FCC Part 15.247

TEST REPORT

For

Latchable, Inc.

450 West 33rd Street. New York, New York, 10001, United States

FCC ID: 2AK5B-C1

Report Type:	**Product Type:**
Original Report	Smart access control product with WiFi and BLE

Report Producer:	Kaylee Chiang
Report Number:	RLK1801005-00A
Report Date:	2018-01-29
Reviewed By:	Jerry Chang

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REVISION HISTORY

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
1.0	RLK1801005	RLK1801005-00A	2018.01.29	Original Report	Kaylee

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	Latchable, Inc. 450 West 33rd Street. New York, New York, 10001, United States
Manufacturer	Goldtek Technology CO., LTD. 16F., No166, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.)
Brand(Trade) Name	Latch
Product (Equipment)	Smart access control product with WiFi and BLE
Model Name	C1
Series Model	N/A
EUT Function	IEEE 802.11 bgn + BT4.0
Frequency Range	IEEE 802.11 b/g/n HT20 mode: 2412 ~ 2462 MHz BLE mode : 2402 ~ 2480 MHz
Number of Channels	IEEE 802.11 b/g/n HT20 mode: 11 Channels BLE mode : 40 Channels
Output Power	IEEE 802.11b mode: 12.69 dBm (0.018 W) IEEE 802.11g mode: 18.35 dBm (0.068W) IEEE 802.11n HT20 mode: 16.92 (0.049 W) BLE mode (C1 HomeSystem) : -2.35 dBm (0.00058 W) BLE mode (Rear Lens PCBA) : -4.21 dBm (0.00037W)
Received Date	Jan 08, 2018.
Date of Test	Jan 09, 2018 ~ Jan 29, 2018
Related Submittal(s)/Grant(s)	FCC Part 15.225 DXX with FCC ID : 2AK5B-C1
Modulation Type	IEEE 802.11b mode: CCK IEEE 802.11g/n HT 20 mode: OFDM BLE mode : GFSK 1Mbps

**All measurement and test data in this report was gathered from production sample serial number: 1801005 (Assigned by BACL, Taiwan).*

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☐ AC 120V/60Hz ☐ Adapter ☐ By Power Core
	☒ DC Type ☐ DC Power Supply ☒ Battery : 9V ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System

1.3 Objective

This report is prepared on behalf of *Latchable, Inc.*. in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC Part 15.247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

1.4 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

KDB 558074 D01 DTS Meas Guidance v04

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on
☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.
☒68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (Taiwan) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3180) and the FCC designation No.TW3180 under the Mutual Recognition Agreement (MRA) in FCC Test. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10-2013.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 974454. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 System Test Configuration

2.1 Description of Test Configuration

The system was configured for testing in engineering mode which was selected by manufacturer.

For Wi-Fi 2.4G mode, there are totally 11 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	-	-
6	2437	-	-
7	2442	-	-

For 802.11b/g/n HT20 modes: Channel 1, 6 and 11 were tested.

For BLE mode, there are totally 40 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	21	2442
1	2404	--	--
2	2406	--	--
3	2408	37	2476
--	--	38	2478
19	2440	39	2480

For BLE mode: Channel 0, 19 and 39 were tested.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the average power and PSD across all date rates bandwidths, and modulations.
Radiated below 1G were tested worst output power mode.

2.2 Equipment Modifications

No modification was made to the EUT

2.3 Description of Worst Test Configuration

Modulation Used for Conformance Test			
Configuration	**N_{TX}**	**Data Rate**	**Worst Data Rate**
802.11b mode	1	1-11 Mbps	1 Mbps
802.11g mode	1	6-54 Mbps	6 Mbps
802.11n HT 20 mode	1	MCS 0-7	MCS 0
BLE mode (C1 HomeSystem)	1	125 kbps-1 Mbps	1 Mbps
BLE mode (Rear Lens PCBA)	1	125 kbps-1 Mbps	1 Mbps

Worst Case of Power Setting				
EUT Exercise Software		Radio tool 1.01.11.11-beta		
Configuration	**N_{TX}**	**Low CH**	**Mid CH**	**High CH**
802.11b mode	1	0	0	0
802.11g mode	1	0	0	0
802.11n HT 20 mode	1	0	0	0

Worst Case of Power Setting				
EUT Exercise Software		Smart RF programe		
Configuration	**N_{TX}**	**Low CH**	**Mid CH**	**High CH**
BLE mode (C1 HomeSystem)	1	Default	Default	Default

Worst Case of Power Setting				
EUT Exercise Software		nrfgostudio_win-64_1.21.2		
Configuration	**N_{TX}**	**Low CH**	**Mid CH**	**High CH**
BLE mode (Rear Lens PCBA)	1	Default	Default	Default

2.4 Support Equipment List and Details

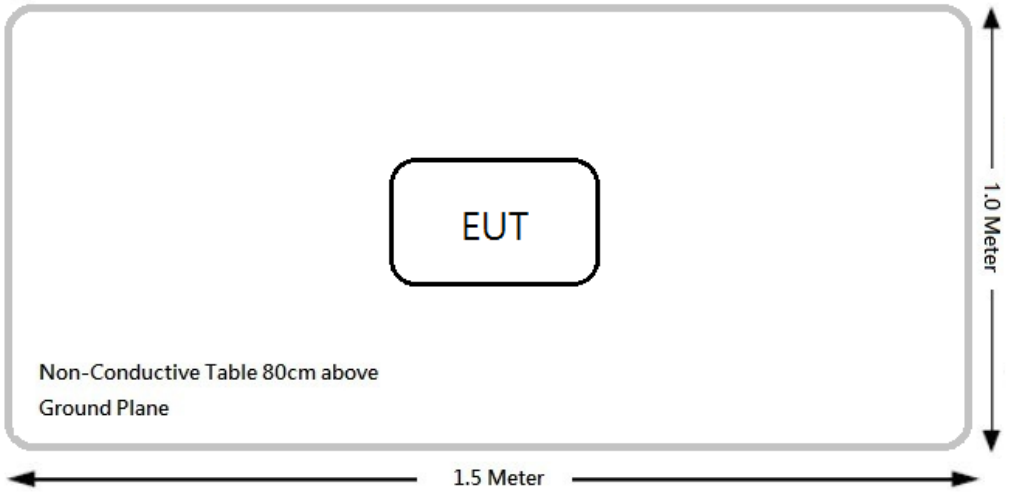
Description	Manufacturer	Model	BSMI	FCC ID / DoC
Notebook	Dell	P62G	N/A	PD98260NGU

2.5 External Cable List and Details

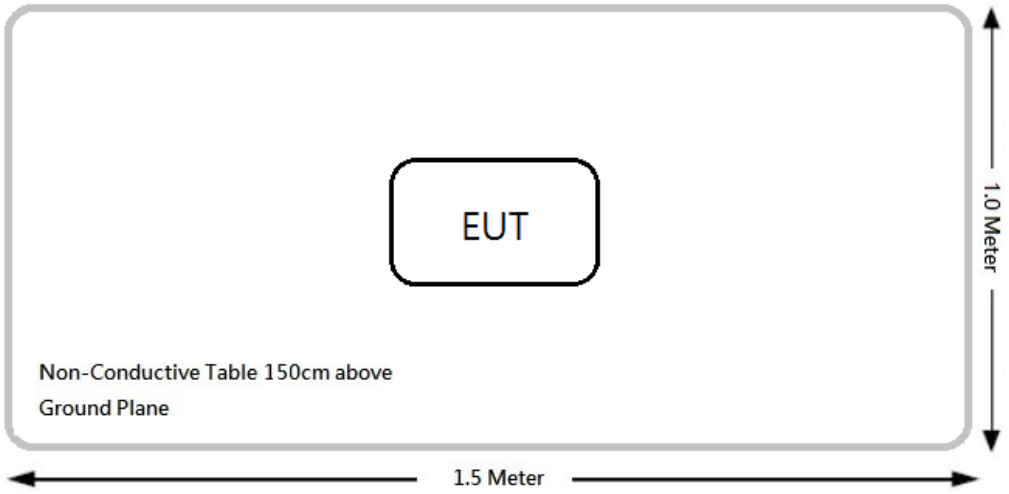
Cable Description	Length (m)	From	To
N/A	N/A	N/A	N/A

2.6 Block Diagram of Test Setup

Radiation below 1G



Radiation above 1G



2.7 Duty Cycle

According to KDB 558074 D01 DTS Meas Guidance v04 section 6.0:

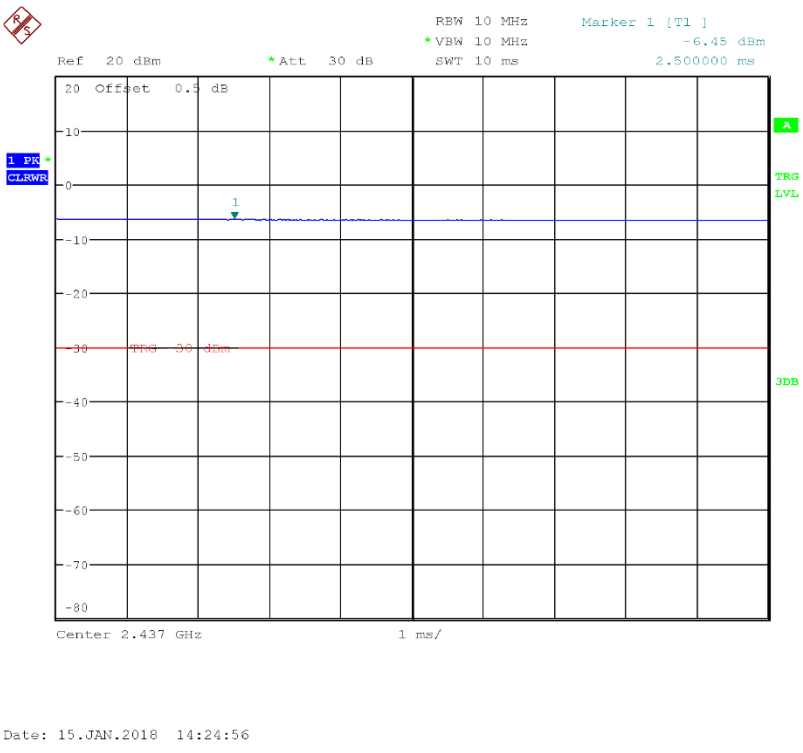
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum power transmission duration, T, are required for each tested mode of operation.

Configuration	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b mode	2.50	2.50	100.00	0.00
802.11g mode	1.92	2.06	93.2	0.31
802.11n HT 20 mode	1.81	2.00	90.50	0.43
BLE mode (C1 HomeSystem)	0.51	0.62	82.26	0.85
BLE mode (Rear Lens PCBA)	5.00	5.00	100.00	0.00

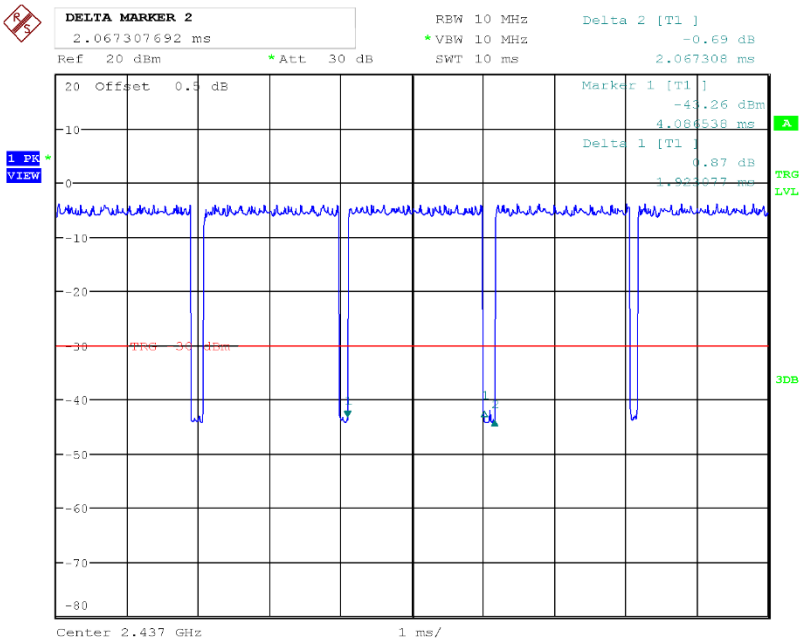
Note: Duty Factor = 10*log (1/Duty cycle)

Please refer to the following plots.

B mode

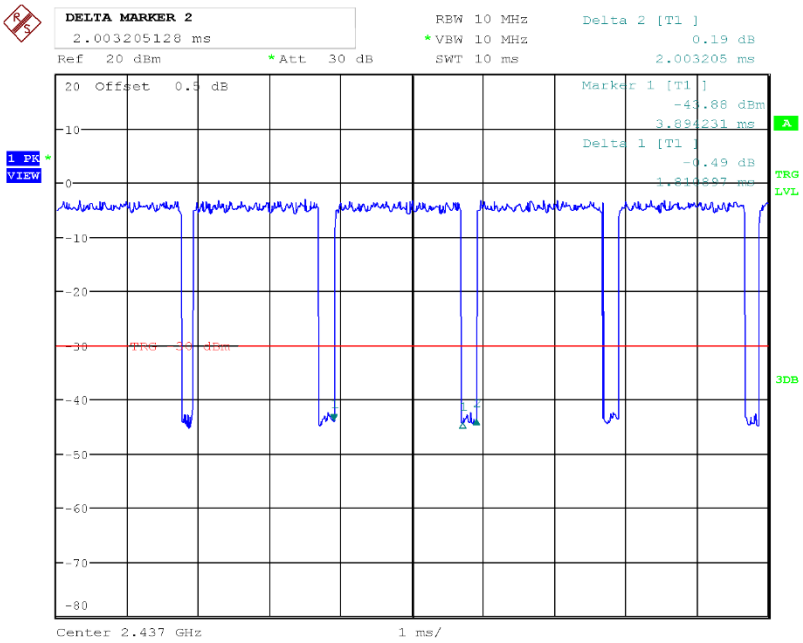


G mode



Date: 15.JAN.2018 14:26:07

N 20 mode



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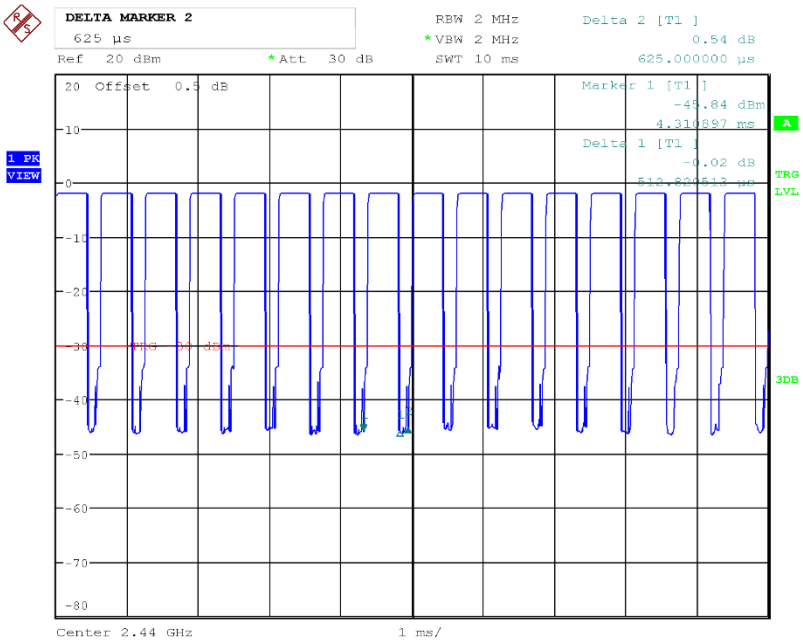
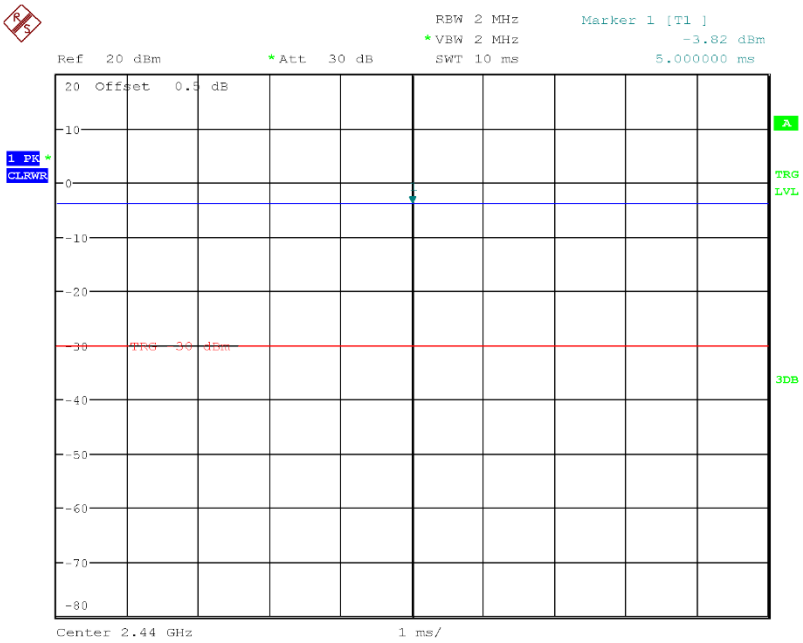
BLE mode (C1 HomeSystem)



Date: 15.JAN.2018 15:15:59

BLE mode (Rear Lens PCBA)



Date: 15.JAN.2018 17:07:30

3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.247(i), §1.1310 ,§ 2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	*Not Applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

* Not Applicable: EUT use DC 9V by battery.

4 FCC § 15.247(i), §1.1310, § 2.1091 - Maximum Permissible Exposure (MPE)

4.1 Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) 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;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
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);

4.2 RF Exposure Evaluation Result

MPE evaluation:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
Wi-Fi	2412-2462	0.96	1.247	18.35	68.391	20	0.0170	1
BLE (C1HomeSystem)	2402-2480	0.96	1.247	-2.35	0.582	20	0.0001	1
BLE (Rear Lens PCBA)	2402-2480	1.69	1.476	-4.21	0.379	20	0.0001	1

Result: MPE evaluation meet 20 cm the requirement of standard.

5 FCC §15.203 – Antenna Requirements

5.1 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.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6 dBi

5.2 Antenna List and Details

Manufacturer	Model	Antenna Type	Antenna Gain	Result
INPAQ TECHNOLOGY CO., LTD	WA-F-LA-03-212	PIFA Antenna	0.96 dBi	Compliance
YAGEO	ANT3216A063R2400A	Chip Antenna	1.69 dBi	Compliance

6 FCC §15.209, §15.205, §15.247(d) – Spurious Emissions

6.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) and RSS-Gen except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

6.2 Measurement Uncertainty

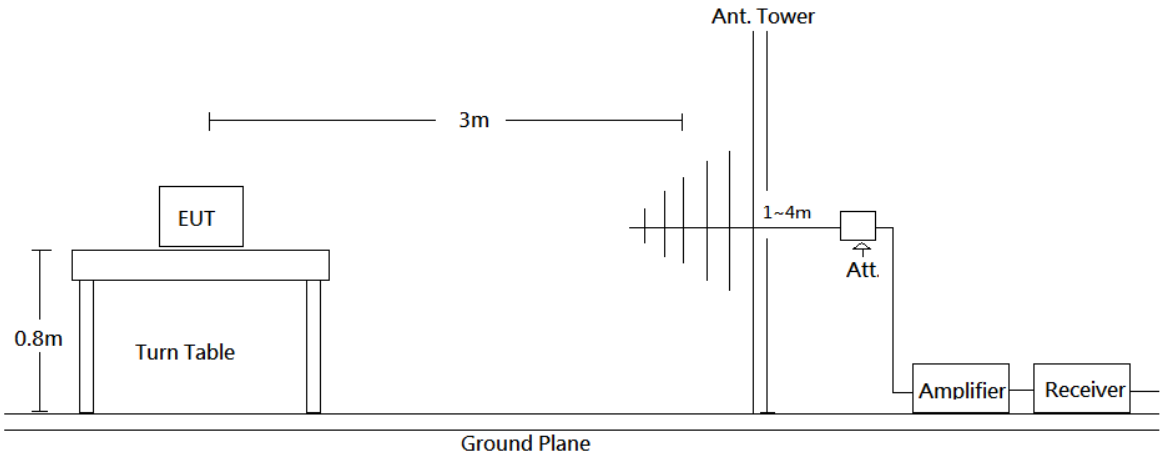
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Taiwan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report.

