

FCC PART 15.407

TEST REPORT

For

ShenZhen LanGi Technology Co. LTD.

Room 201, Block A, No.1, QianWan Road, Qianhai Shenzhen-Hongkong Cooperative Zone,
Shenzhen, Guangdong, China

FCC ID: 2ANTJ6001000RT

Report Type: Original Report	Product Type: Wireless Video Transmisson
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ShenZhen LanGi Technology Co. LTD.'s product, model number: SH700M (FCC ID: 2ANTJ6001000RT) in this report was a Wireless Video Transmisson, which was measured approximately: 143 mm (L) × 80 mm (W) × 40 mm (H) , rated with input voltage: DC 7.2 V.

Notes: This series product models: SH1000M, 600M, 1000M, 600M-ENG, 1000M-ENG and SH700M are identical; they have the same or similar appearance, structure, PCB, Material and function to the testing product. Model SH700M was selected for fully testing, the detailed information can be referred to the attached declaration which was stated and guaranteed by the applicant.

**All measurement and test data in this report was gathered from production sample serial number: 1702058 (Assigned by BACL, shenzhen).The EUT supplied by the applicant was received on 2017-09-11.*

Objective

This type approval report is prepared on behalf of ShenZhen LanGi Technology Co. LTD. in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.209 and 15.407 rules.

Related Submittal(s)/Grant(s)

No related submissions.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter	uncertainty
Occupied Channel Bandwidth	±5%
RF Output Power with Power meter	±0.5dB
RF conducted test with spectrum	±1.5dB
AC Power Lines Conducted Emissions	±1.95dB
All emissions, radiated	±4.88dB
Temperature	-30~60 °C
Humidity	±6%
Supply voltages	±0.4%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

Bay Area Compliance Laboratories Corp. (Shenzhen) has been accredited to ISO/IEC 17025 by CNAS (Lab code: L2408). And accredited to ISO/IEC 17025 by NVLAP (Lab code: 200707-0), the FCC Designation No. CN5001 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Shenzhen) was registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer.

EUT Exercise Software

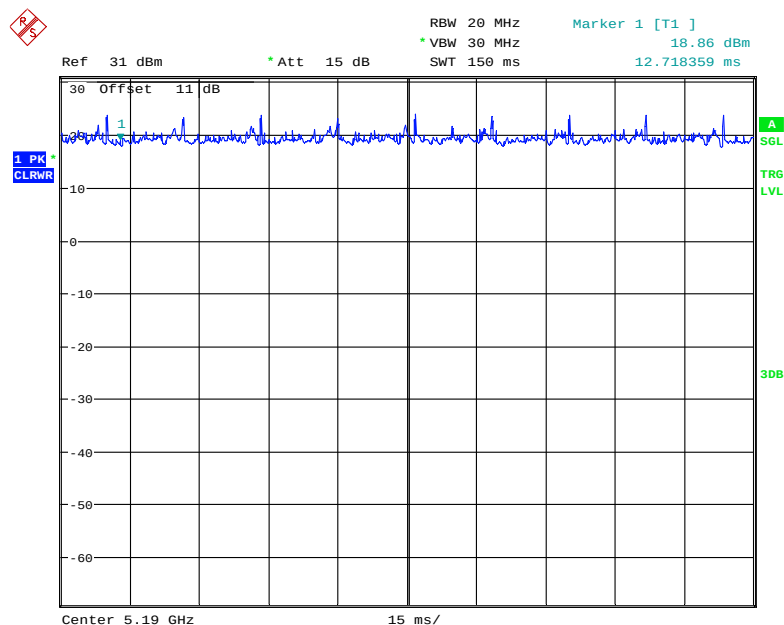
“AppCom-setup-.03.16” software was used for enter testing mode, meanwhile, a HDMI signal need input to the EUT.

The ANT 1 & ANT 2 were tested with the worst case was performed as below:

Modulation type	Power level			
	5190MHz	5230MHz	5755MHz	5795MHz
OFDM	70	70	70	70

Duty cycle

Channel 5190MHz



Date: 11.OCT.2017 13:21:54

Channel	Duty Cycle (%)	T(ms)	1/T(kHz)	VBW Setting	10log(1/x)
5190MHz	100	-	-	10Hz	-

Equipment Modifications

No modification was made to the EUT tested.

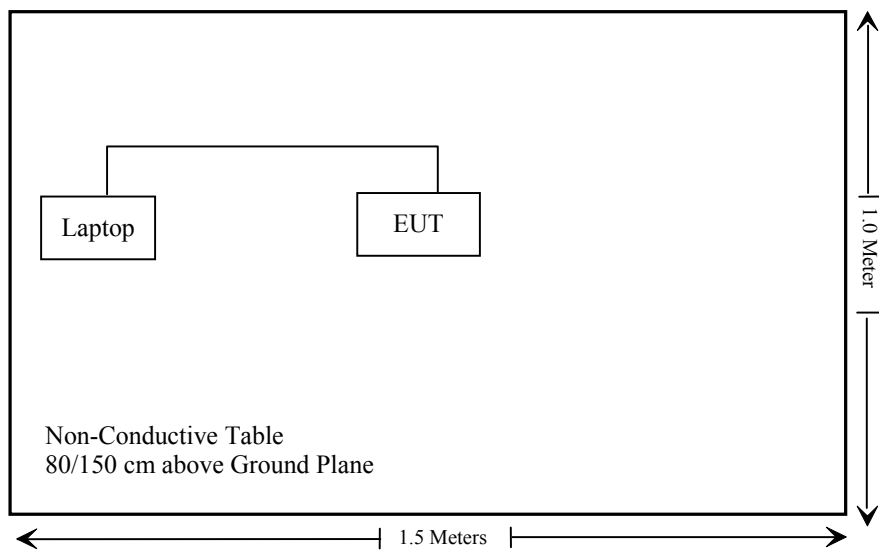
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HP	Laptop	516	Gjh511644g

External I/O Cable

Cable Description	Length (m)	From Port	To
shielded detachable HDMI cable	1.0	EUT	Laptop

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6)& §15.207(a)	Conducted Emissions	Not Applicable
§15.205& §15.209 &§15.407(b) (1),(4),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(b) (1),(4)	Out Of Band Emission	Compliance
§15.407(a) (1),(5),(e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliance
§15.407(g)	Frequency Stability	Compliance
§15.407(a)(1),(3)	Conducted Transmitter Output Power	Compliance
§15.407 (a)(1),(3)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2014-12-29	2017-12-28
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2017-04-24	2018-04-24
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-17	2017-12-16
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-02-14	2018-02-14
HP	Amplifier	HP8447E	1937A01046	2017-05-21	2017-11-19
Anritsu	Signal Generator	68369B	004114	2016-12-05	2017-12-05
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2016-12-07	2017-12-07
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	104PEA	218124002	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	1	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	2	2017-05-22	2017-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2014-12-29	2017-12-28
Ducommun Technologies	Horn Antenna	ARH-4823-02	1007726-04	2014-12-29	2017-12-28
Ducommun Technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2016-12-05	2017-12-05
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2016-11-22	2017-11-22
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR
Fluke	Digital Multimeter	287	19000011	2017-04-09	2018-04-09
Agilent	Power Meter	N1912A	MY5000492	2016-11-18	2017-11-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	837405/023	2017-04-24	2018-04-24
Agilent	Power Sensor	N1921A	MY54210024	2016-11-18	2017-11-17
Ducommun technologies	RF Cable	RG-214	3	2017-05-22	2017-11-22
WEINSCHEL	10dB Attenuator	5324	AU 3842	2017-05-23	2017-11-22

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

§1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
5150-5250	3.5	2.24	23.5	223.87	20	0.10	1.0
5725-5825	3.5	2.24	24	251.19	20	0.11	1.0

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

This product has two external antennas which used a unique type connector attached to the EUT with maximum gain 3.5 dBi, fulfill the requirement of this section, and please refer to the EUT photo.

Result: Compliance.

§15.205 & §15.209 & §15.407(B) (1),(4),(6),(7) – UNDESIRABLE EMISSION**Applicable Standard**

FCC §15.407 (b) (1), (4), (6), (7); §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, 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.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) 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.

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

KDB 789033 D02 General UNII Test Procedures New Rules v01r04, clause II.G 1 d),

(ii) $E [dB\mu V/m] = EIRP [dBm] + 95.2$, for $d = 3$ meters.

