

Test Report No. 7191044466-EEC12/01
dated 08 Nov 2012



PSB Singapore

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 15B & C : 2011
OF A
RF RECEIVER MODULE
[Model : RJB3622B]
[FCC ID : ACJ-11BR1301]

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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)

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QUOTATION NUMBER 219159813

JOB NUMBER 7191044466

TEST PERIOD 10 Oct 2012 - 23 Oct 2012

PREPARED BY

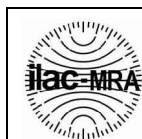
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LA-2007-0380-A
LA-2007-0381-F
LA-2007-0382-B
LA-2007-0383-G
LA-2007-0384-G
LA-2007-0385-E
LA-2007-0386-C
LA-2010-0464-D

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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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 (Non-Restricted Bands)	Pass
15.247(d)	RF Conducted Spurious Emissions (Restricted Bands)	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 86 for details



TEST SUMMARY

Notes

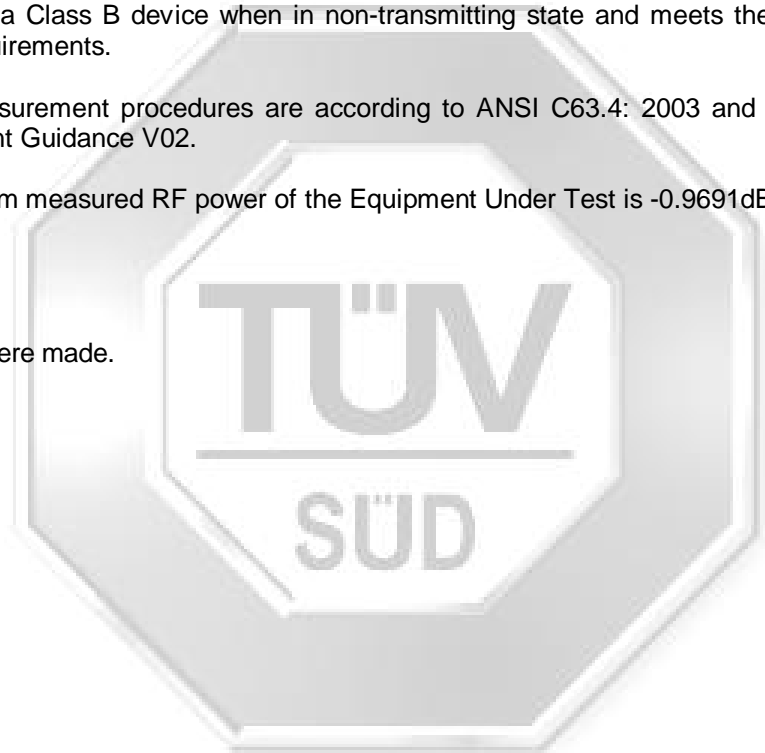
1. Three channels as listed below, which respectively represent the lower, middle and upper channels of the Equipment Under Test (EUT) were chosen and tested. For each channel, the EUT was configured to operate in the test mode.

<u>Transmit Channel</u>	<u>Frequency (GHz)</u>
Channel 1 (<i>lower ch</i>)	2.40335
Channel 20 (<i>mid ch</i>)	2.44135
Channel 38 (<i>upper ch</i>)	2.47735

2. The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.
3. All test measurement procedures are according to ANSI C63.4: 2003 and KDB 558074 D01 DTS Measurement Guidance V02.
4. The maximum measured RF power of the Equipment Under Test is -0.9691dBm.

Modifications

No modifications were made.





PRODUCT DESCRIPTION

Description : The Equipment Under Test (EUT) is a **RF RECEIVER MODULE**.

Applicant : Panasonic AVC Networks Singapore
202, Bedok South Avenue 1
Singapore 469332

Manufacturer : Panasonic Corporation
1006, Oaza Kadoma, Kadoma-City,
Osaka 571-8501
Japan

Factor (ies) : Panasonic AVC Networks Johor Malaysia Sdn. Bhd.
IE PLO 460, Jalan Bandar,
81700 Pasir Gudang, Johor, Malaysia

Model Number : RJB3622B

FCC ID : ACJ-11BR1301

Serial Number : Nil

Microprocessor : AV6210

Operating / Transmitting Frequency : 2403.35MHz (lower channel) to 2477.35MHz (upper channel)
38 (total number of channels) channels.

Clock / Oscillator Frequency : 16MHz

Modulation : $\pi/4$ DQPSK

Antenna Gain : 3.13 dBi (Worst antenna gain)

Port / Connectors : 24P FFC connector

Rated Input Power : 4.5Vdc - 5.5Vdc via 110V 60Hz AC adapter.

Accessories : Refer to manufacturer



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	Nil
Fujitsu Power Adapter	M/N: SEC100P3-19.0 S/N: 10301801D FCC ID: Nil	1.50m unshielded AC power cable 1.80m unshielded DC power cable
SPEC LIN AC Adapter	M/N: SL-0106-5V1.5A-U S/N: Nil FCC ID: Nil	2.00m unshielded power cable
Avnera Connector Board	M/N: AVTF0130-02B S/N: Nil FCC ID: Nil	2.00m unshielded power cable
Avnera USB Converter	M/N: USB to I ² C S/N: 0x15B156A4 FCC ID: DoC	1.50m unshielded USB cable





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 (Non-Restricted Bands)**
6. **RF Conducted Spurious Emissions (Restricted Bands)**
7. **Band Edge Compliance (Conducted)**
8. **Band Edge Compliance (Radiated)**
9. **Peak Power Spectral Density**
10. **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

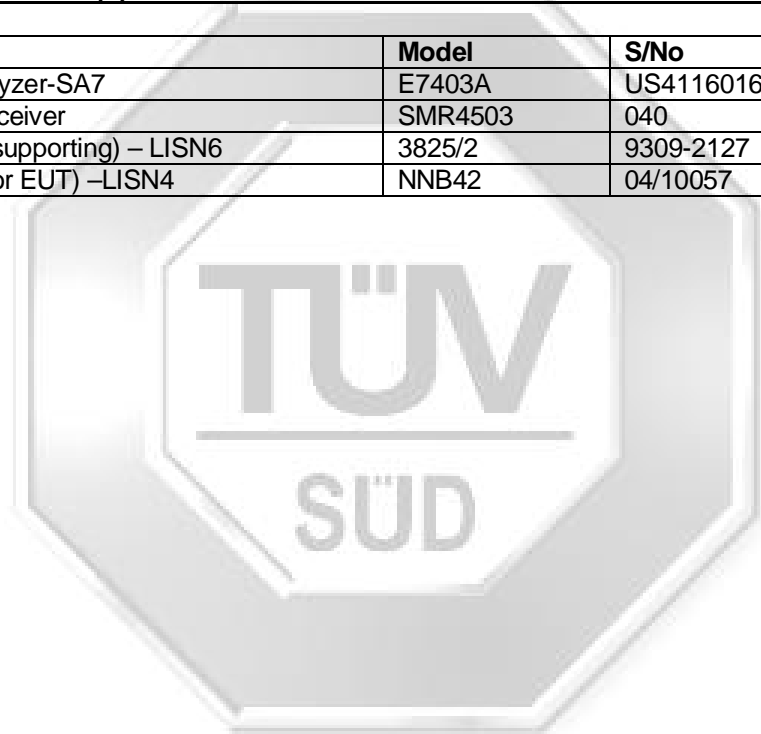
47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Limits

Frequency Range (MHz)	Limit Values (dB μ V)	
	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
Agilent EMC Analyzer-SA7	E7403A	US41160167	28 May 2013
Schaffner EMI Receiver	SMR4503	040	20 Jul 2013
EMCO LISN (for supporting) – LISN6	3825/2	9309-2127	Output monitored
Schaffner LISN (for EUT) –LISN4	NNB42	04/10057	11 Nov 2012





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 = 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 EMISSION TEST



Conducted Emissions Test Setup (Front View)



Conducted Emissions Test Setup (Rear View)



CONDUCTED EMISSION TEST

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

Test Input Power	110V 60Hz	Temperature	22°C
Line Under Test	AC Mains	Relative Humidity	56%
Antenna	1 (Worst Antenna)	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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
0.7079	46.9	56.0	9.2	37.7	46.0	8.4	Live	38
0.8927	42.9	56.0	13.1	36.1	46.0	9.9	Live	38
0.7013	45.7	56.0	10.3	35.6	46.0	10.4	Neutral	38
0.8922	42.4	56.0	13.6	34.8	46.0	11.2	Neutral	38
0.3520	45.4	58.9	13.5	35.6	48.9	13.3	Live	38
1.7516	43.0	56.0	13.0	32.3	46.0	13.7	Neutral	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 "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.

RADIATED EMISSION TEST

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



RADIATED EMISSION TEST

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 9kHz to 10th harmonics of the EUT fundamental frequency, using the loop antenna for frequencies from 9kHz to 30MHz, Bi-log antenna for frequencies from 30MHz up to 1GHz, and the Horn antenna above 1GHz.

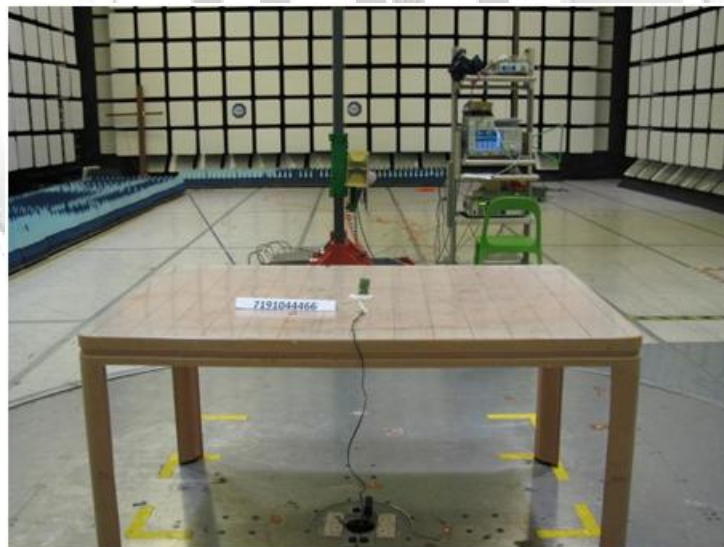
Sample Calculation Example

At 300 MHz	Q-P limit = 46.0 dB μ V/m
Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB	
Q-P reading obtained directly from EMI Receiver = 40.0 dB μ V/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 EMISSION TEST



Radiated Emissions Test Setup (Front View)



Radiated Emissions Test Setup (Rear View)



RADIATED EMISSION TEST

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

Test Input Power	110V 60Hz	Temperature	21°C
Test Distance	3m	Relative Humidity	55%
Antenna	1 (Worst Antenna)	Atmospheric Pressure	1030mbar
		Tested By	Tan Keng Xin / 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
--	--	--	--	--	--	--	--
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--	--	--	--	--	--	--	--
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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
59.9810	33.5	40.0	6.5	100	107	V	38
30.0000	23.9	40.0	16.1	199	167	V	38
49.6330	31.4	40.0	8.6	100	90	V	38
71.2300	23.1	40.0	16.9	100	298	V	38
98.7160	24.0	43.5	19.5	400	107	H	38
137.9830	24.3	43.5	19.2	301	25	H	38

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
1.9025	43.9	74.0	30.1	30.3	54.0	23.7	100	22	H	1
2.9052	51.3	74.0	22.7	37.3	54.0	16.8	100	21	V	1
4.8070	51.3	74.0	22.7	38.3	54.0	15.7	100	183	V	1
7.2105	57.2	74.0	16.8	44.1	54.0	9.9	100	168	H	1
9.6140	57.9	74.0	16.1	44.8	54.0	9.2	100	176	H	1
12.0175	63.1	74.0	10.9	49.4	54.0	4.6	100	158	V	1

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
2.9436	47.5	74.0	26.5	33.5	54.0	20.5	100	0	V	20
4.8829	54.0	74.0	20.0	40.3	54.0	13.7	100	359	H	20
7.3241	58.7	74.0	15.3	44.4	54.0	9.6	100	359	H	20
8.2665	59.4	74.0	14.6	45.2	54.0	8.8	100	0	V	20
9.7654	59.1	74.0	14.9	45.1	54.0	8.9	100	184	H	20
12.2068	62.4	74.0	11.6	49.4	54.0	4.6	100	0	V	20



RADIATED EMISSION TEST

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

Spurious Emissions above 1GHz – 25GHz

Freq (GHz)	Peak Value (dB μ V/m)	Peak Limit (dB μ V/m)	Peak Margin (dB)	AV Value (dB μ V/m)	AV Limit (dB μ V/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
2.9118	43.7	74.0	30.3	31.0	54.0	23.0	100	10	H	38
4.8622	59.1	74.0	14.9	45.1	54.0	8.9	100	184	H	38
5.5250	50.9	74.0	23.1	37.7	54.0	16.3	119	27	H	38
4.9358	47.8	74.0	26.2	37.6	54.0	16.4	143	42	H	38
6.9318	54.6	74.0	19.4	41.3	54.0	12.7	100	29	H	38
10.6152	54.0	74.0	20.0	41.2	54.0	12.8	100	8	V	38

Notes

- 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.
- The transmitting module was found to be in the worst case condition when it was orientated in a vertical position.
- 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.
- 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.
- EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
30MHz - 1GHz
 RBW: 120kHz VBW: 1MHz
>1GHz
 RBW: 1MHz VBW: 1MHz
- 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.
- The channel in the table refers to the transmit channel of the EUT.
- 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 ± 4.0 dB.



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 Spectrum Analyzer	E4440A	MY45304764	20 Jun 2013

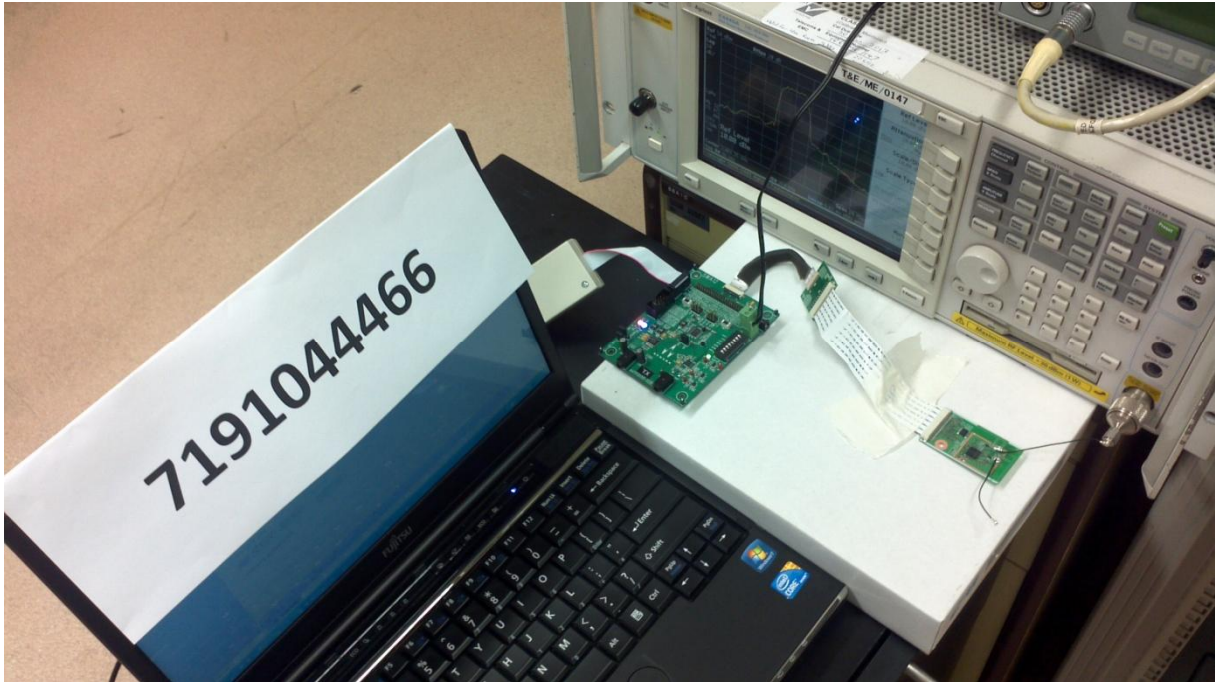
47 CFR FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Test Setup

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 the following:
RBW = 1% - 5% of emission bandwidth (EBW)
VBW = 3 times RBW
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 lower channel.
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 middle and upper channel respectively.

SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST



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	Temperature	22°C
Attached Plots	1 - 3	Relative Humidity	56%
Antenna	0	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)
1 (lower ch)	2.40335	1.520
20 (mid ch)	2.44135	1.550
38 (upper ch)	2.47735	1.580

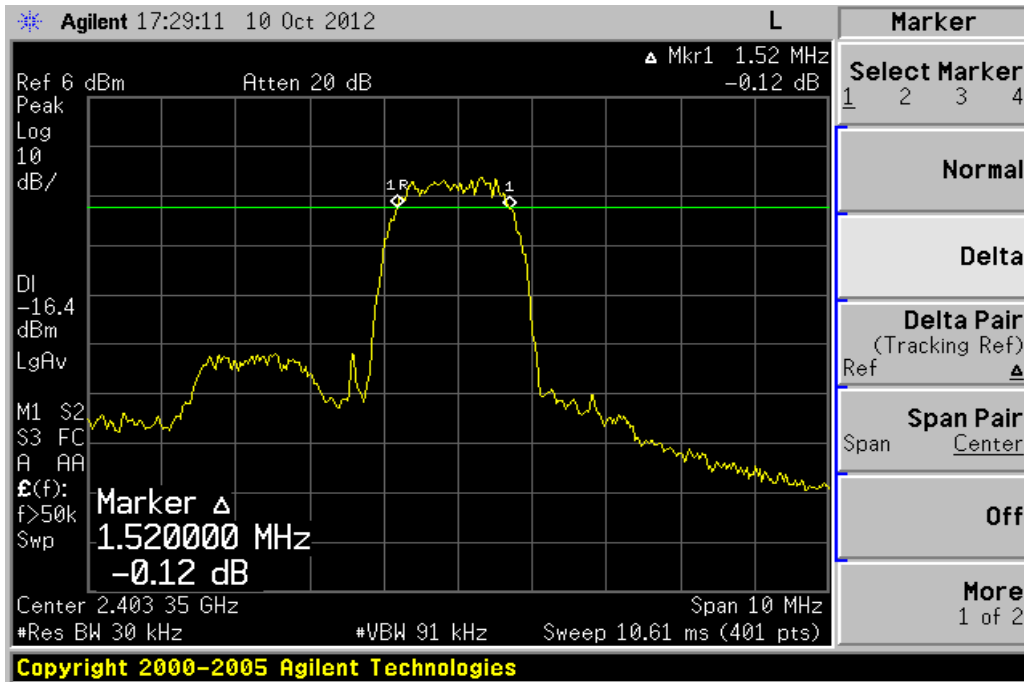
Test Input Power	110V 60Hz	Temperature	22°C
Attached Plots	4 - 6	Relative Humidity	56%
Antenna	1	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)
1 (lower ch)	2.40335	1.600
20 (mid ch)	2.44135	1.600
38 (upper ch)	2.47735	1.520

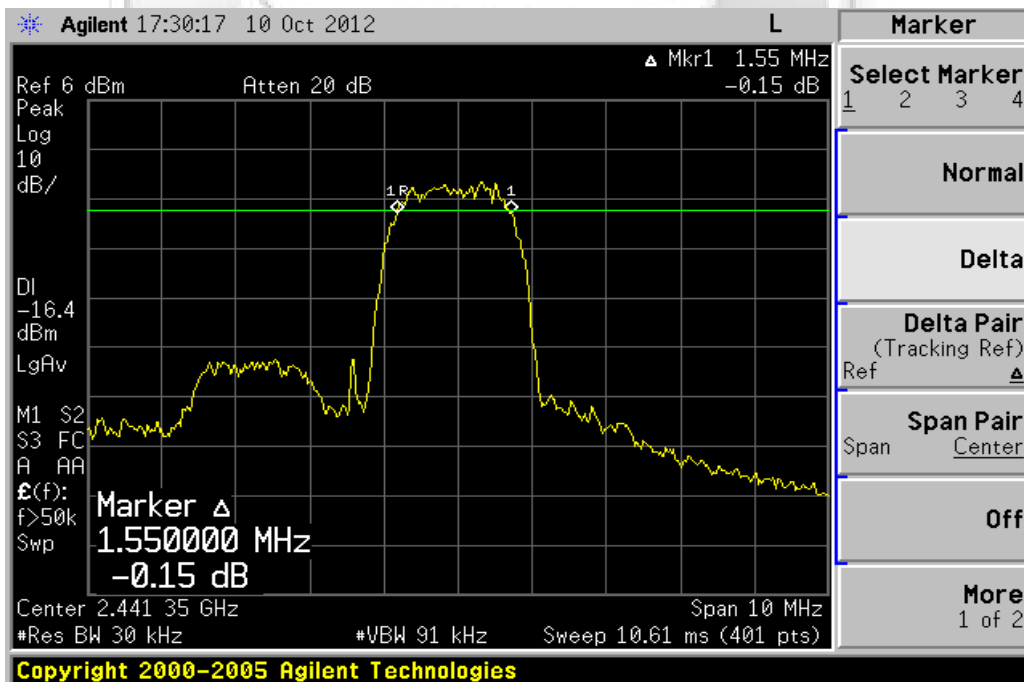


SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

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



Plot 1 - Channel 1 (lower ch)

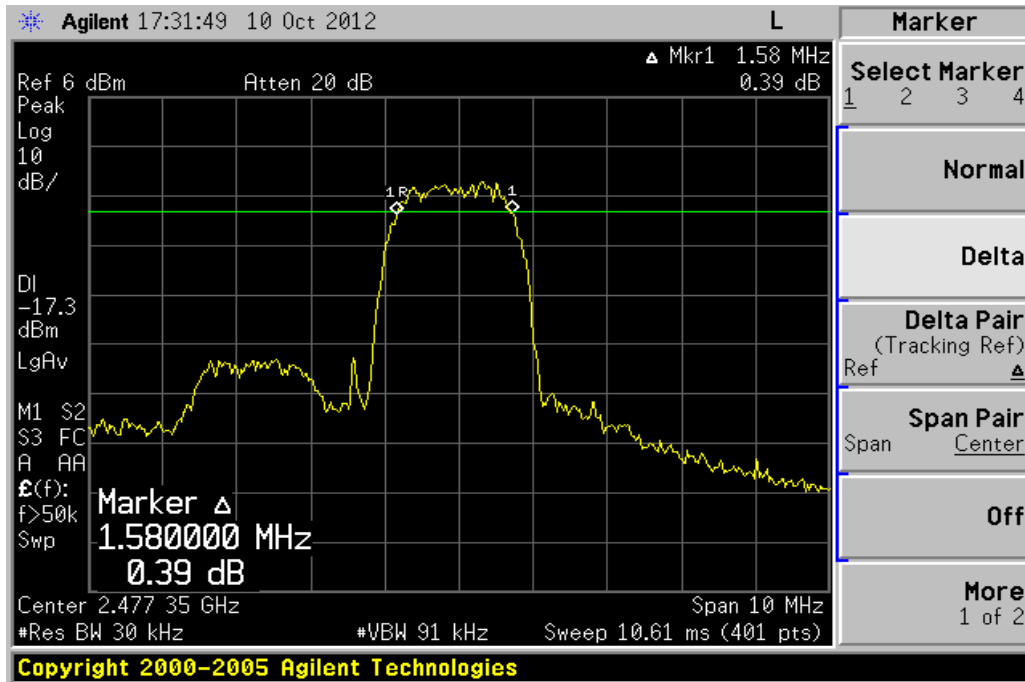


Plot 2 - Channel 20 (middle ch)



SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

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



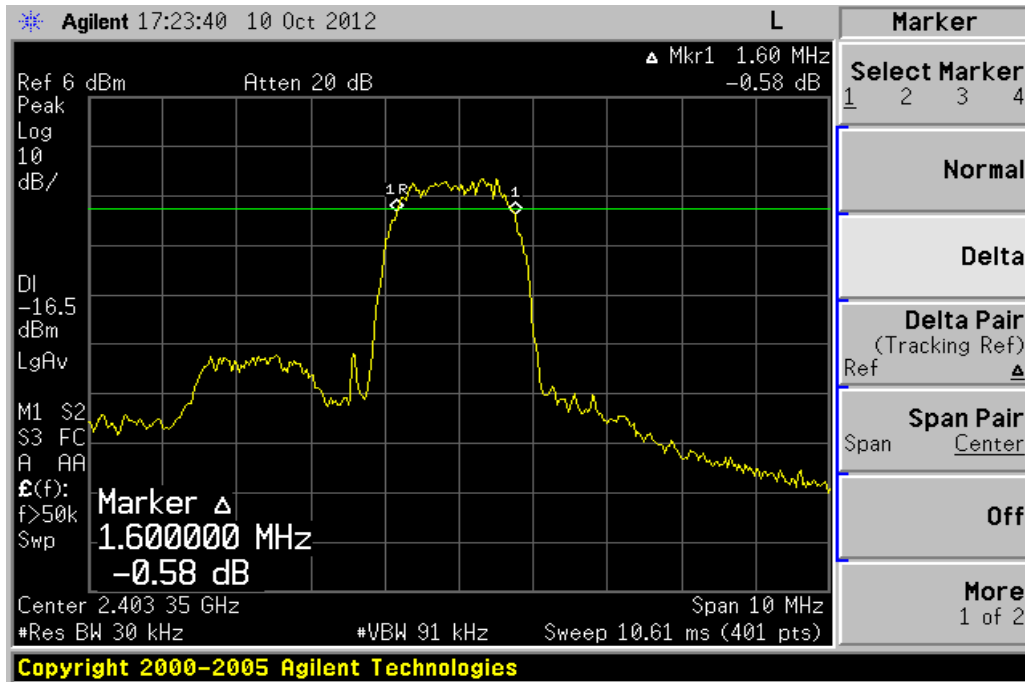
Plot 3 - Channel 38 (upper ch)



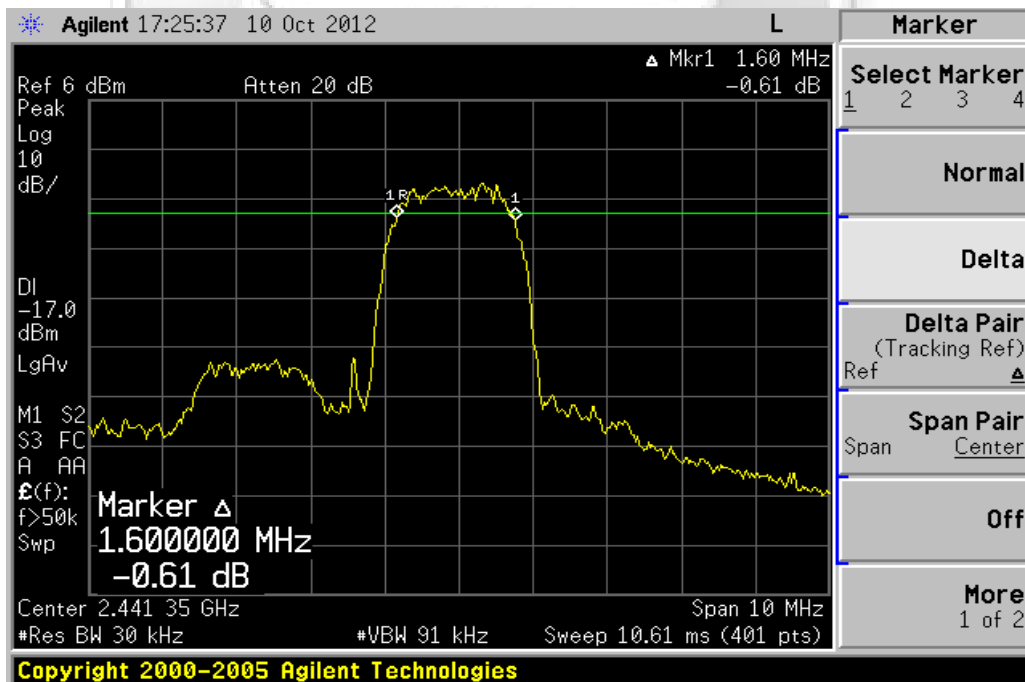


SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

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



Plot 4 - Channel 1 (lower ch)

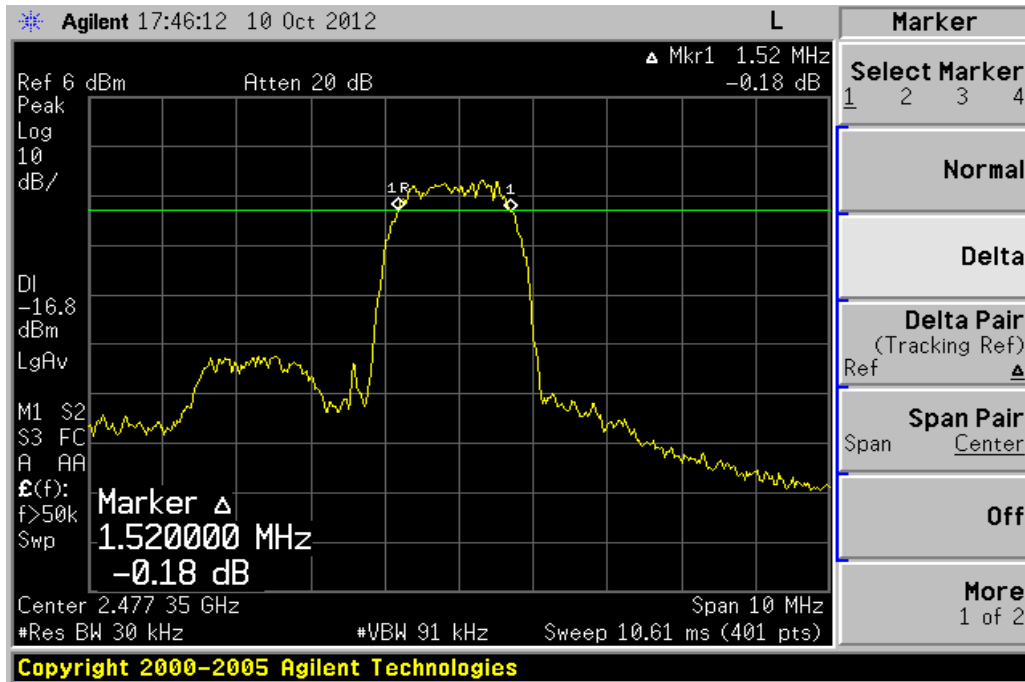


Plot 5 - Channel 20 (middle ch)



SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

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



Plot 6 - Channel 38 (upper ch)





MAXIMUM PEAK POWER TEST

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
Boonton RF Power Meter	4532	72901	05 Jul 2013
Boonton Power Sensor	56218-S/1	1417	05 Jul 2013

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.
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 lower channel.
2. The maximum peak power of the transmitting frequency was detected and recorded.
3. The step 2 was repeated with the transmitting frequency was set to middle and upper channel respectively.

