Prüfbericht-Nr.: *Test report no.:*	60409343 001	**Auftrags-Nr.:** *Order no.*:	238487137	Seite 1 von 31 *Page 1 of 31*
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date*:	29-May-2020	
Auftraggeber: *Client:*	Industrea Mining Technology Pty Ltd 3 Co-Wyn Close, Fountaindale, NSW, 2258, Australia			
Prüfgegenstand: *Test item:*	Personal Digital Assistant			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	PROD1185			
Auftrags-Inhalt: *Order content:*	FCC Part 15E Test report (WiFi 5GHz)			
Prüfgrundlage: *Test specification:*	FCC 47CFR Part 15: Subpart E Section 15.407			

Wareneingangsdatum: *Date of sample receipt:*	14-Jul-2020
Prüfmuster-Nr.: *Test sample no:*	A002866252-005
Prüfzeitraum: *Testing period:*	21-Jul-2020 ~ 31-Jul-2020
Ort der Prüfung: *Place of testing:*	EMC/RF Laboratory Taipei
Prüflaboratorium: *Testing laboratory:*	Taipei Testing Laboratories
Prüfergebnis*: *Test result*:*	Pass

überprüft von: *reviewed by:*		**genehmigt von** *authorized by:*	
Datum: 25-Aug-2020 *Date:*	Ryan W.T. Chen	**Datum:** 25-Aug-2020 *Date:*	Brenda S.H. Chen
Stellung / *Position:*	Project Manager	**Stellung** / *Position:*	Project Manager

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.407(a) & 15.203	Antenna Requirement	Pass
5.1.2	15.407(a)	Maximum Conducted Output Power	Pass
5.1.3	15.407(a)	26 dB Bandwidth	Pass
5.1.3	2.1049	99% Occupied Bandwidth	Pass
5.1.4	15.407(e)	6 dB Bandwidth (U-NII-3 Band only)	Pass
5.1.5	15.407(g)	Frequency Stability	Pass
5.1.6	15.407(a)	Power Spectral Density	Pass
5.1.7	15.407(b) & 15.205 & 15.209	Radiated Spurious Emissions and Band Edges	Pass
-	15.407(h) & KDB 905462 D02	Dynamic Frequency Selection	N/A
-	15.207	Mains Conducted Emission	N/A
6.1	2.1091	RF Exposure Compliance	Pass

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

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APPENDIX A - TEST RESULT OF CONDUCTED

APPENDIX B - TEST RESULT OF RADIATED SPURIOUS EMISSIONS

APPENDIX SP - PHOTOGRAPHS OF TEST SETUP

APPENDIX EP - PHOTOGRAPHS OF EUT

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
60409343 001	Original Release	25-Aug-2020

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 Spurious Emissions
Appendix SP - Photographs of Test Setup
Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
FCC CFR47 Part 15: Subpart E Section 15.407
FCC CFR47 Part 2: Subpart J Section 2.1091
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.: 226631
ISED Registration No.: 25563

Testing Laboratory
3567

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 basics 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)	± 1.30 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 1.30 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 1.54 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.52 dB
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Personal Digital Assistant. 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	Personal Digital Assistant
Type Identification	PROD1185
FCC ID	YIY-PROD1185

Technical Specification of EUT

Item	EUT information
Operating Frequency	Band 1: 5180 MHz ~ 5240 MHz Band 4: 5745 MHz ~ 5825 MHz
Channel Spacing	10 MHz
Channel number	Band 1: 4 for 802.11a, 802.11n HT20/802.11ac VHT20 2 for 802.11n HT40/802.11ac VHT40 1 for 802.11ac VHT80 Band 4: 5 for 802.11a, 802.11n HT20/802.11ac VHT20 2 802.11n HT40/802.11ac VHT40 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 802.11ac: up to MCS9
Operation Voltage	5Vdc ~ 9Vdc (Tested at 5Vdc)
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Maximum Output Power (mW)	5180 ~ 5240 MHz: 84.53 5745 ~ 5825 MHz: 64.71
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.4

Note:
1. The tested voltage has been evaluated at 5Vdc and 9Vdc and found that 5Vdc is the worst case.

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 / 802.11ac VHT20		802.11n HT40 / 802.11ac VHT40		802.11ac VHT80	
Channel	Power Setting	Channel	Power Setting	Channel	Power Setting	Channel	Power Setting
36	19	36	19	38	17.5	42	16.5
40	22	40	22	46	21	155	21
48	22	48	22	151	22		
149	22	149	22	159	22		
157	22	157	22				
165	21	165	21				

4.2 Carrier Frequency and Channel

Band	Channel	Frequency (MHz)	802.11a 802.11n HT20 802.11ac VHT20	802.11n HT40 802.11ac VHT40	802.11ac VHT80
U-NII-1 (Band 1)	36	5180	V		
	38	5190		V	
	40	5200	V		
	42	5210			V
	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			V
	157	5785	V		
	159	5795		V	
	161	5805	V		
	165	5825	V		

4.3 Test Operation and Test Software

Setup for testing: The test sample itself is equipped with a touch screen. It was used to enable the operation modes listed as below.

The samples were used as follows:
A002866252-005
Full test was applied on all test modes, but only worst case was shown.

The EUT provides one transmitter and receiver.