KDB 644545 D03 Guidance for IEEE 802.11ac New Rules v01 clause E.3)

The general limit of -27 dBm EIRP (= 68 dB μ V/m) is applied for unwanted emission of U-NII devices.

However, compliance with unwanted emissions in restricted bands may need to be considered, *e.g.*, some harmonics may land in the restricted bands below 5.15 GHz and above 5.35 GHz (refer

The general limit of -27 dBm EIRP (= 68 dB μ V/m) is applied for unwanted emission of U-NII devices.

However, compliance with unwanted emissions in restricted bands may need to be considered, *e.g.*, some harmonics may land in the restricted bands below 5.15 GHz and above 5.35 GHz (refer to § 15.205 for restricted bands) that have average and peak limits specified in §§ 15.209 and 15.35(b), respectively.

Although the peak limit of 74 dB μ V/m (20 dB above 54 dB μ V/m) in the restricted band appears to be higher than 68 dB μ V/m, the lower average limit of 54 dB μ V/m in the restricted bands needs to be complied to

As to transmitters operating in the 5.725-5.85 GHz band, the strictest limit was applied for undesirable emissions, performed as below:

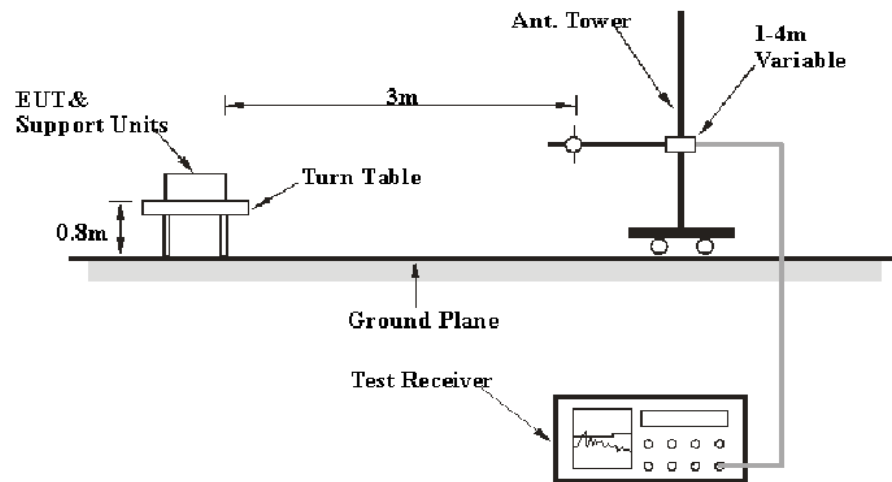
1) For 25MHz-75 MHz above or below the band edge, a level of -27 dBm/MHz (68.2dB μ V/m) was applied.

2) For 5MHz-25 MHz above or below the band edge, a level of 10 dBm/MHz (105.2dB μ V/m) was applied.

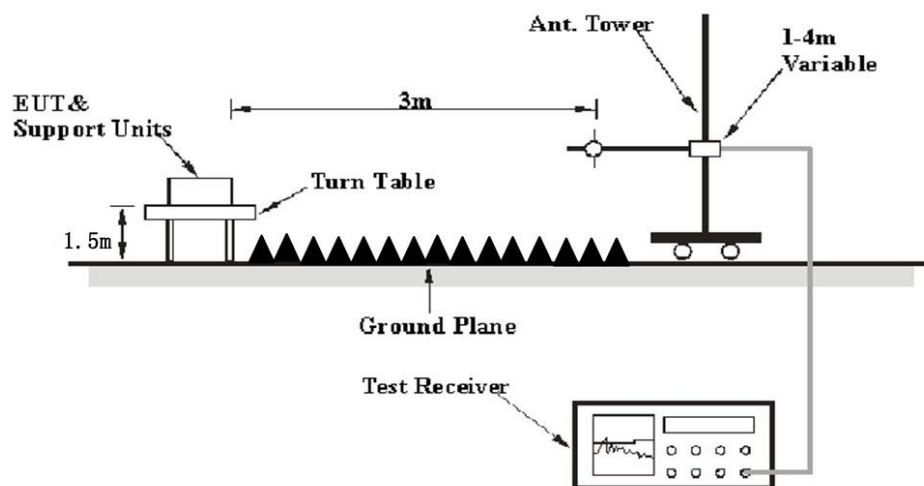
2) For 0MHz-5 MHz above or below the band edge, a level of 15.6 dBm/MHz (110.8dB μ V/m) was applied.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1MHz	10 Hz ^{Note 1}	/	Average
	1MHz	> 1/T ^{Note 2}	/	Average

Note 1: when duty cycle is no less than 98%

Note 2: when duty cycle is less than 98%

Test Procedure

Radiated Spurious Emission

During the radiated emission test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all the installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz, peak and Average detection modes for frequencies above 1GHz.

According to KDB 789033, the limit is $E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2$, for $d = 3$ meters.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Vincent Zheng on 2017-09-14.

EUT operation mode: Transmitting (simultaneous transmission for all the two antennas)

30 MHz ~ 40 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
5190 MHz									
148.3	41.38	QP	60	2.1	H	-4.5	36.88	43.5	6.62
5190.00	68.72	PK	265	2.4	H	41.84	110.56	/	/
5190.00	50.46	Ave.	265	2.4	H	41.84	92.30	/	/
5190.00	69.67	PK	290	1.7	V	41.84	111.51	/	/
5190.00	51.14	Ave.	290	1.7	V	41.84	92.98	/	/
5134.06	24.71	PK	340	1.8	V	41.84	66.55	74	7.45
5134.06	4.53	Ave.	340	1.8	V	41.84	46.37	54	7.63
5143.08	26.08	PK	325	1.5	V	41.84	67.92	74	6.08
5143.08	4.62	Ave.	325	1.5	V	41.84	46.46	54	7.54
10380.00	30.16	PK	211	1.7	V	25.88	56.04	74	17.96
10380.00	17.06	Ave.	211	1.7	V	25.88	42.94	54	11.06
5230 MHz									
148.3	42.15	QP	114	1.8	H	-4.5	37.65	43.5	5.85
5230.00	67.78	PK	335	2.3	H	41.84	109.62	/	/
5230.00	48.36	Ave.	335	2.3	H	41.84	90.20	/	/
5230.00	69.27	PK	99	1.4	V	41.84	111.11	/	/
5230.00	51.74	Ave.	99	1.4	V	41.84	93.58	/	/
5142.98	20.68	PK	191	1.1	V	41.84	62.52	74	11.48
5142.98	4.21	Ave.	191	1.1	V	41.84	46.05	54	7.95
5142.98	19.44	PK	337	1.2	V	41.84	61.28	74	12.72
5142.98	4.22	Ave.	337	1.2	V	41.84	46.06	54	7.94
10460.00	29.59	PK	222	1.6	V	26.78	56.37	74	17.63
10460.00	16.19	Ave.	222	1.6	V	26.78	42.97	54	11.03

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
5755 MHz									
148.3	40.87	QP	105	1.9	H	-4.5	36.37	43.5	7.13
5755.00	70.27	PK	315	1.7	H	42.12	112.39	/	/
5755.00	53.88	Ave.	315	1.7	H	42.12	96.00	/	/
5755.00	73.73	PK	211	2.2	V	42.12	115.85	/	/
5755.00	58.64	Ave.	211	2.2	V	42.12	100.76	/	/
5699.77	50.72	PK	188	1.0	V	42.19	92.91	105.03	12.12
5718.32	54.09	PK	188	1.0	V	42.19	96.28	110.33	14.05
5720.67	53.42	PK	343	1.3	V	42.19	95.61	112.33	16.72
5861.42	28.42	PK	343	1.3	V	42.59	71.01	109	37.99
11510.00	30.71	PK	60	2.3	V	26.62	57.33	74	16.67
11510.00	16.49	Ave.	60	2.3	V	26.62	43.11	54	10.89
5795 MHz									
148.3	41.74	QP	25	1.5	H	-4.5	37.24	43.5	6.26
5795.00	69.44	PK	332	1.9	H	42.12	111.56	/	/
5795.00	48.80	Ave.	332	1.9	H	42.12	90.92	/	/
5795.00	73.00	PK	357	2.4	V	42.12	115.12	/	/
5795.00	58.20	Ave.	357	2.4	V	42.12	100.32	/	/
5697.19	33.14	PK	303	1.1	V	42.19	75.33	103.12	27.79
5708.16	37.49	PK	303	1.1	V	42.19	79.68	107.48	27.80
5720.28	35.85	PK	52	1.5	V	42.19	78.04	111.44	33.40
5850.15	38.65	PK	52	1.5	V	42.59	81.24	121.86	40.62
11590.00	29.22	PK	66	2.4	V	27.15	56.37	74	17.63
11590.00	15.77	Ave.	66	2.4	V	27.15	42.92	54	11.08

Note:

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

Margin = Limit- Corr. Amplitude

Spurious emissions more than 20 dB below the limit were not reported.

