

TEST REPORT

Application No.: SZCR2504001720AT
Applicant: Zircon Corporation
Address of Applicant: 1580 Dell Avenue, Campbell, California, 95008, United States
Manufacturer: ROMPA ShunXing (JiangMen) Plastics Co., Ltd.
Address of Manufacturer: No.290, Qinglan Road, Jianghai District, Jiangman, Guangdong, China
Factory: ROMPA ShunXing (JiangMen) Plastics Co., Ltd.
Address of Factory: No.290, Qinglan Road, Jianghai District, Jiangman, Guangdong, China
Equipment Under Test (EUT):
EUT Name: Water Sensor
Model No.: 5A4330XX(XX=00 to FF) ♣
 ♣ Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark: ZIRCON
FCC ID: N94-NODE-74426
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2025-04-29
Date of Test: 2025-05-22 to 2025-06-10
Date of Issue: 2025-06-10

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu

Keny Xu
EMC Laboratory Manager



SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch EMC Laboratory

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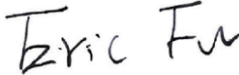
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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2025-06-10		Original

Authorized for issue by:				
				
		Bill Chen/Project Engineer		
				
		Eric Fu/Reviewer		



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2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.2	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass

Declaration of EUT Family Grouping:

Model No.: 5A4330XX(XX=00 to FF)

Only the model 5A433000 was tested, since according to the declaration from the applicant, the electrical circuit design, PCB layout, components used and internal wiring and functions were identical for the above models, with only difference being of model No.



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4 General Information

4.1 Details of E.U.T.

Power supply:	Rechargeable battery DC 3.7V (Charging by Type C cable)
RF cable(Provided by the customer):	0.5dB
Operation Frequency:	902.68MHz-926.205MHz
Modulation Type:	GFSK
Number of Channels:	26
Channel Spacing:	0.941Mhz
Antenna Type:	Built-in Antenna
Antenna Gain:	-5.85dBi

Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	902.68MHz	7	909.267MHz	14	915.854MHz	21	922.441MHz
1	903.621MHz	8	910.208MHz	15	916.795MHz	22	923.382MHz
2	904.562MHz	9	911.149MHz	16	917.736MHz	23	924.323MHz
3	905.503MHz	10	912.09MHz	17	918.677MHz	24	925.264MHz
4	906.444MHz	11	913.031MHz	18	919.618MHz	25	926.205MHz
5	907.385MHz	12	913.972MHz	19	920.559MHz		
6	908.326MHz	13	914.913MHz	20	921.5MHz		

Remark:The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Radiated Emissions which fall in the restricted bands	$\pm 6.0\text{dB}$ (Below 1GHz); $\pm 4.6\text{dB}$ (Above 1GHz)
Radiated Spurious Emissions Below 1GHz	$\pm 6.0\text{dB}$ for 3m; $\pm 5.0\text{dB}$ for 10m
Radiated Spurious Emissions Above 1GHz	$\pm 4.6\text{dB}$ (1-18GHz); $\pm 4.8\text{dB}$ (18-40GHz)
Conducted Peak Output Power	$\pm 0.75\text{dB}$
Minimum 6dB Bandwidth	$\pm 3\%$



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Power Spectrum Density	$\pm 2.84\text{dB}$
Conducted Band Edges Measurement	$\pm 0.75\text{dB}$
Conducted Spurious Emissions	$\pm 0.75\text{dB}$
Remark: The U_{lab} (lab Uncertainty) is less than $U_{\text{CISPR/ETSI}}$ (CISPR/ETSI Uncertainty), so the test results – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.	



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4.4 Test Location

All tests were performed at:

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No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Signal & Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-048	2025-01-07	2026-01-06
Low Noise Amplifier 30M-8GHz	Tonscend	TAP30M8G30	SZ-WRG-M-050	2025-01-07	2026-01-06
Double Ridge Horn Antenna 1GHz-18GHz	SCHWARZBECK	BBHA 9120 D	SZ-WRG-M-055	2023-12-21	2025-12-20
RSE Test Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Chamber	CRTSGSSAC966	N/A	SZ-WRG-C-063	2025-01-06	2028-01-05
Humidity and Temperature Indicator	deli	8838	SEM002-46	2024-07-24	2025-07-23

Radiated Spurious Emissions Below 1GHz					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2023-11-20	2025-11-19
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2023-06-19	2026-06-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2024-08-14	2025-08-13
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2023-09-16	2025-09-15
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2025-03-04	2026-03-03
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2024-07-06	2025-07-05



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Radiated Spurious Emissions Above 1GHz					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Signal & Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-048	2025-01-07	2026-01-06
Low Noise Amplifier 1G-18GHz	Tonscend	TAP01018050	SZ-WRG-M-051	2025-01-07	2026-01-06
Low Noise Amplifier 18G-40GHz	Tonscend	TAP18040048	SZ-WRG-M-052	2025-01-08	2026-01-07
Double Ridge Horn Antenna 1GHz-18GHz	SCHWARZBECK	BBHA 9120 D	SZ-WRG-M-055	2023-12-21	2025-12-20
SHF-EHF Horn 15GHz-40GHz	SCHWARZBECK	BBHA 9170	SZ-WRG-M-056	2023-12-25	2025-12-24
RSE Test Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Chamber	CRTSGSSAC966	N/A	SZ-WRG-C-063	2025-01-06	2028-01-05
Humidity and Temperature Indicator	deli	8838	SEM002-46	2024-07-24	2025-07-23

RF Conducted Test					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Power Sensor	TST PASS	TSPS2023R	SEM009-26	2025-03-04	2026-03-03
Power Sensor	KEYSIGHT	U2021XA	SEM009-16	2025-03-04	2026-03-03
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2024-08-14	2025-08-13
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2025-03-04	2026-03-03
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2024-07-06	2025-07-05
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2025-03-03	2026-03-02

General used equipment					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	deli	8838	SEM002-32	2024-07-24	2025-07-23
Humidity/ Temperature Indicator	deli	8838	SEM002-33	2024-07-24	2025-07-23
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2025-03-03	2026-03-02



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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

Standard 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(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -5.85dBi.

Antenna location: Refer to internal photo.



7 Radio Spectrum Matter Test Results

7.1 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

Humidity: 46.8 % RH

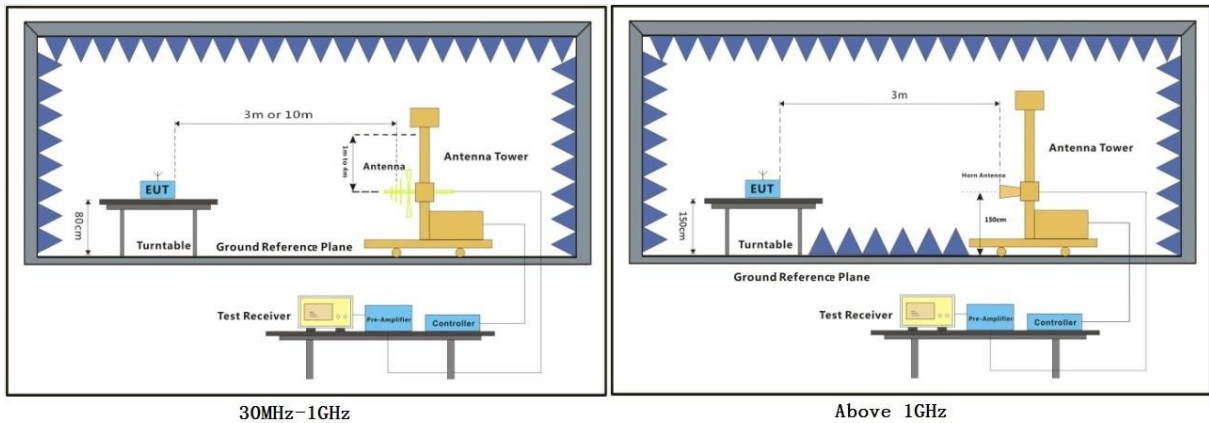
Atmospheric Pressure: 1020 mbar



7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.1.3 Test Setup Diagram



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7.1.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. 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.
- e. 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.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. 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.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

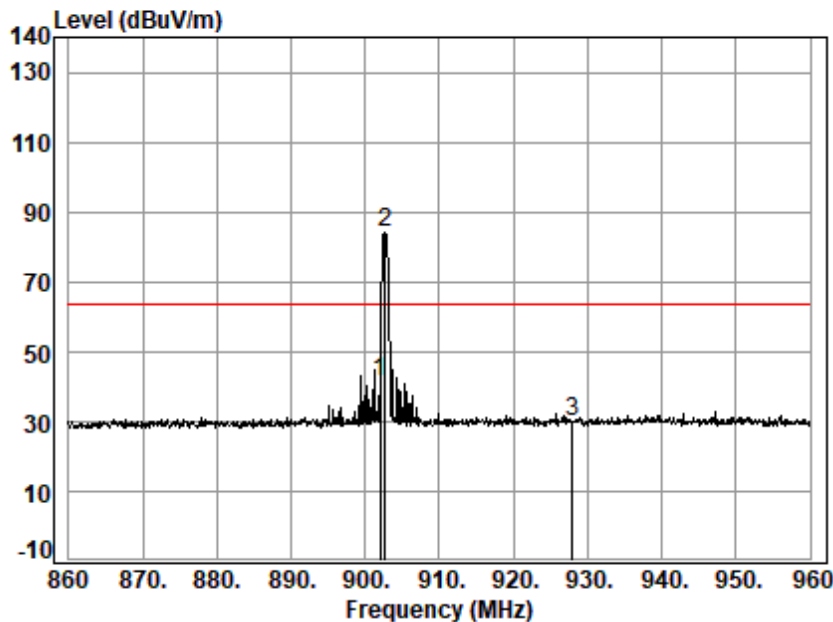
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Remark 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.

Remark 4: For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.



Test Mode: L; Polarity: Horizontal

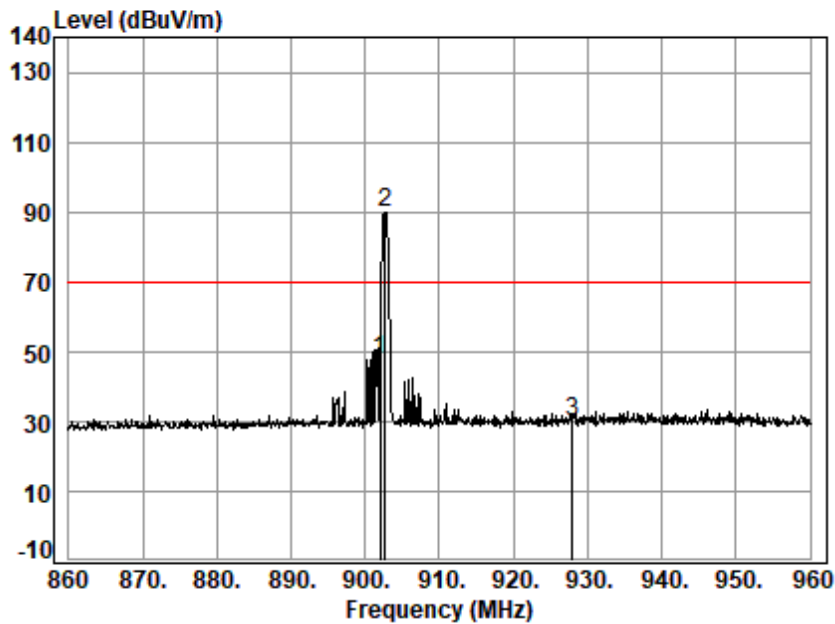


Site : chamber
Condition: 3m HORIZONTAL
Job No. : 01720AT
Test mode: 00
: 902.68M

	Ant Freq	Cable Factor	Preamp Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	902.000	27.82	4.13	26.75	36.15	41.35	63.84	-22.49
2	902.680	27.81	4.13	26.75	78.65	83.84	63.84	20.00
3	928.000	28.18	4.20	26.56	24.22	30.04	63.84	-33.80



