

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT AND INDUSTRY CANADA RSS 247 CLASS II & IV PC REPORT

OF

FCC Applicant: Trimble Inc.
345 SW Avery Ave, Corvallis, OR, United States
Product Name: 2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module
Brand Name: Trimble
Model No.: QCNFA324
Model Difference: N/A
FCC ID: S9E-QCNFA324
IC: 5817A-QCNFA324
Report Number: E2/2018/60029
FCC Rule Part: §15.407, Cat:Nil
IC Rule: RSS-247 issue 2 Feb. 2017
Issue Date: Jun. 22, 2018
Date of Test: Jun. 14, 2018 ~ Jun. 21, 2018
Date of EUT Received: Jun. 14, 2017

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

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

Tested By:

Aken Huang

Aken Huang / Engineer

Approved By:

Jim Chang

Jim Chang / Manager



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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2018/60029	Rev.00	Initial creation of document	All	Jun. 22, 2018	Tiffany Kao

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1. GENERAL INFORMATION

1.1. Product Description

General Information of Host:

Product Name of Host:	Rugged Handheld Computer	
Brand Name:	Trimble	
Model No. of Host:	121500	
Model Difference:	N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Model No. of BT/WLAN Module:	QCNFA324	
Module FCC ID:	S9E-QCNFA324	
Module IC:	5817A-QCNFA324	
Scope:	The test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the module in this specific host.	
Class II & Class IV Permissive change:	802.11 a/b/g/n/ac and Bluetooth Module INSTALLED IN Rugged Handheld Computer	
Power Supply:	10.8Vdc from Rechargeable Li-polymer Battery or 19Vdc from AC/DC Adapter	
	Battery Pack:	Model No.: ETICA-AL001, Supplier: ETICA Battery Inc.
	Adapter:	Model No.: FSP065-REB (DC19V/3.42A, 65w), Supplier: FSP GROUP INC.

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WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Avg.) / Average Rated Power(EIRP)	Modulation Technology	Type of Emission
11a	5150~5250	4	Avg. Power: 16.04dBm EIRP: 22.03dBm	OFDM	16M3D1D
	5250~5350	4	Avg. Power: 18.71dBm EIRP: 24.70dBm		19M5D1D
11n / ac_20M	HT20 / VHT20 5150~5250	4	Avg. Power: 16.31dBm EIRP:22.31dBm	OFDM	17M5D1D
	HT20 / VHT20 5250~5350	4	Avg. Power:17.97dBm EIRP:23.96dBm		17M8D1D
11n / ac_40M	HT40 / VHT40 5150-5250	2	Avg. Power: 16.78dBm EIRP:22.77dBm	OFDM	36M0D1D
	HT40 / VHT40 5250-5350	2	Avg. Power: 16.55dBm EIRP: 22.54dBm		36M0D1D
11ac_80M	VHT80 5150~5250	1	Avg. Power: 12.74dBm EIRP: 18.73dBm	OFDM	75M0D1D
	VHT80 5250~5350	1	Avg. Power: 12.28dBm EIRP: 18.27dBm		75M0D1D
Antenna Designation			PIFA Antenna, 1. Main: Gain: 1.74dBi (5150~5250MHz) Gain: 1.96dBi (5250~5350MHz) 2. Aux: Gain: 3.95dBi (5150~5250MHz) Gain: 3.80dBi (5250~5350MHz)		
Modulation type			CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM		
Transition Rate:			802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps 802.11 ac_20MHz: 6.5 –173.3Mbps 802.11 ac_40MHz: 13.5 –400.0Mbps 802.11 ac_80MHz: 29.3 – 866.7Mbps		

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1.2. Related Submittal(s) / Grant (s)

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules

FCC KDB 662911 D01 Multiple Transmitter Output

FCC KDB 644545 D03 Guidance for IEEE 802.11ac v01

Canada RSS-247 issue 2 May 2017

RSS-Gen Issue 5 Apr. 2018

ANSI C63.10:2013

Note:

All test items have been performed and record as per the above standards.

1.3. Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd.,
Guishan District, Taoyuan City, Taiwan 333. (TAF code 0513)

FCC Registration Numbers are: 735305 / TW0002

Canada Registration Number: 4620A-5

1.4. Special Accessories

There are no special accessories used while test was conducted.

1.5. Equipment Modifications

There was no modification incorporated into the EUT.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT is configured to operate in a continuous transmission mode. EUT placement and various angles were checked to find worst mode where the emission characteristics are maximized.

2.2. EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4. Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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2.5. Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration



Fig. 2-1 Conducted Emission (Antenna Port) Configuration



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	Lenovo	L430	R9-YYG88	Shielded	Unshielded

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3. SUMMARY OF TEST RESULT

FCC / IC Rules	Description Of Test	Result
§15.407(a) RSS-247 §6.2.1~ 4 (1)	The Maximum Output Power Measurement	Compliant
§15.407(b) RSS-247 §6.2.1~ 4 (2)	Undesirable Emission – Radiated Measurement	Compliant
§15.203 RSS- Gen §6.8	Antenna Requirement	Compliant

4. DESCRIPTION OF TEST MODES

4.1 Operated in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

4 channels are provided for 802.11a, 802.11n, HT20, 802.11ac, VHT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n, HT40, 802.11ac, VHT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac, VHT80

CHANNEL	FREQUENCY
42	5210 MHz

Operated band in 5250 MHz ~5350 MHz:

4 channels are provided for 802.11a, 802.11n, HT20, 802.11ac, VHT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

2 channels are provided for 802.11n, HT40, 802.11ac, VHT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
54	5270 MHz	62	5310 MHz

1 channel is provided for 802.11ac, VHT80

CHANNEL	FREQUENCY
58	5290 MHz

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RADIATED EMISSION TEST:

RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	48	OFDM	6	2TX
802.11a	5260~5320	52 to 64	64	OFDM	6	2TX
BANDEGE						
802.11a	5180~5240	36 to 48	36	OFDM	6	2TX
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	64	OFDM	6	2TX
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5270~5310	54 to 62	62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n/ac WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

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ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,40,48	OFDM	6	2TX
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	2TX
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26 dB and 99% Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Measurement	+/- 1.42 dB
Peak Power Spectral Density Measurement	+/- 1.55 dB
Peak Excursion Measurement	+/- 1.55 dB
Undesirable Emission – Conducted Measurement	+/- 1.55 dB
Transmission in case of Absence of Information	+/- 1.55 dB
Frequency Stability	+/- 123.36 Hz
TPC and DFS Measurement	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	9kHz-30MHz: +/-2.87dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

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

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6. MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

6.1 Standard Applicable:

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Mater device)	1 Watt(30dBm)
		Fixed point-to-point Acess Ponit	1 Watt(30dBm)
	√	Mobile and portable clinet device	250mW(23.98dBm)
U-NII-2A	√		250mW(23.98dBm) or 11dBm+10 log B
U-NII-2C	√		250mW(23.98dBm) or 11dBm+10 log B
U-NII-3	√		1 Watt(30dBm)

According to RSS-247 §6.2.1~ 4 (1)

OPERZTION FREQUENCY BAND	LIMIT
5150~5250 MHz	EIRP shall not exceed 200 mW or $10 + 10 \log_{10} B$
5250~5350 MHz	Conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$ EIRP shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm
5470-5600 MHz and 5650-5725 MHz	Conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$ EIRP shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm
5725~5850 MHz	Conducted output power shall not exceed 1 W
Note: B is the 99% emission bandwidth in MHz.	

If transmitting antennas of directional gain greater than 6 dBi are used, 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.

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As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, ..., GN dBi.

(i) If transmit signals are correlated, then Directional gain
 $= 10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$ dBi

[Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

The antenna gain is greater than 6 dBi in MIMO mode the limit reduce as below:

	Effective Legacy Gain (dBi)	Conducted Power Limit (dBm)
UNII-1	5.99	23.98
UNII-2A	5.99	23.98

6.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
5. Record the max. reading and add $10 \log(1/\text{duty cycle})$.
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

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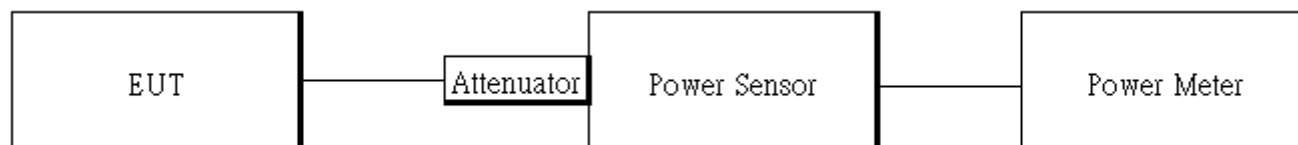
6.3 Measurement Equipment Used:

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
Power Meter	Anritsu	ML2496A	1326001	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315048	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315049	06/23/2017	06/22/2018
Coaxial Cable 30cm	WOKEN	00100A1F1A195 C	RF01	12/24/2017	12/23/2018
DC Block	PASTERNAK	PE8210	RF29	12/24/2017	12/23/2018
Splitter	RF-LAMBDA	RFLT2W1G18G	RF35	12/24/2017	12/23/2018
Attenuator	WOKEN	218FS-10	RF23	12/24/2017	12/23/2018
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2018	05/01/2019

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2018	06/19/2019

Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.

6.4 Test Set-up:



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6.5 Measurement Result

802.11a_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
36	5180	6	10.44	12.75	16.01	29.903	23.98	PASS
44	5220	6	10.47	12.78	16.04	30.110	23.98	PASS
48	5240	6	10.46	12.77	16.03	30.041	23.98	PASS
52	5260	6	13.42	15.29	18.71	55.785	23.98 or $11+10\log(B) = 25.61$	PASS
60	5300	6	13.27	15.11	18.55	53.666	23.98 or $11+10\log(B) = 24.50$	PASS
64	5320	6	11.72	13.02	16.68	34.904	23.98 or $11+10\log(B) = 23.99$	PASS

802.11ac_VHT20_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
36	5180	MCS0	10.66	12.94	16.27	31.320	23.98	PASS
44	5220	MCS0	10.73	12.97	16.31	31.646	23.98	PASS
48	5240	MCS0	10.69	12.96	16.29	31.492	23.98	PASS
52	5260	MCS0	12.62	14.49	17.97	46.400	23.98 or $11+10\log(B) = 24.31$	PASS
60	5300	MCS0	12.81	13.65	17.57	42.272	23.98 or $11+10\log(B) = 24.27$	PASS
64	5320	MCS0	12.37	13.19	17.12	38.103	23.98 or $11+10\log(B) = 24.16$	PASS

802.11ac_VHT40_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
38	5190	MCS0	6.58	8.77	13.26	12.083	23.98	PASS
46	5230	MCS0	10.26	12.18	16.78	27.137	23.98	PASS
54	5270	MCS0	10.34	11.75	16.55	25.777	23.98 or $11+10\log(B) = 27.19$	PASS
62	5310	MCS0	7.59	8.74	13.65	13.223	23.98 or $11+10\log(B) = 27.31$	PASS

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
42	5210	MCS0	7.21	8.54	12.74	12.405	23.98	PASS
58	5290	MCS0	6.94	7.94	12.28	11.166	23.98 or $11+10\log(B) = 30.16$	PASS

*** Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.**

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ERP/EIRP Measurement:

802.11a_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)		RESULT
36	5180	16.01	5.99	22.00	158.521	23.01	or 10+10log(B)= 22.12	PASS
44	5220	16.04	5.99	22.03	159.620	23.01	or 10+10log(B)= 22.12	PASS
48	5240	16.03	5.99	22.02	159.253	23.01	or 10+10log(B)= 22.11	PASS
52	5260	18.71	5.99	24.70	295.229	30	or 17+10log(B)= 29.17	PASS
60	5300	18.55	5.99	24.53	284.017	30	or 17+10log(B)= 29.15	PASS
64	5320	16.68	5.99	22.67	184.721	30	or 17+10log(B)= 29.11	PASS

802.11ac_VHT20_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)		RESULT
36	5180	16.27	5.99	22.26	168.279	23.01	or 10+10log(B)= 22.42	PASS
44	5220	16.31	5.99	22.31	170.028	23.01	or 10+10log(B)= 22.40	PASS
48	5240	16.29	5.99	22.28	169.201	23.01	or 10+10log(B)= 22.40	PASS
52	5260	17.97	5.99	23.96	248.879	30	or 17+10log(B)= 29.43	PASS
60	5300	17.57	5.99	23.56	226.740	30	or 17+10log(B)= 29.42	PASS
64	5320	17.12	5.99	23.10	204.378	30	or 17+10log(B)= 29.43	PASS

802.11ac_VHT40_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)		RESULT
38	5190	13.26	5.99	19.26	84.286	23.01	or 10+10log(B)= 28.75	PASS
46	5230	16.78	5.99	22.77	189.286	23.01	or 10+10log(B)= 28.75	PASS
54	5270	16.55	5.99	22.54	179.496	30	or 17+10log(B)= 32.53	PASS
62	5310	13.65	5.99	19.64	92.077	30	or 17+10log(B)= 32.53	PASS

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)		RESULT
42	5210	12.74	5.99	18.73	74.730	23.01	or 10+10log(B)= 28.75	PASS
58	5290	12.28	5.99	18.27	67.152	30	or 17+10log(B)= 35.74	PASS

* **Note:** EIRP = Average Power + Gain

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7. UNDESIRABLE EMISSION - RADIATED MEASUREMENT

7.1 Standard Applicable

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

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 e.i.r.p. of -27 dBm/MHz.
2. For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules	FIELD STRENGTH AT 3m	
	PK: 74 (dBμV/m)	AV 54 (dBμV/m)
APPLICABLE TO	EIRP LIMIT	FIELD STRENGTH AT 3m
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.3 (dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK:105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK:122.2 (dBμV/m) *4
*1 beyond 75 MHz or more above of the bandedge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

$EIRP = (E \cdot d)^2 / 30$, where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts..