§15.407(B) (1),(4) –OUT OF BAND EMISSION

Applicable Standard

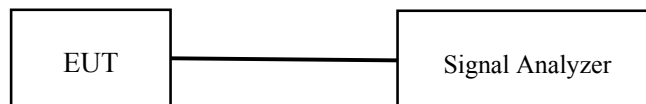
FCC §15.407 (b) (1), (4);

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

For transmitters operating in the 5.725–5.825 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.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The Resolution bandwidth is set to 1MHz, The Video bandwidth is set to ≥ 1 MHz, report the peak value out of the operating band.
3. Repeat above procedures until all frequencies measured were complete.



Test Data

Environmental Conditions

Temperature:	22~25 °C
Relative Humidity:	52~56 %
ATM Pressure:	100~101.0 kPa

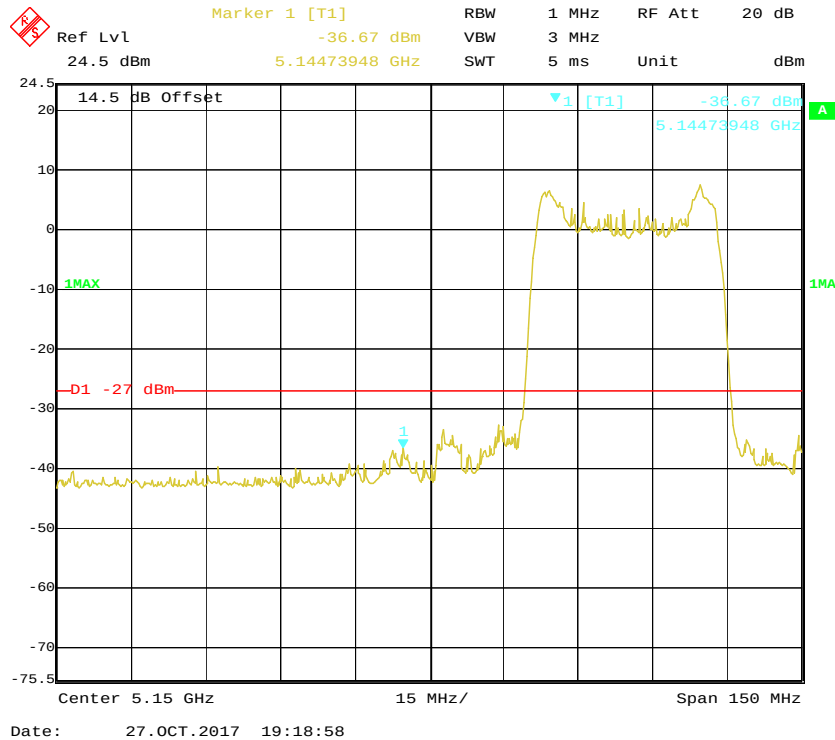
The testing was performed by Vincent Zheng on 2017-10-27.

EUT operation mode: Transmitting

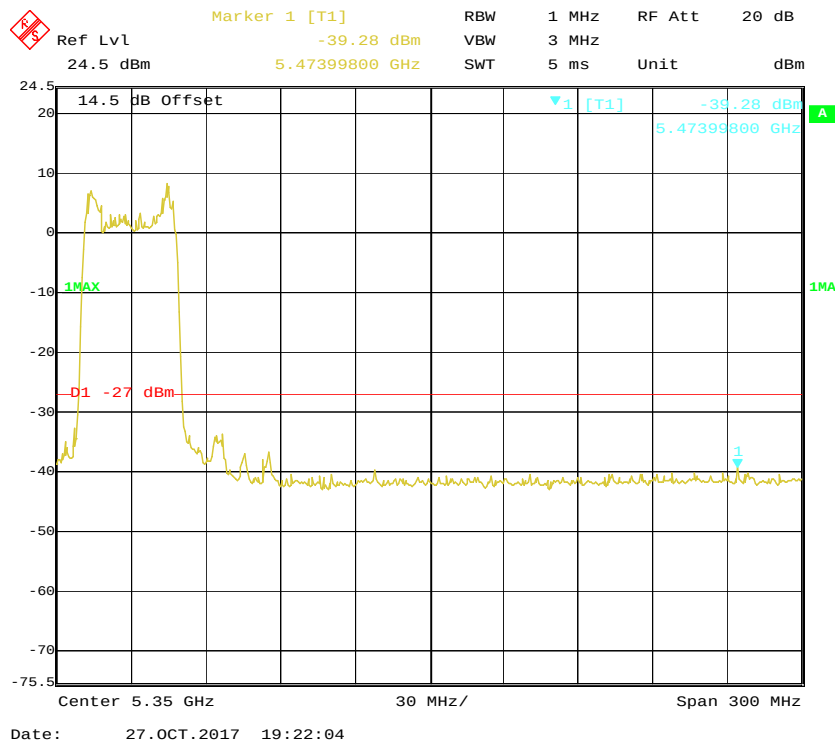
Note: The antenna gain had been offset in the plots, the limit is EIRP. All the margin of every plots are larger than 3dB, so the MIMO result is ok

