FCC RF Test Report

APPLICANT	:	Xiaomi Communications Co., Ltd.
EQUIPMENT	:	Mobile Phone
BRAND NAME	:	MI
MODEL NAME	:	M1804C3DG
FCC ID	:	2AFZZ-RMSC3DG
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

The product was received on Apr. 16, 2018 and testing was completed on Jun. 06, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR841618-01A	Rev. 01	Initial issue of report	Jun. 12, 2018

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	Number of Channels	≥ 15Chs	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	NA	Pass	-
3.5	15.247(b)(1)	Peak Output Power	≤ 125 mW	Pass	-
3.6	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.31 dB at 45.660 MHz
3.9	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 6.01 dB at 0.521 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Xiaomi Communications Co., Ltd.
The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China

1.2 Manufacturer

Xiaomi Communications Co., Ltd.
The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	MI
Model Name	M1804C3DG
FCC ID	2AFZZ-RMSC3DG
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/ DC-HSDPA/HSPA+/LTE WLAN 2.4GHz 802.11b/g/n HT20 Bluetooth v3.0 + EDR/ Bluetooth v 4.0 LE/ Bluetooth v 4.2 LE
IMEI Code	Conducted: N/A Conduction: 868672030013954/868672030013962 Radiation: 868672030013376/868672030013384
HW Version	P2
SW Version	MIUI9
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two types of EUT, the difference between two samples is for memory, the sample 1 is 3+32GB capacity and the sample 2 is 4+64GB capacity. According to the difference, we only choose sample 1 to perform full test.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth BR(1Mbps) : 9.86 dBm (0.0097 W) Bluetooth EDR (2Mbps) : 9.33 dBm (0.0086 W) Bluetooth EDR (3Mbps) : 9.25 dBm (0.0084 W)
Antenna Type / Gain	IFA Antenna with gain 1.38 dBi
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π /4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK

1.5 Modification of EUT

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

1.6 Testing Location

SPORTON INTERNATIONAL INC. is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and under the FCC-recognized accredited testing laboratories by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan 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.		
Test Site Location	No.58, Aly. 75, Ln. 564 Wenha 3rd Rd. Guishan Dist. Taoyuan City Taiwan TEL: +886-3-327-3456 FAX: +886-3-328-4978		
Test Site No.	**Sporton Site No.**	**FCC designation No.**	**FCC Test Firm Registration No.**
	03CH11-HY	TW0007	214511

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

1.7 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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

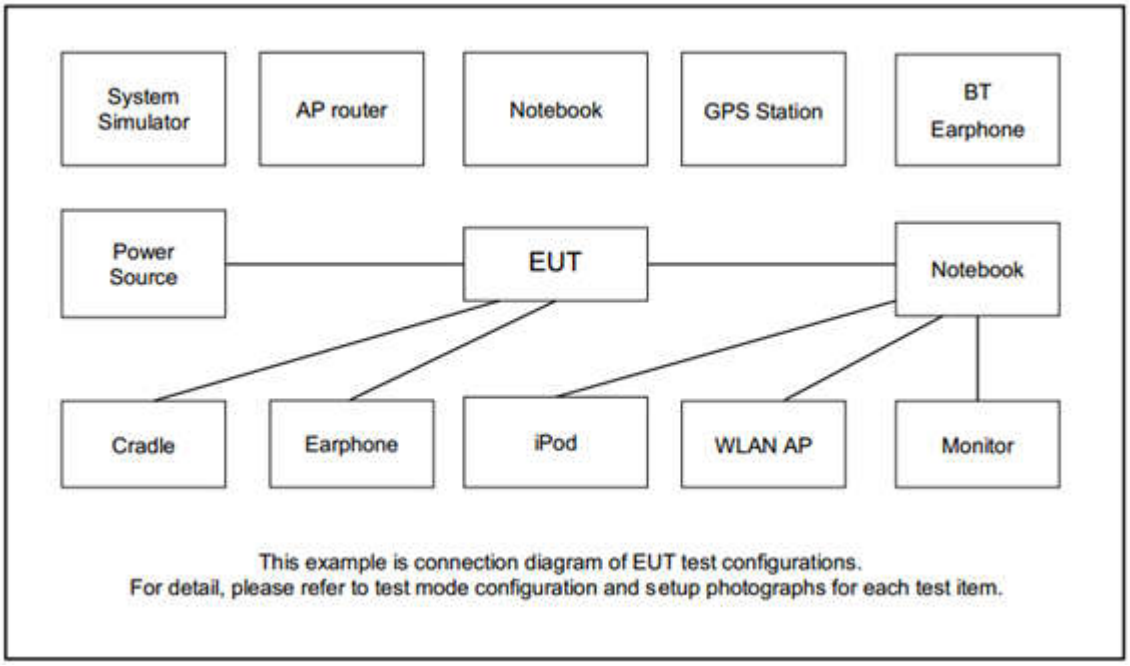
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X-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 π/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 : GSM 850 Idle + Bluetooth Link + WLAN Link (2.4G) + Camera(Rear) + USB Cable 1(Charging from Adapter1) + Earphone + SD Card + SIM 1		
Remark: 1. For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and no other significantly frequencies found in conducted spurious emission. 2. For Radiated Test Cases, The tests were performed with Adapter 1, Earphone and USB Cable 1.			

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	BT Base Station	R&S	CBT	N/A	N/A	Unshielded, 1.8 m
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded,1.8m
4.	Notebook	Dell	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Bluetooth Earphone	Sony Ericsson	MW600	PY700A2029	N/A	N/A
6.	iPod Earphone	Apple	A1285	DoC	UnShielded, 1.2m	N/A
7.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

For Bluetooth function, the engineering test program was provided and enabled to make EUT connect with Bluetooth base station to continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the Notebook under large package sizes transmission.

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 5.3 dB and 20dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 5.3 + 20 = 25.3 (dB)

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.

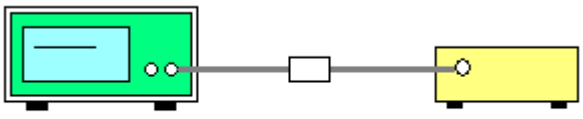
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 ≥ 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

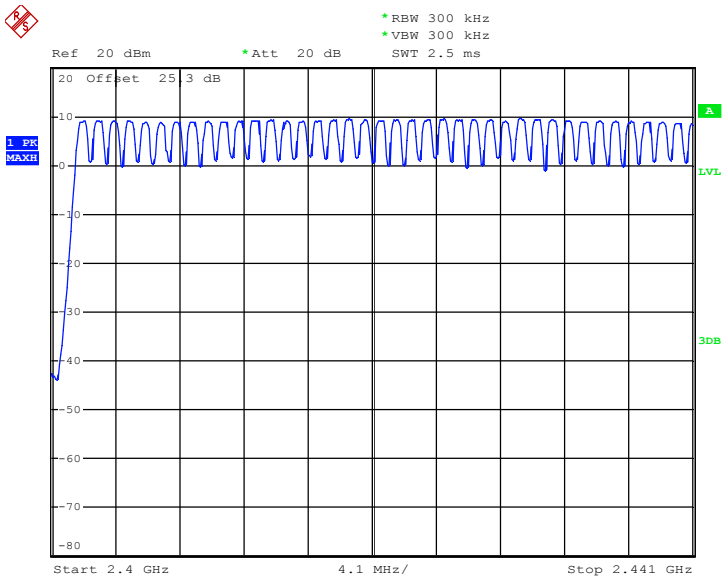


3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	1Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

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

Number of Hopping Channel Plot on Channel 00 - 78



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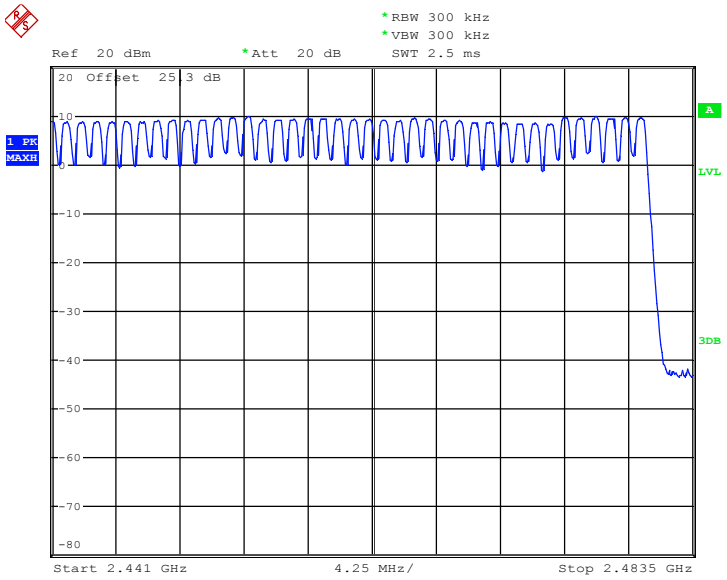

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3.2 Hopping Channel Separation Measurement

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

The measuring equipment is listed in the section 4 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 ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

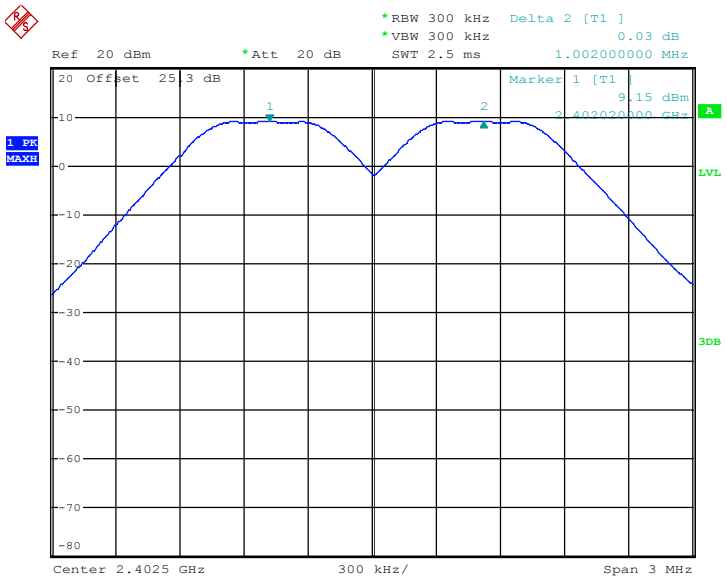
3.2.4 Test Setup

3.2.5 Test Result of Hopping Channel Separation

Test Mode :	1Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.5307	Pass
39	2441	1.002	0.5520	Pass
78	2480	1.008	0.5520	Pass

Channel Separation Plot on Channel 00 - 01



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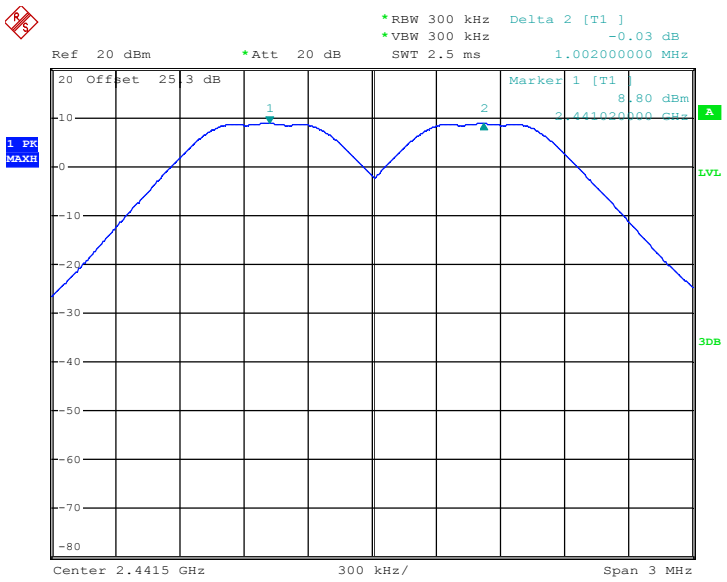
Channel Separation Plot on Channel 39 - 40



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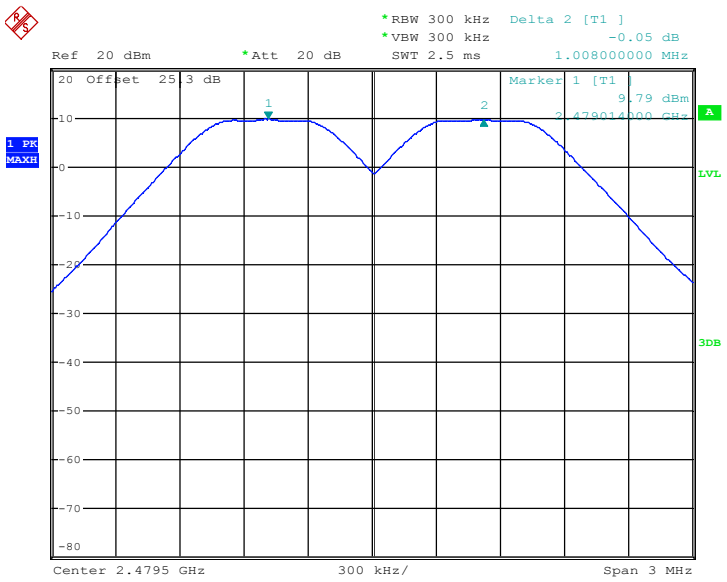
Channel Separation Plot on Channel 77 - 78



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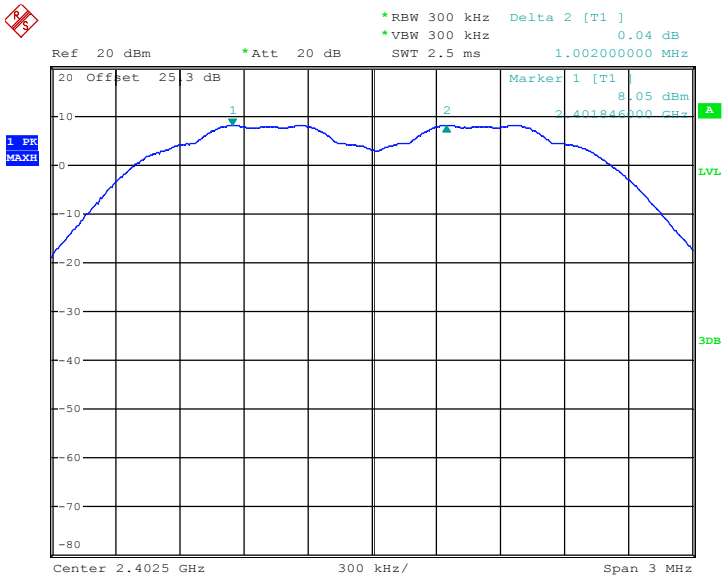
Test Mode :	2Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8280	Pass
39	2441	1.002	0.8320	Pass
78	2480	1.002	0.8320	Pass

