TEST REPORT

Report No.:	BCTC2304311328E
Applicant:	Shenzhen RoyalRay Science and Technology Co., Ltd.
Product Name:	900MHz High Performance UHF RFID Reader
Model/Type reference:	RRU7182
Tested Date:	2023-04-11 to 2023-04-25
Issued Date:	2023-04-25

Shenzhen BCTC Testing Co., Ltd.

FCC ID: 2BA5U-RRU7182

Product Name:	900MHz High Performance UHF RFID Reader
Trademark:	N/A
Model/Type Reference:	RRU7182 RRU7180, RRU7189, RRU7199
Prepared For:	Shenzhen RoyalRay Science and Technology Co., Ltd.
Address:	West Wing, 4F, A1 Building, Xiufeng Industrial Park, No.2 Xiufeng Road, Longgang District, Shenzhen, China
Manufacturer:	Shenzhen RoyalRay Science and Technology Co., Ltd.
Address:	West Wing, 4F, A1 Building, Xiufeng Industrial Park, No.2 Xiufeng Road, Longgang District, Shenzhen, China
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2023-04-11
Sample tested Date:	2023-04-11 to 2023-04-25
Issue Date:	2023-04-25
Report No.:	BCTC2304311328E
Test Standards	FCC CFR Title 47 Part 15 Subpart C Section 15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013
Test Results	PASS

Tested by:

Lei Chen

Lei Chen/Project Handler

Approved by:

Zero Zhou/Reviewer

The test report is effective only with both signature and specialized stamp.This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Testing Co., Ltd, this report can't be reproduced except in full.The tested sample(s) and the sample information are provided by the client.

Table Of Content

(Note: N/A Means Not Applicable)

1. Version

Report No.	Issue Date	Description	Approved
BCTC2304311328E	2023-04-25	Original	Valid

2. Test Summary

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No.	Results
1	Conducted Emission AC Power Port	§15.207	PASS
2	Conducted Peak Output Power	§15.247(b)	PASS
3	Occupied Bandwidth	§15.247(a)	PASS
4	Carrier Frequencies Separation	§15.247 (a)	PASS
5	Hopping Channel Number	§15.247 (a)(1)	PASS
6	Dwell Time	§15.247 (f)	PASS
7	Radiated Emission	§15.205/§15.209	PASS
8	Band Edge	§15.247(d)	PASS

3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	3m Chamber Radiated spurious Emission(30MHz-1GHz)	U=4.3dB
2	3m Chamber Radiated Spurious Emission(9KHz-30MHz)	U=3.7dB
3	3m Chamber Radiated Spurious Emission(1GHz-18GHz)	U=4.5dB
4	3m Chamber Radiated Spurious Emission(18GHz-40GHz)	U=3.34dB
5	Conducted Emission (150kHz-30MHz)	U=3.20dB
6	Conducted Adjacent Channel Power	U=1.38dB
7	Conducted Output Power Uncertainty Above 1G	U=1.576dB
8	Conducted Output Power Uncertainty Below 1G	U=1.28dB
9	Humidity Uncertainty	U=5.3%
10	Temperature Uncertainty	U=0.59℃

4. Product Information And Test Setup

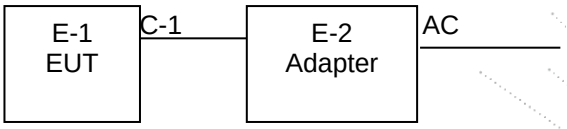
4.1 Product Information

Model/Type reference:	RRU7182 RRU7180, RRU7189, RRU7199
Model differences:	All the model are the same circuit and RF module, except model names.
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	902 -928MHz
Type of Modulation:	ASK
Number Of Channel	50 CH
Antenna installation:	Antenna 1/2/3/4: External antenna
Antenna Gain:	Antenna 1/2/3/4: 0 dBi
Ratings:	DC 3.8-5V
Remark:	The module does not support the MIMO mode.

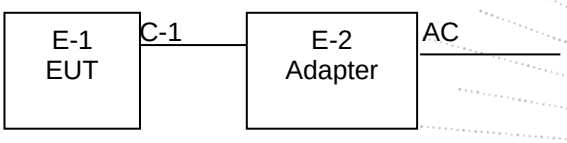
4.2 Test Setup Configuration

See test photographs attached in *EUT TEST SETUP PHOTOGRAPHS* for the actual connections between Product and support equipment.

Conducted Emission:



Radiated Spurious Emission



4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
E-1	900MHz High Performance UHF RFID Reader	N/A	RRU7182	RRU7180, RRU7189, RRU7199	EUT
E-2	Adapter	N/A	JYH32-0903000	N/A	Auxiliary

Item	Shielded Type	Ferrite Core	Length	Note
C-1	N/A	N/A	1M	DC cable unshielded

Notes:
1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
1	902.75	24	914.25	47	925.75
2	903.25	25	914.75	48	926.25
3	903.75	26	915.25	49	926.75
4	904.25	27	915.75	50	927.25
5	904.75	28	916.25		
6	905.25	29	916.75		
7	905.75	30	917.25		
8	906.25	31	917.75		
9	906.75	32	918.25		
10	907.25	33	918.75		
11	907.75	34	919.25		
12	908.25	35	919.75		
13	908.75	36	920.25		
14	909.25	37	920.75		
15	909.75	38	921.25		
16	910.25	39	921.75		
17	910.75	40	922.25		
18	911.25	41	922.75		
19	911.75	42	923.25		
20	912.25	43	923.75		
21	912.75	44	924.25		
22	913.25	45	924.75		
23	913.75	46	925.25		

4.5 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test Mode	Low channel	Middle channel	High channel
1	902.75MHz	914.75MHz	927.25MHz
2	Hopping Mode		
3	Transmitting (Conducted emission & Radiated emission)		

Note:
(1) The measurements are performed at the highest, middle, lowest available channels.

4.6 Table Of Parameters Of Text Software Setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

Test software Version	UHFReader288Demo		
Frequency	902.75MHz	914.75MHz	927.25MHz
Parameters	DEF	DEF	DEF

5. Test Facility And Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.
FCC Test Firm Registration Number: 712850
FCC Designation Number: CN1212
ISED Registered No.: 23583
ISED CAB identifier: CN0017

5.2 Test Instrument Used

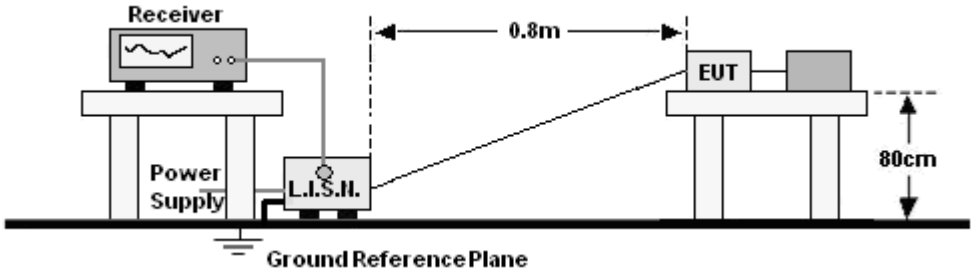
Conducted Emissions Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Receiver	R&S	ESR3	102075	May 24, 2022	May 23, 2023
LISN	R&S	ENV216	101375	May 24, 2022	May 23, 2023
Software	Frad	EZ-EMC	EMC-CON 3A1	\	\
Attenuator	\	10dB DC-6GHz	1650	May 24, 2022	May 23, 2023

RF Conducted Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Power Metter	Keysight	E4419	\	May 24, 2022	May 23, 2023
Power Sensor (AV)	Keysight	E9300A	\	May 24, 2022	May 23, 2023
Signal Analyzer 20kHz-26.5GHz	Keysight	N9020A	MY49100060	May 24, 2022	May 23, 2023
Spectrum Analyzer 9kHz-40GHz	R&S	FSP 40	\	May 24, 2022	May 23, 2023

Radiated Emissions Test (966 Chamber01)					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
966 chamber	ChengYu	966 Room	966	Jun. 06. 2020	Jun. 05, 2023
Receiver	R&S	ESR3	102075	May 24, 2022	May 23, 2023
Receiver	R&S	ESRP	101154	May 24, 2022	May 23, 2023
Amplifier	Schwarzbeck	BBV9744	9744-0037	May 24, 2022	May 23, 2023
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	942	May 26, 2022	May 25, 2023
Loop Antenna(9KHz -30MHz)	Schwarzbeck	FMZB1519B	00014	May 26, 2022	May 25, 2023
Amplifier	SKET	LAPA_01G18 G-45dB	\	May 24, 2022	May 23, 2023
Horn Antenna	Schwarzbeck	BBHA9120D	1541	Jun. 06, 2022	Jun. 05, 2023
Amplifier(18G Hz-40GHz)	MITEQ	TTA1840-35-HG	2034381	May 26, 2022	May 25, 2023
Horn Antenn(18GH z-40GHz)	Schwarzbeck	BBHA9170	00822	Jun. 06, 2022	Jun. 05, 2023
Spectrum Analyzer9kHz-40GHz	R&S	FSP40	100363	May 24, 2022	May 23, 2023
Software	Frad	EZ-EMC	FA-03A2 RE	\	\

