




TEST REPORT

Report No. : **CHEW19110006** Report verification: 

Project No..... : **SHT1909013504EW**

FCC ID..... : **TV7LR9**

Applicant's name..... : **Mikrotikls SIA**

Address..... : Brivibas gatve 214i, Riga,LV-1039,Latvia

Manufacturer..... : Mikrotikls SIA

Address..... : Brivibas gatve 214i, Riga,LV-1039,Latvia

Test item description : **LoRaWAN Gateway mini PCIe card R11e-LoRa9**

Trade Mark : MikroTik

Model/Type reference..... : R11e-LoRa9

Listed Model(s) : -

Standard : **FCC CFR Title 47 Part 15 Subpart C Section 15.247**

Date of receipt of test sample..... : Oct.15,2019

Date of testing..... : Oct.15,2019 ~ Nov.01,2019

Date of issue..... : Nov.04,2019

Result..... : **PASS**

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Hans Hu

Testing Laboratory Name : **Shenzhen Huatongwei International Inspection Co., Ltd.**

Address..... : 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

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The test report merely correspond to the test sample.

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1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

[ANSI C63.10:2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB 558074 D01 15.247 Meas Guidance v05r02](#): Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of The FCC Rules

1.2. Report version

Revision No.	Date of issue	Description
N/A	2019-11-04	Original

2. TEST DESCRIPTION

Test Item	FCC Rule	Result	Test Engineer
Antenna requirement	15.203/15.247(c)	PASS	Ximing Huang
Line Conducted Emissions (AC Main)	15.207	PASS	Ximing Huang
Conducted Peak Output Power	15.247(b)(3)	PASS	Ximing Huang
Power Spectral Density	15.247(e)	PASS	Ximing Huang
6dB Bandwidth	15.247(a)(2)	PASS	Ximing Huang
Restricted band	15.247(d)/15.205	PASS	Ximing Huang
Spurious Emissions	15.247(d)/15.209	PASS	Ximing Huang

Note: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client Information

Applicant:	Mikrotikls SIA
Address:	Brivibas gatve 214i, Riga,LV-1039,Latvia
Manufacturer:	Mikrotikls SIA
Address:	Brivibas gatve 214i, Riga,LV-1039,Latvia

3.2. Product Description

Name of EUT:	LoRaWAN Gateway mini PCIe card R11e-LoRa9	
Trade Mark:	MikroTik	
Model No.:	R11e-LoRa9	
Listed Model(s):	-	
Power supply:	Test fixture with USB 5V power supply	
Adapter information:	-	
Hardware version:	r3	
Software version:	-	
LORA		
Modulation:	FSK	
Operation frequency:	902MHz~928MHz	
Channel number:	16	
Channel separation:	1.6MHz for 00-07 channel 0.6MHz for 08-15 channel	
Antenna type:	ANT 1:PCB Antenna	ANT2: FRP Antenna
Antenna gain:	ANT 1:2.5dBi	ANT2: 6.5dBi

3.3. Operation state

➤ Test frequency list

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the below gray bottom.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	903	08	923.3
01	904.6	09	923.9
02	906.2	10	924.5
03	907.8	11	925.1
04	909.4	12	925.7
05	911	13	926.3
06	912.6	14	926.9
07	914.2	15	927.5

➤ Test mode

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit (duty cycle>98%).
For AC power line conducted emissions:
The EUT connect to laptop by USB cable.the laptop control LORA transmitting.
For Radiated suprious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit(duty cycle>98%). The EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data Recorded in the report.

3.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

1	Laptop	Manufacturer:	acer
		Model No.:	ZRDB

3.5. Modifications

No modifications were implemented to meet testing criteria.

4. TEST ENVIRONMENT

4.1. Address of the test laboratory

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

4.2. Test Facility

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 762235

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files.

IC-Registration No.:5377A

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No.: 5377A.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

4.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

4.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors in calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd. quality system according to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Here after the best measurement capability for Shenzhen Huatongwei International Inspection Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.51 dB	(1)
Conducted spurious emissions 9kHz~40GHz	0.51 dB	(1)
Conducted Disturbance 150kHz~30MHz	3.02 dB	(1)
Radiated Emissions below 1GHz	4.90 dB	(1)
Radiated Emissions above 1GHz	4.96 dB	(1)
Occupied Bandwidth	70 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4.5. Equipments Used during the Test

● Conducted Emission						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Shielded Room	Albatross projects	N/A	N/A	2018/09/28	2023/09/27
●	EMI Test Receiver	R&S	ESCI	101247	2019/10/25	2020/10/24
●	Artificial Mains	SCHWARZBECK	NNLK 8121	573	2019/10/22	2020/10/21
●	Pulse Limiter	R&S	ESH3-Z2	100499	2019/10/26	2020/10/25
●	RF Connection Cable	HUBER+SUHNER	EF400	N/A	2018/11/15	2019/11/14
●	Test Software	R&S	ES-K1	N/A	N/A	N/A

● Radiated Emission-6th test site						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	SAC-3m-02	N/A	2018/09/30	2021/09/29
●	EMI Test Receiver	R&S	ESCI	100900	2019/10/28	2020/10/27
●	Loop Antenna	R&S	HFH2-Z2	100020	2017/11/20	2020/11/19
●	Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	546	2017/04/05	2020/04/04
●	Pre-Amplifier	SCHWARZBECK	BBV 9742	N/A	2018/11/15	2019/11/14
●	RF Connection Cable	HUBER+SUHNER	N/A	N/A	2019/08/21	2020/08/20
●	RF Connection Cable	HUBER+SUHNER	SUCOFLEX104	501184/4	2019/05/27	2020/05/26
●	Test Software	R&S	ES-K1	N/A	N/A	N/A
●	Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A
●	Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A

● Radiated emission-7th test site						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	SAC-3m-01	N/A	2018/09/30	2021/09/29
●	Spectrum Analyzer	R&S	FSP40	100597	2019/10/26	2020/10/25
●	Horn Antenna	SCHWARZBECK	9120D	1011	2017/03/27	2020/03/26
●	Broadband Pre-amplifier	SCHWARZBECK	BBV 9718	9718-248	2019/04/26	2020/04/25
●	Horn Antenna	SCHWARZBECK	BBHA9170	25841	2017/03/27	2020/03/26
●	RF Connection Cable	HUBER+SUHNER	RE-7-FL	N/A	2018/11/15	2019/11/14
●	Test Software	Audix	E3	N/A	N/A	N/A

● RF Conducted Method						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	FSV40	100048	2019/10/26	2020/10/25
●	Spectrum Analyzer	Agilent	N9020A	MY50510187	2018/10/08	2020/10/07
●	Test software	Tonscend	JS1120-2	N/A	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Antenna Requirement

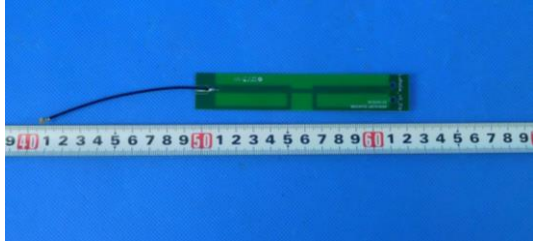

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 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 use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

TEST RESULTS

Passed **Not Applicable**

PCB Antenna	The antenna was permanently attached and the antenna gain is 2.5 dBi, fully compliance the rules	
FRP Antenna	The antenna need professional installation and the antenna gain is 6.5dBi, fully compliance the rules, please see the photo and user manual	

5.2. Conducted Emissions (AC Main)

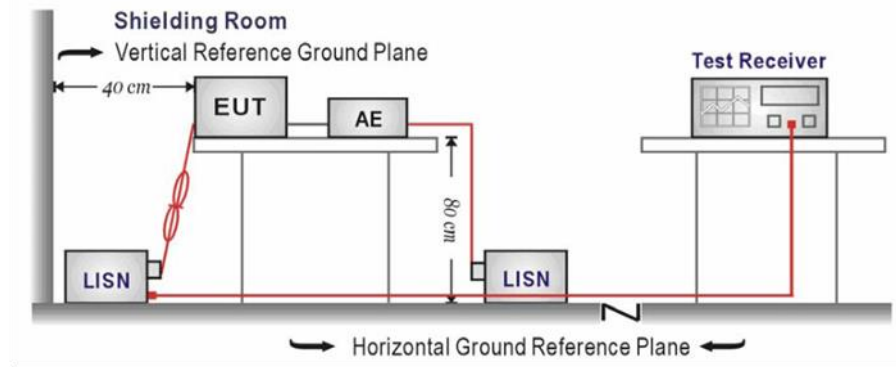
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

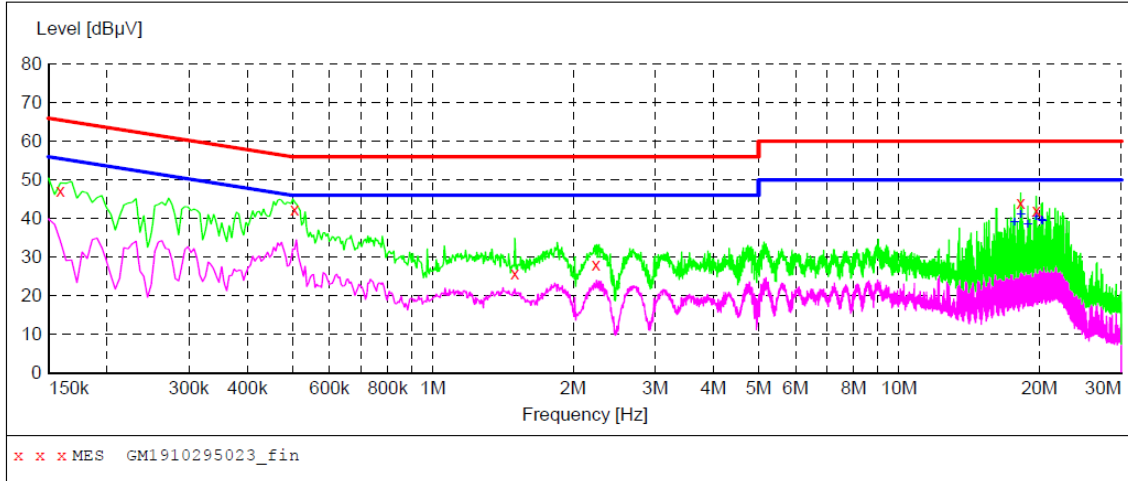
Note:

- 1) Transd = Cable lose + Pulse Limiter Factor + Artificial Mains Factor
- 2) Margin = Limit - Level

PCB Antenna:

Test Line:

L



MEASUREMENT RESULT: "GM1910295023_fin"

10/29/2019 1:08PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.159000	47.20	10.1	66	18.3	QP	L1	GND
0.505500	42.50	10.1	56	13.5	QP	L1	GND
1.500000	25.70	10.1	56	30.3	QP	L1	GND
2.238000	28.20	10.1	56	27.8	QP	L1	GND
18.244500	44.20	10.2	60	15.8	QP	L1	GND
19.711500	42.00	10.2	60	18.0	QP	L1	GND

