
FCC Test Report

Report No.: AGC00957190101FE04

FCC ID : 2ALNV-HUB30

APPLICATION PURPOSE : Original Equipment

PRODUCT DESIGNATION : HUB

BRAND NAME : PROSPACE

MODEL NAME : HUB 3.0

CLIENT : PROSPACE PTE. LTD.

DATE OF ISSUE : Mar. 04, 2019

STANDARD(S) : FCC Part 15.247

TEST PROCEDURE(S) : KDB 558074 D01 DTS Meas Guidance v04

REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

CAUTION:

This report shall not be reproduced except in full without the written permission of the test laboratory and shall not be quoted out of context.



Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Mar. 04, 2019	Valid	Initial Release

TABLE OF CONTENTS

1. GENERAL INFORMATION	6
1.1. PRODUCT DESCRIPTION	6
1.2. TABLE OF CARRIER FREQUENCIES	6
1.3. IEEE 802.11N MODULATION SCHEME	7
1.4. RELATED SUBMITTAL(S) / GRANT (S)	7
1.5. TEST METHODOLOGY	8
1.6. SPECIAL ACCESSORIES	8
1.7. EQUIPMENT MODIFICATIONS	8
2. MEASUREMENT UNCERTAINTY	9
3. DESCRIPTION OF TEST MODES.....	10
4 SYSTEM TEST CONFIGURATION	11
4.1. CONFIGURATION OF EUT SYSTEM	11
4.2. EQUIPMENT USED IN EUT SYSTEM.....	11
4.3. SUMMARY OF TEST RESULTS.....	11
5. TEST FACILITY	12
6. OUTPUT POWER	12
6.1. MEASUREMENT PROCEDURE	13
6.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	13
6.3. LIMITS AND MEASUREMENT RESULT	14
7. 6DB BANDWIDTH	16
7.1. MEASUREMENT PROCEDURE	16
7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	16
7.3. LIMITS AND MEASUREMENT RESULTS	17
9. CONDUCTED SPURIOUS EMISSION	20
9.1. MEASUREMENT PROCEDURE	20
9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	20
9.3. MEASUREMENT EQUIPMENT USED	20
9.4. LIMITS AND MEASUREMENT RESULT	21
10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY	28
10.1 MEASUREMENT PROCEDURE	28
10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	28
10.3 MEASUREMENT EQUIPMENT USED	28
10.4 LIMITS AND MEASUREMENT RESULT	29
11. RADIATED EMISSION.....	32
11.1. MEASUREMENT PROCEDURE	32

11.2. TEST SETUP	33
11.3. LIMITS AND MEASUREMENT RESULT	34
11.4. TEST RESULT	35
12. BAND EDGE EMISSION	38
12.1. MEASUREMENT PROCEDURE	38
12.2. TEST SET-UP.....	38
12.3. RADIATED TEST RESULT	39
12.4. CONDUCTED TEST RESULT	40
13. FCC LINE CONDUCTED EMISSION TEST	42
13.1. LIMITS OF LINE CONDUCTED EMISSION TEST.....	42
13.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST	42
13.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST	43
13.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST	44
13.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST	45
APPENDIX A: PHOTOGRAPHS OF TEST SETUP	47

1. VERIFICATION OF CONFORMITY

Applicant	PROSPACE PTE. LTD.
Address	Block 113, Bishan Street 12, #09-116, 570113 Singapore
Manufacturer	PROSPACE PTE. LTD.
Address	Block 113, Bishan Street 12, #09-116, 570113 Singapore
Factory	NEWWAH TECHNOLOGY PTE. LTD.
Address	21 WOODLANDS CLOSE, #07-38, PRIMZ BIZHUB, SINGAPORE 737854
Product Designation	HUB
Brand Name	PROSPACE
Test Model	HUB 3.0
Date of test	Feb. 27, 2019~Mar. 04, 2019
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-US-BGN/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance(Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with requirement of FCC Part 15 Rules requirement.

The test results of this report relate only to the tested sample identified in this report.

