

FCC Test Report

FCC ID : FDI000000020
Equipment : AirStation
Model No. : WHR-1166D
Brand Name : Buffalo Inc.
Applicant : Buffalo Inc.
Address : Akamon-dori Bldg, 30-20, Ohsu 3-chome,
Naka-ku, Nagoya 460-8315, Japan
Standard : 47 CFR FCC Part 15.247
Received Date : Nov. 02, 2013
Tested Date : Nov. 06 ~ Nov. 19, 2013

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Approved & Reviewed by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR3N0201AI	Rev. 01	Initial issue	Dec. 06, 2013

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.371MHz 37.56 (Margin -10.91dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 500.37MHz 44.62 (Margin -1.38dB) - QP	Pass
15.247(b)(3)	Fundamental Emission Output Power	Power [dBm]: 11a: 27.32 HT20: 27.28 HT40: 27.28 VHT20: 27.35 VHT40: 27.31 VHT80: 22.73	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

1 General Description

1.1 Information

The product has 3 kinds of transformer and DDR. It would be Type A, Type B, and Type C. Please refer to photographs of EUT for more details.

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
IEEE Std. 802.11	Frequency Range (MHz)	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	Data Rate / MCS
a	5725-5850	5745-5825	149-165 [5]	2	6-54 Mbps
n (HT20)	5725-5850	5745-5825	149-165 [5]	2	MCS 0-15
n (HT40)	5725-5850	5755-5795	151-159 [2]	2	MCS 0-15
ac (VHT20)	5725-5850	5745-5825	149-165 [5]	2	MCS 0-9
ac (VHT40)	5725-5850	5755-5795	151-159 [2]	2	MCS 0-9
ac (VHT80)	5725-5850	5775	155 [1]	2	MCS 0-9

Note 1: RF output power specifies that Maximum Conducted Output Power.
 Note 2: 802.11a/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
 Note 3: IEEE802.11ac is draft version.

1.1.2 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector	Remark
1	PCB	3.27	AYU	---
2	PCB	3.40	AYU	---

1.1.3 EUT Operational Condition

Supply Voltage	☒ AC mains	☐ DC	
Type of DC Source	☐ Internal DC supply	☐ External DC adapter	☐ From Host

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	AC Adapter	Brand Name: APD Model Name: WA-12M12FU Power Rating: I/P: 100-240Vac, 50-60Hz, 0.5A O/P: 12Vdc, 1A Power Line: 1.5m non-shielded cable w/o core

1.1.5 Channel List

Frequency band (MHz)		5725~5850	
802.11 a / HT20 / VHT20		HT40 / VHT40	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
149	5745	151	5755
153	5765	159	5795
157	5785	VHT 80	
161	5805	155	5775
165	5825	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	MT76xxE, Version 0.0.2.3001		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11a	88.55%	0.53
	VHT20	87.96%	0.56
	VHT40	78.51%	1.05
	VHT80	63.44%	1.98

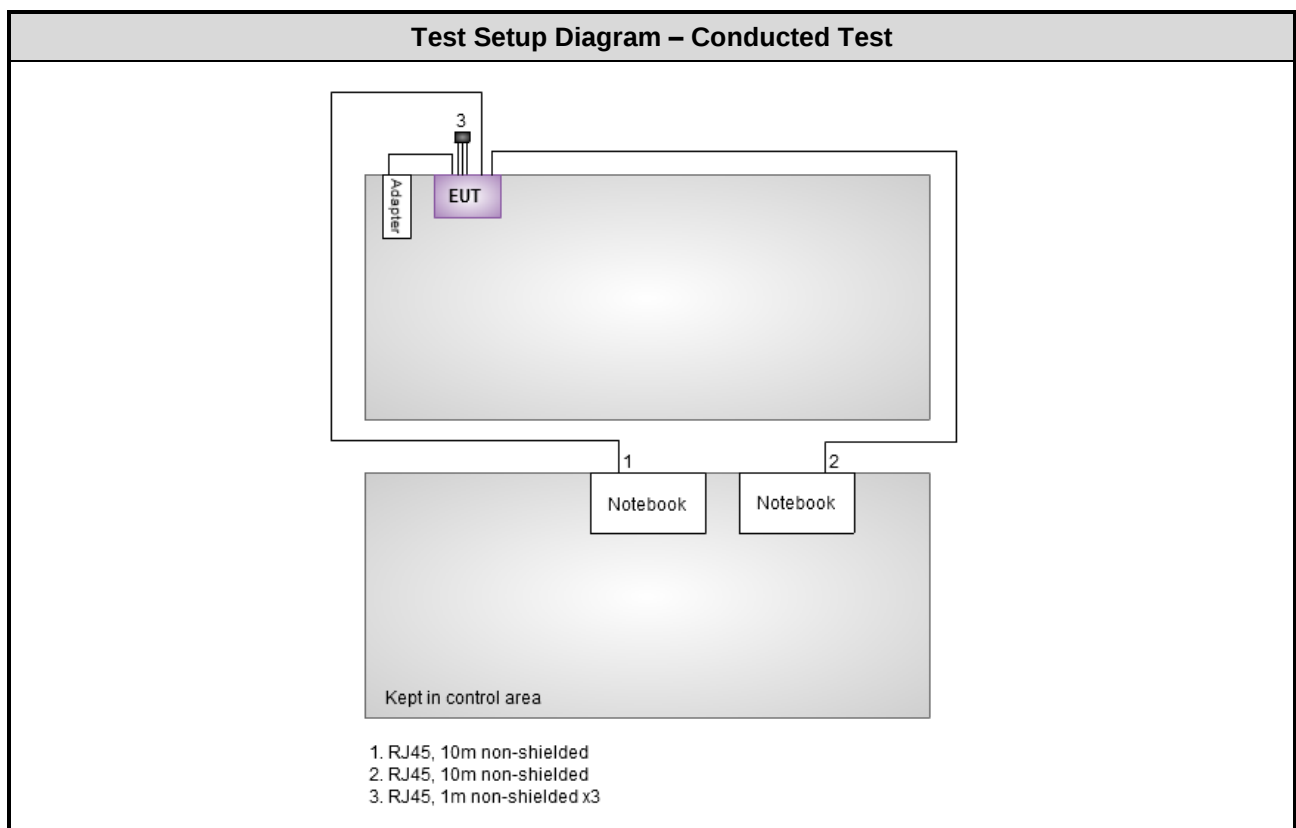
1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11a	5745	1E/21
11a	5785	27/29
11a	5825	1E/21
HT20	5745	1A/1D
HT20	5785	24/27
HT20	5825	1C/1E
HT40	5755	16/18
HT40	5795	22/25
VHT20	5745	1A/1D
VHT20	5785	24/27
VHT20	5825	1C/1E
VHT40	5755	16/18
VHT40	5795	22/25
VHT80	5775	11/13

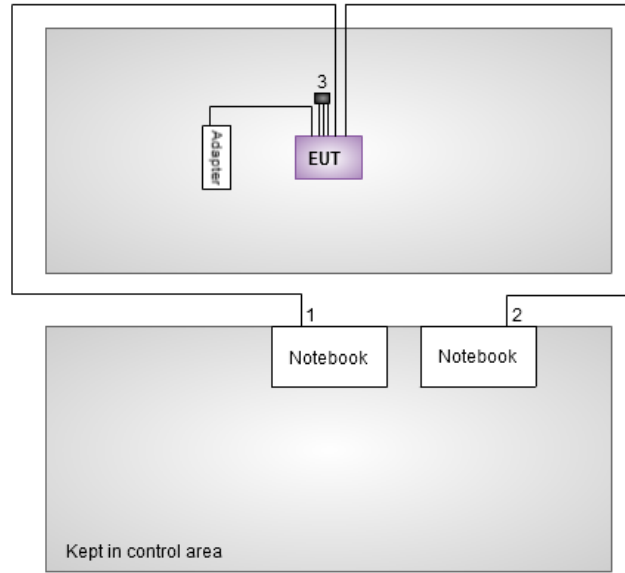
1.2 Local Support Equipment List

Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	E6430	---	DoC	RJ45, 10m non-shielded cable w/o core.
2	Notebook	DELL	E6430	---	DoC	RJ45, 10m non-shielded cable w/o core.

1.3 Test Setup Chart



Test Setup Diagram – Radiated Test



1. RJ45, 10m non-shielded
2. RJ45, 10m non-shielded
3. RJ45, 1m non-shielded x3

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
EMC Receiver	R&S	ESCS 30	100169	Oct. 15, 2013	Oct. 14, 2014
LISN	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-667	Dec. 04, 2012	Dec. 03, 2013
LISN (Support Unit)	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-666	Dec. 04, 2012	Dec. 03, 2013
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Dec. 25, 2012	Dec. 24, 2013
ESH3-Z6 V-Network(+)	R&S	ESH3-Z6	100920	Nov. 21, 2012	Nov. 20, 2013
ESH3-Z6 V-Network(-)	R&S	ESH3-Z6	100951	Jan. 30, 2013	Jan. 29, 2014
Two-Line V-Network	R&S	ENV216	101579	Jan. 07, 2013	Jan. 06, 2014
50 ohm terminal	NA	50	01	Apr. 22, 2013	Apr. 21, 2014
50 ohm terminal	NA	50	02	Apr. 22, 2013	Apr. 21, 2014
50 ohm terminal	NA	50	03	Apr. 22, 2013	Apr. 21, 2014
50 ohm terminal (Support Unit)	NA	50	04	Apr. 22, 2013	Apr. 21, 2014
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission above 1GHz				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
3m semi-anechoic chamber	CHAMPRO	SAC-03	03CH01-WS	Jan. 04, 2013	Jan. 03, 2014
Spectrum Analyzer	R&S	FSV40	101498	Jan. 24, 2013	Jan. 23, 2014
Receiver	R&S	ESR3	101658	Jan. 28, 2013	Jan. 27, 2014
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jan. 11, 2013	Jan. 10, 2014
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Feb. 18, 2013	Feb. 17, 2014
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Jan. 14, 2013	Jan. 13, 2014
Amplifier	Burgeon	BPA-530	100219	Nov. 28, 2012	Nov. 27, 2013
Amplifier	Agilent	83017A	MY39501308	Dec. 18, 2012	Dec. 17, 2013
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 25, 2012	Dec. 24, 2013
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 25, 2012	Dec. 24, 2013
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 25, 2012	Dec. 24, 2013
RF Cable-R03m	Woken	CFD400NL-LW	CFD400NL-001	Dec. 25, 2012	Dec. 24, 2013
RF Cable-R10m	Woken	CFD400NL-LW	CFD400NL-002	Dec. 25, 2012	Dec. 24, 2013
control	EM Electronics	EM1000	60612	N/A	N/A
Note: Calibration Interval of instruments listed above is one year.					

