

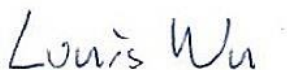
NCC RADIO TEST REPORT

Equipment : 無線整合型 IC 卡與磁條卡終端機
Brand Name : Verifone
Model Name : e280 DB
Applicant : 新加坡商惠爾訊科技股份有限公司台灣分公司
台北市南港區三重路 19-2 號 2 樓
Manufacturer : Verifone, Inc.
Standard : NCC LP0002 (2018-01-10)

The product was received on Oct. 12, 2019 and testing was started from Oct. 12, 2019 and completed on Jan. 13, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures NCC LP0002 (2018-01-10) and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



Reviewed by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
TR832801-06A	01	Initial issue of report	Feb. 12, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	LP0002 3.10.1.6 (1)(A)	Number of Channels	Pass	-
3.2	LP0002 3.10.1.6 (1)(A)	Hopping Channel Separation	Pass	-
3.3	LP0002 3.10.1.6 (1)(A)	Dwell Time of Each Channel	Pass	-
3.4	LP0002 3.10.1.6 (1)(A)	20dB Bandwidth	Pass	-
3.4	-	99% Occupied Bandwidth	Reporting only	-
3.5	LP0002 3.10.1.6 (1)(A)	Peak Output Power	Pass	-
3.6	LP0002 3.10.1.5	Conducted Band Edges	Pass	-
3.7	LP0002 3.10.1.5	Conducted Spurious Emission	Pass	-
3.8	LP0002 3.10.1.5	Radiated Band Edges and Radiated Spurious Emission	Pass	Under limit 6.03 dB at 893.300 MHz
3.9	LP0002 2.3	AC Conducted Emission	Pass	Under limit 7.86 dB at 0.512 MHz
3.10	LP0002 2.2 3.10.1.3 3.10.1.4	Antenna Requirement	Pass	-
Appendix D-Annex A	LP0002 2.11	Receiver Radiated Emission	Pass	Please refer to Appendix D-Annex A

Remark: Except AC Conducted Emissions and Receiver Radiated Emission are carrying out, the TR832801-06A report reuse test data from the FR832801-05A report.

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Cindy Liu

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac, and RFID.

Product Specification subjective to this standard	
Antenna Type	WLAN: Stamping Antenna Bluetooth: Stamping Antenna RFID: Loop Antenna

Specification of Accessory		
AC Adapter	Brand Name	Verifone
	Manufacturer	Phihong
	Model Name	PSAA05A-050QL6V
	Power Rating	Input:100-240Vac, 50-60Hz 0.2A Output: 5V/1A
	Power Cord	N/A
Battery	Brand Name	Verifone
	Model Name	BPK087-700
USB Cable	Brand Name	Verifone
	Model Name	N/A

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory	
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH05-HY	CO05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory	
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855	
Test Site No.	Sporton Site No.	
	03CH12-HY	

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190 and TW0007

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ NCC LP0002 (2018-01-10)
- FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	27	2429	54	2456
	1	2403	28	2430	55	2457
	2	2404	29	2431	56	2458
	3	2405	30	2432	57	2459
	4	2406	31	2433	58	2460
	5	2407	32	2434	59	2461
	6	2408	33	2435	60	2462
	7	2409	34	2436	61	2463
	8	2410	35	2437	62	2464
	9	2411	36	2438	63	2465
	10	2412	37	2439	64	2466
	11	2413	38	2440	65	2467
	12	2414	39	2441	66	2468
	13	2415	40	2442	67	2469
	14	2416	41	2443	68	2470
	15	2417	42	2444	69	2471
	16	2418	43	2445	70	2472
	17	2419	44	2446	71	2473
	18	2420	45	2447	72	2474
	19	2421	46	2448	73	2475
	20	2422	47	2449	74	2476
	21	2423	48	2450	75	2477
	22	2424	49	2451	76	2478
	23	2425	50	2452	77	2479
	24	2426	51	2453	78	2480
	25	2427	52	2454	-	-
	26	2428	53	2455	-	-

2.2 Test Mode

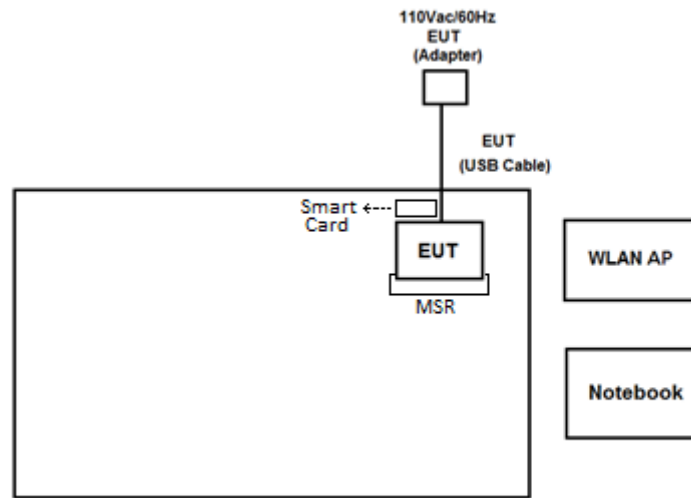
- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

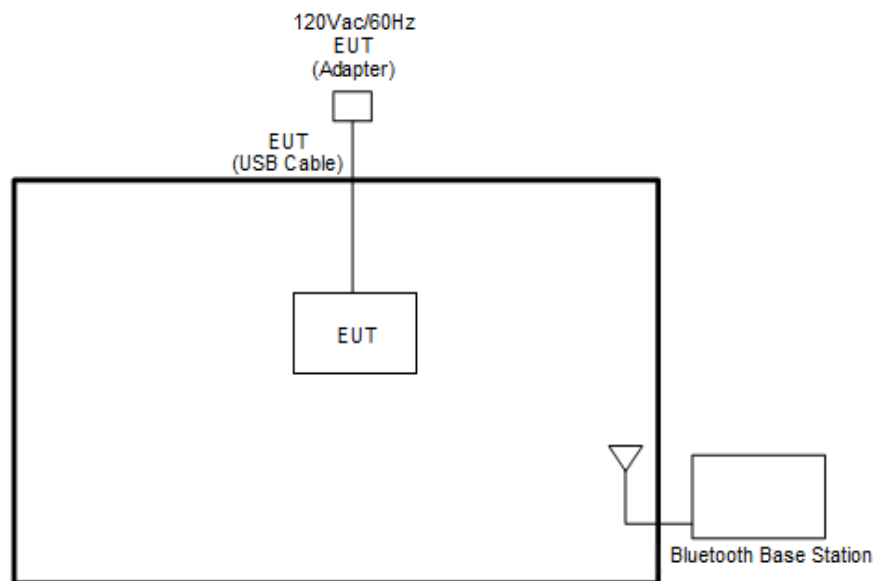
Summary table of Test Cases			
Test Item	Data Rate / Modulation		
	Bluetooth BR 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi/4$ -DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated Test Cases	Bluetooth BR 1Mbps GFSK		
	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz		
AC Conducted Emission	Mode 1 :Bluetooth Idle + WLAN (2.4GHz) Link + RFID On + MSR + Smart Card + Buzzer/Speaker + Display + USB Cable (Charging from Adapter) Mode 2 :Bluetooth Idle + WLAN (5GHz) Link + RFID On + MSR + Smart Card + Buzzer/Speaker + Display + USB Cable (Charging from Adapter) Mode 3 :Bluetooth Idle + WLAN (5GHz) Idle + RFID On + MSR + Smart Card + Buzzer/Speaker + Display + USB Cable (Charging from Adapter)		
Remark:			
1. For radiated test cases, the worst mode data rate 1Mbps was reported only since the highest RF output power in the preliminary tests. The conducted spurious emissions and conducted band edge measurement for other data rates were not worse than 1Mbps, and no other significantly frequencies found in conducted spurious emission.			
2. The worst case of conducted emission is mode 2; only the test data of it was reported.			

2.3 Connection Diagram of Test System

<AC Conducted Emission>



<Bluetooth Tx Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
2.	MSR Card	N/A	N/A	N/A	N/A	N/A
3.	Smart Card	N/A	N/A	N/A	N/A	N/A
4.	Notebook	DELL	Latitude 3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m

Remark: Applicant has ensured accessory would not be attached with the product on the market, accessory is provided by lab for testing.

2.5 EUT Operation Test Setup

The RF test items, utility “Broadcom Blue Tool” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to contact with base station to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)}\end{aligned}$$

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

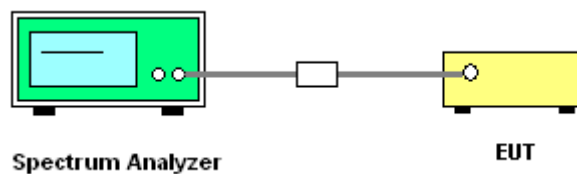
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation;
RBW = 300kHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

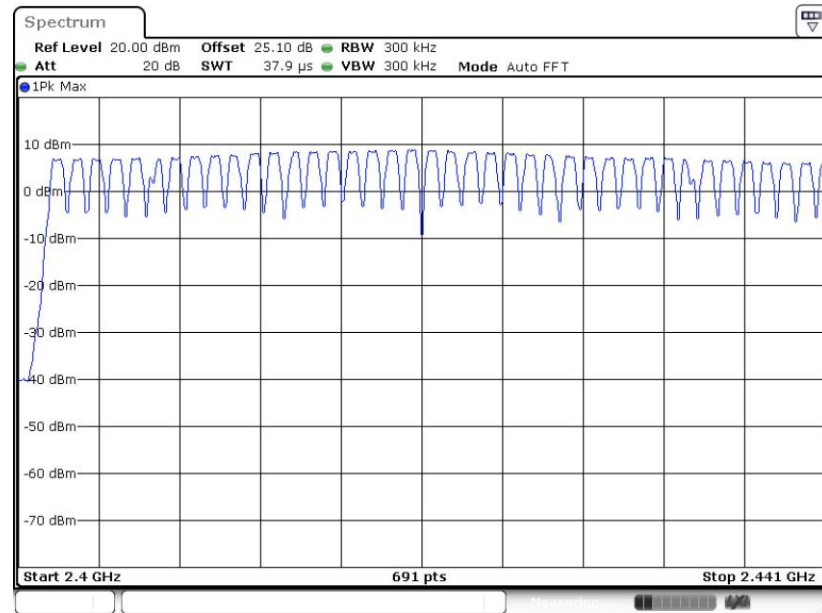
3.1.4 Test Setup



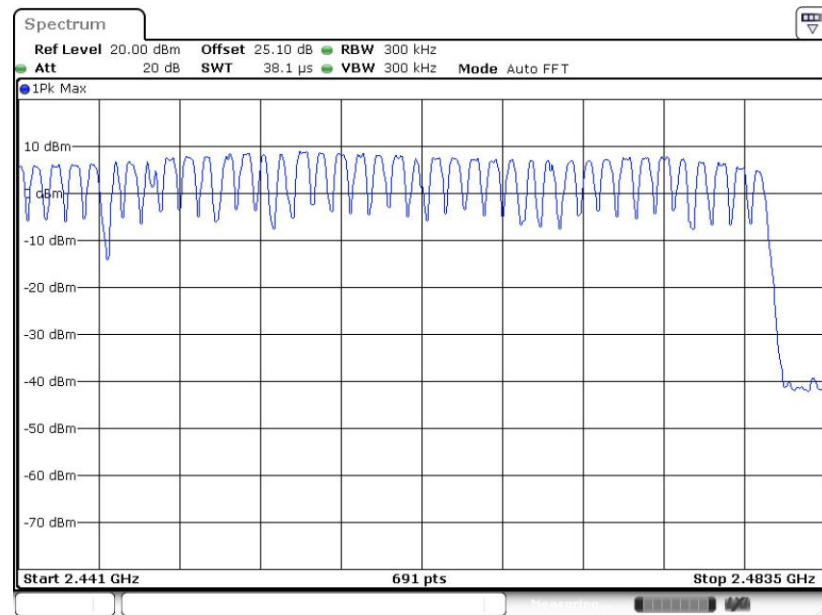
3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.

Number of Hopping Channel Plot on Channel 00 - 78



Date: 2.DEC.2019 02:10:53



Date: 2.DEC.2019 02:11:05

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

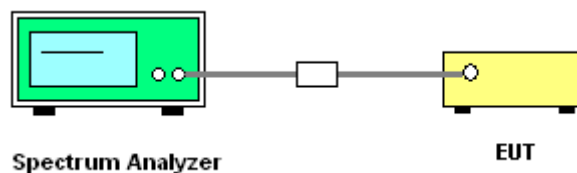
3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels;
RBW = 300kHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup

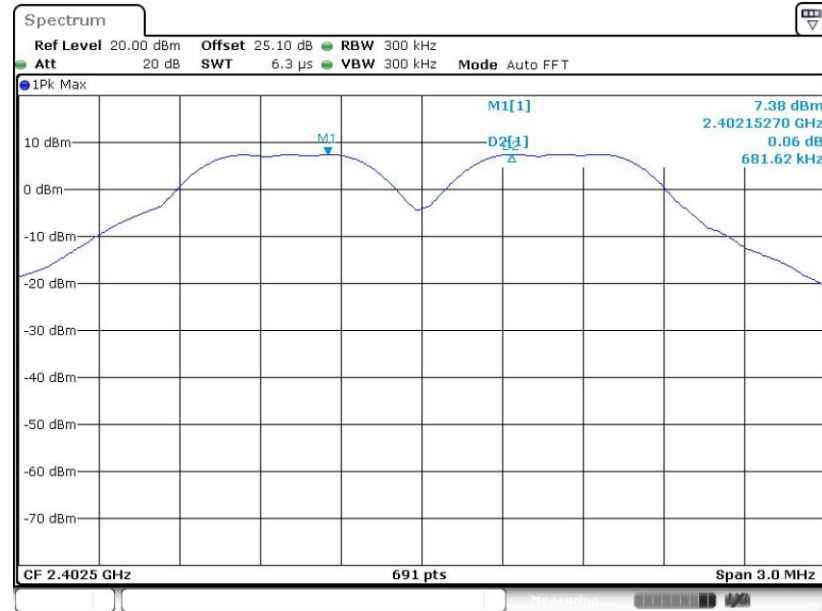


3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.

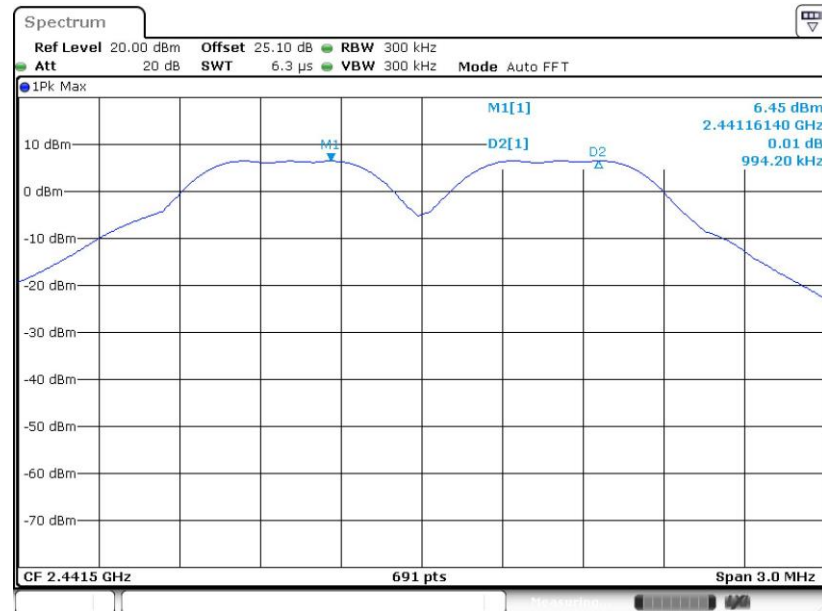
<1Mbps>

Channel Separation Plot on Channel 00 - 01

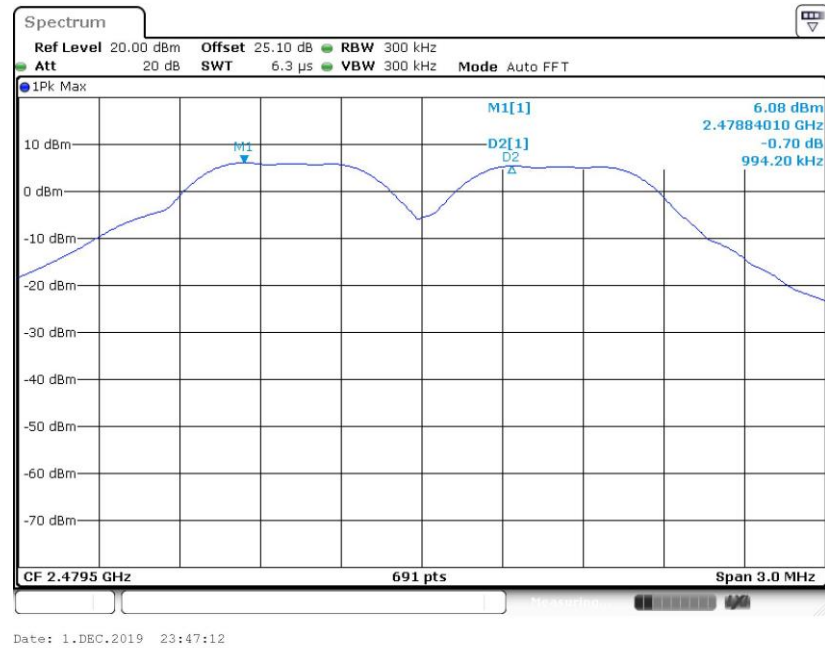
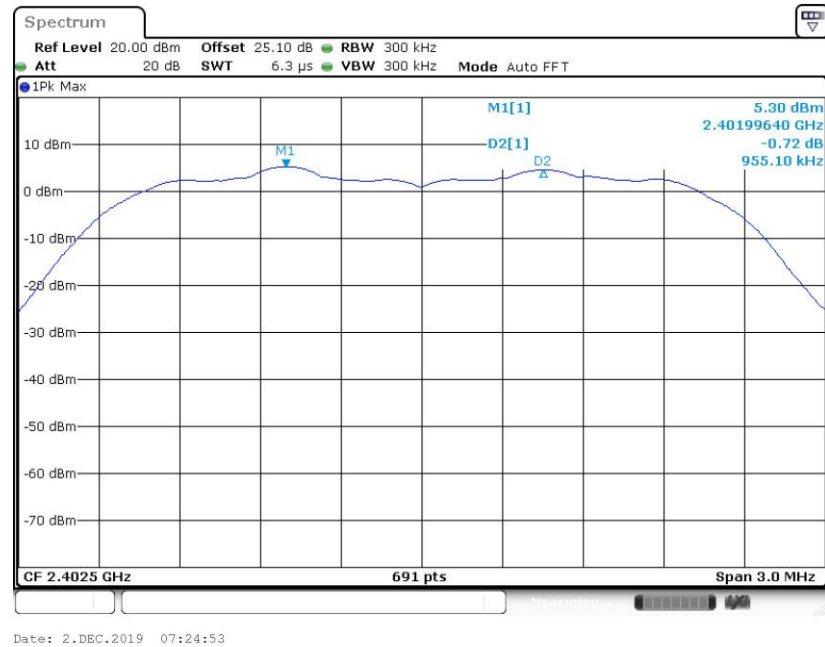


