

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant: CALAMP WIRELESS NETWORKS CORPORATION
2200 Faraday Ave, Suite 220, Carlsbad, CA 92008

Product Name: LMU5541 Broadband Router/Tracker

Brand Name: CalAmp

Model No.: LMU5541LW

Model Difference: N/A

Report Number: ER/2019/C0116

FCC ID: APV-5541LW

IC: 5843C-5541LW

FCC Rule Part: §15.407, Cat: NII

ISED RSS: RSS-247 issue 2 Feb. 2017

Issue Date: Jan. 15, 2020

Date of Test: Dec. 13, 2019 ~ Jan. 07, 2020

Date of EUT Re-ceived: Dec. 13, 2019

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.

Approved By: _____



Vito Pei / Asst. Supervisor



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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2019/C0116	Rev.00	Original.	Jan. 15, 2020	Revised By: Stefanie Yu

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	LMU5541 Broadband Router/Tracker	
Brand Name:	CalAmp	
Model No.:	LMU5541LW	
Model Difference:	N/A	
Hardware Version:	Rev E	
Software Version:	LMU,166 V4.1a	
Power Supply:	12Vdc from Car Battery & 3.7Vdc from Rechargeable Li-ion Battery	
	Battery:	Model No.: GSP633248, Supplier: N/A
Modulation type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only	
Transition Rate:	802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 72.2Mbps 802.11 n_40MHz: 13.5 - 150.0Mbps 802.11 ac_20MHz: 6.5 –86.7Mbps 802.11 ac_40MHz: 13.5 -200.0Mbps 802.11 ac_80MHz: 29.3 – 433.3Mbps	
Antenna Designation:	PIFA antenna, Peak Gain: -0.87dBi (5725~5850)	

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1.2 FCC worst power

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (Avg.) (dBm) (Worst case)	Modulation Technology
a	5725-5850	5	13.97	OFDM
n_HT ac_VHT 20M	5725-5850	5	HT: 11.97	OFDM
n_HT ac_VHT 40M	5725-5850	2	HT: 11.94	OFDM
ac_VHT 80M	5725-5850	1	VHT: 8.68	OFDM

1.3 ISED worst power

Wi-Fi 802.11	Frequency Range	Channels	Avg. or EIRP	Rated Power(dBm) (Worst Case)	Modulation Technology
11a	5725-5850	5	Avg.	13.97	OFDM
11n_HT / ac_VHT 20M	5725-5850	5	Avg.	HT: 11.97	OFDM
11n_HT / ac_VHT 40M	5725-5850	2	Avg.	HT: 11.94	OFDM
11ac VHT80M	5725-5850	1	Avg.	VHT 8.68	OFDM

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1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407
FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
RSS-247 issue 2 Feb. 2017
RSS-Gen. issue 5, Amendment 1, March 2019
ANSI C63.10:2013

1.5 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory (TAF code 0513)
No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

FCC Designation number: TW0001

ISED CAB identifier: TW0513

1.6 Special Accessories

There are no special accessories used while test was conducted.

1.7 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

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 table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/50 ohm 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 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 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 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.

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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.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

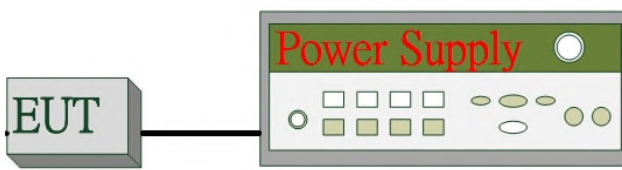


Fig. 2-2 Conducted (Antenna Port) Emission Configuration

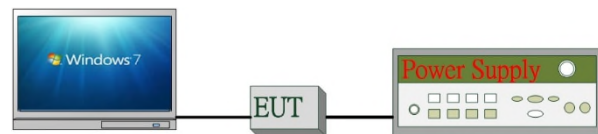


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	DC Power Supply	Agilent	E3640A	MY52410006	N/A	N/A
2.	Notebook	Lenovo	X240	PF-00UH6D	N/A	N/A

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3 SUMMARY OF TEST RESULT

FCC Rules	IC Rules	Description Of Test	Result
§15.207	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	RSS-Gen §6.7 RSS-247 §6.2.4.1	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Maximum Conducted Output Power	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Power Spectral Density	Compliant
§15.205 §15.209 §15.407(b)	RSS-247 §6.2.1~ 4 (2)	Undesirable Radiated Emissions	Compliant
§15.407(c)	RSS-247 §6.4	Transmission in case of Absence of Information	Compliant
§15.407(g)	RSS-Gen §6.11	Frequency Stability	Compliant
§15.203 §15.407(a)	RSS- Gen §6.8	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 802.11a/n/ac operated in U-NII Bands

Operated band in 5745 MHz ~5850 MHz:

20 M		40 M		80 M	
CH	Freq (MHz)	CH	Freq (MHz)	CH	Freq (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.
The gevin UE is pre-scanned among below modes.

Modulation	Transmission Chain				Multiple Transmission Spatial
<input checked="" type="checkbox"/> 802.11 a	<input checked="" type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input type="checkbox"/> 1TX
<input checked="" type="checkbox"/> 802.11 n	<input checked="" type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input type="checkbox"/> MIMO
<input checked="" type="checkbox"/> 802.11 ac	<input checked="" type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input type="checkbox"/> MIMO

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.

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4.2.1 RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	AN-TENNA PORT
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Ch0

RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	AN-TENNA PORT
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Ch0
802.11n_HT20	5745~5825	149 to 165	149,157,165		MCS 0	SISO
802.11n_HT40	5755~5795	151 to 159	151,159		MCS 0	SISO
802.11ac_VHT80	5775	155	155		MCS0	SISO

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 E1 position was reported.

4.2.2 ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	AN-TENNA PORT
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Ch0
802.11n_HT20	5745~5825	149 to 165	149,157,165		MCS0	SISO
802.11ac_VHT20	5745~5825	149 to 165	149,157,165		MCS0	SISO
802.11n_HT40	5755~5795	151 to 159	151,159		MCS0	SISO
802.11ac_VHT40	5755~5795	151 to 159	151,159		MCS0	SISO
802.11ac_VHT80	5775	155	155		MCS0	SISO

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26dB & 6dB Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Measurement	+/- 0.96 dB
Peak Power Spectral Density Measurement	+/- 1.67 dB
Frequency Stability	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission Measurement Uncertainty	
Polarization: Vertical	9kHz~30MHz: +-2.3dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB
Polarization: Horizontal	9kHz~30MHz: +-2.3dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency range within 150 kHz to 30 MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

- The lower limit shall apply at the transition frequencies
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

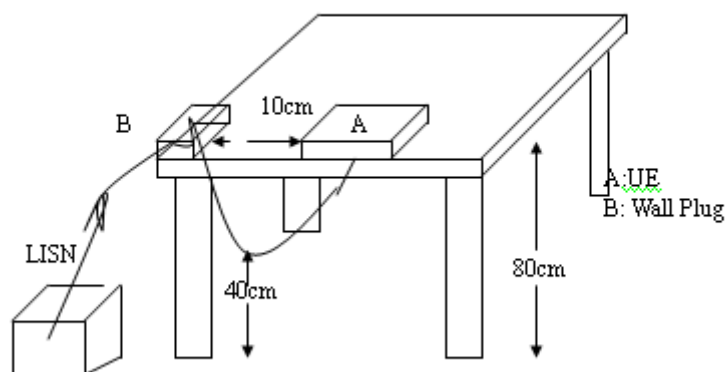
6.2 Measurement Equipment Used

N/A

6.3 EUT Setup

- The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
- The LISN was connected with 120Vac/60Hz power source.

6.4 Test SET-UP



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6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed.

6.6 Measurement Result

N/A, powered from car battery.

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7 DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

7.1 Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

Duty Cycle:

Mode	Duty Cycle (%) =Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11a	95.15	0.22	0.48	1.00
802.11n_20	92.23	0.35	0.52	1.00
802.11ac_20	94.74	0.23	0.52	1.00
802.11n_40	90.65	0.43	1.06	2.00
802.11ac_40	90.74	0.42	1.05	2.00
802.11ac_80	82.79	0.82	2.15	3.00

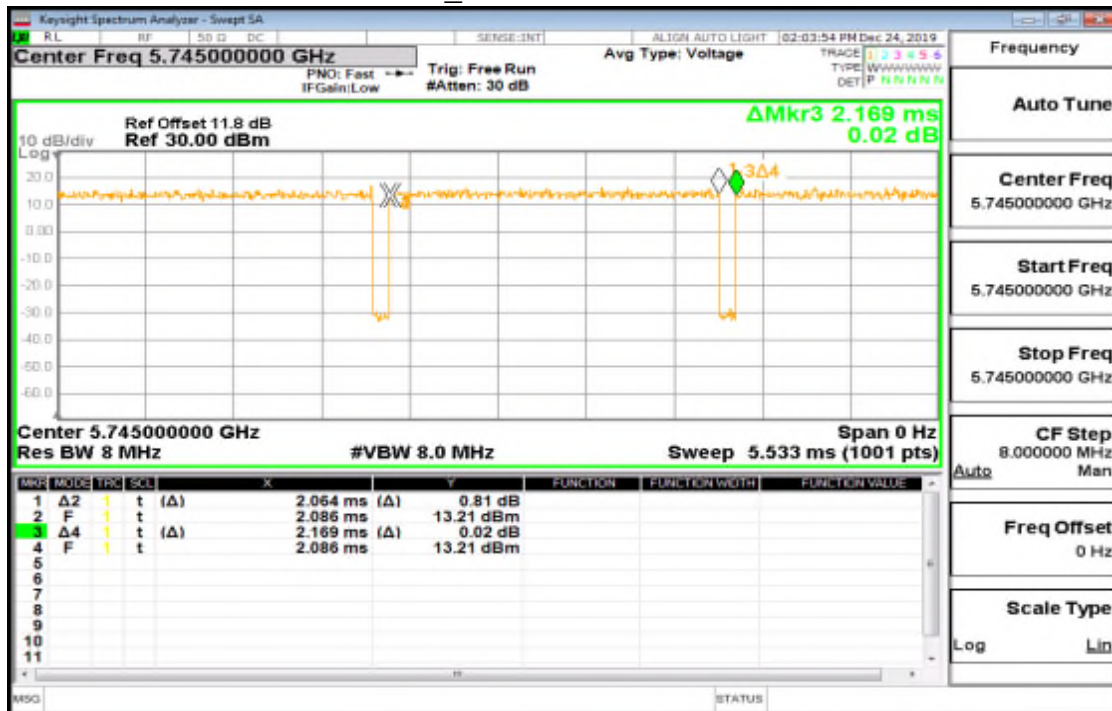
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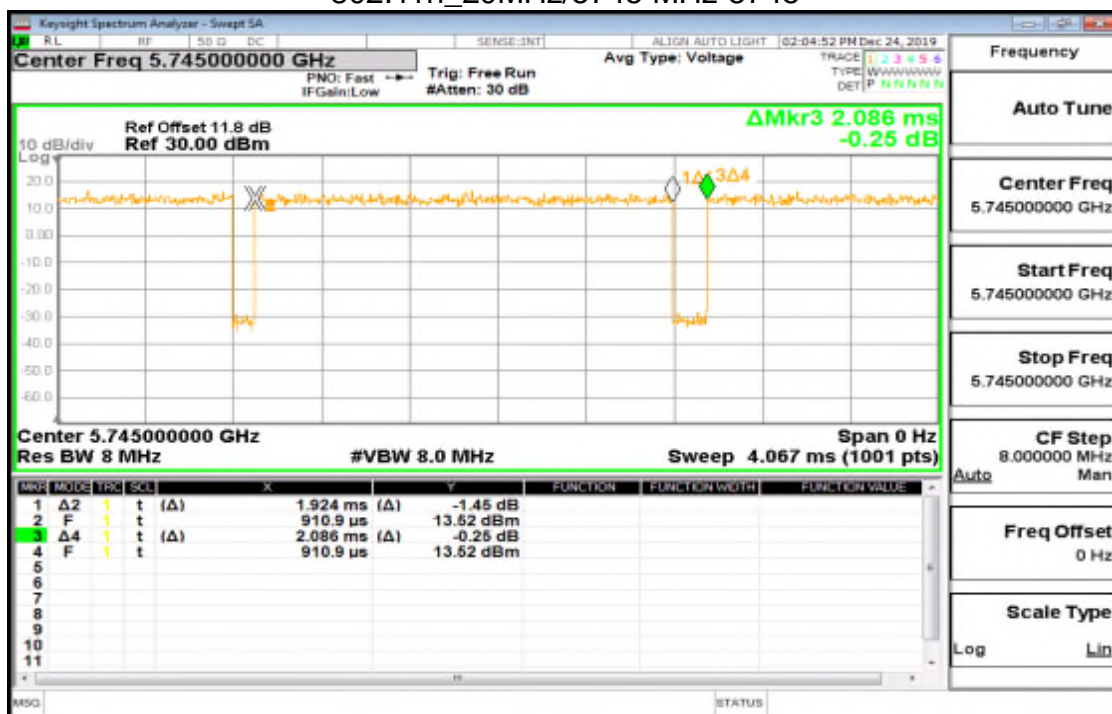
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7.2 DUTY CYCLE TEST SIGNAL MEASUREMENT RESULT

802.11a_20MHz/5745 MHz-5745



802.11n_20MHz/5745 MHz-5745



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802.11n_40MHz/5755 MHz-5755



802.11ac_20MHz/5745 MHz-5745



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802.11ac_40MHz/5755 MHz-5755



802.11ac_80MHz/5775 MHz-5775



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8 26DB, 99% & 6DB EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.

The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

8.2 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 spectrum analyzer.
 - 3.a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW
Sweep=auto,
Detector = Peak,
Trace Mode = Max Hold,
Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
 - 3.b. Mark the peak frequency and -26dB (upper and lower) frequency.
4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
5. Minimum Emission Bandwidth for the band 5.725-5.850GHz.
 - a. Set the spectrum analyzer as
RBW = 100 kHz,
VBW = 3*RBW,
Span = 30M/50MHz,
Detector=Peak,
Sweep=auto
 - b. Mark the peak frequency and -6dB (upper and lower) frequency.
6. For 99% Bandwidth: Set the spectrum analyzer as
RBW=1%,
VBW = 3*RBW,
Span = 30M/50MHz,
Detector=Sample,
Sweep=auto.
7. Turn on the 99% bandwidth function, max reading.
8. Repeat above procedures until all frequency of interest measured was complete.

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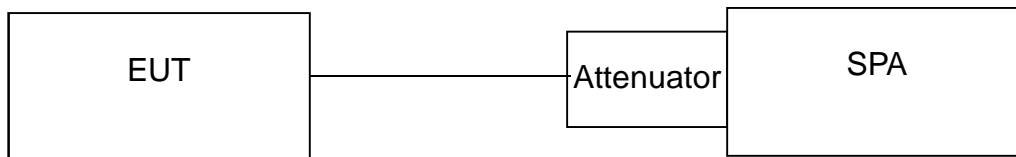
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8.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equip-ment	Manufacturer	Model	Serial Num-ber	Calibration Date	Calibra-tion Due
DC Power Supply	Agilent	E3640A	MY52410006	12/10/2019	12/09/2020
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2019	05/16/2020
EXA Spectrum An-alyzer	KEYSIGHT	N9010A	MY57120290	02/13/2019	02/12/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2019	01/01/2020

8.4 Test Set-up



8.5 Measurement Result

8.5.1 6dB Bandwidth (5725 MHz~ 5850 MHz) measure with Peak detector for FCC

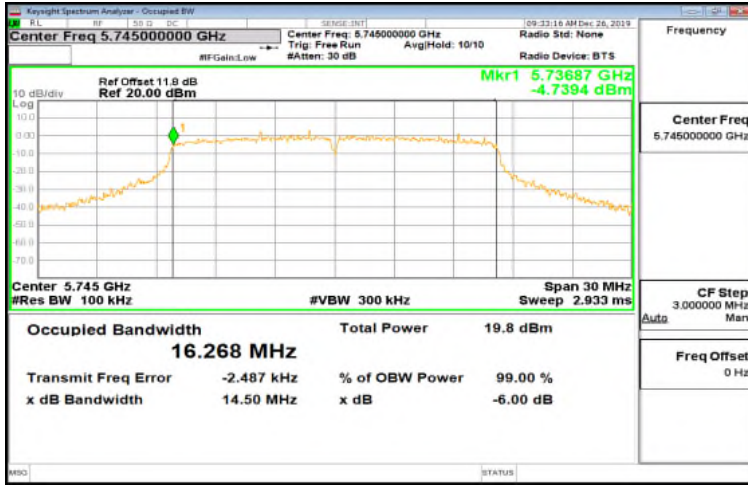
802.11a_Ch0			802.11n_HT20_Ch0			802.11n_HT40_Ch0			802.11ac_VHT80_Ch0		
Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	14.5	11.614	5745	14.08	11.486	5755	33.92	15.305	5775	75.16	18.760
5785	14.46	11.602	5785	15.03	11.770	5795	32.99	15.184			
5825	15.38	11.870	5825	15.13	11.798						

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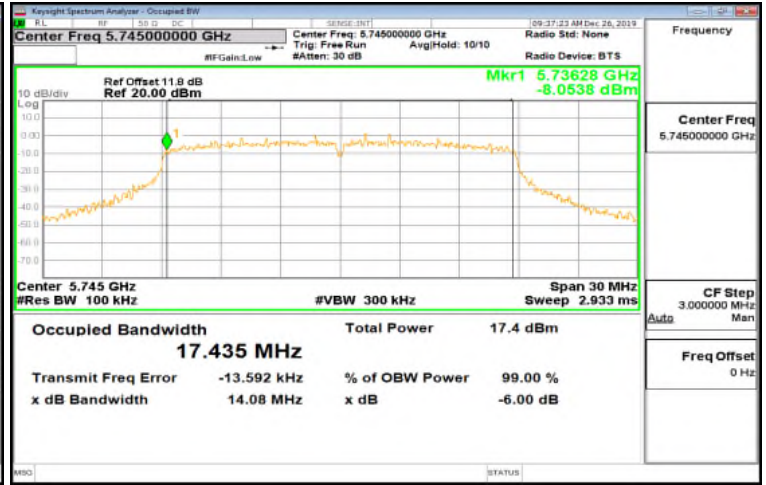
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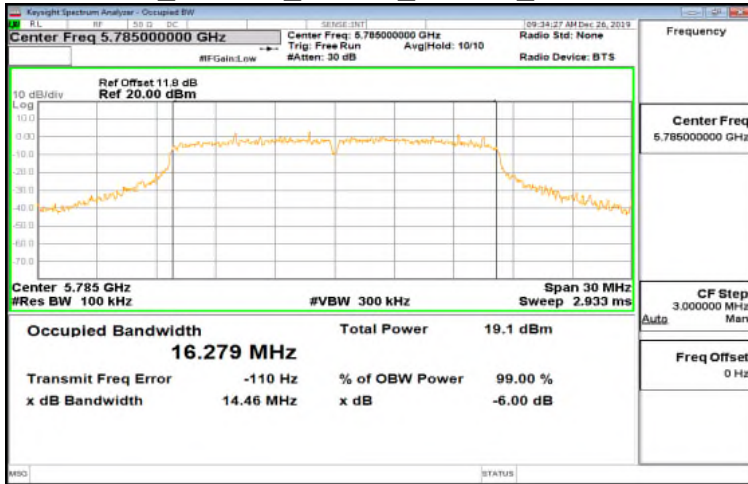
FCC 802.11a 20MHz Chain0 5745MHz



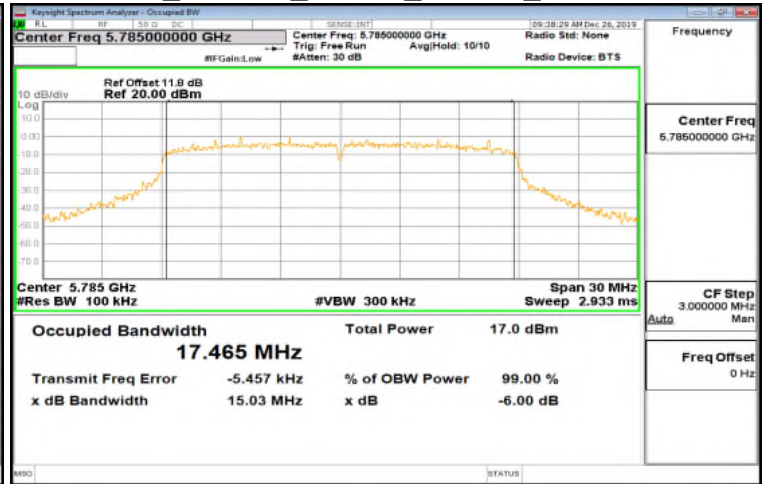
FCC 802.11n 20MHz Chain0 5745MHz



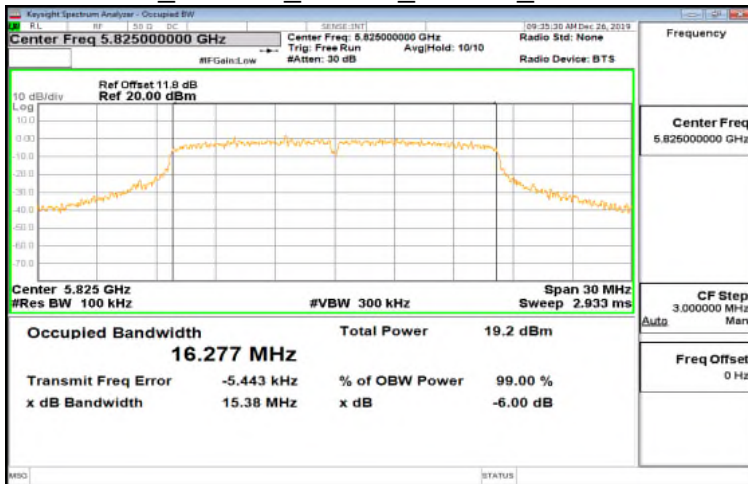
FCC 802.11a 20MHz Chain0 5785MHz



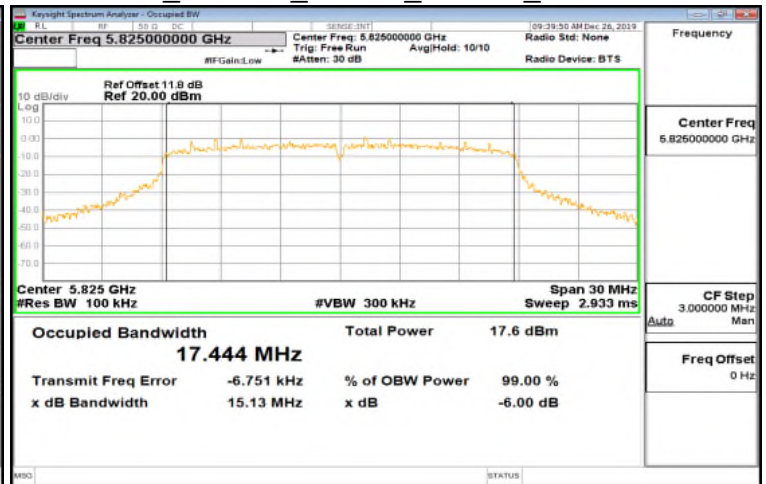
FCC 802.11n 20MHz Chain0 5785MHz



FCC 802.11a 20MHz Chain0 5825MHz



FCC 802.11n 20MHz Chain0 5825MHz



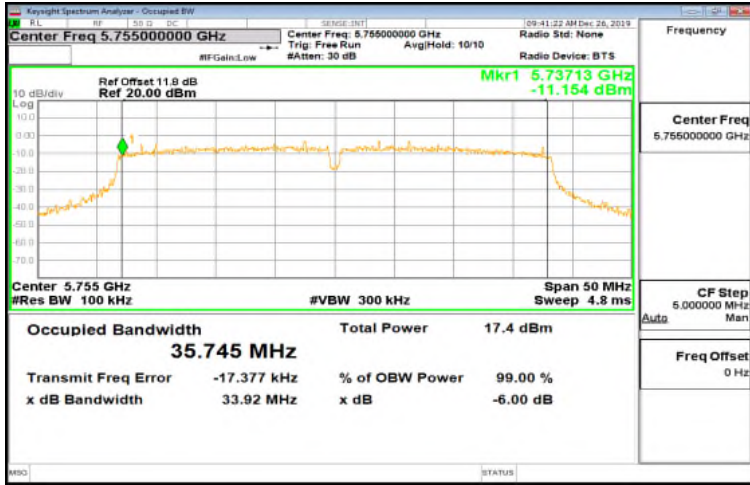
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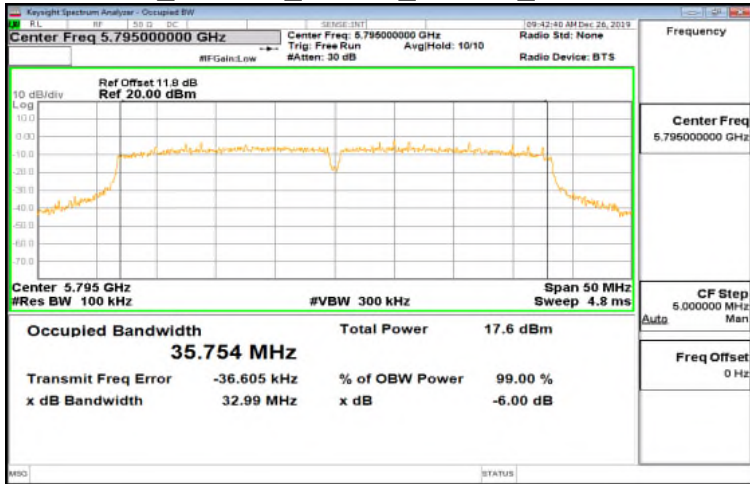
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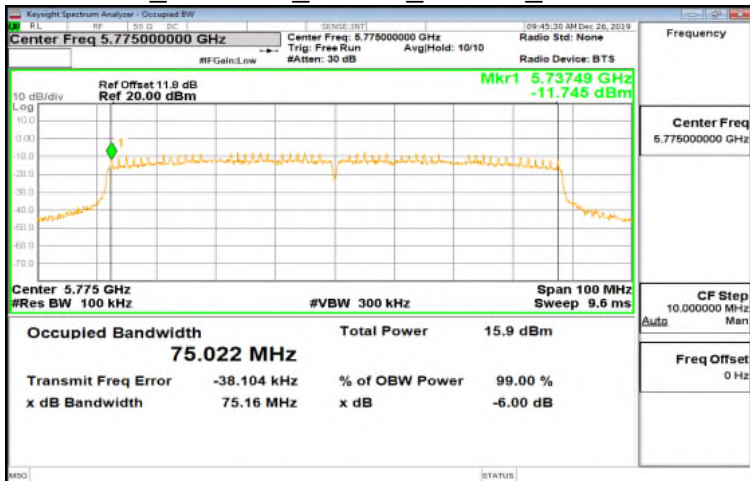
FCC_802.11n_40MHz_Chain0_5755MHz



