



Report No. SH16050055W01

FCC RF TEST REPORT

Issued to

Shanghai TopXGun Robotics Co.,Ltd.

For

900Mhz Wireless Digital Radio

Model Name : 900M DATA-LINK
Trade Name : TopXGun
Brand Name : TopXGun
Standard : 47 CFR Part 15, Subpart C
ANSI C63.10-2013
FCC ID : 2AIUJTXG900DL
Test date : Oct.11, 2016
Issue date : Oct.15, 2016



Shanghai Skylabs Co., Ltd.

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**Change History**

Issue	Date	Reason for change
1.0	Oct.15, 2016	First edition



1. General Information

1.1 Applicant

Shanghai TopXGun Robotics Co.,Ltd.

6F,NO.3 Chuqiaocheng,NO.61 Andemeng Street,Yuhua District,Nanjing City,Jiangsu Province,China

1.2 Manufacturer

Shanghai TopXGun Robotics Co.,Ltd.

6F,NO.3 Chuqiaocheng,NO.61 Andemeng Street,Yuhua District,Nanjing City,Jiangsu Province,China

1.3 Description of EUT

EUT Name.....: 900Mhz Wireless Digital Radio
Model Name: 900M DATA-LINK
Brand Name.....: TopXGun
Trade Name: TopXGun
Hardware Version: V1.0
Software Version: V1.0
Type of Equipment.....: Frequency Hopping System
Modulation Type: FSK (10 kbps), GMSK (200 kbps)
Frequency Range.....: 902 - 928 MHz
Channel Number.....: 10kbps: 64 channels; 200kbps: 64 channels
EUT Stage: Production Unit
Antenna Type.....: Half Wave Dipole Antenna
Antenna Gain.....: 2 dBi

NOTE 1:

The EUT is a Wireless Digital Radio. The EUT contains EUT operating at 902-928MHz ISM band. The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately as below:

10kbps: CH0 (902.4MHz), CH33 (915.2MHz) and CH63 (927.6MHz).

200kbps: CH0 (902.4MHz), CH33 (915.2MHz) and CH63 (927.6MHz).

NOTE 2:

For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacture.



Channel and Center Frequency

No.	Channel No.	Center Frequency (MHz)	No.	Channel No.	Center Frequency (MHz)
1	0	902.4	33	32	915.2
2	1	902.8	34	33	915.6
3	2	903.2	35	34	916
4	3	903.6	36	35	916.4
5	4	904	37	36	916.8
6	5	904.4	38	37	917.2
7	6	904.8	39	38	917.6
8	7	905.2	40	39	918
9	8	905.6	41	40	918.4
10	9	906	42	41	918.8
11	10	906.4	43	42	919.2
12	11	906.8	44	43	919.6
13	12	907.2	45	44	920
14	13	907.6	46	45	920.4
15	14	908	47	46	920.8
16	15	908.4	48	47	921.2
17	16	908.8	49	48	921.6
18	17	909.2	50	49	922
19	18	909.6	51	50	922.4
20	19	910	52	51	922.8
21	20	910.4	53	52	923.2
22	21	910.8	54	53	923.6
23	22	911.2	55	54	924
24	23	911.6	56	55	924.4
25	24	912	57	56	924.8
26	25	912.4	58	57	925.2
27	26	912.8	59	58	925.6
28	27	913.2	60	59	926
29	28	913.6	61	60	926.4
30	29	914	62	61	926.8
31	30	914.4	63	62	927.2
32	31	914.8	64	63	927.6

The Modular hops to channel frequencies at the hopping rate set by manufacture with pseudo randomly hopping map. Each frequency is used equally on the average by transmitter, the receiver has the channel bandwidths hopping map and hops matching frequencies shift of transmitter synchronizing.



2. Facilities and Accreditations

2.1 Test Facility

Shanghai Skylabs Co., Ltd. is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6644. A 9*6*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

FCC registration: 196218

2.2 Environmental Conditions

Ambient temperature: 15~35°C

Relative humidity: 30~60%

Atmosphere pressure: 86-106kPa

2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission: $\pm 1.76\text{dB}$

Uncertainty of Radiated Emission: $\pm 3.16\text{dB}$



2.4 List of Equipments Used

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU26	200880	2016.6.17	1year
Power Splitter	Weinschel	1506A	NW521	(n.a.)	(n.a.)
Power Splitter	Mini-Circuits	ZFRSC-183-S+	765001016	(n.a.)	(n.a.)
Attenuator 1	Resnet	10dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)
Full/Semi-Anechoic Chamber	CHENGYU	9.2×6.25×6.15m	SAR	2016.4.11	3year
EMI Test Receiver	R&S	ESCI7	100787	2016.1.28	1year
LISN	TESEQ	NNB 51	33285	2016.1.28	1year
Personal Computer	HP	6300P	CNG24296YW	(n.a.)	(n.a.)
Test Antenna-Horn	Schwarzbeck	BBHA 9120D	9120D-1033	2016.7.24	1year
Test Antenna-Log	Schwarzbeck	VULB 9163	9163-561	2016.9.24	1year
Test Antenna-Loop	Rohde&Schwarz	FMZB 1519	1519-025	2016.9.21	1year
Power supplier	NF	ES2000S	9087735	2016.10.17	1year
RF Cable	(n.a.)	0~18GHz	(n.a.)	(n.a.)	(n.a.)

NOTE:

Equipments listed above have been calibrated and are in the period of validation.

2.5 Accessory Equipment

Product Name	Manufacture	Model	SN.
Laptop	ACER	Aspire 4376ZG	LXPFY0C004935291221601
Laptop Adapter	LITEON	PA-1650-22	9801016502
USB Data Cable	Kewei	Type-C	/



3. Test Standards and Results

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

Test items and the results are as bellow:

No	FCC Rules	Test Type	Result
1	15.247(a)(1)	Number of Hopping Frequency	PASS
2	15.247(b)(2)	Peak Output Power	PASS
3	15.247(a)(1)	20dB Bandwidth	PASS
4	15.247(a)(1)	Carrier Frequency Separation	PASS
5	15.247(a)(1)	Time of Occupancy (Dwell time)	PASS
6	15.247(d)	Conducted Spurious Emission	PASS
7	15.247(d)	Band Edge	PASS
8	15.207	Conducted Emission	PASS
9	15.247(d)	Radiated Emission	PASS
10	15.203 & 15.247(b)	Antenna Requirement	PASS



4. Test Conditions Setting

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Pre-scanned tests were conducted to determine the final configuration from all possible combinations.

The following tables are showing the test modes as the worst cases and recorded in this report.

Data Rate / Modulation	Conducted Mode	Radiated Mode
10 kbps FSK	Channel 0_902.4 MHz	Channel 0_902.4 MHz
	Channel 33_915.2 MHz	Channel 33_915.2 MHz
	Channel 63_927.6 MHz	Channel 63_927.6 MHz
200 kbps FSK	Channel 0_902.4 MHz	Channel 0_902.4 MHz
	Channel 33_915.2 MHz	Channel 33_915.2 MHz
	Channel 63_927.6 MHz	Channel 63_927.6 MHz

The EUT configuration is EUT + PC.

Mode 1: Continuous Transmitting Mode

During the measurement, EUT is working in the continuous transmitting mode in appropriate Channel controlled by PC software with Hopping Off.

Mode 2: Hopping On Mode

During the measurement, EUT is working in working condition hopping on transmitting mode set by PC software. In this test mode, the PC of laptop exchanges data with EUT.



5. 47 CFR Part 15C requirements

5.1 Antenna requirement

5.1.1 Applicable standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

5.1.2 Result: Compliant

The antenna connector on the EUT is RP-SMA female conductor. Only the authorized antenna by manufacturer can be installed on the EUT. Please refer to internal photo file/external photo file.



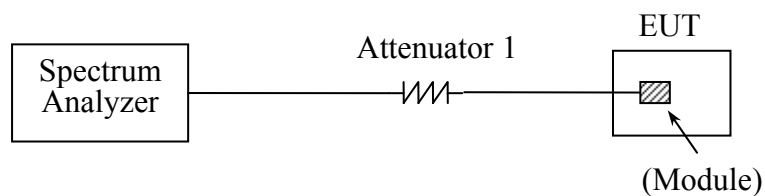
6. Test Result

6.1 Number of Hopping Frequency

6.1.1 Requirement

According to FCC section 15.247(a)(1)(i), 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.

6.1.2 Test Setup



The EUT is coupled to the Spectrum Analyzer (SA) with Attenuators. The RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Measurement setting, Mode 2: Hopping On Mode



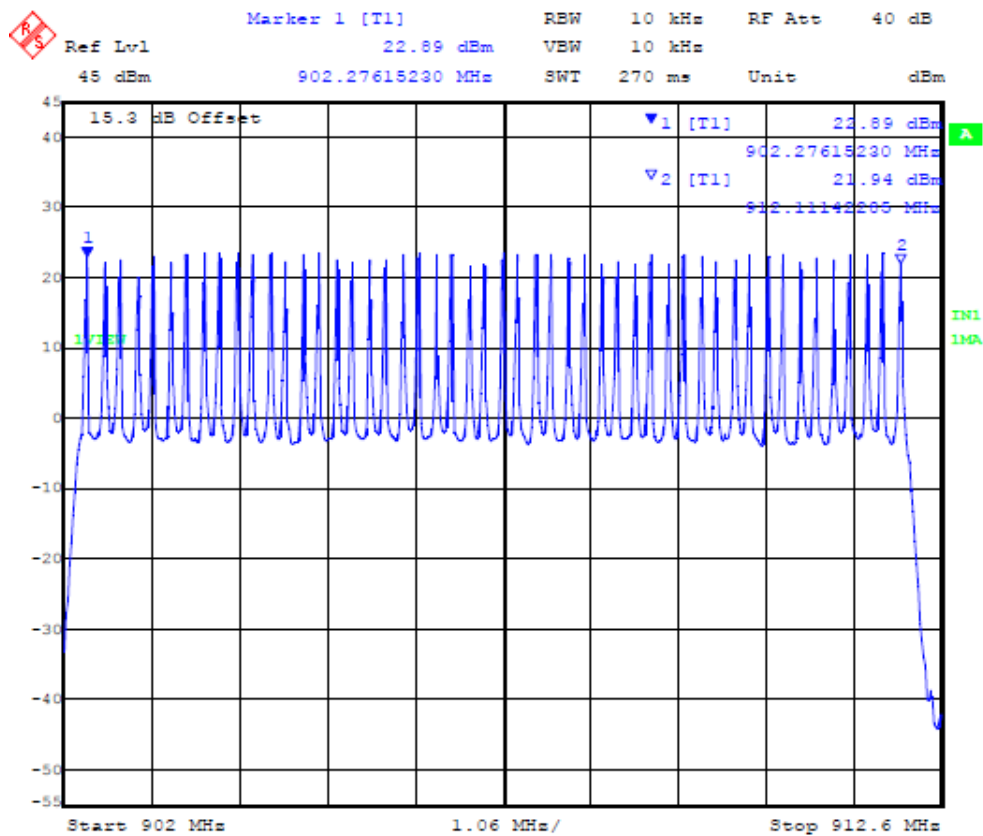
6.1.3 Test Result

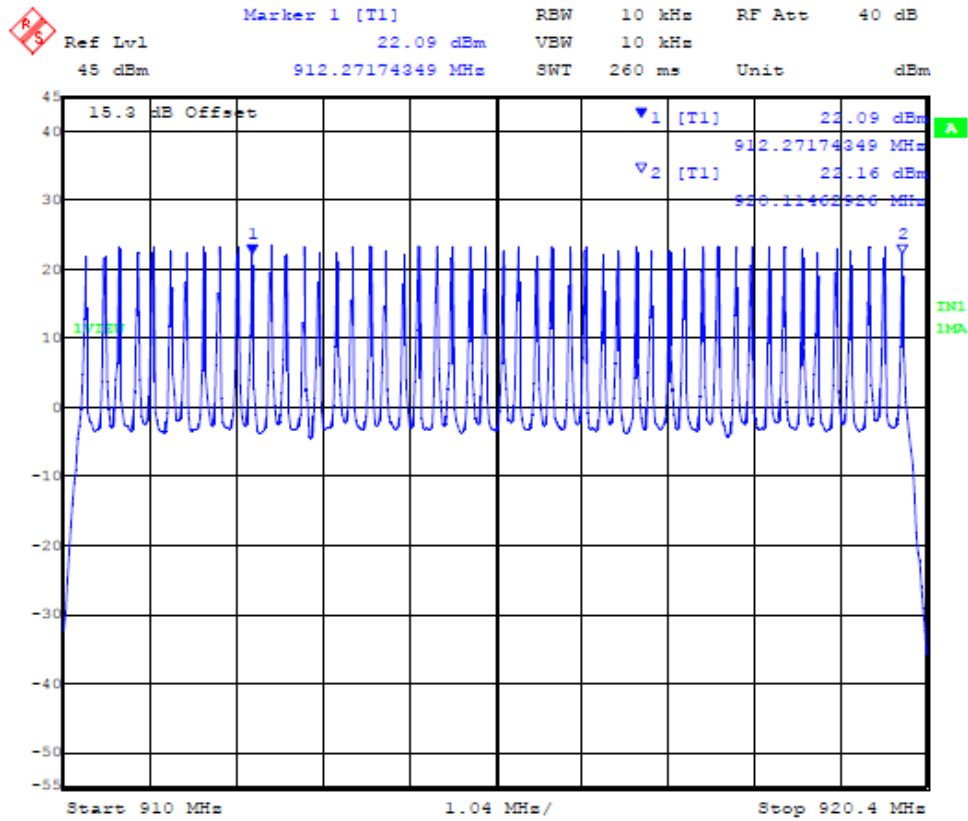
The EUT operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency compliance to Hopping Sequence and Equal Usage of the channels.