6. Conducted Emissions

6.1 Block Diagram Of Test Setup



6.2 Limit

Frequency (MHz)	Limit (dBuV)	
	Quas-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Notes:
1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

6.3 Test procedure

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

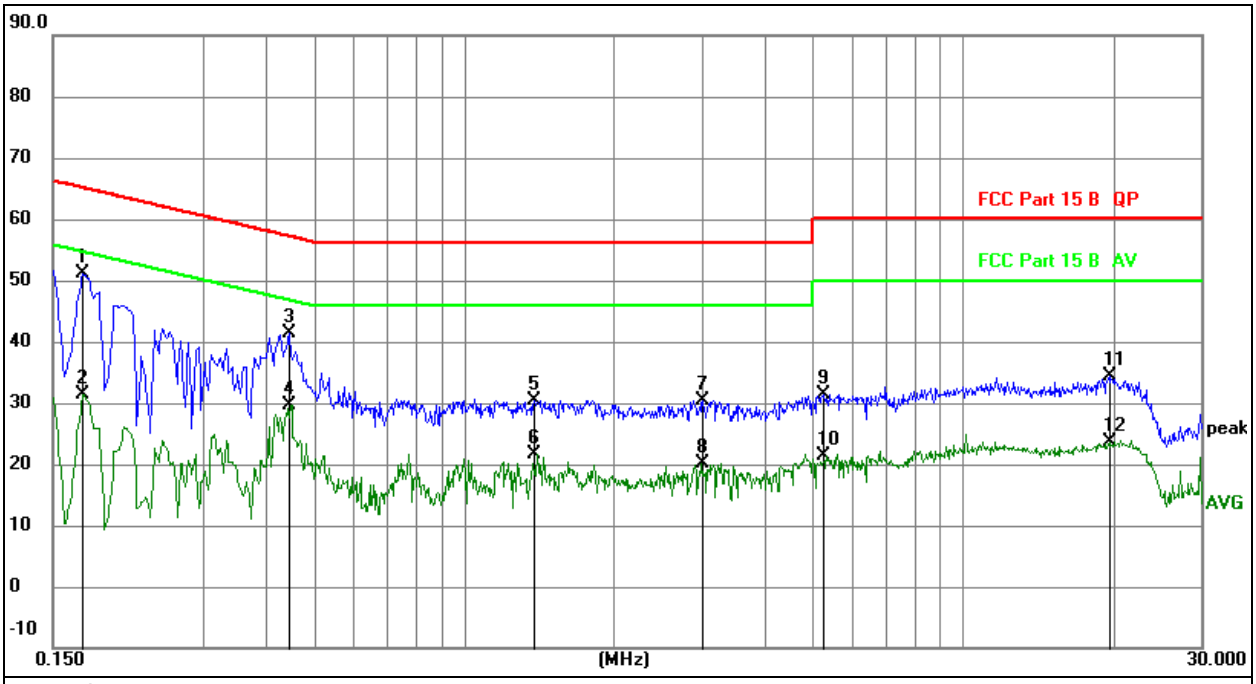
a. The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

6.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

6.5 Test Result

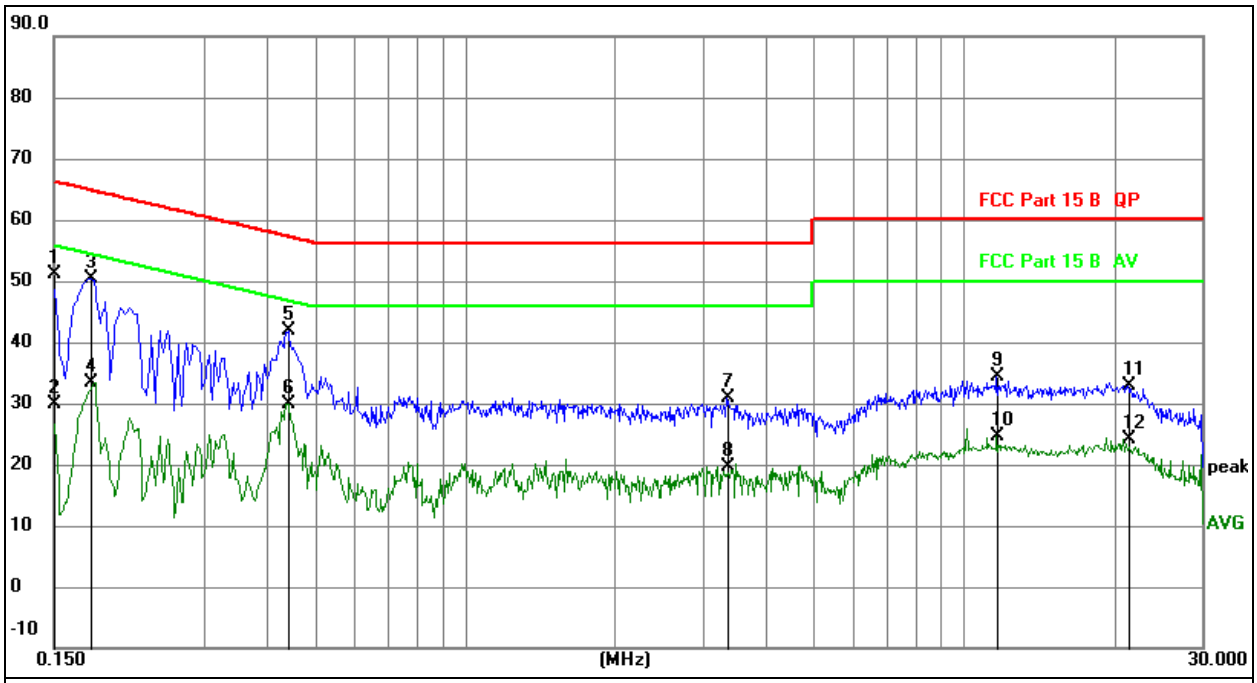
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	L
Test Mode:	Mode 3	Test Voltage :	AC 120V/60Hz



Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement = Reading Level + Correct Factor
4. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1	*	0.1720	31.35	19.73	51.08	64.86	-13.78	QP
2		0.1720	11.74	19.73	31.47	54.86	-23.39	AVG
3		0.4467	21.73	19.73	41.46	56.94	-15.48	QP
4		0.4467	9.96	19.73	29.69	46.94	-17.25	AVG
5		1.3810	10.56	19.81	30.37	56.00	-25.63	QP
6		1.3810	1.84	19.81	21.65	46.00	-24.35	AVG
7		3.0093	10.38	19.99	30.37	56.00	-25.63	QP
8		3.0093	0.04	19.99	20.03	46.00	-25.97	AVG
9		5.2490	11.16	20.13	31.29	60.00	-28.71	QP
10		5.2490	1.26	20.13	21.39	50.00	-28.61	AVG
11		19.7396	13.87	20.50	34.37	60.00	-25.63	QP
12		19.7396	3.19	20.50	23.69	50.00	-26.31	AVG

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	N
Test Mode:	Mode 3	Test Voltage :	AC 120V/60Hz



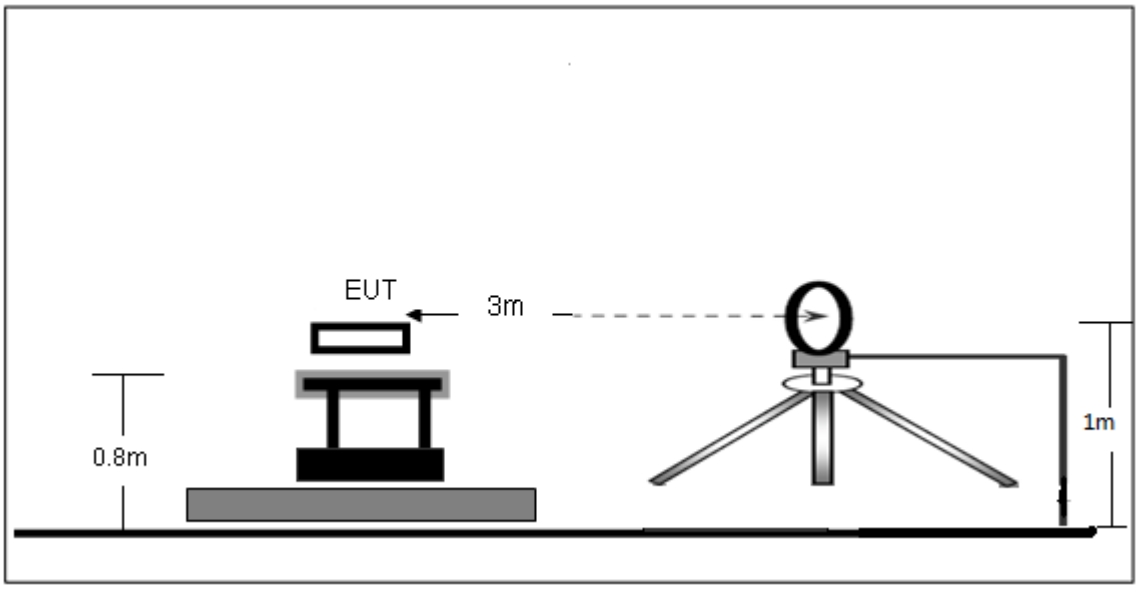
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement = Reading Level + Correct Factor
4. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.1500	31.43	19.67	51.10	66.00	-14.90	QP
2		0.1500	10.25	19.67	29.92	56.00	-26.08	AVG
3	*	0.1770	30.70	19.74	50.44	64.63	-14.19	QP
4		0.1770	13.63	19.74	33.37	54.63	-21.26	AVG
5		0.4425	22.20	19.74	41.94	57.01	-15.07	QP
6		0.4425	10.23	19.74	29.97	47.01	-17.04	AVG
7		3.3630	10.82	20.03	30.85	56.00	-25.15	QP
8		3.3630	-0.50	20.03	19.53	46.00	-26.47	AVG
9		11.6790	14.22	20.28	34.50	60.00	-25.50	QP
10		11.6790	4.31	20.28	24.59	50.00	-25.41	AVG
11		21.2640	12.29	20.51	32.80	60.00	-27.20	QP
12		21.2640	3.67	20.51	24.18	50.00	-25.82	AVG

