FCC Part 15.247

TEST REPORT

For

GlobalSat WorldCom Corporation

16F., No. 186, Jian 1st Rd., Zhonghe Dist., New Taipei City, Taiwan

FCC ID: RID-MDPANIC

Report Type	**Original Report**
Product Name:	**Personal Tracker**
Model Name:	**MD-Panic**
Report Number :	**RLK200413002-00B**
Report Date :	**2020/05/27**
Reviewed By :	**Zeus Chen** Zeus Chen
Prepared By: **Bay Area Compliance Laboratories Corp.(Linkou Laboratory)** **No. 6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.)** **Tel: +886 (3)3961072; Fax: +886 (3) 3961027** **www.bacl.com.tw**	

Revision History

Revision	Report Number	Issue Date	Description
1.0	RLK200413002-00B	2020/05/27	Original Report

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	**GlobalSat WorldCom Corporation** 16F., No. 186, Jian 1st Rd., Zhonghe Dist., New Taipei City, Taiwan
Manufacturer	**GlobalSat WorldCom Corporation** 16F., No. 186, Jian 1st Rd., Zhonghe Dist., New Taipei City, Taiwan
Brand Name	GlobalSat
Product (Equipment)	**Personal Tracker**
Model Name	**MD-Panic**
Frequency Range	902.3 MHz to 914.9 MHz
Number of Channels	64 Channels
Channel Space	125 kHz
Output Power	19.35 dBm (0.0861 W)
Modulation Type	FSK
Related Submittal(s)/Grant(s)	N/A
Received Date	2020-04-13
Date of Test	2020-05-08 to 2020-05-13

**All measurement and test data in this report was gathered from production sample serial number: 200413002 (Assigned by BACL, Linkou Laboratory).*

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☒ AC 120 V/60 Hz ☒ Adapter (Not for Sale) ☐ By Power Cord.
	☒ DC Type ☐ DC Power Supply ☒ Battery 1: *Brand Name: Coppercell Technology Co., Ltd* *Model: PL503035* *3.7Vdc, 500 mAh* ☒ Battery 2: *Brand Name: SHENZHEN SUNHE ENERGY CO.,LTD.* *Model: SH503035* *3.7Vdc, 520 mAh* ☐ 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 GlobalSat WorldCom Corporation Appliance (Model: MD-Panic) 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.

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 Test Environments and Test information

Item	Test Date	Temperature (°C)	Relative Humidity (%)	Test Engineer
Radiated (966A)	2020-05-08	18.9	51	Leo Cheng
Conducted (TH-02)	2020-05-12	23.5	57	Blake Wang
Conduction (Con-01)	2020-05-13	23.5	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.: TW3546. The Test Firm Registration No.: 181430.

2 System Test Configuration

2.1 Description of 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 902.3 MHz to 914.9 MHz, there are totally 64 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**902.3**	**32**	**908.5**
2	902.5	33	908.7
3	902.7	--	--
4	902.9	62	914.5
--	--	63	914.7
31	908.3	**64**	**914.9**

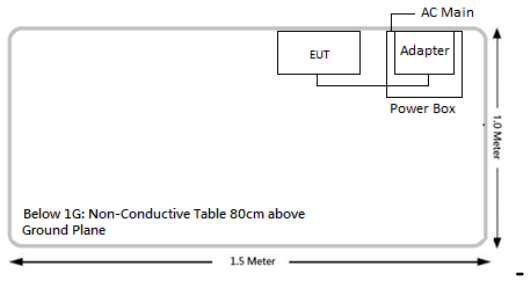
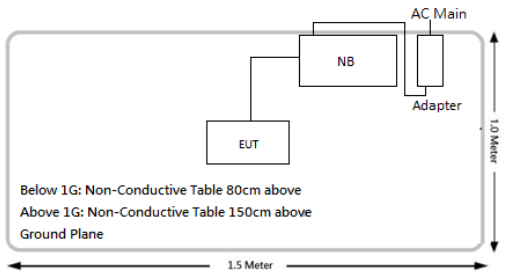
Channel **1**, **32** and **64** were tested, and the Worst Case of Power Setting as below table.