A. Test Verdict:

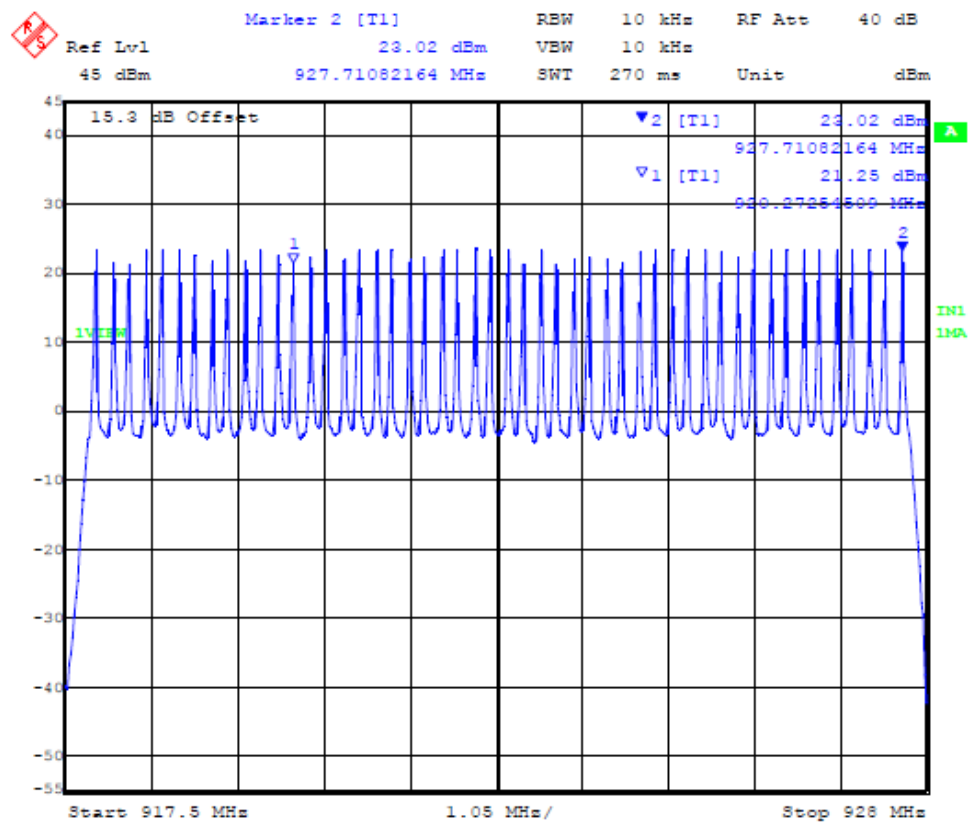
Data Rate	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
10 kbps	902 - 928	64	25	Plot A1/A2/A3	PASS
200 kbps	902 - 928	64	25	Plot C1/C2/C3	PASS

B. Test Plot:

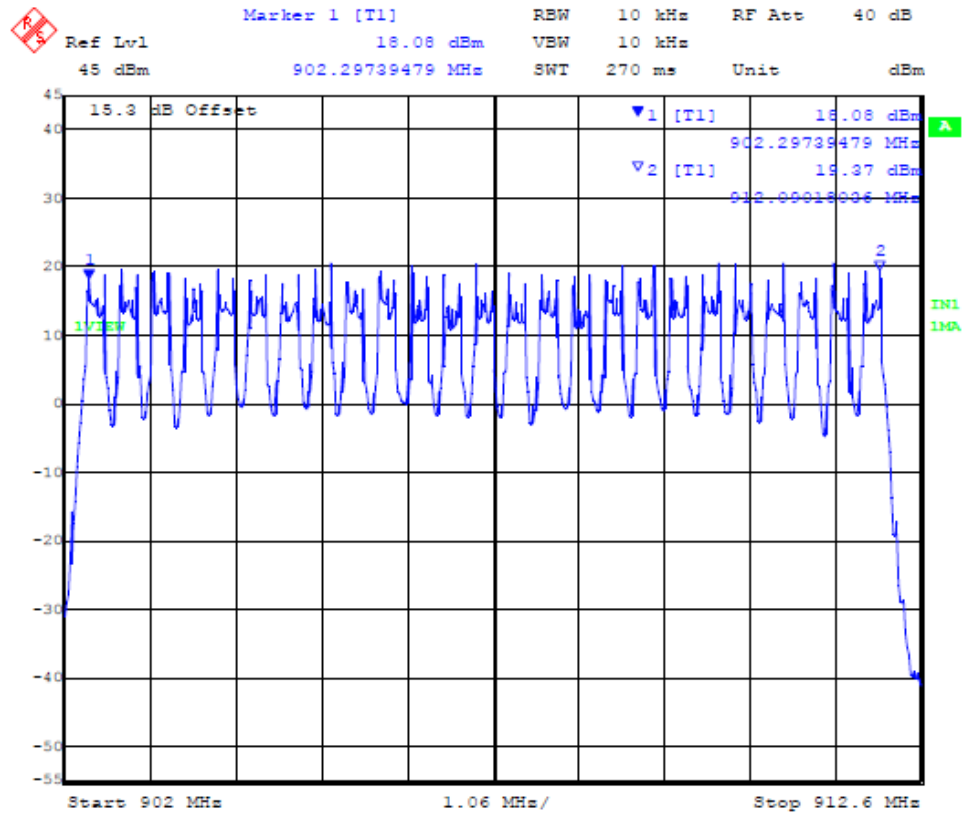




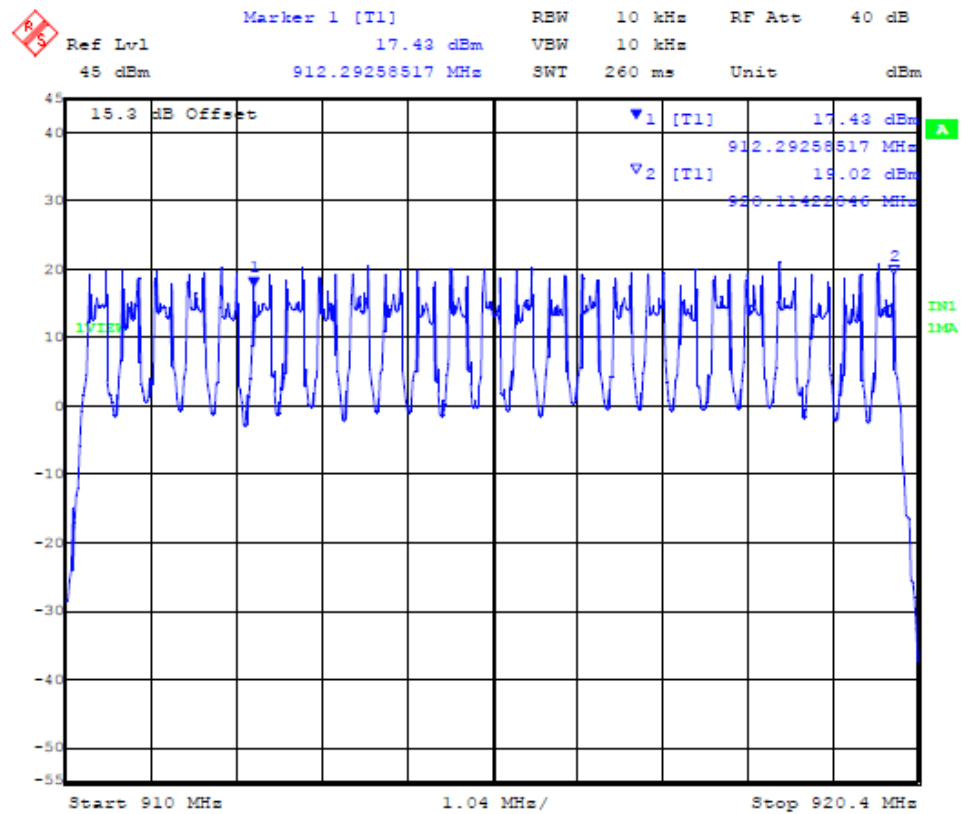
Plot A2 (10 kbps Number of Transmission Channels – Mid Band)



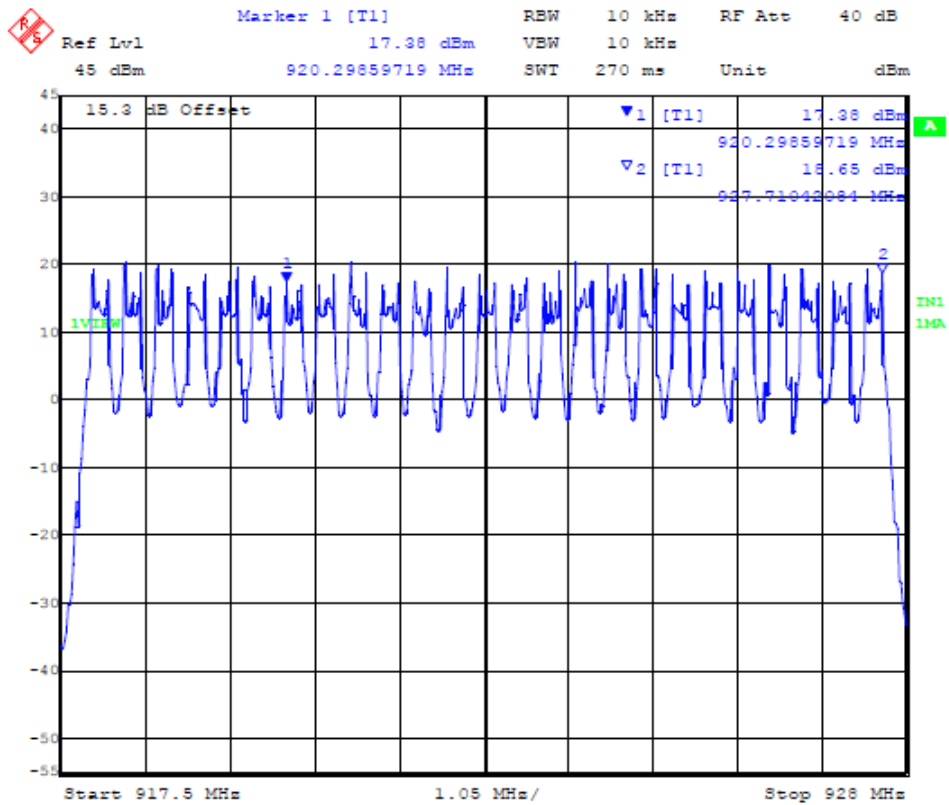
Plot A3 (10 kbps Number of Transmission Channels – Upper Band)



Plot C1 (200 kbps Number of Transmission Channels – Low Band)



Plot C2 (200 kbps Number of Transmission Channels – Mid Band)



Plot C3 (200 kbps Number of Transmission Channels – Upper Band)



6.2 Peak Output Power

6.2.1 Requirement

According to FCC section 15.247(b)(2), 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.

6.2.2 Test Setup

See section 6.1.2 of this report.

Measurement setting , Mode 1: Continuous Transmitting Mode

6.2.3 Test Result

The Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

A. Test Verdict:

10kbps

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	902.4	24.29	0.26853	30	1	PASS
33	915.2	24.74	0.29648			PASS
63	927.6	24.54	0.28445			PASS

200kbps

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	902.4	23.96	0.24889	30	1	PASS
33	915.2	24.27	0.26730			PASS
63	927.6	24.09	0.25645			PASS



Ref Lvl 35 dBm

Marker 1 [T1] 3.26 dBm

RBW 1 MHz

VBW 1 MHz

SWT 5 s

Unit dBm

RF Att 30 dB

15.3 dB Offset

D1 23.284 dBm

D2 3.284 dBm

CH FWR 24.28 dBm

CH BW 3.37474950 MHz

▼ 1 [T1] 3.26 dBm

900.71262525 MHz

▼ 2 [T1] 23.28 dBm

902.28376754 MHz

Δ 1 [T1] 0.12 dB

3.37474950 MHz

Center 902.4 MHz

400 kHz/

Span 4 MHz

Marker 1 [T1]