5150 – 5250 MHz: Antenna 1

Band Edge, Left Side

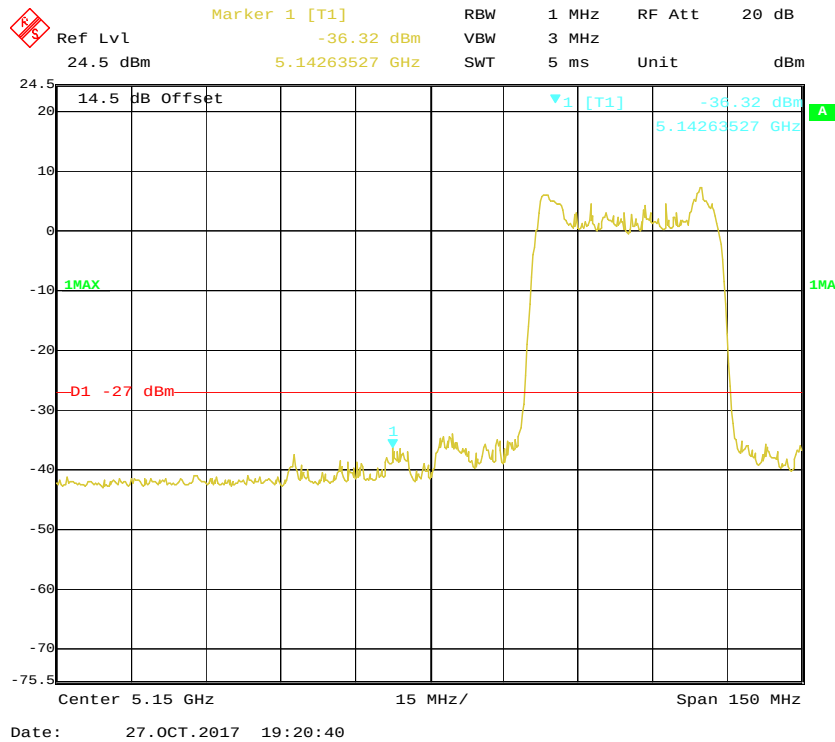


Band Edge, Right Side

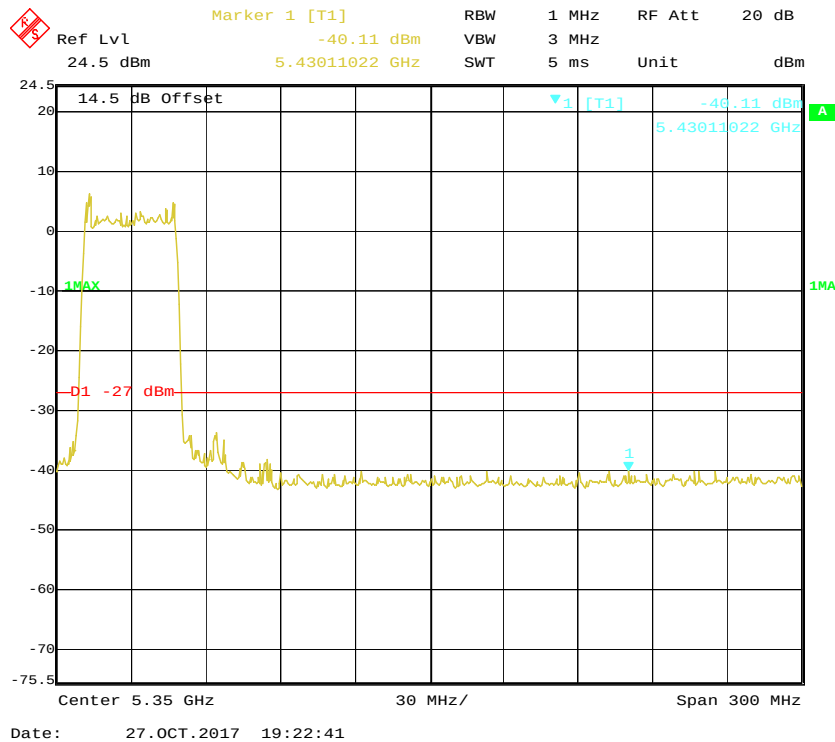


5150 – 5250 MHz, Antenna 2:

Band Edge, Left Side

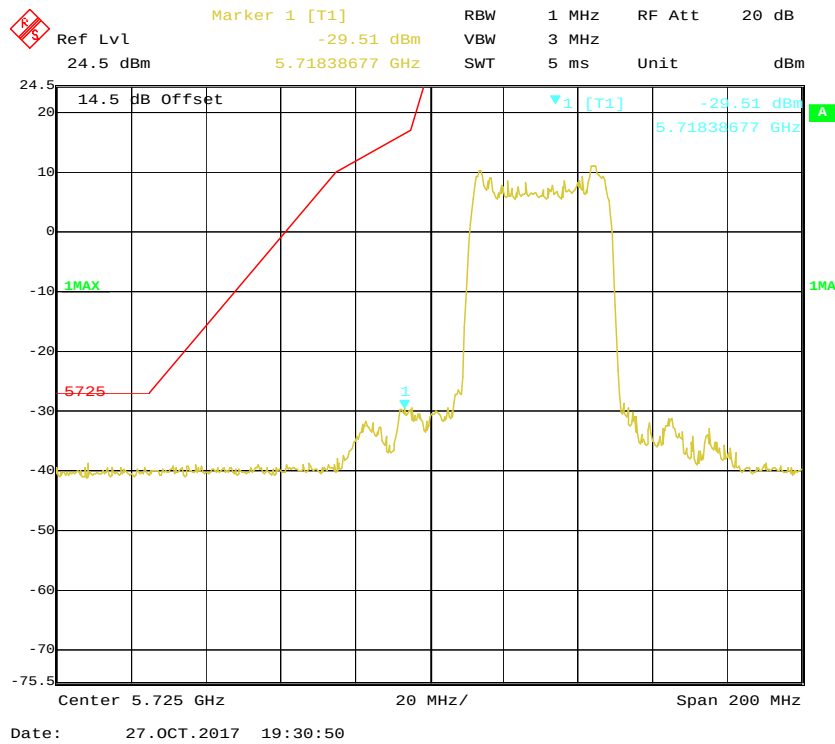


Band Edge, Right Side

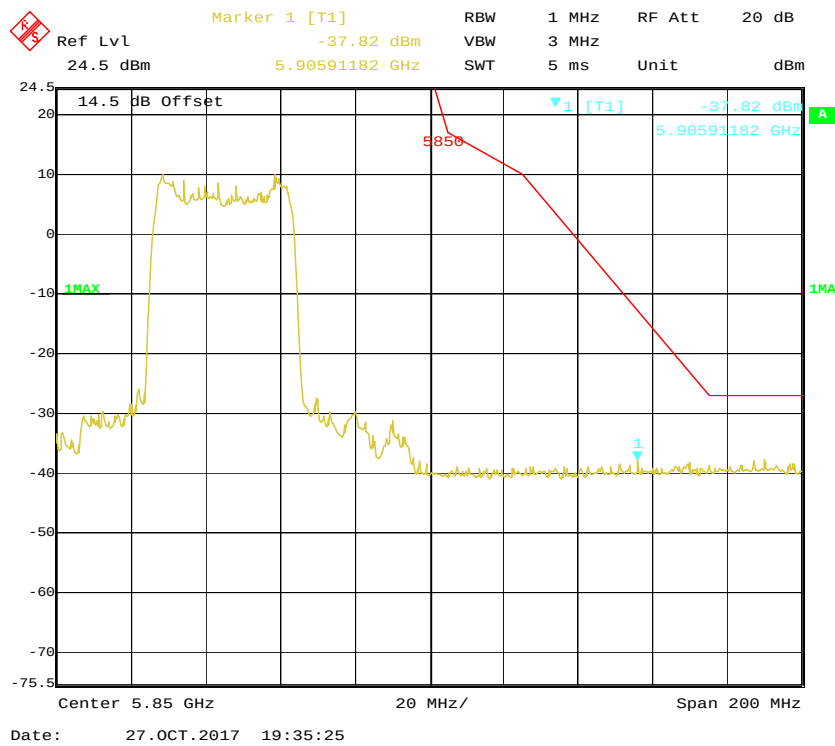


5725 – 5850 MHz, Antenna 1:

Band Edge, Left Side

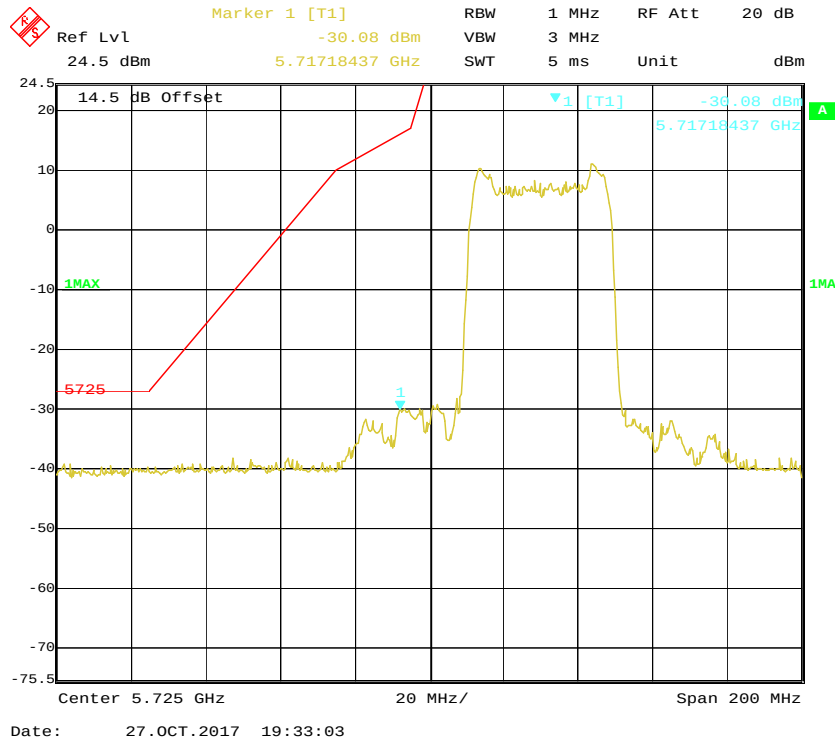


Band Edge, Right Side

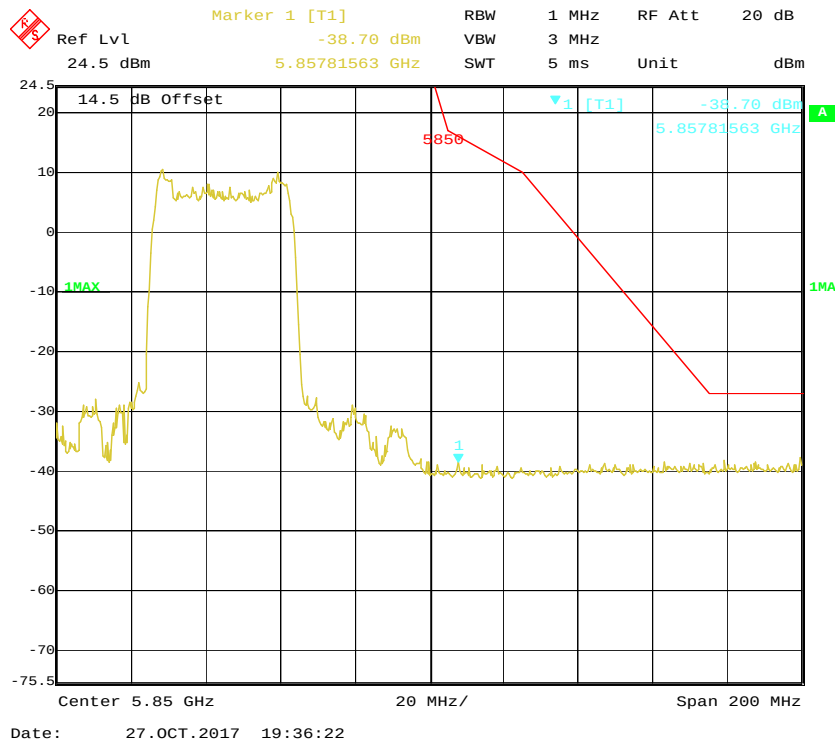


5725 – 5850 MHz, Antenna 2:

Band Edge, Left Side



Band Edge, Right Side



FCC §15.407(a) (1) – 26 dB & 6dB EMISSION BANDWIDTH

Applicable Standard

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure

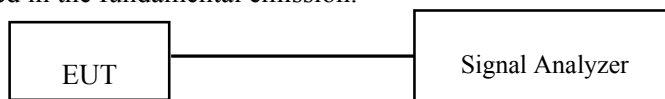
1. Emission Bandwidth (EBW)

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

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



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Vincent Zheng on 2017-09-14.

EUT operation mode: Transmitting

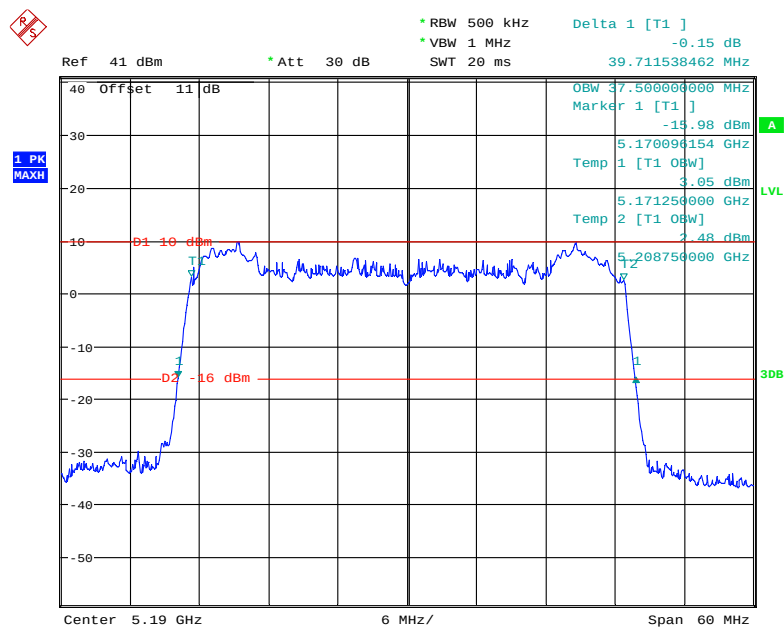
Test Result: Pass; please refer to the following tables and plots.

5120 MHz - 5250 MHz:

Antenna 1

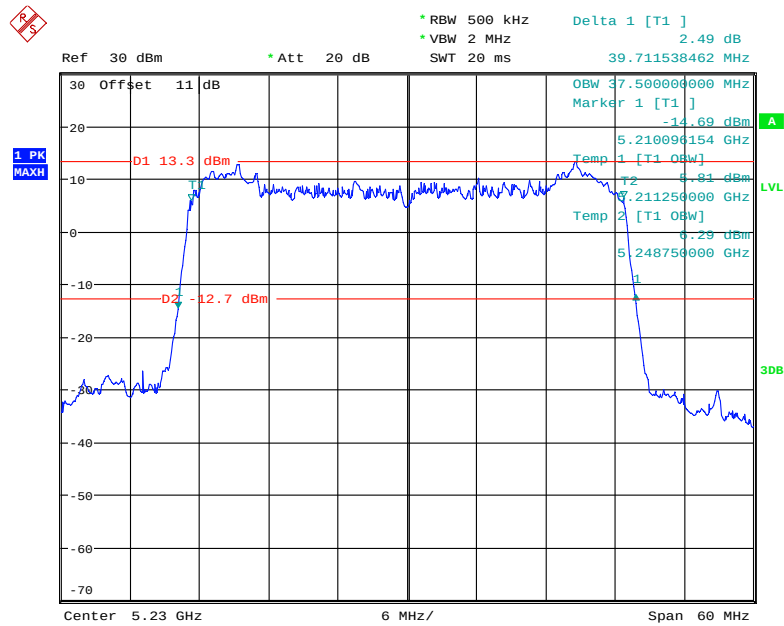
Frequency (MHz)	26dB Emission Bandwidth (MHz)	99% dB Bandwidth (MHz)
5190	39.71	37.50
5230	39.71	37.50

26dB & 99% Bandwidth, 5190 MHz



Date: 14.SEP.2017 15:41:14

26dB & 99% Bandwidth, 5230 MHz



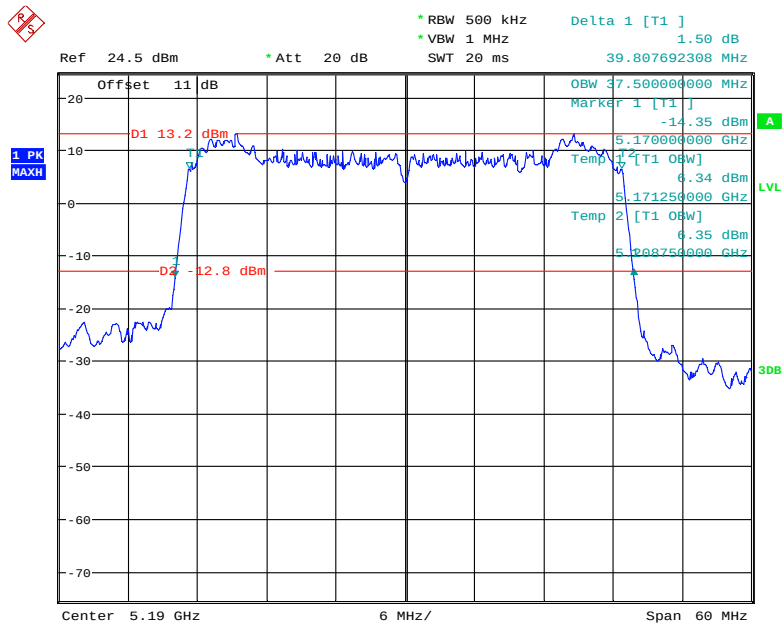
Date: 14.SEP.2017 16:30:15

5120 MHz - 5250 MHz:

Antenna 2

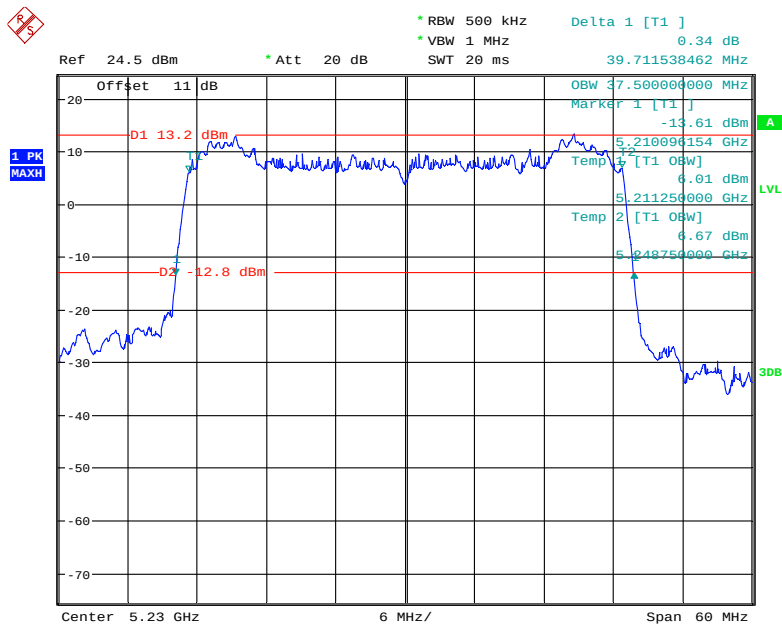
Frequency (MHz)	26dB Emission Bandwidth (MHz)	99% dB Bandwidth (MHz)
5190	39.81	37.50
5230	39.71	37.50