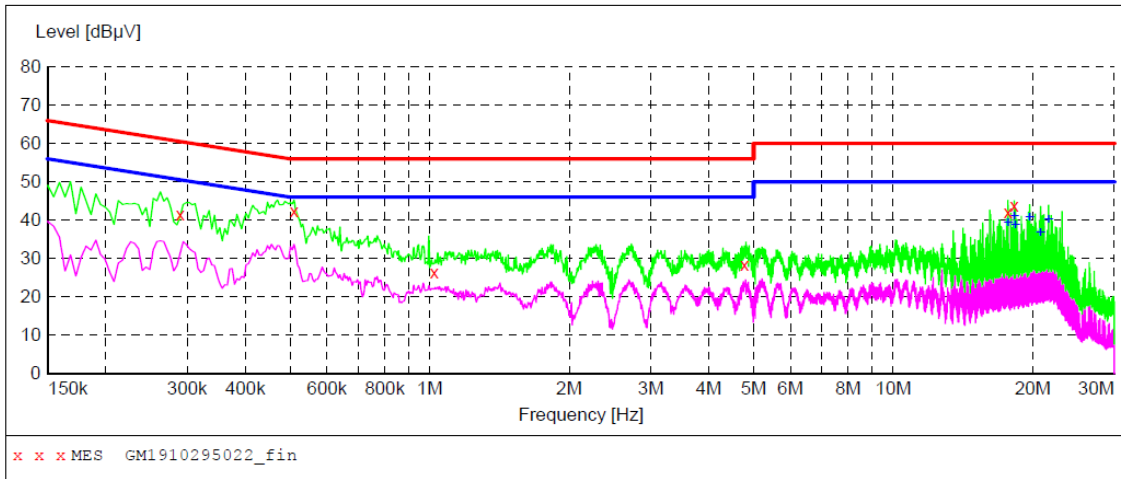
MEASUREMENT RESULT: "GM1910295023_fin2"

10/29/2019 1:08PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
17.695500	39.00	10.2	50	11.0	AV	L1	GND
18.244500	40.90	10.2	50	9.1	AV	L1	GND
18.915000	38.30	10.2	50	11.7	AV	L1	GND
19.707000	40.40	10.2	50	9.6	AV	L1	GND
20.260500	39.60	10.2	50	10.4	AV	L1	GND
20.319000	39.10	10.2	50	10.9	AV	L1	GND

Test Line:

N



MEASUREMENT RESULT: "GM1910295022_fin"

10/29/2019 11:47AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.289500	41.40	10.1	61	19.1	QP	N	GND
0.510000	42.40	10.1	56	13.6	QP	N	GND
1.023000	26.30	10.1	56	29.7	QP	N	GND
4.780500	28.50	10.1	56	27.5	QP	N	GND
17.695500	42.00	10.2	60	18.0	QP	N	GND
18.244500	43.80	10.2	60	16.2	QP	N	GND

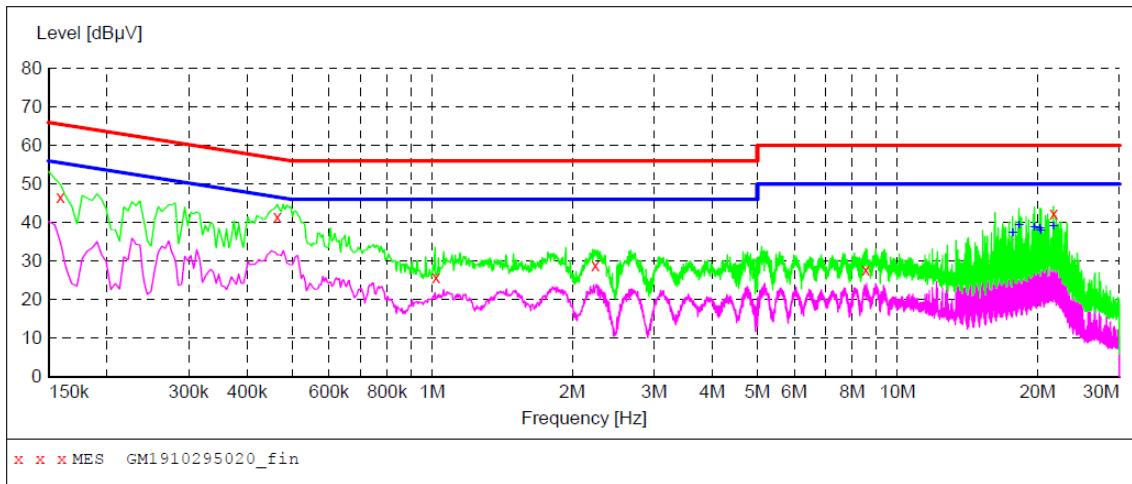
MEASUREMENT RESULT: "GM1910295022_fin2"

10/29/2019 11:47AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
17.695500	39.10	10.2	50	10.9	AV	N	GND
18.244500	40.80	10.2	50	9.2	AV	N	GND
18.366000	38.70	10.2	50	11.3	AV	N	GND
19.707000	40.60	10.2	50	9.4	AV	N	GND
20.805000	36.80	10.2	50	13.2	AV	N	GND
21.664500	40.10	10.2	50	9.9	AV	N	GND

FRP Antenna:

Test Line: L



MEASUREMENT RESULT: "GM1910295020_fin"

10/29/2019 11:40AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.159000	46.70	10.1	66	18.8	QP	L1	GND
0.465000	41.60	10.1	57	15.0	QP	L1	GND
1.018500	25.70	10.1	56	30.3	QP	L1	GND
2.242500	29.00	10.1	56	27.0	QP	L1	GND
8.547000	27.80	10.2	60	32.2	QP	L1	GND
21.664500	42.50	10.2	60	17.5	QP	L1	GND

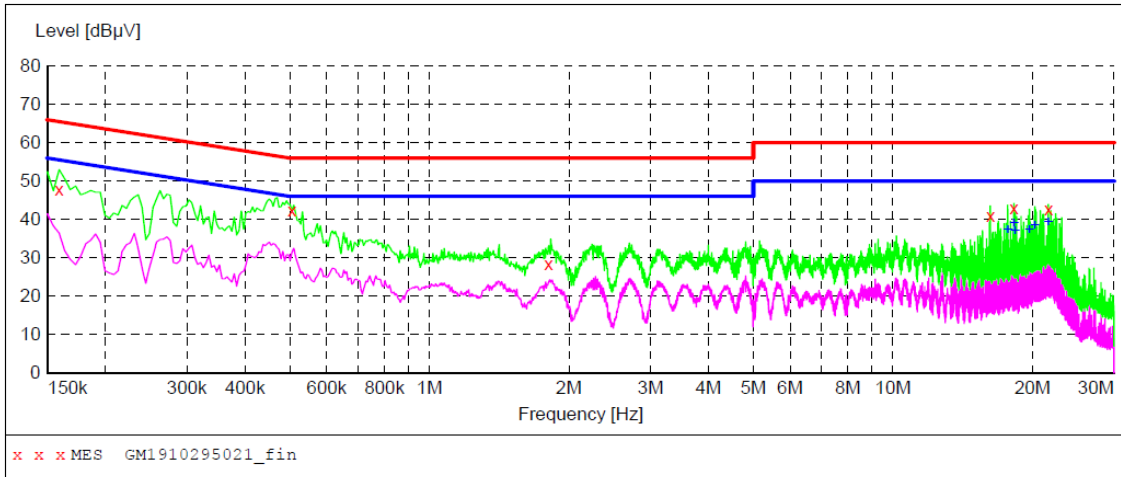
MEASUREMENT RESULT: "GM1910295020_fin2"

10/29/2019 11:40AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
17.695500	37.30	10.2	50	12.7	AV	L1	GND
18.244500	39.20	10.2	50	10.8	AV	L1	GND
19.707000	38.80	10.2	50	11.2	AV	L1	GND
20.256000	38.30	10.2	50	11.7	AV	L1	GND
20.319000	37.80	10.2	50	12.2	AV	L1	GND
21.664500	39.00	10.2	50	11.0	AV	L1	GND

Test Line:

N



MEASUREMENT RESULT: "GM1910295021_fin"

10/29/2019 11:43AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.159000	47.70	10.1	66	17.8	QP	N	GND
0.505500	42.30	10.1	56	13.7	QP	N	GND
1.806000	28.40	10.1	56	27.6	QP	N	GND
16.228500	40.90	10.2	60	19.1	QP	N	GND
18.244500	42.90	10.2	60	17.1	QP	N	GND
21.664500	42.60	10.2	60	17.4	QP	N	GND

MEASUREMENT RESULT: "GM1910295021_fin2"

10/29/2019 11:43AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
17.695500	37.20	10.2	50	12.8	AV	N	GND
18.244500	39.00	10.2	50	11.0	AV	N	GND
18.366000	37.00	10.2	50	13.0	AV	N	GND
19.711500	37.30	10.2	50	12.7	AV	N	GND
20.260500	38.40	10.2	50	11.6	AV	N	GND
21.664500	39.10	10.2	50	10.9	AV	N	GND

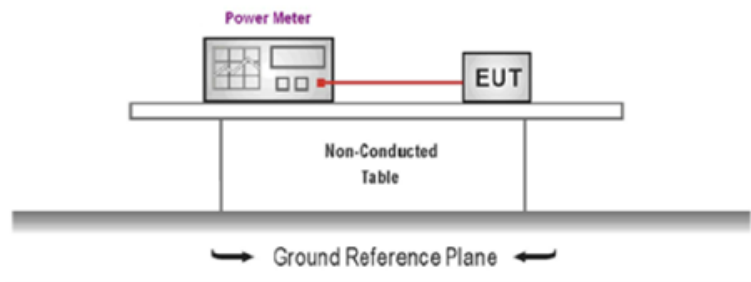
5.3. Conducted Peak Output Power

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): the limit should be 30 dBm.