Ref Lvl 35 dBm

3.68 dBm

913.51262525 MHz

RBW 1 MHz

VBW 1 MHz

SWT 5 s

RF Att 30 dB

Unit dBm

15.3 dB Offset

▼ 1 [T1] 3.68 dBm

913.51262525 MHz

D1 23.731 dBm

CH EWR

24.74 dBm

SW BW

3.38276553 MHz

▼ 2 [T1] 23.73 dBm

915.29218437 MHz

△ 1 [T1] 0.38 dB

3.38276553 MHz

D1 3.731 dBm

1V1EW

IN1 1MA

C0

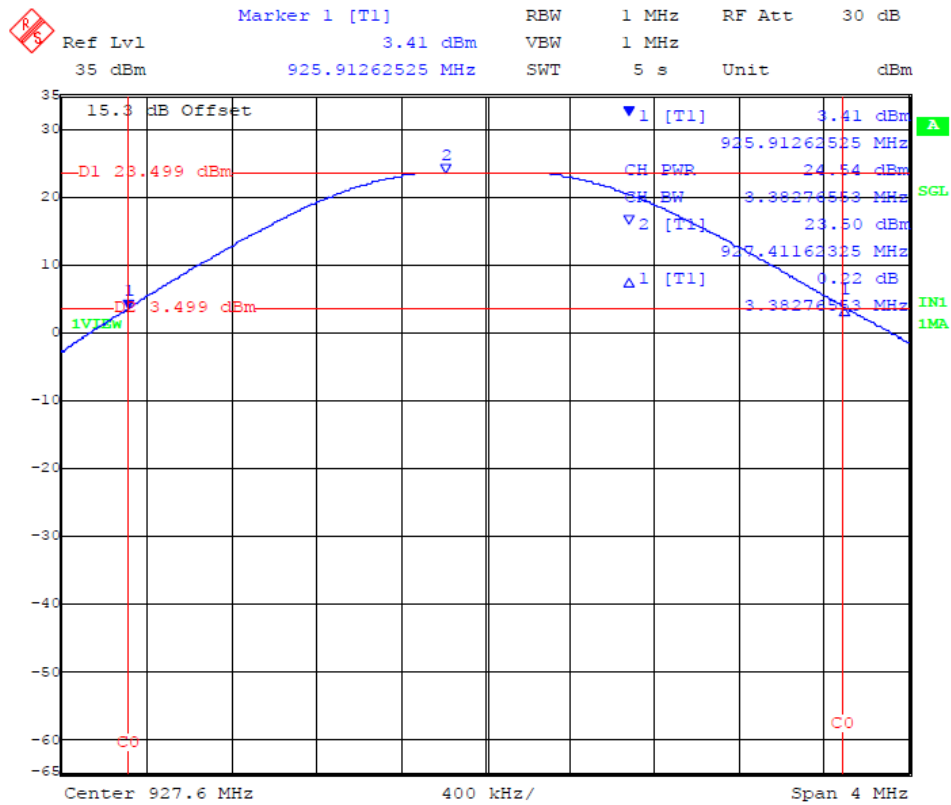
C0

Center 915.2 MHz

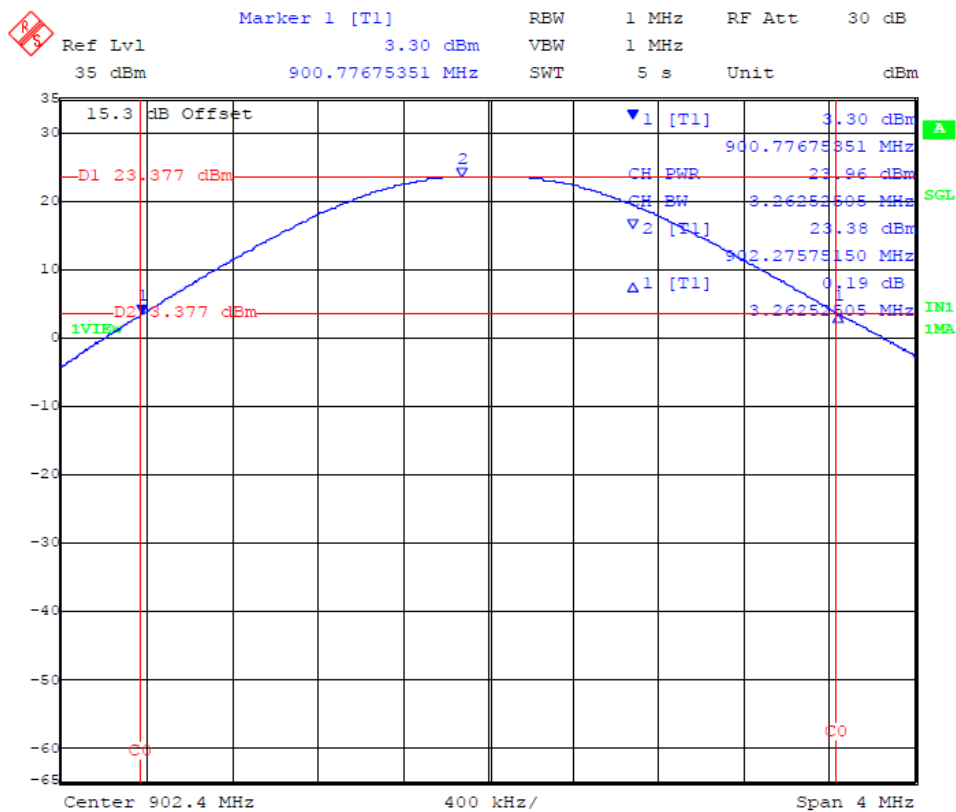
400 kHz/

Span 4 MHz

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10kbps Channel 63



200kbps Channel 0





6.3 20dB Bandwidth

6.3.1 Definition

The 20dB bandwidth ($10 \cdot \log 1\% = 20\text{dB}$) taking the total RF output power.

6.3.2 Test Setup

See section 6.1.2 of this report.

Measurement setting , Mode 1: Continuous Transmitting Mode

6.3.3 Test Result

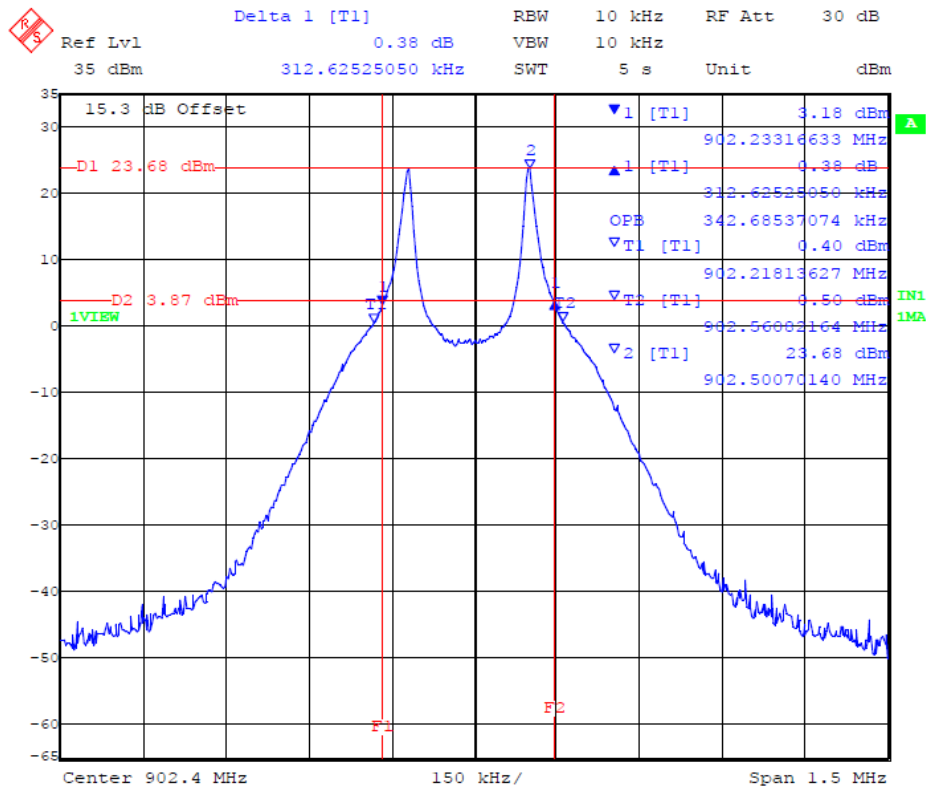
The EUT operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

A. Test Verdict

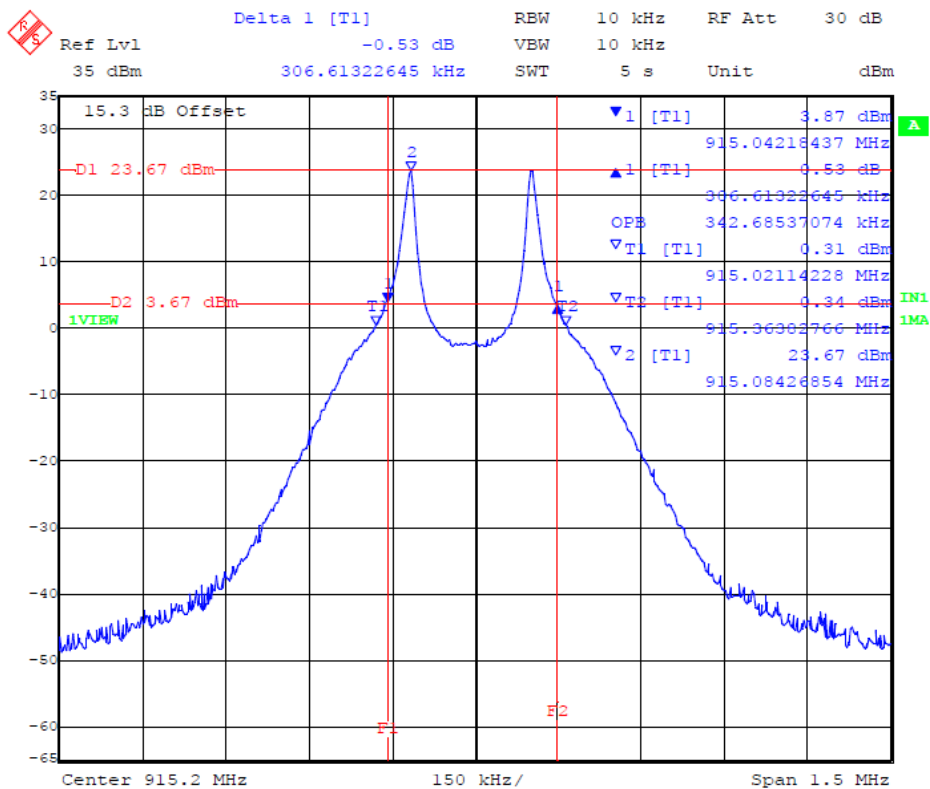
Data Rate	Channel	Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Refer to Plot
10kbps	0	902.4	312.625	<500	Plot A
	33	915.2	306.613		Plot B
	63	927.6	309.118		Plot C
200kbps	0	902.4	387.776		Plot G
	33	915.2	384.770		Plot H
	63	927.6	357.715		Plot I



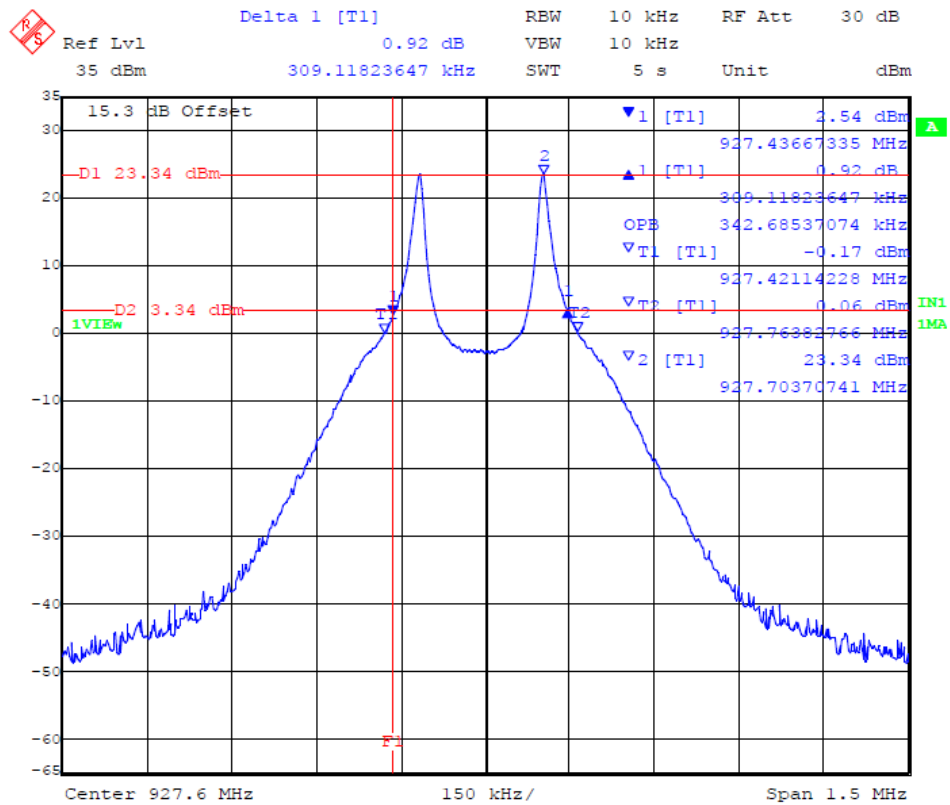
B. Test Plot:



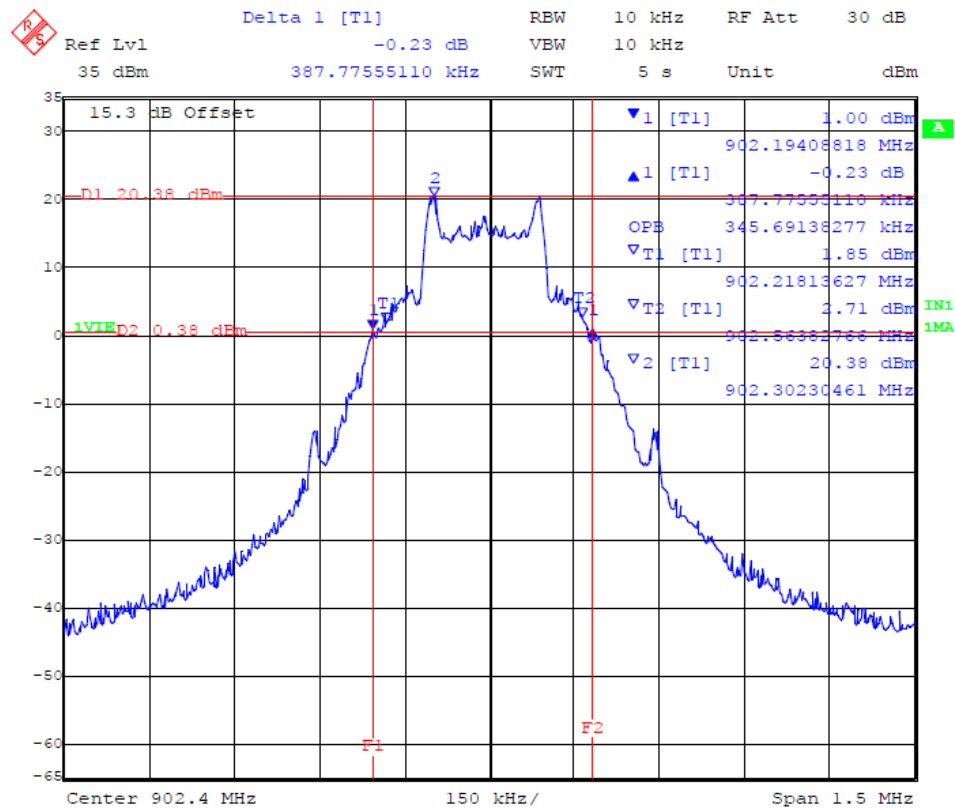
(Plot A: 10kbps Channel 0)