Loop Antenna	R&S	HFH2-Z2	100330	Nov. 15, 2012	Nov. 14, 2014
Amplifier	MITEQ	AMF-6F-260400	9121372	Apr. 19, 2013	Apr. 18, 2015
Note: Calibration Interval of instruments listed above is two year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV 40	101063	Feb. 18, 2013	Feb. 17, 2014
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Nov. 29, 2012	Nov. 28, 2013
Power Meter	Anritsu	ML2495A	1241002	Oct. 24, 2013	Oct. 23, 2014
Power Sensor	Anritsu	MA2411B	1027366	Oct. 24, 2013	Oct. 23, 2014
Signal Generator	R&S	SMB100A	175727	Jan. 14, 2013	Jan. 13, 2014
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247

ANSI C63.10-2009

FCC KDB 558074 D01 DTS Meas Guidance v03r01

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

Note: The EUT has been tested and complied with FCC part 15B requirement. FCC Part 15B test results are issued to another report.

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ($k=2$))

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	± 35.286 Hz
Conducted power	± 0.536 dB
Frequency error	± 35.286 Hz
Temperature	± 0.3 °C
Conducted emission	± 2.946 dB
AC conducted emission	± 2.43 dB
Radiated emission	± 2.49 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	19°C / 55%	Skys Huang
Radiated Emissions ≤ 1GHz	03CH01-WS	25°C / 62%	Haru yang
Radiated Emissions > 1GHz	03CH01-WS	24°C / 63%	Aska Huang
RF Conducted	TH01-WS	22°C / 61%	Felix Sung

➤ FCC site registration No.: 657002

➤ IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate (Mbps) / MCS	Test Configuration
Conducted Emissions	VHT20	5785	MCS 0	---
Radiated Emissions ≤1GHz	VHT20	5785	MCS 0	---
RF Output Power	11a	5745 / 5785 / 5825	6 Mbps	---
	HT20	5745 / 5785 / 5825	MCS 0	---
	HT40	5755 / 5795	MCS 0	---
	VHT20	5745 / 5785 / 5825	MCS 0	---
	VHT40	5755 / 5795	MCS 0	---
	VHT80	5775	MCS 0	---
Radiated Emissions >1GHz 6dB bandwidth Power spectral density	11a	5745 / 5785 / 5825	6 Mbps	---
	VHT20	5745 / 5785 / 5825	MCS 0	---
	VHT40	5755 / 5795	MCS 0	---
	VHT80	5775	MCS 0	---

NOTE:

The product has 3 kinds of transformer and DDR. It would be Type A, Type B, and Type C. Please refer to photographs of EUT for more details. Three types version had been covered during the pretest and found that Type A was the worst one and was selected for final test.

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

3.1.3 Test Setup

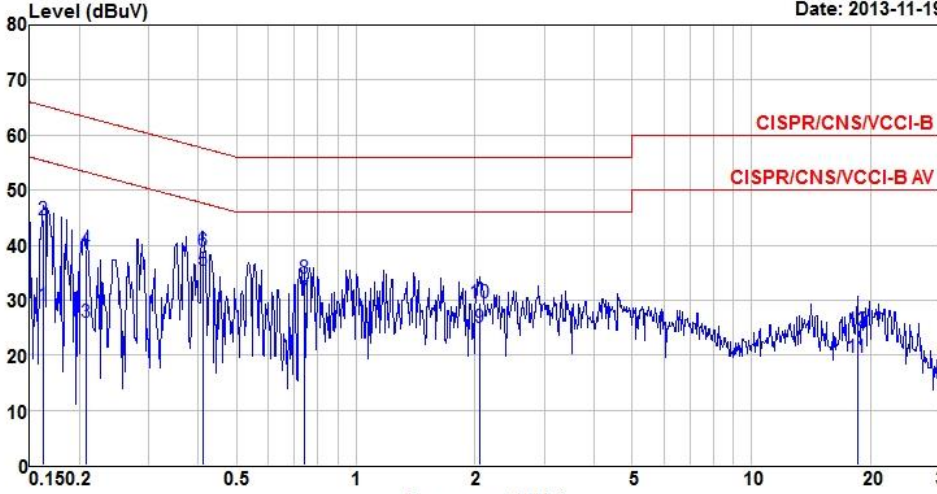


- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

Modulation Mode	VHT20	Test Freq. (MHz)	5785
Power Phase	Line		

Date: 2013-11-19

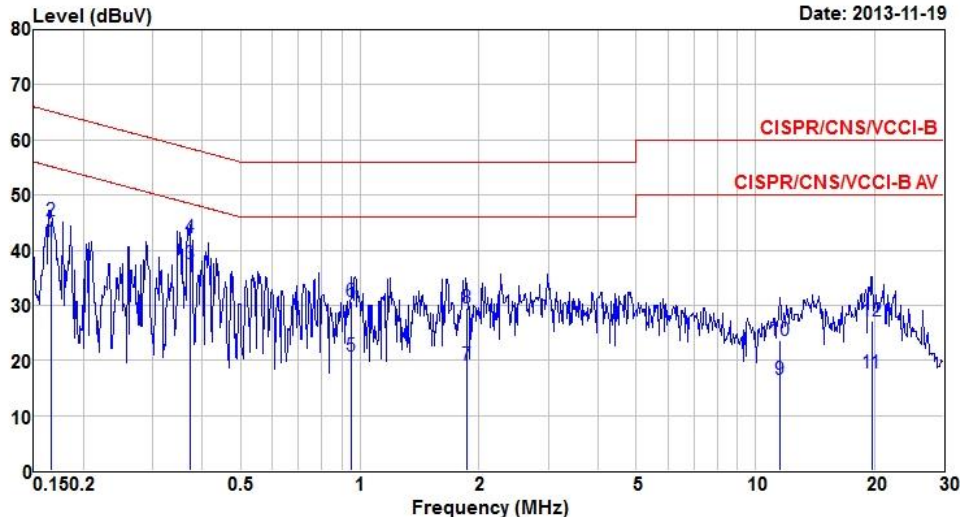


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.162	29.15	55.34	-26.19	29.01	0.05	0.09	Average
2	0.162	44.54	65.34	-20.80	44.40	0.05	0.09	QP
3	0.208	26.00	53.29	-27.29	25.78	0.05	0.17	Average
4	0.208	39.11	63.29	-24.18	38.89	0.05	0.17	QP
5	0.412	35.38	47.61	-12.23	35.26	0.07	0.05	Average
6	0.412	39.05	57.61	-18.56	38.93	0.07	0.05	QP
7	0.743	30.24	46.00	-15.76	30.09	0.11	0.04	Average
8	0.743	33.88	56.00	-22.12	33.73	0.11	0.04	QP
9	2.065	24.97	46.00	-21.03	24.60	0.21	0.16	Average
10	2.065	29.47	56.00	-26.53	29.10	0.21	0.16	QP
11	18.524	19.62	50.00	-30.38	18.01	1.44	0.17	Average
12	18.524	24.54	60.00	-35.46	22.93	1.44	0.17	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
 Note 2: Over Limit (dBuV) = Limit Line (dBuV) – Level (dBuV).

Modulation Mode	VHT20	Test Freq. (MHz)	5785
Power Phase	Neutral		

Level (dBuV)



Frequency (MHz)

Date: 2013-11-19

	Freq	Level	Limit	Over	Read	LISN	cable	Remark
	MHz	dBuV	Line	Limit	Level	factor	loss	
			dBuV	dB	dBuV	dB	dB	
1	0.166	41.49	55.16	-13.67	41.35	0.04	0.10	Average
2	0.166	45.29	65.16	-19.87	45.15	0.04	0.10	QP
3	0.371	37.56	48.47	-10.91	37.44	0.06	0.06	Average
4	0.371	42.35	58.47	-16.12	42.23	0.06	0.06	QP
5	0.953	20.86	46.00	-25.14	20.68	0.14	0.04	Average
6	0.953	30.64	56.00	-25.36	30.46	0.14	0.04	QP
7	1.859	19.11	46.00	-26.89	18.77	0.19	0.15	Average
8	1.859	29.62	56.00	-26.38	29.28	0.19	0.15	QP
9	11.559	16.61	50.00	-33.39	15.83	0.66	0.12	Average
10	11.559	23.66	60.00	-36.34	22.88	0.66	0.12	QP
11	19.740	17.77	50.00	-32.23	15.92	1.66	0.19	Average
12	19.740	27.06	60.00	-32.94	25.21	1.66	0.19	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
 2: Over Limit (dBuV) = Limit Line (dBuV) – Level (dBuV).

3.2 6dB and Occupied Bandwidth

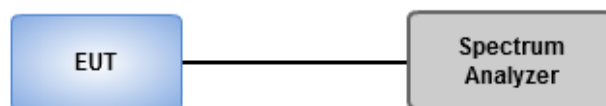
3.2.1 Limit of 6dB Bandwidth

The minimum 6dB bandwidth shall be at least 500 kHz.