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(4): because the FRP antenna gain is 6.5 dBi which larger than 6 dBi, the conducted output power limit should be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. So the conducted output power limit is 29.5 dBm.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10: 2013 and KDB 558074 D01 for compliance to FCC 47 CFR 15.247 requirements.
2. The maximum peak conducted output power may be measured using a broadband peak RF power meter.
3. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.
4. Record the measurement data.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

Type	Channel	Output power (dBm)	Limit (dBm)	Result
LORA	00	1.62	≤29.50	Pass
	08	0.71		
	15	0.62		

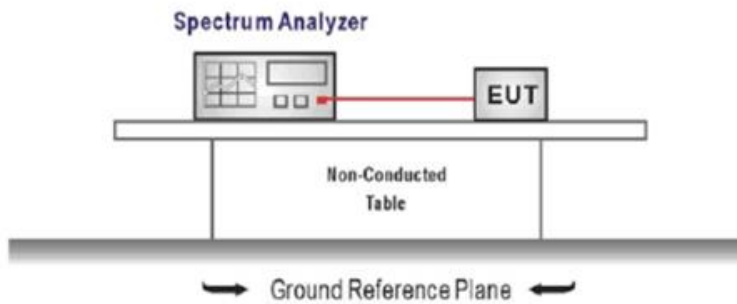
5.4. Power Spectral Density

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 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.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input,
2. Configure the spectrum analyzer as shown below:
 Center frequency=DTS channel center frequency
 Span =1.5 times the DTS bandwidth
 RBW = 3 kHz ≤ RBW ≤ 100 kHz, VBW ≥ 3 × RBW
 Sweep time = auto couple
 Detector = peak
 Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
4. Use the peak marker function to determine the maximum amplitude level within the RBW.
5. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST MODE:

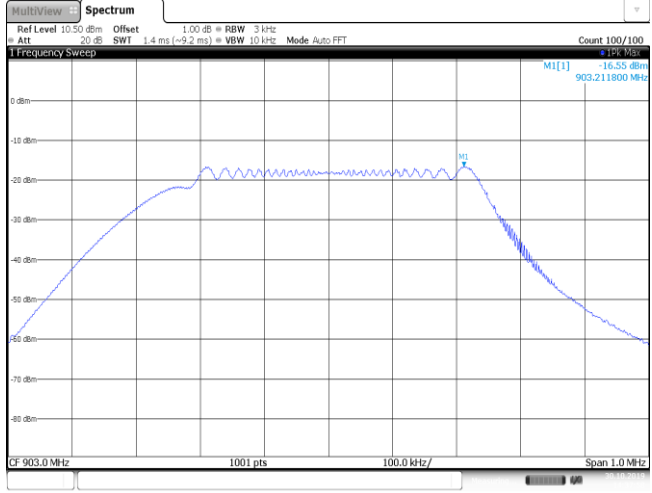
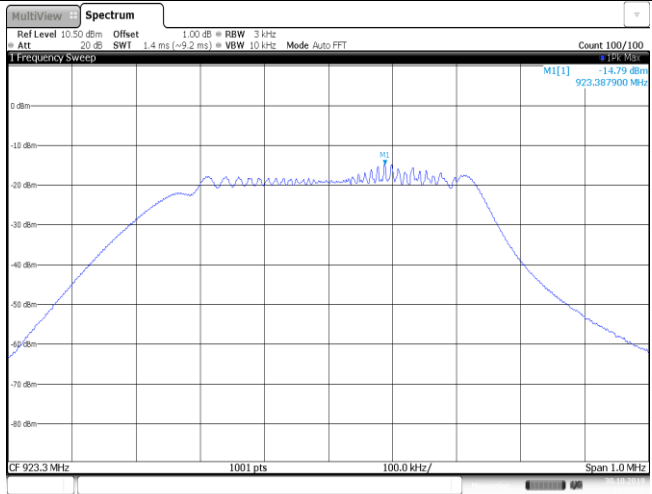
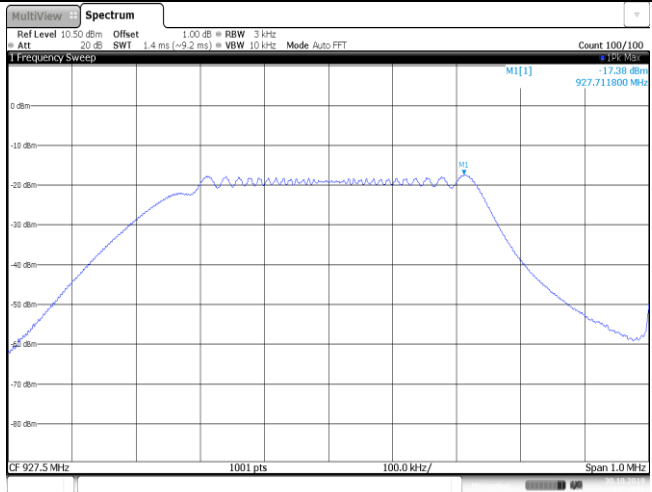
Please refer to the clause 3.3

TEST RESULTS

Passed **Not Applicable**

Type	Channel	Power Spectral Density(dBm/3KHz)	Limit (dBm/3KHz)	Result
LORA	00	-16.55	≤8.00	Pass
	08	-14.79		
	15	-17.38		

Test plot as follows:

<p>CH00</p>	 <p>MultiView Spectrum Ref Level 10.50 dBm Offset 1.00 dB RBW 3 kHz Att 20 dB SWI 1.4 ms (+9.2 ms) VBW 10 kHz Mode Auto FFT Count 100/100 1 Frequency Sweep M1[1] -16.53 dBm 903.211800 MHz 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm -80 dBm CF 903.0 MHz 1001 pts 100.0 kHz/ Span 1.0 MHz Date: 30.OCT.2019 14:37:57</p>
<p>CH08</p>	 <p>MultiView Spectrum Ref Level 10.50 dBm Offset 1.00 dB RBW 3 kHz Att 20 dB SWI 1.4 ms (+9.2 ms) VBW 10 kHz Mode Auto FFT Count 100/100 1 Frequency Sweep M1[1] -14.79 dBm 923.387900 MHz 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm -80 dBm CF 923.3 MHz 1001 pts 100.0 kHz/ Span 1.0 MHz Date: 30.OCT.2019 16:01:58</p>
<p>CH15</p>	 <p>MultiView Spectrum Ref Level 10.50 dBm Offset 1.00 dB RBW 3 kHz Att 20 dB SWI 1.4 ms (+9.2 ms) VBW 10 kHz Mode Auto FFT Count 100/100 1 Frequency Sweep M1[1] -17.28 dBm 927.711800 MHz 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm -80 dBm CF 927.5 MHz 1001 pts 100.0 kHz/ Span 1.0 MHz Date: 30.OCT.2019 16:10:31</p>

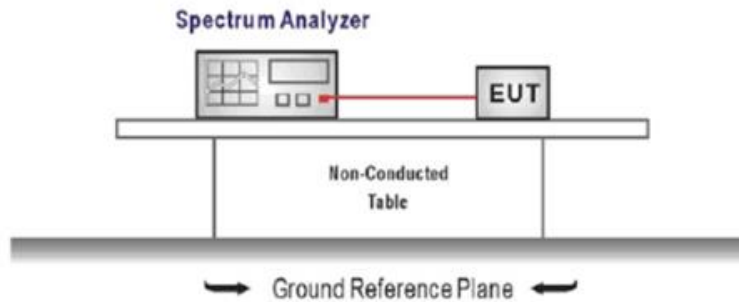
5.5. 6dB bandwidth

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2):

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).
 Center Frequency =DTS channel center frequency
 Span=2 x DTS bandwidth
 RBW = 100 kHz, VBW ≥ 3 × RBW
 Sweep time= auto couple
 Detector = Peak
 Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
4. 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, and record the pertinent measurements.

TEST MODE:

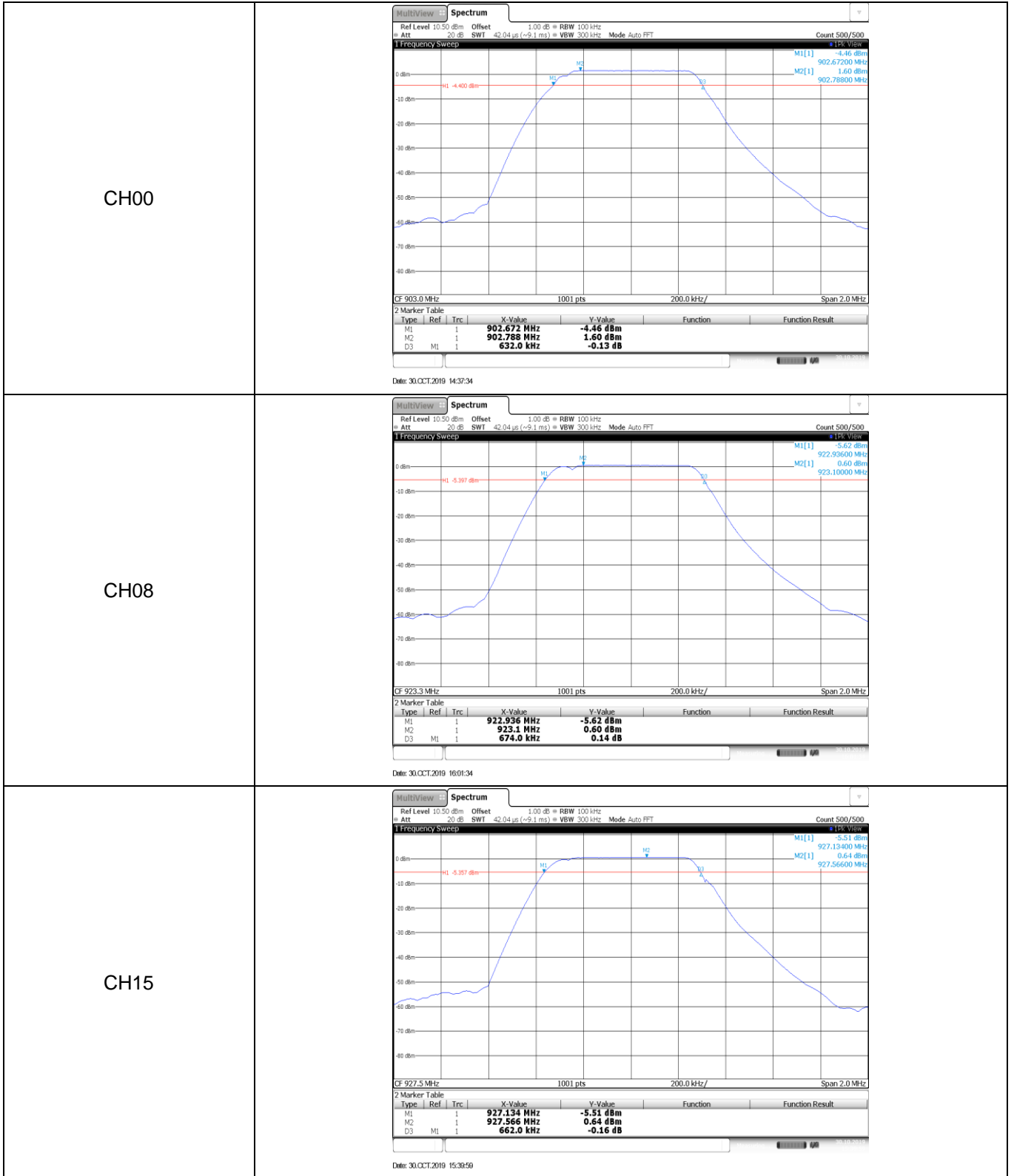
Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

Type	Channel	6dB Bandwidth(KHz)	Limit (KHz)	Result
LORA	00	632.00	≥500	Pass
	08	674.00		
	15	662.00		

Test plot as follows:



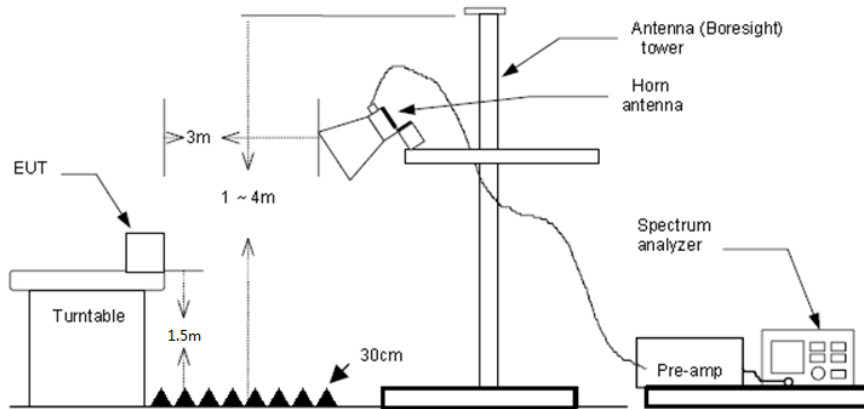
5.6. Restricted band

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, 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)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
 RBW=1MHz, VBW=3MHz Peak detector for Peak value.
 RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