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Unwanted spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

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7.2 Measurement Equipment Used:

SGS 966 Chamber No.C					
Name of Equip- ment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	04/11/2018	04/10/2019
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2017	12/22/2018
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2017	11/02/2018
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2017	12/16/2018
Horn Antenna	Schwarzbeck	BBHA9170	185	08/01/2017	07/31/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/24/2017	12/23/2018
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/24/2017	12/23/2018
Pre Amplifier	R&S	SCU-18	10204	12/24/2017	12/23/2018
Pre Amplifier	EMC Instruments	EMC184045B	980135	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/24/2017	12/23/2018
Attenuator	WOKEN	218FS-10	RF27	12/24/2017	12/23/2018
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2018	03/01/2019
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2018	03/01/2019
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2018	05/03/2019
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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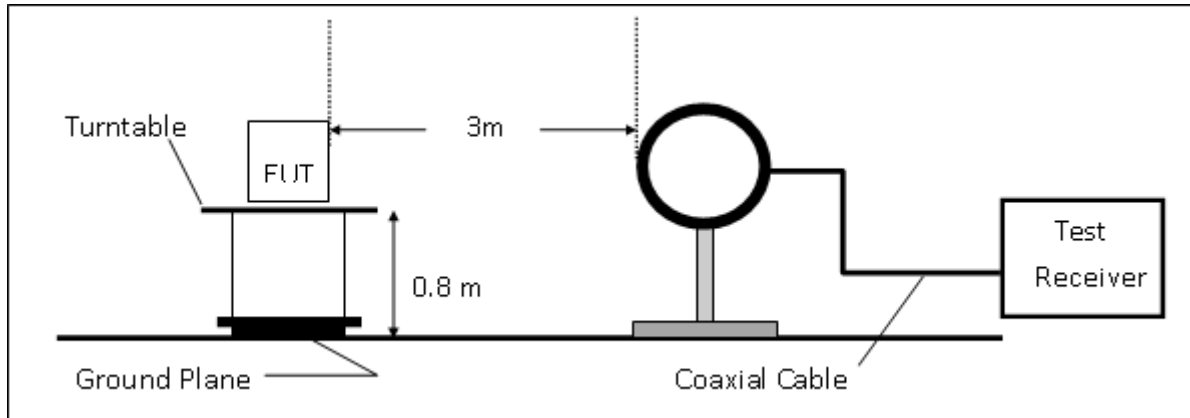
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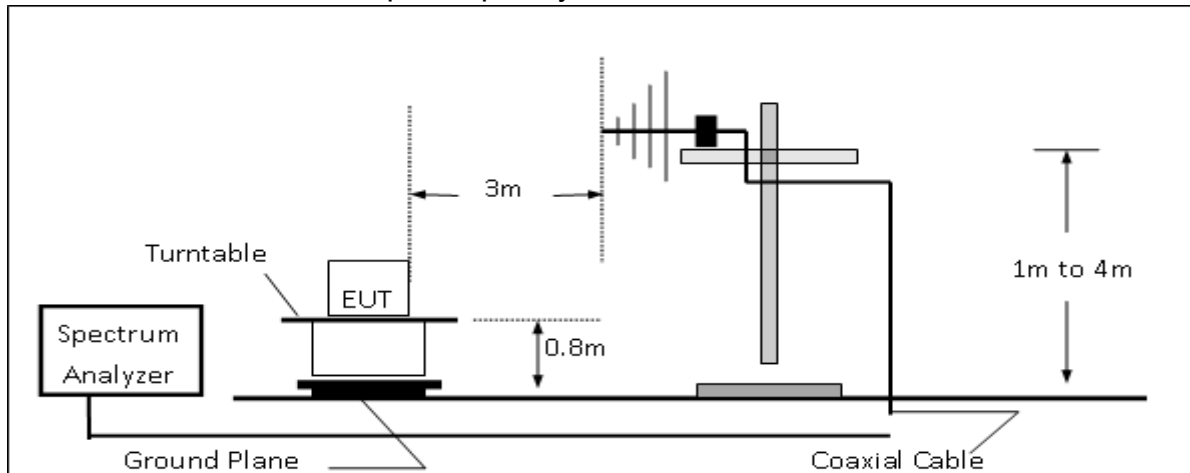
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7.3 Test SET-UP

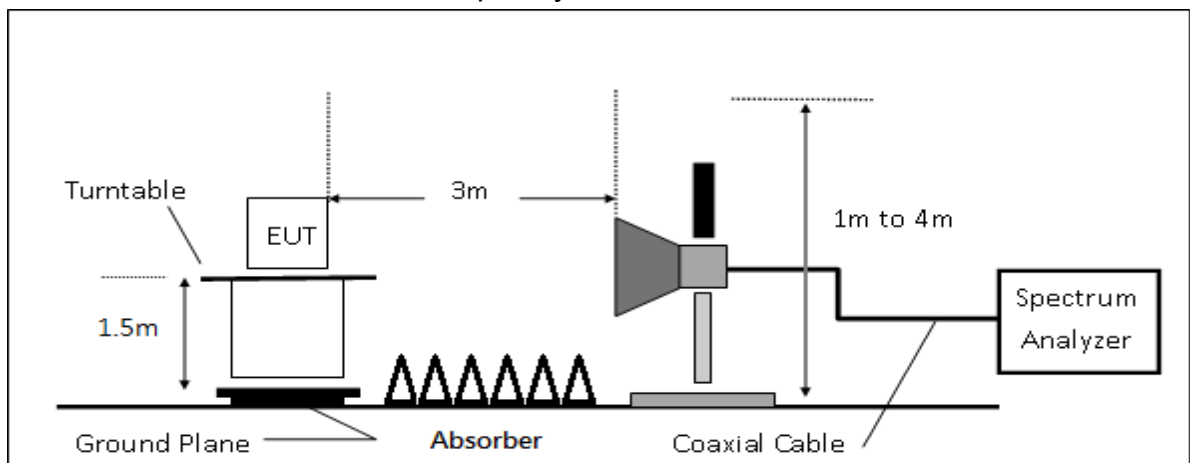
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-UP, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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7.4 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
3. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
4. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
5. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
11. Repeat above procedures until all frequency measured were complete.

7.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

7.6 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

7.7 Measurement Result

Refer to attach tabular data sheets.

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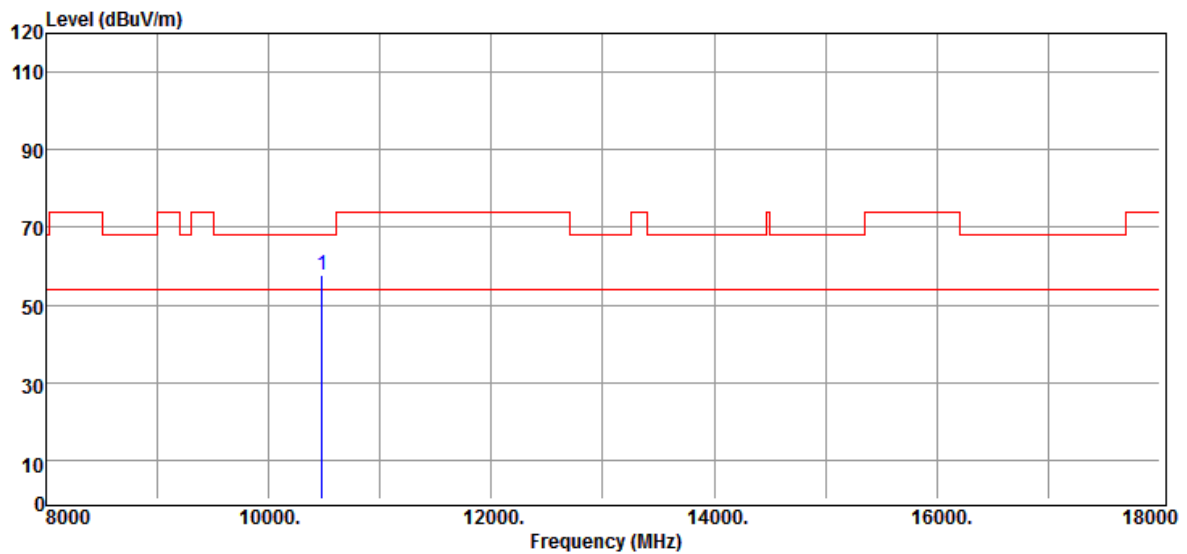
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Radiated Spurious Emission Measurement Result

Above 1GHz Worst-Case Data:

802.11a, 5150~5250 MHz

Operation Mode	:802.11a / Band 1	Test Date	:2018-06-15
Test Mode	:TX CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:5240 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10480.00	Peak	30.52	27.16	57.68	68.20	-10.52

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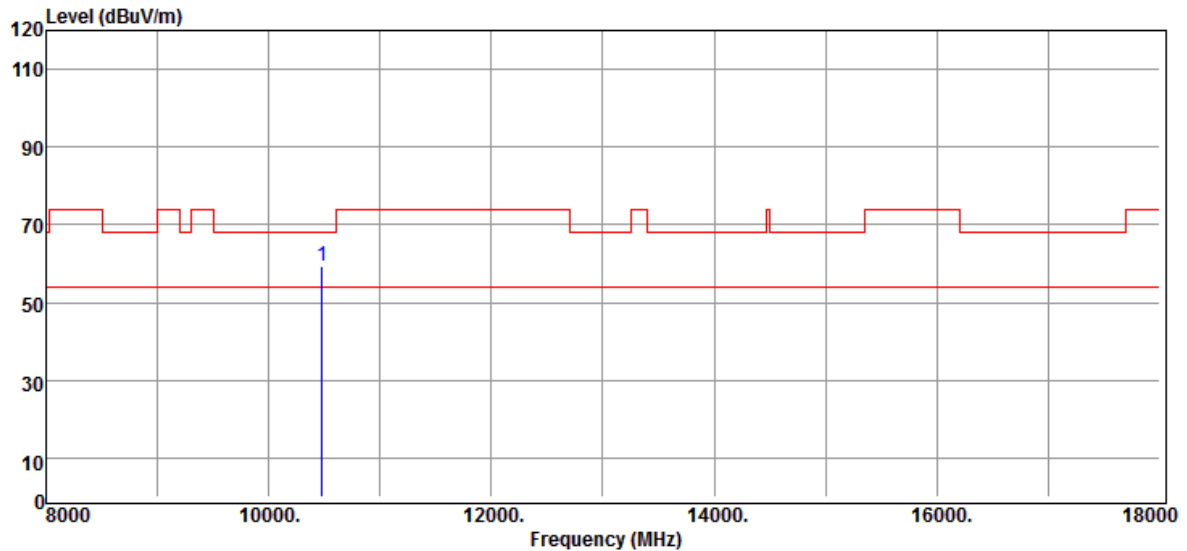
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Operation Mode	:802.11a / Band 1	Test Date	:2018-06-15
Test Mode	:TX CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5240 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10480.00	Peak	32.30	27.16	59.46	68.20	-8.74

