

Prüfbericht-Nr.: Test report no.:	CN2294M4 (ISED-WiFi 5G) 001	Auftrags-Nr.: Order no.:	238546695	Seite 1 von 34 Page 1 of 34
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2022-08-11	
Auftraggeber: Client:	Corsair Memory, Inc. 115 North McCarthy Blvd, Milpitas, CA 95035, USA			
Prüfgegenstand: Test item:	Key Light			
Bezeichnung / Typ-Nr.: Identification / Type no.:	20GAK9902			
Auftrags-Inhalt: Order content:	ISED RSS-247 Test report (WiFi 5GHz)			
Prüfgrundlage: Test specification:	ISED RSS-247 Issue 2 February 2017			
Wareneingangsdatum: Date of sample receipt:	2022-09-16			
Prüfmuster-Nr.: Test sample no:	A003337280-001 A003337280-003			
Prüfzeitraum: Testing period:	2022-10-15 - 2022-11-17 2023-06-09 - 2023-06-14			
Ort der Prüfung: Place of testing:	EMC/RF Taipei Testing Site			
Prüflaboratorium: Testing laboratory:	Taipei Testing Laboratories			
Prüfergebnis*: Test result*:	Pass			
zusammengestellt von: compiled by:			genehmigt von: authorized by:	
Datum: Date:	2023-06-20	Ausstellungsdatum: Issue date:	2023-06-20	
Stellung / Position:	Senior Project Manager	Stellung / Position:	Senior Project Manager	
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
5 = mangelhaft N/T = nicht getestet				
5 = poor N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

TEST SUMMARY

Report Section	ISED Clause	Test Item	Result
5.1.1	RSS-Gen	Antenna Requirement	Pass
5.1.2	RSS-247 6.2	Maximum Conducted Output Power	Pass
5.1.3	RSS-247 6.2.3.1	Transmit Power Control (TPC)	Pass
5.1.4	--	26 dB Bandwidth	Pass
5.1.4	RSS-247 6.2 & RSS-Gen 6.7	99% Occupied Bandwidth	Pass
5.1.5	RSS-247 6.2	6 dB Bandwidth (U-NII-3 Band only)	Pass
5.1.6	RSS-247 6.2	Power Spectral Density	Pass
5.1.7	RSS-247 6.2	Radiated Spurious Emissions and Band Edges	Pass
5.1.8	RSS-247 6.3	Dynamic Frequency Selection	Not Applicable
5.2.1	RSS-Gen	Mains Conducted Emission	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Contents

HISTORY OF THIS TEST REPORT	5
1. GENERAL REMARKS	6
1.1 COMPLEMENTARY MATERIALS.....	6
1.2 DECISION RULE OF CONFORMITY	6
2. TEST SITES	7
2.1 TEST LABORATORY	7
2.2 TEST FACILITY.....	7
2.3 TRACEABILITY	8
2.4 CALIBRATION	8
2.5 MEASUREMENT UNCERTAINTY	8
3. GENERAL PRODUCT INFORMATION.....	9
3.1 PRODUCT FUNCTION AND INTENDED USE	9
3.2 SYSTEM DETAILS AND RATINGS.....	9
3.3 NOISE GENERATING AND NOISE SUPPRESSING PARTS	10
3.4 SUBMITTED DOCUMENTS.....	10
4. TEST SET-UP AND OPERATION MODES.....	11
4.1 PRINCIPLE OF CONFIGURATION SELECTION	11
4.2 CARRIER FREQUENCY AND CHANNEL.....	12
4.3 TEST OPERATION AND TEST SOFTWARE.....	13
4.4 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	15
4.5 TEST SETUP DIAGRAM	16
4.6 DUTY CYCLE OF TEST SIGNAL	17
5. TEST RESULTS	18
5.1 TRANSMITTER REQUIREMENT & TEST SUITES	18
5.1.1 Antenna Requirement	18
5.1.2 Maximum Conducted Output Power	19
5.1.3 Transmit Power Control (TPC).....	22
5.1.4 26 dB Bandwidth and 99% Occupied Bandwidth.....	23
5.1.5 6 dB Bandwidth (5725-5850MHz)	24
5.1.6 Power Spectral Density.....	25
5.1.7 Radiated Spurious Emissions	27
5.1.8 Dynamic Frequency Selection	32
5.2 MAINS EMISSION	33
5.2.1 Mains Conducted Emission.....	33

Prüfbericht - Nr.: CN2294M4 (ISED-WiFi 5G) 001
Test Report No.

Seite 4 von 34
Page 4 of 34

APPENDIX A - TEST RESULT OF CONDUCTED

APPENDIX B - TEST RESULT OF RADIATED EMISSIONS & MAINS CONDUCTED EMISSION

APPENDIX SP - PHOTOGRAPHS OF TEST SETUP

APPENDIX EP - PHOTOGRAPHS OF EUT

Prüfbericht - Nr.: CN2294M4 (ISED-WiFi 5G) 001
Test Report No.

Seite 5 von 34
Page 5 of 34

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN2294M4 (ISED-WiFi 5G) 001	Original Release	2023-06-20

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A - Test Result of Conducted

Appendix B - Test Result of Radiated Emissions & Mains Conducted Emission

Appendix SP - Photographs of Test Setup

Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
ISED RSS-247 Issue 2 February 2017
ISED RSS-Gen Issue 5, Amendment 2, February 2021
ANSI C63.10:2013
KDB 789033 D02 General UNII Test Procedures New Rules v02r01

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)
FCC Registration No.: 180491
ISED Registration No.: 25563

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicate a 95% level of confidence.

Emission Measurement Uncertainty

Parameter	Uncertainty
Radiated Emission (9 kHz ~ 30 MHz)	± 1.15 dB
Radiated Emission (30 MHz ~ 200 MHz)	± 1.32 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 1.31 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 1.53 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.50 dB
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Key Light. It contains a WLAN compatible module enabling the user to communicate data through a Wireless interface.

For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Key Light
Type Identification	20GAK9902
IC	10954A-20GAK9902
HVIN	20GAK9902

Technical Specification of EUT

Item	EUT information
Operating Frequency	Band 1: 5180 MHz ~ 5240 MHz Band 4: 5745 MHz ~ 5825 MHz
Channel Number	Band 1: 4 for 802.11a, 802.11n HT20 2 for 802.11n HT40 1 for 802.11ac VHT80 Band 4: 5 for 802.11a, 802.11n HT20 2 802.11n HT40 1 for 802.11ac VHT80
Data Rate	802.11a: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to MCS7
Operation Voltage	100-240Vac (Adapter), input 13Vdc
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Maximum Output Power (mW)	5180 ~ 5240 MHz: 100.69 5745 ~ 5825 MHz: 86.70
DFS Mode	N/A
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.4

3.3 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.4 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output expected by the customer and is going to be fixed on the firmware of the final end product.

Table for Parameters of Test Software Setting

802.11a		802.11n HT20		802.11n HT40	
Channel	Power Setting	Channel	Power Setting	Channel	Power Setting
36	112	36	112	38	100
40	127	40	127	46	110
48	110	48	108	151	127
149	127	149	127	159	127
157	127	157	127		
165	127	165	127		

4.2 Carrier Frequency and Channel

Band	Channel	Frequency (MHz)	802.11a 802.11n HT20	802.11n HT40
U-NII-1 (Band 1)	36	5180	V	
	38	5190		V
	40	5200	V	
	42	5210		
	44	5220	V	
	46	5230		V
	48	5240	V	
U-NII-3 (Band 4)	149	5745	V	
	151	5755		V
	153	5765	V	
	155	5775		
	157	5785	V	
	159	5795		V
	161	5805	V	
	165	5825	V	

4.3 Test Operation and Test Software

Setup for testing: Test samples are provided with a USB interface which makes it possible to control them through a test software installed on a notebook computer.

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed as below.

Test Software	mptool_2V0
---------------	------------

The samples were used as follows:

A003337280-001

A003337280-003

Full test was applied on all test modes, but only worst case was shown.

Modulation Mode	Tx Function
802.11a	1TX (SISO)
802.11n HT20	1TX (SISO)
802.11n HT40	1TX (SISO)

EUT Configure Mode	Applicable To				Description
	Antenna Port Conducted Measurement	Radiated Spurious Emissions above 1 GHz	Radiated Spurious Emissions below 1 GHz	Mains Conducted Emission	
-	√	√	√	√	-

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on Z-plane.
2. "-" means no effect.

Antenna Port Conducted Measurement

- ☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency (MHz)	Available Channel	Tested Channel	Date Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	6.0
-		5745-5825	149 to 165	149, 157, 165	
-	802.11n HT20	5180-5240	36 to 48	36, 40, 48	6.5
-		5745-5825	149 to 165	149, 157, 165	
-	802.11n HT40	5180-5240	38 to 46	38, 46	MCS0
-		5745-5825	151 to 159	151, 159	

Radiated Spurious Emissions (Above 1 GHz)

- ☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency (MHz)	Available Channel	Tested Channel	Date Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	6.0
-		5745-5825	149 to 165	149, 157, 165	
-	802.11n HT20	5180-5240	36 to 48	36, 40, 48	6.5
-		5745-5825	149 to 165	149, 157, 165	
-	802.11n HT40	5180-5240	38 to 46	38, 46	MCS0
-		5745-5825	151 to 159	151, 159	

Radiated Spurious Emissions (Below 1 GHz)

- ☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency (MHz)	Available Channel	Tested Channel	Date Rate (Mbps)
-	802.11a	5745-5825	149 to 165	157	6.0

Mains Conducted Emission Test

- ☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency (MHz)	Available Channel	Tested Channel	Date Rate (Mbps)
-	802.11a	5745-5825	149 to 165	157	6.0

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Conducted Measurement	18-23 °C	58-67 %	Nick Guan
Radiated Spurious Emissions above 1 GHz	23.7-24.6 °C	52-55 %	Roger Liao
Radiated Spurious Emissions below 1 GHz	23.7-24.6 °C	52-55 %	Roger Liao
Mains Conducted Emission	21 °C	54 %	Ray Huang

4.4 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Accessory of EUT

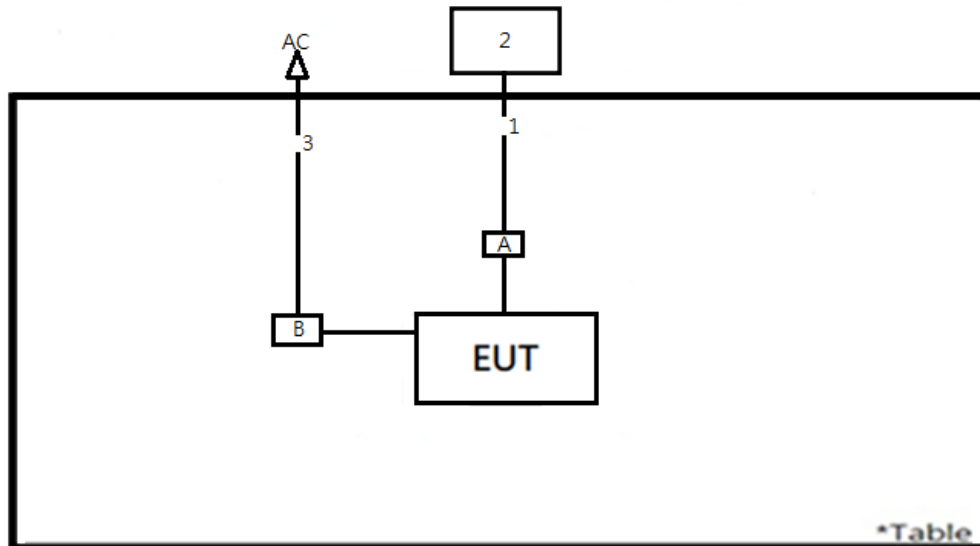
None.

Support Unit

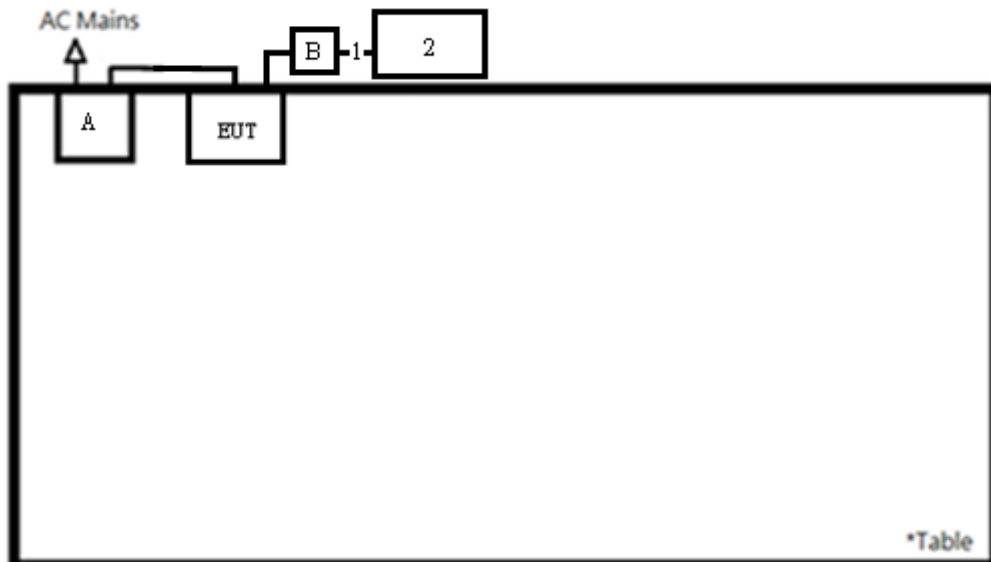
No.	Description	Brand	Model	S/N	Remark
Radiated Test					
A	Uart	Dexatek	CP2102	-	USB to TTL
B	LED Driver	Intertek	A654-13040000I	-	I/P: 100-240 Vac, 50/60 Hz, 1.5 A O/P: 13 Vdc, 4 A 250 cm non-shielded cable with core
1	USB to USB	TUV	TUV-03	-	300 cm non-shielded cable w/o core
2	Notebook	Lenovo	81BL	MP1DCD6Y	-
3	DC cable	TUV	TUV-01	-	300 cm non-shielded cable w/o core
Mains Conducted Test					
A	LED Driver	Intertek	A654-13040000I	-	I/P: 100-240 Vac, 50/60 Hz, 1.5 A O/P: 13 Vdc, 4 A 250 cm non-shielded cable with core
B	Uart	Dexatek	CP2102	-	USB to TTL
1	USB to USB	TUV	TUV-03	-	300 cm non-shielded cable w/o core
2	Notebook	Lenovo	81BL	MP1DCD6Y	-
Conducted Test					
-	Notebook	Lenovo	20CLS3P606	PC0DH09R	NB-06