Channel Separation Plot on Channel 00 - 01



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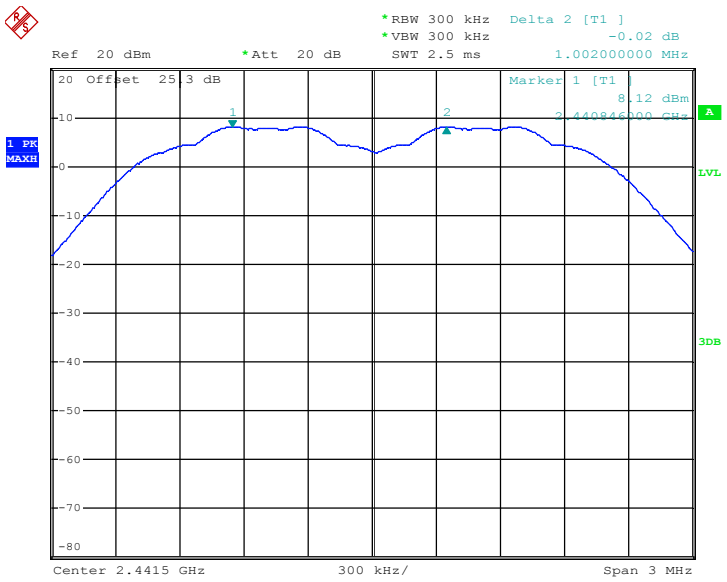
Channel Separation Plot on Channel 39 - 40



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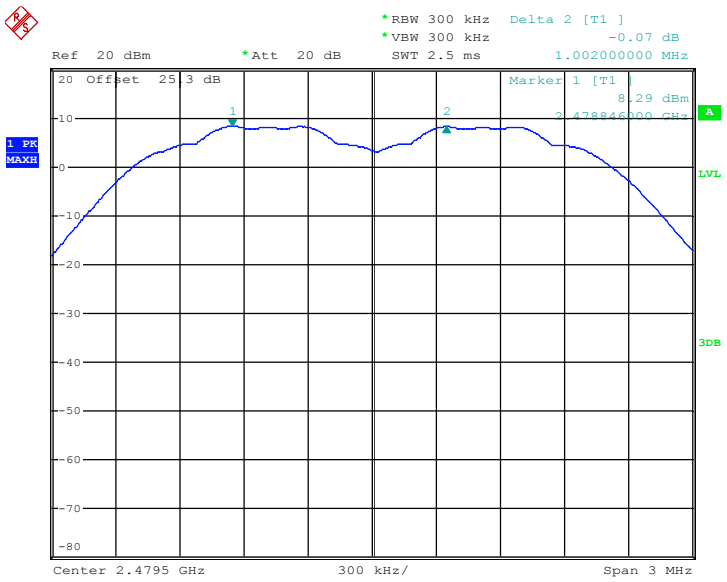
Channel Separation Plot on Channel 77 - 78

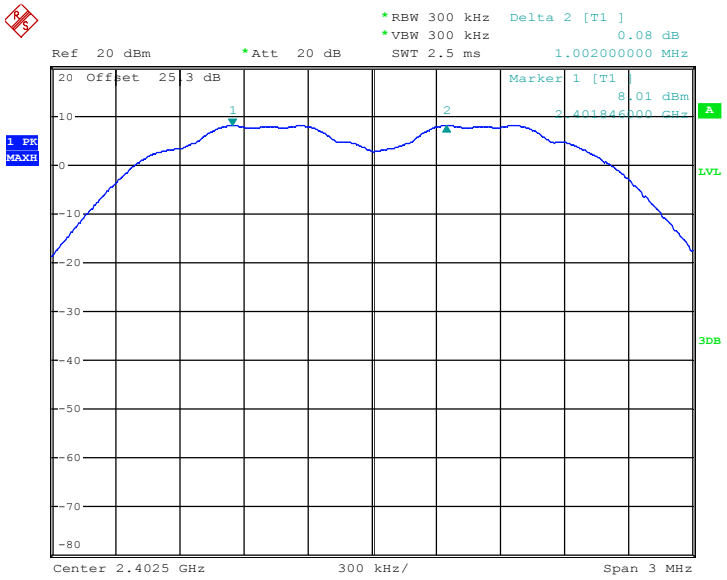


Date: 4.JUN.2018 19:05:27

Test Mode :	3Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8080	Pass
39	2441	1.002	0.8080	Pass
78	2480	1.002	0.8120	Pass

Channel Separation Plot on Channel 00 - 01



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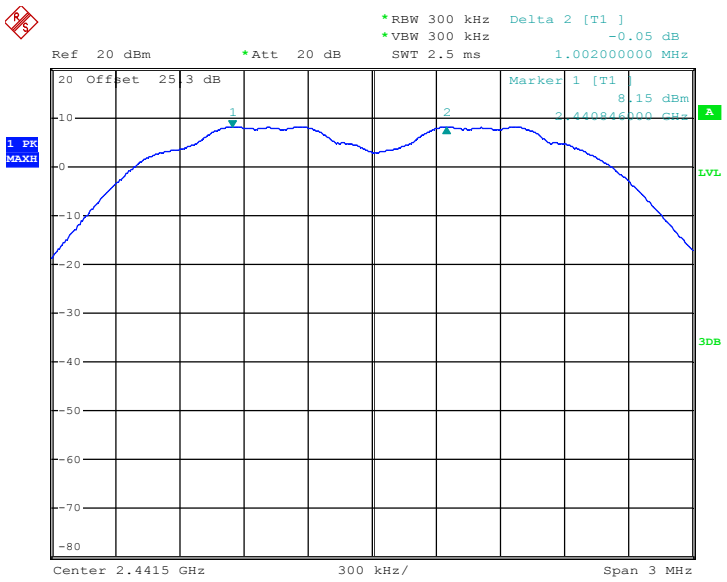
Channel Separation Plot on Channel 39 - 40



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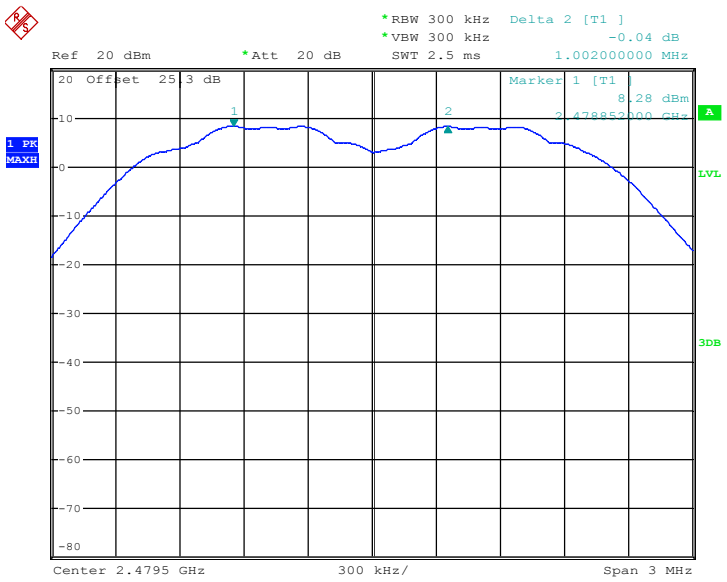
Channel Separation Plot on Channel 77 - 78



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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.

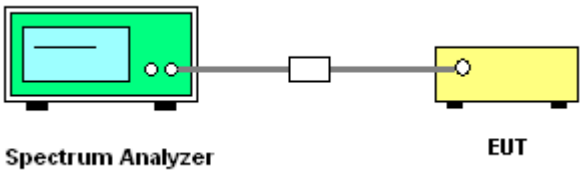
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 ≥ 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

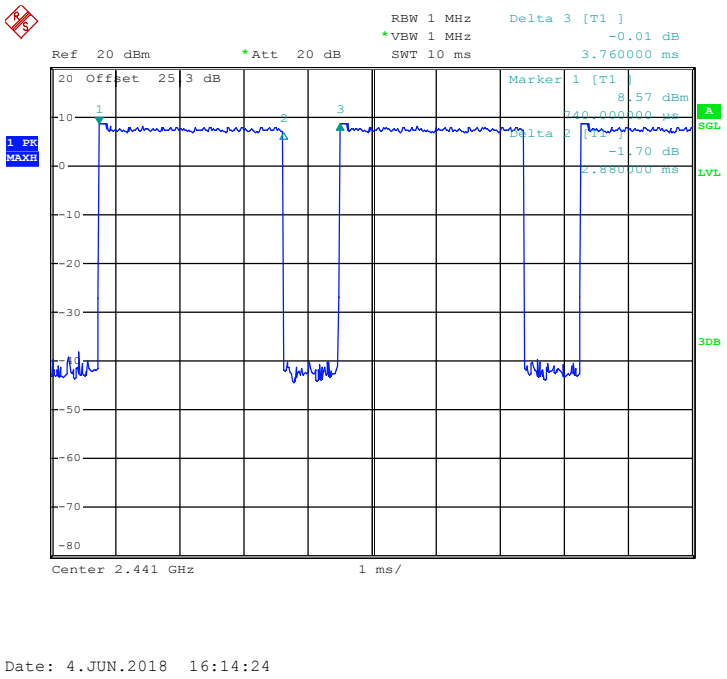


3.3.5 Test Result of Dwell Time

Test Mode :	3DH5	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Mode	Hopping Channel Number	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Normal	79	106.67	2.8800	0.31	0.4	Pass
AFH	20	53.34	2.8800	0.15	0.4	Pass

Package Transfer Time Plot



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 Bandwidth Measurement

3.4.1 Limit of 20dB Bandwidth

Reporting only

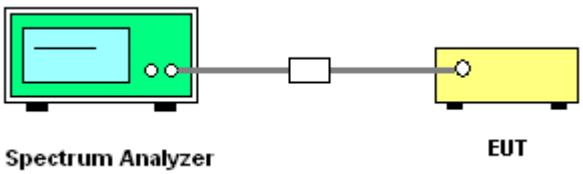
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
5. Measure and record the results in the test report.

3.4.4 Test Setup

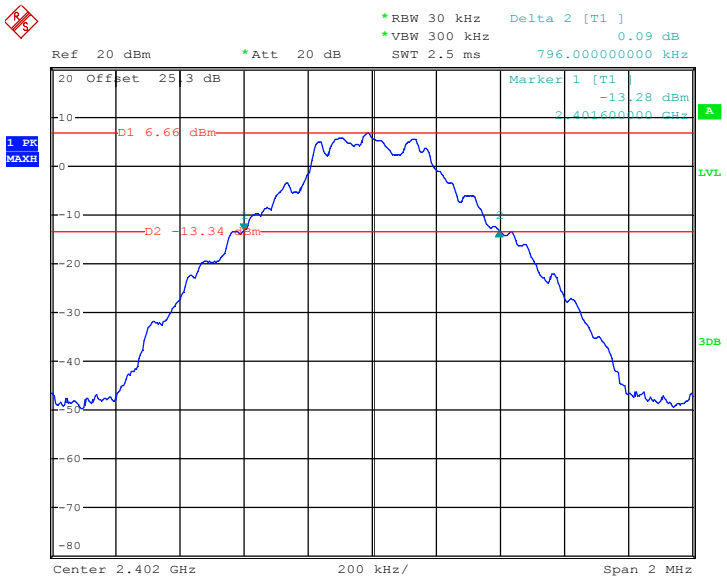


3.4.5 Test Result of 20dB Bandwidth

Test Mode :	1Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.796
39	2441	0.828
78	2480	0.828

20 dB Bandwidth Plot on Channel 00



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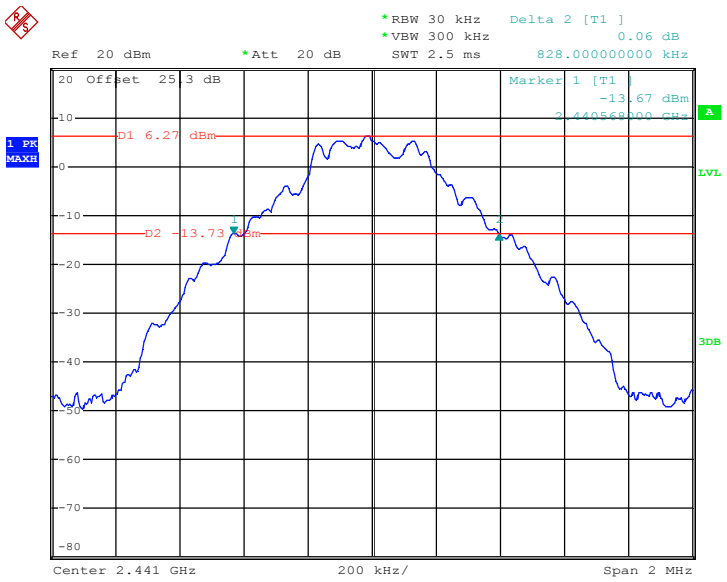
20 dB Bandwidth Plot on Channel 39



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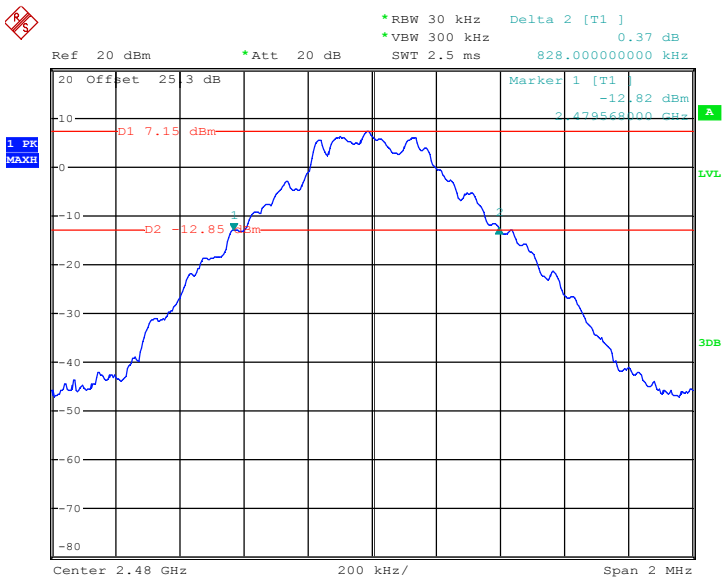
20 dB Bandwidth Plot on Channel 78



