Testing Laboratory
3546

FCC Part 15.247

RSS-247 Issue 2, Feb 2017; RSS-Gen Issue 5, Mar 2019

TEST REPORT

For

Redpine Signals Inc

2107 N First Street, Suite 540, San Jose, CA 95131-2019, USA

FCC ID: XF6-M7DB7
IC: 8407A-M7DB7

Report Type	**Original Report**
Product Name:	**Dual Band 802.11 a/b/g/n, Bluetooth 5.0 SIP Module**
Model Name:	**M7DB**
Report Number :	**RLK200203002-00B**
Report Date :	**2020/05/11**
Reviewed By :	**Zeus Chen** Zeus Chen

Prepared By:

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Revision History

Revision	Report Number	Issue Date	Description
1.0	RLK200203002-00B	2020/05/11	Original Report

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	**Redpine Signals Inc** 2107 N First Street, Suite 540, San Jose, CA 95131-2019, USA
Manufacturer	**Redpine Signals Inc** 2107 N First Street, Suite 540, San Jose, CA 95131-2019, USA
Brand Name	REDPINE SIGNALS DRIVING WIRELESS CONVERGENCE
Product (Equipment)	**Dual Band 802.11 a/b/g/n, Bluetooth 5.0 SIP Module**
Model Name	**M7DB**
Frequency Range	2402 - 2480 MHz
Number of Channels	40 Channels
Output Power	**<Dipole Antenna: TAOGLAS/GW.71.5153>** BLE 1Mbps: 16.12 dBm (0.0409 W) BLE 2Mbps: 18.52 dBm (0.0711 W) **<PIFA Antenna: SMARTEQ/4211613980>** BLE 1Mbps: 17.85 dBm (0.0610 W) BLE 2Mbps: 18.52 dBm (0.0711 W) **<Dipole Antenna: Inside WLAN/PRO-IS-299>** BLE 1Mbps: 19.19 dBm (0.0830 W) BLE 2Mbps: 19.33 dBm (0.0857 W) **<PCB Antenna: Redpine Signals/RSIA7>** BLE 1Mbps: 15.13 dBm (0.0326 W) BLE 2Mbps: 16.57 dBm (0.0454 W)
Modulation Type	GFSK
Related Submittal(s)/Grant(s)	**FCC Part 15.247 DTS with FCC ID: XF6-M7DB7** **FCC Part 15.247 DSS with FCC ID: XF6-M7DB7** **FCC Part 15.247 NII with FCC ID: XF6-M7DB7** **IC RSS-247 DTS with IC: 8407A-M7DB7** **IC RSS-247 FHSS with IC: 8407A-M7DB7** **IC RSS-247 LE-LAN with IC: 8407A-M7DB7**
Received Date	2020-02-03
Date of Test	2020-02-10 to 2020-04-30

**All measurement and test data in this report was gathered from production sample serial number: 190914002(Assigned by BACL, Linkou Laboratory).*

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☐ AC 120 V/60 Hz ☐ Adapter ☐ By Power Cord.
	☒ DC Type ☒ DC Power Supply: 3.3V ☐ Battery: ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System

1.3 Objective and Test Methodology

The Objective of this Test Report was to document the compliance of the Redpine Signals Inc. Appliance (Model: M7DB) to the requirements of the following Standards:

- Part 2, Subpart J, Part 15, Subparts A and C, section 15.247 of the Federal Communication Commission's rules.
- ANSI C63.10-2013 of t American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- RSS-Gen Issue 5, Mar 2019— General Requirements for Compliance of Radio Apparatus
- RSS-247 Issue 2, Feb 2017— Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power	± 1.488 dB
Occupied Channel Bandwidth	± 453.927 Hz
RF Conducted Emission test	± 2.77 dB
AC Power Line Conducted Emission	± 2.66 dB
Radiated Below 1G	± 3.57 dB
Radiated Above 1G	± 5.32 dB

The test results with statement of conformity, the decision rules are based on the specifications and standards. The test results will not take the measurement uncertainty into account.

1.5 Environmental Conditions and Test Date

Test Site	Test Date	Temperature (°C)	Relative Humidity (% RH)	Test Engineer
Conduction (CON-01)	2020-02-07	22.3	53	Blake Wang
Radiated (966A)	2020-02-10 to 2020-03-23	19.5-22.9	58-62	Leo Cheng
Conducted (TH-02)	2020-02-18 to 2020-04-30	16.9-19.5	50-55	Blake Wang

1.6 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Linkou Laboratory) to collect test data is located on

☒ No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.).

Bay Area Compliance Laboratories Corp. (Linkou Laboratory) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3546) by Mutual Recognition Agreement (MRA). The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database. The FCC Registration No.: 0027578244. Designation No.: TW1119. The Test Firm Registration No.: 311381. ISED#: 25102 and CAB identifier is TW3546.

2 System Test Configuration

2.1 Test Channels and Description of Worst Test Configuration

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

No special accessory, No modification was made to the EUT and No special equipment used during test.

For BLE, there are totally 40 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	20	2442
1	2404	--	--
2	2406	--	--
3	2408	37	2476
--	--	38	2478
19	**2440**	**39**	**2480**

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

For Radiated Emission, Conducted Power, Conducted Band Edge and PSD had test for four antenna because the power setting is different, the result will be different. For Bandwidth, Conducted Emission only test one result that because the power not affect the result.

Modulation Used for Conformance Test			
Configuration	**NTX**	**Data Rate**	**Worst Data Rate**
BLE-1M	1	125 kbps-1 Mbps	1 Mbps
BLE-2M	1	125 kbps-2 Mbps	2 Mbps

Worst Case of Power Setting				
EUT Exercise Software	FCC_PER_TEST_GUI.py			
Dipole antenna (TAOGLAS GW.71.5153)				
Configuration	**NTX**	**Low CH**	**Mid CH**	**High CH**
BLE-1Mbps mode	1	15	15	13
BLE-2Mbps mode	1	18	18	12
PIFA Antenna (SMARTEQ 4211613980)				
Configuration	**NTX**	**Low CH**	**Mid CH**	**High CH**
BLE-1Mbps mode	1	17	17	17
BLE-2Mbps mode	1	18	18	18

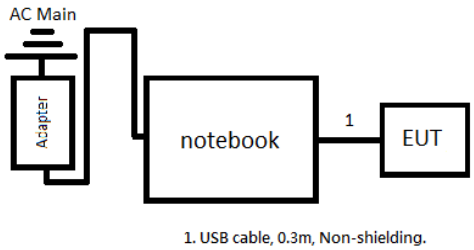
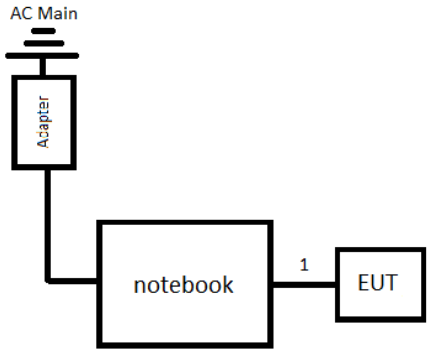
Worst Case of Power Setting				
EUT Exercise Software	FCC_PER_TEST_GUI.py			
Dipole antenna (Inside WLAN PRO-IS-299)				
Configuration	**NTX**	**Low CH**	**Mid CH**	**High CH**
BLE-1Mbps mode	1	18	18	18
BLE-2Mbps mode	1	19	19	21
PCB Antenna (Redpine Signals RSIA7)				
Configuration	**NTX**	**Low CH**	**Mid CH**	**High CH**
BLE-1Mbps mode	1	14	14	12
BLE-2Mbps mode	1	16	16	10

2.2 Support Equipment List and External Cable List

No.	Description	Manufacturer	Model Number
A	Notebook	DELL	Inspiron 15
B	Adapter	Chicony Power	HA65NS5-00 (DELL)

No.	Cable Description	Shielding Type	Length (m)	From	To
1	USB Cable	Non-Shielded	1	EUT	NB

2.3 Block Diagram of Test Setup

Conduction	Radiation
	

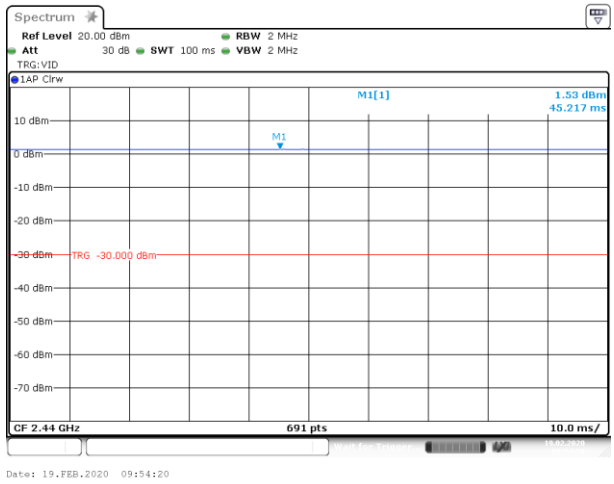
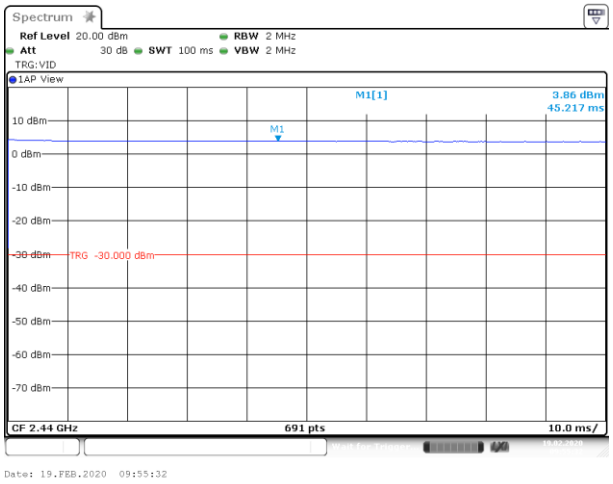
1. USB cable, 0.3m, Non-shielding.

1. USB cable, 0.3m, Non-shielding.

2.4 Duty Cycle

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)
BLE-1Mbps	100	100	100	0.00
BLE-2Mbps	100	100	100	0.00

BLE-1Mbps	BLE-2Mbps
	

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

3 Summary of Test Results

FCC/ISED Rules	Description of Test	Result
§15.247(i), §1.1310, §2.1091	Maximum Permissible Exposure (MPE)	Compliance
ISEDC RSS-102 Sec 2.5.2	Exemption Limits for Routine Evaluation – RF Exposure Evaluation	Compliance
§15.203 ISEDC RSS-Gen Sec 6.8	Antenna Requirement	Compliance
§15.207(a) ISEDC RSS-Gen Sec 6.8	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d) ISED RSS-Gen Sec 8.9 and 8.10 ISEDC RSS-247 Sec 5.5	Spurious Emissions	Compliance
§15.247(a)(2) ISEDC RSS-247 Sec 5.2 ISEDC RSS-Gen Sec 6.7	6 dB Emission Bandwidth and Occupied Bandwidth	Compliance
§15.247(b)(3) ISED RSS-247 Sec5.4(d)	Maximum Output Power	Compliance
§15.247(d) ISEDC RSS-247 Sec 5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e) ISEDC RSS-247 Sec 5.2(b)	Power Spectral Density	Compliance

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/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);

4.2 RF Exposure Evaluation Result

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)			
BLE	2402-2480	3.80	2.3988	19.00	79.4328	20	0.0379	1
BR/EDR	2402-2480	3.80	2.3988	21.00	125.8925	20	0.0601	1
Wi-Fi 2.4G	2412-2472	3.80	2.3988	25.00	316.2278	20	0.1510	1
Wi-Fi 5G	5150-5850	5.50	3.5481	14.50	28.1838	20	0.0199	1

Note: Wi-Fi and BT can't simultaneously.

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

5 RSS-102 Sec 2.5.2 - Exemption Limits for Routine Evaluation – RF Exposure Evaluation

5.1 Applicable Standard

According to subpart RSS-102 Sec 2.5.2,

> RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:
>
> - below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
> - at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
> - at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
> - at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
> - at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).
>
> In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

5.2 RF Exposure Evaluation Result

BLE Max tune-up conducted output power is 19.00 dBm (79.4328 mW) at 2402 MHz, Antenna Gain = 3.80 dBi, EIRP = 22.80 dBm (0.1906 W), so the maximum conducted and E.I.R.P. source-based, time-averaged output is less than 2.68 W for general public use.

BR/EDR Max tune-up conducted output power is 21.00 dBm (125.8925 mW) at 2402 MHz, Antenna Gain = 3.80 dBi, EIRP = 24.80 dBm (0.3020 W), so the maximum conducted and E.I.R.P. source-based, time-averaged output is less than 2.68 W for general public use.

Wi-Fi 2.4G Max tune-up conducted output power is 25.00 dBm (316.2278 mW) at 2437 MHz, Antenna Gain = 3.80 dBi, EIRP = 28.80 dBm (0.7586 W), so the maximum conducted and E.I.R.P. source-based, time-averaged output is less than 2.70 W for general public use.

Wi-Fi 5G Max tune-up conducted output power is 14.50. dBm (28.1839 mW) at 5825 MHz, Antenna Gain = 5.50 dBi, EIRP = 20.00 dBm (0.1000 W), so the maximum conducted and E.I.R.P. source-based, time-averaged output is less than 4.90 W for general public use.

Note: Wi-Fi and BT can't simultaneously.

Result: MPE test exempted.

6 FCC §15.203 and RSS-Gen Sec 6.8 - Antenna Requirements

6.1 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 6dBi

According to RSS-Gen 6.8: Transmitter Antenna for Licence-Exempt Radio Apparatus

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.Footnote8 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

6.2 Antenna List and Details

Brand	Model	Antenna Type	Antenna Gain (dBi)	Result
TAOGLAS	GW.71.5153	Dipole	3.80	Compliance
SMARTEQ	4211613980	PIFA	0.00	Compliance
Inside WLAN	PRO-IS-299	Dipole	2.50	Compliance
Redpine Signals	RSIA7	PCB Antenna	0.71	Compliance

The EUT has an internal antenna arrangement, which was permanently attached, fulfill the requirement of this section.

7 FCC §15.207 and RSS-Gen Sec 6.8 - AC Line Conducted Emissions

7.1 Applicable Standard

According to FCC §15.207,

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

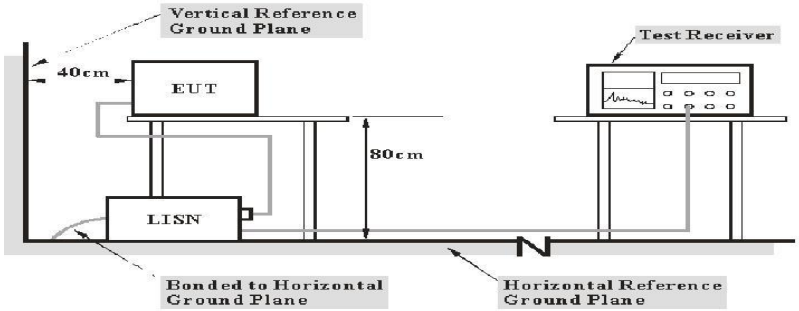
According to RSS-Gen 8.8 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency. Note 2: A linear average detector is required

7.2 EUT Setup and Test Procedure



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz. During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	Receiver RBW
150 kHz - 30 MHz	9 kHz

During the conducted emission test, the adapter was connected to the outlet of the LISN. Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the Quasi-peak and average detection mode.

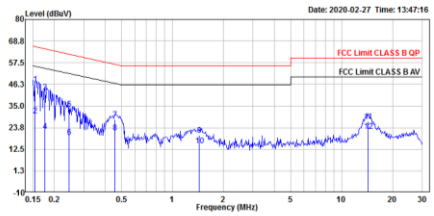
7.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
AC Line Conduction Room (Conduction-01)					
Two-Line V-Network	Rohde & Schwarz	ENV216	100010	2019/09/02	2020/09/01
Pulse Limiter	SCHWARZBECK	VSTD 9561-F	00432	2019/08/28	2020/08/27
EMI Test Receiver	Rohde & Schwarz	ESR3	102448	2019/06/27	2020/06/23
RF Cable	EMCI	EMCCFD300-BM-BM-8000	180526	2019/08/08	2020/08/07
Software	Audix	e3 v9	E3LK-03	N.C.R	N.C.R

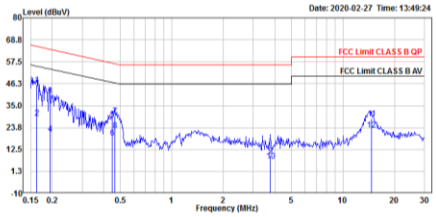
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

7.4 Test Data and Test Plot

Line	Neutral



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.155	26.49	46.43	19.94	65.74	-19.31	QP
2	0.155	10.29	30.23	19.94	55.74	-25.51	Average
3	0.176	22.32	42.26	19.94	64.68	-22.42	QP
4	0.176	2.06	22.00	19.94	54.68	-32.68	Average
5	0.246	13.48	33.42	19.94	61.90	-28.48	QP
6	0.246	-1.10	18.84	19.94	51.90	-33.06	Average
7	0.458	8.20	28.16	19.96	56.74	-28.58	QP
8	0.458	1.13	21.09	19.96	46.74	-25.65	Average
9	1.441	-0.24	19.74	19.98	56.00	-36.26	QP
10	1.441	-5.45	14.53	19.98	46.00	-31.47	Average
11	14.300	6.83	26.97	20.14	60.00	-33.03	QP
12	14.300	1.62	21.76	20.14	50.00	-28.24	Average



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.162	25.81	45.76	19.95	65.34	-19.58	QP
2	0.162	8.93	28.88	19.95	55.34	-26.46	Average
3	0.194	20.19	40.13	19.94	63.88	-23.75	QP
4	0.194	0.76	20.70	19.94	53.88	-33.18	Average
5	0.450	7.96	27.93	19.97	56.87	-28.94	QP
6	0.450	-1.35	18.62	19.97	46.87	-28.25	Average
7	0.465	9.76	29.73	19.97	56.60	-26.87	QP
8	0.465	2.21	22.18	19.97	46.60	-24.42	Average
9	3.780	-10.84	9.19	20.03	56.00	-46.81	QP
10	3.780	-13.36	6.67	20.03	46.00	-39.33	Average
11	14.645	8.06	28.31	20.25	60.00	-31.69	QP
12	14.645	2.19	22.44	20.25	50.00	-27.56	Average

Note1: Transmit Mode

Note2:

Level = Reading Level + Correct Factor

Over Limit = Level – Limit

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

8 FCC §15.209, §15.205, §15.247(d), RSS-Gen Sec 8.9, 8.10 and RSS-247 Sec 5.5 – Spurious Emissions

8.1 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 1MHz.

