

FCC CERTIFICATION TEST REPORT

FOR

Applicant	:	Shenzhen HOPE Microelectronics Co., Ltd
Address	:	30th floor of 8th Building, C Zone, Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, GD, P.R. China
Equipment under Test	:	LoRa Module
Model No.	:	RFM6601
Trade Mark	:	HOPERF [®]
FCC ID	:	2ASEO-RFM6601
Manufacturer	:	Shenzhen HOPE Microelectronics Co., Ltd
Address	:	30th floor of 8th Building, C Zone, Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, GD, P.R. China

Issued By: Dongguan Dongdian Testing Service Co., Ltd.

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808

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REPORT

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Test Report Declare

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Equipment under Test	:	LoRa Module
Model No.	:	RFM6601
Trade mark	:	HOPERF [®]
Manufacturer	:	Shenzhen HOPE Microelectronics Co., Ltd
Address	:	30th floor of 8th Building, C Zone, Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, GD, P.R. China

Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C

Test procedure used:

ANSI C63.10:2013

We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standard.

Report No.:	DDT-R22051717-2E01		
Date of Receipt:	Jul. 08, 2022	Date of Test:	Jul. 08, 2022 ~ Oct. 10, 2022

Prepared By:

Ella Gong

Ella Gong/Engineer

Approved By:



Damon Hu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Oct. 10, 2022	

1 Summary of test results

Description of Test Item	Standard	Verdict
20 dB Bandwidth and 99% Bandwidth	FCC Part 15: 15.247(a)(i) ANSI C63.10:2013	Pass
6 dB Bandwidth	FCC Part 15: 15.247(a)(2) ANSI C63.10:2013	Pass
Maximum Peak Output Power	FCC Part 15: 15.247(b)(2)(3) ANSI C63.10:2013	Pass
Power Spectral Density	FCC Part 15: 15.247(f) ANSI C63.10:2013	Pass
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) ANSI C63.10:2013	Pass
Number of Hopping Channel	FCC Part 15: 15.247(a)(i) ANSI C63.10:2013	Pass
Dwell Time	FCC Part 15: 15.247(f) ANSI C63.10:2013	Pass
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10:2013	Pass
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.10:2013	Pass
Antenna Requirement	FCC Part 15: 15.203	Pass

2 General test information

2.1. Description of EUT

EUT* Name	: LoRa Module
Model Number	: RFM6601
EUT function description	: Please reference user manual of this device
Power supply	: 3.3V
Operation frequency	: 902-928 MHz
Modulation	: CSS
Antenna Type	: RP-SMA antenna, Peak Gain: -0.47 dBi.
Sample Number	: S22051717-01

Note: EUT is the ab. of equipment under test.

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

Channel information (DTS Mode)			
Uplink		Downlink	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	903	0	923.3
1	904.6	1	923.9
2	906.2	2	924.5
3	907.8	3	925.1
4	909.4	4	925.7
5	911	5	926.3

6	912.6	6	926.9
7	914.2	7	927.5

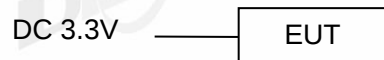
2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Serial No.	Other
N/A	N/A	N/A	N/A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	Serial No.	Other
N/A	N/A	N/A	N/A	N/A

2.4. Block diagram of EUT configuration for test



Tested mode, channel, information		
Mode	Channel	Frequency (MHz)
FHSS	0	902.3
	31	908.5
	63	914.9
DTS (Uplink)	0	903
	4	909.4
	7	914.2
DTS (Downlink)	0	923.3
	4	925.7
	7	927.5

2.5. Deviations of test standard

No Deviation.

2.6. Test environment conditions

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

Temperature range:	21-25°C
Humidity range:	40-75%
Pressure range:	86-106kPa

2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, G-20118

2.8. Measurement uncertainty

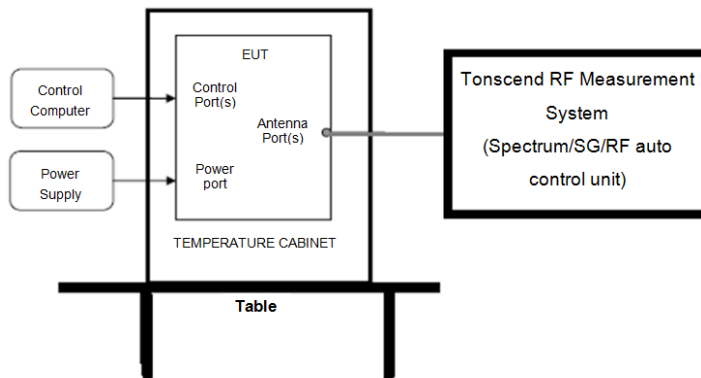
Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power(Conducted)(Spectrum analyzer)	0.86dB (10 MHz $\leq$ f < 3.6GHz);
	1.38dB (3.6GHz $\leq$ f < 8GHz)
Peak Output Power(Conducted)(Power Sensor)	0.74dB
Power Spectral Density	0.74dB (10 MHz $\leq$ f < 3.6GHz);
	1.38dB (3.6GHz $\leq$ f < 8GHz)
Frequencies Stability	6.7×10^{-8} (Antenna couple method)
	5.5×10^{-8} (Conducted method)
Conducted spurious emissions	0.86dB (10 MHz $\leq$ f < 3.6GHz);
	1.40dB (3.6GHz $\leq$ f < 8GHz)
	1.66dB (8GHz $\leq$ f < 22GHz)
Uncertainty for radio frequency (RBW<20kHz)	3×10^{-8}
Temperature	0.4°C
Humidity	2%
Uncertainty for Radiation Emission test (9 kHz-30 MHz)	3.44 dB
Uncertainty for Radiation Emission test (30MHz-1GHz)	4.70 dB (Antenna Polarize: V)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1GHz-40GHz)	4.10dB (1-6GHz)
	4.40dB (6GHz-18GHz)
	3.54dB (18GHz-26GHz)
	4.30dB (26GHz-40GHz)
Uncertainty for Power line conduction emission test	3.32dB (150kHz-30MHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3 Equipment Used During Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☑RF Connected Test (Tonscend RF Measurement System 3#)					
Spectrum analyzer	R&S	FSU26	200071	Apr. 26, 2022	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	May 18, 2022	1 Year
Vector Signal Generator	Agilent	N5182A	MY19060405	May 18, 2022	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180912	May 18, 2022	1 Year
RF Control Unit	Tonsend	JS0806-2	DDT-ZC01449	May 18, 2022	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	May 26, 2022	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.6.77.0518	N/A	N/A
☑Radiation 3#chamber					
EMI Test Receiver	R&S	ESU	100472	May 18, 2022	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	May 18, 2022	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Sep. 19, 2021 Sep. 29, 2022	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	01429	Aug. 07, 2021 Jul. 22, 2022	1 Year
Double Ridged Horn Antenna	Schwarzbeck	BBHA9120	02468	Nov. 29, 2021	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	May 06, 2022	1 Year
Pre-amplifier	COM-POWER	PAM-118A	18040084	Sep. 02, 2021 Aug.17, 2022	1 Year
Pre-amplifier	COM-POWER	PAM-840A	461369	Apr. 11, 2022	1 Year
Test software	Audix	E3	V 6.1.1.1	N/A	N/A

4. 20 dB Bandwidth and 99% Bandwidth

4.1. Block diagram of test setup



4.2. Limits

The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

4.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) The 20 dB Bandwidth set the spectrum analyzer as follows:

RBW: 1% to 5% of the OBW
 VBW: Approximately three times RBW
 Detector Mode: Peak
 Sweep time: auto
 Trace mode: Max hold

(3) Determine the “-20 dB down amplitude” using [(reference value) – 20], using the marker-delta function of the spectrum analyzer.

(4) 99% Bandwidth set the spectrum analyzer as follows:

RBW: 1% to 5% of the OBW
 VBW: Approximately three times RBW
 Detector Mode: Peak
 Sweep time: auto
 Trace mode: Max hold

(5) Allow the trace to stabilize, measure the 99% bandwidth of signal.

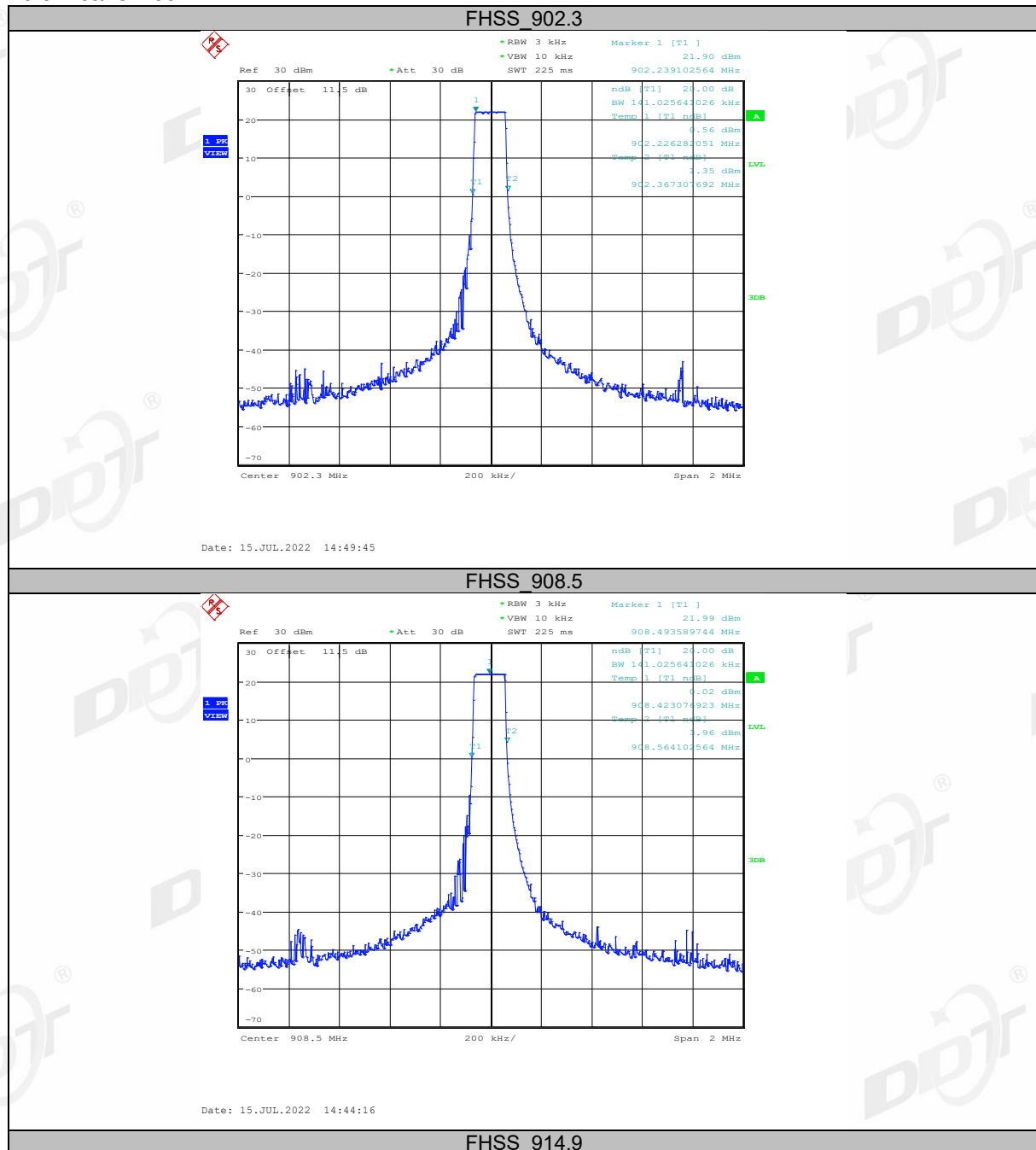
4.4. Test result

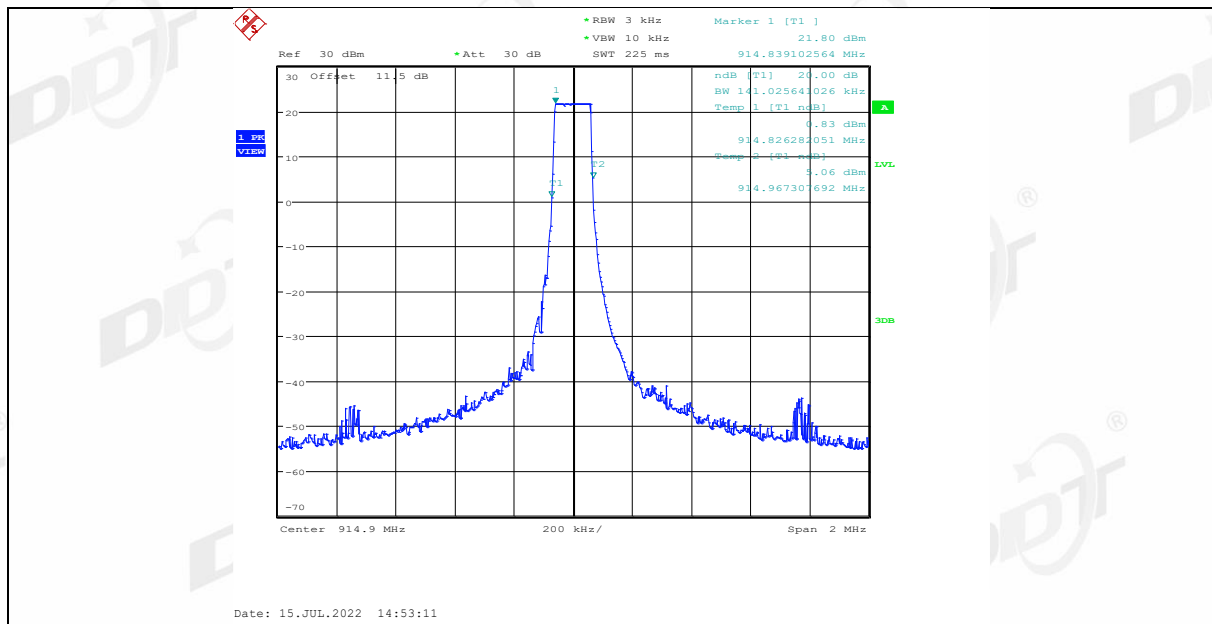
Mode	Channel	Freq. (MHz)	20 dB bandwidth Result (MHz)	99% Bandwidth (MHz)	20 dB bandwidth Limit (kHz)	Verdict
FHSS	0	902.3	0.141	0.128	500	Pass
	31	908.5	0.141	0.126	500	Pass

	63	914.9	0.141	0.126	500	Pass
DTS (Uplink)	0	903	0.551	0.510	---	---
	4	909.4	0.551	0.507	---	---
	7	914.2	0.554	0.510	---	---
DTS (Downlink)	0	923.3	0.554	0.510	---	---
	4	925.7	0.551	0.507	---	---
	7	927.5	0.564	0.531	---	---

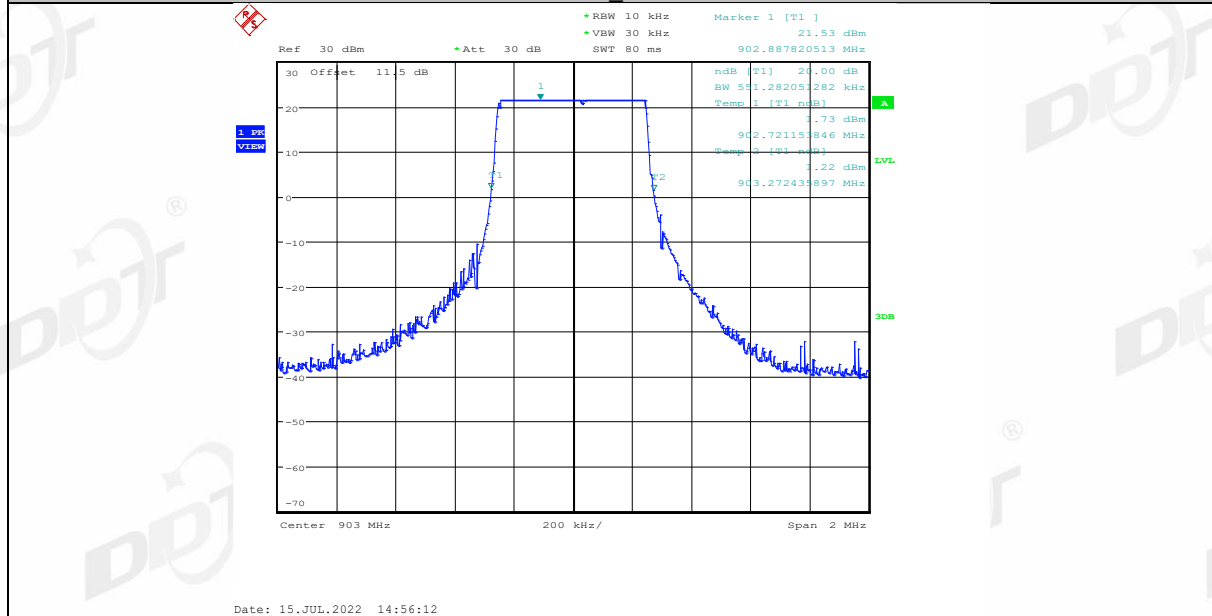
4.5. Original test data

20 dB bandwidth:

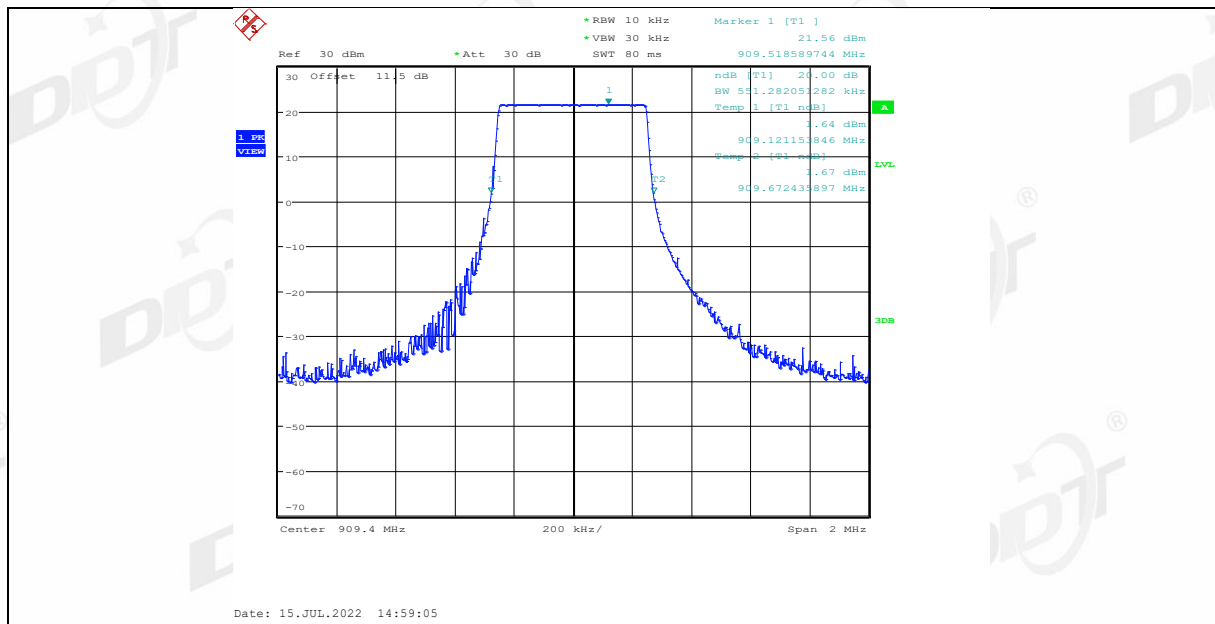




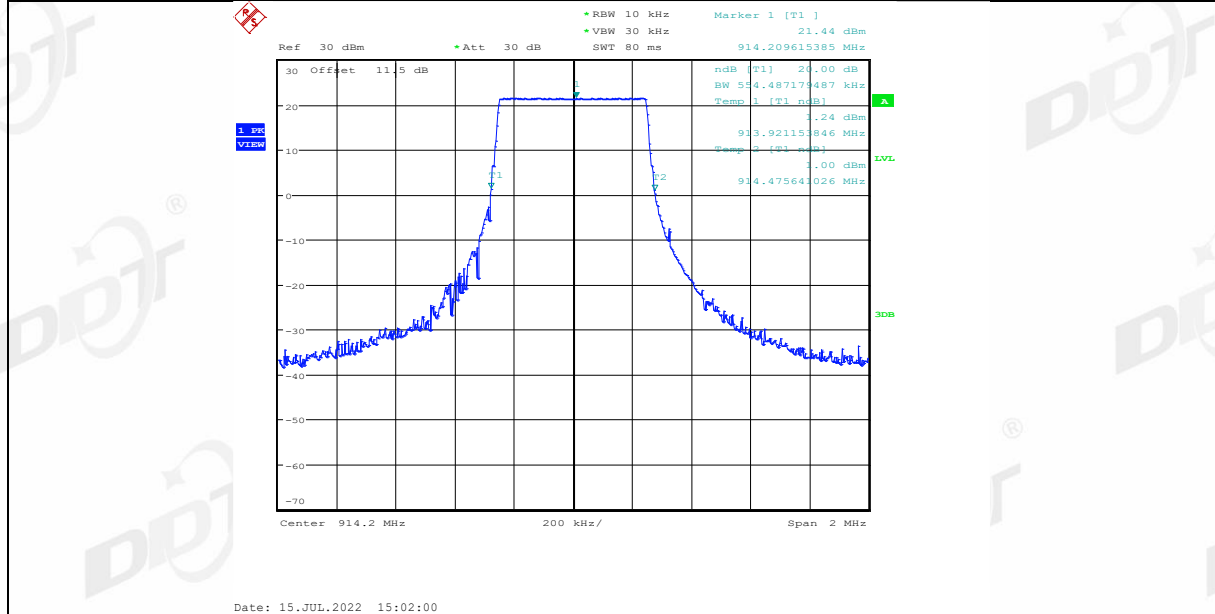
DTS 903



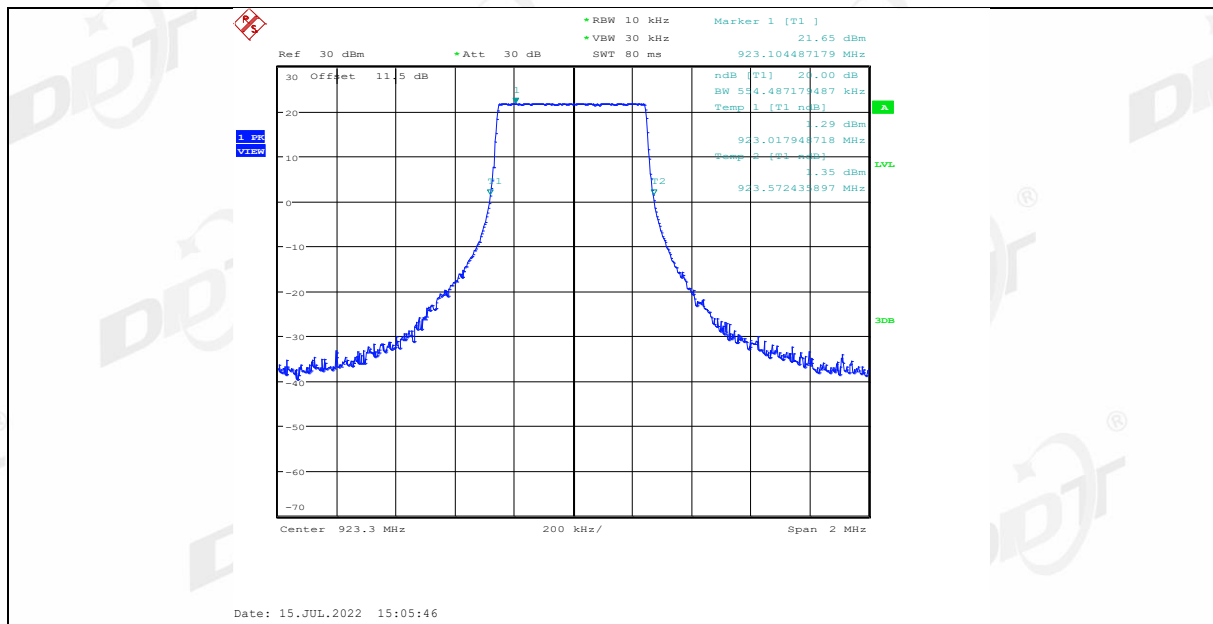
DTS 909.4



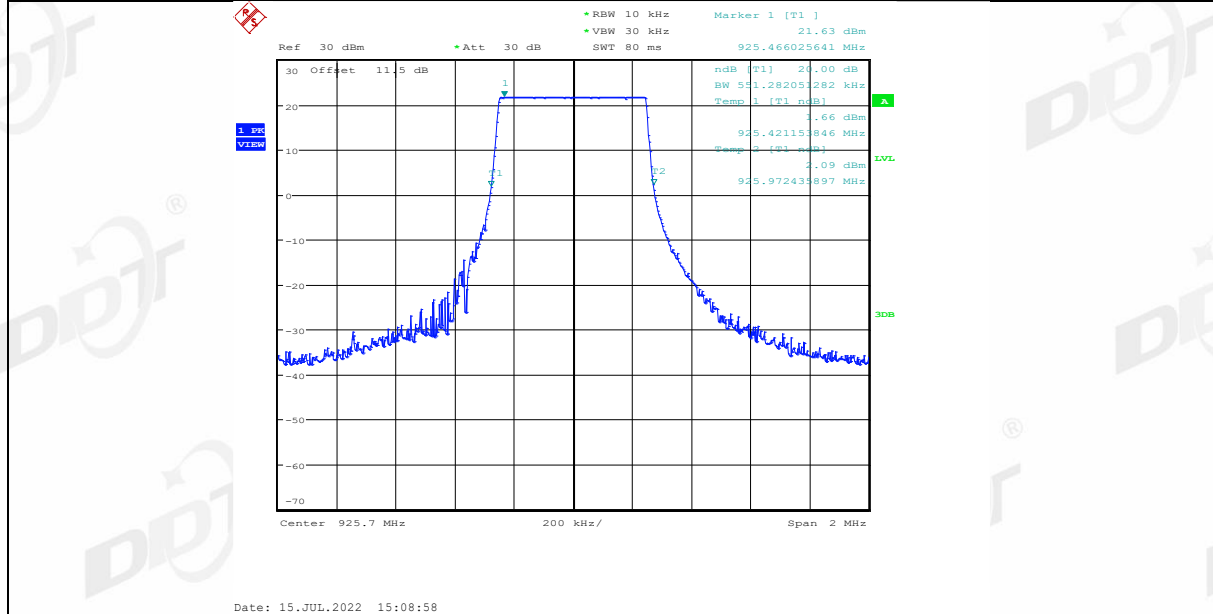
DTS 914.2



DTS 923.3



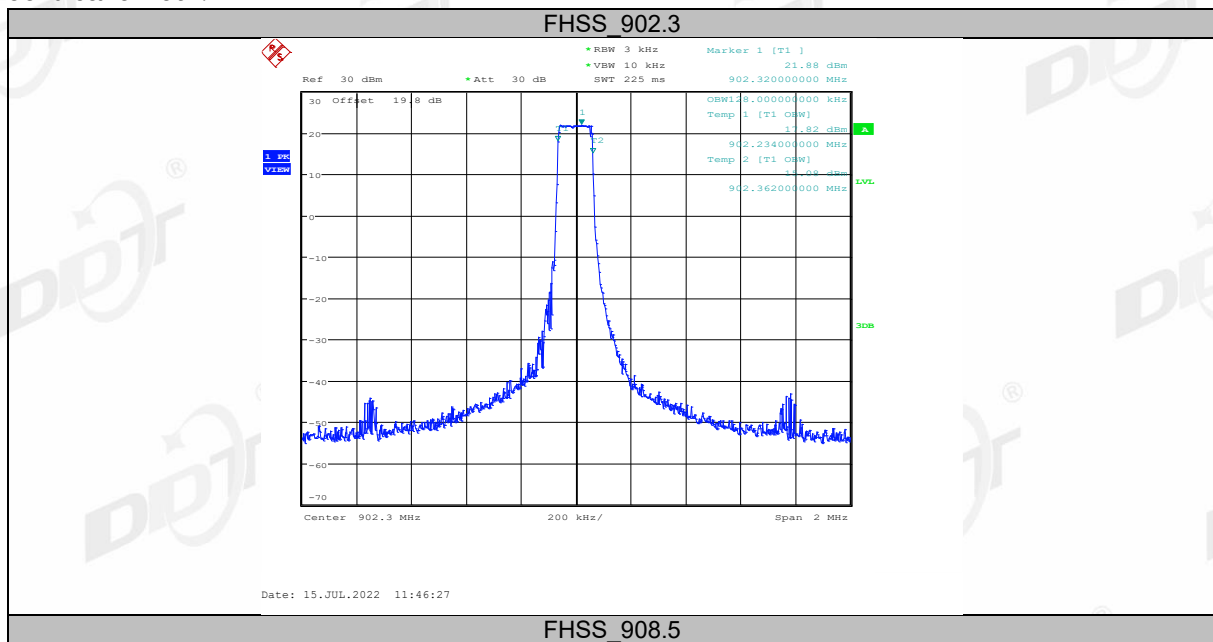
DTS 925.7

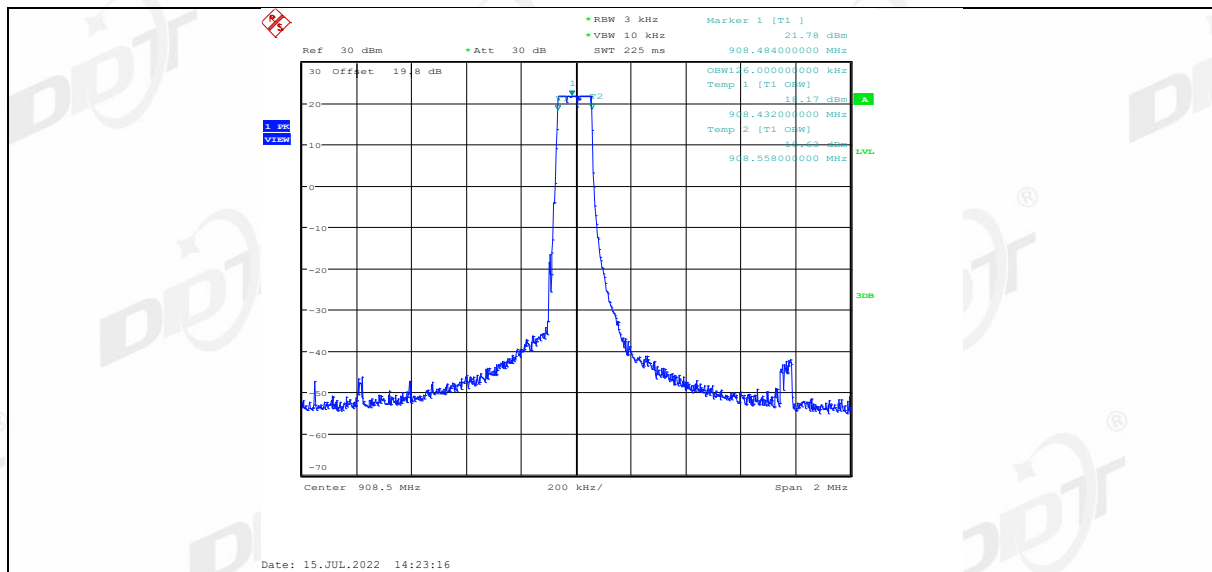


DTS 927.5

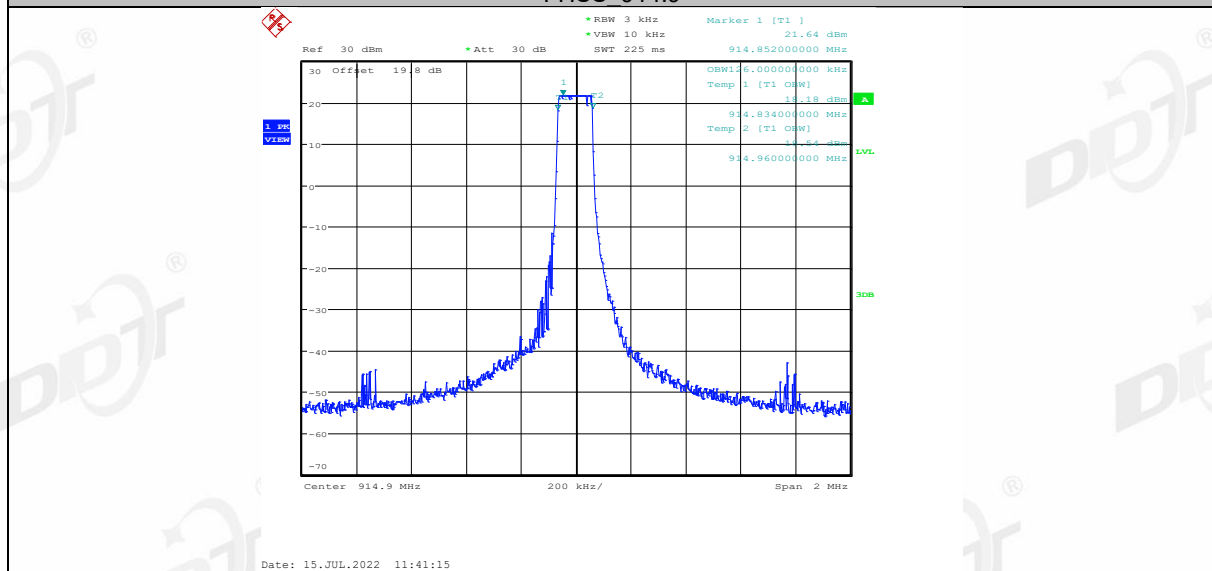


99% bandwidth:

