



**FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 2**

CERTIFICATION TEST REPORT

For

**Smart Suitcase S1
MODEL NUMBER: CWL16S1**

FCC ID: 2AIUOCWL16S1

REPORT NUMBER: 4787496523-4

ISSUE DATE: March 20, 2017

Prepared for

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Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	02/15/17	Initial Issue	

Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	6dB Bandwidth and 99% Bandwidth	FCC 15.247 (a) IC RSS-247 Clause 5.1	Complied
2	Peak Conducted Output Power	FCC 15.247 (b) IC RSS-247 Clause 5.4	Complied
3	Power Spectral Density	FCC 15.27 (e) IC RSS-247 Clause 5.1 (2)	Complied
4	Conducted Bandedge and Spurious	FCC 15.207 RSS-Gen Issue 4 clause 7.2	Complied
5	Radiated Bandedge and Spurious	FCC 15.247 (d) FCC 15.209 FCC 15.205 IC RSS-247 Clause 5.5 IC RSS-GEN Clause 8.9	Complied
6	Conducted Emission Test For AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	N/A
7	Antenna Requirement	FCC 15.203 RSS-GEN Clause 8.3	Complied
Remark: N/A is an abbreviation for Not Applicable, and means this item is not applicable for this device.			

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Cowa Robotic Co., Ltd
Address: 5F, Building 64, No 421, Hongcao Road, Shanghai, China

Manufacturer Information

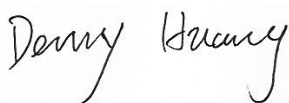
Company Name: Cowa Robotic Co., Ltd
Address: 5F, Building 64, No 421, Hongcao Road, Shanghai, China

EUT Description

Product Name Smart Suitcase S1
Brand Name N/A
Model Name CWL16S1
FCC ID 2AIUOCWL16S1
Date Tested December 16, 2016 ~ December 20, 2016

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS
INDUSTRY CANADA RSS-247 Issue 2	PASS
INDUSTRY CANADA RSS-GEN Issue 4	PASS

Tested By:



Denny Huang
Engineer Project Associate
Approved By:



Stephen Guo
Laboratory Manager

Checked By:



Shawn Wen
Laboratory Leader

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

Test Location	Dongguan Dongdian Testing Service Co., Ltd
Address	No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Dongguan City, Guangdong Province, 523808, China
Accreditation Certificate	<p>Dongguan Dongdian Testing Service Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until January 31, 2018.</p> <p>Dongguan Dongdian Testing Service Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 270092, Renewal date March 11, 2015, valid time is until March 11, 2018.</p> <p>The 3m Alternate Test Site of Dongguan Dongdian Testing Service Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 10288A on April 23, 2015, valid time is until April 23, 2018.</p>

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Bandwidth	1.1%
Peak Output Power(Conducted)(Spectrum analyzer)	0.86dB(10 MHz \leq f < 3.6GHz);
	1.38dB(3.6GHz \leq f < 8GHz)
Peak Output Power(Conducted)(Power Sensor)	0.74dB
Dwell Time	0.6%
Conducted spurious emissions	0.86dB(10 MHz \leq f < 3.6GHz);
	1.40dB(3.6GHz \leq f < 8GHz)
	1.66dB(8GHz \leq f < 22GHz)
Uncertainty for radio frequency (RBW<20KHz)	3 \times 10 ⁻⁸
Temperature	0.4℃
Humidity	2%
Uncertainty for Radiation Emission test (30MHz-1GHz)	4.70 dB (Antenna Polarize: V)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1GHz-18GHz)	4.10dB(1-6GHz)
	4.40dB (6GHz-18Gz)
Uncertainty for Power line conduction emission test	3.32dB (150KHz-30MHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Equipment	Smart Suitcase S1
Model Name	CWL16S1
Radio Technology	IEEE802.11b/g/n
Operation frequency	IEEE 802.11b: 2412MHz—2462MHz IEEE 802.11g: 2412MHz—2462MHz IEEE 802.11n HT20: 2412MHz—2462MHz
Modulation	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)
Battery	DC 14.4V, 4200mA
Power Adapter	Input: AC 100~240V, 50/60Hz Output: DC 16.8V 1400mA

5.2. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Number of Transmit Chains (NTX)	Bluetooth Mode	Frequency (MHz)	Channel Number	Max PK Conducted Power (dBm)
2400-2483.5	1	IEEE 802.11b	2412-2462	1-11[11]	17.59
2400-2483.5	1	IEEE 802.11g	2412-2462	1-11[11]	18.36
2400-2483.5	1	IEEE 802.11n	2412-2462	1-11[11]	16.35

5.3. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	4	2425	7	2442	10	2457
2	2417	5	2432	8	2447	11	2462
3	2422	6	2437	9	2452	N/A	N/A

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel
IEEE 802.11b	LCH :CH1 2412
	MCH: CH6 2437
	HCH: CH11 2462
IEEE 802.11g	LCH :CH1 2412
	MCH: CH6 2437
	HCH: CH11 2462
IEEE 802.11n HT20	LCH :CH1 2412
	MCH: CH6 2437
	HCH: CH11 2462

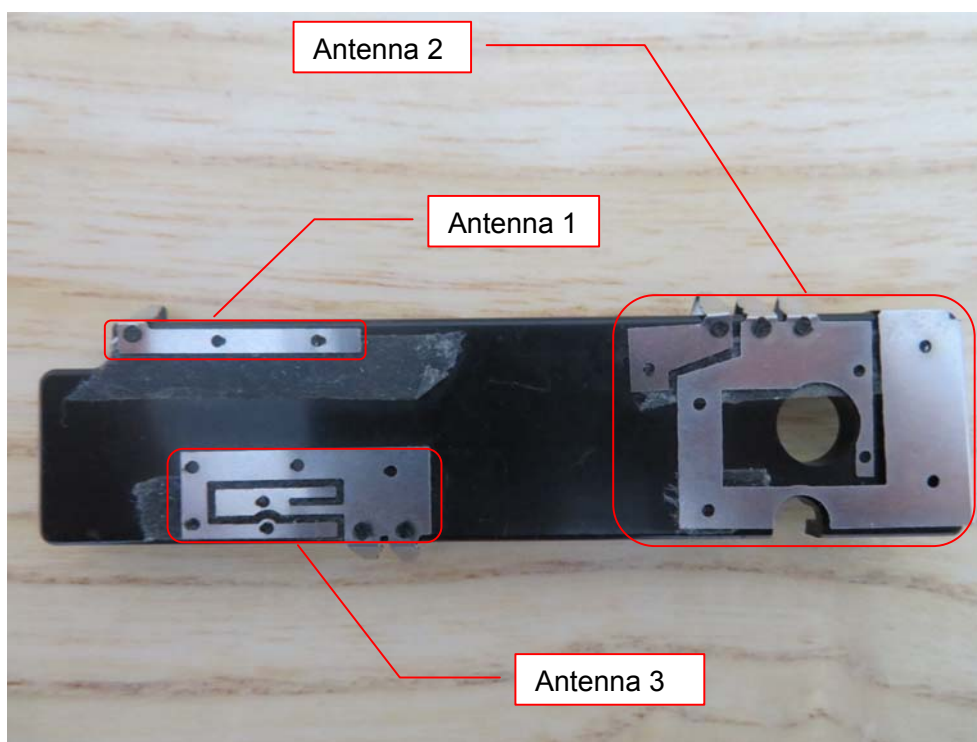
5.5. THE WORSE CASE CONFIGURATIONS

Test Mode	Channel	Setting data rate (Mbps)
IEEE 802.11b	LCH :CH1 2412	11 (set_tx_power 127)
	MCH: CH6 2437	11 (set_tx_power 127)
	HCH: CH11 2462	11 (set_tx_power 127)
IEEE 802.11g	LCH :CH1 2412	54 (set_tx_power 1100)
	MCH: CH6 2437	54 (set_tx_power 1100)
	HCH: CH11 2462	54 (set_tx_power 1100)
IEEE 802.11n HT20	LCH :CH1 2412	65 (set_tx_power 1100)
	MCH: CH6 2437	65 (set_tx_power 1100)
	HCH: CH11 2462	65 (set_tx_power 1100)

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
3	2402-2480	PCB Antenna	2.56

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11b	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.
IEEE 802.11g	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.
IEEE 802.11n HT20	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.



5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	FCC ID
1	Laptop	ThinkPad	Latitude D610	N/A

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB out	USB	Unshielded	N/A	N/A

ACCESSORY

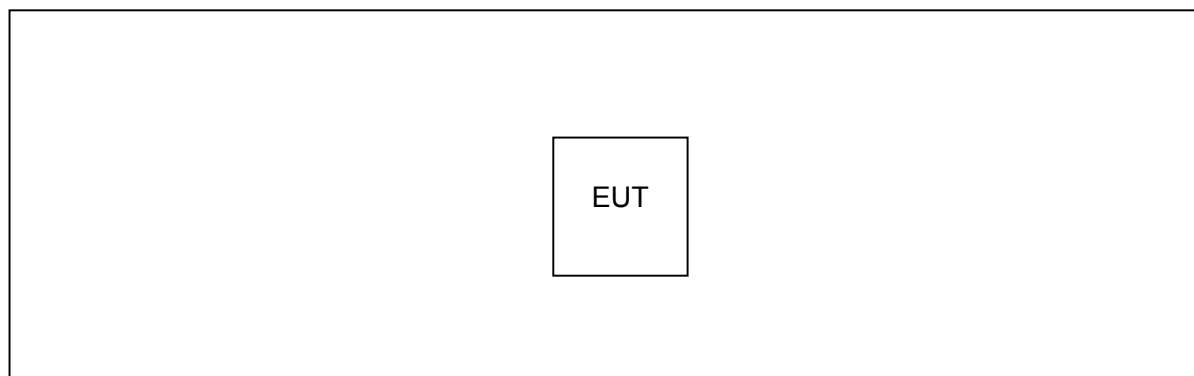
Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

Note: The EUT has no accessory.

TEST SETUP

The EUT can work in an engineer mode with a software through a Laptop.

SETUP DIAGRAM FOR TESTS



5.8. MEASURING INSTRUMENT AND SOFTWARE USED

Instrument (Conducted for RF Port)						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Spectrum Analyzer	Agilent	E4447A	MY50180031	2016/07/06	1 Year
<input checked="" type="checkbox"/>	Spectrum analyzer	R&S	FSU26	1166.1660.26	2016/10/16	1Year
<input checked="" type="checkbox"/>	Power Sensor	Agilent	U2021XA	MY55150010	2016/04/18	1Year
<input checked="" type="checkbox"/>	Power Sensor	Agilent	U2021XA	MY55150011	2016/04/19	1Year
<input checked="" type="checkbox"/>	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/08/18	1Year
<input checked="" type="checkbox"/>	RF Cable	Micable	C10-01-01-1	100309	2016/08/18	1Year
<input checked="" type="checkbox"/>	Test Software	JS Tonscend	JS1120-2	Ver.2.5	N/A	N/A
<input checked="" type="checkbox"/>	USB Data acquisition	Agilent	U2531A	TW55043503	N/A	N/A
<input checked="" type="checkbox"/>	Auto control Unit	JS Tonscend	JS0806-2	158060010	N/A	N/A
Instrument (Radiated Tests)						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Expired date
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESU8	100316	2016/10/16	1 Year
<input checked="" type="checkbox"/>	Spectrum analyzer	R&S	FSU26	1166.1660.26	2016/10/16	1 Year
<input checked="" type="checkbox"/>	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2016/10/27	1 Year
<input checked="" type="checkbox"/>	Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	2016/10/27	1 Year
<input checked="" type="checkbox"/>	Double Ridged Horn Antenna	R&S	HF907	100276	2016/10/12	1 Year
<input checked="" type="checkbox"/>	Horn Antenna	ETS-LINDGERN	3160	SEL0076	2016/10/16	1 Year
<input checked="" type="checkbox"/>	Pre-amplifier	A.H.	PAM-0118	360	2016/10/16	1 Year
<input checked="" type="checkbox"/>	Pre-amplifier	Compliance Directions Systems Inc.	PAP-0126	SEL0168	2016/10/16	1 Year
<input checked="" type="checkbox"/>	RF Cable	HUBSER	CP-X2	W11.03	2016/10/16	1 Year
<input checked="" type="checkbox"/>	RF Cable	HUBSER	CP-X1	W12.02	2016/10/16	1 Year
<input checked="" type="checkbox"/>	MI Cable	HUBSER	C10-01-01-1M	1091629	2016/10/16	1 Year
<input checked="" type="checkbox"/>	Test software	Audix	E3	V 6.11111b	N/A	N/A

6. MEASUREMENT METHODS

No.	Test Items	FCC/IC Rules	Test Results
1	6 dB Bandwidth	FCC 15.247 (a) (2) IC RSS-247 Clause 5.1 (1)	Complied
2	Peak Output Power	FCC 15.247 (b) (3) IC RSS-247 Clause 5.4 (4)	Complied
3	Power Spectral Density	FCC 15.247 (3) IC RSS-247 Clause 5.2 (2)	Complied
4	Out-of-band emissions in non-restricted bands	FCC 15.247 (d) IC RSS-247 Clause 5.5	Complied
5	Out-of-band emissions in restricted bands	FCC 15.247 (d) FCC 15.209 FCC 15.205 IC RSS-247 Clause 5.5 IC RSS-GEN Clause 8.9	Complied
6	Band-edge	FCC 15.207 RSS-GEN Clause 8.8	N/A
7	Conducted Emission Test For AC Power Port	FCC 15.203 RSS-GEN Clause 8.3	Complied

7. ANTENNA PORT TEST RESULTS

7.1. 6 dB DTS BANDWIDTH AND 99% BANDWIDTH

LIMITS

FCC Part15 (15.247) , Subpart C IC RSS-247 ISSUE 1			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(a)(2) IC RSS-247 5.1 (1)	6 dB Bandwidth	$\geq 500\text{KHz}$	2400-2483.5
RSS-Gen Clause 4.4.1	99% Bandwidth	for reporting purposes only.	2400-2483.5

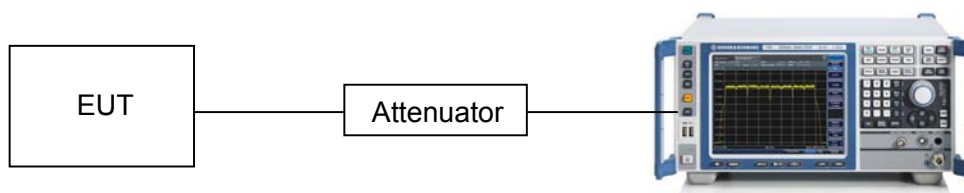
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

TEST SETUP



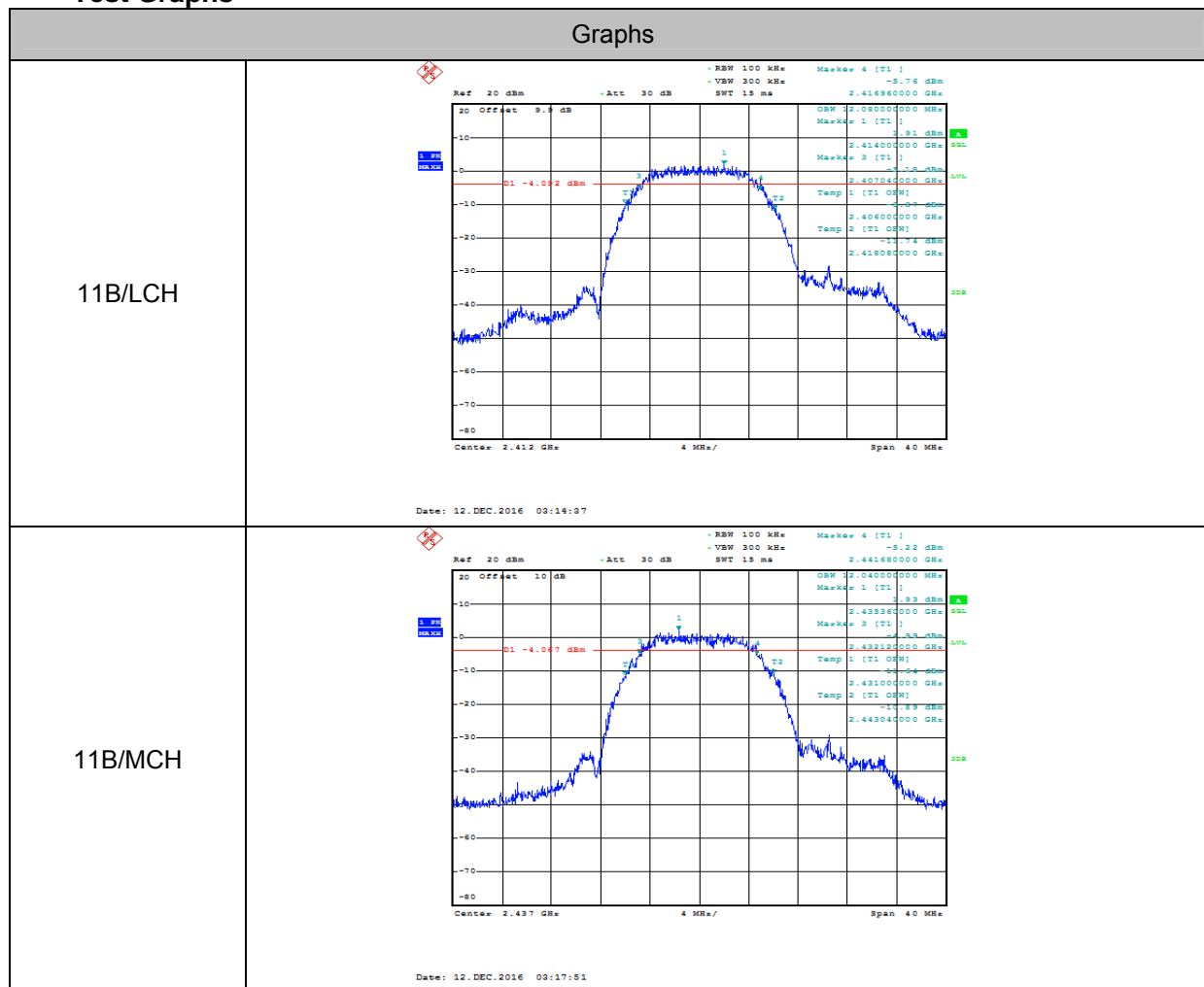
TEST CONDITIONS

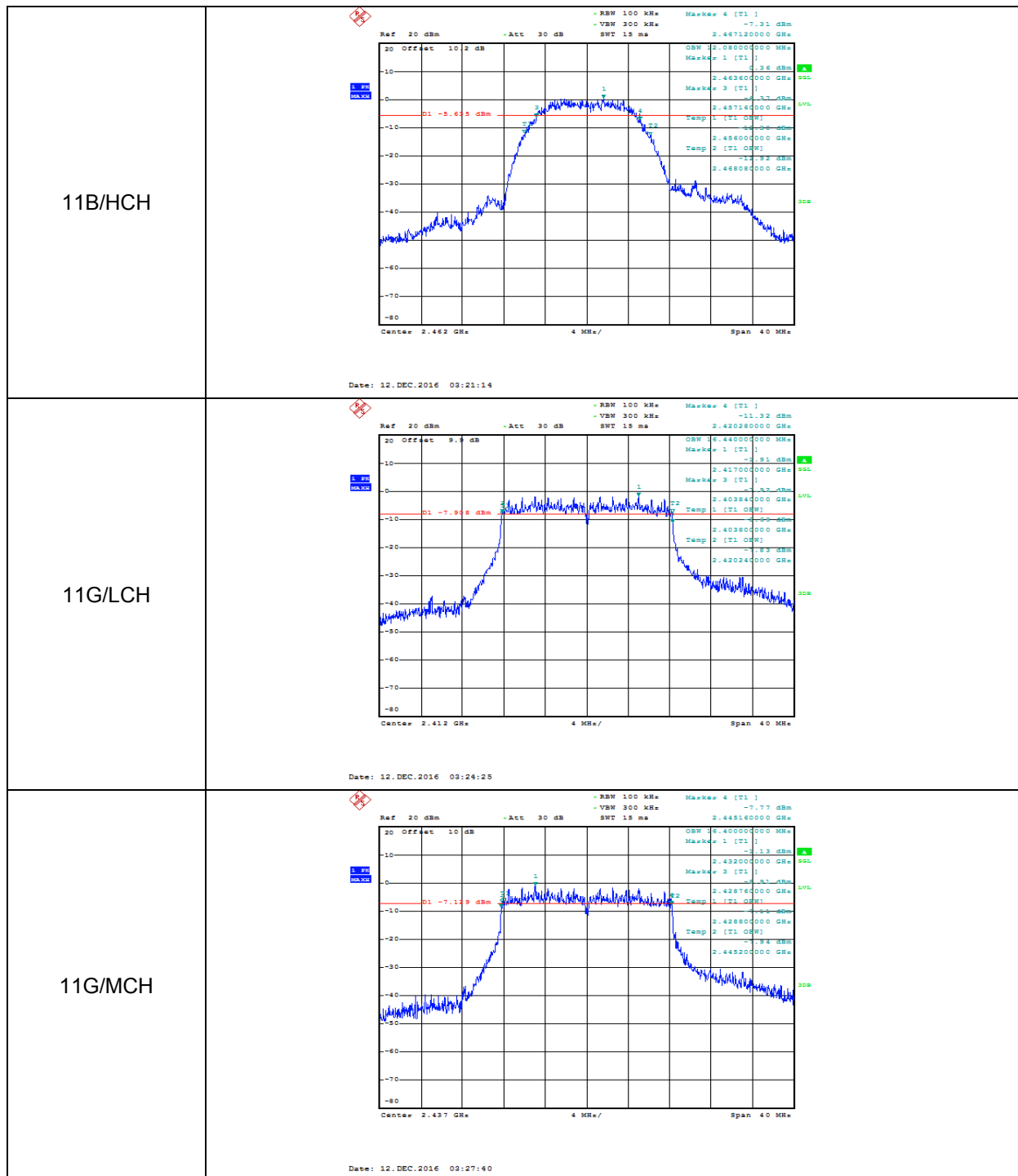
Temperature: 26.6°C
Relative Humidity: 58%
Test Voltage: DC 5V

