



TEST REPORT

Applicant: Digital China (China) Co., Ltd
Address of Applicant: No. 304, 3rd Floor, No. 9 Shangdi 9th Street, Haidian District, Beijing
Manufacturer: Digital China (China) Co., Ltd
Address of Manufacturer: No. 304, 3rd Floor, No. 9 Shangdi 9th Street, Haidian District, Beijing
Product Name: Integrated Forklifts RFID Reader
Model No.: YKFR-2ESK, YKFR-3ESK, YKFR-2ESK Slim,
YKFR-3ESK Slim, YKFR-2ESK Pro, YKFR-3ESK Pro
Trade Mark:  Yunke China
FCC ID: 2BHQW-YKFR
Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249
Date of Test: Jul.11,2024-Aug.24,2024
Date of report issued: Aug.25,2024

Remark:

The results shown in this test report refer only to the sample(s) tested , this test report cannot be reproduced, except in full without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver

Prepared By

Shenzhen ETR Standard Technology Co., Ltd.

Address: No.103, No.10, Phase I, Zone 3, Xinxing Industrial Park, Xinhe, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Compiled by:

Reviewed by:

Approved by:



Project Engineer



Project Manager



Authorized Signature



Report Revision History

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1 Test Summary

Test Item	Section in CFR 47	Result	Test by
Antenna Requirement	15.203/15.247 (c)	Pass	/
AC Power Line Conducted Emission	15.207	NA/	/
Conducted Peak Output Power	15.247 (b)(1)	Pass	Yvan Fan
20dB Occupied Bandwidth	15.247 (a)(1)	Pass	Yvan Fan
Carrier Frequencies Separation	15.247 (a)(1)	Pass	Yvan Fan
Hopping Channel Number	15.247 (a)(1)(iii)	Pass	Yvan Fan
Dwell Time	15.247 (a)(1)(iii)	Pass	Yvan Fan
Radiated Emission	15.205/15.209	Pass	Tianyu Huang
Band Edge	15.247(d)	Pass	Yvan Fan

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2013

Measurement Uncertainty

Test Item	Uncertainty Criterion	Measurement Uncertainty	Notes
Occupied Channel Bandwidth	±5%	±0.55%	(1)
RF output power, conducted	±1.5dB	±0.99dB	(1)
Power Spectral Density, conducted	±3dB	±0.61dB	(1)
Unwanted Emissions, conducted	±3dB	±0.64dB	(1)
AC Power Line Conducted Emission	±6dB	± 2.64 dB	(1)
Radiated emissions Below 1GHz	±6dB	±4.32 dB	(1)
Radiated emissions Above 1GHz	±6dB	±4.56dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

2 General Information

2.1 General Description of EUT

Product Name:	Integrated Forklifts RFID Reader
Model No.:	YKFR-2ESK,YKFR-3ESK,YKFR-2ESK Slim, YKFR-3ESK Slim,YKFR-2ESK Pro,YKFR-3ESK Pro
Test Model:	YKFR-2ESK
Difference of model(s)	All the model are the same circuit and RF module, except the model names and colors
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	902.750MHz~927.250MHz
Channel numbers:	50
Channel separation:	0.5MHz
Modulation type:	FHSS
Antenna Type:	ANT1:Microstrip Ceramics Antenna ANT2:PCB Antenna ANT3 :PCB Antenna Please refer to section 4.1 of this report for specific details.
Antenna gain:	ANT1: -1dBi ANT2: 5.82dBi ANT3: 5.82dBi (Note: Antenna information is provided by applicant, Testing lab is not responsible for the accuracy of the information.)
Battery:	Model: GB-1220 DC 12V/20AH
Power supply:	DC 12V From battery

Operation Frequency each of channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
1	902.750 MHz	21	912.750 MHz	41	922.750 MHz
2	903.250 MHz	22	913.250 MHz	42	923.250 MHz
3	903.750 MHz	23	913.750 MHz	43	923.750 MHz
4	904.250 MHz	24	914.250 MHz	44	924.250 MHz
5	904.750 MHz	25	914.750 MHz	45	924.750 MHz
6	905.250 MHz	26	915.250 MHz	46	925.250 MHz
7	905.750 MHz	27	915.750 MHz	47	925.750 MHz
8	906.250 MHz	28	916.250 MHz	48	926.250 MHz
9	906.750 MHz	29	916.750 MHz	49	926.750 MHz
10	907.250 MHz	30	917.250 MHz	50	927.250 MHz
11	907.750 MHz	31	917.750 MHz		
12	908.250 MHz	32	918.250 MHz		
13	908.750 MHz	33	918.750 MHz		
14	909.250 MHz	34	919.250 MHz		
15	909.750 MHz	35	919.750 MHz		
16	910.250 MHz	36	920.250 MHz		
17	910.750 MHz	37	920.750 MHz		
18	911.250 MHz	38	921.250 MHz		
19	911.750 MHz	39	921.750 MHz		
20	912.250 MHz	40	922.250 MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	902.750 MHz
The middle channel	915.250 MHz
The Highest channel	927.250 MHz

2.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: For battery operated equipment, the EUT was performed using a new DC 12V battery.	

2.3 Description of Support Units

Equipment	Model	S/N	Manufacturer
/	/	/	/

2.4 Deviation from Standards

None.

2.5 Abnormalities from Standard Conditions

None.

2.6 Test Facility

Test laboratory:	Shenzhen ETR Standard Technology Co., Ltd.
CNAS Registration Number:	L11864
A2LA Certificate Number:	6640.01
FCC Designation Number:	CN1326
FCC Test Firm Registration:	183064

2.7 Test Location

All tests were performed at:	
Laboratory location:	No.103, No.10, Phase I, Zone 3, Xinxing Industrial Park, Xinhe, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	+86 755 85259392
Fax:	+86 755 27219460

2.8 Additional Instructions

Test Software	GReaderTool.exe
Power level setup	Default

3 Test Instruments list

Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	Rohde&schwarz	ESCI7	100605	2024.3.12	2025.3.11
2	EMI Test Receiver	Rohde&schwarz	ESCI3	102696	2024.3.12	2025.3.11
3	Loop Antenna	schwarabeck	FMZB 1519 B	FMZB 1519 B	2024.3.19	2026.3.18
4	Broadband antenna	schwarabeck	VULB9168	1064	2024.3.19	2026.3.18
5	Horn antenna	schwarabeck	BBHA9120D	9120D-1145	2024.3.19	2026.3.18
6	amplifier	EMtrace	RP01A	50117	2024.3.12	2025.3.11
7	Artificial power network	schwarabeck	NSLK8127	8127483	2024.3.12	2025.3.11
8	Artificial power network	ETS	3186/2NM	1132	2024.3.12	2025.3.11
9	10dB attenuator	HUBER+SUHNER	10dB	/	2024.3.12	2025.3.11
10	amplifier	Space-Dtronics	EWLAN0118G-P40	19113001	2024.3.12	2025.3.11
11	Filter	Xingbo	XBLBQ-GTA19	210410-3-1	2024.3.12	2025.3.11
12	Spectrum analyzer	KEYSIGHT	N9020A	MY55370280	2024.3.12	2025.3.11
13	Power detector box	MWRFTest	MW100-PSB	MW201020JYT	2024.3.12	2025.3.11
14	Power meter	Rohde&Schwarz	NRP-Z11	1138.3004.02-117725-vh	2024.3.12	2025.3.11
15	amplifier	SKET	LNPA_1840-50 (18-40GHz)	SK2019040302	2024.3.12	2025.3.11
16	Horn antenna	schwarabeck	BBHA 9170	946	2024.3.19	2026.3.18
17	Spectrum analyzer	Rohde&schwarz	FSU40	1166.1660K43	2024.3.12	2025.3.11

Note: the calibration interval of the above test instruments is 12 or 24 months and the calibrations are traceable to international system unit (SI).

Software Name	Manufacturer	Model	Version
RF test software	MWRFTest	MTS 8310	V2.0.0.0
Conducted test software	EZ-EMC	Farad	Ver.EMC-CON 3A1.1
Radiated test software	EZ-EMC	Farad	Ver.FA-03A2 RE

4 Test results and Measurement Data

4.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
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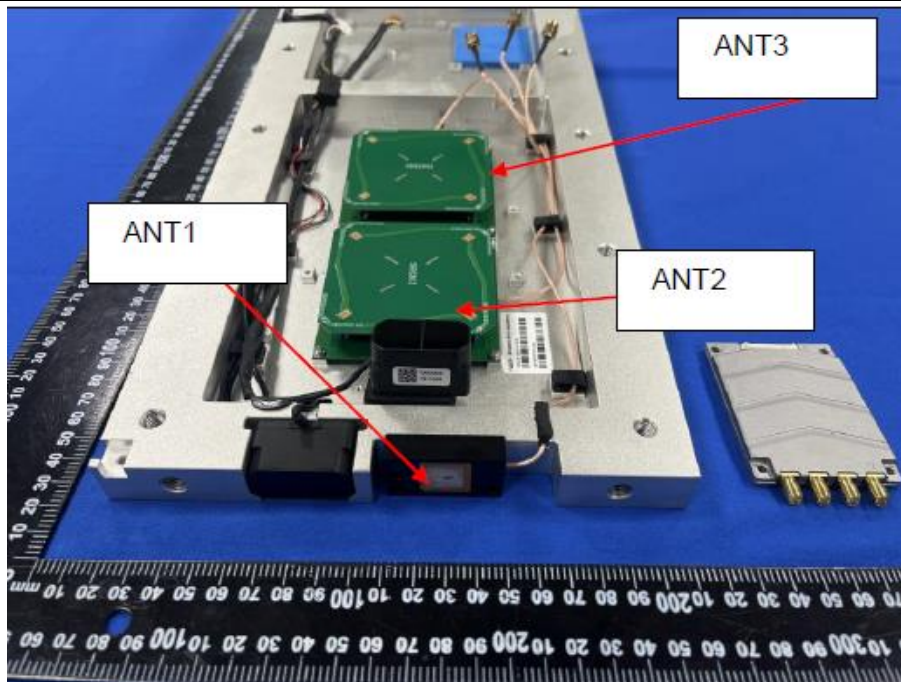
15.203 requirement:

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, 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.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

E.U.T Antenna:



Microstrip Ceramics Antenna (ANT1) gain: -1dBi, PCB Antenna(ANT2/ANT3) gain: 5.82dBi.

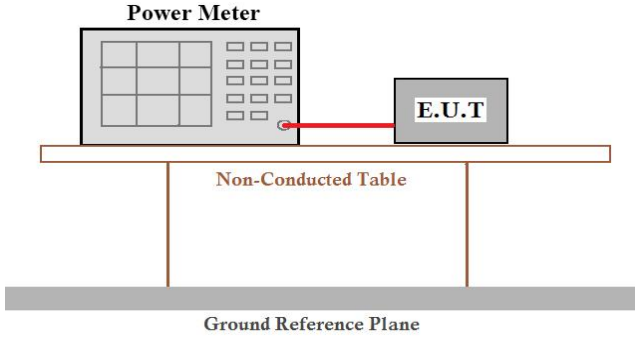
4.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207						
Test Method:	ANSI C63.10:2013						
Test Frequency Range:	150KHz to 30MHz						
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto						
Limit:	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 setup:	Reference Plane 40cm LISN AUX Equipment E.U.T Test table/Insulation plane 80cm LISN Filter AC power EMI Receiver Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m						
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.						
Test Instruments:	Refer to section 3.0 for details						
Test mode:	Refer to section 2.2 for details						
Test environment:	Temp.:	/°C	Humid.:	/%	Press.:	1017mbar	
Test voltage:	/						
Test results:	/						

Remark:

Note: EUT is powered by dedicated batteries, this project is not applicable

4.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(2)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02 KDB662911 D01 Multiple Transmitter Output v02r01
Limit:	Conducted Peak Output Power:30dBm
Test setup:	 The diagram illustrates the test setup. A Power Meter is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. The table is supported by two legs and sits on a Ground Reference Plane.
Test Instruments:	Refer to section 3.0 for details
Test mode:	Refer to section 2.2 for details
Test environment:	Temp.: 24.2°C Humid.: 47%RH
Test voltage:	DC 12V
Test results:	Pass

Measurement Result

ANT	Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
ANT1	Lowest	21.28	30.00	Pass
	Middle	22.04		
	Highest	21.91		
ANT2	Lowest	21.58	30.00	Pass
	Middle	22.13		
	Highest	22.21		
ANT3	Lowest	21.65	30.00	Pass
	Middle	22.38		
	Highest	22.46		

MIMO Mode

Frequency (MHz)	Peak Output Power (dBm)			Peak Output Power (mW)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Result
	ANT1	ANT2	ANT3	ANT1	ANT2	ANT3	ANT1+ANT2 +ANT3	ANT1+ANT2+ANT3		
Lowest	21.28	21.58	21.65	134.28	143.88	146.22	424.38	26.28	27.14	Pass
Middle	22.04	22.13	22.38	159.96	163.31	172.98	496.25	26.96	27.14	Pass
Highest	21.91	22.21	22.46	155.24	166.34	176.20	497.78	26.97	27.14	Pass

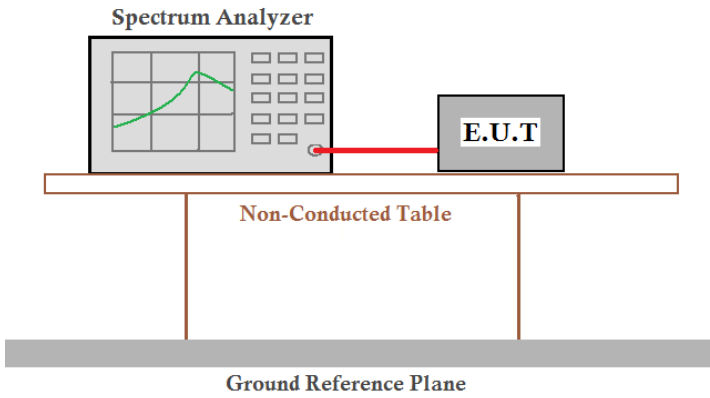
Note:

ANT1 Gain=-1dBi, ANT2 Gain=5.82dBi, ANT3 Gain =5.82dBi, then

Directional gain= $10 \log[(10^{-1/20} + 10^{5.82/20} + 10^{5.82/20})^2 / 3]$ dBi=8.86dBi > 6dBi.

