FCC RF Test Report

APPLICANT	:	**Honeywell International Inc**
EQUIPMENT	:	**99EX Mobile computer**
BRAND NAME	:	**Honeywell**
MODEL NAME	:	**99EX**
FCC ID	:	**HD599EXL00**
STANDARD	:	**FCC Part 15 Subpart E**
CLASSIFICATION	:	**Unlicensed National Information Infrastructure (UNII)**

The product was received on Sep. 28, 2011 and completely tested on Oct. 17, 2011. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown 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:

Jones Tsai

Jones Tsai / Manager

Testing Laboratory 1190

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

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR0D0904-17A	Rev. 01	Initial issue of report	Oct. 20, 2011
FR0D0904-17A	Rev. 02	Update report for revising Maximum Conducted Output Power Measurement	Oct. 24, 2011

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	A9.2	26dB Bandwidth	-	Pass	-
3.2	15.407(a)	A9.2	Maximum Conducted Output Power	≤ 17, 24, 30 dBm (depend on band)	Pass	-
3.3	15.407(a)	A9.2	Power Spectral Density	≤ 4, 11, 17 dBm (depend on band)	Pass	-
3.4	15.407(b)	A9.3	Frequency Band Edges	≤ -17, -27 dBm (depend on band)&15.209(a)	Pass	-
3.5	15.407(b)	A9.3	Spurious Emission	EIRP < -27 dBm/MHz	Pass	-
3.6	15.207	Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 17.2 dB at 0.334 MHz
3.7	15.407(b)	A9.3	Transmitter Radiated Emission	≤ -17, -27 dBm (depend on band)&15.209(a)	Pass	Under limit 6.27 dB at 5350 MHz
3.8	15.407(b)	A9.3	Peak Excursion Ratio	≤ 13dB	Pass	-
3.9	15.407(c)	A9.5	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.10	15.407(g)	A9.5	Frequency Stability	Within Operation Band	Pass	-
3.11	15.203 & 15.407(a)	A9.2	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Honeywell International Inc
9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.2 Manufacturer

Honeywell International Inc
9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	99EX Mobile computer
Brand Name	Honeywell
Model Name	99EX
FCC ID	HD599EXL00
Tx/Rx Frequency Range	5150 MHz ~ 5250 MHz 5250 MHz ~ 5350 MHz 5470 MHz ~ 5725 MHz
Maximum Output Power to Antenna	**<5150 MHz ~ 5250 MHz>** 802.11a : 15.09 dBm / 0.0323 W 802.11n (BW 20MHz) : 15.17 dBm / 0.0329 W **<5250 MHz ~ 5350 MHz>** 802.11a : 14.75 dBm / 0.0299 W 802.11n (BW 20MHz) : 14.97 dBm / 0.0314 W **<5470 MHz ~ 5725 MHz>** 802.11a : 15.00 dBm / 0.0316 W 802.11n (BW 20MHz) : 15.12 dBm / 0.0325 W
Antenna Type	PIFA Antenna with gain 3.5 dBi
HW Version	5
SW Version	26.01
Type of Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
EUT Stage	Production Unit

Remark:

1. For other wireless features of this EUT, test report will be issued separately.
2. This test report recorded only product characteristics and test results of Unlicensed National Information Infrastructure (UNII).
3. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Testing Site

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978		
Test Site No.	Sporton Site No.		FCC/IC Registration No.
	CO05-HY	03CH06-HY	722060/4086B-1

1.5 Applied Standards

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

- FCC Part 15 Subpart E
- FCC Public Notice DA 02-2138, (Measurement Guidelines of UNII)
- ANSI C63.4-2003
- IC RSS-210 Issued 8
- IC RSS-Gen Issue 3

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 (DoC), recorded in a separate test report.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
3.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
5.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A
6.	iPod	Apple	A1199	FCC DoC	Shielded, 1.0 m	N/A
7.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

802.11a Carrier Frequency Channel							
Channel	**Freq. (MHz)**	**Channel**	**Freq. (MHz)**	**Channel**	**Freq. (MHz)**	**Channel**	**Freq. (MHz)**
36	5180	**40**	5200	**44**	5220	**48**	5240
52	5260	**56**	5280	**60**	5300	**64**	5320
100	5500	**104**	5520	**108**	5540	**112**	5560
116	5580	**132**	5660	**136**	5680	**140**	5700

802.11n (BW 20MHz) Carrier Frequency Channel							
Channel	**Freq. (MHz)**	**Channel**	**Freq. (MHz)**	**Channel**	**Freq. (MHz)**	**Channel**	**Freq. (MHz)**
36	5180	**40**	5200	**44**	5220	**48**	5240
52	5260	**56**	5280	**60**	5300	**64**	5320
100	5500	**104**	5520	**108**	5540	**112**	5560
116	5580	**132**	5660	**136**	5680	**140**	5700

2.2 RF Power

Preliminary RF power output tests were performed in different data rate and recorded the in the following table:

Channel	Frequency	5GHz 802.11a RF Power (dBm)							
		Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 36	5180 MHz	**15.09**	14.92	13.96	13.92	13.92	12.81	11.30	11.29
CH 44	5220 MHz	14.77	-	-	-	-	-	-	-
CH 48	5240 MHz	14.75	-	-	-	-	-	-	-
CH 52	5260 MHz	14.70	-	-	-	-	-	-	-
CH 60	5300 MHz	14.66	-	-	-	-	-	-	-
CH 64	5320 MHz	14.75	14.71	13.72	13.66	12.59	12.37	10.93	10.95
CH 100	5500 MHz	14.62	-	-	-	-	-	-	-
CH 116	5580 MHz	14.70	-	-	-	-	-	-	-
CH 140	5700 MHz	15.00	14.94	14.02	13.86	12.88	12.73	11.65	11.63

Channel	Frequency	5GHz 802.11n (BW 20MHz) RF Power (dBm)							
		Data Rate							
		6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
CH 36	5180 MHz	**15.17**	14.31	14.17	13.21	13.08	12.13	11.99	10.66
CH 44	5220 MHz	15.16	-	-	-	-	-	-	-
CH 48	5240 MHz	15.08	-	-	-	-	-	-	-
CH 52	5260 MHz	14.96	-	-	-	-	-	-	-
CH 60	5300 MHz	14.85	-	-	-	-	-	-	-
CH 64	5320 MHz	14.97	14.02	13.95	13.01	12.85	11.41	11.35	10.42
CH 100	5500 MHz	14.93	-	-	-	-	-	-	-
CH 116	5580MHz	14.63	-	-	-	-	-	-	-
CH 140	5700 MHz	15.12	14.25	14.17	13.30	13.12	11.57	11.50	10.56

Remark:

1. The data rates of WLAN 802.11a/n were set in 6Mbps for 802.11a and 6.5Mbps for 802.11n (BW 20MHz) for all the test cases due to the highest RF output power.
2. The EUT is programmed to transmit signal continuously for all testing.
3. Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports.

2.3 Test Mode

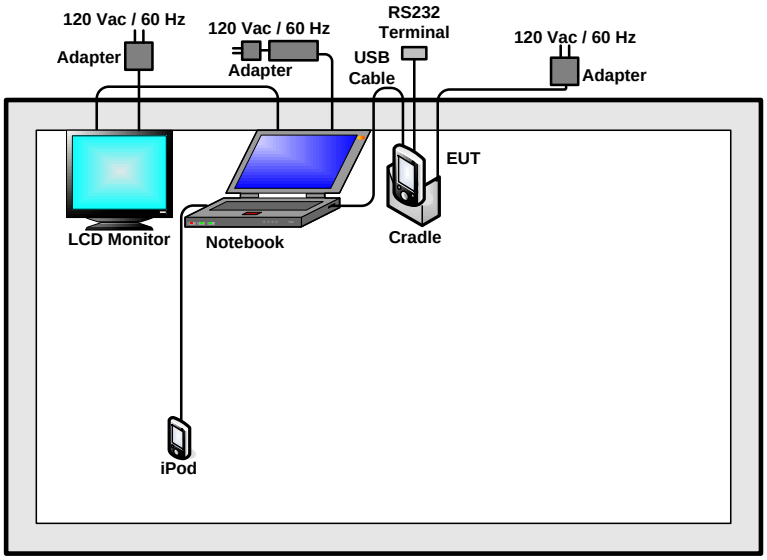
The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Pre-scanned tests were conducted to determine the final configuration from all possible combinations.

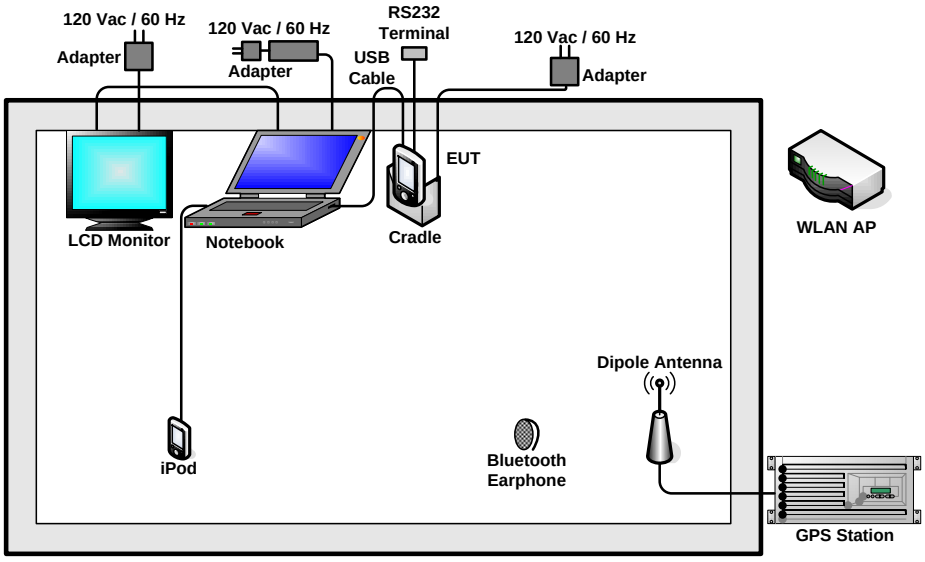
	Test Cases
Test Item	**802.11a/n (Modulation : OFDM)**
Conducted TCs	■ Mode 1: 802.11a_CH36_5180 MHz ■ Mode 2: 802.11a_CH44_5220 MHz ■ Mode 3: 802.11a_CH48_5240 MHz ■ Mode 4: 802.11a_CH52_5260 MHz ■ Mode 5: 802.11a_CH60_5300 MHz ■ Mode 6: 802.11a_CH64_5320 MHz ■ Mode 7: 802.11a_CH100_5500 MHz ■ Mode 8: 802.11a_CH116_5580 MHz ■ Mode 9: 802.11a_CH140_5700 MHz ■ Mode 10: 802.11a_CH36_5180 MHz (BW 20M) ■ Mode 11: 802.11a_CH44_5220 MHz (BW 20M) ■ Mode 12: 802.11a_CH48_5240 MHz (BW 20M) ■ Mode 13: 802.11a_CH52_5260 MHz (BW 20M) ■ Mode 14: 802.11a_CH60_5300 MHz (BW 20M) ■ Mode 15: 802.11a_CH64_5320 MHz (BW 20M) ■ Mode 16: 802.11a_CH100_5500 MHz (BW 20M) ■ Mode 17: 802.11a_CH116_5580 MHz (BW 20M) ■ Mode 18: 802.11a_CH140_5700 MHz (BW 20M)
Radiated TCs	■ Mode 1: 802.11n_CH64_5320 MHz (BW 20M) + TC
AC Conducted Emission	Mode 1 : Bluetooth Link + WLAN (5G) Link + GPS Rx + Scanner + Cradle + Adapter + RS232 Terminal + USB Cable (Link with Notebook)
Remark: TC stands for Test Configuration, and consists of USB cable, RS232 terminal, cradle, and adapter.	

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.5 RF Utility

The programmed RF Utility “TI1273_FCC”, is installed in EUT to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testing. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

3 Test Result

3.1 26dB Bandwidth Measurement

3.1.1 Limit of 26dB Bandwidth

There is no restriction limits for bandwidth. The maximum conducted output power can be limited by measured emission bandwidth (B). For the band 5.15~5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW (17dBm) or 4 dBm + 10log B. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm + 10log B. For the band 5.725-5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W (30dBm) or 17 dBm + 10log B.

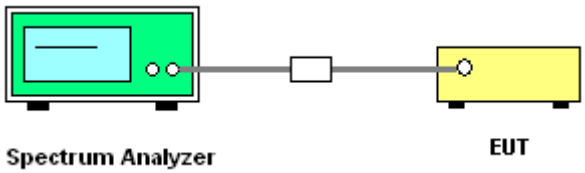
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC Public Notice DA 02-2138 (Measurement Guidelines of UNII).
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Read RBW and repeat measurement as needed until the RBW/BW ratio is approximately 1%.
4. Use a RBW = approximately 1% of the emission bandwidth; Set the VBW > RBW; Use a peak detector.
5. Measure the maximum width of the emission that is 26 dB relative to the peak of the emission and 99% occupied bandwidth.

3.1.4 Test Setup

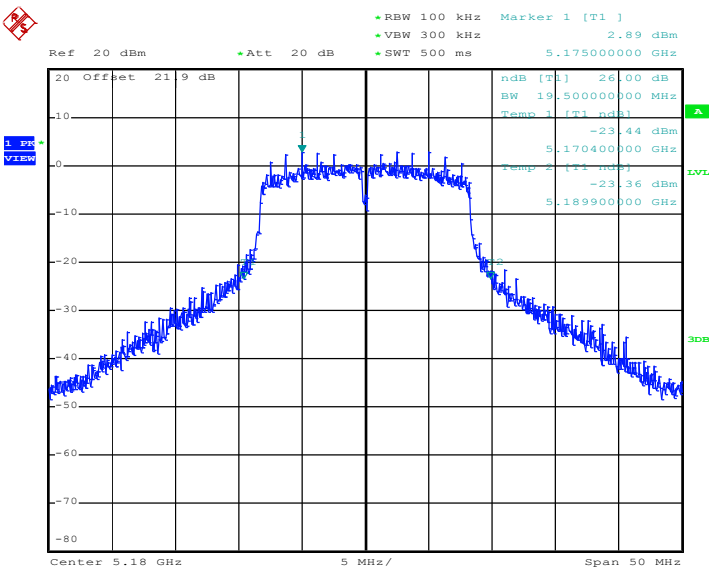


3.1.5 Test Result of 26dB Bandwidth

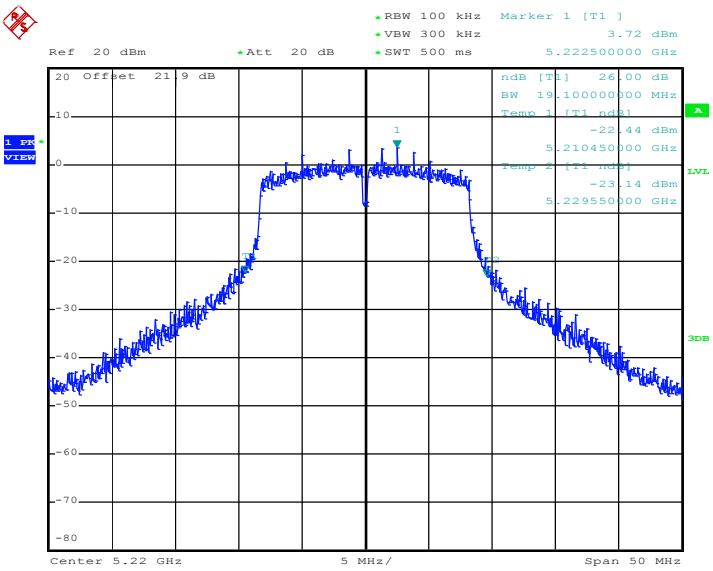
Test Mode :	Mode 1~9	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Channel	Frequency (MHz)	802.11a 26dB Bandwidth (MHz)	Pass/Fail
36	5180	19.50	pass
44	5220	19.10	pass
48	5240	19.30	pass
52	5260	18.65	pass
60	5300	19.10	pass
64	5320	18.70	pass
100	5500	19.05	pass
116	5580	19.05	pass
140	5700	19.30	pass

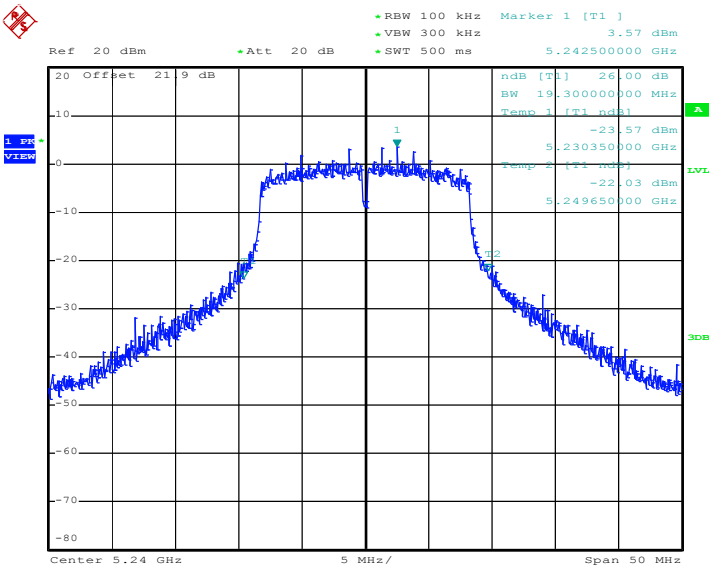
26 dB Bandwidth Plot on 802.11a Channel 36



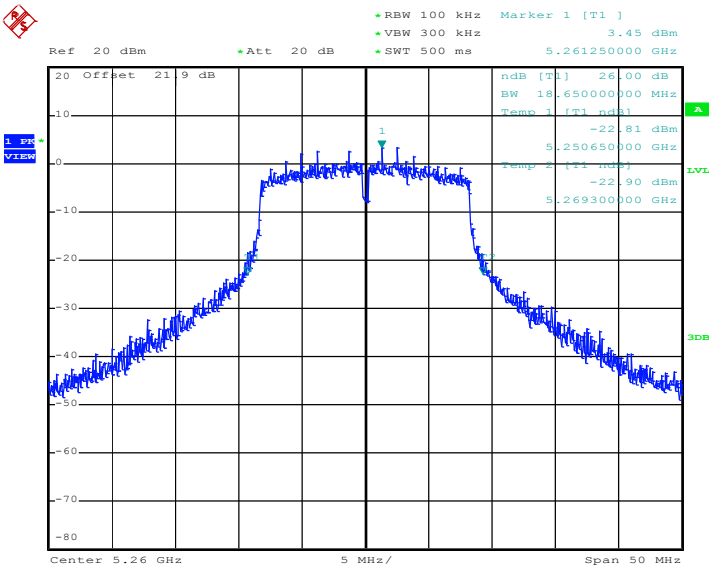
26 dB Bandwidth Plot on 802.11a Channel 44



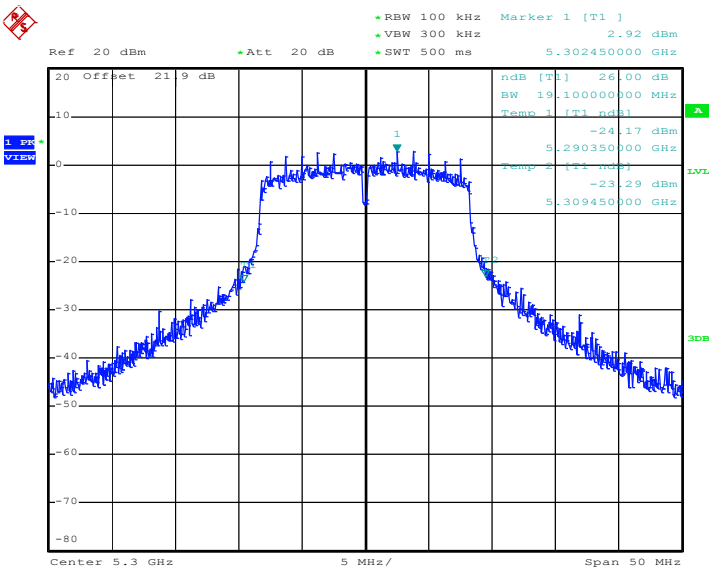
26 dB Bandwidth Plot on 802.11a Channel 48



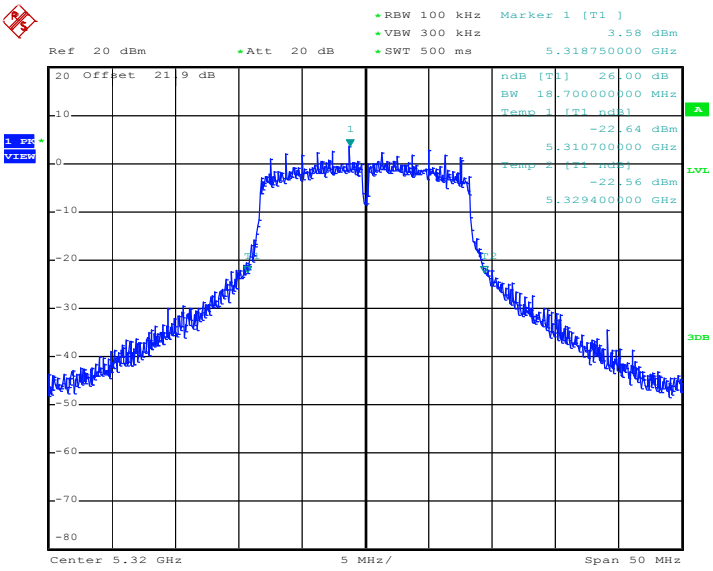
26 dB Bandwidth Plot on 802.11a Channel 52



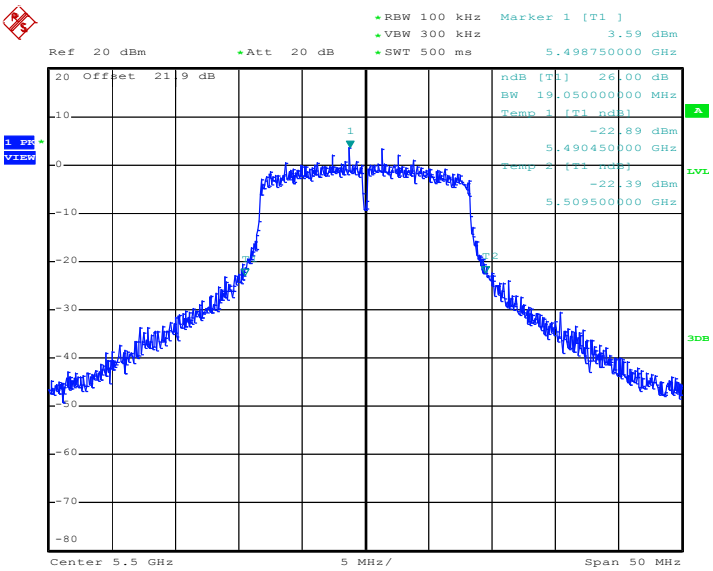
26 dB Bandwidth Plot on 802.11a Channel 60



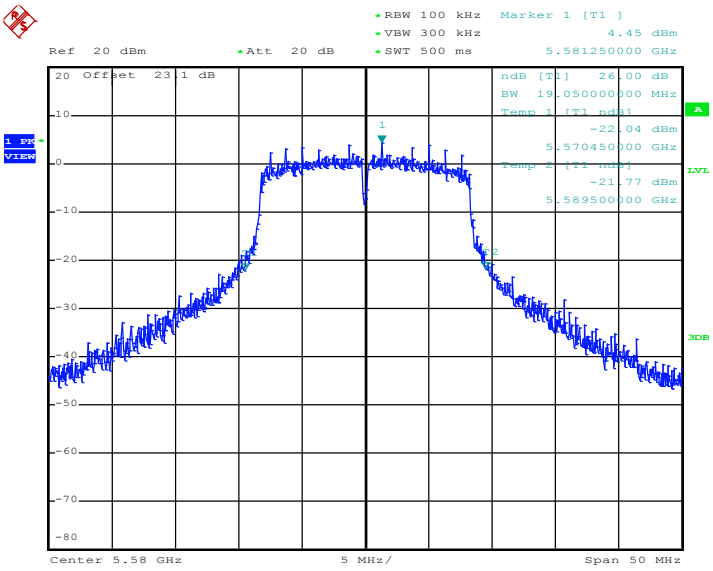
26 dB Bandwidth Plot on 802.11a Channel 64



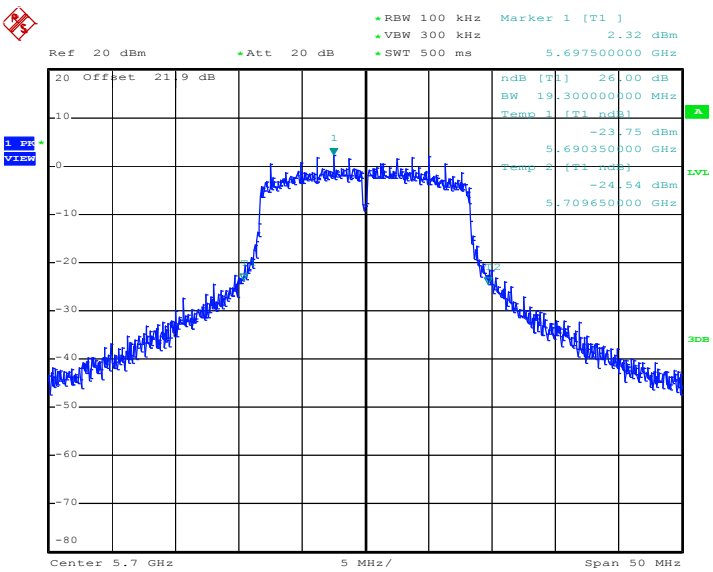
26 dB Bandwidth Plot on 802.11a Channel 100