Modulation Mode	Tx Function
802.11a	1TX
802.11n HT20	1TX
802.11n HT40	1TX
802.11ac VHT20	1TX
802.11ac VHT40	1TX
802.11ac VHT80	1TX

* The modulation and bandwidth are similar for 802.11n mode HT20/HT40 and 802.11ac mode VHT20/VHT40, therefore investigated worse case as representative mode in test report.

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

Note:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on **X-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	
-	802.11ac VHT80	5180-5240	42	42	MCS0
-		5745-5825	155	155	

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	
-	802.11ac VHT80	5180-5240	42	42	MCS0
-		5745-5825	155	155	

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)
-	802.11n HT20	5180-5240	36 to 48	36	MCS0
-	802.11n HT20	5745-5825	149 to 165	165	MCS0

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Conducted Measurement	22-26 °C	50-65 %	Stanislas Charles
Radiated Spurious Emissions above 1 GHz	22-26 °C	50-65 %	Simon Tsai
Radiated Spurious Emissions below 1 GHz	22-26 °C	50-65 %	Simon Tsai

4.4 Special Accessories and Auxiliary Equipment

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

Accessory of EUT

Interface Cable					
No.	Description	Shielded Type	Ferrite Core (Qty)	Length	Remark
A	Power Cable	YES	0	1.5m	--

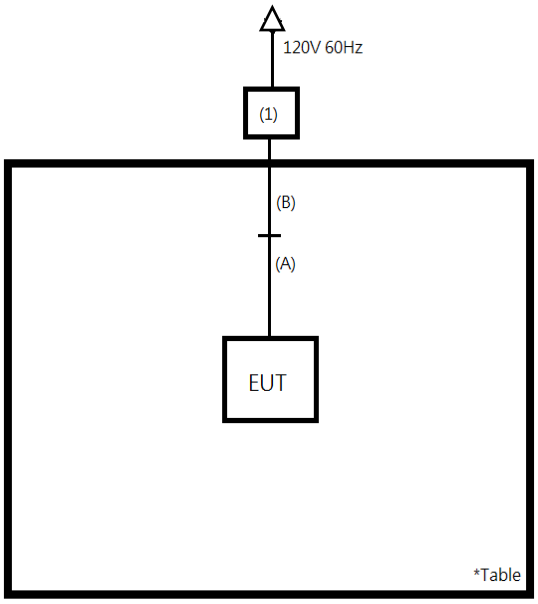
Support Unit

Support Unit					
No.	Description	Brand	Model	S/N	Remark
1	Power Supply	KEITHLEY	2303	N/A	--

Interface Cable					
No.	Description	Shielded Type	Ferrite Core (Qty)	Length	Remark
B	DC Power Cable	NO	0	0.5m	--

4.5 Test Setup Diagram

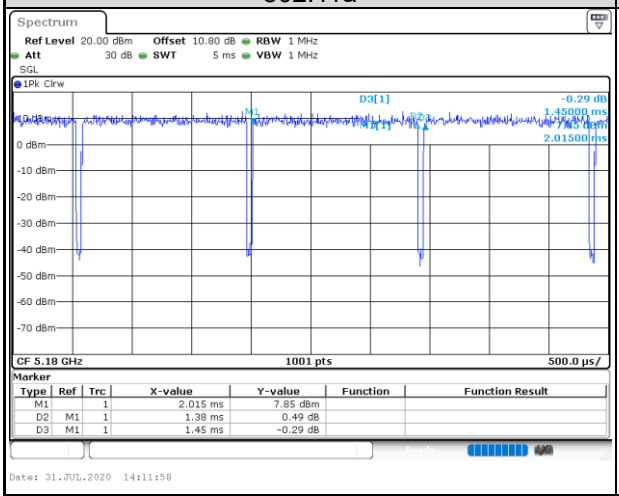
<Radiated Spurious Emissions Tx mode >



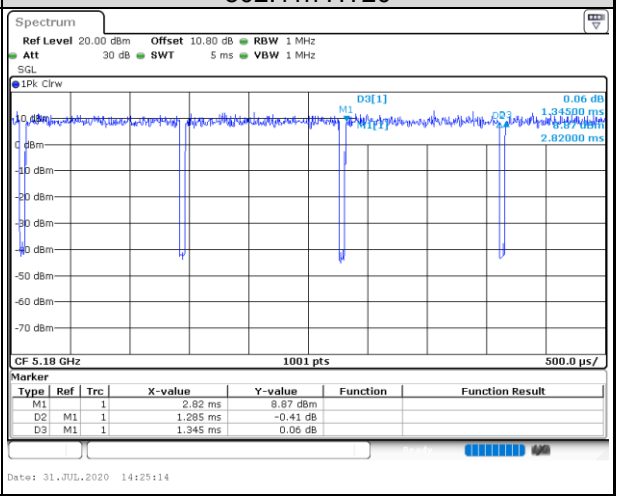
4.6 Duty Cycle of Test Signal

Mode	On + Off Time (ms)	On Time (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11a	1.45	1.38	95.17	0.21
802.11n HT20	1.345	1.285	95.54	0.20
802.11n HT40	695	615	88.49	0.53
802.11ac VHT80	370	285	77.03	1.13