3.2.2 Test Procedures

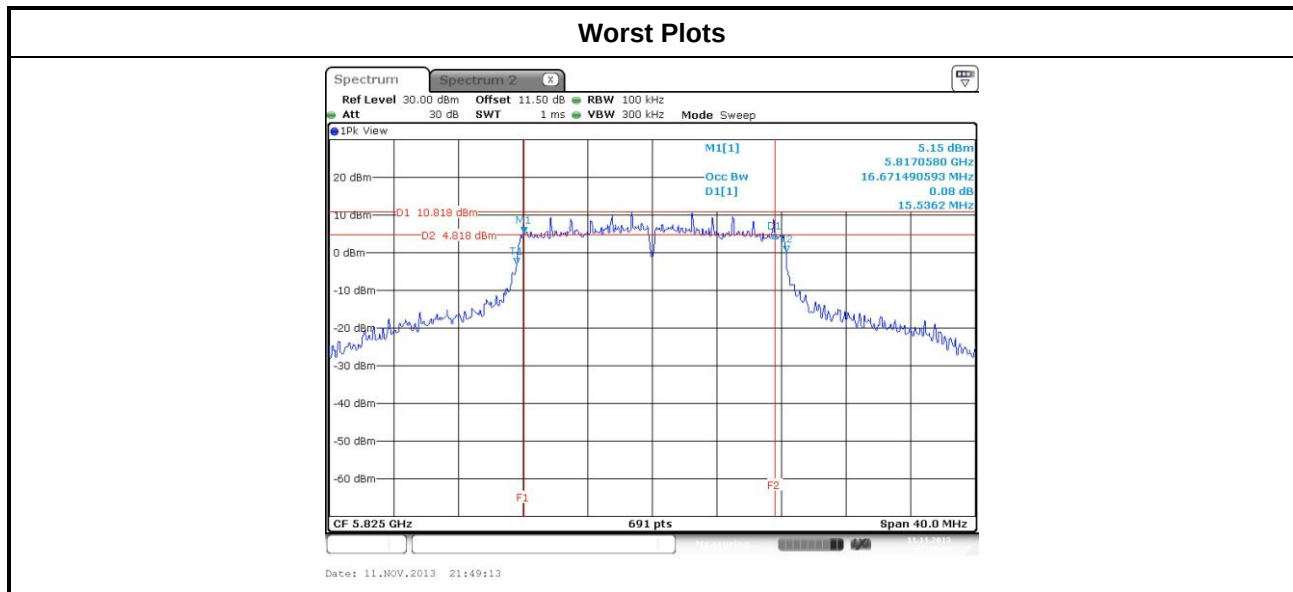
1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

3.2.3 Test Setup

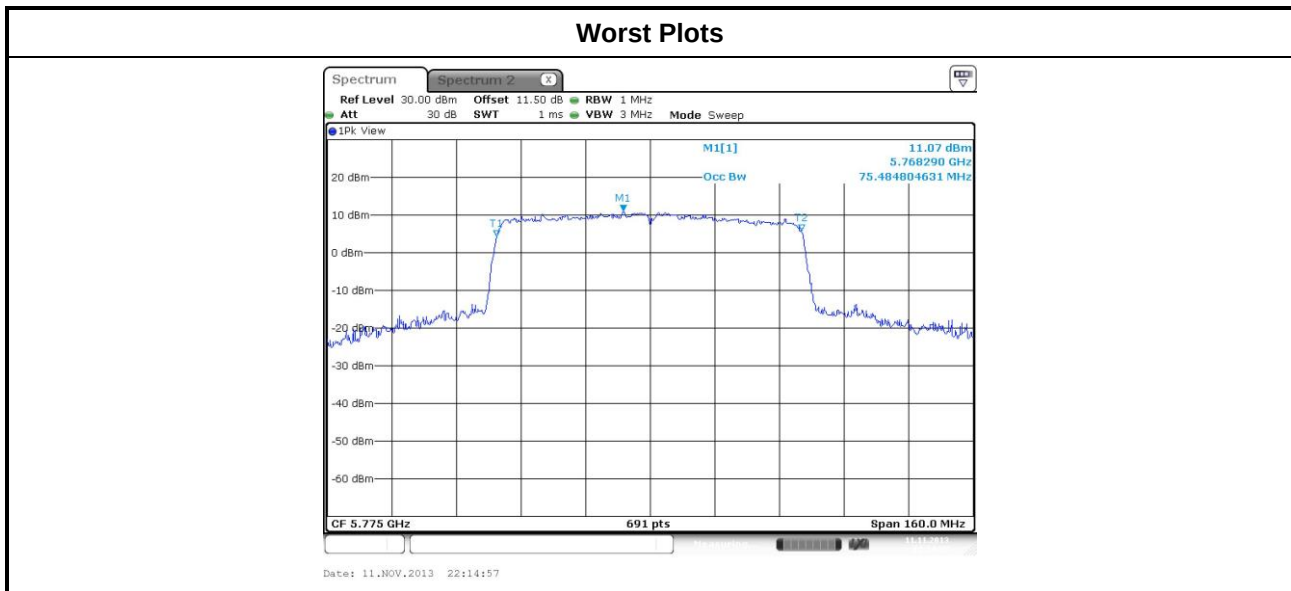


3.2.4 Test Result of 6dB and Occupied Bandwidth

Modulation Mode	N _{TX}	Freq. (MHz)	6dB Bandwidth (MHz)				Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
11a	2	5745	16.06	16.06	---	---	500
11a	2	5785	16.29	16.29	---	---	500
11a	2	5825	16.06	15.54	---	---	500
VHT20	2	5745	16.52	16.75	---	---	500
VHT20	2	5785	17.22	17.33	---	---	500
VHT20	2	5825	15.71	16.81	---	---	500
VHT40	2	5755	35.25	35.25	---	---	500
VHT40	2	5795	35.25	35.25	---	---	500
VHT80	2	5775	75.13	75.13	---	---	500



Modulation Mode	N _{TX}	Freq. (MHz)	99% Occupied Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3
11a	2	5745	19.10	18.70	---	---
11a	2	5785	27.26	25.99	---	---
11a	2	5825	18.35	19.10	---	---
VHT20	2	5745	21.48	19.16	---	---
VHT20	2	5785	27.44	26.22	---	---
VHT20	2	5825	21.36	19.91	---	---
VHT40	2	5755	37.63	37.51	---	---
VHT40	2	5795	52.56	55.11	---	---
VHT80	2	5775	75.25	75.48	---	---



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

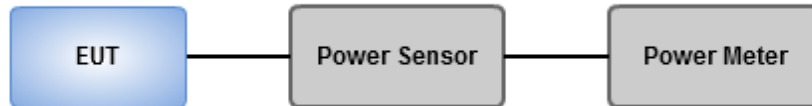
- ☒ Antenna gain $\leq 6\text{dBi}$, no any corresponding reduction is in output power limit.
- ☐ Antenna gain $> 6\text{dBi}$
 - ☐ Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB
 - ☐ Fixed, point to point operations
Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point Operations, maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations ,no any corresponding reduction is in transmitter peak output power

3.3.2 Test Procedures

- ☐ Maximum Peak Conducted Output Power
 - ☐ **Spectrum analyzer**
 1. Set RBW = 1MHz, VBW = 3MHz, Detector = Peak.
 2. Sweep time = auto, Trace mode = max hold, Allow trace to fully stabilize.
 3. Use the spectrum analyzer channel power measurement function with the band limits set equal to the DTS bandwidth edges.
 - ☐ **Power meter**
 1. A broadband Peak RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.
- ☒ Maximum Conducted Output Power (For reference only)
 - ☐ **Spectrum analyzer**
 1. Set RBW = 1MHz, VBW = 3MHz, Detector = RMS.
 2. Set the sweep time to: $\geq 10 \times (\text{number of measurement points in sweep}) \times (\text{maximum data rate per stream})$.
 3. Perform the measurement over a single sweep.
 4. Use the spectrum analyzer's band power measurement function with band limits set equal to the EBW(26dBc) band edges.
 - ☒ **Power meter**
 1. A broadband Average RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.3.3 Test Setup



3.3.4 Test Result of Maximum Output Power

Modulation Mode	N _{TX}	Freq. (MHz)	Conducted (average) output power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11a	2	5745	22.25	22.21	---	---	334.222	25.24	30.00
11a	2	5785	24.23	24.38	---	---	539.007	27.32	30.00
11a	2	5825	22.12	22.31	---	---	333.145	25.23	30.00
HT20	2	5745	22.28	22.24	---	---	336.538	25.27	30.00
HT20	2	5785	24.23	24.30	---	---	534.003	27.28	30.00
HT20	2	5825	22.15	22.18	---	---	329.255	25.18	30.00
HT40	2	5755	21.38	21.31	---	---	272.611	24.36	30.00
HT40	2	5795	24.25	24.29	---	---	534.607	27.28	30.00
VHT20	2	5745	22.32	22.31	---	---	340.824	25.33	30.00
VHT20	2	5785	24.28	24.39	---	---	542.706	27.35	30.00
VHT20	2	5825	22.30	22.31	---	---	340.040	25.32	30.00
VHT40	2	5755	21.42	21.36	---	---	275.448	24.40	30.00
VHT40	2	5795	24.27	24.32	---	---	537.696	27.31	30.00
VHT80	2	5775	19.78	19.65	---	---	187.318	22.73	30.00

3.4 Power Spectral Density

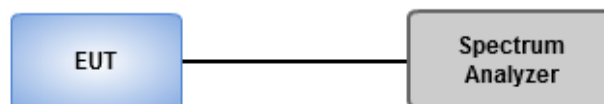
3.4.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

3.4.2 Test Procedures

- ☐ Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.
 1. Set the RBW = 30kHz, VBW = 100kHz.
 2. Detector = Peak, Sweep time = auto couple.
 3. Trace mode = max hold, allow trace to fully stabilize.
 4. Use the peak marker function to determine the maximum amplitude level.
- ☒ Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.
 1. Set the RBW = 30kHz, VBW = 100 kHz.
 2. Detector = RMS, Sweep time = auto couple.
 3. Set the sweep time to: $\geq 10 \times (\text{number of measurement points in sweep}) \times (\text{maximum data rate per stream})$.
 4. Perform the measurement over a single sweep.
 5. Use the peak marker function to determine the maximum amplitude level.