4.5 Test Setup Diagram

<Radiated Spurious Emissions mode>

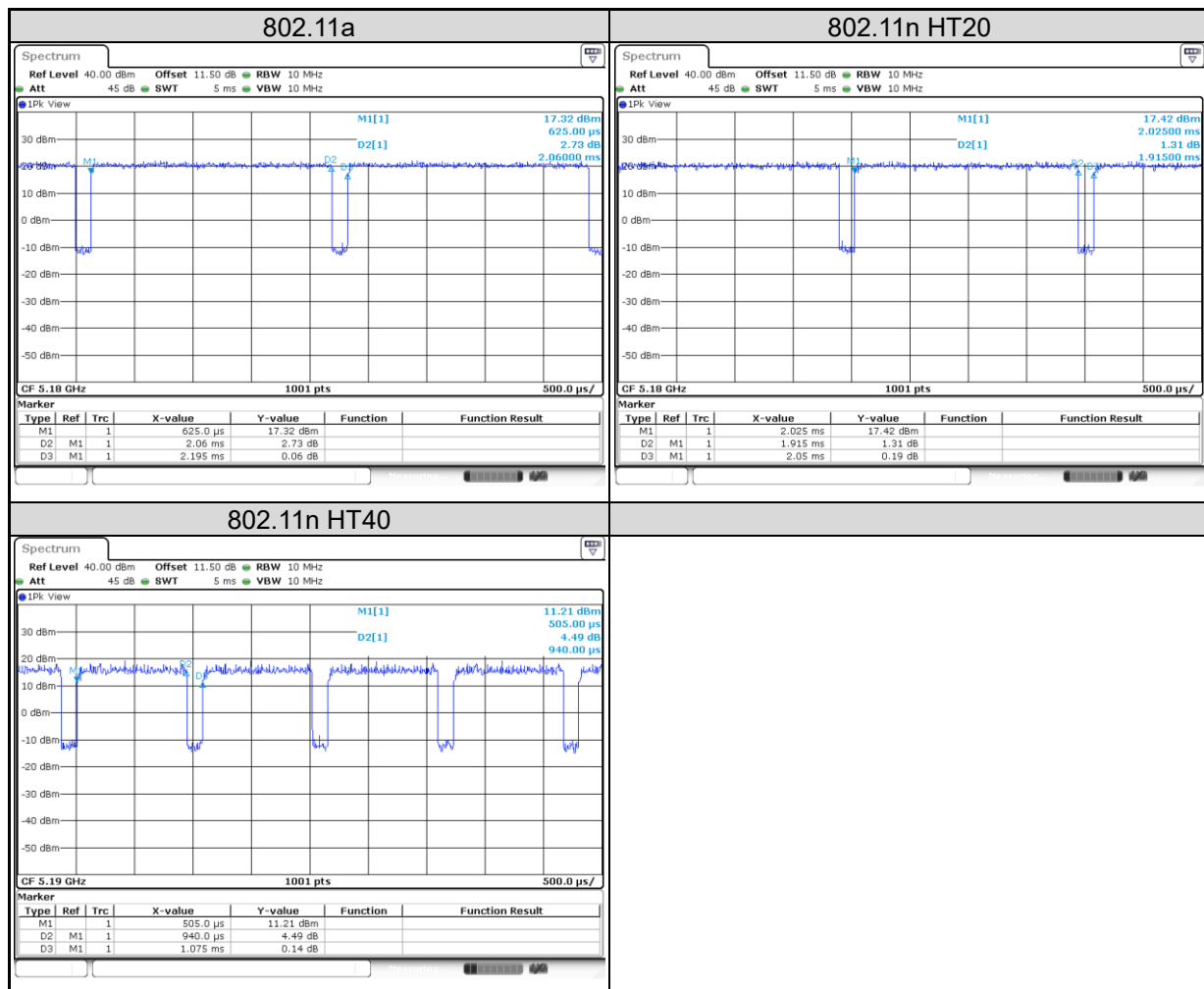


<Mains Conducted Emission mode>



4.6 Duty Cycle of Test Signal

Mode	On + Off Time (ms)	On Time (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11a	2.195	2.06	93.85	0.28
802.11n HT20	2.05	1.915	93.41	0.30
802.11n HT40	1.075	0.94	87.44	0.58



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

Requirement Use of approved antennas only

According to the manufacturer declaration, the EUT's antenna specifications are described as below.
The antenna is used with no possibility of replacement with a non-approved antenna by the end-user.
Therefore, the EUT is considered to comply with this provision.

Chip antenna with 0.8 dBi gain (5180 ~ 5240 MHz)

Chip antenna with 0.2 dBi gain (5745 ~ 5825 MHz)

Refer to EUT photo for details.

5.1.2 Maximum Conducted Output Power

Limit

Frequency Band	EUT Category	Limit
5.150 ~ 5.250 GHz	OEM devices installed in Vehicles	Maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm Transmitter power control (TPC) capability: 3 dB below the maximum permitted e.i.r.p. of 30 mW
	Other devices	Maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm
5.250 ~ 5.350 GHz	OEM devices installed in Vehicles	Maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm Transmitter power control (TPC) capability: 3 dB below the maximum permitted e.i.r.p. of 30 mW
	Other devices	Conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm EIRP shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm
5.470 ~ 5.600 GHz 5.650 ~ 5.725 GHz	---	Conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm EIRP shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm
5.725 ~ 5.850 GHz	---	Conducted output power shall not exceed 1 W.

Note: Where B is the occupied bandwidth in megahertz

Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

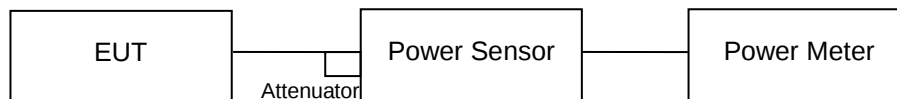
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Power Meter	Anritsu	ML2495A	1901008	2022/3/15	2023/3/14	2022/10/5	2022/11/17
Power Sensor	Anritsu	MA2411B	1725269	2022/3/15	2023/3/14	2022/10/5	2022/11/17

Test Procedures

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst and set the detector to AVERAGE. Duty factor is not added to measured value.

Test Result
For U-NII-1
<802.11a>

Channel	Channel Frequency (MHz)	Average Output Power		EIRP Power (dBm)	Limit (dBm)
		(dBm)	(mW)		
36	5180	16.63	46.03	17.43	22.86
40	5200	19.83	96.16	20.63	23.00
48	5240	17.41	55.08	18.21	22.32

Note:

1. $10 \text{ dBm} + 10\log(19.34) = 22.86 \text{ dBm} < 23 \text{ dBm}$.
2. $10 \text{ dBm} + 10\log(27.61) = 24.41 \text{ dBm} > 23 \text{ dBm}$.
3. $10 \text{ dBm} + 10\log(17.06) = 22.32 \text{ dBm} < 23 \text{ dBm}$.

<802.11n HT20>

Channel	Channel Frequency (MHz)	Average Output Power		EIRP Power (dBm)	Limit (dBm)
		(dBm)	(mW)		
36	5180	16.55	45.19	17.35	22.94
40	5200	20.03	100.69	20.83	23.00
48	5240	17.32	53.95	18.12	22.63

Note:

1. $10 \text{ dBm} + 10\log(19.70) = 22.94 \text{ dBm} < 23 \text{ dBm}$.
2. $10 \text{ dBm} + 10\log(29.17) = 24.65 \text{ dBm} > 23 \text{ dBm}$.
3. $10 \text{ dBm} + 10\log(18.34) = 22.63 \text{ dBm} < 23 \text{ dBm}$.

<802.11n HT40>

Channel	Channel Frequency (MHz)	Average Output Power		EIRP Power (dBm)	Limit (dBm)
		(dBm)	(mW)		
38	5190	14.09	25.64	14.89	23.00
46	5230	17.40	54.95	18.20	23.00

Note:

1. $10 \text{ dBm} + 10\log(35.88) = 25.55 \text{ dBm} > 23 \text{ dBm}$.
2. $10 \text{ dBm} + 10\log(37.32) = 25.72 \text{ dBm} > 23 \text{ dBm}$.

For U-NII-3

<802.11a>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
149	5745	18.91	77.80	30.00
157	5785	18.42	69.50	30.00
165	5825	18.95	78.52	30.00

<802.11n HT20>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
149	5745	19.38	86.70	30.00
157	5785	18.84	76.56	30.00
165	5825	19.02	79.80	30.00

<802.11n HT40>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
151	5755	19.34	85.90	30.00
159	5795	18.76	75.16	30.00

5.1.3 Transmit Power Control (TPC)

Requirement The maximum e.i.r.p. shall not exceed 1.0W or $17 + 10\log_{10}B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1W.

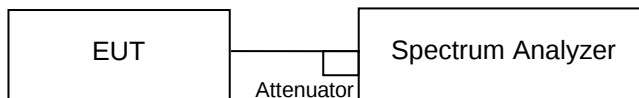
Maximum EIRP of this device is 159.22mW which is less than 500mW, therefore it's not require TPC function.

TPC	E.I.R.P	15.407(h)(1)
	> 500mW	The TPC mechanism is required for system with an E.I.R.P. of above 500mW
V	< 500mW	-

5.1.4 26 dB Bandwidth and 99% Occupied Bandwidth

Limit N/A

Kind of Test Site Shielded room



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2022/2/24	2023/2/23	2022/10/5	2022/11/17
Thermal Chamber	GIANT FORCE	GCT-099-40-S	MAF0103-007	2022/3/2	2023/3/1	2022/10/5	2022/11/17

Test Procedure

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
- For 99% Bandwidth Measurement, the transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean power of a given emission.

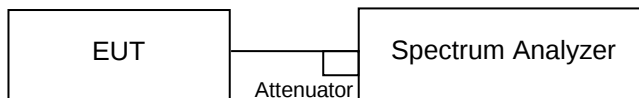
Test Results

Please refer to Appendix A

5.1.5 6 dB Bandwidth (5725-5850MHz)

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2022/2/24	2023/2/23	2022/10/5	2022/11/17
Thermal Chamber	GIANT FORCE	GCT-099-40-S	MAF0103-007	2022/3/2	2023/3/1	2022/10/5	2022/11/17

Test Procedure

MEASUREMENT PROCEDURE REF

- Set resolution bandwidth (RBW) = 100 kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Results

Please refer to Appendix A

5.1.6 Power Spectral Density

Limit

For the 5.15~5.25GHz Bands:

The EIRP spectral density shall not exceed 10 dBm in any 1.0 MHz band.

For the 5.25~5.35GHz and 5.47~5.725GHz Bands:

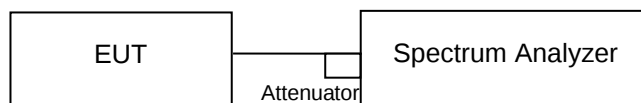
The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

For the 5.745~5.85GHz Bands:

The power spectral density shall not exceed 30 dBm in any 500kHz band.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2022/2/24	2023/2/23	2022/10/5	2022/11/17
Thermal Chamber	GIANT FORCE	GCT-099-40-S	MAF0103-007	2022/3/2	2023/3/1	2022/10/5	2022/11/17

Test Procedure

For U-NII-1 band:

Using method SA-2

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW $\geq$ 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to "free run".
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value and add 10 log (1/duty cycle)

※For U-NII-3:

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 500 kHz, Set VBW $\geq$ 3 RBW, Detector = RMS
3. Use the peak marker function to determine the maximum power level in any 500 kHz band segment within the fundamental EBW.
4. Sweep time = auto, trigger set to "free run".
5. Trace average at least 100 traces in power averaging mode.
6. Record the max value and add 10 log (1/duty cycle)

For MIMO mode, calculation method follows FCC KDB 662911 Method 2) a) of power density measurement using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

Test Results

Please refer to Appendix A

5.1.7 Radiated Spurious Emissions

Limit

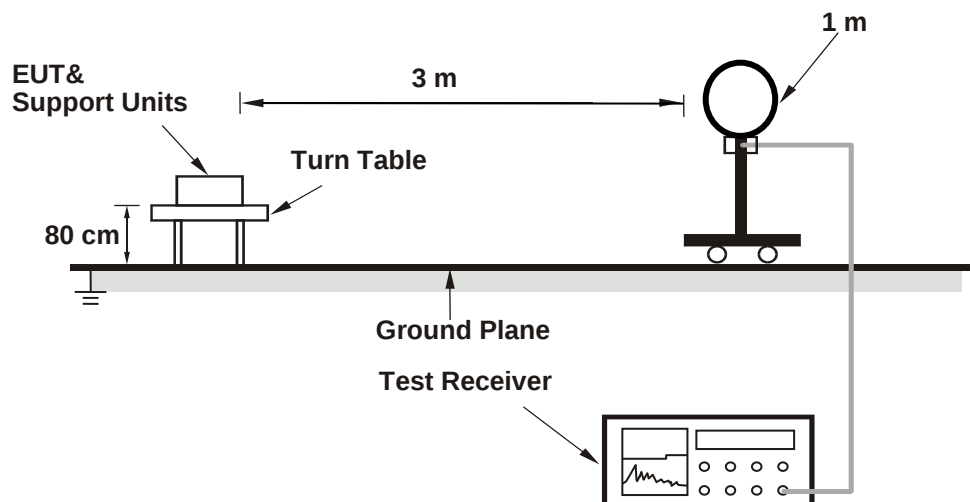
Radiated emissions which fall in the restricted bands, as defined in RSS-Gen i5, 8.10 (Table 7), must comply with the radiated emission limits specified in RSS-Gen 5, 8.9 (Table 5 and 6).

Emissions radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in RSS-247 i2, 6.2.

