

Test Report No. 7191092673-EEC14/01
dated 19 Aug 2014



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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 15B & C : 2012
OF A
BLUETOOTH 4.0 REMOTE CONTROL
[Model : RC1534059/01B]
[FCC ID : 2AADIRC1534059]

TEST FACILITY

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FCC REG. NO.

99142 (3m and 10m Semi-Anechoic Chamber, Science Park)

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QUOTATION NUMBER

2191001545

JOB NUMBER

7191092673

TEST PERIOD

24 Jul 2014 – 18 Aug 2014

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LA-2007-0380-A LA-2007-0384-G
LA-2007-0381-F LA-2007-0385-E
LA-2007-0382-B LA-2007-0386-C
LA-2007-0382-B-1 LA-2010-0464-D
LA-2007-0383-G FFT-2013-0002-A
LA-2007-0383-G-1

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: 2012		
15.107(a), 15.207	Conducted Emissions	Not Applicable *See Note 6
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	Not Applicable *See Note 8



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TEST SUMMARY

Notes

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

<u>Transmit Channel</u>	<u>Frequency (MHz)</u>
Channel 0	2.402
Channel 19	2.440
Channel 39	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.
5. The maximum measured RF power of the Equipment Under Test is -0.970dBm.
6. The Equipment Under Test (EUT) is a battery operated device and contains no provision for public utility connections.
7. The EUT was tested using fully charged batteries with DC voltage of 3.22V.
8. The Equipment Under Test (EUT) is a handheld device and according to KDB447498 clause 4.3.1, the 1g SAR test exclusion thresholds for 100 MHz to 6 GHz is ≤ 3.0 .

Modifications

No modifications were made.



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PRODUCT DESCRIPTION

Description	: The Equipment Under Test (EUT) is BLUETOOTH 4.0 REMOTE CONTROL.
Manufacturer	: Home Control Singapore Pte Ltd 620A Lorong 1 Toa Payoh Singapore 319762
Model Number	: RC1534059/01B
FCC ID	: 2AADIRC1534059
Serial Number	: Nil
Microprocessor	: CC2541 (8051 based MPU)
Operating / Transmitting Frequency	: 2402MHz (lower channel) to 2480MHz (upper channel) 40 (total number of channels) channels
Clock / Oscillator Frequency	: 32MHz
Modulation	: Gaussian Frequency Shift Keying (GFSK)
Antenna Gain	: 2.0 dBi (Max)
Port / Connectors	: Refer to manufacturer's user manual / operating manual
Rated Input Power	: 2 x 1.5V AA Battery
Accessories	: 2 x 1.5V AA Battery



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SUPPORTING EQUIPMENT DESCRIPTION

The EUT was tested as a stand-alone unit without any supporting equipment.





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EUT OPERATING CONDITIONS

47 CFR FCC Part 15

1. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)
2. Spectrum Bandwidth (6dB Bandwidth Measurement)
3. Maximum Peak Power
4. RF Conducted Spurious Emissions (Non-Restricted Bands)
5. RF Conducted Spurious Emissions (Restricted Bands)
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. Band Edge Compliance (Conducted)
2. Band Edge Compliance (Radiated)

The EUT was exercised by operating in maximum continuous transmission with frequency hopping on.





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RADIATED EMISSION TEST

47 CFR FCC Part 15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.090	-	0.110	16.42
0.495	-	0.505	16.69475
2.1735	-	2.1905	16.80425
4.125	-	4.128	25.5
4.17725	-	4.17775	37.5
4.20725	-	4.20775	73
6.215	-	6.218	74.8
6.26775	-	6.26825	108
6.31175	-	6.31225	123
8.291	-	8.294	149.9
8.362	-	8.366	156.52475
8.37625	-	8.38675	156.7
8.41425	-	8.41475	162.0125
12.29	-	12.293	167.72
12.51975	-	12.52025	240
12.57675	-	12.57725	322
13.36	-	13.41	335.4
			399.9
			608
			960
			1300
			1435
			1645.5
			1660
			1718.8
			2200
			2310
			2483.5
			2690
			3260
			3332
			3345.8
			3600
			410
			614
			1240
			1427
			1626.5
			1646.5
			1710
			1722.2
			2300
			2390
			2500
			2900
			3267
			3339
			3358
			4400
			Above 38.6

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	23 Jul 2015
Schaffner Bilog Antenna -(30MHz-2GHz) BL3 (Ref)	CBL6112D	2549	23 Jan 2015
EMCO Horn Antenna(1GHz-18GHz)	3115	0003-6088	13 Mar 2015
ETS Horn Antenna(18GHz-40GHz)(Ref)	3116	0004-2474	16 Oct 2014
Toyo Preamplifier (26.5GHz-40GHz)	HAP26-40W	00000005	16 Oct 2014
R&S Preamplifier (1GHz -18GHz)	SCU18	102191	14 Mar 2015
Agilent Preamplifier(1GHz-26.5GHz) (PA18)	8449D	3008A02305	04 Oct 2014
Com-Power Preamplifier (1MHz-1GHz)	PAM-103	441056	16 Aug 2014
Micro-tronics Bandstop Filter	BRm50701-02	007	13 Aug 2015



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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 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 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



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RADIATED EMISSION TEST

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

Test Input Power	2 x 1.5V AA Battery	Temperature	22°C
Test Distance	3m	Relative Humidity	58%
		Atmospheric Pressure	1030mbar
		Tested By	Chelmin Li

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dB μ V/m)	Q-P Limit (dB μ V/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Channel
30.0000	9.6	40.0	30.4	352	213	V	39
88.2690	16.4	43.5	27.1	320	131	H	39
100.2890	16.9	43.5	26.6	400	138	H	39
167.9980	13.1	43.5	30.4	271	305	V	39
239.9980	5.6	46.0	40.4	197	129	V	39
393.1110	11.1	46.0	34.9	100	277	H	39

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
4.8204	55.3	74.0	18.7	44.2	54.0	9.8	100	280	H	0
7.2242	46.1	74.0	27.9	36.7	54.0	17.3	300	49	H	0
--	--	--	--	--	--	--	--	--	--	--
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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
4.9062	52.2	74.0	21.8	46.7	54.0	7.3	100	273	H	19
7.3530	42.1	74.0	31.9	-- *See Note 3	54.0	11.9	100	76	V	19
8.8982	43.3	74.0	30.7	-- *See Note 3	54.0	10.7 *See Note 4	300	152	H	19
14.9507	49.8	74.0	24.2	-- *See Note 3	54.0	4.2 *See Note 4	200	346	V	19
--	--	--	--	--	--	--	--	--	--	--
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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
4.9921	46.8	74.0	27.2	-- *See Note 3	54.0	7.2 *See Note 4	100	141	V	39
7.6534	43.0	74.0	31.0	-- *See Note 3	54.0	11.0 *See Note 4	200	40	V	39
14.8648	51.0	74.0	23.0	41.5	54.0	12.5	200	176	V	39
17.8696	55.4	74.0	18.6	43.8	54.0	10.2	400	186	V	39
--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--

Notes

1. All possible modes of operation were investigated. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. The EUT was found to be in the worst case condition when it was orientated in a horizontal (lying down) position.
3. As the measured peak shows compliance to the average limit, as such no average measurement was required.
4. The average margin indicates the margin of the measured peak value below the average limit.
5. “--” indicates no emissions were found and shows compliance to the limits.
6. 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.
7. 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.
8. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
30MHz - 1GHz
 RBW: 120kHz VBW: 1MHz
>1GHz
 RBW: 1MHz VBW: 1MHz
9. 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.
10. The channel in the table refers to the transmit channel of the EUT.
11. Radiated Emissions Measurement Uncertainty
 All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz is $\pm 4.0\text{dB}$.



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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	E4404B	US39440632	03 Apr 2015
Agilent DC Power Supply	E3620A	MY40000448	Output Monitor

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 = 100kHz
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.



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SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

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

Test Input Power	3Vdc	Temperature	24°C
Attached Plots	1 – 3	Relative Humidity	56%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)
0 (<i>lower ch</i>)	2.402	0.746
19 (<i>mid ch</i>)	2.440	0.740
39 (<i>upper ch</i>)	2.480	0.730

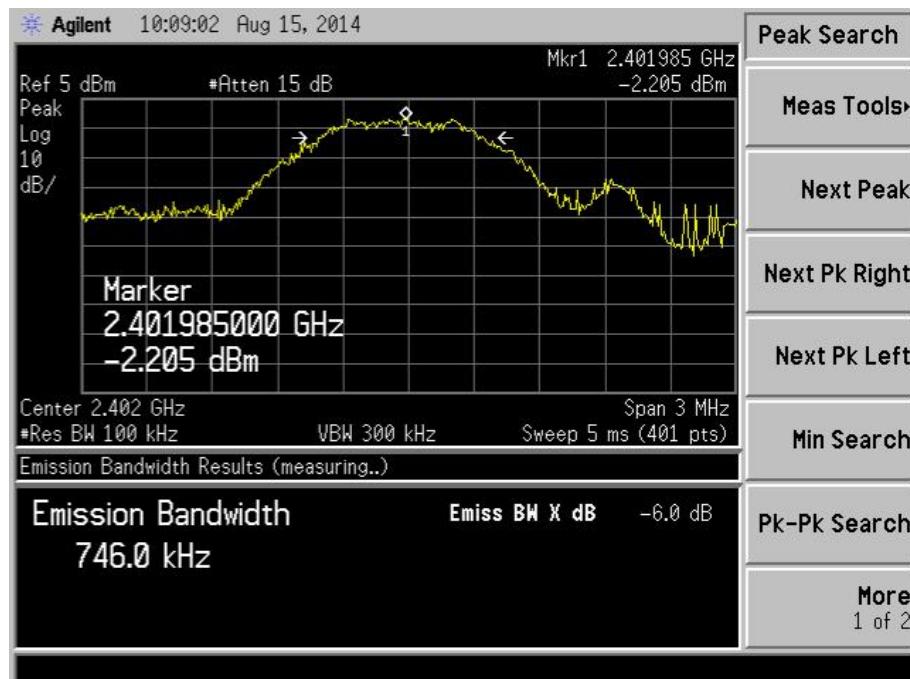




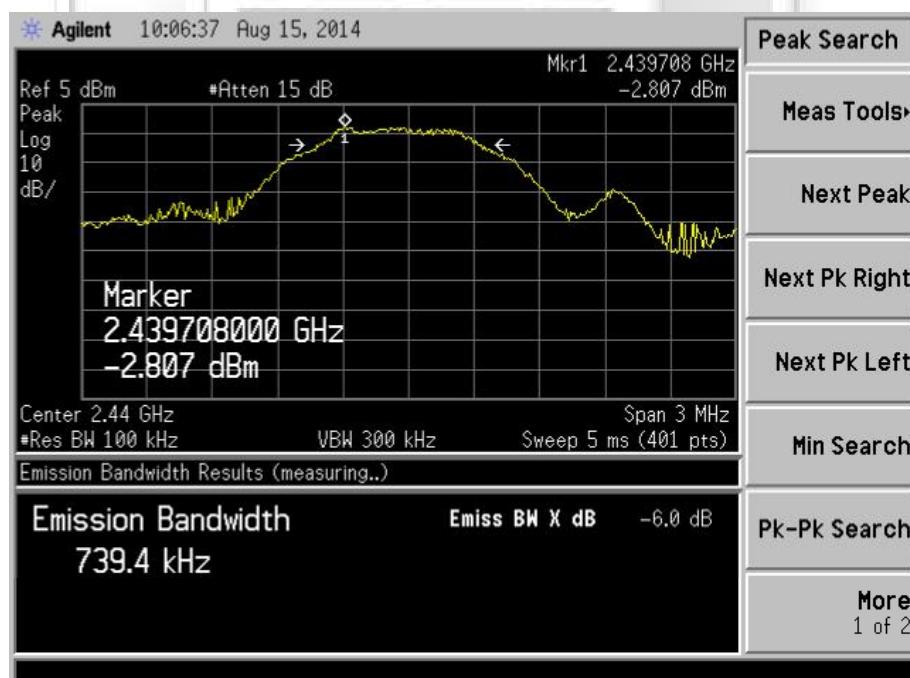
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SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

Spectrum Bandwidth (6dB Bandwidth Measurement) Plots



Plot 1 – Channel 0 (lower ch)



Plot 2 – Channel 19 (mid ch)



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SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

Spectrum Bandwidth (6dB Bandwidth Measurement) Plots



Plot 3 – Channel 39 (upper ch)

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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
Agilent Power Meter	E4416A	GB41290618	14 Aug 2014
Agilent Power Sensor	8482A	MY41090429	18 Dec 2014

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.



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MAXIMUM PEAK POWER TEST

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

Test Input Power	3Vdc	Temperature	24°C
Antenna Gain	2.0 dBi	Relative Humidity	56%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Maximum EIRP (W)	Limit (W)
0 (<i>lower ch</i>)	2.402	0.0008	0.0013	1.0
19 (<i>mid ch</i>)	2.440	0.0006	0.0010	1.0
39 (<i>upper ch</i>)	2.480	0.0004	0.0006	1.0

Notes

1. Nil.





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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	14 Nov 2014
Agilent DC Power Supply	E3620A	MY40000448	Output Monitor

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.



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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

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

Test Input Power	3Vdc	Temperature	24°C
Attached Plots	4 – 35 : Channel 0 (lower ch)	Relative Humidity	56%
	36 – 67 : Channel 19 (middle ch)	Atmospheric Pressure	1030mbar
	68 – 99 : Channel 39 (upper ch)	Tested By	Chang Wai Kit

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

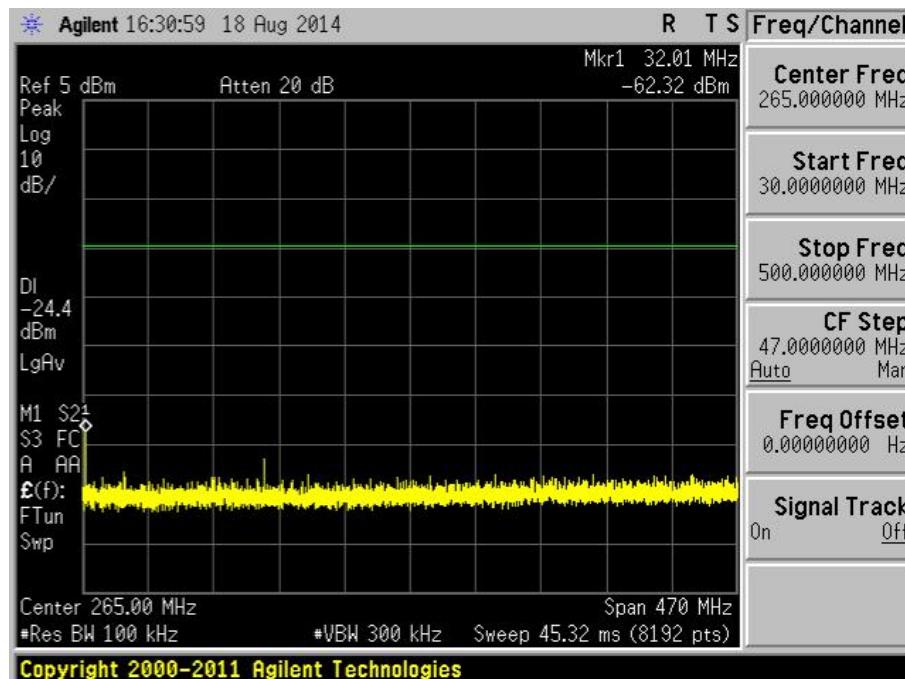




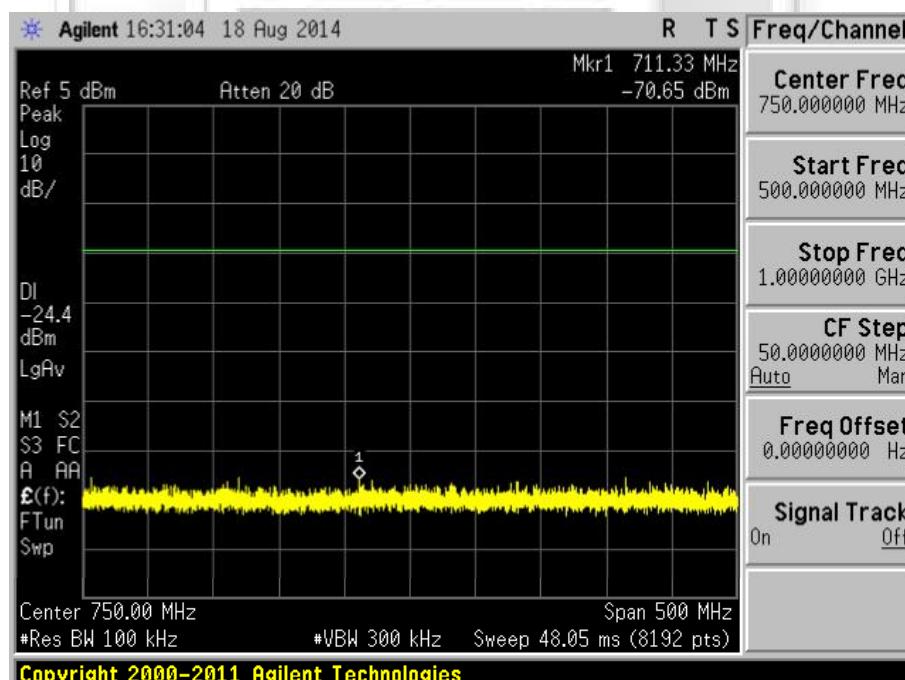
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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 4 – Channel 0 (lower ch)



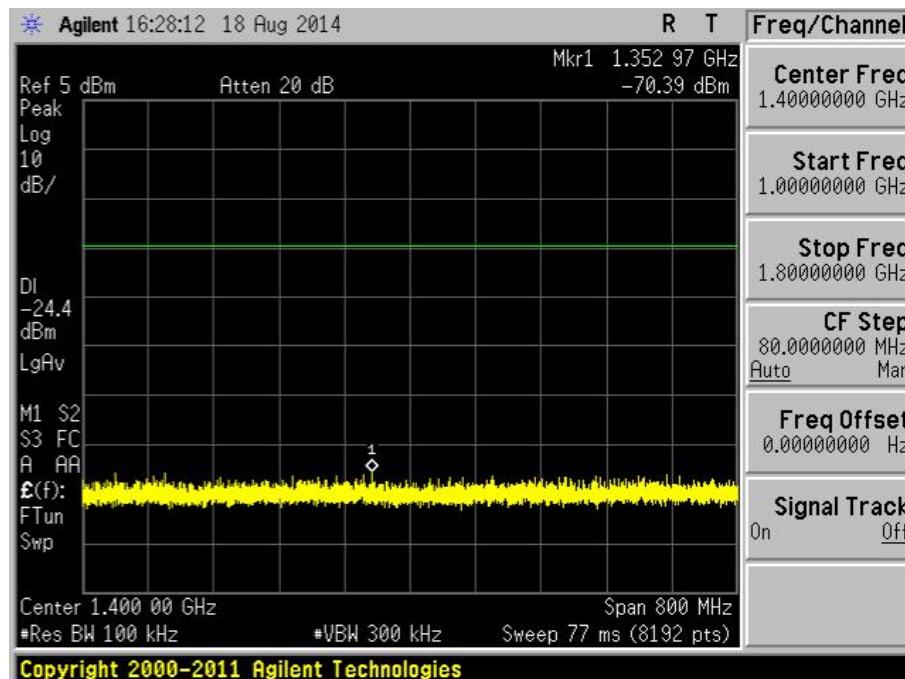
Plot 5 – Channel 0 (lower ch)



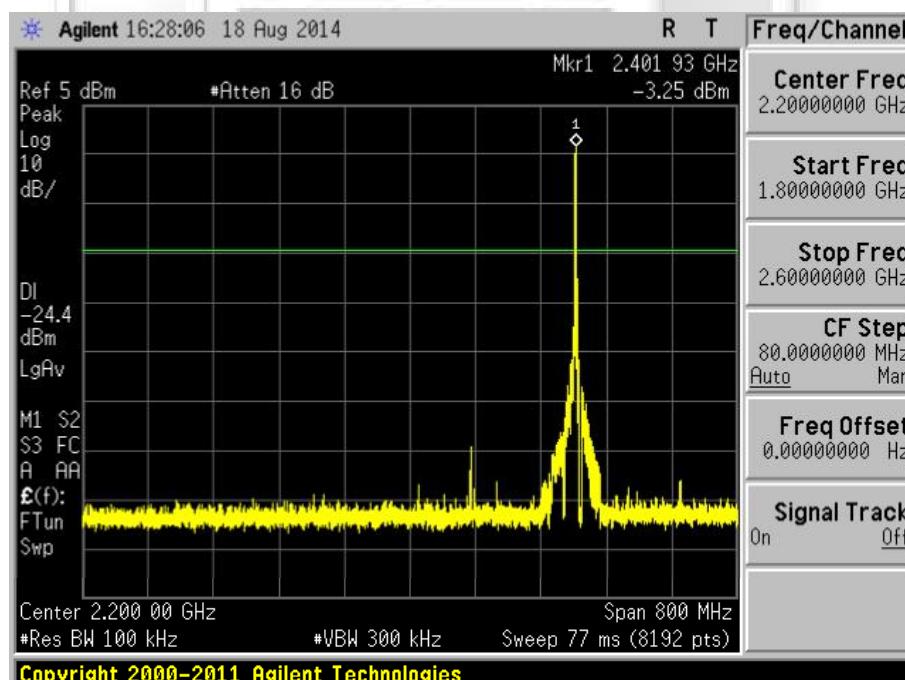
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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 6 – Channel 0 (lower ch)



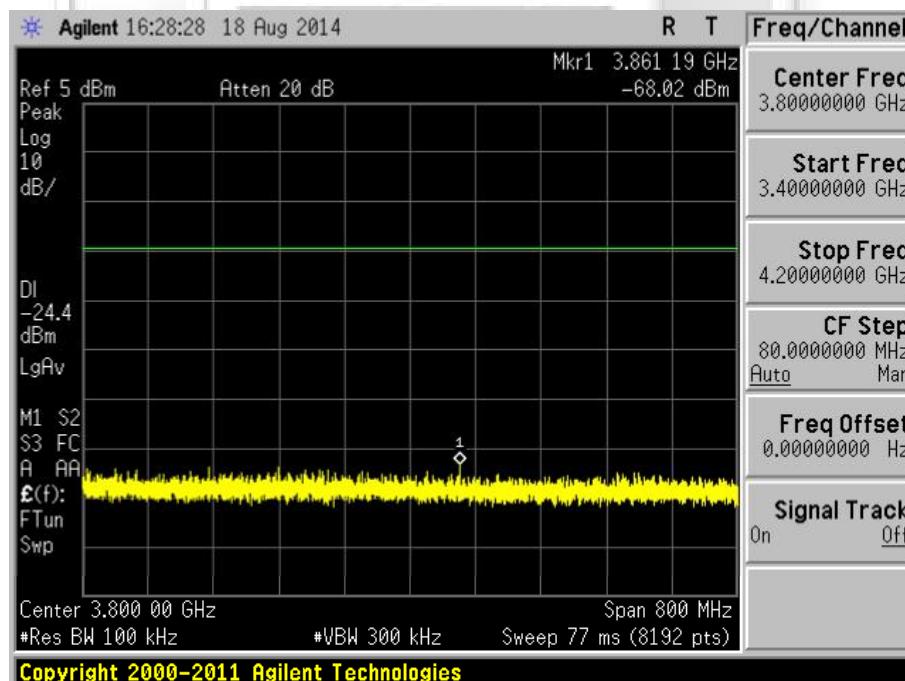
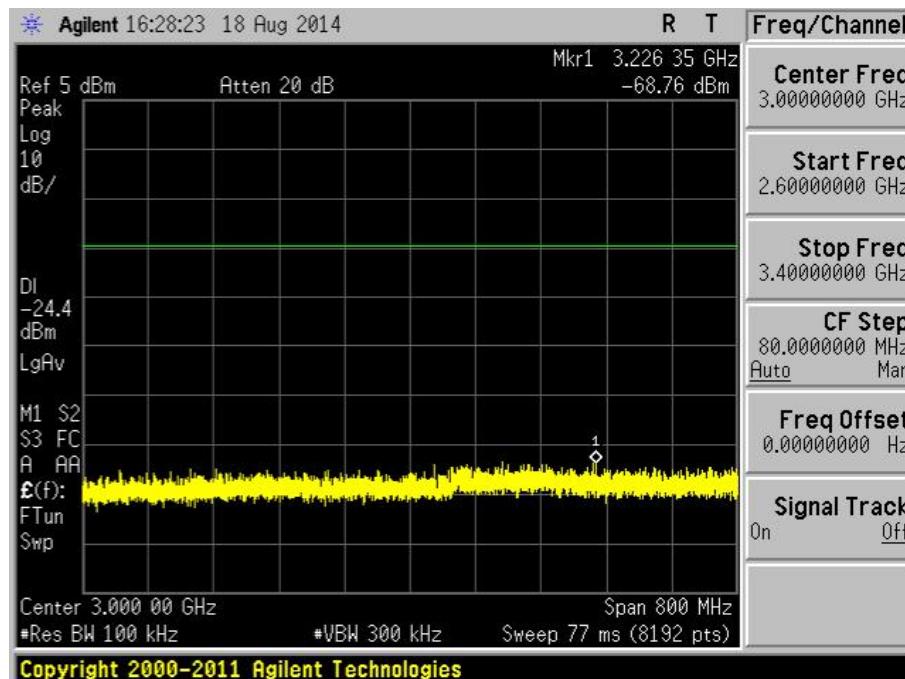
Plot 7 – Channel 0 (lower ch)



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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

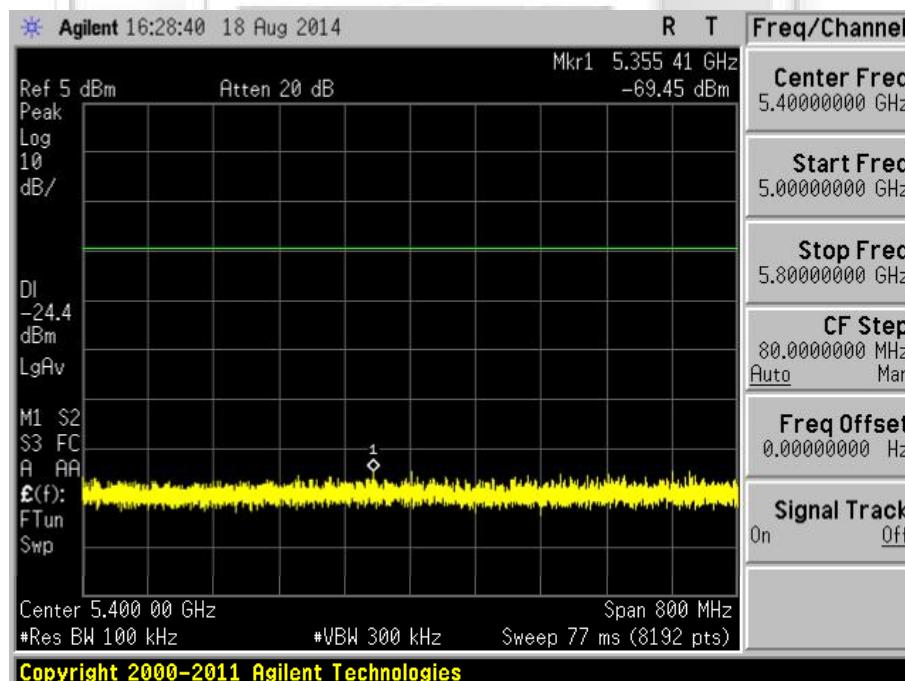
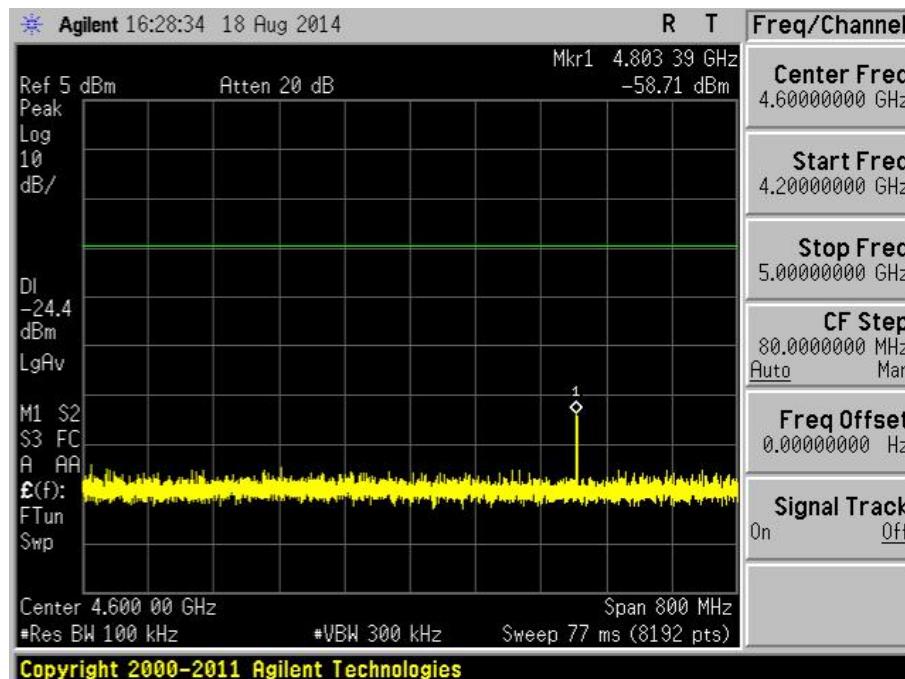




PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

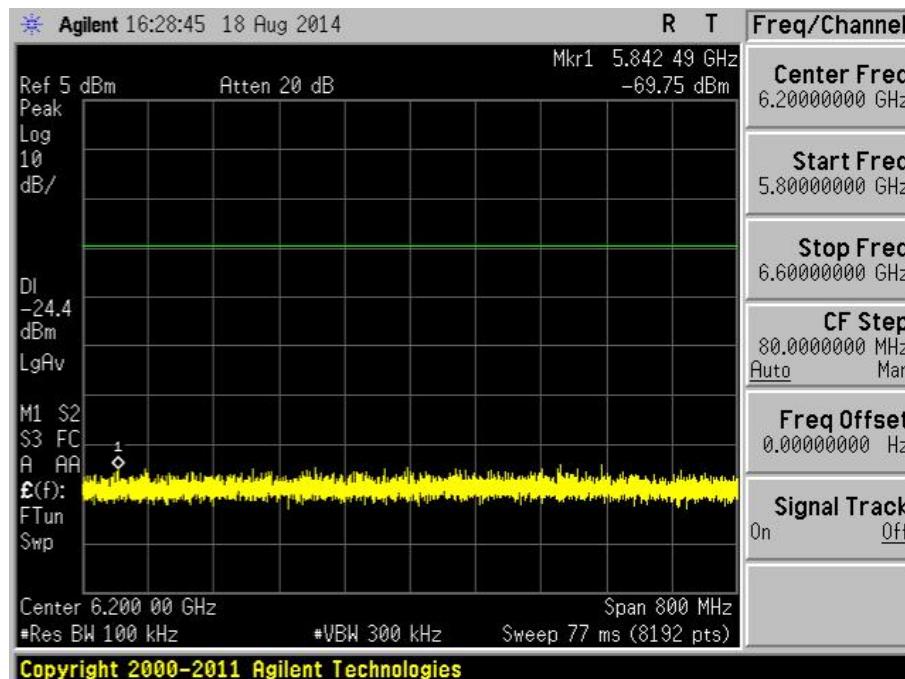




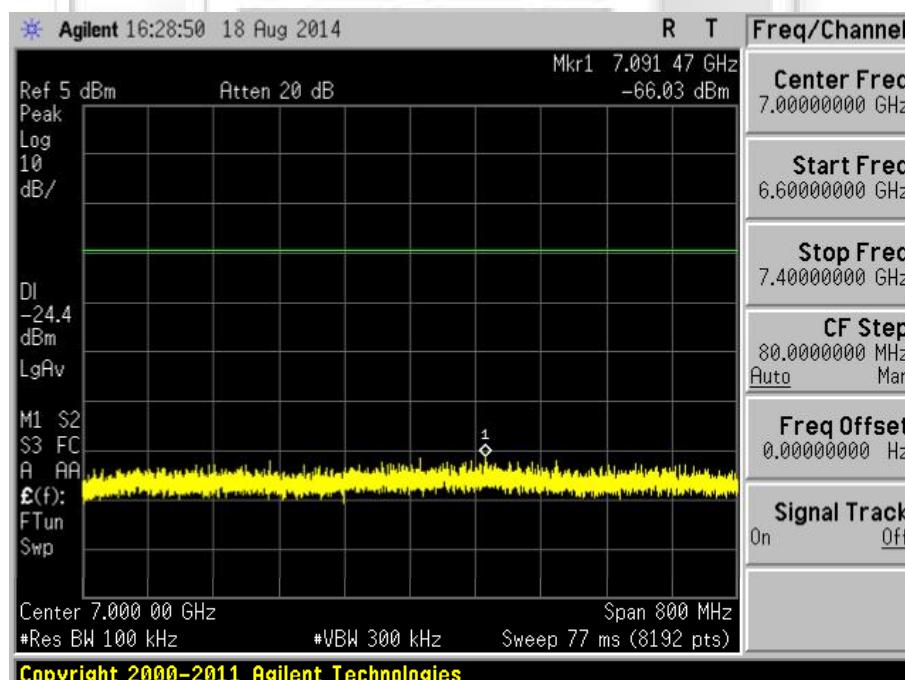
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 12 – Channel 0 (lower ch)



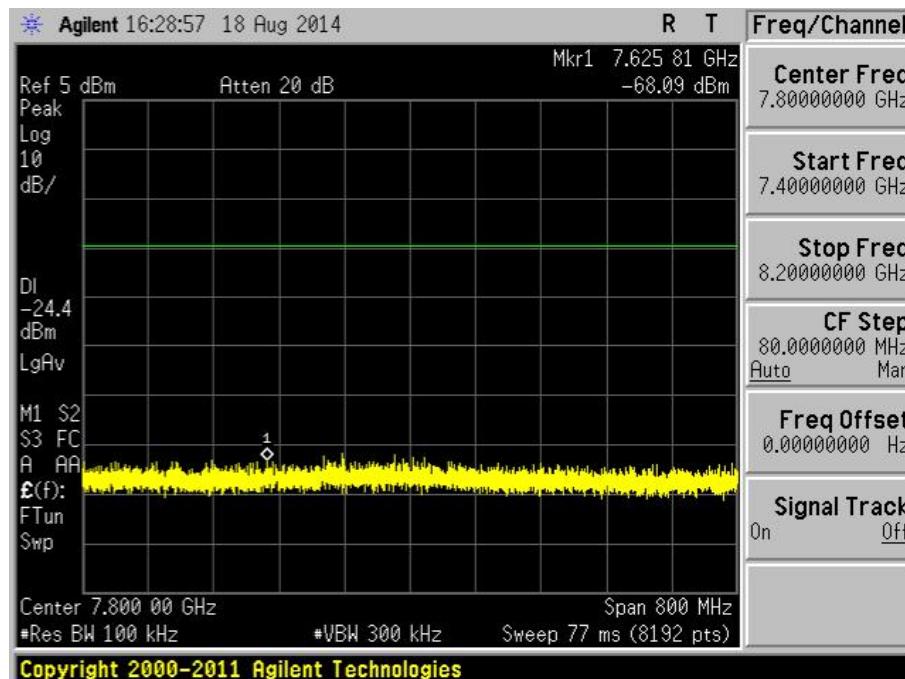
Plot 13 – Channel 0 (lower ch)