3.4.3 Test Setup

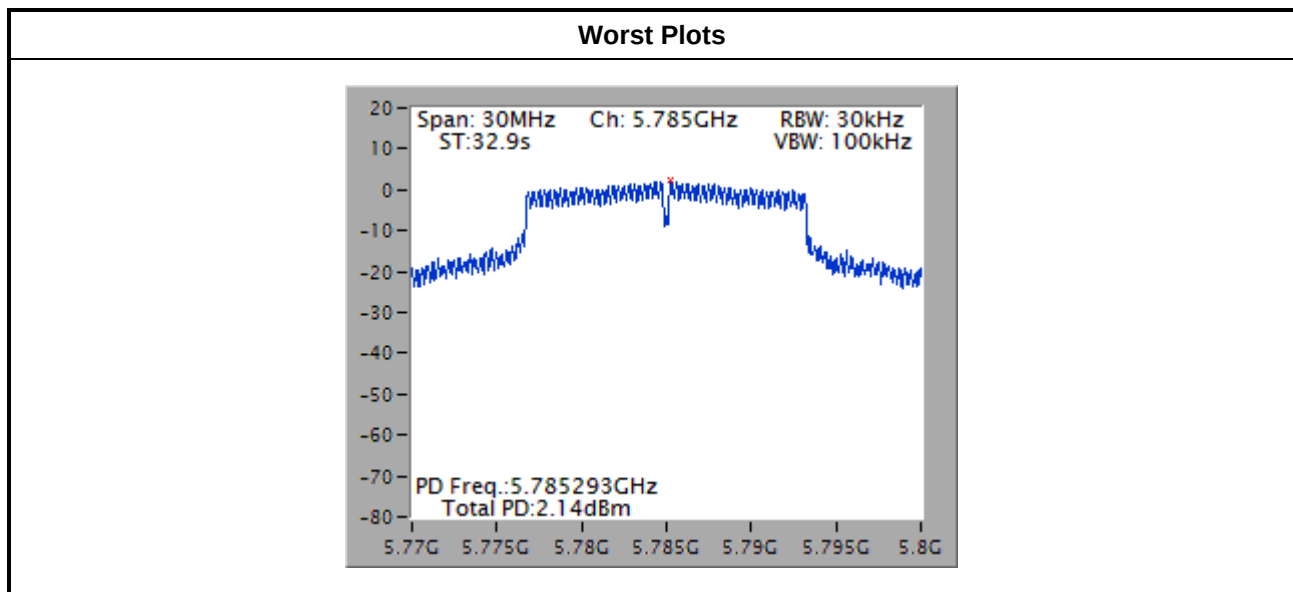


3.4.4 Test Result of Power Spectral Density

Modulation Mode	N _{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/30kHz)	Limit (dBm/3kHz)
11a	2	5745	-0.10	7.65
11a	2	5785	2.14	7.65
11a	2	5825	0.47	7.65
VHT20	2	5745	0.38	7.65
VHT20	2	5785	1.64	7.65
VHT20	2	5825	-0.06	7.65
VHT40	2	5755	-4.63	7.65
VHT40	2	5795	-1.71	7.65
VHT80	2	5775	-8.02	7.65

Note:

- Test result is bin-by-bin summing measured value of each TX port.
- Directional gain = $10 * \log((10^{3.27/20} + 10^{3.4/20})^2 / 2) = 6.35 \text{ dBi} > 6 \text{ dBi}$
Limit shall be reduced to 8 dBm – (6.35 dBi – 6 dBi) = 7.65 dBm



3.5 Unwanted Emissions into Restricted Frequency Bands

3.5.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9~90 kHz, 110~490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.5.2 Test Procedures

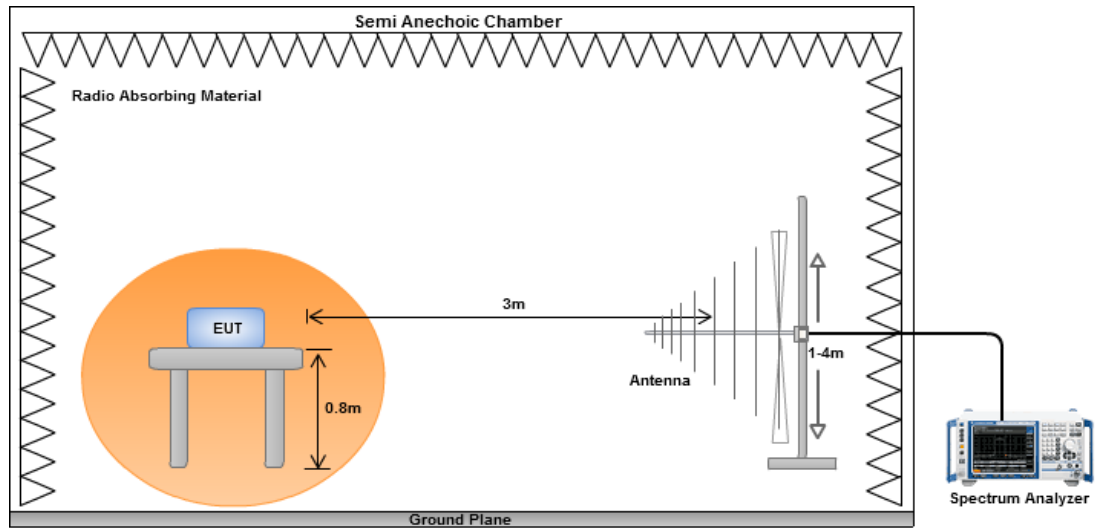
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

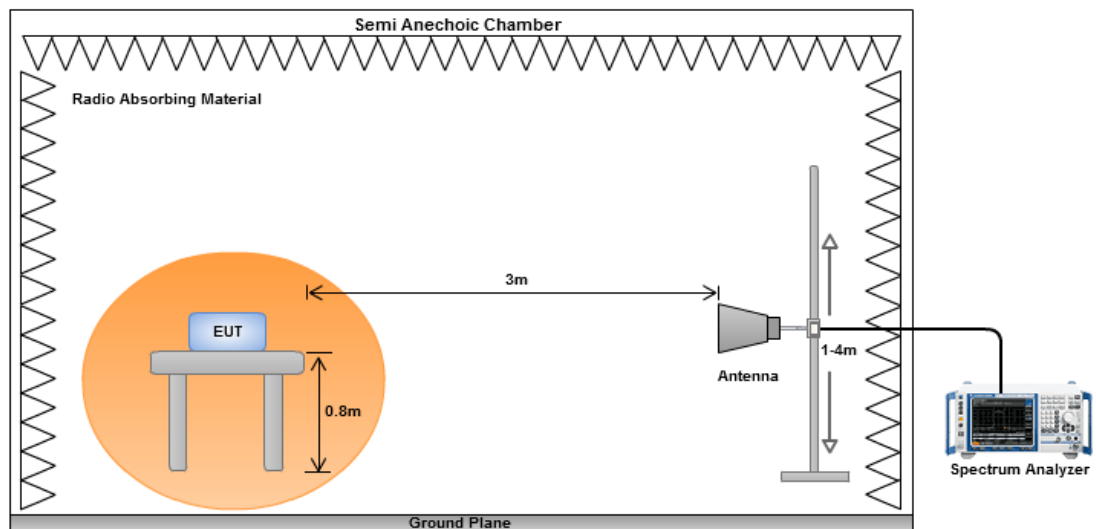
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.5.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



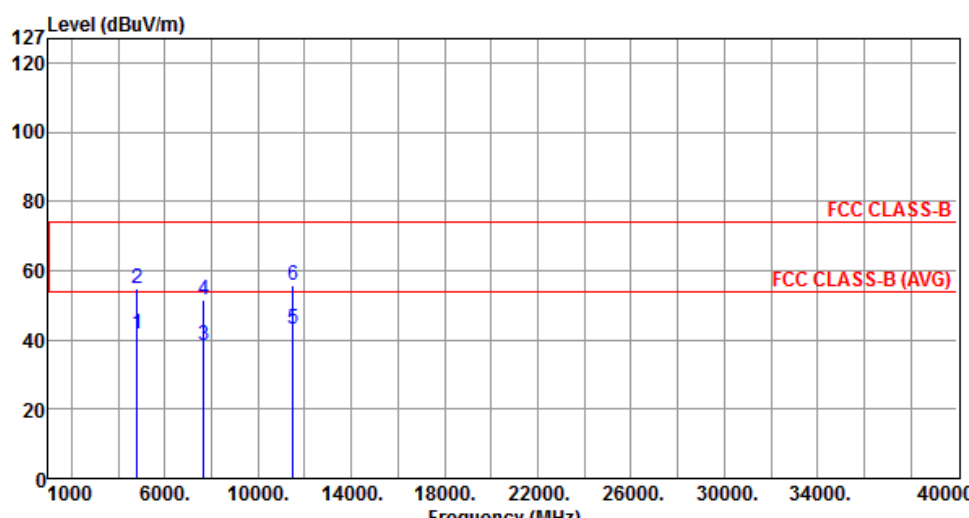
3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	VHT20	Test Freq. (MHz)	5785
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	VHT20	Test Freq. (MHz)	5785
Polarization	Vertical		
Level (dBuV/m)			

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11a

Modulation	11a	Test Freq. (MHz)	5745
Polarization	Horizontal		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	4800.00	41.63	54.00	-12.37	37.36	4.27	Average	---	---
2	4800.00	54.90	74.00	-19.10	50.63	4.27	Peak	---	---
3	7660.00	38.34	54.00	-15.66	28.71	9.63	Average	---	---
4	7660.00	51.52	74.00	-22.48	41.89	9.63	Peak	---	---
5	11490.00	43.14	54.00	-10.86	28.17	14.97	Average	---	---
6	11490.00	55.97	74.00	-18.03	41.00	14.97	Peak	---	---

