FCC PART 15.247

TEST REPORT

For

WUXI IDATA TECHNOLOGY COMPANY LTD.

Floor 11, Building B1,Wuxi Binhu National Sensing Information Center, No.999 Gaolang East Road, Wuxi, China

FCC ID: 2ADE3RM001

Report Type:	**Product Type:**
Original Report	RFID Module

Report Number: RSZ180201002-00

Report Date: 2018-04-18

Reviewed By: Candy Li, RF Engineer

Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen)
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *WUXI IDATA TECHNOLOGY COMPANY LTD.'s* product, model number: *Q5000-UHF-NA (FCC ID: 2ADE3RM001)* or the "EUT" in this report was a *RFID Module,* which was measured approximately: 101 mm (L) * 76 mm (W) * 29.5 mm (H), rated with input voltage: DC 3.3 V from Pistol Grip and rated input voltage is 3.7V from battery for Pistol Grip.

Notes: This series products model: NX2-NA-1043 and Q5000-UHF-NA are electrically identical, only named differently. Model Q5000-UHF-NA was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.

**All measurement and test data in this report was gathered from production sample serial number: 1800115 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-02-01.*

Objective

This test report is prepared on behalf of *WUXI IDATA TECHNOLOGY COMPANY LTD.* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.5dB
RF conducted test with spectrum		±1.5dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±3℃
Humidity		±6%
Supply voltages		±0.4%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 342867, the FCC Designation No. : CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

EUT operating frequency range list table as below:

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

EUT Exercise Software

“UHF_Demo” exercise software was tested, and power level is 29.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
IDATA	New Mobile Computer	iData 50	1289587
IDATA	Pistol Grip	Q5000	1301682
IDATA	Charger	Q5000	500050D000948

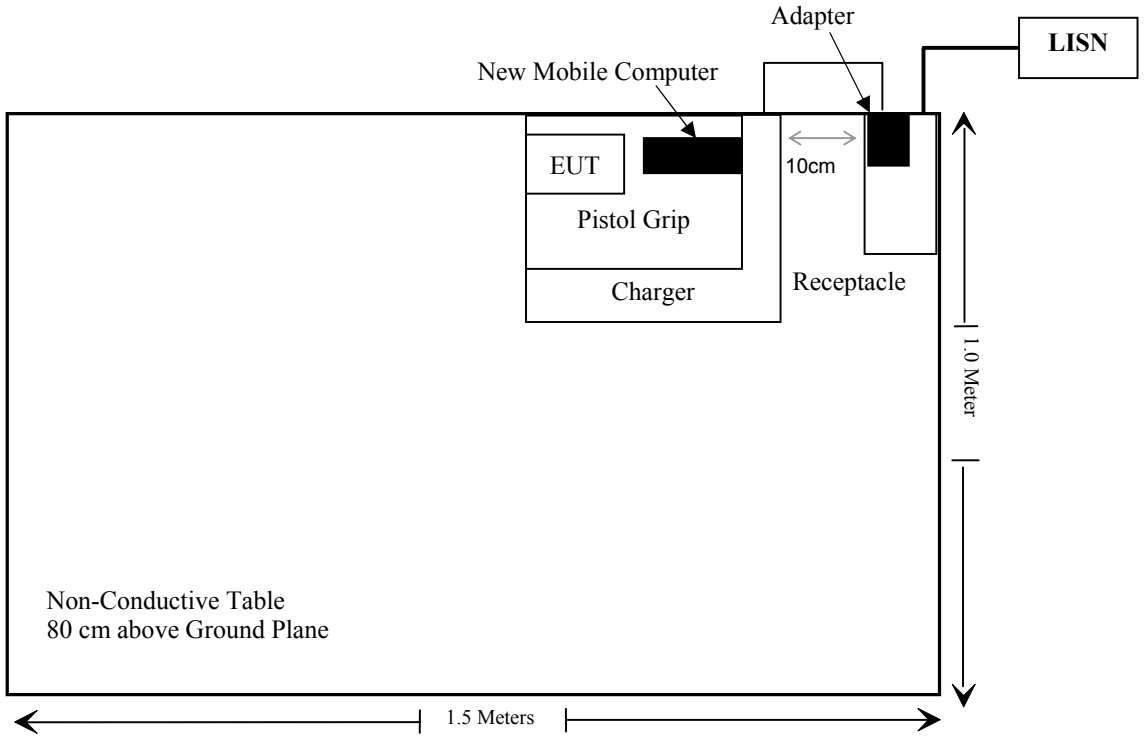
Adatper (Auxiliary):
Model: FJ-SW1202000N
Input: 100-240V~50/60Hz 0.6A Max
Output: 12V 2000mA

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-Shielding Un-Detachable DC Power Cable	1.0	Charger	Adapter

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC§15.247 (i), §1.1307 (b) (1) &§2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(i)	20 dB Emission Bandwidth	Compliance
§15.247(a)(1)(i)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(i)	Quantity of hopping channel Test	Compliance
§15.247(b)(2)	Peak Output Power Measurement	Compliance
§15.247(d)	Band edges	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2017-08-04	2018-08-04
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2017-12-21	2018-12-21
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2017-11-29	2018-05-21
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
N/A	Conducted Emission Cable	N/A	UF A210B-1-0720-504504	2017-11-12	2018-05-12
Radiated Emission Test					
A.H.System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2017-04-24	2018-04-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-05-21	2018-05-21
HP	Amplifier	HP8447E	1937A01046	2017-11-19	2018-05-21
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-01-11	2019-01-11
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	104PEA	218124002	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	1	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	2	2017-11-22	2018-05-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun Technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03
RF Conducted Test					
Agilent	P-Series Power Meter	N1912A	MY5000448	2018-01-02	2019-01-02
Agilent	Wideband Power Sensor	N1921A	MY54210016	2018-01-02	2019-01-02
WEINSCHEL	10dB Attenuator	5324	AU 3842	2017-11-22	2018-05-23
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-05	2018-12-05
Ducommun technologies	RF Cable	RG-214	3	2017-11-22	2018-05-22

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (i), §1.1307 (b) (1) &§2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Measurement Result

Please refer to SAR test report: RSZ180201002-20.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 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. 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has one internal antenna arrangement, which was permanently attached and the antenna gain is 3.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

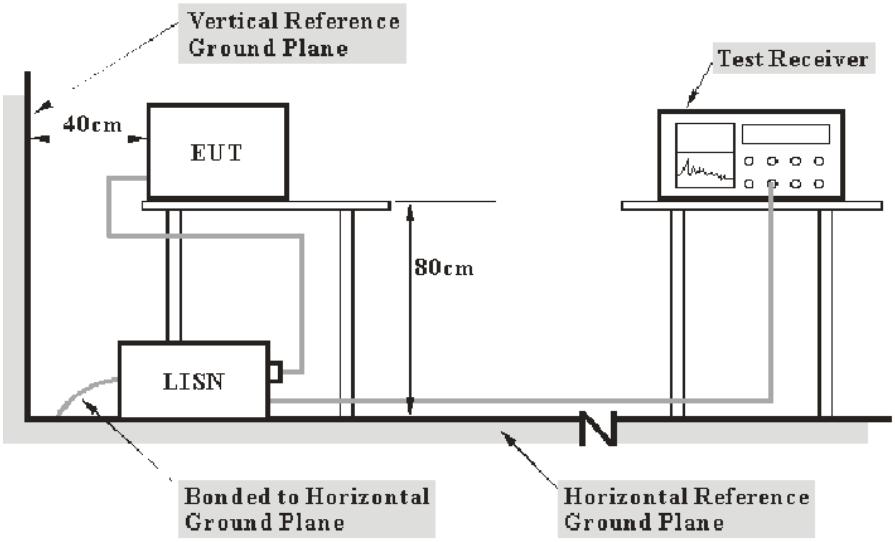
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

