384-G
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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TABLE OF CONTENTS

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)(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 (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 52 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 0	2.402
Channel 39	2.441
Channel 78	2.480

2. All the measurements in section 15.247 were done based on conducted measurements except Band Edge Compliance (Radiated) test..

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 and FCC Public Notice DA 00-705.

5. The maximum measured RF power of the Equipment Under Test is 2.31dBm.

Modifications

No modifications were made.

PRODUCT DESCRIPTION

Description	:	The Equipment Under Test (EUT) is a **COMPACT STEREO SYSTEM.**
Applicant	:	Panasonics AVC Networks Singapore 202, Bedok South Avenue 1 Singapore 469332
Manufacturer	:	Panasonic Corporation 1-15 Matsuo-cho, Kadoma-shi, Osaka 571-8504
Factor (ies)	:	Panasonic AVC Networks Johor Malaysia Sdn. Bhd. IE PLO 460, Jalan Bandar, 81700 Pasir Gudang, Johor, Malaysia
Model Number	:	SC-HC58
FCC ID	:	ACJ-11NR1301
Serial Number	:	Nil
Microprocessor	:	MN101EF16KXW / ZXWPanasonic Semiconductor Devices Asia
Operating / Transmitting Frequency	:	AM 520kHz-1630kHz FM 87.5MHz-108MHz <u>Bluetooth</u> 2.402GHz Low Channel 2.441GHz Mid Channel 2.480GHz High Channel
Clock / Oscillator Frequency	:	128kHz (FM/AM), 16MHz (BT)
Modulation	:	GFSK
Antenna Gain	:	1.13 dBi
Port / Connectors	:	Refer to manufacturer's User Manual
Rated Input Power	:	120Vac 60Hz 34W
Accessories	:	Remote Control FM/AM Antenna AC Cord AA size batteries

SUPPORTING EQUIPMENT DESCRIPTION

Equipment Description (Including Brand Name)	Model, Serial & FCC ID Number	Cable Description (List Length, Type & Purpose)
Fujitsu Lifebook Laptop	M/N: SH560 S/N: R0400172 FCC ID: DoC	1.80m unshielded power cable
Fujitsu Power Adapter	M/N: SEC100P3-19.0 S/N: 10301801D FCC ID: Nil	1.80m unshielded power cable

EUT OPERATING CONDITIONS

47 CFR FCC Part 15
1. Conducted Emissions **2. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)** **3. Spectrum Bandwidth (20dB Bandwidth Measurement)** **4. Maximum Peak Power** **5. RF Conducted Spurious Emissions** **6. Peak Power Spectral Density** **7. Maximum Permissible Exposure**
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.
47 CFR FCC Part 15
1. Carrier Frequency Separation **2. Number of Hopping Frequencies** **3. Average Frequency Dwell Time** **4. Band Edge Compliance (Conducted)** **5. Band Edge Compliance (Radiated)**
The EUT was exercised by operating in maximum continuous transmission with frequency hopping on.

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

Frequency Range (MHz)	Limit Values (dBµV)	
	Quasi-peak (Q-P)	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
R&S Test Receiver(9kHz-7GHz) – ESI3	ESIB7	100015	25 Jul 2013
Agilent EMC Analyzer-SA7	E7403A	US41160167	28 May 2013
R&S LISN –LISN1 (for supporting)	ESH2-Z5	862060/017	27 Sep 2013
EMCO LISN (for supporting) – LISN6	3825/2	9309-2127	Output monitored

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 = 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 = 60.0 - 40.0 = 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	Temperature	15^{o}C
Line Under Test	AC Mains	Relative Humidity	53%
Test Mode	EDR (worst mode)	Atmospheric Pressure	1030mbar
		Tested By	Lim Kay Tak

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
0.1992	52.4	63.6	11.2	37.3	53.6	16.3	Live	39
0.2580	46.2	61.5	15.3	30.6	51.5	20.9	Neutral	39
0.3294	40.7	59.5	18.8	27.5	49.5	22.0	Neutral	39
0.4837	30.3	56.3	26.0	16.7	46.3	29.6	Live	39
0.5705	26.9	56.0	29.1	12.5	46.0	33.5	Neutral	39
12.8255	44.9	60.0	15.1	32.1	50.0	17.9	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 "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a “negative” margin indicates a FAIL.
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
R&S Test Receiver – ESI1	ESI40	100010	05 Jun 2013
Schaffner Bilog Antenna –(30MHz-2GHz) BL3 (Ref)	CBL6112B	2549	19 Jan 2013
EMCO Horn Antenna(1GHz-18GHz) – H14 (Ref)	3115	0003-6087	12 Jul 2013
ETS Horn Antenna(18GHz-40GHz)(Ref)	3116	0004-2474	17 Jul 2013
Teseq Preamplifier (9kHz-1GHz)	LNA6901	72267	22 Jun 2013
Agilent Preamplifier(1GHz-26.5GHz) (PA18)	8449D	3008A02305	07 Oct 2013
Micro-tronics Bandstop filter	BRM50701-02	007	13 Aug 2013
EMCO Loop Antenna	6502	00134413	31 May 2013

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

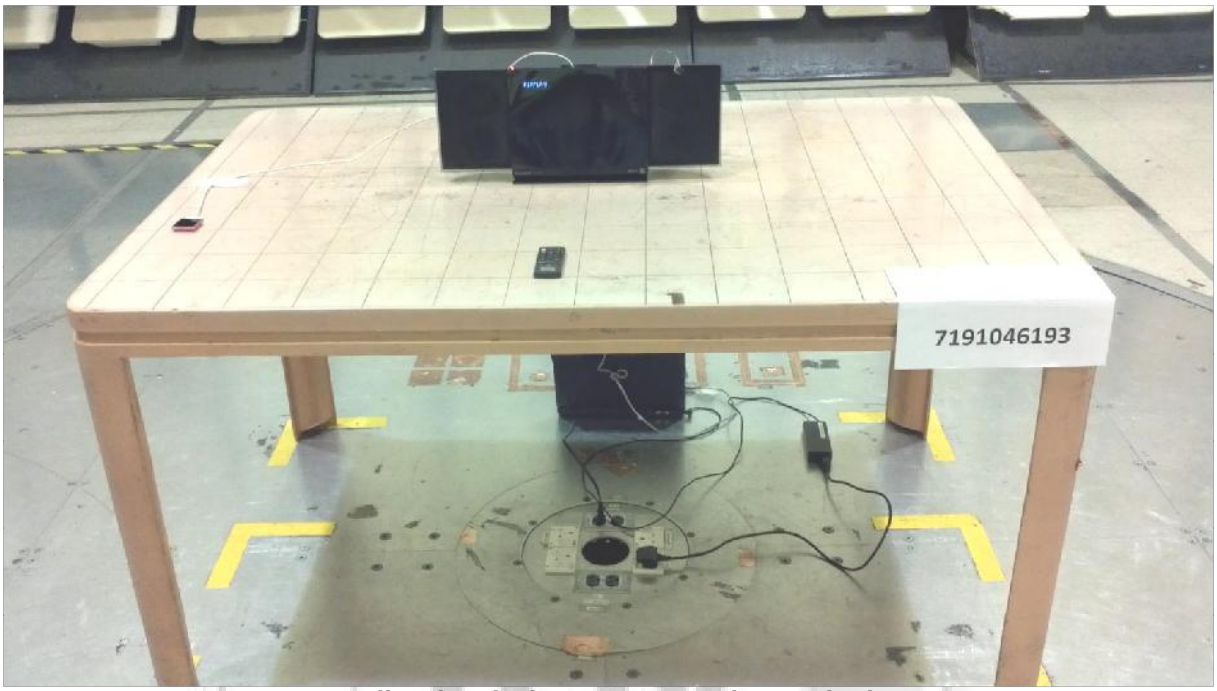
1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The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

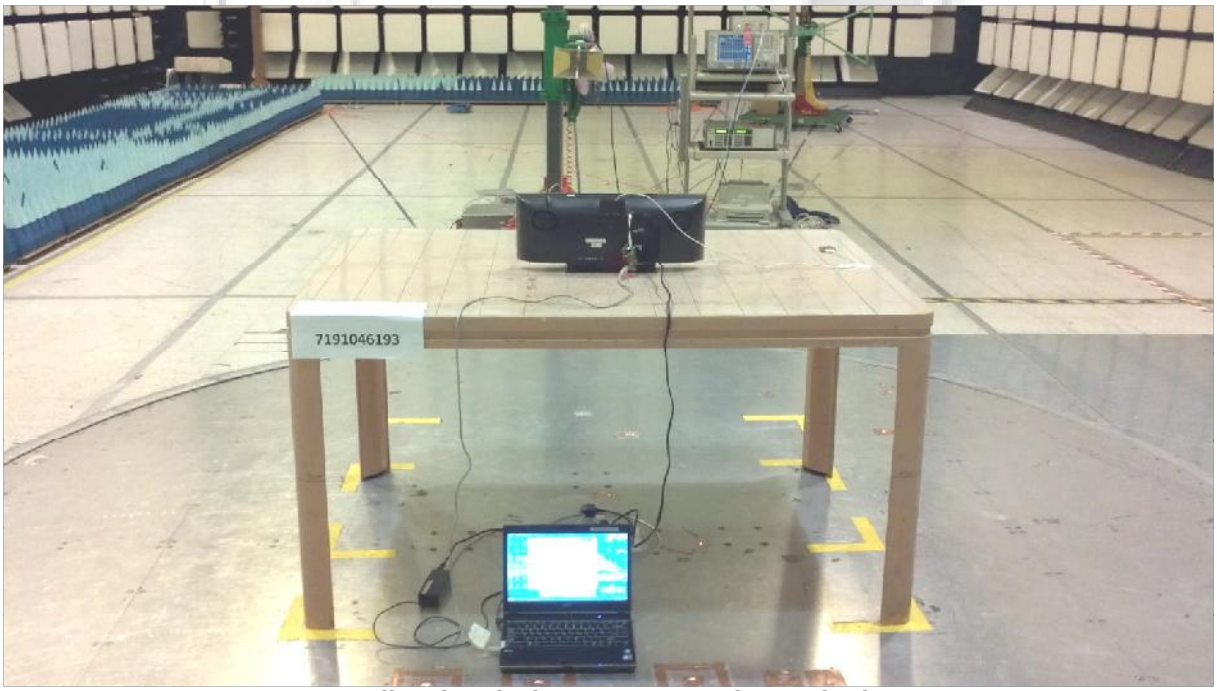
1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude 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 = 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 = 46.0 - 40.0 = 6.0	i.e. 6.0 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 50Hz	Temperature	23°C
Test Distance	3m	Relative Humidity	60%
Mode	EDR (worst mode)	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Spurious Emissions ranging from 9kHz – 30MHz

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Limit (dBµV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Channel
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Limit (dBµV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Channel
30.6610	18.0	40.0	22.0	271	307	18.0	39
73.7240	30.7	40.0	9.3	233	344	30.7	39
183.4340	32.5	43.5	11.0	191	39	32.5	39
291.7100	35.2	46.0	10.8	99	320	35.2	39
335.9800	38.2	46.0	7.8	98	180	38.2	39
745.6580	17.7	46.0	28.3	99	350	17.7	39

Spurious Emissions above 1GHz – 25GHz

Freq (GHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	AV Value (dBµV/m)	AV Limit (dBµV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
2.8934	44.1	74.0	29.9	30.5	54.0	23.5	149	127	H	0
5.0816	51.0	74.0	23.0	37.5	54.0	16.5	317	320	V	0
5.5567	53.2	74.0	20.8	40.1	54.0	13.9	393	20	H	0
6.1857	50.6	74.0	23.4	37.4	54.0	16.6	400	195	H	0
6.4888	53.7	74.0	20.3	39.9	54.0	14.1	303	104	H	0
6.9389	57.9	74.0	16.1	44.4	54.0	9.6	202	284	V	0

Spurious Emissions above 1GHz – 25GHz

Freq (GHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	AV Value (dBµV/m)	AV Limit (dBµV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
1.1056	33.5	74.0	40.5	20.1	54.0	33.9	147	148	H	39
2.3832	40.8	74.0	33.2	27.5	54.0	26.5	241	202	V	39
2.8787	43.7	74.0	30.3	29.8	54.0	24.2	167	46	H	39
5.5563	53.9	74.0	20.1	40.0	54.0	14.0	101	131	V	39
6.3971	50.4	74.0	23.6	37.2	54.0	16.8	237	107	V	39
6.9415	57.7	74.0	16.3	44.2	54.0	9.8	321	225	H	39

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

Test Input Power	110V 50Hz	Temperature	23°C
Test Distance	3m	Relative Humidity	60%
Mode	EDR (worst mode)	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Spurious Emissions above 1GHz

Freq (GHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	AV Value (dBµV/m)	AV Limit (dBµV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
2.3823	51.0	74.0	23.0	37.4	54.0	16.6	220	120	V	78
2.9025	52.9	74.0	21.1	40.3	54.0	13.7	160	180	H	78
5.5046	61.6	74.0	12.4	48.2	54.0	5.8	214	0	V	78
5.9376	61.4	74.0	12.6	47.8	54.0	6.2	205	225	V	78
6.5500	61.5	74.0	12.5	48.1	54.0	5.9	100	332	H	78
6.9416	65.0	74.0	9.0	48.0	54.0	6.0	144	129	V	78

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. "--" indicates no emissions were found and shows compliance to the limits.
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 "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
5. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   9kHz – 150kHz
   RBW: 200Hz VBW: 600Hz
   150kHz – 30MHz
   RBW: 9kHz VBW: 27kHz
   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 is ±4.0dB.

CARRIER FREQUENCY SEPARATION TEST

47 CFR 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).

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

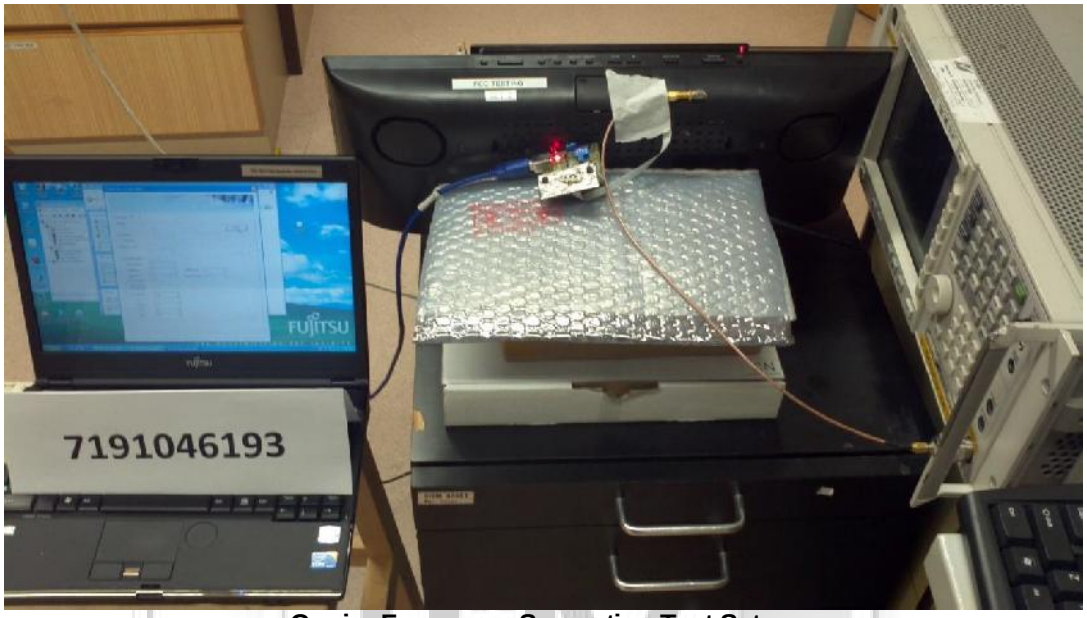
Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	20 Jun 2013

47 CFR 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 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR 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 2.400GHz and 2.405GHz.
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



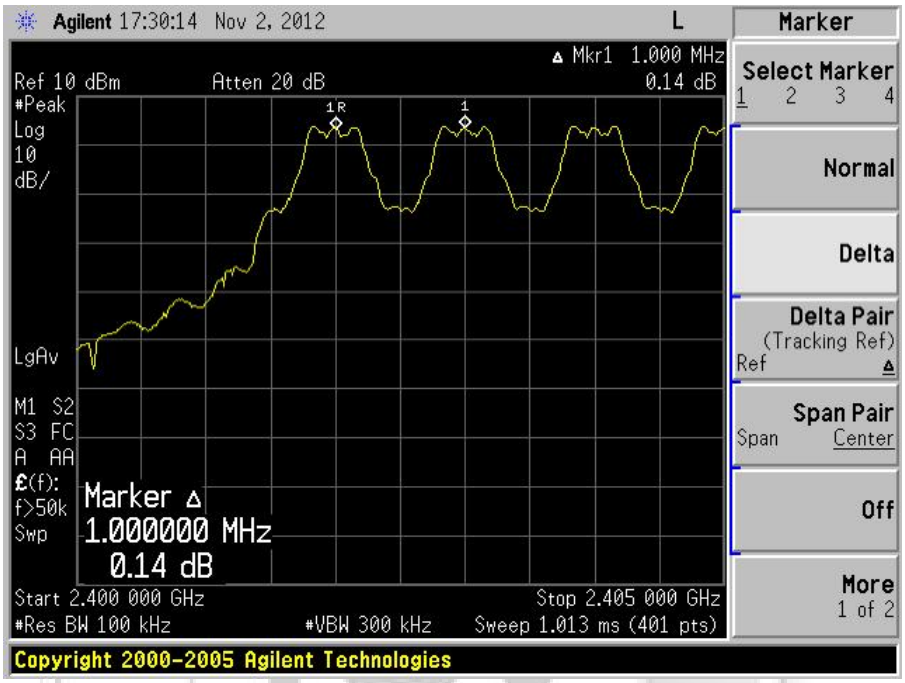
Carrier Frequency Separation Test Setup

47 CFR FCC Part 15.247(a)(1) Carrier Frequency Separation Results

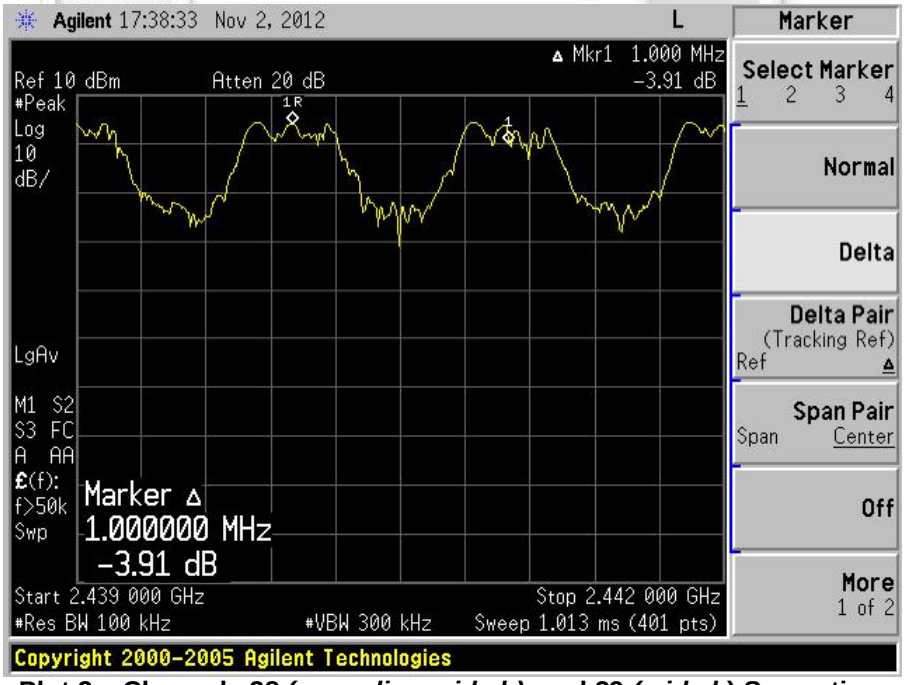
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	1 - 4	Relative Humidity	55%
Mode	EDR (worst mode)	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Adjacent Channels	Channel Separation (MHz)
0 and 1 (2.402GHz and 2.403GHz)	1.000
38 and 39 (2.440GHz and 2.441GHz)	1.000
39 and 40 (2.441GHz and 2.442GHz)	1.000
77 and 78 (2.479GHz and 2.480GHz)	1.000

Carrier Frequency Separation Plots

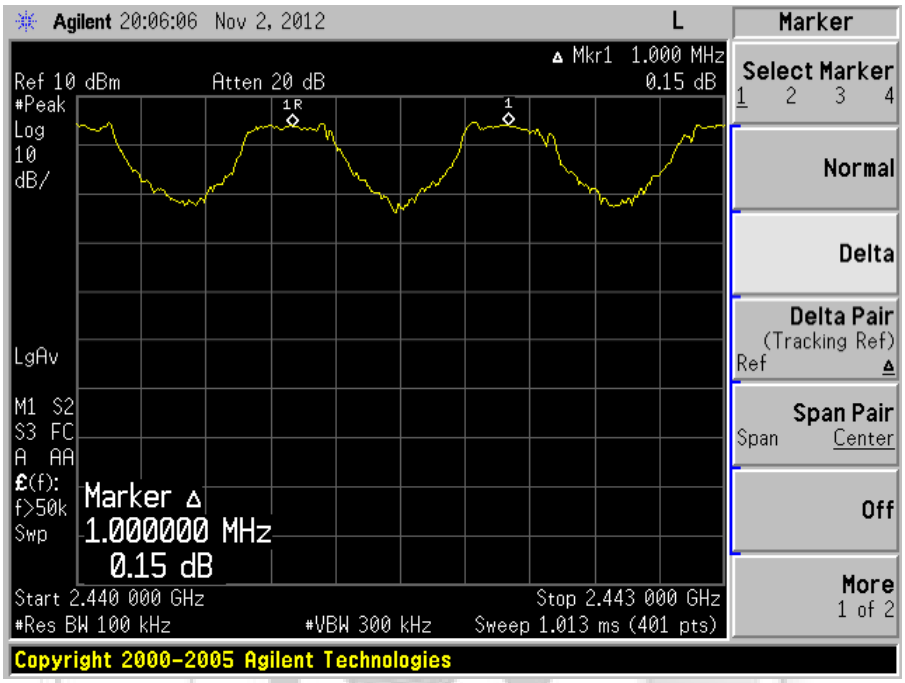


Plot 1 - Channels 0 *(lower ch)* and 1 *(ch after lower ch)* Separation



Plot 2 – Channels 38 *(preceding mid ch)* and 39 *(mid ch)* Separation

Carrier Frequency Separation Plots



Plot 3 - Channels 39 *(mid ch)* and 40 *(ch after mid ch)* Separation

Plot 4 - Channels 77 *(preceding upper ch)* and 78 *(upper ch)* Separation

SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

47 CFR 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.

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

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	20 Jun 2013

47 CFR 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.

47 CFR 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 X (2.402GHz) *(lower ch)*.
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) *(mid ch)* and Channel 78 (2.480GHz) *(upper ch)* respectively.