As Per FCC §15.205(a) 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	13.36-13.41	399.9-410	4.5-5.15
0.495-0.505	16.42-16.423	608-614	5.35-5.46
2.1735-2.1905	16.69475-16.69525	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	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 470-806MHz. 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 20dB. 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).

As per RSS-Gen 8.9,

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz

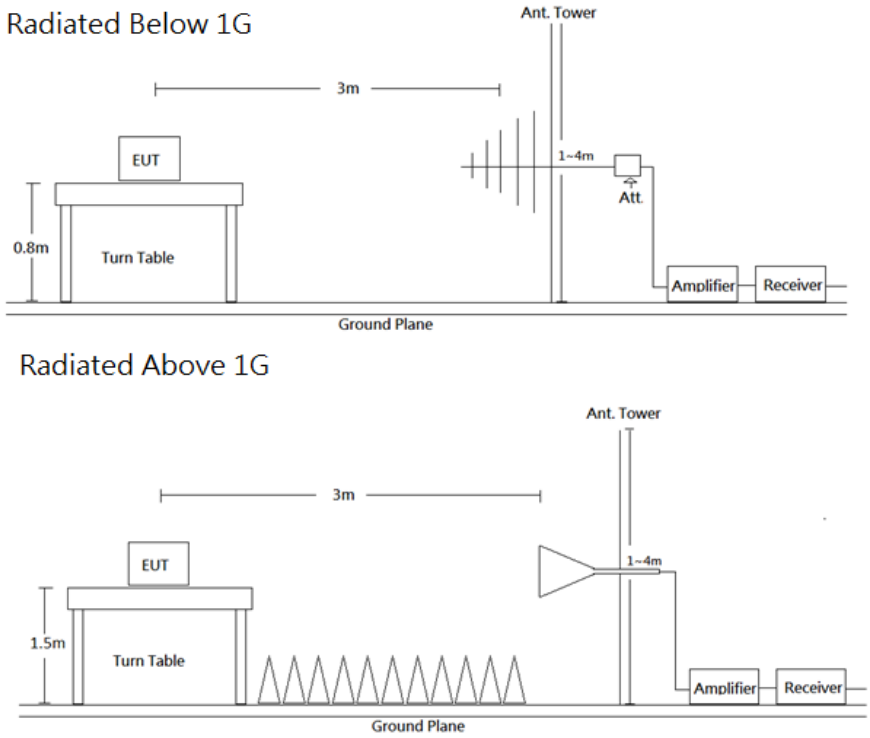
Frequency (MHz)	Field Strength (μv/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.2 EUT Setup and Test Procedure



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.

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	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	-	QP
Above 1 GHz	1 MHz	3 MHz	-	PK
	1 MHz	10 Hz	>98%	Ave
	1 MHz	1/T	<98%	Ave

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.

8.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Radiation 3M Room (966A)					
Active Loop	EMCO	6502	0001-3322	2020/03/16	2021/03/15
Bilog Antenna/6 dB Attenuator	SUNOL SCIENCES & EMEC /EMCI	JB3/N-6-06	A111513/AT-N0668	2020/03/19	2021/03/18
Horn Antenna	ETS-Lindgren	3115	00109141	2019/07/05	2020/07/04
Horn Antenna	ETS-Lindgren	3160-09	00123852	2019/07/11	2020/07/10
Preamplifier	A.H. Systems	PAM-0118	470	2020/03/16	2021/03/15
Preamplifier	A.H. Systems	PAM-1840VH	174	2020/03/25	2021/03/24
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	101456	2019/07/12	2020/07/11
Microflex Cable (1m)	EMCI	EMC106-SM-SM-2000	180515	2019/08/07	2020/08/06
Microflex Cable (2m)	MTJ	H0919	00000-MT28A-100	2019/08/07	2020/08/06
Microflex Cable (8m)	UTIFLEX	UFA210A-1-3149-300300	MFR 64639 232490-001	2019/08/07	2020/08/06
Turn Table	Chaintek	T-200-S-1	003501	N.C.R	N.C.R
Antenna Tower	Chaintek	MBD-400-1	003504	N.C.R	N.C.R
Controller	Chaintek	3000-1	003507	N.C.R	N.C.R
Software	Audix	e3 v9	E3LK-01	N.C.R	N.C.R
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

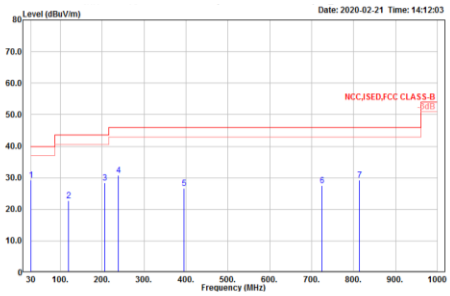
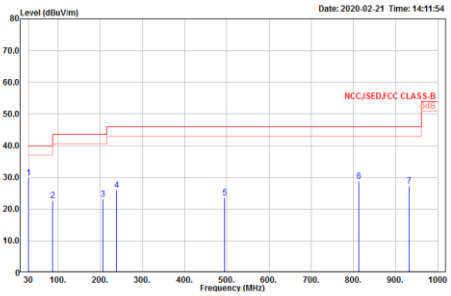
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

8.4 Test Result

<Dipole Antenna: TAOGLAS/GW.71.5153>

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

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

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	30.970	29.17	40.00	-10.83	36.01	-6.84	Peak	horizontal
2	119.240	22.70	43.50	-20.80	40.66	-17.96	Peak	horizontal
3	205.570	28.34	43.50	-15.16	48.04	-19.70	Peak	horizontal
4	239.520	30.77	46.00	-15.23	50.46	-19.69	Peak	horizontal
5	394.720	26.76	46.00	-19.24	42.94	-16.18	Peak	horizontal
6	724.520	27.44	46.00	-18.56	38.05	-10.61	Peak	horizontal
7	813.760	29.20	46.00	-16.80	38.52	-9.32	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	30.000	29.95	40.00	-10.05	36.08	-6.13	Peak	vertical
2	87.230	22.71	40.00	-17.29	45.85	-23.14	Peak	vertical
3	205.570	23.10	43.50	-20.40	42.80	-19.70	Peak	vertical
4	239.520	26.02	46.00	-19.98	45.71	-19.69	Peak	vertical
5	494.630	23.70	46.00	-22.30	37.87	-14.17	Peak	vertical
6	812.790	28.92	46.00	-17.08	38.26	-9.34	Peak	vertical
7	931.130	27.29	46.00	-18.71	35.51	-8.22	Peak	vertical

Level = Reading Level + Correct Factor

Over Limit = Level – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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

Above 1G (1 GHz-26.5 GHz)

BLE-1Mbps mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2362.200	41.01	54.00	-12.99	48.71	-7.70	Average
2362.200	51.86	74.00	-22.14	59.56	-7.70	Peak
2401.900	103.80			111.42	-7.62	Average
2401.900	105.01			112.63	-7.62	Peak
3202.700	36.93	54.00	-17.07	41.19	-4.26	Average
3202.700	44.02	74.00	-29.98	48.28	-4.26	Peak
4804.000	48.12	54.00	-5.88	47.50	0.62	Average
4804.000	54.60	74.00	-19.40	53.98	0.62	Peak
7206.000	43.89	54.00	-10.11	38.64	5.25	Average
7206.000	53.36	74.00	-20.64	48.10	5.26	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2362.400	47.16	54.00	-6.84	54.86	-7.70	Average
2362.400	54.72	74.00	-19.28	62.42	-7.70	Peak
2402.300	111.08			118.70	-7.62	Average
2402.300	112.38			120.00	-7.62	Peak
3202.700	40.90	54.00	-13.10	45.20	-4.30	Average
3202.700	45.67	74.00	-28.33	49.97	-4.30	Peak
4804.000	53.42	54.00	-0.58	52.80	0.62	Average
4804.000	59.47	74.00	-14.53	58.85	0.62	Peak
7206.000	53.26	54.00	-0.74	48.01	5.25	Average
7206.000	61.76	74.00	-12.24	56.50	5.26	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2359.852	36.70	54.00	-17.30	44.41	-7.71	Average
2359.852	50.41	74.00	-23.59	58.12	-7.71	Peak
2439.954	103.48			111.00	-7.52	Average
2439.954	104.80			112.32	-7.52	Peak
2525.138	37.29	54.00	-16.71	44.54	-7.25	Average
2525.138	51.15	74.00	-22.85	58.40	-7.25	Peak
3253.300	36.77	54.00	-17.23	40.80	-4.03	Average
3253.300	45.15	74.00	-28.85	49.18	-4.03	Peak
4880.000	48.01	54.00	-5.99	47.20	0.81	Average
4880.000	54.46	74.00	-19.54	53.65	0.81	Peak
7320.000	46.64	54.00	-7.36	40.92	5.72	Average
7320.000	56.32	74.00	-17.68	50.60	5.72	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2373.646	37.83	54.00	-16.17	45.49	-7.66	Average
2373.646	52.11	74.00	-21.89	59.77	-7.66	Peak
2439.954	110.25			117.77	-7.52	Average
2439.954	111.55			119.07	-7.52	Peak
2491.742	38.18	54.00	-15.82	45.51	-7.33	Average
2491.742	52.10	74.00	-21.90	59.43	-7.33	Peak
3253.300	41.31	54.00	-12.69	45.38	-4.07	Average
3253.300	46.12	74.00	-27.88	50.19	-4.07	Peak
4880.000	53.60	54.00	-0.40	52.79	0.81	Average
4880.000	59.44	74.00	-14.56	58.63	0.81	Peak
7320.000	51.53	54.00	-2.47	45.81	5.72	Average
7320.000	59.44	74.00	-14.56	53.74	5.70	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.758	99.95			107.30	-7.35	Average
2479.758	100.98			108.33	-7.35	Peak
2483.500	46.28	54.00	-7.72	53.62	-7.34	Average
2483.500	56.14	74.00	-17.86	63.48	-7.34	Peak
3306.700	37.41	54.00	-16.59	41.34	-3.93	Average
3306.700	42.94	74.00	-31.06	46.87	-3.93	Peak
4960.000	46.21	54.00	-7.79	45.39	0.82	Average
4960.000	53.80	74.00	-20.20	52.99	0.81	Peak
7440.000	41.01	54.00	-12.99	34.95	6.06	Average
7440.000	51.93	74.00	-22.07	45.87	6.06	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.758	106.62			113.97	-7.35	Average
2479.758	107.90			115.25	-7.35	Peak
2483.500	52.65	54.00	-1.35	59.99	-7.34	Average
2483.500	62.74	74.00	-11.26	70.08	-7.34	Peak
3306.700	38.97	54.00	-15.03	42.90	-3.93	Average
3306.700	44.89	74.00	-29.11	48.82	-3.93	Peak
4960.000	49.43	54.00	-4.57	48.61	0.82	Average
4960.000	56.12	74.00	-17.88	55.31	0.81	Peak
7440.000	46.86	54.00	-7.14	40.80	6.06	Average
7440.000	55.94	74.00	-18.06	49.88	6.06	Peak

BLE-2Mbps mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2362.100	41.17	54.00	-12.83	48.87	-7.70	Average
2362.100	52.06	74.00	-21.94	59.76	-7.70	Peak
2401.600	103.98			111.60	-7.62	Average
2401.600	107.35			114.97	-7.62	Peak
3202.700	36.90	54.00	-17.10	41.16	-4.26	Average
3202.700	42.84	74.00	-31.16	47.10	-4.26	Peak
4804.000	48.27	54.00	-5.73	47.65	0.62	Average
4804.000	56.27	74.00	-17.73	55.65	0.62	Peak
7206.000	45.77	54.00	-8.23	40.52	5.25	Average
7206.000	57.73	74.00	-16.27	52.47	5.26	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2362.400	47.59	54.00	-6.41	55.29	-7.70	Average
2362.400	56.49	74.00	-17.51	64.19	-7.70	Peak
2402.600	111.02			118.63	-7.61	Average
2402.600	114.07			121.68	-7.61	Peak
3202.700	41.36	54.00	-12.64	45.66	-4.30	Average
3202.700	46.54	74.00	-27.46	50.84	-4.30	Peak
4804.000	53.14	54.00	-0.86	52.52	0.62	Average
4804.000	61.22	74.00	-12.78	60.60	0.62	Peak
7206.000	53.36	54.00	-0.64	48.11	5.25	Average
7206.000	62.76	74.00	-11.24	57.51	5.25	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2355.254	37.14	54.00	-16.86	44.86	-7.72	Average
2355.254	51.01	74.00	-22.99	58.73	-7.72	Peak
2440.680	103.11			110.63	-7.52	Average
2440.680	106.57			114.09	-7.52	Peak
2520.298	37.24	54.00	-16.76	44.50	-7.26	Average
2520.298	51.37	74.00	-22.63	58.63	-7.26	Peak
3253.300	36.94	54.00	-17.06	40.97	-4.03	Average
3253.300	44.33	74.00	-29.67	48.36	-4.03	Peak
4880.000	48.39	54.00	-5.61	47.58	0.81	Average
4880.000	56.66	74.00	-17.34	55.85	0.81	Peak
7320.000	48.45	54.00	-5.55	42.73	5.72	Average
7320.000	58.21	74.00	-15.79	52.51	5.70	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2368.564	39.17	54.00	-14.83	46.85	-7.68	Average
2368.564	52.24	74.00	-21.76	59.92	-7.68	Peak
2439.712	109.90			117.42	-7.52	Average
2439.712	113.05			120.57	-7.52	Peak
2495.856	38.93	54.00	-15.07	46.26	-7.33	Average
2495.856	51.88	74.00	-22.12	59.21	-7.33	Peak
3253.300	41.57	54.00	-12.43	45.50	-3.93	Average
3253.300	46.03	74.00	-27.97	49.96	-3.93	Peak
4880.000	53.14	54.00	-0.86	52.33	0.81	Average
4880.000	60.46	74.00	-13.54	59.65	0.81	Peak
7320.000	52.61	54.00	-1.39	46.91	5.70	Average
7320.000	61.89	74.00	-12.11	56.19	5.70	Peak

High CH

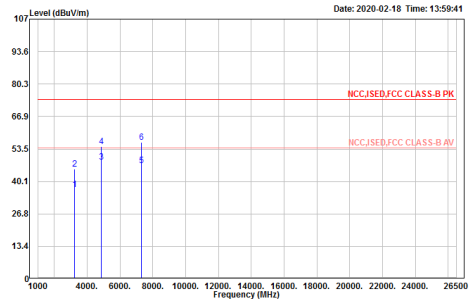
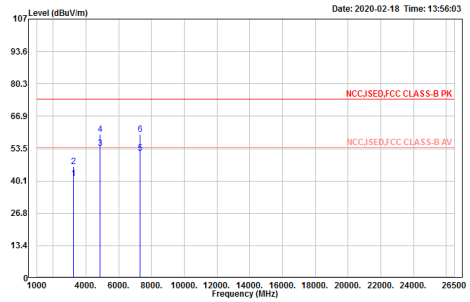
Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.512	95.62			102.97	-7.35	Average
2479.512	99.02			106.37	-7.35	Peak
2483.500	46.07	54.00	-7.93	53.41	-7.34	Average
2483.500	56.10	74.00	-17.90	63.44	-7.34	Peak
3306.700	36.55	54.00	-17.45	40.48	-3.93	Average
3306.700	44.52	74.00	-29.48	48.45	-3.93	Peak
4960.000	41.39	54.00	-12.61	40.58	0.81	Average
4960.000	50.71	74.00	-23.29	49.89	0.82	Peak
7440.000	36.31	54.00	-17.69	30.25	6.06	Average
7440.000	49.02	74.00	-24.98	42.96	6.06	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.512	102.61			109.96	-7.35	Average
2479.512	105.67			113.02	-7.35	Peak
2483.500	52.97	54.00	-1.03	60.31	-7.34	Average
2483.500	63.66	74.00	-10.34	71.00	-7.34	Peak
3306.700	40.69	54.00	-13.31	44.62	-3.93	Average
3306.700	43.95	74.00	-30.05	47.88	-3.93	Peak
4960.000	44.92	54.00	-9.08	44.10	0.82	Average
4960.000	53.67	74.00	-20.33	52.86	0.81	Peak
7440.000	40.34	54.00	-13.66	34.28	6.06	Average
7440.000	51.84	74.00	-22.16	45.78	6.06	Peak

Above 1G (1 GHz-26.5 GHz): The worst mode: BLE-1Mbps Middle CH.