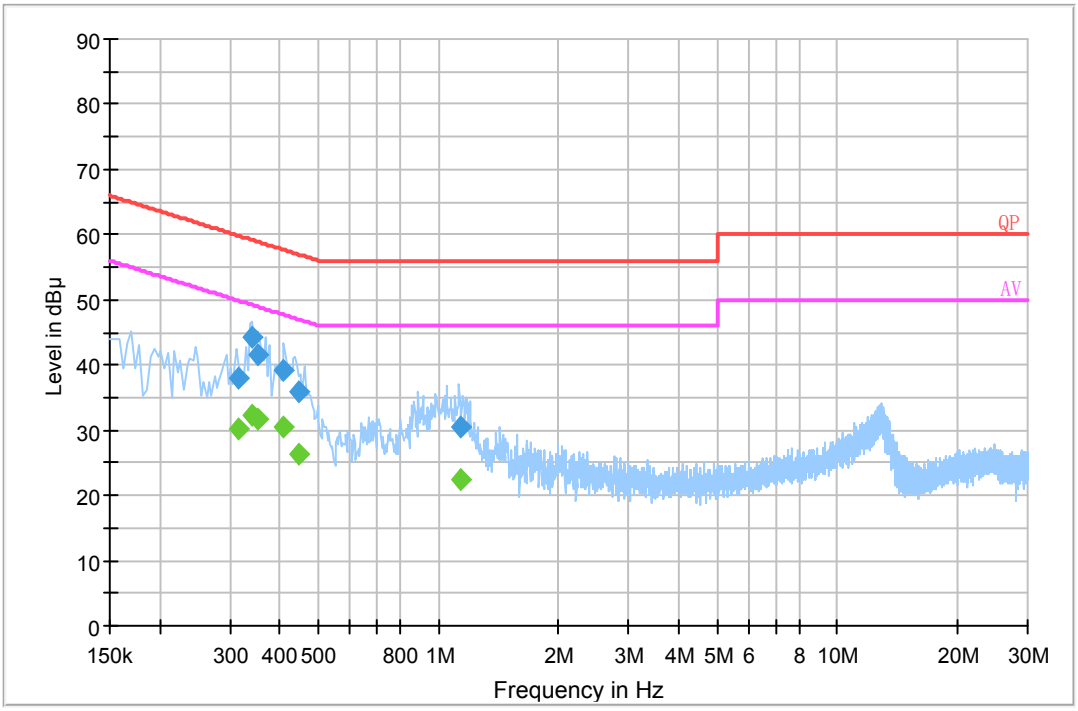
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2018-02-23.

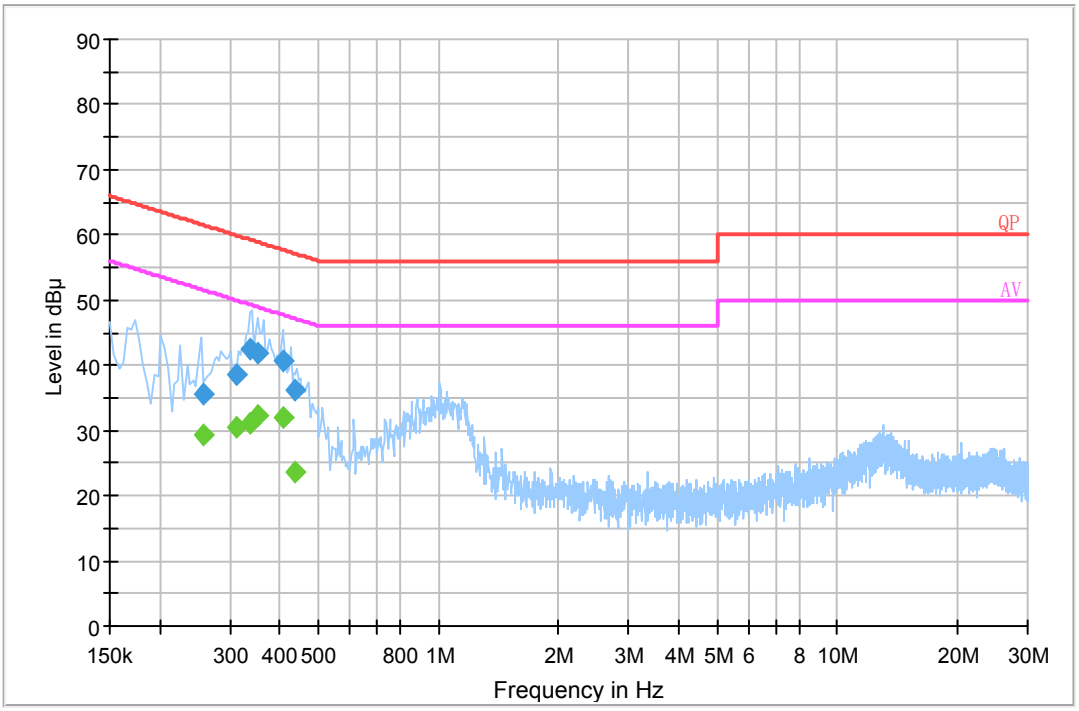
*EUT operation mode: Transmitting (*worst case is Low Channel)

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.314650	37.9	20.2	59.8	21.9	QP
0.340870	44.3	20.2	59.2	14.9	QP
0.352690	41.7	20.2	58.9	17.2	QP
0.407850	39.3	20.2	57.7	18.4	QP
0.444570	35.8	20.2	57.0	21.2	QP
1.141110	30.5	20.1	56.0	25.5	QP
0.314650	30.1	20.2	49.8	19.7	Ave.
0.340870	32.2	20.2	49.2	17.0	Ave.
0.352690	31.8	20.2	48.9	17.1	Ave.
0.407850	30.4	20.2	47.7	17.3	Ave.
0.444570	26.2	20.2	47.0	20.8	Ave.
1.141110	22.3	20.1	46.0	23.7	Ave.

AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.257500	35.5	20.2	61.5	26.0	QP
0.313290	38.7	20.2	59.9	21.2	QP
0.336870	42.5	20.2	59.3	16.8	QP
0.352690	42.0	20.2	58.9	16.9	QP
0.407910	40.6	20.2	57.7	17.1	QP
0.435370	36.3	20.2	57.1	20.8	QP
0.257500	29.2	20.2	51.5	22.3	Ave.
0.313290	30.4	20.2	49.9	19.5	Ave.
0.336870	31.0	20.2	49.3	18.3	Ave.
0.352690	32.2	20.2	48.9	16.7	Ave.
0.407910	31.9	20.2	47.7	15.8	Ave.
0.435370	23.7	20.2	47.1	23.4	Ave.