Test Mode: L; Polarity: Vertical

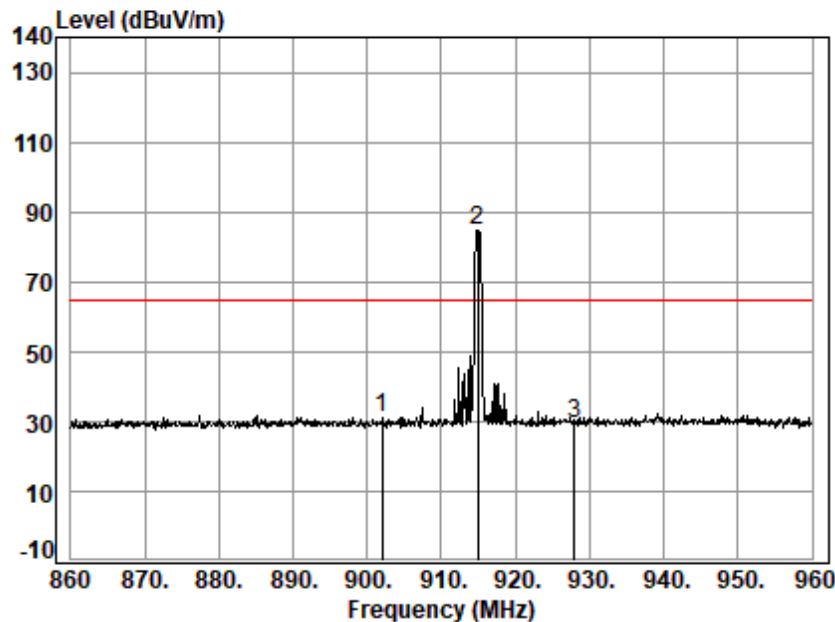


Site : chamber
Condition: 3m VERTICAL
Job No. : 01720AT
Test mode: 00
: 902.68M

	Ant Freq	Cable Factor	Preamp Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	902.000	27.82	4.13	26.75	42.31	47.51	69.96	-22.45
2	902.680	27.81	4.13	26.75	84.77	89.96	69.96	20.00
3	928.000	28.18	4.20	26.56	23.92	29.74	69.96	-40.22



Test Mode: M; Polarity: Horizontal

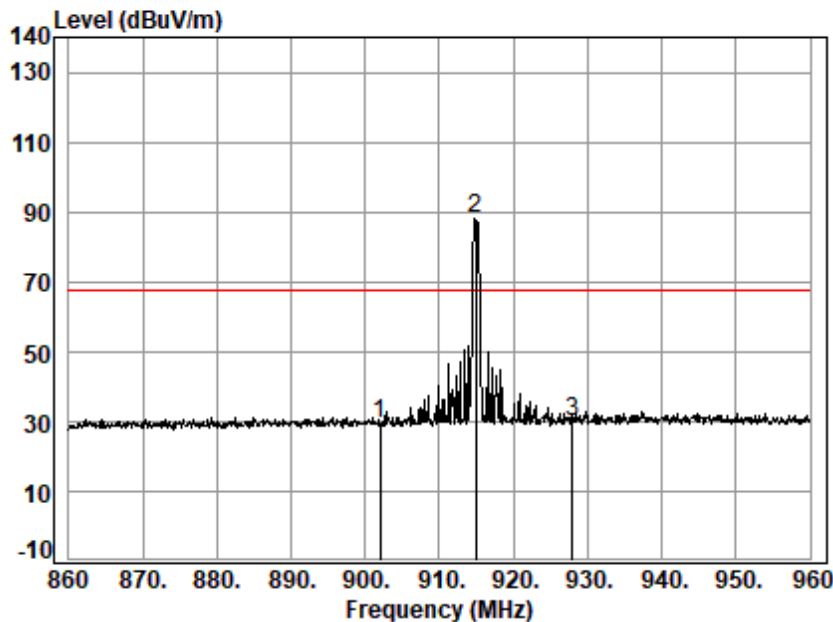


Site : chamber
Condition: 3m HORIZONTAL
Job No. : 01720AT
Test mode: 00
: 914.91M

	Ant Freq	Cable Factor	Preamp Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	902.000	27.82	4.13	26.75	26.06	31.26	64.88	-33.62
2	914.910	28.03	4.16	26.66	79.35	84.88	64.88	20.00
3	928.000	28.18	4.20	26.56	23.69	29.51	64.88	-35.37



Test Mode: M; Polarity: Vertical

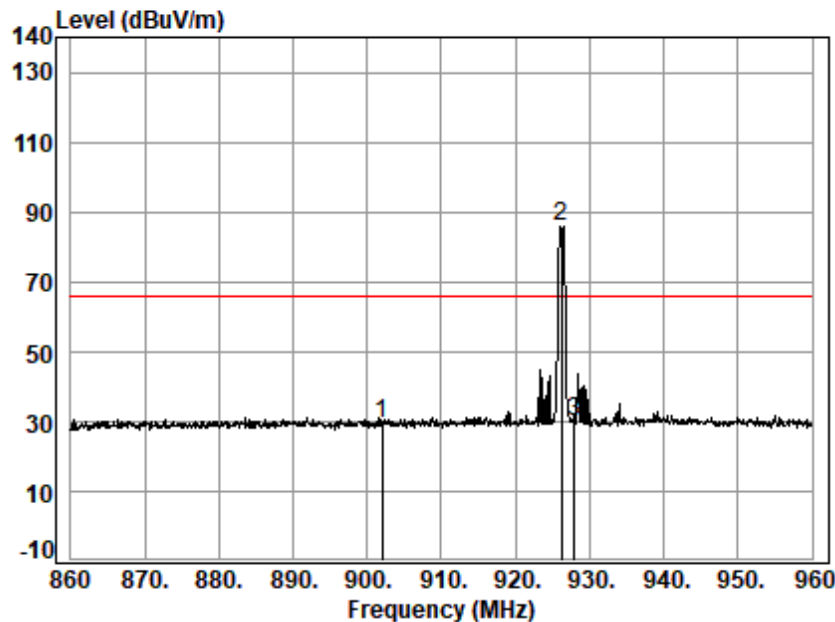


Site : chamber
Condition: 3m VERTICAL
Job No. : 01720AT
Test mode: 00
: 914.91M

	Ant Freq	Cable Factor	Preamp Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	902.000	27.82	4.13	26.75	24.21	29.41	67.82	-38.41
2	914.910	28.03	4.16	26.66	82.29	87.82	67.82	20.00
3	928.000	28.18	4.20	26.56	23.99	29.81	67.82	-38.01



Test Mode: H; Polarity: Horizontal

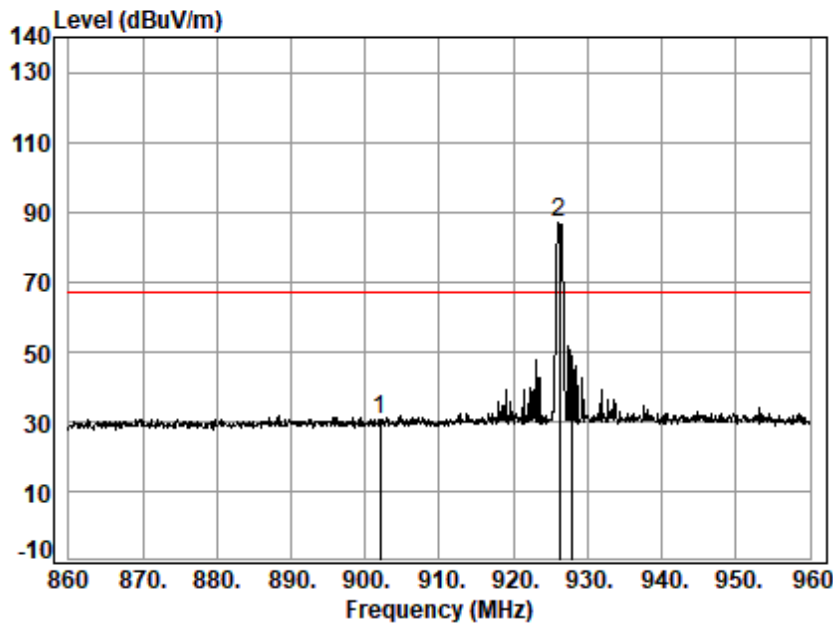


Site : chamber
 Condition: 3m HORIZONTAL
 Job No. : 01720AT
 Test mode: 00
 : 926.2M

	Ant Freq	Cable Factor	Preamp Loss	Read Level	Limit Level	Over Line	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	902.000	27.82	4.13	26.75	24.18	65.67	-36.29
2	926.200	28.13	4.19	26.58	79.93	65.67	20.00
3	928.000	28.18	4.20	26.56	23.84	65.67	-36.01



Test Mode: H; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : 01720AT
Test mode: 00
: 926.2M

	Ant Freq	Cable Factor	Preamp Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	902.000	27.82	4.13	26.75	25.06	30.26	66.79	-36.53
2	926.200	28.13	4.19	26.58	81.05	86.79	66.79	20.00
3	928.000	28.18	4.20	26.56	23.89	29.71	66.79	-37.08



7.2 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
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
960-1000	500	3

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23.8 °C

Humidity: 42.8 % RH

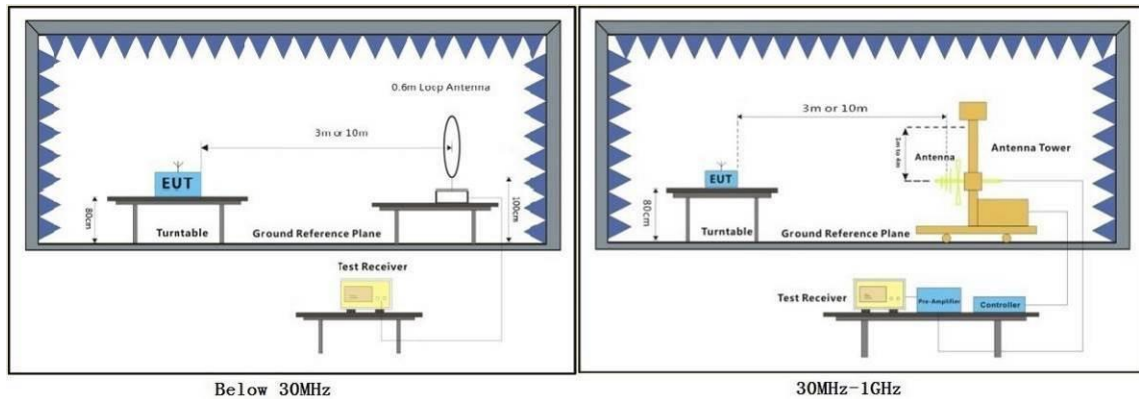
Atmospheric Pressure: 1020 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.



7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

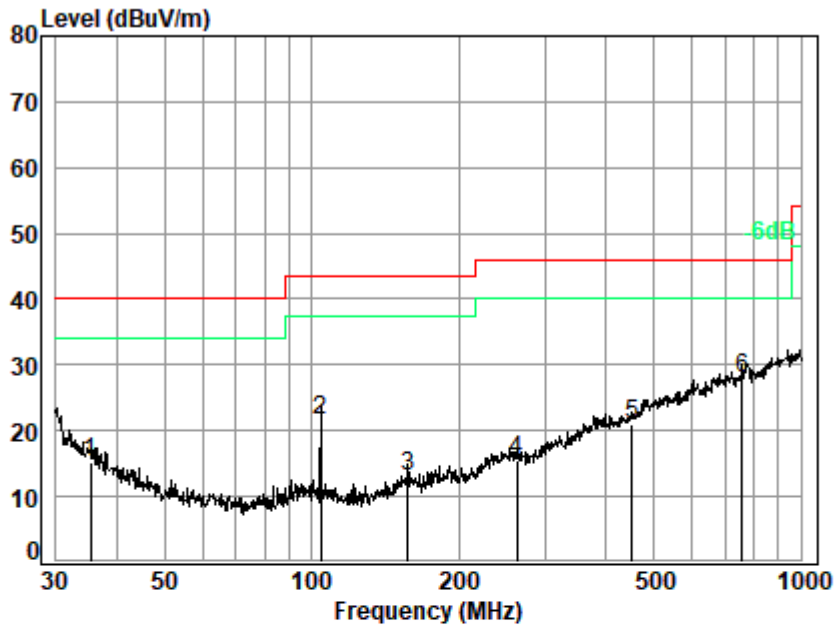
- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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 quasi-peak method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel, the middle channel, the Highest channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- Repeat above procedures until all frequencies measured was complete.

