

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : OT-214-RWD-010

Reception No. : 2102000816

Applicant : ZTACOM Co.,Ltd

Address : 103-510, KT Daeduk 2 Research Center, 70, Yuseong-daero-1689beon-gil, Yuseong-gu,
Daejeon, 34047, South Korea

Manufacturer : ZTACOM Co.,Ltd

Address : Unit1301, 165, Magokjungang-ro, Gangseo-gu, Seoul, Republic of Korea

Type of Equipment : GPS Tracker & Messenger

FCC ID. : 2AUFQZLD-300UA

Model Name : ZLD-300U

Multiple Model Name : N/A

Serial number : N/A

Total page of Report : 50 pages (including this page)

Date of Incoming : March 02, 2021

Date of issue : April 07, 2021

SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

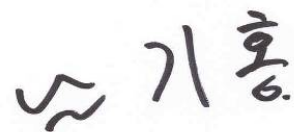
It is not a generally valid assessment of the features of the respective products of the mass-production.



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15. LIST OF TEST EQUIPMENT50

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-214-RWD-010	April 07, 2021	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : ZTACOM Co.,Ltd
 Address : 103-510, KT Daeduk 2 Research Center, 70, Yuseong-daero-1689beon-gil, Yuseong-gu, Daejeon,
 34047, South Korea
 Contact Person : Byungmin Park / Director of Technology
 Telephone No. : +82-10-3620-7652
 FCC ID : 2AUFQZLD-300UA
 Model Name : ZLD-300U
 Brand Name : -
 Serial Number : N/A
 Date : April 07, 2021

EQUIPMENT CLASS	DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	GPS Tracker & Messenger
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2020
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247(a)(1)(i)	20 dB Bandwidth	Met the Limit / PASS
15.247(b)(2)	Conducted Maximum Peak Output Power	Met the Limit / PASS
15.247(a)(1)	Carrier Frequency Separation	Met the Limit / PASS
15.247(a)(1)(i)	Number of Hopping Frequencies	Met the Limit / PASS
15.247(a)(1)(i)	Time of Occupancy	Met the Limit / PASS
15.247(d)	Conducted Spurious Emissions	Met the Limit / PASS
15.247(d)	Band Edge(Out of Band Emissions)	Met the Limit / PASS
15.207(a)	AC Power line Conducted Emissions	Met the Limit / PASS
15.247(d), 15.205, 15.209	Radiated Spurious Emissions	Met the Limit / PASS
15.247(d), 15.205, 15.209	Radiated Restricted Band Edge	Met the Limit / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2020. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The ZTACOM Co.,Ltd, Model ZLD-300U (referred to as the EUT in this report) is an GPS Tracker & Messenger, Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	GPS Tracker & Messenger		
Temperature Range	-20 °C ~ +80 °C		
Rated Supply Voltage	DC 3.7 V		
OPERATING FREQUENCY	LoRa	125 kHz	902.3 MHz ~ 914.9 MHz
		500 kHz	903.0 MHz ~ 914.2 MHz
	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
MODULATION TYPE	LoRa	125 kHz	GFSK
		500 kHz	CSS
	Bluetooth LE	GFSK	
RF OUTPUT POWER	LoRa	125 kHz	16.94 dBm
		500 kHz	16.44 dBm
	Bluetooth LE	-0.56 dBm	
NUMBER OF CHANNEL	LoRa	125 kHz	64 Channel
		500 kHz	8 Channel
	Bluetooth LE	40 Channel	
ANTENNA TYPE	LoRa	FPCB Antenna	
	Bluetooth LE	Chip Antenna	
ANTENNA GAIN	LoRA	-2.90 dBi	
	Bluetooth	3.10 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32.768 kHz, 32 MHz		

3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	ZTACOM Co.,Ltd	IM_PLUS_Rev1.3	N/A
DC Battery	Shenzhen BENZO Energy technology Co., Ltd	UF 502535	N/A

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
ZLD-300U	ZTACOM Co.,Ltd	GPS Tracker & Messenger (EUT)	-
CP2102 MODULES	N/A	Jig Board	EUT
HP Probook	HP	Notebook PC	-
PPP009L-E	LIE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	AC Adapter	-

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 902.3 MHz, 908.5 MHz, and 914.9 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XZ” axis, but the worst data was recorded in this report.

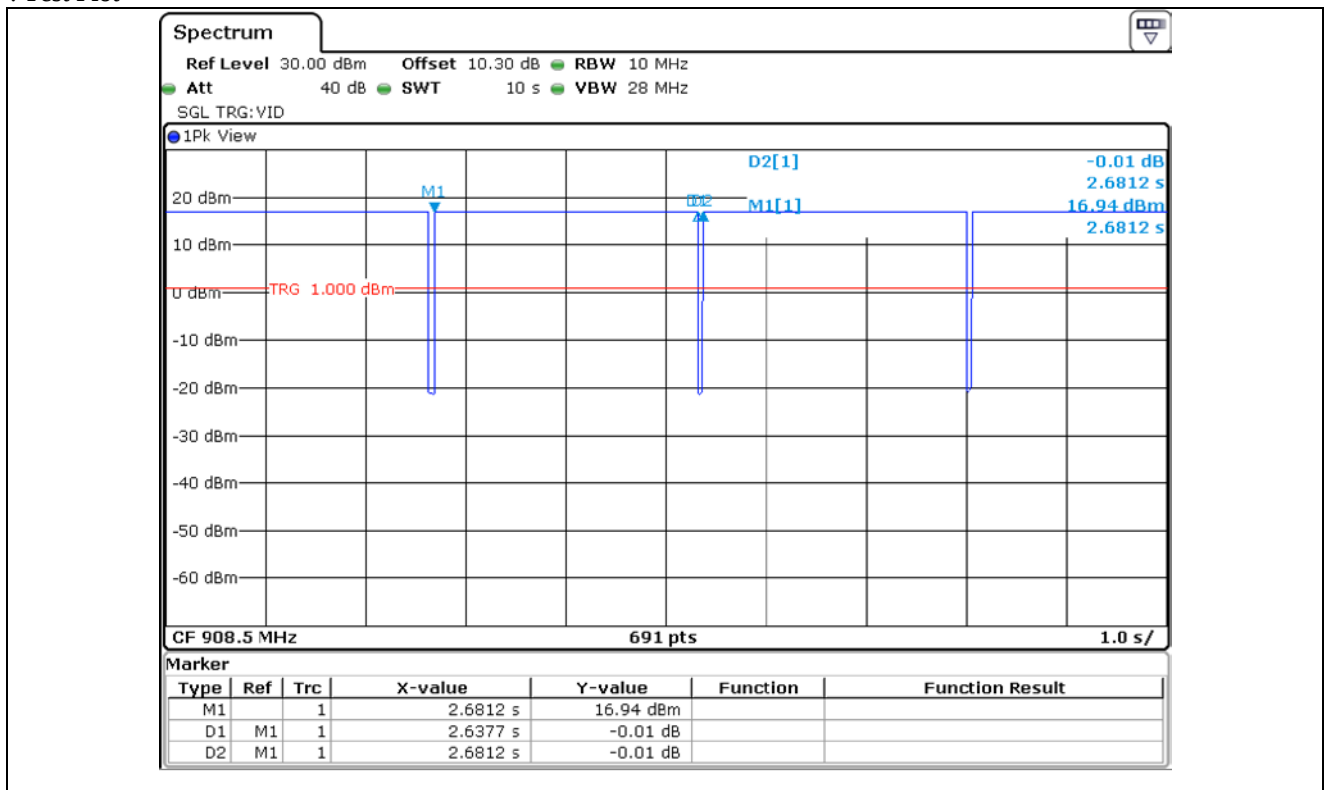
-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
LoRa	2 681.2	43.5	98.38	0.07

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

Correction Factor : 10 * Log(1 / (Duty Cycle / 100))

-. Test Plot



-. Channel List

LoRa_125 kHz					
Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
0	902.3	1	902.5	2	902.7
3	902.9	4	903.1	5	903.3
6	903.5	7	903.7	8	903.9
9	904.1	10	904.3	11	904.5
12	904.7	13	904.9	14	905.1
15	905.3	16	905.5	17	905.7
18	905.9	19	906.1	20	906.3
21	906.5	22	906.7	23	906.9
24	907.1	25	907.3	26	907.5
27	907.7	28	907.9	29	908.1
30	908.3	31	908.5	32	908.7
33	908.9	34	909.1	35	909.3
36	909.5	37	909.7	38	909.9
39	910.1	40	910.3	41	910.5
42	910.7	43	910.9	44	911.1
45	911.3	46	911.5	47	911.7
48	911.9	49	912.1	50	912.3
51	912.5	52	912.7	53	912.9
54	913.1	55	913.3	56	913.5
57	913.7	58	913.9	59	914.1
60	914.3	61	914.5	62	914.7
63	914.9	-	-	-	-

LoRa_500 kHz					
Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
64	903.0	65	904.6	66	906.2
67	907.8	68	909.4	69	911.0
70	912.6	71	914.2	-	-

Bluetooth LE			
Channel	Frequency [MHz]	Channel	Frequency [MHz]
0	2 402.00	21	2 444.00
1	2 404.00	22	2 446.00
2	2 406.00	23	2 448.00
3	2 408.00	24	2 450.00
4	2 410.00	25	2 452.00
5	2 412.00	26	2 454.00
6	2 414.00	27	2 456.00
7	2 416.00	28	2 458.00
8	2 418.00	29	2 460.00
9	2 420.00	30	2 462.00
10	2 422.00	31	2 464.00
11	2 424.00	32	2 466.00
12	2 426.00	33	2 468.00
13	2 428.00	34	2 470.00
14	2 430.00	35	2 472.00
15	2 432.00	36	2 474.00
16	2 434.00	37	2 476.00
17	2 436.00	38	2 478.00
18	2 438.00	39	2 480.00
19	2 440.00	-	-
20	2 442.00	-	-

5.4 Configuration of Test System

Line Conducted Test: The EUT was tested in a Charging & Transmitter mode. The EUT was connected to USB and the Power of USB was Connected to DC Adaptor. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2020 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2020 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

For intentional device, according to 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.

Antenna Construction:

The antenna of the EUT is FPCB Antenna on the main board in the EUT, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Charging & Transmitter Mode	X

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

7. MAXIMUM PEAK OUTPUT POWER

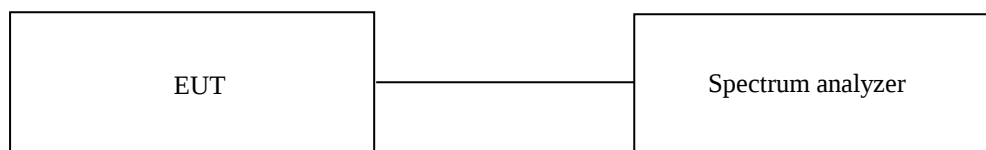
7.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

7.2 Test set-up

The maximum peak output power of the intentional radiator shall not exceed the following:

1. For frequency hopping systems operating in the 902-928 MHz band: 1 watt (30 dBm) for systems employing at least 50 hopping channels; and, 0.25 watts (24 dBm) for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.
2. The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.
3. The e.i.r.p of this module not exceed 4 W because the antenna gain not exceed not 6 dBi.



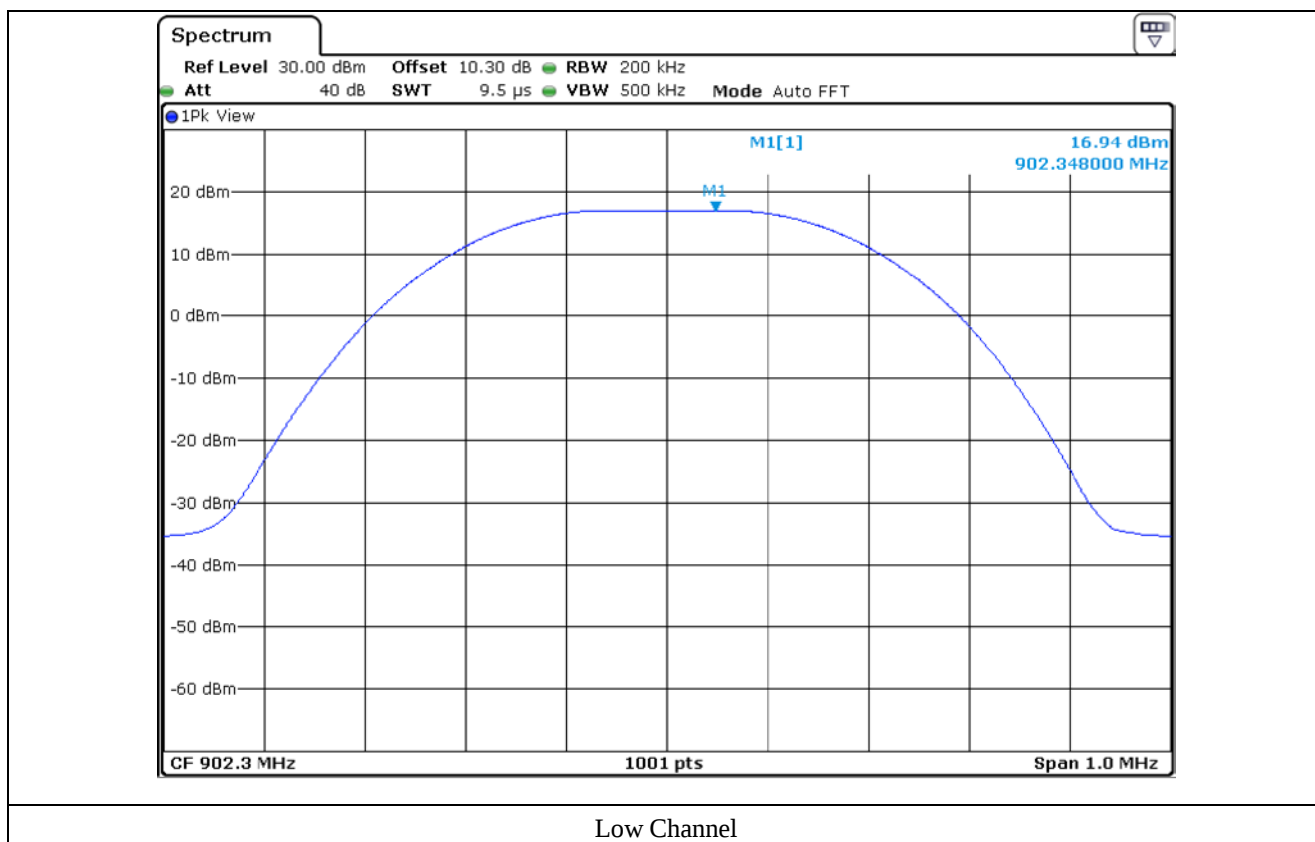
7.3 Test Date

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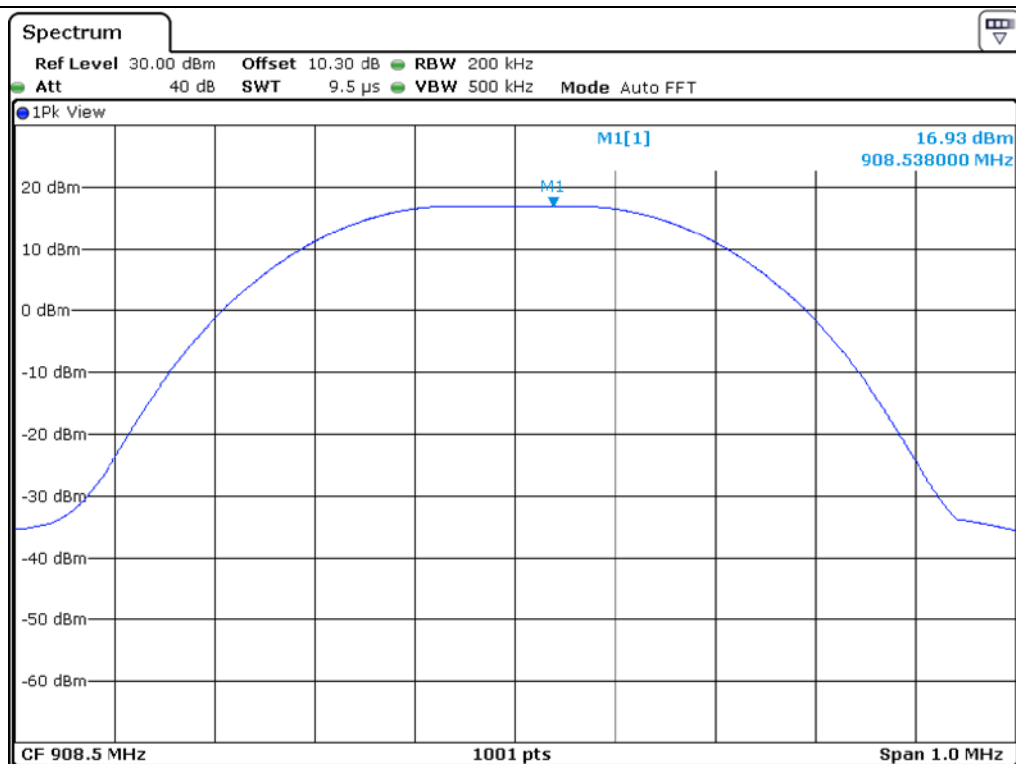
7.4 Test data

