TEST REPORT

APPLICANT	:	Shenzhen Chainway Information Technology Co., Ltd
PRODUCT NAME	:	UHF RFID Scanner
MODEL NAME	:	SR160
BRAND NAME	:	CHAINWAY
FCC ID	:	2AC6ASR160
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2023-03-31
TEST DATE	:	2023-04-26 to 2023-05-10
ISSUE DATE	:	2023-10-17

Edited by: Su xiaoxian

Su Xiaoxian (Rapporteur)

Approved by: Shen Junsheng

Shen Junsheng (Supervisor)

NOTE: This document is issued by Shenzhen Morlab Communications Technology Co., Ltd., the test report shall not be reproduced except in full without prior written permission of the company. The test results apply only to the particular sample(s) tested and to the specific tests carried out which is available on request for validation and information confirmed at our website.

MORLAB

Shenzhen Morlab Communications Technology Co., Ltd.
FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road,
Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China

Tel: 86-755-36698555 Fax: 86-755-36698525
Http://www.morlab.cn E-mail: service@morlab.cn

DIRECTORY

1. Technical Information ····· 3
1.1. Applicant and Manufacturer Information ····· 3
1.2. Equipment Under Test (EUT) Description ····· 3
1.3. The Channel Number and Frequency ····· 5
1.4. Test Standards and Results ····· 6
1.5. Environmental Conditions ····· 7
2. 47 CFR Part 15C Requirements ····· 8
2.1. Antenna Requirement ····· 8
2.2. Hopping Mechanism ····· 8
2.3. Number of Hopping Frequency ····· 9
2.4. Duty Cycle of Test Signal ····· 11
2.5. Maximum Peak Conducted Output Power ····· 12
2.6. Maximum Average Conducted Output Power ····· 15
2.7. 20 dB Bandwidth ····· 16
2.8. Carried Frequency Separation ····· 19
2.9. Time of Occupancy (Dwell time) ····· 21
2.10. Conducted Spurious Emissions ····· 24
2.11. Conducted Emission ····· 29
2.12. Radiated Emission ····· 33
Annex A Test Uncertainty ····· 46
Annex B Testing Laboratory Information ····· 47

Change History		
Version	Date	Reason for change
1.0	2023-10-17	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Shenzhen Chainway Information Technology Co., Ltd
Applicant Address:	9F Building 2, Daqian Industrial Park, District 67, XingDong Community, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China
Manufacturer:	Shenzhen Chainway Information Technology Co., Ltd
Manufacturer Address:	9F Building 2, Daqian Industrial Park, District 67, XingDong Community, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China

1.2. Equipment Under Test (EUT) Description

Product Name:	UHF RFID Scanner	
Sample No.:	1#	
Hardware Version:	SR160_hardware_version P	
Software Version:	SR160_software_version P	
Modulation Technology:	FHSS	
Equipment Type:	RFID	
Operating Frequency Range:	902MHz–928MHz	
Antenna Type:	Circular Polarization Antenna	
Antenna Gain:	-6.08dBi	
Accessory Information:	Battery	
	Brand Name:	CHAINWAY
	Model No.:	J972
	Serial No.:	N/A
	Capacity:	2600mAh
	Rated Voltage:	3.7V
	Charge Limit:	4.2V
	Manufacturer:	Shenzhen Hixon Technology co.,LTD

Accessory Information:	AC Adapter	
	Brand Name:	FULLPOWER
	Model No.:	NA010050020
	Serial No.:	N/A
	Rated Input:	100-240V~50/60Hz, 0.5A
	Rated Output:	5V⎓2A
	Manufacturer:	SHENZHEN SHI YING YUAN ELECTRONICS CO LTD
	USB Cable	
	Model No.:	1.8.17.095
	Manufacturer:	King Power Electronics Co., Ltd.

Note 1: We use the dedicated software to control the EUT continuous transmission.

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. The Channel Number and Frequency

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**902.75**	16	910.25	31	917.25	46	925.25
2	903.25	17	910.75	32	918.25	47	925.75
3	903.75	18	911.25	33	918.75	48	926.25
4	904.25	19	911.75	34	919.25	49	926.75
5	904.75	20	912.25	35	919.75	**50**	**927.25**
6	905.25	21	912.75	36	920.25		
7	905.75	22	913.25	37	920.75		
8	906.25	23	913.75	38	921.25		
9	906.75	24	914.25	39	921.75		
10	907.25	25	914.75	40	922.25		
11	907.75	**26**	**915.25**	41	922.75		
12	908.25	27	915.75	42	923.25		
13	908.75	28	916.25	43	923.75		
14	909.25	29	916.75	44	924.25		
15	909.75	30	917.25	45	924.75		

Note 1: The black bold channels were selected for test.

1.4. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result	Method Determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	No deviation
2	15.247(a) 15.247(h)	Hopping Mechanism	N/A	N/A	PASS	No deviation
3	15.247(a)	Number of Hopping Frequency	Apr. 26, 2023	He Yuyang	PASS	No deviation
4	ANSI C63.10	Duty Cycle	Apr. 26, 2023	He Yuyang	PASS	No deviation
5	15.247(b)	Maximum Peak Conducted Output Power	Apr. 26, 2023	He Yuyang	PASS	No deviation
6	15.247(b)	Maximum Average Conducted Output Power	Apr. 26, 2023	He Yuyang	PASS	No deviation
7	15.247(a)	20dB Bandwidth	Apr. 26, 2023	He Yuyang	PASS	No deviation
8	15.247(a)	Carrier Frequency Separation	Apr. 26, 2023	He Yuyang	PASS	No deviation
9	15.247(a)	Time of Occupancy (Dwell time)	Apr. 26, 2023	He Yuyang	PASS	No deviation
10	15.247(d)	Conducted Spurious Emission	Apr. 26, 2023	He Yuyang	PASS	No deviation
11	15.207	Conducted Emission	Apr. 26, 2023	Fan Zehang	PASS	No deviation
12	15.209, 15.247(d)	Radiated Emission	May. 10, 2023	Gao Jianrou	PASS	No deviation

Note 1: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013 and KDB558074 D01 v05r02.

Note 2: Additions to, deviation, or exclusions from the method shall be judged in the "method

determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 3: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

1.5. Environmental Conditions

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

Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR Part 15C Requirements

2.1. Antenna Requirement

2.1.1. Applicable Standard

According to FCC 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.

2.1.2. Test Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. Hopping Mechanism

2.2.1. Requirement

According to FCC §15.247(a)(1), a frequency hopping spread spectrum system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.
According to FCC §15.247(h), the incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

2.2.2. Result: Compliant

The hopping mechanism of the EUT is based on the protocol that "***ISO18000-6C***".

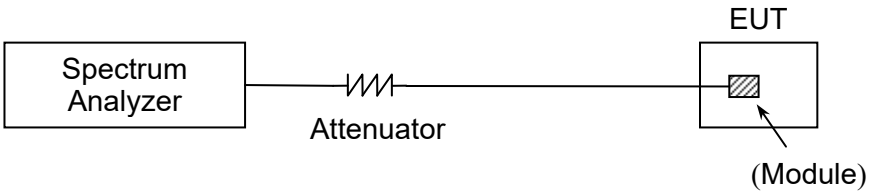
2.3. Number of Hopping Frequency

2.3.1. Requirement

According to FCC section 15.247(a)(1)(i), frequency hopping systems operating in the 902MHz to 928MHz bands shall use at least 50 hopping frequencies if the 20dB bandwidth of the hopping channel is less than 250KHz; or at least 25 hopping frequencies if the 20dB bandwidth of the hopping channel is 250KHz or greater.

2.3.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the EUT is activated by the PC via Lan port.

2.3.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = the frequency band of operation
RBW ≥ 1% of the span
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

2.3.4. Test Result

A.Test Verdict:

Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
902-928	50	50	PASS

B.Test Plots:

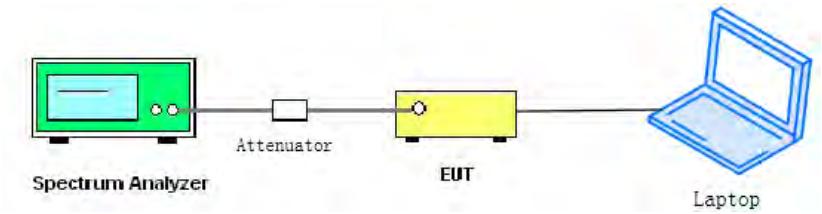
2.4. Duty Cycle of Test Signal

2.4.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%).When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).
When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this sub clause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ±2%; otherwise, the duty cycle is considered to be nonconstant.

2.4.2. Test Description

Test Setup:



ANSI C63.10 2013 Clause 11.6 was used in order to prove compliance.

2.4.3. Test Result

Duty Cycle (%) (D)	Duty Factor (10*lg[1/D])
48.90	3.11

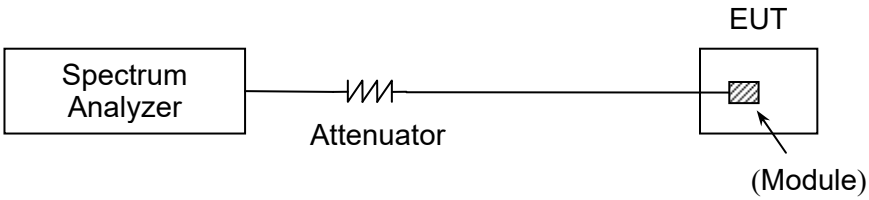
2.5. Maximum Peak Conducted Output Power

2.5.1. Requirement

According to FCC section 15.247(b)(2), for frequency hopping systems that operates in the 902MHz to 928MHz band employing at least 50 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt, and 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

2.5.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the EUT is activated by the PC via Lan port.