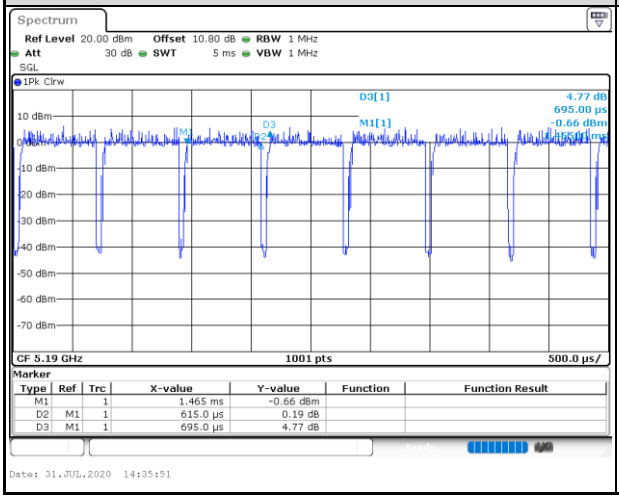
802.11a



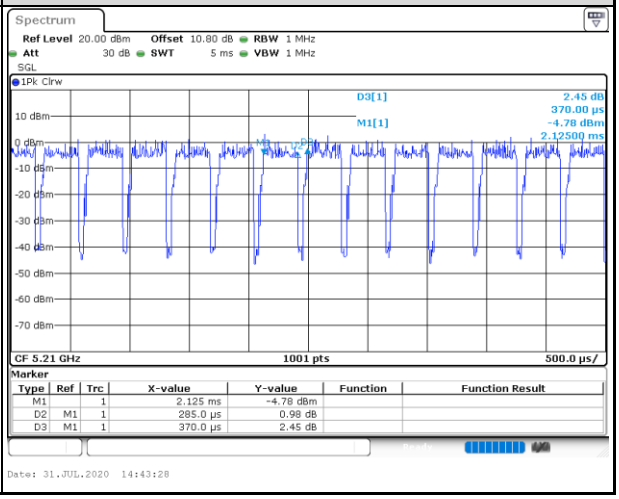
802.11n HT20



802.11n HT40



802.11ac VHT80



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.

PCB antenna with 3.747 dBi gain (5180 ~ 5240 MHz)
PCB antenna with 4.129 dBi gain (5745 ~ 5825 MHz)

Refer to EUT photo for details.

5.1.2 Maximum Conducted Output Power

Limit

Operation Band	EUT Category	Limit
U-NII-1	Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p ≦ 125 mW (21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
	Fixed point-to-point Access Point	1 Watt (30 dBm)
	Indoor Access Point	1 Watt (30 dBm)
	Mobile and Portable client device	250 mW (24 dBm)
U-NII-2A	---	250 mW (24 dBm) or 11 dBm + 10 log B*
U-NII-2C	---	250 mW (24 dBm) or 11 dBm + 10 log B*
U-NII-3	---	1 Watt (30 dBm)

Note: B* is the 26 dB emission bandwidth in megahertz

Kind of Test Site Shielded room

Test Setup

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Power Meter	Anritsu	ML2495A	1901008	2020/4/6	2021/4/5
Power Sensor	Anritsu	MA2411B	1725269	2020/4/7	2021/4/6

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

<802.11a>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
36	5180	16.60	45.71	24.00
40	5200	19.22	83.56	24.00
48	5240	19.27	84.53	24.00
149	5745	16.87	48.64	30.00
157	5785	16.56	45.29	30.00
165	5825	16.12	40.93	30.00

<802.11n HT20>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
36	5180	16.30	42.66	24.00
40	5200	19.25	84.14	24.00
48	5240	19.14	82.04	24.00
149	5745	17.62	57.81	30.00
157	5785	16.86	48.53	30.00
165	5825	17.58	57.28	30.00

<802.11n HT40>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
38	5190	14.78	30.06	24.00
46	5230	18.35	68.39	24.00
151	5755	17.62	57.81	30.00
159	5795	18.11	64.71	30.00

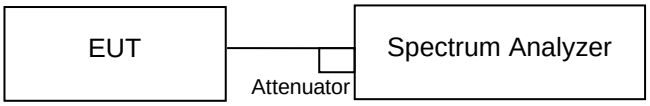
<802.11ac VHT80>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
42	5210	14.95	31.26	24.00
155	5775	16.78	47.64	30.00

5.1.3 26 dB Bandwidth and 99% Occupied Bandwidth

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/17

Test Procedure

a. Set RBW = approximately 1% of the emission bandwidth.
b. Set the VBW > RBW.
c. Detector = Peak.
d. Trace mode = max hold.
e. 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%.
f. 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.