Note:

- 1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor
- 2) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

PCB Antenna:

Test channel:	CH00	Polarity	Horizontal					
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	902.0000	17.40	32.20	49.60	74.00	24.40	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	902.0000	9.89	32.20	42.09	54.00	11.91	Horizontal	AV

Test channel:	CH00	Polarity	Vertical					
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	902.0000	15.30	32.20	47.50	74.00	26.50	Vertical	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	902.0000	10.66	32.20	42.86	54.00	11.14	Vertical	AV

Test channel:	CH15	Polarity	Horizontal					
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	928.0000	18.99	32.31	51.30	74.00	22.70	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	928.0000	17.10	32.31	49.41	54.00	4.59	Horizontal	AV

Test channel:	CH15	Polarity	Vertical					
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	928.0000	20.35	32.31	52.66	74.00	21.34	Vertical	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	928.0000	16.98	32.31	49.29	54.00	4.71	Vertical	AV

FRP Antenna:

Test channel:		CH00			Polarity		Horizontal	
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector
1	902.0000	17.47	32.20	49.67	74.00	24.33	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector
1	902.0000	10.23	32.20	42.43	54.00	11.57	Horizontal	AV

Test channel:		CH00			Polarity		Vertical	
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector
1	902.0000	15.88	32.20	48.08	74.00	25.92	Vertical	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector
1	902.0000	9.92	32.20	42.12	54.00	11.88	Vertical	AV

Test channel:		CH15			Polarity		Horizontal	
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector
1	928.0000	19.39	32.31	51.70	74.00	22.30	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector
1	928.0000	17.45	32.31	49.76	54.00	4.24	Horizontal	AV

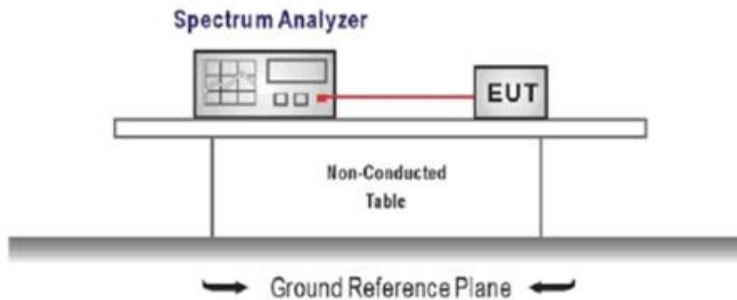
Test channel:		CH15			Polarity		Vertical	
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector
1	928.0000	18.83	32.31	51.14	74.00	22.86	Vertical	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector
1	928.0000	15.70	32.31	48.01	54.00	5.99	Vertical	AV

5.7. Band edge and Spurious Emissions (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d): In any 100 kHz bandwidth outside the frequency band 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.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Establish a reference level by using the following procedure
Center frequency=DTS channel center frequency
The span = 1.5 times the DTS bandwidth.
RBW = 100 kHz, VBW \geq 3 x RBW
Detector = peak, Sweep time = auto couple, Trace mode = max hold
Allow trace to fully stabilize
Use the peak marker function to determine the maximum PSD level

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

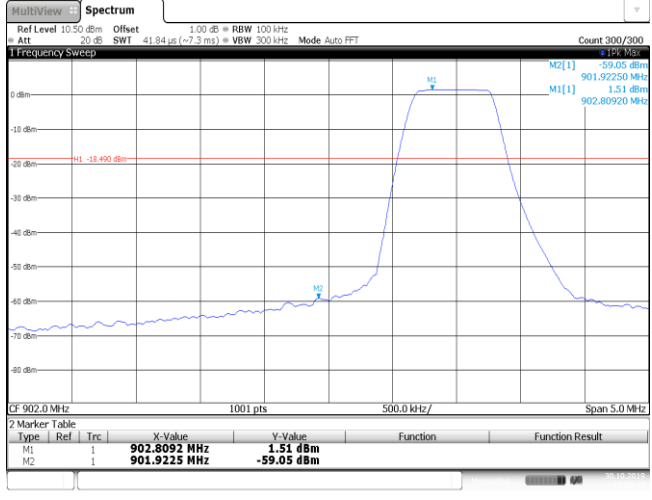
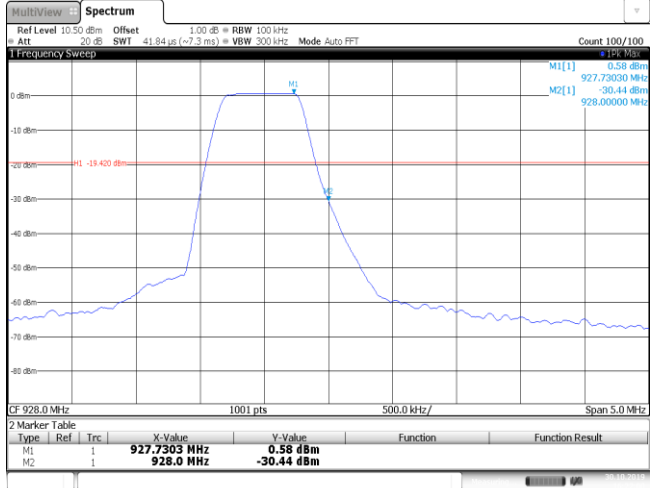
3. Emission level measurement
Set the center frequency and span to encompass frequency range to be measured
RBW = 100 kHz, VBW \geq 3 x RBW
Detector = peak, Sweep time = auto couple, Trace mode = max hold
Allow trace to fully stabilize
Use the peak marker function to determine the maximum amplitude level.
4. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
5. Ensure that the amplitude of all unwanted emission outside of the authorized frequency band excluding restricted frequency bands) are attenuated by at least the minimum requirements specified (at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz). Report the three highest emission relative to the limit.

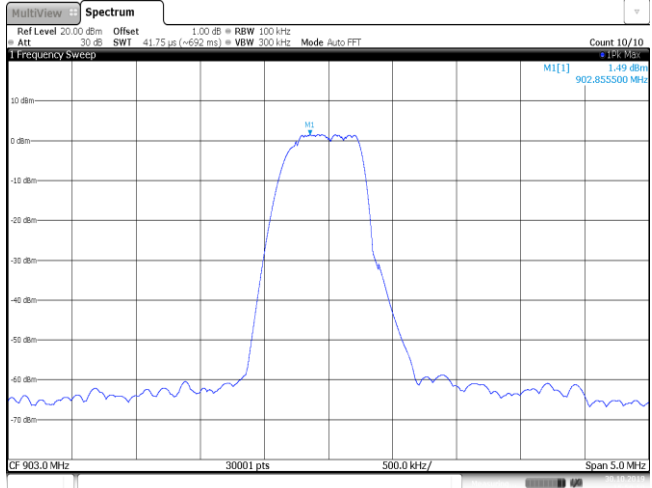
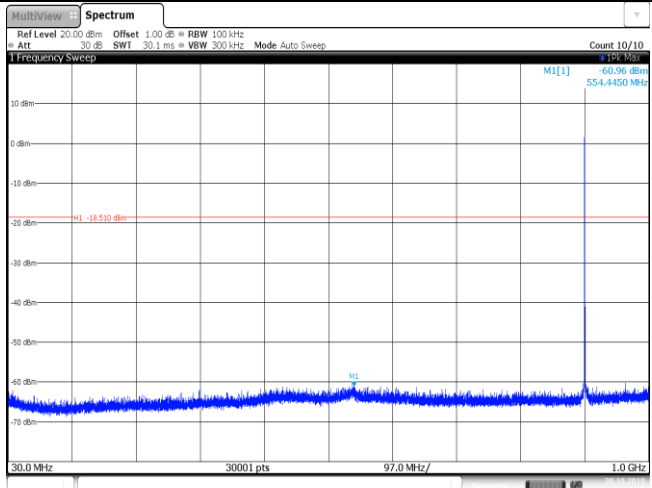
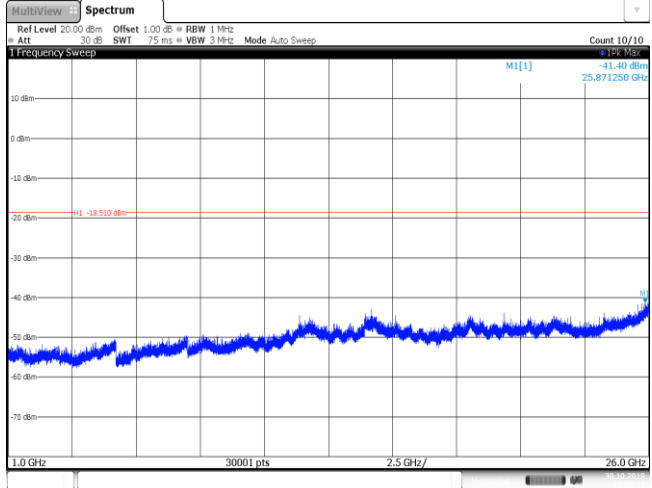
TEST MODE:

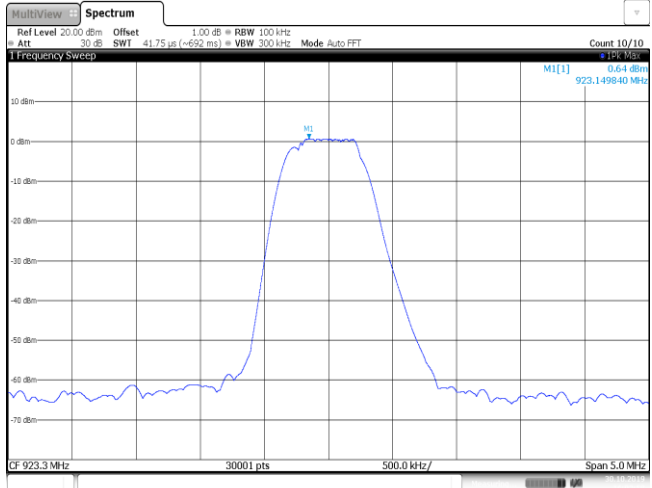
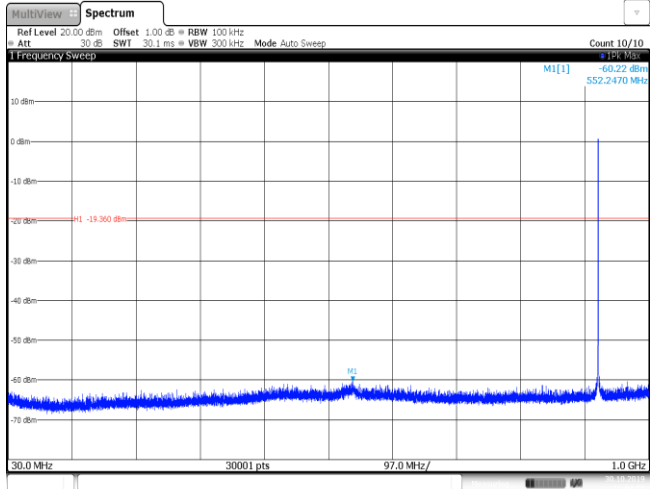
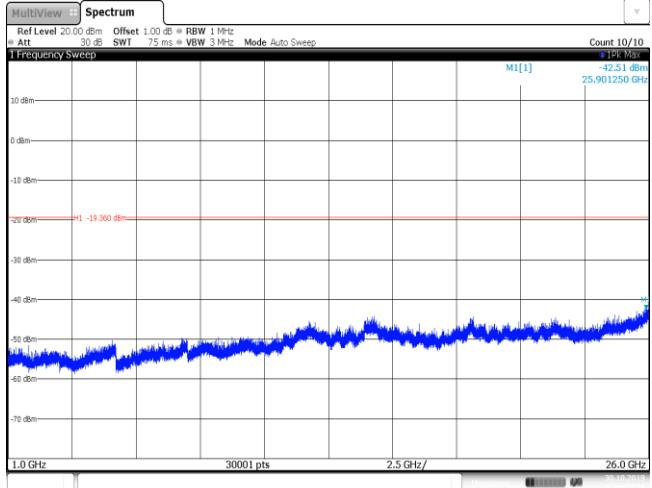
Please refer to the clause 3.3

