FCC Test Report

FCC ID	:	**RID-LS134**
Equipment	:	**LoRa® Smoke and Heat Detector**
Model No.	:	**LS-134XX** **(X can be any alphanumeric character for marketing purpose)**
Brand Name	:	**GlobalSat**
Applicant	:	**GlobalSat WorldCom Corporation**
Address	:	**16F., No.186, Jian 1st Rd., Zhonghe Dist., New Taipei City, 23553, Taiwan**
Standard	:	**47 CFR FCC Part 15.247**
Received Date	:	**Sep. 19, 2017**
Tested Date	:	**Jun. 05 ~ Aug. 30, 2018**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

Table of Contents

1 GENERAL DESCRIPTION 5

1.1 Information 5
1.2 Local Support Equipment List 8
1.3 Test Setup Chart 8
1.4 The Equipment List 9
1.5 Test Standards 10
1.6 Measurement Uncertainty 11

2 TEST CONFIGURATION 12

2.1 Testing Condition 12
2.2 The Worst Test Modes and Channel Details 12

3 TRANSMITTER TEST RESULTS 13

3.1 Unwanted Emissions into Restricted Frequency Bands 13
3.2 Unwanted Emissions into Non-Restricted Frequency Bands 39
3.3 Conducted Output Power 44
3.4 Number of Hopping Frequency 45
3.5 20dB and Occupied Bandwidth 47
3.6 Channel Separation 50
3.7 Number of Dwell Time 53
3.8 Power Spectral Density 57

4 TEST LABORATORY INFORMATION 60

Release Record

Report No.	Version	Description	Issued Date
FR791901-01-1	Rev. 01	Initial issue	Sep. 13, 2018

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	Note	N/A
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 955.38MHz 42.80 (Margin -3.20dB) - PK	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(2)(3)	Conducted Output Power	Power [dBm]: 18.56	Pass
15.247(a)(1)(i)	Number of Hopping Channels	Meet the requirement of limit	Pass
15.247(a)(1)	Hopping Channel Separation	Meet the requirement of limit	Pass
15.247(f)	Dwell Time	Meet the requirement of limit	Pass
15.247(f)	Power spectral density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

Note: The EUT consumes DC power, so the test is not required.

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
Frequency Range (MHz)	**Ch. Freq. (MHz)**	**Channel Number**	**Physical bit rate (bit/s)**	**Spread Factor**	**Channel Bandwidth (kHz)**
902 ~ 928	902.3 ~ 914.9	0-63 [64]	5470~ 980	7~10	125
902 ~ 928	903.0 ~ 914.2	0-7 [8]	12500	8	500
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. Note 2: The device uses FSK modulation. Note 3: The device supports hybrid mode.					

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)
1	chip	N/A	1.6

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3Vdc from battery

1.1.4 Accessories

Accessories		
No.	**Equipment**	**Description**
1	Lithium battery	Brand: Panasonic Model: CR123A Power Rating: 3Vdc
2	Sensor Programmable Cable	1m non-shielded without core.

1.1.5 Channel List

Channel Bandwidth (kHz): 125							
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
0	902.3	16	905.5	32	908.7	48	911.9
1	902.5	17	905.7	33	908.9	49	912.1
2	902.7	18	905.9	34	909.1	50	912.3
3	902.9	19	906.1	35	909.3	51	912.5
4	903.1	20	906.3	36	909.5	52	912.7
5	903.3	21	906.5	37	909.7	53	912.9
6	903.5	22	906.7	38	909.9	54	913.1
7	903.7	23	906.9	39	910.1	55	913.3
8	903.9	24	907.1	40	910.3	56	913.5
9	904.1	25	907.3	41	910.5	57	913.7
10	904.3	26	907.5	42	910.7	58	913.9
11	904.5	27	907.7	43	910.9	59	914.1
12	904.7	28	907.9	44	911.1	60	914.3
13	904.9	29	908.1	45	911.3	61	914.5
14	905.1	30	908.3	46	911.5	62	914.7
15	905.3	31	908.5	47	911.7	63	914.9

Channel Bandwidth (kHz): 500	
Channel	**Frequency (MHz)**
0	903.0
1	904.6
2	906.2
3	907.8
4	909.4
5	911.0
6	912.6
7	914.2

1.1.6 Test Tool and Duty Cycle

Channel Bandwidth (kHz): 125	
Test Tool	Realterm, version: 2.0.0.70
Duty cycle	100.00%

Channel Bandwidth (kHz): 500	
Test Tool	Realterm, version: 2.0.0.70
Duty cycle	94.86%

1.1.7 Power Setting

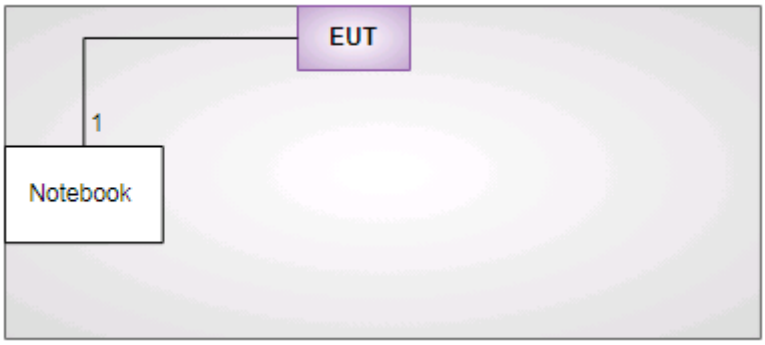
Channel Bandwidth (kHz)	**Modulation Mode**	**Test Frequency (MHz)**		
		902.3	**908.5**	**914.9**
125	FSK	7	7	7

Channel Bandwidth (kHz)	**Modulation Mode**	**Test Frequency (MHz)**		
		903.0	**907.8**	**914.2**
500	FSK	7	7	7

1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**FCC ID**	**Remarks**
1	Notebook	DELL	Latitude E6440	DoC	---

1.3 Test Setup Chart

Test Setup Diagram	
	
No.	**Signal cable / Length (m)**
1	USB, 1m non-shielded. (Sending test comment to control EUT to transmit continuously)

1.4 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Jun. 05, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2017	Dec. 03, 2018
Receiver	R&S	ESR3	101658	Nov. 20, 2017	Nov. 19, 2018
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 25, 2017	Jul. 24, 2018
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 20, 2017	Dec. 19, 2018
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 23, 2017	Nov. 22, 2018
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2017	Nov. 12, 2018
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 07, 2017	Dec. 06, 2018
Preamplifier	EMC	EMC02325	980225	Jul. 28, 2017	Jul. 27, 2018
Preamplifier	Agilent	83017A	MY39501308	Oct. 06, 2017	Oct. 05, 2018
Preamplifier	EMC	EMC184045B	980192	Aug. 22, 2017	Aug. 21, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 07, 2017	Dec. 06, 2018
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	16052	Dec. 07, 2017	Dec. 06, 2018
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 07, 2017	Dec. 06, 2018
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 07, 2017	Dec. 06, 2018
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Aug. 29 ~ Aug. 30, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101486	Nov. 21, 2017	Nov. 20, 2018
Power Meter	Anritsu	ML2495A	1241002	Oct. 16, 2017	Oct. 15, 2018
Power Sensor	Anritsu	MA2411B	1207366	Oct. 16, 2017	Oct. 15, 2018
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 01, 2017	Nov. 30, 2018
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Aug. 30 ~ Aug. 31, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2017	Dec. 03, 2018
Receiver	R&S	ESR3	101658	Nov. 20, 2017	Nov. 19, 2018
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 18, 2018	Jul. 17, 2019
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 20, 2017	Dec. 19, 2018
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 23, 2017	Nov. 22, 2018
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2017	Nov. 12, 2018
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 07, 2017	Dec. 06, 2018
Preamplifier	EMC	EMC02325	980225	Jul. 20, 2018	Jul. 19, 2019
Preamplifier	Agilent	83017A	MY39501308	Oct. 06, 2017	Oct. 05, 2018
Preamplifier	EMC	EMC184045B	980192	Aug. 09, 2018	Aug. 08, 2019
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16140/4	May 09, 2018	May 08, 2019
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 07, 2017	Dec. 06, 2018
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	16052	Dec. 07, 2017	Dec. 06, 2018
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 07, 2017	Dec. 06, 2018
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 07, 2017	Dec. 06, 2018
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247
ANSI C63.10-2013
FCC KDB 558074 D01 15.247 Meas Guidance v05

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Bandwidth	±34.134 Hz
Conducted power	±0.808 dB
Power density	±0.463 dB
Conducted emission	±2.670 dB
AC conducted emission	±2.90 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH01-WS	24-25°C / 61-62%	Akun Chung Roger Lu
RF Conducted	TH01-WS	24°C / 66%	Felix Sung

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Channel Bandwidth (kHz): 125

Test item	Test Frequency (MHz)	Channel Bandwidth (kHz)	Modulation / SF
Radiated Emissions ≤ 1GHz Radiated Emissions > 1GHz Conducted Output Power Hopping Channel Separation 20dB and Occupied bandwidth Power Spectral Density	902.3 / 908.5 / 914.9	125	FSK / 10
Number of Hopping Channels	902.3 ~ 914.9	125	FSK / 10
Dwell Time	902.3	125	FSK: 10 / 9 / 8 / 7

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.

Channel Bandwidth (kHz): 500

Test item	Test Frequency (MHz)	Channel Bandwidth (kHz)	Modulation / SF
Radiated Emissions ≤ 1GHz Radiated Emissions > 1GHz Conducted Output Power Hopping Channel Separation 20dB and Occupied bandwidth Power Spectral Density	903.0 / 907.8 / 914.2	500	FSK / 8
Number of Hopping Channels	903.0 ~ 914.2	500	FSK / 8
Dwell Time	903.0	500	FSK / 8

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.

3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

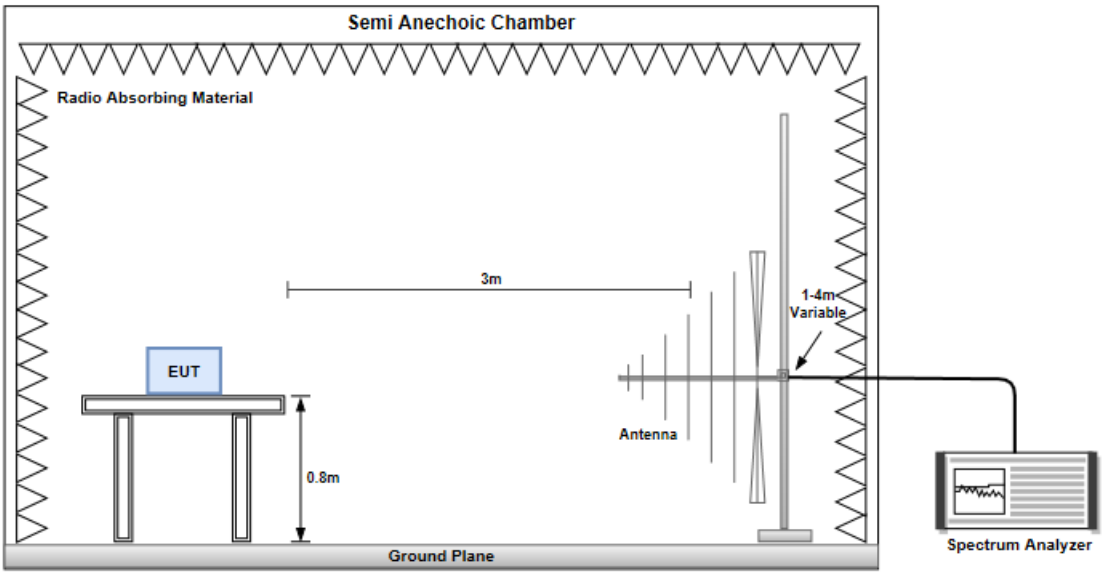
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

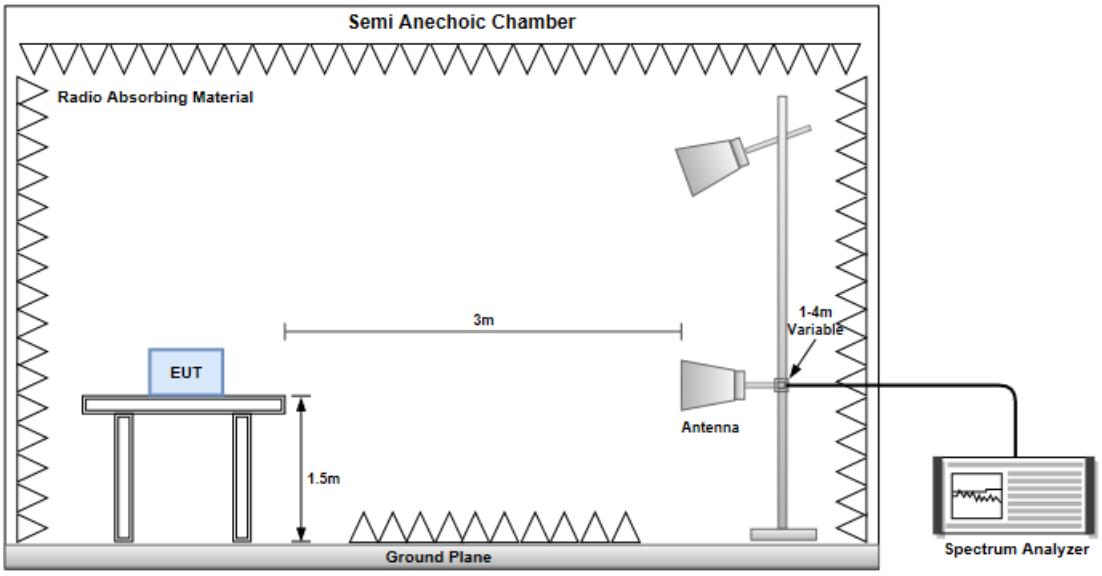
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.1.3 Test Setup