26 dB Bandwidth Plot on 802.11a Channel 116



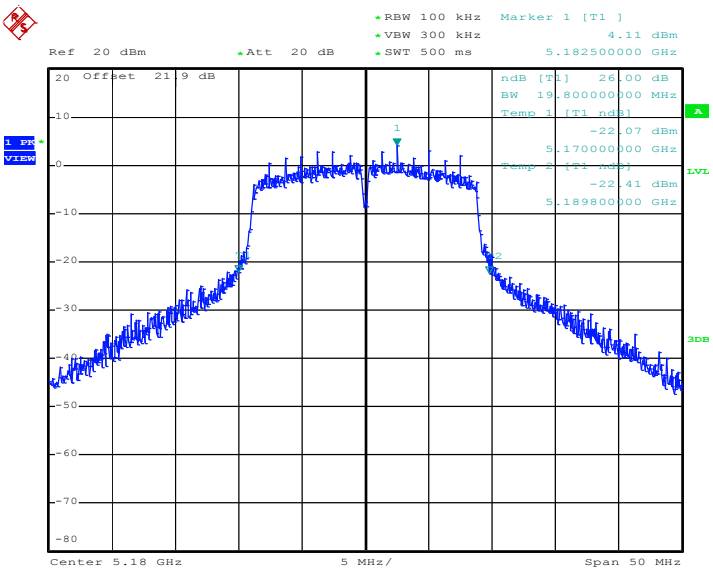
26 dB Bandwidth Plot on 802.11a Channel 140



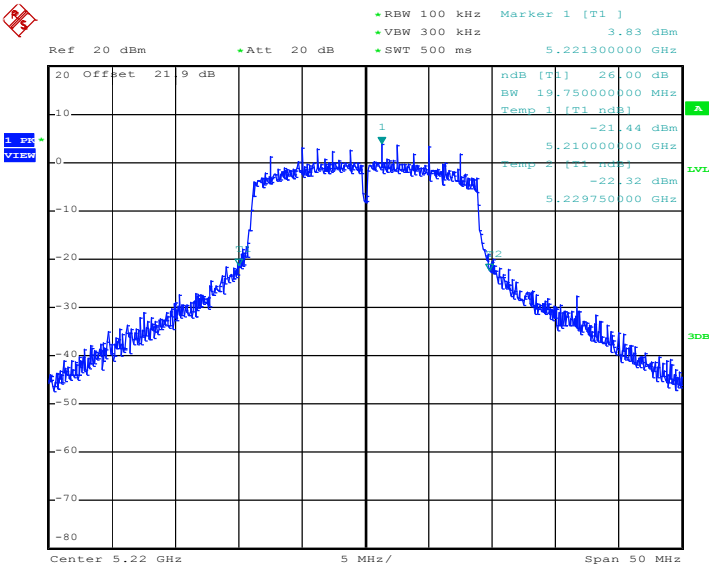
Test Mode :	Mode 10~18	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Channel	Frequency (MHz)	802.11n (BW 20MHz) 26dB Bandwidth (MHz)	Pass/Fail
36	5180	19.80	pass
44	5220	19.75	pass
48	5240	19.95	pass
52	5260	19.95	pass
60	5300	19.55	pass
64	5320	19.75	pass
100	5500	20.00	pass
116	5580	20.00	pass
140	5700	20.15	pass

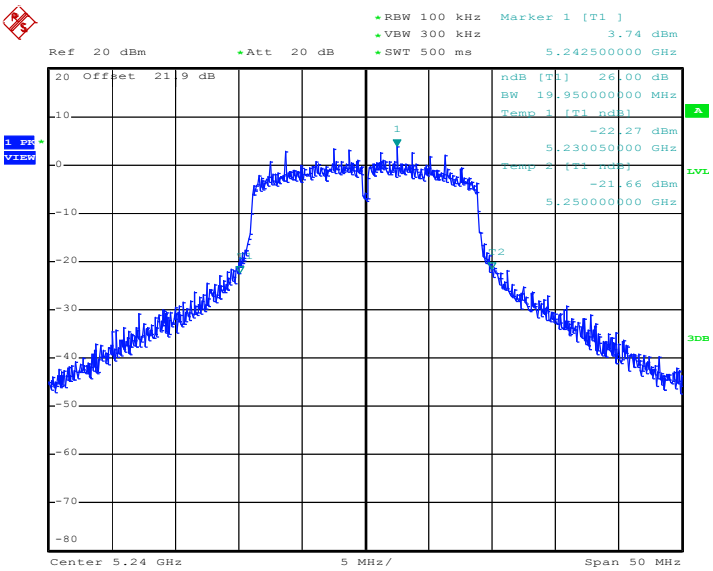
26 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 36



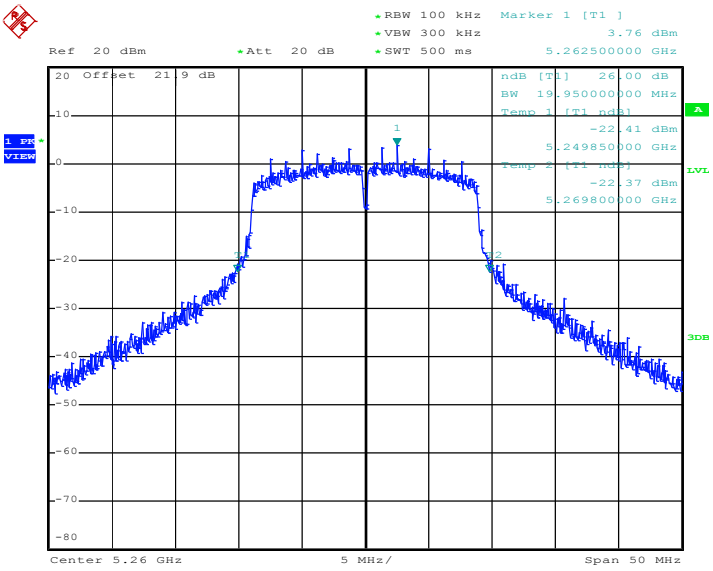
26 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 44



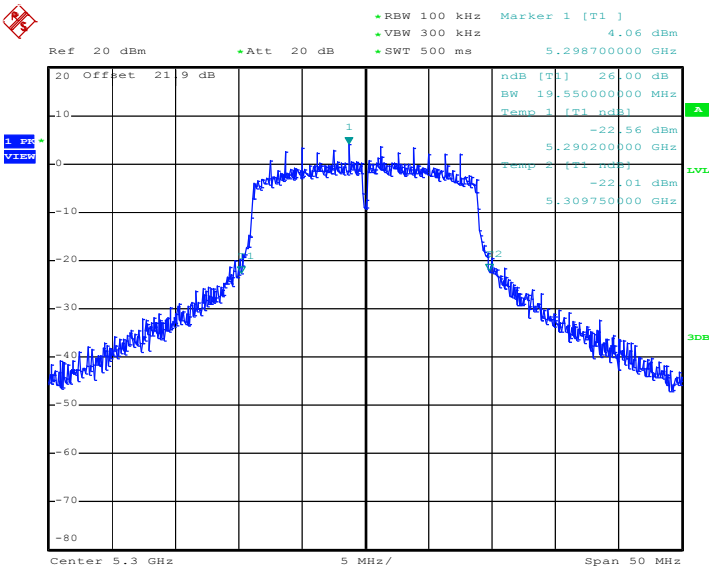
26 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 48



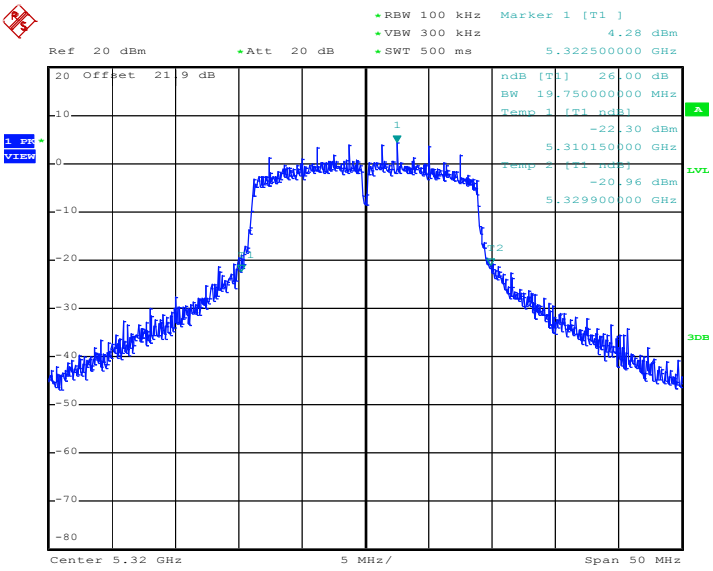
26 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 52



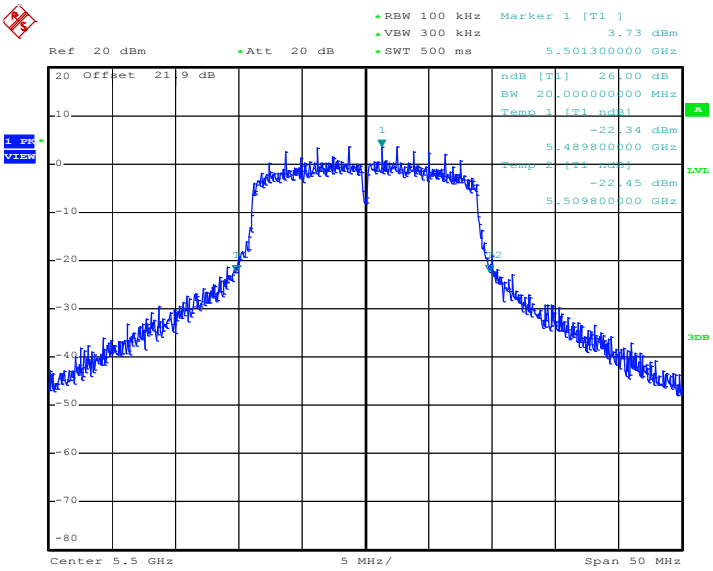
26 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 60



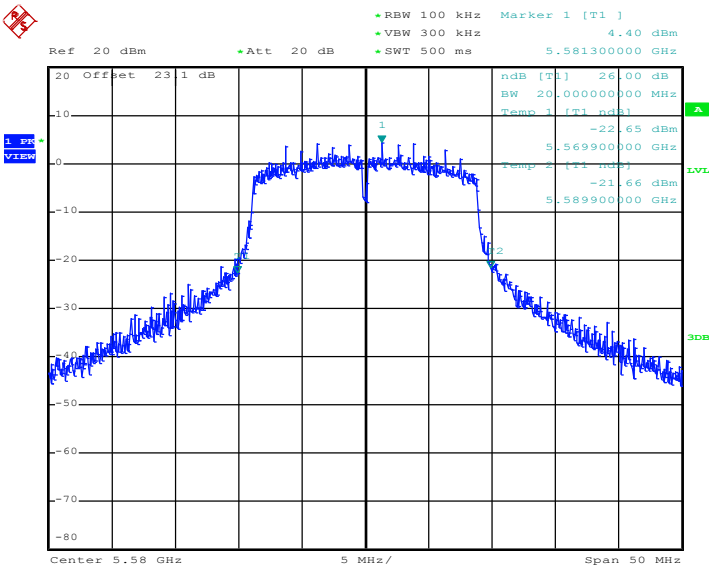
26 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 64



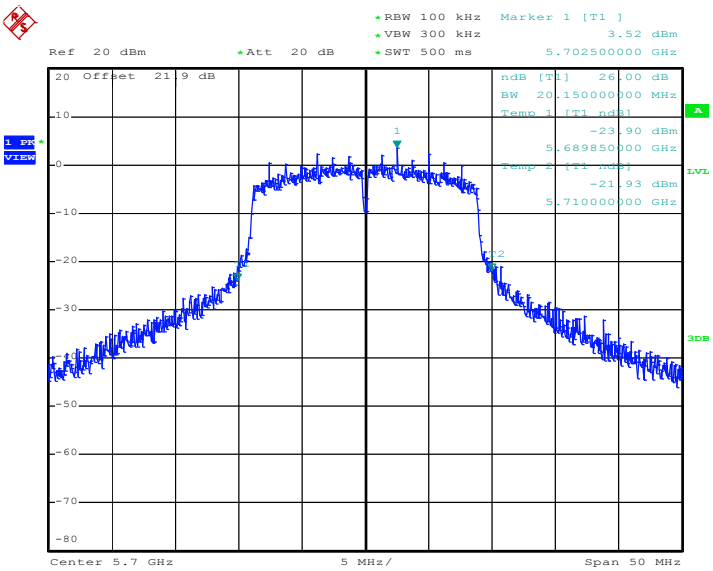
26 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 100



26 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 116



26 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 140



3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

For the band 5.15~5.25 GHz, the maximum conducted output power shall not exceed the lesser of 50 mW (17dBm) or 4 dBm + 10log B, where B is the 26 dB emissions bandwidth in MHz. If transmitting antenna directional gain is greater than 6 dBi, the peak output power and power density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power shall not exceed the lesser of 250 mW (24dBm) or 11 dBm + 10log B. If transmitting antenna directional gain is greater than 6 dBi, the peak output power and power density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

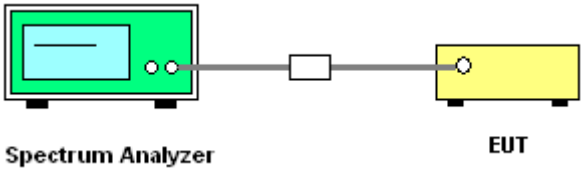
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows FCC Public Notice DA 02-2138 (Measurement Guidelines of UNII).
   Method #3:
   - Set span to encompass the entire emission bandwidth (EBW) of the signal.
   - Set sweep trigger to “free run”.
   - Set RBW = 1 MHz. Set VBW ≥ 1/T
   - Use linear display mode.
   - Use sample detector mode if bin width (i.e., span/number of points in spectrum < 0.5 RBW otherwise use peak detector mode.)
   - Set max hold.
   - Allow max hold to run for 60 seconds.
   - Compute power by integrating the spectrum across the 26 dB EBW or apply a bandwidth correction factor of 10 log(EBW/1 MHz) to the spectral peak of the emission. The integration can be performed using the spectrum analyzer’s band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be obtained by averaging, in linear power terms, power levels in summed can be each frequency bin across the 1 MHz.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Measure the power and record it.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Test Mode :	Mode 1~9	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Channel	Frequency (MHz)	802.11a Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
36	5180	15.09	16.90	Pass
44	5220	14.77	16.81	Pass
48	5240	14.75	16.86	Pass
52	5260	14.70	23.71	Pass
60	5300	14.66	23.81	Pass
64	5320	14.75	23.72	Pass
100	5500	14.62	23.80	Pass
116	5580	14.82	23.80	Pass
140	5700	15.00	23.86	Pass

Test Mode :	Mode 10~18	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Channel	Frequency (MHz)	802.11n (BW 20MHz) Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
36	5180	15.17	16.97	Pass
44	5220	15.16	16.96	Pass
48	5240	15.08	17.00	Pass
52	5260	14.96	24.00	Pass
60	5300	14.85	23.91	Pass
64	5320	14.97	23.96	Pass
100	5500	14.93	24.00	Pass
116	5580	14.71	24.00	Pass
140	5700	15.12	24.00	Pass

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

For the band 5.15–5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1MHz band. For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 1MHz band. If transmitting antenna directional gain is greater than 6 dBi, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

The transmitter output is connected to the spectrum analyzer. According

Use sample detector and power averaging (not video averaging) mode. Set RBW= 1 MHz, VBW > 1 MHz. The PPSD is the highest level found across the emission in any1-MHz band after 100 sweeps of averaging.

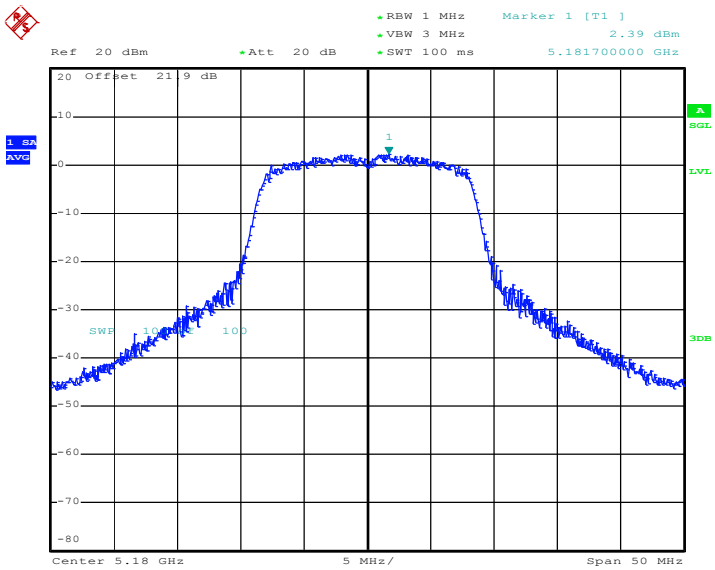
3.3.4 Test Setup

3.3.5 Test Result of Power Spectral Density

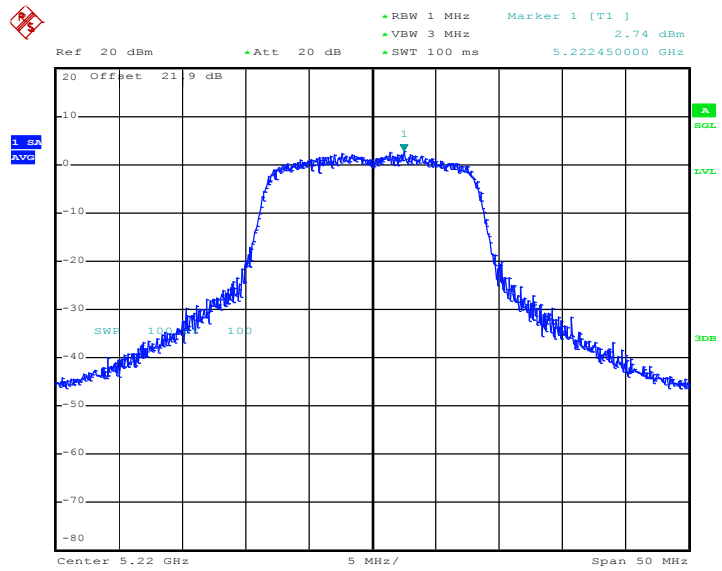
Test Mode :	Mode 1~9	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Channel	Frequency (MHz)	802.11a Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
36	5180	2.39	4	Pass
44	5220	2.74	4	Pass
48	5240	2.21	4	Pass
52	5260	2.98	11	Pass
60	5300	3.34	11	Pass
64	5320	2.58	11	Pass
100	5500	2.61	11	Pass
116	5580	5.44	11	Pass
140	5700	1.62	11	Pass