FCC_802.11n_40MHz_Chain0_5795MHz



FCC_802.11ac_80MHz_Chain0_5775MHz



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8.5.2 6dB Bandwidth (5725 MHz~ 5850 MHz) measure with sample detector for ISED

802.11a_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.05	12.055
5785	15.73	11.967
5825	15.78	11.981

802.11n_HT20_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.8	12.253
5785	16.99	12.302
5825	17.22	12.360

802.11n_HT40_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	35.42	15.492
5795	35.3	15.478

802.11ac_VHT80_Ch0

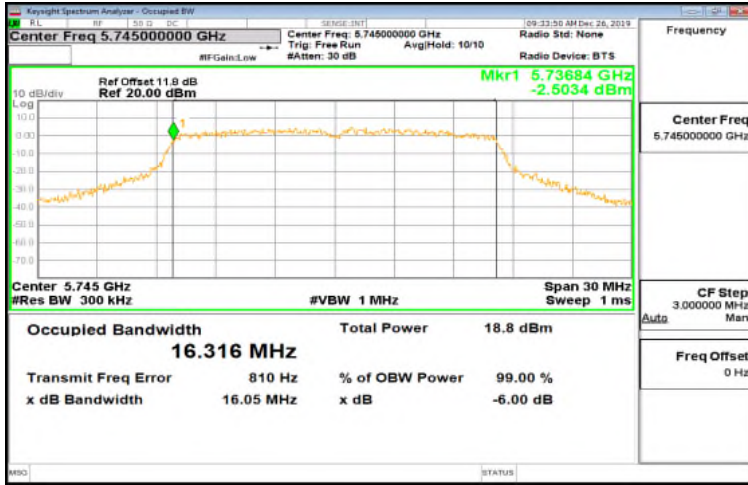
Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.38	18.773

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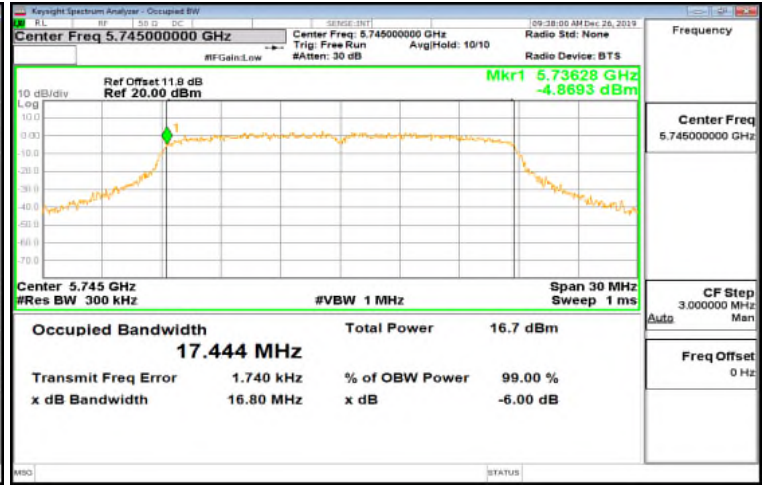
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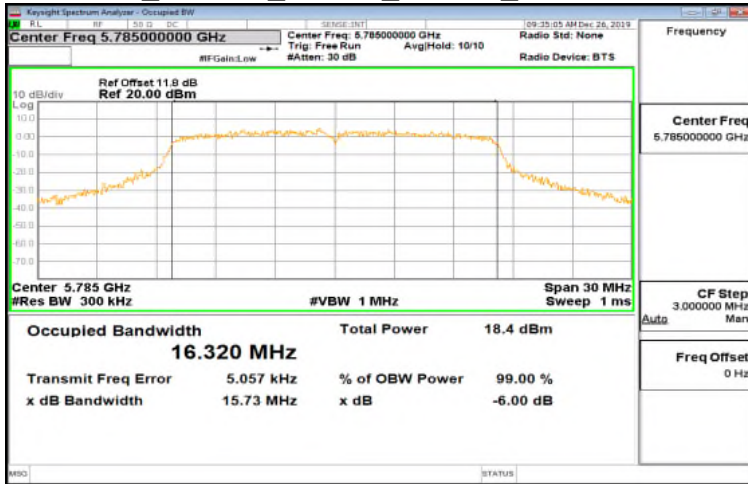
IC 802.11a 20MHz Chain0 5745MHz



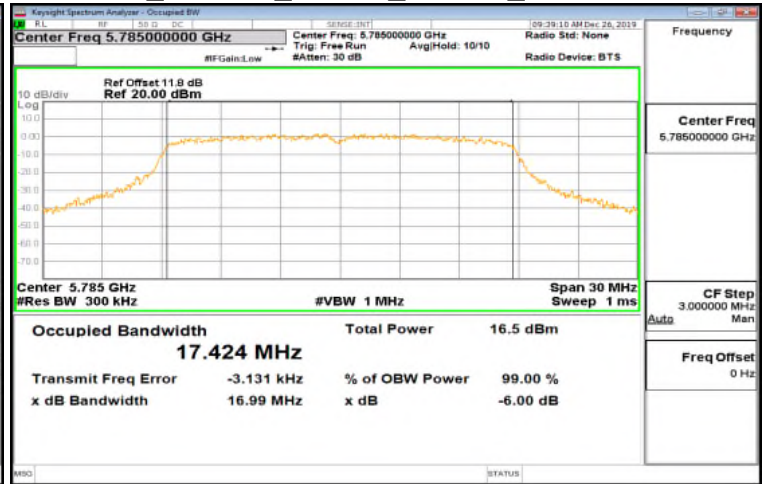
IC 802.11n 20MHz Chain0 5745MHz



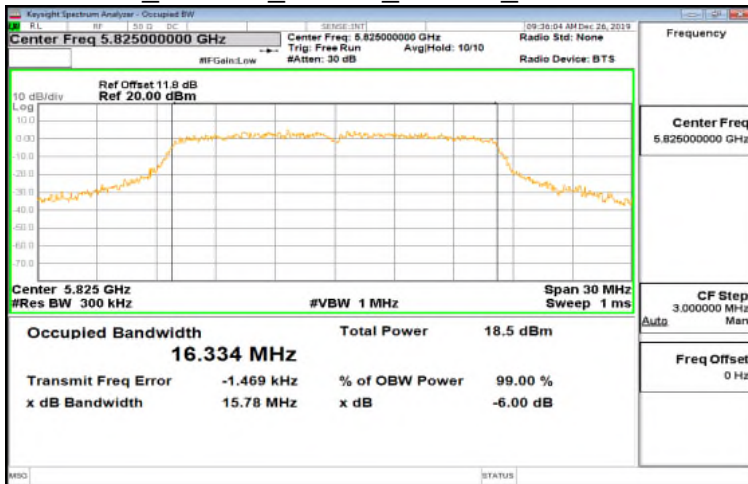
IC 802.11a 20MHz Chain0 5785MHz



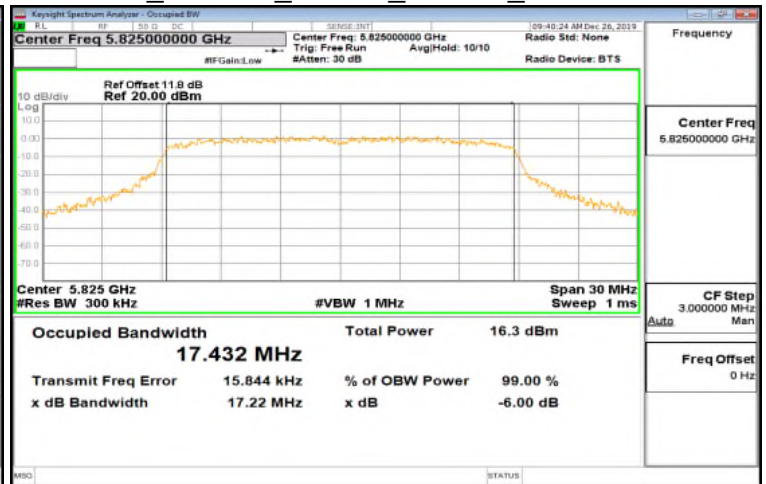
IC 802.11n 20MHz Chain0 5785MHz



IC 802.11a 20MHz Chain0 5825MHz



IC 802.11n 20MHz Chain0 5825MHz



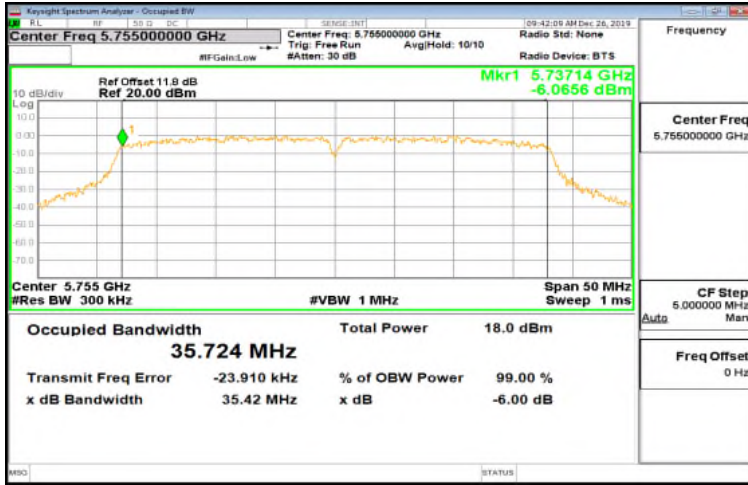
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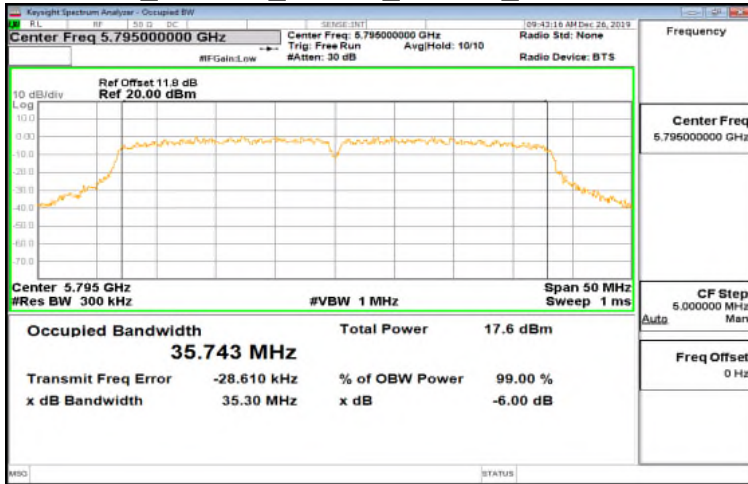
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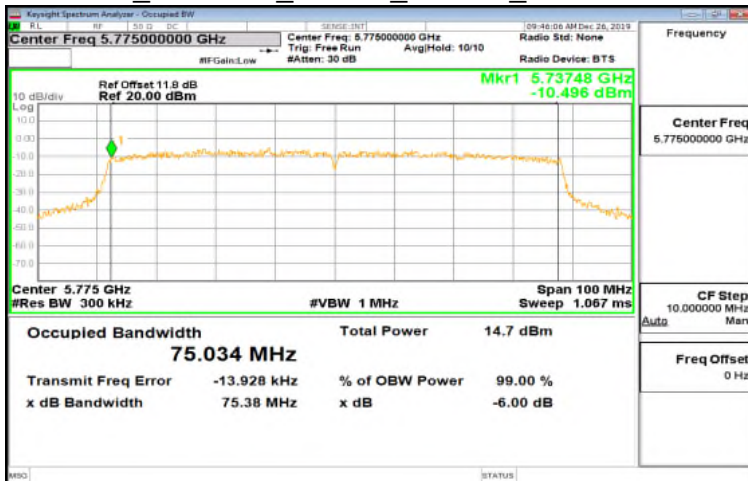
IC 802.11n_40MHz_Chain0_5755MHz



IC 802.11n_40MHz_Chain0_5795MHz



IC 802.11ac_80MHz_Chain0_5775MHz



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8.5.3 99% BW Verification for DFS Function

802.11a_Ch0			802.11n_HT20_Ch0		
Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)	Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5745	5736.87	> 5725	5745	5736.28	> 5725

802.11n_HT40_Ch0			802.11ac_VHT80_Ch0		
Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)	Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5755	5737.13	> 5725	5775	5737.49	> 5725

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9 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

FCC

OPERZTION Band	LIMIT
U-NII-3	1 Watt(30dBm)
If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum transmit power shall be reduced by the amount in dB that the direction-al gain of the antenna exceeds 6 dBi.	

ISED

OPERZTION FREQUENCY BAND	LIMIT
5725~5850 MHz	Conducted output power shall not exceed 1 W
For equipment operating in the band 5725-5850 MHz, If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum transmit power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	

The antenna gain is not granter than 6 dBi. Therefore, reduction of power is not required.

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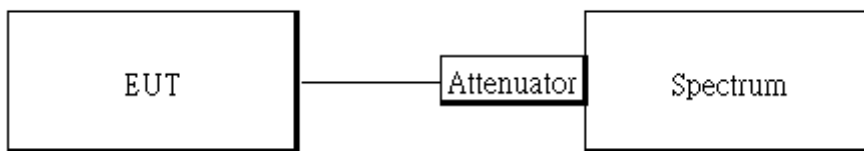
9.2 Measurement Procedure

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/duty cycle).
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

9.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Meter	Anritsu	ML2496A	1804001	02/13/2019	02/12/2020
Power Sensor	Anritsu	MA2411B	1726104	02/13/2019	02/12/2020
Power Sensor	Anritsu	MA2411B	1726107	02/13/2019	02/12/2020
DC Power Supply	Agilent	E3640A	MY52410006	12/10/2019	12/09/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020

9.4 Test Set-up



Note:

Cable Loss= 11.8 dB

9.5 Measurement Result

9.5.1 Conducted output power (FCC)

802.11a_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
149	5745	6	13.97	24.922	30	PASS
157	5785	6	13.90	24.524	30	PASS
165	5825	6	13.93	24.694	30	PASS

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802.11n_HT20_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
149	5745	MCS0	11.97	15.744	30	PASS
157	5785	MCS0	11.86	15.351	30	PASS
165	5825	MCS0	11.89	15.457	30	PASS

802.11n_HT40_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
151	5755	MCS0	11.85	15.298	30	PASS
159	5795	MCS0	11.94	15.618	30	PASS

802.11ac_VHT80_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
155	5775	MCS0	8.68	7.379	30	PASS

9.5.2 Conducted output power (ISED)
802.11a_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
149	5745	13.97	24.922	30	PASS
157	5785	13.90	24.524	30	PASS
165	5825	13.93	24.694	30	PASS

802.11n_HT20_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
149	5745	11.97	15.744	30	PASS
157	5785	11.86	15.351	30	PASS
165	5825	11.89	15.457	30	PASS

802.11n_HT40_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
151	5755	11.85	15.298	30	PASS
159	5795	11.94	15.618	30	PASS

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802.11ac_VHT80_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
155	5775	8.68	7.379	30	PASS

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10 MAXIMUM POWER SPECTRAL DENSITY

10.1 Standard Applicable

FCC

OPERZTION Band	LIMIT
U-NII-3	30dBm/ 500kHz
If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	

ISED

OPERZTION FREQUENCY BAND	LIMIT
5725~5850 MHz	30dBm / 500 kHz
For equipment operating in the band 5725-5850 MHz, If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	

The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

10.2 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 Spectrum. Set RBW=500 kHz, VBW \geq 3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
4. Use the cursor on spectrum to peak search the highest level of trace
5. Record the max. reading and add 10 log(1/duty cycle).
6. Repeat above procedures until all default test channel (low, middle, and high) was complete.

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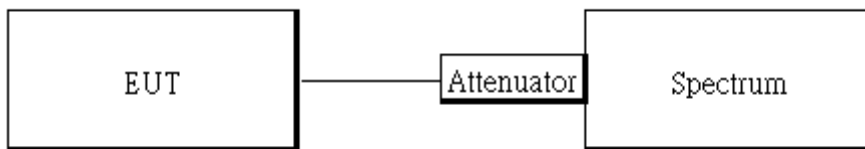
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10.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equip-ment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
DC Power Supply	Agilent	E3640A	MY52410006	12/10/2019	12/09/2020
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2019	05/16/2020
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	02/13/2019	02/12/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2019	01/01/2020

10.4 Test Set-up



Note:

Cable Loss= 11.8 dB

10.5 Measurement Result

10.5.1 Power spectral density

POWER DENSITY 802.11a MODE					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5745.00	-0.04	0.22	0.18	30.00	-29.82
5785.00	0.08	0.22	0.30	30.00	-29.70
5825.00	-0.38	0.22	-0.16	30.00	-30.16
POWER DENSITY 802.11n HT20 MODE					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5745	-1.87	0.35	-1.52	30	-31.52
5785	-1.94	0.35	-1.59	30	-31.59
5825	-2.57	0.35	-2.22	30	-32.22

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POWER DENSITY 802.11n HT40 MODE					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5755	-5.33	0.43	-4.90	30	-34.90
5795	-5.04	0.43	-4.61	30	-34.61
POWER DENSITY 802.11ac VHT80 MODE					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5775	-11.83	0.82	-11.01	30	-41.01

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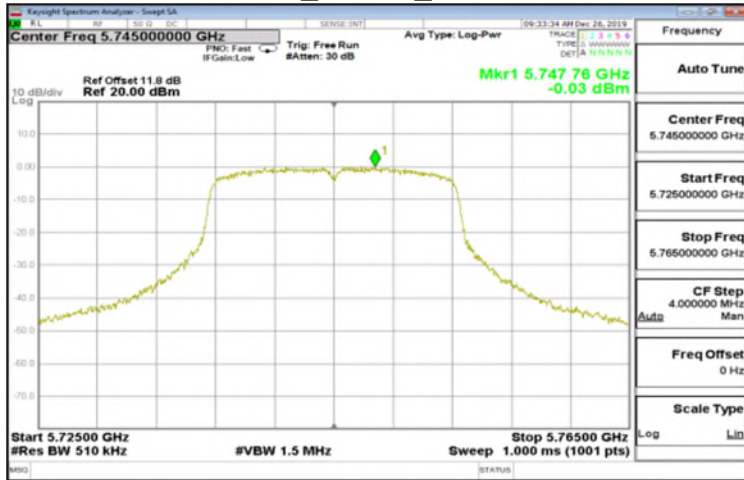
t (886-2) 2299-3279

f (886-2) 2298-0488

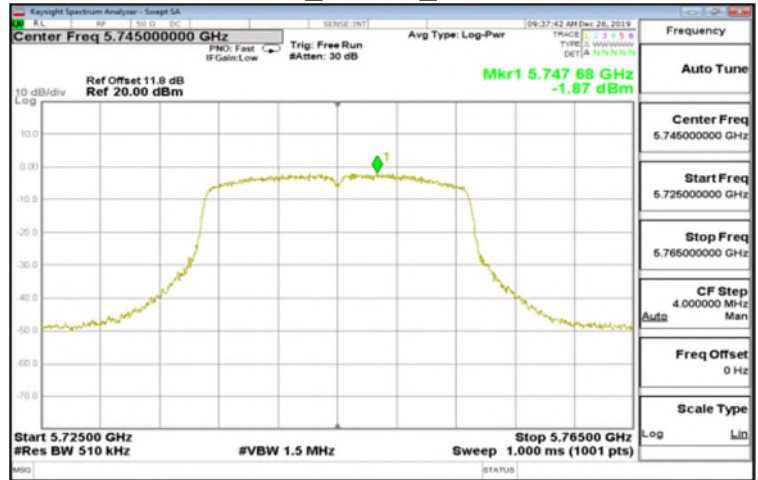
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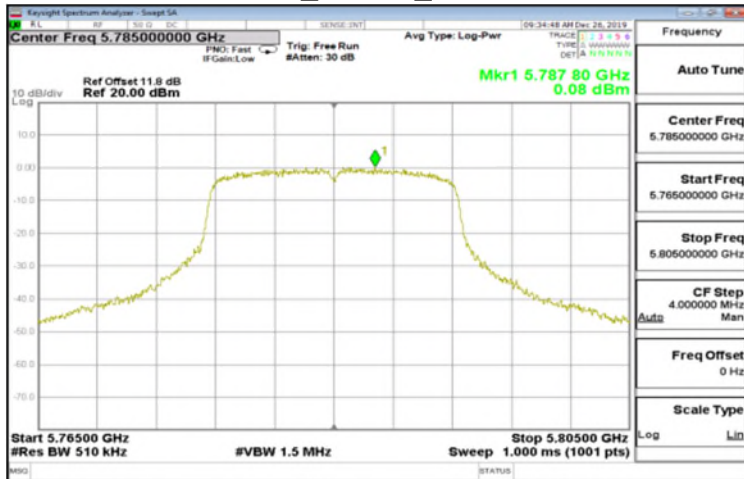
802.11a 20MHz_5745MHz