MAXIMUM PEAK POWER TEST



Maximum Peak Power Test Setup





MAXIMUM PEAK POWER TEST

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

Test Input Power	110V 60Hz	Temperature	23°C
Antenna Gain	3.13 dBi	Relative Humidity	56%
Antenna	0	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Limit (W)
1 (lower ch)	2.40335	0.0006	1.0
20 (mid ch)	2.44135	0.0007	1.0
38 (upper ch)	2.47735	0.0008	1.0

Test Input Power	110V 60Hz	Temperature	23°C
Antenna Gain	3.13 dBi	Relative Humidity	56%
Antenna	1	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Limit (W)
1 (lower ch)	2.40335	0.0008	1.0
20 (mid ch)	2.44135	0.0008	1.0
38 (upper ch)	2.47735	0.0007	1.0

Notes

1. Nil.



RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions (Non-Restricted Bands) 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 Emissions (Non-Restricted Bands) 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 (Non-Restricted Bands) 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 (Non-Restricted Bands) 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 the transmitting frequency was set to lower channel.
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 middle and upper channel respectively.

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST



RF Conducted Spurious Emissions (Non-Restricted Bands) Test Setup

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions (Non-Restricted Bands) Results

Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	7 - 12	Relative Humidity	56%
Antenna	0	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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

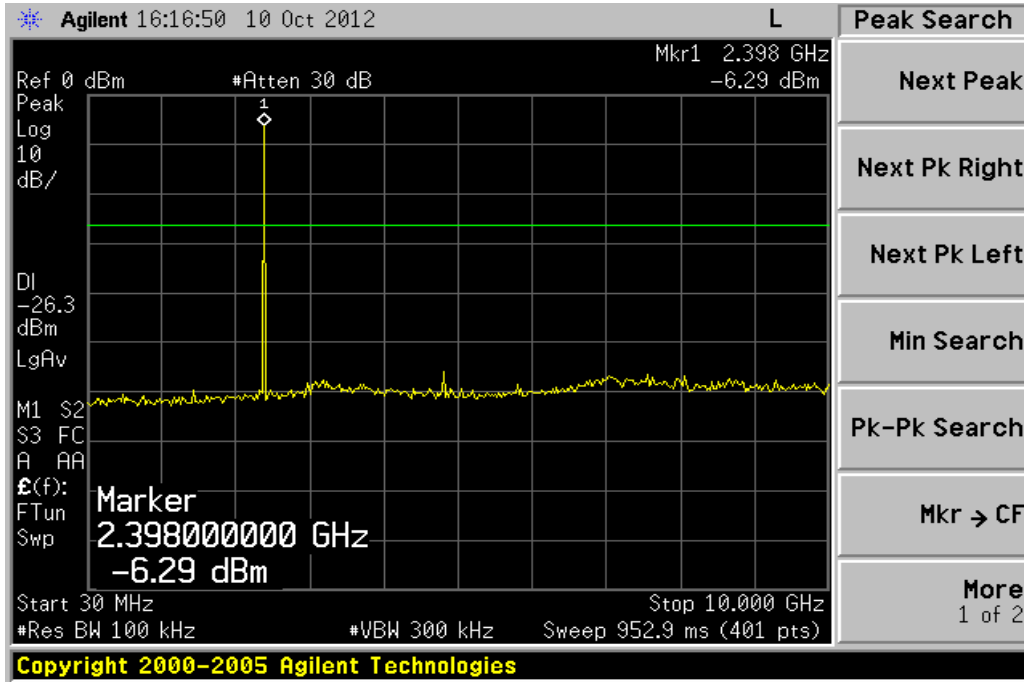
Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	13 - 18	Relative Humidity	56%
Antenna	1	Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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

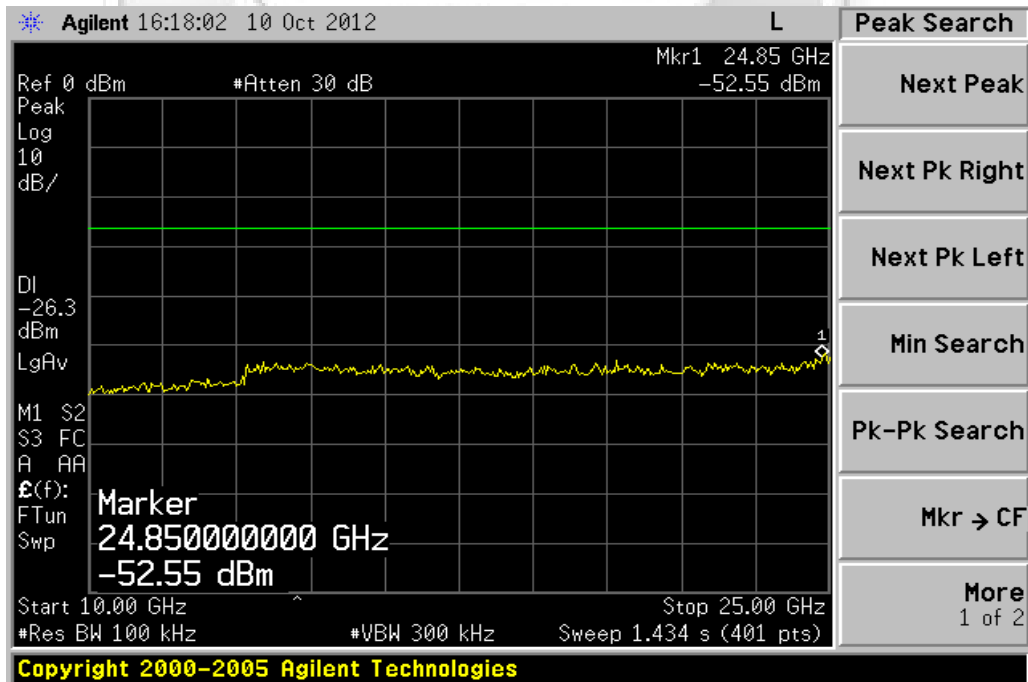


RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots (Antenna 0)



Plot 7 – Channel 1 (lower ch)

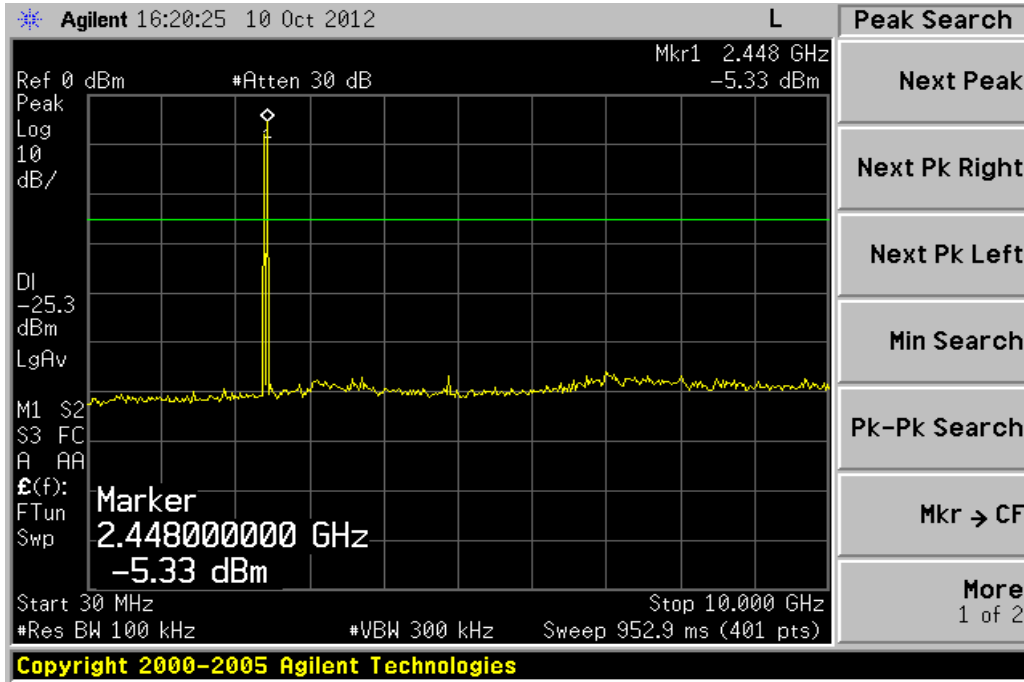


Plot 8 – Channel 1 (lower ch)

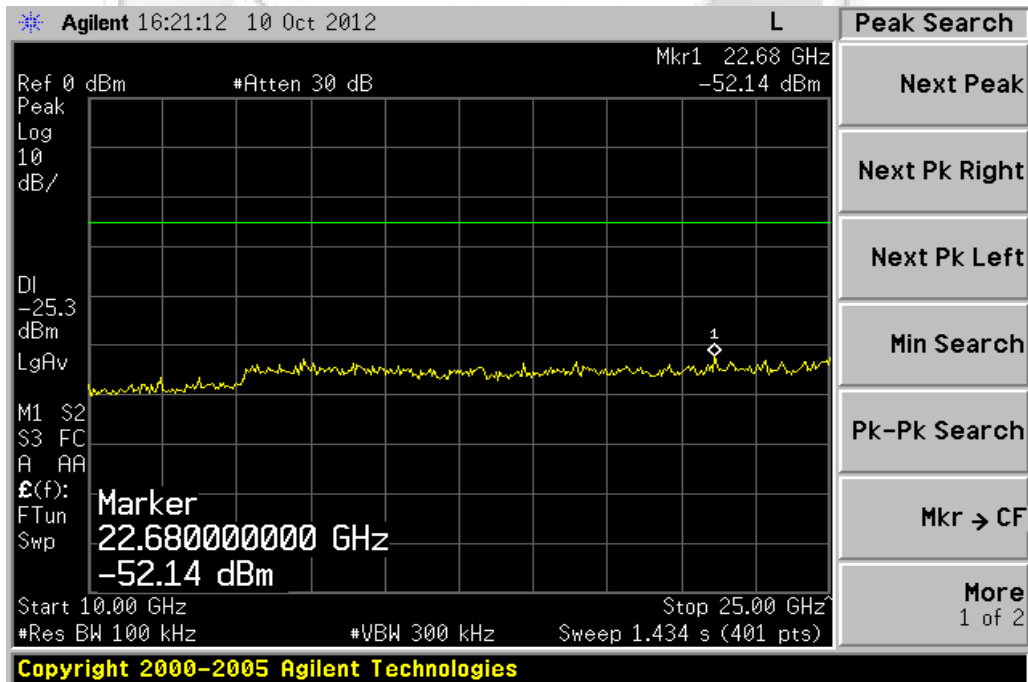


RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots (Antenna 0)



Plot 9 – Channel 20 (middle ch)

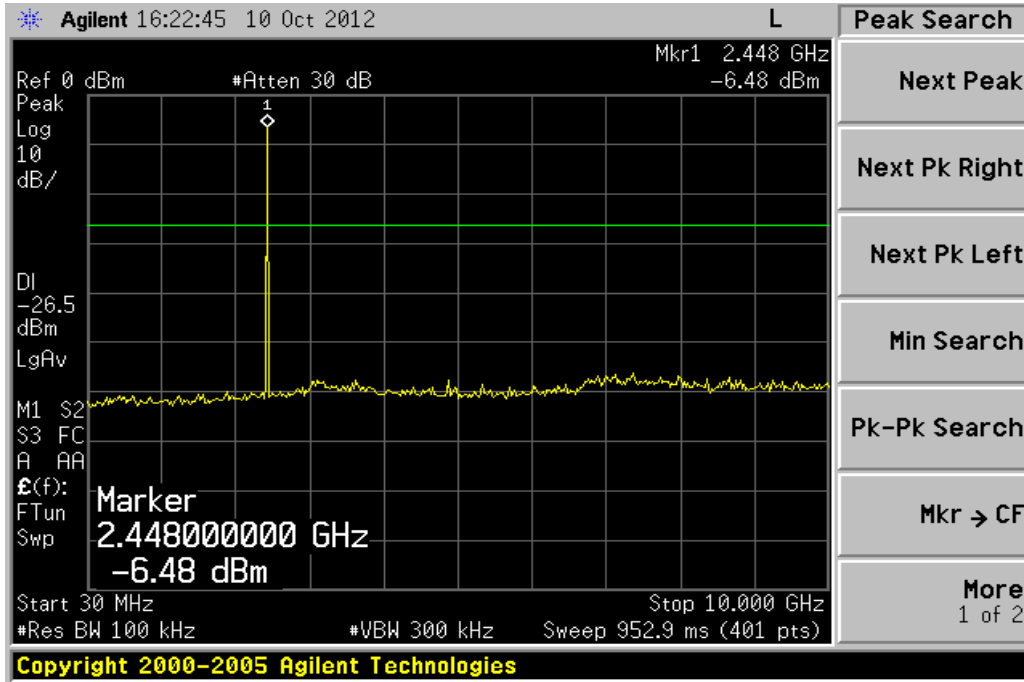


Plot 10 – Channel 20 (middle ch)

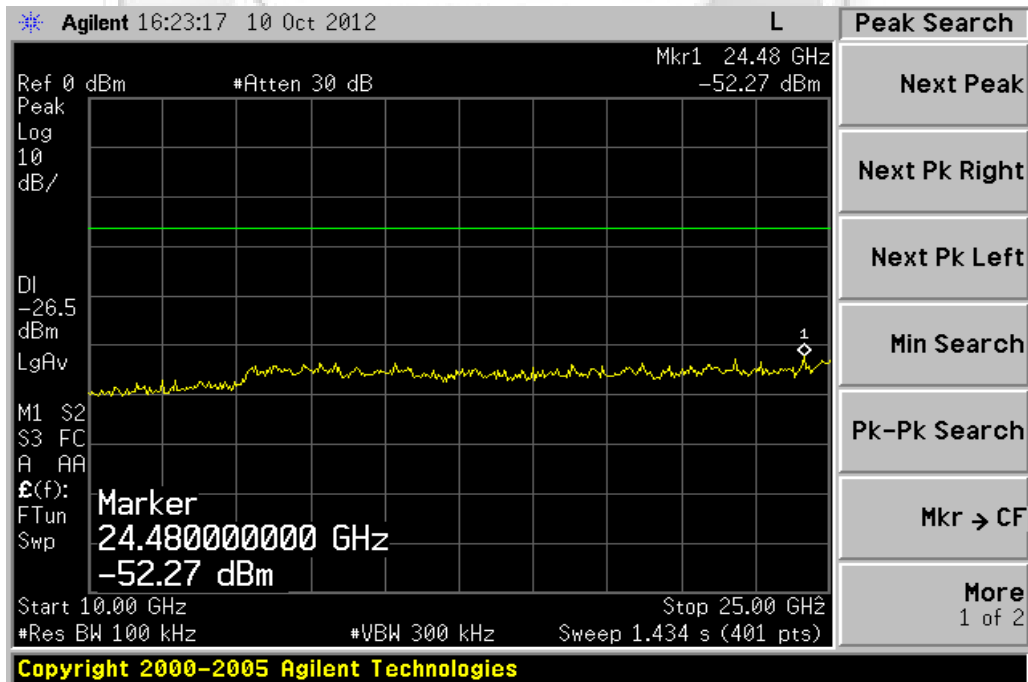


RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots (Antenna 0)



Plot 11 – Channel 38 (upper ch)

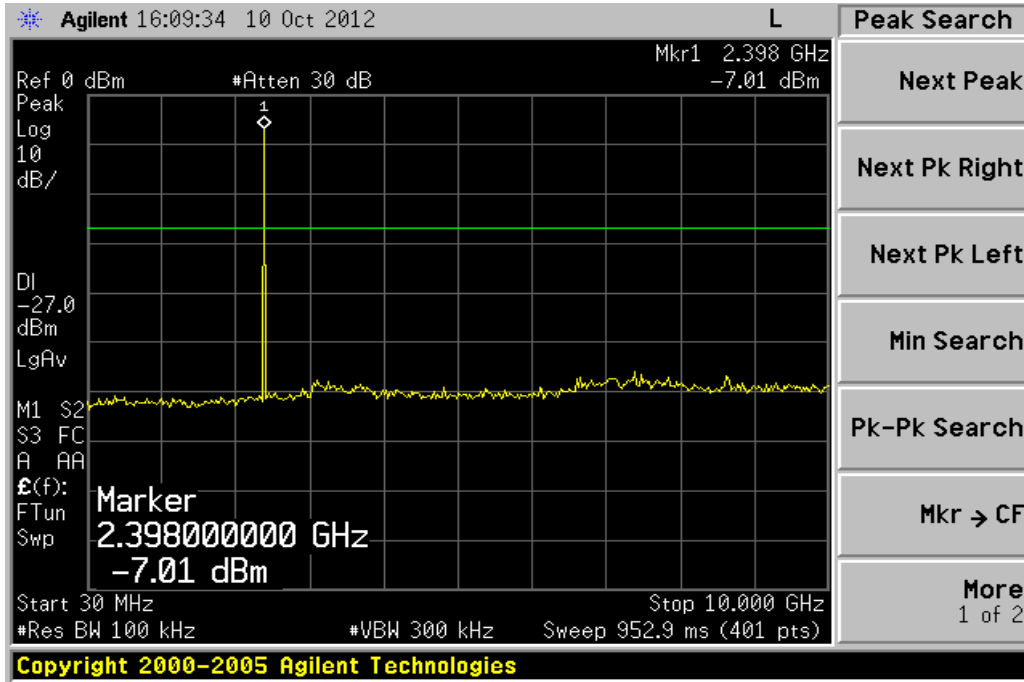


Plot 12 – Channel 38 (upper ch)

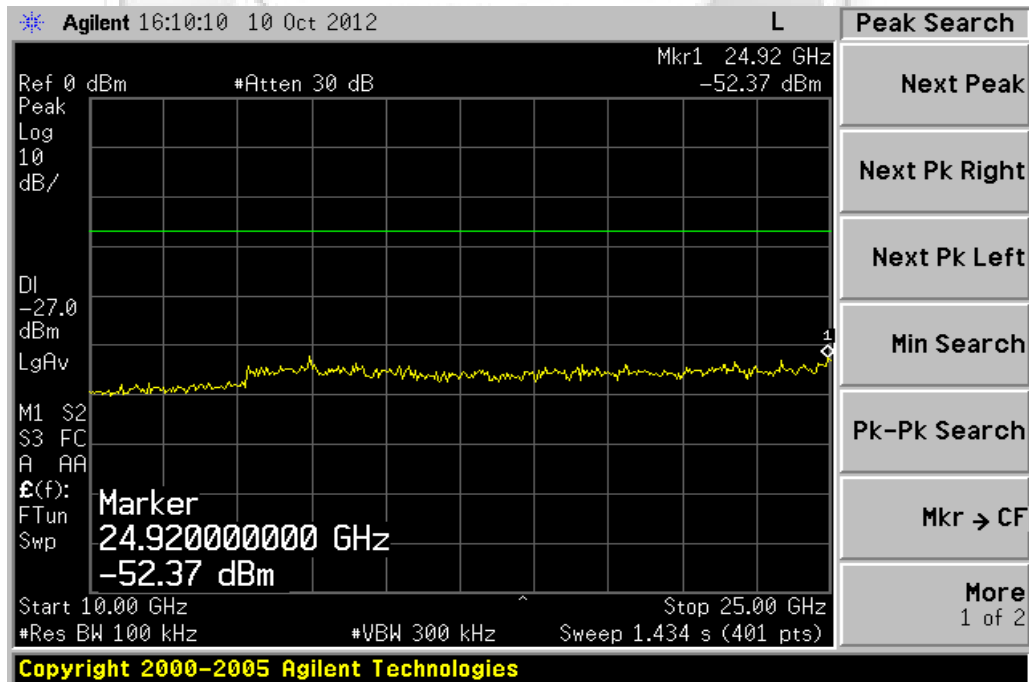


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots (Antenna 1)



Plot 13 – Channel 1 (lower ch)

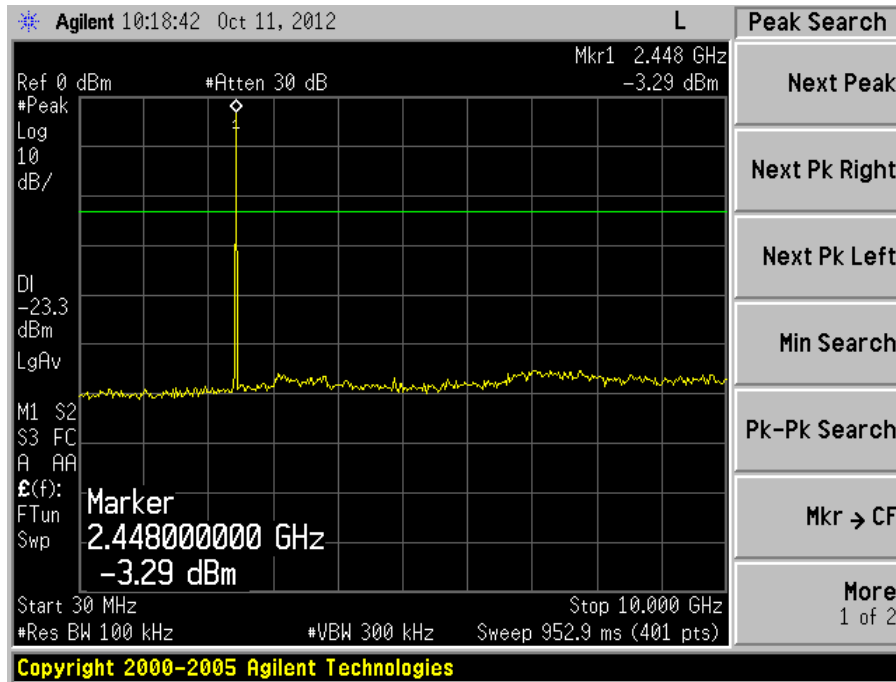


Plot 14 – Channel 1 (lower ch)

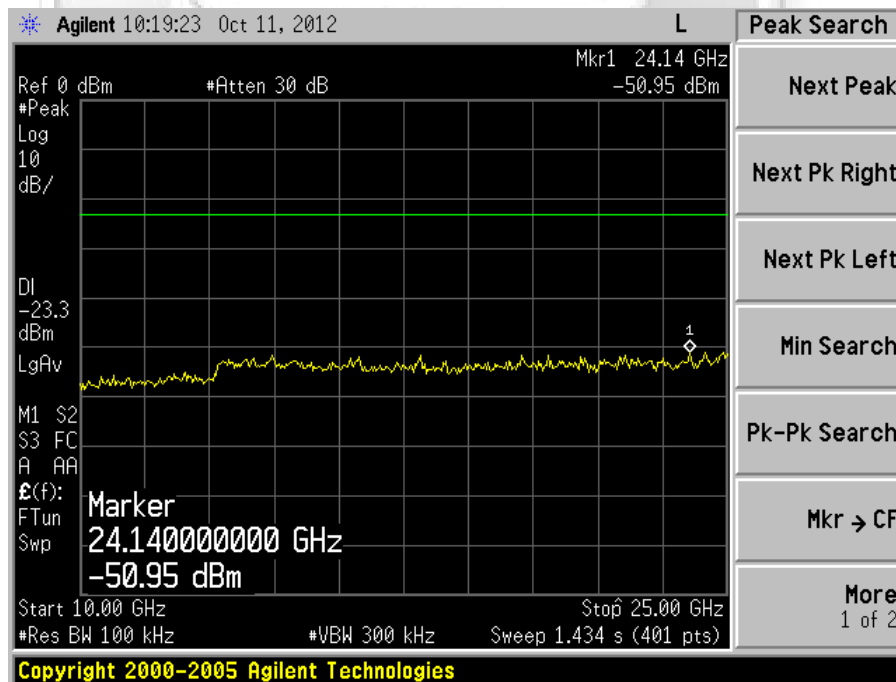


RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots (Antenna 1)



Plot 15 – Channel 20 (middle ch)

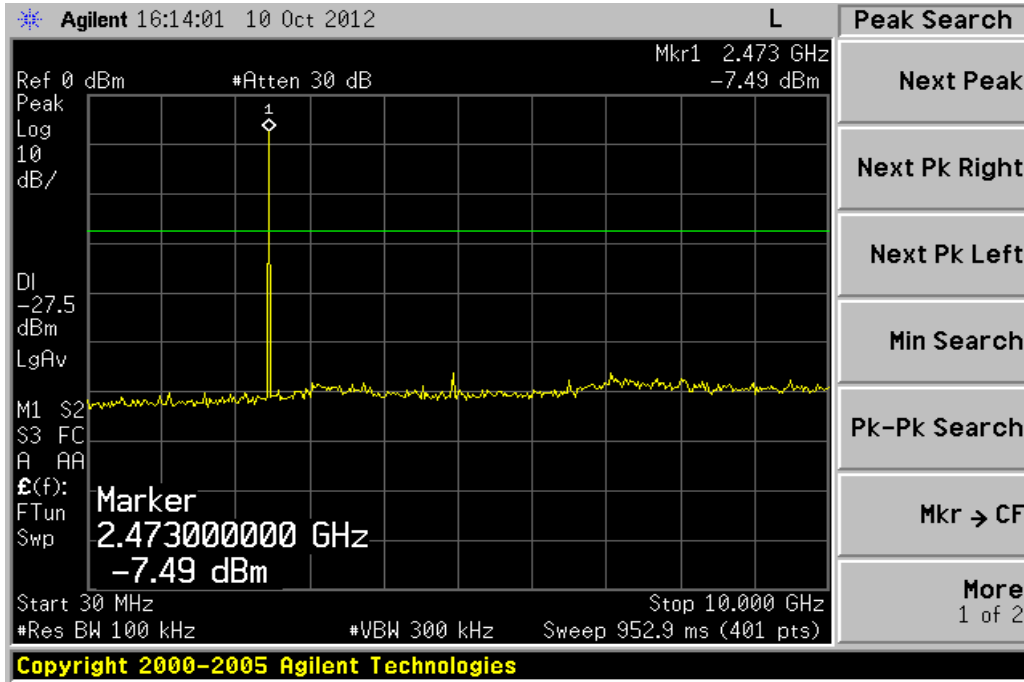


Plot 16 – Channel 20 (middle ch)

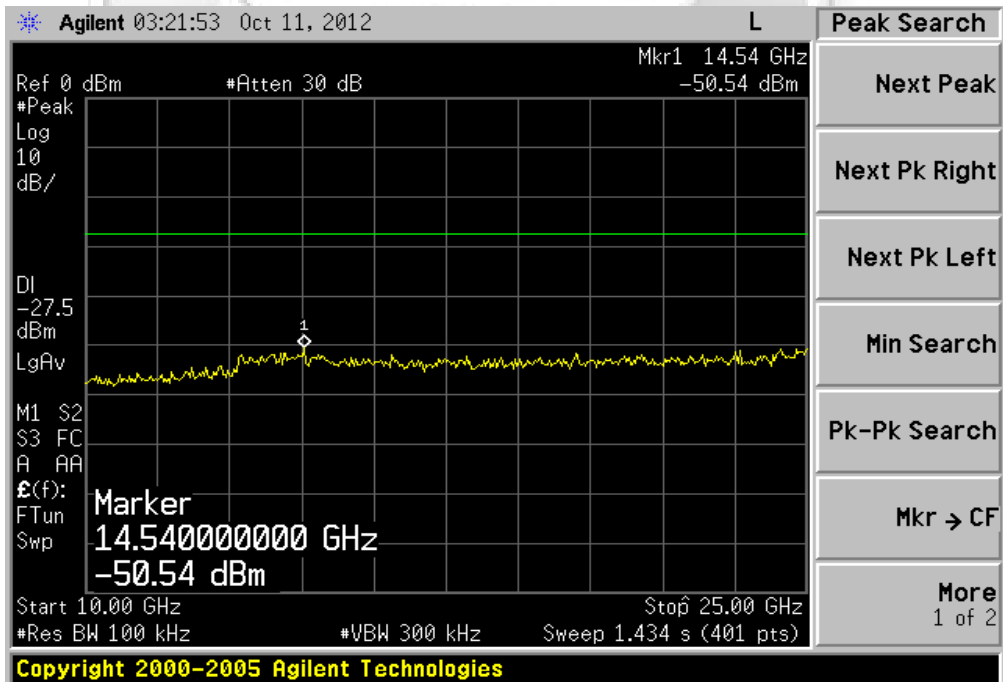


RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots (Antenna 1)



Plot 17 - Channel 38 (upper ch)



Plot 18 - Channel 38 (upper ch)

RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

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 Part 15.247(d) RF Conducted Spurious Emissions (Restricted Bands) Limits

The EUT shows compliance to the requirements of this section, which states that emissions which fall in the restricted bands must comply with the radiated emission limits specified in the table below:

Frequency Range (MHz)	EIRP (dBm)	Radiated Emissions (dBµV/m)
0.009 – 0.490	-6.7 – (-41.4) **	67.6 – 20logF* @ 300m **
0.490 – 1.705	-41.4 – (-52.3) **	87.6 – 20logF* @ 30m **
1.705 – 30	-45.7	29.5 @ 30m
30 - 88	-55.2	40.0 @ 3m
88 - 216	-51.7	43.5 @ 3m
216 - 960	-49.2	46.0 @ 3m
>960	-41.2 ***	54.0 @ 3m ***
* F is frequency in kHz.		
** Decreasing linearly with the logarithm of the frequency.		
*** Above 1GHz, a peak limit of 20dB above the average limit does apply.		