Note:
1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
2) Corrected Amplitude = Reading + Correction Factor
3) Margin = Limit – Corrected Amplitude

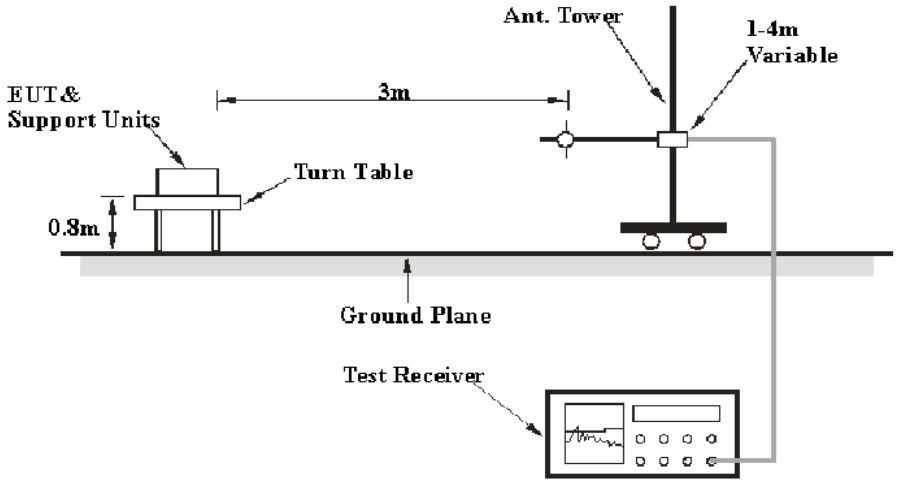
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

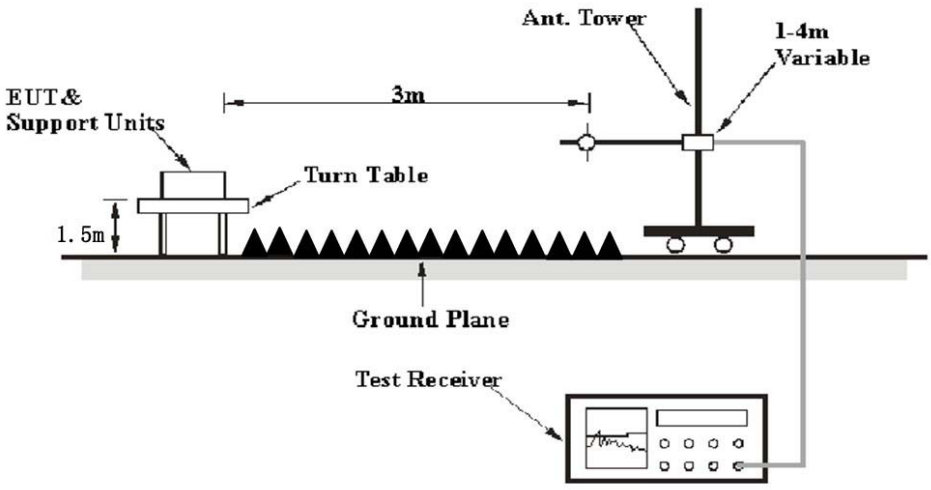
FCC §15.205; §15.209; §15.247(d)

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 10 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Average

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

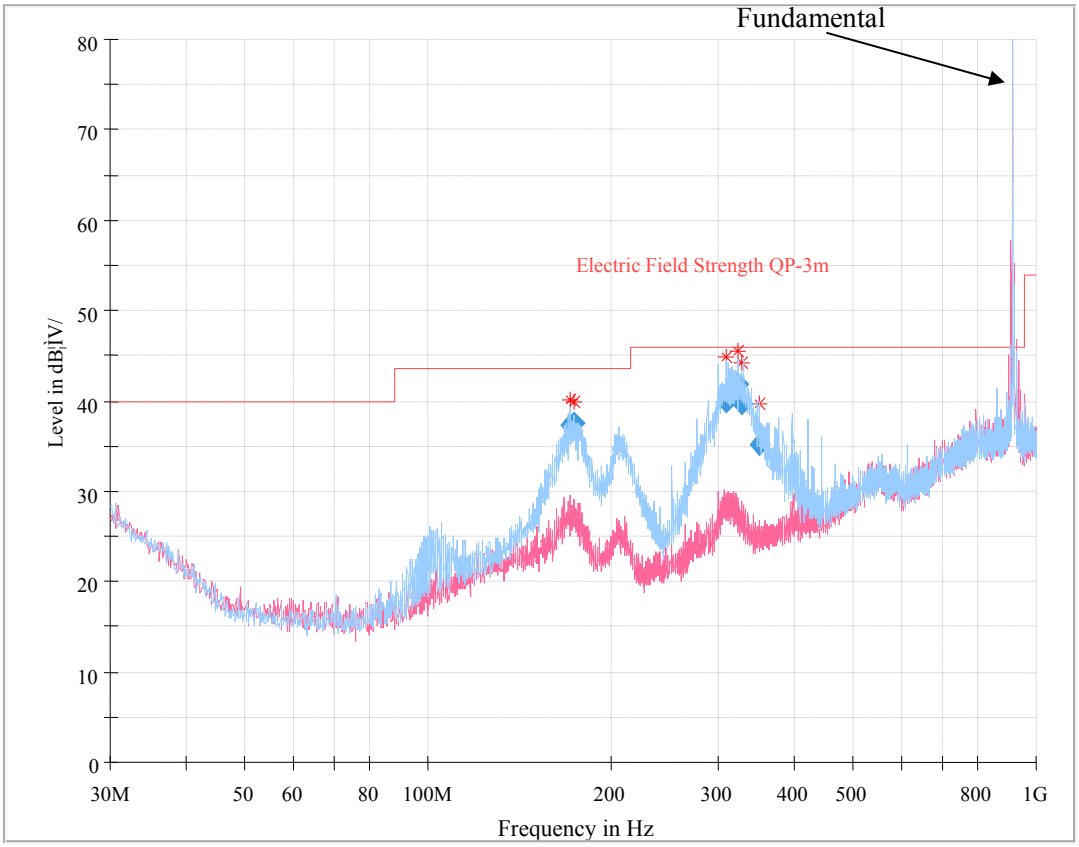
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2018-02-26 and 2018-03-01.

EUT operation mode: Transmitting

30 MHz~1000 MHz: (Pre-scan with Low, Middle, High Channel, the worst case is Low Channel)



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
171.528875	37.29	162.0	H	305.0	-5.8	43.50	6.21
173.386625	37.52	162.0	H	315.0	-5.7	43.50	5.98
309.687750	39.81	109.0	H	90.0	-2.8	46.00	6.19
324.357250	41.76	104.0	H	122.0	-2.7	46.00	4.24
329.164500	39.63	104.0	H	95.0	-2.7	46.00	6.37
350.061000	35.06	100.0	H	88.0	-2.6	46.00	10.94