Tested By

Jeast

Jeast Zhan(Zhan jiangdong)

Mar. 04, 2019

Reviewed By

Bart Xie

Bart Xie(Xie Xiaobin)

Mar. 04, 2019

Approved By

Forrest Lei

Forrest Lei(Lei Yonggang)
Authorized Officer

Mar. 04, 2019

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as "HUB ". It is designed by way of utilizing the DSSS and OFDM technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.412 GHz~2.462GHz
Output Power	IEEE 802.11b: 17.61 dBm, IEEE 802.11g: 17.46 dBm; IEEE 802.11n(20): 17.32 dBm, IEEE 802.11n(40): 14.59 dBm
Modulation	DSSS(DBPSK/DQPSK/CCK);OFDM(BPSK/QPSK/16-QAM/64-QAM)
Number of channels	11 Channels (IEEE802.11b/g/n20)& 7 Channels (IEEE802.11n40)
Hardware Version	V1.0
Software Version	V1.0
Antenna Designation	PCB Antenna
Antenna Gain	2.0dBi
Power Supply	DC 5V by Built-in Li-ion Battery

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2400~2483.5MHZ	1	2412 MHZ
	2	2417 MHZ
	3	2422 MHZ
	4	2427 MHZ
	5	2432 MHZ
	6	2437 MHZ
	7	2442 MHZ
	8	2447 MHZ
	9	2452 MHZ
	10	2457 MHZ
	11	2462 MHZ

Note: For 20MHZ bandwidth system use Channel 1 to Channel 11

For 802.11n 40MHZ bandwidth system use Channel 3 to Channel 9.

2.3. IEEE 802.11N MODULATION SCHEME

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Data rate(Mbps)	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0
6	1	64-QAM	3/4	6	312	648	234	489	58.5	121.5
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	Guard interval

2.4. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for FCC ID: 2ALNV-HUB30 filing to comply with the FCC Part 15 requirements.

2.5. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters. Others testing (listed at item 5.3) was performed according to the procedures in FCC Part 15.247 rules KDB 558074 D01 DTS Meas Guidance v05.

2.6. SPECIAL ACCESSORIES

Refer to section 5.2.

2.7. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

3. MEASUREMENT UNCERTAINTY

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance 0.15~30MHz	±3.20dB	(1)

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX
2	Middle channel TX
3	High channel TX
4	Normal operating

Note:
Transmit by 802.11b with Date rate (1/2/5.5/11)
Transmit by 802.11g with Date rate (6/9/12/18/24/36/48/54)
Transmit by 802.11n (20MHz) with Date rate (6.5/13/19.5/26/39/52/58.5/65)
Transmit by 802.11n (40MHz) with Date rate (13.5/27/40.5/54/81/108/121.5/135)

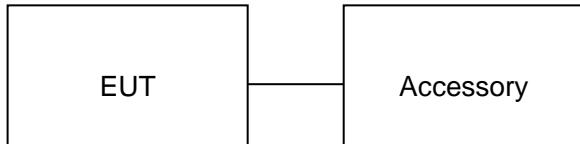
Note:

1. The EUT has been set to operate continuously on the lowest, middle and highest operation frequency individually, and the eut is operating at its maximum duty cycle>or equal 98%
2. All modes under which configure applicable have been tested and the worst mode test data recording in the test report, if no other mode data.
3. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

5 SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configure:



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	HUB	HUB 3.0	2ALNV-HUB30	EUT
2	Antenna	N/A	N/A	Accessory

Note: All the accessories have been used during the test in conduction emission test.

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247	Output Power	Compliant
§15.247	6 dB Bandwidth	Compliant
§15.247	Conducted Spurious Emission	Compliant
§15.247	Maximum Conducted Output Power SPECTRAL Density	Compliant
§15.209	Radiated Emission	Compliant
§15.247	Band Edges	Compliant
§15.207	Line Conduction Emission	Compliant