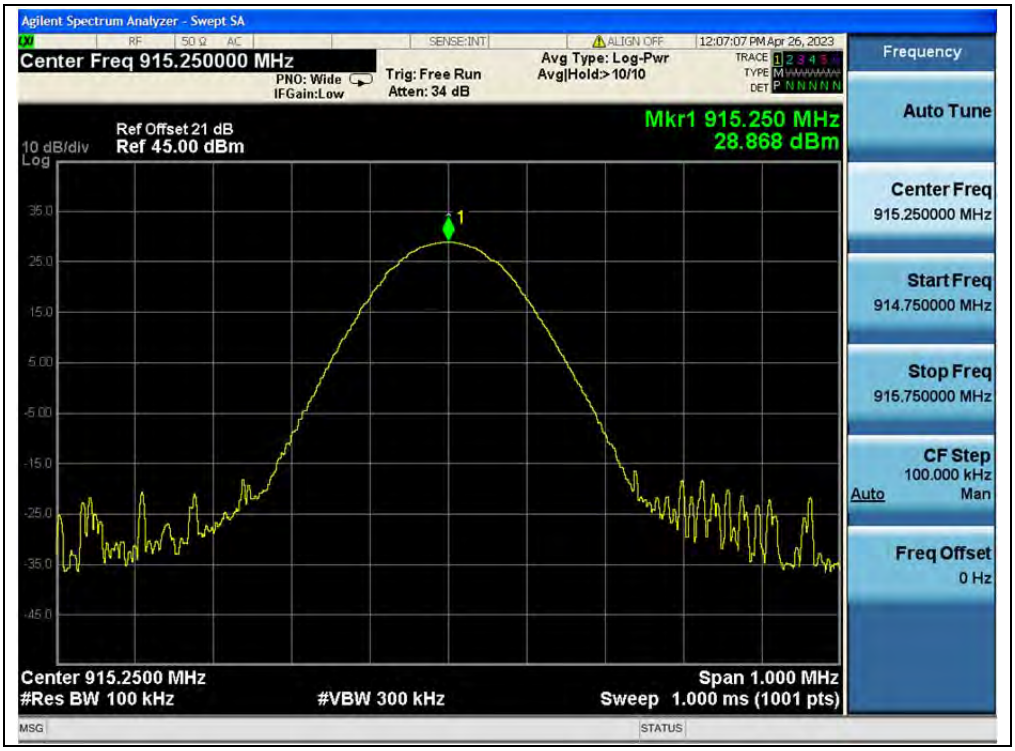
2.5.3. Test Result

A.Test Verdict:

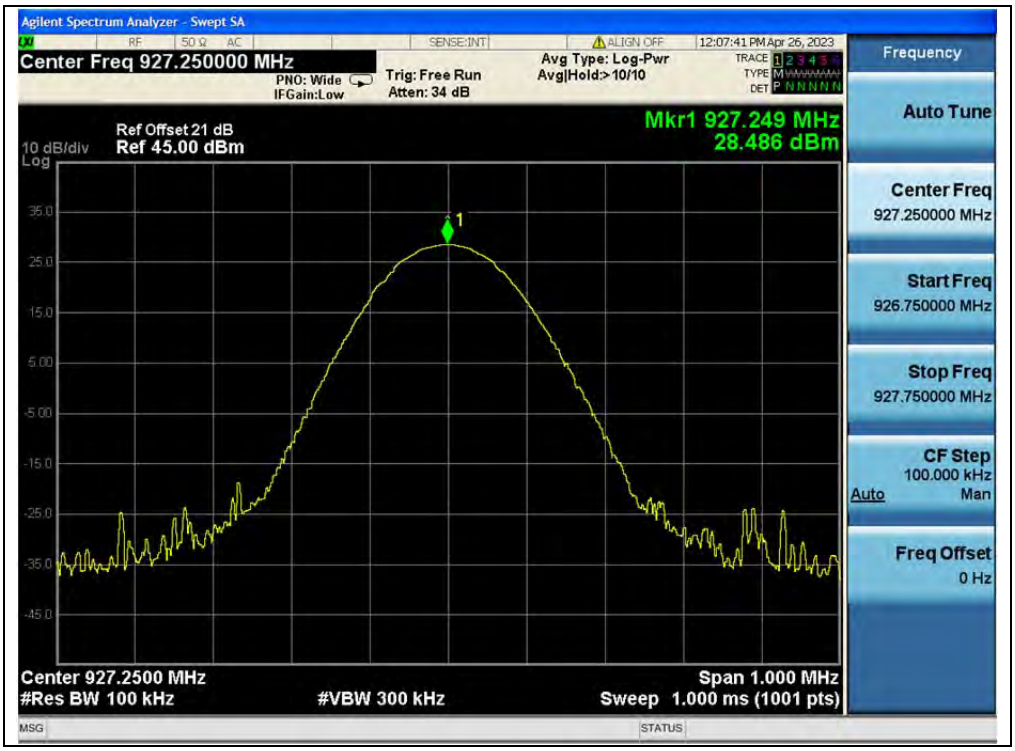
Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	902.75	**29.38**	**0.8670**	30	1	PASS
26	915.25	28.87	0.7709			PASS
50	927.25	28.49	0.7063			PASS

B.Test Plot:

(Channel 1)



(Channel 26)



(Channel 50)

2.6. Maximum Average Conducted Output Power

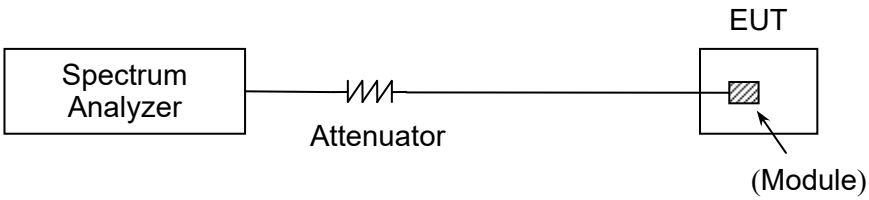
2.6.1. Requirement

According to FCC section 15.247(b)(2), for frequency hopping systems that operates in the 902MHz to 928MHz band employing at least 50 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt, and 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

2.6.2. Test Description

The measured output power was calculated by the reading of the USB Wideband Power Sensor and calibration.

Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the EUT is activated by the PC via Lan port.

2.6.3. Test Result

Channel	Frequency (MHz)	Measured	Average Power			Limit		Verdict
			Duty Factor	Duty Factor Calculated				
		dBm		dBm	W	dBm	W	
1	902.75	24.99	3.11	28.10	0.6457	30	1	PASS
26	915.25	**25.13**		**28.24**	**0.6668**			PASS
50	927.25	24.66		27.77	0.5984			PASS

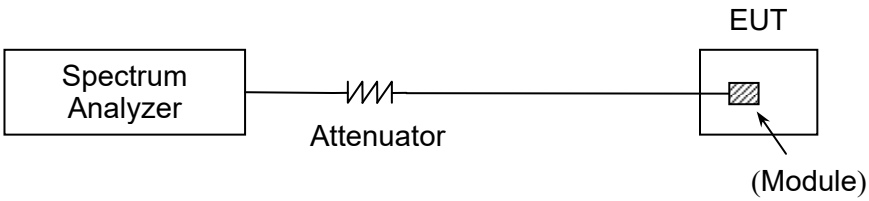
2.7. 20 dB Bandwidth

2.7.1. Definition

According to FCC §15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20 dB bandwidth (10*log1% = 20dB) taking the total RF output power.

2.7.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the EUT is activated by the PC via Lan port.

2.7.3. Test Procedure

Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW ≥1% to 5% of the 20 dB bandwidth
VBW ≥ three times RBW
Sweep = auto
Detector function = peak
Trace = max hold

2.7.4. Test Result

A.Test Verdict:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	Result
1	902.75	55.55	PASS
26	915.25	54.85	PASS
50	927.25	55.15	PASS

B.Test Plot:

(Channel 1)

(Channel 26)

(Channel 50)

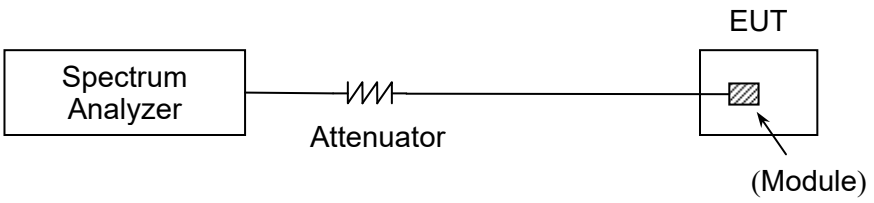
2.8. Carried Frequency Separation

2.8.1. Definition

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

2.8.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the EUT is activated by the PC via Lan port.

2.8.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
Video (or Average) Bandwidth (VBW) ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

2.8.4. Test Result

A.Test Verdict:

Test Mode	Measured Channel Numbers	Carried Frequency Separation (kHz)	20dB bandwidth (kHz)	Min. Limit	Verdict
RFID	25 and 26	499	55.55	20dB bandwidth	PASS

B.Test Plot:

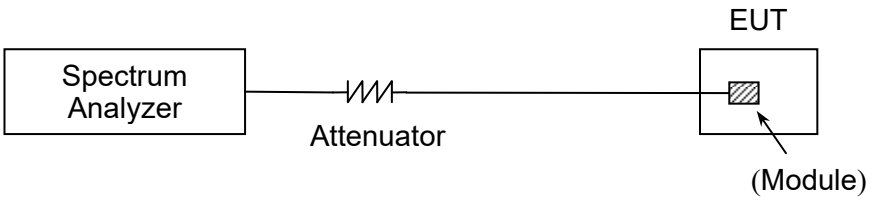
2.9. Time of Occupancy (Dwell time)

2.9.1. Requirement

According to FCC §15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

2.9.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the EUT is activated by the PC via Lan port.

2.9.3. Test Procedure

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in 10 second scan, to enable resolution of each occurrence.
The average time of occupancy in the specified 20 second period is equal to (# of pulses in 20s) * pulse width.