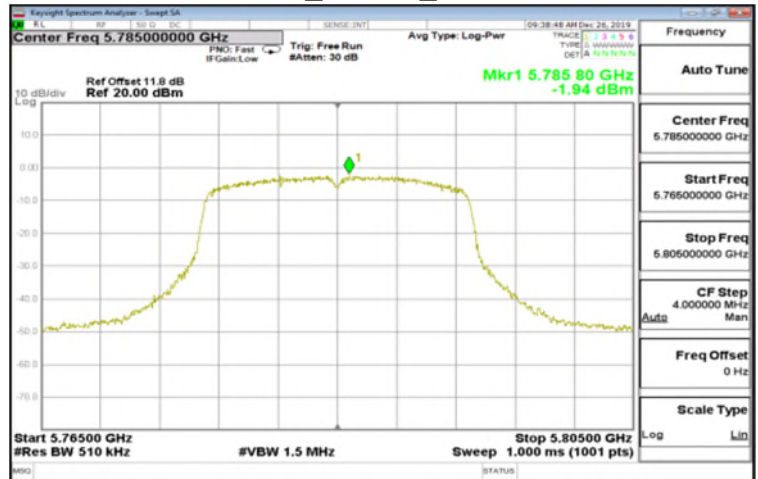
802.11n 20MHz_5745MHz



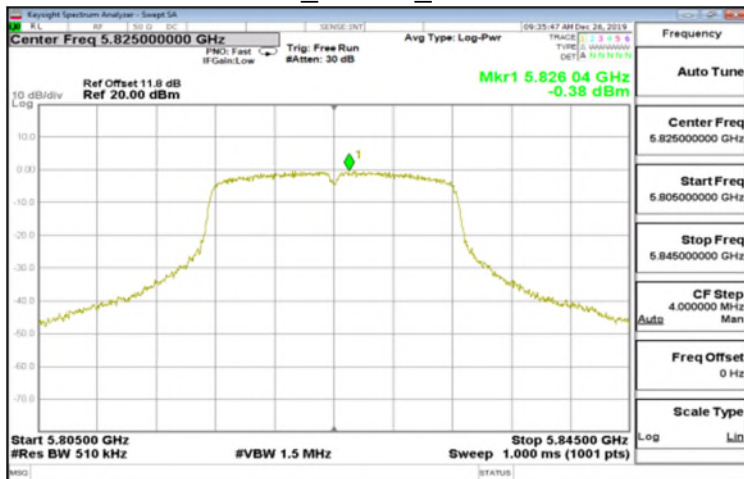
802.11a 20MHz_5785MHz



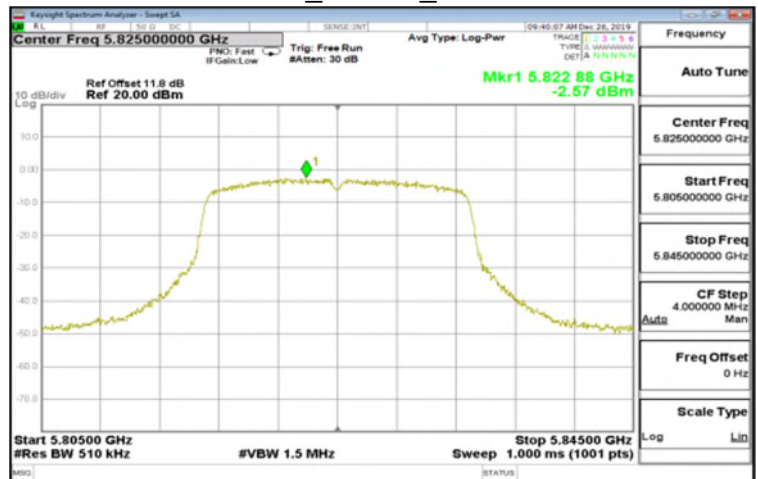
802.11n 20MHz_5785MHz



802.11a 20MHz_5825MHz



802.11n 20MHz_5825MHz



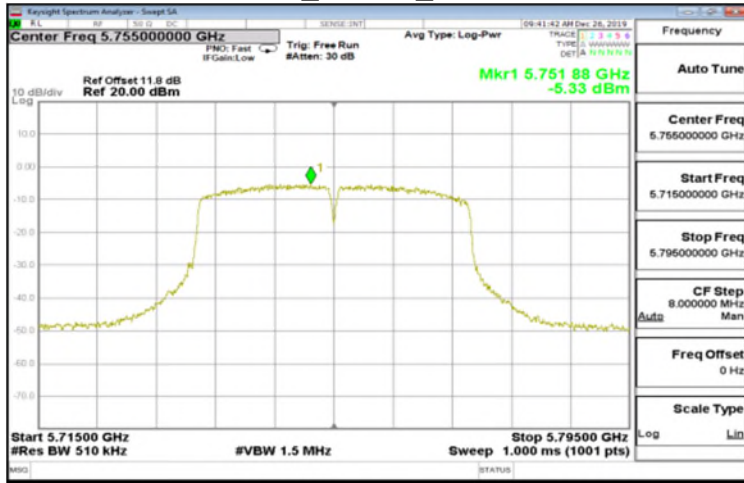
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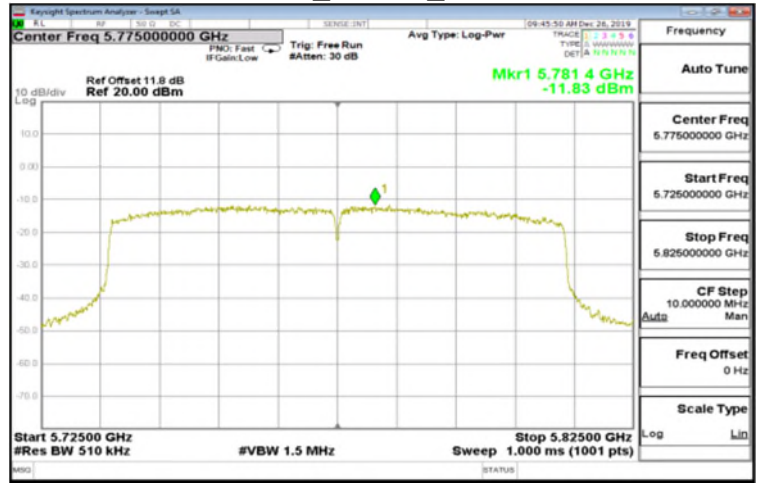
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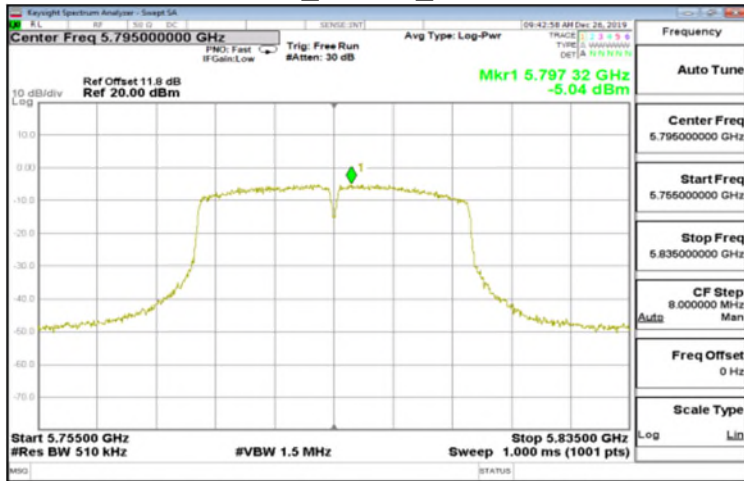
802.11n_40MHz_5755MHz



802.11ac_80MHz_5775MHz



802.11n_40MHz_5795MHz



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11 UNDESIRABLE RADIATED EMISSION MEASUREMENT

11.1 Standard Applicable

11.1.1 Band Edge

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

- 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	EIRP LIMIT	FIELD STRENGTH AT 3m
15.407(b)(4)(i) RSS-247 §6.2.4.2	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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11.1.2 Spurious Emission

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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11.2 Measurement Equipment Used

SGS SAC-III					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Horn Antenna	Schwarzbeck	BBHA9170	184	12/25/2019	12/24/2020
Horn Antenna	Schwarzbeck	BBHA9120D	D803	12/20/2019	12/19/2020
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	01/10/2019	01/09/2020
Loop Antenna	ETS.LINDGREN	6502	148045	10/15/2019	10/14/2020
DC Power Supply	Agilent	E3640A	MY52410006	12/10/2019	12/09/2020
EMI Test Receiver	R&S	ESCI 7	1166.5950.07	07/04/2019	07/03/2020
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/15/2019	07/14/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	01/02/2019	01/01/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	01/02/2020	01/01/2021
Pre-Amplifier	EMC Instruments	EMC051825	980152	01/02/2019	01/01/2020
Pre-Amplifier	EMC Instruments	EMC051825	980152	01/02/2020	01/01/2021
Pre-Amplifier	HP	8447D	2944A09469	01/02/2019	01/01/2020
Pre-Amplifier	HP	8447D	2944A09469	01/02/2020	01/01/2021
Attenuator	Mini-Circuit	BW-S10W2+	4	01/02/2019	01/01/2020
Attenuator	Mini-Circuit	BW-S10W2+	4	01/02/2020	01/01/2021
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	01/02/2019	01/01/2020
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	01/02/2020	01/01/2021
High Pass Filter	WI	WHKX4.0/18G-10SS	22	01/02/2019	01/01/2020
High Pass Filter	WI	WHKX4.0/18G-10SS	22	01/02/2020	01/01/2021
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	01/02/2019	01/01/2020
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	01/02/2020	01/01/2021
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	01/02/2019	01/01/2020
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	01/02/2020	01/01/2021
Coaxial Cable	Huber Suhner	EMC 104-SM-SM-2000	160123	01/02/2019	01/01/2020
Coaxial Cable	Huber Suhner	EMC 104-SM-SM-2000	160123	01/02/2020	01/01/2021

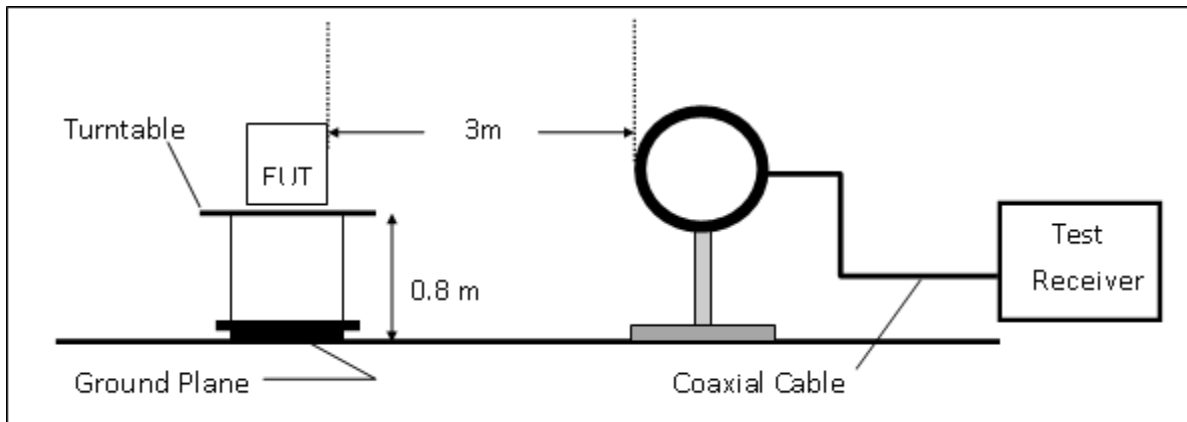
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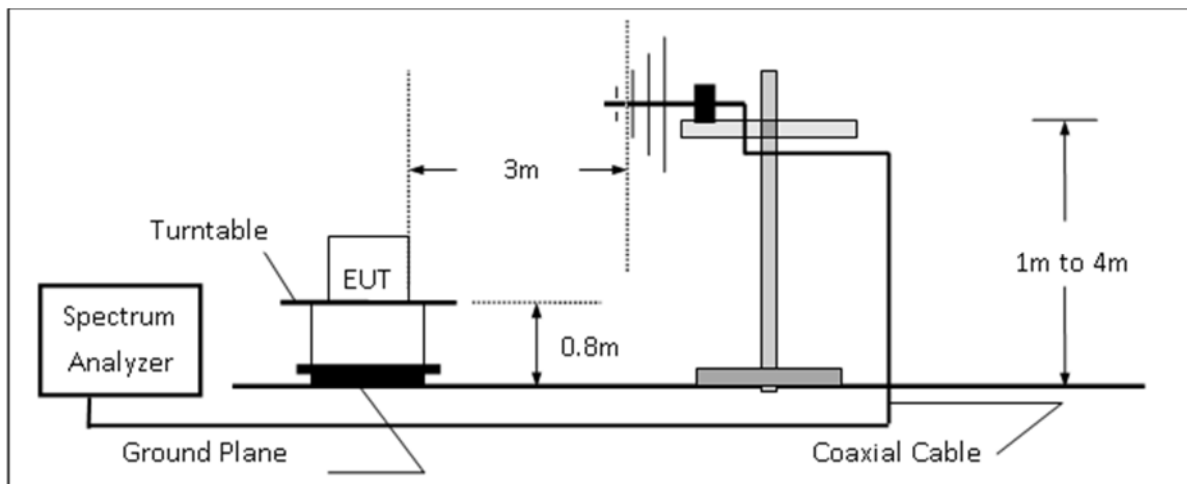
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11.3 Test SET-UP

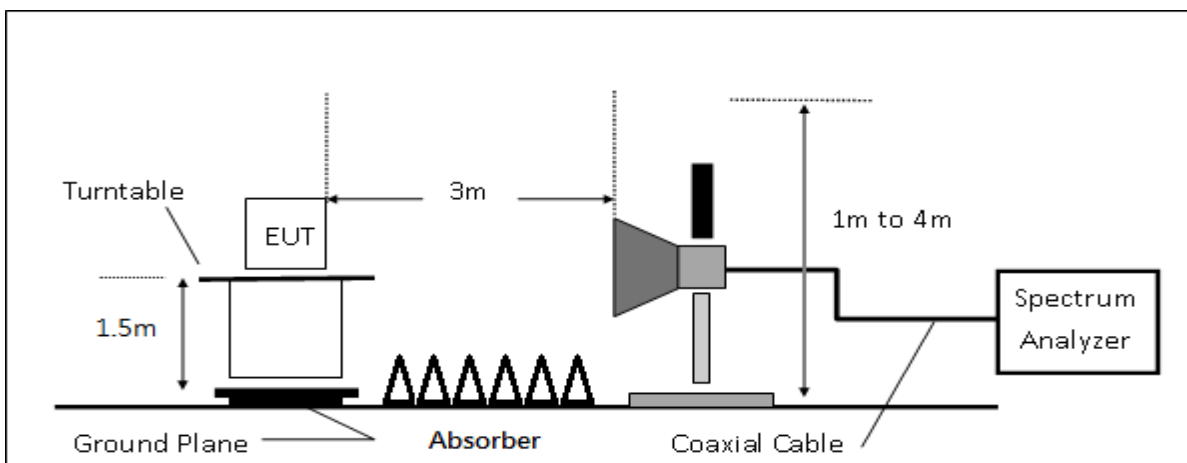
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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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11.4 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 .
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.

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11.5 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

The limit of the emission level is expressed in dBuV/m, which converts $20 \cdot \log(uV/m)$

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

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

11.6 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) & RSS-GEN §6.13.2 was not reported.

Pre-scanned was done at frequency 5.47 GHz and 5.85 GHz for bandedge measurement of straddle channels 138, 142 and 144 which was 20dB lower than the limit per 15.31(o) & RSS-GEN §6.13.2 was not reported.

11.7 Radiated Spurious Emission Measurement Result

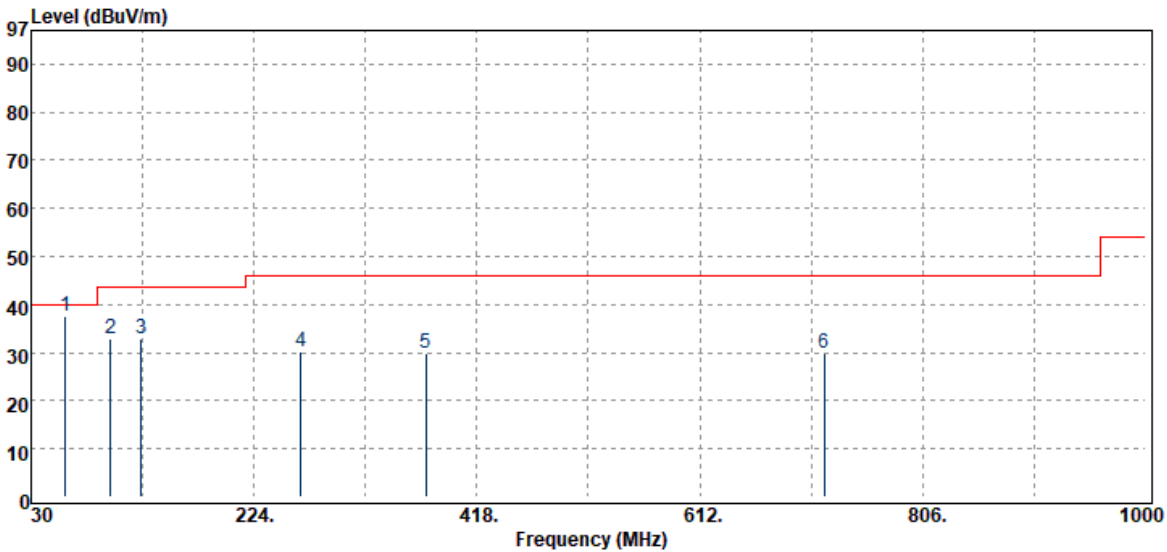
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11.7.1 Below 1GHz Worst-Case Data:

Report Number	:ER/2019/C0116	Test Date	:2020-01-03
Operation Mode	:802.11aB4	Temp./Humi.	:21.8/61
Test Channel	:5785 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Tx CH Mid	Engineer	:Thomas
EUT Pol	:E1 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
60.07	Peak	55.07	-17.33	37.74	40.00	-2.26
98.87	Peak	45.51	-12.60	32.91	43.50	-10.59
126.03	Peak	44.02	-11.20	32.82	43.50	-10.68
264.74	Peak	38.60	-8.47	30.13	46.00	-15.87
373.38	Peak	36.69	-6.97	29.72	46.00	-16.28
720.64	Peak	32.37	-2.43	29.94	46.00	-16.06

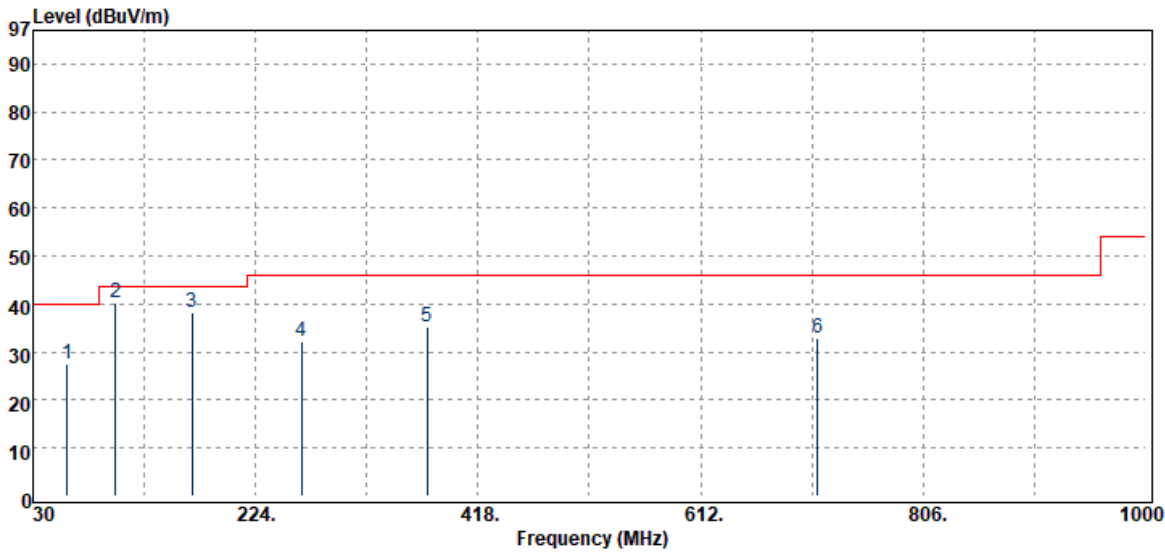
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Report Number :ER/2019/C0116
Operation Mode :802.11aB4
Test Channel :5785 MHz
Test Mode :Tx CH Mid
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
60.07	Peak	44.86	-17.33	27.53	40.00	-12.47
101.78	Peak	52.58	-12.25	40.33	43.50	-3.17
168.71	Peak	51.17	-12.94	38.23	43.50	-5.27
263.77	Peak	40.65	-8.43	32.22	46.00	-13.78
373.38	Peak	42.13	-6.97	35.16	46.00	-10.84
713.85	Peak	35.54	-2.70	32.84	46.00	-13.16

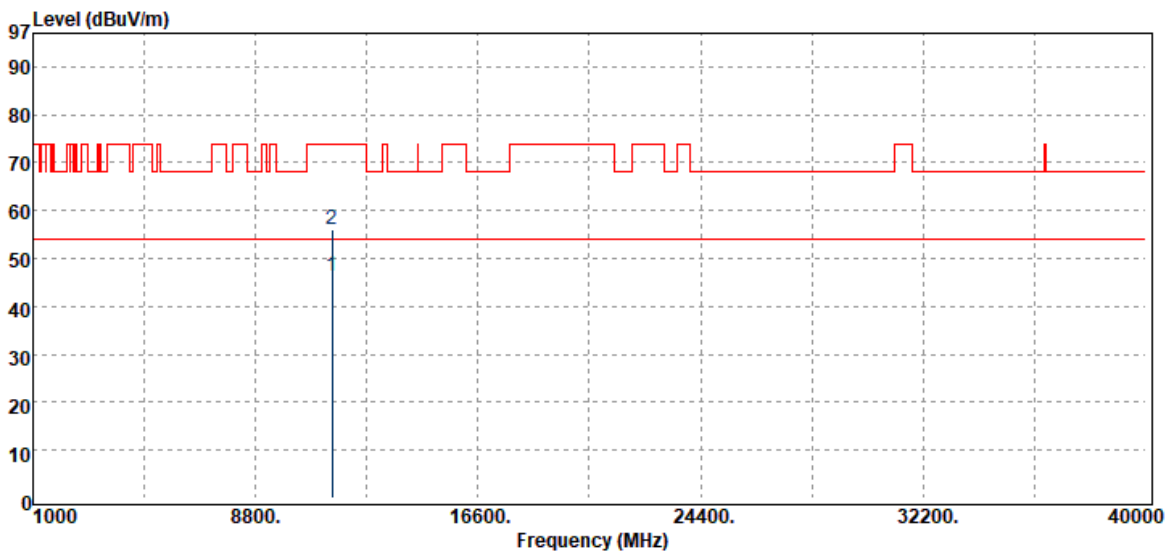
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11.7.2 Above 1GHz Worst-Case Data:

Report Number	:ER/2019/C0116	Test Date	:2020-01-03
Operation Mode	:802.11aB4	Temp./Humi.	:21.8/61
Test Channel	:5745 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH Low	Engineer	:Thomas
EUT Pol	:E1 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11490.00	Average	20.15	26.25	46.40	54.00	-7.60
11490.00	Peak	29.95	26.25	56.20	74.00	-17.80

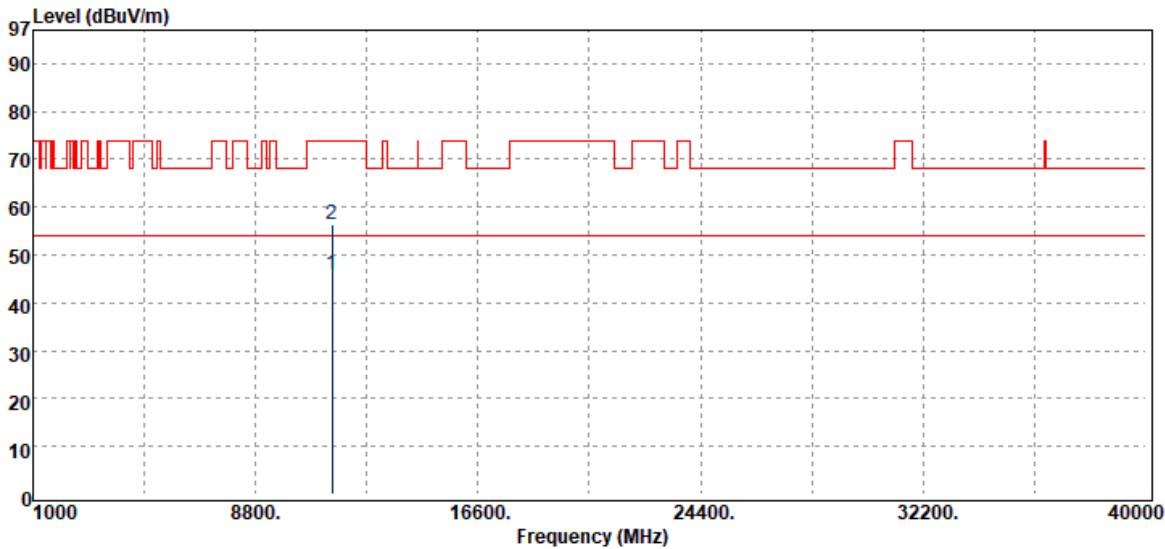
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Report Number :ER/2019/C0116
Operation Mode :802.11aB4
Test Channel :5745 MHz
Test Mode :TX CH Low
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11490.00	Average	19.71	26.25	45.96	54.00	-8.04
11490.00	Peak	30.23	26.25	56.48	74.00	-17.52

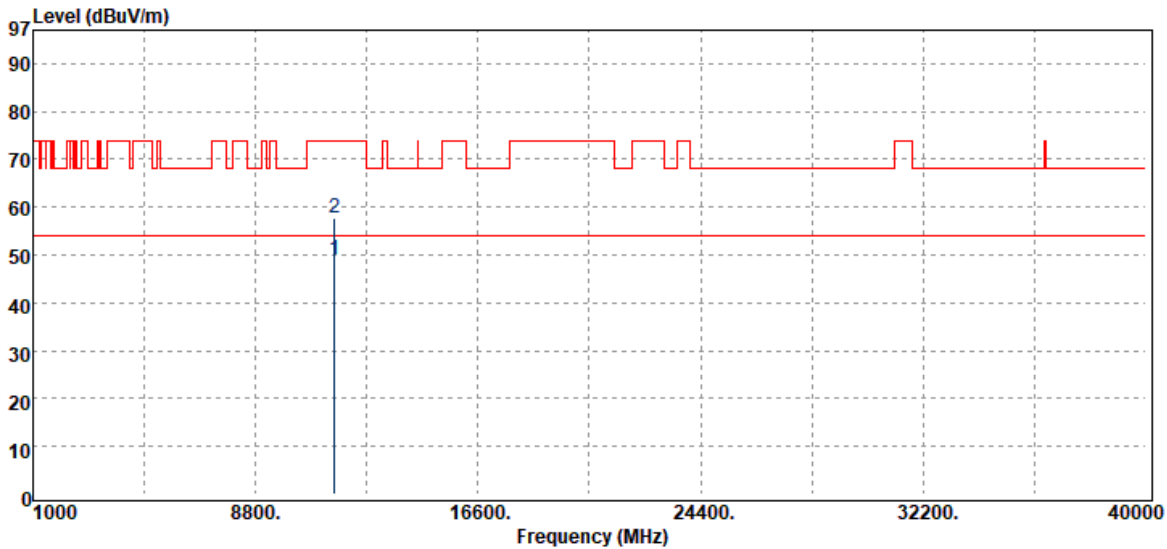
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Report Number :ER/2019/C0116
Operation Mode :802.11aB4
Test Channel :5785 MHz
Test Mode :TX CH Mid
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11570.00	Average	20.22	28.73	48.95	54.00	-5.05
11570.00	Peak	29.12	28.73	57.85	74.00	-16.15