26dB & 99% Bandwidth, 5190 MHz



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26dB & 99% Bandwidth, 5230 MHz



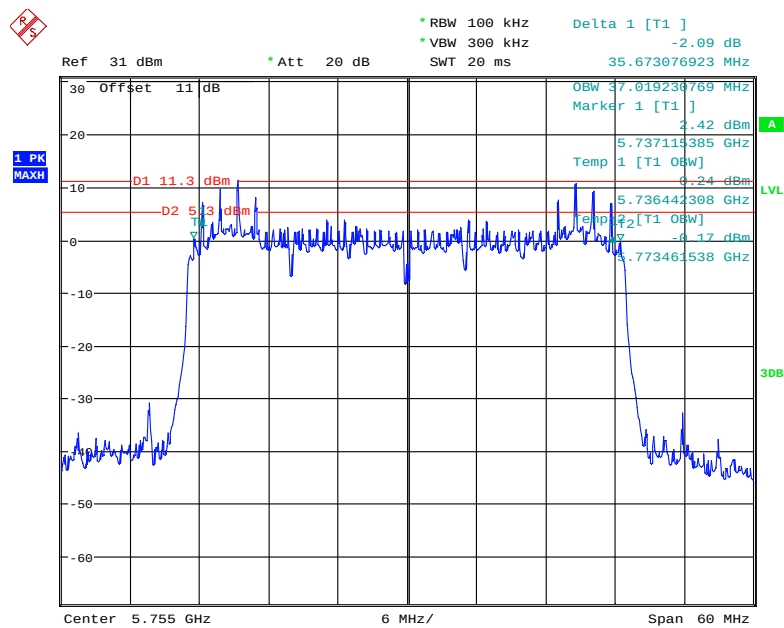
Date: 14.SEP.2017 16:10:21

5725 MHz – 5850 MHz:

Antenna 1

Frequency (MHz)	6dB Emission Bandwidth (MHz)	99% dB Bandwidth (MHz)
5755	35.67	37.02
5795	35.67	37.02

6dB & 99% Bandwidth, 5755 MHz



Date: 14.SEP.2017 17:03:23

1 PK
MAXH

Ref 31 dBm * Att 20 dB * RBW 100 kHz * VBW 300 kHz * Delta 1 [T1] 0.26 dB
SWT 20 ms 35.673076923 MHz

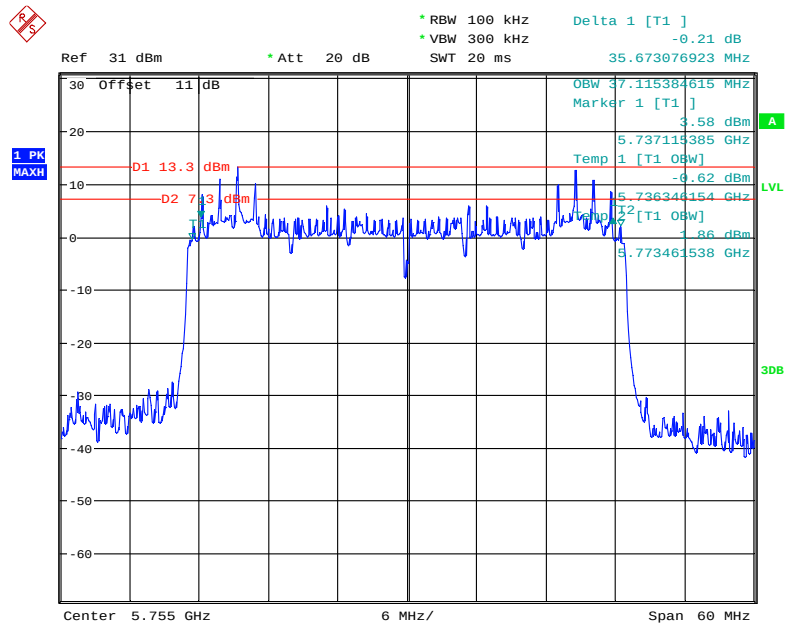
30 Offset 11 dB
OBW 37.019230769 MHz
Marker 1 [T1]
3.11 dBm
5.777115385 GHz
Temp 1 [T1 OBW]
-0.06 dBm
D1 10.81 dBm
D2 4.81 dBm
5.776442308 GHz
SNR 2 [T1 OBW]
-0.49 dBm
5.813461538 GHz

Center 5.795 GHz 6 MHz/ Span 60 MHz

5725 MHz – 5850 MHz:

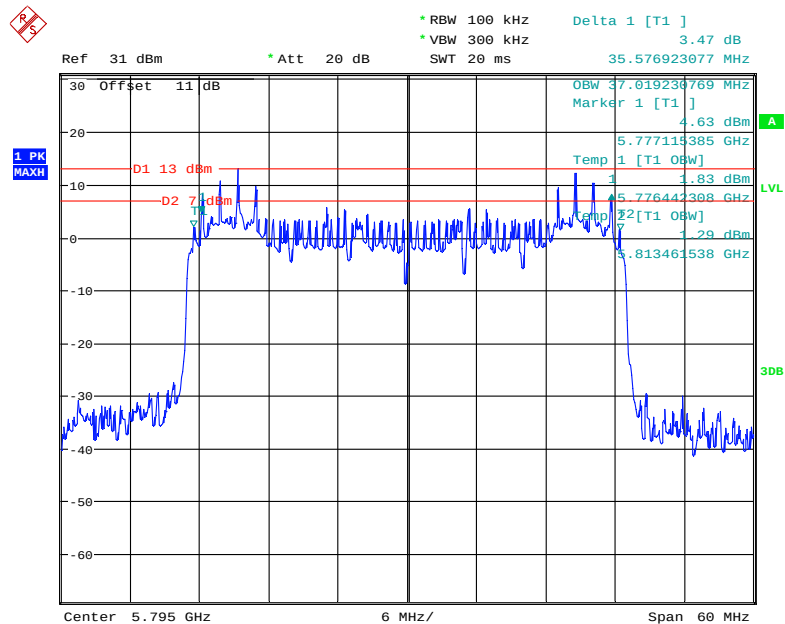
Frequency (MHz)	6dB Emission Bandwidth (MHz)	99% dB Bandwidth (MHz)
5755	35.67	37.12
5795	35.58	37.02

6dB & 99% Bandwidth, 5755 MHz



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6dB & 99% Bandwidth, 5795 MHz



Date: 14.SEP.2017 17:24:23

FCC §15.407(a) (1) (3)– CONDUCTED TRANSMITTER OUTPUT POWER**Applicable Standard**

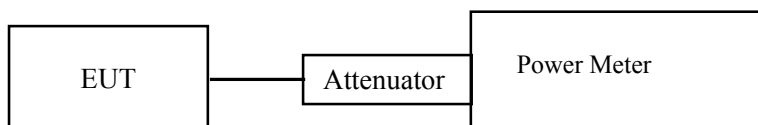
For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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.

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. 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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

**Test Data****Environmental Conditions**

Temperature:	26 °C
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Vincent Zheng 2017-09-14.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables.

5150 MHz – 5250 MHz:

Frequency (MHz)	Antenna Port	Average Output Power (dBm)	Average Output Power (dBm) Ant 1+ Ant 2	Limit (dBm)
5190	1	18.22	22.47	30
	2	20.43		
5230	1	20.02	23.29	
	2	20.52		

5725 MHz – 5825 MHz:

Frequency (MHz)	Antenna Port	Average Output Power (dBm)	Average Output Power (dBm) Ant 1+ Ant 2	Limit (dBm)
5755	1	19.87	23.52	30
	2	21.07		
5795	1	19.21	23.08	
	2	20.79		

NOTE: EUT is a indoor device.

FCC §15.407(g) – FREQUENCY STABILITY

Applicable Standard

FCC §15.407(G)

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 users manual.

Test Procedure

According to ANSI C63.10-2013 §6.8

Some unlicensed wireless device requirements specify frequency stability tests with variation of supply voltage and temperature; the requirements can be found in the regulatory specifications for each type of unlicensed wireless device. The procedures listed in 6.8.1 and 6.8.2 shall be used for frequency stability tests.