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 !	3253.300	36.77	54.00	-17.23	40.80	-4.03	Average	horizontal
2	3253.300	45.15	74.00	-28.85	49.18	-4.03	Peak	horizontal
3 !	4880.000	48.01	54.00	-5.99	47.20	0.81	Average	horizontal
4 !	4880.000	54.46	74.00	-19.54	53.65	0.81	Peak	horizontal
5 !	7320.000	46.64	54.00	-7.36	40.92	5.72	Average	horizontal
6 !	7320.000	56.32	74.00	-17.68	50.60	5.72	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 !	3253.300	41.31	54.00	-12.69	45.38	-4.07	Average	vertical
2	3253.300	46.12	74.00	-27.88	50.19	-4.07	Peak	vertical
3 !	4880.000	53.60	54.00	-0.40	52.79	0.81	Average	vertical
4 !	4880.000	59.44	74.00	-14.56	58.63	0.81	Peak	vertical
5 !	7320.000	51.53	54.00	-2.47	45.81	5.72	Average	vertical
6 !	7320.000	59.44	74.00	-14.56	53.74	5.70	Peak	vertical

Level = Reading Level + Correct Factor

Over Limit = Level – Limit

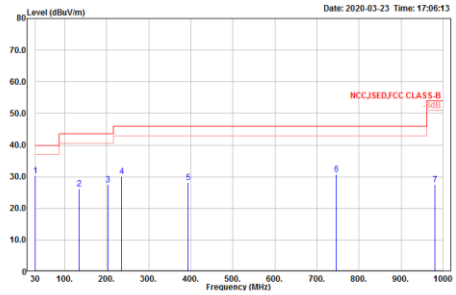
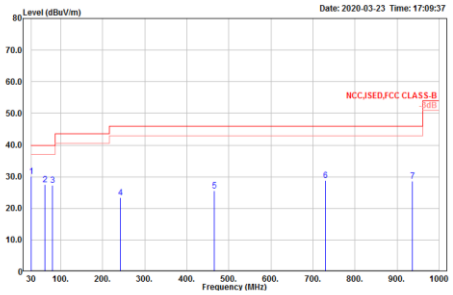
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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

<PIFA Antenna: SMARTEQ/4211613980>

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

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

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	30.000	30.30	40.00	-9.70	36.53	-6.23	Peak	horizontal
2	134.760	26.13	43.50	-17.37	43.74	-17.61	Peak	horizontal
3	202.660	27.51	43.50	-15.99	46.72	-19.21	Peak	horizontal
4	235.640	30.21	46.00	-15.79	49.94	-19.73	Peak	horizontal
5	393.750	28.27	46.00	-17.73	44.25	-15.98	Peak	horizontal
6	745.860	30.78	46.00	-15.22	40.61	-9.83	Peak	horizontal
7	980.600	27.50	54.00	-26.50	34.89	-7.39	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	30.000	30.20	40.00	-9.80	36.43	-6.23	Peak	vertical
2	62.980	27.56	40.00	-12.44	49.74	-22.18	Peak	vertical
3	81.410	27.41	40.00	-12.59	50.43	-23.02	Peak	vertical
4	241.460	23.38	46.00	-22.62	42.97	-19.59	Peak	vertical
5	465.530	25.54	46.00	-20.46	40.02	-14.48	Peak	vertical
6	729.370	28.94	46.00	-17.06	39.03	-10.09	Peak	vertical
7	935.980	28.53	46.00	-17.47	36.19	-7.66	Peak	vertical

Level = Reading Level + Correct Factor

Over Limit = Level – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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

Above 1G (1 GHz-26.5 GHz)

BLE-1Mbps mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2337.100	37.65	54.00	-16.35	45.44	-7.79	Average
2337.100	50.73	74.00	-23.27	58.52	-7.79	Peak
2401.900	98.70			106.32	-7.62	Average
2401.900	99.94			107.56	-7.62	Peak
3202.700	36.36	54.00	-17.64	40.62	-4.26	Average
3202.700	42.61	74.00	-31.39	46.87	-4.26	Peak
4804.000	46.72	54.00	-7.28	46.10	0.62	Average
4804.000	53.32	74.00	-20.68	52.70	0.62	Peak
7206.000	52.91	54.00	-1.09	47.66	5.25	Average
7206.000	61.46	74.00	-12.54	56.21	5.25	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2361.700	38.58	54.00	-15.42	46.28	-7.70	Average
2361.700	51.10	74.00	-22.90	58.80	-7.70	Peak
2402.300	100.27			107.89	-7.62	Average
2402.300	101.56			109.18	-7.62	Peak
3202.700	38.54	54.00	-15.46	42.80	-4.26	Average
3202.700	43.66	74.00	-30.34	47.92	-4.26	Peak
4804.000	53.22	54.00	-0.78	52.60	0.62	Average
4804.000	59.22	74.00	-14.78	58.60	0.62	Peak
7206.000	51.98	54.00	-2.02	46.73	5.25	Average
7206.000	59.87	74.00	-14.13	54.62	5.25	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.618	36.24	54.00	-17.76	43.87	-7.63	Average
2389.618	49.85	74.00	-24.15	57.48	-7.63	Peak
2440.438	99.84			107.36	-7.52	Average
2440.438	101.01			108.53	-7.52	Peak
2505.294	37.00	54.00	-17.00	44.30	-7.30	Average
2505.294	50.66	74.00	-23.34	57.96	-7.30	Peak
3253.300	33.35	54.00	-20.65	37.38	-4.03	Average
3253.300	43.15	74.00	-30.85	47.18	-4.03	Peak
4880.000	46.17	54.00	-7.83	45.36	0.81	Average
4880.000	53.55	74.00	-20.45	52.74	0.81	Peak
7320.000	53.44	54.00	-0.56	47.74	5.70	Average
7320.000	62.30	74.00	-11.70	56.60	5.70	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2341.944	36.29	54.00	-17.71	44.06	-7.77	Average
2341.944	50.13	74.00	-23.87	57.90	-7.77	Peak
2439.954	101.22			108.74	-7.52	Average
2439.954	102.53			110.05	-7.52	Peak
2505.778	37.20	54.00	-16.80	44.50	-7.30	Average
2505.778	51.12	74.00	-22.88	58.42	-7.30	Peak
3253.300	40.85	54.00	-13.15	44.88	-4.03	Average
3253.300	44.46	74.00	-29.54	48.49	-4.03	Peak
4880.000	52.97	54.00	-1.03	52.16	0.81	Average
4880.000	58.80	74.00	-15.20	57.99	0.81	Peak
7320.000	53.04	54.00	-0.96	47.34	5.70	Average
7320.000	61.17	74.00	-12.83	55.47	5.70	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.250	100.28			107.63	-7.35	Average
2480.250	101.60			108.95	-7.35	Peak
2483.500	41.54	54.00	-12.46	48.88	-7.34	Average
2483.500	52.05	74.00	-21.95	59.39	-7.34	Peak
3306.700	33.64	54.00	-20.36	37.57	-3.93	Average
3306.700	42.77	74.00	-31.23	46.70	-3.93	Peak
4960.000	46.43	54.00	-7.57	45.62	0.81	Average
4960.000	53.60	74.00	-20.40	52.79	0.81	Peak
7440.000	53.56	54.00	-0.44	47.50	6.06	Average
7440.000	62.36	74.00	-11.64	56.30	6.06	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.758	102.30			109.65	-7.35	Average
2479.758	103.59			110.94	-7.35	Peak
2483.500	42.17	54.00	-11.83	49.51	-7.34	Average
2483.500	53.80	74.00	-20.20	61.14	-7.34	Peak
3306.700	39.34	54.00	-14.66	43.27	-3.93	Average
3306.700	45.33	74.00	-28.67	49.26	-3.93	Peak
4960.000	52.42	54.00	-1.58	51.61	0.81	Average
4960.000	57.28	74.00	-16.72	56.47	0.81	Peak
7440.000	53.29	54.00	-0.71	47.23	6.06	Average
7440.000	61.99	74.00	-12.01	55.93	6.06	Peak

BLE-2Mbps mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2362.100	37.55	54.00	-16.45	45.25	-7.70	Average
2362.100	50.61	74.00	-23.39	58.31	-7.70	Peak
2402.600	96.94			104.55	-7.61	Average
2402.600	100.31			107.92	-7.61	Peak
3202.700	33.62	54.00	-20.38	37.88	-4.26	Average
3202.700	42.59	74.00	-31.41	46.85	-4.26	Peak
4804.000	44.72	54.00	-9.28	44.10	0.62	Average
4804.000	53.22	74.00	-20.78	52.60	0.62	Peak
7206.000	53.06	54.00	-0.94	47.81	5.25	Average
7206.000	61.91	74.00	-12.09	56.66	5.25	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2359.900	37.67	54.00	-16.33	45.38	-7.71	Average
2359.900	51.13	74.00	-22.87	58.84	-7.71	Peak
2402.600	98.69			106.30	-7.61	Average
2402.600	102.04			109.65	-7.61	Peak
3202.700	39.57	54.00	-14.43	43.83	-4.26	Average
3202.700	44.67	74.00	-29.33	48.93	-4.26	Peak
4804.000	51.21	54.00	-2.79	50.59	0.62	Average
4804.000	59.29	74.00	-14.71	58.67	0.62	Peak
7206.000	51.17	54.00	-2.83	45.92	5.25	Average
7206.000	60.56	74.00	-13.44	55.31	5.25	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2376.308	36.40	54.00	-17.60	44.06	-7.66	Average
2376.308	50.06	74.00	-23.94	57.72	-7.66	Peak
2439.712	96.78			104.30	-7.52	Average
2439.712	100.16			107.68	-7.52	Peak
2533.850	37.11	54.00	-16.89	44.31	-7.20	Average
2533.850	50.97	74.00	-23.03	58.17	-7.20	Peak
3253.300	34.47	54.00	-19.53	38.50	-4.03	Average
3253.300	42.81	74.00	-31.19	46.84	-4.03	Peak
4880.000	44.41	54.00	-9.59	43.60	0.81	Average
4880.000	53.21	74.00	-20.79	52.40	0.81	Peak
7320.000	53.19	54.00	-0.81	47.49	5.70	Average
7320.000	62.43	74.00	-11.57	56.73	5.70	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2380.664	36.32	54.00	-17.68	43.97	-7.65	Average
2380.664	50.67	74.00	-23.33	58.32	-7.65	Peak
2440.680	98.99			106.51	-7.52	Average
2440.680	102.36			109.88	-7.52	Peak
2546.676	37.30	54.00	-16.70	44.44	-7.14	Average
2546.676	51.28	74.00	-22.72	58.42	-7.14	Peak
3253.300	39.52	54.00	-14.48	43.55	-4.03	Average
3253.300	44.82	74.00	-29.18	48.85	-4.03	Peak
4880.000	51.17	54.00	-2.83	50.36	0.81	Average
4880.000	58.21	74.00	-15.79	57.40	0.81	Peak
7320.000	52.08	54.00	-1.92	46.38	5.70	Average
7320.000	61.09	74.00	-12.91	55.39	5.70	Peak

High CH

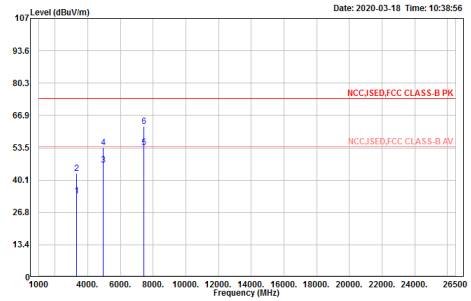
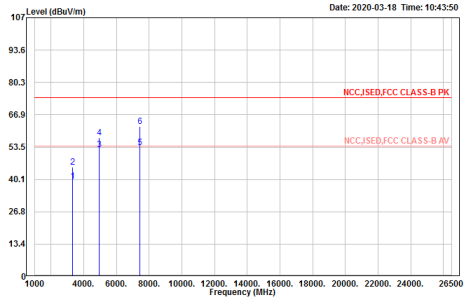
Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.512	98.10			105.45	-7.35	Average
2479.512	101.38			108.73	-7.35	Peak
2483.500	48.01	54.00	-5.99	55.35	-7.34	Average
2483.500	57.84	74.00	-16.16	65.18	-7.34	Peak
3306.700	35.90	54.00	-18.10	39.83	-3.93	Average
3306.700	41.36	74.00	-32.64	45.29	-3.93	Peak
4960.000	43.15	54.00	-10.85	42.34	0.81	Average
4960.000	51.43	74.00	-22.57	50.62	0.81	Peak
7440.000	53.32	54.00	-0.68	47.26	6.06	Average
7440.000	61.54	74.00	-12.46	55.48	6.06	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.512	100.17			107.52	-7.35	Average
2479.512	103.53			110.88	-7.35	Peak
2483.500	49.96	54.00	-4.04	57.30	-7.34	Average
2483.500	59.03	74.00	-14.97	66.37	-7.34	Peak
3306.700	40.34	54.00	-13.66	44.27	-3.93	Average
3306.700	44.54	74.00	-29.46	48.47	-3.93	Peak
4960.000	49.79	54.00	-4.21	48.98	0.81	Average
4960.000	57.69	74.00	-16.31	56.88	0.81	Peak
7440.000	52.50	54.00	-1.50	46.44	6.06	Average
7440.000	61.82	74.00	-12.18	55.76	6.06	Peak

Above 1G (1 GHz-26.5 GHz): The worst mode: BLE-1Mbps High CH.

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	3306.700	33.64	54.00	-20.36	37.57	-3.93	Average	horizontal
2	3306.700	42.77	74.00	-31.23	46.70	-3.93	Peak	horizontal
3 !	4960.000	46.43	54.00	-7.57	45.62	0.81	Average	horizontal
4	4960.000	53.60	74.00	-20.40	52.79	0.81	Peak	horizontal
5 !	7440.000	53.56	54.00	-0.44	47.50	6.06	Average	horizontal
6 !	7440.000	62.36	74.00	-11.64	56.30	6.06	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 !	3306.700	39.34	54.00	-14.66	43.27	-3.93	Average	vertical
2	3306.700	45.33	74.00	-28.67	49.26	-3.93	Peak	vertical
3 !	4960.000	52.42	54.00	-1.58	51.61	0.81	Average	vertical
4 !	4960.000	57.28	74.00	-16.72	56.47	0.81	Peak	vertical
5 !	7440.000	53.29	54.00	-0.71	47.23	6.06	Average	vertical
6 !	7440.000	61.99	74.00	-12.01	55.93	6.06	Peak	vertical

Level = Reading Level + Correct Factor

Over Limit = Level – Limit

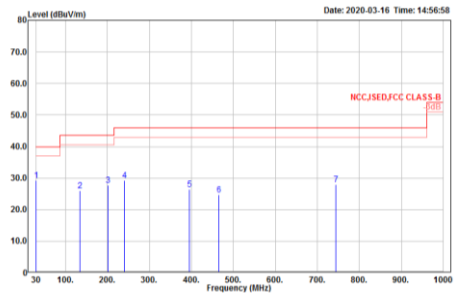
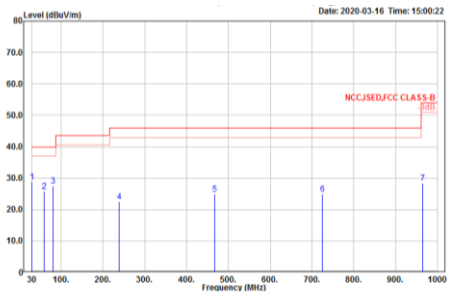
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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

<Dipole Antenna: Inside WLAN/PRO-IS-299>

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Y axis)

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

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	30.000	29.28	40.00	-10.72	35.51	-6.23	Peak	horizontal
2	134.760	26.10	43.50	-17.40	43.71	-17.61	Peak	horizontal
3	201.690	27.84	43.50	-15.66	46.67	-18.83	Peak	horizontal
4	240.490	29.20	46.00	-16.80	48.78	-19.58	Peak	horizontal
5	394.720	26.45	46.00	-19.55	42.42	-15.97	Peak	horizontal
6	465.530	24.72	46.00	-21.28	39.20	-14.48	Peak	horizontal
7	743.920	27.96	46.00	-18.04	37.83	-9.87	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	30.970	28.76	40.00	-11.24	35.66	-6.90	Peak	vertical
2	60.070	25.87	40.00	-14.13	48.03	-22.16	Peak	vertical
3	81.410	27.44	40.00	-12.56	50.46	-23.02	Peak	vertical
4	239.520	22.60	46.00	-23.40	42.19	-19.59	Peak	vertical
5	467.470	24.95	46.00	-21.05	39.33	-14.38	Peak	vertical
6	724.520	24.86	46.00	-21.14	35.07	-10.21	Peak	vertical
7	964.110	28.43	54.00	-25.57	35.90	-7.47	Peak	vertical

Level = Reading Level + Correct Factor

Over Limit = Level – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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

Above 1G (1 GHz-26.5 GHz)