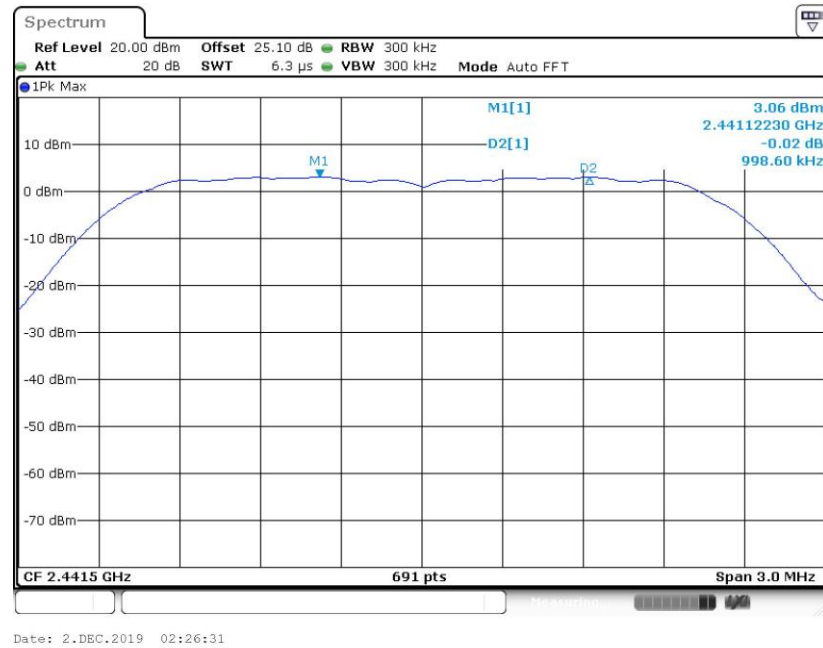
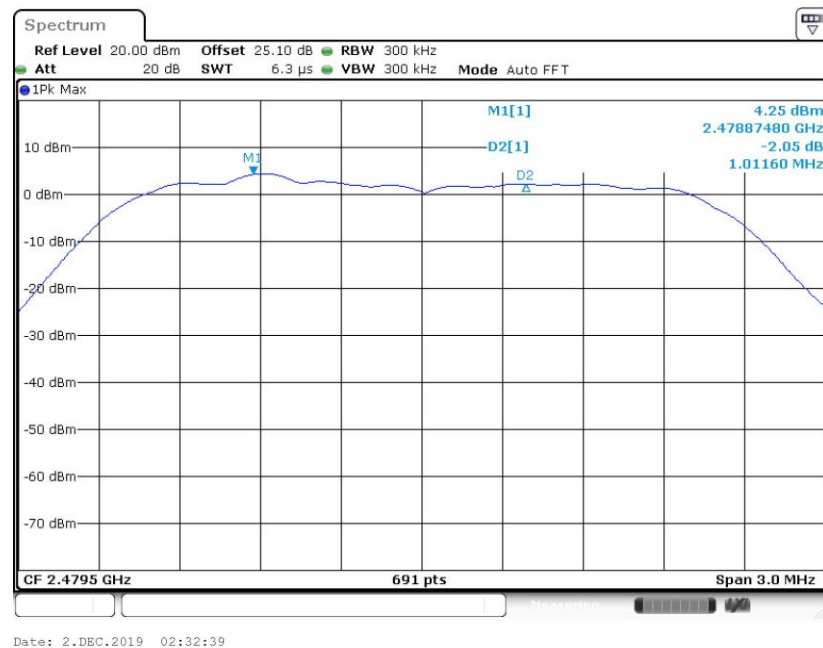
Date: 1.DEC.2019 22:39:52

Channel Separation Plot on Channel 39 - 40



Date: 1.DEC.2019 22:56:09

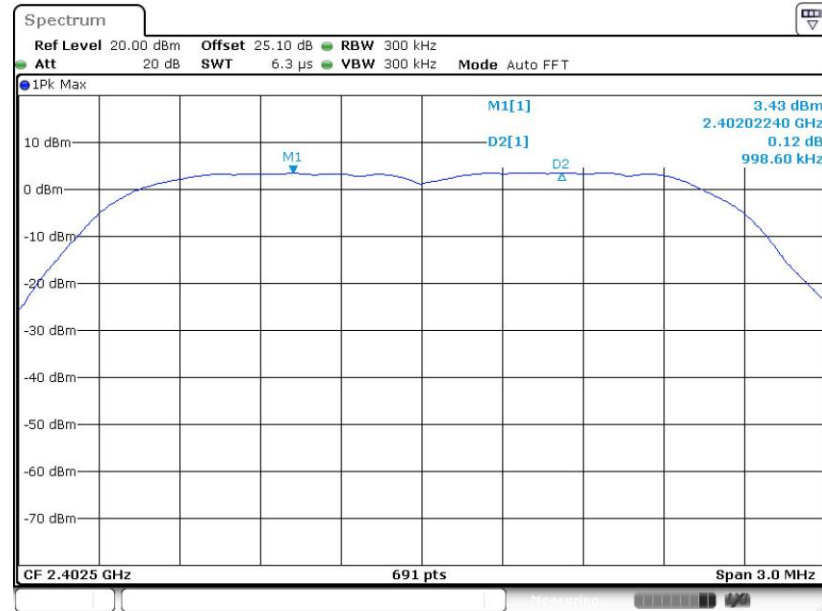
Channel Separation Plot on Channel 77 - 78

<2Mbps>
Channel Separation Plot on Channel 00 - 01


Channel Separation Plot on Channel 39 - 40

Channel Separation Plot on Channel 77 - 78




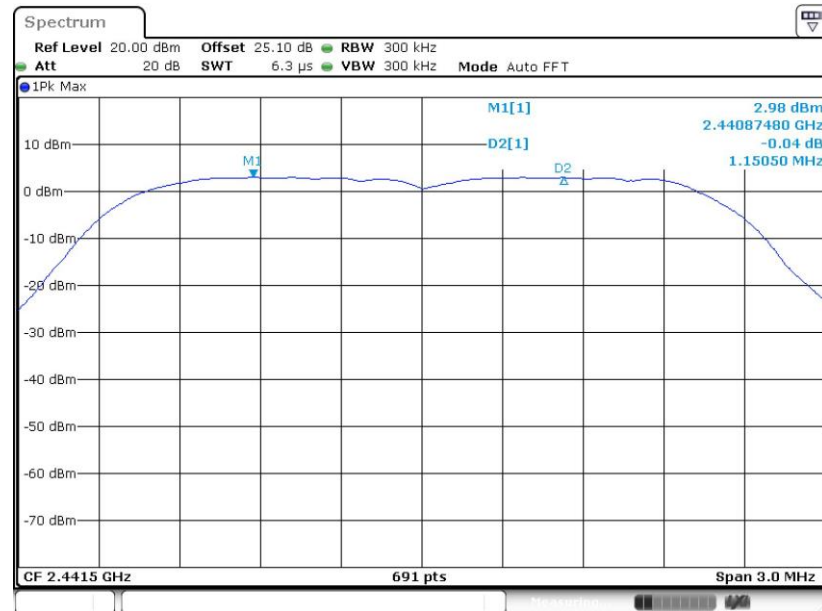
<3Mbps>

Channel Separation Plot on Channel 00 - 01



Date: 2.DEC.2019 02:44:16

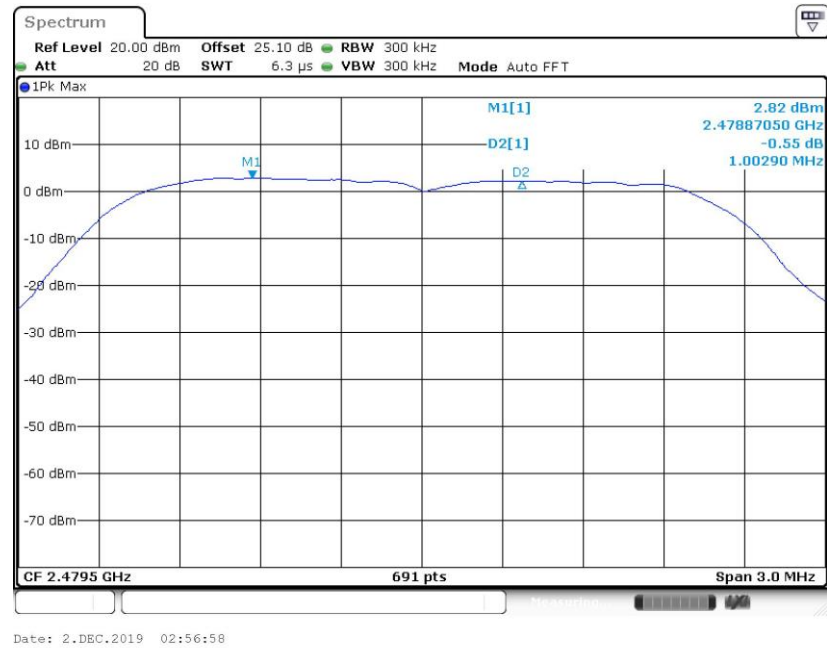
Channel Separation Plot on Channel 39 - 40



Date: 2.DEC.2019 02:51:12



Channel Separation Plot on Channel 77 - 78



3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

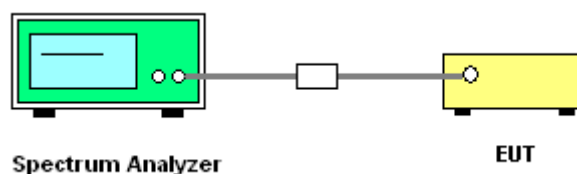
3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW $\geq$ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

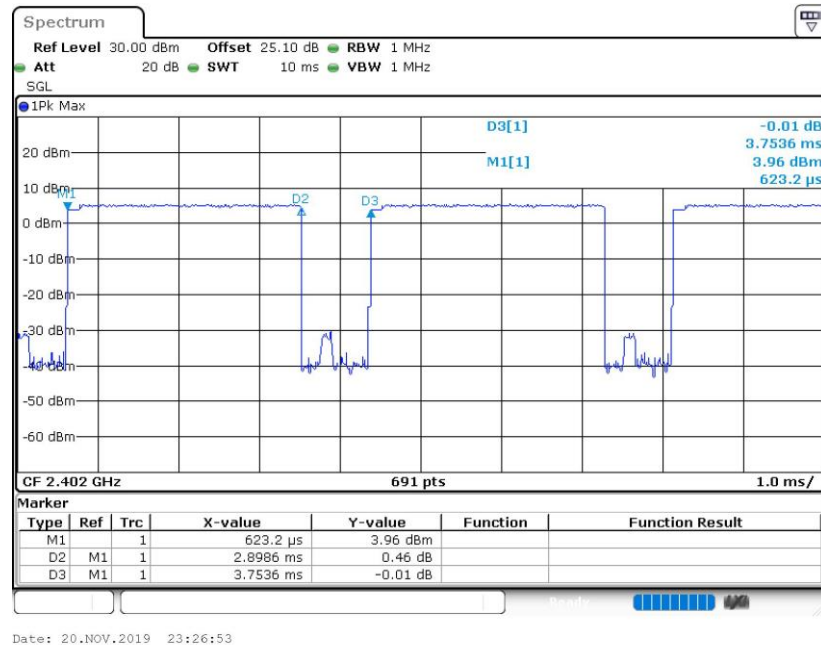
3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

Please refer to Appendix A.

Package Transfer Time Plot



Date: 20.NOV.2019 23:26:53

Remark:

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.
2. In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels. With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s), Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.33 hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

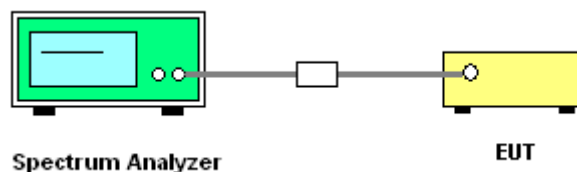
3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
RBW $\geq$ 1% of the 20 dB bandwidth; VBW $\geq$ RBW; Sweep = auto; Detector function = peak;
Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
RBW $\geq$ 1-5% of the 99% bandwidth; VBW $\geq$ 3 * RBW; Sweep = auto; Detector function = peak;
Trace = max hold.
6. Measure and record the results in the test report.

3.4.4 Test Setup

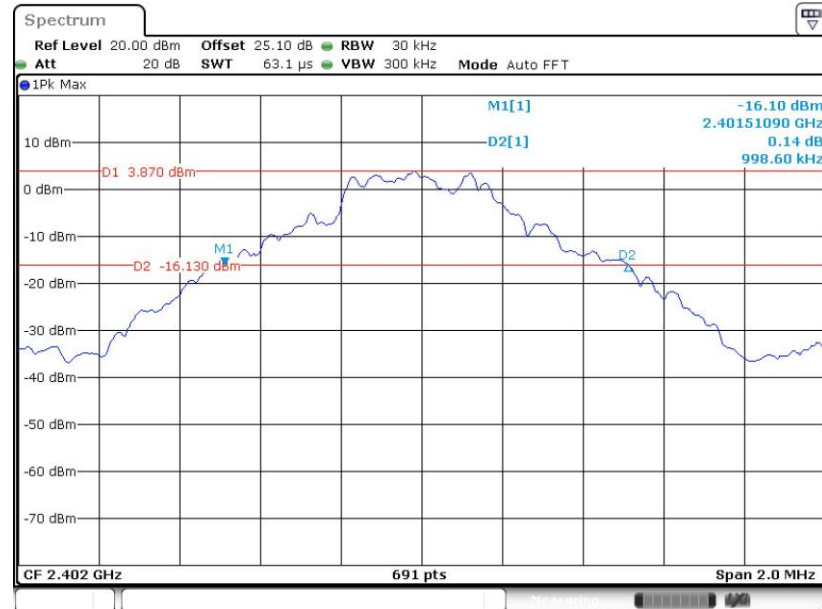


3.4.5 Test Result of 20dB Bandwidth

Please refer to Appendix A.

<1Mbps>

20 dB Bandwidth Plot on Channel 00



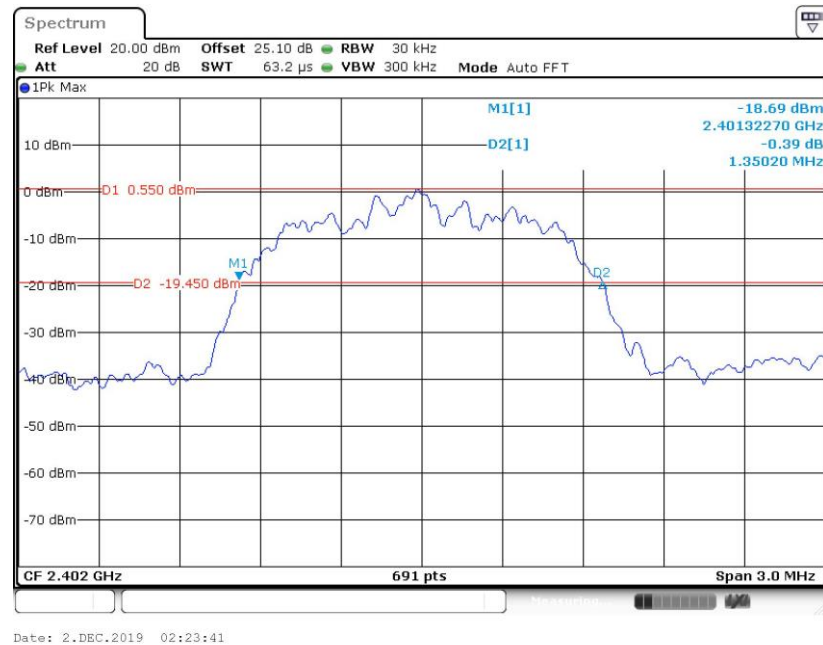
Date: 2.DEC.2019 07:11:10

20 dB Bandwidth Plot on Channel 39



Date: 2.DEC.2019 02:05:50

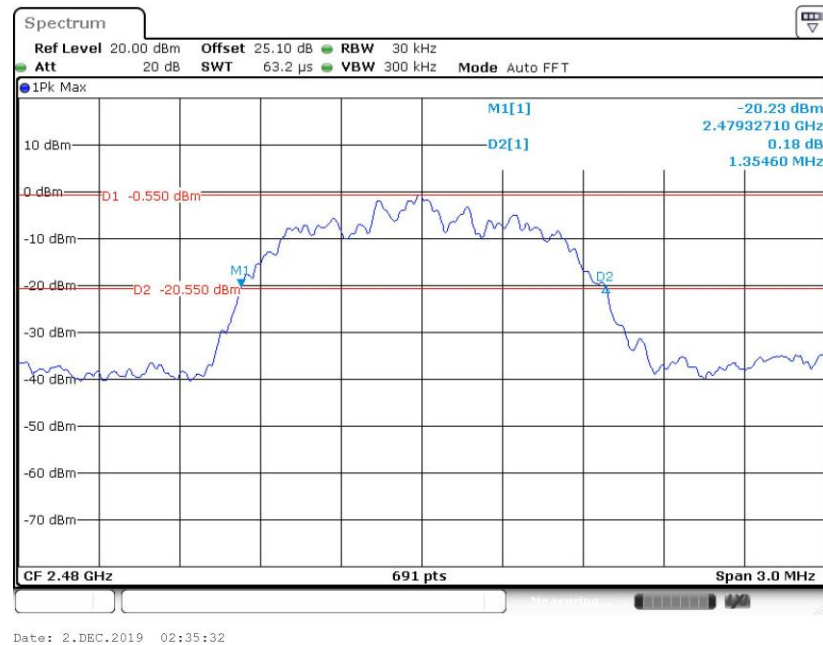
20 dB Bandwidth Plot on Channel 78

<2Mbps>
20 dB Bandwidth Plot on Channel 00


20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78





Spectrum

Ref Level 20.00 dBm Offset 25.10 dB RBW 30 kHz
Att 20 dB SWT 63.2 μ s VBW 300 kHz Mode Auto FFT

IPk Max

M1[1] -19.28 dBm
2.40134880 GHz
0.06 dB
1.31110 MHz

D1 0.600 dBm
D2 -19.400 dBm

CF 2.402 GHz 691 pts Span 3.0 MHz

Spectrum

Ref Level 20.00 dBm **Offset** 25.10 dB **RBW** 30 kHz
Att 20 dB **SWT** 63.2 μ s **VBW** 300 kHz **Mode** Auto FFT

1Pk Max

The spectrum plot displays a signal with two main peaks, M1 and M2, and two markers, D1 and D2. The y-axis represents power in dBm, ranging from -70 dBm to 10 dBm. The x-axis represents frequency in GHz, ranging from 2.441 GHz to 2.444 GHz. The signal is centered around 2.442 GHz. The peak M1 is at -19.81 dBm, and the peak M2 is at -19.84 dBm. The marker D1 is at 0.160 dBm, and the marker D2 is at -19.840 dBm. The plot also shows the signal's bandwidth and other parameters.