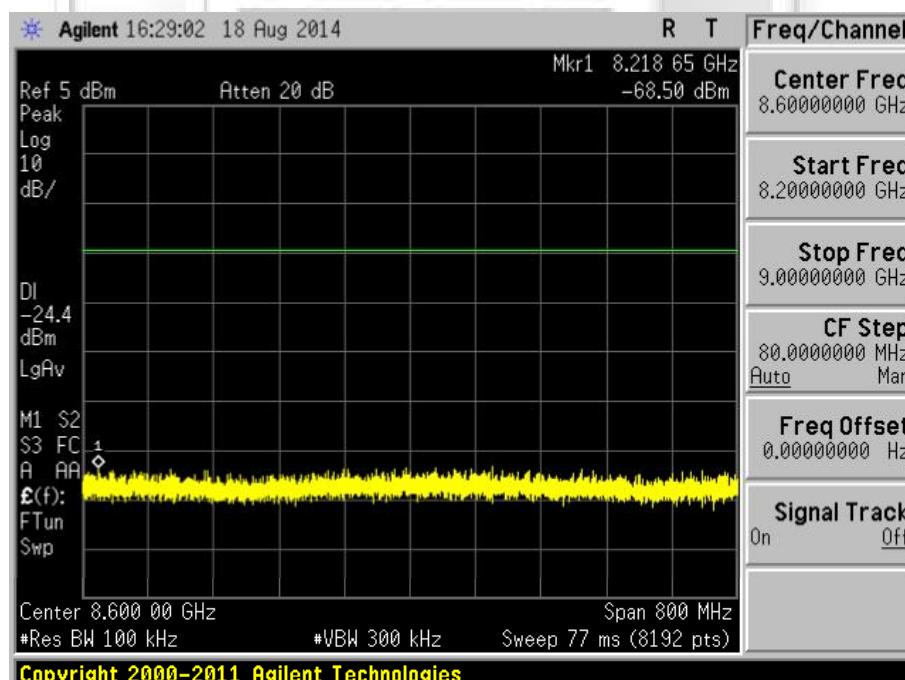
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 14 – Channel 0 (lower ch)



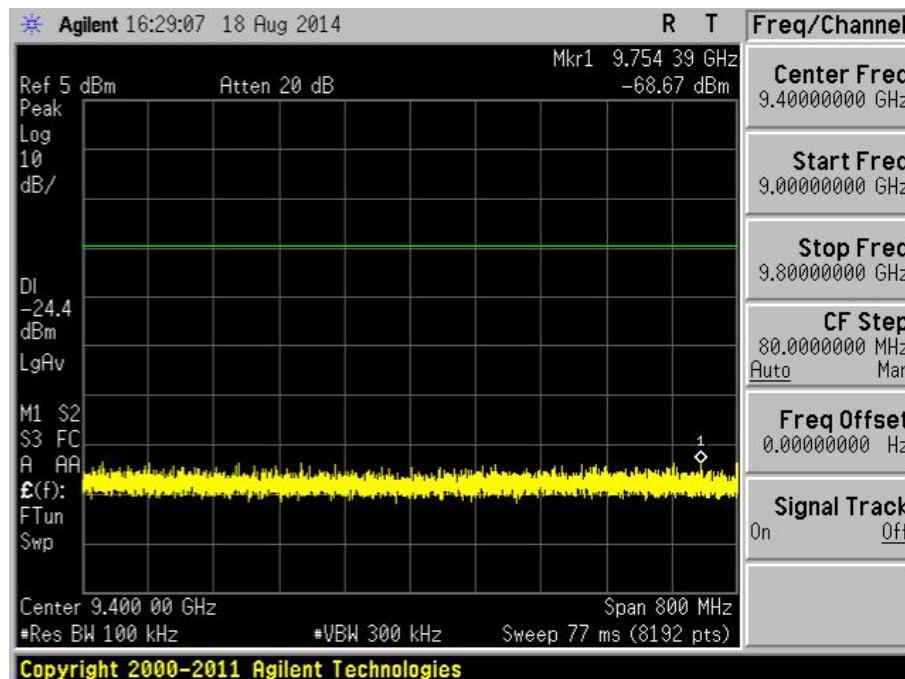
Plot 15 – Channel 0 (lower ch)



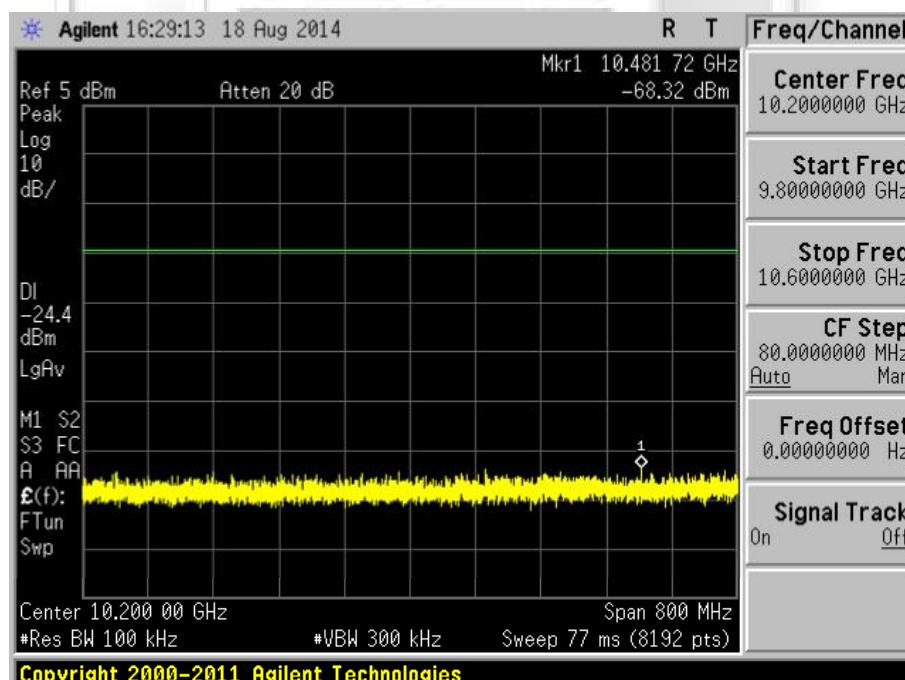
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 16 – Channel 0 (lower ch)



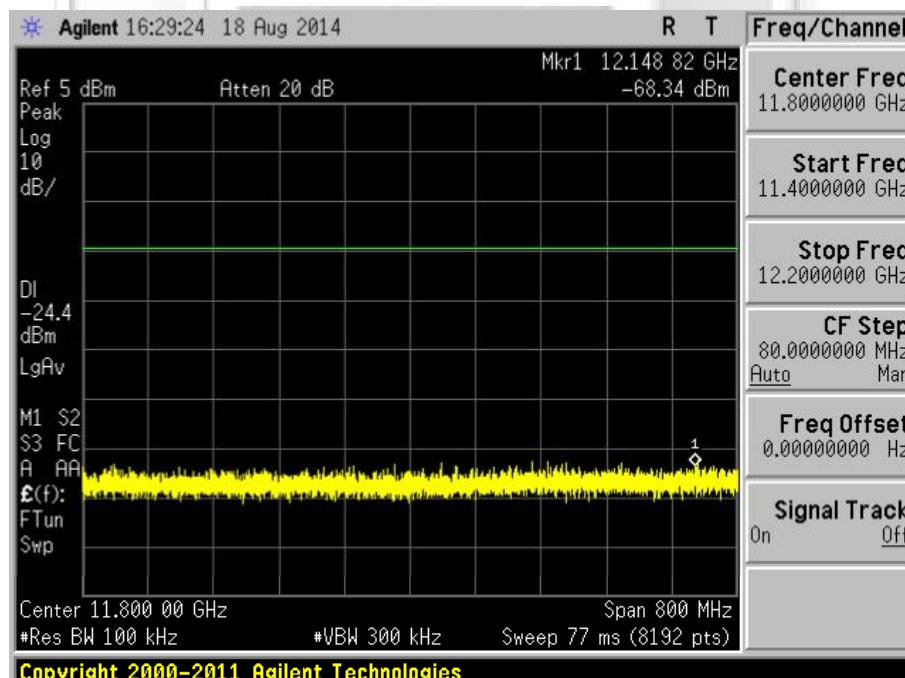
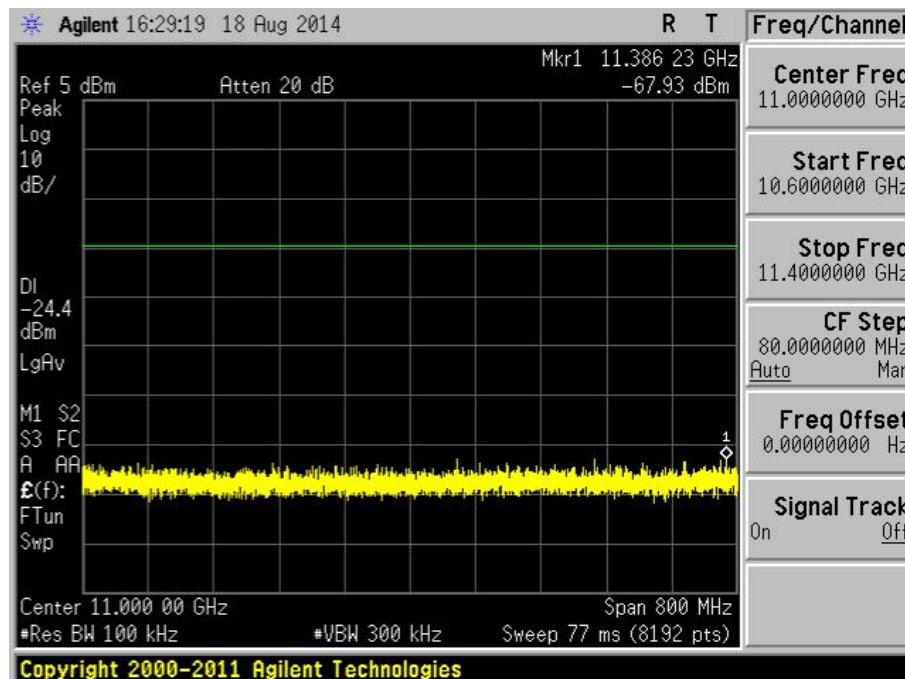
Plot 17 – Channel 0 (lower ch)



PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

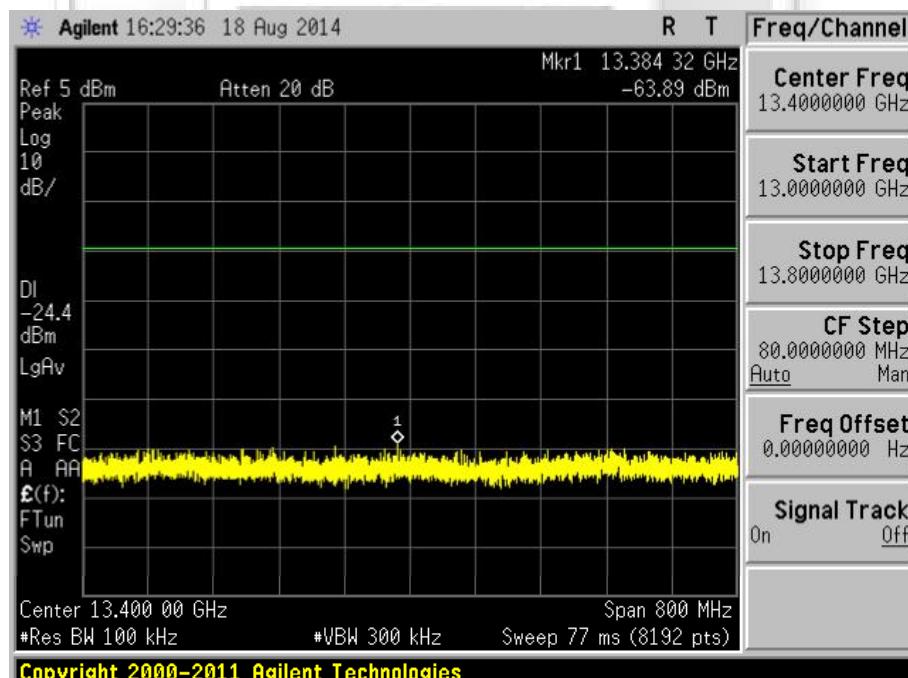
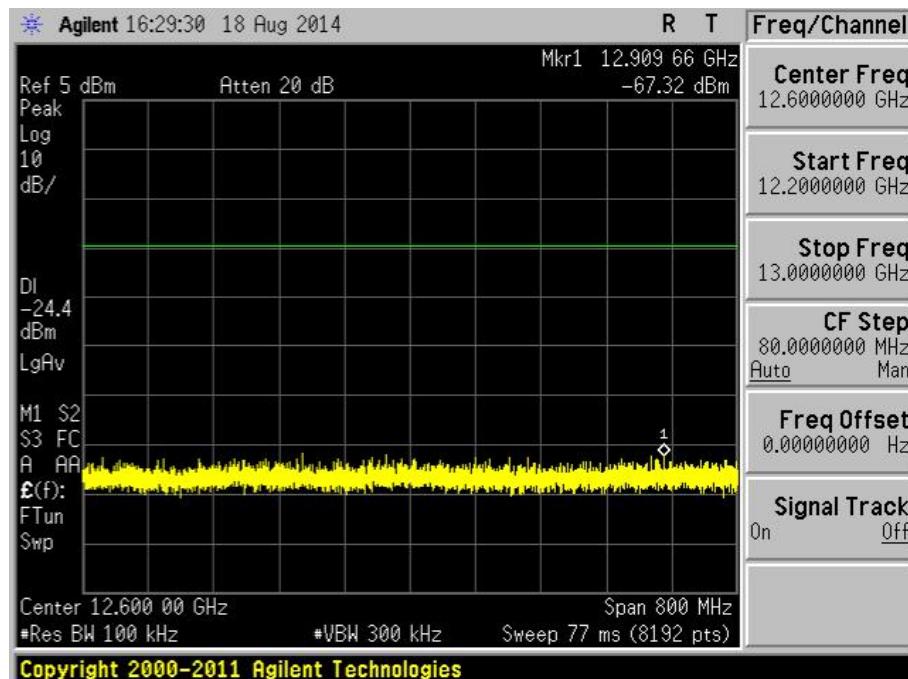




PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

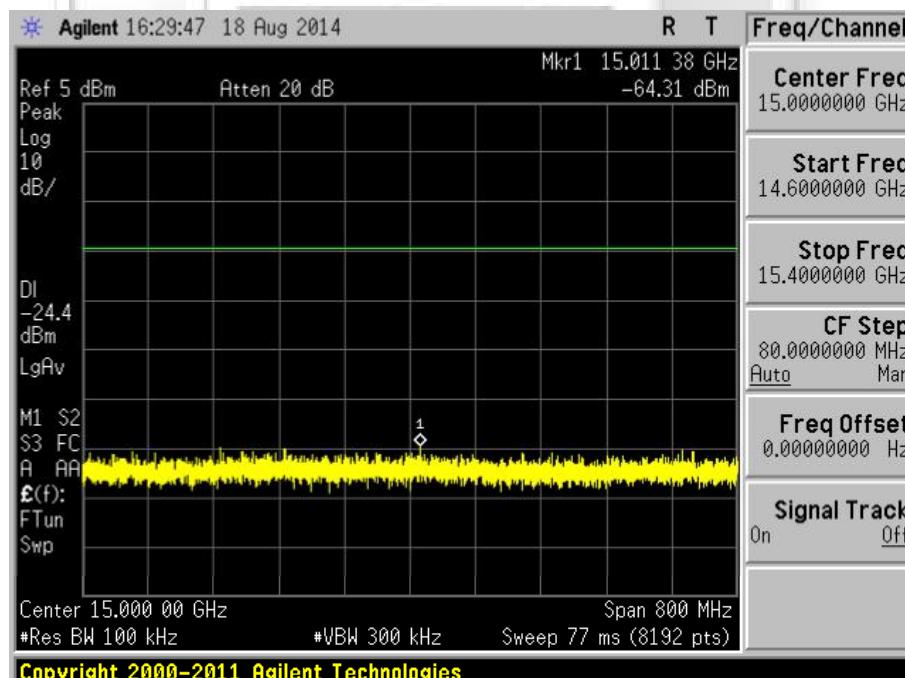
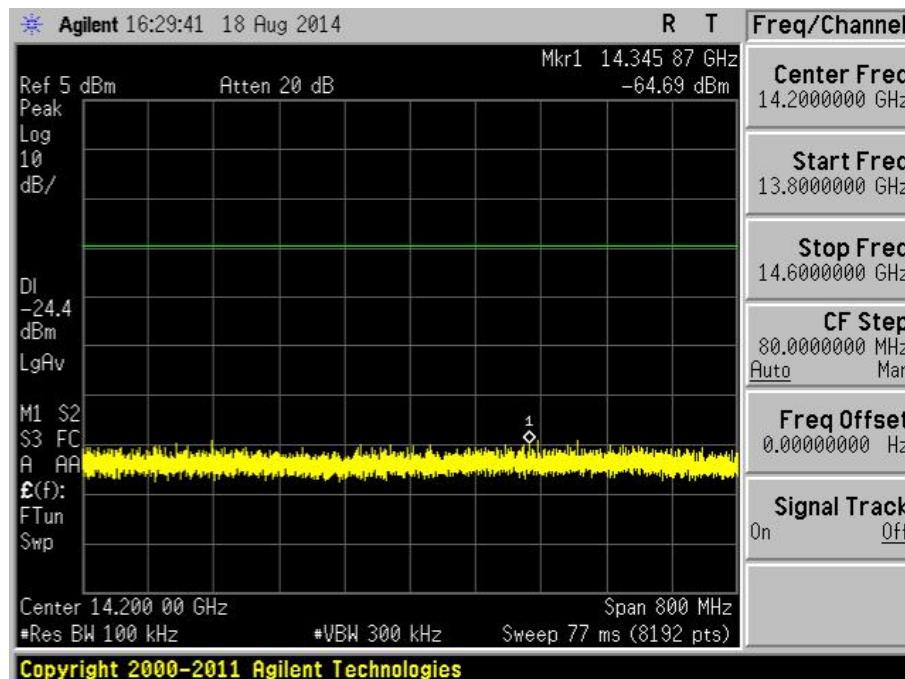




PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

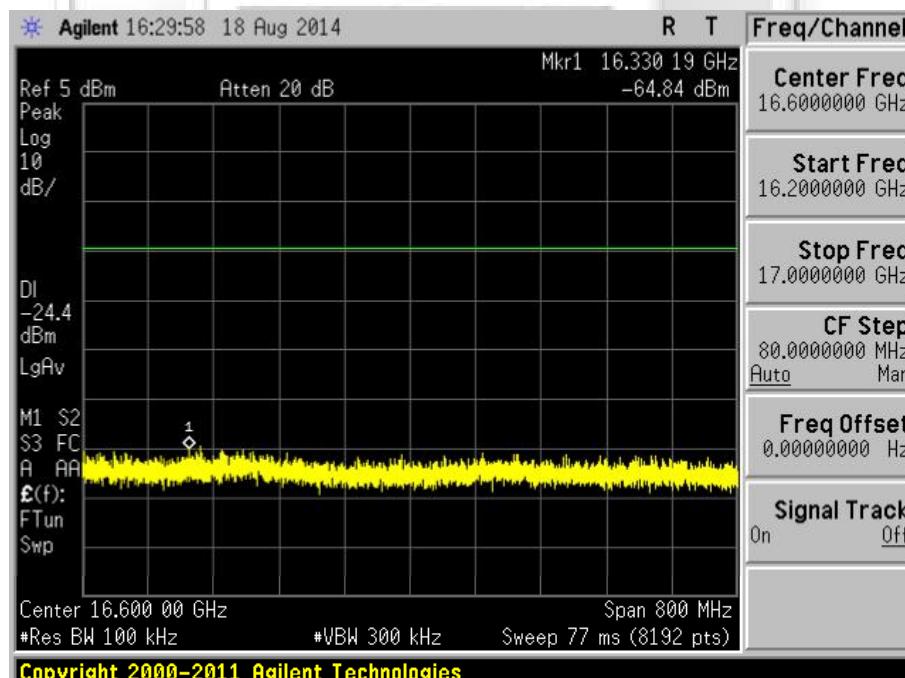
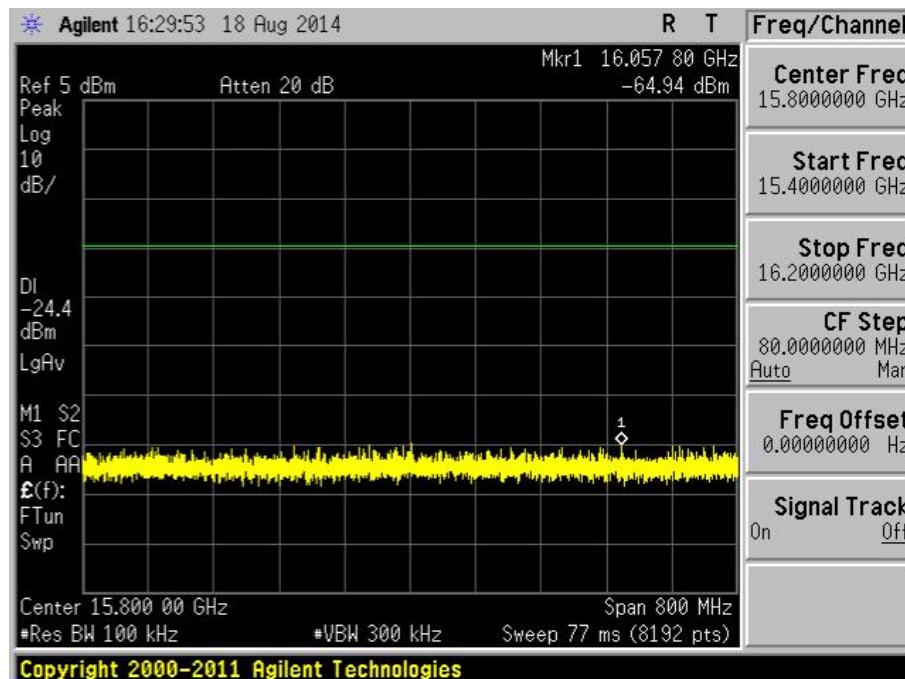




PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

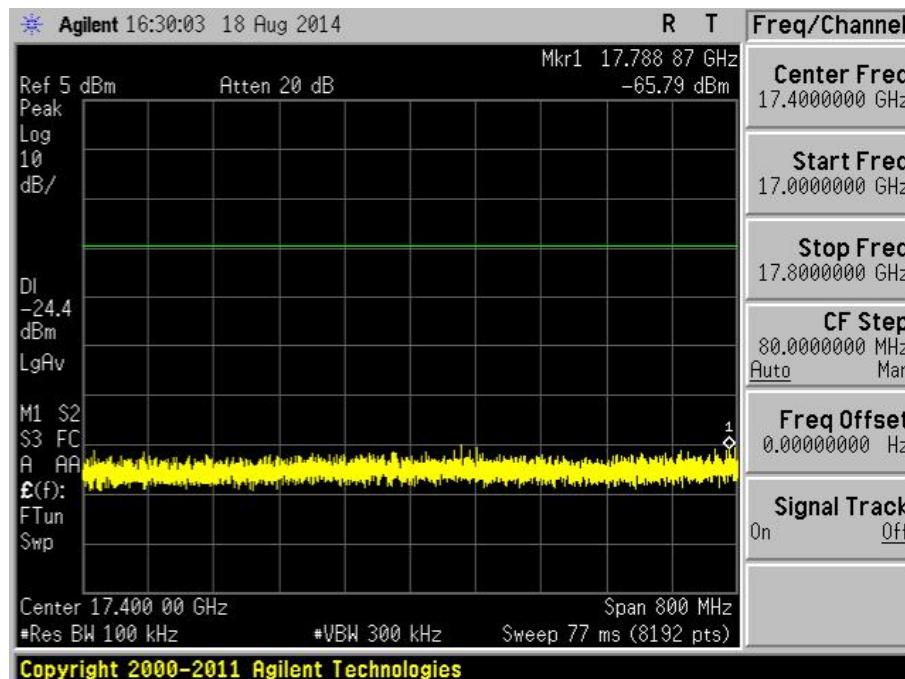




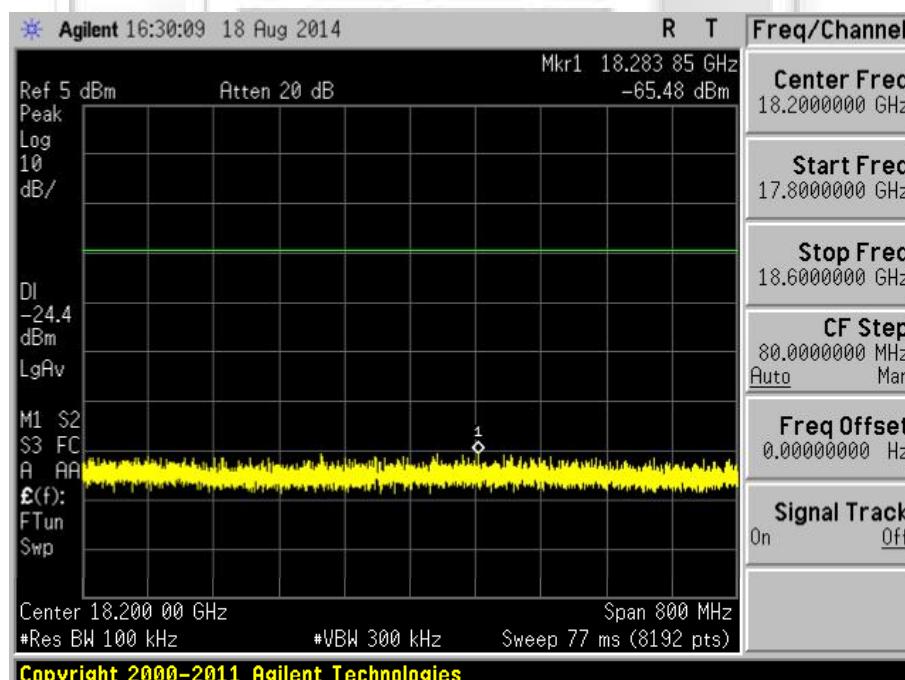
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 26 – Channel 0 (lower ch)



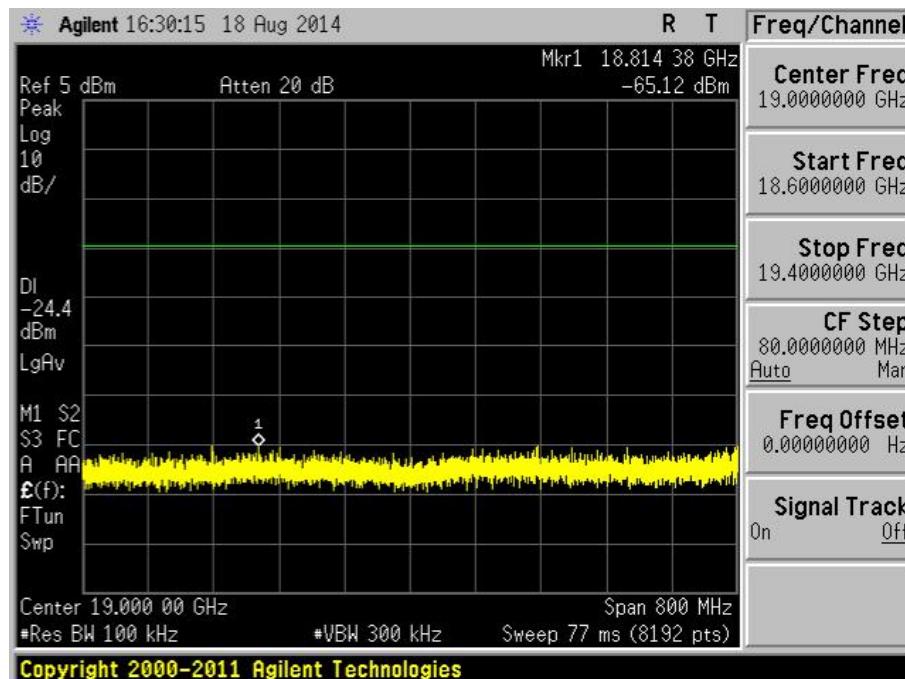
Plot 27 – Channel 0 (lower ch)



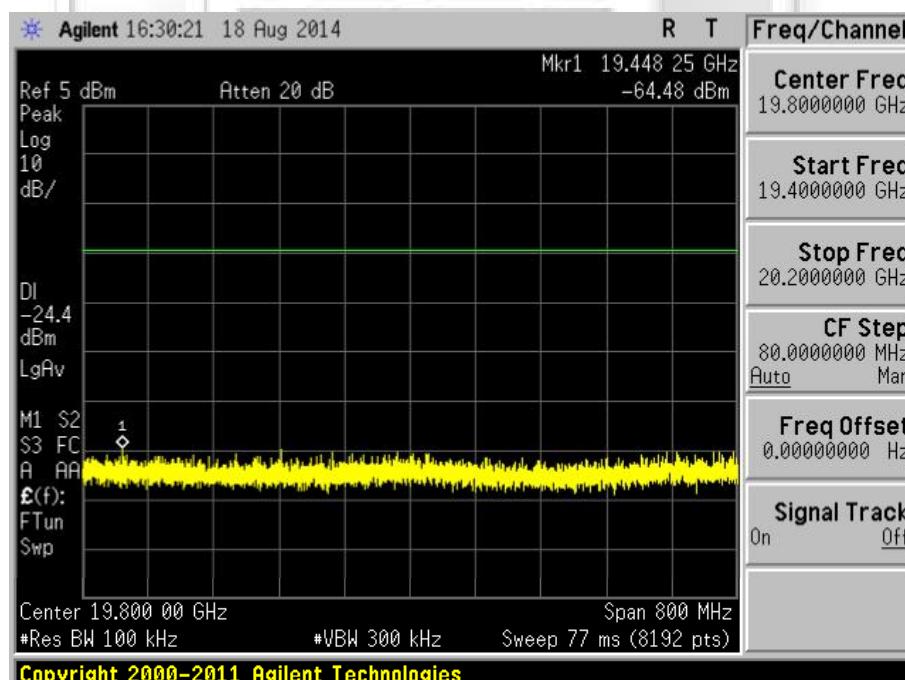
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 28 – Channel 0 (lower ch)



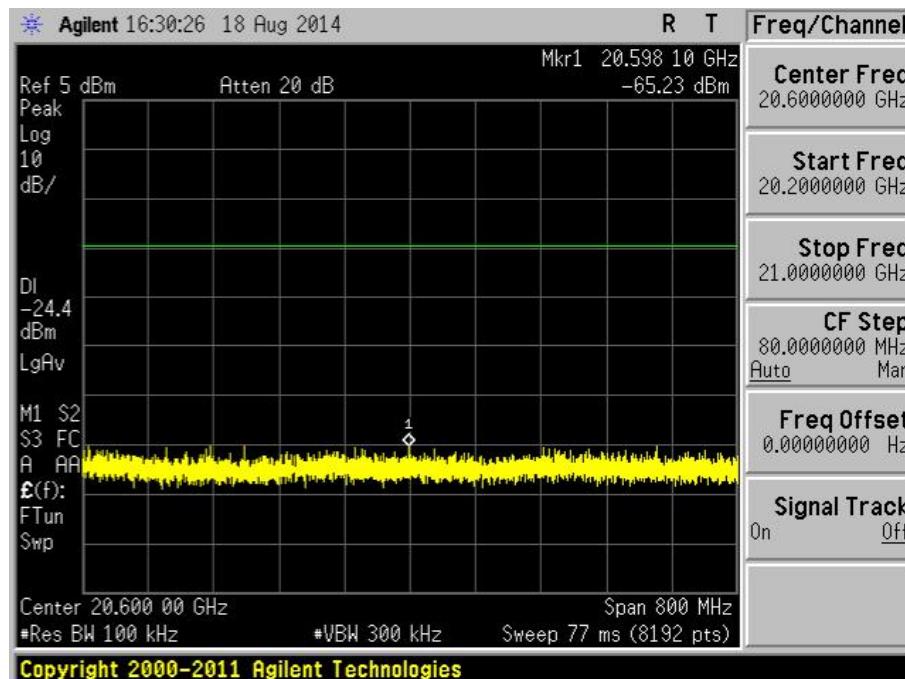
Plot 29 – Channel 0 (lower ch)



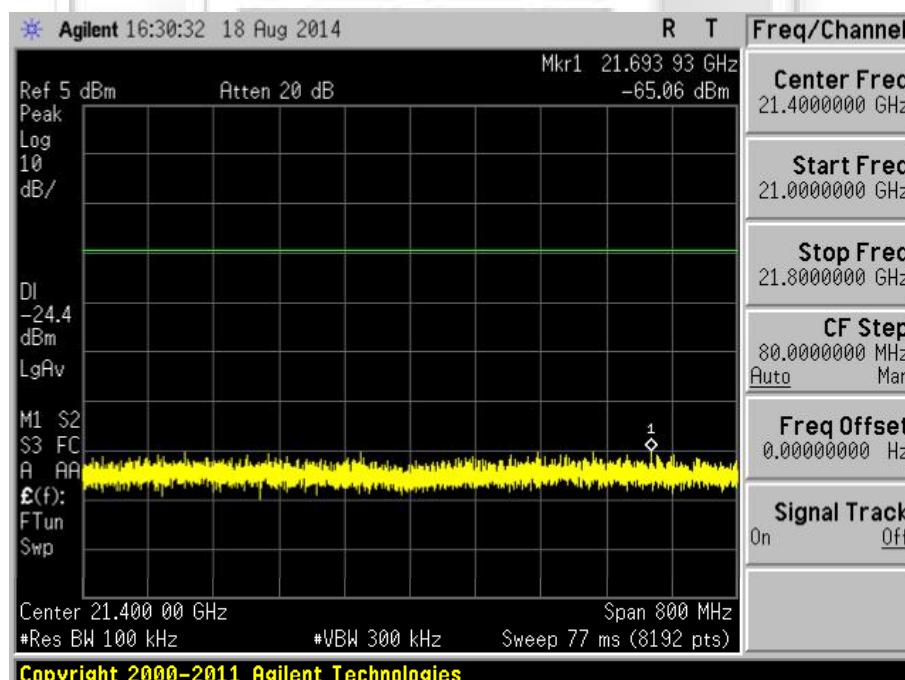
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 30 – Channel 0 (lower ch)



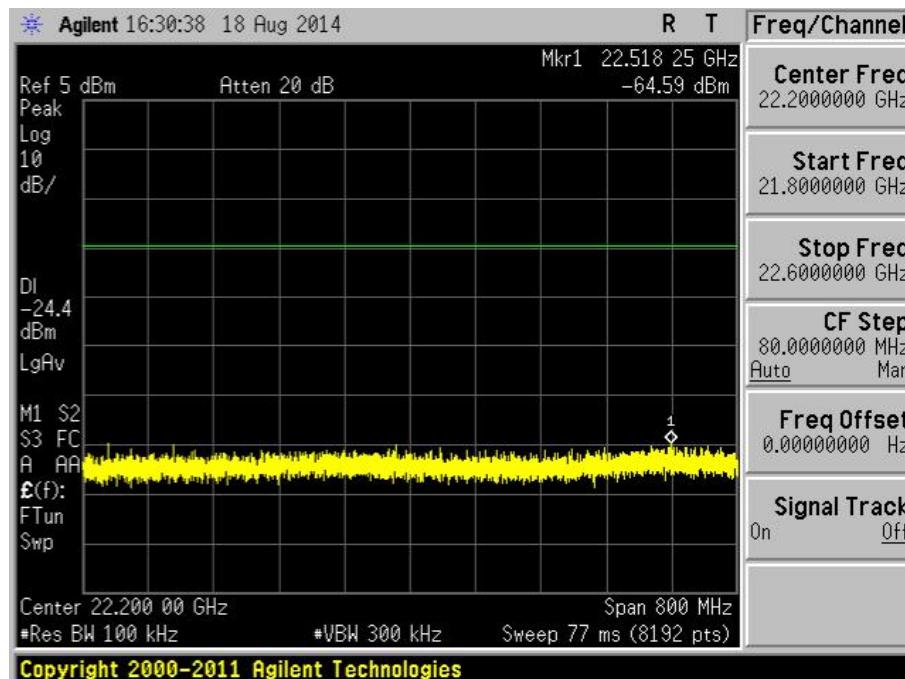
Plot 31 – Channel 0 (lower ch)