6. TEST FACILITY

Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

ALL TEST EQUIPMENT LIST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Jun.18, 2018	Jun.17, 2019
LISN	R&S	ESH2-Z5	100086	Aug.19, 2018	Aug.18, 2019
TEST RECEIVER	R&S	ESCI	10096	Jun.18, 2018	Jun.17, 2019
EXA Signal Analyzer	Agilent	N9010A	MY53470504	Dec.06, 2018	Dec.05, 2019
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Mar. 01, 2018	Feb. 28, 2020
preamplifier	ChengYi	EMC184045SE	980508	Sep.20, 2018	Sep.19, 2019
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Mar. 01, 2018	Feb. 28, 2020
Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-205	Jun.18, 2018	Jun.17, 2019
ANTENNA	SCHWARZBECK	VULB9168	D69250	Mar. 01, 2018	Feb. 28, 2020
SIGNAL ANALYZER	Agilent	N9020A	MY52090123	Sep.20, 2018	Sep.19, 2019
USB Wideband Power Sensor	Agilent	U2021XA	MY54110007	Sep. 20, 2018	Sep. 19, 2019
LOOP ANTENNA	A.H	SAS-562B	/	Mar. 01, 2018	Feb. 28, 2020
Horn Ant (18G-40GHz)	Schwarzbeck	BBHA 9170	/	Mar.01,2018	Feb. 28, 2020
Horn Ant (18G-40GHz)	ETS	QWH_SL_18_40_K_SG	/	Mar.01,2018	Feb. 28, 2020

6. OUTPUT POWER

6.1. MEASUREMENT PROCEDURE

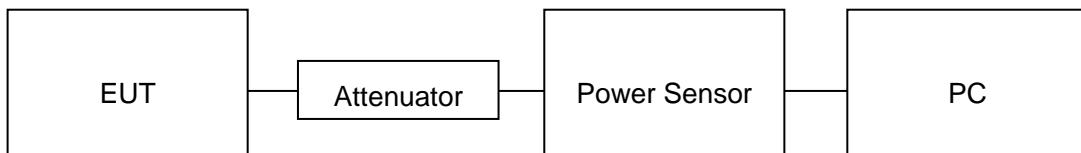
For max average conducted output power test:

1. Connect EUT RF output port to power probe through an RF attenuator.
2. Connect the power probe to the PC.
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Record the maximum power from the software.

Note : The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

6.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

AVERAGE POWER SETUP



6.3. LIMITS AND MEASUREMENT RESULT

TEST ITEM	OUTPUT POWER
TEST MODE	802.11b with data rate 1

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.412	17.32	30	Pass
2.437	17.47	30	Pass
2.462	17.61	30	Pass

TEST ITEM	OUTPUT POWER
TEST MODE	802.11g with data rate 6

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.412	17.00	30	Pass
2.437	17.46	30	Pass
2.462	17.21	30	Pass

TEST ITEM	OUTPUT POWER
TEST MODE	802.11n 20 with data rate 6.5

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.412	16.79	30	Pass
2.437	17.32	30	Pass
2.462	17.25	30	Pass

TEST ITEM	OUTPUT POWER
TEST MODE	802.11n 40 with data rate 13.5

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.422	14.57	30	Pass
2.437	14.53	30	Pass
2.452	14.59	30	Pass

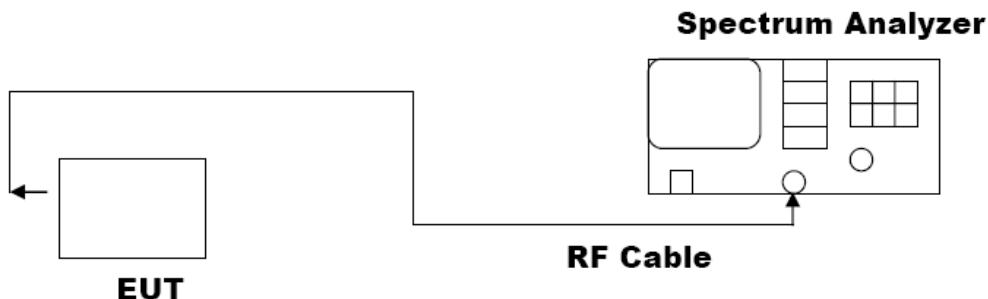
7. 6dB BANDWIDTH

7.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW \geqslant 3 \times RBW.
4. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