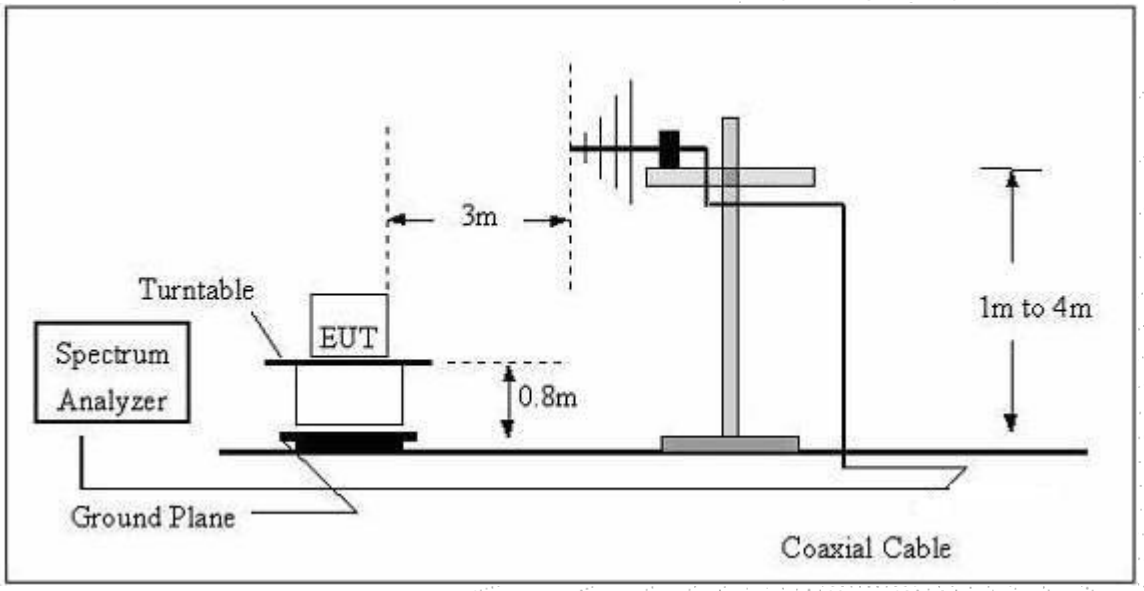
7. Radiated Emissions

7.1 Block Diagram Of Test Setup

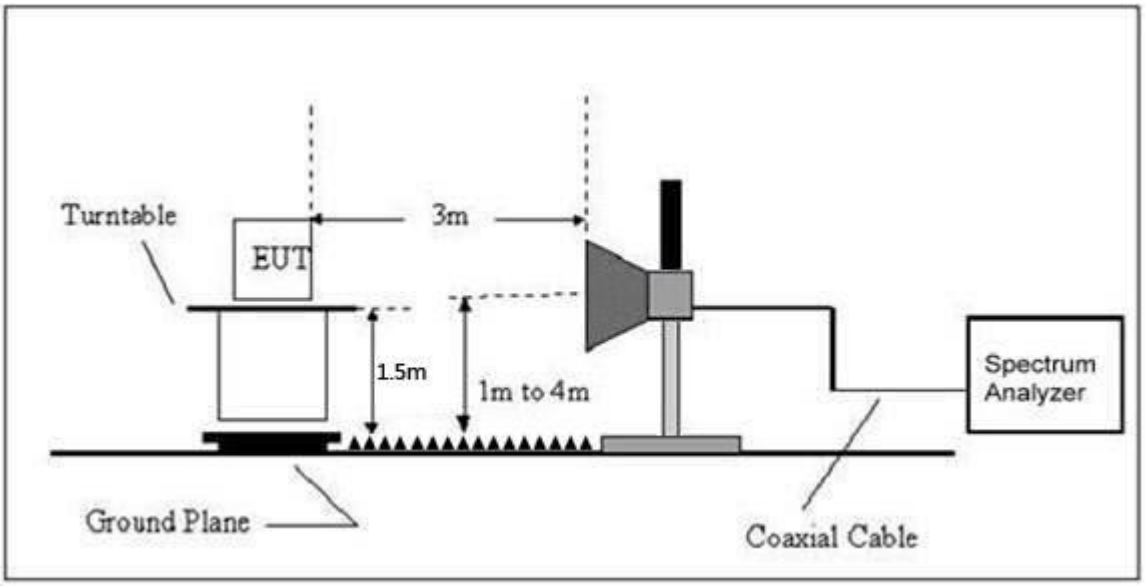
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



7.2 Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency	Field Strength	Distance	Field Strength Limit at 3m Distance	
(MHz)	uV/m	(m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))}$ + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))}$ + 40
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)}$ + 40
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Limits Of Radiated Emission Measurement (Above 1000MHz)

Frequency (MHz)	Limit (dBuV/m) (at 3M)	
	Peak	Average
Above 1000	74	54

Notes:

(1)The limit for radiated test was performed according to FCC PART 15C.

(2)The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Frequency Range Of Radiated Measurement

(a) For an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(4) If the intentional radiator operates at or above 95 GHz: To the third harmonic of the highest fundamental frequency or to 750 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(5) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a) (1)through (4) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

7.3 Test procedure

Receiver Parameter	Setting
Attenuation	Auto
9kHz~150kHz	RBW 200Hz for QP
150kHz~30MHz	RBW 9kHz for QP
30MHz~1000MHz	RBW 120kHz for QP

Spectrum Parameter	Setting
1-25GHz	RBW 1 MHz /VBW 1 MHz for Peak, RBW 1 MHz / VBW 10Hz for Average

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. 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.

d. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. 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.

Above 1GHz test procedure as below:

a.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.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.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.

d.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.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. 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.

g. Test the EUT in the lowest channel, the middlest channel, the Highest channel.

Note:
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

7.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

7.5 Test Result

Below 30MHz

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage :	AC120V/60Hz
Test Mode:	Mode 3		

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

Note:

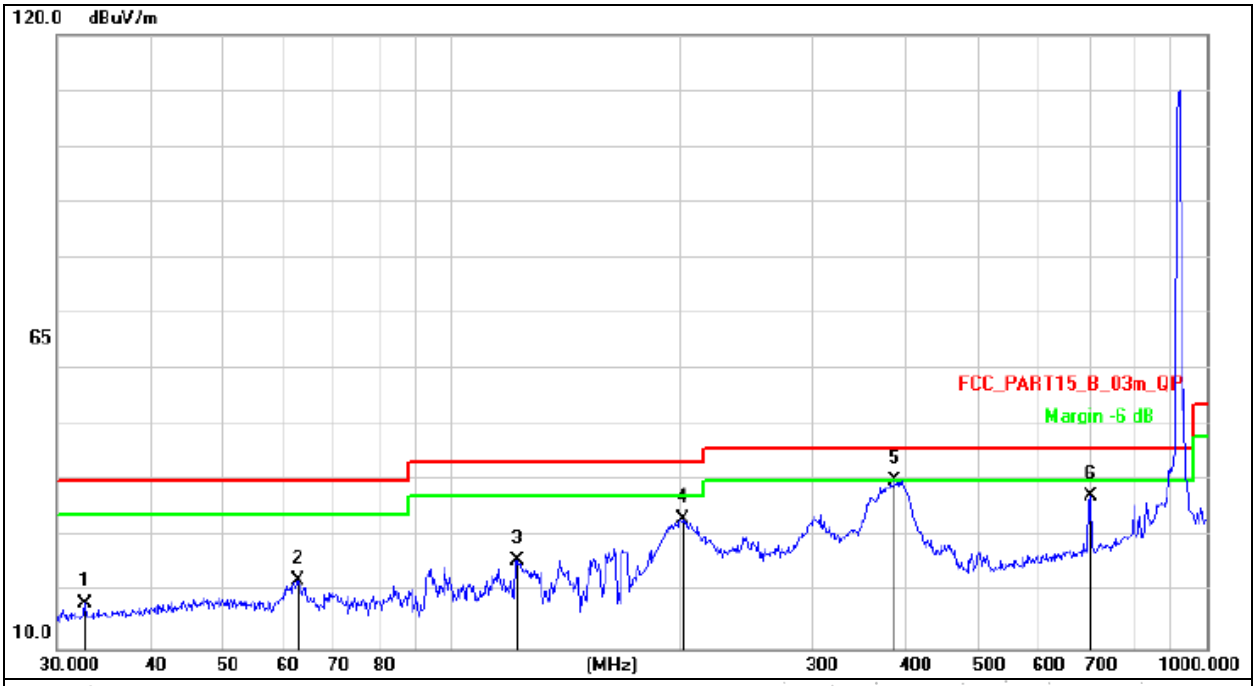
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