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	11a	Test Freq. (MHz)	5745																																																																																										
Polarization	Vertical																																																																																												
Level (dBUV/m) 127 120 100 80 60 40 20 0 1 2 3 4 5 6 1000 6000 10000 14000 18000 22000 26000 30000 34000 40000 Frequency (MHz) FCC CLASS-B FCC CLASS-B (AVG) <table><tr><td></td><td>Freq.</td><td>Emission</td><td>Limit</td><td>Margin</td><td>SA</td><td>Factor</td><td>Remark</td><td>ANT</td><td>Turn</td></tr><tr><td></td><td></td><td>level</td><td></td><td></td><td>reading</td><td></td><td></td><td>High</td><td>Table</td></tr><tr><td></td><td>MHz</td><td>dBuV/m</td><td>dBuV/m</td><td>dB</td><td>dBuV</td><td>dB</td><td></td><td>cm</td><td>deg</td></tr><tr><td>1</td><td>4800.00</td><td>42.31</td><td>54.00</td><td>-11.69</td><td>38.04</td><td>4.27</td><td>Average</td><td>---</td><td>---</td></tr><tr><td>2</td><td>4800.00</td><td>55.40</td><td>74.00</td><td>-18.60</td><td>51.13</td><td>4.27</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>3</td><td>7660.00</td><td>38.22</td><td>54.00</td><td>-15.78</td><td>28.59</td><td>9.63</td><td>Average</td><td>---</td><td>---</td></tr><tr><td>4</td><td>7660.00</td><td>51.23</td><td>74.00</td><td>-22.77</td><td>41.60</td><td>9.63</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>5</td><td>11490.00</td><td>45.86</td><td>54.00</td><td>-8.14</td><td>30.89</td><td>14.97</td><td>Average</td><td>---</td><td>---</td></tr><tr><td>6</td><td>11490.00</td><td>60.57</td><td>74.00</td><td>-13.43</td><td>45.60</td><td>14.97</td><td>Peak</td><td>---</td><td>---</td></tr></table>					Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn			level			reading			High	Table		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg	1	4800.00	42.31	54.00	-11.69	38.04	4.27	Average	---	---	2	4800.00	55.40	74.00	-18.60	51.13	4.27	Peak	---	---	3	7660.00	38.22	54.00	-15.78	28.59	9.63	Average	---	---	4	7660.00	51.23	74.00	-22.77	41.60	9.63	Peak	---	---	5	11490.00	45.86	54.00	-8.14	30.89	14.97	Average	---	---	6	11490.00	60.57	74.00	-13.43	45.60	14.97	Peak	---	---
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn																																																																																				
		level			reading			High	Table																																																																																				
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg																																																																																				
1	4800.00	42.31	54.00	-11.69	38.04	4.27	Average	---	---																																																																																				
2	4800.00	55.40	74.00	-18.60	51.13	4.27	Peak	---	---																																																																																				
3	7660.00	38.22	54.00	-15.78	28.59	9.63	Average	---	---																																																																																				
4	7660.00	51.23	74.00	-22.77	41.60	9.63	Peak	---	---																																																																																				
5	11490.00	45.86	54.00	-8.14	30.89	14.97	Average	---	---																																																																																				
6	11490.00	60.57	74.00	-13.43	45.60	14.97	Peak	---	---																																																																																				
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).																																																																																													

Modulation	11a	Test Freq. (MHz)	5785
Polarization	Horizontal		
Level (dBUV/m)			

Modulation	11a	Test Freq. (MHz)	5785
Polarization	Vertical		
Level (dBuV/m) <			

Modulation	11a	Test Freq. (MHz)	5825
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	11a	Test Freq. (MHz)	5825																																																																																
Polarization	Vertical																																																																																		
Level (dBuV/m) 127 120 100 80 60 40 20 0 2 1 4 3 6 5 1000 6000. 10000. 14000. 18000. 22000. 26000. 30000. 34000. 40000 Frequency (MHz) FCC CLASS-B FCC CLASS-B (AVG) <table><tr><th></th><th>Freq.</th><th>Emission level</th><th>Limit</th><th>Margin</th><th>SA reading</th><th>Factor</th><th>Remark</th><th>ANT High</th><th>Turn Table</th></tr><tr><th></th><th>MHz</th><th>dBuV/m</th><th>dBuV/m</th><th>dB</th><th>dBuV</th><th>dB</th><th></th><th>cm</th><th>deg</th></tr><tr><td>1</td><td>4800.00</td><td>41.89</td><td>54.00</td><td>-12.11</td><td>37.62</td><td>4.27</td><td>Average</td><td>---</td><td>---</td></tr><tr><td>2</td><td>4800.00</td><td>55.16</td><td>74.00</td><td>-18.84</td><td>50.89</td><td>4.27</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>3</td><td>7766.66</td><td>38.05</td><td>54.00</td><td>-15.95</td><td>28.34</td><td>9.71</td><td>Average</td><td>---</td><td>---</td></tr><tr><td>4</td><td>7766.66</td><td>51.50</td><td>74.00</td><td>-22.50</td><td>41.79</td><td>9.71</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>5</td><td>11650.00</td><td>45.41</td><td>54.00</td><td>-8.59</td><td>30.65</td><td>14.76</td><td>Average</td><td>---</td><td>---</td></tr><tr><td>6</td><td>11650.00</td><td>60.49</td><td>74.00</td><td>-13.51</td><td>45.73</td><td>14.76</td><td>Peak</td><td>---</td><td>---</td></tr></table>					Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg	1	4800.00	41.89	54.00	-12.11	37.62	4.27	Average	---	---	2	4800.00	55.16	74.00	-18.84	50.89	4.27	Peak	---	---	3	7766.66	38.05	54.00	-15.95	28.34	9.71	Average	---	---	4	7766.66	51.50	74.00	-22.50	41.79	9.71	Peak	---	---	5	11650.00	45.41	54.00	-8.59	30.65	14.76	Average	---	---	6	11650.00	60.49	74.00	-13.51	45.73	14.76	Peak	---	---
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table																																																																										
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg																																																																										
1	4800.00	41.89	54.00	-12.11	37.62	4.27	Average	---	---																																																																										
2	4800.00	55.16	74.00	-18.84	50.89	4.27	Peak	---	---																																																																										
3	7766.66	38.05	54.00	-15.95	28.34	9.71	Average	---	---																																																																										
4	7766.66	51.50	74.00	-22.50	41.79	9.71	Peak	---	---																																																																										
5	11650.00	45.41	54.00	-8.59	30.65	14.76	Average	---	---																																																																										
6	11650.00	60.49	74.00	-13.51	45.73	14.76	Peak	---	---																																																																										
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).																																																																																			

3.5.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT20

Modulation	VHT20	Test Freq. (MHz)	5745
Polarization	Horizontal		
Level (dBUV/m)			

Modulation	VHT20	Test Freq. (MHz)	5745
Polarization	Vertical		
Level (dBuV/m) <			

Modulation	VHT20	Test Freq. (MHz)	5785
Polarization	Horizontal		
Level (dBuV/m) <			

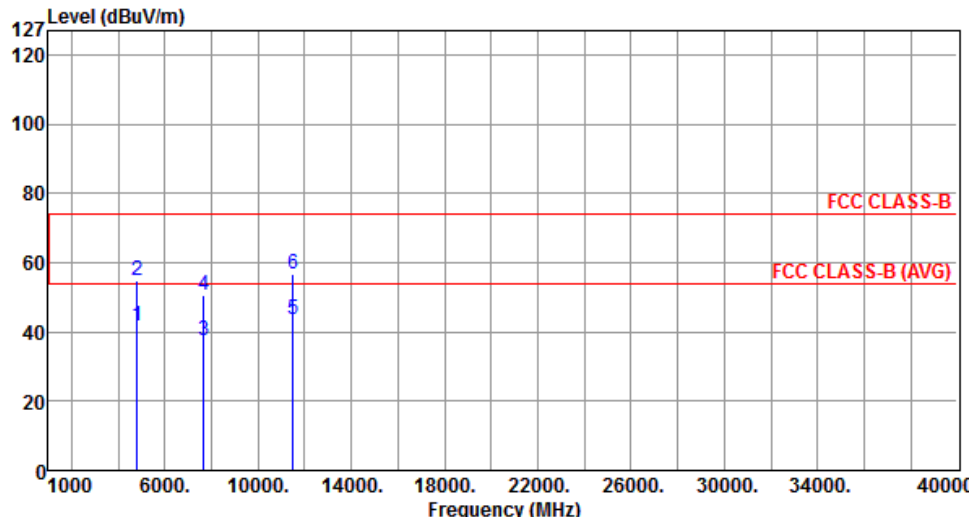
Modulation	VHT20	Test Freq. (MHz)	5785
Polarization	Vertical		
Level (dBuV/m) <			

Modulation	VHT20	Test Freq. (MHz)	5825
Polarization	Horizontal		
Level (dBUV/m) <			

Modulation	VHT20	Test Freq. (MHz)	5825
Polarization	Vertical		
Level (dBUV/m)			

3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT40

Modulation	VHT40	Test Freq. (MHz)	5755
Polarization	Horizontal		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	4800.00	41.87	54.00	-12.13	37.60	4.27	Average	---	---
2	4800.00	54.60	74.00	-19.40	50.33	4.27	Peak	---	---
3	7673.33	37.29	54.00	-16.71	27.66	9.63	Average	---	---
4	7673.33	50.53	74.00	-23.47	40.90	9.63	Peak	---	---
5	11510.00	43.67	54.00	-10.33	28.71	14.96	Average	---	---
6	11510.00	56.59	74.00	-17.41	41.63	14.96	Peak	---	---

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	VHT40	Test Freq. (MHz)	5755
Polarization	Vertical		
Level (dBuV/m)			

Modulation	VHT40	Test Freq. (MHz)	5795
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	VHT40	Test Freq. (MHz)	5795
Polarization	Vertical		
Level (dBUV/m) </			

3.5.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT80

Modulation	VHT80	Test Freq. (MHz)	5775
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	VHT80	Test Freq. (MHz)	5775
Polarization	Vertical		
Level (dBUV/m)			

3.6 Unwanted Emissions into Non-Restricted Frequency Bands

3.6.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

- ☒ The peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.
- ☐ The peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.6.2 Test Procedures

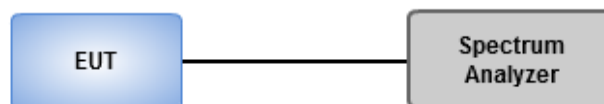
Reference Level Measurement

1. Set the RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Set Sweep time = auto couple, Trace mode = max hold.
3. Allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