EUT Exercise Software		TR203 Log Tool		
Configuration	**NTX**	**Low CH**	**Mid CH**	**High CH**
902.3 MHz to 914.9 MHz	1	Default	Default	Default

2.2 Support Equipment List and Details

No.	Description	Manufacturer	Model Number	Serial Number
A	Notebook	DELL	Latitude E6410	PP27LA001
B	USB Cable	GlobalSat	1m	N/A
C	Adapter	MYCELL	AC-B04	B0401

2.3 Block Diagram of Test Setup

Conduction	Radiation
	

3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.247(i), § 2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance

4 FCC§15.247(i), § 2.1093 – RF Exposure

4.1 Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance v06

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·

[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

4.2 RF Exposure Evaluation Result

Please refer to the SAR report, report No.: R2005213-SAR

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

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

5.2 Antenna List and Details

Brand	Model	Antenna Type	Antenna Gain	Result
anjie	MY501	FPC	-2.80 dBi	Compliance

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

6 FCC §15.207 - AC Line Conducted Emissions

6.1 Applicable Standard

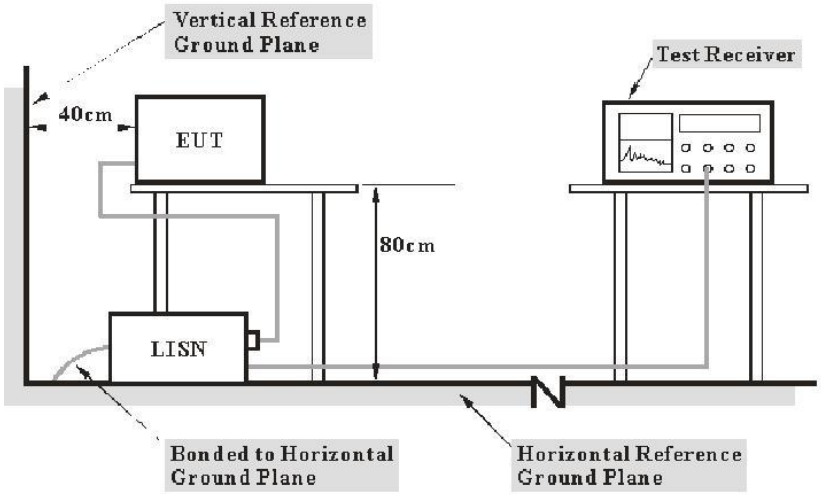
According to FCC §15.207,

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.

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

6.2 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.

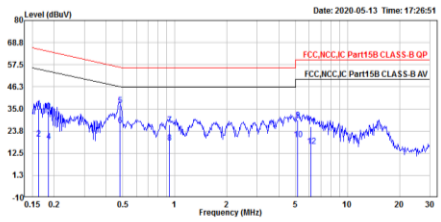
6.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
AC Line Conduction Room (CON-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

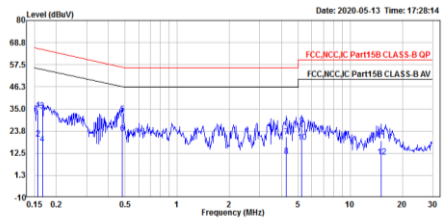
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units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

6.4 Test Result

Line	Neutral



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.162	15.07	35.01	19.94	65.34	-30.33	QP
2	0.162	-0.08	19.86	19.94	55.34	-35.48	Average
3	0.186	14.01	33.95	19.94	64.21	-30.26	QP
4	0.186	-1.52	18.42	19.94	54.21	-35.79	Average
5	0.480	16.99	36.95	19.96	56.34	-19.39	QP
6	0.480	6.63	26.59	19.96	46.34	-19.75	Average
7	0.930	7.14	27.10	19.96	56.00	-28.90	QP
8	0.930	-2.26	17.70	19.96	46.00	-28.30	Average
9	5.157	9.20	29.24	20.04	60.00	-30.76	QP
10	5.157	-0.46	19.58	20.04	50.00	-30.42	Average
11	6.145	5.96	26.01	20.05	60.00	-33.99	QP
12	6.145	-3.75	16.30	20.05	50.00	-33.70	Average



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.157	14.46	34.41	19.95	65.60	-31.19	QP
2	0.157	-0.16	19.79	19.95	55.60	-35.81	Average
3	0.166	14.26	34.21	19.95	65.14	-30.93	QP
4	0.166	-2.72	17.23	19.95	55.14	-37.91	Average
5	0.480	12.55	32.52	19.97	56.34	-23.82	QP
6	0.480	2.60	22.57	19.97	46.34	-23.77	Average
7	4.260	0.71	20.75	20.04	56.00	-35.25	QP
8	4.260	-9.06	10.98	20.04	46.00	-35.02	Average
9	5.240	6.52	26.59	20.07	60.00	-33.41	QP
10	5.240	-1.89	18.18	20.07	50.00	-31.82	Average
11	15.120	-1.51	18.75	20.26	60.00	-41.25	QP
12	15.120	-9.45	10.81	20.26	50.00	-39.19	Average

Note1: Transmit Mode.