Between 30MHz – 1GHz

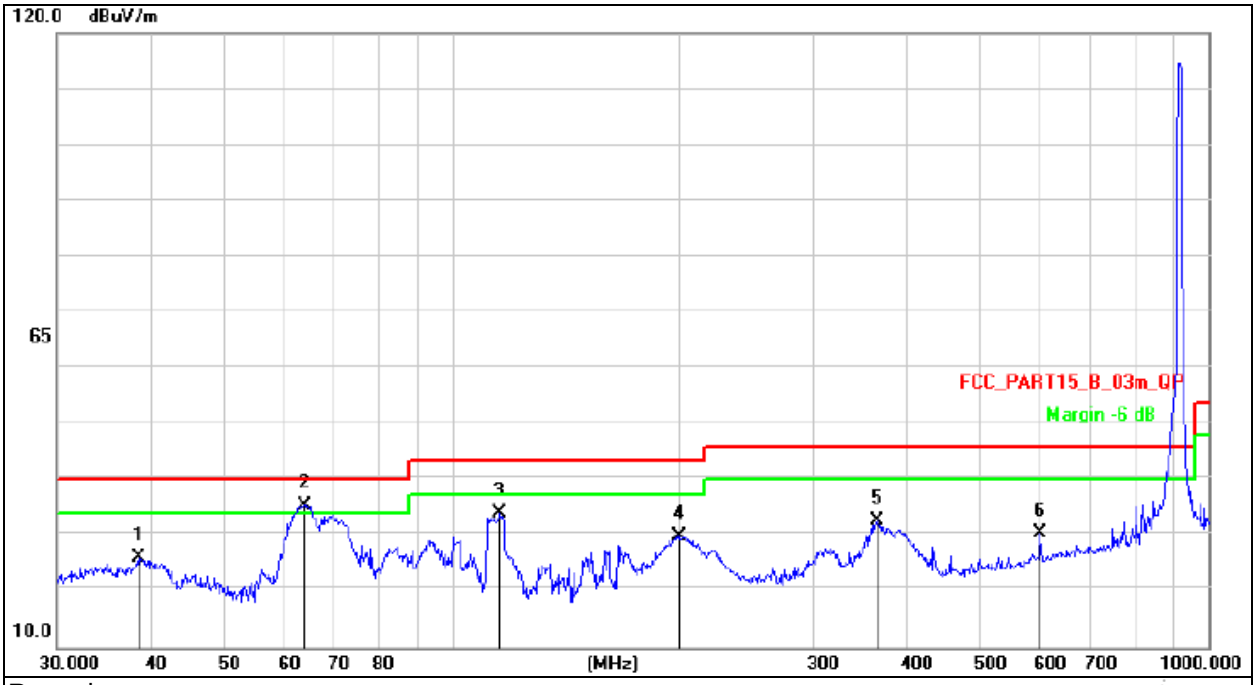
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Horizontal
Test Mode:	Mode 3	Test Voltage:	AC 120V/60Hz



Remark:
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement = Reading Level + Correct Factor
3. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		32.6340	36.12	-17.94	18.18	40.00	-21.82	QP
2		62.6507	40.08	-17.85	22.23	40.00	-17.77	QP
3		122.4039	44.96	-19.23	25.73	43.50	-17.77	QP
4		202.8103	50.62	-17.28	33.34	43.50	-10.16	QP
5	*	386.6338	52.60	-12.36	40.24	46.00	-5.76	QP
6		701.7609	44.55	-7.16	37.39	46.00	-8.61	QP

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Vertical
Test Mode:	Mode 3	Test Voltage:	AC 120V/60Hz



Remark:
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement = Reading Level + Correct Factor
3. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		38.4808	43.00	-16.97	26.03	40.00	-13.97	QP
2	*	63.7588	53.62	-18.16	35.46	40.00	-4.54	QP
3		115.7256	52.83	-18.79	34.04	43.50	-9.46	QP
4		199.9856	47.41	-17.37	30.04	43.50	-13.46	QP
5		365.5391	45.18	-12.61	32.57	46.00	-13.43	QP
6		599.3212	38.88	-8.42	30.46	46.00	-15.54	QP

Between 1GHz – 25GHz

Antenna 1 (the worst antenna)

Polar (H/V)	Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Measure-ment (dBuV/m)	Limits (dBuV/m)	Over (dB)	Detector Type
ASK Low channel							
V	1805.50	54.65	-0.43	54.22	74.00	-19.78	PK
V	1805.50	43.84	-0.43	43.41	54.00	-10.59	AV
V	2708.25	46.46	8.31	54.77	74.00	-19.23	PK
V	2708.25	35.55	8.31	43.86	54.00	-10.14	AV
H	1805.50	52.57	-0.43	52.14	74.00	-21.86	PK
H	1805.50	42.00	-0.43	41.57	54.00	-12.43	AV
H	2708.25	43.91	8.31	52.22	74.00	-21.78	PK
H	2708.25	36.11	8.31	44.42	54.00	-9.58	AV
ASK Middle channel							
V	1829.50	53.49	-0.38	53.11	74.00	-20.89	PK
V	1829.50	45.93	-0.38	45.55	54.00	-8.45	AV
V	2744.25	45.07	8.83	53.90	74.00	-20.10	PK
V	2744.25	35.50	8.83	44.33	54.00	-9.67	AV
H	1829.50	49.35	-0.38	48.97	74.00	-25.03	PK
H	1829.50	39.73	-0.38	39.35	54.00	-14.65	AV
H	2744.25	42.52	8.83	51.35	74.00	-22.65	PK
H	2744.25	35.12	8.83	43.95	54.00	-10.05	AV
ASK High channel							
V	1854.50	55.77	-0.32	55.45	74.00	-18.55	PK
V	1854.50	45.43	-0.32	45.11	54.00	-8.89	AV
V	2781.75	49.52	9.35	58.87	74.00	-15.13	PK
V	2781.75	40.40	9.35	49.75	54.00	-4.25	AV
H	1854.50	54.02	-0.32	53.70	74.00	-20.30	PK
H	1854.50	44.80	-0.32	44.48	54.00	-9.52	AV
H	2781.75	48.03	9.35	57.38	74.00	-16.62	PK
H	2781.75	39.23	9.35	48.58	54.00	-5.42	AV

Remark:

1.Emission Level = Meter Reading + Factor, Factor = Antenna Factor + Cable Loss – Pre-amplifier. Over= Emission Level - Limit

2.If peak below the average limit, the average emission was no test.

3. In restricted bands of operation, The spurious emissions below the permissible value more than 20dB

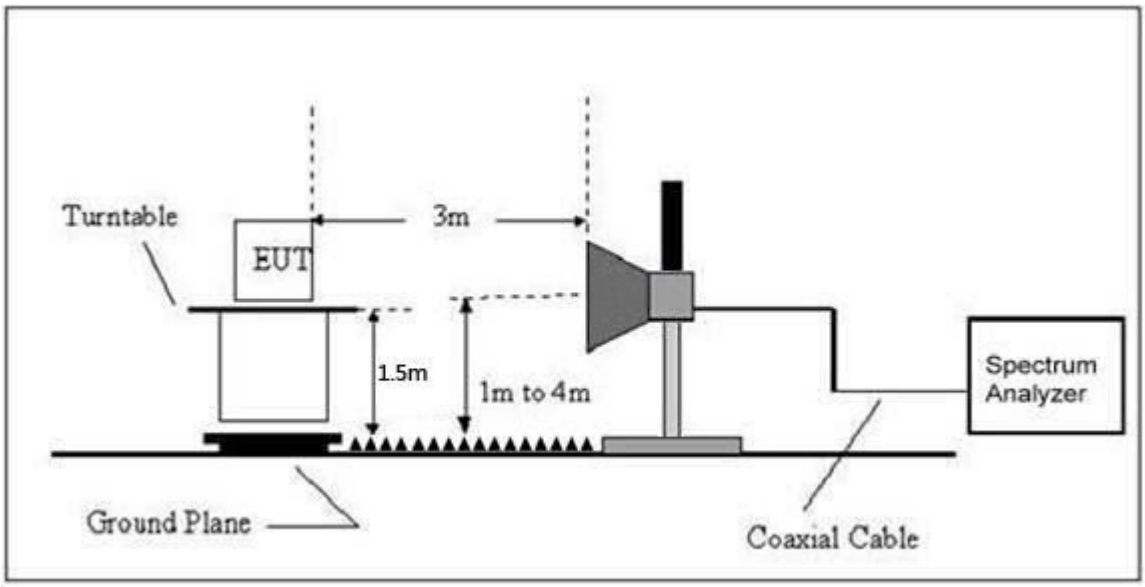
4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

5. All the antenna are test, the worst antenna is antenna 1, the data recording in the report.

8. Radiated Band Emission Measurement And Restricted Bands Of Operation

8.1 Block Diagram Of Test Setup

Radiated Emission Test-Up Frequency Above 1GHz



8.2 Limit

FCC Part15 C Section 15.209 and 15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

Limits Of Radiated Emission Measurement (Above 1000MHz)

Frequency (MHz)	Limit (dBuV/m) (at 3M)	
	Peak	Average
Above 1000	74	54

Notes:
(1)The limit for radiated test was performed according to FCC PART 15C.
(2)The tighter limit applies at the band edges.
(3)Emission level (dBuV/m)=20log Emission level (uV/m).