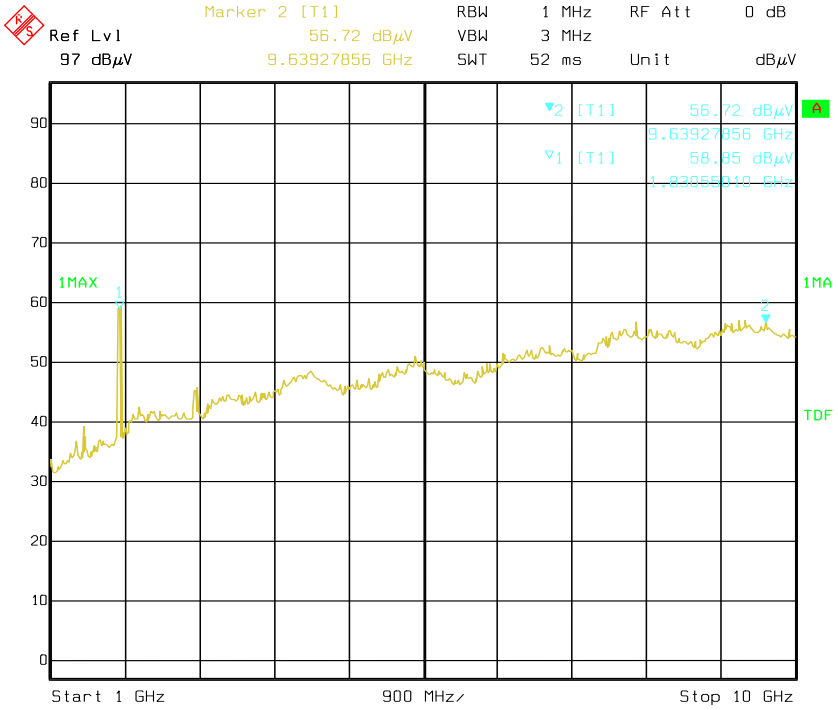
900MHz - 10 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (902.75 MHz)									
902.75	109.60	QP	0	1.5	H	9.60	119.20	/	/
902.75	111.83	QP	0	1.4	V	9.60	121.43	/	/
901.99	42.80	QP	0	1.4	H	9.60	52.40	99.20	46.80
901.99	44.80	QP	0	1.5	V	9.60	54.40	101.43	47.03
1805.50	53.75	PK	339	2.2	H	-4.87	48.88	99.20	50.32
1805.50	63.04	PK	358	1.4	V	-4.87	58.17	101.43	43.26
2708.25	50.12	PK	33	2.5	H	-0.65	49.47	74	24.53
2708.25	44.58	Ave.	33	2.5	H	-0.65	43.93	54	10.07
2708.25	48.52	PK	134	1.6	V	-0.65	47.87	74	26.13
2708.25	43.21	Ave.	134	1.6	V	-0.65	42.56	54	11.44
Middle Channel (915.25 MHz)									
915.25	111.71	QP	0	1.4	H	9.30	121.01	/	/
915.25	112.40	QP	0	1.6	V	9.30	121.70	/	/
1830.50	64.53	PK	125	1.5	H	-4.87	59.66	101.01	41.35
1830.50	66.99	PK	316	2.2	V	-4.87	62.12	101.70	39.58
2745.75	51.09	PK	12	2.5	H	-0.65	50.44	74	23.56
2745.75	46.42	Ave.	12	2.5	H	-0.65	45.77	54	8.23
2745.75	49.46	PK	71	1.4	V	-0.65	48.81	74	25.19
2745.75	43.54	Ave.	71	1.4	V	-0.65	42.89	54	11.11

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (927.25 MHz)									
927.25	114.87	QP	0	1.6	H	9.00	123.87	/	/
927.25	115.42	QP	0	1.4	V	9.00	124.42	/	/
928.01	46.20	QP	0	1.3	H	9.00	55.20	103.87	48.67
928.01	48.70	QP	0	1.5	V	9.00	57.70	104.42	46.72
1854.50	63.02	PK	57	1.1	H	-4.99	58.03	103.87	45.84
1854.50	66.02	PK	12	1.4	V	-4.99	61.03	104.42	43.39
2781.75	50.71	PK	160	1.3	H	-0.57	50.14	74	23.86
2781.75	45.77	Ave.	160	1.3	H	-0.57	45.20	54	8.80
2781.75	56.08	PK	306	1.9	V	-0.57	55.51	74	18.49
2781.75	51.62	Ave.	306	1.9	V	-0.57	51.05	54	2.95

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude
The other spurious emission which is 20dB to the limit was not recorded.

Pre-scan with Middle channel
Horizontal - For Peak



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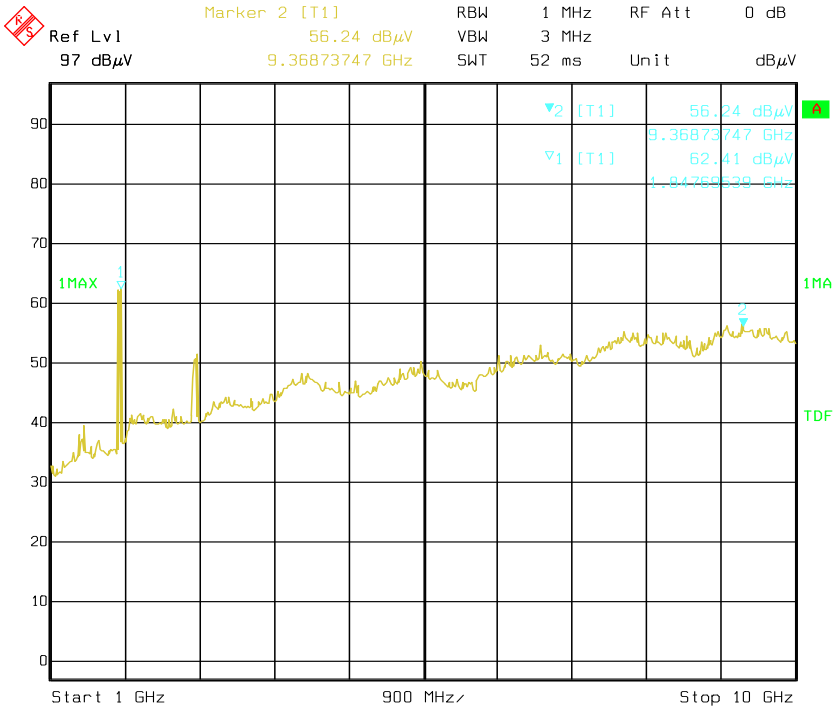
Vertical - For Peak