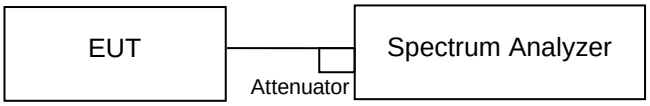
Test Results

Please refer to Appendix A

5.1.4 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
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/17

Test Procedure

MEASUREMENT PROCEDURE REF

a. Set resolution bandwidth (RBW) = 100 kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. 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

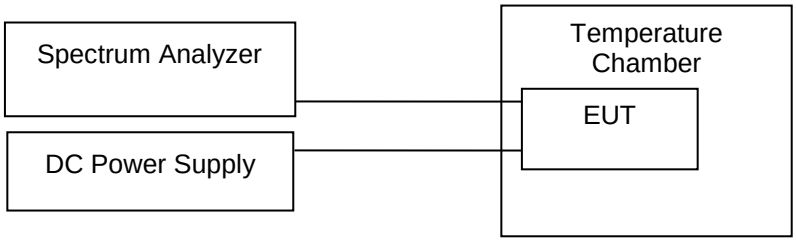
Please refer to Appendix A

5.1.5 Frequency Stability Measurement

Limit ±20 ppm

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/17
Thermal Chamber	Giant Force	GHT-150-40-CP-SD	MAA1902-011	2020/3/10	2021/3/9

Test Procedure

a. 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.
b. 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 10 dB lower than the measured peak value.
c. 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.

Test Results

Frequency (MHz)	5200			
Voltage (V)	Measurement Frequency (MHz)			Max. Deviation (ppm)
5	5199.998			0.385
Temperature (°C)	Measurement Frequency (MHz)			
	0 Minute	2 Minute	5 Minute	10 Minute
50	5199.936	5199.987	5199.962	5199.917
40	5199.926	5200.012	5200.089	5199.966
30	5200.051	5200.091	5200.034	5199.971
20	5200.067	5200.024	5199.987	5199.961
10	5199.978	5199.964	5200.042	5200.075
0	5199.953	5200.077	5200.01	5200.056
-10	5200.086	5200.044	5200.088	5200.009
-20	5199.977	5200.01	5199.962	5199.907
Limit (ppm)	±20			
Max. Deviation (ppm)	16.538	17.500	17.115	17.885

Frequency (MHz)	5785			
Voltage (V)	Measurement Frequency (MHz)			Max. Deviation (ppm)
5	5785.027			4.667
Temperature (°C)	Measurement Frequency (MHz)			
	0 Minute	2 Minute	5 Minute	10 Minute
50	5785.093	5785.028	5785.019	5785.062
40	5785.055	5784.945	5785.036	5784.996
30	5785.05	5785.044	5784.985	5785.005
20	5784.978	5784.981	5785.032	5784.915
10	5785.059	5785.014	5785.055	5784.916
0	5784.999	5785.061	5784.93	5784.921
-10	5785.01	5785.02	5785.069	5785.055
-20	5784.947	5785.105	5784.995	5785.034
Limit (ppm)	±20			
Max. Deviation (ppm)	17.547	19.811	13.208	16.038

5.1.6 Power Spectral Density

Limit

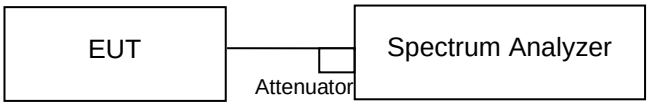
For the 5.15~5.25GHz Bands:
For mobile and portable client devices in the 5.15~5.25GHz band, the Maximum Power spectral density shall not exceed 11dBm/MHz. For an indoor access point operating in the band 5.15~5.25GHz, the maximum power spectral density shall not exceed 17dBm/MHz.

For the 5.25~5.35GHz and 5.47~5.725GHz Bands:
The maximum power spectral density shall not exceed 11dBm/MHz.

For the 5.745~5.85GHz Bands:
The maximum power spectral density shall not exceed 30dBm/500kHz.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/17

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 ≥ 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 ≥ 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)

Test Results

Please refer to Appendix A

5.1.7 Radiated Spurious Emissions

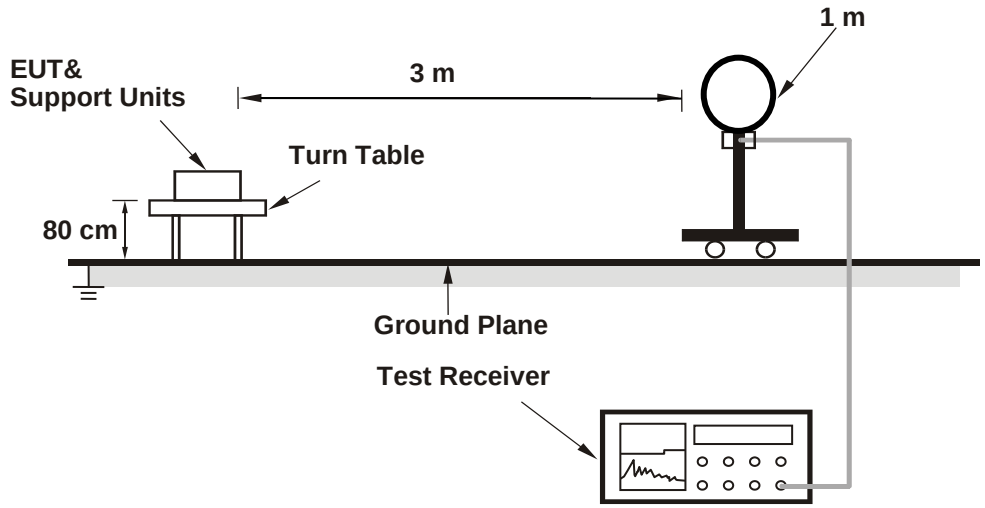
Limit

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).
Emissions radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in §15.407(b).