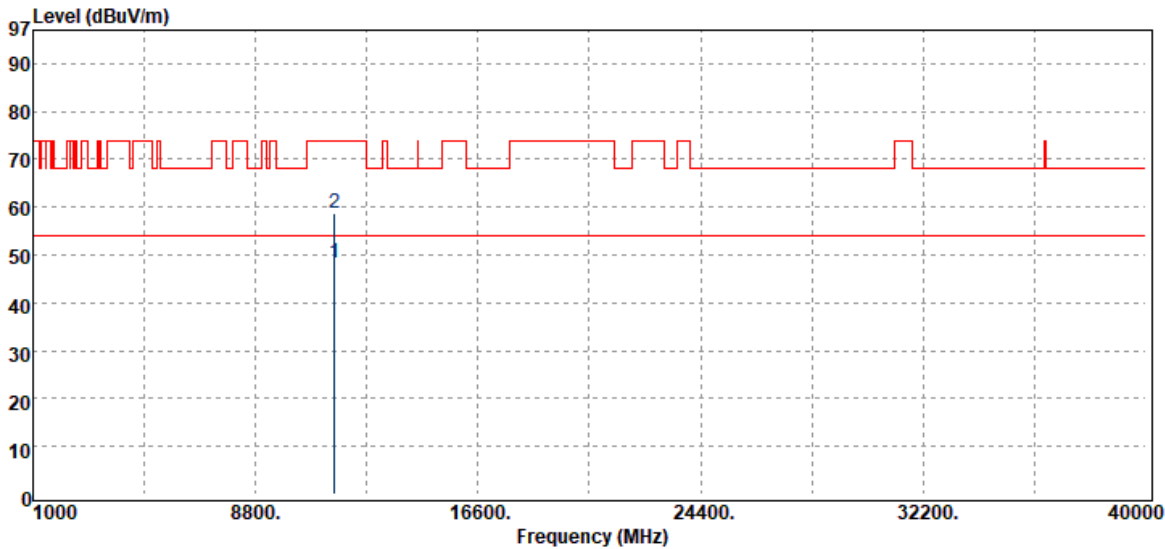
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Report Number :ER/2019/C0116
Operation Mode :802.11aB4
Test Channel :5785 MHz
Test Mode :TX CH Mid
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11570.00	Average	19.50	28.73	48.23	54.00	-5.77
11570.00	Peak	29.92	28.73	58.65	74.00	-15.35

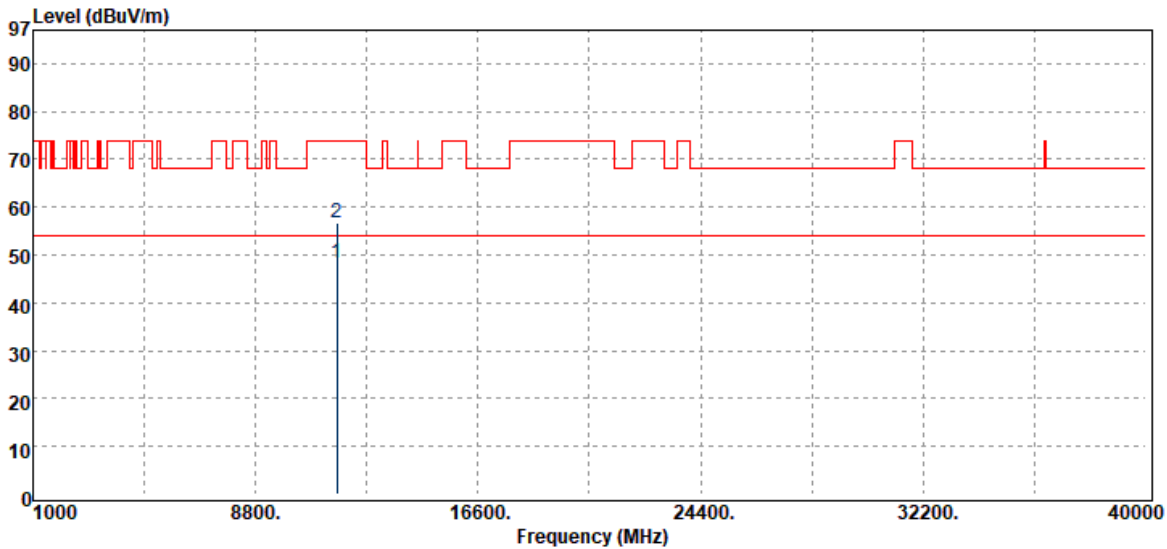
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Report Number :ER/2019/C0116
Operation Mode :802.11aB4
Test Channel :5825 MHz
Test Mode :TX CH High
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11650.00	Average	20.19	28.03	48.22	54.00	-5.78
11650.00	Peak	28.66	28.03	56.69	74.00	-17.31

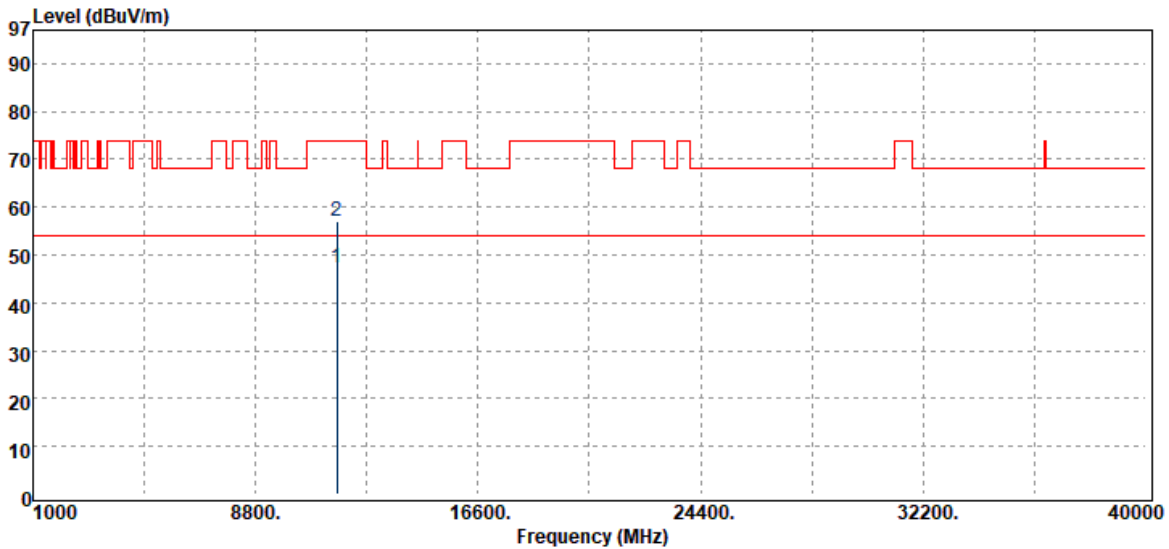
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Report Number :ER/2019/C0116
Operation Mode :802.11aB4
Test Channel :5825 MHz
Test Mode :TX CH High
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11650.00	Average	19.41	28.03	47.44	54.00	-6.56
11650.00	Peak	29.12	28.03	57.15	74.00	-16.85

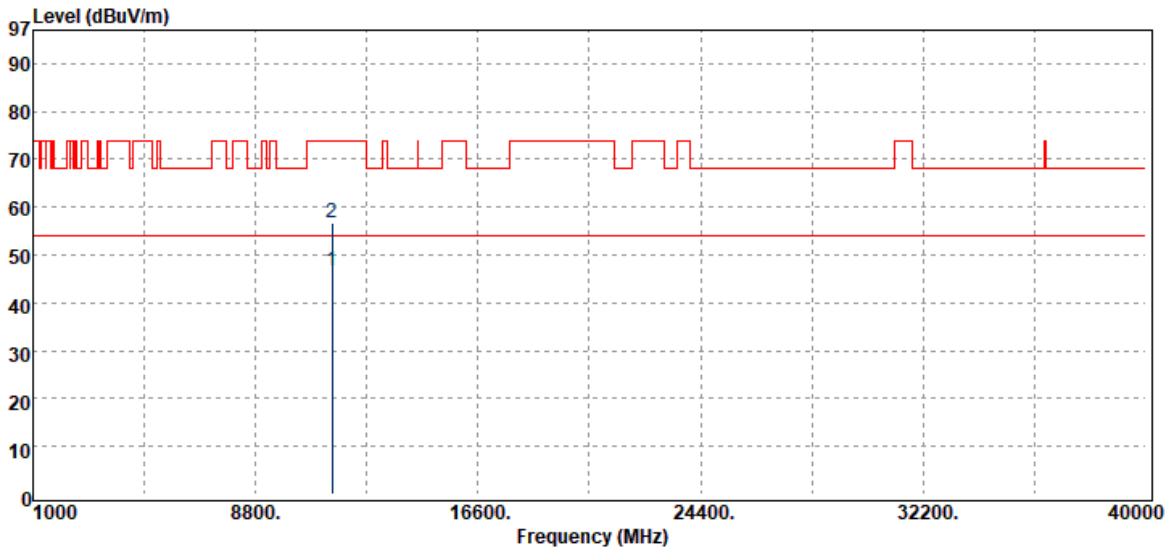
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Report Number :ER/2019/C0116
Operation Mode :802.11n20B4
Test Channel :5745 MHz
Test Mode :TX CH Low
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11490.00	Average	20.41	26.25	46.66	54.00	-7.34
11490.00	Peak	30.37	26.25	56.62	74.00	-17.38

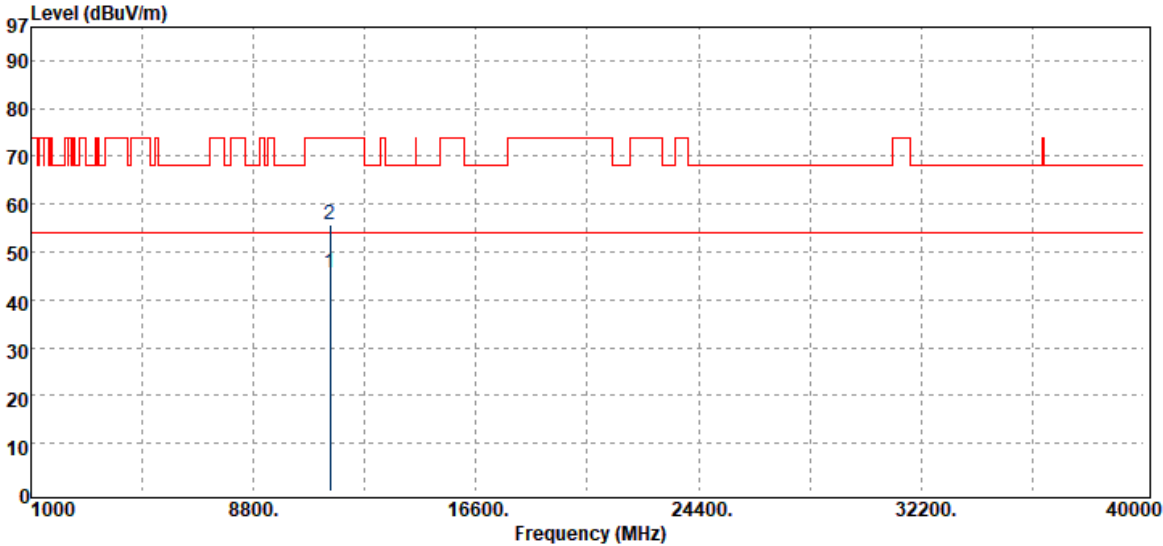
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Report Number :ER/2019/C0116
Operation Mode :802.11n20B4
Test Channel :5745 MHz
Test Mode :TX CH Low
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11490.00	Average	19.46	26.25	45.71	54.00	-8.29
11490.00	Peak	29.36	26.25	55.61	74.00	-18.39

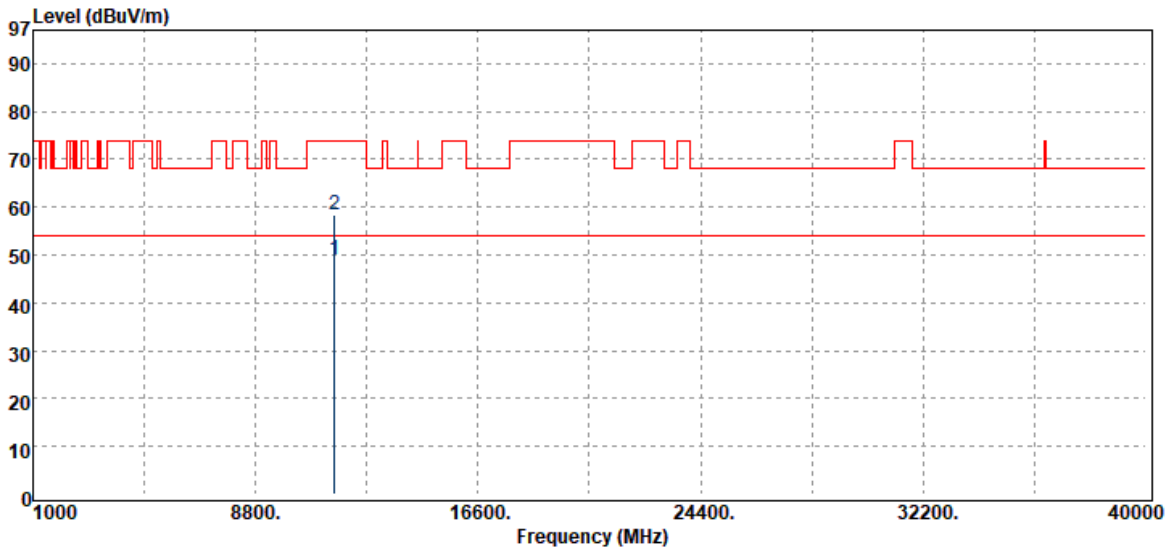
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Report Number :ER/2019/C0116
Operation Mode :802.11n20B4
Test Channel :5785 MHz
Test Mode :TX CH Mid
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11570.00	Average	20.27	28.73	49.00	54.00	-5.00
11570.00	Peak	29.80	28.73	58.53	74.00	-15.47

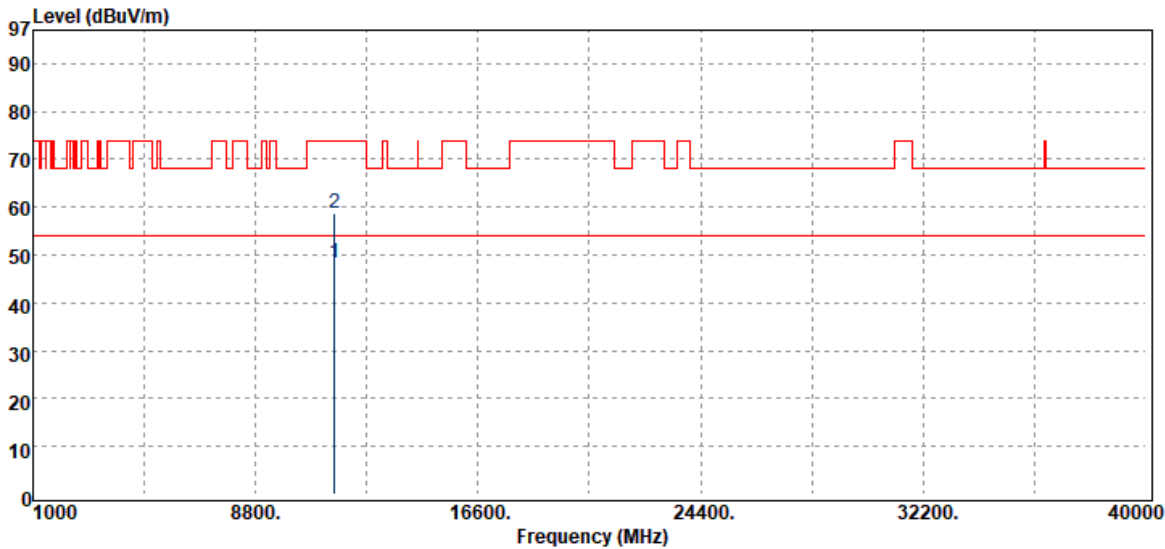
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Report Number :ER/2019/C0116
Operation Mode :802.11n20B4
Test Channel :5785 MHz
Test Mode :TX CH Mid
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11570.00	Average	19.60	28.73	48.33	54.00	-5.67
11570.00	Peak	30.14	28.73	58.87	74.00	-15.13

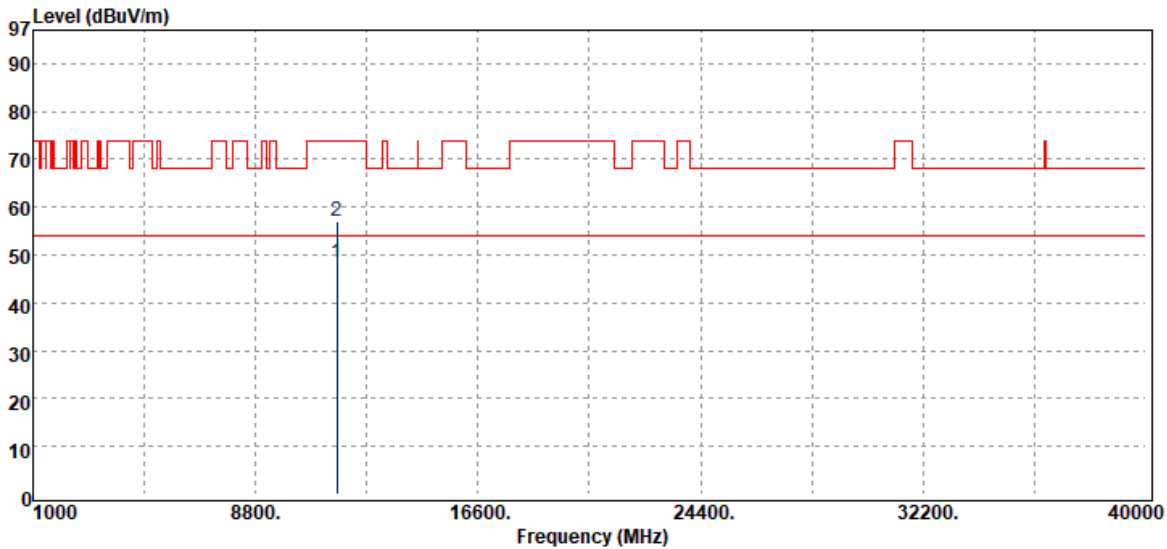
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Report Number :ER/2019/C0116
Operation Mode :802.11n20B4
Test Channel :5825 MHz
Test Mode :TX CH High
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11650.00	Average	20.28	28.03	48.31	54.00	-5.69
11650.00	Peak	29.02	28.03	57.05	74.00	-16.95

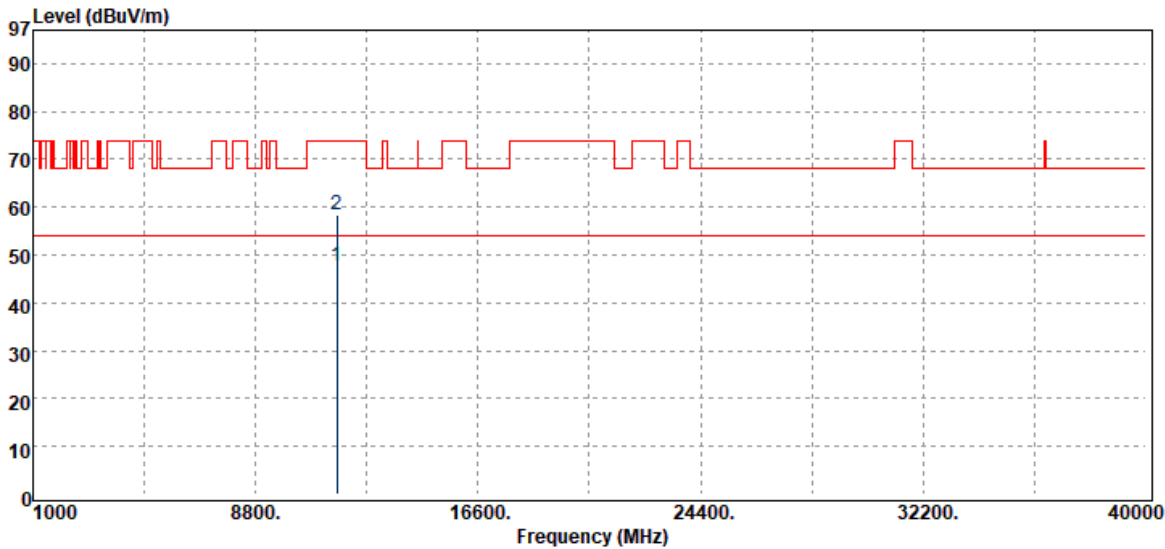
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Report Number :ER/2019/C0116
Operation Mode :802.11n20B4
Test Channel :5825 MHz
Test Mode :TX CH High
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11650.00	Average	19.55	28.03	47.58	54.00	-6.42
11650.00	Peak	30.54	28.03	58.57	74.00	-15.43

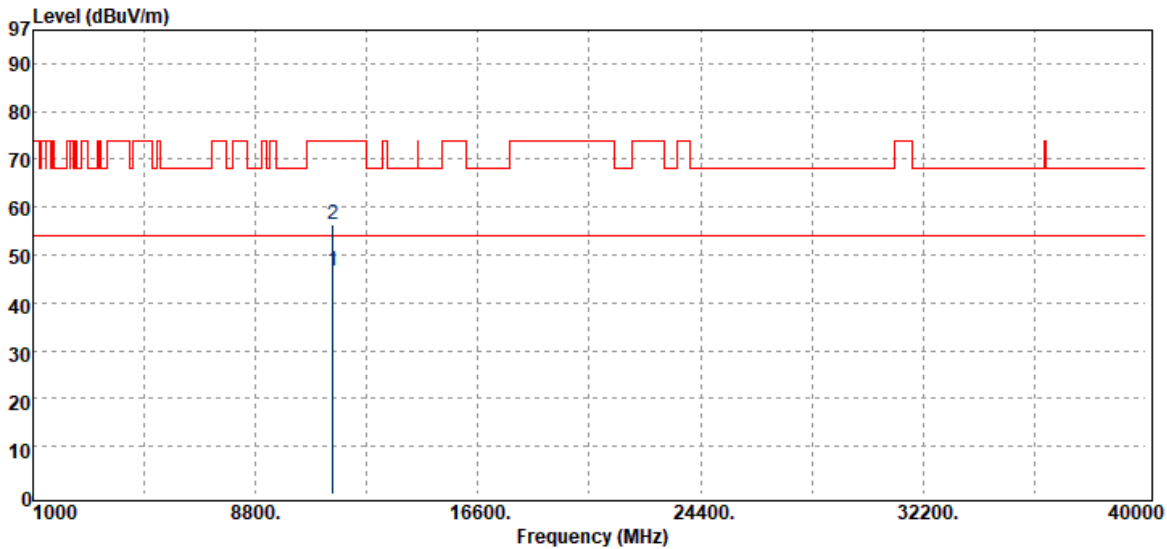
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Report Number :ER/2019/C0116
Operation Mode :802.11n40B4
Test Channel :5755 MHz
Test Mode :TX CH Low
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11510.00	Average	20.31	26.47	46.78	54.00	-7.22
11510.00	Peak	30.08	26.47	56.55	74.00	-17.45