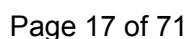
RESULTS

Mode	Channel	6dB Bandwidth [MHz]	99% OBW [MHz]	Verdict
11B	LCH	9.920	12.080	PASS
11B	MCH	9.560	12.040	PASS
11B	HCH	9.960	12.080	PASS
11G	LCH	16.440	16.440	PASS
11G	MCH	16.400	16.400	PASS
11G	HCH	16.440	16.480	PASS
11N20SISO	LCH	17.720	17.680	PASS
11N20SISO	MCH	17.520	17.680	PASS
11N20SISO	HCH	17.760	17.720	PASS

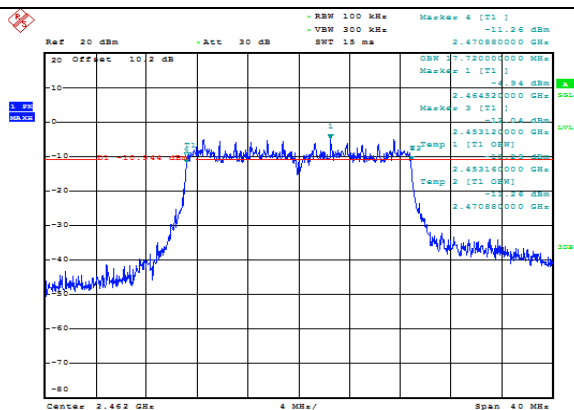
Test Graphs







11N20SISO/HCH



Date: 12.DEC.2016 04:12:02

7.2. PEAK CONDUCTED OUTPUT POWER

LIMITS

FCC Part15 (15.247) , Subpart C IC RSS-247 ISSUE 1			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(b)(3) IC RSS-247 5.4 (4)	Peak Output Power	1 watt or 30dBm	2400-2483.5

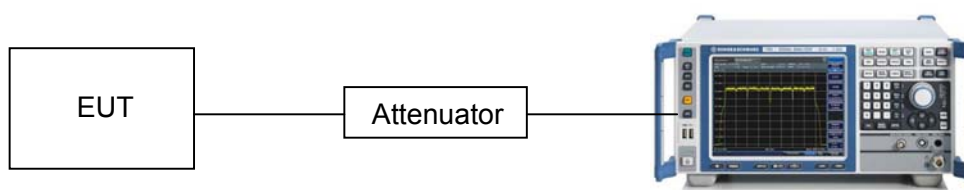
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	\geq DTS bandwidth(e.g. 1 MHz for BLE)
VBW	$\geq 3 \times$ RBW
Span	$3 \times$ RBW
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use peak marker function to determine the peak amplitude level.

TEST SETUP



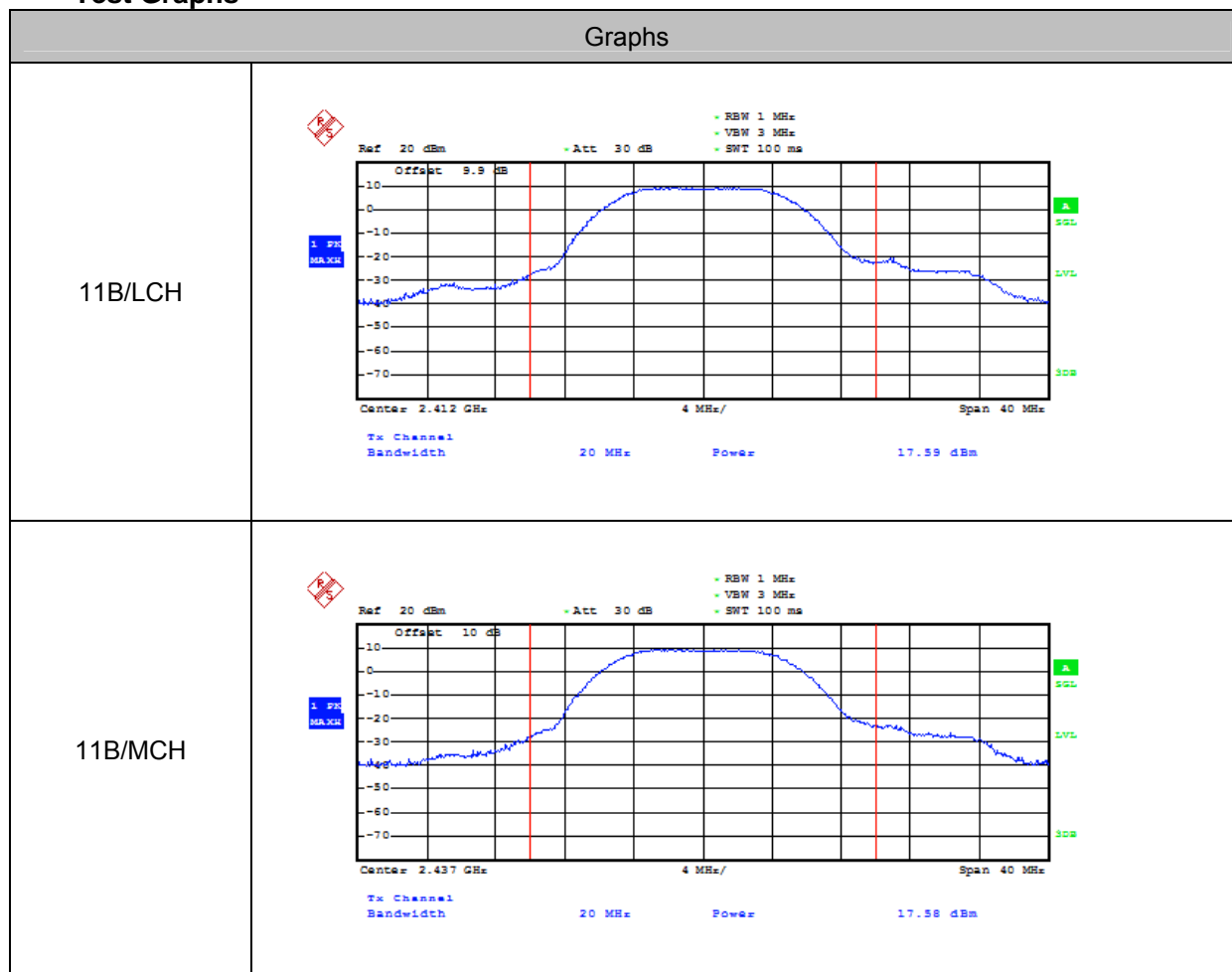
TEST CONDITIONS

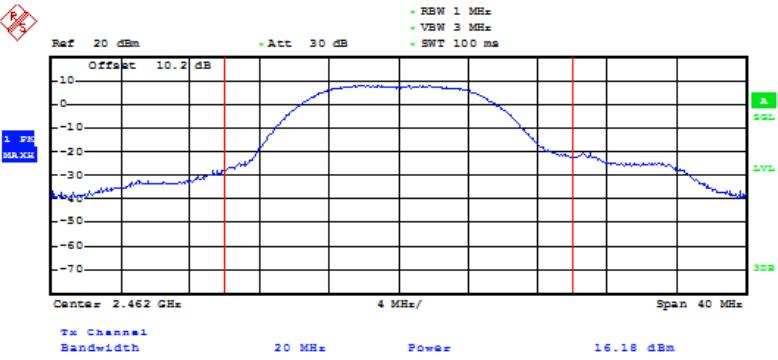
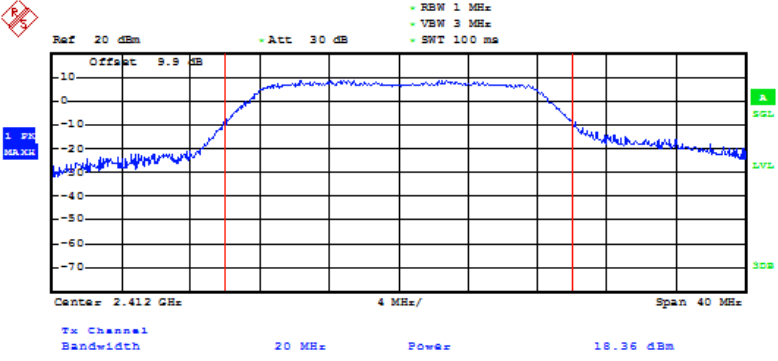
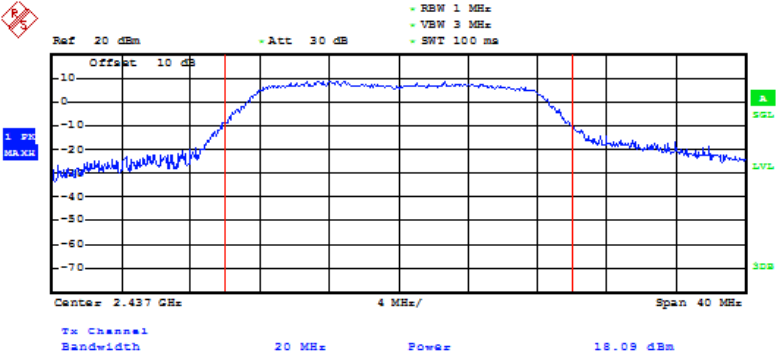
Temperature: 26.6°C
Relative Humidity: 58%
Test Voltage: DC 5V

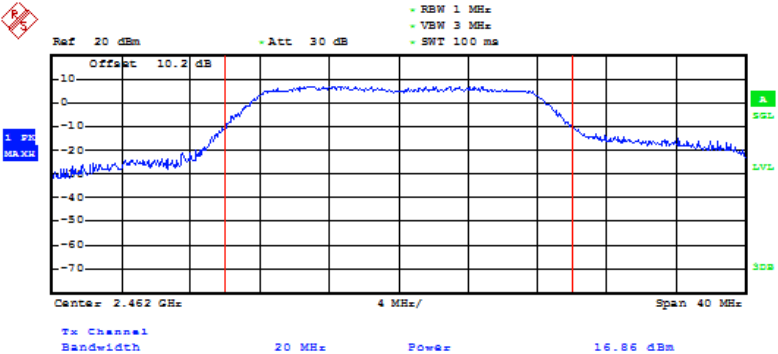
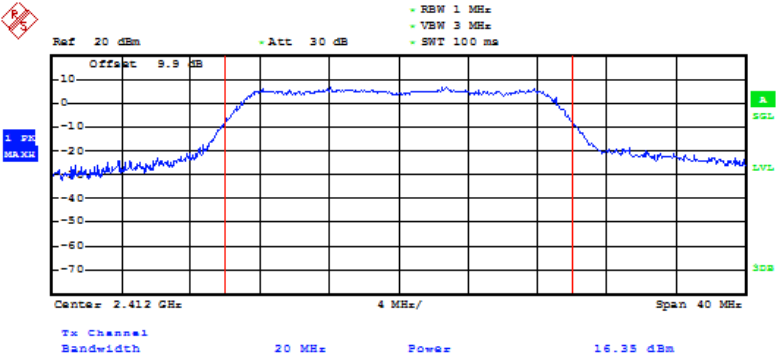
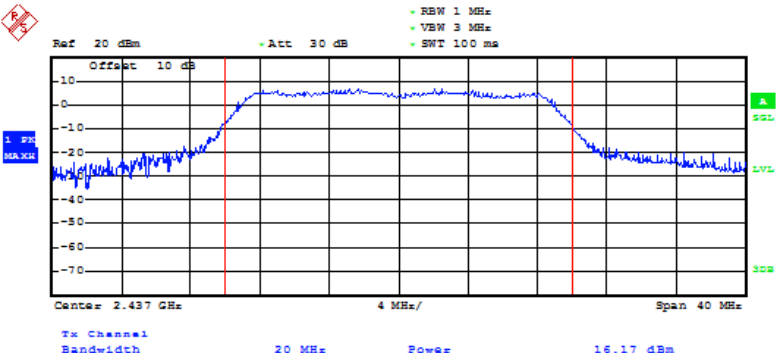
RESULTS

Mode	Channel	Peak.Power [dBm]	Verdict
11B	LCH	17.59	PASS
11B	MCH	17.58	PASS
11B	HCH	16.18	PASS
11G	LCH	18.36	PASS
11G	MCH	18.09	PASS
11G	HCH	16.86	PASS
11N20SISO	LCH	16.35	PASS
11N20SISO	MCH	16.17	PASS
11N20SISO	HCH	14.89	PASS

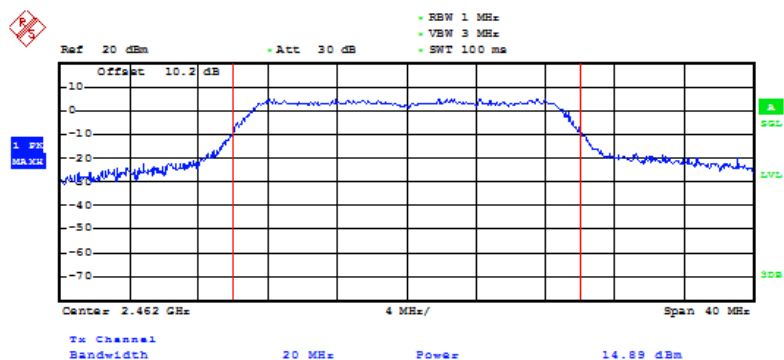
Test Graphs



11B/HCH	 <p>Ref 20 dBm - Att 30 dB RBW 1 MHz VSW 3 MHz SWT 100 ms</p> <p>Offset 10.2 dB</p> <p>Center 2.462 GHz 4 MHz/ Span 40 MHz</p> <p>Tx Channel Bandwidth 20 MHz Power 16.18 dBm</p>
11G/LCH	 <p>Ref 20 dBm - Att 30 dB RBW 1 MHz VSW 3 MHz SWT 100 ms</p> <p>Offset 9.9 dB</p> <p>Center 2.412 GHz 4 MHz/ Span 40 MHz</p> <p>Tx Channel Bandwidth 20 MHz Power 18.36 dBm</p>
11G/MCH	 <p>Ref 20 dBm - Att 30 dB RBW 1 MHz VSW 3 MHz SWT 100 ms</p> <p>Offset 10 dB</p> <p>Center 2.437 GHz 4 MHz/ Span 40 MHz</p> <p>Tx Channel Bandwidth 20 MHz Power 18.09 dBm</p>

11G/HCH	 <p>Ref 20 dBm - Att 30 dB</p> <p>Offset 10.2 dB</p> <p>Center 2.462 GHz 4 MHz/ Span 40 MHz</p> <p>Tx Channel Bandwidth 20 MHz Power 16.86 dBm</p>
11N20SISO/LCH	 <p>Ref 20 dBm - Att 30 dB</p> <p>Offset 9.9 dB</p> <p>Center 2.412 GHz 4 MHz/ Span 40 MHz</p> <p>Tx Channel Bandwidth 20 MHz Power 16.35 dBm</p>
11N20SISO/MCH	 <p>Ref 20 dBm - Att 30 dB</p> <p>Offset 10 dB</p> <p>Center 2.437 GHz 4 MHz/ Span 40 MHz</p> <p>Tx Channel Bandwidth 20 MHz Power 16.17 dBm</p>

11N20SISO/HCH



7.3. POWER SPECTRAL DENSITY

LIMITS

FCC Part15 (15.247) , Subpart C IC RSS-247 ISSUE 1			
Section	Test Item	Limit	Frequency Range (MHz)
FCC §15.247 (e) IC RSS-247 5.2 (2)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5

TEST PROCEDURE

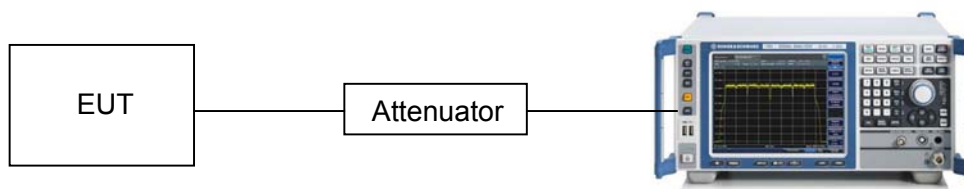
Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SETUP



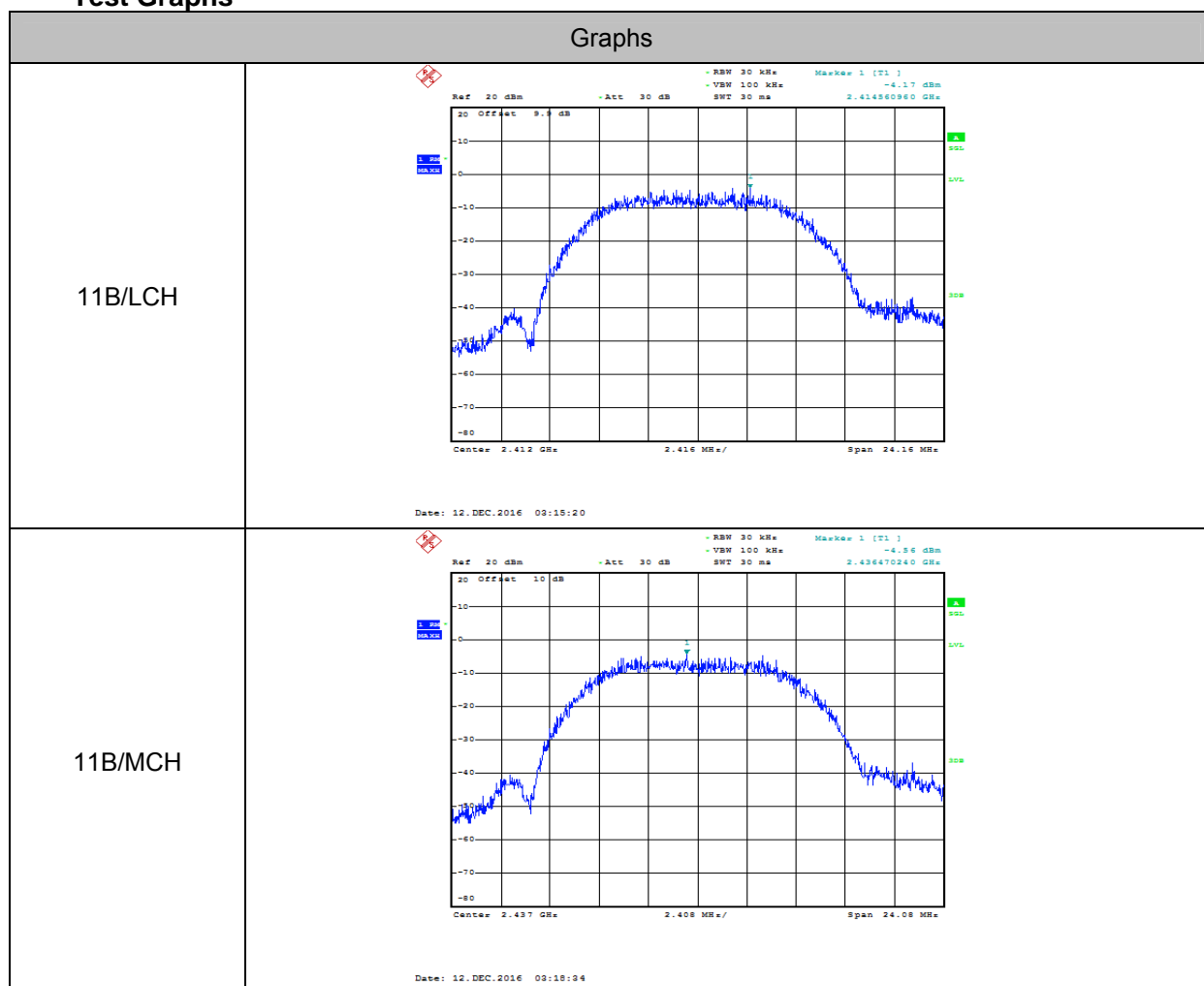
TEST CONDITIONS

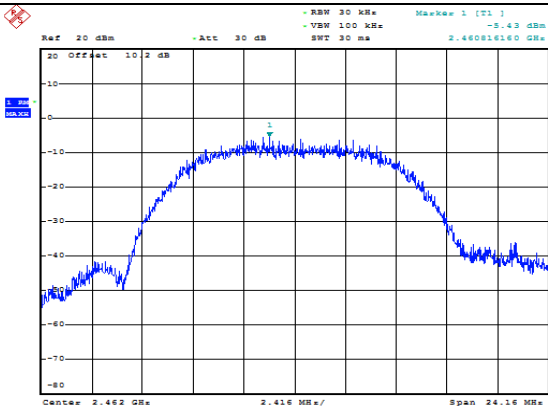
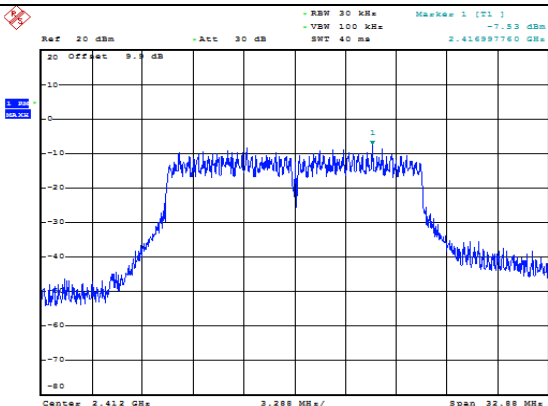
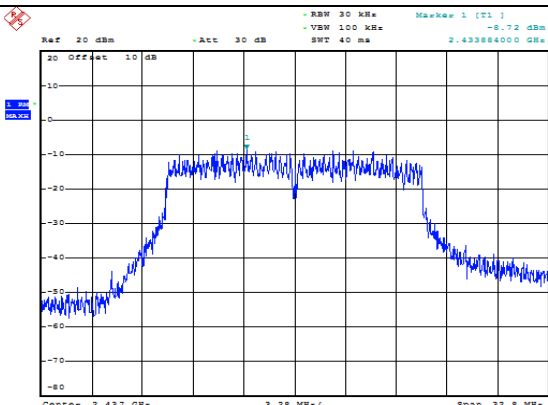
Temperature: 27°C
Relative Humidity: 60%
Test Voltage: DC 5V