Unwanted Emissions Level Measurement

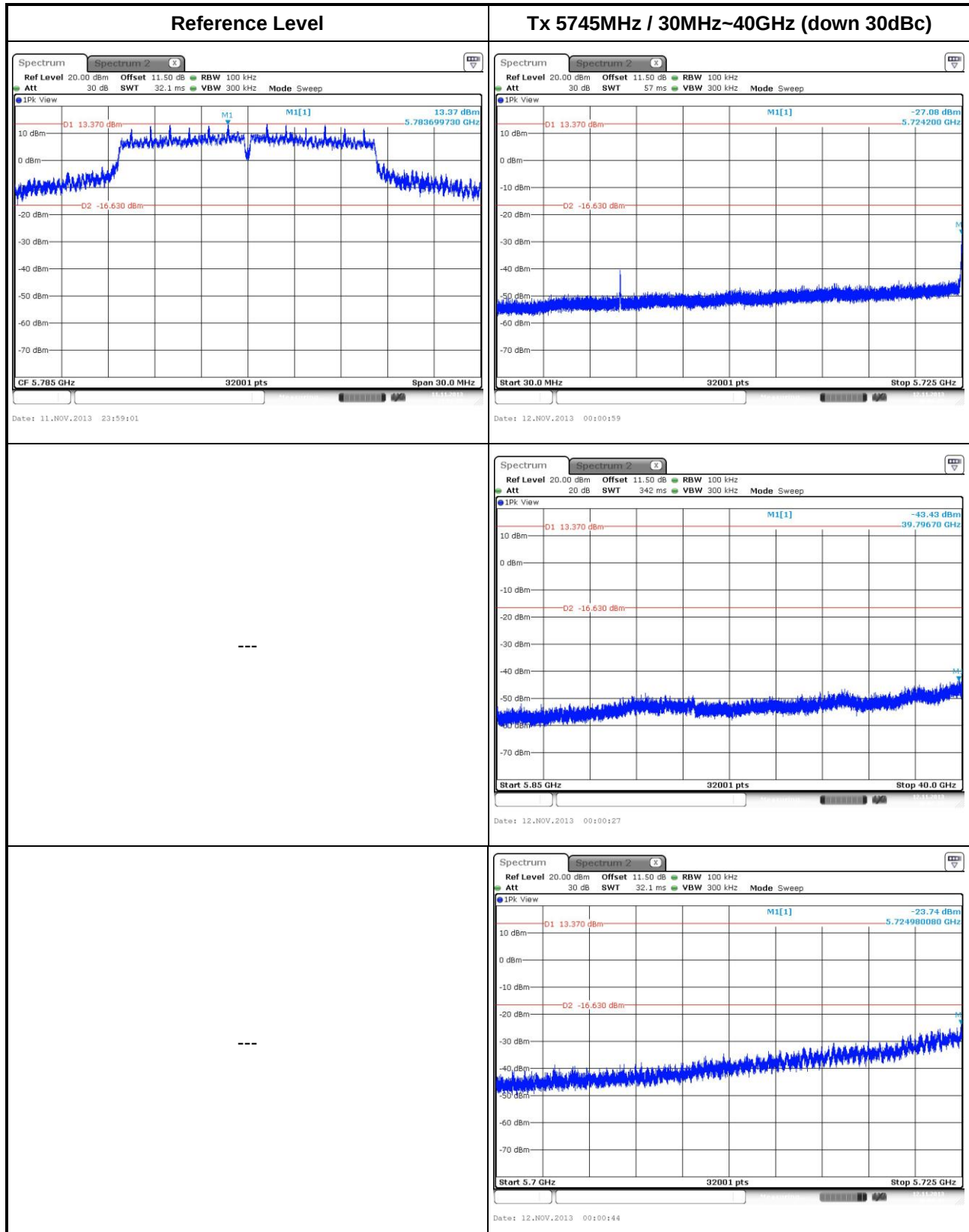
1. Set RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Trace Mode = max hold, Sweep = auto couple.
3. Allow the trace to stabilize.
4. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

3.6.3 Test Setup

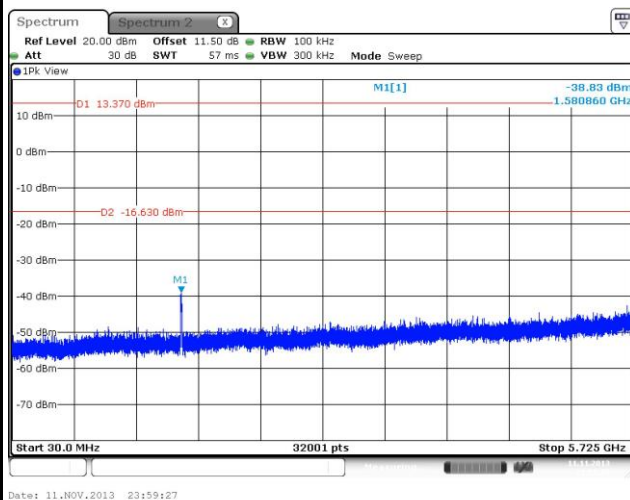


3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands

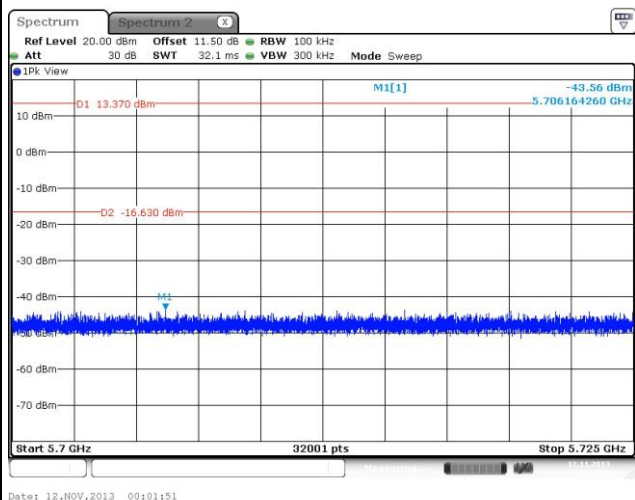
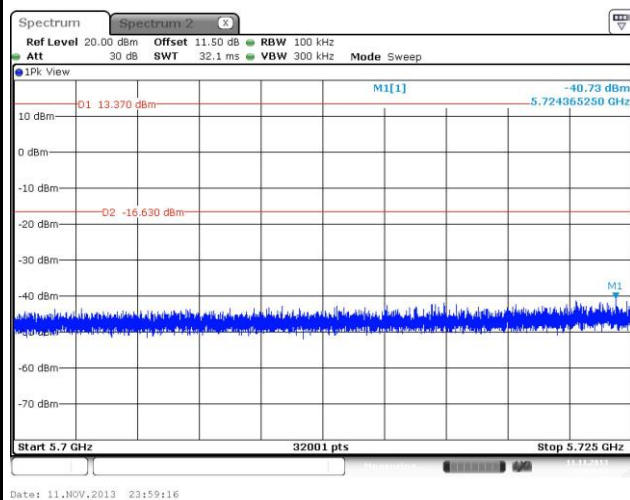
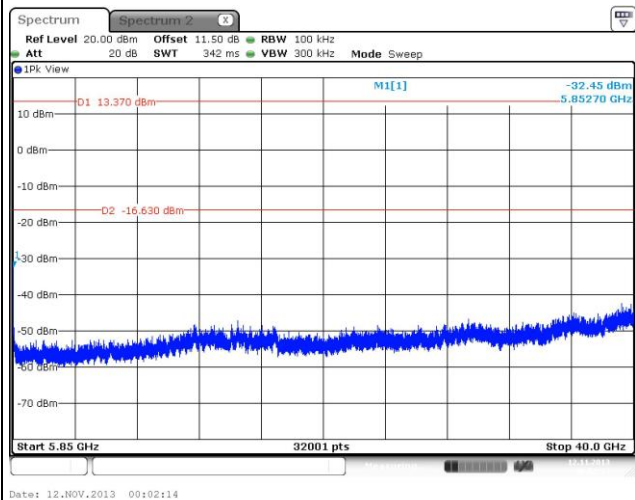
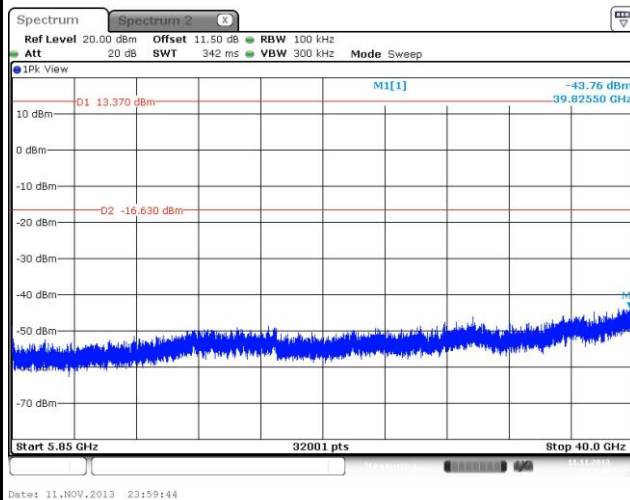
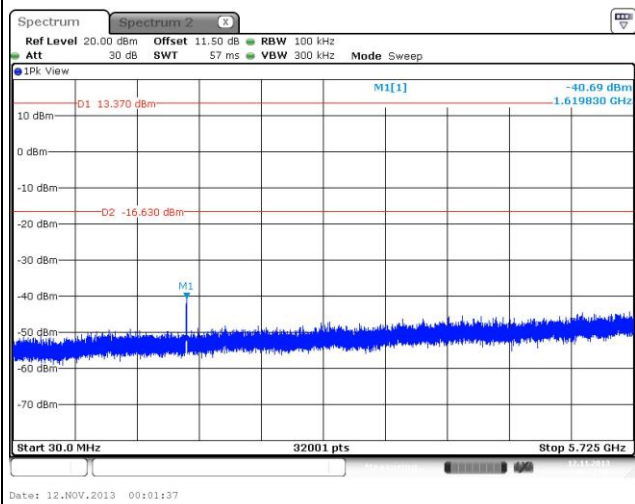
802.11a