Remark:

- Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
- Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.



Test Mode: 00; Polarity: Horizontal

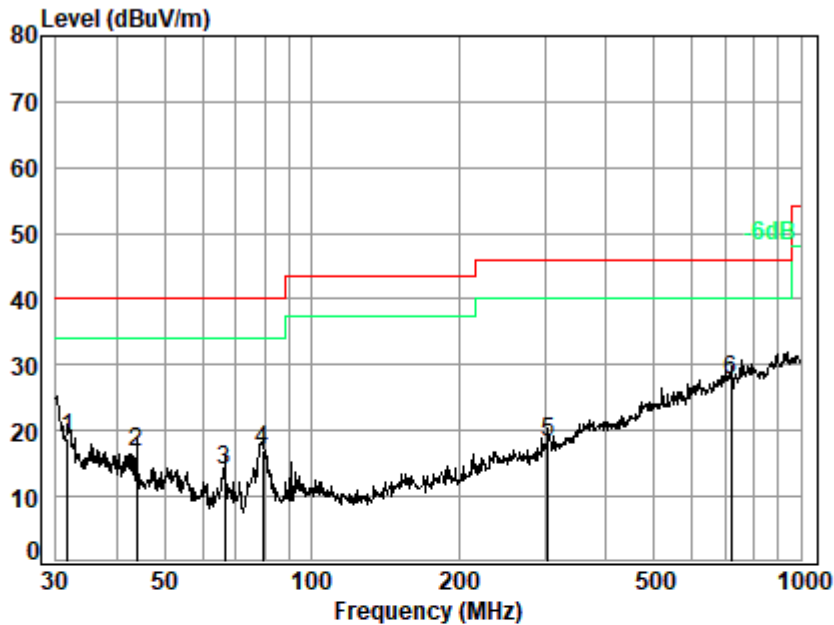


Site : chamber
Condition: 3m HORIZONTAL
Job No. : 01720AT
Test Mode: 00

		Ant	Cable	Preamp	Read		Limit	Over	
	Freq	Factor	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	35.375	18.66	0.79	27.65	23.51	15.31	40.00	-24.69	QP
2	104.170	12.22	1.25	27.61	35.86	21.72	43.50	-21.78	QP
3	157.559	13.63	1.53	27.73	25.61	13.04	43.50	-30.46	QP
4	262.896	17.13	1.98	27.60	23.93	15.44	46.00	-30.56	QP
5	452.720	21.20	2.67	27.86	24.91	20.92	46.00	-25.08	QP
6 q	758.041	26.48	3.58	27.69	25.72	28.09	46.00	-17.91	QP



Test Mode: 00; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : 01720AT
Test Mode: 00

	Ant Freq	Cable Factor	Preamp Loss	Read Level	Limit Level	Over Line	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	31.731	20.39	0.76	27.65	25.36	18.86	40.00 -21.14 QP
2	43.812	14.62	0.85	27.64	28.88	16.71	40.00 -23.29 QP
3	66.266	10.90	0.96	27.62	29.74	13.98	40.00 -26.02 QP
4	79.243	10.42	1.09	27.61	33.04	16.94	40.00 -23.06 QP
5	303.544	18.30	2.13	27.51	25.43	18.35	46.00 -27.65 QP
6 q	719.200	26.25	3.47	27.79	25.75	27.68	46.00 -18.32 QP



7.3 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.6

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 24.5 °C

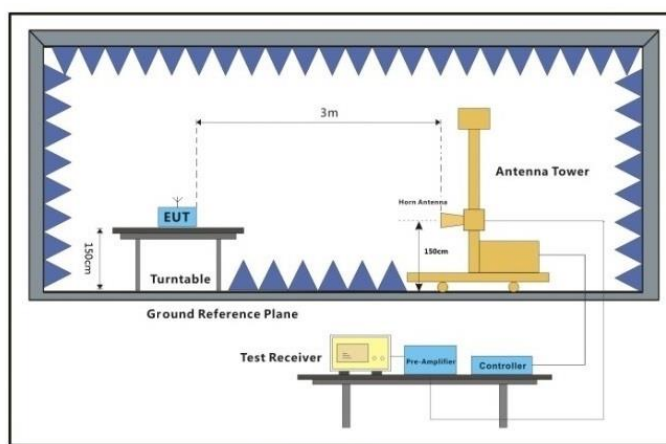
Humidity: 50.8 % RH

Atmospheric Pressure: 1020 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.3.3 Test Setup Diagram



Above 1GHz



7.3.4 Measurement Procedure and Data

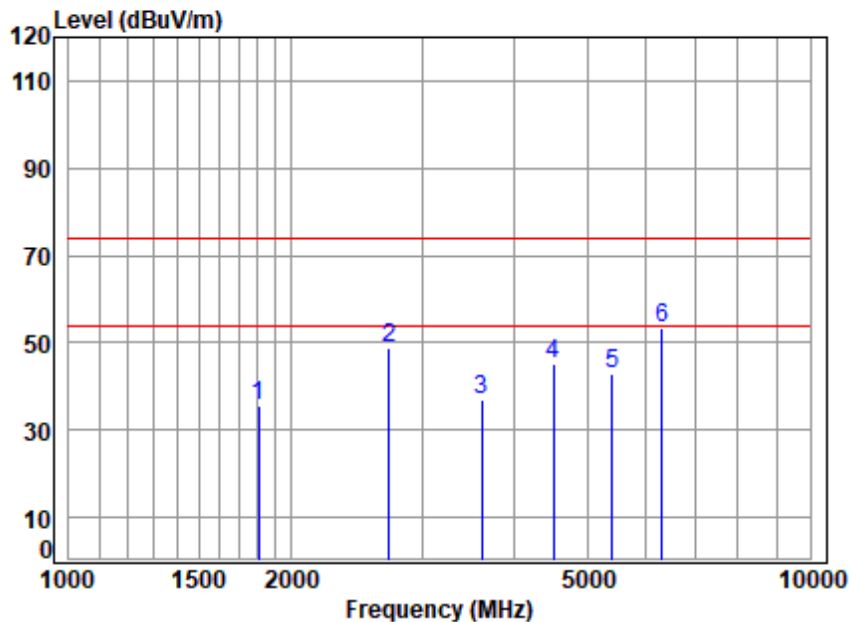
- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which 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 or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.
- 5:For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle<98%) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.



Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Condition: 3m HORIZONTAL

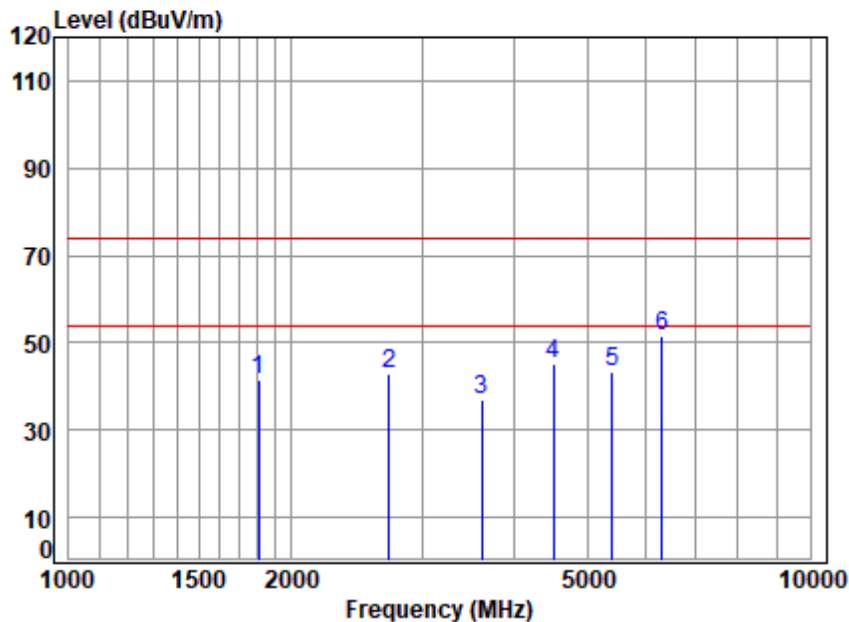
Job No : 01720AT

Mode : 902.68 TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1805.360	7.97	25.42	54.70	56.86	35.55	74.00	-38.45	Peak
2	2708.040	6.71	28.36	54.91	68.63	48.79	74.00	-25.21	Peak
3	3610.720	7.57	29.88	55.37	55.03	37.11	74.00	-36.89	Peak
4	4513.400	8.47	31.57	55.96	60.93	45.01	74.00	-28.99	Peak
5	5416.080	9.80	32.83	56.55	56.83	42.91	74.00	-31.09	Peak
6 pp	6318.760	10.57	34.64	56.84	65.05	53.42	74.00	-20.58	Peak



Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Condition: 3m VERTICAL

Job No : 01720AT

Mode : 902.68 TX RSE

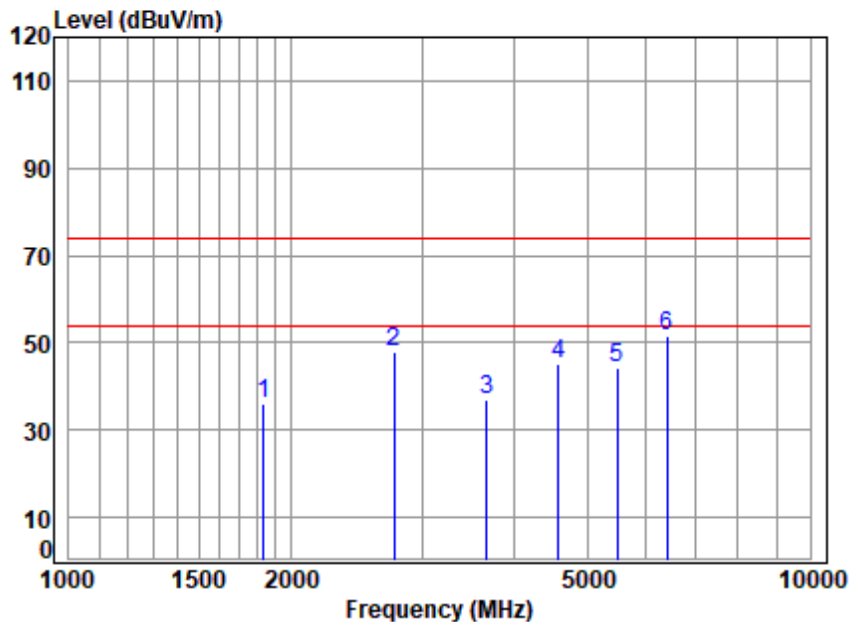
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1805.360	7.97	25.42	54.70	62.70	41.39	74.00	-32.61	Peak
2	2708.040	6.71	28.36	54.91	62.67	42.83	74.00	-31.17	Peak
3	3610.720	7.57	29.88	55.37	54.80	36.88	74.00	-37.12	Peak
4	4513.400	8.47	31.57	55.96	60.97	45.05	74.00	-28.95	Peak
5	5416.080	9.80	32.83	56.55	57.40	43.48	74.00	-30.52	Peak
6 pp	6318.760	10.57	34.64	56.84	63.40	51.77	74.00	-22.23	Peak