So the limit=30-(8.86-6)=27.14 dBm

4.4 20dB Emission Bandwidth

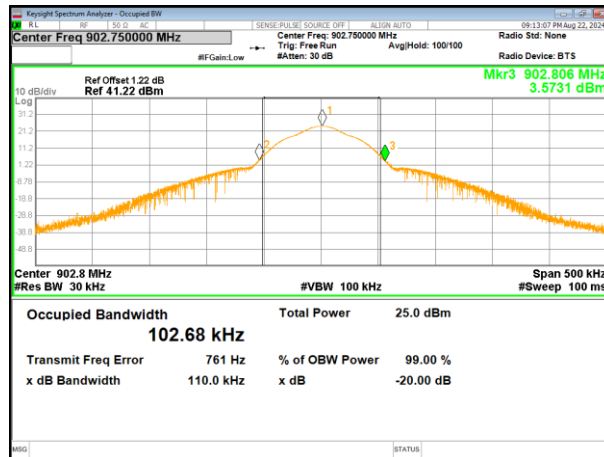
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)	
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02	
Limit:	≤ 250 kHz	
Test setup:		
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 24.2°C	Humid.: 47%RH
Test voltage:	DC 12V	
Test results:	Pass	

Measurement Result

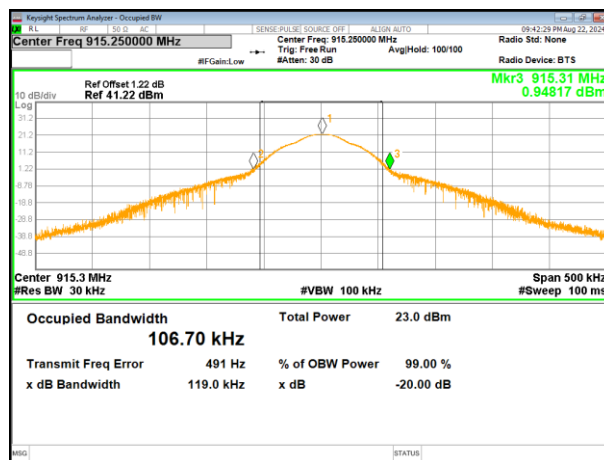
ANT	Test channel	20dB Emission Bandwidth (MHz)	Result
ANT1	Lowest	0.1100	Pass
	Middle	0.1190	
	Highest	0.1160	
ANT2	Lowest	0.1135	Pass
	Middle	0.1115	
	Highest	0.1108	
ANT3	Lowest	0.1137	Pass
	Middle	0.1113	
	Highest	0.1113	

Test plot as follows:

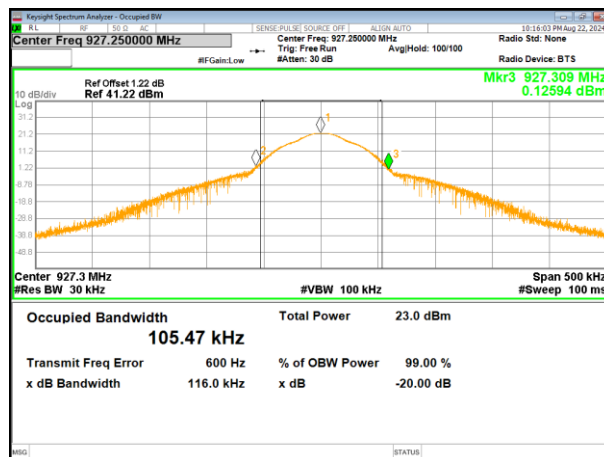
ANT1:



Lowest channel

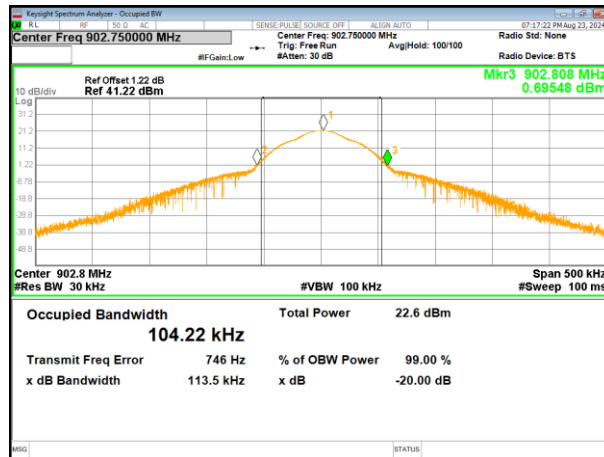


Middle channel

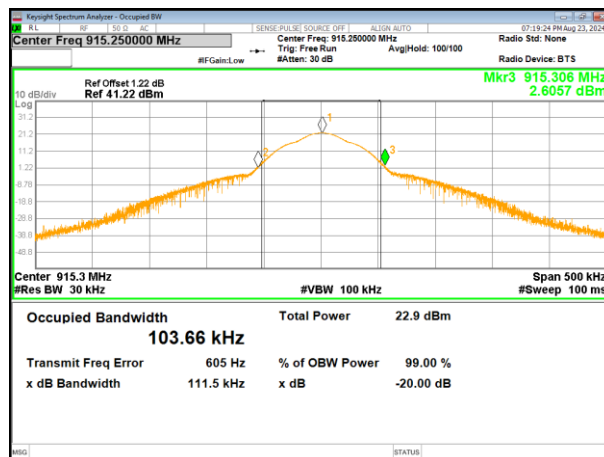


Highest channel

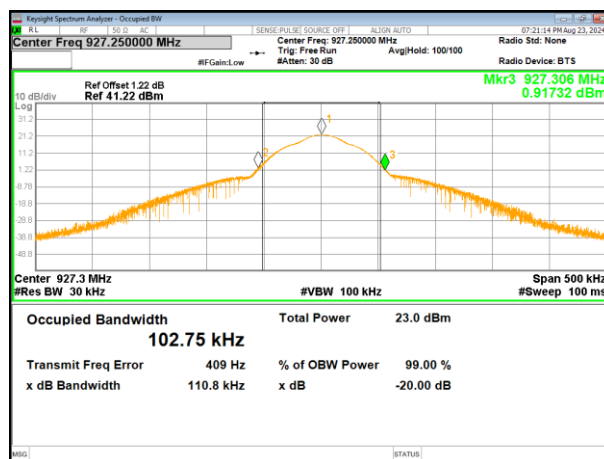
ANT2:



Lowest channel

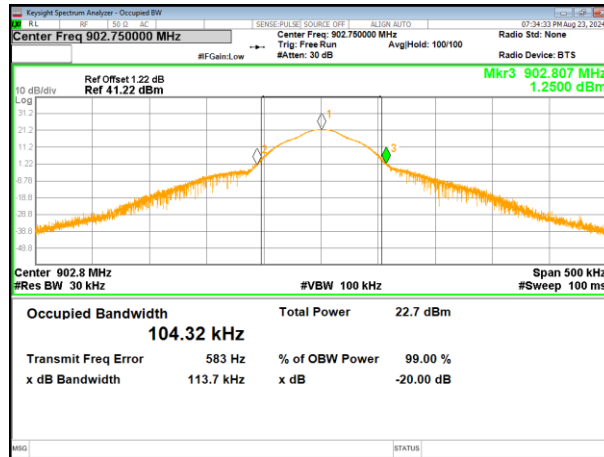


Middle channel

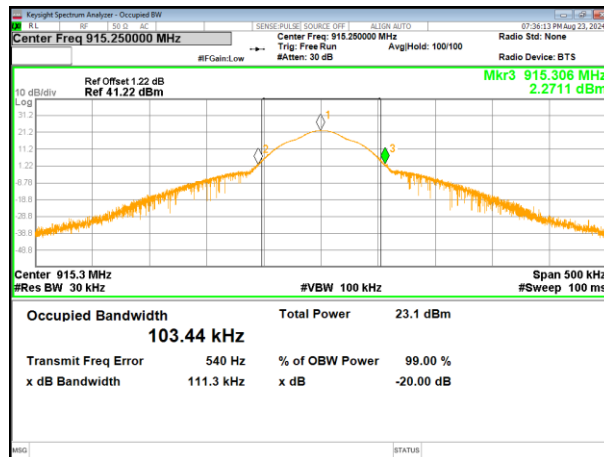


Highest channel

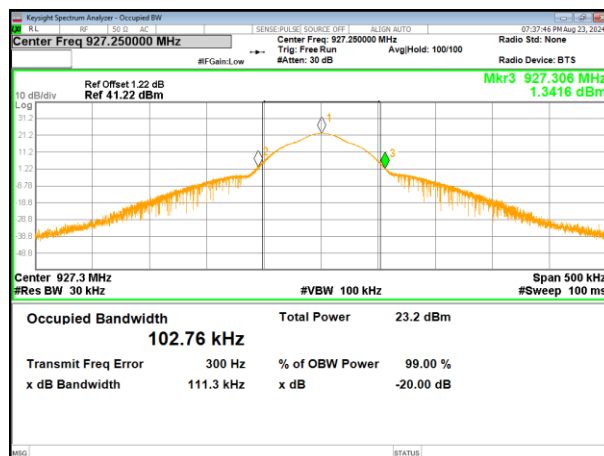
ANT3:



Lowest channel

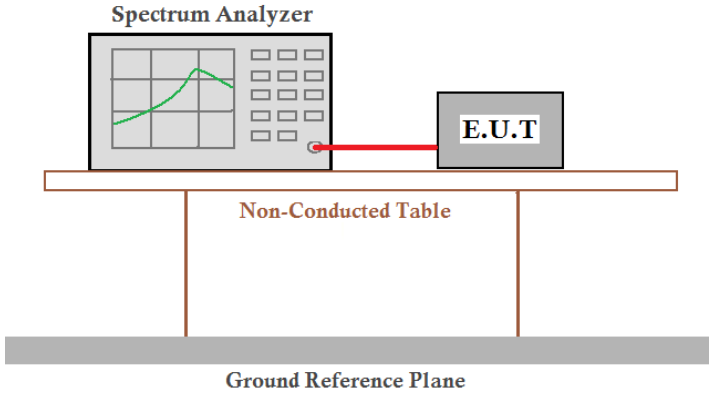


Middle channel



Highest channel

4.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)	
Test Method:	ANSI C63.10:2013	
Receiver setup:	RBW=30KHz, VBW=100KHz, detector=Peak	
Limit:	>0.025MHz or 20dB bandwidth (whichever is greater)	
Test setup:		
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 24.2°C	Humid.: 47%RH
Test voltage:	DC 12V	
Test results:	Pass	