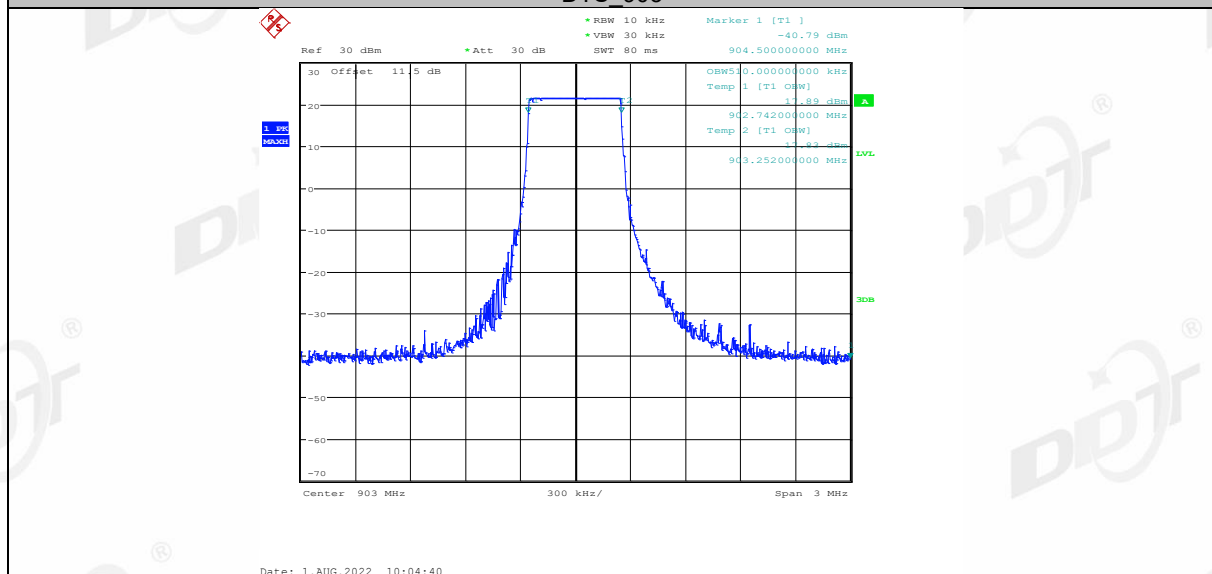




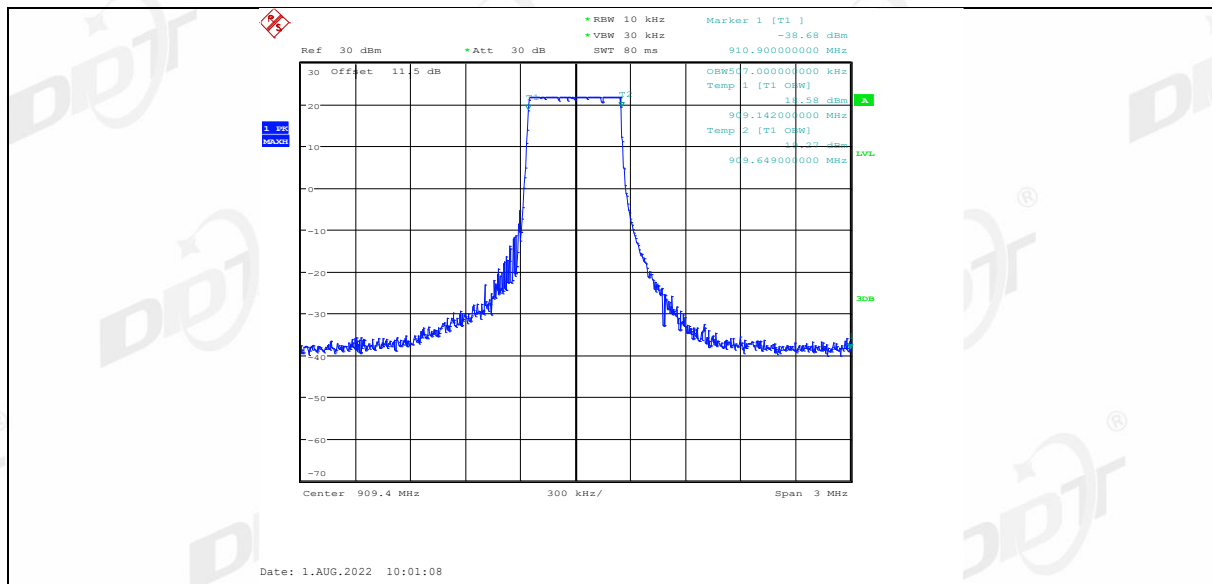
FHSS 914.9



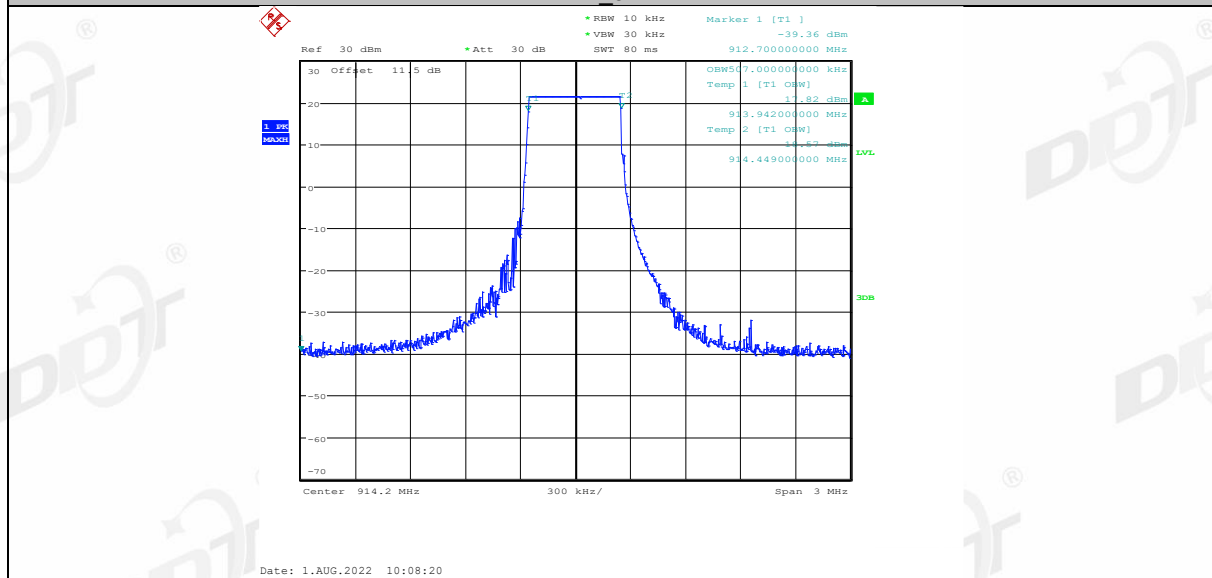
DTS 903



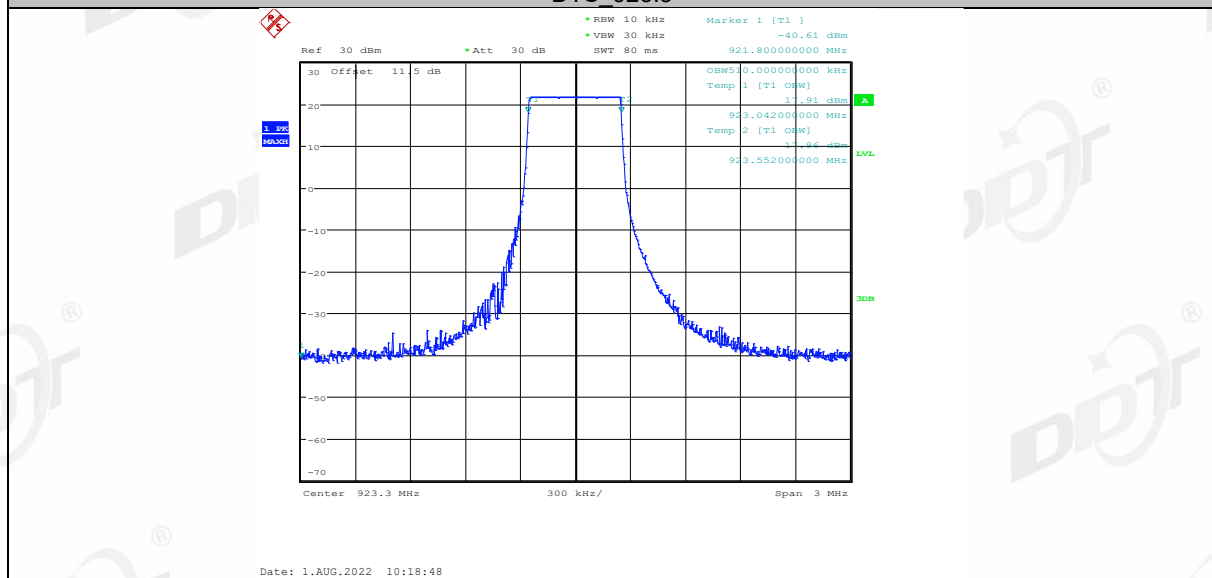
DTS 909.4



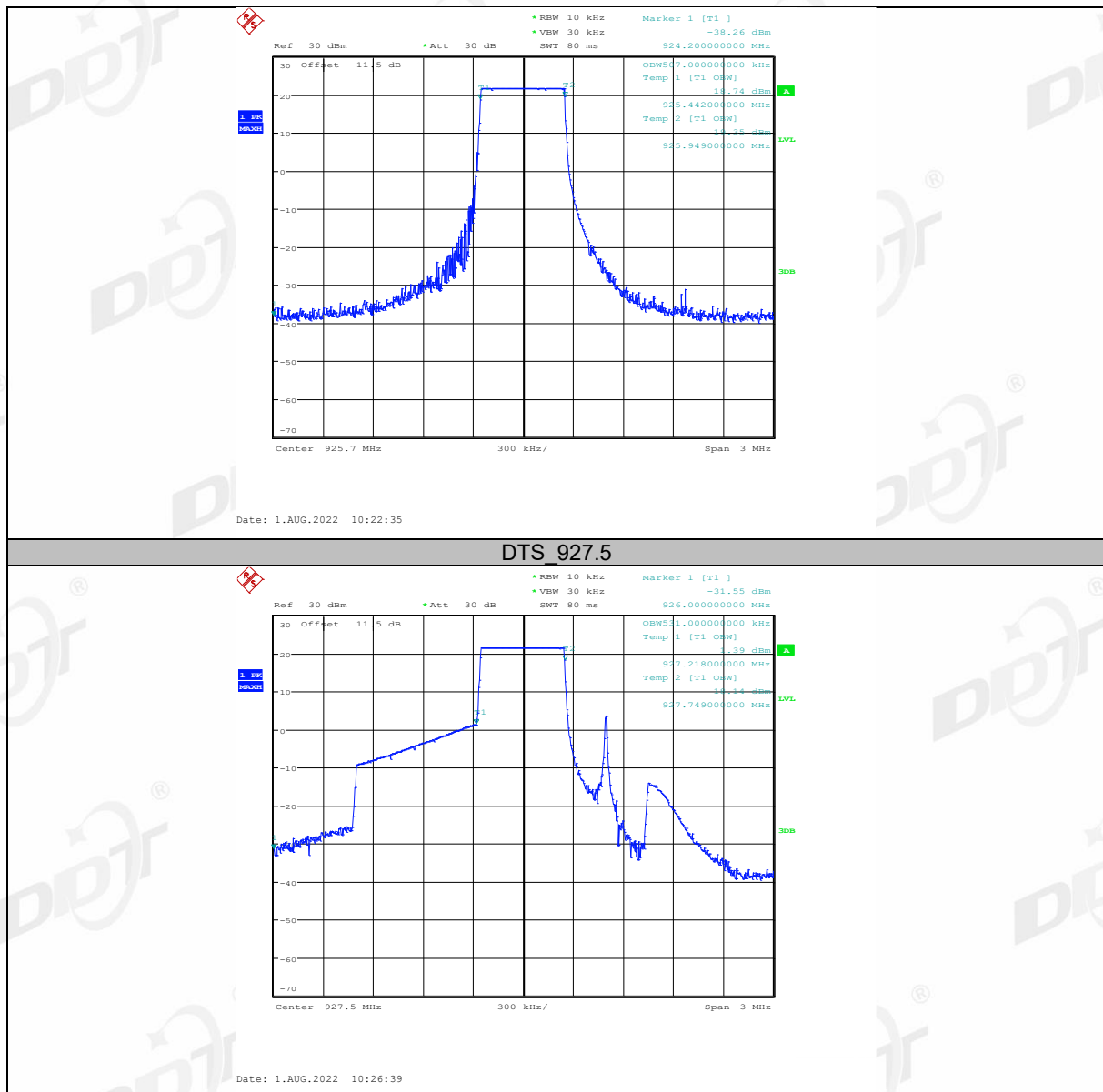
DTS 914.2



DTS 923.3

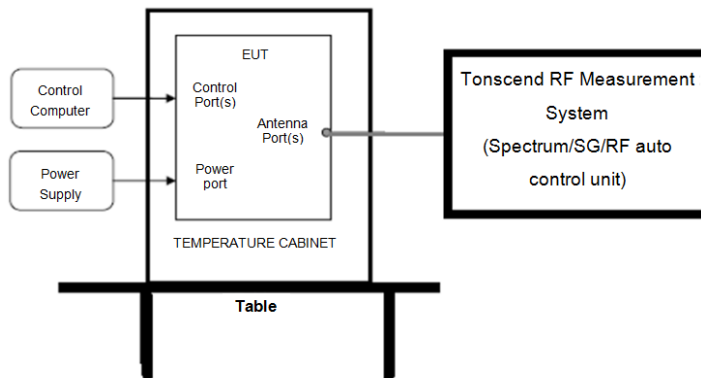


DTS 925.7



5. 6 dB Bandwidth

5.1. Block diagram of test setup



5.2. Limits

For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz

5.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) 6 dB Bandwidth set the spectrum analyzer as follows:

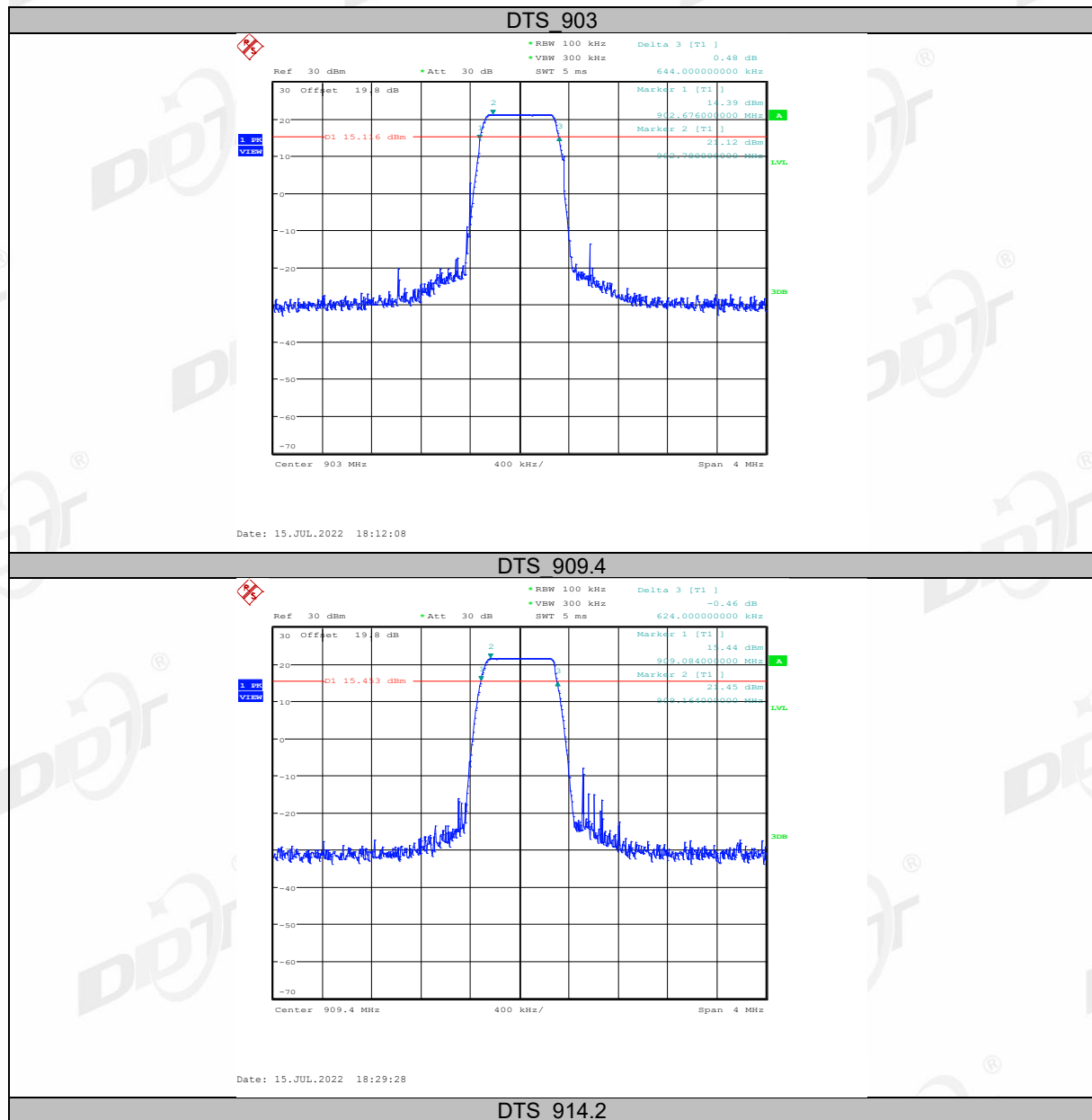
RBW: 100 kHz
 VBW: 300 kHz
 Detector Mode: Peak
 Sweep time: auto
 Trace mode: Max hold

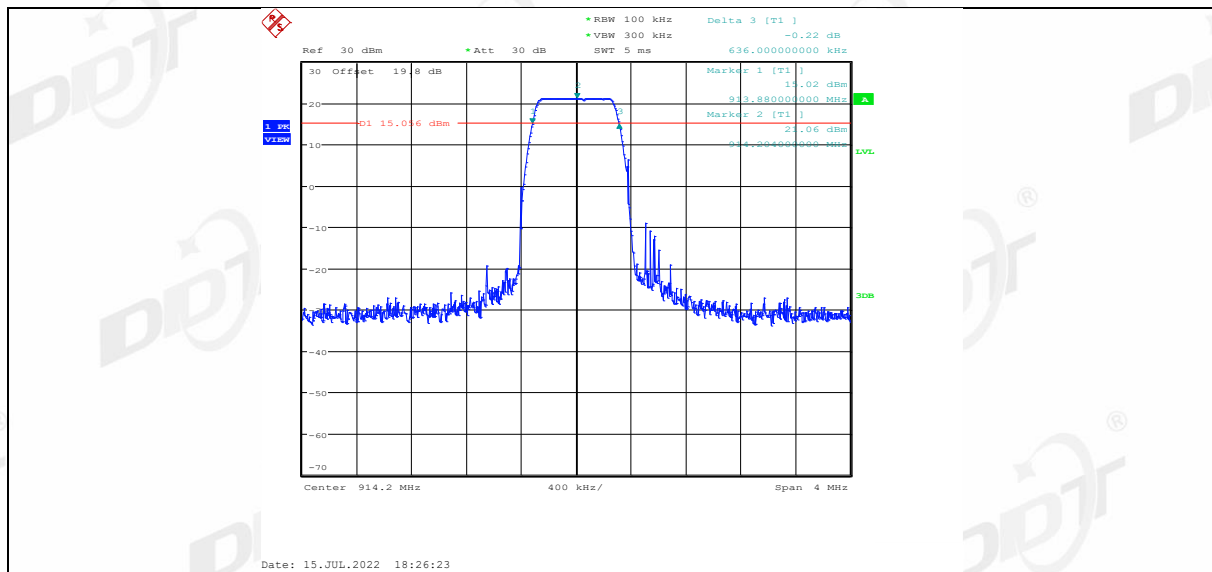
(3) Allow the trace to stabilize, measure the 6 dB bandwidth of signal.

5.4. Test result

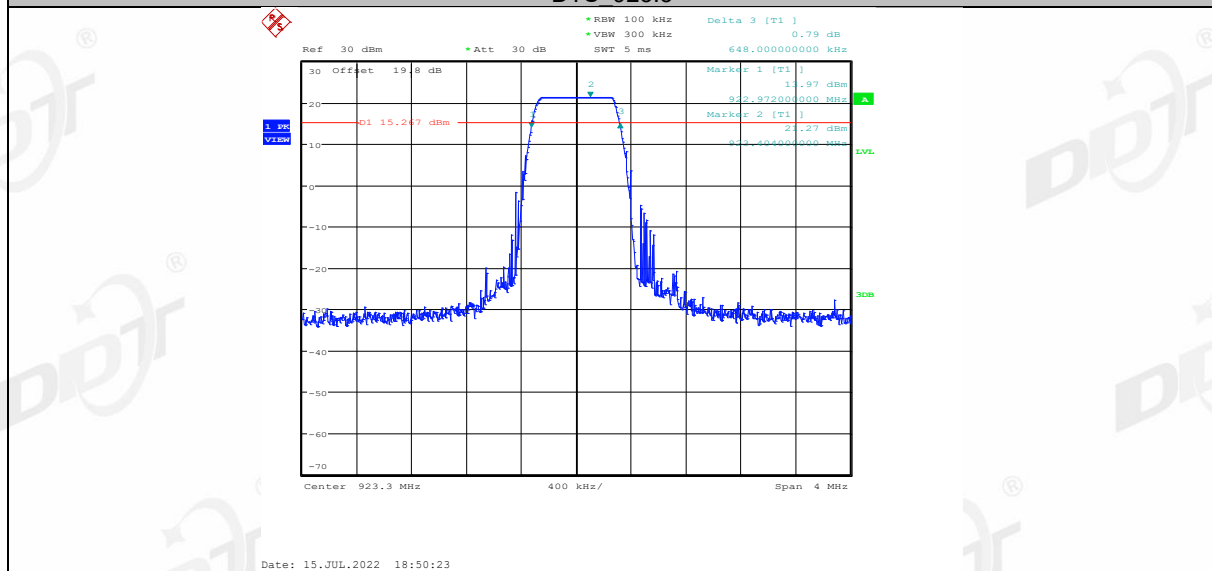
Mode	Channel	Freq. (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Limit (kHz)	Verdict
DTS (Uplink)	0	903	0.644	≥500	Pass
	4	909.4	0.624	≥500	Pass
	7	914.2	0.636	≥500	Pass
DTS (Downlink)	0	923.3	0.648	≥500	Pass
	4	925.7	0.644	≥500	Pass
	7	927.5	0.640	≥500	Pass

5.5. Original test data

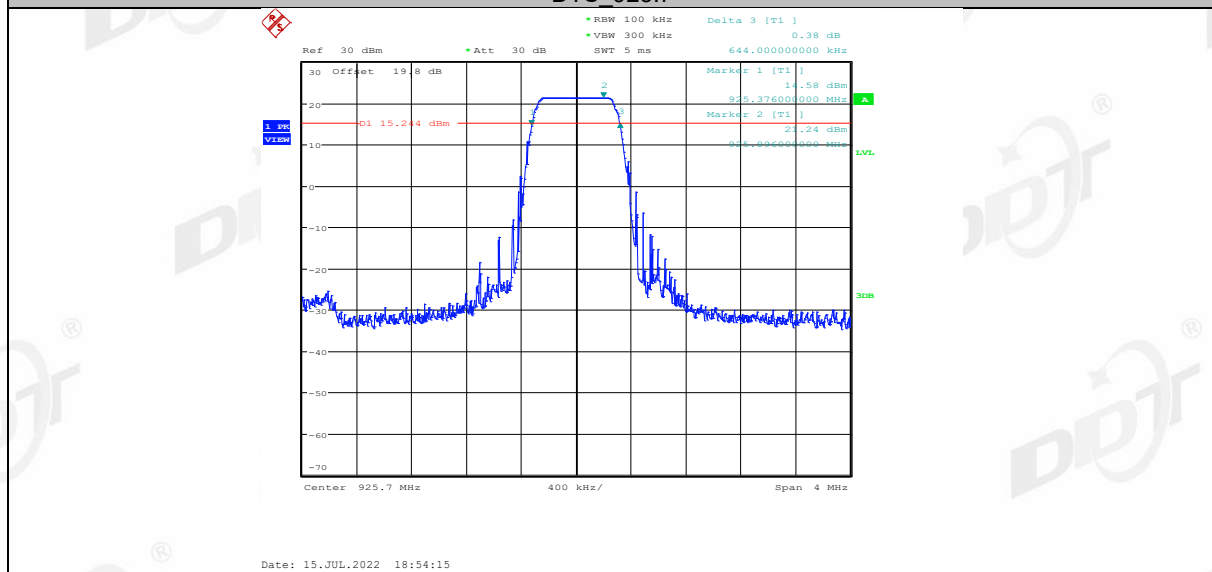




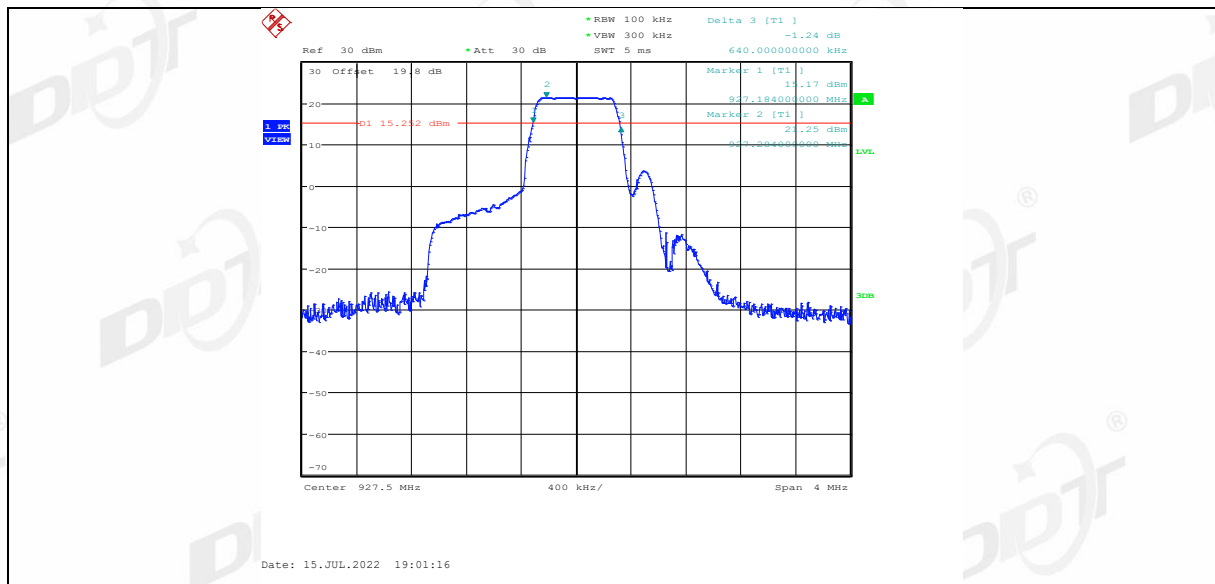
DTS 923.3



DTS 925.7

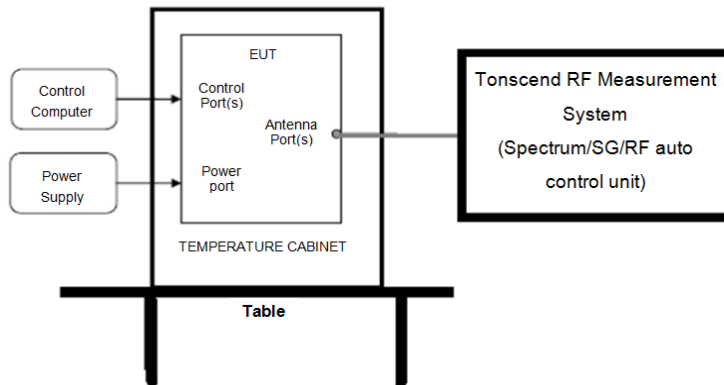


DTS 927.5



6. Maximum Peak Output Power

6.1. Block diagram of test setup



6.2. Limits

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

6.3. Test procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (2) Measure the maximum conducted output power of EUT by spectrum analyzer with PK detector and RBW=3 MHz (above 20 dB bandwidth of measured signal), VBW=10 MHz

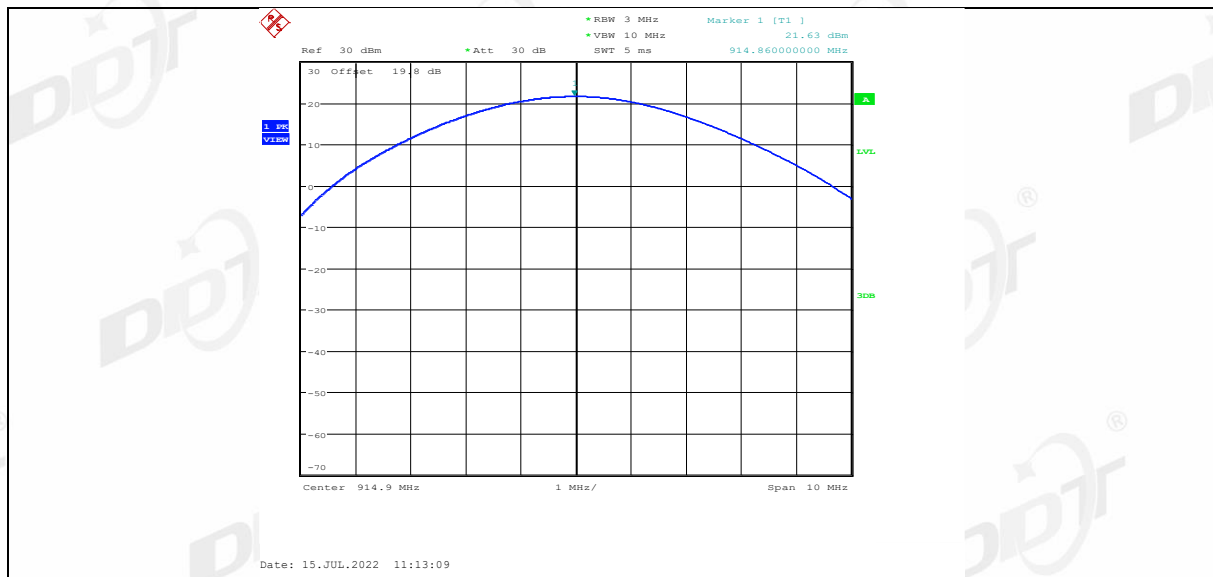
Note: The attenuator loss was inputted into spectrum analyzer as amplitude offset.