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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Condition: 3m HORIZONTAL

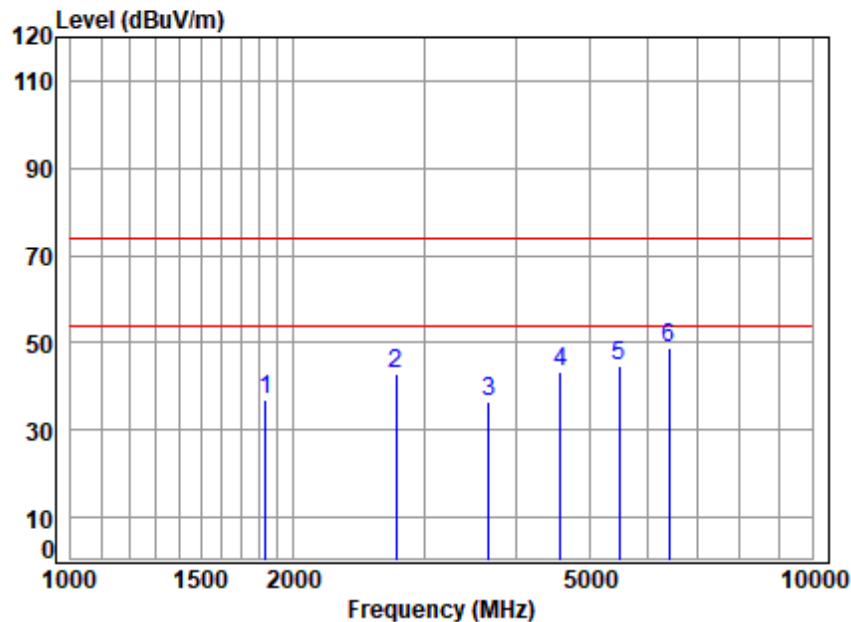
Job No : 01720AT

Mode : 914.91 TX RSE

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1829.820	8.92	25.52	54.70	56.47	36.21	74.00	-37.79	Peak
2	2744.730	6.87	28.66	54.92	67.25	47.86	74.00	-26.14	Peak
3	3659.640	7.63	29.80	55.40	54.94	36.97	74.00	-37.03	Peak
4	4574.550	8.53	31.65	56.00	60.97	45.15	74.00	-28.85	Peak
5	5489.460	9.83	32.90	56.59	58.23	44.37	74.00	-29.63	Peak
6 pp	6404.370	10.48	34.80	56.82	63.09	51.55	74.00	-22.45	Peak



Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



Condition: 3m VERTICAL

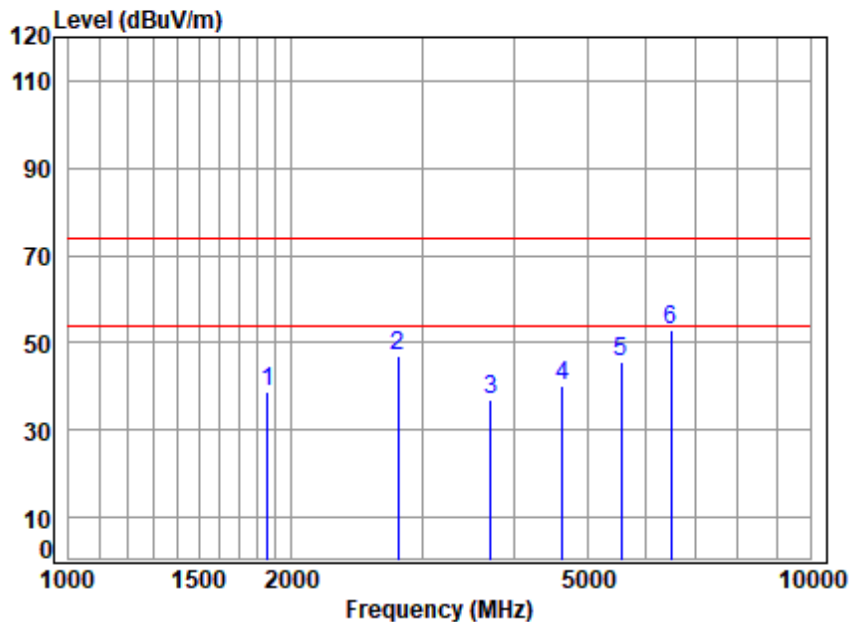
Job No : 01720AT

Mode : 914.91 TX RSE

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1829.820	8.92	25.52	54.70	57.15	36.89	74.00	-37.11	Peak
2	2744.730	6.87	28.66	54.92	62.21	42.82	74.00	-31.18	Peak
3	3659.640	7.63	29.80	55.40	54.40	36.43	74.00	-37.57	Peak
4	4574.550	8.53	31.65	56.00	59.31	43.49	74.00	-30.51	Peak
5	5489.460	9.83	32.90	56.59	58.76	44.90	74.00	-29.10	Peak
6 pp	6404.370	10.48	34.80	56.82	60.18	48.64	74.00	-25.36	Peak



Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Condition: 3m HORIZONTAL

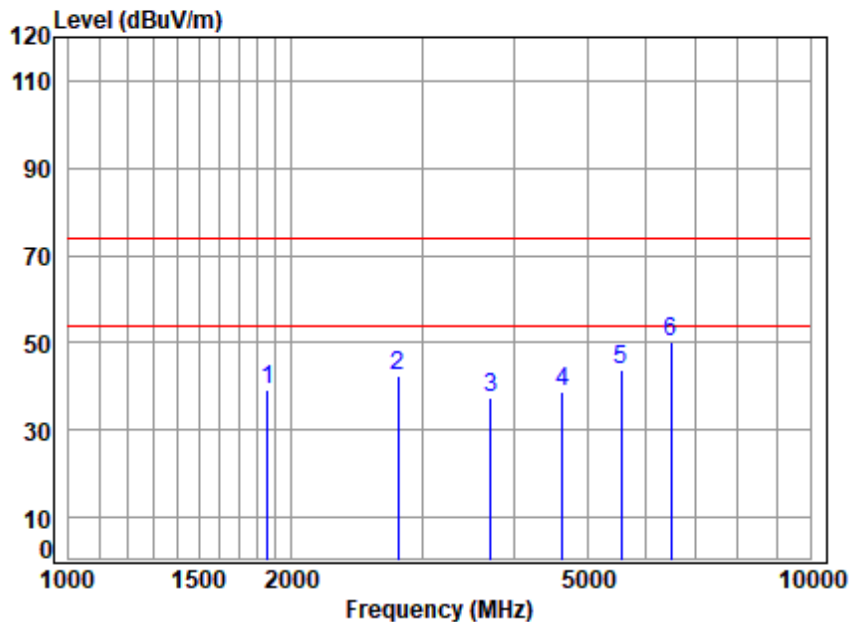
Job No : 01720AT

Mode : 926.2 TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1852.400	9.80	25.60	54.70	57.97	38.67	74.00	-35.33	Peak
2	2778.600	7.01	28.64	54.93	66.46	47.18	74.00	-26.82	Peak
3	3704.800	7.68	29.81	55.42	54.95	37.02	74.00	-36.98	Peak
4	4631.000	8.62	31.74	56.04	55.94	40.26	74.00	-33.74	Peak
5	5557.200	9.76	32.91	56.63	59.59	45.63	74.00	-28.37	Peak
6 pp	6483.400	10.57	34.87	56.80	64.50	53.14	74.00	-20.86	Peak



Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Condition: 3m VERTICAL

Job No : 01720AT

Mode : 926.2 TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1852.400	9.80	25.60	54.70	58.48	39.18	74.00	-34.82	Peak
2	2778.600	7.01	28.64	54.93	61.70	42.42	74.00	-31.58	Peak
3	3704.800	7.68	29.81	55.42	55.23	37.30	74.00	-36.70	Peak
4	4631.000	8.62	31.74	56.04	54.37	38.69	74.00	-35.31	Peak
5	5557.200	9.76	32.91	56.63	57.77	43.81	74.00	-30.19	Peak
6 pp	6483.400	10.57	34.87	56.80	61.77	50.41	74.00	-23.59	Peak



7.4 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9.2

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq$ hopping channels < 50
	1 for digital modulation
2400-2483.5	1 for ≥ 75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 24.1 °C

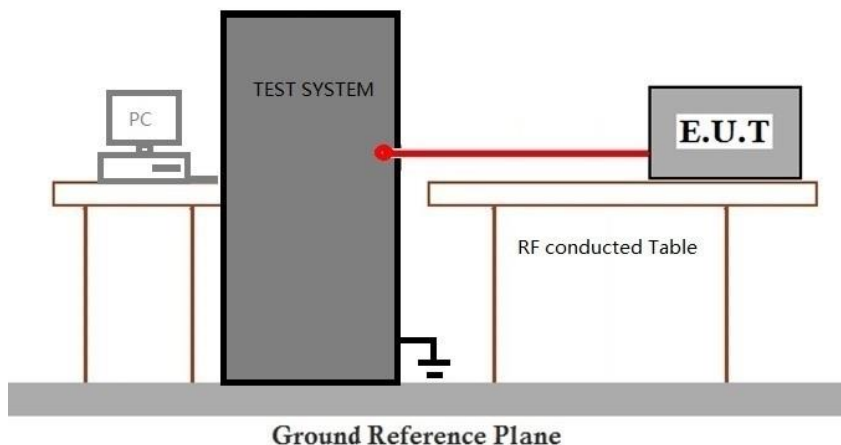
Humidity: 38.4 % RH

Atmospheric Pressure: 1020 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_ Keep the EUT in continuously transmitting mode with GFSK modulation.

7.4.3 Test Setup Diagram



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7.4.4 Measurement Procedure and Data

Note: Since the verify power the same operating range bandwidth and smaller power can be covered by the higher power.

Please Refer to Appendix for Details



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Shenzhen Branch (SZEMC) Laboratory

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7.5 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)

Test Method: ANSI C63.10 (2013) Section 11.8.1

Limit:

≥500 kHz

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 24.1 °C

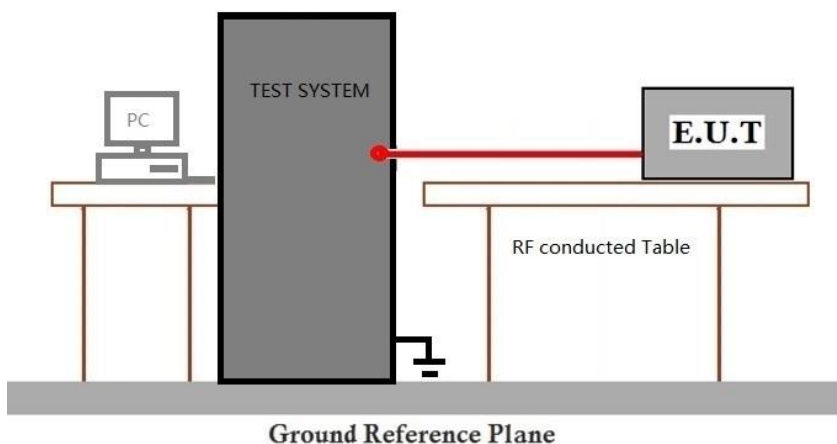
Humidity: 38.4 % RH

Atmospheric Pressure: 1020 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_ Keep the EUT in continuously transmitting mode with GFSK modulation.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer to Appendix for Details



7.6 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)

Test Method: ANSI C63.10 (2013) Section 11.10.2

Limit:

≤8dBm in any 3 kHz band during any time interval of continuous transmission

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 24.1 °C

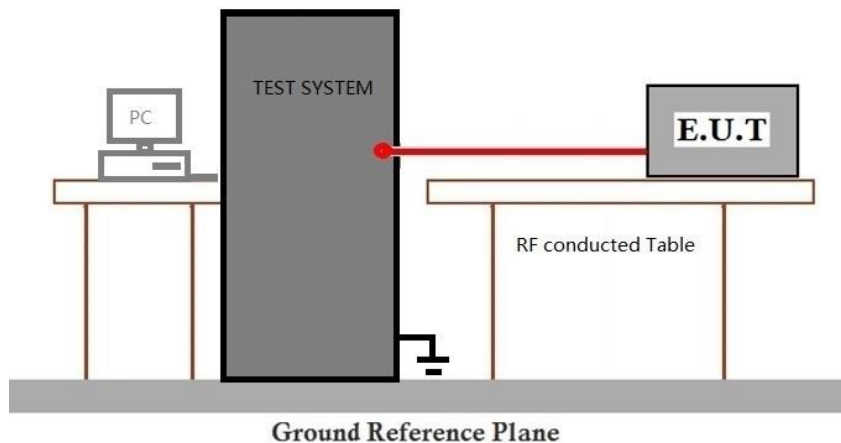
Humidity: 38.4 % RH

Atmospheric Pressure: 1020 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_ Keep the EUT in continuously transmitting mode with GFSK modulation.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details



7.7 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
Test Method: ANSI C63.10 (2013) Section 11.13.3.2

Limit:

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)).