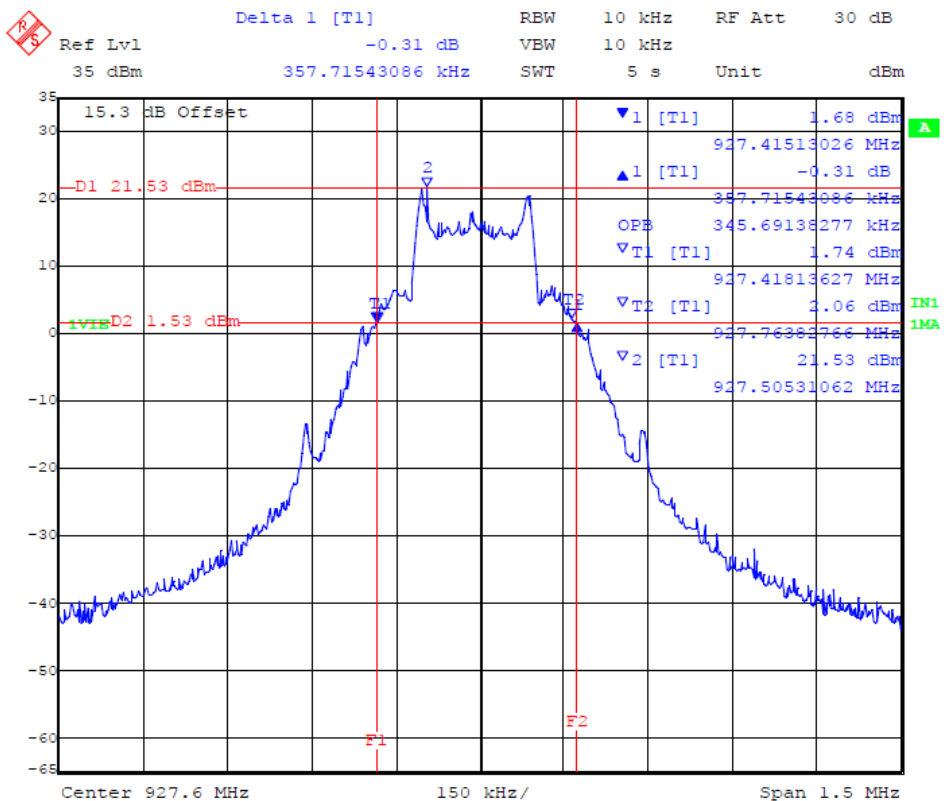
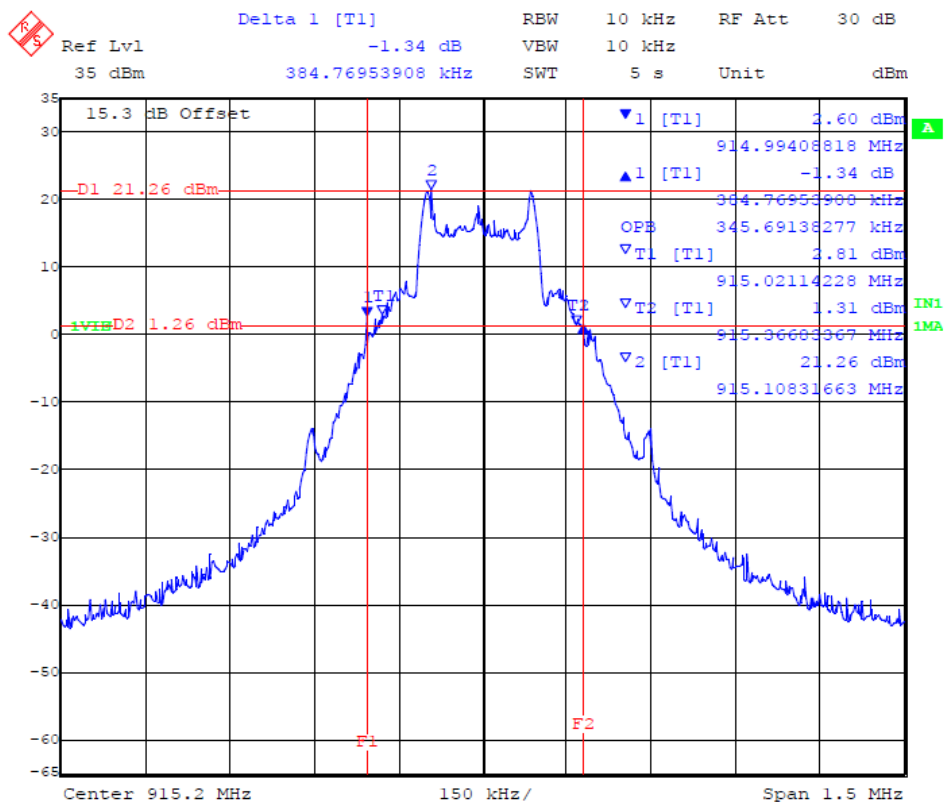
(Plot B: 10kbps Channel 33)



(Plot C: 10kbps Channel 63)



(Plot G: 200kbps Channel 0)





6.4 Carried Frequency Separation

6.4.1 Definition

According to FCC section 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

6.4.2 Test Setup

See section 6.1.2 of this report.

Measurement setting, Mode 2: Hopping On Mode

6.4.3 Test Result

The EUT operates at hopping-on test mode.

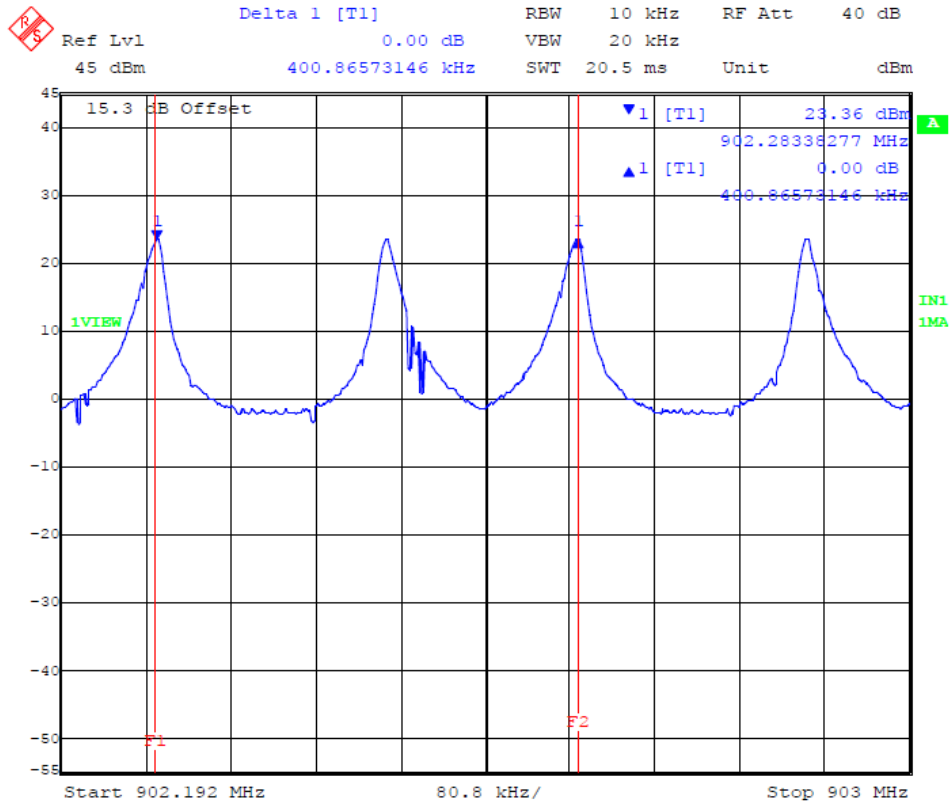
For any adjacent channels, the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater. So, the verdict is PASS.

A. Test Verdict:

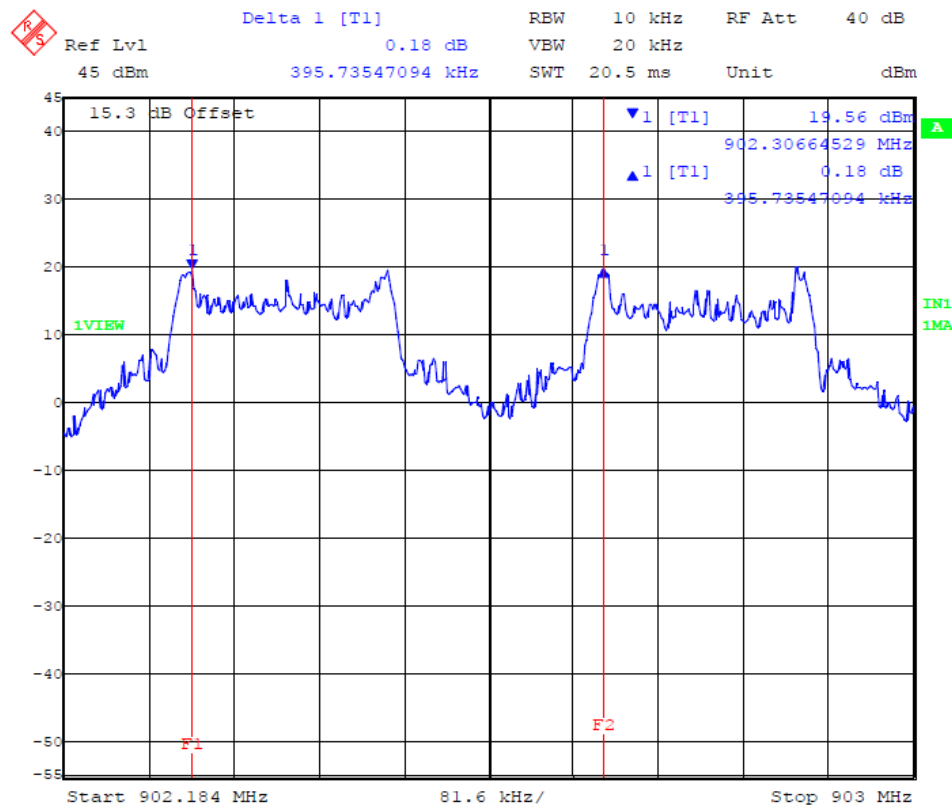
Data Rate	Carried Frequency Separation (KHz)	Limit (MHz)	Refer to Plot	Result
10kbps	400.866	0.025 or 2/3 the 20dB bandwidth	Plot A	PASS
200kbps	395.735	0.025 or 2/3 the 20dB bandwidth	Plot C	PASS



Test Plot:



(Plot A: 10kbps)



(Plot C: 200kbps)



6.5 Time of Occupancy (Dwell time)

6.5.1 Requirement

According to FCC section 15.247(a)(1)(i), 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.

6.5.2 Test Setup

See section 6.1.2 of this report.

Measurement setting , Mode 1: Continuous Transmitting Mode

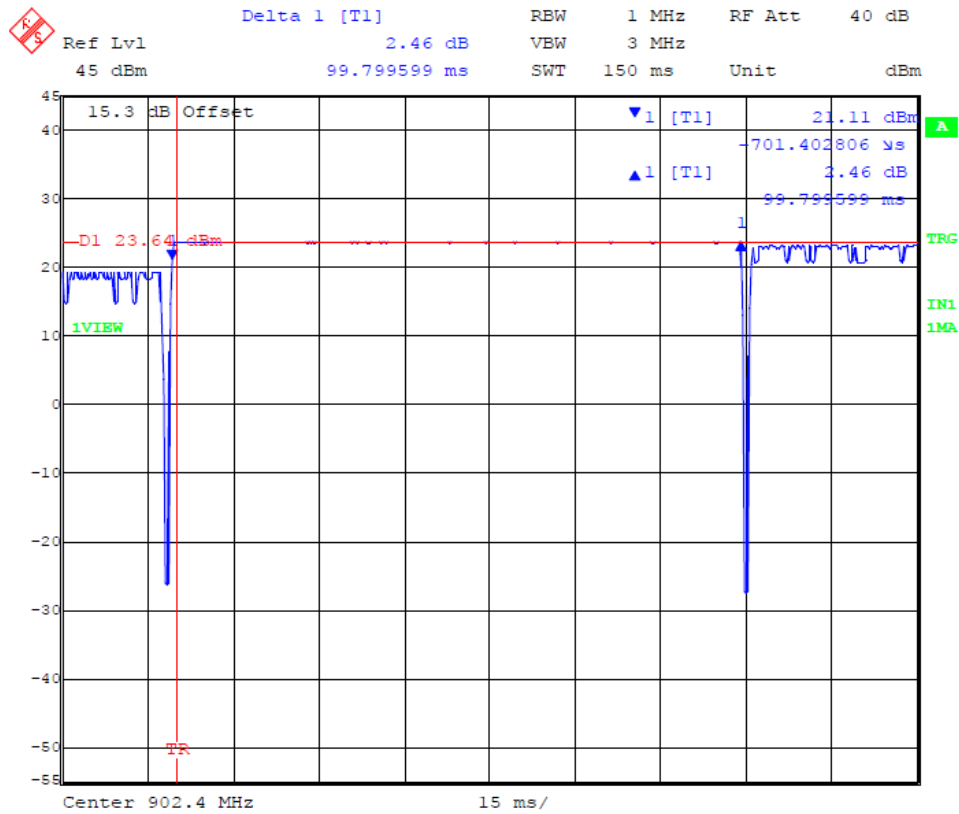
6.5.3 Test Result

A. Test Verdict:

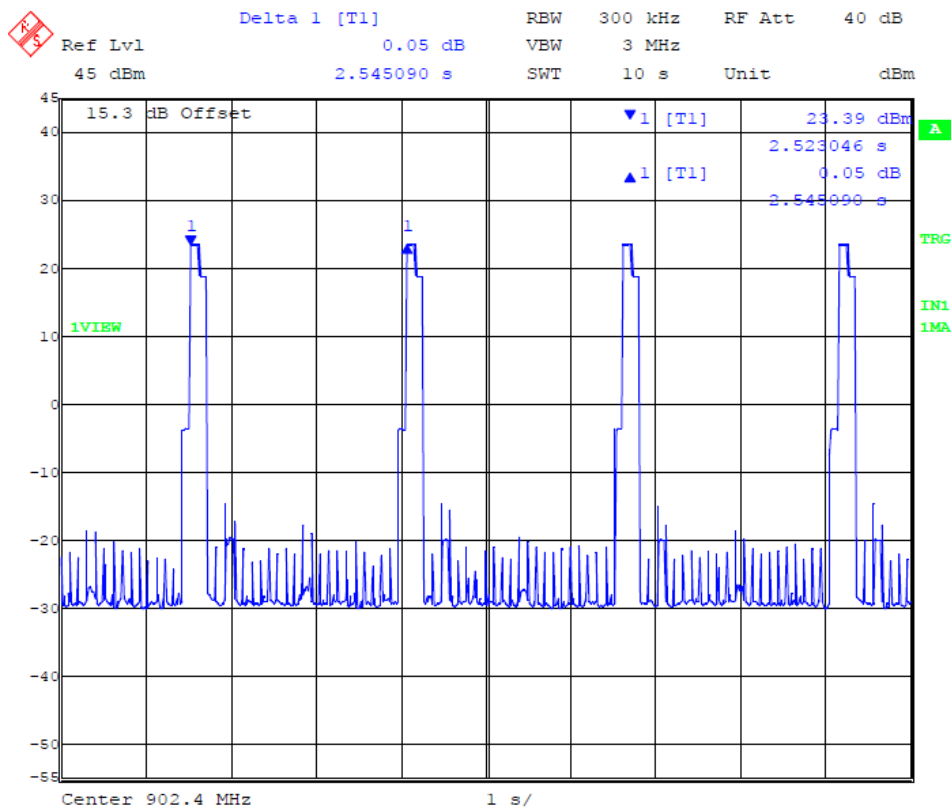
Data Rate	Channel	Channel Dwell Time (single channel) (ms)	Channel Occupancy within 10 Second Period (ms)	Plot	Limit (ms)	Result
10kbps	0	99.800	$4 \times 99.800 = 399.200$	Plot A1/A2	400	PASS
200kbps	0	99.449	$4 \times 99.449 = 397.796$	Plot C1/C2	400	PASS