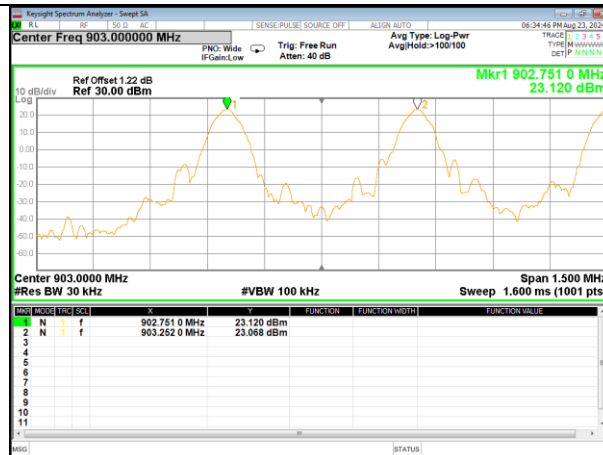
Measurement Result

ANT	Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
ANT1	Lowest	0.5010	0.1100	Pass
	Middle	0.4972	0.1190	Pass
	Highest	0.5010	0.1160	Pass
ANT2	Lowest	0.4988	0.1135	Pass
	Middle	0.5010	0.1115	Pass
	Highest	0.5002	0.1108	Pass
ANT3	Lowest	0.4995	0.1137	Pass
	Middle	0.4995	0.1113	Pass
	Highest	0.5003	0.1113	Pass

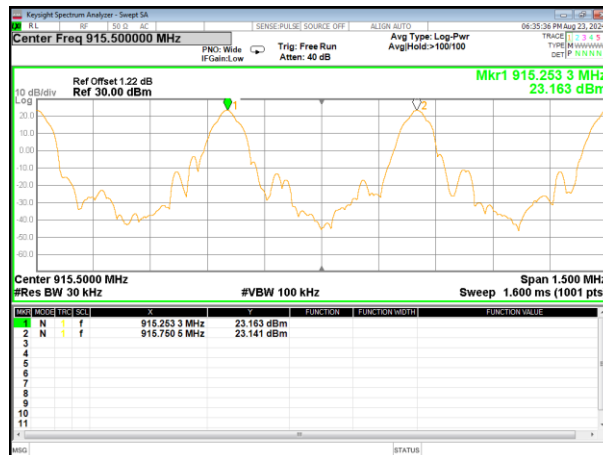
Note: According to section 4.4

Test plot as follows:

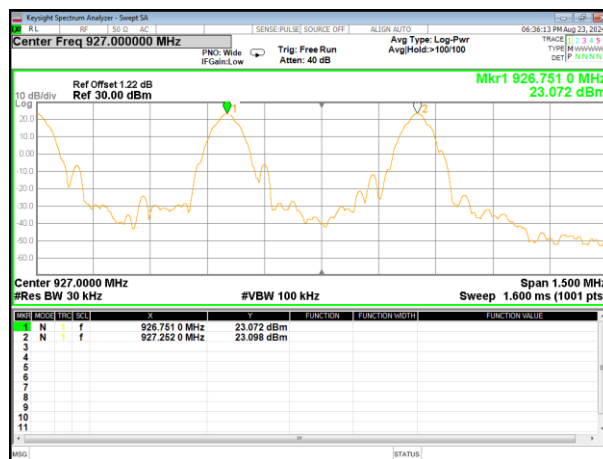
ANT1:



Lowest channel

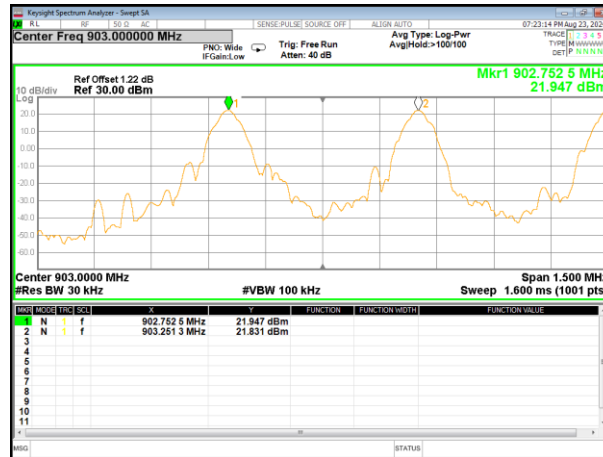


Middle channel

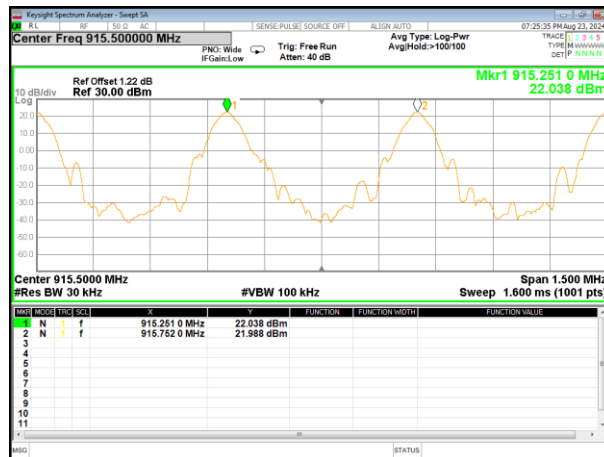


Highest channel

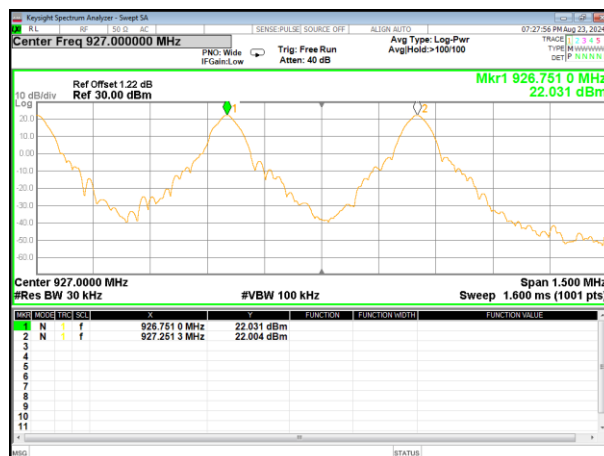
ANT2:



Lowest channel

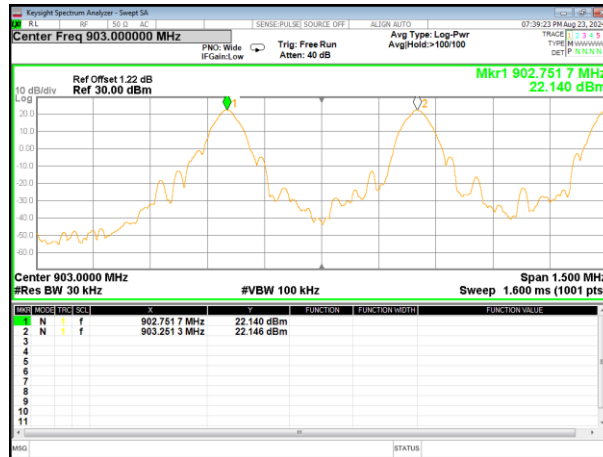


Middle channel

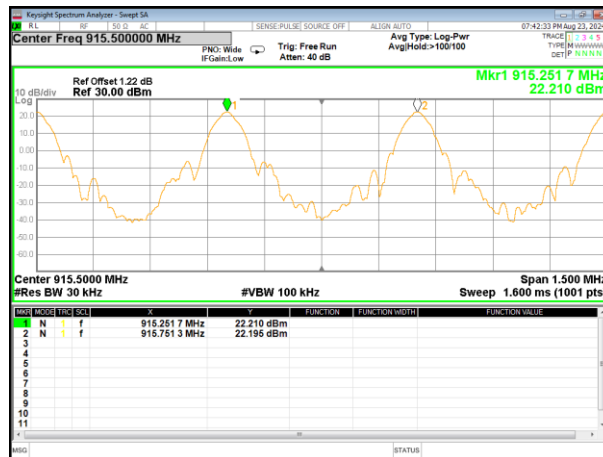


Highest channel

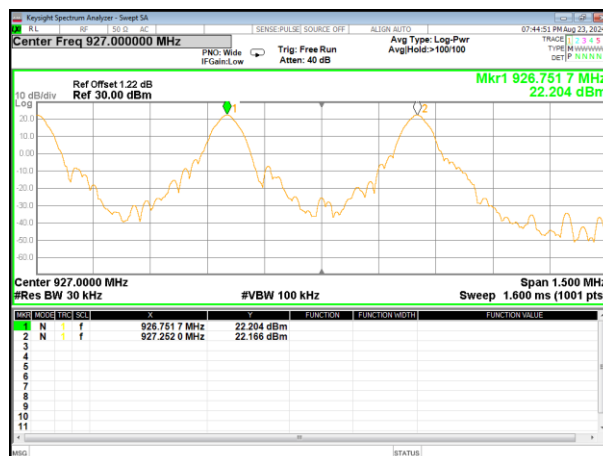
ANT3:



Lowest channel

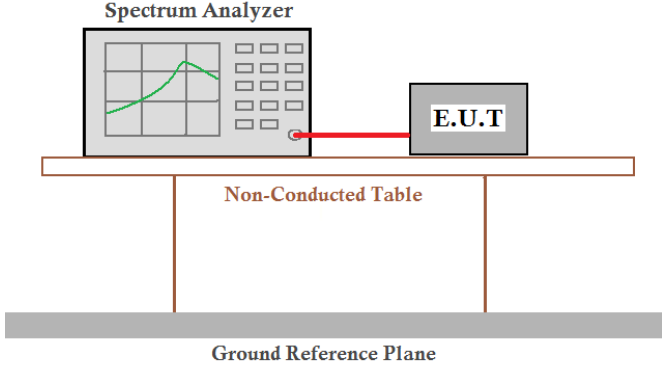


Middle channel



Highest channel

4.6 Hopping Channel Number

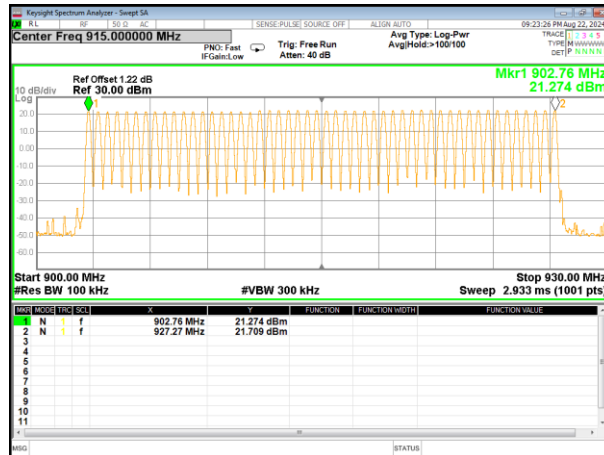
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)	
Test Method:	ANSI C63.10:2013	
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=900MHz-930MHz, Detector=Peak	
Limit:	50 channels	
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.	
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 24.2°C	Humid.: 47%RH
Test voltage:	DC 12V	
Test results:	Pass	

Measurement Data:

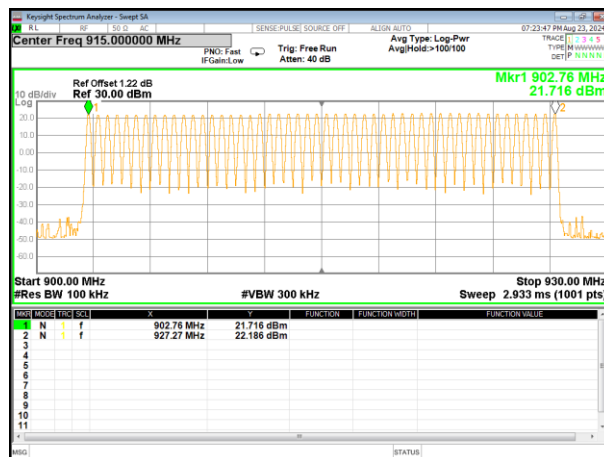
ANT	Hopping channel numbers	Limit	Result
ANT1	50	50	Pass
ANT2	50	50	Pass
ANT3	50	50	Pass

Test plot as follows:

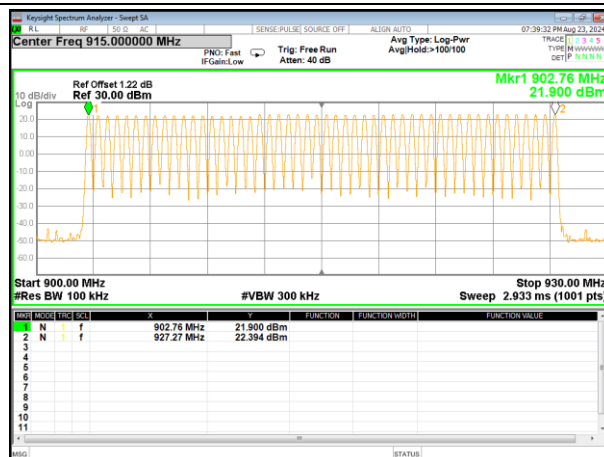
ANT1:



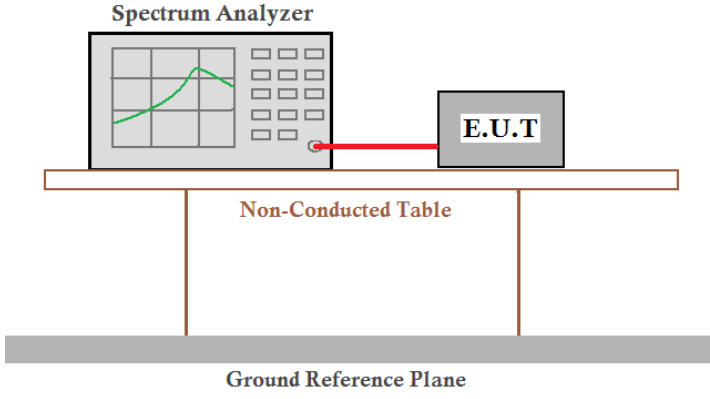
ANT2:



ANT3:



4.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)	
Test Method:	ANSI C63.10:2013	
Receiver setup:	RBW=100KHz, VBW=300KHz, Span=0Hz, Detector=Peak	
Limit:	0.4 Second	
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T are placed on a Non-Conducted Table. The table is supported by two vertical legs. Below the table is a Ground Reference Plane.	
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 24.2°C	Humid.: 47%RH
Test voltage:	DC 12V	
Test results:	Pass	

Measurement Result**ANT1:**

Frequency	Dwell time(ms)	Limit(ms)	Result
902.750 MHz	362.34	400	Pass

Remarks:

The test period: $T = 0.4 \text{ Second/Channel} \times 50 \text{ Channel} = 20 \text{ s}$
time slot = $16.47 \text{ (ms)} \times 22 = 362.34 \text{ ms}$

ANT2:

Frequency	Dwell time(ms)	Limit(ms)	Result
915.250 MHz	362.34	400	Pass

Remarks:

The test period: $T = 0.4 \text{ Second/Channel} \times 50 \text{ Channel} = 20 \text{ s}$
time slot = $16.47 \text{ (ms)} \times 22 = 362.34 \text{ ms}$

ANT3:

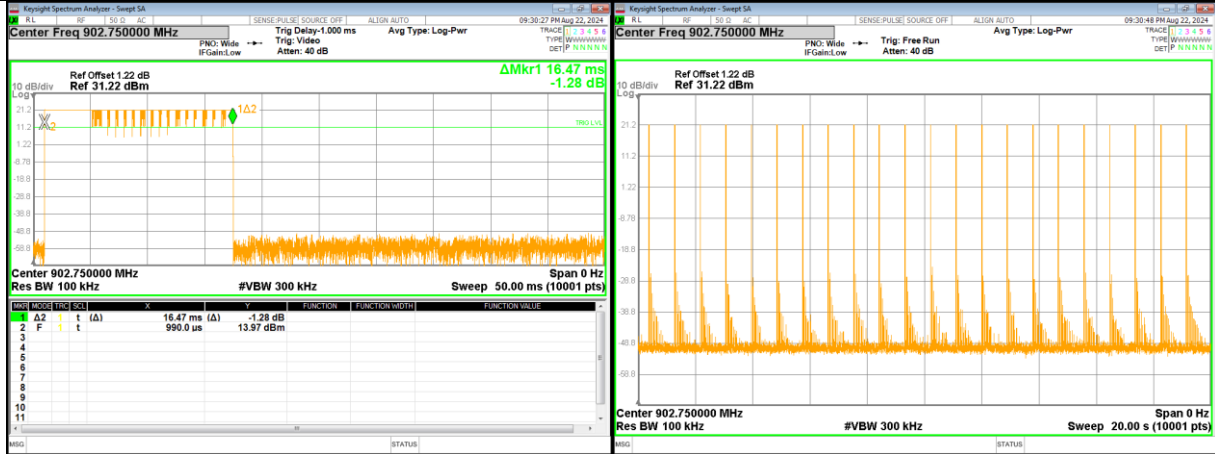
Frequency	Dwell time(ms)	Limit(ms)	Result
927.250 MHz	362.34	400	Pass

Remarks:

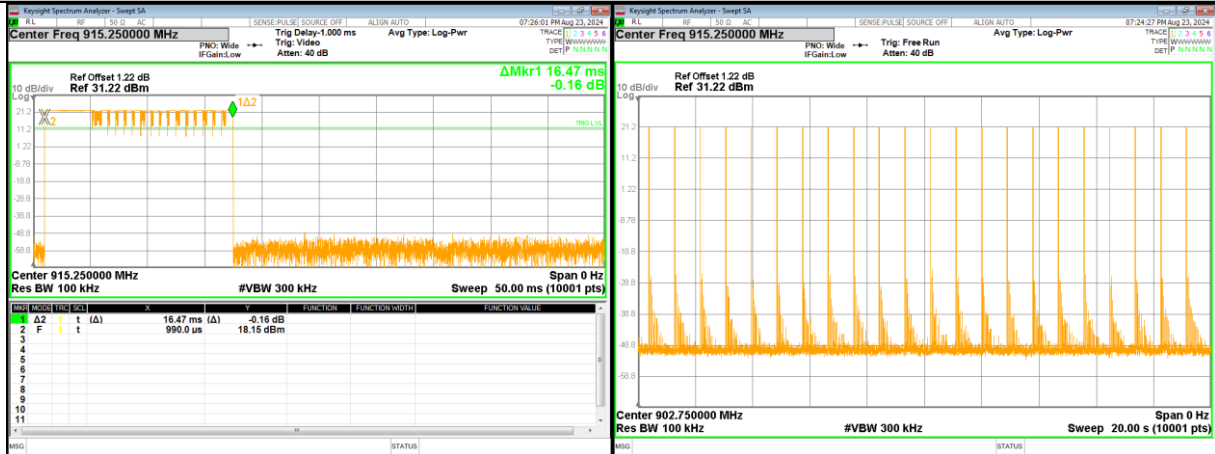
The test period: $T = 0.4 \text{ Second/Channel} \times 50 \text{ Channel} = 20 \text{ s}$
time slot = $16.47 \text{ (ms)} \times 22 = 362.34 \text{ ms}$

Test plot as follows:

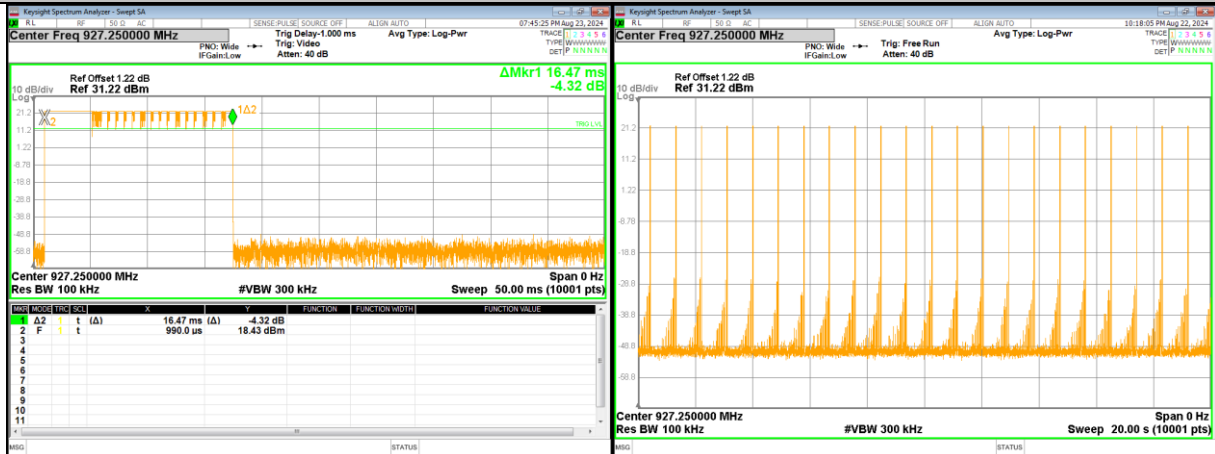
ANT1:



ANT2:

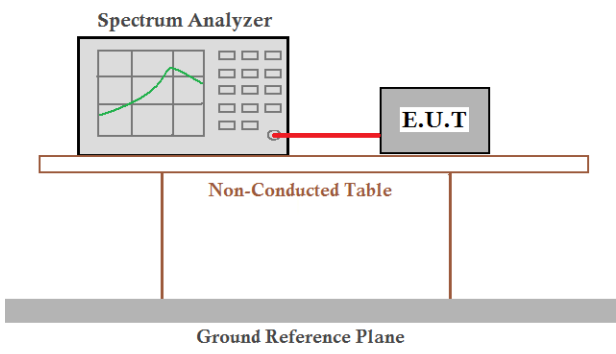


ANT3:



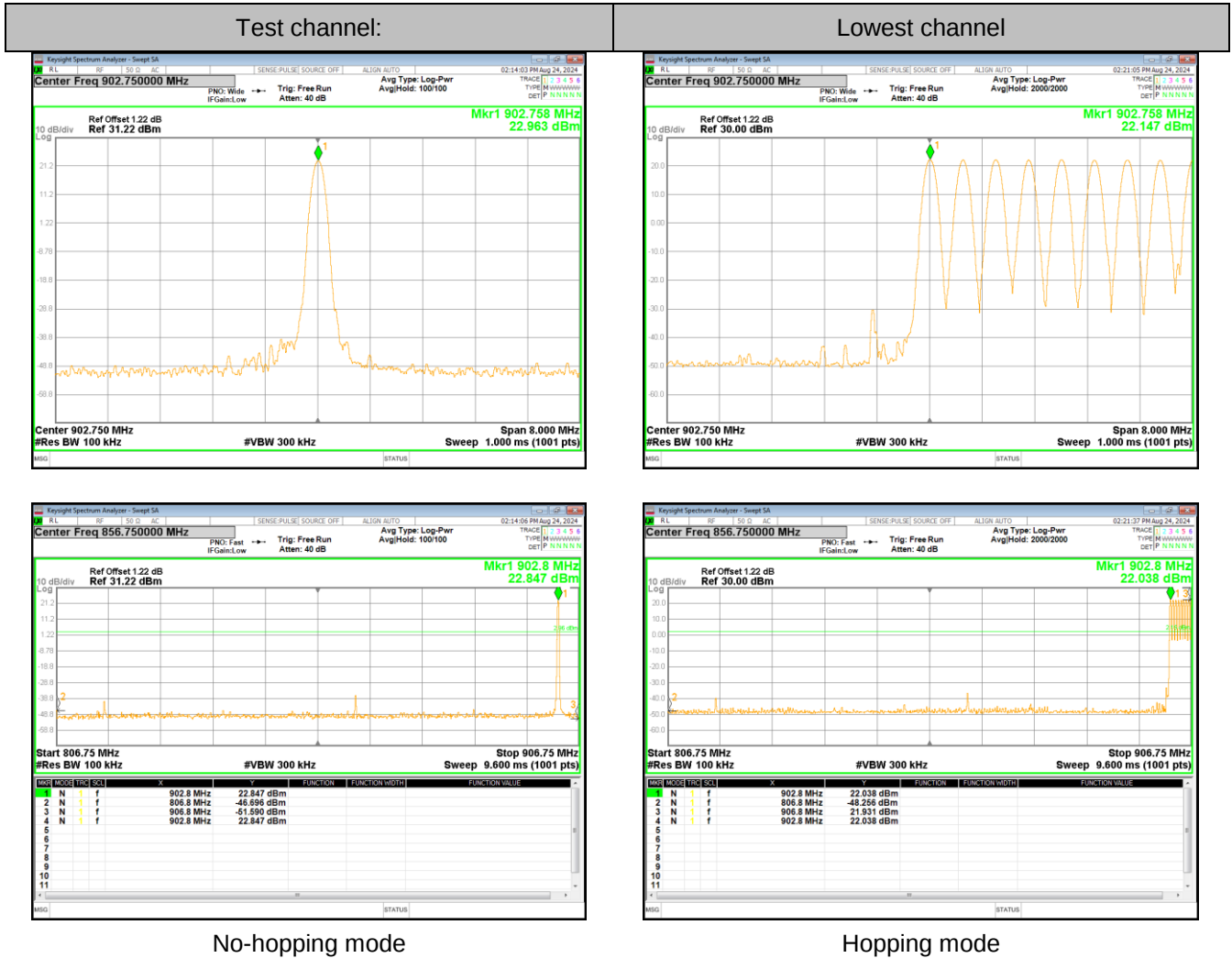
4.8 Band Edge

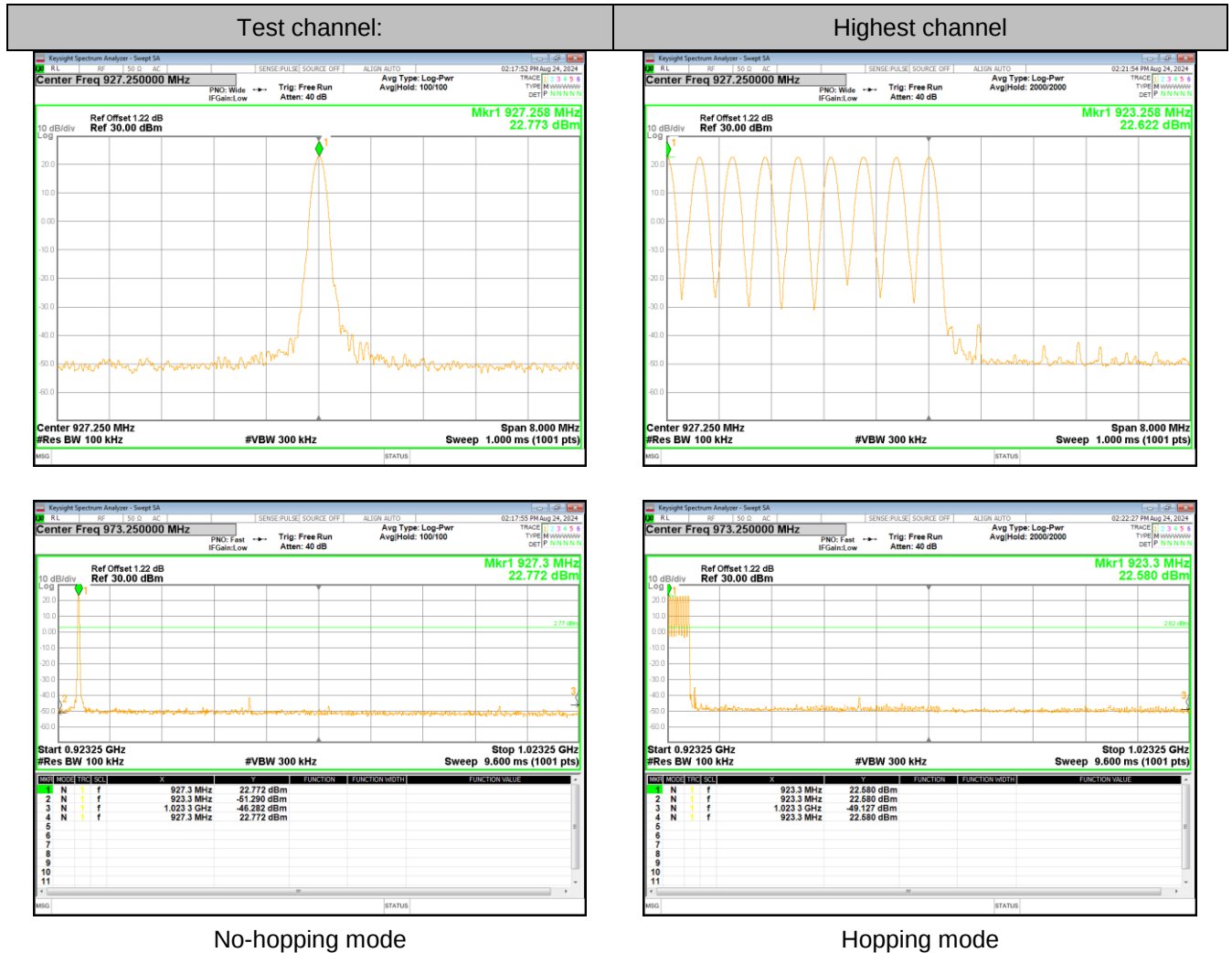
4.8.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)	
Test Method:	ANSI C63.10:2013	
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak	
Limit:	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 setup:		
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 24.2°C	Humid.: 47%RH
Test voltage:	DC 12V	
Test results:	Pass	

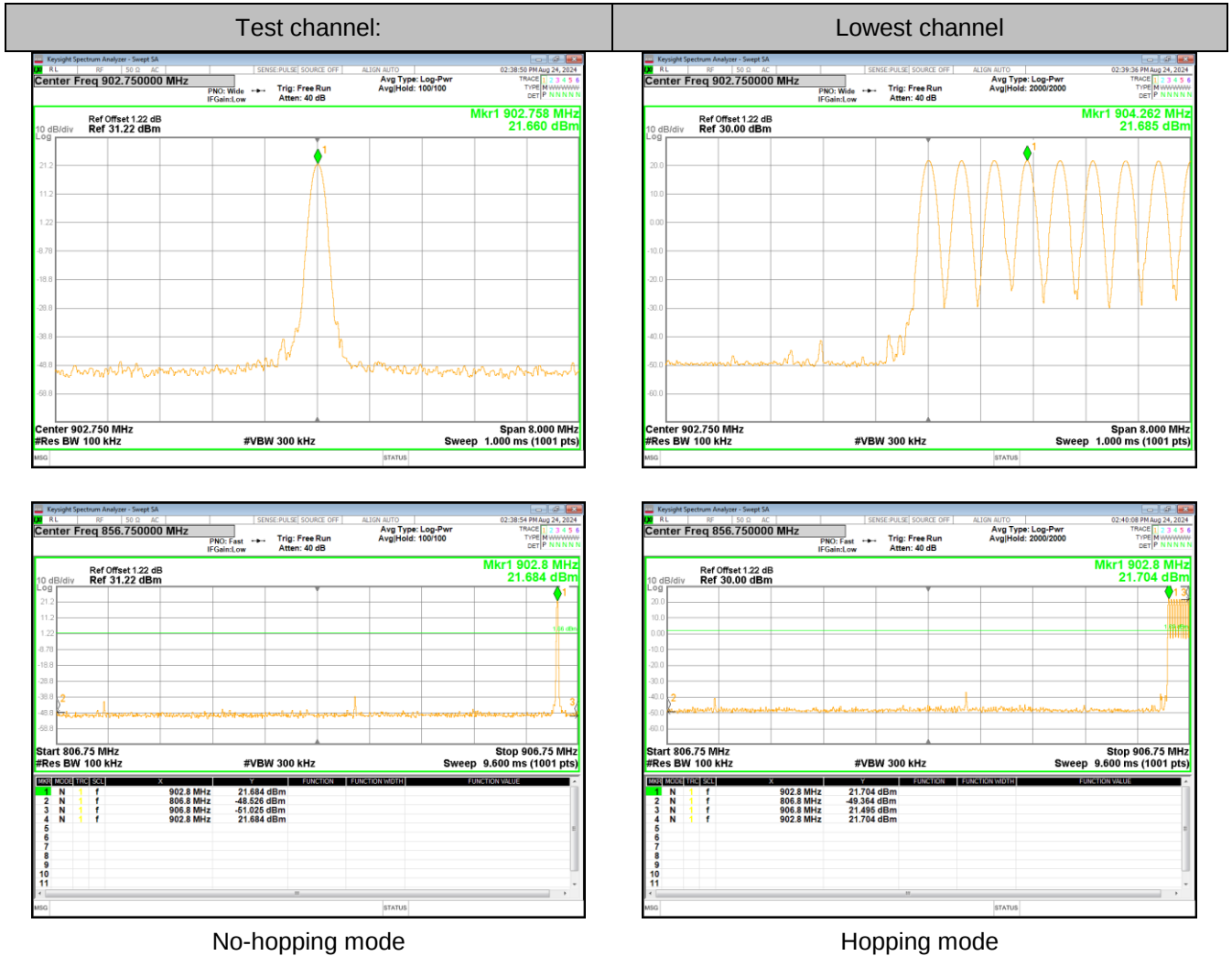
Test plot as follows:

ANT1:





ANT2:

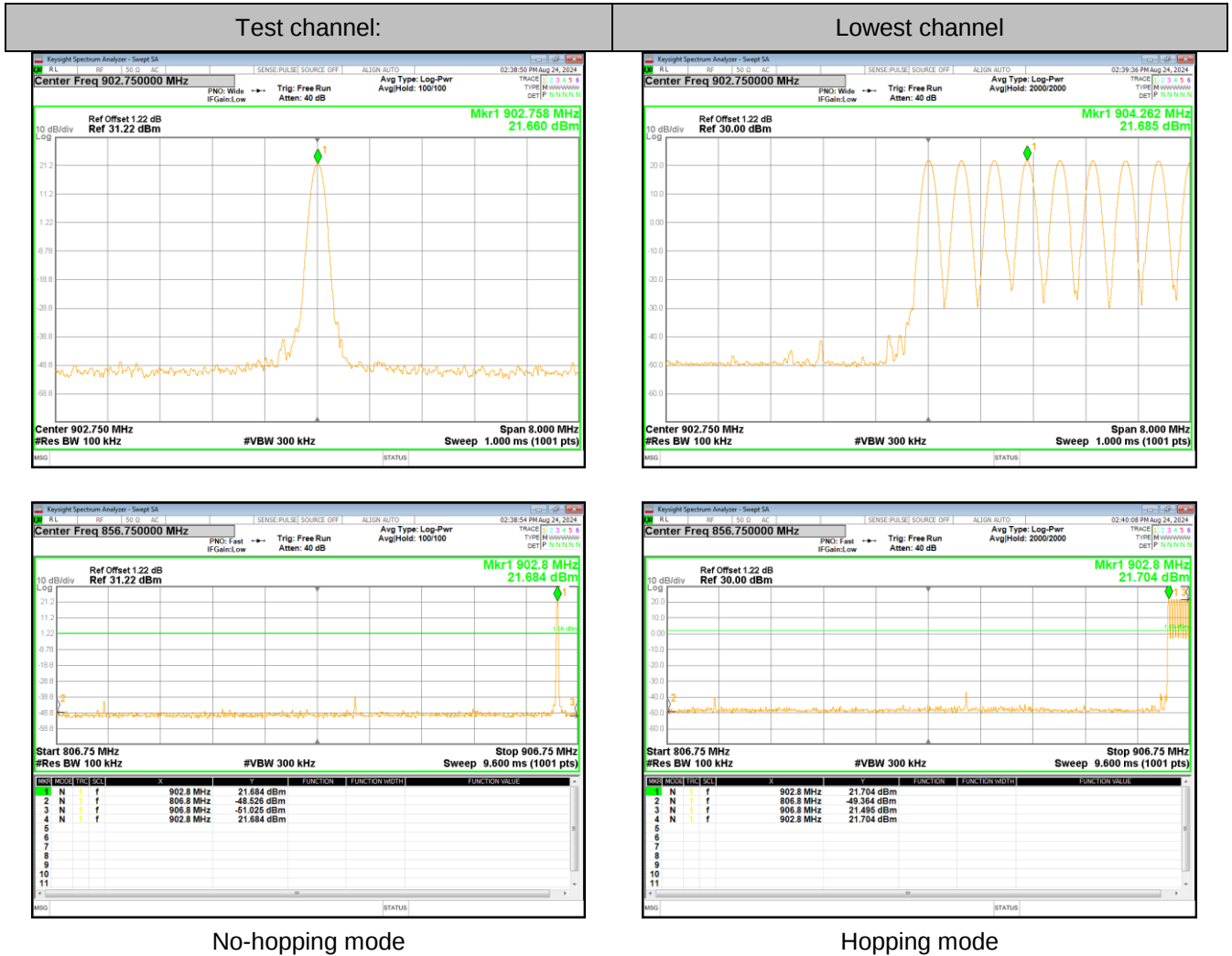


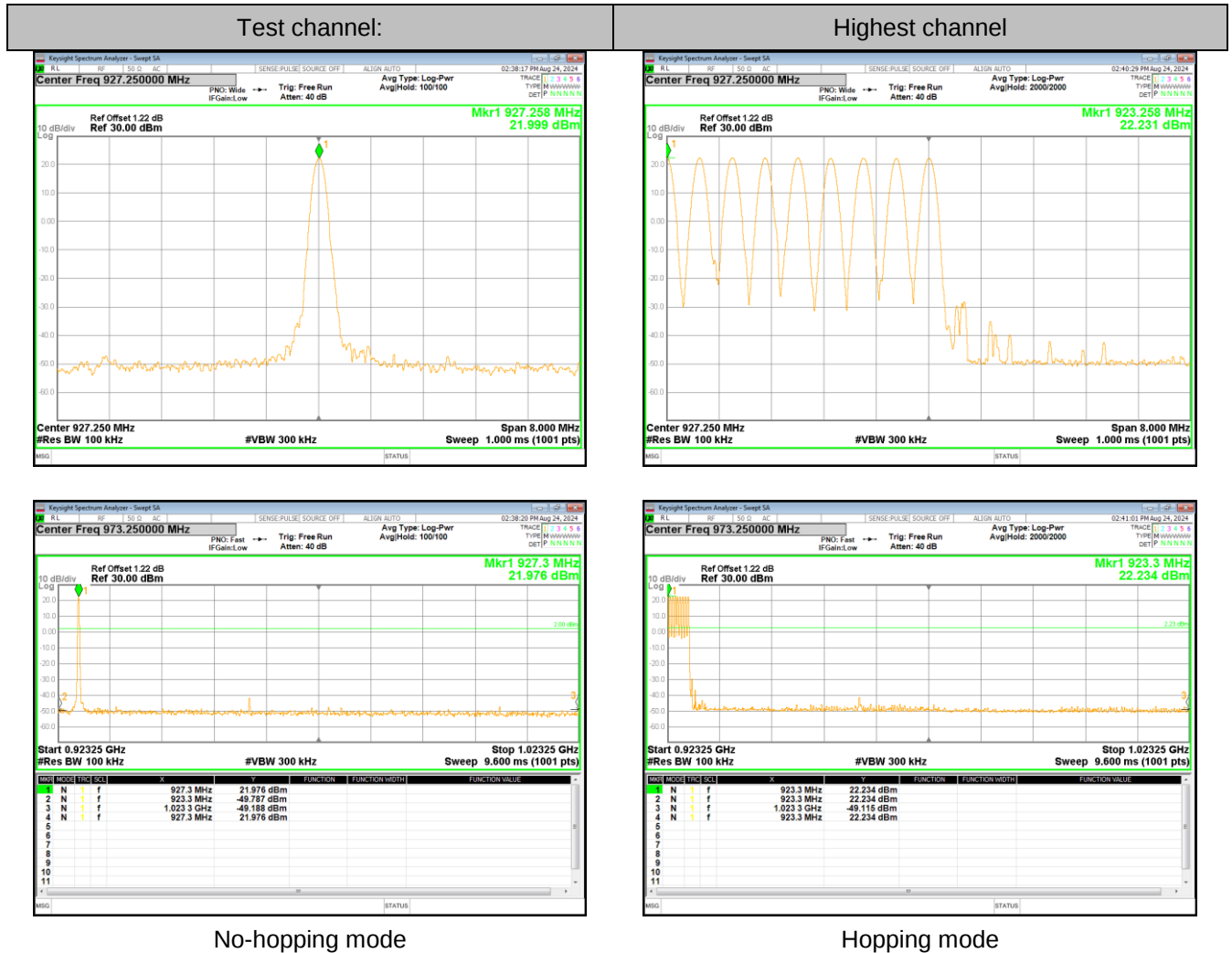
No-hopping mode

Hopping mode

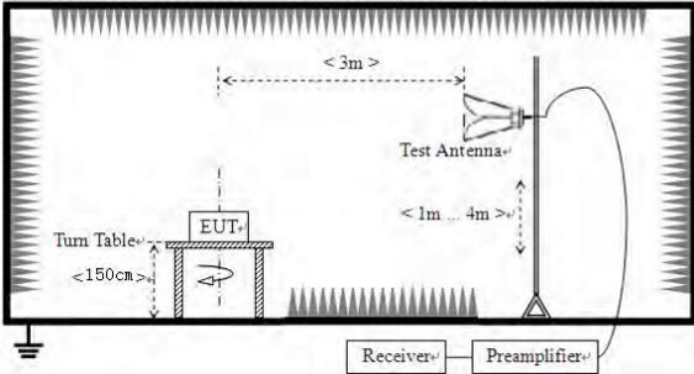


ANT3:





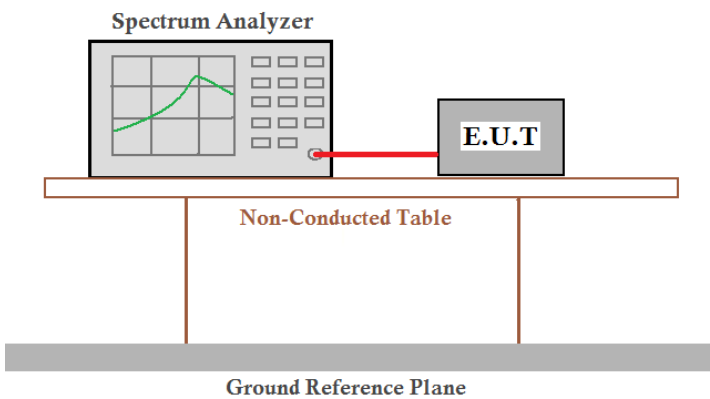
4.8.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	N/A				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	Above 1GHz		54.00		Average Value
			74.00		Peak Value
Test setup:					
Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.				
Test Instruments:	Refer to section 3.0 for details				
Test mode:	Refer to section 2.2 for details				
Test environment:	Temp.: 26.9°C		Humid.: 55%RH		
Test voltage:	DC 12V				
Test results:	Pass				

Remark: This frequency band is not within the restricted frequency range, and this project is not applicable

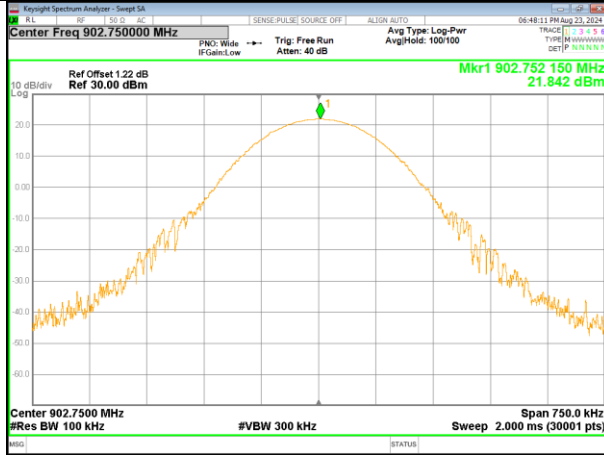
4.9 Spurious Emission

4.9.1 Conducted Emission Method

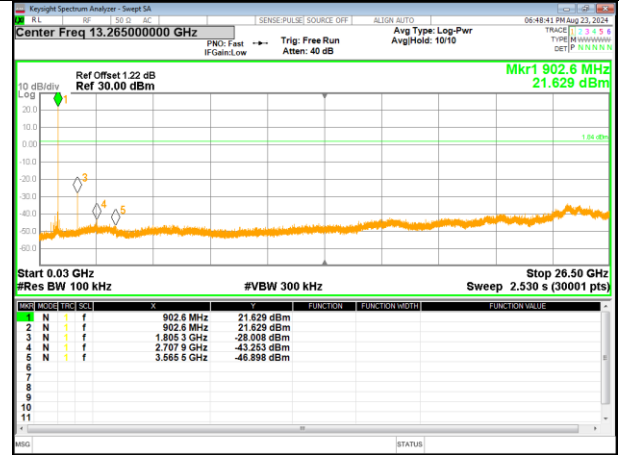
Test Requirement:	FCC Part15 C Section 15.247 (d)	
Test Method:	ANSI C63.10:2013	
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below 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 setup:	 The diagram illustrates the test setup for conducted emission measurement. A Spectrum Analyzer is connected via a red cable to an E.U.T (Equipment Under Test). Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.	
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 24.2°C	Humid.: 47%RH
Test voltage:	DC 12V	
Test results:	Pass	

ANT1:

Test channel:

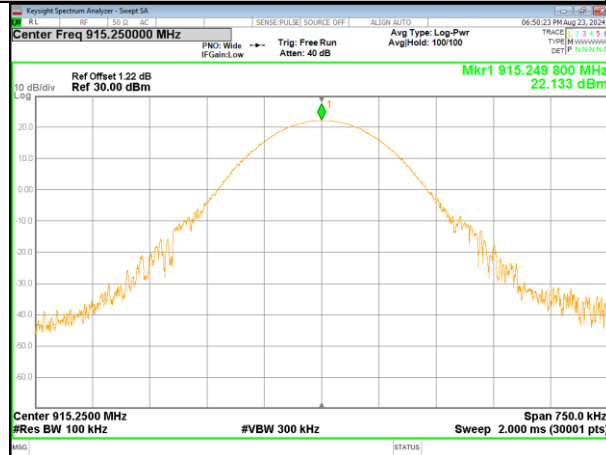


Lowest channel

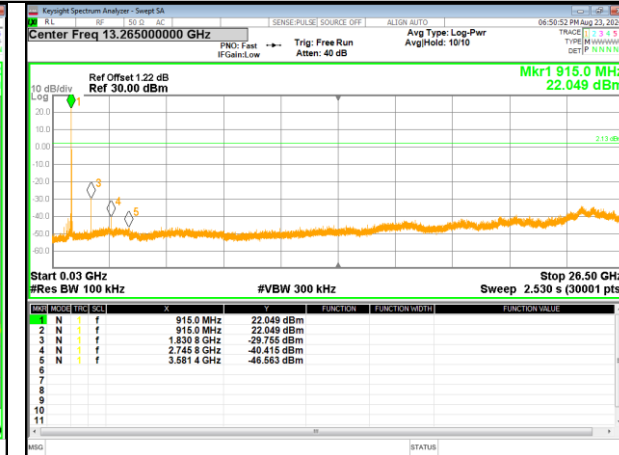


30MHz~25GHz

Test channel:

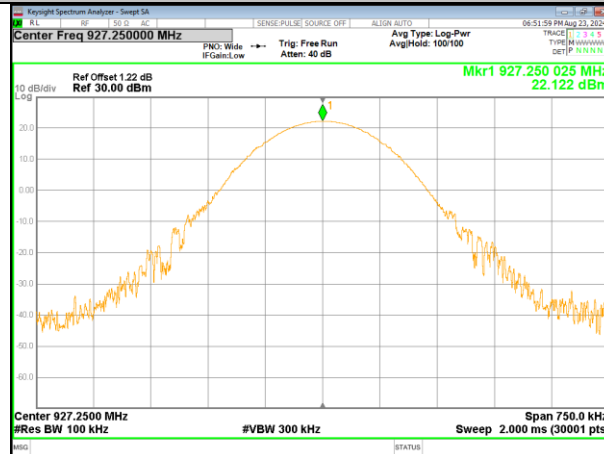


Middle channel

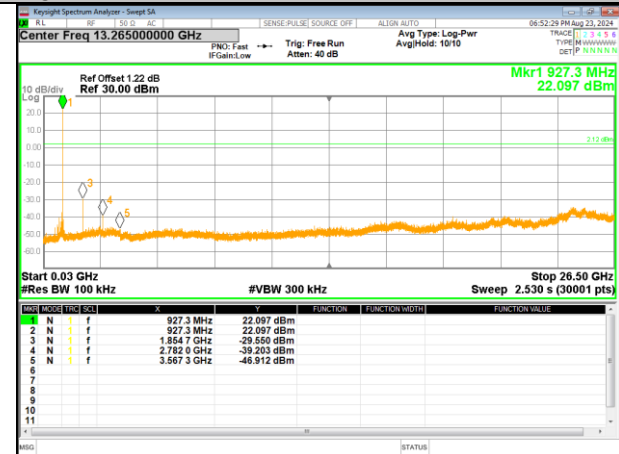


30MHz~25GHz

Test channel:



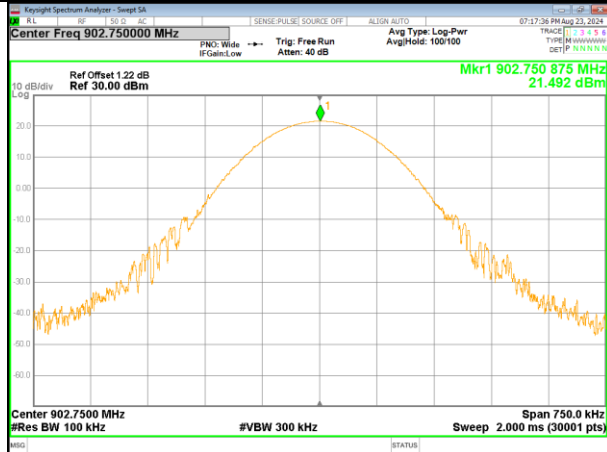
Highest channel



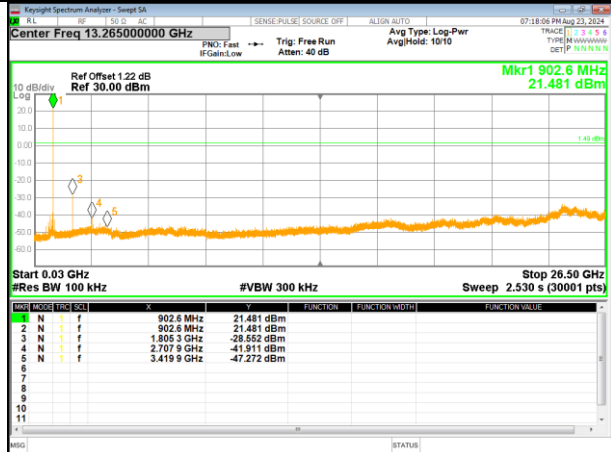
30MHz~25GHz

ANT2:

Test channel:

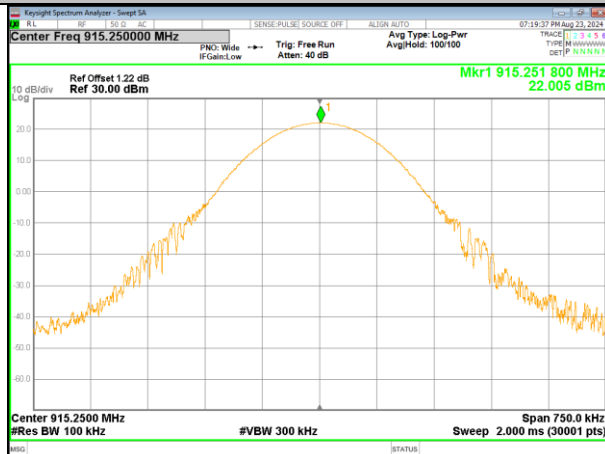


Lowest channel

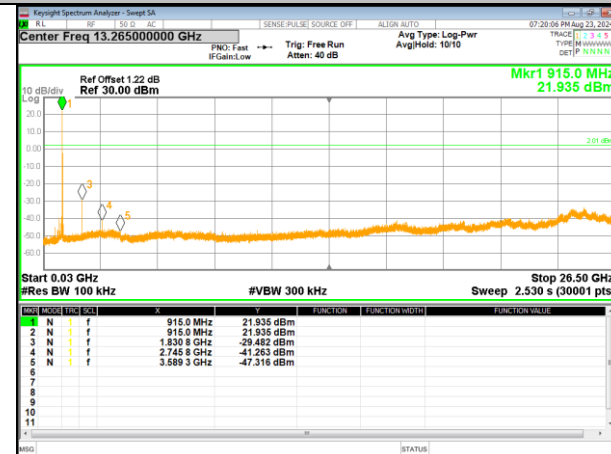


30MHz~25GHz

Test channel:

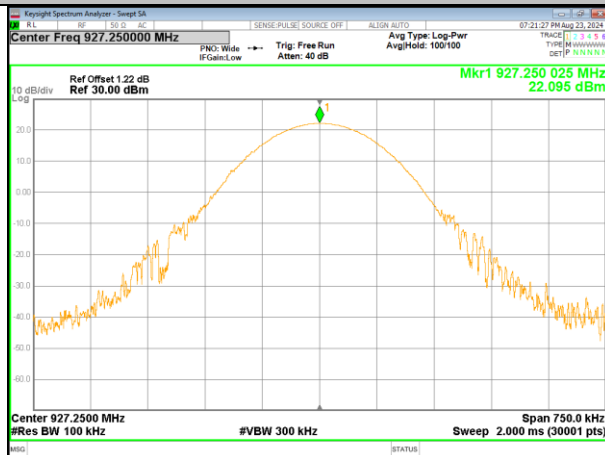


Middle channel

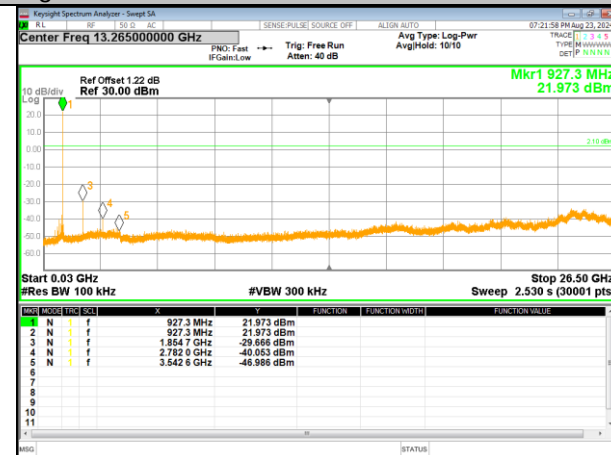


30MHz~25GHz

Test channel:



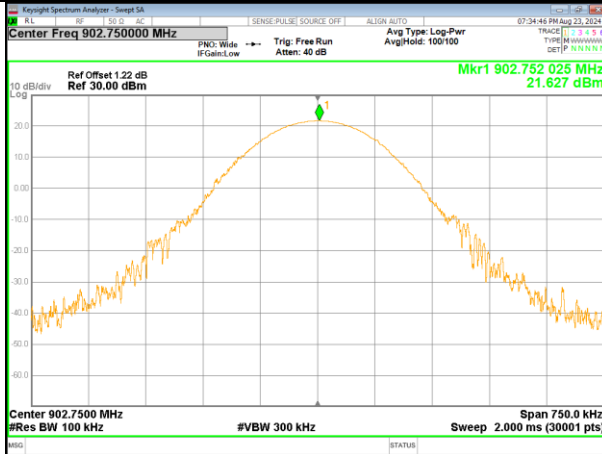
Highest channel



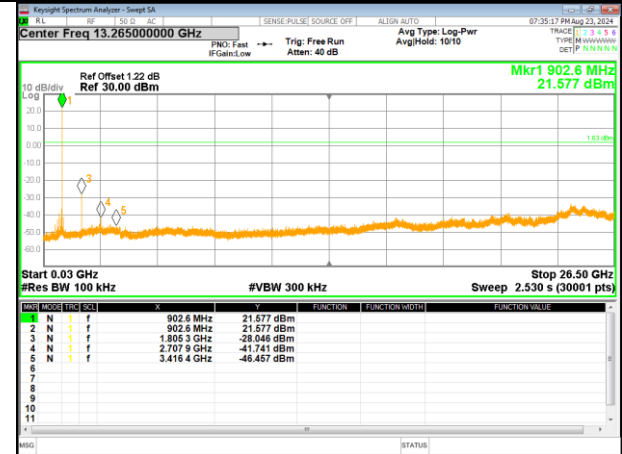
30MHz~25GHz

ANT3:

Test channel:

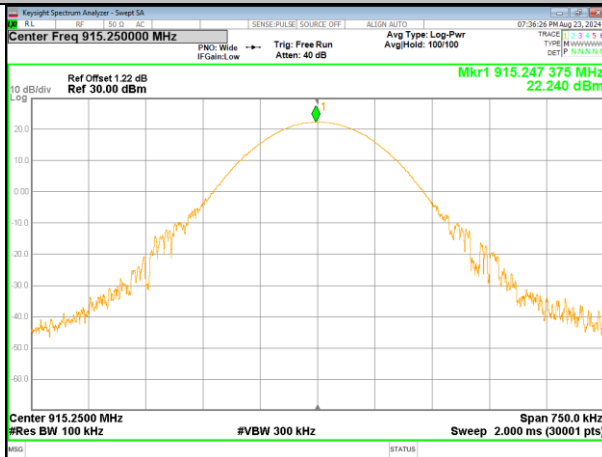


Lowest channel

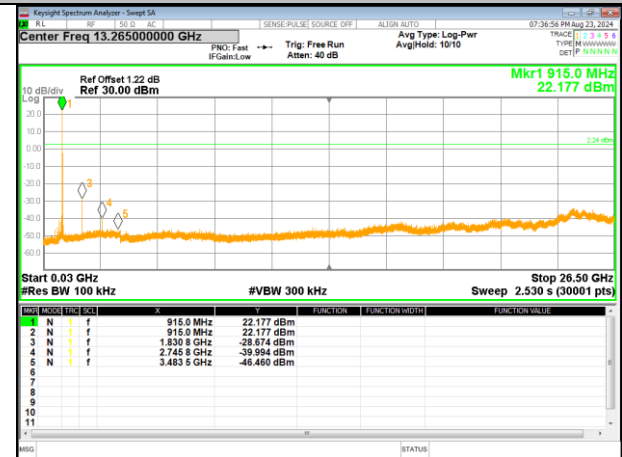


30MHz~25GHz

Test channel:

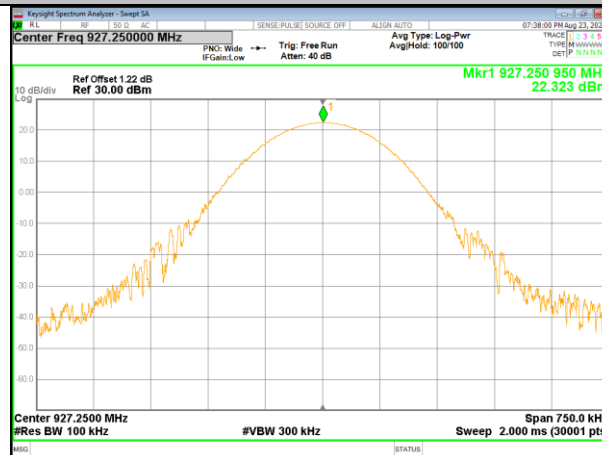


Middle channel

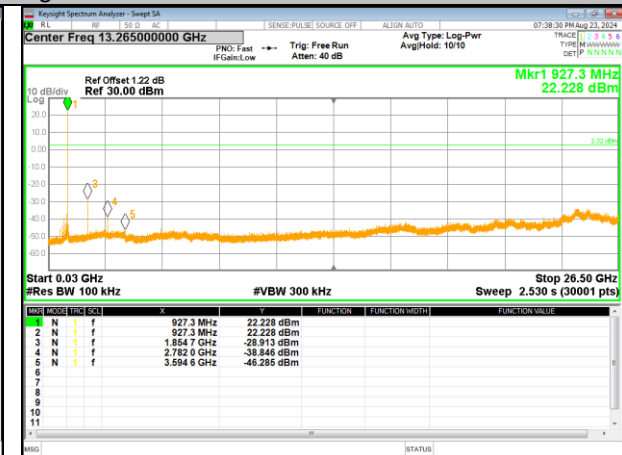


30MHz~25GHz

Test channel:

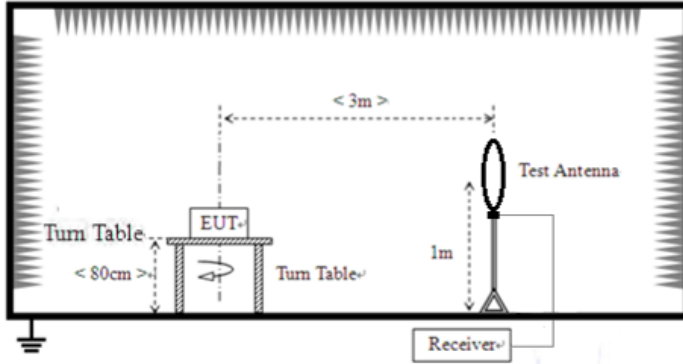


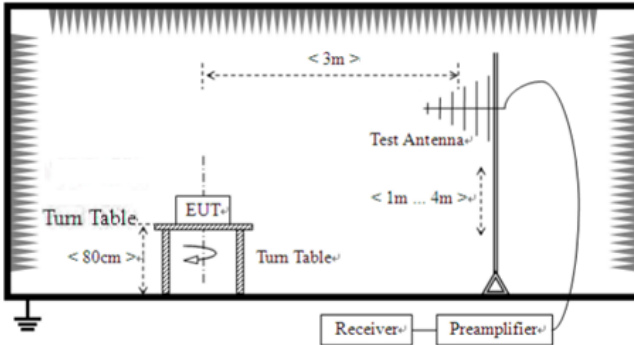
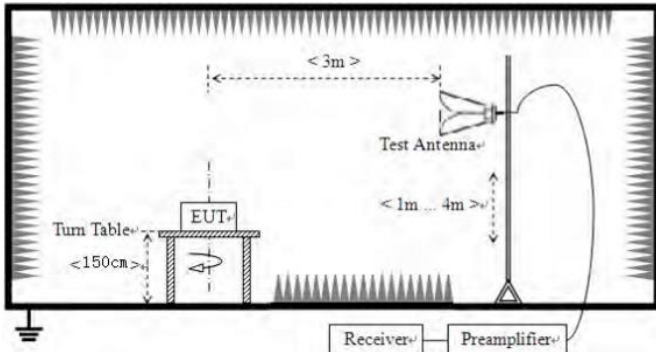
Highest channel