7.7.1 E.U.T. Operation

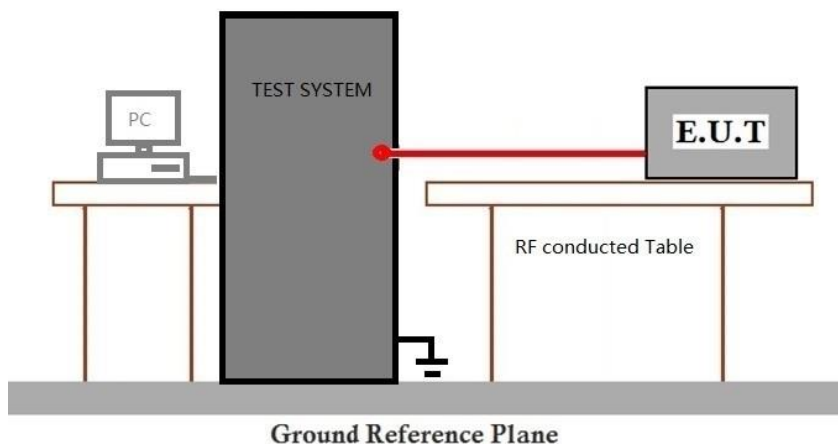
Operating Environment:

Temperature: 24.1 °C Humidity: 38.4 % RH Atmospheric Pressure: 1020 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.8 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 11.11

Limit:

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)).

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 24.1 °C

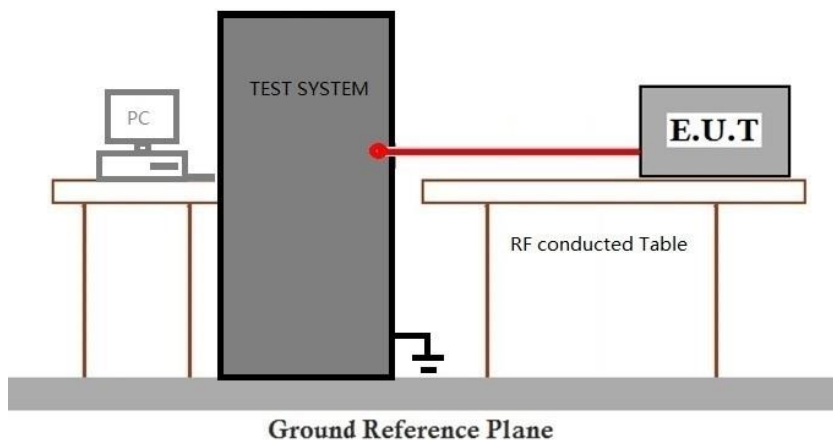
Humidity: 38.4 % RH

Atmospheric Pressure: 1020 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SZCR2504001720AT

9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for SZCR2504001720AT



10 Appendix

1. Duty Cycle

1.1 Test Result

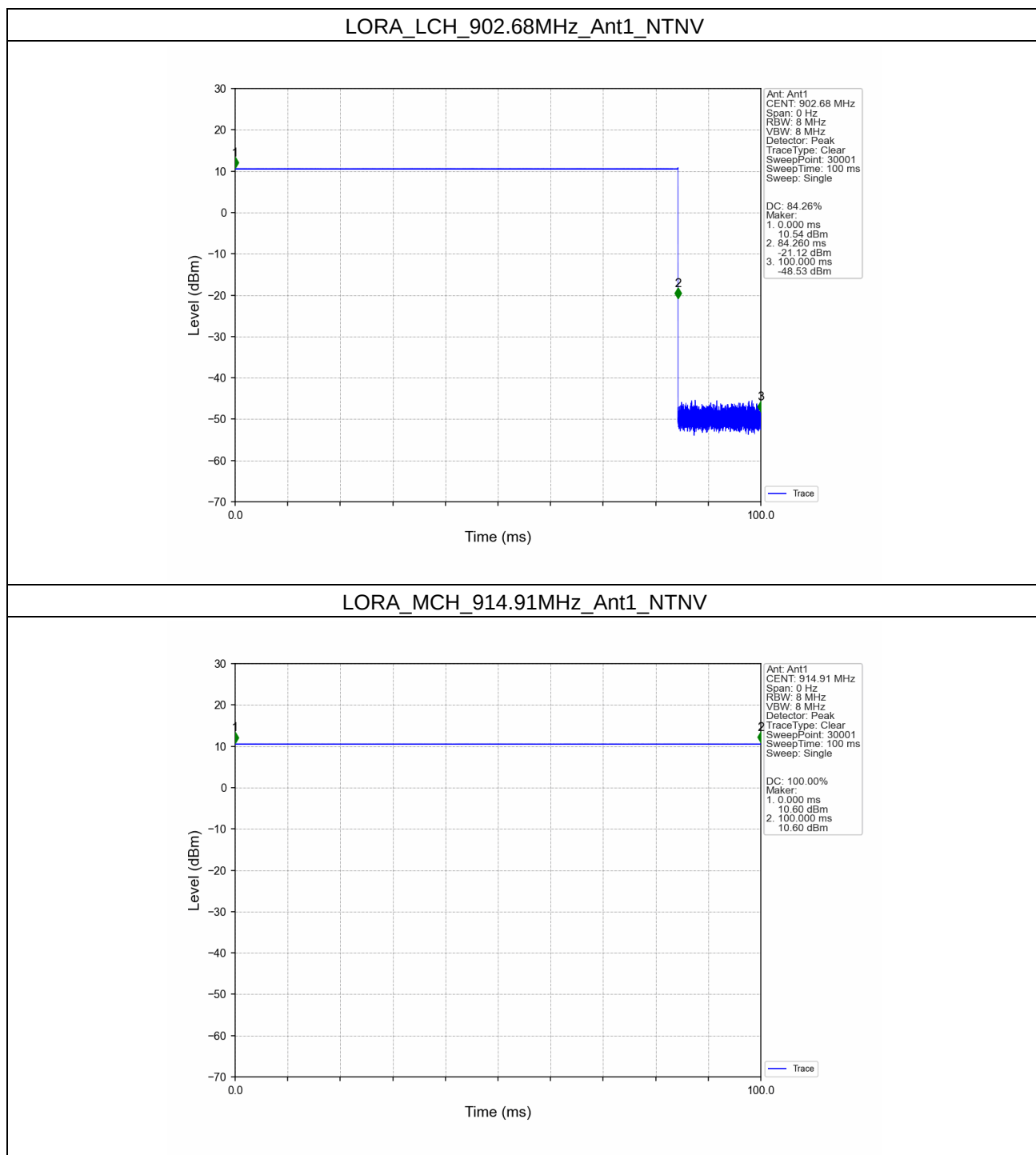
1.1.1 Ant1

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
LORA	SISO	902.68	84.260	100.000	84.26	0.74	0.00
		914.913	100.000	100.000	100.00	0.00	0.00
		926.205	100.000	100.000	100.00	0.00	0.00



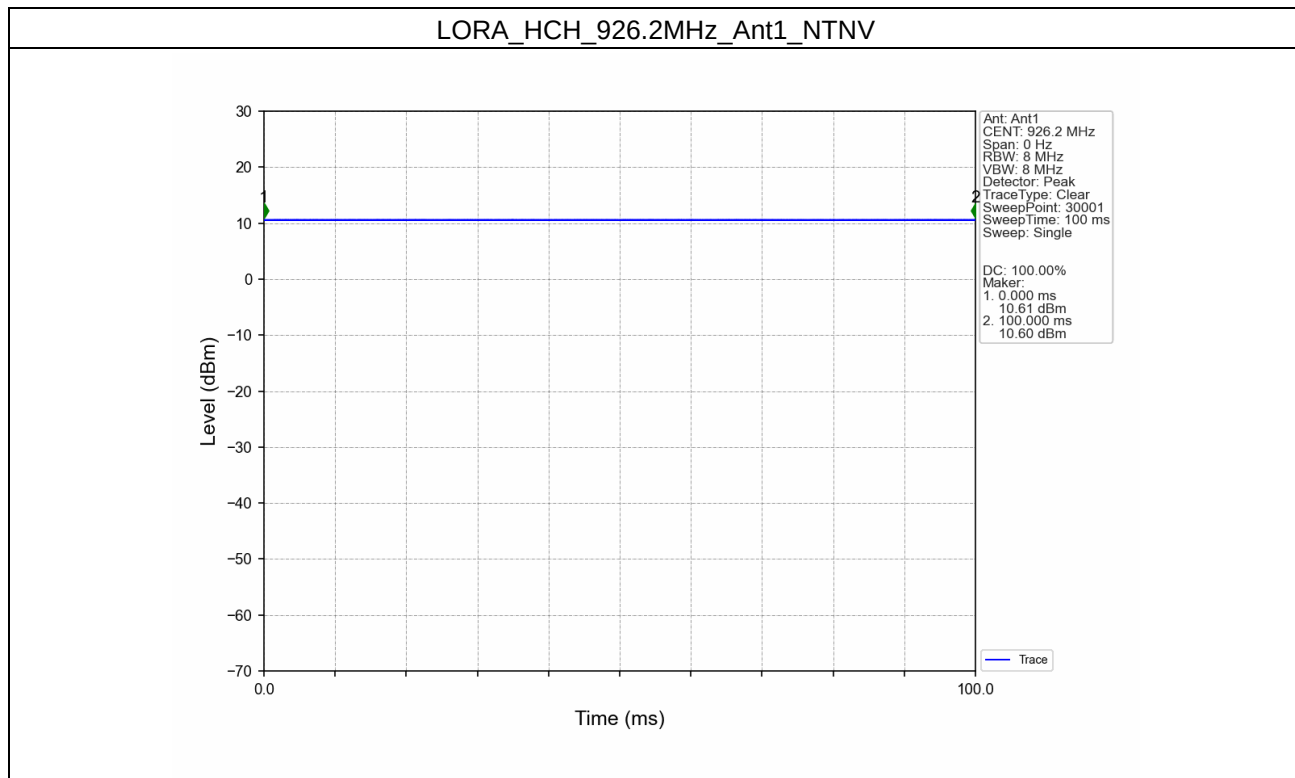
1.2 Test Graph

1.2.1 Ant1



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2. Bandwidth

2.1 Test Result

2.1.1 OBW

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)		Verdict
				Result	Limit	
LORA	SISO	902.68	1	0.658	/	Pass
		914.913	1	0.650	/	Pass
		926.205	1	0.654	/	Pass