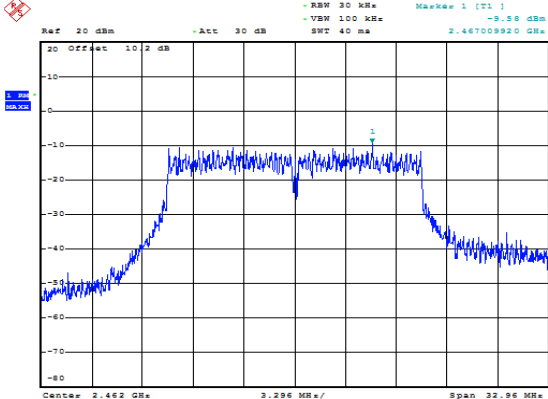
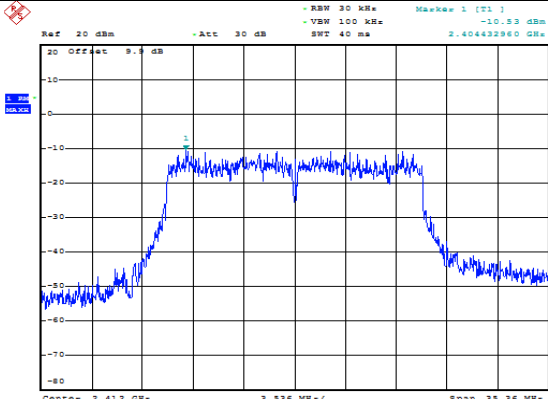
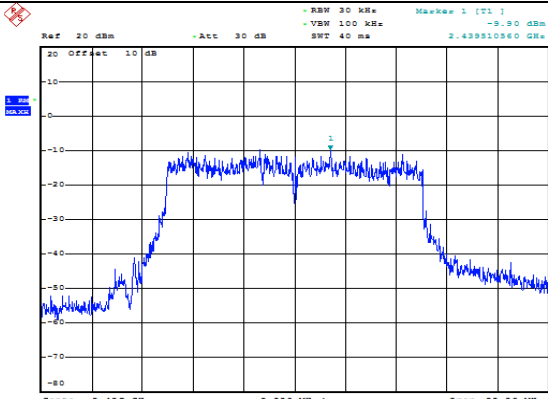
RESULTS

Mode	Channel	Meas.Level [dBm]	Verdict
11B	LCH	-4.170	PASS
11B	MCH	-4.560	PASS
11B	HCH	-5.430	PASS
11G	LCH	-7.530	PASS
11G	MCH	-8.720	PASS
11G	HCH	-9.580	PASS
11N20SISO	LCH	-10.530	PASS
11N20SISO	MCH	-9.900	PASS
11N20SISO	HCH	-11.880	PASS

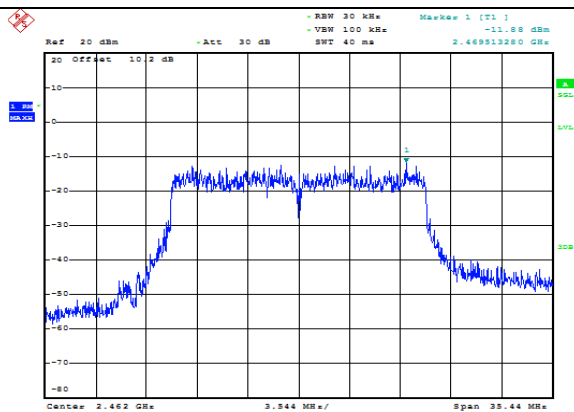
Test Graphs



11B/HCH	 <p>Date: 12.DEC.2016 09:21:58</p>
11G/LCH	 <p>Date: 12.DEC.2016 09:25:08</p>
11G/MCH	 <p>Date: 12.DEC.2016 09:25:24</p>

11G/HCH	 <p>Ref 20 dBm - Att 30 dB - RBW 30 KHz - VBW 100 KHz - SWF 40 ms - Marker 1 (T1) -9.58 dBm - 2.467009920 GHz</p> <p>20 Offset 10.2 dB</p> <p>Center 2.462 GHz 3.296 MHz/ Span 32.96 MHz</p> <p>Date: 12.DEC.2016 09:31:51</p>
11N20SISO/LCH	 <p>Ref 20 dBm - Att 30 dB - RBW 30 KHz - VBW 100 KHz - SWF 40 ms - Marker 1 (T1) -10.53 dBm - 2.404432960 GHz</p> <p>20 Offset 9.4 dB</p> <p>Center 2.412 GHz 3.336 MHz/ Span 33.36 MHz</p> <p>Date: 12.DEC.2016 09:37:18</p>
11N20SISO/MCH	 <p>Ref 20 dBm - Att 30 dB - RBW 30 KHz - VBW 100 KHz - SWF 40 ms - Marker 1 (T1) -9.80 dBm - 2.439310960 GHz</p> <p>20 Offset 10 dB</p> <p>Center 2.437 GHz 3.336 MHz/ Span 33.36 MHz</p> <p>Date: 12.DEC.2016 04:10:08</p>

11N20SISO/HCH



Date: 12.DEC.2016 04:12:45

7.4. CONDUCTED BANDEGE

LIMITS

FCC Part15 (15.247) , Subpart C IC RSS-247 ISSUE 1		
Section	Test Item	Limit
FCC §15.247 (d) IC RSS-247 5.5	Conducted Bandedge and Spurious Emissions	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

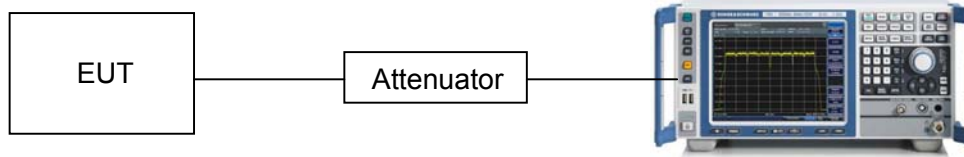
Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum PSD level.

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.

TEST SETUP

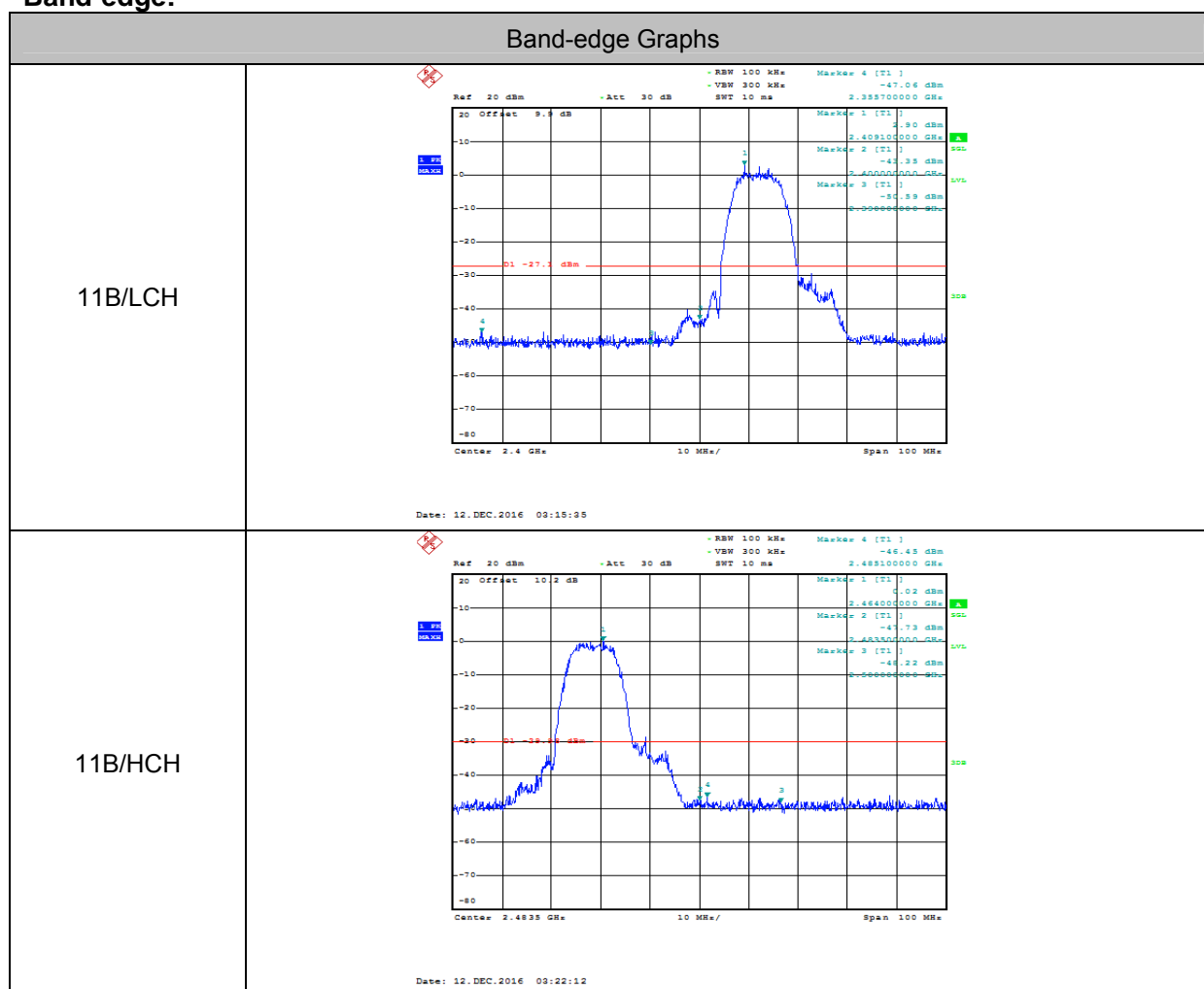


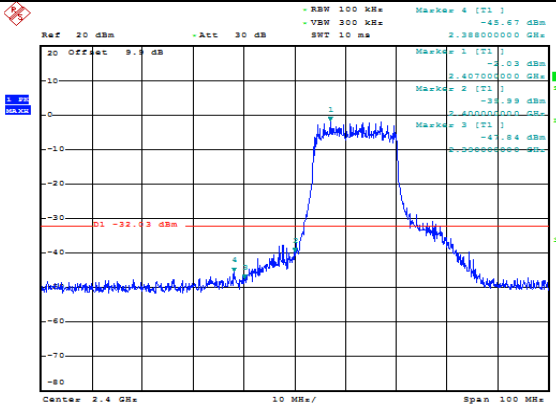
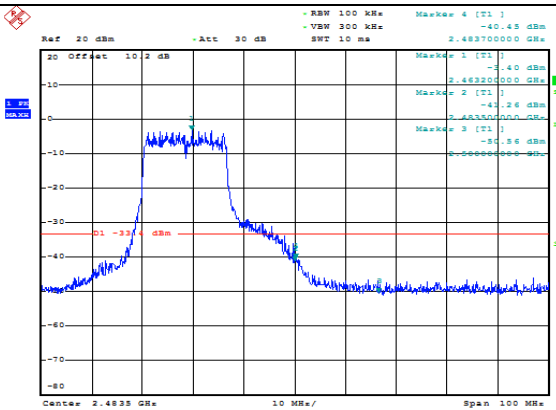
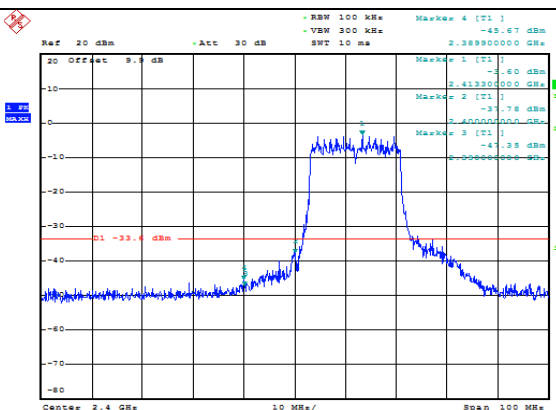
TEST CONDITIONS

Temperature: 27°C
Relative Humidity: 60%
Test Voltage: DC 5V

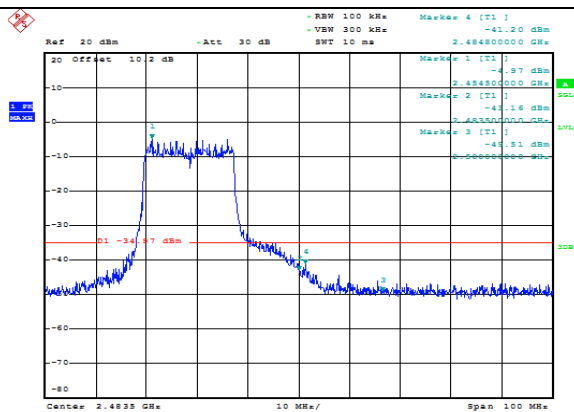
RESULTS

Band-edge:



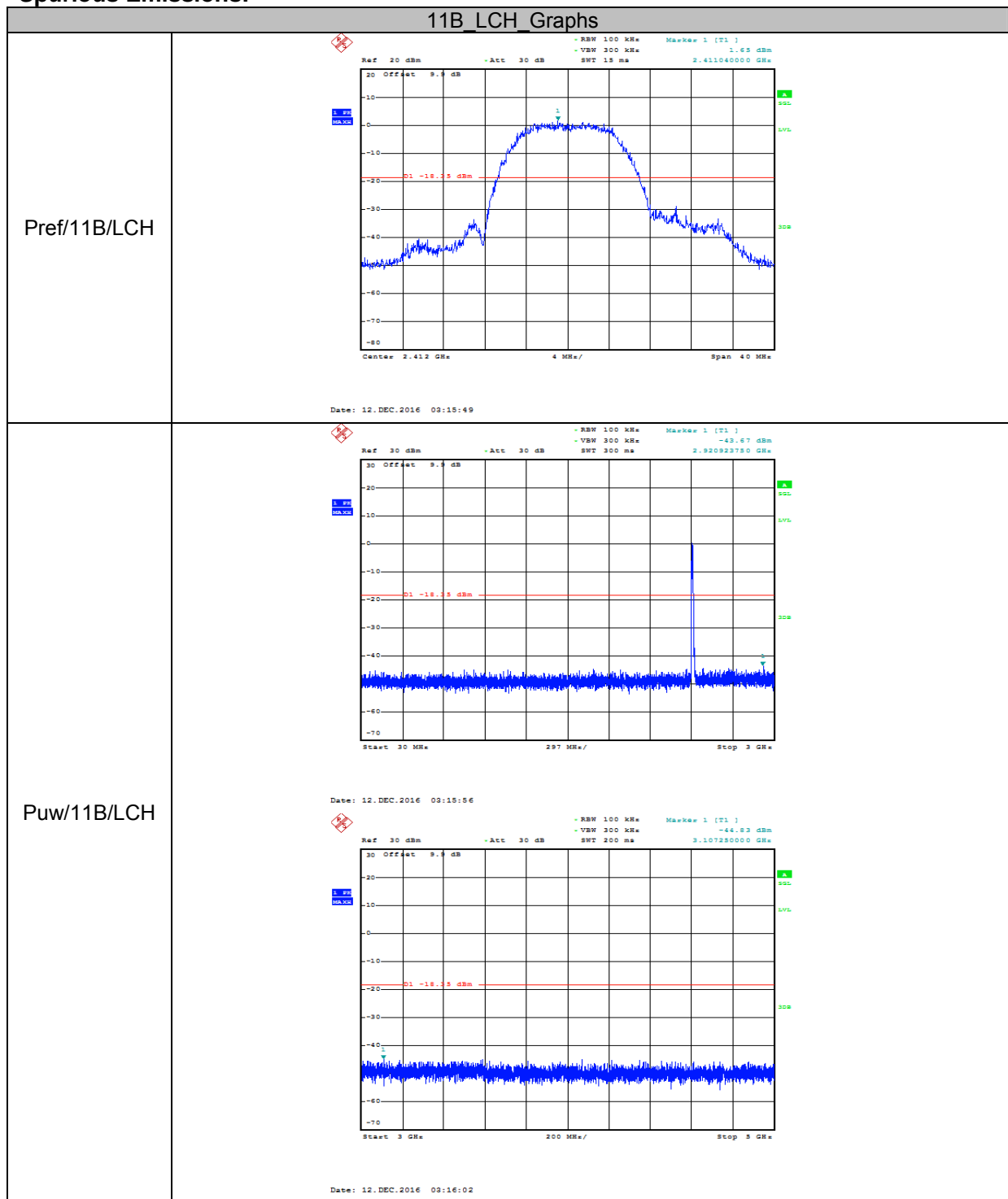
11G/LCH	 <p>Date: 12.DEC.2016 09:25:23</p>
11G/HCH	 <p>Date: 12.DEC.2016 09:32:05</p>
11N20SISO/LCH	 <p>Date: 12.DEC.2016 09:37:32</p>