Radiated Emissions below 1 GHz



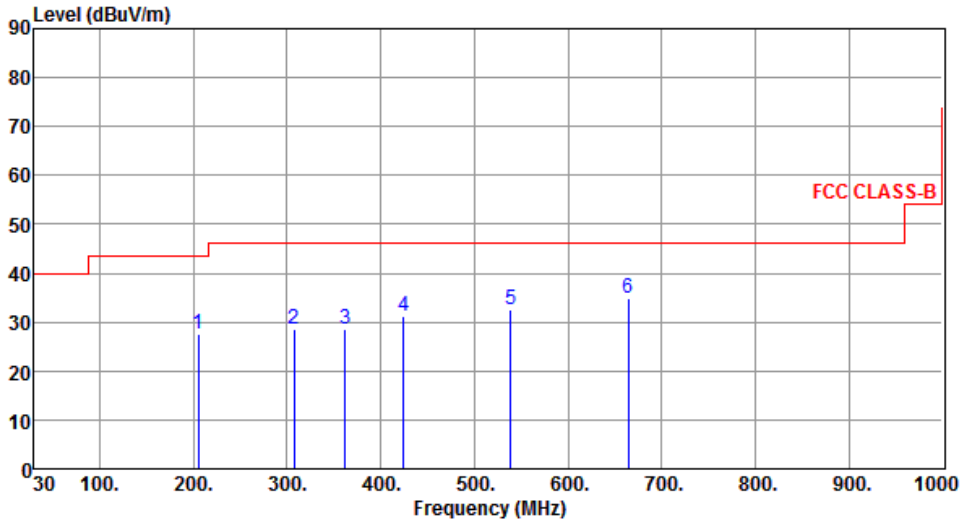
Radiated Emissions above 1 GHz



Channel Bandwidth (kHz): 125

3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

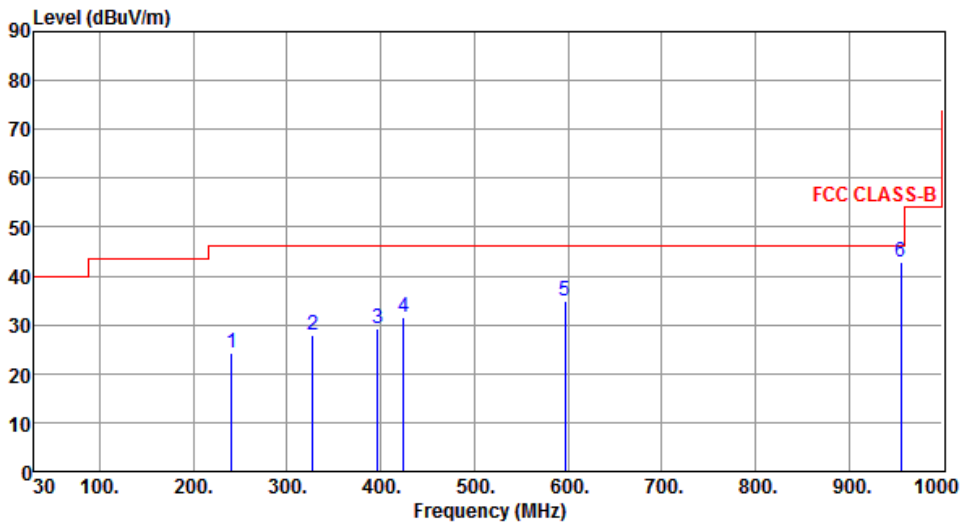
Modulation / SF	FSK / 10	**Test Freq. (MHz)**	902.3
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	205.57	27.50	43.50	-16.00	38.29	-10.79	Peak	---	---
2	307.42	28.40	46.00	-17.60	35.86	-7.46	Peak	---	---
3	361.74	28.70	46.00	-17.30	34.75	-6.05	Peak	---	---
4	424.79	31.10	46.00	-14.90	35.48	-4.38	Peak	---	---
5	539.25	32.63	46.00	-13.37	34.60	-1.97	Peak	---	---
6	664.38	34.84	46.00	-11.16	34.71	0.13	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

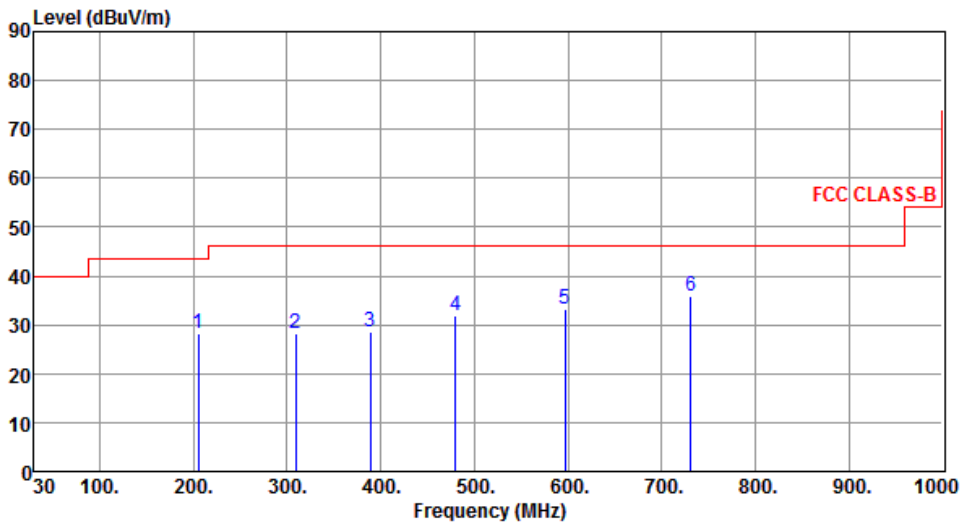
Modulation / SF	FSK / 10	Test Freq. (MHz)	902.3
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	240.49	24.13	46.00	-21.87	33.77	-9.64	Peak	---	---
2	327.79	27.91	46.00	-18.09	34.87	-6.96	Peak	---	---
3	396.66	29.21	46.00	-16.79	34.25	-5.04	Peak	---	---
4	424.79	31.69	46.00	-14.31	36.07	-4.38	Peak	---	---
5	596.48	34.87	46.00	-11.13	35.62	-0.75	Peak	---	---
6	955.38	42.80	46.00	-3.20	37.87	4.93	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

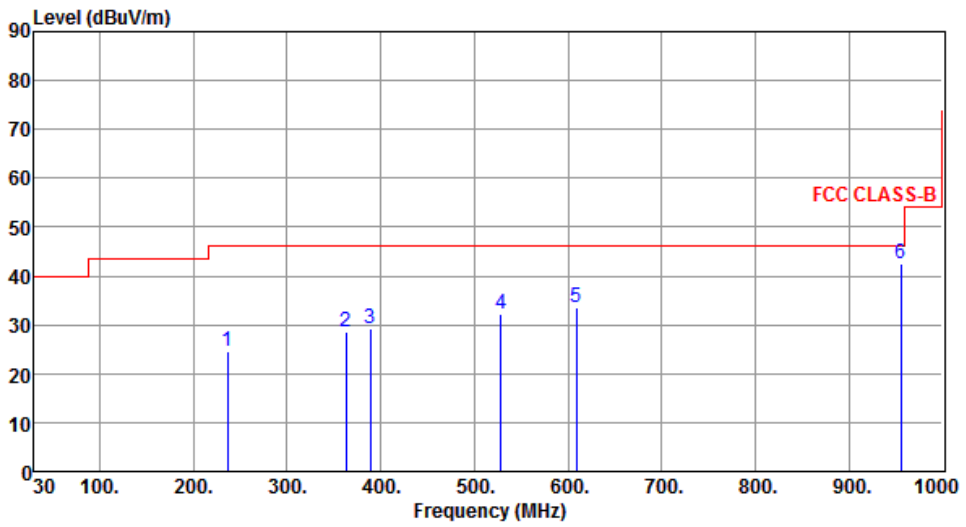
Modulation / SF	FSK / 10	Test Freq. (MHz)	908.5
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	205.57	28.20	43.50	-15.30	38.99	-10.79	Peak	---	---
2	309.36	28.15	46.00	-17.85	35.56	-7.41	Peak	---	---
3	388.90	28.45	46.00	-17.55	33.71	-5.26	Peak	---	---
4	480.08	31.76	46.00	-14.24	34.98	-3.22	Peak	---	---
5	596.48	33.28	46.00	-12.72	34.03	-0.75	Peak	---	---
6	731.31	35.71	46.00	-10.29	34.27	1.44	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

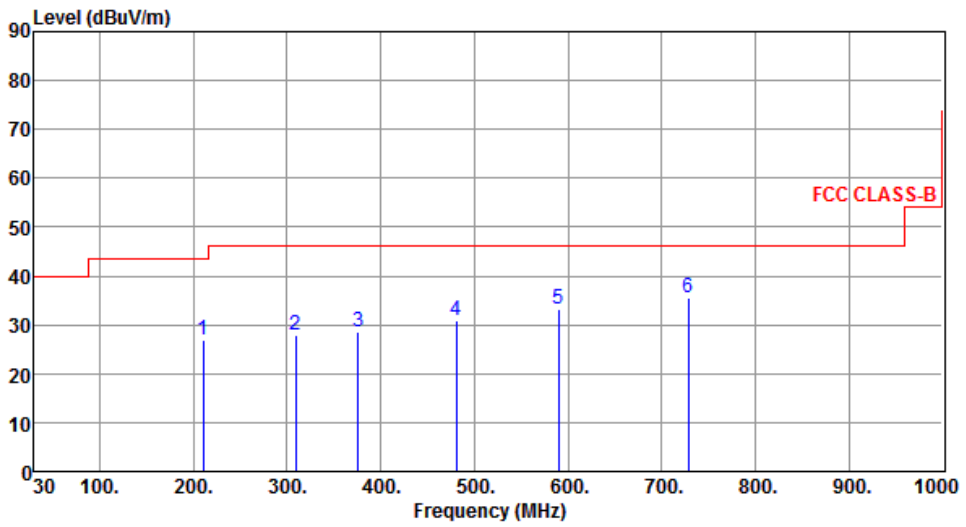
Modulation / SF	FSK / 10	Test Freq. (MHz)	908.5
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	236.61	24.41	46.00	-21.59	34.26	-9.85	Peak	---	---
2	362.71	28.71	46.00	-17.29	34.74	-6.03	Peak	---	---
3	388.90	29.35	46.00	-16.65	34.61	-5.26	Peak	---	---
4	528.58	32.37	46.00	-13.63	34.57	-2.20	Peak	---	---
5	609.09	33.50	46.00	-12.50	34.08	-0.58	Peak	---	---
6	955.38	42.50	46.00	-3.50	37.57	4.93	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

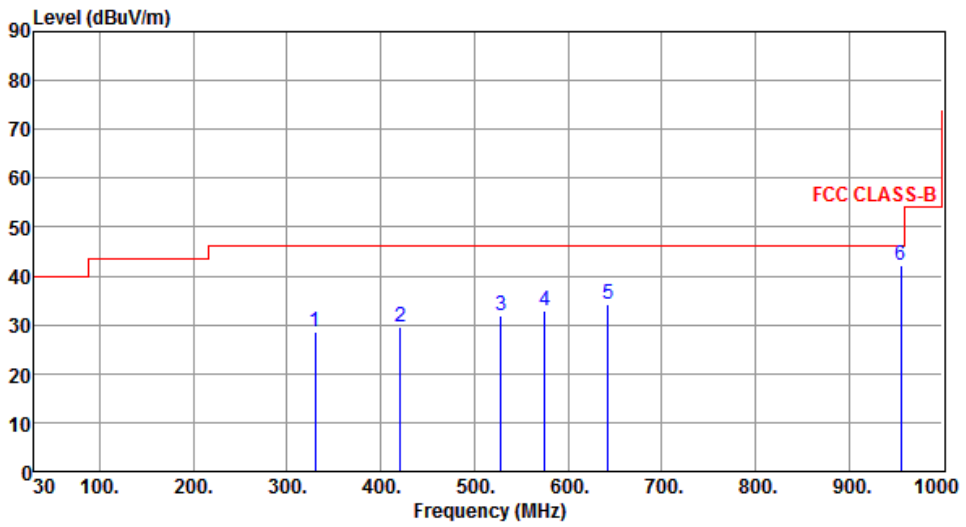
Modulation / SF	FSK / 10	Test Freq. (MHz)	914.9
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	210.42	27.06	43.50	-16.44	37.85	-10.79	Peak	---	---
2	309.36	27.86	46.00	-18.14	35.27	-7.41	Peak	---	---
3	376.29	28.41	46.00	-17.59	34.05	-5.64	Peak	---	---
4	481.05	30.93	46.00	-15.07	34.13	-3.20	Peak	---	---
5	589.69	33.13	46.00	-12.87	34.03	-0.90	Peak	---	---
6	728.40	35.56	46.00	-10.44	34.18	1.38	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation / SF	FSK / 10	Test Freq. (MHz)	914.9
Polarization	Vertical		

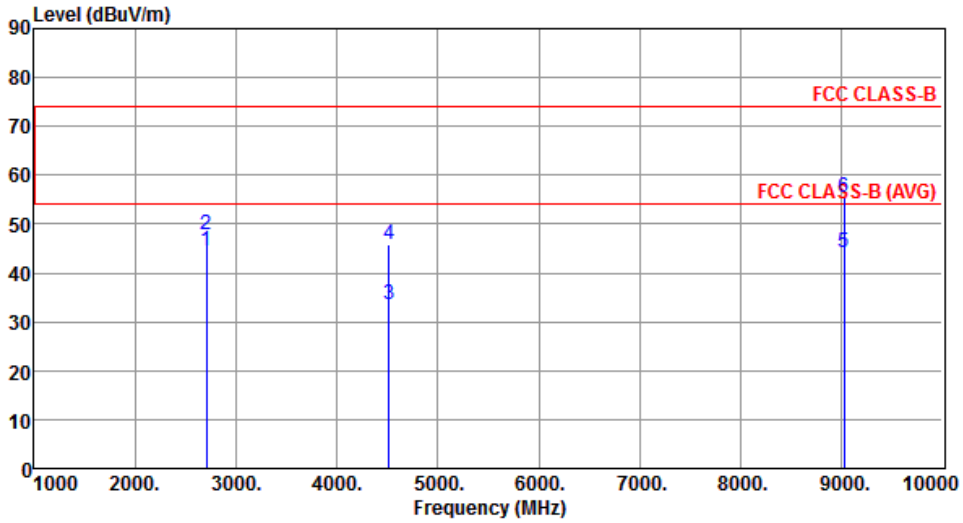


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	329.73	28.49	46.00	-17.51	35.40	-6.91	Peak	---	---
2	420.91	29.64	46.00	-16.36	34.10	-4.46	Peak	---	---
3	528.58	31.94	46.00	-14.06	34.14	-2.20	Peak	---	---
4	575.14	32.89	46.00	-13.11	34.09	-1.20	Peak	---	---
5	643.04	34.11	46.00	-11.89	34.32	-0.21	Peak	---	---
6	955.38	42.16	46.00	-3.84	37.23	4.93	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