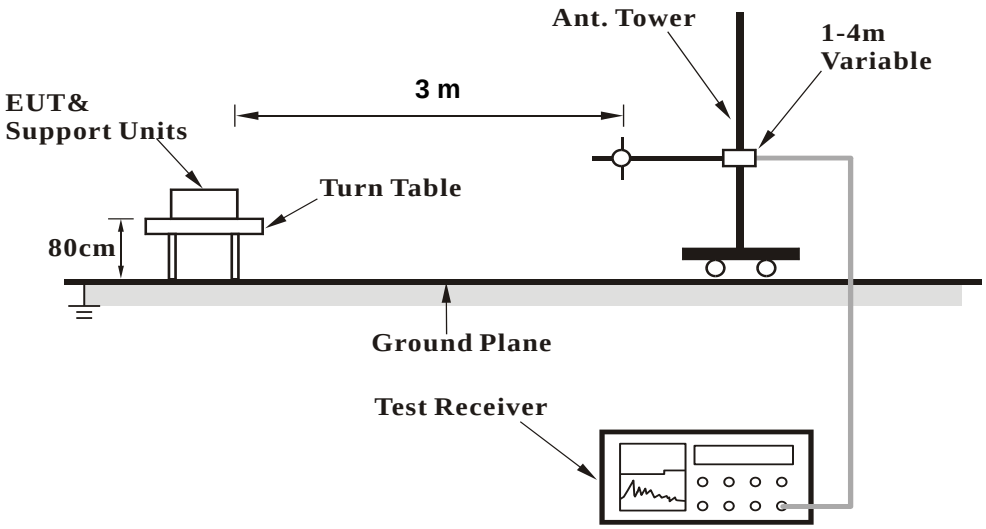
Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

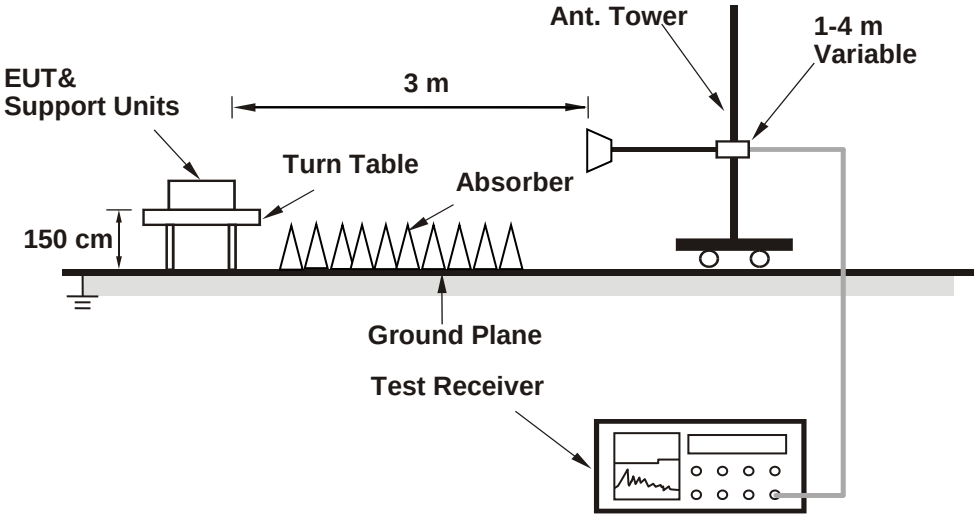
<Radiated Emissions below 30 MHz>



<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).

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV40	101508	2020/3/16	2021/3/15
Receiver	R&S	ESR7	102108	2020/4/22	2021/4/21
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2020/2/14	2021/2/13
Horn Antenna	ETS-Lindgren	3117	00218930	2019/12/6	2020/12/5
LF-AMP	Agilent	8447D	2944A10772	2020/2/11	2021/2/10
HF-AMP + AC source	EMCI	EMC051845SE	980633	2020/2/17	2021/2/16
HF-AMP + AC source	EMCI	EMC184045SE	980657	2020/2/17	2021/2/16
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2020/4/10	2021/4/9
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104EA	800056/4EA	2020/3/25	2021/3/24
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	804680/4	2020/3/25	2021/3/24
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	MY37202/4	2020/3/25	2021/3/24
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800898/2EA	2020/4/22	2021/4/21
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800901/2EA	2020/4/22	2021/4/21
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	801027/2EA	2020/4/22	2021/4/21
Loop Antenna	Chance Most	EMCILPA600 +calibration	287	2020/1/9	2021/1/8

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, perpendicular, and ground-parallel 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: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

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 ≥ 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, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

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.

6. Safety Human Exposure

6.1 RF Exposure Compliance

6.1.1 Power Density

Results

Separation distance is more than 20 cm, thus mobile device exposure limits can be applied.