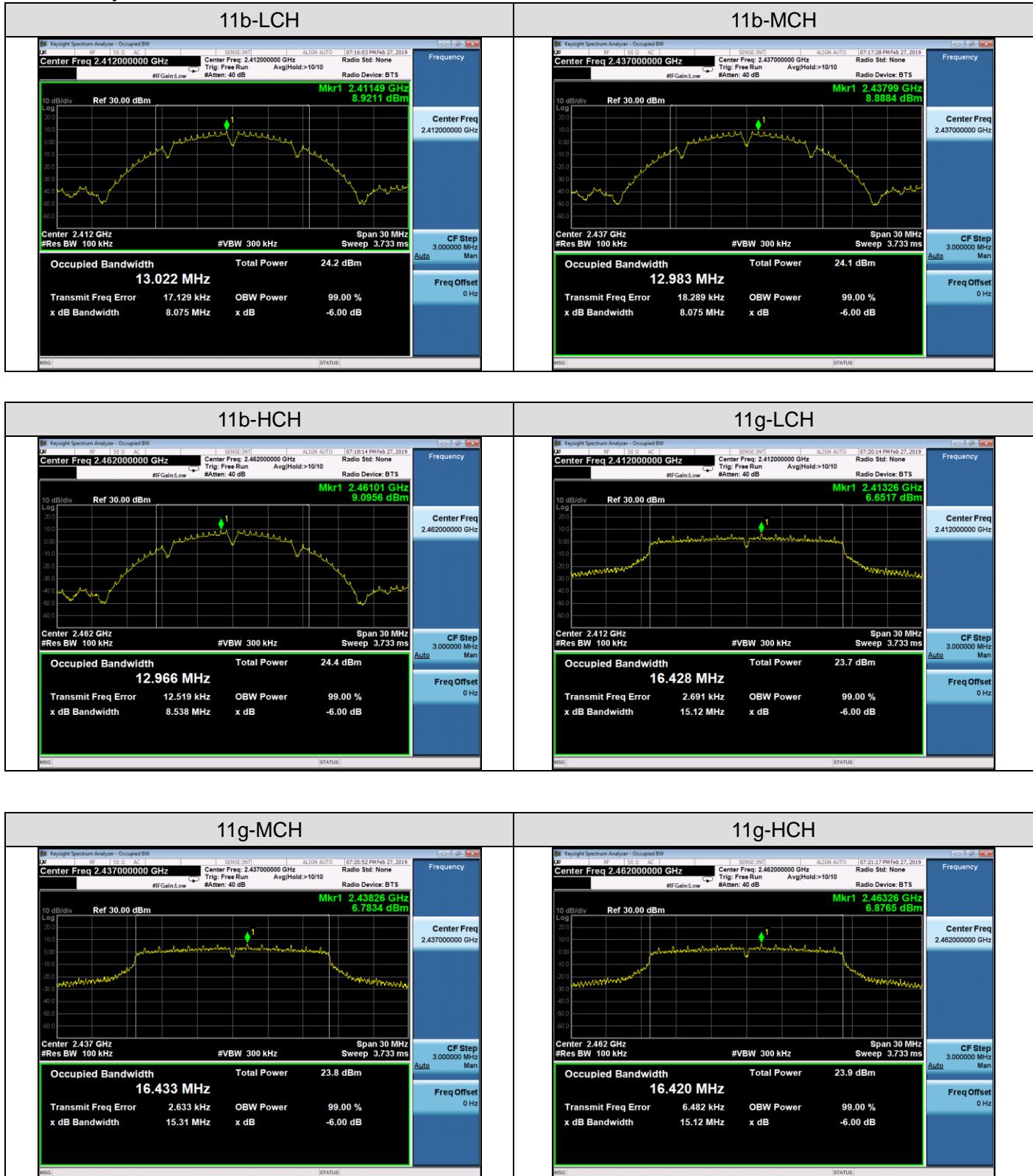
7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