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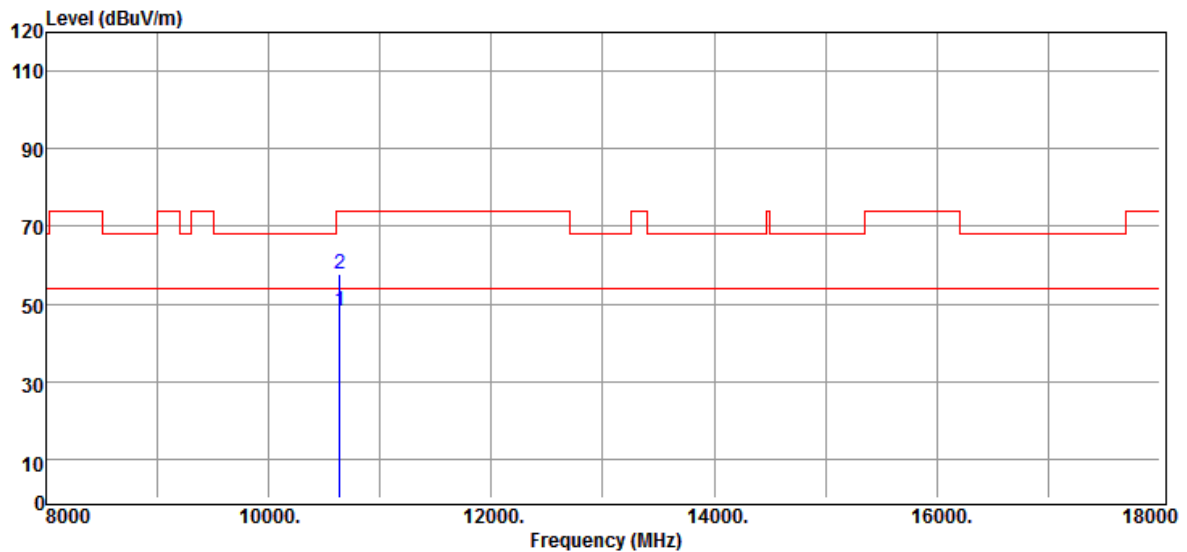
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Radiated Spurious Emission Measurement Result

802.11a, 5250MHz-5350MHz

Operation Mode	:802.11a / Band 2	Test Date	:2018-06-15
Test Mode	:TX CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:5320 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10640.00	Average	20.83	27.20	48.03	54.00	-5.97
10640.00	Peak	30.38	27.20	57.58	74.00	-16.42

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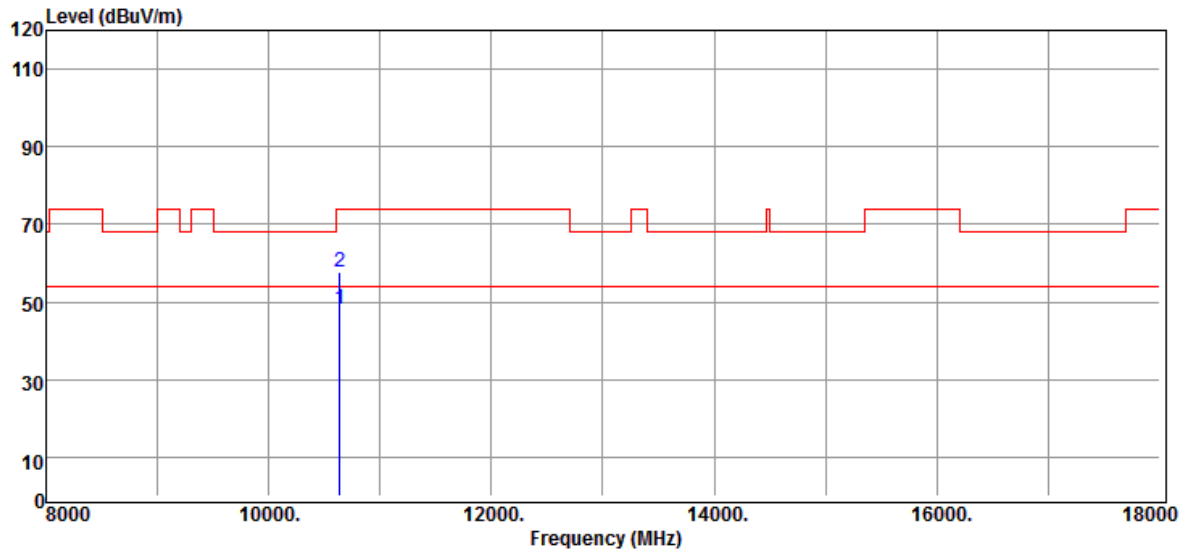
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Operation Mode	:802.11a / Band 2	Test Date	:2018-06-15
Test Mode	:TX CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5320 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10640.00	Average	20.87	27.20	48.07	54.00	-5.93
10640.00	Peak	30.66	27.20	57.86	74.00	-16.14

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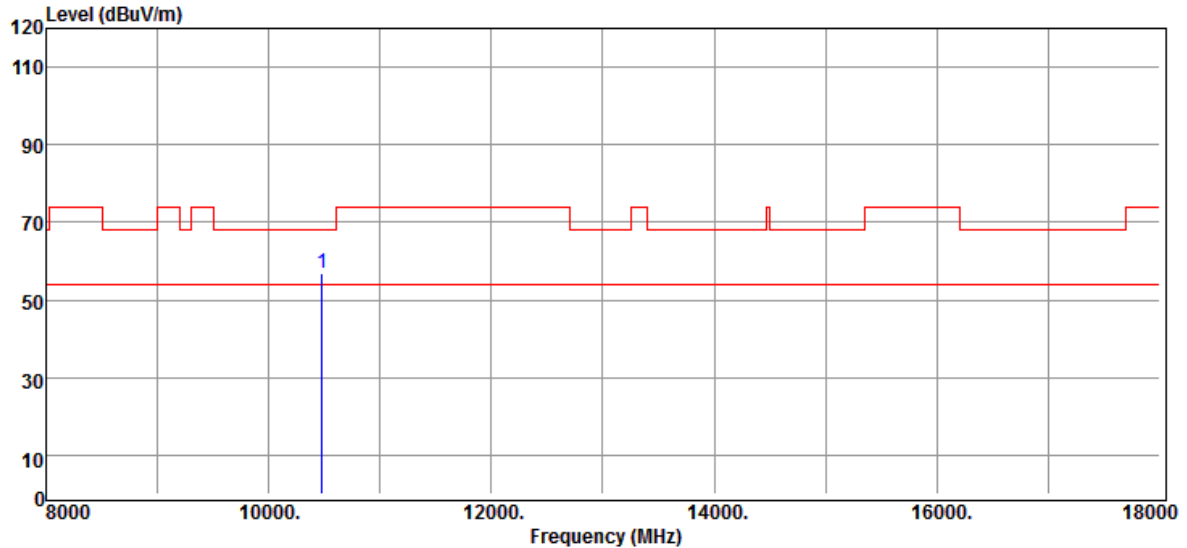
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802.11ac_VHT20, 5150~5250 MHz

Operation Mode	:802.11ac20 / Band 1	Test Date	:2018-06-15
Test Mode	:TX CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:5240 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10480.00	Peak	29.91	27.16	57.07	68.20	-11.13

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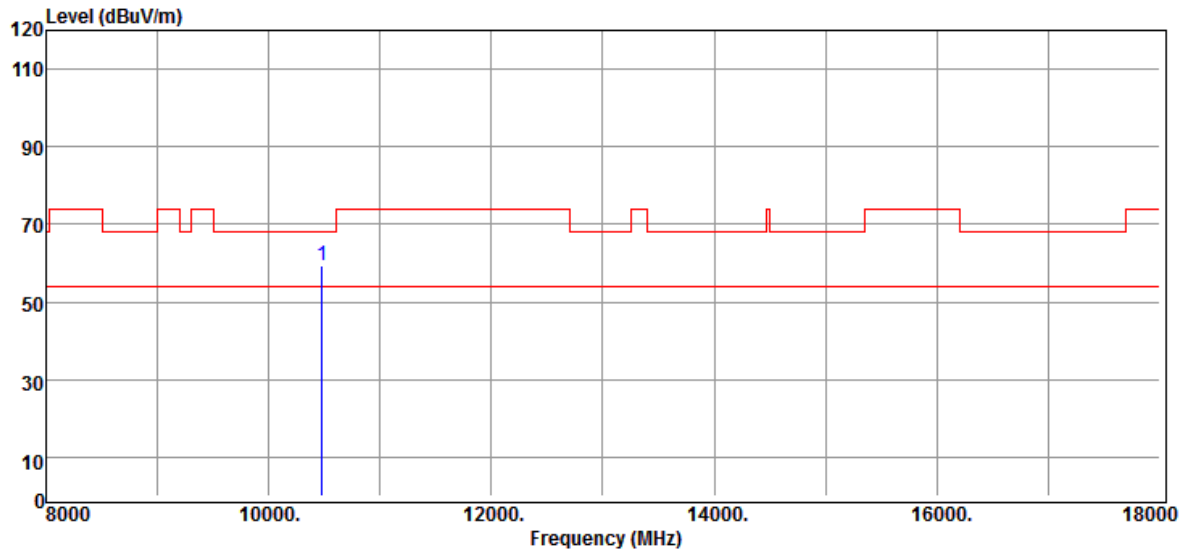
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Operation Mode	:802.11ac20 / Band 1	Test Date	:2018-06-15
Test Mode	:TX CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5240 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10480.00	Peak	32.20	27.16	59.36	68.20	-8.84

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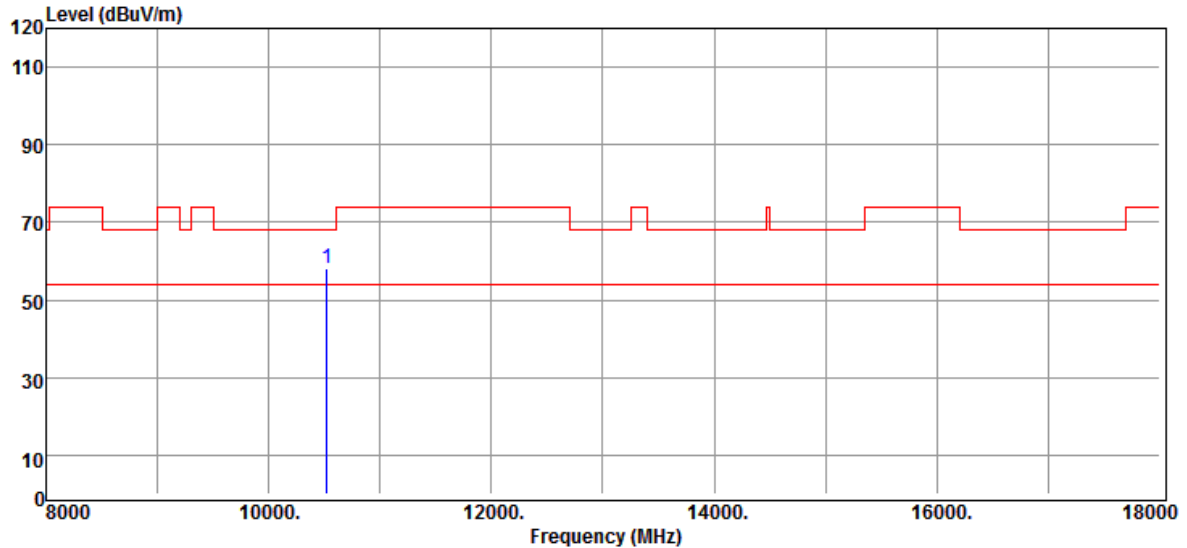
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Member of SGS Group

802.11ac_VHT20, 5250~5350 MHz

Operation Mode :802.11ac20 / Band 2
Test Mode :TX CH LOW
EUT Pol :E2 Plan
Test Channel :5260 MHz

Test Date :2018-06-15
Temp./Humi. :23/70
Antenna Pol. :VERTICAL
Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10520.00	Peak	30.82	27.23	58.05	68.20	-10.15