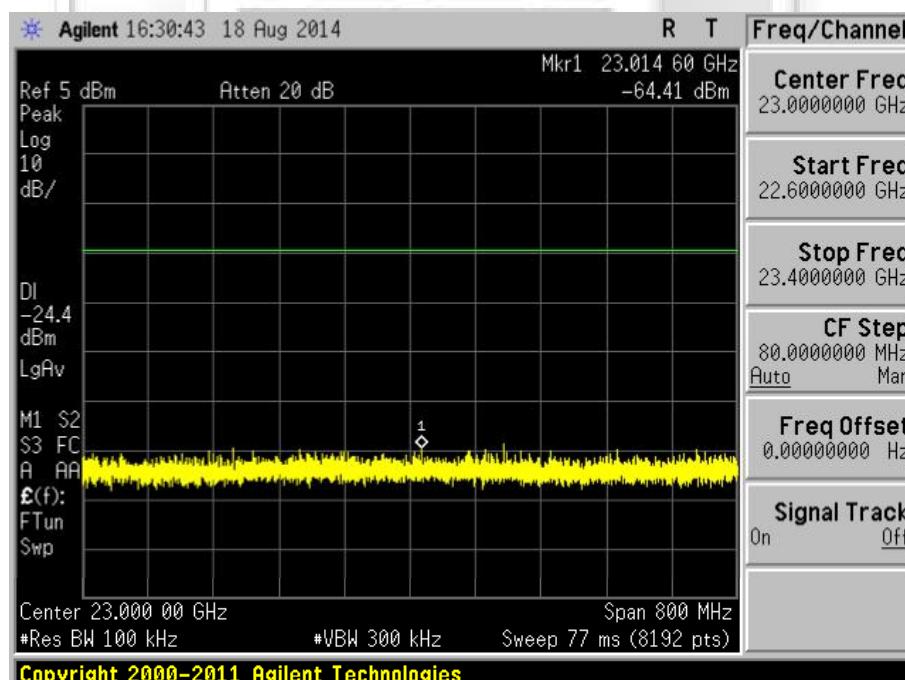
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 32 – Channel 0 (lower ch)



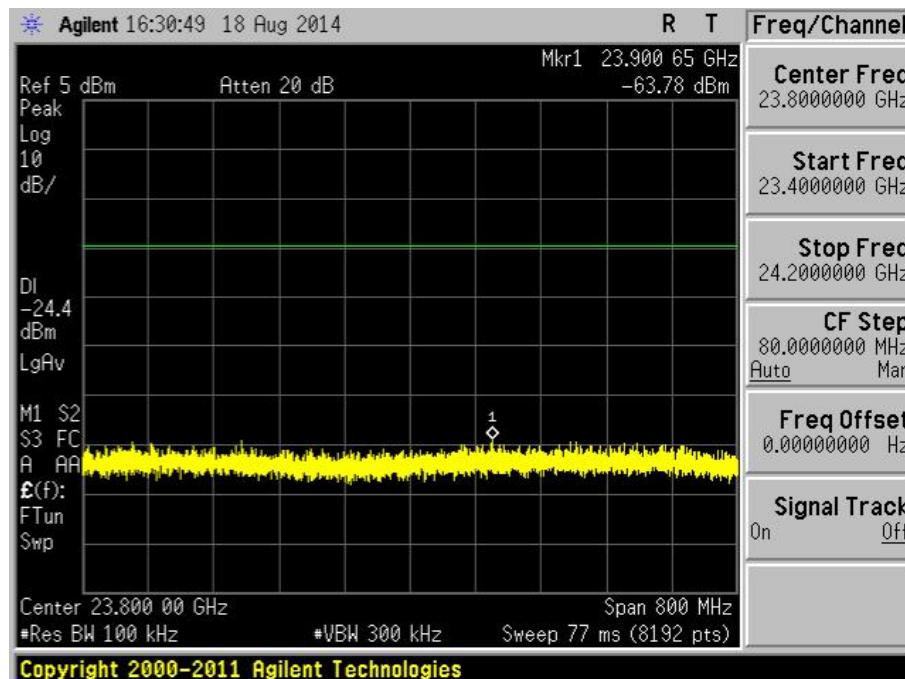
Plot 33 – Channel 0 (lower ch)



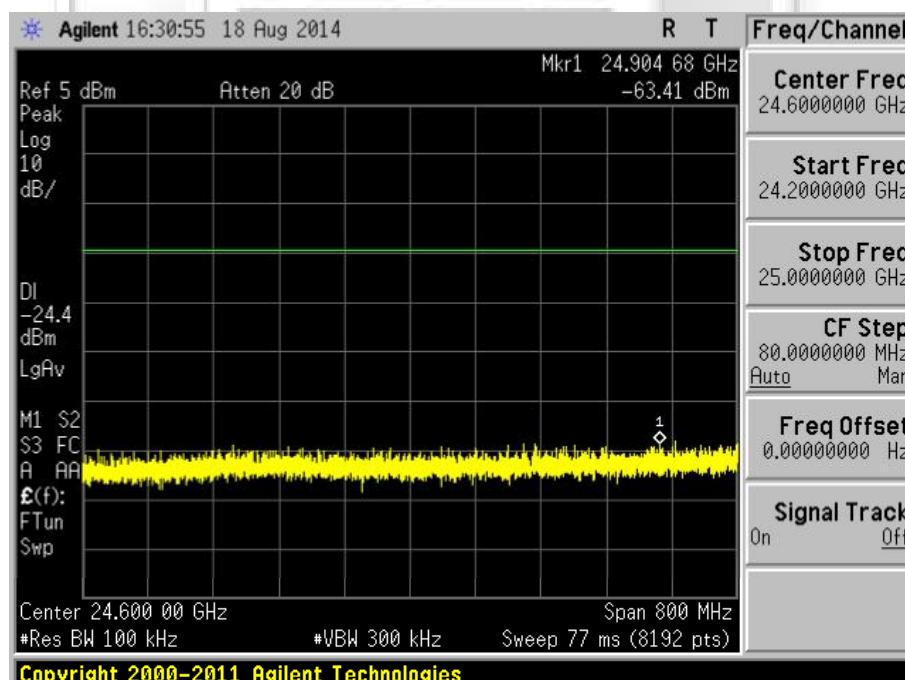
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 34 – Channel 0 (lower ch)



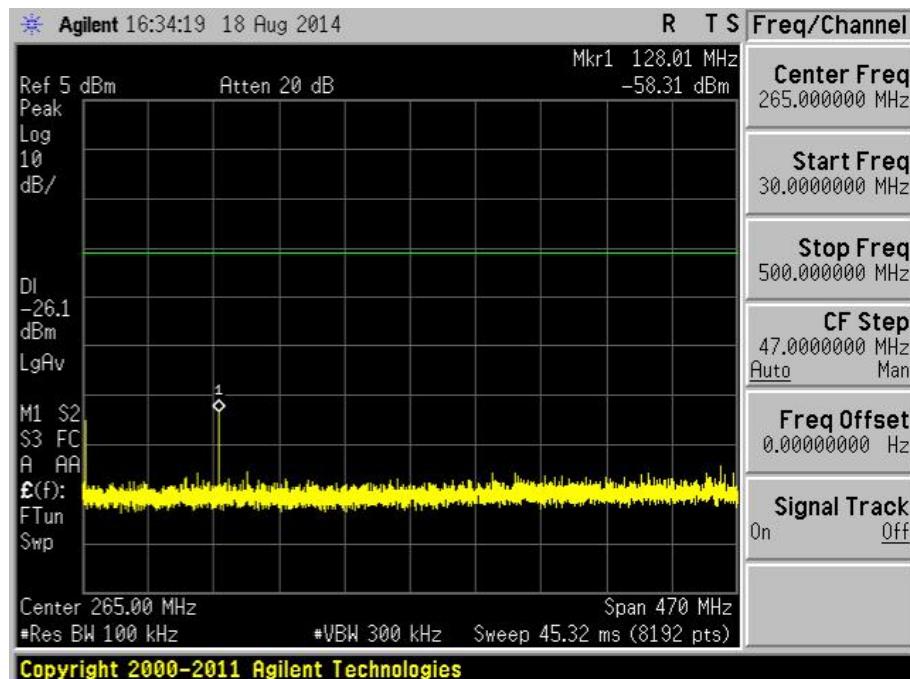
Plot 35 – Channel 0 (lower ch)



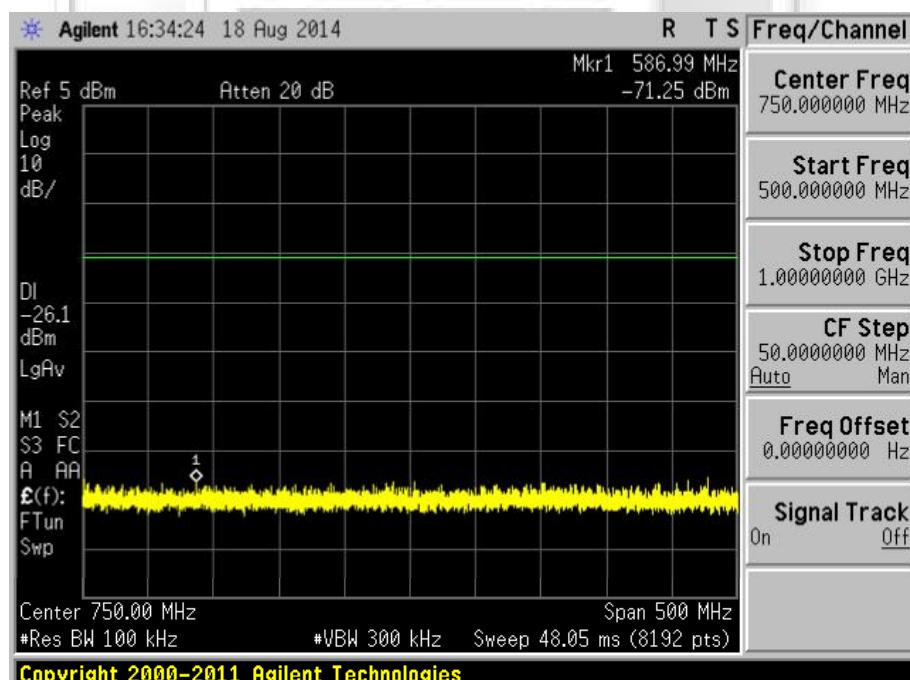
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 36 – Channel 19 (*middle ch*)



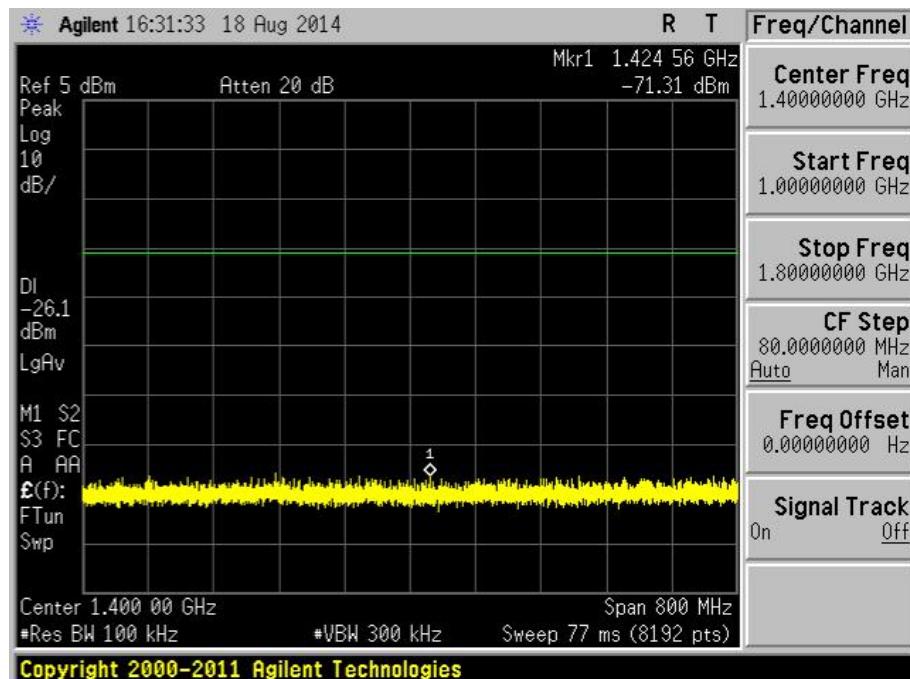
Flight Techniques



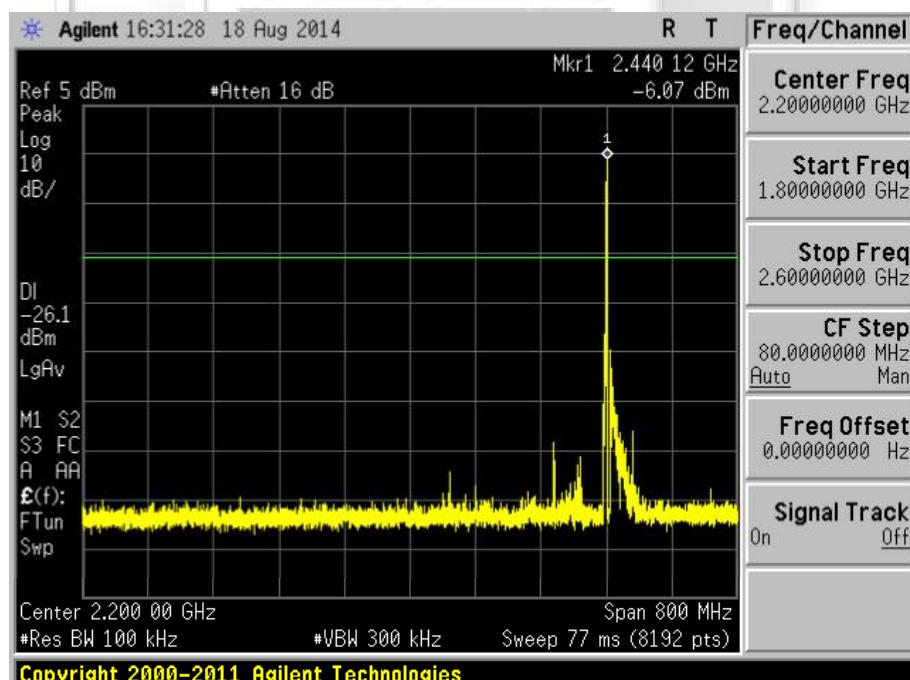
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 38 – Channel 19 (*middle ch*)



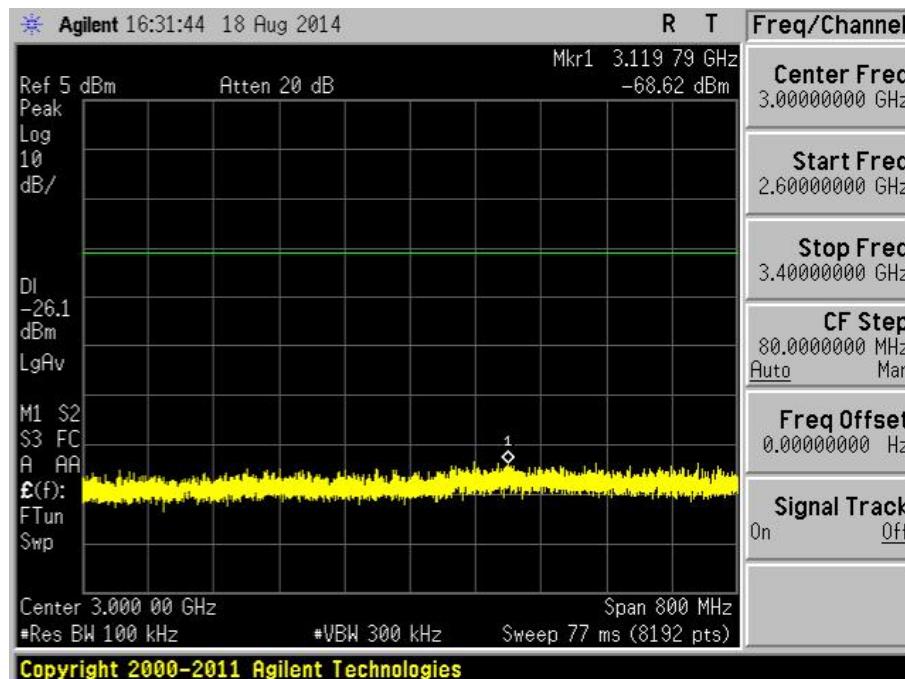
Plot 39 – Channel 19 (*middle ch*)



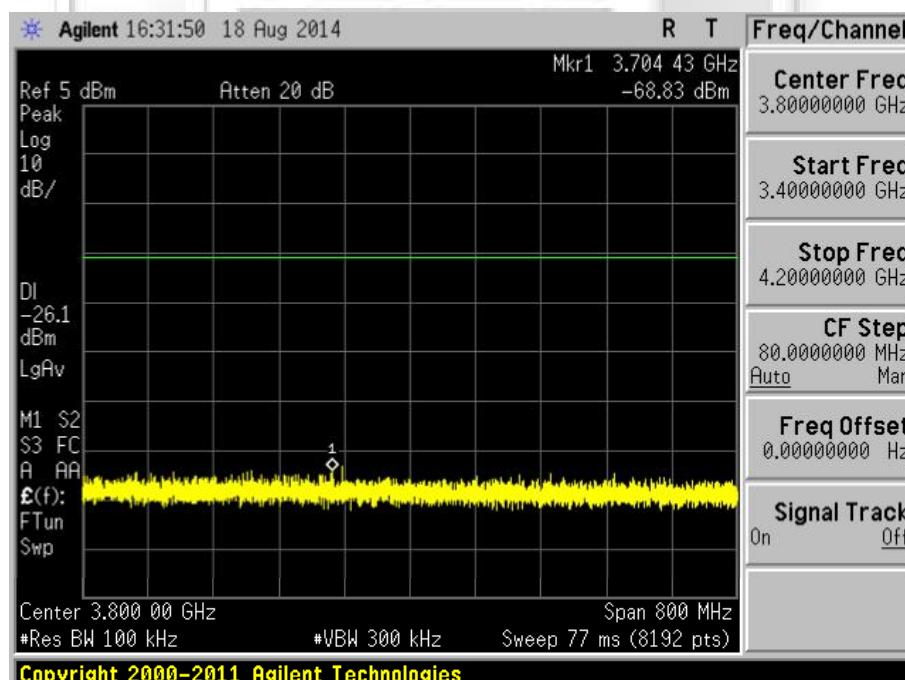
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 40 – Channel 19 (middle ch)



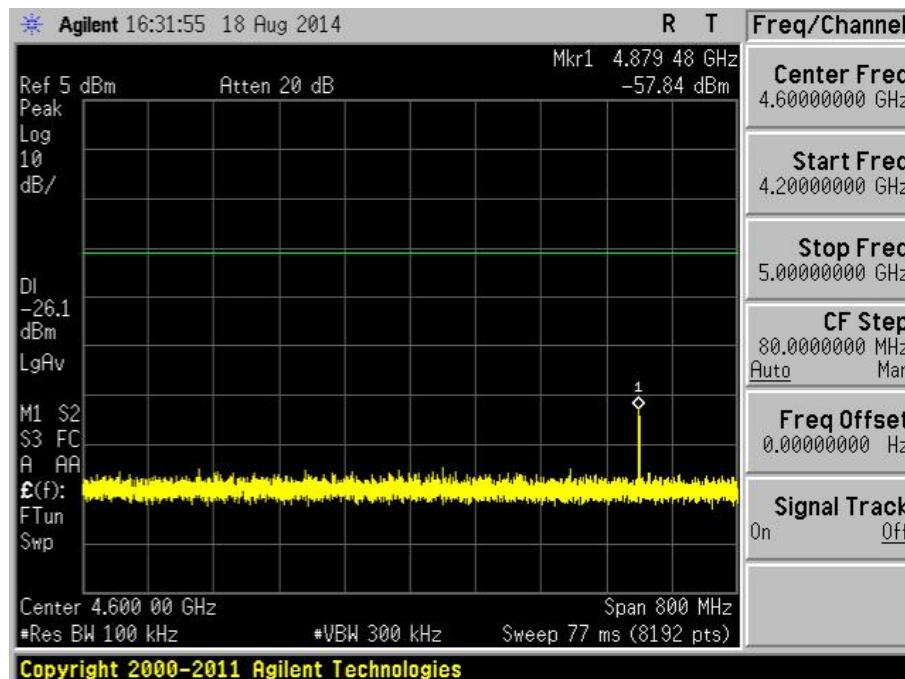
Plot 41 – Channel 19 (middle ch)



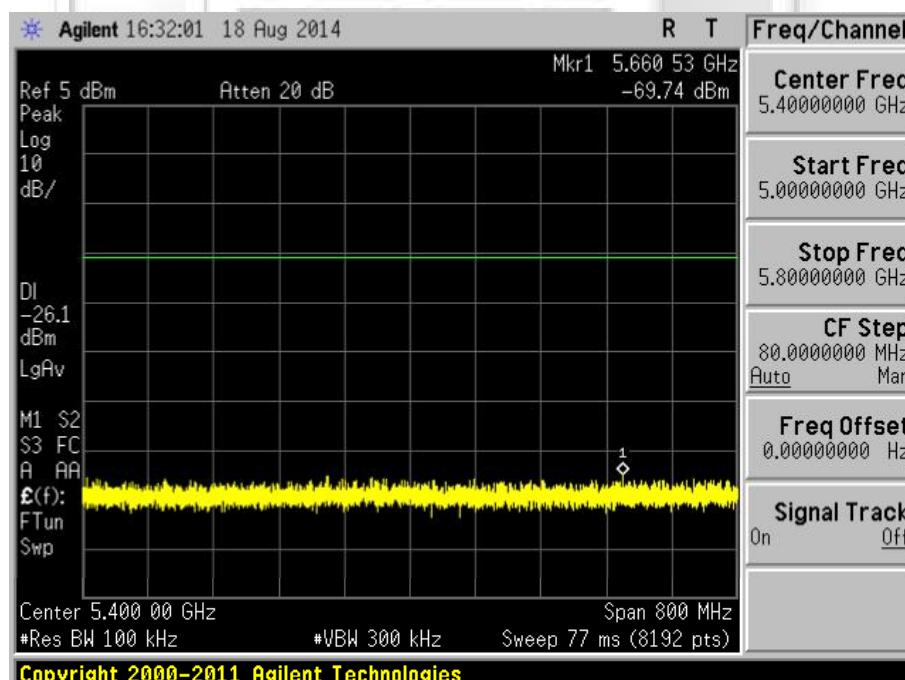
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 42 – Channel 19 (middle ch)



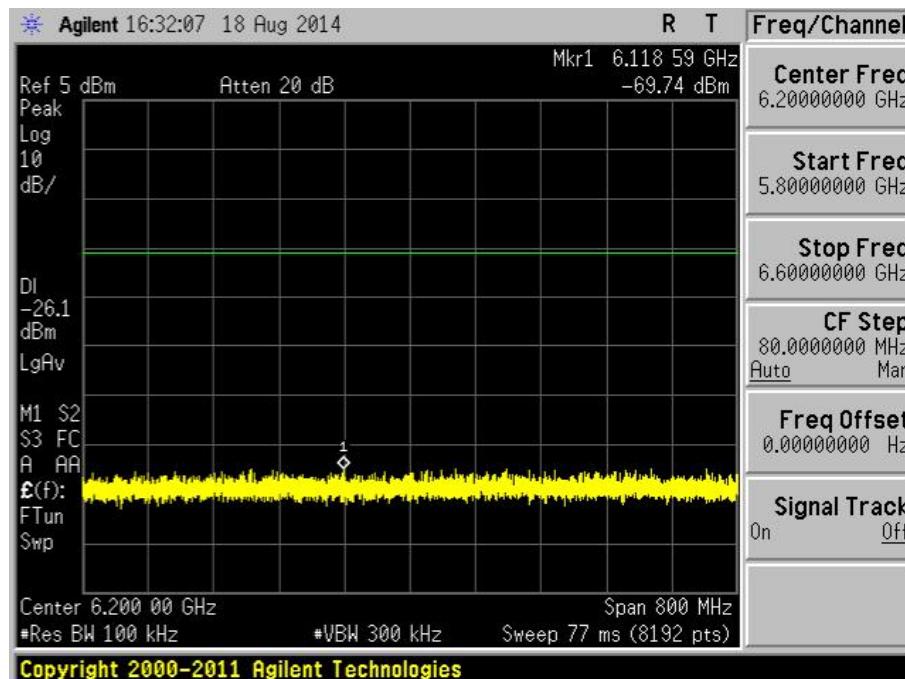
Plot 43 – Channel 19 (middle ch)



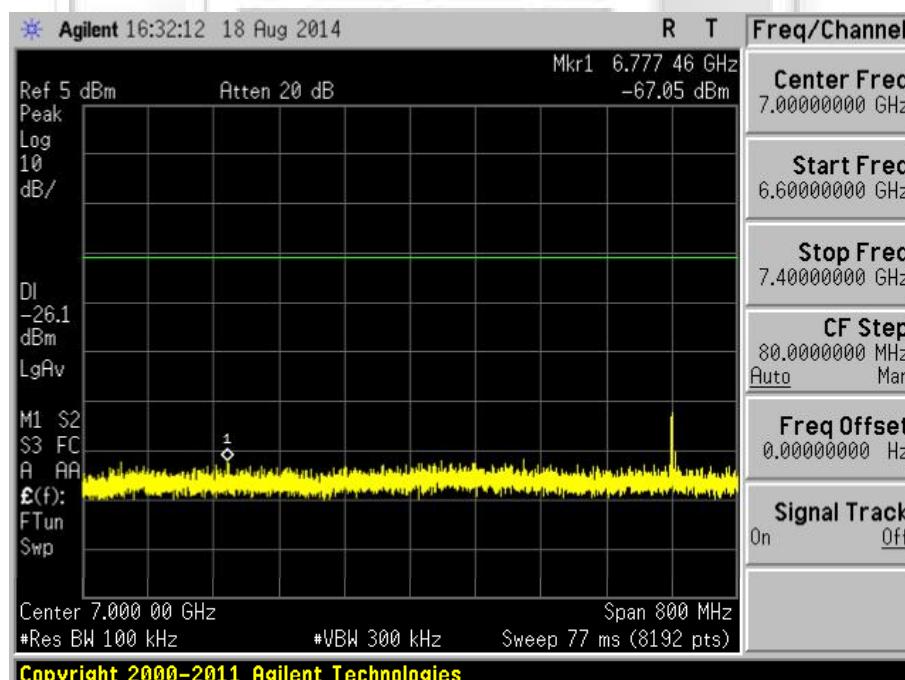
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 44 – Channel 19 (middle ch)



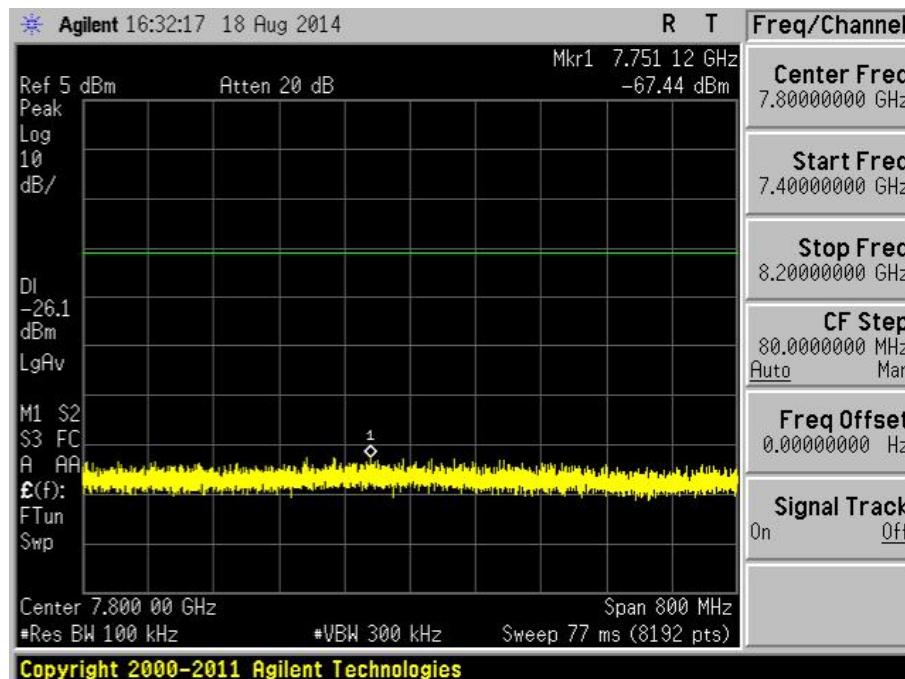
Plot 45 – Channel 19 (middle ch)



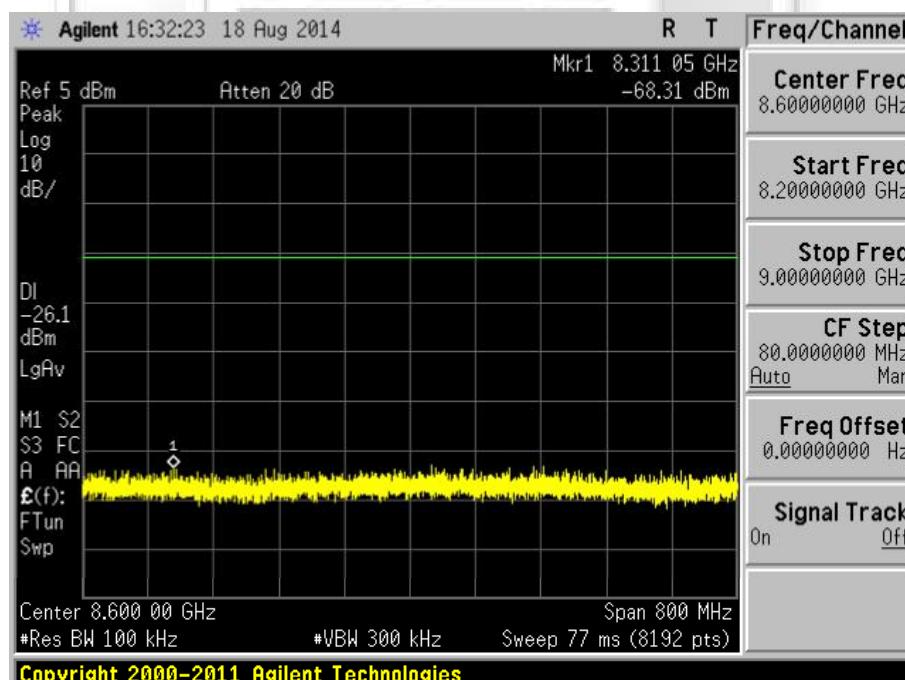
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 46 – Channel 19 (middle ch)



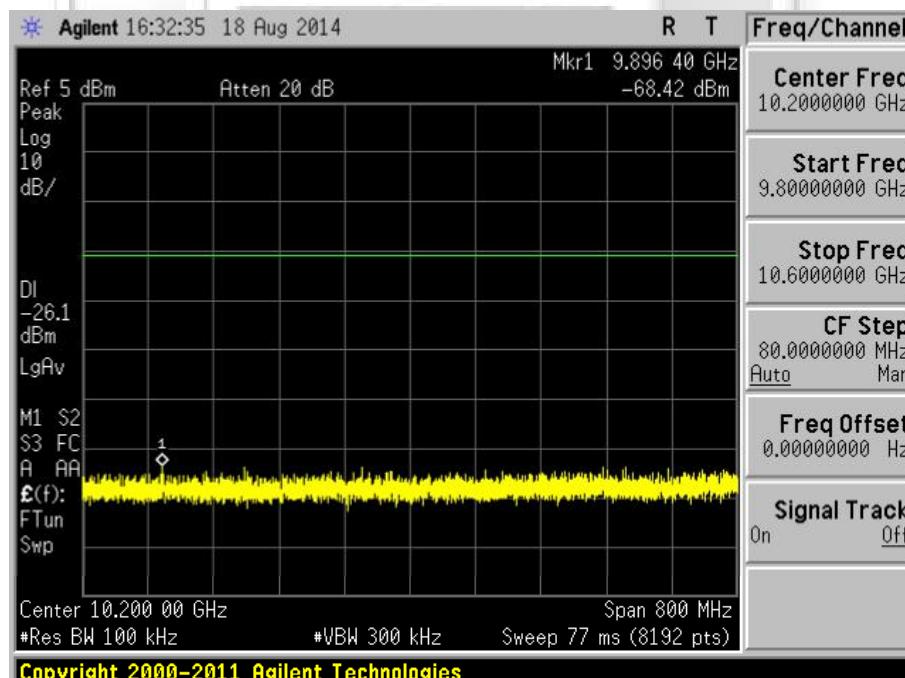
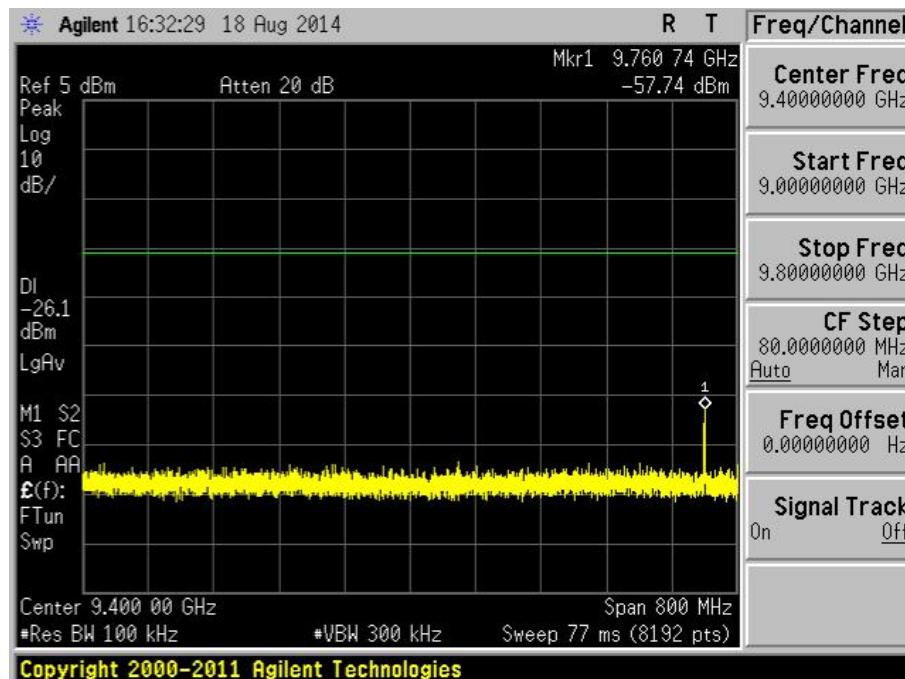
Plot 47 – Channel 19 (middle ch)



PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

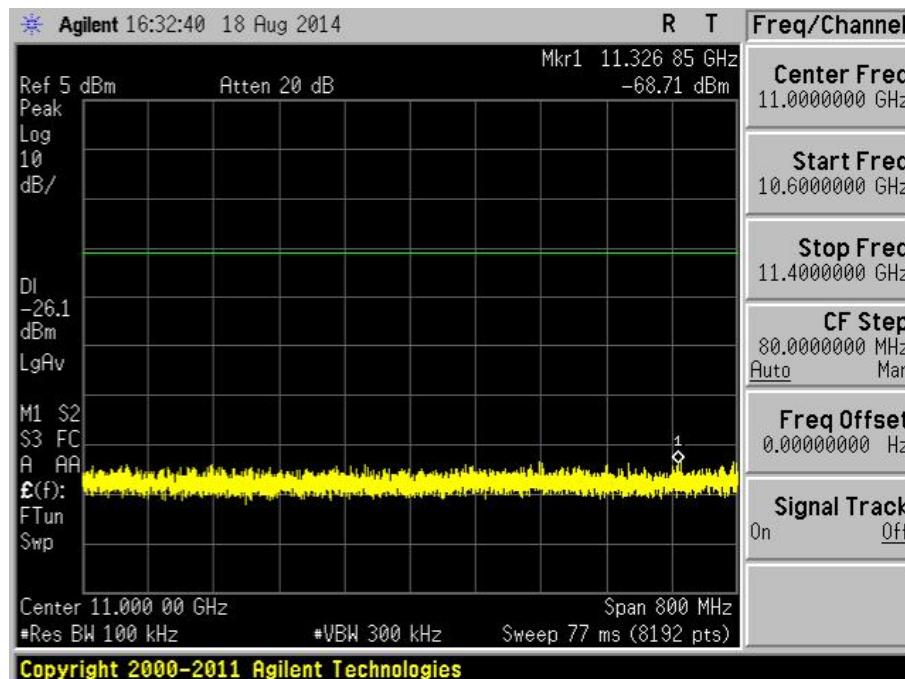




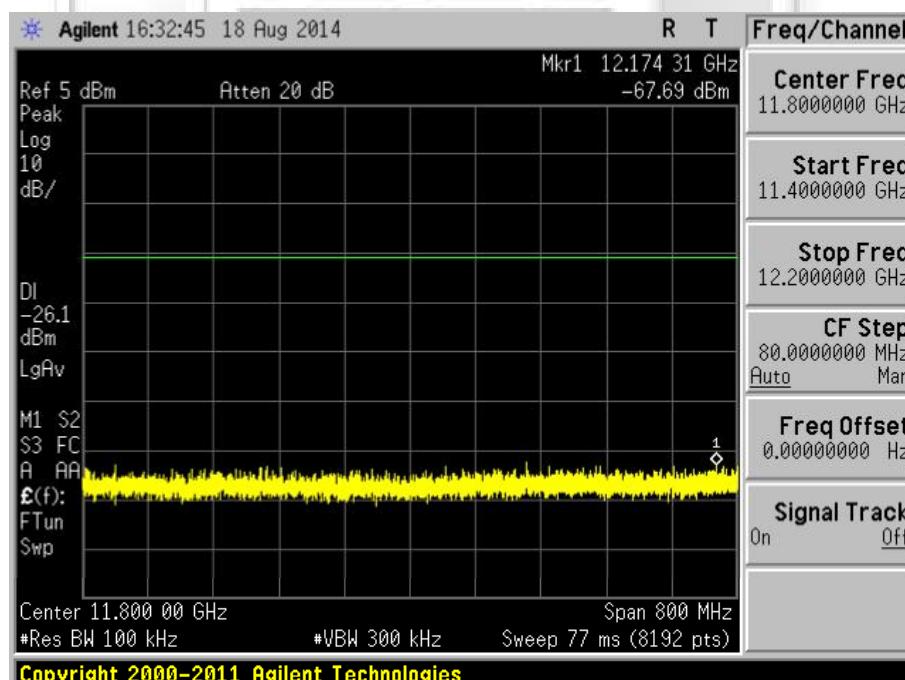
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 50 – Channel 19 (middle ch)