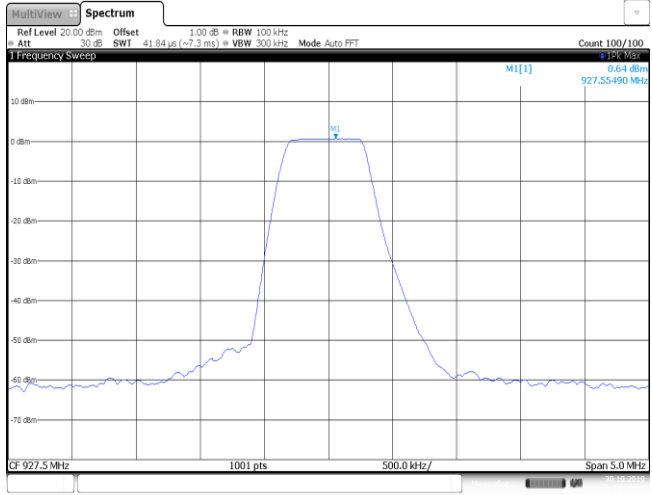
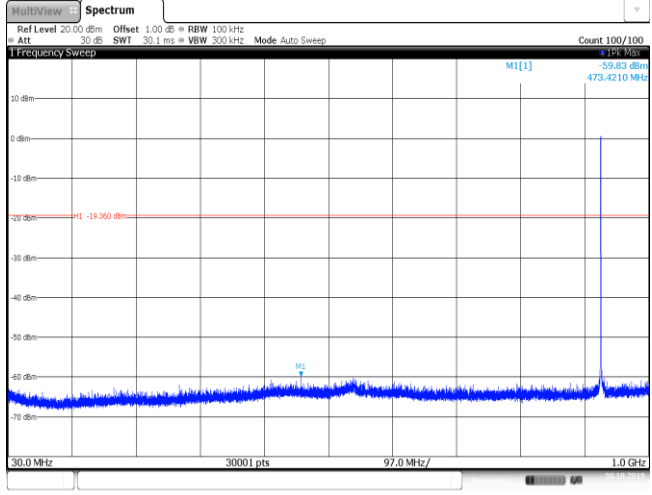
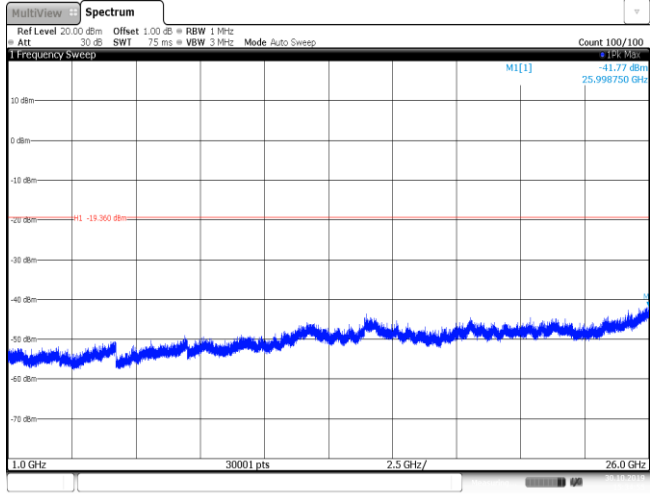
TEST RESULTS

Passed Not Applicable

Test Item:	Band edge																					
<p style="text-align: center;">CH00</p>	 <p>MultiView Spectrum</p> <p>Ref Level 10.50 dBm Offset 1.00 dB BW 100 kHz Att -20.0 dB SWI 41.84 μs (7.3 ms) VIEW 300 kHz Mode Auto FFT Count 300/300</p> <p>1 Frequency Sweep</p> <p>0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm -80 dBm</p> <p>CF 902.0 MHz 1001 pts 500.0 kHz/ Span 5.0 MHz</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>902.8092 MHz</td> <td>1.51 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>901.9225 MHz</td> <td>-59.05 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 30.OCT.2019 15:04:47</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		902.8092 MHz	1.51 dBm			M2	1		901.9225 MHz	-59.05 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																
M1	1		902.8092 MHz	1.51 dBm																		
M2	1		901.9225 MHz	-59.05 dBm																		
<p style="text-align: center;">CH15</p>	 <p>MultiView Spectrum</p> <p>Ref Level 10.50 dBm Offset 1.00 dB BW 100 kHz Att -20.0 dB SWI 41.84 μs (7.3 ms) VIEW 300 kHz Mode Auto FFT Count 100/100</p> <p>1 Frequency Sweep</p> <p>0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm -80 dBm</p> <p>CF 928.0 MHz 1001 pts 500.0 kHz/ Span 5.0 MHz</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>927.7303 MHz</td> <td>0.58 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>928.0 MHz</td> <td>-30.44 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 30.OCT.2019 16:22:01</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		927.7303 MHz	0.58 dBm			M2	1		928.0 MHz	-30.44 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																
M1	1		927.7303 MHz	0.58 dBm																		
M2	1		928.0 MHz	-30.44 dBm																		

Test Item:	SE
CH00 Reference level	 <p>MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 41.75 μs (≈62 ms) VBW 300 kHz Mode Auto FFT Count 10/10 1 Frequency Sweep M1[1] 1.49 dBm 902.85500 MHz CF 903.0 MHz 30001 pts 500.0 kHz/ Span 5.0 MHz Date: 30.OCT.2019 15:50:59</p>
CH00 30MHz~1000MHz	 <p>MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 1 Frequency Sweep M1[1] -60.96 dBm 554.4450 MHz M1 -18.510 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 30.OCT.2019 15:52:09</p>
CH00 1GHz~26GHz	 <p>MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 1 MHz Att 30 dB SWI 75 ms VBW 3 MHz Mode Auto Sweep Count 10/10 1 Frequency Sweep M1[1] -41.40 dBm 25.871250 GHz M1 -18.510 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 30.OCT.2019 15:53:21</p>

<p>CH08 Reference level</p>	 <p>The plot shows a spectrum with a central peak at 923.149840 MHz. The y-axis represents power in dBm, ranging from -75 to 10. The x-axis represents frequency in MHz, with a span of 5.0 MHz. The peak is labeled M1 and has a value of 0.64 dBm. The plot title is 'Spectrum' and it includes parameters like Ref Level 20.00 dBm, Att 30 dB, and SWI 41.75 μs.</p>
<p>CH08 30MHz~1000MHz</p>	 <p>The plot shows a spectrum with a sharp peak at 552.2470 MHz. The y-axis represents power in dBm, ranging from -75 to 10. The x-axis represents frequency in MHz, with a span of 1.0 GHz. The peak is labeled M1 and has a value of -60.22 dBm. A red horizontal line is drawn at -19.360 dBm. The plot title is 'Spectrum' and it includes parameters like Ref Level 20.00 dBm, Att 30 dB, and SWI 30.1 ms.</p>
<p>CH08 1GHz~26GHz</p>	 <p>The plot shows a spectrum with a peak at 25.901250 GHz. The y-axis represents power in dBm, ranging from -75 to 10. The x-axis represents frequency in GHz, with a span of 26.0 GHz. The peak is labeled M1 and has a value of -42.51 dBm. A red horizontal line is drawn at -19.360 dBm. The plot title is 'Spectrum' and it includes parameters like Ref Level 20.00 dBm, Att 30 dB, and SWI 75 ms.</p>

<p>CH15 Reference level</p>	 <p>The plot shows a spectrum with a central peak at 927.55 MHz. The y-axis represents power in dBm, ranging from -75 to 10. The x-axis represents frequency in MHz, with a span of 5.0 MHz centered at 927.5 MHz. The peak is labeled M1[1] and has a count of 100/100. The plot title is 'Spectrum' and it includes parameters like Ref Level 20.00 dBm, Offset 1.00 dB, RBW 100 kHz, and Mode Auto FFT.</p>
<p>CH15 30MHz~1000MHz</p>	 <p>The plot shows a spectrum from 30.0 MHz to 1.0 GHz. A sharp peak is visible at 473.4210 MHz, labeled M1[1] with a count of 100/100. The y-axis ranges from -75 to 10 dBm. The plot title is 'Spectrum' and it includes parameters like Ref Level 20.00 dBm, Offset 1.00 dB, RBW 100 kHz, and Mode Auto Sweep.</p>
<p>CH15 1GHz~26GHz</p>	 <p>The plot shows a spectrum from 1.0 GHz to 26.0 GHz. A peak is visible at 25.998750 GHz, labeled M1[1] with a count of 100/100. The y-axis ranges from -75 to 10 dBm. The plot title is 'Spectrum' and it includes parameters like Ref Level 20.00 dBm, Offset 1.00 dB, RBW 1 MHz, and Mode Auto Sweep.</p>

5.8. Spurious Emissions (radiated)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

Frequency	Limit (dBuV/m)	Value
0.009 MHz ~0.49 MHz	2400/F(kHz) @300m	Quasi-peak
0.49 MHz ~ 1.705 MHz	24000/F(kHz) @30m	Quasi-peak
1.705 MHz ~30 MHz	30 @30m	Quasi-peak

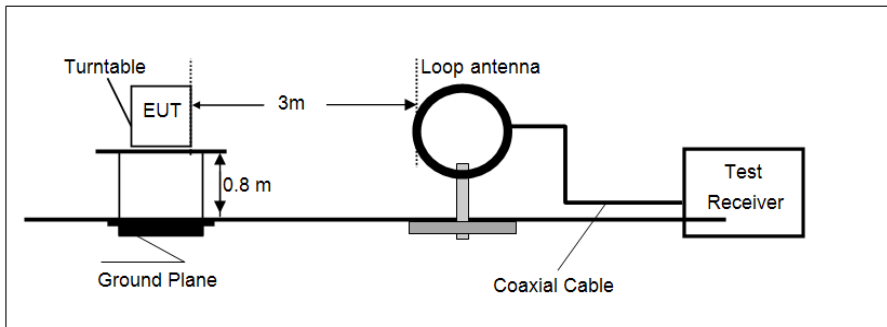
Note: Limit dBuV/m @3m = Limit dBuV/m @300m + 40*log(300/3)= Limit dBuV/m @300m +80,