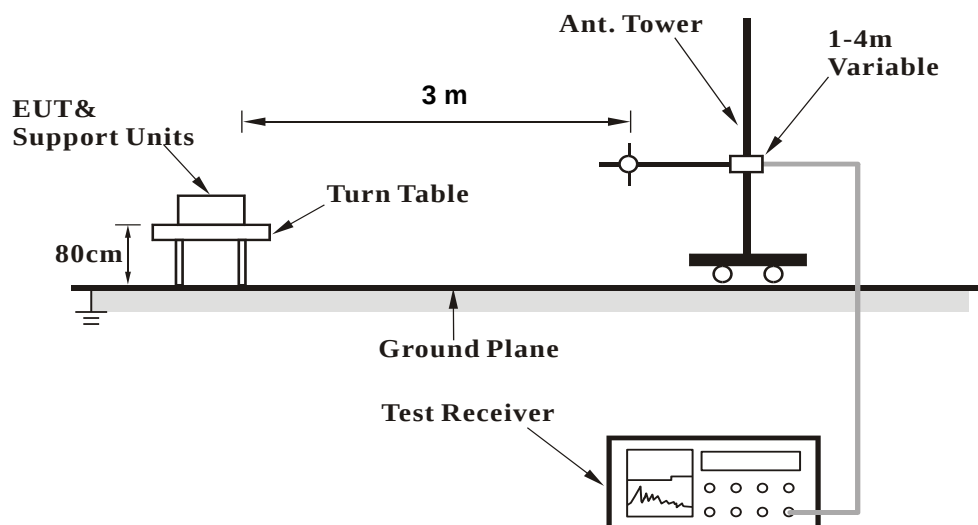
Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

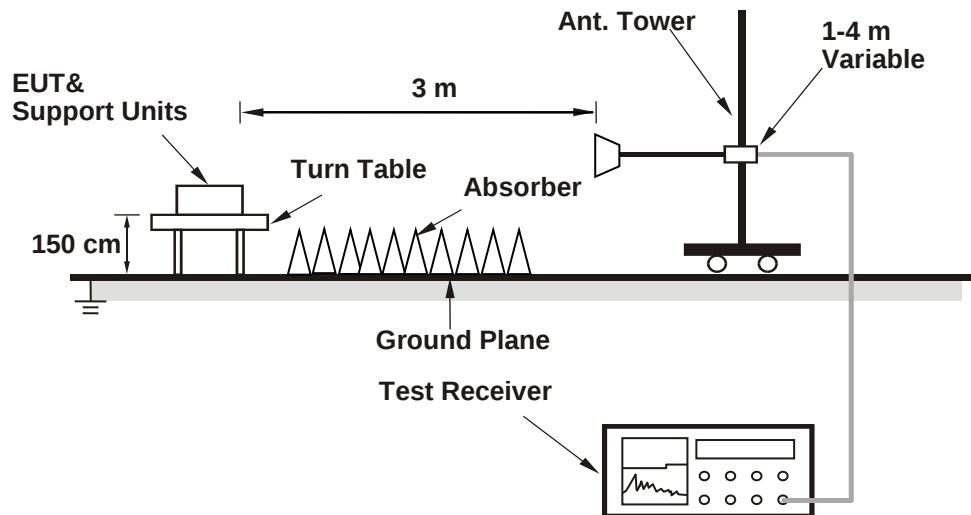
<Radiated Emissions below 30 MHz>



<Radiated Emissions 30 MHz to 1 GHz>



<Radiated Emissions above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Prüfbericht - Nr.: CN2294M4 (ISED-WiFi 5G) 001
Test Report No.
Seite 29 von 34
Page 29 of 34
Test Instruments

Test Date: 2022/10/21 ~ 2022/10/25

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Above 1GHz					
Signal Analyzer	R&S	FSV40	101509	2022/4/22	2023/4/21
Horn Antenna	ETS-Lindgren	3117	00218929	2021/11/25	2022/11/24
HF-AMP + AC source	EMCI	EMC051845SE	980635	2022/1/20	2023/1/19
HF-AMP + AC source	EMCI	EMC184045SE	980656	2022/1/20	2023/1/19
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2022/3/29	2023/3/28
30MHz-1GHz					
Receiver	R&S	ESR7	102109	2022/2/25	2023/2/24
Bilog Antenna	SCHWARZBECK	VULB-9168	00949	2022/5/29	2023/5/28
LF-AMP	Agilent	8447D	2727A05146	2022/2/16	2023/2/15
Below 30MHz					
Receiver	R&S	ESR7	102109	2022/2/25	2023/2/24
Microwave Cable	SUCOFLEX 104EA	800056/4EA	804680/4	2022/3/22	2023/3/21
Loop Antenna	SCHWARZBECK	FMZB 1519B	00215	2021/12/8	2022/12/7

Test Date: 2023/6/9 ~ 2023/6/12

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
30MHz-1GHz					
Receiver	R&S	ESR7	102109	2023/2/24	2024/2/23
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2023/3/31	2024/3/29
LF-AMP	Agilent	8447D	2727A05146	2023/2/16	2024/2/15
Below 30MHz					
Receiver	R&S	ESR7	102109	2023/2/24	2024/2/23
Loop Antenna	SCHWARZBECK	FMZB 1519B	00215	2023/1/4	2024/1/3

Test Procedures**For Radiated Emissions below 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel (OPEN), perpendicular (CLOSE), and ground-parallel (GROUND) orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated Emissions above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98 %) or 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.
6. The emission levels of other frequencies (including the 10th harmonic of the highest fundamental frequency) are very lower than the limit and are not shown in the test report.

Prüfbericht - Nr.: CN2294M4 (ISED-WiFi 5G) 001
Test Report No.

Seite 31 von 34
Page 31 of 34

Test Results

Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

Please refer to Appendix B.

Prüfbericht - Nr.: CN2294M4 (ISED-WiFi 5G) 001
Test Report No.

Seite 32 von 34
Page 32 of 34

5.1.8 Dynamic Frequency Selection

Not Applicable.

5.2 Mains Emission

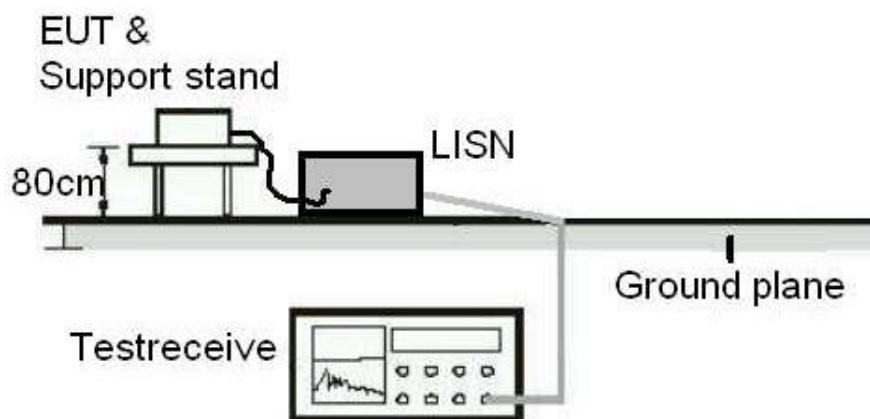
5.2.1 Mains Conducted Emission

Limit

Mains Conducted emissions as defined in RSS-Gen 8.8 must comply with the mains conducted emission limits.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Test Date: 2023/6/14

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Two-Line V-Network	Rohde & Schwarz	ENV216	101938	2022/9/22	2023/9/21
EMI Test Receiver	R&S	ESCI	100797	2022/6/19	2023/6/18

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

Test Results

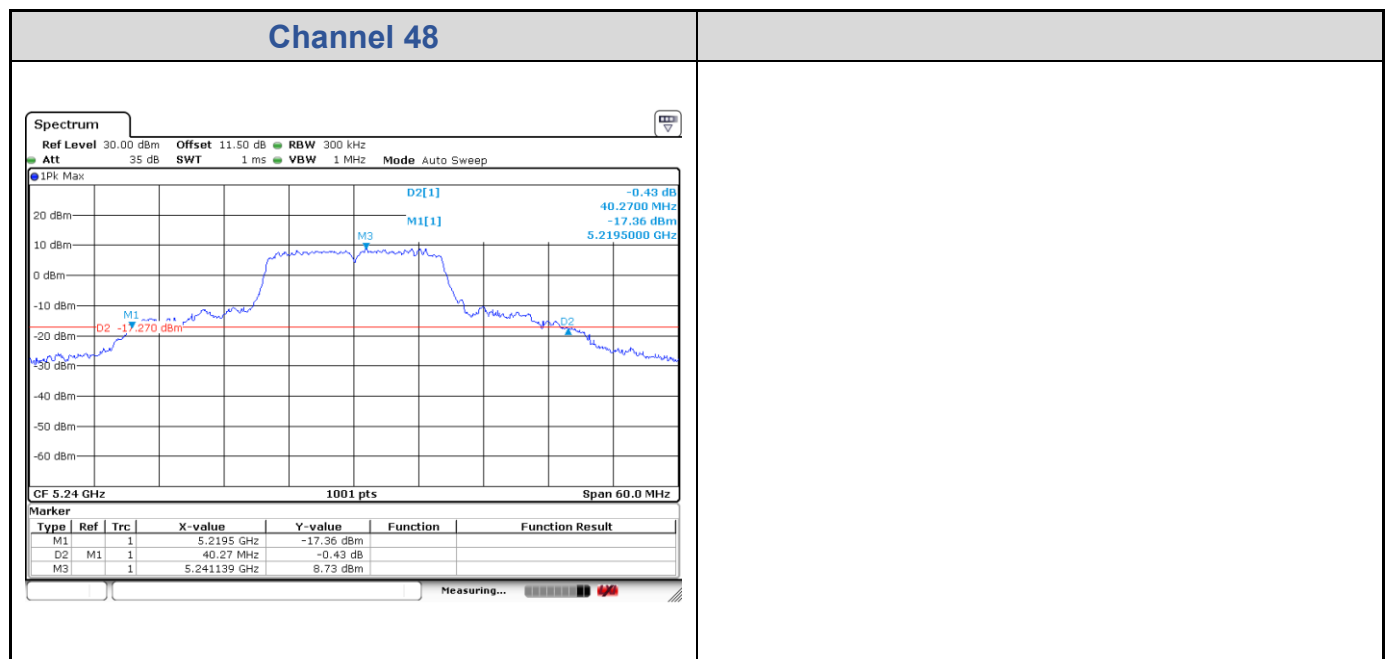
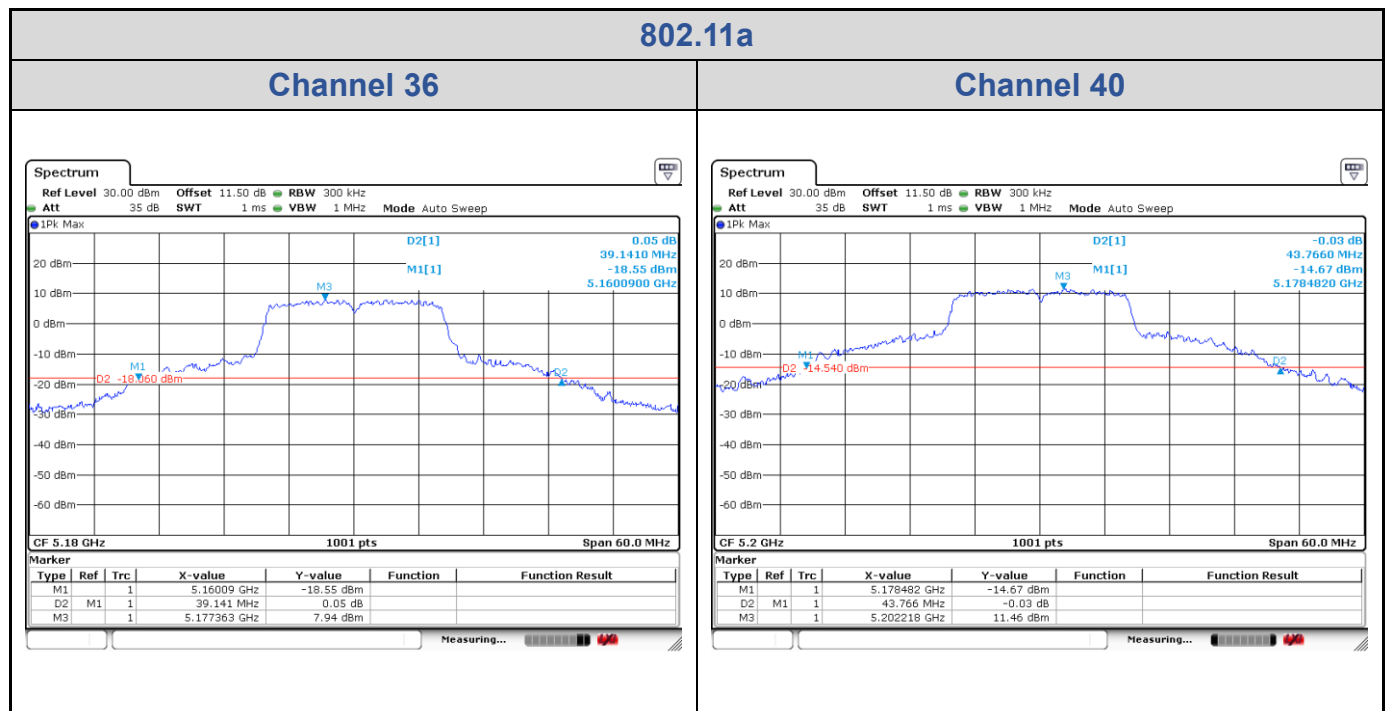
Please refer to Appendix B.

Appendix A: Test Results of Conducted Test

Test Result of 26 dB Bandwidth

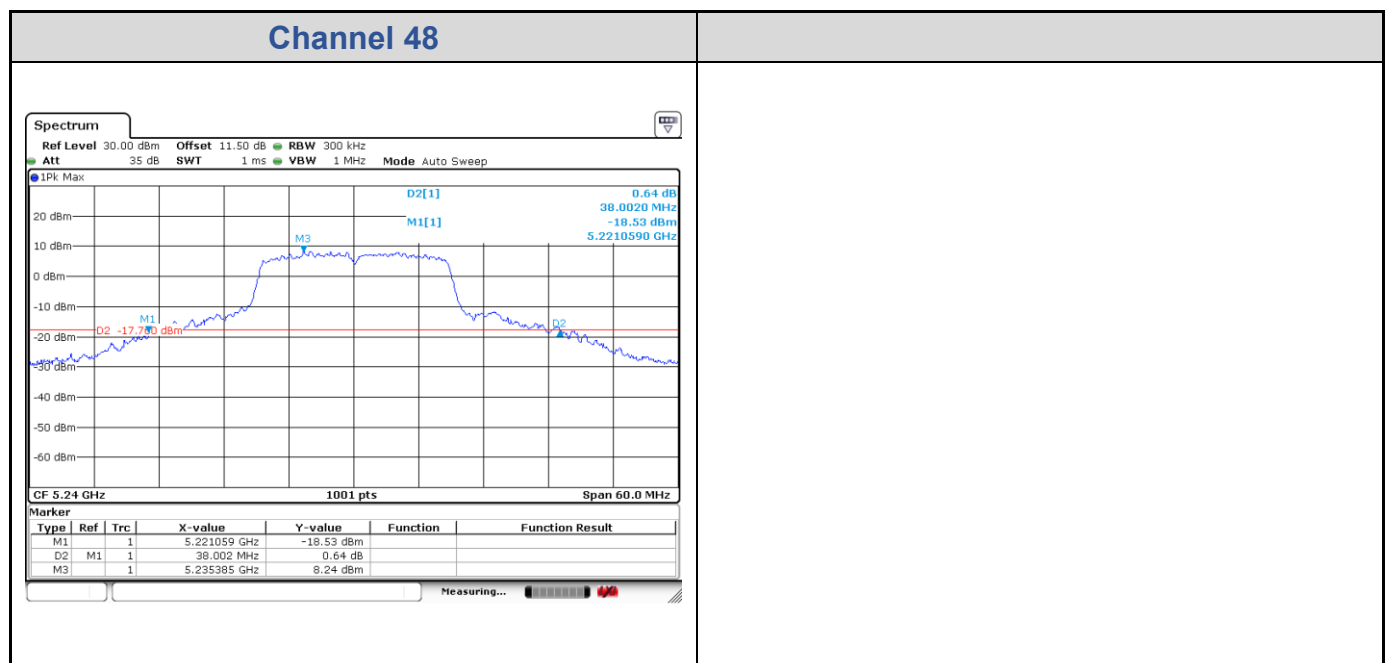
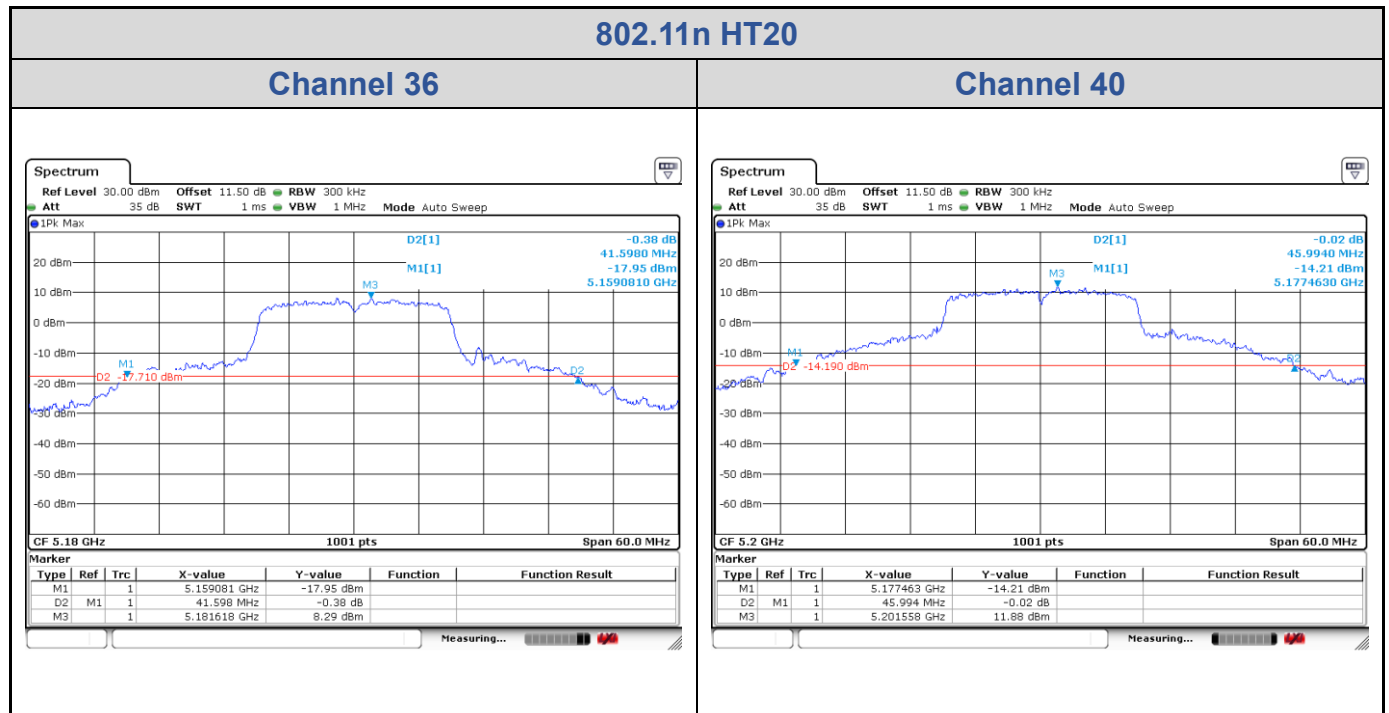
802.11a