Note2:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

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

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

7.1 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

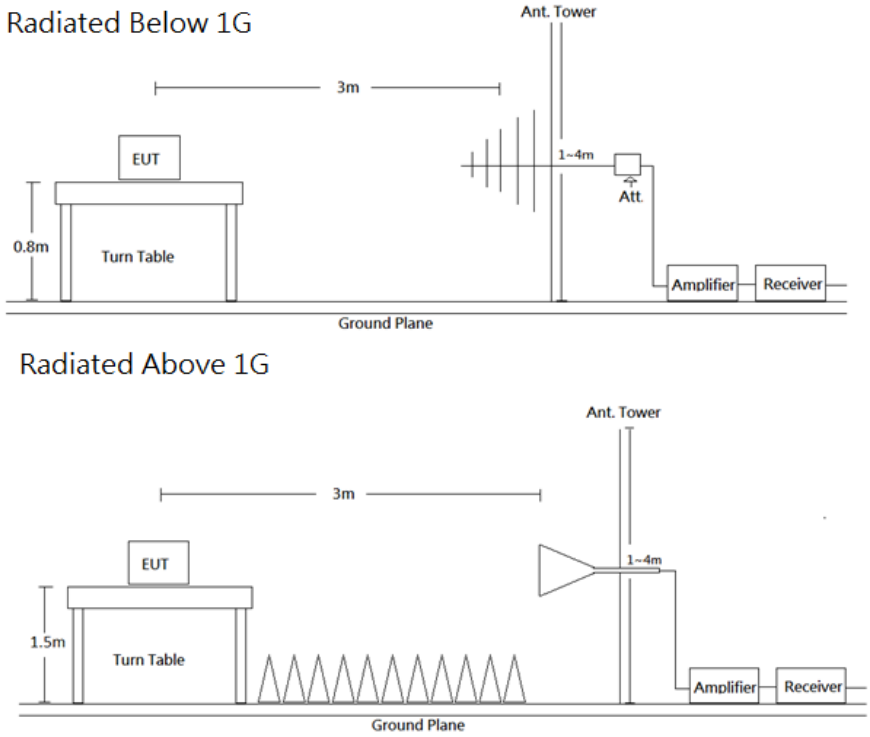
As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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).

7.2 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 10 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

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.

7.3 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
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	101456	2019/07/12	2020/07/11
Horn Antenna	ETS-Lindgren	3115	00109141	2019/07/05	2020/07/04
Preamplifier	A.H. Systems	PAM-0118	470	2020/03/16	2021/03/15
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	/

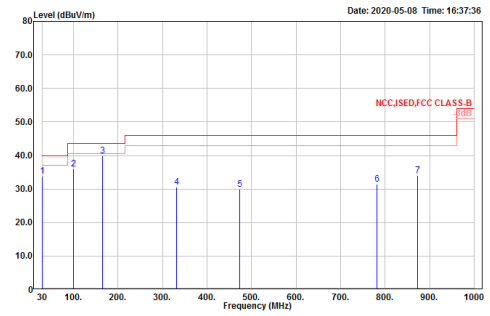
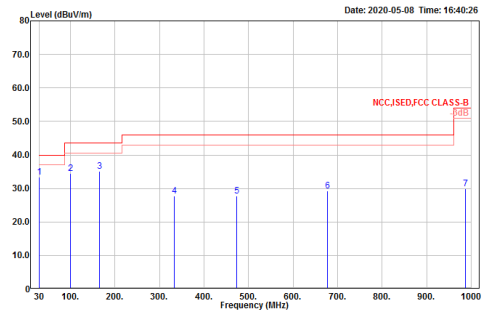
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units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

7.4 Radiated Emission Test Plot and Data

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

Test the worst power mode with Battery PL503035.

Below 1G (30 MHz-1 GHz)

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	30.000	33.72	40.00	-6.28	39.75	-6.03	Peak
2	99.840	36.01	43.50	-7.49	56.84	-20.83	Peak
3	165.800	39.97	43.50	-3.53	59.47	-19.50	Peak
4	331.670	30.67	46.00	-15.33	48.12	-17.45	Peak
5	473.290	29.84	46.00	-16.16	44.38	-14.54	Peak
6	780.780	31.34	46.00	-14.66	40.88	-9.54	Peak
7	872.930	34.08	46.00	-11.92	42.60	-8.52	Peak

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	30.000	33.34	40.00	-6.66	39.37	-6.03	Peak
2	99.840	34.42	43.50	-9.08	55.25	-20.83	Peak
3	165.800	35.12	43.50	-8.38	54.62	-19.50	Peak
4	332.640	27.78	46.00	-18.22	45.20	-17.42	Peak
5	473.290	27.82	46.00	-18.18	42.36	-14.54	Peak
6	676.990	29.37	46.00	-16.63	40.35	-10.98	Peak
7	987.390	29.87	54.00	-24.13	37.39	-7.52	Peak

Note1: Transmit mode

Note2: Peak value can pass the limit of QP.