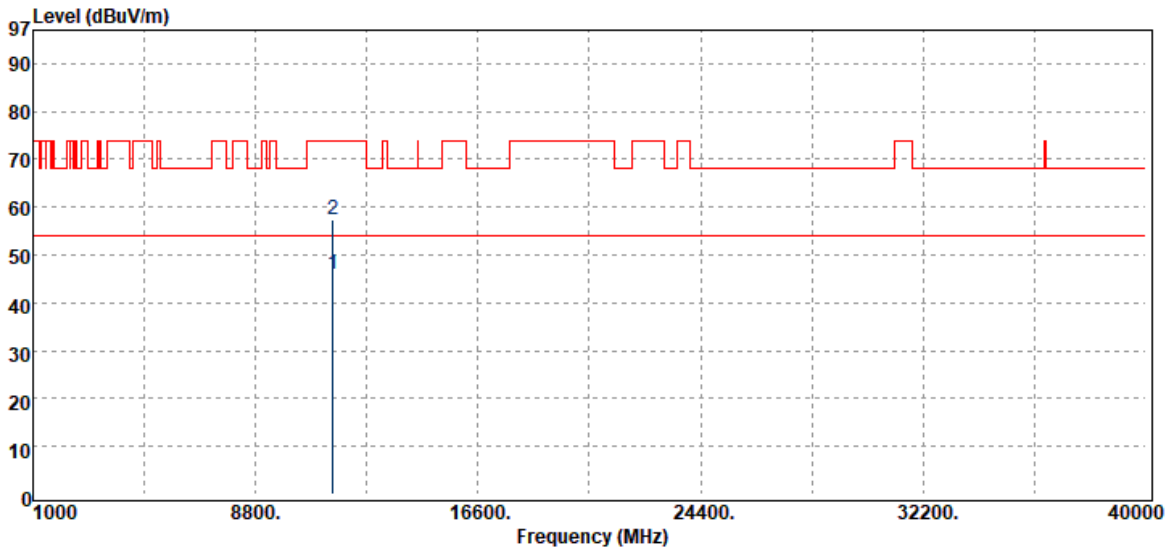
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Report Number :ER/2019/C0116
Operation Mode :802.11n40B4
Test Channel :5755 MHz
Test Mode :TX CH Low
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11510.00	Average	19.64	26.47	46.11	54.00	-7.89
11510.00	Peak	30.85	26.47	57.32	74.00	-16.68

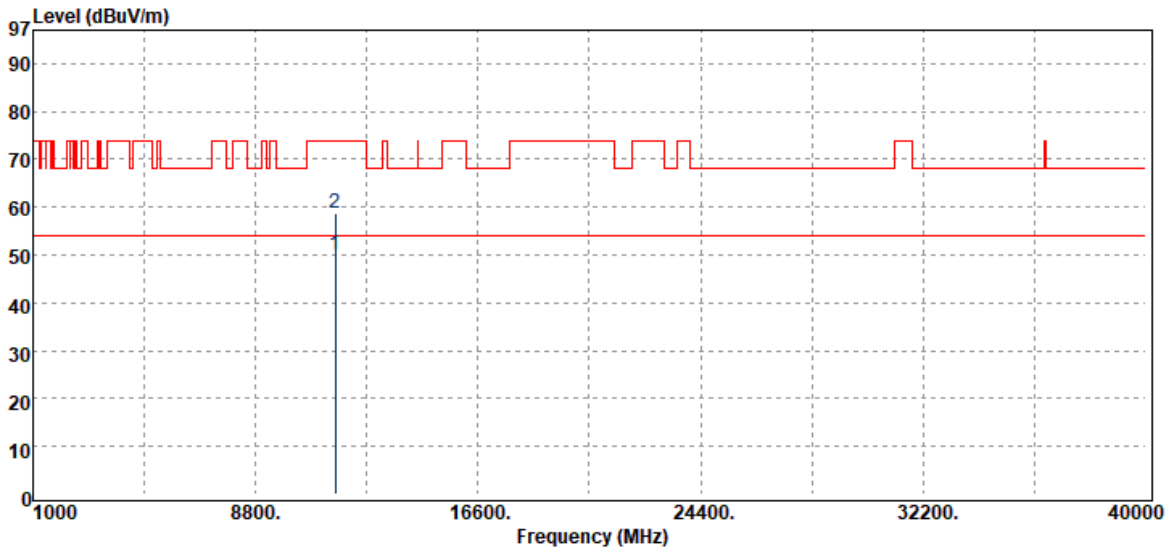
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Report Number :ER/2019/C0116
 Operation Mode :802.11n40B4
 Test Channel :5795 MHz
 Test Mode :TX CH High
 EUT Pol :E1 Plane

Test Date :2020-01-03
 Temp./Humi. :21.8/61
 Antenna Pol. :VERTICAL
 Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11590.00	Average	20.40	29.55	49.95	54.00	-4.05
11590.00	Peak	29.31	29.55	58.86	74.00	-15.14

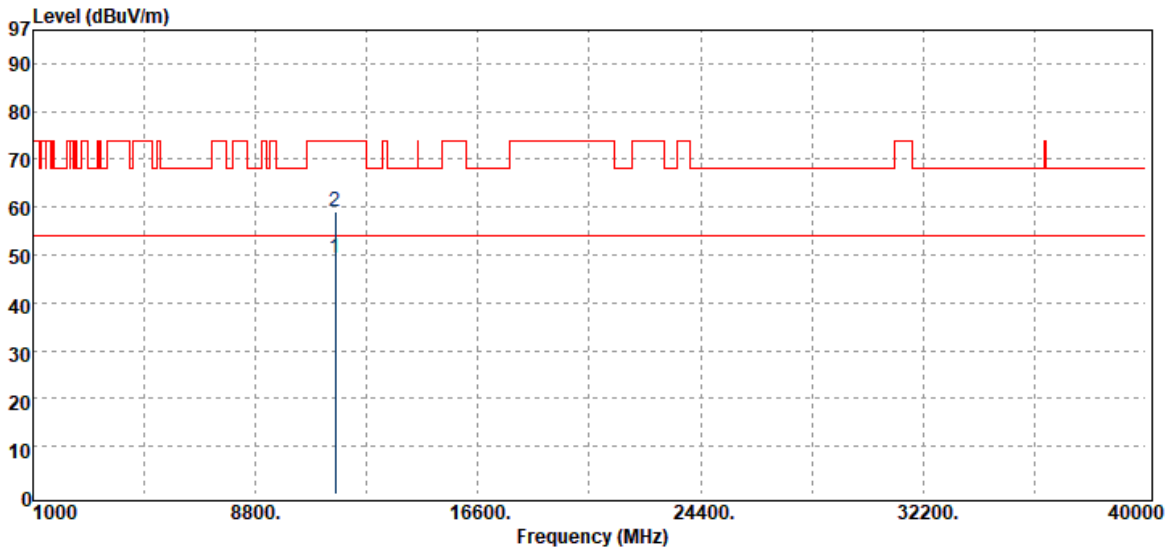
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Report Number :ER/2019/C0116
Operation Mode :802.11n40B4
Test Channel :5795 MHz
Test Mode :TX CH High
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11590.00	Average	19.67	29.55	49.22	54.00	-4.78
11590.00	Peak	29.61	29.55	59.16	74.00	-14.84

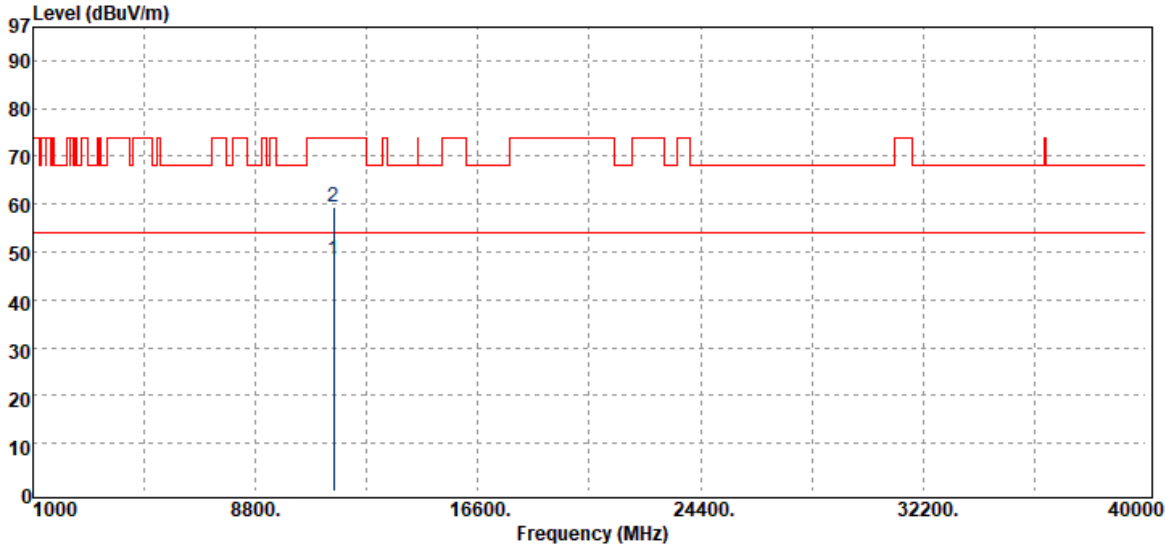
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Report Number :ER/2019/C0116
Operation Mode :802.11ac80B4
Test Channel :5775 MHz
Test Mode :TX CH High
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11550.00	Average	20.53	27.91	48.44	54.00	-5.56
11550.00	Peak	31.59	27.91	59.50	74.00	-14.50

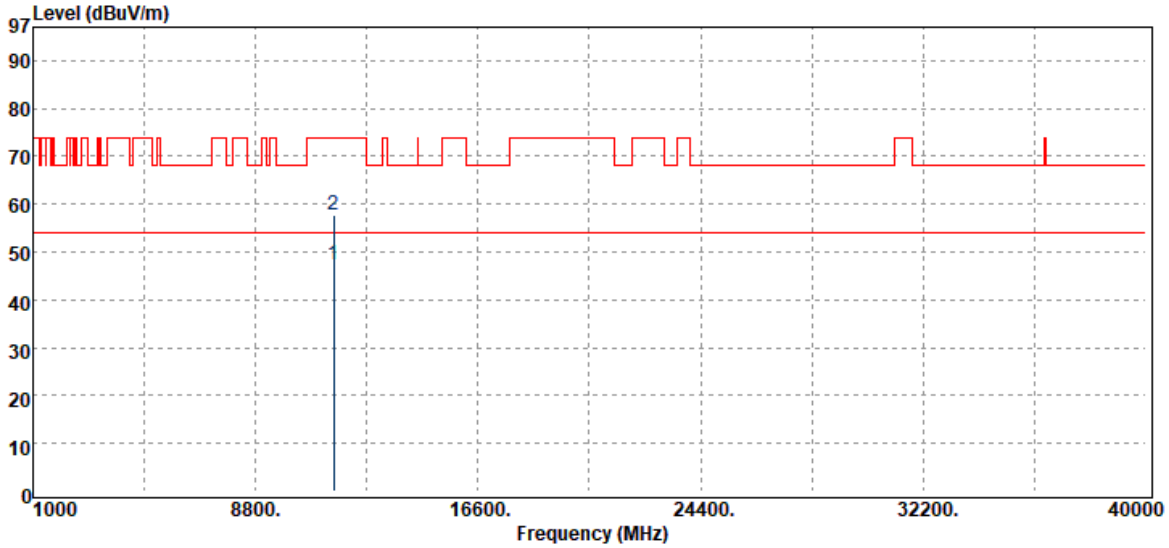
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Report Number :ER/2019/C0116
Operation Mode :802.11ac80B4
Test Channel :5775 MHz
Test Mode :TX CH High
EUT Pol :E1 Plane

Test Date :2020-01-03
Temp./Humi. :21.8/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
11550.00	Average	19.41	27.91	47.32	54.00	-6.68
11550.00	Peak	29.69	27.91	57.60	74.00	-16.40

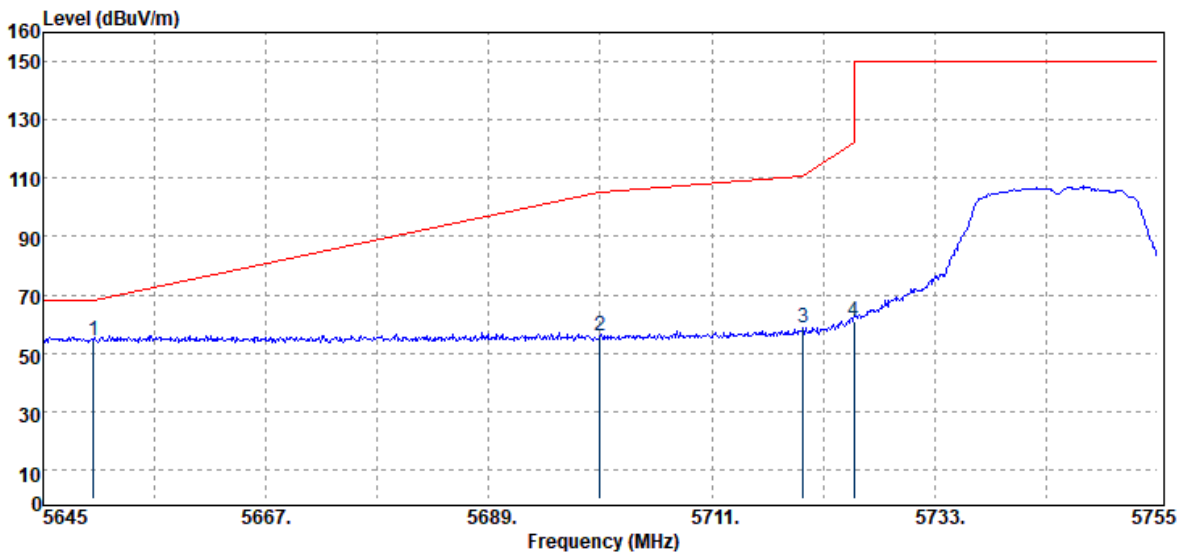
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11.7.3 Band edge falling to restricted band

Report Number	:ER/2019/C0116	Test Date	:2020-01-01
Operation Mode	:802.11aB4	Temp./Humi.	:22.5/61
Test Channel	:5745 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH Low	Engineer	:Thomas
EUT Pol	:E1 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5650.00	Peak	39.15	15.24	54.39	68.20	-13.81
5700.00	Peak	40.55	15.17	55.72	105.20	-49.48
5720.00	Peak	43.08	15.37	58.45	110.80	-52.35
5725.00	Peak	45.66	15.42	61.08	122.20	-61.12

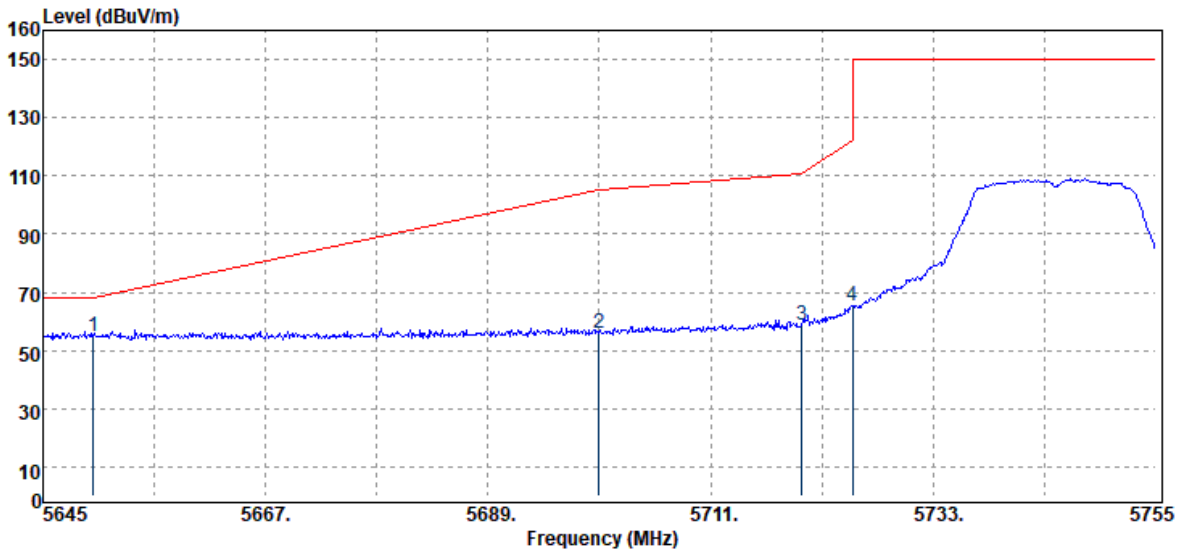
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Report Number :ER/2019/C0116
Operation Mode :802.11aB4
Test Channel :5745 MHz
Test Mode :Bandedge CH Low
EUT Pol :E1 Plane

Test Date :2020-01-01
Temp./Humi. :22.5/61
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5650.00	Peak	39.73	15.24	54.97	68.20	-13.23
5700.00	Peak	40.78	15.17	55.95	105.20	-49.25
5720.00	Peak	43.58	15.37	58.95	110.80	-51.85
5725.00	Peak	50.03	15.42	65.45	122.20	-56.75

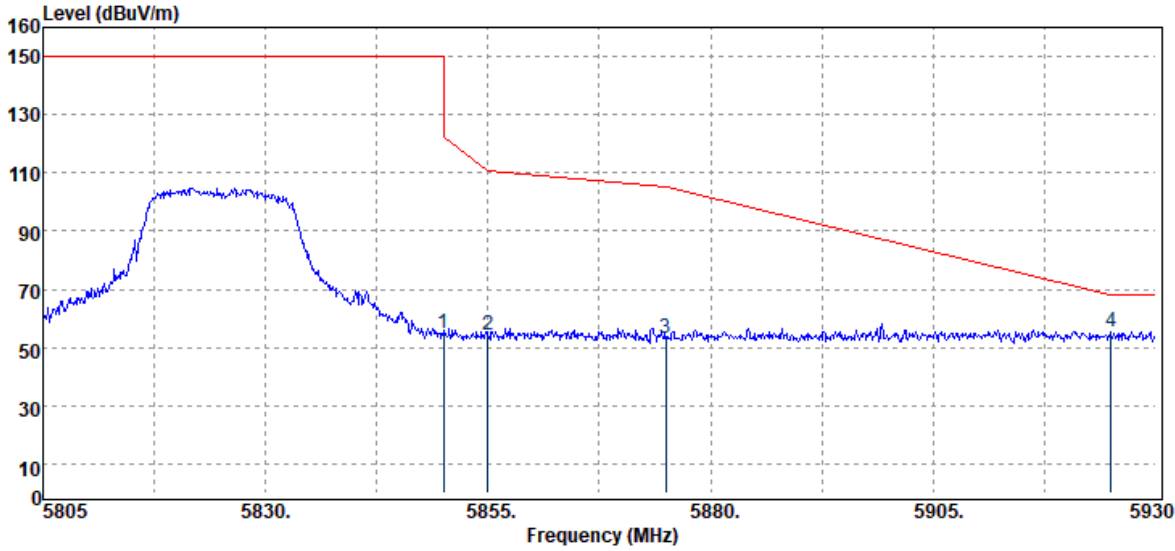
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Report Number :ER/2019/C0116
Operation Mode :802.11aB4
Test Channel :5825 MHz
Test Mode :Bandedge CH High
EUT Pol :E1 Plane

Test Date :2020-01-02
Temp./Humi. :21.2/58
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5850.00	Peak	38.69	16.24	54.93	122.20	-67.27
5855.00	Peak	37.76	16.26	54.02	110.80	-56.78
5875.00	Peak	37.00	16.33	53.33	105.20	-51.87
5925.00	Peak	38.74	16.41	55.15	68.20	-13.05

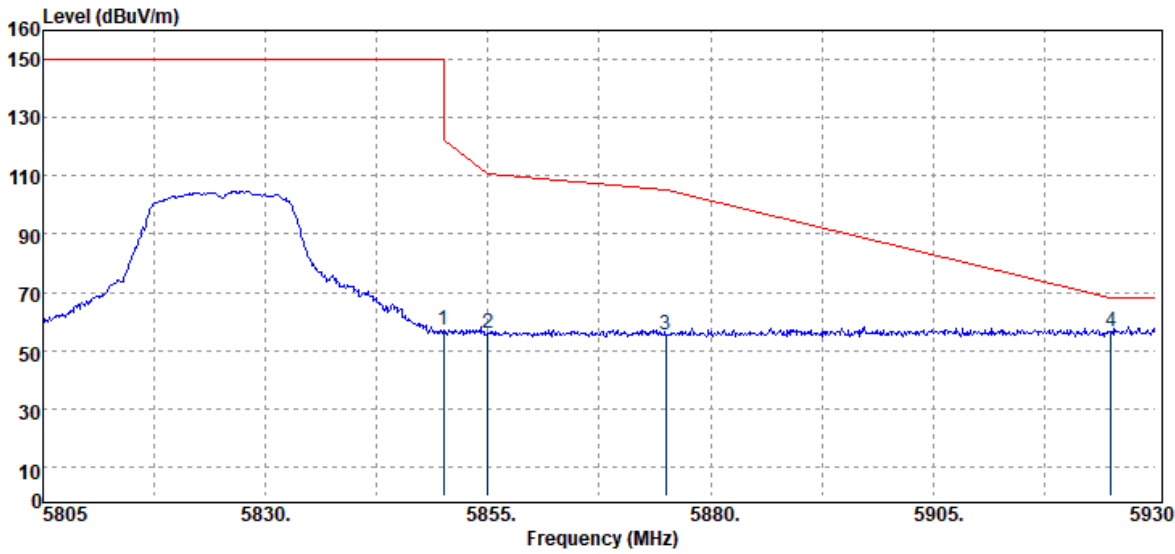
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Report Number :ER/2019/C0116
 Operation Mode :802.11aB4
 Test Channel :5825 MHz
 Test Mode :Bandedge CH High
 EUT Pol :E1 Plane

Test Date :2020-01-02
 Temp./Humi. :21.2/58
 Antenna Pol. :HORIZONTAL
 Engineer :Thomas



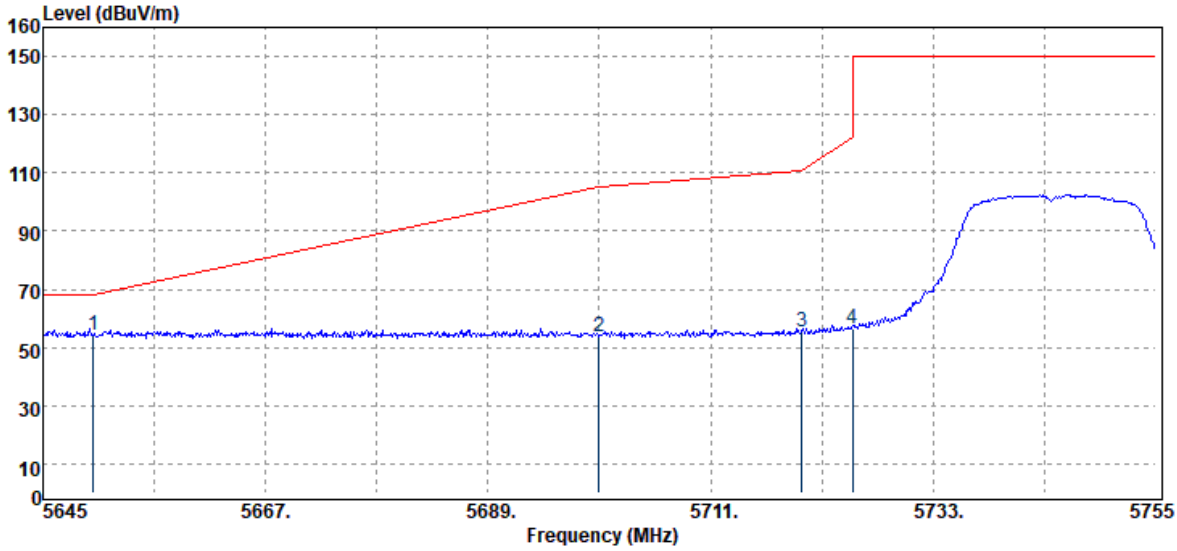
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5850.00	Peak	40.60	16.24	56.84	122.20	-65.36
5855.00	Peak	39.77	16.26	56.03	110.80	-54.77
5875.00	Peak	38.93	16.33	55.26	105.20	-49.94
5925.00	Peak	39.79	16.41	56.20	68.20	-12.00

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Report Number	:ER/2019/C0116	Test Date	:2020-01-02
Operation Mode	:802.11n20B4	Temp./Humi.	:21.2/58
Test Channel	:5745 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH Low	Engineer	:Thomas
EUT Pol	:E1 Plane		