8.3 Test procedure

Receiver Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (Emission In Restricted Band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Above 1GHz test procedure as below:
a.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.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.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.

d.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.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. 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.

g. Test the EUT in the lowest channel, the Highest channel.

Note:
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

8.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

8.5 Test Result

Antenna 1 (the worst antenna)

Test mode	Polar (H/V)	Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Measure-ment (dBuV/m)	Limits (dBuV/m)		Result
					PK	PK	AV	
ASK	Low Channel 902.75MHz							
	H	900	52.79	-6.70	46.09	74.00	54.00	PASS
	H	902	57.64	-6.71	50.93	74.00	54.00	PASS
	V	900	52.25	-6.70	45.55	74.00	54.00	PASS
	V	902	53.76	-6.71	47.05	74.00	54.00	PASS
	High Channel 927.25MHz							
	H	928	53.15	-6.79	46.36	74.00	54.00	PASS
	H	930	49.31	-6.81	42.50	74.00	54.00	PASS
	V	928	51.10	-6.79	44.31	74.00	54.00	PASS
	V	930	46.48	-6.81	39.67	74.00	54.00	PASS

Remark:

1. Emission Level = Meter Reading + Factor, Factor = Antenna Factor + Cable Loss – Pre-amplifier. Over= Emission Level - Limit

2. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

3 In restricted bands of operation, The spurious emissions below the permissible value more than 20dB

4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

5. All the antenna are test, the worst antenna is antenna 1, the data recording in the report.

9. Conducted Spurious Emission Measurement

9.1 Block Diagram Of Test Setup

9.2 Limit

Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 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))

9.3 Test procedure

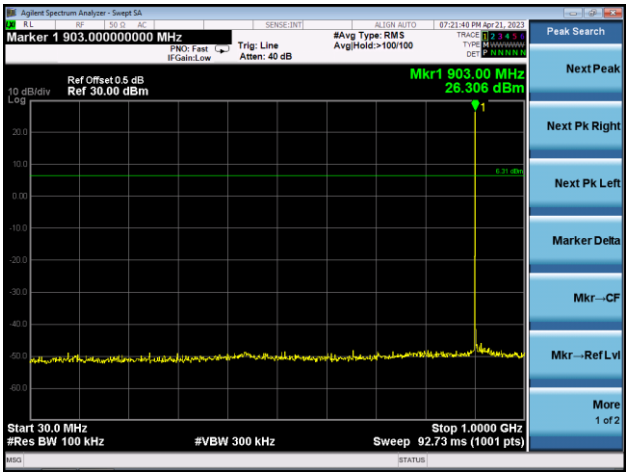
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

9.4 Test Result

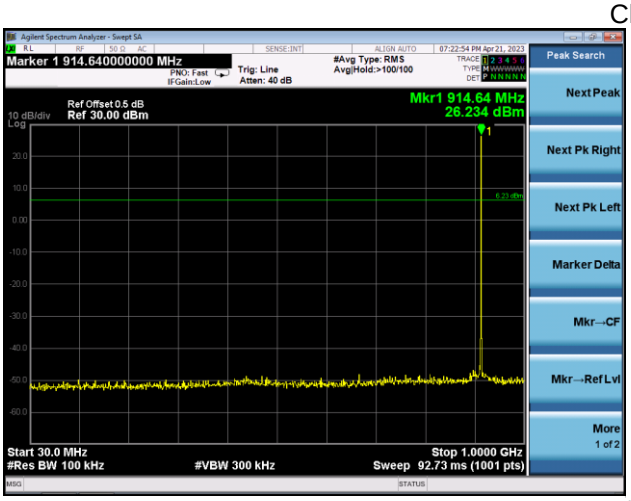
30MHz – 25GHz

Antenna1

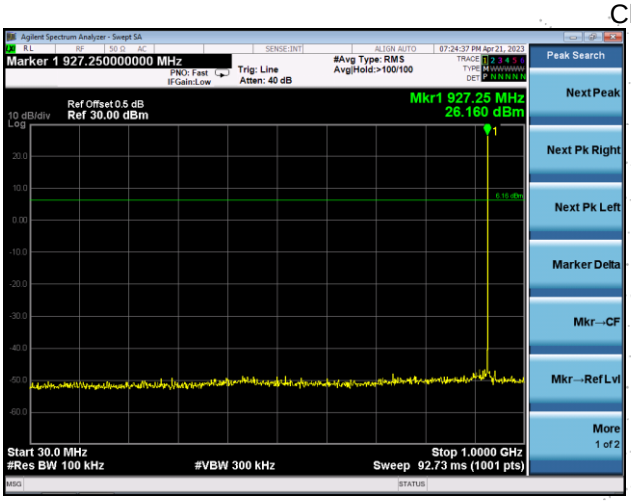
Channel 1



Channel 25

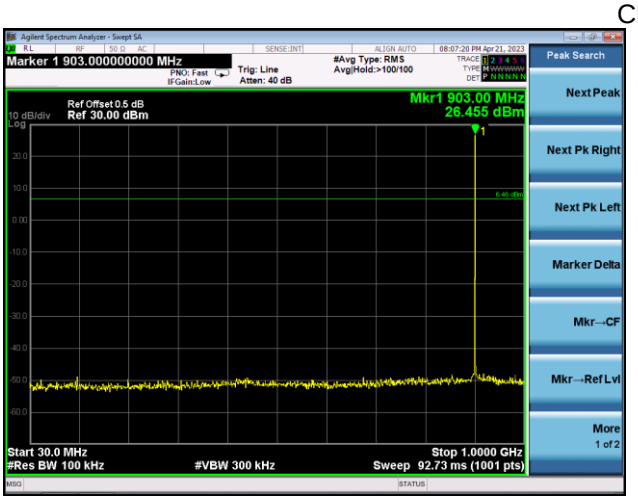


Channel 50



Antenna2

Channel 1



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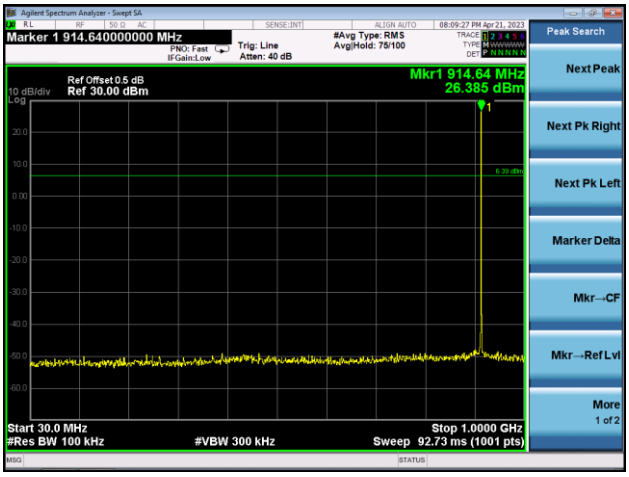

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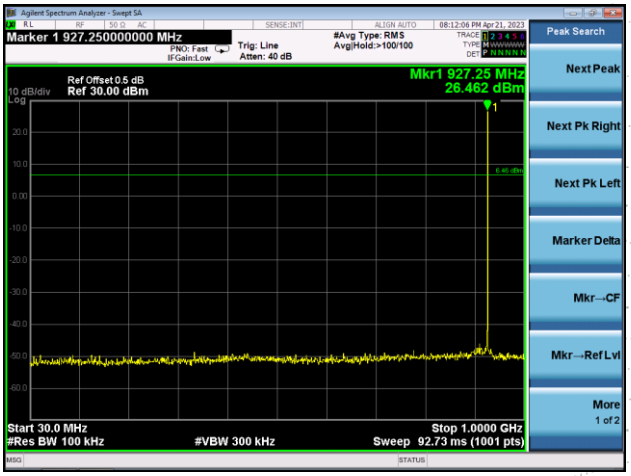
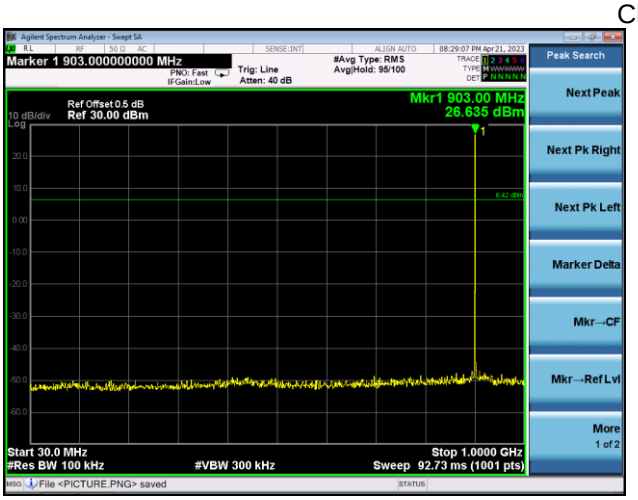
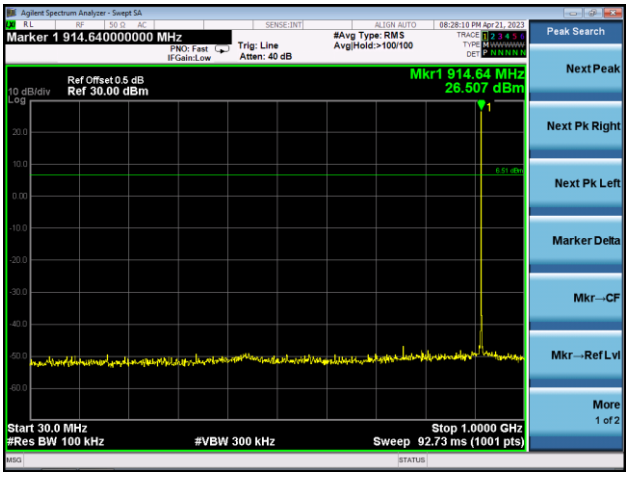