-. Test Result : Pass

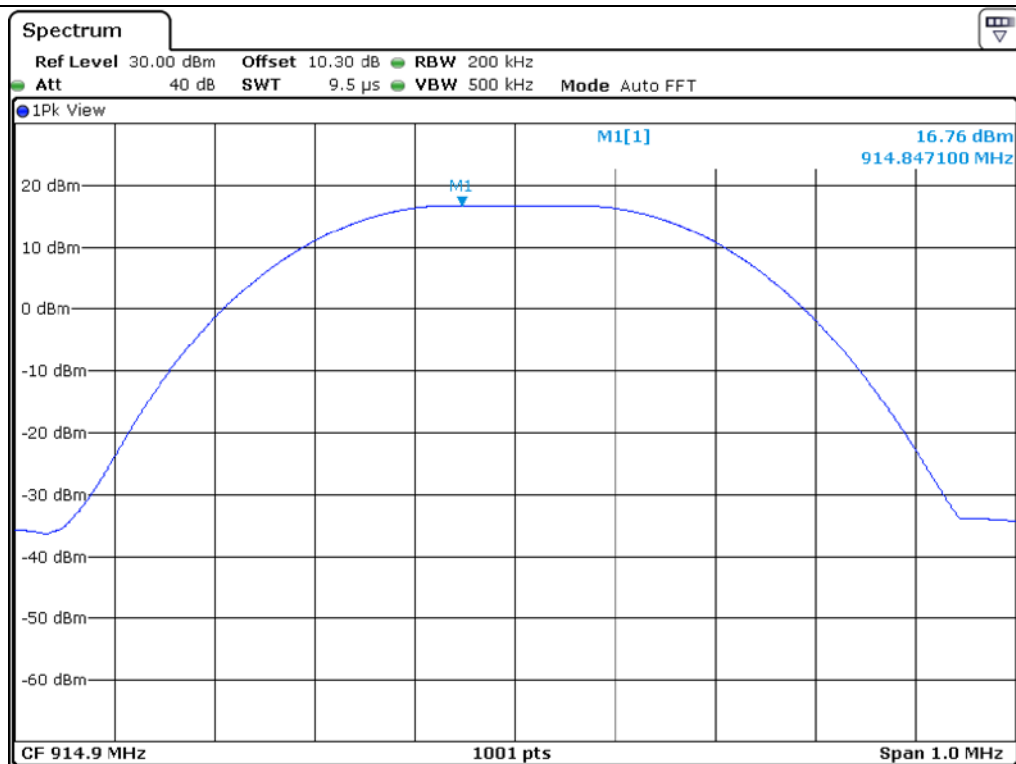
CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE		LIMIT (mW)	MARGIN (dB)
		(dBm)	(mW)		
LOW	902.300 0	16.94	49.43	1 000.00	950.57
MIDDLE	908.500 0	16.93	49.32	1 000.00	950.68
HIGH	914.900 0	16.76	47.42	1 000.00	952.58



Low Channel



Middle Channel



High Channel

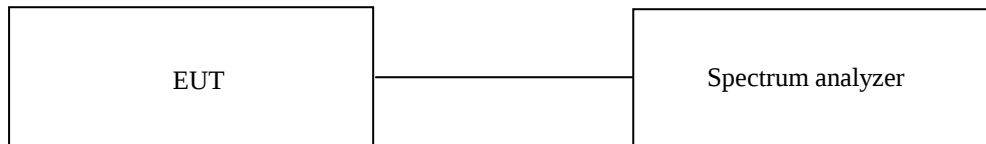
8. BAND EDGES

8.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

8.2 Test set-up

According to §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.



8.3 Test Date

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8.4 Test data

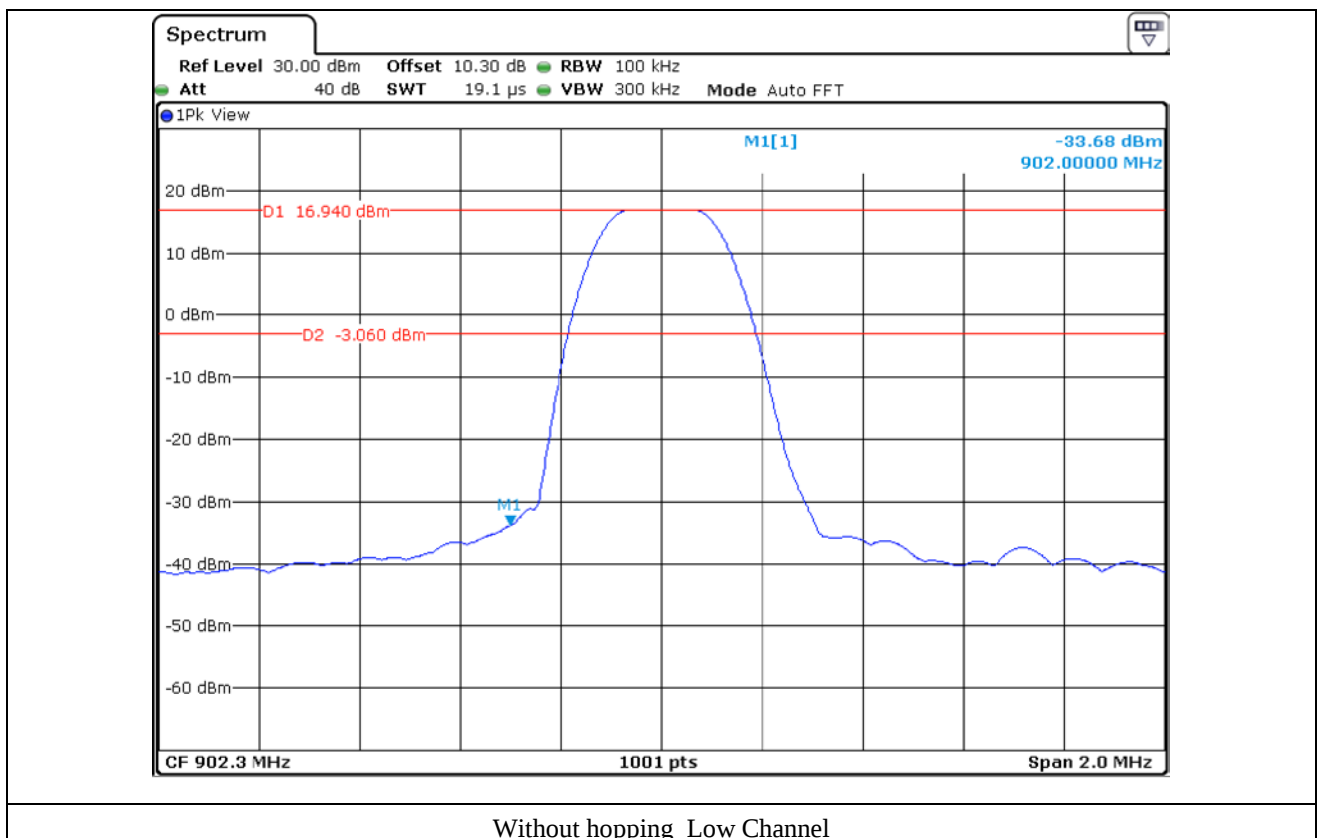
-. Test Result : Pass

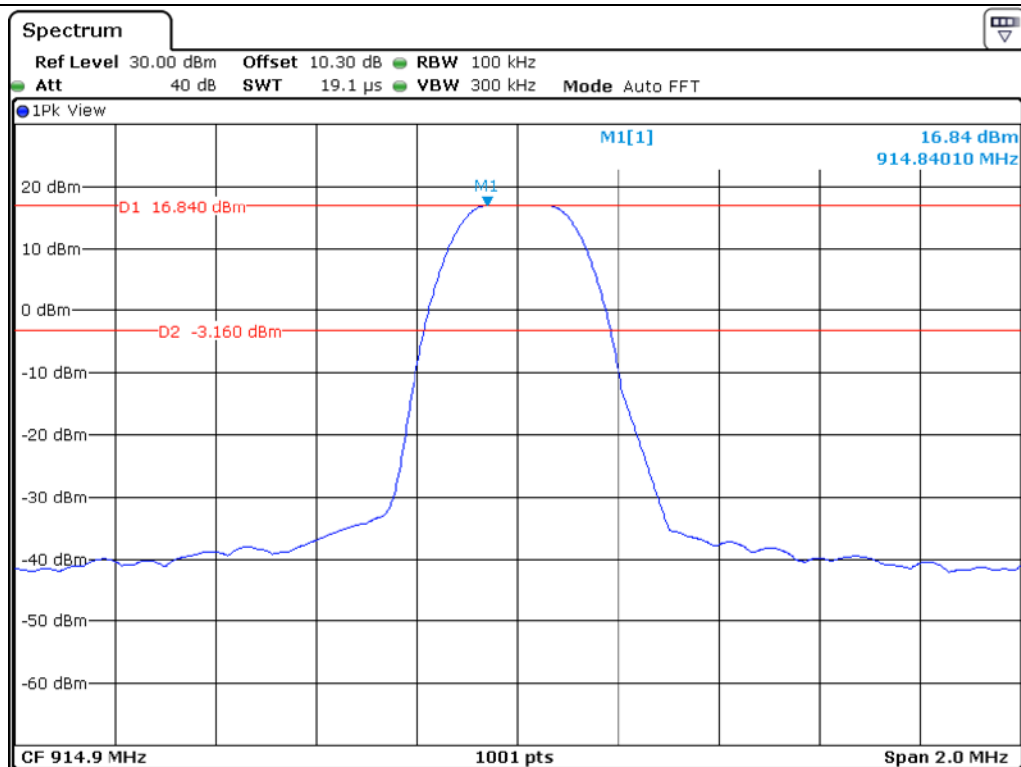
-. Without hopping

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dB)	LIMIT (dBc)	MARGIN (dB)
LOW	902.000 0	50.62 (16.94 + 33.68)	20.00	30.62
HIGH	928.000 0	78.73 (16.84 + 61.89)	20.00	58.73

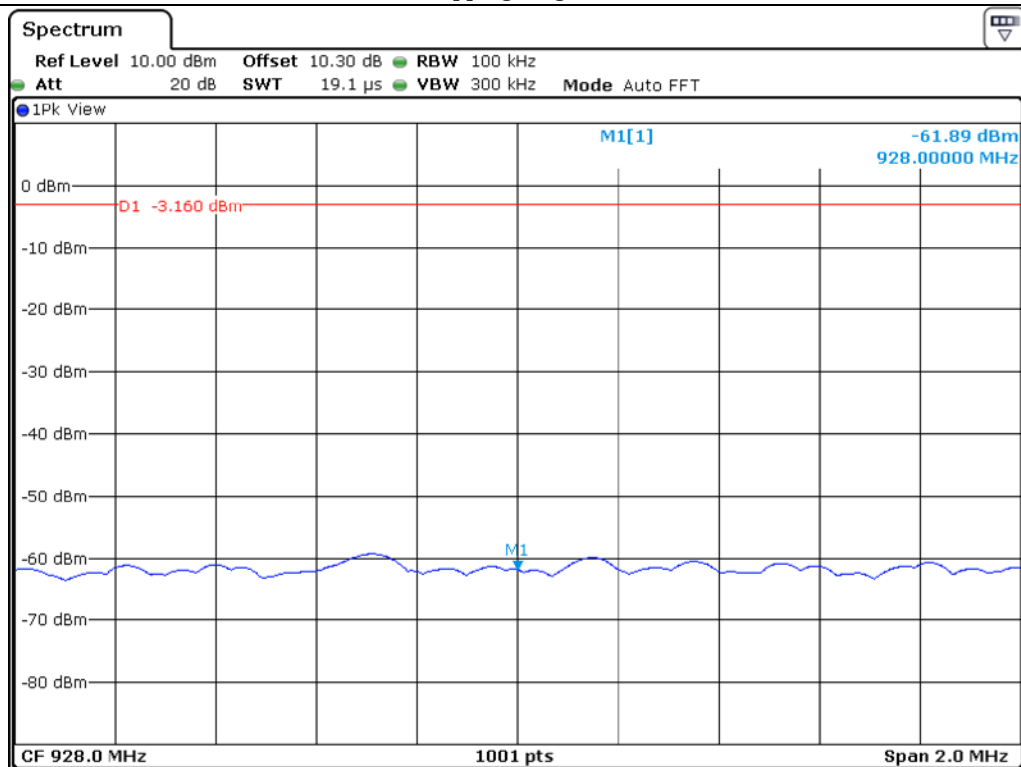
-. With Hopping

Mode	FREQUENCY (MHz)	MEASURED VLAUE (dB)	LIMIT (dBc)	MARGIN (dB)
Hopping	902.000 0	53.88 (17.03 + 36.85)	20.00	33.88
	928.000 0	69.94 (17.03 + 52.91)	20.00	49.94