30MHz~25GHz

4.9.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m	
	0.490MHz-1.705MHz	24000/F(KHz)	QP	30m	
	1.705MHz-30MHz	30	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
		5000	Peak		
Test setup:	For radiated emissions from 9kHz to 30MHz				
					

	For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 					
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.					
Test Instruments:	Refer to section 3.0 for details					
Test mode:	Refer to section 2.2 for details					
Test environment:	Temp.:	24.2 °C	Humid.:	47%	Press.:	1012mbar
Test results:	Pass					

Measurement data:

Remarks:

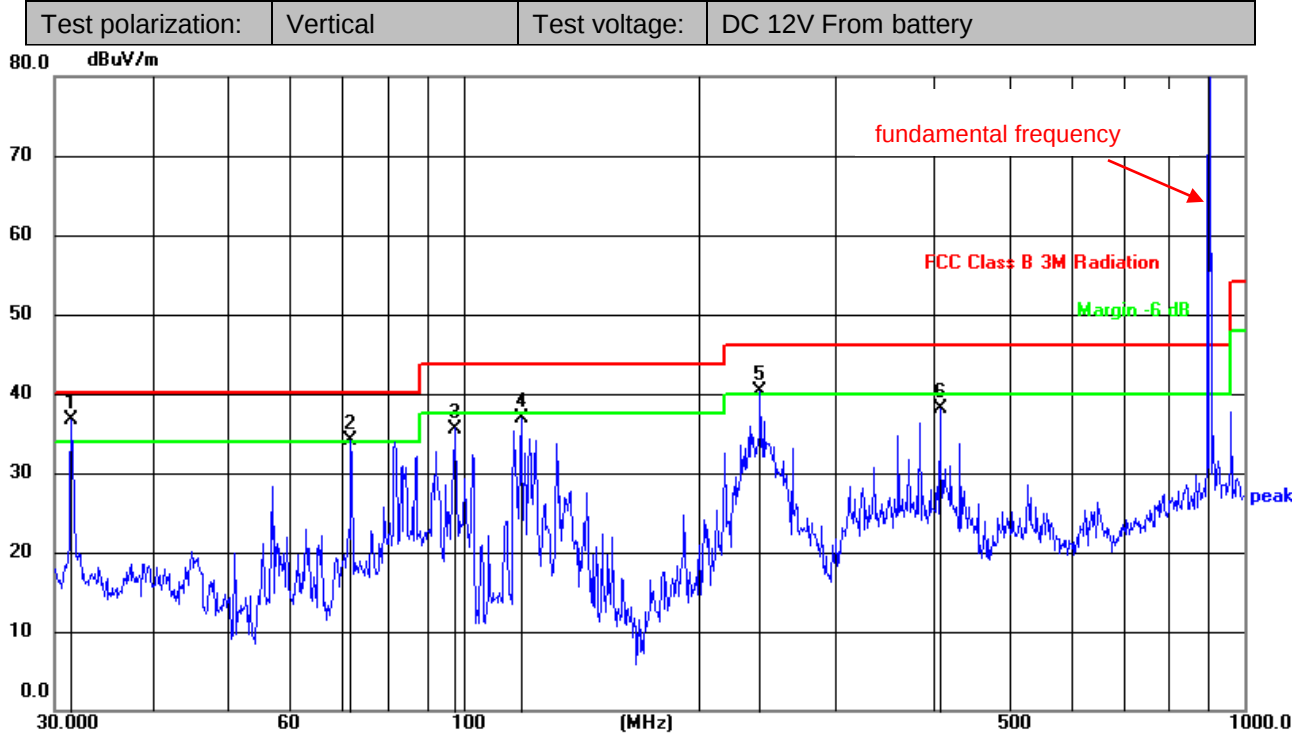
1. *During the testing process, a pre scan revealed that ANT1+ANT2+ANT3 is the worst-case scenario, The signal exceeding the limit is the fundamental signal.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

■ **9kHz~30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

■ Below 1GHz

Pre-scan the mode of BLE and RF ID working simultaneously, found worst case at ANT1+ANT2+ANT3 (927.25MHz), and report only show the test result of ANT1+ANT2+ANT3 (927.25MHz).

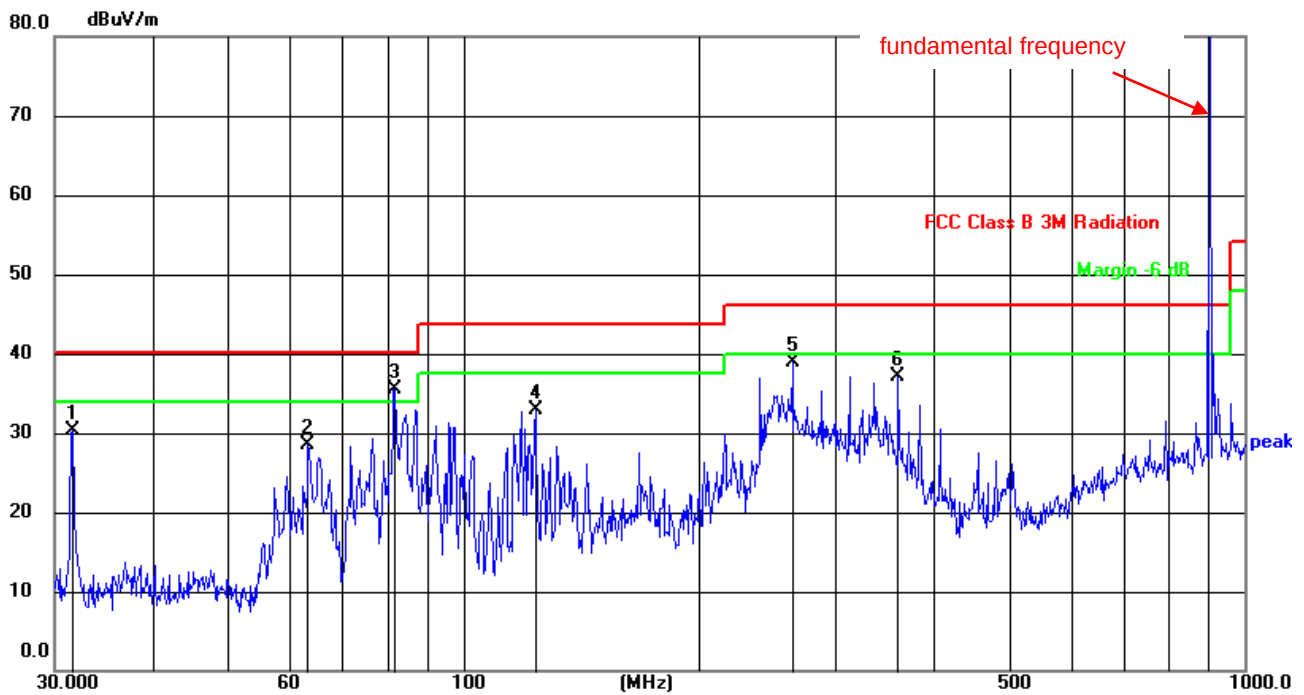


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	31.5095	59.14	-22.45	36.69	40.00	-3.31	QP
2	71.8320	58.56	-24.52	34.04	40.00	-5.96	QP
3	97.4556	60.84	-25.27	35.57	43.50	-7.93	QP
4	118.6013	60.30	-23.30	37.00	43.50	-6.50	QP
5	239.9873	62.85	-22.47	40.38	46.00	-5.62	QP
6	407.5144	55.17	-16.98	38.19	46.00	-7.81	QP

Level = Reading + Factor, Margin=level-Limit

Factor= Antenna Factor + Cable Loss – Preamplifier Factor

Test polarization:	Horizontal	Test voltage:	DC 12V From battery
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No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	31.6201	52.81	-22.43	30.38	40.00	-9.62	QP
2	63.3132	51.67	-23.07	28.60	40.00	-11.40	QP
3	81.7832	61.51	-25.96	35.55	40.00	-4.45	QP
4	123.6984	55.78	-22.95	32.83	43.50	-10.67	QP
5	263.8190	60.81	-21.94	38.87	46.00	-7.13	QP
6	360.4476	55.90	-18.89	37.01	46.00	-8.99	QP

Level = Reading + Factor, Margin=level-Limit

Factor= Antenna Factor + Cable Loss – Preamplifier Factor

■ Above 1GHz

Pre-scan the mode of BLE and RF ID working simultaneously, found worst case at RF ID ANT1+ANT2+ANT3, and report only show the test result of ANT1+ANT2+ANT3.

Test channel:	Lowest	Test voltage:	DC 12V From battery
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Peak value:

Frequency (MHz)	Read Level (dBuV/m)	Correction Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1805.50	72.33	-15.39	56.94	74.00	-17.06	Horizontal
3611.00	62.35	-10.40	51.95	74.00	-22.05	Horizontal
5416.50	---	---	---	---	---	Horizontal
7222.00	---	---	---	---	---	Horizontal
1805.50	73.96	-15.39	58.57	74.00	-15.43	Vertical
3611.00	63.60	-10.40	53.20	74.00	-20.80	Vertical
5416.50	---	---	---	---	---	Vertical
7222.00	---	---	---	---	---	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV/m)	Correction Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1805.50	60.04	-15.39	44.65	54.00	-9.35	Horizontal
3611.00	50.46	-10.40	40.06	54.00	-13.94	Horizontal
5416.50	---	---	---	---	---	Horizontal
7222.00	---	---	---	---	---	Horizontal
1805.50	61.24	-15.39	45.85	54.00	-8.15	Vertical
3611.00	50.33	-10.40	39.93	54.00	-14.07	Vertical
5416.50	---	---	---	---	---	Vertical
7222.00	---	---	---	---	---	Vertical

Test channel:	Middle	Test voltage:	DC 12V From battery
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Peak value:

Frequency (MHz)	Read Level (dBuV/m)	Correction Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1830.50	72.78	-15.40	57.38	74.00	-16.62	Horizontal
3661.00	67.14	-10.30	56.84	74.00	-17.16	Horizontal
5491.50	---	---	---	---	---	Horizontal
7322.00	---	---	---	---	---	Horizontal
1830.50	71.42	-15.40	56.02	74.00	-17.98	Vertical
3661.00	67.06	-10.30	56.76	74.00	-17.24	Vertical
5491.50	---	---	---	---	---	Vertical
7322.00	---	---	---	---	---	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV/m)	Correction Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1830.50	61.12	-15.40	45.72	54.00	-8.28	Horizontal
3661.00	51.04	-10.30	40.74	54.00	-13.26	Horizontal
5491.50	---	---	---	---	---	Horizontal
7322.00	---	---	---	---	---	Horizontal
1830.50	60.22	-15.40	44.82	54.00	-9.18	Vertical
3661.00	50.01	-10.30	39.71	54.00	-14.29	Vertical
5491.50	---	---	---	---	---	Vertical
7322.00	---	---	---	---	---	Vertical

Test channel:	Highest	Test voltage:	DC 12V From battery
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Peak value:

Frequency (MHz)	Read Level (dBuV/m)	Correction Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1854.50	72.07	-15.42	56.65	74.00	-17.35	Horizontal
3709.00	61.49	-10.22	51.27	74.00	-22.73	Horizontal
5563.50	---	---	---	---	---	Horizontal
7418.00	---	---	---	---	---	Horizontal
1854.50	73.69	-15.42	58.27	74.00	-15.73	Vertical
3709.00	60.58	-10.22	50.36	74.00	-23.64	Vertical
5563.50	---	---	---	---	---	Vertical
7418.00	---	---	---	---	---	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV/m)	Correction Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1854.50	58.16	-15.42	42.74	54.00	-11.26	Horizontal
3709.00	49.78	-10.22	39.56	54.00	-14.44	Horizontal
5563.50	---	---	---	---	---	Horizontal
7418.00	---	---	---	---	---	Horizontal
1854.50	58.24	-15.42	42.82	54.00	-11.18	Vertical
3709.00	50.13	-10.22	39.91	54.00	-14.09	Vertical
5563.50	---	---	---	---	---	Vertical
7418.00	---	---	---	---	---	Vertical

Remarks:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *“*”, means 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.*

5 Test Setup Photo

Reference to the **appendix I** for details.

6 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----