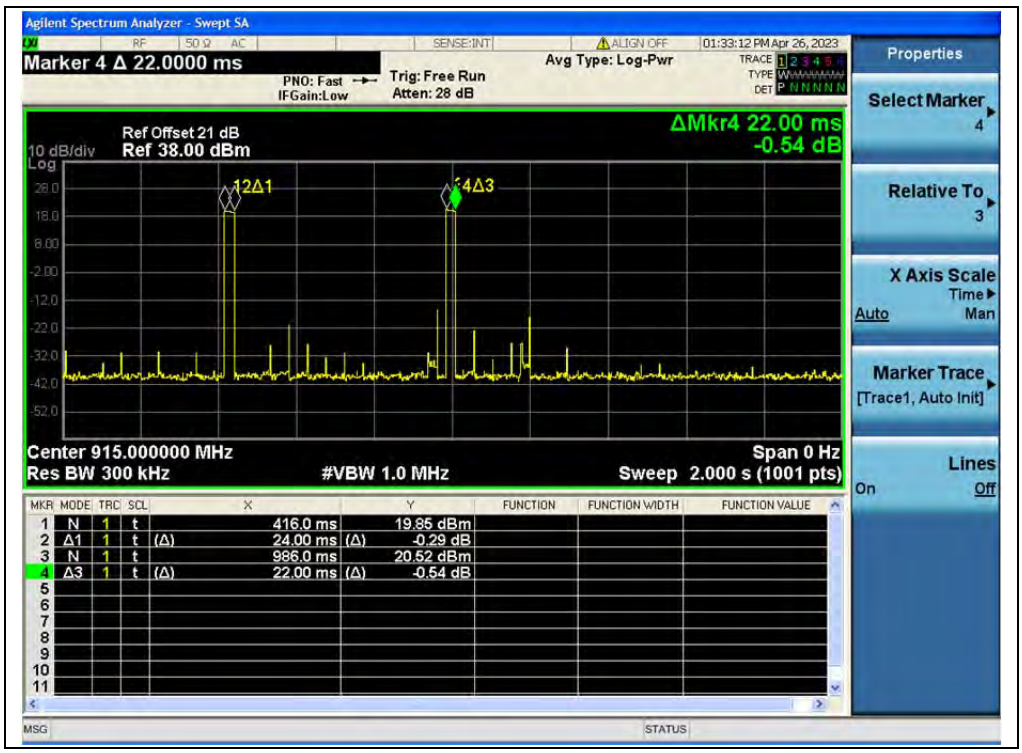
2.9.4. Test Result

GFSK Mode

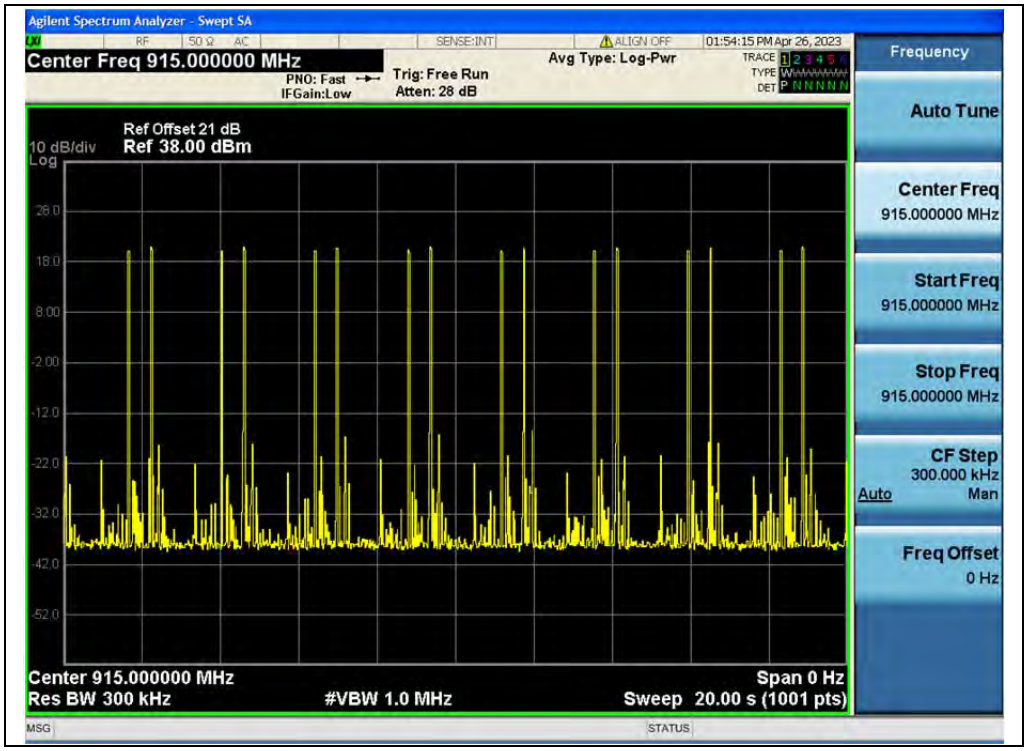
A.Test Verdict:

Frequency (MHz)	Pulse Width (sec)	Number of pulse in 20 seconds	Average Time of Occupancy (sec)	Limit (sec)	Verdict
915	0.024	16	0.384	0.4	PASS

B.Test Plot:



(Dwell time_ Pulse Width)



(Dwell time_Number of pulse)

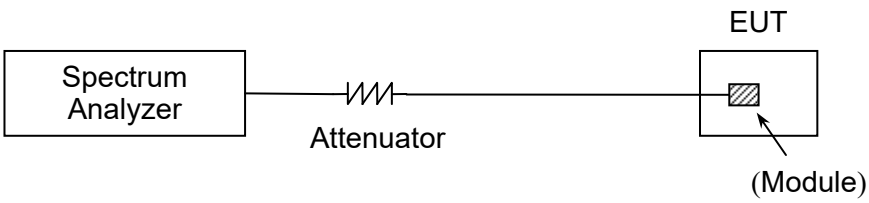
2.10. Conducted Spurious Emissions

2.10.1. Requirement

According to FCC §15.247(d), in any 100kHz 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 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.10.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) with Attenuators the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the EUT is activated by the PC via Lan port.

2.10.3. Test Procedure

Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

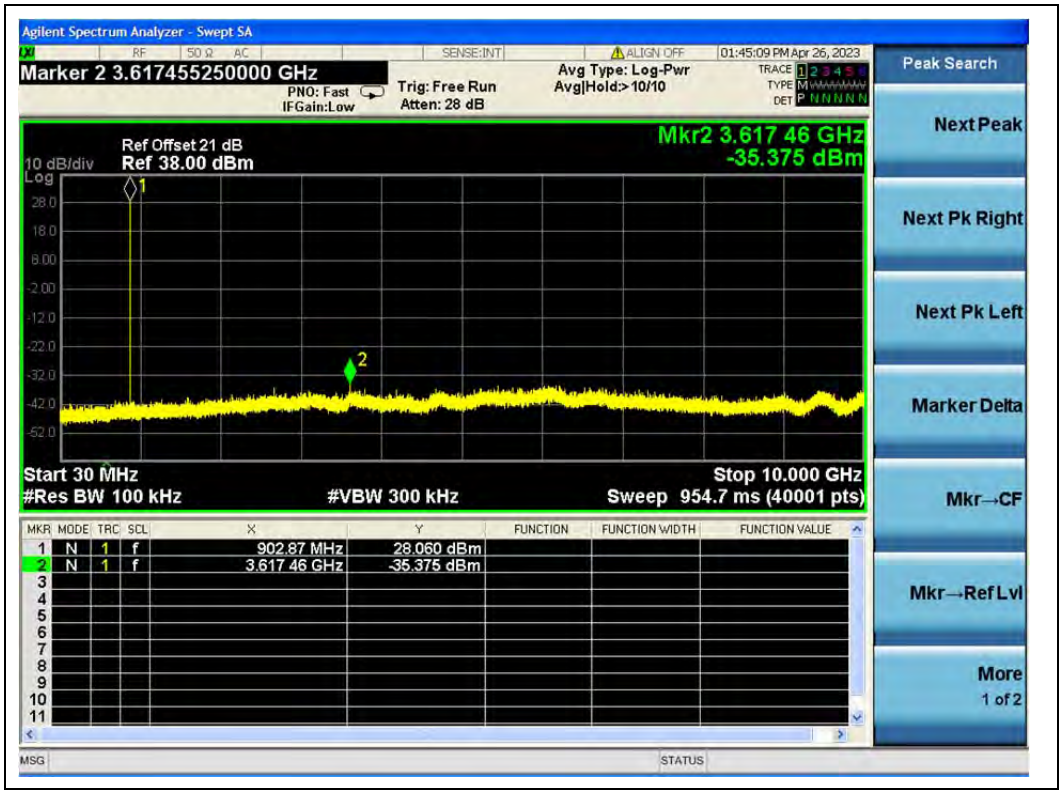
2.10.4. Test Result

GFSK Mode

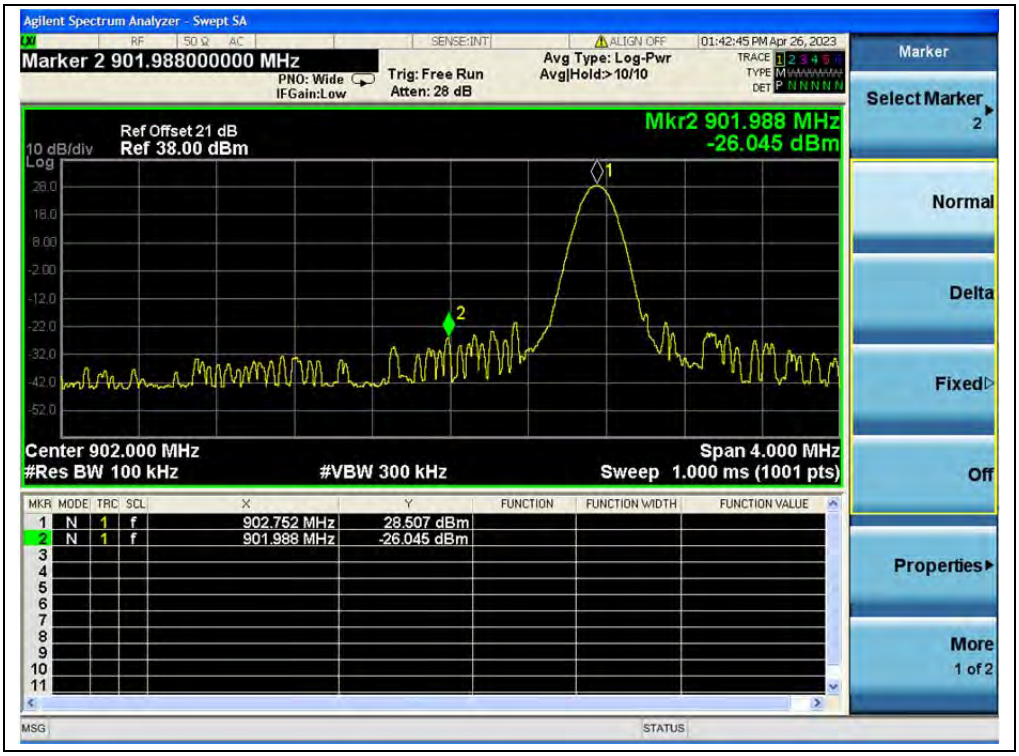
A.Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	902.75	-35.375	28.060	8.060	PASS
26	915.25	-35.636	28.536	8.536	PASS
50	927.25	-35.319	27.955	7.955	PASS

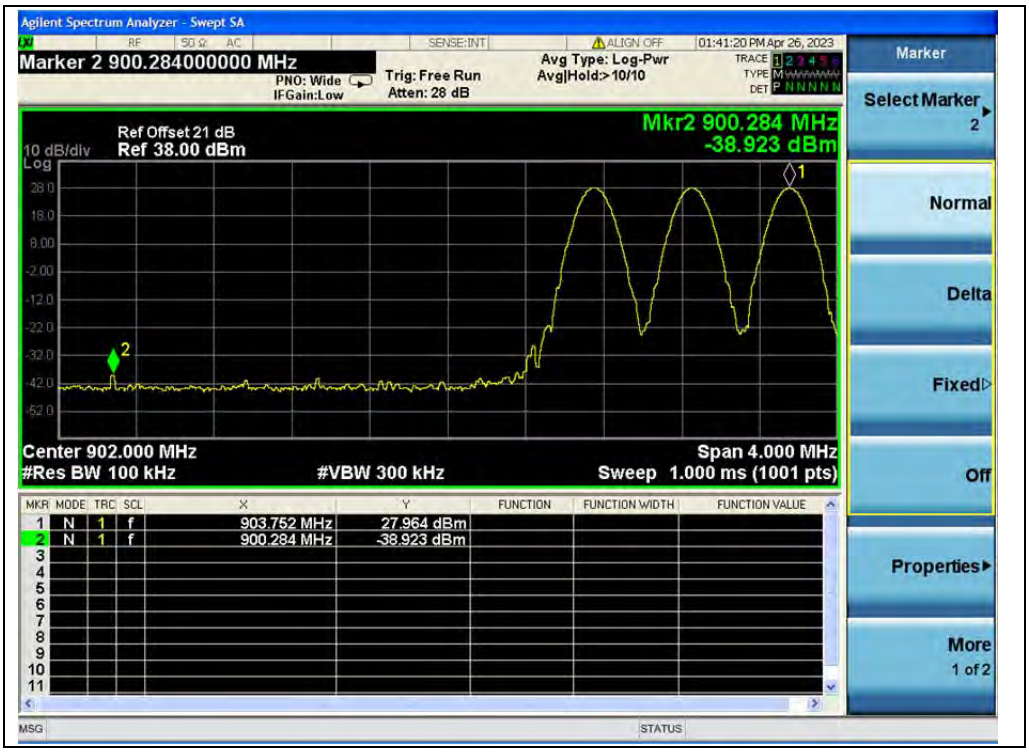
B.Test Plot:



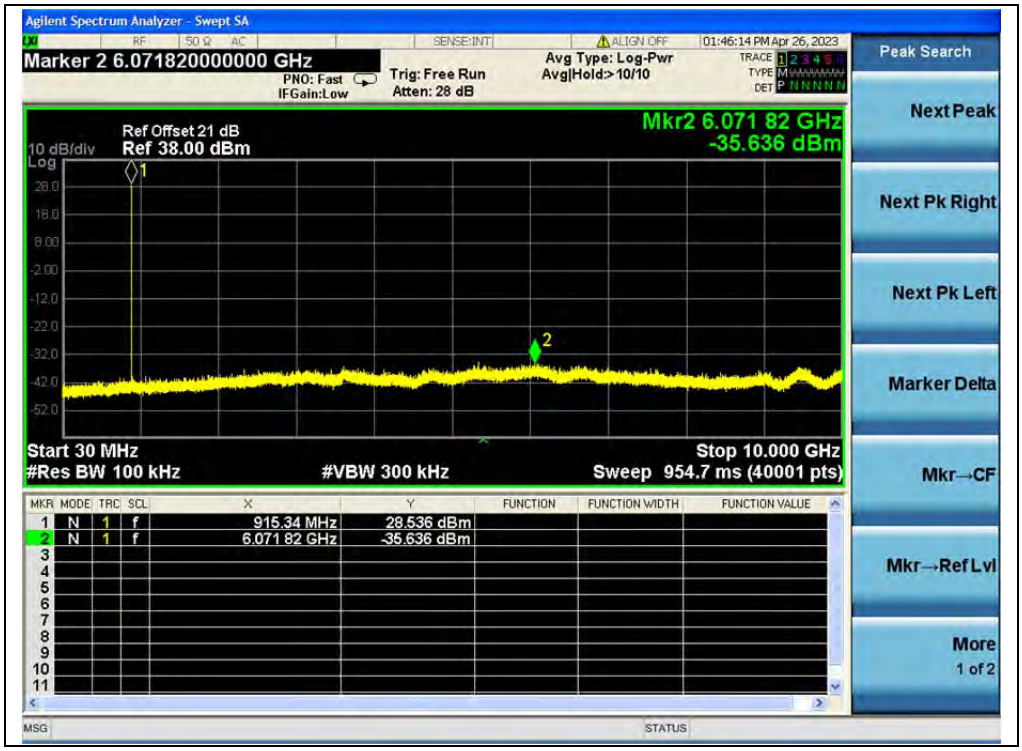
(30MHz to 10GHz, Channel 1, GFSK)



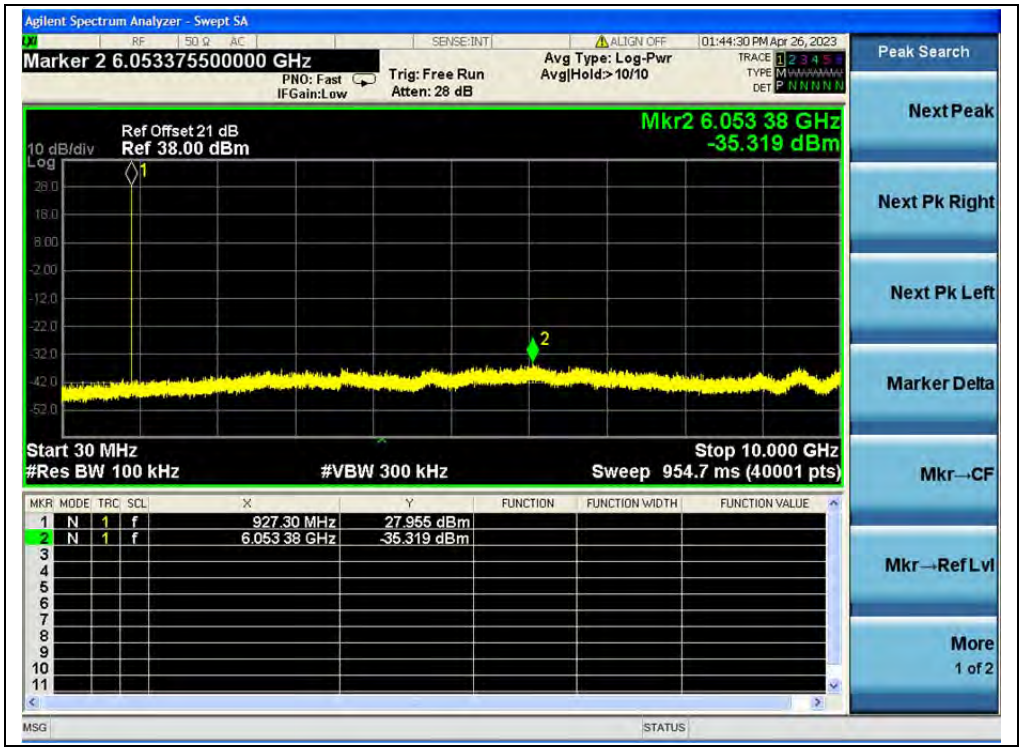
(Band edge, Channel 1, GFSK)



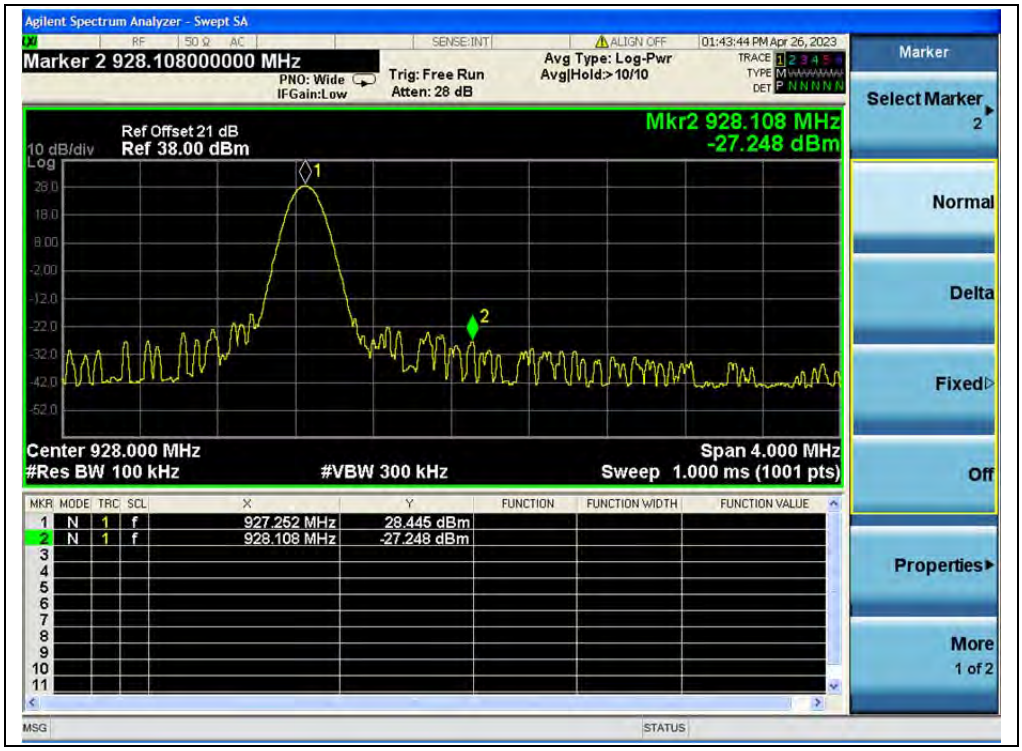
(Band edge with hopping on, Channel 1, GFSK)



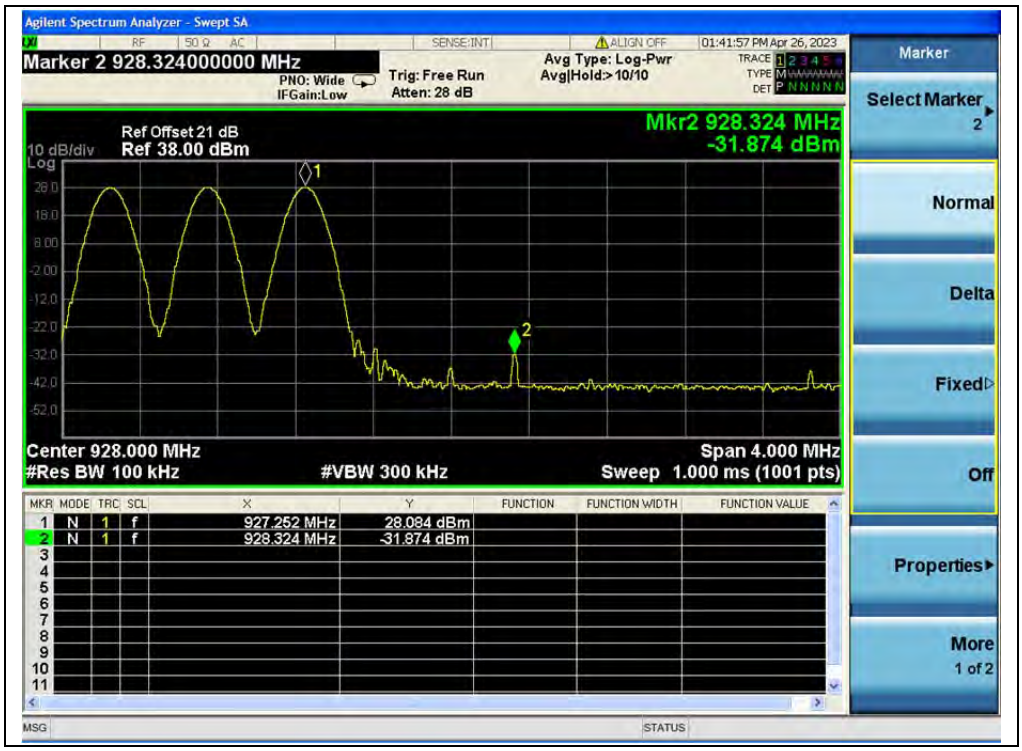
(30MHz to 10GHz, Channel 26, GFSK)



(30MHz to 10GHz, Channel 50, GFSK)



(Band edge, Channel 50, GFSK)



(Band edge with hopping on, Channel 50, GFSK)

2.11. Conducted Emission

2.11.1. Requirement

According to FCC section 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5- 30	60	50