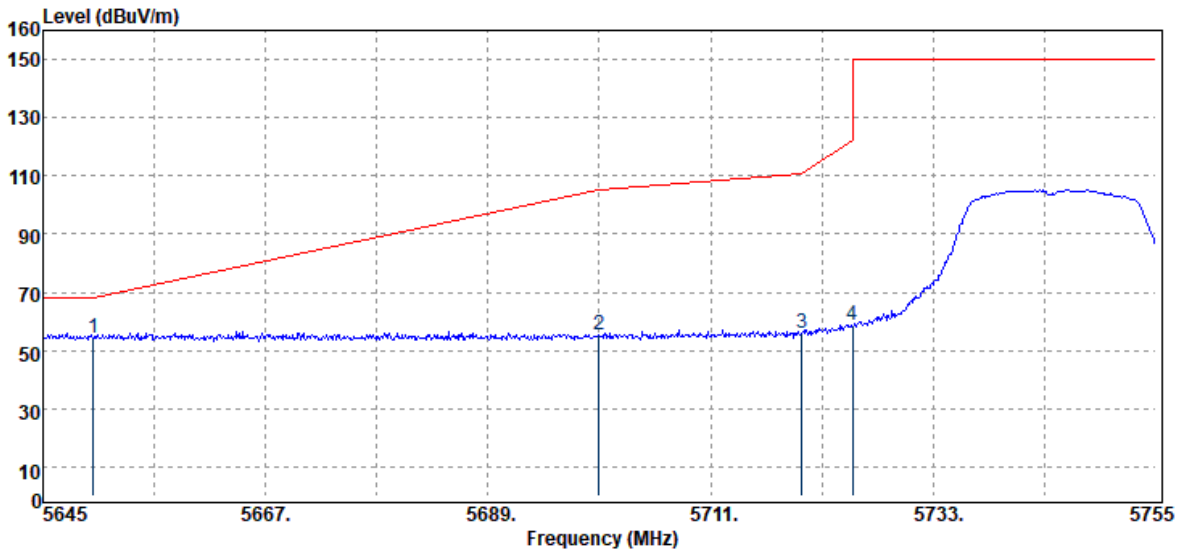
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5650.00	Peak	39.13	15.24	54.37	68.20	-13.83
5700.00	Peak	38.58	15.17	53.75	105.20	-51.45
5720.00	Peak	39.79	15.37	55.16	110.80	-55.64
5725.00	Peak	40.78	15.42	56.20	122.20	-66.00

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Report Number :ER/2019/C0116
Operation Mode :802.11n20B4
Test Channel :5745 MHz
Test Mode :Bandedge CH Low
EUT Pol :E1 Plane

Test Date :2020-01-02
Temp./Humi. :21.2/58
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5650.00	Peak	39.20	15.24	54.44	68.20	-13.76
5700.00	Peak	40.25	15.17	55.42	105.20	-49.78
5720.00	Peak	40.57	15.37	55.94	110.80	-54.86
5725.00	Peak	43.38	15.42	58.80	122.20	-63.40

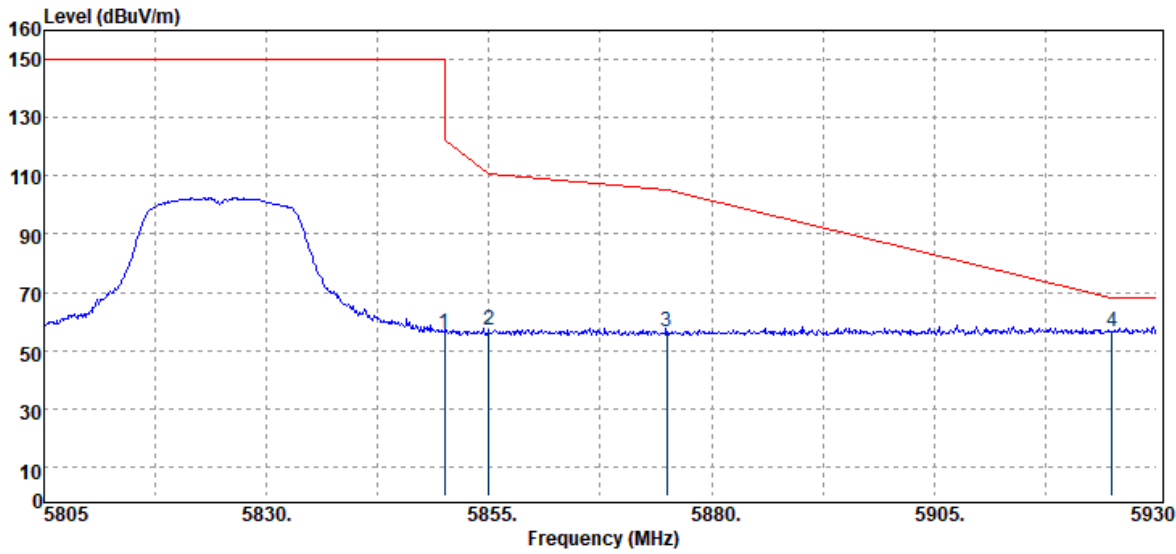
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Report Number :ER/2019/C0116
Operation Mode :802.11n20B4
Test Channel :5825 MHz
Test Mode :Bandedge CH High
EUT Pol :E1 Plane

Test Date :2020-01-02
Temp./Humi. :21.2/58
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5850.00	Peak	39.75	16.24	55.99	122.20	-66.21
5855.00	Peak	40.51	16.26	56.77	110.80	-54.03
5875.00	Peak	40.12	16.33	56.45	105.20	-48.75
5925.00	Peak	40.12	16.41	56.53	68.20	-11.67

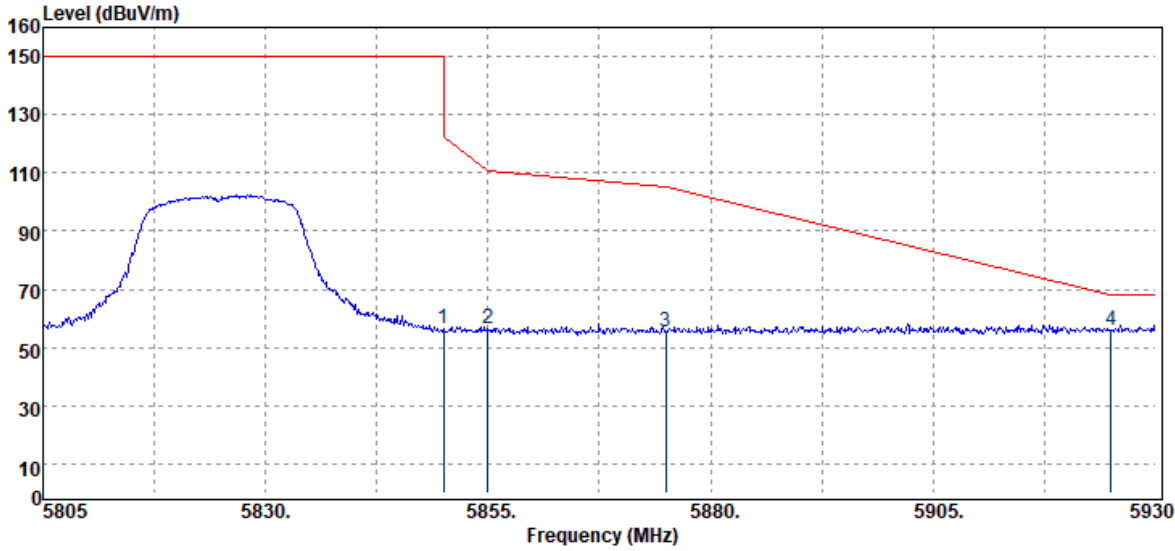
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Report Number :ER/2019/C0116
 Operation Mode :802.11n20B4
 Test Channel :5825 MHz
 Test Mode :Bandedge CH High
 EUT Pol :E1 Plane

Test Date :2020-01-02
 Temp./Humi. :21.2/58
 Antenna Pol. :HORIZONTAL
 Engineer :Thomas



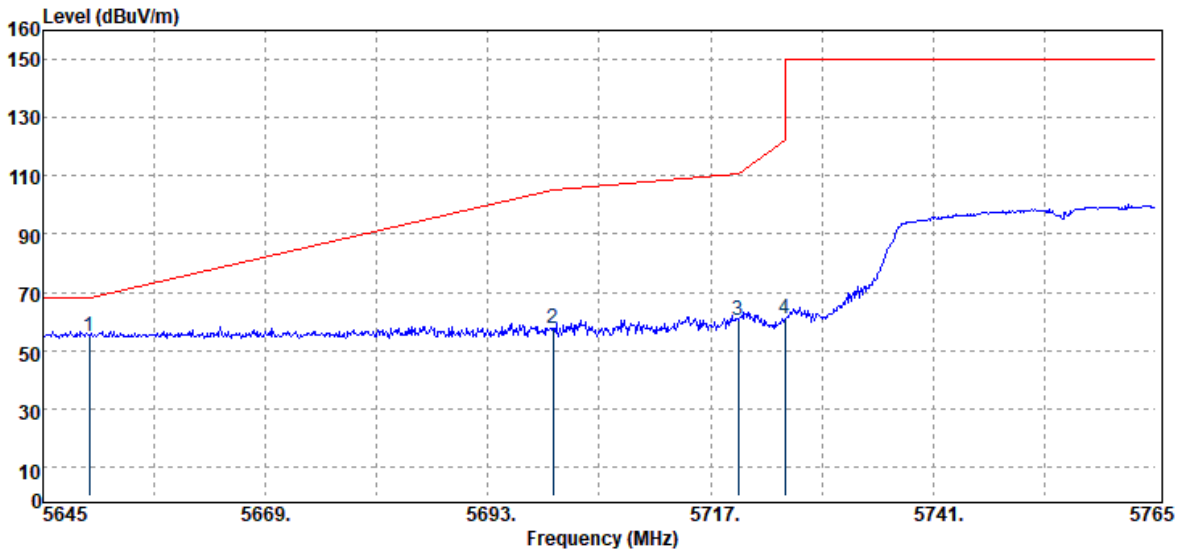
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5850.00	Peak	40.36	16.24	56.60	122.20	-65.60
5855.00	Peak	40.06	16.26	56.32	110.80	-54.48
5875.00	Peak	39.05	16.33	55.38	105.20	-49.82
5925.00	Peak	39.69	16.41	56.10	68.20	-12.10

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Report Number	:ER/2019/C0116	Test Date	:2020-01-02
Operation Mode	:802.11n40B4	Temp./Humi.	:21.2/58
Test Channel	:5755 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH Low	Engineer	:Thomas
EUT Pol	:E1 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5650.00	Peak	39.75	15.24	54.99	68.20	-13.21
5700.00	Peak	42.33	15.17	57.50	105.20	-47.70
5720.00	Peak	44.91	15.37	60.28	110.80	-50.52
5725.00	Peak	45.66	15.42	61.08	122.20	-61.12

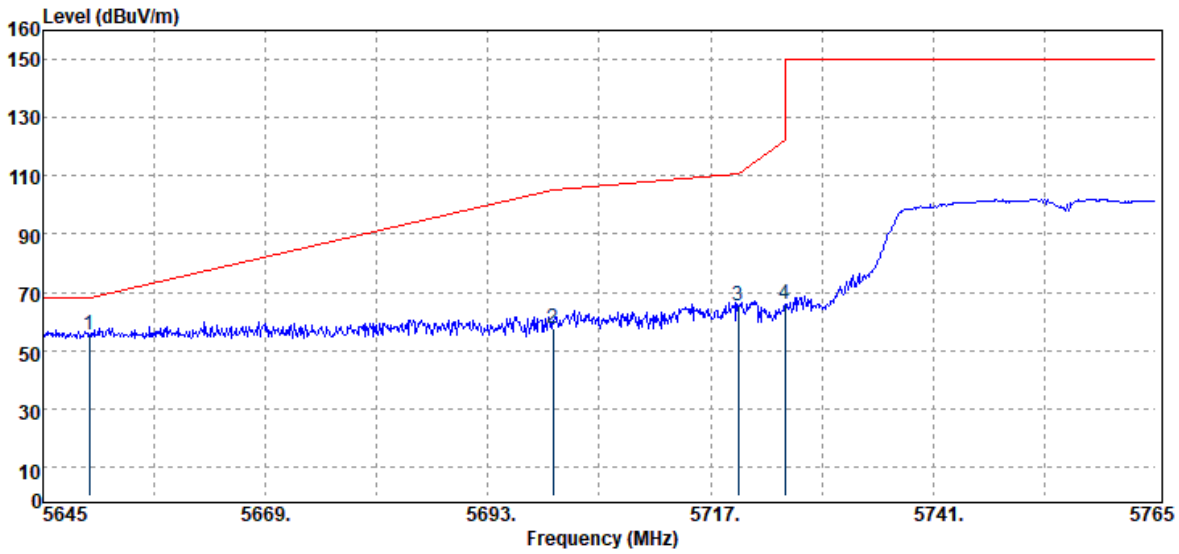
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Report Number :ER/2019/C0116
Operation Mode :802.11n40B4
Test Channel :5755 MHz
Test Mode :Bandedge CH Low
EUT Pol :E1 Plane

Test Date :2020-01-02
Temp./Humi. :21.2/58
Antenna Pol. :HORIZONTAL
Engineer :Thomas



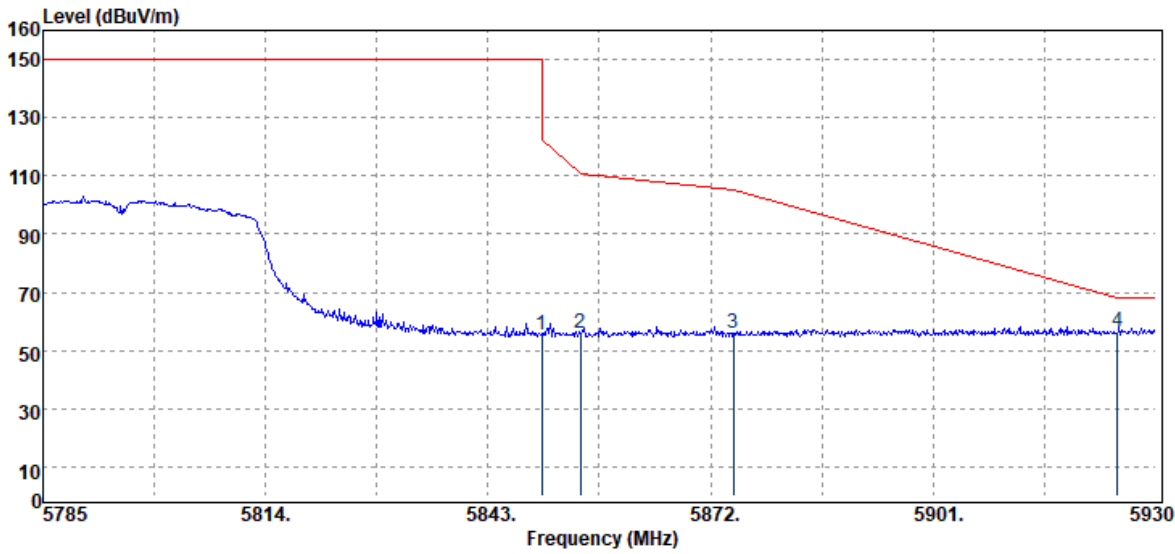
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5650.00	Peak	40.33	15.24	55.57	68.20	-12.63
5700.00	Peak	42.57	15.17	57.74	105.20	-47.46
5720.00	Peak	50.12	15.37	65.49	110.80	-45.31
5725.00	Peak	50.72	15.42	66.14	122.20	-56.06

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Report Number	:ER/2019/C0116	Test Date	:2020-01-02
Operation Mode	:802.11n40B4	Temp./Humi.	:21.2/58
Test Channel	:5795 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH High	Engineer	:Thomas
EUT Pol	:E1 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5850.00	Peak	39.27	16.24	55.51	122.20	-66.69
5855.00	Peak	39.39	16.26	55.65	110.80	-55.15
5875.00	Peak	39.63	16.33	55.96	105.20	-49.24
5925.00	Peak	39.88	16.41	56.29	68.20	-11.91

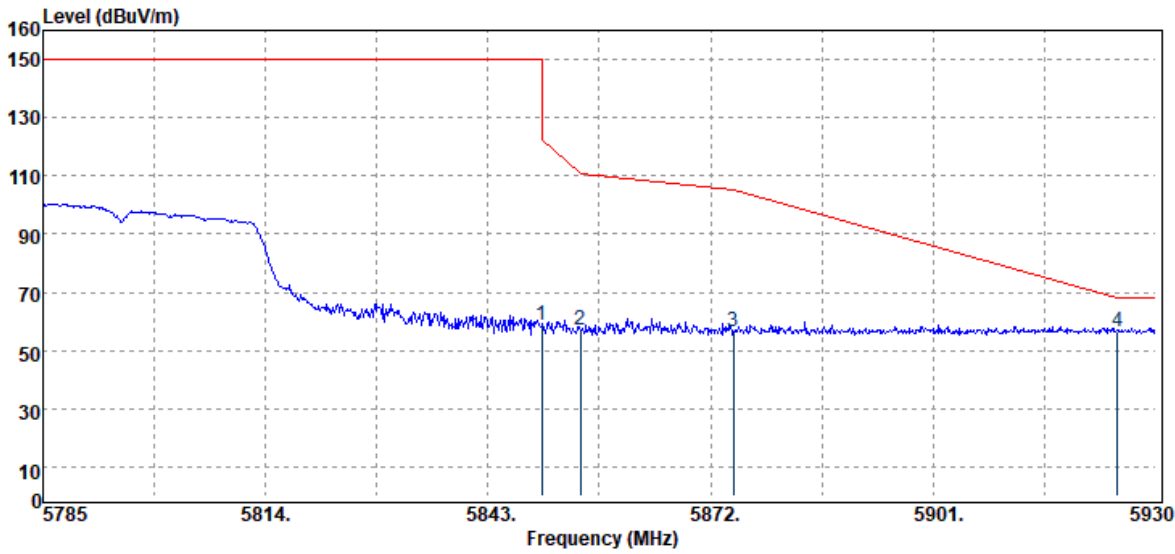
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Report Number :ER/2019/C0116
Operation Mode :802.11n40B4
Test Channel :5795 MHz
Test Mode :Bandedge CH High
EUT Pol :E1 Plane

Test Date :2020-01-02
Temp./Humi. :21.2/58
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5850.00	Peak	42.46	16.24	58.70	122.20	-63.50
5855.00	Peak	40.61	16.26	56.87	110.80	-53.93
5875.00	Peak	40.26	16.33	56.59	105.20	-48.61
5925.00	Peak	39.88	16.41	56.29	68.20	-11.91

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台灣檢驗科技股份有限公司

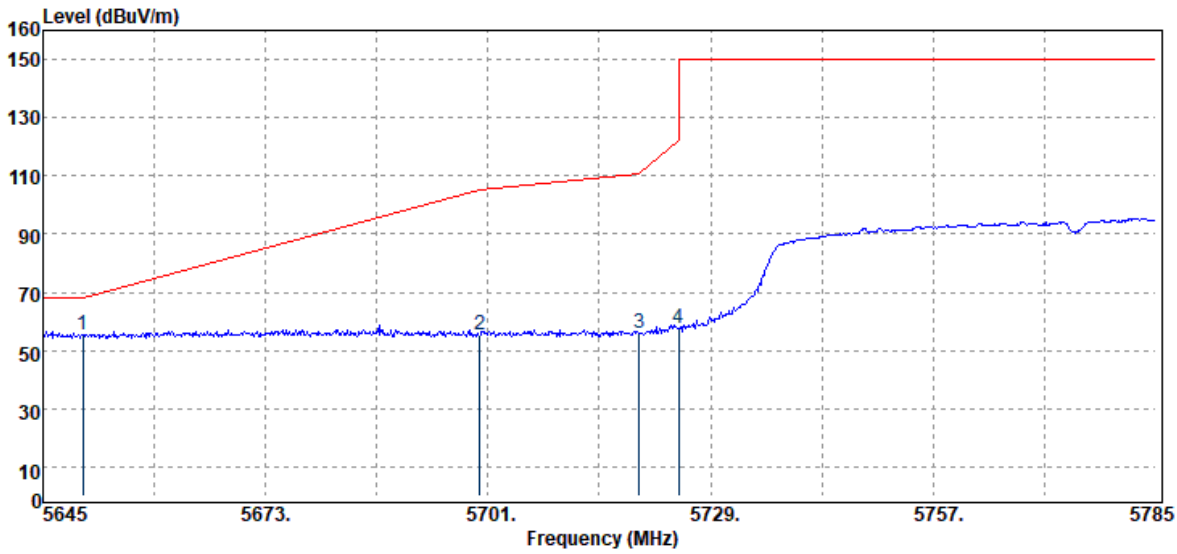
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Report Number	:ER/2019/C0116	Test Date	:2020-01-02
Operation Mode	:802.11ac80B4	Temp./Humi.	:21.2/58
Test Channel	:5775 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH Low	Engineer	:Thomas
EUT Pol	:E1 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5650.00	Peak	39.95	15.24	55.19	68.20	-13.01
5700.00	Peak	40.38	15.17	55.55	105.20	-49.65
5720.00	Peak	40.75	15.37	56.12	110.80	-54.68
5725.00	Peak	42.39	15.42	57.81	122.20	-64.39

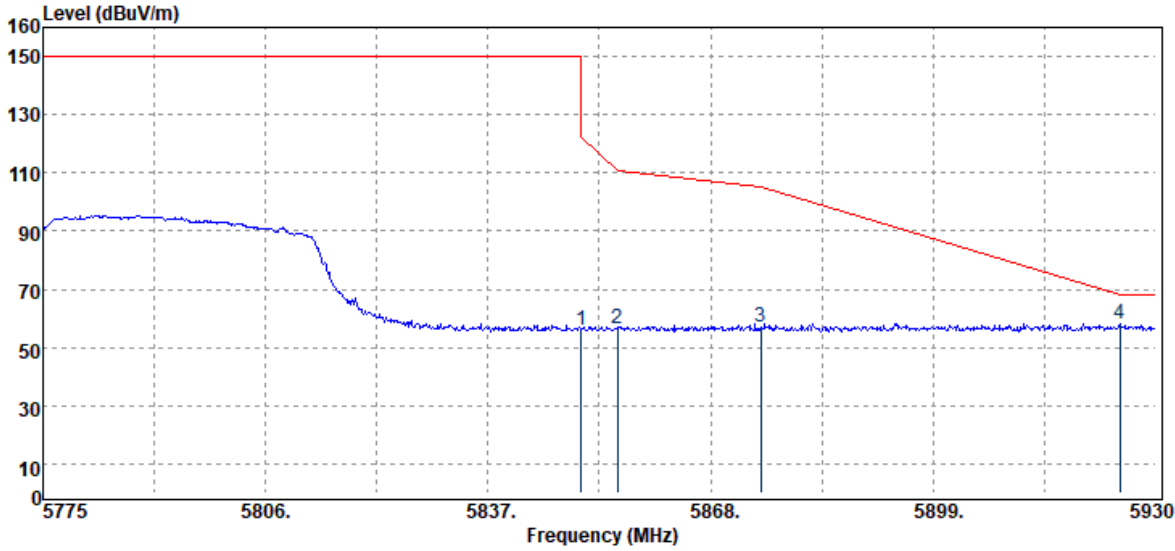
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Report Number :ER/2019/C0116
Operation Mode :802.11ac80B4
Test Channel :5775 MHz
Test Mode :Bandedge CH Low
EUT Pol :E1 Plane

Test Date :2020-01-02
Temp./Humi. :21.2/58
Antenna Pol. :VERTICAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5850.00	Peak	39.75	16.24	55.99	122.20	-66.21
5855.00	Peak	40.34	16.26	56.60	110.80	-54.20
5875.00	Peak	40.73	16.33	57.06	105.20	-48.14
5925.00	Peak	41.60	16.41	58.01	68.20	-10.19

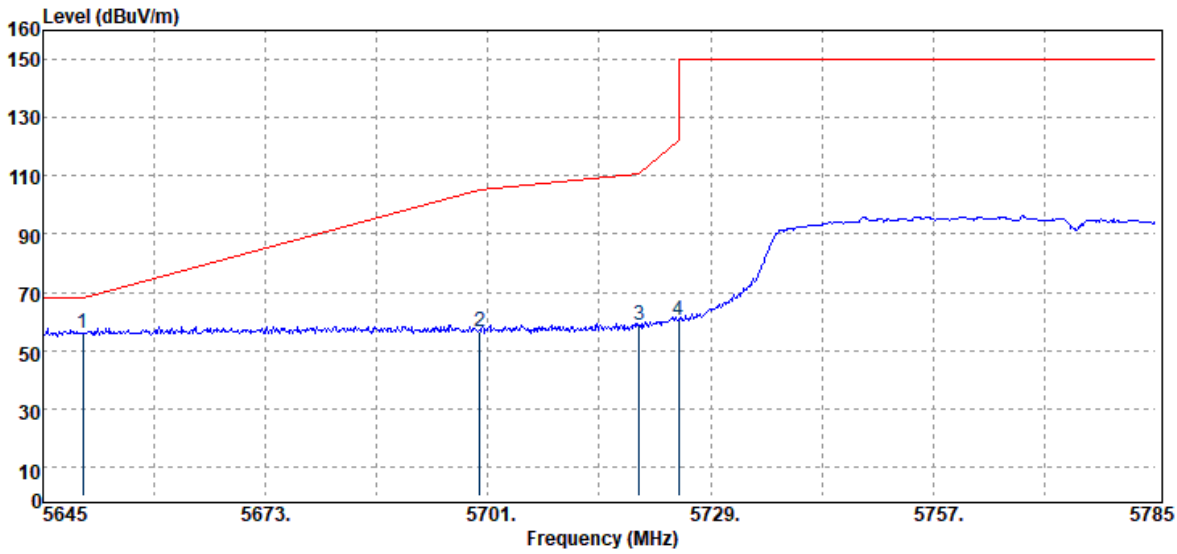
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Report Number :ER/2019/C0116
Operation Mode :802.11ac80B4
Test Channel :5775 MHz
Test Mode :Bandedge CH Low
EUT Pol :E1 Plane