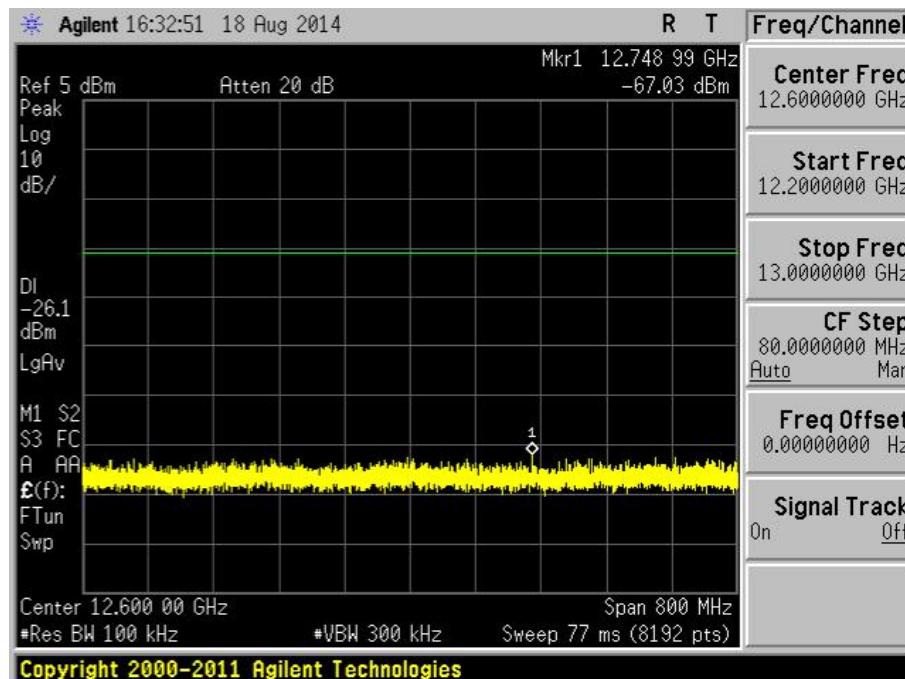
Plot 51 – Channel 19 (middle ch)



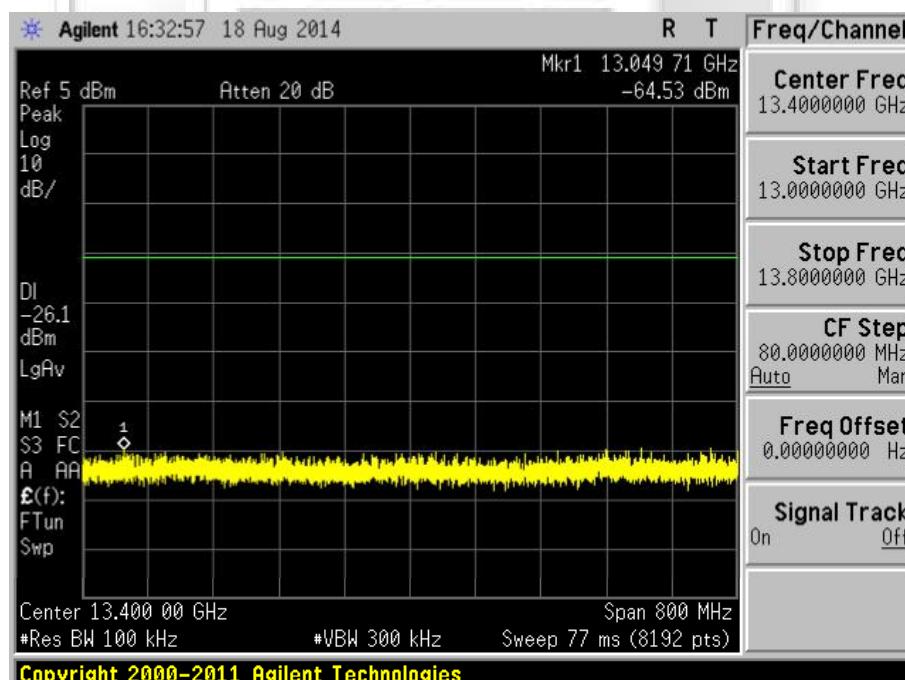
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 52 – Channel 19 (middle ch)



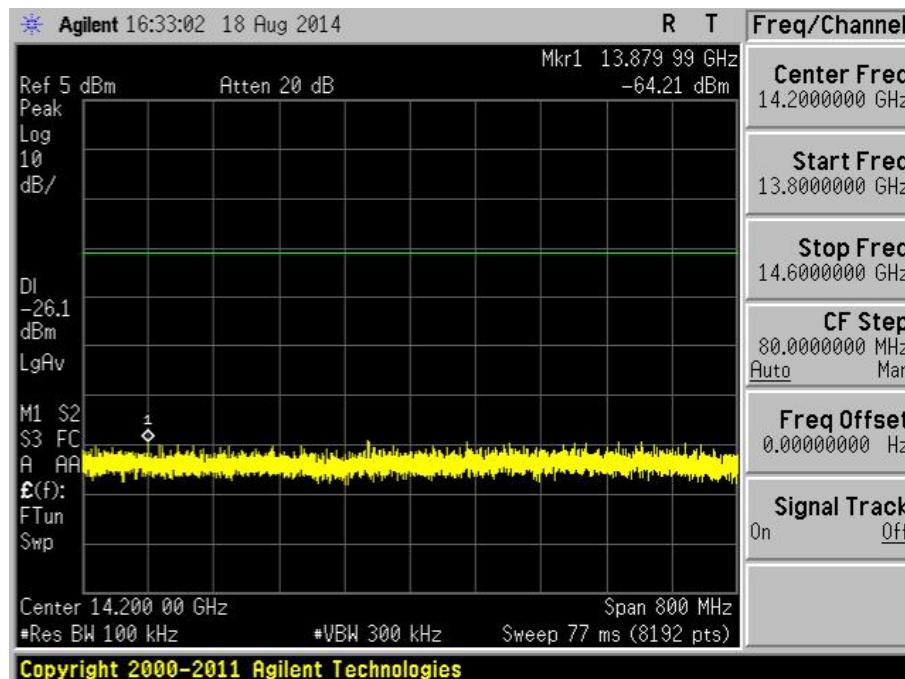
Plot 53 – Channel 19 (middle ch)



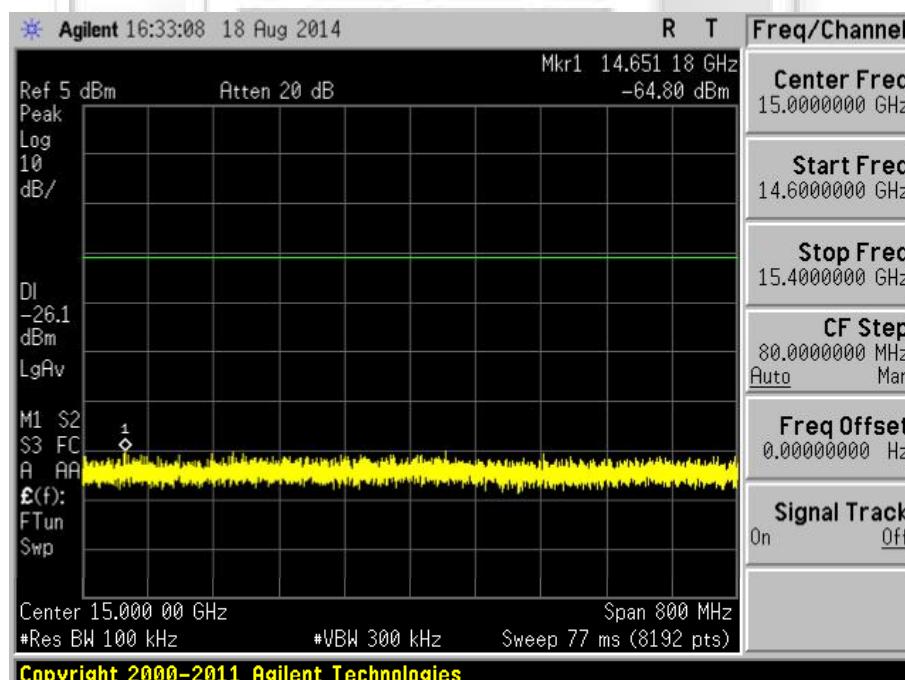
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 54 – Channel 19 (middle ch)



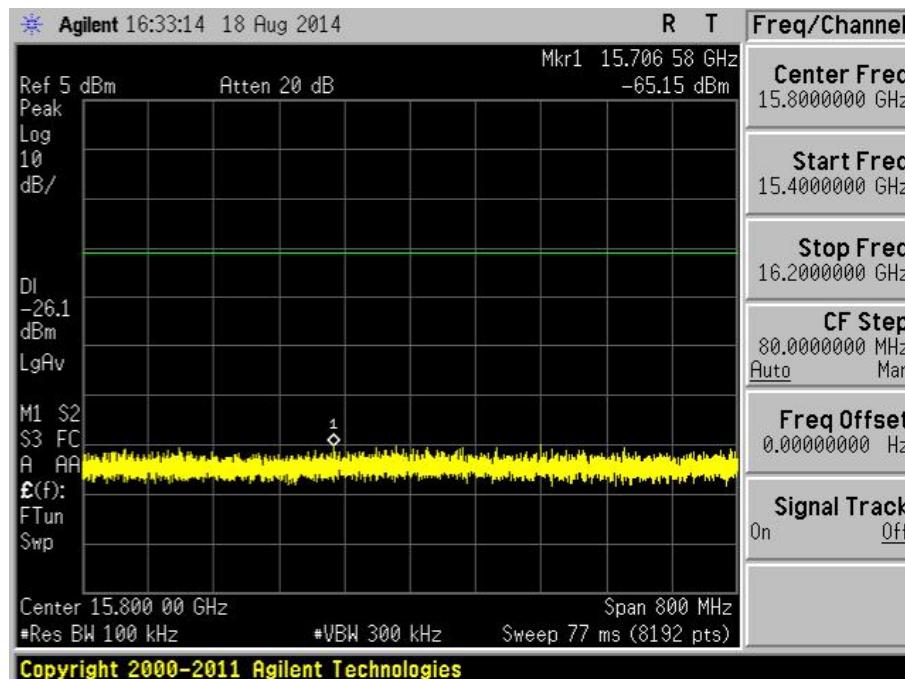
Plot 55 – Channel 19 (middle ch)



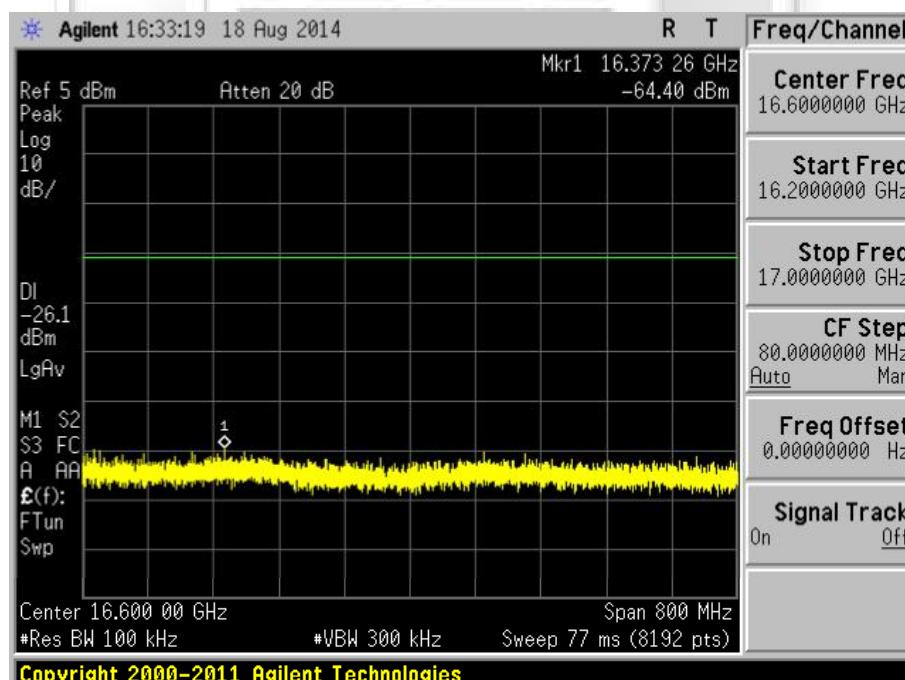
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 56 – Channel 19 (middle ch)



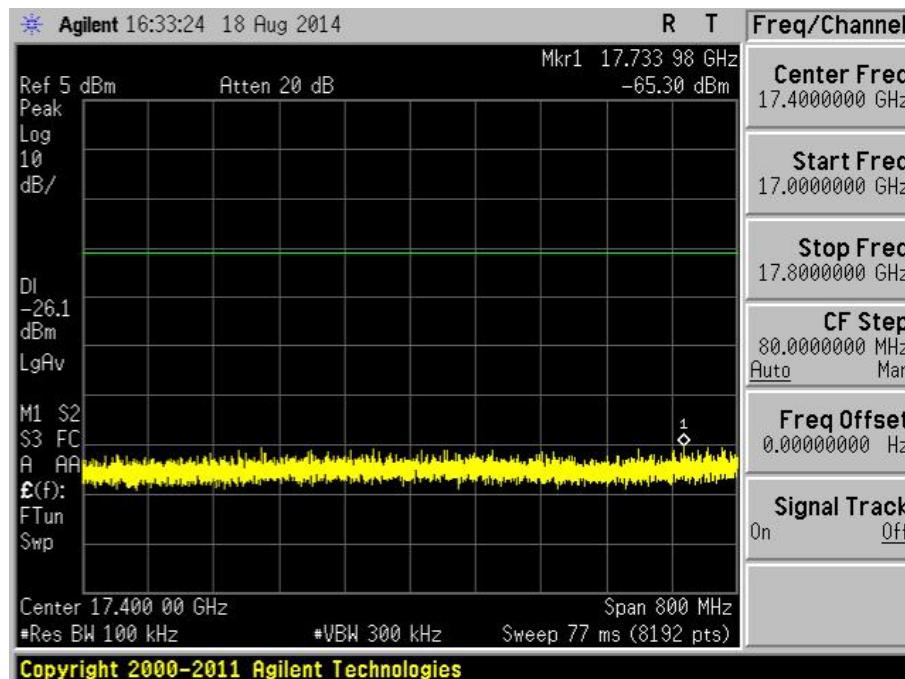
Plot 57 – Channel 19 (middle ch)



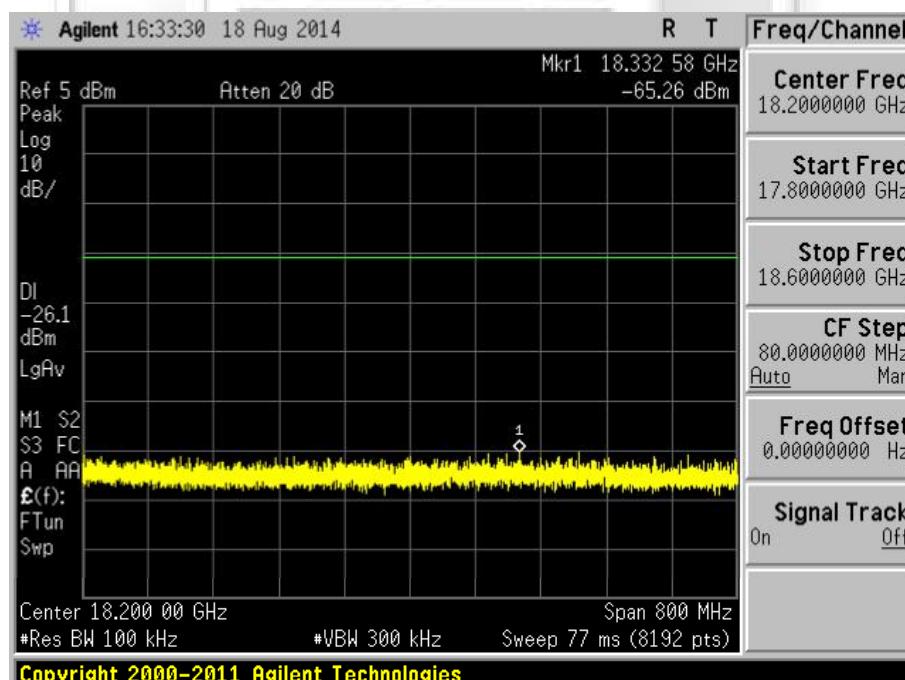
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 58 – Channel 19 (middle ch)



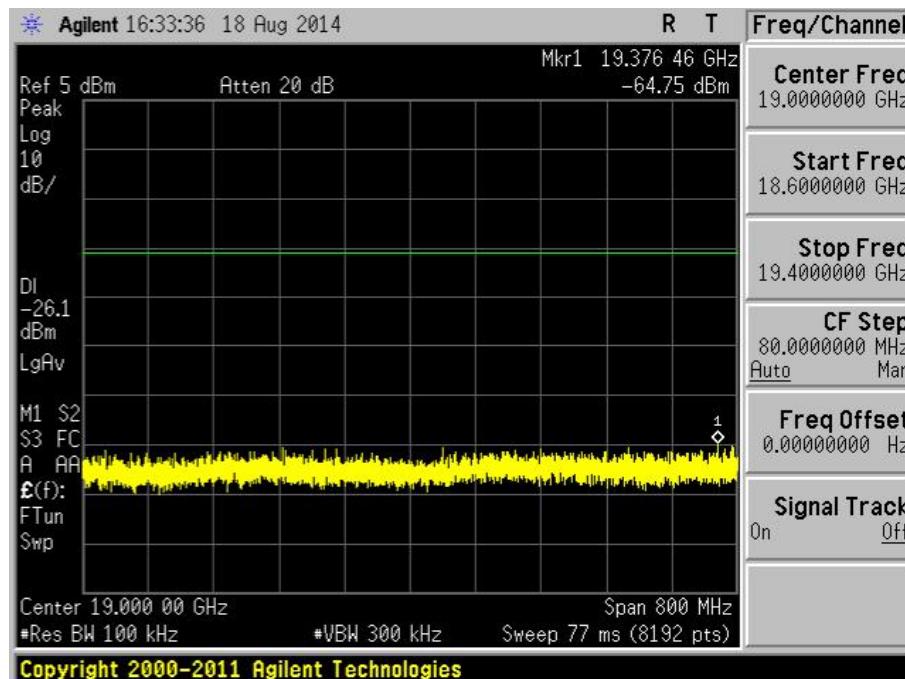
Plot 59 – Channel 19 (middle ch)



PSB Singapore

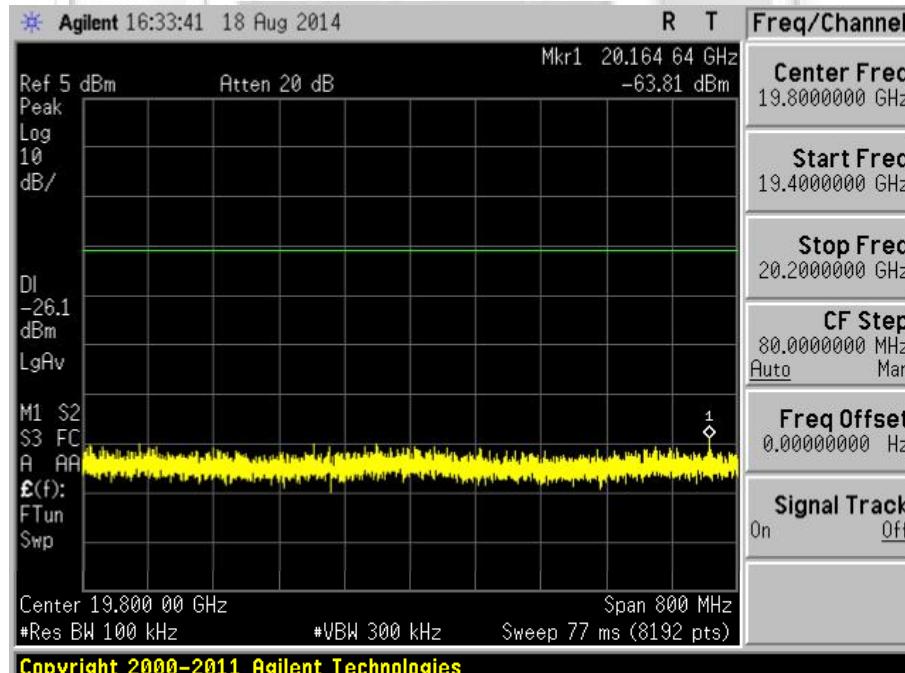
RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



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Plot 60 – Channel 19 (middle ch)



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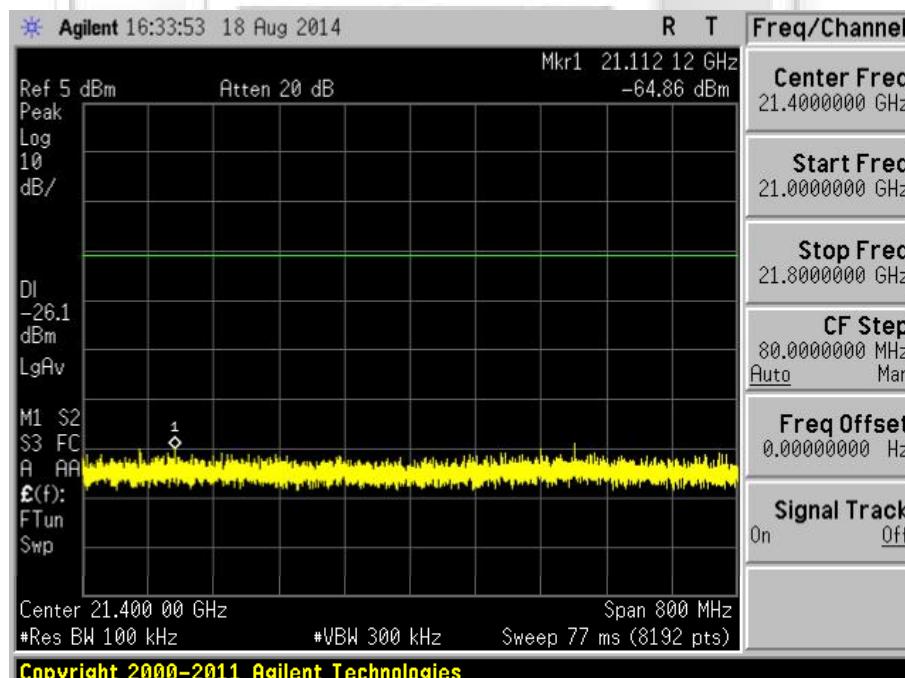
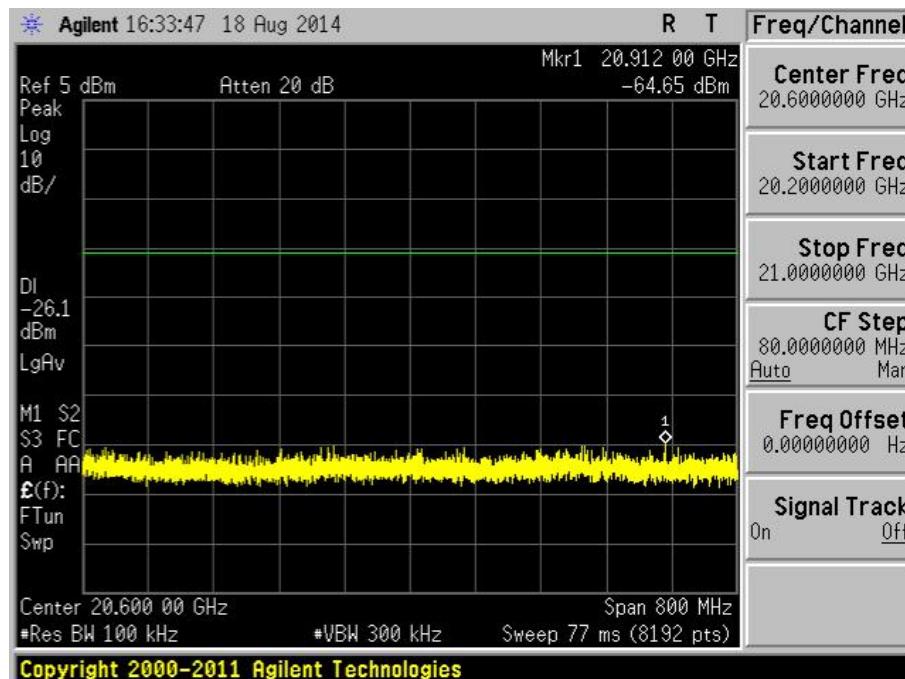
Plot 61 – Channel 19 (middle ch)



PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

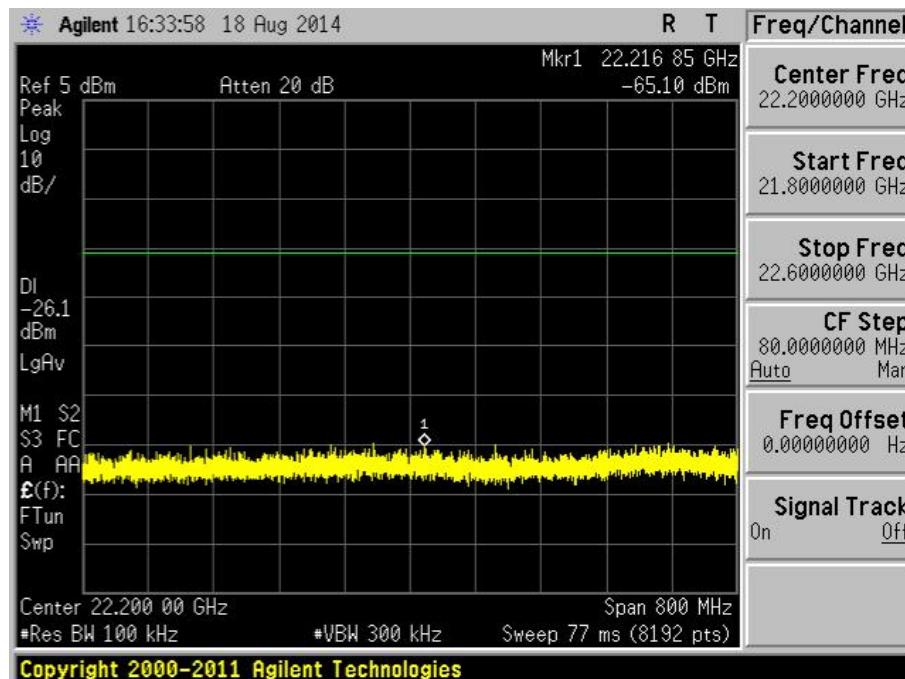




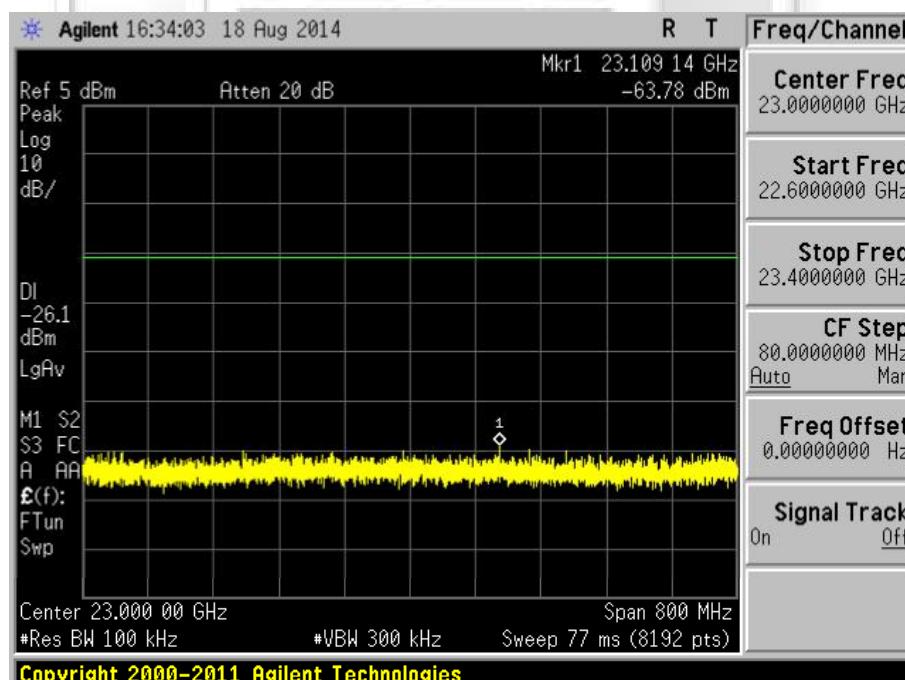
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 64 – Channel 19 (middle ch)



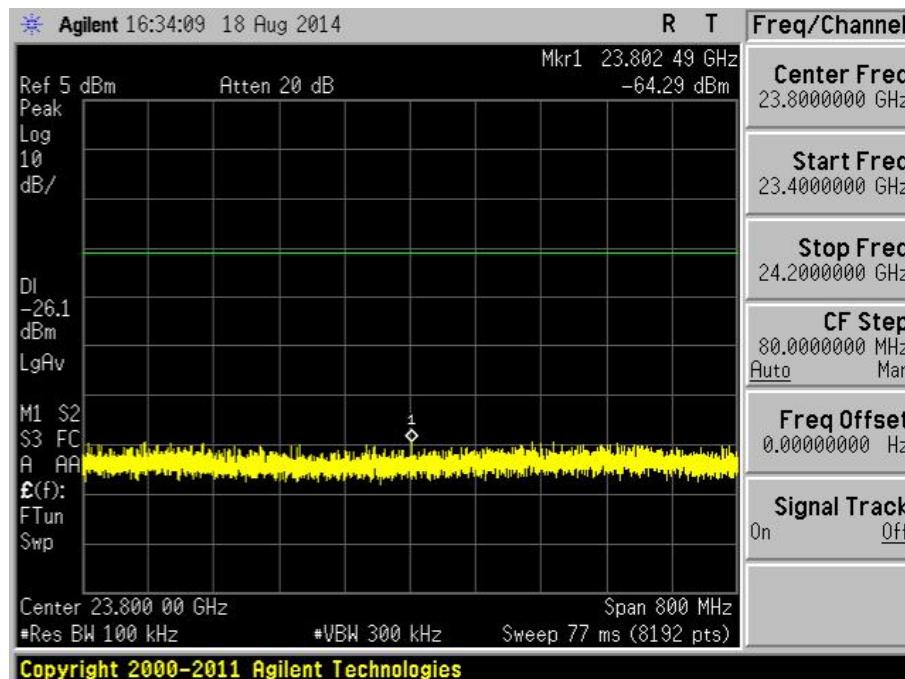
Plot 65 – Channel 19 (middle ch)



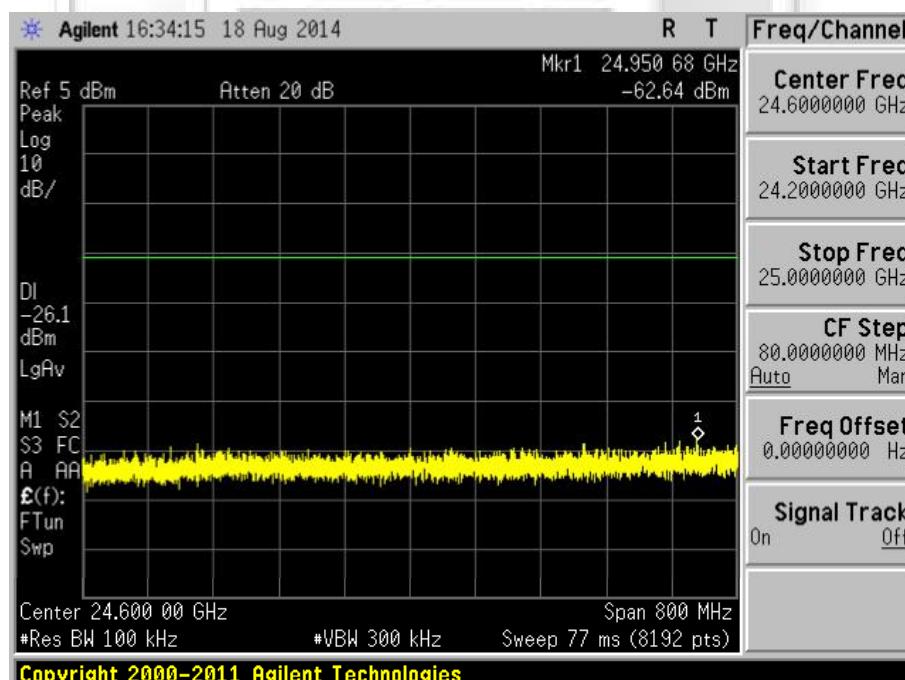
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 66 – Channel 19 (middle ch)



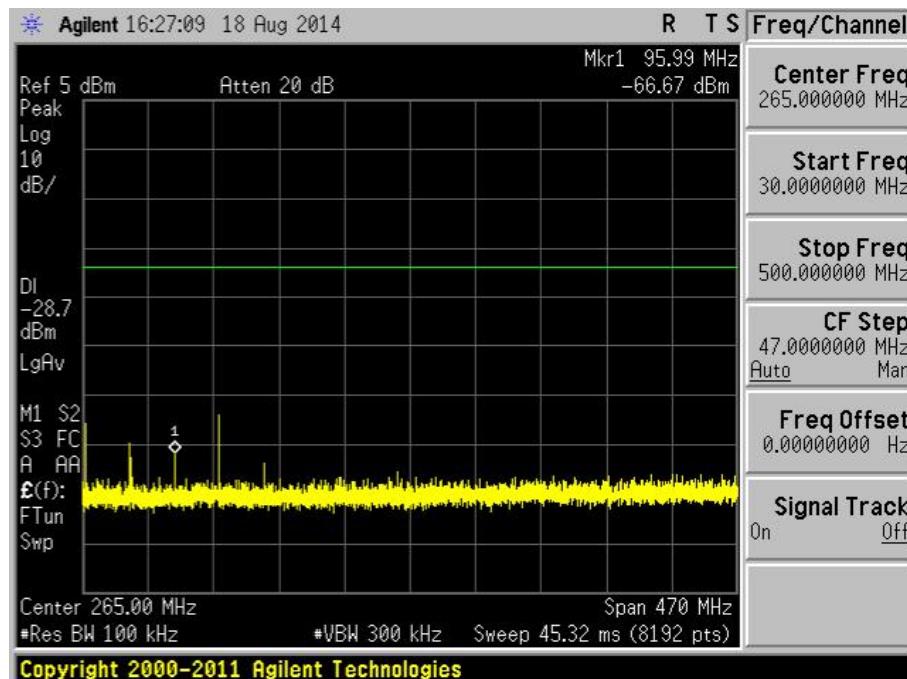
Plot 67 – Channel 19 (middle ch)