Spectrum Bandwidth (20dB Bandwidth Measurement) Test Setup

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

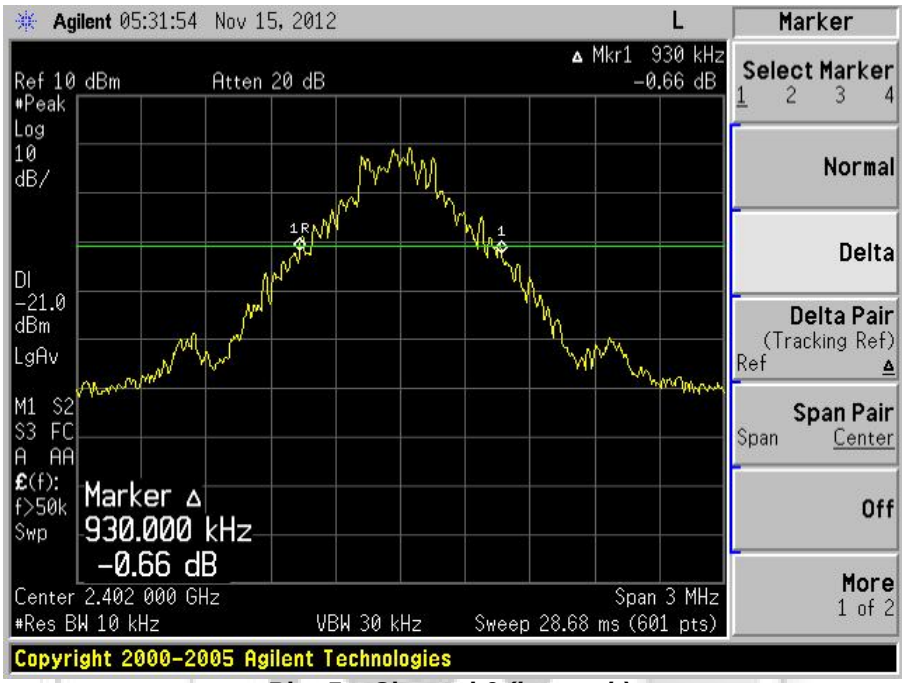
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	5 - 7	Relative Humidity	55%
Mode	BDR	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	20dB Bandwidth (MHz)
0 *(lower ch)*	2.402	0.930
39 *(mid ch)*	2.441	0.925
78 *(upper ch)*	2.480	0.925

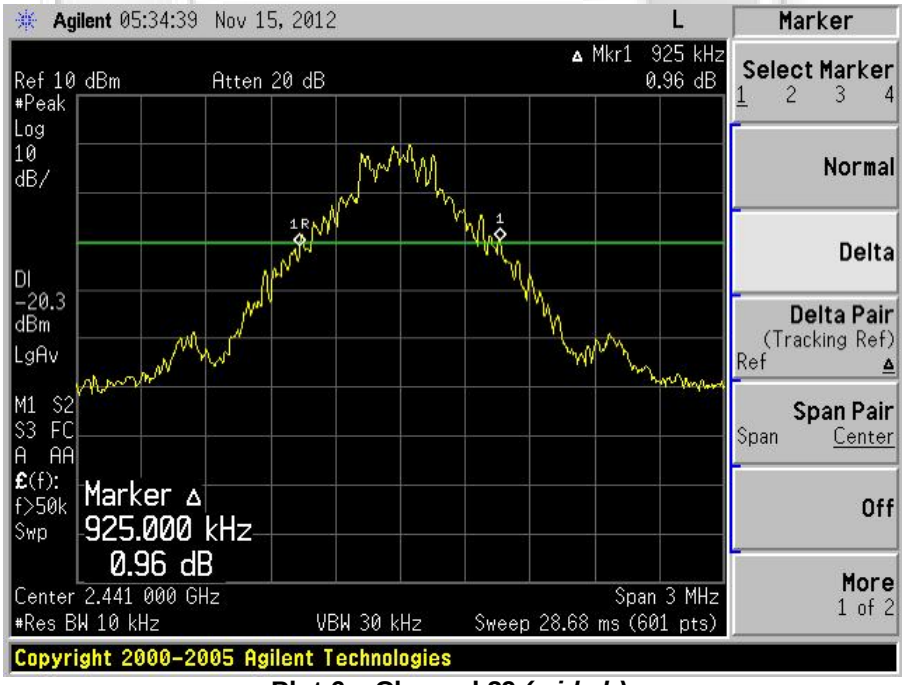
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	8 - 10	Relative Humidity	55%
Mode	EDR	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	20dB Bandwidth (MHz)
0 *(lower ch)*	2.402	0.930
39 *(mid ch)*	2.441	0.930
78 *(upper ch)*	2.480	0.930

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots

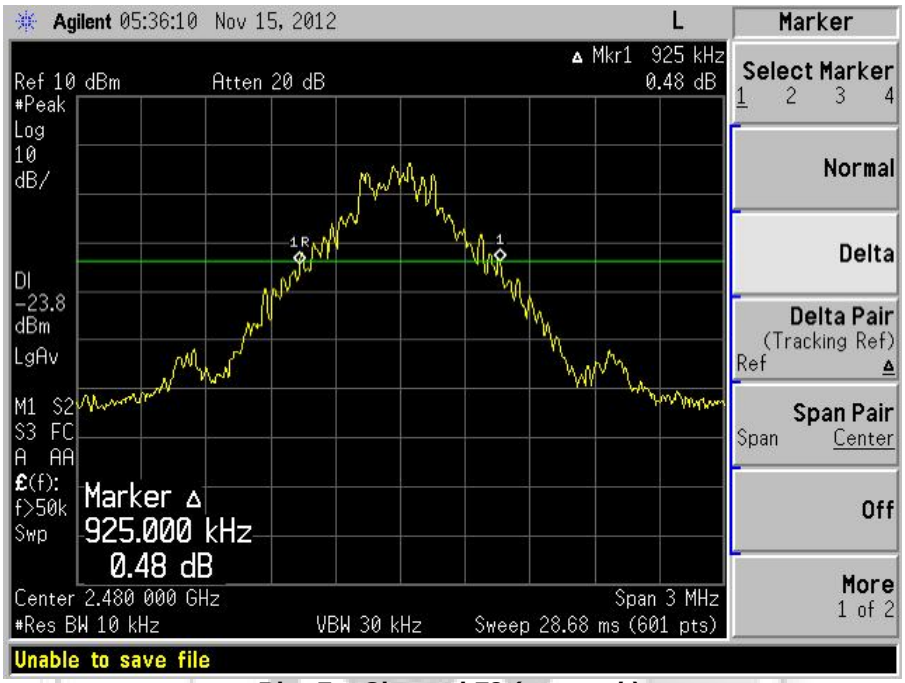


Plot 5 – Channel 0 *(lower ch)*



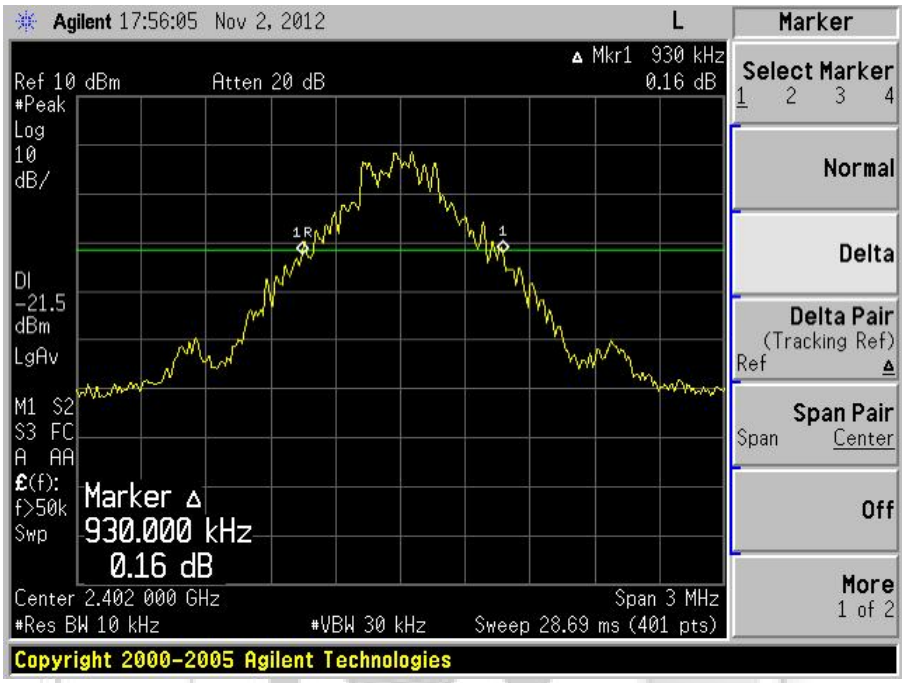
Plot 6 – Channel 39 *(mid ch)*

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots

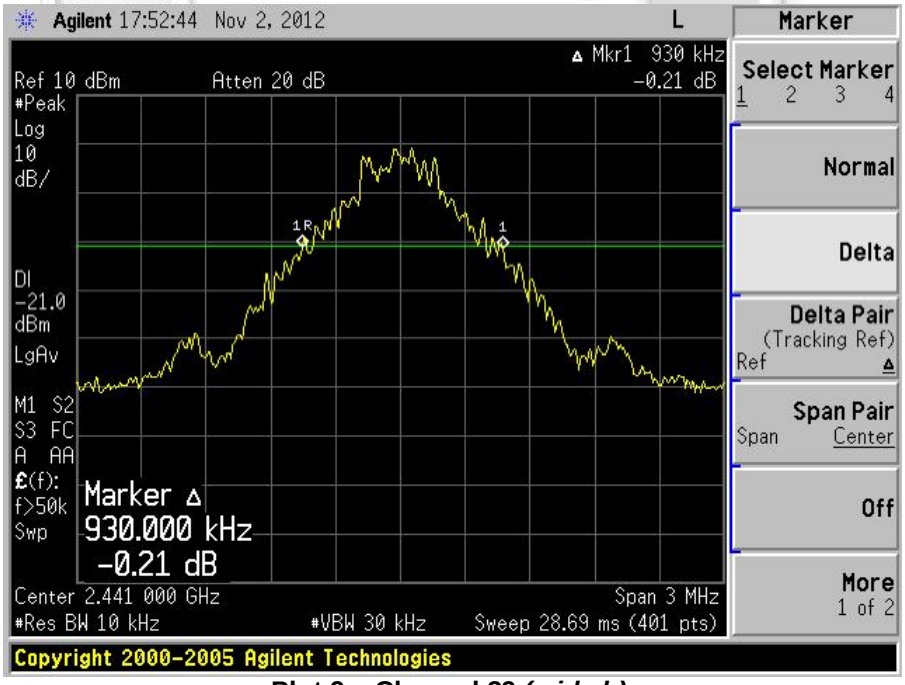


Plot 7 – Channel 78 *(upper ch)*

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots

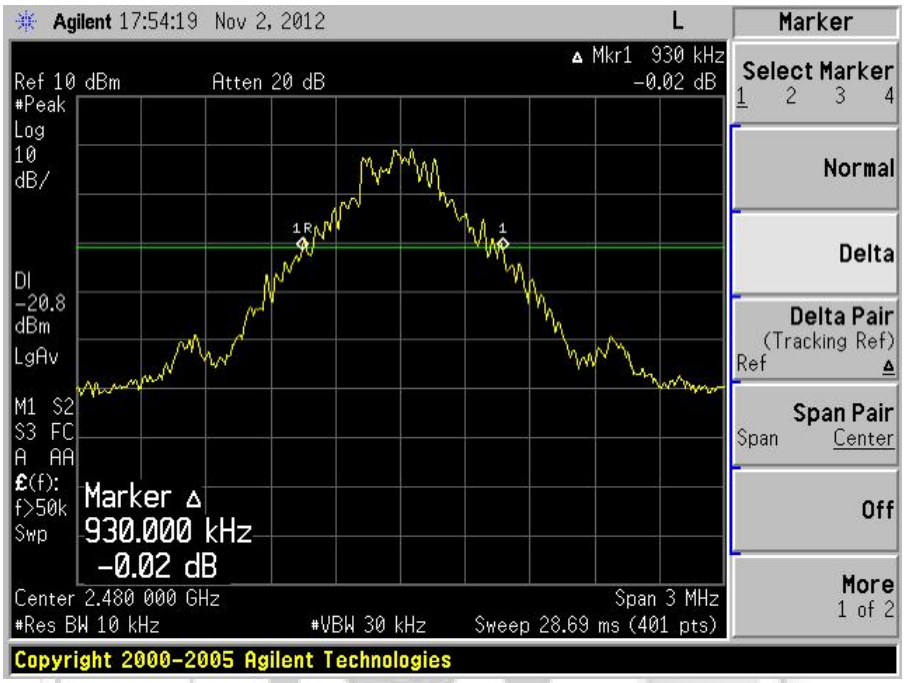


Plot 8 – Channel 0 *(lower ch)*



Plot 9 – Channel 39 *(mid ch)*

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots



Plot 10 – Channel 78 *(upper ch)*

47 CFR 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.

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

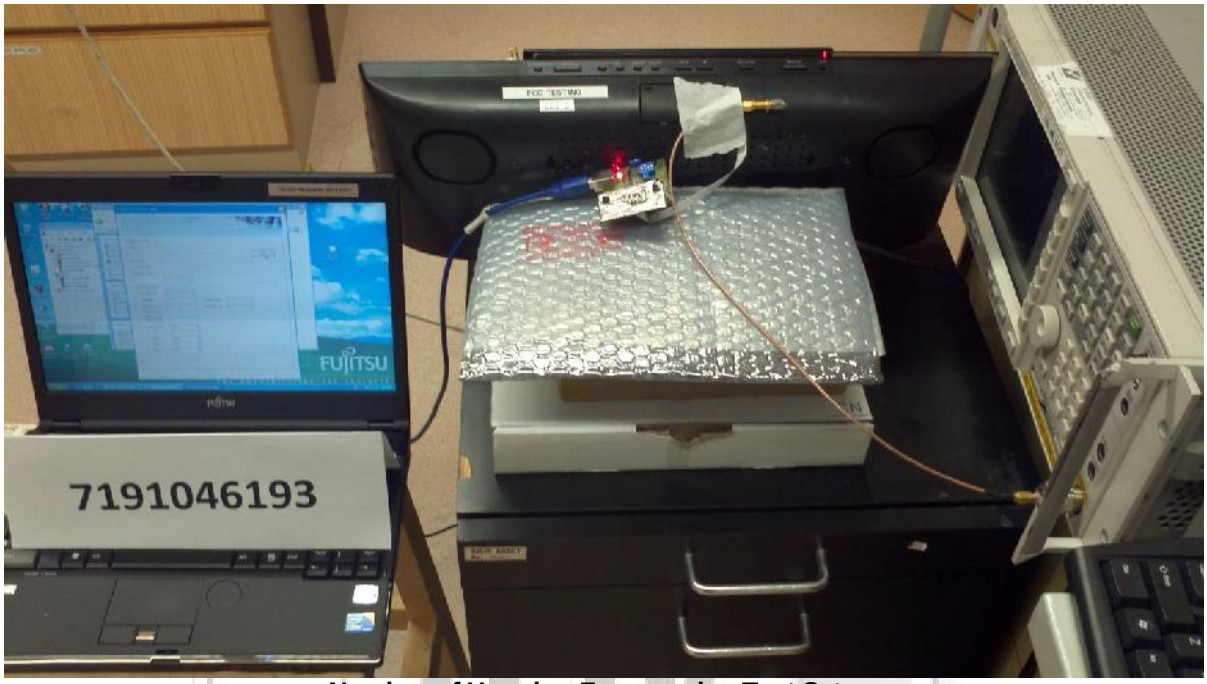
Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	20 Jun 2013

47 CFR 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 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR 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 2.39GHz and 2.420GHz.
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. 2.441GHz to 2.461GHz
   c. 2.461GHz to 2.4835GHz
6. The total number of hopping frequencies is the sum of the number of the hopping frequencies found for each span.



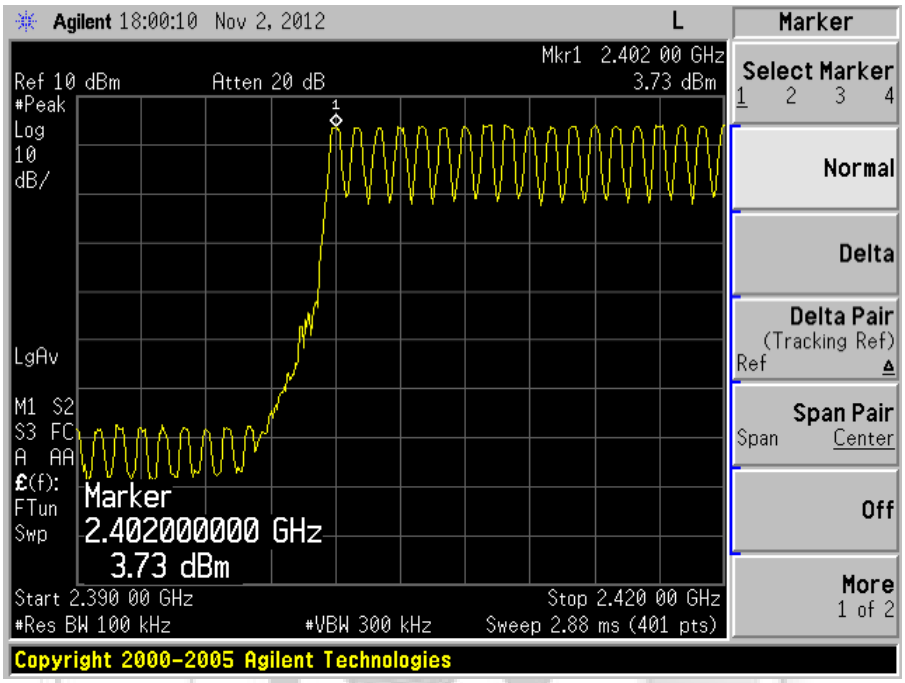
Number of Hopping Frequencies Test Setup

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

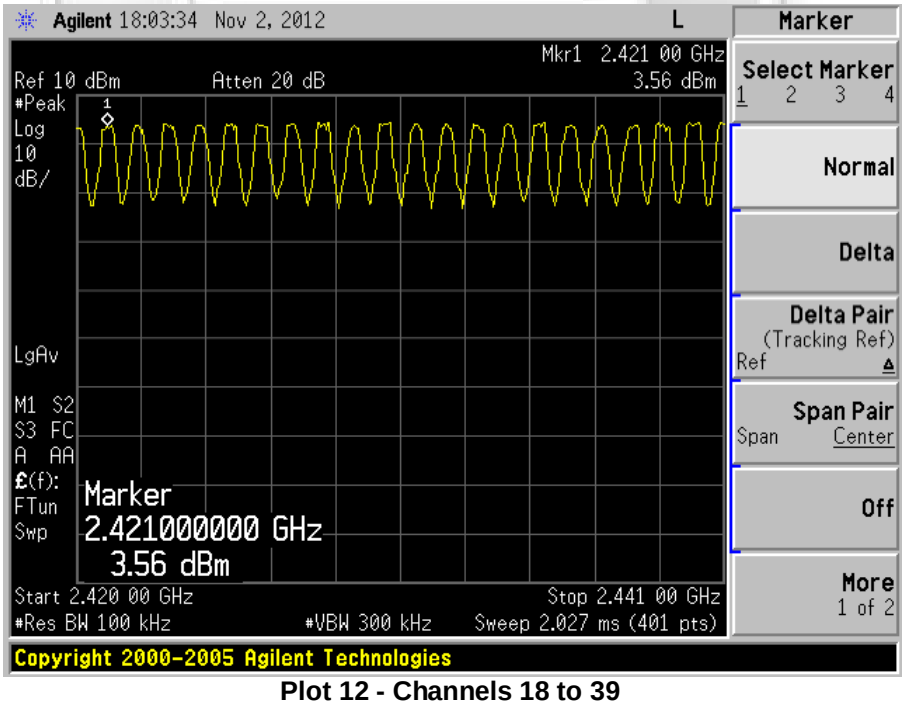
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	11 - 14	Relative Humidity	55%
Mode	EDR (worst mode)	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

The EUT was found to have 79 *(total number of ch)* hopping frequencies. Please refer to the attached plots.

Number Of Hopping Frequencies Plots

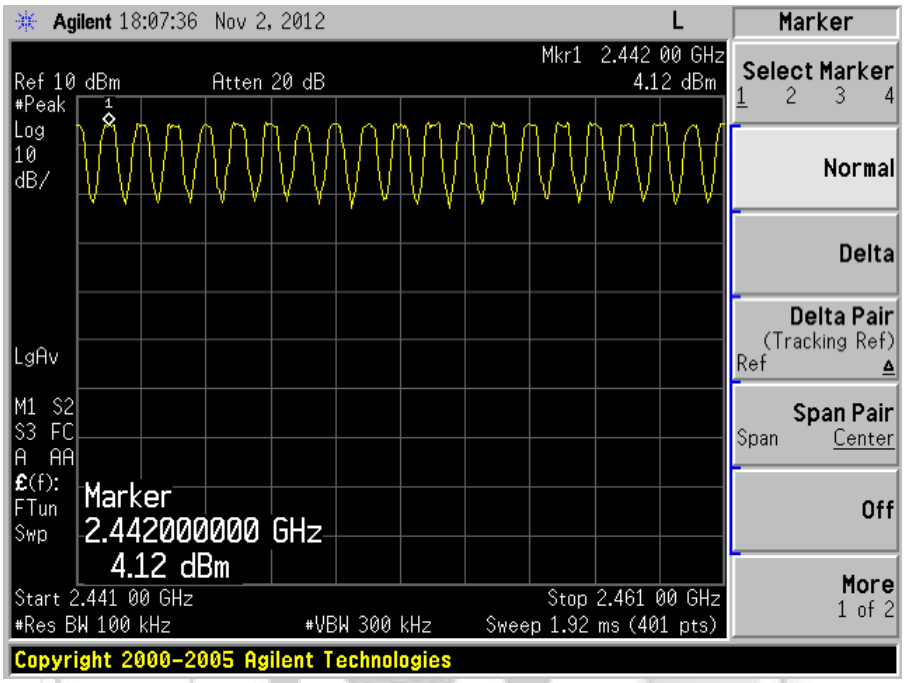


Plot 11 - Channels 0 to 18

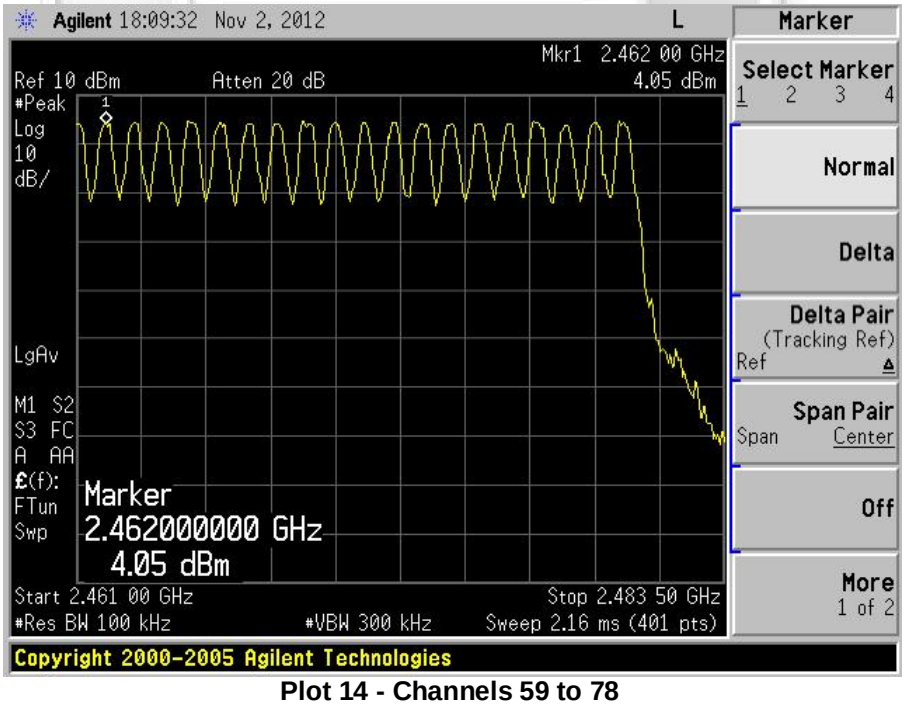


Plot 12 - Channels 18 to 39

Number Of Hopping Frequencies Plots



Plot 13 - Channels 39 to 59



Plot 14 - Channels 59 to 78

47 CFR 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.

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

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	20 Jun 2013

47 CFR 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.

47 CFR 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 2.402GHz *(lower ch)* 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 based on general expression as shown below:
   Average Frequency Dwell Time = [measured time slot length x hopping rate / number of hopping channels] x [0.4 x number of hopping channels]
5. The steps 2 to 4 were repeated with the center frequency of the spectrum analyser were set to 2.441GHz *(mid ch)* and 2.480GHz *(upper ch)* respectively.