Antenna3

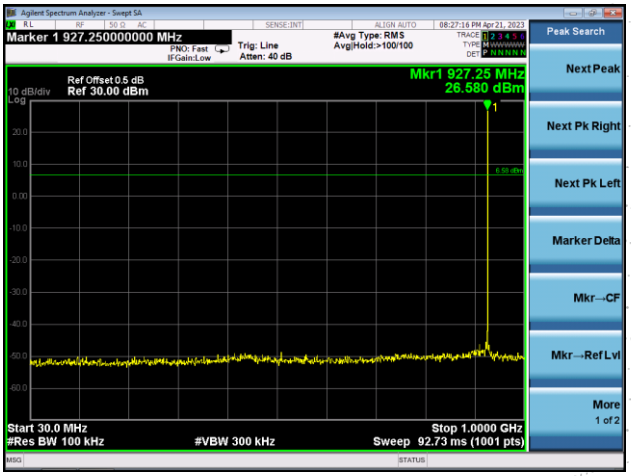
Channel 1



Channel 25

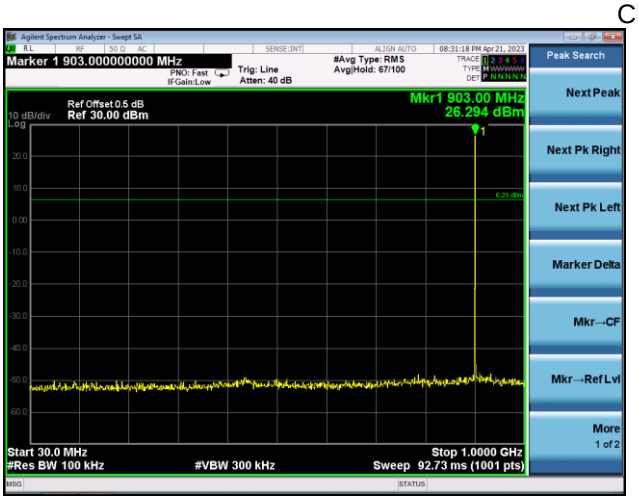


Channel 50

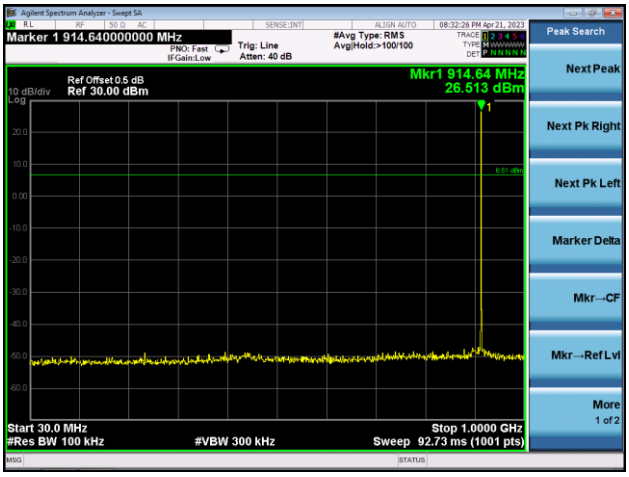


Antenna4

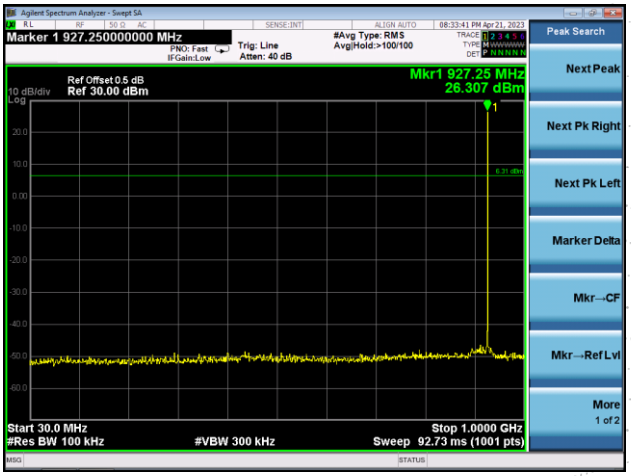
Channel 1



Channel 25

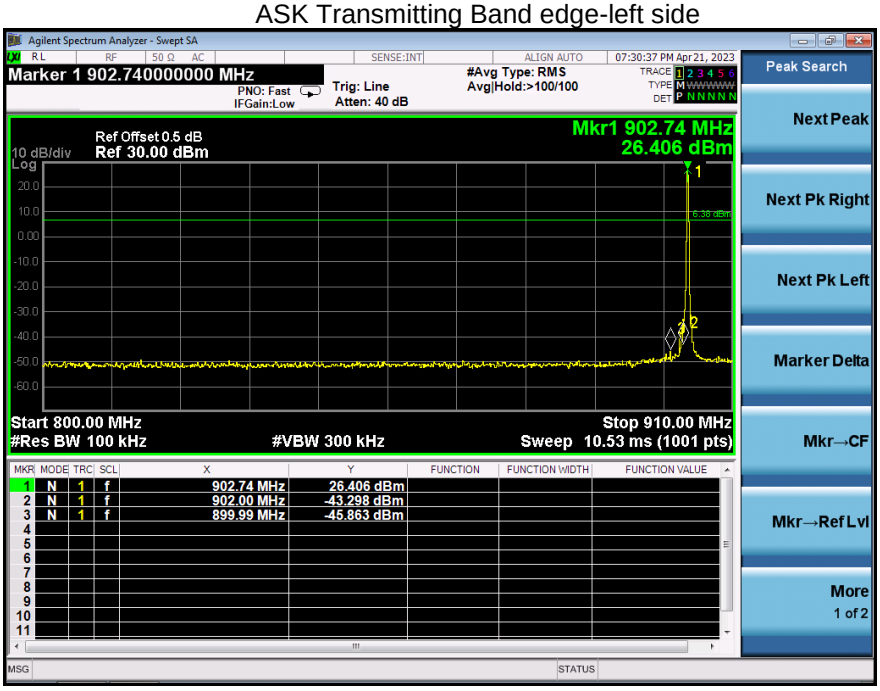


Channel 50

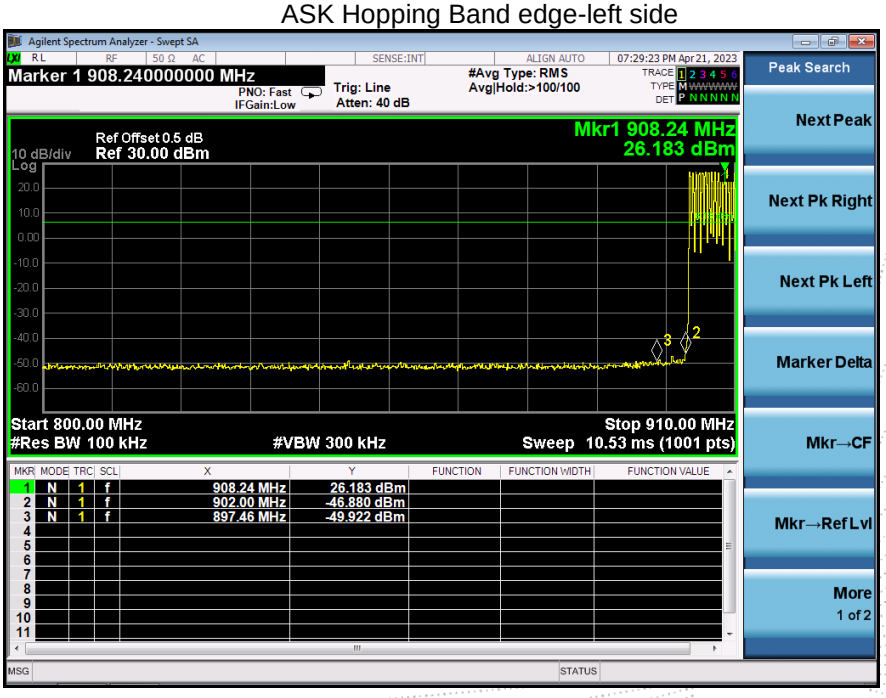


Antenna1

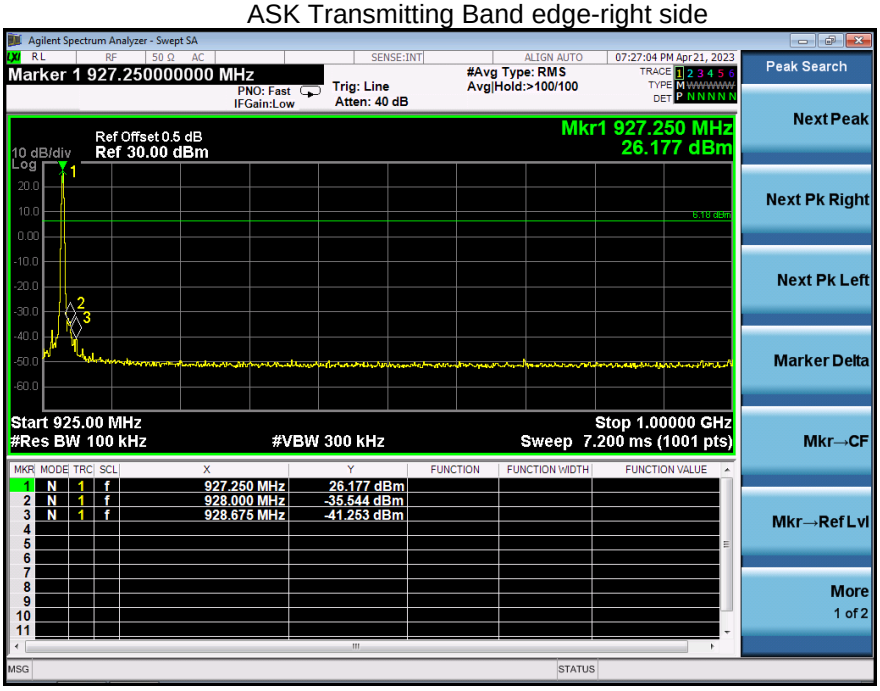