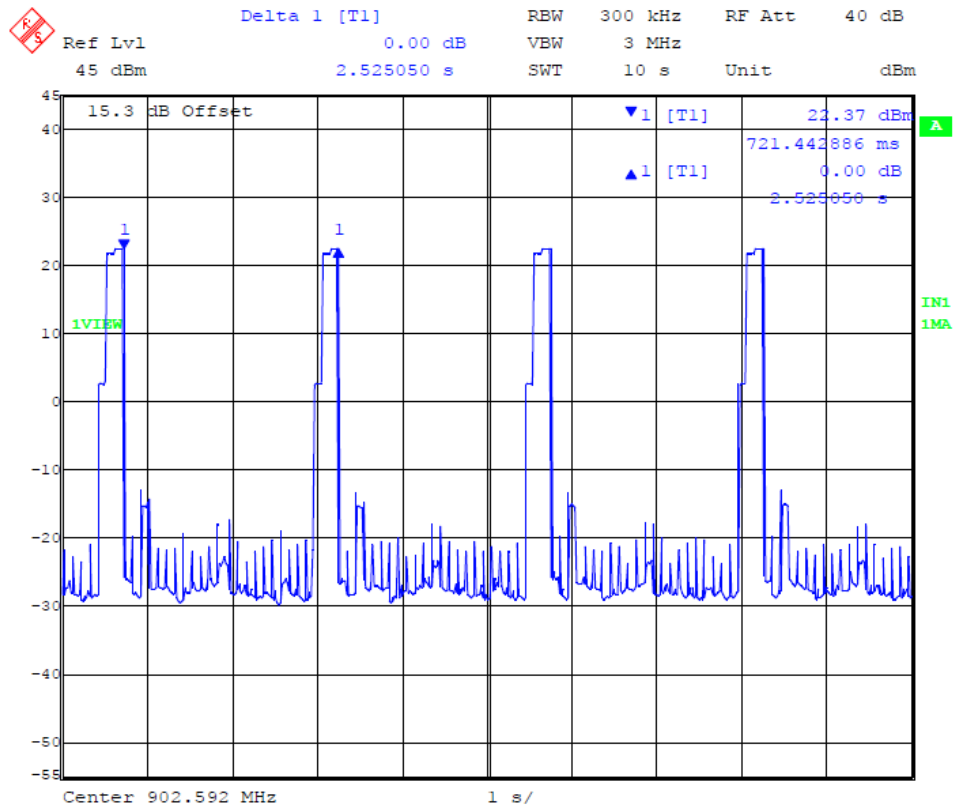
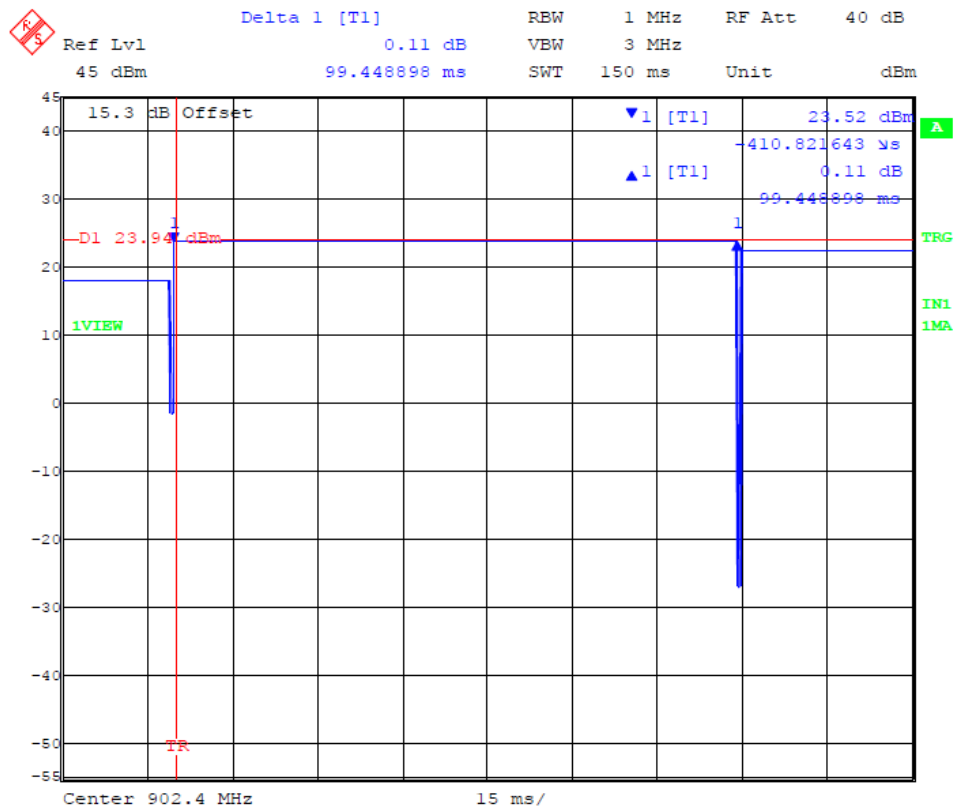
Test Plot:



Plot A1: 10kbps



Plot A2: 10kbps





6.6 Conducted Spurious Emissions

6.6.1 Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

6.6.2 Test Setup

See section 6.1.2 of this report.

Measurement setting , Mode 1: Continuous Transmitting Mode

6.6.3 Test Result

The EUT operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

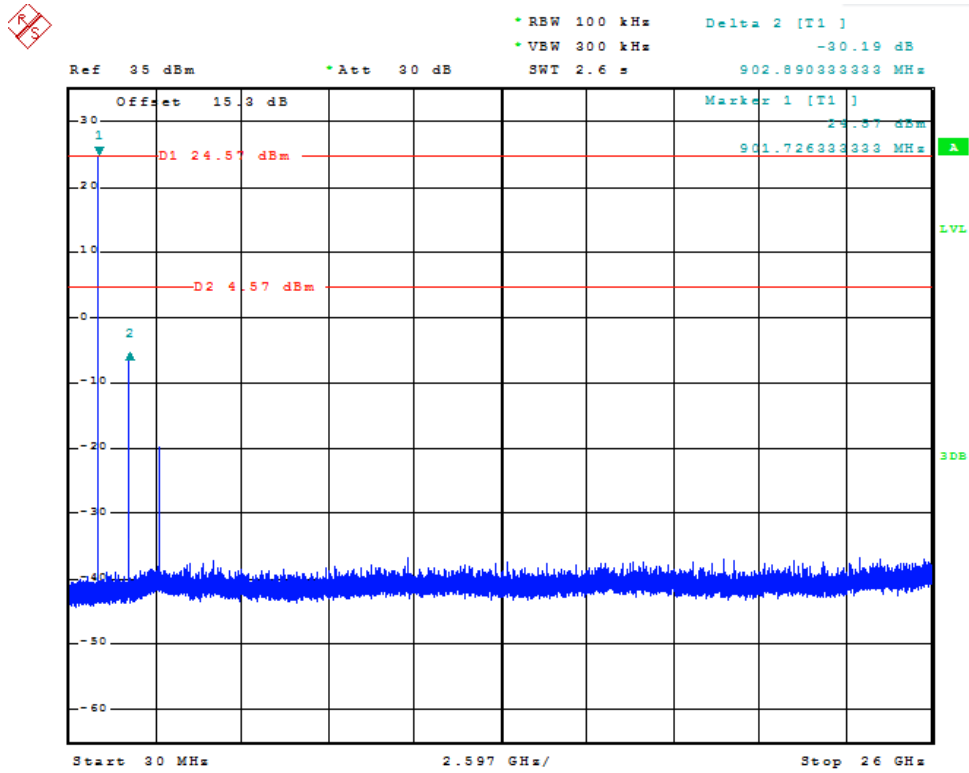
A. Test Verdict

Data rate: 10kbps

Channel	Frequency (MHz)	Measured Max Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Result
				Carrier Level	Calculated -20dBc Limit	
0	902.4	-5.62	Plot A	24.57	4.57	PASS
33	915.2	-8.16	Plot B	23.81	3.81	PASS
63	927.6	-8.25	Plot C	23.42	3.42	PASS