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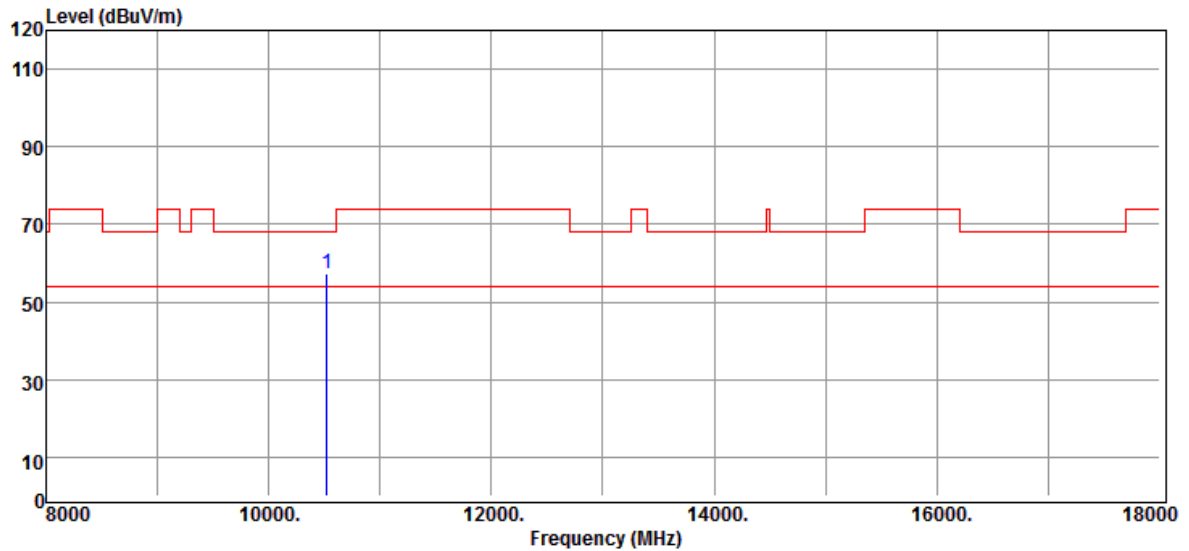
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Operation Mode	:802.11ac20 / Band 2	Test Date	:2018-06-15
Test Mode	:TX CH LOW	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5260 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10520.00	Peak	30.26	27.23	57.49	68.20	-10.71

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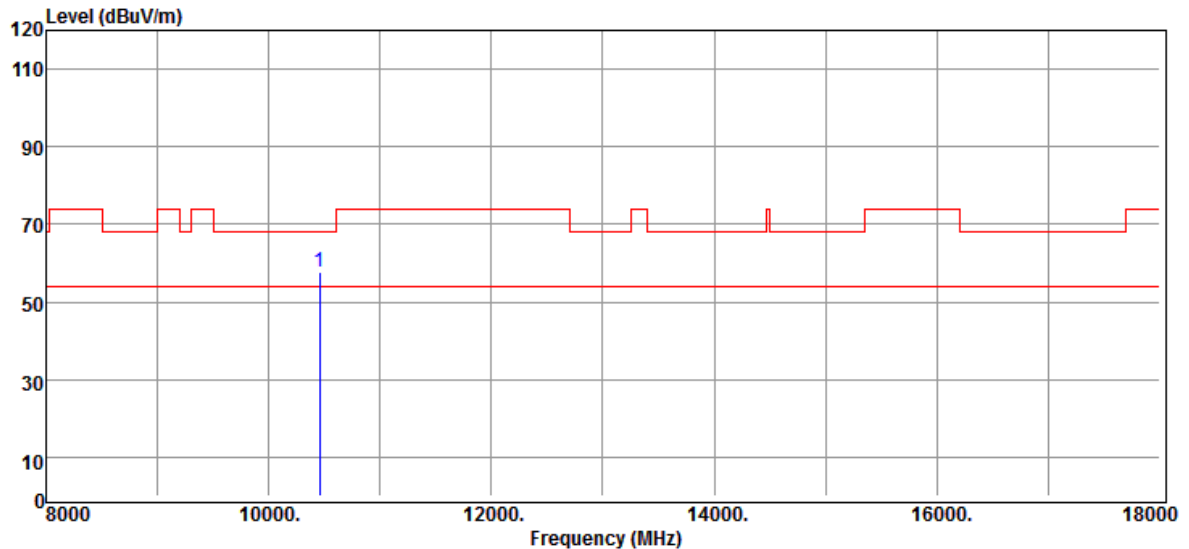
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Member of SGS Group

802.11ac_VHT40, 5150~5250 MHz

Operation Mode :802.11ac40 / Band 1
Test Mode :TX CH HIGH
EUT Pol :E2 Plan
Test Channel :5230 MHz

Test Date :2018-06-15
Temp./Humi. :23/70
Antenna Pol. :VERTICAL
Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10460.00	Peak	30.60	27.06	57.66	68.20	-10.54

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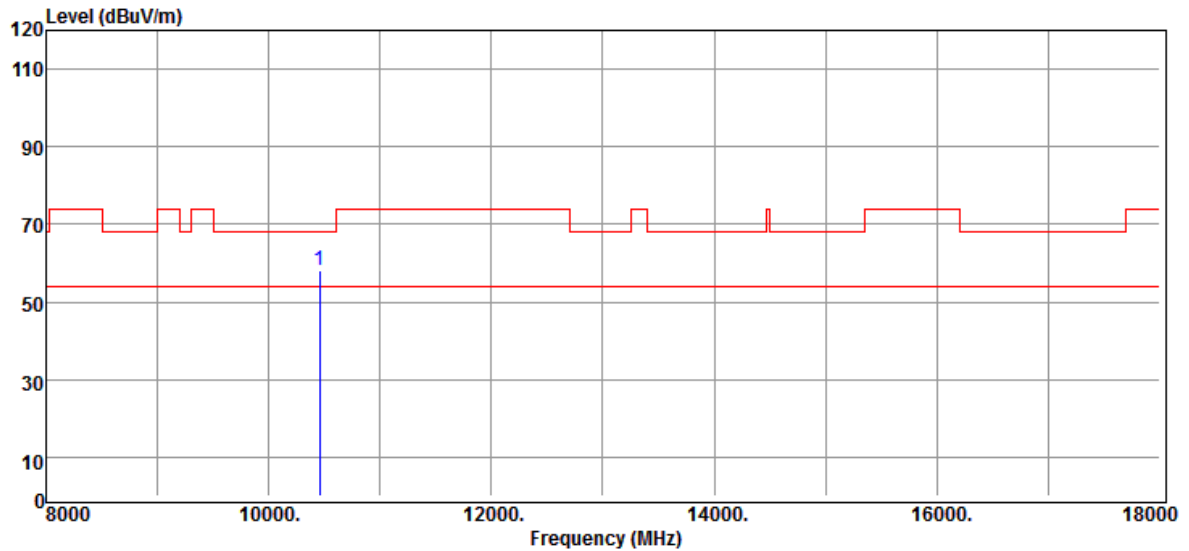
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Operation Mode	:802.11ac40 / Band 1	Test Date	:2018-06-15
Test Mode	:TX CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5230 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
10460.00	Peak	31.26	27.06	58.32	68.20	-9.88

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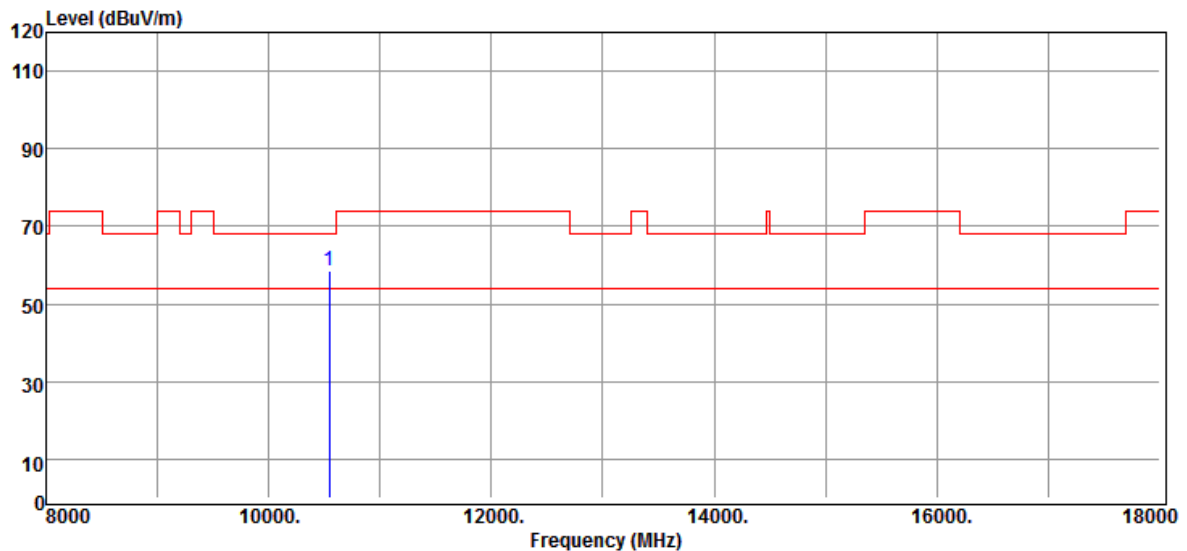
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Member of SGS Group

802.11ac_VHT40, 5250~5350 MHz

Operation Mode :802.11ac40 / Band 2
Test Mode :TX CH LOW
EUT Pol :E2 Plan
Test Channel :5270 MHz

Test Date :2018-06-15
Temp./Humi. :23/70
Antenna Pol. :VERTICAL
Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10540.00	Peak	31.24	27.23	58.47	68.20	-9.73

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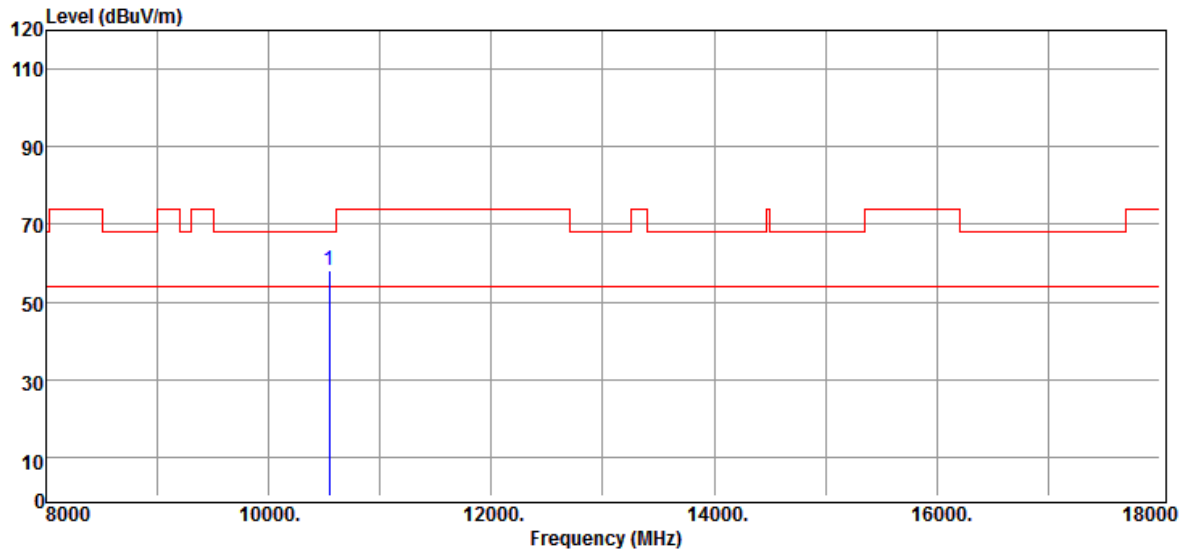
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Operation Mode	:802.11ac40 / Band 2	Test Date	:2018-06-15
Test Mode	:TX CH LOW	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5270 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10540.00	Peak	30.75	27.23	57.98	68.20	-10.22