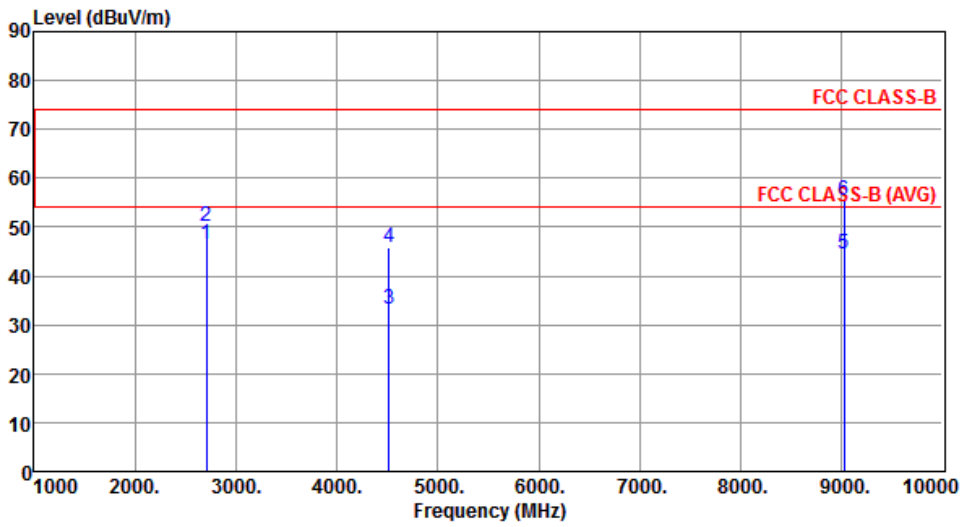
Modulation / SF	FSK / 10	**Test Freq. (MHz)**	902.3
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2706.90	44.41	54.00	-9.59	46.72	-2.31	Average	100	263
2	2706.90	47.91	74.00	-26.09	50.22	-2.31	Peak	100	263
3	4511.50	33.38	54.00	-20.62	30.75	2.63	Average	100	190
4	4511.50	45.93	74.00	-28.07	43.30	2.63	Peak	100	190
5	9023.00	44.24	54.00	-9.76	33.17	11.07	Average	100	126
6	9023.00	55.38	74.00	-18.62	44.31	11.07	Peak	100	126

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

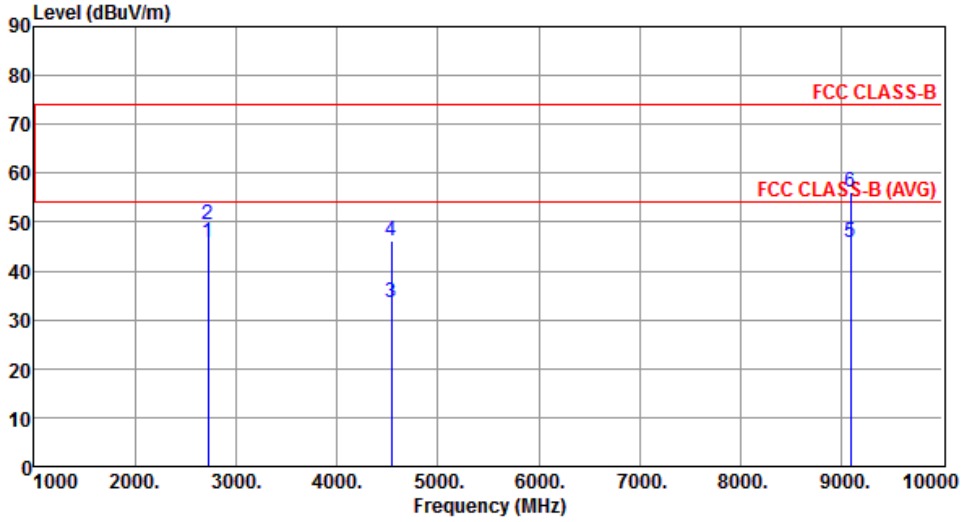
Modulation / SF	FSK / 10	Test Freq. (MHz)	902.3
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2706.90	46.47	54.00	-7.53	48.78	-2.31	Average	247	36
2	2706.90	50.11	74.00	-23.89	52.42	-2.31	Peak	247	36
3	4511.50	33.28	54.00	-20.72	30.65	2.63	Average	100	3
4	4511.50	45.96	74.00	-28.04	43.33	2.63	Peak	100	3
5	9023.00	44.43	54.00	-9.57	33.36	11.07	Average	100	230
6	9023.00	55.33	74.00	-18.67	44.26	11.07	Peak	100	230

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

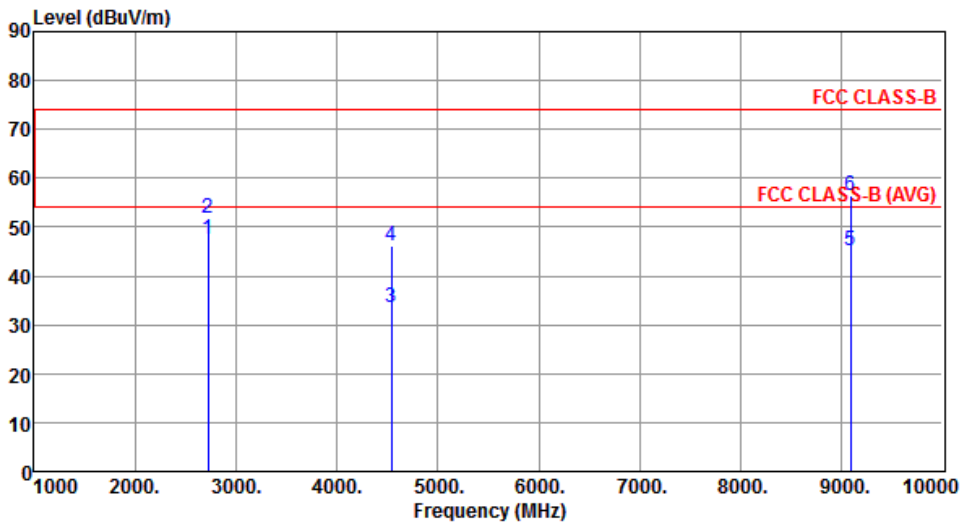
Modulation / SF	FSK / 10	Test Freq. (MHz)	908.5
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2725.50	45.77	54.00	-8.23	48.01	-2.24	Average	121	297
2	2725.50	49.39	74.00	-24.61	51.63	-2.24	Peak	121	297
3	4542.50	33.55	54.00	-20.45	30.83	2.72	Average	100	187
4	4542.50	46.14	74.00	-27.86	43.42	2.72	Peak	100	187
5	9085.00	45.80	54.00	-8.20	34.57	11.23	Average	100	125
6	9085.00	56.11	74.00	-17.89	44.88	11.23	Peak	100	125

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

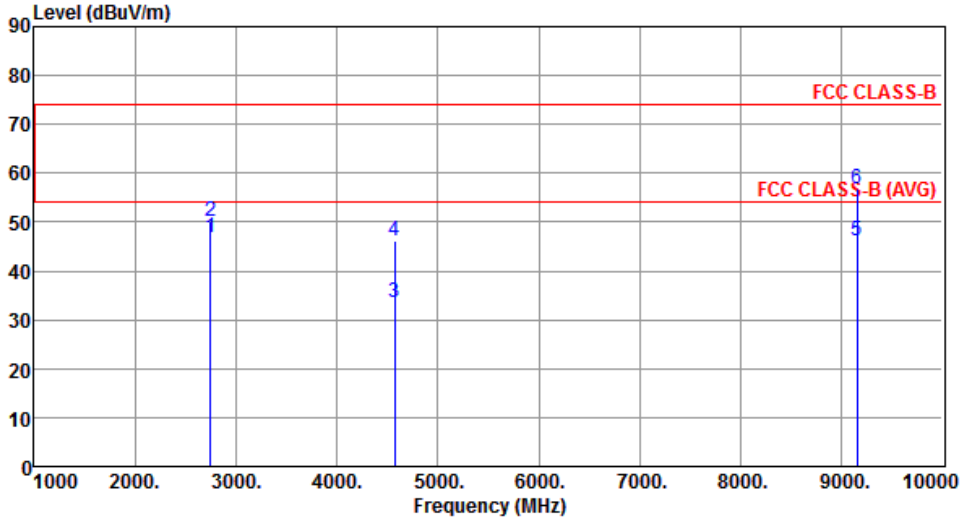
Modulation / SF	FSK / 10	Test Freq. (MHz)	908.5
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2725.50	47.52	54.00	-6.48	49.76	-2.24	Average	100	9
2	2725.50	51.70	74.00	-22.30	53.94	-2.24	Peak	100	9
3	4542.50	33.44	54.00	-20.56	30.72	2.72	Average	100	5
4	4542.50	46.12	74.00	-27.88	43.40	2.72	Peak	100	5
5	9085.00	45.18	54.00	-8.82	33.95	11.23	Average	100	217
6	9085.00	56.42	74.00	-17.58	45.19	11.23	Peak	100	217

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

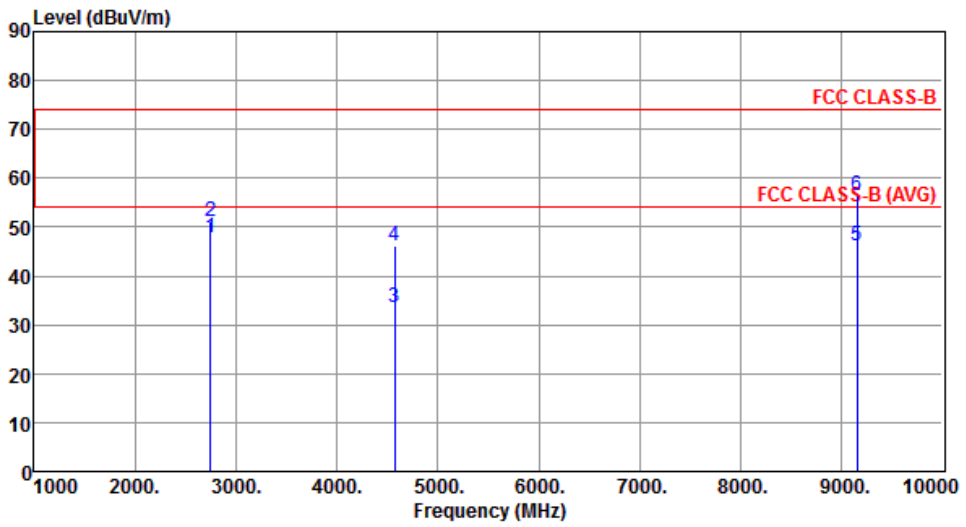
Modulation / SF	FSK / 10	Test Freq. (MHz)	914.9
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2744.70	46.68	54.00	-7.32	48.87	-2.19	Average	117	273
2	2744.70	50.01	74.00	-23.99	52.20	-2.19	Peak	117	273
3	4574.50	33.65	54.00	-20.35	30.86	2.79	Average	100	188
4	4574.50	46.24	74.00	-27.76	43.45	2.79	Peak	100	188
5	9149.00	46.28	54.00	-7.72	34.90	11.38	Average	100	129
6	9149.00	56.67	74.00	-17.33	45.29	11.38	Peak	100	129

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation / SF	FSK / 10	Test Freq. (MHz)	914.9
Polarization	Vertical		



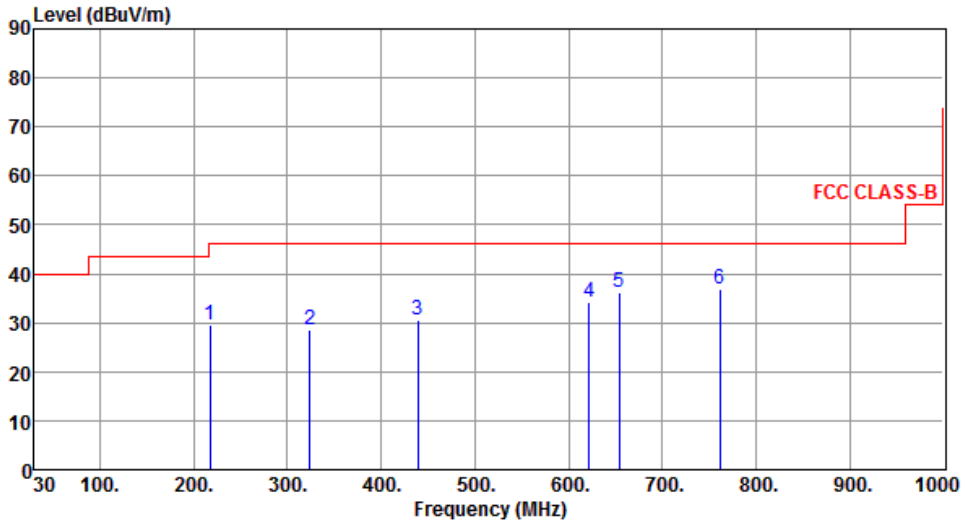
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2744.70	47.90	54.00	-6.10	50.09	-2.19	Average	100	119
2	2744.70	51.15	74.00	-22.85	53.34	-2.19	Peak	100	119
3	4574.50	33.49	54.00	-20.51	30.70	2.79	Average	100	4
4	4574.50	46.23	74.00	-27.77	43.44	2.79	Peak	100	4
5	9149.00	46.27	54.00	-7.73	34.89	11.38	Average	100	212
6	9149.00	56.53	74.00	-17.47	45.15	11.38	Peak	100	212

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Channel Bandwidth (kHz): 500

3.1.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

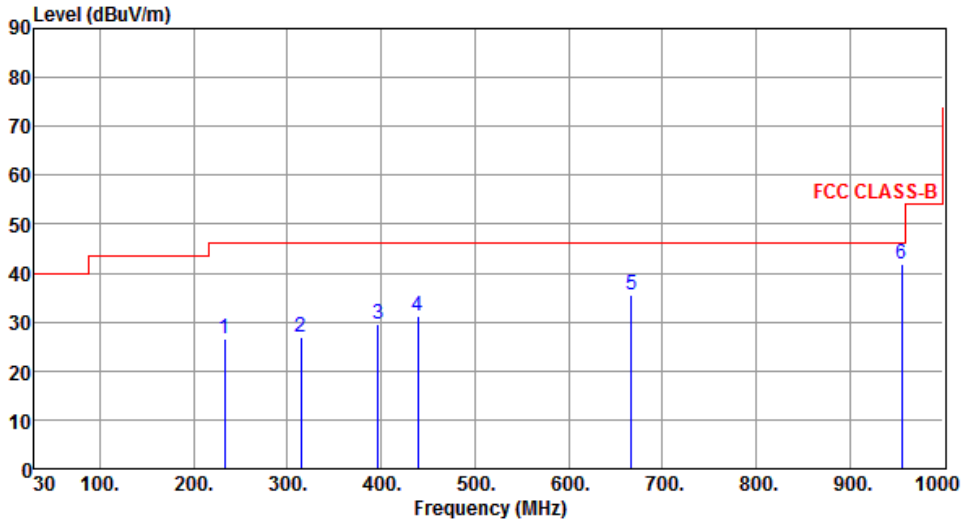
Modulation / SF	FSK / 8	**Test Freq. (MHz)**	903.0
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	217.31	29.66	46.00	-16.34	40.60	-10.94	Peak	---	---
2	323.88	28.44	46.00	-17.56	35.76	-7.32	Peak	---	---
3	439.45	30.46	46.00	-15.54	34.88	-4.42	Peak	---	---
4	621.80	34.21	46.00	-11.79	34.76	-0.55	Peak	---	---
5	653.69	36.33	46.00	-9.67	36.65	-0.32	Peak	---	---
6	761.44	36.75	46.00	-9.25	35.17	1.58	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