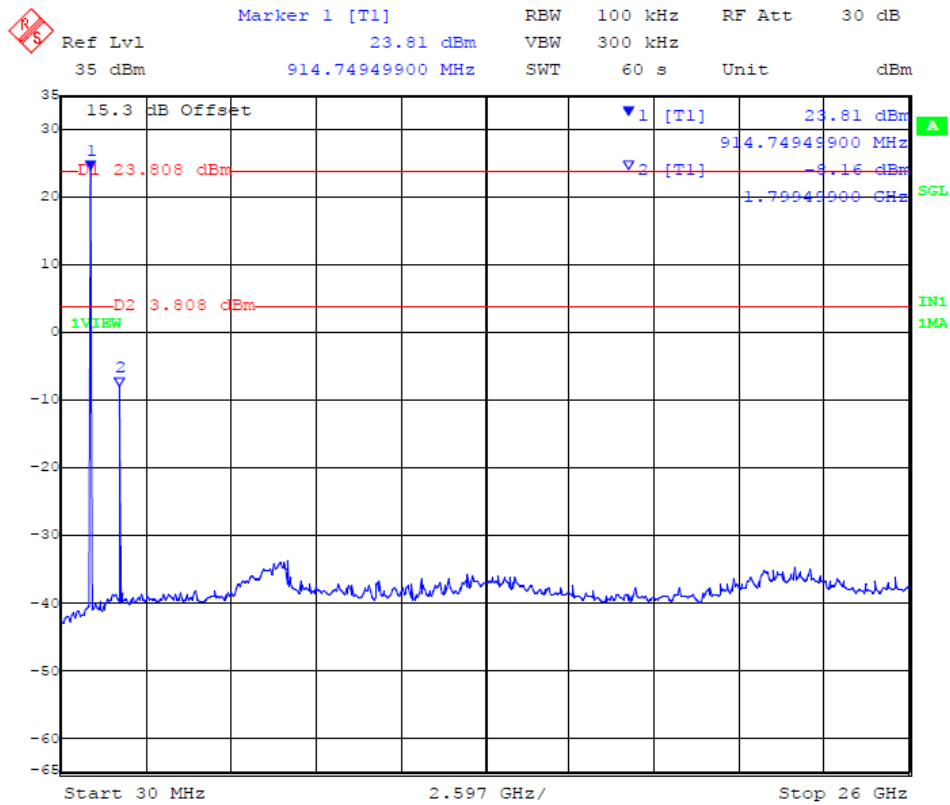


Test Plot

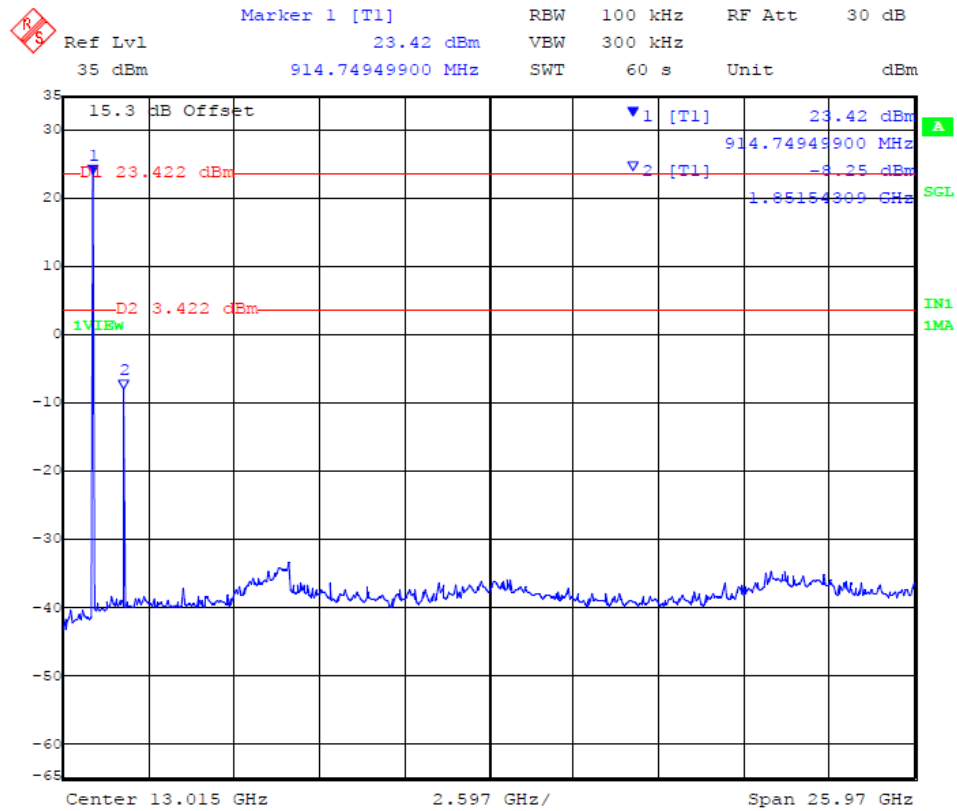


Date: 12.DEC.2016 17:10:36

Plot A



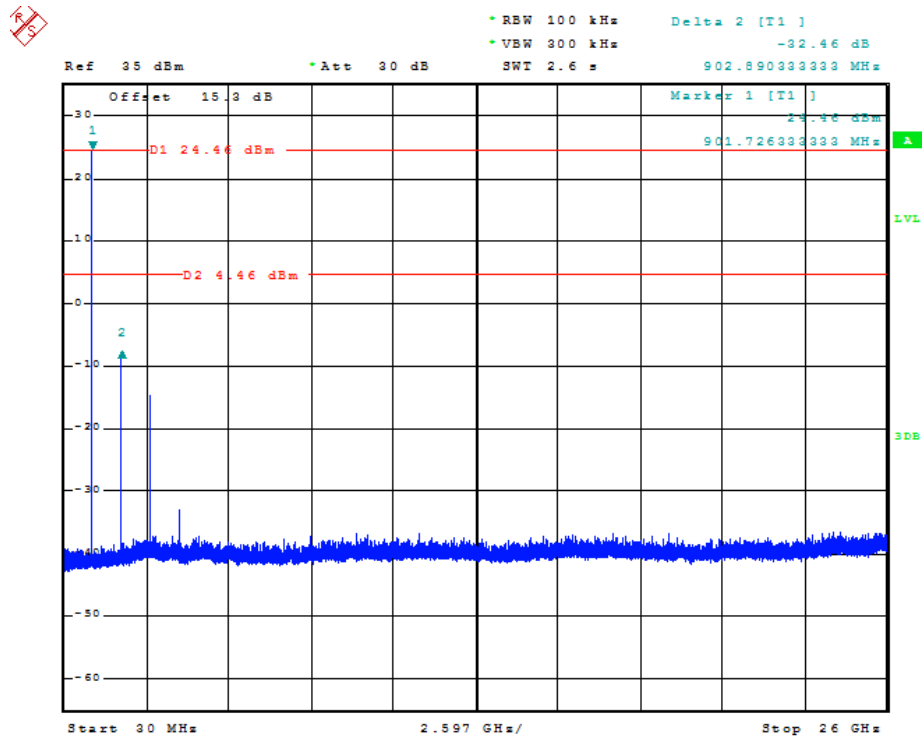
Plot B



Plot C

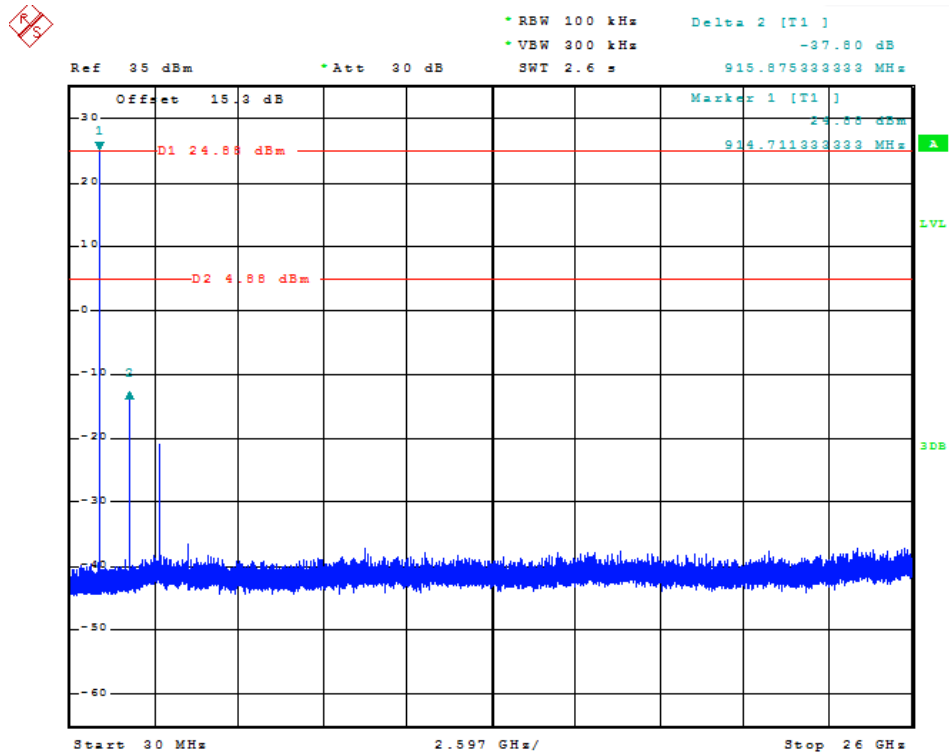
Data rate: 200kbps

Channel	Frequency (MHz)	Measured Max Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Result
				Carrier Level	Calculated -20dBc Limit	
0	902.4	-8.00	Plot D	24.46	4.46	PASS
33	915.2	-12.92	Plot E	24.88	4.88	PASS
63	927.6	-12.9	Plot F	24.77	4.77	PASS



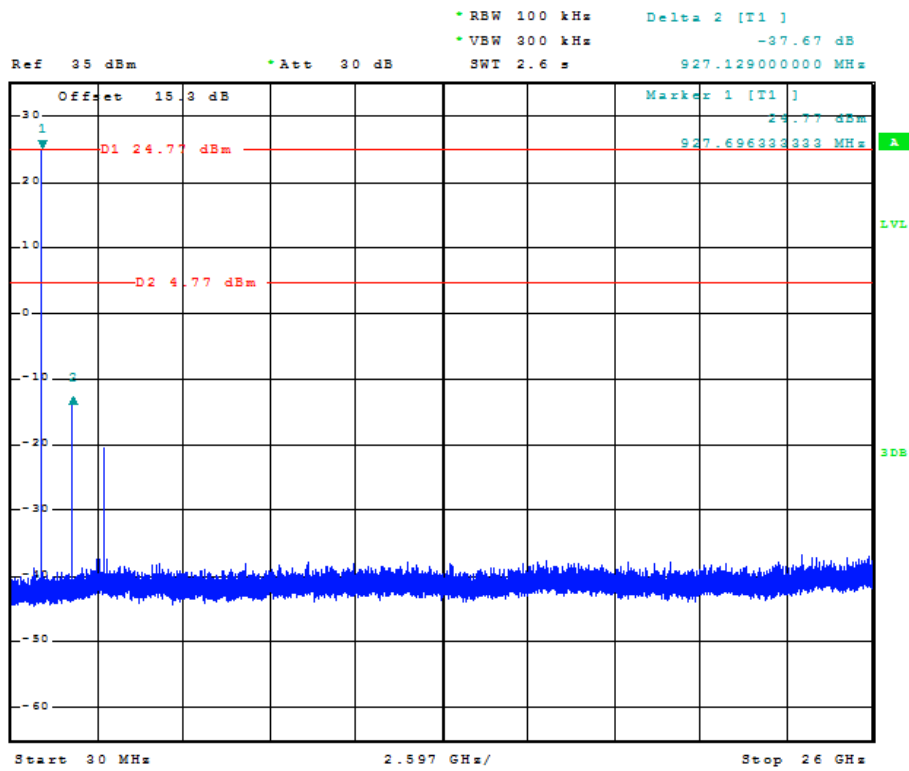
Date: 12.DEC.2016 16:59:26

Plot D



Date: 12.DEC.2016 17:06:23

Plot E



Date: 12.DEC.2016 17:08:10

Plot F



6.7 Band Edge

6.7.1 Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

6.7.2 Test Setup

See section 6.1.2 of this report.

Measurement setting , Mode 1: Continuous Transmitting Mode

6.7.3

6.7.4 Test Result

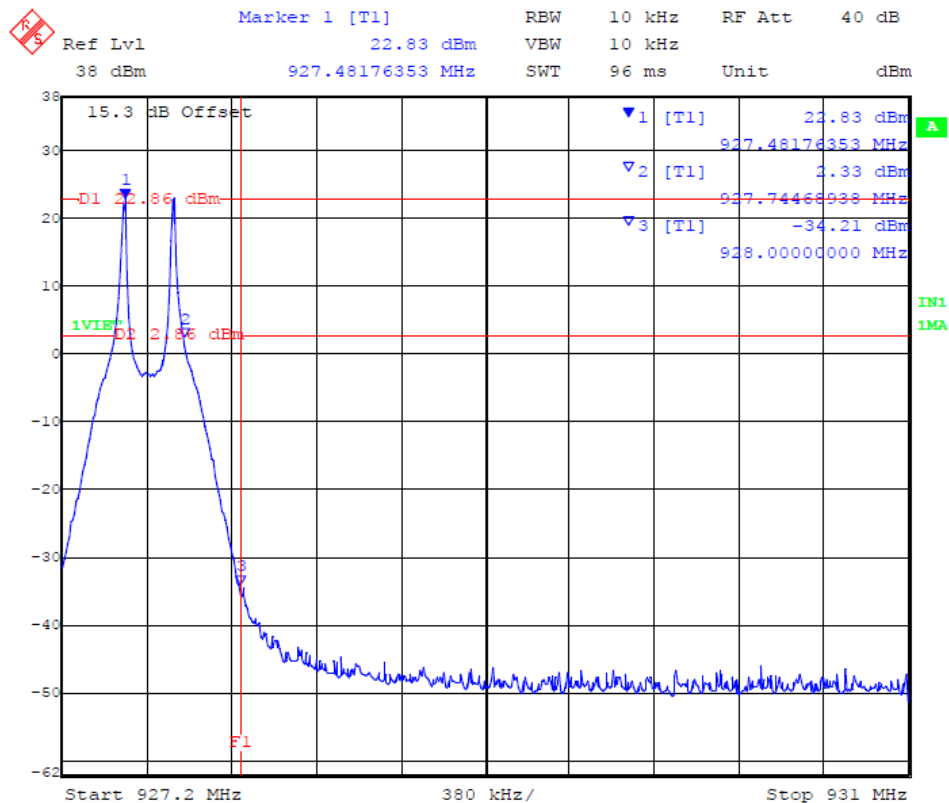
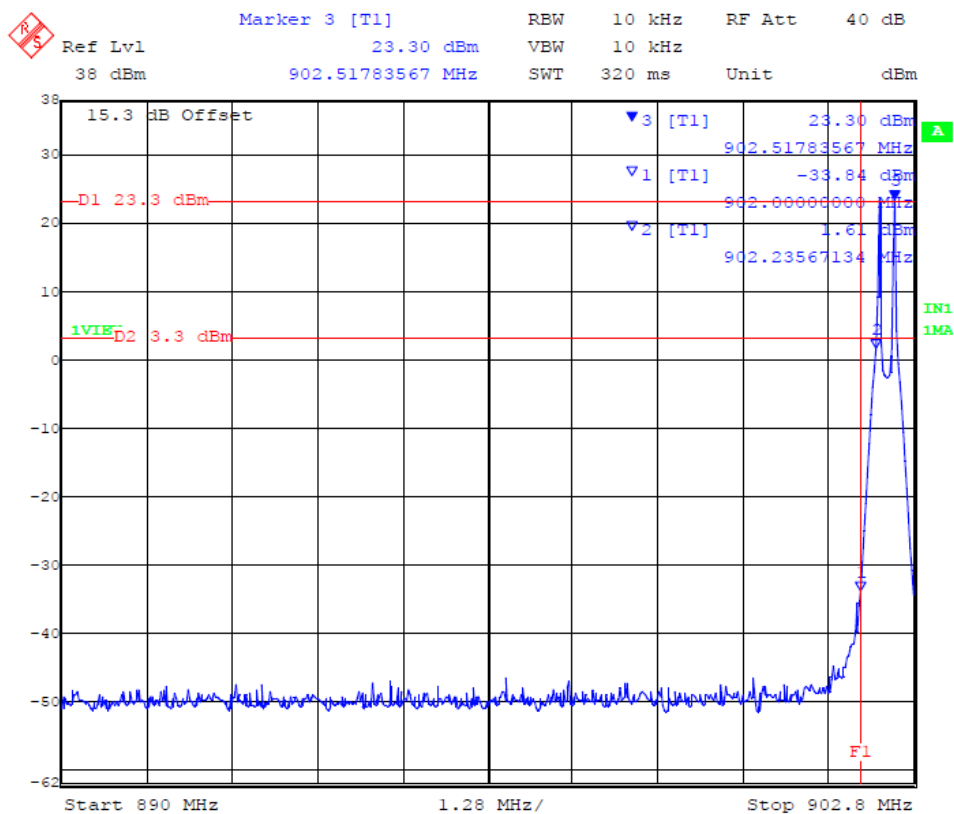
The EUT operates at both hopping-off test mode and hopping-on mode. The worst case (hopping-off mode) is recorded in the report. The lowest and highest channels are tested to verify the band edge emissions.