Average Frequency Dwell Time Test Setup

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

Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	15 - 17	Relative Humidity	55%
Hopping Rate	1600 hops / s	Atmospheric Pressure	1030mbar
Number of Hopping Channels	79 channels	Tested By	Kyaw Soe Hein
Mode	BDR	Packet Type	DH5

Channel	Channel Frequency (GHz)	Measured Time Slot Length (ms)	Average Frequency Dwell Time (s)	Average Occupancy Limit (s)
0 *(lower ch)*	2.402	3.7333	0.1200	0.4
39 *(mid ch)*	2.441	3.7500	0.1200	0.4
78 *(upper ch)*	2.480	3.7500	0.1200	0.4

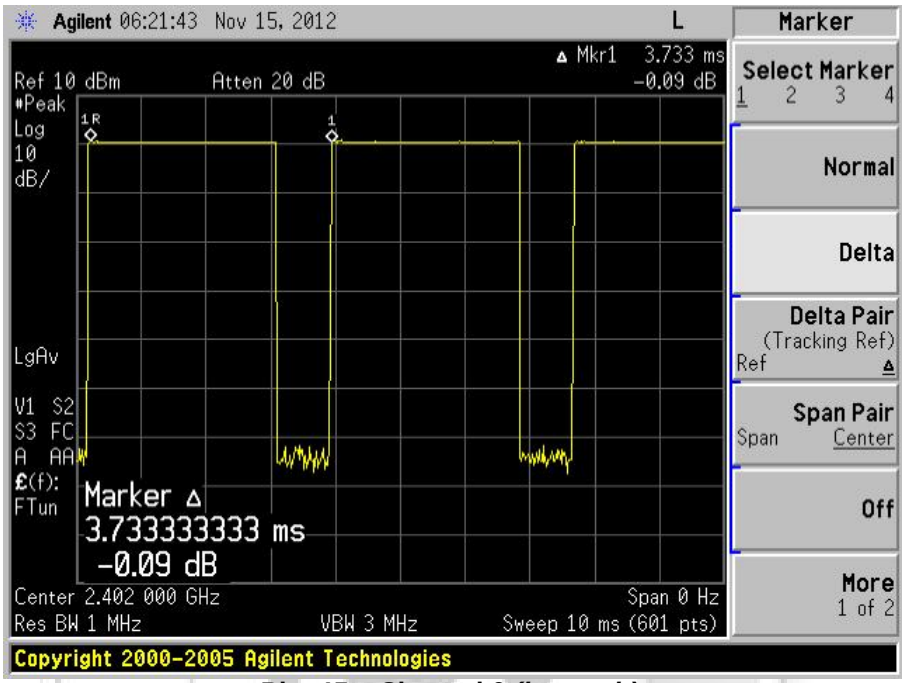
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	18 - 20	Relative Humidity	55%
Hopping Rate	1600 hops / s	Atmospheric Pressure	1030mbar
Number of Hopping Channels	79 channels	Tested By	Kyaw Soe Hein
Mode	EDR	Packet Type	DH5

Channel	Channel Frequency (GHz)	Measured Time Slot Length (ms)	Average Frequency Dwell Time (s)	Average Occupancy Limit (s)
0 *(lower ch)*	2.402	3.7500	0.1200	0.4
39 *(mid ch)*	2.441	3.7500	0.1200	0.4
78 *(upper ch)*	2.480	3.7500	0.1200	0.4

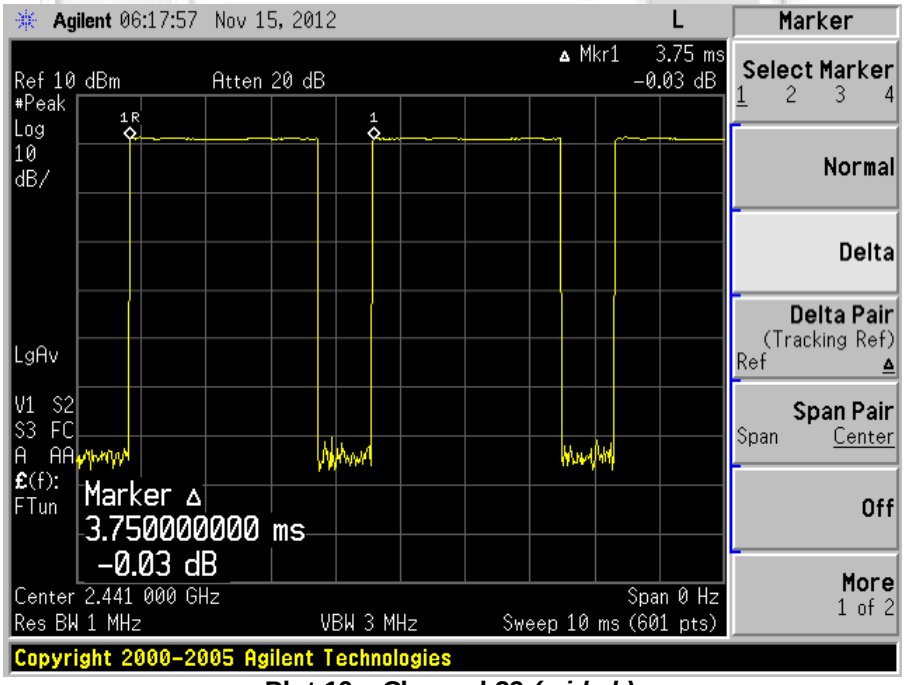
Notes

1. The EUT operates based on 1-slot transmission and 1-slot reception basis. As such, there are [1600 / (1 + 1)] transmissions per second and the time occupancy per channel is [measured time slot length / 2].
2. Average Frequency Dwell Time = [measured time slot length / 2 x hopping rate / 2 / number of hopping channels] x [0.4 x number of hopping channels]

Average Frequency Dwell Time Plots

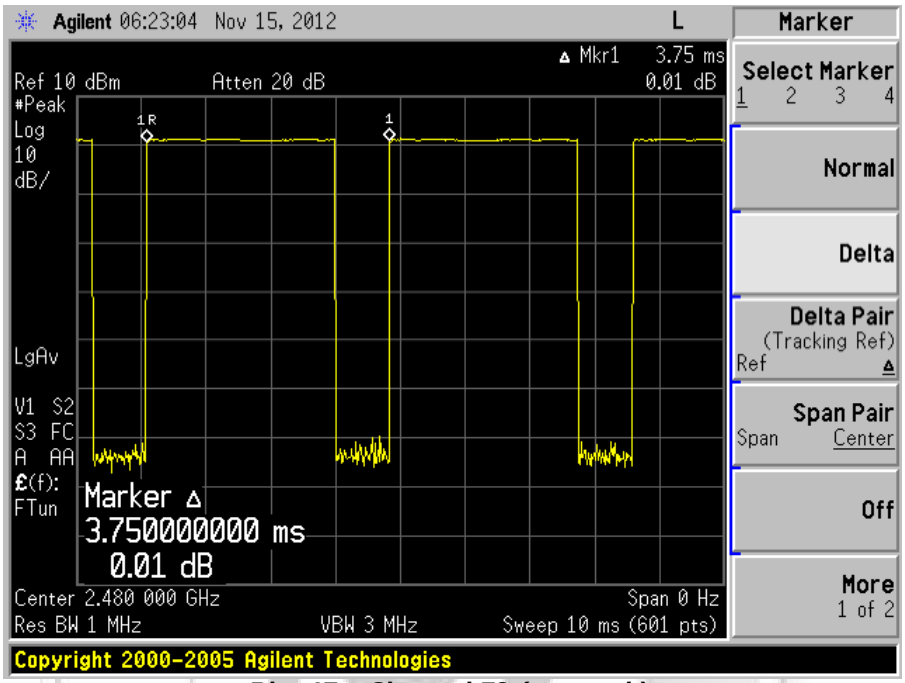


Plot 15 – Channel 0 *(lower ch)*



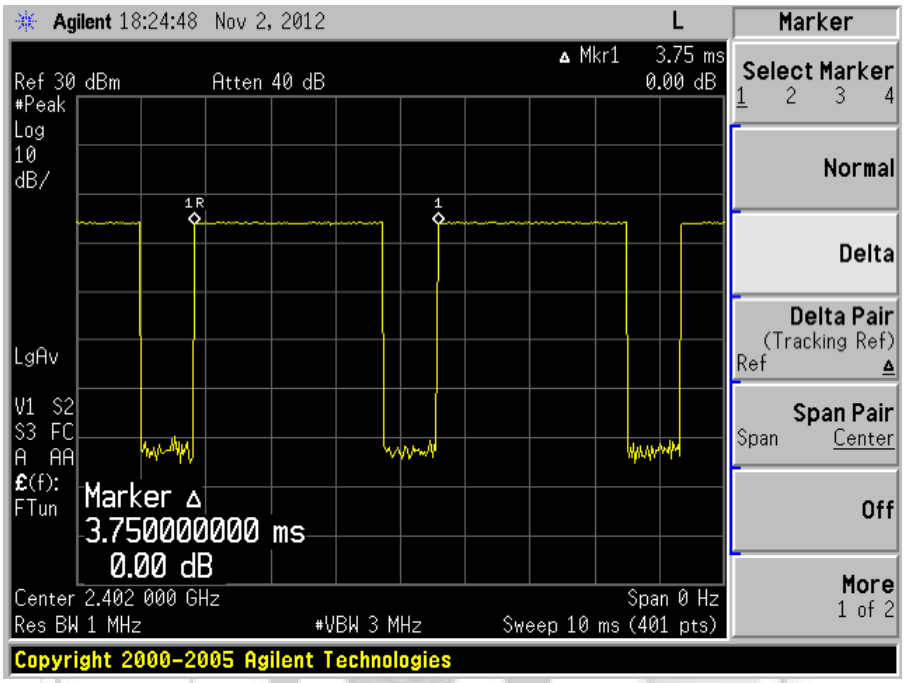
Plot 16 – Channel 39 *(mid ch)*

Average Frequency Dwell Time Plots

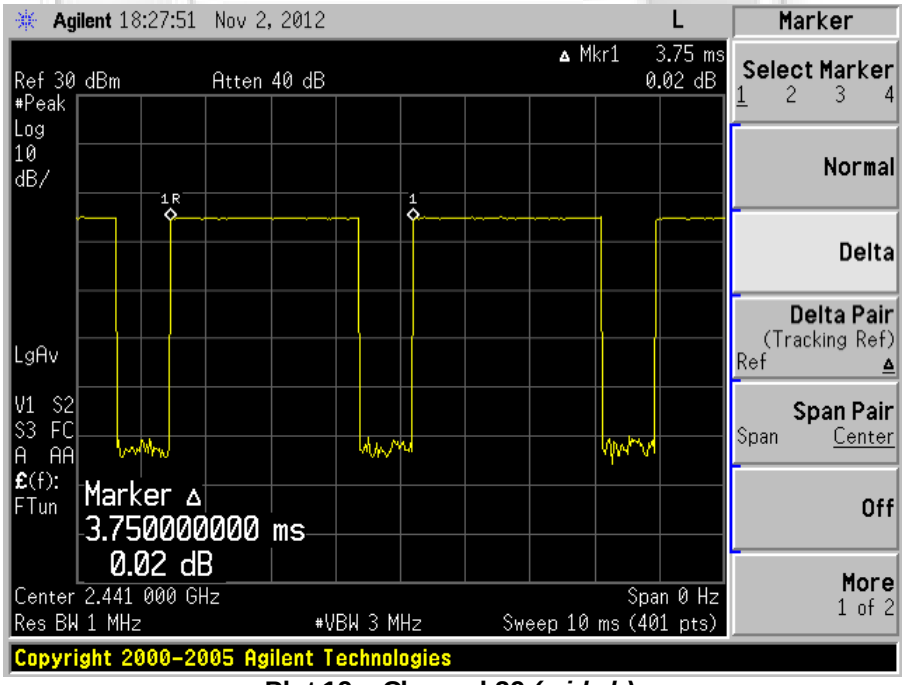


Plot 17 – Channel 78 *(upper ch)*

Average Frequency Dwell Time Plots

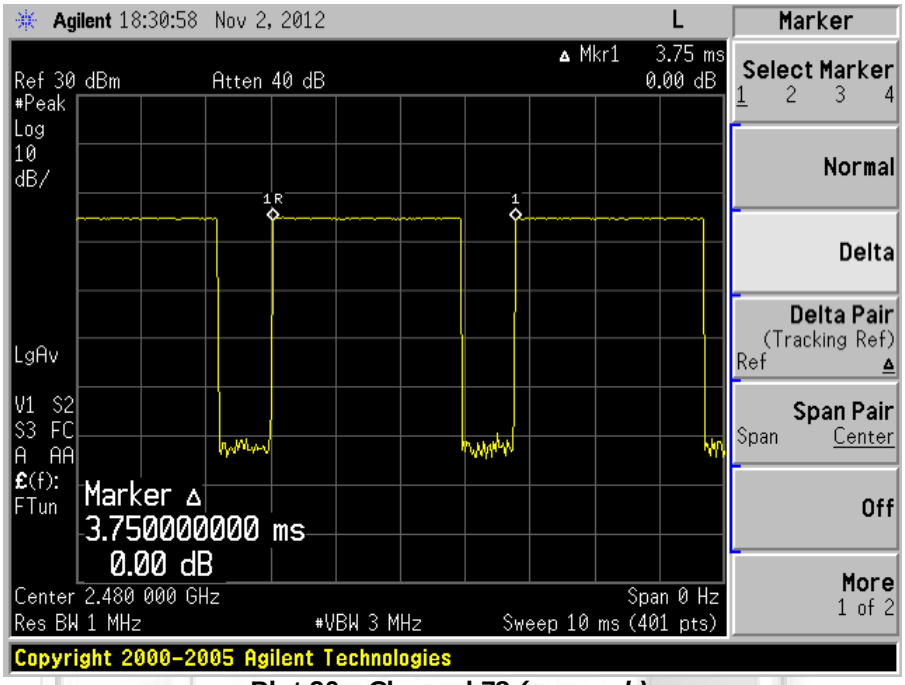


Plot 18 – Channel 0 *(lower ch)*



Plot 19 – Channel 39 *(mid ch)*

Average Frequency Dwell Time Plots



Plot 20 – Channel 78 *(upper ch)*

47 CFR 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).

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

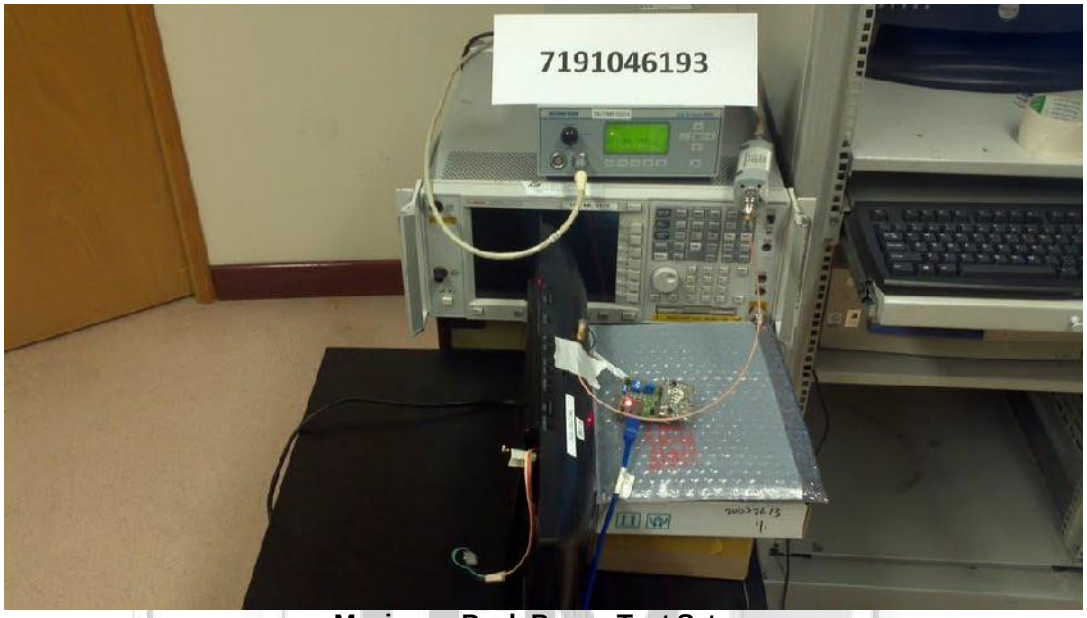
Instrument	Model	S/No	Cal Due Date
Boonton RF Power Meter	4532	72901	20 Jun 2013
Boonton Power Sensor	56218-S/1	1417	20 Jun 2013

47 CFR 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 power meter, which set into power analyser mode 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)(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 0 (2.402GHz) *(lower ch)*.
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 39 (2.441GHz) *(mid ch)* and Channel 78 (2.480GHz) *(upper ch)* respectively.



Maximum Peak Power Test Setup

47 CFR FCC Part 15.247(b)(1) Maximum Peak Power Results

Test Input Power	110V 50Hz	Temperature	22°C
Antenna Gain	1.13 dBi	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Maximum EIRP (W)	Limit (W)
0 *(lower ch)*	2.402	0.0015	0.0019	1.0
39 *(mid ch)*	2.441	0.0017	0.0022	1.0
78 *(upper ch)*	2.480	0.0017	0.0022	1.0

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.

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 Spectrum Analyzer	E4440A	MY45304764	20 Jun 2013

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 X (2.402GHz) *(lower ch)*.
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) *(mid h)* and Channel 78 (2.480GHz) *(upper ch)* respectively.

RF Conducted Spurious Emissions Test Setup

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

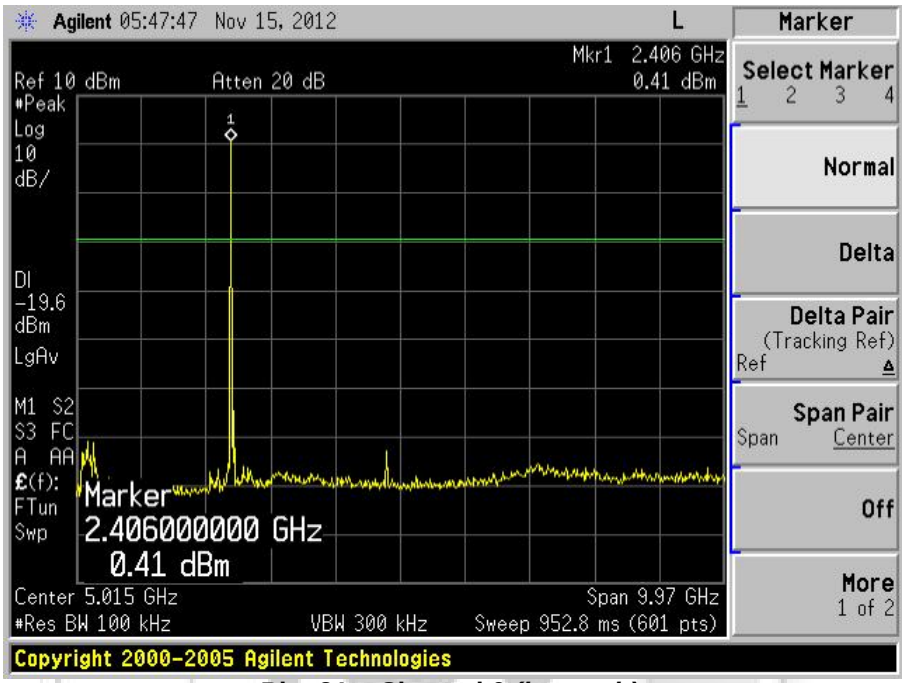
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	21 - 26	Relative Humidity	55%
Mode	BDR	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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

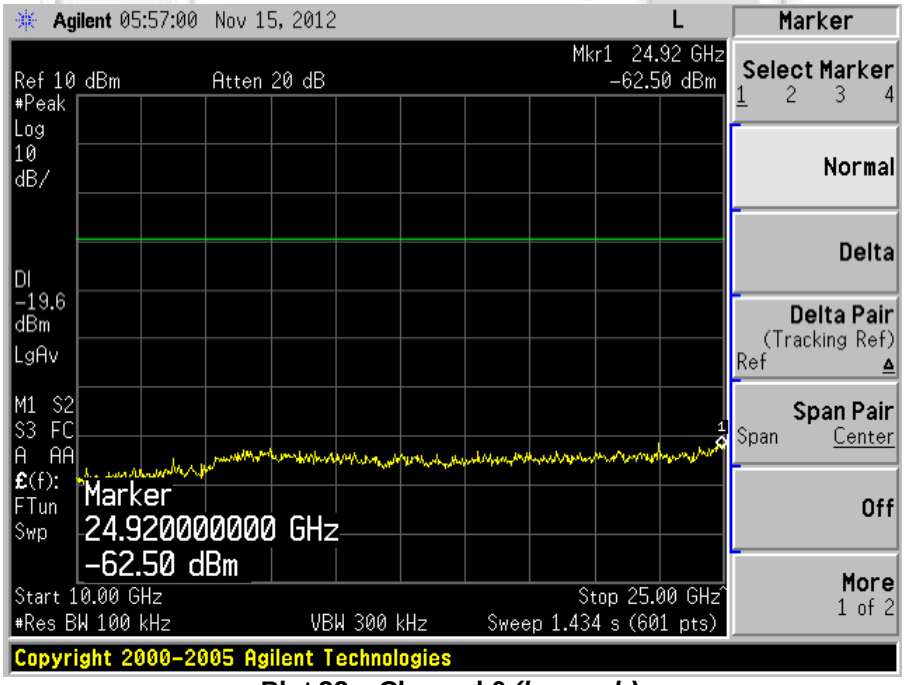
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	27 - 32	Relative Humidity	55%
Mode	EDR	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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