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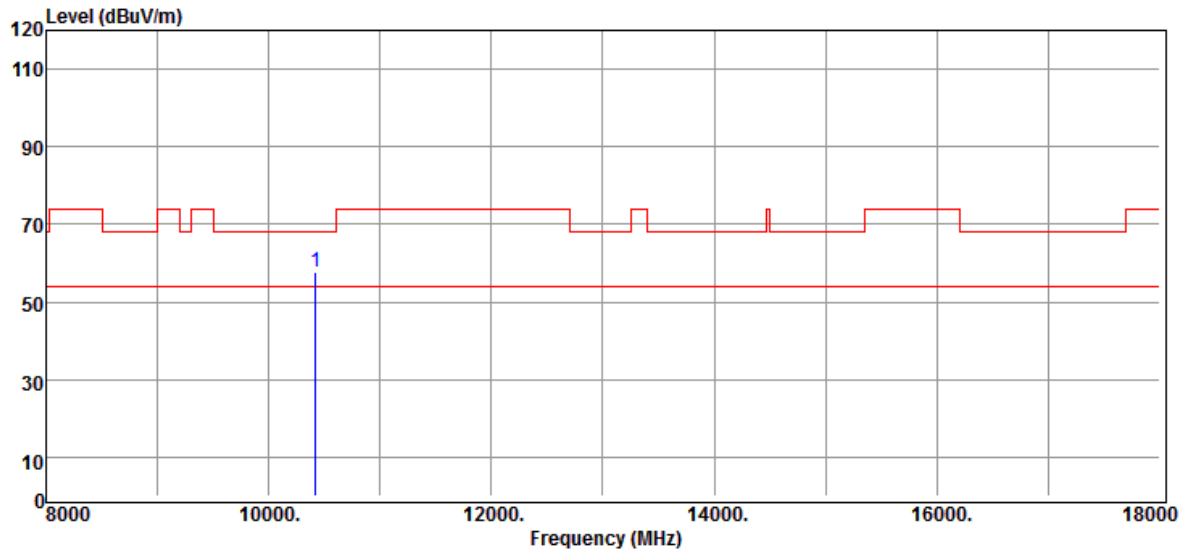
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Member of SGS Group

802.11ac_VHT80, 5150~5250 MHz

Operation Mode :802.11ac80 / Band 1
Test Mode :TX CH LOW
EUT Pol :E2 Plan
Test Channel :5210 MHz

Test Date :2018-06-15
Temp./Humi. :23/70
Antenna Pol. :VERTICAL
Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
10420.00	Peak	30.80	26.87	57.67	68.20	-10.53

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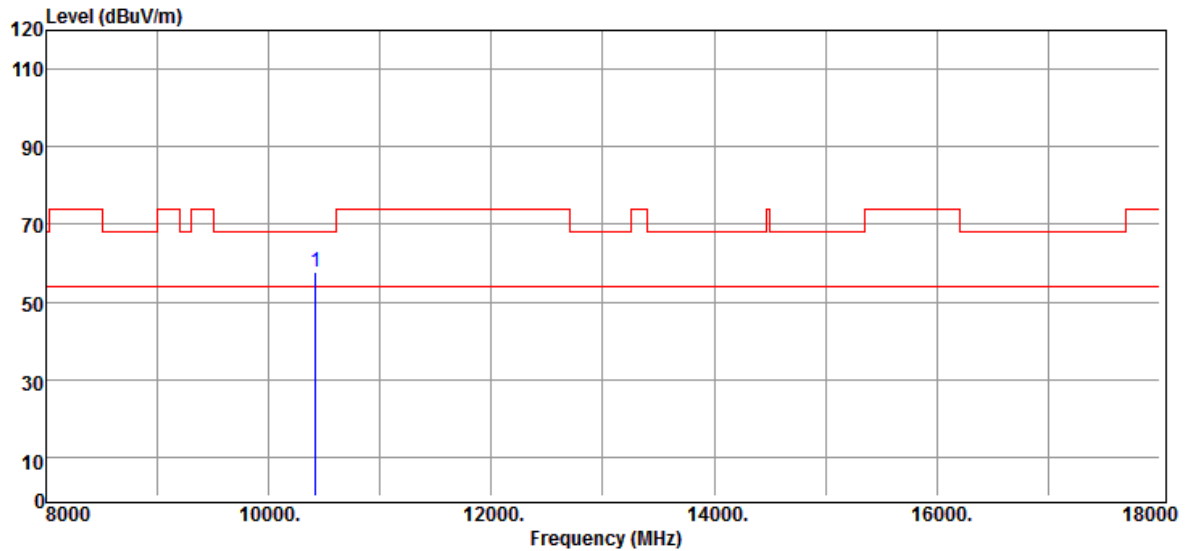
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Operation Mode	:802.11ac80 / Band 1	Test Date	:2018-06-15
Test Mode	:TX CH LOW	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5210 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
10420.00	Peak	30.75	26.87	57.62	68.20	-10.58

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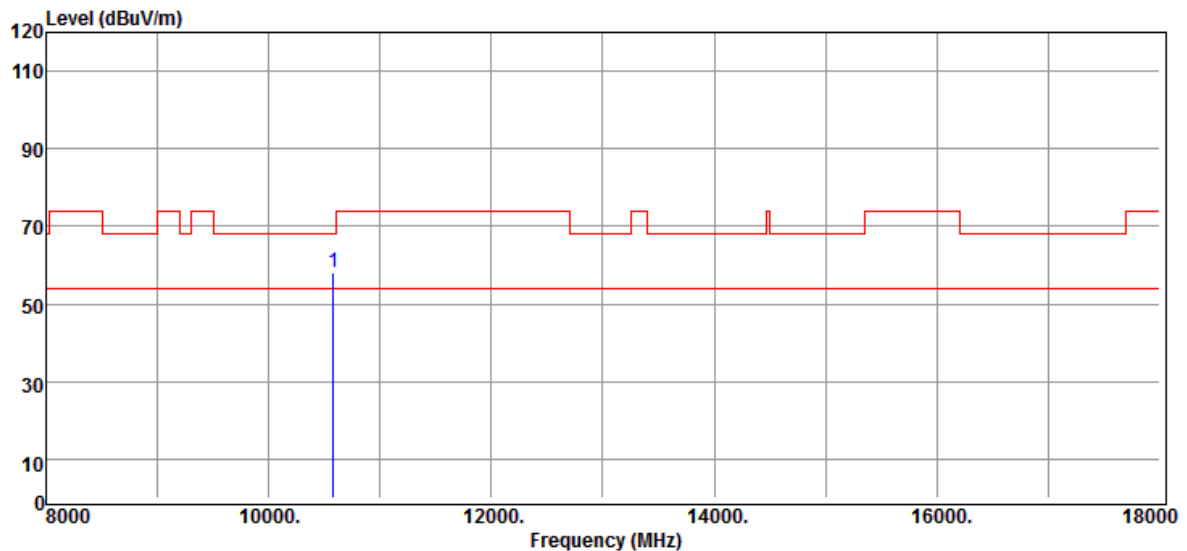
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Member of SGS Group

802.11ac_VHT80, 5250~5350 MHz

Operation Mode :802.11ac80 / Band 2
Test Mode :TX CH HIGH
EUT Pol :E2 Plan
Test Channel :5290 MHz

Test Date :2018-06-15
Temp./Humi. :23/70
Antenna Pol. :VERTICAL
Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10580.00	Peak	30.88	27.22	58.10	68.20	-10.10

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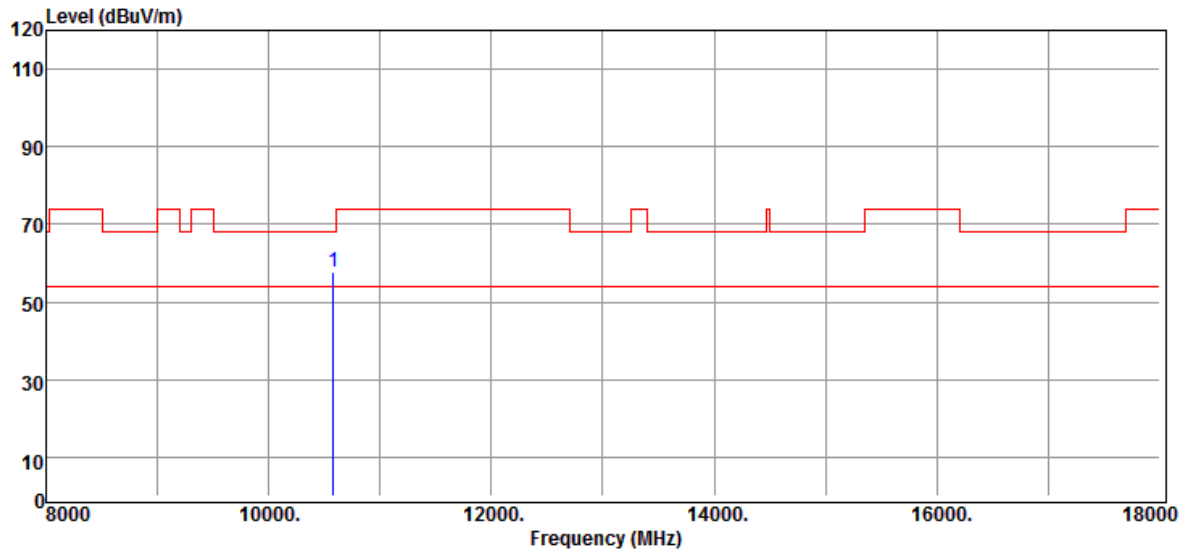
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Operation Mode	:802.11ac80 / Band 2	Test Date	:2018-06-15
Test Mode	:TX CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5290 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
10580.00	Peak	30.42	27.22	57.64	68.20	-10.56

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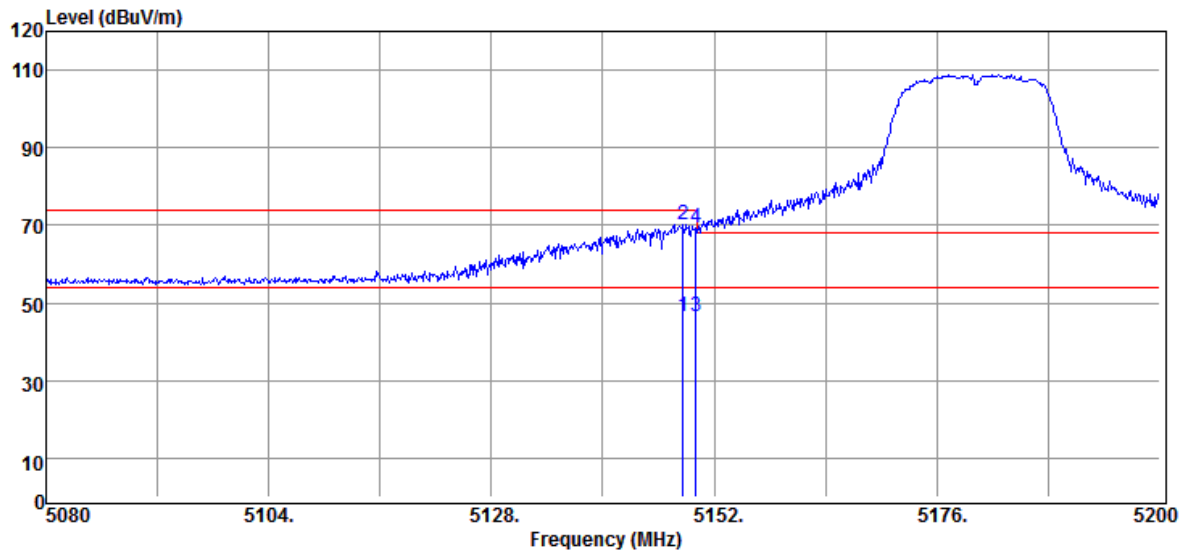
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Band edge falling to restricted band

802.11a mode

Operation Mode	:802.11a / Band 1	Test Date	:2018-06-14
Test Mode	:BE CH LOW	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:5180 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5148.64	Average	32.82	13.63	46.45	54.00	-7.55
5148.64	Peak	56.57	13.63	70.20	74.00	-3.80
5150.00	Average	33.01	13.65	46.66	54.00	-7.34
5150.00	Peak	55.83	13.65	69.48	74.00	-4.52