M1[1] -19.81 dBm
D2[1] 2.44035310 GHz
0.32 dB
1.31110 MHz

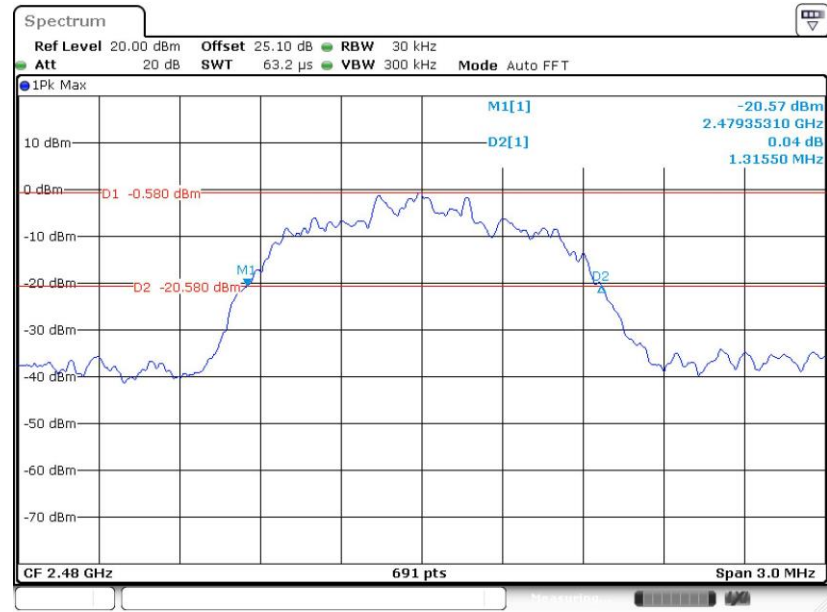
D1 0.160 dBm
D2 -19.840 dBm

CF 2.441 GHz **691 pts** **Span** 3.0 MHz

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Issued Date : Feb. 12, 2020
Report Version : 01



20 dB Bandwidth Plot on Channel 78



Date: 2.DEC.2019 03:04:19

3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

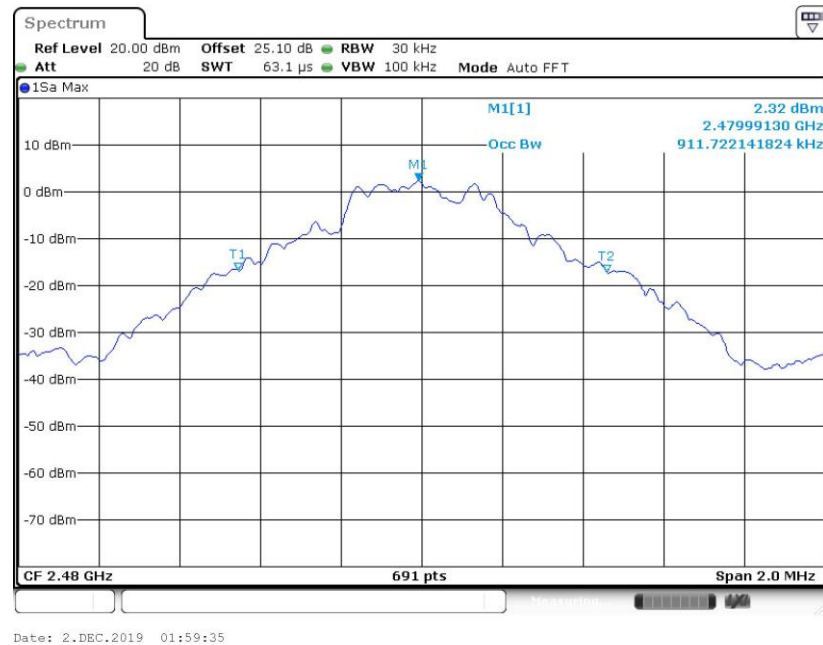
<1Mbps>

99% Occupied Bandwidth Plot on Channel 00



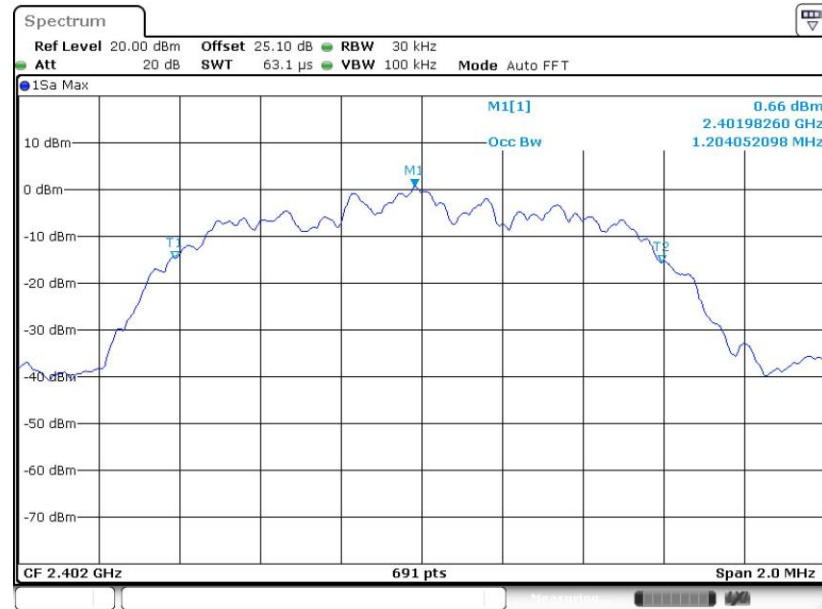
Date: 1.DEC.2019 22:51:25

99% Occupied Bandwidth Plot on Channel 39

99% Occupied Bandwidth Plot on Channel 78


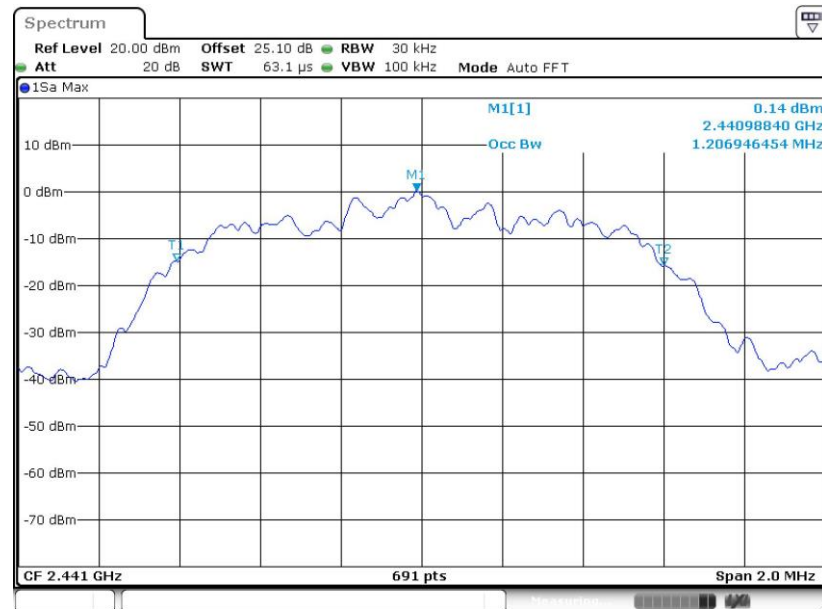
<2Mbps>

99% Occupied Bandwidth Plot on Channel 00

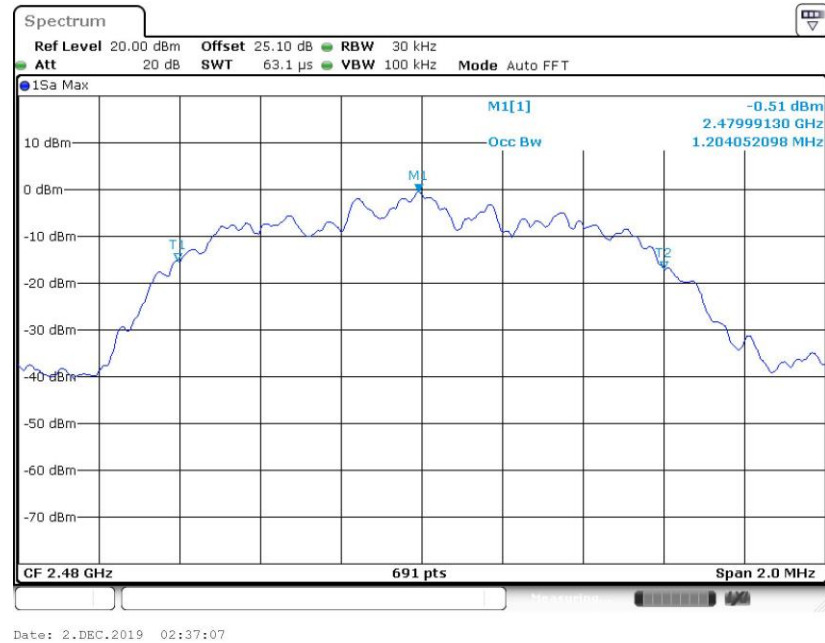
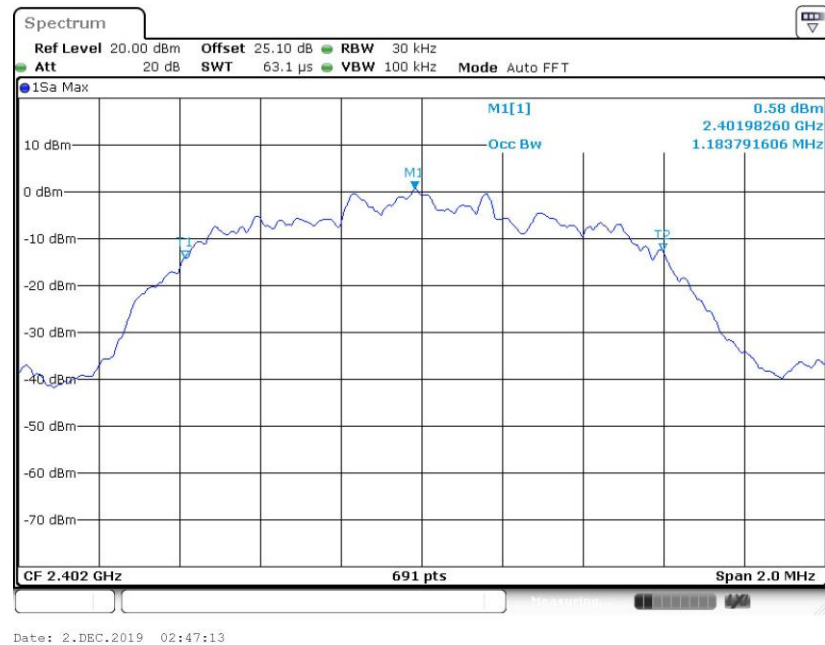


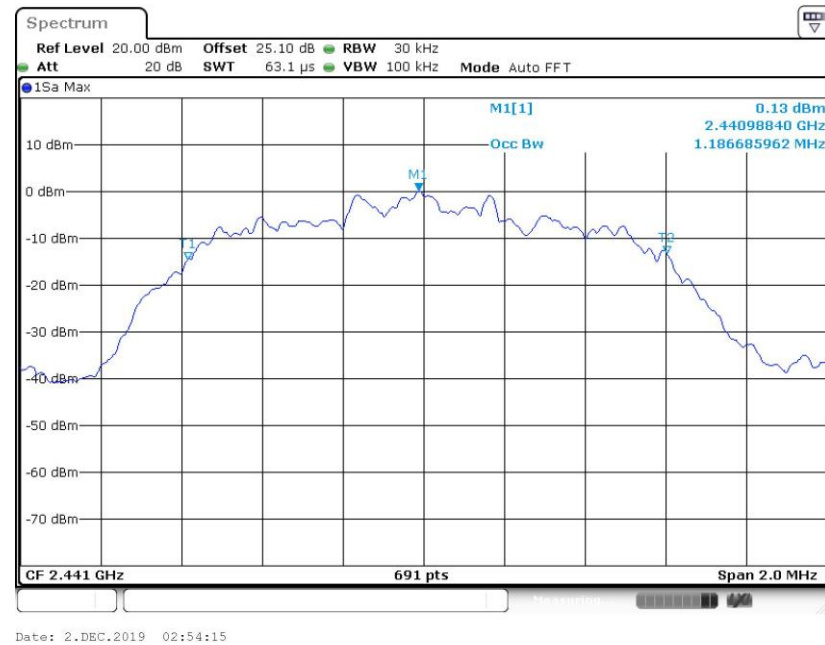
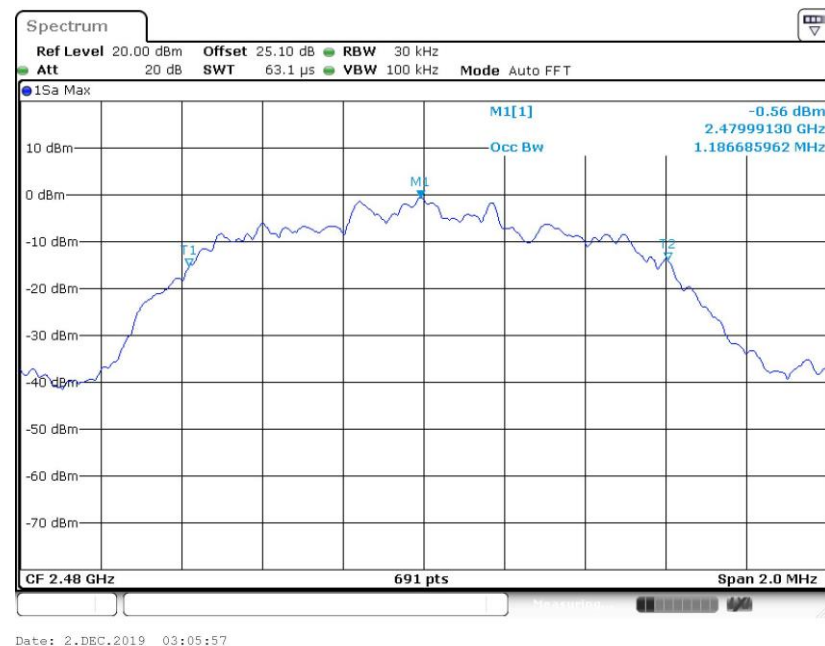
Date: 2.DEC.2019 02:20:13

99% Occupied Bandwidth Plot on Channel 39



Date: 2.DEC.2019 02:29:27

99% Occupied Bandwidth Plot on Channel 78

<3Mbps>
99% Occupied Bandwidth Plot on Channel 00


99% Occupied Bandwidth Plot on Channel 39

99% Occupied Bandwidth Plot on Channel 78


Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.5 Output Power Measurement

3.5.1 Limit of Output Power

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.

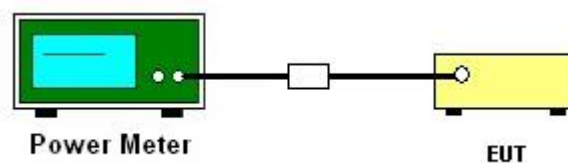
3.5.2 Measuring Instruments

See list of measuring equipment of this test report.

3.5.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.5.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

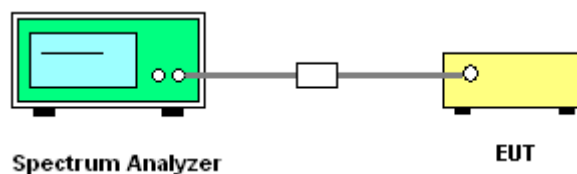
3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.6.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100kHz, VBW = 300kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2. and 3.
5. Measure and record the results in the test report.