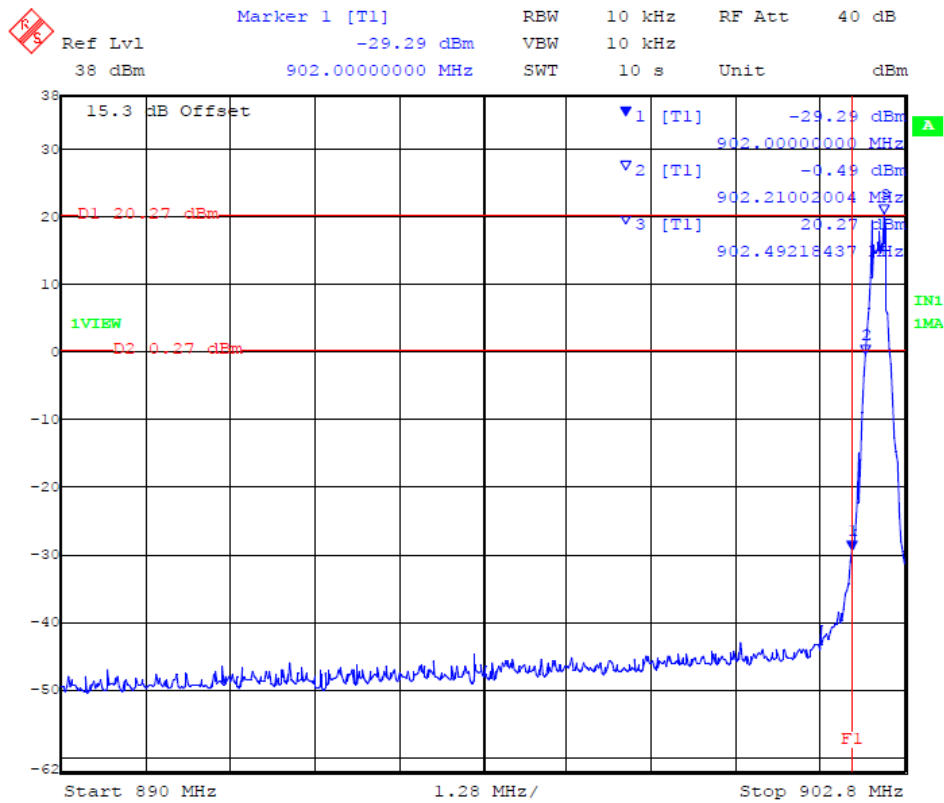
Data rate: 10kbps

Channel	Frequency (MHz)	Band-edge Frequency (MHz)	Amplitude @ Band-edge (dBm)	Plot	Limit (dBm)	Result
0	902.4	902.0	-33.84	Plot A	3.30	PASS
63	927.6	928.0	-34.21	Plot B	2.86	PASS

Data rate: 200kbps

Channel	Frequency (MHz)	Band-edge Frequency (MHz)	Amplitude @ Band-edge (dBm)	Plot	Limit (dBm)	Result
0	902.4	902.0	-29.29	Plot E	0.27	PASS
63	927.6	928.0	-32.07	Plot F	-0.36	PASS





Plot E



Plot F



6.8 Conducted Emission

6.8.1 Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network(LISN).

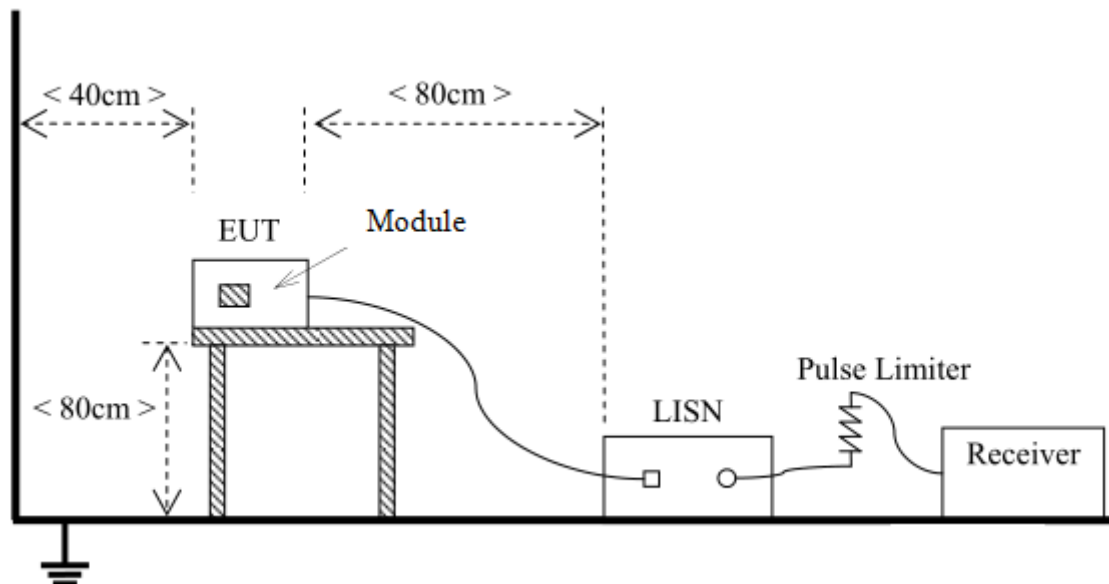
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

6.8.2 Test Description

The EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10:2013



Measurement setting, Mode 2: Hopping On Mode

Test Voltage: 120 V AC, 60Hz

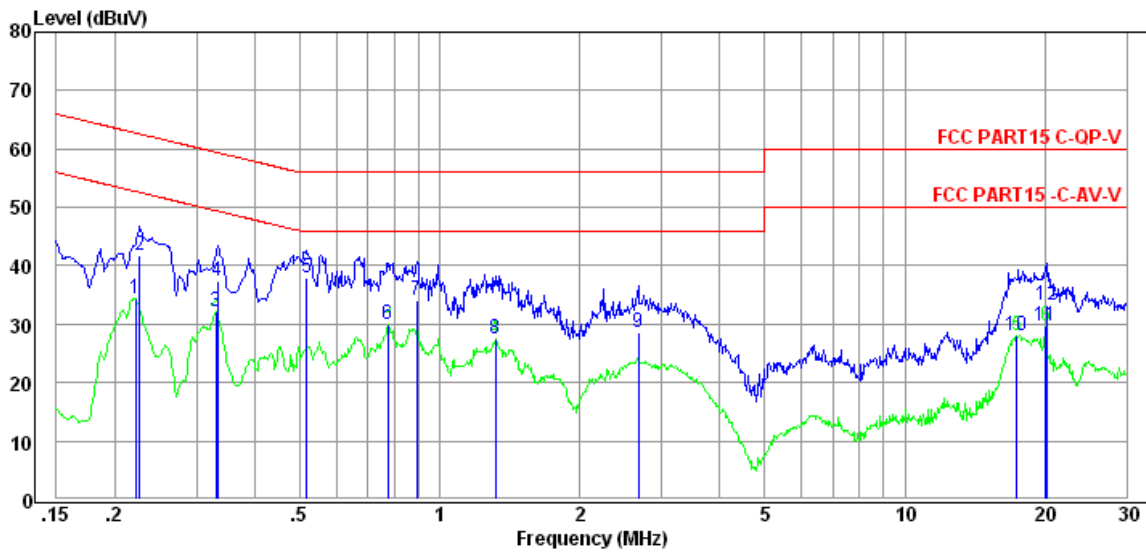


6.8.3 Test result

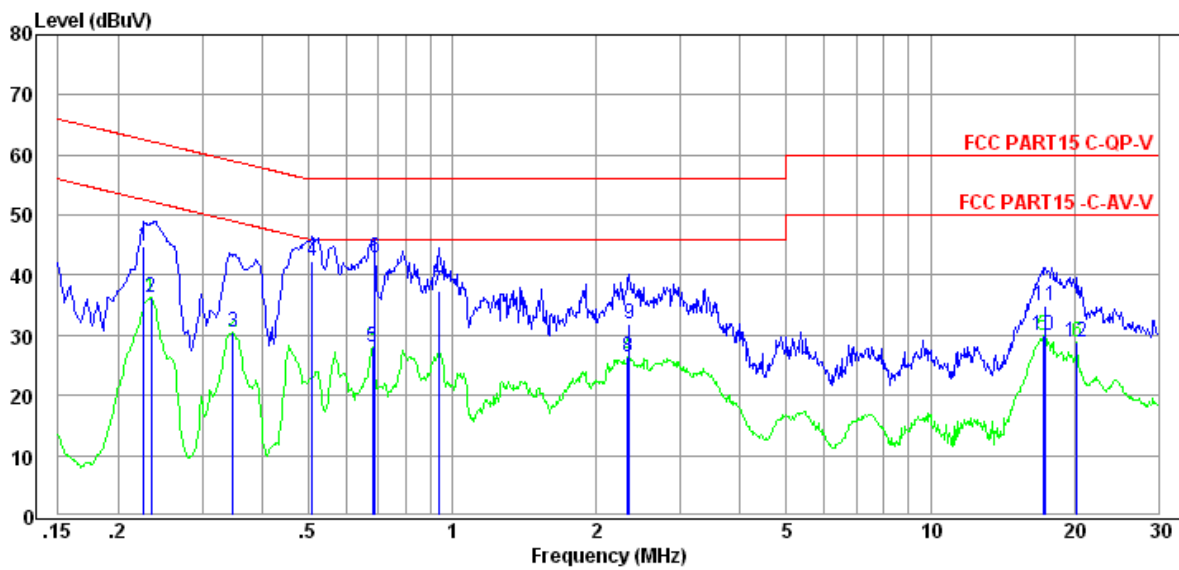
Frequency (MHz)	Level (dBuV)	Limit Line (dBuV)	Margin (dB)	Phase line	Detector
0.22	34.41	52.74	18.33	L	Average
0.23	41.81	62.57	20.76	L	QP
0.33	32.05	49.44	17.39	L	Average
0.33	37.32	59.35	22.03	L	QP
0.52	37.87	56.00	18.13	L	QP
0.78	29.88	46.00	16.12	L	Average
0.89	34.07	56.00	21.93	L	QP
1.32	27.36	46.00	18.64	L	Average
2.68	28.70	56.00	27.30	L	QP
17.38	27.94	50.00	22.06	L	Average
20.06	29.65	50.00	20.35	L	Average
20.27	33.21	60.00	26.79	L	QP
0.23	44.73	62.57	17.84	N	QP
0.24	36.41	52.26	15.85	N	Average
0.35	30.50	49.00	18.50	N	Average
0.51	42.39	56.00	13.61	N	QP
0.68	28.05	46.00	17.95	N	Average
0.69	42.76	56.00	13.24	N	QP
0.94	37.44	56.00	18.56	N	QP
2.33	26.45	46.00	19.55	N	Average
2.35	31.84	56.00	24.16	N	QP
17.20	29.83	50.00	20.17	N	Average
17.38	34.87	60.00	25.13	N	QP
20.27	28.91	50.00	21.09	N	Average



6.8.4 Test Plot



L Line



N Line



6.9 Radiated Emission

6.9.1 Requirement

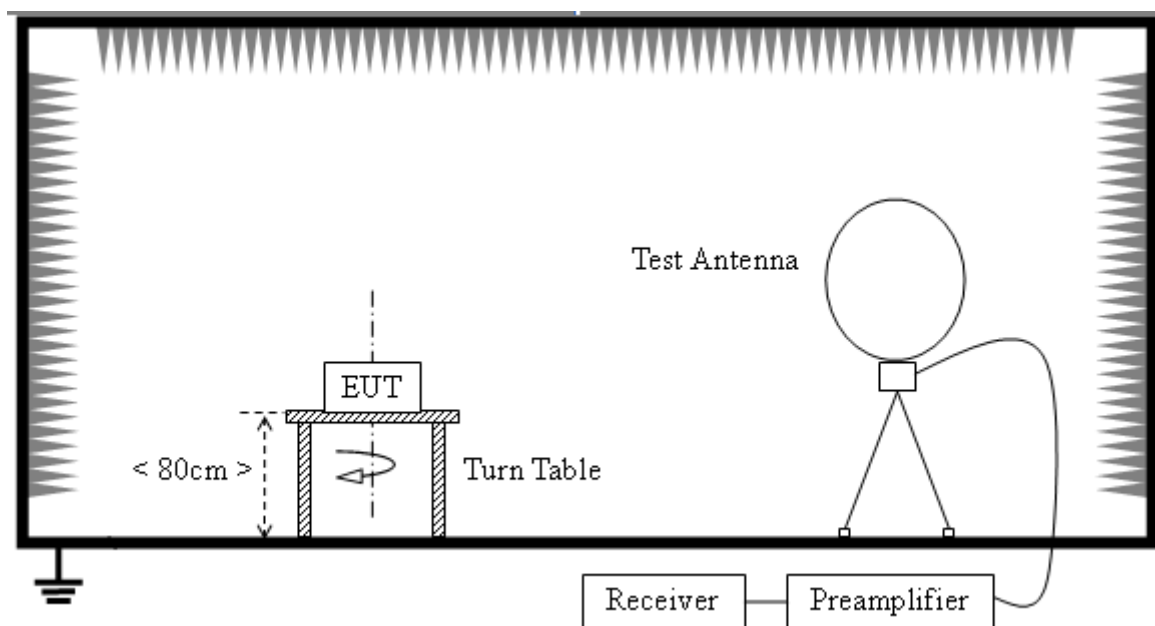
According to FCC section 15.247(c), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