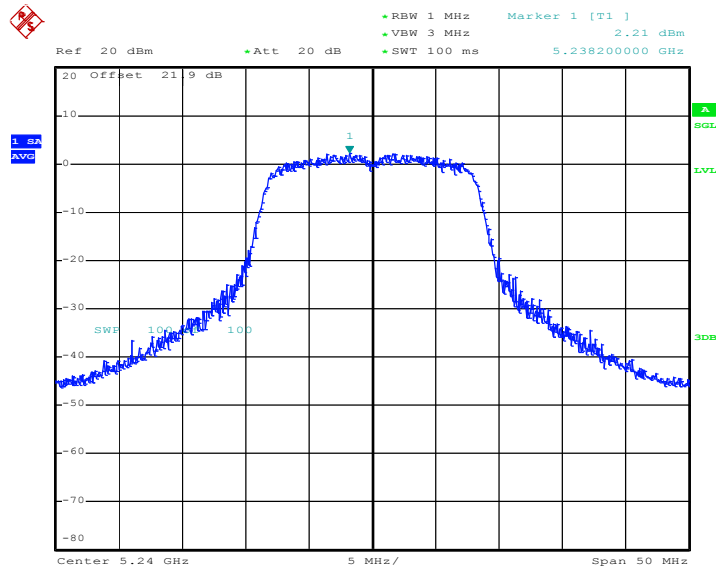
PSD Plot on 802.11a Channel 36



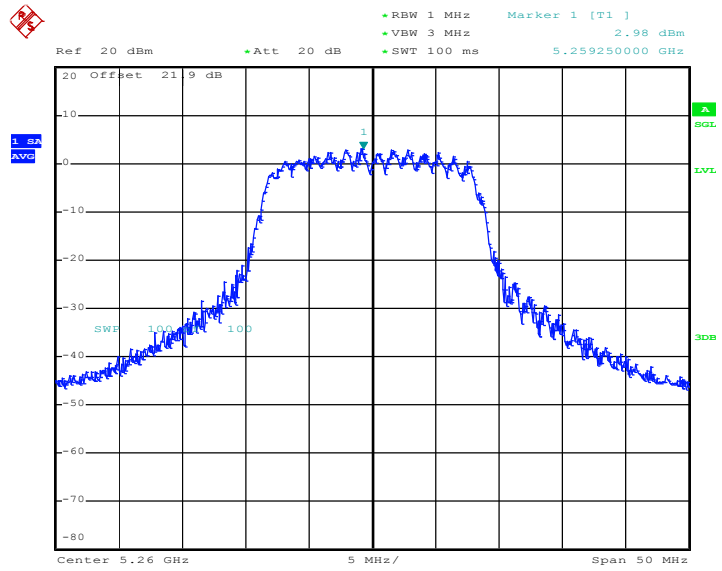
PSD Plot on 802.11a Channel 44



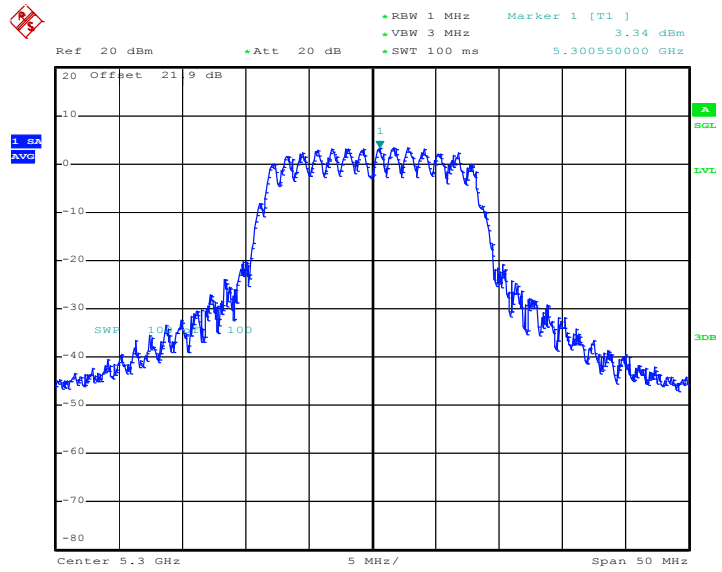
PSD Plot on 802.11a Channel 48



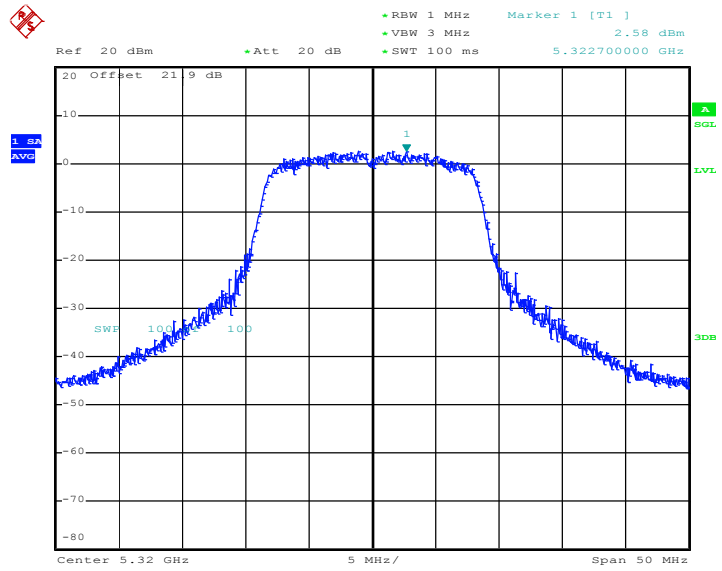
PSD Plot on 802.11a Channel 52



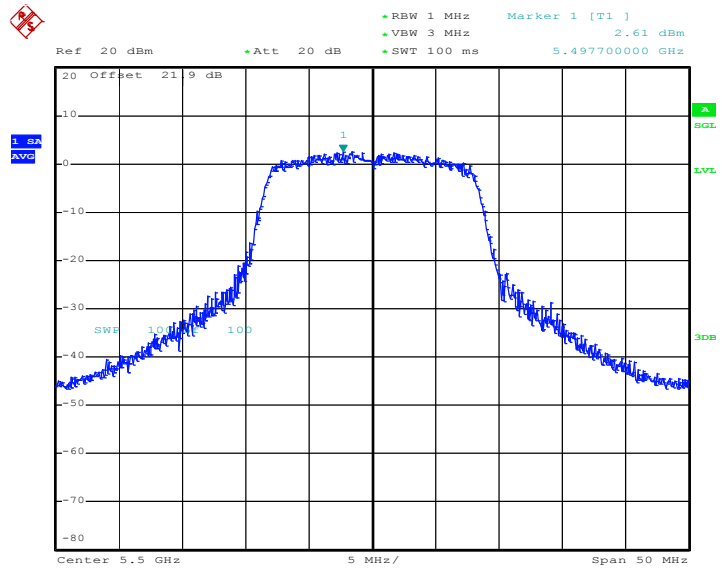
PSD Plot on 802.11a Channel 60



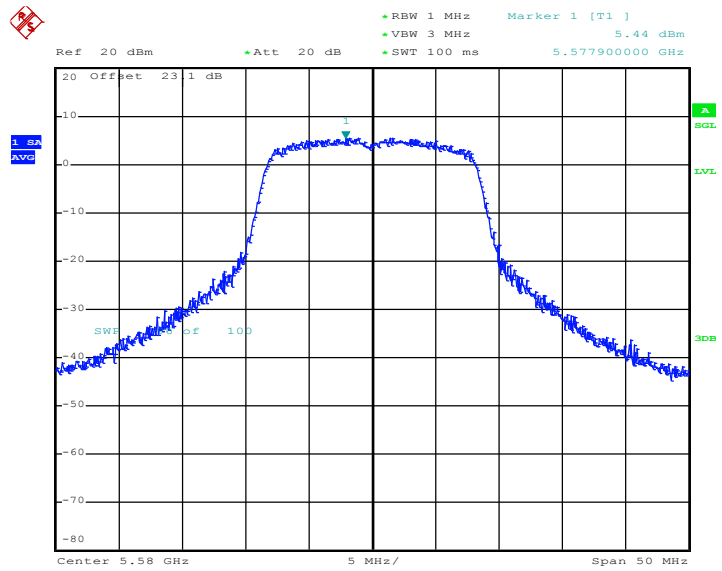
PSD Plot on 802.11a Channel 64



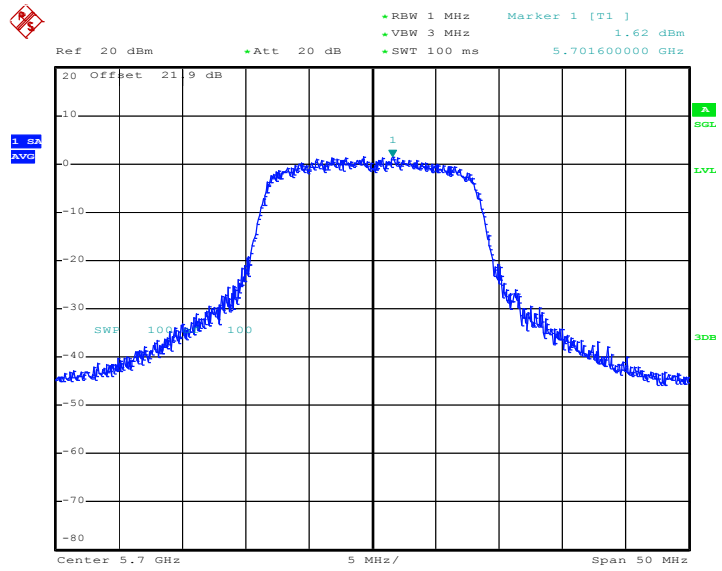
PSD Plot on 802.11a Channel 100



PSD Plot on 802.11a Channel 116



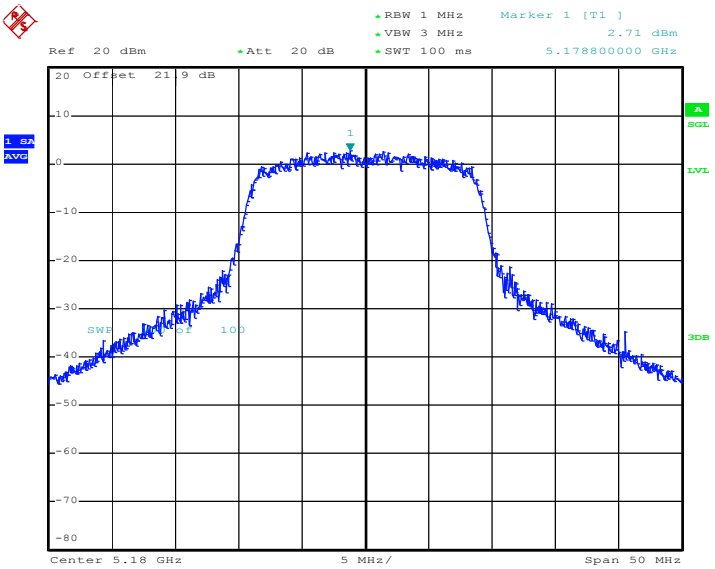
PSD Plot on 802.11a Channel 140



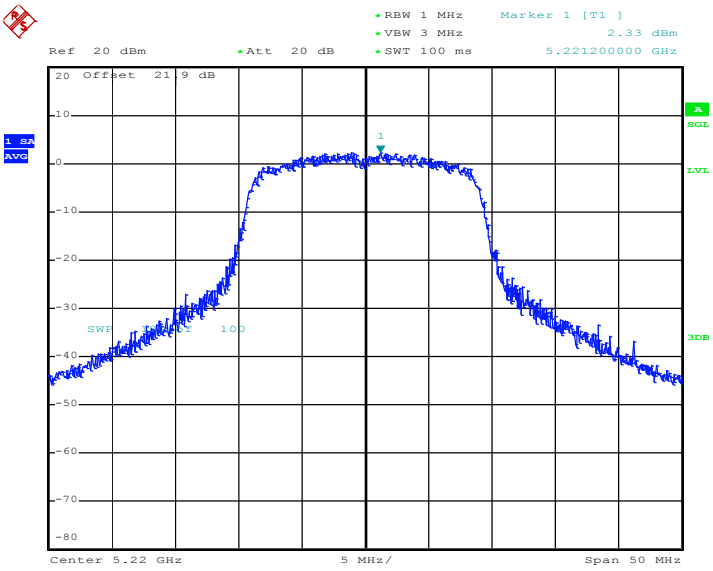
Test Mode :	Mode 10~18	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Channel	Frequency (MHz)	802.11n (BW 20MHz) Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
36	5180	2.71	4	Pass
44	5220	2.33	4	Pass
48	5240	2.98	4	Pass
52	5260	2.46	11	Pass
60	5300	2.25	11	Pass
64	5320	2.84	11	Pass
100	5500	2.69	11	Pass
116	5580	5.66	11	Pass
140	5700	1.41	11	Pass

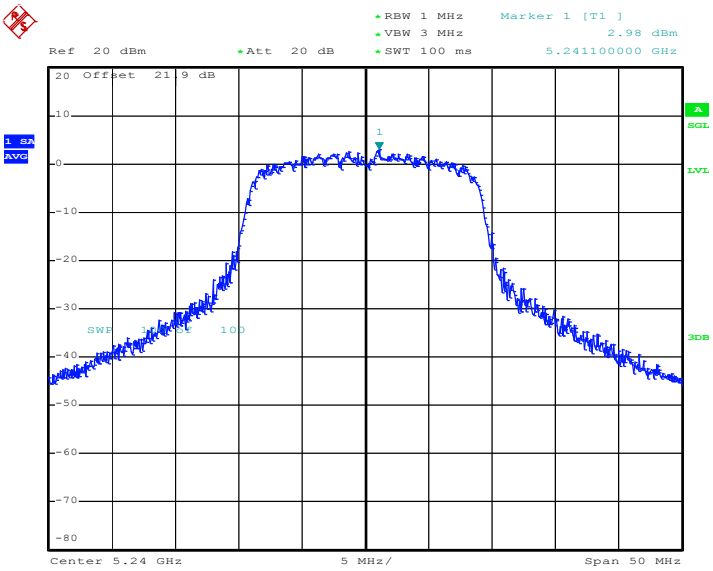
PSD Plot on 802.11n (BW 20MHz) Channel 36



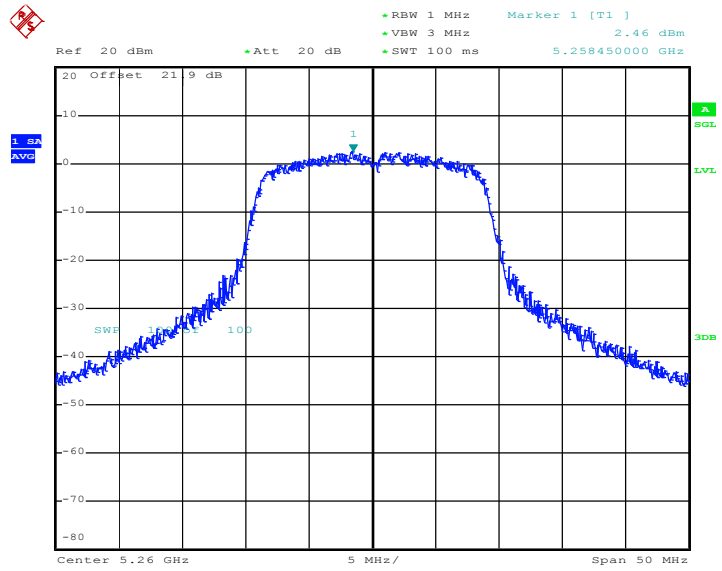
PSD Plot on 802.11n (BW 20MHz) Channel 44



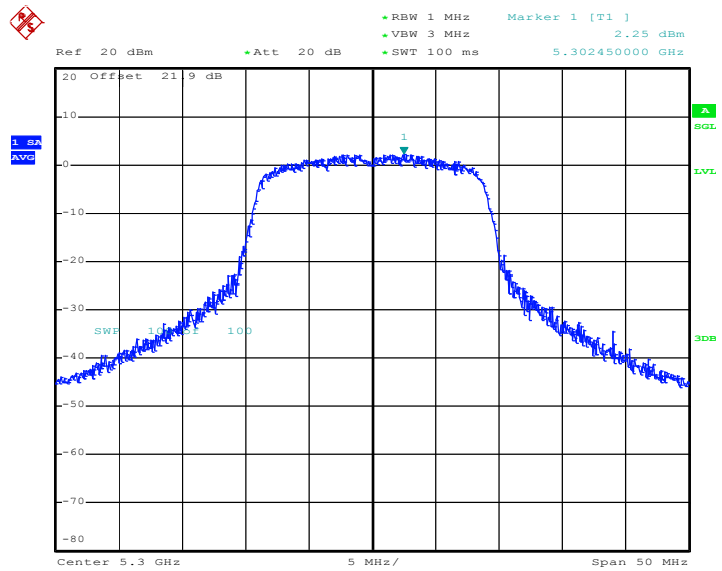
PSD Plot on 802.11n (BW 20MHz) Channel 48



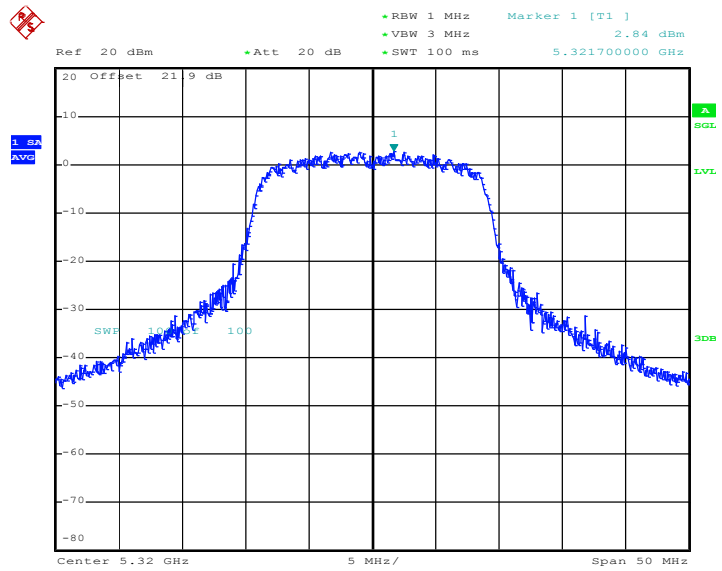
PSD Plot on 802.11n (BW 20MHz) Channel 52



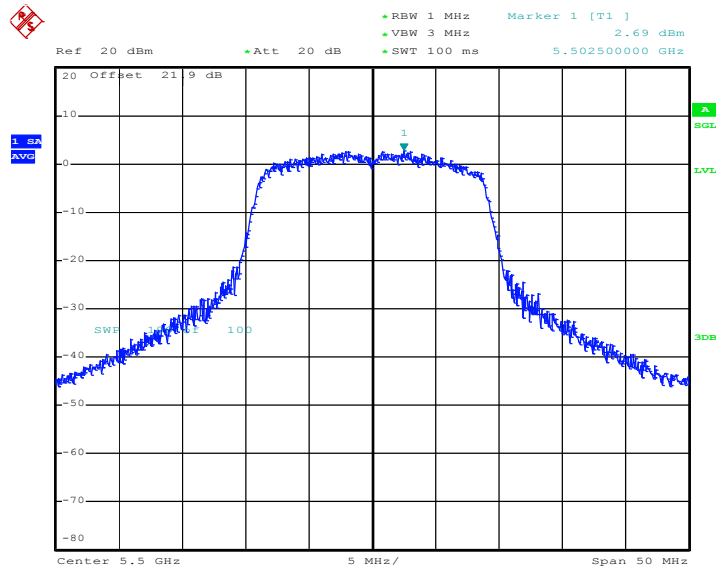
PSD Plot on 802.11n (BW 20MHz) Channel 60



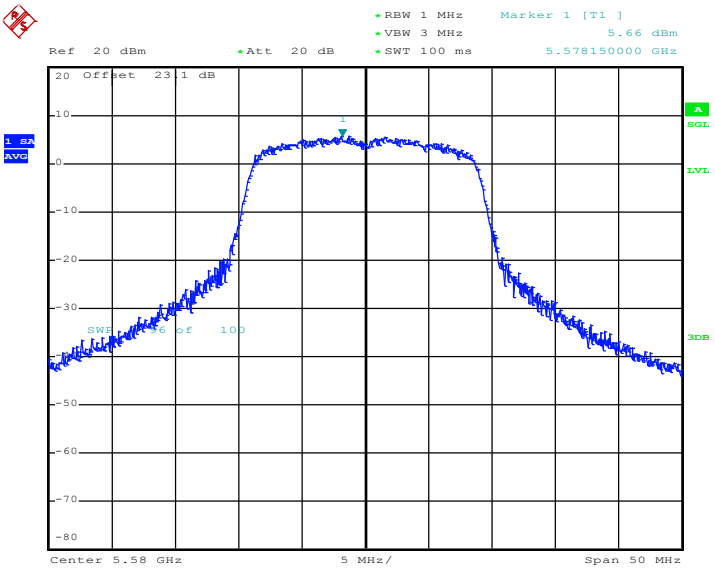
PSD Plot on 802.11n (BW 20MHz) Channel 64



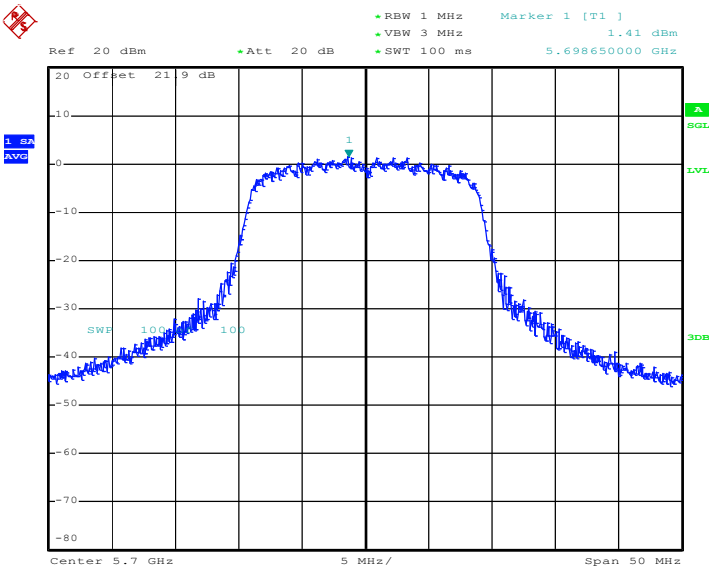
PSD Plot on 802.11n (BW 20MHz) Channel 100



PSD Plot on 802.11n (BW 20MHz) Channel 116



PSD Plot on 802.11n (BW 20MHz) Channel 140



3.4 Band Edges Measurement

3.4.1 Limit of Band Edges

(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band. For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) The provisions of Section 15.205 Restricted bands of operation of this part apply to intentional radiators operating under this section.

3.4.2 Measuring Instruments

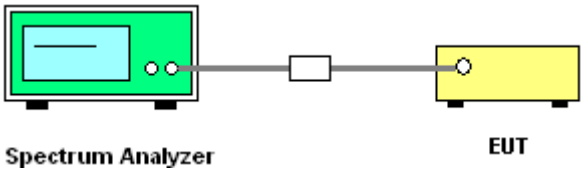
See list of measuring instruments of this test report.

3.4.3 Test Procedures

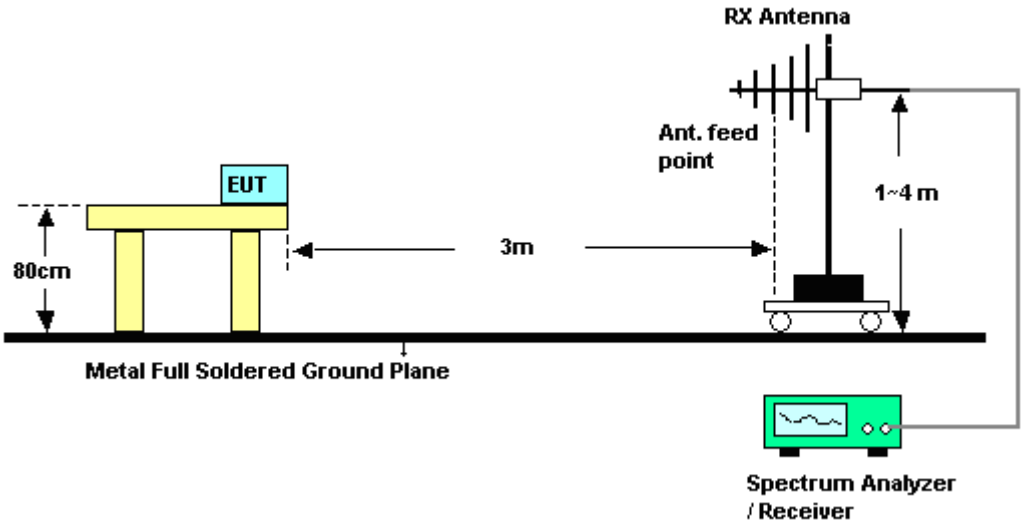
1. Set both RBW / VBW of spectrum analyzer to 1MHz / 3MHz with convenient frequency span including 1MHz bandwidth from band edge.
2. The band edges was measured and recorded.

3.4.4 Test Setup

<Conducted>



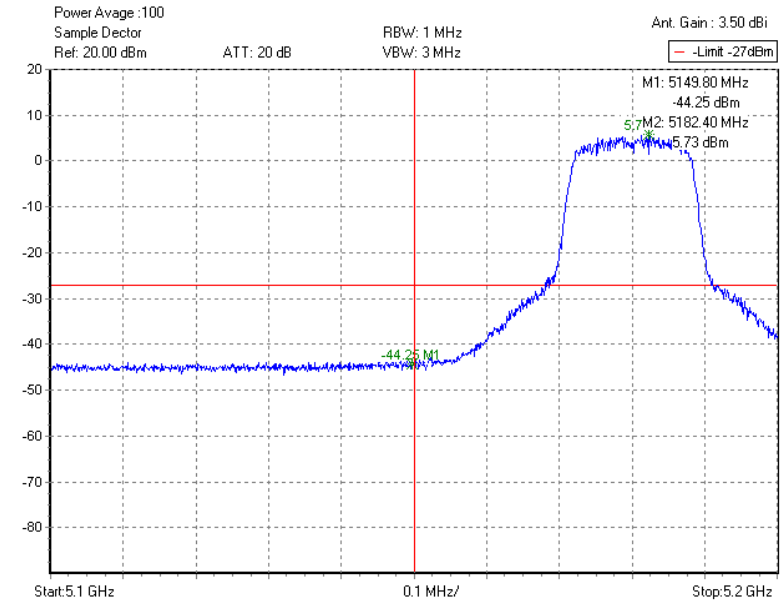
<Radiated>



3.4.5 Test Result of Conducted Band Edges

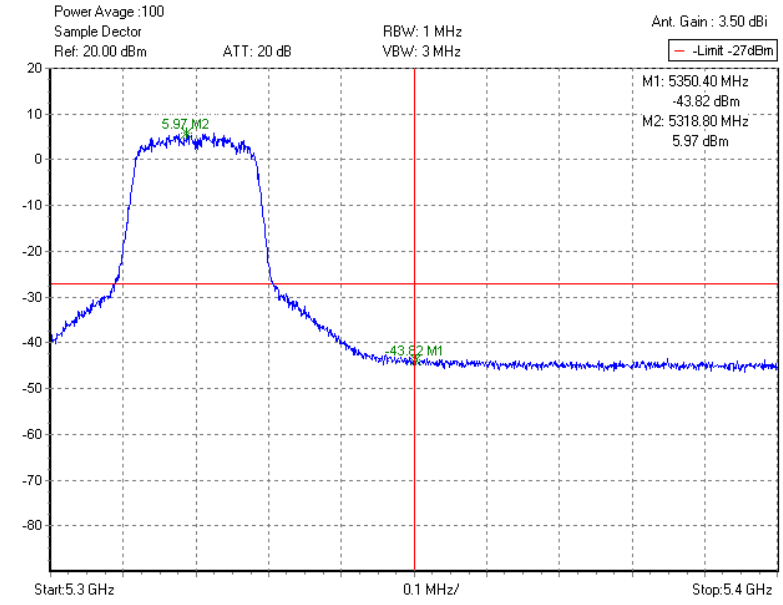
Test Mode :	Mode 1 and 6	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Low Band Edge Plot on Channel 36



Test result was offseted with path loss, and antenna gain.

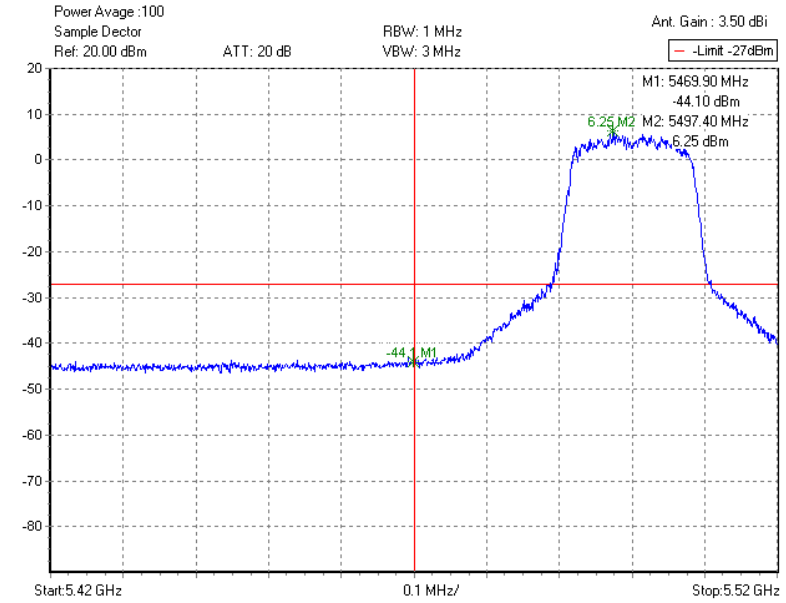
High Band Edge Plot on Channel 64



Test result was offseted with path loss, and antenna gain.

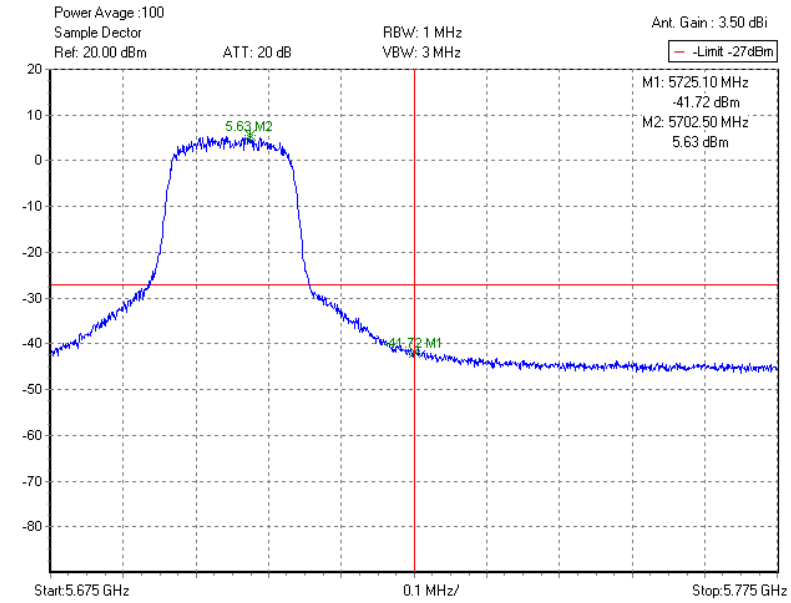
Test Mode :	Mode 7 and 9	**Temperature :**	24~26℃
Test Engineer :	Alan Liu	**Relative Humidity :**	45~49%

Low Band Edge Plot on Channel 100



Test result was offseted with path loss, and antenna gain.

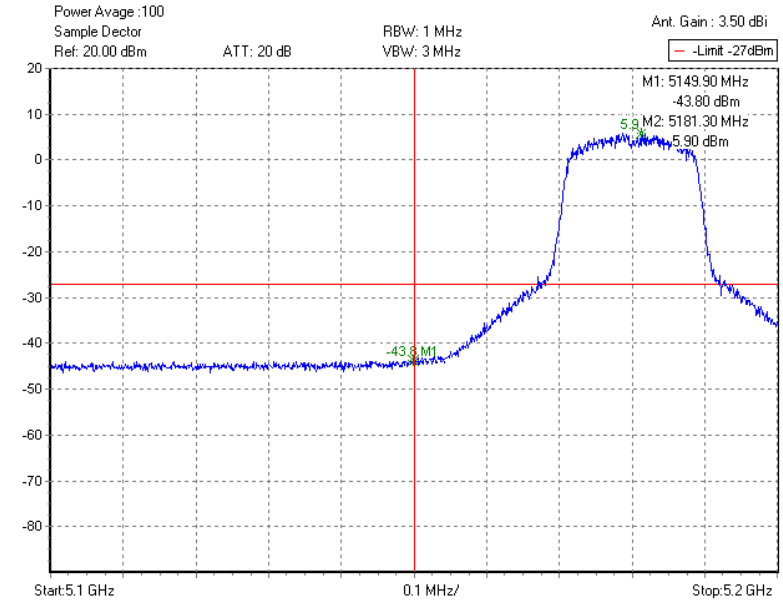
High Band Edge Plot on Channel 140



Test result was offseted with path loss, and antenna gain.

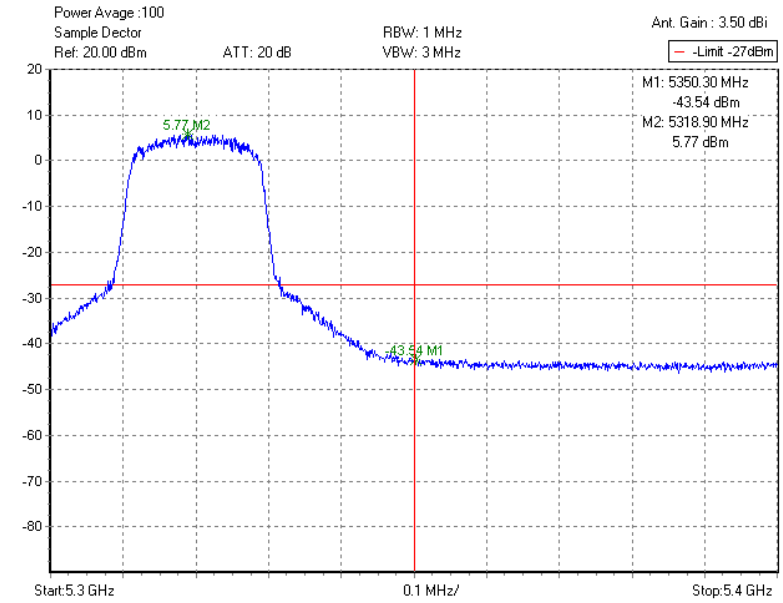
Test Mode :	Mode 10 and 15	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Low Band Edge Plot on Channel 36



Test result was offseted with path loss, and antenna gain.