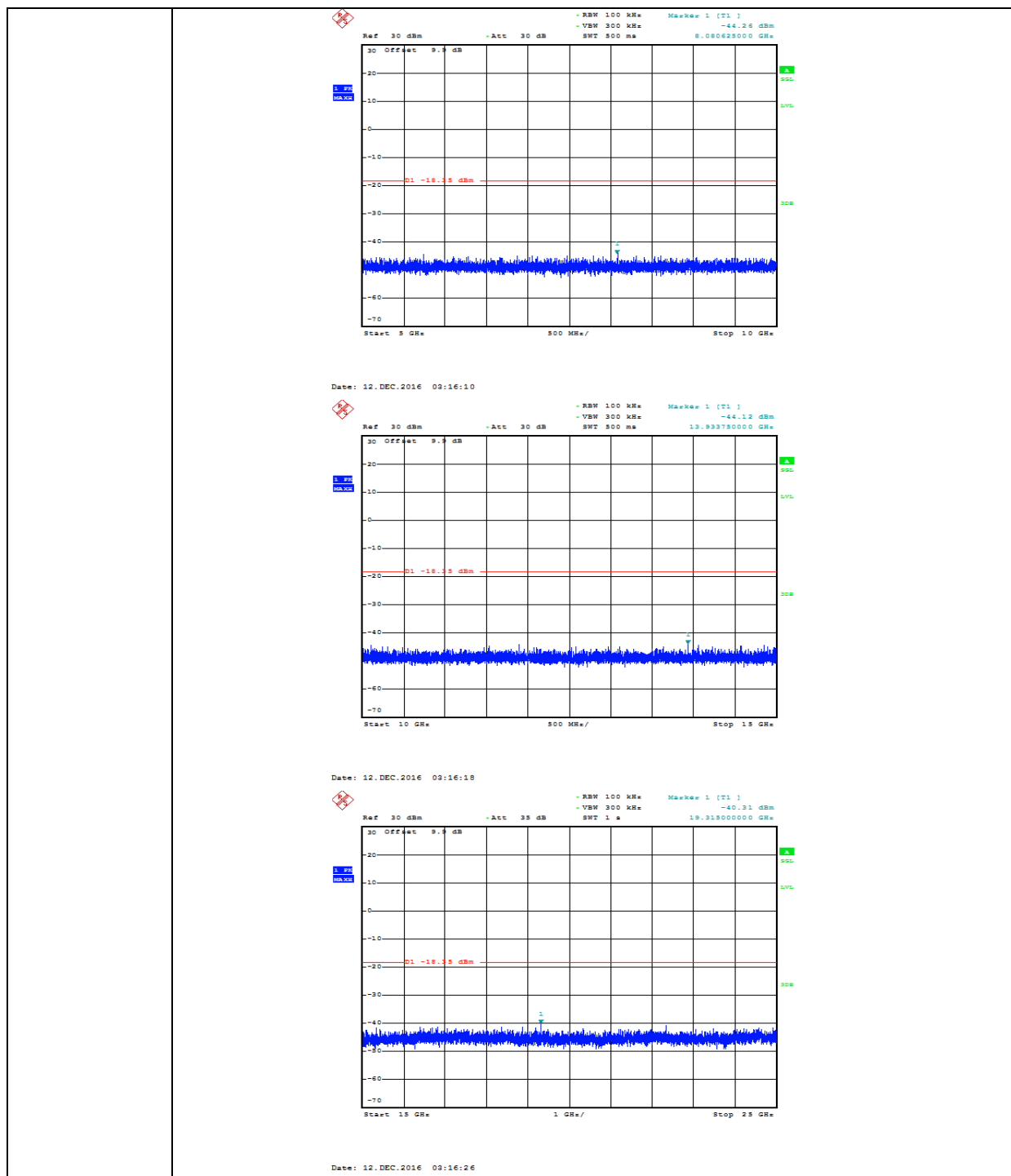
11N20SISO/HCH



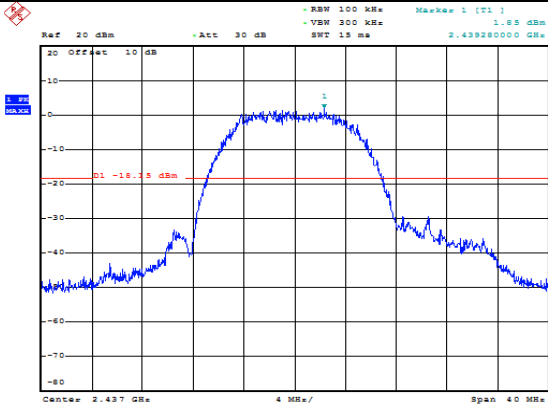
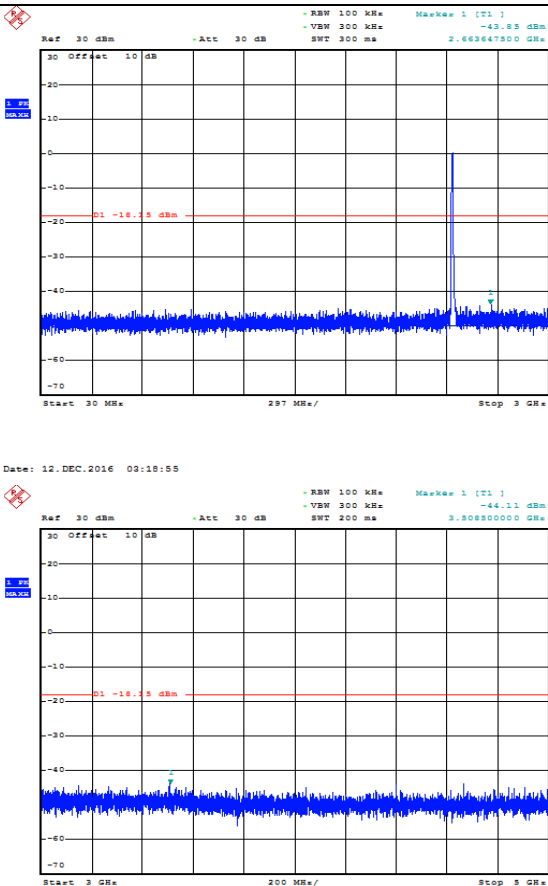
Date: 12.DEC.2016 04:13:00

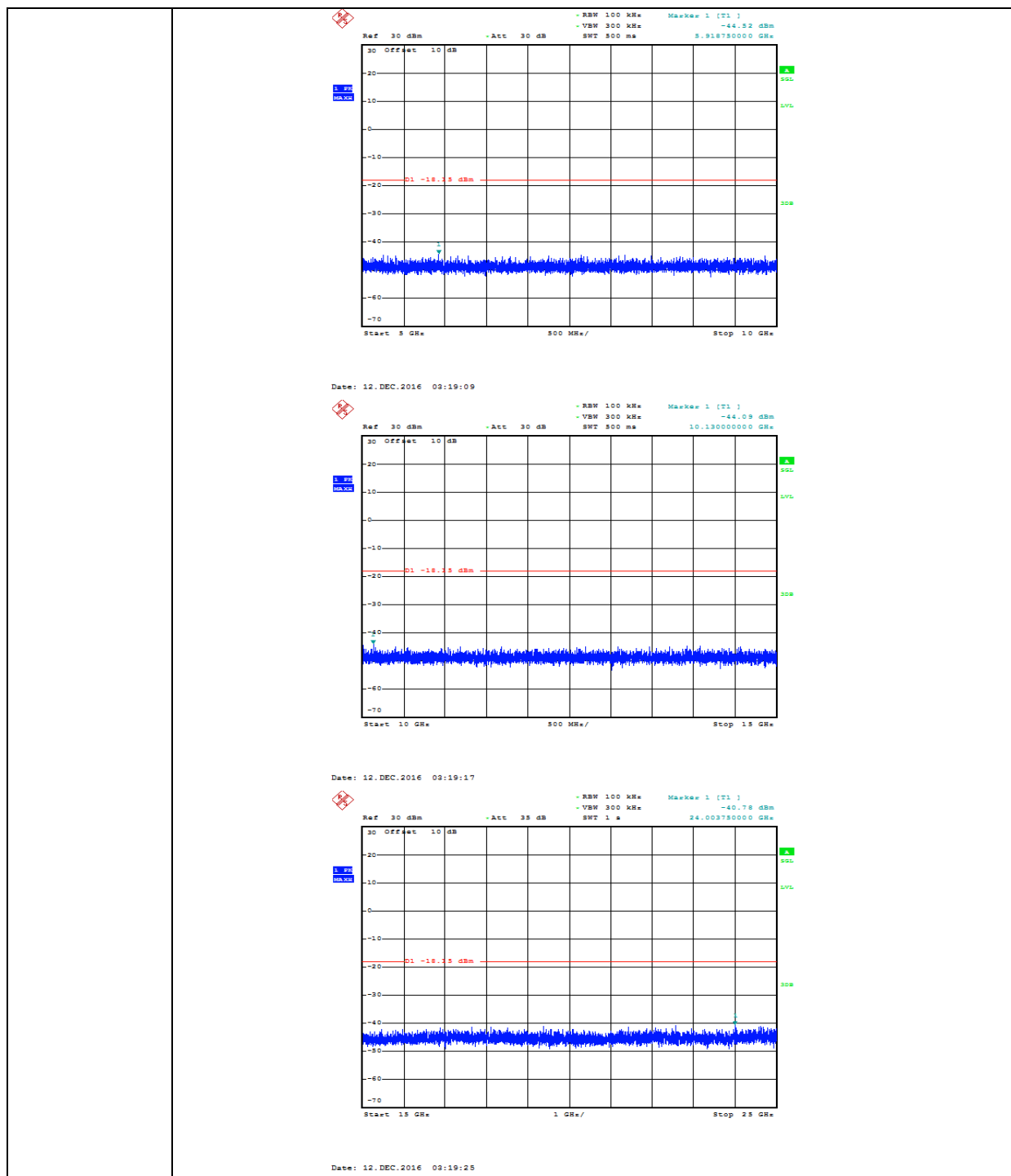
Spurious Emissions:



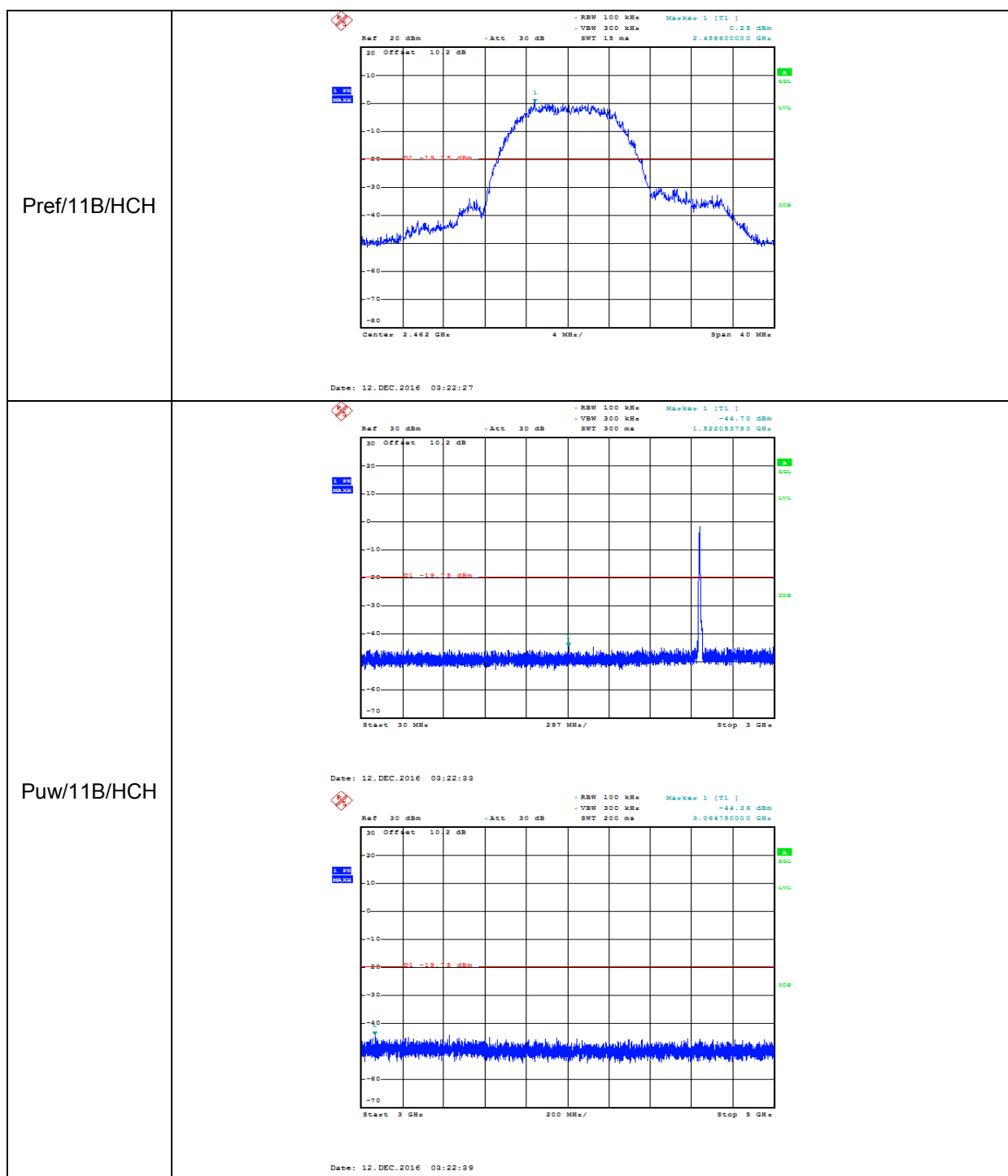


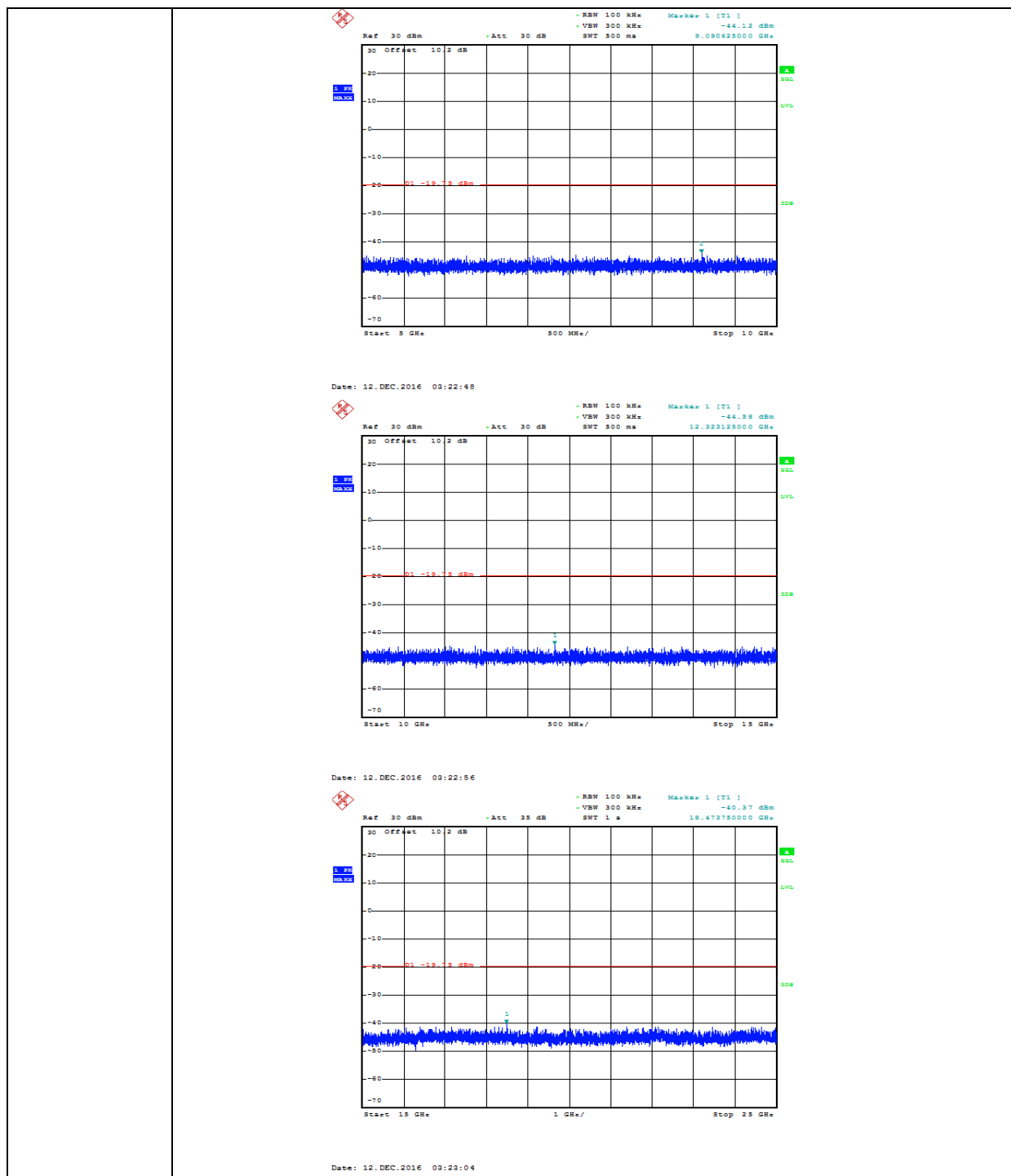
11B_MCH_Graphs

<p>Pref/11B/MCH</p>	 <p>Date: 12.DEC.2016 09:18:48</p>
<p>Puw/11B/MCH</p>	 <p>Date: 12.DEC.2016 09:18:55</p> <p>Date: 12.DEC.2016 09:19:01</p>