Band	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
U-NII-1	36	5180	39.14
	40	5200	43.77
	48	5240	40.27



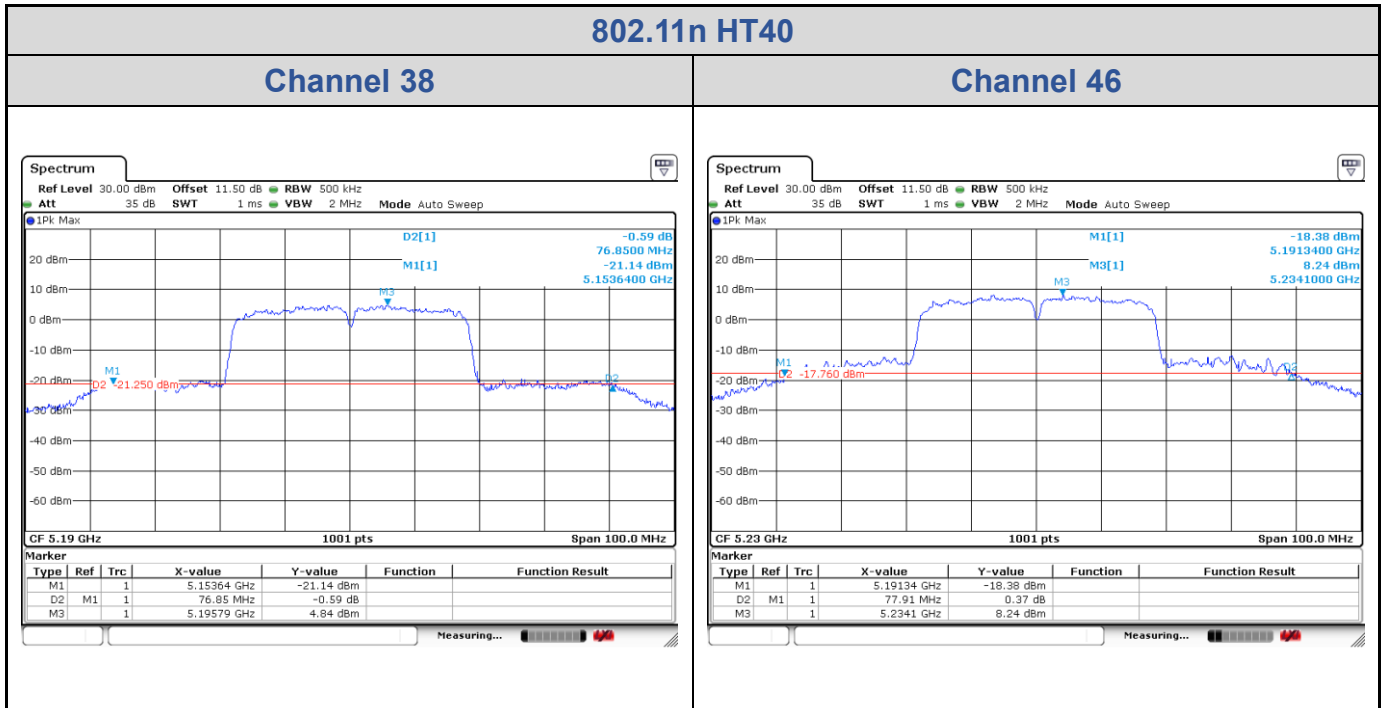
802.11n HT20

Band	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
U-NII-1	36	5180	41.60
	40	5200	45.99
	48	5240	38.00



802.11n HT40

Band	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
U-NII-1	38	5190	76.85
	46	5230	77.91



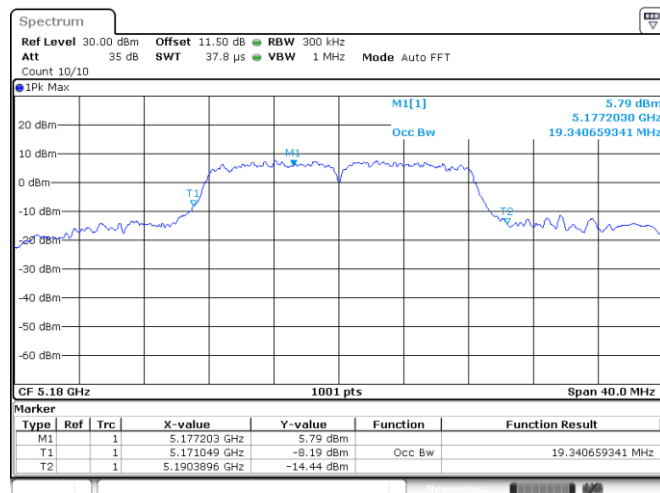
Test Result of 99% Occupied Bandwidth

802.11a

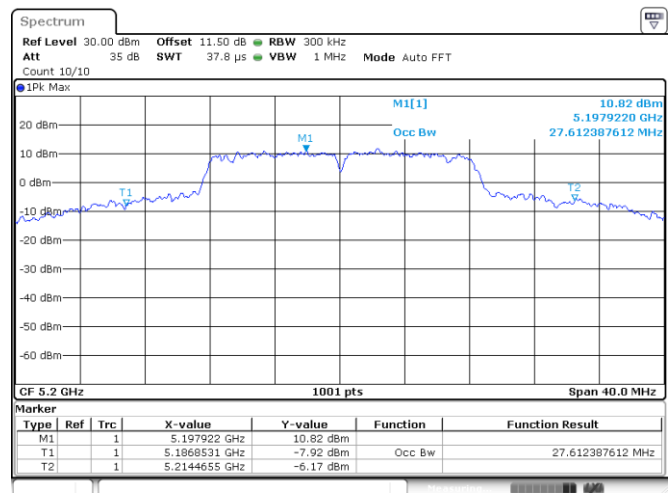
Band	Channel	Frequency (MHz)	99% Bandwidth (MHz)
U-NII-1	36	5180	19.34
	40	5200	27.61
	48	5240	17.06
U-NII-3	149	5745	21.18
	157	5785	19.38
	165	5825	21.42