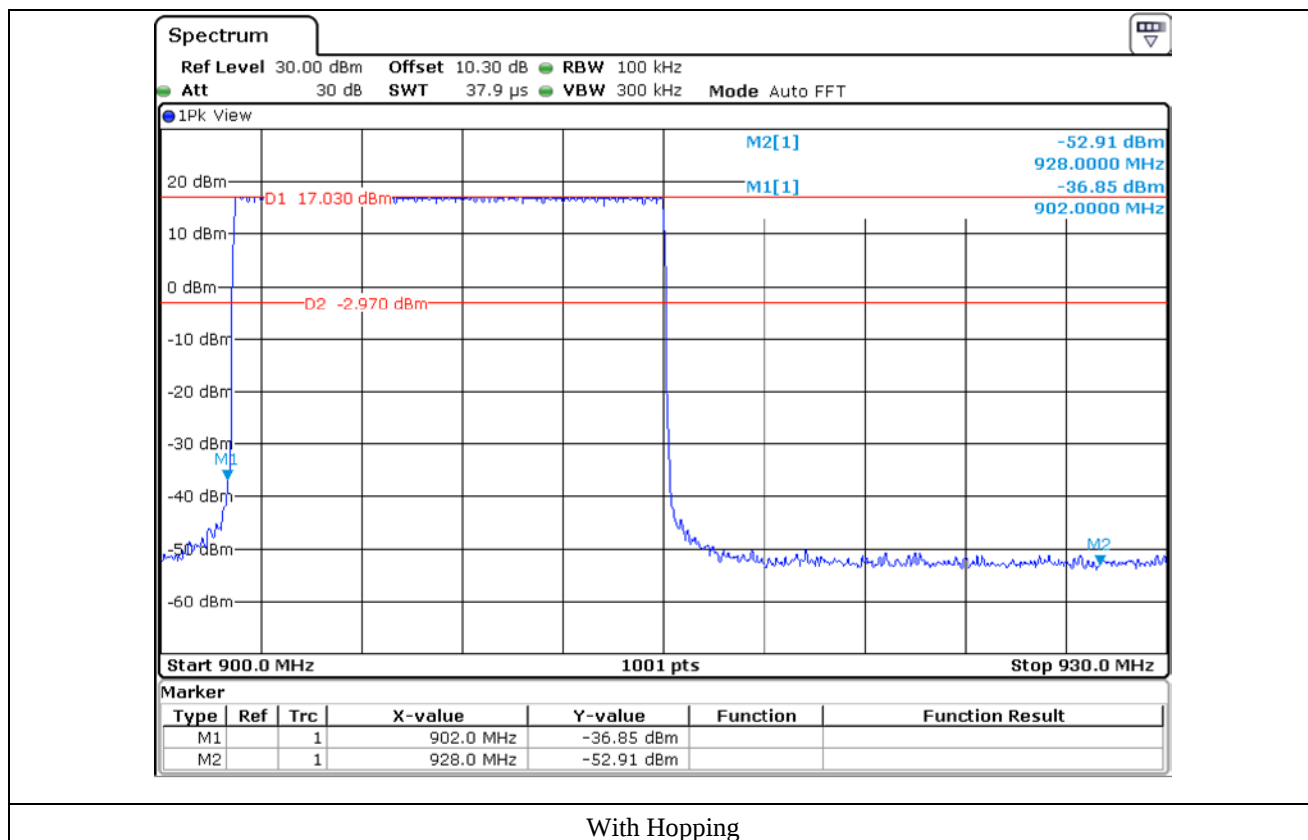




Without hopping_High Channel_1



Without hopping_High Channel_2



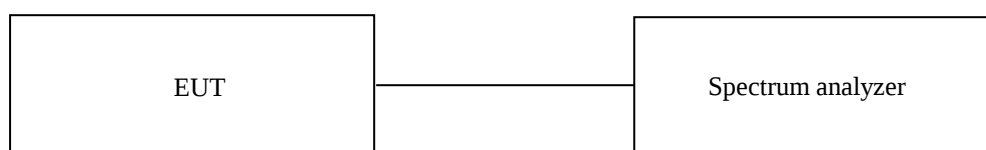
9. FREQUENCY SEPARATION / OCCUPIED BANDWIDTH (20 dB BANDWIDTH)

9.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

9.2 Test set-up

According to §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.



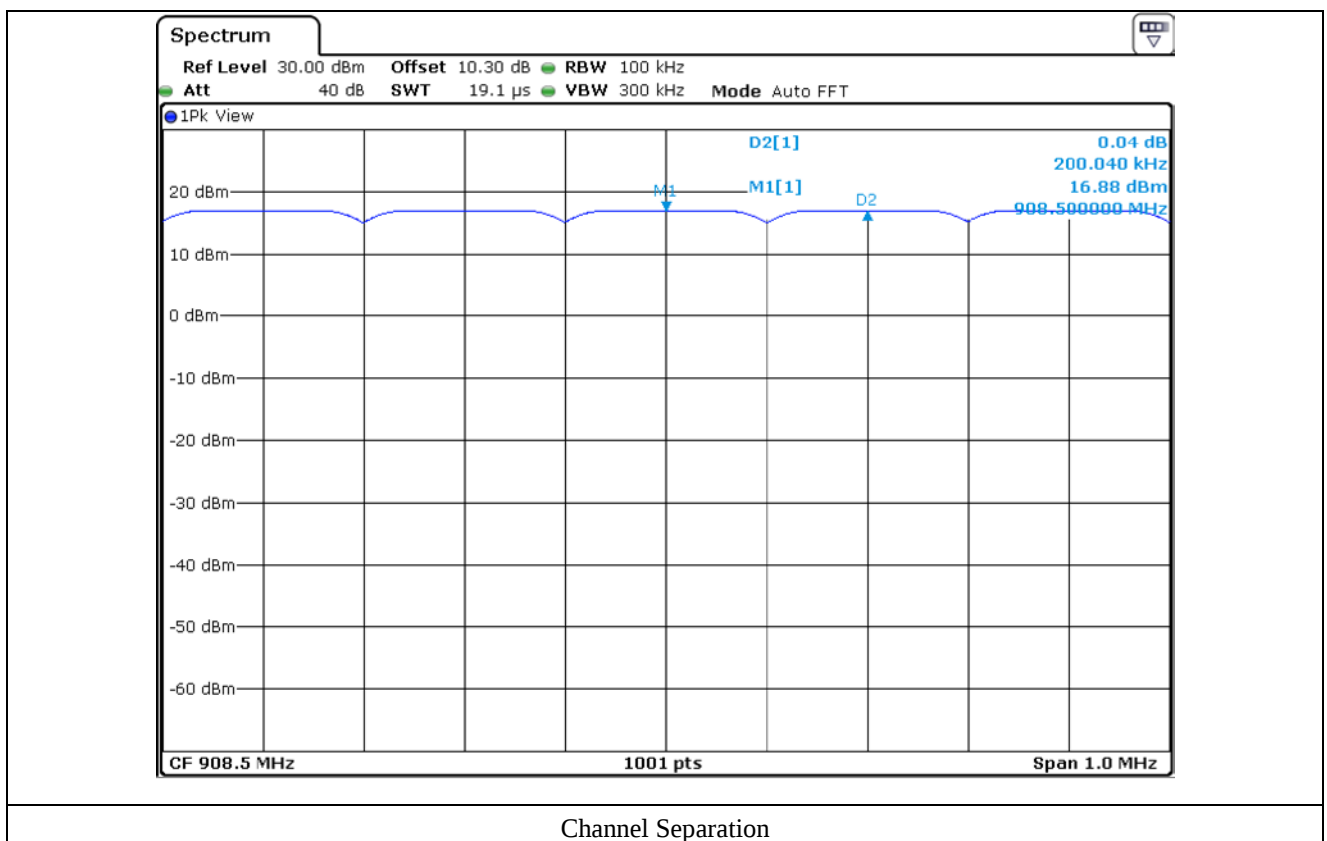
9.3 Test Date

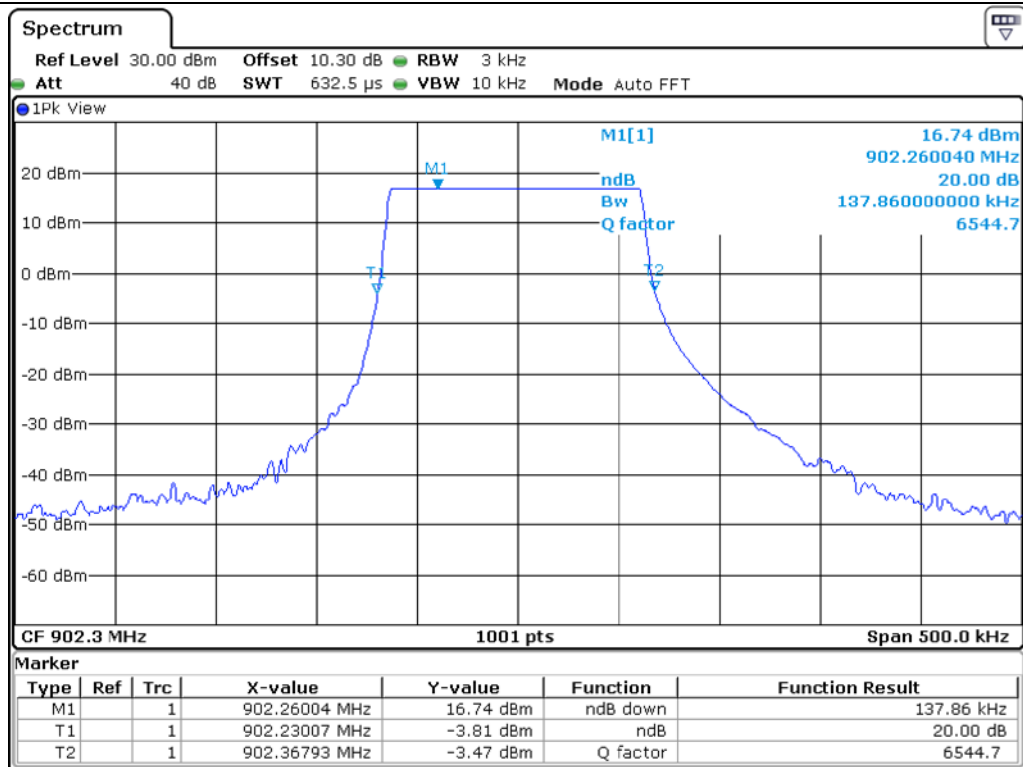
March 29, 2021 ~ April 01, 2021

9.4 Test data

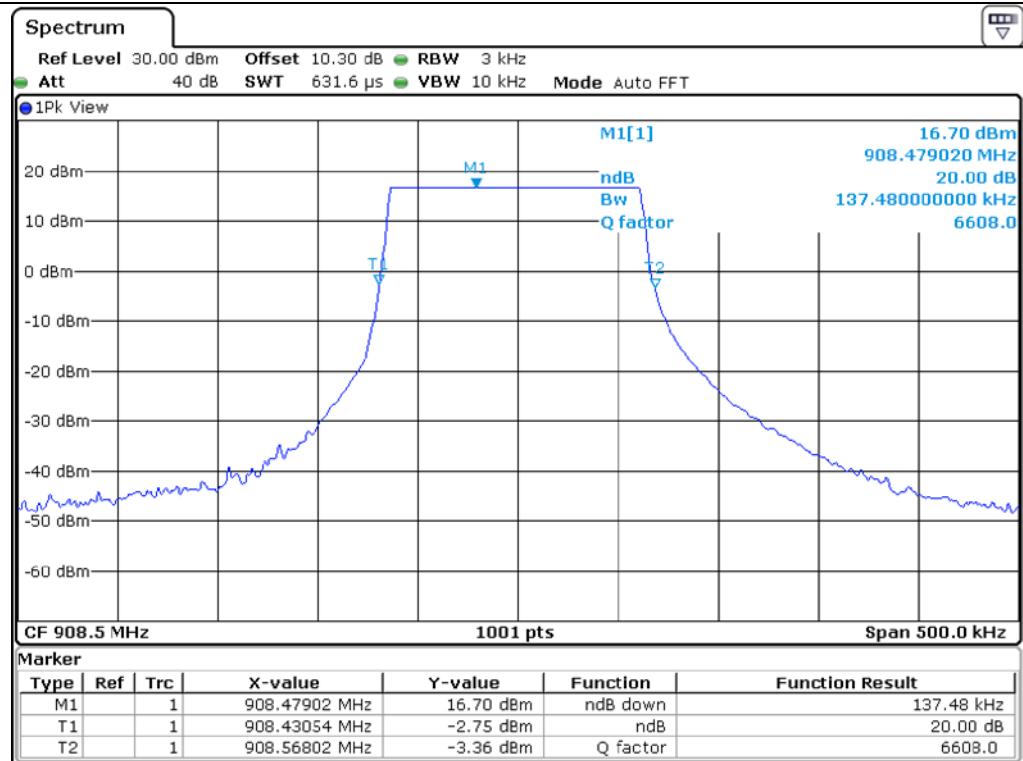
-. Test Result : Pass

Channel Separation (kHz)	20 dB Bandwidth		Limit (kHz)	Result
	Channel	Measured Value (kHz)		
200.04	LOW	137.86	> 20 dB B.W. of Hopping Channel	Pass
	MIDDLE	137.48		
	HIGH	137.86		

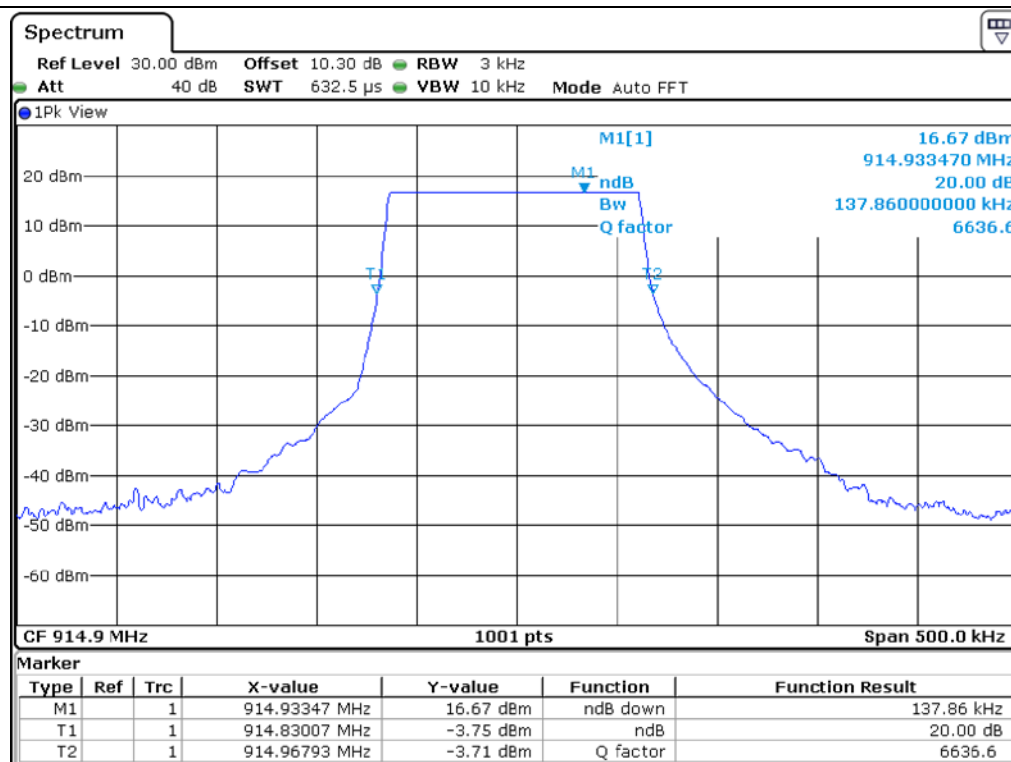




Low Channel



Middle Channel



High Channel

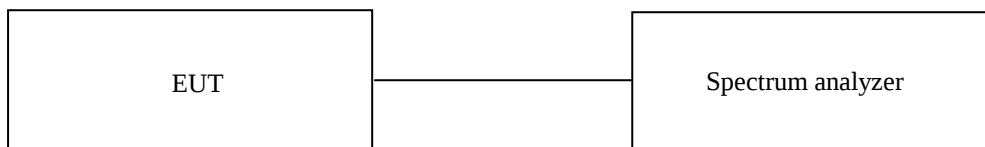
10. NUMBER OF HOPPING FREQUENCY

10.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

10.2 Test set-up

According to §15.247(a)(1)(i) if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel 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 channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz..