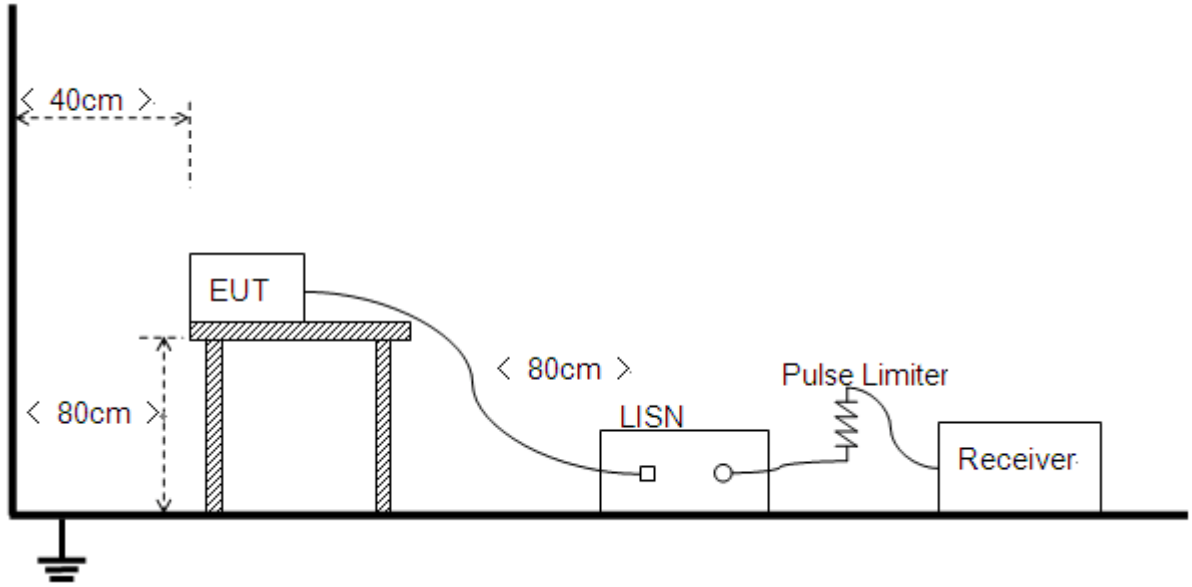
Note:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.11.2. Test Description

Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

2.11.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hzwere considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A.Test Setup:

Test Mode: EUT + PC + USB Cable + RFID TX

Test Voltage: AC 120V/60Hz

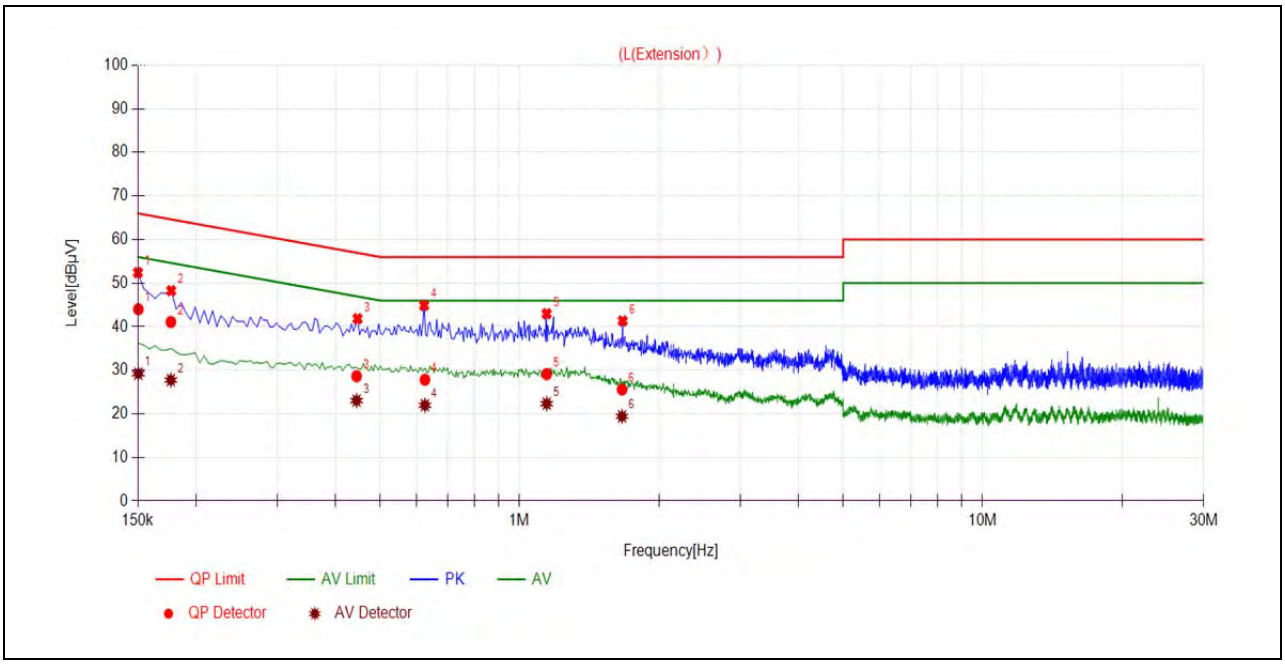
The measurement results are obtained as below:

E [dBμV] $=U_R + L_{Cable\ loss}$ [dB] + A_{Factor}

U_R: Receiver Reading

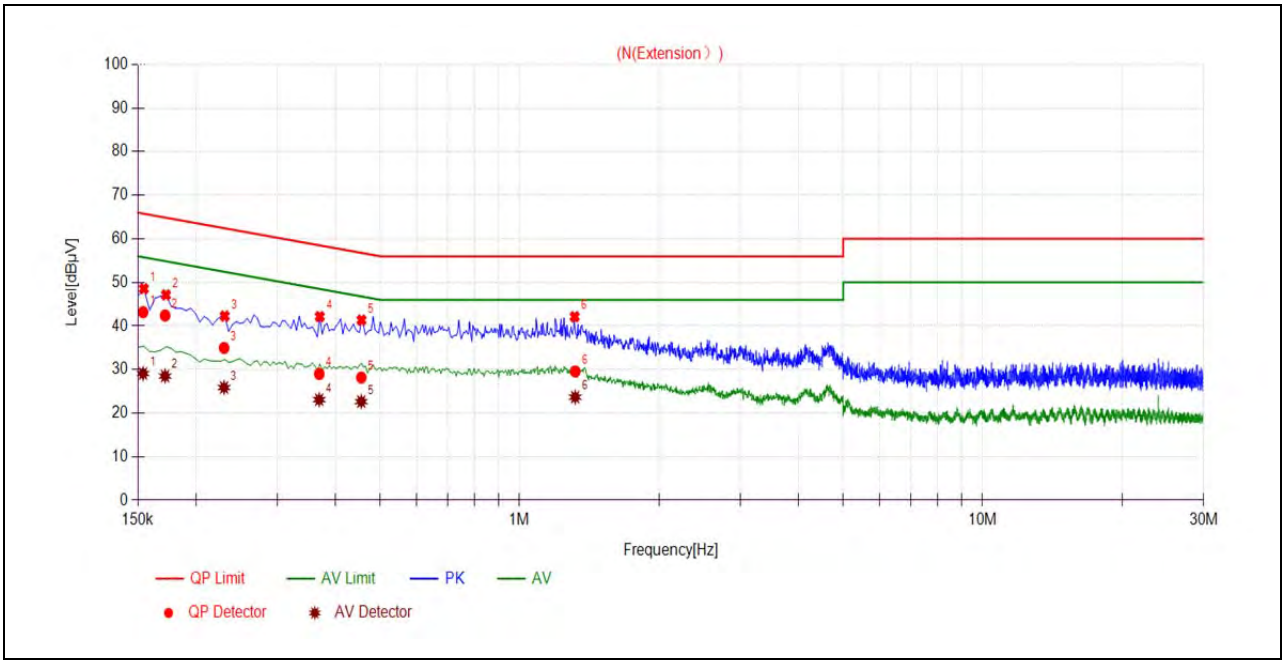
A_{Factor}: Voltage division factor of LISN

B.Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1503	44.00	29.23	65.98	55.98	Line	PASS
2	0.1767	41.09	27.75	64.64	54.64		PASS
3	0.4448	28.64	23.04	56.97	46.97		PASS
4	0.6249	27.83	21.98	56.00	46.00		PASS
5	1.1451	29.12	22.34	56.00	46.00		PASS
6	1.6648	25.58	19.43	56.00	46.00		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1539	43.17	29.08	65.79	55.79	Neutral	PASS
2	0.1717	42.41	28.51	64.88	54.88		PASS
3	0.2302	34.96	25.87	62.44	52.44		PASS
4	0.3694	28.98	23.08	58.51	48.51		PASS
5	0.4554	28.16	22.64	56.78	46.78		PASS
6	1.3191	29.57	23.67	56.00	46.00		PASS

2.12. Radiated Emission

2.12.1. Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).
According to FCC section 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:

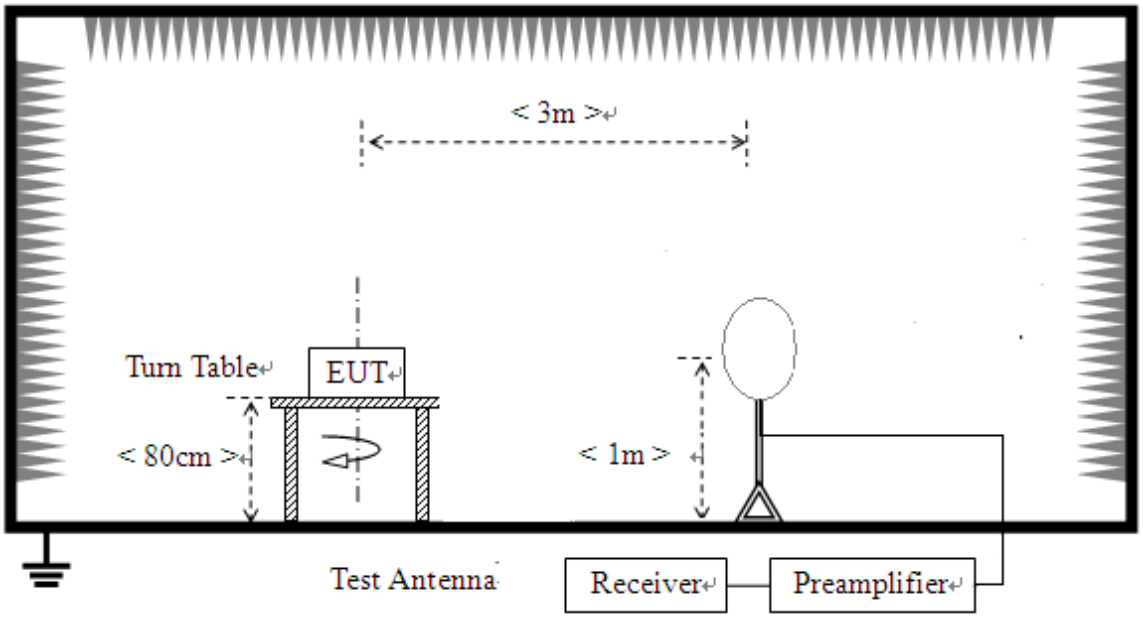
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note1: For above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
Note2: For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).