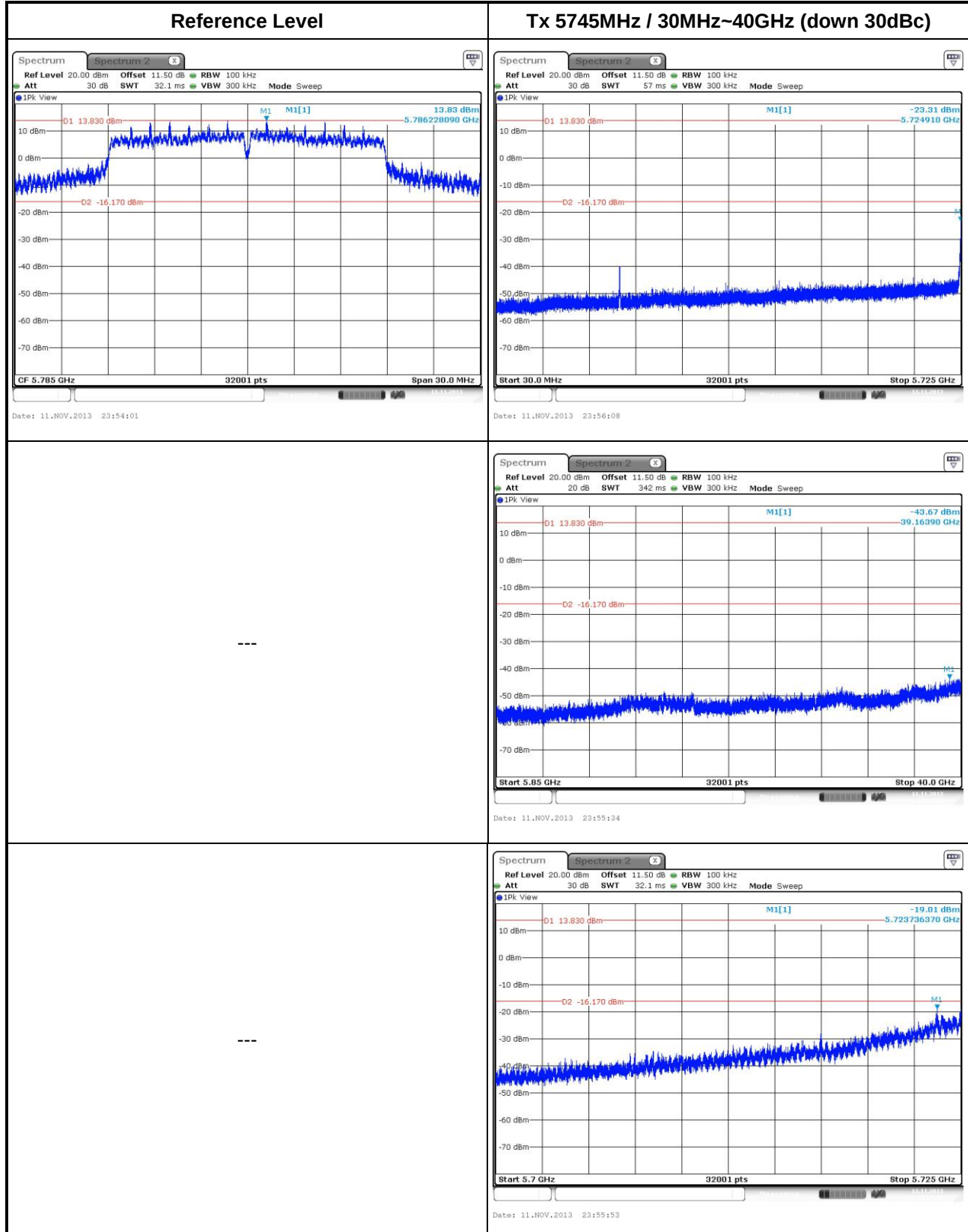
Tx 5785MHz / 30MHz~40GHz (down 30dBc)



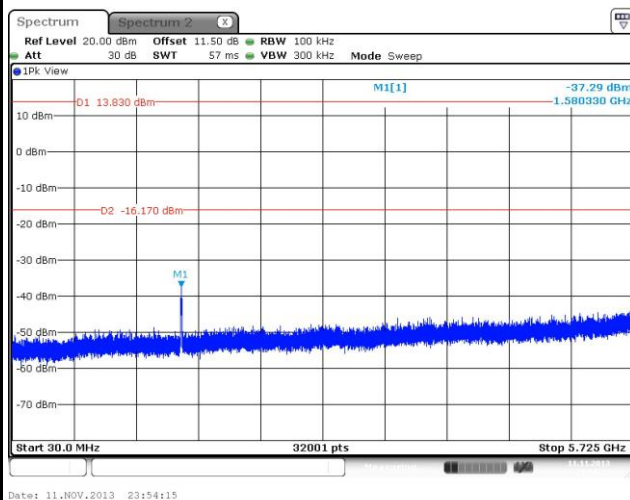
Tx 5825MHz / 30MHz~40GHz (down 30dBc)



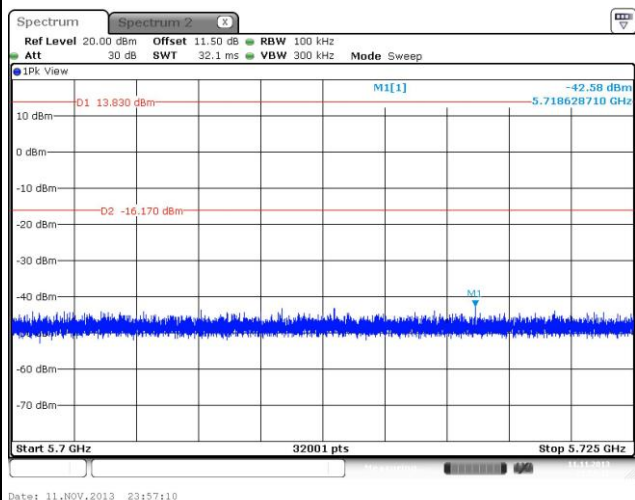
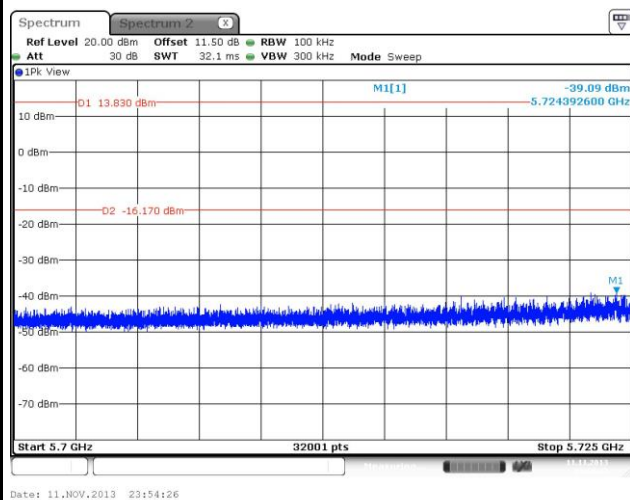
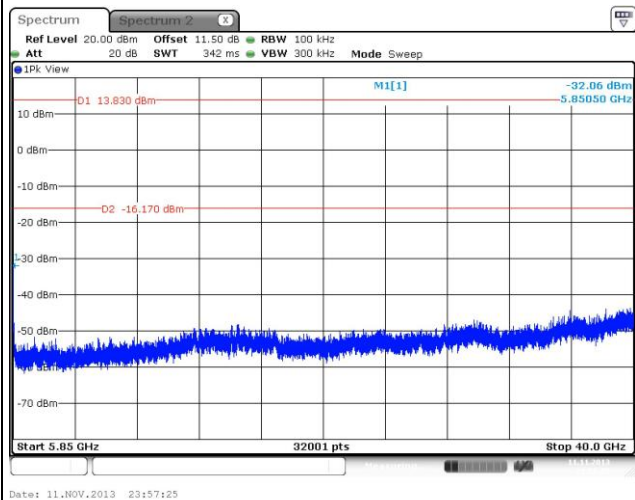
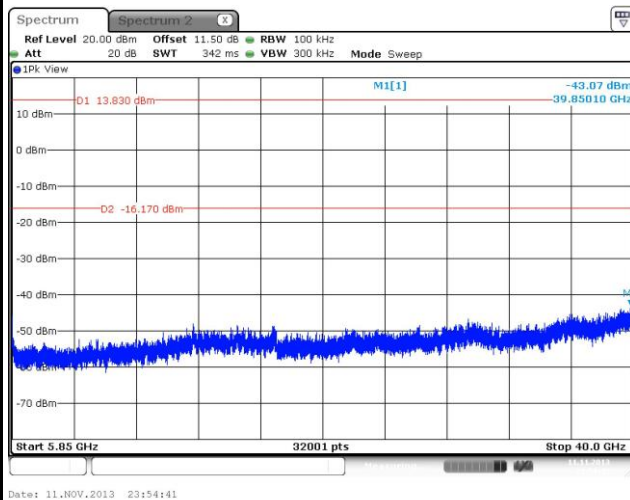
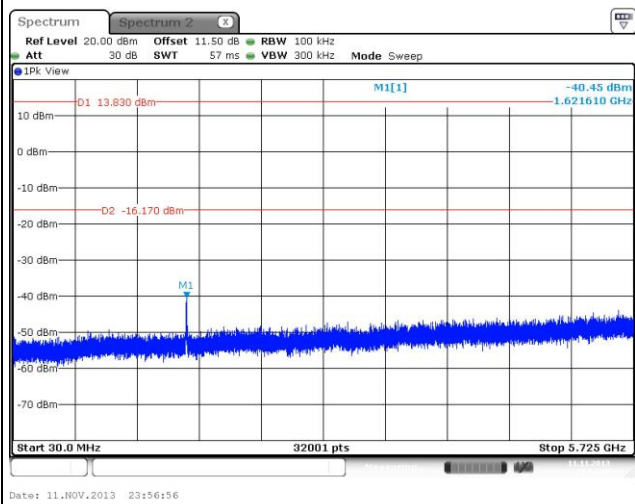
802.11n VHT20