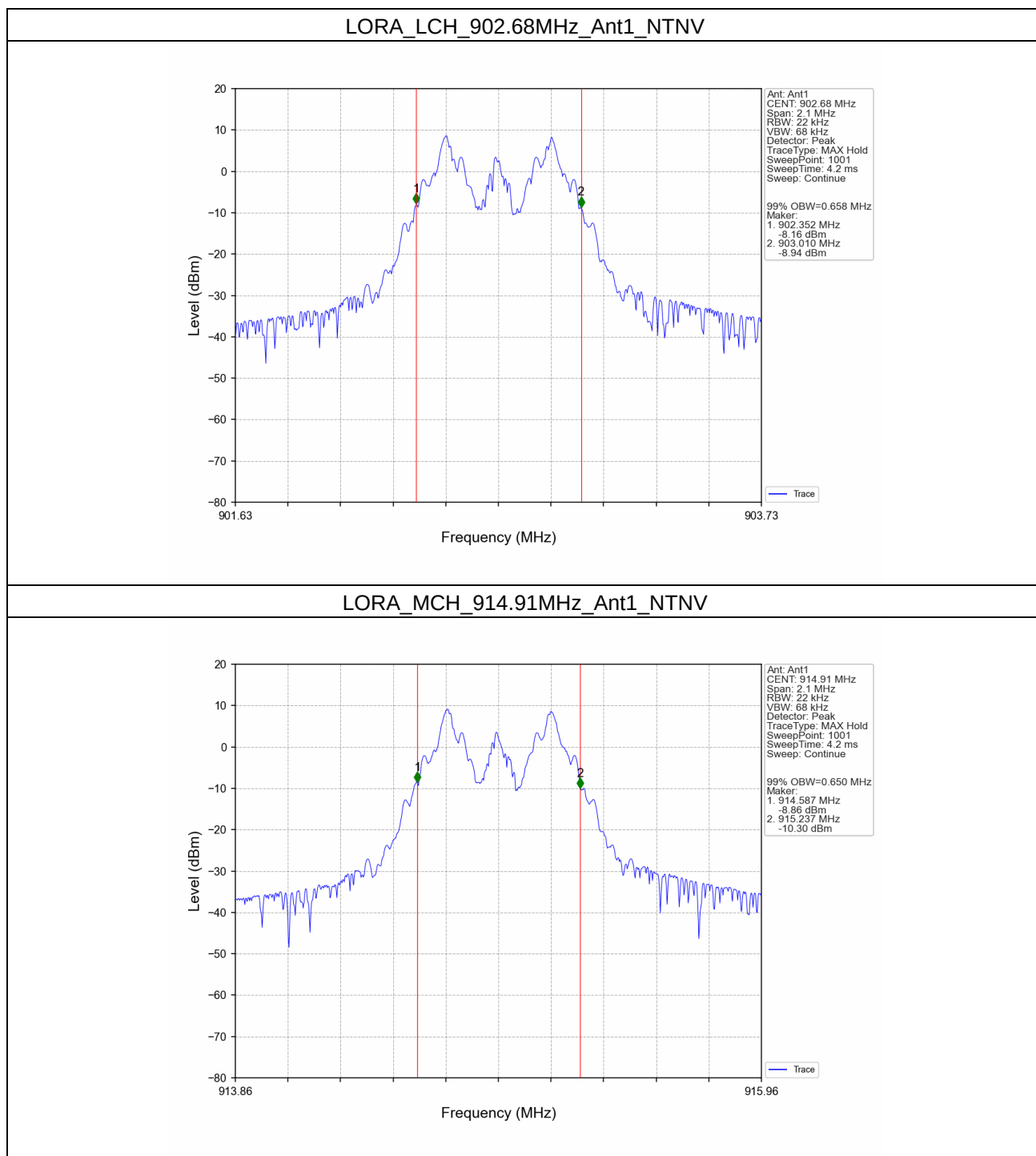
2.1.2 6dB BW

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
LORA	SISO	902.68	1	0.650	≥ 0.5	Pass
		914.913	1	0.590	≥ 0.5	Pass
		926.205	1	0.608	≥ 0.5	Pass



2.2 Test Graph

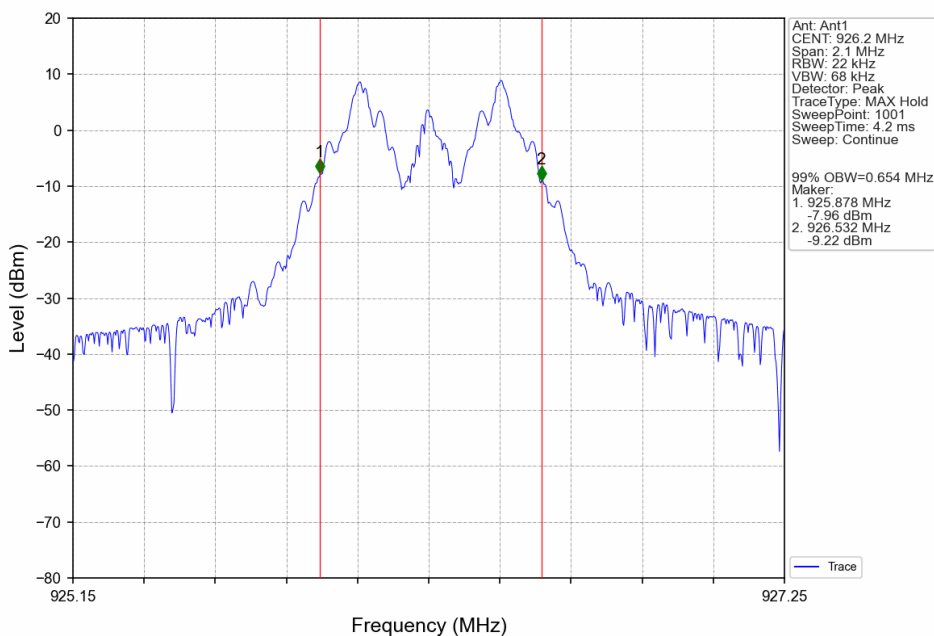
2.2.1 OBW



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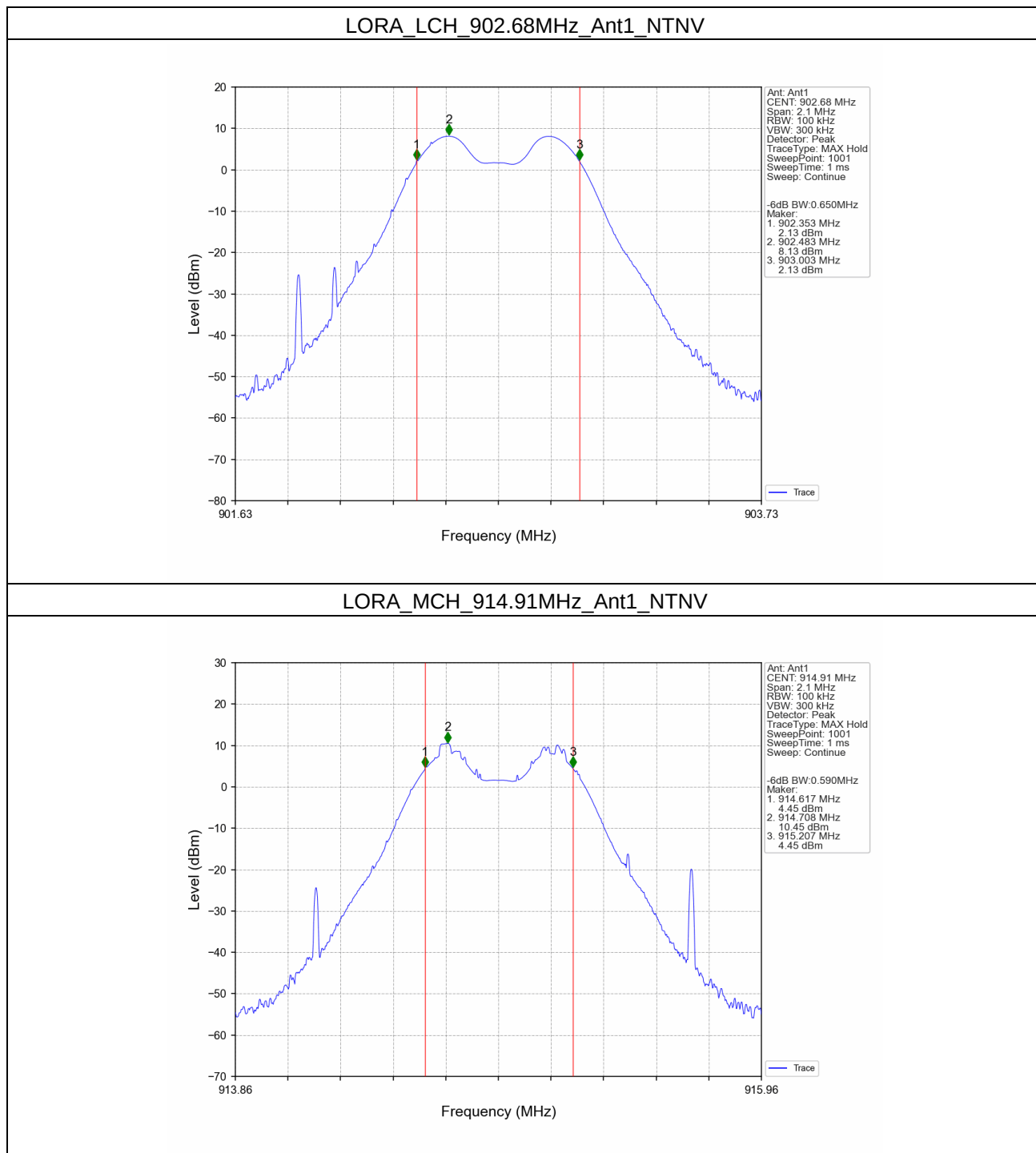
LORA_HCH_926.2MHz_Ant1_NTNV



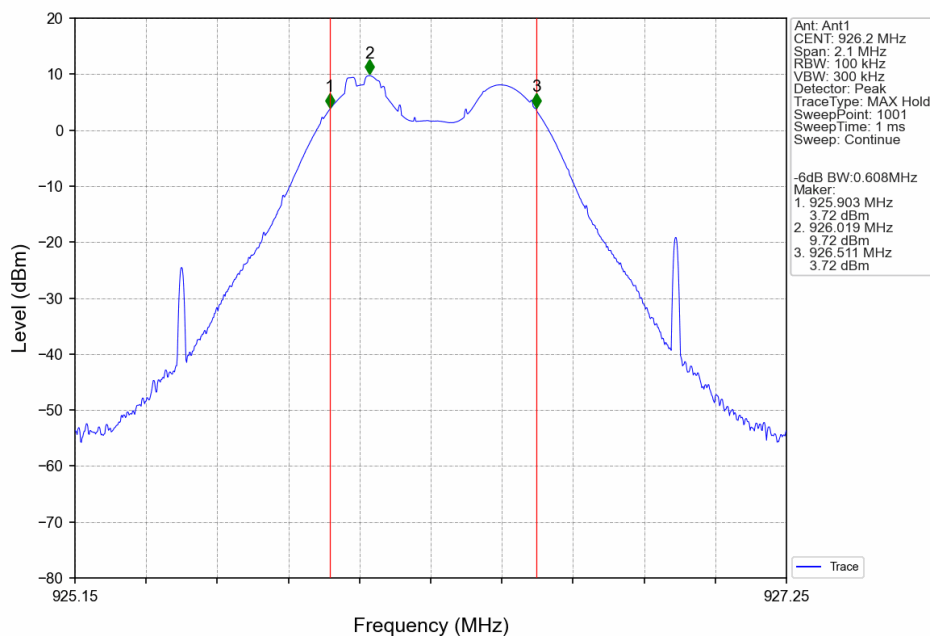
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2.2.2 6dB BW



LORA_HCH_926.2MHz_Ant1_NTNV



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3. Maximum Conducted Output Power