802.11a

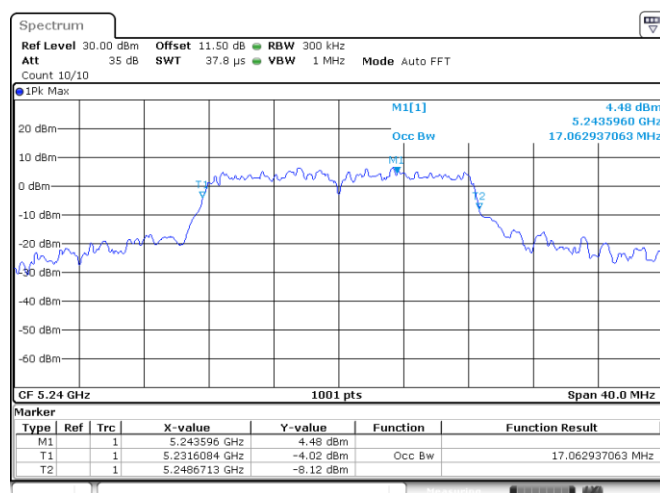
Channel 36



Channel 40

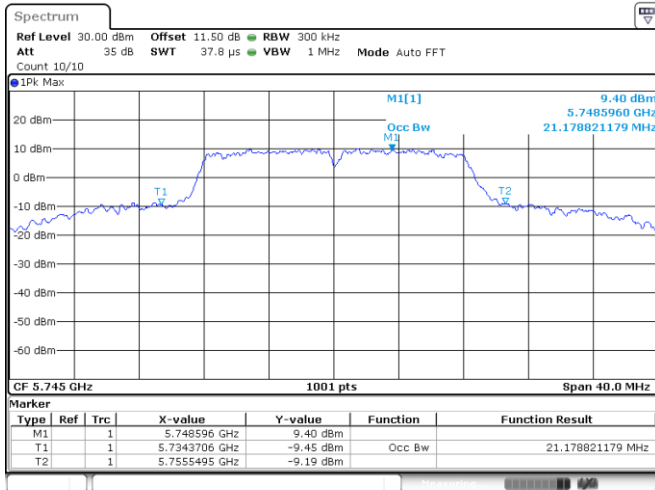


Channel 48

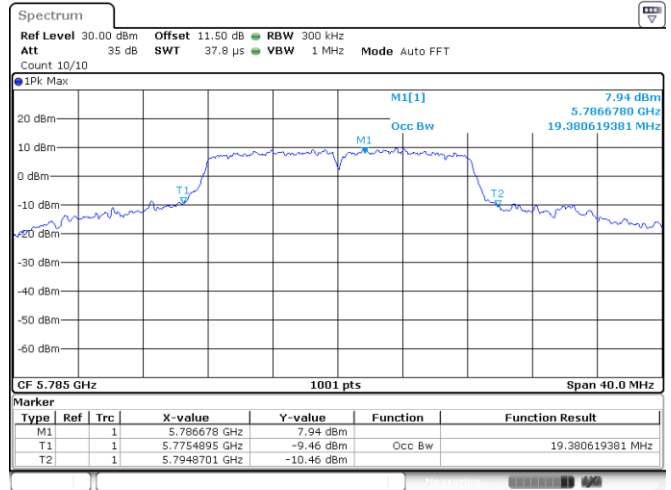


802.11a

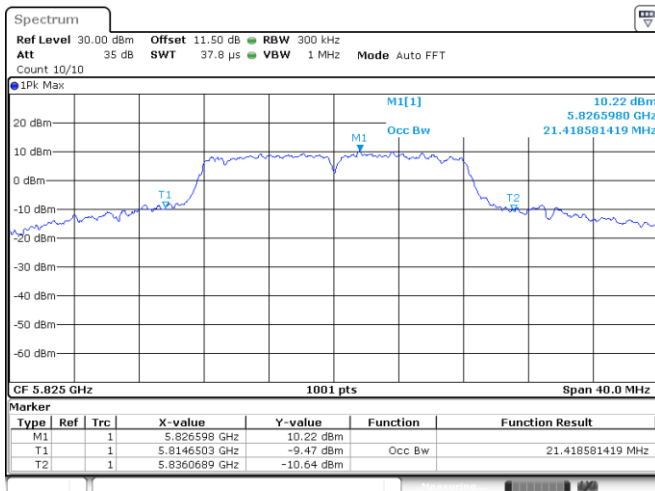
Channel 149



Channel 157

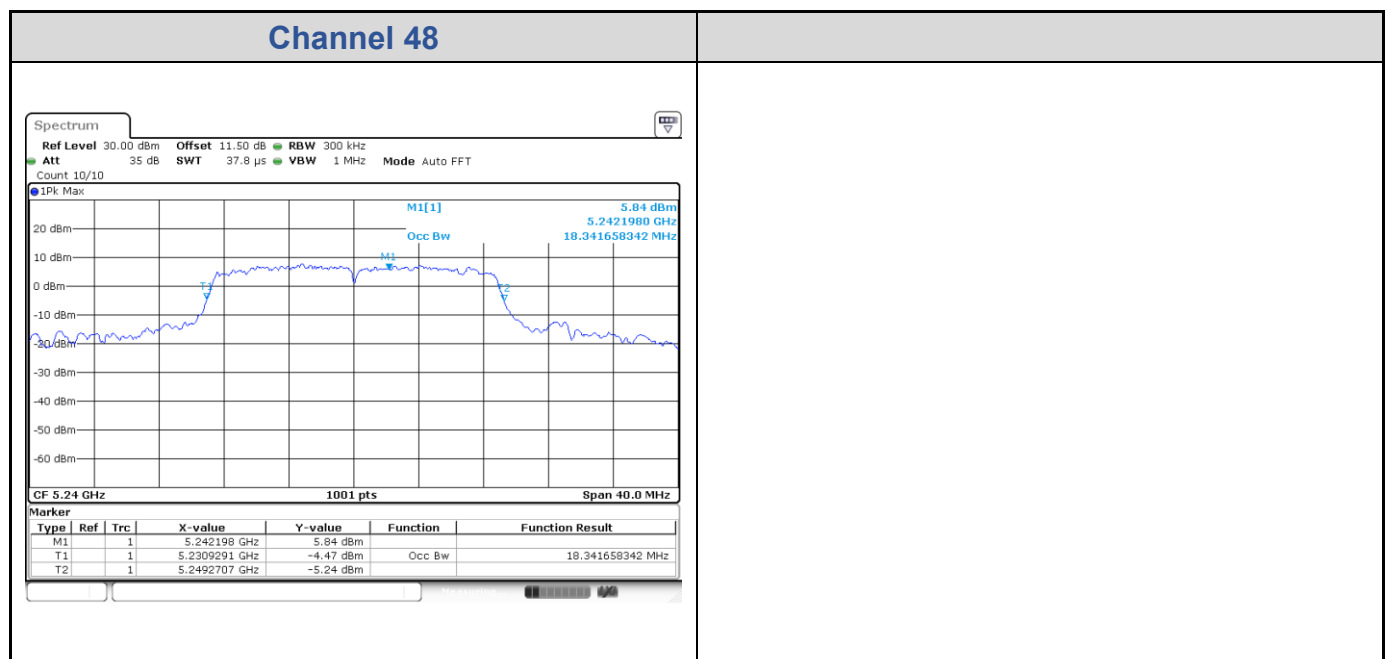
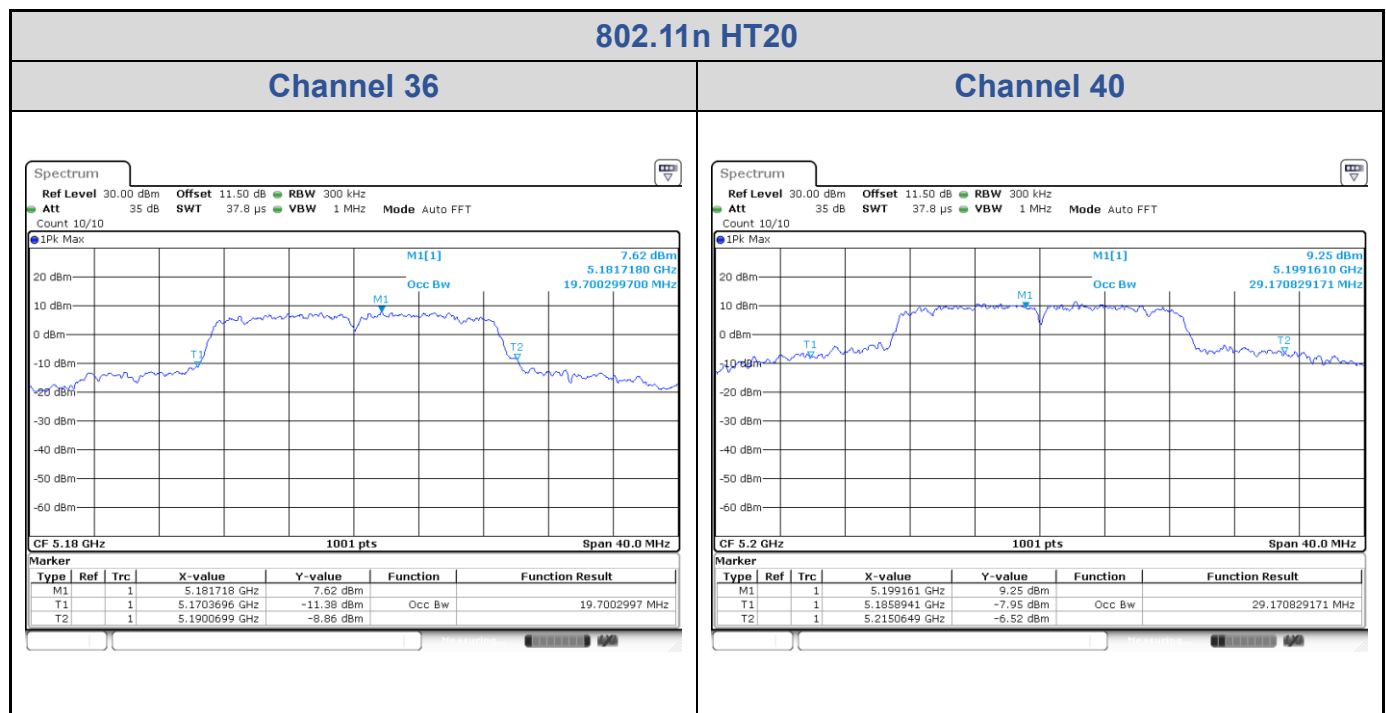


Channel 165



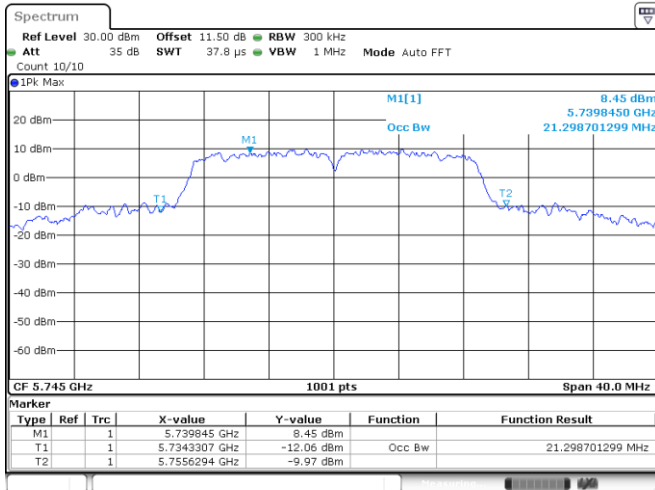
802.11n HT20

Band	Channel	Frequency (MHz)	99% Bandwidth (MHz)
U-NII-1	36	5180	19.70
	40	5200	29.17
	48	5240	18.34
U-NII-3	149	5745	21.30
	157	5785	19.46
	165	5825	20.66

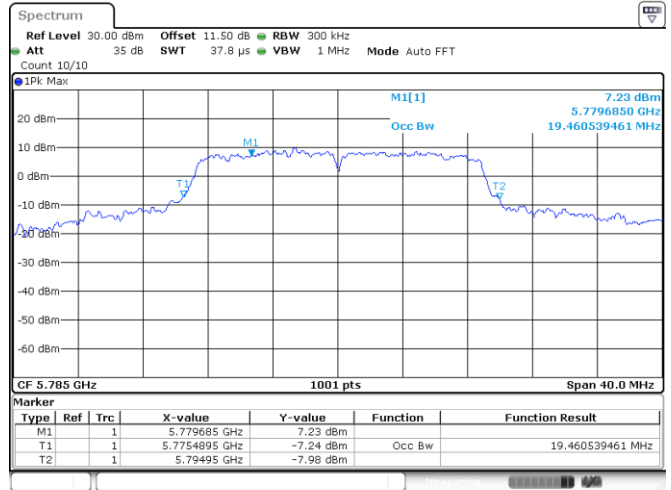


802.11n HT20

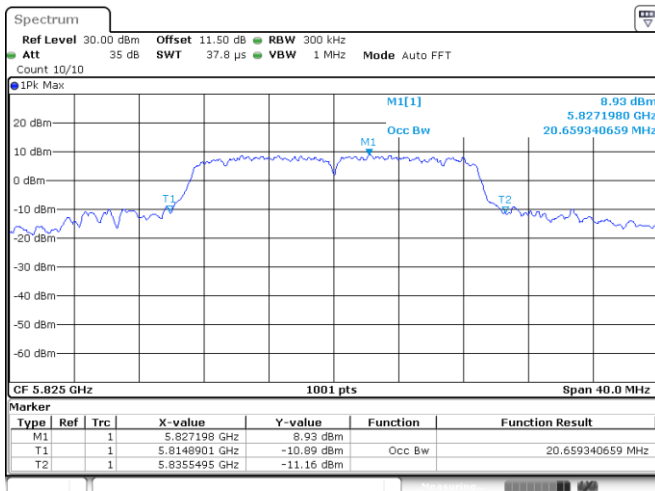
Channel 149



Channel 157

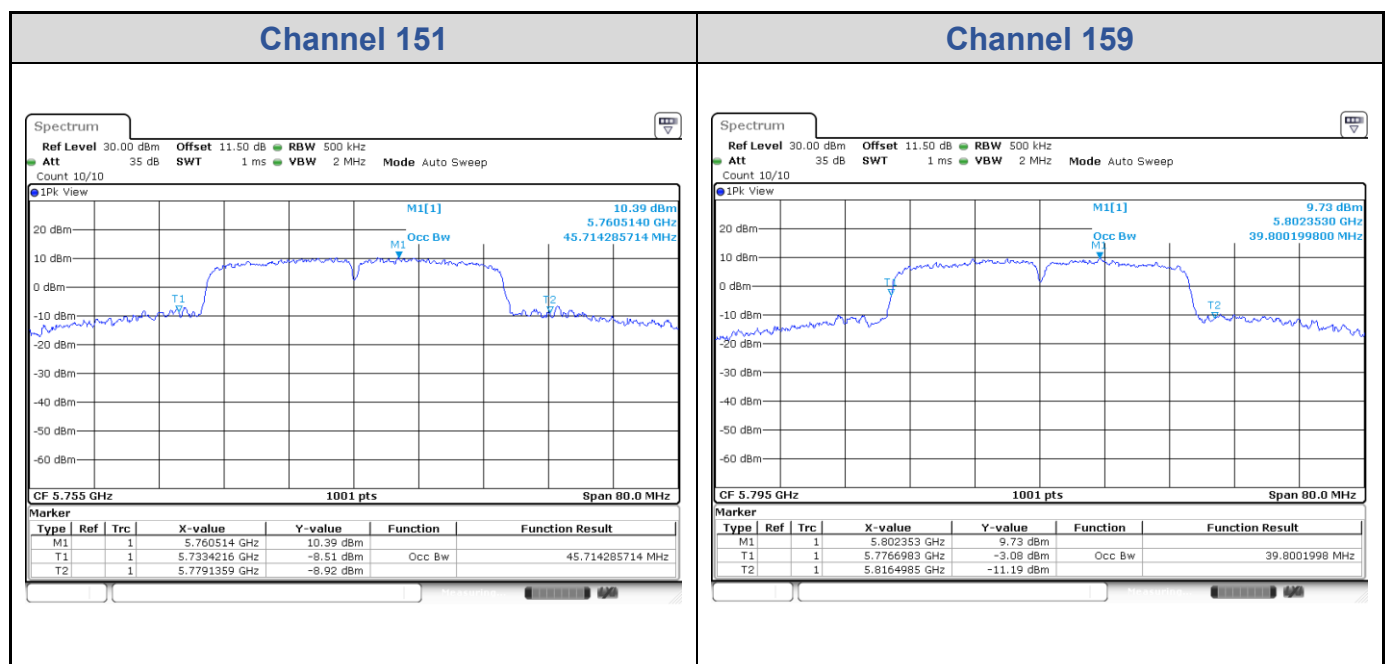
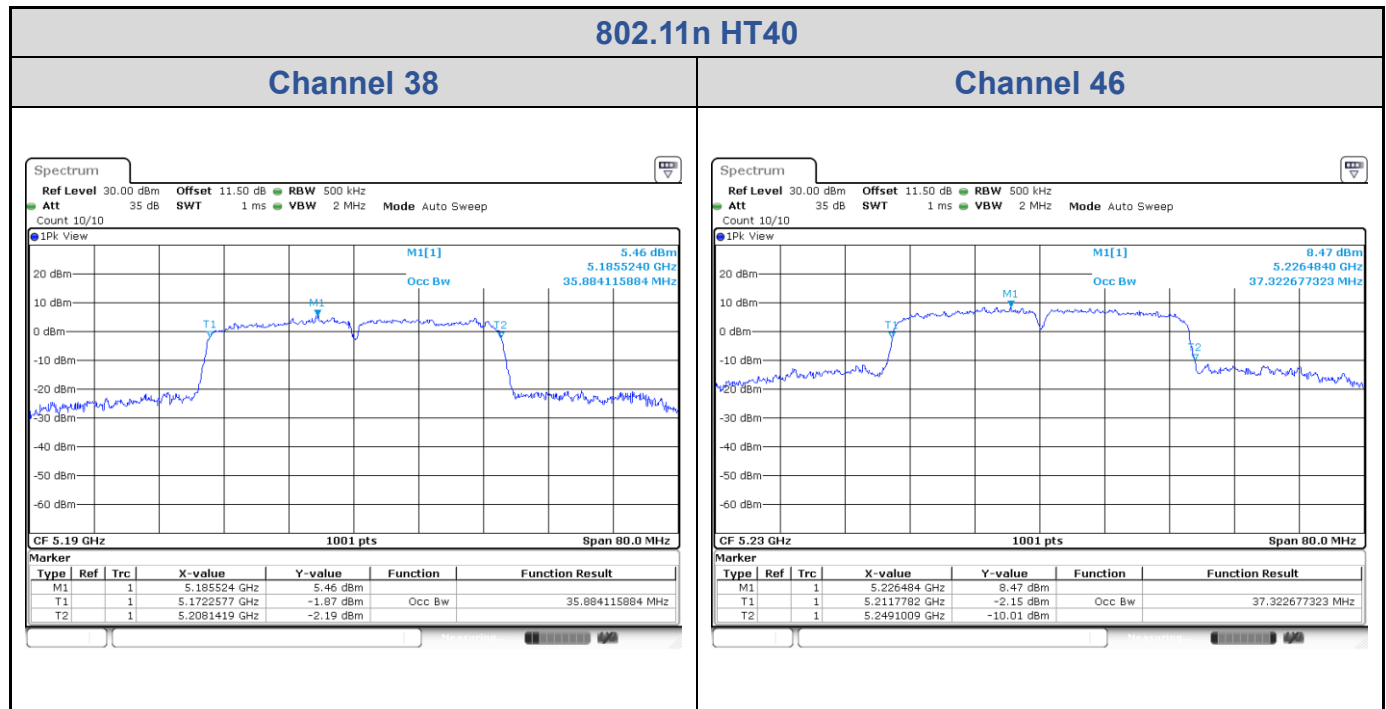


Channel 165



802.11n HT40

Band	Channel	Frequency (MHz)	99% Bandwidth (MHz)
U-NII-1	38	5190	35.88
	46	5230	37.32
U-NII-3	151	5755	45.71
	159	5795	39.80