Test Data

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Vincent Zheng 2017-09-15.

EUT operation mode: Transmitting

Test Result: Pass

Antenna 1:

Test Condition		Frequency (MHz)			
Temperature (°C)	Voltage (V _{DC})	f _L at Low Channel	f _H at High Channel	f _L Limit	f _H Limit
5150-5250					
-10	7.2	5171.2473	5248.7494	5150	5250
0		5171.2533	5248.7497	5150	5250
10		5171.2545	5248.7483	5150	5250
20		5171.2500	5248.7500	5150	5250
30		5171.2539	5248.7487	5150	5250
40		5171.2535	5248.7468	5150	5250
50		5171.2439	5248.7487	5150	5250
20	6.12	5171.2516	5248.7508	5150	5250
	8.28	5171.2527	5248.7494	5150	5250
5725-5850					
-10	7.2	5736.4452	5813.4593	5725	5850
0		5736.4421	5813.4605	5725	5850
10		5736.4431	5813.4579	5725	5850
20		5736.4423	5813.4615	5725	5850
30		5736.4426	5813.4588	5725	5850
40		5736.4444	5813.4591	5725	5850
50		5736.4461	5813.4611	5725	5850
20	6.12	5736.4435	5813.4569	5725	5850
	8.28	5736.4423	5813.4576	5725	5850

Note: F_L is the mark of low channel's OBW edge, and F_H is the mark of high channel's OBW edge.
The manufactor declared the operating temperature range is -10 ~ 50 °C.

FCC §15.407(a) (1) (5) - POWER SPECTRAL DENSITY

Applicable Standard

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

For devices operating in the bands 5.15-5.25 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

- a) Set $RBW \geq 1/T$, where T is defined in section II.B.1.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log(500 \text{ kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10 \log(1\text{MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Vincent Zheng on 2017-09-14.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables and plots.

Note: This Device Emploies Cyclic Delay Diversity.

When determining reductions in power spectral density limits, array gain is calculated as follows:

Array gain = $10 \log(N_{\text{ANT}})$, where N_{ANT} is the number of transmit antennas.

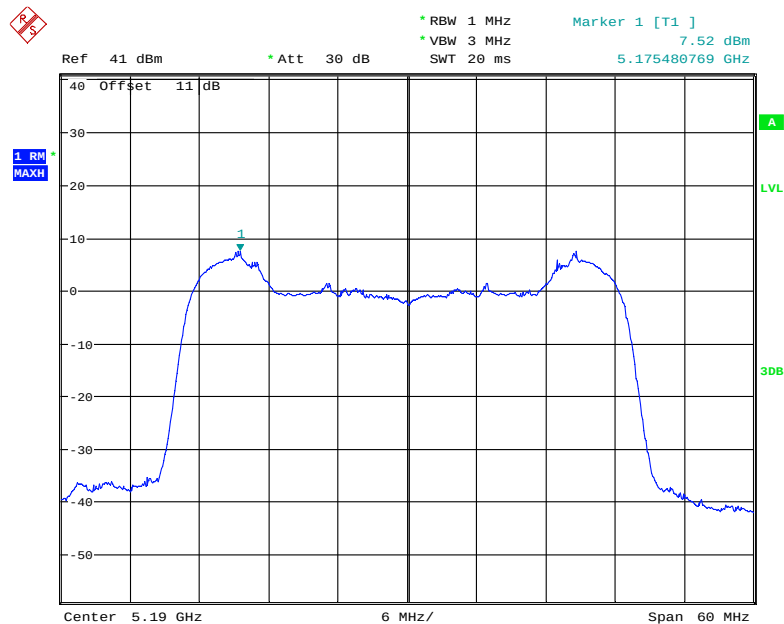
Total directional gain (dBi) = gain of individual transmit antennas (dBi) + 3.0 (dB) = 6.5dBi.

So the limit of power spectral density should be subtracted 0.5dB.

5150 MHz – 5250 MHz:

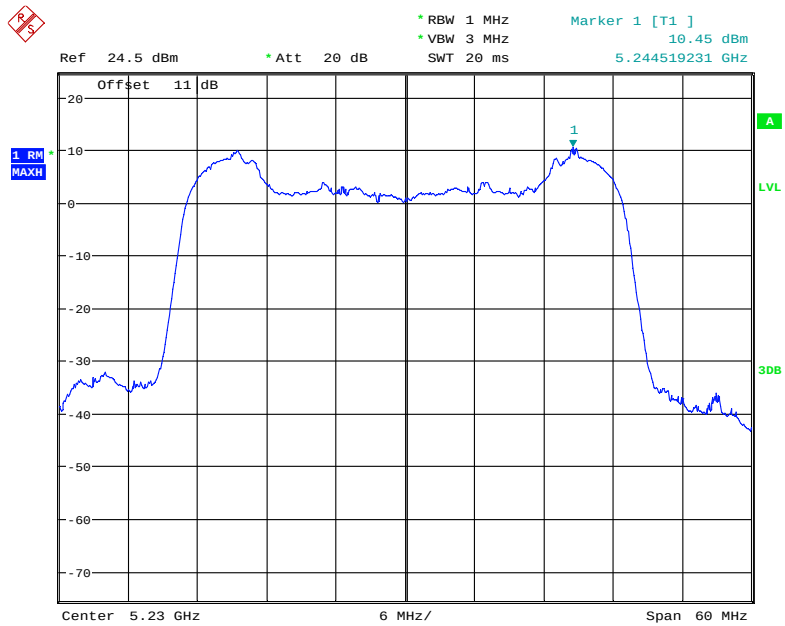
Frequency (MHz)	Antenna Port	Power Spectral Density (dBm/MHz)	Power spectral density (dBm/MHz) Ant 1+Ant 2	Limit (dBm/MHz)
5190	1	7.52	11.45	16.5
	2	9.19		
5230	1	10.45	13.64	
	2	10.80		