6.4. Test result

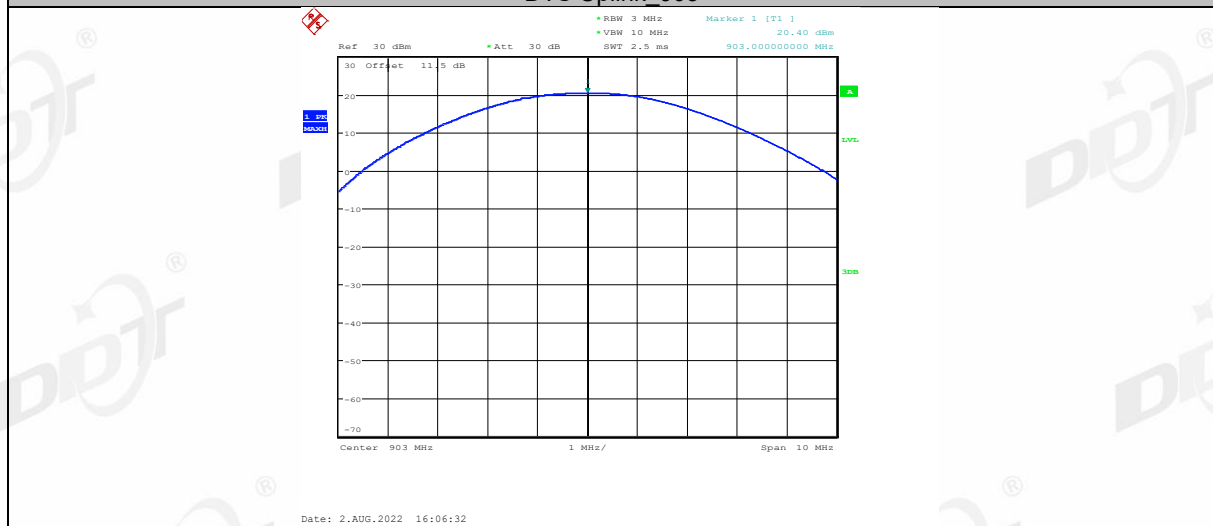
Mode	Channel	Freq. (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Verdict
FHSS	0	902.3	21.65	30	Pass
	31	908.5	21.8	30	Pass
	63	914.9	21.63	30	Pass
DTS (Uplink)	0	903	20.40	30	Pass
	4	909.4	20.48	30	Pass
	7	914.2	20.33	30	Pass
DTS (Downlink)	0	923.3	20.33	30	Pass
	4	925.7	20.17	30	Pass
	7	927.5	20.21	30	Pass

6.5. Original test data

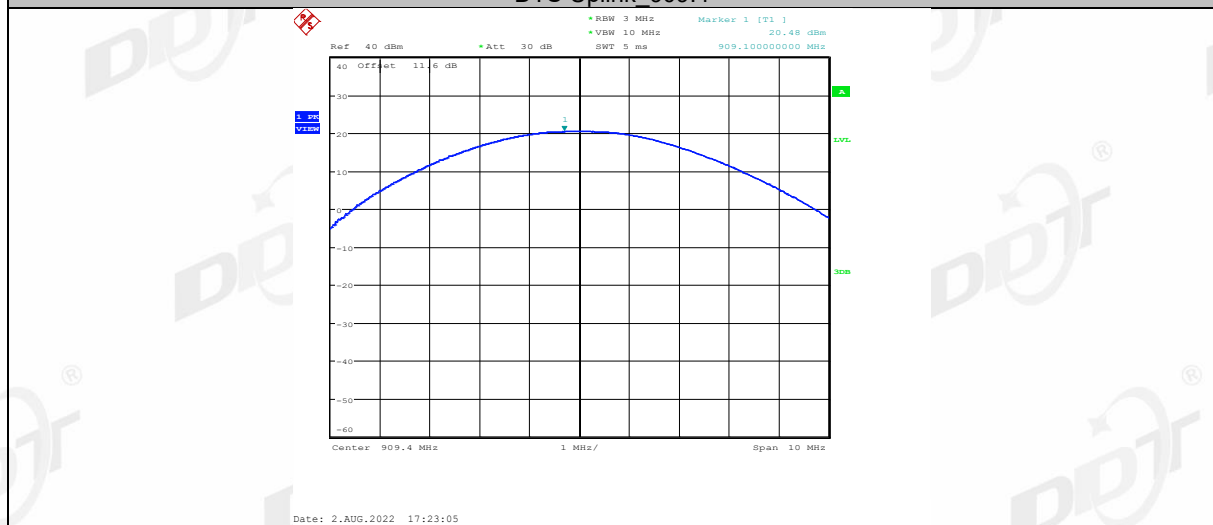




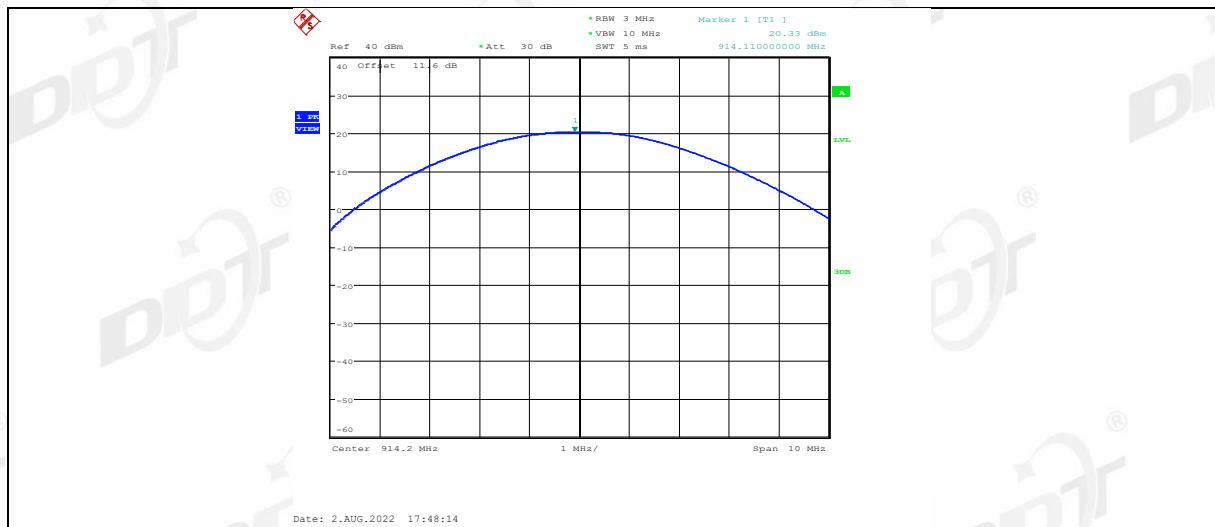
DTS Uplink_903



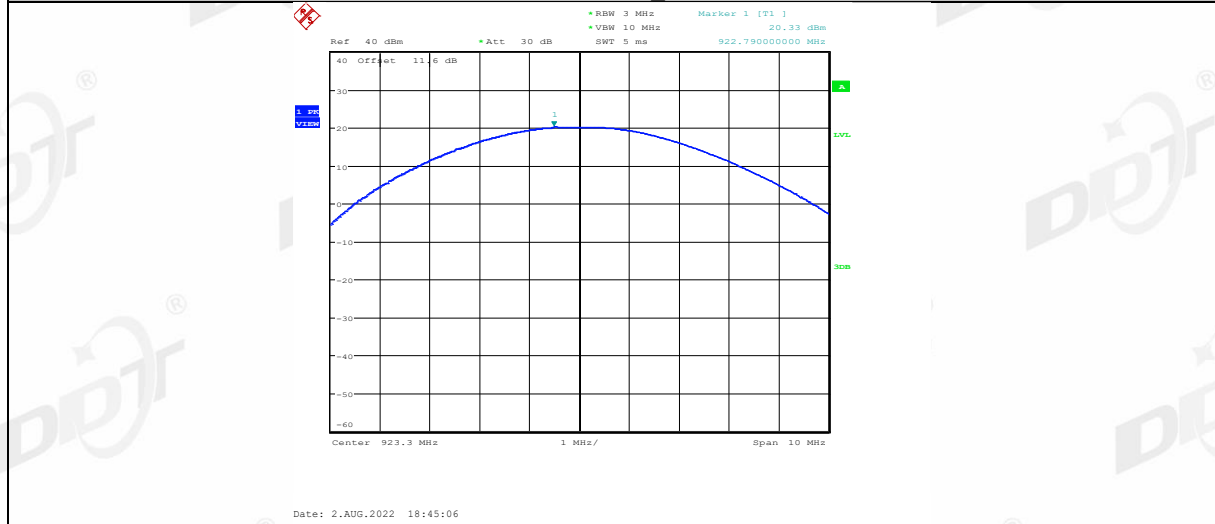
DTS Uplink_909.4



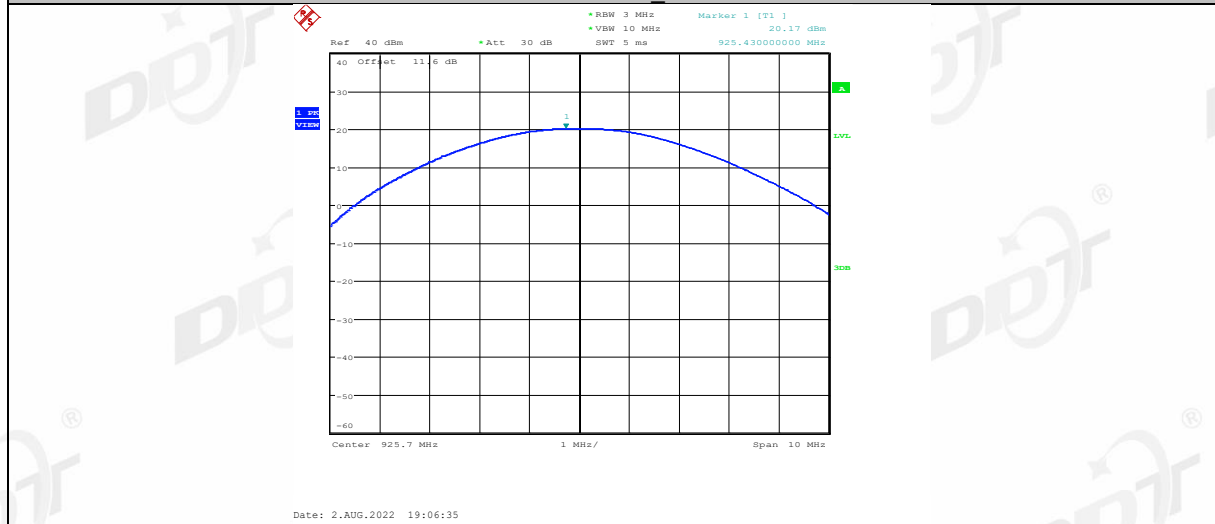
DTS Uplink_914.2



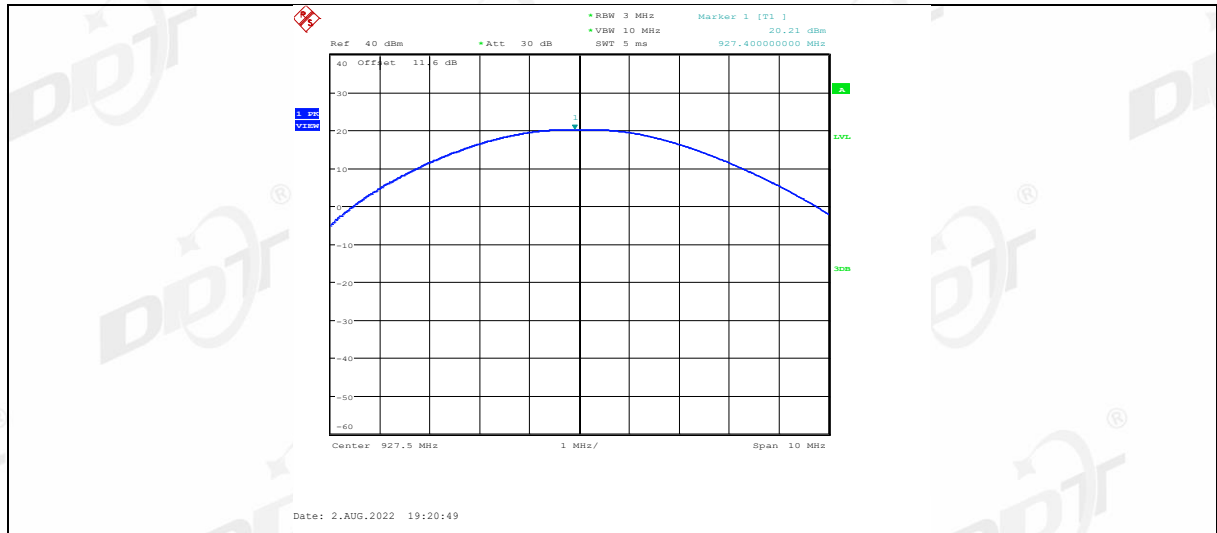
DTS Downlink_923.3



DTS Downlink_925.7

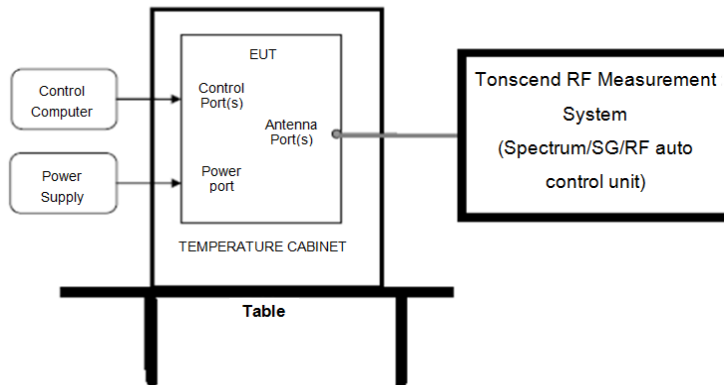


DTS Downlink_927.5



7. Power Spectral Density

7.1. Block diagram of test setup



7.2. Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

Center frequency	DTS Channel center frequency
RBW:	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW:	$\geq 3\text{RBW}$
Span	1.5 times the DTS bandwidth
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.

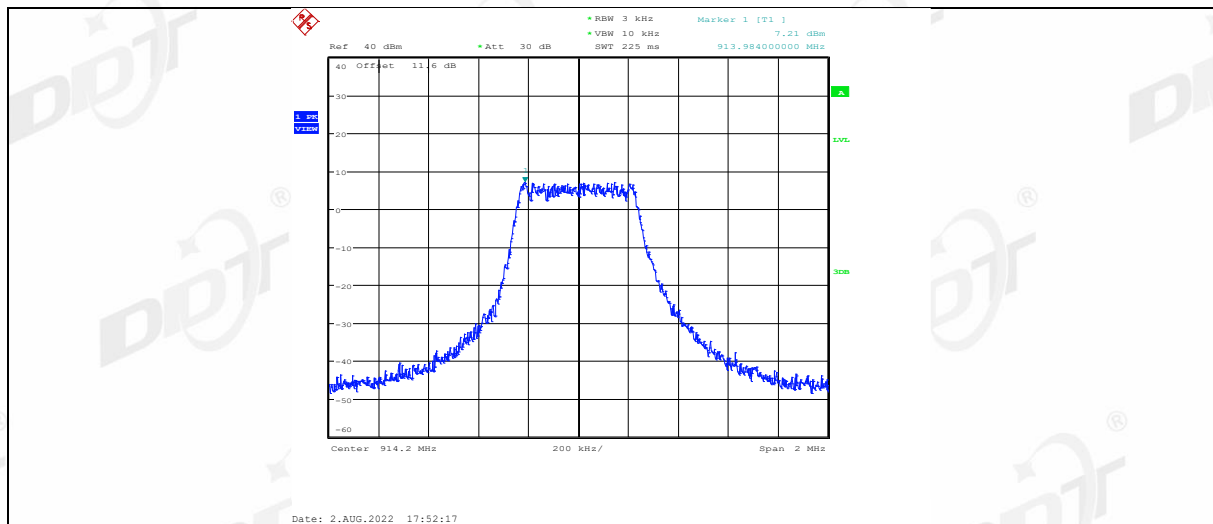
(4) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

7.4. Test result

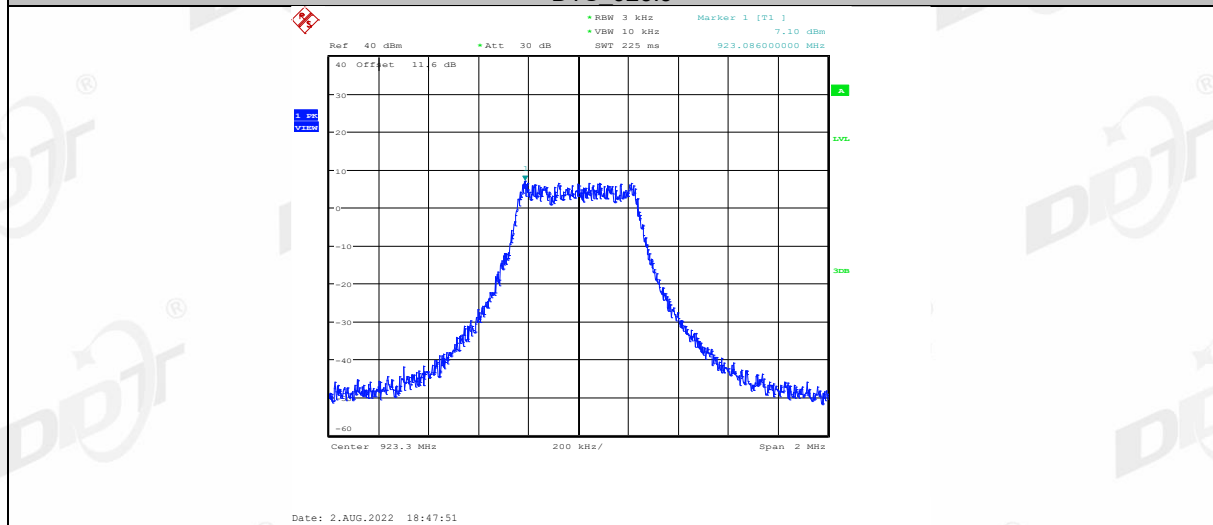
Mode	Channel	Freq. (MHz)	Result (dBm/3 kHz)	Limit (dBm/3 kHz)	Verdict
DTS (Uplink)	0	903	7.30	<8	Pass
	4	909.4	7.62	<8	Pass
	7	914.2	7.21	<8	Pass
DTS (Downlink)	0	923.3	7.10	<8	Pass
	4	925.7	6.84	<8	Pass
	7	927.5	7.26	<8	Pass

7.5. Original test data

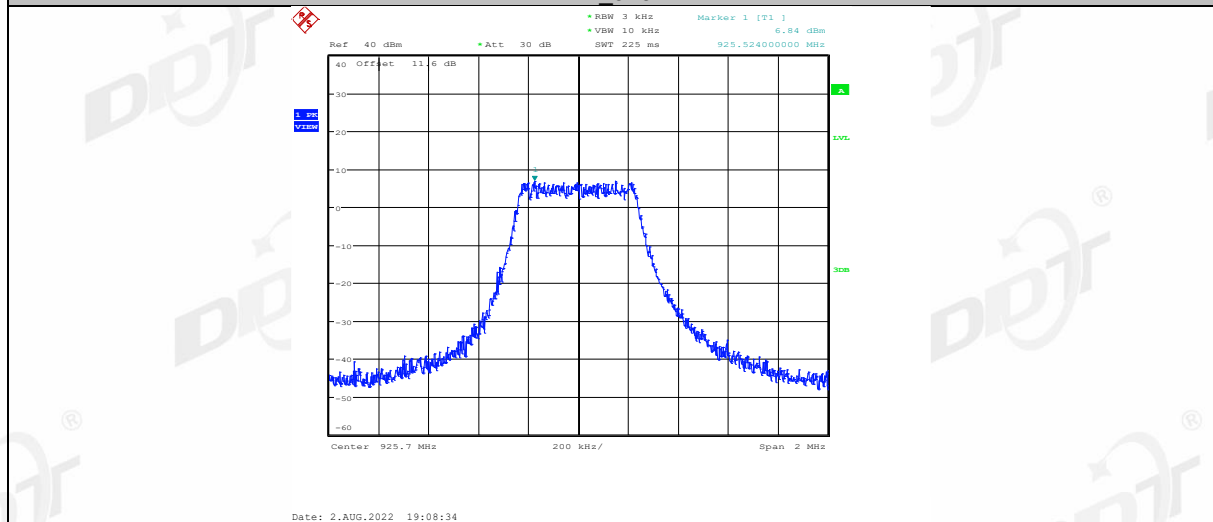




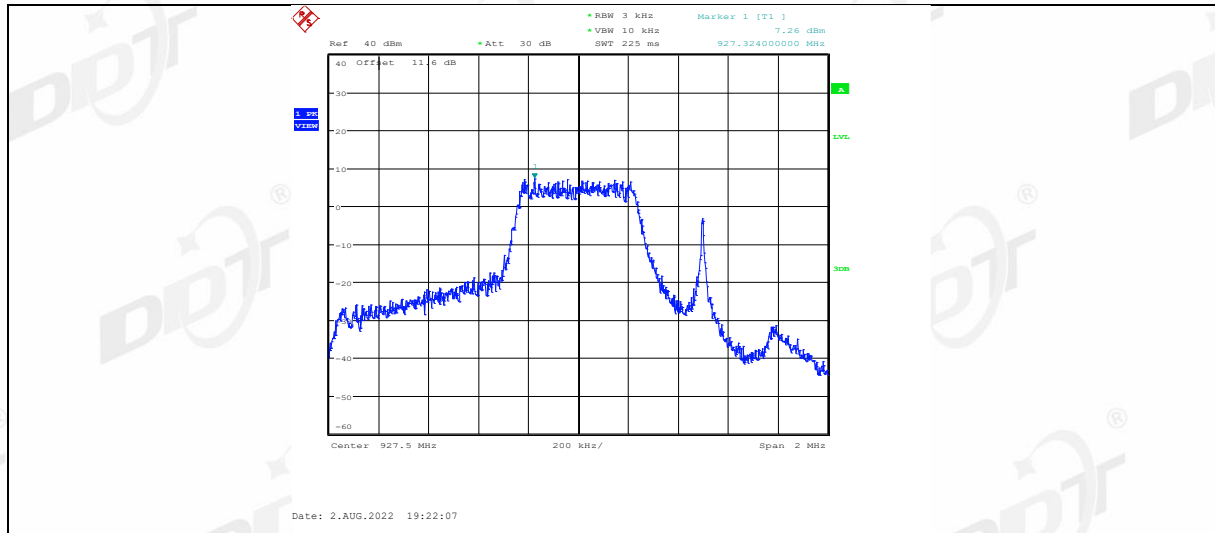
DTS 923.3



DTS 925.7

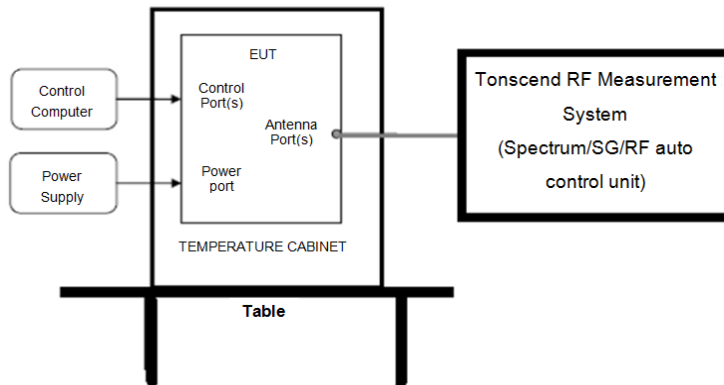


DTS 927.5



8. Carrier Frequency Separation

8.1. Block diagram of test setup



8.2. Limits

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

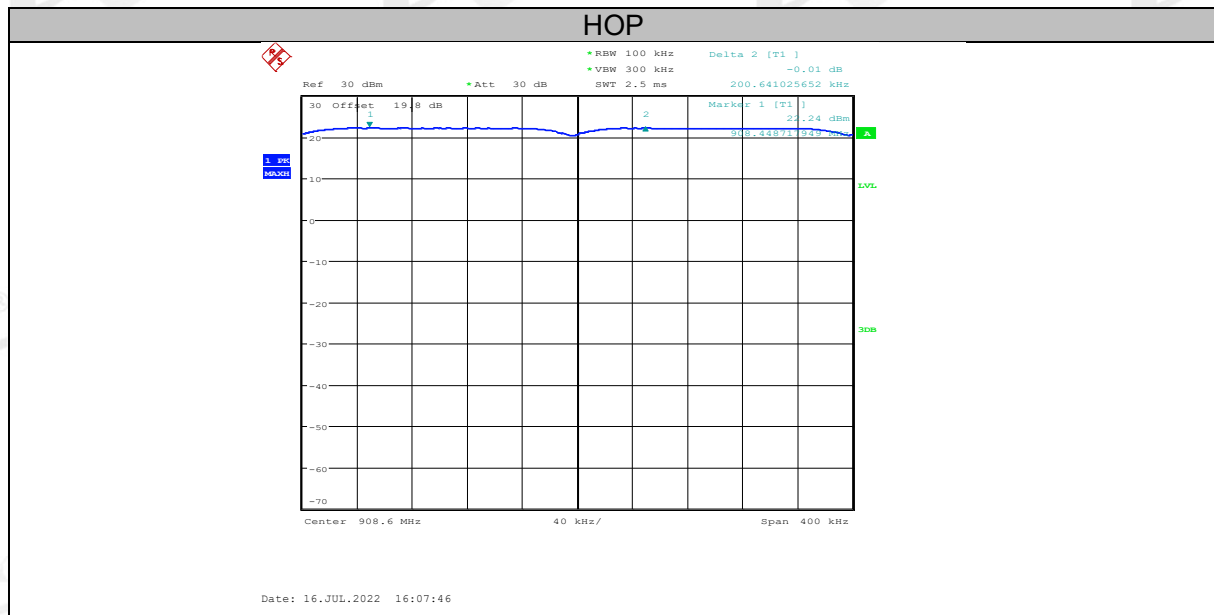
8.3. Test procedure

- (5) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (6) The carrier frequency was measured by spectrum analyzer with 100 kHz RBW and 300 kHz VBW.