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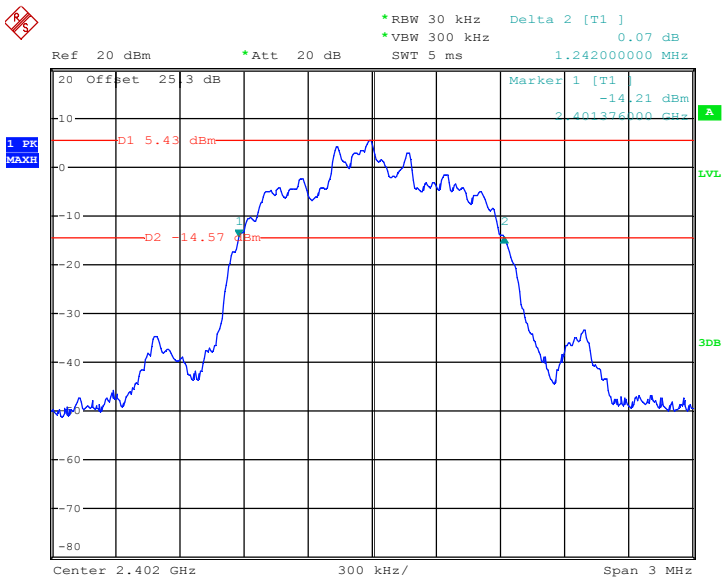
Test Mode :	2Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

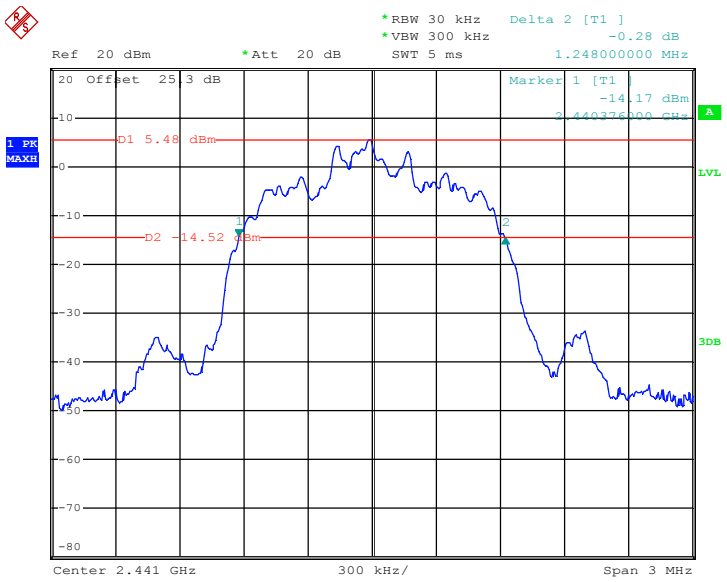
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.242
39	2441	1.248
78	2480	1.248

20 dB Bandwidth Plot on Channel 00



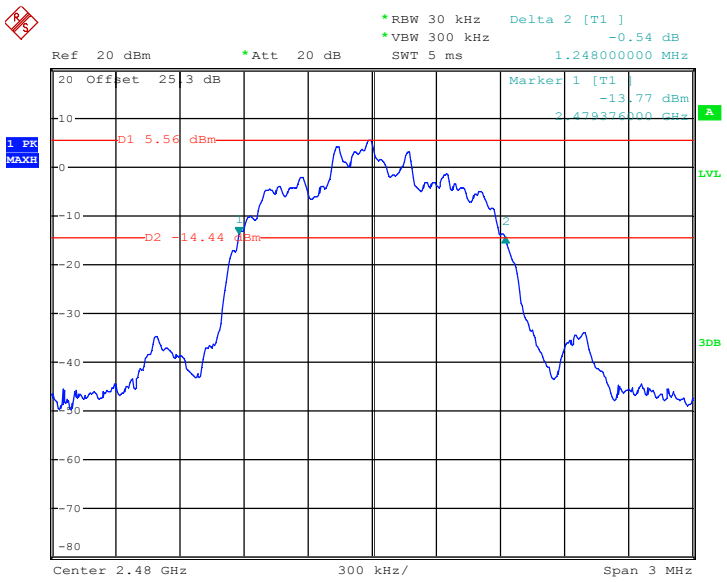
Date: 4.JUN.2018 19:12:50

20 dB Bandwidth Plot on Channel 39



Date: 4.JUN.2018 19:15:41

20 dB Bandwidth Plot on Channel 78

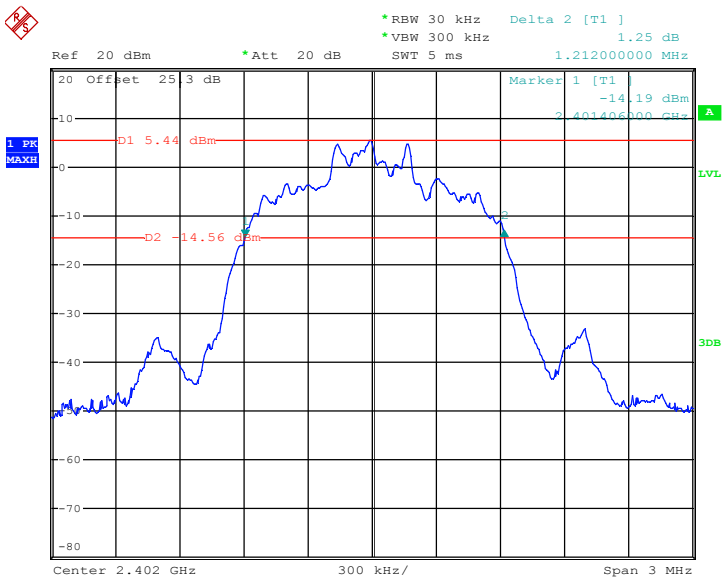


Date: 4.JUN.2018 19:20:10

Test Mode :	3Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

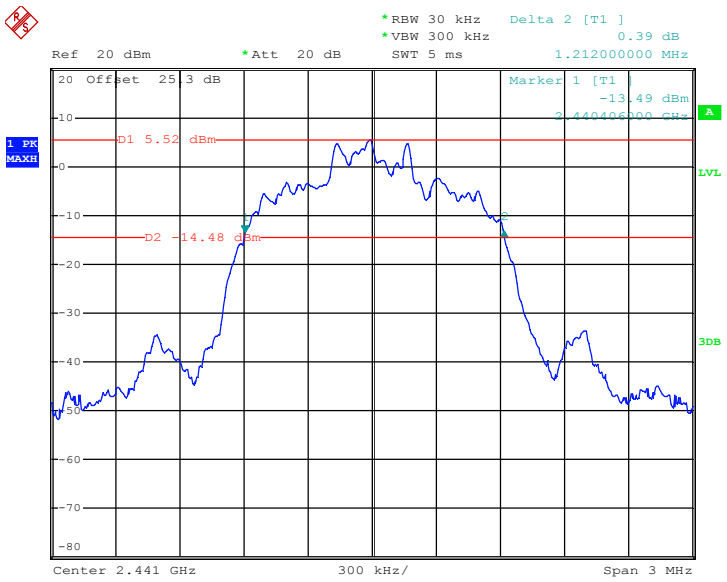
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.212
39	2441	1.212
78	2480	1.218

20 dB Bandwidth Plot on Channel 00



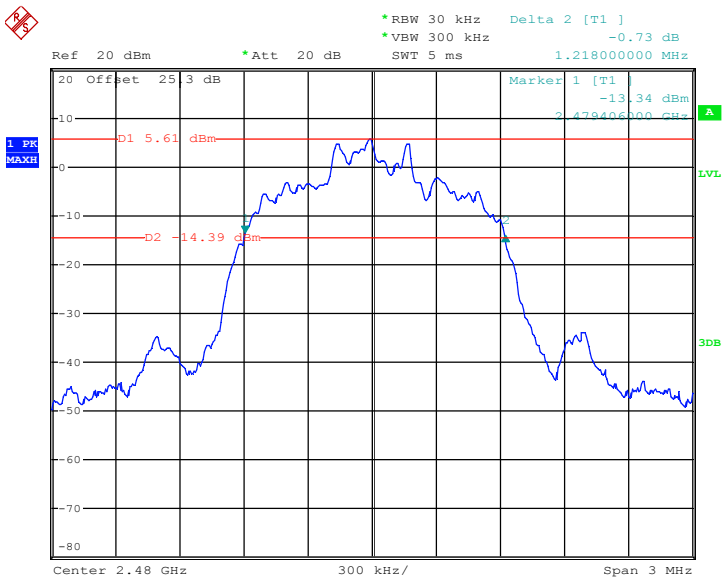
Date: 4.JUN.2018 19:36:58

20 dB Bandwidth Plot on Channel 39



Date: 4.JUN.2018 19:41:26

20 dB Bandwidth Plot on Channel 78



Date: 4.JUN.2018 19:49:09

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: (1) 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. The power limit for 1Mbps, 2Mbps, 3Mbps and AFH modes are 0.125 watts.

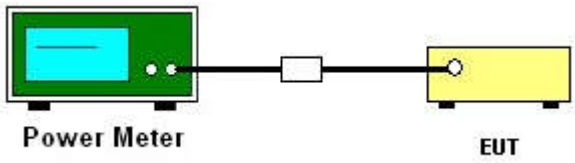
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 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

Test Mode :	1Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	9.30	20.97	Pass
39	2441	9.65	20.97	Pass
78	2480	9.86	20.97	Pass

Test Mode :	2Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Channel	Frequency (MHz)	RF Power (dBm)		
		π /4-DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	8.60	20.97	Pass
39	2441	8.87	20.97	Pass
78	2480	9.33	20.97	Pass

Test Mode :	3Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	8.70	20.97	Pass
39	2441	8.95	20.97	Pass
78	2480	9.25	20.97	Pass

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.

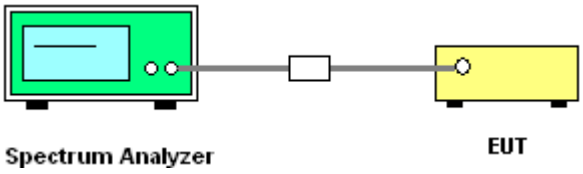
3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 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.

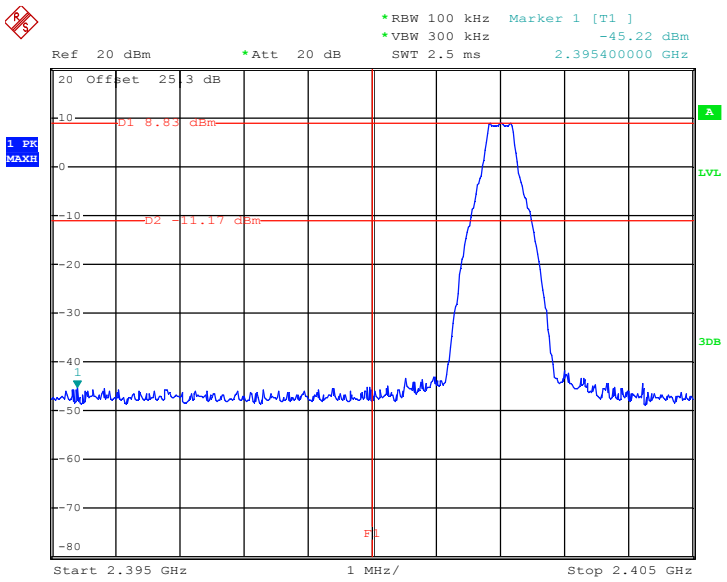
3.6.4 Test Setup



3.6.5 Test Result of Conducted Band Edges

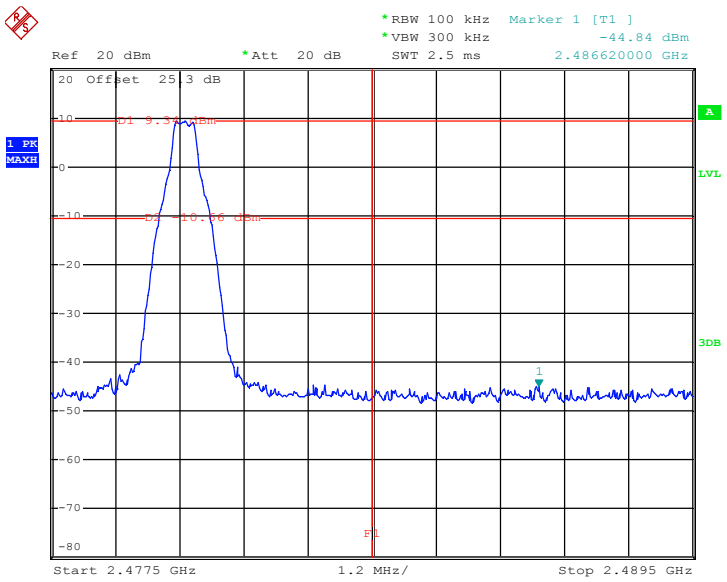
Test Mode :	1Mbps	Temperature :	21~25℃
Test Channel :	00 and 78	Relative Humidity :	51~54%
		Test Engineer :	Tommy Lee/Luffy Lin

Low Band Edge Plot on Channel 00



Date: 4.JUN.2018 17:33:28

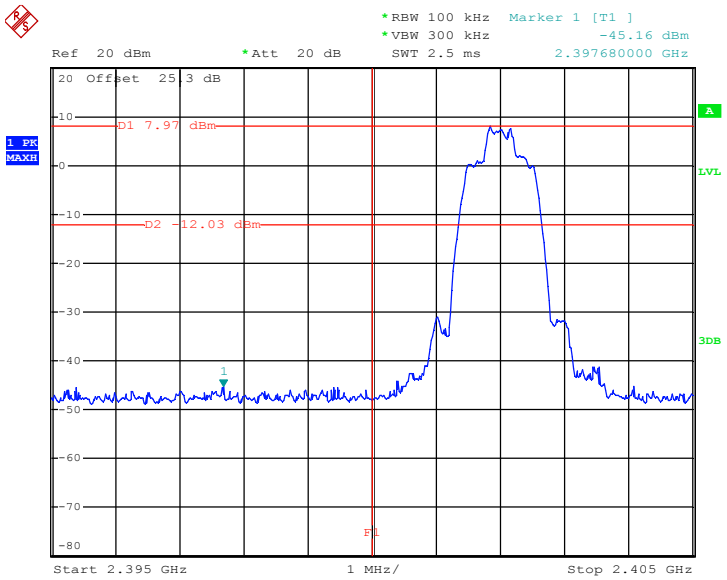
High Band Edge Plot on Channel 78



Date: 4.JUN.2018 17:52:29

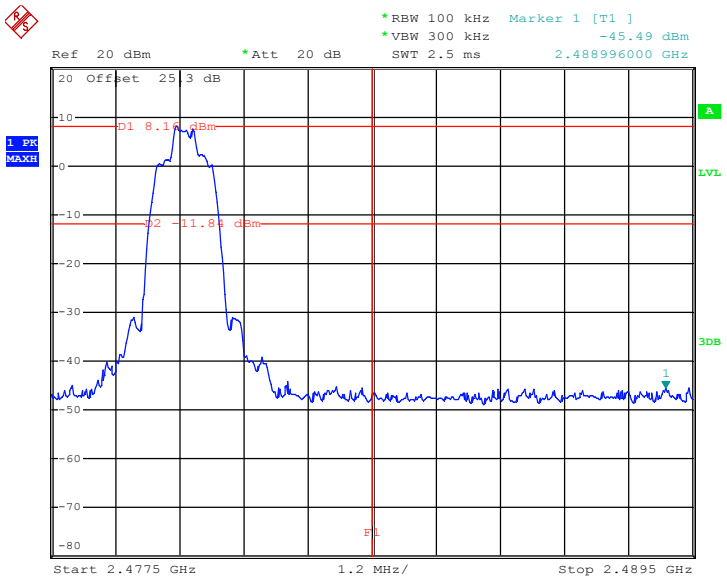
Test Mode :	2Mbps	Temperature :	21~25℃
Test Channel :	00 and 78	Relative Humidity :	51~54%
		Test Engineer :	Tommy Lee/Luffy Lin