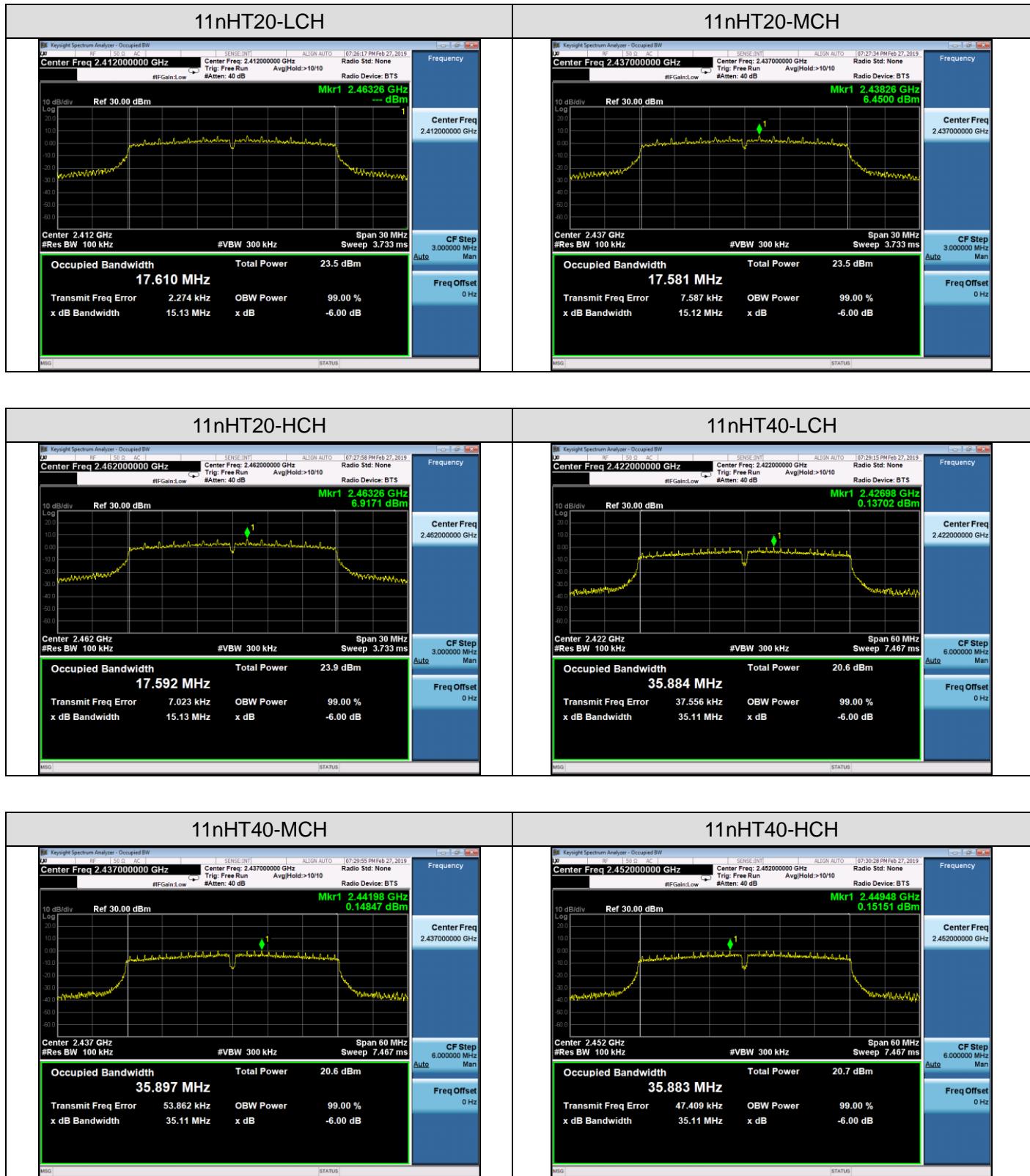


7.3. LIMITS AND MEASUREMENT RESULTS

Mode	Channel	6dB Bandwidth [MHz]	Verdict
11b	LCH	8.075	PASS
	MCH	8.075	PASS
	HCH	8.538	PASS
11g	LCH	15.12	PASS
	MCH	15.31	PASS
	HCH	15.12	PASS
11nHT20	LCH	15.13	PASS
	MCH	15.12	PASS
	HCH	15.13	PASS
11nHT40	LCH	35.11	PASS
	MCH	35.11	PASS
	HCH	35.11	PASS

Test Graph





9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

Owing to satisfy the requirements of the number of measurement points, we set the RBW=1MHz, VBW>RBW, scan up through 10th harmonic, and consider the tested results as the worst case, if the tested results conform to the requirement, we can deem that the real tested results(set the RBW=100KHz, VBW>RBW) are conform to the requirement.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2.