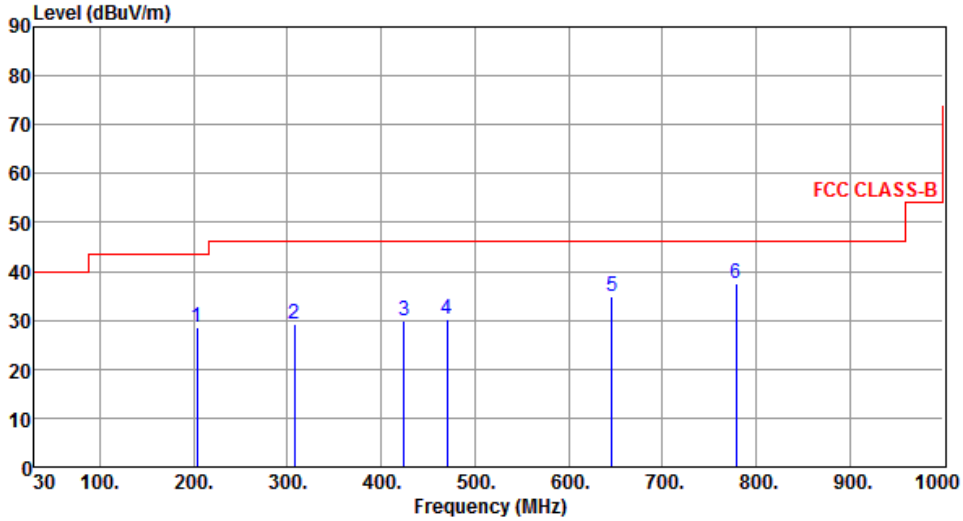
Modulation / SF	FSK / 8	Test Freq. (MHz)	903.0
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	233.21	26.49	46.00	-19.51	36.64	-10.15	Peak	---	---
2	314.33	27.06	46.00	-18.94	34.61	-7.55	Peak	---	---
3	396.55	29.49	46.00	-16.51	34.89	-5.40	Peak	---	---
4	439.35	31.33	46.00	-14.67	35.75	-4.42	Peak	---	---
5	667.33	35.41	46.00	-10.59	35.46	-0.05	Peak	---	---
6	955.44	41.92	46.00	-4.08	37.83	4.09	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

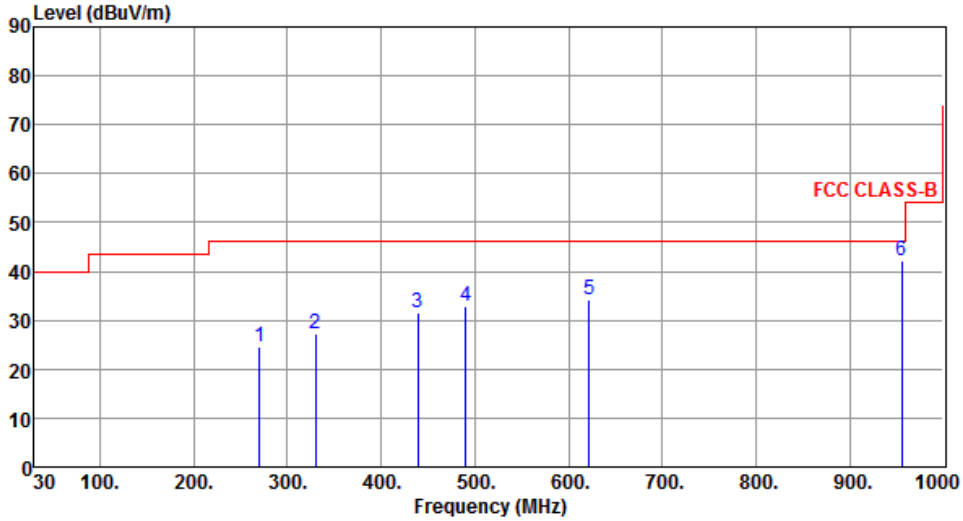
Modulation / SF	FSK / 8	Test Freq. (MHz)	907.8
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	203.49	28.69	43.50	-14.81	39.72	-11.03	Peak	---	---
2	307.39	29.22	46.00	-16.78	37.01	-7.79	Peak	---	---
3	424.79	29.88	46.00	-16.12	34.54	-4.66	Peak	---	---
4	470.22	30.23	46.00	-15.77	34.05	-3.82	Peak	---	---
5	645.88	34.85	46.00	-11.15	35.18	-0.33	Peak	---	---
6	778.89	37.45	46.00	-8.55	35.74	1.71	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

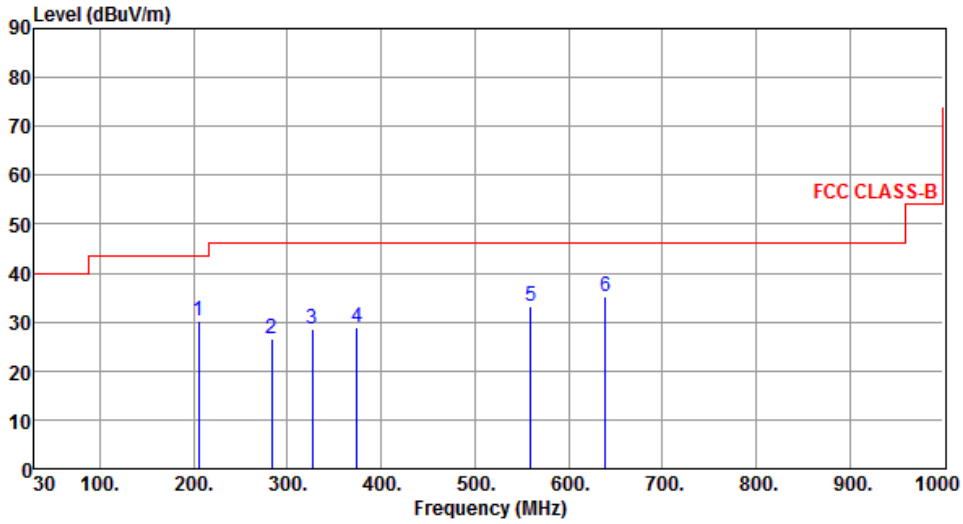
Modulation / SF	FSK / 8	Test Freq. (MHz)	907.8
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	270.49	24.44	46.00	-21.56	33.13	-8.69	Peak	---	---
2	329.66	27.23	46.00	-18.77	34.33	-7.10	Peak	---	---
3	439.55	31.44	46.00	-14.56	35.86	-4.42	Peak	---	---
4	490.68	32.77	46.00	-13.23	36.11	-3.34	Peak	---	---
5	621.69	34.26	46.00	-11.74	34.82	-0.56	Peak	---	---
6	955.44	42.21	46.00	-3.79	38.12	4.09	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

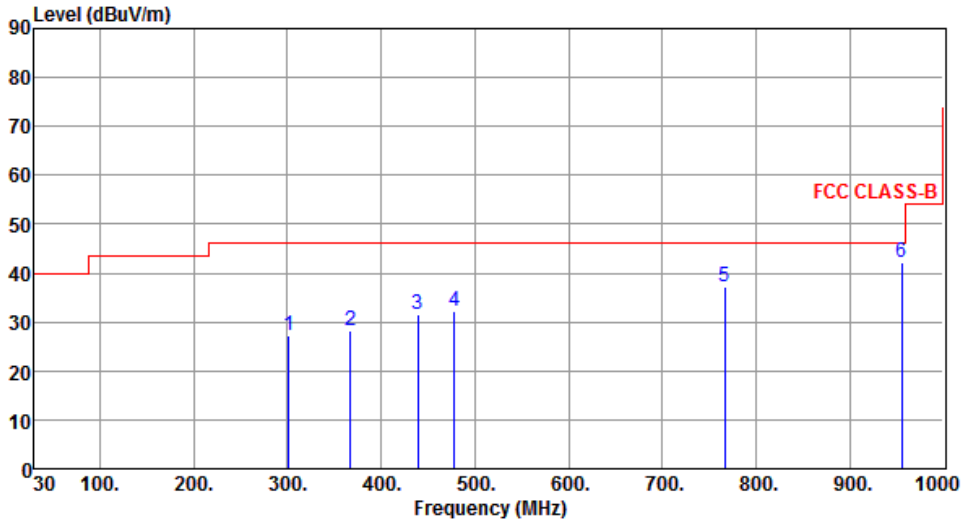
Modulation / SF	FSK / 8	Test Freq. (MHz)	914.2
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	205.44	30.12	43.50	-13.38	41.18	-11.06	Peak	---	---
2	283.22	26.41	46.00	-19.59	34.64	-8.23	Peak	---	---
3	326.79	28.64	46.00	-17.36	35.87	-7.23	Peak	---	---
4	374.44	28.85	46.00	-17.15	34.75	-5.90	Peak	---	---
5	559.55	33.21	46.00	-12.79	34.98	-1.77	Peak	---	---
6	639.22	35.21	46.00	-10.79	35.58	-0.37	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation / SF	FSK / 8	Test Freq. (MHz)	914.2
Polarization	Vertical		

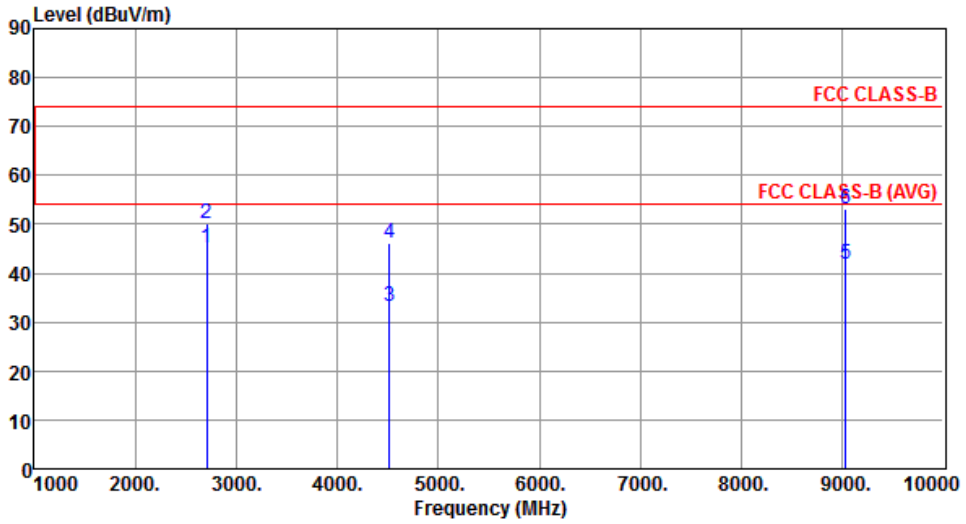


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	301.20	27.23	46.00	-18.77	35.16	-7.93	Peak	---	---
2	367.49	28.12	46.00	-17.88	34.17	-6.05	Peak	---	---
3	439.55	31.65	46.00	-14.35	36.07	-4.42	Peak	---	---
4	478.22	32.31	46.00	-13.69	35.94	-3.63	Peak	---	---
5	766.39	37.26	46.00	-8.74	35.66	1.60	Peak	---	---
6	955.28	42.12	46.00	-3.88	38.03	4.09	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.1.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

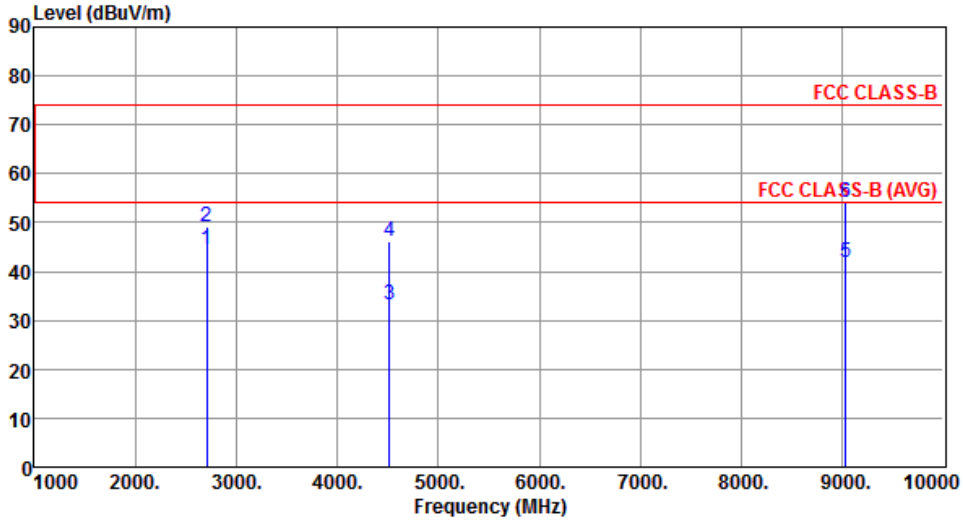
Modulation / SF	FSK / 8	Test Freq. (MHz)	903.0
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2709.00	45.16	54.00	-8.84	47.47	-2.31	Average	100	1
2	2709.00	50.26	74.00	-23.74	52.57	-2.31	Peak	100	1
3	4515.00	33.17	54.00	-20.83	30.53	2.64	Average	100	30
4	4515.00	46.03	74.00	-27.97	43.39	2.64	Peak	100	30
5	9030.00	41.79	54.00	-12.21	30.69	11.10	Average	100	50
6	9030.00	53.29	74.00	-20.71	42.19	11.10	Peak	100	50