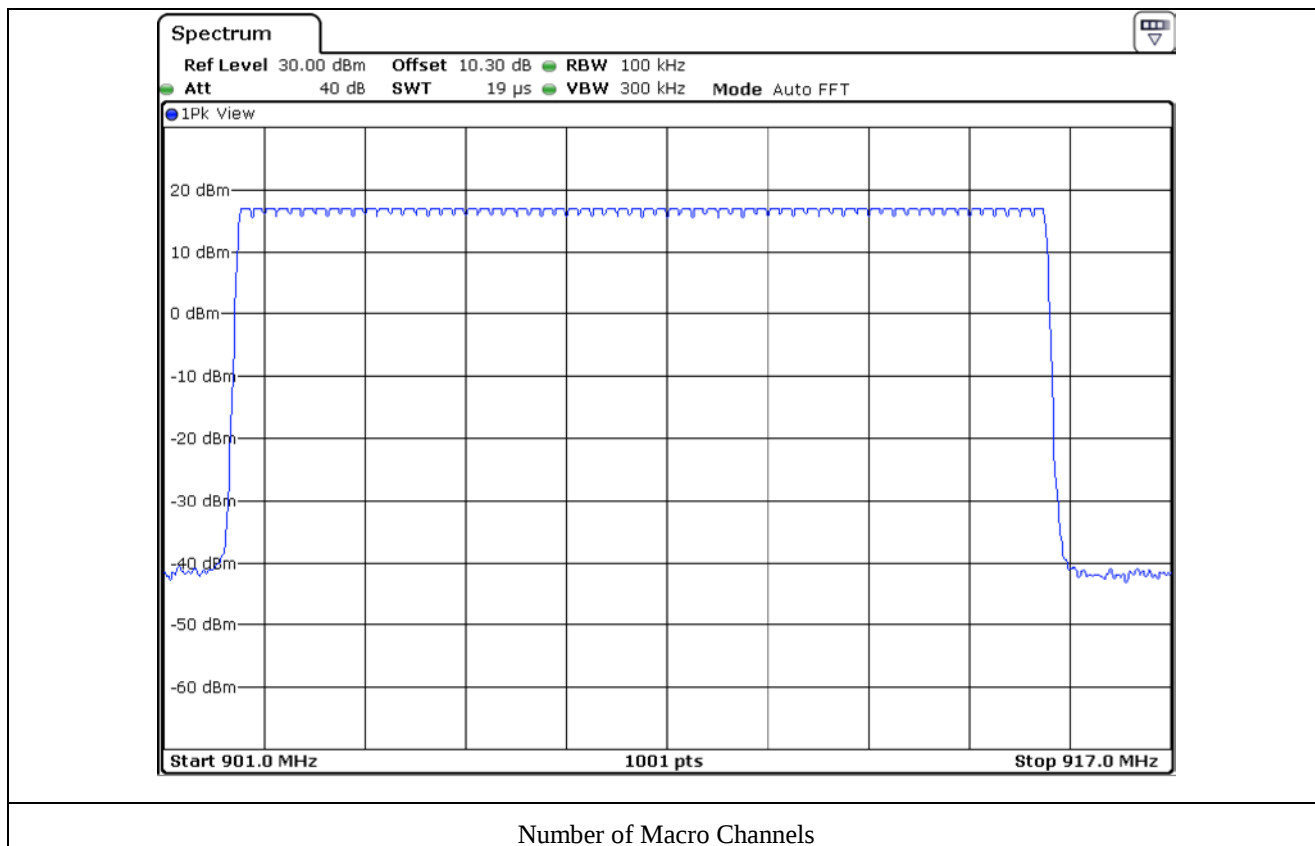
10.3 Test Date

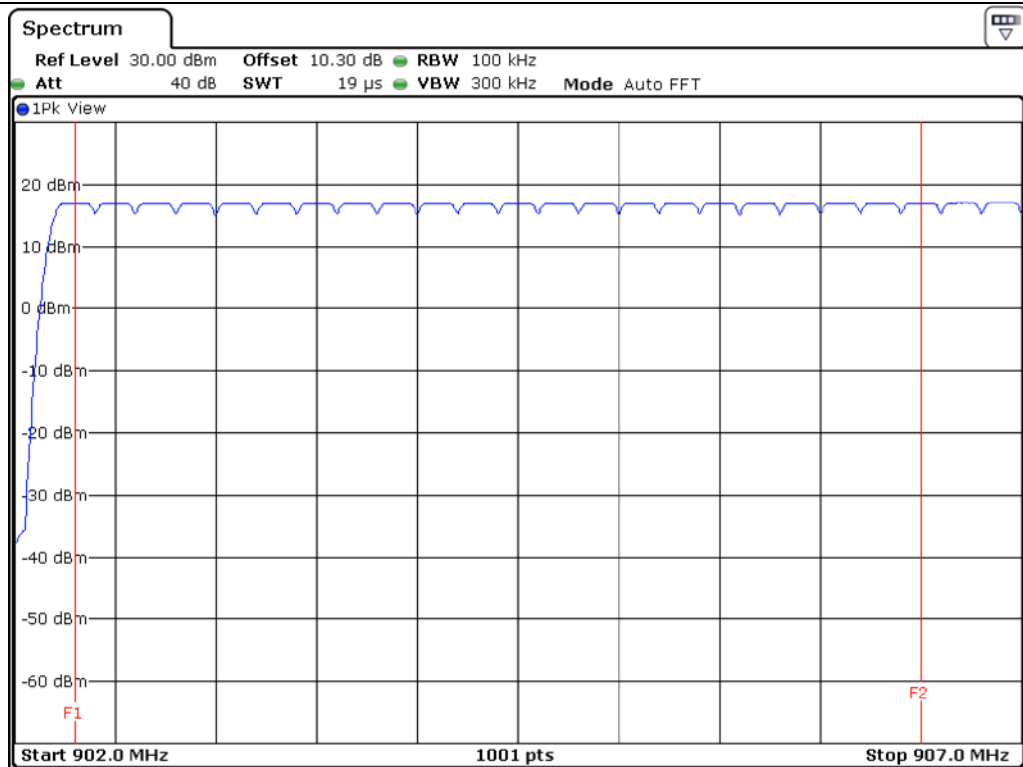
March 29, 2021 ~ April 01, 2021

10.4 Test data

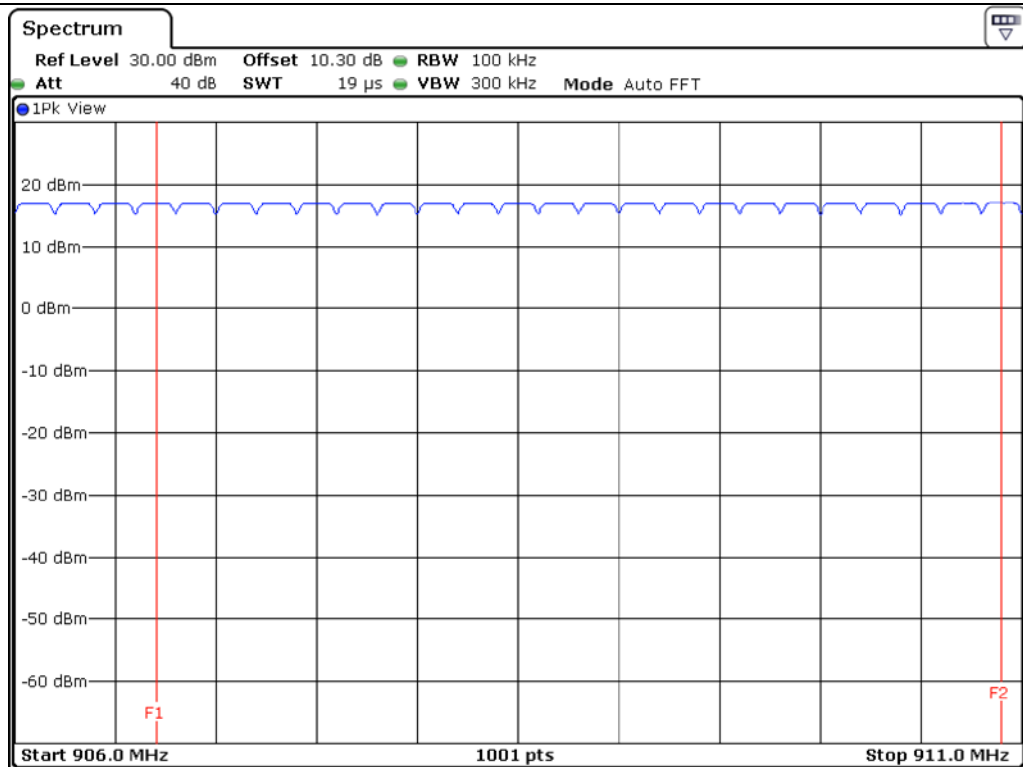
-. Test Result : Pass

Number of Hopping Frequencies	Limit (EA)
64.00 (22.0 + 22.0 + 20.0)	50.00

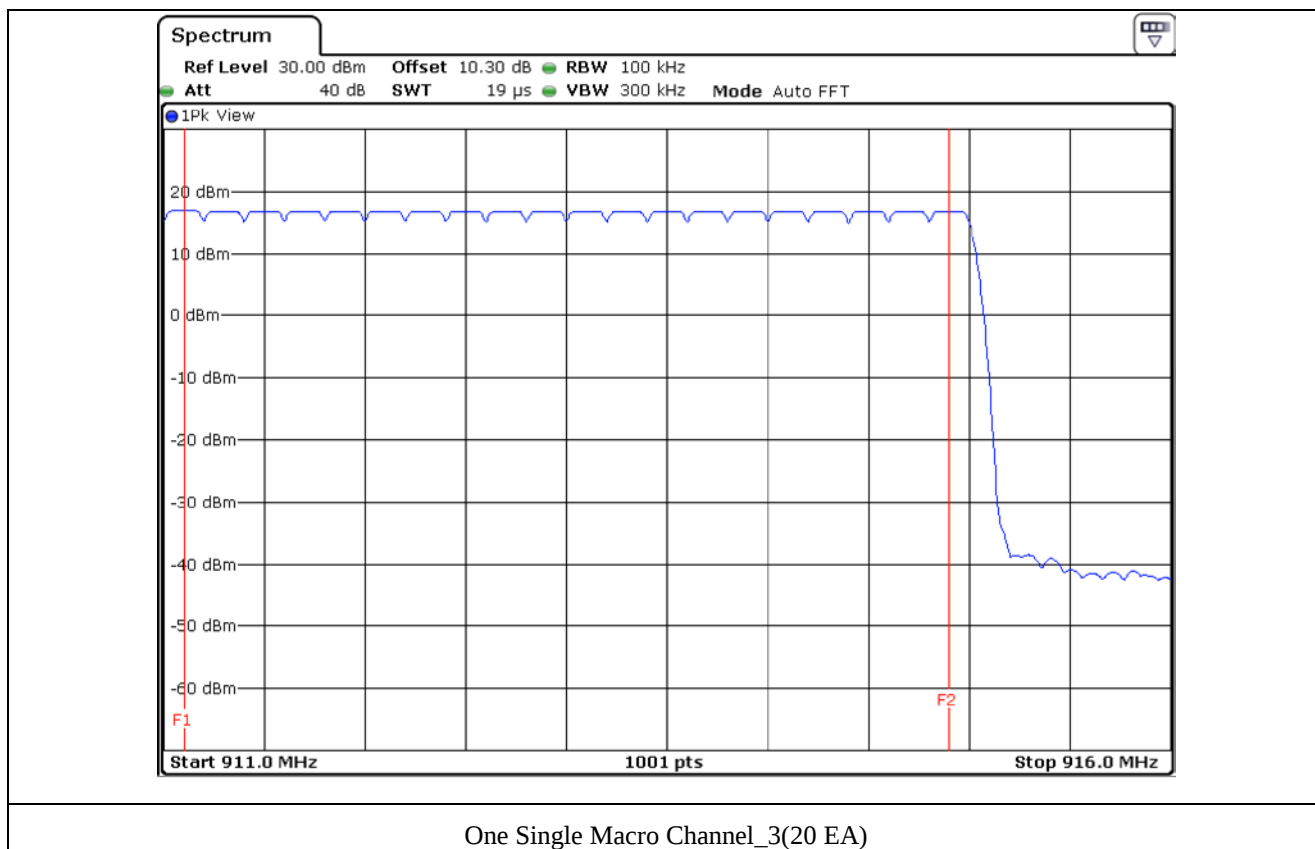




One Single Macro Channel_1(22 EA)



One Single Macro Channel_2(22 EA)



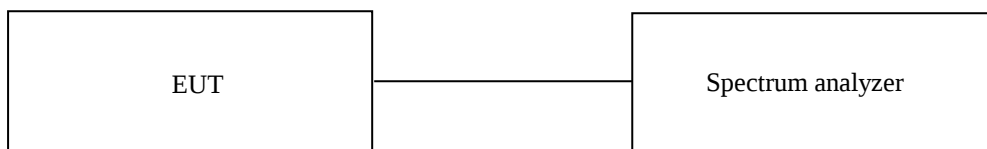
11. TIME OF OCCUPANCY(DWELL TIME)

11.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

11.2 Test set-up

According to §15.247(a)(1)(i) / RSS-247 5.1.3, Frequency hopping systems operating in the 902 MHz ~ 928 MHz bands. 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.