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

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



RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions (Restricted Bands) 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) of the spectrum analyser was set to the following settings. The video bandwidth (VBW) was set to at least three times of the RBW.

Frequency (MHz)	RBW (kHz)
0.009 – 0.150	0.2
0.150 – 30.0	9.0
30.0 - 1000	100.0
> 1000	1000.0

5. The detector of the spectrum analyser was set to peak detection mode.
6. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions (Restricted Bands) Test Method

1. Measurement in the range 9kHz – 1000MHz
 - 1.1 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 the transmitting frequency was set to lower channel.
 - 1.2 The start and stop frequencies of the spectrum analyser were set according to the supported RBW.
 - 1.3 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.
 - 1.4 No further measurement was required if all the captured emissions complied to the limits. Else, the spectrum analyser was set to zoom to the captured emission with the detector of the spectrum analyser was set to quasi-peak. The emission level of the captured frequency was measured.
 - 1.5 The step 1.4 was repeated until all the captured emissions which exceeding the limits were measured.
 - 1.6 The steps 1.2 to 1.5 were repeated with the transmitting frequency was set to middle and upper channel respectively.
2. Measurement above 1000MHz
 - 2.1 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 the transmitting frequency was set to lower channel.
 - 2.2 The start and stop frequencies of the spectrum analyser were set according to the supported frequency band of the set RBW with the number of points in a sweep was set to equal or greater than 2 times of the ratio of span over RBW.
 - 2.3 The detector of the spectrum analyser was set to power average (RMS) mode with the sweep time was set to equal or greater than 10 times of the product of number of measurement points in a sweep and transmission symbol time.
 - 2.4 The spectrum analyser was then allowed to capture any spurious emissions within a single sweep. The peak marker function of the spectrum analyser was used to locate the highest power level.
 - 2.5 The steps 2.2 to 2.4 were repeated until all the required frequency bands were measured.
 - 2.6 The steps 2.2 to 2.5 were repeated with the transmitting frequency was set to middle and upper channel respectively.
 - 2.7 The measurements were repeated with the detector of the spectrum analyser was set to peak detecting mode. The sweep time was set to auto coupler.

RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST



RF Conducted Spurious Emissions (Restricted Bands) Test Setup

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

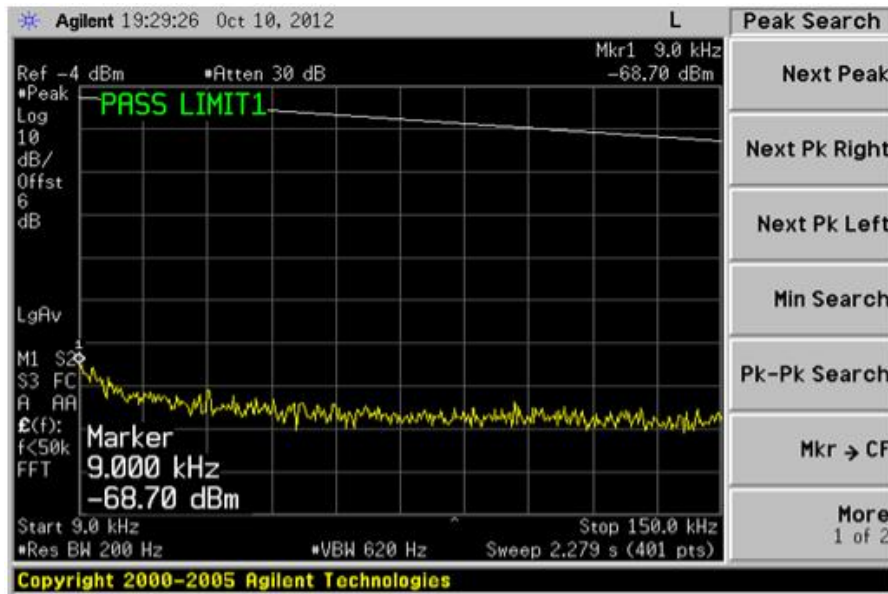
Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	19 – 45 (Antenna 0) 46 – 72 (Antenna 1)	Relative Humidity	56%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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

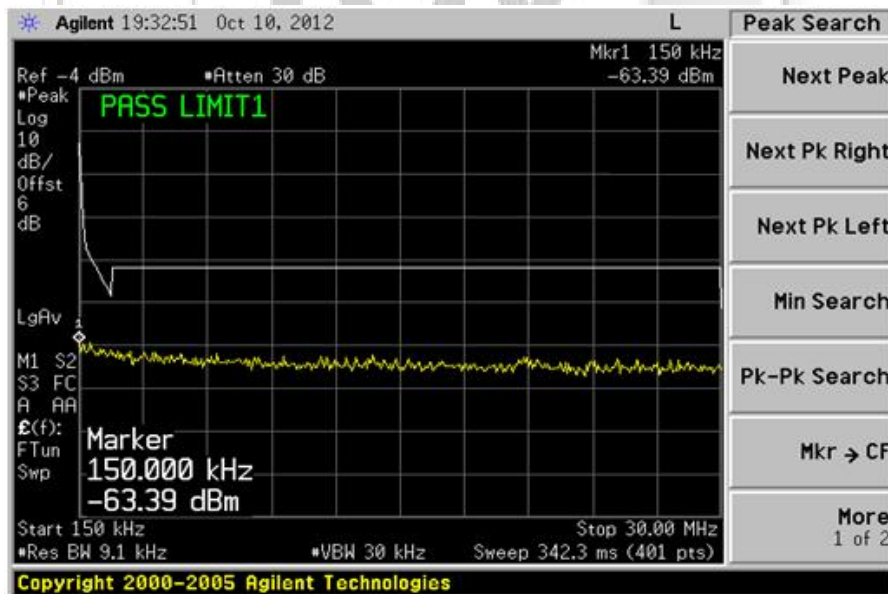


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 19 – Channel 1 (lower ch)

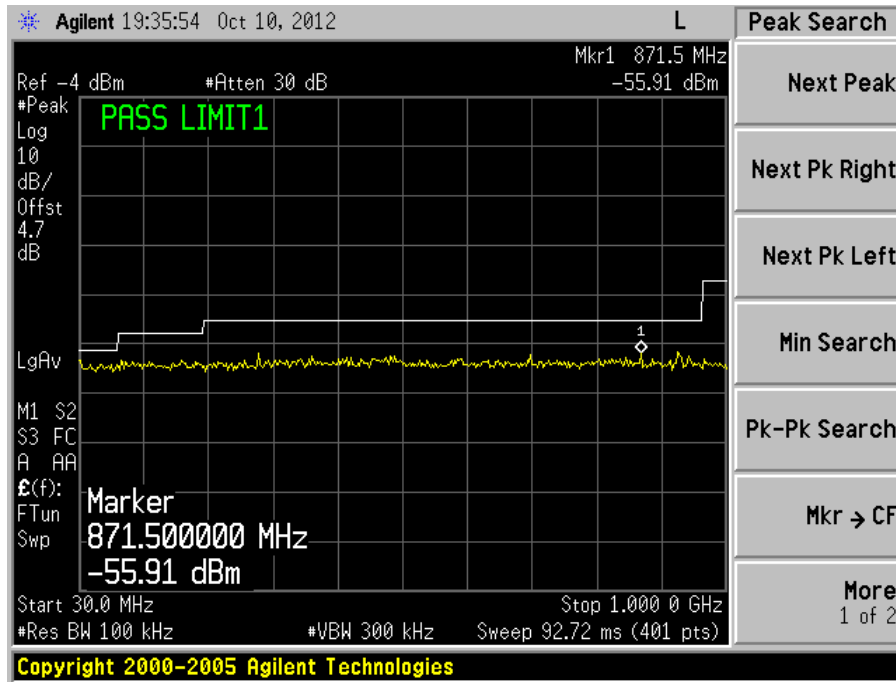


Plot 20 – Channel 1 (lower ch)

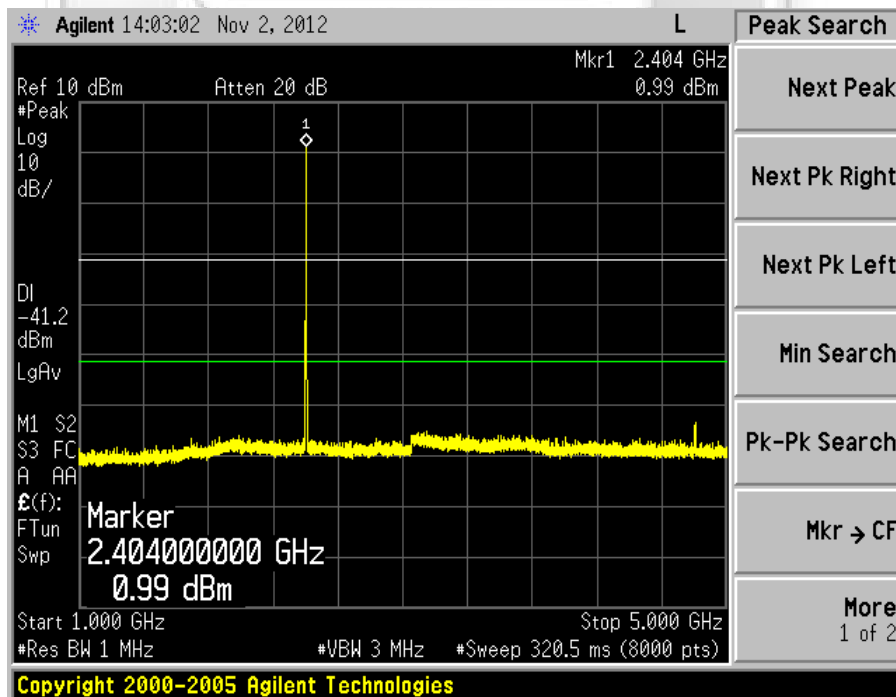


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 21 – Channel 1 (lower ch)

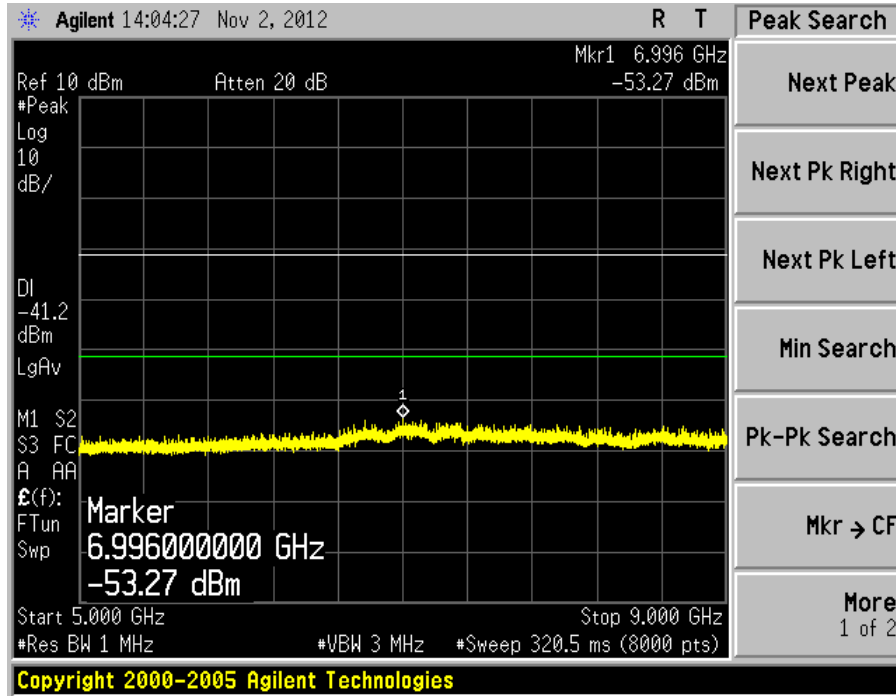


Plot 22 – Channel 1 (lower ch)

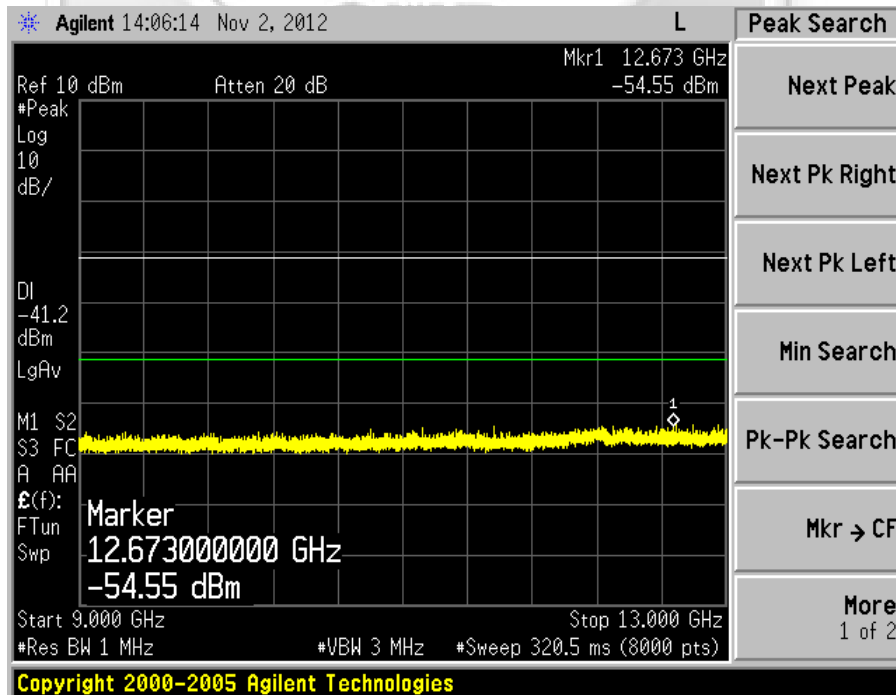


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 23- Channel 1 (lower ch)

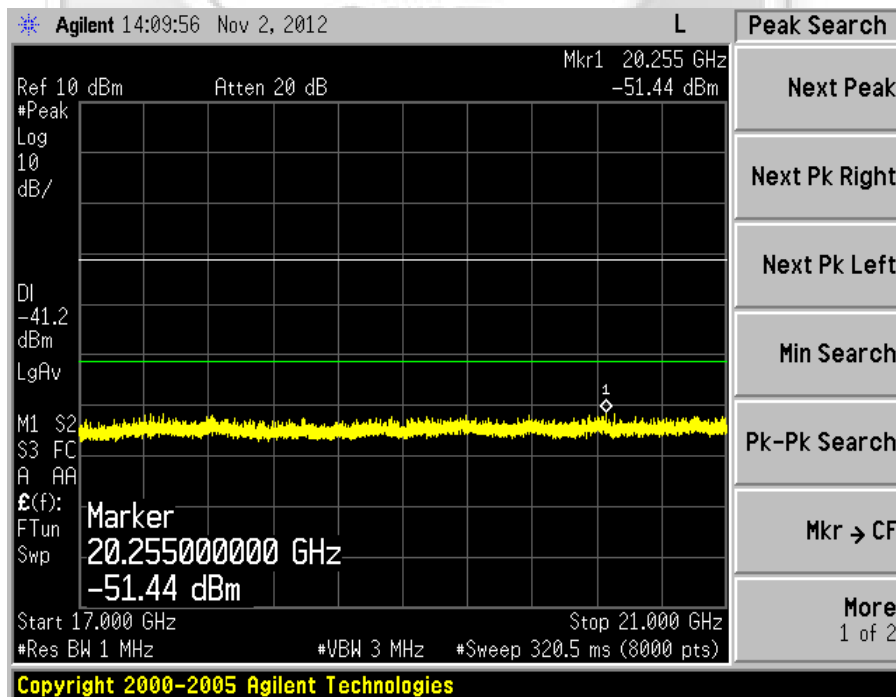
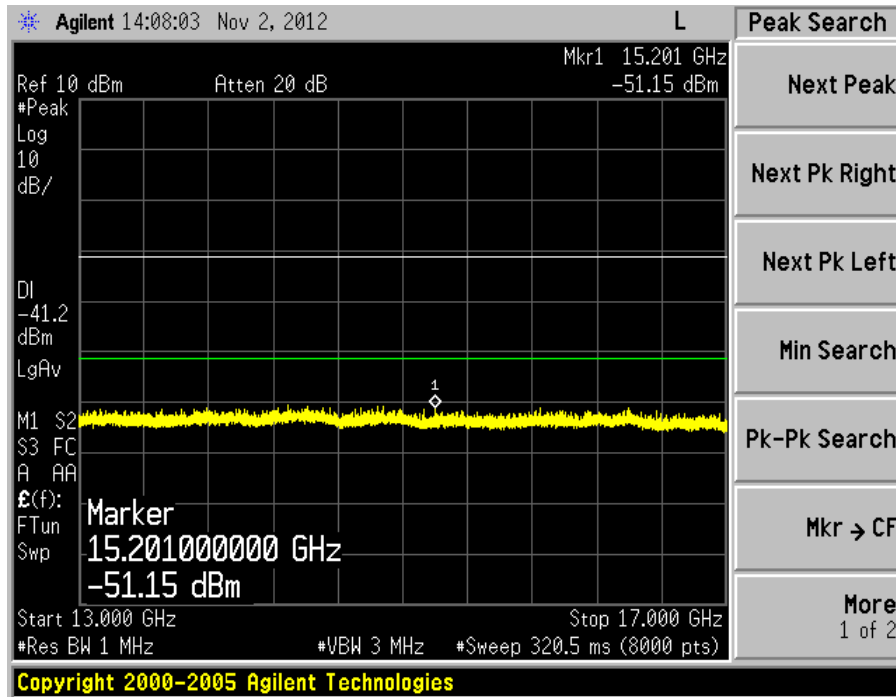


Plot 24 - Channel 1 (lower ch)



RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

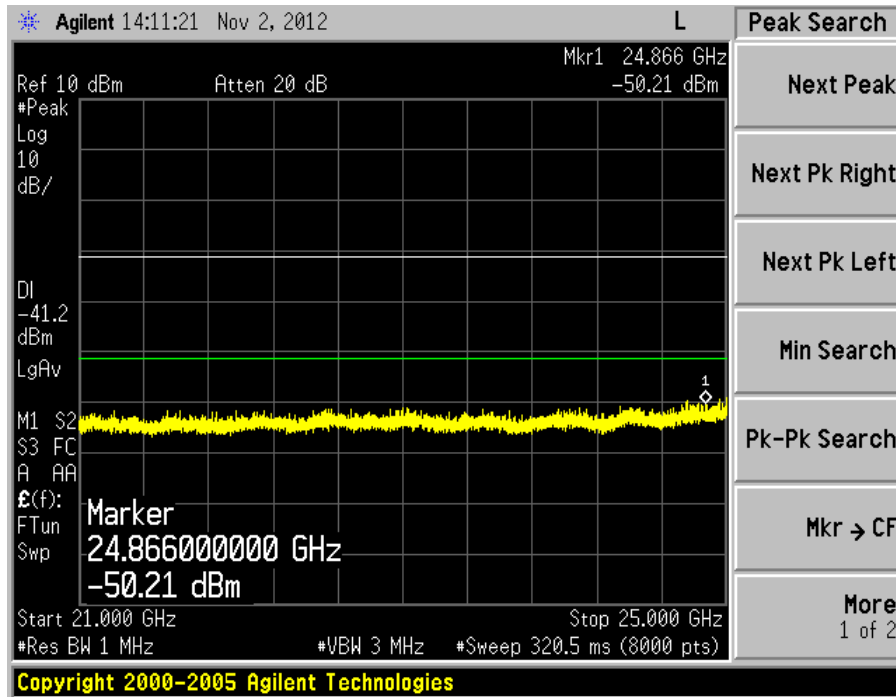
RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)





RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



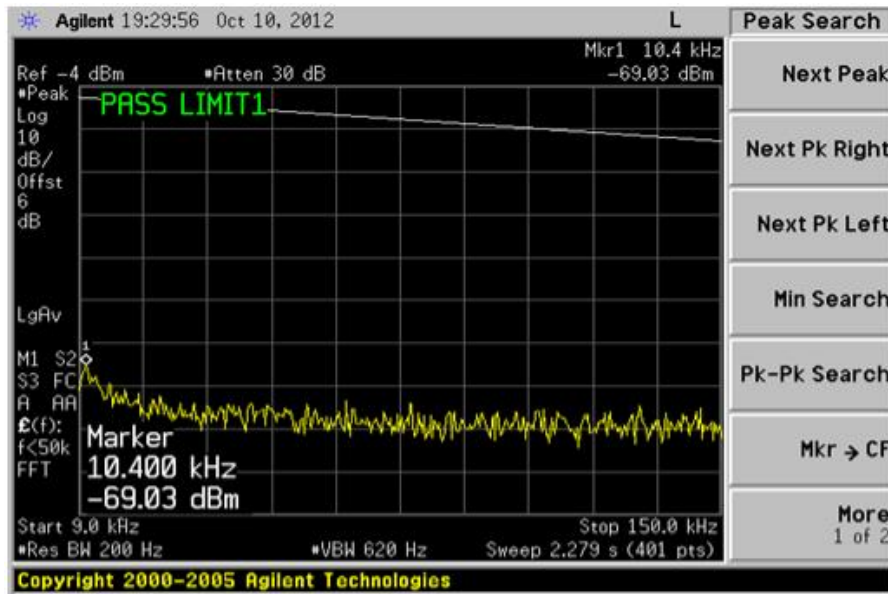
Plot 27 – Channel 1 (lower ch)



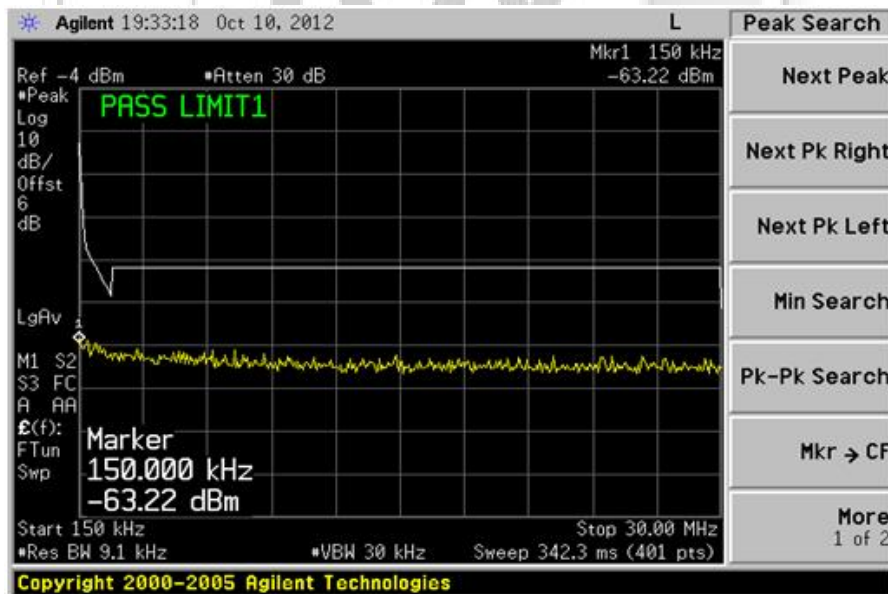


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 28 – Channel 20 (middle ch)

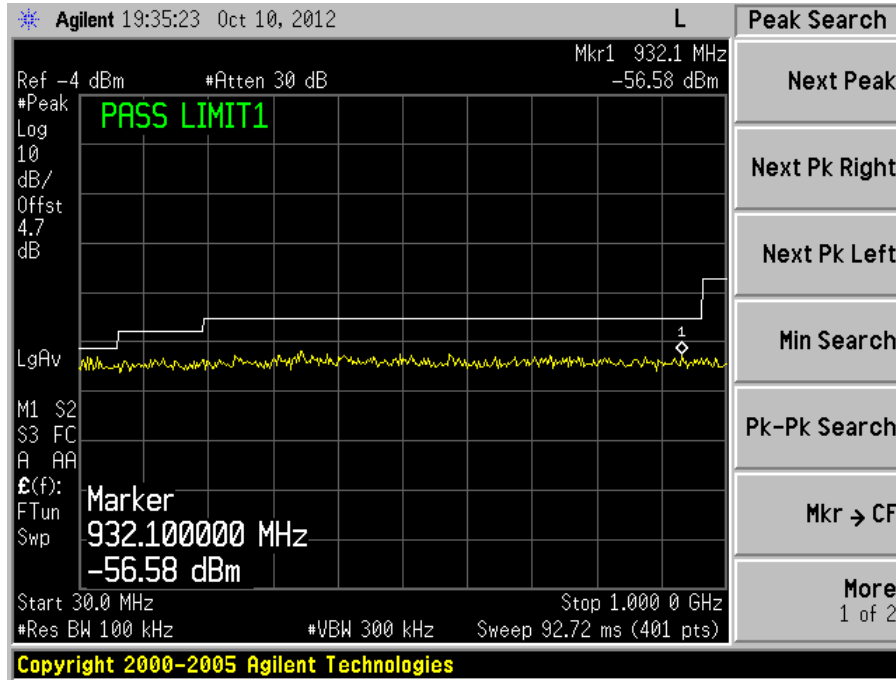


Plot 29 – Channel 20 (middle ch)

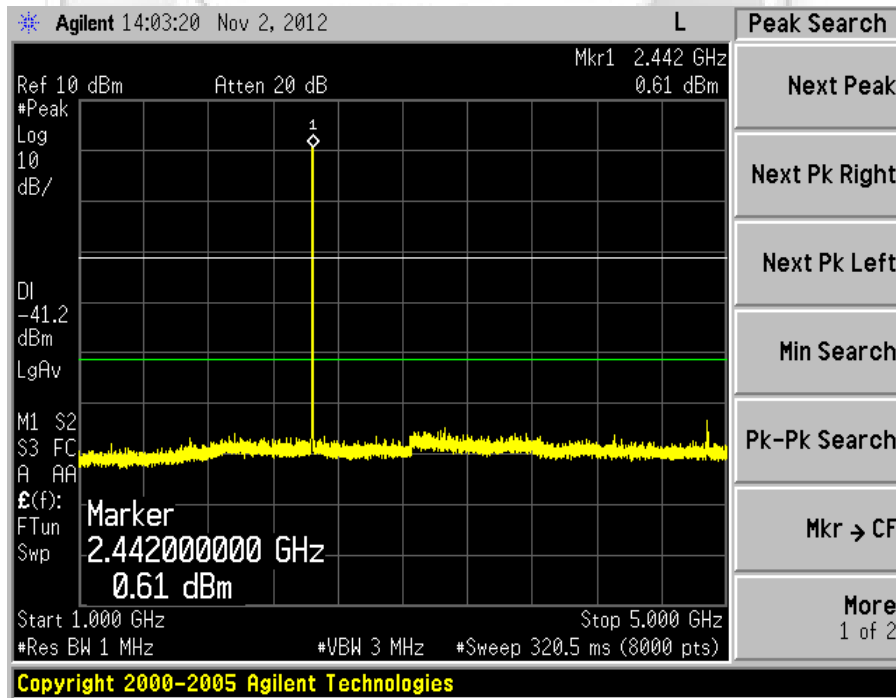


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 30 – Channel 20 (middle ch)