Limit dBuV/m @3m = Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

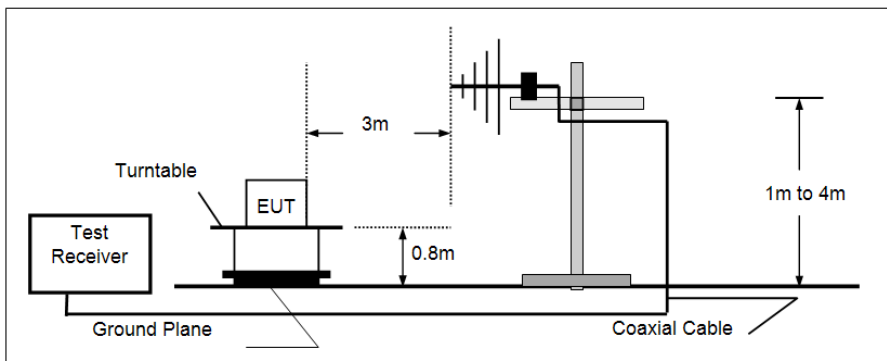
Frequency	Limit (dBuV/m @3m)	Value
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

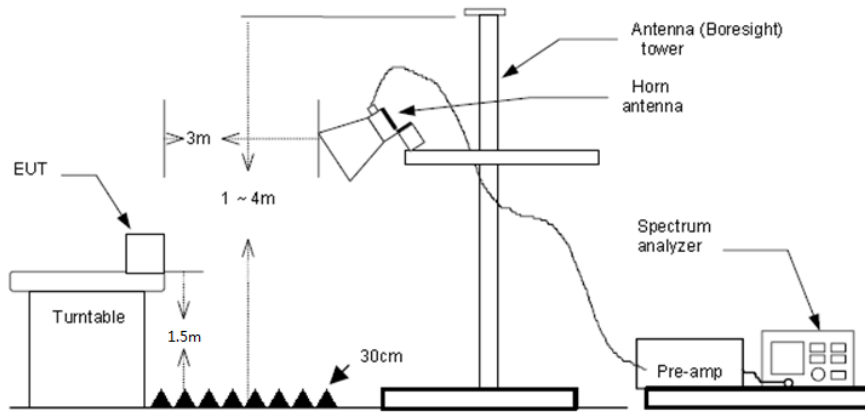
- 9 kHz ~ 30 MHz



- 30 MHz ~ 1 GHz



- Above 1 GHz



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz:
 RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
 If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) From 1 GHz to 10th harmonic:
 RBW=1MHz, VBW=3MHz Peak detector for Peak value.
 RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

Passed **Not Applicable**

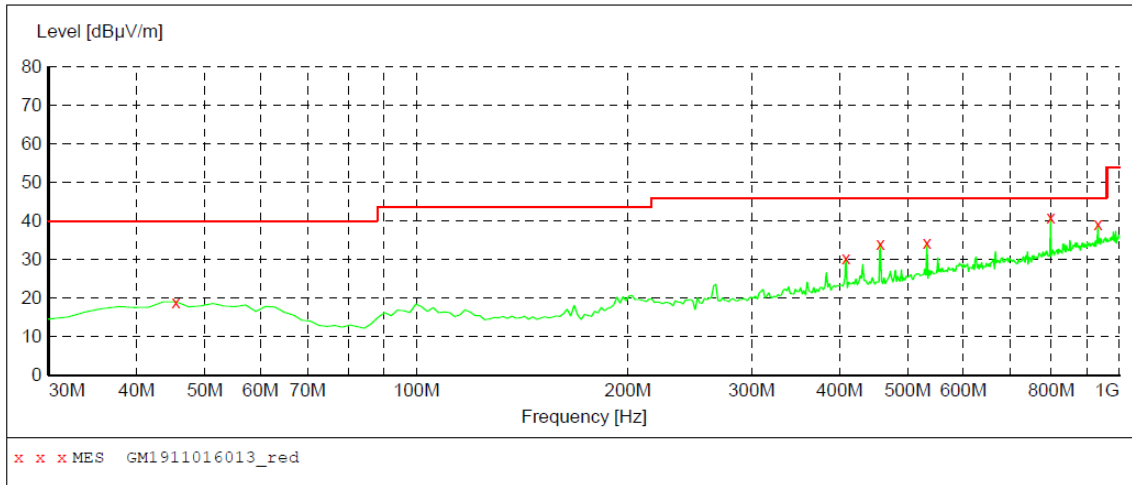
Note:

- 1) Above 1GHz Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
 - 2) The emission levels of other frequencies are very lower than the limit and not show in test report.
- **9 kHz ~ 30 MHz**
 The EUT was pre-scanned the frequency band (9 kHz ~ 30 MHz), found the radiated level lower than the limit, so don't show on the report.
- **30 MHz ~ 1000 MHz**
 Have pre-scan low/middle/high channel, found the low channel was the worst case , so only the worst case's data on the test report

➤ 30 MHz ~ 1 GHz

PCB Antenna:

Polarization: Vertical

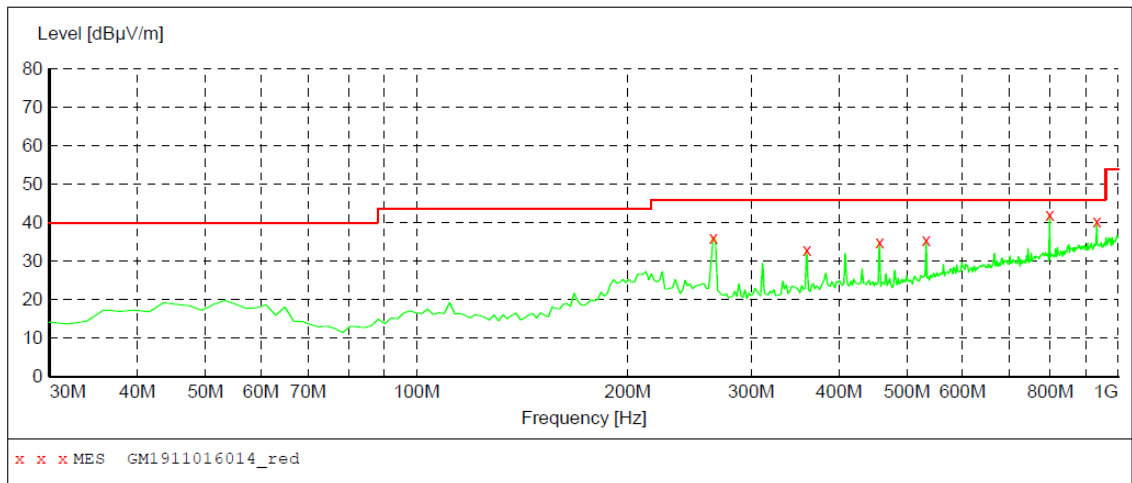


MEASUREMENT RESULT: "GM1911016013_red"

11/1/2019 10:12AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
45.520000	19.10	-8.4	40.0	20.9	QP	100.0	360.00	VERTICAL
408.300000	30.40	-3.3	46.0	15.6	QP	100.0	360.00	VERTICAL
456.800000	34.20	-2.4	46.0	11.8	QP	100.0	356.00	VERTICAL
532.460000	34.40	-0.4	46.0	11.6	QP	100.0	62.00	VERTICAL
798.240000	40.90	5.6	46.0	5.1	QP	100.0	146.00	VERTICAL
932.100000	39.20	7.8	46.0	6.8	QP	100.0	146.00	VERTICAL

Polarization: Horizontal

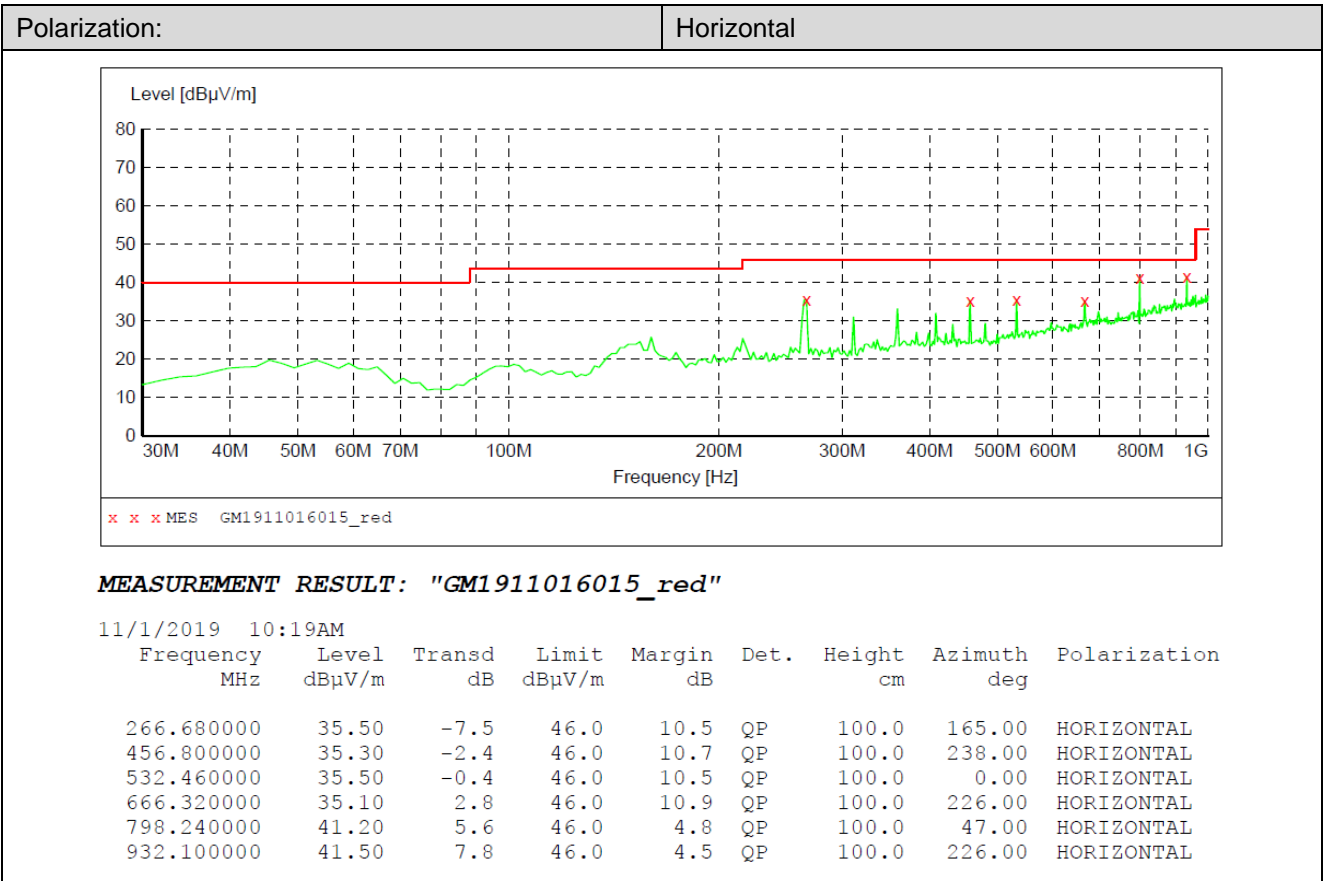
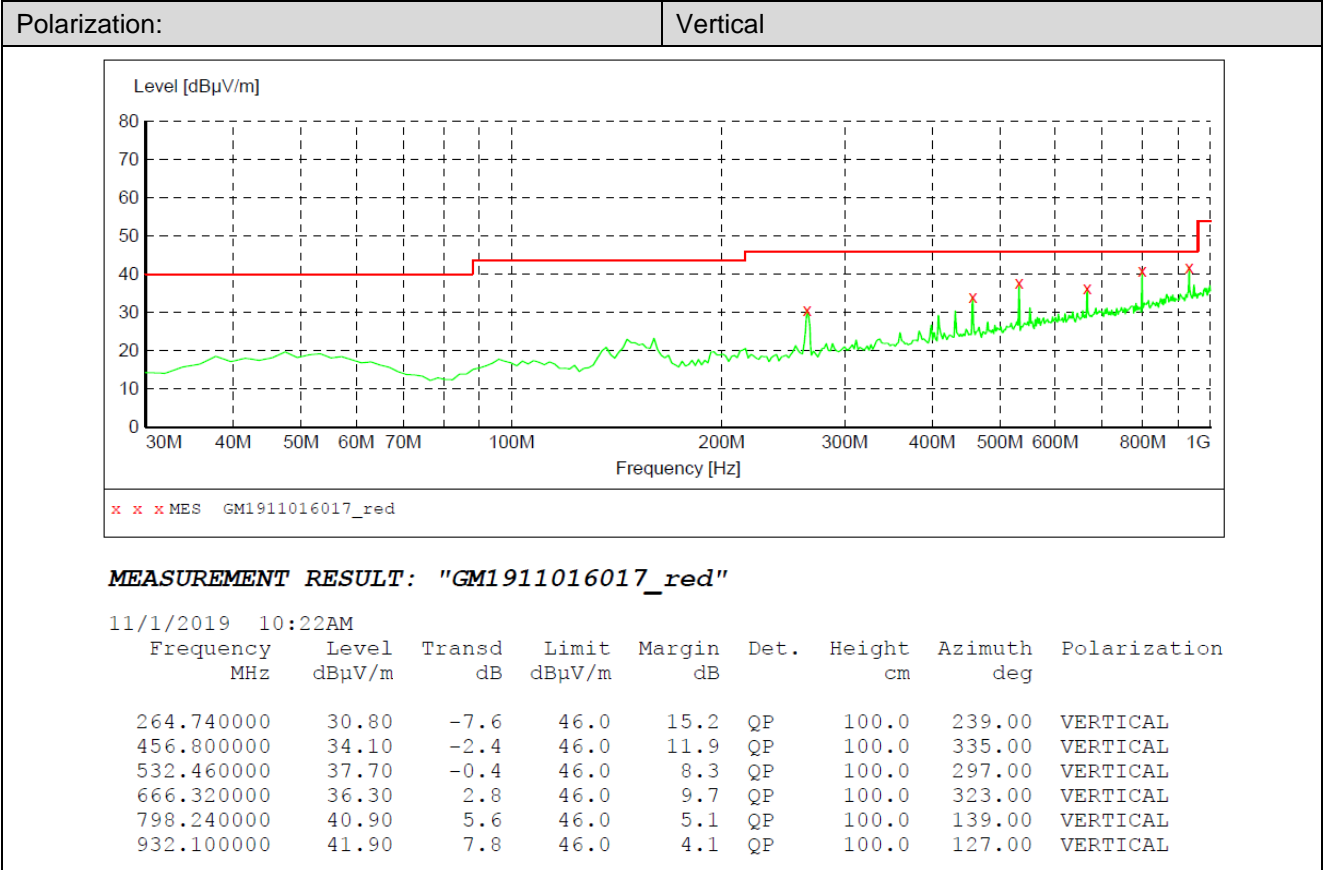