Low Band Edge Plot on Channel 00



Date: 4.JUN.2018 19:10:36

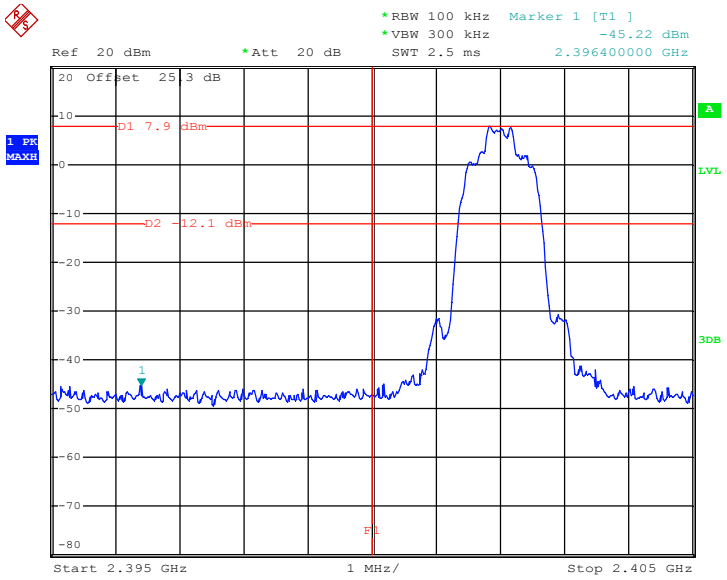
High Band Edge Plot on Channel 78



Date: 4.JUN.2018 19:19:13

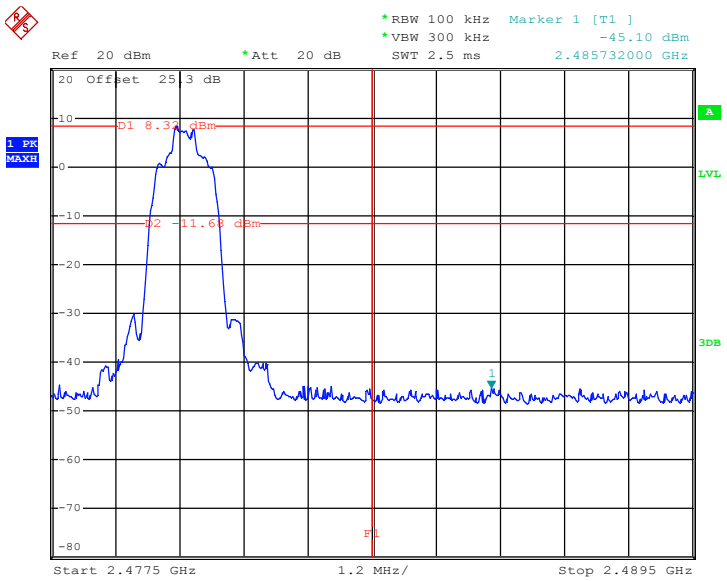
Test Mode :	3Mbps	**Temperature :**	21~25℃
Test Channel :	00 and 78	**Relative Humidity :**	51~54%
		Test Engineer :	Tommy Lee/Luffy Lin

Low Band Edge Plot on Channel 00



Date: 4.JUN.2018 19:36:05

High Band Edge Plot on Channel 78

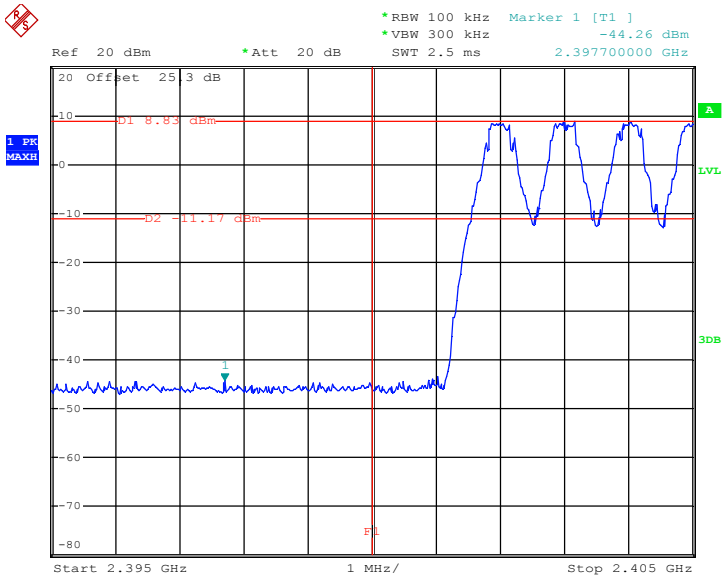


Date: 4.JUN.2018 19:47:41

3.6.6 Test Result of Conducted Hopping Mode Band Edges

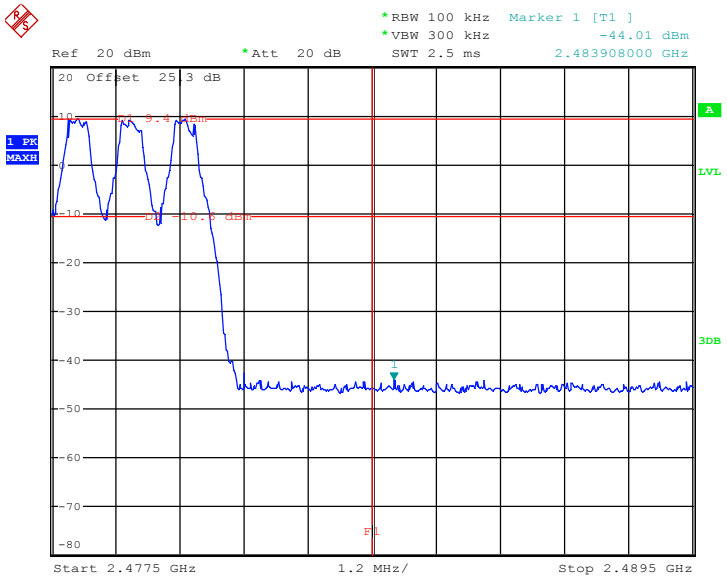
Test Mode :	1Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Hopping Mode Low Band Edge Plot



Date: 4.JUN.2018 17:58:30

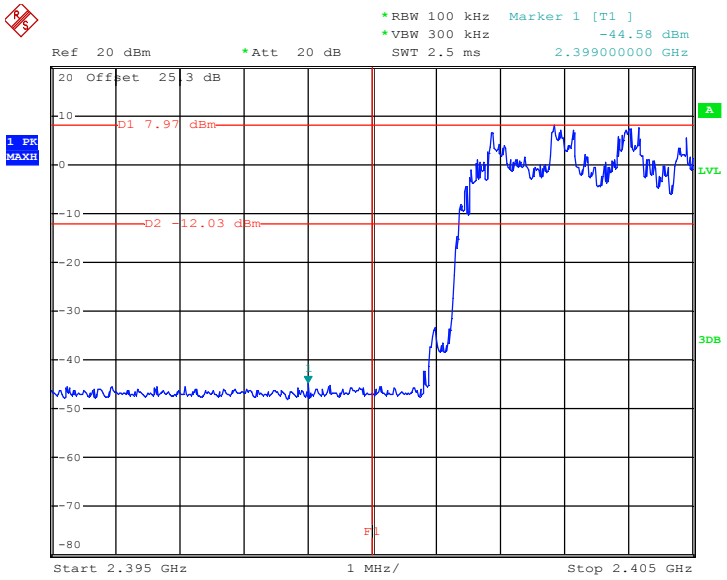
Hopping Mode High Band Edge Plot



Date: 4.JUN.2018 18:02:24

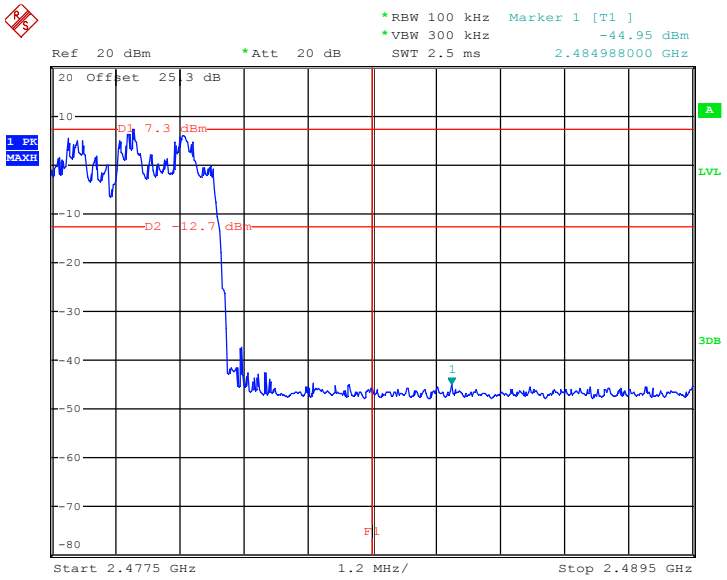
Test Mode :	2Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Hopping Mode Low Band Edge Plot



Date: 4.JUN.2018 18:57:57

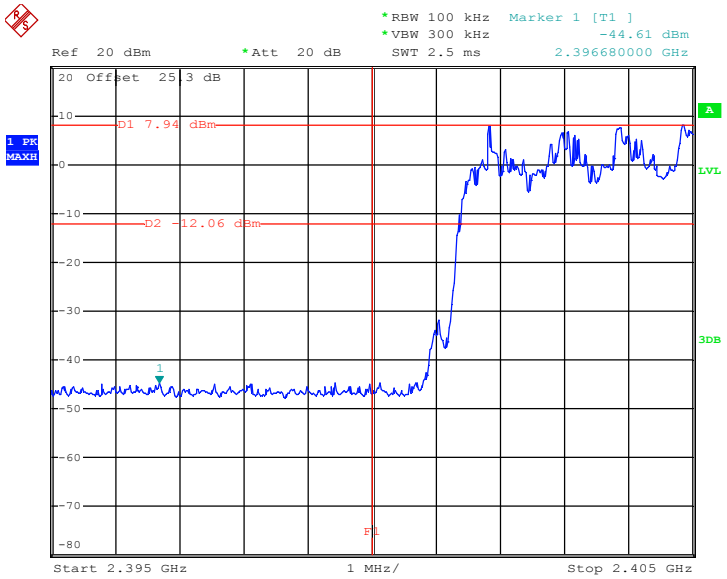
Hopping Mode High Band Edge Plot



Date: 4.JUN.2018 18:58:59

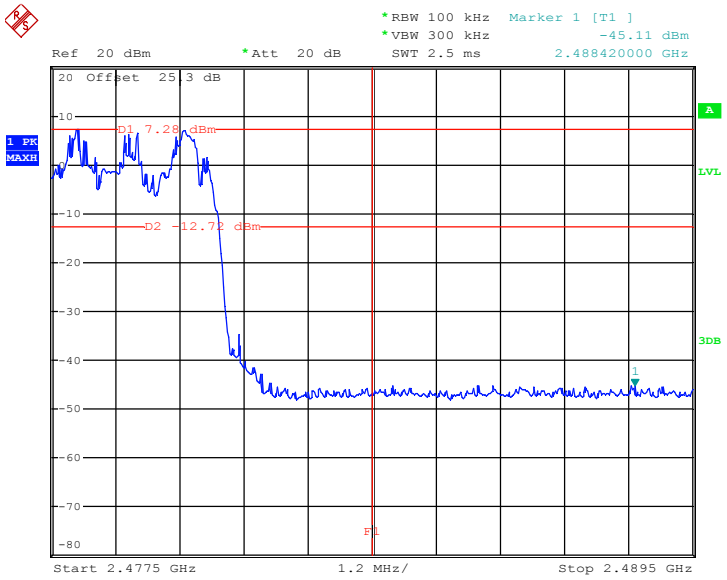
Test Mode :	3Mbps	Temperature :	21~25℃
Test Engineer :	Tommy Lee/Luffy Lin	Relative Humidity :	51~54%

Hopping Mode Low Band Edge Plot



Date: 4.JUN.2018 19:00:39

Hopping Mode High Band Edge Plot



Date: 4.JUN.2018 19:01:26

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.

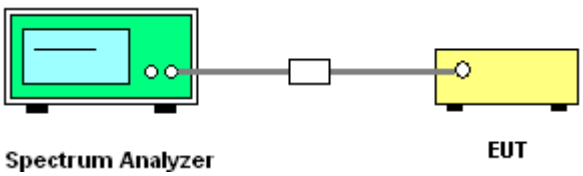
3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 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.