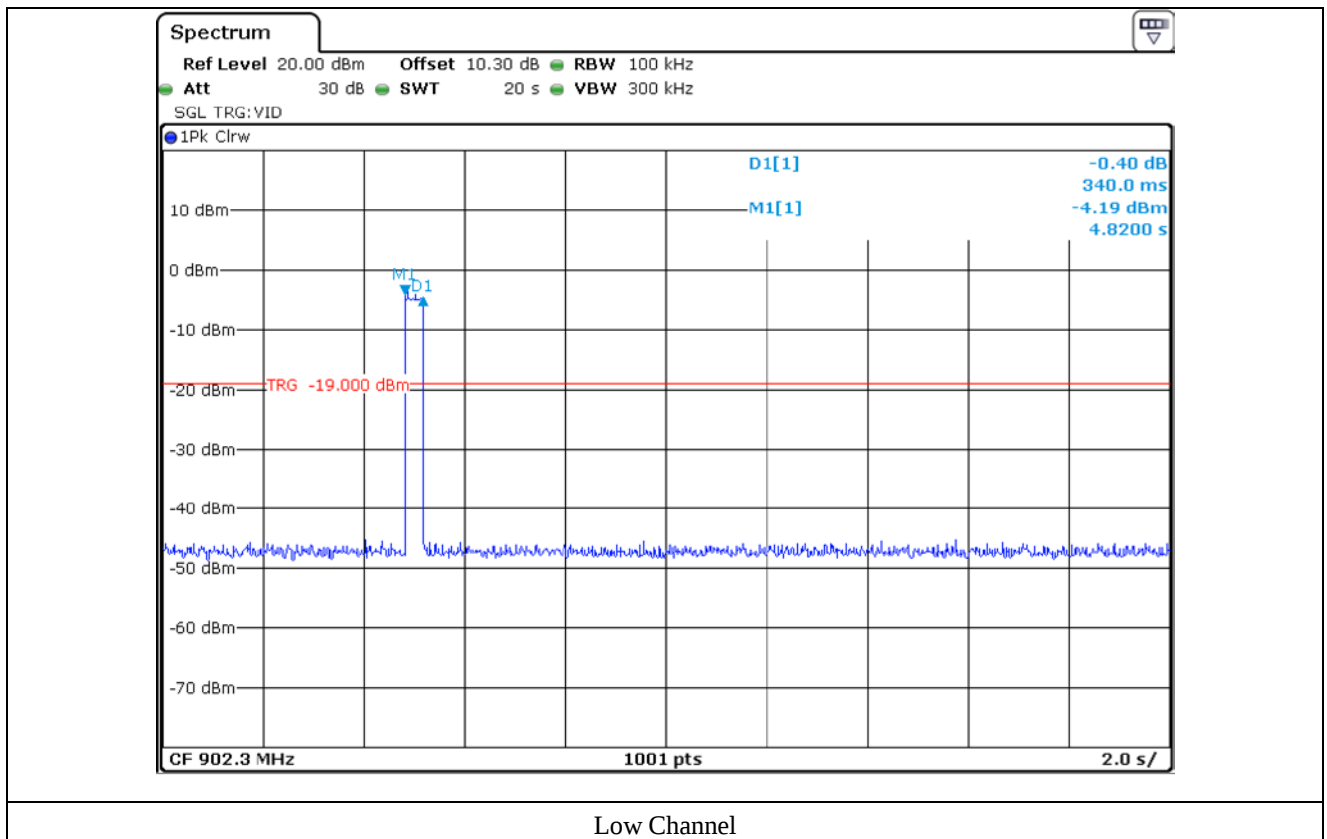
11.3 Test Date

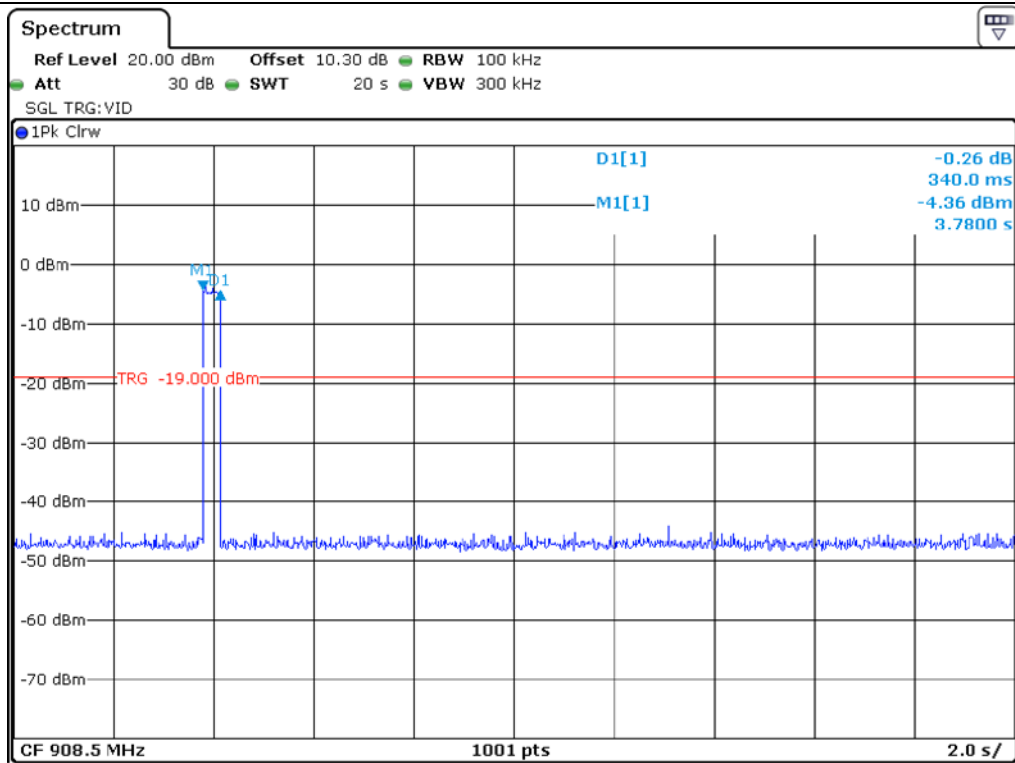
March 29, 2021 ~ April 01, 2021

11.4 Test data

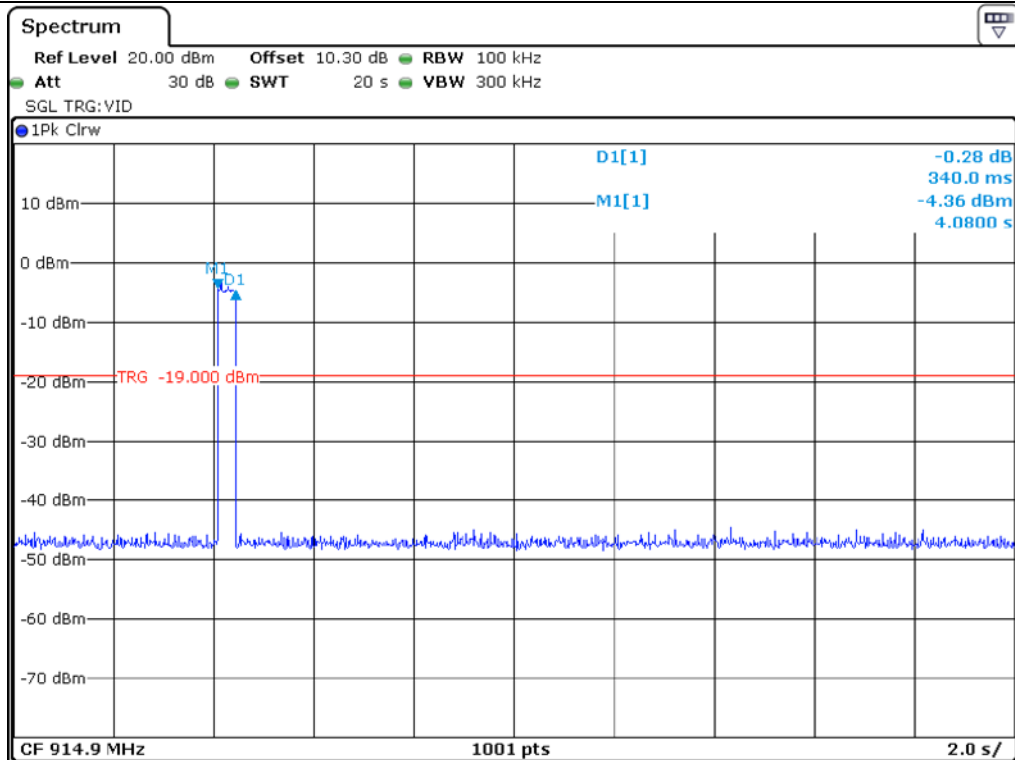
-. Test Result : Pass

	Channel	Measured Value(ms)	Limit(ms)	Result
Pulse Time (ms)	LOW	340.00 (340.00 * 1)	400.00	Pass
	MIDDLE	340.00 (340.00 * 1)		
	HIGH	340.00 (340.00 * 1)		





Middle Channel



High Channel

12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

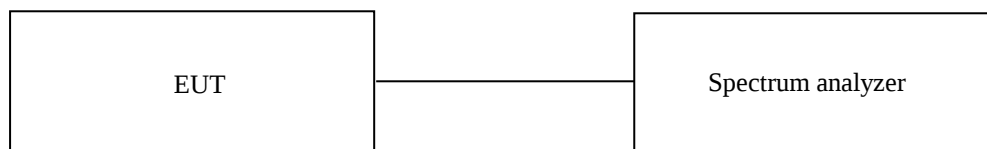
12.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

12.2 Test set-up for conducted / radiated measurement

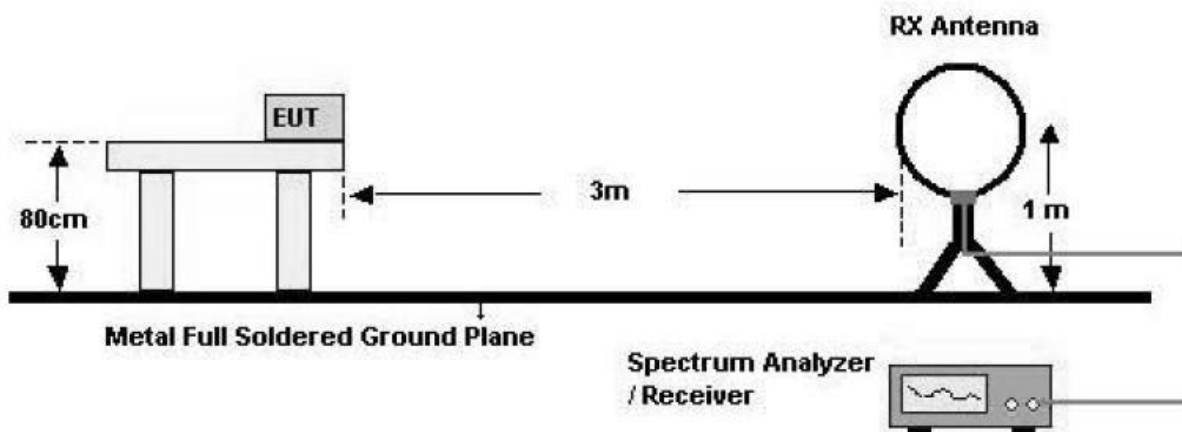
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the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