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

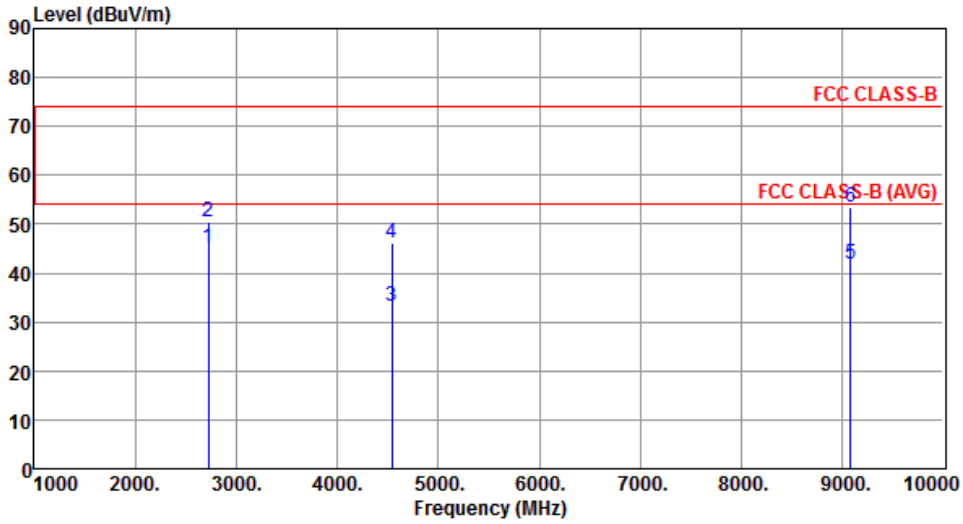
Modulation / SF	FSK / 8	Test Freq. (MHz)	903.0
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2709.00	44.51	54.00	-9.49	46.82	-2.31	Average	298	135
2	2709.00	49.15	74.00	-24.85	51.46	-2.31	Peak	298	135
3	4515.00	33.22	54.00	-20.78	30.58	2.64	Average	100	50
4	4515.00	46.22	74.00	-27.78	43.58	2.64	Peak	100	50
5	9030.00	42.01	54.00	-11.99	30.91	11.10	Average	100	60
6	9030.00	54.13	74.00	-19.87	43.03	11.10	Peak	100	60

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

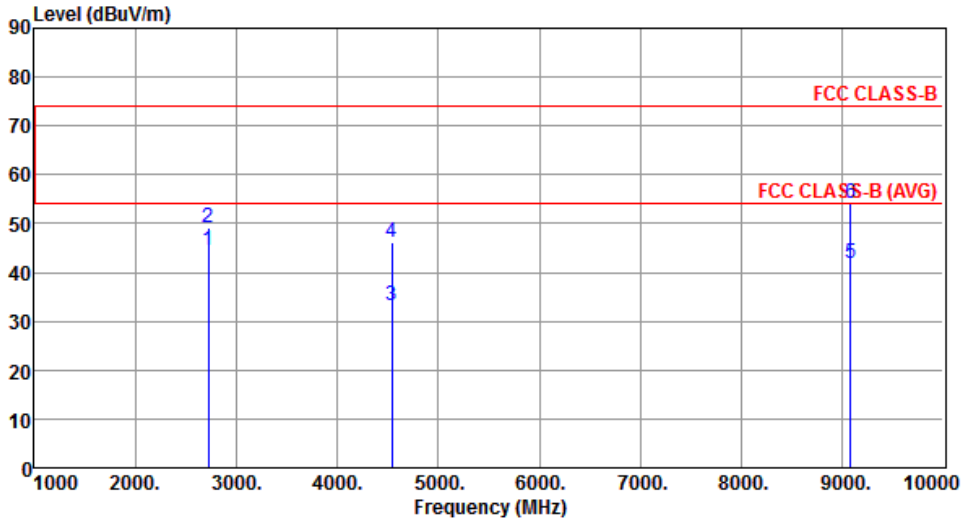
Modulation / SF	FSK / 8	Test Freq. (MHz)	907.8
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2723.40	45.20	54.00	-8.80	47.46	-2.26	Average	100	0
2	2723.40	50.34	74.00	-23.66	52.60	-2.26	Peak	100	0
3	4539.00	33.12	54.00	-20.88	30.42	2.70	Average	100	20
4	4539.00	46.23	74.00	-27.77	43.53	2.70	Peak	100	20
5	9078.00	41.86	54.00	-12.14	30.65	11.21	Average	100	20
6	9078.00	53.34	74.00	-20.66	42.13	11.21	Peak	100	20

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

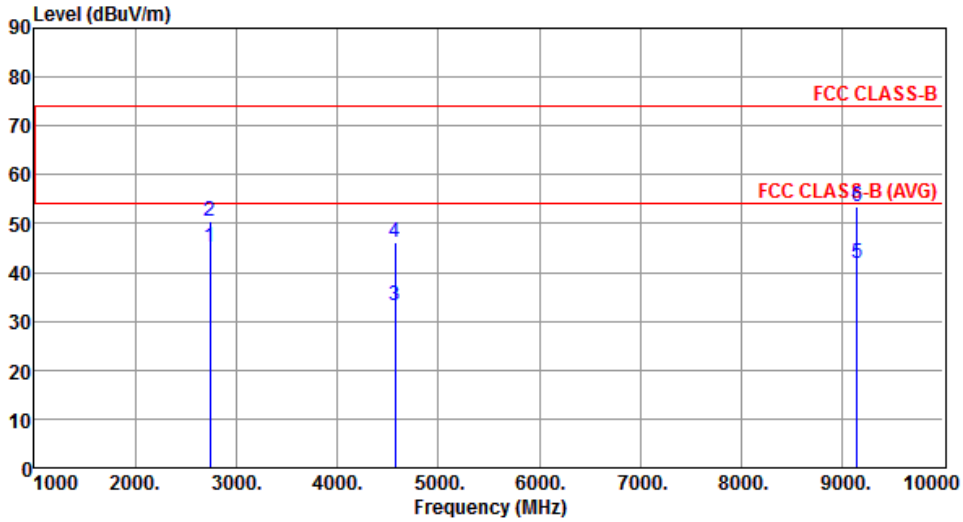
Modulation / SF	FSK / 8	Test Freq. (MHz)	907.8
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2723.40	44.62	54.00	-9.38	46.88	-2.26	Average	299	134
2	2723.40	49.26	74.00	-24.74	51.52	-2.26	Peak	299	134
3	4539.00	33.26	54.00	-20.74	30.56	2.70	Average	100	60
4	4539.00	46.26	74.00	-27.74	43.56	2.70	Peak	100	60
5	9078.00	41.99	54.00	-12.01	30.78	11.21	Average	100	50
6	9078.00	54.03	74.00	-19.97	42.82	11.21	Peak	100	50

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

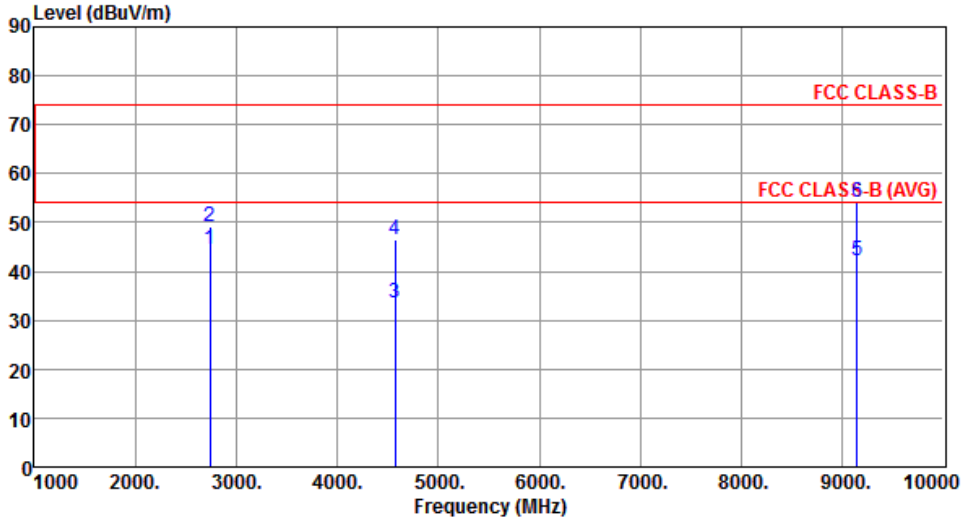
Modulation / SF	FSK / 8	Test Freq. (MHz)	914.2
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2742.60	45.31	54.00	-8.69	47.51	-2.20	Average	100	2
2	2742.60	50.46	74.00	-23.54	52.66	-2.20	Peak	100	2
3	4571.00	33.26	54.00	-20.74	30.47	2.79	Average	100	30
4	4571.00	46.12	74.00	-27.88	43.33	2.79	Peak	100	30
5	9142.00	41.79	54.00	-12.21	30.43	11.36	Average	100	31
6	9142.00	53.46	74.00	-20.54	42.10	11.36	Peak	100	31

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation / SF	FSK / 8	Test Freq. (MHz)	914.2
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2742.60	44.59	54.00	-9.41	46.79	-2.20	Average	295	135
2	2742.60	49.31	74.00	-24.69	51.51	-2.20	Peak	295	135
3	4571.00	33.49	54.00	-20.51	30.70	2.79	Average	100	70
4	4571.00	46.33	74.00	-27.67	43.54	2.79	Peak	100	70
5	9142.00	42.03	54.00	-11.97	30.67	11.36	Average	100	55
6	9142.00	54.06	74.00	-19.94	42.70	11.36	Peak	100	55

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.2 Unwanted Emissions into Non-Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

The peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.2.2 Test Procedures

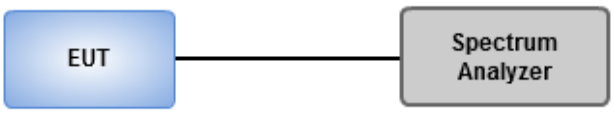
Reference Level Measurement

1. Set the RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Set Sweep time = auto couple, Trace mode = max hold.
3. Allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

Unwanted Emissions Level Measurement

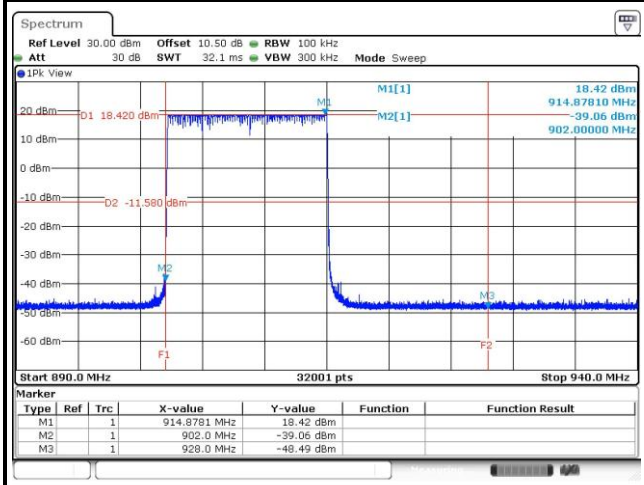
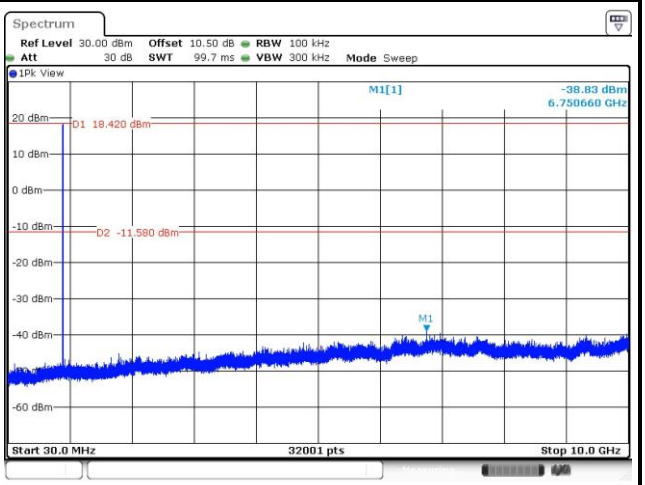
1. Set RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Trace Mode = max hold, Sweep = auto couple.
3. Allow the trace to stabilize.
4. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

3.2.3 Test Setup



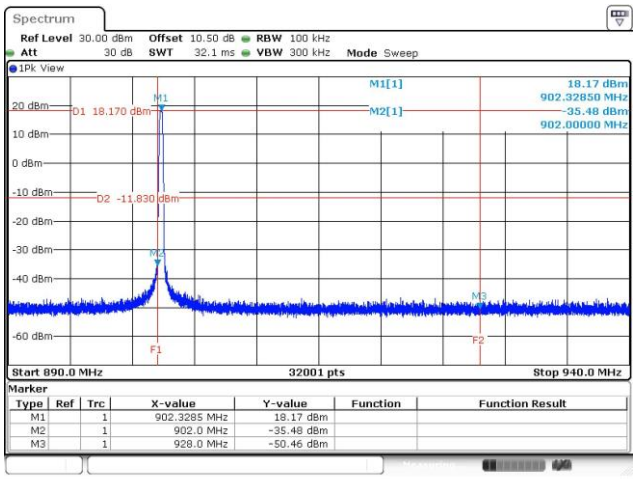
Channel Bandwidth (kHz): 125

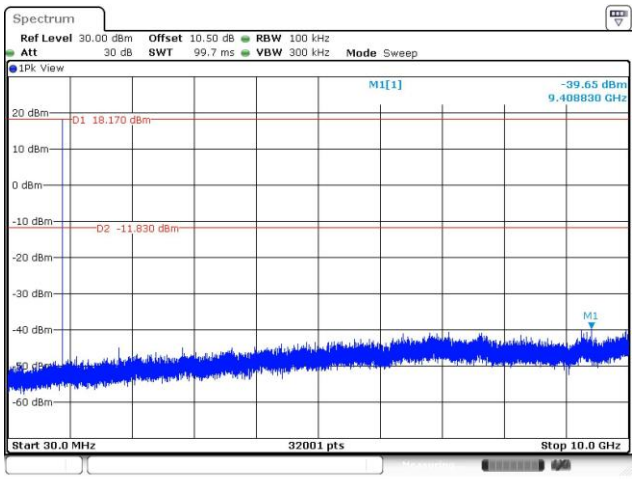
3.2.4 Unwanted Emissions into Non-Restricted Frequency Bands

Hopping on	
30MHz~10GHz (down 30dBc)	
	