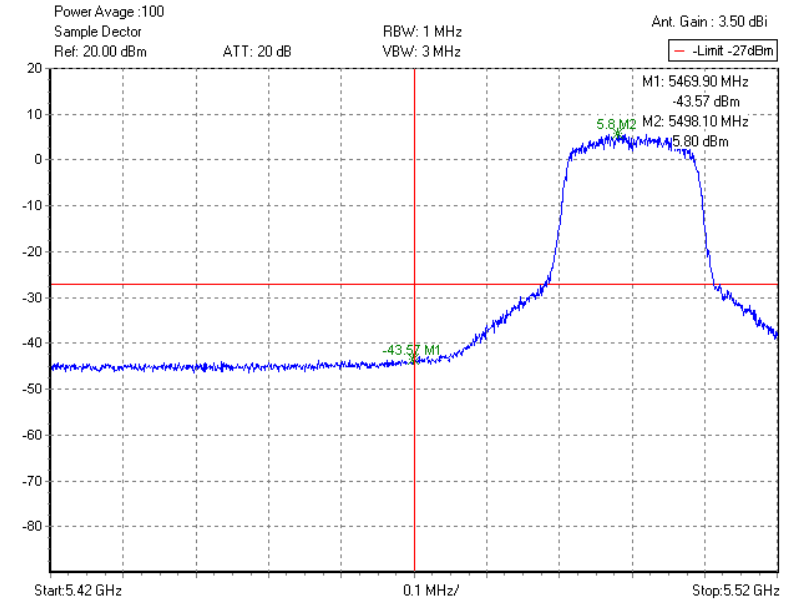
High Band Edge Plot on Channel 64



Test result was offseted with path loss, and antenna gain.

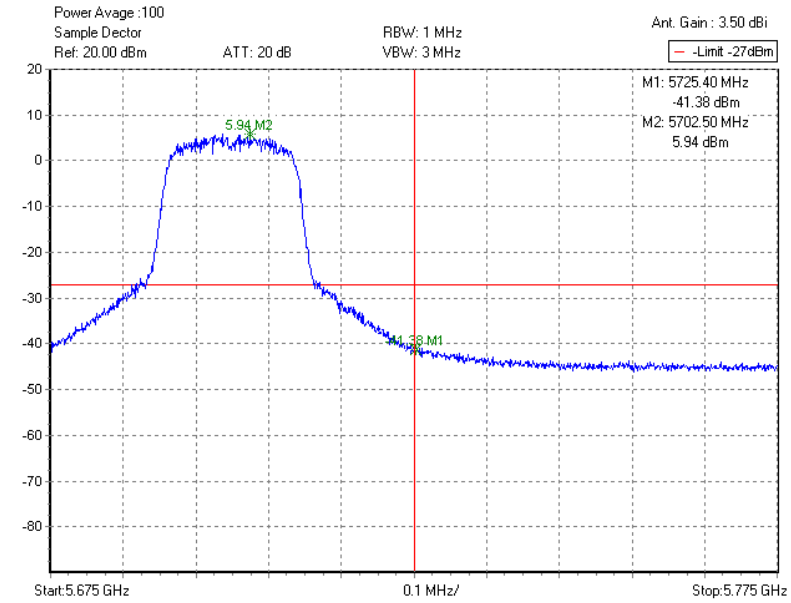
Test Mode :	Mode 16 and 18	**Temperature :**	24~26℃
Test Engineer :	Alan Liu	**Relative Humidity :**	45~49%

Low Band Edge Plot on Channel 100



Test result was offseted with path loss, and antenna gain.

High Band Edge Plot on Channel 140



Test result was offseted with path loss, and antenna gain.

3.4.6 Test Result of Radiated Band Edges

Test Mode :	Mode 1	**Temperature :**	23~24°C
Test Band :	802.11n (BW 20MHz)	**Relative Humidity :**	45~46%
Test Channel :	64	**Test Engineer :**	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5350	64.4	-9.6	74	55.2	34.58	8.47	33.85	164	268	Peak
5350	47.73	-6.27	54	38.53	34.58	8.47	33.85	164	268	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
5350	62.3	-11.7	74	53.1	34.58	8.47	33.85	148	357	Peak
5350	44.46	-9.54	54	35.26	34.58	8.47	33.85	148	357	Average

3.5 Spurious Emission

3.5.1 Limit of Spurious Emission Measurement

(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.

(2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band.

(3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

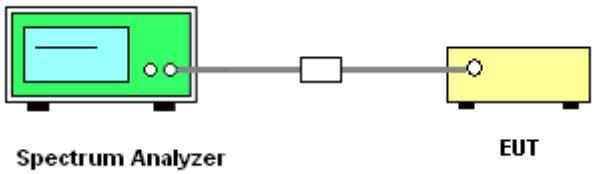
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedure

1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set RBW = VBW = 1 MHz, Video bandwidth (VBW), scan from 30 MHz to 40 GHz.

3.5.4 Test Setup

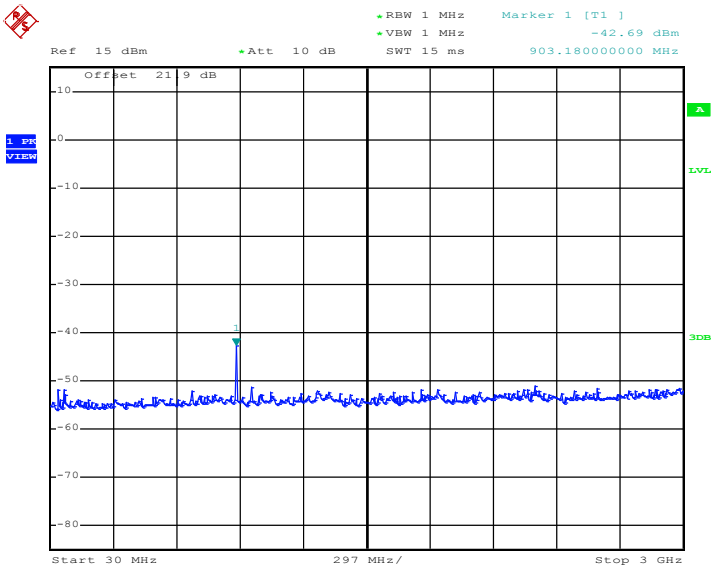


3.5.5 Test Result

Test Mode :	Mode 1~9	**Temperature :**	24~26℃
Test Band :	802.11a	**Relative Humidity :**	45~49%
Test Channel :	36, 44, 48, 52, 60, 64, 100, 116, 140	**Test Engineer :**	Alan Liu