Note3:

Level = Read Level + 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-10 GHz)

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1804.600	51.71	54.00	-2.29	61.58	-9.87	Average
1804.600	52.69	74.00	-21.31	62.56	-9.87	Peak
4511.500	46.47	54.00	-7.53	46.93	-0.46	Average
4511.500	50.16	74.00	-23.84	50.62	-0.46	Peak
5413.800	47.75	54.00	-6.25	47.60	0.15	Average
5413.800	50.75	74.00	-23.25	50.60	0.15	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1804.600	51.98	54.00	-2.02	61.85	-9.87	Average
1804.600	52.74	74.00	-21.26	62.61	-9.87	Peak
3609.200	37.09	54.00	-16.91	40.10	-3.01	Average
3609.200	44.55	74.00	-29.45	47.56	-3.01	Peak
5413.800	45.55	54.00	-8.45	45.40	0.15	Average
5413.800	49.52	74.00	-24.48	49.37	0.15	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1817.400	53.23	54.00	-0.77	62.97	-9.74	Average
1817.400	53.89	74.00	-20.11	63.63	-9.74	Peak
4543.500	44.62	54.00	-9.38	44.98	-0.36	Average
4543.500	49.15	74.00	-24.85	49.51	-0.36	Peak
5452.200	48.05	54.00	-5.95	47.75	0.30	Average
5452.200	52.10	74.00	-21.90	51.80	0.30	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1817.400	52.76	54.00	-1.24	62.50	-9.74	Average
1817.400	53.08	74.00	-20.92	62.82	-9.74	Peak
4543.500	44.51	54.00	-9.49	44.87	-0.36	Average
4543.500	49.49	74.00	-24.51	49.85	-0.36	Peak
5452.200	47.62	54.00	-6.38	47.32	0.30	Average
5452.200	51.26	74.00	-22.74	50.96	0.30	Peak

High CH

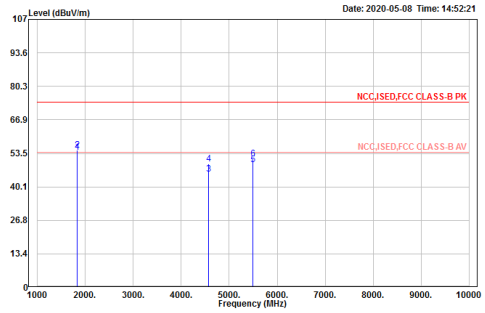
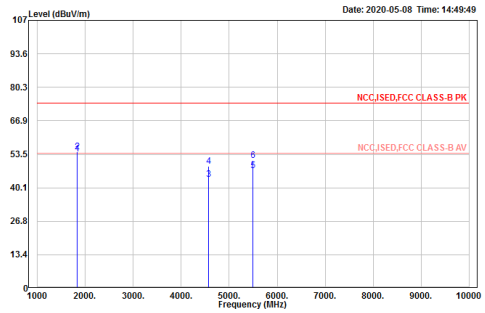
Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1829.800	53.89	54.00	-0.11	63.49	-9.60	Average
1829.800	54.88	74.00	-19.12	64.48	-9.60	Peak
4574.500	45.38	54.00	-8.62	45.60	-0.22	Average
4574.500	49.30	74.00	-24.70	49.52	-0.22	Peak
5489.400	49.04	54.00	-4.96	48.57	0.47	Average
5489.400	51.47	74.00	-22.53	51.00	0.47	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1829.800	53.72	54.00	-0.28	63.32	-9.60	Average
1829.800	54.44	74.00	-19.56	64.04	-9.60	Peak
4574.500	43.59	54.00	-10.41	43.81	-0.22	Average
4574.500	48.76	74.00	-25.24	48.98	-0.22	Peak
5489.400	47.06	54.00	-6.94	46.59	0.47	Average
5489.400	50.93	74.00	-23.07	50.46	0.47	Peak

Above 1G (1 GHz-10 GHz): The worst mode: High Channel

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1 !	1829.800	53.89	54.00	-0.11	63.49	-9.60	Average
2 !	1829.800	54.88	74.00	-19.12	64.48	-9.60	Peak
3 !	4574.500	45.38	54.00	-8.62	45.60	-0.22	Average
4	4574.500	49.30	74.00	-24.70	49.52	-0.22	Peak
5 !	5489.400	49.04	54.00	-4.96	48.57	0.47	Average
6	5489.400	51.47	74.00	-22.53	51.00	0.47	Peak

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1 !	1829.800	53.72	54.00	-0.28	63.32	-9.60	Average
2 !	1829.800	54.44	74.00	-19.56	64.04	-9.60	Peak
3 !	4574.500	43.59	54.00	-10.41	43.81	-0.22	Average
4	4574.500	48.76	74.00	-25.24	48.98	-0.22	Peak
5 !	5489.400	47.06	54.00	-6.94	46.59	0.47	Average
6	5489.400	50.93	74.00	-23.07	50.46	0.47	Peak