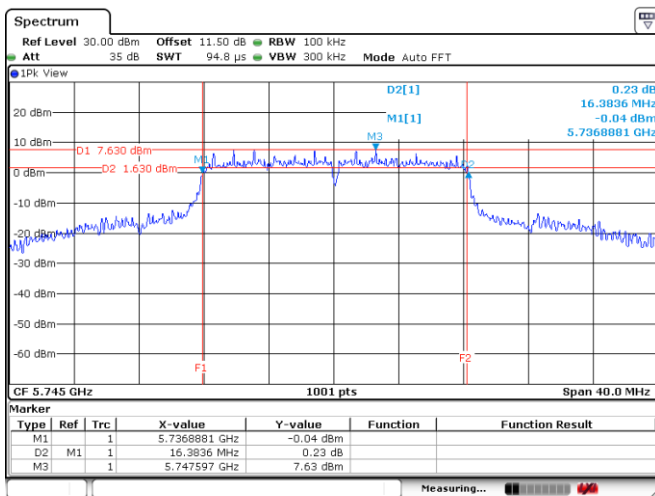
Test Result of 6 dB Bandwidth

802.11a

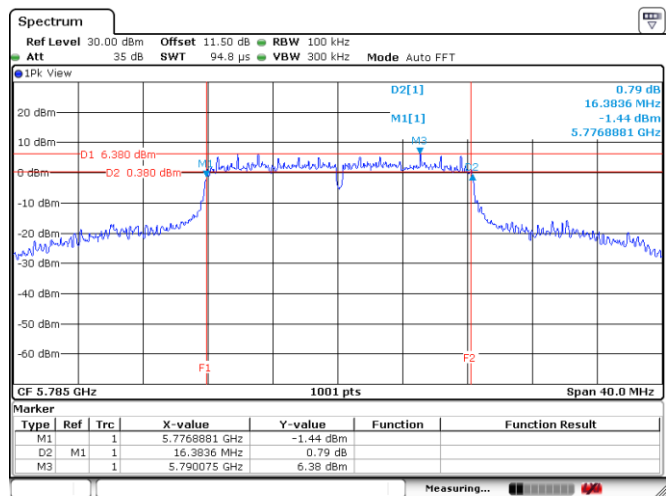
Band	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
U-NII-3	149	5745	16.38
	157	5785	16.38
	165	5825	16.38

802.11a

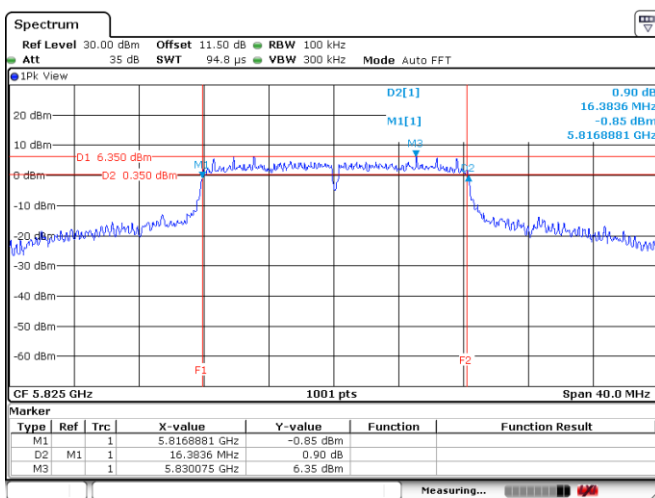
Channel 149



Channel 157

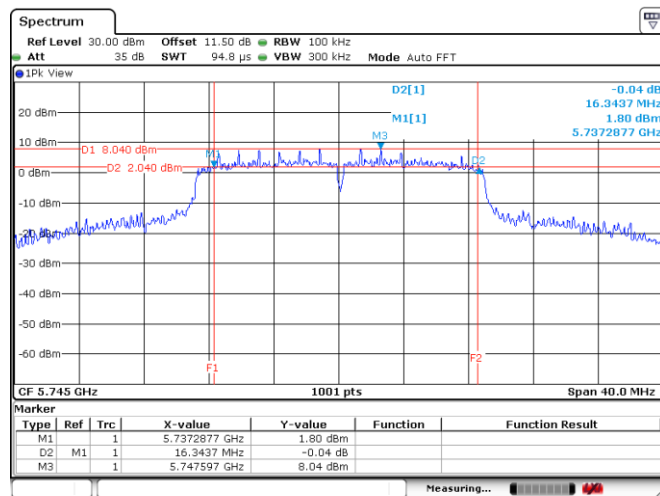
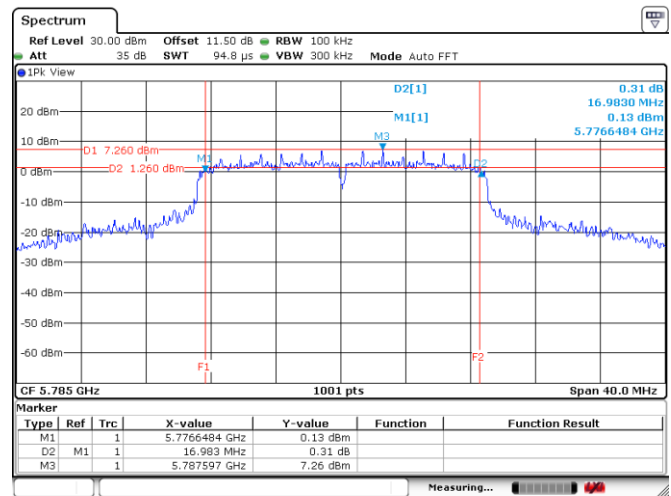
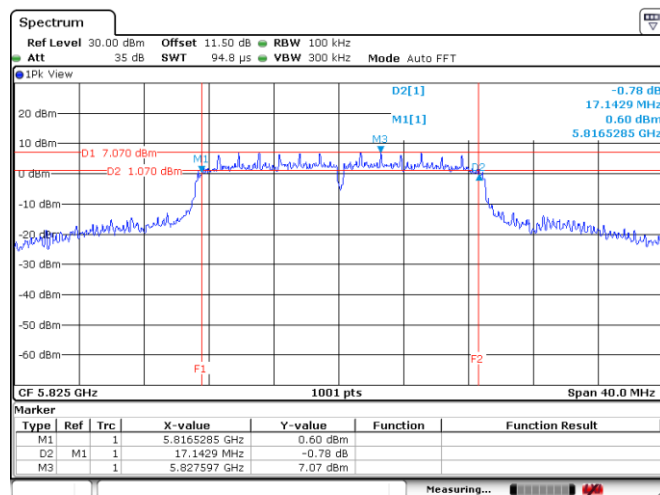


Channel 165



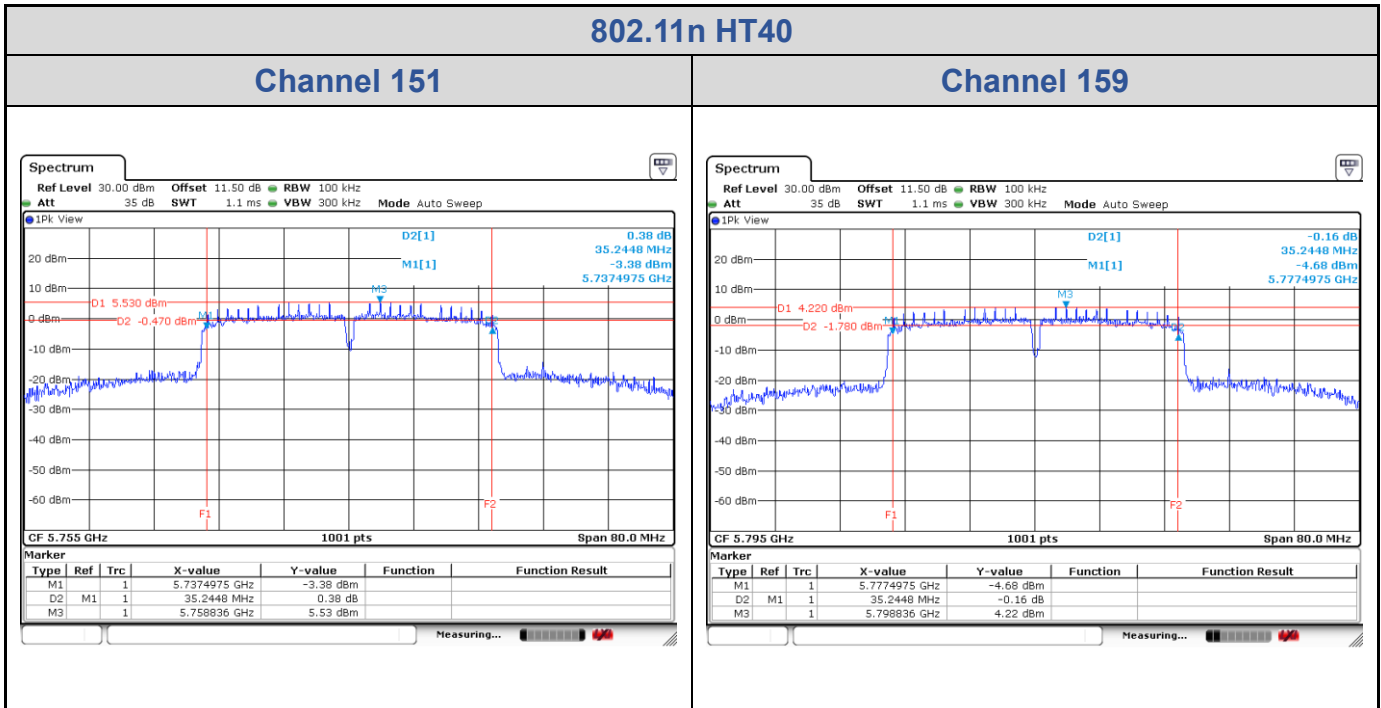
802.11n HT20

Band	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
U-NII-3	149	5745	16.34
	157	5785	16.98
	165	5825	17.14

802.11n HT20
Channel 149

Channel 157

Channel 165


802.11n HT40

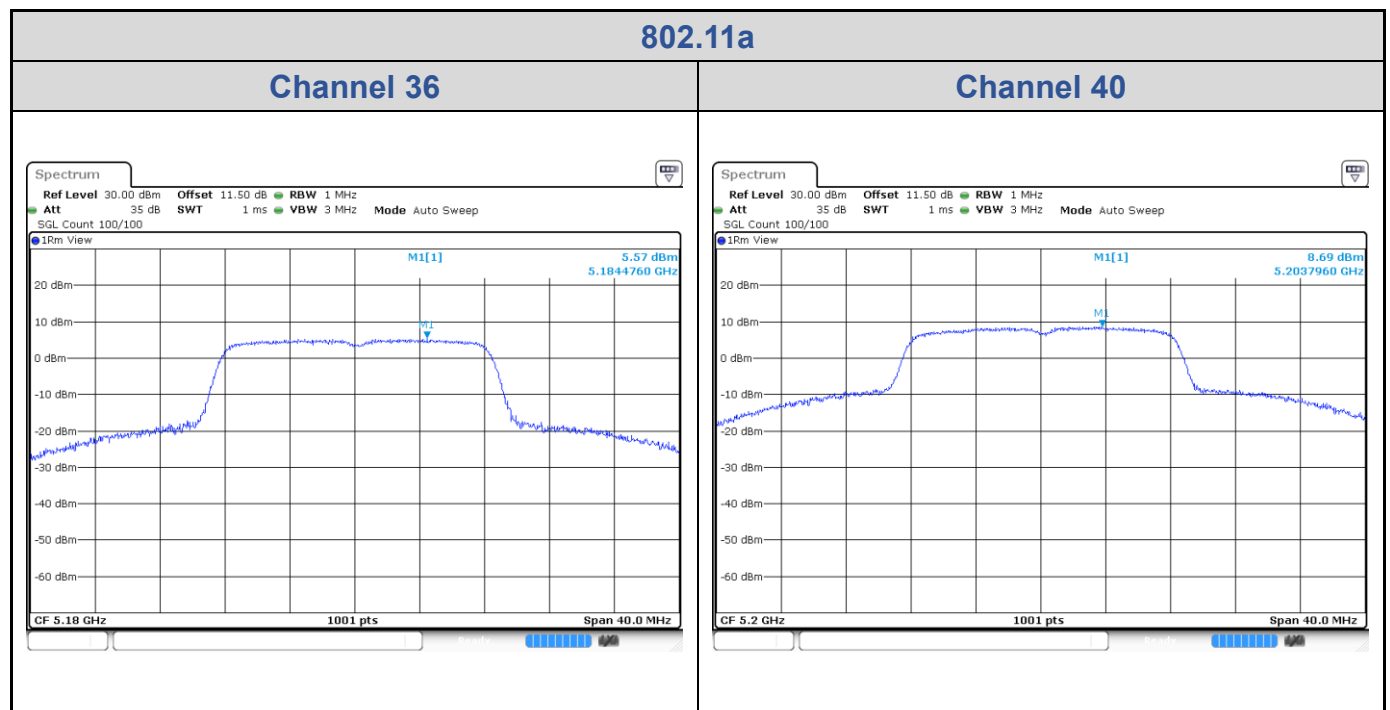
Band	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
U-NII-3	151	5755	35.24
	159	5795	35.24



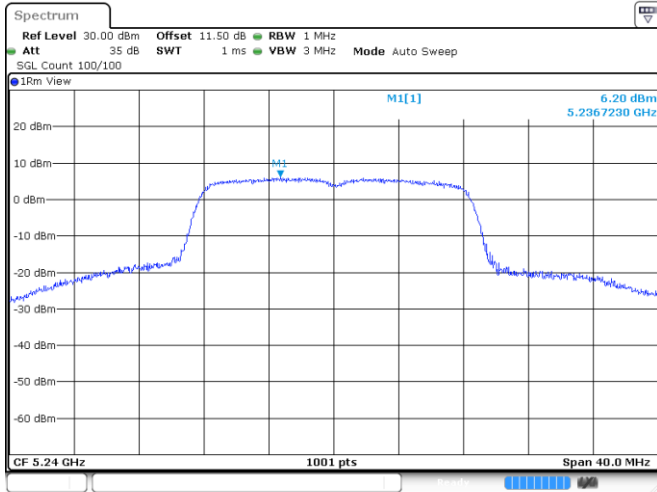
Test Result of Power Spectral Density

802.11a

Band	Channel	Frequency (MHz)	PSD with Duty Factor (dBm/MHz)	EIRP Total Power Density with Duty Factor (dBm/MHz)	Maximum Limit (dBm/MHz)	Pass / Fail
U-NII-1	36	5180	5.57	6.37	10	Pass
	40	5200	8.69	9.49	10	Pass
	48	5240	6.20	7.00	10	Pass