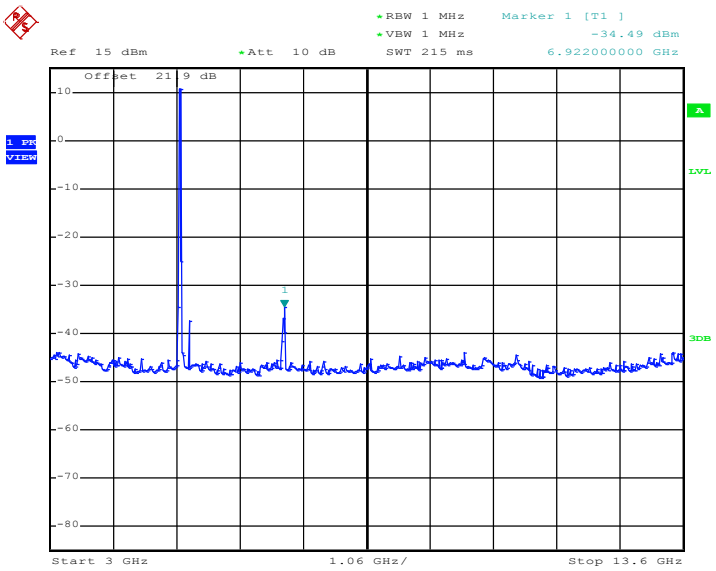
Mode 1 : Spurious Emission Plot between

802.11a 30 MHz ~ 3 GHz



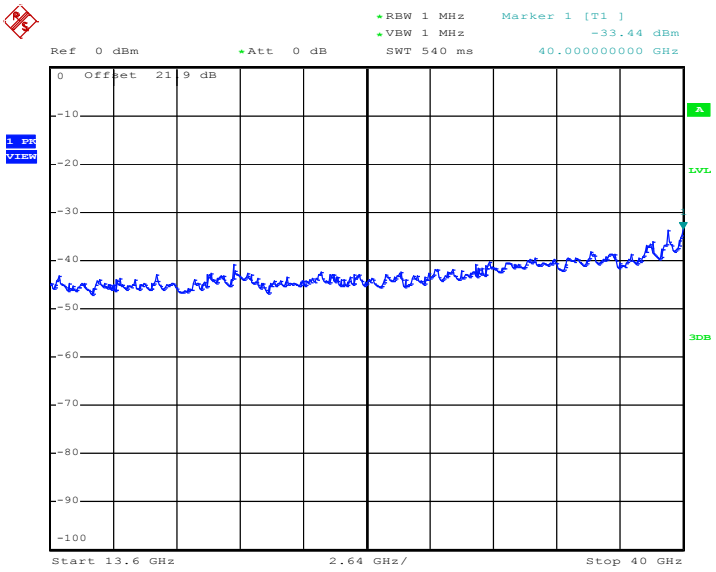
Mode 1 : Spurious Emission Plot between

802.11a 3 GHz ~ 13.6 GHz



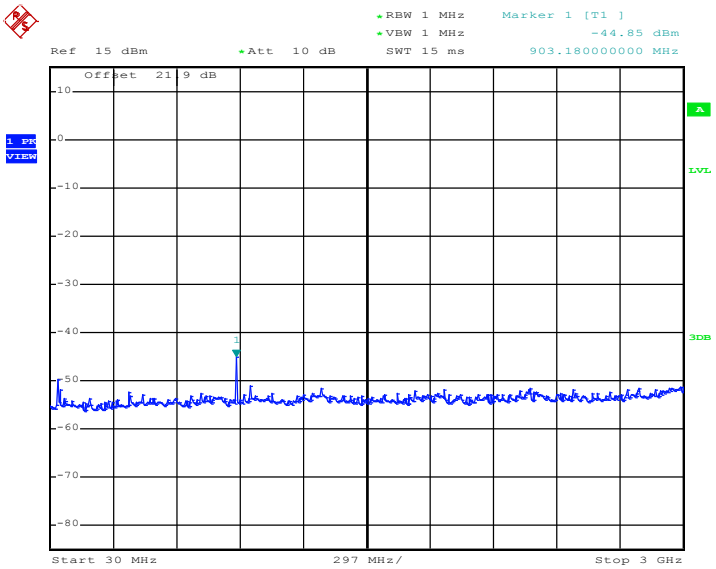
Mode 1 : Spurious Emission Plot between

802.11a 13.6 GHz ~ 40 GHz



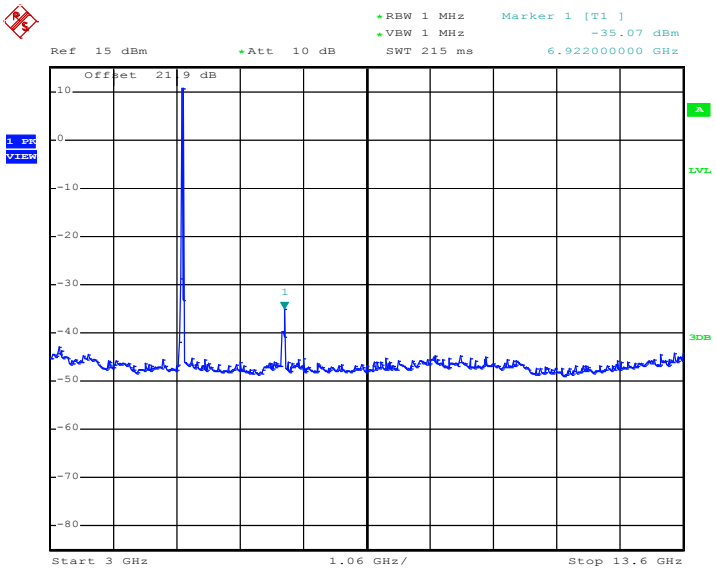
Mode 2 : Spurious Emission Plot between

802.11a 30 MHz ~ 3 GHz



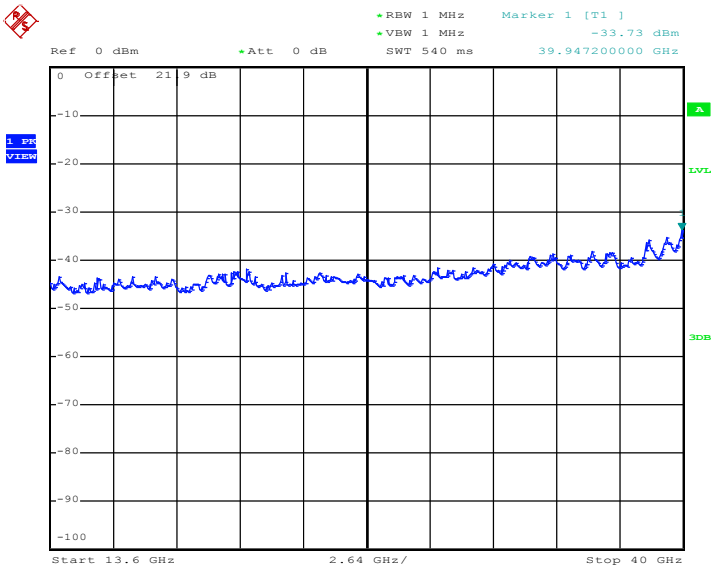
Mode 2 : Spurious Emission Plot between

802.11a 3 GHz ~ 13.6 GHz



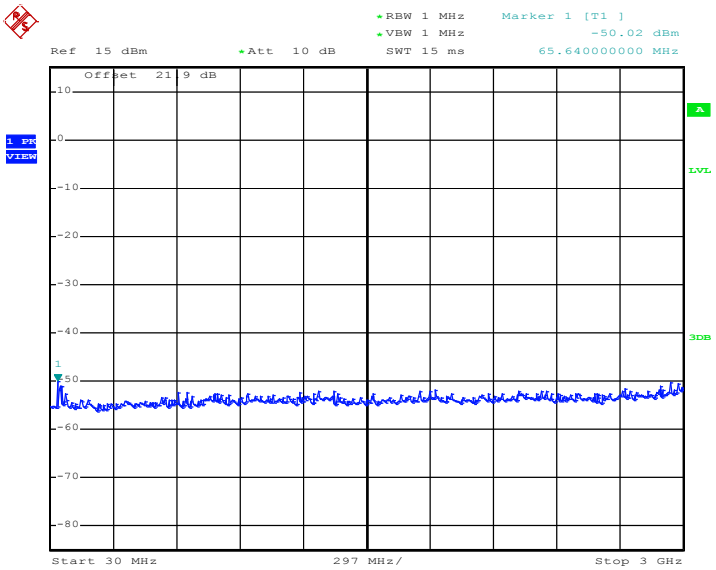
Mode 2 : Spurious Emission Plot between

802.11a 13.6 GHz ~ 40 GHz



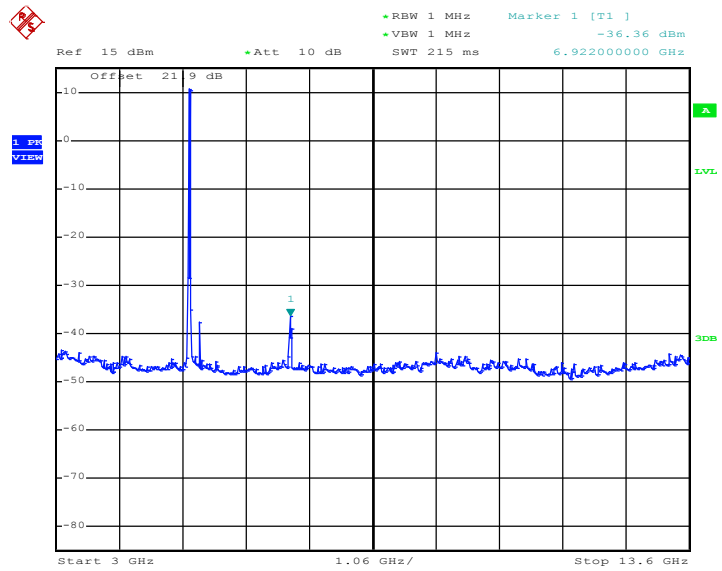
Mode 3 : Spurious Emission Plot between

802.11a 30 MHz ~ 3 GHz



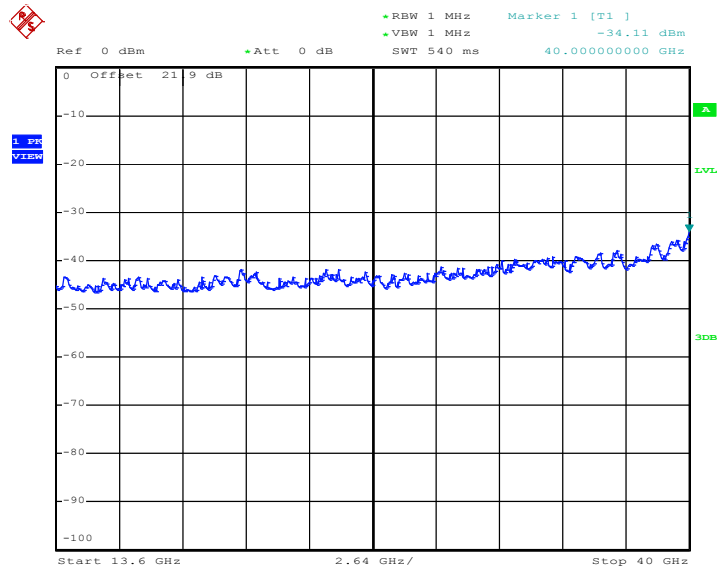
Mode 3 : Spurious Emission Plot between

802.11a 3 GHz ~ 13.6 GHz



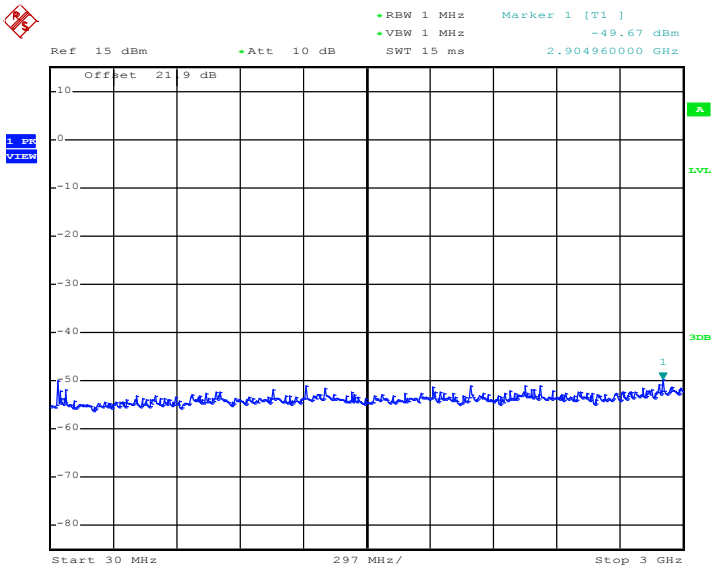
Mode 3 : Spurious Emission Plot between

802.11a 13.6 GHz ~ 40 GHz



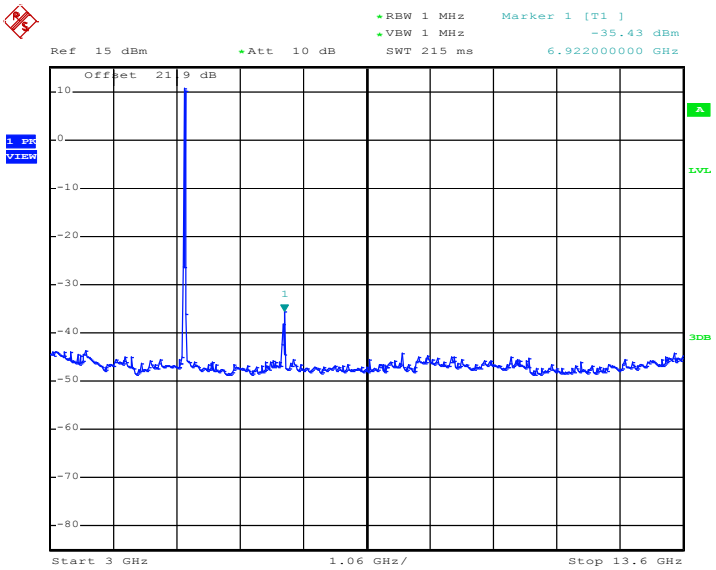
Mode 4 : Spurious Emission Plot between

802.11a 30 MHz ~ 3 GHz



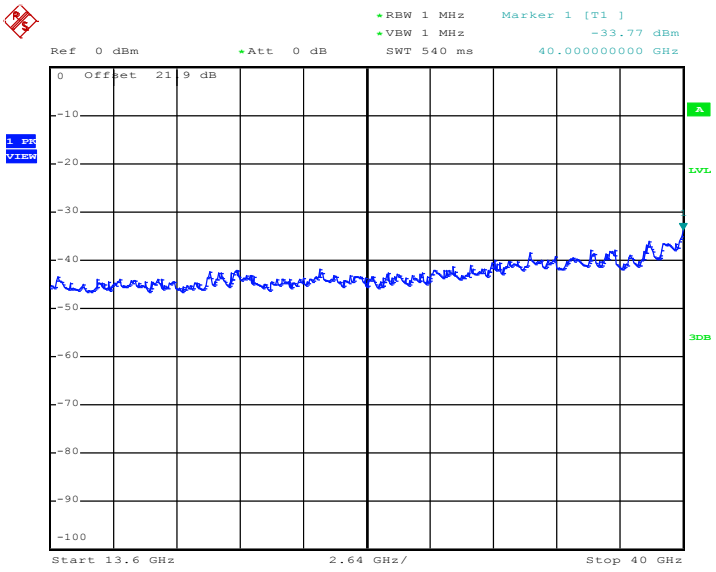
Mode 4 : Spurious Emission Plot between

802.11a 3 GHz ~ 13.6 GHz



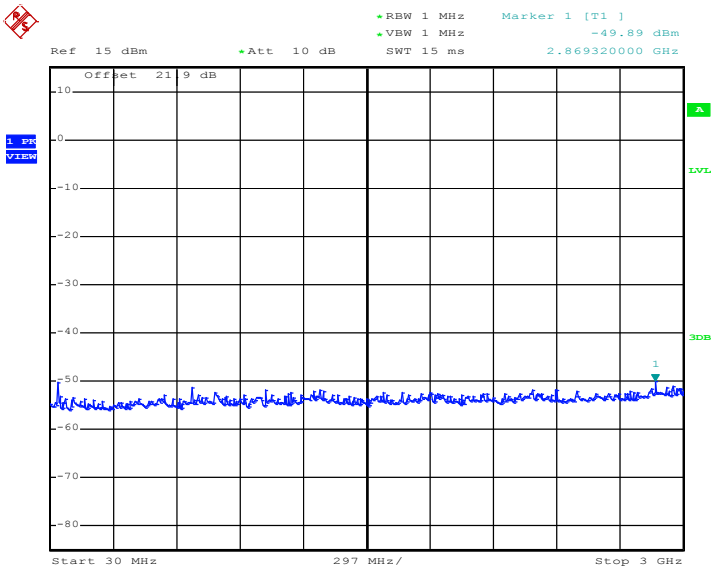
Mode 4 : Spurious Emission Plot between

802.11a 13.6 GHz ~ 40 GHz



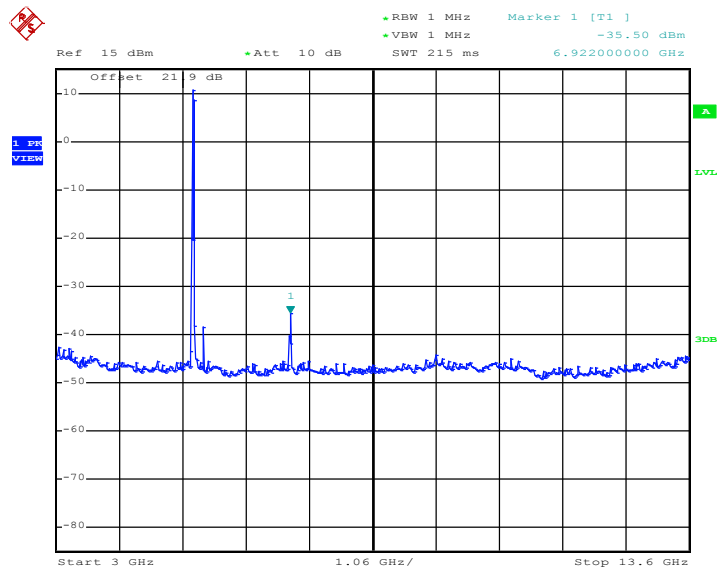
Mode 5 : Spurious Emission Plot between

802.11a 30 MHz ~ 3 GHz



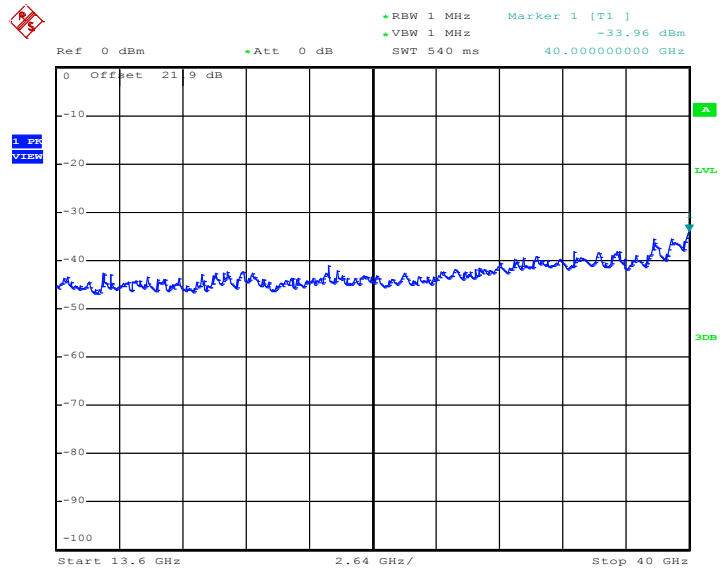
Mode 5 : Spurious Emission Plot between

802.11a 3 GHz ~ 13.6 GHz



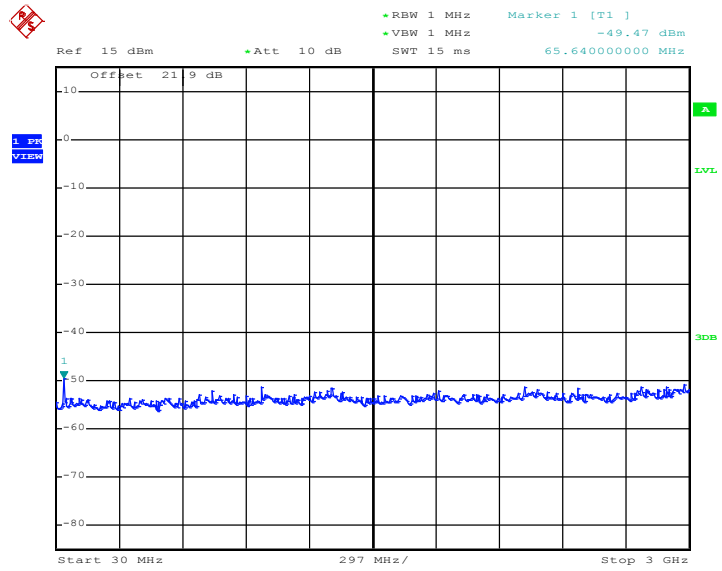
Mode 5 : Spurious Emission Plot between

802.11a 13.6 GHz ~ 40 GHz



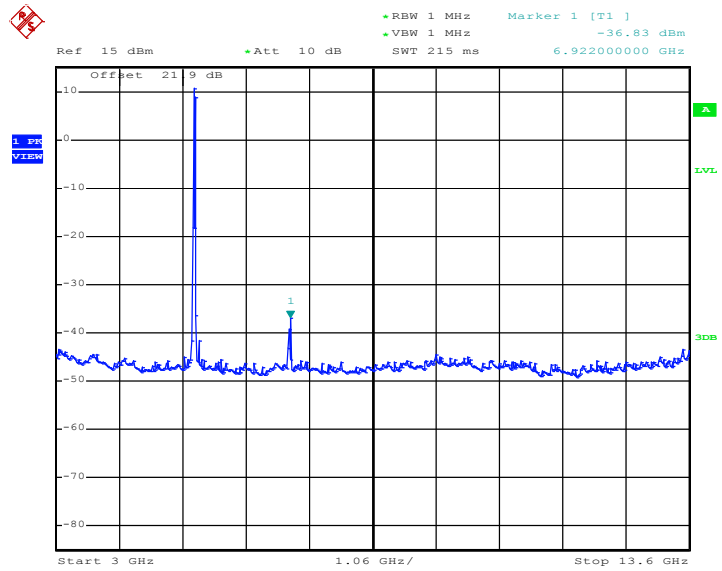
Mode 6 : Spurious Emission Plot between

802.11a 30 MHz ~ 3 GHz



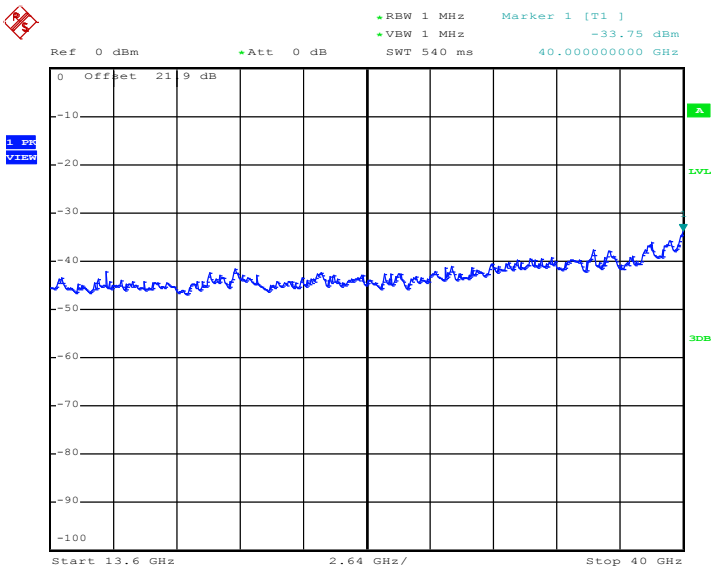
Mode 6 : Spurious Emission Plot between

802.11a 3 GHz ~ 13.6 GHz



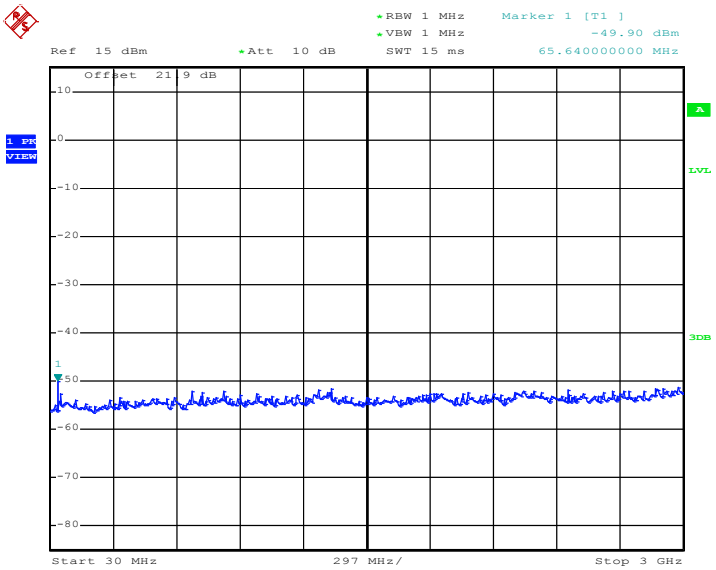
Mode 6 : Spurious Emission Plot between

802.11a 13.6 GHz ~ 40 GHz



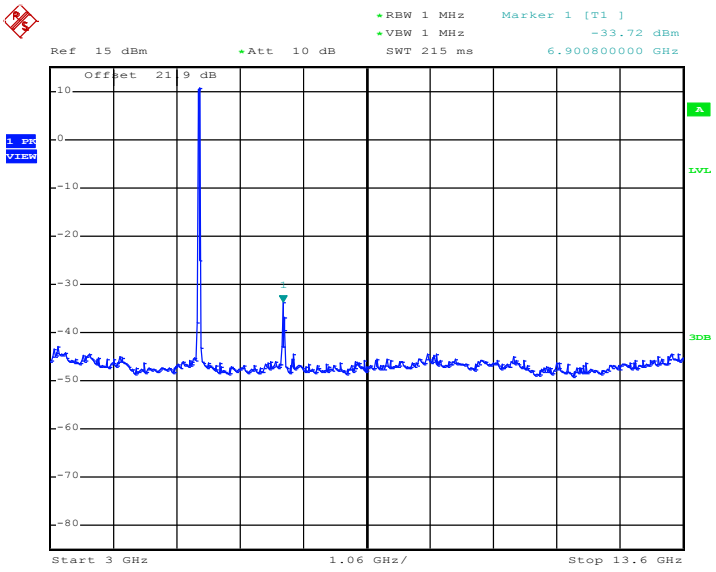
Mode 7 : Spurious Emission Plot between

802.11a 30 MHz ~ 3 GHz



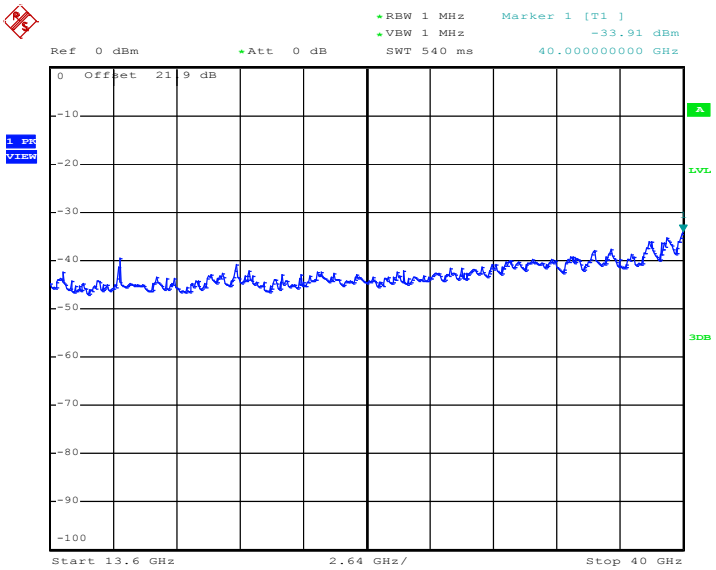
Mode 7 : Spurious Emission Plot between

802.11a 3 GHz ~ 13.6 GHz



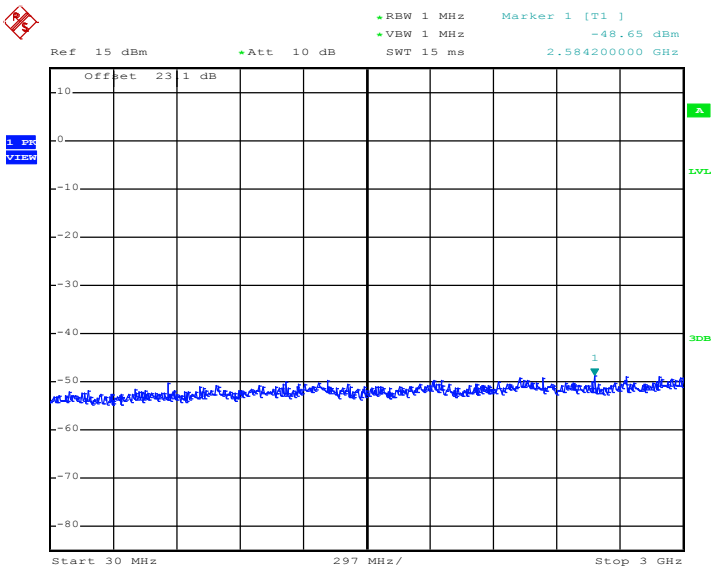
Mode 7 : Spurious Emission Plot between

802.11a 13.6 GHz ~ 40 GHz



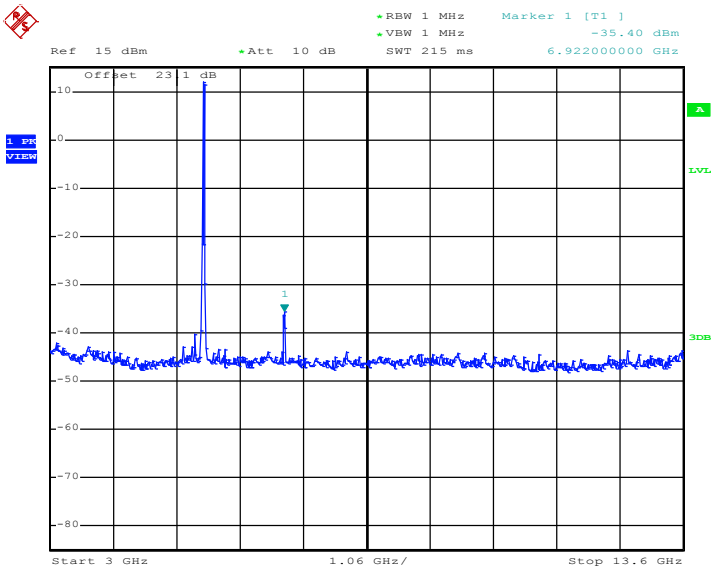
Mode 8 : Spurious Emission Plot between

802.11a 30 MHz ~ 3 GHz



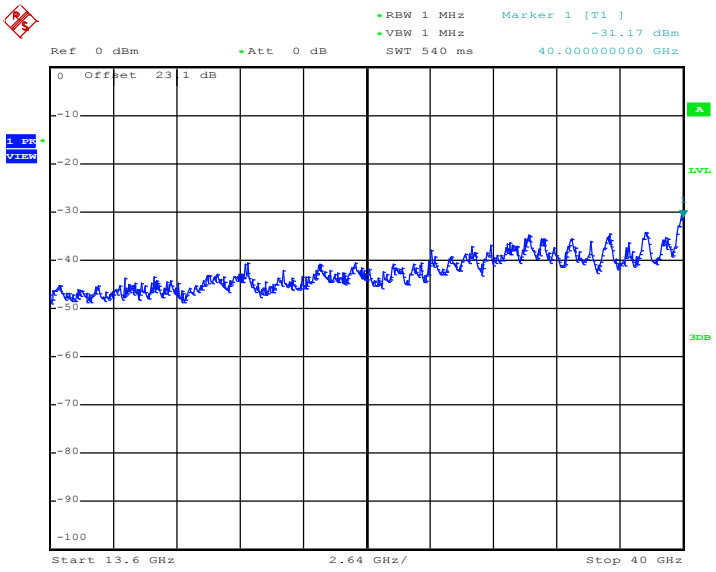
Mode 8 : Spurious Emission Plot between

802.11a 3 GHz ~13.6 GHz



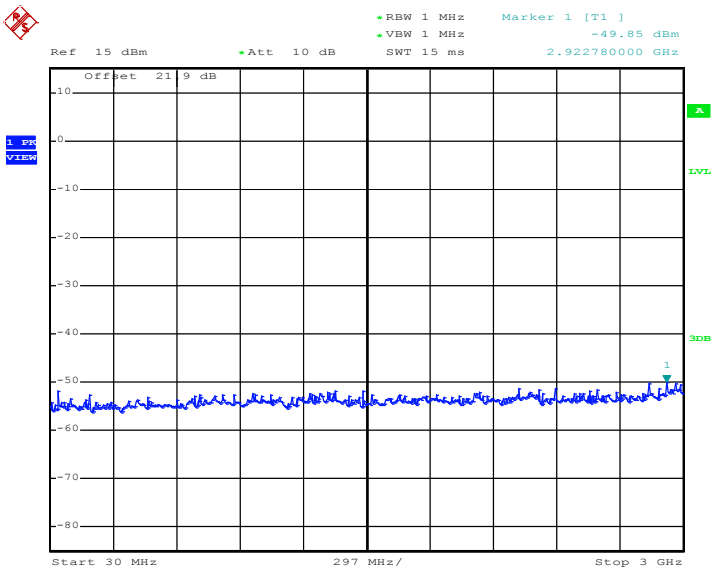
Mode 8 : Spurious Emission Plot between

802.11a 13.6 GHz ~ 40 GHz



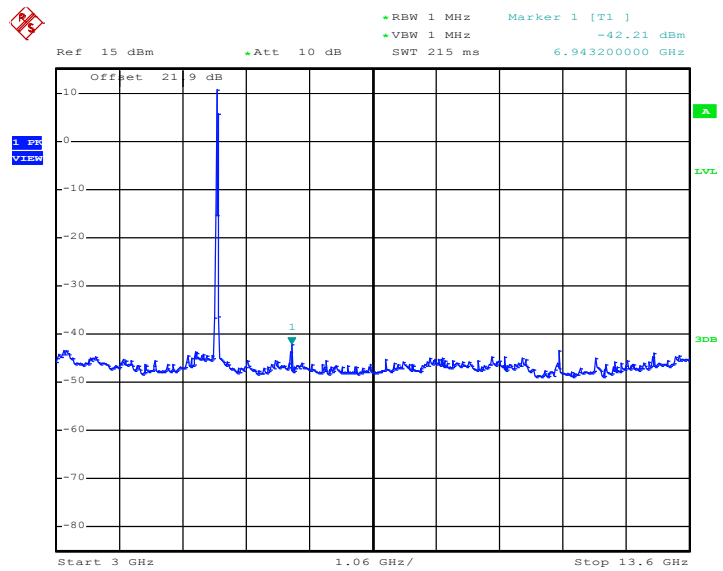
Mode 9 : Spurious Emission Plot between

802.11a 30 MHz ~ 3 GHz



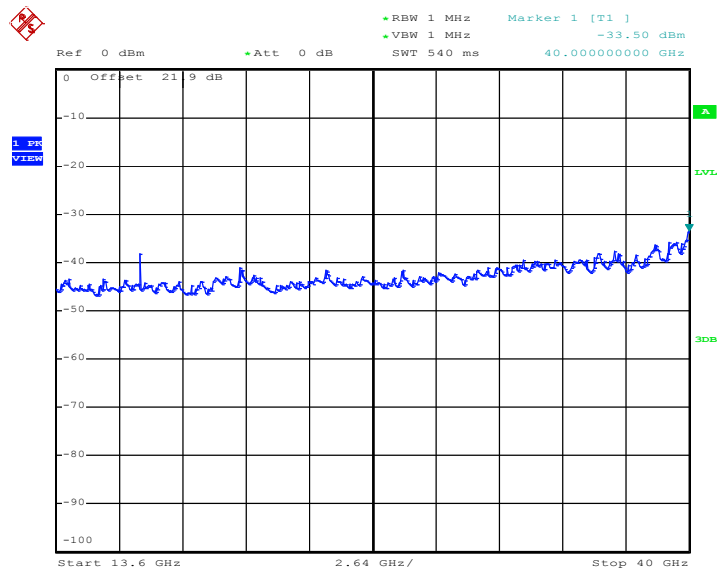
Mode 9 : Spurious Emission Plot between

802.11a 3 GHz ~ 13.6 GHz



Mode 9 : Spurious Emission Plot between

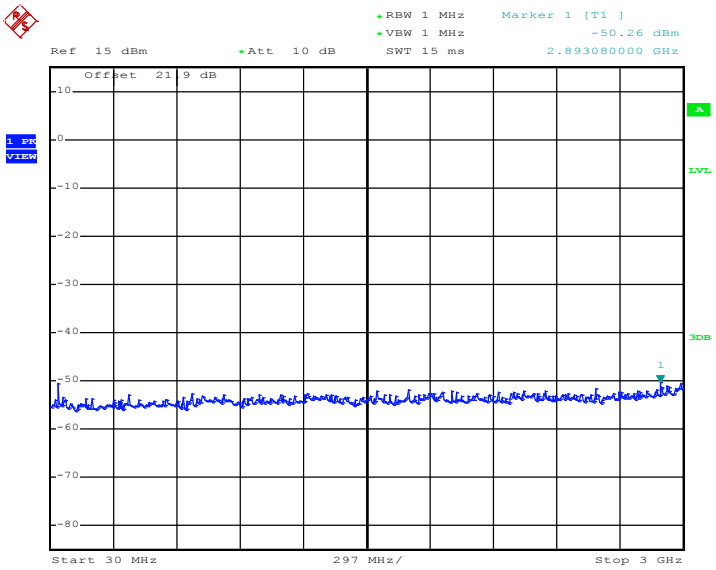
802.11a 13.6 GHz ~ 40 GHz



Test Mode :	Mode 10~18	**Temperature :**	24~26℃
Test Band :	802.11n (BW 20MHz)	**Relative Humidity :**	45~49%
Test Channel :	36, 44, 48, 52, 60, 64, 100, 116, 140	**Test Engineer :**	Alan Liu