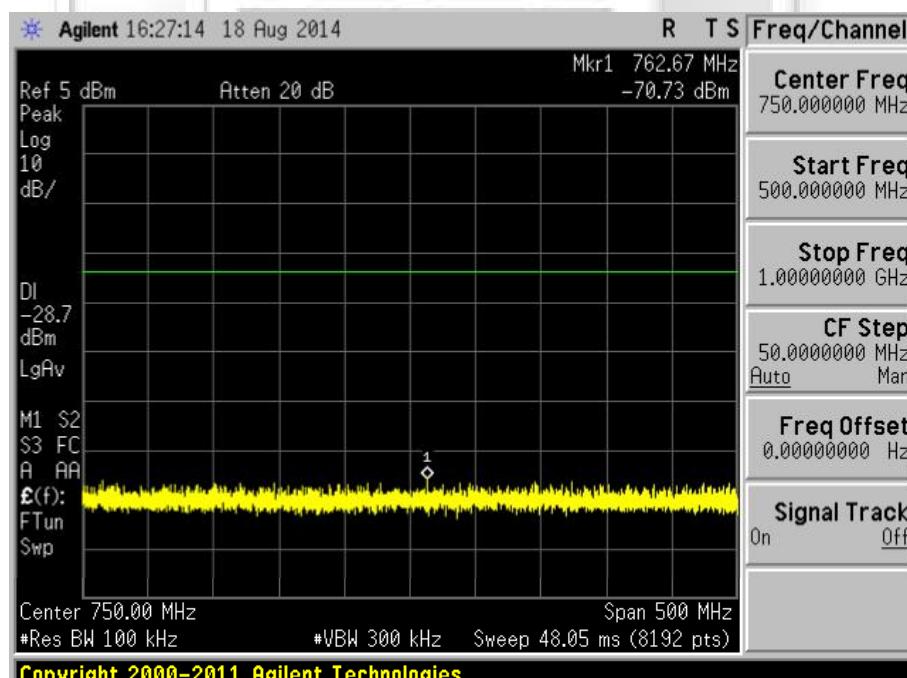
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 68 – Channel 39 (upper ch)



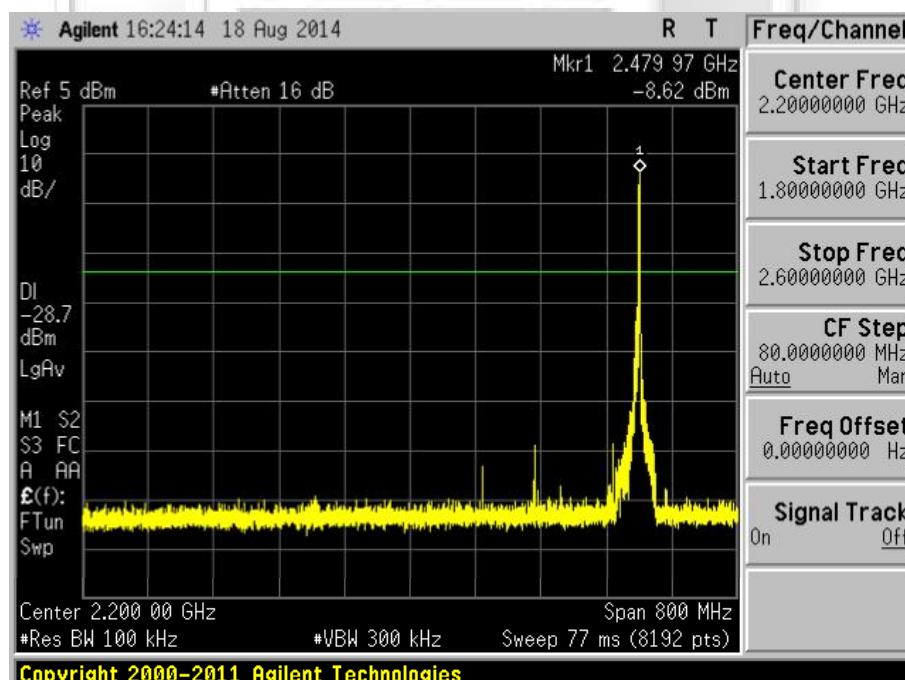
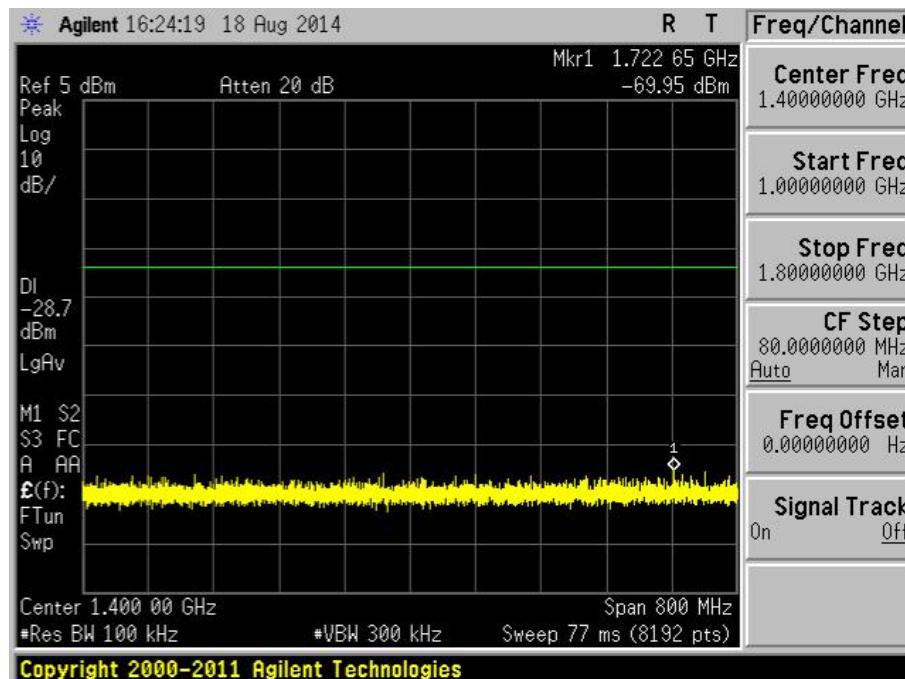
Plot 69 – Channel 39 (upper ch)



PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

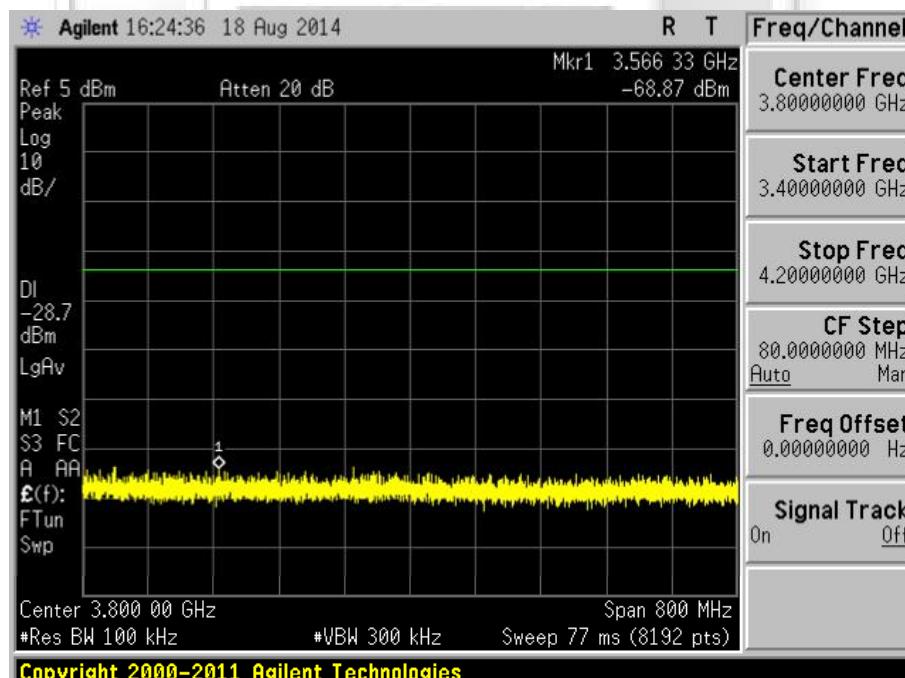
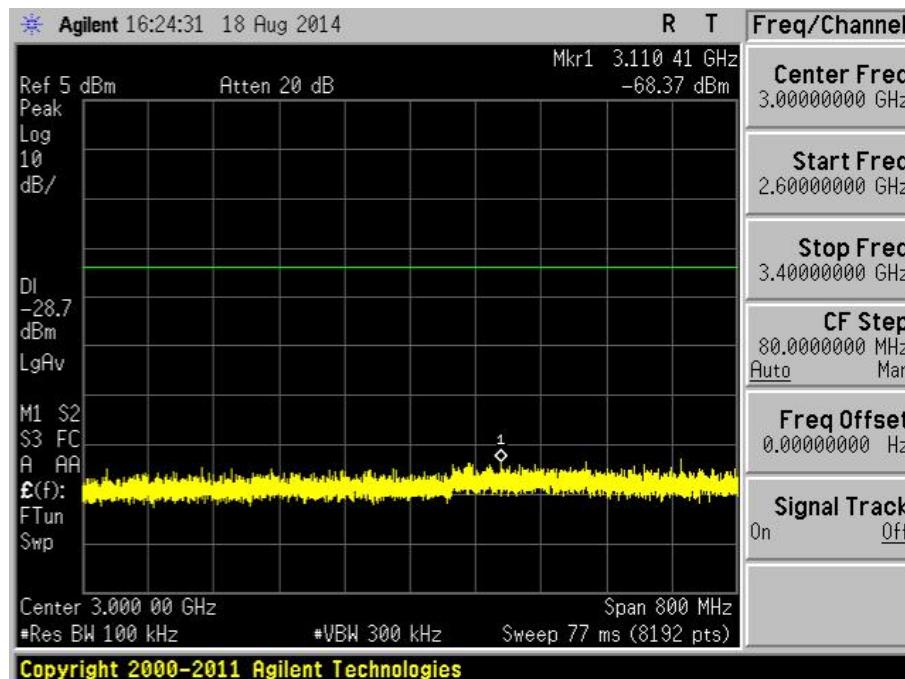




PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

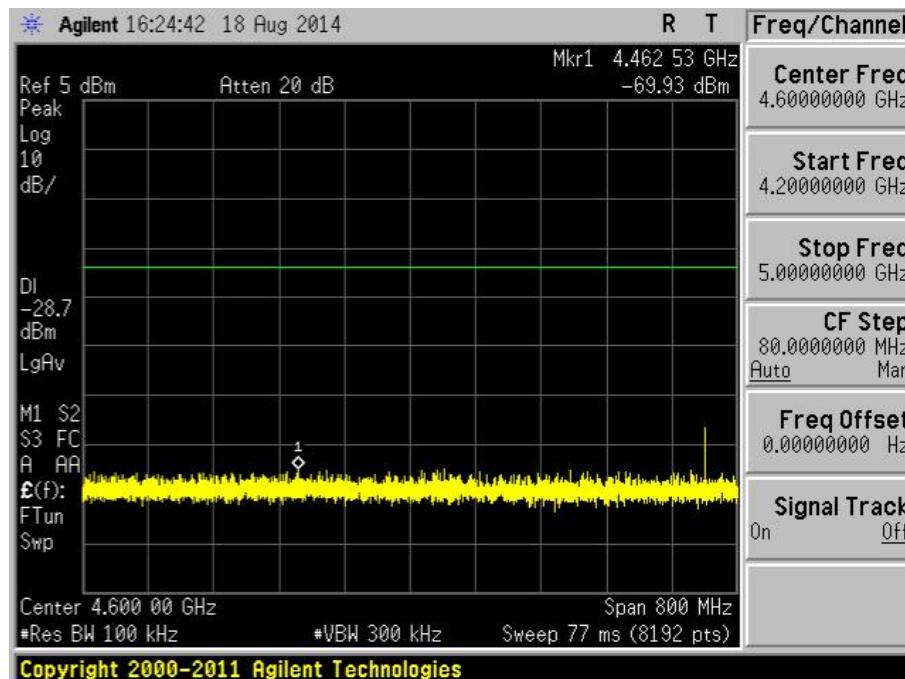




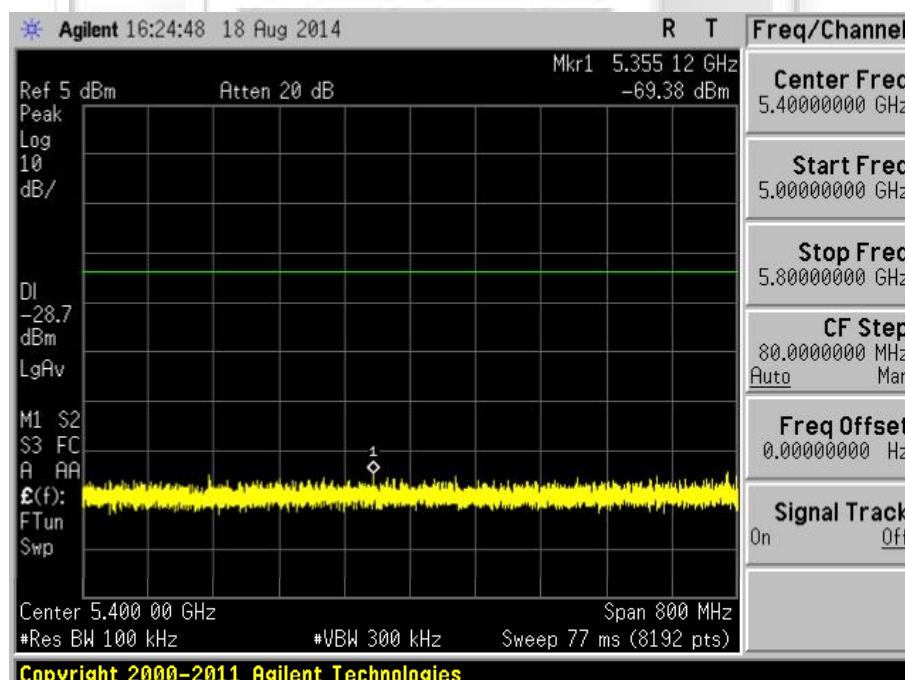
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 74 – Channel 39 (upper ch)



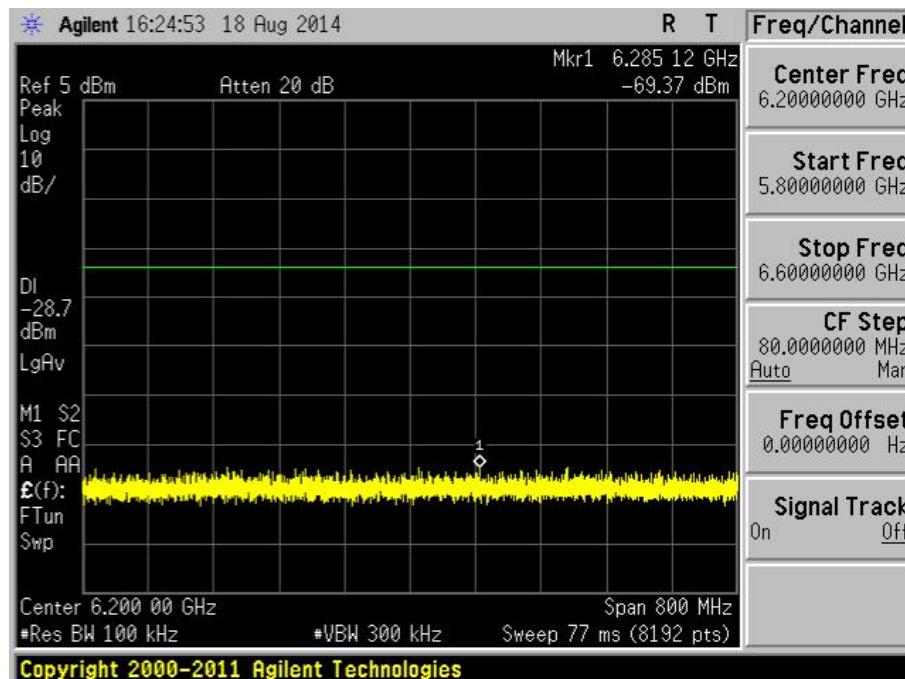
Plot 75 – Channel 39 (upper ch)



PSB Singapore

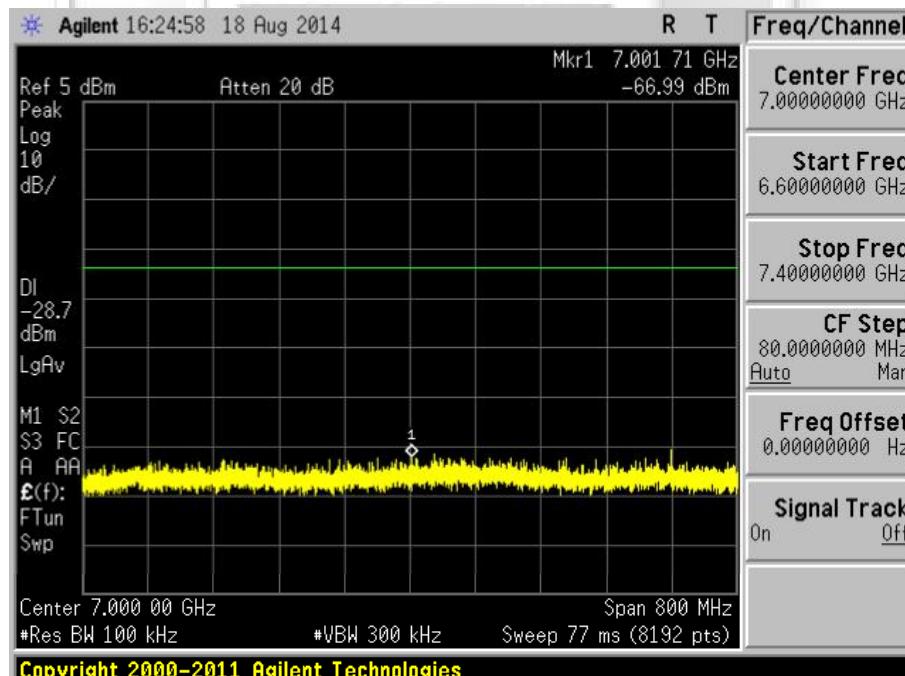
RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



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Plot 76 – Channel 39 (upper ch)



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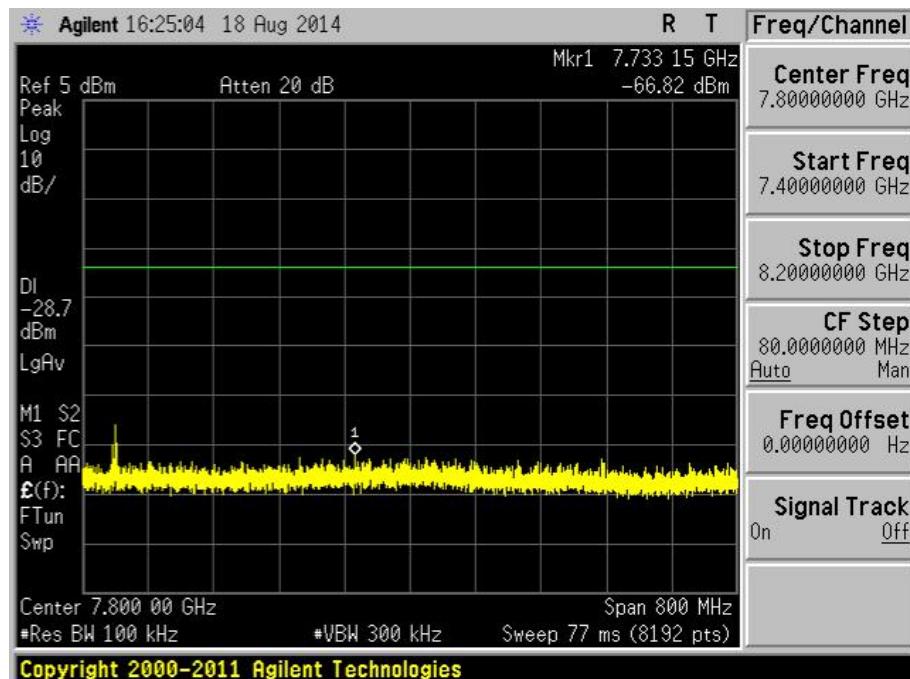
Plot 77 – Channel 39 (upper ch)



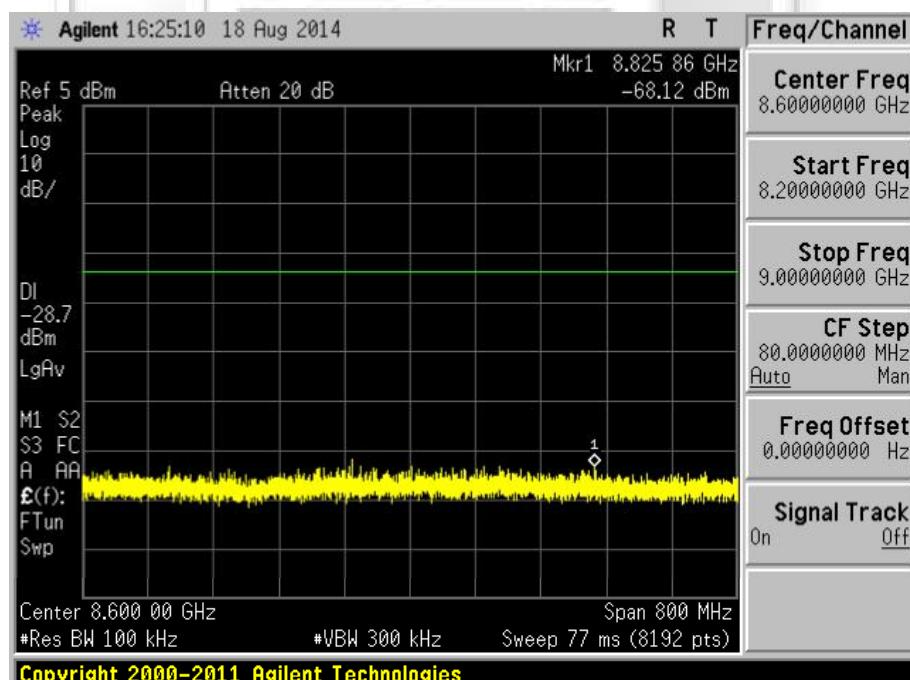
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 78 – Channel 39 (*upper ch*)



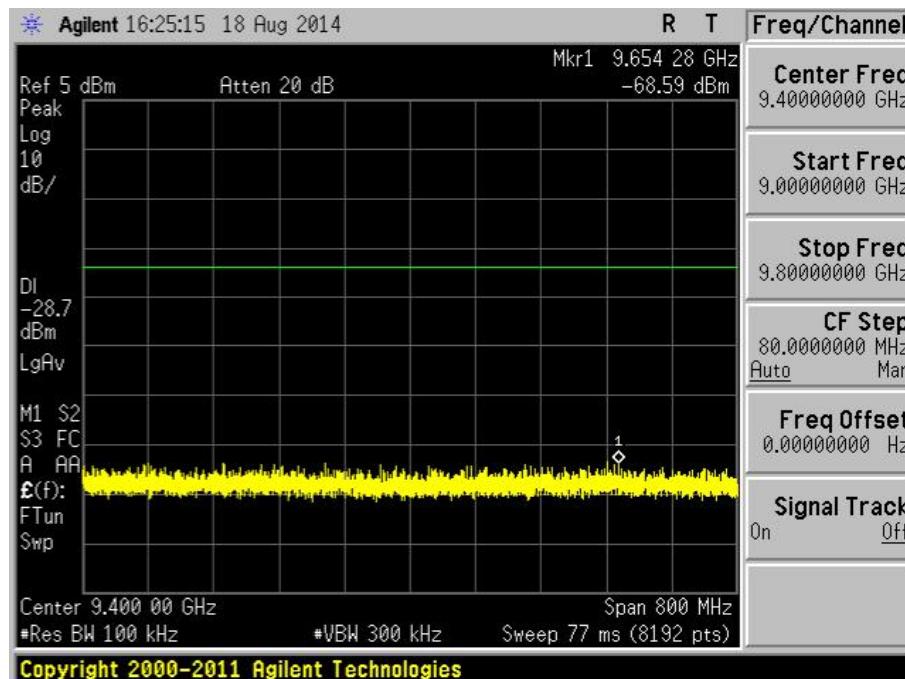
Plot 79 - Channel 39 (upper ch)



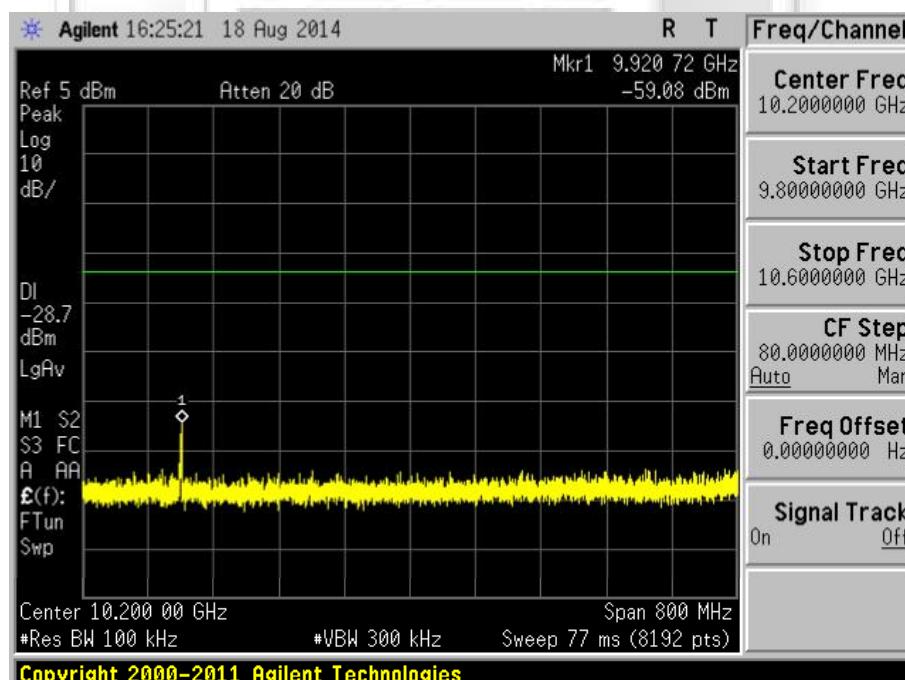
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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 80 – Channel 39 (upper ch)



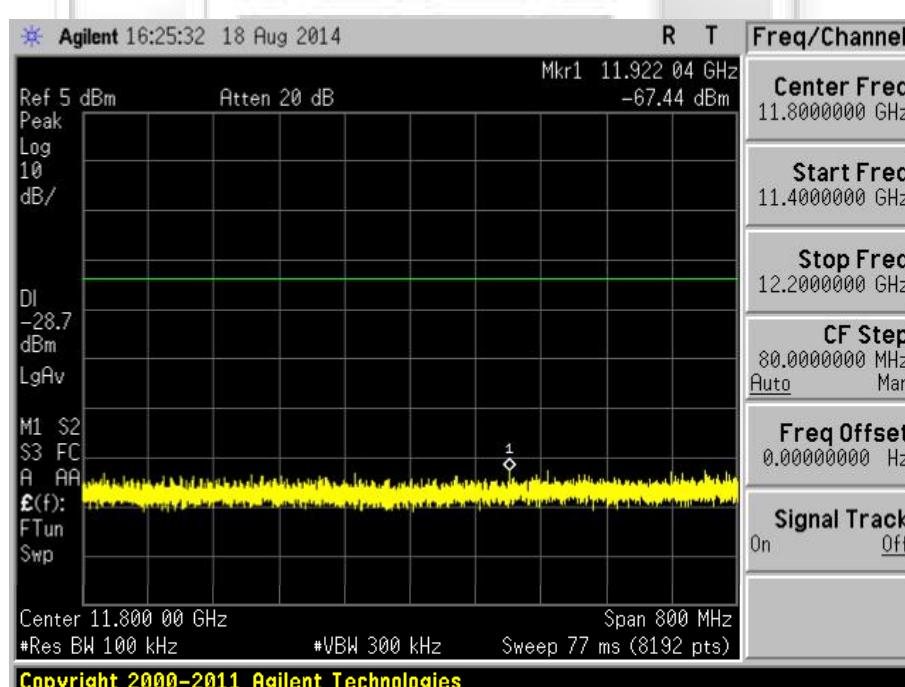
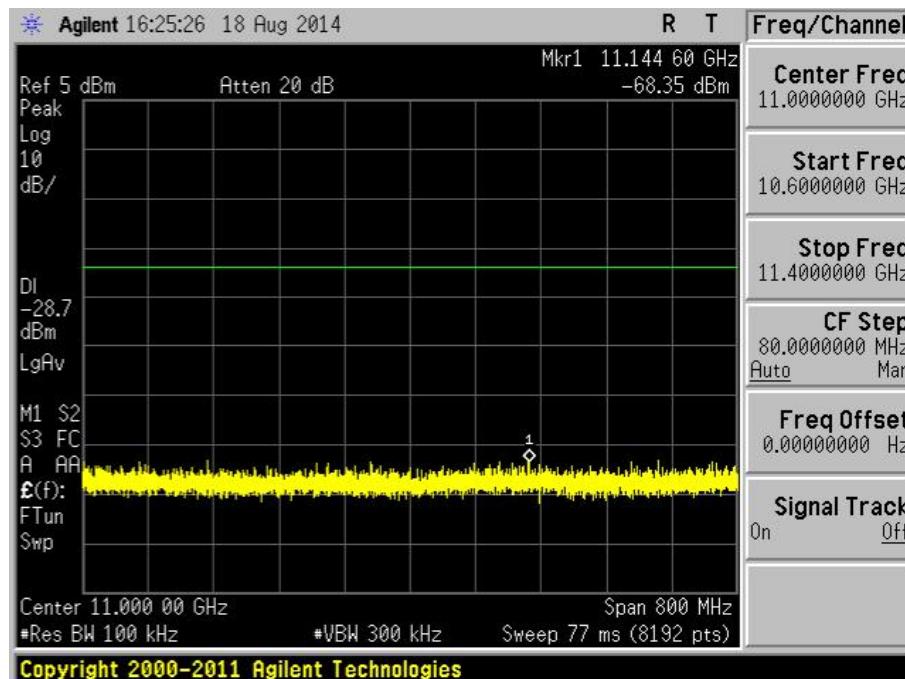
Plot 81 – Channel 39 (upper ch)



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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

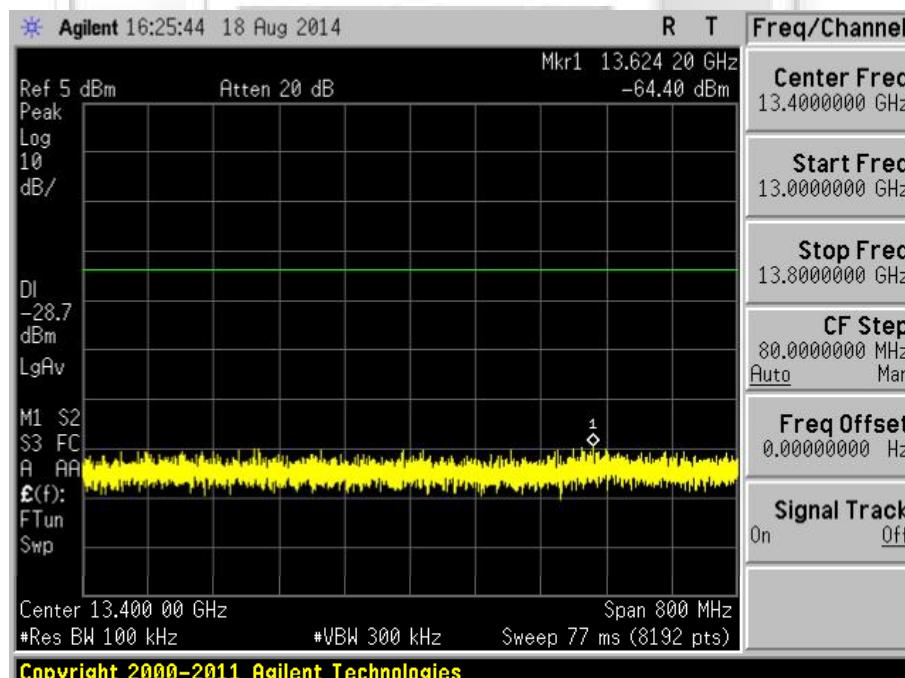
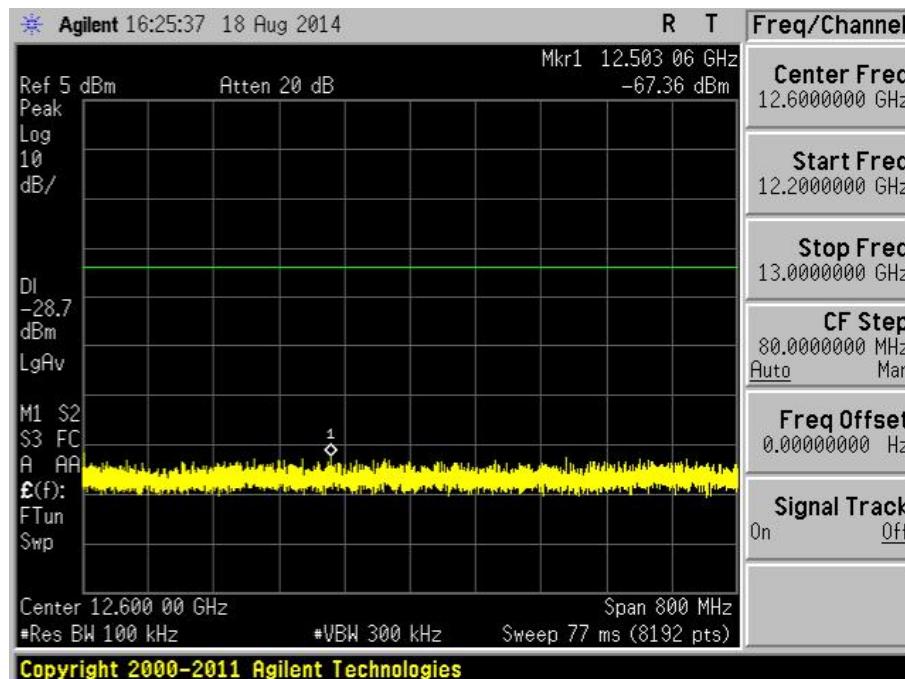




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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

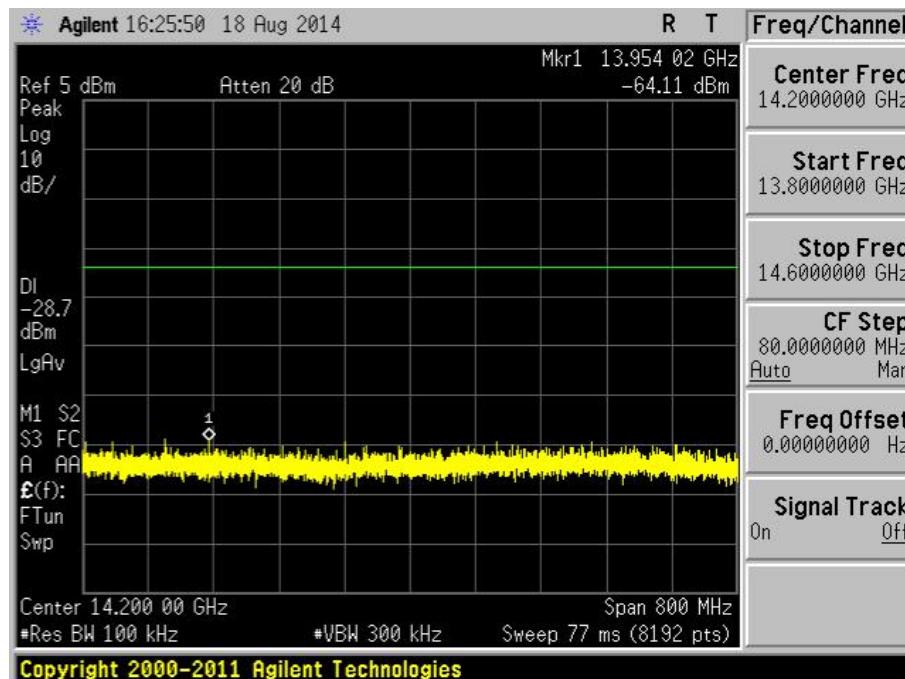




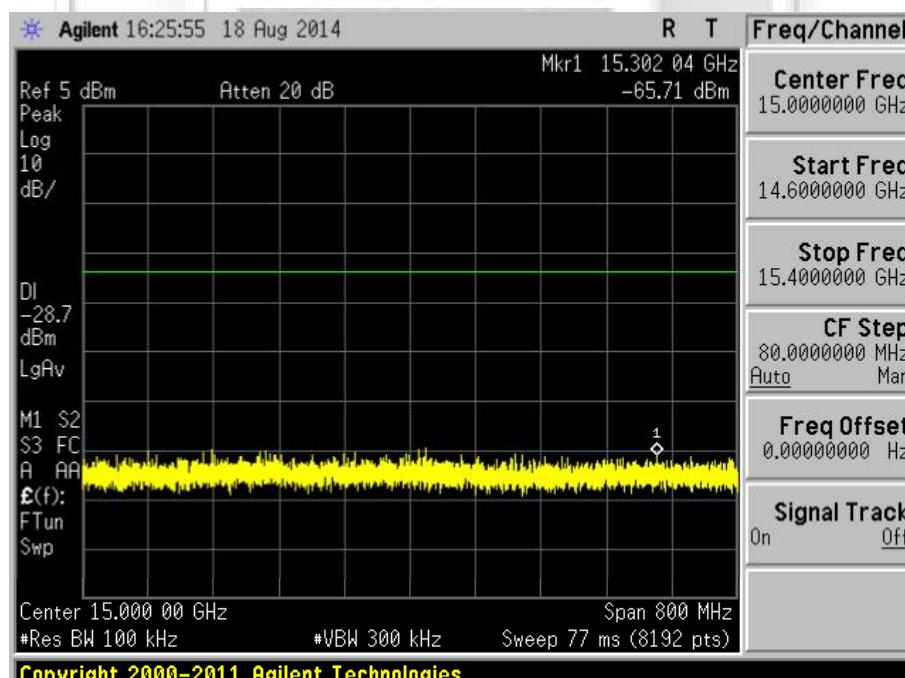
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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 86 – Channel 39 (upper ch)