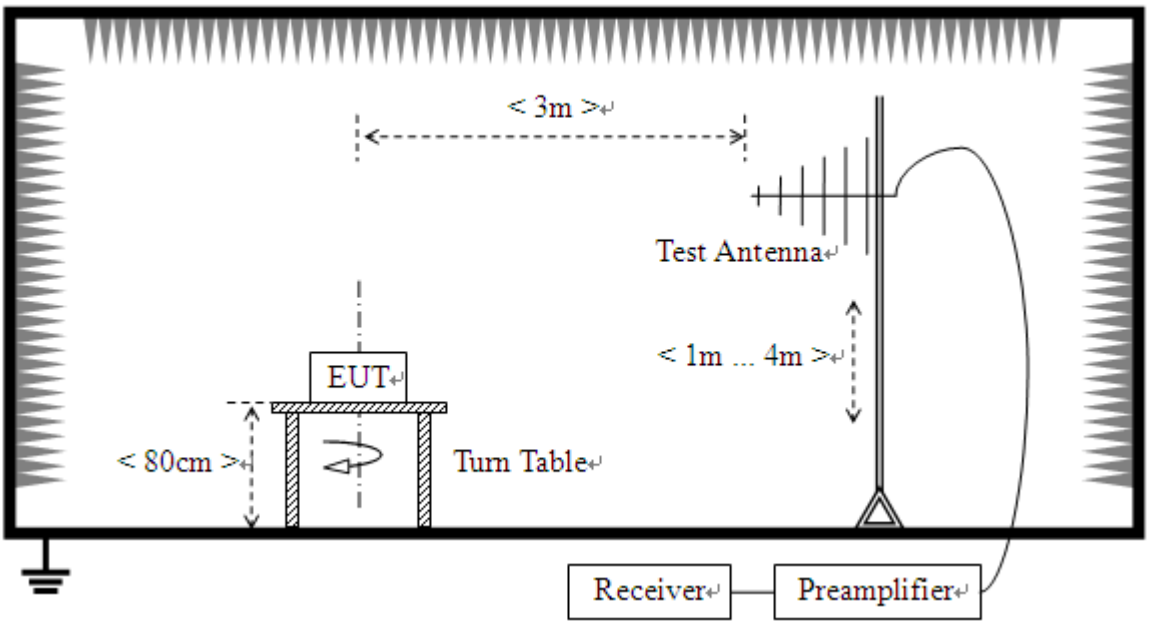
2.12.2. Test Description

Test Setup:

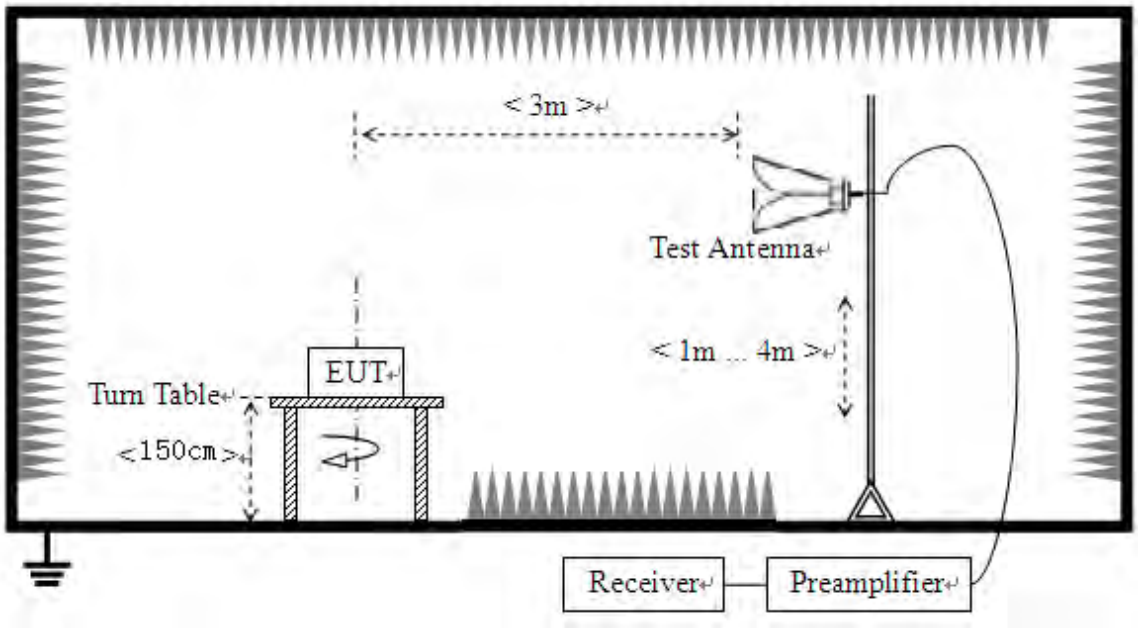
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz.The antenna to EUT distance is 3meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

2.12.3. Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

E [dBμV/m] $=U_R + A_T + A_{Factor}$ [dB]; $A_T = L_{Cable\ loss}$ [dB]$-G_{preamp}$ [dB]

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

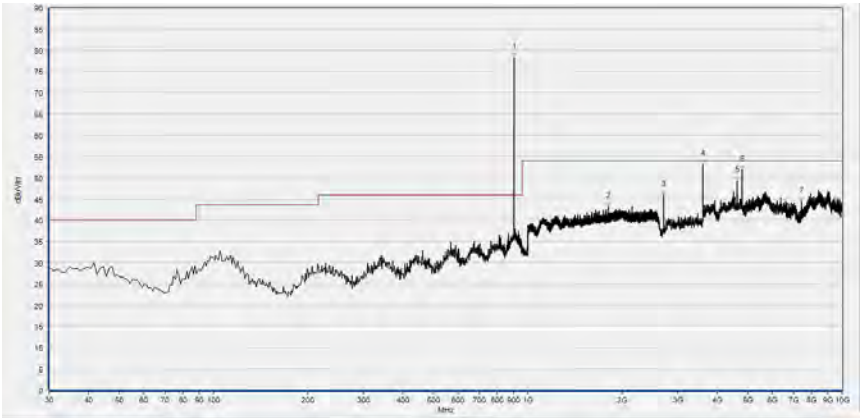
During the test, the total correction Factor AT and A_{Factor} were built in test software.

Note 1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note 2: For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

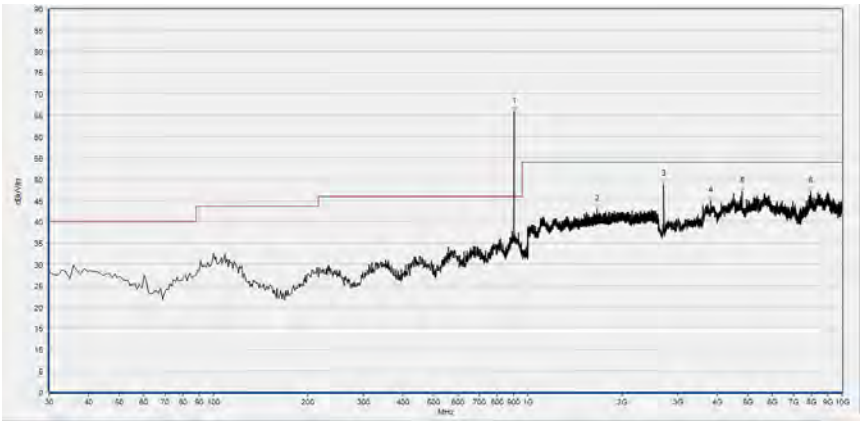
Note 3: N/A means the frequency is the basic frequency or the base station frequency, they are no need to verdict.

Plots for Channel 1



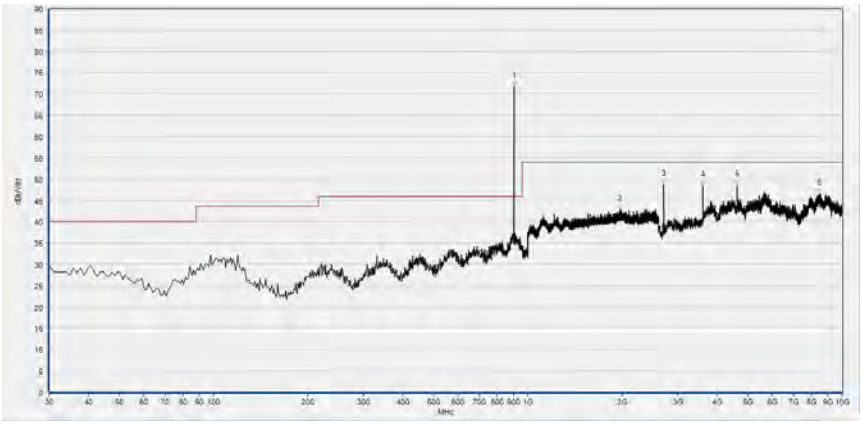
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
903.000	78.20	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1805.333	43.27	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2707.800	45.99	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3610.240	53.09	N/A	48.11	74.00	N/A	54.00	Horizontal	PASS
4632.800	49.22	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4805.280	51.71	N/A	42.90	74.00	N/A	54.00	Horizontal	PASS
7438.680	44.46	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(X axis, 30MHz to 10GHz)



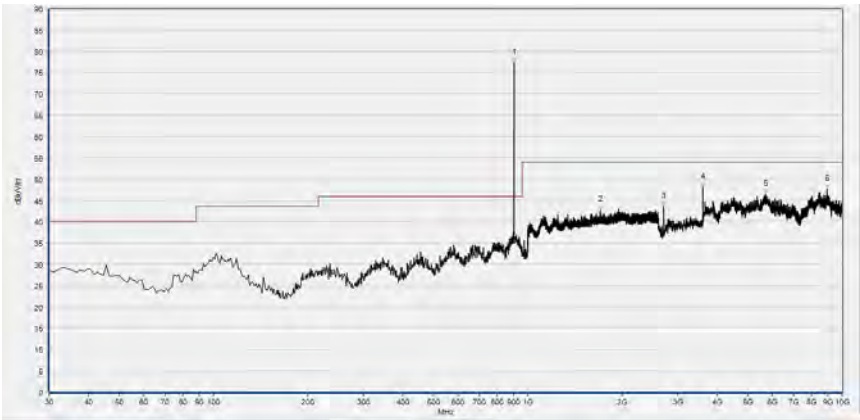
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
903.000	65.90	N/A	N/A	N/A	46.00	N/A	Vertical	N/A
1664.533	42.84	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2707.800	48.83	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3813.520	44.87	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4802.200	47.05	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7940.720	47.02	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(X axis, 30MHz to 10GHz)



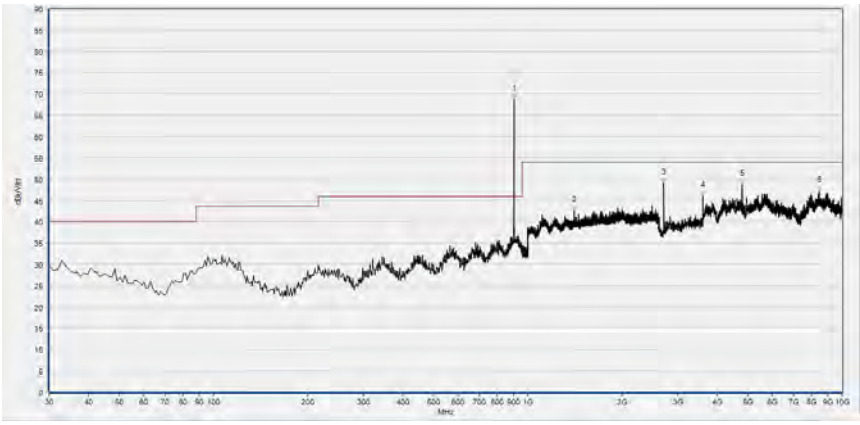
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
903.000	71.77	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1968.000	42.85	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2707.800	48.81	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3610.240	48.46	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4629.720	48.55	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8436.600	46.60	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Y axis, 30MHz to 10GHz)