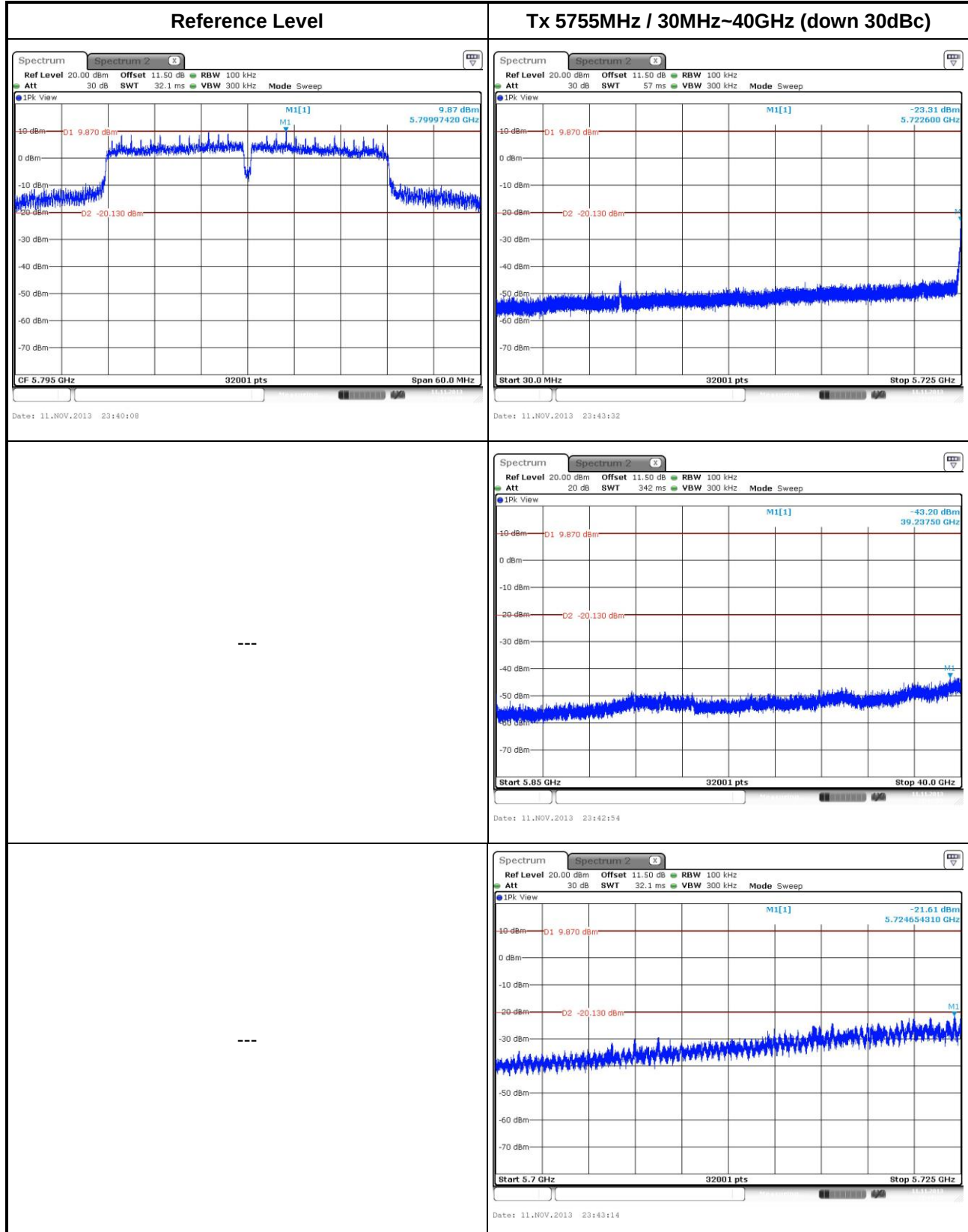
Tx 5785MHz / 30MHz~40GHz (down 30dBc)



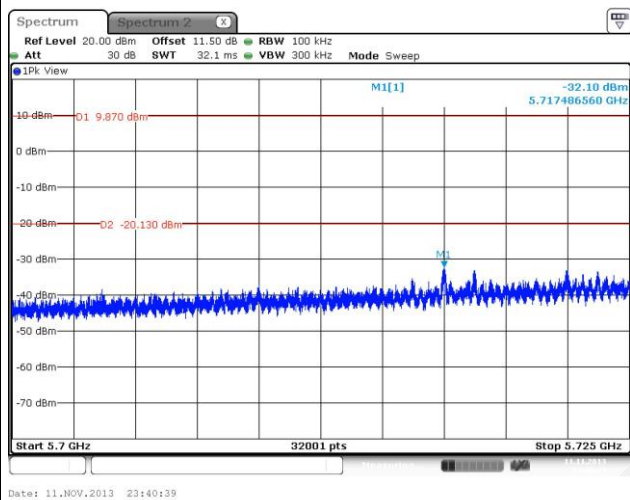
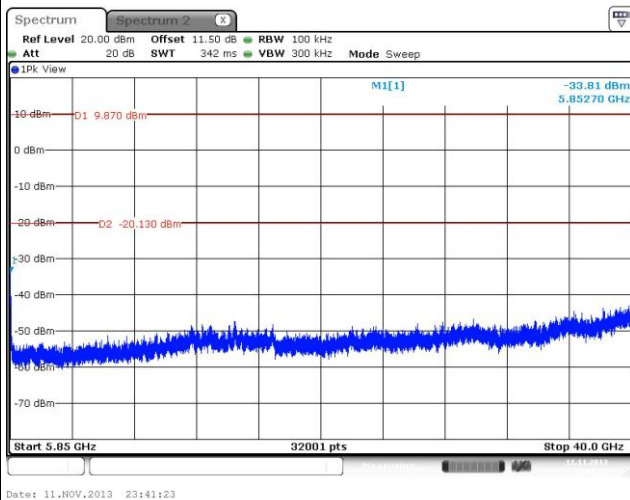
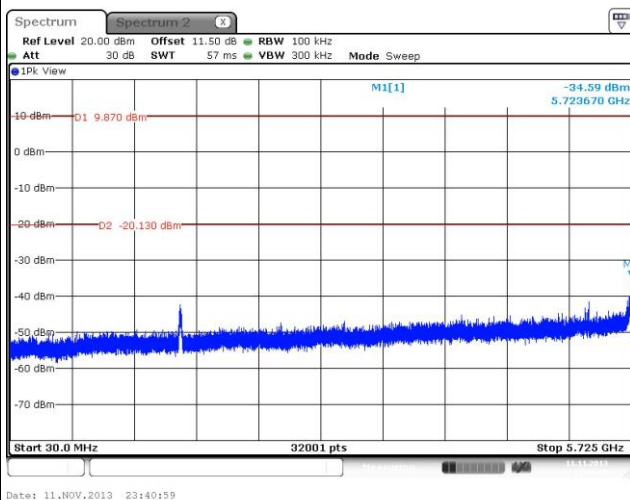
Tx 5825MHz / 30MHz~40GHz (down 30dBc)



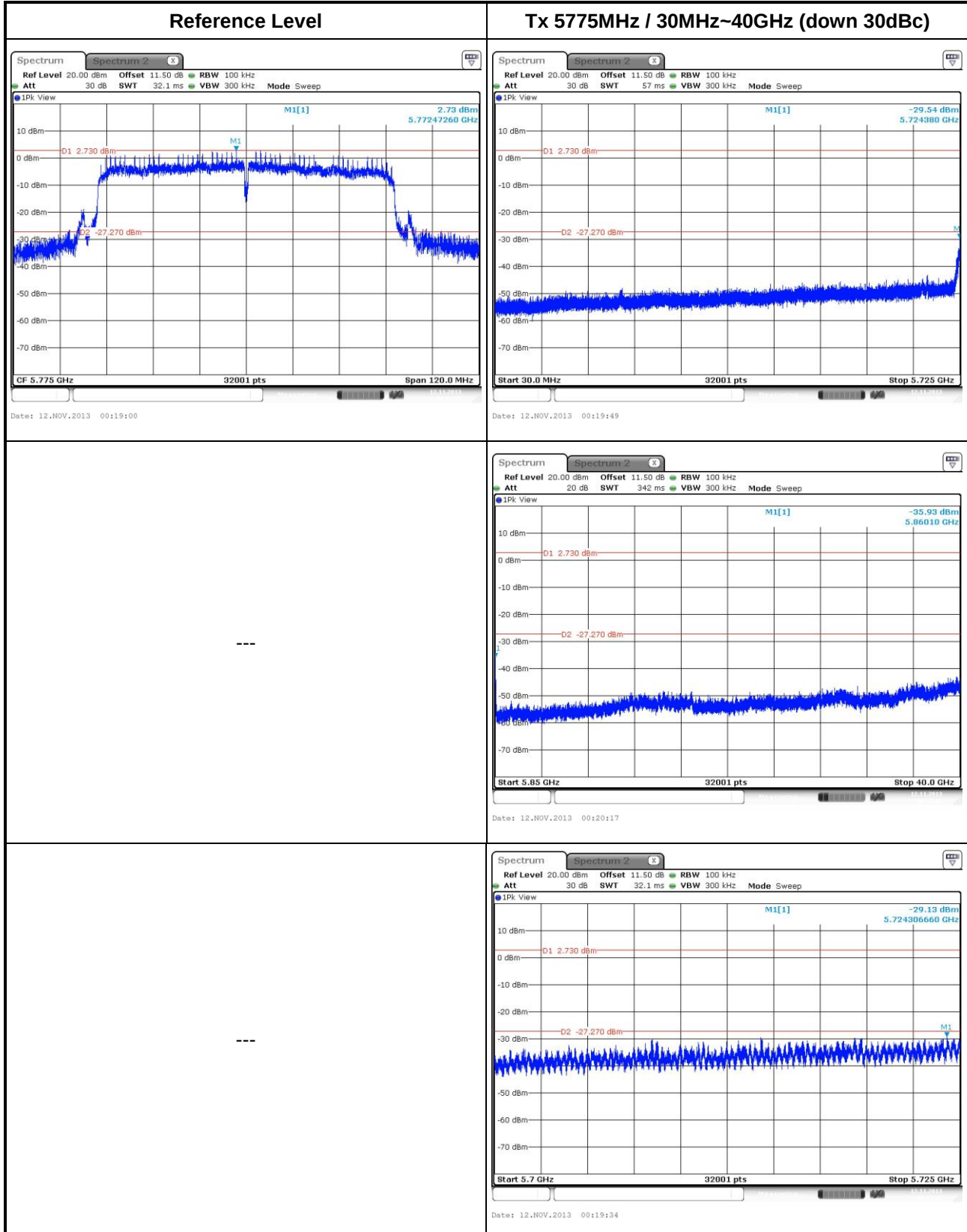
802.11n VHT40



Tx 5795MHz / 30MHz~40GHz (down 30dBc)



802.11n VHT80



4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp, it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information

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