Note1: Transmit mode

Note2:

Level = Read Level + Factor

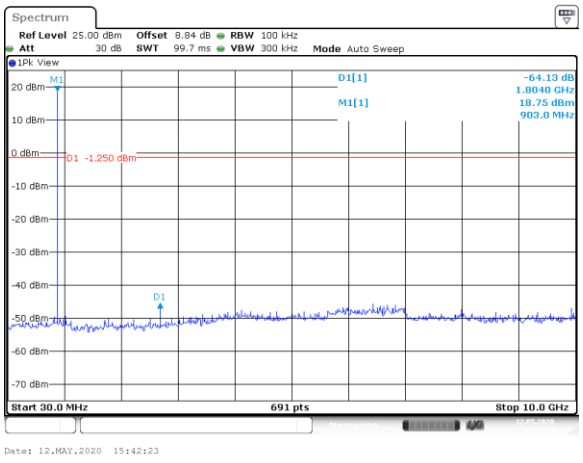
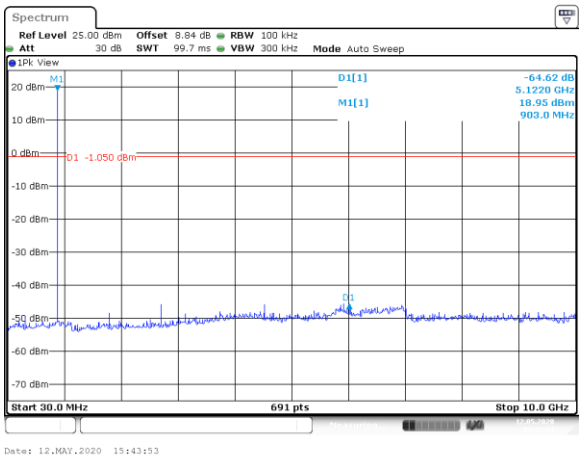
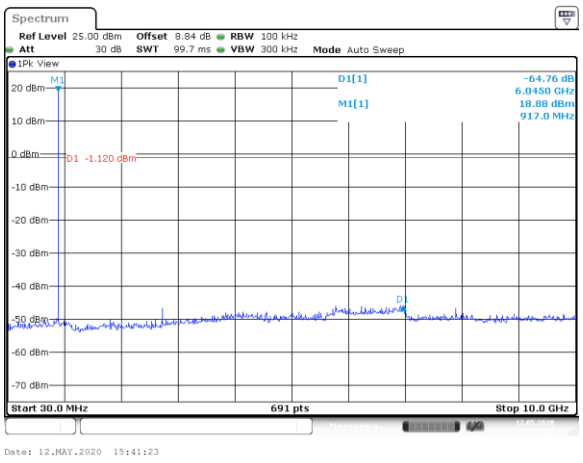
Over Limit = Level – Limit

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
Low	902.3	64.13	≥ 20	Compliance
Mid	908.5	64.62	≥ 20	Compliance
High	914.9	64.76	≥ 20	Compliance

Low CH	Middle CH
	
High CH	**-**
	-

8 FCC §15.247(a)(1) – 20 dB Emission Bandwidth

8.1 Applicable Standard

According to FCC §15.247(a) (1) (i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

8.2 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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

(3) Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

(4) Repeat above procedures until all frequencies measured were complete.

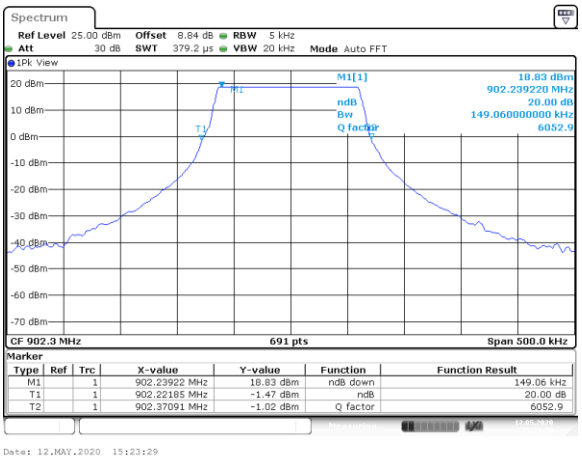
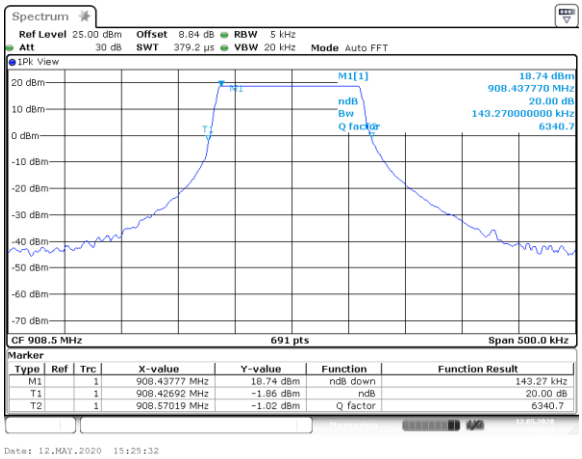
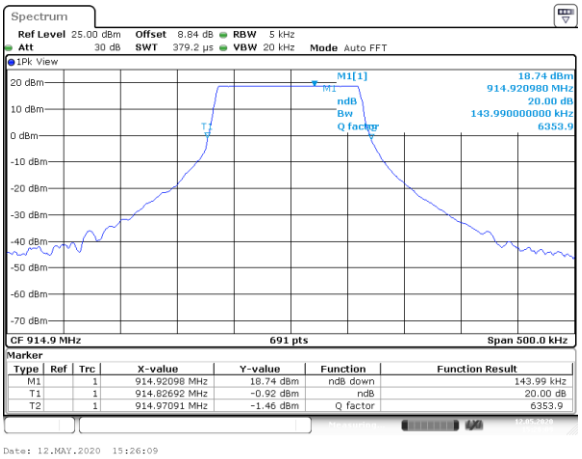
8.3 Test Equipment List and Details