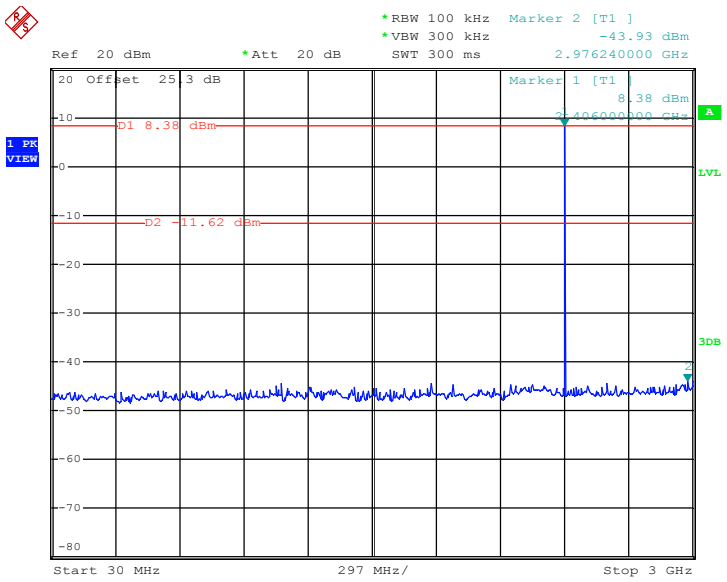
3.7.4 Test Setup



3.7.5 Test Result of Conducted Spurious Emission

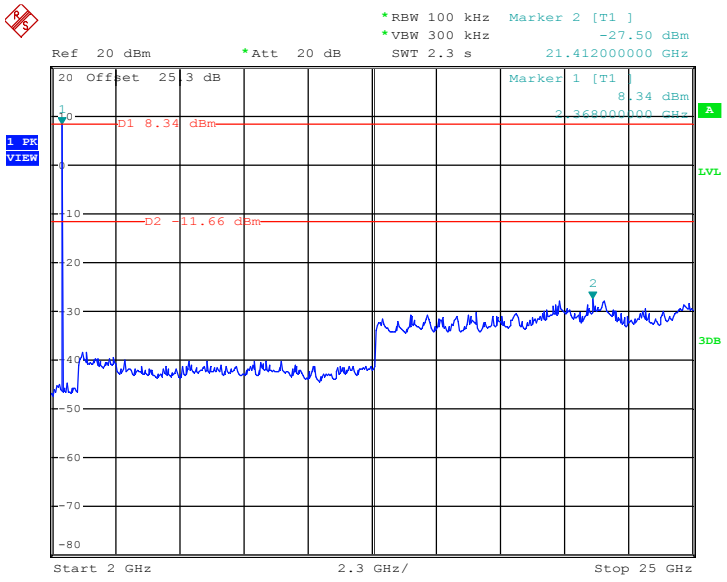
Test Mode :	1Mbps	Temperature :	21~25℃
Test Channel :	00	Relative Humidity :	51~54%
		Test Engineer :	Tommy Lee/Luffy Lin

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



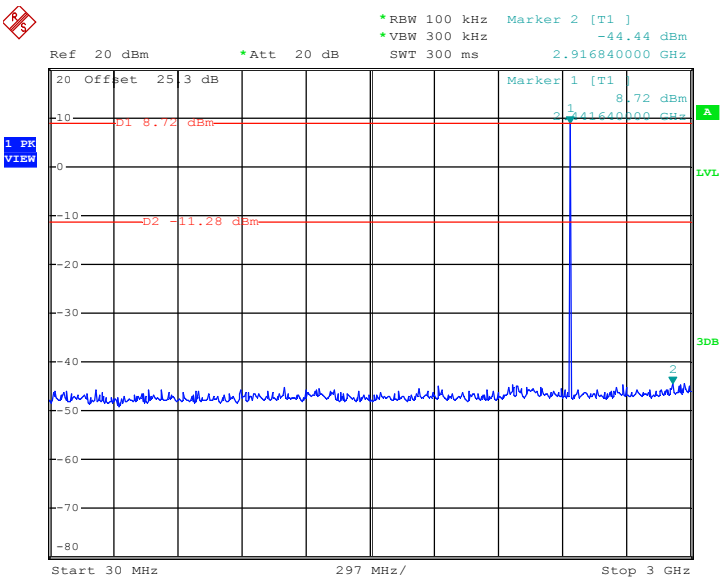
Date: 4.JUN.2018 17:31:48

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



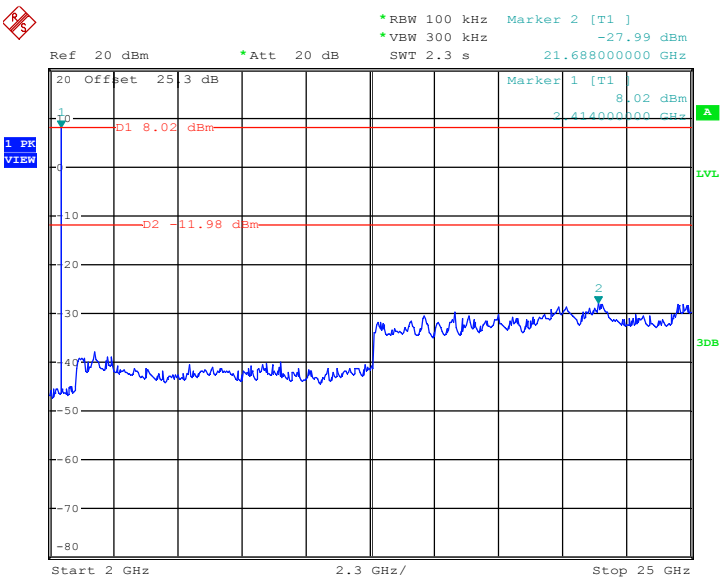
Date: 4.JUN.2018 17:32:41

CSE Plot on Ch 39 between 30MHz ~ 3 GHz



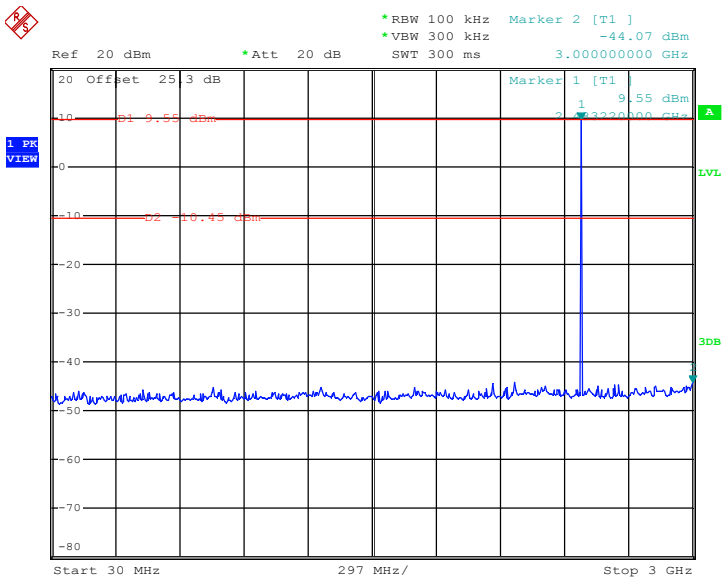
Date: 4.JUN.2018 17:41:40

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



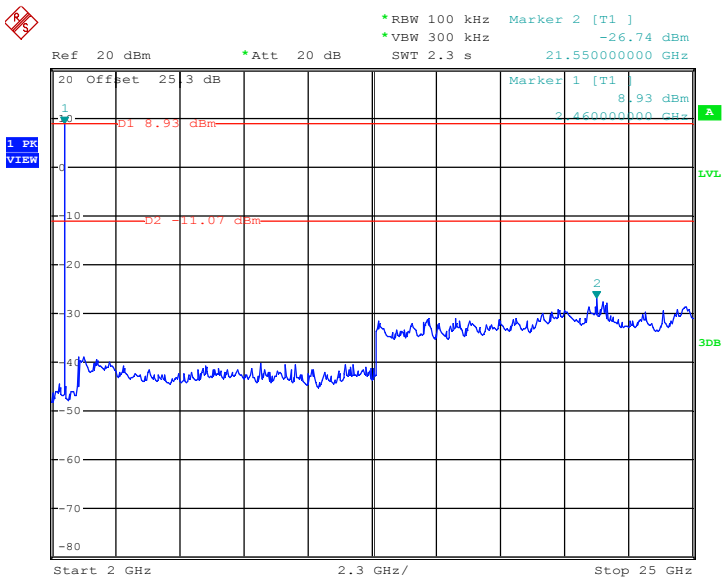
Date: 4.JUN.2018 17:42:26

CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 4.JUN.2018 17:49:59

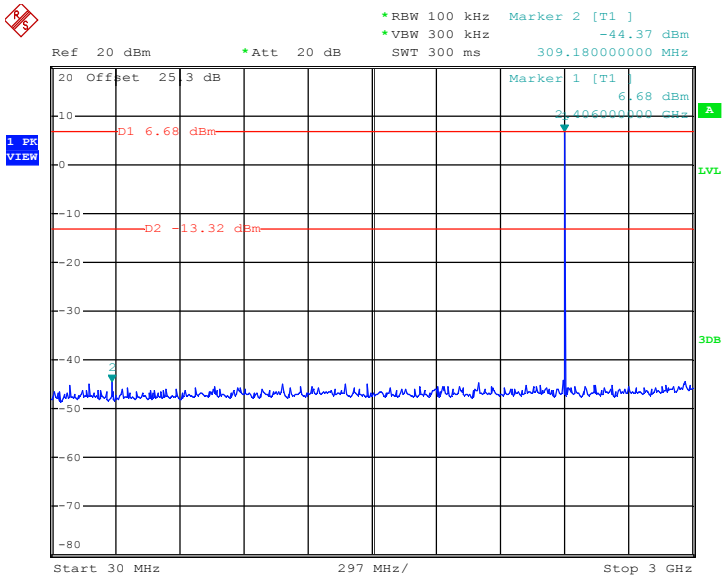
CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 4.JUN.2018 17:51:15

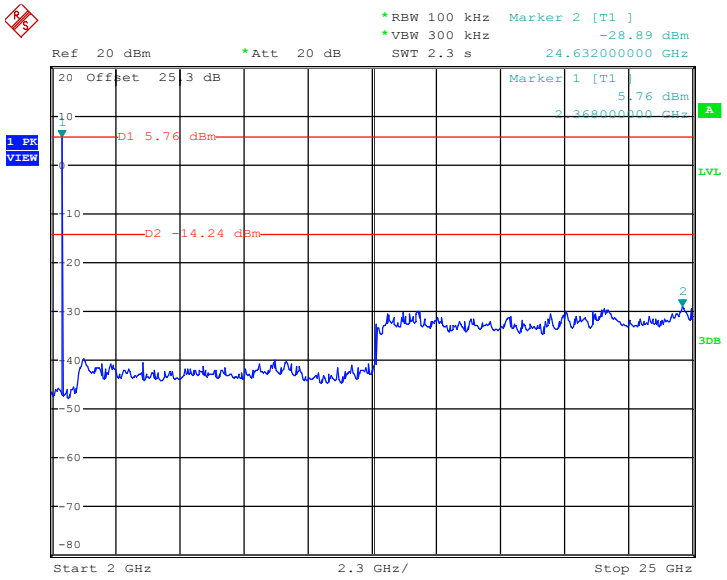
Test Mode :	2Mbps	Temperature :	21~25℃
Test Channel :	00	Relative Humidity :	51~54%
		Test Engineer :	Tommy Lee/Luffy Lin