8.4. Test result

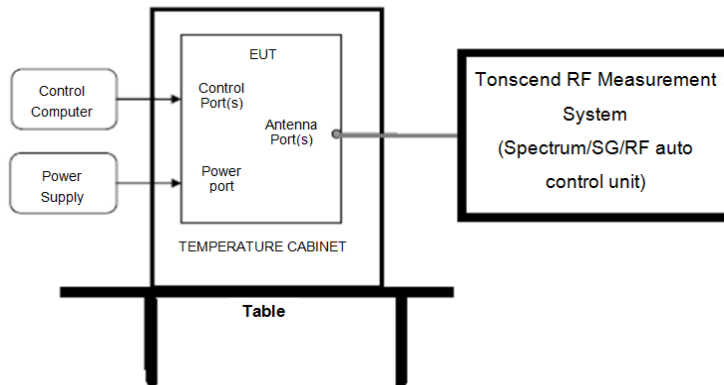
Mode	Channel separation (kHz)	20dB bandwidth (kHz) (worse case)	Limit (kHz) 20dB bandwidth	Verdict
FHSS	200.641	141	≥141	Pass

8.5. Original test data



9. Number of Hopping Channel

9.1. Block diagram of test setup



9.2. Limits

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

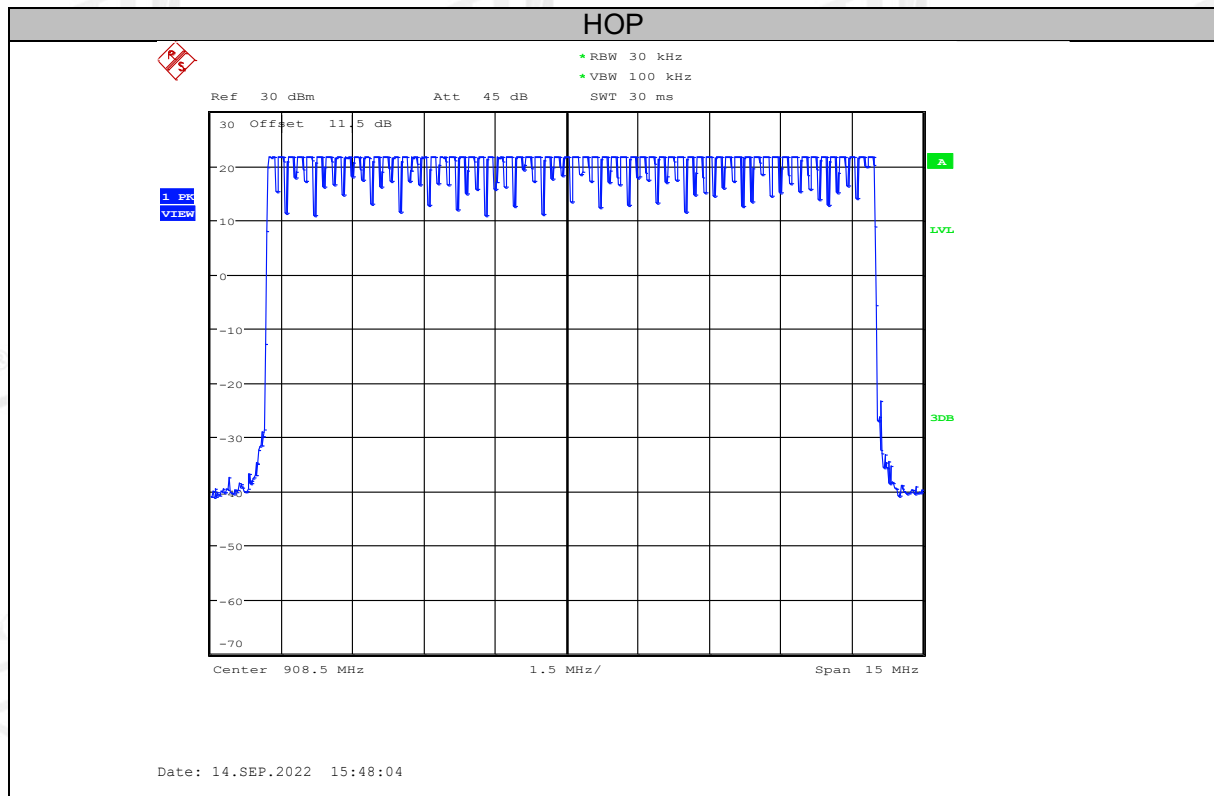
9.3. Test procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (2) The number of hopping channels was measured by spectrum analyzer with 30 kHz RBW and 100 kHz VBW.

9.4. Test result

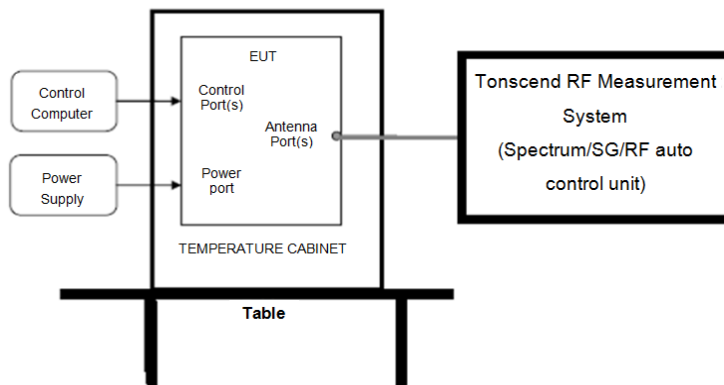
Mode	Number of hopping channels	Limit	Verdict
FHSS	64	>50	Pass

9.5. Original test data



10. Dwell Time

10.1. Block diagram of test setup



10.2. Limits

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

10.3. Test procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (2) The test period: $T=20$ s.
- (3) Measure the hopping number and on time of each pulse with spectrum analyzer in zero span set, and calculate dwell time with formula $\text{Dwell time} = \text{total hops} * \text{pulse's on time}$.

10.4. Test result

Mode	Dwell time (s)	Pulse's on time (ms)	Total hops	Limit	Verdict
FHSS	0.166	20.71	8	<400ms	Pass

Note: $\text{Dwell time} = \text{total hops} * \text{pulse's on time}$.

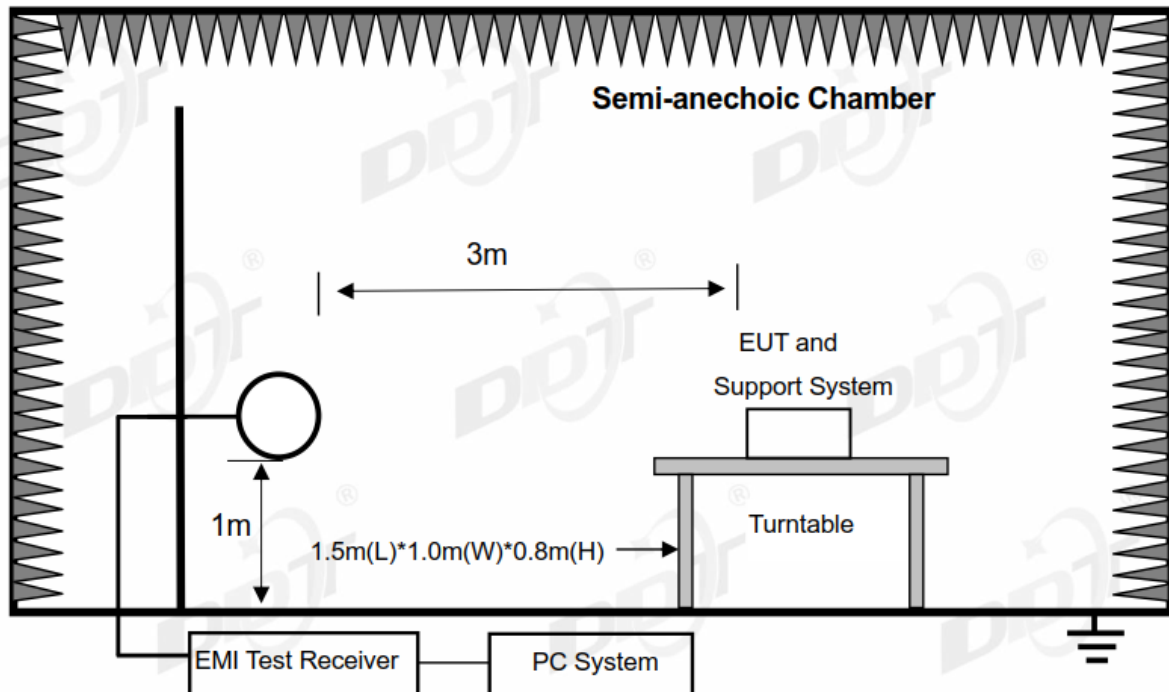
10.5. Original test data



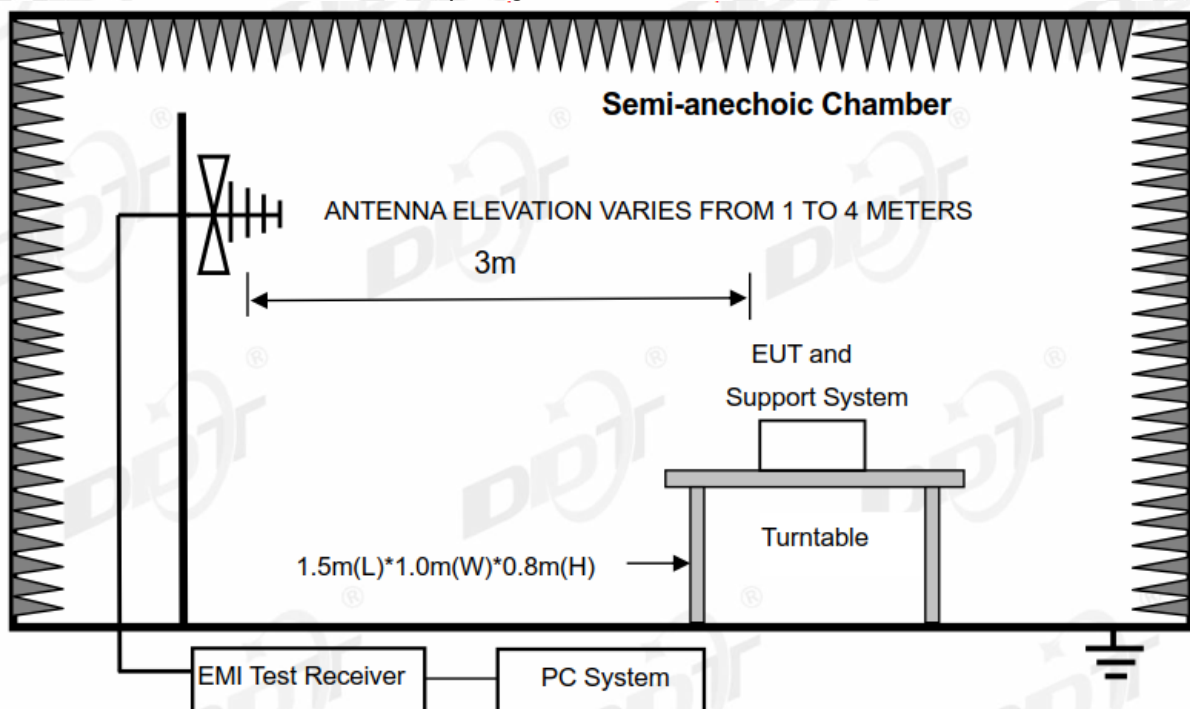
11. Radiated Emission

11.1. Block diagram of test setup

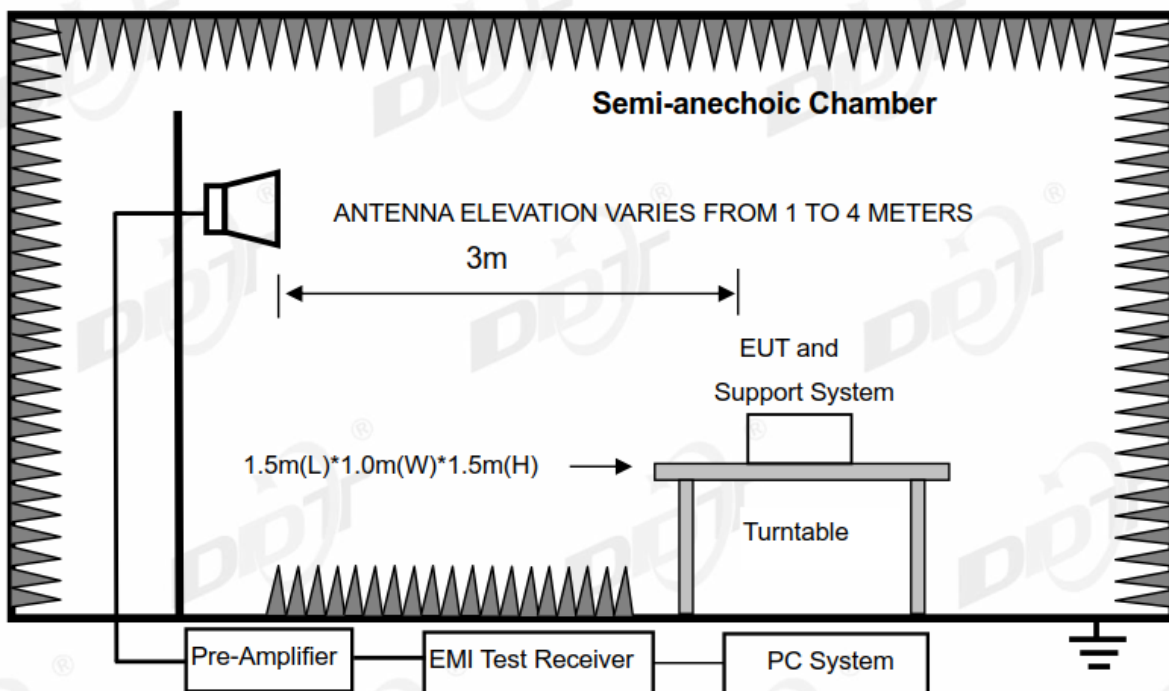
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:



In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

11.2. Limit

(1) FCC 15.205 Restricted frequency band

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
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&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			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6

(2) FCC 15.209 Limit.

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 ~ 0.490	300	$2400/\text{F}(\text{kHz})$	$67.6-20\log(\text{F})$
0.490 ~ 1.705	30	$24000/\text{F}(\text{kHz})$	$87.6-20\log(\text{F})$
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz and above 1000 MHz, radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30 MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dB}\mu\text{V}/\text{m}) = \text{Limit}_{30\text{m}}(\text{dB}\mu\text{V}/\text{m}) + 40\log(30\text{m}/3\text{m})$$

(3) Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits.

11.3. Test Procedure

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1G and 150 cm above the ground plane inside a fully-anechoic chamber for above 1G.

(2) Test antenna was located 3 m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used	Test antenna distance
9 kHz - 30 MHz	Active Loop antenna	3 m
30 MHz - 1 GHz	Trilog Broadband Antenna	3 m
1 GHz - 18 GHz	Double Ridged Horn Antenna (1 GHz - 18 GHz)	3 m
18 GHz - 40 GHz	Horn Antenna (18 GHz - 40 GHz)	1 m

According ANSI C63.10:2013 clause 6.4.6 and 6.5.3, for measurements below 30 MHz, Antenna was located 3 m from EUT, the loop antenna was positioned in three antenna orientations (parallel, perpendicular, and round-parallel), for each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable, and the lowest height of the magnetic antenna shall be 1

m above the ground. For measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

(3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 GHz:

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1 m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18 GHz to 25 GHz, so below final test was performed with frequency range from 9 kHz to 18 GHz.

(4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.

(5) The emissions from 9 kHz to 1 GHz were measured based on CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz, for emissions from 9 kHz - 90 kHz, 110 kHz - 490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.

(6) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW.

Frequency band	RBW
9 kHz - 150 kHz	200 Hz
150 kHz - 30 MHz	9 kHz
30 MHz - 1 GHz	120 kHz

(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; According ANSI C63.10:2013 clause 4.1.4.2.2 procedure for average measure.

(8) X axis, Y axis, Z axis are tested, and worse setup X axis is reported.

11.4. Test result

Pass. (See below detailed test result)

All the emissions except fundamental emission from 9 kHz to 10 GHz were comply with 15.209 limits.

Note1: According exploratory test, the emission levels are 20 dB below the limit detected from 9 kHz to 30 MHz, so the final test was performed with frequency range from 30 MHz to 10 GHz and recorded in below.

Note2: For emissions below 1 GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1 GHz, the final test was only performed with worst mode.

Note3: For emissions above 1 GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

Radiated Emission test (below 1 GHz)

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

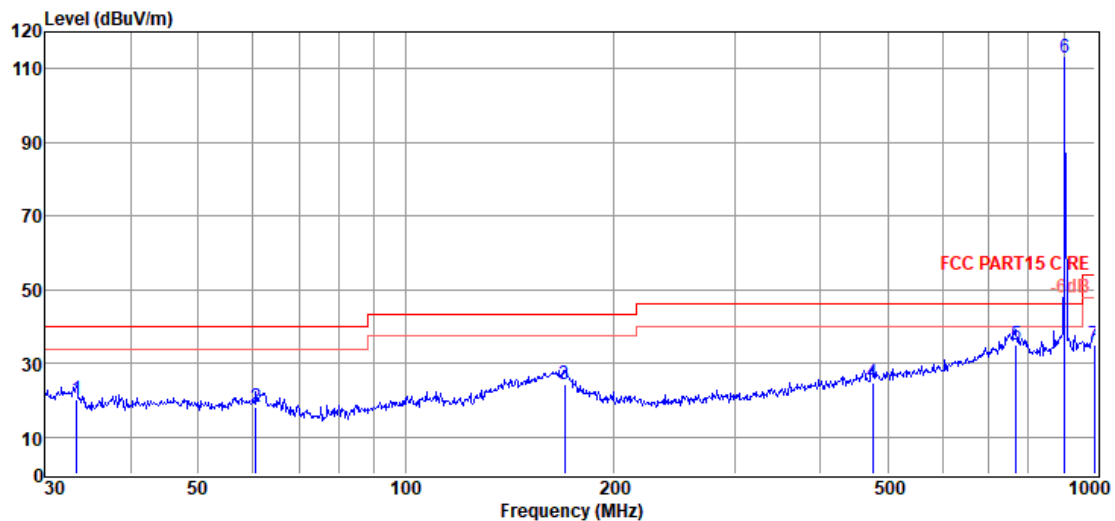
Model Number : RFM6601

Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 903Mhz(20DB)



Data: 19

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	33.33	5.11	11.37	3.57	20.05	40.00	-19.95	QP	HORIZONTAL
2	60.70	2.48	11.87	3.76	18.11	40.00	-21.89	QP	HORIZONTAL
3	170.20	0.42	19.40	4.34	24.16	43.50	-19.34	QP	HORIZONTAL
4	475.50	2.07	17.20	5.41	24.68	46.00	-21.32	QP	HORIZONTAL
5	768.75	7.44	21.50	6.15	35.09	46.00	-10.91	QP	HORIZONTAL
6	903.31	83.64	22.77	6.49	112.90	---	---	Peak	HORIZONTAL
7	996.50	4.34	23.86	6.82	35.02	54.00	-18.98	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

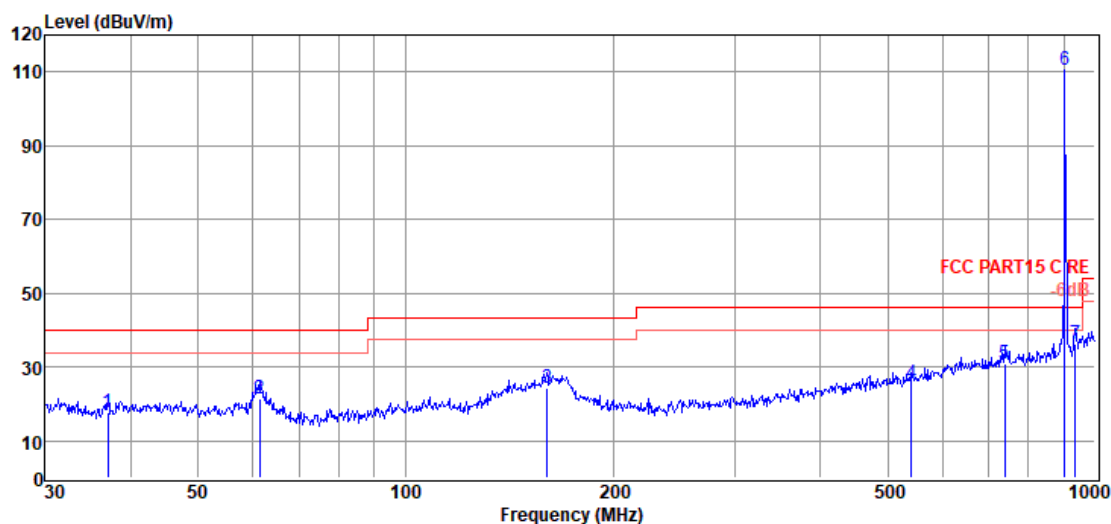
Model Number : RFM6601

Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa **Antenna/Distance** : 2022 9161 #3/3m/VERTICAL

Memo : 903Mhz(20DB)



Data: 20

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	37.03	2.27	11.90	3.60	17.77	40.00	-22.23	QP	VERTICAL
2	61.35	5.70	11.80	3.76	21.26	40.00	-18.74	QP	VERTICAL
3	160.35	1.05	18.97	4.30	24.32	43.50	-19.18	QP	VERTICAL
4	541.37	1.98	18.03	5.56	25.57	46.00	-20.43	QP	VERTICAL
5	739.66	3.61	21.27	6.08	30.96	46.00	-15.04	QP	VERTICAL
6	903.31	81.32	22.77	6.49	110.58	---	---	Peak	VERTICAL
7	935.55	6.63	23.11	6.54	36.28	46.00	-9.72	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

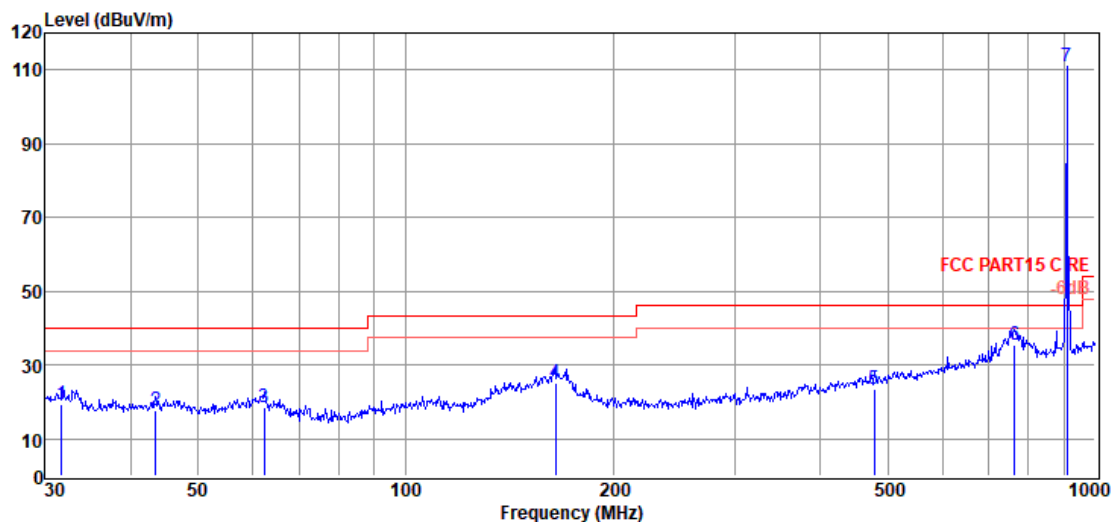
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 909.4Mhz(20DB)



Data: 21

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	31.73	4.89	11.07	3.56	19.52	40.00	-20.48	QP	HORIZONTAL
2	43.35	1.15	12.74	3.64	17.53	40.00	-22.47	QP	HORIZONTAL
3	62.43	3.37	11.43	3.77	18.57	40.00	-21.43	QP	HORIZONTAL
4	164.91	1.14	19.50	4.32	24.96	43.50	-18.54	QP	HORIZONTAL
5	478.85	0.77	17.20	5.42	23.39	46.00	-22.61	QP	HORIZONTAL
6	763.38	7.93	21.50	6.13	35.56	46.00	-10.44	QP	HORIZONTAL
7	909.67	81.66	22.61	6.50	110.77	---	---	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

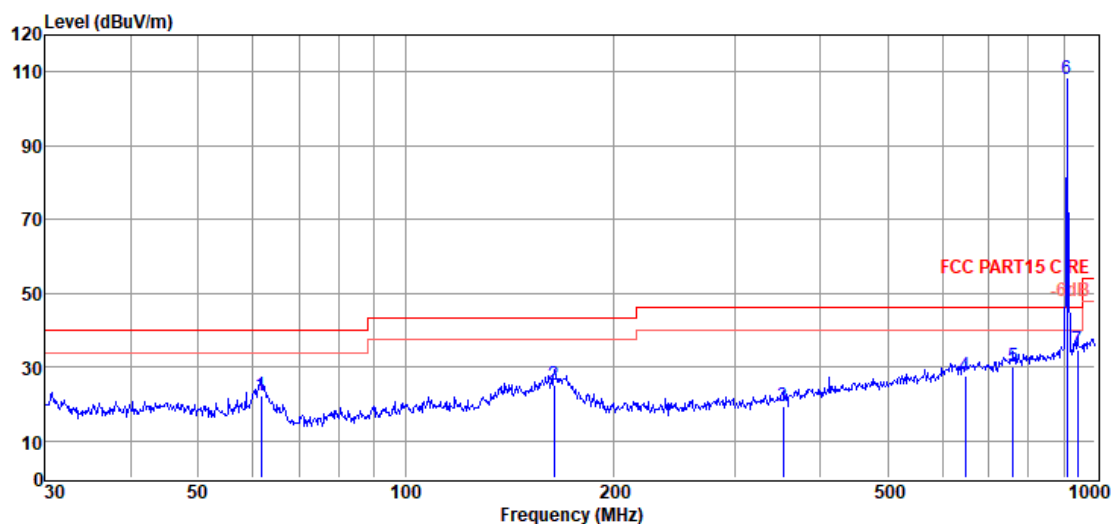
Model Number : RFM6601

Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa **Antenna/Distance** : 2022 9161 #3/3m/VERTICAL

Memo : 909.4Mhz(20DB)



Data: 22

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	61.78	6.68	11.67	3.76	22.11	40.00	-17.89	QP	VERTICAL
2	164.33	1.37	19.50	4.32	25.19	43.50	-18.31	QP	VERTICAL
3	352.94	0.21	14.22	5.01	19.44	46.00	-26.56	QP	VERTICAL
4	647.39	1.68	19.90	5.85	27.43	46.00	-18.57	QP	VERTICAL
5	760.70	2.39	21.50	6.13	30.02	46.00	-15.98	QP	VERTICAL
6	909.67	79.01	22.61	6.50	108.12	---	---	Peak	VERTICAL
7	942.13	4.71	23.24	6.56	34.51	46.00	-11.49	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

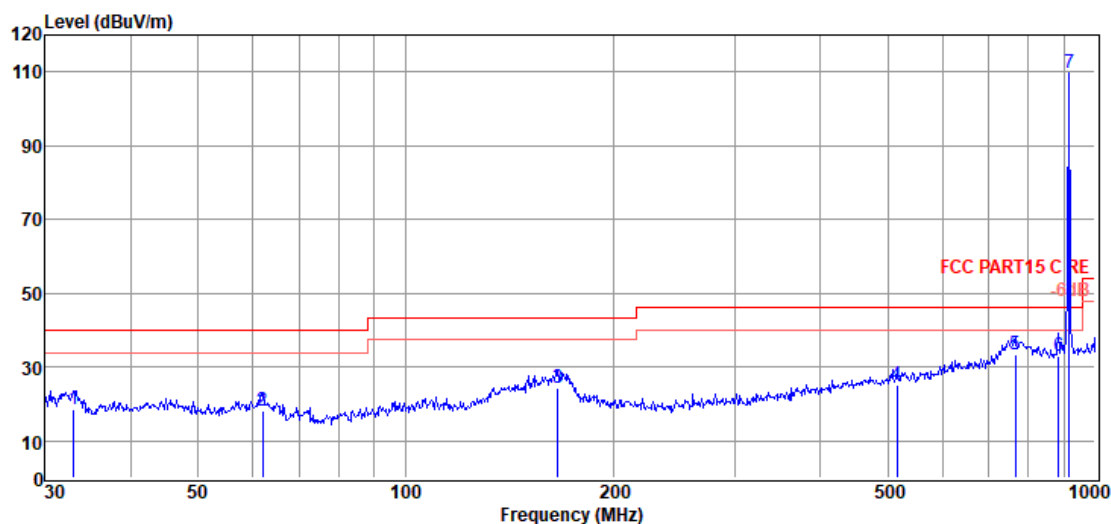
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 914.2Mhz(20DB)



Data: 23

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	32.98	3.72	11.30	3.57	18.59	40.00	-21.41	QP	HORIZONTAL
2	62.00	2.67	11.60	3.77	18.04	40.00	-21.96	QP	HORIZONTAL
3	166.07	0.35	19.50	4.32	24.17	43.50	-19.33	QP	HORIZONTAL
4	515.44	2.12	17.71	5.51	25.34	46.00	-20.66	QP	HORIZONTAL
5	766.06	5.87	21.50	6.14	33.51	46.00	-12.49	QP	HORIZONTAL
6	884.50	4.20	22.49	6.44	33.13	46.00	-12.87	QP	HORIZONTAL
7	916.07	80.48	22.90	6.51	109.89	---	---	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

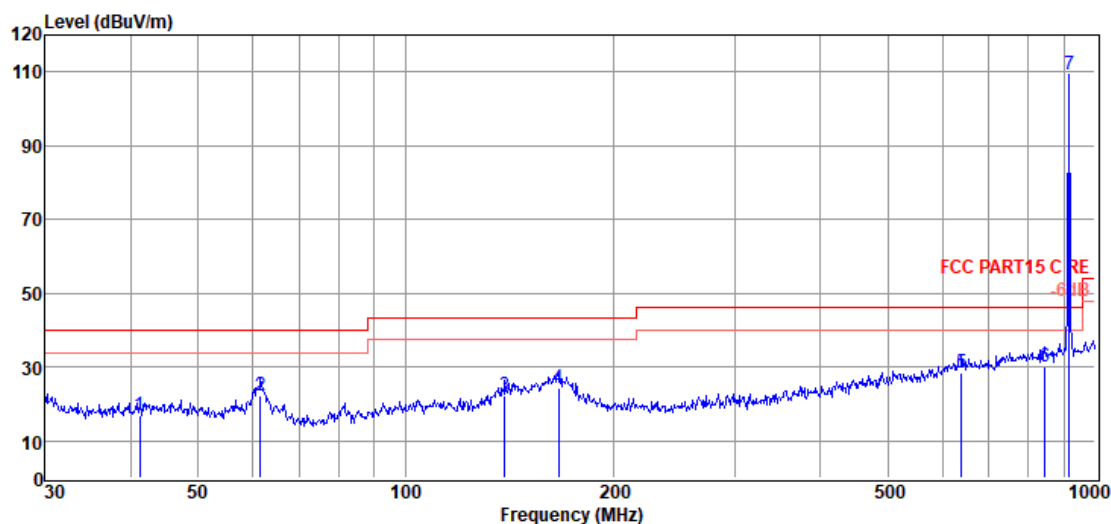
Model Number : RFM6601

Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa **Antenna/Distance** : 2022 9161 #3/3m/VERTICAL

Memo : 914.2Mhz(20DB)



Data: 24

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	41.13	0.72	12.41	3.62	16.75	40.00	-23.25	QP	VERTICAL
2	61.56	6.79	11.73	3.76	22.28	40.00	-17.72	QP	VERTICAL
3	139.36	1.29	16.71	4.21	22.21	43.50	-21.29	QP	VERTICAL
4	166.65	0.64	19.50	4.33	24.47	43.50	-19.03	QP	VERTICAL
5	640.61	2.53	19.90	5.84	28.27	46.00	-17.73	QP	VERTICAL
6	845.09	1.63	22.30	6.33	30.26	46.00	-15.74	QP	VERTICAL
7	916.07	79.84	22.90	6.51	109.25	---	---	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