ASK Transmitting Band edge-left side



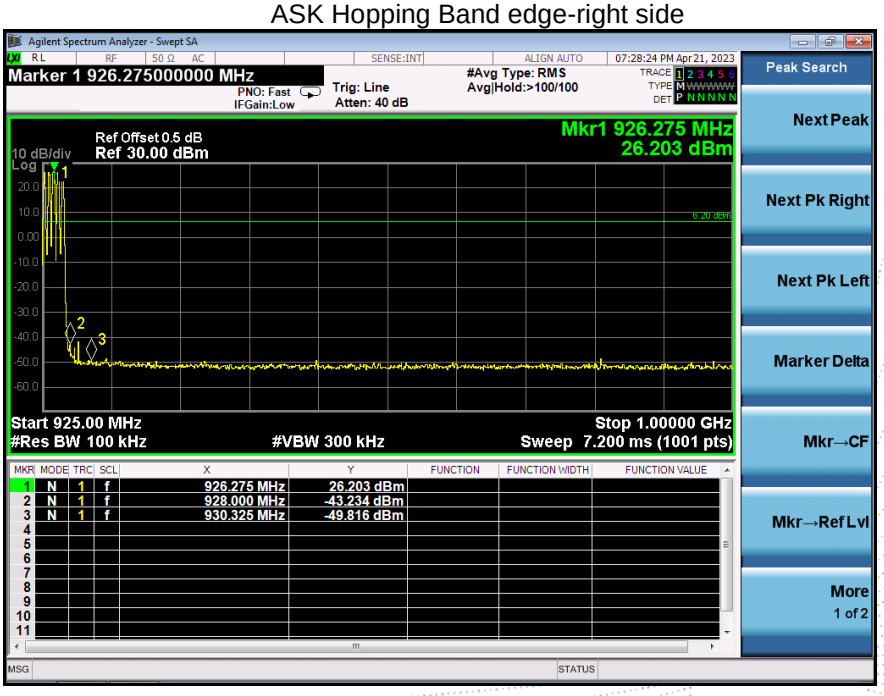
ASK Hopping Band edge-left side



ASK Transmitting Band edge-right side

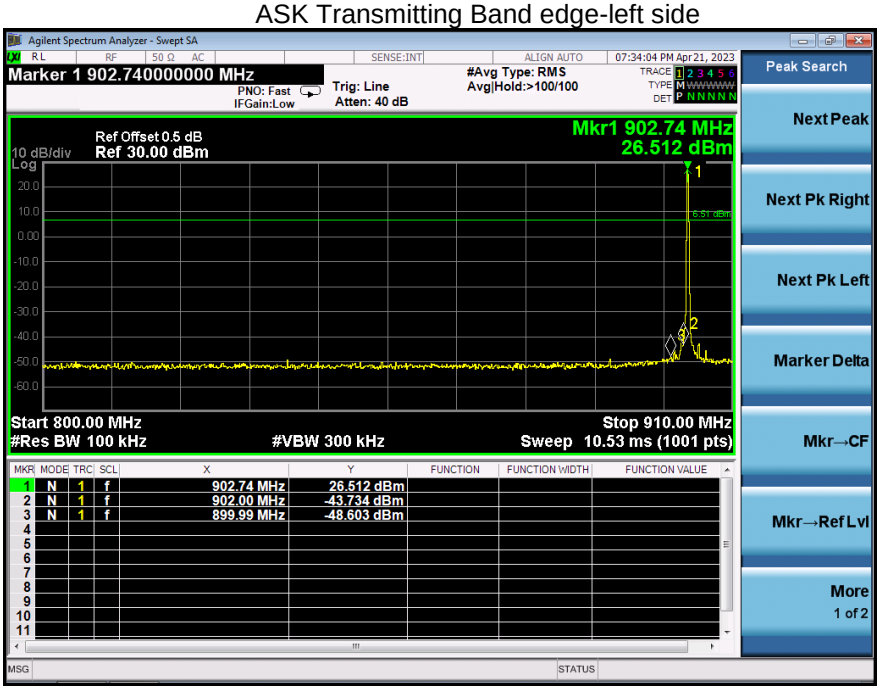


ASK Hopping Band edge-right side



Antenna2

ASK Transmitting Band edge-left side



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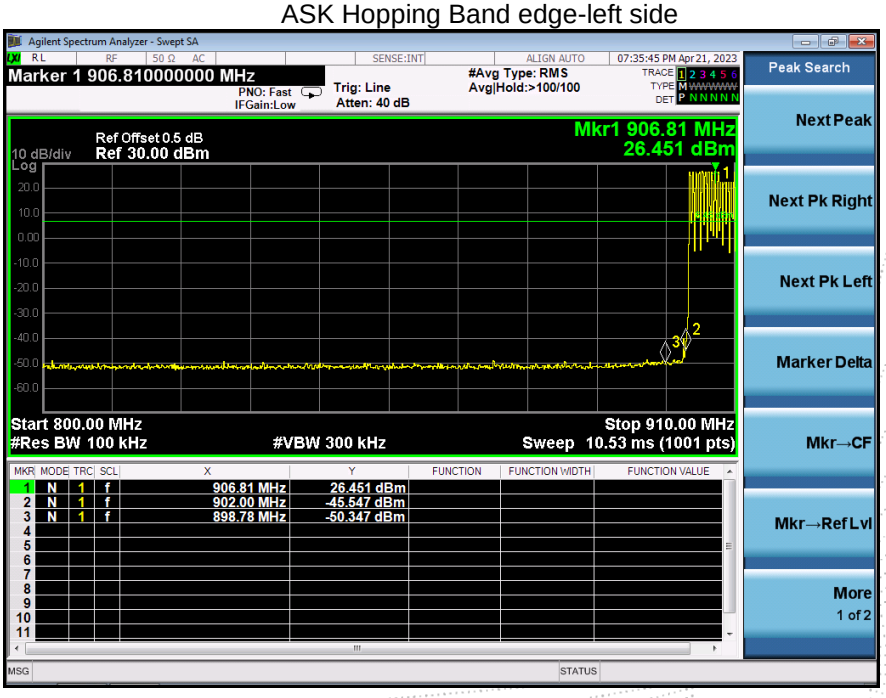