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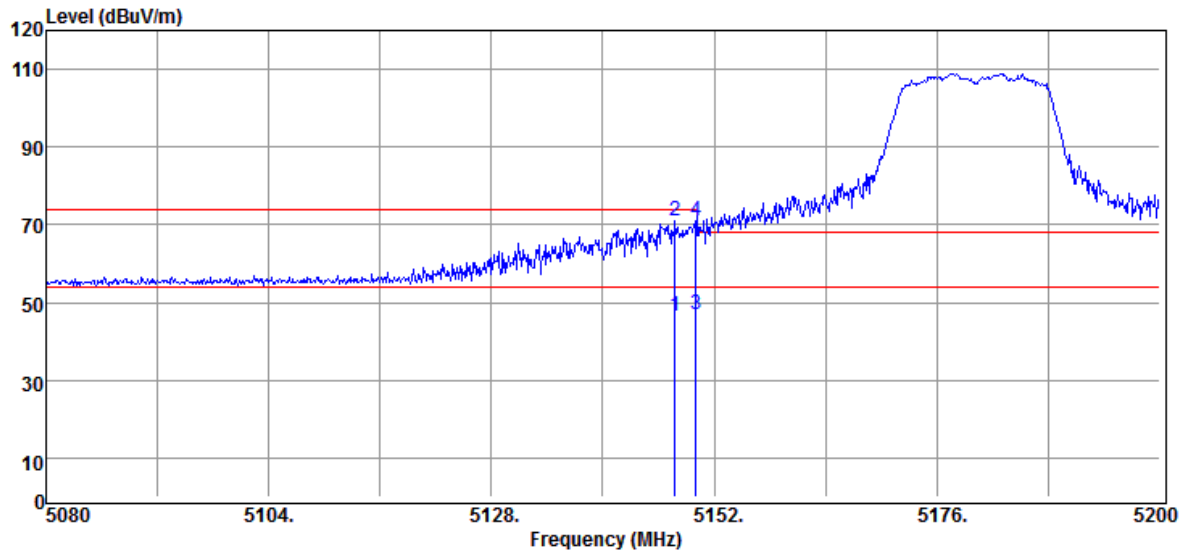
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Operation Mode	:802.11a / Band 1	Test Date	:2018-06-14
Test Mode	:BE CH LOW	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5180 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
5147.80	Average	32.94	13.63	46.57	54.00	-7.43
5147.80	Peak	57.51	13.63	71.14	74.00	-2.86
5150.00	Average	33.18	13.65	46.83	54.00	-7.17
5150.00	Peak	57.17	13.65	70.82	74.00	-3.18

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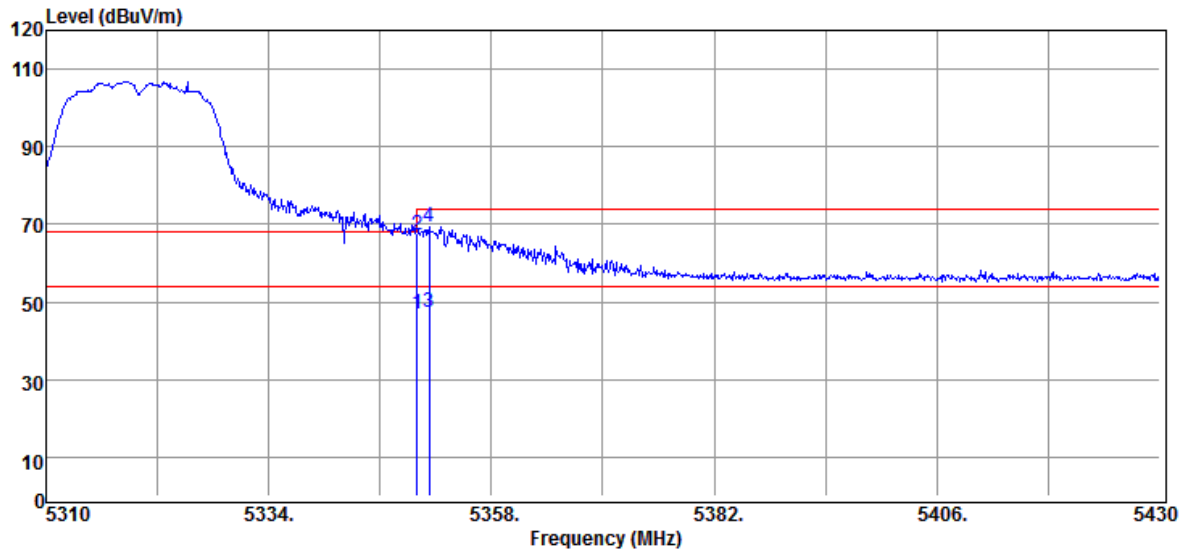
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Operation Mode	:802.11a / Band 2	Test Date	:2018-06-14
Test Mode	:BE CH HIGH	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:5320 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
5350.00	Average	32.91	14.16	47.07	54.00	-6.93
5350.00	Peak	53.21	14.16	67.37	74.00	-6.63
5351.28	Average	33.04	14.17	47.21	54.00	-6.79
5351.28	Peak	55.22	14.17	69.39	74.00	-4.61

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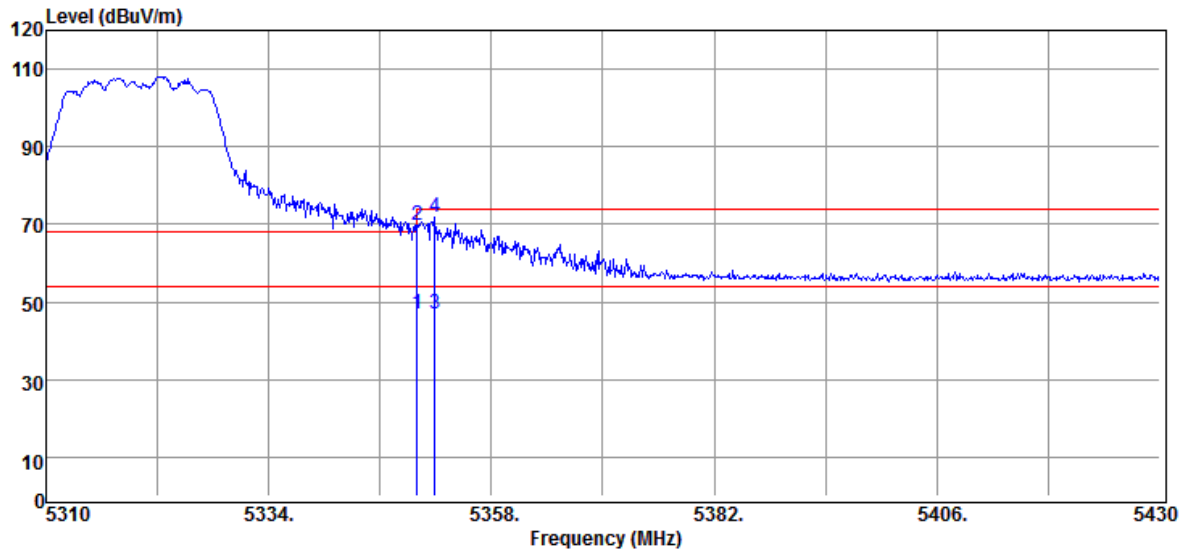
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Operation Mode	:802.11a / Band 2	Test Date	:2018-06-14
Test Mode	:BE CH HIGH	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5320 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
5350.00	Average	32.94	14.16	47.10	54.00	-6.90
5350.00	Peak	55.66	14.16	69.82	74.00	-4.18
5351.88	Average	32.95	14.17	47.12	54.00	-6.88
5351.88	Peak	57.50	14.17	71.67	74.00	-2.33

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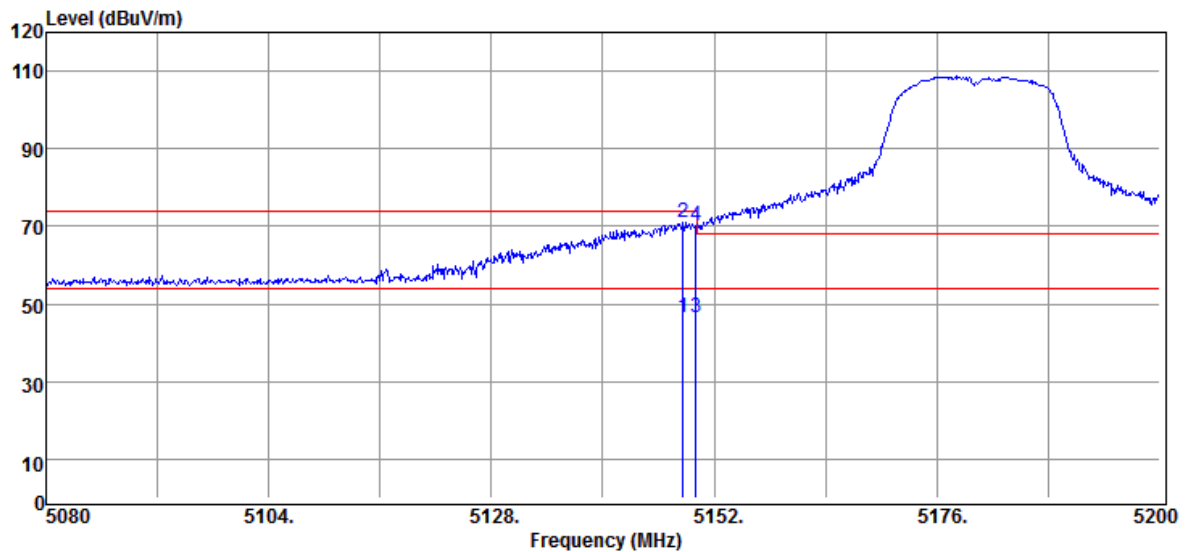
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Band edge falling to restricted band

802.11ac_VHT20 mode

Operation Mode :802.11ac20 / Band 1
Test Mode :BE CH LOW
EUT Pol :E2 Plan
Test Channel :5180 MHz

Test Date :2018-06-14
Temp./Humi. :25/60
Antenna Pol. :VERTICAL
Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5148.64	Average	32.72	13.63	46.35	54.00	-7.65
5148.64	Peak	57.33	13.63	70.96	74.00	-3.04
5150.00	Average	32.86	13.65	46.51	54.00	-7.49
5150.00	Peak	56.43	13.65	70.08	74.00	-3.92

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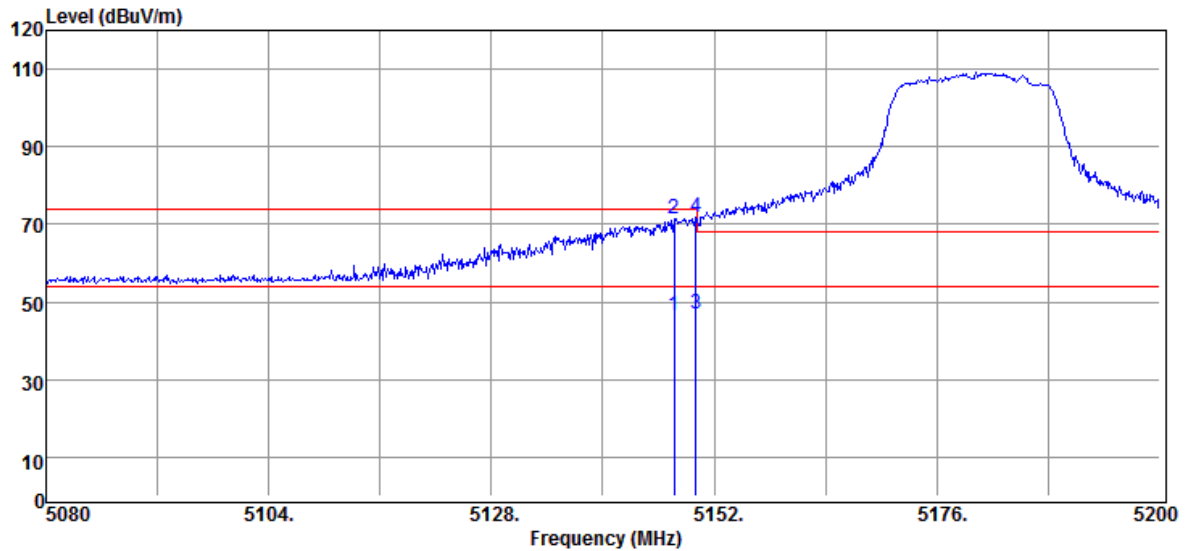
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Operation Mode	:802.11ac20 / Band 1	Test Date	:2018-06-14
Test Mode	:BE CH LOW	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5180 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
5147.68	Average	32.92	13.63	46.55	54.00	-7.45
5147.68	Peak	57.87	13.63	71.50	74.00	-2.50
5150.00	Average	33.17	13.65	46.82	54.00	-7.18
5150.00	Peak	58.31	13.65	71.96	74.00	-2.04