RF Conducted Spurious Emissions Plots

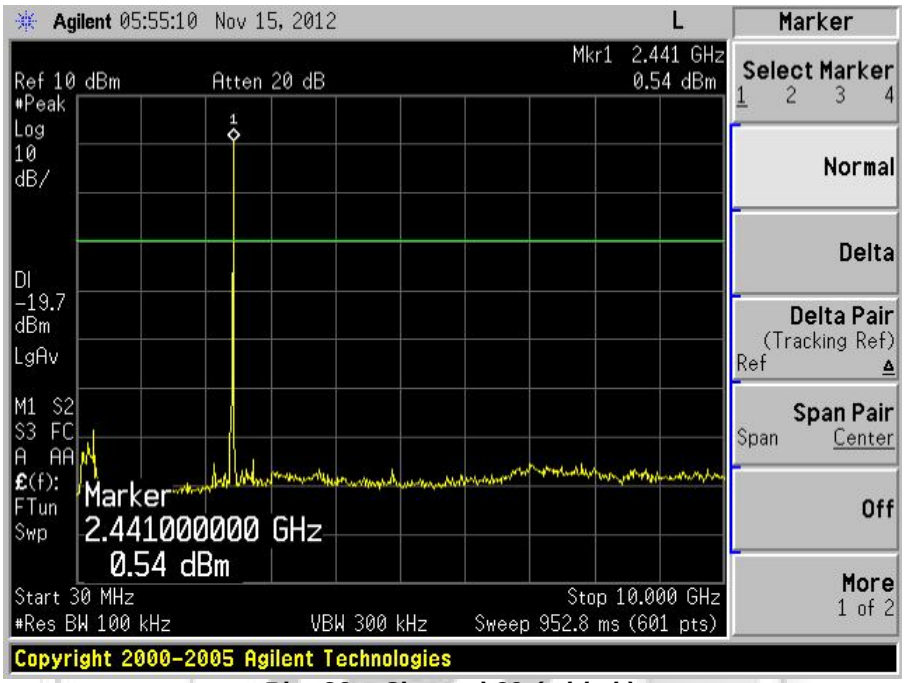


Plot 21 – Channel 0 *(lower ch)*

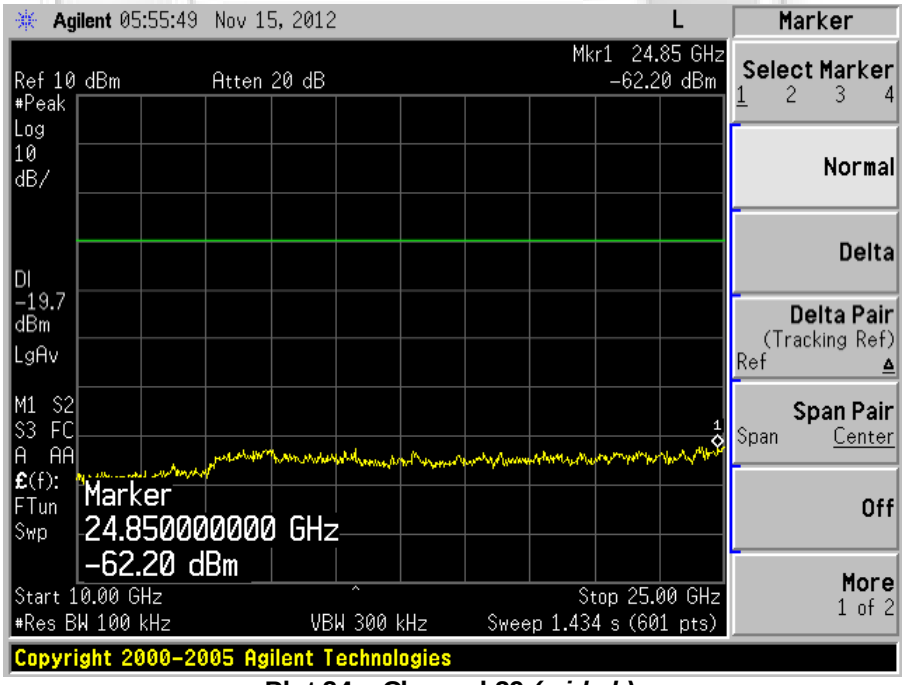


Plot 22 – Channel 0 *(lower ch)*

RF Conducted Spurious Emissions Plots

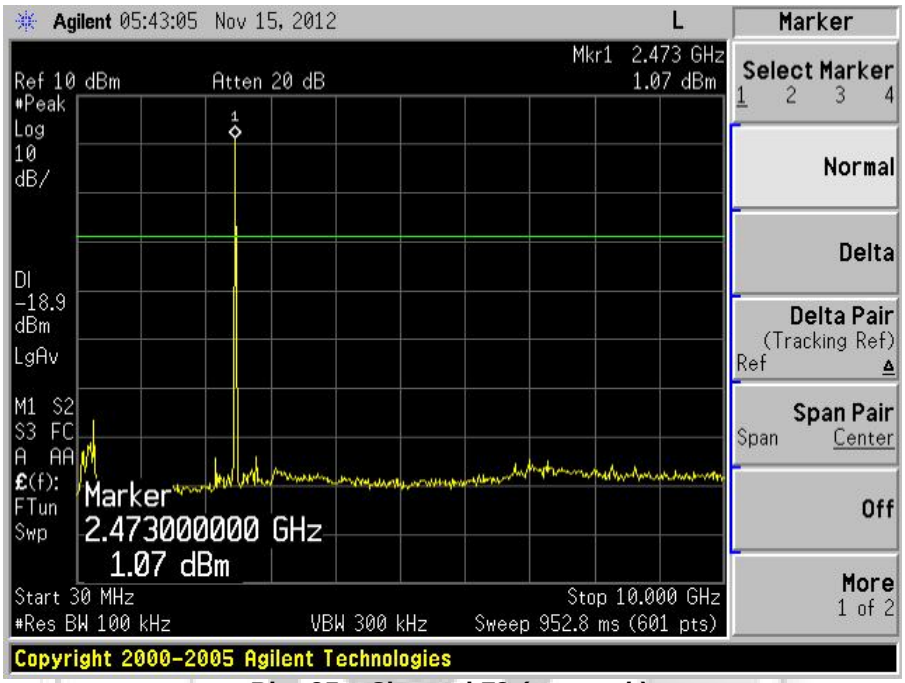


Plot 23 – Channel 39 *(mid ch)*

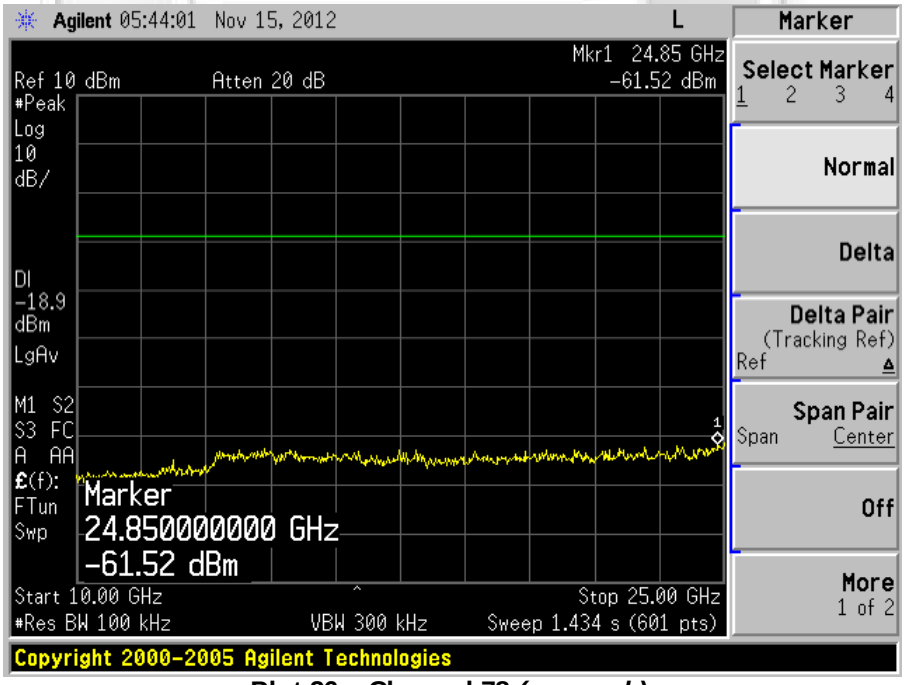


Plot 24 – Channel 39 *(mid ch)*

RF Conducted Spurious Emissions Plots

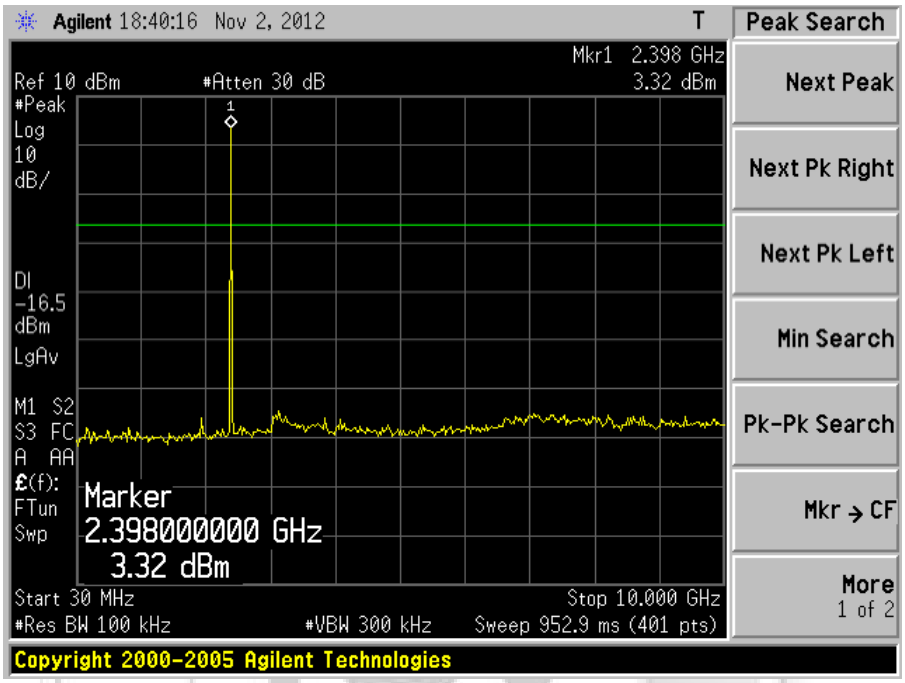


Plot 25 – Channel 78 *(upper ch)*

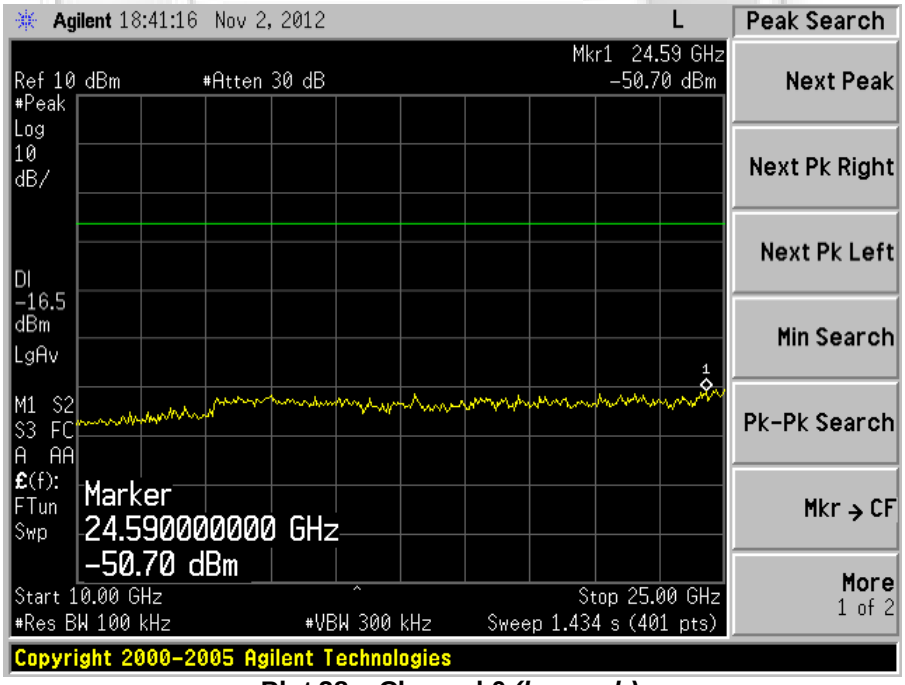


Plot 26 – Channel 78 *(upper ch)*

RF Conducted Spurious Emissions Plots

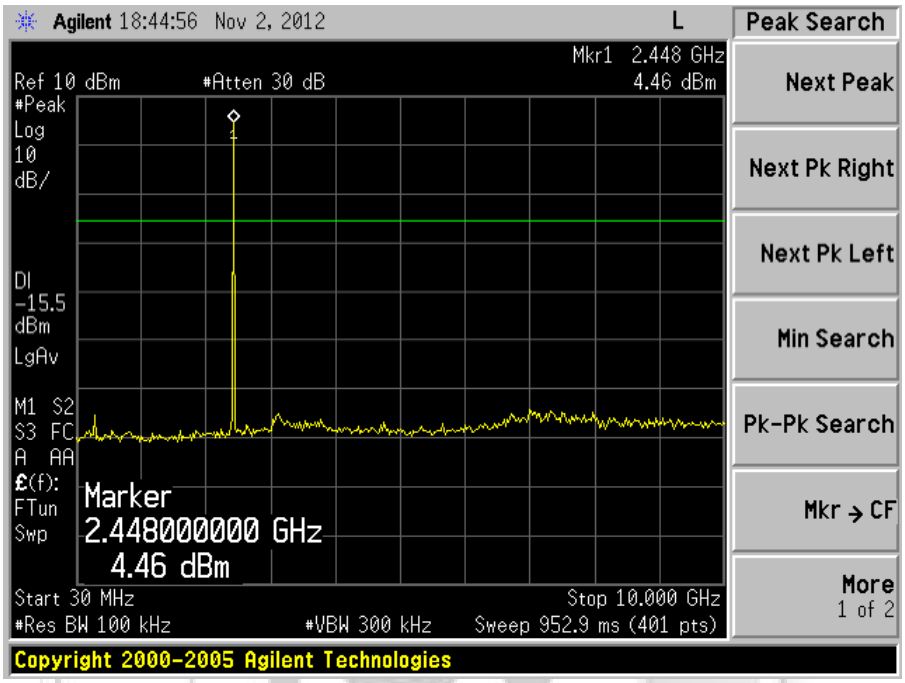


Plot 27 – Channel 0 *(lower ch)*

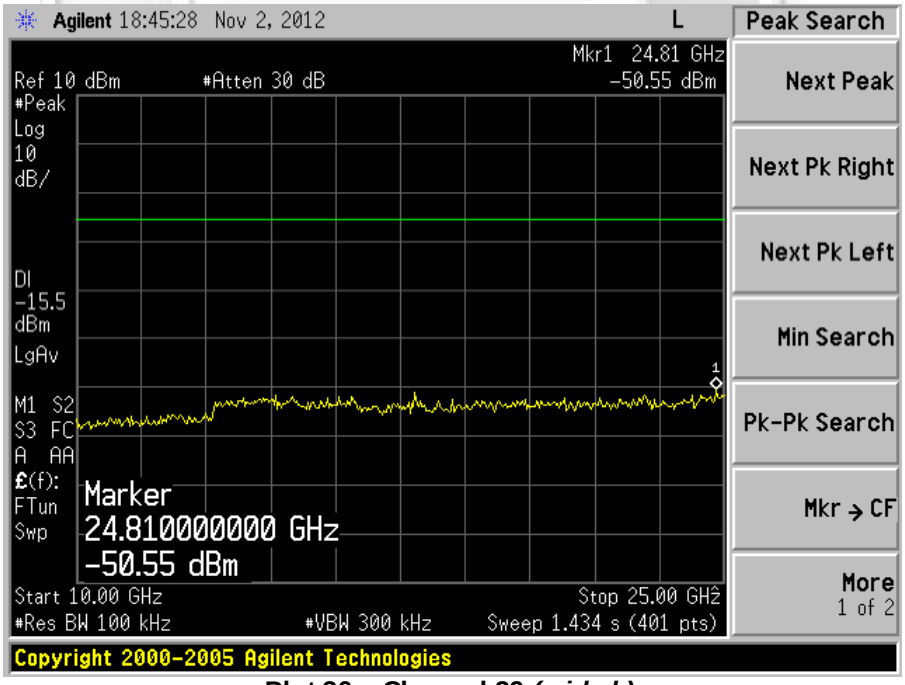


Plot 28 – Channel 0 *(lower ch)*

RF Conducted Spurious Emissions Plots

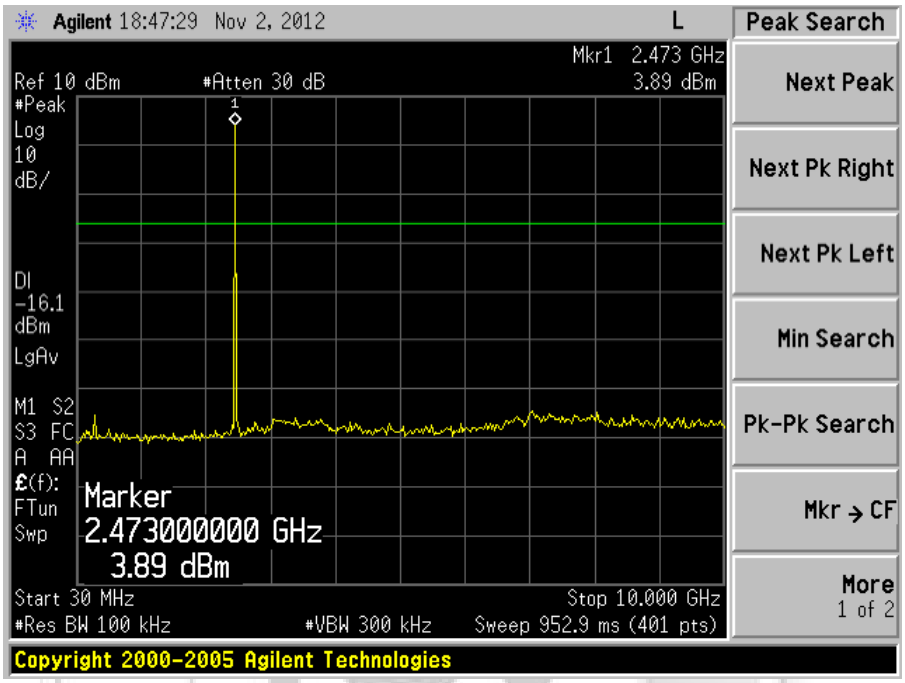


Plot 29 – Channel 39 *(mid ch)*

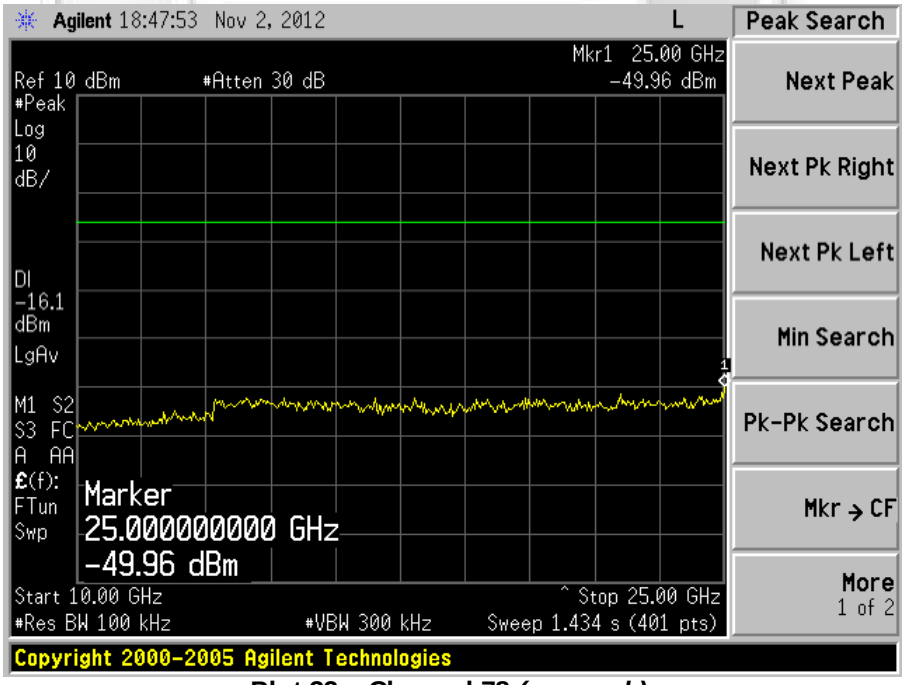


Plot 30 – Channel 39 *(mid ch)*

RF Conducted Spurious Emissions Plots



Plot 31 – Channel 78 *(upper ch)*



Plot 32 – Channel 78 *(upper ch)*

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 Spectrum Analyzer	E4440A	MY45304764	20 Jun 2013

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 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 (Conducted) Test Setup

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

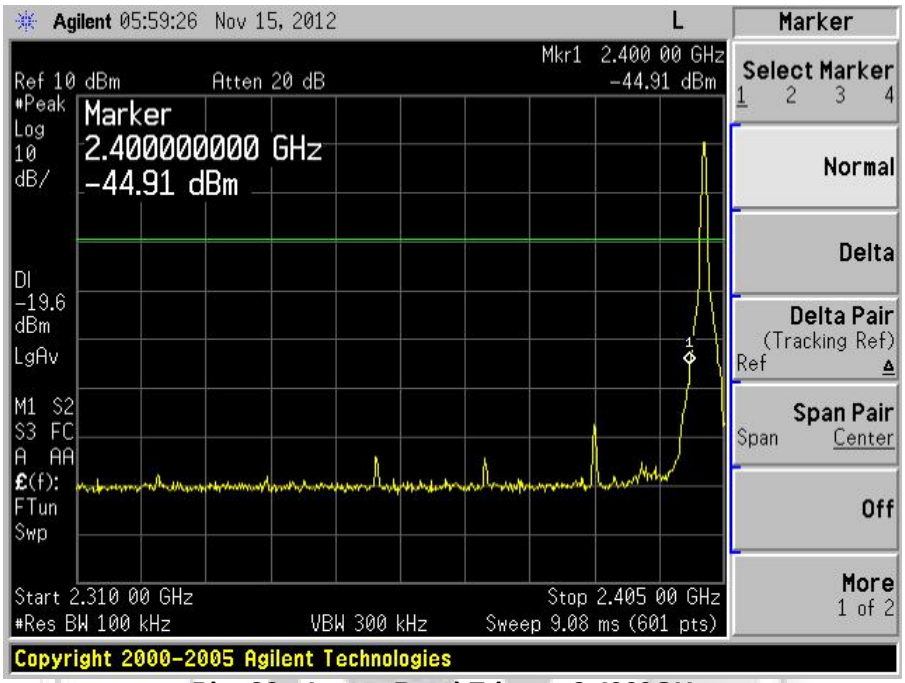
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	33 - 34	Relative Humidity	55%
Mode	BDR	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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

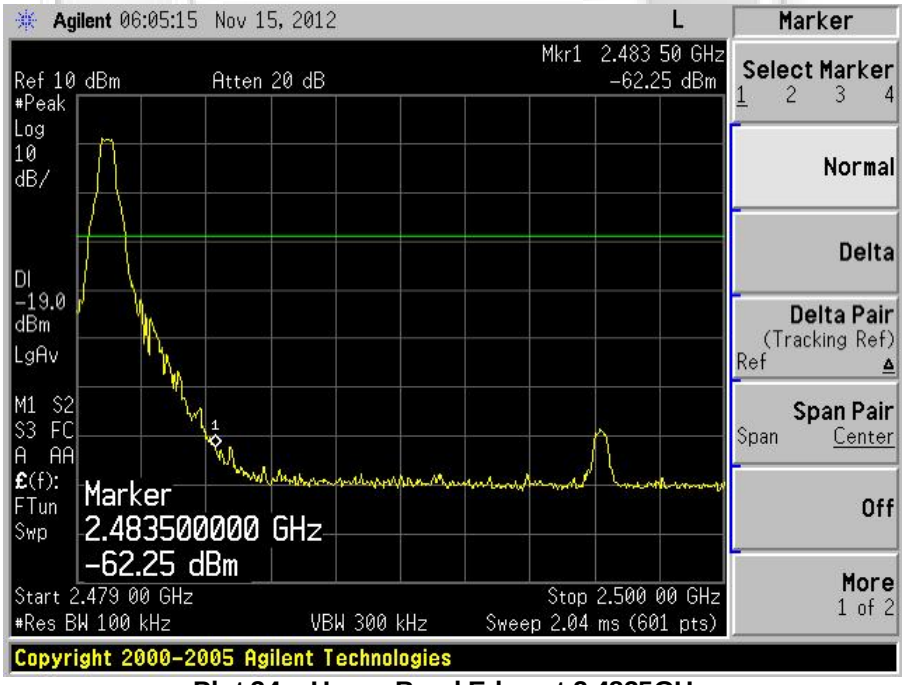
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	35 - 36	Relative Humidity	55%
Mode	EDR	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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