- Conducted Configuration

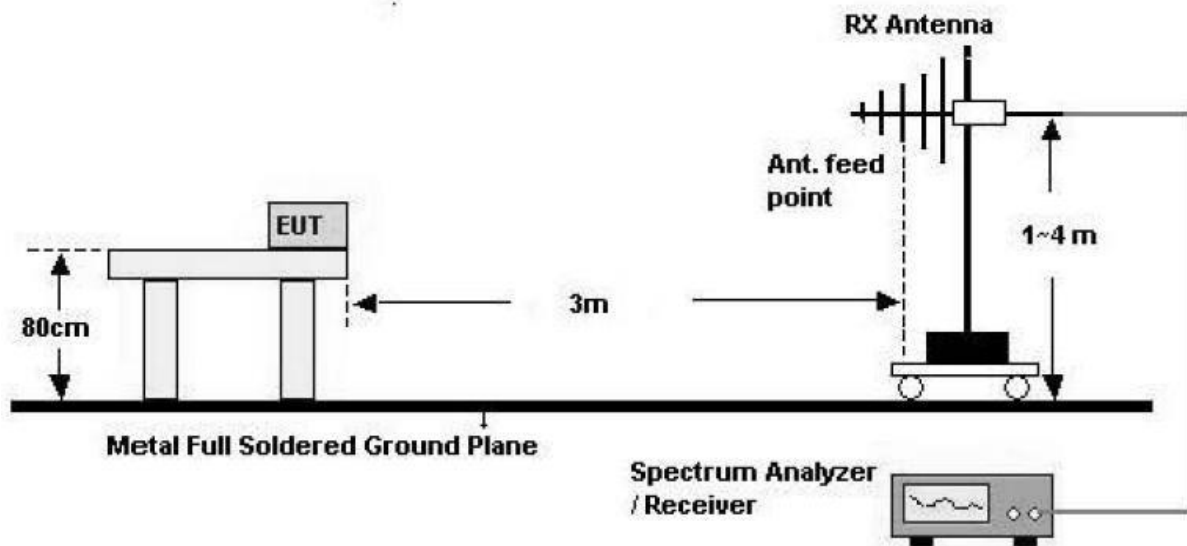


- Radiated Configuration

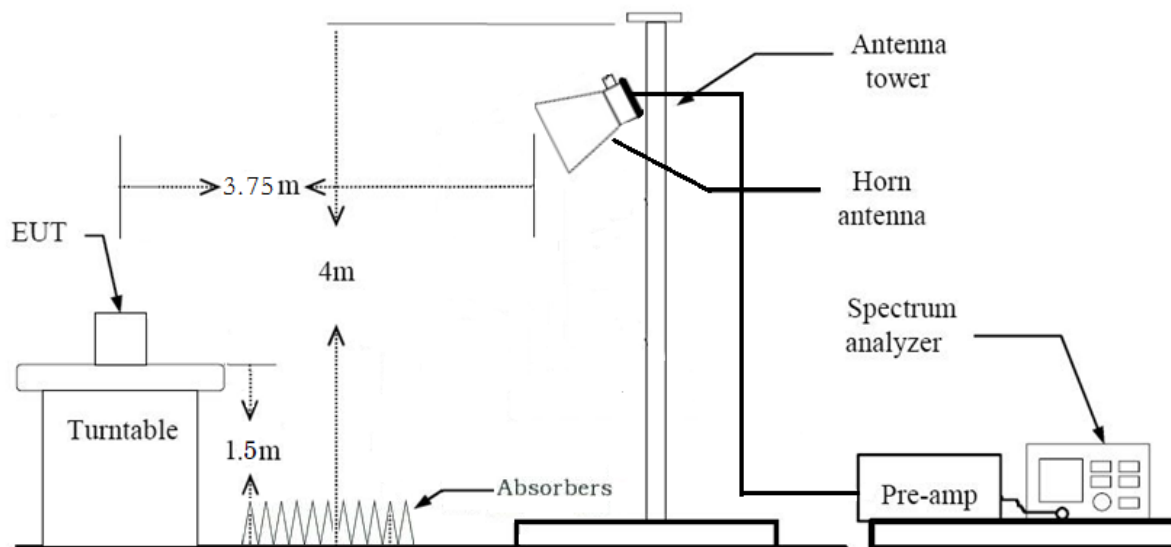
1. Below 30 MHz



2. 30 MHz - 1 GHz



3. Above 1 GHz



12.3 Test Date

March 29, 2021 ~ April 01, 2021

12.4 Test data for conducted emission

-. Resolution bandwidth : 100 kHz

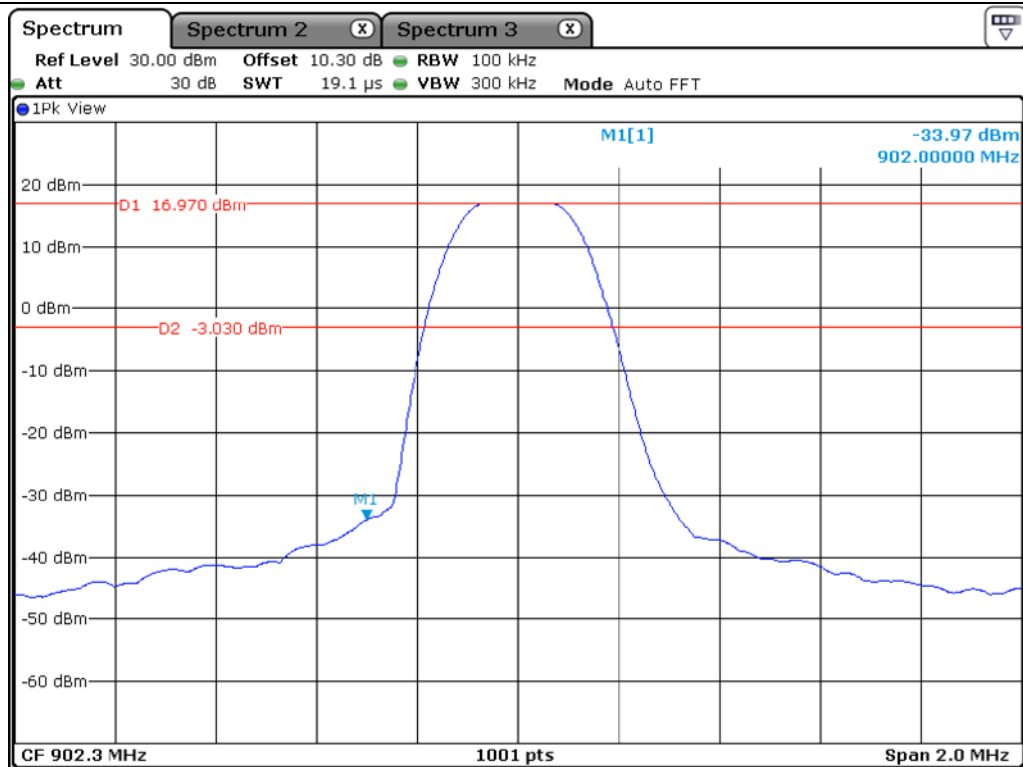
-. Video bandwidth : 300 kHz

-. Detector : Peak

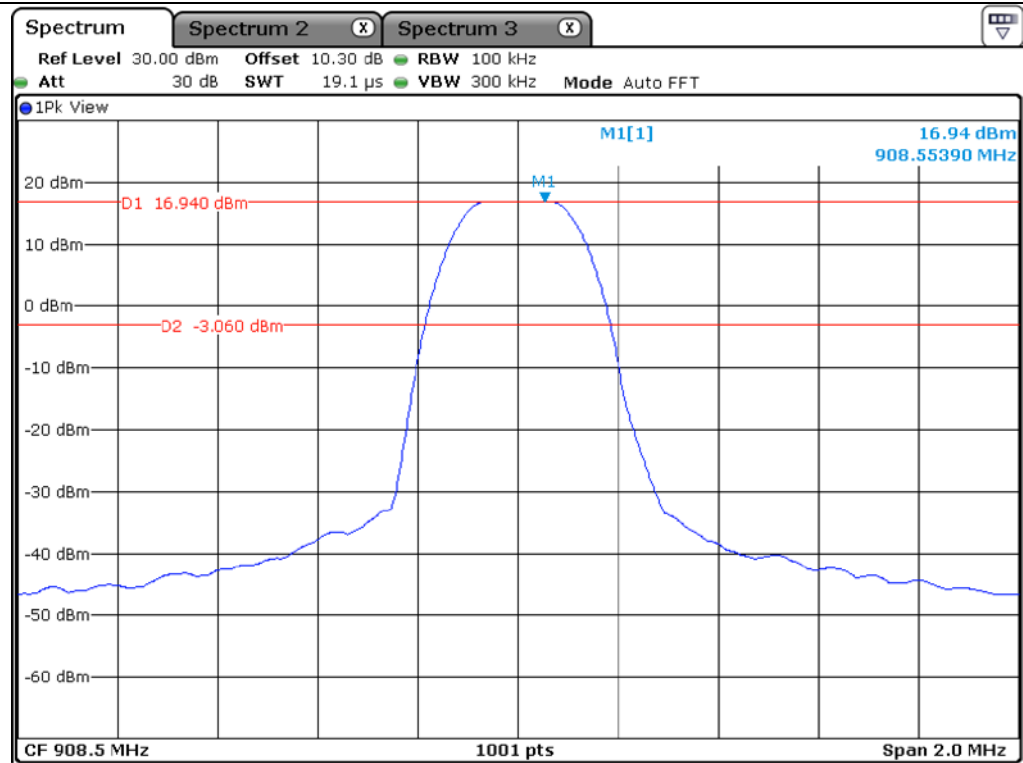
-. Result : PASSED

Channel	Frequency Range	Measured Value(dBm)	Limit(dBm)	Margin(dB)
Low	Fundamental	16.97	-20.00	-3.23
	30 M ~ 1 GHz	-49.63	-3.23	46.40
	1 GHz ~ 10 GHz	-30.25	-3.23	27.02
Middle	Fundamental	16.94	-20.00	-3.06
	30 M ~ 1 GHz	-50.56	-3.06	47.50
	1 GHz ~ 10 GHz	-30.51	-3.06	27.45
High	Fundamental	16.77	-20.00	-3.23
	30 M ~ 1 GHz	-50.93	-3.23	47.70
	1 GHz ~ 10 GHz	-30.23	-3.23	27.00