MEASUREMENT RESULT: "GM1911016014_red"

11/1/2019 10:14AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
264.740000	36.20	-7.6	46.0	9.8	QP	100.0	356.00	HORIZONTAL
359.800000	32.90	-5.2	46.0	13.1	QP	100.0	121.00	HORIZONTAL
456.800000	35.00	-2.4	46.0	11.0	QP	100.0	215.00	HORIZONTAL
532.460000	35.40	-0.4	46.0	10.6	QP	100.0	38.00	HORIZONTAL
798.240000	42.20	5.6	46.0	3.8	QP	100.0	336.00	HORIZONTAL
932.100000	40.40	7.8	46.0	5.6	QP	100.0	49.00	HORIZONTAL

FRP Antenna:



➤ 1 GHz ~ 25 GHz

PCB Antenna:

Test channel					CH00			
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1063.156	41.80	-7.16	34.64	74.00	39.36	Horizontal	PK
2	1572.812	39.14	-6.10	33.04	74.00	40.96	Horizontal	PK
3	2708.156	32.48	0.71	33.19	74.00	40.81	Horizontal	PK
4	4533.812	30.79	5.49	36.28	74.00	37.72	Horizontal	PK
5	5907.093	30.95	10.01	40.96	74.00	33.04	Horizontal	PK
6	8032.375	31.16	16.24	47.40	74.00	26.60	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1064.625	38.12	-7.14	30.98	74.00	43.02	Vertical	PK
2	1725.562	39.64	-6.02	33.62	74.00	40.38	Vertical	PK
3	2575.968	38.17	-1.52	36.65	74.00	37.35	Vertical	PK
4	3676.062	32.42	1.56	33.98	74.00	40.02	Vertical	PK
5	5102.218	30.58	8.80	39.38	74.00	34.62	Vertical	PK
6	7428.718	30.24	15.38	45.62	74.00	28.38	Vertical	PK

Test channel					CH08			
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1064.625	42.89	-7.14	35.75	74.00	38.25	Horizontal	PK
2	1584.562	43.36	-6.18	37.18	74.00	36.82	Horizontal	PK
3	2355.656	39.81	-2.38	37.43	74.00	36.57	Horizontal	PK
4	4031.500	32.44	3.09	35.53	74.00	38.47	Horizontal	PK
5	5155.093	30.74	8.90	39.64	74.00	34.36	Horizontal	PK
6	6694.343	31.08	13.45	44.53	74.00	29.47	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1063.156	40.85	-7.16	33.69	74.00	40.31	Vertical	PK
2	1603.656	41.87	-6.27	35.60	74.00	38.40	Vertical	PK
3	2655.281	40.92	-0.27	40.65	74.00	33.35	Vertical	PK
4	3676.062	32.70	1.56	34.26	74.00	39.74	Vertical	PK
5	5127.187	31.13	8.85	39.98	74.00	34.02	Vertical	PK
6	7358.218	30.40	15.24	45.64	74.00	28.36	Vertical	PK

Test channel					CH15			
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1061.687	49.83	-7.17	42.66	74.00	31.34	Horizontal	PK
2	1525.812	42.94	-5.80	37.14	74.00	36.86	Horizontal	PK
3	2493.718	42.62	-2.12	40.50	74.00	33.50	Horizontal	PK
4	4300.281	31.24	3.77	35.01	74.00	38.99	Horizontal	PK
5	5933.531	30.61	10.14	40.75	74.00	33.25	Horizontal	PK
6	7327.375	31.07	15.14	46.21	74.00	27.79	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1061.687	44.48	-7.17	37.31	74.00	36.69	Vertical	PK
2	1715.281	39.00	-6.05	32.95	74.00	41.05	Vertical	PK
3	2655.281	36.90	-0.27	36.63	74.00	37.37	Vertical	PK
4	4213.625	31.74	3.81	35.55	74.00	38.45	Vertical	PK
5	5143.343	30.72	8.88	39.60	74.00	34.40	Vertical	PK
6	6844.156	30.91	13.60	44.51	74.00	29.49	Vertical	PK

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The peak level is lower than average limit(54dB μ V/m), this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

FRP Antenna:

Test channel					CH00			
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1195.343	46.21	-5.88	40.33	74.00	33.67	Horizontal	PK
2	1537.562	39.97	-5.87	34.10	74.00	39.90	Horizontal	PK
3	2718.437	38.52	0.87	39.39	74.00	34.61	Horizontal	PK
4	4219.500	32.74	3.81	36.55	74.00	37.45	Horizontal	PK
5	5149.218	31.55	8.89	40.44	74.00	33.56	Horizontal	PK
6	8017.687	31.50	16.22	47.72	74.00	26.28	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1066.093	41.39	-7.13	34.26	74.00	39.74	Vertical	PK
2	1594.843	43.19	-6.25	36.94	74.00	37.06	Vertical	PK
3	2125.062	38.45	-3.75	34.70	74.00	39.30	Vertical	PK
4	2625.906	46.27	-0.83	45.44	74.00	28.56	Vertical	PK
5	5172.718	31.77	8.93	40.70	74.00	33.30	Vertical	PK
6	7939.843	31.48	16.26	47.74	74.00	26.26	Vertical	PK

Test channel					CH08			
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1063.156	45.62	-7.16	38.46	74.00	35.54	Horizontal	PK
2	1514.062	40.41	-5.72	34.69	74.00	39.31	Horizontal	PK
3	2769.843	35.86	1.64	37.50	74.00	36.50	Horizontal	PK
4	3825.875	32.52	2.17	34.69	74.00	39.31	Horizontal	PK
5	5331.343	31.90	8.50	40.40	74.00	33.60	Horizontal	PK
6	7102.656	30.99	14.44	45.43	74.00	28.57	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1061.687	42.09	-7.17	34.92	74.00	39.08	Vertical	PK
2	1596.312	45.13	-6.26	38.87	74.00	35.13	Vertical	PK
3	2658.218	40.66	-0.21	40.45	74.00	33.55	Vertical	PK
4	3974.218	32.60	2.93	35.53	74.00	38.47	Vertical	PK
5	5118.375	30.96	8.83	39.79	74.00	34.21	Vertical	PK
6	7358.218	31.29	15.24	46.53	74.00	27.47	Vertical	PK

Test channel					CH15			
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1061.687	45.40	-7.17	38.23	74.00	35.77	Horizontal	PK
2	1497.906	38.76	-5.63	33.13	74.00	40.87	Horizontal	PK
3	2781.593	32.84	1.81	34.65	74.00	39.35	Horizontal	PK
4	4131.375	31.89	3.43	35.32	74.00	38.68	Horizontal	PK
5	5203.562	31.33	8.96	40.29	74.00	33.71	Horizontal	PK
6	7613.781	30.41	15.81	46.22	74.00	27.78	Horizontal	PK
Suspected Data List								
NO.	Freq. [MHz]	Reading [dB μ V/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Polarity	Detector
1	1061.687	39.92	-7.17	32.75	74.00	41.25	Vertical	PK
2	1876.843	37.41	-5.82	31.59	74.00	42.41	Vertical	PK
3	2664.093	41.23	-0.10	41.13	74.00	32.87	Vertical	PK
4	4207.750	32.86	3.82	36.68	74.00	37.32	Vertical	PK
5	5215.312	31.86	8.90	40.76	74.00	33.24	Vertical	PK
6	7571.187	30.29	15.74	46.03	74.00	27.97	Vertical	PK