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



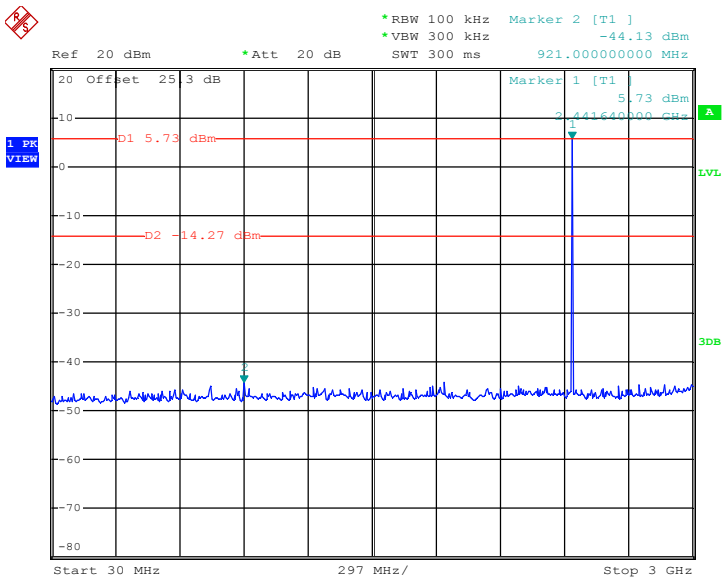
Date: 4.JUN.2018 19:08:55

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



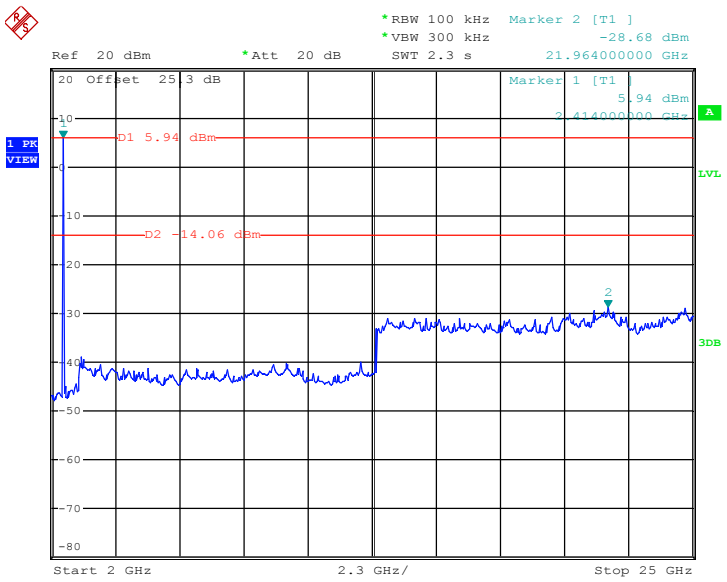
Date: 4.JUN.2018 19:09:25

CSE Plot on Ch 39 between 30MHz ~ 3 GHz



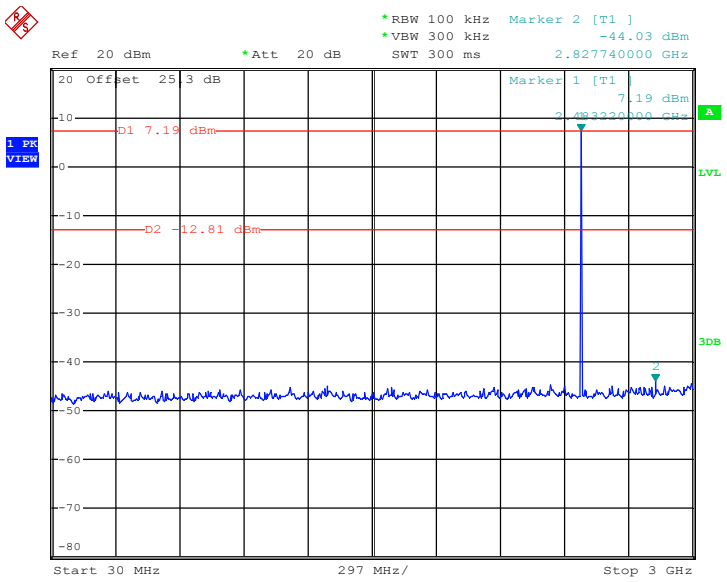
Date: 4.JUN.2018 19:13:25

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



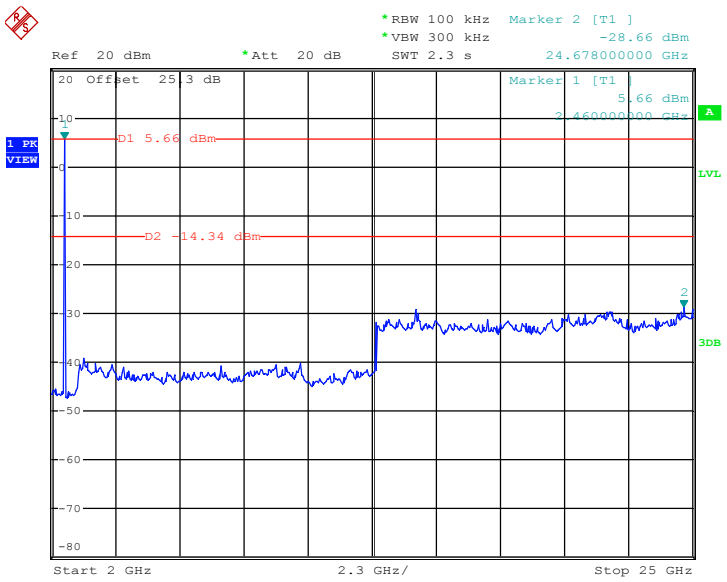
Date: 4.JUN.2018 19:13:55

CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 4.JUN.2018 19:17:36

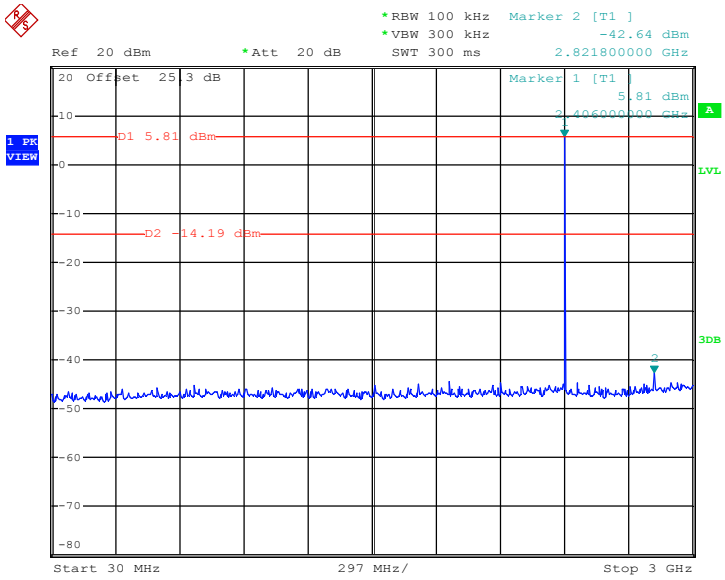
CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 4.JUN.2018 19:18:02

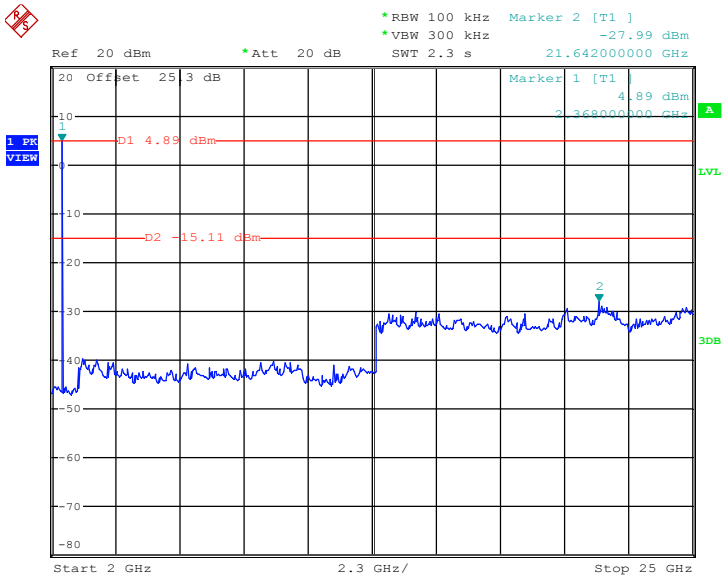
Test Mode :	3Mbps	Temperature :	21~25℃
Test Channel :	00	Relative Humidity :	51~54%
		Test Engineer :	Tommy Lee/Luffy Lin

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



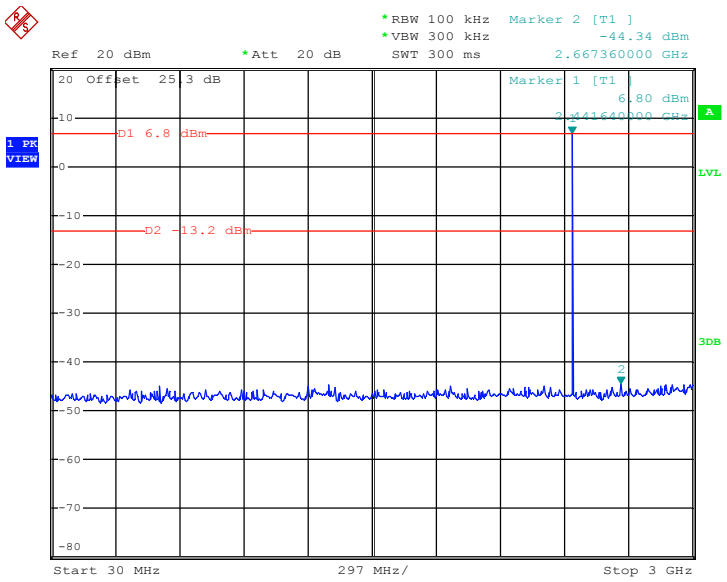
Date: 4.JUN.2018 19:33:38

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



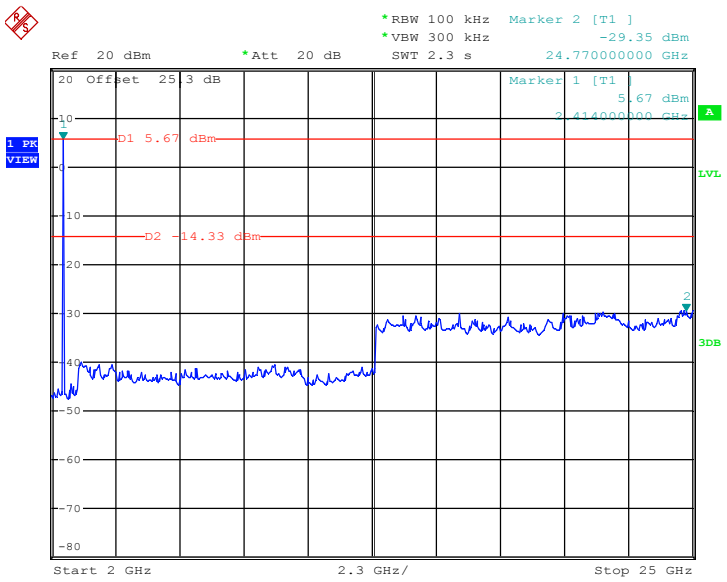
Date: 4.JUN.2018 19:34:52

CSE Plot on Ch 39 between 30MHz ~ 3 GHz



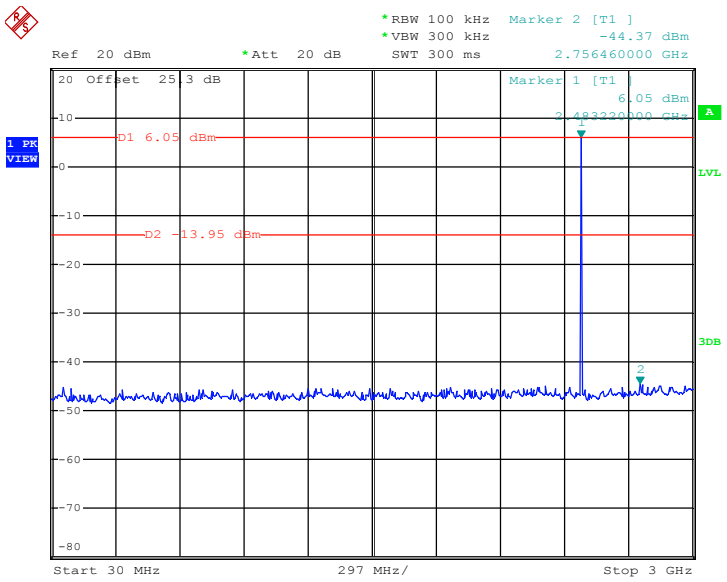
Date: 4.JUN.2018 19:39:23

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



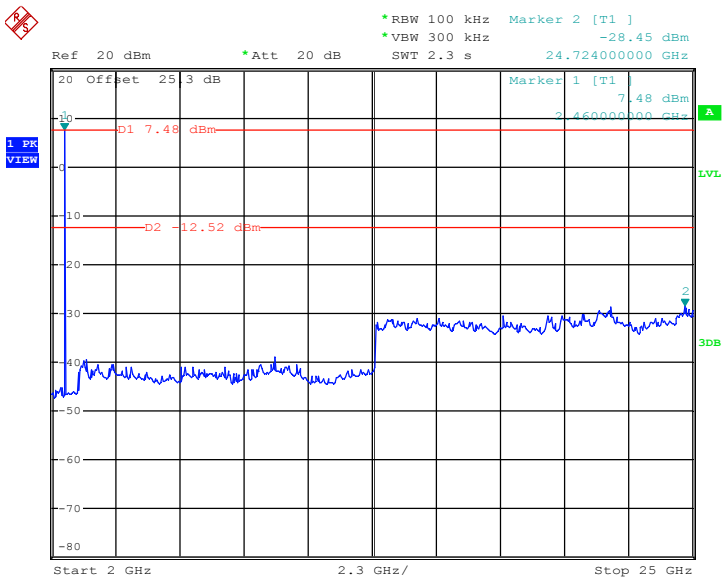
Date: 4.JUN.2018 19:39:50

CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 4.JUN.2018 19:44:39

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 4.JUN.2018 19:46:16

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 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

The measuring equipment is listed in the section 4 of this test report.

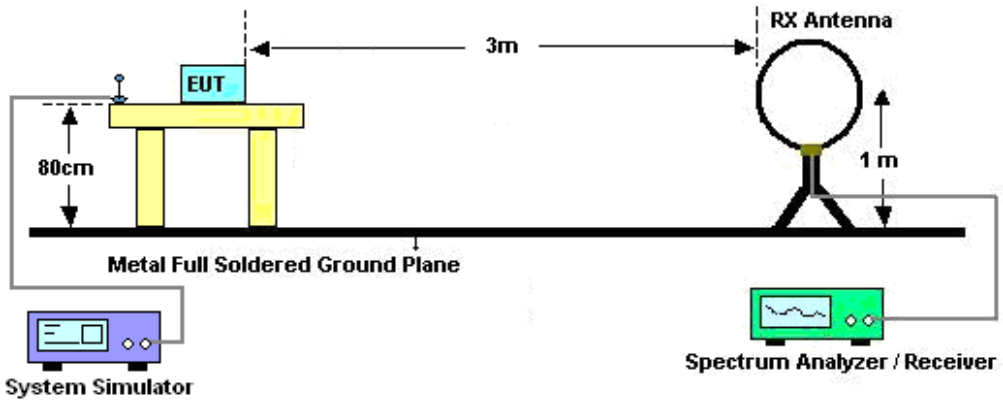
3.8.3 Test Procedures

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>1GHz ; VBW ≥ 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 = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   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(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.

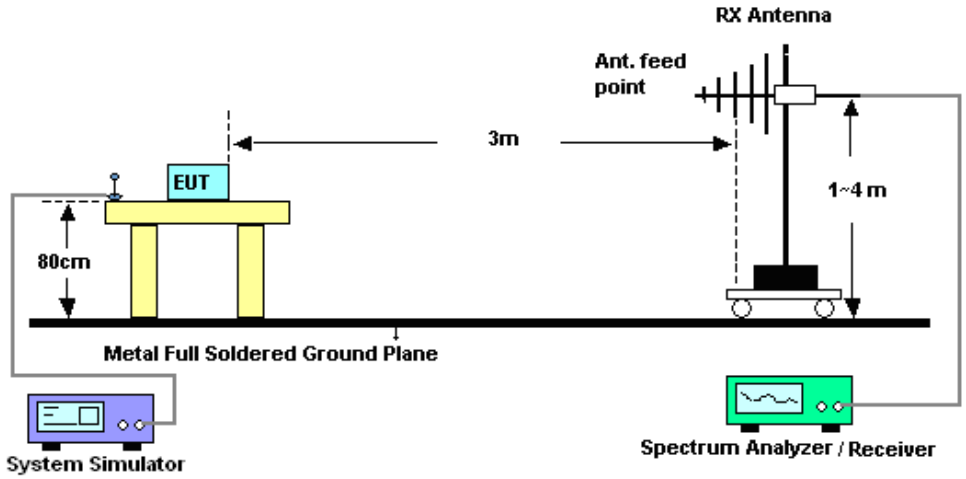
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

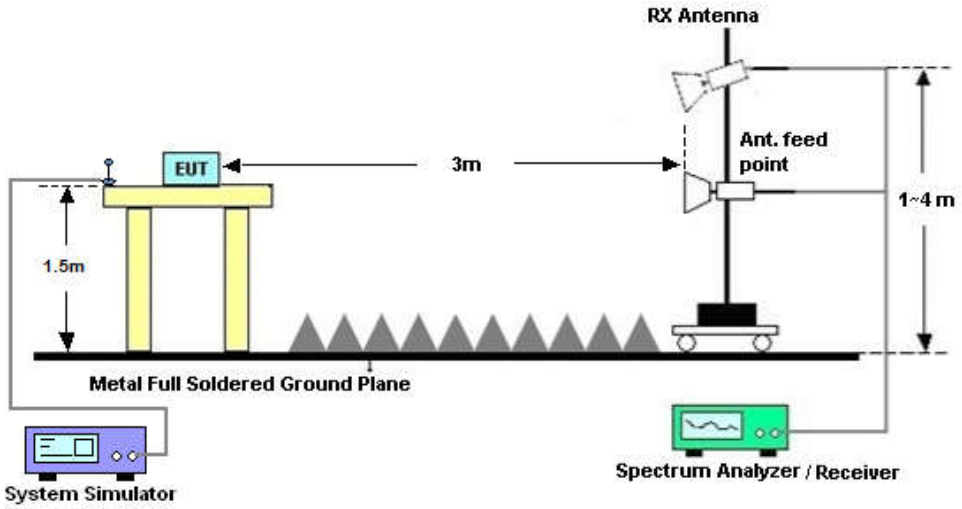
For radiated emissions below 30MHz



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 was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

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

Please refer to Appendix B.

3.8.8 Duty cycle correction factor for average measurement

Please refer to Appendix C.

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 (dBμV)	
	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.