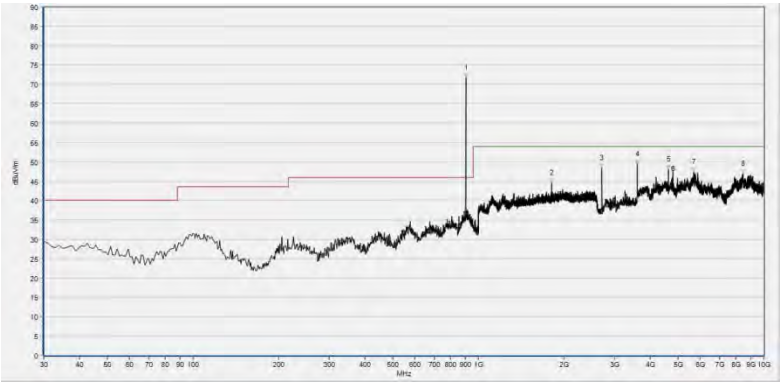
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
903.000	77.25	N/A	N/A	N/A	46.00	N/A	Vertical	N/A
1700.800	42.71	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2707.800	43.50	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3610.240	48.05	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5704.640	46.37	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8950.960	47.52	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Y axis, 30MHz to 10GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
903.000	68.70	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1402.667	42.57	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2707.800	49.10	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3610.240	46.04	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4805.280	48.82	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8448.920	47.25	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

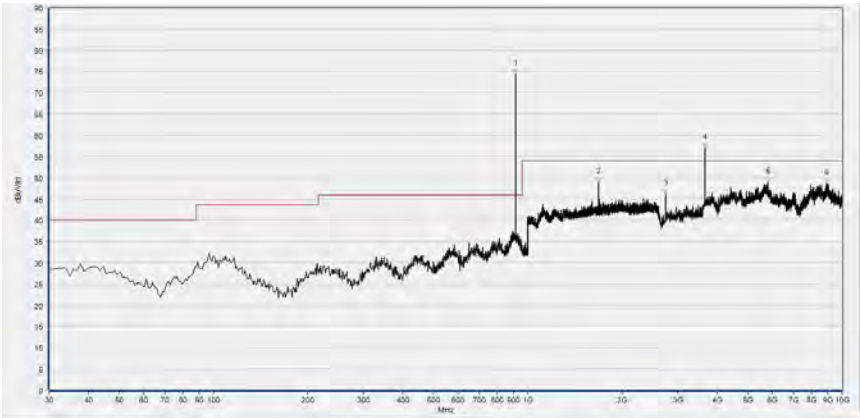
(Z axis, 30MHz to 10GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
903.000	71.81	N/A	N/A	N/A	46.00	N/A	Vertical	N/A
1805.333	44.50	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2707.800	48.49	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3610.240	49.41	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4632.800	48.07	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4805.280	47.64	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5692.320	47.41	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8445.840	46.88	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

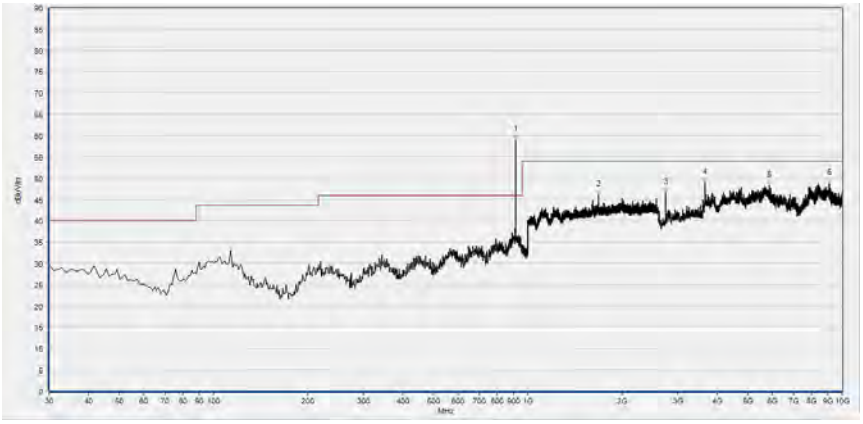
(Z axis, 30MHz to 10GHz)

Plot for Channel 26



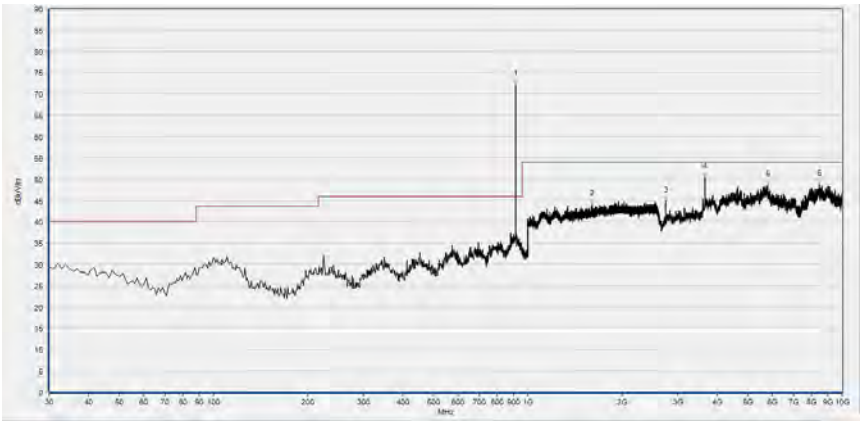
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
915.610	74.42	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1680.000	48.96	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2744.760	46.26	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3659.520	56.92	N/A	50.44	74.00	N/A	54.00	Horizontal	PASS
5812.440	49.01	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8901.680	48.68	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(X axis, 30MHz to 10GHz)



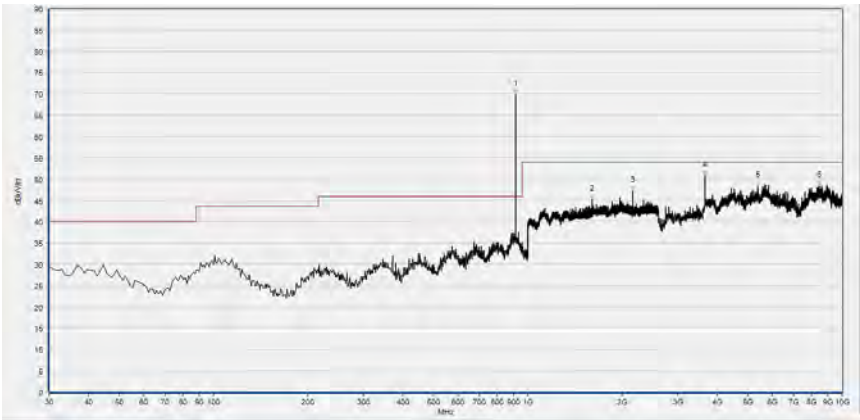
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
915.610	58.94	N/A	N/A	N/A	46.00	N/A	Vertical	N/A
1679.467	46.03	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2744.760	46.58	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3659.520	48.97	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5855.560	48.21	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9089.560	48.76	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(X axis, 30MHz to 10GHz)



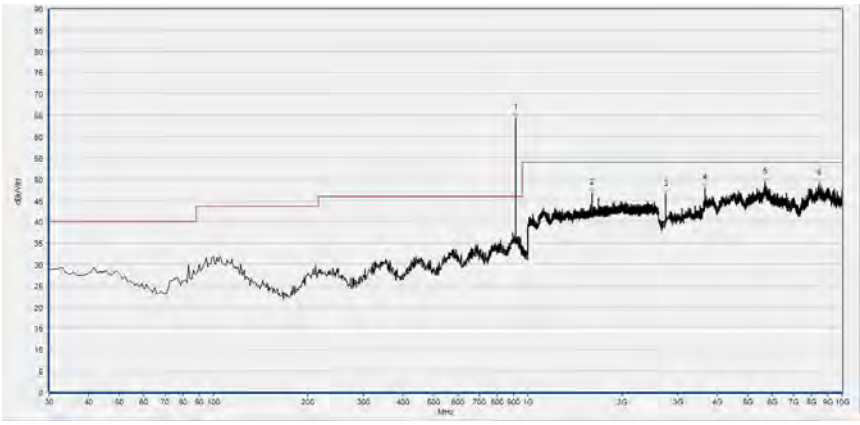
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
915.610	72.16	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1600.000	44.07	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2744.760	44.95	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3659.520	50.53	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5809.360	48.52	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8448.920	48.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Y axis, 30MHz to 10GHz)



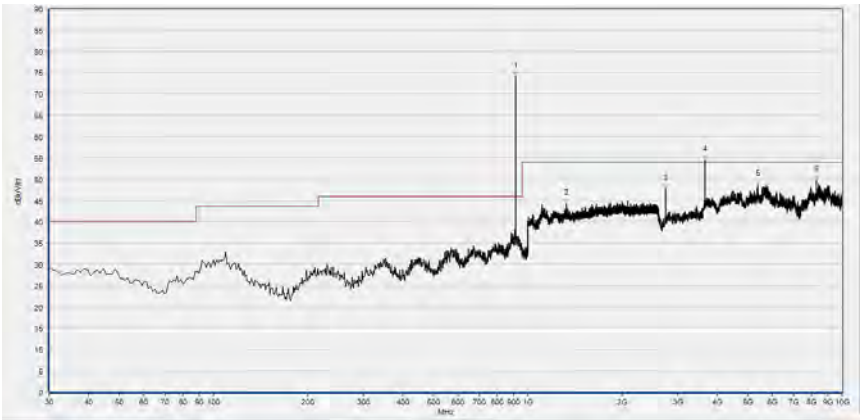
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
915.610	69.93	N/A	N/A	N/A	46.00	N/A	Vertical	N/A
1600.000	45.17	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2160.000	47.22	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3659.520	50.75	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5381.240	48.38	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8470.480	48.47	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Y axis, 30MHz to 10GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
915.610	64.35	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1600.000	46.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2744.760	46.48	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3659.520	47.98	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5680.000	49.19	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8476.640	48.88	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