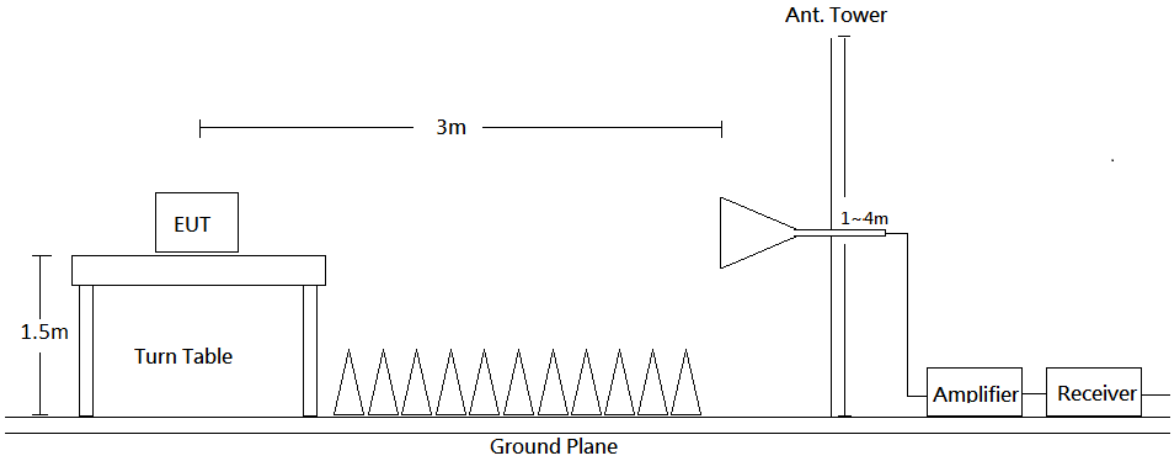
Frequency	Measurement uncertainty
30 MHz~200 MHz	3.76 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.12 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.84 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	5.16 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.84 dB (k=2, 95% level of confidence)
26 GHz~40 GHz	4.30 dB (k=2, 95% level of confidence)

6.3 EUT Setup

Blow 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

6.4 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Detector	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	QP		QP
Above 1 GHz	1 MHz	3 MHz	PK		PK
	1 MHz	3 MHz	RMS	>98%	Ave
	1 MHz	1/T	PK	<98%	Ave

6.5 Test Procedure

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

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

6.6 Corrected Factor & Margin Calculation

The Correct Factor 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:

Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain

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

Margin = Result –Limit

6.7 Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.209 Limit. Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$Lm + U(Lm) \leq Llim + Ucispr$

In BACL, U(Lm) is less than Ucispr, if Lm is less than Llim, it implies that the EUT complies with the limit.

6.8 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
966A Room					
Bilog Antenna	Sunol & Mini-Circuits	JB6/ UNAT-6+	A050115 / 15542_01	2017/12/20	2018/12/19
Horn Antenna	EMCO	3115	9311-4158	2017/05/31	2018/05/30
Horn Antenna	ETS-Lindgren	3116	00062638	2017/09/02	2018/09/01
Preamplifier	Sonoma	310N	130602	2017/07/03	2018/07/02
Preamplifier	EMEC	EM01G18G	060697	2017/04/14	2018/04/13
Preamplifier	EMEC	EM18G40G	060656	2018/01/15	2019/01/14
EMI Test Receiver	R & S	ESR7	101419	2017/11/06	2018/11/05
Spectrum Analyzer	Rohde & Schwarz	FSV40	101203	2017/07/13	2018/07/12
Microflex Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2017/10/31	2018/10/30
Microflex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2017/11/10	2018/11/09
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2017/03/24	2018/03/23
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2018/01/29	2019/01/28
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	060772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2017/05/08	2018/05/07
Cable	WOKEN	SFL402	S02-160323-07	2017/02/22	2018/02/21

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

6.9 Test Environmental Conditions

Temperature:	25° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian from 2018-01-08 to 2018-01-29

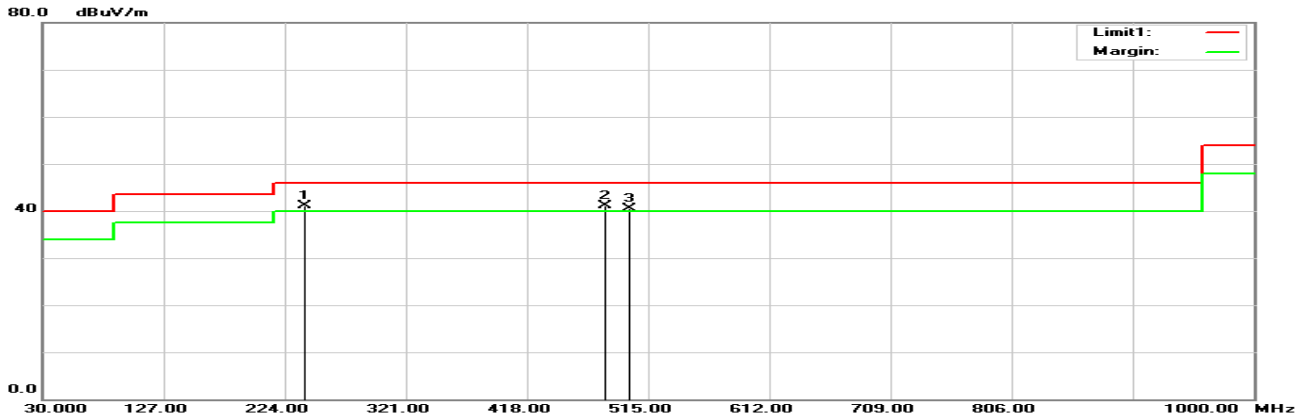
6.10 Test Results

Wi-Fi Mode: Transmitting Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis)*

Below 1G (30 MHz-1 GHz) test the output power worst mode:

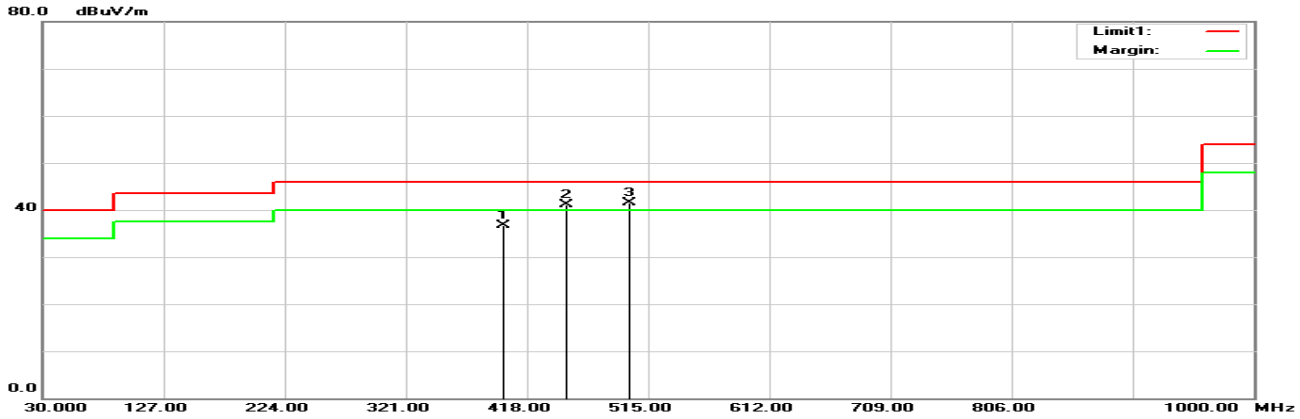
Wi-Fi mode: Worst case is 802.11g mode Middle Channel

Horizontal



Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
239.5200	53.17	-12.01	41.16	46.00	-4.84	100	299	peak
480.0800	47.13	-6.05	41.08	46.00	-4.92	100	193	peak
500.4500	46.20	-5.71	40.49	46.00	-5.51	100	331	peak

Vertical

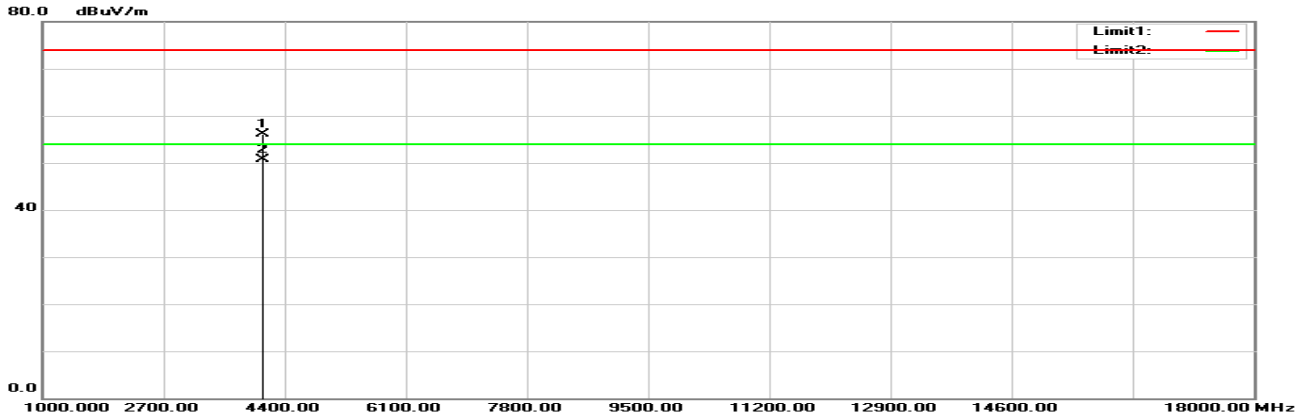


Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
399.5700	44.53	-7.74	36.79	46.00	-9.21	100	329	peak
450.0100	47.66	-6.54	41.12	46.00	-4.88	100	201	peak
500.4500	47.15	-5.71	41.44	46.00	-4.56	100	177	peak

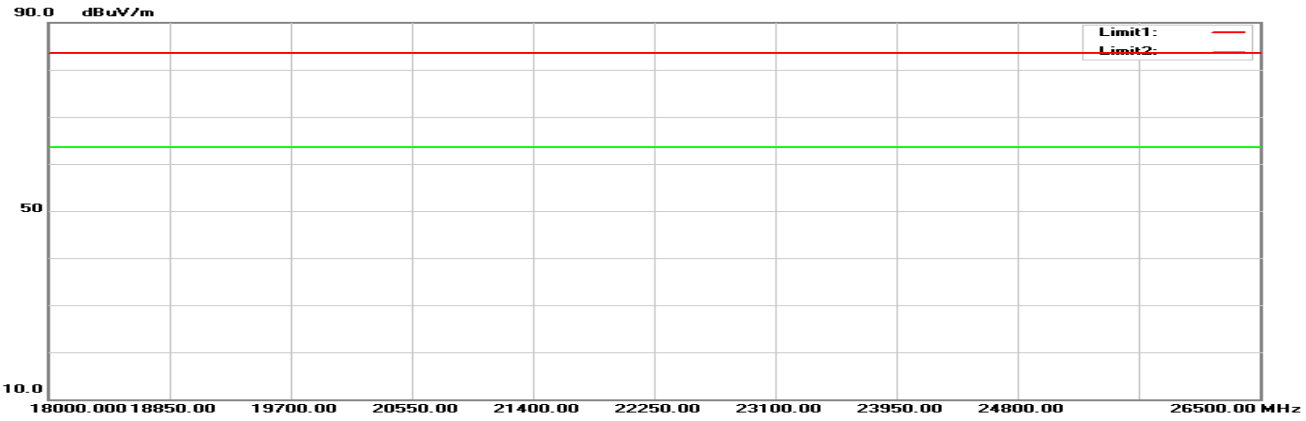
Above 1G (1 GHz-26.5 GHz) test the output power worst mode: Worst case is 802.11b mode High channel

Horizontal

1GHz-18GHz:

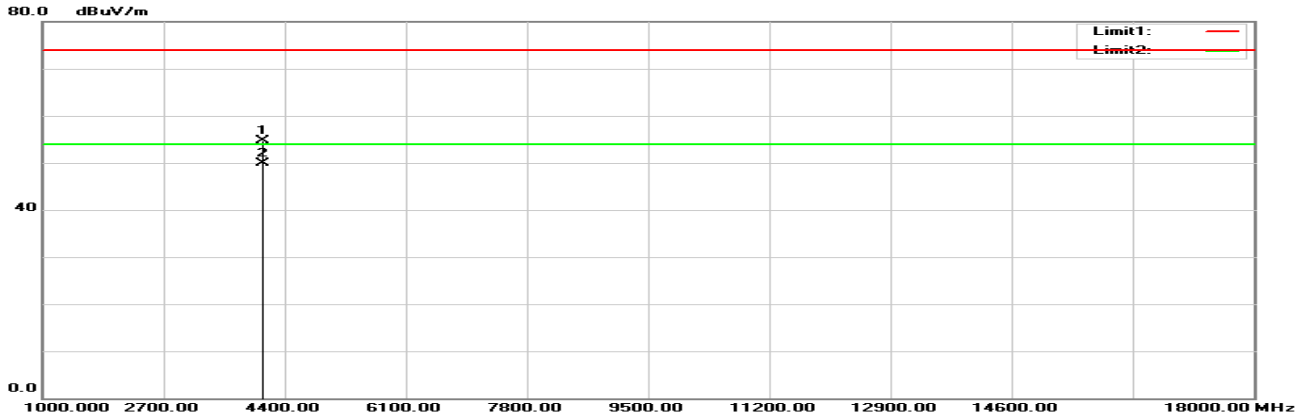


18GHz-26.5GHz:

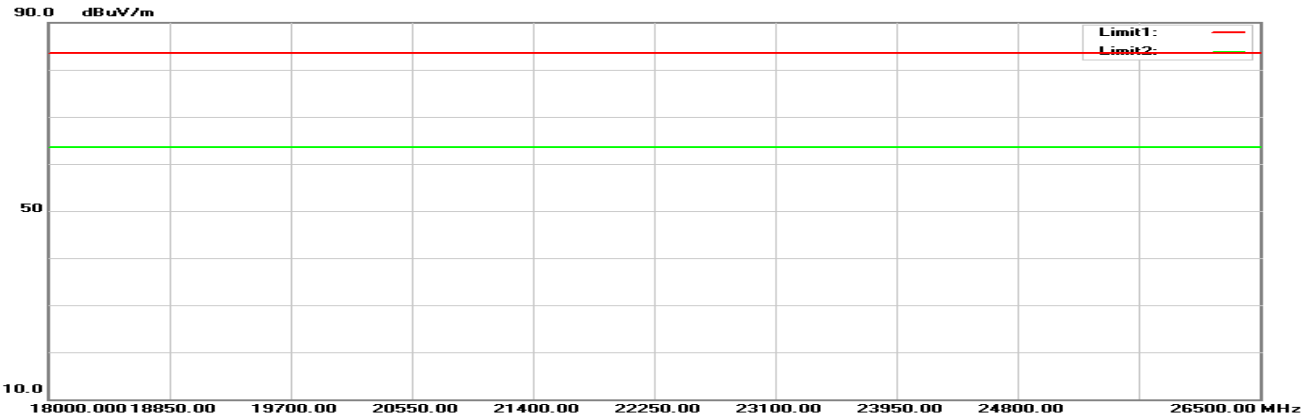


Vertical

1GHz-18GHz:



18GHz-26.5GHz:



Wi-Fi B mode

Horizontal

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2314.025	59.36	-5.06	54.30	74.00	-19.70	150	105	peak
2314.025	49.63	-5.06	44.57	54.00	-9.43	150	105	AVG
2411.200	101.34	-4.84	96.50	N/A	N/A	150	105	peak
2411.200	97.70	-4.84	92.86	N/A	N/A	150	105	AVG
4009.000	54.71	0.06	54.77	74.00	-19.23	150	42	peak
4009.000	50.48	0.06	50.54	54.00	-3.46	150	42	AVG
Mid Channel								
2389.040	46.99	-4.89	42.10	74.00	-31.90	150	20	peak
2389.040	29.57	-4.89	24.68	54.00	-29.32	150	20	AVG
2438.200	101.50	-4.78	96.72	N/A	N/A	150	103	peak
2438.200	99.45	-4.78	94.67	N/A	N/A	150	103	AVG
2499.200	55.77	-4.64	51.13	74.00	-22.87	150	106	peak
2499.200	45.01	-4.64	40.37	54.00	-13.63	150	106	AVG
4060.000	54.59	0.03	54.62	74.00	-19.38	150	45	peak
4060.000	50.41	0.03	50.44	54.00	-3.56	150	45	AVG
High Channel								
2463.050	101.82	-4.72	97.10	N/A	N/A	150	92	peak
2463.050	99.17	-4.72	94.45	N/A	N/A	150	92	AVG
2488.050	55.24	-4.67	50.57	74.00	-23.43	150	89	peak
2488.050	42.80	-4.67	38.13	54.00	-15.87	150	89	AVG
4094.000	56.14	0.03	56.17	74.00	-17.83	150	58	peak
4094.000	50.73	0.03	50.76	54.00	-3.24	150	58	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

Vertical

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2360.255	54.68	-4.95	49.73	74.00	-24.27	150	15	peak
2360.255	39.92	-4.95	34.97	54.00	-19.03	150	15	AVG
2411.200	91.42	-4.84	86.58	N/A	N/A	150	55	peak
2411.200	90.54	-4.84	85.70	N/A	N/A	150	55	AVG
4009.000	50.42	0.06	50.48	74.00	-23.52	150	48	peak
4009.000	48.00	0.06	48.06	54.00	-5.94	150	48	AVG
5760.000	45.93	3.11	49.04	74.00	-24.96	150	226	peak
5760.000	45.42	3.11	48.53	54.00	-5.47	150	226	AVG
Mid Channel								
2357.500	52.55	-4.96	47.59	74.00	-26.41	150	2	peak
2357.500	31.48	-4.96	26.52	54.00	-27.48	150	2	AVG
2438.000	92.97	-4.78	88.19	N/A	N/A	150	43	peak
2438.000	90.70	-4.78	85.92	N/A	N/A	150	43	AVG
2495.700	54.88	-4.65	50.23	74.00	-23.77	150	202	peak
2495.700	40.03	-4.65	35.38	54.00	-18.62	150	202	AVG
4060.000	50.94	0.03	50.97	74.00	-23.03	150	285	peak
4060.000	47.23	0.03	47.26	54.00	-6.74	150	285	AVG
High Channel								
2461.100	93.60	-4.73	88.87	N/A	N/A	150	333	peak
2461.100	88.79	-4.73	84.06	N/A	N/A	150	333	AVG
2498.100	53.47	-4.64	48.83	74.00	-25.17	150	92	peak
2498.100	39.62	-4.64	34.98	54.00	-19.02	150	92	AVG
4094.000	54.62	0.03	54.65	74.00	-19.35	150	293	peak
4094.000	49.97	0.03	50.00	54.00	-4.00	150	293	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

Wi-Fi G mode

Horizontal

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2311.610	59.35	-5.06	54.29	74.00	-19.71	150	109	peak
2311.610	46.99	-5.06	41.93	54.00	-12.07	150	109	AVG
2410.165	102.59	-4.83	97.76	N/A	N/A	150	106	peak
2410.165	94.15	-4.83	89.32	N/A	N/A	150	106	AVG
4009.000	48.10	0.06	48.16	74.00	-25.84	150	41	peak
4009.000	41.06	0.06	41.12	54.00	-12.88	150	41	AVG
Mid Channel								
2389.610	46.69	-4.89	41.80	74.00	-32.20	150	38	peak
2389.610	30.11	-4.89	25.22	54.00	-28.78	150	38	AVG
2438.300	104.10	-4.78	99.32	N/A	N/A	150	106	peak
2438.300	95.68	-4.78	90.90	N/A	N/A	150	106	AVG
2491.200	55.88	-4.66	51.22	74.00	-22.78	150	92	peak
2491.200	43.42	-4.66	38.76	54.00	-15.24	150	92	AVG
4060.000	50.66	0.03	50.69	74.00	-23.31	150	48	peak
4060.000	43.19	0.03	43.22	54.00	-10.78	150	48	AVG
High Channel								
2463.850	103.85	-4.72	99.13	N/A	N/A	150	90	peak
2463.850	94.38	-4.72	89.66	N/A	N/A	150	90	AVG
2483.700	61.37	-4.68	56.69	74.00	-17.31	150	77	peak
2483.700	44.71	-4.68	40.03	54.00	-13.97	150	77	AVG
4094.000	50.49	0.03	50.52	74.00	-23.48	150	53	peak
4094.000	42.16	0.03	42.19	54.00	-11.81	150	53	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

Vertical

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2361.175	54.94	-4.95	49.99	74.00	-24.01	150	18	peak
2361.175	39.76	-4.95	34.81	54.00	-19.19	150	18	AVG
2413.730	92.22	-4.84	87.38	N/A	N/A	150	53	peak
2413.730	86.20	-4.84	81.36	N/A	N/A	150	53	AVG
4009.000	46.21	0.06	46.27	74.00	-27.73	150	55	peak
4009.000	36.79	0.06	36.85	54.00	-17.15	150	55	AVG
Mid Channel								
2366.810	51.68	-4.93	46.75	74.00	-27.25	150	1	peak
2366.810	31.63	-4.93	26.70	54.00	-27.30	150	1	AVG
2438.300	95.19	-4.78	90.41	N/A	N/A	150	333	peak
2438.300	85.97	-4.78	81.19	N/A	N/A	150	333	AVG
2489.900	54.16	-4.67	49.49	74.00	-24.51	150	161	peak
2489.900	39.68	-4.67	35.01	54.00	-18.99	150	161	AVG
4060.000	50.84	0.03	50.87	74.00	-23.13	150	48	peak
4060.000	43.23	0.03	43.26	54.00	-10.74	150	48	AVG
High Channel								
2461.000	91.76	-4.73	87.03	74.00	N/A	150	333	peak
2461.000	82.12	-4.73	77.39	54.00	N/A	150	333	AVG
2487.800	54.20	-4.67	49.53	74.00	-24.47	150	190	peak
2487.800	39.75	-4.67	35.08	54.00	-18.92	150	190	AVG
4094.000	45.39	0.03	45.42	74.00	-28.58	150	291	peak
4094.000	36.44	0.03	36.47	54.00	-17.53	150	291	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