3.1 Test Result

3.1.1 Power

Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
LORA	SISO	902.68	10.59	<=30	Pass
		914.913	10.56	<=30	Pass
		926.205	10.58	<=30	Pass

Note1: Antenna Gain: Ant1: -5.85dBi;

4. Maximum Power Spectral Density

4.1 Test Result

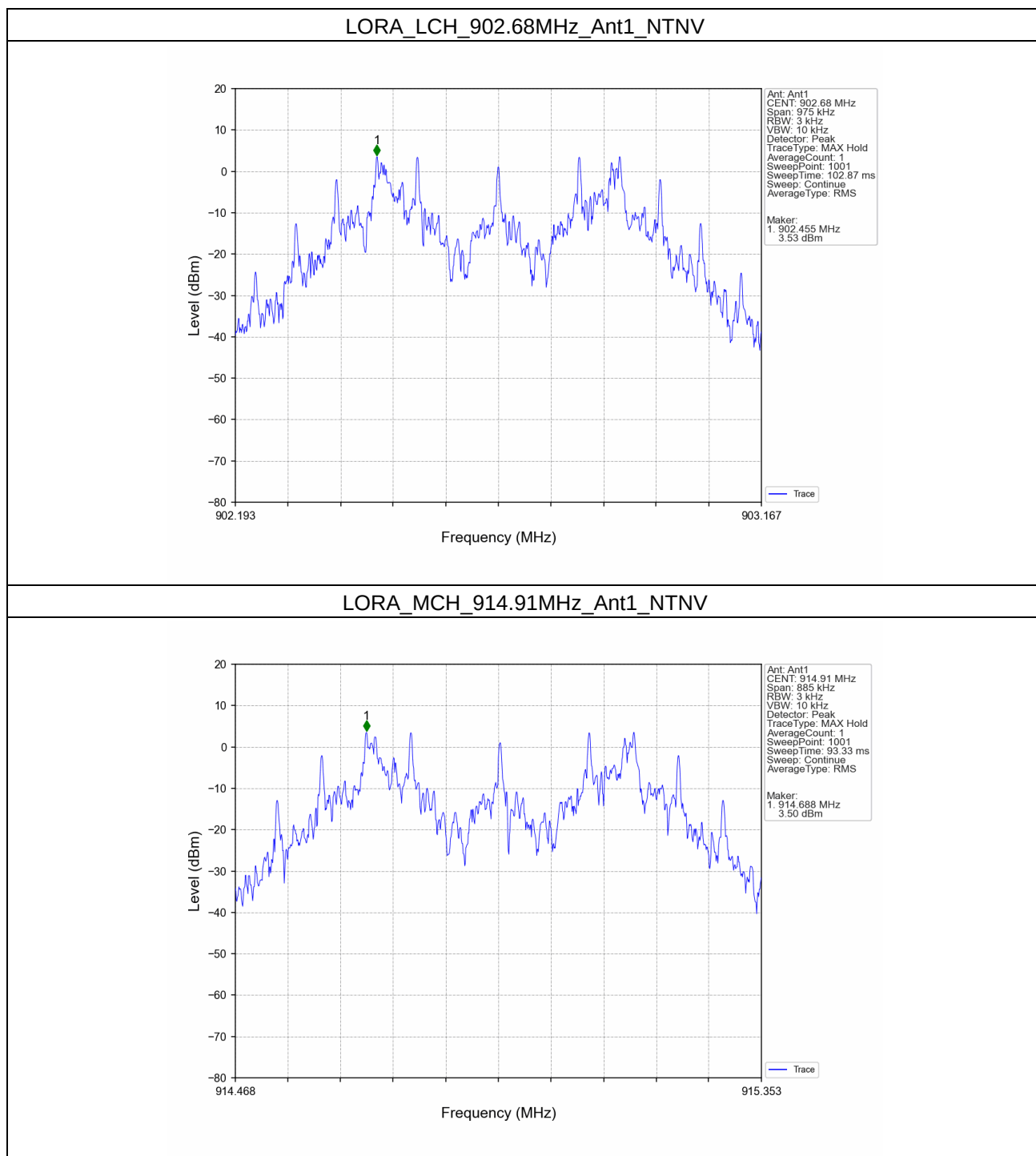
4.1.1 PSD

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
LORA	SISO	902.68	3.53	<=8	Pass
		914.913	3.50	<=8	Pass
		926.205	3.52	<=8	Pass

Note1: Antenna Gain: Ant1: -5.85dBi;

4.2 Test Graph

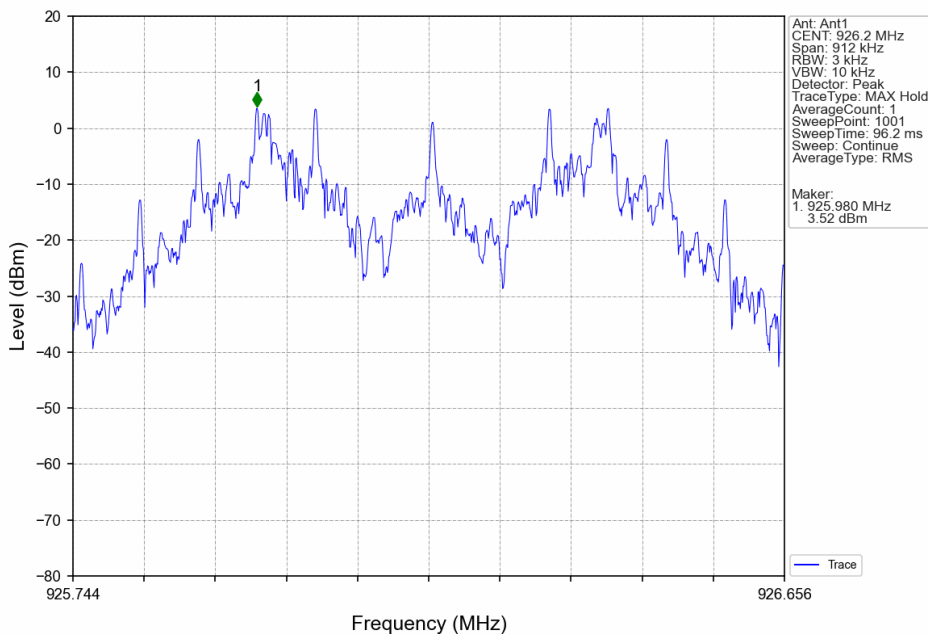
4.2.1 PSD



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LORA_HCH_926.2MHz_Ant1_NTNV



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5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Test Result

5.1.1 Ref

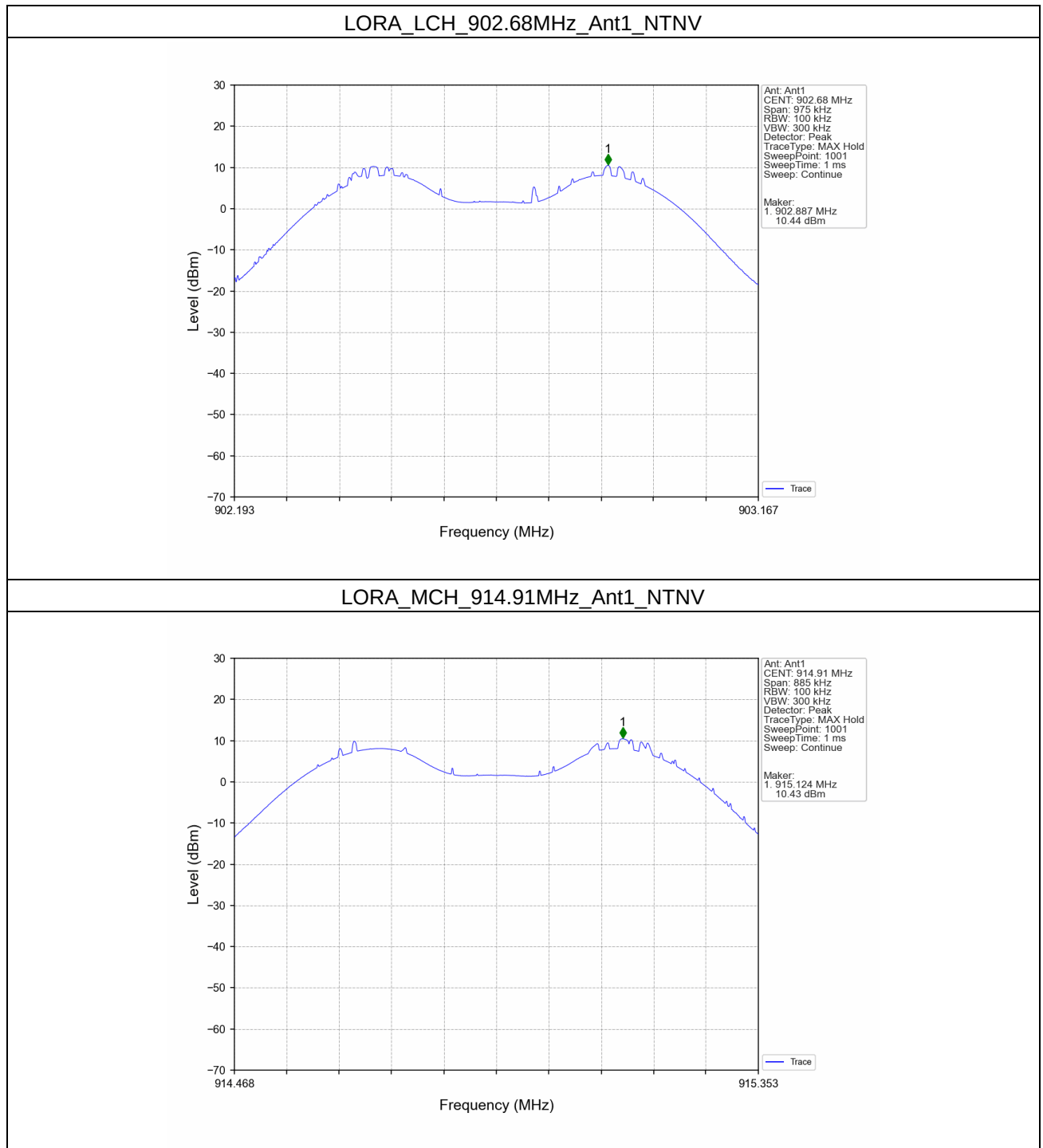
Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
LORA	SISO	902.68	1	10.44
		914.913	1	10.43
		926.205	1	10.38
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.				

5.1.2 CSE

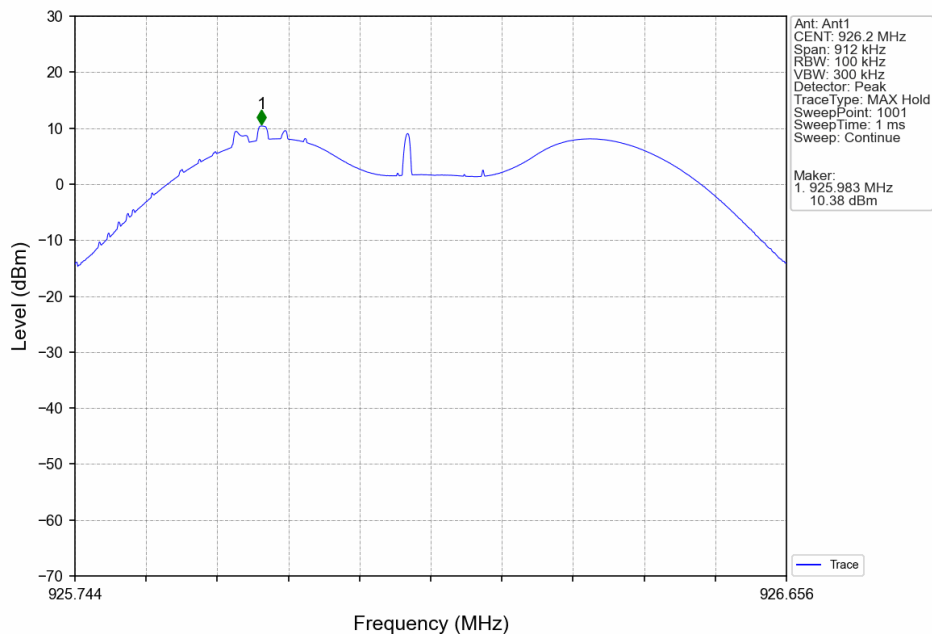
Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
LORA	SISO	902.68	1	10.44	-9.56	Pass
		914.913	1	10.44	-9.56	Pass
		926.205	1	10.44	-9.56	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.						