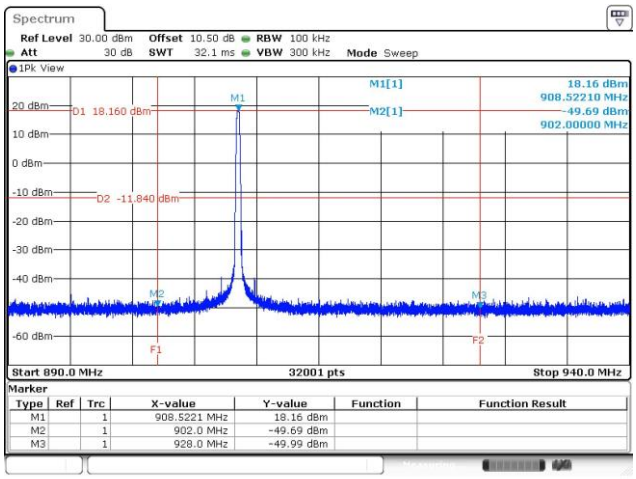
Hopping off

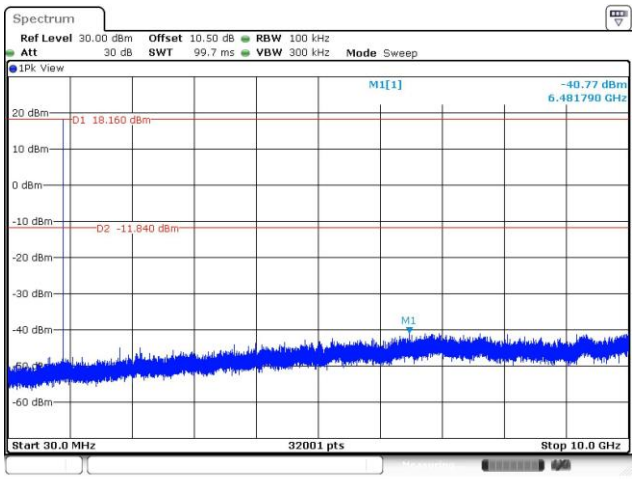
TX Frequency 902.3MHz / 30MHz~10GHz (down 30dBc)



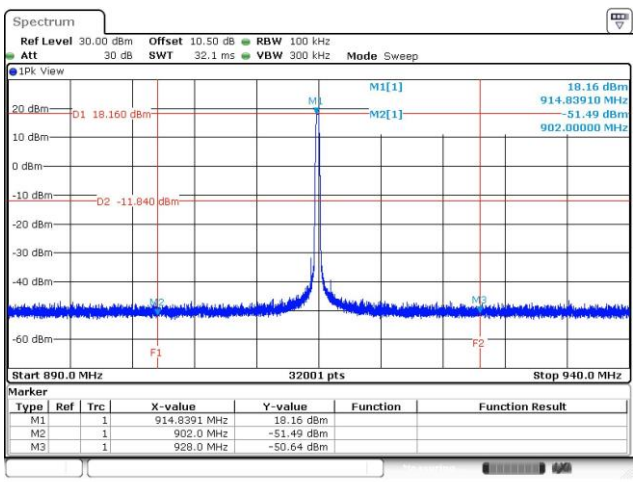


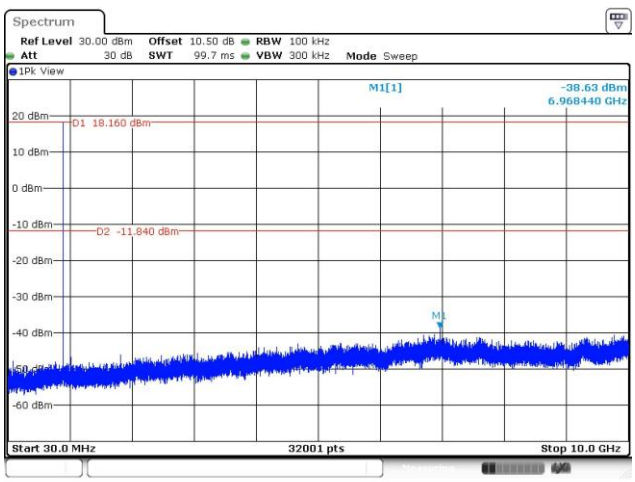
TX Frequency 908.5MHz / 30MHz~10GHz (down 30dBc)





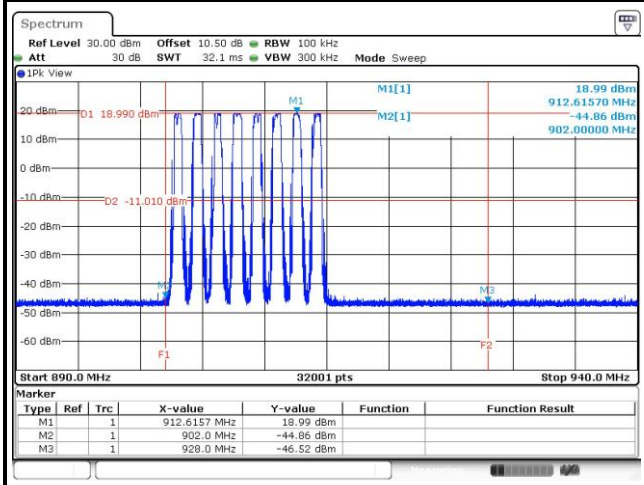
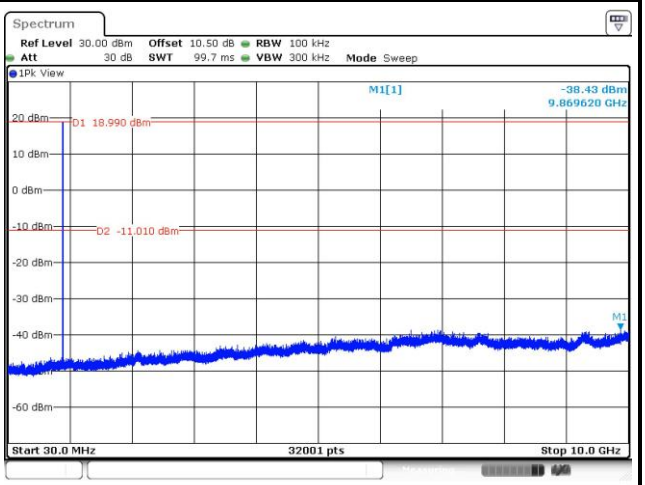
TX Frequency 914.9MHz / 30MHz~10GHz (down 30dBc)





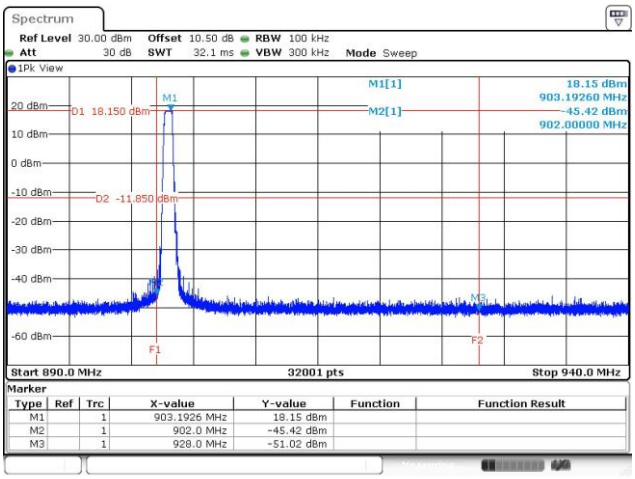
Channel Bandwidth (kHz): 500

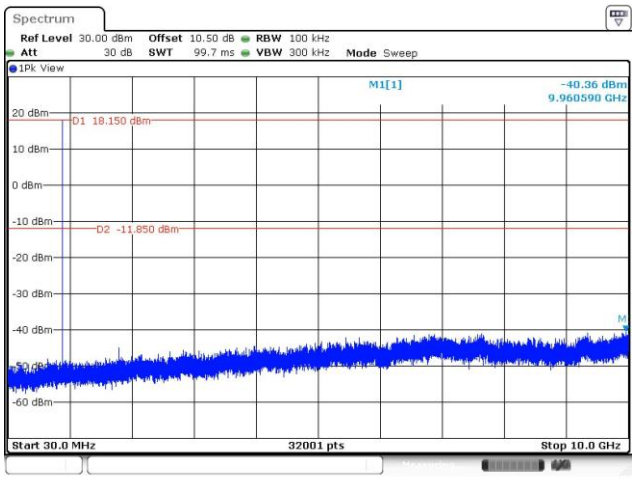
3.2.5 Unwanted Emissions into Non-Restricted Frequency Bands

Hopping on	
30MHz~10GHz (down 30dBc)	
	

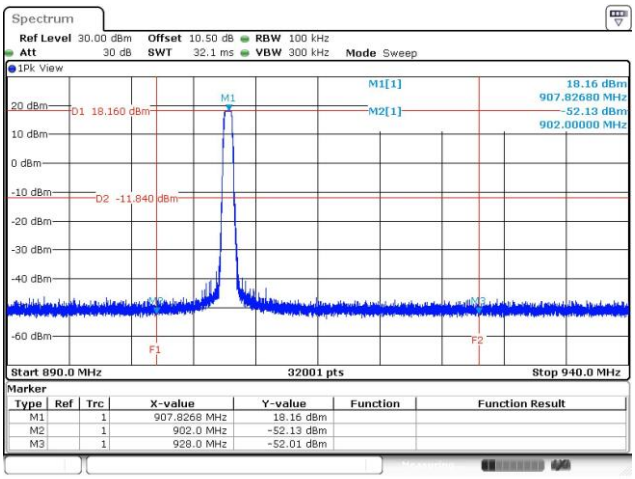
Hopping off

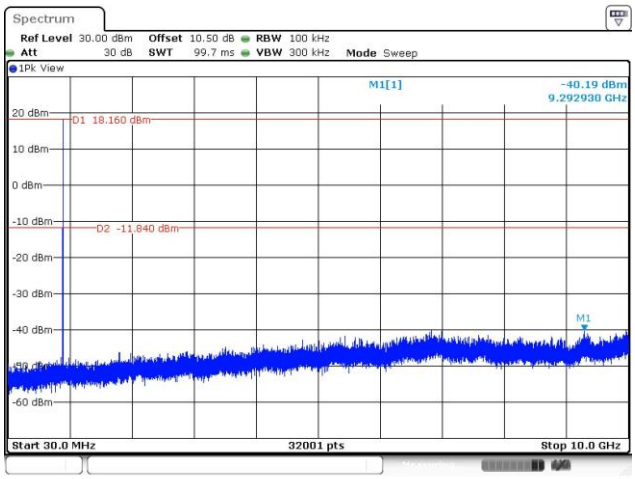
TX Frequency 903.0MHz / 30MHz~10GHz (down 30dBc)



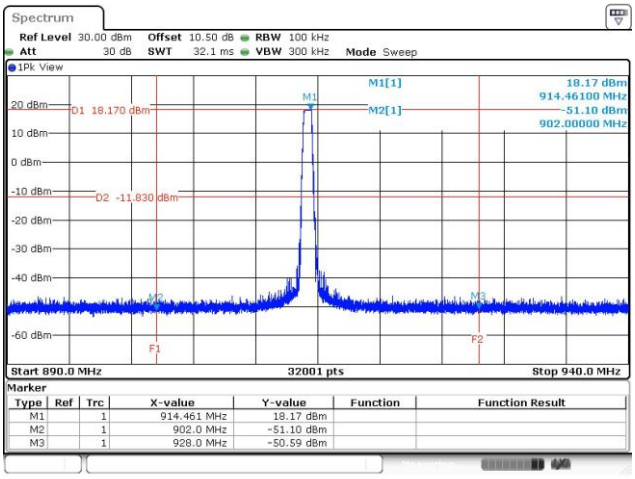


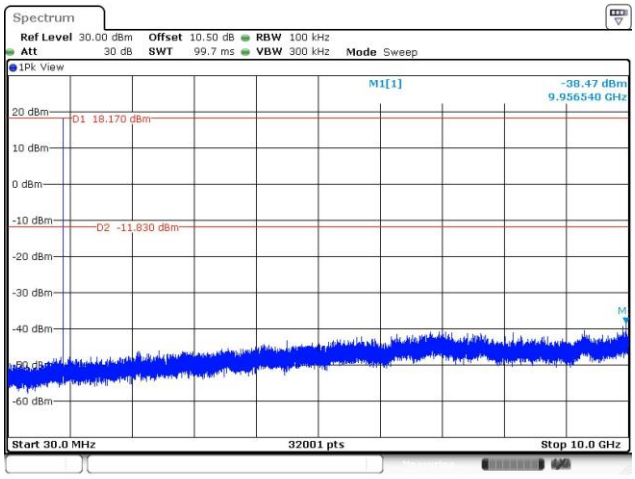
TX Frequency 907.8MHz / 30MHz~10GHz (down 30dBc)





TX Frequency 914.2MHz / 30MHz~10GHz (down 30dBc)





3.3 Conducted Output Power

3.3.1 Limit of Conducted Output Power

1 Watt

3.3.2 Test Procedures

1. A wideband power meter is used for power measurement. Bandwidth of power senor and meter is 50MHz
2. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power

3.3.3 Test Setup

3.3.4 Test Result of Conducted Output Power

Channel Bandwidth (kHz): 125

Modulation / SF	Freq. (MHz)	Output Power (mW)	Output Power (dBm)	Limit (W)
FSK / 10	902.3	71.78	18.56	1
FSK / 10	908.5	71.61	18.55	1
FSK / 10	914.9	71.29	18.53	1

Channel Bandwidth (kHz): 500

Modulation / SF	Freq. (MHz)	Output Power (mW)	Output Power (dBm)	Limit (W)
FSK / 8	903.0	70.47	18.48	1
FSK / 8	907.8	70.63	18.49	1
FSK / 8	914.2	70.15	18.46	1

3.4 Number of Hopping Frequency

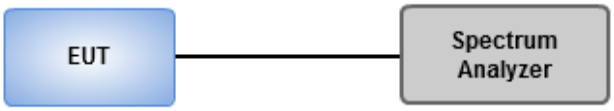
3.4.1 Limit of Number of Hopping Frequency

Number of Hopping Frequencies Limit for Frequency Hopping Systems		
☒	902-928 MHz Band:	
	☐	N ≥ 50, 20 dB bandwidth of the hopping channel is less than 250 kHz
	☐	N ≥ 25, 20 dB bandwidth of the hopping channel is 250 kHz or greater
	☒	Hybrid mode, No minimum number of hopping channels associated with hybrid system.
N: Number of Hopping Frequencies		

3.4.2 Test Procedures

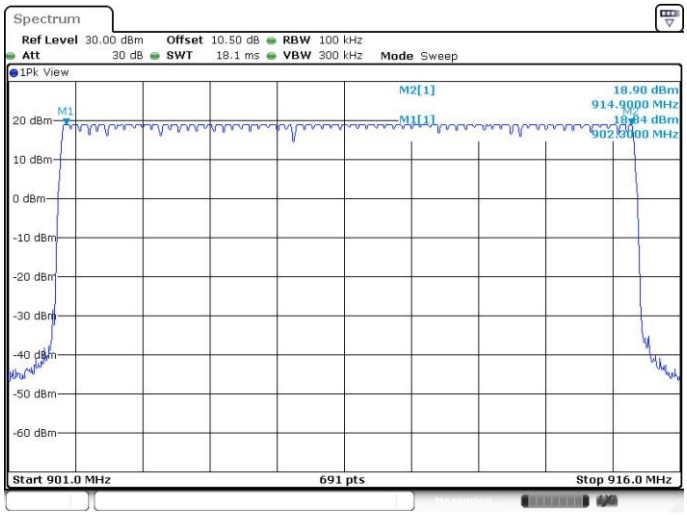
1. Set RBW = 100kHz, VBW = 300kHz, Sweep time = Auto, Detector = Peak Trace max hold.
2 Allow trace to stabilize.