Wi-Fi N20 mode

Horizontal

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2389.925	61.53	-4.89	56.64	74.00	-17.36	150	90	peak
2389.925	44.36	-4.89	39.47	54.00	-14.53	150	90	AVG
2411.315	102.39	-4.84	97.55	N/A	N/A	150	90	peak
2411.315	92.79	-4.84	87.95	N/A	N/A	150	90	AVG
4009.000	48.86	0.06	48.92	74.00	-25.08	150	48	peak
4009.000	40.82	0.06	40.88	54.00	-13.12	150	48	AVG
Mid Channel								
2389.230	47.08	-4.89	42.19	74.00	-31.81	150	18	peak
2389.230	29.36	-4.89	24.47	54.00	-29.53	150	18	AVG
2435.700	104.88	-4.78	100.10	N/A	N/A	150	89	peak
2435.700	95.92	-4.78	91.14	N/A	N/A	150	89	AVG
2490.600	55.82	-4.67	51.15	74.00	-22.85	150	92	peak
2490.600	43.74	-4.67	39.07	54.00	-14.93	150	92	AVG
4060.000	49.29	0.03	49.32	74.00	-24.68	150	33	peak
4060.000	39.32	0.03	39.35	54.00	-14.65	150	33	AVG
High Channel								
2463.400	102.20	-4.72	97.48	N/A	N/A	150	94	peak
2463.400	92.31	-4.72	87.59	N/A	N/A	150	94	AVG
2485.050	59.96	-4.67	55.29	74.00	-18.71	150	103	peak
2485.050	43.75	-4.67	39.08	54.00	-14.92	150	103	AVG
4094.000	49.36	0.03	49.39	74.00	-24.61	150	54	peak
4094.000	41.52	0.03	41.55	54.00	-12.45	150	54	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

Vertical

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2370.605	54.83	-4.93	49.90	74.00	-24.10	150	237	peak
2370.605	40.86	-4.93	35.93	54.00	-18.07	150	237	AVG
2410.050	91.50	-4.83	86.67	N/A	N/A	150	46	peak
2410.050	84.37	-4.83	79.54	N/A	N/A	150	46	AVG
4009.000	45.08	0.06	45.14	74.00	-28.86	150	55	peak
4009.000	36.83	0.06	36.89	54.00	-17.11	150	55	AVG
Mid Channel								
2364.340	51.34	-4.94	46.40	74.00	-27.60	150	359	peak
2364.340	31.23	-4.94	26.29	54.00	-27.71	150	359	AVG
2435.600	95.25	-4.78	90.47	N/A	N/A	150	333	peak
2435.600	85.70	-4.78	80.92	N/A	N/A	150	333	AVG
2484.400	53.20	-4.67	48.53	74.00	-25.47	150	208	peak
2484.400	41.00	-4.67	36.33	54.00	-17.67	150	208	AVG
4060.000	46.12	0.03	46.15	74.00	-27.85	150	290	peak
4060.000	37.89	0.03	37.92	54.00	-16.08	150	290	AVG
High Channel								
2460.850	92.00	-4.73	87.27	N/A	N/A	150	337	peak
2460.850	81.89	-4.73	77.16	N/A	N/A	150	337	AVG
2484.200	53.68	-4.68	49.00	74.00	-25.00	150	340	peak
2484.200	41.36	-4.68	36.68	54.00	-17.32	150	340	AVG
4094.000	44.07	0.03	44.10	74.00	-29.90	150	290	peak
4094.000	35.96	0.03	35.99	54.00	-18.01	150	290	AVG

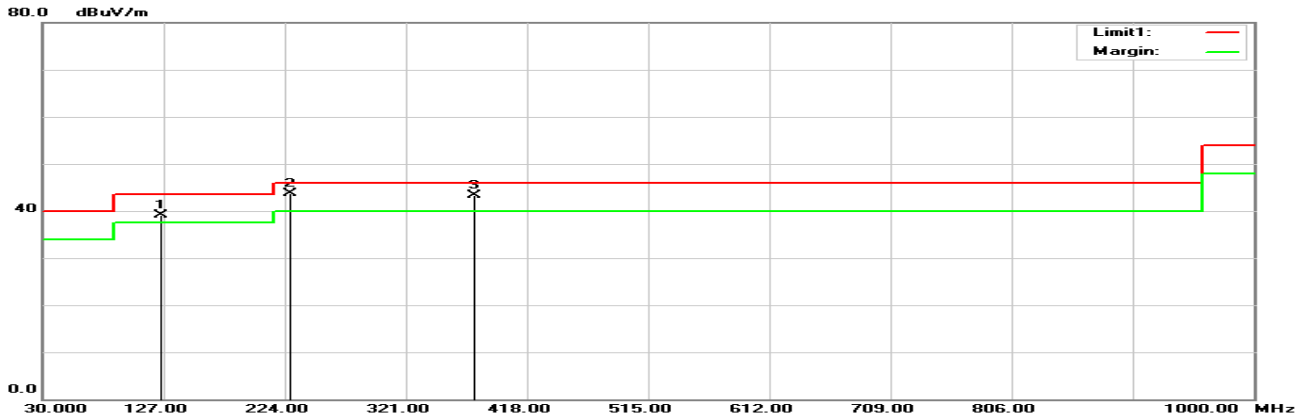
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

BLE Mode (C1 HomeSystem): Transmitting Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis)*

Below 1G (30 MHz-1 GHz) test the output power worst mode:

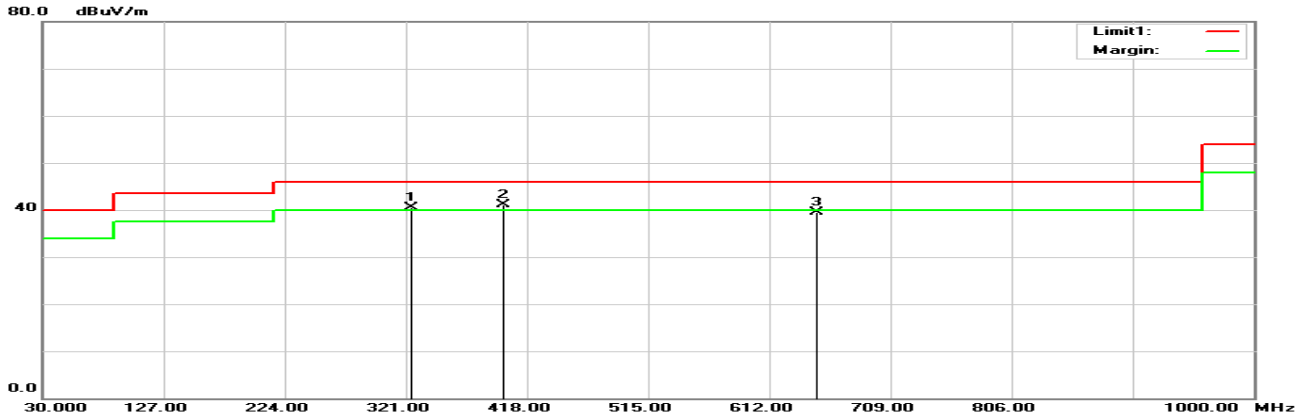
BLE mode (C1 HomeSystem): Worst case is BLE (C1 HomeSystem) Middle Channel

Horizontal



Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
125.0600	49.73	-10.66	39.07	43.50	-4.43	100	89	peak
227.8800	56.06	-12.41	43.65	46.00	-2.35	100	254	peak
375.3200	51.52	-8.24	43.28	46.00	-2.72	100	154	peak

Vertical

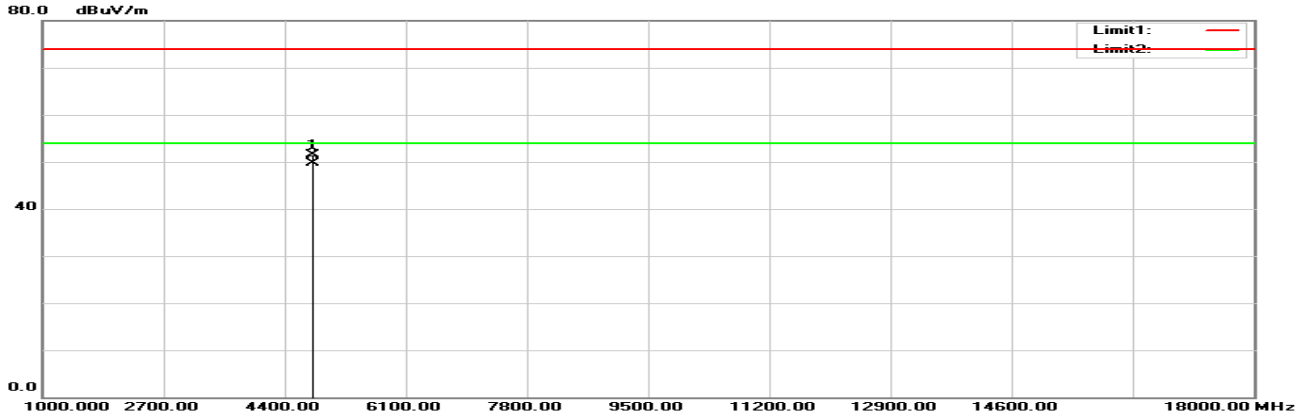


Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
324.8800	49.85	-9.31	40.54	46.00	-5.46	100	206	peak
399.5700	48.80	-7.74	41.06	46.00	-4.94	100	226	peak
649.8300	42.80	-3.35	39.45	46.00	-6.55	100	80	peak

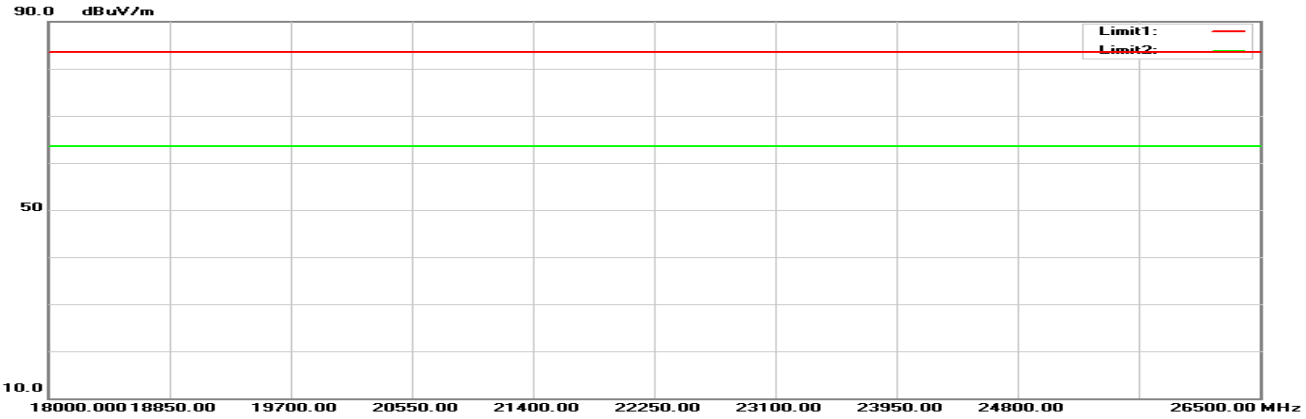
Above 1G (1 GHz-26.5 GHz) test the output power worst mode: Worst case is BLE mode Low channel

Horizontal

1GHz-18GHz:

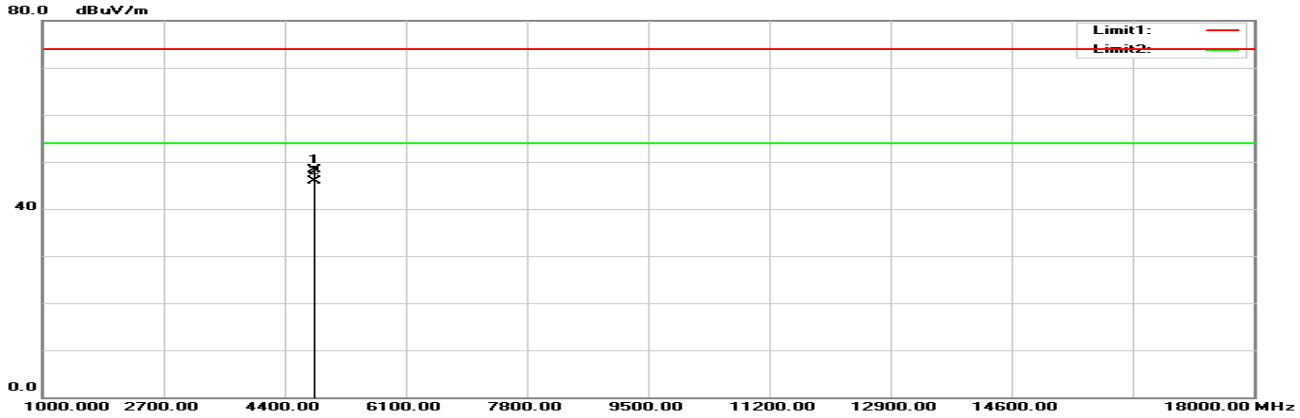


18GHz-26.5GHz:

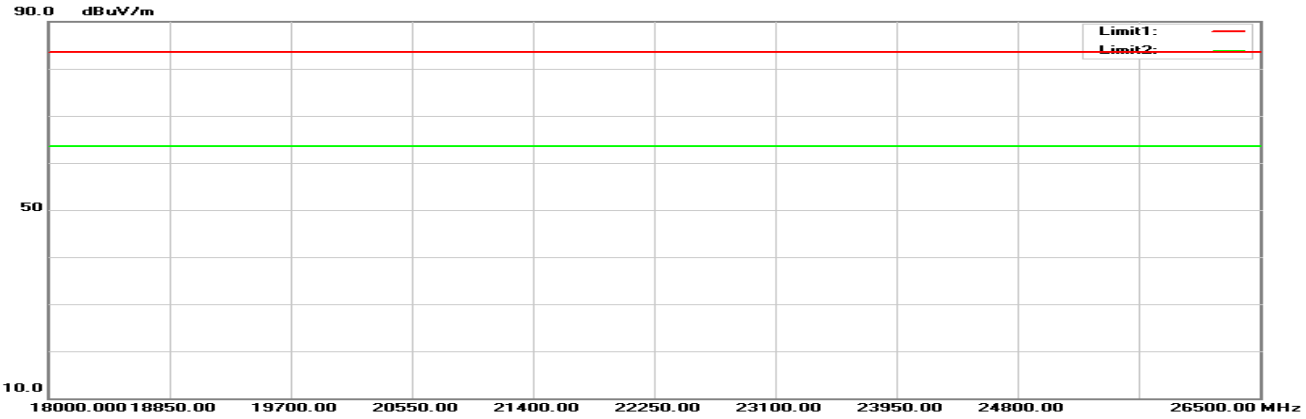


Vertical

1GHz-18GHz:



18GHz-26.5GHz:



BLE mode (C1 HomeSystem)

Horizontal

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2370.230	62.30	-4.93	57.37	74.00	-16.63	150	187	peak
2370.230	37.80	-4.93	32.87	54.00	-21.13	150	187	AVG
2401.770	98.27	-4.86	93.41	N/A	N/A	150	30	peak
2401.770	97.69	-4.86	92.83	N/A	N/A	150	30	AVG
4791.000	50.63	0.93	51.56	74.00	-22.44	150	241	peak
4791.000	48.74	0.93	49.67	54.00	-4.33	150	241	AVG
Mid Channel								
2373.460	49.40	-4.92	44.48	74.00	-29.52	150	360	peak
2373.460	36.57	-4.92	31.65	54.00	-22.35	150	360	AVG
2439.770	98.15	-4.78	93.37	N/A	N/A	150	29	peak
2439.770	97.64	-4.78	92.86	N/A	N/A	150	29	AVG
2492.020	61.47	-4.66	56.81	74.00	-17.19	150	25	peak
2492.020	38.12	-4.66	33.46	54.00	-20.54	150	25	AVG
4876.000	48.07	1.23	49.30	74.00	-24.70	173	251	peak
4876.000	46.29	1.23	47.52	54.00	-6.48	173	251	AVG
High Channel								
2479.720	96.80	-4.68	92.12	N/A	N/A	150	29	peak
2479.720	96.26	-4.68	91.58	N/A	N/A	150	29	AVG
2491.990	62.63	-4.66	57.97	74.00	-16.03	150	31	peak
2491.990	40.13	-4.66	35.47	54.00	-18.53	150	31	AVG
4961.000	47.71	1.52	49.23	74.00	-24.77	150	246	peak
4961.000	45.94	1.52	47.46	54.00	-6.54	150	246	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

Vertical

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2314.465	61.67	-5.06	56.61	74.00	-17.39	150	333	peak
2314.465	38.02	-5.06	32.96	54.00	-21.04	150	333	AVG
2402.245	94.69	-4.86	89.83	N/A	N/A	150	337	peak
2402.245	94.18	-4.86	89.32	N/A	N/A	150	337	AVG
4808.000	47.35	0.99	48.34	74.00	-25.66	150	41	peak
4808.000	44.82	0.99	45.81	54.00	-8.19	150	41	AVG
Mid Channel								
2316.650	49.30	-5.05	44.25	74.00	-29.75	150	310	peak
2316.650	37.11	-5.05	32.06	54.00	-21.94	150	310	AVG
2439.770	93.47	-4.78	88.69	N/A	N/A	150	20	peak
2439.770	92.91	-4.78	88.13	N/A	N/A	150	20	AVG
2491.830	59.51	-4.66	54.85	74.00	-19.15	150	32	peak
2491.830	38.23	-4.66	33.57	54.00	-20.43	150	32	AVG
4876.000	44.16	1.23	45.39	74.00	-28.61	139	329	peak
4876.000	41.05	1.23	42.28	54.00	-11.72	139	329	AVG
High Channel								
2479.750	90.93	-4.68	86.25	N/A	N/A	150	21	peak
2479.750	90.37	-4.68	85.69	N/A	N/A	150	21	AVG
2491.900	58.85	-4.66	54.19	74.00	-19.81	150	23	peak
2491.900	39.29	-4.66	34.63	54.00	-19.37	150	23	AVG
4961.000	44.73	1.52	46.25	74.00	-27.75	176	330	peak
4961.000	42.16	1.52	43.68	54.00	-10.32	176	330	AVG

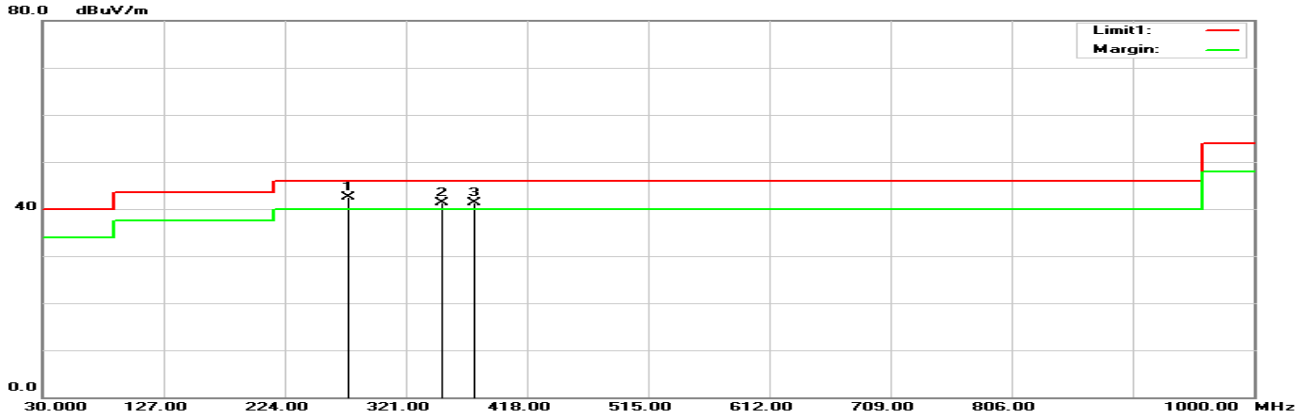
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

BLE Mode (Rear Lens PCBA) : Transmitting Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis)*

Below 1G (30 MHz-1 GHz) test the output power worst mode:

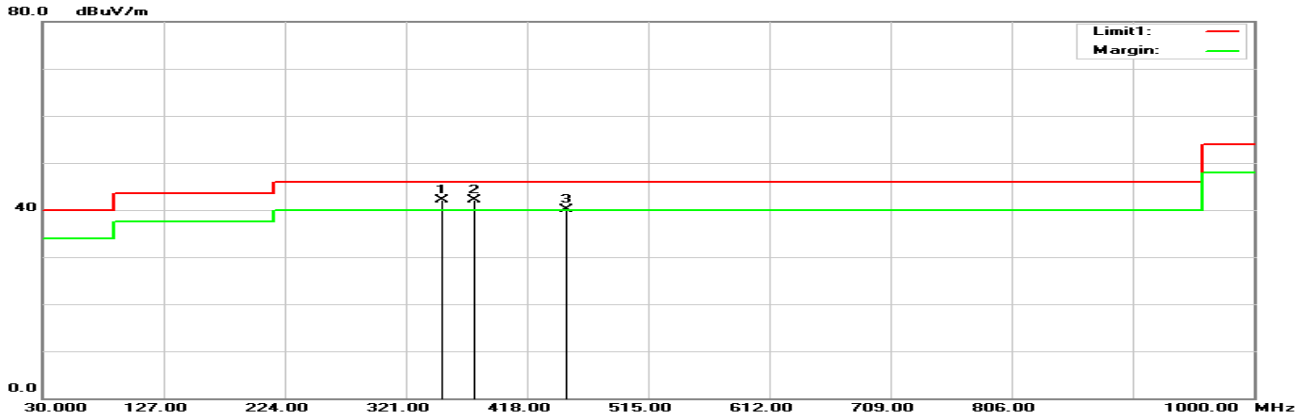
BLE mode (Rear Lens PCBA): Worst case is BLE (Rear Lens PCBA) Low Channel

Horizontal



Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
274.4400	52.66	-10.21	42.45	46.00	-3.55	100	352	peak
350.1000	50.17	-8.78	41.39	46.00	-4.61	100	24	peak
375.3200	49.45	-8.24	41.21	46.00	-4.79	100	68	peak