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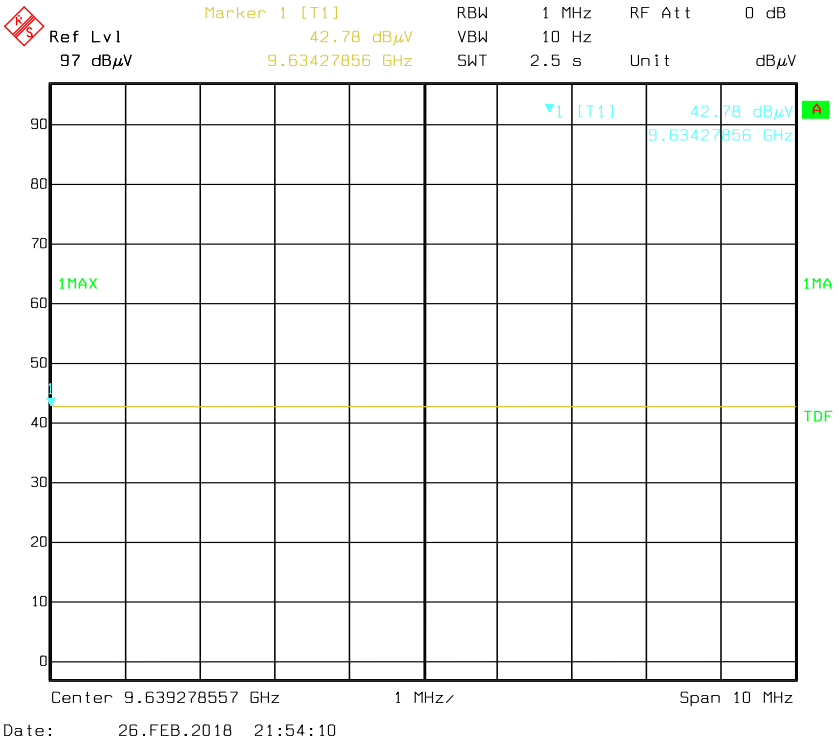
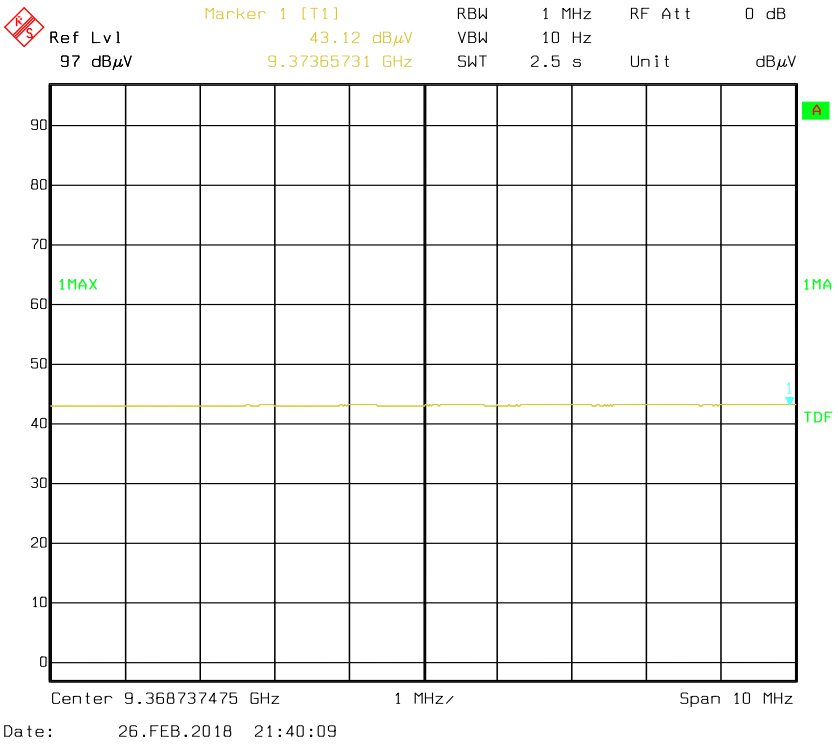
Horizontal - For Average



Vertical - For Average



FCC §15.247(a)(1) – CHANNEL SEPARATION TEST

Applicable Standard

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

Test Procedure

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2018-03-27

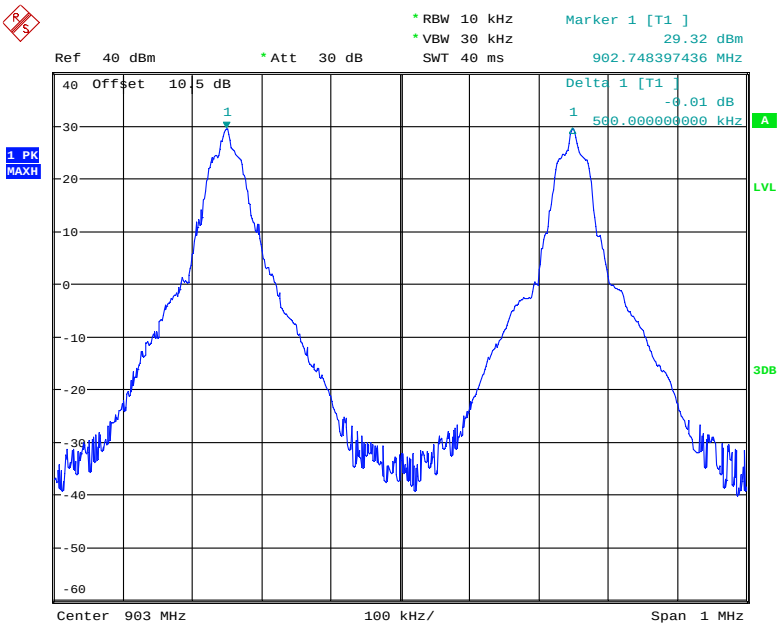
EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table and plots

Channel	Frequency (MHz)	Channel Separation (MHz)	≥Limit (MHz)	Result
Low	902.75	0.500	0.083	Pass
Adjacent	903.25			
Middle	915.25	0.500	0.084	Pass
Adjacent	915.75			
High	927.25	0.500	0.089	Pass
Adjacent	926.75			

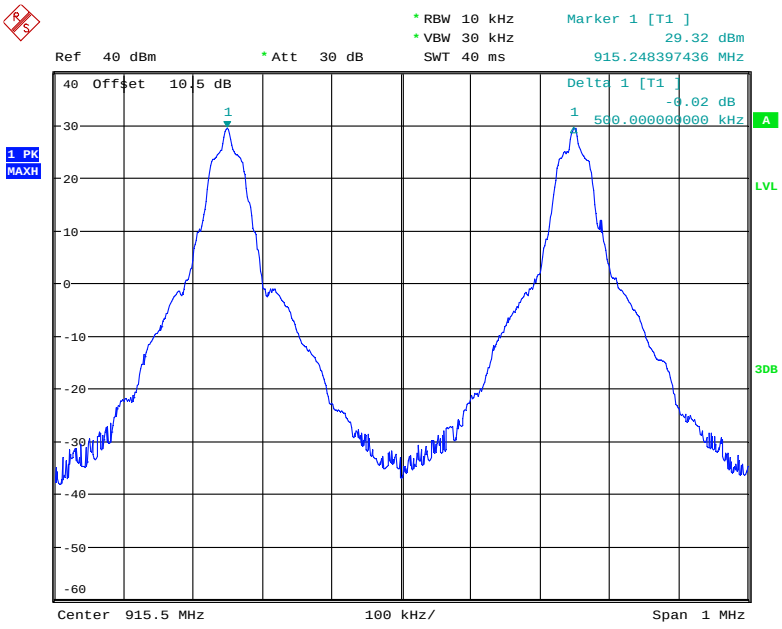
Note: Limit = 20 dB bandwidth

Low Channel



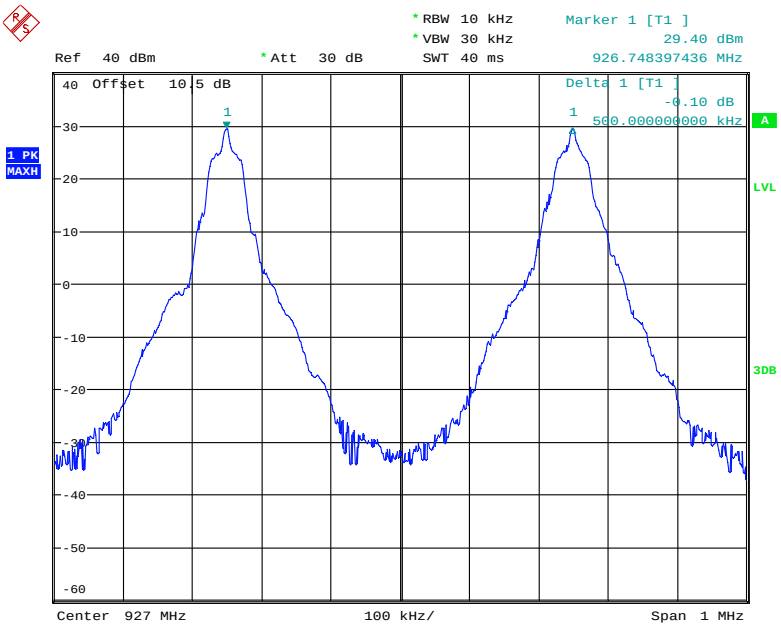
Date: 27.MAR.2018 00:56:44

Middle Channel



Date: 27.MAR.2018 00:57:33

High Channel



Date: 27.MAR.2018 00:59:00

FCC §15.247(a)(1)(i) – 20 dB EMISSION BANDWIDTH

Applicable Standard

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.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