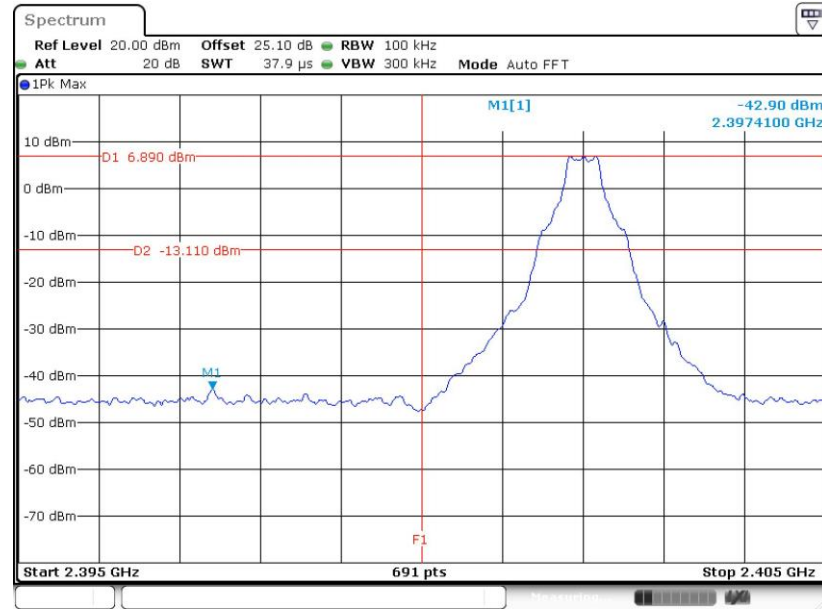
3.6.4 Test Setup



3.6.5 Test Result of Conducted Band Edges

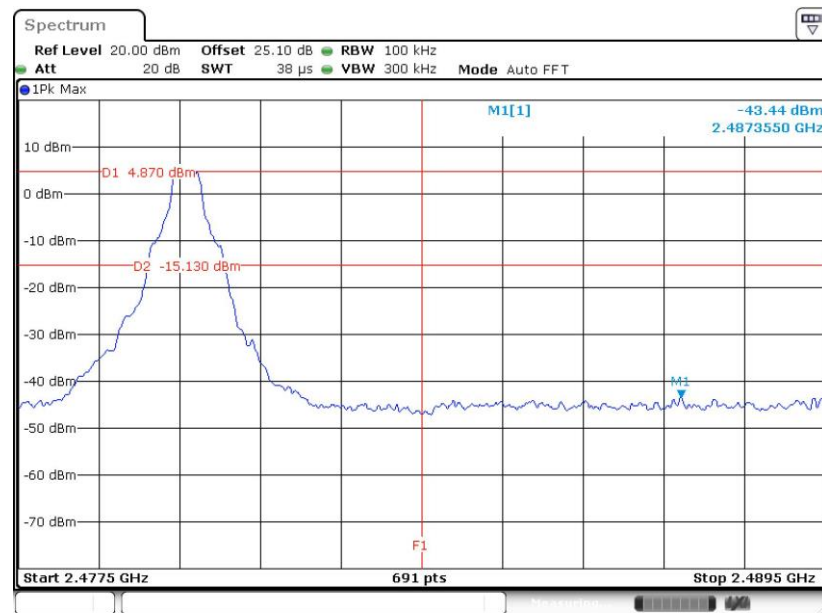
<1Mbps>

Low Band Edge Plot on Channel 00



Date: 2.DEC.2019 02:07:06

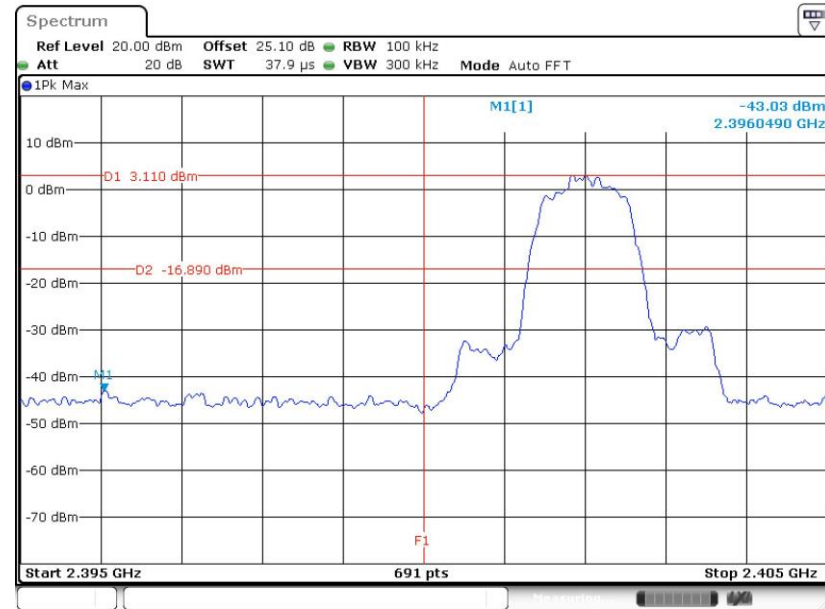
High Band Edge Plot on Channel 78



Date: 2.DEC.2019 02:09:07

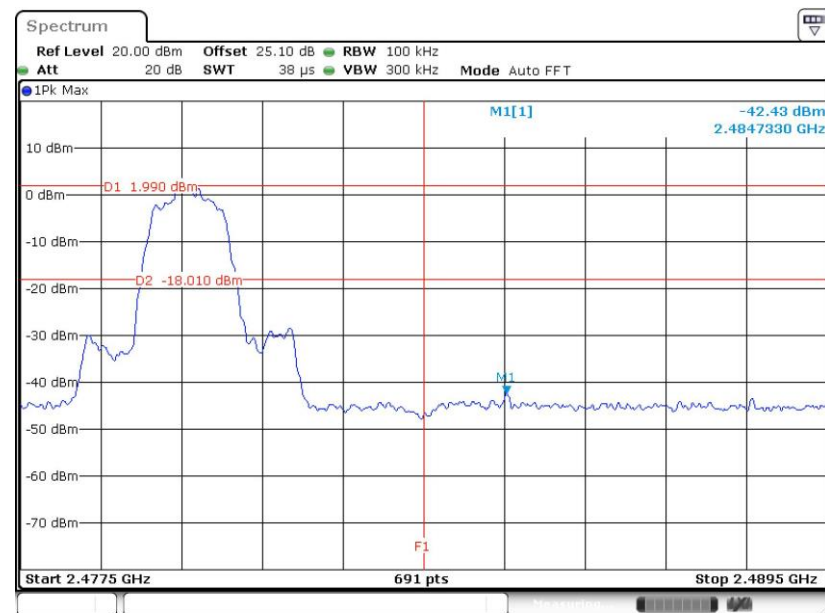
<2Mbps>

Low Band Edge Plot on Channel 00



Date: 2.DEC.2019 02:24:15

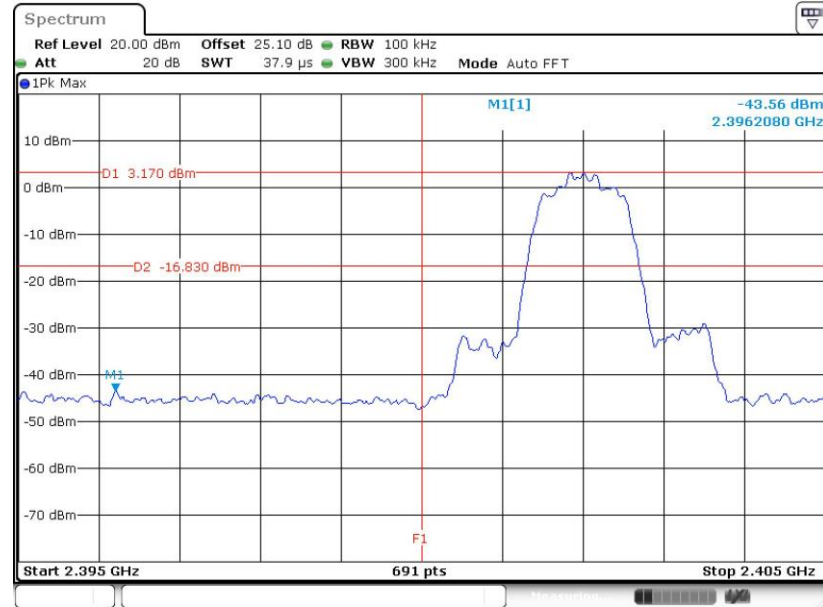
High Band Edge Plot on Channel 78



Date: 2.DEC.2019 02:36:21

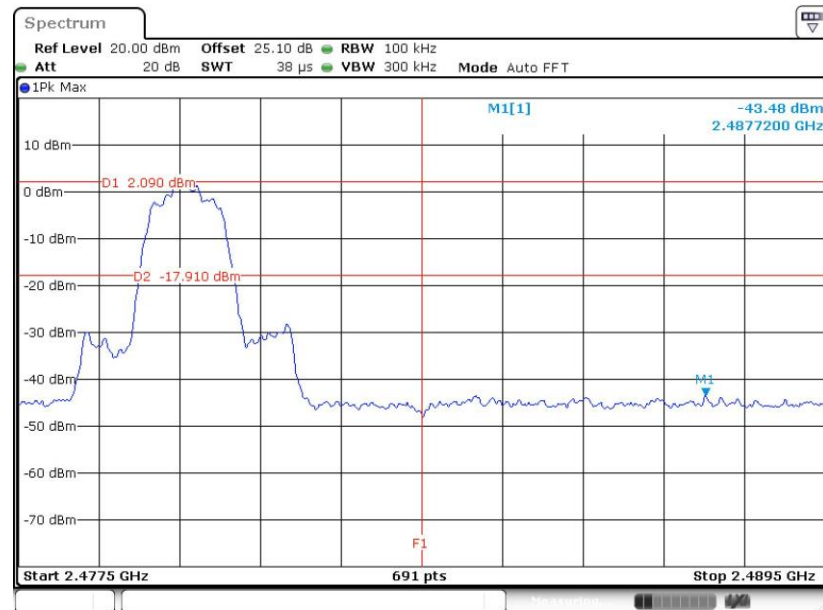
<3Mbps>

Low Band Edge Plot on Channel 00



Date: 2.DEC.2019 02:46:36

High Band Edge Plot on Channel 78

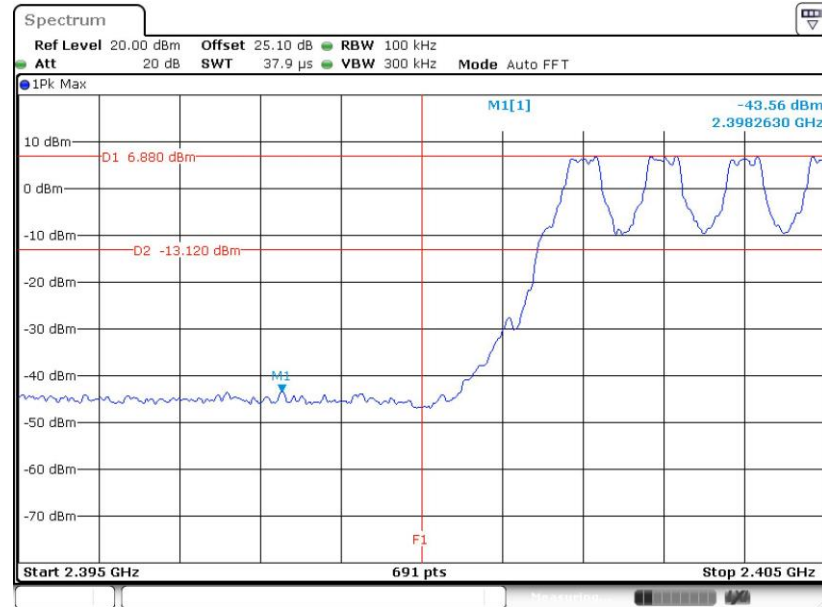


Date: 2.DEC.2019 03:04:56

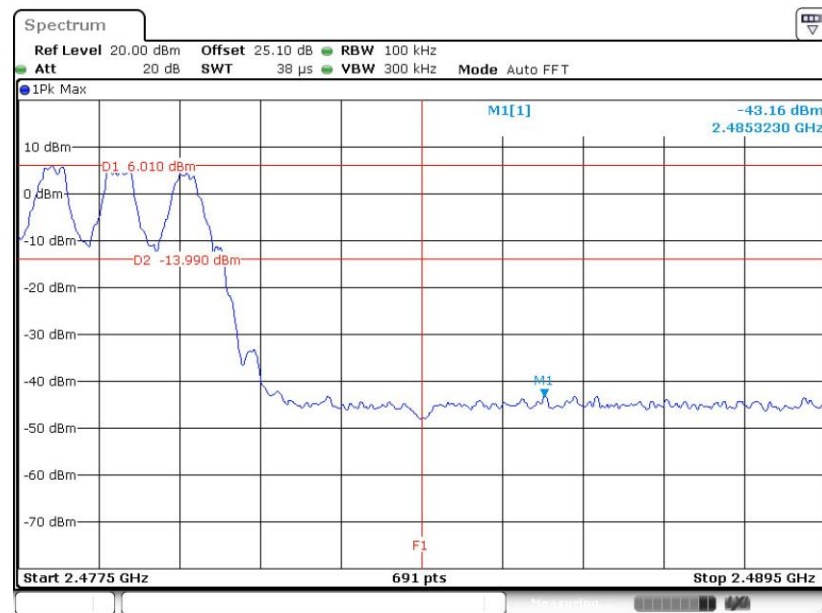
3.6.6 Test Result of Conducted Hopping Mode Band Edges

<1Mbps>

Hopping Mode Low Band Edge Plot

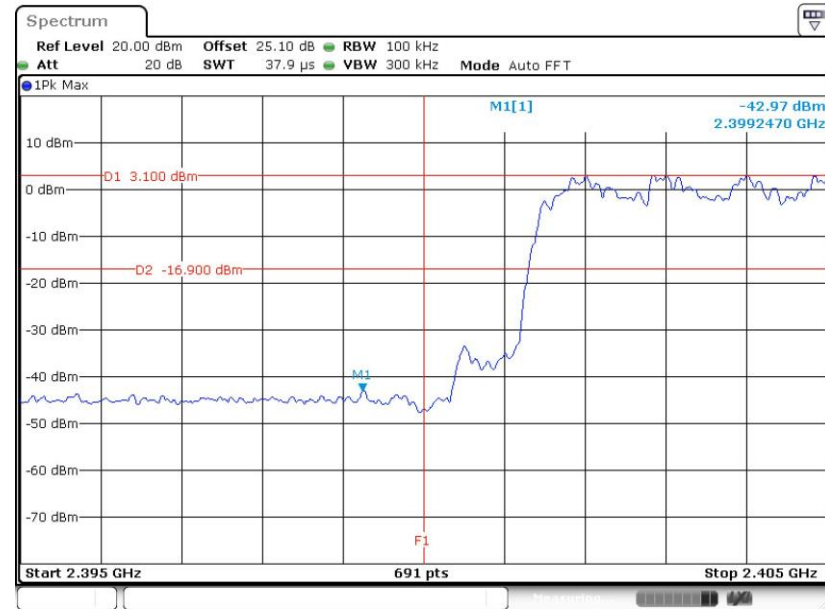


Hopping Mode High Band Edge Plot



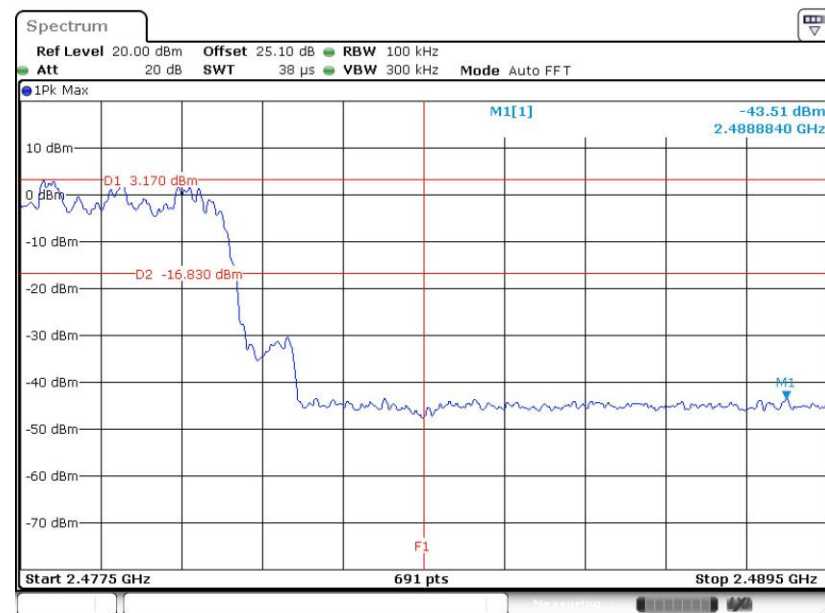
<2Mbps>

Hopping Mode Low Band Edge Plot



Date: 2.DEC.2019 02:40:23

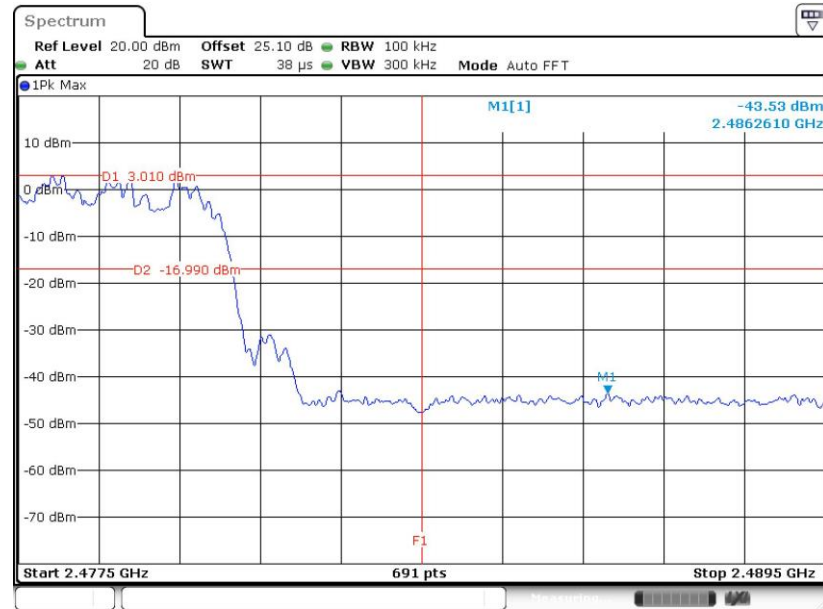
Hopping Mode High Band Edge Plot



Date: 2.DEC.2019 02:39:09

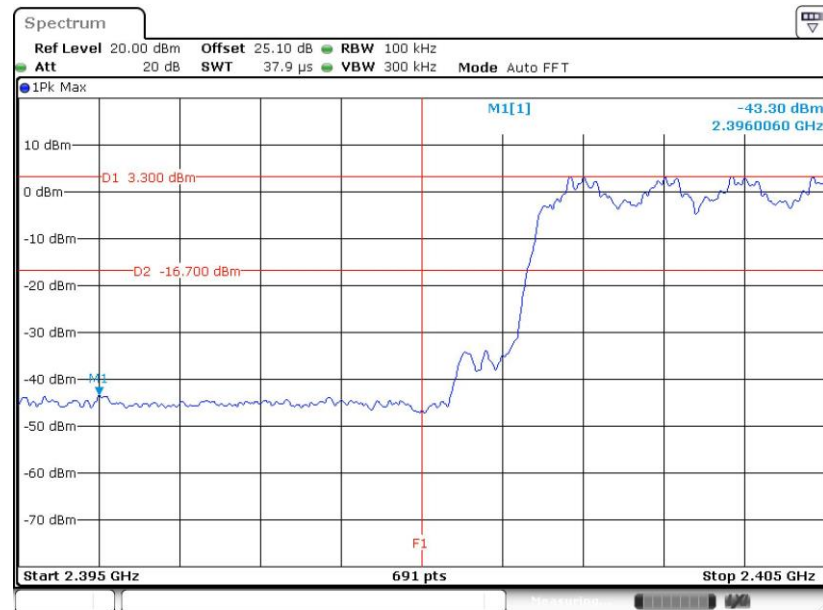
<3Mbps>

Hopping Mode Low Band Edge Plot



Date: 2.DEC.2019 02:42:49

Hopping Mode High Band Edge Plot



Date: 2.DEC.2019 02:41:26

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

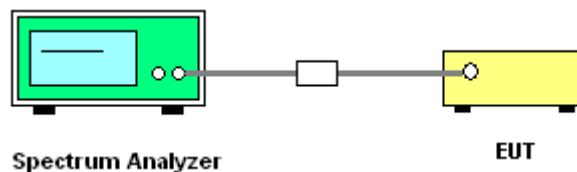
3.7.2 Measuring Instruments

See list of measuring equipment of this test report.