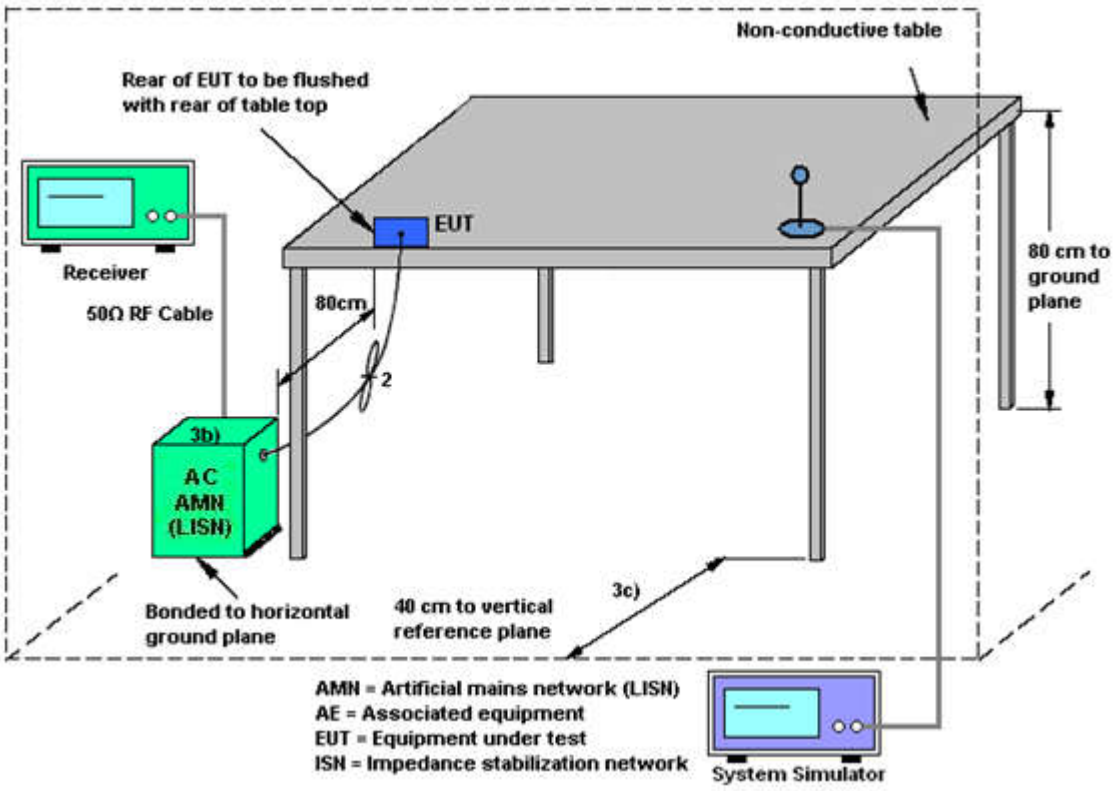
3.9.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 rule.

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-H1	34893241	N/A	Mar. 06, 2018	Jun. 04, 2018	Mar. 05, 2019	Conducted (TH05-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Dec. 20, 2017	Jun. 04, 2018	Dec. 19, 2018	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	50MHz~18GHz	Dec. 20, 2017	Jun. 04, 2018	Dec. 19, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	9kHz ~ 30GHz	Nov. 13, 2017	Jun. 04, 2018	Nov. 12, 2018	Conducted (TH05-HY)
BT Base Station (Measure)	Rohde & Schwarz	CBT	101136	BT 3.0	Sep. 20, 2017	Jun. 04, 2018	Sep. 19, 2018	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	NCR	May 14, 2018	NCR	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	3.6GHz	Dec. 08, 2017	May 14, 2018	Dec. 07, 2018	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Mar. 06, 2018	May 14, 2018	Mar. 05, 2019	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	May 14, 2018	Nov. 29, 2018	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 03, 2018	May 14, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 03, 2018	May 14, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Nov. 23, 2017	Jun. 05, 2018~ Jun. 06, 2018	Nov. 22, 2018	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D&N-6-06	35414&AT-N0602	30MHz~1GHz	Oct. 14, 2017	Jun. 05, 2018~ Jun. 06, 2018	Oct. 13, 2018	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz ~ 18GHz	Oct. 16, 2017	Jun. 05, 2018~ Jun. 06, 2018	Oct. 15, 2018	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 27, 2017	Jun. 05, 2018~ Jun. 06, 2018	Nov. 26, 2018	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Jan. 16, 2018	Jun. 04, 2018~ Jun. 06, 2018	Jan. 15, 2019	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55-303K	1710001800054002	1GHz~18GHz	Apr. 17, 2018	Jun. 04, 2018~ Jun. 06, 2018	Apr. 16, 2019	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Jan. 16, 2018	Jun. 04, 2018~ Jun. 06, 2018	Jan. 15, 2019	Radiation (03CH11-HY)
Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 18, 2017	Jun. 04, 2018~ Jun. 06, 2018	Jul. 17, 2018	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz ~ 44GHz	Oct. 19, 2017	Jun. 04, 2018~ Jun. 06, 2018	Oct. 18, 2018	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	NCR	Jun. 04, 2018~ Jun. 06, 2018	NCR	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	NCR	Jun. 04, 2018~ Jun. 06, 2018	NCR	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	NCR	Jun. 04, 2018~ Jun. 06, 2018	NCR	Radiation (03CH11-HY)

Hygrometer	TECPEL	DTN-303B	TP140325	N/A	Oct. 12, 2017	Jun. 04, 2018~ Jun. 06, 2018	Oct. 11, 2018	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4	9K-30M	Mar. 20, 2018	Jun. 04, 2018~ Jun. 06, 2018	Mar. 19, 2019	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4	30M-18G	Mar. 15, 2018	Jun. 04, 2018~ Jun. 06, 2018	Mar. 14, 2019	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2589/2	30M-18G	Mar. 15, 2018	Jun. 04, 2018~ Jun. 06, 2018	Mar. 14, 2019	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60SS	SN3	2.7G High Pass	Sep. 18, 2017	Jun. 04, 2018~ Jun. 06, 2018	Sep. 17, 2018	Radiation (03CH11-HY)
Filter	Wainwright	WLK4-1000-1530-8000-40SS	SN11	1G Low Pass	Sep. 18, 2017	Jun. 04, 2018~ Jun. 06, 2018	Sep. 17, 2018	Radiation (03CH11-HY)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.7dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.5dB**

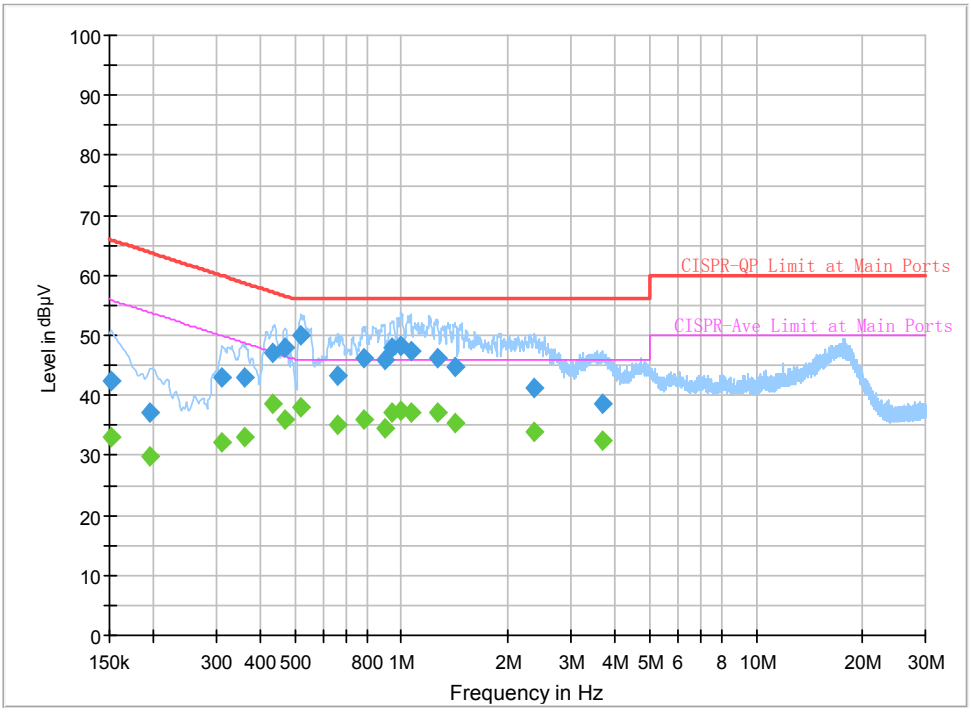
Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2dB**

Appendix A. AC Conducted Emission Test Results

Test Engineer :	Arthur Hsieh	**Temperature :**	21~25℃
		Relative Humidity :	51~55%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line

Full Spectrum

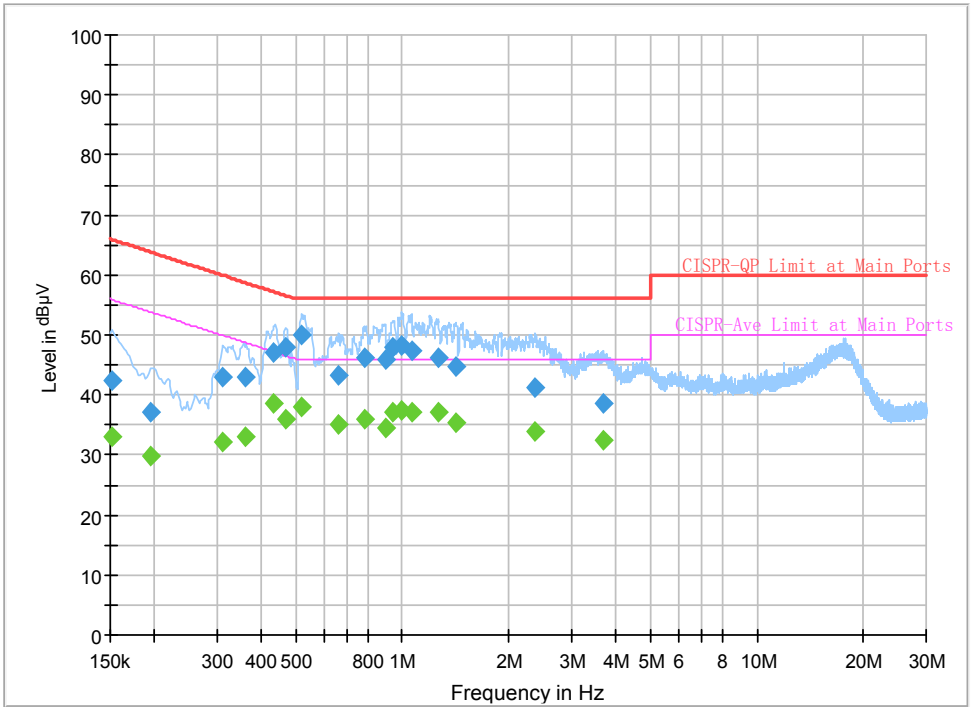


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	33.18	55.88	22.70	L1	OFF	19.5
0.152250	42.35	---	65.88	23.53	L1	OFF	19.5
0.195000	---	29.86	53.82	23.96	L1	OFF	19.5
0.195000	37.18	---	63.82	26.64	L1	OFF	19.5
0.309750	---	32.16	49.98	17.82	L1	OFF	19.5
0.309750	42.98	---	59.98	17.00	L1	OFF	19.5
0.361500	---	33.15	48.69	15.54	L1	OFF	19.5
0.361500	43.05	---	58.69	15.64	L1	OFF	19.5
0.431250	---	38.62	47.23	8.61	L1	OFF	19.5
0.431250	46.99	---	57.23	10.24	L1	OFF	19.5
0.467250	---	35.93	46.56	10.63	L1	OFF	19.5
0.467250	47.94	---	56.56	8.62	L1	OFF	19.5
0.521250	---	37.94	46.00	8.06	L1	OFF	19.5
0.521250	49.99	---	56.00	6.01	L1	OFF	19.5
0.663000	---	35.00	46.00	11.00	L1	OFF	19.5
0.663000	43.28	---	56.00	12.72	L1	OFF	19.5
0.784500	---	35.91	46.00	10.09	L1	OFF	19.5
0.784500	46.25	---	56.00	9.75	L1	OFF	19.5

Test Engineer :	Arthur Hsieh	**Temperature :**	21~25℃
		Relative Humidity :	51~55%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line

Full Spectrum

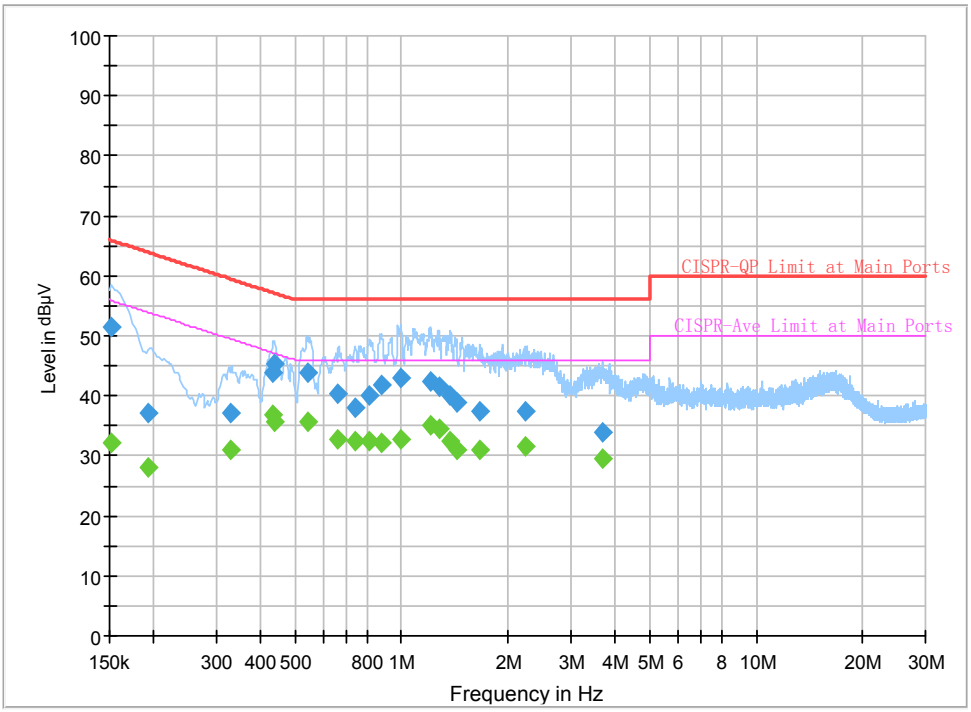


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.892500	---	34.41	46.00	11.59	L1	OFF	19.5
0.892500	45.77	---	56.00	10.23	L1	OFF	19.5
0.937500	---	37.16	46.00	8.84	L1	OFF	19.5
0.937500	48.04	---	56.00	7.96	L1	OFF	19.5
0.993750	---	37.36	46.00	8.64	L1	OFF	19.5
0.993750	48.37	---	56.00	7.63	L1	OFF	19.5
1.059000	---	37.16	46.00	8.84	L1	OFF	19.5
1.059000	47.49	---	56.00	8.51	L1	OFF	19.5
1.257000	---	37.11	46.00	8.89	L1	OFF	19.6
1.257000	46.05	---	56.00	9.95	L1	OFF	19.6
1.423500	---	35.34	46.00	10.66	L1	OFF	19.6
1.423500	44.85	---	56.00	11.15	L1	OFF	19.6
2.375250	---	33.93	46.00	12.07	L1	OFF	19.5
2.375250	41.35	---	56.00	14.65	L1	OFF	19.5
3.669000	---	32.37	46.00	13.63	L1	OFF	19.6
3.669000	38.51	---	56.00	17.49	L1	OFF	19.6