Vertical

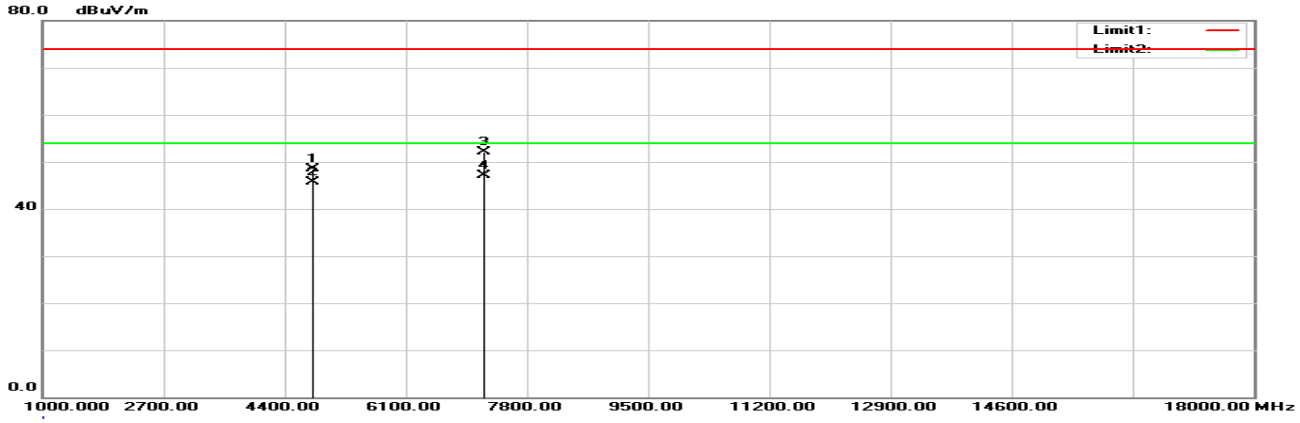


Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
350.1000	50.93	-8.78	42.15	46.00	-3.85	100	269	peak
375.3200	50.34	-8.24	42.10	46.00	-3.90	100	218	peak
450.0100	46.69	-6.54	40.15	46.00	-5.85	100	287	peak

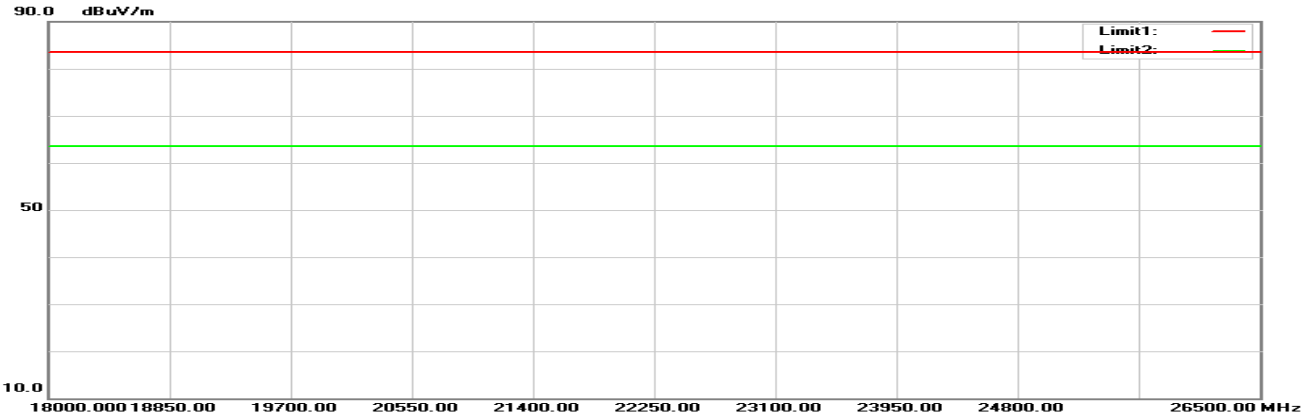
Above 1G (1 GHz-26.5 GHz) test the output power worst mode: Worst case is BLE mode Low channel

Horizontal

1GHz-18GHz:

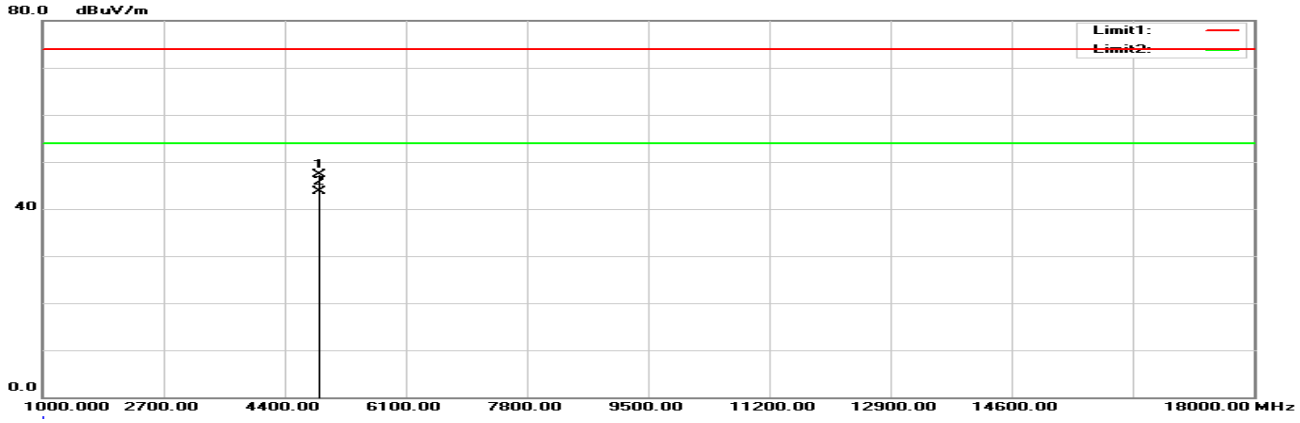


18GHz-26.5GHz:

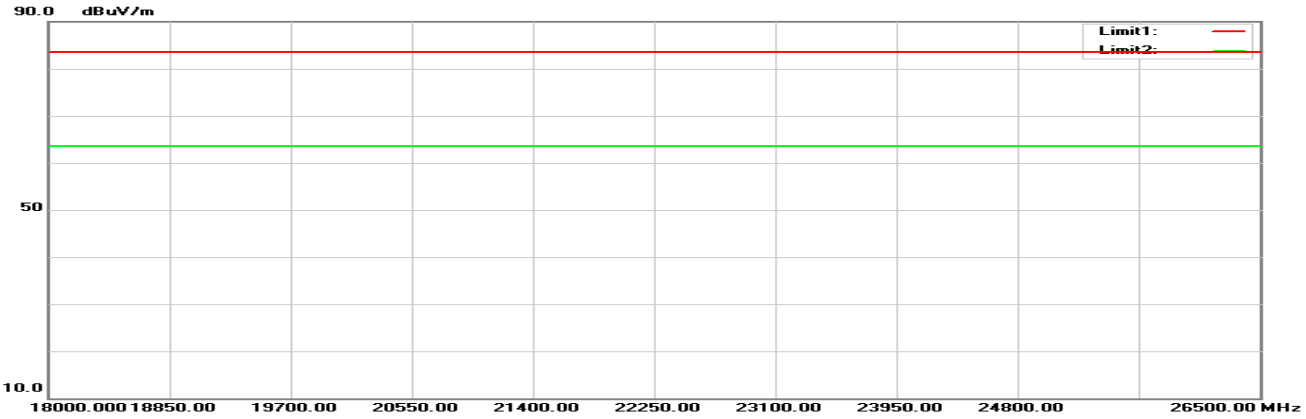


Vertical

1GHz-18GHz:



18GHz-26.5GHz:



BLE mode (Rear Lens PCBA)

Horizontal

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2378.875	53.63	-4.91	48.72	74.00	-25.28	150	87	peak
2378.875	39.72	-4.91	34.81	54.00	-19.19	150	87	AVG
2401.675	91.39	-4.86	86.53	N/A	N/A	150	234	peak
2401.675	90.88	-4.86	86.02	N/A	N/A	150	234	AVG
4791.000	47.61	0.93	48.54	74.00	-25.46	150	206	peak
4791.000	44.68	0.93	45.61	54.00	-8.39	150	206	AVG
7205.000	45.45	6.56	52.01	74.00	-21.99	150	343	peak
7205.000	40.56	6.56	47.12	54.00	-6.88	150	343	AVG
Mid Channel								
2439.600	91.51	-4.78	86.73	N/A	N/A	150	237	peak
2439.600	91.02	-4.78	86.24	N/A	N/A	150	237	AVG
2485.800	53.26	-4.67	48.59	74.00	-25.41	150	211	peak
2485.800	39.61	-4.67	34.94	54.00	-19.06	150	211	AVG
4876.000	46.04	1.23	47.27	74.00	-26.73	150	300	peak
4876.000	42.55	1.23	43.78	54.00	-10.22	150	300	AVG
High Channel								
2479.660	89.52	-4.68	84.84	N/A	N/A	150	315	peak
2479.660	88.93	-4.68	84.25	N/A	N/A	150	315	AVG
2494.060	53.70	-4.66	49.04	74.00	-24.96	150	60	peak
2494.060	39.52	-4.66	34.86	54.00	-19.14	150	60	AVG
4961.000	50.13	1.52	51.65	74.00	-22.35	150	305	peak
4961.000	47.39	1.52	48.91	54.00	-5.09	150	305	AVG
7443.000	41.43	7.49	48.92	74.00	-25.08	150	140	peak
7443.000	34.76	7.49	42.25	54.00	-11.75	150	140	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

Vertical

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (˚)	Remark
Low Channel								
2375.645	53.36	-4.92	48.44	74.00	-25.56	150	254	peak
2375.645	39.62	-4.92	34.70	54.00	-19.30	150	254	AVG
2401.675	92.20	-4.86	87.34	N/A	N/A	150	241	peak
2401.675	91.57	-4.86	86.71	N/A	N/A	150	241	AVG
4808.000	46.31	0.99	47.30	74.00	-26.70	150	312	peak
4808.000	41.79	0.99	42.78	54.00	-11.22	150	312	AVG
7205.000	46.45	6.56	53.01	74.00	-20.99	150	282	peak
7205.000	40.66	6.56	47.22	54.00	-6.78	150	282	AVG
Mid Channel								
2440.100	92.21	-4.78	87.43	N/A	N/A	150	245	peak
2440.100	91.69	-4.78	86.91	N/A	N/A	150	245	AVG
2486.200	53.35	-4.67	48.68	74.00	-25.32	150	66	peak
2486.200	39.65	-4.67	34.98	54.00	-19.02	150	66	AVG
4876.000	44.57	1.23	45.80	74.00	-28.20	150	226	peak
4876.000	39.39	1.23	40.62	54.00	-13.38	150	226	AVG
High Channel								
2479.600	91.09	-4.68	86.41	N/A	N/A	150	266	peak
2479.600	90.48	-4.68	85.80	N/A	N/A	150	266	AVG
2498.770	53.44	-4.64	48.80	74.00	-25.20	150	144	peak
2498.770	40.01	-4.64	35.37	54.00	-18.63	150	144	AVG
4961.000	48.23	1.52	49.75	74.00	-24.25	150	304	peak
4961.000	44.84	1.52	46.36	54.00	-7.64	150	304	AVG
7443.000	40.81	7.49	48.30	74.00	-25.70	150	281	peak
7443.000	32.18	7.49	39.67	54.00	-14.33	150	281	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported

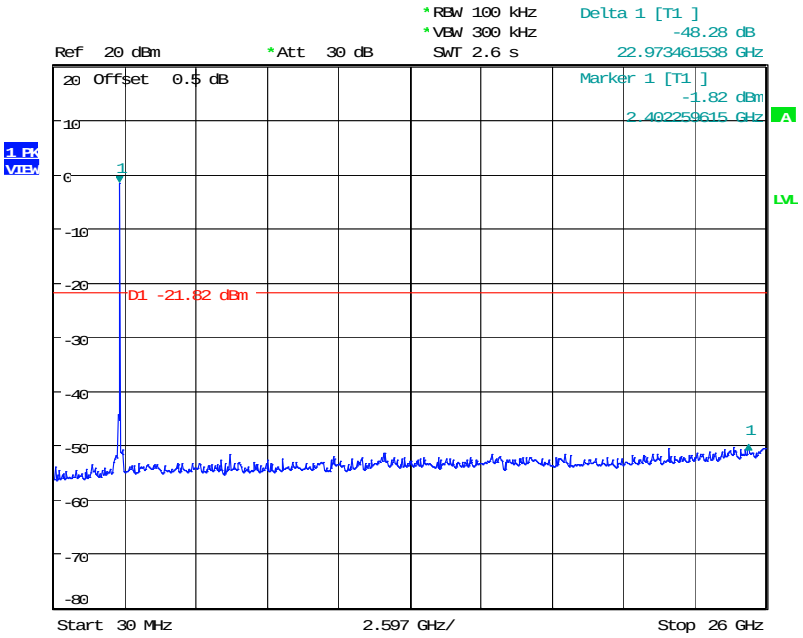
Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B mode				
Low	2412	48.28	≥ 20	Compliance
Mid	2437	48.85	≥ 20	Compliance
High	2462	49.28	≥ 20	Compliance
G mode				
Low	2412	43.71	≥ 20	Compliance
Mid	2437	45.56	≥ 20	Compliance
High	2462	45.26	≥ 20	Compliance
N20 mode				
Low	2412	41.04	≥ 20	Compliance
Mid	2437	46.25	≥ 20	Compliance
High	2462	41.70	≥ 20	Compliance
BLE mode (C1 HomeSystem)				
Low	2402	46.31	≥ 20	Compliance
Mid	2440	46.71	≥ 20	Compliance
High	2480	47.57	≥ 20	Compliance
BLE mode (Rear Lens PCBA)				
Low	2402	32.91	≥ 20	Compliance
Mid	2440	30.42	≥ 20	Compliance
High	2480	31.98	≥ 20	Compliance

Please refer to the following plots

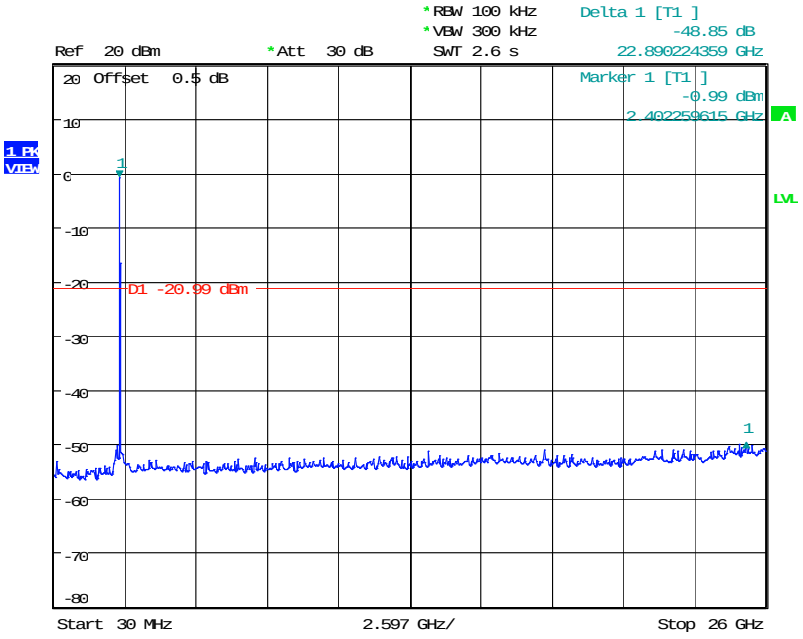
Wi-Fi B mode:

Low Channel



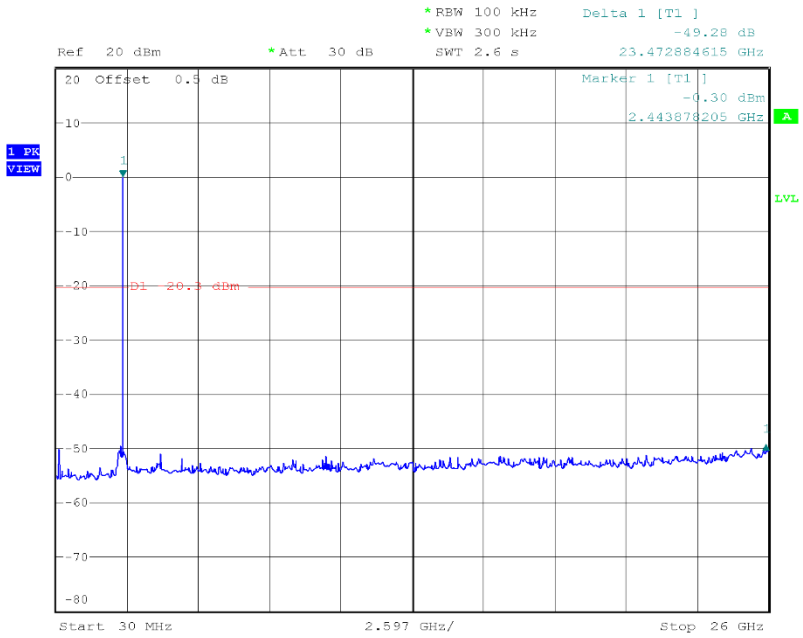
Date: 26.JAN.2018 15:37:19

Middle Channel



Date: 26.JAN.2018 15:40:40

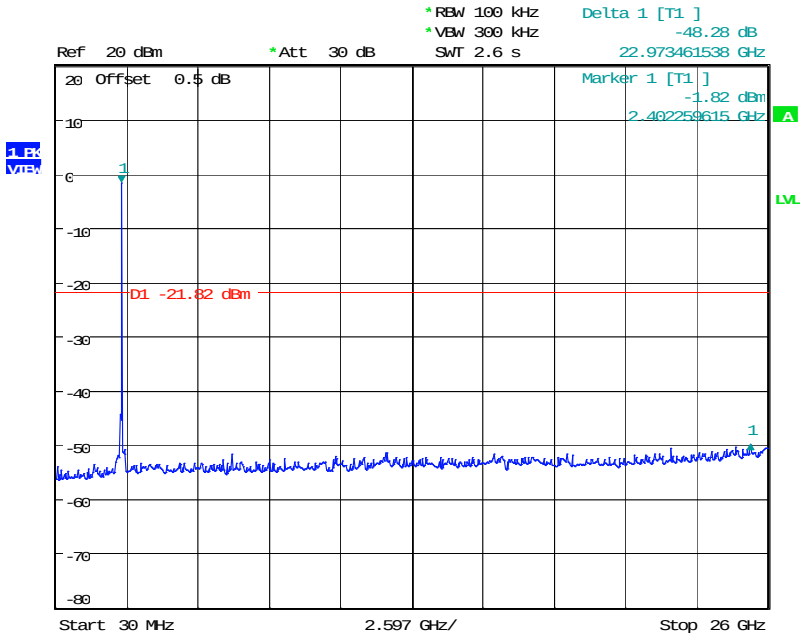
High Channel



Date: 29.JAN.2018 16:56:53

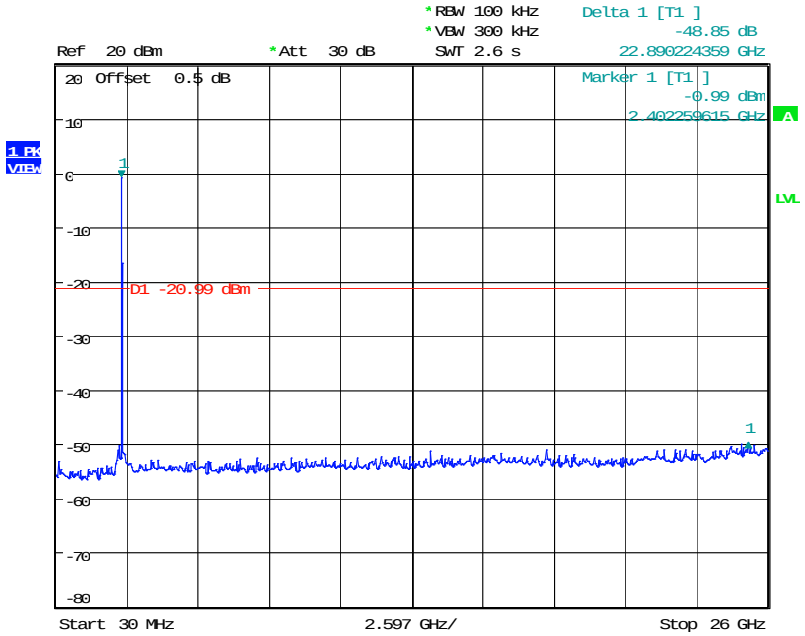
Wi-Fi G mode:

Low Channel



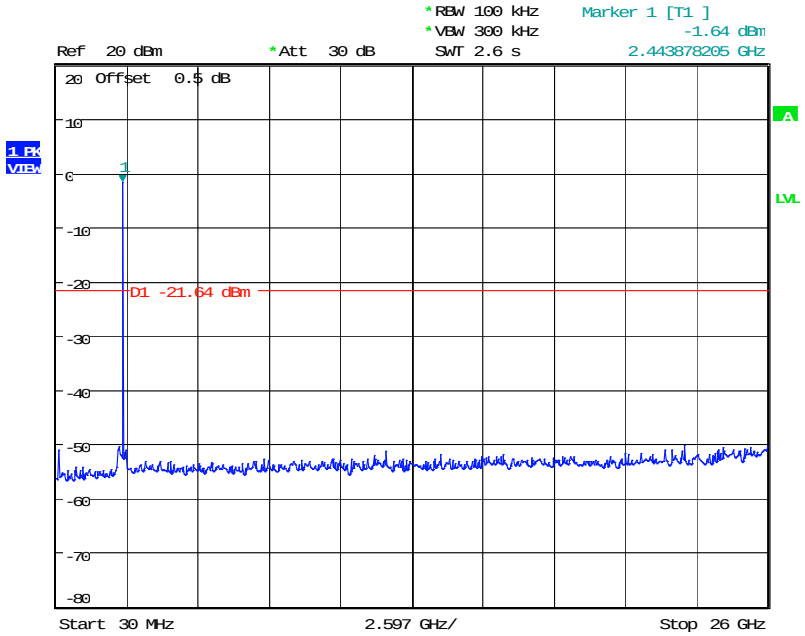
Date: 26.JAN.2018 15:37:19

Middle Channel



Date: 26.JAN.2018 15:40:40

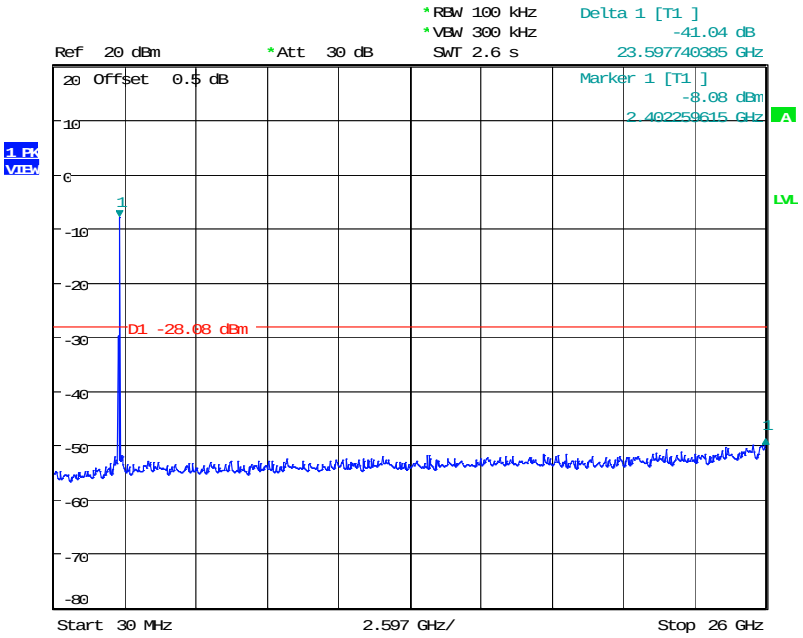
High Channel



Date: 26.JAN.2018 15:43:12

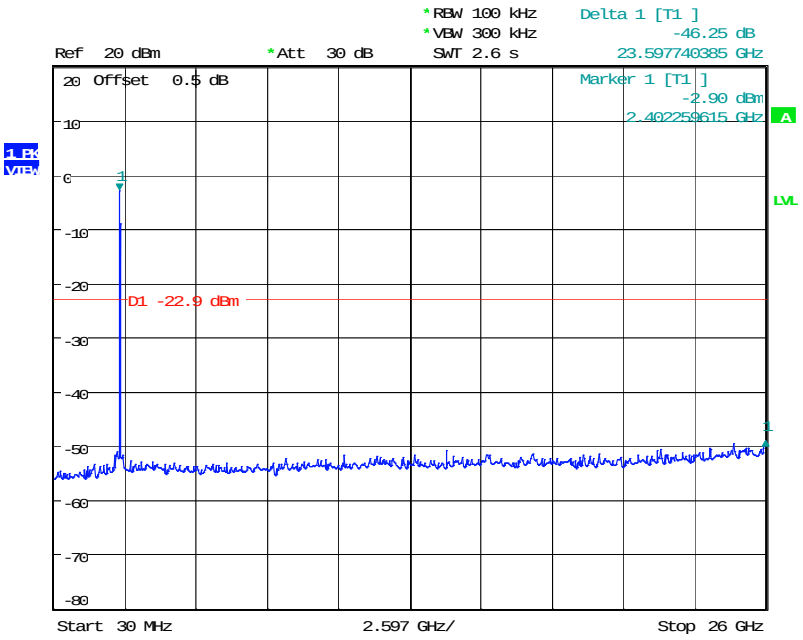
Wi-Fi N20 mode:

Low Channel



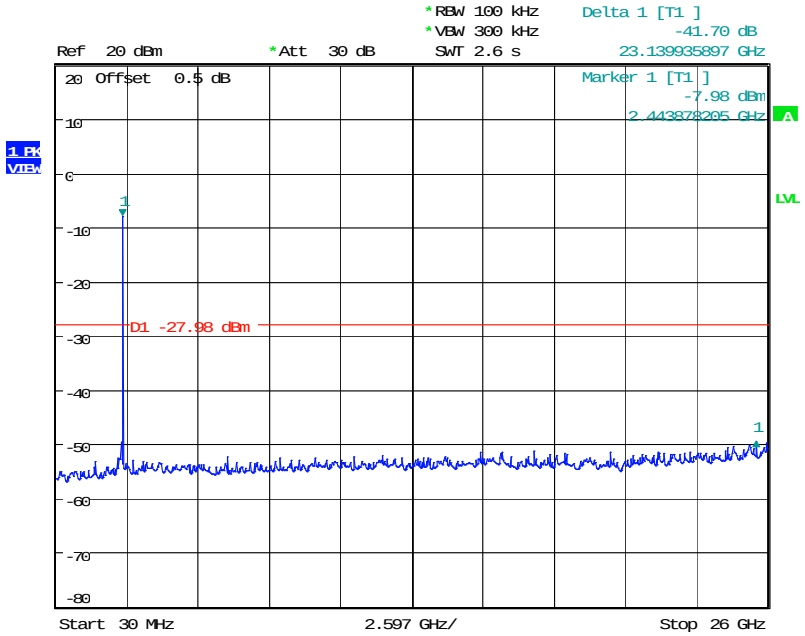
Date: 26.JAN.2018 16:19:25

Middle Channel



Date: 26.JAN.2018 16:22:29

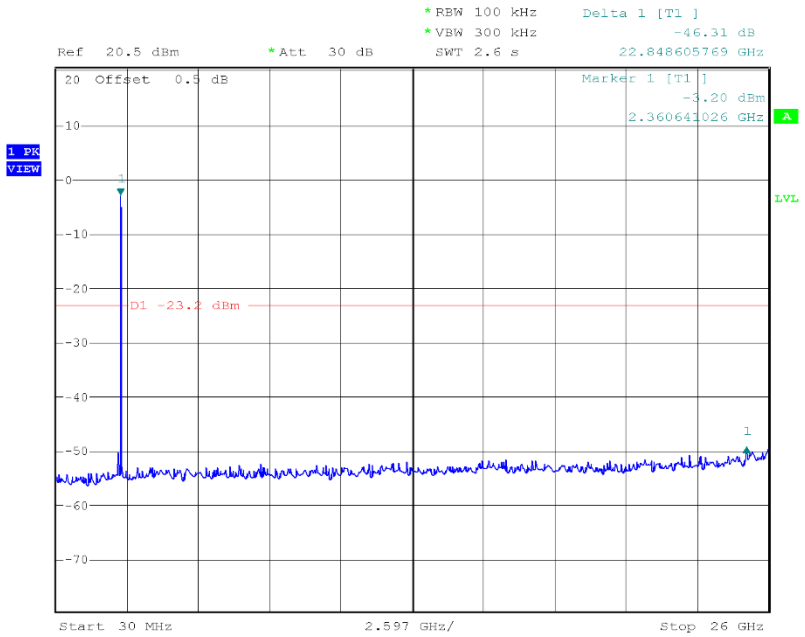
High Channel



Date: 26.JAN.2018 16:25:41

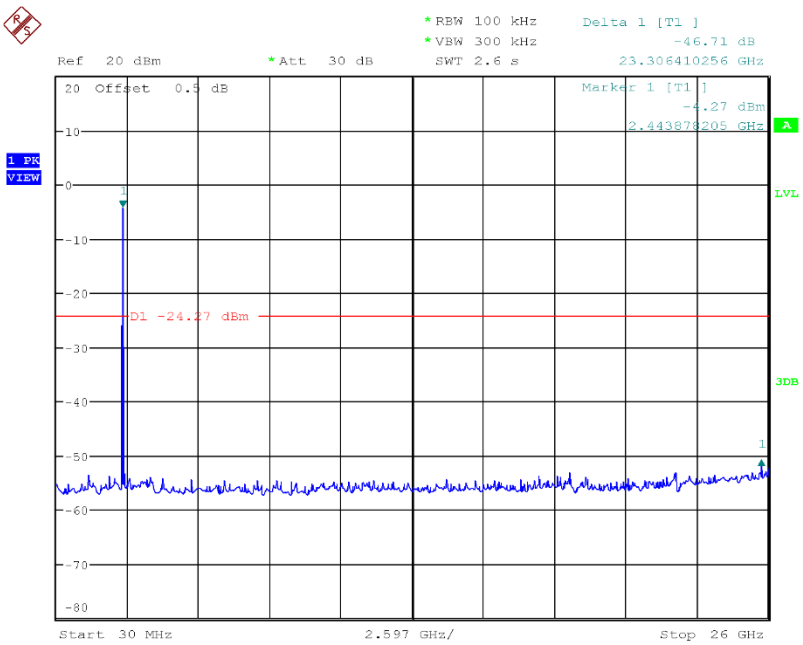
BLE mode (C1 HomeSystem):

Low Channel



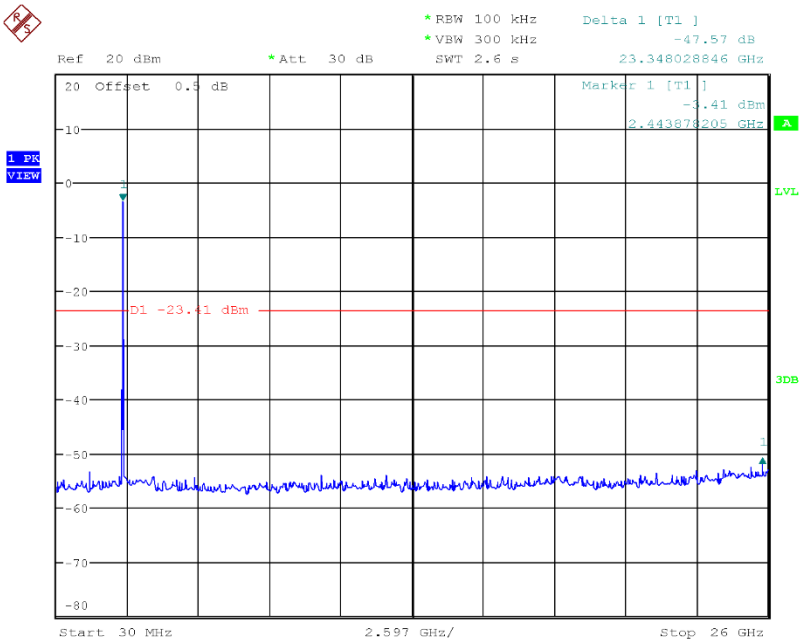
Date: 15.JAN.2018 15:10:42

Middle Channel



Date: 15.JAN.2018 15:14:29

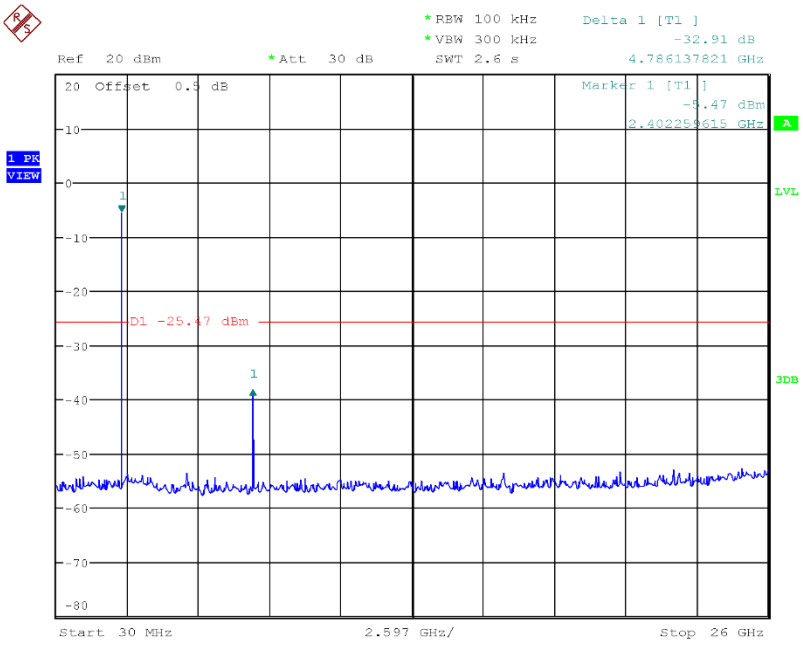
High Channel



Date: 15.JAN.2018 15:21:25

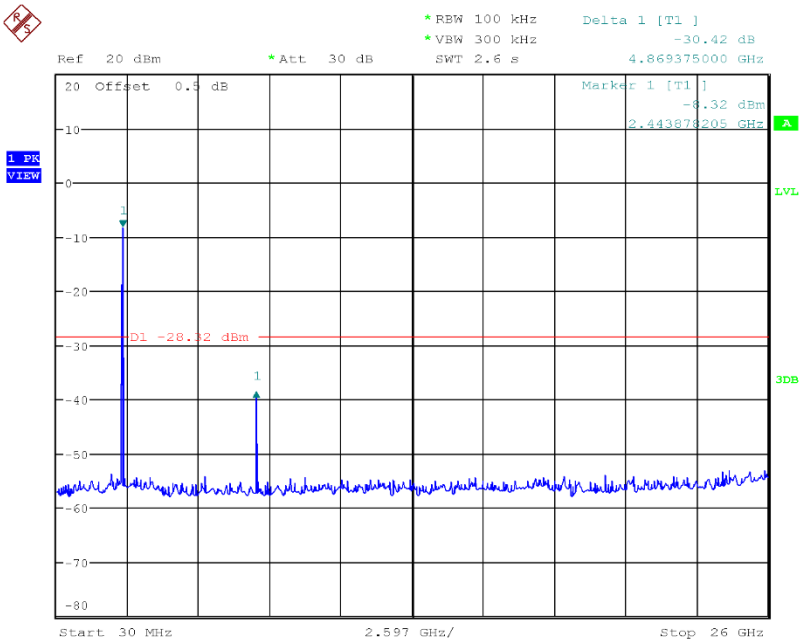
BLE mode (Rear Lens PCBA):

Low Channel



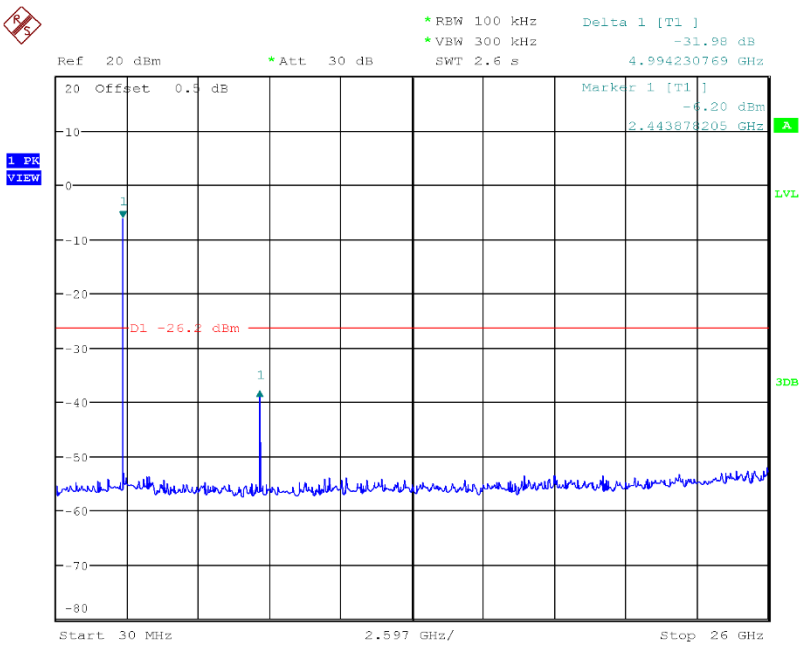
Date: 15.JAN.2018 16:59:53

Middle Channel



Date: 15.JAN.2018 17:09:42

High Channel



Date: 15.JAN.2018 17:14:34

7 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

7.1 Applicable Standard

According to FCC §15.247(a) (2).

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.2 Test Procedure

According to ANSI C63.10-2013

6 dB Emission Bandwidth
The steps for the first option are as follows:
a) Set RBW = 100 kHz.
b) Set the VBW ≥ [3 × RBW].
c) Detector = peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) 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.

7.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2017/05/08	2018/05/07
Cable	WOKEN	SFL402	S02-160323-07	2017/02/22	2018/02/21

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

7.4 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian Tu from 2018-01-08 to 2018-01-29.

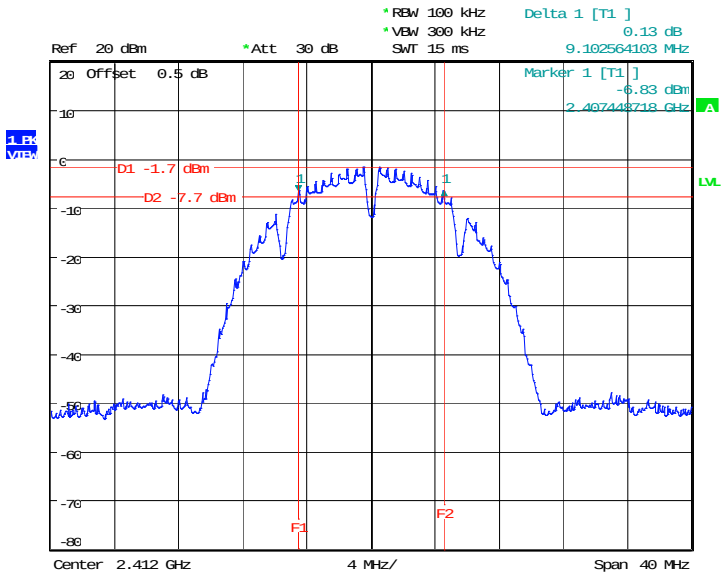
7.5 Test Results

Channel	Frequency (MHz)	99% Bandwidth (MHz)	6 dB OBW (MHz)	6dB Limit (MHz)	Result
B mode					
Low	2412	13.86	9.10	> 0.5	Compliance
Middle	2437	13.86	9.10	> 0.5	Compliance
High	2462	13.94	9.10	> 0.5	Compliance
G mode					
Low	2412	17.46	15.19	> 0.5	Compliance
Middle	2437	17.86	15.12	> 0.5	Compliance
High	2462	17.46	15.06	> 0.5	Compliance
N20 mode					
Low	2412	18.10	15.19	> 0.5	Compliance
Middle	2437	18.50	15.06	> 0.5	Compliance
High	2462	18.02	15.06	> 0.5	Compliance
BLE mode (C1 HomeSystem)					
Low	2402	1.0576	0.689	> 0.5	Compliance
Middle	2440	1.0576	0.689	> 0.5	Compliance
High	2480	1.0416	0.689	> 0.5	Compliance
BLE mode (Rear Lens PCBA)					
Low	2402	1.0737	0.721	> 0.5	Compliance
Middle	2440	1.0737	0.721	> 0.5	Compliance
High	2480	1.0897	0.753	> 0.5	Compliance

Please refer to the following plots

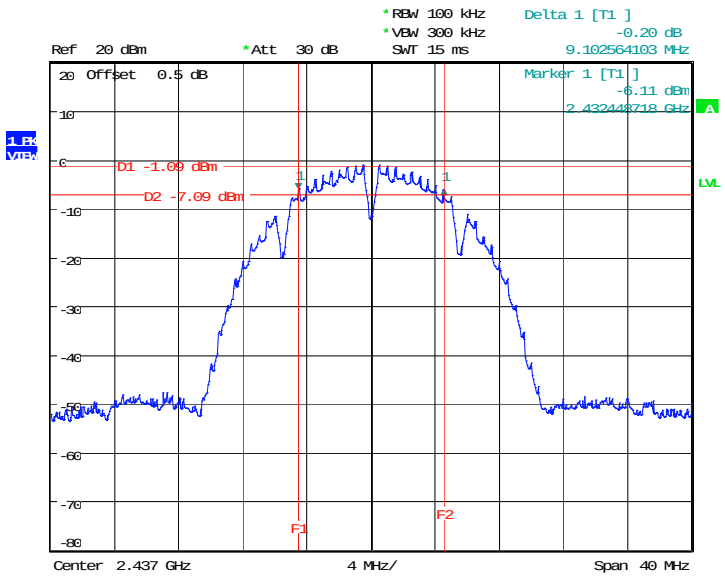
Wi-Fi B mode:

Low Channel



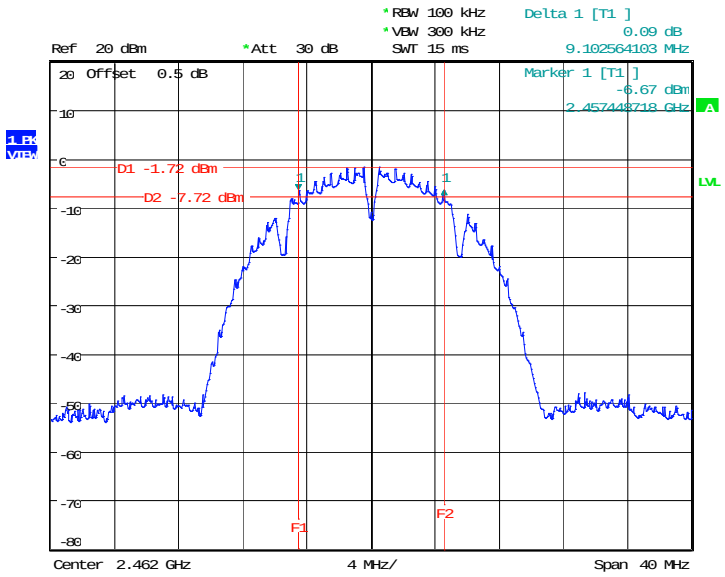
Date: 26.JAN.2018 14:58:23

Middle Channel



Date: 26.JAN.2018 15:03:44

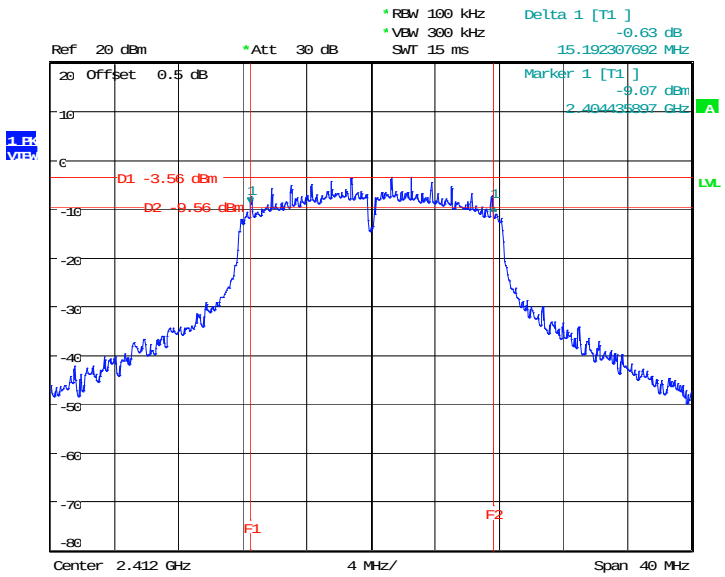
High Channel



Date: 26.JAN.2018 15:24:50

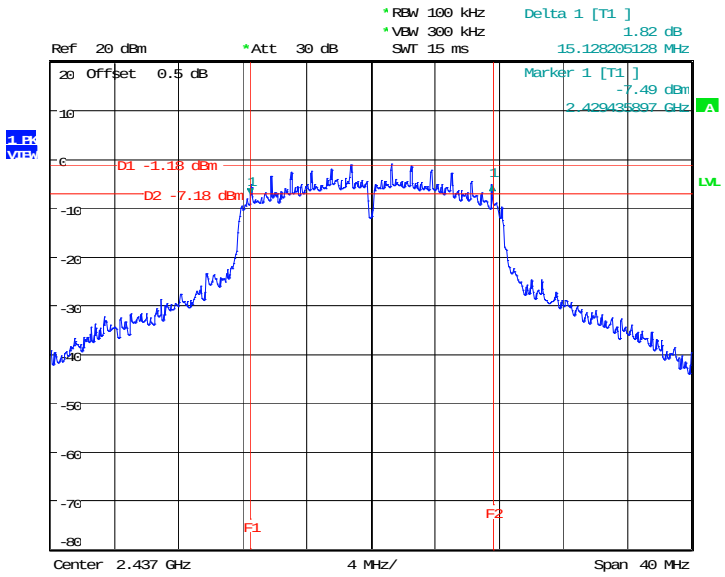
Wi-Fi G mode:

Low Channel



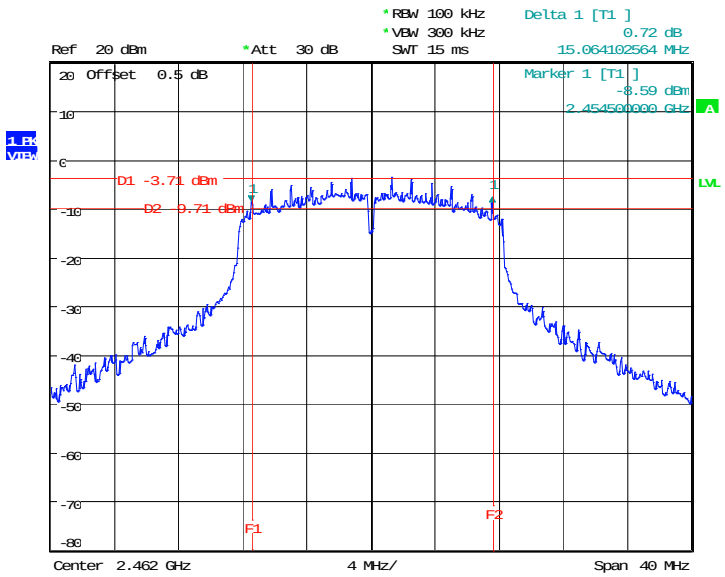
Date: 26.JAN.2018 15:51:42

Middle Channel



Date: 26.JAN.2018 15:55:42

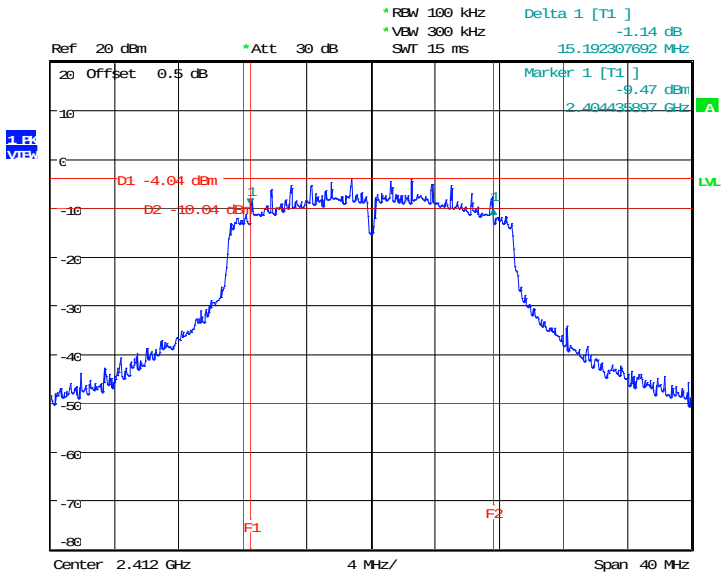
High Channel



Date: 26.JAN.2018 16:00:39

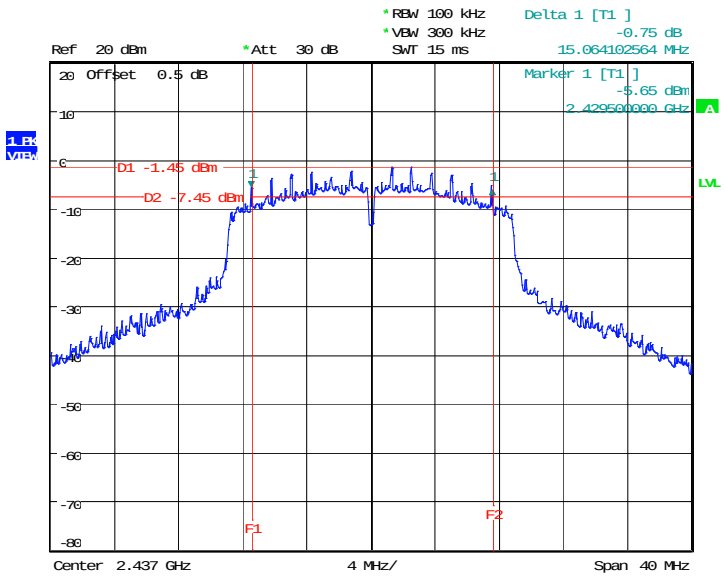
Wi-Fi N20 mode:

Low Channel



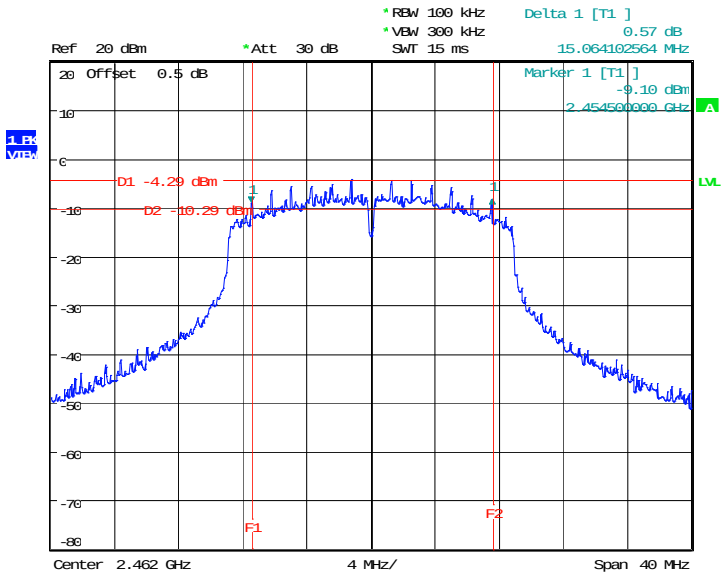
Date: 26.JAN.2018 16:17:28

Middle Channel



Date: 26.JAN.2018 16:20:46

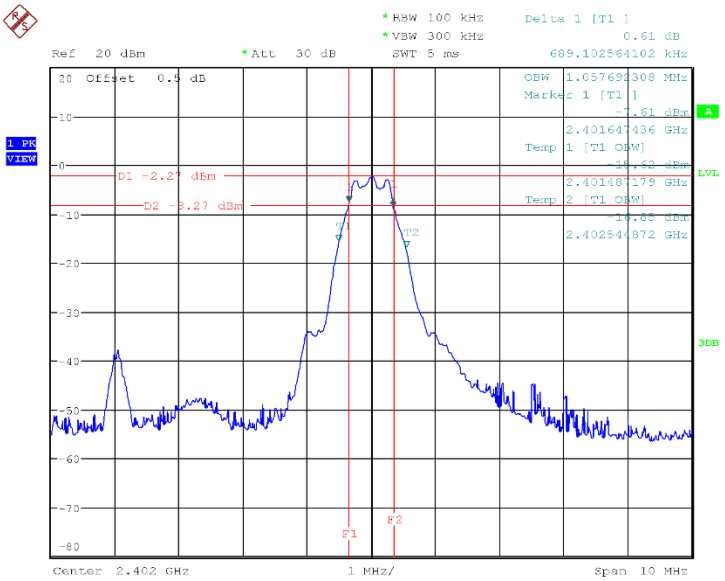
High Channel



Date: 26.JAN.2018 16:24:11

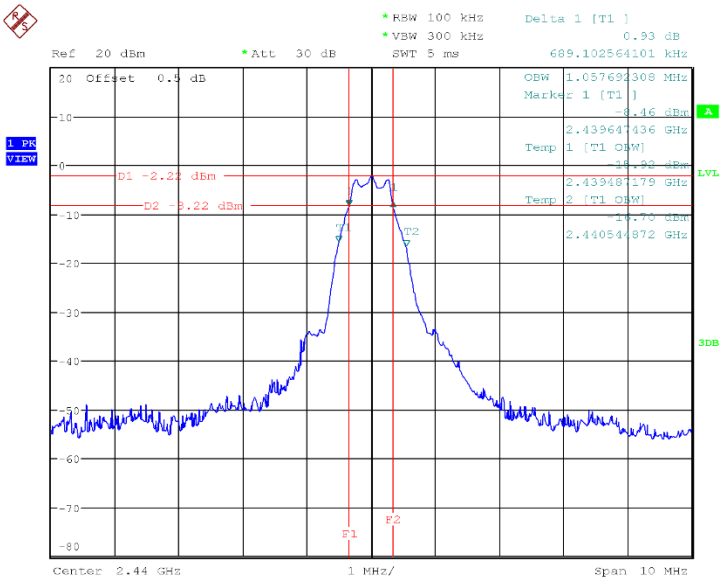
BLE mode (C1 HomeSystem):

Low Channel



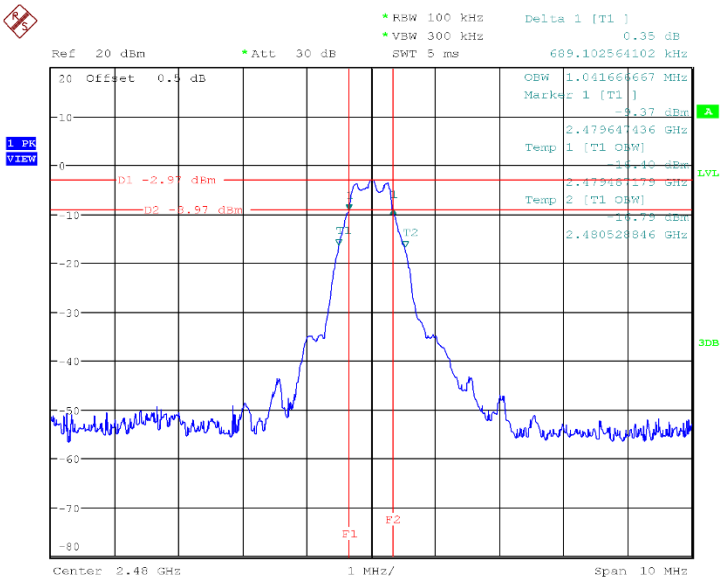
Date: 15.JAN.2018 15:09:44

Middle Channel



Date: 15.JAN.2018 15:13:34

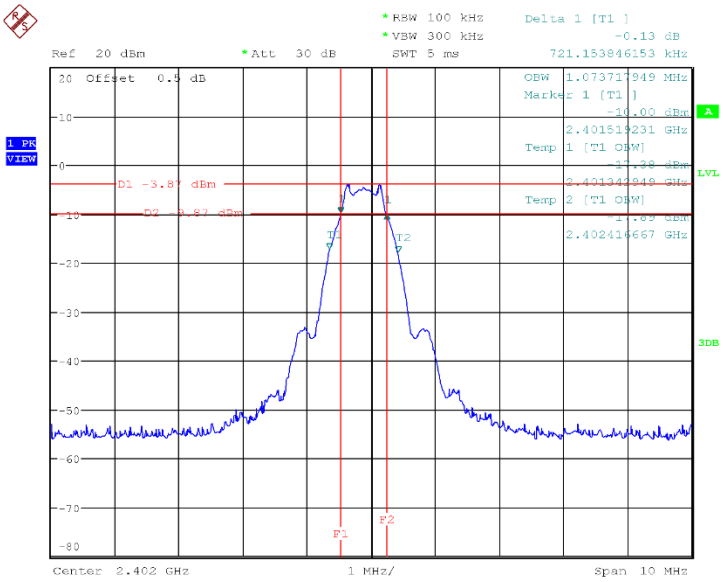
High Channel



Date: 15.JAN.2018 15:17:46

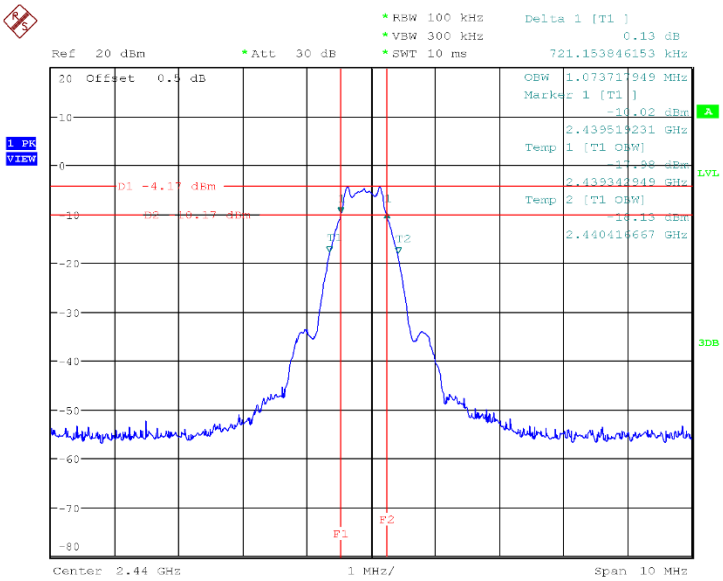
BLE mode (Rear Lens PCBA):

Low Channel



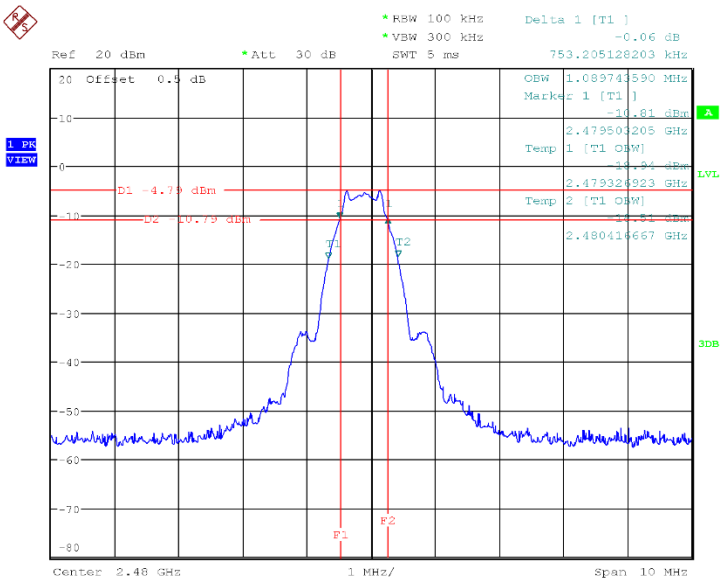
Date: 15.JAN.2018 16:58:52

Middle Channel



Date: 15.JAN.2018 17:08:41

High Channel



Date: 15.JAN.2018 17:12:32

8 FCC §15.247(b)(3) – Maximum Output Power

8.1 Applicable Standard

According to FCC §15.247(b) (3).

Systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

8.2 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 measuring equipment.

8.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2017/03/21	2018/03/20
Cable	WOKEN	SFL402	S02-160323-07	2017/02/22	2018/02/21

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

8.4 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian from 2018-01-08 to 2018-01-29.

8.5 Test Results

Channel	Frequency (MHz)	Maximum peak Conducted Output Power (dBm)	Limit (dBm)	Result
B mode				
Low	2412	12.65	30	Compliance
Middle	2437	12.69	30	Compliance
High	2462	12.21	30	Compliance
G mode				
Low	2412	15.26	30	Compliance
Middle	2437	18.35	30	Compliance
High	2462	15.07	30	Compliance
N20 mode				
Low	2412	14.84	30	Compliance
Middle	2437	16.92	30	Compliance
High	2462	14.53	30	Compliance
BLE mode (C1 HomeSystem)				
Low	2402	-3.21	30	Compliance
Middle	2440	-2.35	30	Compliance
High	2480	-3.52	30	Compliance
BLE mode (Rear Lens PCBA)				
Low	2402	-4.21	30	Compliance
Middle	2440	-4.23	30	Compliance
High	2480	-5.02	30	Compliance

Channel	Frequency (MHz)	Average Output Power (dBm)	Duty Factor	Total Average Output Power (dBm)	Limit (dBm)	Result
B mode						
Low	2412	8.28	0.00	8.28	30	Compliance
Middle	2437	8.81	0.00	8.81	30	Compliance
High	2462	8.12	0.00	8.12	30	Compliance
G mode						
Low	2412	6.30	0.31	6.61	30	Compliance
Middle	2437	8.15	0.31	8.46	30	Compliance
High	2462	6.09	0.31	6.40	30	Compliance
N20 mode						
Low	2412	5.34	0.43	5.77	30	Compliance
Middle	2437	7.65	0.43	8.08	30	Compliance
High	2462	5.19	0.43	5.62	30	Compliance
BLE mode (C1 HomeSystem)						
Low	2402	-4.42	0.85	-3.57	30	Compliance
Middle	2440	-3.49	0.85	-2.64	30	Compliance
High	2480	-4.33	0.85	-3.48	30	Compliance
BLE mode (Rear Lens PCBA)						
Low	2402	-4.38	0.00	-4.38	30	Compliance
Middle	2440	-4.58	0.00	-4.58	30	Compliance
High	2480	-5.28	0.00	-5.28	30	Compliance

9 FCC §15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

9.1 Applicable Standard

According to FCC §15.247(d).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

9.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

9.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2017/05/08	2018/05/07
Cable	WOKEN	SFL402	S02-160323-07	2017/02/22	2018/02/21

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

9.4 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian from 2018-01-08 to 2018-01-29

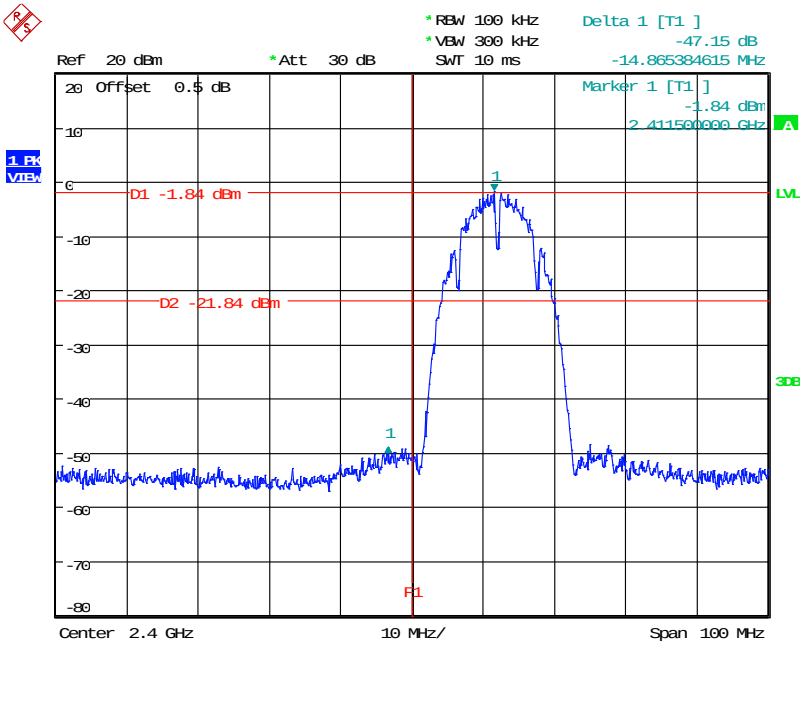
9.5 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	RESULT
B mode				
Low	2412	47.51	≥ 20	PASS
High	2462	49.98	≥ 20	PASS
G mode				
Low	2412	32.02	≥ 20	PASS
High	2462	47.92	≥ 20	PASS
N20 mode				
Low	2412	32.97	≥ 20	PASS
High	2462	46.61	≥ 20	PASS
BLE mode (C1 HomeSystem)				
Low	2402	35.58	≥ 20	PASS
High	2480	48.15	≥ 20	PASS
BLE mode (Rear Lens PCBA)				
Low	2402	45.39	≥ 20	PASS
High	2480	49.36	≥ 20	PASS