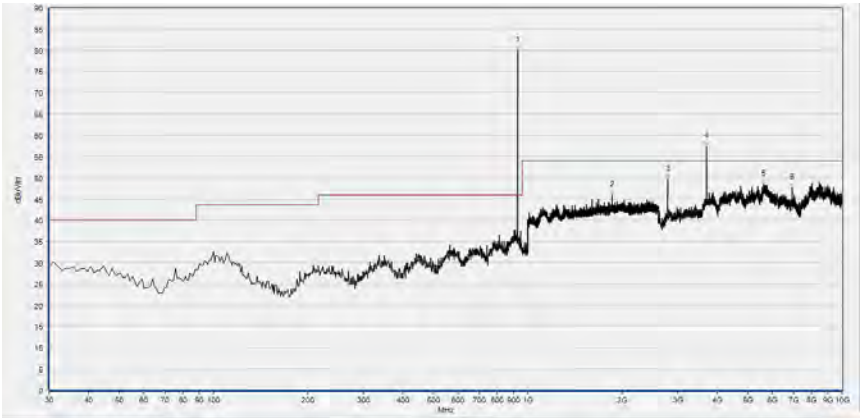
(Z axis, 30MHz to 10GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
915.610	74.06	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1326.933	44.30	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2744.760	47.72	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3659.520	54.42	N/A	46.71	74.00	N/A	54.00	Vertical	PASS
5393.560	48.83	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8285.680	49.78	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

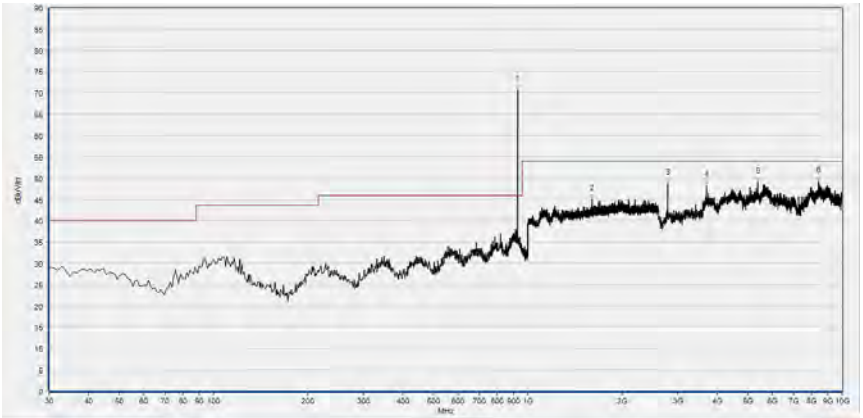
(Z axis, 30MHz to 10GHz)

Plot for Channel 50



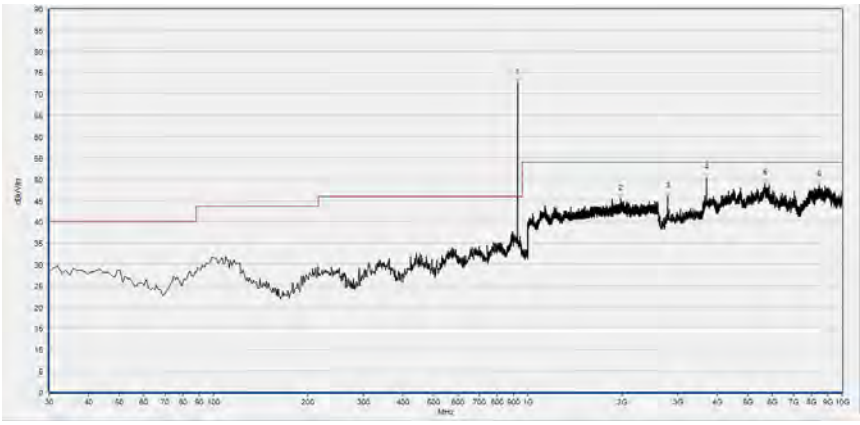
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
927.250	79.87	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1854.400	45.90	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2781.720	49.66	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3708.800	57.32	N/A	49.36	74.00	N/A	54.00	Horizontal	PASS
5621.480	48.36	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6948.960	47.57	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(X axis, 30MHz to 10GHz)



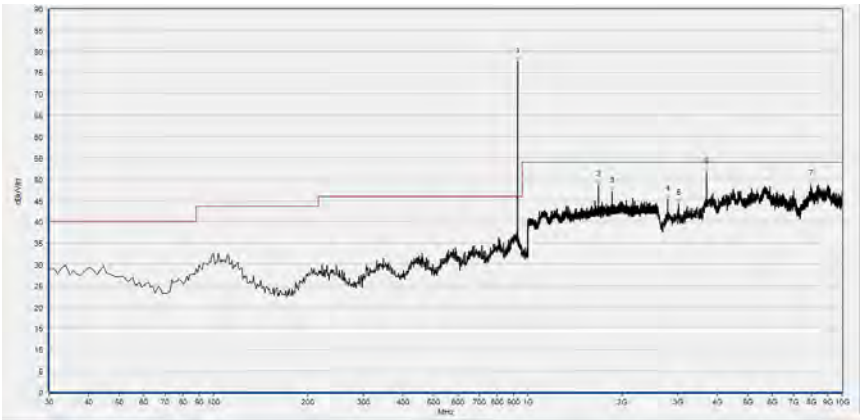
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
927.250	70.71	N/A	N/A	N/A	46.00	N/A	Vertical	N/A
1600.000	45.07	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2781.720	48.84	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3708.800	48.24	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5393.560	49.14	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8421.200	49.25	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(X axis, 30MHz to 10GHz)



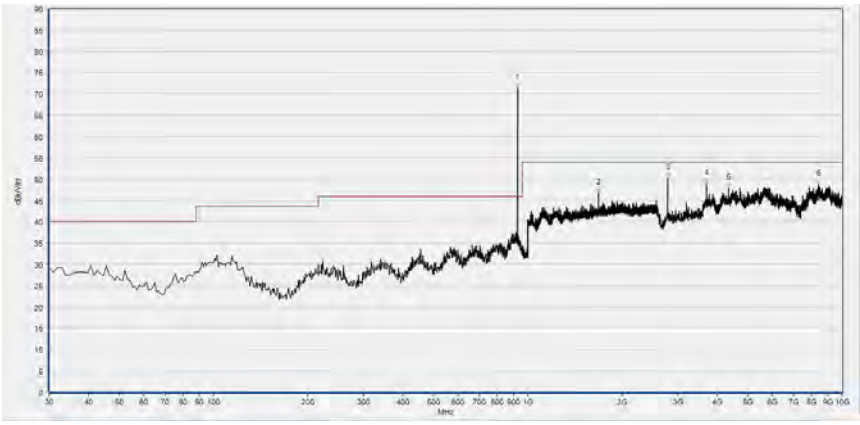
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
927.250	72.59	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1978.133	45.48	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2781.720	45.89	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3708.800	50.33	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5686.160	48.91	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8448.920	48.61	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Y axis, 30MHz to 10GHz)



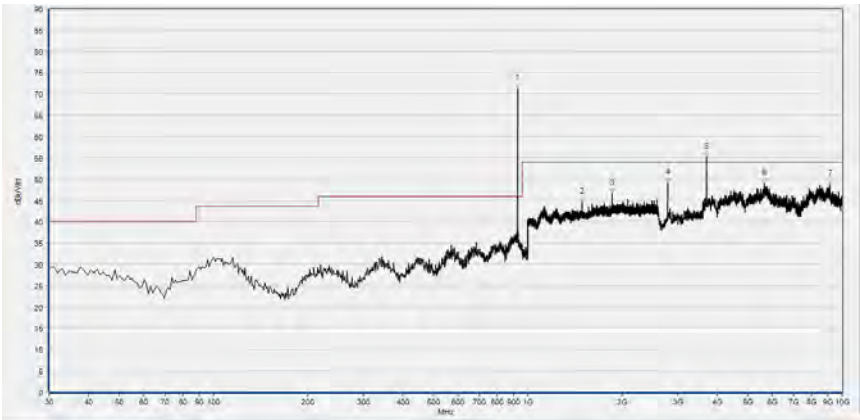
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
927.250	77.52	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1680.533	48.61	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1854.400	47.12	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2781.720	45.33	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3021.960	44.23	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3708.800	51.68	N/A	42.55	74.00	N/A	54.00	Vertical	PASS
7925.320	48.75	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Y axis, 30MHz to 10GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
927.250	71.44	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1680.000	46.70	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2781.720	50.25	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3708.800	48.95	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4358.680	47.96	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8411.960	48.80	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Z axis, 30MHz to 10GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
927.250	71.20	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1485.867	44.53	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1854.400	46.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2781.720	49.11	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3708.800	55.15	N/A	47.37	74.00	N/A	54.00	Vertical	PASS
5649.200	48.94	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9135.760	48.84	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Z axis, 30MHz to 10GHz)

Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test Items	Uncertainty
Number of Hopping Frequency	±5%
Peak Output Power	±2.22dB
20dB Bandwidth	±5%
Carrier Frequency Separation	±5%
Time of Occupancy (Dwell time)	±5%
Conducted Spurious Emission	±2.77dB
Restricted Frequency Bands	±5%
Radiated Emission	±2.95dB
Conducted Emission	±2.44dB

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
EXA Signal Analzyer	MY53470836	N9010A	Agilent	2023.02.27	2024.02.26
RF Cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial Cable	CB02	RF02	Morlab	N/A	N/A
SMA Connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2023.02.09	2024.02.08
LISN	8127449	NSLK 8127	Schwarzbeck	2023.02.21	2024.02.20
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2022.07.06	2023.07.05
RF Coaxial Cable (DC-100MHz)	BNC	MRE04	Qualwave	2022.07.08	2023.07.07
Notebook	N/A	A1370	APPLE	N/A	N/A
Notebook Adapter	N/A	A1374	APPLE	N/A	N/A
Adapter	N/A	ICP30A-120-2000	ULLPOWER	N/A	N/A

4.3 List of Software Used

Description	Manufacturer	Software Version
Test System	Tonscend	V2.6
MORLAB EMCR V1.2	MORLAB	V1.0
TS+ -[JS32-CE]	Tonscend	V2.5.0.0

4.4 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2022.07.06	2023.07.05
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2022.05.25	2025.05.24
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2022.02.11	2025.02.10
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2022.07.13	2025.07.12
Test Antenna – Horn	BBHA9170 #773	BBHA9170	Schwarzbeck	2022.07.14	2025.07.13
Preamplifier (10MHz-6GHz)	46732	S10M100L3802	LUCIX CORP.	2022.07.08	2023.07.07
Preamplifier (2GHz-18GHz)	61171/61172	S020180L3203	LUCIX CORP.	2022.07.08	2023.07.07
Preamplifier (18GHz-40GHz)	DS77209	DCLNA0118-40C-S	Decentest	2022.07.23	2023.07.22
RF Coaxial Cable (DC-18GHz)	MRE001	PE330	Pasternack	2022.07.08	2023.07.07
RF Coaxial Cable (DC-18GHz)	MRE002	CLU18	Pasternack	2022.07.08	2023.07.07
RF Coaxial Cable (DC-18GHz)	MRE003	CLU18	Pasternack	2022.07.08	2023.07.07
RF Coaxial Cable (DC-40GHz)	22290045	QA360-40-KK-0.5	Qualwave	2022.07.08	2023.07.07
RF Coaxial Cable (DC-40GHz)	22290046	QA360-40-KKF-2	Qualwave	2022.07.08	2023.07.07
RF Coaxial Cable (DC-18GHz)	22120181	QA500-18-NN-5	Qualwave	2022.07.08	2023.07.07
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	2022.07.08	2023.07.07
Anechoic Chamber	N/A	9m*6m*6m	CRT	2022.05.10	2025.05.09

END OF REPORT