BLE-1Mbps mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2377.400	36.04	54.00	-17.96	43.69	-7.65	Average
2377.400	50.64	74.00	-23.36	58.29	-7.65	Peak
2402.300	84.08			91.70	-7.62	Average
2402.300	85.41			93.03	-7.62	Peak
3202.700	34.79	54.00	-19.21	39.05	-4.26	Average
3202.700	42.91	74.00	-31.09	47.17	-4.26	Peak
4804.000	49.99	54.00	-4.01	49.37	0.62	Average
4804.000	56.00	74.00	-18.00	55.39	0.61	Peak
7206.000	49.76	54.00	-4.24	44.51	5.25	Average
7206.000	58.13	74.00	-15.87	52.88	5.25	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2323.700	37.52	54.00	-16.48	45.33	-7.81	Average
2323.700	50.99	74.00	-23.01	58.80	-7.81	Peak
2402.300	97.76			105.38	-7.62	Average
2402.300	99.01			106.63	-7.62	Peak
3202.700	37.90	54.00	-16.10	42.16	-4.26	Average
3202.700	43.86	74.00	-30.14	48.12	-4.26	Peak
4804.000	53.57	54.00	-0.43	52.95	0.62	Average
4804.000	60.13	74.00	-13.87	59.51	0.62	Peak
7206.000	46.61	54.00	-7.39	41.36	5.25	Average
7206.000	55.38	74.00	-18.62	50.13	5.25	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2377.034	36.19	54.00	-17.81	43.85	-7.66	Average
2377.034	50.02	74.00	-23.98	57.68	-7.66	Peak
2440.438	87.04			94.56	-7.52	Average
2440.438	88.37			95.89	-7.52	Peak
2497.550	37.02	54.00	-16.98	44.34	-7.32	Average
2497.550	50.81	74.00	-23.19	58.13	-7.32	Peak
3253.300	34.94	54.00	-19.06	38.97	-4.03	Average
3253.300	43.20	74.00	-30.80	47.23	-4.03	Peak
4880.000	48.46	54.00	-5.54	47.65	0.81	Average
4880.000	55.31	74.00	-18.69	54.51	0.80	Peak
7320.000	45.00	54.00	-9.00	39.30	5.70	Average
7320.000	54.94	74.00	-19.06	49.24	5.70	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2356.706	36.41	54.00	-17.59	44.13	-7.72	Average
2356.706	49.83	74.00	-24.17	57.55	-7.72	Peak
2439.954	99.02			106.54	-7.52	Average
2439.954	100.16			107.68	-7.52	Peak
2542.804	37.28	54.00	-16.72	44.45	-7.17	Average
2542.804	51.51	74.00	-22.49	58.68	-7.17	Peak
3253.300	37.28	54.00	-16.72	41.31	-4.03	Average
3253.300	44.12	74.00	-29.88	48.15	-4.03	Peak
4880.000	53.75	54.00	-0.25	52.94	0.81	Average
4880.000	60.39	74.00	-13.61	59.59	0.80	Peak
7320.000	49.27	54.00	-4.73	43.57	5.70	Average
7320.000	58.49	74.00	-15.51	52.79	5.70	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.250	90.28			97.63	-7.35	Average
2480.250	91.58			98.93	-7.35	Peak
2504.194	38.00	54.00	-16.00	45.30	-7.30	Average
2504.194	51.35	74.00	-22.65	58.65	-7.30	Peak
3306.700	35.00	54.00	-19.00	38.93	-3.93	Average
3306.700	43.67	74.00	-30.33	47.60	-3.93	Peak
4960.000	47.38	54.00	-6.62	46.57	0.81	Average
4960.000	54.62	74.00	-19.38	53.79	0.83	Peak
7440.000	45.57	54.00	-8.43	39.51	6.06	Average
7440.000	55.33	74.00	-18.67	49.27	6.06	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.758	100.54			107.89	-7.35	Average
2479.758	101.90			109.25	-7.35	Peak
2484.022	41.99	54.00	-12.01	49.33	-7.34	Average
2484.022	53.65	74.00	-20.35	60.99	-7.34	Peak
3306.700	37.66	54.00	-16.34	41.59	-3.93	Average
3306.700	44.03	74.00	-29.97	47.96	-3.93	Peak
4960.000	53.10	54.00	-0.90	52.29	0.81	Average
4960.000	59.47	74.00	-14.53	58.64	0.83	Peak
7440.000	50.96	54.00	-3.04	44.90	6.06	Average
7440.000	59.74	74.00	-14.26	53.68	6.06	Peak

BLE-2Mbps mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2361.800	36.05	54.00	-17.95	43.75	-7.70	Average
2361.800	50.72	74.00	-23.28	58.42	-7.70	Peak
2402.600	81.76			89.37	-7.61	Average
2402.600	85.20			92.81	-7.61	Peak
3202.700	34.87	54.00	-19.13	39.13	-4.26	Average
3202.700	43.12	74.00	-30.88	47.38	-4.26	Peak
4804.000	47.32	54.00	-6.68	46.71	0.61	Average
4804.000	55.58	74.00	-18.42	54.96	0.62	Peak
7206.000	46.56	54.00	-7.44	41.31	5.25	Average
7206.000	56.06	74.00	-17.94	50.81	5.25	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2369.200	37.10	54.00	-16.90	44.78	-7.68	Average
2369.200	50.97	74.00	-23.03	58.65	-7.68	Peak
2402.600	95.26			102.87	-7.61	Average
2402.600	98.59			106.20	-7.61	Peak
3202.700	37.45	54.00	-16.55	41.71	-4.26	Average
3202.700	43.58	74.00	-30.42	47.84	-4.26	Peak
4804.000	53.08	54.00	-0.92	52.46	0.62	Average
4804.000	59.56	74.00	-14.44	58.95	0.61	Peak
7206.000	44.84	54.00	-9.16	39.59	5.25	Average
7206.000	55.02	74.00	-18.98	49.77	5.25	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2340.734	35.98	54.00	-18.02	43.75	-7.77	Average
2340.734	50.22	74.00	-23.78	57.99	-7.77	Peak
2440.680	84.84			92.36	-7.52	Average
2440.680	87.99			95.51	-7.52	Peak
2538.448	37.19	54.00	-16.81	44.39	-7.20	Average
2538.448	51.06	74.00	-22.94	58.26	-7.20	Peak
3253.300	34.65	54.00	-19.35	38.68	-4.03	Average
3253.300	43.16	74.00	-30.84	47.19	-4.03	Peak
4880.000	46.42	54.00	-7.58	45.61	0.81	Average
4880.000	54.70	74.00	-19.30	53.90	0.80	Peak
7320.000	44.60	54.00	-9.40	38.90	5.70	Average
7320.000	55.19	74.00	-18.81	49.49	5.70	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2319.922	37.16	54.00	-16.84	44.97	-7.81	Average
2319.922	49.97	74.00	-24.03	57.78	-7.81	Peak
2439.712	96.72			104.24	-7.52	Average
2439.712	99.98			107.50	-7.52	Peak
2544.740	37.53	54.00	-16.47	44.69	-7.16	Average
2544.740	51.28	74.00	-22.72	58.44	-7.16	Peak
3253.300	37.34	54.00	-16.66	41.37	-4.03	Average
3253.300	44.10	74.00	-29.90	48.13	-4.03	Peak
4880.000	53.03	54.00	-0.97	52.22	0.81	Average
4880.000	59.96	74.00	-14.04	59.16	0.80	Peak
7320.000	48.30	54.00	-5.70	42.60	5.70	Average
7320.000	58.12	74.00	-15.88	52.42	5.70	Peak

High CH

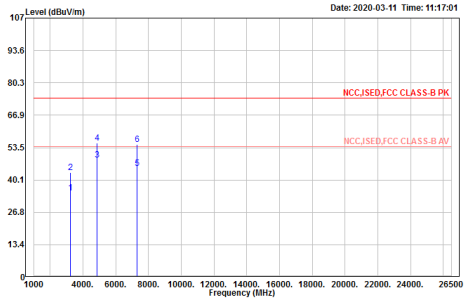
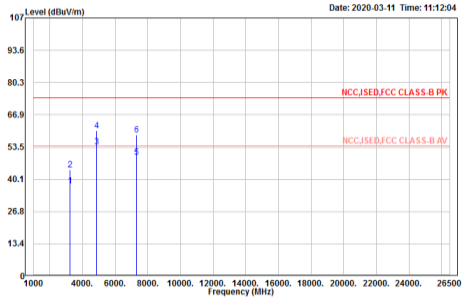
Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.496	89.83			97.18	-7.35	Average
2480.496	93.23			100.58	-7.35	Peak
2483.530	42.10	54.00	-11.90	49.44	-7.34	Average
2483.530	52.83	74.00	-21.17	60.17	-7.34	Peak
3306.700	34.79	54.00	-19.21	38.72	-3.93	Average
3306.700	42.49	74.00	-31.51	46.42	-3.93	Peak
4960.000	47.67	54.00	-6.33	46.86	0.81	Average
4960.000	56.68	74.00	-17.32	55.85	0.83	Peak
7440.000	44.51	54.00	-9.49	38.45	6.06	Average
7440.000	55.86	74.00	-18.14	49.80	6.06	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.496	99.61			106.96	-7.35	Average
2480.496	102.84			110.19	-7.35	Peak
2483.500	50.61	54.00	-3.39	57.95	-7.34	Average
2483.500	58.57	74.00	-15.43	65.91	-7.34	Peak
3306.700	38.66	54.00	-15.34	42.59	-3.93	Average
3306.700	44.65	74.00	-29.35	48.58	-3.93	Peak
4960.000	53.65	54.00	-0.35	52.84	0.81	Average
4960.000	61.32	74.00	-12.68	60.49	0.83	Peak
7440.000	49.58	54.00	-4.42	43.52	6.06	Average
7440.000	59.94	74.00	-14.06	53.88	6.06	Peak

Above 1G (1 GHz-26.5 GHz): The worst mode: BLE-1Mbps Middle CH.

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 !	3253.300	34.94	54.00	-19.06	38.97	-4.03	Average	horizontal
2	3253.300	43.20	74.00	-30.80	47.23	-4.03	Peak	horizontal
3 !	4880.000	48.46	54.00	-5.54	47.65	0.81	Average	horizontal
4 !	4880.000	55.31	74.00	-18.69	54.51	0.80	Peak	horizontal
5 !	7320.000	45.00	54.00	-9.00	39.30	5.70	Average	horizontal
6 !	7320.000	54.94	74.00	-19.06	49.24	5.70	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 !	3253.300	37.28	54.00	-16.72	41.31	-4.03	Average	vertical
2	3253.300	44.12	74.00	-29.88	48.15	-4.03	Peak	vertical
3 !	4880.000	53.75	54.00	-0.25	52.94	0.81	Average	vertical
4 !	4880.000	60.39	74.00	-13.61	59.59	0.80	Peak	vertical
5 !	7320.000	49.27	54.00	-4.73	43.57	5.70	Average	vertical
6 !	7320.000	58.49	74.00	-15.51	52.79	5.70	Peak	vertical

Level = Reading Level + Correct Factor

Over Limit = Level – Limit

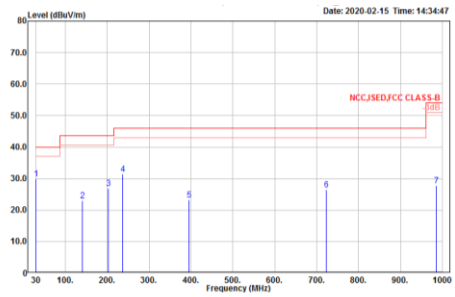
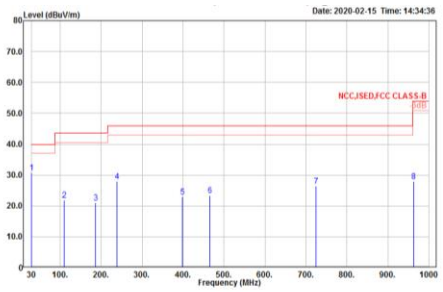
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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

<PCB Antenna: Redpine Signals/RSIA7>

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

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

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	30.970	29.99	40.00	-10.01	36.83	-6.84	Peak	horizontal
2	141.550	23.06	43.50	-20.44	41.53	-18.47	Peak	horizontal
3	202.660	26.89	43.50	-16.61	45.88	-18.99	Peak	horizontal
4	237.580	31.47	46.00	-14.53	51.25	-19.78	Peak	horizontal
5	394.720	23.19	46.00	-22.81	39.37	-16.18	Peak	horizontal
6	722.580	26.51	46.00	-19.49	37.16	-10.65	Peak	horizontal
7	984.480	27.84	54.00	-26.16	35.33	-7.49	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	30.000	30.81	40.00	-9.19	36.94	-6.13	Peak	vertical
2	109.540	21.91	43.50	-21.59	40.47	-18.56	Peak	vertical
3	186.170	21.08	43.50	-22.42	41.13	-20.05	Peak	vertical
4	239.520	27.92	46.00	-18.08	47.61	-19.69	Peak	vertical
5	398.600	23.03	46.00	-22.97	39.14	-16.11	Peak	vertical
6	464.560	23.37	46.00	-22.63	38.21	-14.84	Peak	vertical
7	724.520	26.37	46.00	-19.63	36.98	-10.61	Peak	vertical
8	963.140	27.92	54.00	-26.08	35.65	-7.73	Peak	vertical

Level = Reading Level + Correct Factor

Over Limit = Level – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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

Above 1G (1 GHz-26.5 GHz)

BLE-1Mbps mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2362.326	43.50	54.00	-10.50	51.20	-7.70	Average
2362.326	53.27	74.00	-20.73	60.97	-7.70	Peak
2401.800	109.50			117.12	-7.62	Average
2401.800	110.78			118.40	-7.62	Peak
3202.700	41.88	54.00	-12.12	46.18	-4.30	Average
3202.700	44.83	74.00	-29.17	49.13	-4.30	Peak
4804.000	46.32	54.00	-7.68	45.70	0.62	Average
4804.000	52.44	74.00	-21.56	51.82	0.62	Peak
7206.000	39.59	54.00	-14.41	34.34	5.25	Average
7206.000	50.63	74.00	-23.37	45.38	5.25	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2369.160	38.19	54.00	-15.81	45.87	-7.68	Average
2369.160	50.79	74.00	-23.21	58.47	-7.68	Peak
2402.310	99.88			107.50	-7.62	Average
2402.310	101.27			108.89	-7.62	Peak
3202.700	39.52	54.00	-14.48	43.82	-4.30	Average
3202.700	44.44	74.00	-29.56	48.74	-4.30	Peak
4804.000	53.13	54.00	-0.87	52.51	0.62	Average
4804.000	59.40	74.00	-14.60	58.78	0.62	Peak
7206.000	47.01	54.00	-6.99	41.76	5.25	Average
7206.000	55.69	74.00	-18.31	50.44	5.25	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.860	37.79	54.00	-16.21	45.42	-7.63	Average
2389.860	51.48	74.00	-22.52	59.11	-7.63	Peak
2439.954	111.55			119.07	-7.52	Average
2439.954	112.85			120.37	-7.52	Peak
2488.112	39.74	54.00	-14.26	47.07	-7.33	Average
2488.112	53.16	74.00	-20.84	60.49	-7.33	Peak
3253.300	42.62	54.00	-11.38	46.69	-4.07	Average
3253.300	45.75	74.00	-28.25	49.82	-4.07	Peak
4880.000	45.38	54.00	-8.62	44.57	0.81	Average
4880.000	52.57	74.00	-21.43	51.76	0.81	Peak
7320.000	40.79	54.00	-13.21	35.09	5.70	Average
7320.000	51.46	74.00	-22.54	45.76	5.70	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2379.454	36.62	54.00	-17.38	44.27	-7.65	Average
2379.454	51.14	74.00	-22.86	58.79	-7.65	Peak
2439.954	102.56			110.08	-7.52	Average
2439.954	103.84			111.36	-7.52	Peak
2509.892	37.58	54.00	-16.42	44.87	-7.29	Average
2509.892	51.38	74.00	-22.62	58.67	-7.29	Peak
3253.300	39.73	54.00	-14.27	43.80	-4.07	Average
3253.300	44.72	74.00	-29.28	48.79	-4.07	Peak
4880.000	53.38	54.00	-0.62	52.57	0.81	Average
4880.000	59.42	74.00	-14.58	58.61	0.81	Peak
7320.000	48.25	54.00	-5.75	42.55	5.70	Average
7320.000	57.14	74.00	-16.86	51.44	5.70	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.758	110.02			117.37	-7.35	Average
2479.758	111.29			118.64	-7.35	Peak
2483.500	52.84	54.00	-1.16	60.18	-7.34	Average
2483.500	65.40	74.00	-8.60	72.74	-7.34	Peak
3306.700	42.06	54.00	-11.94	45.99	-3.93	Average
3306.700	46.32	74.00	-27.68	50.25	-3.93	Peak
4960.000	45.72	54.00	-8.28	44.91	0.81	Average
4960.000	53.27	74.00	-20.73	52.46	0.81	Peak
7440.000	41.16	54.00	-12.84	35.10	6.06	Average
7440.000	51.86	74.00	-22.14	45.80	6.06	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.758	101.01			108.36	-7.35	Average
2479.758	102.34			109.69	-7.35	Peak
2483.500	40.26	54.00	-13.74	47.60	-7.34	Average
2483.500	56.00	74.00	-18.00	63.34	-7.34	Peak
3306.700	40.29	54.00	-13.71	44.22	-3.93	Average
3306.700	44.80	74.00	-29.20	48.73	-3.93	Peak
4960.000	52.24	54.00	-1.76	51.43	0.81	Average
4960.000	57.72	74.00	-16.28	56.91	0.81	Peak
7440.000	46.55	54.00	-7.45	40.49	6.06	Average
7440.000	55.67	74.00	-18.33	49.61	6.06	Peak