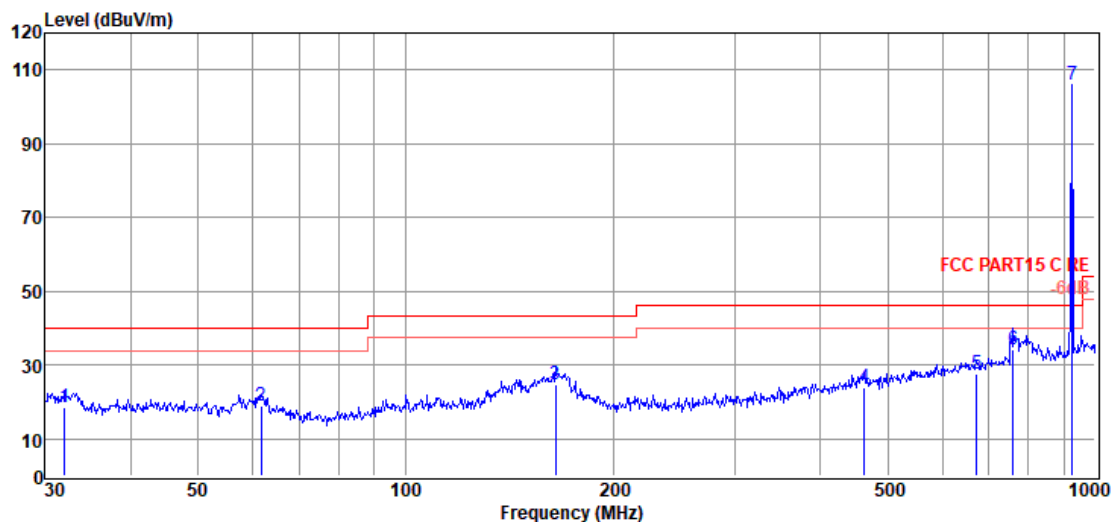
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 923.3Mhz(20DB)



Data: 25

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	32.07	4.08	11.11	3.56	18.75	40.00	-21.25	QP	HORIZONTAL
2	61.78	3.59	11.67	3.76	19.02	40.00	-20.98	QP	HORIZONTAL
3	164.91	0.93	19.50	4.32	24.75	43.50	-18.75	QP	HORIZONTAL
4	462.35	1.42	17.20	5.36	23.98	46.00	-22.02	QP	HORIZONTAL
5	672.84	1.56	20.00	5.92	27.48	46.00	-18.52	QP	HORIZONTAL
6	760.70	6.40	21.50	6.13	34.03	46.00	-11.97	QP	HORIZONTAL
7	925.76	76.44	22.92	6.53	105.89	---	---	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

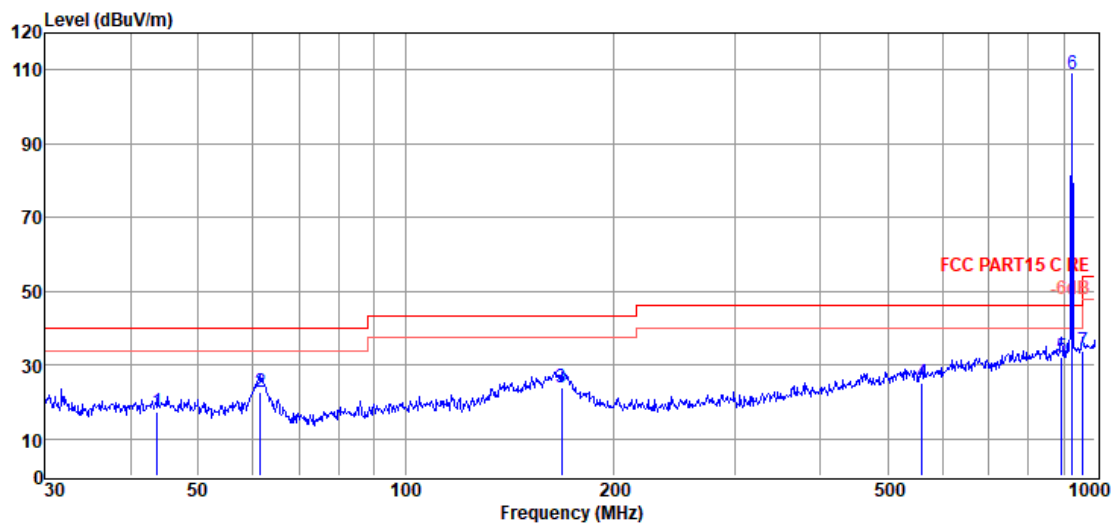
Model Number : RFM6601

Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa **Antenna/Distance** : 2022 9161 #3/3m/VERTICAL

Memo : 923.3Mhz(20DB)



Data: 26

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	43.66	0.71	12.77	3.64	17.12	40.00	-22.88	QP	VERTICAL
2	61.56	7.17	11.73	3.76	22.66	40.00	-17.34	QP	VERTICAL
3	168.41	0.18	19.46	4.33	23.97	43.50	-19.53	QP	VERTICAL
4	560.69	1.28	18.31	5.62	25.21	46.00	-20.79	QP	VERTICAL
5	893.86	3.22	22.68	6.46	32.36	46.00	-13.64	QP	VERTICAL
6	925.76	79.23	22.92	6.53	108.68	---	---	Peak	VERTICAL
7	958.79	3.61	23.50	6.62	33.73	46.00	-12.27	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

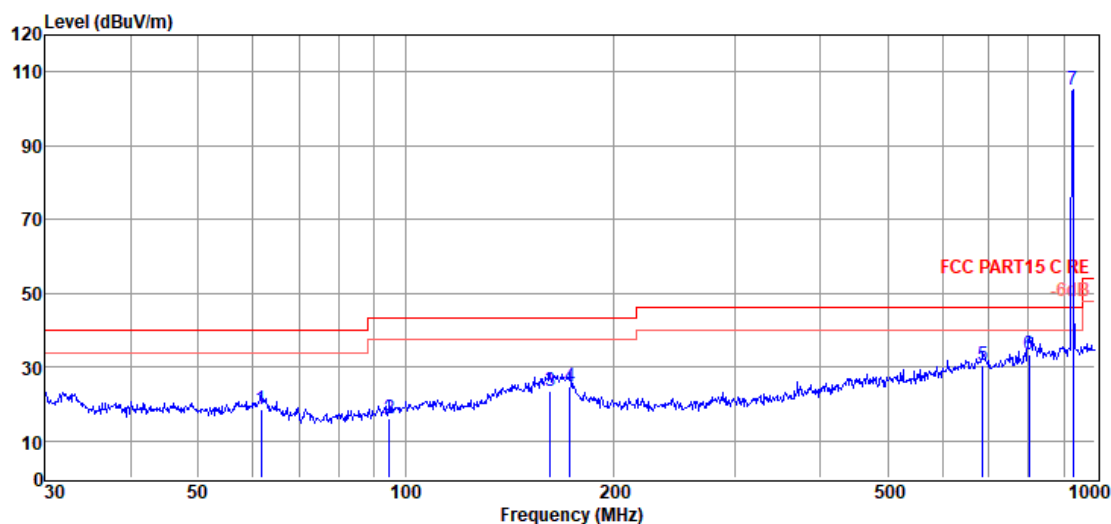
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 925.7Mhz(20DB)



Data: 27

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	61.78	3.02	11.67	3.76	18.45	40.00	-21.55	QP	HORIZONTAL
2	94.76	0.22	11.88	3.96	16.06	43.50	-27.44	QP	HORIZONTAL
3	162.04	-0.02	19.31	4.31	23.60	43.50	-19.90	QP	HORIZONTAL
4	173.21	2.04	18.16	4.35	24.55	43.50	-18.95	QP	HORIZONTAL
5	687.15	4.37	20.10	5.96	30.43	46.00	-15.57	QP	HORIZONTAL
6	801.79	5.40	21.84	6.22	33.46	46.00	-12.54	QP	HORIZONTAL
7	929.01	75.72	22.98	6.53	105.23	---	---	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

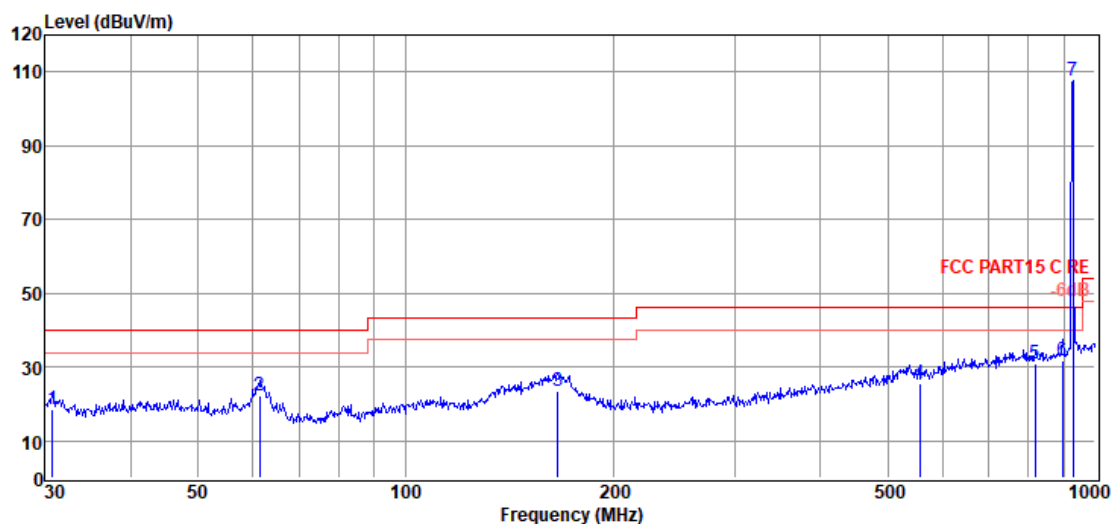
Model Number : RFM6601

Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa **Antenna/Distance** : 2022 9161 #3/3m/VERTICAL

Memo : 925.7Mhz(20DB)



Data: 28

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	30.75	3.99	10.95	3.55	18.49	40.00	-21.51	QP	VERTICAL
2	61.35	6.63	11.80	3.76	22.19	40.00	-17.81	QP	VERTICAL
3	166.07	-0.33	19.50	4.32	23.49	43.50	-20.01	QP	VERTICAL
4	556.77	1.88	18.24	5.60	25.72	46.00	-20.28	QP	VERTICAL
5	818.83	2.37	22.08	6.27	30.72	46.00	-15.28	QP	VERTICAL
6	897.00	2.44	22.70	6.47	31.61	46.00	-14.39	QP	VERTICAL
7	929.01	78.16	22.98	6.53	107.67	---	---	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

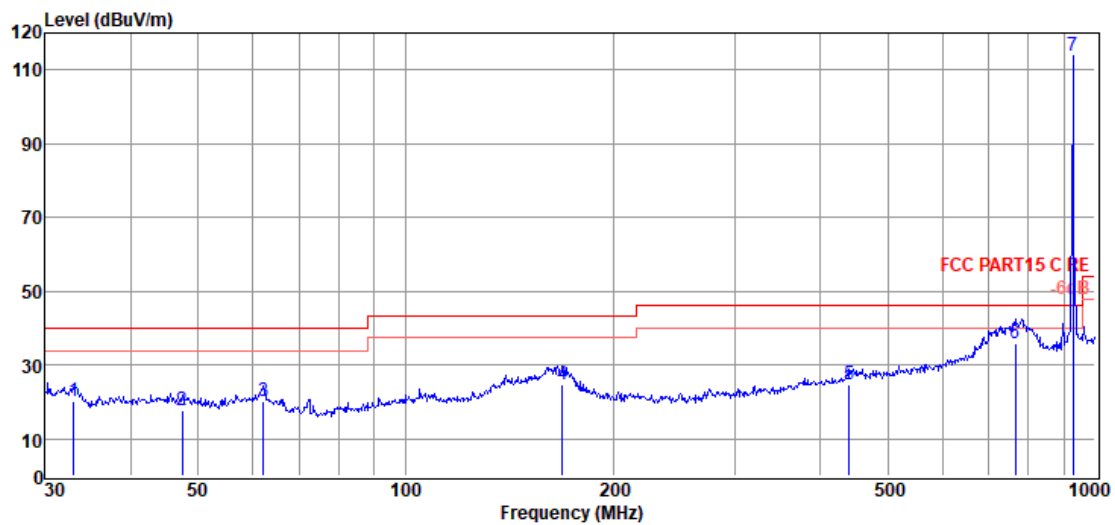
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 927.5Mhz(20DB)



Data: 29

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	32.98	5.22	11.30	3.57	20.09	40.00	-19.91	QP	HORIZONTAL
2	47.49	1.63	12.55	3.66	17.84	40.00	-22.16	QP	HORIZONTAL
3	62.21	5.05	11.51	3.77	20.33	40.00	-19.67	QP	HORIZONTAL
4	169.01	1.13	19.40	4.34	24.87	43.50	-18.63	QP	HORIZONTAL
5	440.20	2.74	16.80	5.29	24.83	46.00	-21.17	QP	HORIZONTAL
6	766.06	8.03	21.50	6.14	35.67	46.00	-10.33	QP	HORIZONTAL
7	929.01	84.43	22.98	6.53	113.94	---	---	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-03

Tested By : Bairong

EUT : LoRa Module

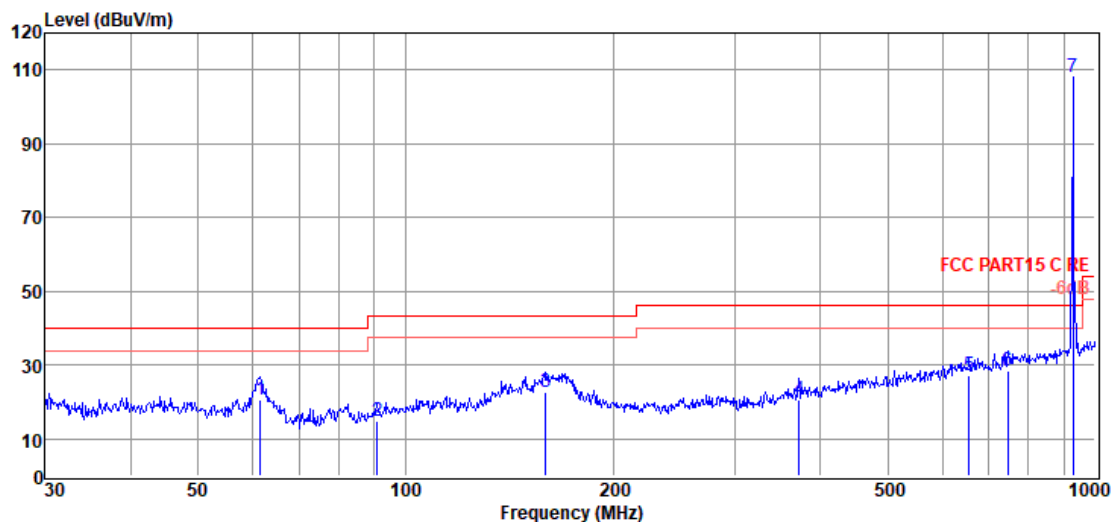
Model Number : RFM6601

Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa **Antenna/Distance** : 2022 9161 #3/3m/VERTICAL

Memo : 927.5Mhz(20DB)



Data: 30

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	61.56	5.25	11.73	3.76	20.74	40.00	-19.26	QP	VERTICAL
2	90.86	-0.36	11.37	3.94	14.95	43.50	-28.55	QP	VERTICAL
3	159.78	-0.31	18.86	4.30	22.85	43.50	-20.65	QP	VERTICAL
4	372.00	0.09	15.34	5.07	20.50	46.00	-25.50	QP	VERTICAL
5	656.53	1.24	19.93	5.88	27.05	46.00	-18.95	QP	VERTICAL
6	747.48	1.03	21.50	6.09	28.62	46.00	-17.38	QP	VERTICAL
7	929.01	78.71	22.98	6.53	108.22	---	---	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

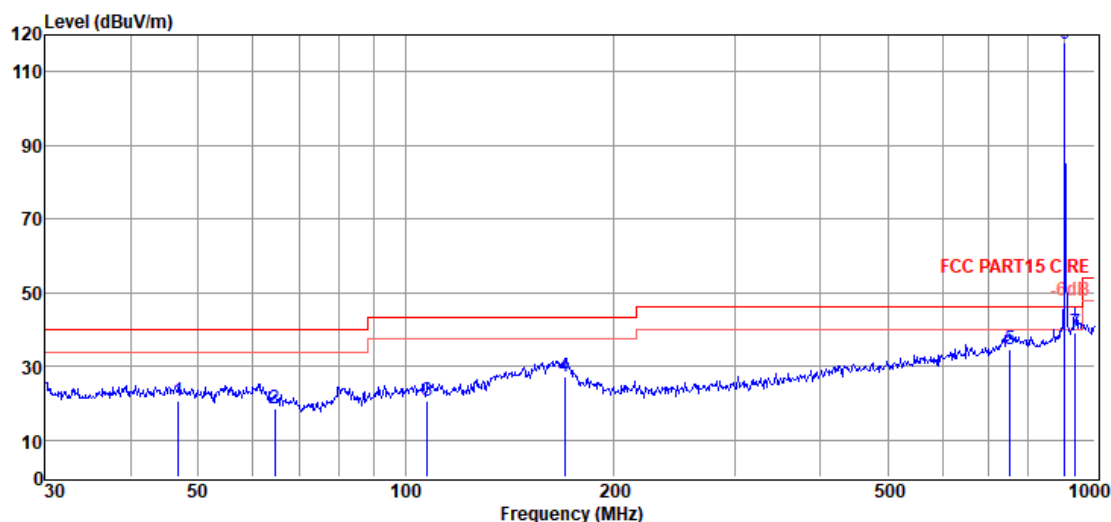
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 902.3Mhz



Data: 13

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	46.83	4.05	12.73	3.65	20.43	40.00	-19.57	QP	HORIZONTAL
2	64.66	4.32	10.37	3.78	18.47	40.00	-21.53	QP	HORIZONTAL
3	107.51	3.61	12.95	4.03	20.59	43.50	-22.91	QP	HORIZONTAL
4	170.20	3.39	19.40	4.34	27.13	43.50	-16.37	QP	HORIZONTAL
5	752.74	7.09	21.50	6.11	34.70	46.00	-11.30	QP	HORIZONTAL
6	903.31	88.07	22.77	6.49	117.33	---	---	Peak	HORIZONTAL
7	935.55	9.32	23.11	6.54	38.97	46.00	-7.03	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

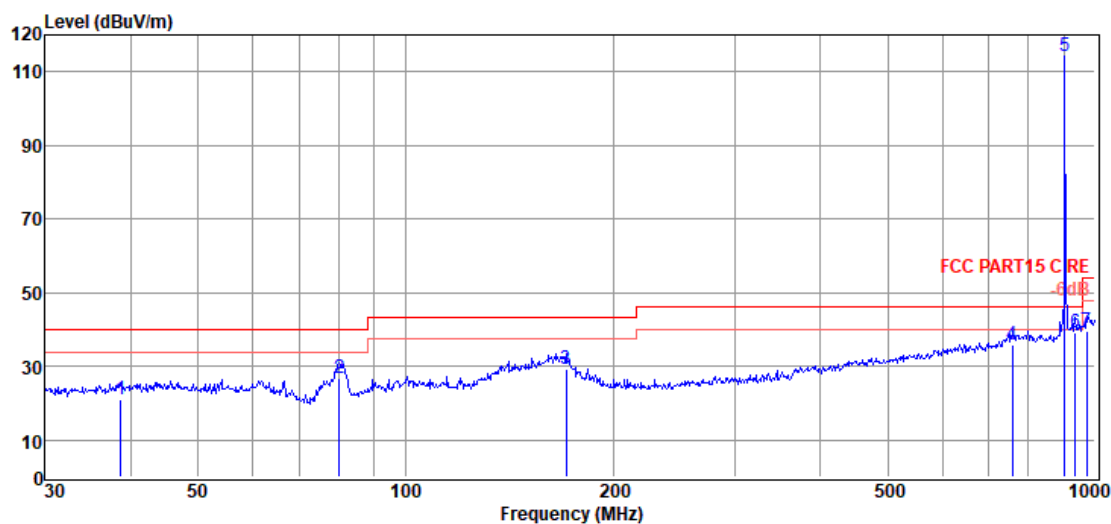
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/VERTICAL

Memo : 902.3Mhz



Data: 14

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	38.62	5.44	12.12	3.61	21.17	40.00	-18.83	QP	VERTICAL
2	80.08	13.71	9.32	3.88	26.91	40.00	-13.09	QP	VERTICAL
3	170.79	5.61	19.40	4.34	29.35	43.50	-14.15	QP	VERTICAL
4	758.04	8.07	21.50	6.12	35.69	46.00	-10.31	QP	VERTICAL
5	903.31	84.88	22.77	6.49	114.14	---	---	Peak	VERTICAL
6	935.55	9.59	23.11	6.54	39.24	46.00	-6.76	QP	VERTICAL
7	972.34	9.03	23.80	6.69	39.52	54.00	-14.48	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

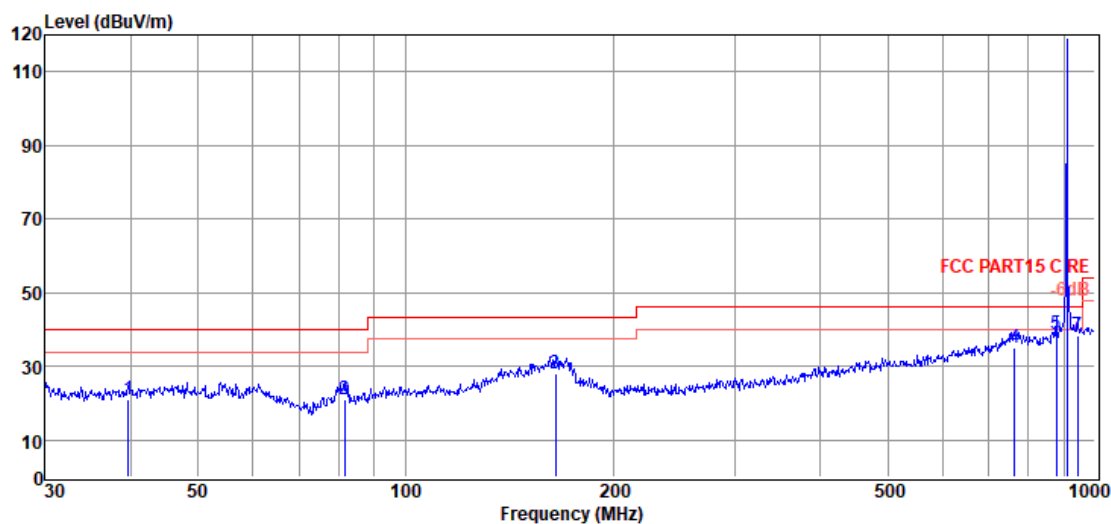
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 908.5Mhz



Data: 15

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	39.58	5.06	12.26	3.61	20.93	40.00	-19.07	QP	HORIZONTAL
2	81.50	7.56	9.60	3.89	21.05	40.00	-18.95	QP	HORIZONTAL
3	164.91	4.16	19.50	4.32	27.98	43.50	-15.52	QP	HORIZONTAL
4	763.38	7.48	21.50	6.13	35.11	46.00	-10.89	QP	HORIZONTAL
5	878.32	10.04	22.37	6.42	38.83	46.00	-7.17	QP	HORIZONTAL
6	909.67	89.82	22.61	6.50	118.93	---	---	Peak	HORIZONTAL
7	942.13	8.53	23.24	6.56	38.33	46.00	-7.67	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

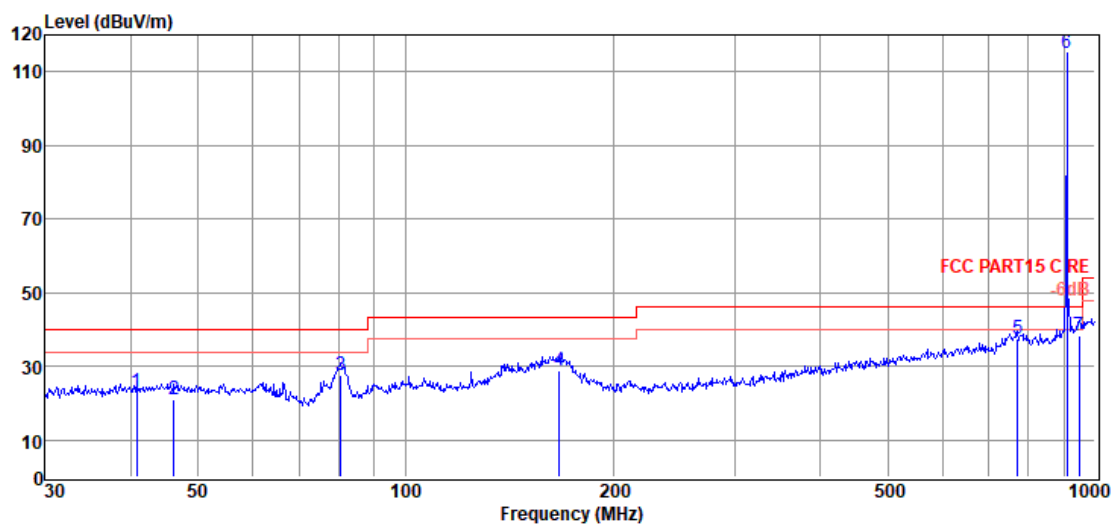
Model Number : RFM6601

Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa **Antenna/Distance** : 2022 9161 #3/3m/VERTICAL

Memo : 908.5Mhz



Data: 16

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	40.70	6.90	12.37	3.62	22.89	40.00	-17.11	QP	VERTICAL
2	46.18	4.51	12.86	3.65	21.02	40.00	-18.98	QP	VERTICAL
3	80.64	14.15	9.43	3.88	27.46	40.00	-12.54	QP	VERTICAL
4	167.24	4.94	19.50	4.33	28.77	43.50	-14.73	QP	VERTICAL
5	771.45	9.88	21.53	6.15	37.56	46.00	-8.44	QP	VERTICAL
6	909.67	86.12	22.61	6.50	115.23	---	---	Peak	VERTICAL
7	948.76	8.59	23.38	6.57	38.54	46.00	-7.46	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

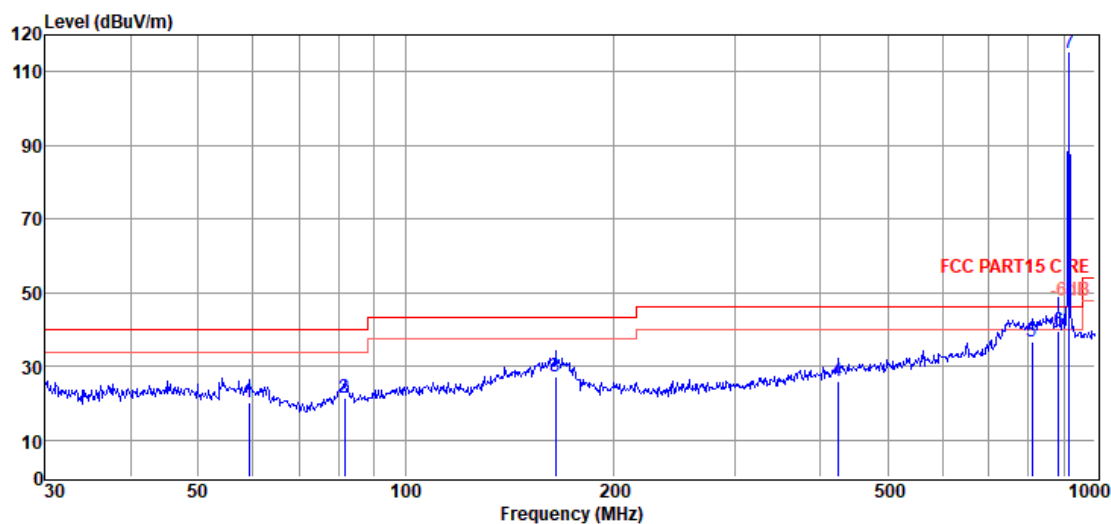
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 914.9Mhz



Data: 31

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	59.23	4.78	11.72	3.75	20.25	40.00	-19.75	QP	HORIZONTAL
2	81.50	8.04	9.60	3.89	21.53	40.00	-18.47	QP	HORIZONTAL
3	164.91	3.49	19.50	4.32	27.31	43.50	-16.19	QP	HORIZONTAL
4	423.54	4.41	16.34	5.23	25.98	46.00	-20.02	QP	HORIZONTAL
5	810.27	8.58	22.00	6.25	36.83	46.00	-9.17	QP	HORIZONTAL
6	884.50	10.50	22.49	6.44	39.43	46.00	-6.57	QP	HORIZONTAL
7	916.07	85.49	22.90	6.51	114.90	---	---	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

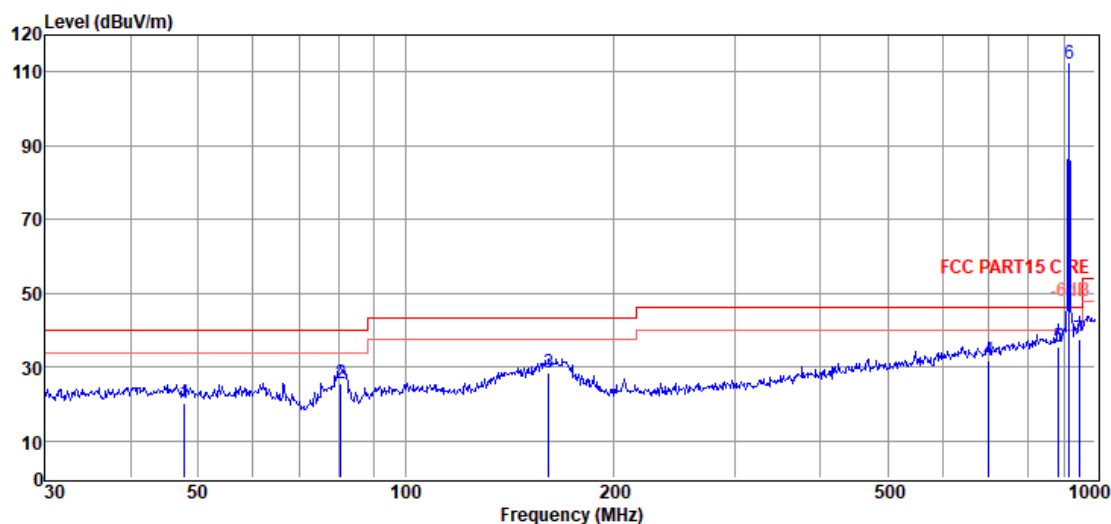
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/VERTICAL