3.7.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.8.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

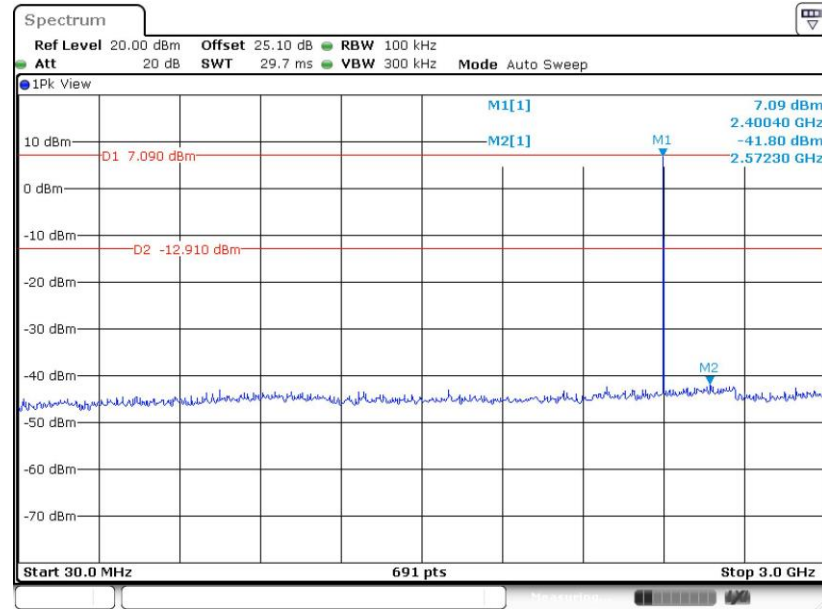
3.7.4 Test Setup



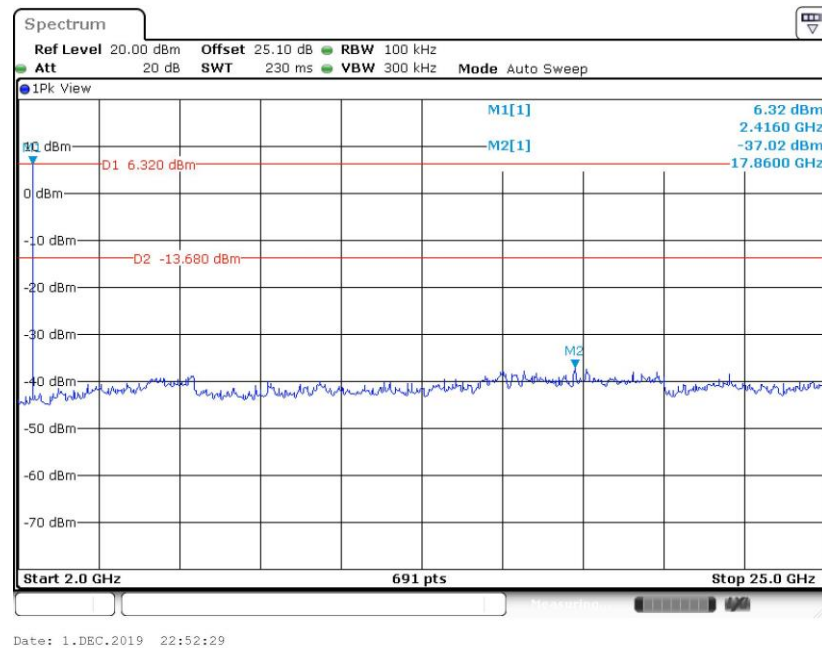
3.7.5 Test Result of Conducted Spurious Emission

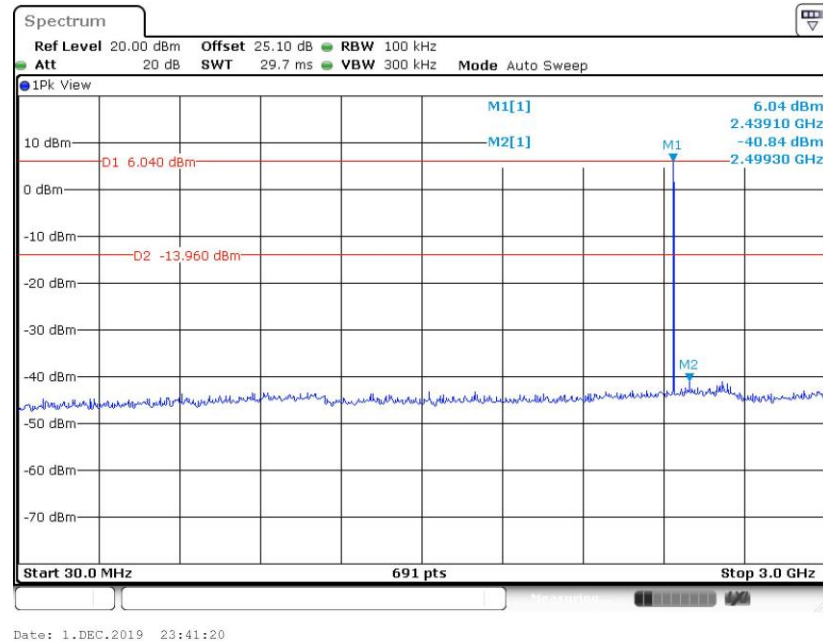
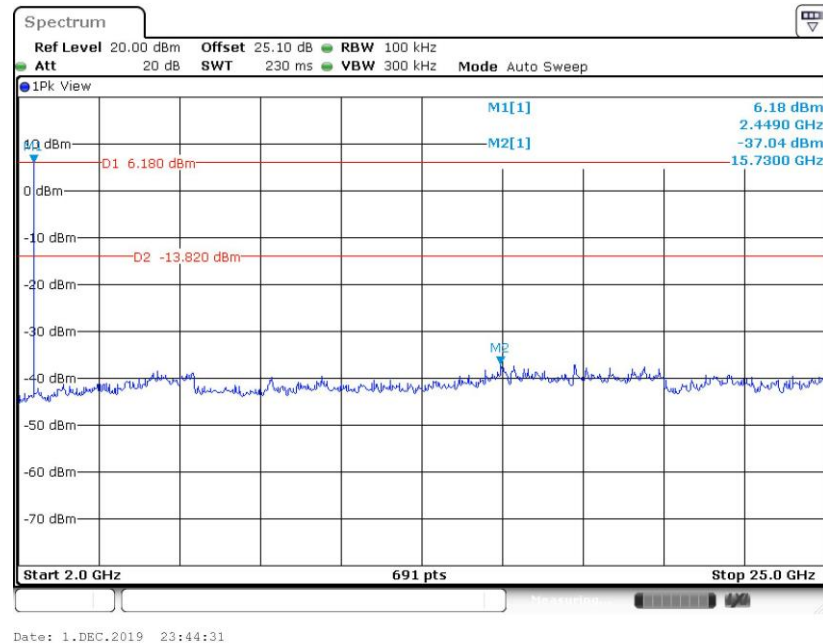
<1Mbps>

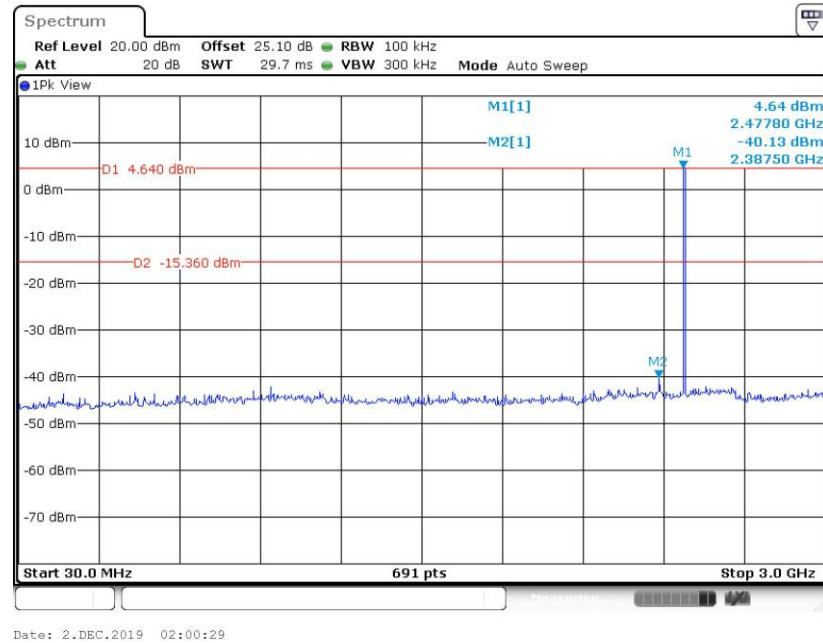
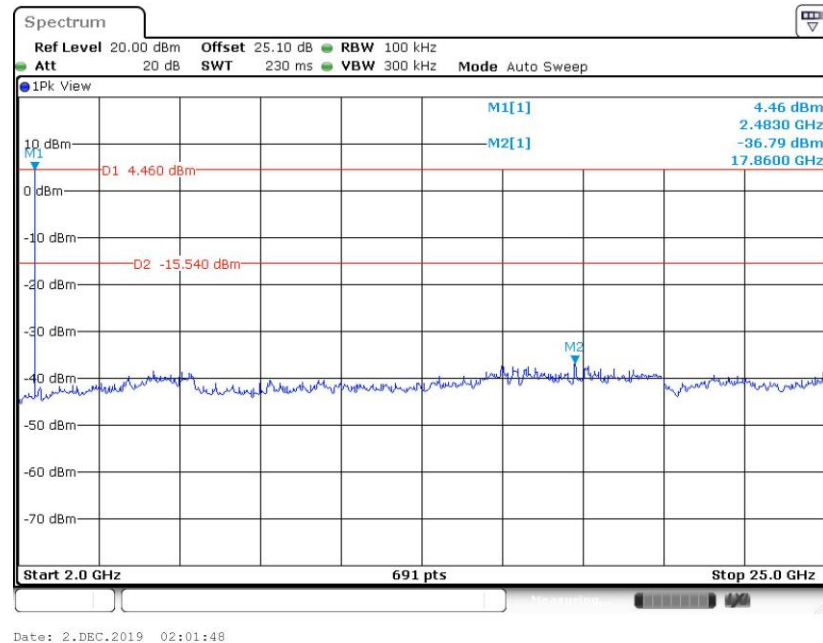
CSE Plot on Ch 00 between 30MHz ~ 3 GHz



1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

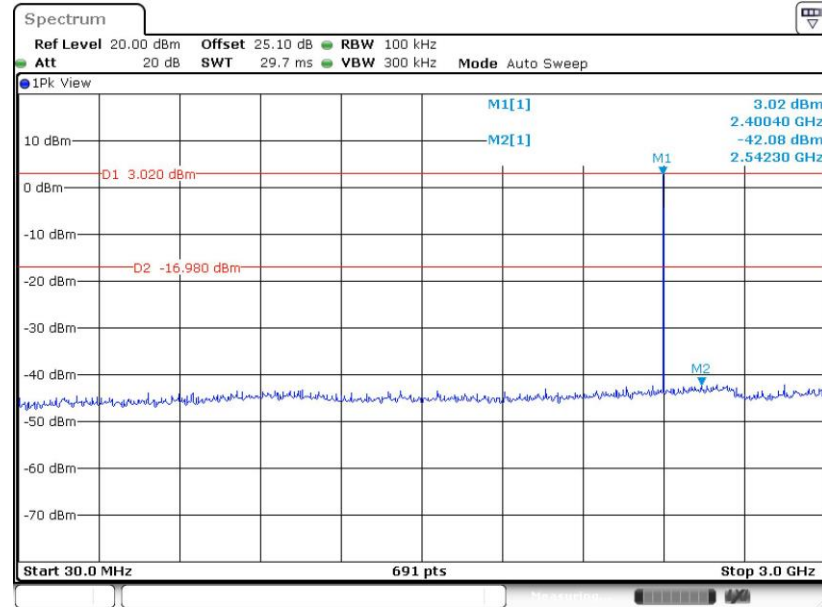


CSE Plot on Ch 39 between 30MHz ~ 3 GHz

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz


CSE Plot on Ch 78 between 30MHz ~ 3 GHz

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz


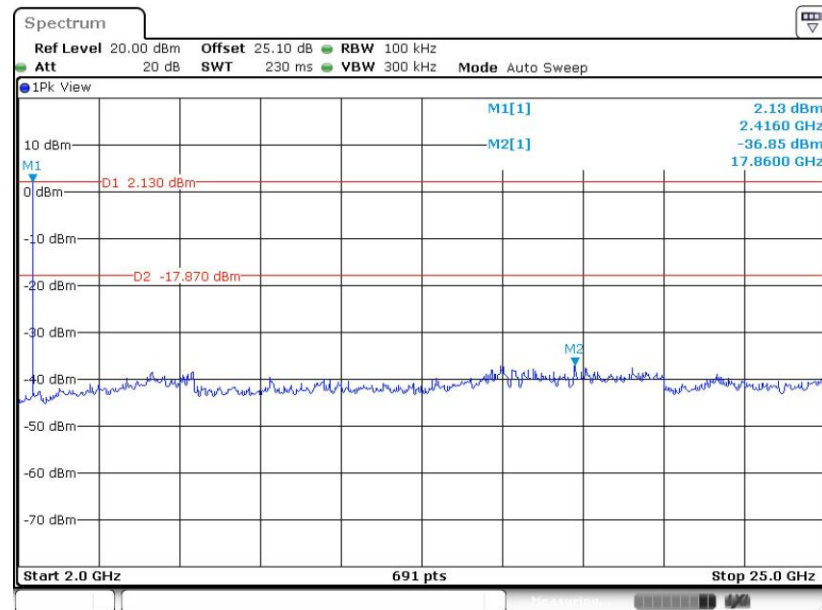
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CSE Plot on Ch 00 between 30MHz ~ 3 GHz

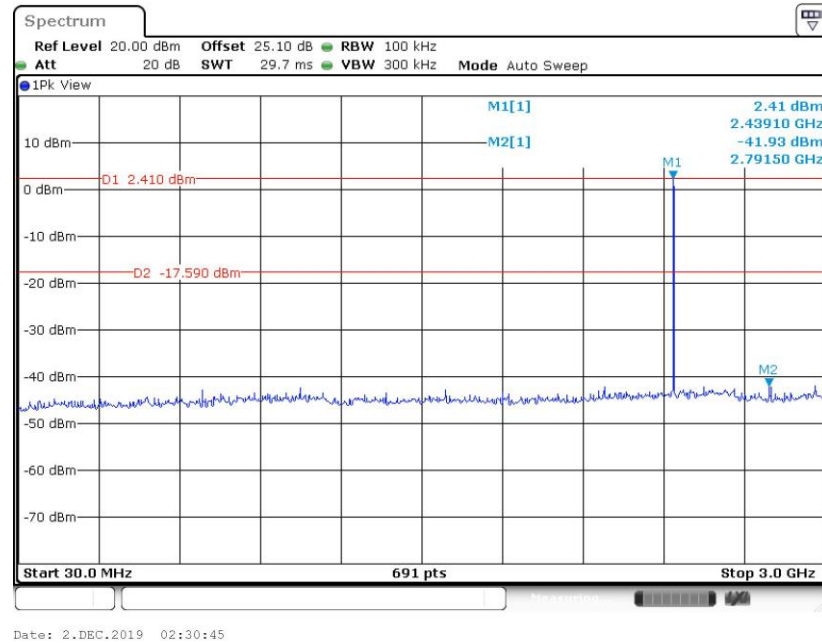
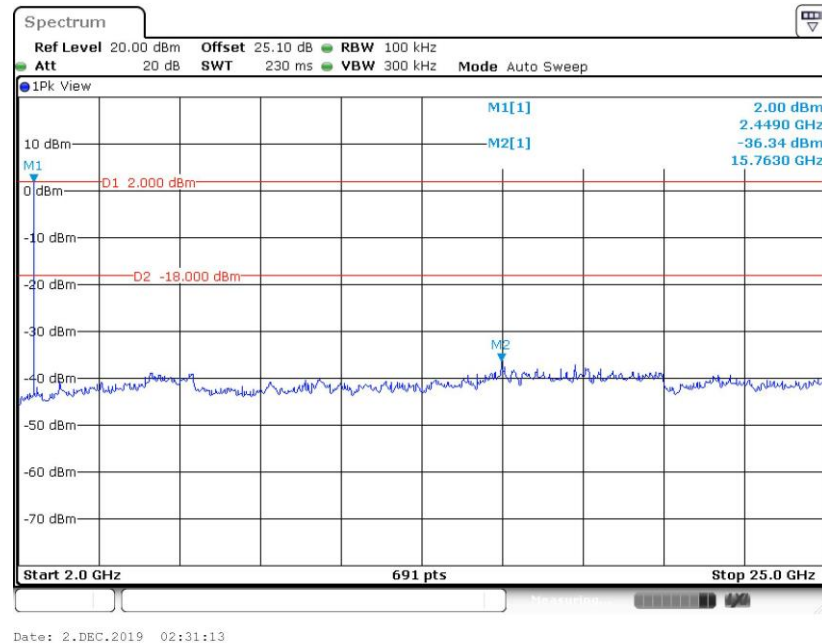


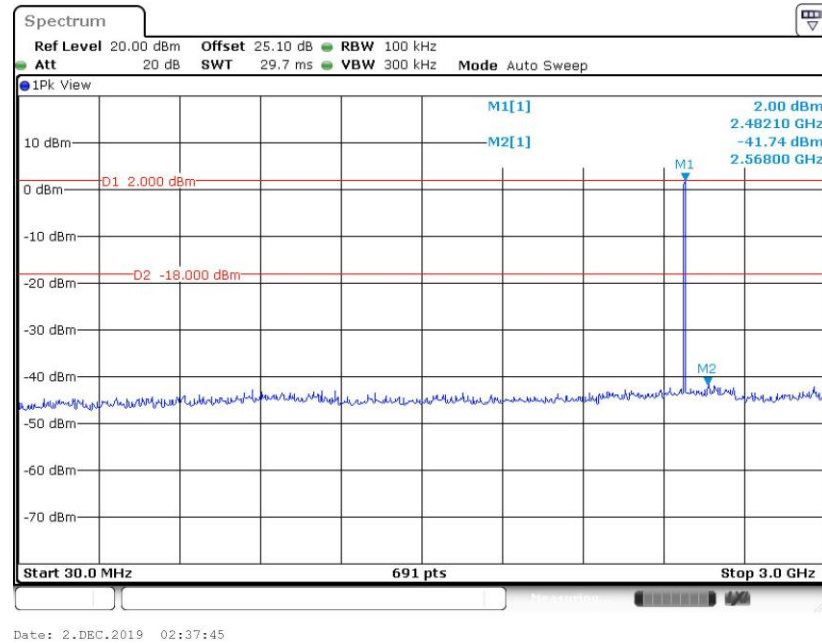
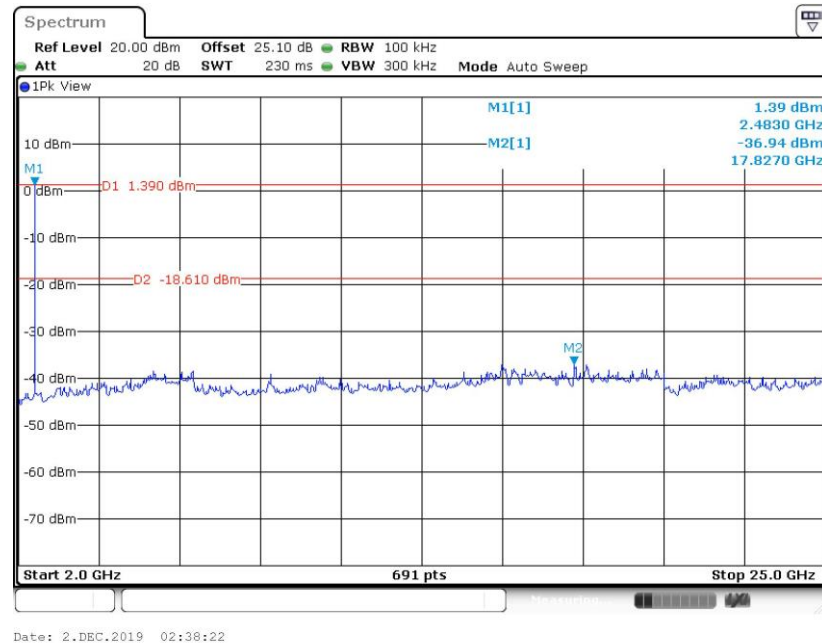
Date: 2.DEC.2019 02:20:55