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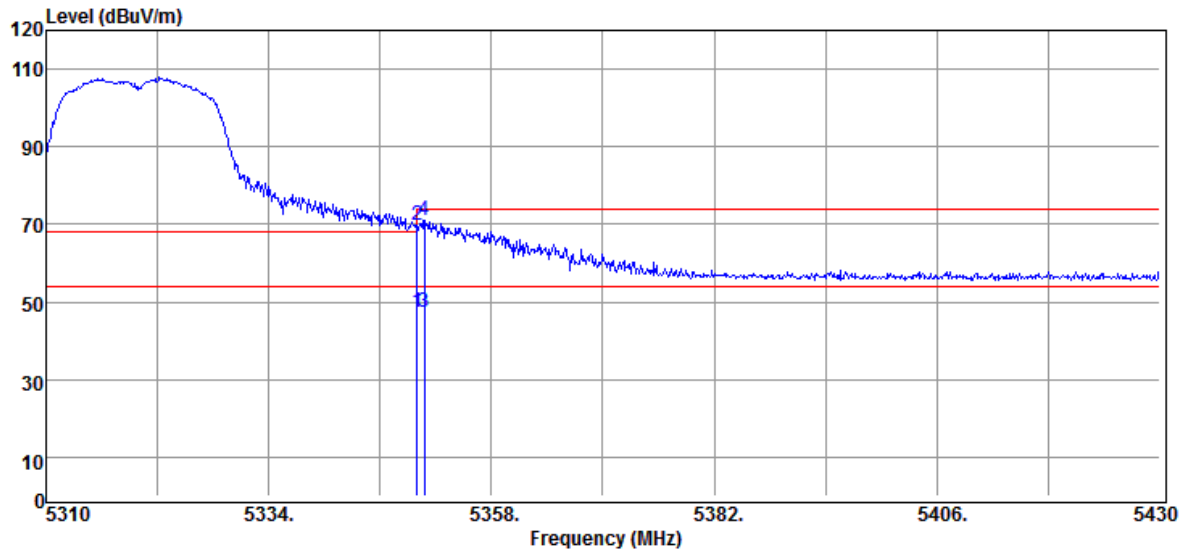
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Operation Mode	:802.11ac20 / Band 2	Test Date	:2018-06-14
Test Mode	:BE CH HIGH	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:5320 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
5350.00	Average	33.02	14.16	47.18	54.00	-6.82
5350.00	Peak	55.56	14.16	69.72	74.00	-4.28
5350.80	Average	33.12	14.17	47.29	54.00	-6.71
5350.80	Peak	56.74	14.17	70.91	74.00	-3.09

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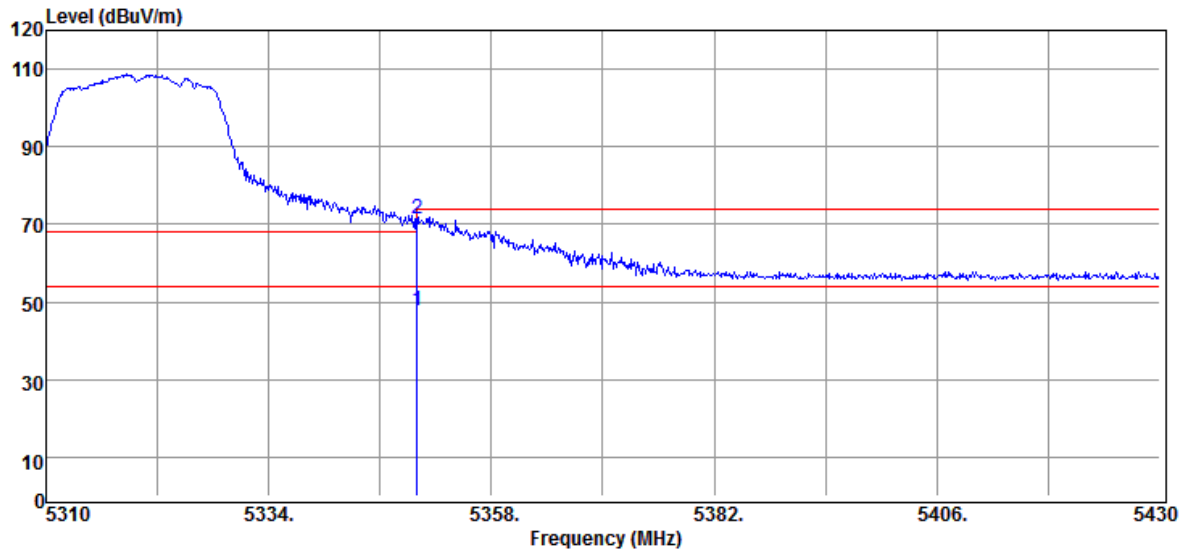
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Operation Mode	:802.11ac20 / Band 2	Test Date	:2018-06-14
Test Mode	:BE CH HIGH	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5320 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
5350.00	Average	33.42	14.16	47.58	54.00	-6.42
5350.00	Peak	57.10	14.16	71.26	74.00	-2.74

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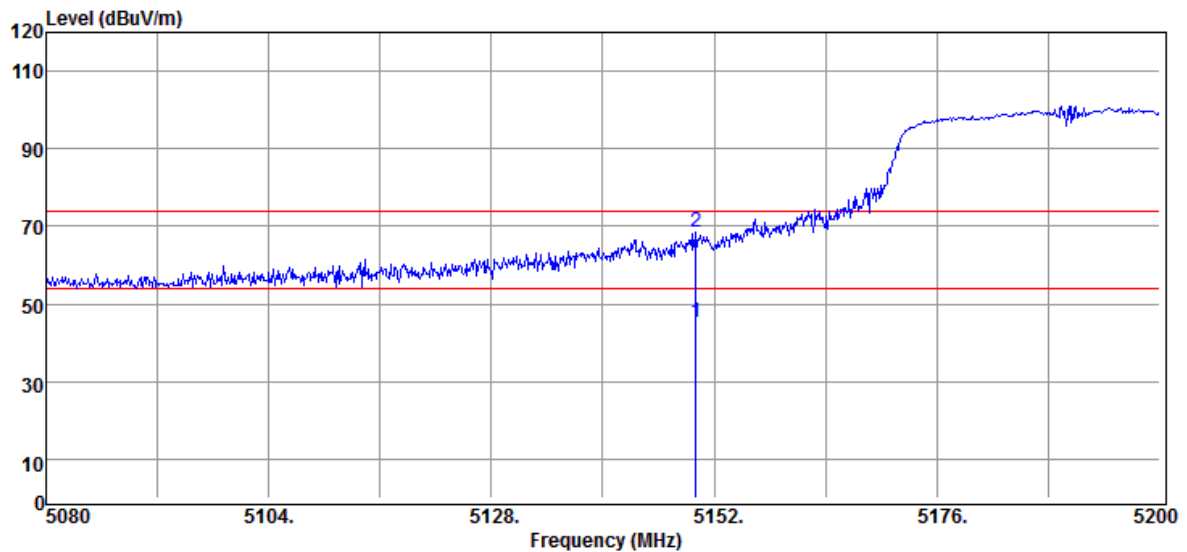
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Band edge falling to restricted band

802.11ac_VHT40 mode

Operation Mode :802.11ac40/Band 1
Test Mode :BE CH LOW
EUT Pol :E2 Plan
Test Channel :5190 MHz

Test Date :2018-06-15
Temp./Humi. :23/70
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5150.00	Average	31.80	13.65	45.45	54.00	-8.55
5150.00	Peak	54.76	13.65	68.41	74.00	-5.59

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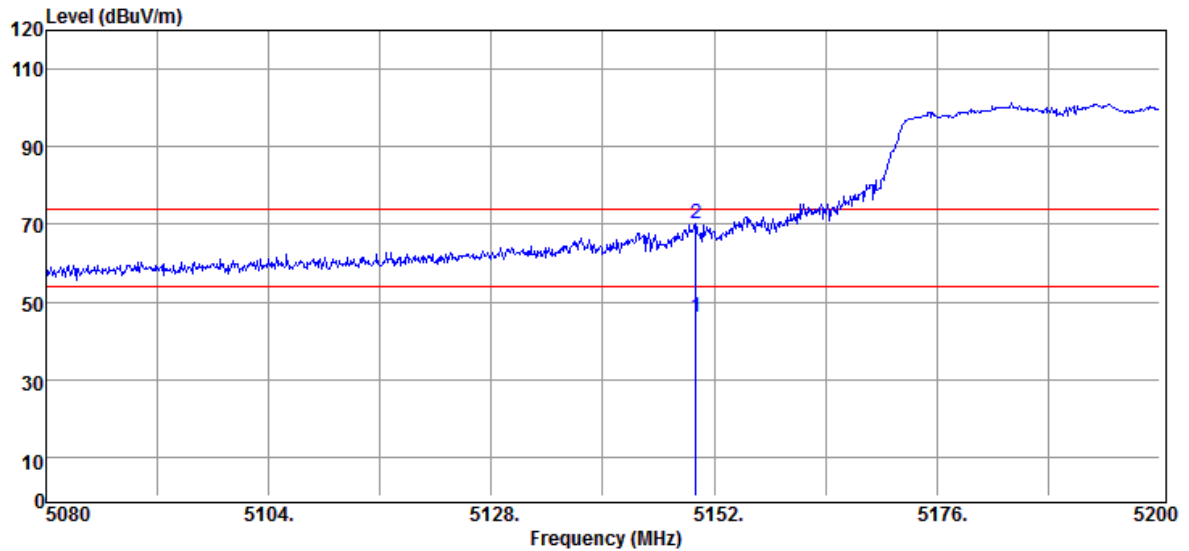
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Operation Mode	:802.11ac40/Band 1	Test Date	:2018-06-15
Test Mode	:BE CH LOW	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5190 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5150.00	Average	32.56	13.65	46.21	54.00	-7.79
5150.00	Peak	56.48	13.65	70.13	74.00	-3.87

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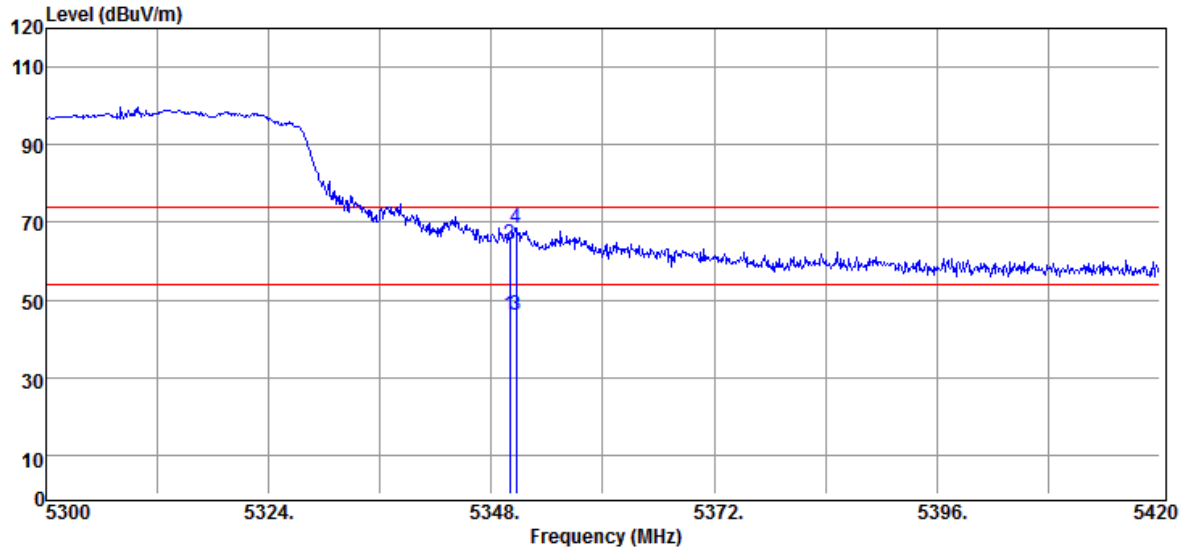
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Operation Mode	:802.11ac40/Band 2	Test Date	:2018-06-15
Test Mode	:BE CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:5310 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5350.00	Average	32.08	14.16	46.24	54.00	-7.76
5350.00	Peak	50.11	14.16	64.27	74.00	-9.73
5350.64	Average	32.04	14.17	46.21	54.00	-7.79
5350.64	Peak	54.39	14.17	68.56	74.00	-5.44