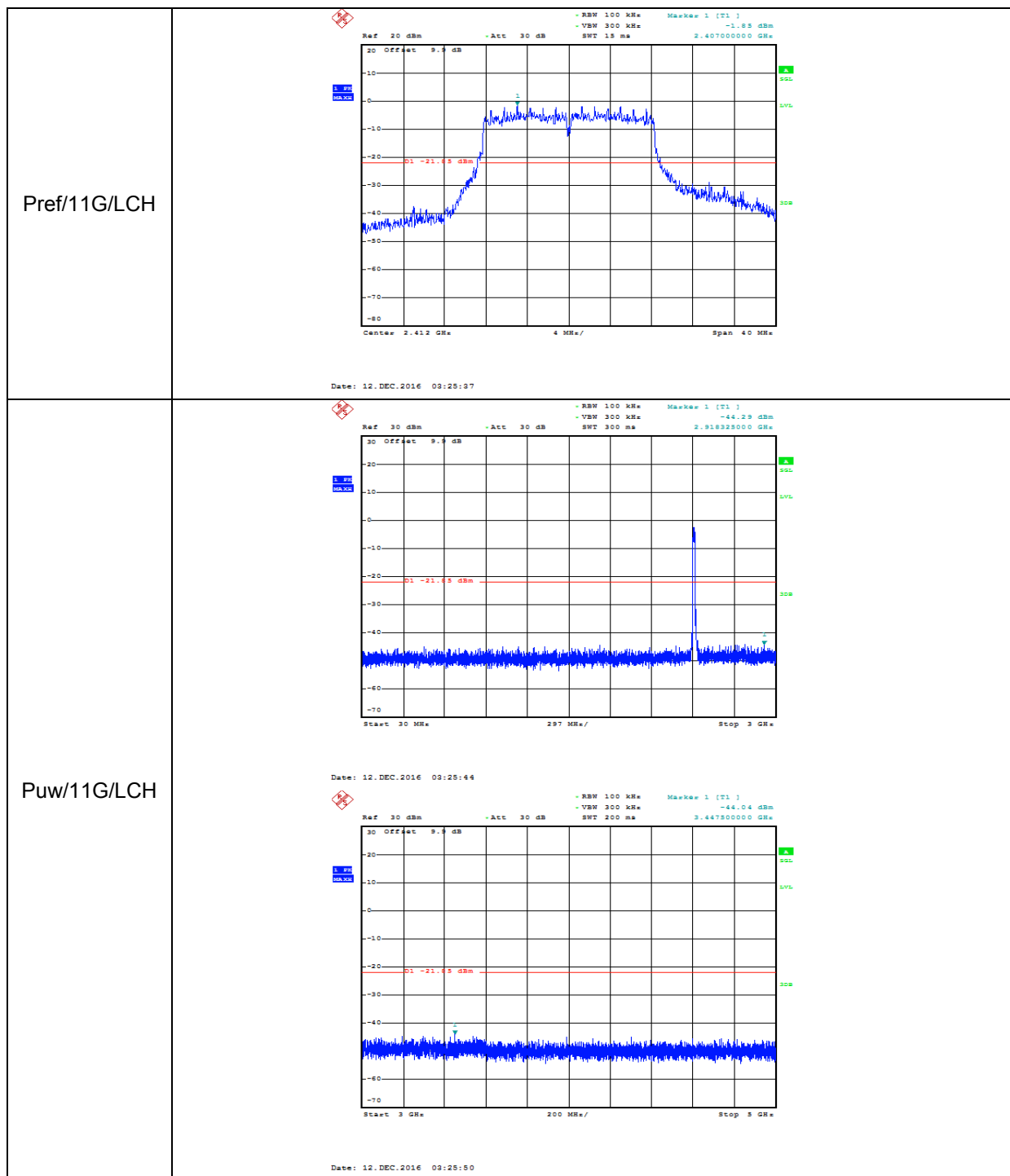


11B_HCH_Graphs



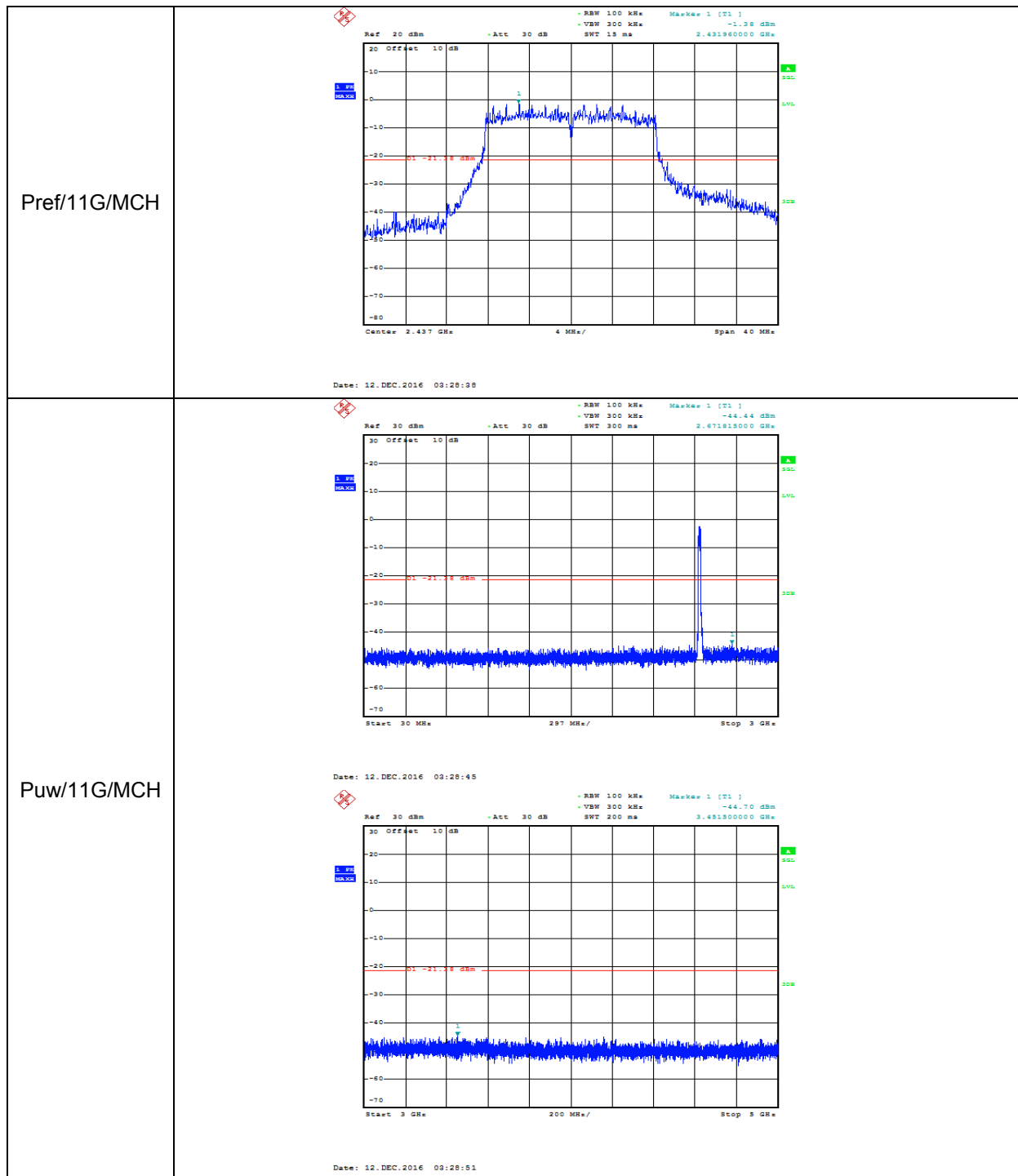


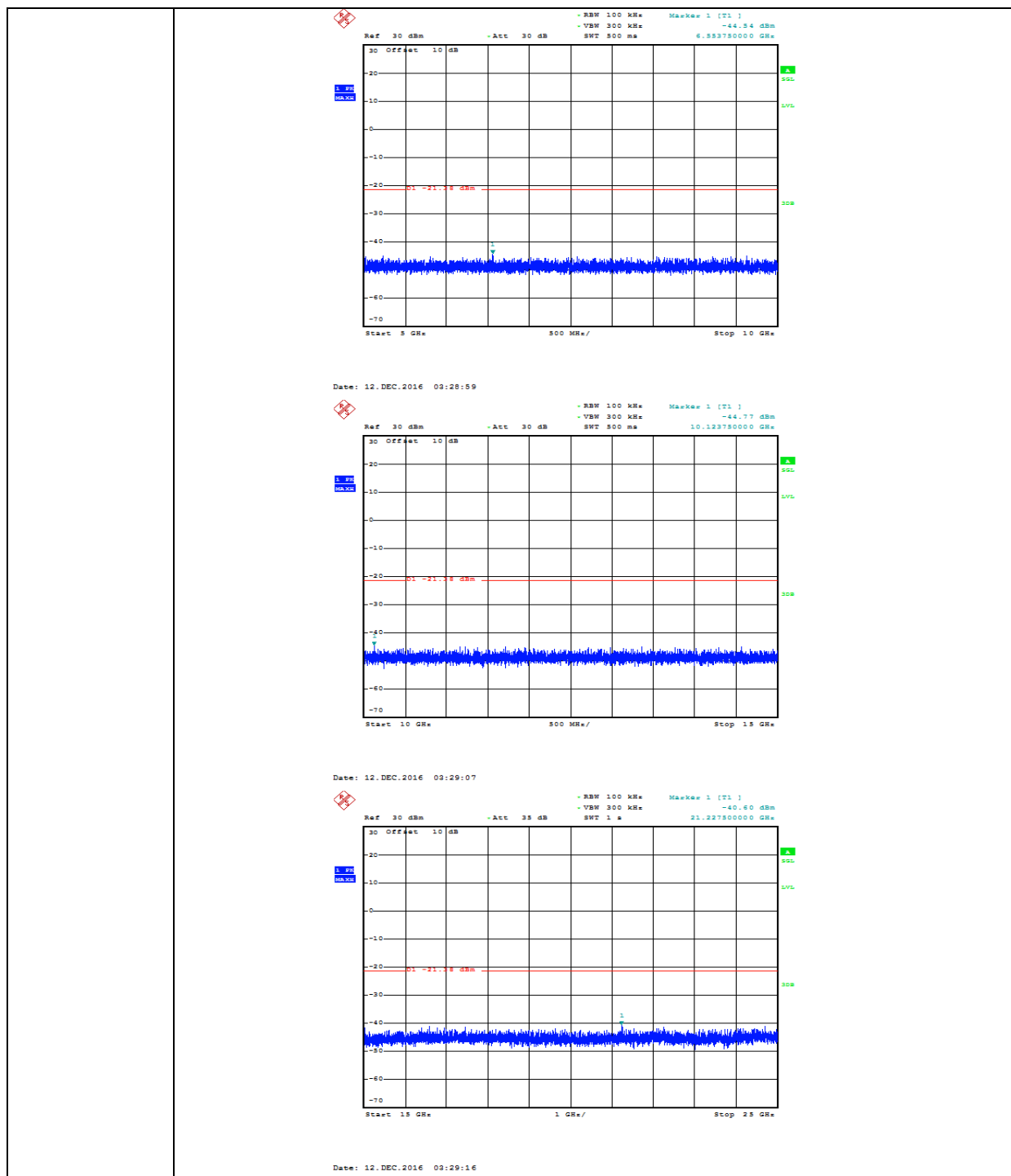
11G_LCH_Graphs



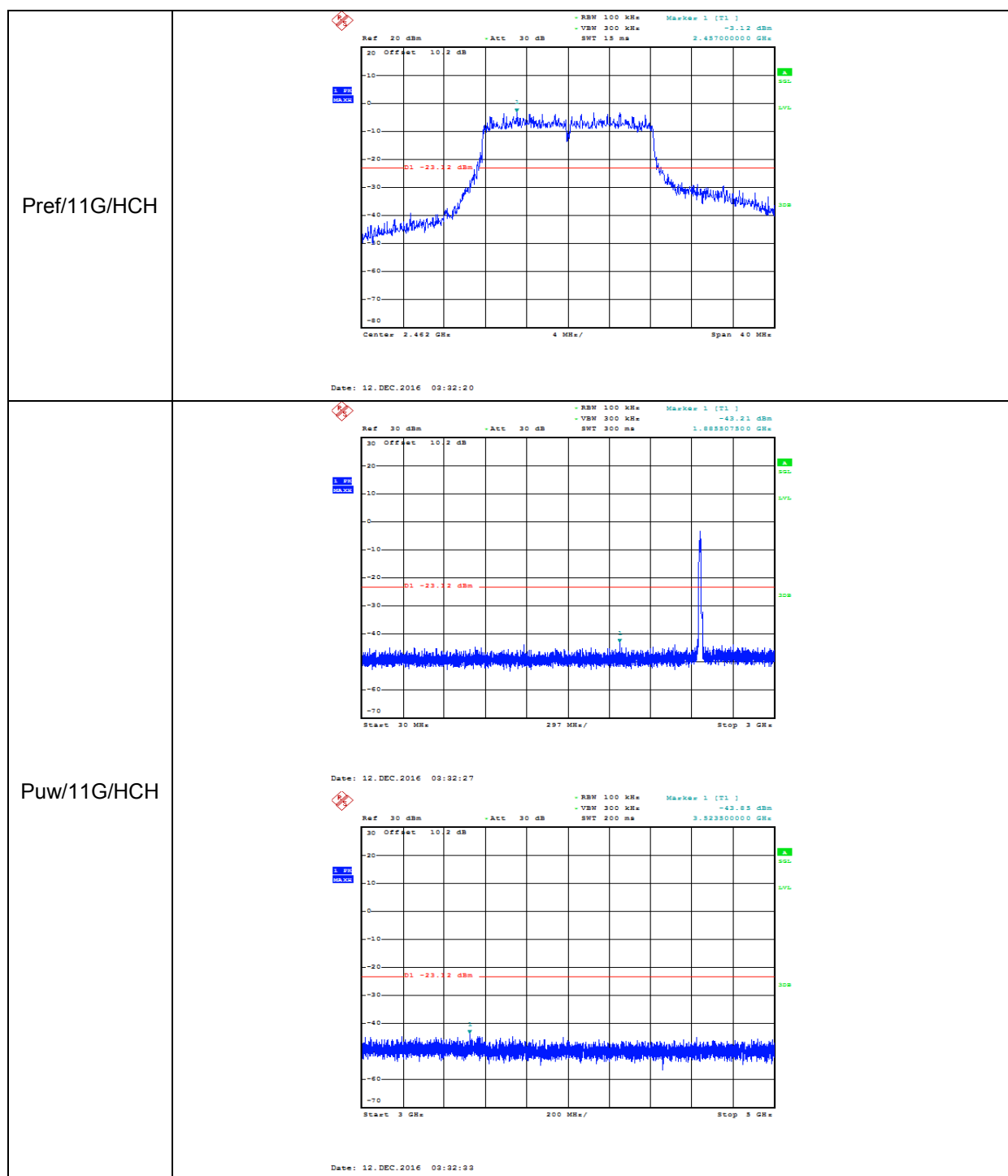


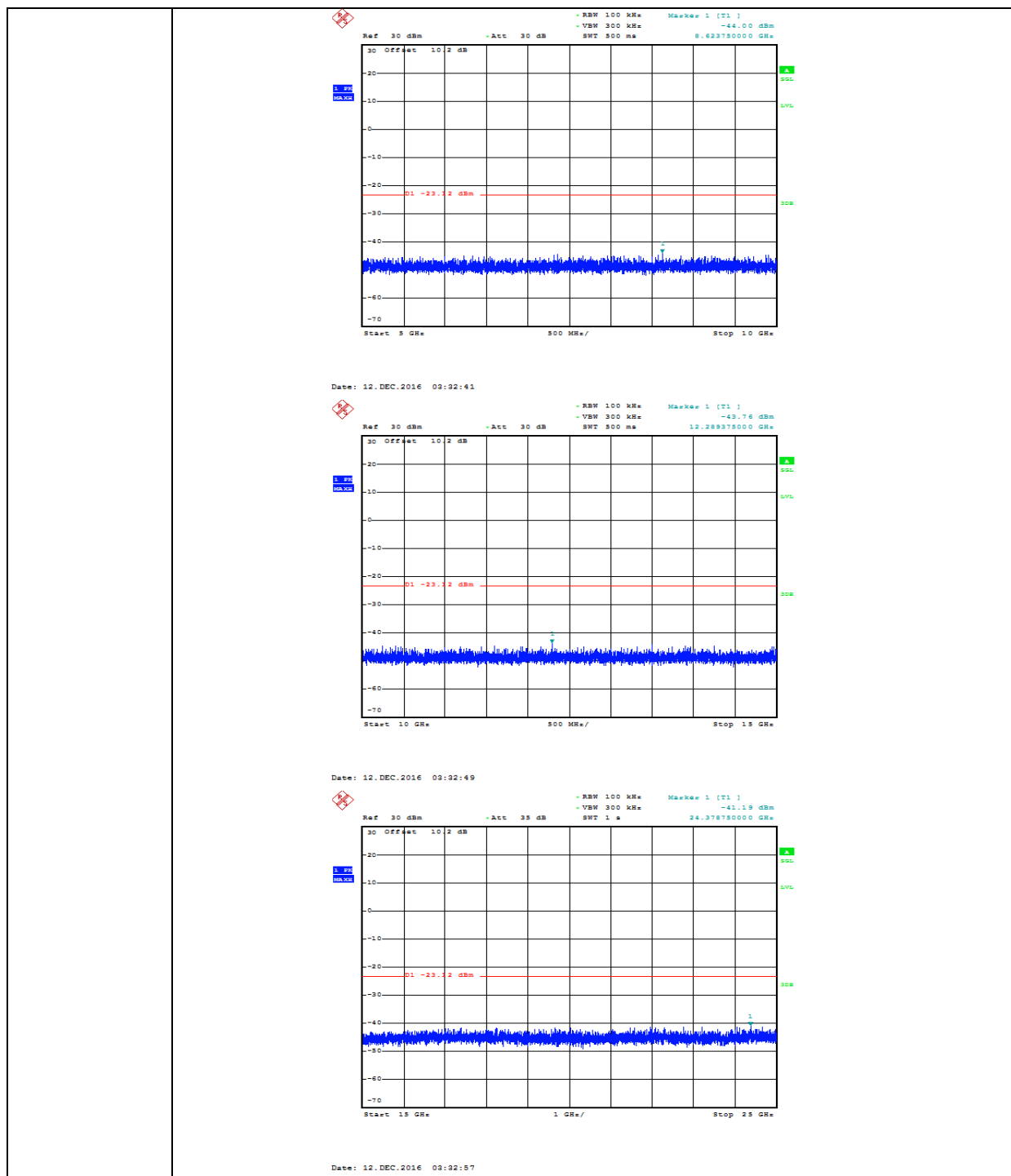
11G_MCH_Graphs



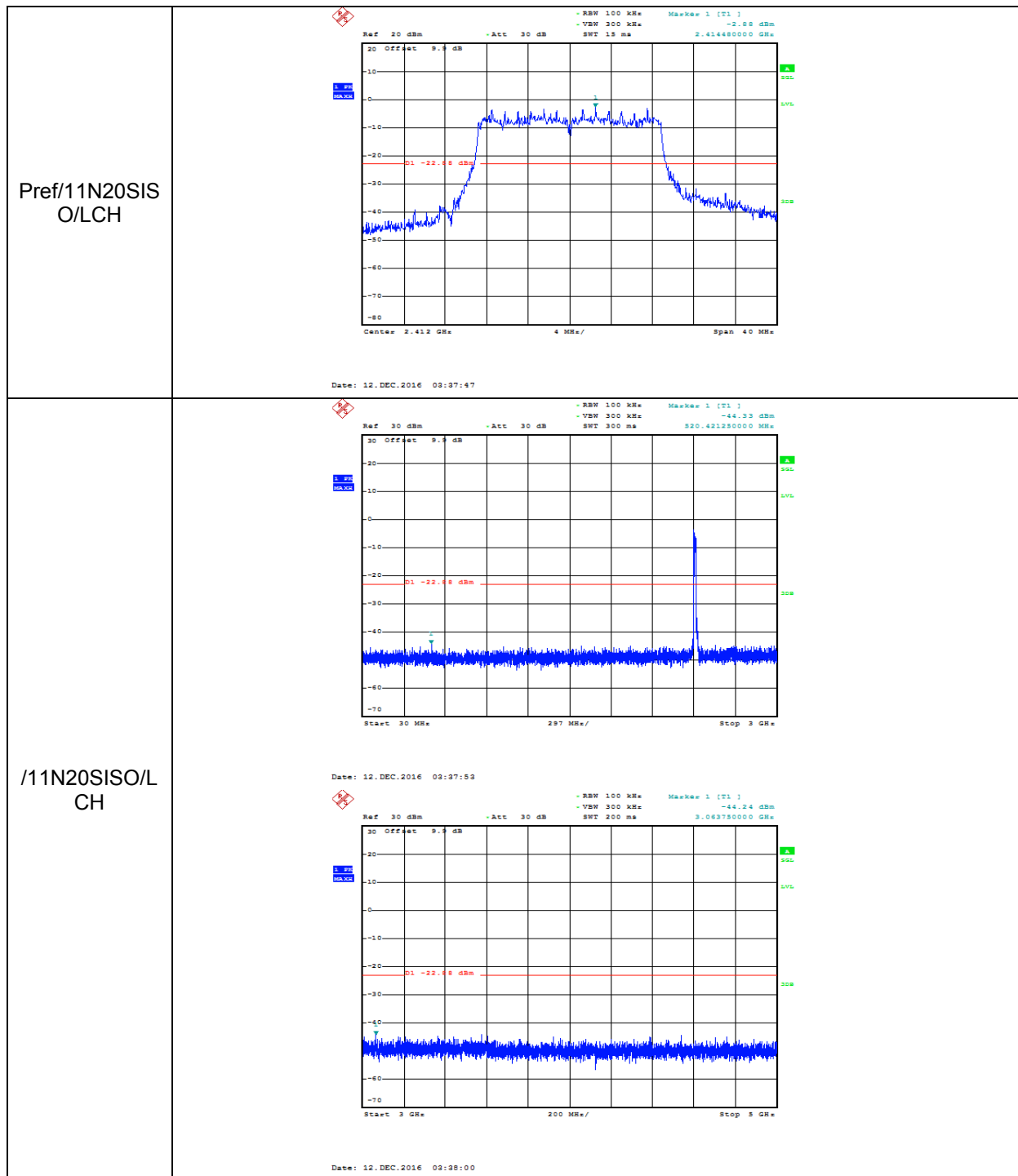


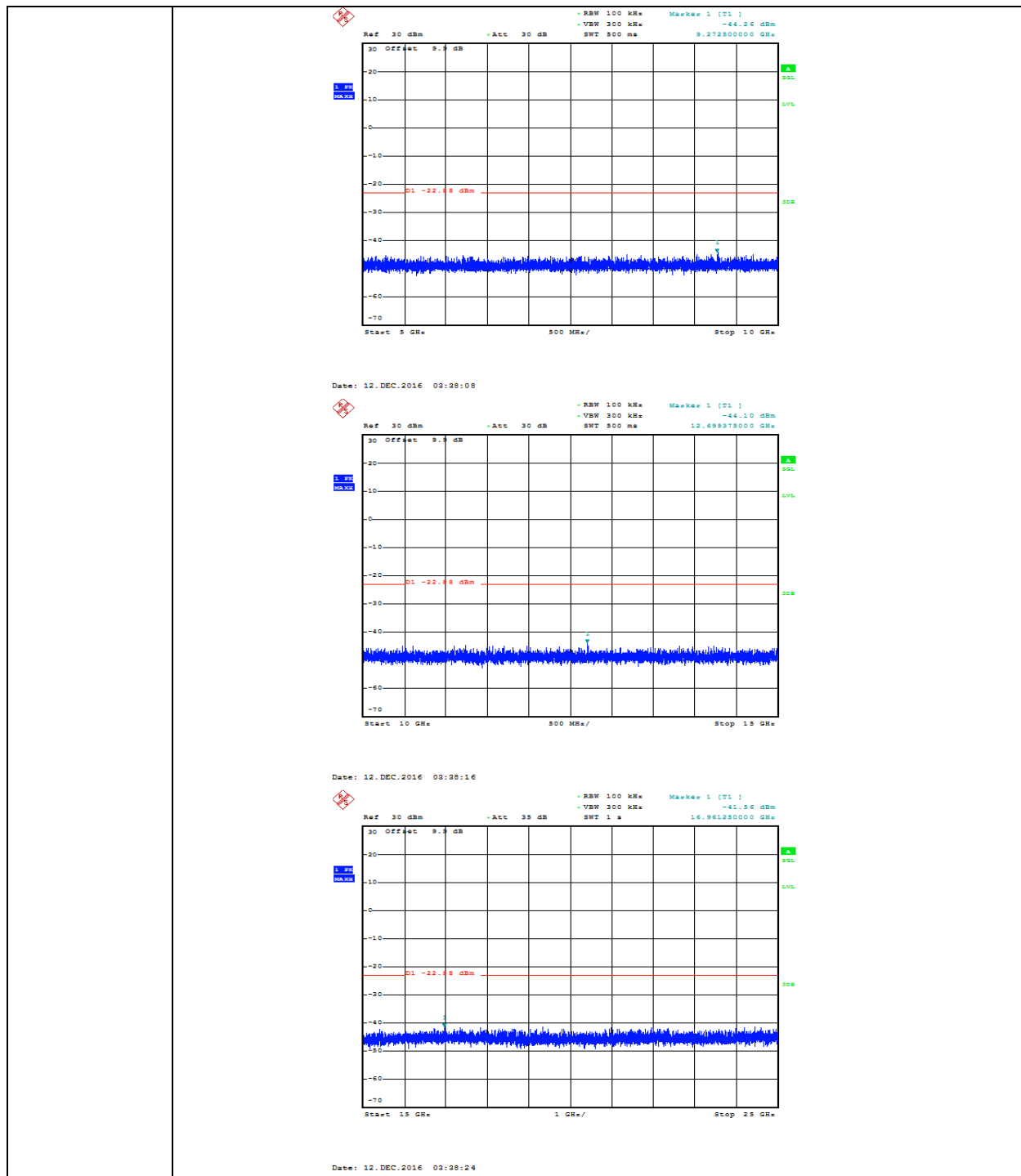
11G_HCH_Graphs



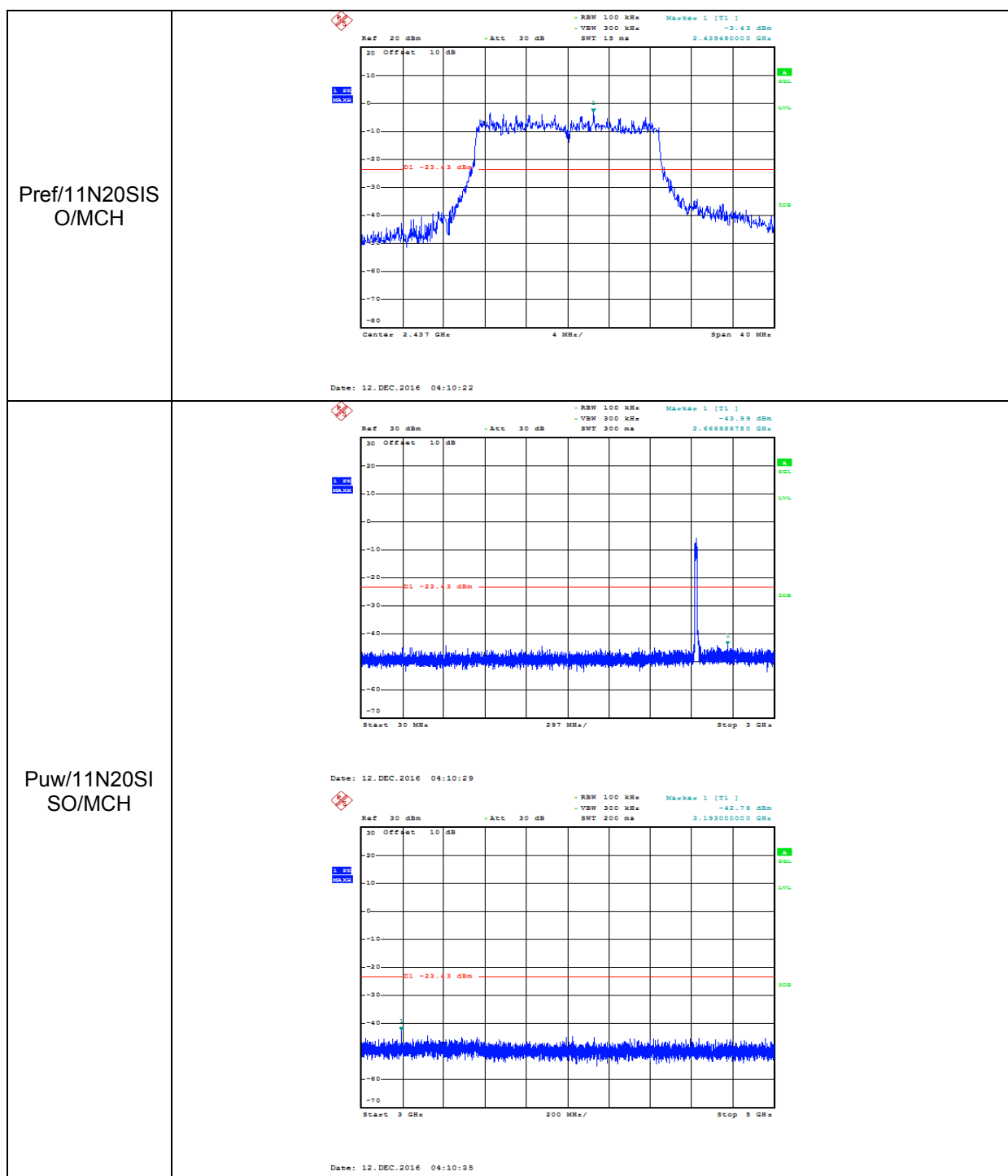


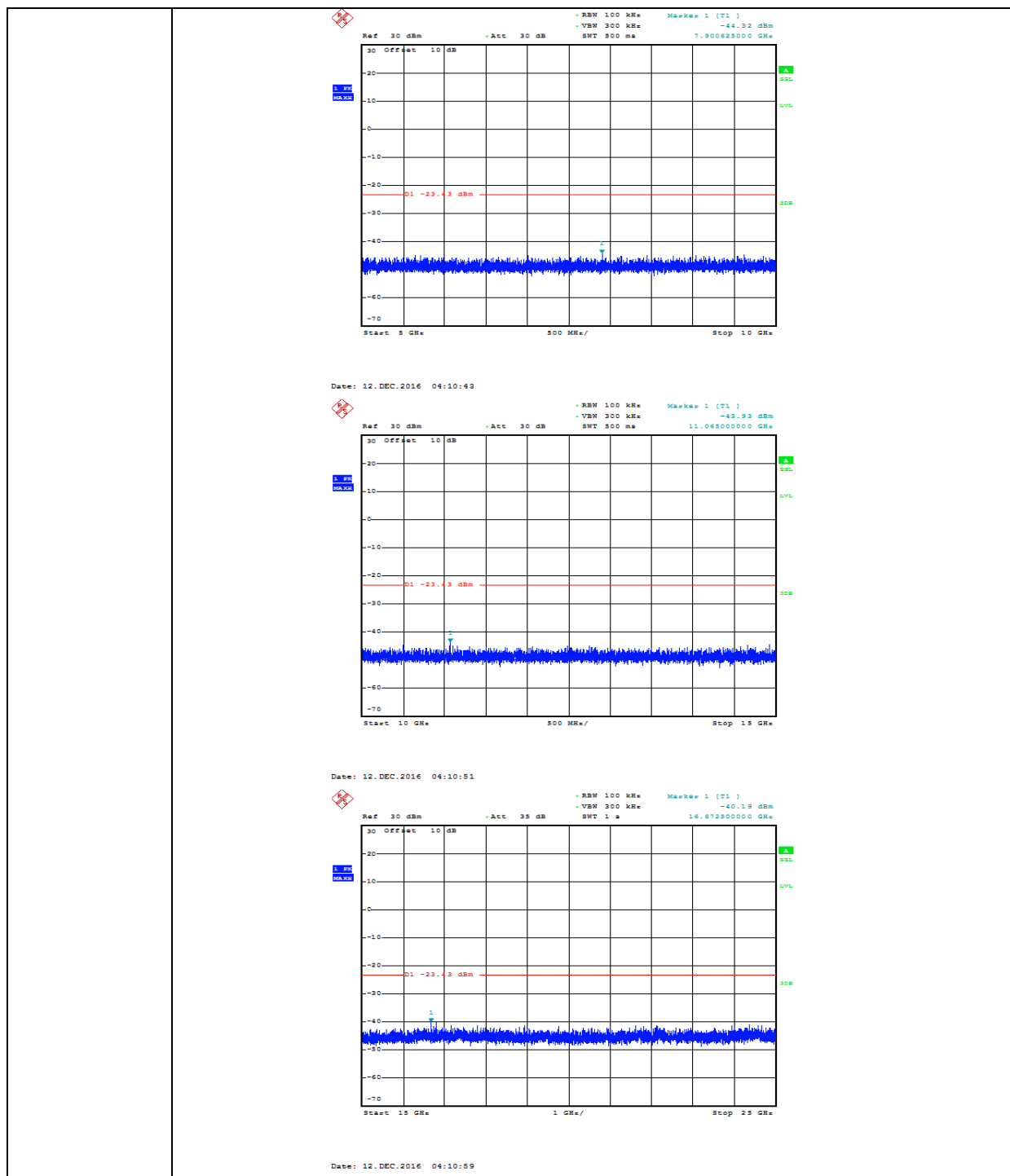
11N20SISO_LCH_Graphs



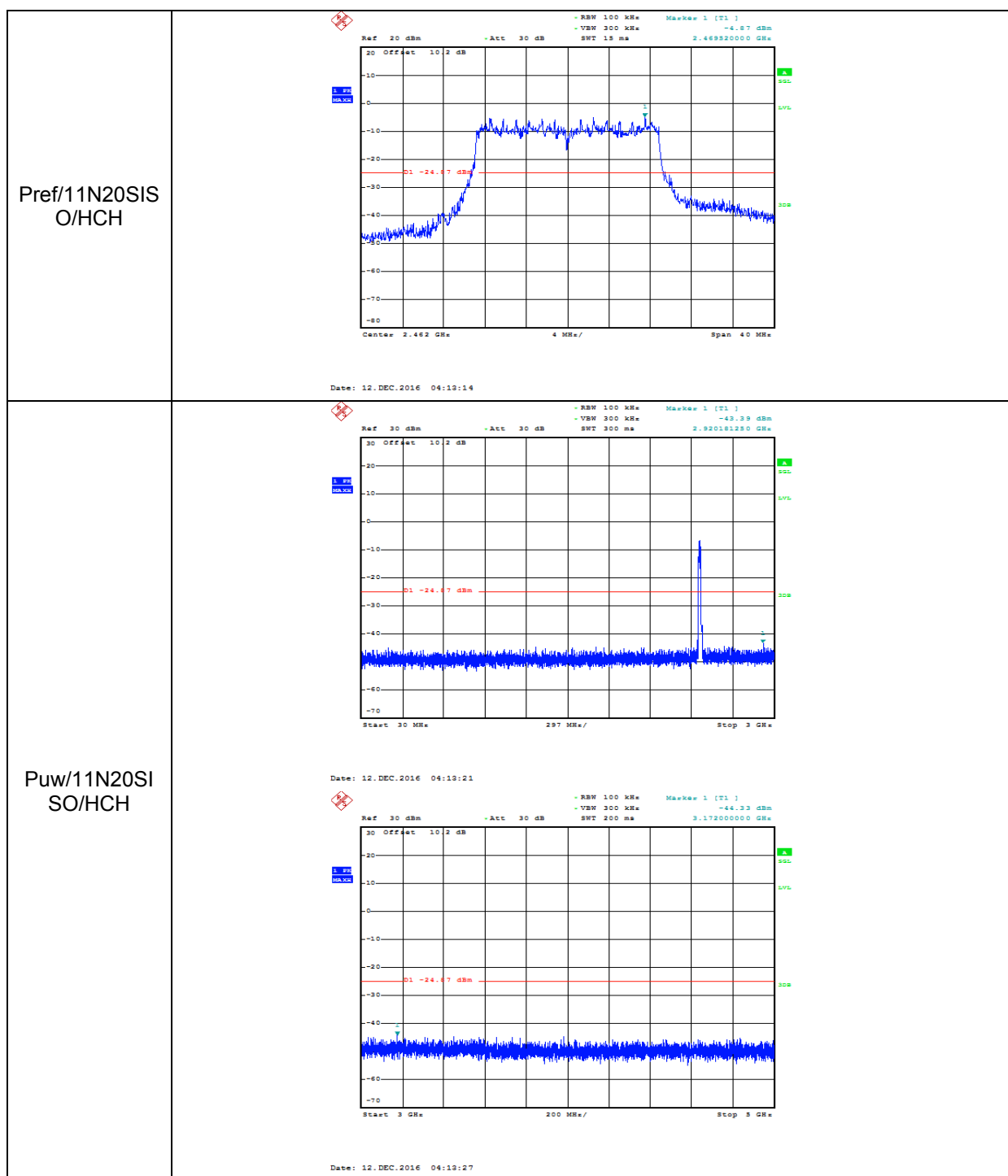


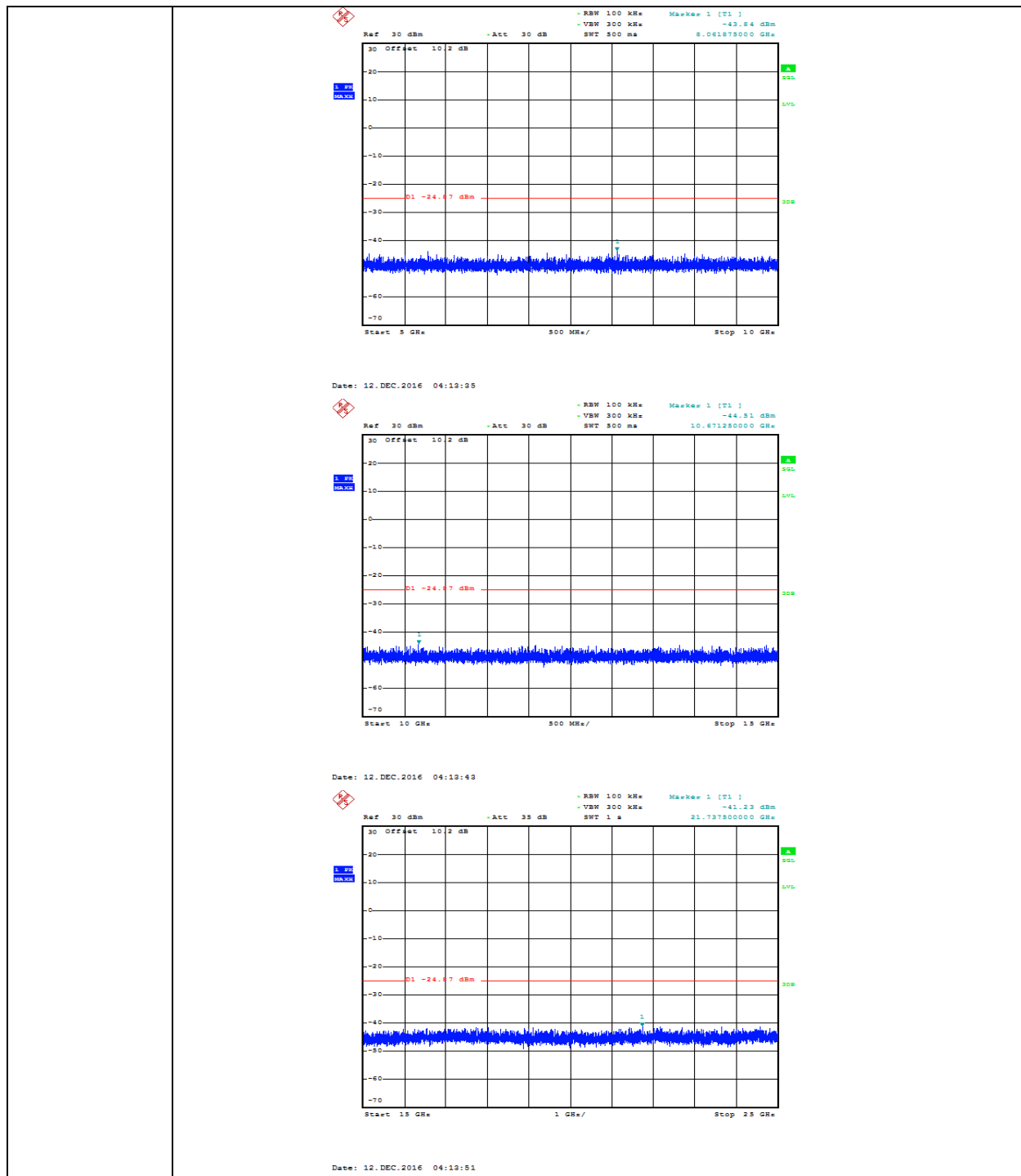
11N20SISO_MCH_Graphs





11N20SISO_HCH_Graphs





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

Please refer to FCC §15.205 and §15.209

Please refer to IC RSS-GEN Clause 8.9 (Transmitter)

Radiation Disturbance Test Limit for FCC (Class B)(9KHz-1GHz)

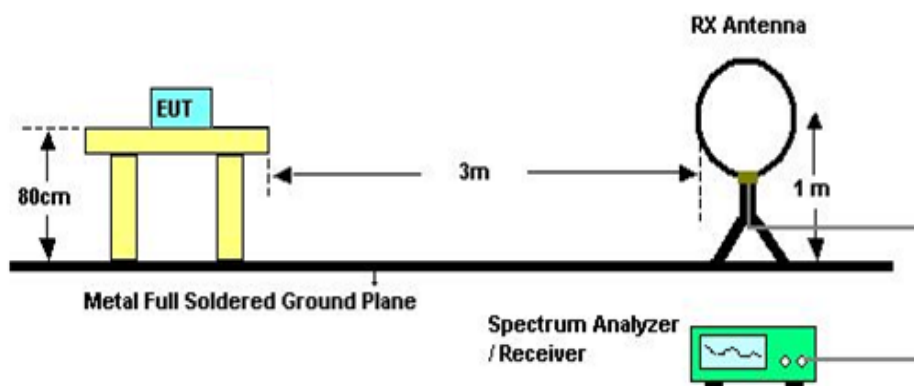