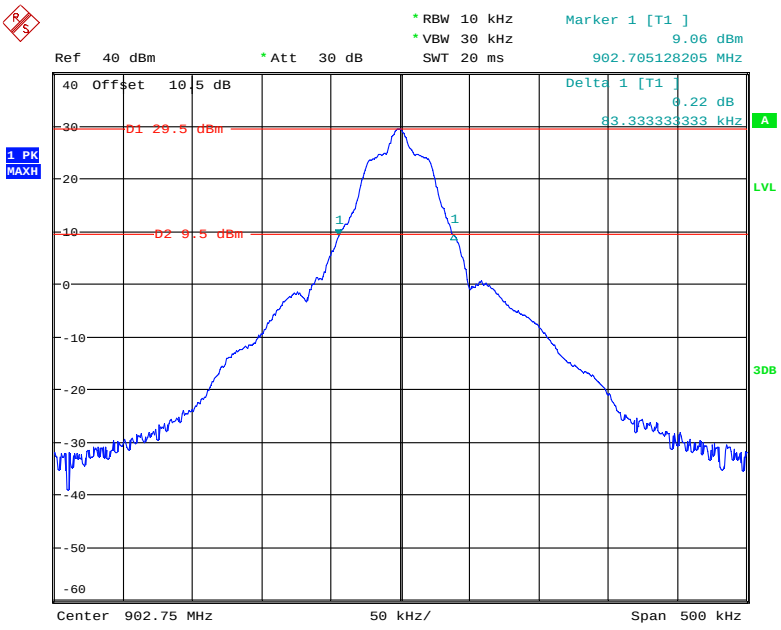
The testing was performed by Jacob Kong on 2018-03-27.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table and plots

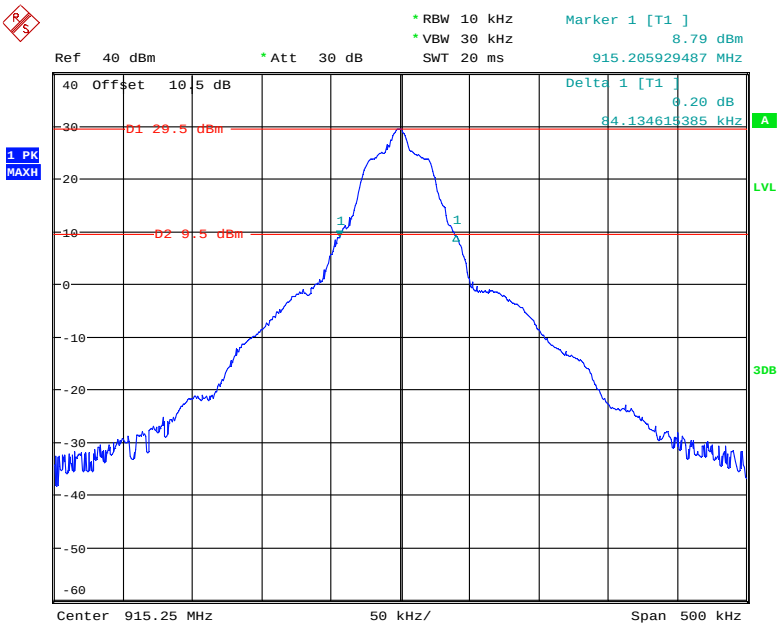
Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)	Limit (MHz)
Low	902.75	0.083	0.5
Middle	915.25	0.084	0.5
High	927.25	0.089	0.5

Low Channel



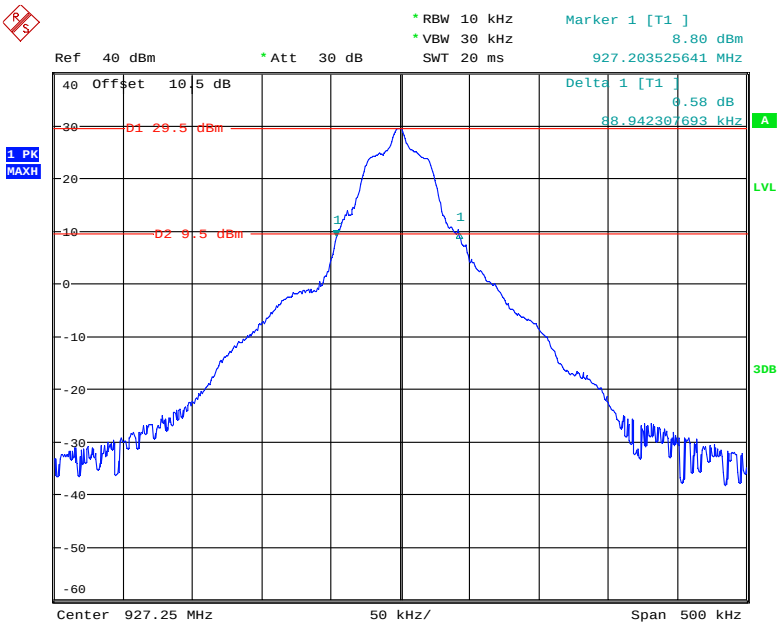
Date: 27.MAR.2018 00:37:26

Middle Channel



Date: 27.MAR.2018 00:38:43

High Channel



Date: 27.MAR.2018 00:39:24

FCC §15.247(a)(1)(i) – QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

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.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the max-hold function record the quantity of the channel.

Test Data

Environmental Conditions

Temperature:	22 ℃
Relative Humidity:	50 %
ATM Pressure:	100.0 kPa

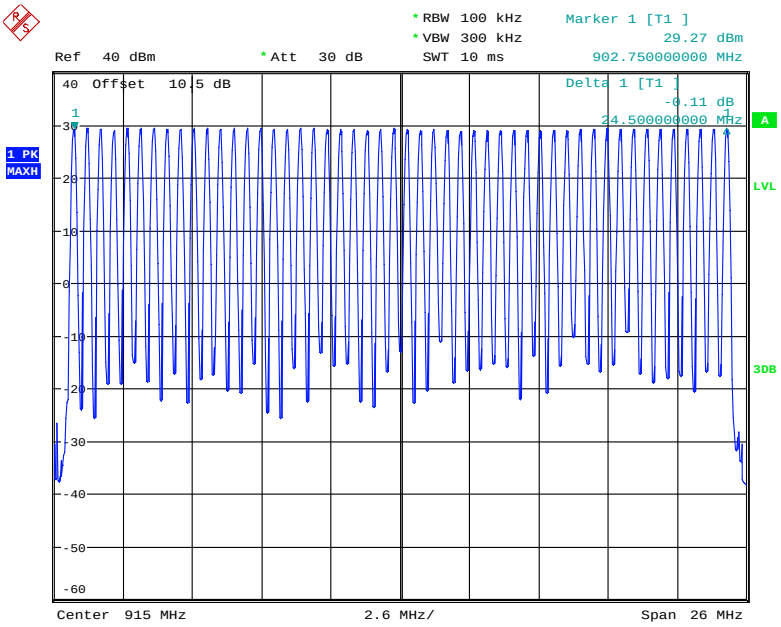
The testing was performed by Jacob Kong on 2018-03-27.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table and plot.

Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
902-928	50	≥50

Number of Hopping Channels



Date: 27.MAR.2018 00:47:55

FCC §15.247(a) (1) (i) – TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

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.

Test Procedure

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

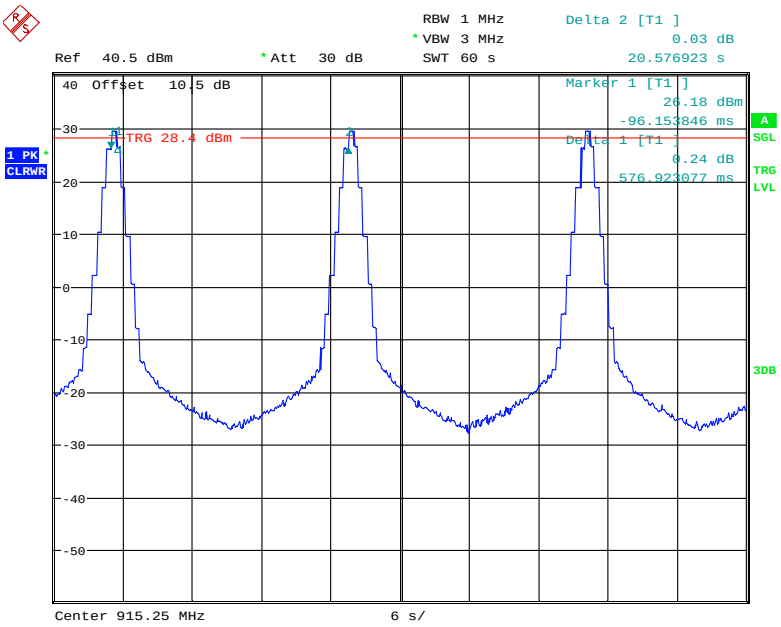
The testing was performed by Jacob Kong on 2018-03-27.

EUT operation mode: Hopping for Normal Use

Test Result: Compliance. Please refer to following table and plots.

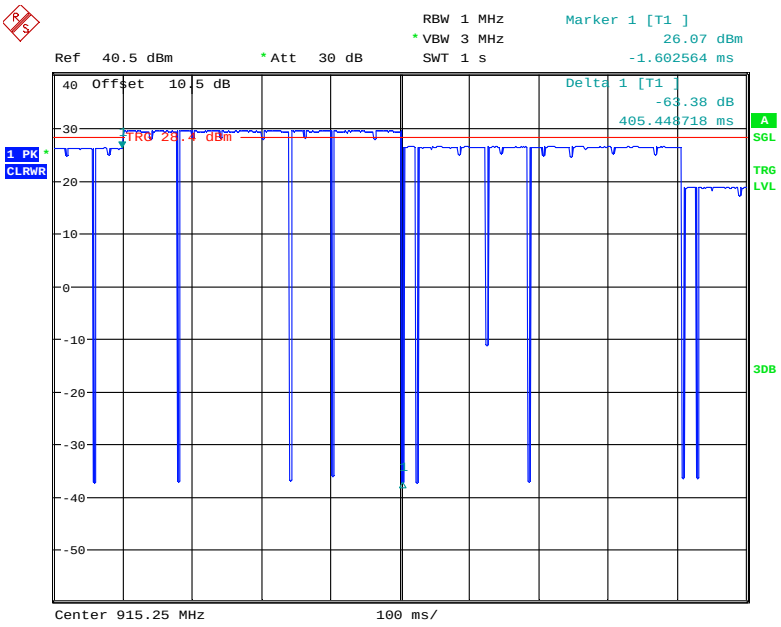
Frequency (MHz)	Observe time (s)	Number of Pulse	Pulse Time (ms)	Average Occupancy Time (s)	Limit (s)
915.25	20	20	18.558	0.371	0.4
Note: In Hopping mode, it will hop one by one for each channel every 20s.					

Observe time: 60s



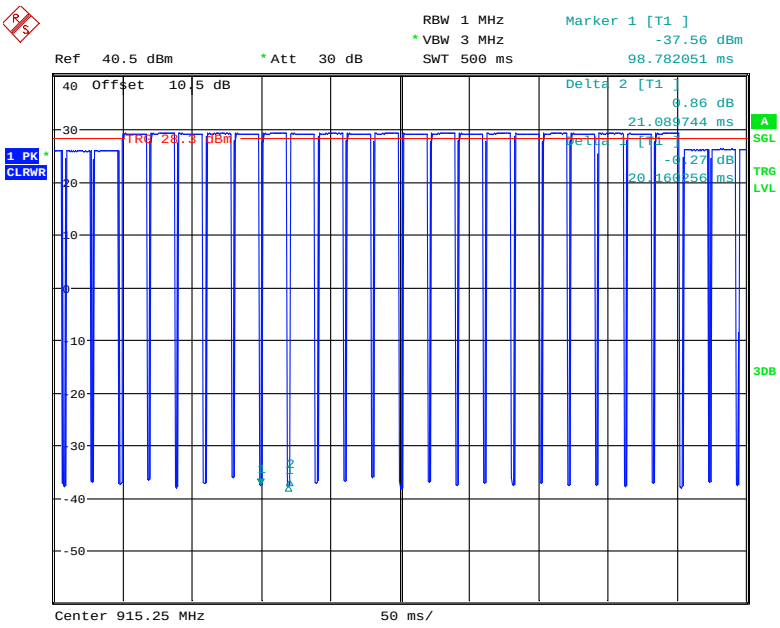
Date: 27.MAR.2018 01:28:03

Observe time: 1s



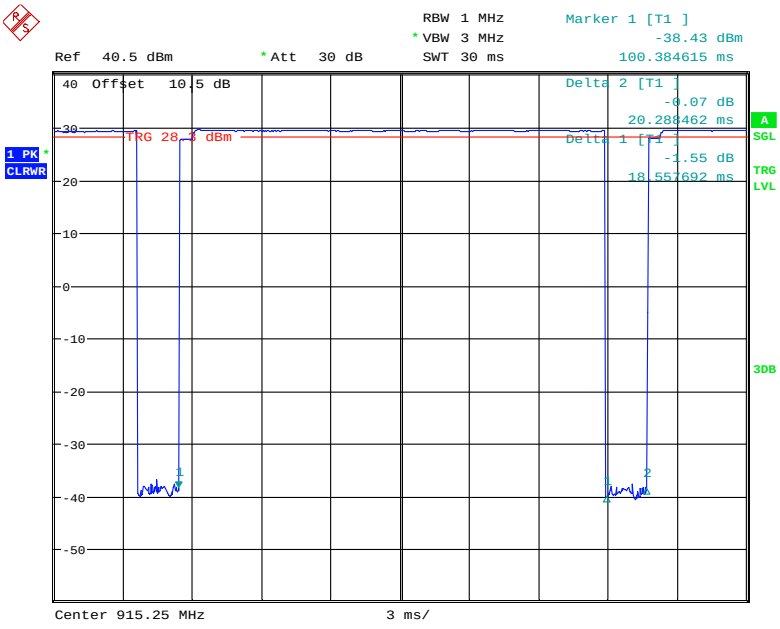
Date: 27.MAR.2018 01:29:32

Observe time: 500ms



Date: 27.MAR.2018 01:39:02

One Pulse



Date: 27.MAR.2018 01:36:24

FCC §15.247(b) (2) – PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

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.

Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2018-03-26.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table.

Channel	Frequency (MHz)	Reading Peak Power (dBm)	Reading Peak Power (mW)	Limit (mW)
Low	902.75	29.56	903.65	1000
Middle	915.25	29.43	877.00	1000
High	927.25	29.42	874.98	1000

Note: Test with conducted method.

FCC §15.247(d) – BAND EDGES TESTING

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

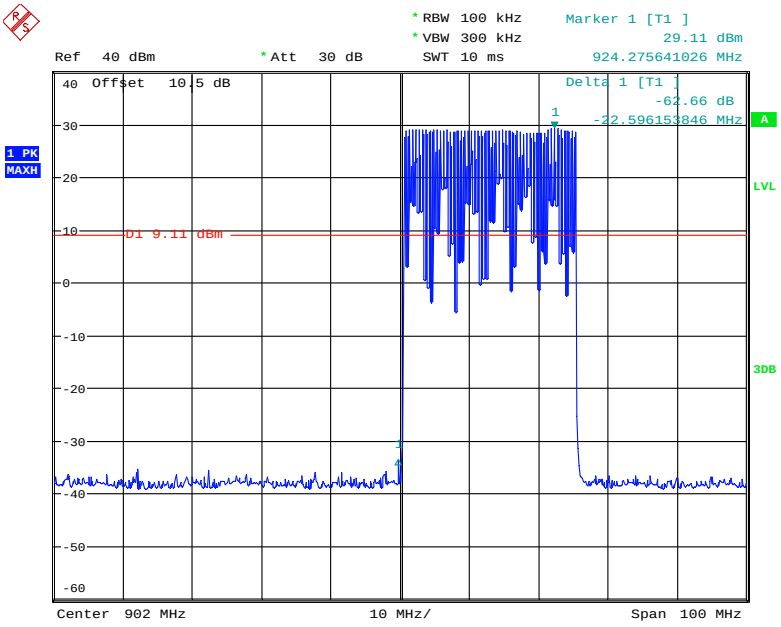
The testing was performed by Jacob Kong on 2018-03-27.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following plots.

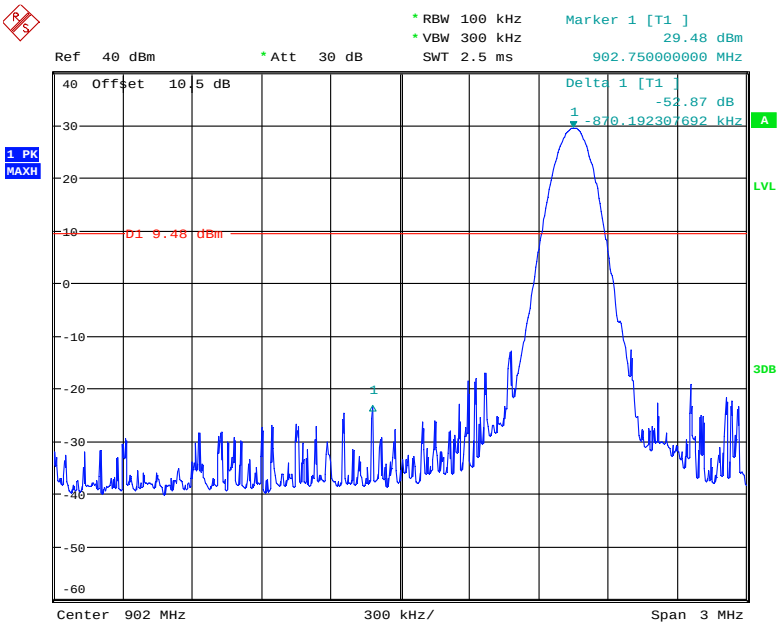
Band Edge-Left Side

Hopping



Date: 27.MAR.2018 00:49:01

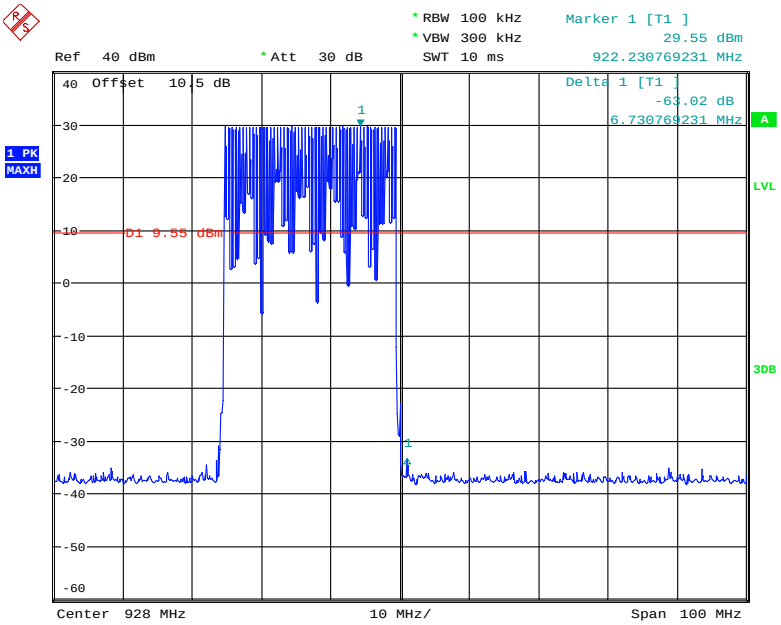
Single



Date: 27.MAR.2018 00:46:21

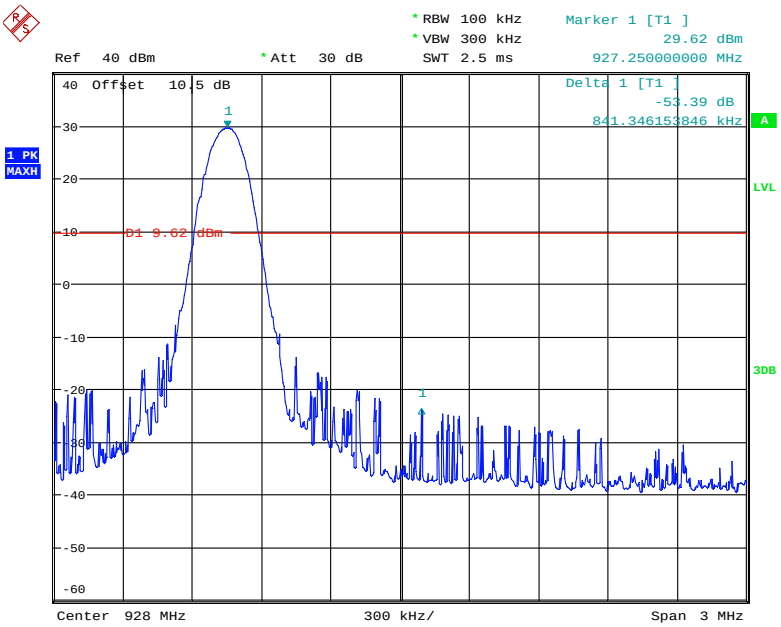
Band Edge-Right Side

Hopping



Date: 27.MAR.2018 00:51:03

Single



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******* END OF REPORT *******