Test Engineer :	Arthur Hsieh	**Temperature :**	21~25℃
		Relative Humidity :	51~55%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral

Full Spectrum

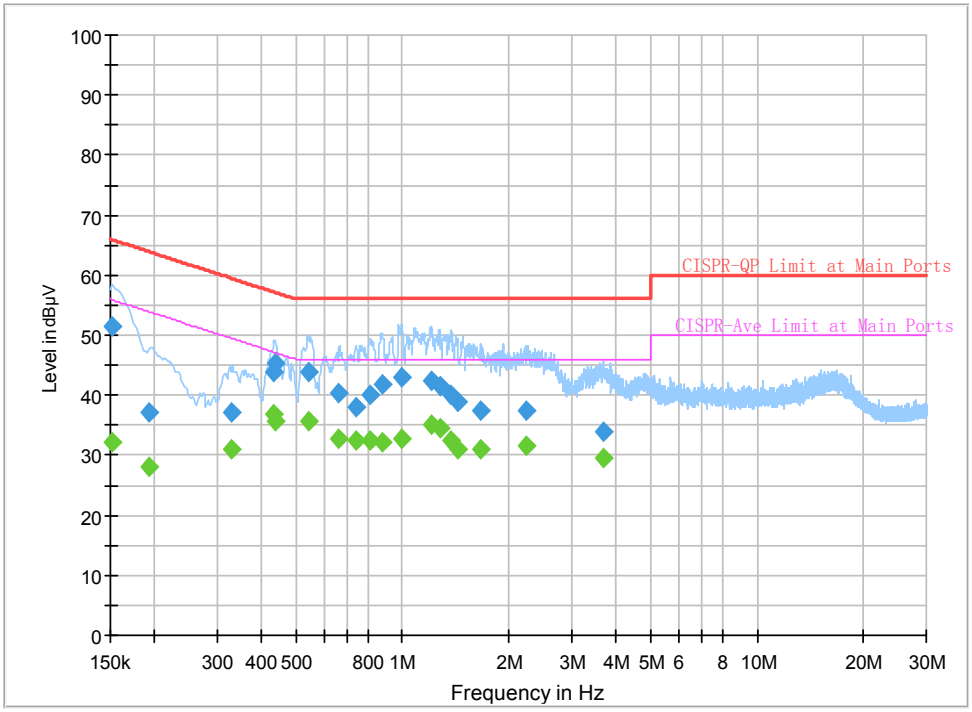


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	32.24	55.88	23.64	N	OFF	19.5
0.152250	51.36	---	65.88	14.52	N	OFF	19.5
0.192750	---	28.17	53.92	25.75	N	OFF	19.5
0.192750	37.24	---	63.92	26.68	N	OFF	19.5
0.330000	---	31.11	49.45	18.34	N	OFF	19.5
0.330000	37.08	---	59.45	22.37	N	OFF	19.5
0.431250	---	36.83	47.23	10.40	N	OFF	19.5
0.431250	43.77	---	57.23	13.46	N	OFF	19.5
0.438000	---	35.78	47.10	11.32	N	OFF	19.5
0.438000	45.30	---	57.10	11.80	N	OFF	19.5
0.541500	---	35.79	46.00	10.21	N	OFF	19.5
0.541500	43.81	---	56.00	12.19	N	OFF	19.5
0.660750	---	32.89	46.00	13.11	N	OFF	19.5
0.660750	40.29	---	56.00	15.71	N	OFF	19.5
0.737250	---	32.53	46.00	13.47	N	OFF	19.5
0.737250	38.01	---	56.00	17.99	N	OFF	19.5

Test Engineer :	Arthur Hsieh	Temperature :	21~25℃
		Relative Humidity :	51~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.811500	---	32.58	46.00	13.42	N	OFF	19.5
0.811500	39.91	---	56.00	16.09	N	OFF	19.5
0.879000	---	32.15	46.00	13.85	N	OFF	19.5
0.879000	41.84	---	56.00	14.16	N	OFF	19.5
0.991500	---	32.80	46.00	13.20	N	OFF	19.5
0.991500	42.90	---	56.00	13.10	N	OFF	19.5
1.200750	---	35.21	46.00	10.79	N	OFF	19.5
1.200750	42.35	---	56.00	13.65	N	OFF	19.5
1.270500	---	34.46	46.00	11.54	N	OFF	19.5
1.270500	41.52	---	56.00	14.48	N	OFF	19.5
1.374000	---	32.52	46.00	13.48	N	OFF	19.5
1.374000	39.96	---	56.00	16.04	N	OFF	19.5
1.434750	---	30.93	46.00	15.07	N	OFF	19.5
1.434750	38.99	---	56.00	17.01	N	OFF	19.5
1.657500	---	31.04	46.00	14.96	N	OFF	19.6
1.657500	37.42	---	56.00	18.58	N	OFF	19.6
2.222250	---	31.47	46.00	14.53	N	OFF	19.4
2.222250	37.39	---	56.00	18.61	N	OFF	19.4
3.689250	---	29.46	46.00	16.54	N	OFF	19.6
3.689250	33.97	---	56.00	22.03	N	OFF	19.6

Appendix B. Radiated Spurious Emission

Test Engineer :	Hao Chuan	**Temperature :**	21~26°C
		Relative Humidity :	51~56%

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		2355.255	42.02	-31.98	74	42.29	27.04	6.29	33.6	100	123	P	H
		2355.255	17.23	-36.77	54	-	-	-	-	-	-	A	H
	*	2402	105.21	-	-	105.31	27.13	6.36	33.59	100	123	P	H
	*	2402	80.42	-	-	-	-	-	-	-	-	A	H
		2388.96	43.2	-30.8	74	43.31	27.13	6.36	33.6	362	85	P	V
		2388.96	18.41	-35.59	54	-	-	-	-	-	-	A	V
	*	2402	102.44	-	-	102.54	27.13	6.36	33.59	362	85	P	V
	*	2402	77.65	-	-	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		2379.16	41.99	-32.01	74	42.21	27.09	6.29	33.6	100	119	P	H
		2379.16	17.2	-36.8	54	-	-	-	-	-	-	A	H
	*	2441	104.92	-	-	104.85	27.27	6.38	33.58	100	119	P	H
	*	2441	80.13	-	-	-	-	-	-	-	-	A	H
		2489.57	42.37	-31.63	74	42.16	27.4	6.39	33.58	100	119	P	H
		2489.57	17.58	-36.42	54	-	-	-	-	-	-	A	H
		2351.16	41.25	-32.75	74	41.63	27	6.22	33.6	393	83	P	V
		2351.16	16.46	-37.54	54	-	-	-	-	-	-	A	V
	*	2441	101.83	-	-	101.76	27.27	6.38	33.58	393	83	P	V
	*	2441	77.04	-	-	-	-	-	-	-	-	A	V
		2498.11	41.8	-32.2	74	41.58	27.4	6.39	33.57	393	83	P	V
		2498.11	17.01	-36.99	54	-	-	-	-	-	-	A	V

BT CH 78 2480MHz	*	2480	103.47	-	-	103.31	27.36	6.38	33.58	107	138	P	H
	*	2480	78.68	-	-	-	-	-	-	-	-	A	H
		2486.16	43.55	-30.45	74	43.38	27.36	6.39	33.58	107	138	P	H
		2486.16	18.76	-35.24	54	-	-	-	-	-	-	A	H
	*	2480	100.48	-	-	100.32	27.36	6.38	33.58	380	83	P	V
	*	2480	75.69	-	-	-	-	-	-	-	-	A	V
		2495.16	42.6	-31.4	74	42.38	27.4	6.39	33.57	380	83	P	V
		2495.16	17.81	-36.19	54	-	-	-	-	-	-	A	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	39.57	-34.43	74	54.86	31.26	10.03	56.58	100	0	P	H
		4804	14.78	-39.22	54	-	-	-	-	-	-	A	H
		4804	40.27	-33.73	74	55.56	31.26	10.03	56.58	100	0	P	V
		4804	15.48	-38.52	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	39.8	-34.2	74	54.98	31.38	9.99	56.55	100	0	P	H
		4882	15.01	-38.99	54	-	-	-	-	-	-	A	H
		7323	42.37	-31.63	74	50.51	36.32	11.75	56.21	100	0	P	H
		7323	17.58	-36.42	54	-	-	-	-	-	-	A	H
		4882	38.8	-35.2	74	53.98	31.38	9.99	56.55	100	0	P	V
		4882	14.01	-39.99	54	-	-	-	-	-	-	A	V
		7323	42.07	-31.93	74	50.21	36.32	11.75	56.21	100	0	P	V
		7323	17.28	-36.72	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	39.6	-34.4	74	54.6	31.54	9.97	56.51	100	0	P	H
		4960	14.81	-39.19	54	-	-	-	-	-	-	A	H
		7440	42.35	-31.65	74	50.1	36.59	11.72	56.06	100	0	P	H
		7440	17.56	-36.44	54	-	-	-	-	-	-	A	H
		4960	39.32	-34.68	74	54.32	31.54	9.97	56.51	100	0	P	V
		4960	14.53	-39.47	54	-	-	-	-	-	-	A	V
		7440	42.39	-31.61	74	50.14	36.59	11.72	56.06	100	0	P	V
		7440	17.6	-36.4	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)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		40.8	24.03	-15.97	40	37.01	18.68	0.83	32.49	-	-	P	H
		167.43	23.53	-19.97	43.5	38.71	15.53	1.71	32.42	-	-	P	H
		265.17	20.41	-25.59	46	31.1	19.52	2.17	32.38	-	-	P	H
		491.8	25.19	-20.81	46	31.09	23.59	2.89	32.38	-	-	P	H
		644.4	27.85	-18.15	46	30.68	26.32	3.31	32.46	-	-	P	H
		955.9	33.26	-12.74	46	29.41	30.92	4.07	31.14	100	0	P	H
		45.66	36.69	-3.31	40	52.02	16.14	1.02	32.49	100	0	P	V
		63.48	27.55	-12.45	40	47.32	11.69	1.03	32.49	-	-	P	V
		150.96	30.81	-12.69	43.5	44.76	16.79	1.69	32.43	-	-	P	V
		493.2	24.5	-21.5	46	30.37	23.62	2.89	32.38	-	-	P	V
		699	27.78	-18.22	46	30.37	26.4	3.48	32.47	-	-	P	V
		884.5	31.79	-14.21	46	30.56	29.08	3.89	31.74	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

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	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

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

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(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)

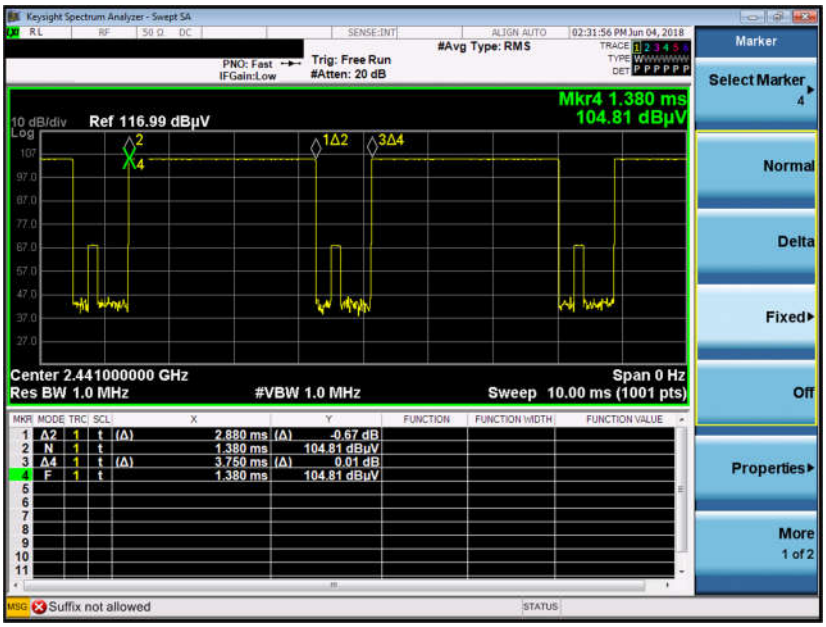
= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

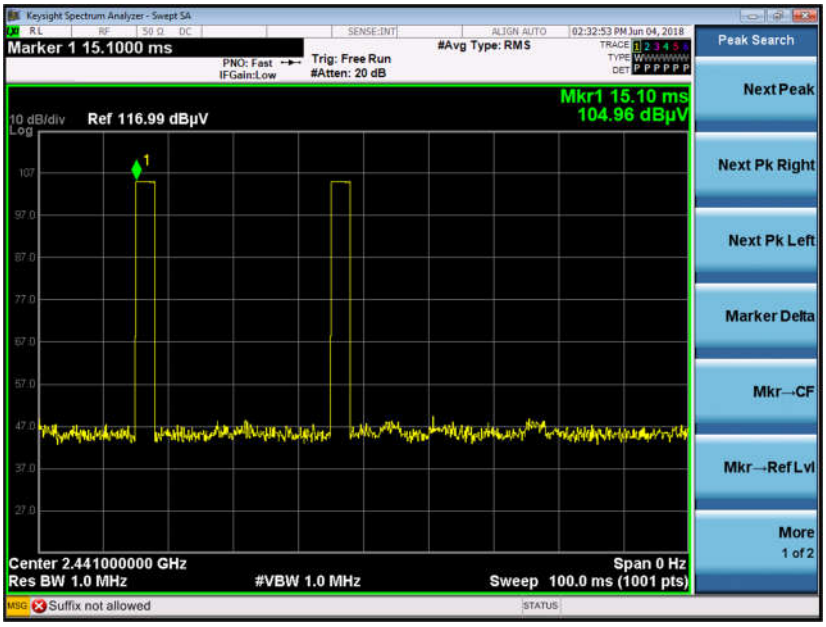
Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix C. Duty Cycle Plots

DH5 on time (One Pulse) Plot on Channel 39



DH5 on time (Count Pulses) Plot on Channel 39



Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.88 / 100 = 5.76 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.79 dB
3. DH5 has the highest duty cycle worst case and is reported.