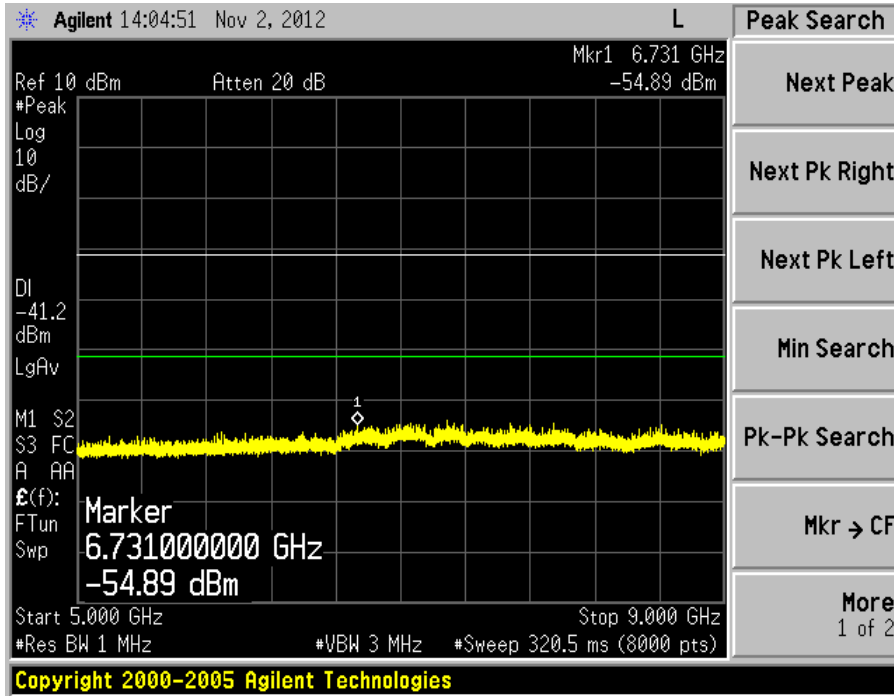


Plot 31 – Channel 20 (middle ch)

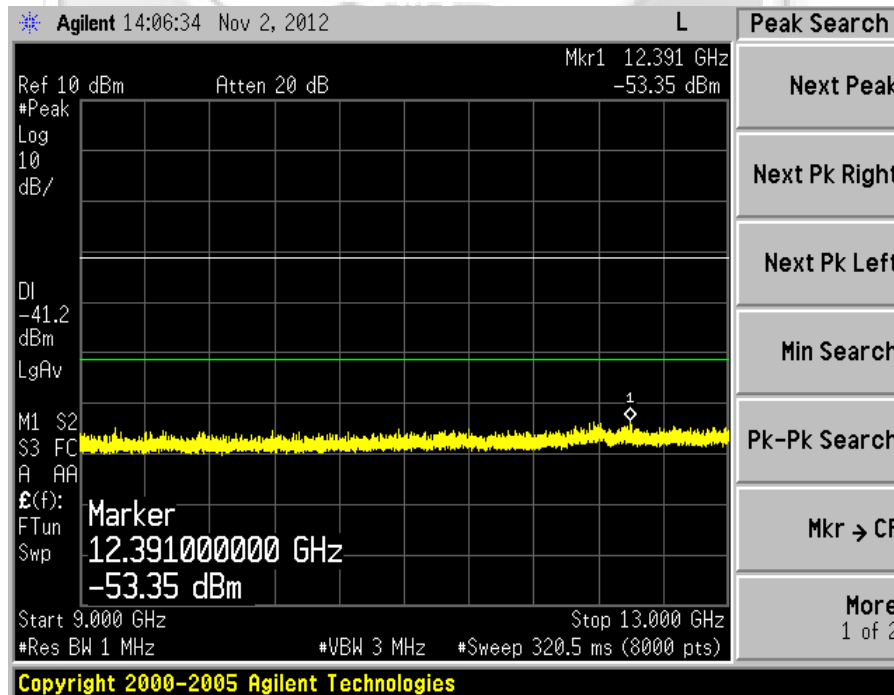


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 32 – Channel 20 (middle ch)

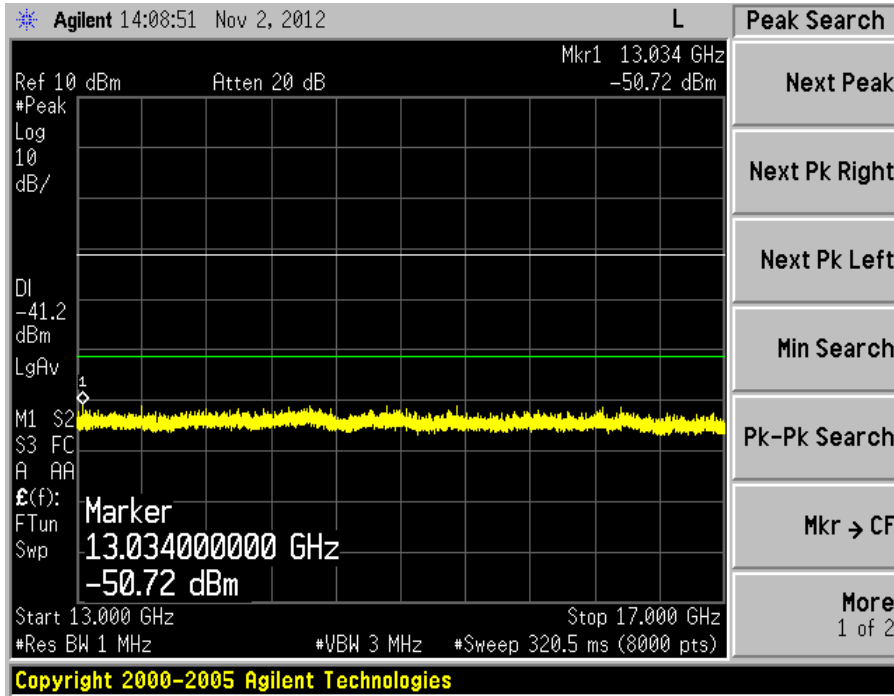


Plot 33 – Channel 20 (middle ch)

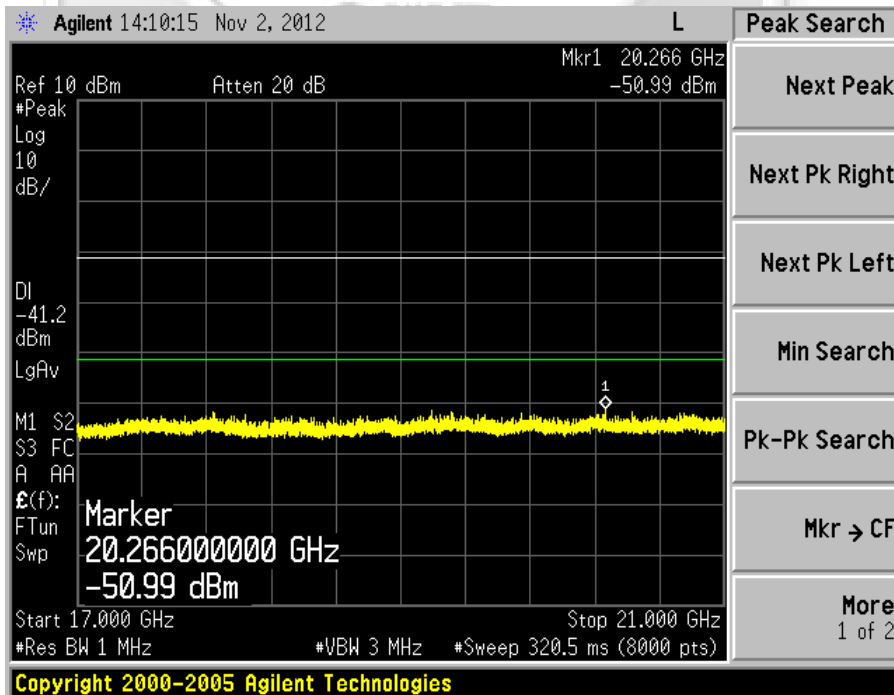


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 34 – Channel 20 (middle ch)

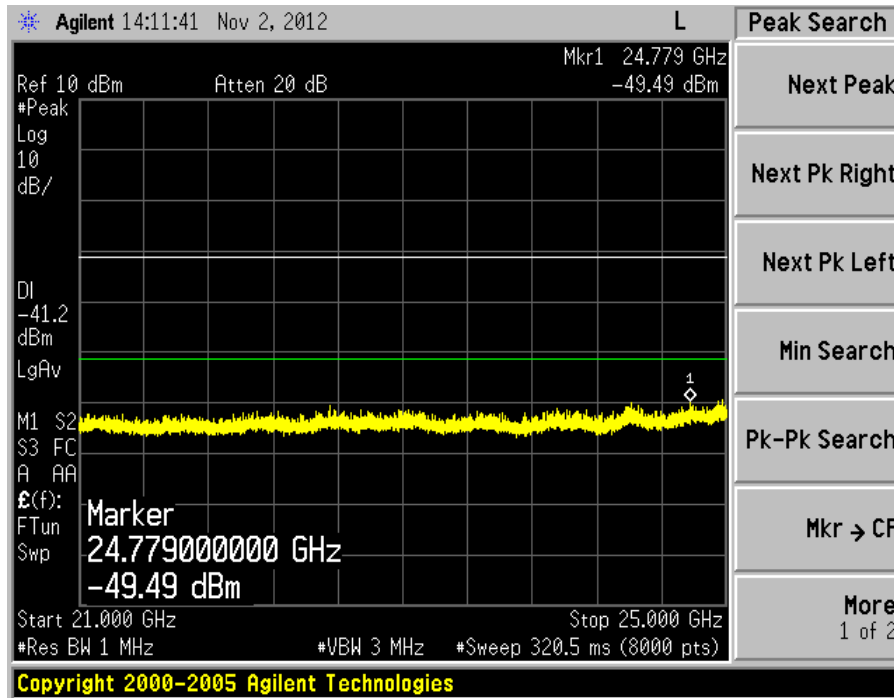


Plot 35 – Channel 20 (middle ch)



RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



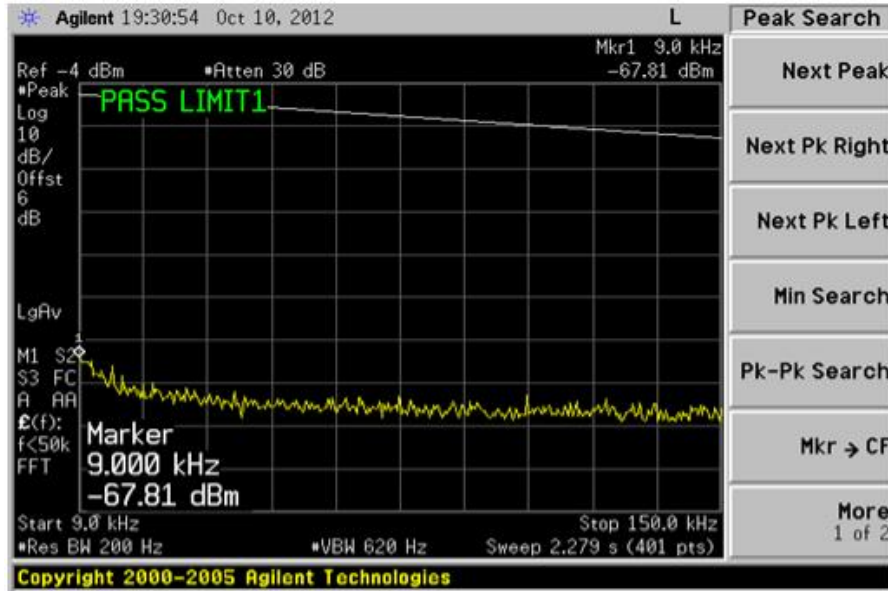
Plot 36 – Channel 20 (middle ch)



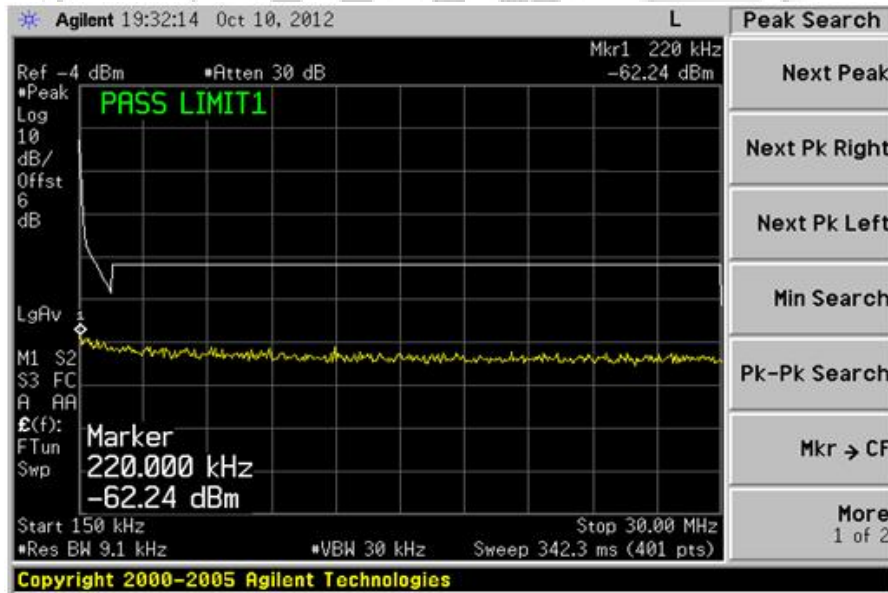


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 37 – Channel 38 (upper ch)

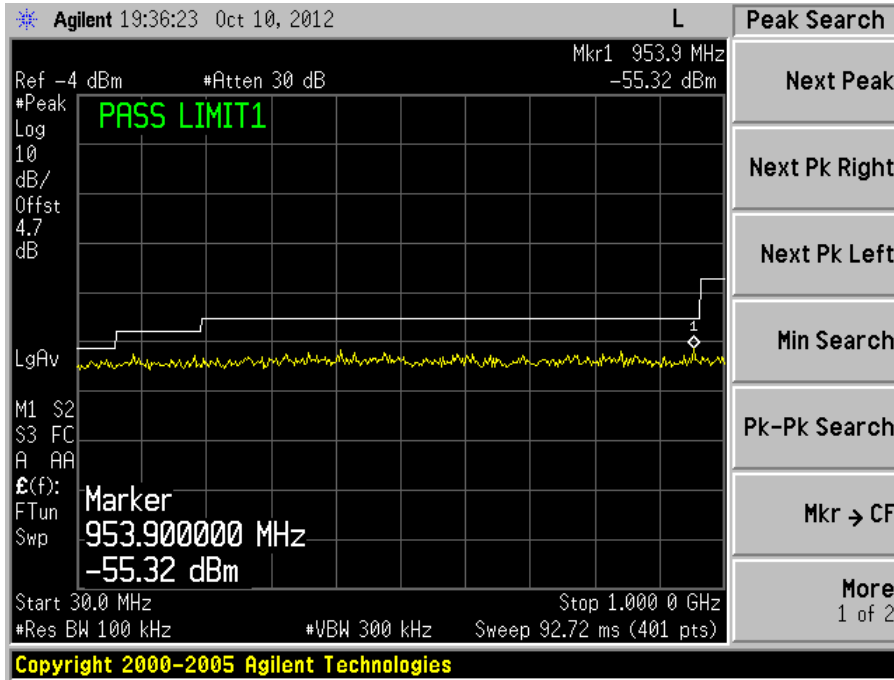


Plot 38 – Channel 38 (upper ch)

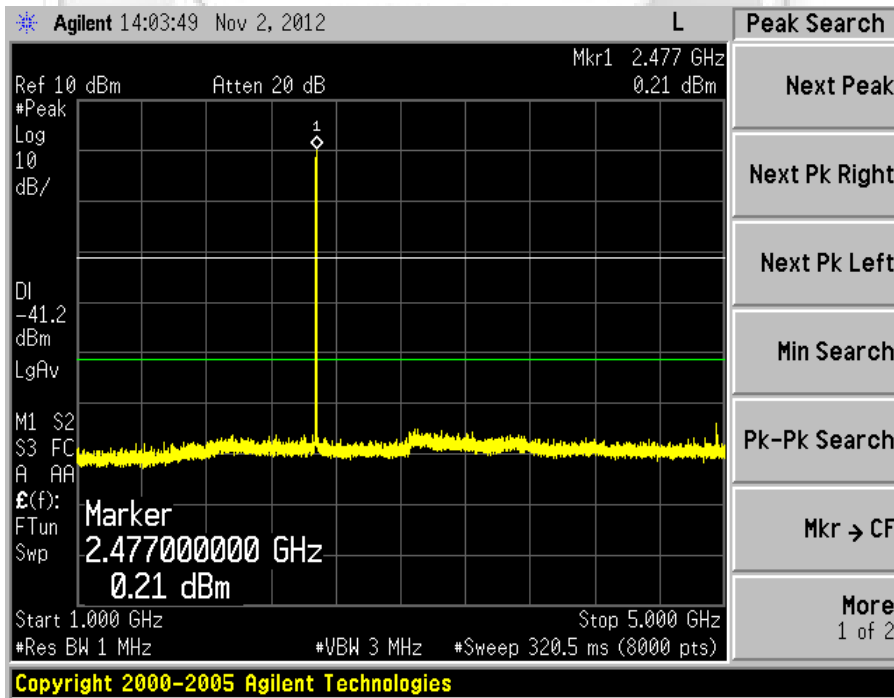


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 39 – Channel 38 (upper ch)

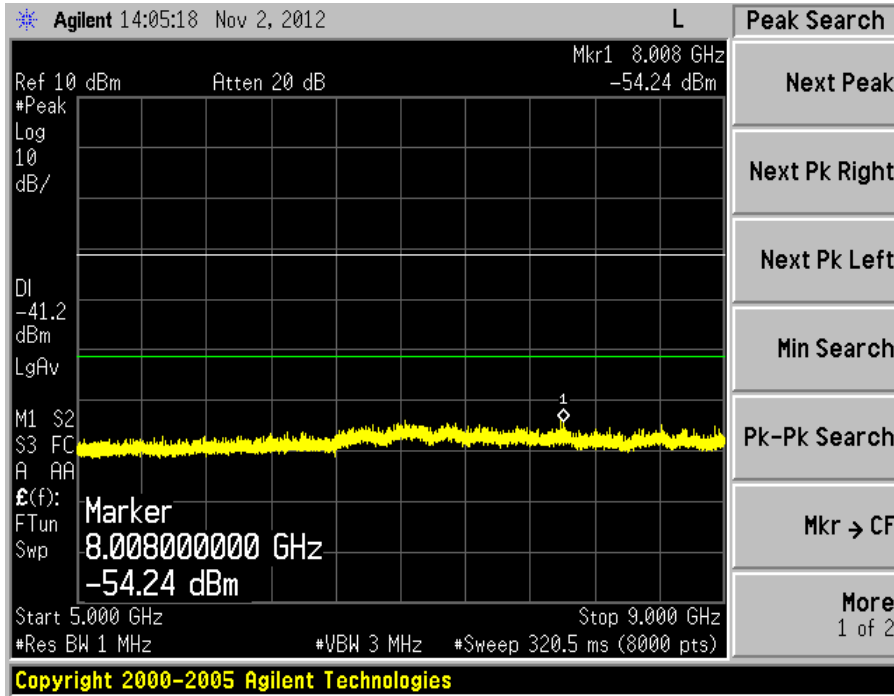


Plot 40 – Channel 38 (upper ch)

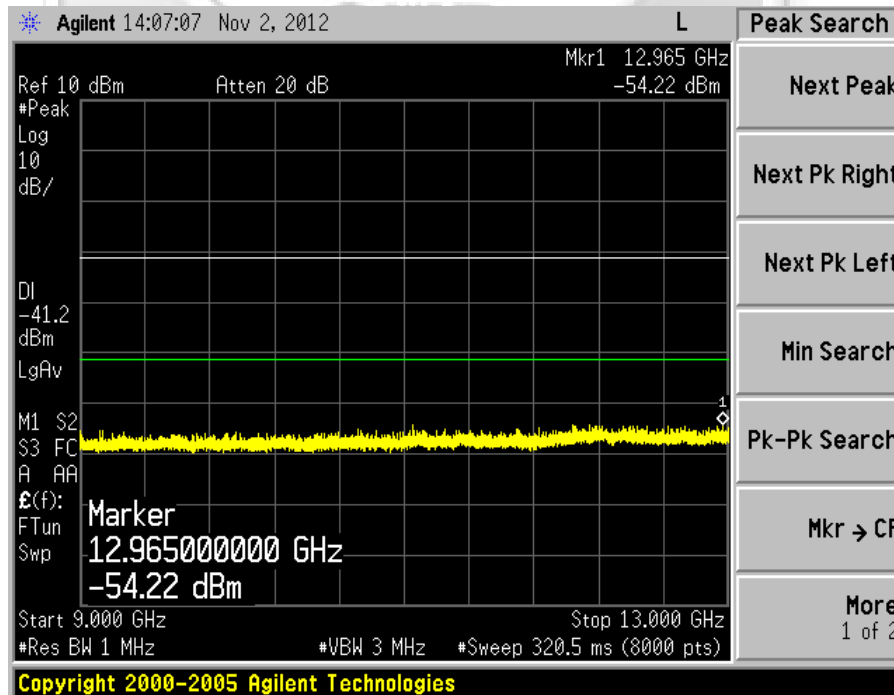


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 41 - Channel 38 (upper ch)

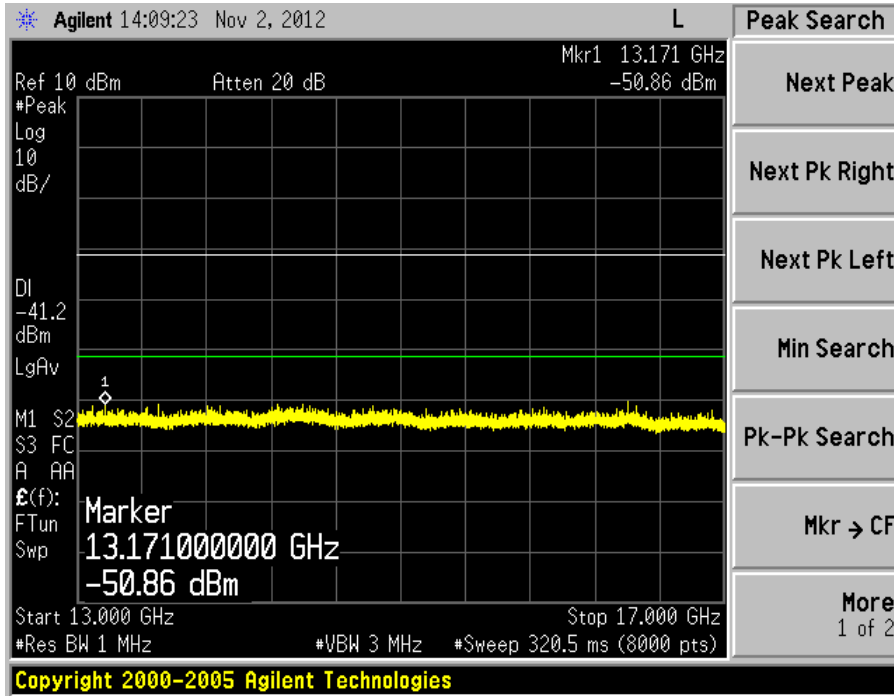


Plot 42 - Channel 38 (upper ch)

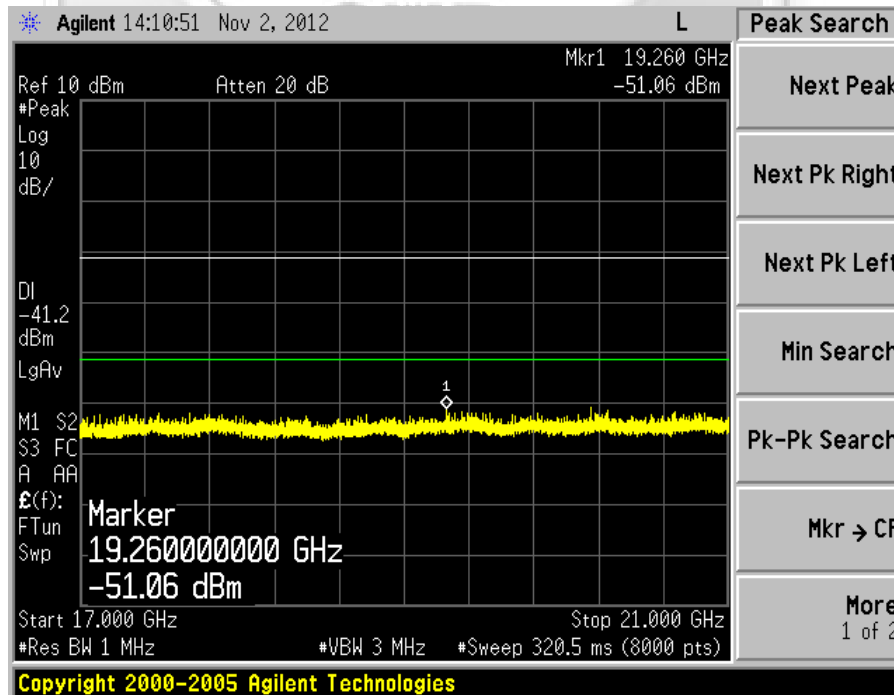


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



Plot 43 - Channel 38 (upper ch)

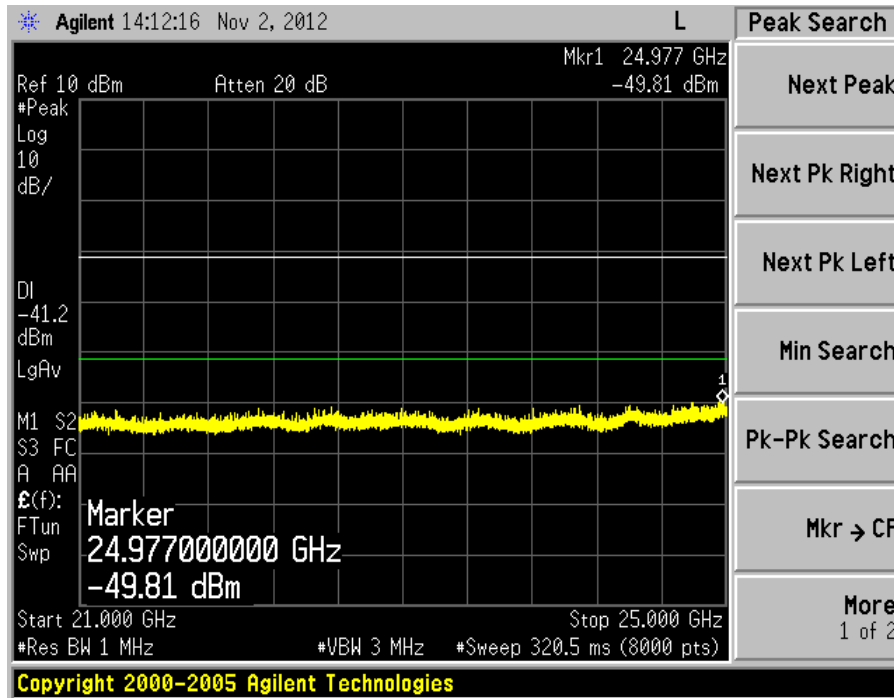


Plot 44 - Channel 38 (upper ch)



RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 0)



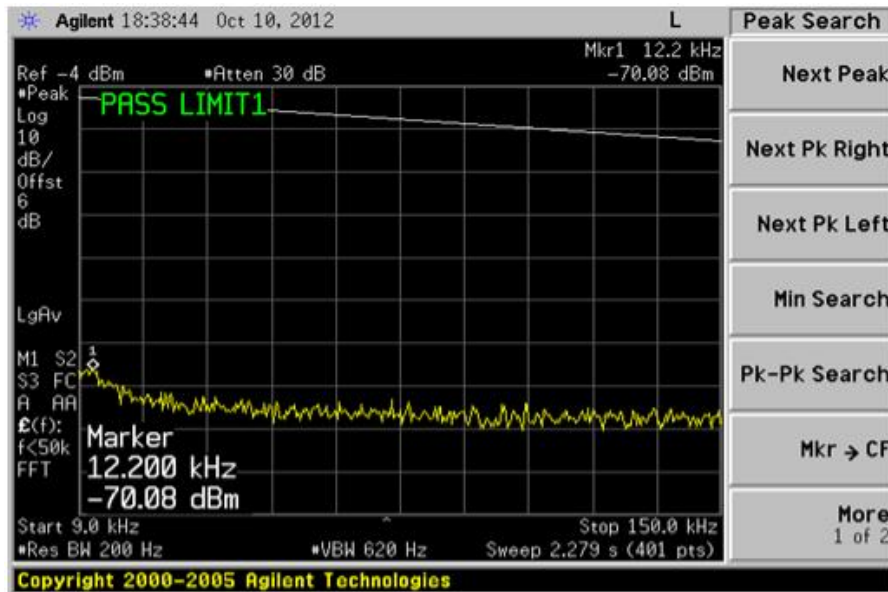
Plot 45- Channel 38 (upper ch)