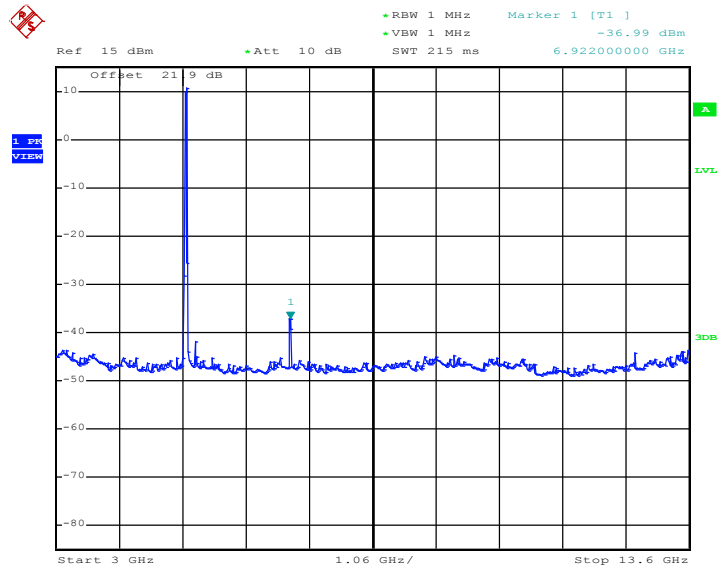
Mode 10 :Spurious Emission Plot between

802.11n (BW 20MHz) 30 MHz ~ 3 GHz



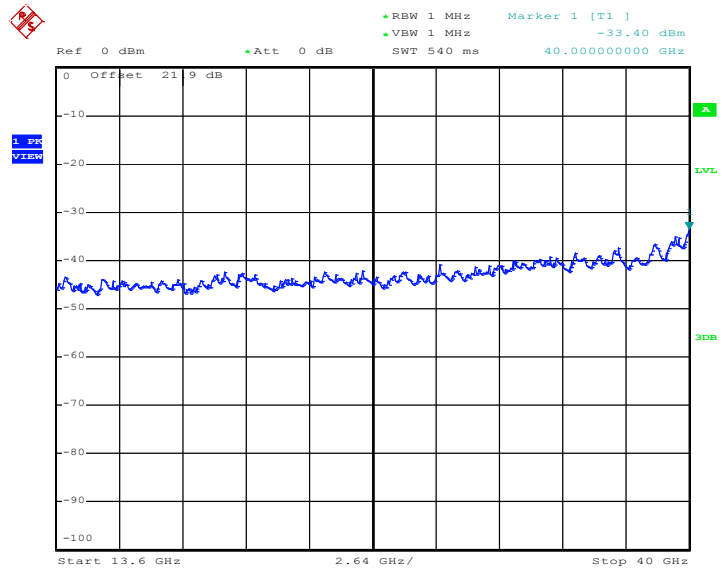
Mode 10 :Spurious Emission Plot between

802.11n (BW 20MHz) 3 GHz ~ 13.6 GHz



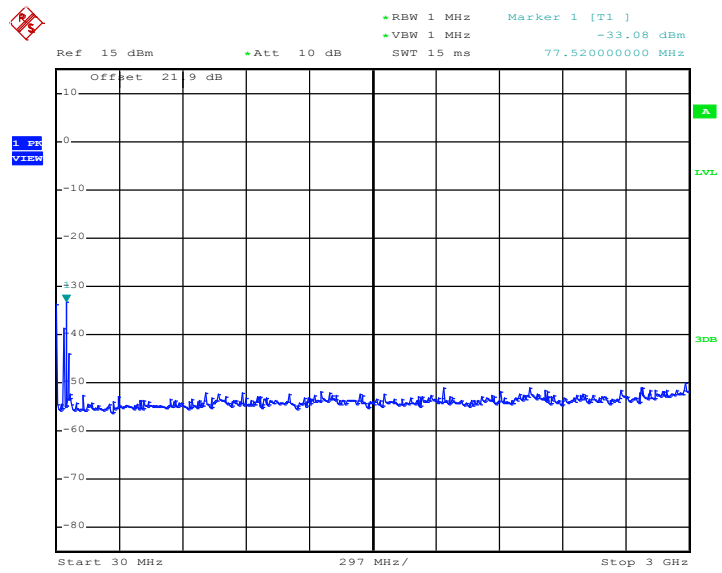
Mode 10 :Spurious Emission Plot between

802.11n (BW 20MHz) 13.6 GHz ~ 40 GHz



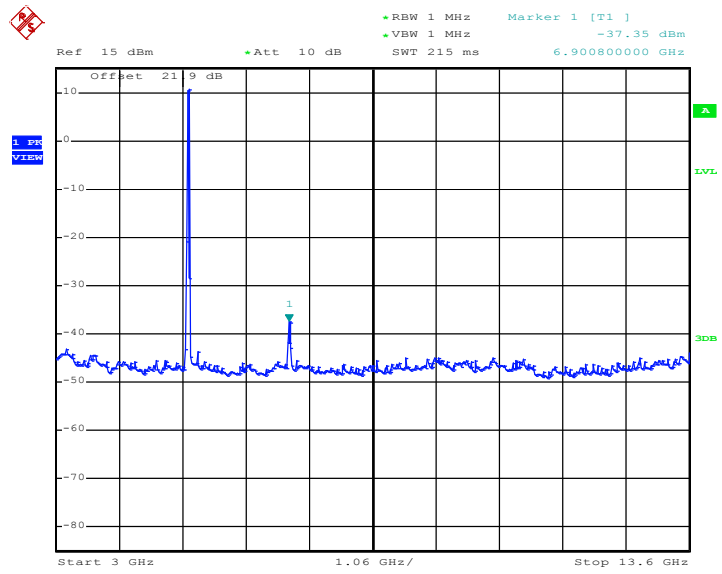
Mode 11 :Spurious Emission Plot between

802.11n (BW 20MHz) 30 MHz ~ 3 GHz



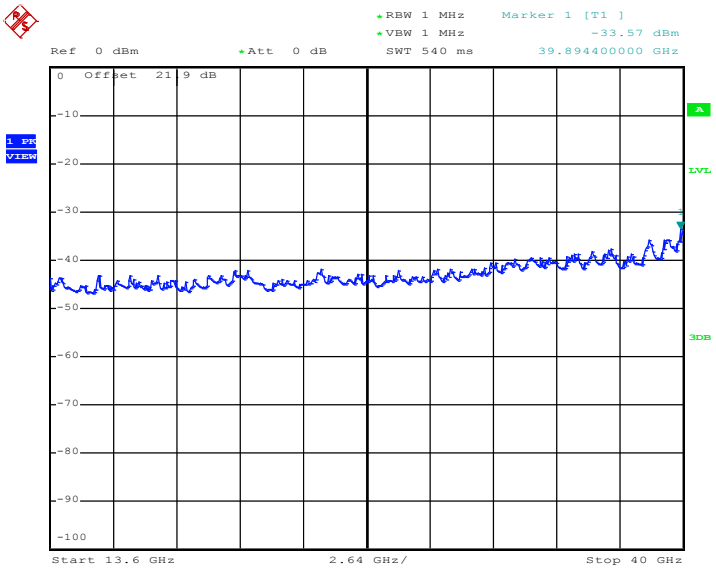
Mode 11 :Spurious Emission Plot between

802.11n (BW 20MHz) 3 GHz ~ 13.6 GHz



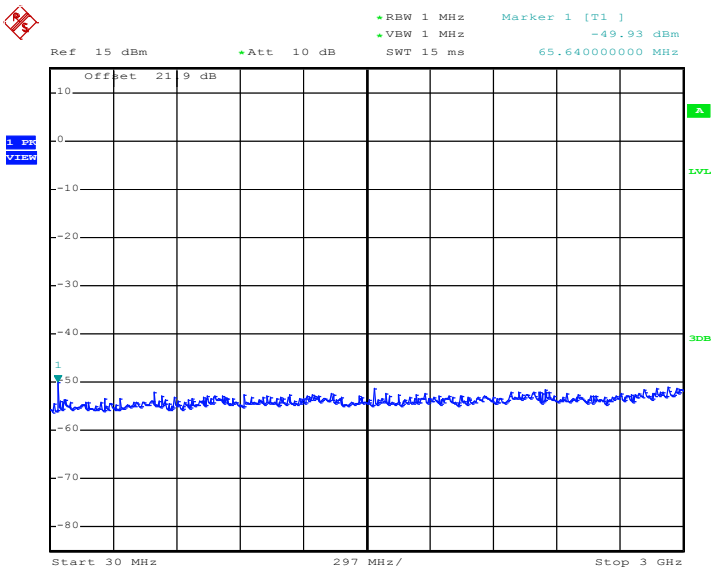
Mode 11 :Spurious Emission Plot between

802.11n (BW 20MHz) 13.6 GHz ~ 40 GHz



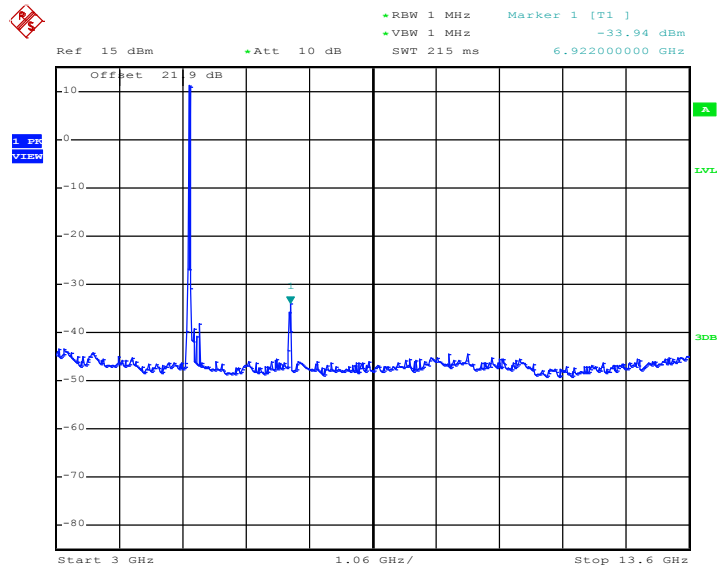
Mode 12 :Spurious Emission Plot between

802.11n (BW 20MHz) 30 MHz ~ 3 GHz



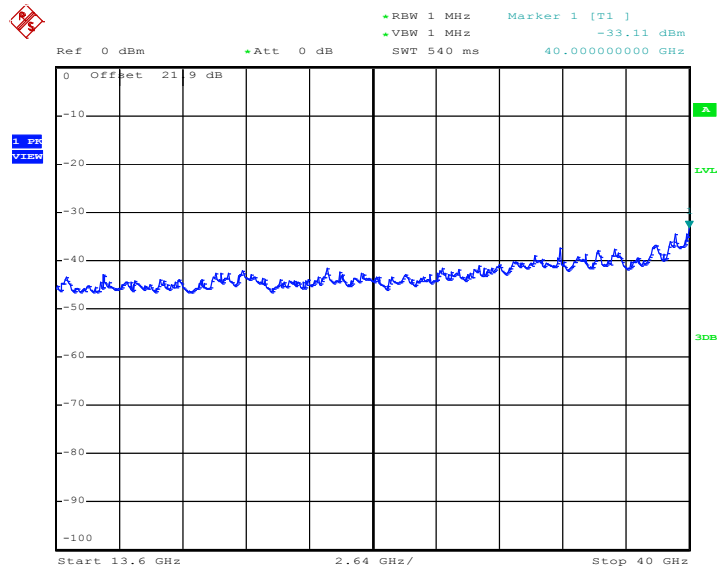
Mode 12 :Spurious Emission Plot between

802.11n (BW 20MHz) 3 GHz ~ 13.6 GHz



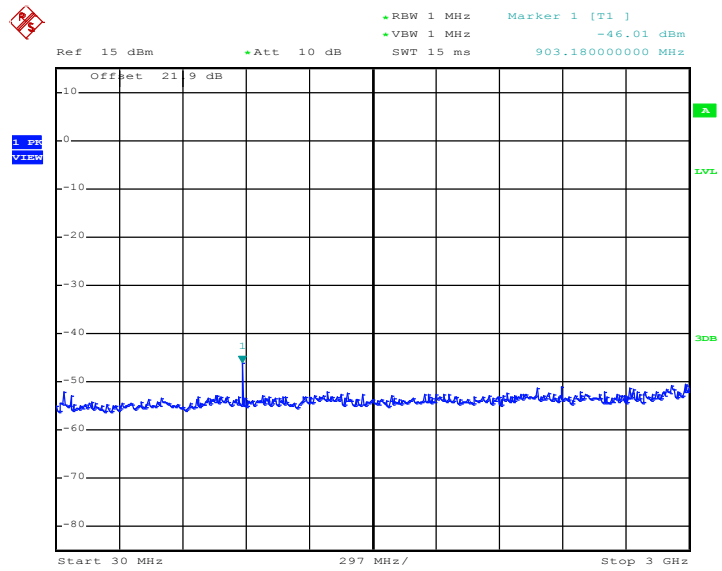
Mode 12 :Spurious Emission Plot between

802.11n (BW 20MHz) 13.6 GHz ~ 40 GHz



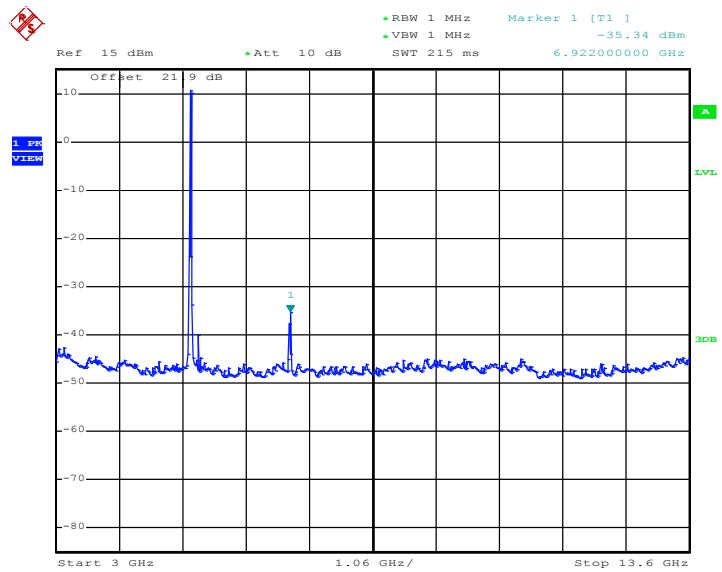
Mode 13 :Spurious Emission Plot between

802.11n (BW 20MHz) 30 MHz ~ 3 GHz



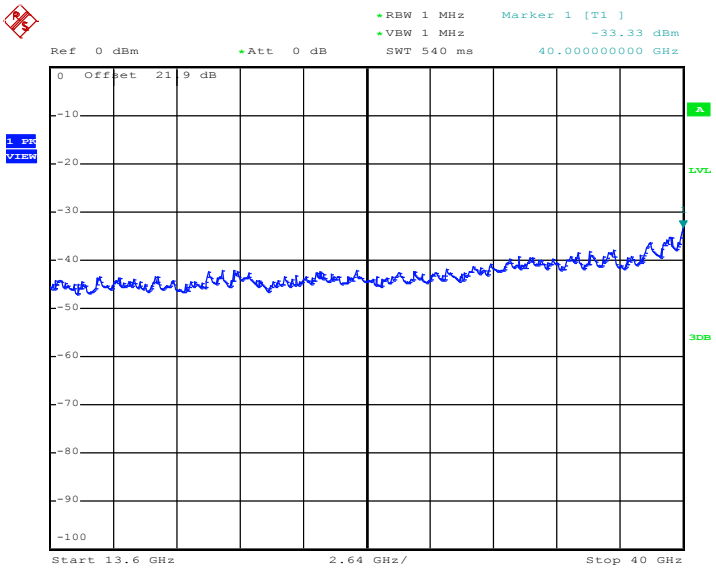
Mode 13 :Spurious Emission Plot between

802.11n (BW 20MHz) 3 GHz ~ 13.6 GHz



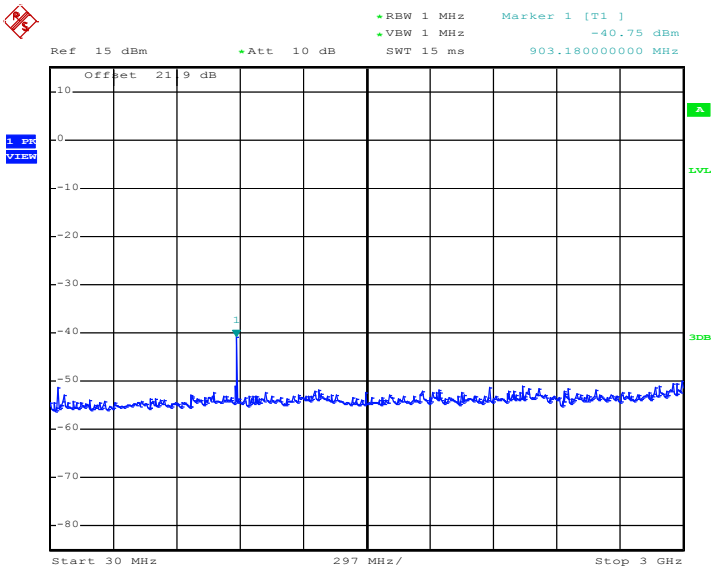
Mode 13 :Spurious Emission Plot between

802.11n (BW 20MHz) 13.6 GHz ~ 40 GHz



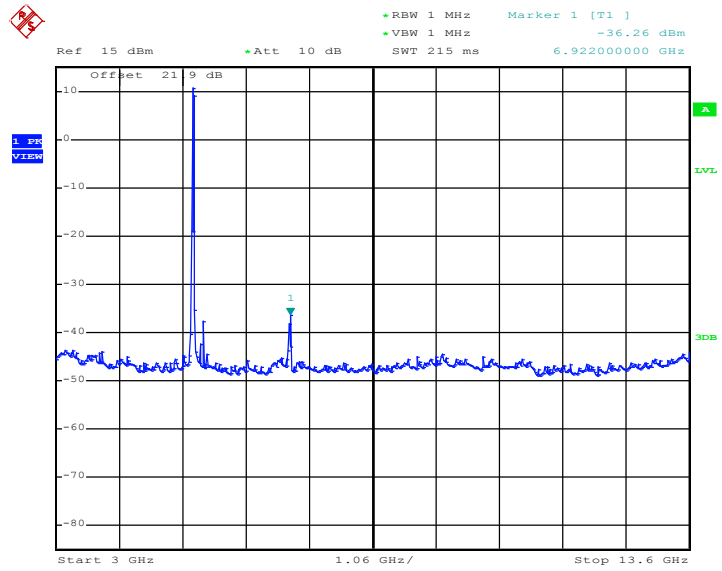
Mode 14 :Spurious Emission Plot between

802.11n (BW 20MHz) 30 MHz ~ 3 GHz



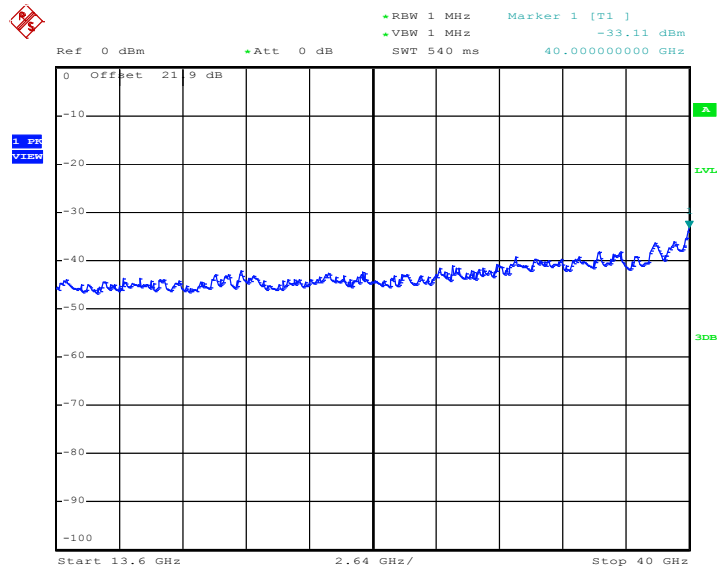
Mode 14 :Spurious Emission Plot between

802.11n (BW 20MHz) 3 GHz ~ 13.6 GHz



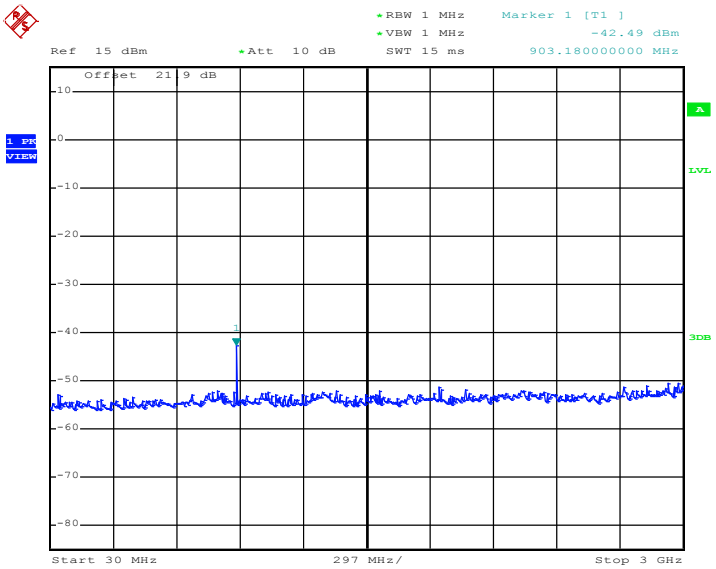
Mode 14 :Spurious Emission Plot between

802.11n (BW 20MHz) 13.6 GHz ~ 40 GHz



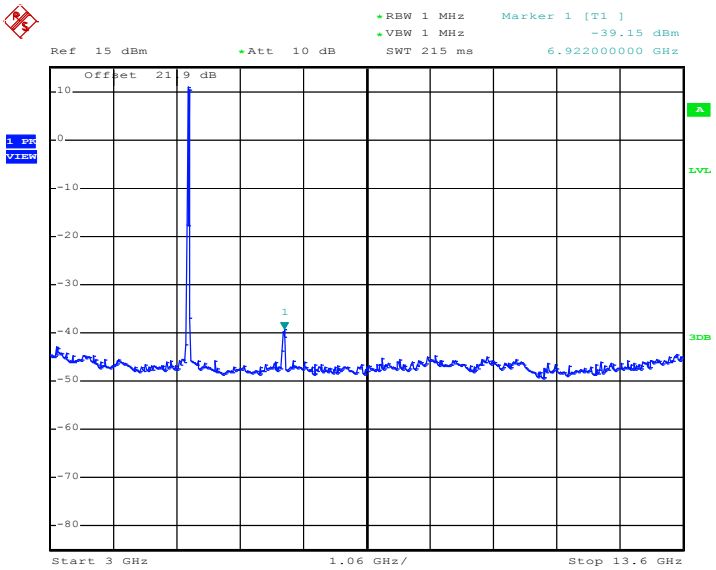
Mode 15 :Spurious Emission Plot between

802.11n (BW 20MHz) 30 MHz ~ 3 GHz



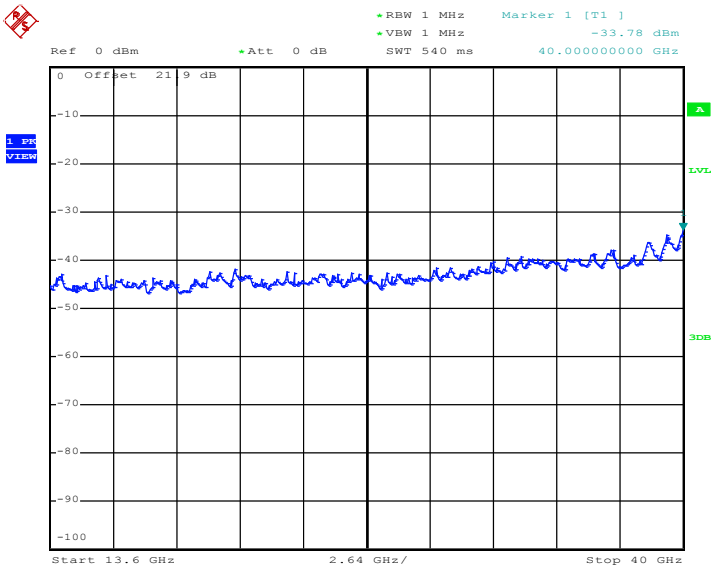
Mode 15 :Spurious Emission Plot between

802.11n (BW 20MHz) 3 GHz ~ 13.6 GHz



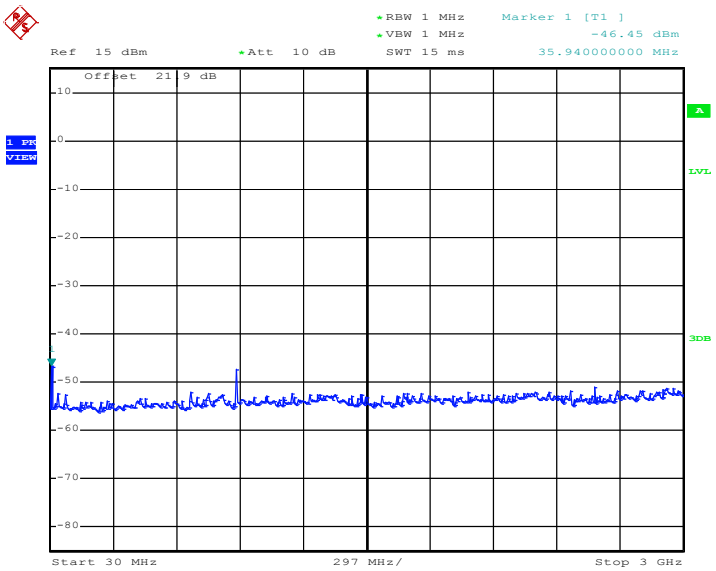
Mode 15 :Spurious Emission Plot between

802.11n (BW 20MHz) 13.6 GHz ~ 40 GHz



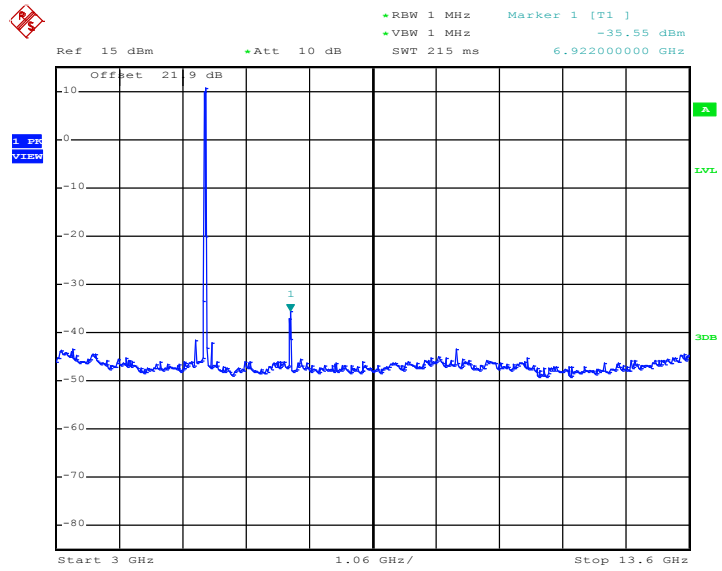
Mode 16 :Spurious Emission Plot between

802.11n (BW 20MHz) 30 MHz ~ 3 GHz



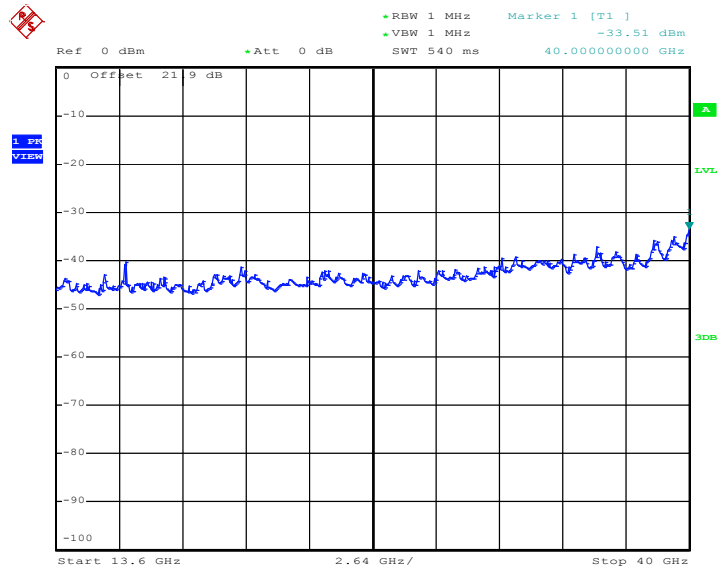
Mode 16 :Spurious Emission Plot between

802.11n (BW 20MHz) 3 GHz ~ 13.6 GHz



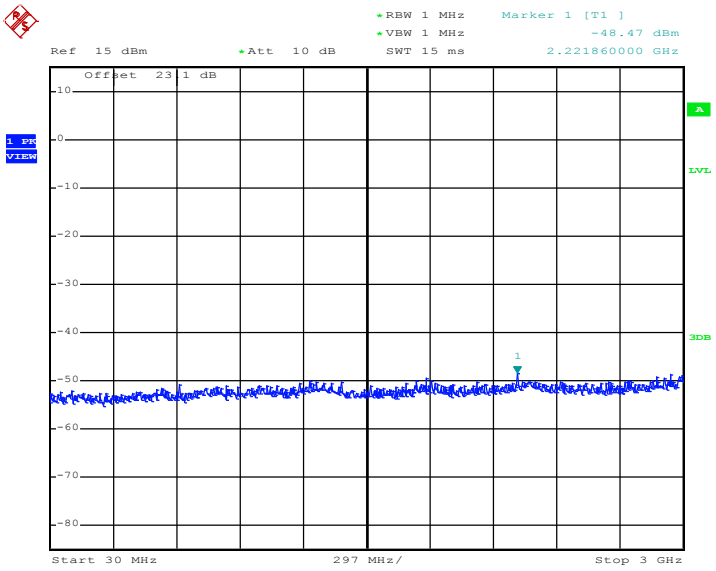
Mode 16 :Spurious Emission Plot between

802.11n (BW 20MHz) 13.6 GHz ~ 40 GHz



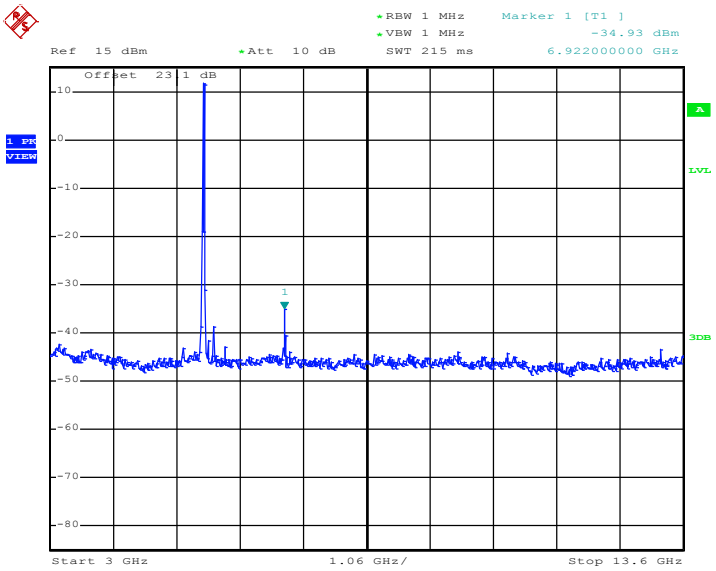
Mode 17 :Spurious Emission Plot between

802.11n (BW 20MHz) 30 MHz ~ 3 GHz



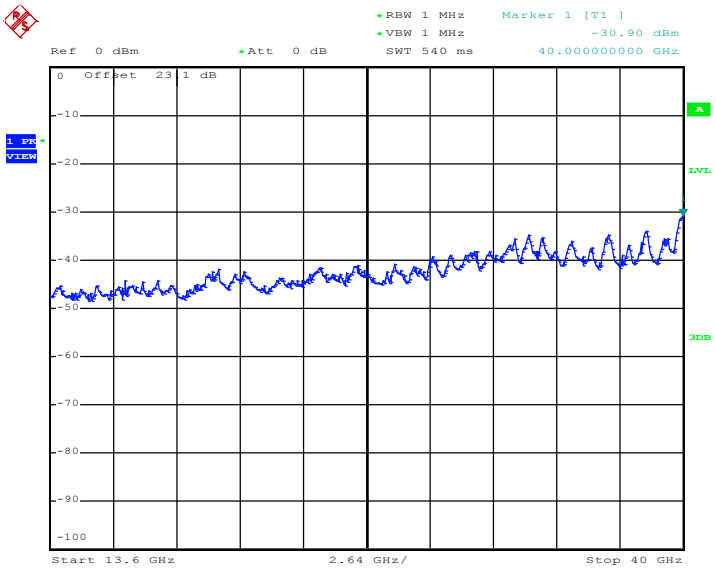
Mode 17 :Spurious Emission Plot between

802.11n (BW 20MHz) 3 GHz ~ 13.6 GHz



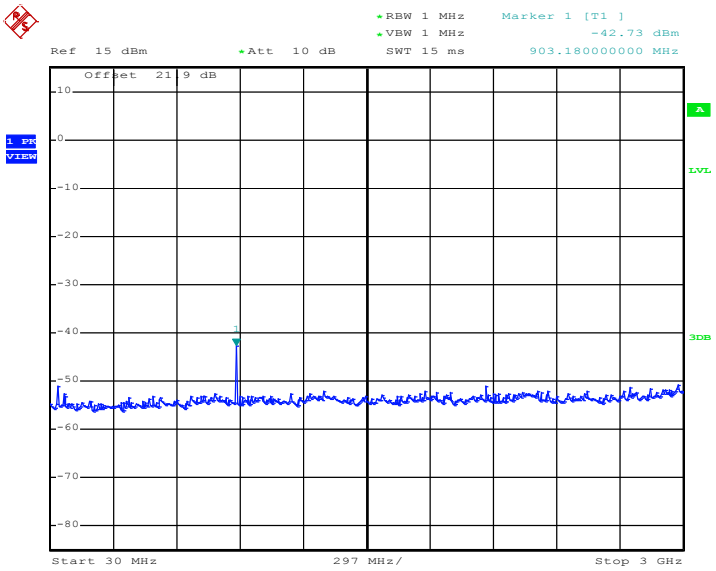
Mode 17 :Spurious Emission Plot between

802.11n (BW 20MHz) 13.6 GHz ~ 40 GHz



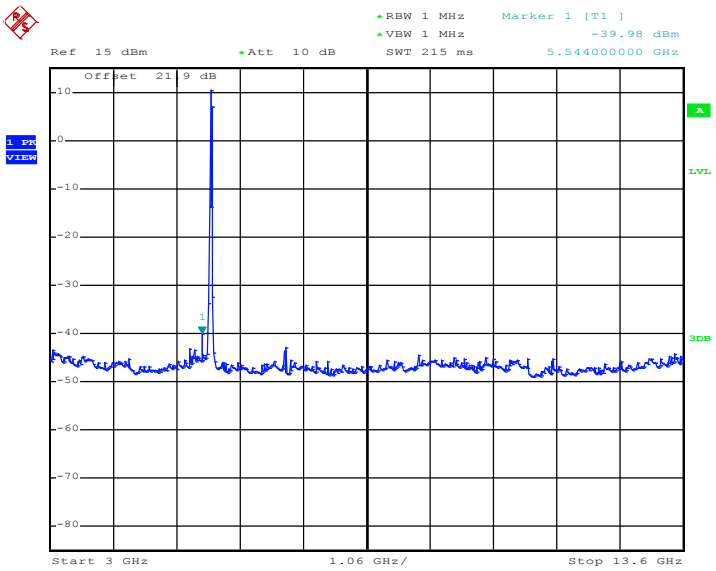
Mode 18 :Spurious Emission Plot between

802.11n (BW 20MHz) 30 MHz ~ 3 GHz



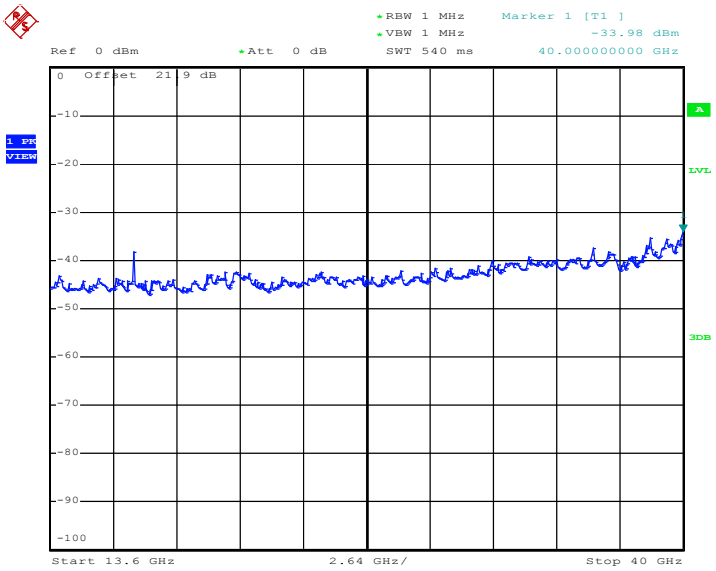
Mode 18 :Spurious Emission Plot between

802.11n (BW 20MHz) 3 GHz ~ 13.6 GHz



Mode 18 :Spurious Emission Plot between

802.11n (BW 20MHz) 13.6 GHz ~ 40 GHz



3.6 AC Conducted Emission Measurement

3.6.1 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 (dBuV)	
	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.

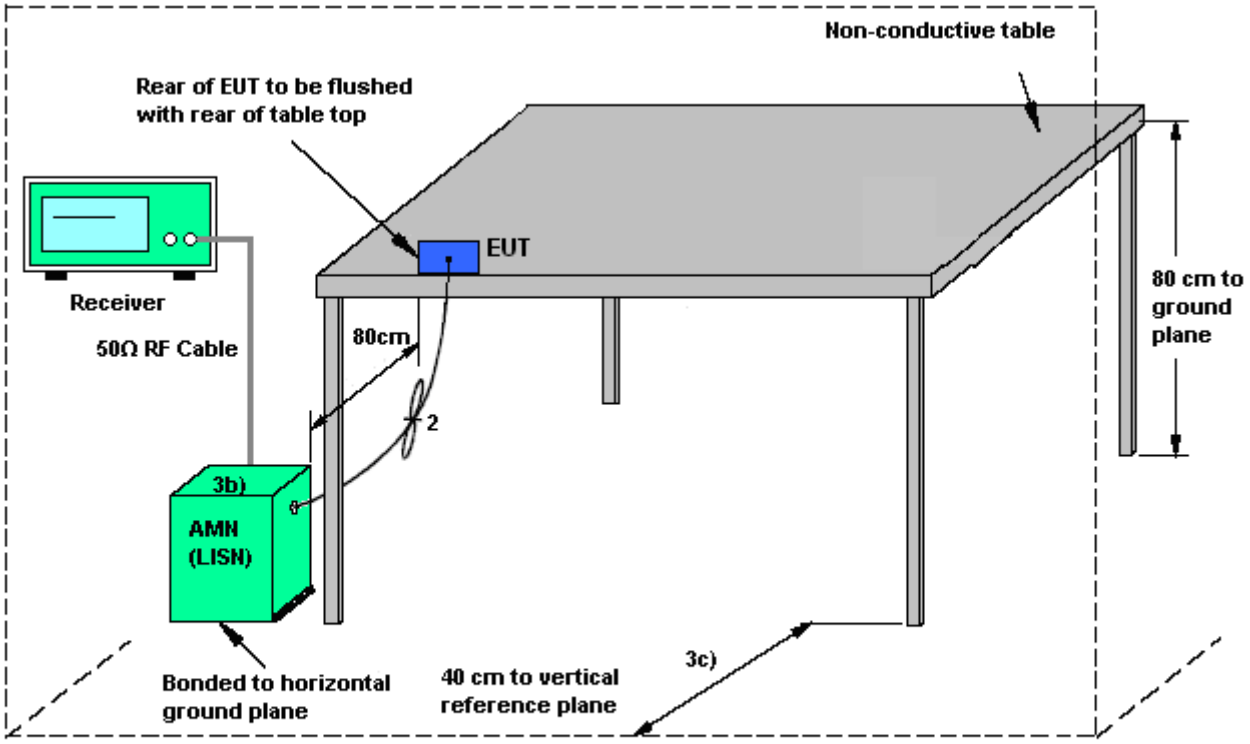
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

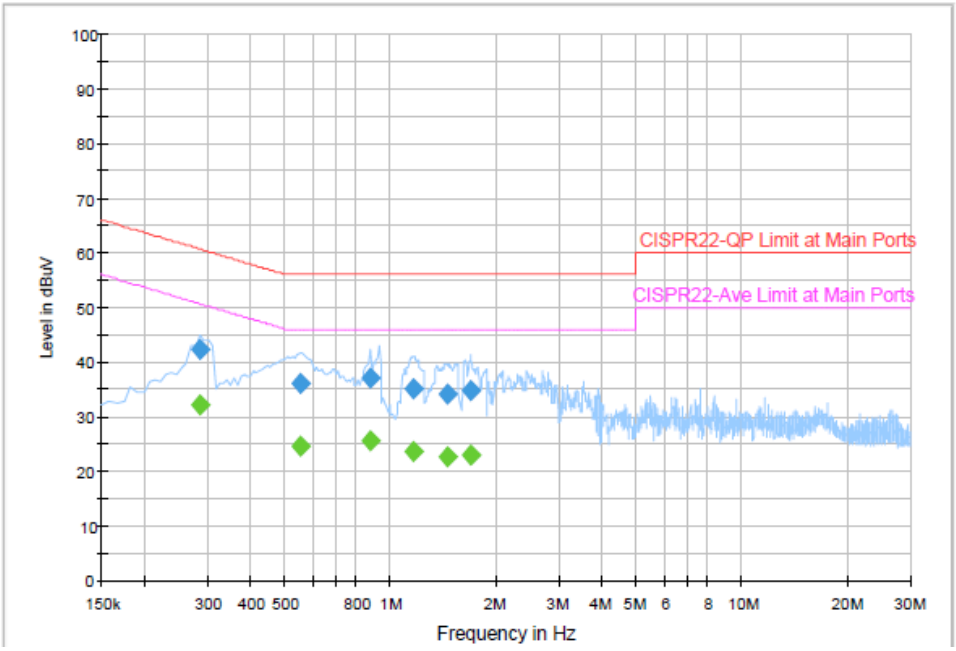
1. Please follow the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	**Temperature :**	21~23℃
Test Engineer :	Kai-Chun Chu	**Relative Humidity :**	42~44%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	Bluetooth Link + WLAN (5G) Link + GPS Rx + Scanner + Cradle + Adapter + RS232 Terminal + USB Cable (Link with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



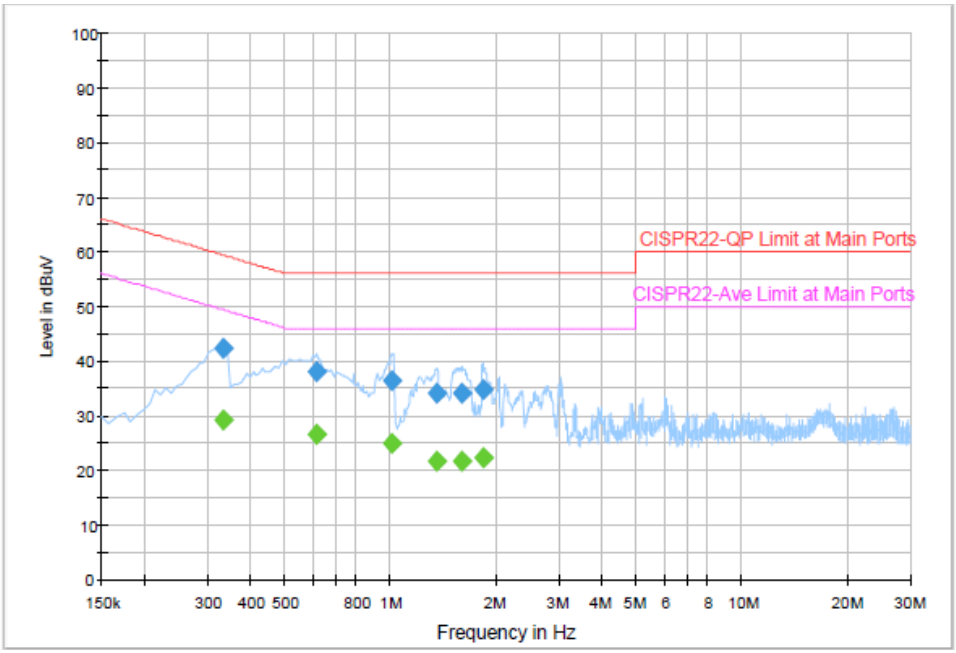
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.286000	42.2	Off	L1	19.4	18.4	60.6
0.550000	36.0	Off	L1	19.4	20.0	56.0
0.870000	37.1	Off	L1	19.5	18.9	56.0
1.158000	35.1	Off	L1	19.4	20.9	56.0
1.454000	34.2	Off	L1	19.4	21.8	56.0
1.686000	34.8	Off	L1	19.4	21.2	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.286000	32.1	Off	L1	19.4	18.5	50.6
0.550000	24.5	Off	L1	19.4	21.5	46.0
0.870000	25.7	Off	L1	19.5	20.3	46.0
1.158000	23.7	Off	L1	19.4	22.3	46.0
1.454000	22.6	Off	L1	19.4	23.4	46.0
1.686000	22.9	Off	L1	19.4	23.1	46.0

Test Mode :	Mode 1	**Temperature :**	21~23℃