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Radiation Disturbance Test Limit for FCC (Above 1G)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

TEST SETUP AND PROCEDURE

Below 30MHz

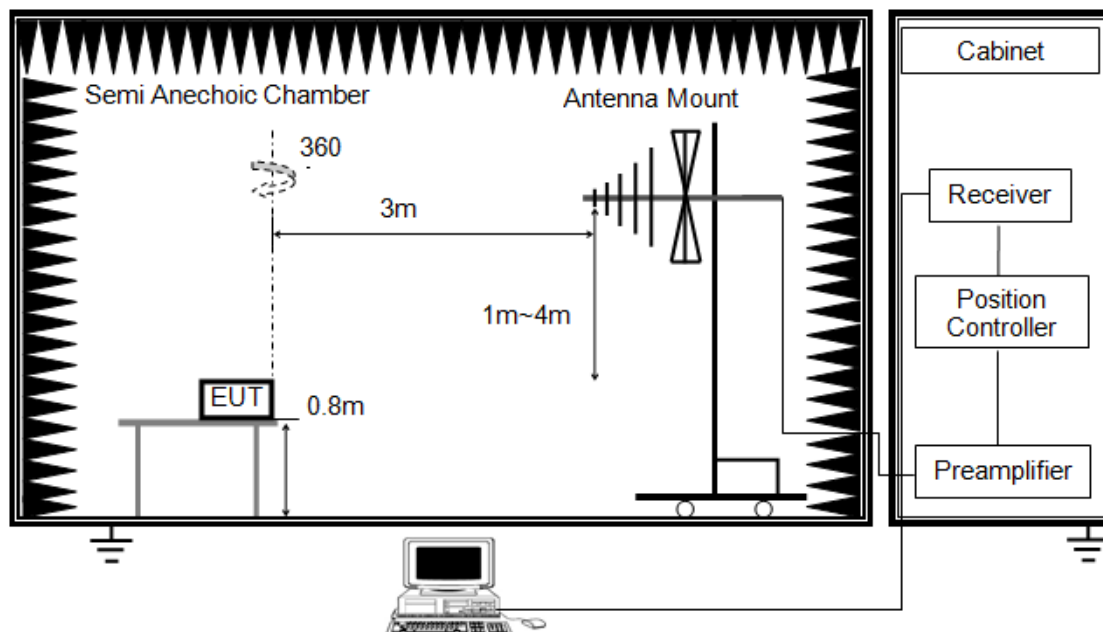


The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

Below 1G

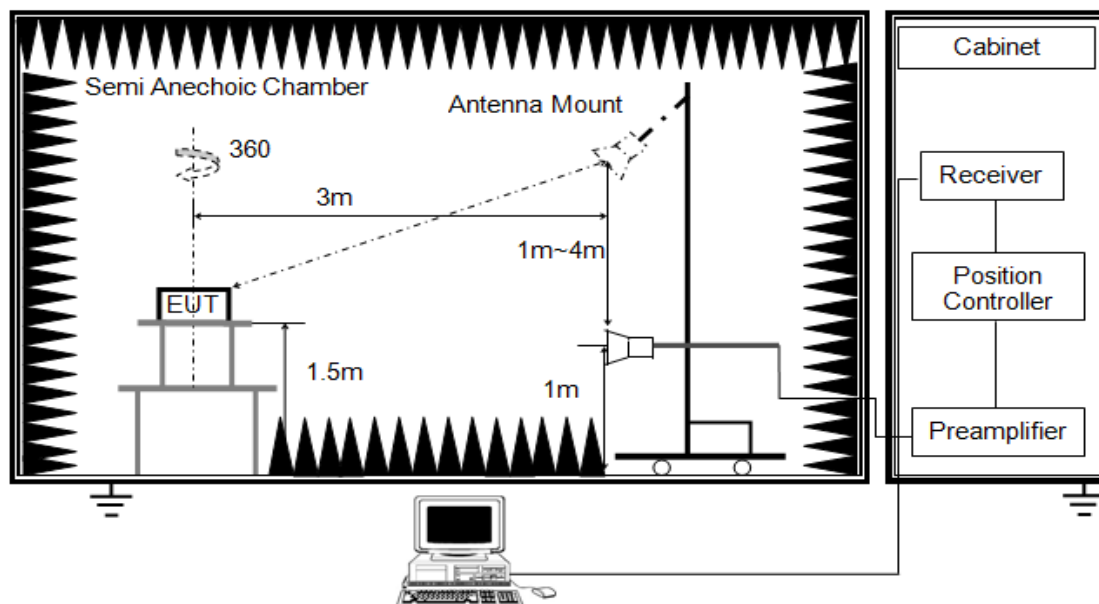


The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

ABOVE 1G



The setting of the spectrum analyser

RBW	1M
VBW	3M
Sweep	Auto
Detector	Peak and CISPR Average
Trace	Max hold

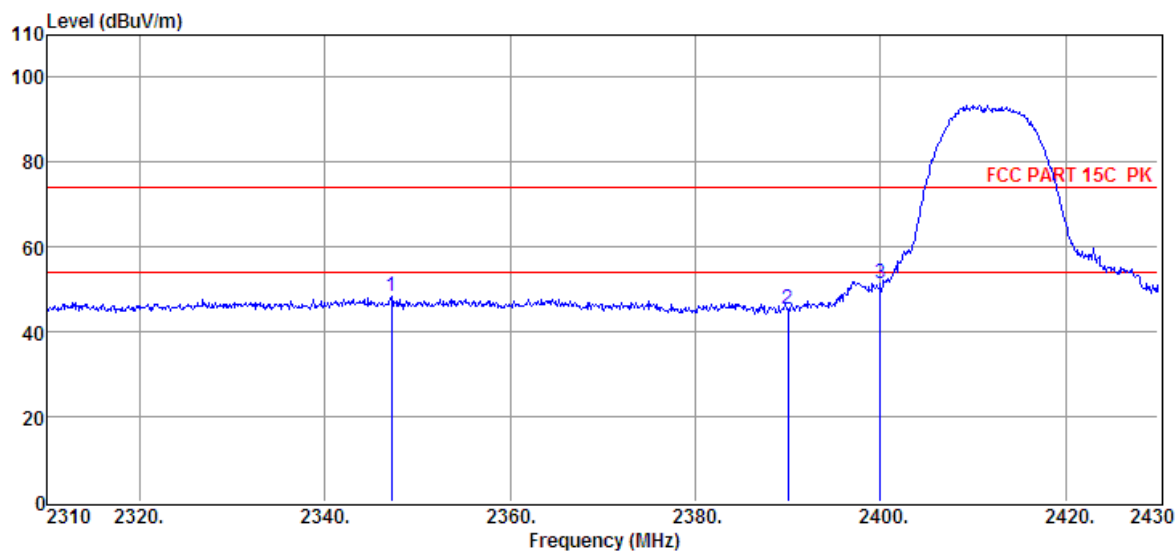
1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (1.5 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement above 1GHz, the emission measurement will be measured by the peak detector and the AV detector.
7. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