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



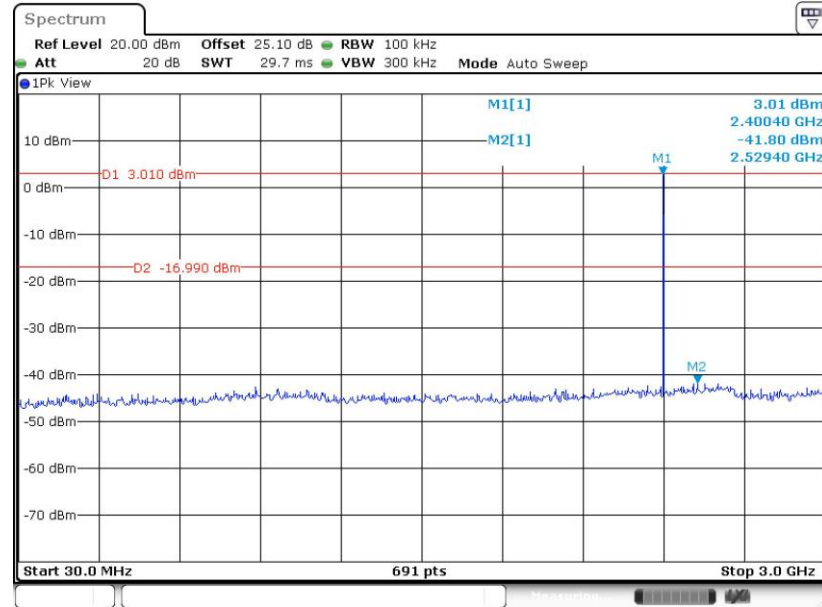
Date: 2.DEC.2019 02:21:32

CSE Plot on Ch 39 between 30MHz ~ 3 GHz

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz


CSE Plot on Ch 78 between 30MHz ~ 3 GHz

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz


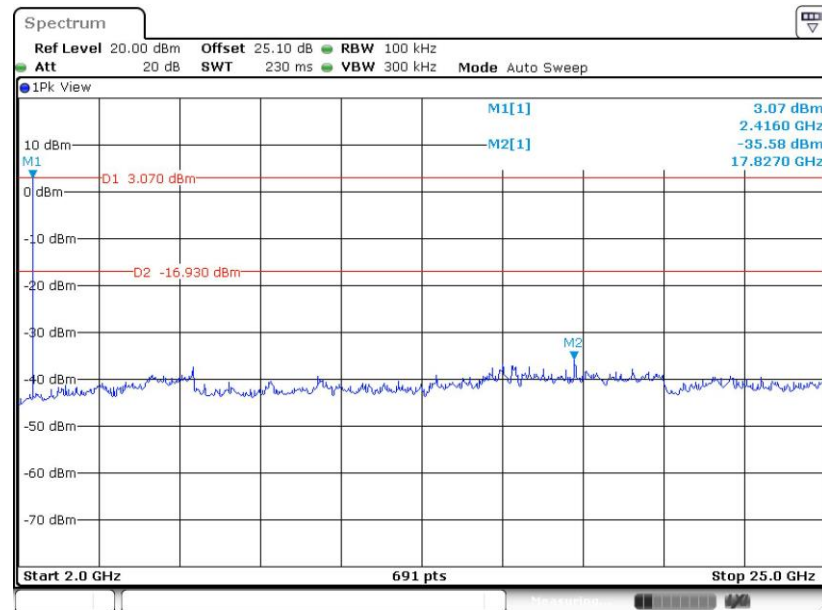
<3Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz

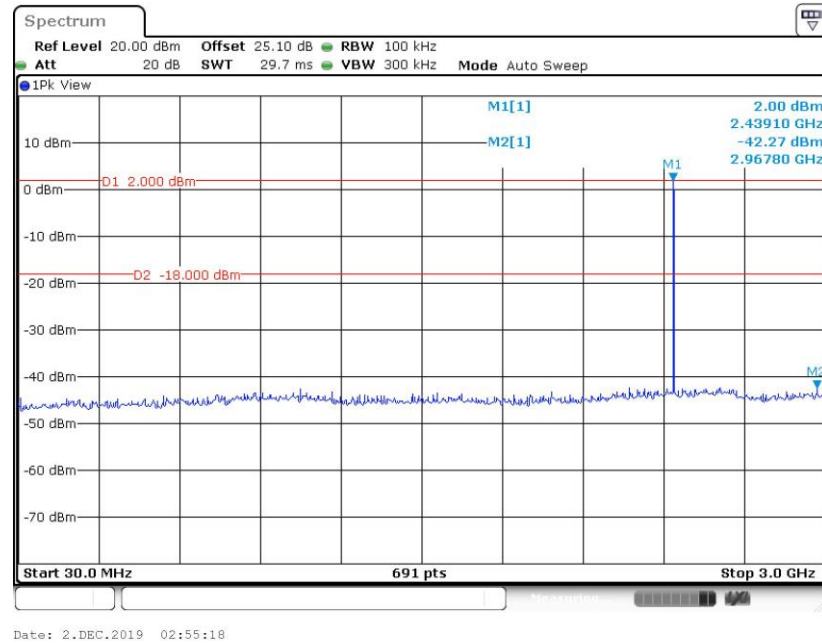
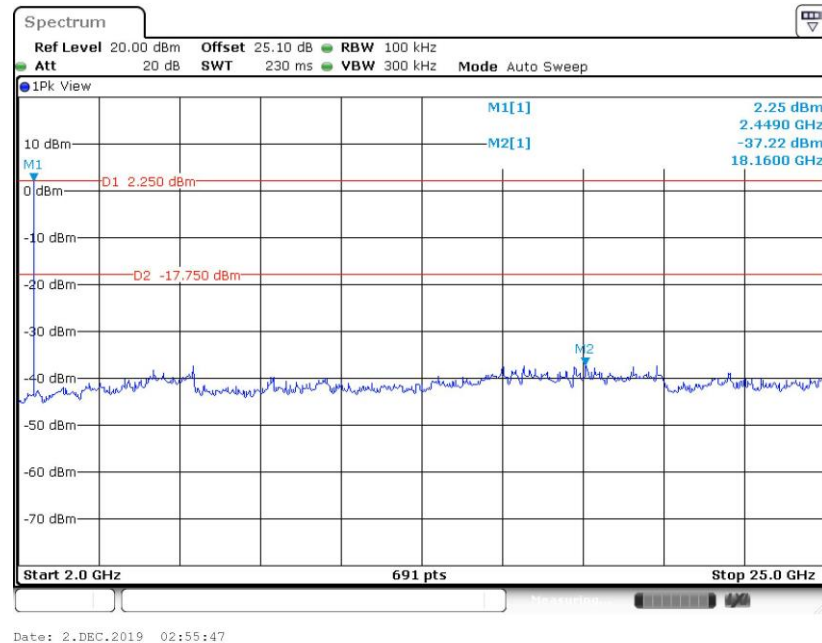


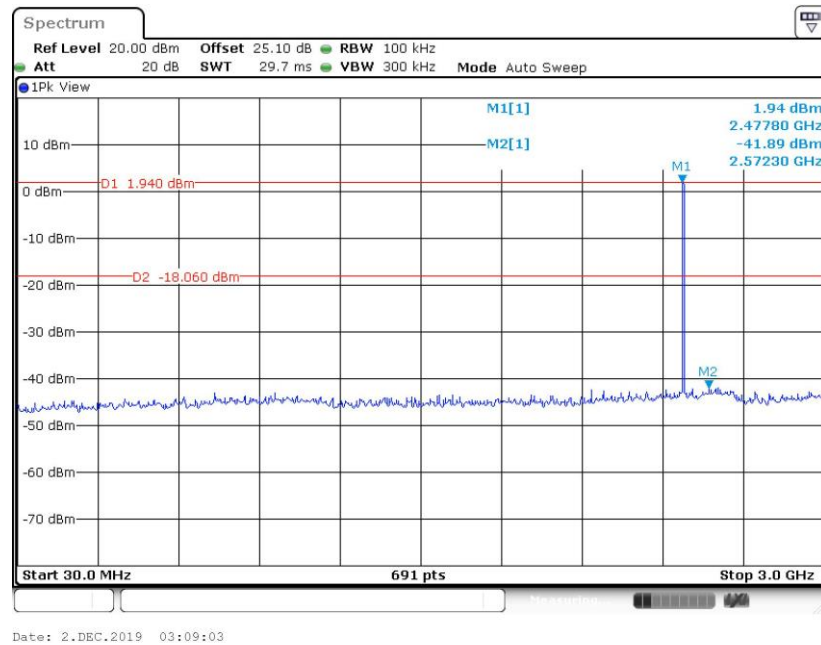
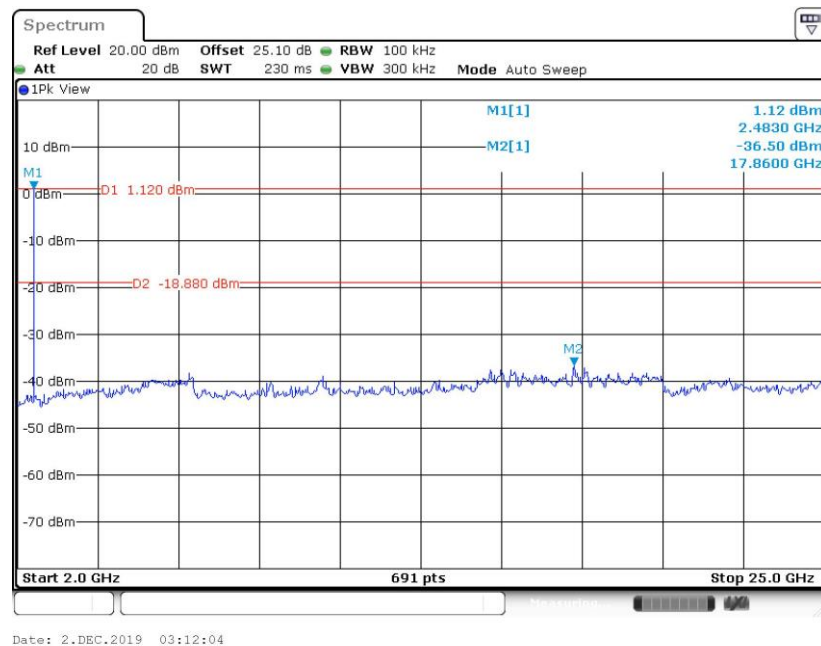
Date: 2.DEC.2019 02:48:55

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 2.DEC.2019 02:49:24

CSE Plot on Ch 39 between 30MHz ~ 3 GHz

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz


CSE Plot on Ch 78 between 30MHz ~ 3 GHz

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz


3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the NCC LP0002 section 2.8 limits as below.

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
Above 960	500	3

3.8.2 Measuring Instruments

See list of measuring equipment of this test report.

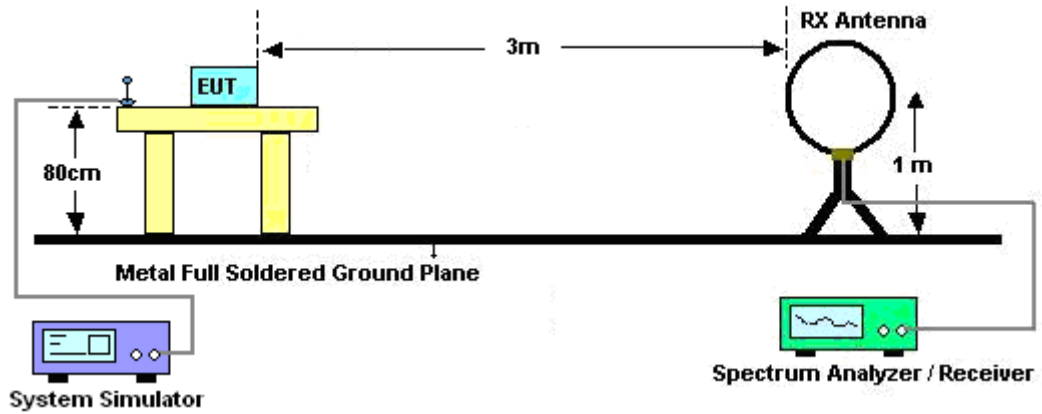
3.8.3 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, 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 to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz, RBW=1MHz for $f > 1$ GHz ; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - (3) For average measurement: use duty cycle correction factor method per 15.35(c).
Duty cycle = On time/100 milliseconds
On time = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$
Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
Average Emission Level = Peak Emission Level + $20 * \log(\text{Duty cycle})$
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

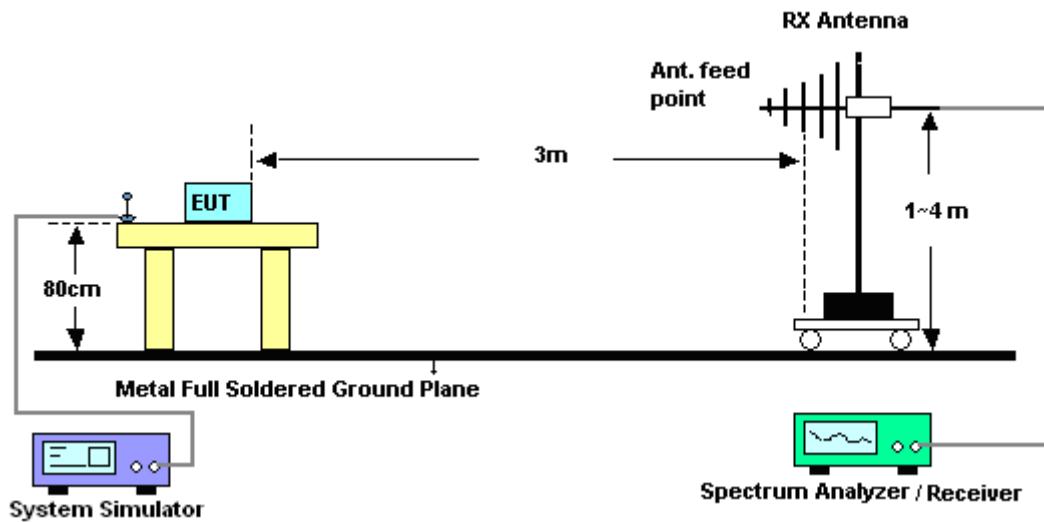
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.76dB) derived from $20 \log(\text{dwell time}/100\text{ms})$. This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

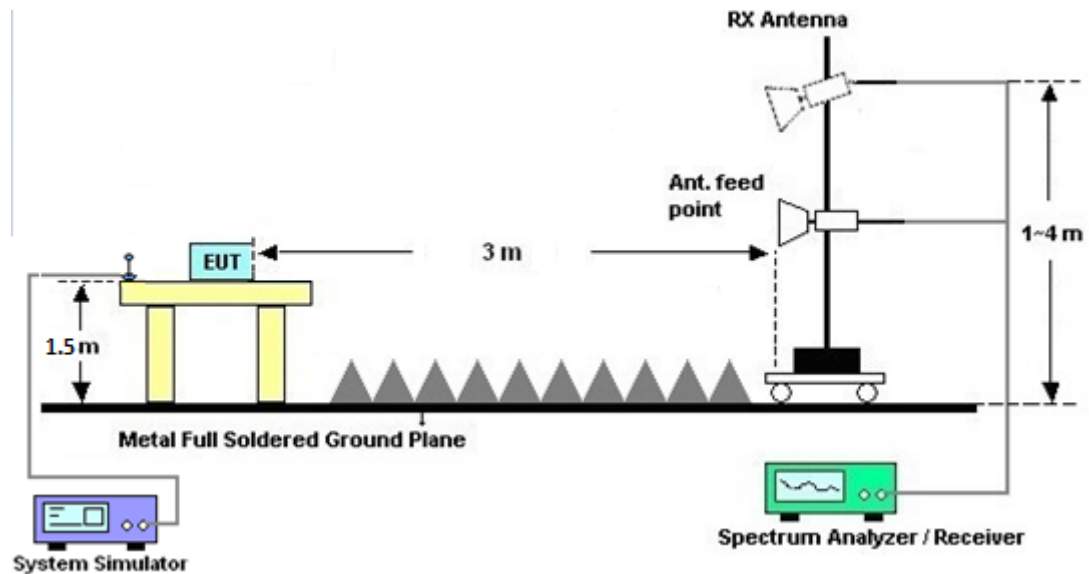
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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 NCC LP0002 section 5.13 was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.8.7 Duty Cycle

Please refer to Appendix E.

3.8.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

For terminal test result, the testing follows FCC KDB 174176.

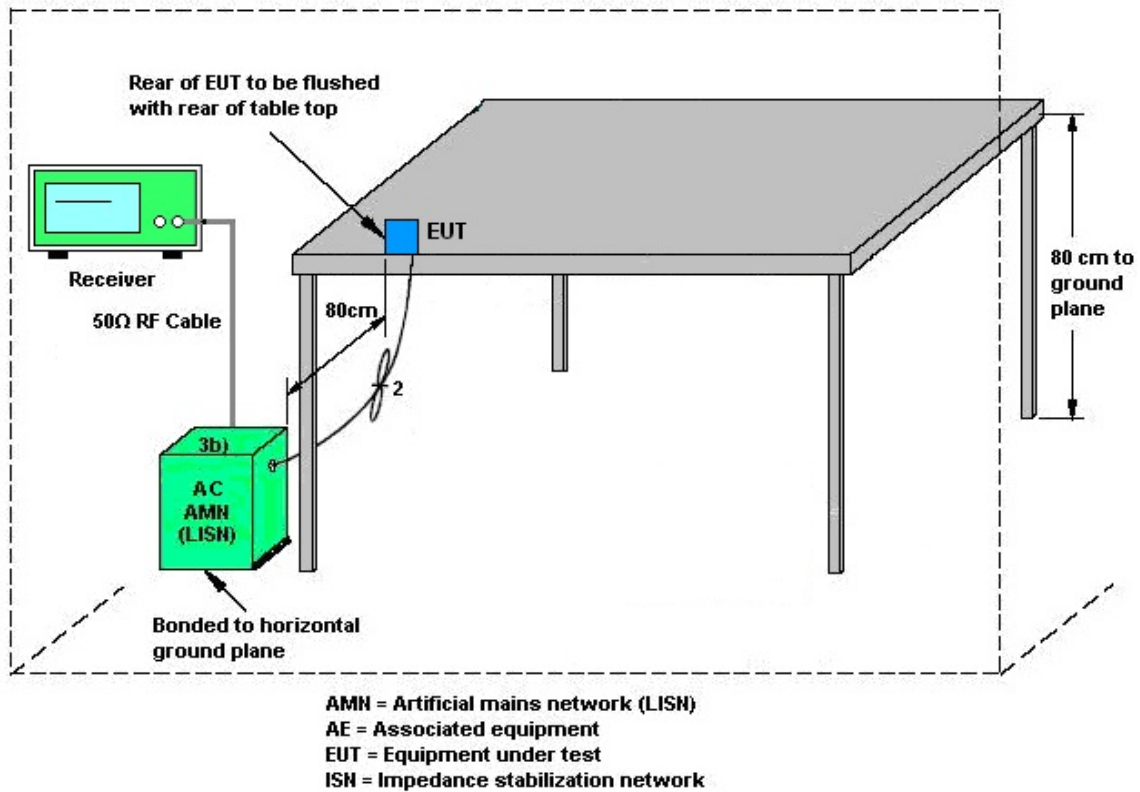
3.9.2 Measuring Instruments

See list of measuring equipment of this test report.

3.9.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.9.4 Test Setup



3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.10 Antenna Requirements

3.10.1 Standard Applicable

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. 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 LP0002 Section 2.2, Section 3.10.1.3, and Section 3.10.1.4.