Antenna 1

Power Spectral Density, 5190 MHz

Date: 14.SEP.2017 15:45:58

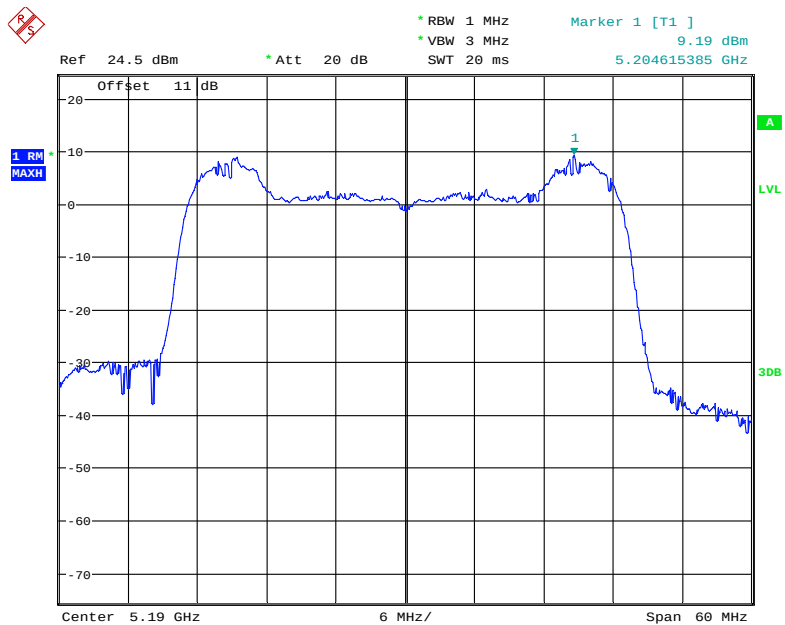
Power Spectral Density, 5230 MHz



Date: 14.SEP.2017 16:24:53

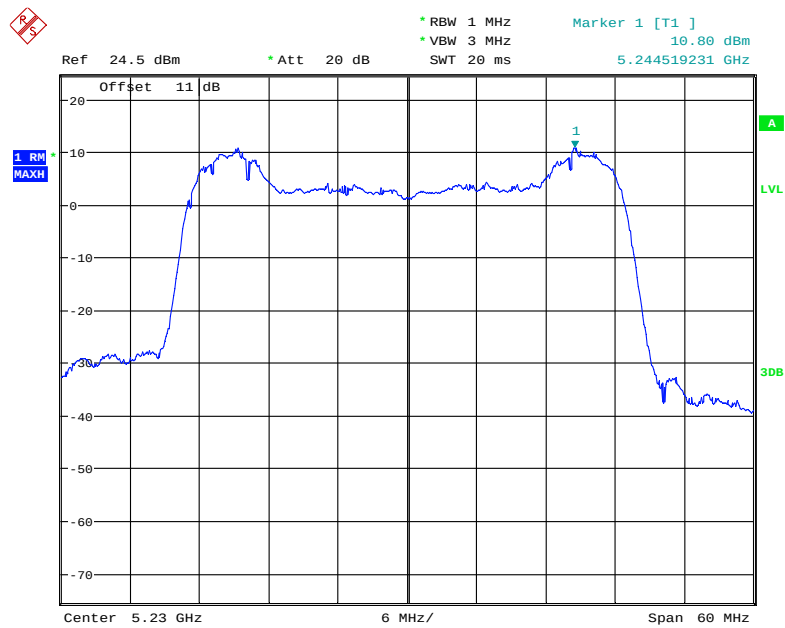
Antenna 2

Power Spectral Density, 5190 MHz



Date: 14.SEP.2017 15:55:39

Power Spectral Density, 5230 MHz



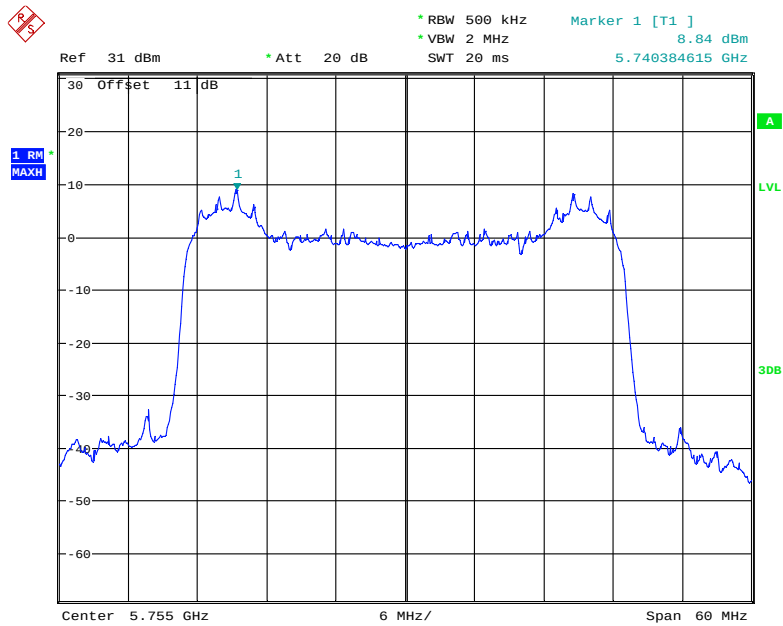
Date: 14.SEP.2017 16:13:31

5725 MHz – 5825 MHz:

Frequency (MHz)	Antenna Port	Power Spectral Density (dBm/500kHz)	Power spectral density (dBm/500kHz) Ant 1+Ant 2	Limit (dBm/500kHz)
5755	1	8.84	12.93	29.5
	2	10.78		
5795	1	8.22	12.63	
	2	10.68		

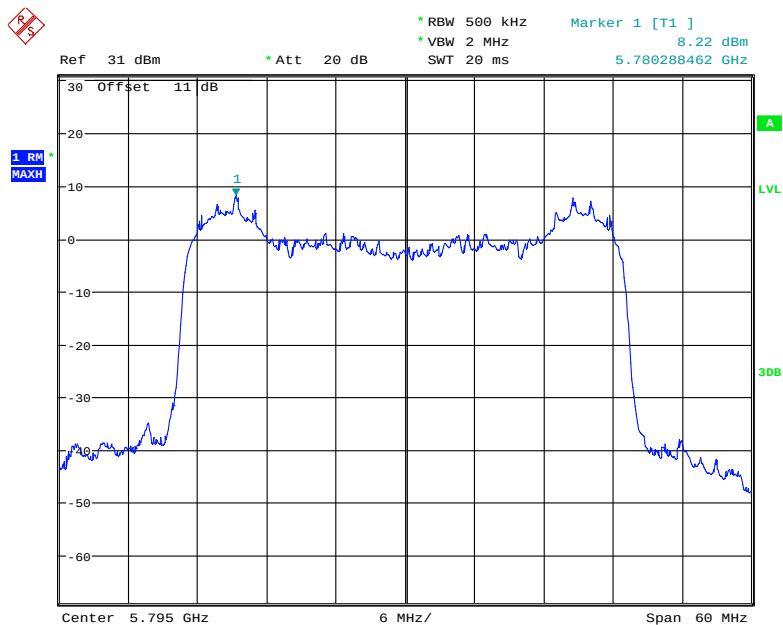
Antenna 1

Power Spectral Density, 5755 MHz



Date: 14.SEP.2017 17:07:24

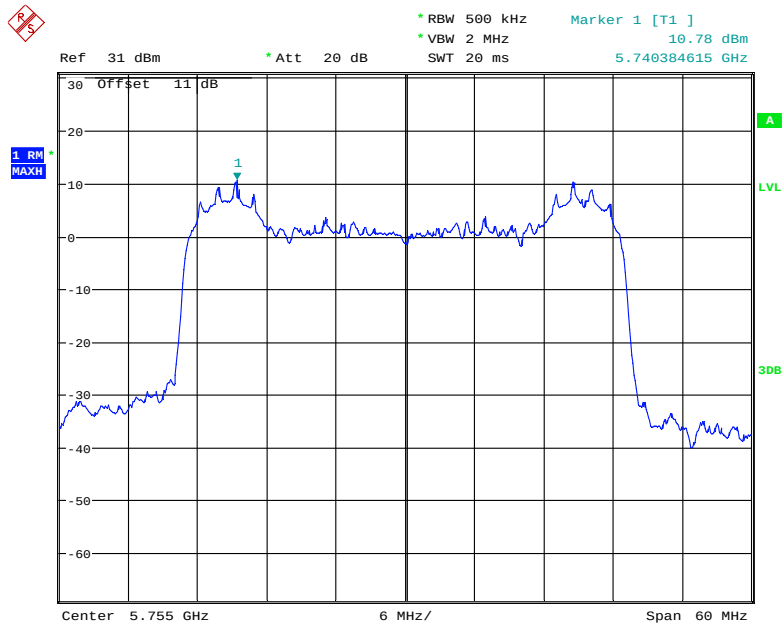
Power Spectral Density, 5795 MHz



Date: 14.SEP.2017 17:18:15

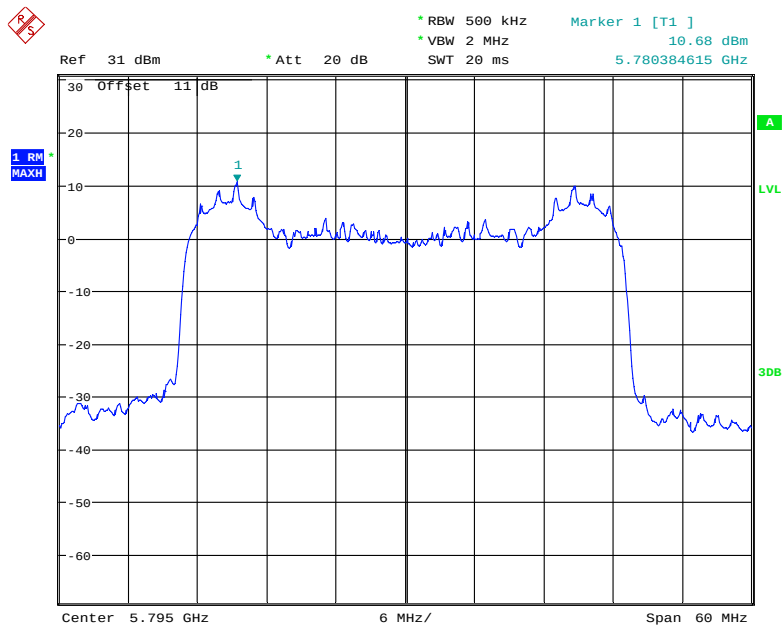
Antenna 2

Power Spectral Density, 5755 MHz



Date: 14.SEP.2017 16:57:23

Power Spectral Density, 5795 MHz



Date: 14.SEP.2017 17:32:26

***** END OF REPORT *****