Test Engineer :	Kai-Chun Chu	**Relative Humidity :**	42~44%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	Bluetooth Link + WLAN (5G) Link + GPS Rx + Scanner + Cradle + Adapter + RS232 Terminal + USB Cable (Link with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.334000	42.2	Off	N	19.4	17.2	59.4
0.614000	38.0	Off	N	19.4	18.0	56.0
1.006000	36.4	Off	N	19.5	19.6	56.0
1.350000	34.2	Off	N	19.5	21.8	56.0
1.598000	34.2	Off	N	19.5	21.8	56.0
1.830000	34.8	Off	N	19.5	21.2	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.334000	29.1	Off	N	19.4	20.3	49.4
0.614000	26.5	Off	N	19.4	19.5	46.0
1.006000	24.8	Off	N	19.5	21.2	46.0
1.350000	21.5	Off	N	19.5	24.5	46.0
1.598000	21.6	Off	N	19.5	24.4	46.0
1.830000	22.3	Off	N	19.5	23.7	46.0

3.7 Radiated Emission Measurement

3.7.1 Limit of Radiated Emission

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209.

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

(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.

(2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band.

(3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(4) The provisions of Section 15.205 Restricted bands of operation of this part apply to intentional radiators operating under this section.

Note: The following formula is used to convert the EIRP to field strength.

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

EIRP (dBm)	Field Strength at 3m (dBuV/m)
- 27	68.3

3.7.2 Measuring Instruments

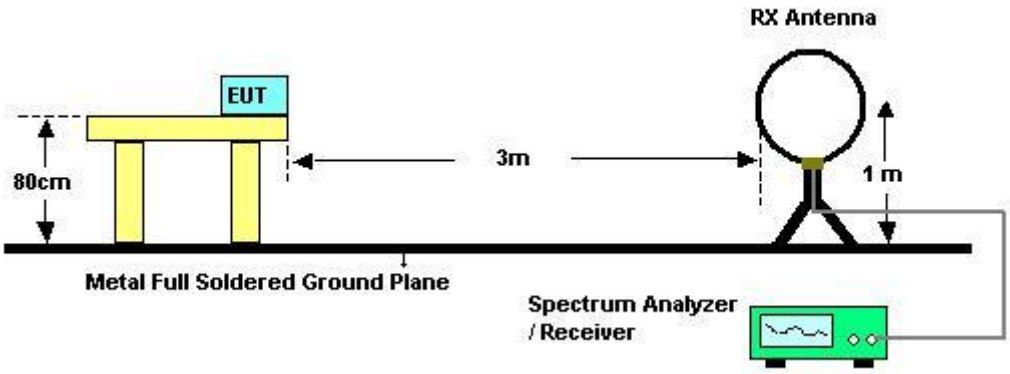
See list of measuring instruments of this test report.

3.7.3 Test Procedures

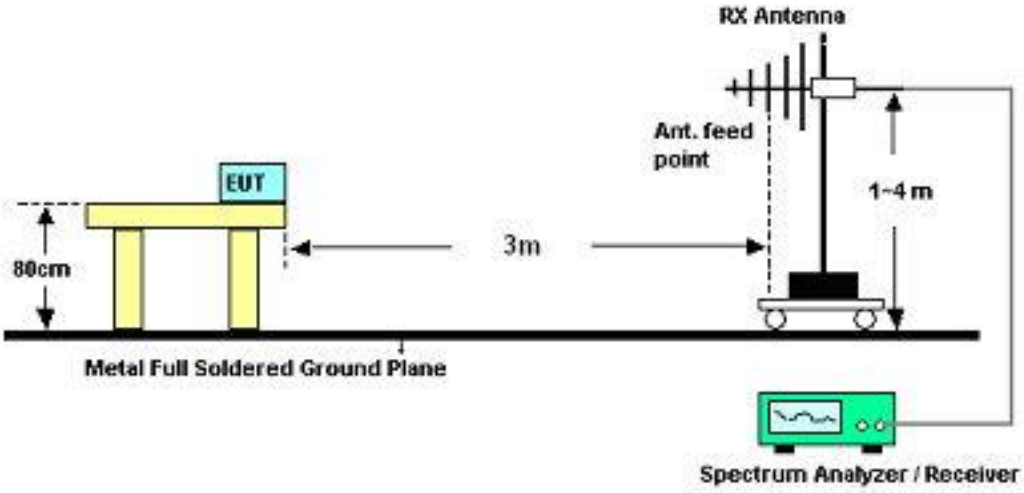
1. The testing follows the guidelines in FCC Public Notice DA 02-2138, (Measurement Guidelines of UNII)
2. The EUT was placed on a rotatable table top 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest radiation.
5. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
6. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
7. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
8. For testing below 1GHz, If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the quasi-peak method and reported.
9. 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 testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.7.4 Test Setup

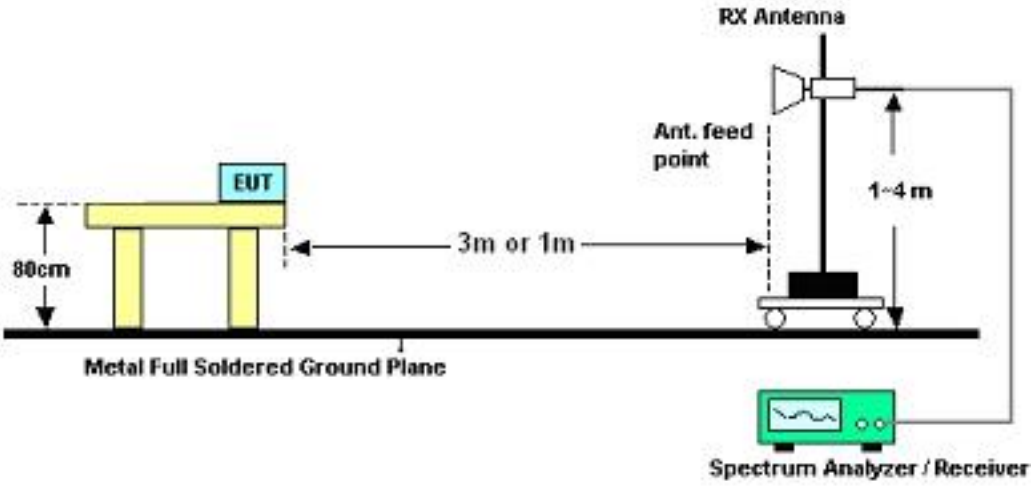
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

Temperature	23~24°C	Humidity	45~46%
Test Engineer	Kai Wang		

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

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

Test Mode :	Mode 1	**Temperature :**	23~24°C
Test Channel :	64	**Relative Humidity :**	45~46%
Test Engineer :	Kai Wang	**Polarization :**	Horizontal
Remark :	5320 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
42.69	22.88	-17.12	40	42.52	11.25	0.81	31.7	-	-	Peak
180.39	29.53	-13.97	43.5	50.22	9.44	1.56	31.69	-	-	Peak
294.33	35.06	-10.94	46	51.29	13.38	2.04	31.65	-	-	Peak
332.9	37.16	-8.84	46	52.35	14.22	2.17	31.58	100	32	Peak
402.9	28.83	-17.17	46	42.39	15.82	2.42	31.8	-	-	Peak
920.2	29.86	-16.14	46	35.78	21.72	3.77	31.41	-	-	Peak
5150	56.09	-17.91	74	47.23	34.42	8.25	33.81	164	268	Peak
5150	39.17	-14.83	54	30.31	34.42	8.25	33.81	164	268	Average
5320	111.9	-	-	102.75	34.55	8.44	33.84	164	268	Peak
5320	101.67	-	-	92.52	34.55	8.44	33.84	164	268	Average
5350	64.4	-9.6	74	55.2	34.58	8.47	33.85	164	268	Peak
5350	47.73	-6.27	54	38.53	34.58	8.47	33.85	164	268	Average

Test Mode :	Mode 1	Temperature :	23~24°C
Test Channel :	64	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	5320 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
38.64	33.04	-6.96	40	50.67	13.27	0.8	31.7	100	129	Peak
56.19	30.42	-9.58	40	54.07	7.11	0.91	31.67	-	-	Peak
134.49	34.48	-9.02	43.5	53.18	11.59	1.41	31.7	-	-	Peak
313.3	32.11	-13.89	46	47.86	13.77	2.11	31.63	-	-	Peak
460.3	30.57	-15.43	46	42.87	17.01	2.54	31.85	-	-	Peak
890.8	29.41	-16.59	46	35.79	21.55	3.72	31.65	-	-	Peak
5150	52.79	-21.21	74	43.93	34.42	8.25	33.81	148	357	Peak
5150	38.4	-15.6	54	29.54	34.42	8.25	33.81	148	357	Average
5320	109.49	-	-	100.34	34.55	8.44	33.84	148	357	Peak
5320	99.31	-	-	90.16	34.55	8.44	33.84	148	357	Average
5350	62.3	-11.7	74	53.1	34.58	8.47	33.85	148	357	Peak
5350	44.46	-9.54	54	35.26	34.58	8.47	33.85	148	357	Average

3.8 Peak Excursion Ratio Measurement

3.8.1 Limit of Peak Excursion Ratio

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

3.8.3 Test Procedures

The transmitter output of EUT is connected to the spectrum analyzer, and the cable loss is offset as shown in the test equipment.

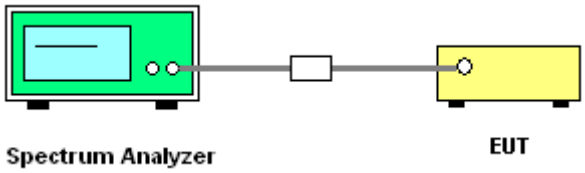
1st Trace :

• Set RBW =1 MHz, VBW ≥ 3 MHz with peak detector and max-hold settings

2nd Trace:

• Set RBW = 1 MHz, VBW ≥ 3 MHz, sample detector mode, and 100 sweets of power averaging as same as method 1 of conducted power measurement.