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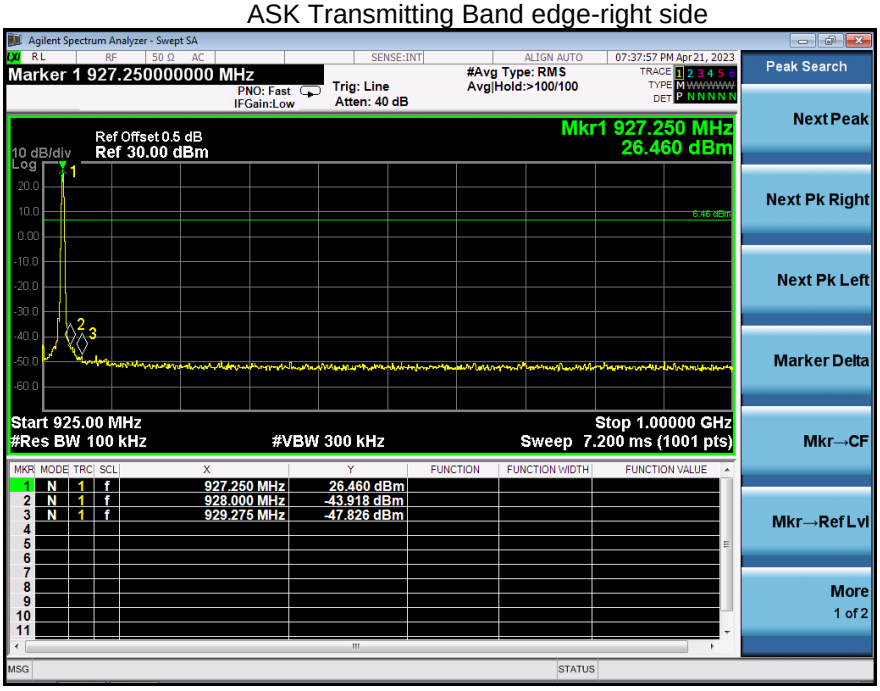

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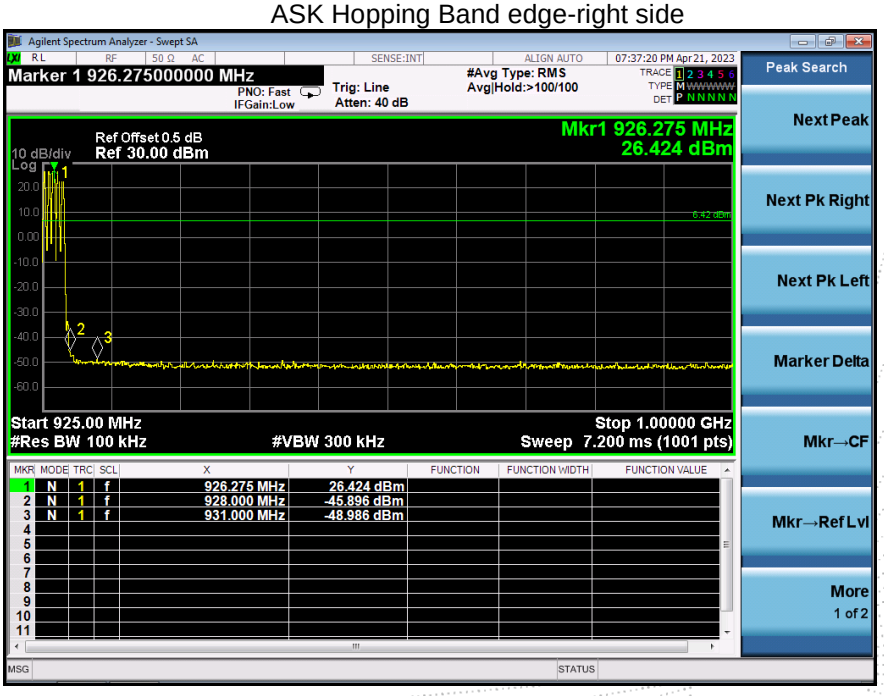

Antenna3

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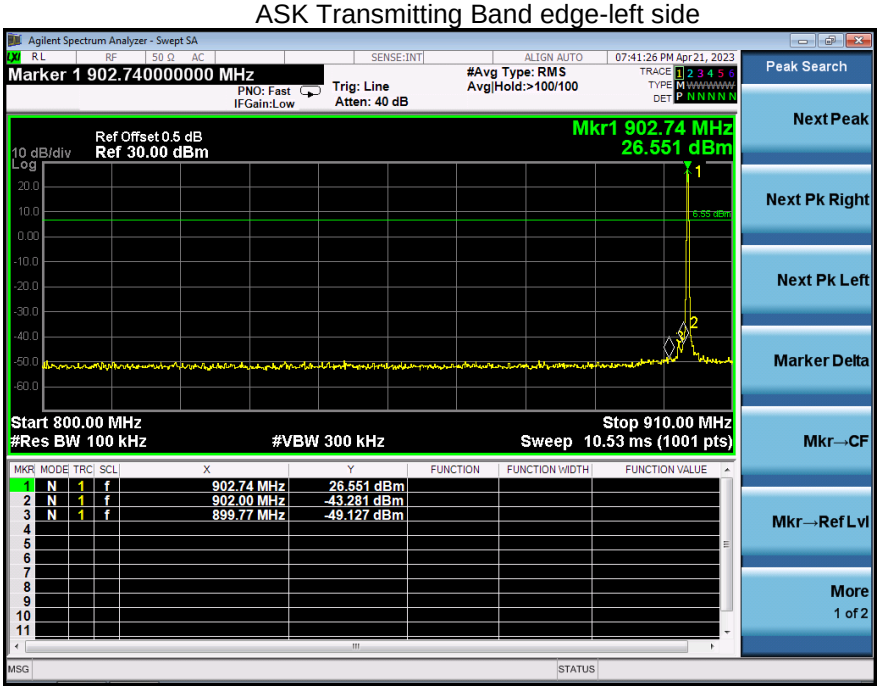

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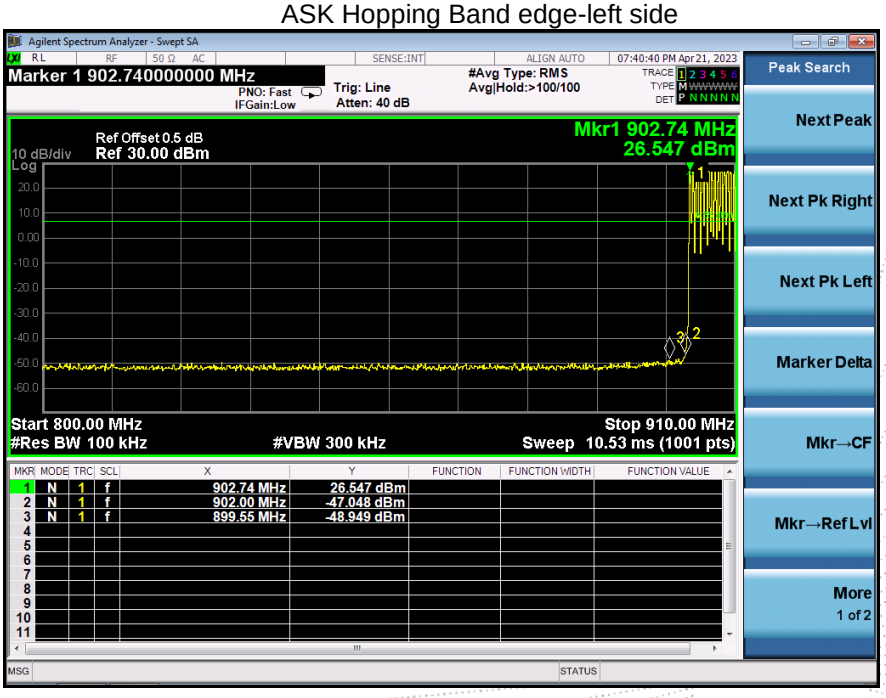

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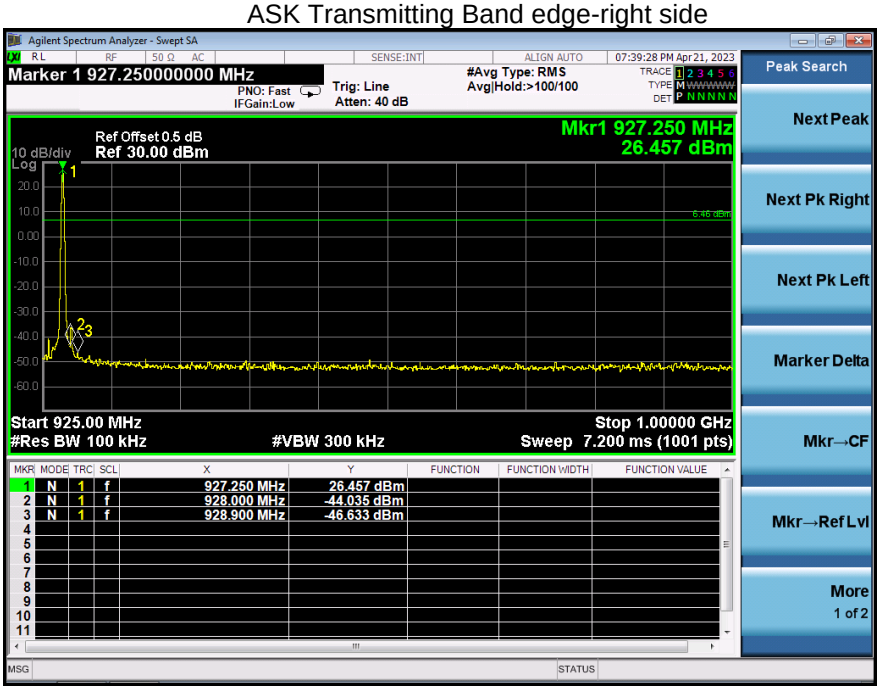

ASK Hopping Band edge-right side