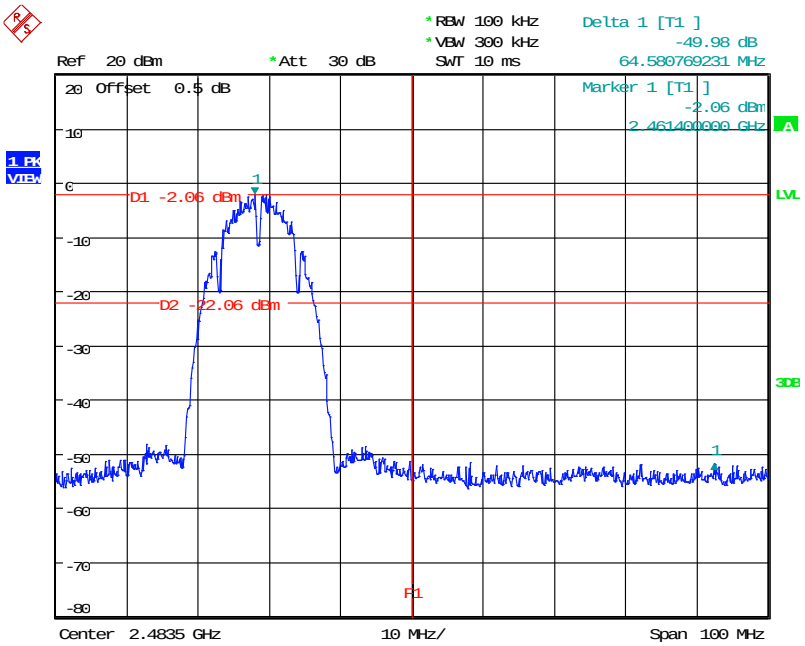
Please refer to the following plots

Wi-Fi B mode:

Band Edge, Left Side



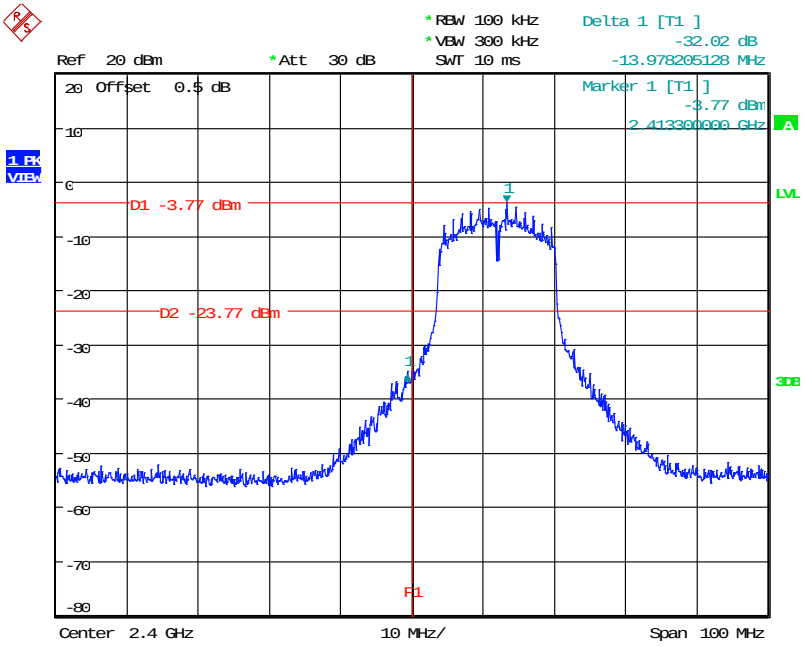
Band Edge, Right Side



Date: 26.JAN.2018 17:01:45

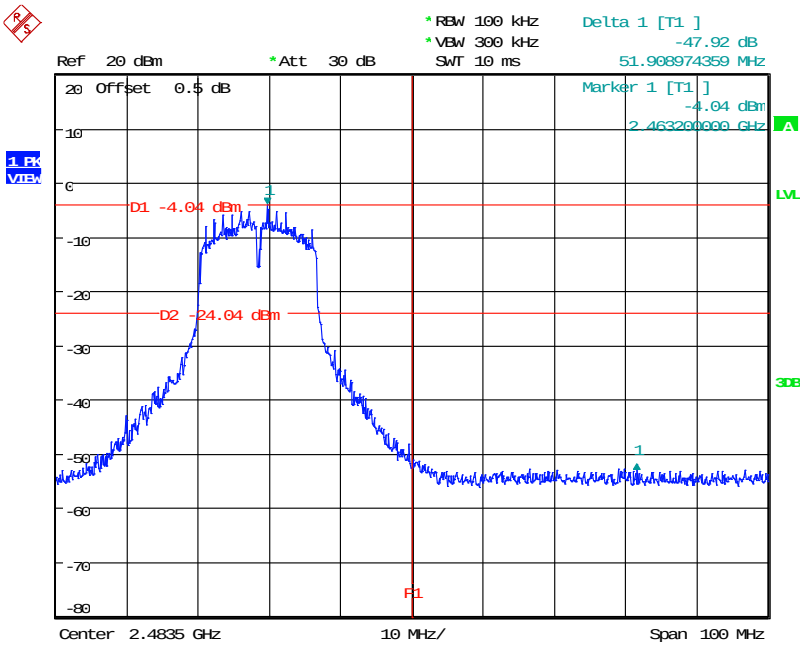
Wi-Fi G mode:

Band Edge, Left Side



Date: 26.JAN.2018 17:04:01

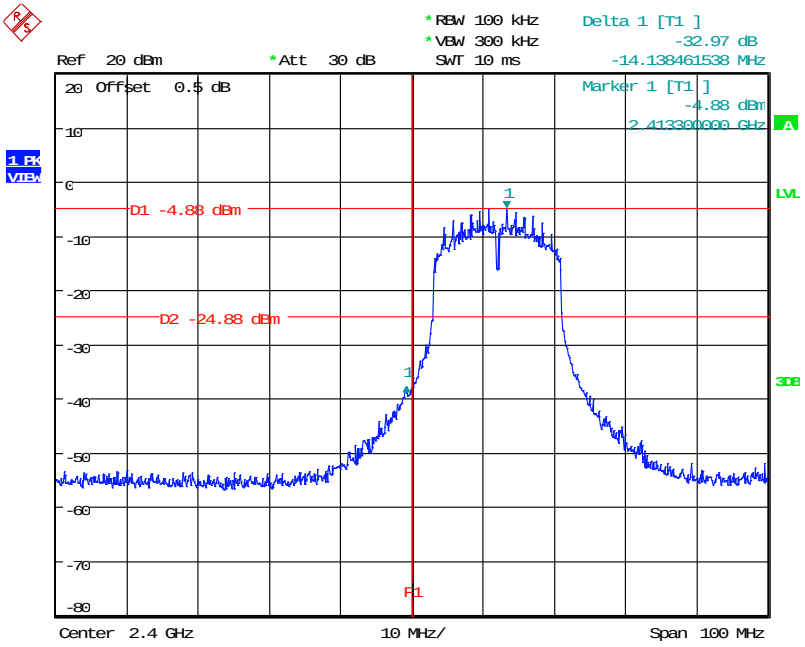
Band Edge, Right Side



Date: 26.JAN.2018 17:04:51

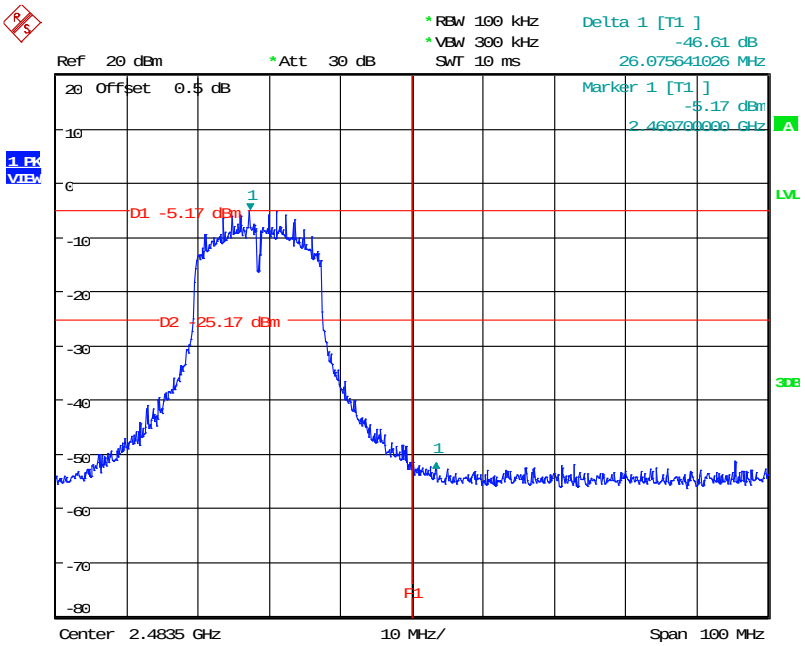
Wi-Fi N20 mode:

Band Edge, Left Side



Date: 26.JAN.2018 17:05:38

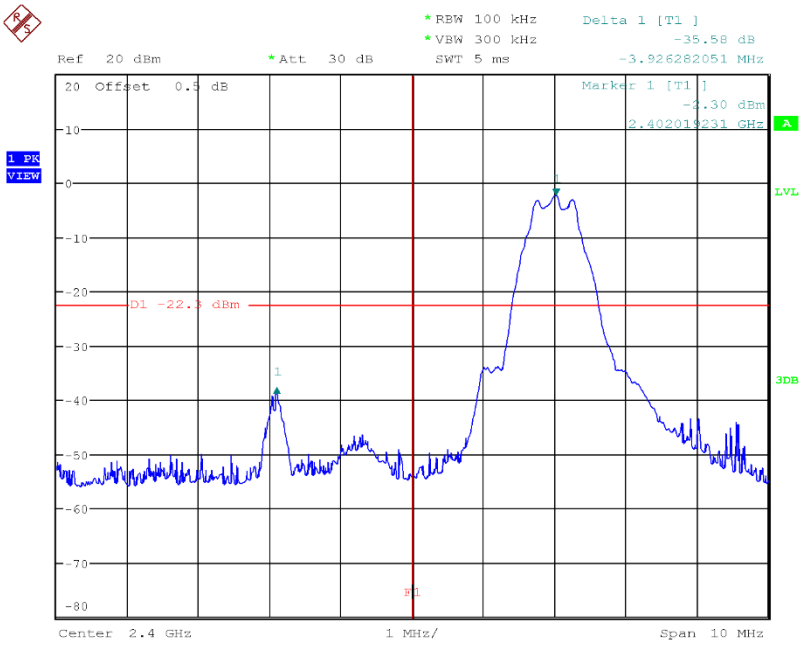
Band Edge, Right Side



Date: 26.JAN.2018 17:06:36

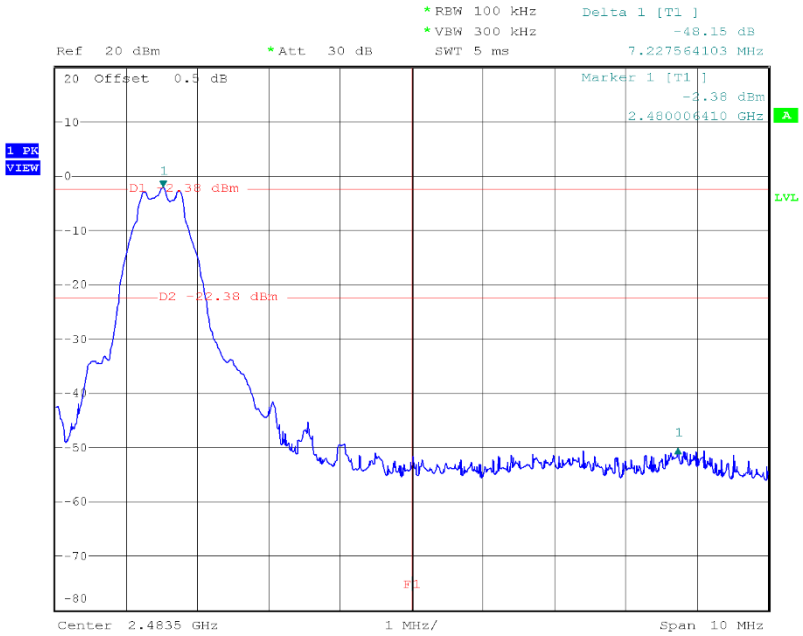
BLE mode (C1 HomeSystem):

Band Edge, Left Side



Date: 15.JAN.2018 15:11:47

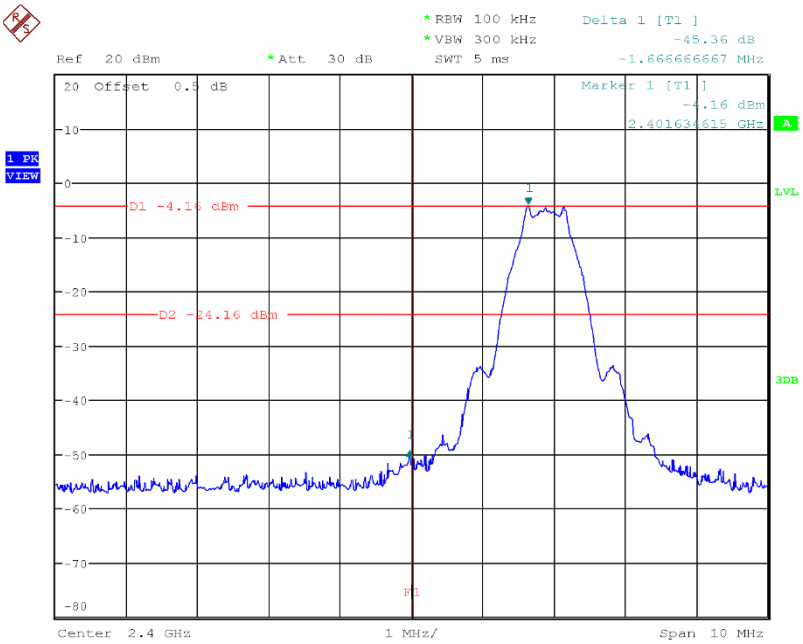
Band Edge, Right Side



Date: 15.JAN.2018 15:19:28

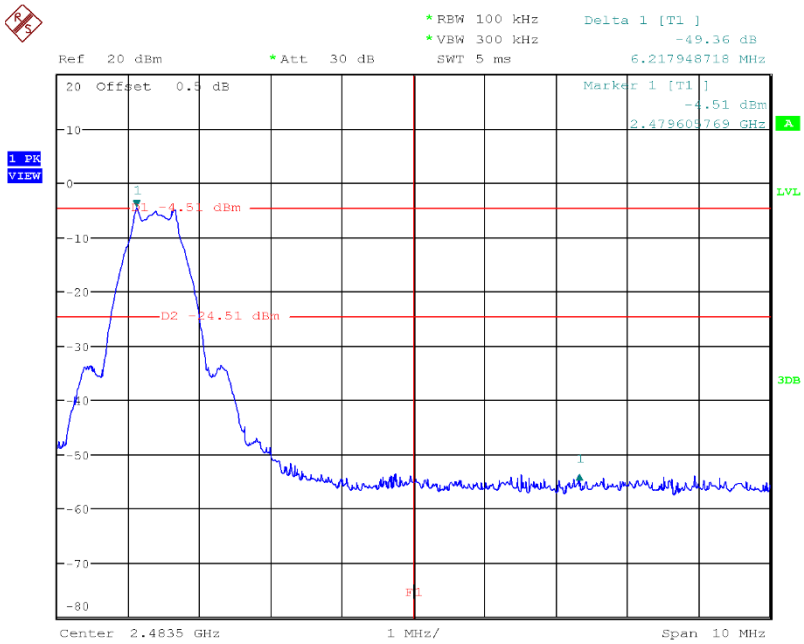
BLE mode (Rear Lens PCBA):

Band Edge, Left Side



Date: 15.JAN.2018 17:01:05

Band Edge, Right Side



Date: 15.JAN.2018 17:13:48

10 FCC §15.247(e) – Power Spectral Density

10.1 Applicable Standard

According to FCC §15.247(e).

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

10.2 Test Procedure

According to ANSI C63.10-2013

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span to 1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

10.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2017/05/08	2018/05/07
Cable	WOKEN	SFL402	S02-160323-07	2017/02/22	2018/02/21

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

10.4 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian from 2018-01-08 to 2018-01-29.

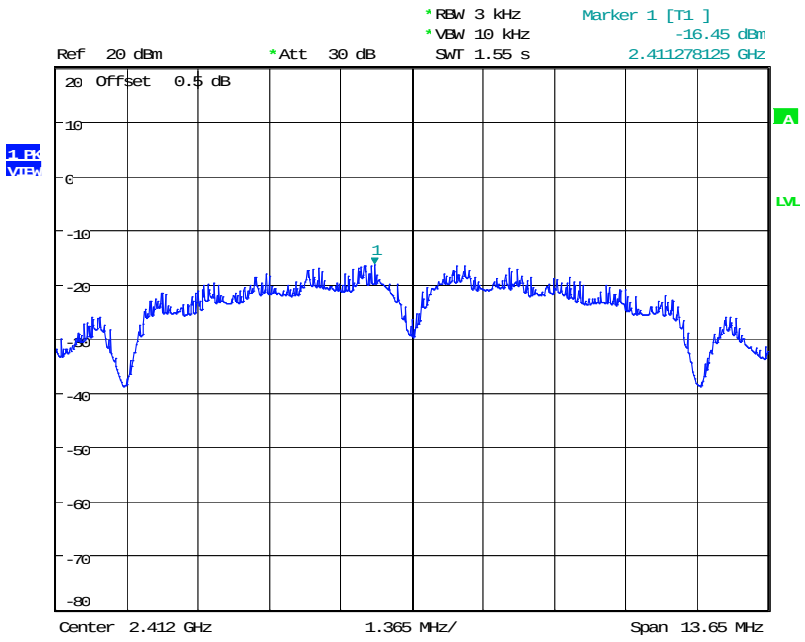
10.5 Test Results

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
B mode				
Low	2412	-16.45	8	Compliance
Middle	2437	-15.82	8	Compliance
High	2462	-16.19	8	Compliance
G mode				
Low	2412	-20.22	8	Compliance
Middle	2437	-15.43	8	Compliance
High	2462	-19.87	8	Compliance
N20 mode				
Low	2412	-19.91	8	Compliance
Middle	2437	-17.52	8	Compliance
High	2462	-20.21	8	Compliance
BLE mode (C1 HomeSystem)				
Low	2402	-14.98	8	Compliance
Middle	2440	-14.65	8	Compliance
High	2480	-15.98	8	Compliance
BLE mode (Rear Lens PCBA)				
Low	2402	-14.62	8	Compliance
Middle	2440	-15.03	8	Compliance
High	2480	-15.25	8	Compliance

Please refer to the following plots

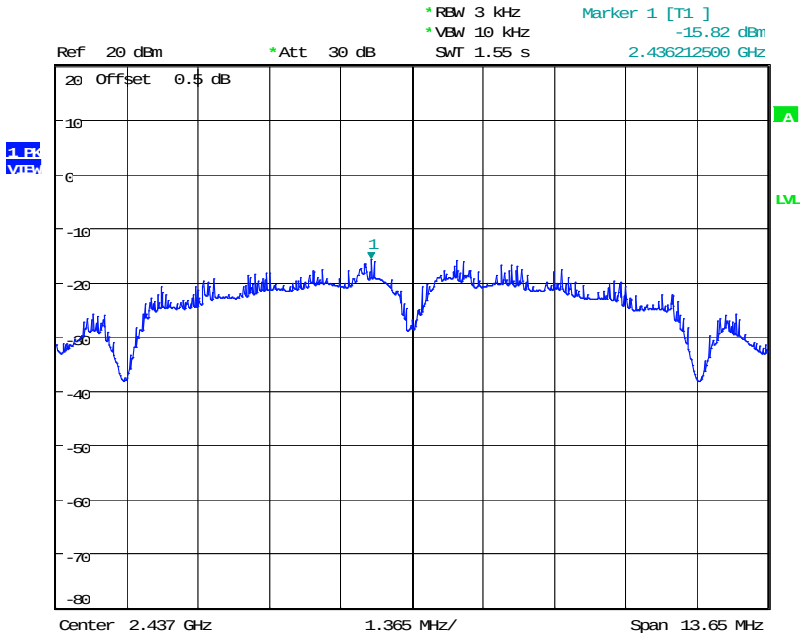
Wi-Fi B mode:

Low Channel



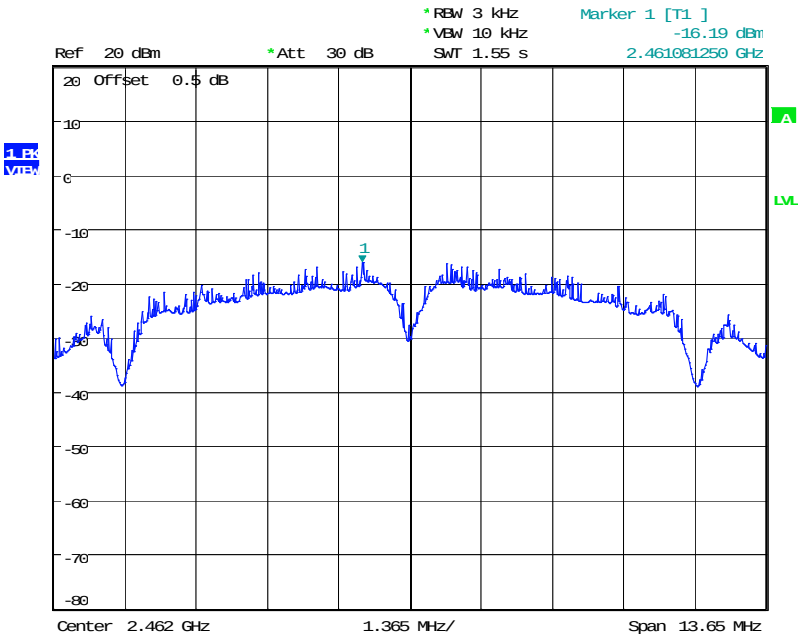
Date: 26.JAN.2018 15:39:26

Middle Channel



Date: 26.JAN.2018 15:41:54

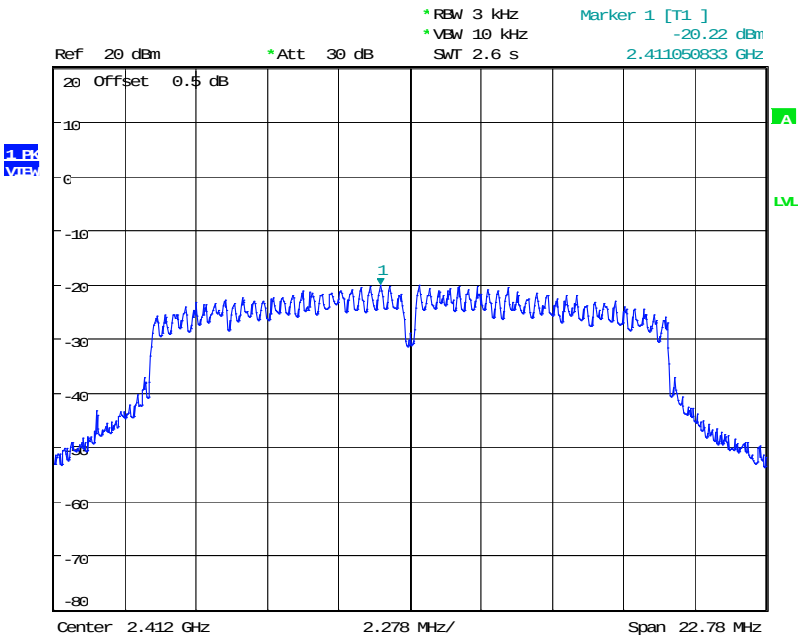
High Channel



Date: 26.JAN.2018 15:44:30

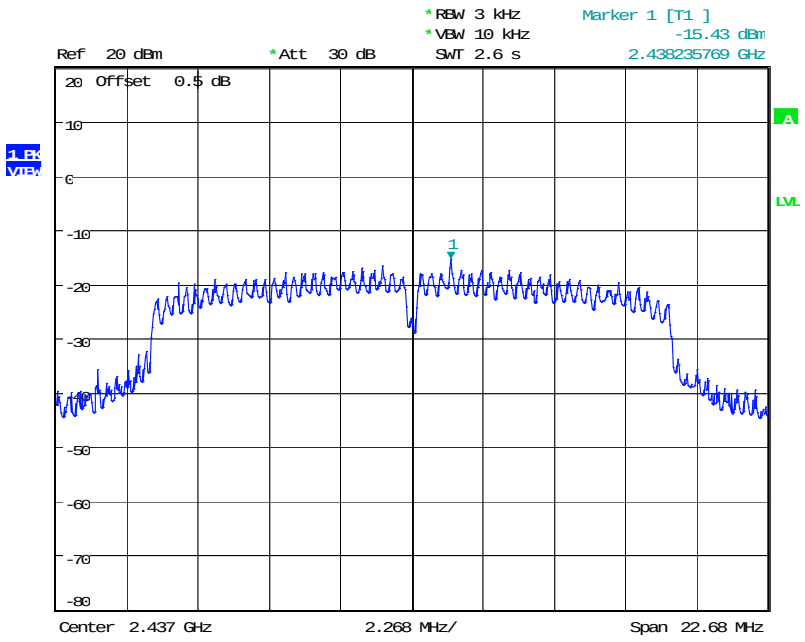
Wi-Fi G mode:

Low Channel



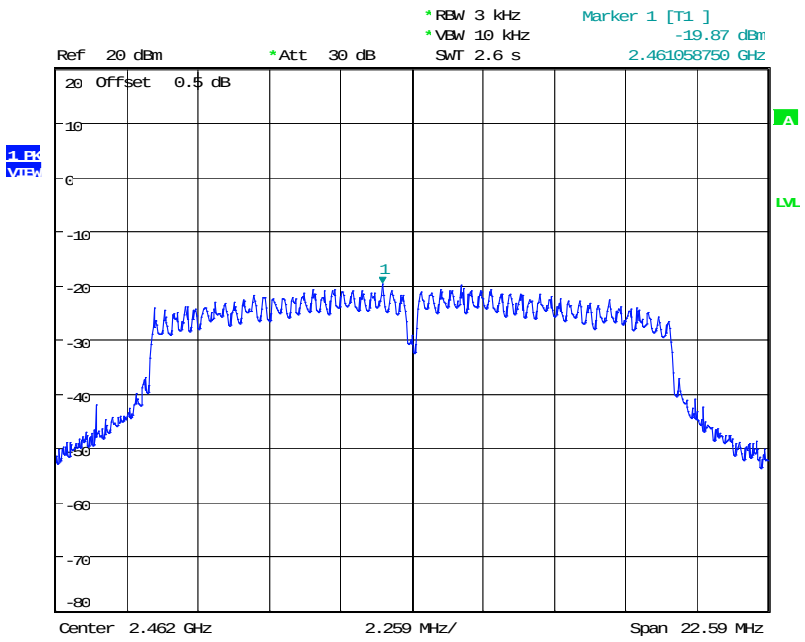
Date: 26.JAN.2018 16:11:39

Middle Channel



Date: 26.JAN.2018 16:13:36

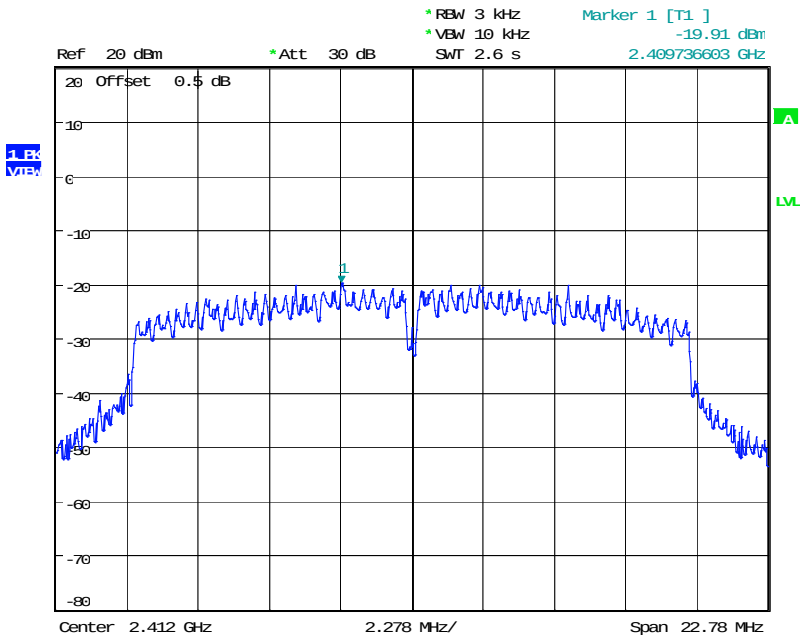
High Channel



Date: 26.JAN.2018 16:14:22

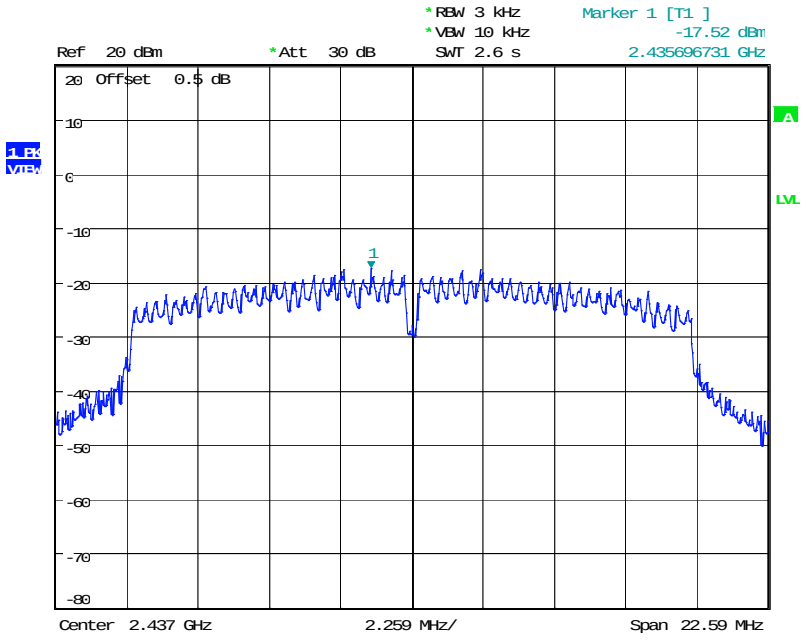
Wi-Fi N20 mode:

Low Channel



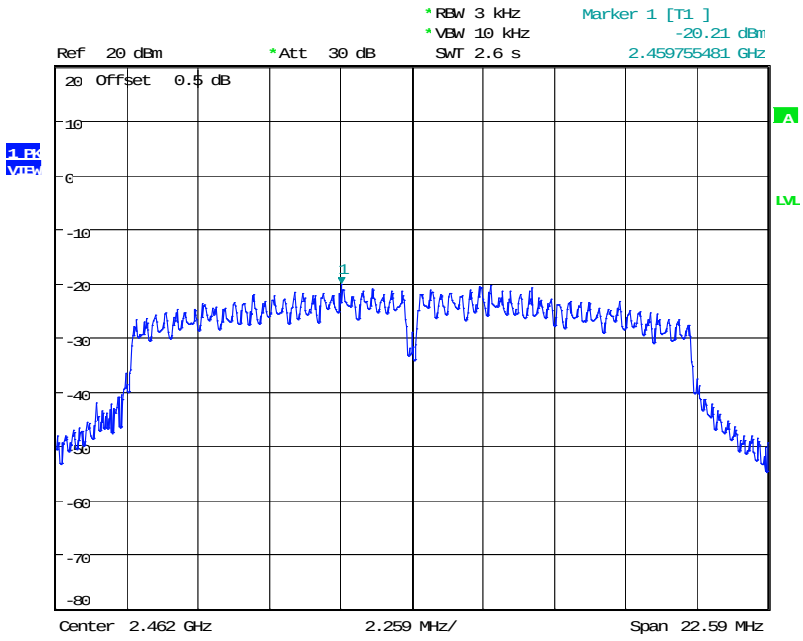
Date: 26.JAN.2018 16:53:55

Middle Channel



Date: 26.JAN.2018 16:54:38

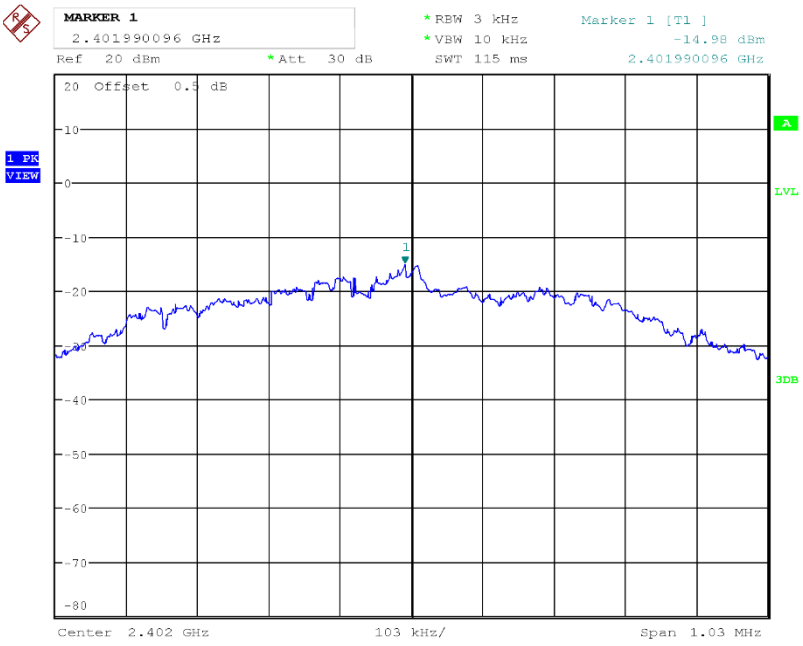
High Channel



Date: 26.JAN.2018 16:55:13

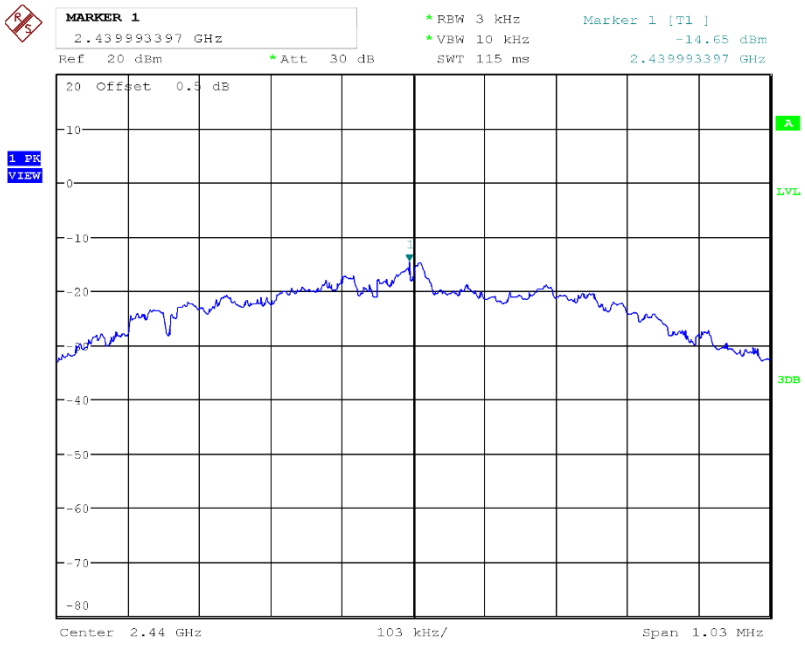
BLE mode (C1 HomeSystem):

Low Channel



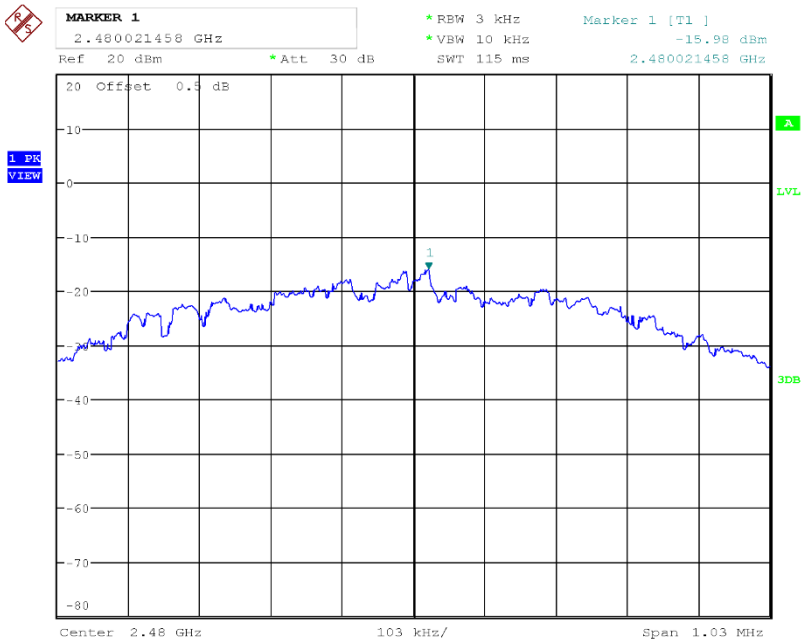
Date: 15.JAN.2018 15:23:42

Middle Channel



Date: 15.JAN.2018 15:24:33

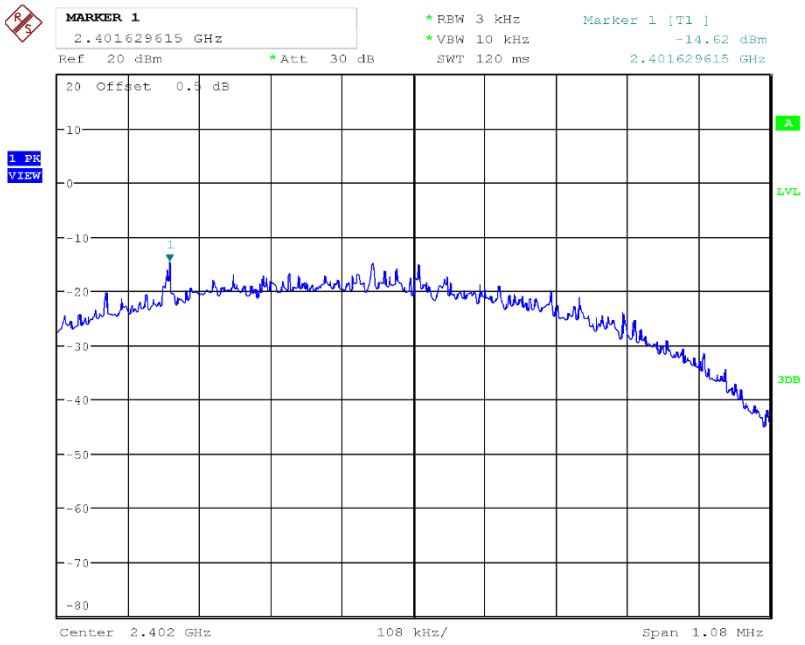
High Channel



Date: 15.JAN.2018 15:25:20

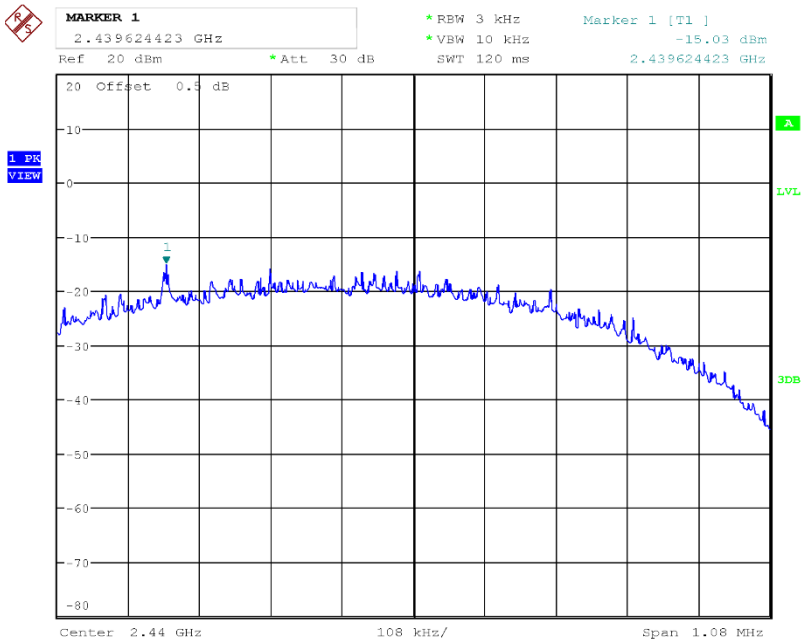
BLE mode (Rear Lens PCBA):

Low Channel



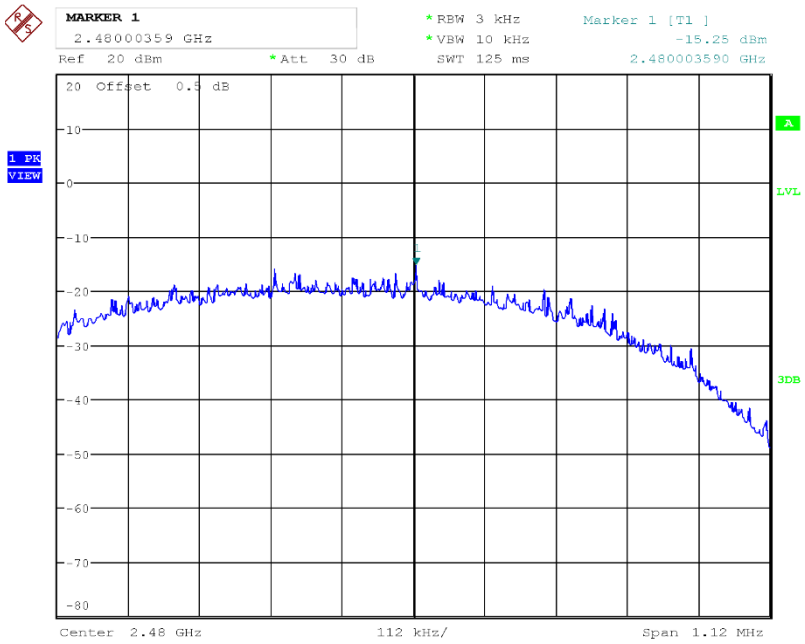
Date: 15.JAN.2018 17:02:39

Middle Channel



Date: 15.JAN.2018 17:10:19

High Channel



Date: 15.JAN.2018 17:15:20

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