Maximum Exposure:

Power to Antenna (dBm)	19.27	dBm
Antenna Gain	3.747	dBi
Power+Ant Gain	200.3	mW
Distance	20	cm
S=	0.040	mW/cm^2

Limit FCC: 1500-100,000 MHz 1.0 mW/cm^2

Appendix A: Test Results of Conducted Test

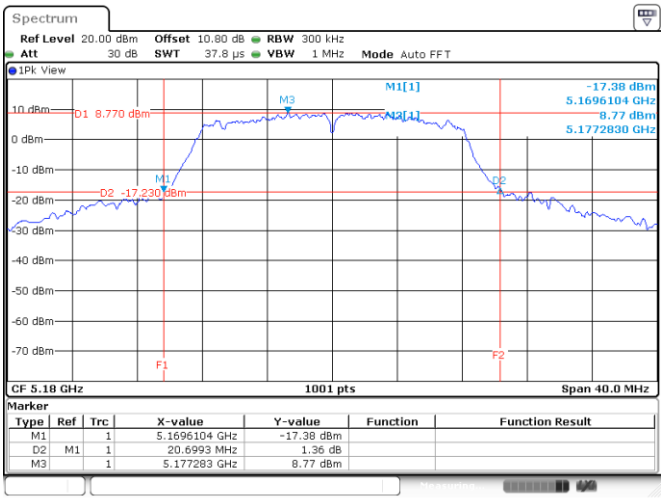
Test Result of 26 dB Bandwidth

802.11a

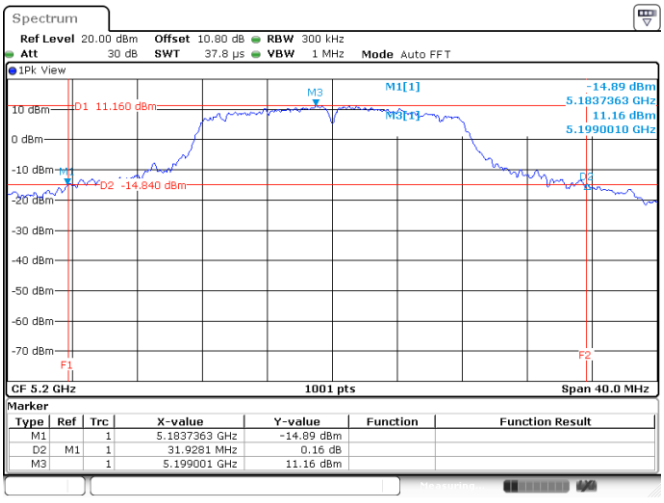
Band	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
U-NII-1	36	5180	20.70
	40	5200	31.93
	48	5240	33.41

802.11a

Channel 36

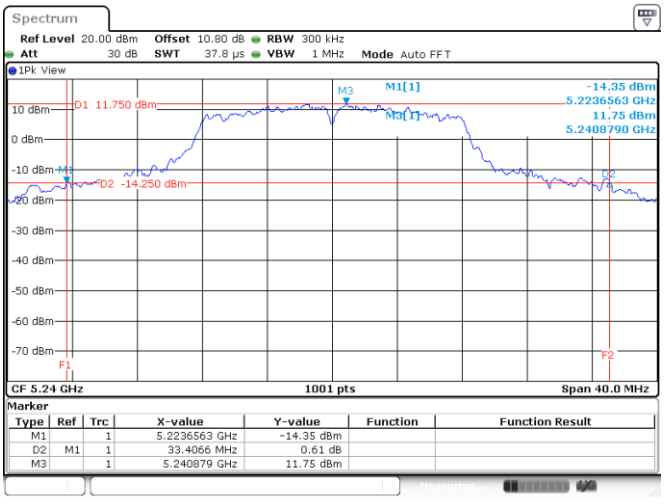


Channel 40



802.11a

Channel 48

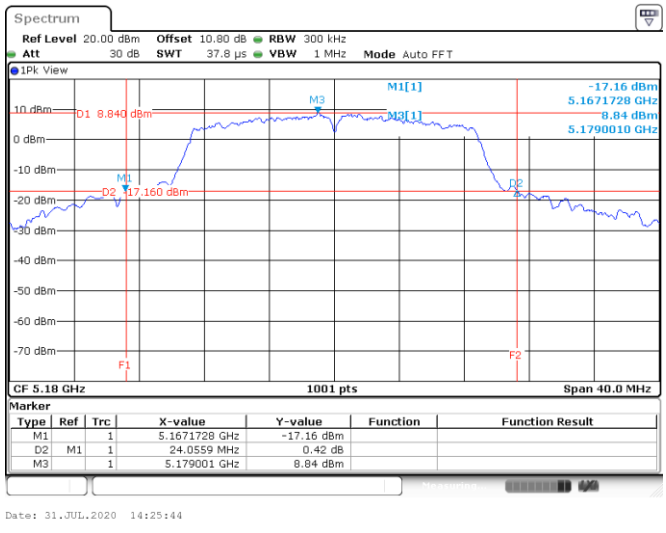


802.11n HT20

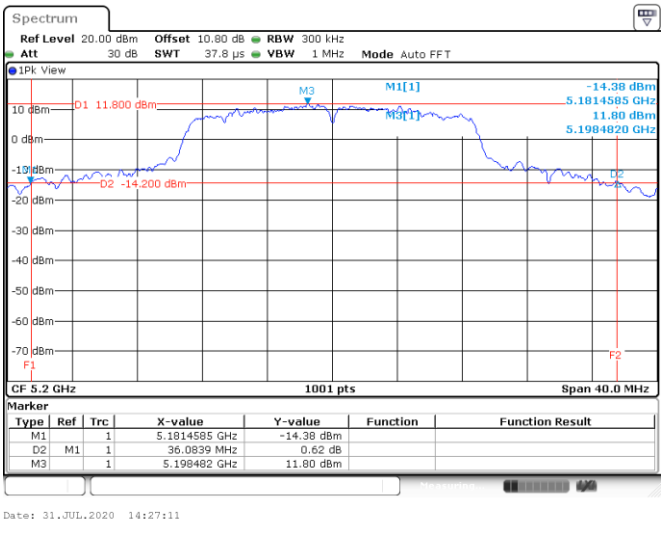
Band	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
U-NII-1	36	5180	24.06
	40	5200	36.08
	48	5240	33.49