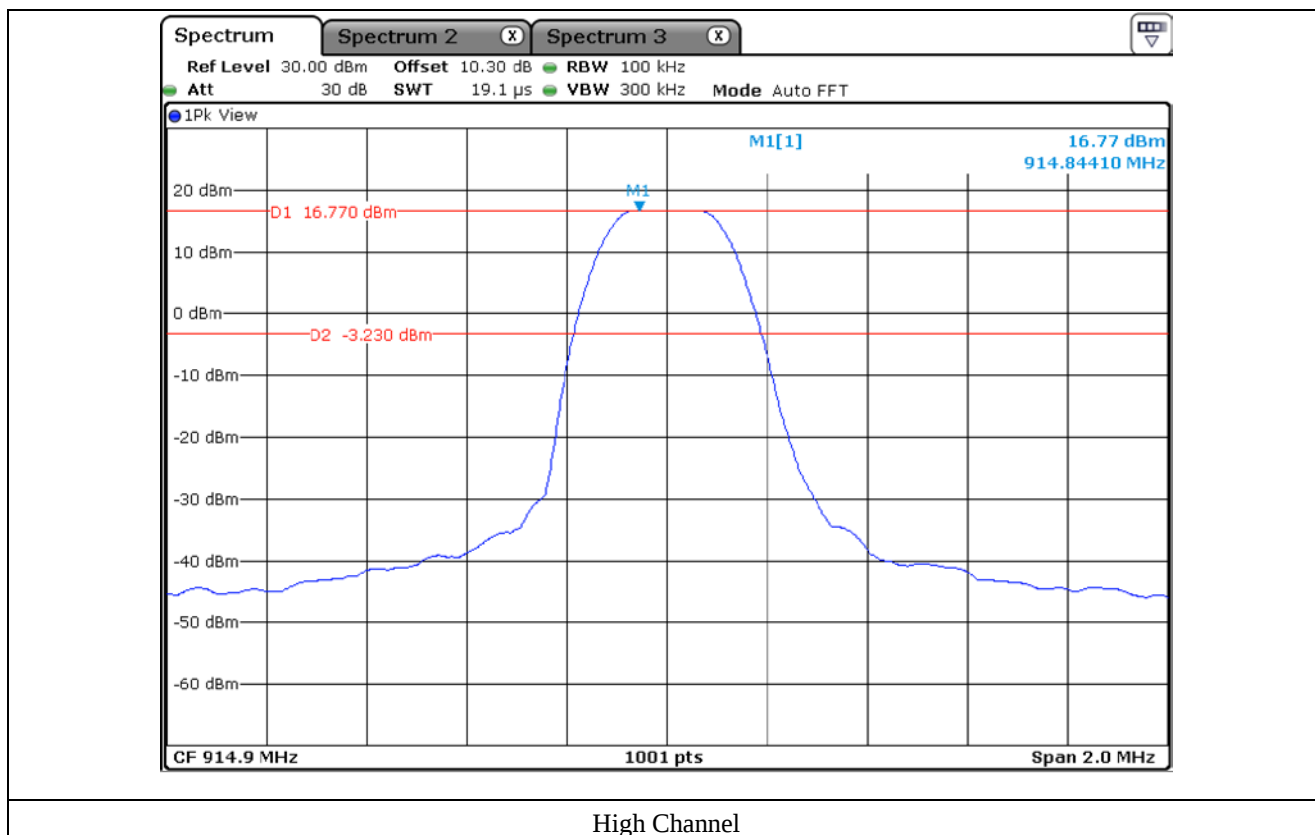
Remark: "H": Horizontal, "V": Vertical

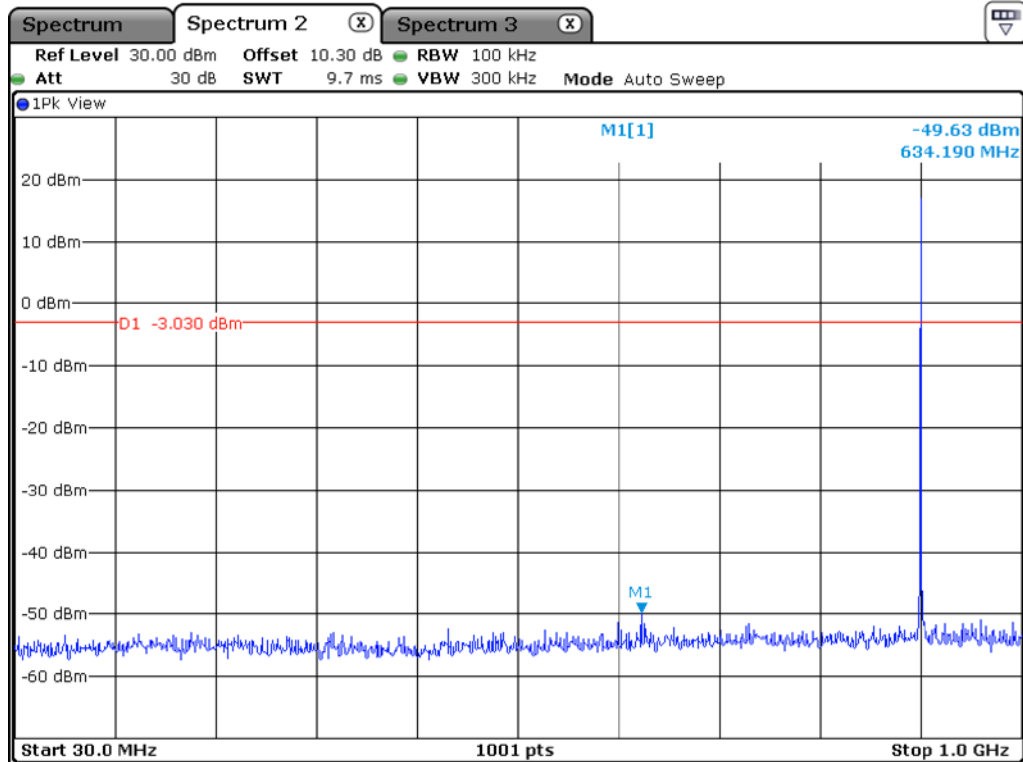


Low Channel

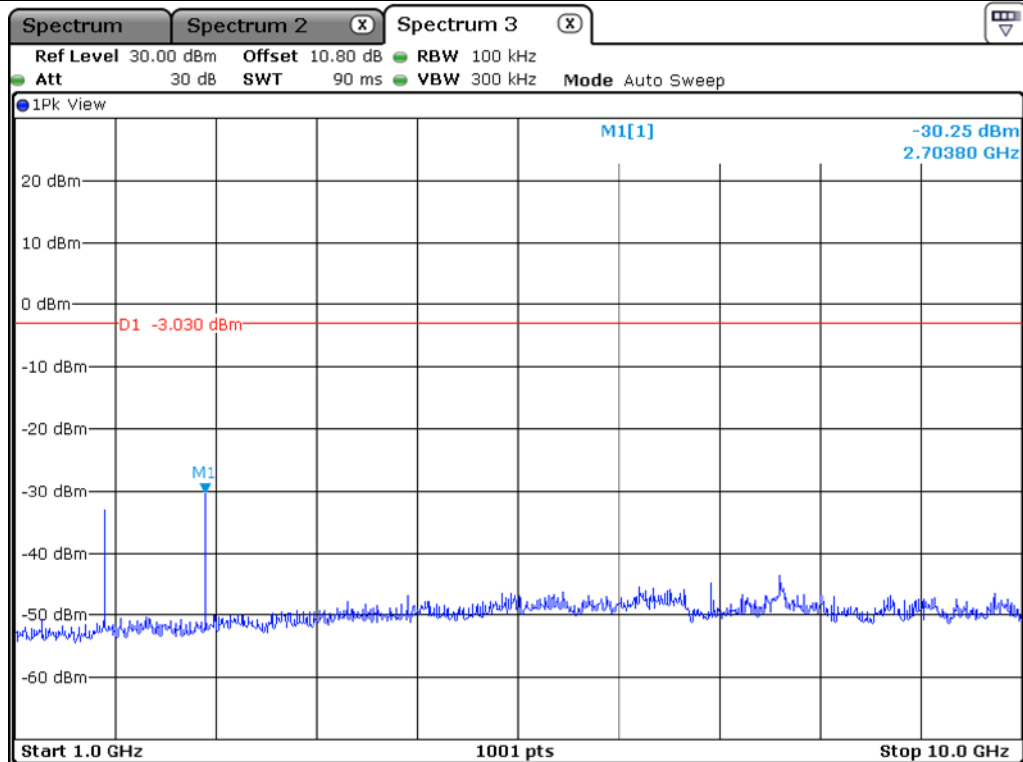


Middle Channel

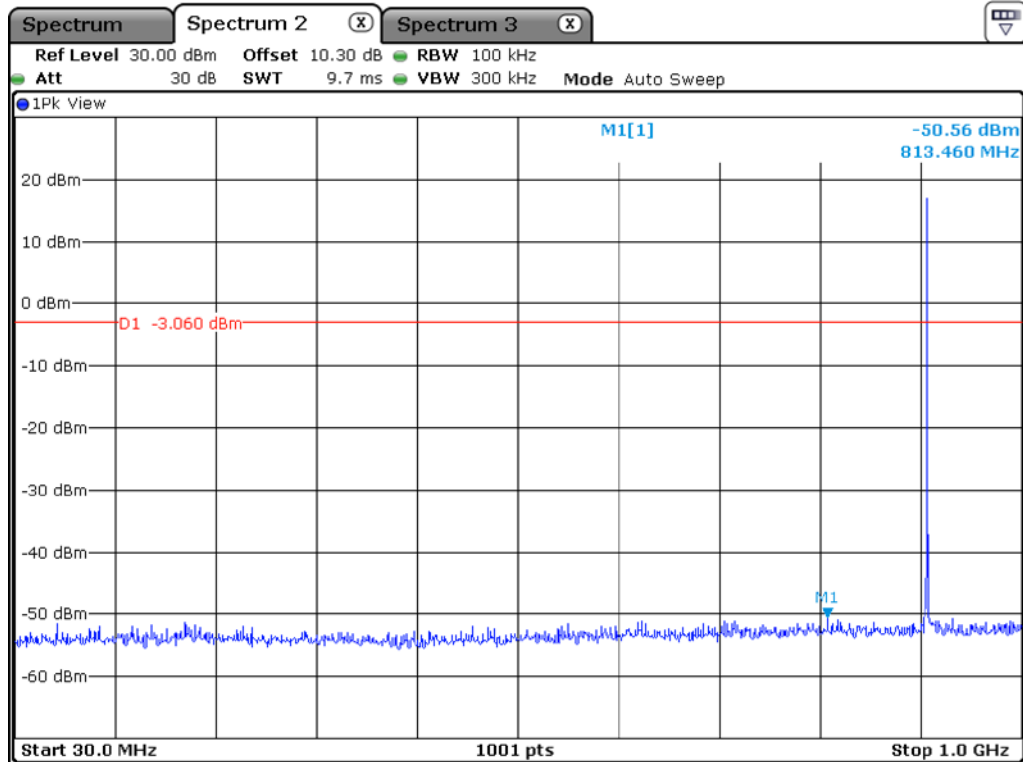




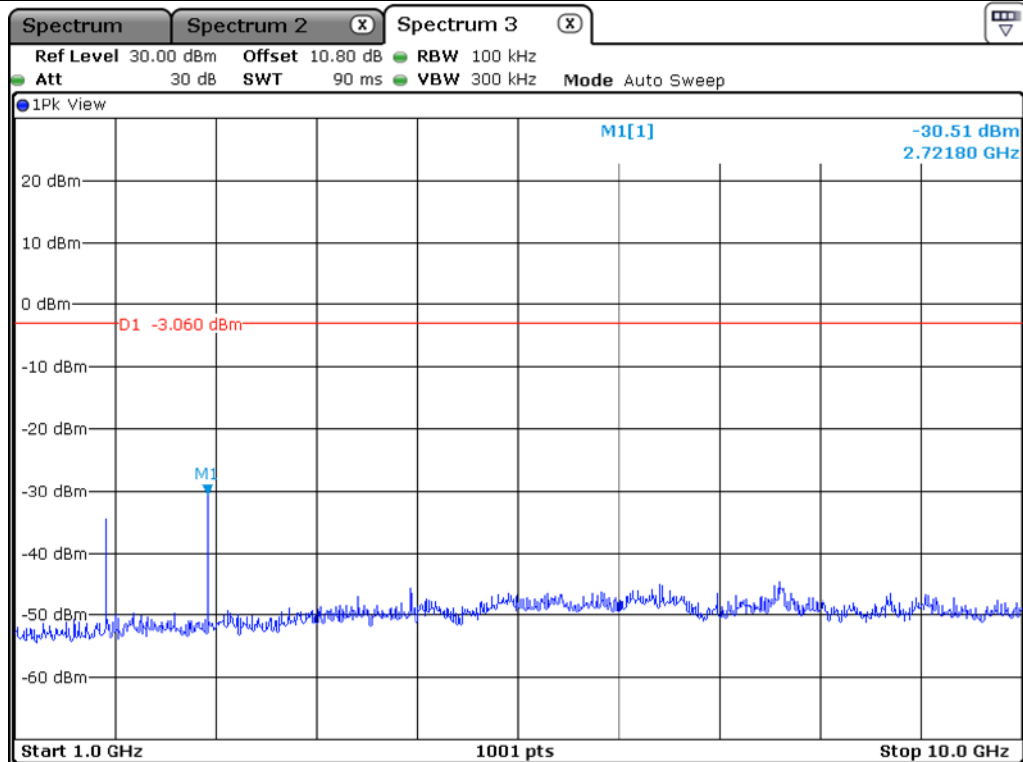
Low Channel



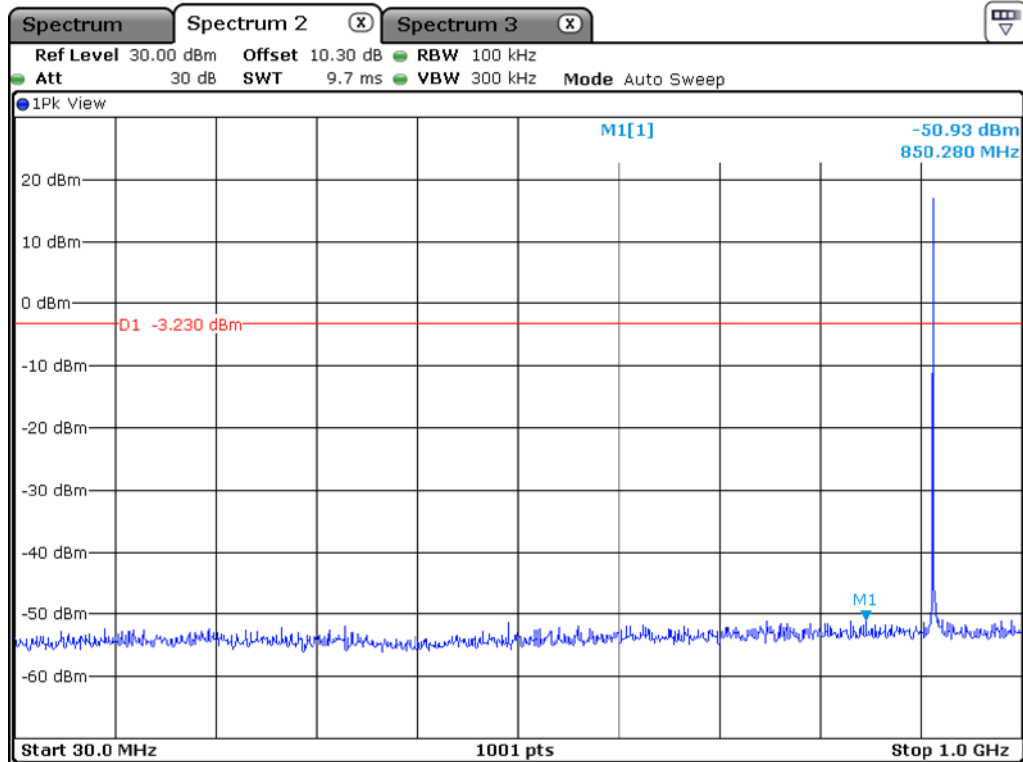
Low Channel



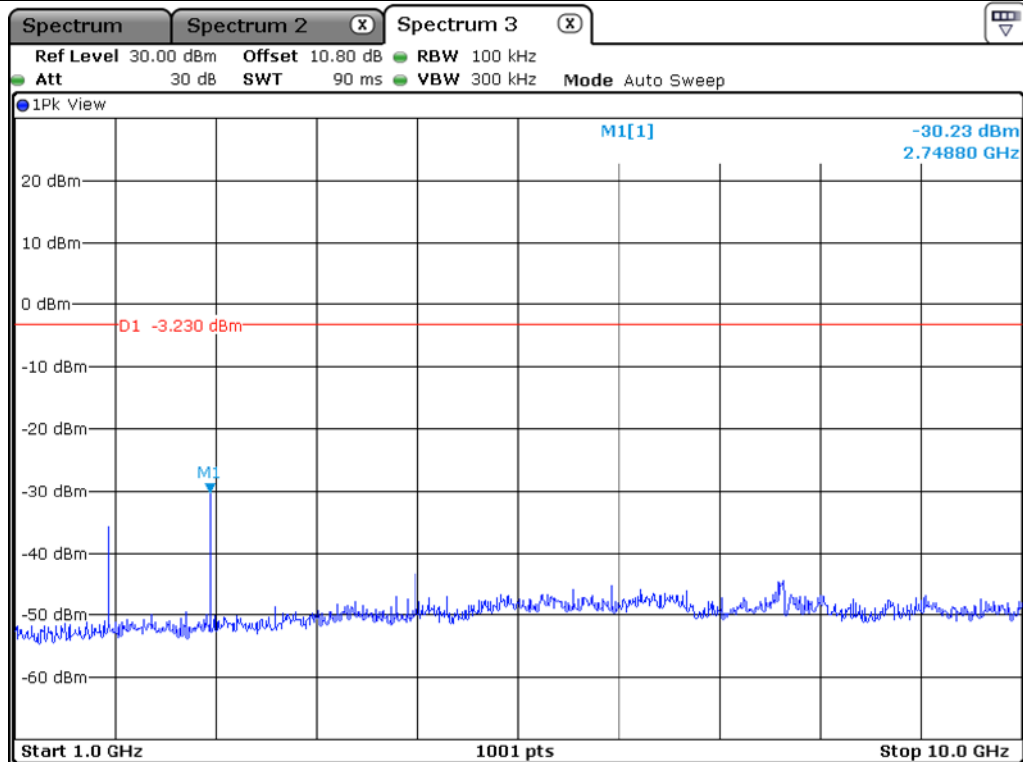
Middle Channel



Middle Channel



High Channel



High Channel

12.5 Test data for Transmitting mode radiated emission

12.5.1 Spurious & Harmonic Radiated Emission above 1 GHz

- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 3 MHz for Peak Mode(Peak Detector), 3 MHz for Average Mode(RMS Detector)
- Frequency range : 1 GHz ~ 10.0 GHz
- Duty Cycle : 98.38 %
- Measurement distance : 3 m
- Result : PASSED

Channel	Frequency (MHz)	Reading (dBuV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBuV/m)	Limits (dBuV/m)	Margin (dB)
Low	1 804.600	34.70	Peak	H	25.30	4.66	-	64.66	74.00	9.34
		18.84	Average	H			0.07	48.87	54.00	5.13
		32.54	Peak	V			-	62.50	74.00	11.50
		18.31	Average	V			0.07	48.34	54.00	5.66
	2 706.900	25.01	Peak	H	28.20	5.70	-	58.91	74.00	15.09
		12.77	Average	H			0.07	46.74	54.00	7.26
		25.13	Peak	V			-	59.03	74.00	14.97
		12.8	Average	V			0.07	46.77	54.00	7.23
Middle	1 817.000	34.76	Peak	H	25.30	4.66	-	64.72	74.00	9.28
		18.88	Average	H			0.07	48.91	54.00	5.09
		35.04	Peak	V			-	65.00	74.00	9.00
		20.36	Average	V			0.07	50.39	54.00	3.61
	2 725.500	25.31	Peak	H	28.20	5.70	-	59.21	74.00	14.79
		9.62	Average	H			0.07	43.59	54.00	10.41
		26.30	Peak	V			-	60.20	74.00	13.80
		13.56	Average	V			0.07	47.53	54.00	6.47

High	1 829.800	34.51	Peak	H	25.30	4.66	-	64.47	74.00	9.53
		18.82	Average	H			0.07	48.85	54.00	5.15
		32.70	Peak	V			-	62.66	74.00	11.34
		19.86	Average	V			0.07	49.89	54.00	4.11
	2 744.700	25.6	Peak	H	28.20	5.70	-	59.50	74.00	14.50
		11.51	Average	H			0.07	45.48	54.00	8.52
		26.46	Peak	V			-	60.36	74.00	13.64
		10.44	Average	V			0.07	44.41	54.00	9.59

Remark: "H": Horizontal, "V": Vertical, "*" Frequency fall in restricted band

13. RADIATED EMISSION TEST

13.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

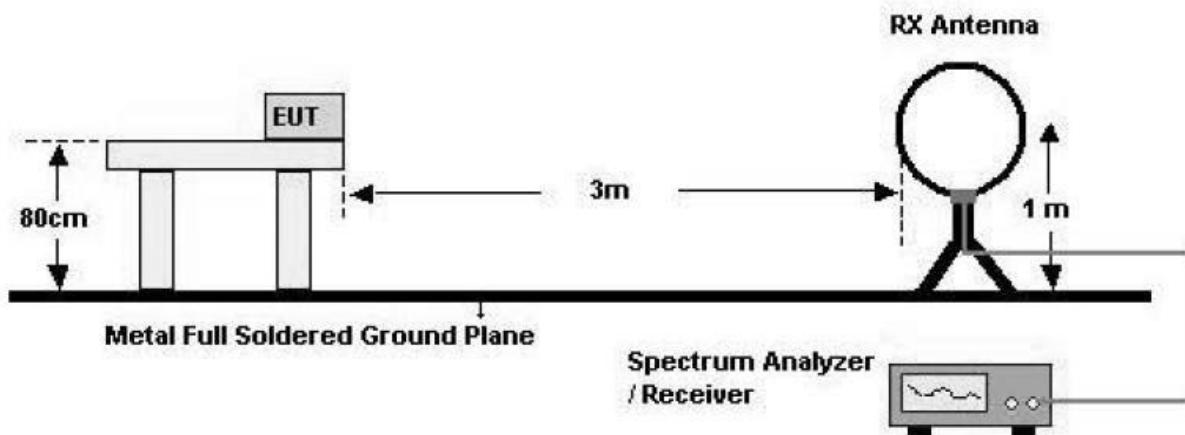
13.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

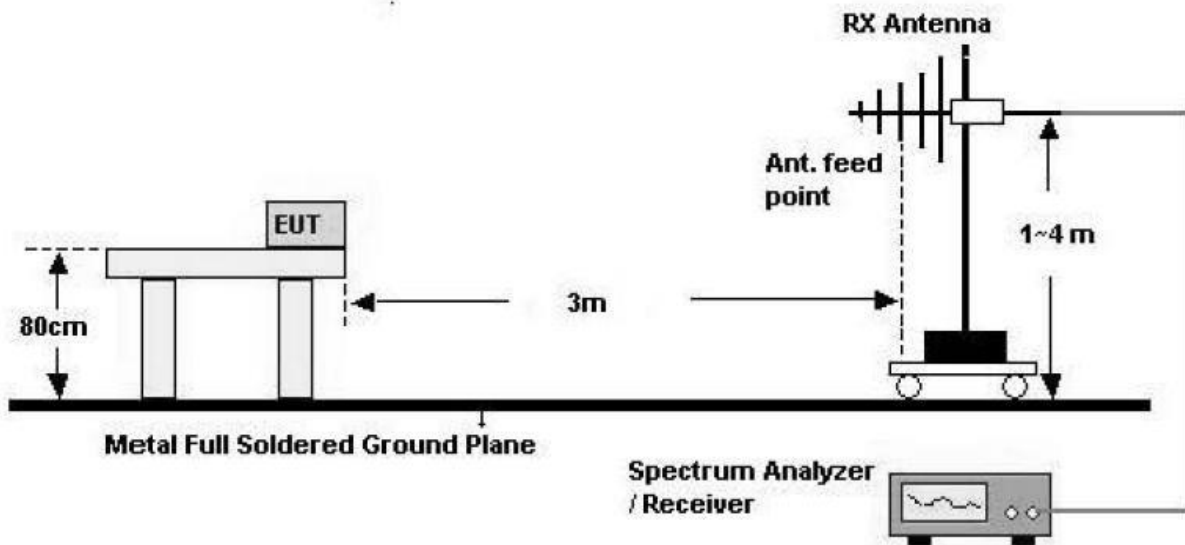
The frequency spectrum from 30 MHz to 10 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