Test Date :2020-01-02
Temp./Humi. :21.2/58
Antenna Pol. :HORIZONTAL
Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5650.00	Peak	40.67	15.24	55.91	68.20	-12.29
5700.00	Peak	41.46	15.17	56.63	105.20	-48.57
5720.00	Peak	43.24	15.37	58.61	110.80	-52.19
5725.00	Peak	44.90	15.42	60.32	122.20	-61.88

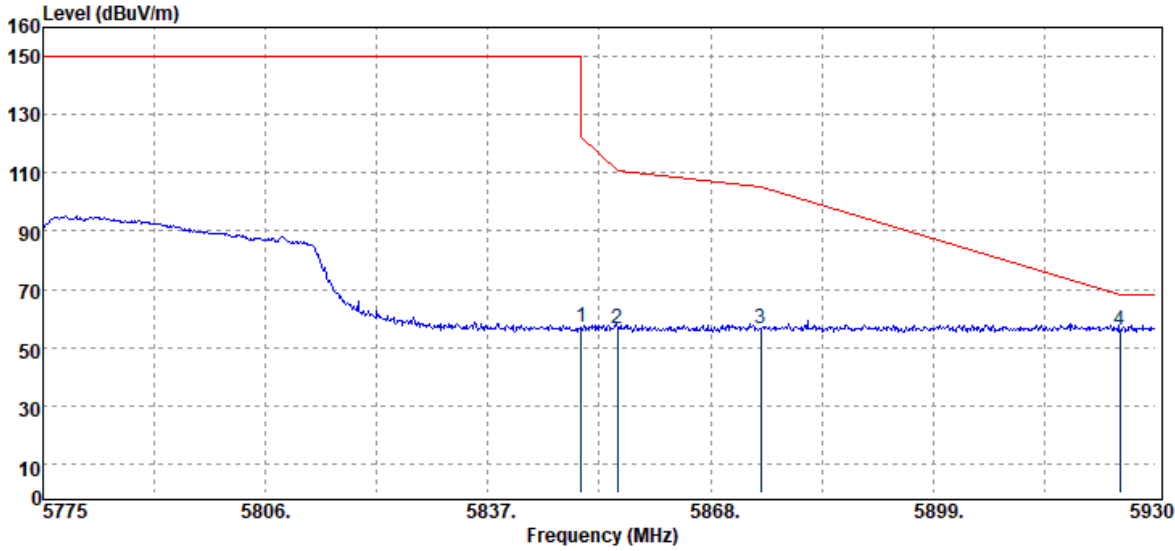
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Report Number :ER/2019/C0116
 Operation Mode :802.11ac80B4
 Test Channel :5775 MHz
 Test Mode :Bandedge CH Low
 EUT Pol :E1 Plane

Test Date :2020-01-02
 Temp./Humi. :21.2/58
 Antenna Pol. :HORIZONTAL
 Engineer :Thomas



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
5850.00	Peak	40.76	16.24	57.00	122.20	-65.20
5855.00	Peak	40.05	16.26	56.31	110.80	-54.49
5875.00	Peak	40.09	16.33	56.42	105.20	-48.78
5925.00	Peak	39.38	16.41	55.79	68.20	-12.41

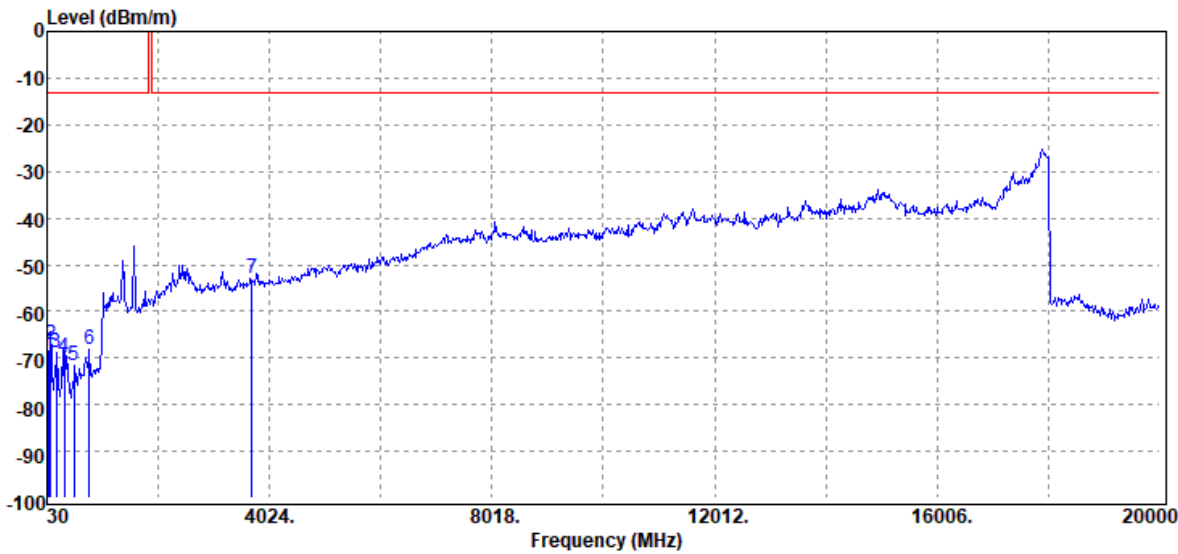
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11.8 Co-located Emission

Report Number	:ER/2019/C0117	Test Date	:2020-01-08
Operation Mode	:WCDMA B2/802.11aB4	Temp./Humi.	:21.8/61
Test Mode	:Tx CH Low/Tx CH Mid	Antenna Pol.	:VERTICAL
EUT Pol	:E1 Plane	Engineer	:Thomas
Test Channel	:1852.4 MHz/5785 MHz		



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
60.07	-68.62	-52.63	-15.26	-0.73	-13.00	-55.62
95.96	-67.13	-60.49	-5.69	-0.95	-13.00	-54.13
197.81	-68.79	-65.07	-2.34	-1.38	-13.00	-55.79
343.31	-69.73	-66.25	-1.59	-1.89	-13.00	-56.73
516.94	-71.79	-67.76	-1.45	-2.58	-13.00	-58.79
781.75	-68.24	-63.83	-1.68	-2.73	-13.00	-55.24
3704.80	-52.99	-59.44	12.39	-5.94	-13.00	-39.99

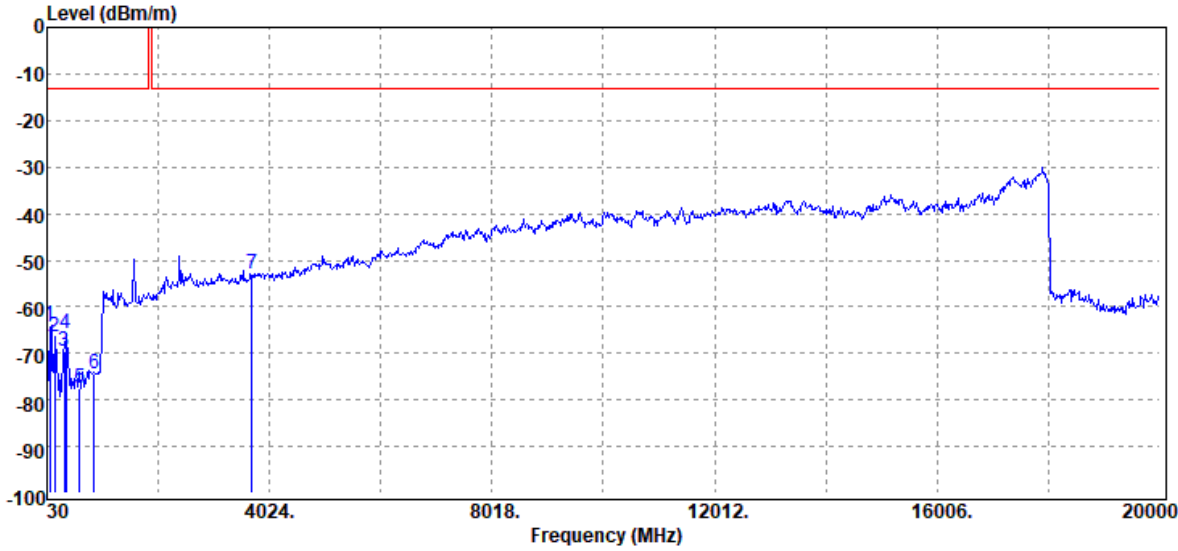
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Report Number :ER/2019/C0117
 Operation Mode :WCDMA B2/802.11aB4
 Test Mode :Tx CH Low/Tx CH Mid
 EUT Pol :E1 Plane
 Test Channel :1852.4 MHz/5785 MHz

Test Date :2020-01-08
 Temp./Humi. :21.8/61
 Antenna Pol. :HORIZONTAL
 Engineer :Thomas



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
86.26	-64.06	-56.40	-6.77	-0.89	-13.00	-51.06
165.80	-66.30	-58.52	-6.45	-1.33	-13.00	-53.30
333.61	-69.65	-66.06	-1.68	-1.91	-13.00	-56.65
367.56	-65.76	-62.27	-1.58	-1.91	-13.00	-52.76
613.94	-77.50	-73.09	-1.87	-2.54	-13.00	-64.50
880.69	-74.31	-70.06	-1.74	-2.51	-13.00	-61.31
3704.80	-53.02	-59.47	12.39	-5.94	-13.00	-40.02

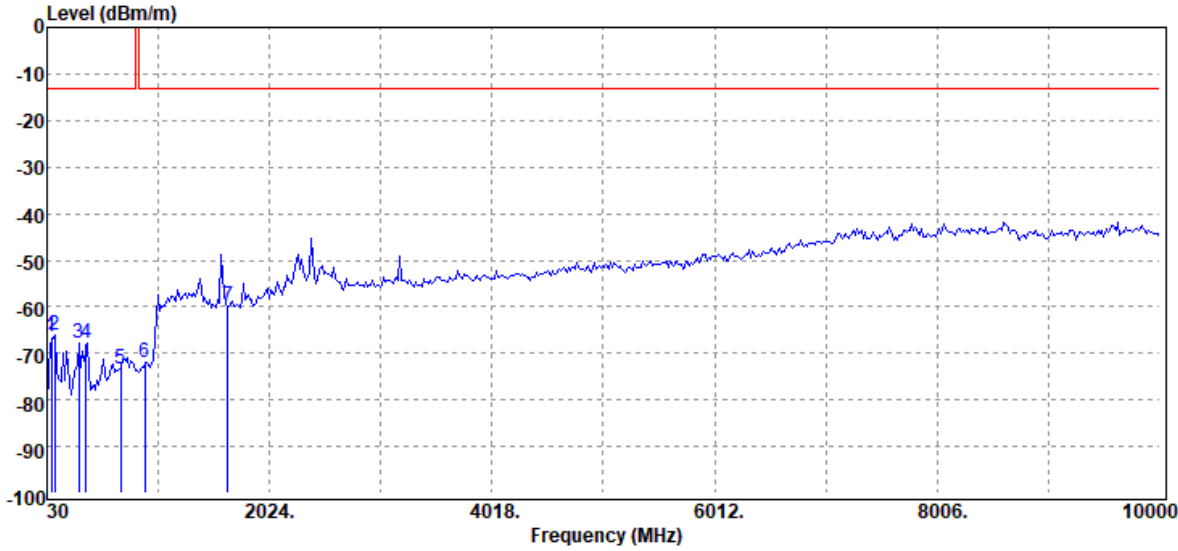
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Report Number :ER/2019/C0117
 Operation Mode :WCDMA B5/802.11aB4
 Test Mode :Tx CH Low/Tx CH Mid
 EUT Pol :E1 Plane
 Test Channel :826.4 MHz/5785 MHz

Test Date :2020-01-08
 Temp./Humi. :21.8/61
 Antenna Pol. :VERTICAL
 Engineer :Thomas



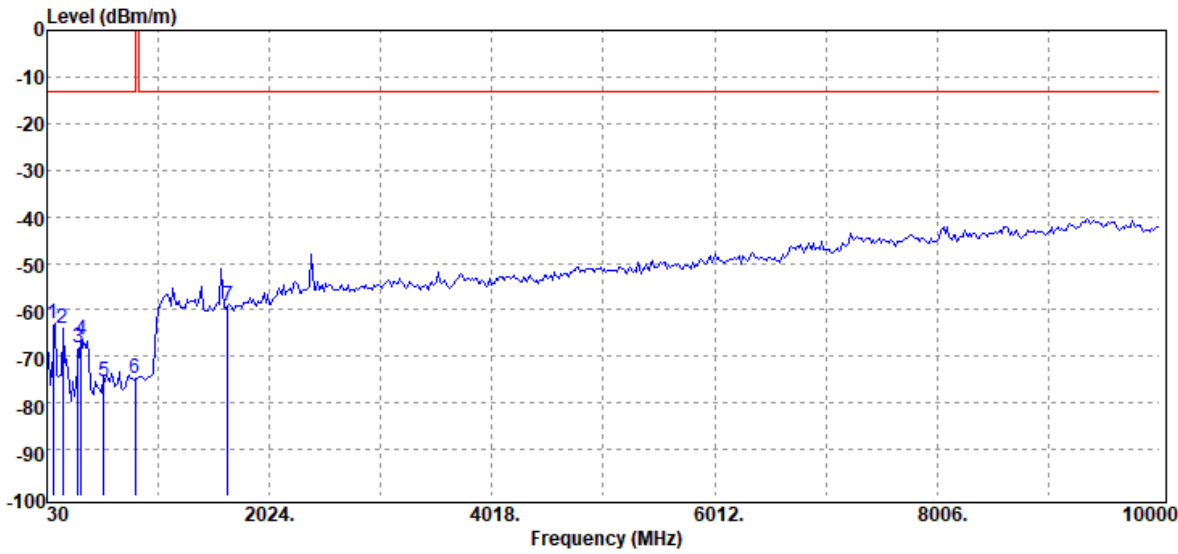
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
66.86	-66.51	-52.57	-13.15	-0.79	-13.00	-53.51
98.87	-66.10	-59.11	-6.02	-0.97	-13.00	-53.10
312.27	-67.90	-64.61	-1.65	-1.64	-13.00	-54.90
379.20	-67.88	-64.32	-1.64	-1.92	-13.00	-54.88
687.66	-73.23	-69.45	-1.29	-2.49	-13.00	-60.23
907.85	-71.85	-67.19	-1.84	-2.82	-13.00	-58.85
1652.80	-59.74	-65.05	9.32	-4.01	-13.00	-46.74

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Report Number	:ER/2019/C0117	Test Date	:2020-01-08
Operation Mode	:WCDMA B5/802.11aB4	Temp./Humi.	:21.8/61
Test Mode	:Tx CH Low/Tx CH Mid	Antenna Pol.	:HORIZONTAL
EUT Pol	:E1 Plane	Engineer	:Thomas
Test Channel	:826.4 MHz/5785 MHz		



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
86.26	-63.15	-55.49	-6.77	-0.89	-13.00	-50.15
170.65	-63.96	-56.84	-5.83	-1.29	-13.00	-50.96
311.30	-68.06	-64.77	-1.67	-1.62	-13.00	-55.06
338.46	-66.60	-63.09	-1.62	-1.89	-13.00	-53.60
541.19	-75.43	-71.88	-1.39	-2.16	-13.00	-62.43
818.61	-74.57	-69.77	-1.72	-3.08	-13.00	-61.57
1652.80	-59.12	-64.43	9.32	-4.01	-13.00	-46.12

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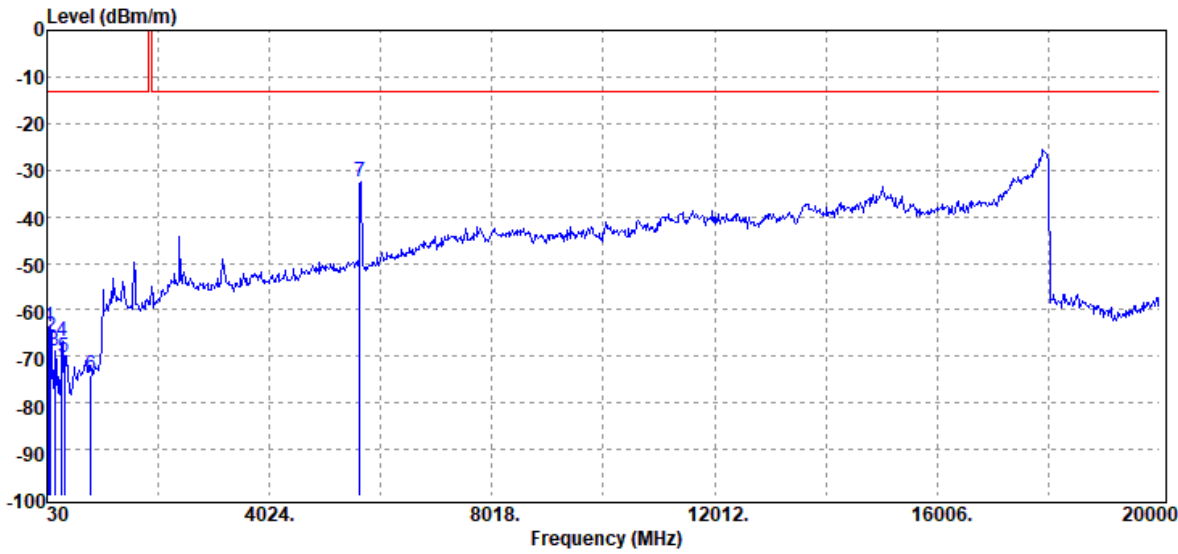
f (886-2) 2298-0488

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Report Number :ER/2019/C0117
 Operation Mode :LTE B2/802.11aB4
 Test Mode :Tx CH Mid/Tx CH Mid
 EUT Pol :E1 Plane
 Test Channel :1880 MHz/5785 MHz

Test Date :2020-01-08
 Temp./Humi. :21.8/61
 Antenna Pol. :VERTICAL
 Engineer :Thomas



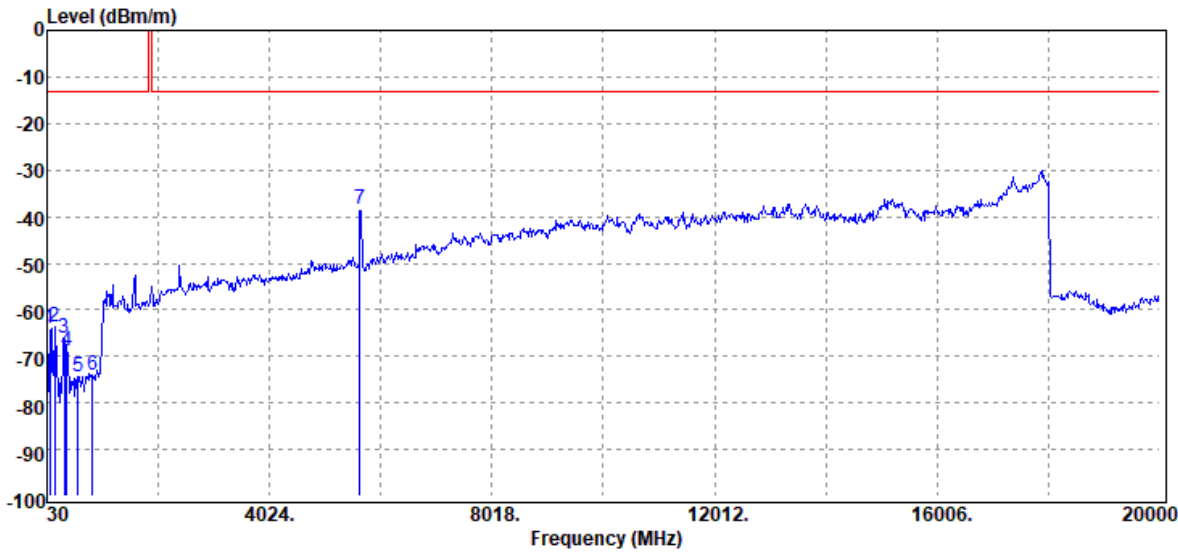
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
67.83	-63.51	-49.87	-12.85	-0.79	-13.00	-50.51
90.14	-65.79	-58.95	-5.93	-0.91	-13.00	-52.79
169.68	-68.69	-61.41	-5.98	-1.30	-13.00	-55.69
290.93	-66.71	-63.24	-1.78	-1.69	-13.00	-53.71
337.49	-70.11	-66.59	-1.63	-1.89	-13.00	-57.11
811.82	-74.18	-69.43	-1.59	-3.16	-13.00	-61.18
5640.00	-32.54	-38.32	13.26	-7.48	-13.00	-19.54

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Report Number	:ER/2019/C0117	Test Date	:2020-01-08
Operation Mode	:LTE B2/802.11aB4	Temp./Humi.	:21.8/61
Test Mode	:Tx CH Mid/Tx CH Mid	Antenna Pol.	:HORIZONTAL
EUT Pol	:E1 Plane	Engineer	:Thomas
Test Channel	:1880 MHz/5785 MHz		



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
87.23	-63.85	-56.45	-6.50	-0.90	-13.00	-50.85
171.62	-63.81	-56.90	-5.62	-1.29	-13.00	-50.81
333.61	-66.22	-62.63	-1.68	-1.91	-13.00	-53.22
379.20	-68.96	-65.40	-1.64	-1.92	-13.00	-55.96
589.69	-74.50	-70.85	-1.71	-1.94	-13.00	-61.50
846.74	-73.98	-69.19	-1.68	-3.11	-13.00	-60.98
5640.00	-38.50	-44.28	13.26	-7.48	-13.00	-25.50

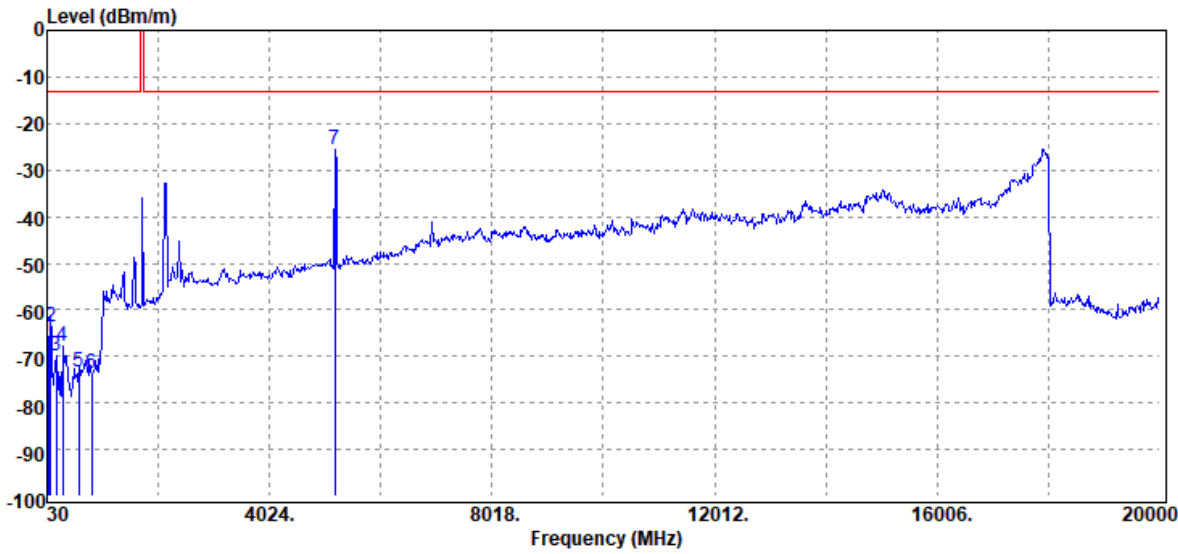
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Report Number :ER/2019/C0117
 Operation Mode :LTE B4/802.11aB4
 Test Mode :Tx CH Mid/Tx CH Mid
 EUT Pol :E1 Plane
 Test Channel :1732.5 MHz/5785 MHz

Test Date :2020-01-08
 Temp./Humi. :21.8/61
 Antenna Pol. :VERTICAL
 Engineer :Thomas