BLE-2Mbps mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2361.510	43.02	54.00	-10.98	50.72	-7.70	Average
2361.510	53.36	74.00	-20.64	61.06	-7.70	Peak
2402.616	108.47			116.08	-7.61	Average
2402.616	111.80			119.41	-7.61	Peak
3202.700	41.02	54.00	-12.98	45.32	-4.30	Average
3202.700	45.48	74.00	-28.52	49.78	-4.30	Peak
4804.000	45.57	54.00	-8.43	44.95	0.62	Average
4804.000	54.22	74.00	-19.78	53.60	0.62	Peak
7206.000	40.67	54.00	-13.33	35.42	5.25	Average
7206.000	51.85	74.00	-22.15	46.60	5.25	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2386.296	38.22	54.00	-15.78	45.86	-7.64	Average
2386.296	51.68	74.00	-22.32	59.32	-7.64	Peak
2402.616	99.25			106.86	-7.61	Average
2402.616	102.59			110.20	-7.61	Peak
3202.700	39.44	54.00	-14.56	43.74	-4.30	Average
3202.700	44.02	74.00	-29.98	48.32	-4.30	Peak
4804.000	53.31	54.00	-0.69	52.69	0.62	Average
4804.000	60.96	74.00	-13.04	60.34	0.62	Peak
7206.000	47.64	54.00	-6.36	42.39	5.25	Average
7206.000	57.04	74.00	-16.96	51.79	5.25	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2385.020	38.55	54.00	-15.45	46.19	-7.64	Average
2385.020	51.66	74.00	-22.34	59.30	-7.64	Peak
2440.680	110.20			117.72	-7.52	Average
2440.680	113.58			121.10	-7.52	Peak
2488.838	40.61	54.00	-13.39	47.94	-7.33	Average
2488.838	53.95	74.00	-20.05	61.28	-7.33	Peak
3253.300	41.52	54.00	-12.48	45.59	-4.07	Average
3253.300	45.92	74.00	-28.08	49.99	-4.07	Peak
4880.000	36.48	54.00	-17.52	35.67	0.81	Average
4880.000	52.66	74.00	-21.34	51.85	0.81	Peak
7320.000	41.19	54.00	-12.81	35.49	5.70	Average
7320.000	52.57	74.00	-21.43	46.87	5.70	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2362.998	36.84	54.00	-17.16	44.53	-7.69	Average
2362.998	50.53	74.00	-23.47	58.22	-7.69	Peak
2439.712	101.57			109.09	-7.52	Average
2439.712	105.03			112.55	-7.52	Peak
2519.572	37.81	54.00	-16.19	45.07	-7.26	Average
2519.572	51.77	74.00	-22.23	59.03	-7.26	Peak
3253.300	40.16	54.00	-13.84	44.23	-4.07	Average
3253.300	44.13	74.00	-29.87	48.20	-4.07	Peak
4880.000	53.17	54.00	-0.83	52.36	0.81	Average
4880.000	60.75	74.00	-13.25	59.94	0.81	Peak
7320.000	49.17	54.00	-4.83	43.47	5.70	Average
7320.000	58.34	74.00	-15.66	52.64	5.70	Peak

High CH

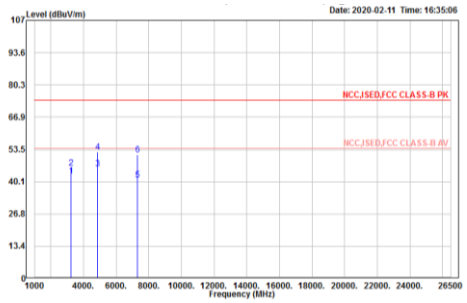
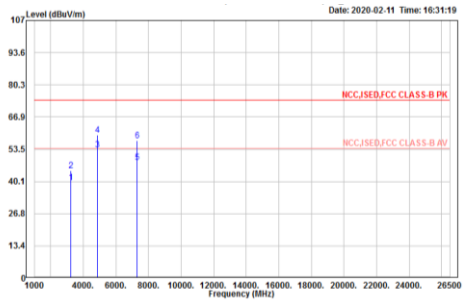
Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.496	105.04			112.39	-7.35	Average
2480.496	108.42			115.77	-7.35	Peak
2483.500	53.76	54.00	-0.24	61.10	-7.34	Average
2483.500	64.99	74.00	-9.01	72.33	-7.34	Peak
3306.700	41.37	54.00	-12.63	45.30	-3.93	Average
3306.700	45.53	74.00	-28.47	49.46	-3.93	Peak
4960.000	45.68	54.00	-8.32	44.87	0.81	Average
4960.000	53.72	74.00	-20.28	52.91	0.81	Peak
7440.000	41.86	54.00	-12.14	35.80	6.06	Average
7440.000	53.03	74.00	-20.97	46.97	6.06	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.512	95.76			103.11	-7.35	Average
2479.512	99.17			106.52	-7.35	Peak
2483.500	44.96	54.00	-9.04	52.30	-7.34	Average
2483.500	56.42	74.00	-17.58	63.76	-7.34	Peak
3306.700	41.57	54.00	-12.43	45.50	-3.93	Average
3306.700	44.75	74.00	-29.25	48.68	-3.93	Peak
4960.000	50.10	54.00	-3.90	49.29	0.81	Average
4960.000	57.24	74.00	-16.76	56.43	0.81	Peak
7440.000	45.48	54.00	-8.52	39.42	6.06	Average
7440.000	54.92	74.00	-19.08	48.86	6.06	Peak

Above 1G (1 GHz-26.5 GHz): The worst mode: BLE-1Mbps Middle CH.

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	3253.300	42.62	54.00	-11.38	46.69	-4.07	Average	horizontal
2	3253.300	45.75	74.00	-28.25	49.82	-4.07	Peak	horizontal
3	4880.000	45.38	54.00	-8.62	44.57	0.81	Average	horizontal
4	4880.000	52.57	74.00	-21.43	51.76	0.81	Peak	horizontal
5	7320.000	40.79	54.00	-13.21	35.09	5.70	Average	horizontal
6	7320.000	51.46	74.00	-22.54	45.76	5.70	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	3253.300	39.73	54.00	-14.27	43.80	-4.07	Average	vertical
2	3253.300	44.72	74.00	-29.28	48.79	-4.07	Peak	vertical
3	4880.000	53.38	54.00	-0.62	52.57	0.81	Average	vertical
4	4880.000	59.42	74.00	-14.58	58.61	0.81	Peak	vertical
5	7320.000	48.25	54.00	-5.75	42.55	5.70	Average	vertical
6	7320.000	57.14	74.00	-16.86	51.44	5.70	Peak	vertical

Level = Reading Level + Correct Factor

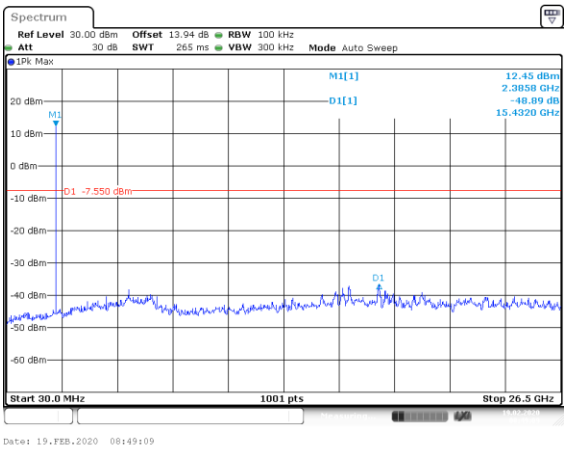
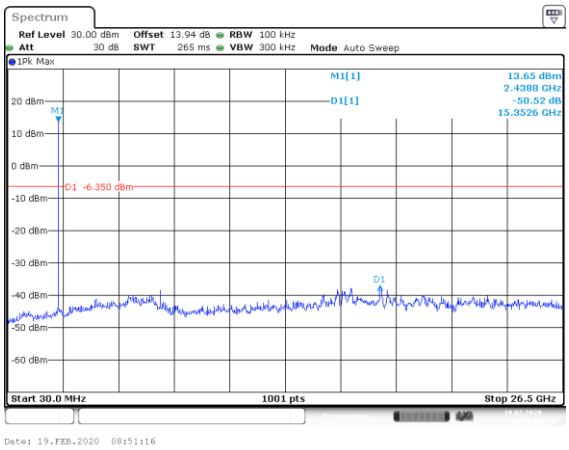
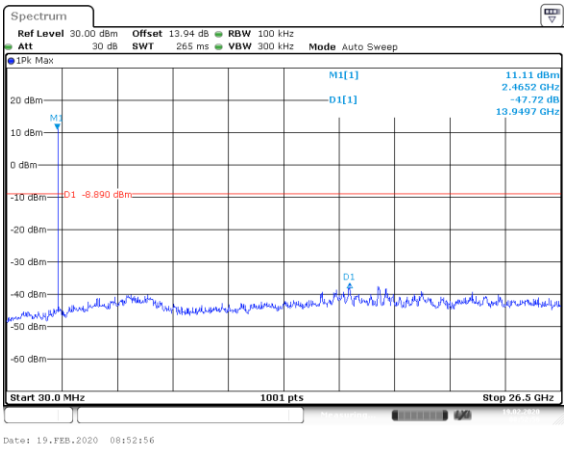
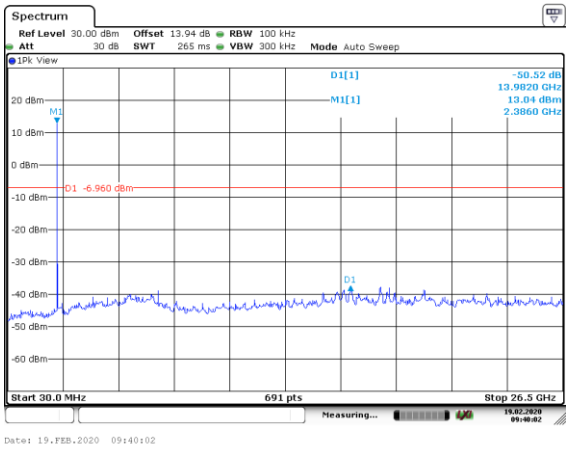
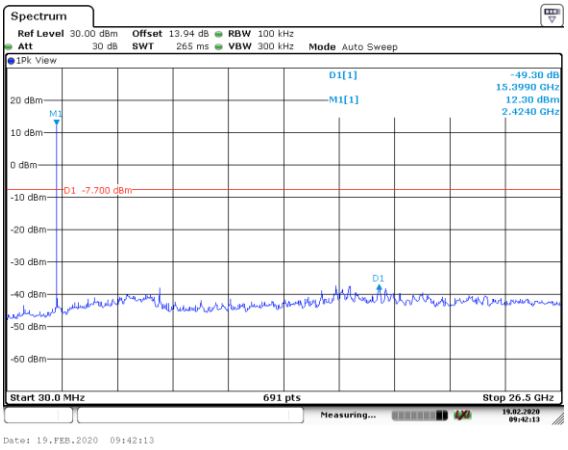
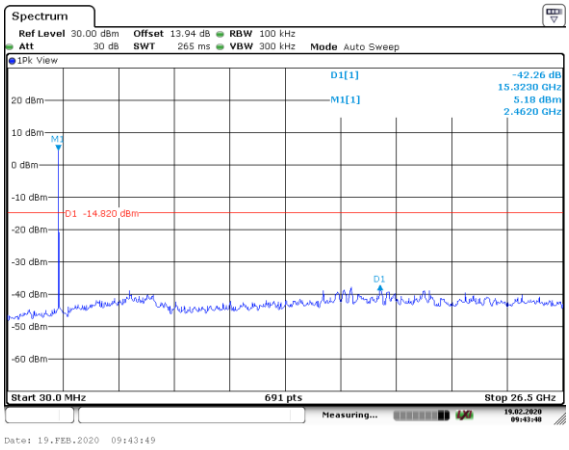
Over Limit = Level – Limit

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
BLE-1Mbps				
Low	2402	48.89	≥ 20	Compliance
Mid	2440	50.52	≥ 20	Compliance
High	2480	47.72	≥ 20	Compliance
BLE-2Mbps				
Low	2402	50.52	≥ 20	Compliance
Mid	2440	49.30	≥ 20	Compliance
High	2480	42.26	≥ 20	Compliance

BLE-1Mbps Low CH	BLE-1Mbps Middle CH
	
BLE-1Mbps High CH	**BLE-2Mbps Low CH**
	
BLE-2Mbps Middle CH	**BLE-2Mbps High CH**
	

9 FCC §15.247(a)(2) and RSS-247 Sec 5.2 – 6 dB Emission Bandwidth and RSS-Gen Sec 6.7 99% OBW

9.1 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.

According to RSS-247 §5.2 a),
The minimum 6 dB bandwidth shall be 500 kHz.

According to RSS-Gen §6.7,

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

9.2 Test Procedure

6 dB Emission Bandwidth

According to ANSI C63.10-2013, the steps for the first option are as follows:

(1) Set RBW = 100 kHz. (2) Set the VBW ≥ [3 × RBW]. (3) Detector = peak. (4) Trace mode = max hold.

(5) Sweep = auto couple. (6) Allow the trace to stabilize. (7) 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.

99% Emission Bandwidth

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

The following procedure shall be used for measuring 99% power bandwidth:

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

9.3 Test Equipment List and Details

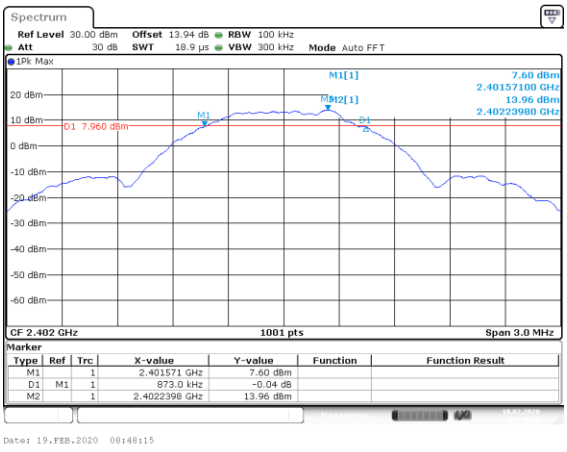
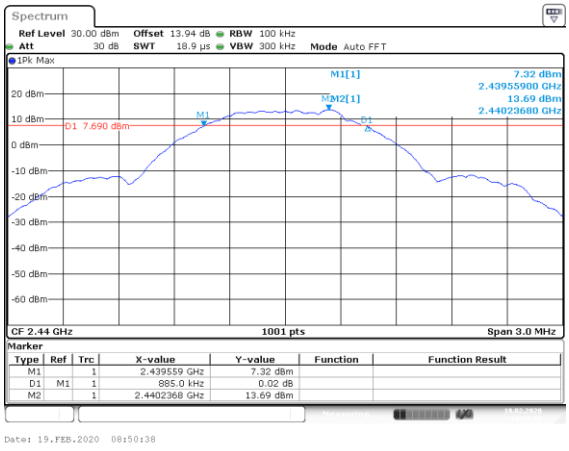
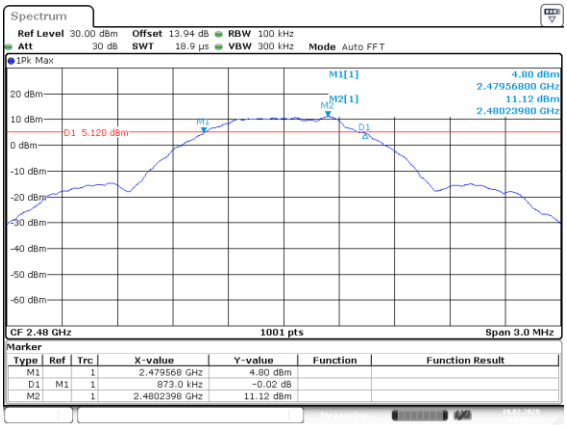
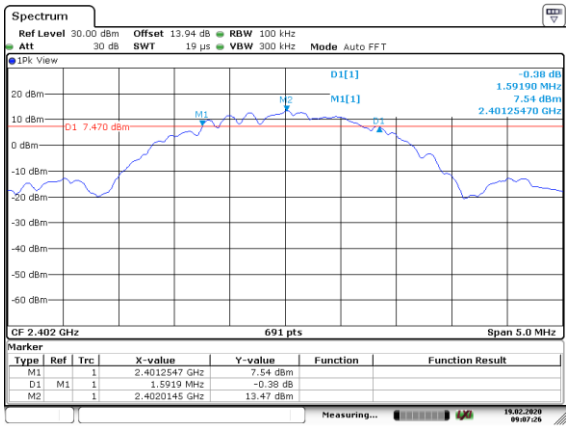
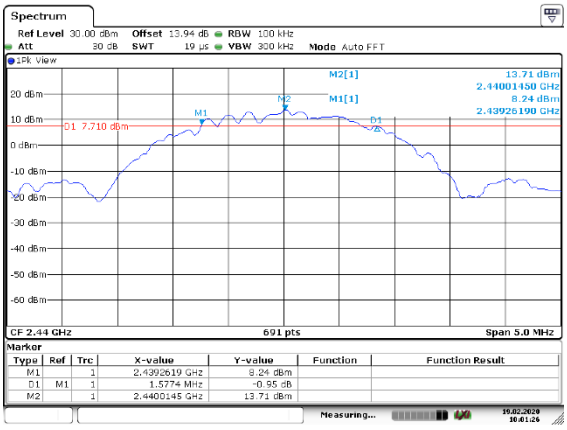
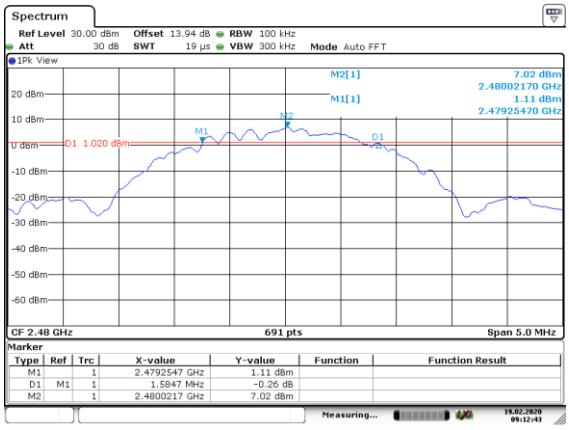
Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