9.3. MEASUREMENT EQUIPMENT USED

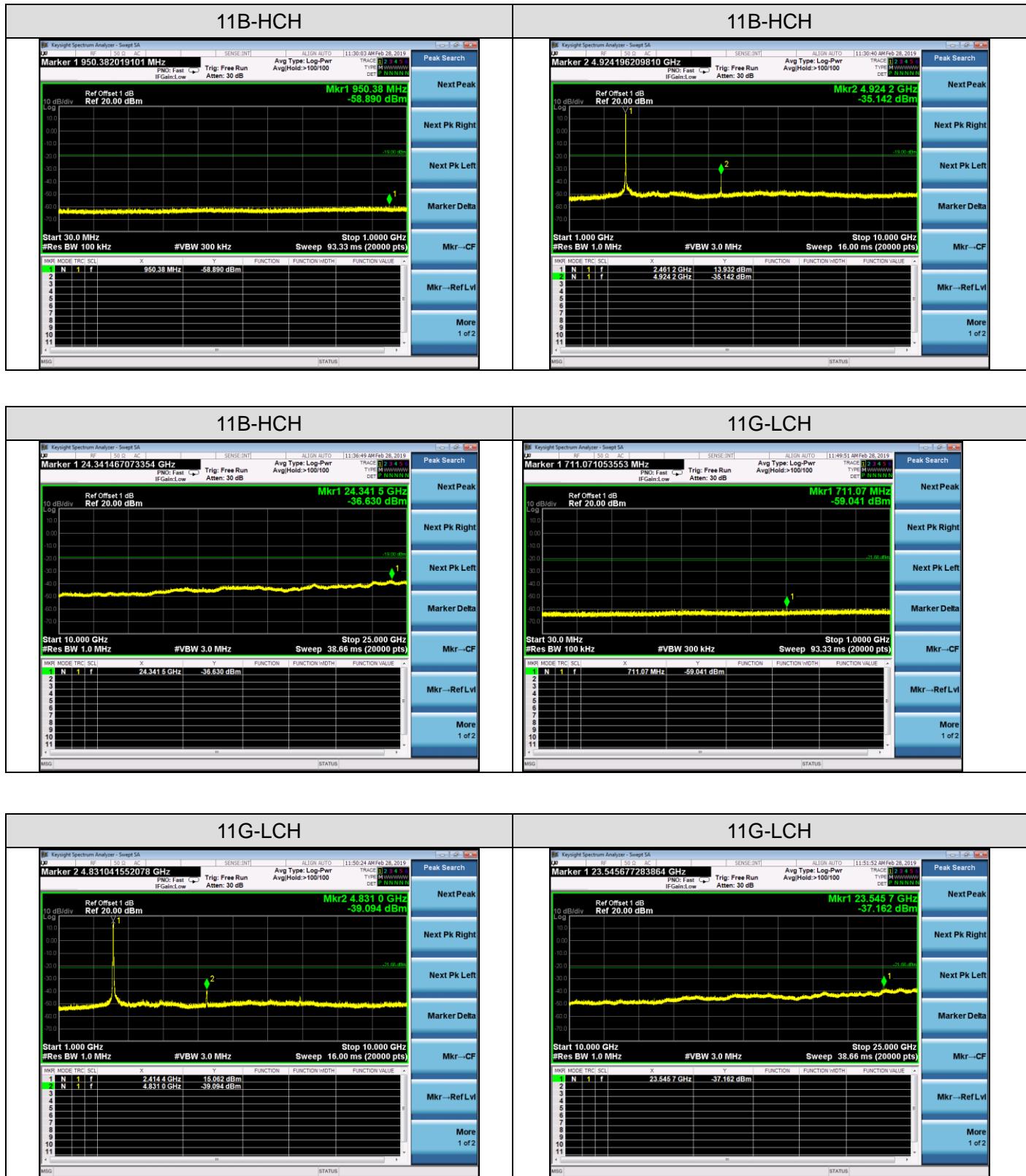
The same as described in section 6.