TEST CONDITIONS

Temperature: 23.5°C
Relative Humidity: 59.2%
Test Voltage: DC 5V

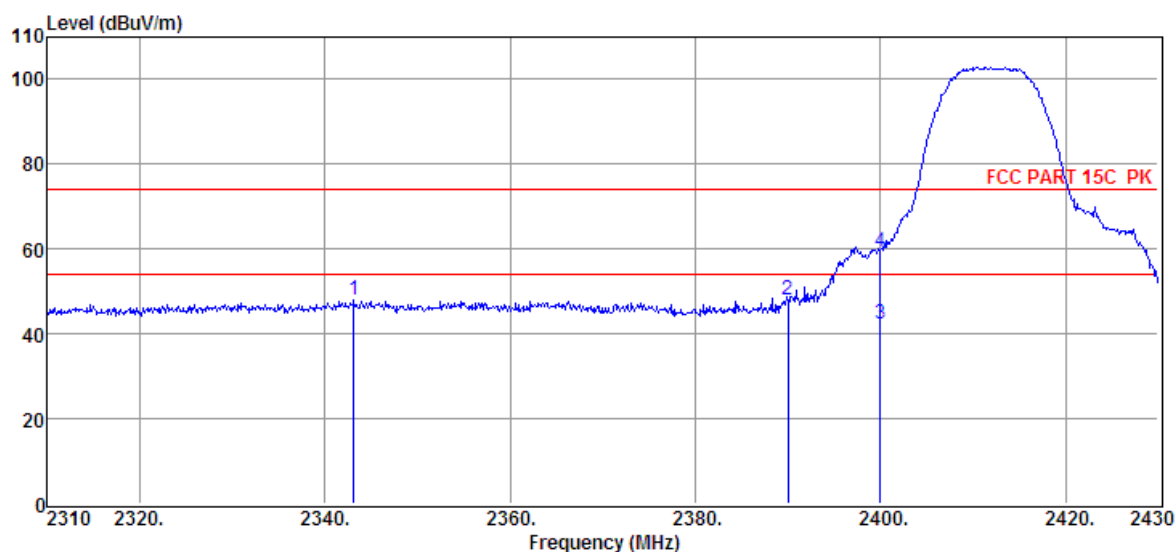
8.2. RESTRICTED BANDEDGE

RESTRICTED BANDEDGE (11b LOW CHANNEL, HORIZONTAL)



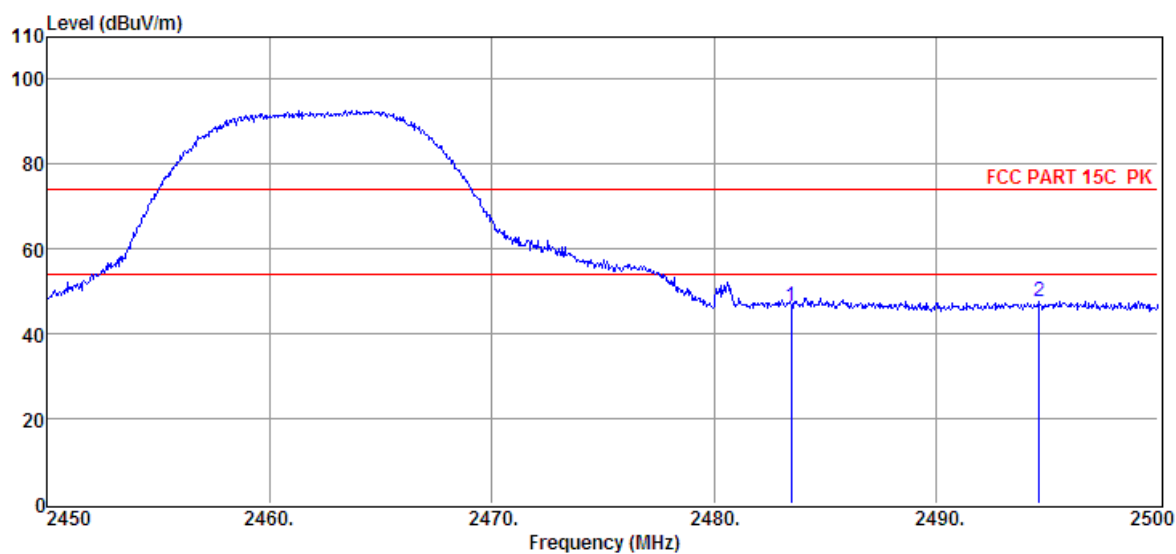
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	2347.20	42.05	29.61	29.33	5.96	48.29	74.00	-25.71	Peak	HORIZONTAL
2	2390.00	39.00	29.78	29.41	6.01	45.38	74.00	-28.62	Peak	HORIZONTAL
3	2400.00	45.16	29.82	29.44	6.03	51.57	74.00	-22.43	Peak	HORIZONTAL

RESTRICTED BANDEDGE (11b LOW CHANNEL, VERTICAL)



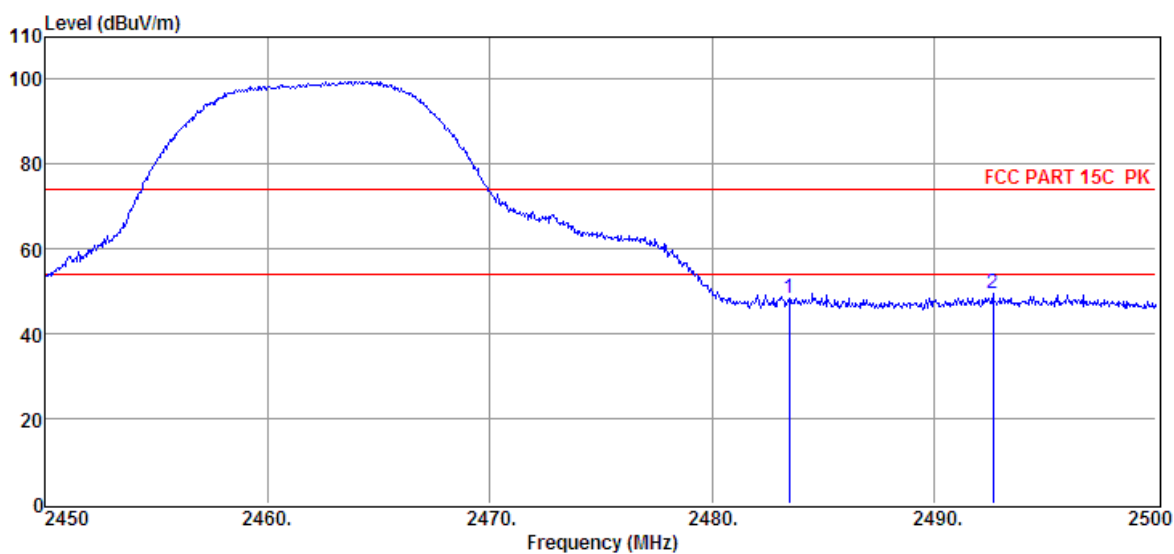
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	2343.12	41.61	29.59	29.33	5.96	47.83	74.00	-26.17	Peak	VERTICAL
2	2390.00	41.75	29.78	29.41	6.01	48.13	74.00	-25.87	Peak	VERTICAL
3	2400.00	36.06	29.82	29.44	6.03	42.47	54.00	-11.53	Average	VERTICAL
4	2400.00	53.12	29.82	29.44	6.03	59.53	74.00	-14.47	Peak	VERTICAL

RESTRICTED BANDEDGE (11b HIGH CHANNEL, HORIZONTAL)



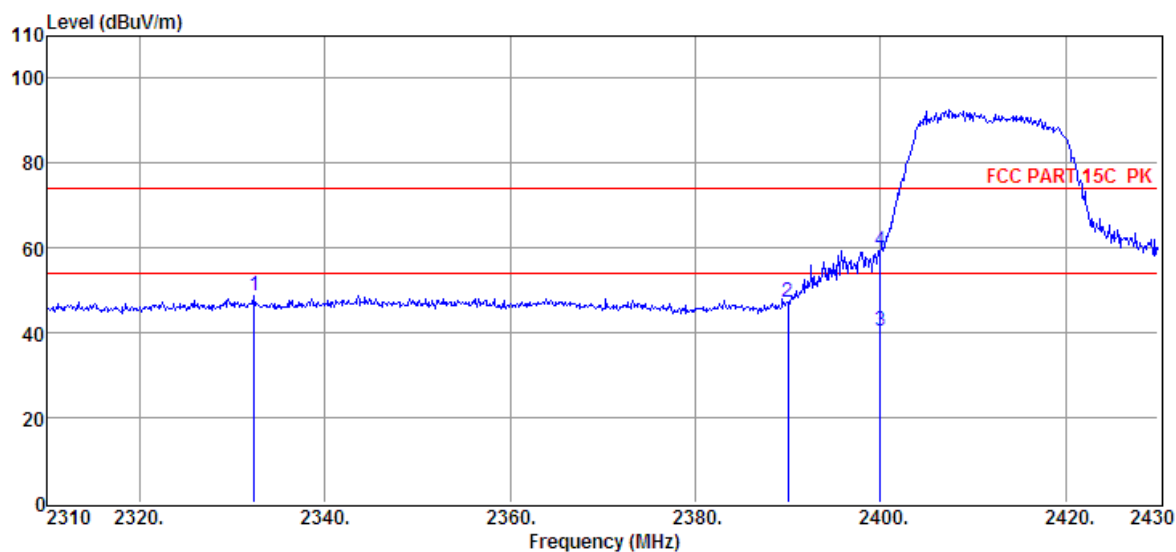
Item	Freq.	Read	Antenna	PRM	Cable	Result	Limit	Over	Detect	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor dB	Loss dB	(dBμV/m)	(dBμV/m)	(dB)	or	
1	2483.50	40.09	30.14	29.71	6.15	46.67	74.00	-27.33	Peak	HORIZONTAL
2	2494.65	40.97	30.18	29.73	6.15	47.57	74.00	-26.43	Peak	HORIZONTAL

RESTRICTED BANDEDGE (11b HIGH CHANNEL, VERTICAL)



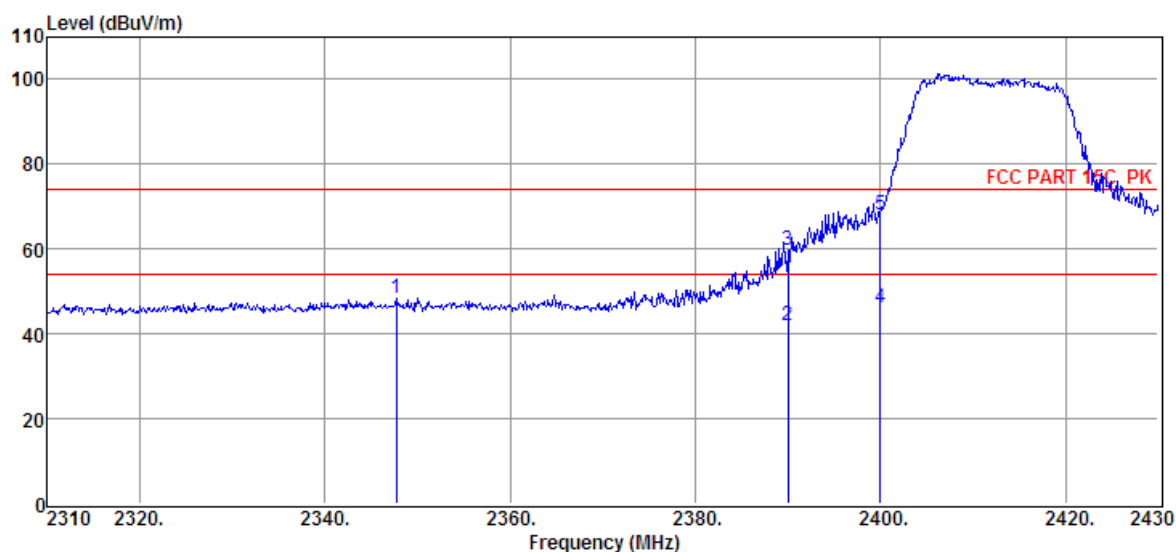
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	2483.50	41.68	30.14	29.71	6.15	48.26	74.00	-25.74	Peak	VERTICAL
2	2492.65	42.99	30.17	29.73	6.15	49.58	74.00	-24.42	Peak	VERTICAL

RESTRICTED BANDEDGE (11g LOW CHANNEL, HORIZONTAL)



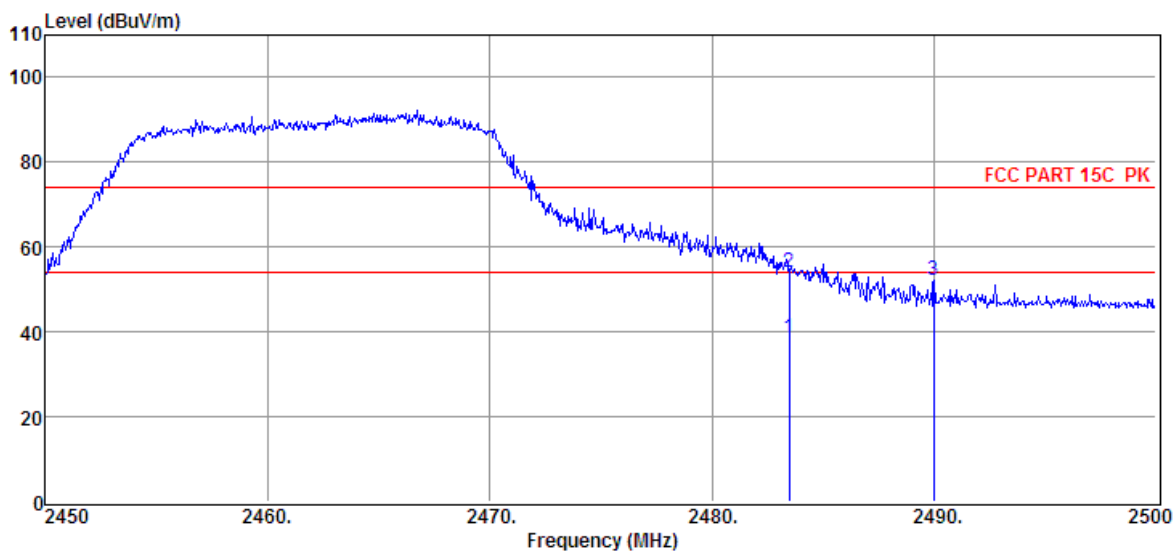
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	2332.32	42.48	29.55	29.31	5.94	48.66	74.00	-25.34	Peak	HORIZONTAL
2	2390.00	40.83	29.78	29.41	6.01	47.21	74.00	-26.79	Peak	HORIZONTAL
3	2400.00	33.98	29.82	29.44	6.03	40.39	54.00	-13.61	Average	HORIZONTAL
4	2400.00	53.02	29.82	29.44	6.03	59.43	74.00	-14.57	Peak	HORIZONTAL

RESTRICTED BANDEDGE (11g LOW CHANNEL, VERTICAL)



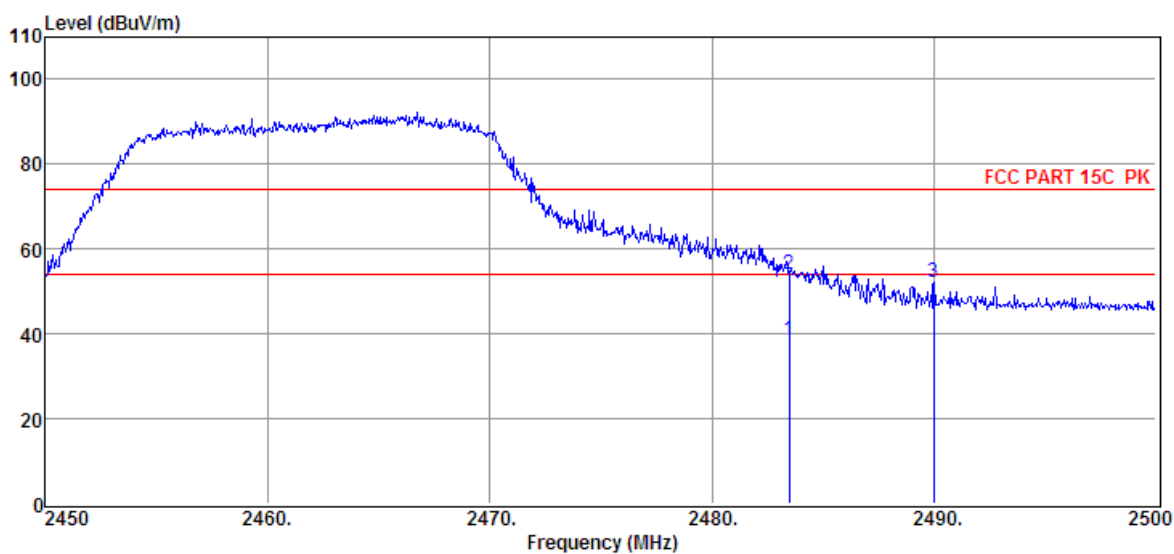
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	2347.68	42.30	29.61	29.33	5.96	48.54	74.00	-25.46	Peak	VERTICAL
2	2390.04	35.68	29.78	29.41	6.01	42.06	54.00	-11.94	Average	VERTICAL
3	2390.04	53.24	29.78	29.41	6.01	59.62	74.00	-14.38	Peak	VERTICAL
4	2400.00	39.65	29.82	29.44	6.03	46.06	54.00	-7.94	Average	VERTICAL
5	2400.00	61.60	29.82	29.44	6.03	68.01	74.00	-5.99	Peak	VERTICAL

RESTRICTED BANDEDGE (11g HIGH CHANNEL, HORIZONTAL)



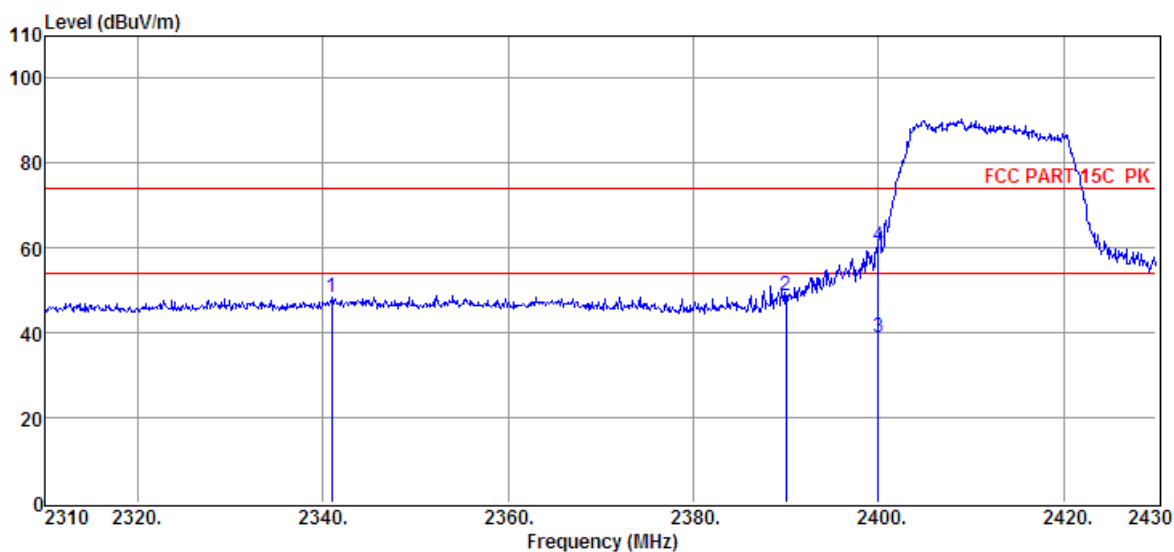
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	2483.50	32.05	30.14	29.71	6.15	38.63	54.00	-15.37	Average	HORIZONTAL
2	2483.50	47.53	30.14	29.71	6.15	54.11	74.00	-19.89	Peak	HORIZONTAL
3	2490.00	45.70	30.16	29.73	6.15	52.28	74.00	-21.72	Peak	HORIZONTAL