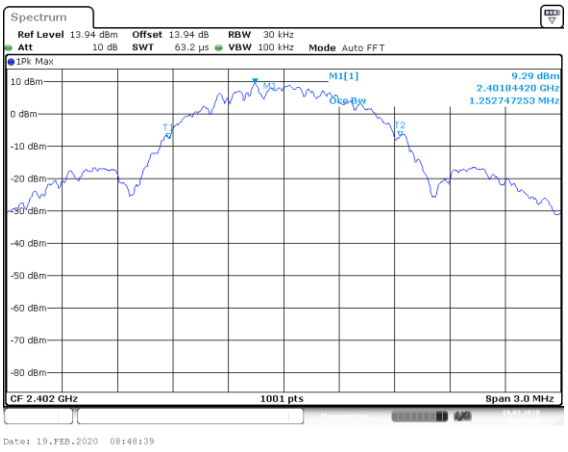
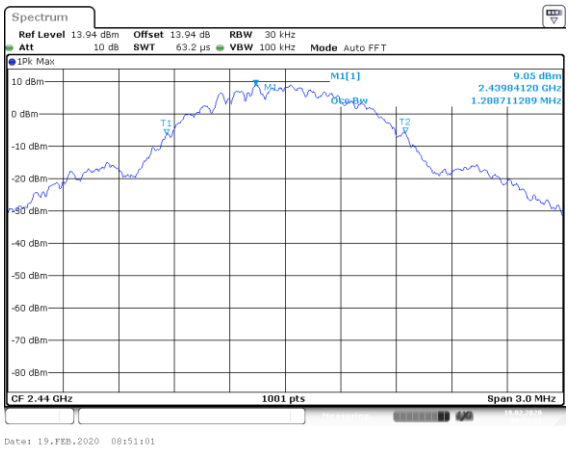
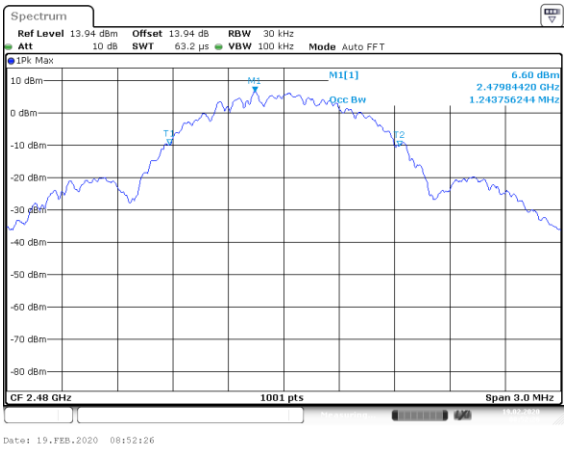
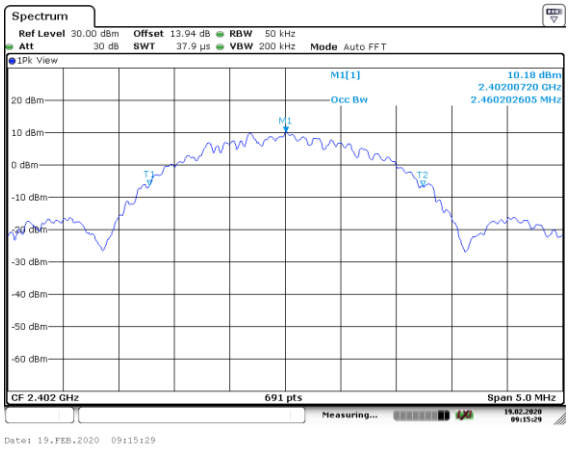
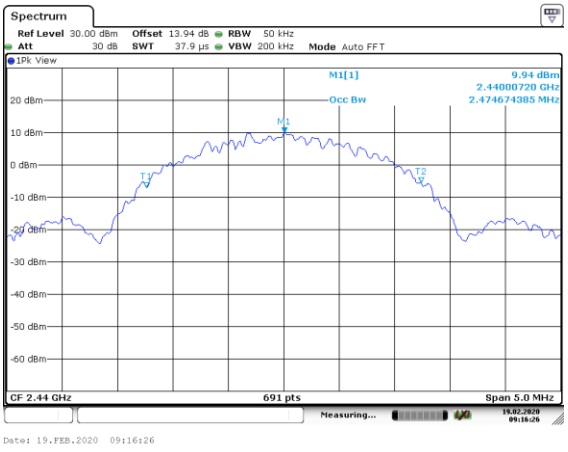
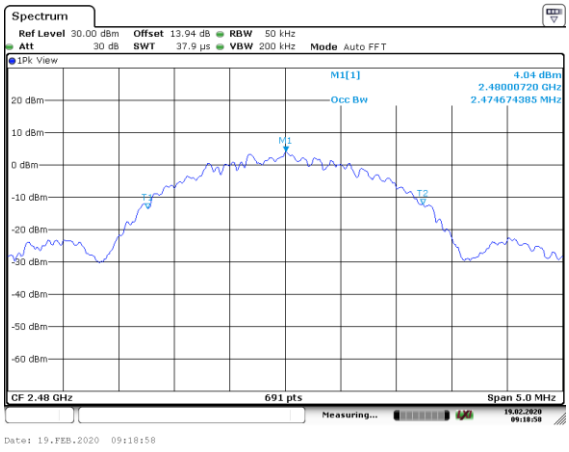
9.4 Test Results

Channel	Frequency (MHz)	99% OBW (MHz)	6 dB BW (MHz)	6dB Limit (MHz)	Result
BLE-1Mbps					
Low	2402	1.25	0.873	> 0.5	Compliance
Middle	2440	1.29	0.885	> 0.5	Compliance
High	2480	1.24	0.873	> 0.5	Compliance
BLE-2Mbps					
Low	2402	2.46	1.592	> 0.5	Compliance
Middle	2440	2.48	1.557	> 0.5	Compliance
High	2480	2.48	1.585	> 0.5	Compliance

6dB BW

BLE-1Mbps Low CH	BLE-1Mbps Middle CH
	
BLE-1Mbps High CH	**BLE-2Mbps Low CH**
	
BLE-2Mbps Middle CH	**BLE-2Mbps High CH**
	

Occupied BW

BLE-1Mbps Low CH	BLE-1Mbps Middle CH
	
BLE-1Mbps High CH	**BLE-2Mbps Low CH**
	
BLE-2Mbps Middle CH	**BLE-2Mbps High CH**
	

10 FCC §15.247(b) (3) and RSS-247 Sec 5.4(d) – Maximum Output Power

10.1 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.

According to RSS-247 §5.4(d).

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

10.2 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. (3). Add a correction factor to the display.

10.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
USB Wideband Power Sensor	Agilent	U2021XA	MY56120026	2019/09/06	2020/09/05
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

10.4 Test Results

<Dipole Antenna: TAOGLAS/GW.71.5153>

Mode	CH	Freq. (MHz)	Peak Output Power		Ant Gain (dBi)	EIRP Peak Output Power		Limit (dBm)	EIRP Limit (dBm)
			(dBm)	(W)		(dBm)	(W)		
BLE-1Mbps	Low	2402	16.12	0.0409	3.80	19.92	0.0982	30	36
	Middle	2440	16.09	0.0406	3.80	19.89	0.0975	30	36
	High	2480	13.37	0.0217	3.80	17.17	0.0521	30	36
BLE-2Mbps	Low	2402	18.52	0.0711	3.80	22.32	0.1706	30	36
	Middle	2440	18.21	0.0662	3.80	22.01	0.1589	30	36
	High	2480	11.86	0.0153	3.80	15.66	0.0368	30	36

Note1: Conducted Power Limit: 1W = 30 dBm, 4W = 36 dBm

Mode	CH	Freq. (MHz)	Average Output Power		Ant Gain (dBi)	EIRP Average Output Power		Limit (dBm)	EIRP Limit (dBm)
			(dBm)	(W)		(dBm)	(W)		
BLE-1Mbps	Low	2402	15.65	0.0367	3.80	19.92	0.0982	30	36
	Middle	2440	15.63	0.0366	3.80	19.89	0.0975	30	36
	High	2480	12.91	0.0195	3.80	17.17	0.0521	30	36
BLE-2Mbps	Low	2402	17.63	0.0579	3.80	22.32	0.1706	30	36
	Middle	2440	17.26	0.0532	3.80	22.01	0.1589	30	36
	High	2480	10.81	0.0121	3.80	15.66	0.0368	30	36

Note1: Conducted Power Limit: 1W = 30 dBm, 4W = 36 dBm

Note2: Duty Cycle is 100% and Duty Factor is 0 dB

<PIFA Antenna: SMARTEQ/4211613980>

Mode	CH	Freq. (MHz)	Peak Output Power		Ant Gain (dBi)	EIRP Peak Output Power		Limit (dBm)	EIRP Limit (dBm)
			(dBm)	(W)		(dBm)	(W)		
BLE-1Mbps	Low	2402	17.85	0.0610	0.00	17.85	0.0610	30	36
	Middle	2440	17.38	0.0547	0.00	17.38	0.0547	30	36
	High	2480	16.67	0.0465	0.00	16.67	0.0465	30	36
BLE-2Mbps	Low	2402	18.52	0.0711	0.00	18.52	0.0711	30	36
	Middle	2440	18.21	0.0662	0.00	18.21	0.0662	30	36
	High	2480	17.32	0.0540	0.00	17.32	0.0540	30	36

Note1: Conducted Power Limit: 1W = 30 dBm, 4W = 36 dBm

Mode	CH	Freq. (MHz)	Average Output Power		Ant Gain (dBi)	EIRP Average Output Power		Limit (dBm)	EIRP Limit (dBm)
			(dBm)	(W)		(dBm)	(W)		
BLE-1Mbps	Low	2402	17.45	0.0556	0.00	17.45	0.0556	30	36
	Middle	2440	16.94	0.0494	0.00	16.94	0.0494	30	36
	High	2480	16.27	0.0424	0.00	16.27	0.0424	30	36
BLE-2Mbps	Low	2402	18.52	0.0711	0.00	18.52	0.0711	30	36
	Middle	2440	18.21	0.0662	0.00	18.21	0.0662	30	36
	High	2480	17.32	0.0540	0.00	17.32	0.0540	30	36

Note1: Conducted Power Limit: 1W = 30 dBm, 4W = 36 dBm

Note2: Duty Cycle is 100% and Duty Factor is 0 dB

<Dipole Antenna: Inside WLAN/PRO-IS-299>

Mode	CH	Freq. (MHz)	Peak Output Power		Ant Gain (dBi)	EIRP Peak Output Power		Limit (dBm)	EIRP Limit (dBm)
			(dBm)	(W)		(dBm)	(W)		
BLE-1Mbps	Low	2402	19.19	0.0830	2.50	21.69	0.1476	30	36
	Middle	2440	18.58	0.0721	2.50	21.08	0.1282	30	36
	High	2480	17.81	0.0604	2.50	20.31	0.1074	30	36
BLE-2Mbps	Low	2402	19.19	0.0830	2.50	21.69	0.1476	30	36
	Middle	2440	18.67	0.0736	2.50	21.17	0.1309	30	36
	High	2480	19.33	0.0857	2.50	21.83	0.1524	30	36

Note1: Conducted Power Limit: 1W = 30 dBm, 4W = 36 dBm

Mode	CH	Freq. (MHz)	Average Output Power		Ant Gain (dBi)	EIRP Average Output Power		Limit (dBm)	EIRP Limit (dBm)
			(dBm)	(W)		(dBm)	(W)		
BLE-1Mbps	Low	2402	18.77	0.0753	2.50	21.27	0.1340	30	36
	Middle	2440	18.11	0.0647	2.50	20.61	0.1151	30	36
	High	2480	17.36	0.0545	2.50	19.86	0.0968	30	36
BLE-2Mbps	Low	2402	18.26	0.0670	2.50	20.76	0.1191	30	36
	Middle	2440	17.79	0.0601	2.50	20.29	0.1069	30	36
	High	2480	18.28	0.0673	2.50	20.78	0.1197	30	36

Note1: Conducted Power Limit: 1W = 30 dBm, 4W = 36 dBm

Note2: Duty Cycle is 100% and Duty Factor is 0 dB

<PCB Antenna: Redpine Signals/RSIA7>

Mode	CH	Freq. (MHz)	Peak Output Power		Ant Gain (dBi)	EIRP Peak Output Power		Limit (dBm)	EIRP Limit (dBm)
			(dBm)	(W)		(dBm)	(W)		
BLE-1Mbps	Low	2402	15.13	0.0326	0.71	15.84	0.0384	30	36
	Middle	2440	14.67	0.0293	0.71	15.38	0.0345	30	36
	High	2480	12.36	0.0172	0.71	13.07	0.0203	30	36
BLE-2Mbps	Low	2402	16.57	0.0454	0.71	17.28	0.0535	30	36
	Middle	2440	16.15	0.0412	0.71	16.86	0.0485	30	36
	High	2480	9.46	0.0088	0.71	10.17	0.0104	30	36

Note1: Conducted Power Limit: 1W = 30 dBm, 4W = 36 dBm

Mode	CH	Freq. (MHz)	Average Output Power		Ant Gain (dBi)	EIRP Average Output Power		Limit (dBm)	EIRP Limit (dBm)
			(dBm)	(W)		(dBm)	(W)		
BLE-1Mbps	Low	2402	14.65	0.0292	0.71	15.36	0.0344	30	36
	Middle	2440	14.21	0.0264	0.71	14.92	0.0310	30	36
	High	2480	11.84	0.0153	0.71	12.55	0.0180	30	36
BLE-2Mbps	Low	2402	15.57	0.0361	0.71	16.28	0.0425	30	36
	Middle	2440	15.13	0.0326	0.71	15.84	0.0384	30	36
	High	2480	8.38	0.0069	0.71	9.09	0.0081	30	36

Note1: Conducted Power Limit: 1W = 30 dBm, 4W = 36 dBm

Note2: Duty Cycle is 100% and Duty Factor is 0 dB

11 FCC §15.247(d) and RSS-247 Sec 5.5– 100 kHz Bandwidth of Frequency Band Edge

11.1 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)).

According to RSS-247 §5.5. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

11.2 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.

11.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

11.4 Test Results

<Dipole Antenna: TAOGLAS/GW.71.5153>

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE-1Mbps				
Low	2402	46.93	≥ 20	Compliance
High	2480	54.17	≥ 20	Compliance
BLE-2Mbps				
Low	2402	27.22	≥ 20	Compliance
High	2480	49.89	≥ 20	Compliance

<PIFA Antenna: SMARTEQ/4211613980>

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE-1Mbps				
Low	2402	44.97	≥ 20	Compliance
High	2480	56.13	≥ 20	Compliance
BLE-2Mbps				
Low	2402	27.22	≥ 20	Compliance
High	2480	52.35	≥ 20	Compliance

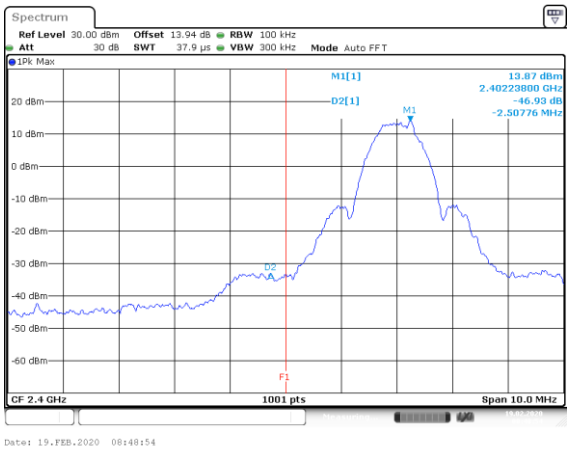
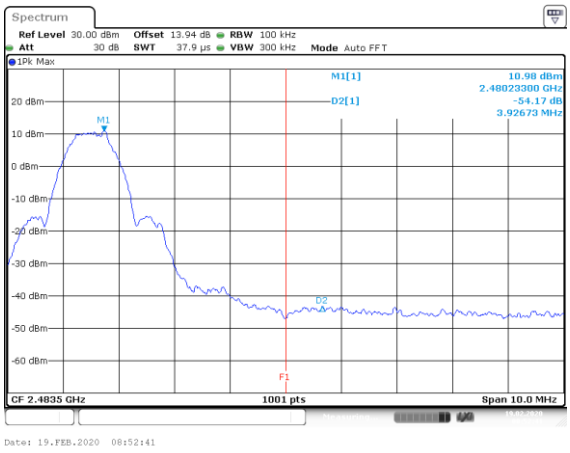
<Dipole Antenna: Inside WLAN/PRO-IS-299>

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE-1Mbps				
Low	2402	42.83	≥ 20	Compliance
High	2480	56.71	≥ 20	Compliance
BLE-2Mbps				
Low	2402	27.15	≥ 20	Compliance
High	2480	54.45	≥ 20	Compliance

<PCB Antenna: Redpine Signals/RSIA7>

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE-1Mbps				
Low	2402	44.07	≥ 20	Compliance
High	2480	53.19	≥ 20	Compliance
BLE-2Mbps				
Low	2402	28.06	≥ 20	Compliance
High	2480	48.07	≥ 20	Compliance

<Dipole Antenna: TAOGLAS/GW.71.5153>

BLE-1Mbps Left Side	BLE-1Mbps Right Side
	
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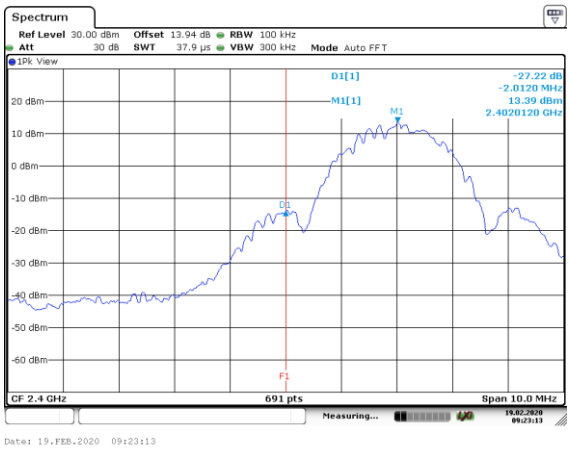	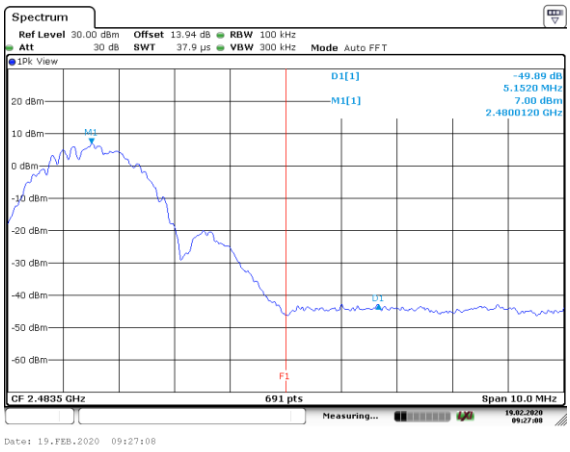