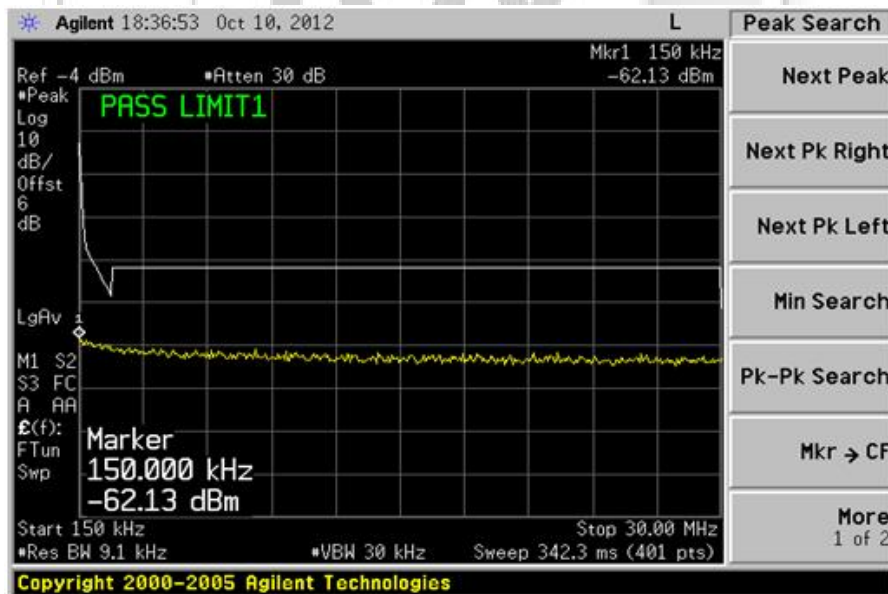


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 46 – Channel 1 (lower ch)

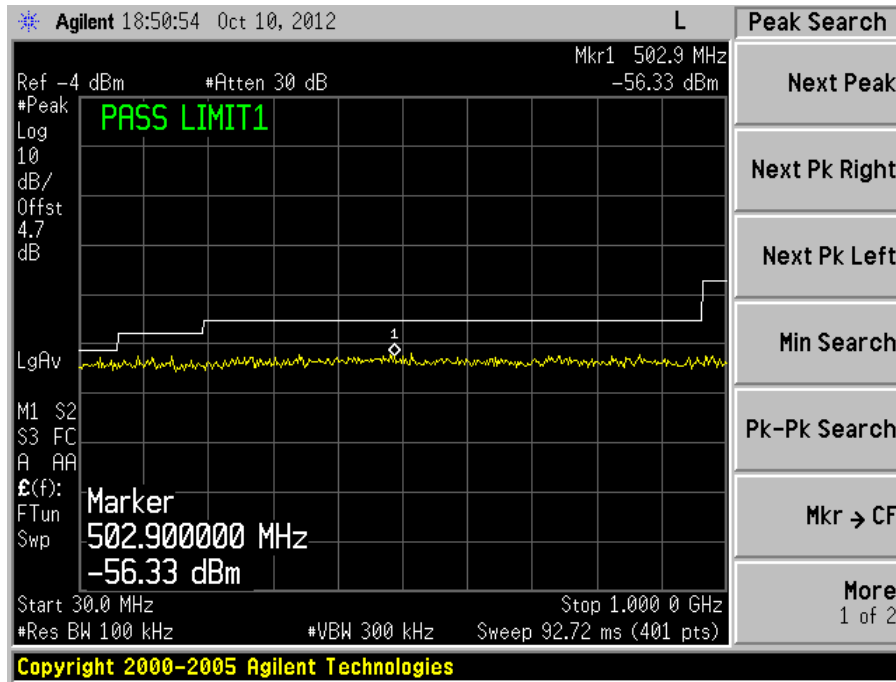


Plot 47 – Channel 1 (lower ch)

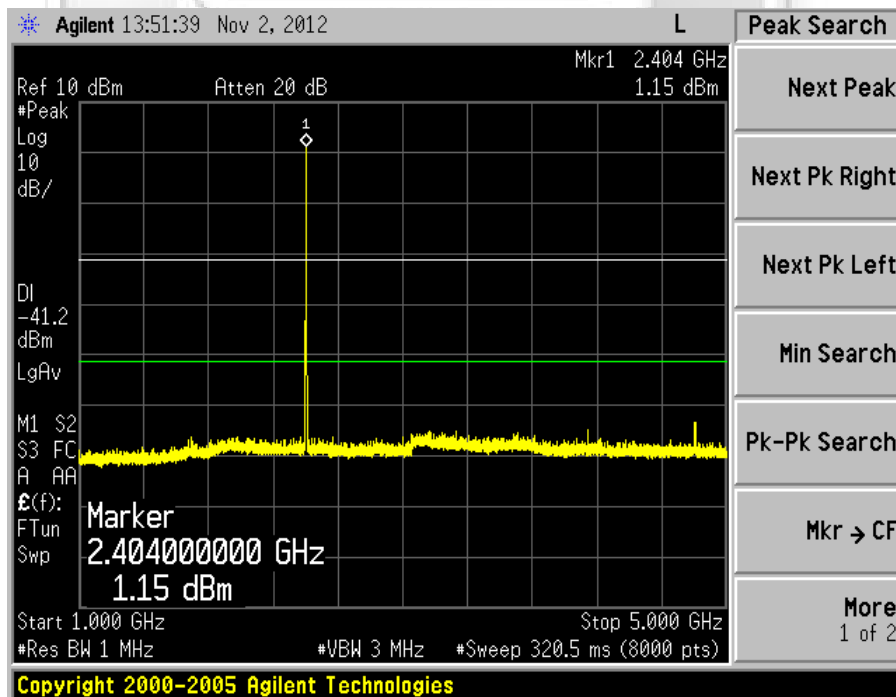


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 48 – Channel 1 (lower ch)

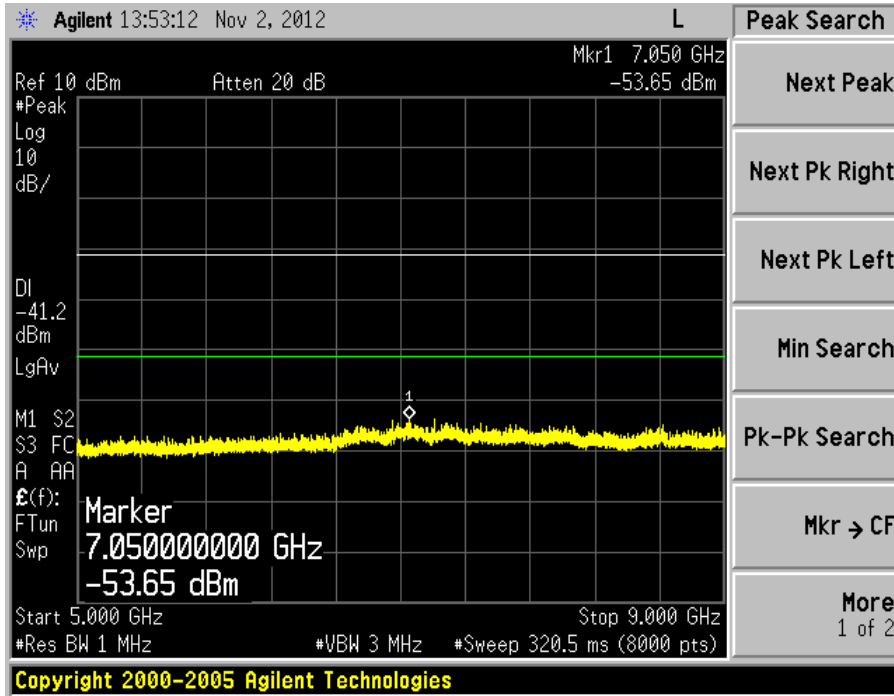


Plot 49 – Channel 1 (lower ch)

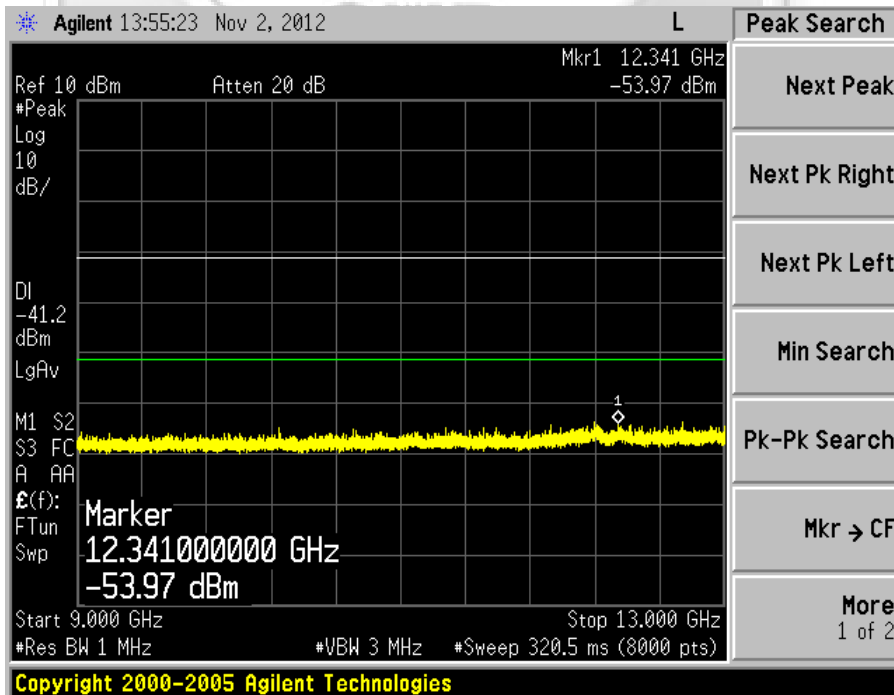


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 50- Channel 1 (lower ch)

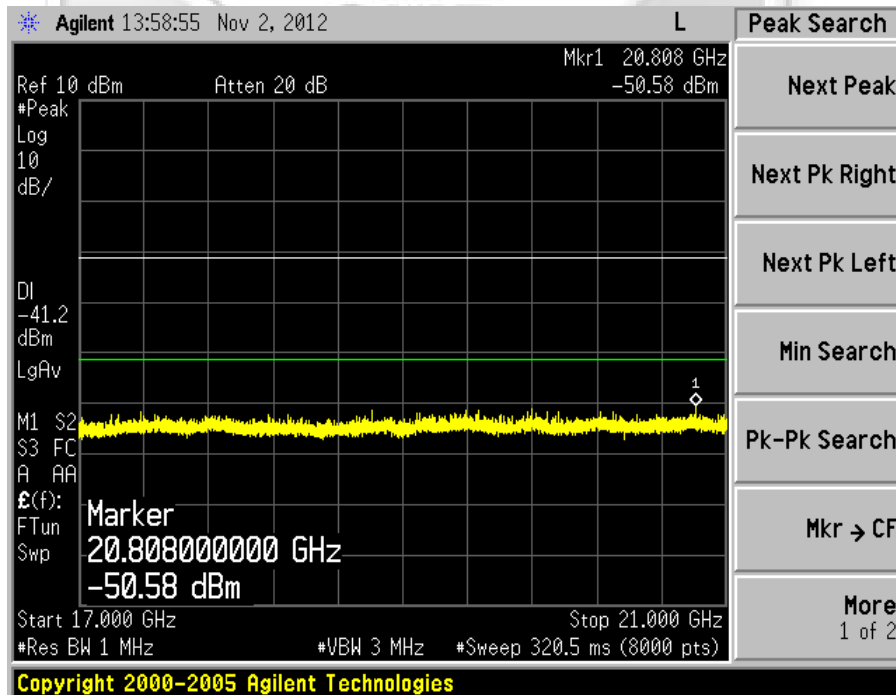
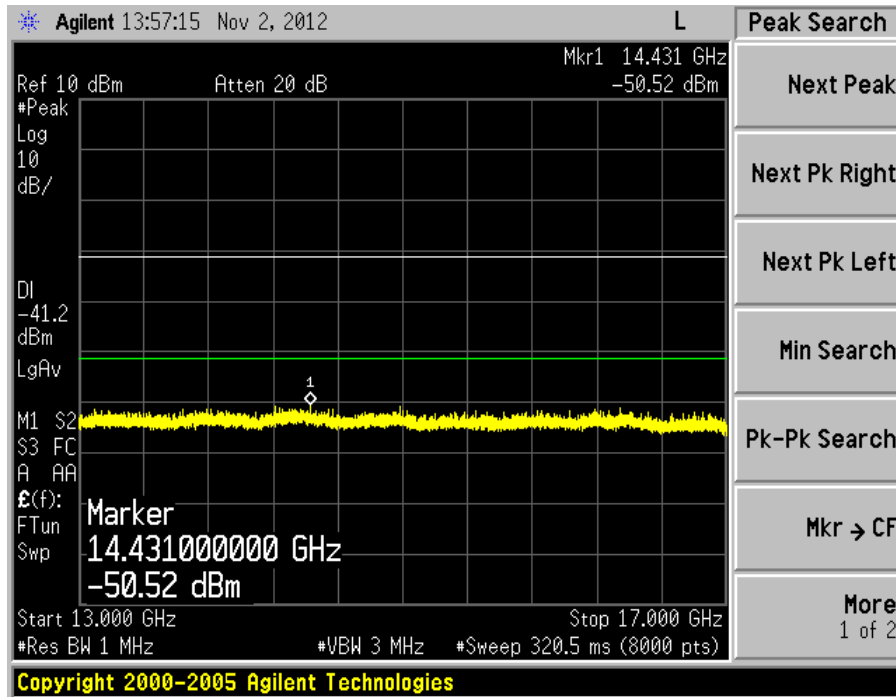


Plot 51 - Channel 1 (lower ch)



RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

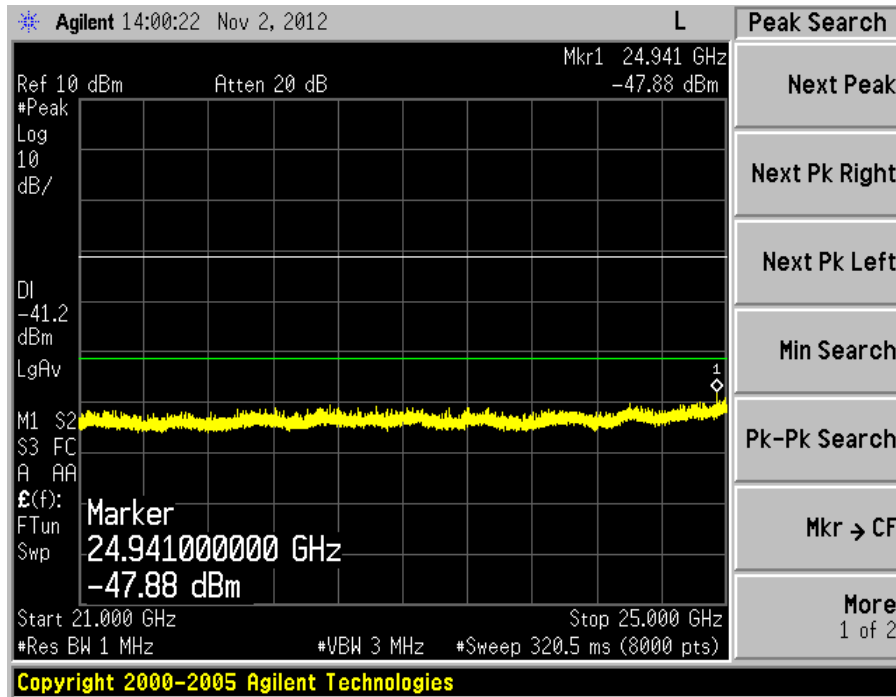
RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)





RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



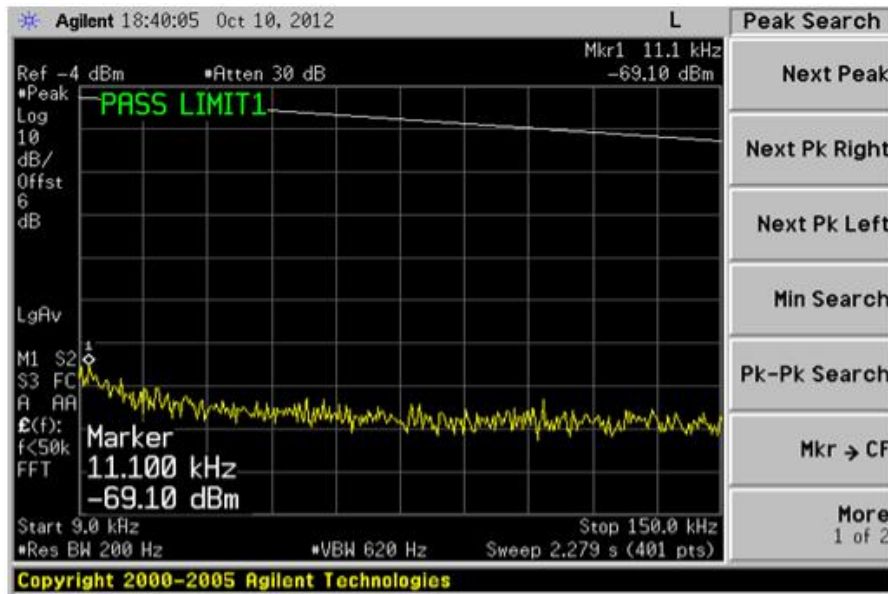
Plot 54 – Channel 1 (lower ch)



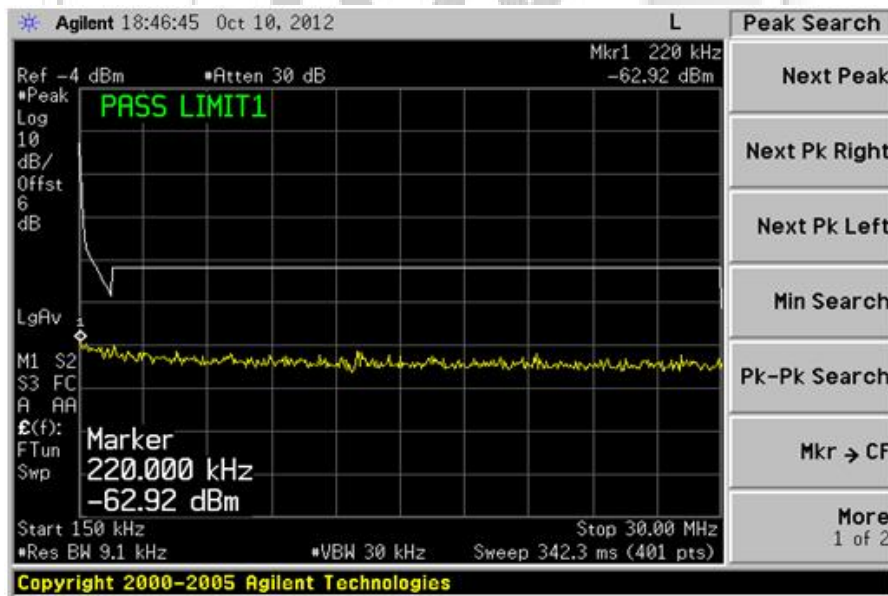


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 55 – Channel 20 (middle ch)

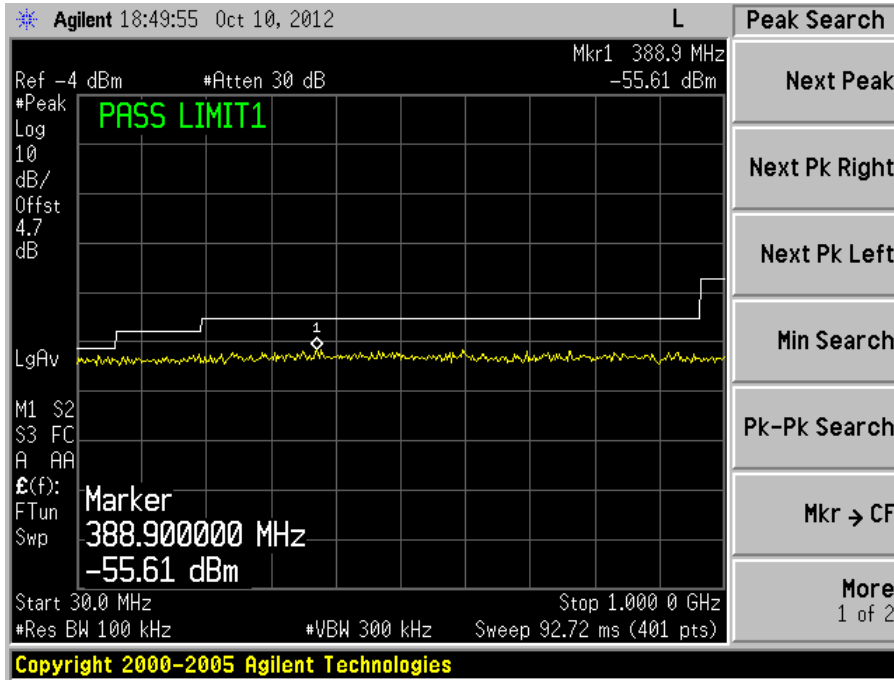


Plot 56 – Channel 20 (middle ch)

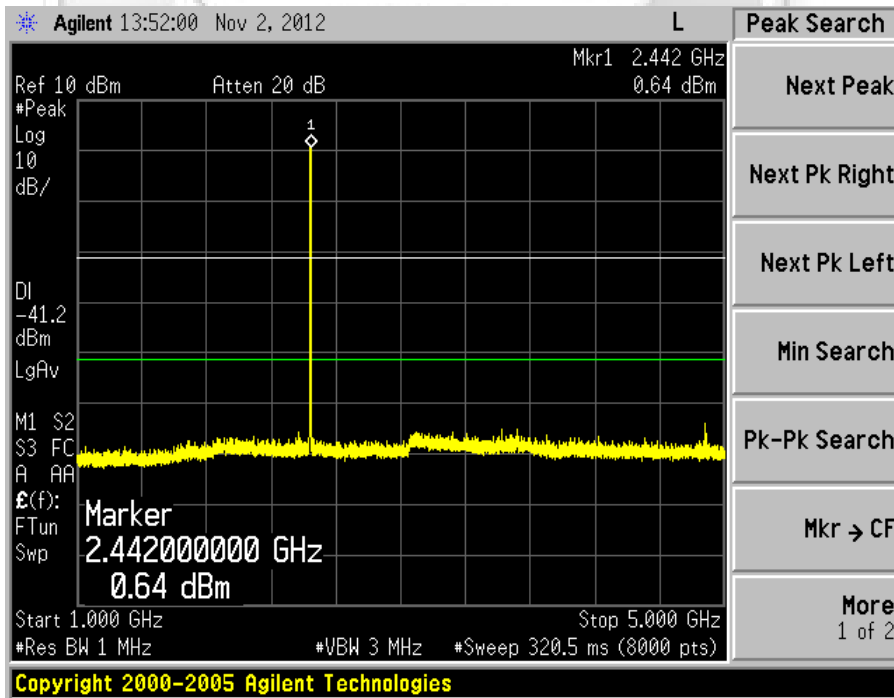


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 57 – Channel 20 (middle ch)

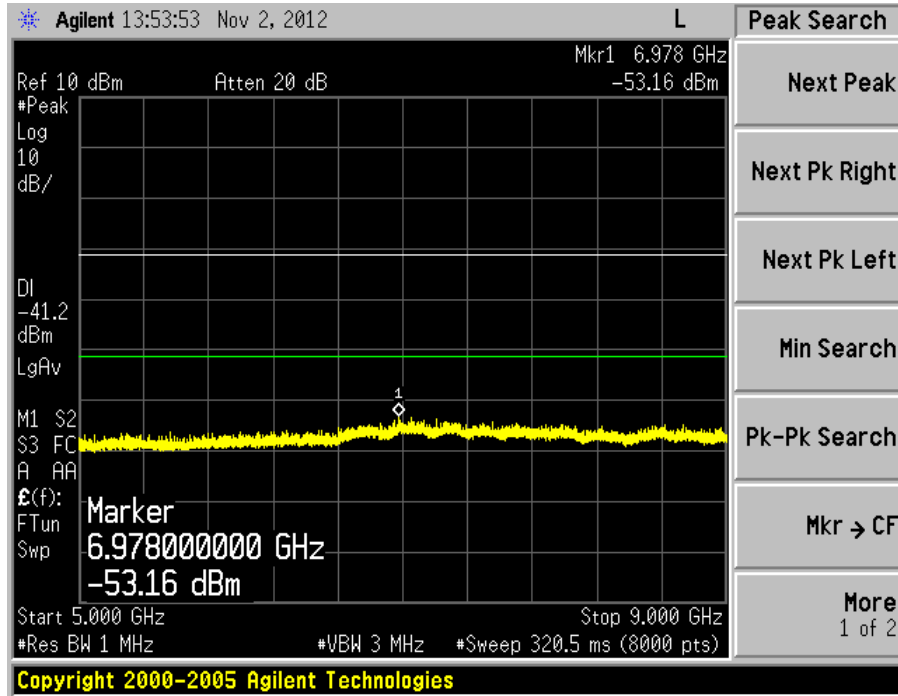


Plot 58 – Channel 20 (middle ch)

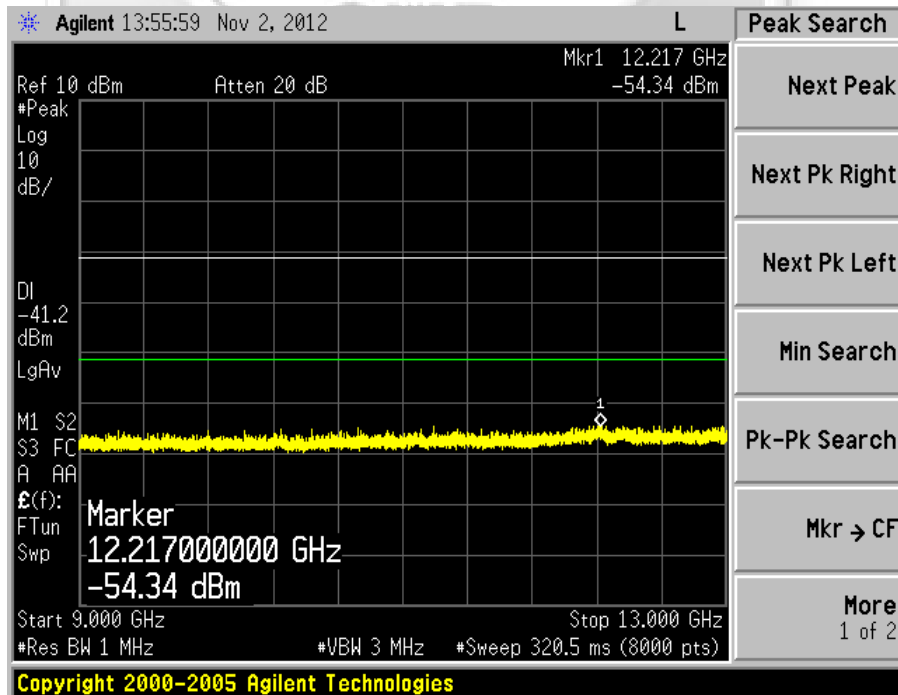


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 59 – Channel 20 (middle ch)

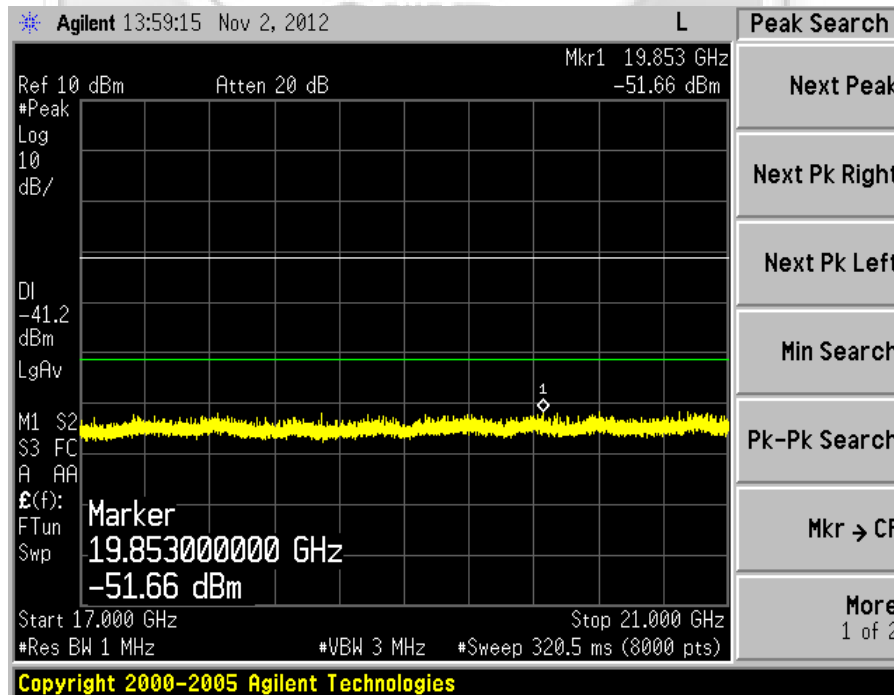
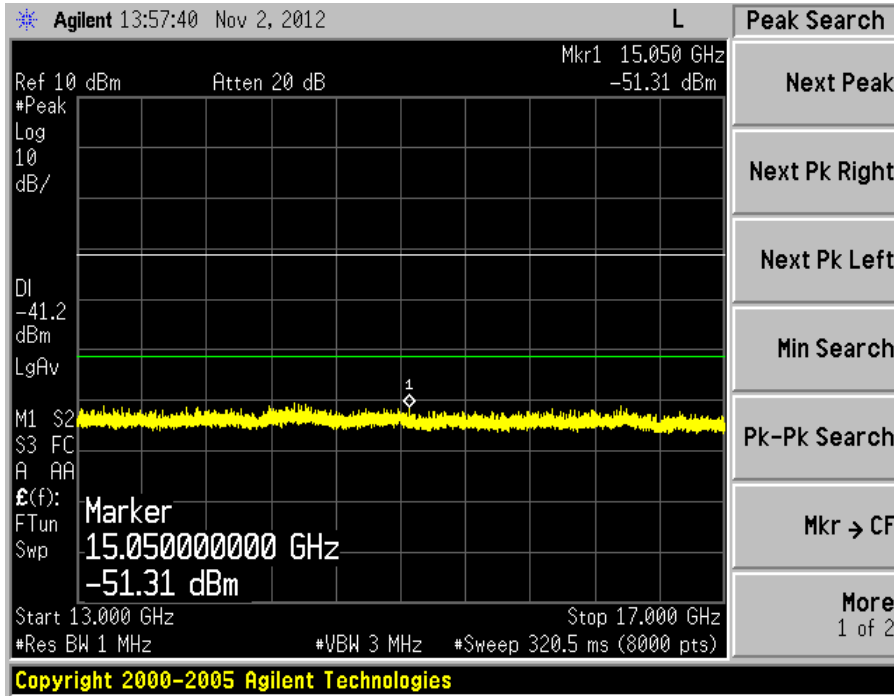