3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.10.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H2	41410069	N/A	Jun. 17, 2019	Nov. 21, 2019 ~ Dec. 02, 2019	Jun. 16, 2020	Conducted (TH05-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Dec. 27, 2018	Nov. 21, 2019 ~ Dec. 02, 2019	Dec. 26, 2019	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	50MHz~18GHz	Dec. 27, 2018	Nov. 21, 2019 ~ Dec. 02, 2019	Dec. 26, 2019	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Jul. 15, 2019	Nov. 21, 2019 ~ Dec. 02, 2019	Jul. 14, 2020	Conducted (TH05-HY)
BT Base Station	Rohde & Schwarz	CBT	100815	BT 3.0	Feb. 13, 2019	Nov. 21, 2019 ~ Dec. 02, 2019	Feb. 12, 2020	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC1208382	N/A	Mar. 27, 2019	Nov. 21, 2019 ~ Dec. 02, 2019	Mar. 26, 2020	Conducted (TH05-HY)
Bilog Antenna	TESEQ	CBL 6111D&0080 0N1D01N-06	37059&01	30MHz~1GHz	Oct. 12, 2019	Oct. 12, 2019 ~ Dec. 03, 2019	Oct. 11, 2020	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1328	1GHz ~ 18GHz	Nov. 09, 2018	Oct. 12, 2019 ~ Nov. 07, 2019	Nov. 08, 2019	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-02037	1GHz ~ 18GHz	Oct. 28, 2019	Nov. 07, 2019 ~ Dec. 03, 2019	Oct. 27, 2020	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz~40GHz	May 14, 2019	Oct. 12, 2019 ~ Dec. 03, 2019	May 13, 2020	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 25, 2019	Oct. 12, 2019 ~ Jan. 08, 2020	Mar. 24, 2020	Radiation (03CH12-HY)
Preamplifier	Agilent	8449B	3008A02375	1GHz~26.5GHz	May 27, 2019	Oct. 12, 2019 ~ Jan. 08, 2020	May 26, 2020	Radiation (03CH12-HY)
Preamplifier	Jet-Power	JPA0010180 0-30-10P	16011180002	1GHz~18GHz	Aug. 01, 2019	Oct. 12, 2019 ~ Dec. 03, 2019	Jul. 31, 2020	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 06, 2018	Oct. 12, 2019 ~ Dec. 03, 2019	Dec. 05, 2019	Radiation (03CH12-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 19, 2019	Oct. 12, 2019 ~ Dec. 03, 2019	Mar. 18, 2020	Radiation (03CH12-HY)
Hygrometer	TECPEL	DTM-303B	TP161243	N/A	Jun. 17, 2019	Oct. 12, 2019 ~ Dec. 03, 2019	Jun. 16, 2020	Radiation (03CH12-HY)
Filter	Wainwright	WLKS1200-12SS	SN1	1.2 GHz Lowpass	Mar. 22, 2019	Oct. 12, 2019 ~ Jan. 08, 2020	Mar. 21, 2020	Radiation (03CH12-HY)
Filter	Wainwright	WHKX12-27 00-3000-180 00-60ST	SN2	3GHz High Pass	Jul. 15, 2019	Oct. 12, 2019 ~ Jan. 08, 2020	Jul. 14, 2020	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30M~40GHz	Feb. 26, 2019	Oct. 12, 2019 ~ Jan. 08, 2020	Feb. 25, 2020	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30M~40GHz	Feb. 26, 2019	Oct. 12, 2019 ~ Jan. 08, 2020	Feb. 25, 2020	Radiation (03CH12-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Oct. 12, 2019 ~ Dec. 03, 2019	N/A	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500 -B	N/A	1m~4m	N/A	Oct. 12, 2019 ~ Dec. 03, 2019	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Oct. 12, 2019 ~ Dec. 03, 2019	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-000989	N/A	N/A	Oct. 12, 2019 ~ Dec. 03, 2019	N/A	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D&0080 0N1D01N-06	37059&01	30MHz~1GHz	Oct. 12, 2019	Oct. 12, 2019 ~ Dec. 03, 2019	Oct. 11, 2020	Radiation (03CH12-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jan. 07, 2019	Jan. 07, 2020 ~ Jan. 08, 2020	Dec. 25, 2020	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1328	1GHz ~ 18GHz	Nov. 14, 2018	Jan. 07, 2020 ~ Jan. 08, 2020	Nov. 13, 2020	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz ~ 40GHz	Dec. 10, 2019	Jan. 07, 2020 ~ Jan. 08, 2020	Dec. 09, 2020	Radiation (03CH12-HY)
Preamplifier	Jet-Power	JAP00101800-30-10P	160118550004	1GHz~18GHz	Sep. 27, 2019	Jan. 07, 2020 ~ Jan. 08, 2020	Sep. 26, 2020	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 13, 2019	Jan. 07, 2020 ~ Jan. 08, 2020	Dec. 12, 2020	Radiation (03CH12-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV30	103738	9kHz~30GHz	May 23, 2019	Jan. 07, 2020 ~ Jan. 08, 2020	May 22, 2020	Radiation (03CH12-HY)
Hygrometer	TECEPEL	DTM-303B	TP140349	N/A	Oct. 25, 2019	Jan. 07, 2020 ~ Jan. 08, 2020	Oct. 24, 2020	Radiation (03CH12-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Jan. 07, 2020 ~ Jan. 08, 2020	N/A	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Jan. 07, 2020 ~ Jan. 08, 2020	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Jan. 07, 2020 ~ Jan. 08, 2020	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-000989	N/A	N/A	Jan. 07, 2020 ~ Jan. 08, 2020	N/A	Radiation (03CH12-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jan. 11, 2020 ~ Jan. 13, 2020	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 15, 2019	Jan. 11, 2020 ~ Jan. 13, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Mar. 19, 2019	Jan. 11, 2020 ~ Jan. 13, 2020	Mar. 18, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 15, 2019	Jan. 11, 2020 ~ Jan. 13, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Jan. 11, 2020 ~ Jan. 13, 2020	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 02, 2020	Jan. 11, 2020 ~ Jan. 13, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 02, 2020	Jan. 11, 2020 ~ Jan. 13, 2020	Jan. 01, 2021	Conduction (CO05-HY)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.0
--	-----

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.1
--	-----

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.6
--	-----

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.0
--	-----

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Derek Hsu / Ethan Lin	Temperature:	21~25	°C
Test Date:	2019/11/21~2019/12/02	Relative Humidity:	51~54	%

TEST RESULTS DATA**20dB and 99% Occupied Bandwidth and Hopping Channel Separation**

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	20db BW (MHz)	99% Bandwidth (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.999	0.912	0.682	0.6657	Pass
DH	1Mbps	1	39	2441	1.042	0.915	0.994	0.6947	Pass
DH	1Mbps	1	78	2480	1.039	0.912	0.994	0.6927	Pass
2DH	2Mbps	1	0	2402	1.350	1.204	0.955	0.9001	Pass
2DH	2Mbps	1	39	2441	1.355	1.207	0.999	0.9031	Pass
2DH	2Mbps	1	78	2480	1.355	1.204	1.012	0.9031	Pass
3DH	3Mbps	1	0	2402	1.311	1.184	0.999	0.8741	Pass
3DH	3Mbps	1	39	2441	1.311	1.187	1.151	0.8741	Pass
3DH	3Mbps	1	78	2480	1.316	1.187	1.003	0.8770	Pass

TEST RESULTS DATA**Dwell Time**

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Nomal	79	106.67	2.90	0.31	0.4	Pass
AFH	20	53.33	2.90	0.15	0.4	Pass

TEST RESULTS DATA**Peak Power Table**

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH1	0	1	8.11	20.97	Pass
	39	1	7.25	20.97	Pass
	78	1	6.40	20.97	Pass
2DH1	0	1	6.72	20.97	Pass
	39	1	6.40	20.97	Pass
	78	1	5.31	20.97	Pass
3DH1	0	1	6.80	20.97	Pass
	39	1	6.42	20.97	Pass
	78	1	5.40	20.97	Pass

TEST RESULTS DATA**Average Power Table****(Reporting Only)**

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH1	0	1	7.22	5.10
	39	1	6.24	5.10
	78	1	4.90	5.10
2DH1	0	1	3.56	5.05
	39	1	3.01	5.05
	78	1	1.92	5.05
3DH1	0	1	3.58	5.05
	39	1	3.02	5.05
	78	1	1.95	5.05

TEST RESULTS DATA**Number of Hopping Frequency**

Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail
79	20	> 15	Pass



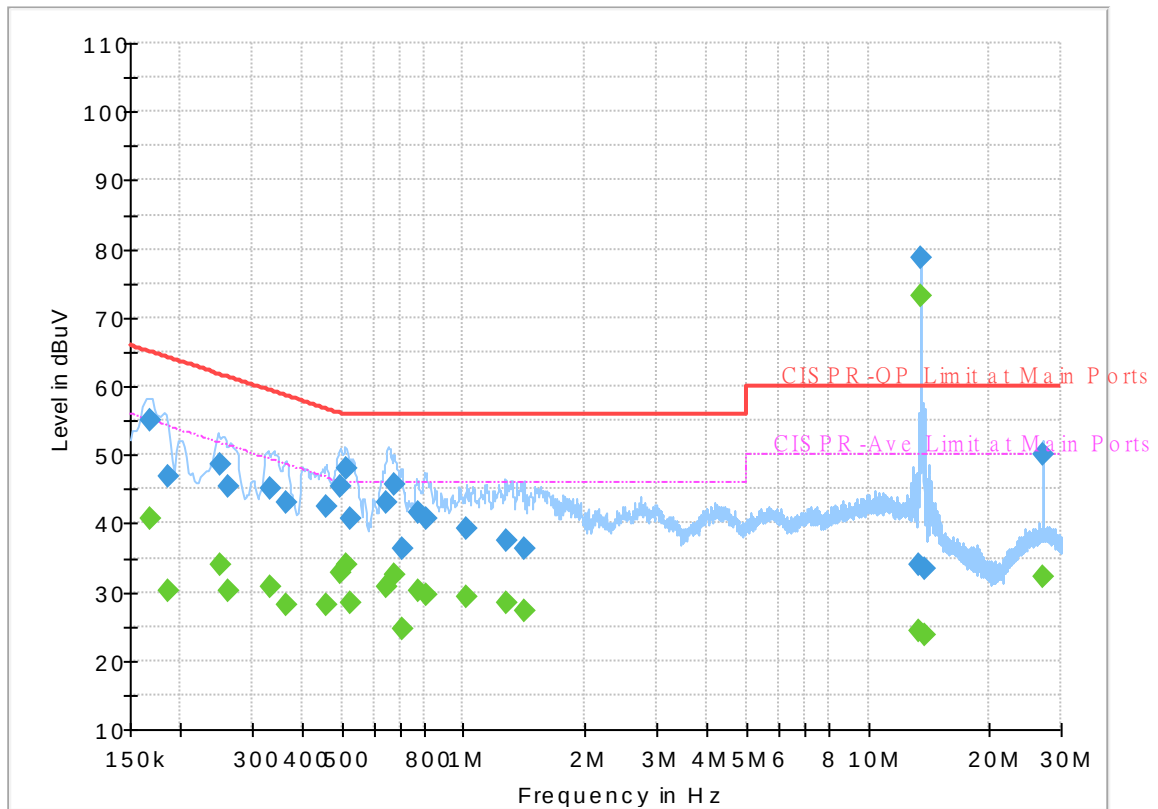
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Howard Huang	Temperature :	21~23℃
		Relative Humidity :	42~45%

Original

Report NO : 832801-06
Test Mode : Mode 2
Test Voltage : 110Vac/60Hz
Phase : Line

Full Spectrum



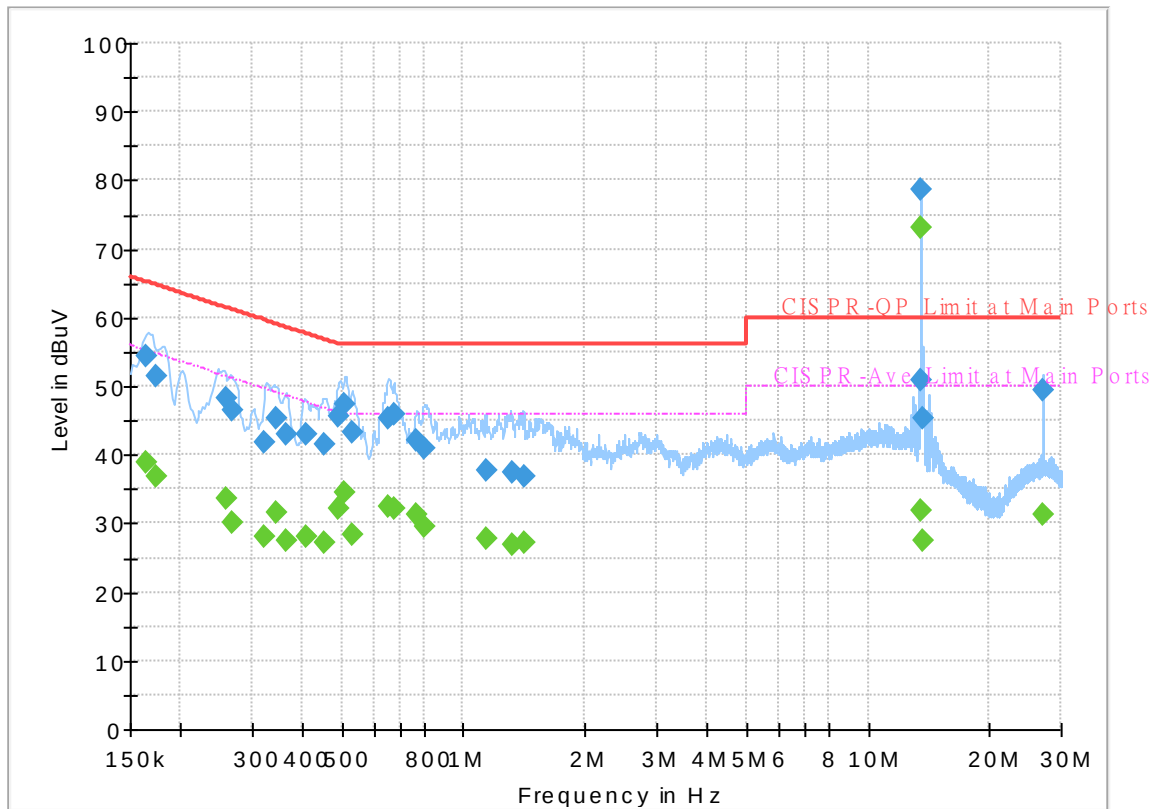
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.167640	---	40.58	55.08	14.50	L1	OFF	19.6
0.167640	54.94	---	65.08	10.14	L1	OFF	19.6
0.186000	---	30.31	54.21	23.90	L1	OFF	19.6
0.186000	46.96	---	64.21	17.25	L1	OFF	19.6
0.251250	---	34.12	51.72	17.60	L1	OFF	19.6
0.251250	48.59	---	61.72	13.13	L1	OFF	19.6
0.262500	---	30.17	51.35	21.18	L1	OFF	19.6
0.262500	45.51	---	61.35	15.84	L1	OFF	19.6
0.334500	---	30.66	49.34	18.68	L1	OFF	19.6
0.334500	45.09	---	59.34	14.25	L1	OFF	19.6
0.364110	---	28.06	48.63	20.57	L1	OFF	19.6
0.364110	43.03	---	58.63	15.60	L1	OFF	19.6
0.458700	---	28.13	46.72	18.59	L1	OFF	19.6
0.458700	42.39	---	56.72	14.33	L1	OFF	19.6
0.498750	---	32.91	46.02	13.11	L1	OFF	19.6
0.498750	45.47	---	56.02	10.55	L1	OFF	19.6
0.512250	---	33.89	46.00	12.11	L1	OFF	19.6
0.512250	48.14	---	56.00	7.86	L1	OFF	19.6
0.526920	---	28.36	46.00	17.64	L1	OFF	19.6
0.526920	40.66	---	56.00	15.34	L1	OFF	19.6
0.645000	---	30.73	46.00	15.27	L1	OFF	19.6

0.645000	43.17	---	56.00	12.83	L1	OFF	19.6
0.675690	---	32.40	46.00	13.60	L1	OFF	19.6
0.675690	45.70	---	56.00	10.30	L1	OFF	19.6
0.706830	---	24.67	46.00	21.33	L1	OFF	19.6
0.706830	36.34	---	56.00	19.66	L1	OFF	19.6
0.771000	---	30.09	46.00	15.91	L1	OFF	19.6
0.771000	41.54	---	56.00	14.46	L1	OFF	19.6
0.807360	---	29.48	46.00	16.52	L1	OFF	19.6
0.807360	40.79	---	56.00	15.21	L1	OFF	19.6
1.018140	---	29.21	46.00	16.79	L1	OFF	19.6
1.018140	39.22	---	56.00	16.78	L1	OFF	19.6
1.270860	---	28.50	46.00	17.50	L1	OFF	19.6
1.270860	37.59	---	56.00	18.41	L1	OFF	19.6
1.414500	---	27.18	46.00	18.82	L1	OFF	19.6
1.414500	36.45	---	56.00	19.55	L1	OFF	19.6
13.347150	---	24.41	50.00	25.59	L1	OFF	20.0
13.347150	34.01	---	60.00	25.99	L1	OFF	20.0
13.560000	---	73.07	50.00	-23.07	L1	OFF	20.0
13.560000	78.74	---	60.00	-18.74	L1	OFF	20.0
13.767000	---	23.77	50.00	26.23	L1	OFF	20.0
13.767000	33.40	---	60.00	26.60	L1	OFF	20.0
27.119940	---	32.18	50.00	17.82	L1	OFF	20.4
27.119940	50.11	---	60.00	9.89	L1	OFF	20.4

Report NO : 832801-06
Test Mode : Mode 2
Test Voltage : 110Vac/60Hz
Phase : Neutral