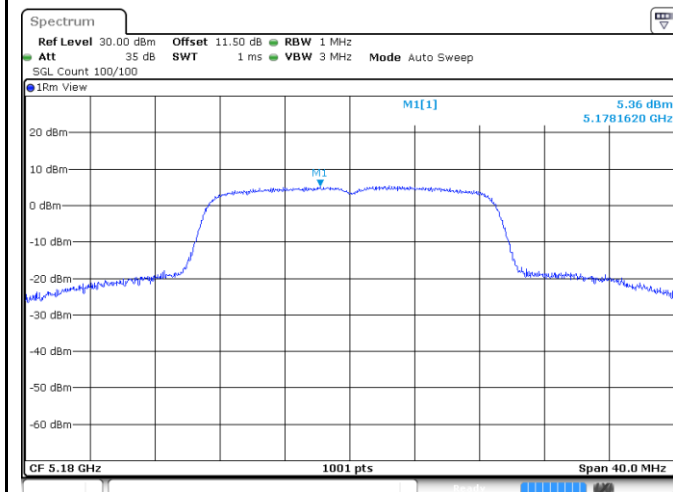
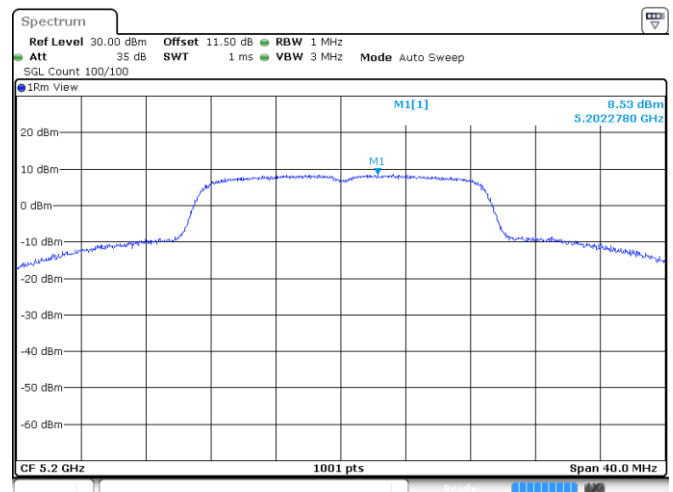
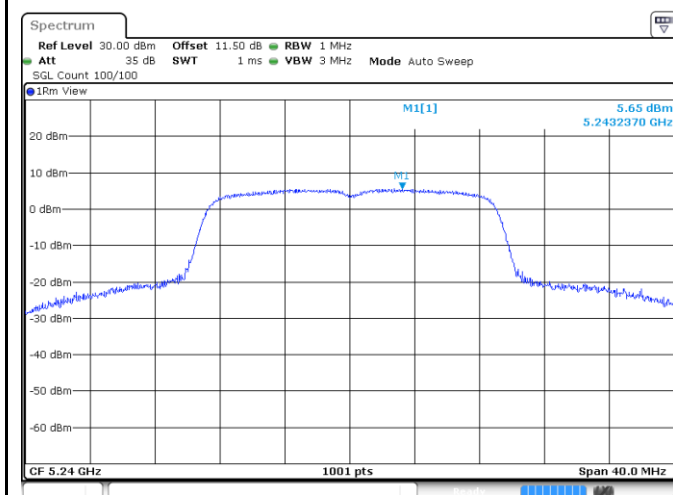


Channel 48



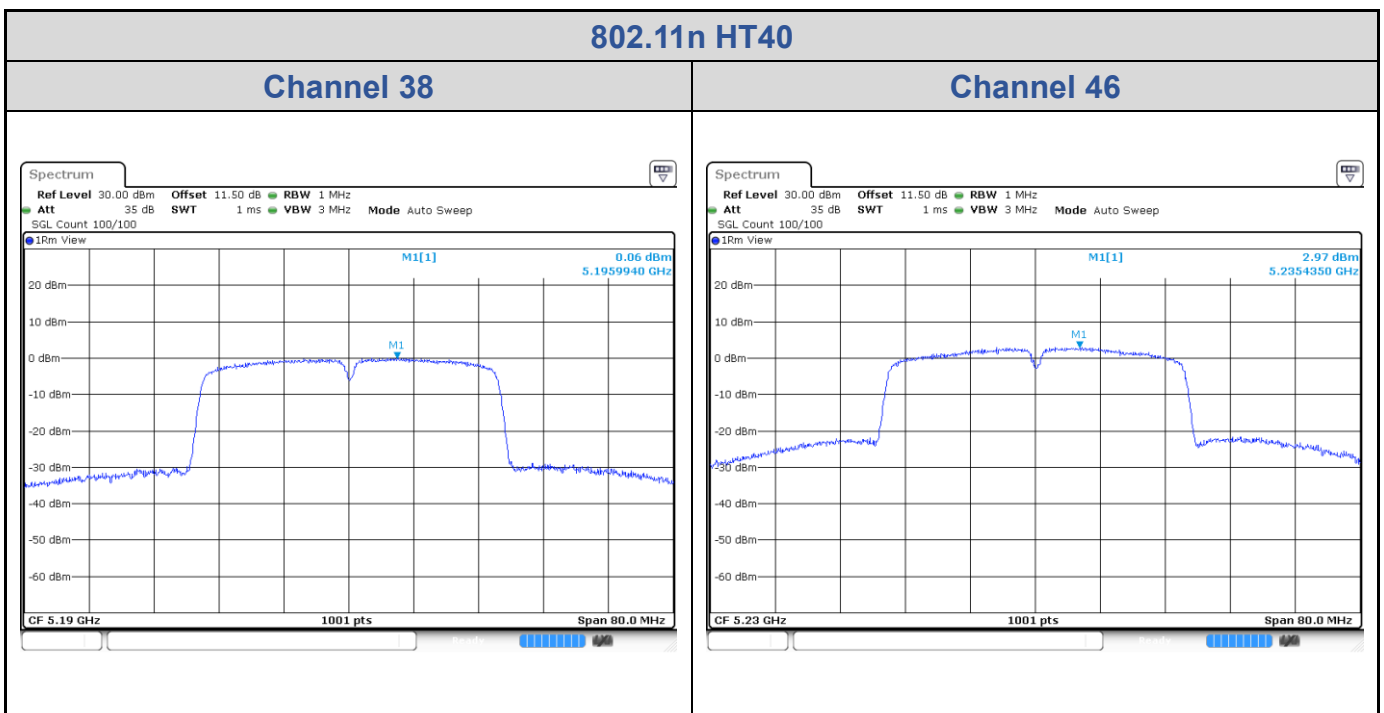
802.11n HT20

Band	Channel	Frequency (MHz)	PSD with Duty Factor (dBm/MHz)	EIRP Total Power Density with Duty Factor (dBm/MHz)	Maximum Limit (dBm/MHz)	Pass / Fail
U-NII-1	36	5180	5.36	6.16	10	Pass
	40	5200	8.53	9.33	10	Pass
	48	5240	5.65	6.45	10	Pass

802.11n HT20
Channel 36

Channel 40

Channel 48


802.11n HT40

Band	Channel	Frequency (MHz)	PSD with Duty Factor (dBm/MHz)	EIRP Total Power Density with Duty Factor (dBm/MHz)	Maximum Limit (dBm/MHz)	Pass / Fail
U-NII-1	38	5190	0.06	0.86	10	Pass
	46	5230	2.97	3.77	10	Pass



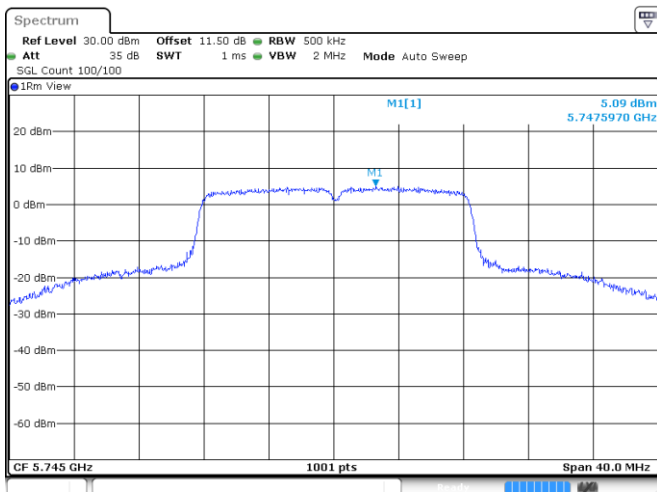
Test Result of Power Spectral Density

802.11a

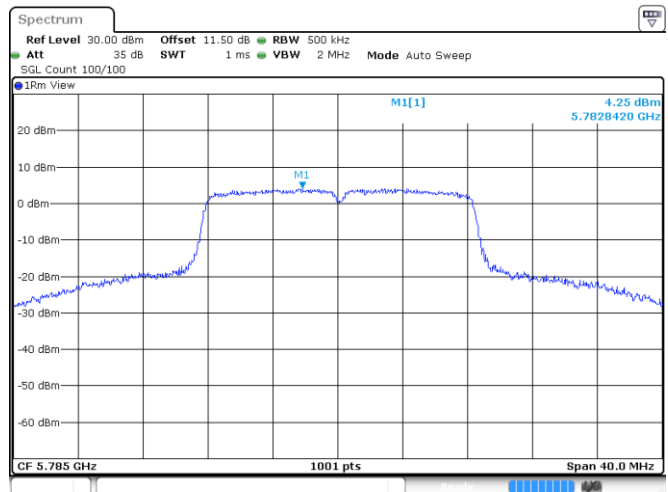
Band	Channel	Frequency (MHz)	PSD with Duty Factor (dBm/500kHz)	Total Power Density with Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass / Fail
U-NII-3	149	5745	5.09	5.36	30	Pass
	157	5785	4.25	4.53	30	Pass
	165	5825	5.00	5.27	30	Pass

802.11a

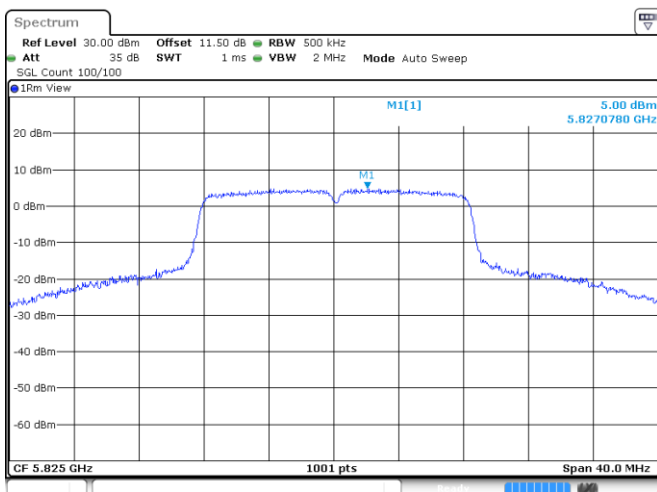
Channel 149



Channel 157

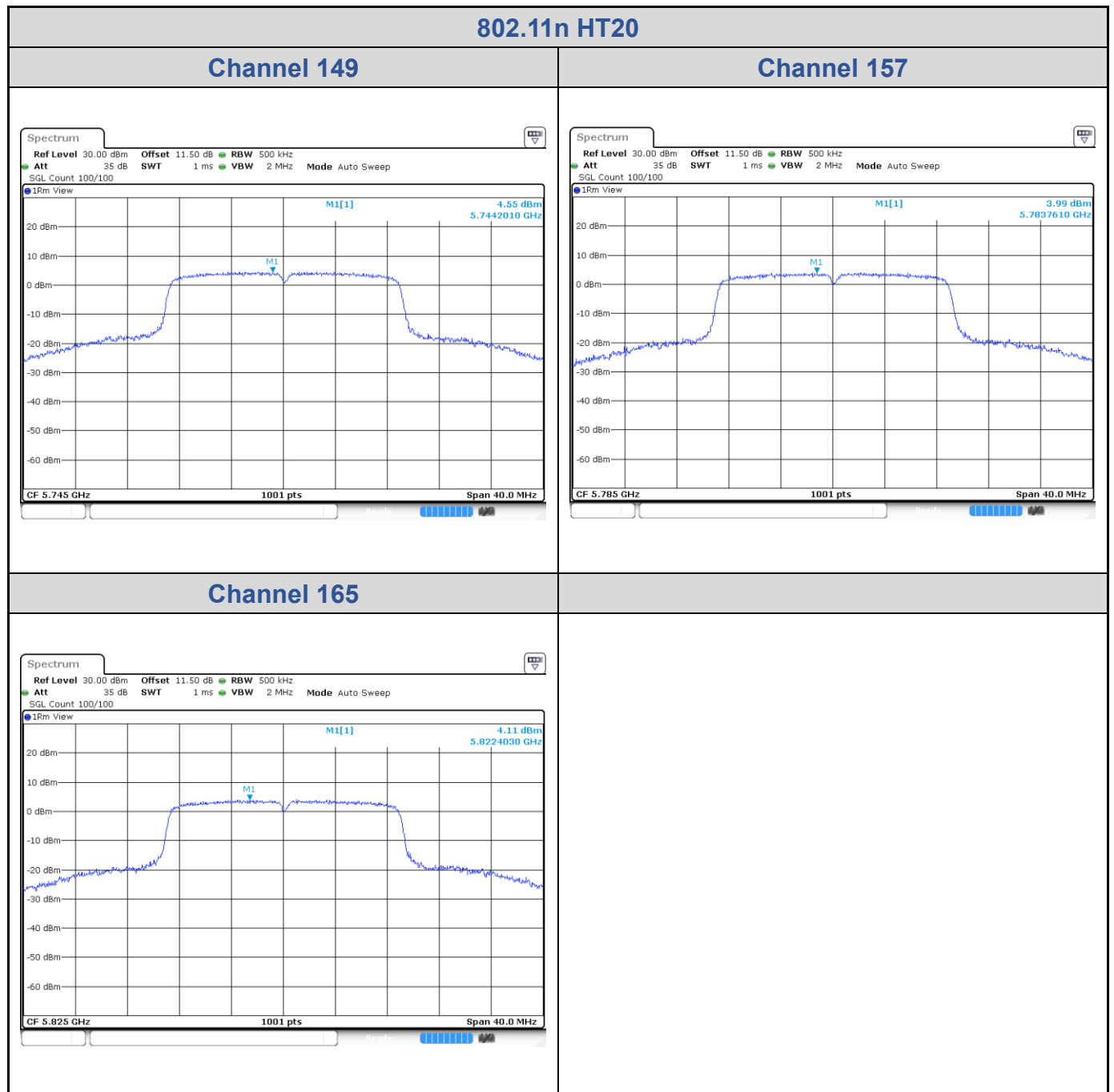


Channel 165



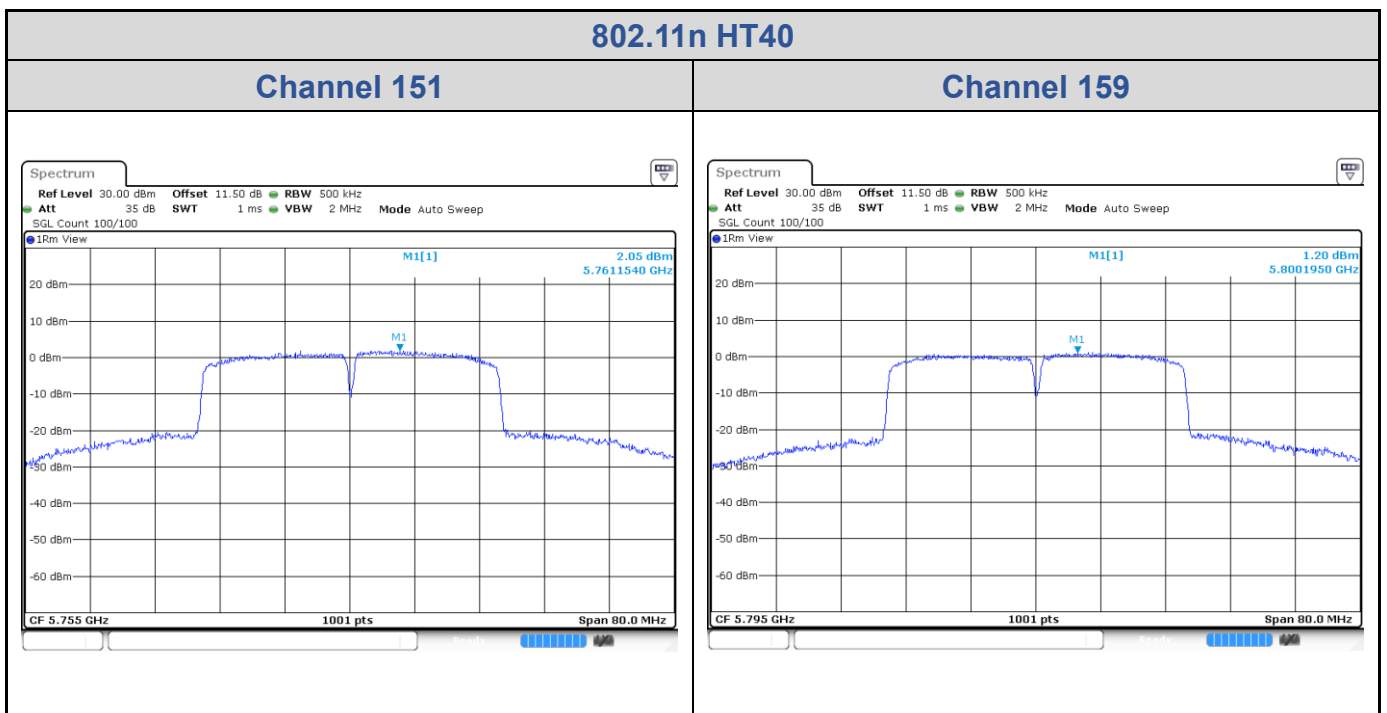
802.11n HT20

Band	Channel	Frequency (MHz)	PSD with Duty Factor (dBm/500kHz)	Total Power Density with Duty Factor (dBm/500KHz)	Limit (dBm/500kHz)	Pass / Fail
U-NII-3	149	5745	4.55	4.85	30	Pass
	157	5785	3.99	4.28	30	Pass
	165	5825	4.11	4.40	30	Pass