802.11n HT20

Channel 36

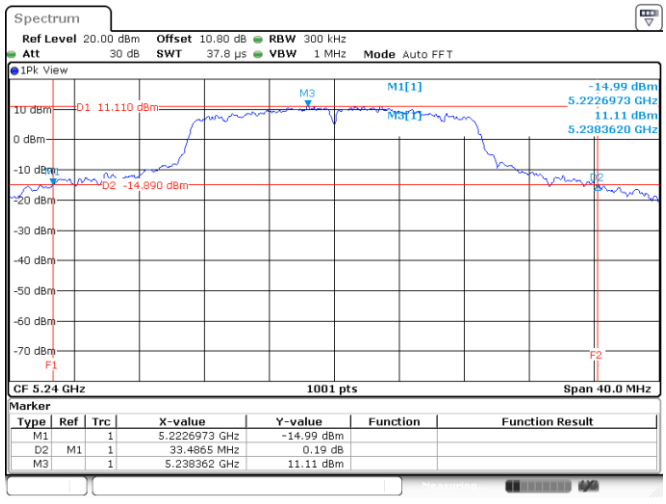


Channel 40



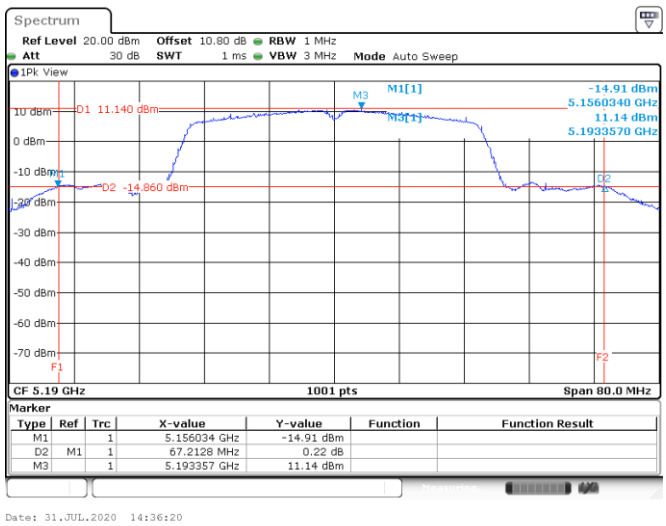
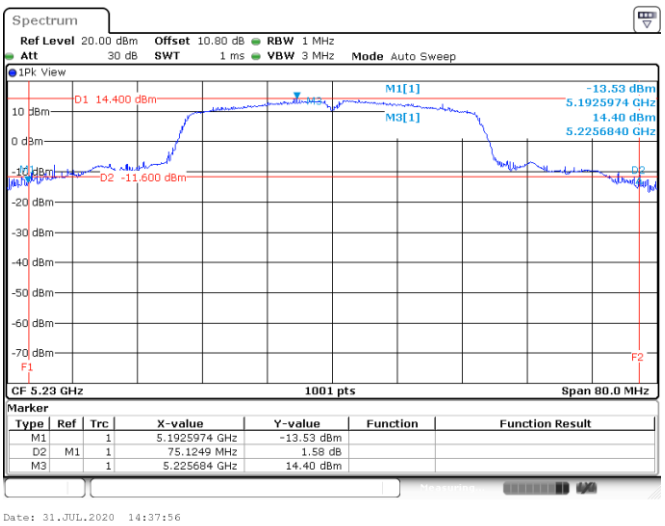
802.11n HT20

Channel 48



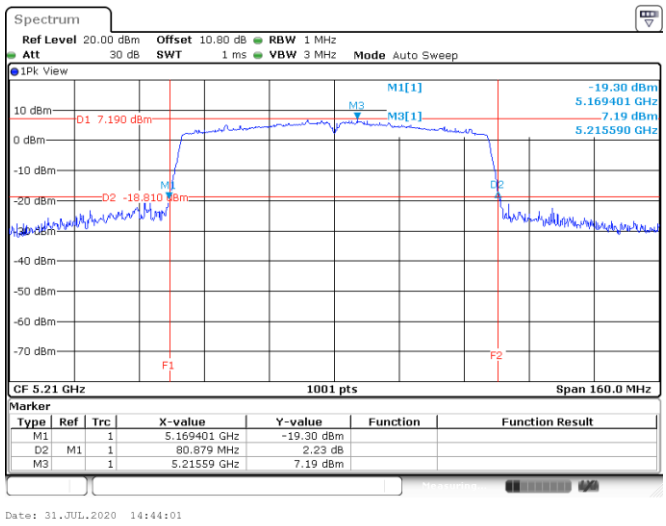
802.11n HT40

Band	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
U-NII-1	38	5190	67.21
	46	5230	75.12