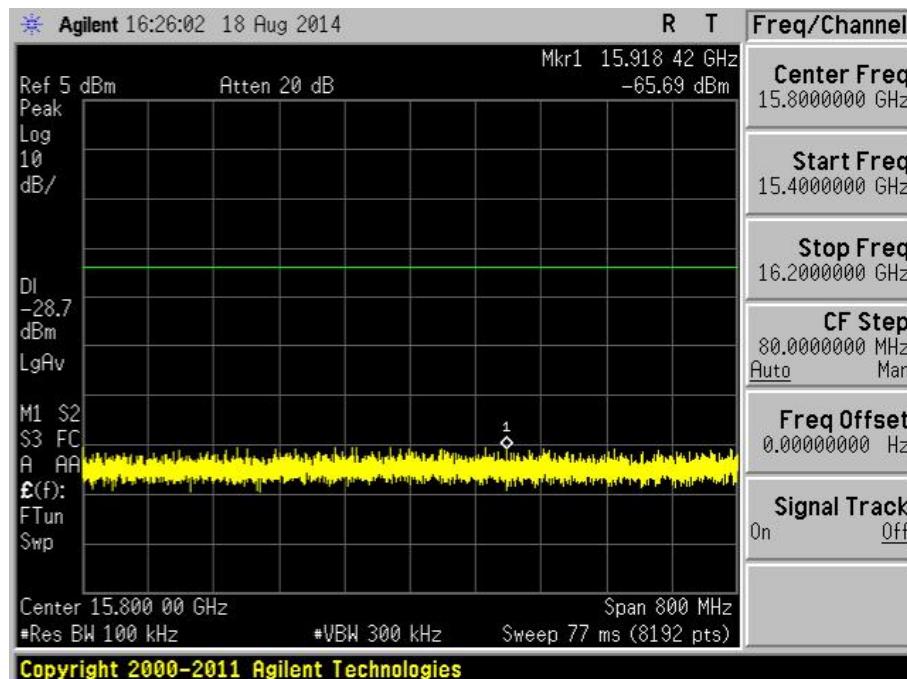
Plot 87 – Channel 39 (upper ch)



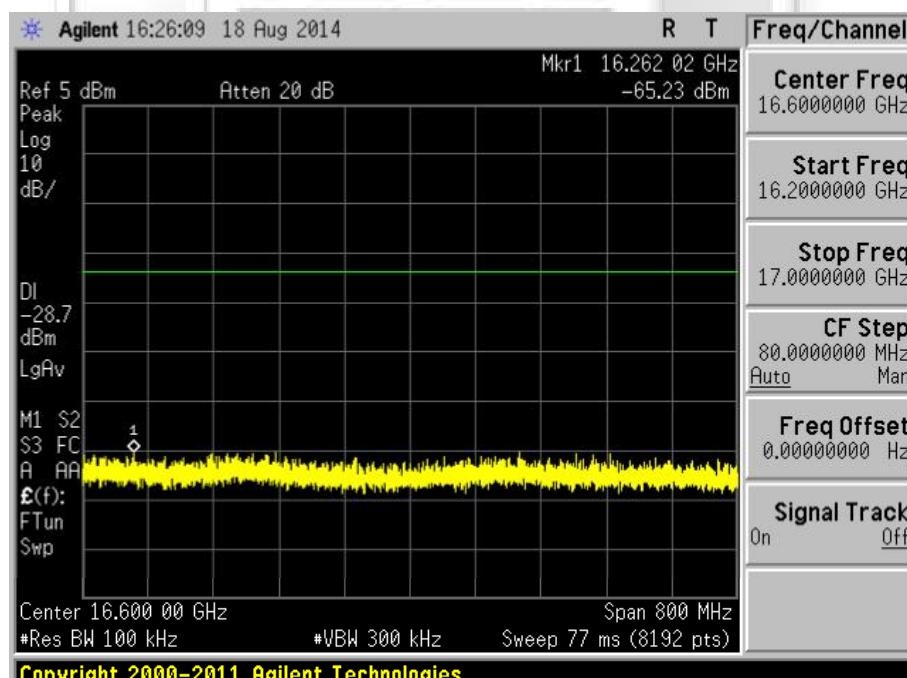
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 88 – Channel 39 (upper ch)



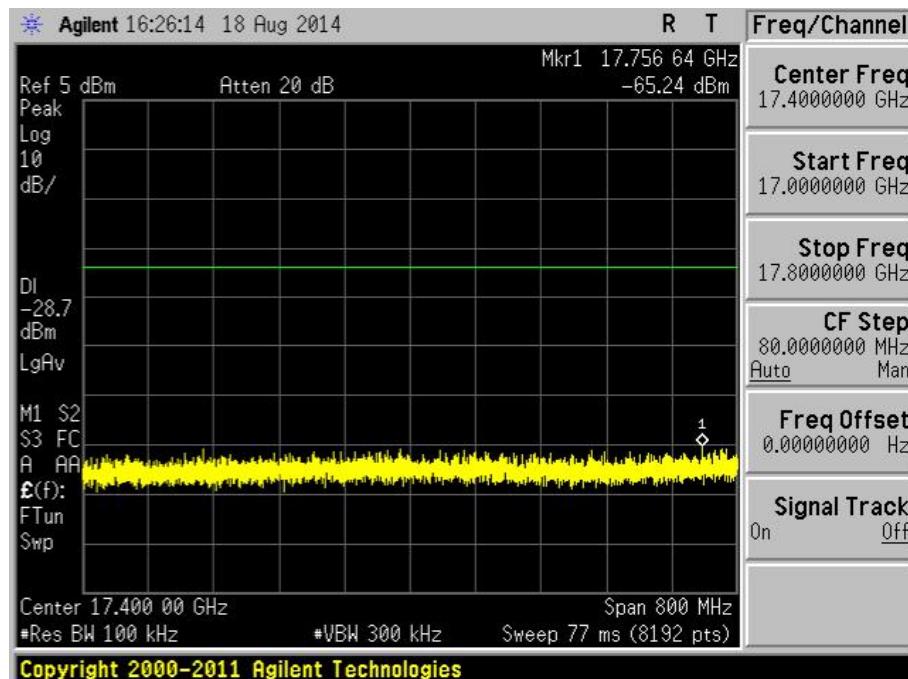
Plot 89 – Channel 39 (upper ch)



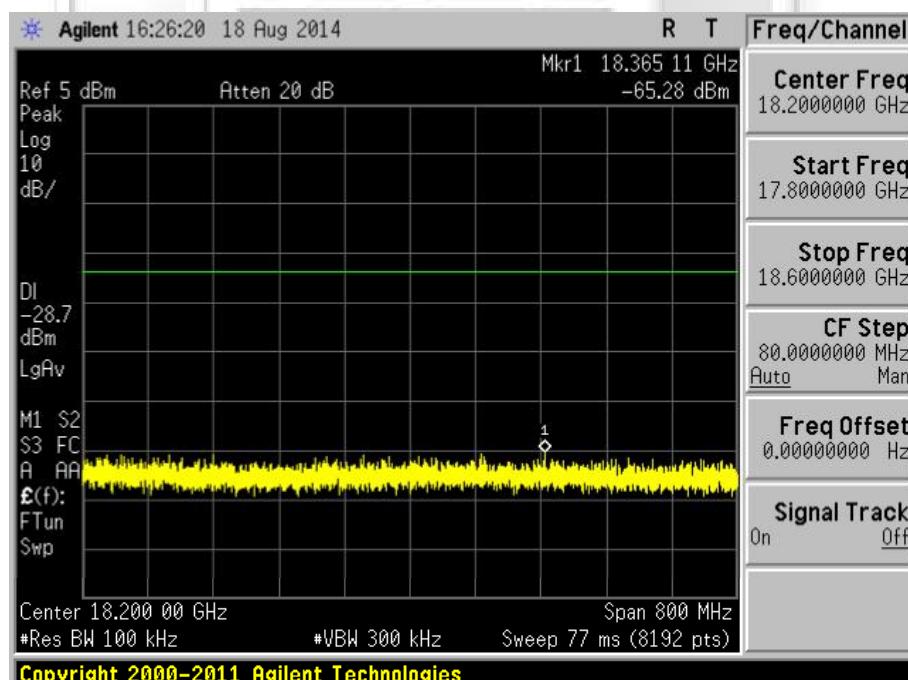
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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 90 – Channel 39 (upper ch)



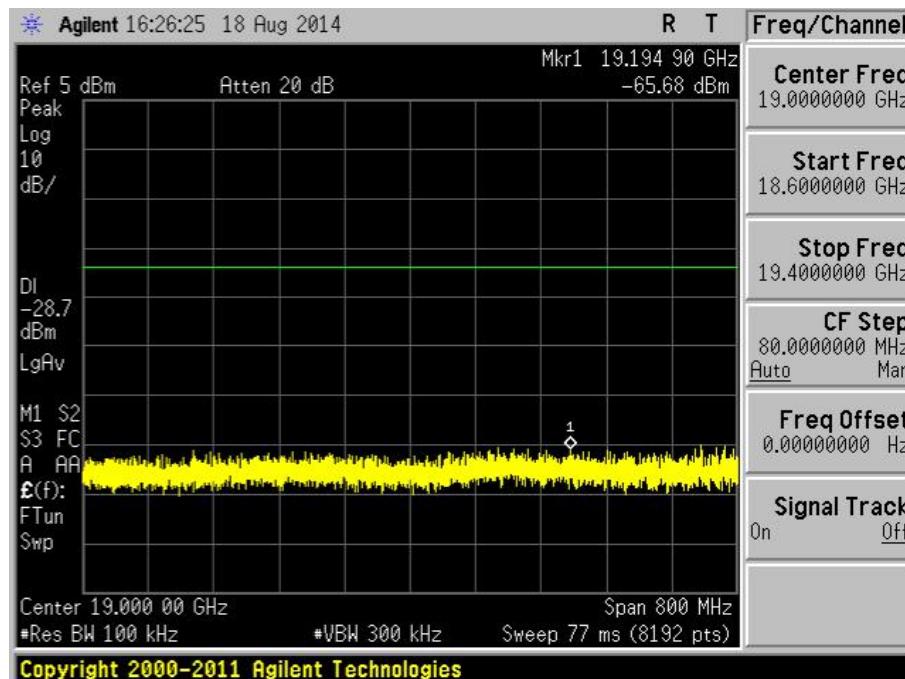
Plot 91 – Channel 39 (upper ch)



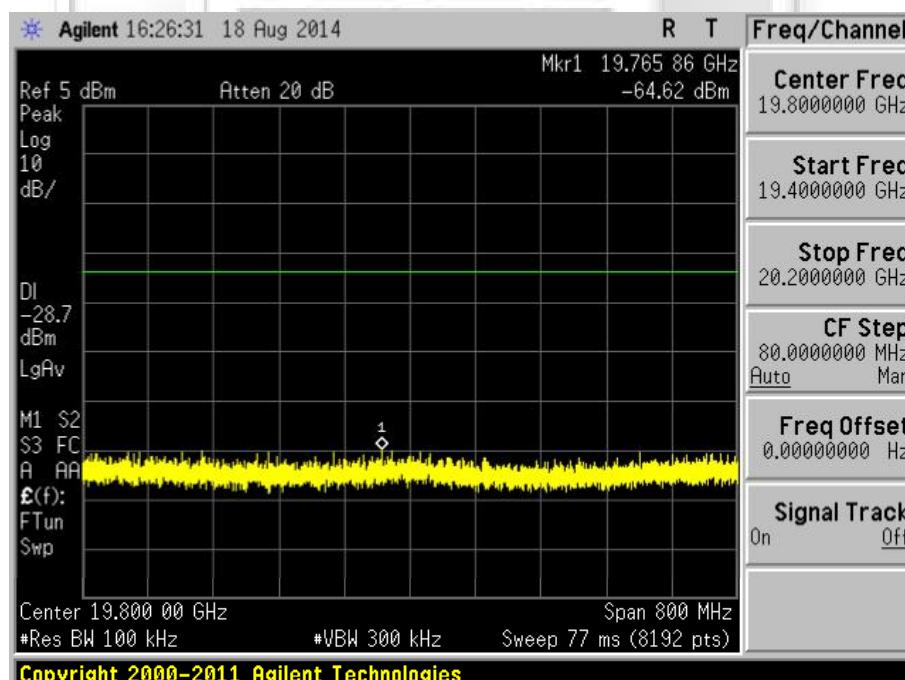
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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 92 – Channel 39 (upper ch)



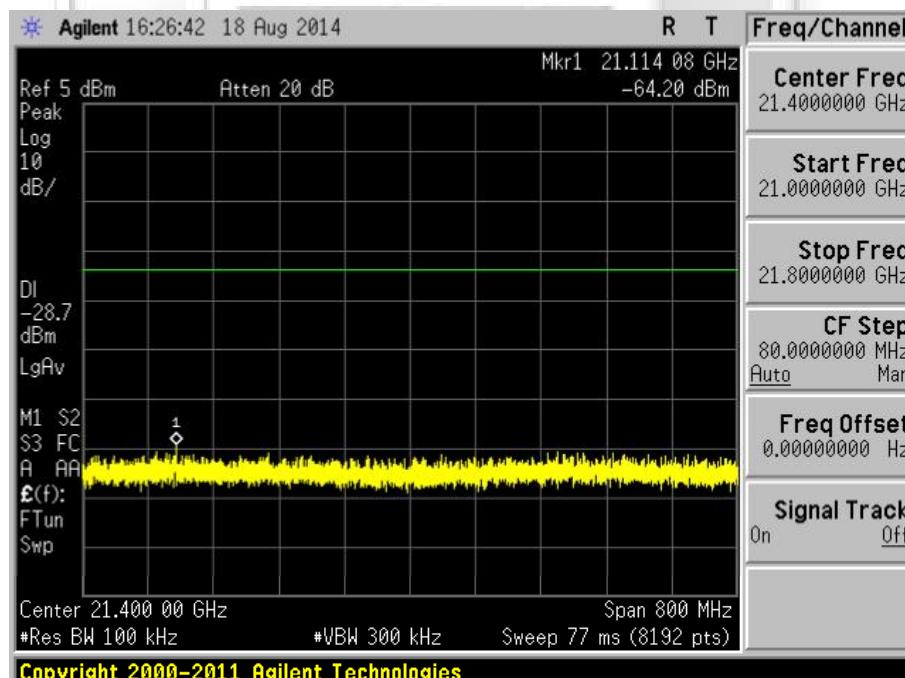
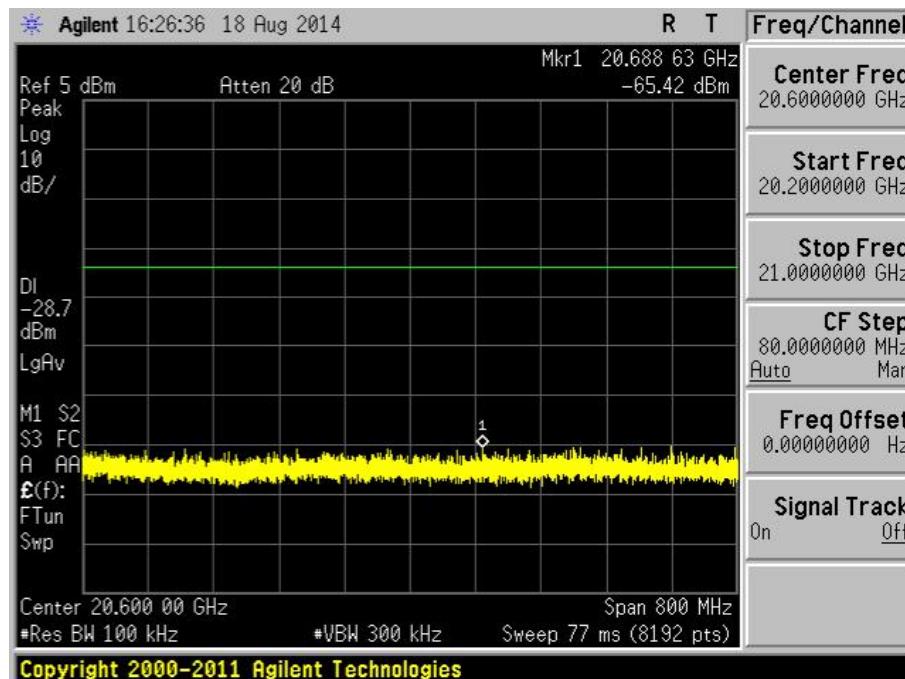
Plot 93 – Channel 39 (upper ch)



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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

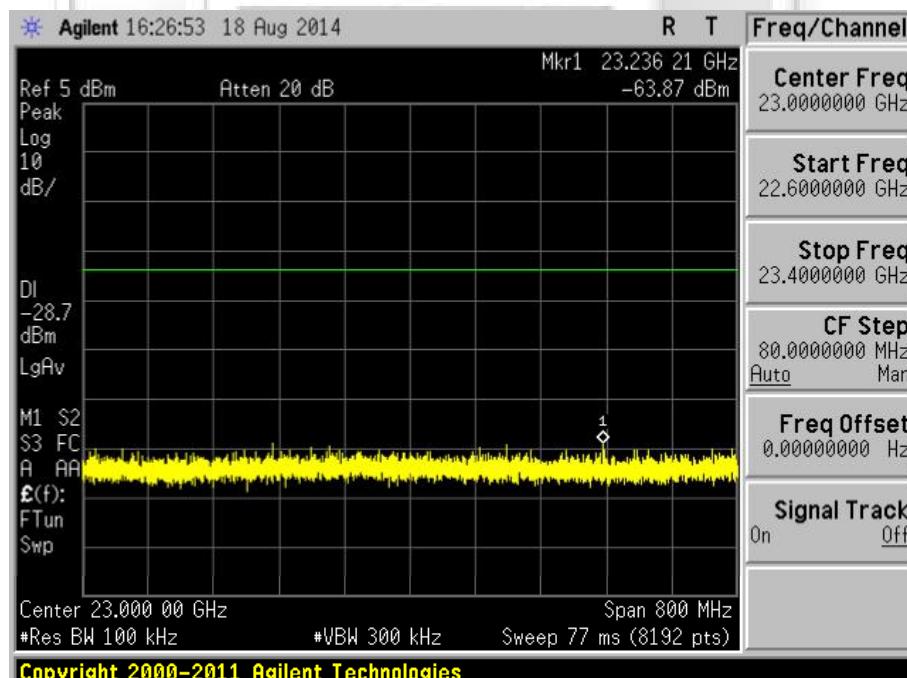
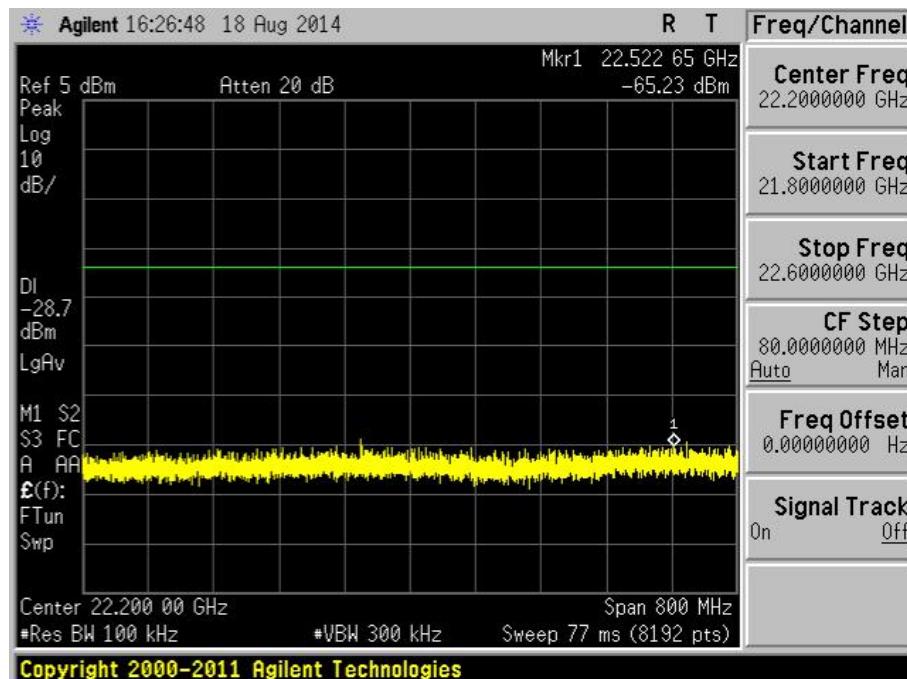




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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots

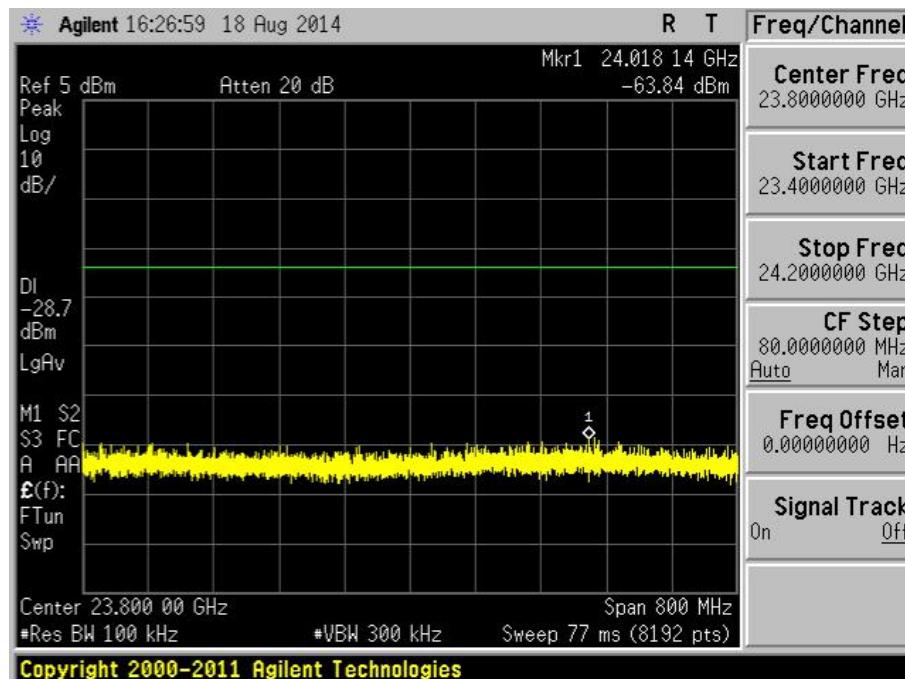




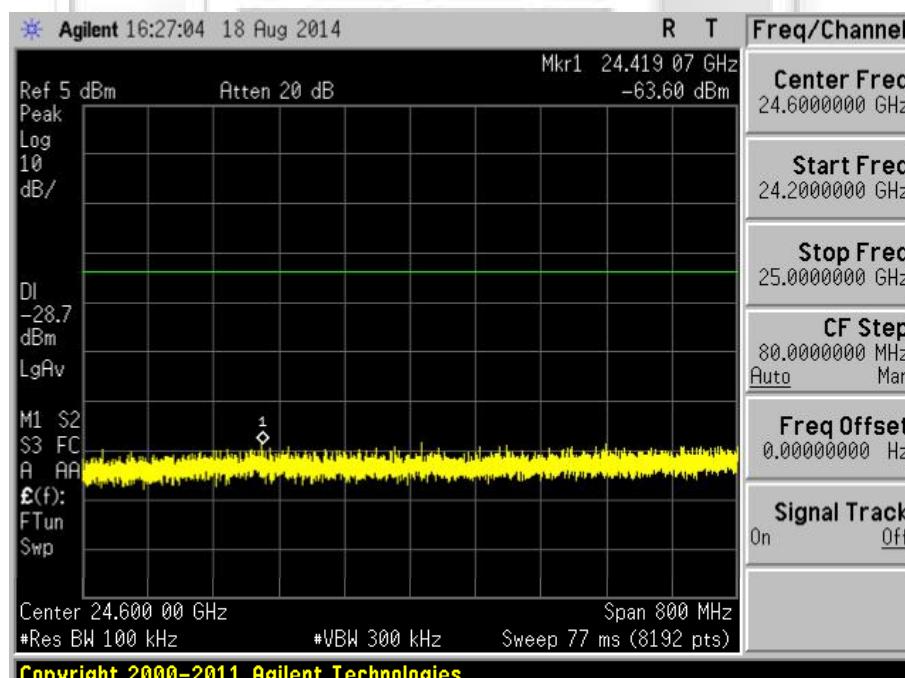
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RF CONDUCTED SPURIOUS EMISSIONS (NON-RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Non-Restricted Bands) Plots



Plot 98 – Channel 39 (upper ch)



Plot 99 – Channel 39 (upper ch)



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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
0.495	- 0.505	16.69475	- 16.69525
2.1735	- 2.1905	16.80425	- 16.80475
4.125	- 4.128	25.5	- 25.67
4.17725	- 4.17775	37.5	- 38.25
4.20725	- 4.20775	73	- 74.6
6.215	- 6.218	74.8	- 75.2
6.26775	- 6.26825	108	- 121.94
6.31175	- 6.31225	123	- 138
8.291	- 8.294	149.9	- 150.05
8.362	- 8.366	156.52475	- 156.52525
8.37625	- 8.38675	156.7	- 156.9
8.41425	- 8.41475	162.0125	- 167.17
12.29	- 12.293	167.72	- 173.2
12.51975	- 12.52025	240	- 285
12.57675	- 12.57725	322	- 335.4
13.36	- 13.41		
			Above 38.6

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	14 Nov 2014
Agilent DC Power Supply	E3620A	MY40000448	Output Monitor



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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.



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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

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

Test Input Power	3Vdc	Temperature	24°C
Attached Plots	100 – 108 : Channel 0 (lower ch)	Relative Humidity	56%
	109 – 117 : Channel 19 (middle ch)	Atmospheric Pressure	1030mbar
	118 – 126 : Channel 39 (upper ch)	Tested By	Chang Wai Kit

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

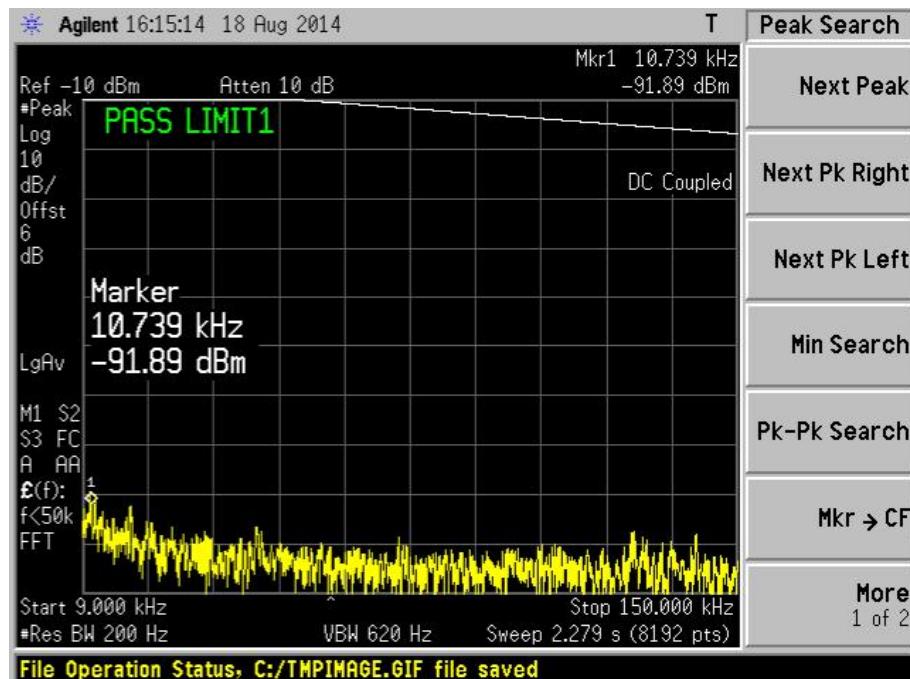




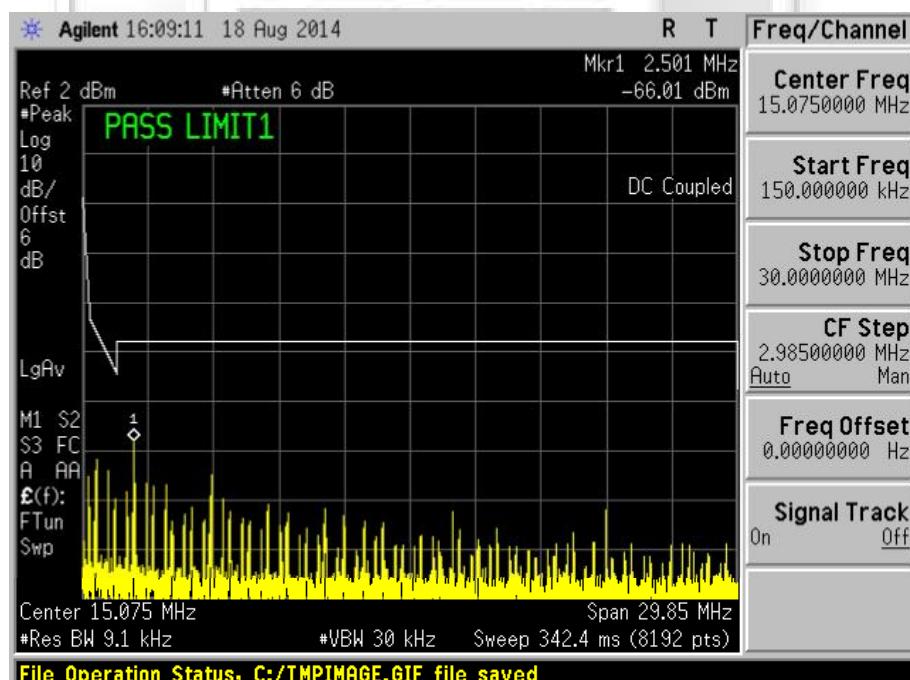
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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 100 – Channel 0 (lower ch)



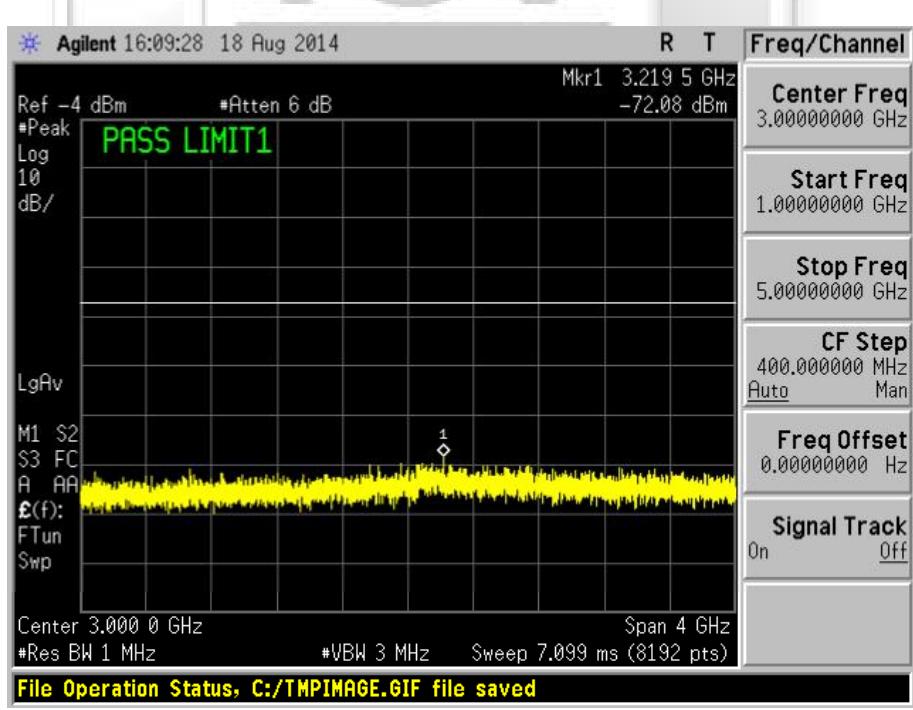
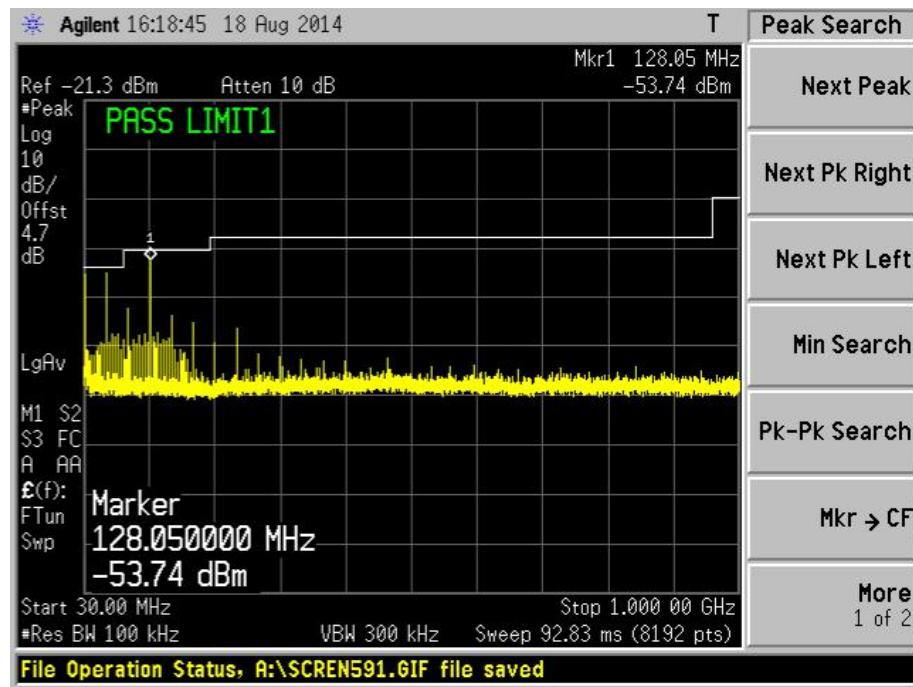
Plot 101 – Channel 0 (lower ch)



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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots

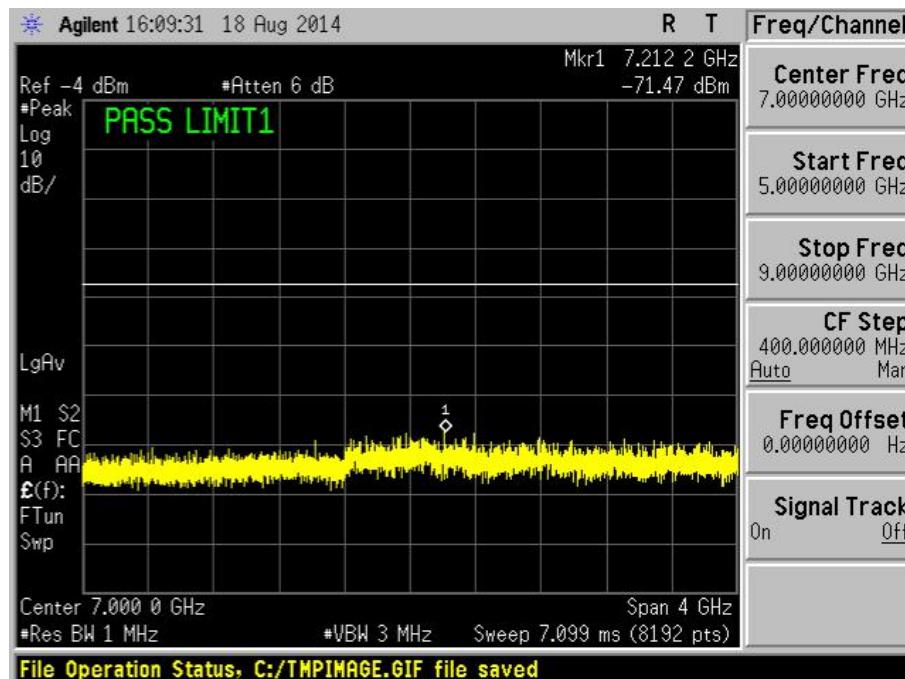




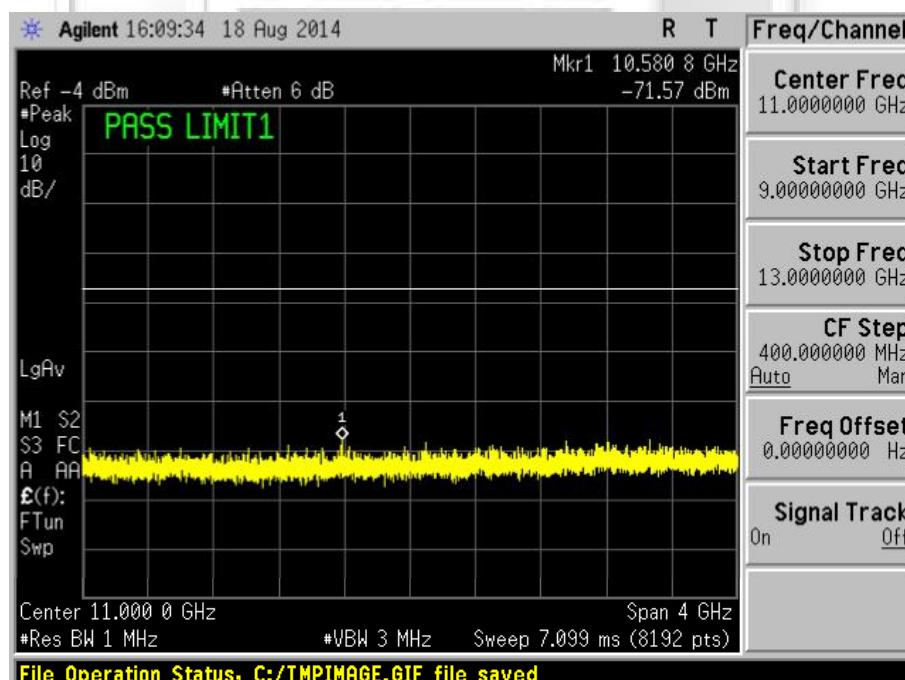
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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 104 – Channel 0 (lower ch)



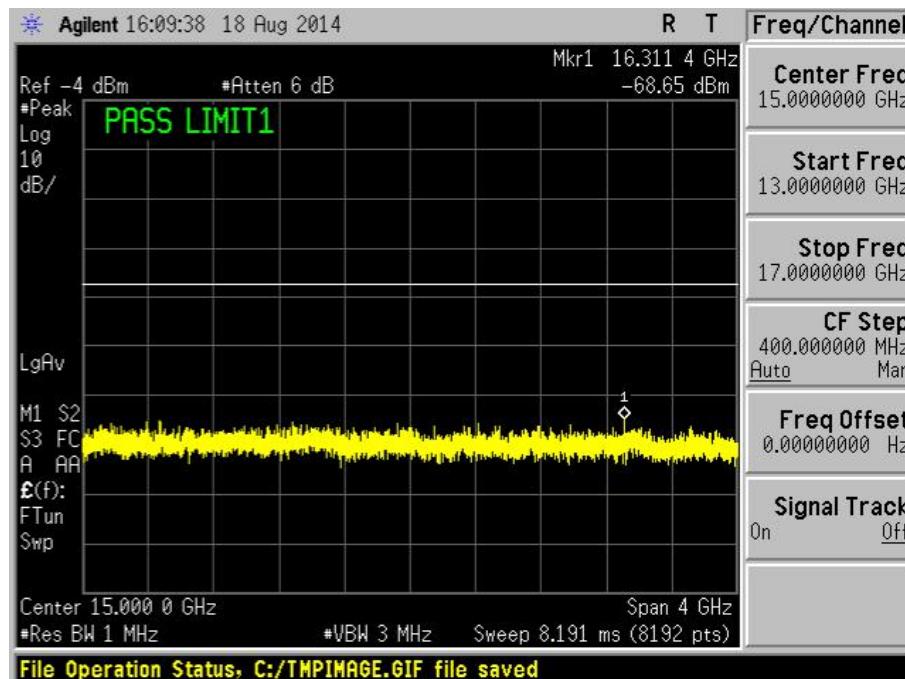
Plot 105 – Channel 0 (lower ch)



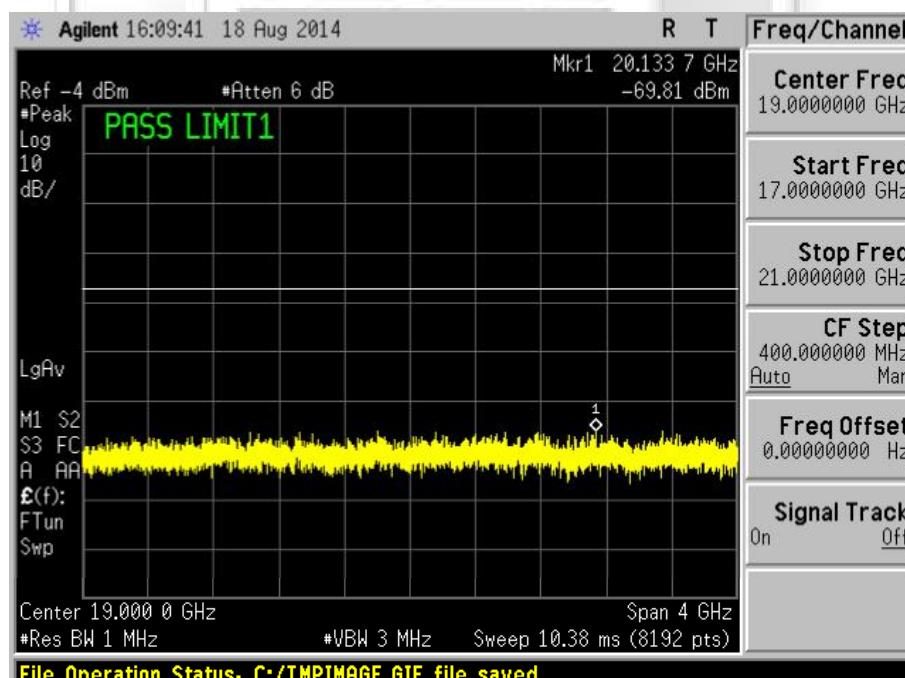
PSB Singapore

RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 106 – Channel 0 (lower ch)



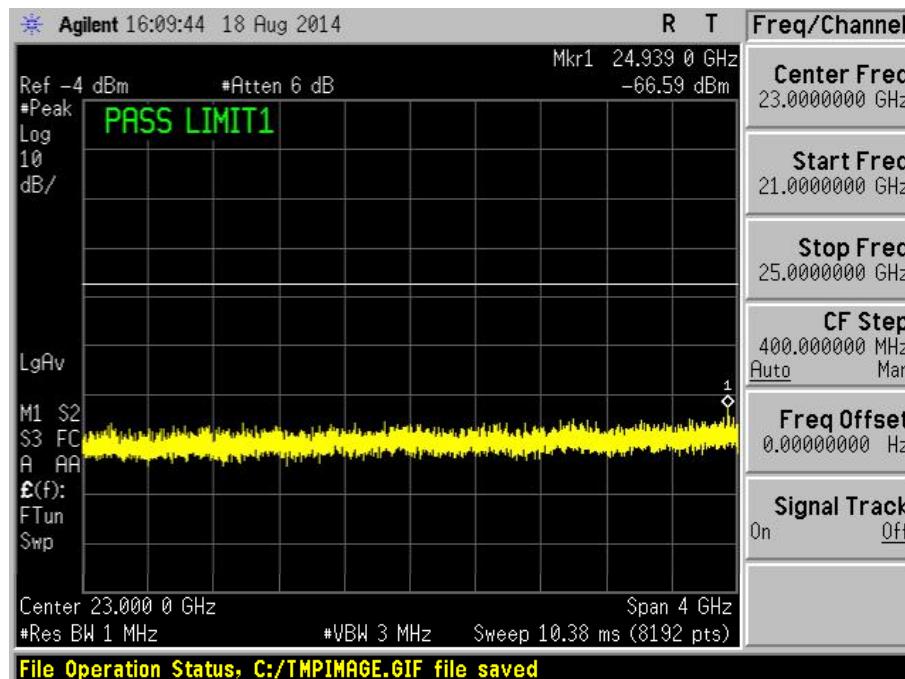
Plot 107 – Channel 0 (lower ch)



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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



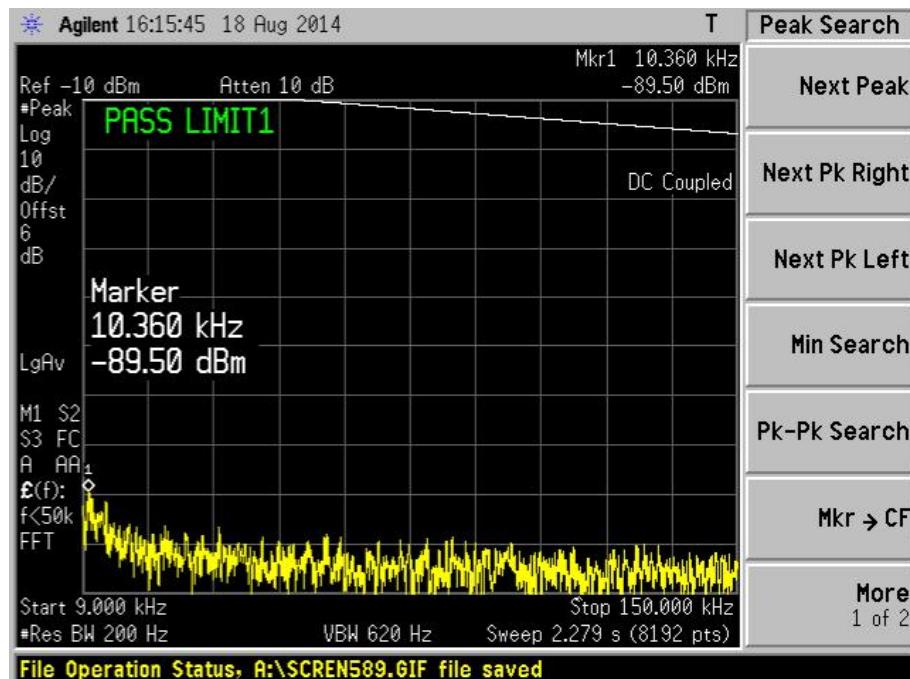
Plot 108 – Channel 0 (lower ch)



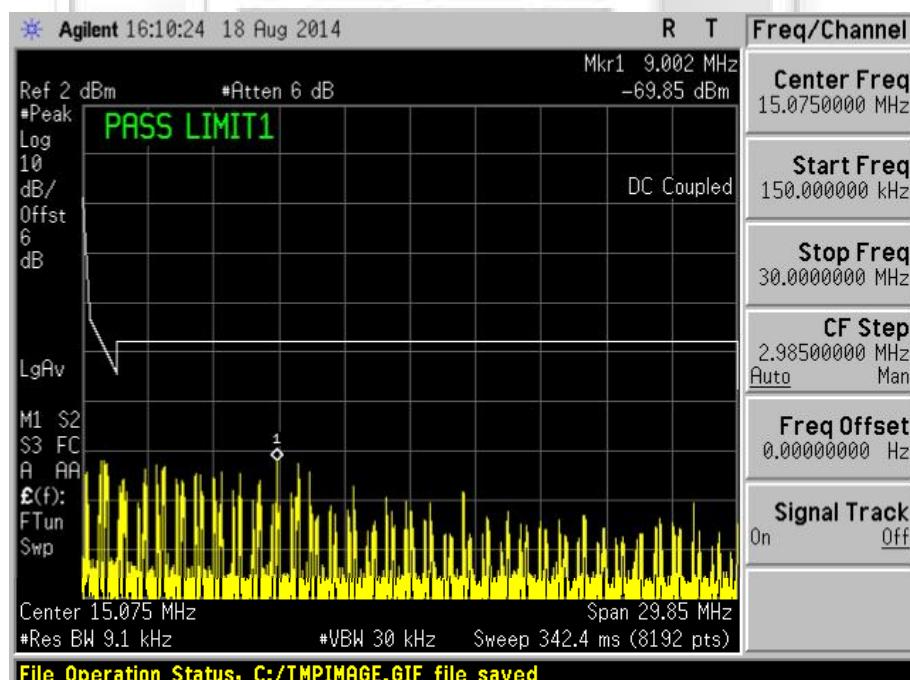
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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 109 – Channel 19 (middle ch)



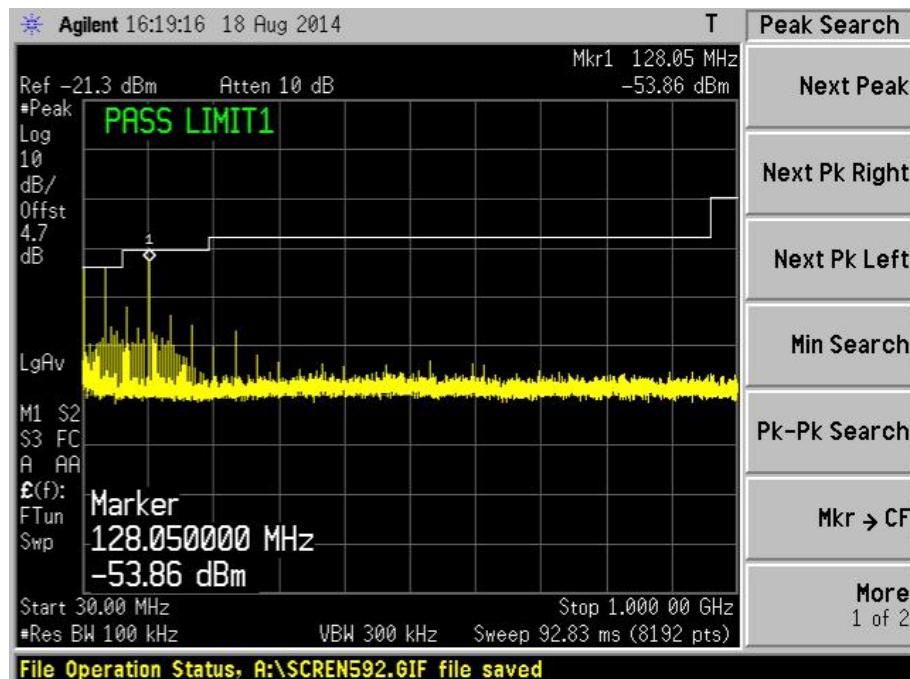
Plot 110 – Channel 19 (middle ch)



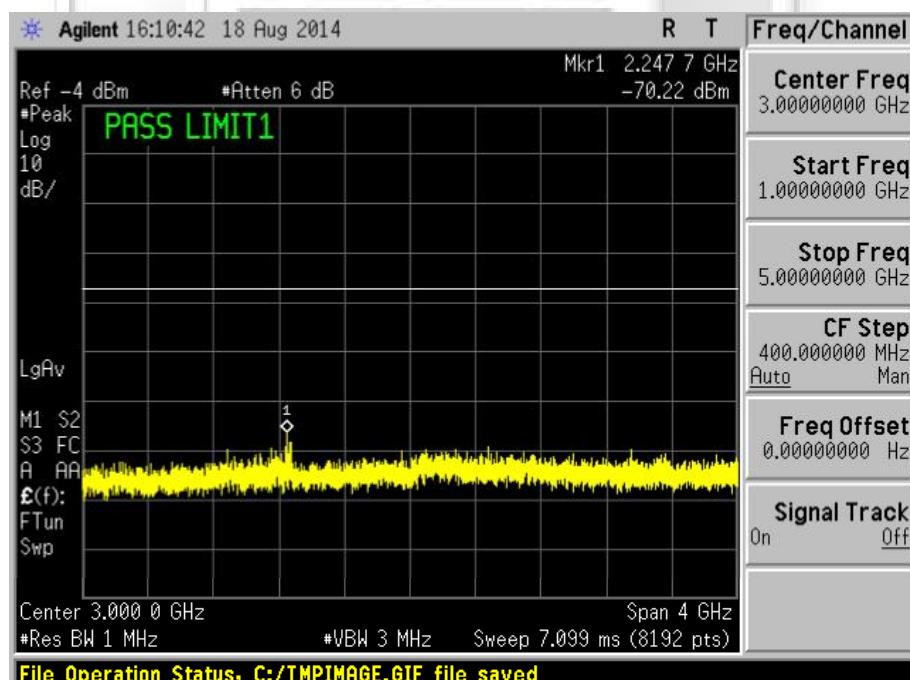
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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 111 – Channel 19 (middle ch)



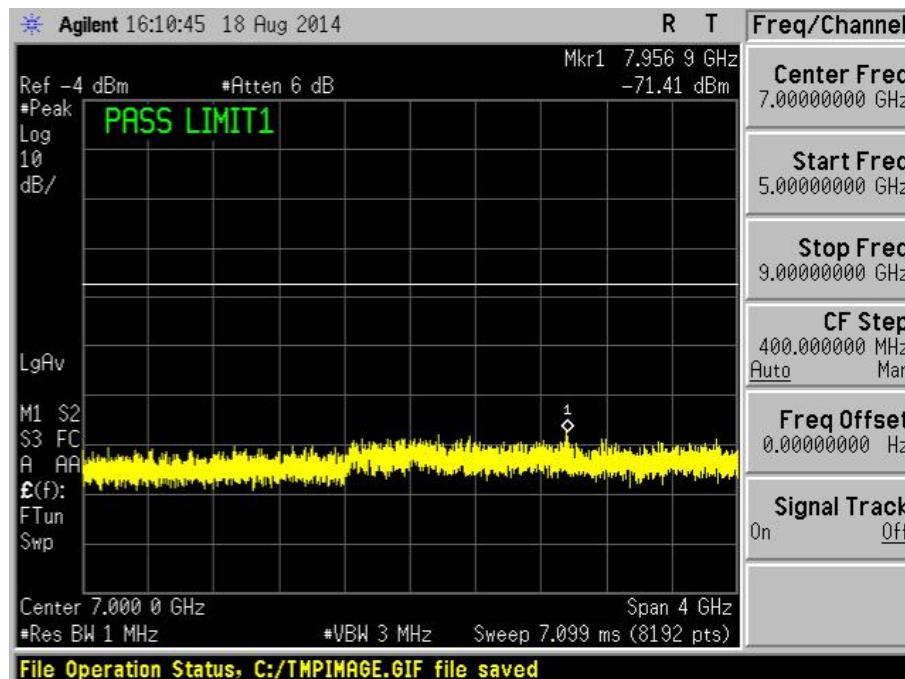
Plot 112 – Channel 19 (middle ch)



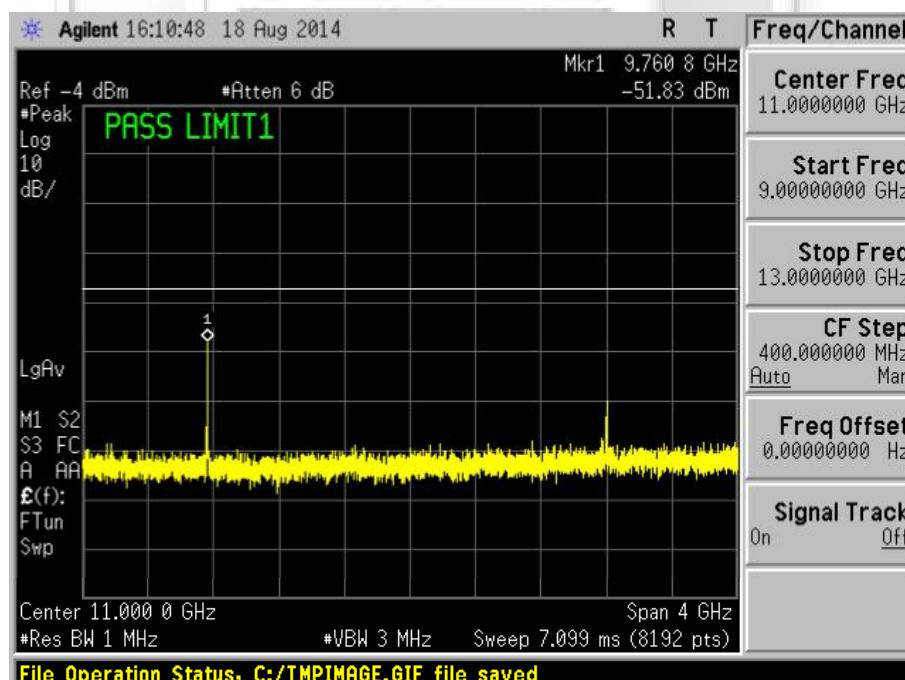
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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 113 – Channel 19 (middle ch)



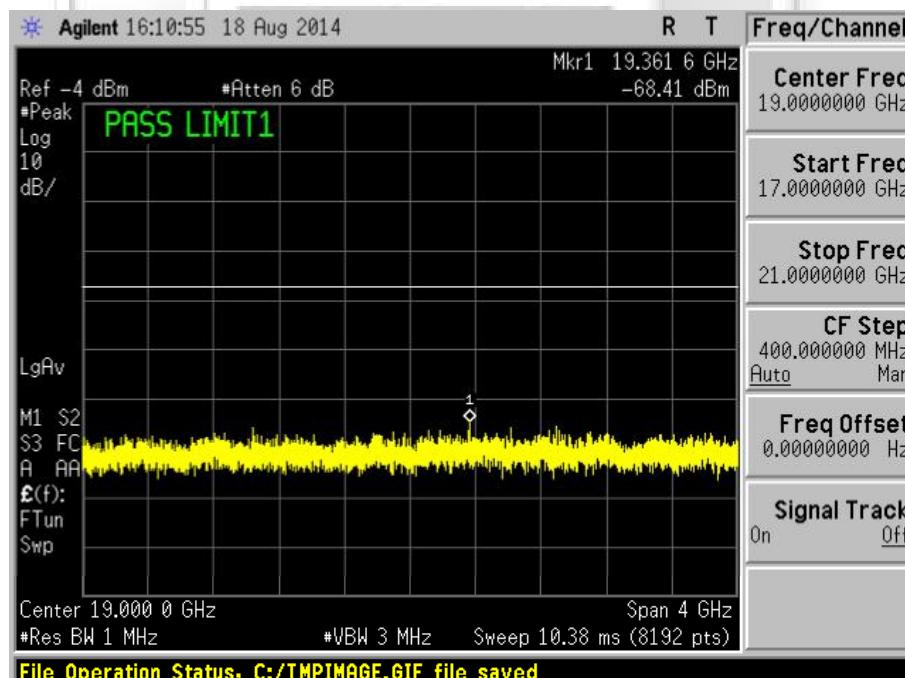
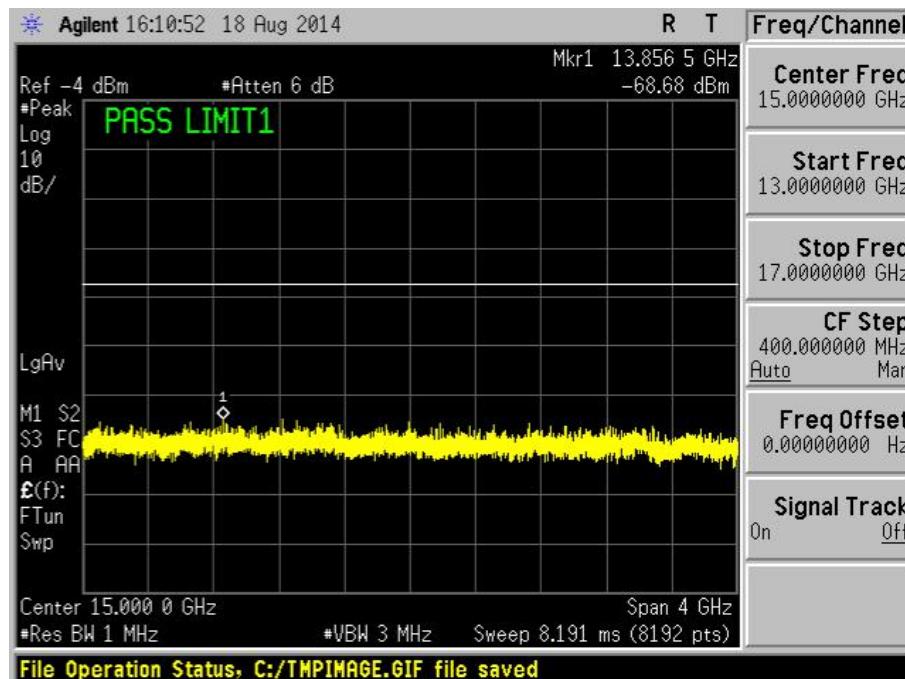
Plot 114 – Channel 19 (middle ch)



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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots

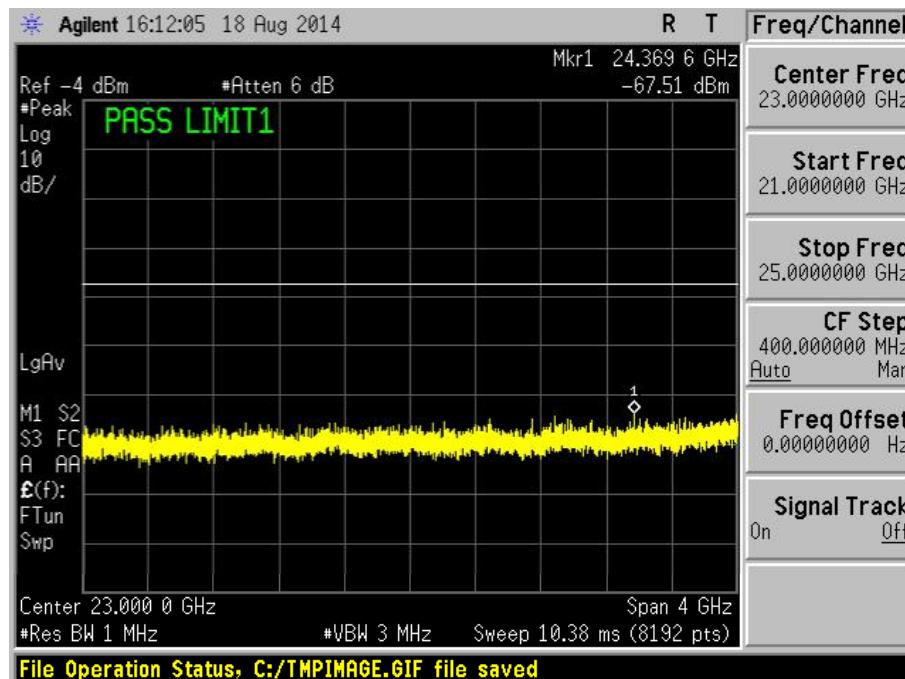




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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



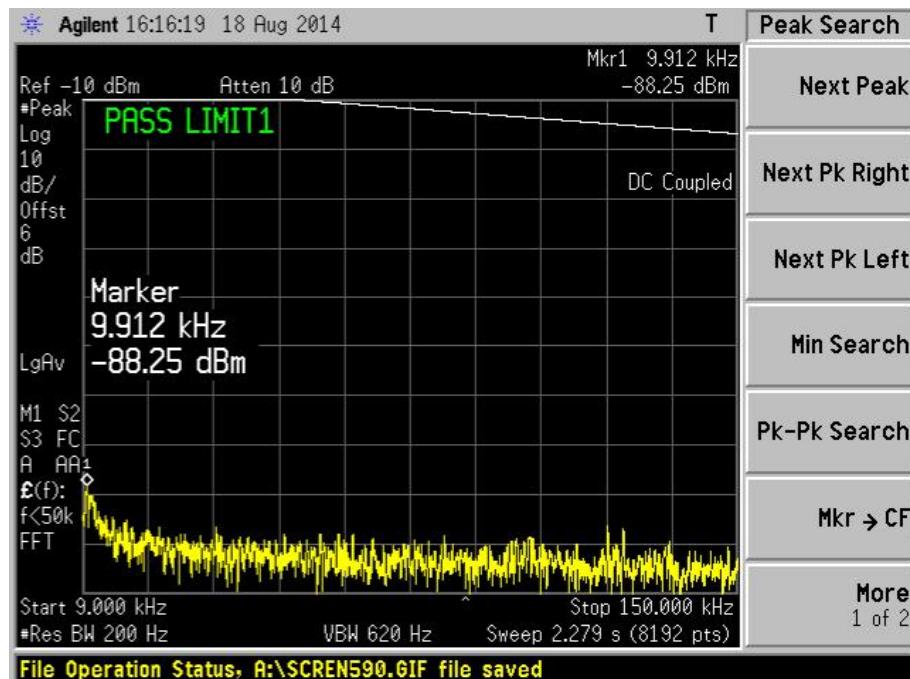
Plot 117 – Channel 19 (middle ch)



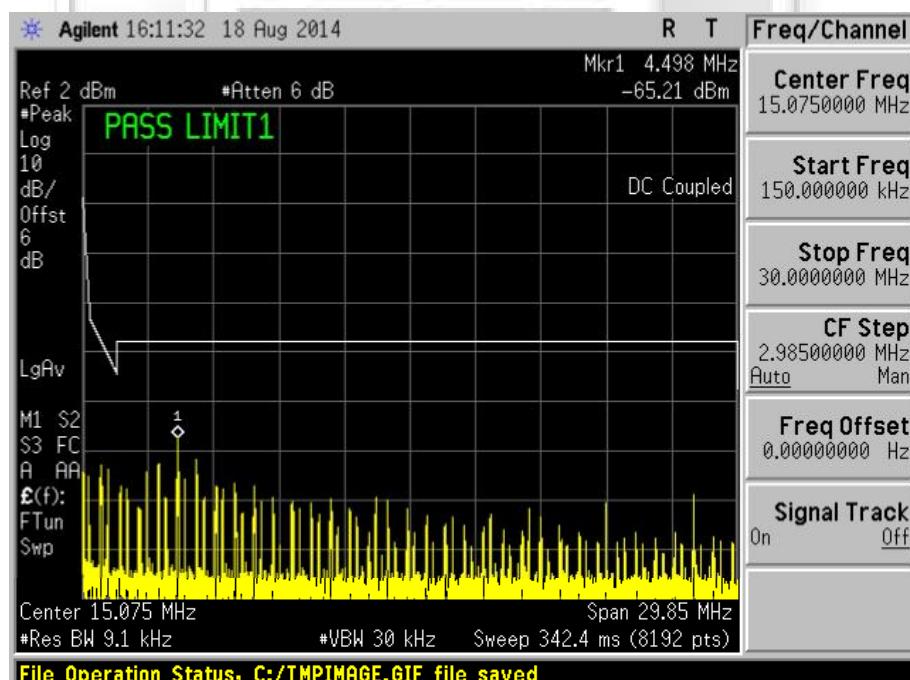
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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 118 – Channel 39 (upper ch)



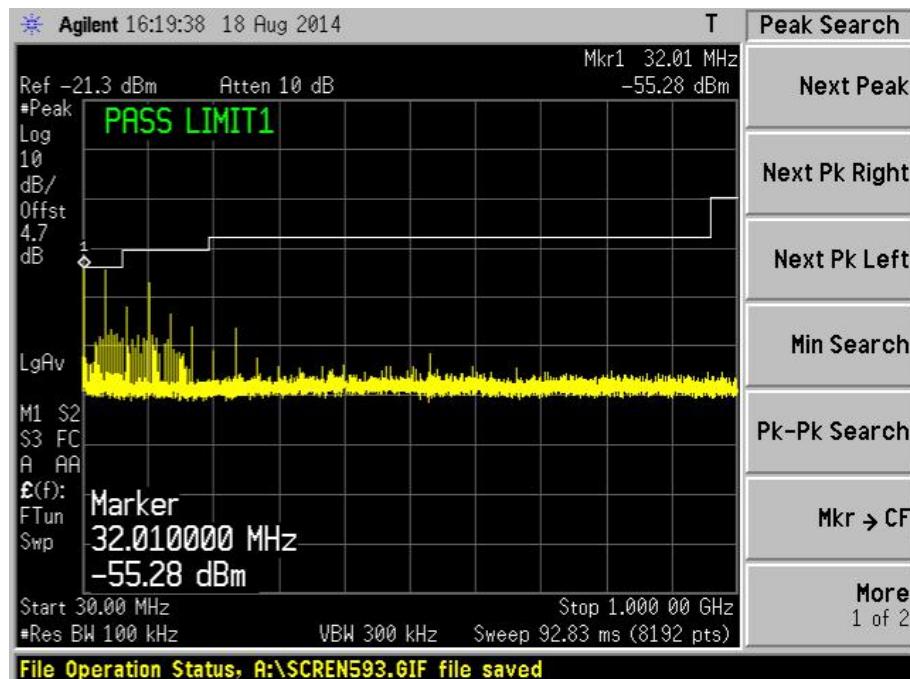
Plot 119 – Channel 39 (upper ch)



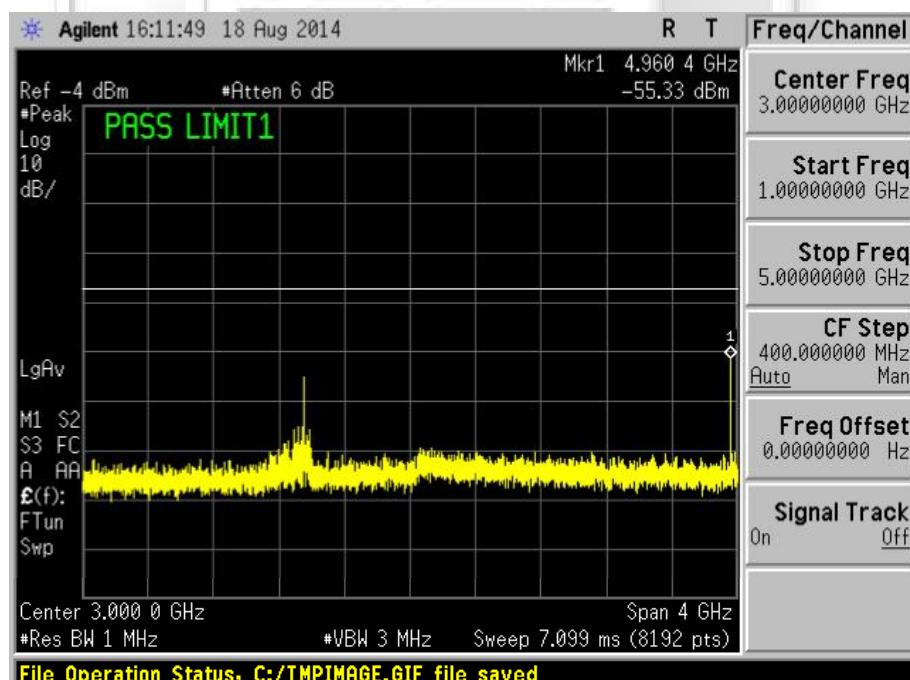
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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 120 – Channel 39 (upper ch)