802.11n HT40

Band	Channel	Frequency (MHz)	PSD with Duty Factor (dBm/500kHz)	Total Power Density with Duty Factor (dBm/500KHz)	Limit (dBm/500kHz)	Pass / Fail
U-NII-3	151	5755	2.05	2.63	30	Pass
	159	5795	1.20	1.78	30	Pass



Appendix B: Test Results of Radiation Spurious Emissions & Mains

Conducted Emission

Band Edges

U-NII-1

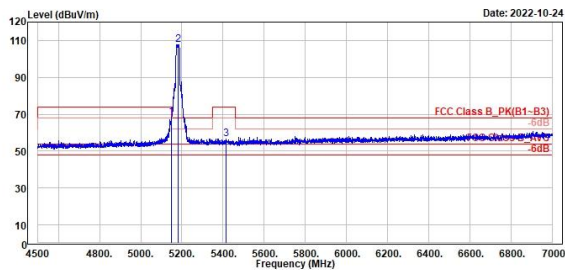
802.11a

CH 36 (Horizontal) Peak

CH 36 (Vertical) Peak



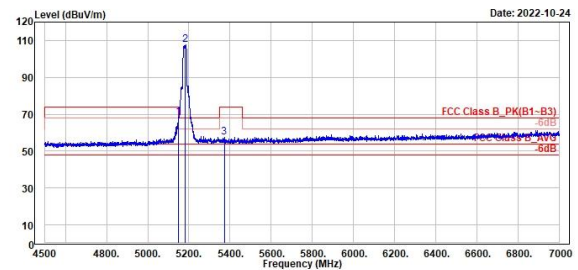
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
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Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB		cm	deg			
1 !	5148.50	68.54	25.67	42.87	74.00	-5.46	161	108	Peak	Horizontal	
2 *	5180.00	107.77	64.81	42.96	68.20	39.57	161	108	Peak	Horizontal	
3	5416.00	56.76	13.63	43.13	74.00	-17.24	161	108	Peak	Horizontal	



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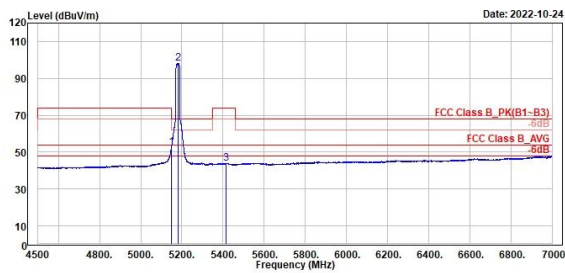
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MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB		cm	deg			
1 !	5148.50	68.40	26.03	42.37	74.00	-5.60	304	218	Peak	Vertical	
2 *	5180.00	107.61	65.15	42.46	68.20	39.41	304	218	Peak	Vertical	
3	5372.00	57.41	14.66	42.75	74.00	-16.59	304	218	Peak	Vertical	

802.11a

CH 36 (Horizontal) Average



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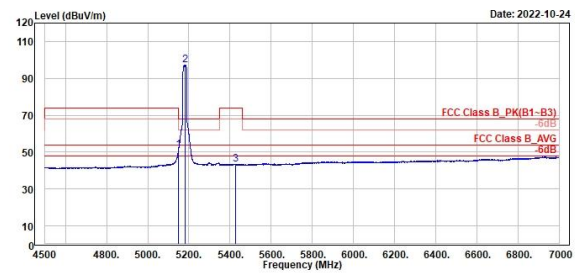


	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB		cm	deg			
1	5150.00	52.69	9.82	42.87	54.00	-1.31	161	108	Average	Horizontal		
2	5180.00	97.94	54.98	42.96	54.00	43.94	161	108	Average	Horizontal		
3	5413.00	43.94	0.81	43.13	54.00	-10.86	161	108	Average	Horizontal		

CH 36 (Vertical) Average



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	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB		cm	deg			
1	5150.00	51.01	8.64	42.37	54.00	-2.99	304	218	Average	Vertical		
2	5180.00	97.36	54.90	42.46	54.00	43.36	304	218	Average	Vertical		
3	5426.00	43.52	0.62	42.90	54.00	-10.48	304	218	Average	Vertical		

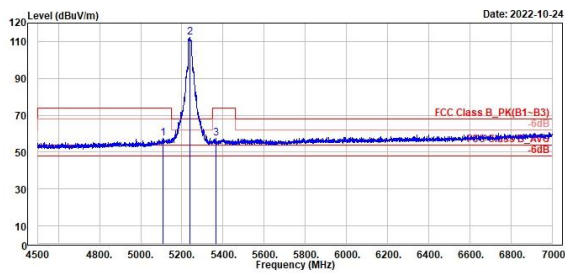
802.11a

CH 48 (Horizontal) Peak

CH 48 (Vertical) Peak



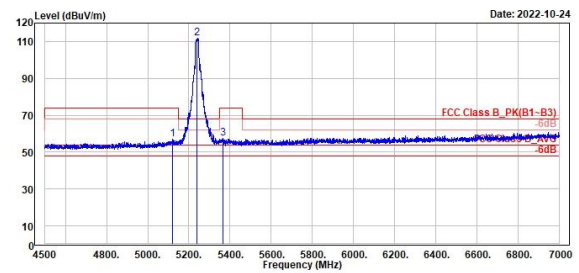
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	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	5109.50	57.42	14.58	42.84	74.00	-16.58	159	109	Peak	Horizontal		
2 *	5240.00	112.09	69.21	42.88	68.20	43.89	159	109	Peak	Horizontal		
3	5364.50	57.58	14.64	42.94	74.00	-16.42	159	109	Peak	Horizontal		



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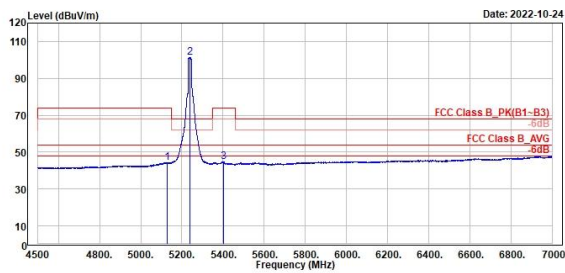
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	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	5122.00	56.86	14.51	42.35	74.00	-17.14	297	218	Peak	Vertical		
2 *	5240.00	111.87	69.33	42.54	68.20	43.67	297	218	Peak	Vertical		
3	5365.50	57.38	14.63	42.75	74.00	-16.62	297	218	Peak	Vertical		

802.11a

CH 48 (Horizontal) Average



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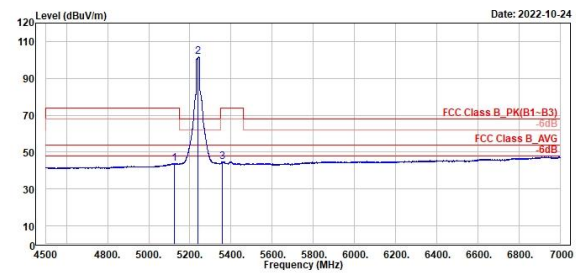


	Freq	Level	Read	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	5127.50	44.39	1.54	42.85	54.00	-9.61	159	109 Average	Horizontal	
2 *	5240.00	101.49	58.61	42.88	54.00	47.49	159	109 Average	Horizontal	
3	5403.00	44.75	1.58	43.17	54.00	-9.25	159	109 Average	Horizontal	

CH 48 (Vertical) Average



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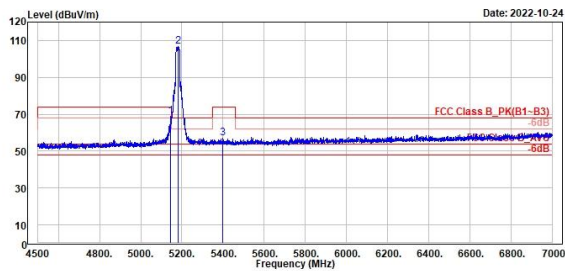
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	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	5125.50	43.89	1.54	42.35	54.00	-10.11	297	218 Average	Vertical	
2 *	5240.00	101.55	59.01	42.54	54.00	47.55	297	218 Average	Vertical	
3	5357.00	44.75	2.01	42.74	54.00	-9.25	297	218 Average	Vertical	

802.11n HT20

CH 36 (Horizontal) Peak



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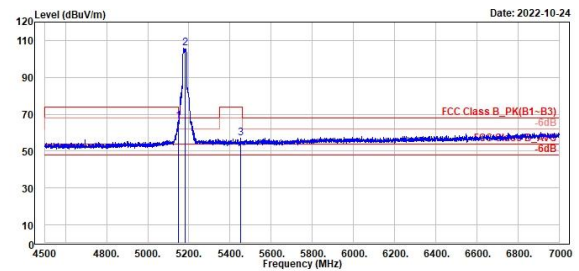


	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB		cm	deg			
1	5146.50	68.99	26.12	42.87	74.00	-5.01	161	106	Peak	Horizontal		
2	5180.00	106.63	63.67	42.96	68.20	38.43	161	106	Peak	Horizontal		
3	5398.50	56.88	13.72	43.16	74.00	-17.12	161	106	Peak	Horizontal		

CH 36 (Vertical) Peak



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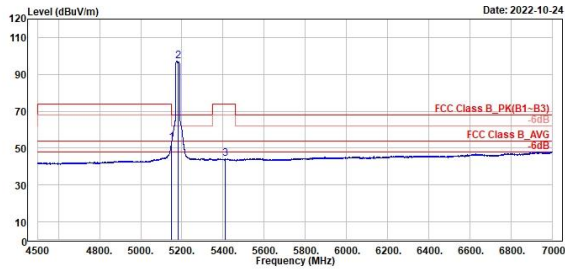
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	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB		cm	deg			
1	5150.00	66.16	23.79	42.37	68.20	-2.04	290	217	Peak	Vertical		
2	5180.00	105.91	63.45	42.46	68.20	37.71	290	217	Peak	Vertical		
3	5452.00	56.92	13.90	43.02	74.00	-17.08	290	217	Peak	Vertical		

802.11n HT20

CH 36 (Horizontal) Average



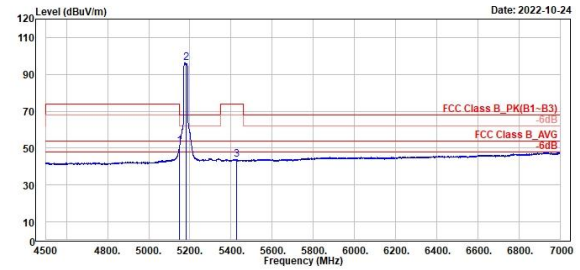
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	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	5158.00	52.84	9.97	42.87	54.00	-1.16	161	106	Average	Horizontal		
2	5180.00	97.31	54.35	42.96	54.00	43.31	161	106	Average	Horizontal		
3	5412.00	44.26	1.13	43.13	54.00	-9.74	161	106	Average	Horizontal		



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	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	5158.00	51.18	8.81	42.37	54.00	-2.82	290	217	Average	Vertical		
2	5180.00	96.13	53.67	42.46	54.00	42.13	290	217	Average	Vertical		
3	5427.00	43.86	0.95	42.91	54.00	-10.14	290	217	Average	Vertical		

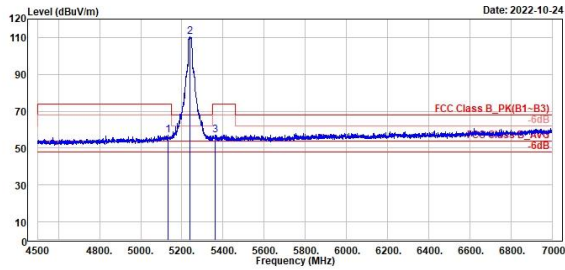
802.11n HT20

CH 48 (Horizontal) Peak

CH 48 (Vertical) Peak



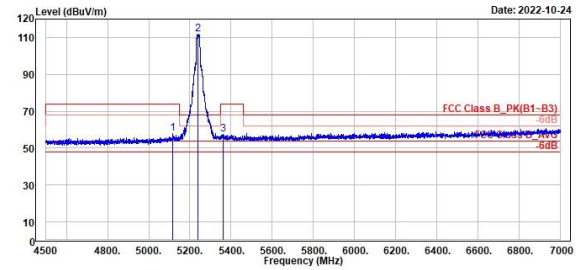
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	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	5134.00	57.18	14.32	42.86	74.00	-16.82	100	100	Peak	Horizontal		
2 *	5240.00	110.37	67.49	42.88	68.20	42.17	100	100	Peak	Horizontal		
3	5362.50	57.13	14.22	42.91	74.00	-16.87	100	100	Peak	Horizontal		



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	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	5115.00	57.79	15.45	42.34	74.00	-16.21	299	218	Peak	Vertical		
2 *	5240.00	111.56	69.02	42.54	68.20	43.36	299	218	Peak	Vertical		
3	5361.00	57.55	14.81	42.74	74.00	-16.45	299	218	Peak	Vertical		