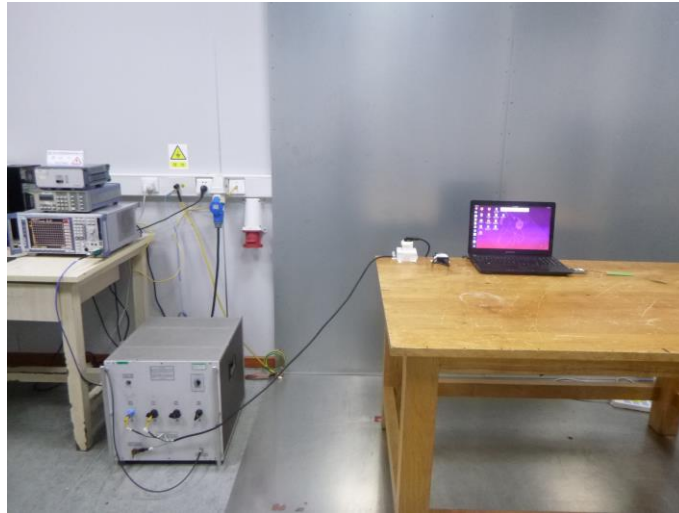
Remark:

4. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
5. The peak level is lower than average limit(54dB μ V/m), this data is the too weak instrument of signal is unable to test.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

6. TEST SETUP PHOTOS

Conducted Emissions (AC Mains)

PCB Antenna:



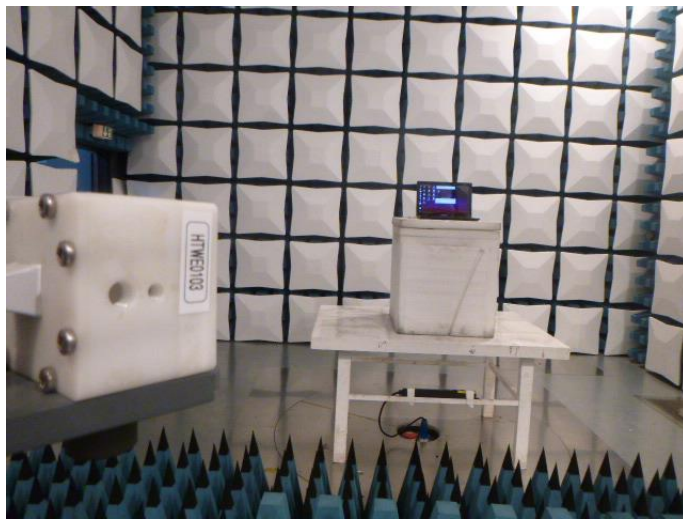
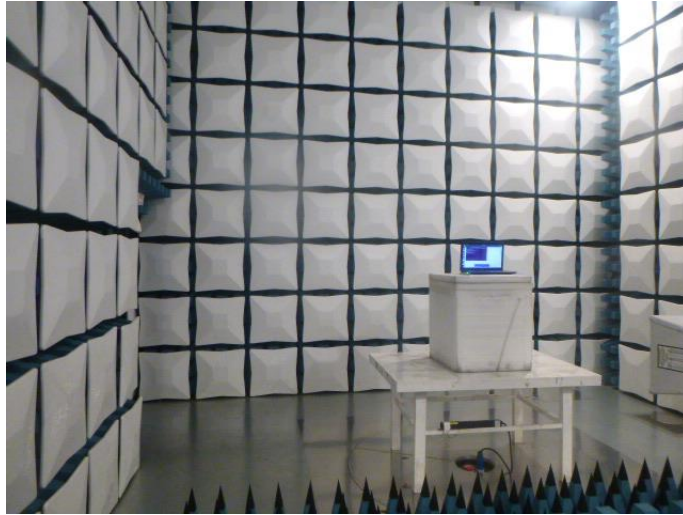
FRP Antenna:



Radiated Emissions

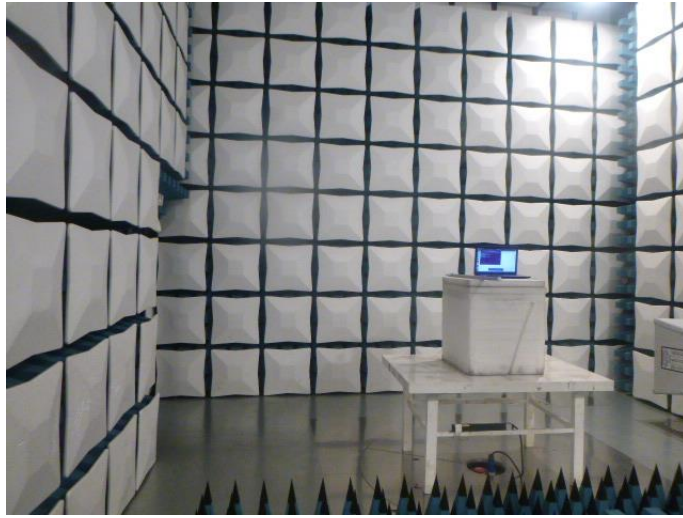
PCB Antenna:





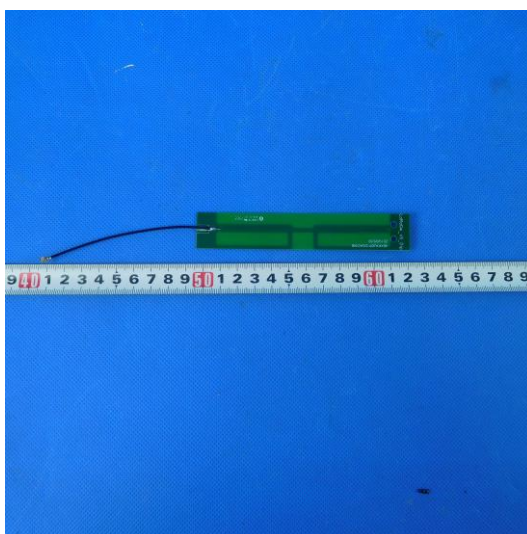
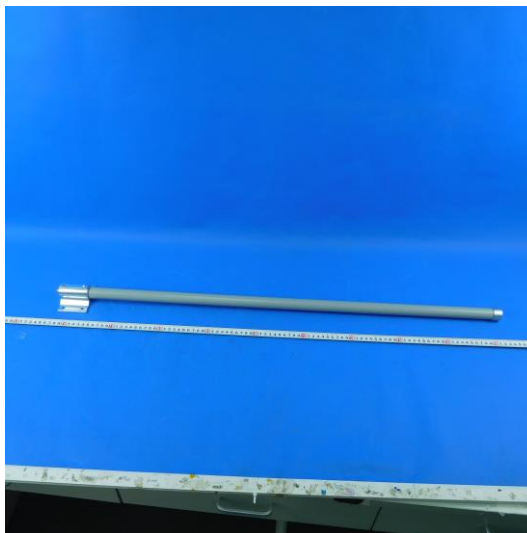
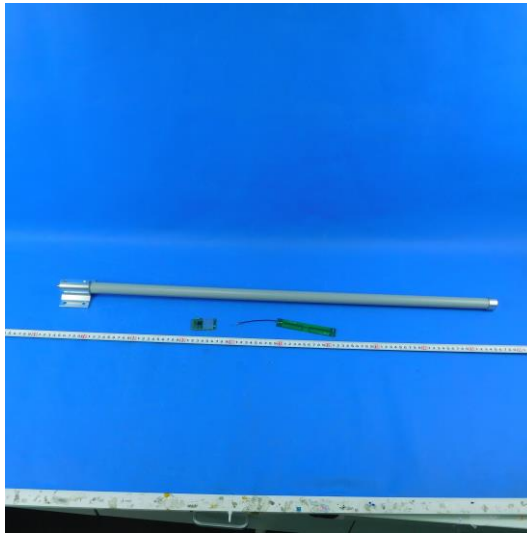
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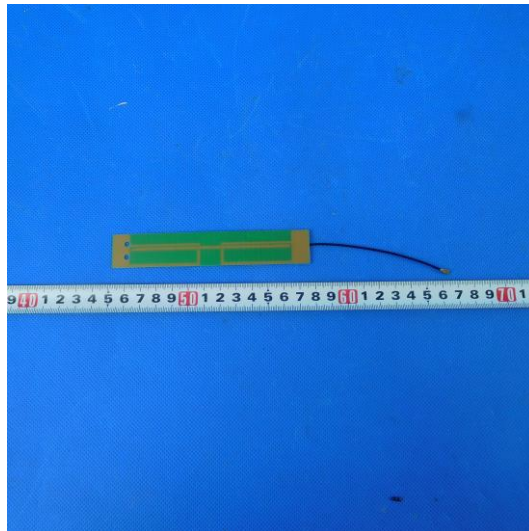




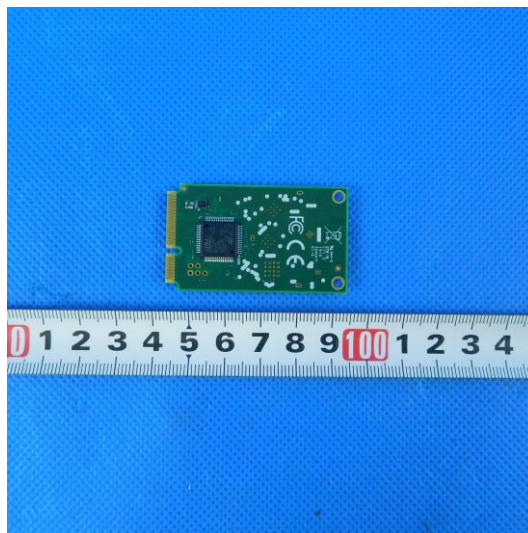
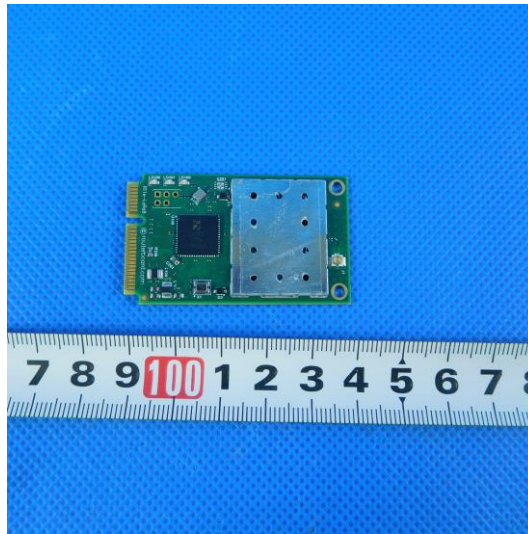
7. EXTERANAL AND INTERNAL PHOTOS

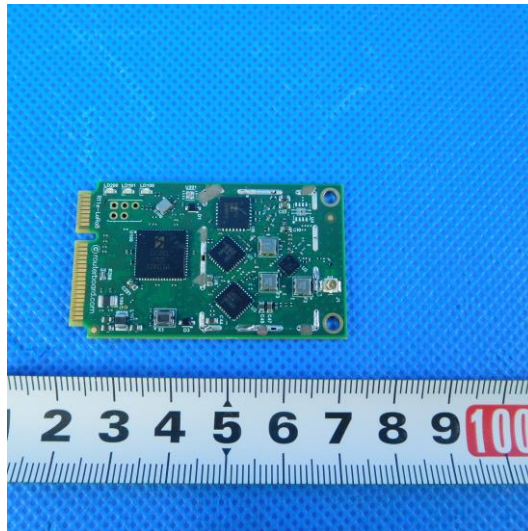
External Photos





Internal Photos





-----End of Report-----