Full Spectrum



Final_Result

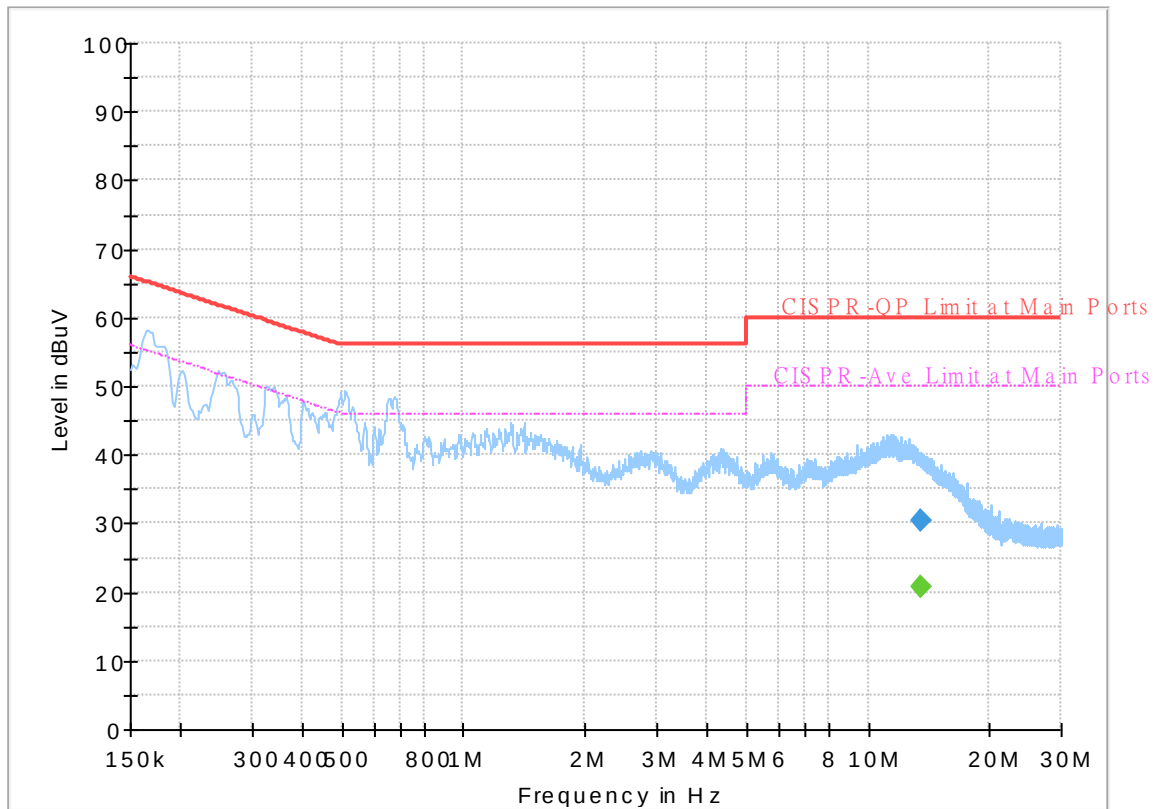
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.165120	---	38.76	55.20	16.44	N	OFF	19.6
0.165120	54.25	---	65.20	10.95	N	OFF	19.6
0.174750	---	36.80	54.73	17.93	N	OFF	19.6
0.174750	51.57	---	64.73	13.16	N	OFF	19.6
0.258540	---	33.57	51.48	17.91	N	OFF	19.6
0.258540	48.16	---	61.48	13.32	N	OFF	19.6
0.267900	---	30.03	51.18	21.15	N	OFF	19.6
0.267900	46.60	---	61.18	14.58	N	OFF	19.6
0.321000	---	28.22	49.68	21.46	N	OFF	19.6
0.321000	41.93	---	59.68	17.75	N	OFF	19.6
0.343500	---	31.53	49.12	17.59	N	OFF	19.6
0.343500	45.37	---	59.12	13.75	N	OFF	19.6
0.366450	---	27.37	48.58	21.21	N	OFF	19.6
0.366450	43.11	---	58.58	15.47	N	OFF	19.6
0.408390	---	27.99	47.68	19.69	N	OFF	19.6
0.408390	43.00	---	57.68	14.68	N	OFF	19.6
0.453750	---	27.28	46.81	19.53	N	OFF	19.6
0.453750	41.48	---	56.81	15.33	N	OFF	19.6
0.492630	---	32.26	46.12	13.86	N	OFF	19.6
0.492630	45.73	---	56.12	10.39	N	OFF	19.6
0.507750	---	34.44	46.00	11.56	N	OFF	19.6

0.507750	47.42	---	56.00	8.58	N	OFF	19.6
0.534300	---	28.44	46.00	17.56	N	OFF	19.6
0.534300	43.25	---	56.00	12.75	N	OFF	19.6
0.652920	---	32.36	46.00	13.64	N	OFF	19.6
0.652920	45.34	---	56.00	10.66	N	OFF	19.6
0.676410	---	32.26	46.00	13.74	N	OFF	19.6
0.676410	45.83	---	56.00	10.17	N	OFF	19.6
0.764970	---	31.17	46.00	14.83	N	OFF	19.6
0.764970	42.11	---	56.00	13.89	N	OFF	19.6
0.804750	---	29.56	46.00	16.44	N	OFF	19.6
0.804750	41.04	---	56.00	14.96	N	OFF	19.6
1.137750	---	27.73	46.00	18.27	N	OFF	19.6
1.137750	37.83	---	56.00	18.17	N	OFF	19.6
1.315500	---	26.98	46.00	19.02	N	OFF	19.6
1.315500	37.49	---	56.00	18.51	N	OFF	19.6
1.410000	---	27.19	46.00	18.81	N	OFF	19.6
1.410000	36.75	---	56.00	19.25	N	OFF	19.6
13.471890	---	31.80	50.00	18.20	N	OFF	20.1
13.471890	50.90	---	60.00	9.10	N	OFF	20.1
13.560000	---	72.99	50.00	-22.99	N	OFF	20.1
13.560000	78.69	---	60.00	-18.69	N	OFF	20.1
13.636500	---	27.41	50.00	22.59	N	OFF	20.1
13.636500	45.39	---	60.00	14.61	N	OFF	20.1
27.118410	---	31.31	50.00	18.69	N	OFF	20.3
27.118410	49.29	---	60.00	10.71	N	OFF	20.3

Terminal

Report NO : 832801-06
Test Mode : Mode 2
Test Voltage : 110Vac/60Hz
Phase : Line

Full Spectrum

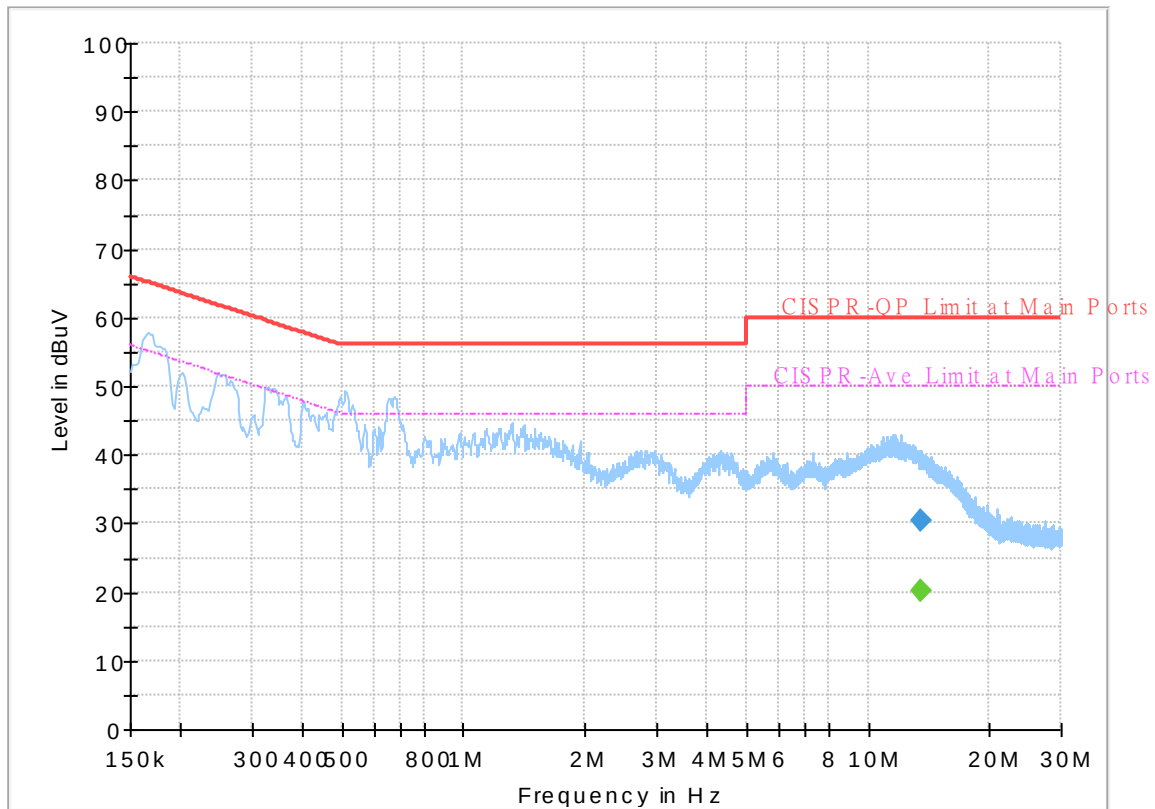


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
13.559730	---	20.64	50.00	29.36	L1	OFF	20.0
13.559730	30.46	---	60.00	29.54	L1	OFF	20.0

Report NO : 832801-06
 Test Mode : Mode 2
 Test Voltage : 110Vac/60Hz
 Phase : Neutral

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
13.564230	---	20.31	50.00	29.69	N	OFF	20.1
13.564230	30.28	---	60.00	29.72	N	OFF	20.1



Appendix C. Radiated Spurious Emission

Test Engineer :	Jack Cheng, Lance Chiang, and Chuan Chu	Temperature :	19.2~26.8°C
		Relative Humidity :	53.5~69%

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2386.545	45.73	-28.27	74	44.76	27.53	6.59	33.15	297	305	P	H
		2386.545	20.97	-33.03	54	-	-	-	-	-	-	A	H
	*	2402	102.3	-	-	101.36	27.5	6.61	33.17	297	305	P	H
	*	2402	77.54	-	-	-	-	-	-	-	-	A	H
													H
													H
		2351.58	45.7	-28.3	74	44.66	27.6	6.55	33.11	102	354	P	V
		2351.58	20.94	-33.06	54	-	-	-	-	-	-	A	V
	*	2402	103.46	-	-	102.52	27.5	6.61	33.17	102	354	P	V
	*	2402	78.7	-	-	-	-	-	-	-	-	A	V
													V
													V
BT CH 39 2441MHz		2315.04	45.57	-28.43	74	44.39	27.74	6.51	33.07	289	311	P	H
		2315.04	20.81	-33.19	54	-	-	-	-	-	-	A	H
	*	2441	102.49	-	-	101.64	27.42	6.65	33.22	289	311	P	H
	*	2441	77.73	-	-	-	-	-	-	-	-	A	H
		2484.25	45.08	-28.92	74	44.34	27.33	6.68	33.27	289	311	P	H
		2484.25	20.32	-33.68	54	-	-	-	-	-	-	A	H
		2358.44	45.98	-28.02	74	44.96	27.58	6.56	33.12	100	354	P	V
		2358.44	21.22	-32.78	54	-	-	-	-	-	-	A	V
	*	2441	103.56	-	-	102.72	27.42	6.64	33.22	100	354	P	V
	*	2441	78.8	-	-	-	-	-	-	-	-	A	V
		2494.12	45.29	-28.71	74	44.57	27.31	6.69	33.28	100	354	P	V
		2494.12	20.53	-33.47	54	-	-	-	-	-	-	A	V



BT CH 78 2480MHz	*	2480	99.27	-	-	98.52	27.34	6.68	33.27	291	305	P	H
	*	2480	74.51	-	-	-	-	-	-	-	-	A	H
		2484.28	47.24	-26.76	74	46.5	27.33	6.68	33.27	291	305	P	H
		2484.28	22.48	-31.52	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	101.44	-	-	100.69	27.34	6.68	33.27	100	356	P	V
	*	2480	76.68	-	-	-	-	-	-	-	-	A	V
		2484.04	48.46	-25.54	74	47.72	27.33	6.68	33.27	100	356	P	V
		2484.04	23.7	-30.3	54	-	-	-	-	-	-	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 00 2402MHz		4804	37.66	-36.34	74	59.05	31.1	10.07	62.56	100	0	P	H
		4804	12.9	-41.1	54	-	-	-	-	-	-	A	H
													H
													H
		4804	37.41	-36.59	74	58.8	31.1	10.07	62.56	100	0	P	V
		4804	12.65	-41.35	54	-	-	-	-	-	-	A	V
													V
													V
BT CH 39 2441MHz		4882	39.91	-34.09	74	61.31	31.1	10.08	62.58	100	0	P	H
		4882	15.15	-38.85	54	-	-	-	-	-	-	A	H
		7323	45.3	-28.7	74	59.96	36.39	12.51	63.56	100	0	P	H
		7323	20.54	-33.46	54	-	-	-	-	-	-	A	H
		4882	38.6	-35.4	74	60	31.1	10.08	62.58	100	0	P	V
		4882	13.84	-40.16	54	-	-	-	-	-	-	A	V
		7323	44.7	-29.3	74	59.36	36.39	12.51	63.56	100	0	P	V
		7323	19.94	-34.06	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	38.17	-35.83	74	59.44	31.24	10.08	62.59	100	0	P	H
		4960	13.41	-40.59	54	-	-	-	-	-	-	A	H
		7440	43.01	-30.99	74	57.59	36.4	12.61	63.59	100	0	P	H
		7440	18.25	-35.75	54	-	-	-	-	-	-	A	H
		4960	37.64	-36.36	74	58.91	31.24	10.08	62.59	100	0	P	V
		4960	12.88	-41.12	54	-	-	-	-	-	-	A	V
		7440	43.15	-30.85	74	57.73	36.4	12.61	63.59	100	0	P	V
		7440	18.39	-35.61	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz BT (LF)

[illegible]



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical

A calculation example for radiated spurious emission is shown as below:

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
= 55.45 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
= 43.54 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.



Appendix D. Radiated Spurious Emission Plots

Test Engineer :	Jack Cheng, Lance Chiang, and Chuan Chu	Temperature :	19.2~26.8°C
		Relative Humidity :	53.5~69%

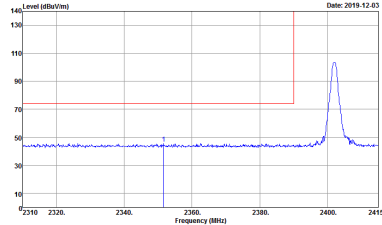
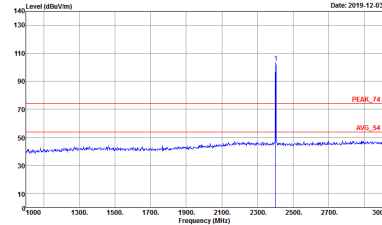
Note symbol

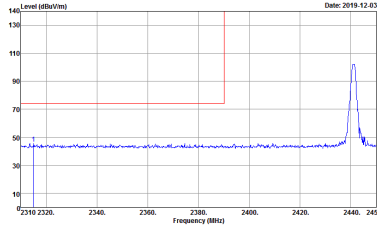
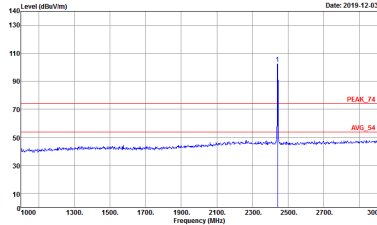
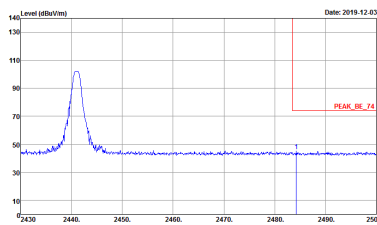
-L	Low channel location
-R	High channel location

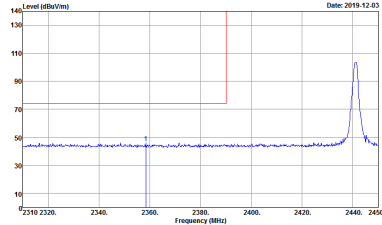
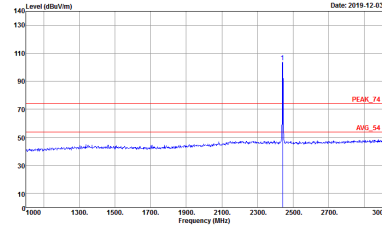
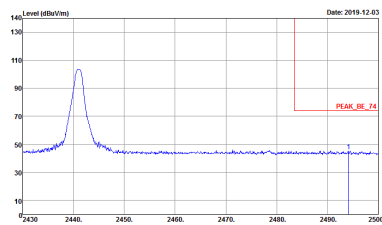
2.4GHz 2400~2483.5MHz

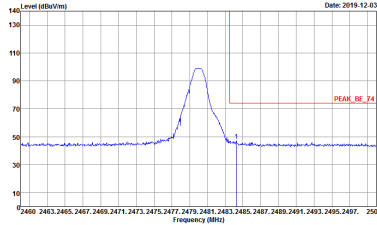
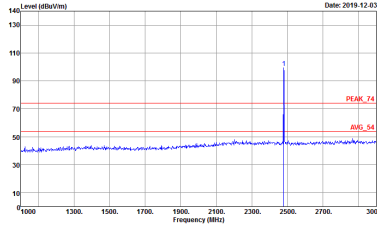
BT (Band Edge @ 3m)

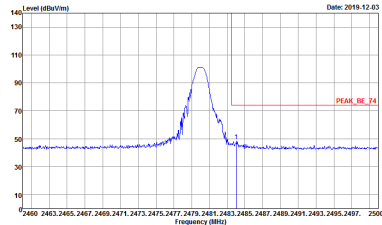
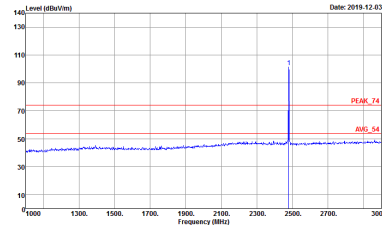
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Horizontal	Fundamental
Peak	Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto Detector : Peak Project : 832801.05	Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto Detector : Peak Project : 832801.05

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Vertical	Fundamental
Peak	 Site : 03CH12-11Y Condition : PEAK, 74 3m HORN, 91200, 1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 832801-05	 Site : 03CH12-11Y Condition : PEAK, 74 3m HORN, 91200, 1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 832801-05

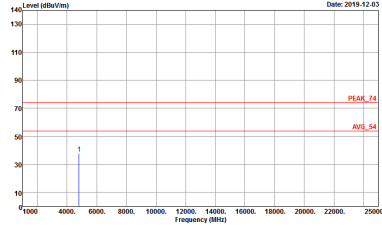
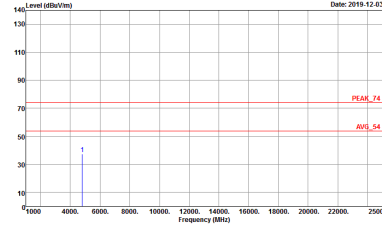
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 HORIZONTAL Detector : Peak Project : 832801-05	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL Detector : Peak Project : 832801-05
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 HORIZONTAL Detector : Peak Project : 832801-05	Left blank

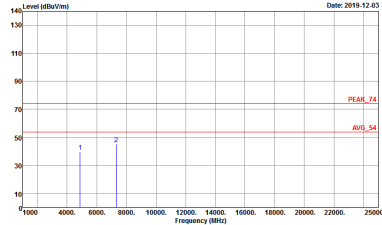
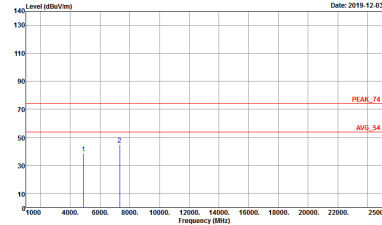
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Vertical	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 832801-05	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 832801-05
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 832801-05	Left blank

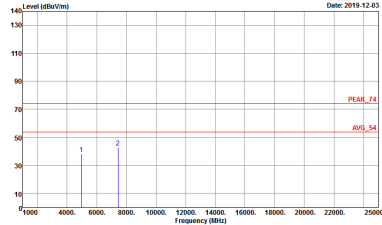
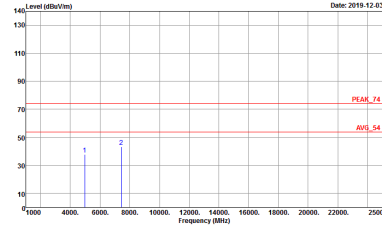
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 832801-05	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 832801-05

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 832801-05	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 832801-05

2.4GHz 2400~2483.5MHz
BT (Harmonic @ 3m)

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL Detector : Peak Project : 832801-05	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 832801-05

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH12-11Y Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL Detector : Peak Project : 832801-05	 Site : 03CH12-11Y Condition : PEAK_74 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 832801-05

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH12-11Y Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL Detector : Peak Project : 832801-05	 Site : 03CH12-11Y Condition : PEAK_74 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 832801-05