Band Edge Compliance (Conducted) Plots

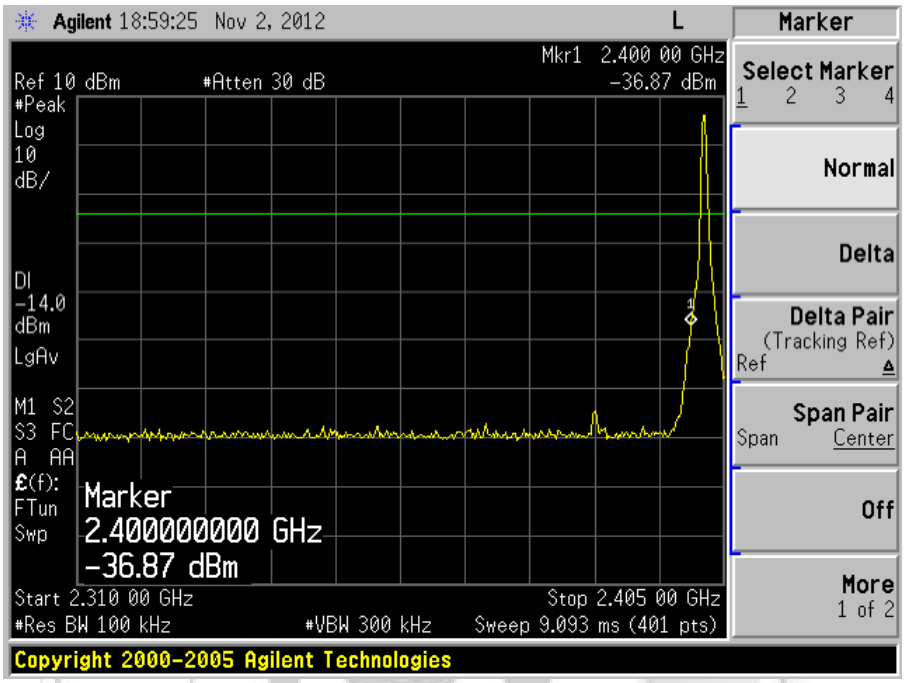


Plot 33 – Lower Band Edge at 2.4000GHz

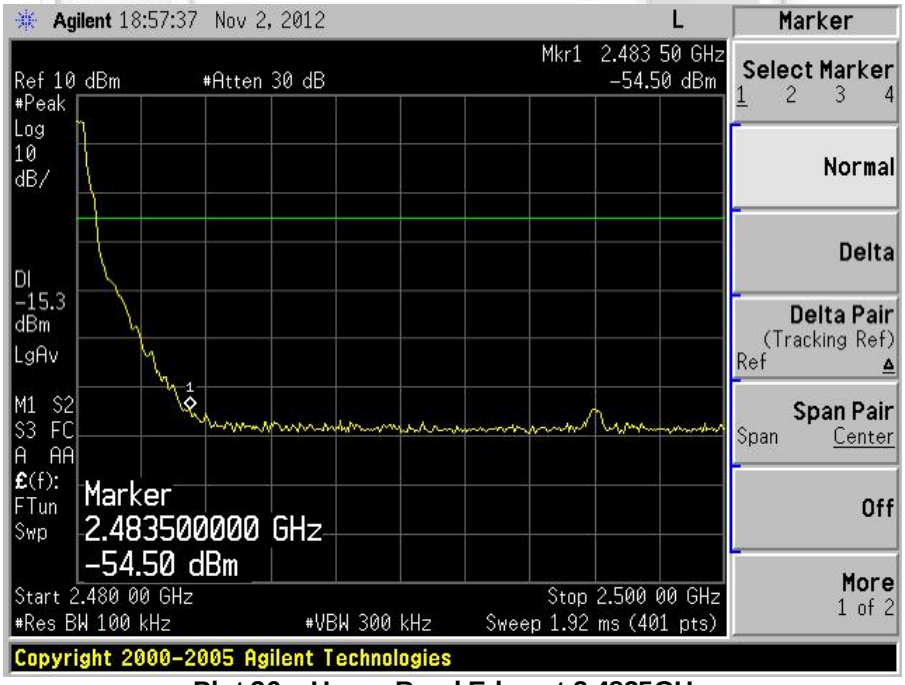


Plot 34 – Upper Band Edge at 2.4835GHz

Band Edge Compliance (Conducted) Plots



Plot 35 – Lower Band Edge at 2.4000GHz



Plot 36 – Upper Band Edge at 2.4835GHz

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

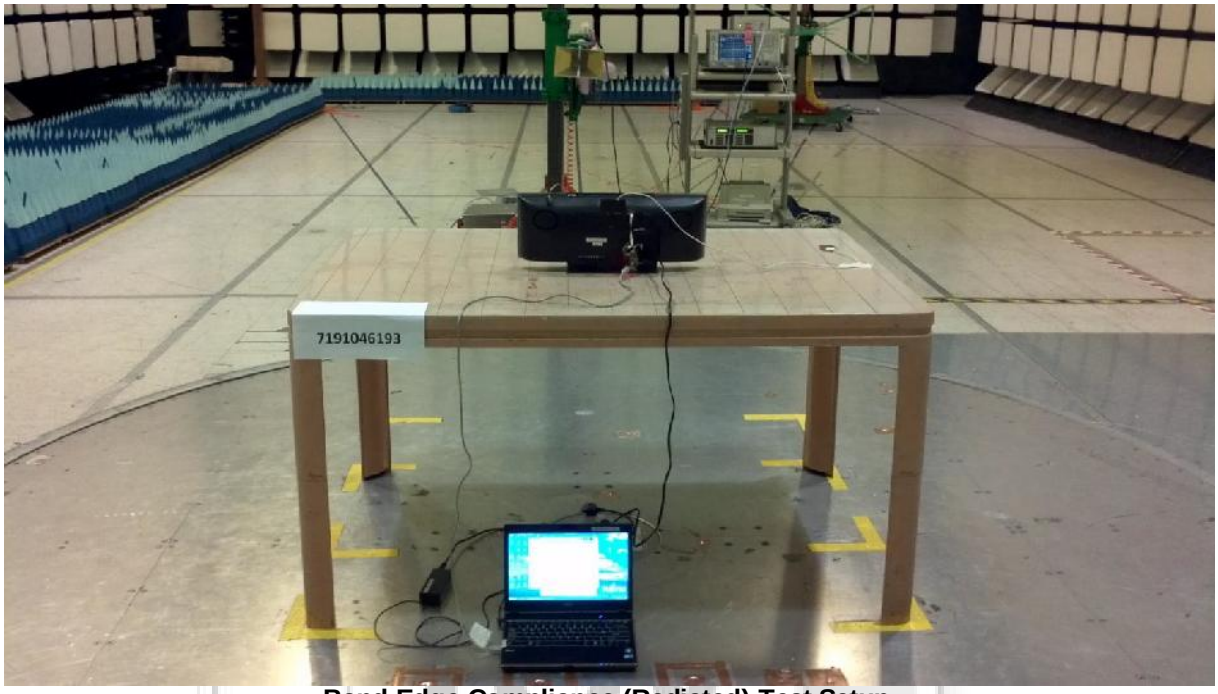
Instrument	Model	S/No	Cal Due Date
R&S Test Receiver – ESI1	ESI40	100010	05 Jun 2013
EMCO Horn Antenna(1GHz-18GHz) – H14 (Ref)	3115	0003-6087	12 Jul 2013
Agilent Preamplifier(1GHz-26.5GHz) (PA18)	8449D	3008A02305	07 Oct 2013

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 = 10kHz
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 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.



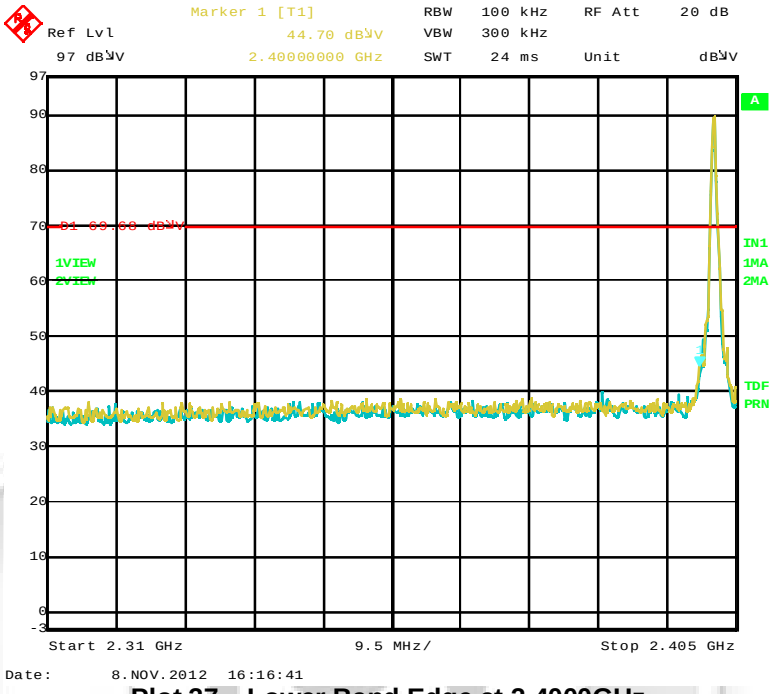
Band Edge Compliance (Radiated) Test Setup

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

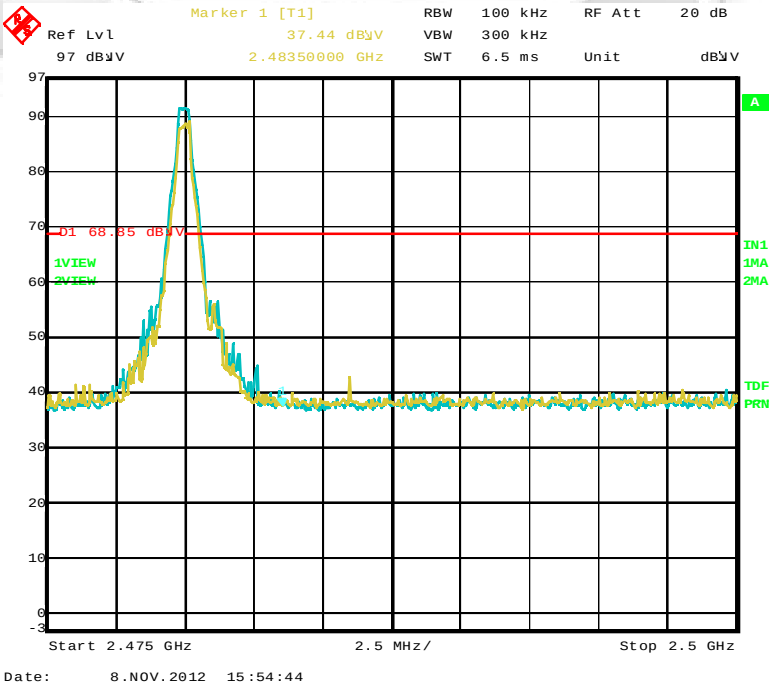
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	37 - 42	Relative Humidity	55%
Mode	EDR (worst mode)	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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

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

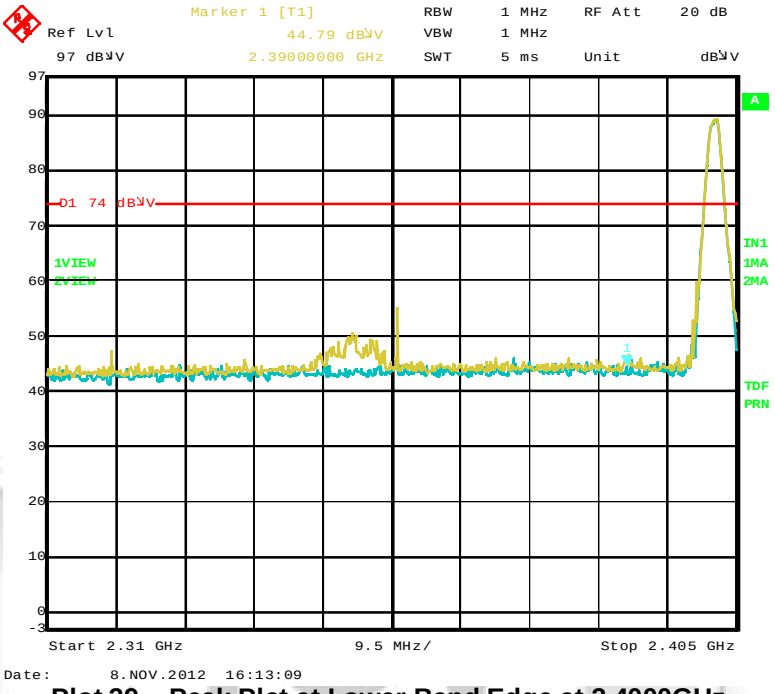


Plot 37 – Lower Band Edge at 2.4000GHz

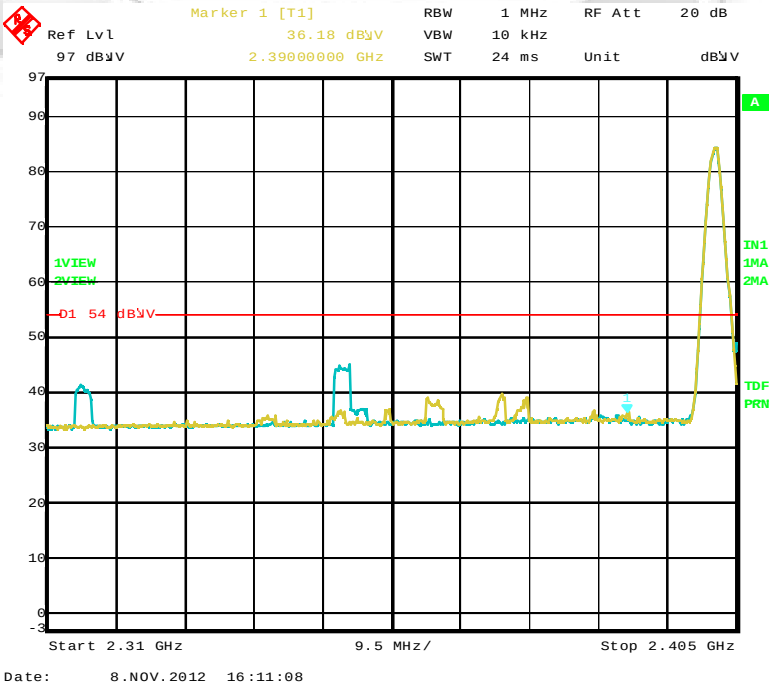


Plot 38 – Upper Band Edge at 2.4835GHz

Band Edge Compliance (Radiated) Plots (Restricted Band)

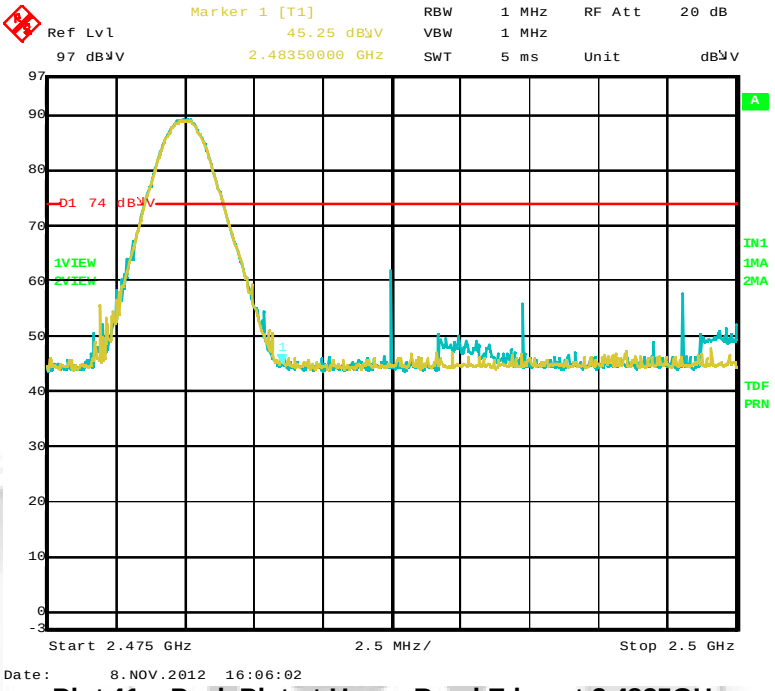


Plot 39 – Peak Plot at Lower Band Edge at 2.4000GHz

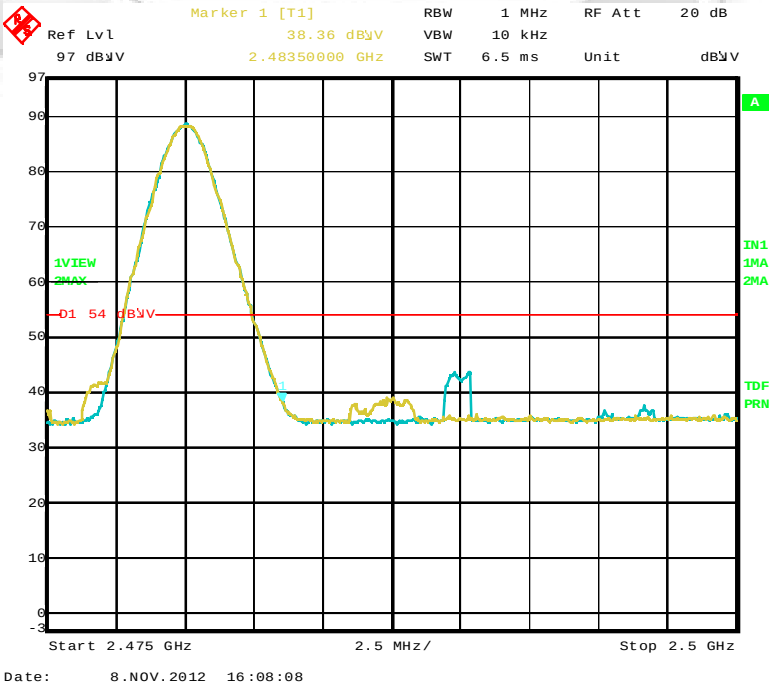


Plot 40 – Average Plot at Lower Band Edge at 2.4000GHz

Band Edge Compliance (Radiated) Plots (Restricted Band)



Plot 41 – Peak Plot at Upper Band Edge at 2.4835GHz



Plot 42 – 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 Spectrum Analyzer	E4440A	MY45304764	20 Jun 2013

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, non-hopping with transmitting frequency at Channel 0 (2.402GHz) *(lower ch)*.
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 (2.441GHz) *(mid ch)* and Channel 78 (2.480GHz) *(upper ch)* respectively.

Peak Power Spectral Density Test Setup

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

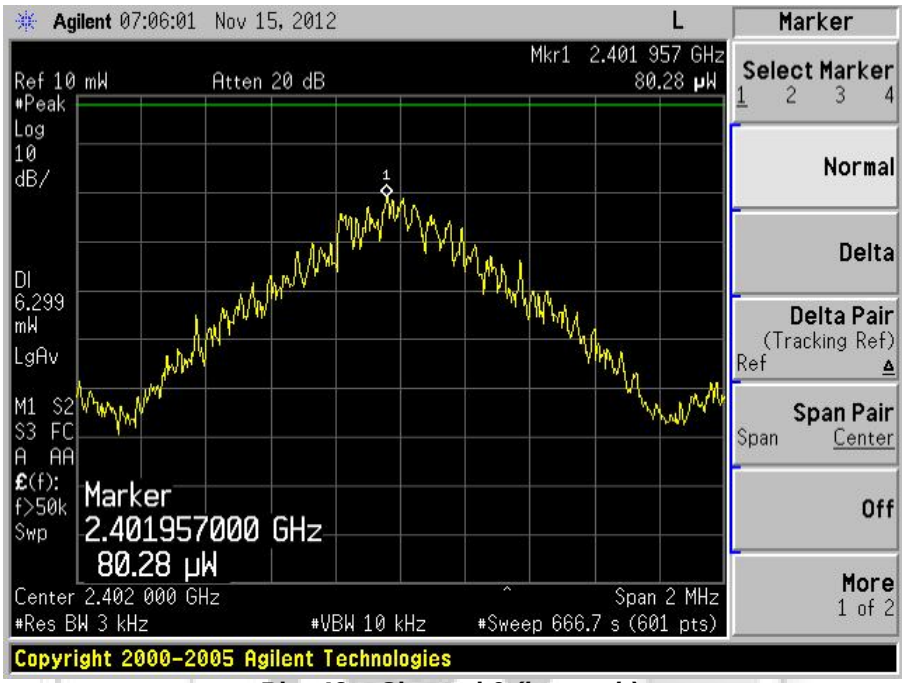
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	43 - 45	Relative Humidity	55%
Mode	BDR	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)
0 *(lower ch)*	2.402	0.0803	6.3
39 *(mid ch)*	2.441	0.0909	6.3
78 *(upper ch)*	2.480	0.0939	6.3

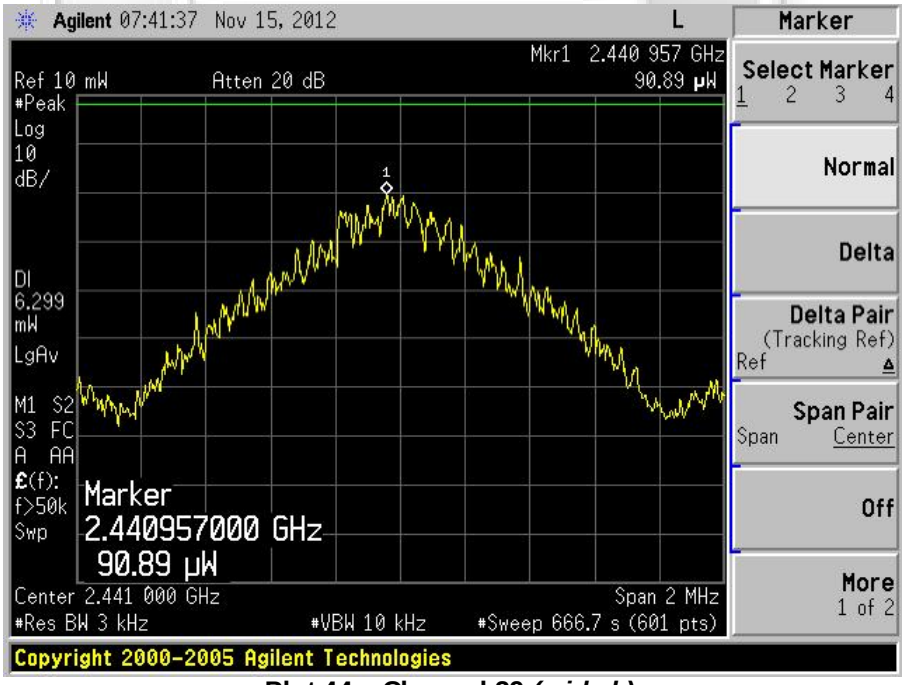
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	46 - 48	Relative Humidity	55%
Mode	EDR	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)
0 *(lower ch)*	2.402	0.3090	6.3
39 *(mid ch)*	2.441	0.2254	6.3
78 *(upper ch)*	2.480	0.2259	6.3