Memo : 914.9Mhz



Data: 32

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	47.83	4.19	12.45	3.66	20.30	40.00	-19.70	QP	VERTICAL
2	80.64	12.17	9.43	3.88	25.48	40.00	-14.52	QP	VERTICAL
3	161.47	4.85	19.19	4.30	28.34	43.50	-15.16	QP	VERTICAL
4	701.76	5.49	20.10	5.99	31.58	46.00	-14.42	QP	VERTICAL
5	884.50	6.73	22.49	6.44	35.66	46.00	-10.34	QP	VERTICAL
6	916.07	82.86	22.90	6.51	112.27	---	---	Peak	VERTICAL
7	948.76	7.71	23.38	6.57	37.66	46.00	-8.34	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

Radiated Emission test (Above 1 GHz)

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

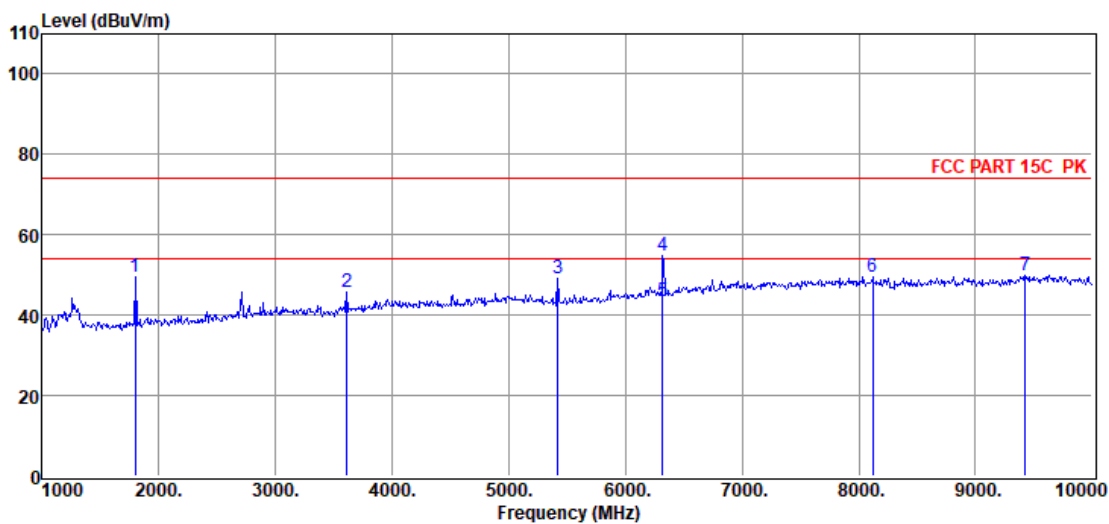
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D
3#/3m/HORIZONTAL

Memo : 903M(20DB)

Data: 19



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1806.00	60.33	26.18	39.10	1.51	0.64	49.56	92.9	-43.34	Peak	HORIZONTAL
2	3612.00	53.59	29.77	40.08	1.78	0.83	45.89	74	-28.11	Peak	HORIZONTAL
3	5418.00	53.33	32.85	40.44	2.57	1.01	49.32	74	-24.68	Peak	HORIZONTAL
4	6321.00	56.14	34.77	40.24	3.18	1.07	54.92	92.9	-37.98	Peak	HORIZONTAL
5	6321.00	44.72	34.77	40.24	3.18	1.07	43.50	---	---	Average	HORIZONTAL
6	8119.00	47.93	37.19	39.81	3.20	1.18	49.69	74	-24.31	Peak	HORIZONTAL
7	9424.00	46.44	38.64	40.20	3.58	1.26	49.72	74	-24.28	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

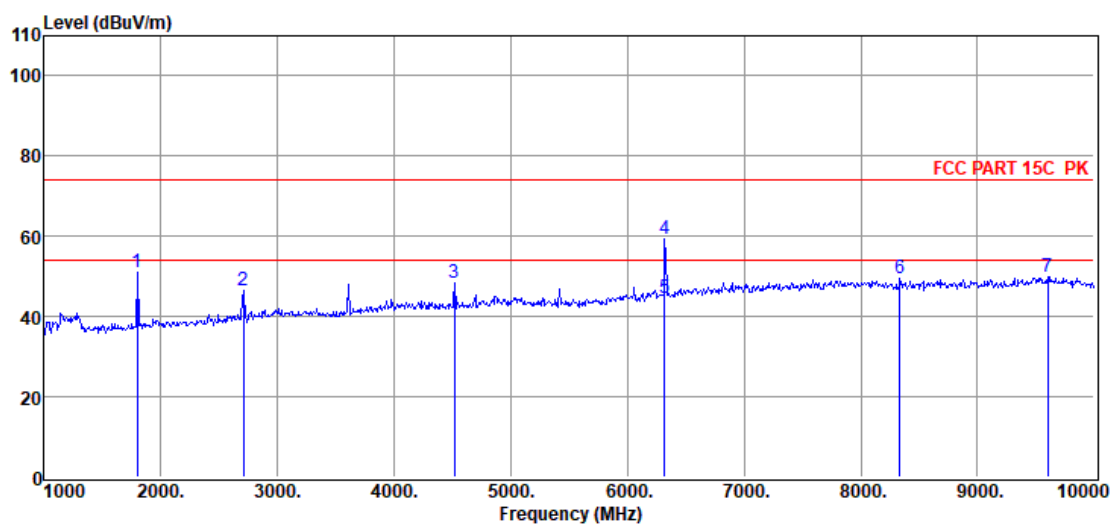
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D 3#/3m/VERTICAL

Memo : 903M(20DB)

Data: 20



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1806	61.72	26.18	39.1	1.51	0.64	50.95	92.9	-41.95	Peak	VERTICAL
2	2709	55.12	28.4	39.76	1.79	0.76	46.31	74	-27.69	Peak	VERTICAL
3	4515	53.91	31.56	40.3	2.37	0.89	48.43	74	-25.57	Peak	VERTICAL
4	6321	60.62	34.77	40.24	3.18	1.07	59.4	92.9	-33.5	Peak	VERTICAL
5	6321	45.88	34.77	40.24	3.18	1.07	44.66	---	---	Average	VERTICAL
6	8335	47.46	37.54	39.83	3.21	1.18	49.56	74	-24.44	Peak	VERTICAL
7	9604	46.5	38.64	40.32	3.63	1.29	49.74	74	-24.26	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

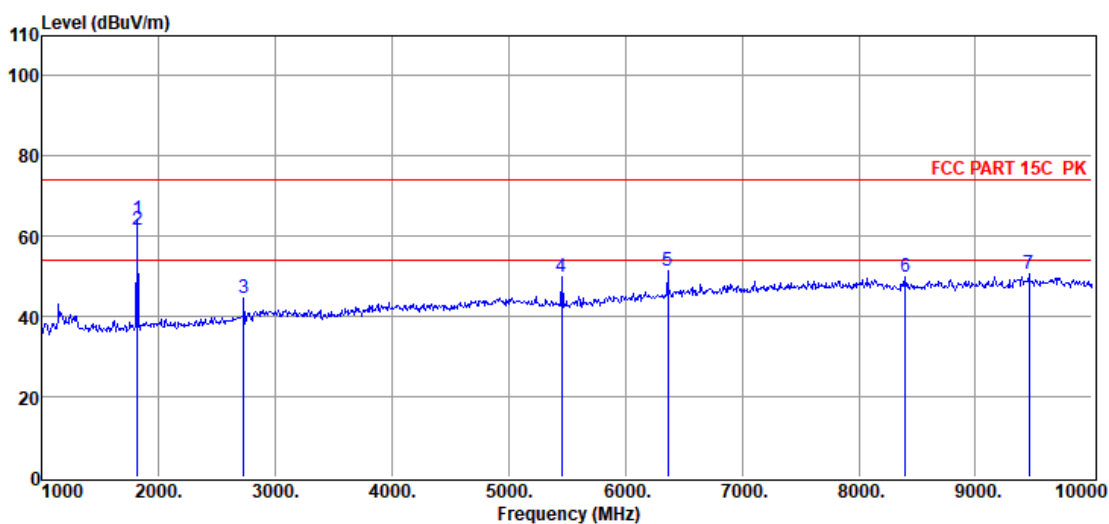
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D
3#/3m/HORIZONTAL

Memo : 909.4M(20DB)

Data: 21



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1818	74.99	26.23	39.13	1.52	0.65	64.26	90.77	-26.51	Peak	HORIZONTAL
2	1818	72.25	26.23	39.13	1.52	0.65	61.52	---	---	Average	HORIZONTAL
3	2728	53.49	28.47	39.76	1.8	0.76	44.76	74	-29.24	Peak	HORIZONTAL
4	5456	54.08	32.83	40.45	2.57	1.01	50.04	74	-23.96	Peak	HORIZONTAL
5	6366	52.67	34.87	40.21	3.2	1.06	51.59	90.77	-39.18	Peak	HORIZONTAL
6	8398	47.53	37.64	39.84	3.21	1.18	49.72	74	-24.28	Peak	HORIZONTAL
7	9460	47.23	38.67	40.22	3.6	1.27	50.55	74	-23.45	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

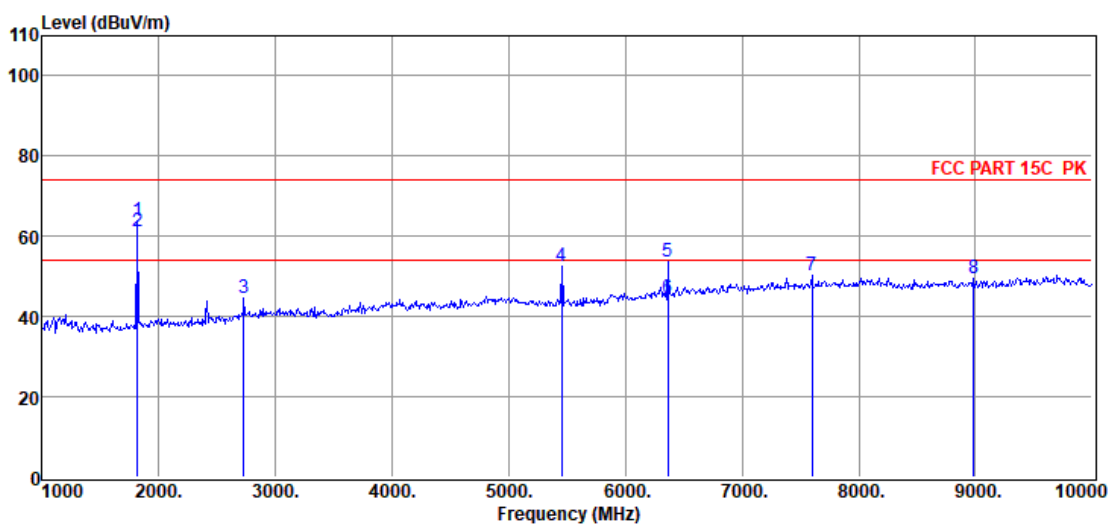
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D 3#/3m/VERTICAL

Memo : 909.4M(20DB)

Data: 22



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1818	74.55	26.23	39.13	1.52	0.65	63.82	90.77	-26.95	Peak	VERTICAL
2	1818	71.92	26.23	39.13	1.52	0.65	61.19	---	---	Average	VERTICAL
3	2728	53.23	28.47	39.76	1.8	0.76	44.5	74	-29.5	Peak	VERTICAL
4	5456	56.59	32.83	40.45	2.57	1.01	52.55	74	-21.45	Peak	VERTICAL
5	6366	54.64	34.87	40.21	3.2	1.06	53.56	90.77	-37.21	Peak	VERTICAL
6	6366	45.53	34.87	40.21	3.2	1.06	44.45	---	---	Average	VERTICAL
7	7597	49.28	36.52	39.76	3.15	1.08	50.27	74	-23.73	Peak	VERTICAL
8	8983	46.76	38.28	39.9	3.33	1.18	49.65	90.77	-41.12	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

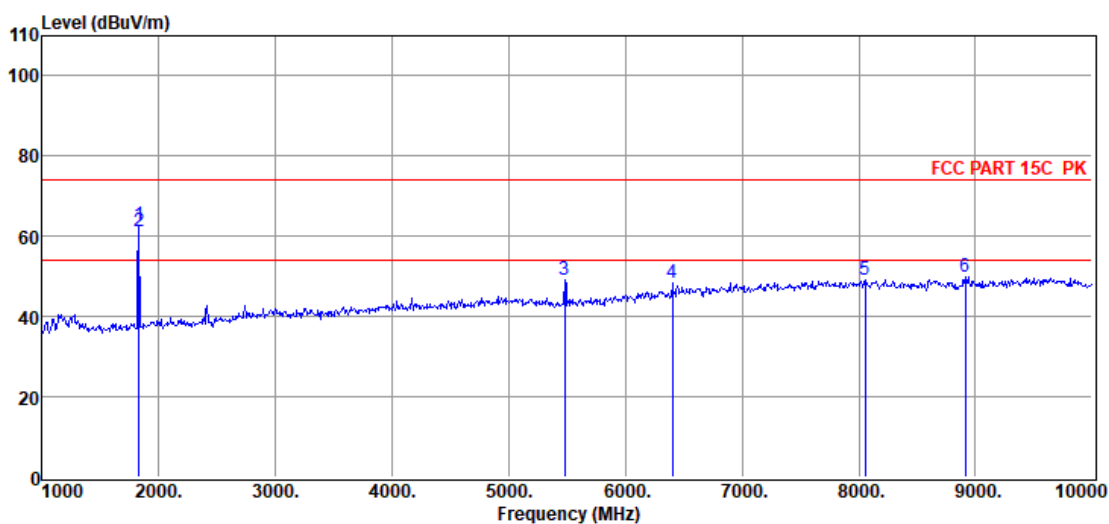
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D
3#/3m/HORIZONTAL

Memo : 914.2M(20DB)

Data: 23



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1828	73.62	26.25	39.14	1.52	0.65	62.9	89.89	-26.99	Peak	HORIZONTAL
2	1828	71.78	26.25	39.14	1.52	0.65	61.06	---	---	Average	HORIZONTAL
3	5485	53.19	32.81	40.45	2.57	1.02	49.14	89.89	-40.75	Peak	HORIZONTAL
4	6399	49.16	34.96	40.18	3.22	1.06	48.22	89.89	-41.67	Peak	HORIZONTAL
5	8056	47.41	37.09	39.81	3.19	1.18	49.06	74	-24.94	Peak	HORIZONTAL
6	8911	47.1	38.21	39.89	3.31	1.18	49.91	89.89	-39.98	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

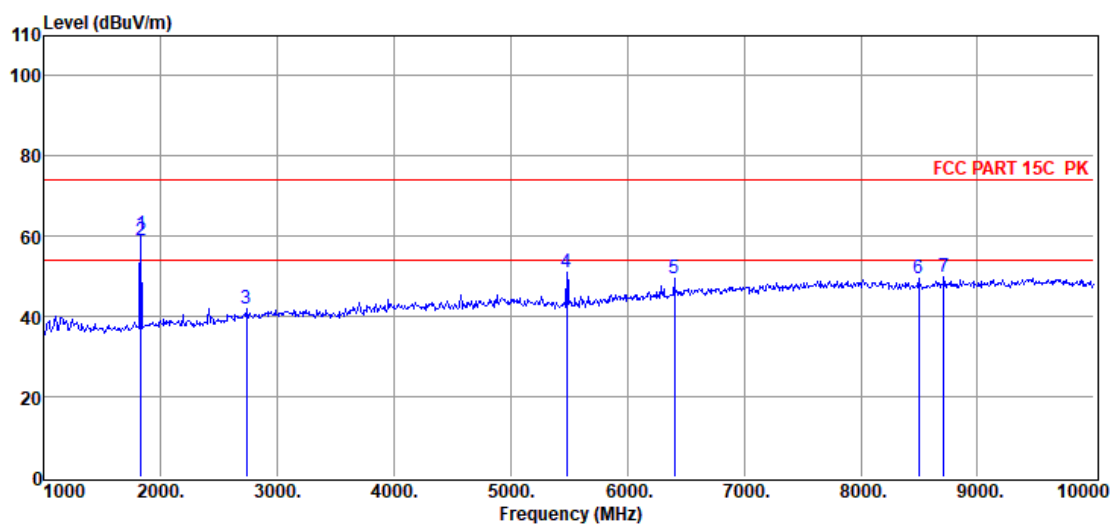
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D 3#/3m/VERTICAL

Memo : 914.2M(20DB)

Data: 24



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1828	71.18	26.25	39.14	1.52	0.65	60.46	89.89	-29.43	Peak	VERTICAL
2	1828	69.54	26.25	39.14	1.52	0.65	58.82	---	---	Average	VERTICAL
3	2742	50.74	28.5	39.77	1.8	0.76	42.03	74	-31.97	Peak	VERTICAL
4	5485	55.02	32.81	40.45	2.57	1.02	50.97	89.89	-38.92	Peak	VERTICAL
5	6399	50.5	34.96	40.18	3.22	1.06	49.56	89.89	-40.33	Peak	VERTICAL
6	8497	47.12	37.8	39.85	3.22	1.18	49.47	74	-24.53	Peak	VERTICAL
7	8713	47.28	38.01	39.87	3.27	1.18	49.87	89.89	-40.02	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

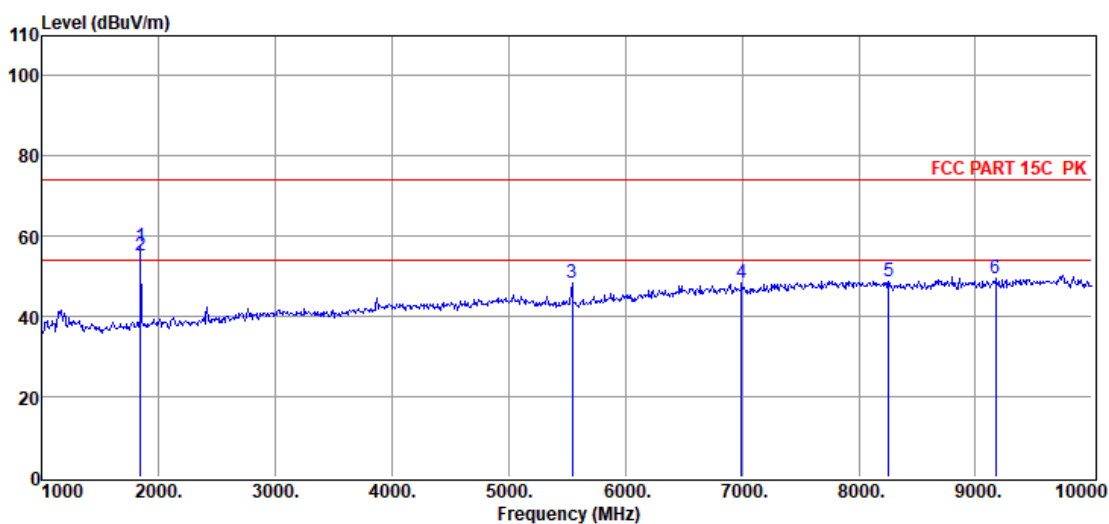
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D
3#/3m/HORIZONTAL

Memo : 923.3M(20DB)

Data: 25



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1846	68.28	26.3	39.17	1.53	0.65	57.59	88.68	-31.09	Peak	HORIZONTAL
2	1846	66.07	26.3	39.17	1.53	0.65	55.38	---	---	Average	HORIZONTAL
3	5540	52.2	32.91	40.45	2.61	1.04	48.31	88.68	-40.37	Peak	HORIZONTAL
4	6994	48.28	35.99	39.7	3.02	0.93	48.52	88.68	-40.16	Peak	HORIZONTAL
5	8254	46.79	37.41	39.83	3.21	1.18	48.76	74	-25.24	Peak	HORIZONTAL
6	9172	46.3	38.44	40.02	3.43	1.21	49.36	74	-24.64	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

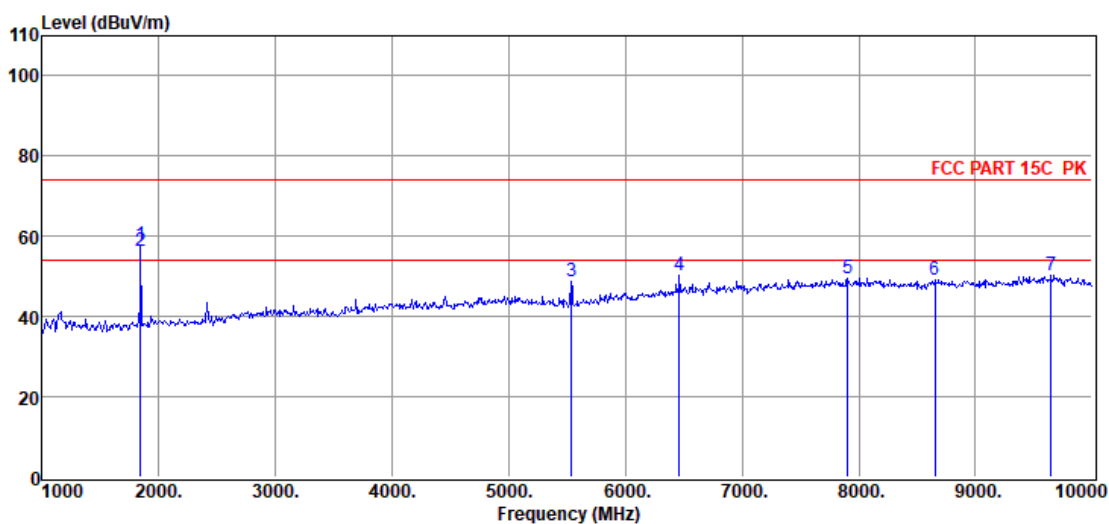
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D 3#/3m/VERTICAL

Memo : 923.3M(20DB)

Data: 26



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1846	68.43	26.3	39.17	1.53	0.65	57.74	88.68	-30.94	Peak	VERTICAL
2	1846	66.88	26.3	39.17	1.53	0.65	56.19	---	---	Average	VERTICAL
3	5540	52.55	32.89	40.45	2.6	1.03	48.62	88.68	-40.06	Peak	VERTICAL
4	6463	51.02	35.11	40.13	3.25	1.04	50.29	88.68	-38.39	Peak	VERTICAL
5	7903	48.17	36.88	39.79	3.18	1.16	49.6	88.68	-39.08	Peak	VERTICAL
6	8650	46.82	37.95	39.87	3.25	1.18	49.33	88.68	-39.35	Peak	VERTICAL
7	9649	47.27	38.61	40.35	3.63	1.3	50.46	74	-23.54	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

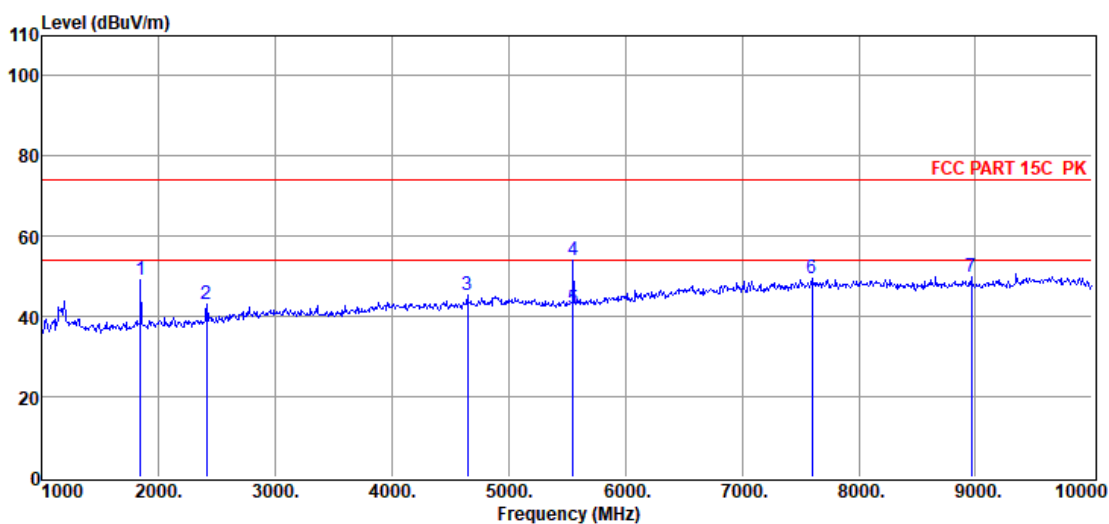
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D
3#/3m/HORIZONTAL

Memo : 925.7M(20DB)

Data: 27



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1851	59.75	26.3	39.17	1.53	0.65	49.06	87.67	-38.61	Peak	HORIZONTAL
2	2413	52.75	27.44	39.61	1.72	0.73	43.03	87.67	-44.64	Peak	HORIZONTAL
3	4629	50.44	31.96	40.33	2.41	0.89	45.37	74	-28.63	Peak	HORIZONTAL
4	5554	57.9	32.93	40.46	2.62	1.04	54.03	87.67	-33.64	Peak	HORIZONTAL
5	5554	45.87	32.93	40.46	2.62	1.04	42	---	---	Average	HORIZONTAL
6	7597	48.38	36.52	39.76	3.15	1.08	49.37	74	-24.63	Peak	HORIZONTAL
7	8965	46.9	38.26	39.9	3.32	1.18	49.76	87.67	-37.91	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

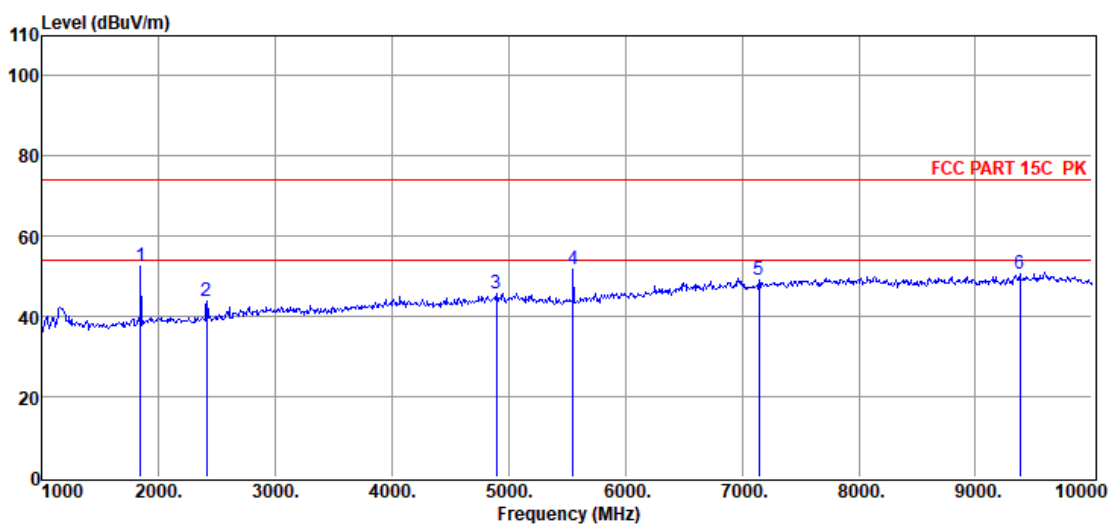
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D 3#/3m/VERTICAL

Memo : 925.7M(20DB)

Data: 28



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1851	63.06	26.3	39.17	1.53	0.65	52.37	87.67	-35.3	Peak	VERTICAL
2	2413	53.58	27.44	39.61	1.72	0.73	43.86	87.67	-43.81	Peak	VERTICAL
3	4897	49.97	32.77	40.38	2.5	0.9	45.76	74.00	-28.24	Peak	VERTICAL
4	5554	55.52	32.93	40.46	2.62	1.04	51.65	87.67	-36.02	Peak	VERTICAL
5	7147	48.57	36.12	39.71	3.06	0.97	49.01	87.67	-38.66	Peak	VERTICAL
6	9379	47.34	38.6	40.17	3.55	1.25	50.57	74.00	-23.43	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

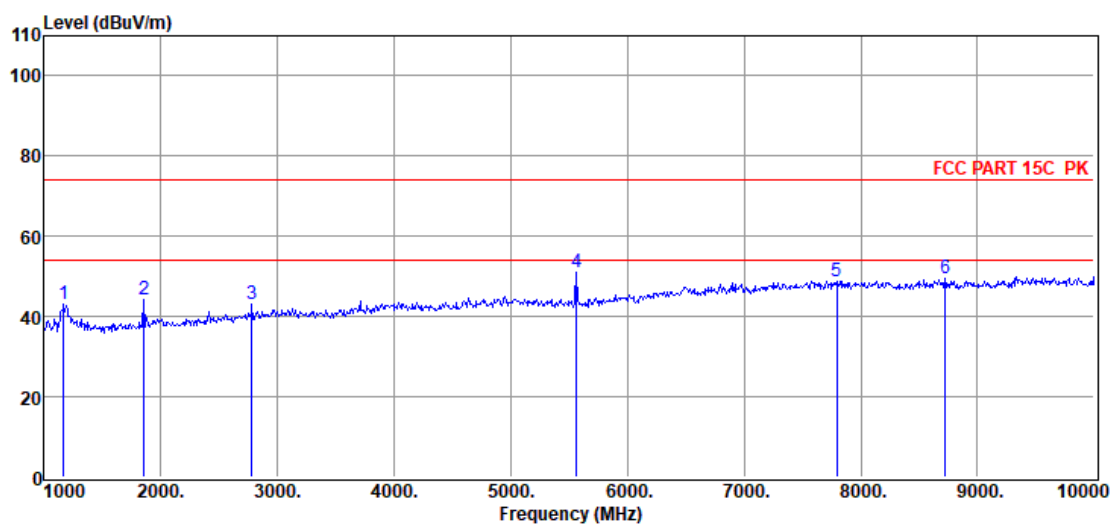
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D
3#/3m/HORIZONTAL

Memo : 927.5M(20DB)

Data: 29



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1171	53.92	25.47	38.16	1.2	0.53	42.96	74	-31.04	Peak	HORIZONTAL
2	1855	54.78	26.32	39.18	1.54	0.65	44.11	93.94	-49.83	Peak	HORIZONTAL
3	2782	51.8	28.67	39.79	1.81	0.77	43.26	74	-30.74	Peak	HORIZONTAL
4	5565	54.92	32.95	40.46	2.63	1.04	51.08	93.94	-42.86	Peak	HORIZONTAL
5	7795	47.59	36.75	39.78	3.17	1.13	48.86	74	-25.14	Peak	HORIZONTAL
6	8722	47.05	38.02	39.87	3.27	1.18	49.65	93.94	-44.29	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