<PIFA Antenna: SMARTEQ/4211613980>

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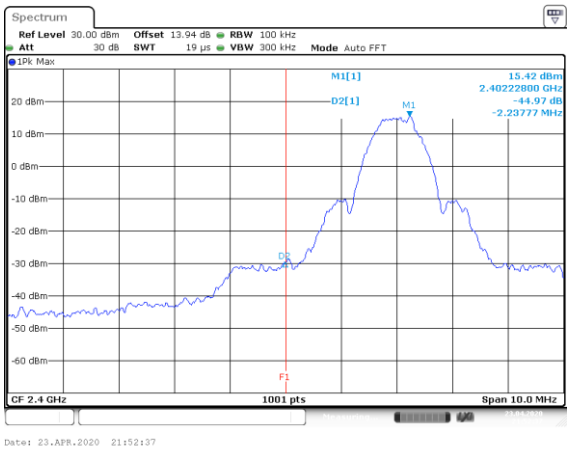
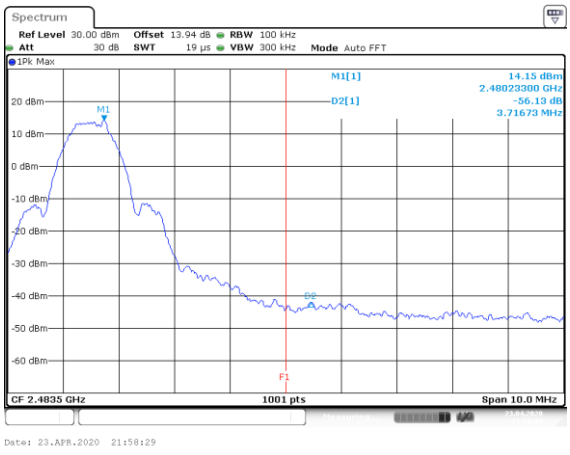
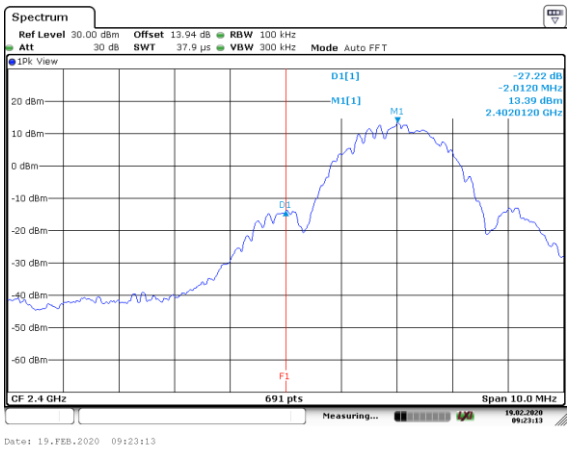
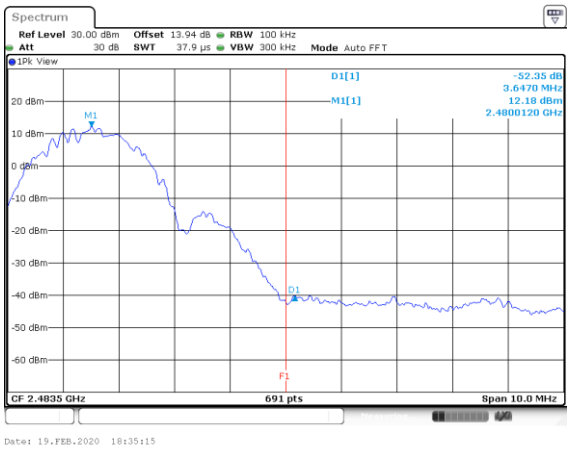
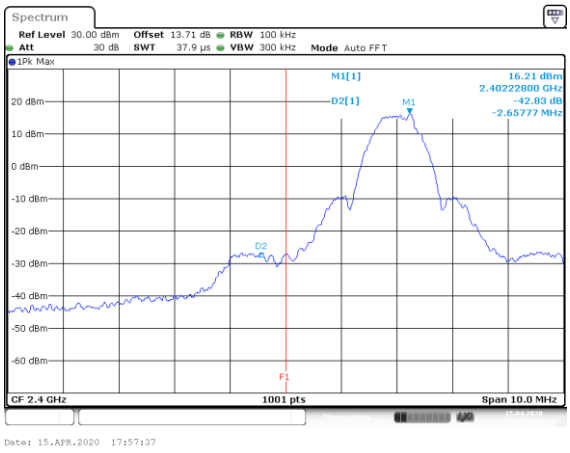
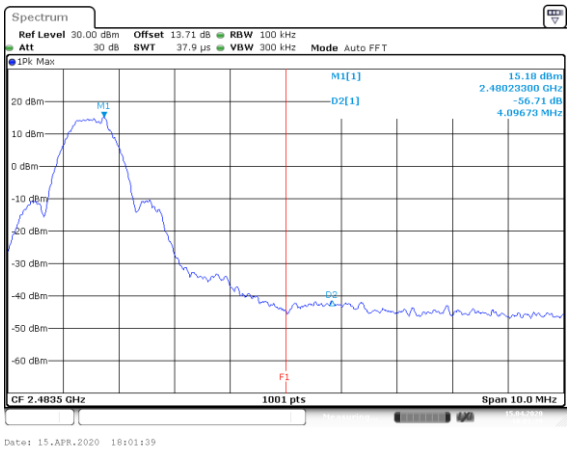
	
BLE-2Mbps Left Side	**BLE-2Mbps Right Side**
	

<Dipole Antenna: Inside WLAN/PRO-IS-299>

BLE-1Mbps Left Side	BLE-1Mbps Right Side
	
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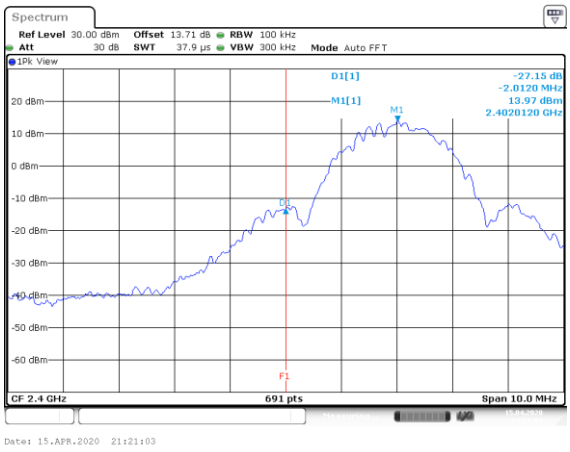	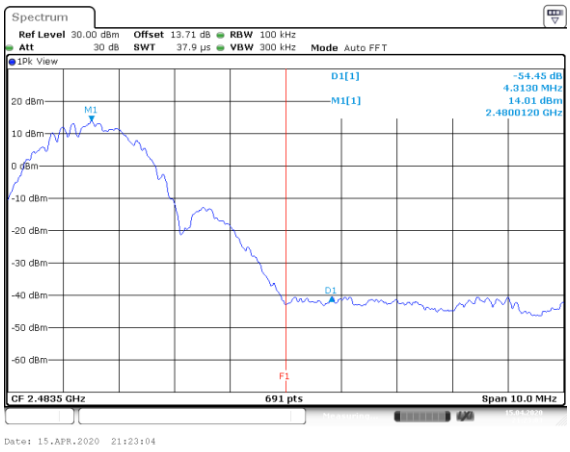

<PCB Antenna: Redpine Signals/RSIA7>

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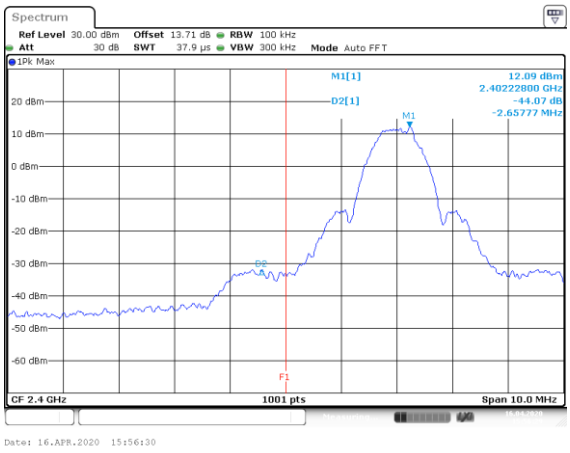
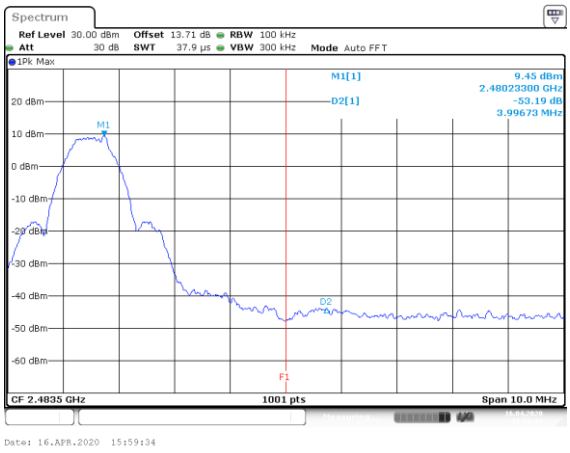
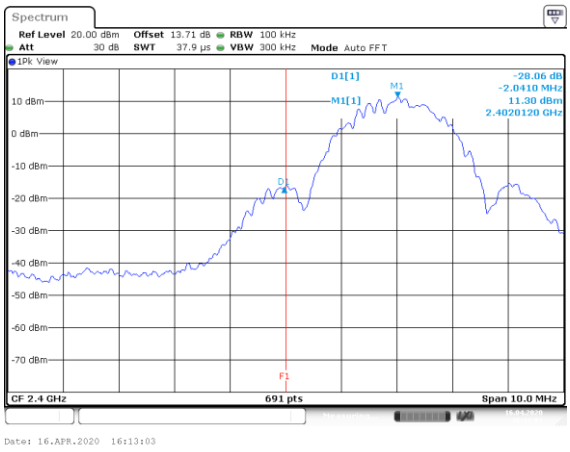
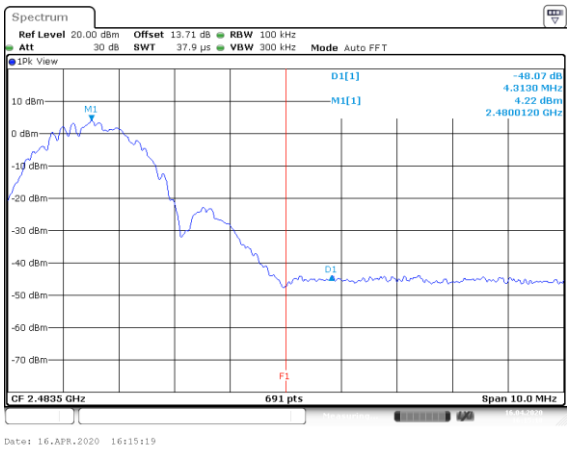
	
BLE-2Mbps Left Side	**BLE-2Mbps Right Side**
	

12 FCC §15.247(e) and RSS-247 Sec 5.2(b) – Power Spectral Density

12.1 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.

According to RSS-247 §5.2(b).

The transmitter power spectral density conducted from the transmitter 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 section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

12.2 Test Procedure

According to ANSI C63.10-2013,

(1) Set analyzer center frequency to DTS channel center frequency.

(2) Set the span to 1.5 times the DTS bandwidth. (3) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

(4) Set the VBW ≥ [3 × RBW]. (5) Detector = peak. (6) Sweep time = auto couple.

(7) Trace mode = max hold. (8) Allow trace to fully stabilize.

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

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

12.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

12.4 Test Results

<Dipole Antenna: TAOGLAS/GW.71.5153>

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
BLE-1Mbps				
Low	2402	-2.75	8	Compliance
Middle	2440	-2.62	8	Compliance
High	2480	-5.25	8	Compliance
BLE-2Mbps				
Low	2402	-1.28	8	Compliance
Middle	2440	-1.40	8	Compliance
High	2480	-7.37	8	Compliance

<PIFA Antenna: SMARTEQ/4211613980>

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
BLE mode-1Mbps				
Low	2402	-1.01	8	Compliance
Middle	2440	-0.83	8	Compliance
High	2480	-1.61	8	Compliance
BLE mode-2Mbps				
Low	2402	-1.28	8	Compliance
Middle	2440	-1.40	8	Compliance
High	2480	-2.50	8	Compliance

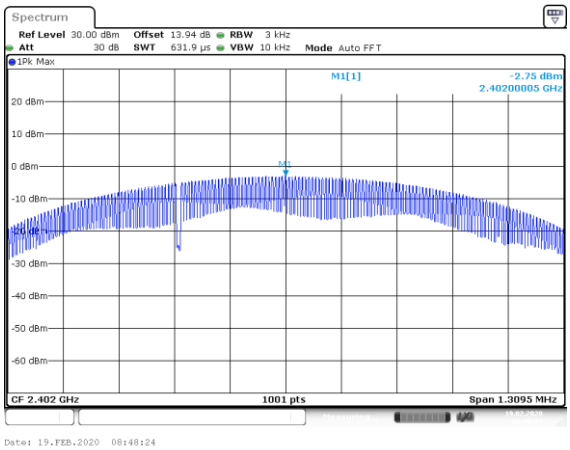
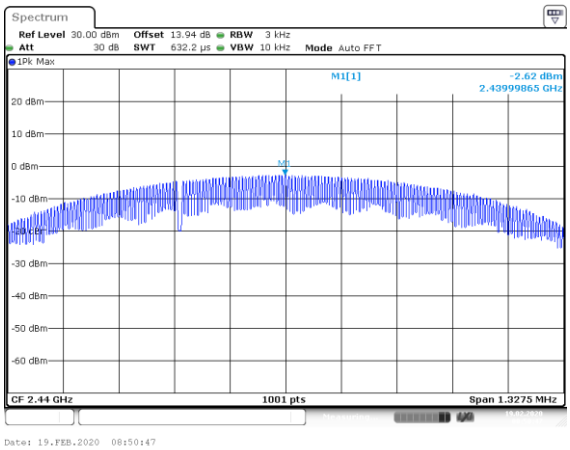
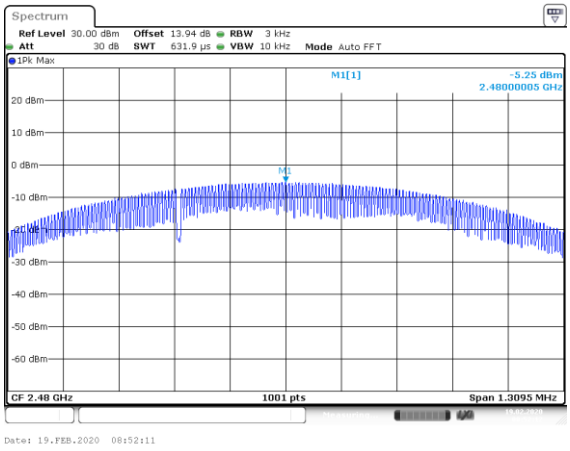
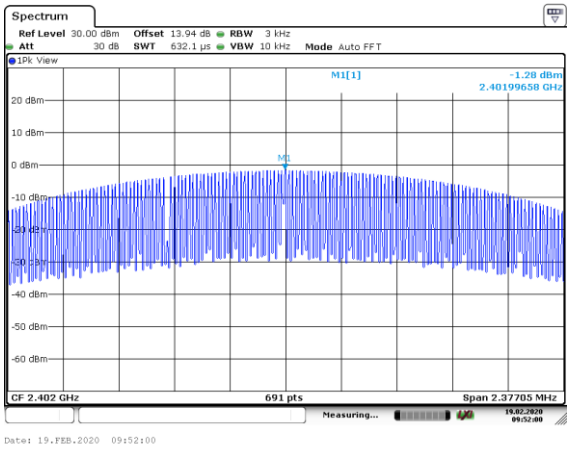
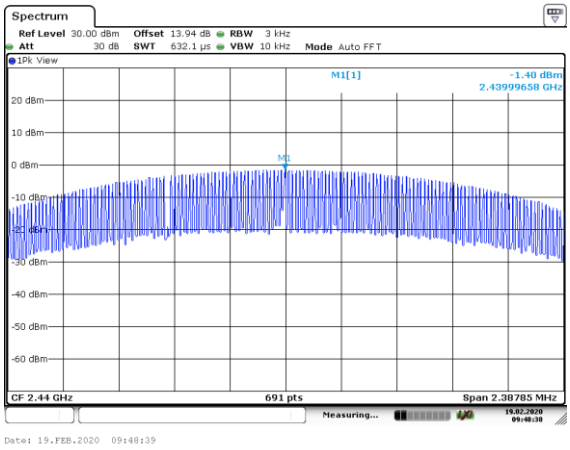
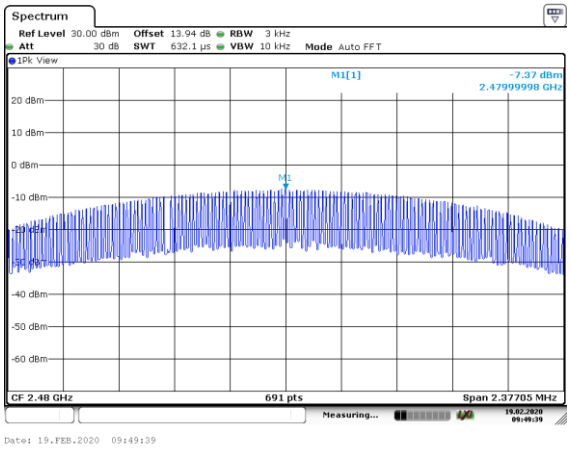
<Dipole Antenna: Inside WLAN/PRO-IS-299>