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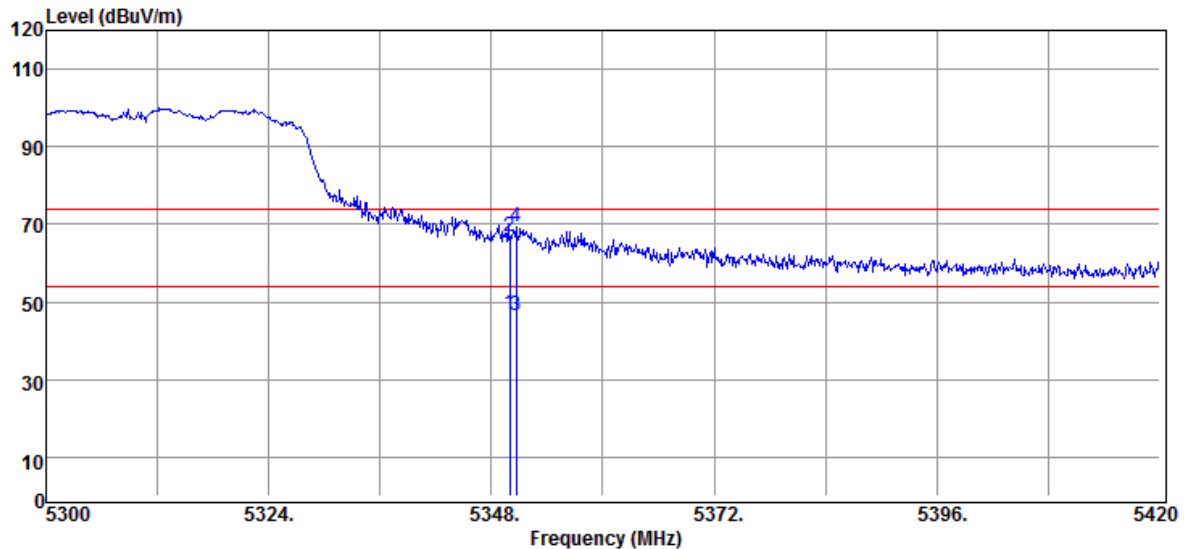
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Operation Mode	:802.11ac40/Band 2	Test Date	:2018-06-15
Test Mode	:BE CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5310 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
5350.00	Average	32.57	14.16	46.73	54.00	-7.27
5350.00	Peak	52.48	14.16	66.64	74.00	-7.36
5350.64	Average	32.40	14.17	46.57	54.00	-7.43
5350.64	Peak	55.18	14.17	69.35	74.00	-4.65

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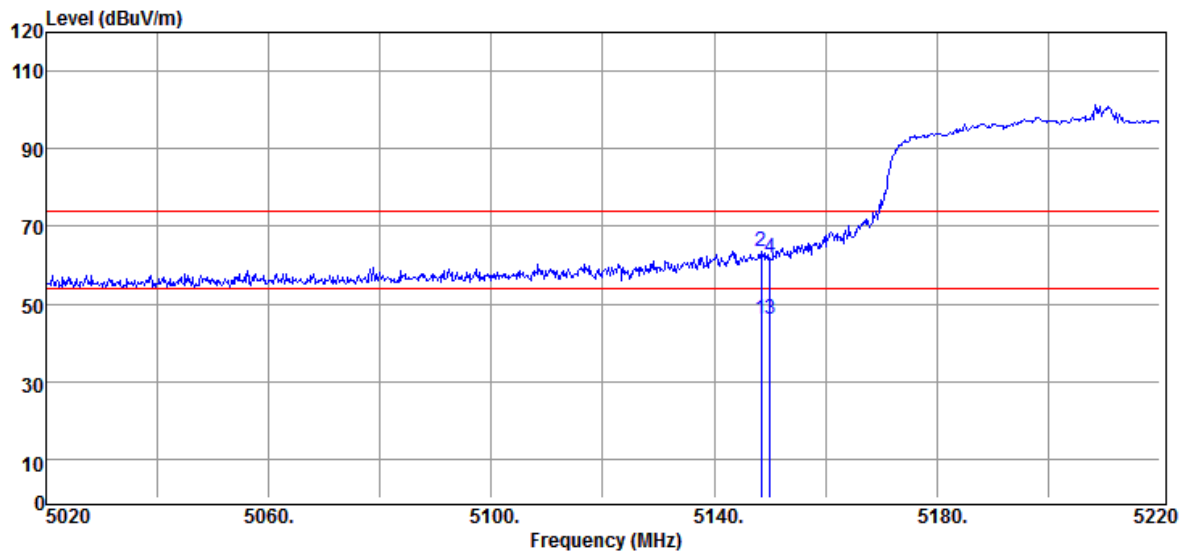
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Band edge falling to restricted band

802.11ac_VHT80 mode

Operation Mode	:802.11ac80/Band 1	Test Date	:2018-06-15
Test Mode	:BE CH LOW	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:5210 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5148.40	Average	32.37	13.63	46.00	54.00	-8.00
5148.40	Peak	50.08	13.63	63.71	74.00	-10.29
5150.00	Average	32.33	13.65	45.98	54.00	-8.02
5150.00	Peak	48.20	13.65	61.85	74.00	-12.15

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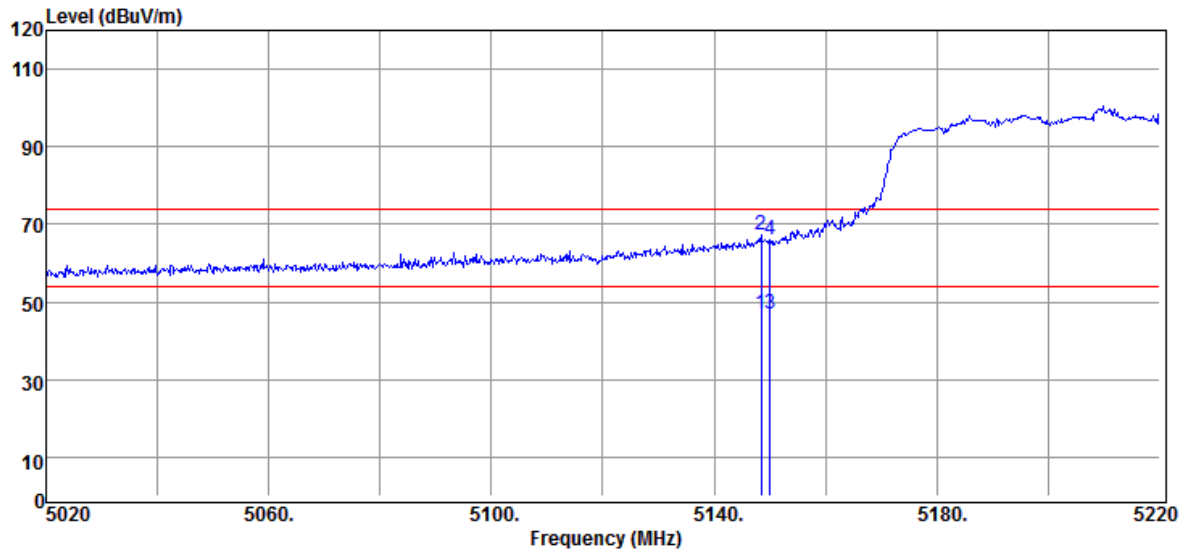
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Operation Mode	:802.11ac80/Band 1	Test Date	:2018-06-15
Test Mode	:BE CH LOW	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5210 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5148.40	Average	33.13	13.63	46.76	54.00	-7.24
5148.40	Peak	53.47	13.63	67.10	74.00	-6.90
5150.00	Average	33.12	13.65	46.77	54.00	-7.23
5150.00	Peak	52.29	13.65	65.94	74.00	-8.06

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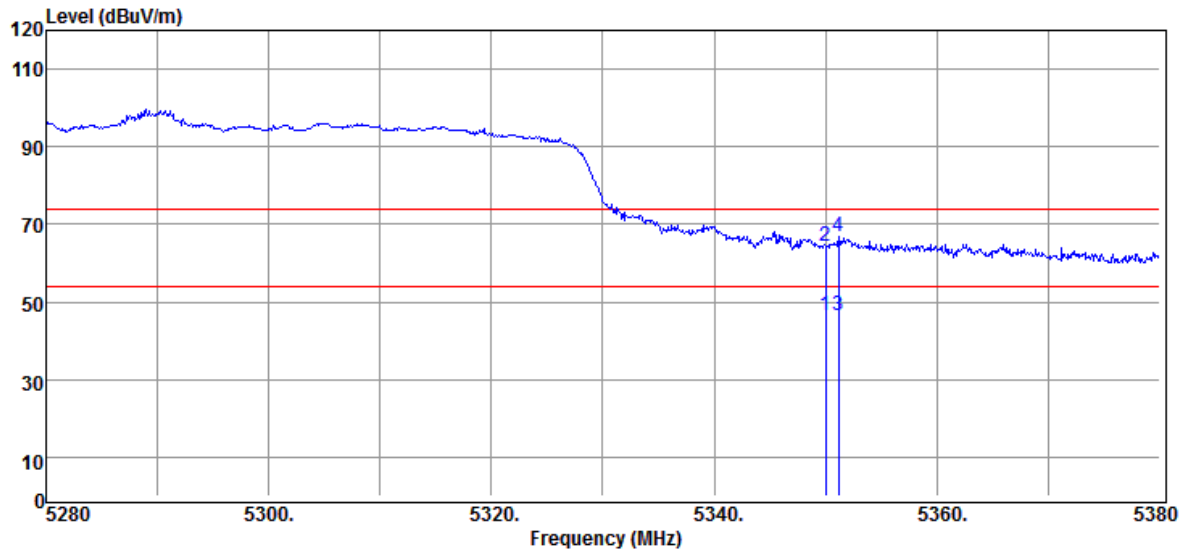
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Operation Mode	:802.11ac80 / Band 2	Test Date	:2018-06-15
Test Mode	:BE CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:5290 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5350.00	Average	32.14	14.16	46.30	54.00	-7.70
5350.00	Peak	50.10	14.16	64.26	74.00	-9.74
5351.20	Average	32.32	14.17	46.49	54.00	-7.51
5351.20	Peak	52.54	14.17	66.71	74.00	-7.29

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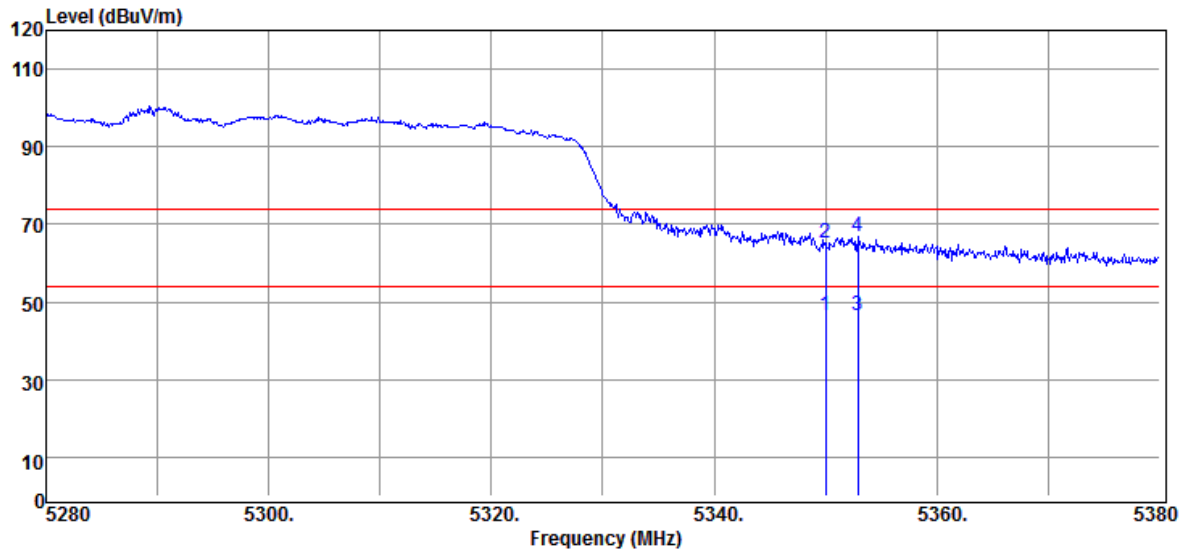
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Operation Mode	:802.11ac80 / Band 2	Test Date	:2018-06-15
Test Mode	:BE CH HIGH	Temp./Humi.	:23/70
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5290 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5350.00	Average	32.55	14.16	46.71	54.00	-7.29
5350.00	Peak	50.86	14.16	65.02	74.00	-8.98
5352.90	Average	32.51	14.17	46.68	54.00	-7.32
5352.90	Peak	52.85	14.17	67.02	74.00	-6.98

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8. ANTENNA REQUIREMENT

7.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

7.2 Antenna Connected Construction

An embedded-in antenna design is used.

The antenna is designed with permanent attached and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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

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