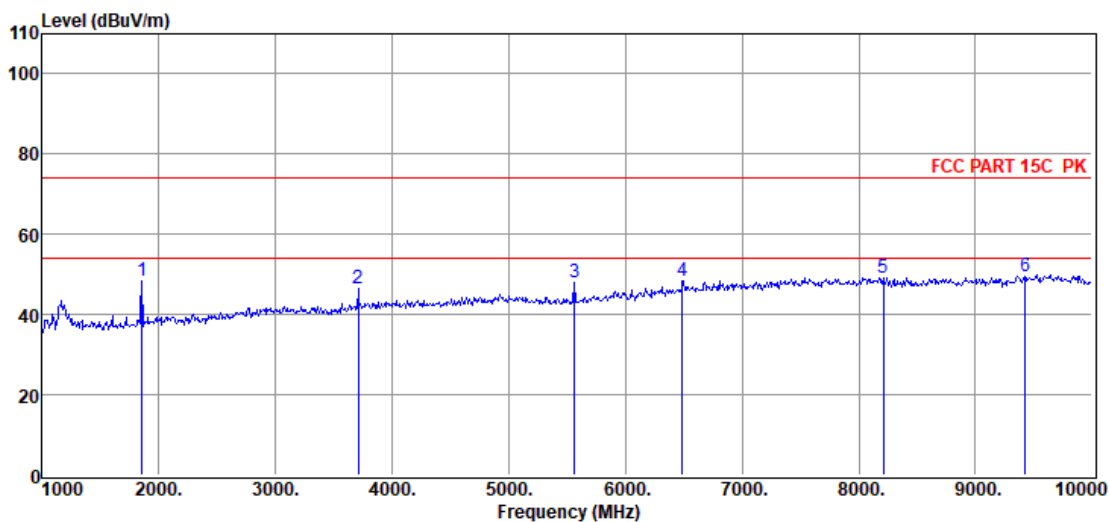
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D 3#/3m/VERTICAL

Memo : 927.5M(20DB)

Data: 30



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1855	59.23	26.32	39.18	1.54	0.65	48.56	93.94	-45.38	Peak	VERTICAL
2	3709	53.65	30.11	40.11	1.87	0.84	46.36	74.00	-27.64	Peak	VERTICAL
3	5563	52.03	32.95	40.46	2.63	1.04	48.19	93.94	-45.75	Peak	VERTICAL
4	6490	49.04	35.18	40.11	3.27	1.04	48.42	93.94	-45.52	Peak	VERTICAL
5	8209	47.21	37.33	39.82	3.2	1.18	49.1	74.00	-24.9	Peak	VERTICAL
6	9424	46.29	38.64	40.2	3.58	1.26	49.57	74.00	-24.43	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

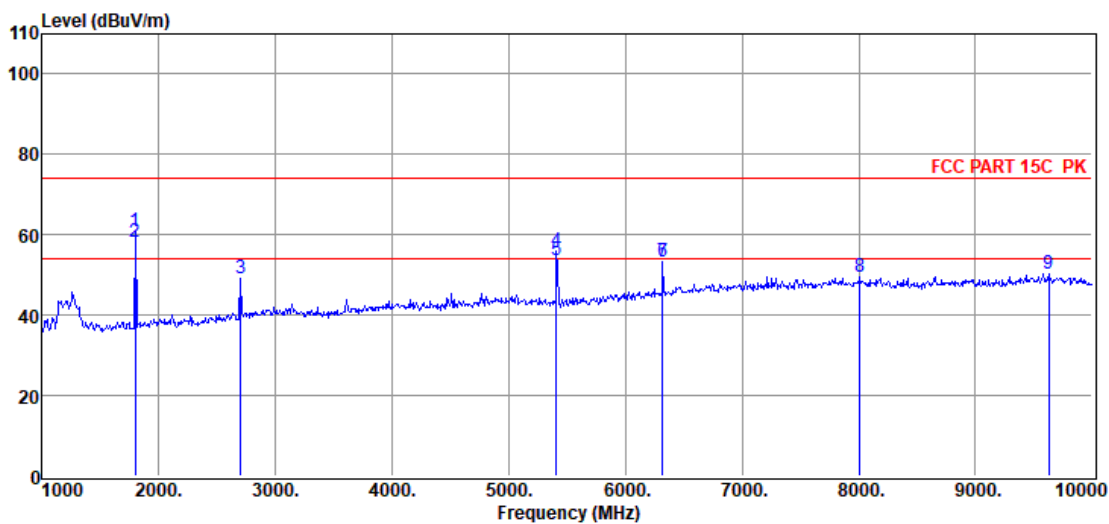
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D
3#/3m/HORIZONTAL

Memo : 902.3M

Data: 13



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1805	71.54	26.18	39.1	1.51	0.64	60.77	97.33	-36.56	Peak	HORIZONTAL
2	1805	68.89	26.18	39.1	1.51	0.64	58.12	---	---	Average	HORIZONTAL
3	2707	57.97	28.36	39.75	1.79	0.76	49.13	74	-24.87	Peak	HORIZONTAL
4	5414	59.82	32.85	40.44	2.56	1	55.79	74	-18.21	Peak	HORIZONTAL
5	5414	57.77	32.85	40.44	2.56	1	53.74	54	-0.26	Average	HORIZONTAL
6	6316	54.64	34.77	40.24	3.18	1.07	53.42	97.33	-43.91	Peak	HORIZONTAL
7	6316	54.66	34.77	40.24	3.18	1.07	53.44	---	---	Average	HORIZONTAL
8	8011	47.79	37.02	39.8	3.19	1.18	49.38	74	-24.62	Peak	HORIZONTAL
9	9631	47	38.62	40.34	3.63	1.3	50.21	97.33	-47.12	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

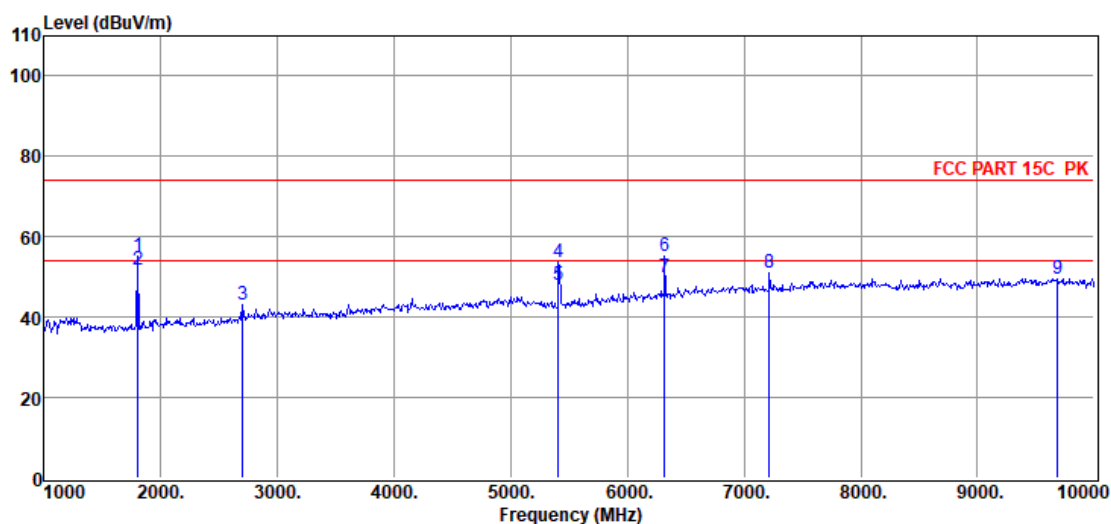
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D 3#/3m/VERTICAL

Memo : 902.3M

Data: 14



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1805	65.89	26.2	39.11	1.51	0.65	55.14	97.33	-42.19	Peak	VERTICAL
2	1805	62.45	26.2	39.11	1.51	0.65	51.7	---	---	Average	VERTICAL
3	2707	52.11	28.36	39.75	1.79	0.76	43.27	74	-30.73	Peak	VERTICAL
4	5414	57.86	32.85	40.44	2.56	1	53.83	74	-20.17	Peak	VERTICAL
5	5414	51.87	32.85	40.44	2.56	1	47.84	54	-6.16	Average	VERTICAL
6	6316	56.23	34.77	40.24	3.18	1.07	55.01	97.33	-42.32	Peak	VERTICAL
7	6316	51.23	34.77	40.24	3.18	1.07	50.01	---	---	Average	VERTICAL
8	7218	50.44	36.18	39.72	3.07	0.98	50.95	97.33	-46.38	Peak	VERTICAL
9	9685	46.54	38.59	40.38	3.64	1.31	49.7	97.33	-47.63	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

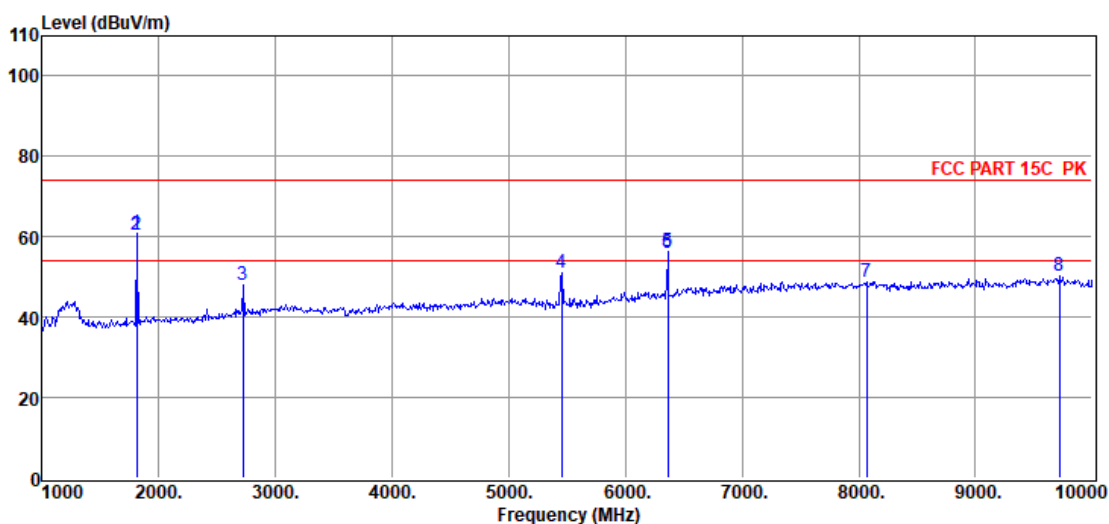
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D
3#/3m/HORIZONTAL

Memo : 908.5M

Data: 15



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1817	71.53	26.21	39.12	1.52	0.65	60.79	98.93	-38.14	Peak	HORIZONTAL
2	1817	71.03	26.21	39.12	1.52	0.65	60.29	---	---	Average	HORIZONTAL
3	2725	56.86	28.43	39.76	1.8	0.76	48.09	74	-25.91	Peak	HORIZONTAL
4	5451	55.14	32.83	40.45	2.57	1.01	51.1	98.93	-47.83	Peak	HORIZONTAL
5	6360	57.26	34.87	40.21	3.2	1.06	56.18	98.93	-42.75	Peak	HORIZONTAL
6	6360	56.85	34.87	40.21	3.2	1.06	55.77	---	---	Average	HORIZONTAL
7	8065	47.24	37.1	39.81	3.19	1.18	48.9	74	-25.1	Peak	HORIZONTAL
8	9721	47.22	38.57	40.4	3.64	1.32	50.35	98.93	-48.58	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

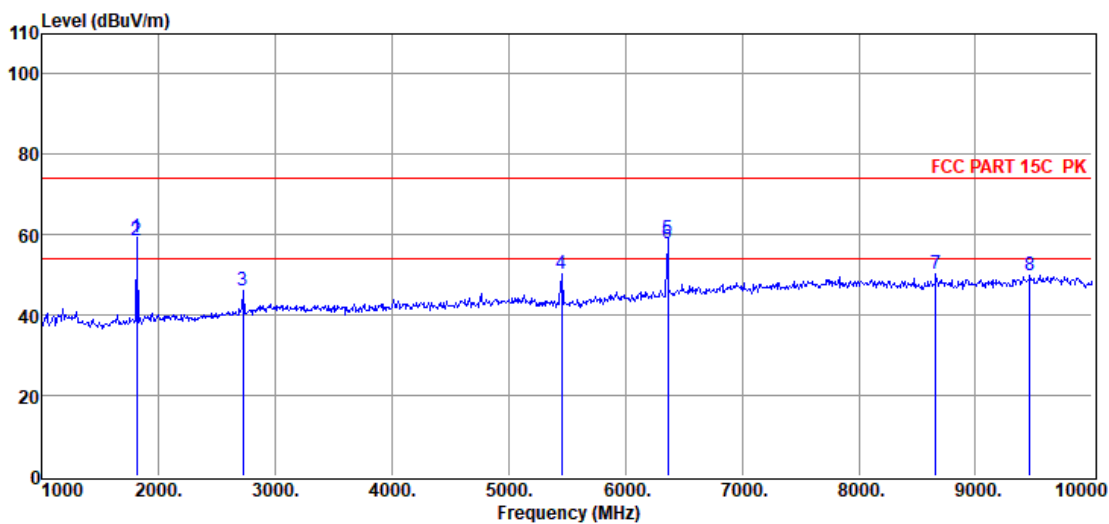
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D 3#/3m/VERTICAL

Memo : 908.5M

Data: 16



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1817	69.96	26.21	39.12	1.52	0.65	59.22	98.93	-39.71	Peak	VERTICAL
2	1817	69.4	26.21	39.12	1.52	0.65	58.66	---	---	Average	VERTICAL
3	2725	54.76	28.43	39.76	1.8	0.76	45.99	74	-28.01	Peak	VERTICAL
4	5451	54.21	32.83	40.45	2.57	1.01	50.17	74	-23.83	Peak	VERTICAL
5	6360	59.91	34.87	40.21	3.2	1.06	58.83	98.93	-40.1	Peak	VERTICAL
6	6360	58.95	34.87	40.21	3.2	1.06	57.87	---	---	Average	VERTICAL
7	8659	47.6	37.96	39.87	3.25	1.18	50.12	98.93	-48.81	Peak	VERTICAL
8	9469	46.7	38.68	40.23	3.6	1.27	50.02	74	-23.98	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
ABOVE 1G .EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

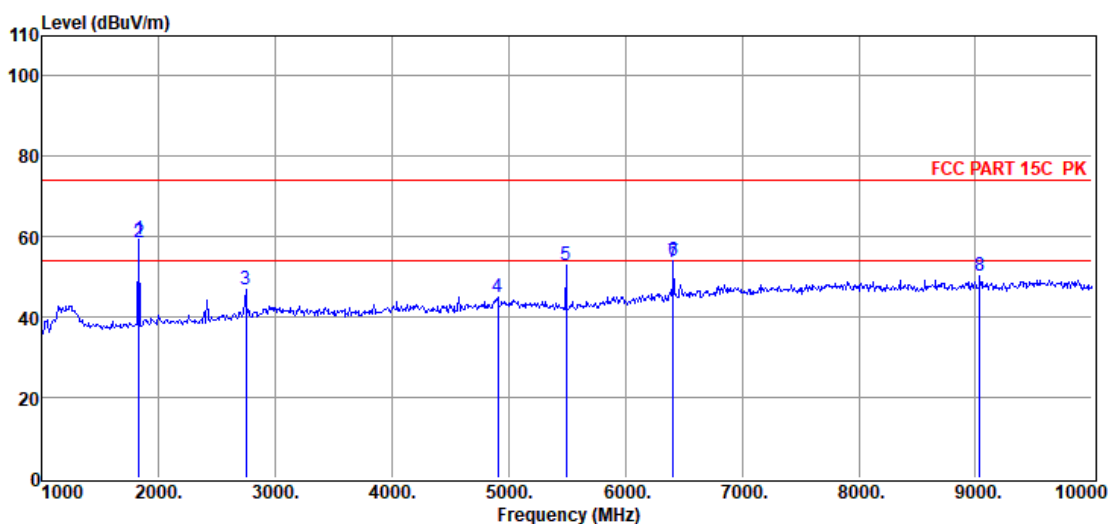
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D
3#/3m/HORIZONTAL

Memo : 914.9M

Data: 17



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1829	70.23	26.25	39.14	1.52	0.65	59.51	94.9	-35.39	Peak	HORIZONTAL
2	1829	69.28	26.25	39.14	1.52	0.65	58.56	---	---	Average	HORIZONTAL
3	2744	55.56	28.53	39.77	1.8	0.76	46.88	94.9	-48.02	Peak	HORIZONTAL
4	4906	49.26	32.8	40.38	2.51	0.91	45.1	74	-28.9	Peak	HORIZONTAL
5	5489	56.84	32.81	40.45	2.57	1.02	52.79	94.9	-42.11	Peak	HORIZONTAL
6	6404	55.05	34.98	40.17	3.23	1.05	54.14	94.9	-40.76	Peak	HORIZONTAL
7	6404	54.58	34.98	40.17	3.23	1.05	53.67	---	---	Average	HORIZONTAL
8	9037	47.44	38.33	39.93	3.35	1.19	50.38	74	-23.62	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

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Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

Power Supply : DC 3.3V

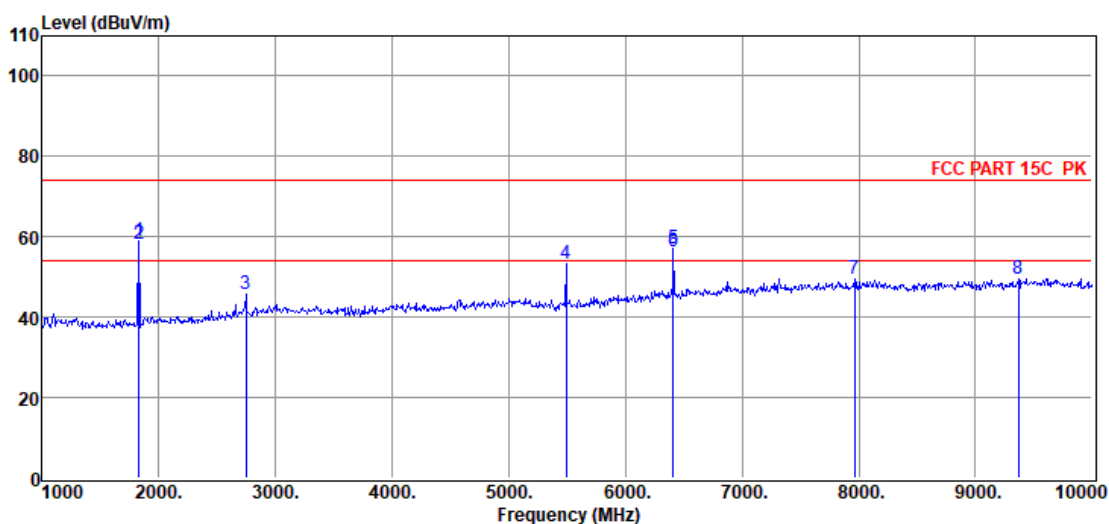
Test Mode : Tx Mode

Condition : Temp:22°C,Humi:59.4%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D 3#/3m/VERTICAL

Memo : 914.9M

Data: 18



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Filter Factor dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1829	69.6	26.25	39.14	1.52	0.65	58.88	94.9	-36.02	Peak	VERTICAL
2	1829	69.09	26.25	39.14	1.52	0.65	58.37	---	---	Average	VERTICAL
3	2745	54.34	28.53	39.77	1.8	0.76	45.66	94.9	-49.24	Peak	VERTICAL
4	5489	57.37	32.81	40.45	2.57	1.02	53.32	94.9	-41.58	Peak	VERTICAL
5	6404	57.83	34.98	40.17	3.23	1.05	56.92	94.9	-37.98	Peak	VERTICAL
6	6404	57.29	34.98	40.17	3.23	1.05	56.38	94.9	-38.52	Average	VERTICAL
7	7966	47.95	36.96	39.8	3.19	1.17	49.47	---	---	Peak	VERTICAL
8	9370	46.34	38.6	40.16	3.54	1.25	49.57	74	-24.43	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

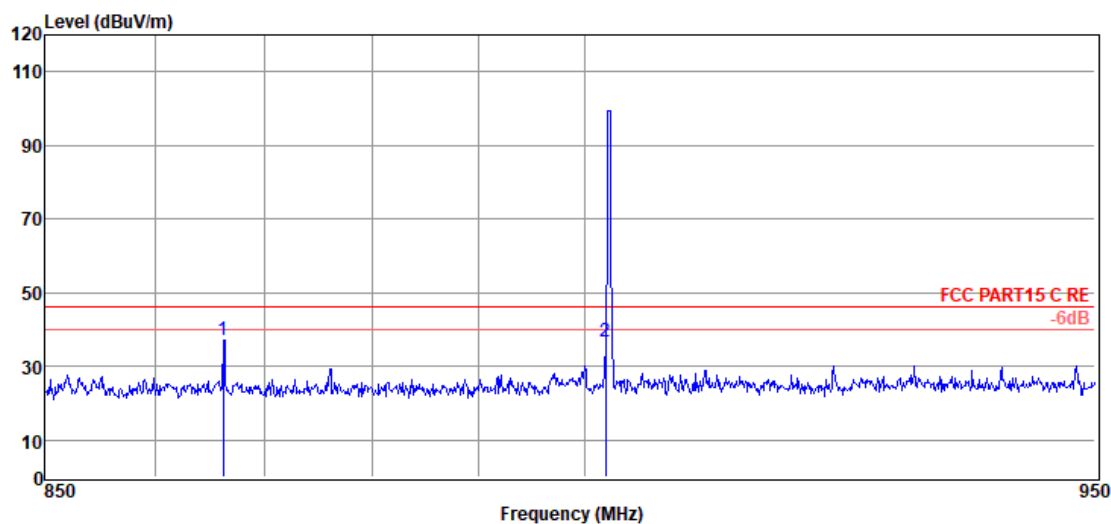
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 902.3MHz



Data: 33

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	866.23	41.04	22.12	6.39	37.14	46.00	-8.86	Peak	HORIZONTAL
2	902.00	39.86	22.74	6.48	36.87	46.00	-9.13	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

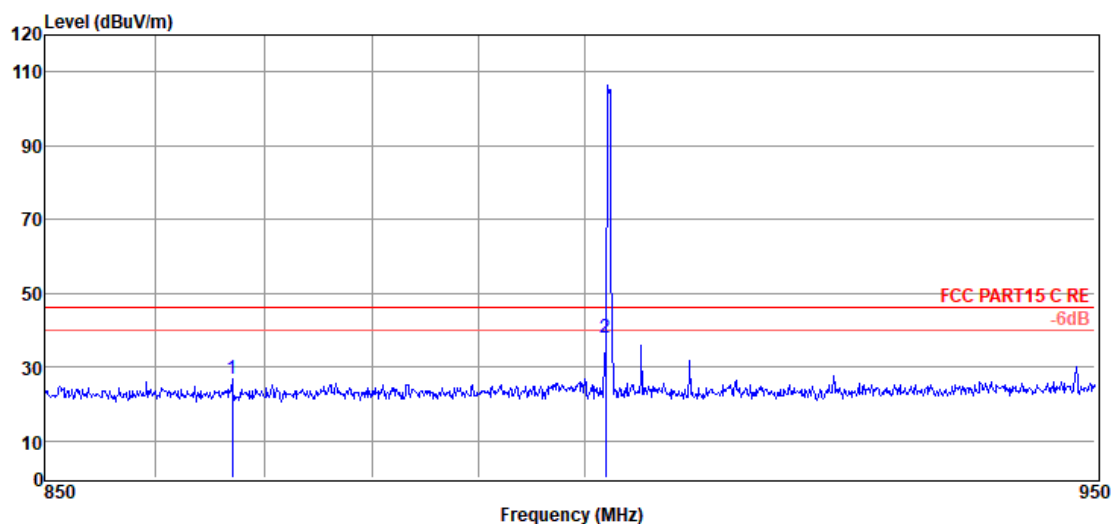
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/VERTICAL

Memo : 902.3MHz



Data: 34

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	867.00	30.75	22.14	6.39	26.88	46.00	-19.12	Peak	VERTICAL
2	902.00	40.89	22.74	6.48	37.90	46.00	-8.10	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

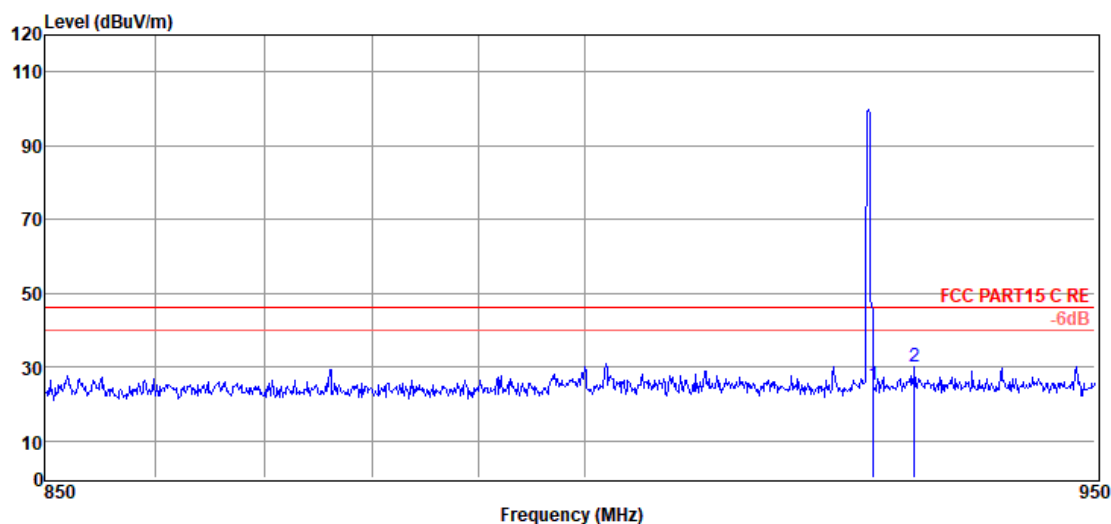
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/HORIZONTAL

Memo : 927.5MHz



Data: 35

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	928.00	27.61	22.96	6.53	25.21	46.00	-20.79	Peak	HORIZONTAL
2	932.00	32.50	23.04	6.54	30.24	46.00	-15.76	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22051717-2E 915MHz\FCC
BELOW 1G.EM6

Test Date : 2022-08-02

Tested By : Bairong

EUT : LoRa Module

Model Number : RFM6601

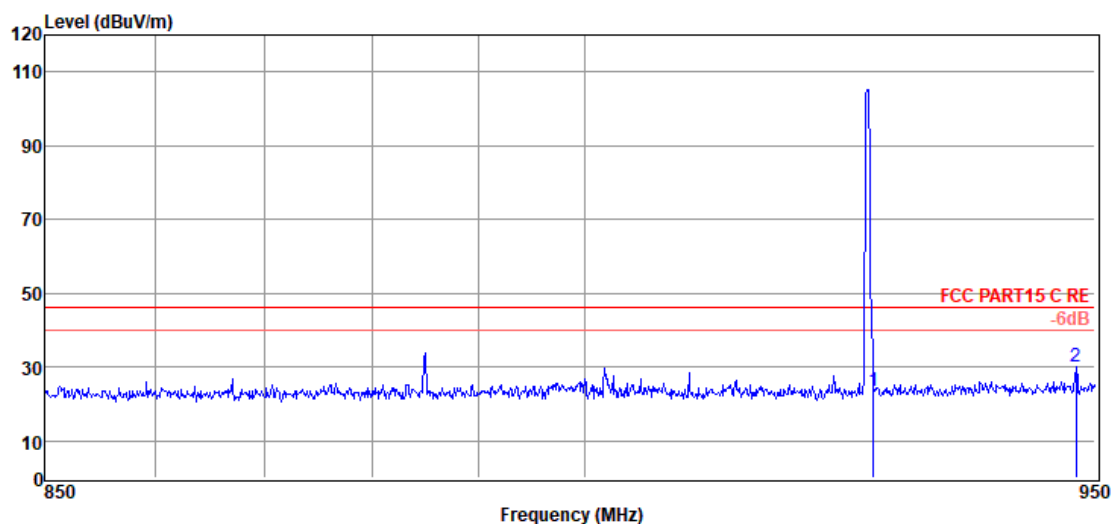
Power Supply : DC 3.3V

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:57.1%,Press:100.3kPa

Antenna/Distance : 2022 9161 #3/3m/VERTICAL

Memo : 927.5MHz



Data: 36

Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	928.00	25.72	22.96	6.53	23.32	46.00	-22.68	Peak	VERTICAL
2	948.10	31.87	23.36	6.57	30.15	46.00	-15.85	Peak	VERTICAL

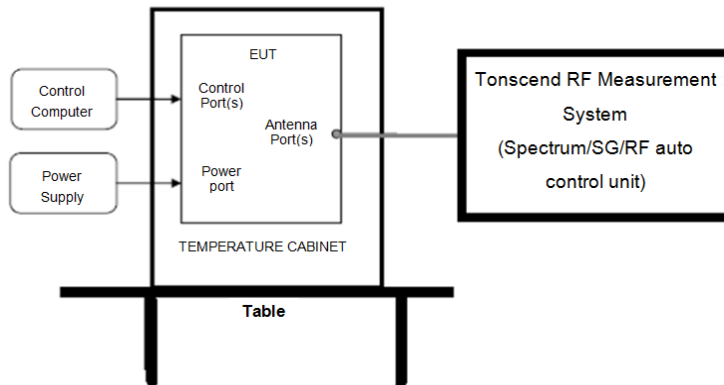
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

12. RF Conducted Spurious Emissions

12.1. Block diagram of test setup



12.2. Limits

In any 100 kHz bandwidth outside the frequency bands 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.