9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	Refer Test Graph	PASS

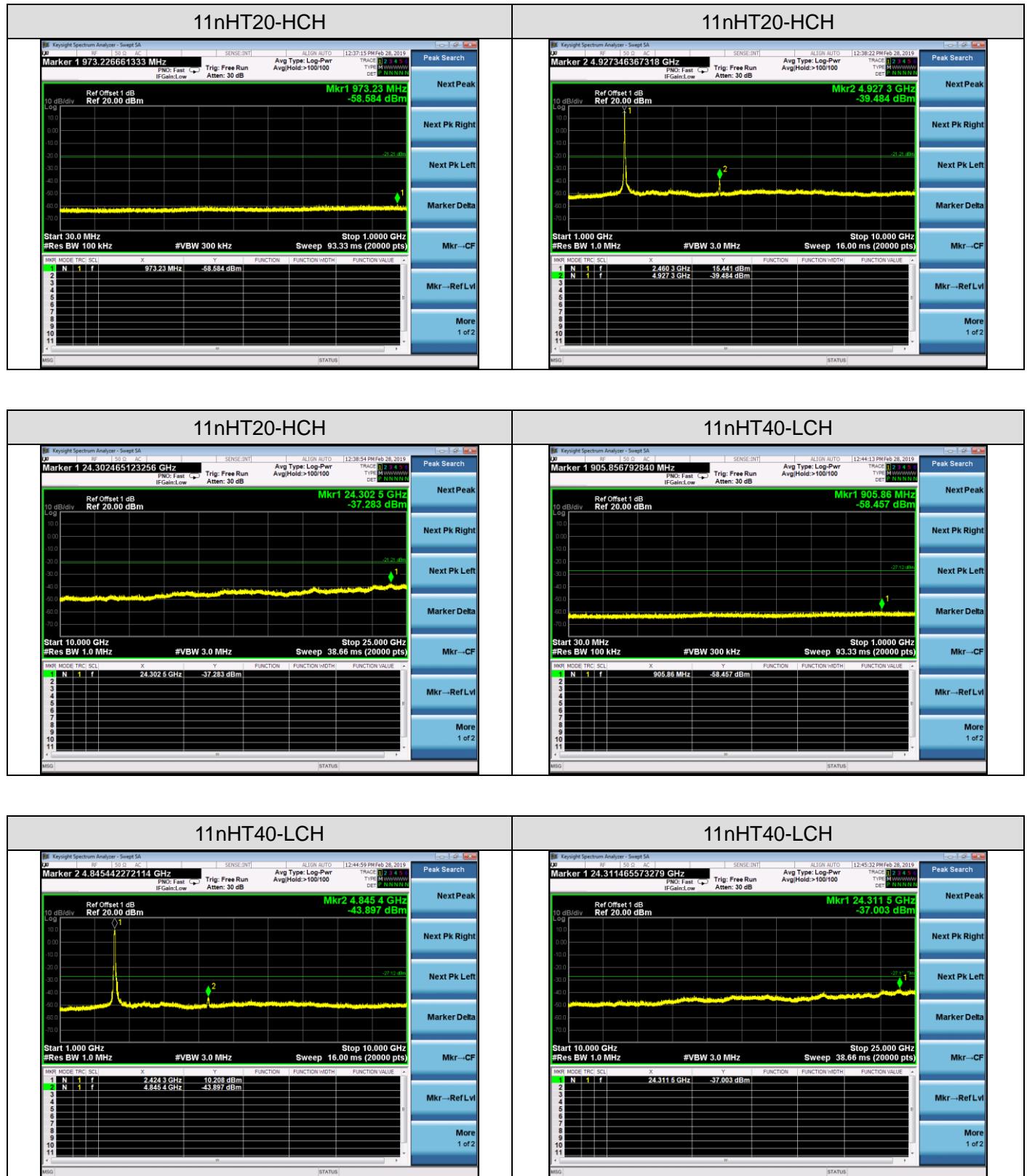
Test Graph

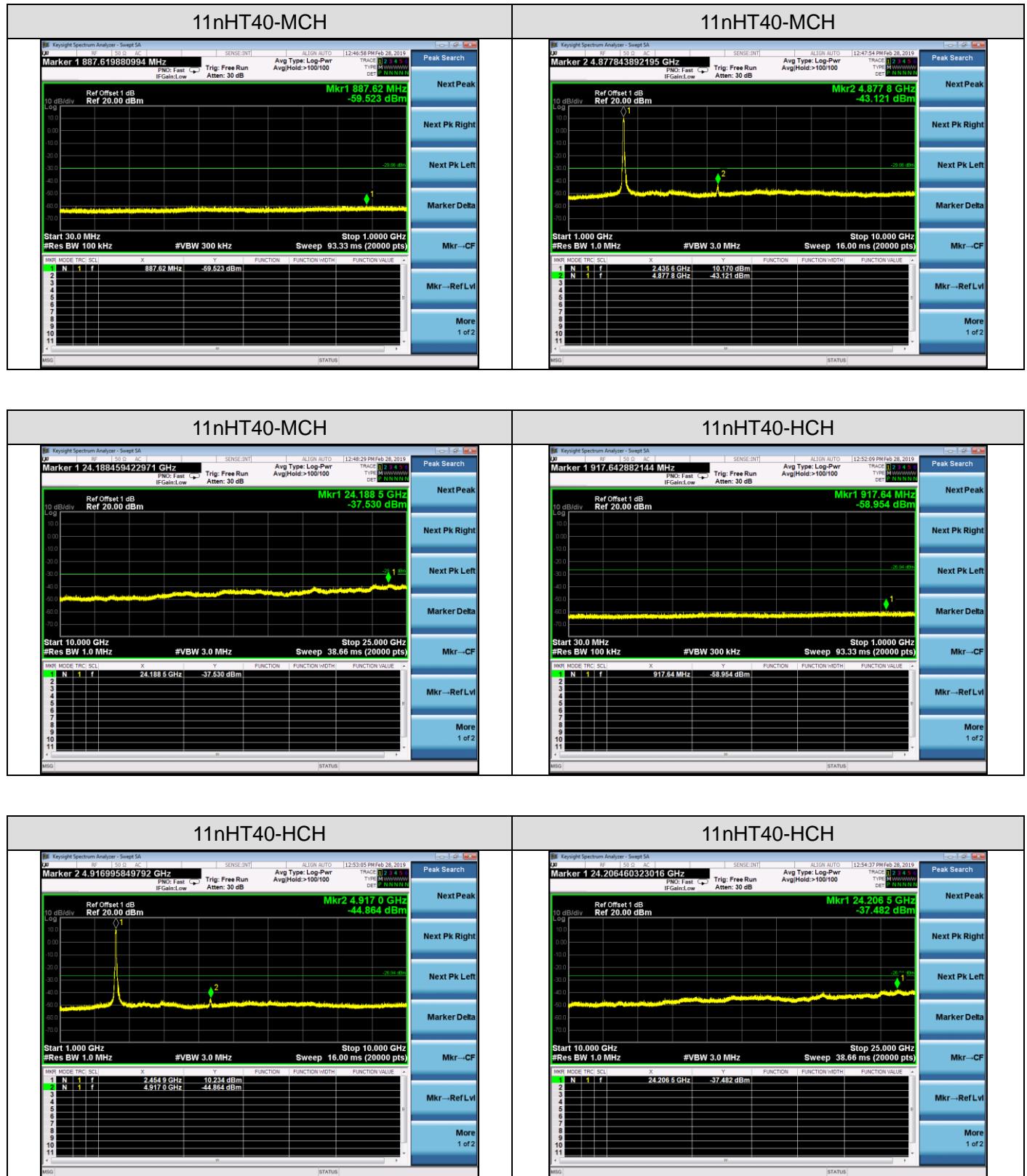












10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

10.1 MEASUREMENT PROCEDURE

- (1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (3). Set SPA Trace 1 Max hold, then View.

Note: The method of AVGPSD-1 in the ANSI C63.10 (2013) item 11.10 was used in this testing.

10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer To Section 8.2.

10.3 MEASUREMENT EQUIPMENT USED

Refer To Section 6.

10.4 LIMITS AND MEASUREMENT RESULT

Mode	Channel	PSD [dBm/20kHz]	Limit[dBm/3kHz]	Verdict
11b	LCH	4.269	8	PASS
	MCH	4.429	8	PASS
	HCH	3.550	8	PASS
11g	LCH	1.777	8	PASS
	MCH	2.014	8	PASS
	HCH	2.933	8	PASS
11nHT20	LCH	1.137	8	PASS
	MCH	1.212	8	PASS
	HCH	1.505	8	PASS
11NHT40	LCH	-1.392	8	PASS
	MCH	-0.990	8	PASS
	HCH	-1.204	8	PASS

Test Graph