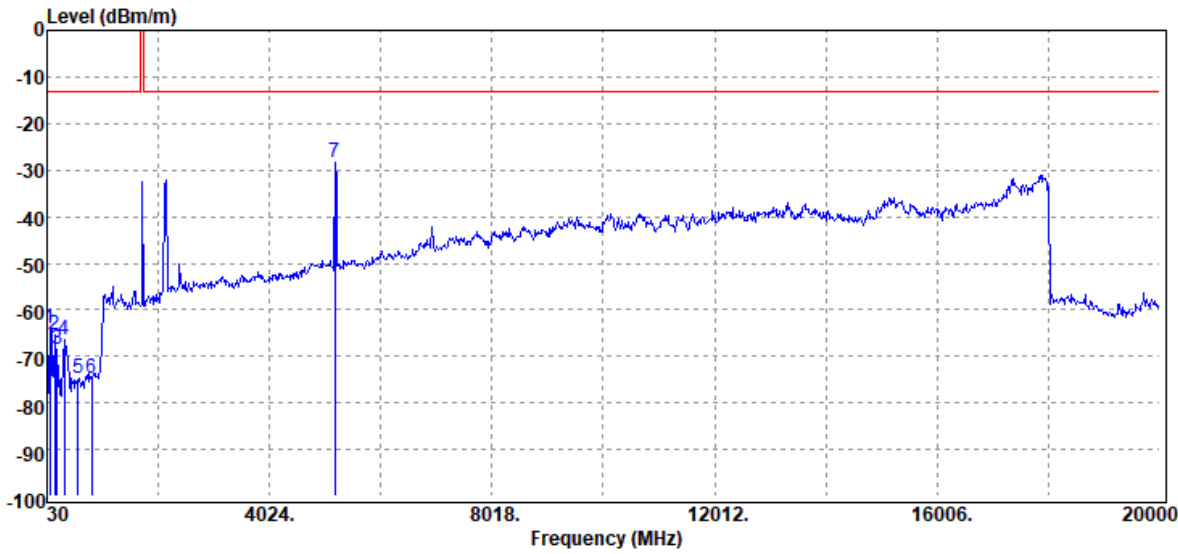
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
60.07	-65.59	-49.60	-15.26	-0.73	-13.00	-52.59
91.11	-63.59	-56.92	-5.75	-0.92	-13.00	-50.59
197.81	-69.88	-66.16	-2.34	-1.38	-13.00	-56.88
306.45	-67.73	-64.43	-1.67	-1.63	-13.00	-54.73
601.33	-73.44	-69.21	-1.91	-2.32	-13.00	-60.44
832.19	-73.73	-68.98	-1.78	-2.97	-13.00	-60.73
5197.50	-25.66	-30.77	12.29	-7.18	-13.00	-12.66

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Report Number	:ER/2019/C0117	Test Date	:2020-01-08
Operation Mode	:LTE B4/802.11aB4	Temp./Humi.	:21.8/61
Test Mode	:Tx CH Mid/Tx CH Mid	Antenna Pol.	:HORIZONTAL
EUT Pol	:E1 Plane	Engineer	:Thomas
Test Channel	:1732.5 MHz/5785 MHz		



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
86.26	-63.98	-56.32	-6.77	-0.89	-13.00	-50.98
169.68	-65.34	-58.06	-5.98	-1.30	-13.00	-52.34
207.51	-68.59	-65.43	-1.75	-1.41	-13.00	-55.59
343.31	-66.44	-62.96	-1.59	-1.89	-13.00	-53.44
589.69	-74.77	-71.12	-1.71	-1.94	-13.00	-61.77
829.28	-74.77	-70.06	-1.75	-2.96	-13.00	-61.77
5197.50	-28.52	-33.63	12.29	-7.18	-13.00	-15.52

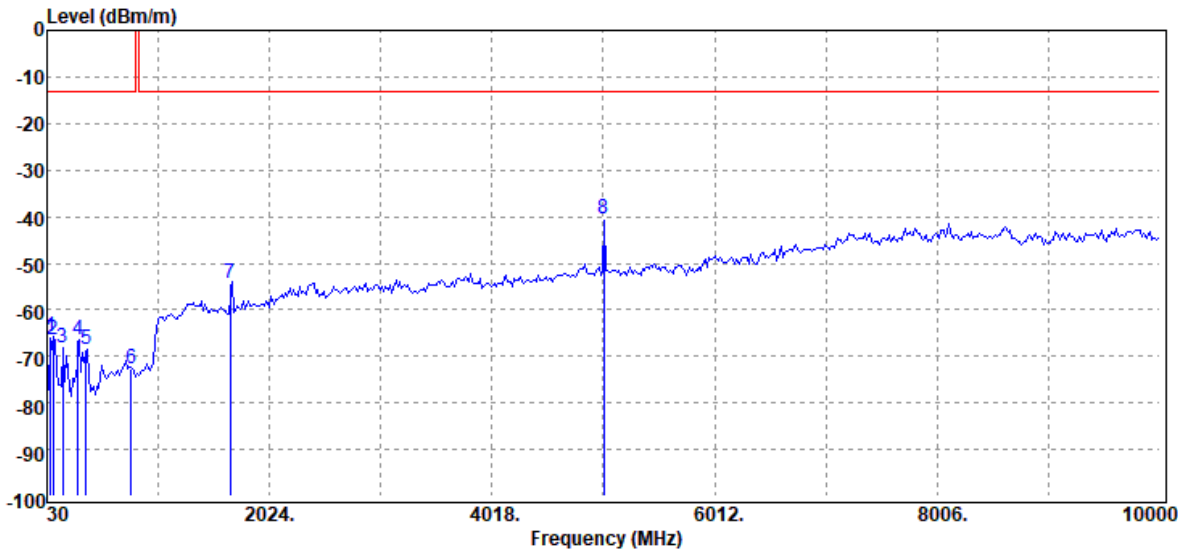
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Report Number :ER/2019/C0117
 Operation Mode :LTE B5/802.11aB4
 Test Mode :Tx CH Mid/Tx CH Mid
 EUT Pol :E1 Plane
 Test Channel :836.5 MHz/5785 MHz

Test Date :2020-01-08
 Temp./Humi. :21.8/61
 Antenna Pol. :VERTICAL
 Engineer :Thomas



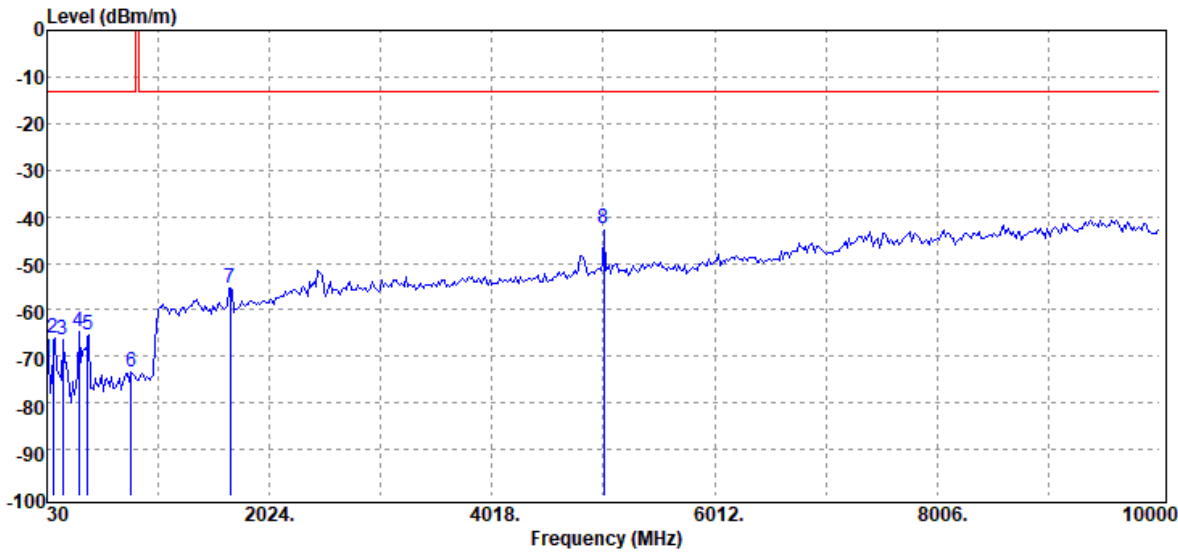
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
65.89	-65.91	-51.73	-13.40	-0.78	-13.00	-52.91
87.23	-66.27	-58.87	-6.50	-0.90	-13.00	-53.27
169.68	-68.26	-60.98	-5.98	-1.30	-13.00	-55.26
311.30	-66.58	-63.29	-1.67	-1.62	-13.00	-53.58
378.23	-68.46	-64.89	-1.65	-1.92	-13.00	-55.46
781.75	-72.82	-68.41	-1.68	-2.73	-13.00	-59.82
1673.00	-54.47	-59.93	9.49	-4.03	-13.00	-41.47
5019.00	-40.39	-45.69	12.32	-7.02	-13.00	-27.39

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Report Number	:ER/2019/C0117	Test Date	:2020-01-08
Operation Mode	:LTE B5/802.11aB4	Temp./Humi.	:21.8/61
Test Mode	:Tx CH Mid/Tx CH Mid	Antenna Pol.	:HORIZONTAL
EUT Pol	:E1 Plane	Engineer	:Thomas
Test Channel	:836.5 MHz/5785 MHz		



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
32.91	-70.48	-49.42	-20.49	-0.57	-13.00	-57.48
87.23	-66.16	-58.76	-6.50	-0.90	-13.00	-53.16
171.62	-66.53	-59.62	-5.62	-1.29	-13.00	-53.53
313.24	-64.77	-61.50	-1.62	-1.65	-13.00	-51.77
395.69	-65.24	-61.68	-1.61	-1.95	-13.00	-52.24
781.75	-73.28	-68.87	-1.68	-2.73	-13.00	-60.28
1673.00	-55.27	-60.73	9.49	-4.03	-13.00	-42.27
5019.00	-42.56	-47.86	12.32	-7.02	-13.00	-29.56

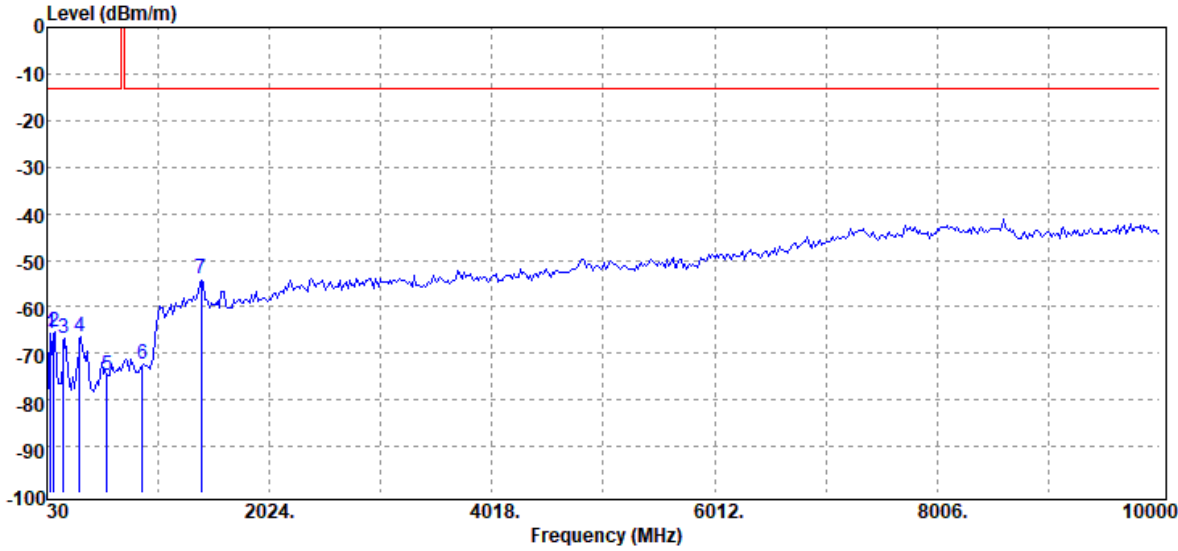
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Report Number :ER/2019/C0117
 Operation Mode :LTE B12/802.11aB4
 Test Mode :Tx CH Mid/Tx CH Mid
 EUT Pol :E1 Plane
 Test Channel :707.5 MHz/5785 MHz

Test Date :2020-01-08
 Temp./Humi. :21.8/61
 Antenna Pol. :VERTICAL
 Engineer :Thomas



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
59.10	-65.79	-49.56	-15.50	-0.73	-13.00	-52.79
90.14	-65.53	-58.69	-5.93	-0.91	-13.00	-52.53
180.35	-66.80	-61.40	-4.15	-1.25	-13.00	-53.80
324.88	-66.42	-62.98	-1.60	-1.84	-13.00	-53.42
565.44	-74.68	-71.02	-1.40	-2.26	-13.00	-61.68
884.57	-72.48	-68.20	-1.70	-2.58	-13.00	-59.48
1415.00	-54.14	-58.37	7.93	-3.70	-13.00	-41.14

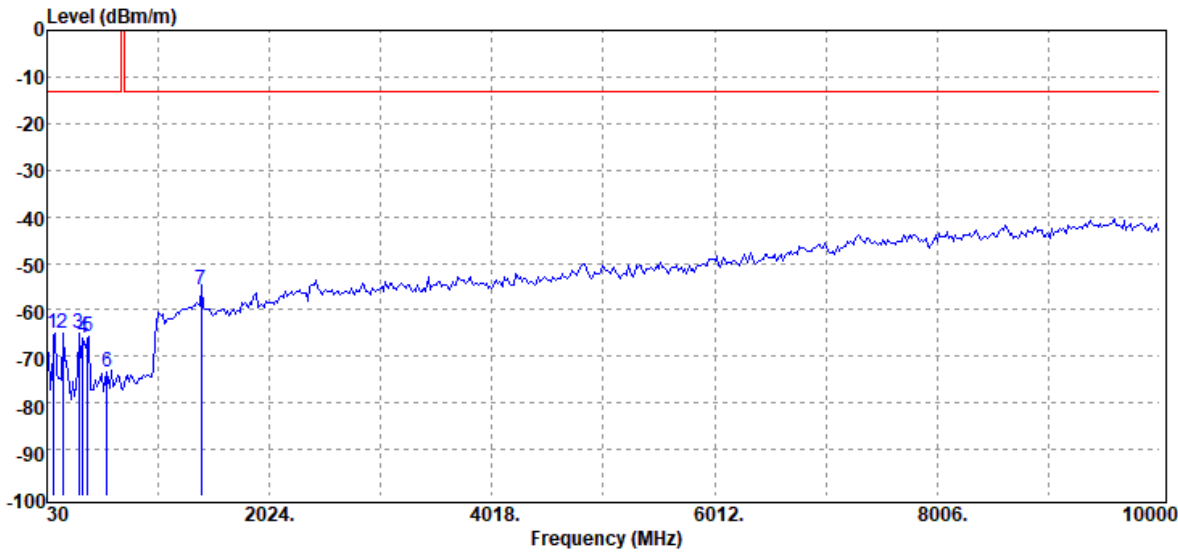
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Report Number :ER/2019/C0117
 Operation Mode :LTE B12/802.11aB4
 Test Mode :Tx CH Mid/Tx CH Mid
 EUT Pol :E1 Plane
 Test Channel :707.5 MHz/5785 MHz

Test Date :2020-01-08
 Temp./Humi. :21.8/61
 Antenna Pol. :HORIZONTAL
 Engineer :Thomas



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
87.23	-64.91	-57.51	-6.50	-0.90	-13.00	-51.91
167.74	-64.97	-57.49	-6.17	-1.31	-13.00	-51.97
312.27	-65.12	-61.83	-1.65	-1.64	-13.00	-52.12
348.16	-66.09	-62.70	-1.50	-1.89	-13.00	-53.09
395.69	-65.61	-62.05	-1.61	-1.95	-13.00	-52.61
565.44	-73.38	-69.72	-1.40	-2.26	-13.00	-60.38
1415.00	-55.67	-59.90	7.93	-3.70	-13.00	-42.67

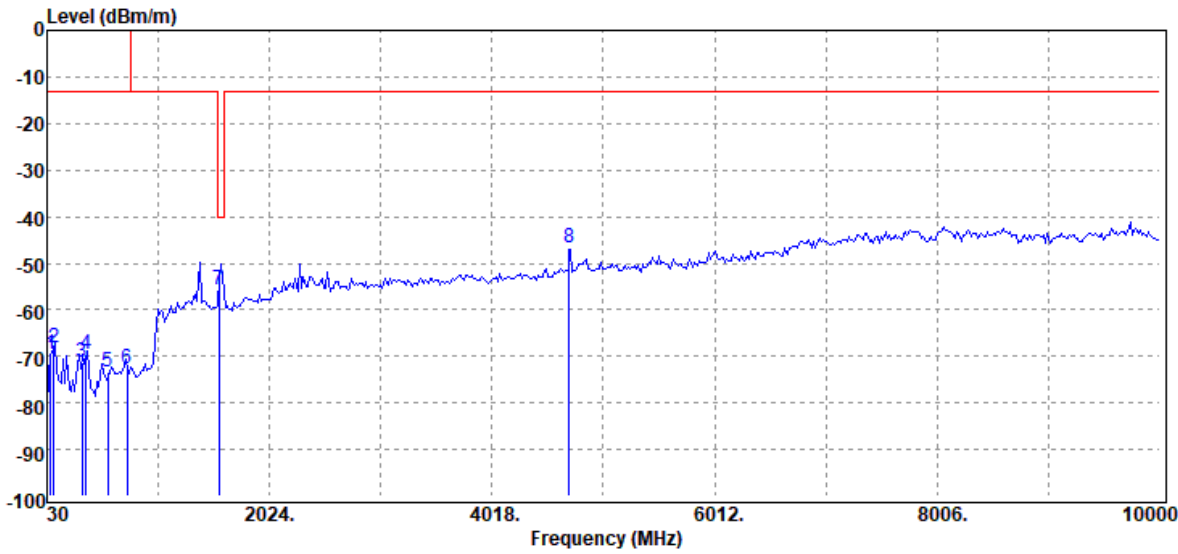
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Report Number :ER/2019/C0117
 Operation Mode :LTE B13/802.11aB4
 Test Mode :Tx CH High/Tx CH Mid
 EUT Pol :E1 Plane
 Test Channel :784.5 MHz/5785 MHz

Test Date :2020-01-08
 Temp./Humi. :21.8/61
 Antenna Pol. :VERTICAL
 Engineer :Thomas



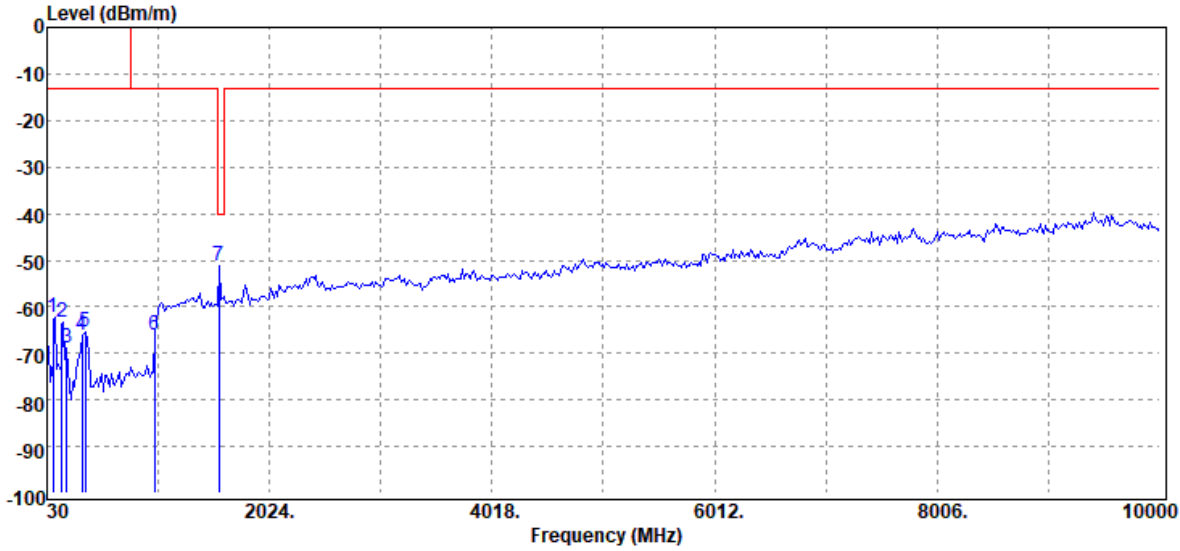
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
60.07	-69.58	-53.59	-15.26	-0.73	-13.00	-56.58
93.05	-68.15	-61.55	-5.67	-0.93	-13.00	-55.15
347.19	-71.29	-67.87	-1.53	-1.89	-13.00	-58.29
379.20	-69.69	-66.13	-1.64	-1.92	-13.00	-56.69
577.08	-73.52	-69.92	-1.56	-2.04	-13.00	-60.52
745.86	-72.68	-68.47	-1.81	-2.40	-13.00	-59.68
1569.00	-55.84	-61.08	9.14	-3.90	-40.00	-15.84
4707.00	-46.57	-51.82	12.03	-6.78	-13.00	-33.57

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Report Number	:ER/2019/C0117	Test Date	:2020-01-08
Operation Mode	:LTE B13/802.11aB4	Temp./Humi.	:21.8/61
Test Mode	:Tx CH High/Tx CH Mid	Antenna Pol.	:HORIZONTAL
EUT Pol	:E1 Plane	Engineer	:Thomas
Test Channel	:784.5 MHz/5785 MHz		



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
87.23	-62.20	-54.80	-6.50	-0.90	-13.00	-49.20
166.77	-63.34	-55.70	-6.32	-1.32	-13.00	-50.34
209.45	-68.77	-65.73	-1.63	-1.41	-13.00	-55.77
343.31	-66.17	-62.69	-1.59	-1.89	-13.00	-53.17
371.44	-65.25	-61.74	-1.60	-1.91	-13.00	-52.25
990.30	-66.07	-61.16	-1.63	-3.28	-13.00	-53.07
1569.00	-51.28	-56.52	9.14	-3.90	-40.00	-11.28

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12 TRANSMISSION IN THE ABSENCE OF DATA

12.1 Standard Applicable

According to §15.407(c)

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

12.2 Result

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the control-signal of ASK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

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13 FREQUENCY STABILITY

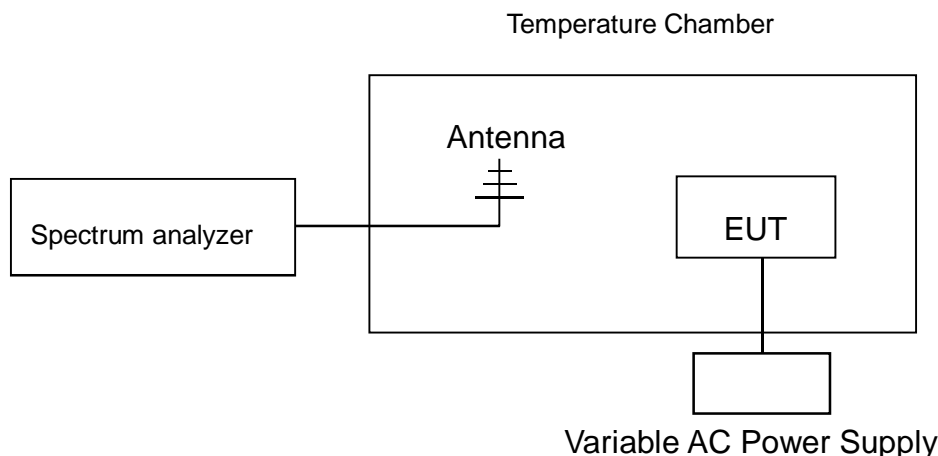
13.1 Standard Applicable

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

13.2 Measurement Procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.

13.3 Test SET-UP



13.4 Measurement Equipment Used:

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
DC Power Supply	Agilent	E3640A	MY52410006	12/10/2019	12/09/2020
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2019	05/16/2020
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	02/13/2019	02/12/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2019	01/01/2020

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13.5 Measurement Result

Start up

Start up

Operation Mode	802.11 a	Test Date	2019.12.25
Temperature	: 23.6°C	Test By	Gary
Humidity	: 60%		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
-30	30	149	5745	5,744.99295	0.00000123
	9	149	5745	5,744.99444	0.00000097
25	12	149	5745	5,745.00173	-0.00000030
70	30	149	5745	5,745.00896	-0.00000156
	9	149	5745	5,745.00271	-0.00000047

2 minutes

Operation Mode	802.11 a	Test Date	2019.12.25
Temperature	: 23.6°C	Test By	Gary
Humidity	: 60%		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
-30	30	149	5745	5,744.99849	0.00000026
	9	149	5745	5,744.99829	0.00000030
25	12	149	5745	5,745.00658	-0.00000115
70	30	149	5745	5,745.00444	-0.00000077
	9	149	5745	5,745.00246	-0.00000043

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5 minutes

Operation Mode	802.11 a	Test Date	2019.12.25
Temperature	: 23.6°C	Test By	Gary
Humidity	: 60%		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
-30	30	149	5745	5,744.99893	0.0000019
	9	149	5745	5,744.99623	0.0000066
25	12	149	5745	5,745.00340	-0.0000059
70	30	149	5745	5,745.00164	-0.0000029
	9	149	5745	5,745.00389	-0.0000068

10 minutes

Operation Mode	802.11 a	Test Date	2019.12.25
Temperature	: 23.6°C	Test By	Gary
Humidity	: 60%		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
-30	30	149	5745	5,744.99389	0.0000106
	9	149	5745	5,744.99212	0.0000137
25	12	149	5745	5,745.00009	-0.0000002
70	30	149	5745	5,745.00351	-0.0000061
	9	149	5745	5,745.00220	-0.0000038

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14 ANTENNA REQUIREMENT

14.1 Standard Applicable

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.

According to §15.407, If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

14.2 Antenna Connected Construction

The antenna is designed with unique RF connector and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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