Peak Power Spectral Density Plots

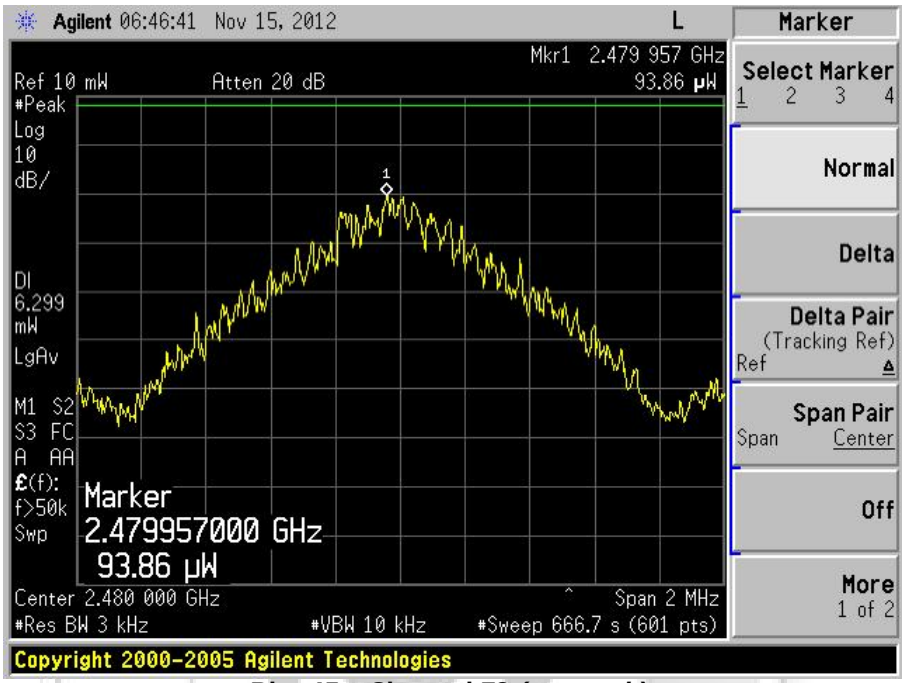


Plot 43 – Channel 0 *(lower ch)*



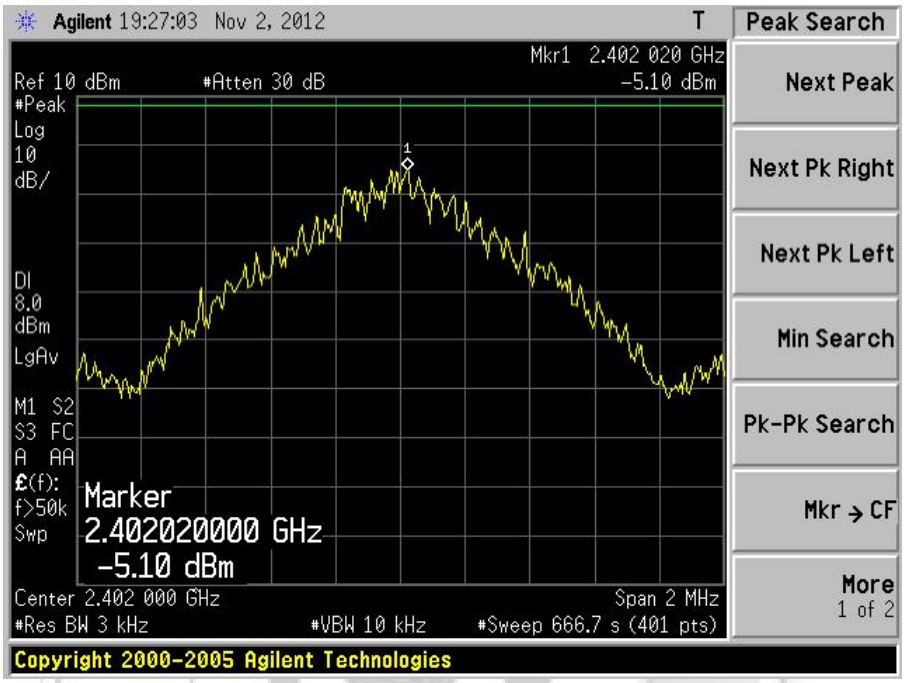
Plot 44 – Channel 39 *(mid ch)*

Peak Power Spectral Density Plots

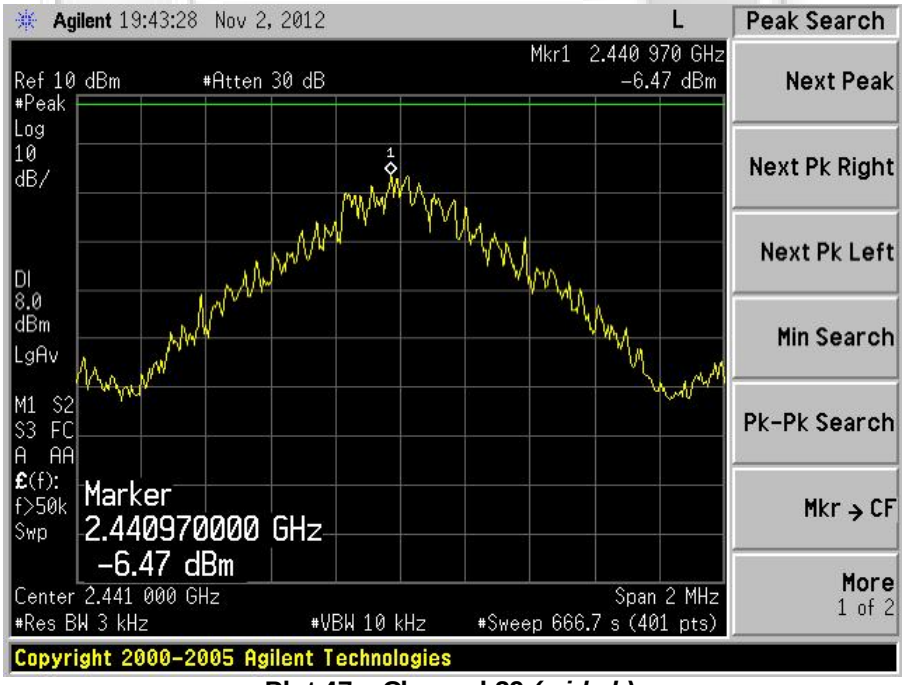


Plot 45 – Channel 78 *(upper ch)*

Peak Power Spectral Density Plots

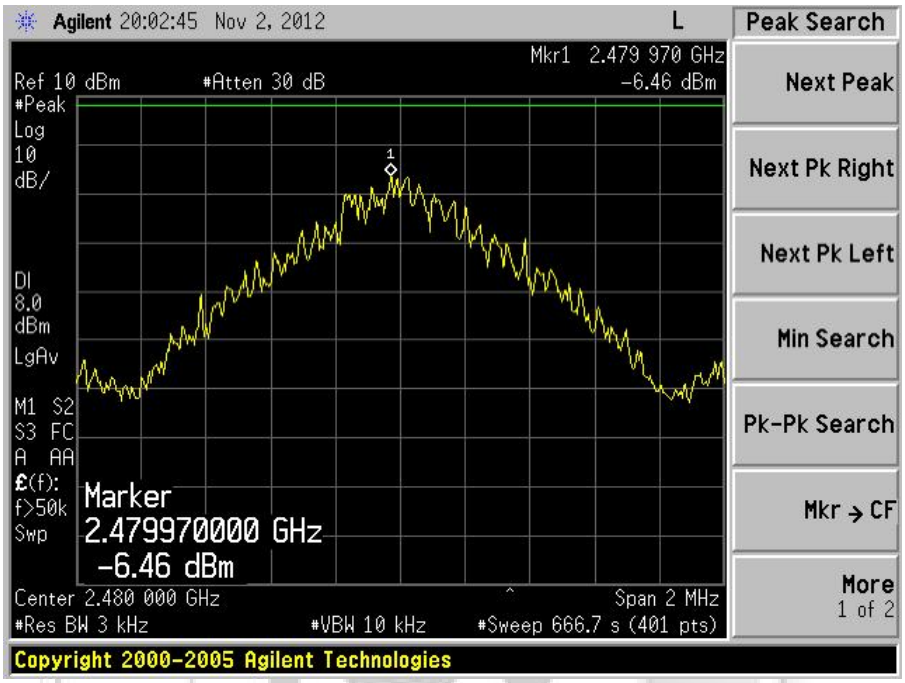


Plot 46 – Channel 0 ***(lower ch)***



Plot 47 – Channel 39 ***(mid ch)***

Peak Power Spectral Density Plots



Plot 48 – Channel 78 *(upper ch)*

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 = 0.0017 W
d = Test distance at 0.2m
G = Numerical isotropic gain, 1.30 (1.13dBi)

Substituting the relevant parameters into the formula:

$S = [(30GP) / 377d^2]$
$= 0.0044\ W/m^2$
$= 0.0004\ mW/cm^2$

∴ The power density of the EUT at 20cm distance is 0.0004 mW/cm^2 based on the above computation and found to be lower thant the power density limit of 1.0mW/cm^2.

PSB Singapore

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.

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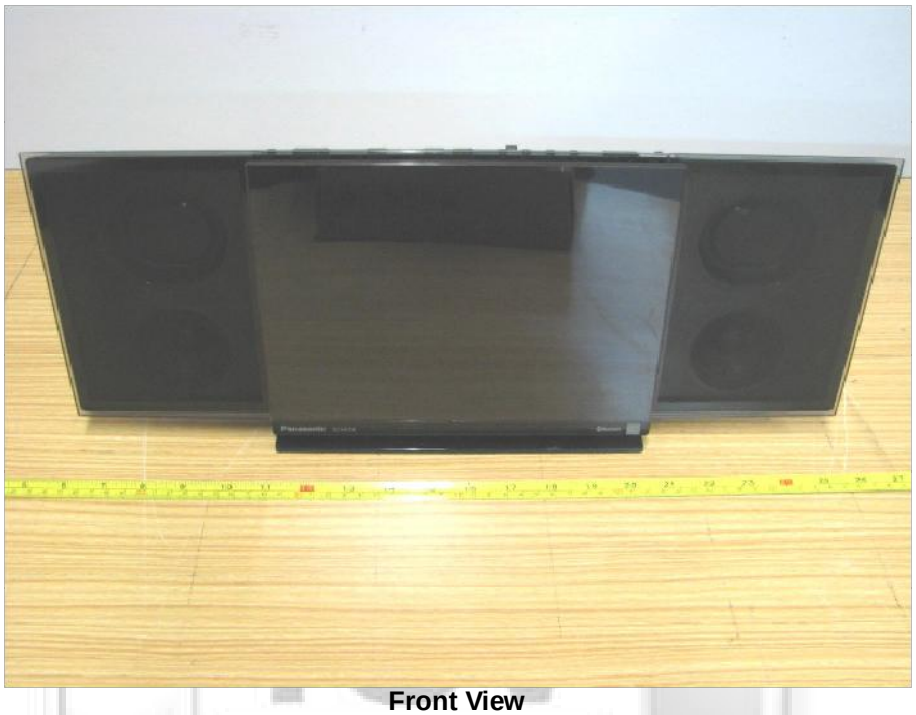
5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

July 2011

ANNEX A

EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS



Front View

Rear View

EUT PHOTOGRAPHS

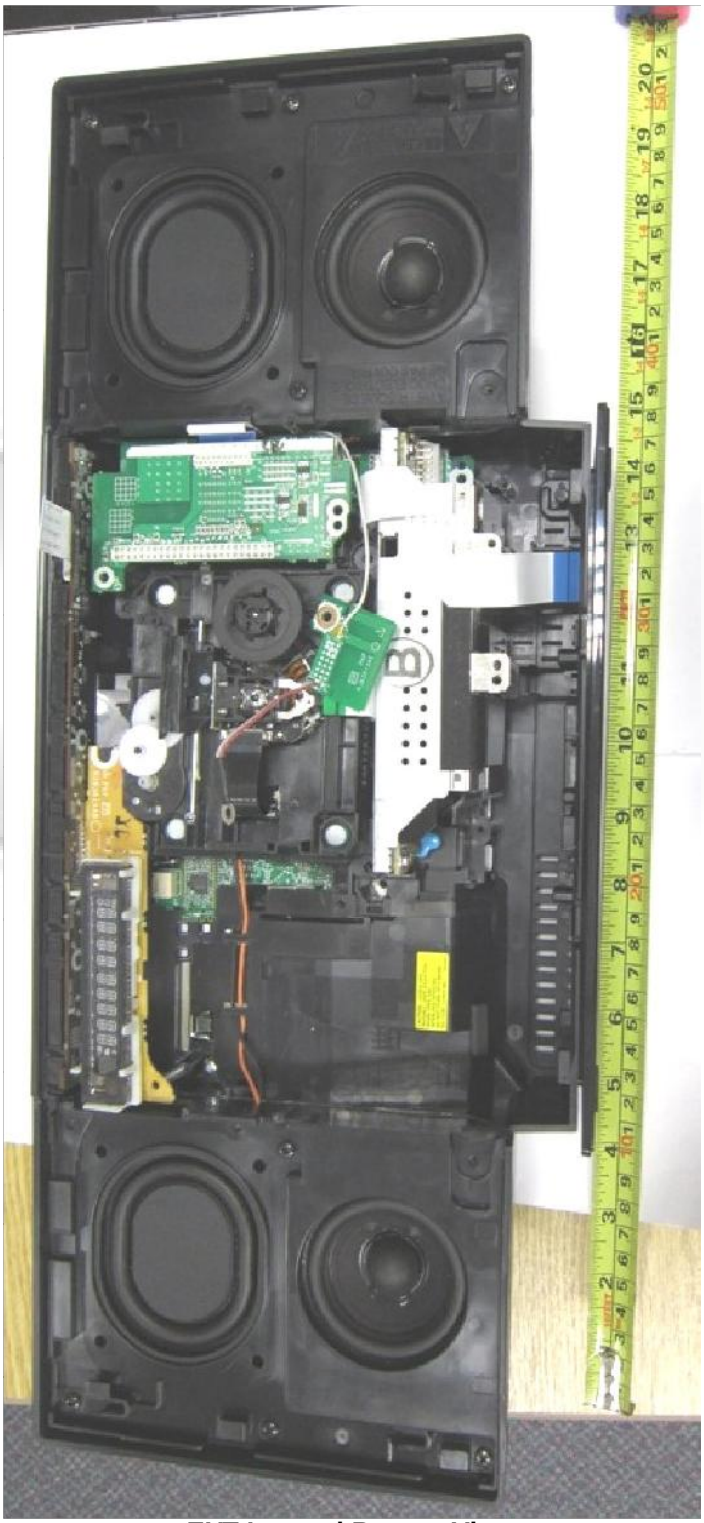
Front View

Rear View

EUT PHOTOGRAPHS

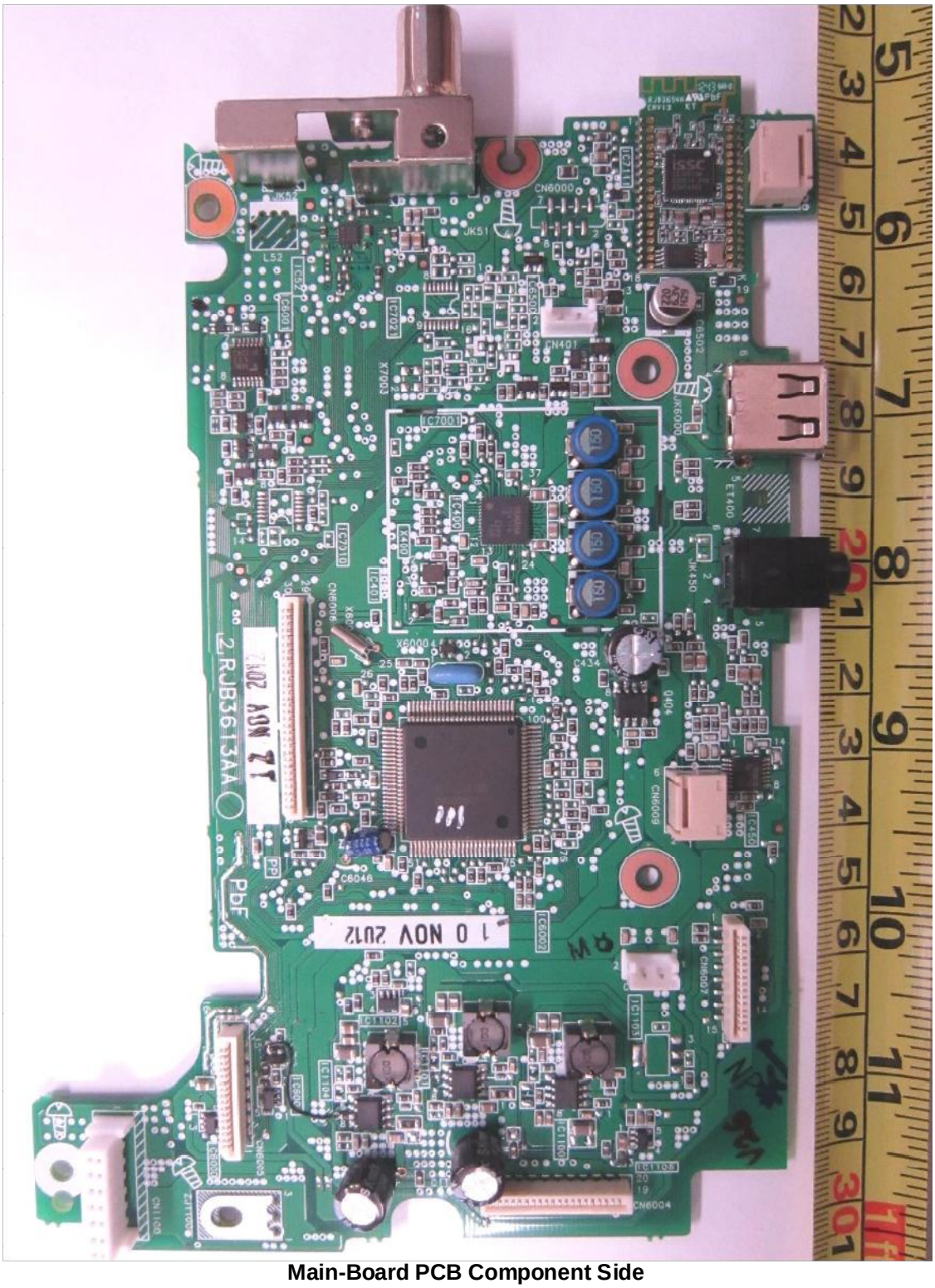
EUT Internal Top View (Front Panel)

EUT PHOTOGRAPHS



EUT Internal Bottom View

EUT PHOTOGRAPHS

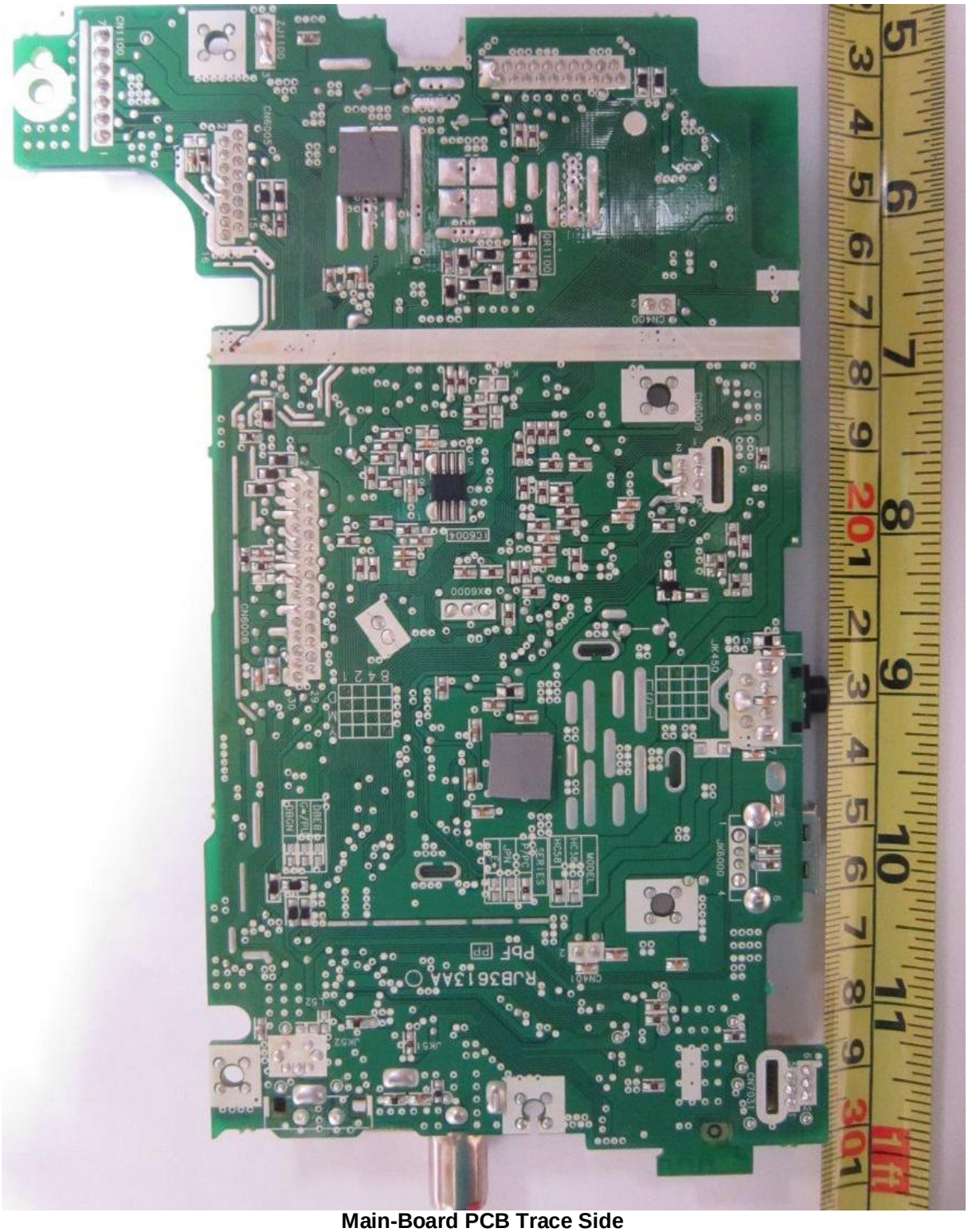


Main-Board PCB Component Side

PSB Singapore

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS

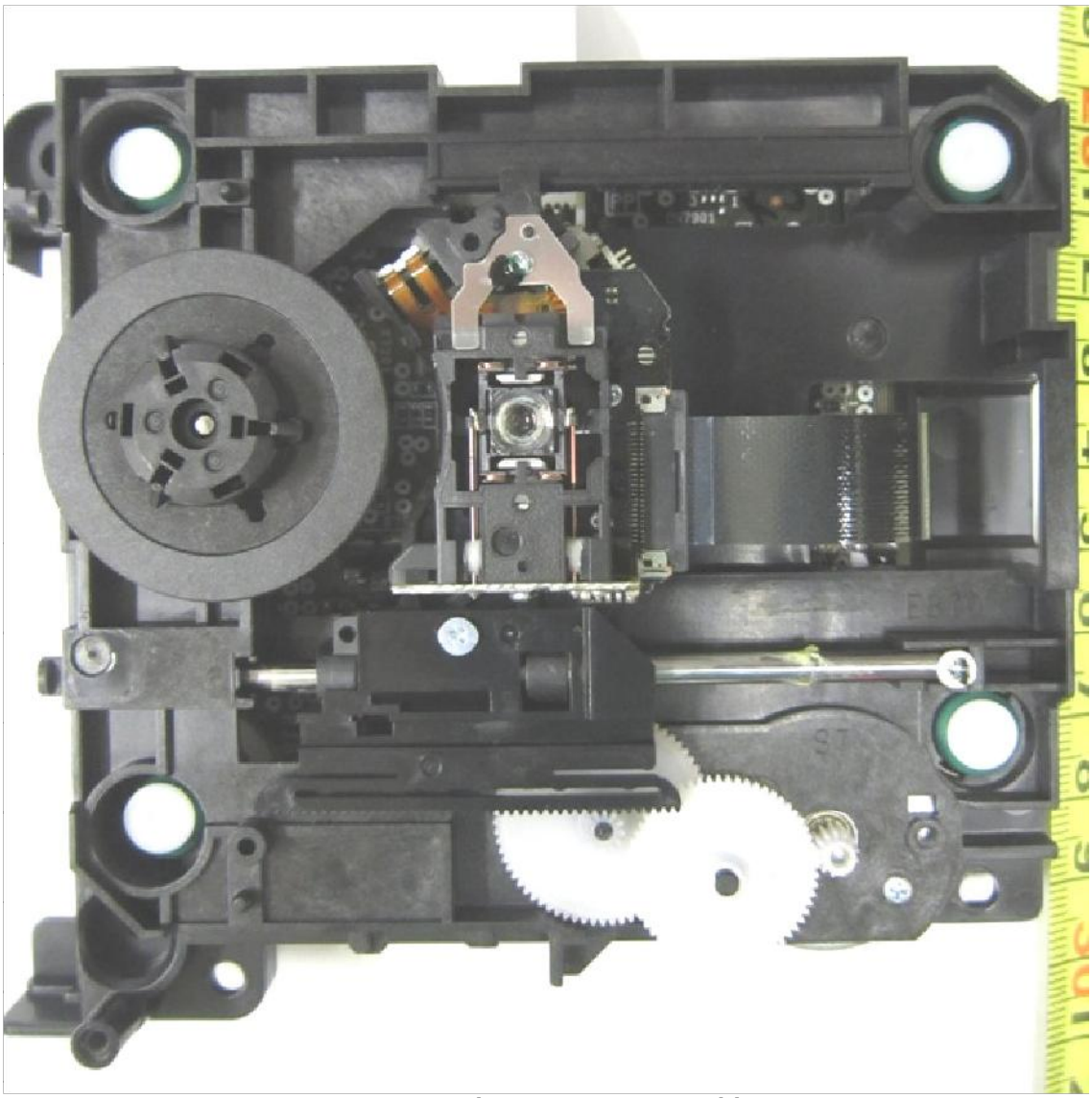


Main-Board PCB Trace Side

PSB Singapore

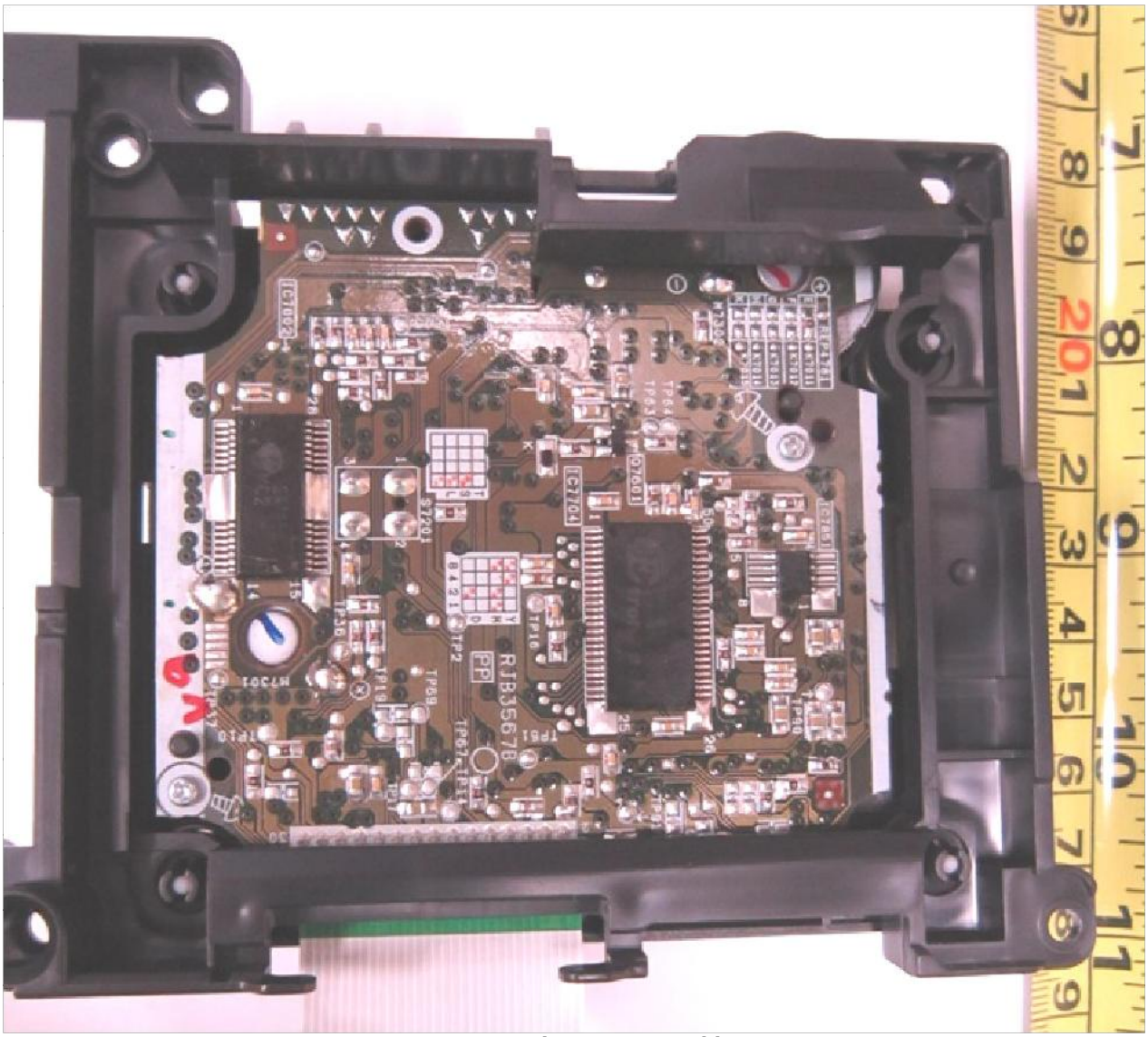
ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS



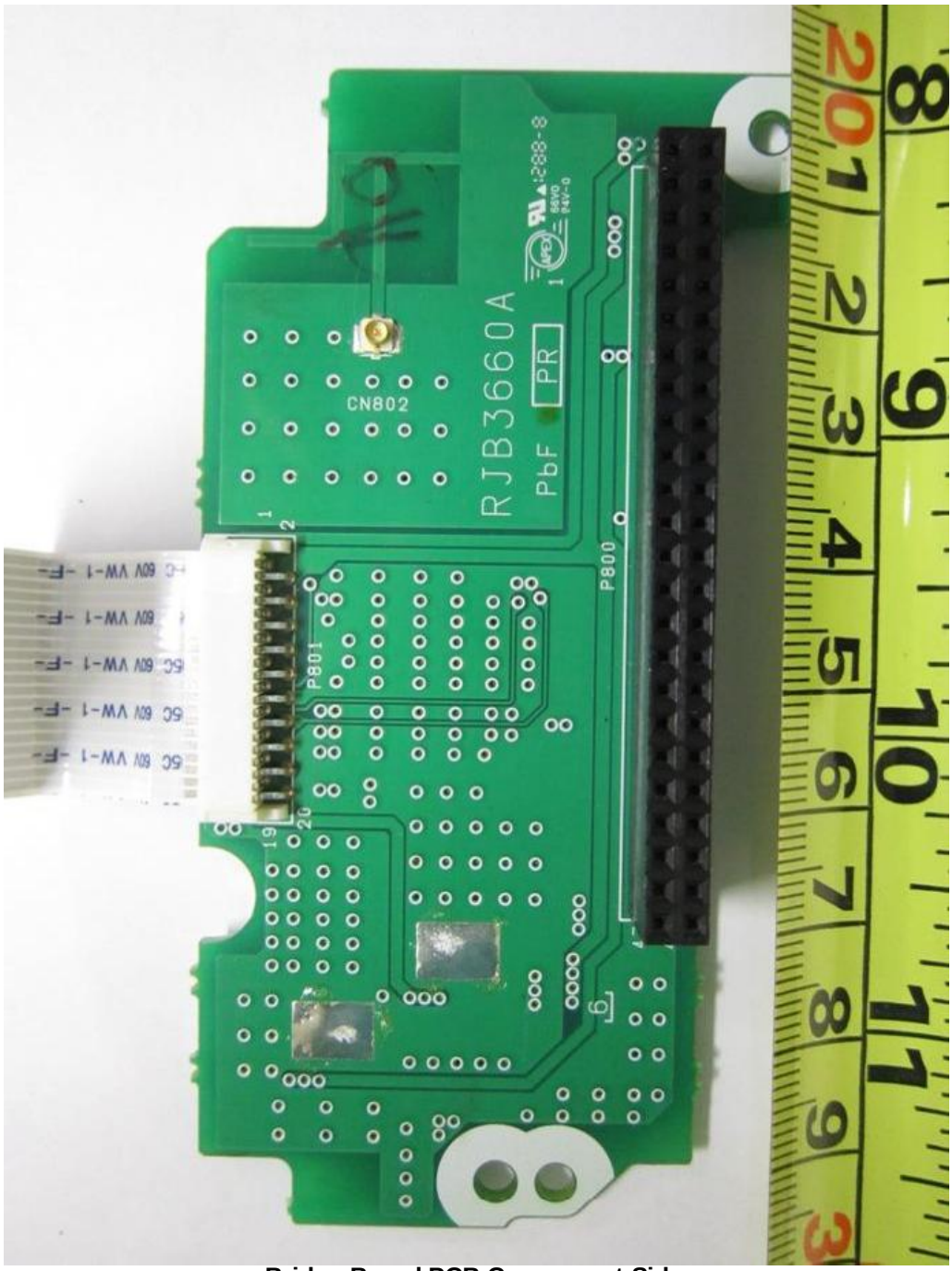
Mega-Board PCB Component Side

EUT PHOTOGRAPHS



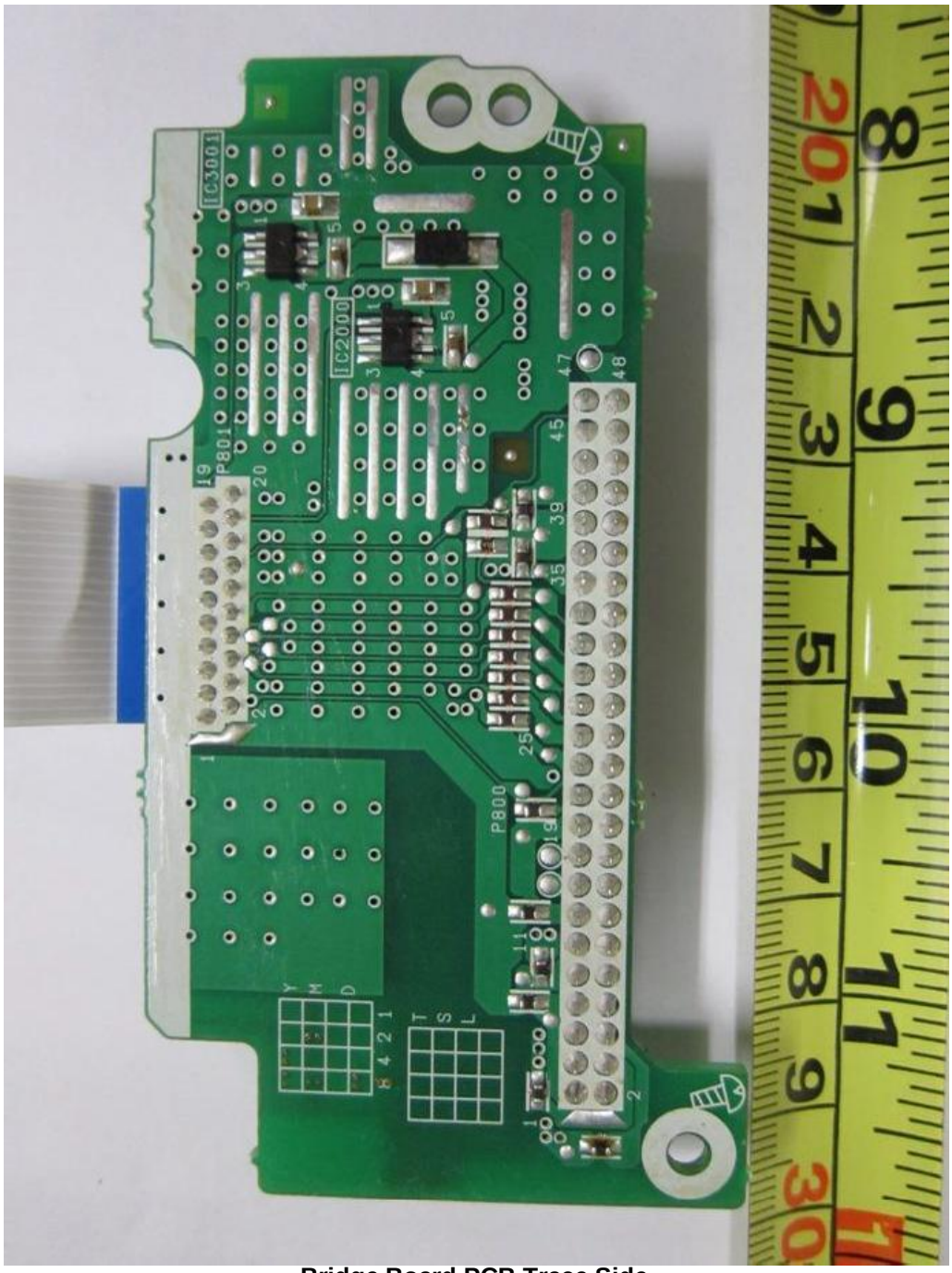
Mega-Board PCB Trace Side

EUT PHOTOGRAPHS



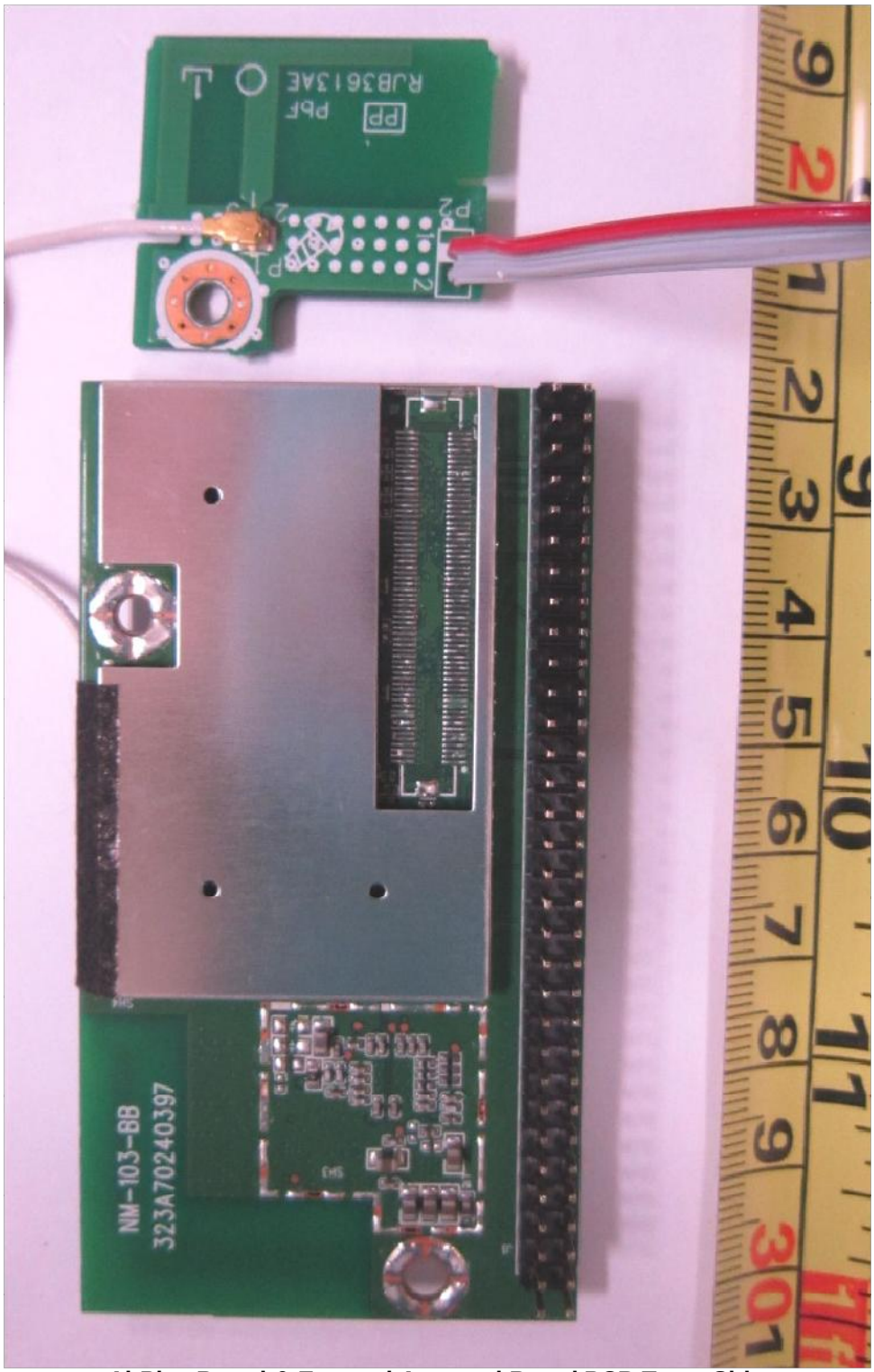
Bridge Board PCB Component Side

EUT PHOTOGRAPHS



Bridge Board PCB Trace Side

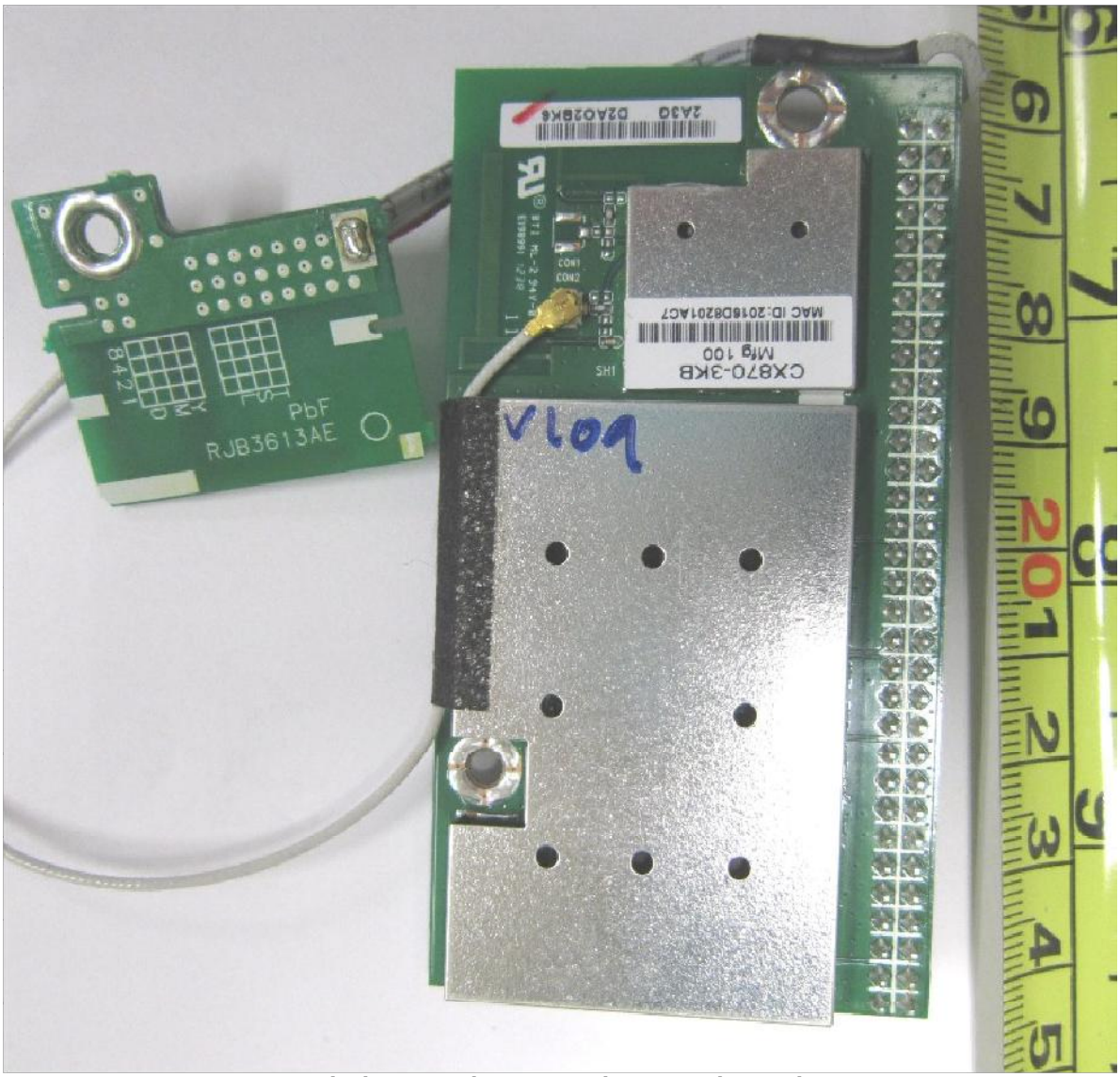
EUT PHOTOGRAPHS



AirPlay Board & External Antennal Board PCB Trace Side

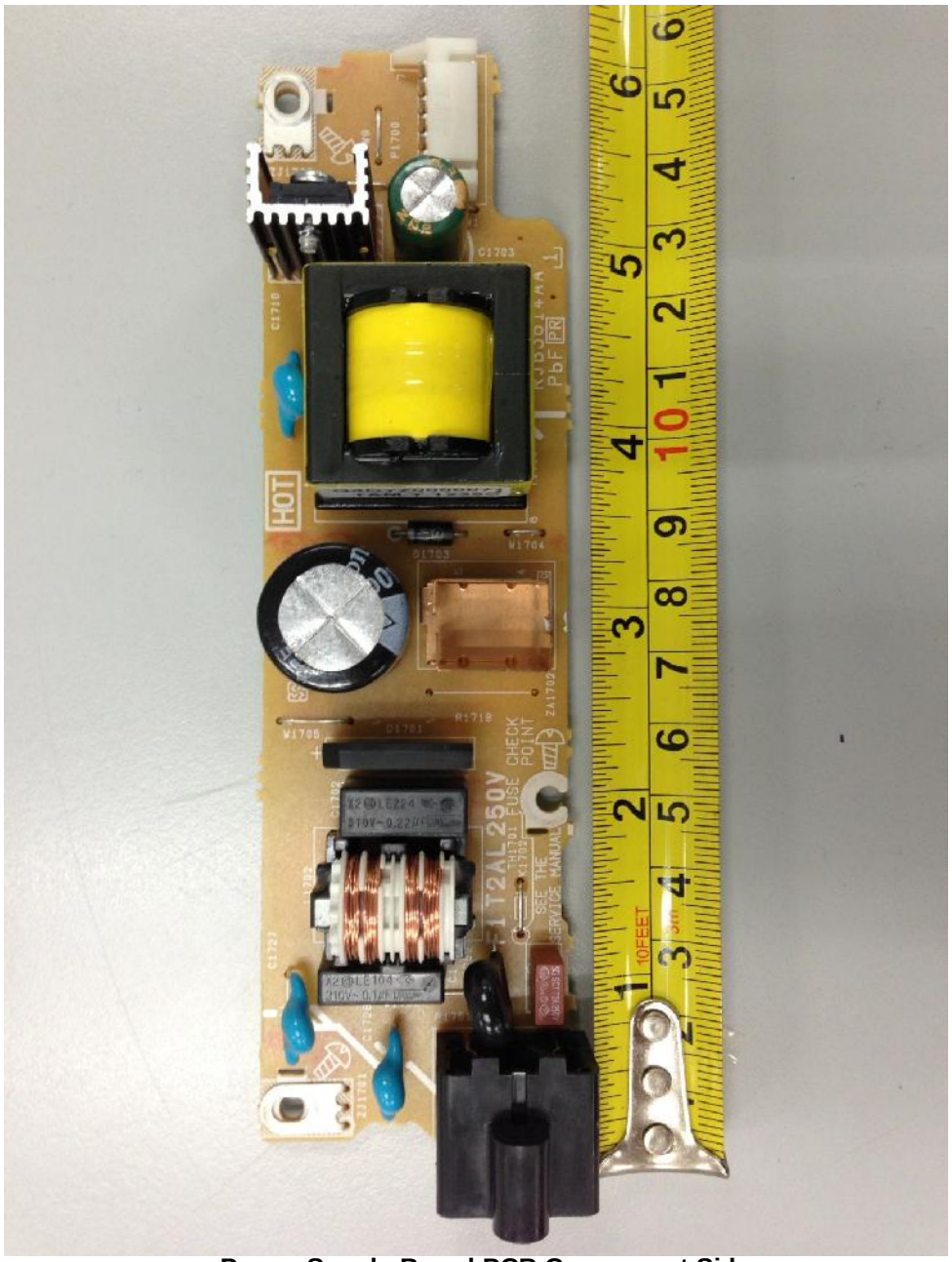
ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS



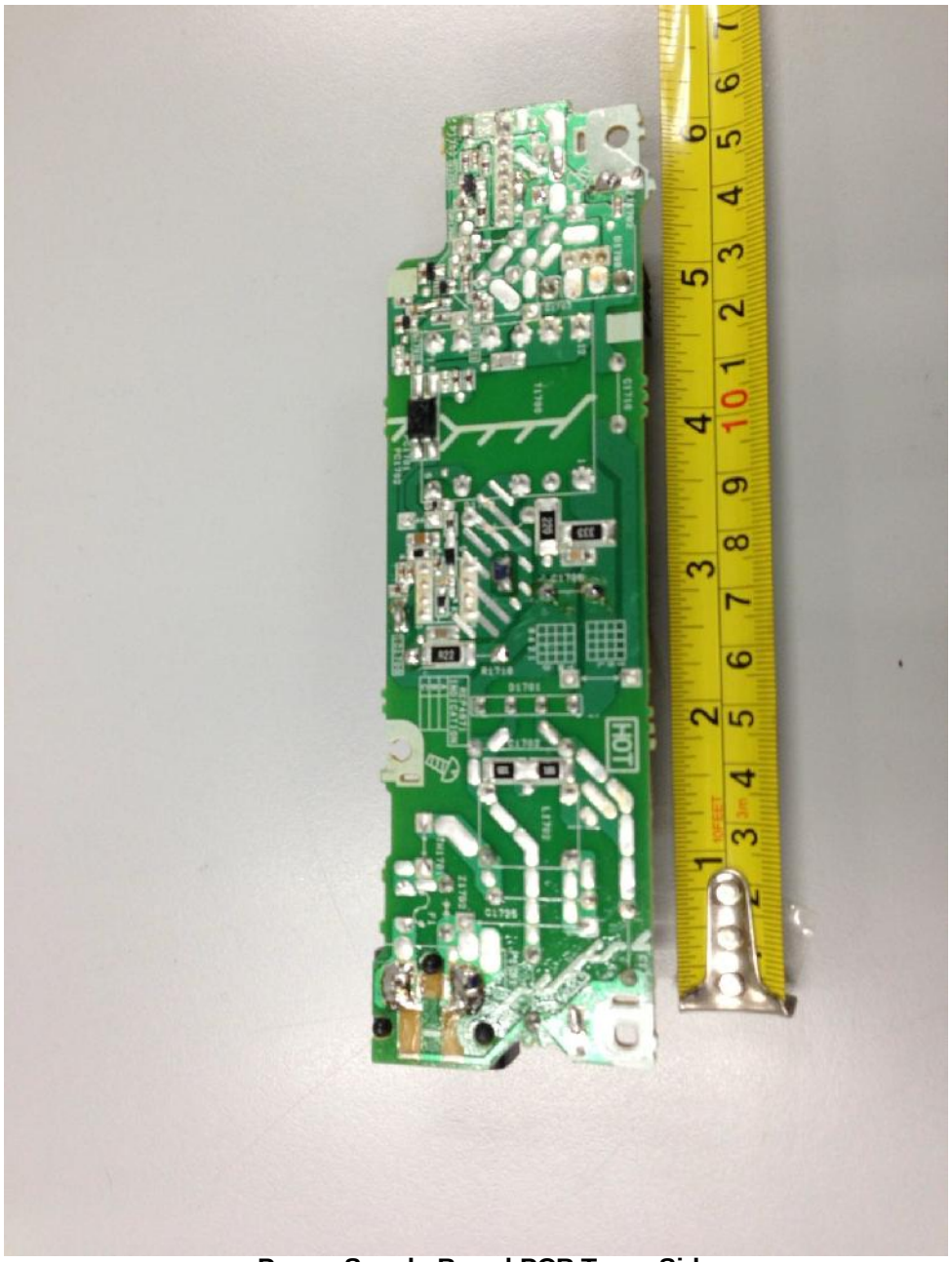
AirPlay Board & External Antennal Board

EUT PHOTOGRAPHS



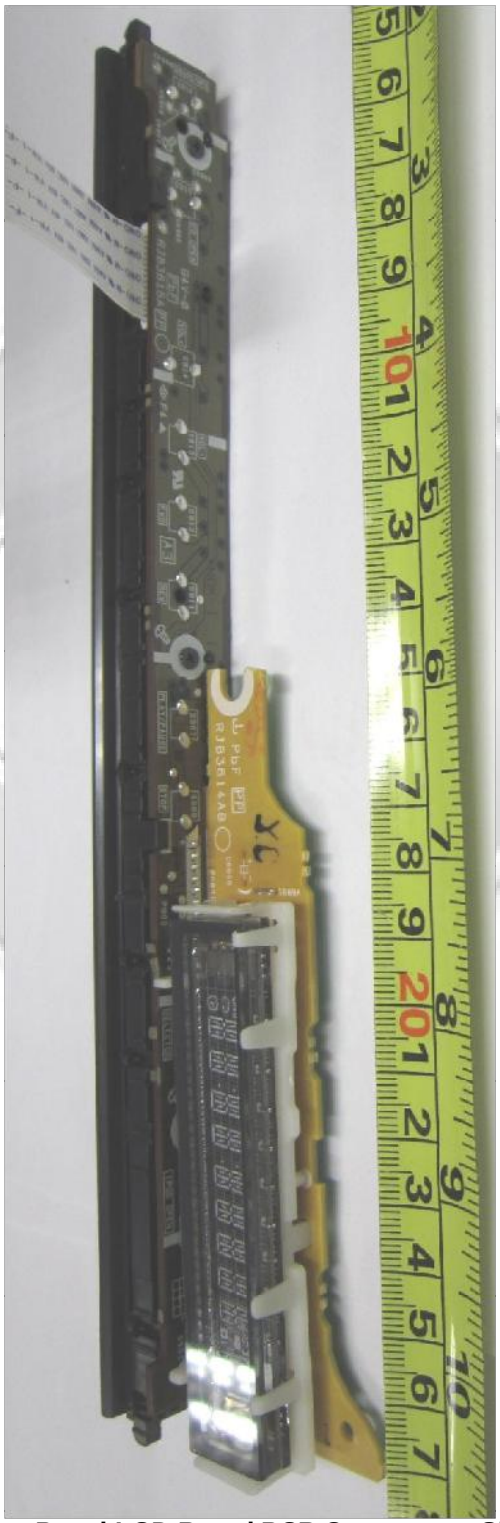
Power Supply Board PCB Component Side

EUT PHOTOGRAPHS



Power Supply Board PCB Trace Side

EUT PHOTOGRAPHS

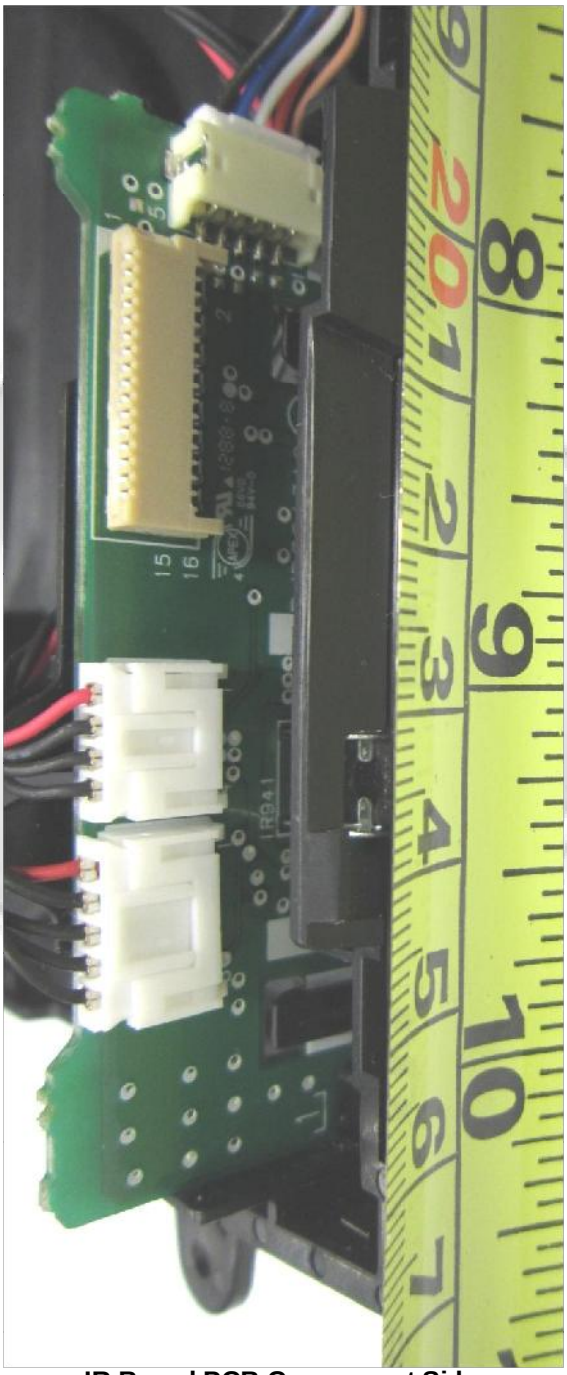


Front Panel LCD Board PCB Component Side

EUT PHOTOGRAPHS

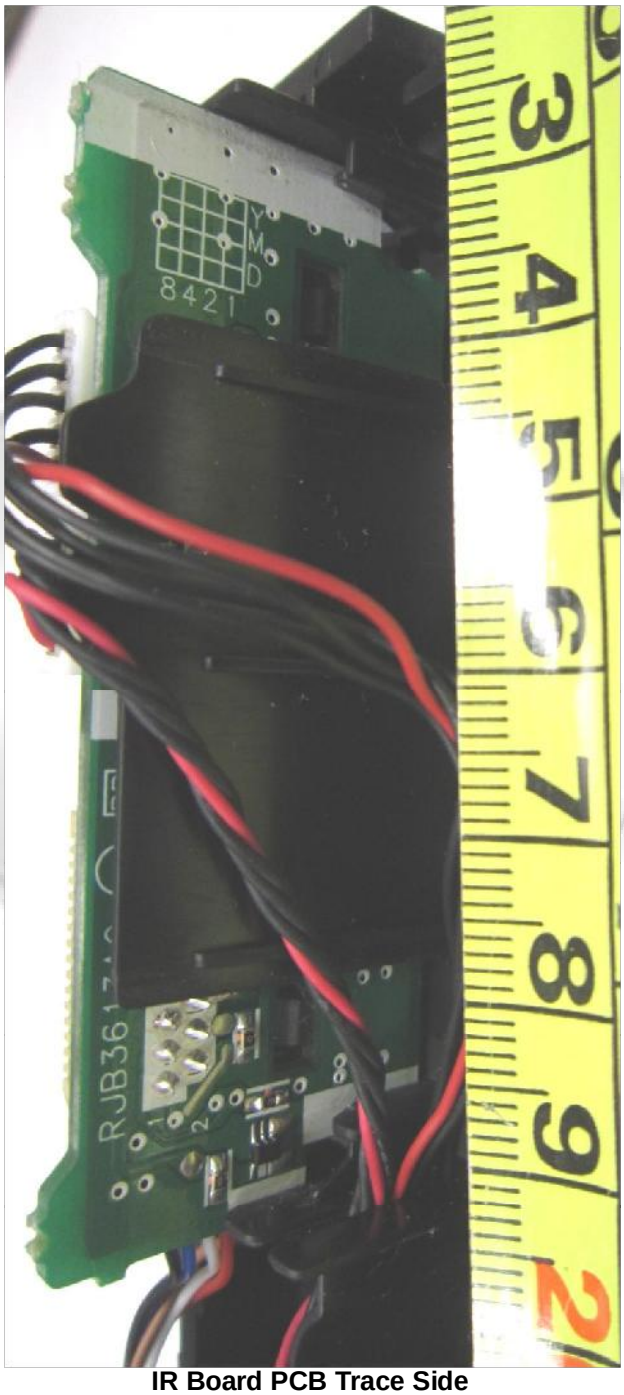
Front Panel LCD Board PCB Trace Side

EUT PHOTOGRAPHS



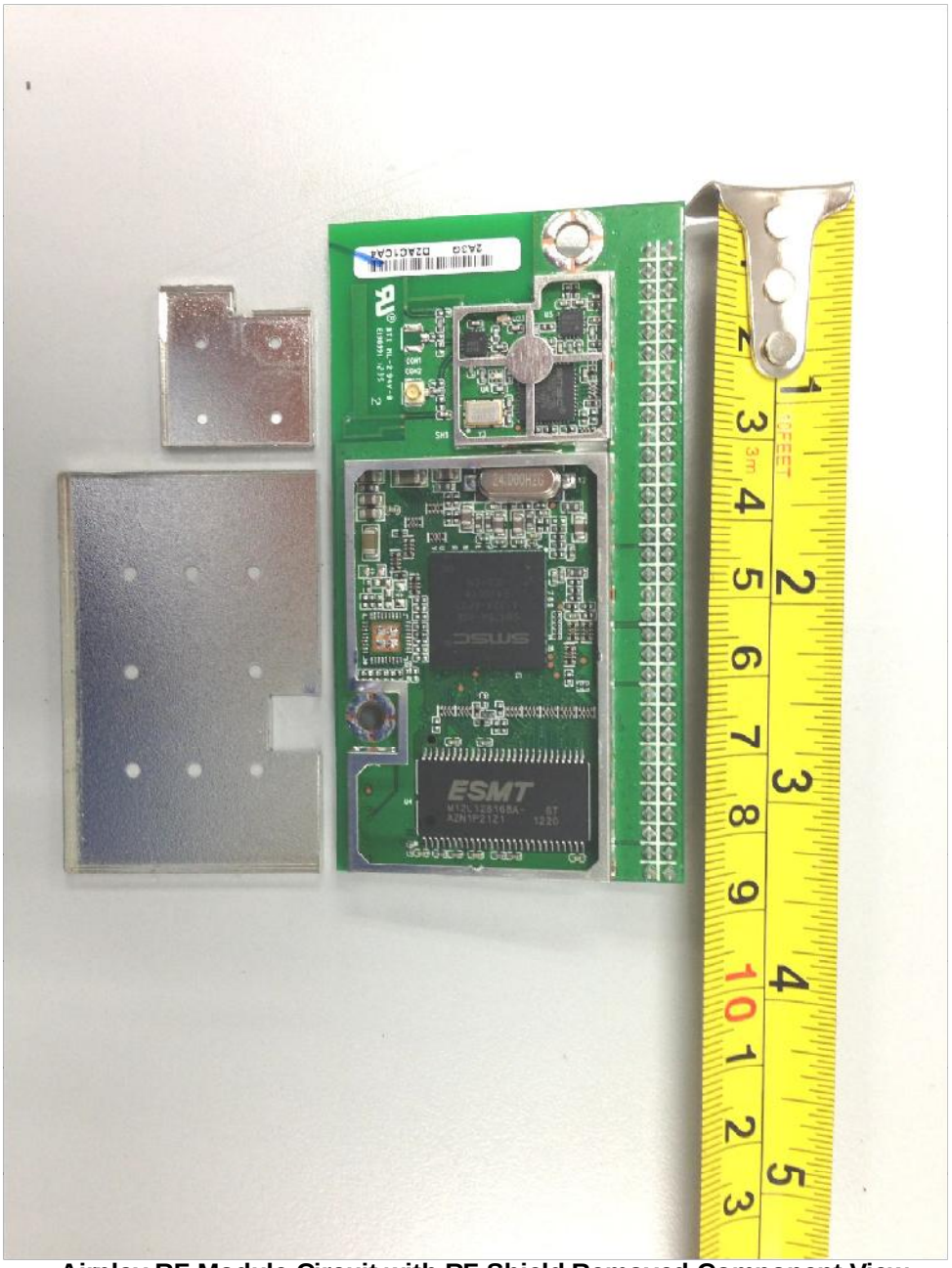
IR Board PCB Component Side

EUT PHOTOGRAPHS



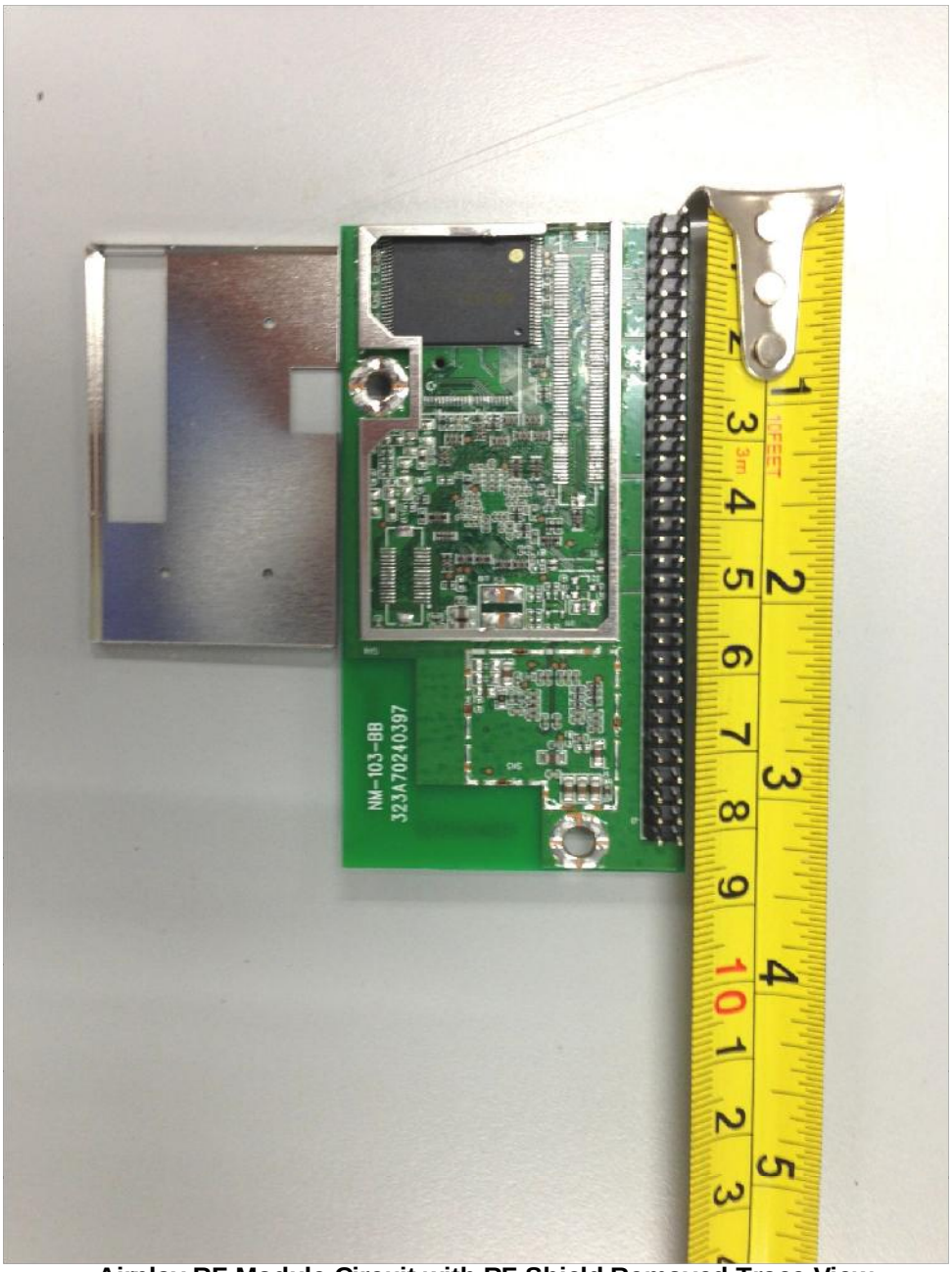
IR Board PCB Trace Side

EUT PHOTOGRAPHS



Airplay RF Module Circuit with RF Shield Removed Component View

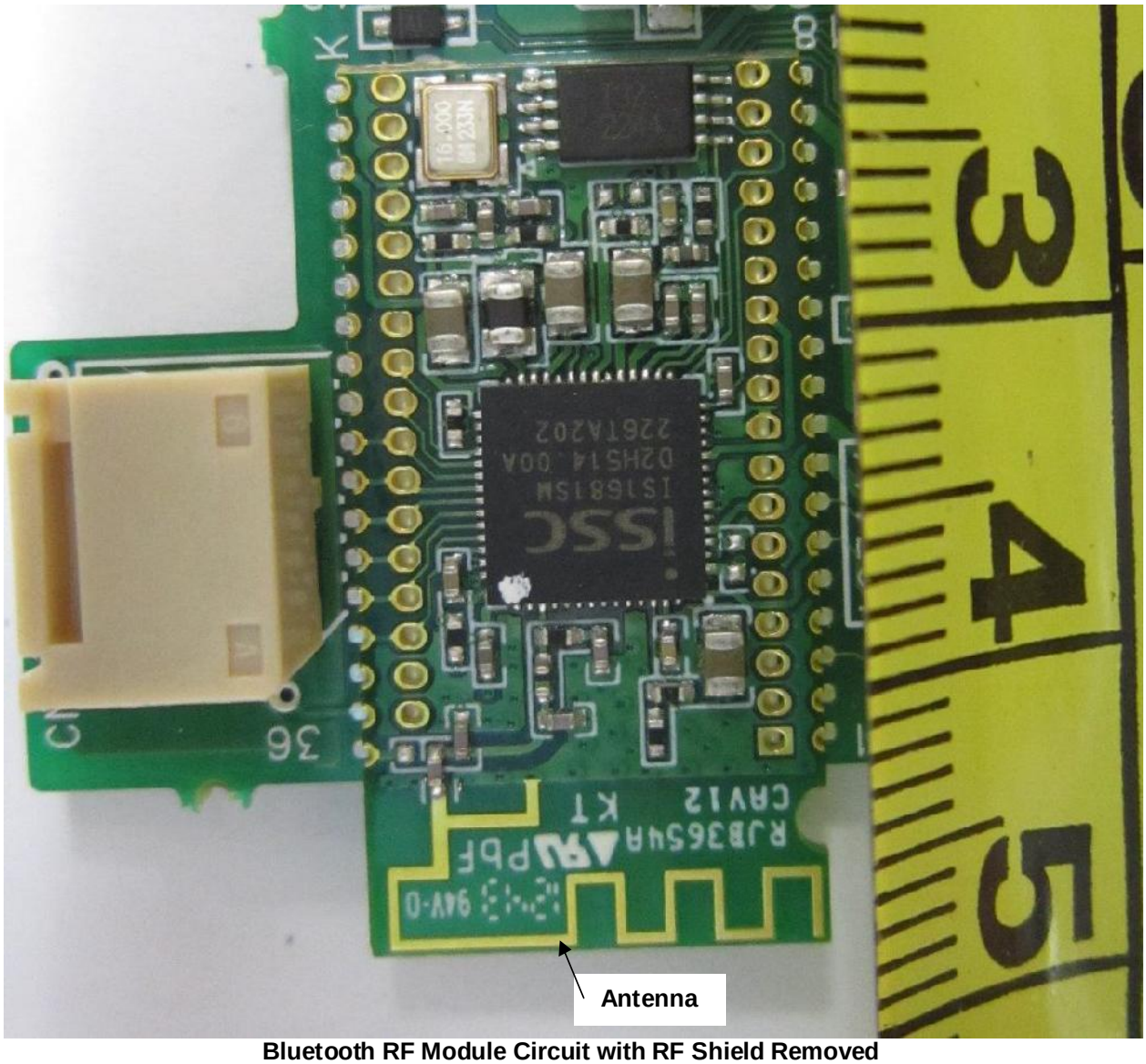
EUT PHOTOGRAPHS



Airplay RF Module Circuit with RF Shield Removed Trace View

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS



Bluetooth RF Module Circuit with RF Shield Removed

ANNEX B

USER MANUAL
TECHNICAL DESCRIPTION
BLOCK & CIRCUIT DIAGRAMS

(Please refer to manufacturer for details)

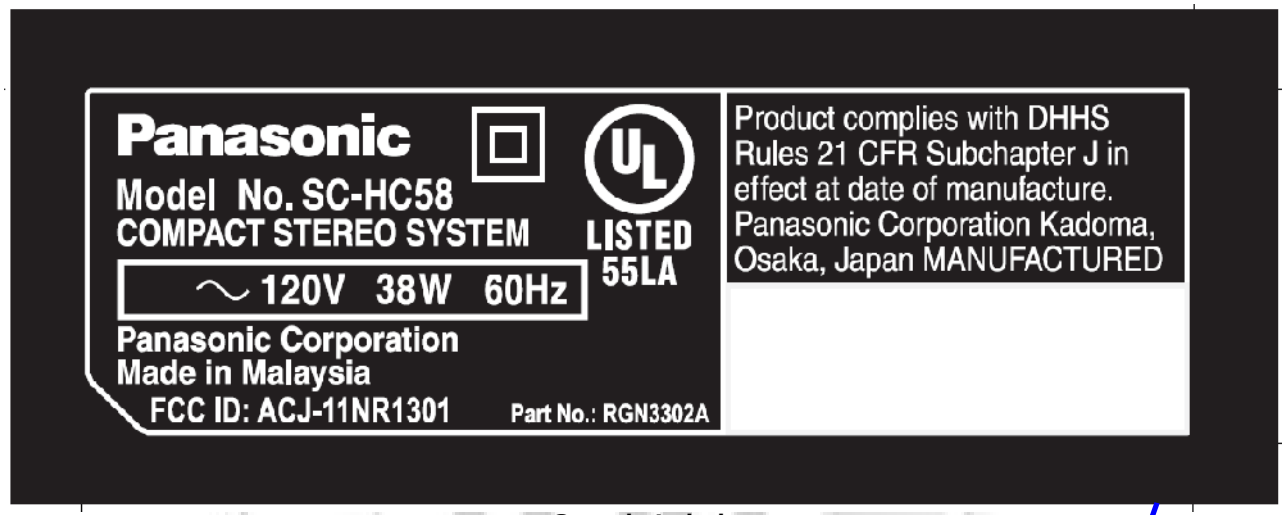
ANNEX C

FCC LABEL & POSITION

ANNEX C FCC LABEL & POSITION

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