802.11n HT40	
Channel 38	**Channel 46**
	

802.11ac VHT80

Band	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
U-NII-1	42	5210	80.88

802.11ac VHT80	
Channel 42	
	

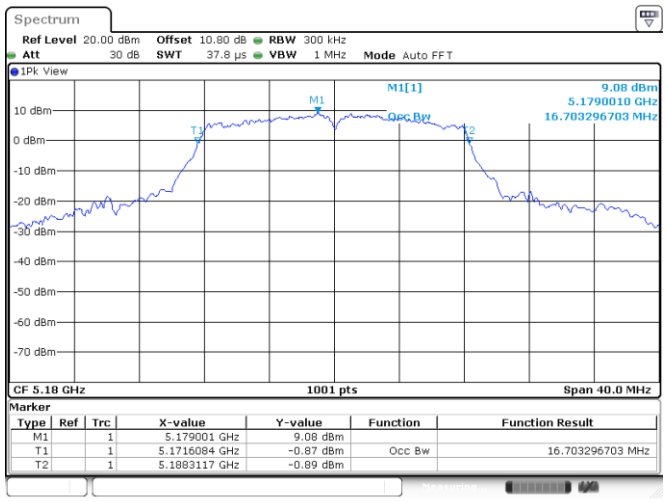
Test Result of 99% Occupied Bandwidth

802.11a

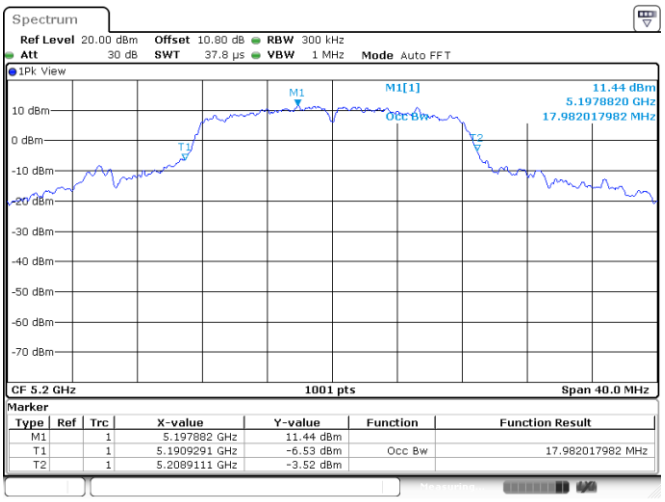
Band	Channel	Frequency (MHz)	99% Bandwidth (MHz)
U-NII-1	36	5180	16.70
	40	5200	17.98
	48	5240	17.78
U-NII-3	149	5745	18.18
	157	5785	17.74
	165	5825	17.26

802.11a

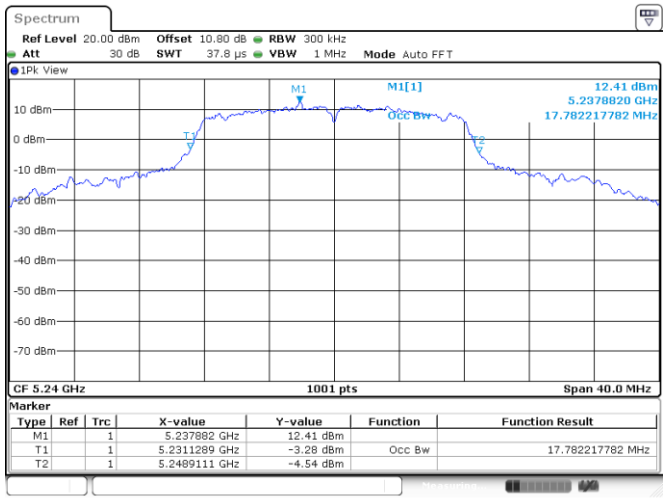
Channel 36



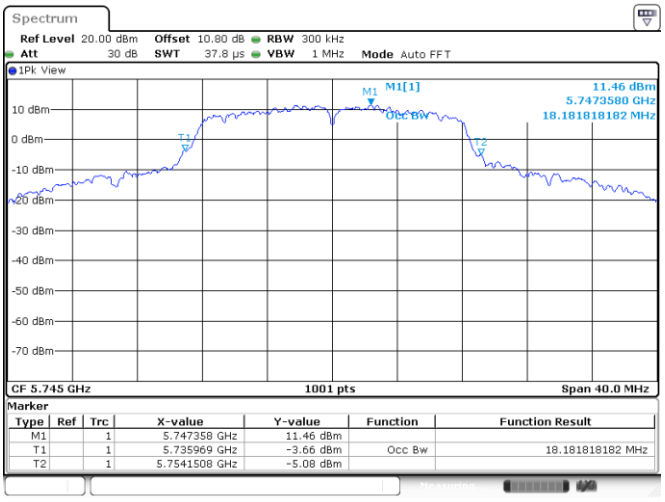
Channel 40



Channel 48



Channel 149



802.11a	
Channel 157	**Channel 165**