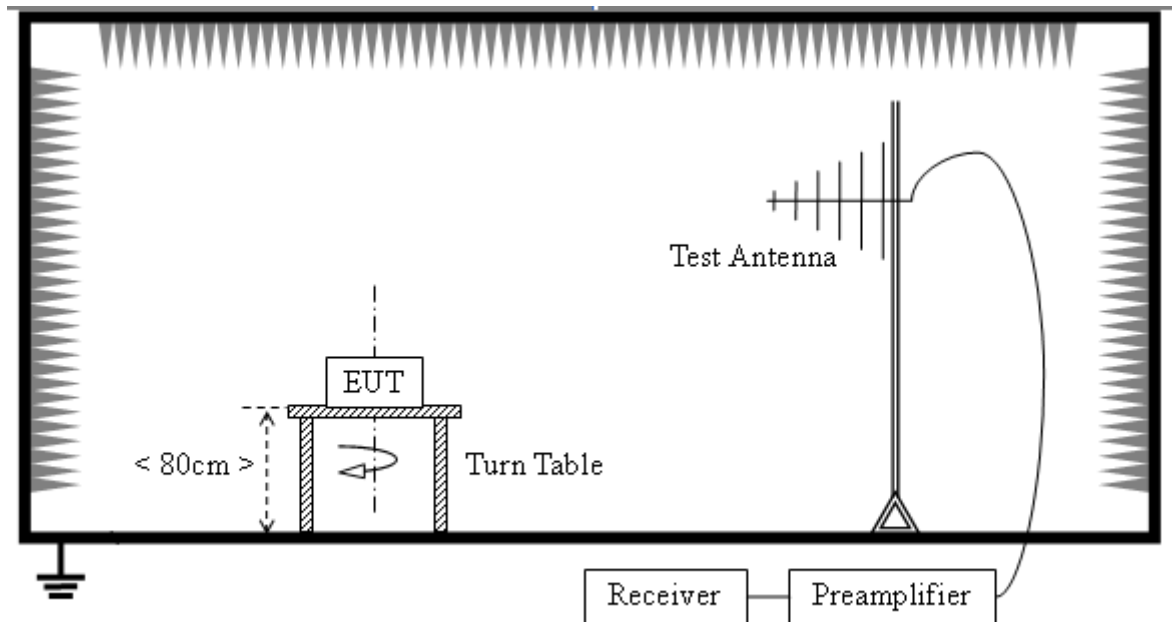
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)	Limit($\text{dB}\mu\text{V/m}$)	Detector
0.009-0.490	2400/F(kHz)	300	/	/
0.490-1.705	24000/F(kHz)	30	/	/
1.705-30	30	30	/	/
30 - 88	100	3	40	QP
88 - 216	150	3	43.5	QP
216 - 960	200	3	46	QP
960 - 1000	500	3	54	QP
Above 1000	500	3	54	AV

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

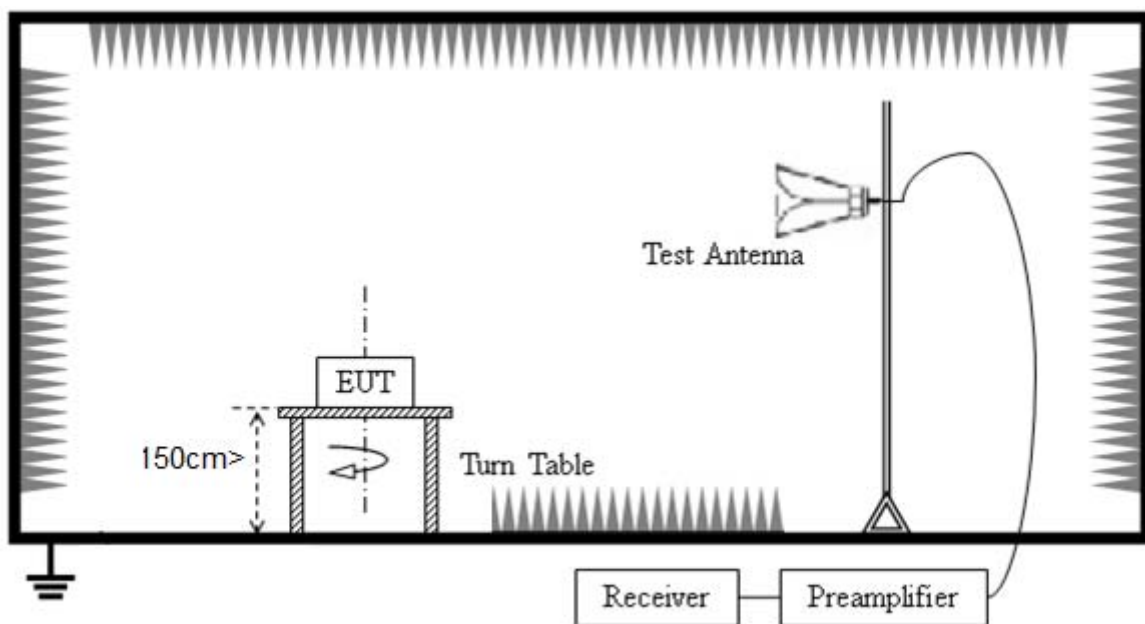
6.9.2 Test Setup



Radiated Emissions below 30MHz



Radiated Emissions 30-1000MHz



Radiated Emissions above 1000MHz

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). The EUT was set-up on insulator 80cm above the Ground Plane while RE test below 1GHz, and 150cm while RE test above 1GHz. The set-up and test methods were according to ANSI C63.10.



The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the EUT is activated and controlled by the software running on laptop, and is set to operate under hopping-off test mode transmitting packages at maximum power.

For the Test Antenna: In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength, the azimuth range of turntable was 0° to 360°, the receive antenna has two polarizations horizontal and vertical. When doing measurements above 1GHz, the EUT was placed within the 3dB beam width range of the horn antenna as recommended in ANSI C63.10 for Radiated Emissions and the worst-case data was presented.

Measurement setting, Mode 1: Continuous Transmitting Mode

Receiver Setting:

(9-150kHz): RBW=200Hz, VBW=1kHz, Detector: PK, Max Hold.

(0.15-30MHz): RBW=9kHz, VBW=30kHz, Detector: PK, Max Hold.

(30MHz-1GHz): RBW=120kHz, VBW=300kHz, Detector: QP, Max Hold.

(Above 1GHz): RBW=1MHz, VBW=3MHz, Detector: AV, Max Hold.

6.9.3 Test Result

A. Test Result for 9 kHz ~ 30 MHz:

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
--	--	20	--	See Note

Note:

- The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.*
- Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);*
- Limit line = specific limits (dBuV) + distance extrapolation factor.*

B. Test Result for 30 MHz ~ 10th Harmonic

Frequency (MHz)	Level (dBuV)	Limit Line (dBuV)	Margin (dB)	Detector	Antenna Polarization	Result
47.99	30.50	40.00	9.50	QP	H	PASS
72.08	34.45	40.00	5.55	QP	H	PASS
95.76	39.82	43.50	3.68	QP	H	PASS
107.89	41.95	43.50	1.55	QP	H	PASS
131.76	38.10	43.50	5.40	QP	H	PASS
143.83	40.41	43.50	3.09	QP	H	PASS
1177.10	48.06	54.00	5.94	Average	H	PASS



Frequency (MHz)	Level (dBuV)	Limit Line (dBuV)	Margin (dB)	Detector	Antenna Polarization	Result
1806.30	52.08	54.00	1.92	Average	H	PASS
2722.62	51.21	54.00	2.79	Average	H	PASS
3626.53	51.06	54.00	2.94	Average	H	PASS
4553.19	52.03	54.00	1.97	Average	H	PASS
5427.19	48.38	54.00	5.62	Average	H	PASS
8904.34	50.86	54.00	3.14	Average	H	PASS
47.83	35.79	40.00	4.21	QP	V	PASS
59.86	34.94	40.00	5.06	QP	V	PASS
72.08	28.58	40.00	11.42	QP	V	PASS
83.82	32.65	40.00	7.35	QP	V	PASS
95.76	33.31	43.50	10.19	QP	V	PASS
120.28	37.79	43.50	5.71	QP	V	PASS
1812.79	52.44	54.00	1.56	Average	V	PASS
2114.79	36.25	54.00	17.75	Average	V	PASS
2722.62	51.37	54.00	2.63	Average	V	PASS
3620.03	38.01	54.00	15.99	Average	V	PASS
4545.04	37.05	54.00	16.95	Average	V	PASS
5436.92	28.48	54.00	25.52	Average	V	PASS
8929.02	33.99	54.00	20.01	Average	V	PASS

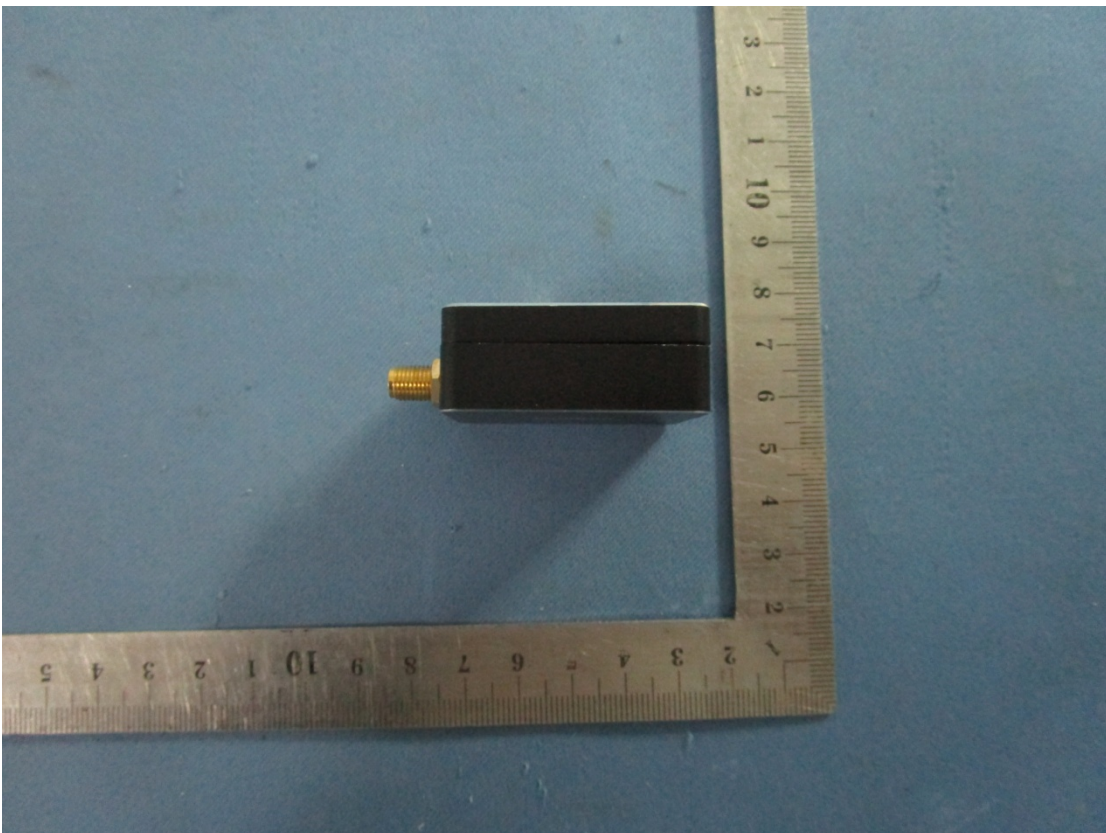
Note:

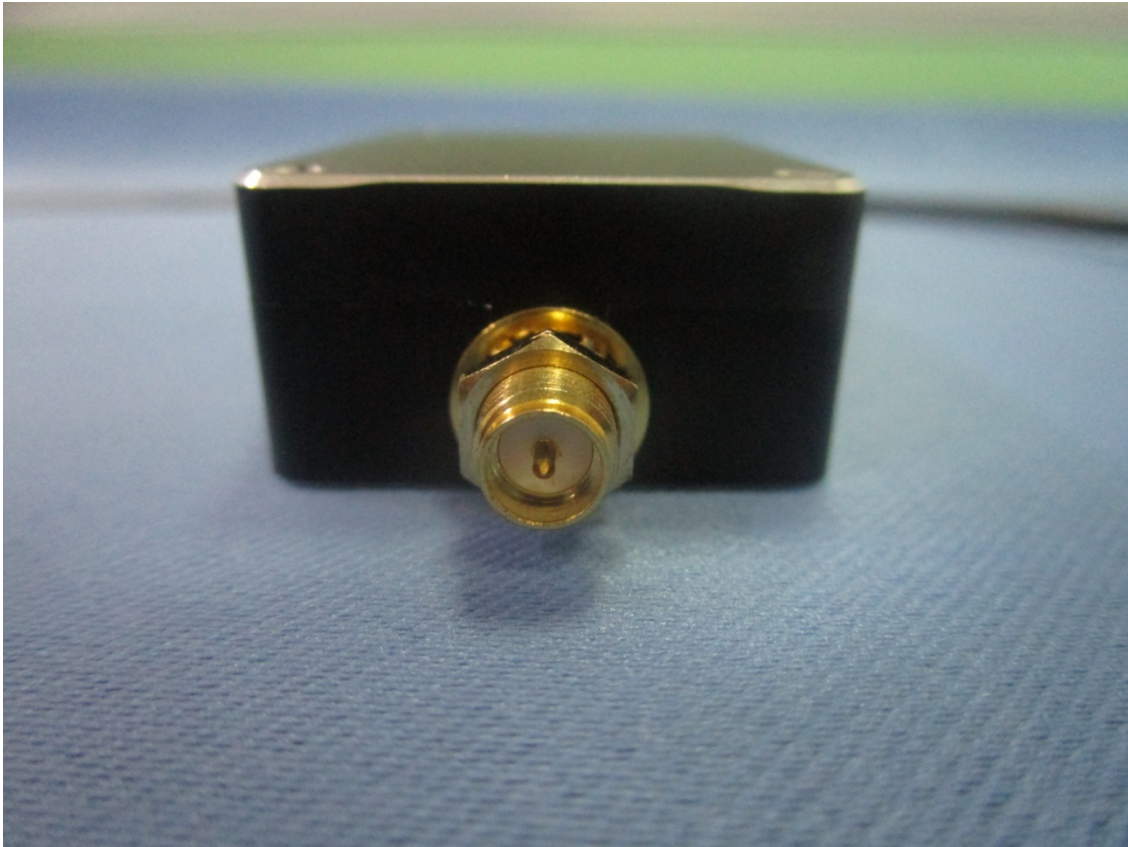
The worst case (10kbps, Channel 0:902.4MHz) is recorded in the report.



Annex A Photos of the EUT









Annex B Photos of Setup

1. Conducted Emission



2. Radiated Emission





** END OF REPORT **