3.4.3 Test Setup

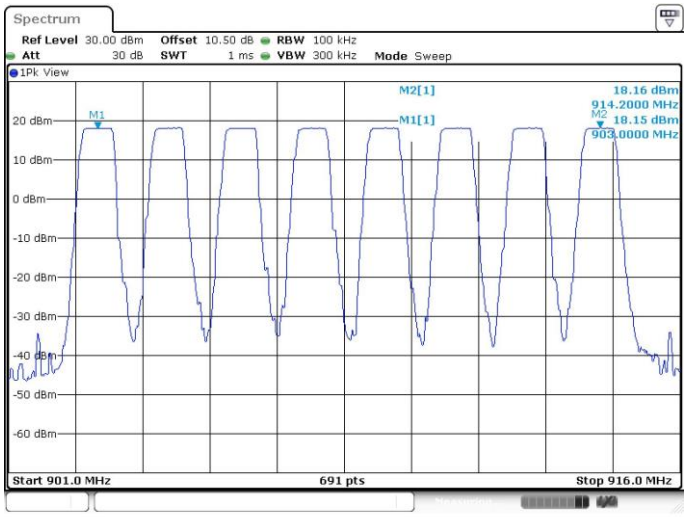


3.4.4 Test Result of Number of Hopping Frequency

Channel Bandwidth (kHz): 125



Channel Bandwidth (kHz): 500



3.5 20dB and Occupied Bandwidth

3.5.1 Test Procedures

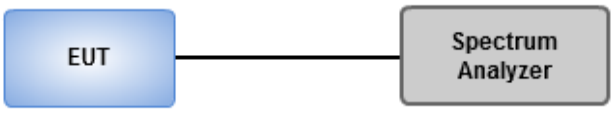
20dB Bandwidth

1. Set RBW = 3kHz, VBW = 10kHz, Sweep time = Auto, Detector = Peak, Trace max hold.
2 Allow trace to stabilize.
3 Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

1. Set RBW = 3kHz, VBW = 10kHz,Sweep time = Auto, Detector = Peak, Trace max hold
2 Allow trace to stabilize
3. Use Occupied bandwidth function of spectrum analyzer to measuring 99% occupied bandwidth

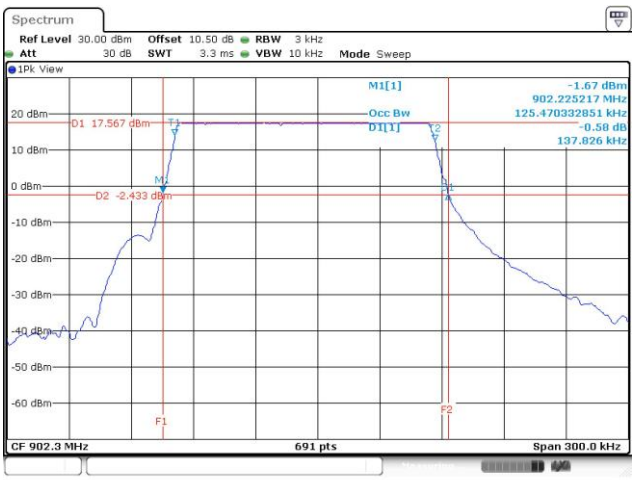
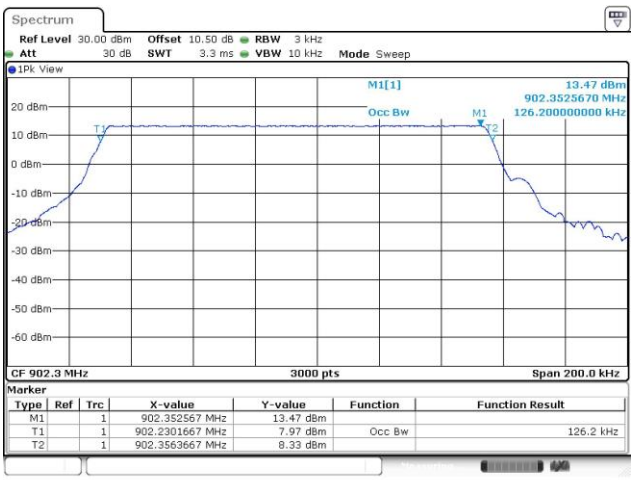
3.5.2 Test Setup



3.5.3 Test result of 20dB and Occupied Bandwidth

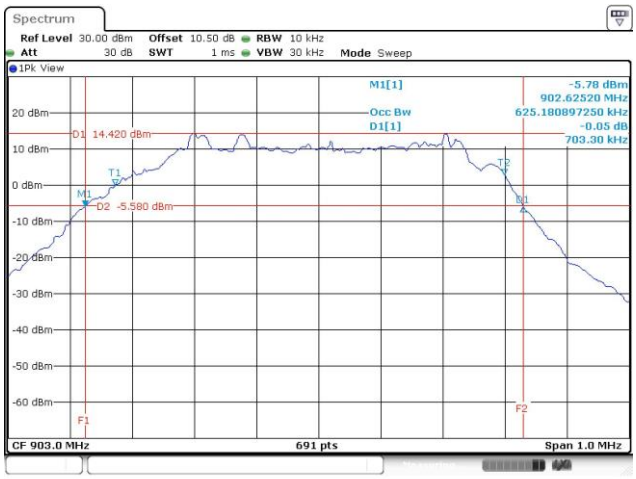
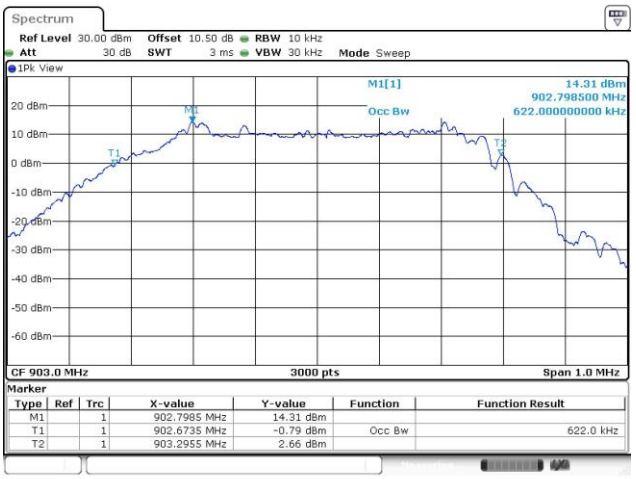
Channel Bandwidth (kHz): 125

Modulation / SF	Freq. (MHz)	20dB Bandwidth (kHz)	Occupied Bandwidth (kHz)
FSK / 10	902.3	137.83	126.20
FSK / 10	908.5	137.83	125.80
FSK / 10	914.9	137.83	126.00

Worst Plot of 20dB Bandwidth	Worst Plot of Occupied Bandwidth
	

Channel Bandwidth (kHz): 500

Modulation / SF	Freq. (MHz)	20dB Bandwidth (kHz)	Occupied Bandwidth (kHz)
FSK / 8	903.0	703.30	622.00
FSK / 8	907.8	703.30	617.67
FSK / 8	914.2	699.00	614.00

Worst Plot of 20dB Bandwidth	Worst Plot of Occupied Bandwidth
	

3.6 Channel Separation

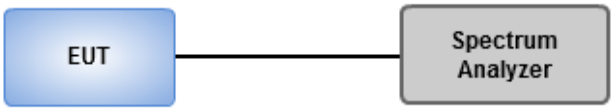
3.6.1 Limit of Channel Separation

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.

3.6.2 Test Procedures

1. Set RBW=10kHz, VBW=30kHz, Sweep time=Auto, Detector=Peak Trace max hold.
2 Allow trace to stabilize.
3 Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The EUT shall show compliance with the appropriate regulatory limit

3.6.3 Test Setup

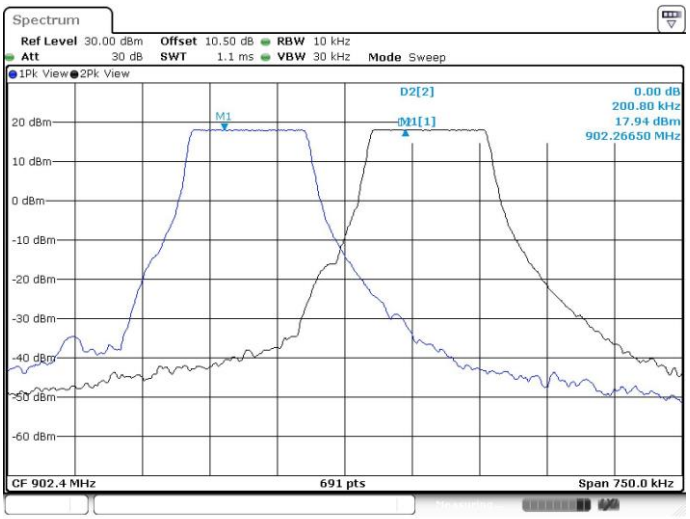


3.6.4 Test result of Channel Separation

Channel Bandwidth (kHz): 125

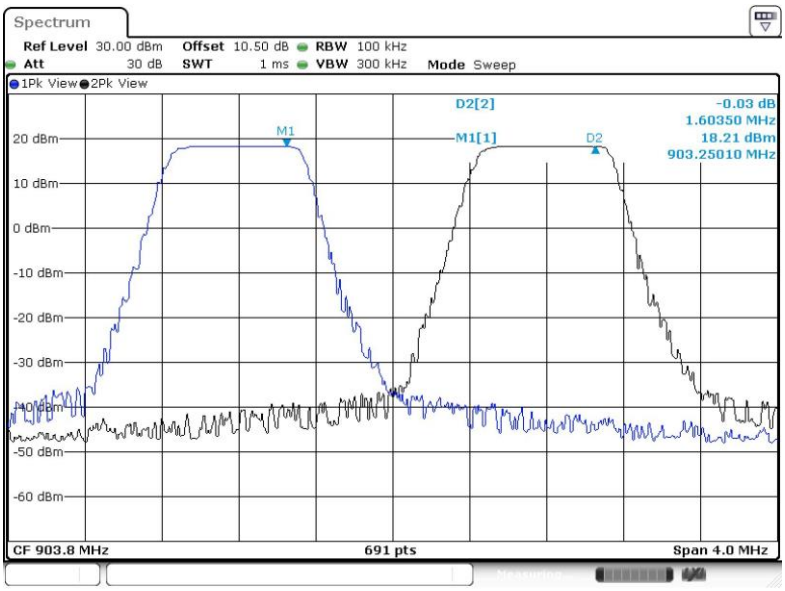
Modulation / SF	Freq. (MHz)	Adjacent Channel Separation (kHz)	20dB Bandwidth (kHz)	Pass/Fail
FSK / 10	902.3	200.80	137.83	Pass
FSK / 10	908.5	200.80	137.83	Pass
FSK / 10	914.9	200.80	137.83	Pass

Worst Plot



Channel Bandwidth (kHz): 500

Modulation / SF	Freq. (MHz)	Adjacent Channel Separation (kHz)	20dB Bandwidth (kHz)	Pass/Fail
FSK / 8	903.0	1603.50	703.30	Pass
FSK / 8	907.8	1603.50	703.30	Pass
FSK / 8	914.2	1603.50	699.00	Pass

Worst Plot


3.7 Number of Dwell Time

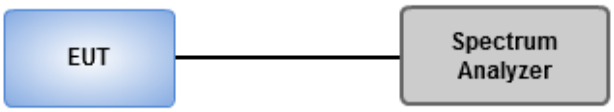
3.7.1 Limit of Dwell time

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems		
☒	902-928 MHz Band:	
	☐	≤ 0.4 second within a 20 second period, 20 dB bandwidth of the hopping channel is less than 250 kHz
	☐	≤ 0.4 second within a 10 second period, 20 dB bandwidth of the hopping channel is 250 kHz or greater
	☒	Hybrid mode ,an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

3.7.2 Test Procedures

1. Set RBW=100 kHz, VBW=300 kHz, Sweep time=6.4s / 500ms, Detector=Peak, Span=0Hz, Trace max hold.
2. Measure and record the burst on time.