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).*

8.4 Test Results

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	20 dB Bandwidth Limit (kHz)
Low	902.3	149.06	< 250.00
Middle	908.5	143.27	< 250.00
High	914.9	143.99	< 250.00

Low CH	Middle CH
	
High CH	**-**
	-

9 FCC §15.247(a)(1) – Channel Separation Test

9.1 Applicable Standard

According to FCC §15.247(a) (1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

9.2 Test Procedure

According to ANSI 63.10 7.8.3

a) Span: Wide enough to capture the peaks of two adjacent channels. b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.

c) Video (or average) bandwidth (VBW) ≥ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold.

g) Allow the trace to stabilize

9.3 Test Equipment List and Details

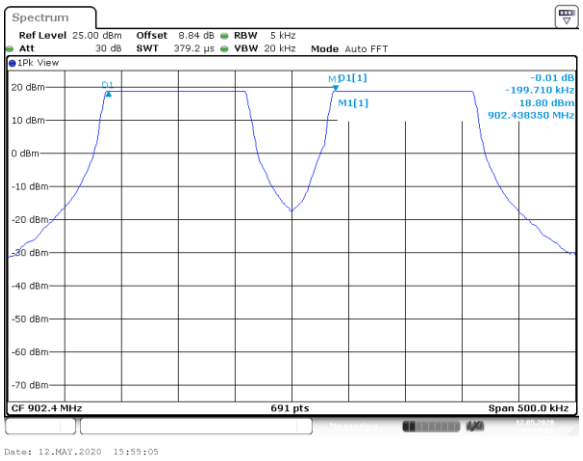
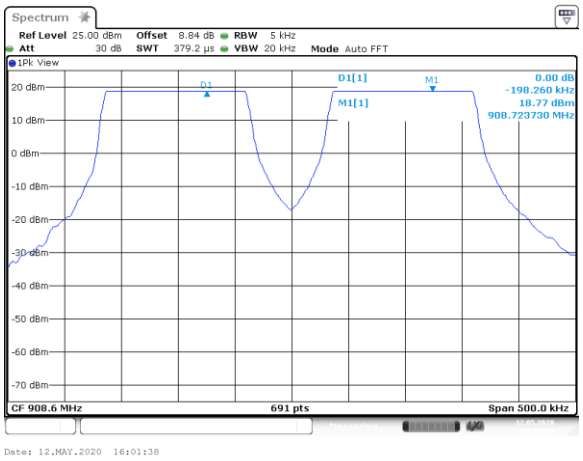
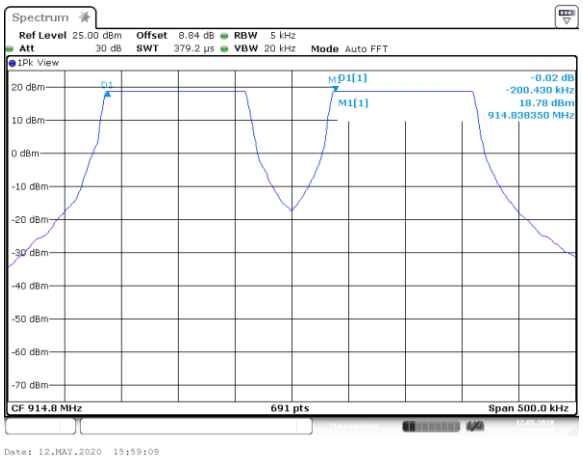
Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***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)	Channel Separation (kHz)	Limit (kHz)	Result
Low	902.3	199.71	>149.78	Compliance
Middle	908.5	198.26	>149.78	Compliance
High	914.9	200.43	>149.78	Compliance

**Limit > 20dB Bandwidth.*

Low CH	Middle CH
	
High CH	**-**
	-

10 FCC §15.247(a)(1)(iii) – Time of Occupancy (Dwell Time)

10.1 Applicable Standard

According to FCC §15.247(a) (1) (i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

10.2 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel

RBW ≤ channel spacing and where possible RBW should be set >> 1/T, where T is the expected dwell time per channel

Sweep = as necessary to capture the entire dwell time per hopping channel Detector function = peak

Trace = max hold

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements.

Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) x (period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

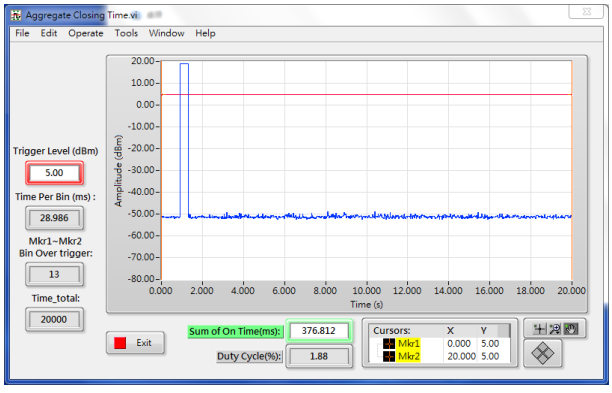
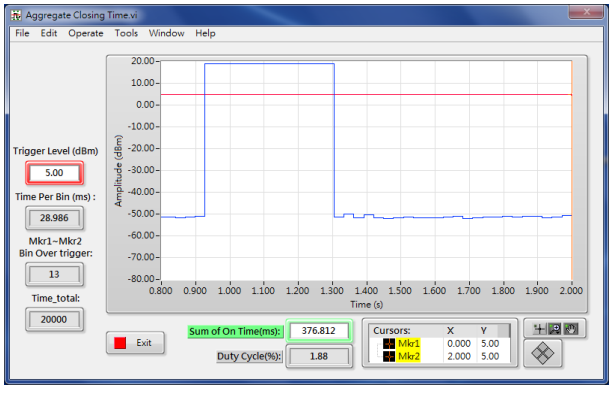
10.3 Test Equipment List and Details

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).*

10.4 Test Results

Frequency (MHz)	Pulse Duration (ms)	Number of Pulses	Measure Time (s)	Dwell Time (s)	Limits (s)	Test Result
902.3 MHz to 914.9 MHz	376.8120	1	20	0.3768	0.4000	**Complies**

Dwell Time - 20s	Dwell Time – Zoon In Pulse Duration
	

11 FCC §15.247(a)(1)(iii) –Quantity of hopping channel Test

11.1 Applicable Standard

According to FCC §15.247(a) (1) (i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

11.2 Test Procedure

Span = the frequency band of operation.

RBW < 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller VBW ≥ RBW.

Sweep = auto. Detector function = peak Trace = max hold.

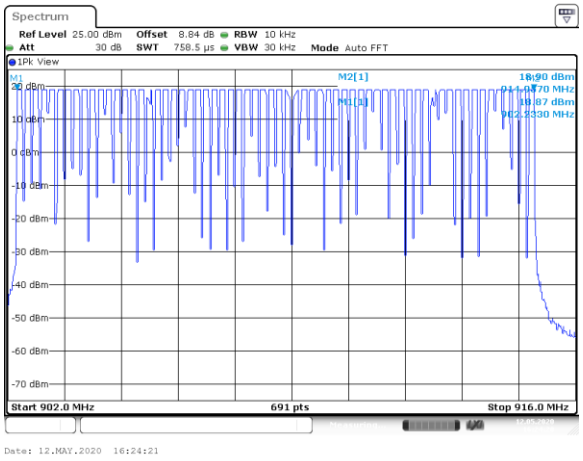
11.3 Test Equipment List and Details

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

Mode	Frequency Range (MHz)	Number of Hopping Channel	Limit (CH)	Result
902.3 MHz to 914.9 MHz	902.3 MHz to 914.9 MHz	64	>50	Compliance

902.3 MHz to 914.9 MHz	-
	-

Note:

Channel Separate = 200 KHz

914.9 MHz - 902.3 MHz = 12.6 MHz, (12.6 MHz / 0.2 MHz) + 1 =64CH

12 FCC §15.247(b)(1) – Maximum Output Power

12.1 Applicable Standard

According to FCC §15.247(b) (2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

12.2 Test Procedure

Place the EUT on a bench and set it in transmitting mode.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Power sensor.