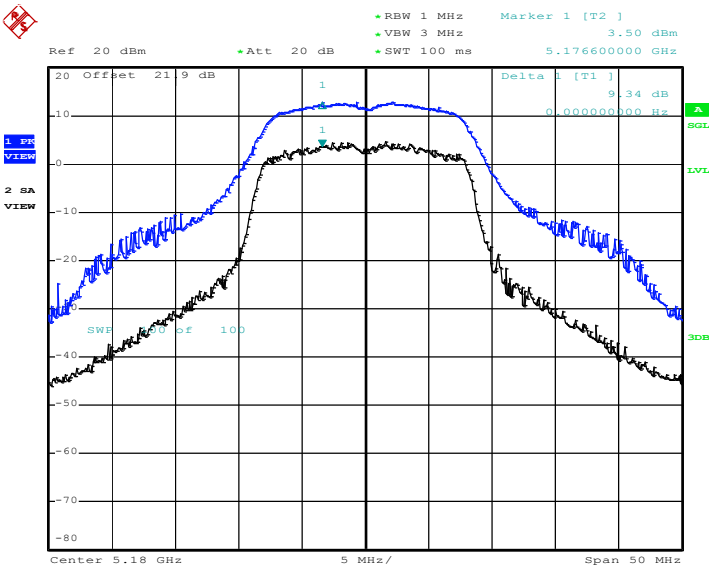
3.8.4 Test Setup



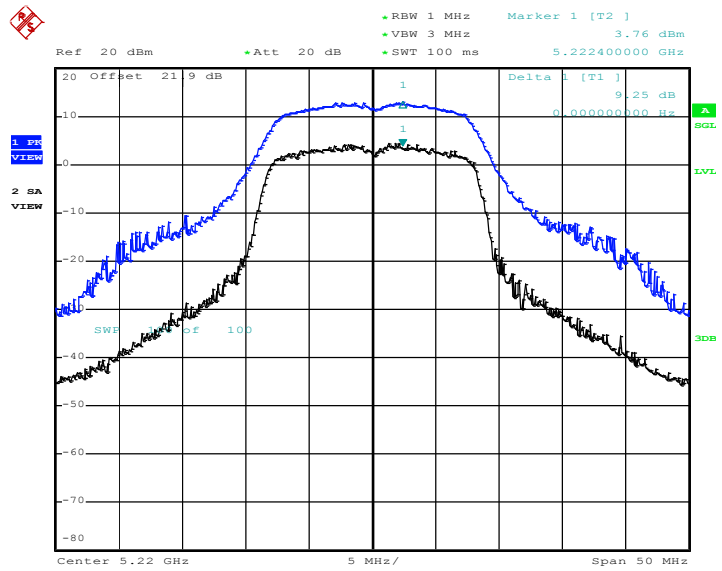
3.8.5 Test Result of Peak Excursion Ratio

Test Mode :	Mode 1~9	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

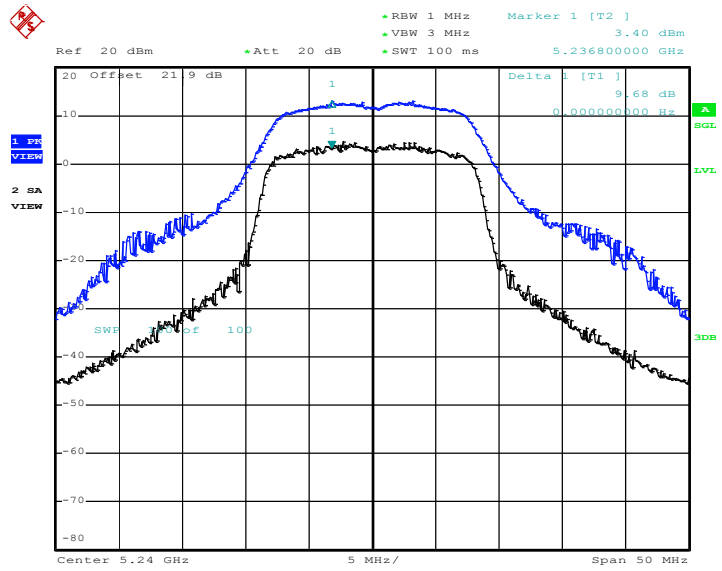
Peak Excursion Ratio Plot on 802.11a Channel 36



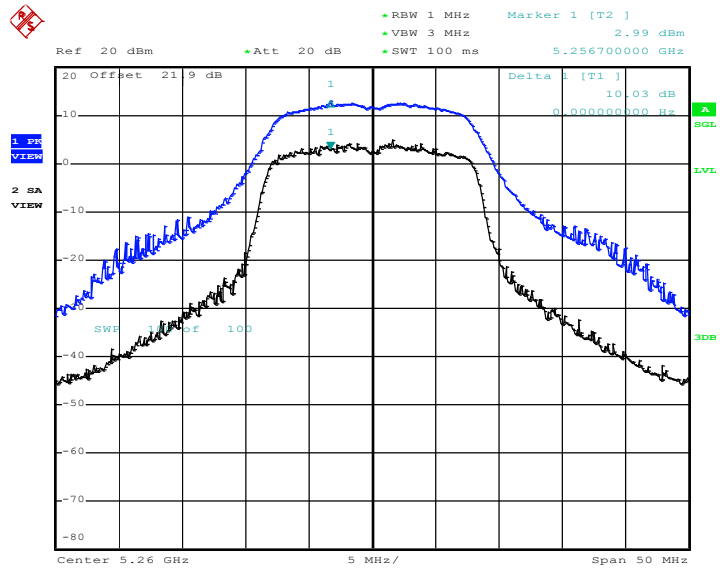
Peak Excursion Ratio Plot on 802.11a Channel 44



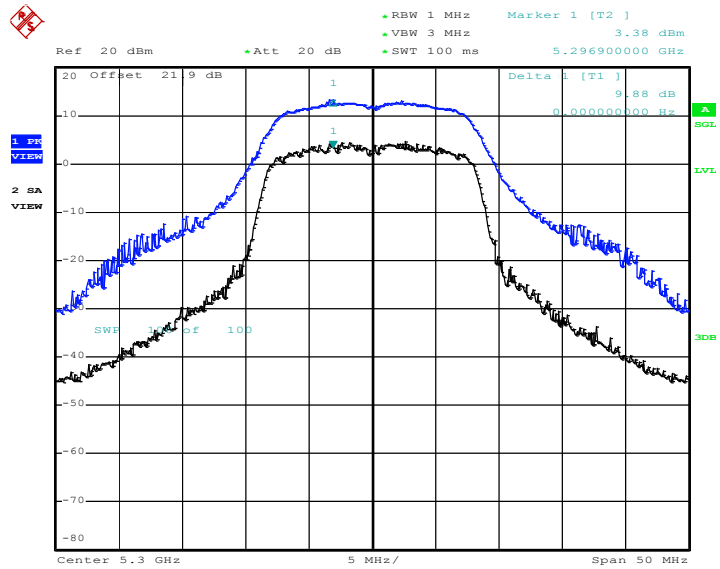
Peak Excursion Ratio Plot on 802.11a Channel 48



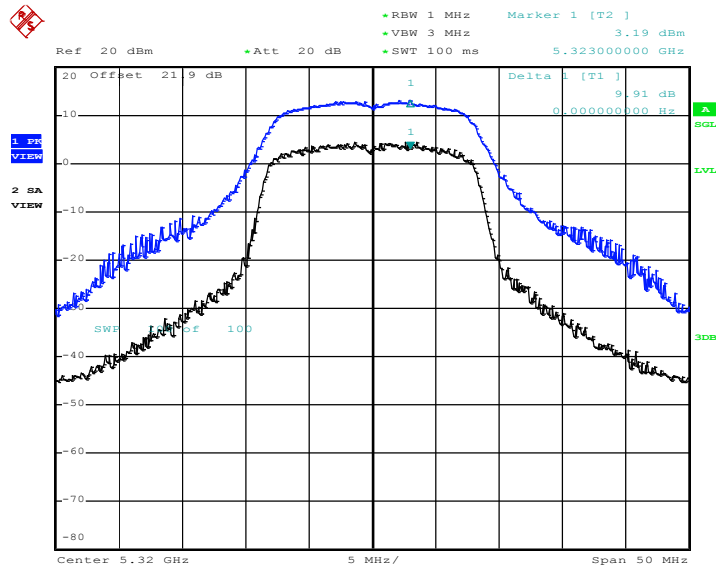
Peak Excursion Ratio Plot on 802.11a Channel 52



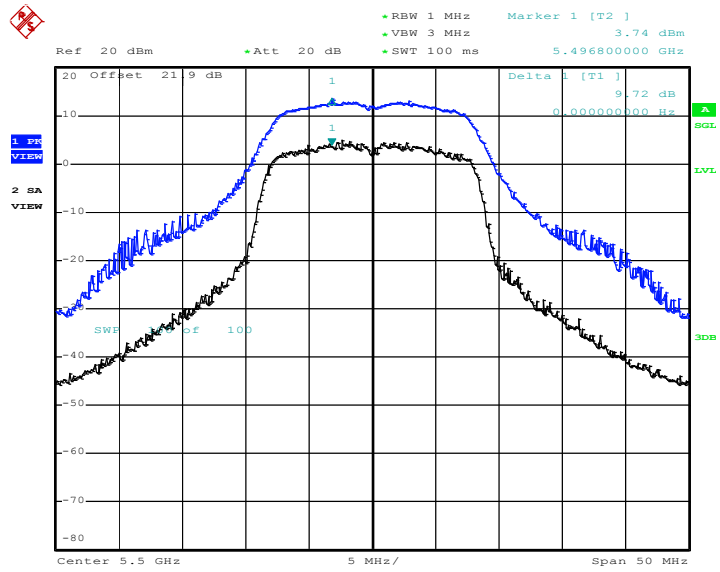
Peak Excursion Ratio Plot on 802.11a Channel 60



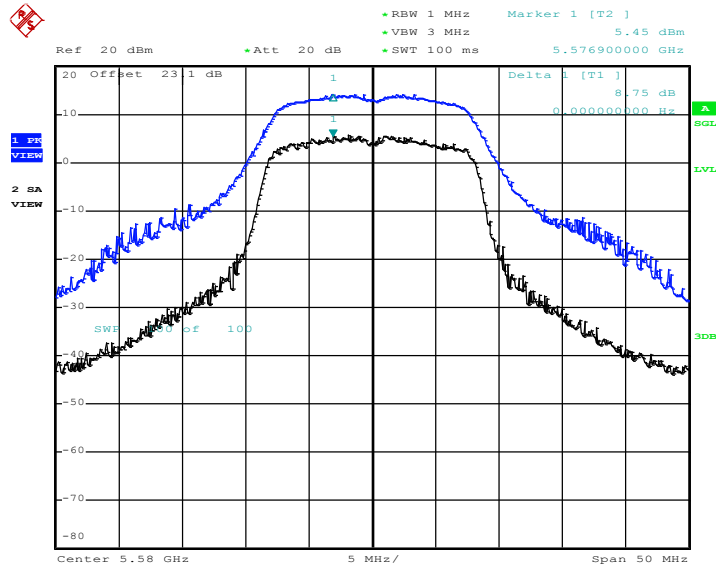
Peak Excursion Ratio Plot on 802.11a Channel 64



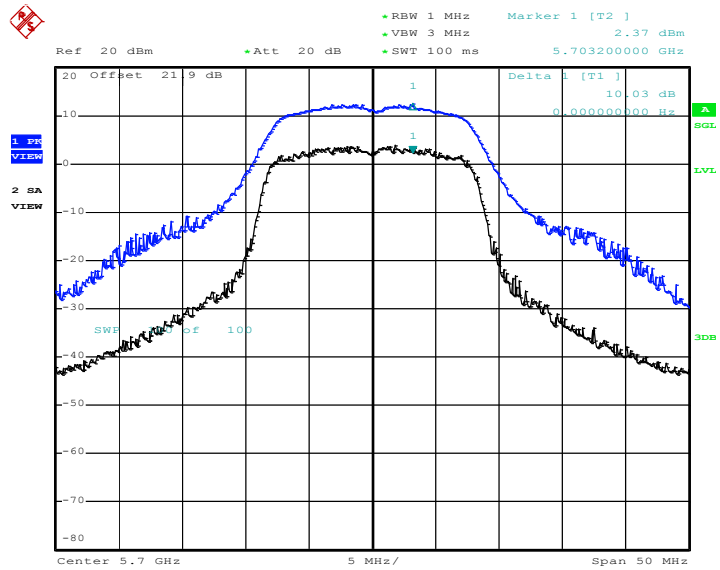
Peak Excursion Ratio Plot on 802.11a Channel 100



Peak Excursion Ratio Plot on 802.11a Channel 116

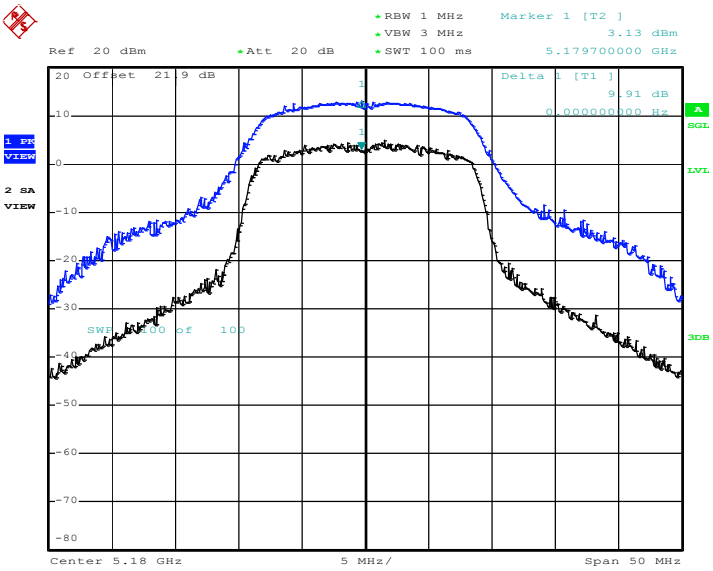


Peak Excursion Ratio Plot on 802.11a Channel 140

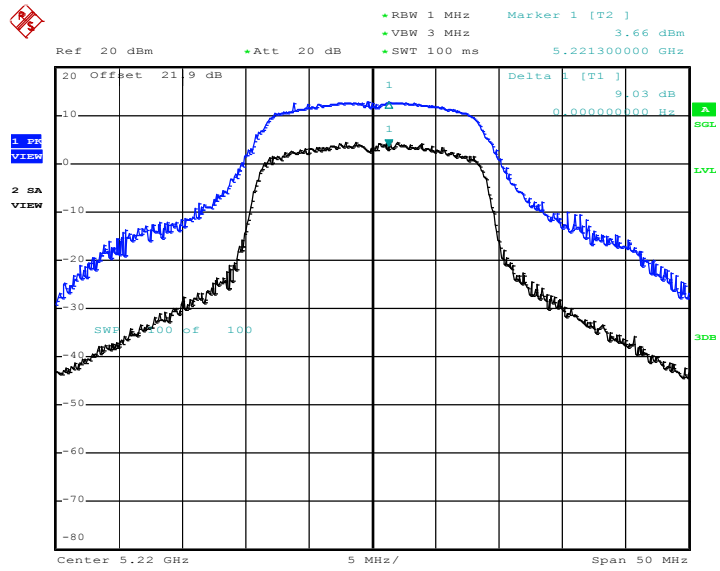


Test Mode :	Mode 10~18	**Temperature :**	24~26℃
Test Engineer :	Alan Liu	**Relative Humidity :**	45~49%

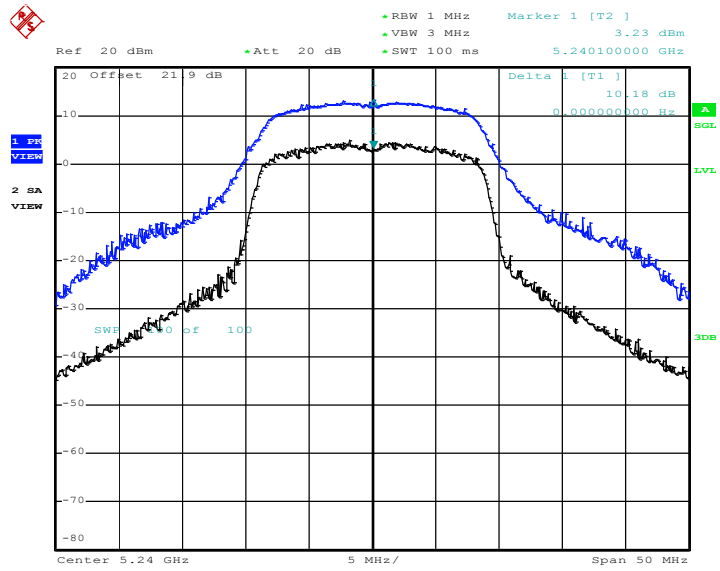
Peak Excursion Ratio Plot on 802.11n (BW 20MHz) Channel 36



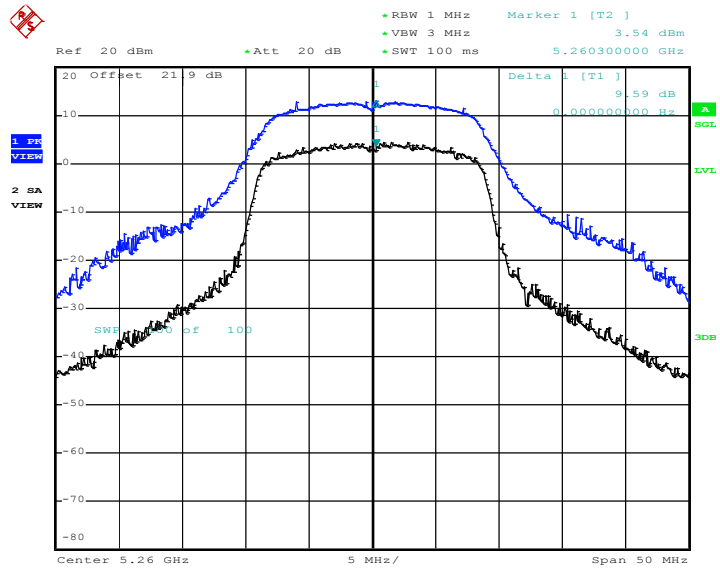
Peak Excursion Ratio Plot on 802.11n (BW 20MHz) Channel 44



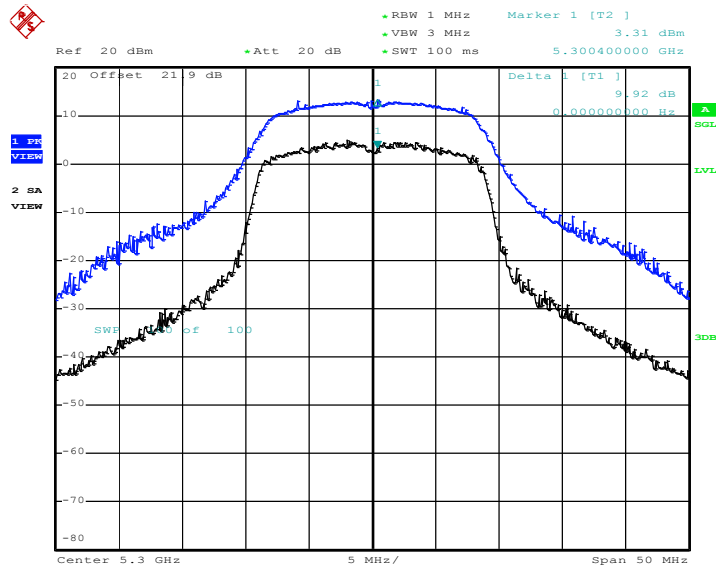
Peak Excursion Ratio Plot on 802.11n (BW 20MHz) Channel 48



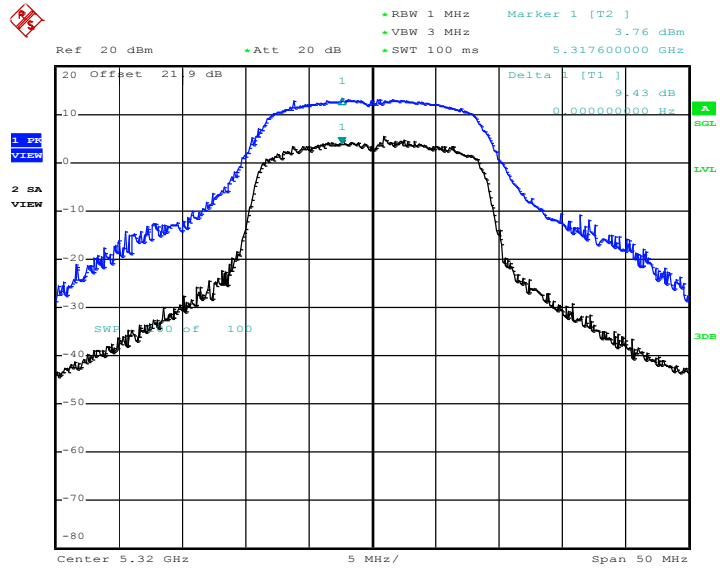
Peak Excursion Ratio Plot on 802.11n (BW 20MHz) Channel 52



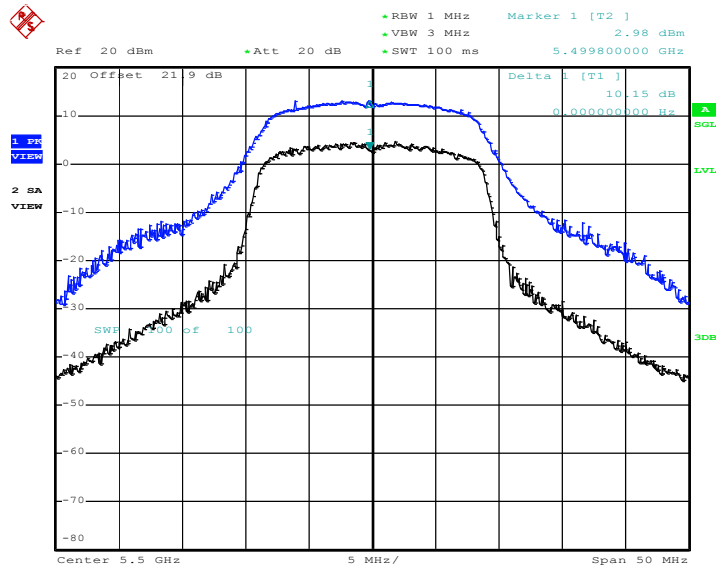
Peak Excursion Ratio Plot on 802.11n (BW 20MHz) Channel 60



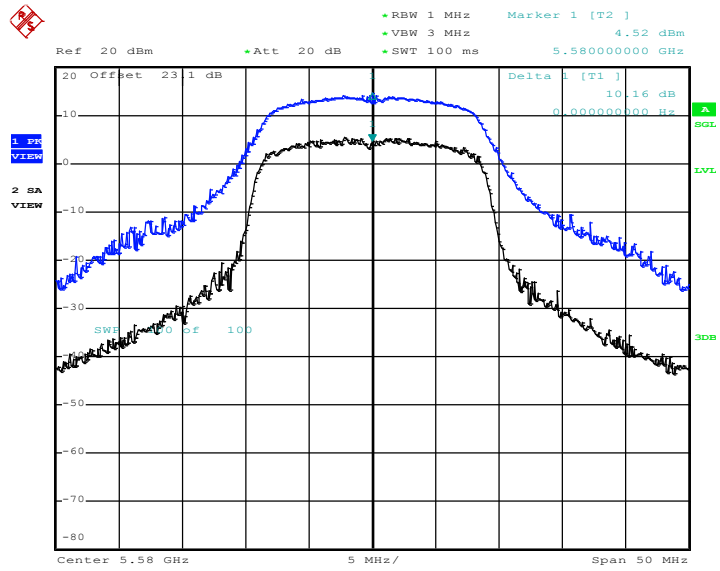
Peak Excursion Ratio Plot on 802.11n (BW 20MHz) Channel 64



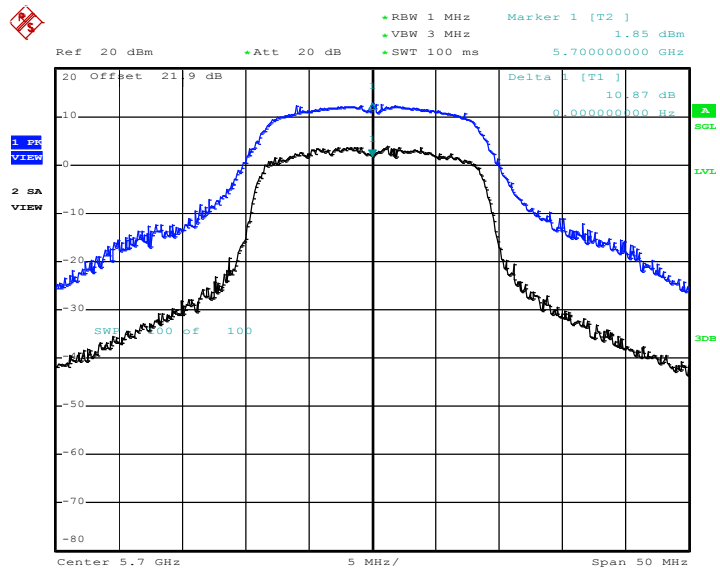
Peak Excursion Ratio Plot on 802.11n (BW 20MHz) Channel 100



Peak Excursion Ratio Plot on 802.11n (BW 20MHz) Channel 116



Peak Excursion Ratio Plot on 802.11n (BW 20MHz) Channel 140



3.9 Automatically Discontinue Transmission

3.9.1 Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

3.9.3 Test Result of Automatically Discontinue Transmission

During no any information transmission, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

3.10 Frequency Stability Measurement

3.10.1 Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

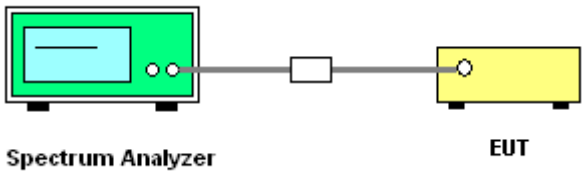
3.10.2 Measuring Instruments

See list of measuring instruments of this test report.

3.10.3 Test Procedures

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

3.10.4 Test Setup



3.10.5 Test Result of Frequency Stability

Test Mode :	Mode 1~9	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Channel	Frequency (MHz)	Low Frequency (Fl)	High Frequency (Fh)	Frequency Stability (ppm)
36	5180	5171.72	5188.28	0.00
44	5220	5211.72	5228.28	0.00
48	5240	5231.72	5248.28	0.00
52	5260	5251.72	5268.28	0.00
60	5300	5291.72	5308.28	0.00
64	5320	5311.72	5328.28	0.00
100	5500	5491.72	5508.28	0.00
116	5580	5571.74	5588.26	0.00
140	5700	5691.72	5708.28	0.00

Test Mode :	Mode 10~18	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	45~49%

Channel	Frequency (MHz)	Low Frequency (Fl)	High Frequency (Fh)	Frequency Stability (ppm)
36	5180	5171.16	5188.92	7.72
44	5220	5211.12	5228.88	0.00
48	5240	5231.16	5248.88	3.82
52	5260	5251.16	5268.88	3.80
60	5300	5291.12	5308.92	3.77
64	5320	5311.12	5328.88	0.00
100	5500	5491.08	5508.88	-3.64
116	5580	5571.10	5588.82	-7.17
140	5700	5691.12	5708.84	-3.51

3.11 Antenna Requirements

3.11.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.11.2 Antenna Connected Construction

The antennas type used in this product is PIFA Antenna without connector and it is considered to meet antenna requirement of FCC.

3.11.3 Antenna Gain

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

4 List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 13, 2011	Jun. 12, 2012	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 18, 2011	Sep. 17, 2012	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 18, 2011	Sep. 17, 2012	Conducted (TH02-HY)
EMI Test Receive	R&S	ESCI 7	100724	9kHz~7GHz	Aug. 22, 2011	Aug. 21, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz – 30MHz	Dec. 03, 2010	Dec. 02, 2011	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz – 30MHz	Dec. 01, 2010	Nov. 30, 2011	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
GPS Station	Pendulum	GSG-54	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
Spectrum Analyzer	R&S	FSP40	100057	9KHz-40GHz	Oct. 25, 2010	Oct. 24, 2011	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/003	20MHz-1000MHz	May 10, 2011	May 09, 2012	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz -2GHz	Oct. 31, 2010	Oct. 30, 2011	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz~18GHz	Aug. 01, 2011	Jul. 31, 2012	Radiation (03CH06-HY)
Double Ridge Horn Antenna	Training Research	AH-0801	95119	8GHz~18GHz	Oct. 20, 2010	Oct. 19, 2011	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 18, 2010	Oct. 17, 2011	Radiation (03CH06-HY)
Pre Amplifier	Agilent	8449B	3008A01917	1GHz- 26.5GHz	Apr. 14, 2011	Apr. 13, 2012	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz~1GHz	Apr. 14, 2011	Apr. 13, 2012	Radiation (03CH06-HY)

5 Uncertainty of Evaluation

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.10	Normal (k=2)	0.05
Cable Loss	0.10	Normal (k=2)	0.05
AMN Insertion Loss	2.50	Rectangular	0.63
Receiver Specification	1.50	Rectangular	0.43
Site Imperfection	1.39	Rectangular	0.80
Mismatch	+0.34 / -0.35	U-Shape	0.24
Combined Standard Uncertainty Uc(y)	**1.13**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.26**		

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
Combined Standard Uncertainty Uc(y)	**1.27**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.54**		

Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	±0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	±1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	±0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site Imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR Γ1 = 0.197 Antenna VSWR Γ2 = 0.194 Uncertainty = 20Log(1-Γ1*Γ2)	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty Uc(y)	**2.36**				
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**				

Appendix A. Photographs of EUT

Please refer to Sporton report number EP0D0904-17 as below.