RESTRICTED BANDEDGE (11g HIGH CHANNEL, VERTICAL)



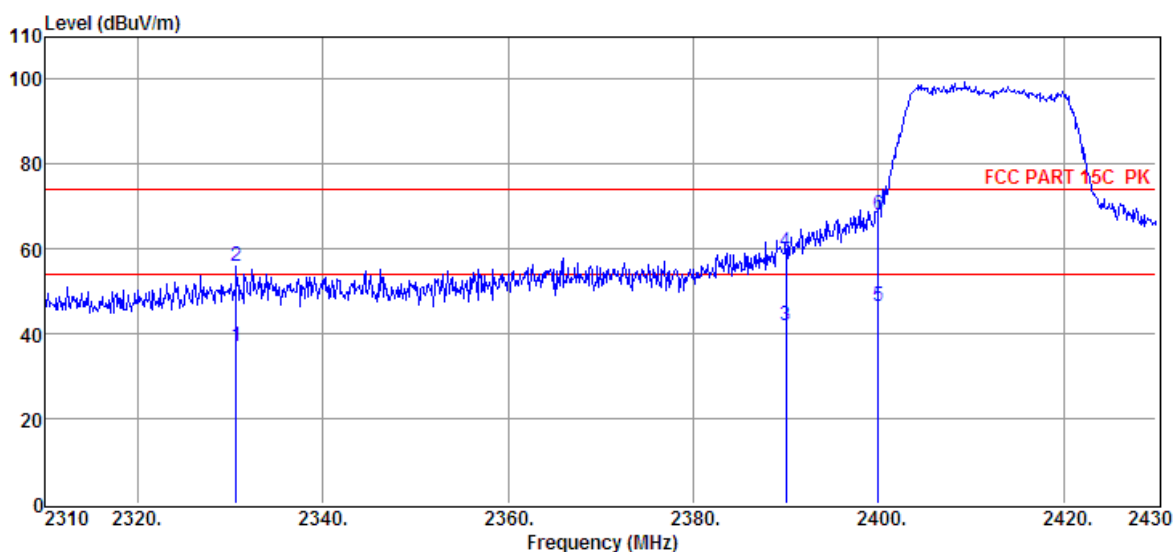
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	2483.50	32.05	30.14	29.71	6.15	38.63	54.00	-15.37	Average	HORIZONTAL
2	2483.50	47.53	30.14	29.71	6.15	54.11	74.00	-19.89	Peak	HORIZONTAL
3	2490.00	45.70	30.16	29.73	6.15	52.28	74.00	-21.72	Peak	HORIZONTAL

RESTRICTED BANDEDGE (11n/20 LOW CHANNEL, HORIZONTAL)



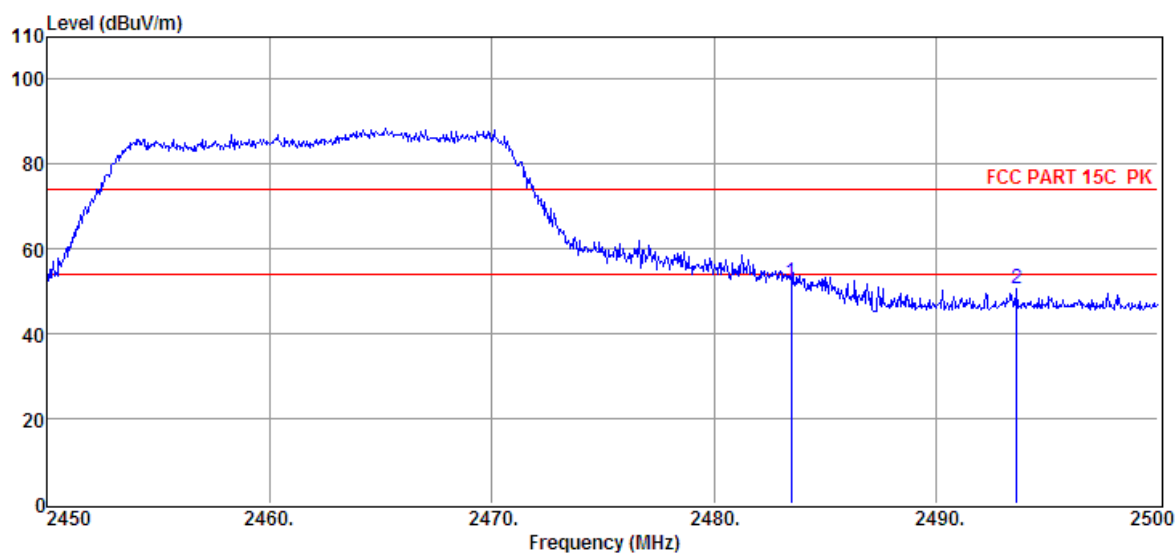
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	2340.96	42.10	29.58	29.32	5.96	48.32	74.00	-25.68	Peak	HORIZONTAL
2	2390.00	42.23	29.78	29.41	6.01	48.61	74.00	-25.39	Peak	HORIZONTAL
3	2400.00	32.60	29.82	29.44	6.03	39.01	54.00	-14.99	Average	HORIZONTAL
4	2400.00	54.26	29.82	29.44	6.03	60.67	74.00	-13.33	Peak	HORIZONTAL

RESTRICTED BANDEDGE (11n/20 LOW CHANNEL, VERTICAL)



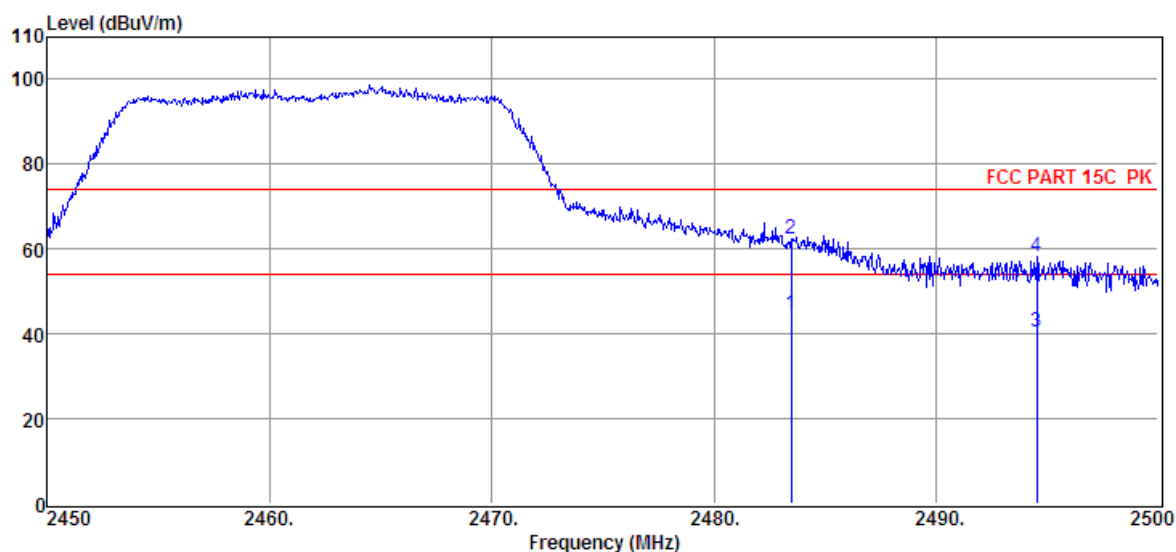
Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detecto r	Polarization
1	2330.64	31.06	29.54	29.31	5.94	37.23	54.00	-16.77	Average	VERTICAL
2	2330.64	49.68	29.54	29.31	5.94	55.85	74.00	-18.15	Peak	VERTICAL
3	2390.00	35.47	29.78	29.41	6.01	41.85	54.00	-12.15	Average	VERTICAL
4	2390.00	52.98	29.78	29.41	6.01	59.36	74.00	-14.64	Peak	VERTICAL
5	2400.00	39.90	29.82	29.44	6.03	46.31	54.00	-7.69	Average	VERTICAL
6	2400.00	61.66	29.82	29.44	6.03	68.07	74.00	-5.93	Peak	VERTICAL

RESTRICTED BANDEDGE (11n/20 HIGH CHANNEL, HORIZONTAL)



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	2483.50	45.67	30.14	29.71	6.15	52.25	74.00	-21.75	Peak	HORIZONTAL
2	2493.65	43.87	30.18	29.73	6.15	50.47	74.00	-23.53	Peak	HORIZONTAL

RESTRICTED BANDEDGE (11n/20 HIGH CHANNEL, VERTICAL)



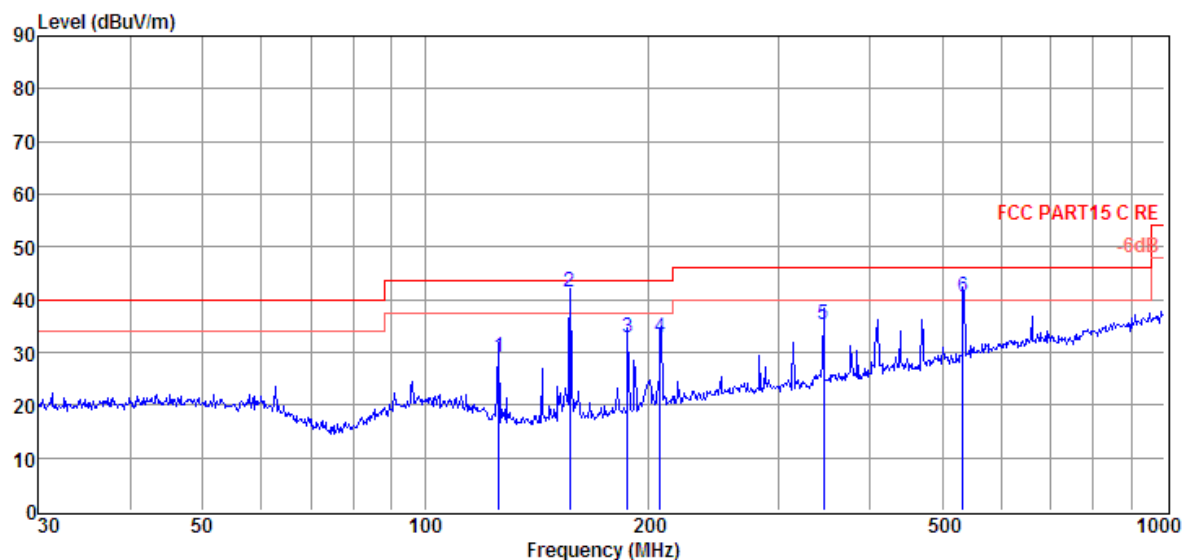
Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detecto r	Polarization
1	2483.50	37.97	30.14	29.71	6.15	44.55	54.00	-9.45	Average	VERTICAL
2	2483.50	55.84	30.14	29.71	6.15	62.42	74.00	-11.58	Peak	VERTICAL
3	2494.55	33.68	30.18	29.73	6.15	40.28	54.00	-13.72	Average	VERTICAL
4	2494.55	51.69	30.18	29.73	6.15	58.29	74.00	-15.71	Peak	VERTICAL

Note: EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

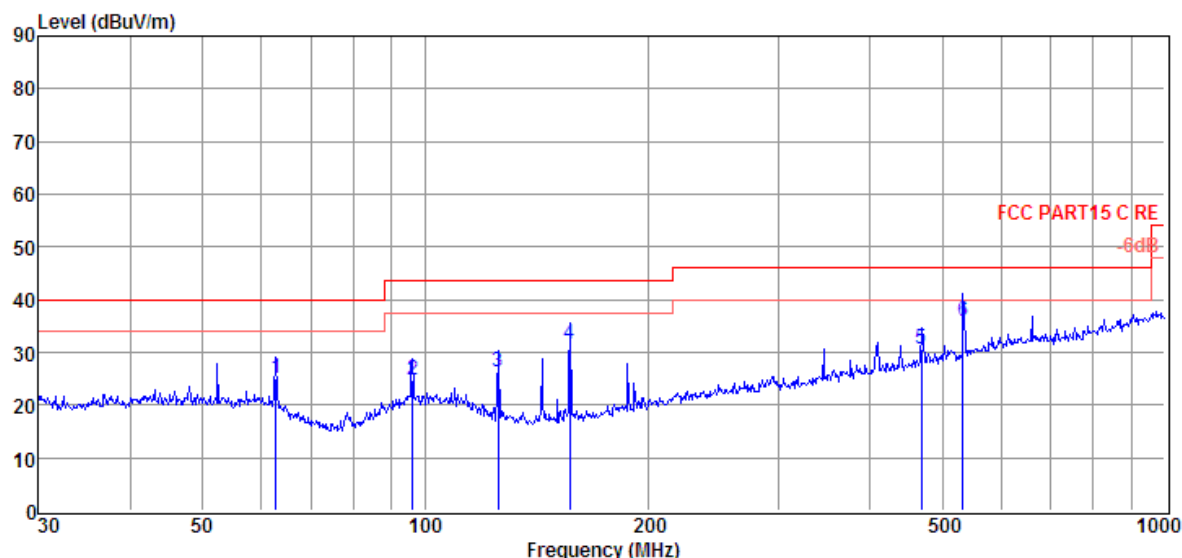
SPURIOUS EMISSIONS (1~25GHz)

Freq (MHz)	Read level (dBμV)	Antenna Factor (dB/m)	PRM Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector type	Polarization
11b LCH									
1329.00	47.44	24.73	29.37	4.49	47.29	74.00	-26.71	Peak	VERTICAL
3926.00	36.89	33.19	29.08	7.57	48.57	74.00	-25.43	Peak	VERTICAL
4824.00	30.79	33.73	29.32	8.50	43.70	54.00	-10.30	Average	VERTICAL
4824.00	46.52	33.73	29.32	8.50	59.43	74.00	-14.57	Peak	VERTICAL
7236.00	33.28	36.39	30.52	10.63	49.78	74.00	-24.22	Peak	VERTICAL
7699.00	35.66	36.64	30.97	10.97	52.30	74.00	-21.70	Peak	VERTICAL
3198.00	39.02	31.78	30.05	6.98	47.73	74.00	-26.27	Peak	HORIZONTAL
4437.00	36.91	33.75	29.17	8.08	49.57	74.00	-24.43	Peak	HORIZONTAL
4822.00	37.90	33.73	29.32	8.50	50.81	74.00	-23.19	Peak	HORIZONTAL
6061.00	34.77	35.10	29.23	9.72	50.36	74.00	-23.64	Peak	HORIZONTAL
7236.00	33.58	36.39	30.52	10.63	50.08	74.00	-23.92	Peak	HORIZONTAL
7706.00	35.05	36.64	30.97	10.97	51.69	74.00	-22.31	Peak	HORIZONTAL
11b MCH									
2281.00	38.58	29.34	29.23	5.87	44.56	74.00	-29.44	Peak	HORIZONTAL
3331.00	38.13	31.84	29.90	7.13	47.20	74.00	-26.80	Peak	HORIZONTAL
4437.00	36.49	33.75	29.17	8.08	49.15	74.00	-24.85	Peak	HORIZONTAL
4874.00	40.10	33.72	29.33	8.56	53.05	74.00	-20.95	Peak	HORIZONTAL
6047.00	34.46	35.08	29.23	9.71	50.02	74.00	-23.98	Peak	HORIZONTAL
7311.00	32.75	36.45	30.57	10.69	49.32	74.00	-24.68	Peak	HORIZONTAL
1861.00	43.52	27.47	29.01	5.34	47.32	74.00	-26.68	Peak	VERTICAL
3464.00	38.29	31.89	29.62	7.26	47.82	74.00	-26.18	Peak	VERTICAL
4874.00	30.03	33.72	29.33	8.56	42.98	54.00	-11.02	Average	VERTICAL
4874.00	43.79	33.72	29.33	8.56	56.74	74.00	-17.26	Peak	VERTICAL
6278.00	34.28	35.45	29.46	9.83	50.10	74.00	-23.90	Peak	VERTICAL
7311.00	34.62	36.45	30.57	10.69	51.19	74.00	-22.81	Peak	VERTICAL
11b HCH									
1329.00	45.34	24.73	29.37	4.49	45.19	74.00	-28.81	Peak	HORIZONTAL
3947.00	36.80	33.25	29.07	7.58	48.56	74.00	-25.44	Peak	HORIZONTAL
4924.00	36.71	33.71	29.34	8.60	49.68	74.00	-24.32	Peak	HORIZONTAL
6047.00	35.92	35.08	29.23	9.71	51.48	74.00	-22.52	Peak	HORIZONTAL
6859.00	34.66	36.09	30.28	10.30	50.77	74.00	-23.23	Peak	HORIZONTAL
7386.00	34.14	36.51	30.65	10.75	50.75	74.00	-23.25	Peak	HORIZONTAL
1329.00	48.57	24.73	29.37	4.49	48.42	74.00	-25.58	Peak	VERTICAL
3996.00	36.76	33.39	29.05	7.61	48.71	74.00	-25.29	Peak	VERTICAL
4924.00	31.65	33.71	29.34	8.60	44.62	54.00	-9.38	Average	VERTICAL
4924.00	45.85	33.71	29.34	8.60	58.82	74.00	-15.18	Peak	VERTICAL
6068.00	35.32	35.11	29.24	9.72	50.91	74.00	-23.09	Peak	VERTICAL
7386.00	32.55	36.51	30.65	10.75	49.16	74.00	-24.84	Peak	VERTICAL
Result: Pass									
Note :1.30MHz~18GHz: (Scan with 11b, 11g and 11n HT20, the worst case is 11b Mode) 2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor. 3. EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.									

SPURIOUS EMISSIONS 30M ~ 1 GHz



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	125.89	16.40	8.15	4.46	29.01	43.50	-14.49	QP	HORIZONTAL
2	157.01	29.00	7.92	4.64	41.56	43.50	-1.94	QP	HORIZONTAL
3	187.75	18.03	9.80	4.83	32.66	43.50	-10.84	QP	HORIZONTAL
4	207.85	17.13	10.71	4.94	32.78	43.50	-10.72	QP	HORIZONTAL
5	345.60	14.94	14.70	5.57	35.21	46.00	-10.79	QP	HORIZONTAL
6	533.83	16.38	17.83	6.29	40.50	46.00	-5.50	QP	HORIZONTAL



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	62.87	10.74	10.42	4.00	25.16	40.00	-14.84	QP	VERTICAL
2	96.10	8.78	11.69	4.27	24.74	43.50	-18.76	QP	VERTICAL
3	125.45	13.54	8.17	4.45	26.16	43.50	-17.34	QP	VERTICAL
4	157.01	18.86	7.92	4.64	31.42	43.50	-12.08	QP	VERTICAL
5	468.88	8.05	16.57	6.06	30.68	46.00	-15.32	QP	VERTICAL
6	533.83	11.89	17.83	6.29	36.01	46.00	-9.99	QP	VERTICAL

Note: EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

8.3. SPURIOUS EMISSIONS BELOW 30M

Note 1: The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Note 2: EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

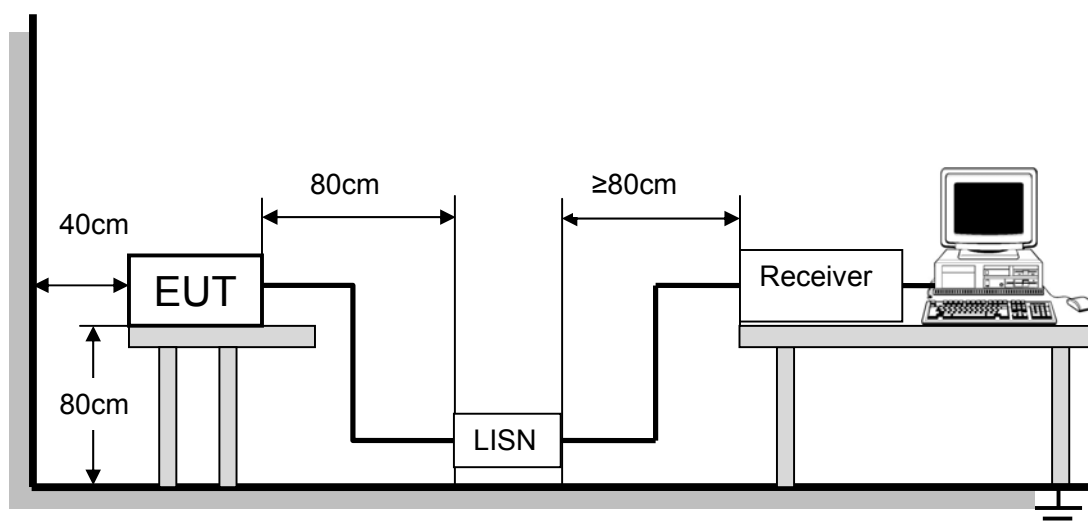
9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a) and RSS-Gen Clause 8.8

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

TEST SETUP AND PROCEDURE



The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 7 and 13 of ANSI C63.4-2014. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST RESULTS

Not Applicable

10. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

ANTENNA CONNECTOR

EUT has a PCB antenna without antenna connector.

ANTENNA GAIN

The antenna gain of EUT is less than 6 dBi.

END OF REPORT

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