5.2 Test Graph

5.2.1 Ref



LORA_HCH_926.2MHz_Ant1_NTNV

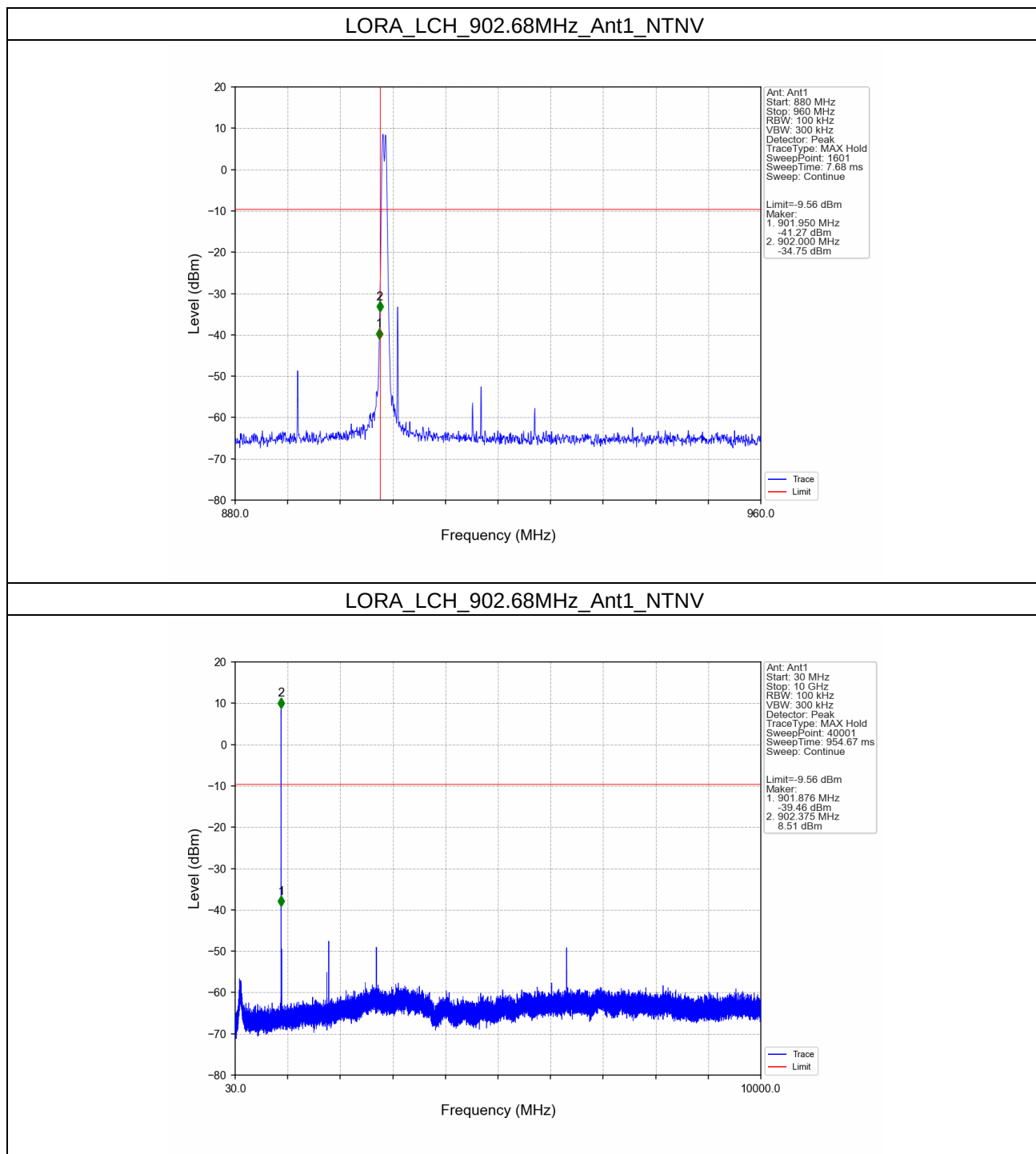


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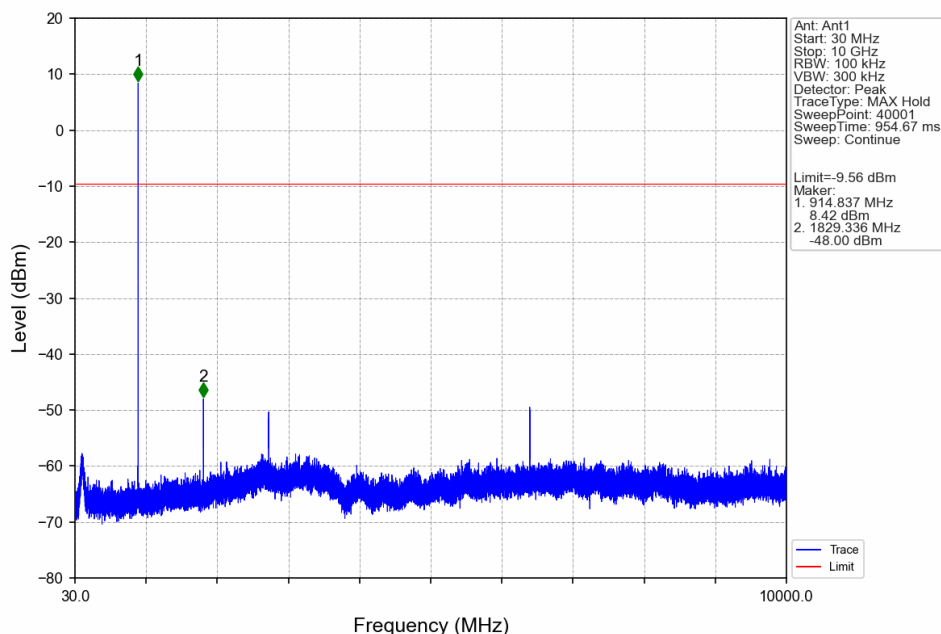
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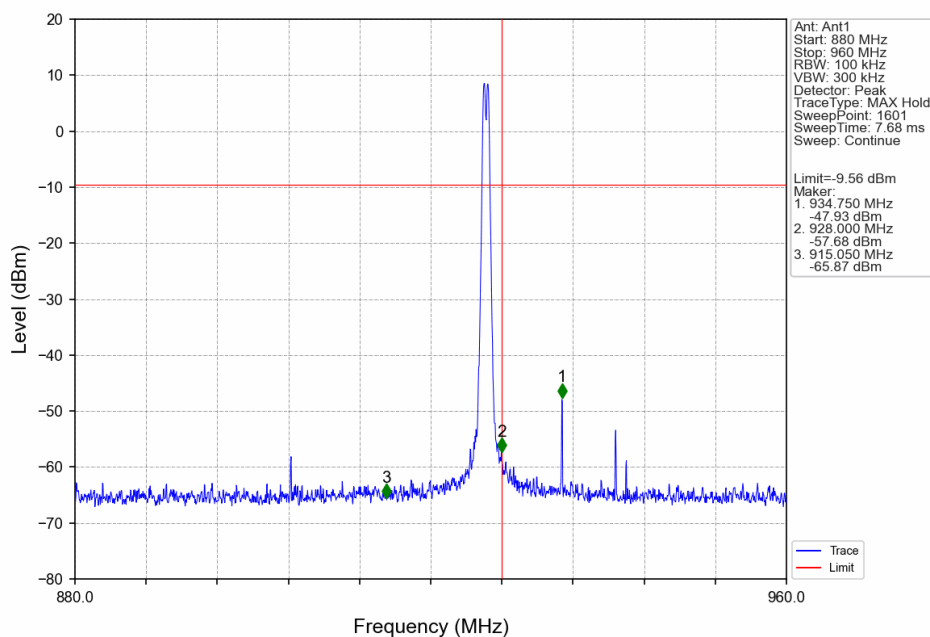
5.2.2 CSE



LORA_MCH_914.91MHz_Ant1_NTNV



LORA_HCH_926.2MHz_Ant1_NTNV

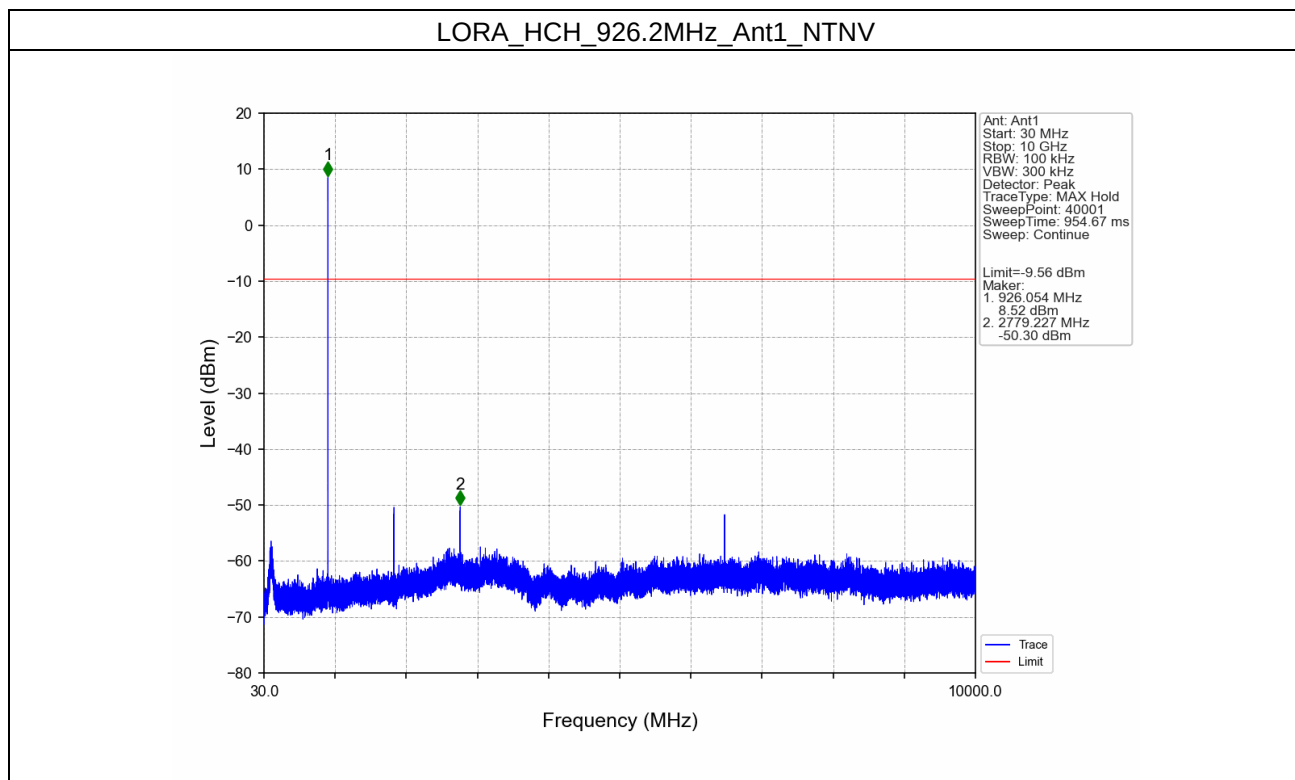


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