3.7.3 Test Setup

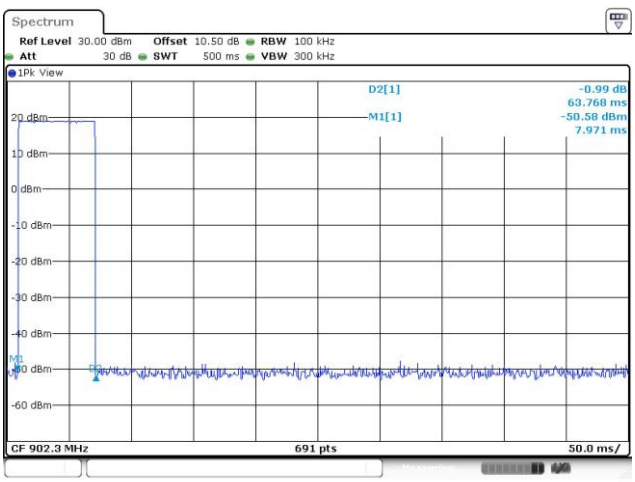


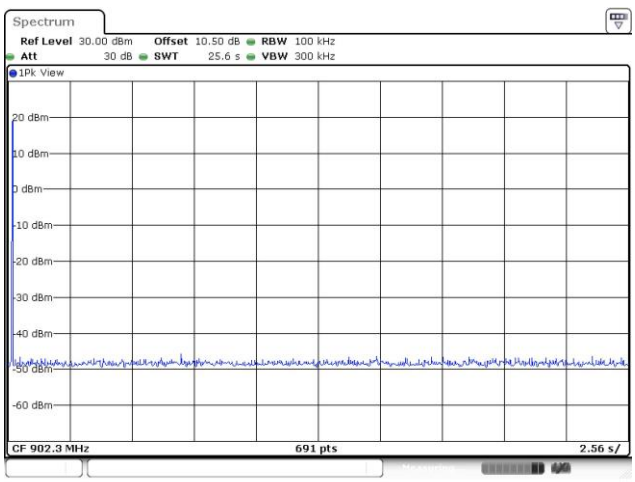
3.7.4 Test Result of Dwell Time

Channel Bandwidth (kHz): 125

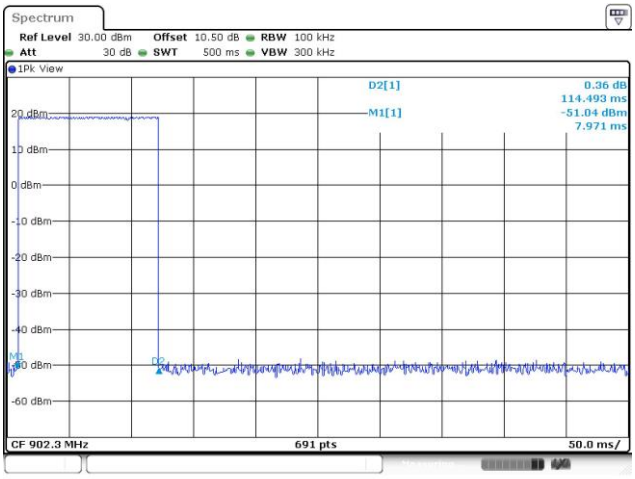
Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 25.6 s (64 Hopping*0.4s)	Result (s)	Limit (s)
FSK / 7	902.3	0.063768	1	0.063768	0.4
FSK / 8	902.3	0.114493	1	0.114493	0.4
FSK / 9	902.3	0.207971	1	0.207971	0.4
FSK / 10	902.3	0.373188	1	0.373188	0.4

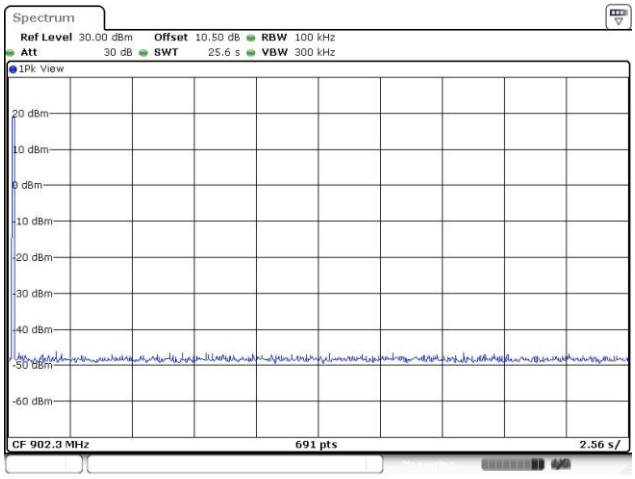
SF 7



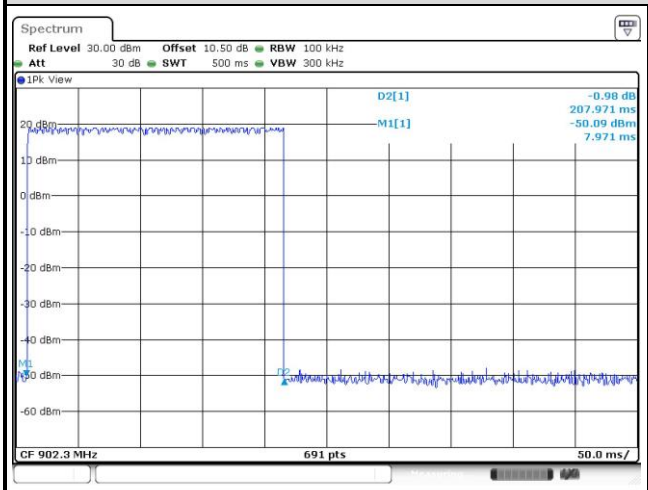


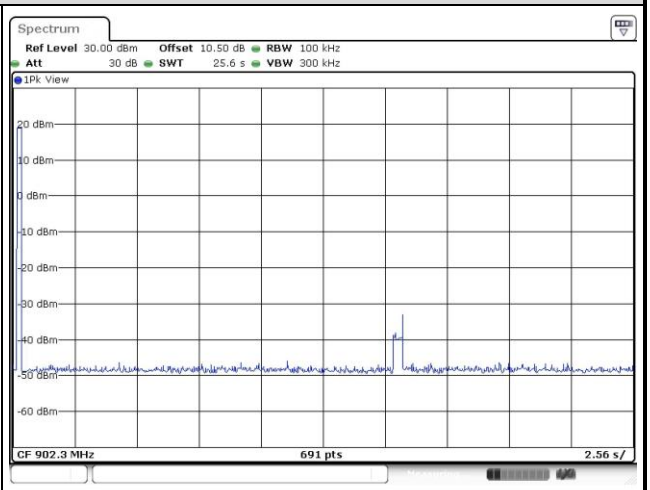
SF 8



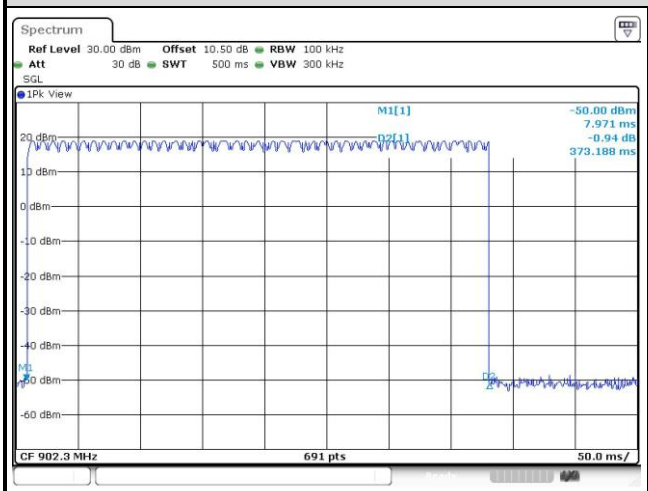


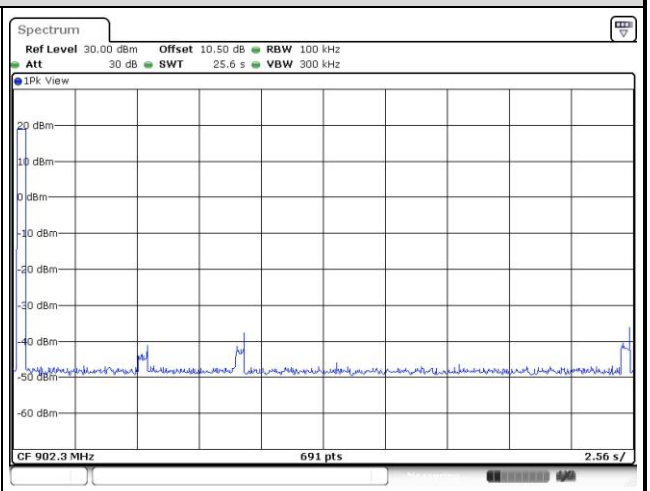
SF 9


Spectrum
Ref Level 30.00 dBm Offset 10.50 dB RBW 100 kHz
Att 30 dB SWT 500 ms VBW 300 kHz
1Pk View
D2[1] -0.98 dB
207.971 ms
M1[1] -50.09 dBm
7.971 ms
CF 902.3 MHz 691 pts 50.0 ms/


Spectrum
Ref Level 30.00 dBm Offset 10.50 dB RBW 100 kHz
Att 30 dB SWT 25.6 s VBW 300 kHz
1Pk View
CF 902.3 MHz 691 pts 2.56 s/

SF 10

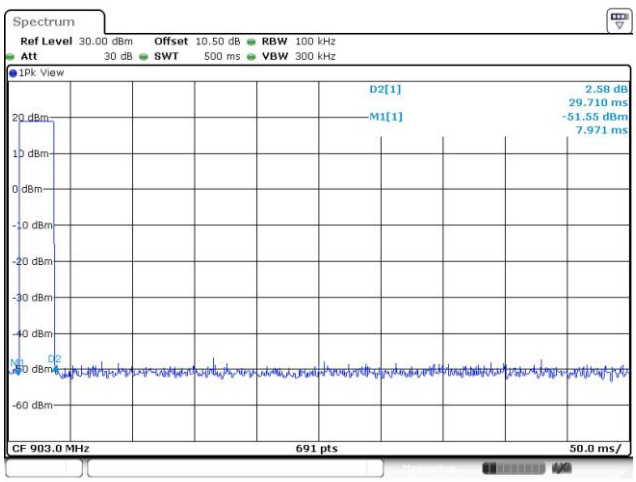

Spectrum
Ref Level 30.00 dBm Offset 10.50 dB RBW 100 kHz
Att 30 dB SWT 500 ms VBW 300 kHz
SGL
1Pk View
M1[1] -50.00 dBm
7.971 ms
D2[1] -0.94 dB
373.188 ms
CF 902.3 MHz 691 pts 50.0 ms/

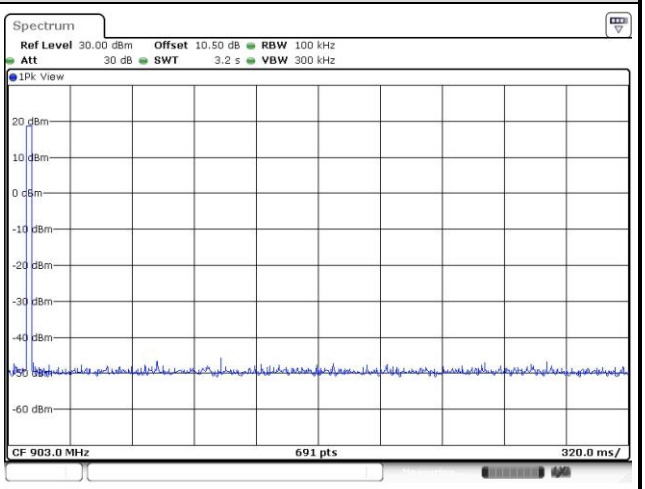

Spectrum
Ref Level 30.00 dBm Offset 10.50 dB RBW 100 kHz
Att 30 dB SWT 25.6 s VBW 300 kHz
1Pk View
CF 902.3 MHz 691 pts 2.56 s/

Channel Bandwidth (kHz): 500

Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 25.6 s (64 Hopping*0.4s)	Result (s)	Limit (s)
FSK / 8	903.0	0.029710	1	0.029710	0.4

SF 8





3.8 Power Spectral Density

3.8.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band. This item is for Hybrid mode.

3.8.2 Test Procedures

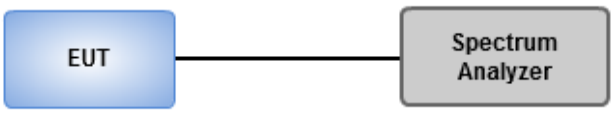
☐ Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.

1. Set the RBW = 3kHz, VBW = 10kHz.
2. Detector = Peak, Sweep time = auto couple.
3. Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

☒ Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.

1. Set the RBW = 3kHz, VBW = 10 kHz.
2. Detector = RMS, Sweep time = auto couple.
3. Employ trace averaging (RMS) mode over a minimum of 100 traces
4. Use the peak marker function to determine the maximum amplitude level.

3.8.3 Test Setup

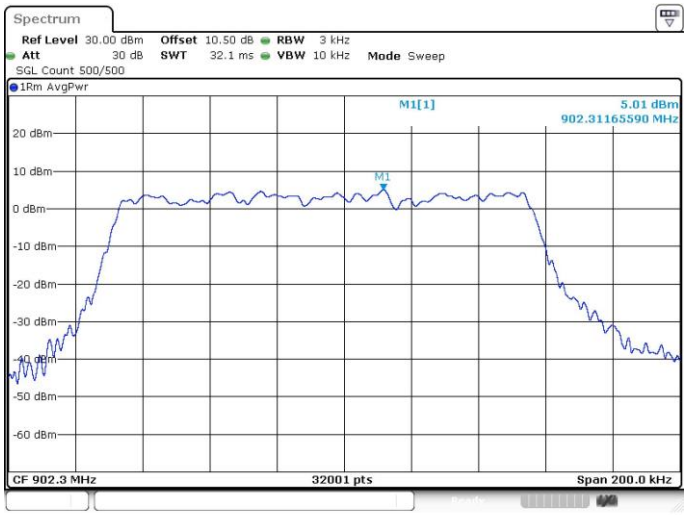


3.8.4 Test Result of Power Spectral Density

Channel Bandwidth (kHz): 125

Modulation / SF	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
FSK / 10	902.3	5.01	8.00
FSK / 10	908.5	4.60	8.00
FSK / 10	914.9	5.01	8.00

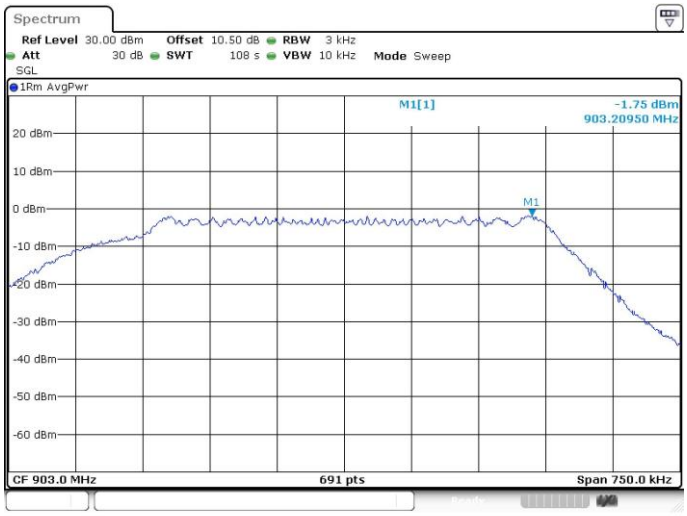
Worst Plot



Channel Bandwidth (kHz): 500

Modulation / SF	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
FSK / 8	903.0	-1.75	8.00
FSK / 8	907.8	-1.84	8.00
FSK / 8	914.2	-1.75	8.00

Worst Plot



4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

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