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
BLE mode-1Mbps				
Low	2402	-0.59	8	Compliance
Middle	2440	0.05	8	Compliance
High	2480	-0.46	8	Compliance
BLE mode-2Mbps				
Low	2402	-0.83	8	Compliance
Middle	2440	-0.73	8	Compliance
High	2480	-0.55	8	Compliance

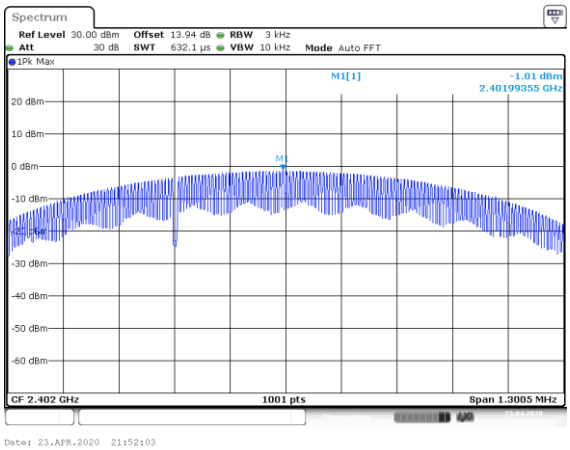
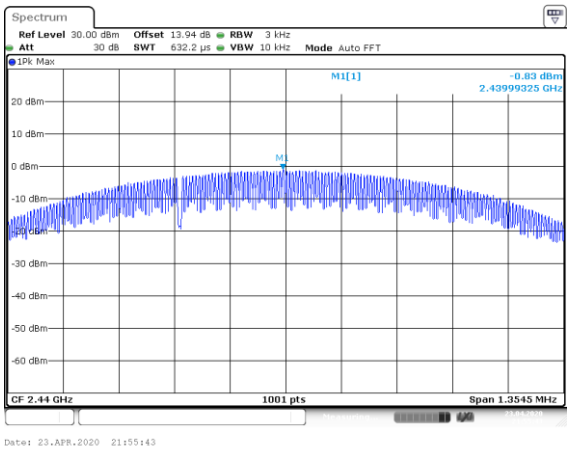
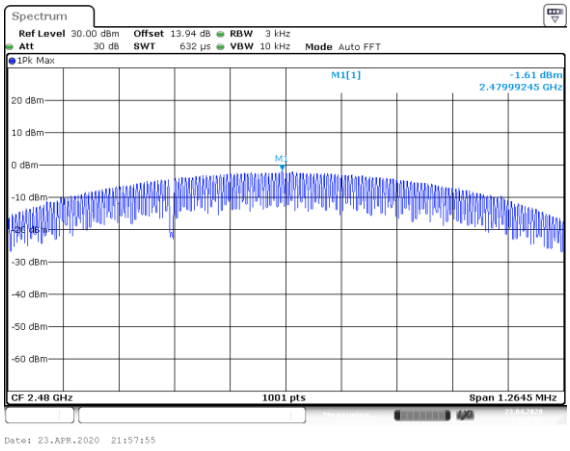
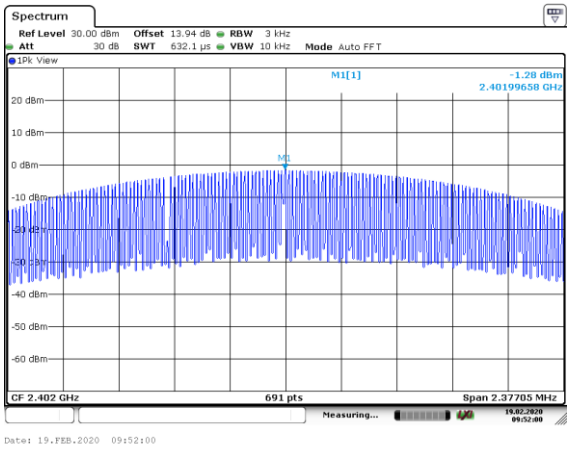
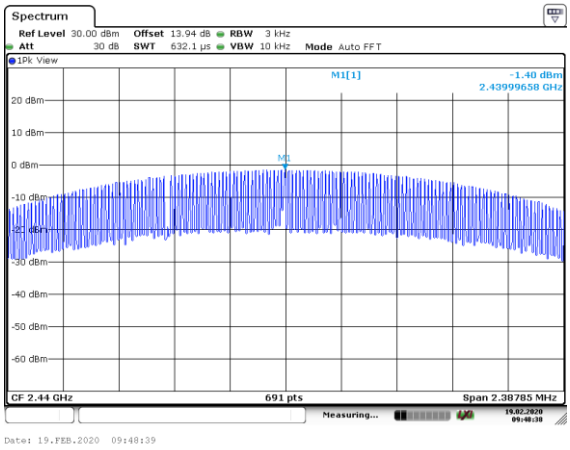
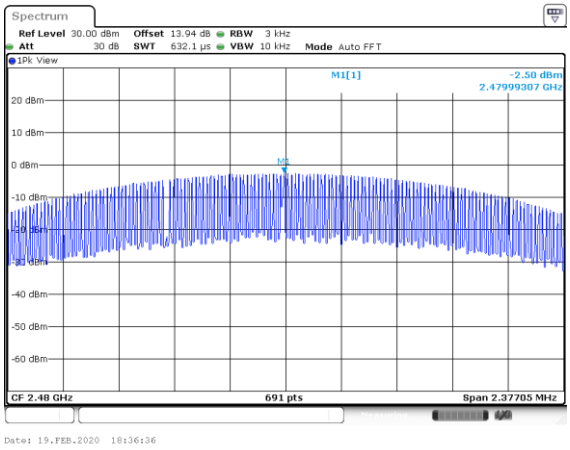
<PCB Antenna: Redpine Signals/RSIA7>

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
BLE mode-1Mbps				
Low	2402	-4.41	8	Compliance
Middle	2440	-4.48	8	Compliance
High	2480	-6.71	8	Compliance
BLE mode-2Mbps				
Low	2402	-3.61	8	Compliance
Middle	2440	-3.49	8	Compliance
High	2480	-10.50	8	Compliance

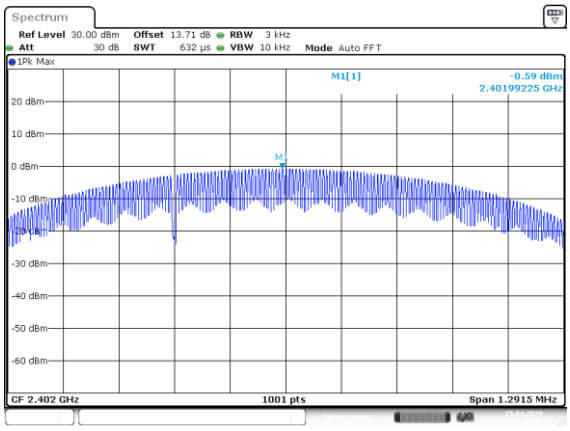
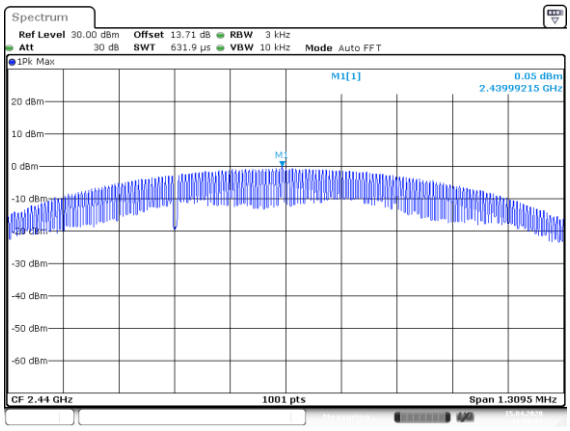
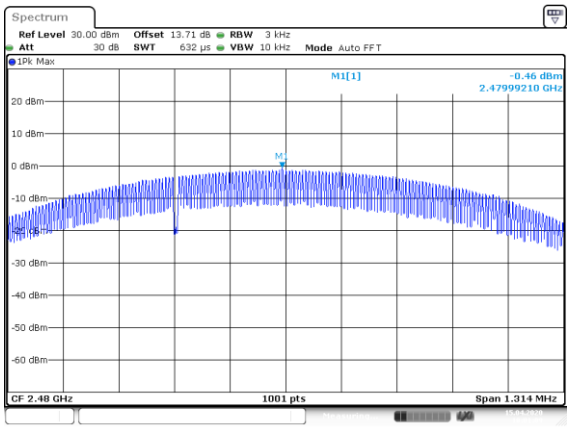
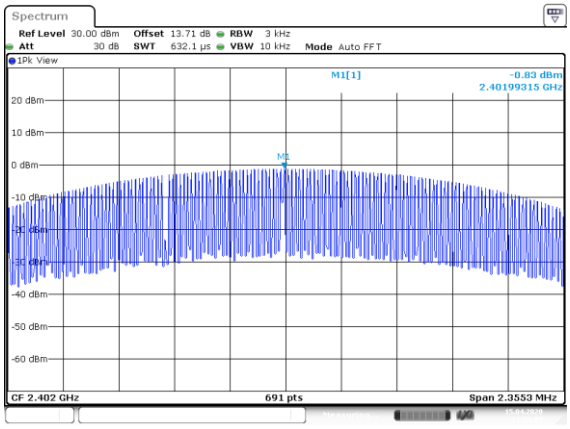
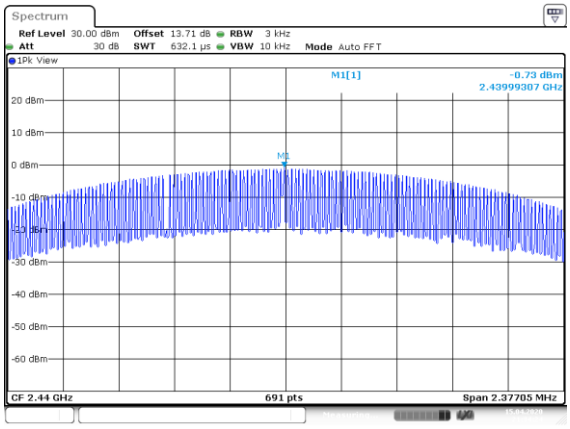
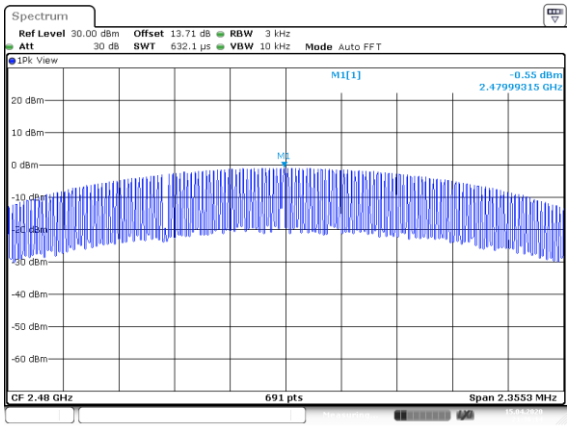
<Dipole Antenna: TAOGLAS/GW.71.5153>

BLE-1Mbps Low CH	BLE-1Mbps Middle CH
	
BLE-1Mbps High CH	**BLE-2Mbps Low CH**
	
BLE-2Mbps Middle CH	**BLE-2Mbps High CH**
	

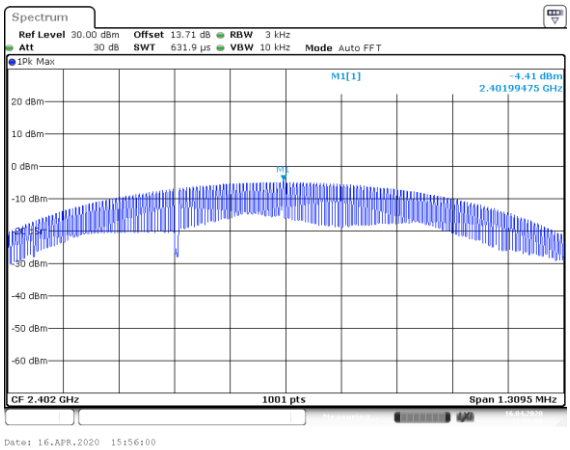
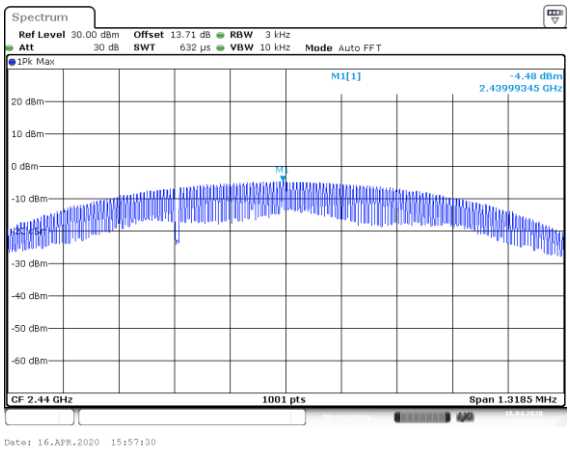
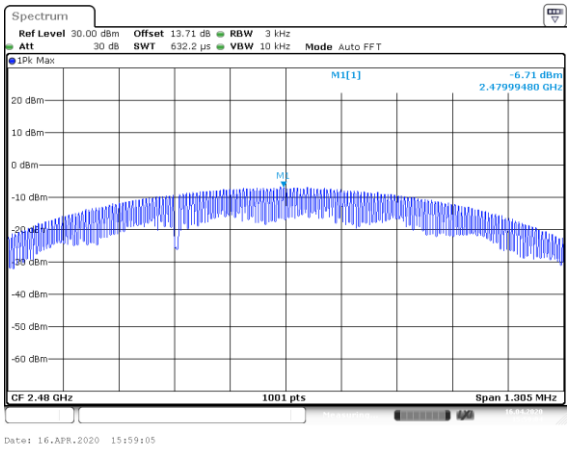
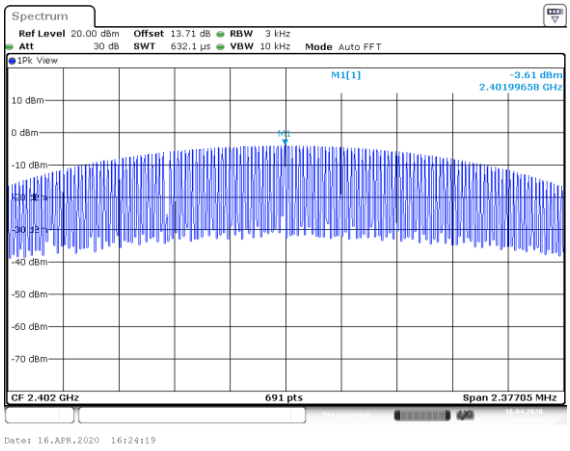
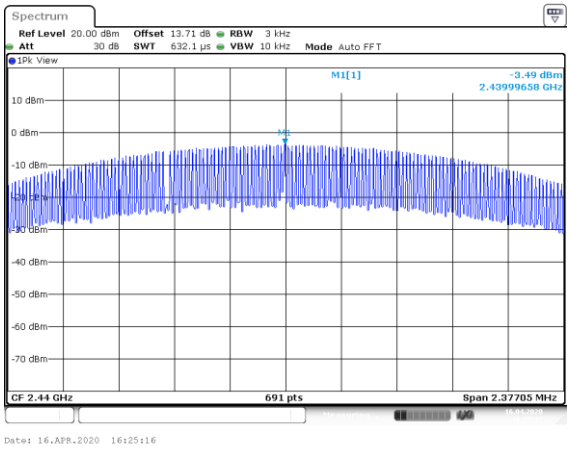
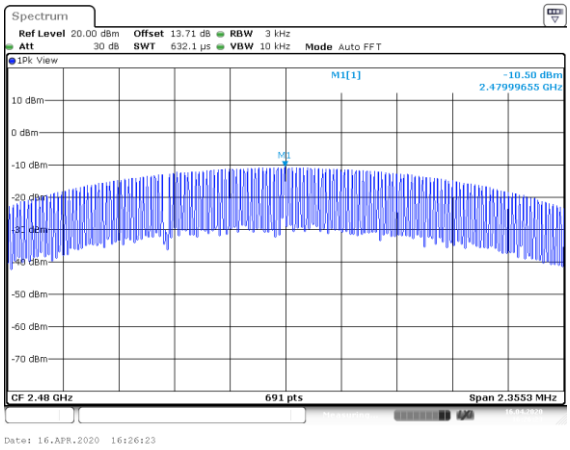
<PIFA Antenna: SMARTEQ/4211613980>

BLE-1Mbps Low CH	BLE-1Mbps Middle CH
	
BLE-1Mbps High CH	**BLE-2Mbps Low CH**
	
BLE-2Mbps Middle CH	**BLE-2Mbps High CH**
	

<Dipole Antenna: Inside WLAN/PRO-IS-299>

BLE-1Mbps Low CH	BLE-1Mbps Middle CH
	
BLE-1Mbps High CH	**BLE-2Mbps Low CH**
	
BLE-2Mbps Middle CH	**BLE-2Mbps High CH**
	

<PCB Antenna: Redpine Signals/RSIA7>

BLE-1Mbps Low CH	BLE-1Mbps Middle CH
	
BLE-1Mbps High CH	**BLE-2Mbps Low CH**
	
BLE-2Mbps Middle CH	**BLE-2Mbps High CH**
	

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