- Test Configuration

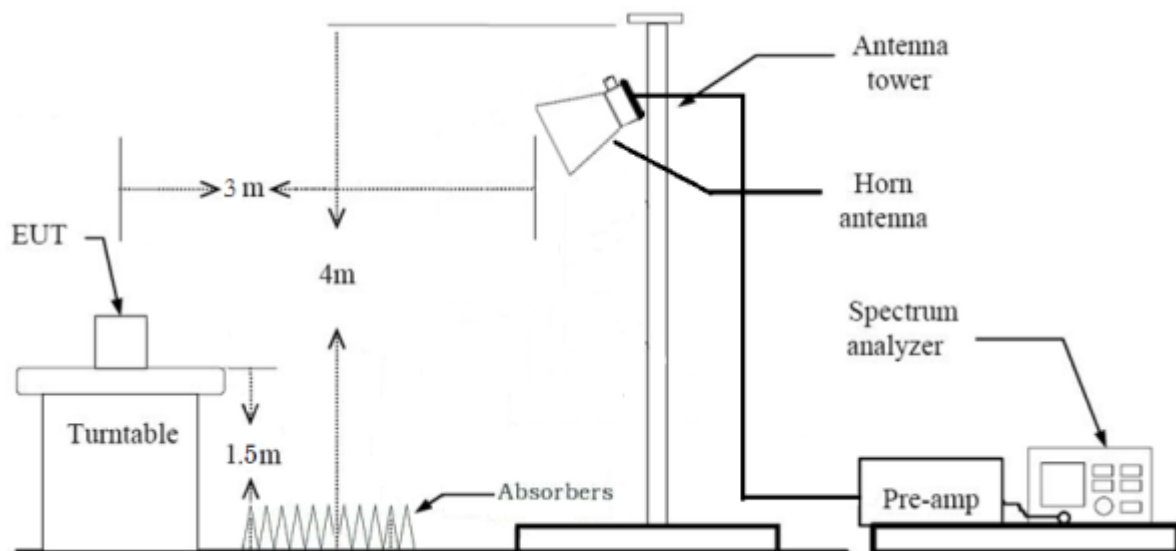
1. Below 30 MHz



2. 30 MHz - 1 GHz



3. Above 1 GHz



13.3 Test Date

March 02, 2021 ~ March 05, 2021

13.4 Test Data

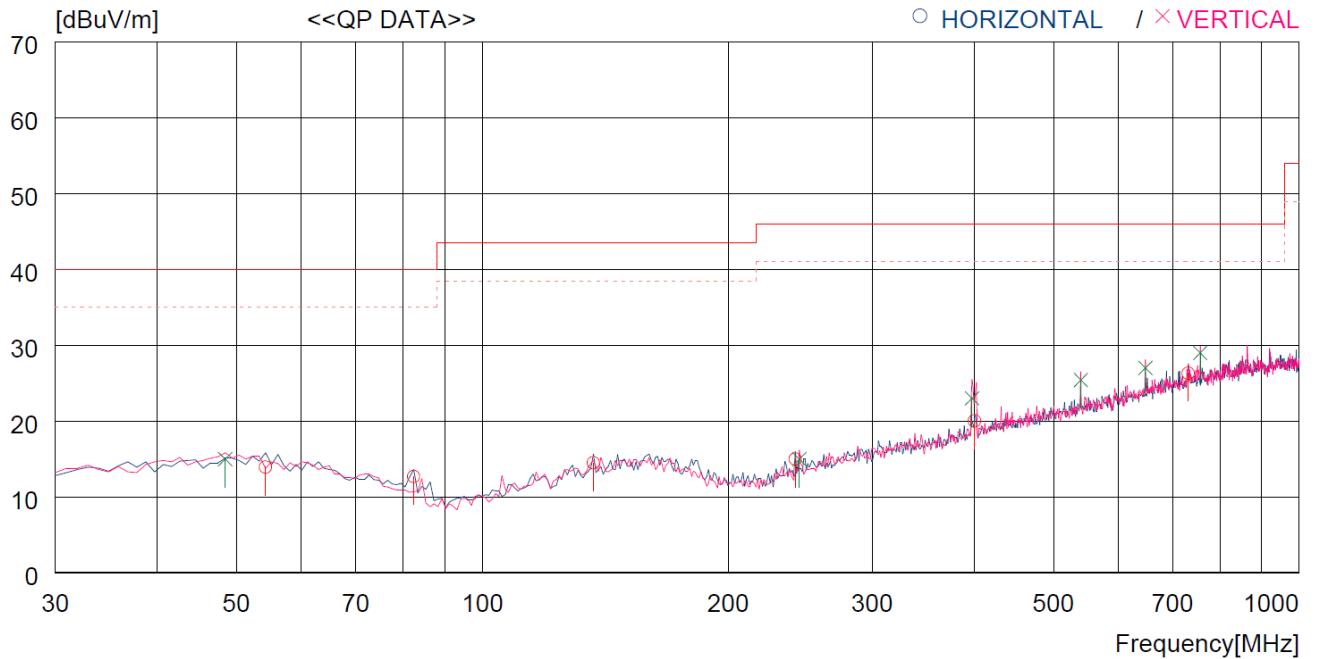
13.4.1 Test data for 30 MHz ~ 1 GHz

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : GPS Tracker & Messenger

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	54.250	25.8	19.6	1.2	32.7	13.9	40.0	26.1	200	359
2	82.380	29.1	14.7	1.5	32.6	12.7	40.0	27.3	300	0
3	136.700	27.0	18.1	2.0	32.6	14.5	43.5	29.0	200	289
4	241.460	27.6	17.3	2.6	32.5	15.0	46.0	31.0	100	0
5	400.540	27.4	21.5	3.4	32.3	20.0	46.0	26.0	200	201
6	731.304	26.8	27.2	4.7	32.4	26.3	46.0	19.7	200	359
----- Vertical -----										
7	48.430	26.9	19.7	1.1	32.7	15.0	40.0	25.0	100	359
8	244.370	27.5	17.4	2.6	32.5	15.0	46.0	31.0	100	359
9	397.630	30.5	21.5	3.4	32.4	23.0	46.0	23.0	400	0
10	540.220	29.4	24.4	4.0	32.4	25.4	46.0	20.6	100	177
11	647.887	28.9	26.2	4.4	32.5	27.0	46.0	19.0	200	323
12	756.523	29.0	27.6	4.8	32.4	29.0	46.0	17.0	100	359

13.4.2 Test Data for Below 30 MHz

- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

13.4.3 Test Data for above 1 GHz

- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 10 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

14.2 Test set-up

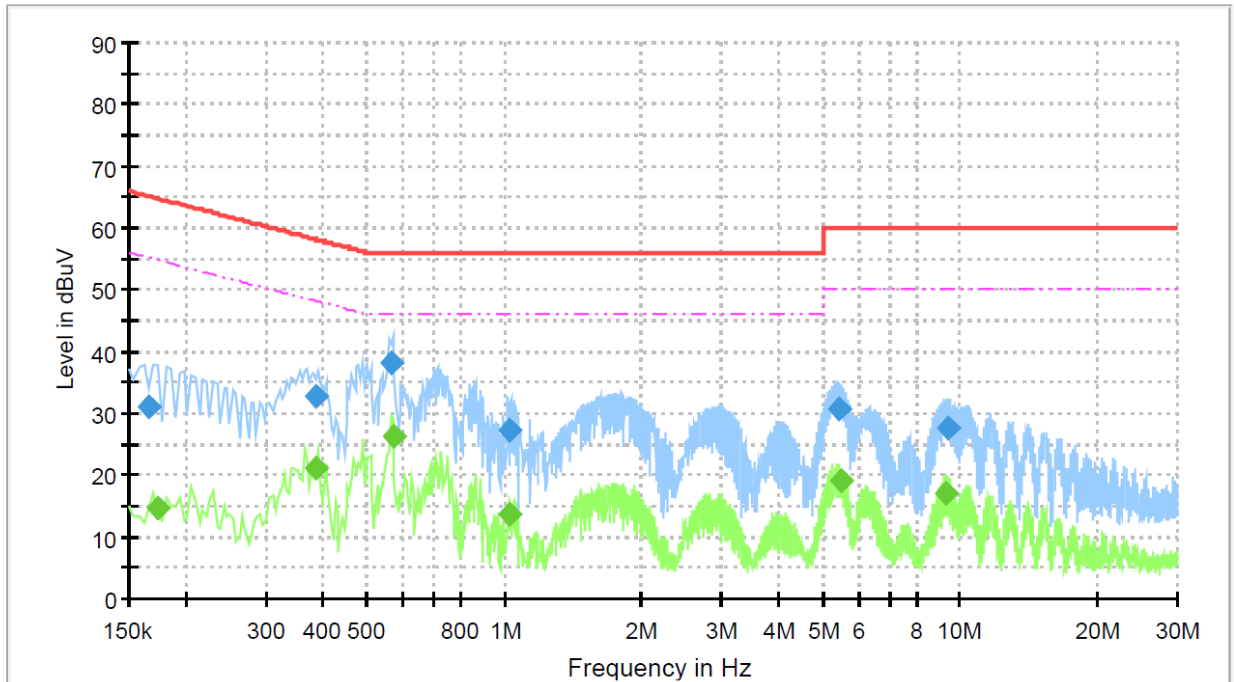
The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

14.3 Test Date

March 02, 2021 ~ March 05, 2021

14.4 Test data

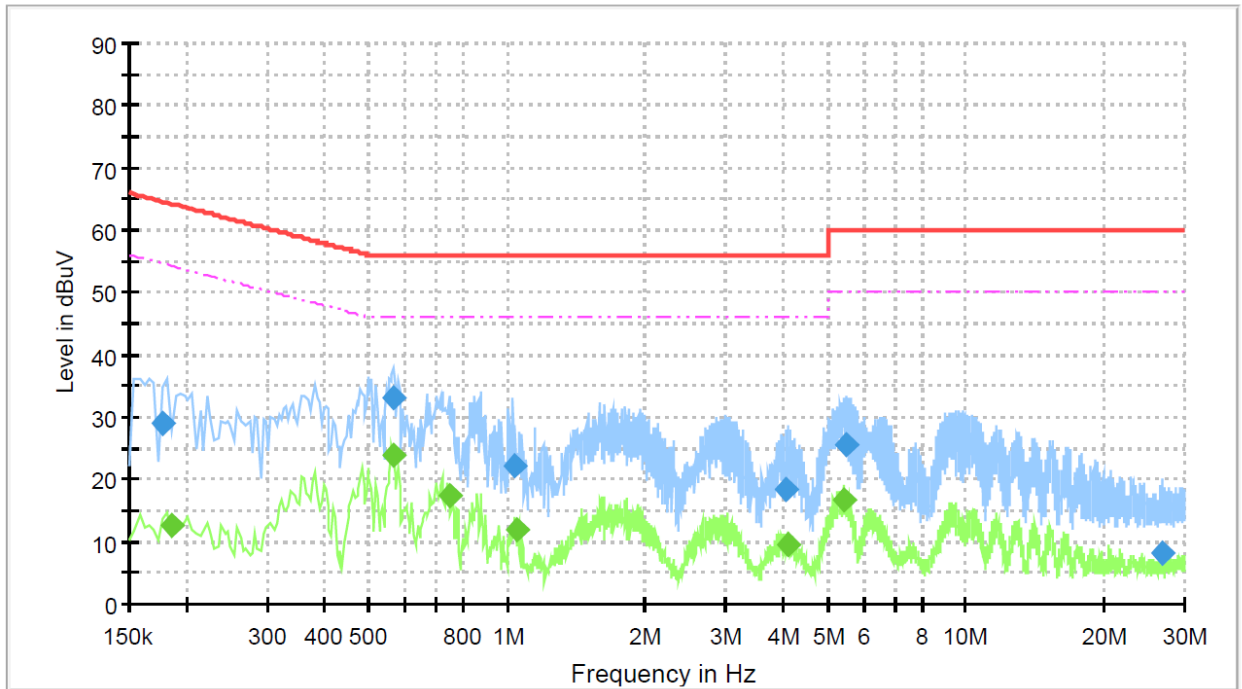
- . Resolution bandwidth : 9 kHz
- . Frequency range : 0.15 MHz ~ 30 MHz
- . Tested Line : HOT LINE



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.167	31.15	---	65.13	33.99	3000.0	9.0	L1	9.93
0.175	---	14.51	54.74	40.23	3000.0	9.0	L1	9.92
0.385	---	21.05	48.16	27.11	3000.0	9.0	L1	9.93
0.385	32.76	---	58.16	25.40	3000.0	9.0	L1	9.93
0.564	38.31	---	56.00	17.69	3000.0	9.0	L1	9.94
0.572	---	26.15	46.00	19.85	3000.0	9.0	L1	9.94
1.028	27.31	---	56.00	28.69	3000.0	9.0	L1	9.99
1.028	---	13.69	46.00	32.31	3000.0	9.0	L1	9.99
5.399	30.81	---	60.00	29.19	3000.0	9.0	L1	10.10
5.472	---	19.15	50.00	30.85	3000.0	9.0	L1	10.10
9.313	---	17.19	50.00	32.81	3000.0	9.0	L1	10.29
9.392	27.72	---	60.00	32.28	3000.0	9.0	L1	10.29

-. Tested Line : NEUTRAL LINE



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.178	28.97	---	64.60	35.63	3000.0	9.0	N	9.93
0.186	---	12.52	54.24	41.71	3000.0	9.0	N	9.93
0.564	---	23.92	46.00	22.08	3000.0	9.0	N	9.95
0.564	33.08	---	56.00	22.92	3000.0	9.0	N	9.95
0.749	---	17.28	46.00	28.72	3000.0	9.0	N	9.96
1.036	21.99	---	56.00	34.01	3000.0	9.0	N	9.99
1.052	---	11.91	46.00	34.09	3000.0	9.0	N	9.99
4.073	18.41	---	56.00	37.59	3000.0	9.0	N	10.08
4.113	---	9.63	46.00	36.37	3000.0	9.0	N	10.08
5.408	---	16.63	50.00	33.37	3000.0	9.0	N	10.13
5.483	25.52	---	60.00	34.48	3000.0	9.0	N	10.13
26.795	8.10	---	60.00	51.90	3000.0	9.0	N	10.77

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

15. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV40-N	Rohde & Schwarz	Signal Analyzer	101546	Jun. 24, 2020 (1Y)
ESW	Rohde & Schwarz	EMI Test Receiver	101851	Mar. 22, 2021 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	392756	Oct. 16, 2020 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 15, 2020 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 15, 2020 (1Y)
DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A
CO3000	Innco Systems GmbH	Controller	N/A	N/A
VULB9168	Schwarzbeck	Hybrid Antenna	01088	Dec. 09, 2019 (2Y)
AH-118	Com-Power	Horn Antenna	10050061	Oct. 15, 2020 (1Y)
VULB9163	Schwarzbeck	TRILOG Broadband Antenna	777	Apr. 08, 2020 (2Y)
BBHA 9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 23, 2020 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2021 (1Y)
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 24, 2020 (2Y)
ESR3	Rohde & Schwarz	EMI TEST RECEIVER	102602	Mar. 15, 2021 (1Y)
NSLK8126	Schwarzbeck	AMN	8126-404	Mar. 15, 2021 (1Y)
ESH3Z2	Rohde & Schwarz	PULSE LIMITER	357.8810.52	Mar. 15, 2021 (1Y)