Plot 60 – Channel 20 (middle ch)



RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

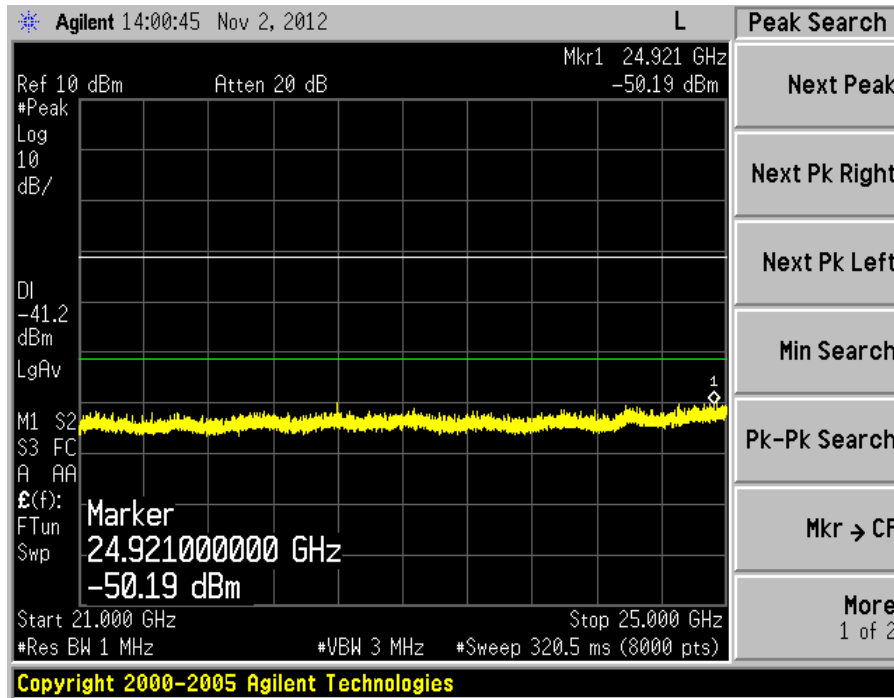
RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)





RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



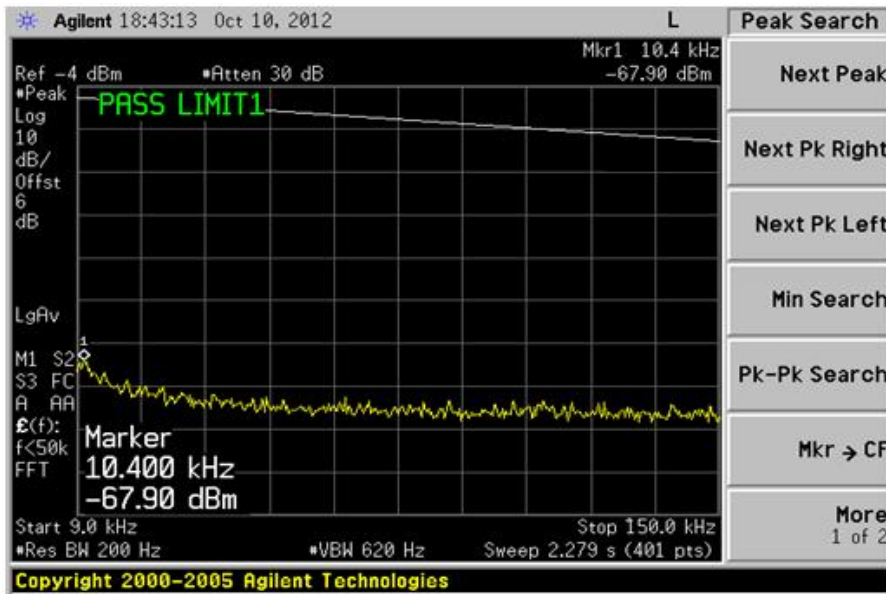
Plot 63 – Channel 20 (middle ch)



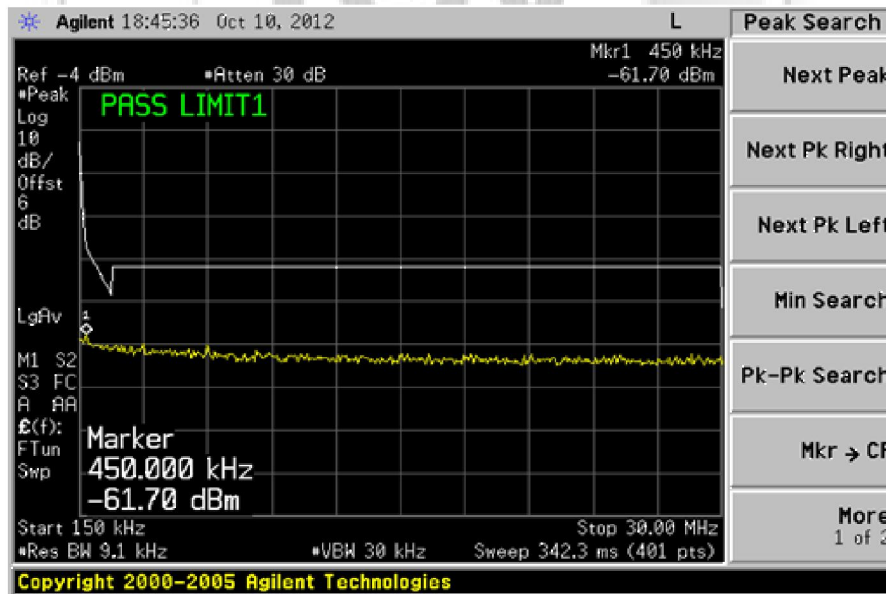


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 64 – Channel 38 (upper ch)

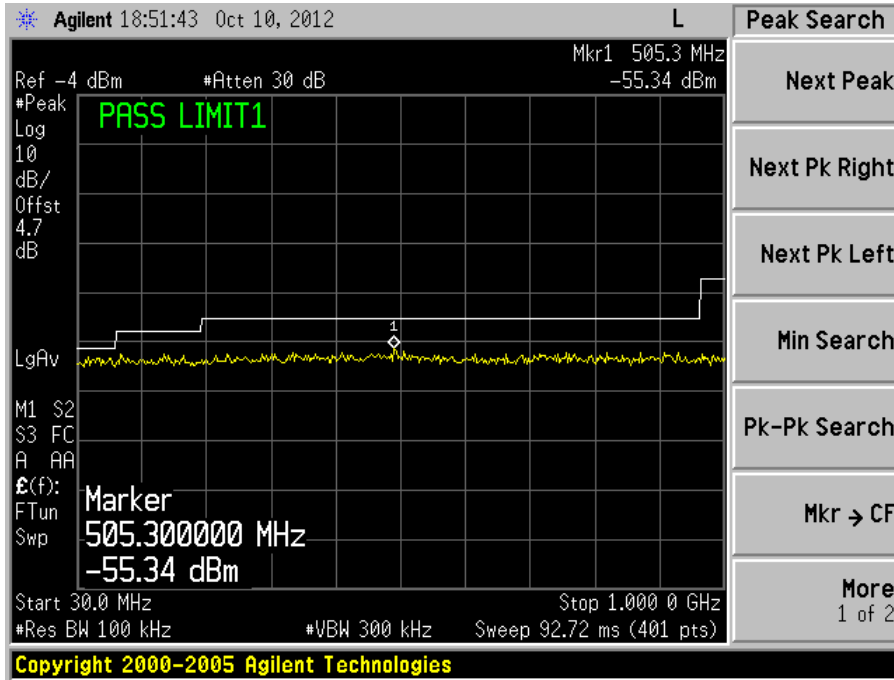


Plot 65 – Channel 38 (upper ch)

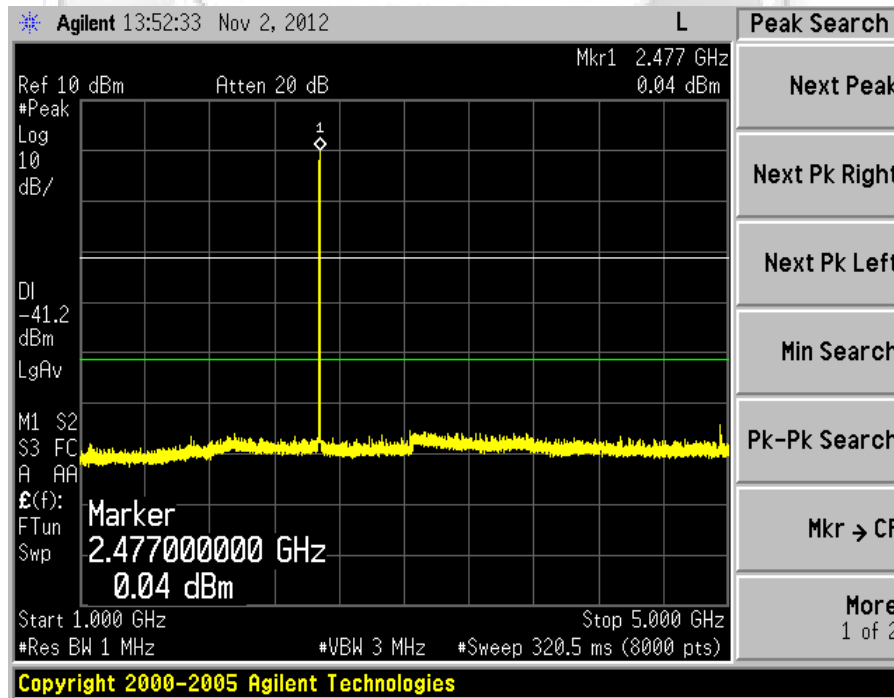


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 66 – Channel 38 (upper ch)

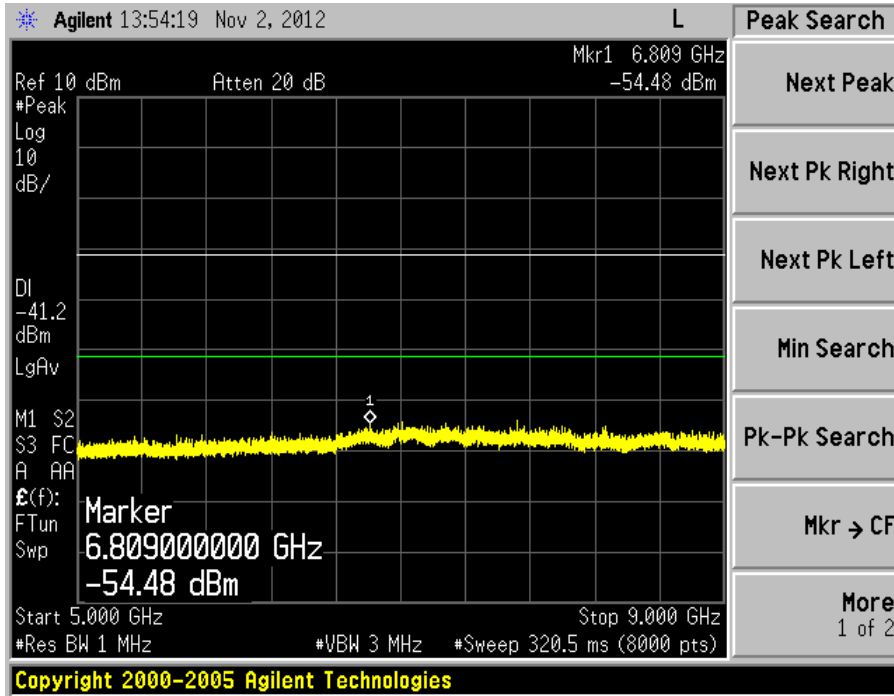


Plot 67 – Channel 38 (upper ch)

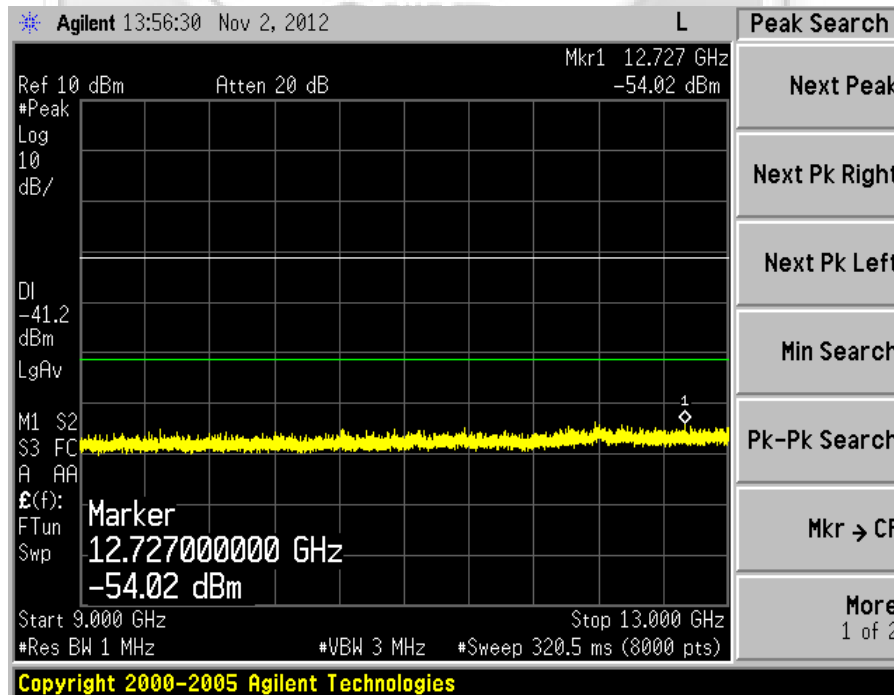


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 68 – Channel 38 (upper ch)

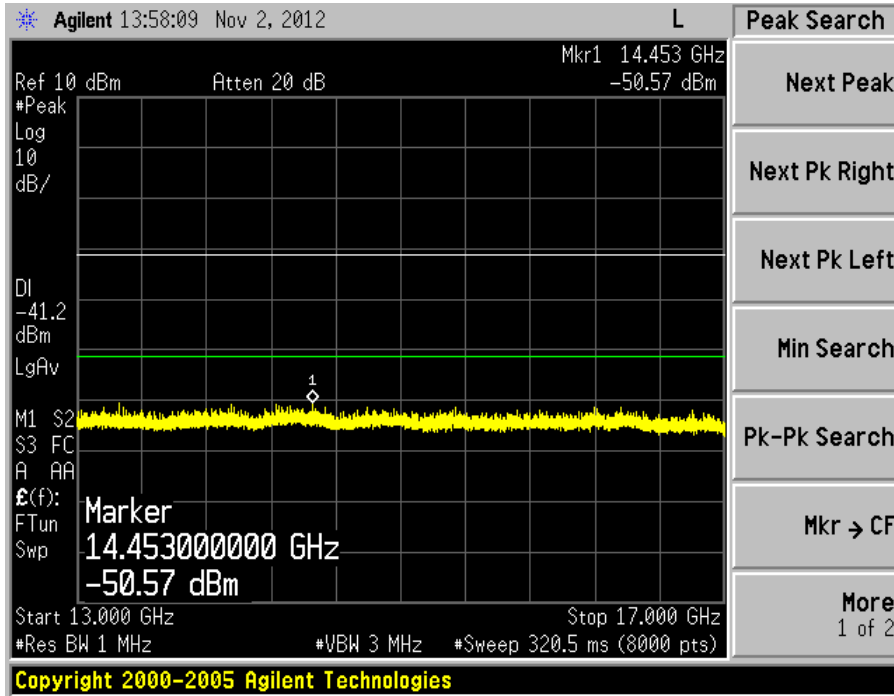


Plot 69– Channel 38 (upper ch)

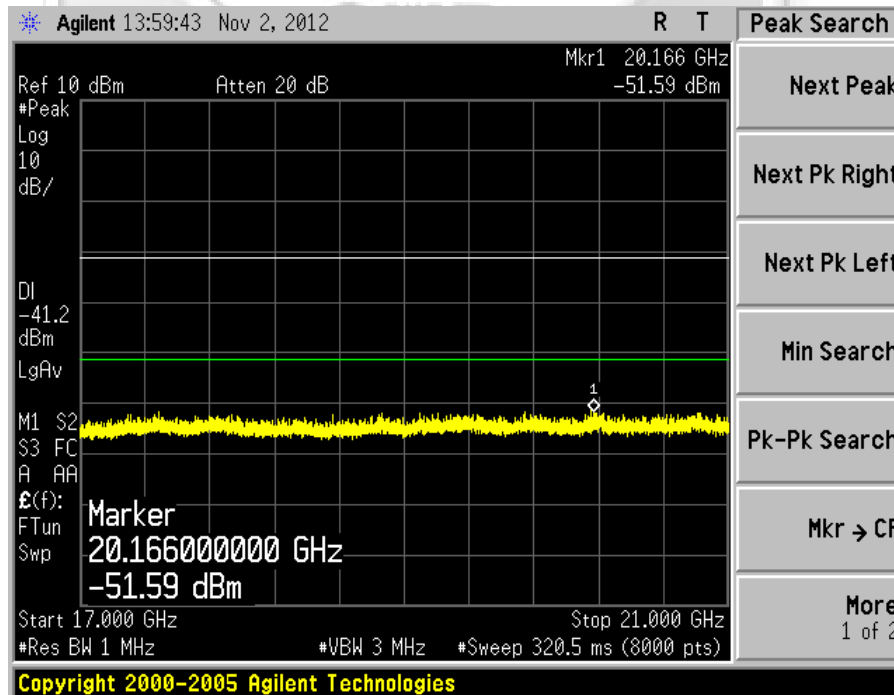


RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 70 – Channel 38 (upper ch)

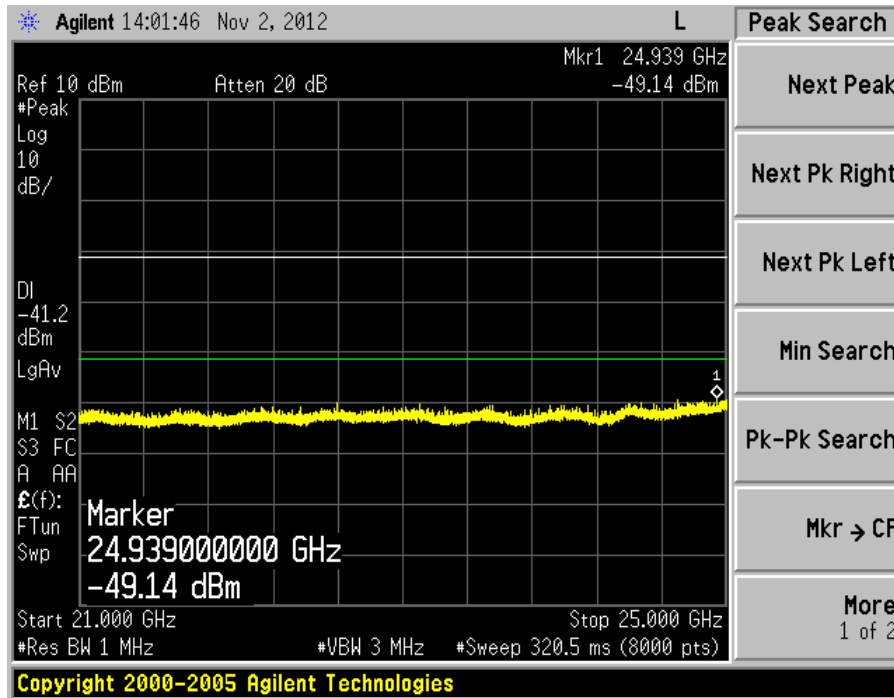


Plot 71 – Channel 38 (upper ch)



RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Peak Plots (Antenna 1)



Plot 72 - Channel 38 (upper ch)





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 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.
2. The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.

BAND EDGE COMPLIANCE (CONDUCTED) TEST



Band Edge Compliance (Conducted) Test Setup

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

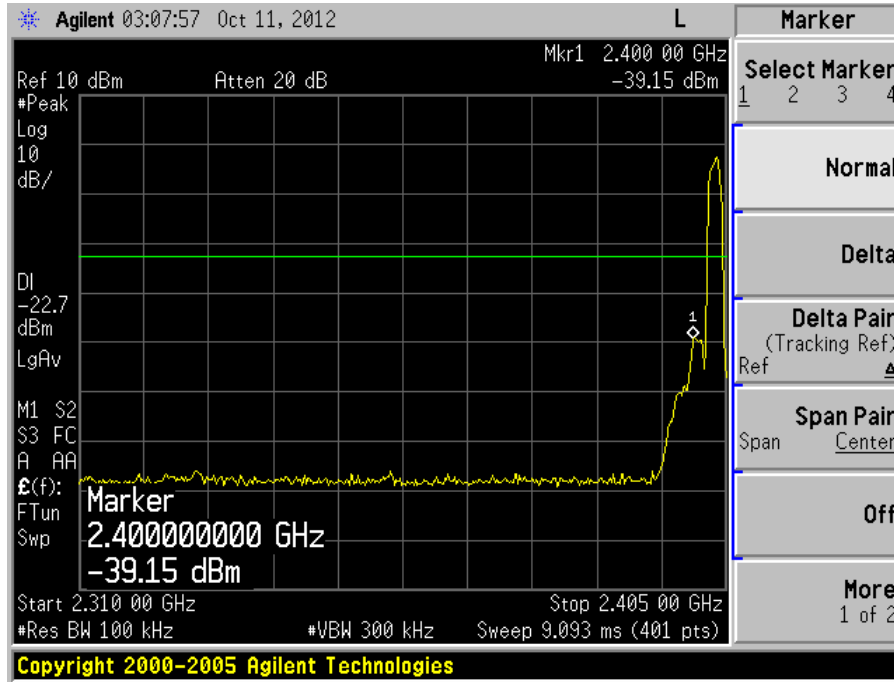
Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	Plot 73 – 74 (Antenna 0) Plot 75 – 76 (Antenna 1)	Relative Humidity	56%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

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

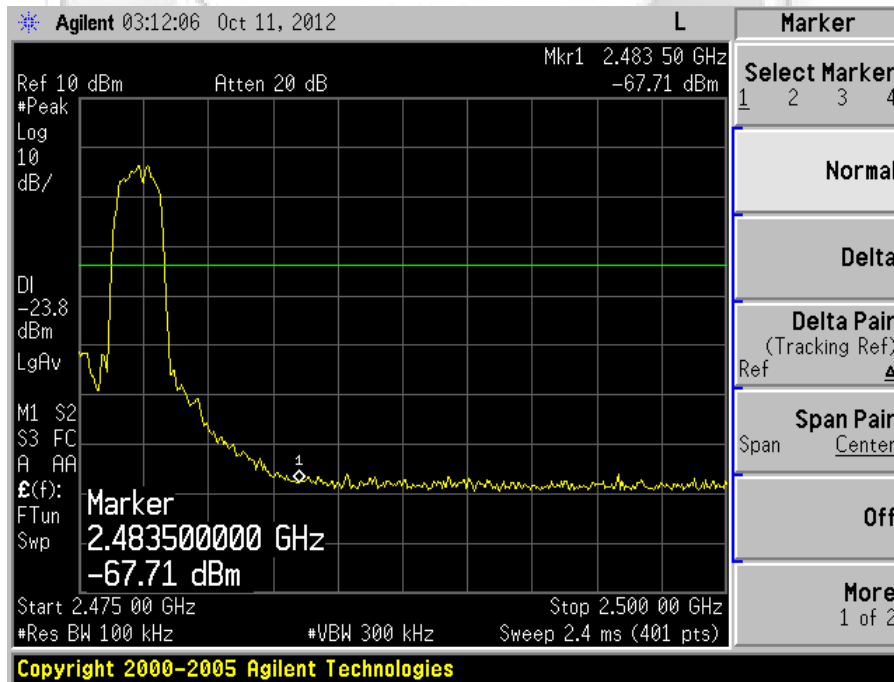


BAND EDGE COMPLIANCE (CONDUCTED) TEST

Band Edge Compliance (Conducted) Plots (Antenna 0)



Plot 73 – Lower Band Edge at 2.400GHz

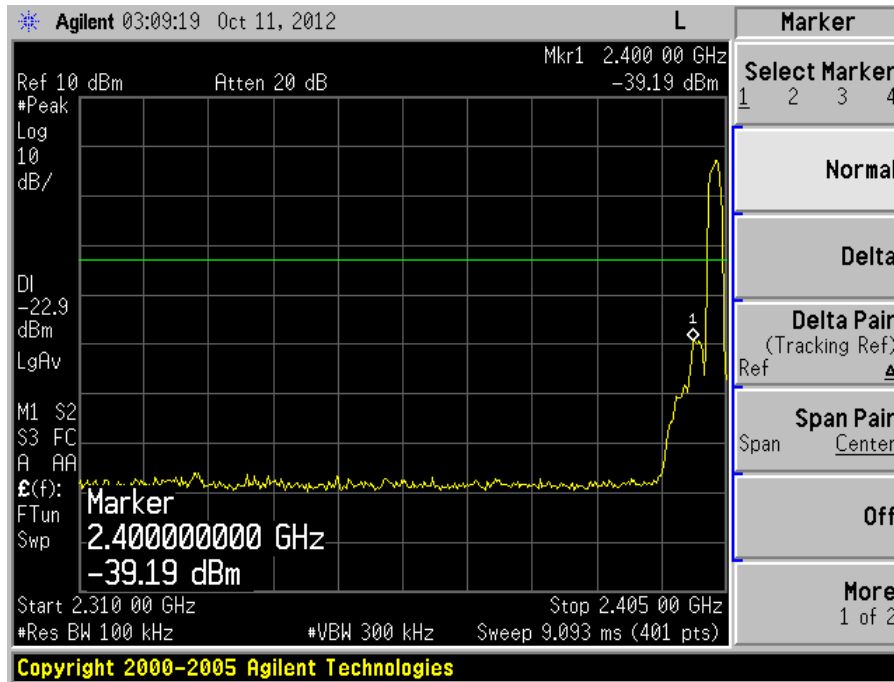


Plot 74 – Upper Band Edge at 2.4835GHz

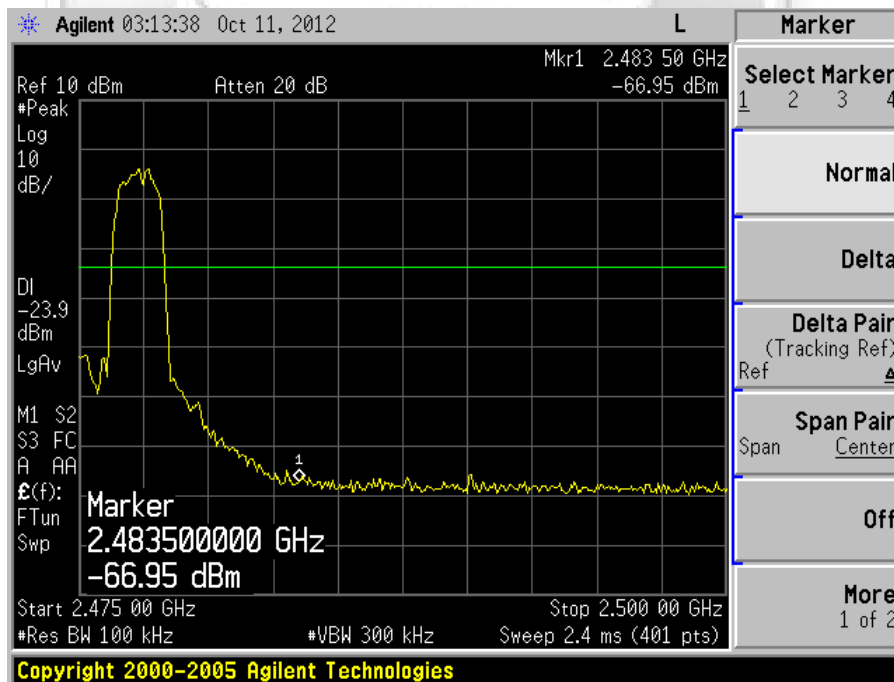


BAND EDGE COMPLIANCE (CONDUCTED) TEST

Band Edge Compliance (Conducted) Plots (Antenna 1)



Plot 75 – Lower Band Edge at 2.400GHz



Plot 76 – 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	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

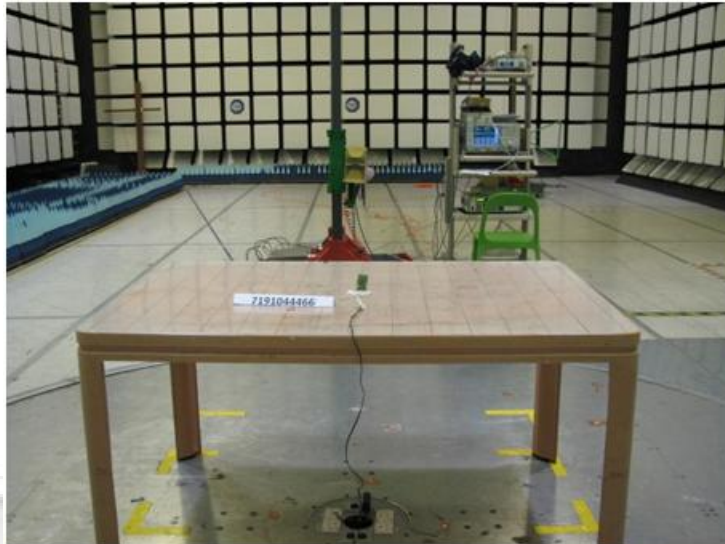
47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Setup

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.
2. The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.