12.3 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).*

12.4 Test Results

Channel	Frequency (MHz)	Maximum Peak Output Power (dBm)	Maximum Peak Output Power (W)	Limit (dBm)	Result
Low	902.3	19.35	0.0861	30	Compliance
Middle	908.5	19.28	0.0847	30	Compliance
High	914.9	19.25	0.0841	30	Compliance

Channel	Frequency (MHz)	Average Output Power (dBm)	Average Output Power (W)	Limit (dBm)	Result
Low	902.3	18.29	0.0675	30	Compliance
Middle	908.5	18.25	0.0668	30	Compliance
High	914.9	18.22	0.0664	30	Compliance

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

13.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c)

.

13.2 Test Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.

RBW = 100 kHz VBW = 300 kHz.

Sweep = coupled. Detector function = peak Trace = max hold.

13.3 Test Equipment List and Details

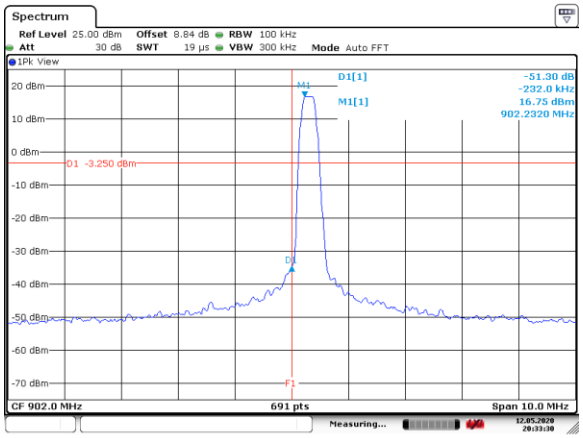
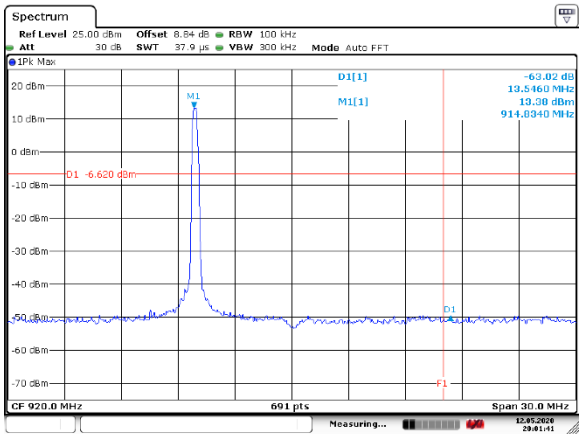
Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***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).*

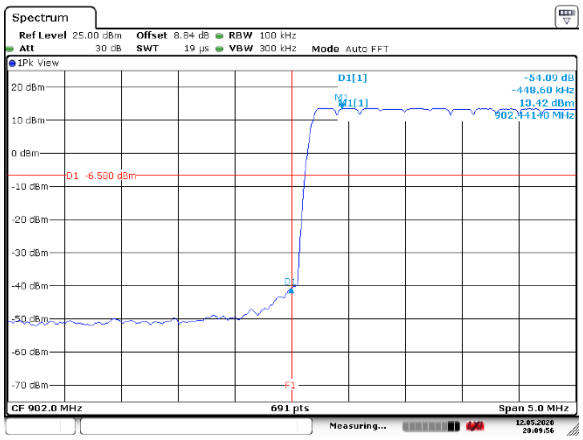
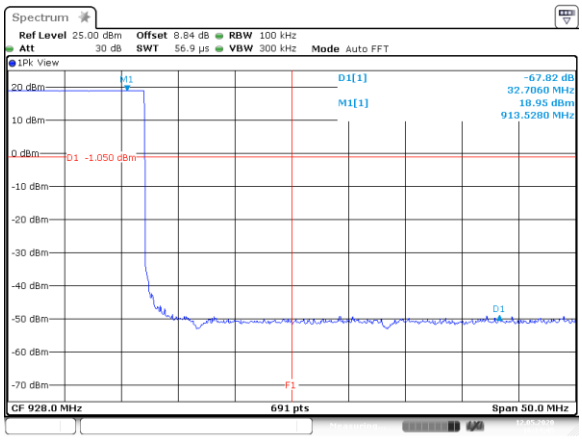
13.4 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
902.3 MHz to 914.9 MHz				
Low	902.3	-51.30	≥ 20	Compliance
High	914.9	-63.02	≥ 20	Compliance
902.3 MHz to 914.9 MHz (Hopping)				
Low	902.3	54.09	≥ 20	Compliance
High	914.9	67.82	≥ 20	Compliance

902.3 MHz to 914.9 MHz:

Left Side	Right Side
	

902.3 MHz to 914.9 MHz Hopping:

Left Side	Right Side
	

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