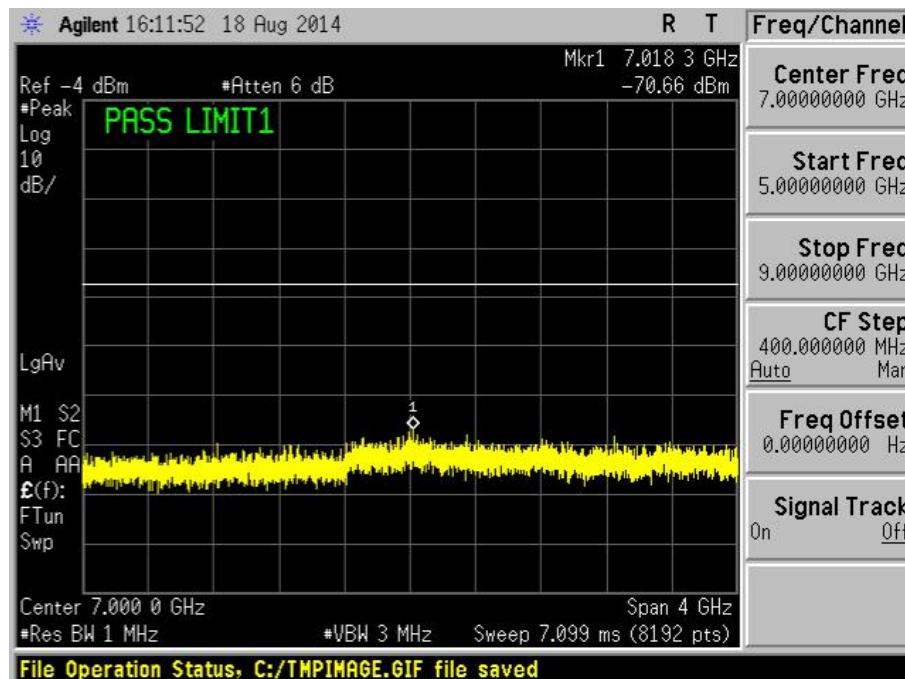
Plot 121 – Channel 39 (upper ch)



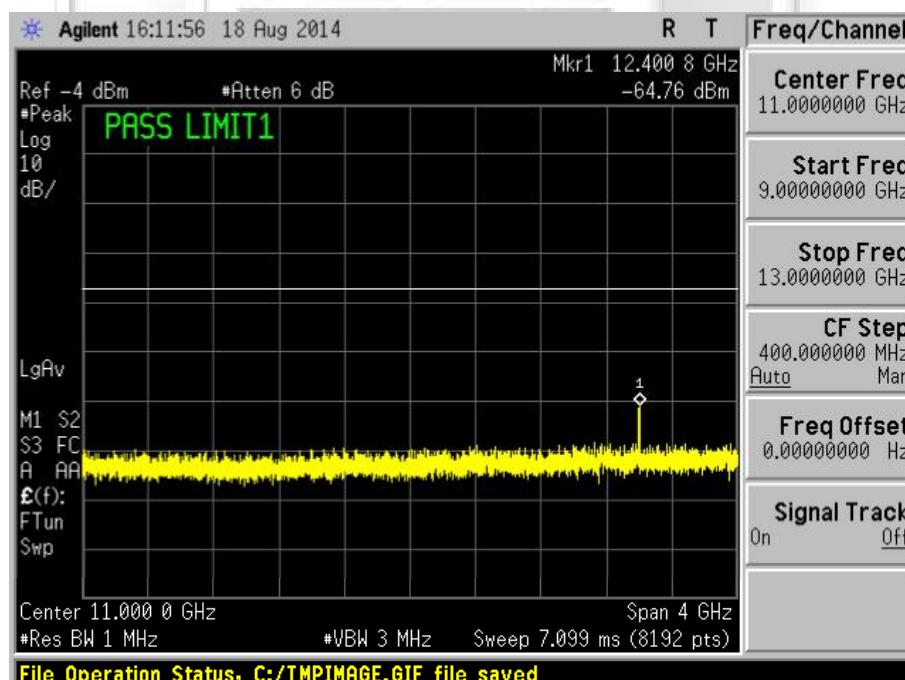
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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 122 – Channel 39 (upper ch)



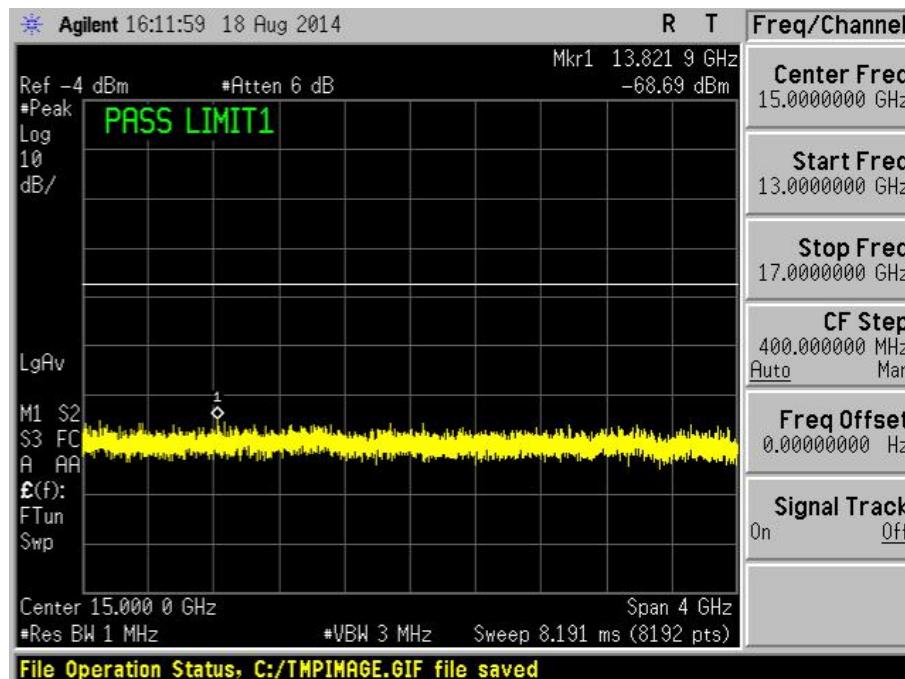
Plot 123 – Channel 39 (upper ch)



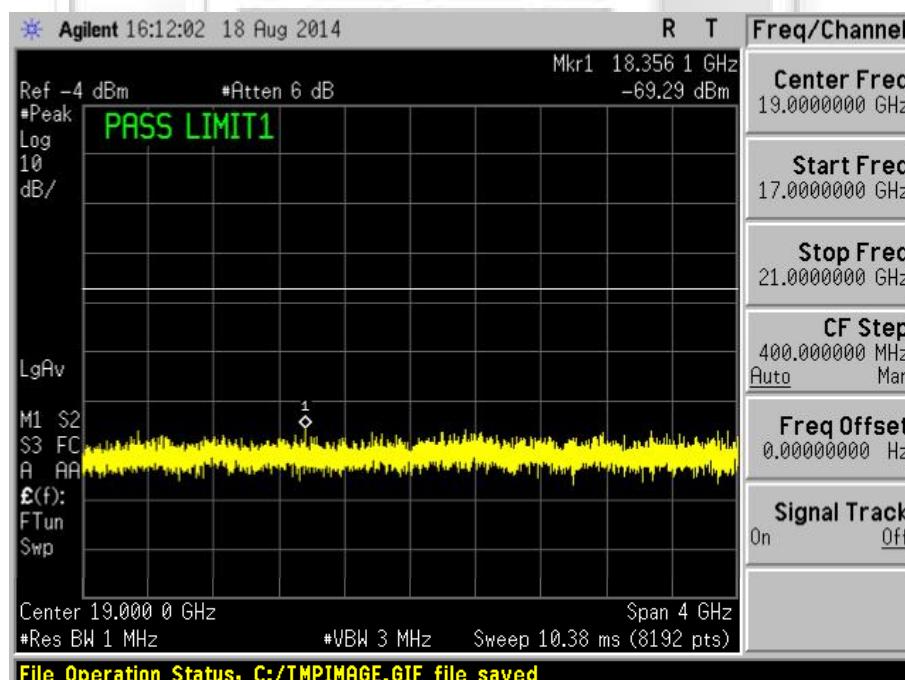
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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 124 – Channel 39 (upper ch)



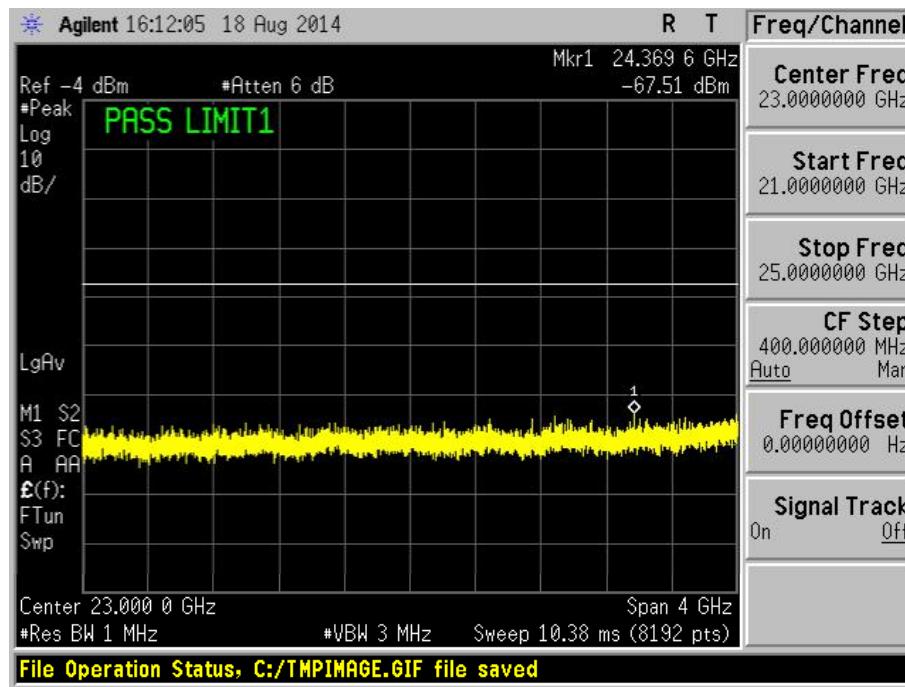
Plot 125 – Channel 39 (upper ch)



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RF CONDUCTED SPURIOUS EMISSIONS (RESTRICTED BANDS) TEST

RF Conducted Spurious Emissions (Restricted Bands) Plots



Plot 126 – Channel 39 (upper ch)



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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	E4404B	US39440632	03 Apr 2015
Agilent DC Power Supply	E3620A	MY40000448	Output Monitor

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.



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BAND EDGE COMPLIANCE (CONDUCTED) TEST

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

Test Input Power	3Vdc	Temperature	24°C
Attached Plots	127 – 128	Relative Humidity	56%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

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





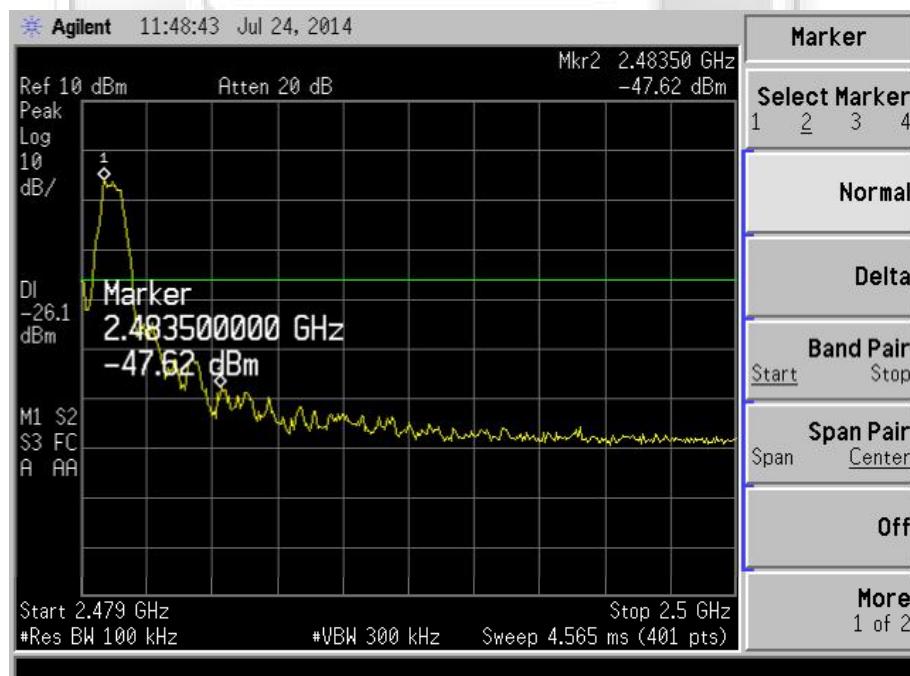
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BAND EDGE COMPLIANCE (CONDUCTED) TEST

Band Edge Compliance (Conducted) Plots



Plot 127 – Lower Band Edge at 2.4000GHz



Plot 128 – Upper Band Edge at 2.4835GHz



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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	23 Jul 2015
Schaffner Bilog Antenna -(30MHz-2GHz) BL3 (Ref)	CBL6112D	2549	23 Jan 2015
EMCO Horn Antenna(1GHz-18GHz)	3115	0003-6088	13 Mar 2015
R&S Preamplifier (1GHz -18GHz)	SCU18	102191	14 Mar 2015

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

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz to show compliance of spurious at band edges are at least 20dB below the carriers. For restricted band spurious at band edges, peak and average measurement plots were taken using the following setting:
 - a. Peak Plot:
RBW = VBW = 1MHz
 - b. Average Plot
RBW = 1MHz, VBW = 10Hz
4. All other supporting equipment were powered separately from another filtered mains.

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

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode 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.



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BAND EDGE COMPLIANCE (RADIATED) TEST

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

Test Input Power	2 x 1.5V AA Battery	Temperature	22°C
Attached Plots	129 – 134	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Dylan Lin

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

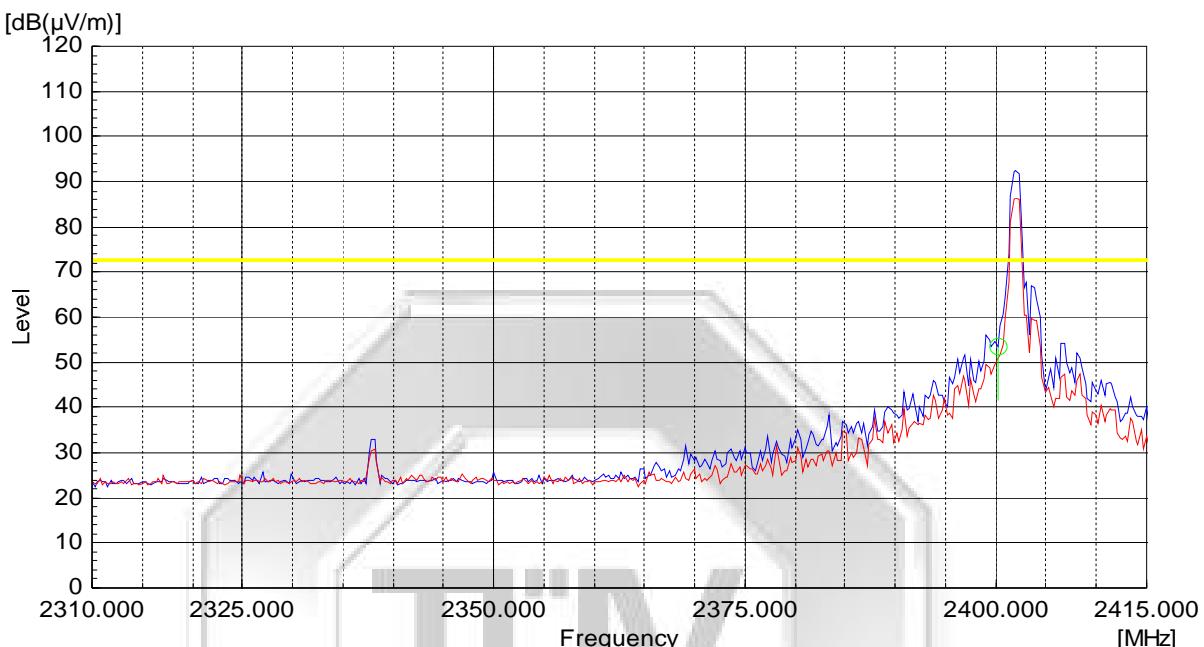




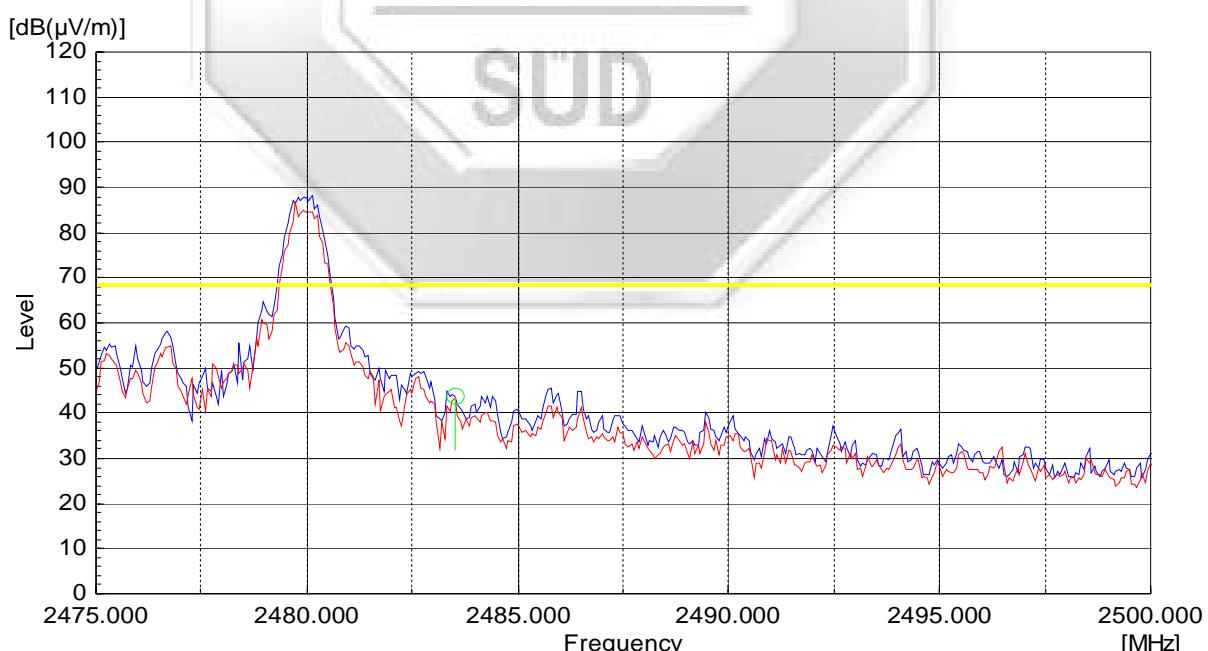
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BAND EDGE COMPLIANCE (RADIATED) TEST

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



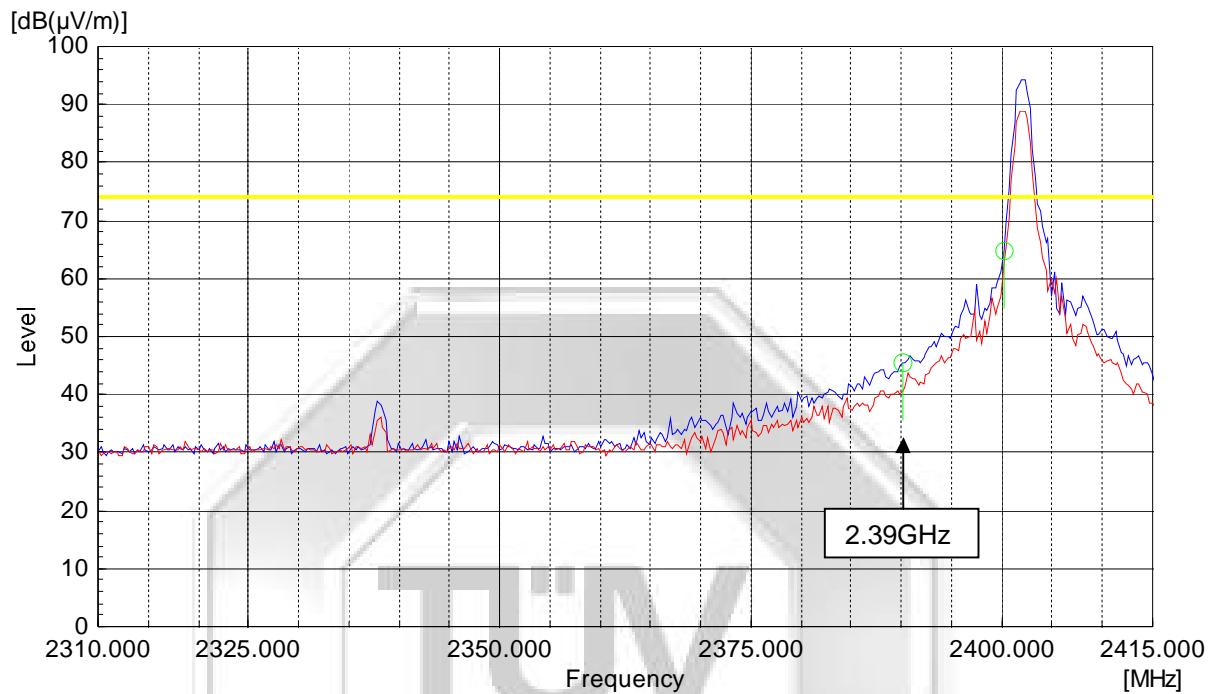
Plot 129 – Lower Band Edge at 2.4000GHz



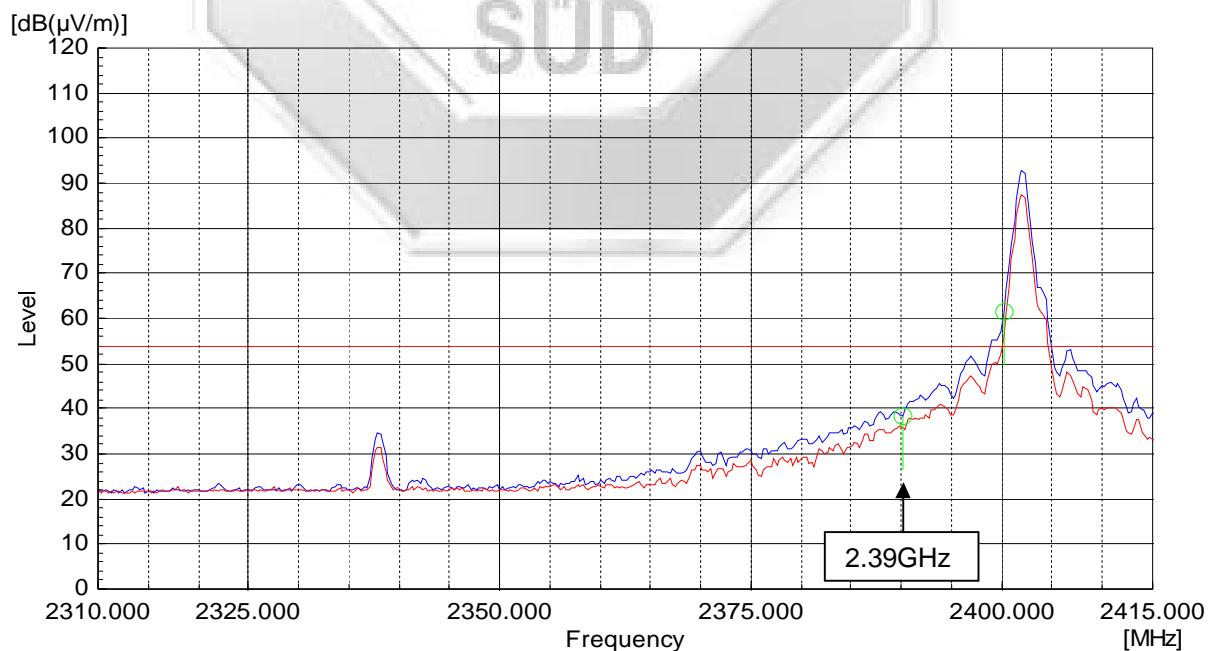
Plot 130 – Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band)



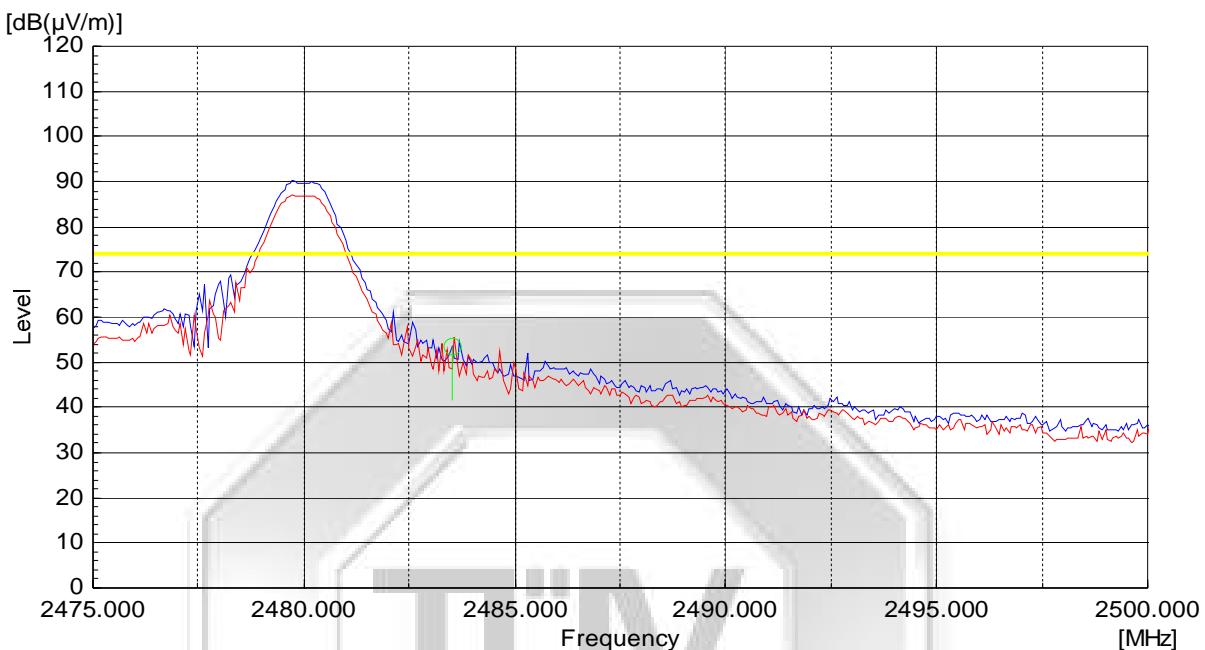
Plot 131 – Peak Plot at Lower Band Edge at 2.3900GHz



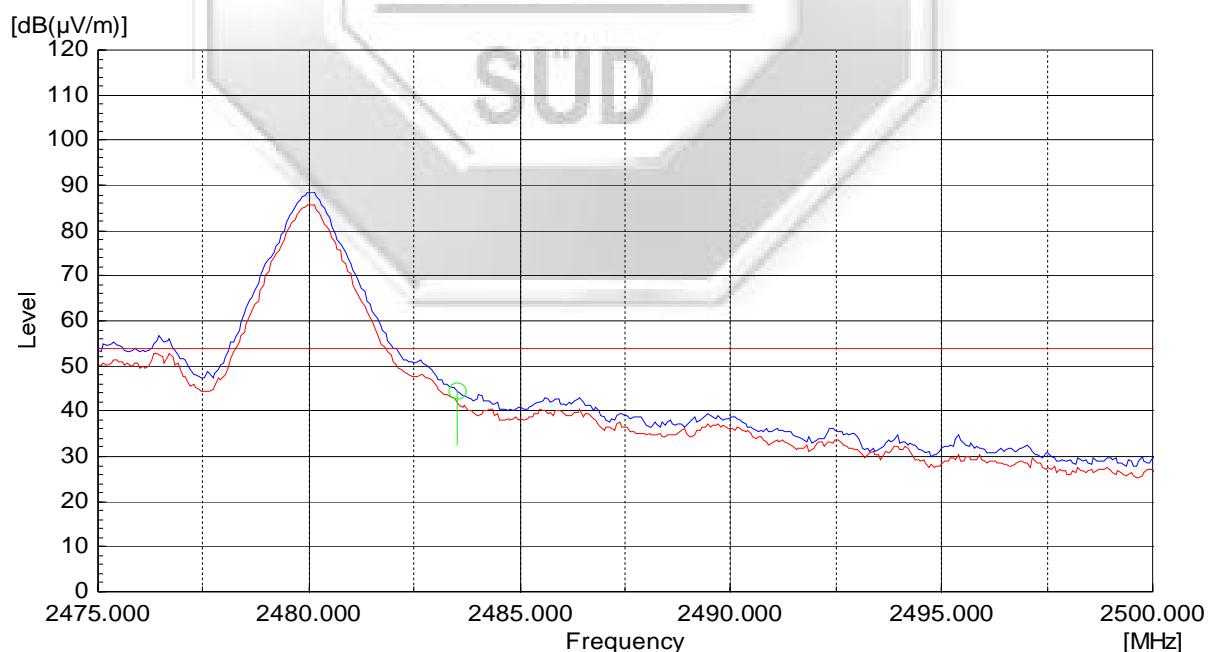
Plot 132 – Average Plot at Lower Band Edge at 2.3900GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band)



Plot 133 – Peak Plot at Upper Band Edge at 2.4835GHz



Plot 134 – Average Plot at Upper Band Edge at 2.4835GHz



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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	E4404B	US39440632	03 Apr 2015
Agilent DC Power Supply	E3620A	MY40000448	Output Monitor

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 19 (2.440GHz) (*mid ch*) and Channel 39 (2.480GHz) (*upper ch*) respectively.



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PEAK POWER SPECTRAL DENSITY TEST

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

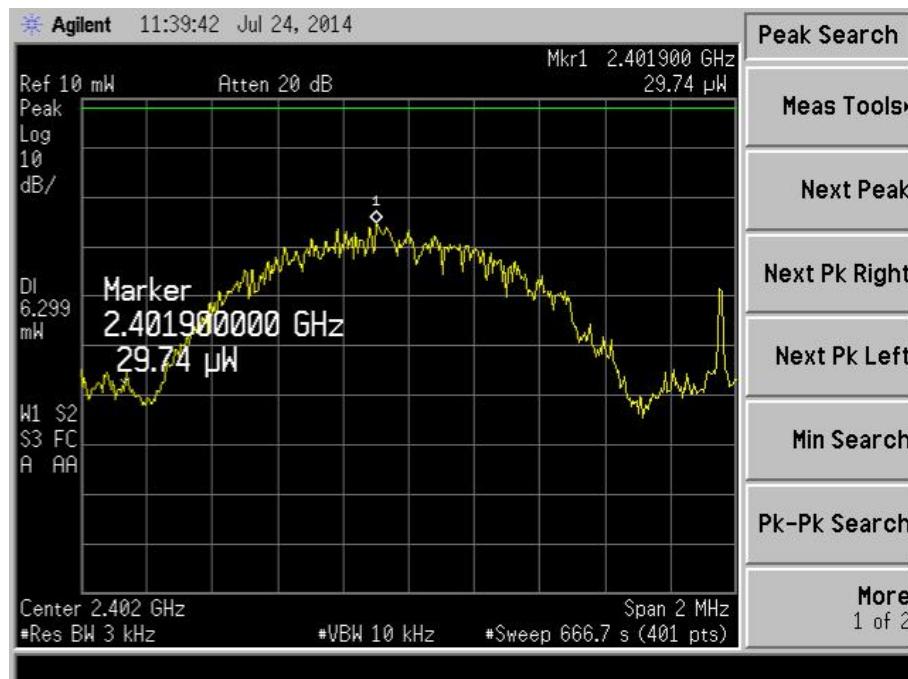
Test Input Power	3Vdc	Temperature	24°C
Attached Plots	135 – 137	Relative Humidity	56%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)
0 (<i>lower ch</i>)	2.402	0.02974	6.3
19 (<i>mid ch</i>)	2.440	0.02032	6.3
39 (<i>upper ch</i>)	2.480	0.01323	6.3

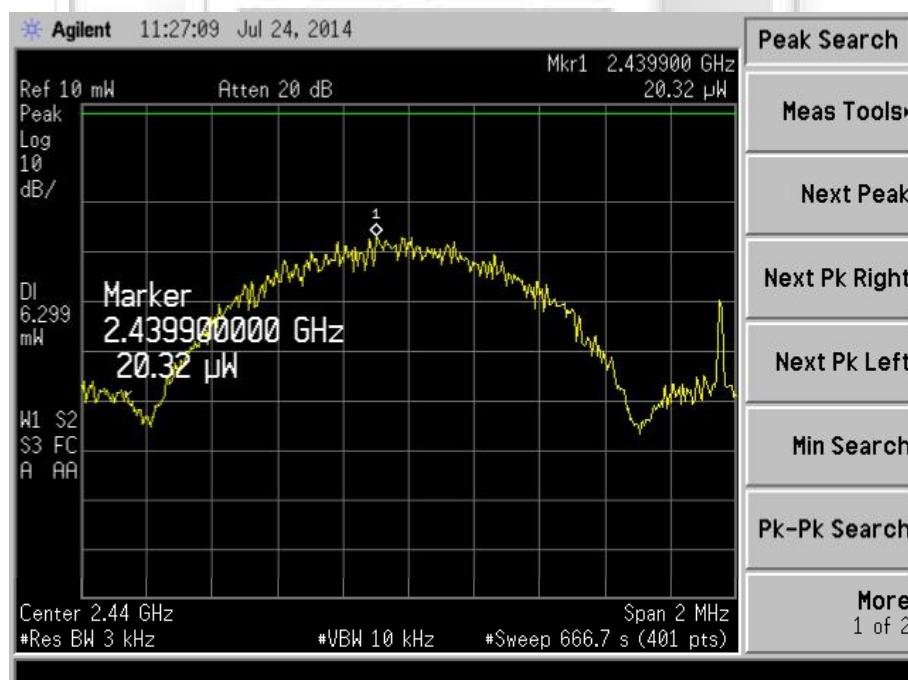


PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots



Plot 135 – Channel 0 (lower ch)



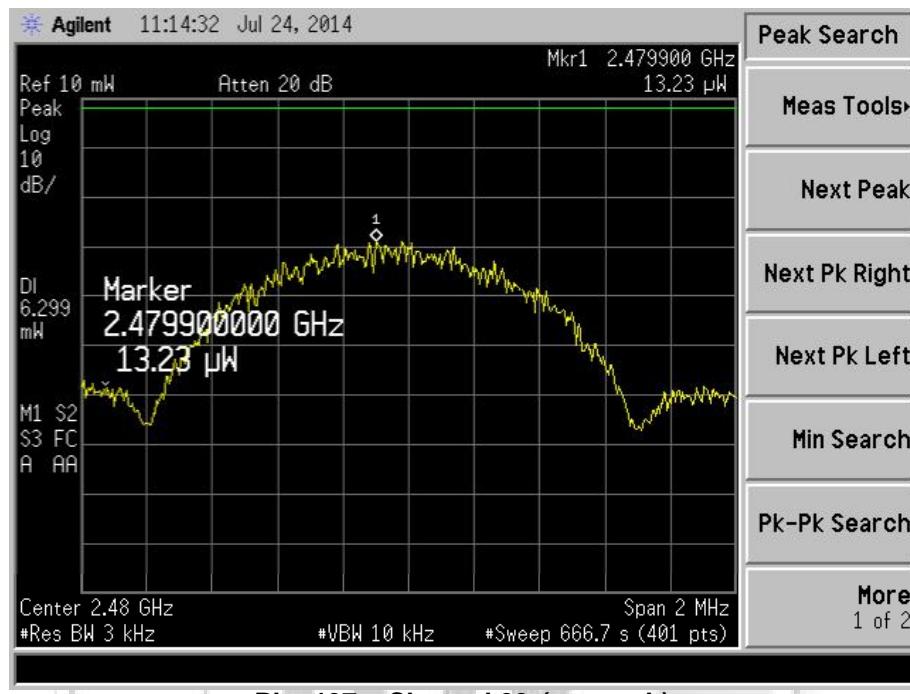
Plot 136 – Channel 19 (mid ch)



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PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots



Plot 137 – Channel 39 (upper ch)

Test Report No. 7191092673-EEC14/01
dated 19 Aug 2014



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July 2011