BAND EDGE COMPLIANCE (RADIATED) TEST



Band Edge Compliance (Radiated) Test Setup

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

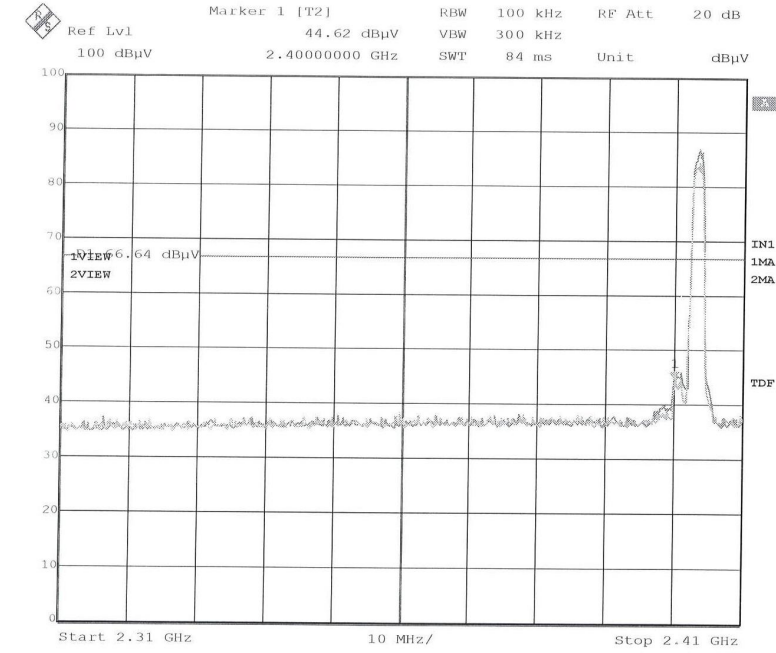
Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	Plot 77 – 82 (Antenna 0) Plot 83 – 88 (Antenna 1)	Relative Humidity	56%
		Atmospheric Pressure	1030mbar
		Tested By	Tan Keng Xin

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

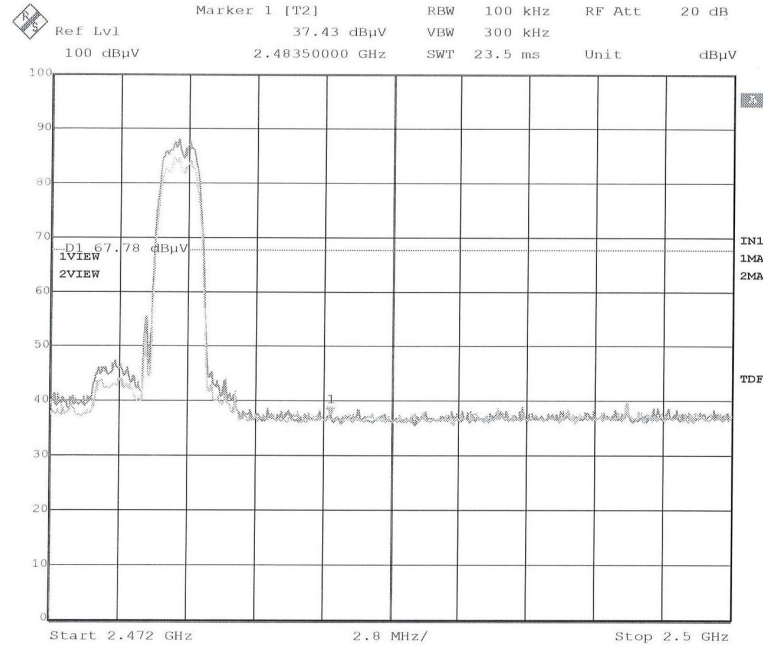


BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge) (Antenna 0)



Date: 19.OCT.2012 03:57:48
Plot 77 – Lower Band Edge at 2.400GHz

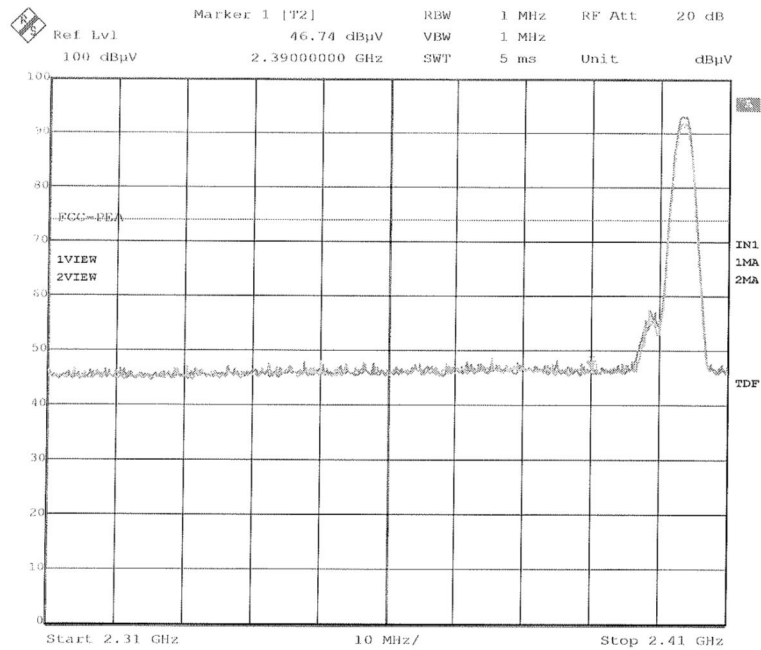


Date: 19.OCT.2012 03:13:19
Plot 78 – Upper Band Edge at 2.4835GHz



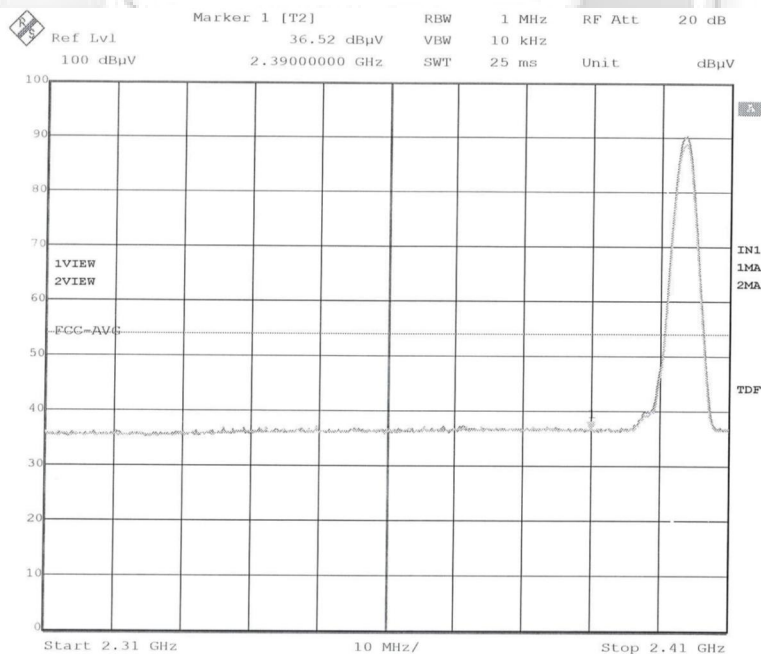
BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) (Antenna 0)



Date: 19.OCT.2012 04:01:50

Plot 79 – Peak Plot at Lower Band Edge at 2.3900GHz



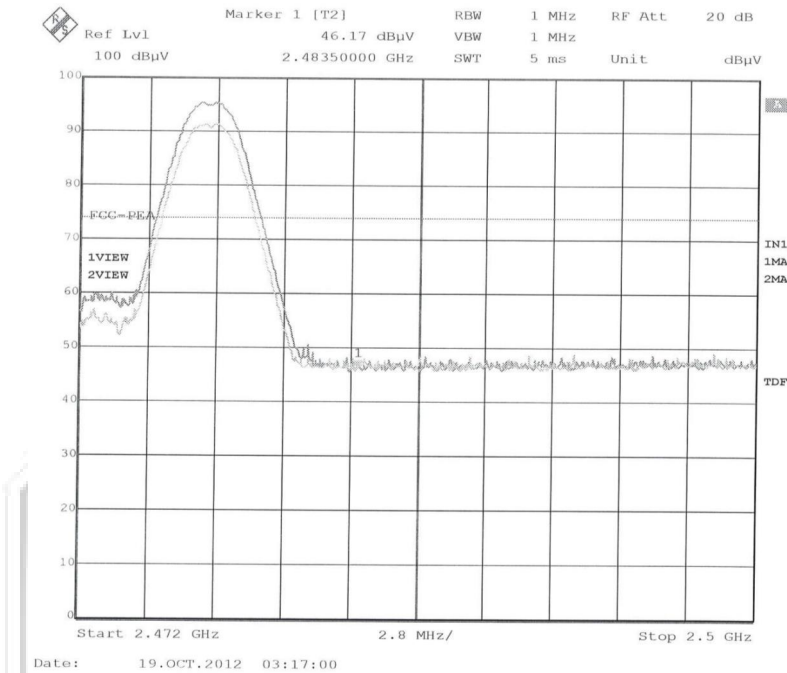
Date: 19.OCT.2012 04:05:27

Plot 80 – Average Plot at Lower Band Edge at 2.3900GHz

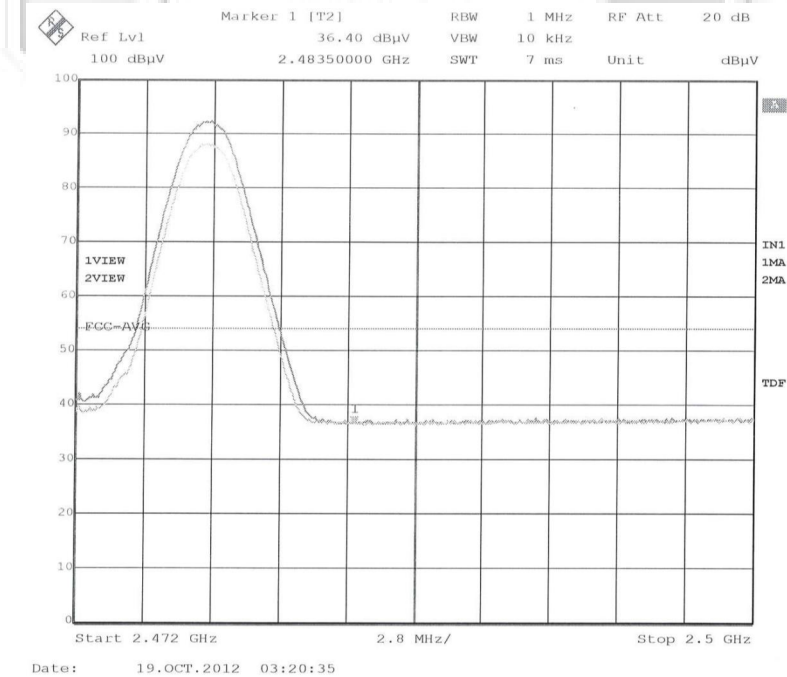


BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) (Antenna 0)



Plot 81 – Peak Plot at Upper Band Edge at 2.4835GHz

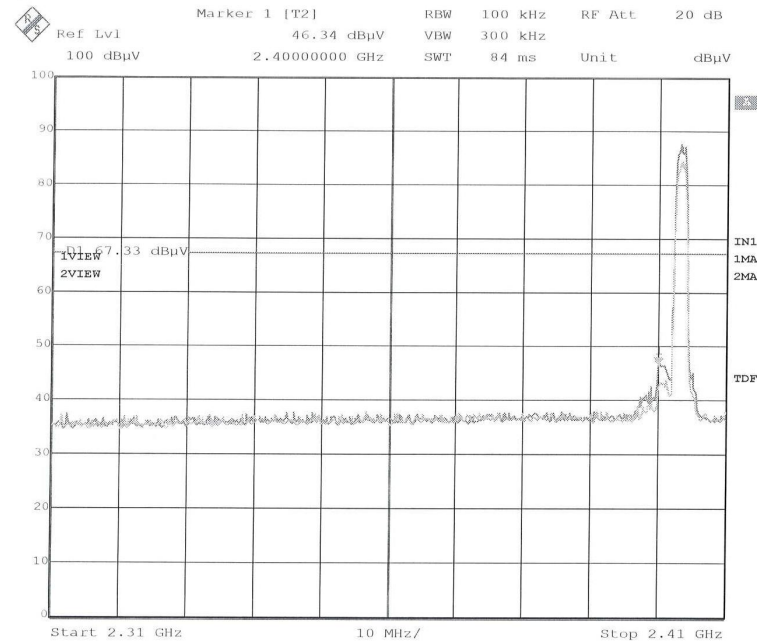


Plot 82 – Average Plot at Upper Band Edge at 2.4835GHz



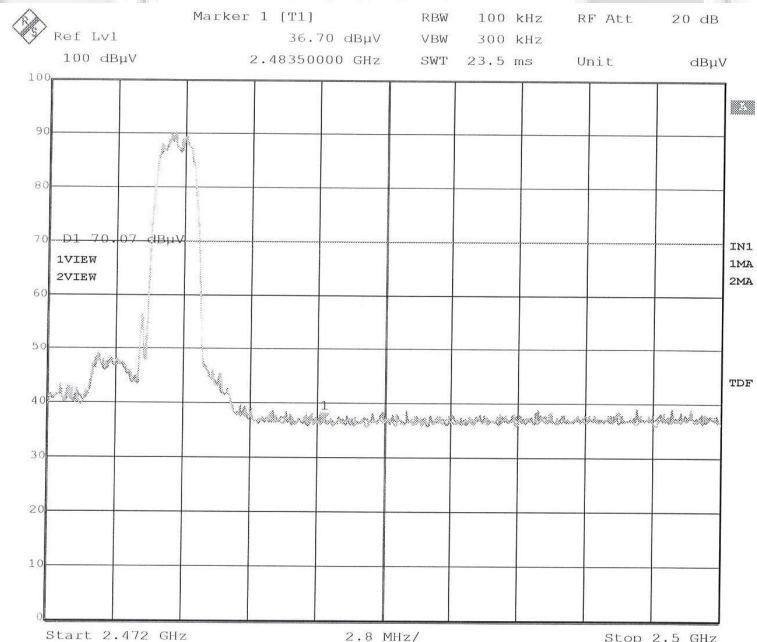
BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge) (Antenna 1)



Date: 19.OCT.2012 04:20:49

Plot 83 – Lower Band Edge at 2.4000GHz



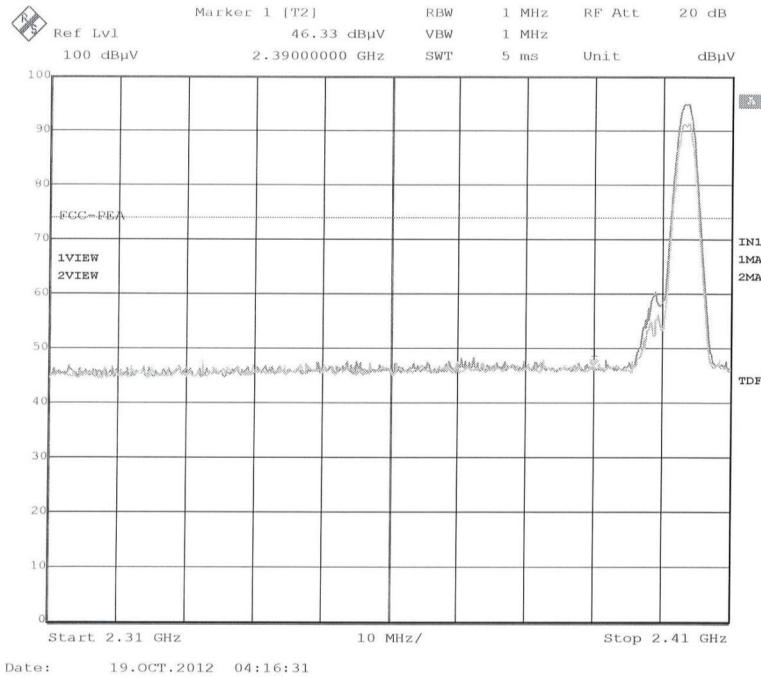
Date: 19.OCT.2012 03:46:29

Plot 84 – Upper Band Edge at 2.4835GHz

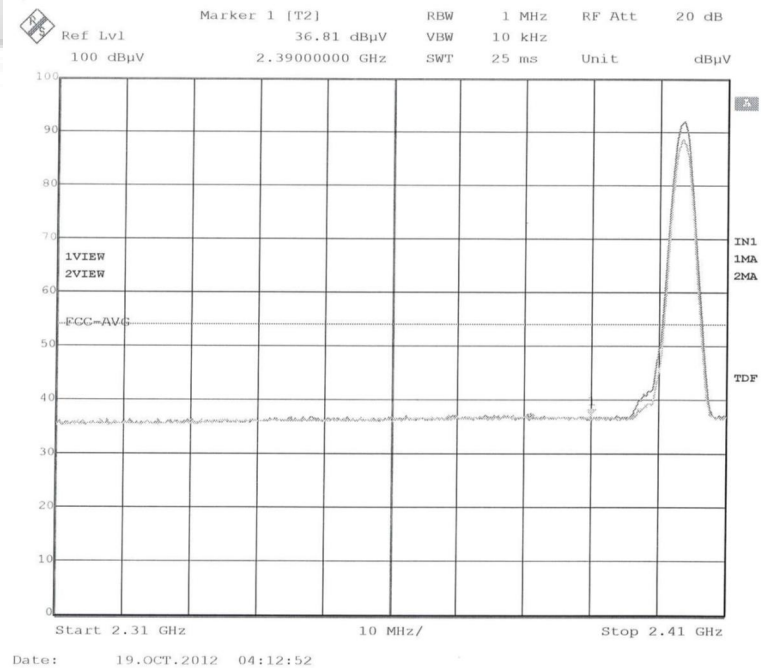


BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) (Antenna 1)



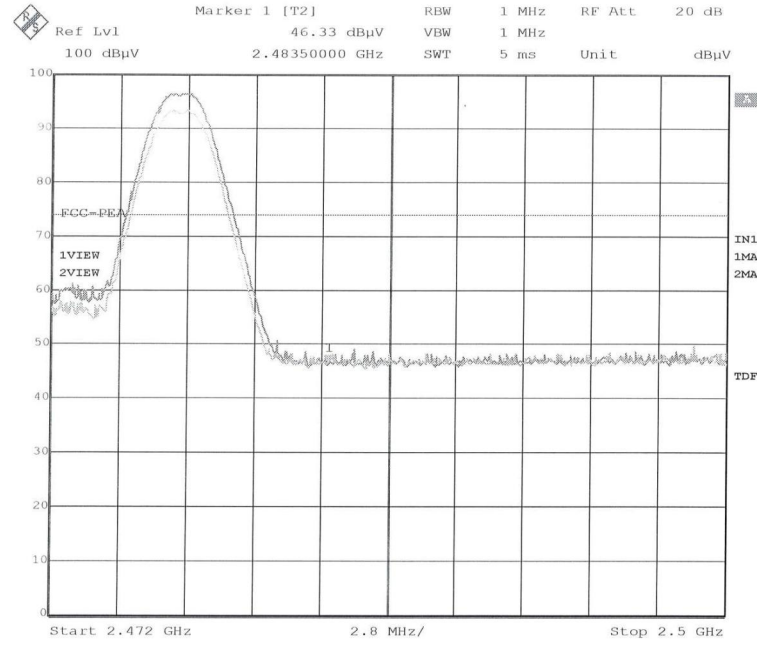
Plot 85 – Peak Plot at Lower Band Edge at 2.3900GHz



Plot 86 – Average Plot at Lower Band Edge at 2.3900GHz

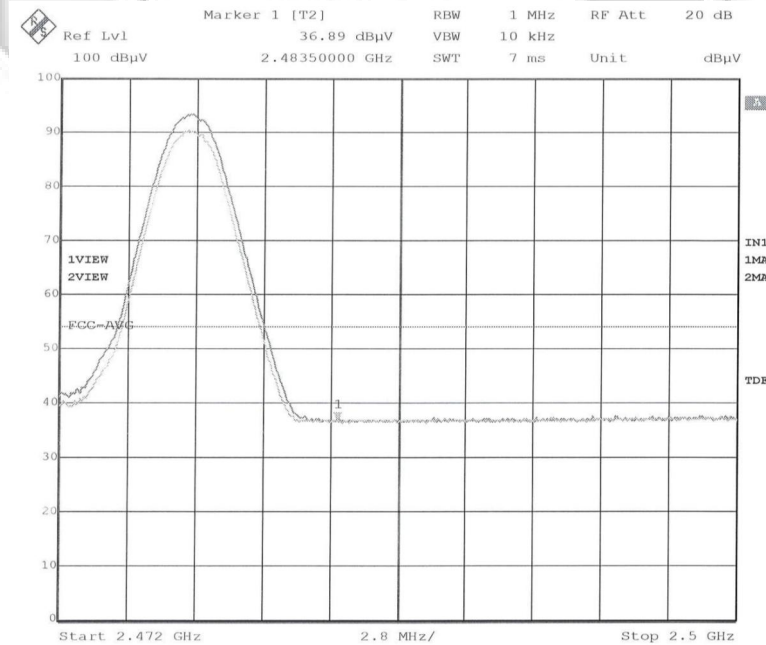
BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) (Antenna 1)



Date: 19.OCT.2012 03:41:38

Plot 87 – Peak Plot at Upper Band Edge at 2.4835GHz



Date: 19.OCT.2012 03:38:58

Plot 88 – Average Plot at Upper Band Edge at 2.4835GHz



PEAK POWER SPECTRAL DENSITY TEST

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), video bandwidth (VBW) and span of the spectrum analyser were set to the following:
RBW \geq 3kHz
VBW \geq 3 X RBW
Span = 5% to 30% greater than EBW
Detector = Peak
Sweep time = auto couple
5. All other supporting equipment were powered separately from another filtered mains.

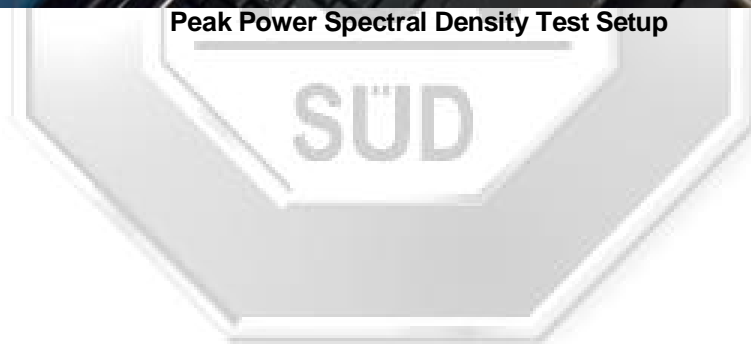
47 CFR FCC Part 15.247(e) Peak Power Spectral Density Test Method

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 lower channel.
2. The peak of the transmitting frequency was detected with the marker peak function of the spectrum analyser.
3. The peak power density of the transmitting frequency was plotted and recorded.
4. The steps 2 to 4 were repeated with the transmitting frequency was set to middle and upper channel respectively.