12.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

Center frequency	Test frequency
RBW:	100 kHz
VBW:	300 kHz
Span	Wide enough to capture the peak level of the in-band emission
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Number of measurement	$\geq \text{span}/\text{RBW}$

points

Detector Mode:

Peak

Sweep time:

auto

Trace mode

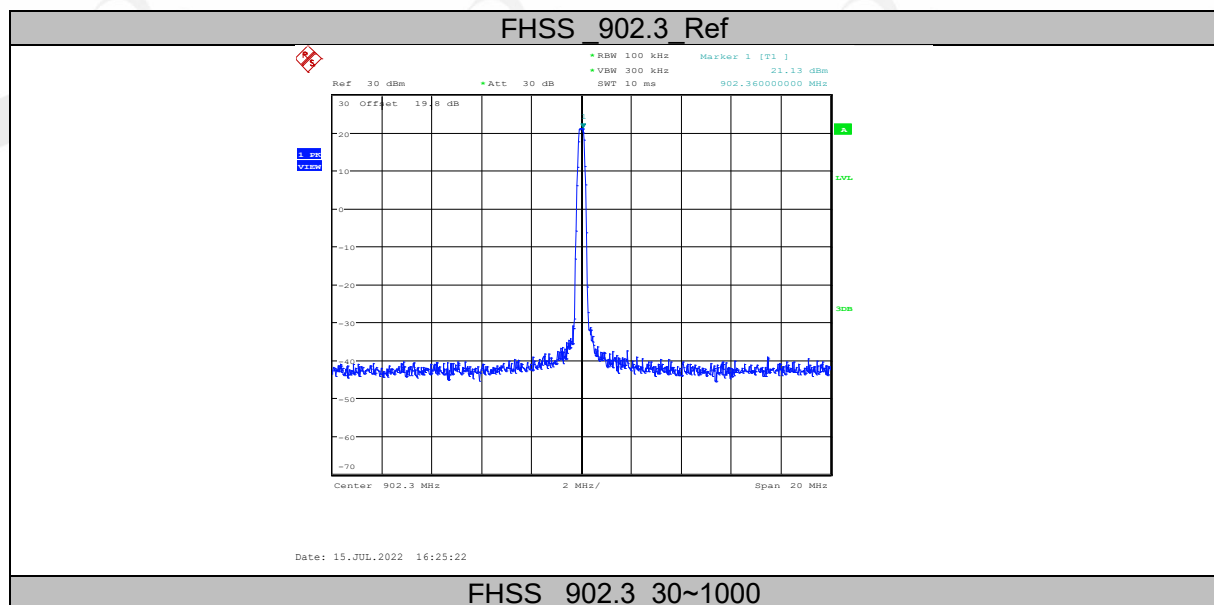
Max hold

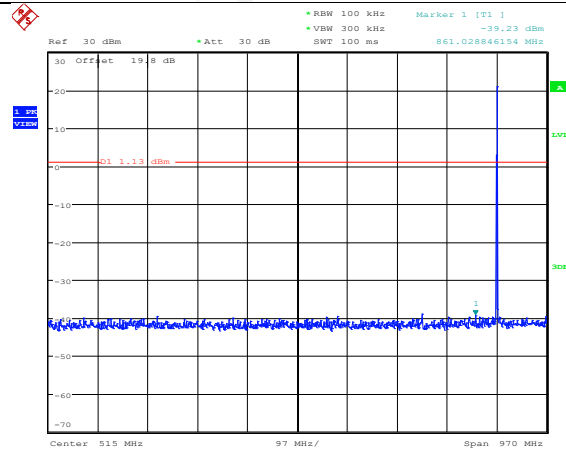
- (5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

12.4. Test result

Mode	Channel	Freq. (MHz)	Verdict
FHSS	0	902.3	Pass
	31	908.5	Pass
	63	914.9	Pass
DTS (Uplink)	0	903	Pass
	4	909.4	Pass
	7	914.2	Pass
DTS (Downlink)	0	923.3	Pass
	4	925.7	Pass
	7	927.5	Pass

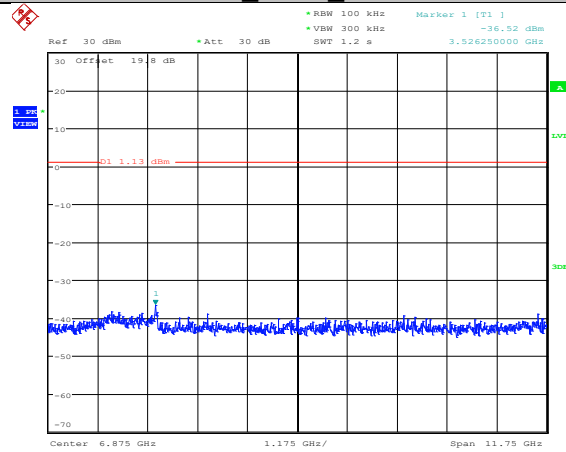
12.5. Original test data





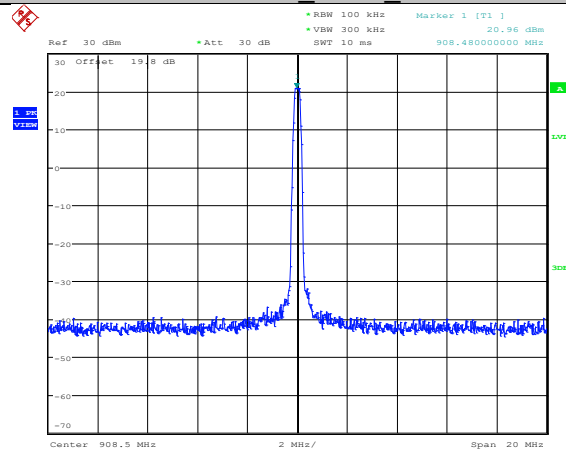
Date: 15.JUL.2022 16:32:59

FHSS_902.3 1000~12500



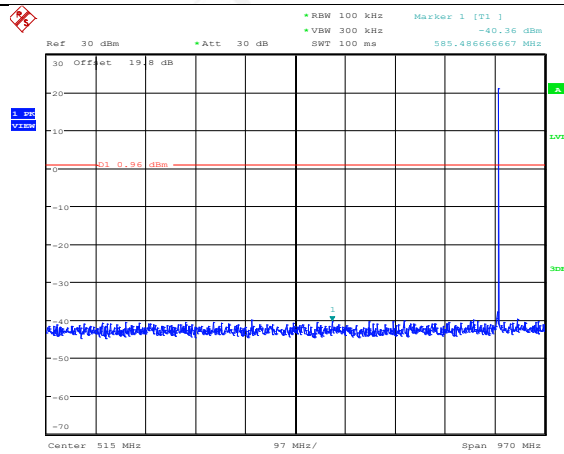
Date: 15.JUL.2022 16:37:21

FHSS_908.5 Ref



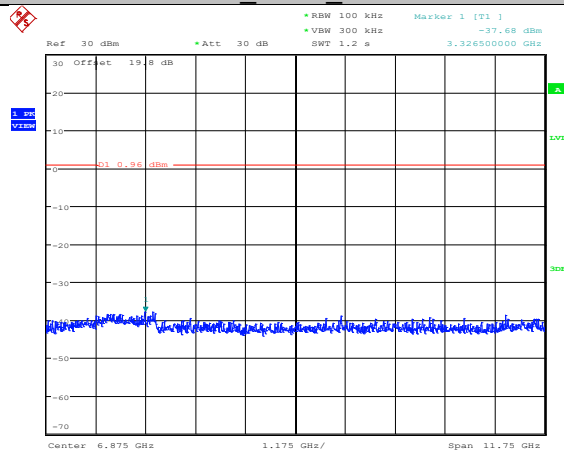
Date: 15.JUL.2022 16:41:08

FHSS_908.5 30~1000



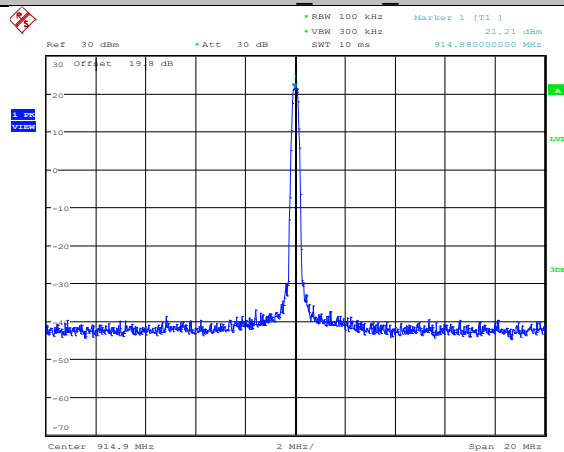
Date: 15.JUL.2022 16:46:11

FHSS_908.5 1000~12500



Date: 15.JUL.2022 16:47:28

FHSS_914.9 Ref



Date: 15.JUL.2022 16:50:30

FHSS_914.9 30~1000

Date: 15.JUL.2022 16:55:22

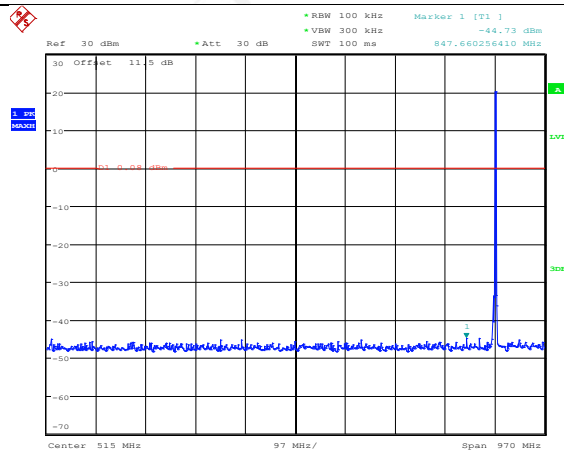
FHSS_914.9_1000~12500

Date: 15.JUL.2022 16:56:48

DTS 903 Ref

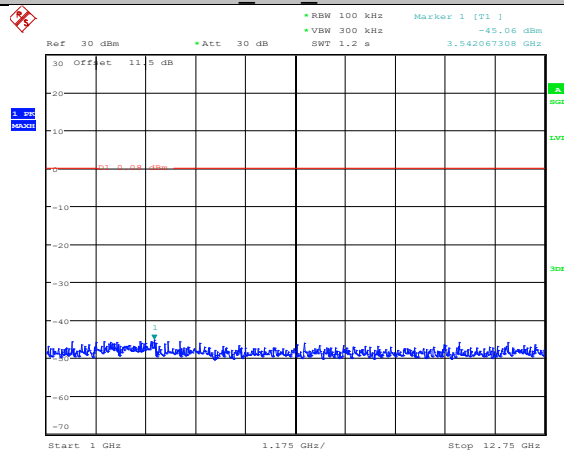
Date: 2.AUG.2022 16:09:49

DTS 903 30~1000



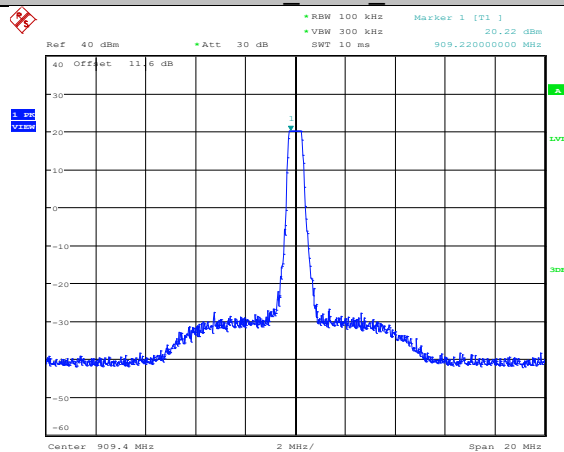
Date: 2.AUG.2022 16:14:18

DTS_903 1000~12500



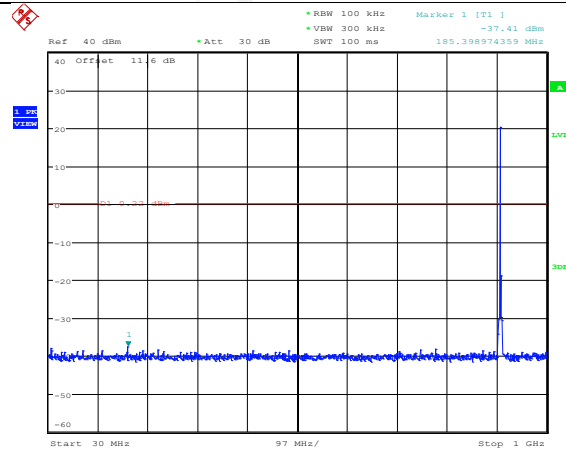
Date: 2.AUG.2022 16:15:30

DTS_909.4 Ref



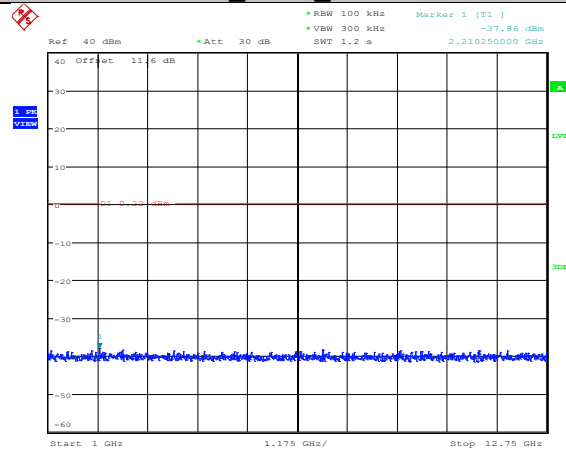
Date: 2.AUG.2022 17:41:58

DTS_909.4 30~1000



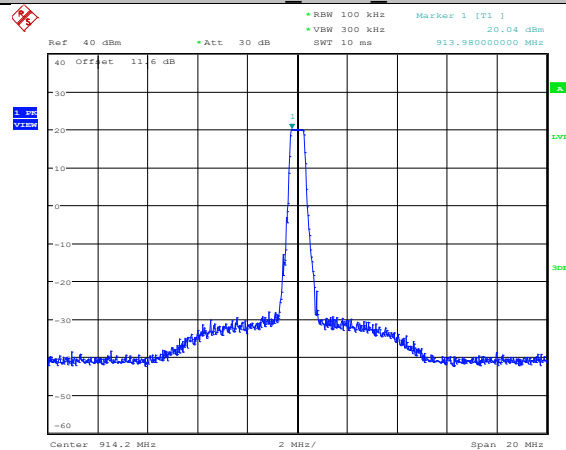
Date: 2.AUG.2022 17:44:40

DTS_909.4 1000~12500



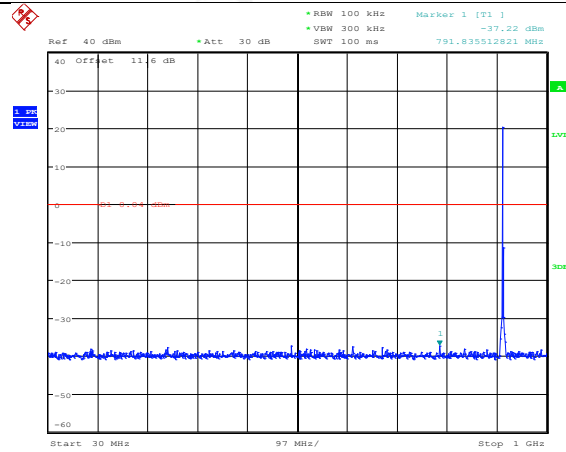
Date: 2.AUG.2022 17:45:49

DTS_914.2 Ref

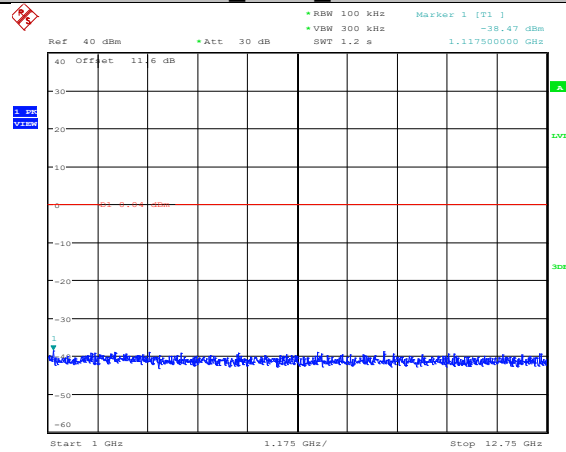


Date: 2.AUG.2022 18:01:10

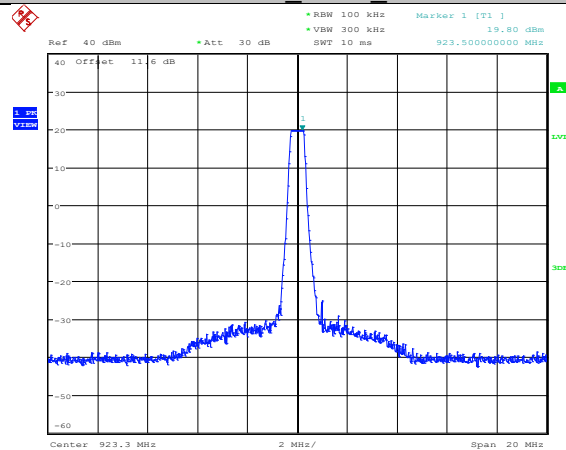
DTS_914.2 30~1000



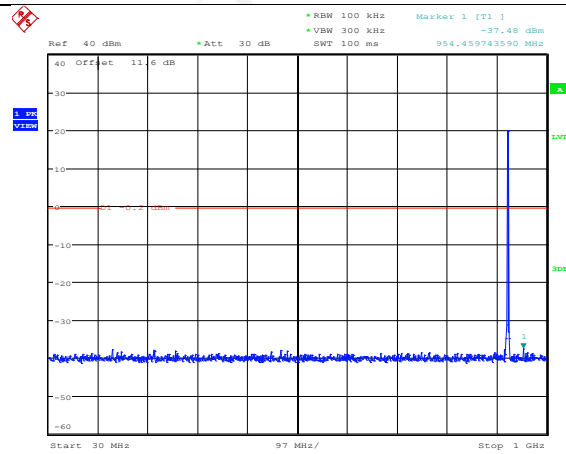
DTS_914.2 1000~12500



DTS_923.3 Ref

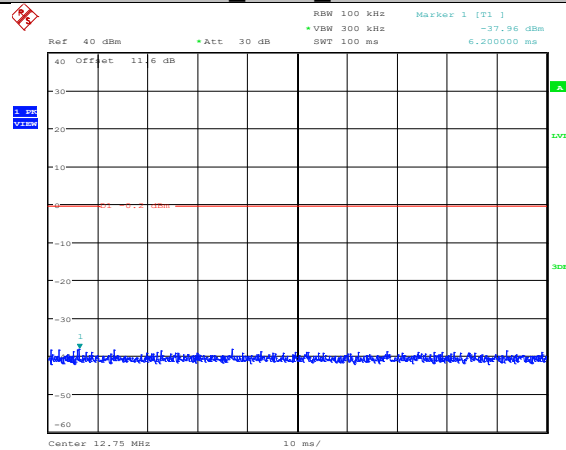


DTS_923.3 30~1000



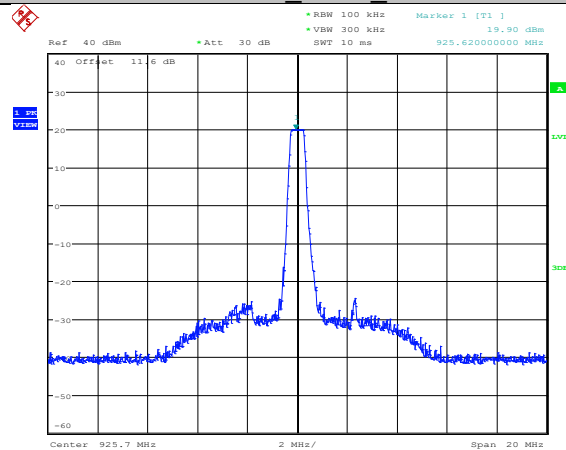
Date: 2.AUG.2022 18:57:52

DTS_923.3 1000~12500



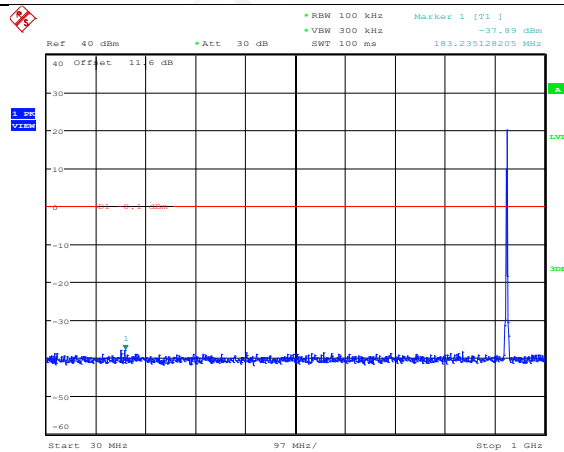
Date: 2.AUG.2022 18:58:30

DTS_925.7 Ref



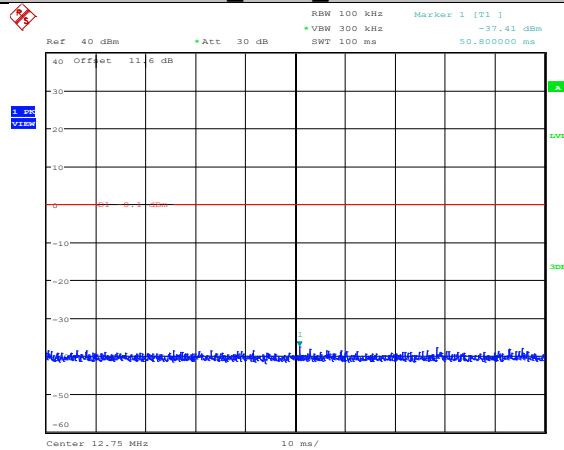
Date: 2.AUG.2022 19:15:19

DTS_925.7 30~1000



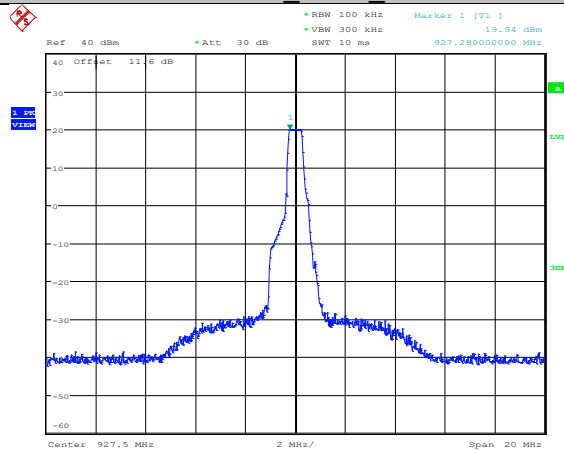
Date: 2.AUG.2022 19:17:26

DTS_925.7 1000~12500



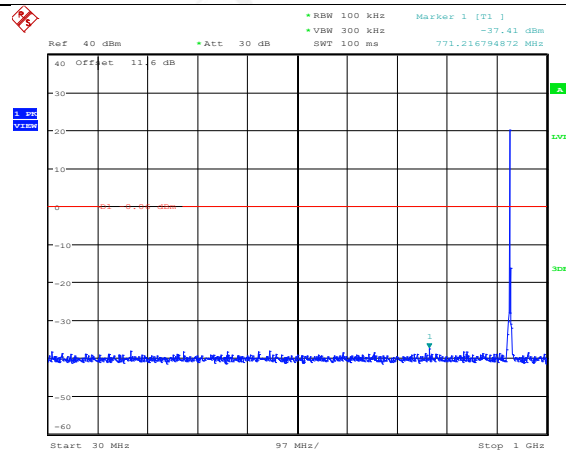
Date: 2.AUG.2022 19:18:20

DTS_927.5 Ref



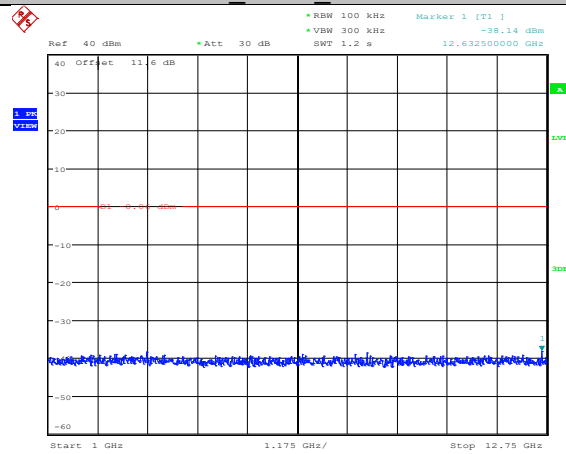
Date: 2.AUG.2022 19:26:56

DTS_927.5 30~1000



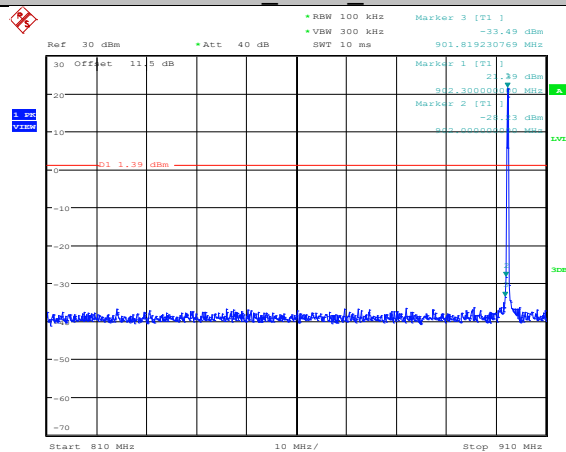
Date: 2.AUG.2022 19:28:08

DTS_927.5_1000~12500



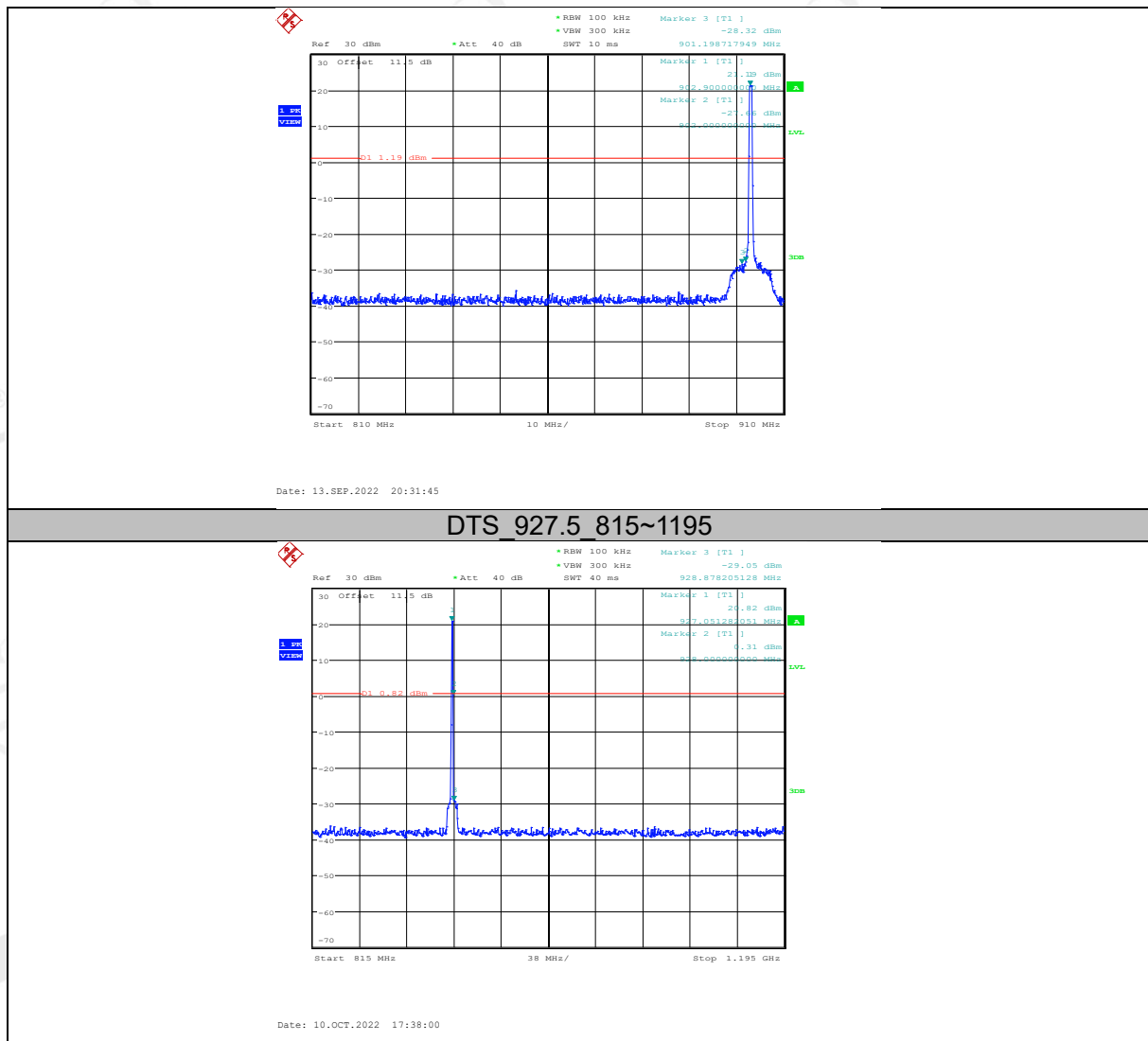
Date: 2.AUG.2022 19:28:47

FHSS 902.3 810~910



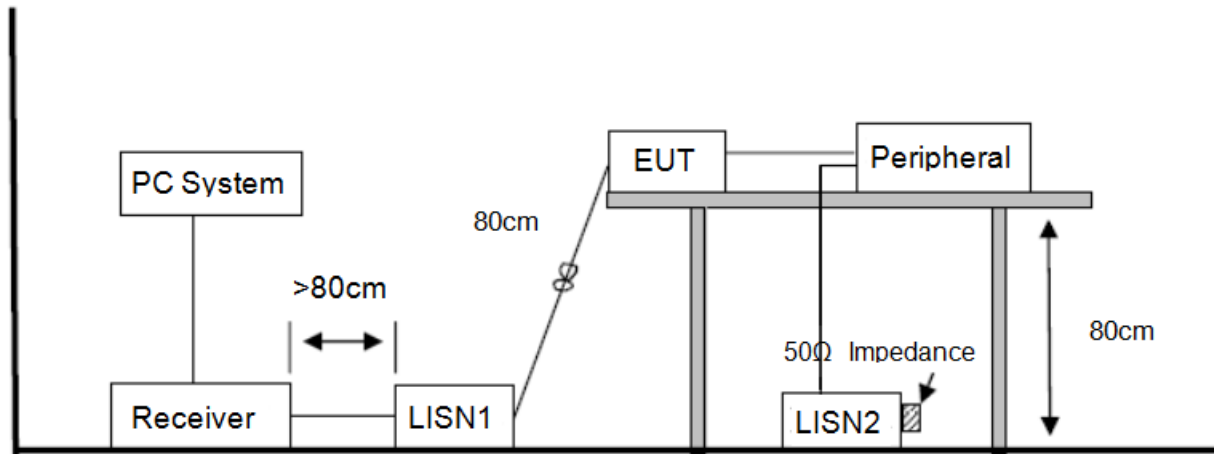
Date: 13.SEP.2022 20:20:40

DTS 903 810~910



13. Power Line Conducted Emission

13.1. Block diagram of test setup



13.2. Power line conducted emission limits

Frequency	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150 kHz ~ 500 kHz	66 ~ 56*	56 ~ 46*
500 kHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

13.3. Test procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 13.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

13.4. Test result

Not Applicable

Measurements to demonstrate compliance with the conducted limits are not required for devices which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines according to 15.207(C).

14. Antenna Requirements

14.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

14.2. Result

The product is PR-SMA antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain is -0.47 dBi.