PEAK POWER SPECTRAL DENSITY TEST



Peak Power Spectral Density Test Setup





PEAK POWER SPECTRAL DENSITY TEST

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

Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	89 – 91 (Antenna 0)	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)
1 (lower ch)	2.40335	0.0105	6.3
20 (mid ch)	2.44135	0.0096	6.3
38 (upper ch)	2.47735	0.0084	6.3

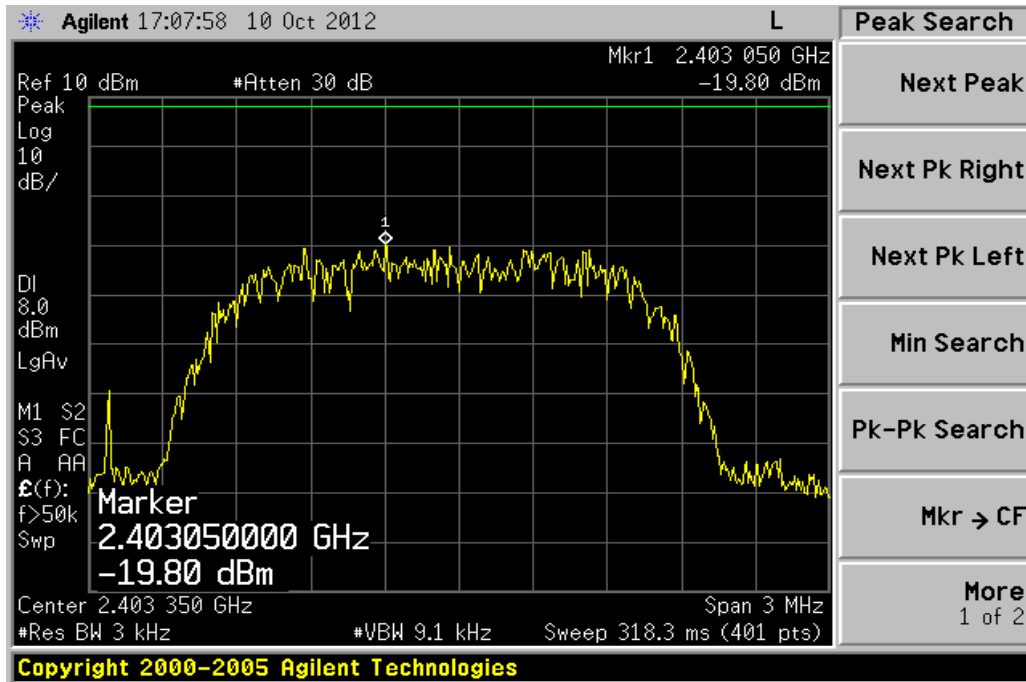
Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	92 – 94 (Antenna 1)	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)
1 (lower ch)	2.40335	0.0114	6.3
20 (mid ch)	2.44135	0.0100	6.3
38 (upper ch)	2.47735	0.0129	6.3

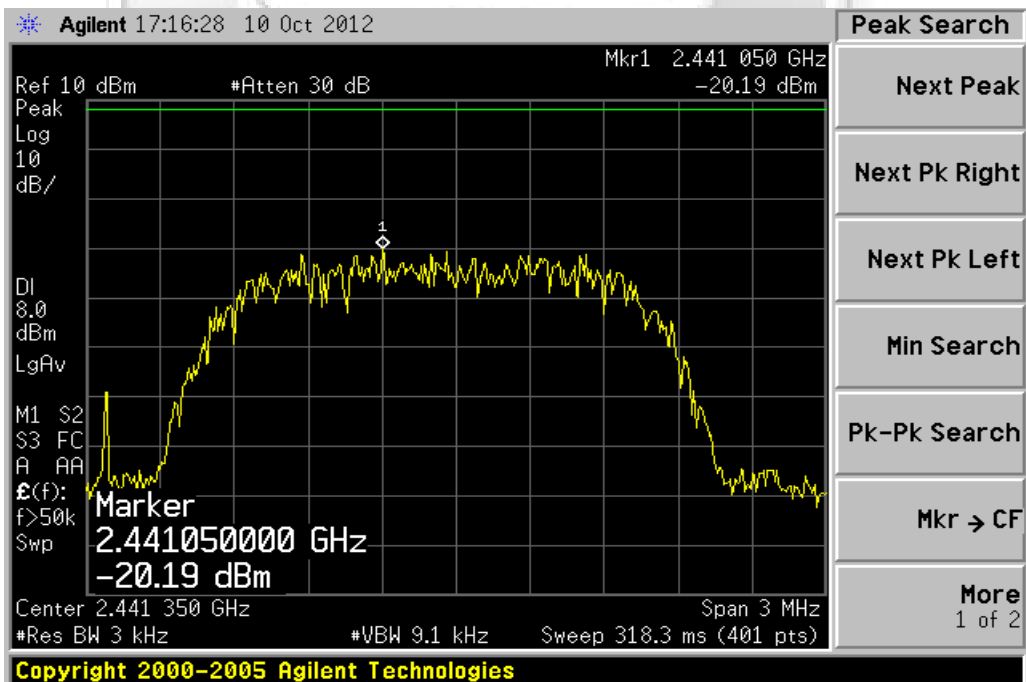


PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots (Antenna 0)



Plot 89 – Channel 1 (lower ch)

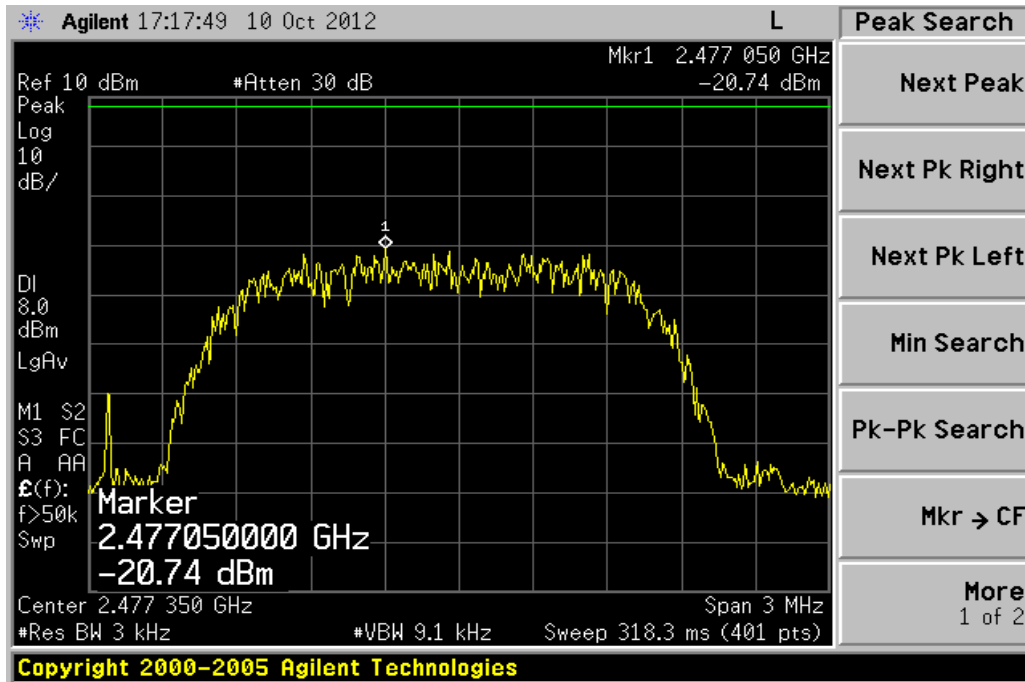


Plot 90 – Channel 20 (middle ch)



PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots (Antenna 0)



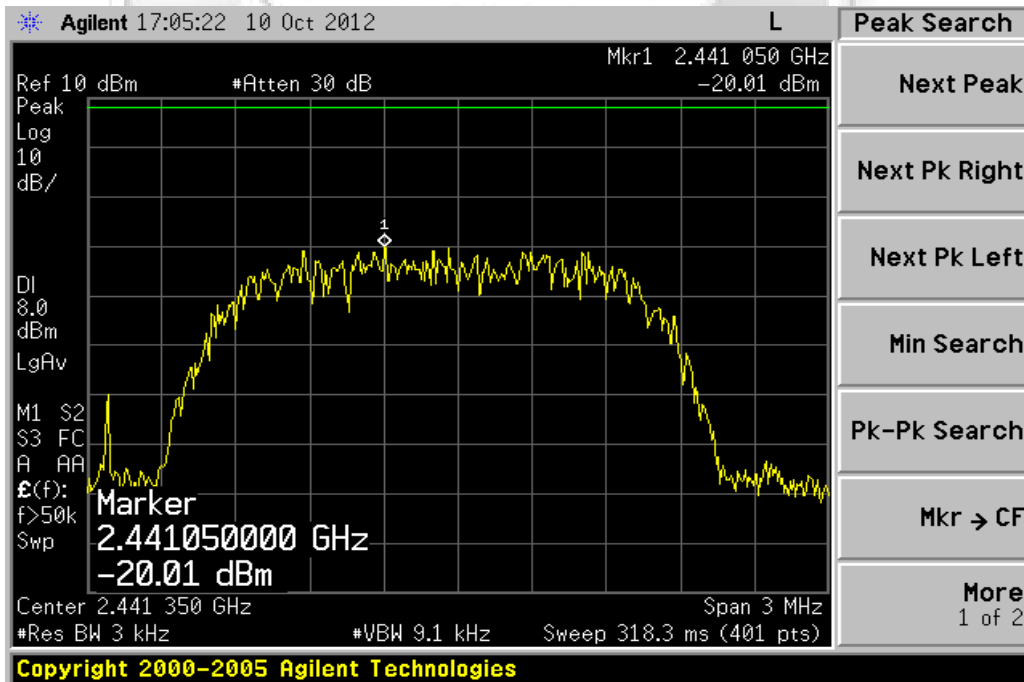
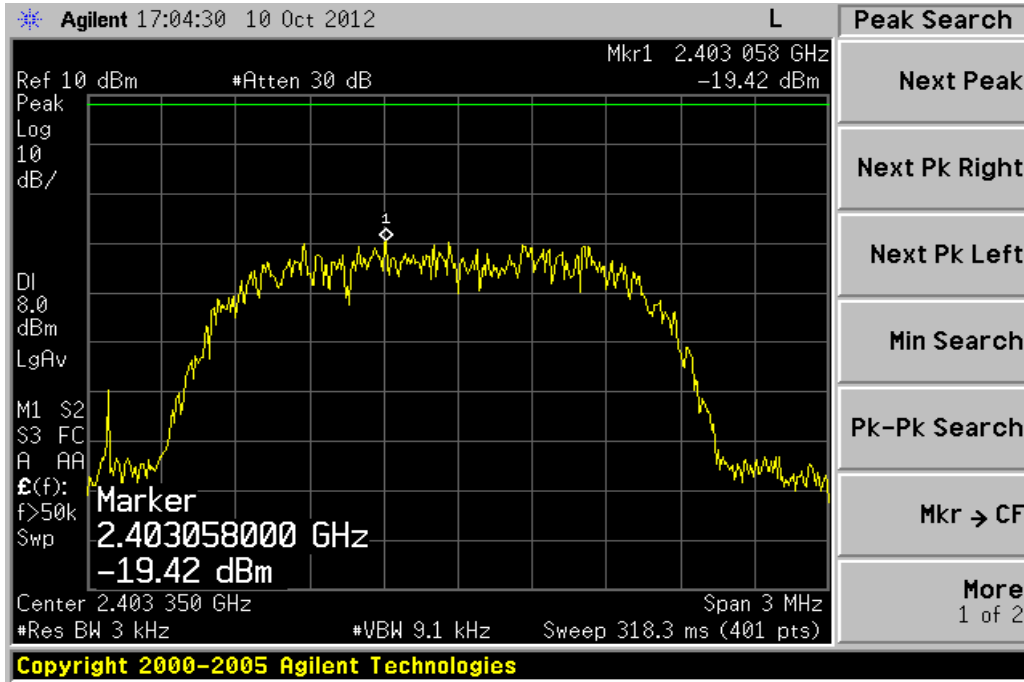
Plot 91 – Channel 38 (upper ch)





PEAK POWER SPECTRAL DENSITY TEST

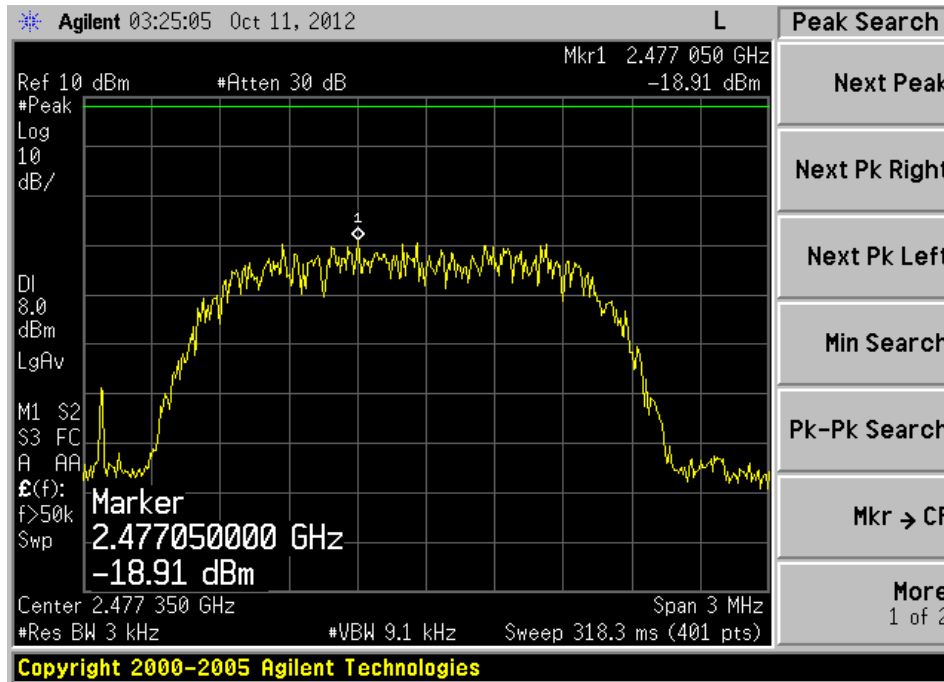
Peak Power Spectral Density Plots (Antenna 1)





PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots (Antenna 1)



Plot 94 – Channel 38 (upper ch)





MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST

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:

$$S = \frac{(30GP)}{(377d^2)}$$

where

- S = Power density in W/m²
- P = 0.0008W
- d = Test distance at 0.2m
- G = Numerical isotropic gain, 2.06 (3.13dBi)

Substituting the relevant parameters into the formula:

$$S = \frac{[(30GP)}{377d^2]}$$

$$= 0.0033 \text{ W/m}^2$$

$$= 0.0004 \text{ mW/cm}^2$$

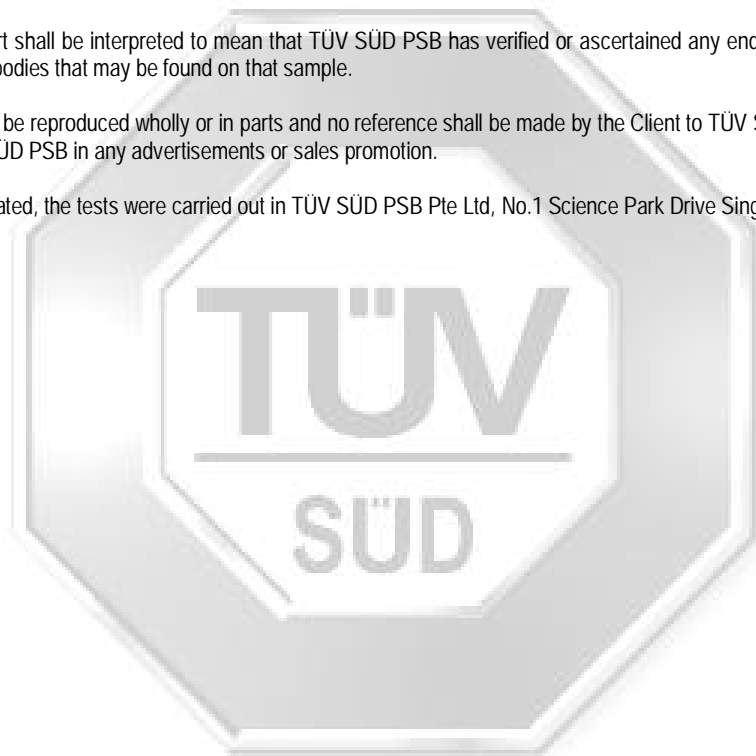
∴ The power density of the EUT at 20cm distance is 0.0004 mW/cm² based on the above computation and found to be lower than the power density limit of 1.0mW/cm².



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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



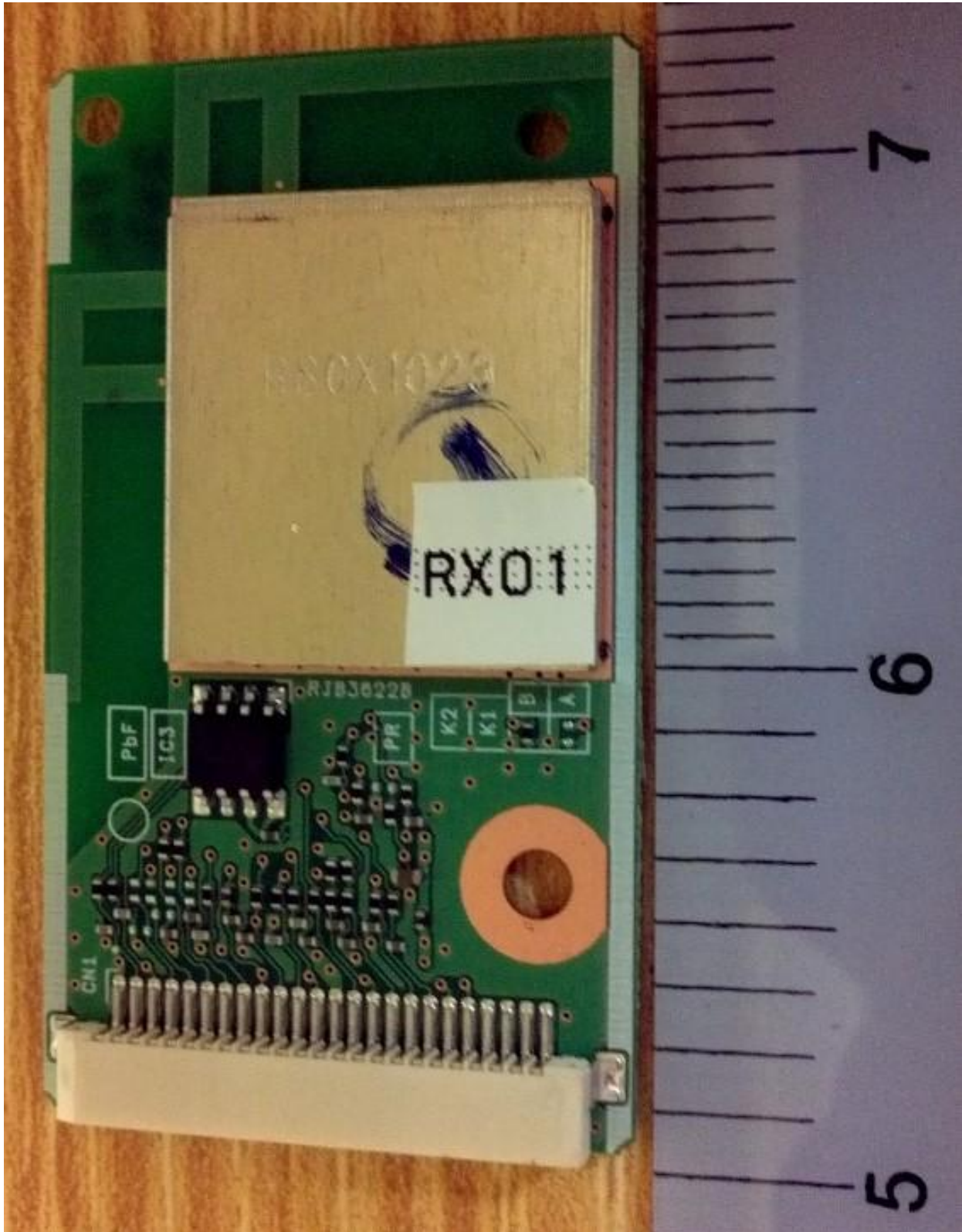


ANNEX A EUT PHOTOGRAPHS / DIAGRAMS



ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS

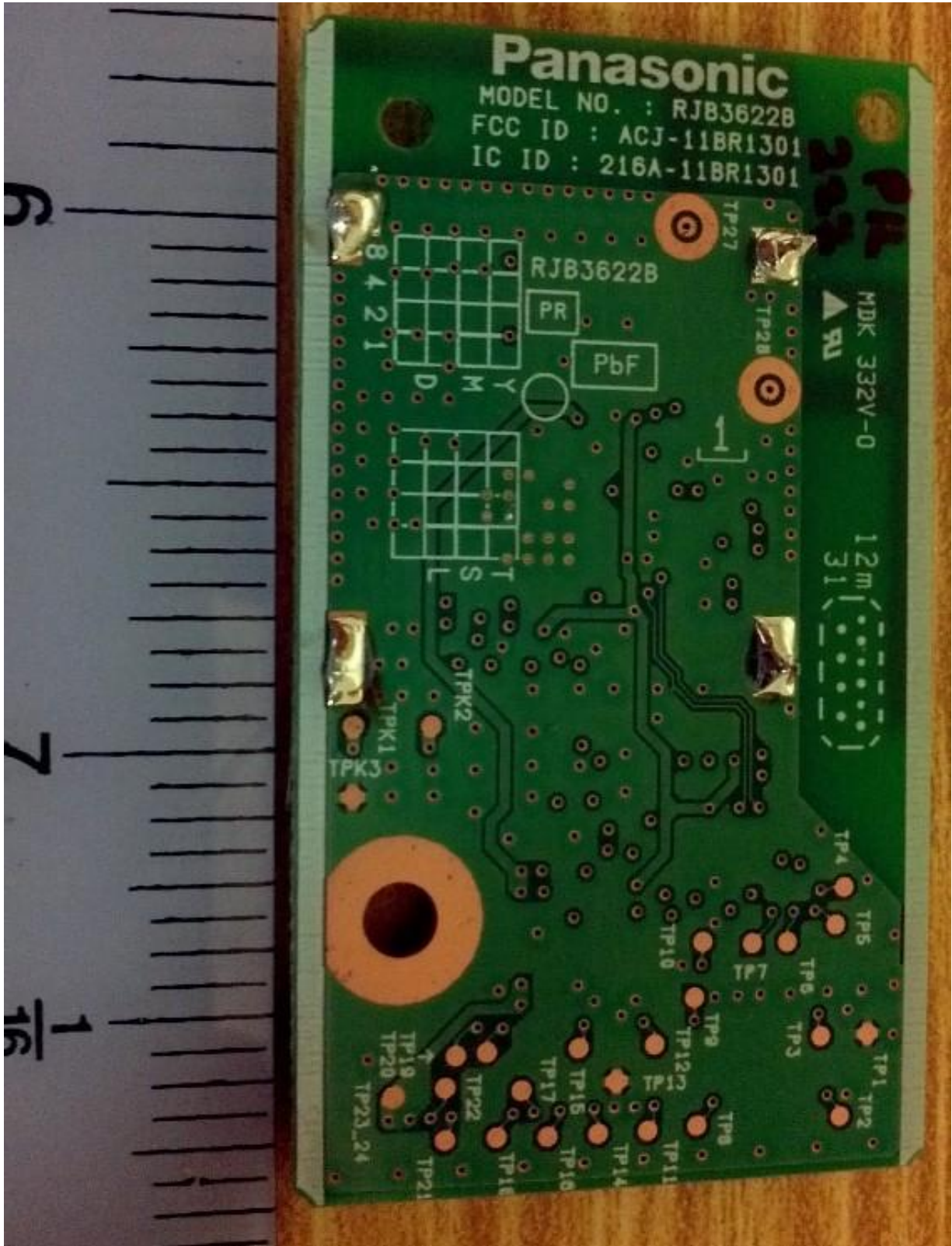


Main-Board PCB Component Side

Panasonic AVC Networks Singapore
RF Receiver Module [Model : RJB3622B]
[FCC ID : ACJ-11BR1301]

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

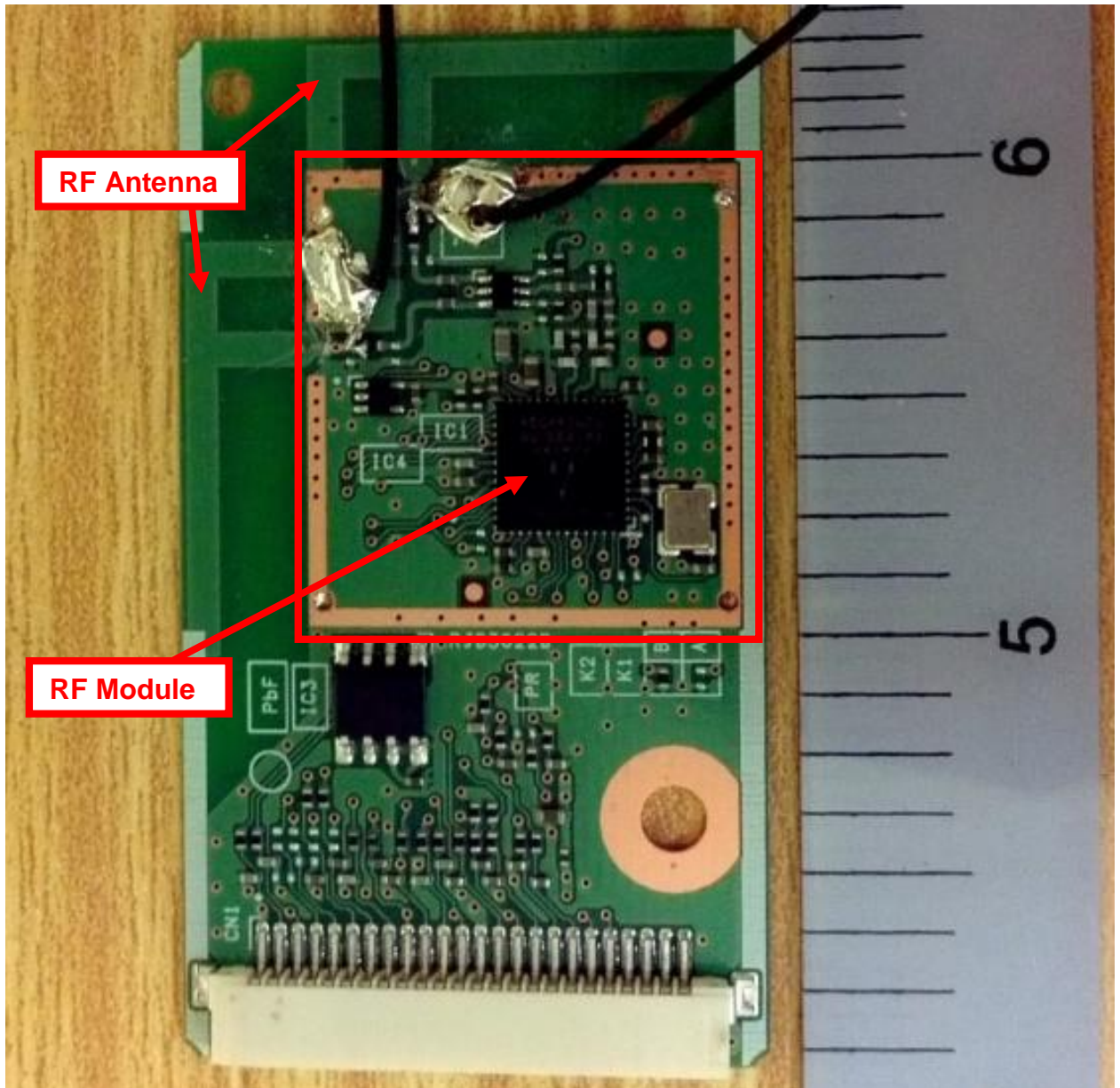
EUT PHOTOGRAPHS



Main-Board PCB Trace Side

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS



RF Module Circuit with RF Shield Removed



ANNEX B USER MANUAL TECHNICAL DESCRIPTION BLOCK & CIRCUIT DIAGRAMS





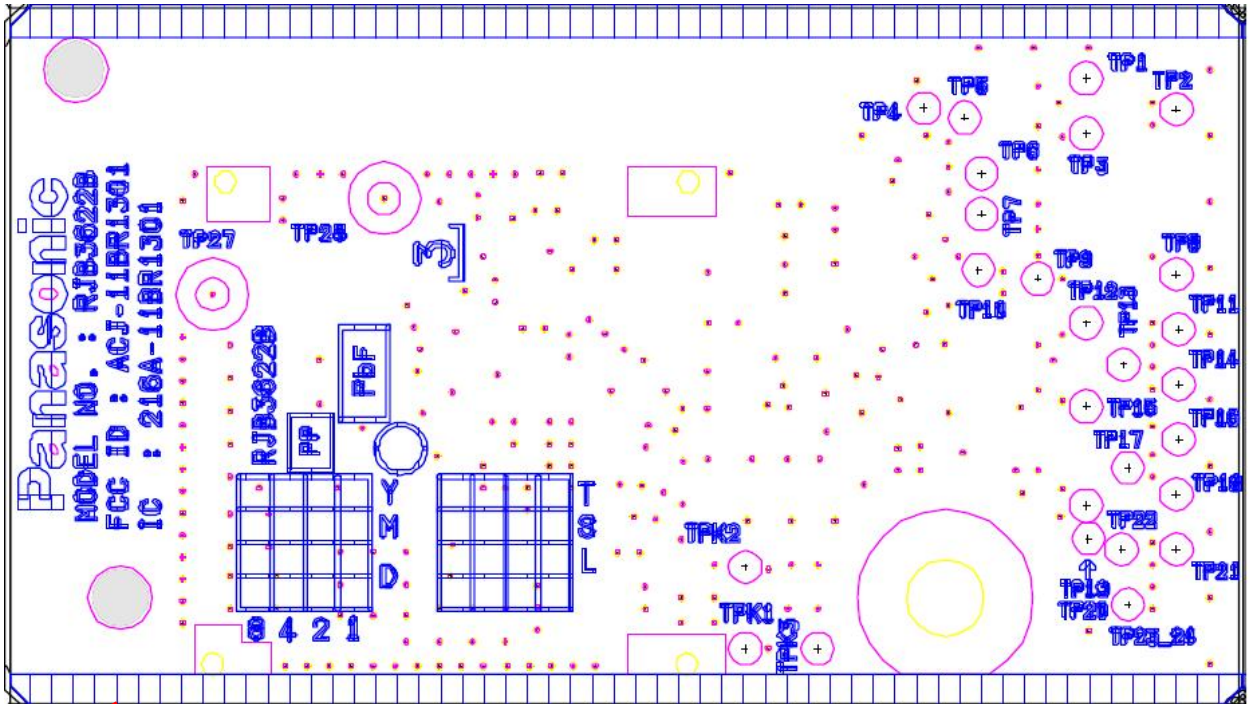
ANNEX C FCC LABEL & POSITION



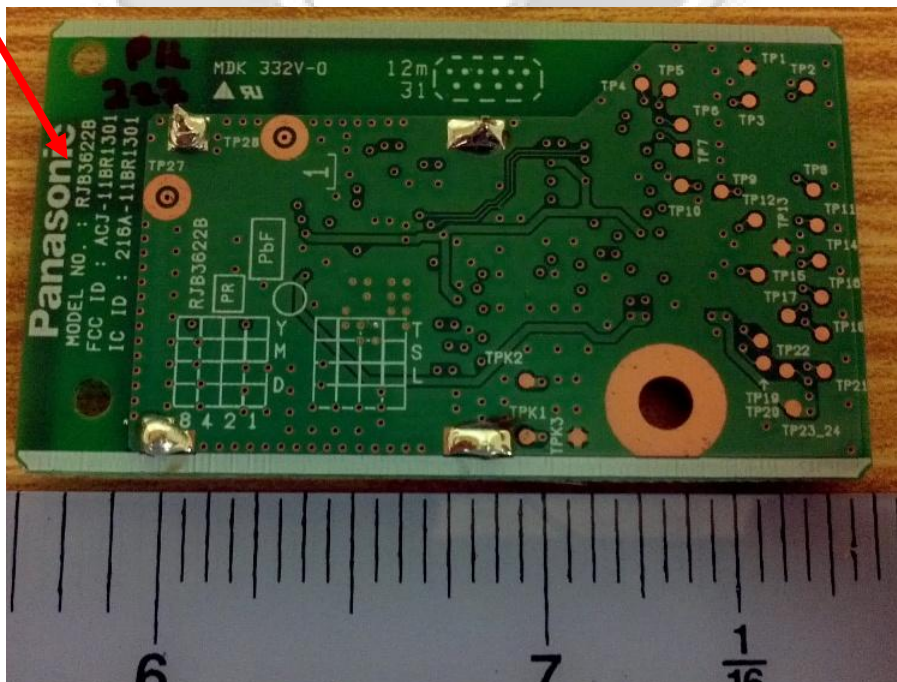
ANNEX C FCC LABEL & POSITION

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