



TESTING LABORATORY
CERTIFICATE #4820.01



FCC PART 15.247 TEST REPORT

For

Rosslare Enterprises Ltd

Room 905, 12 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong

FCC ID: GCD-AYU9XXBT

Report Type: Original Report	Product Name: Extended Long Range UHF-RFID Reader with Bluetooth BLE-ID
Report Number: RDG180420001-00B	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Extended Long Range UHF-RFID Reader with Bluetooth BLE-ID
EUT Model:	AY-U920BT-US
Multiple Model:	AY-U915BT-US
Antenna Gain:	AY-U920BT-US: 9.7 dBi AY-U915BT-US: 8.5 dBi
FCC ID:	GCD-AYU9XXBT
Rated Input Voltage:	DC 9~15V form RS-485 Cable
External Dimension:	AY-U920BT-US:Length (365 mm)*Width (365mm)*High (32 mm) AY-U915BT-US:Length (295 mm)*Width (295 mm)*High (32 mm)
Serial Number:	180420001-1(AY-U920BT-US), 180420001-2(AY-U915BT-US)
EUT Received Date:	2018.04.20

The device contains a certified Bluetooth module, the Bluetooth module FCC ID:S9NSPBTLERF

Note: The series product, models AY-U920BT-US and AY-U915BT-US are electrically identical, we selected AY-U920BT-US for full test, and both model for AC line conducted emission test and radiation test, please refer to the declaration letter for details.

Objective

This report is prepared on behalf of *Rosslare Enterprises Ltd* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

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

Related Submittal(s)/Grant(s)

N/A

Test Methodology

All measurements detailed in this test report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB,200M~1GHz: 5.92 dB,1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, 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. : 897218,the FCC Designation No. : CN1220.

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode. 50 hopping channels are provided:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	903.24	14	909.48	27	915.72	40	921.96
2	903.72	15	909.96	28	916.20	41	922.44
3	904.20	16	910.44	29	916.68	42	922.92
4	904.68	17	910.92	30	917.16	43	923.40
5	905.16	18	911.40	31	917.64	44	923.88
6	905.64	19	911.88	32	918.12	45	924.36
7	906.12	20	912.36	33	918.60	46	924.84
8	906.60	21	912.84	34	919.08	47	925.32
9	907.08	22	913.32	35	919.56	48	925.80
10	907.56	23	913.80	36	920.04	49	926.28
11	908.04	24	914.28	37	920.52	50	926.76
12	908.52	25	914.76	38	921.00	/	/
13	909.00	26	915.24	39	921.48	/	/

Channel 1, 26, 50 were selected to test.

EUT Exercise Software

Test software: ' Docklight Scripting.exe ' was used in test, the system configured maximum power level as below setting:

Test Software Version	Docklight Scripting.exe		
Test Frequency	903.24MHz	915.24MHz	926.76MHz
Power setting	25	25	25

Equipment Modifications

No modification was made to the EUT.

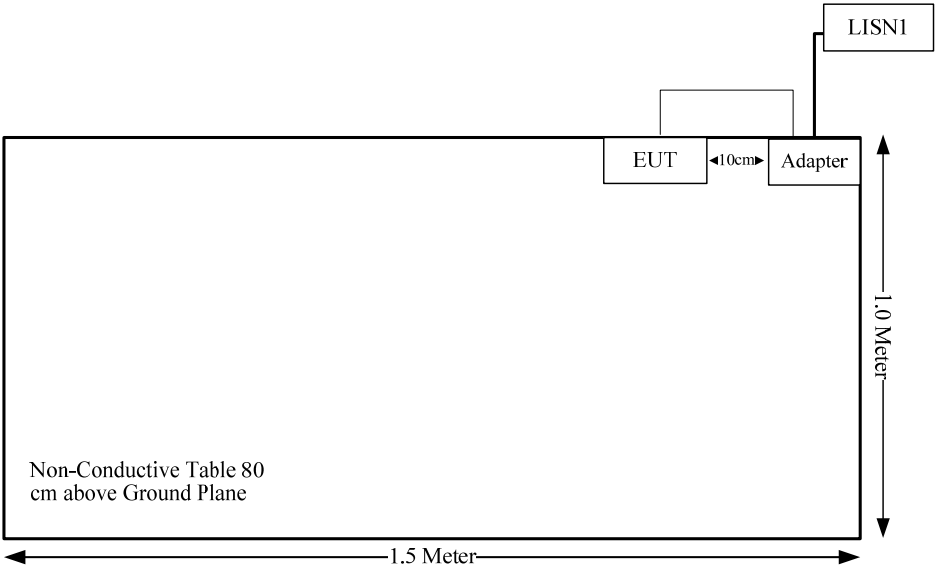
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
MAKEN	Adapter	FJ-SW2017150400D	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
RS-485 Cable	No	No	10	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(1)	20 dB Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	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

FCC §15.247 (i) , §1.1310 , §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculation Formula:

Prediction of power density at the distance of the applicable MPE limit:

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

Mode	Frequency (MHz)	EIRP		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBm)	(mW)			
915MHz Radio	903.24-926.76	35.2	3311.31	25.00	0.42	0.6
Bluetooth	2402-2480	4.2	2.63	25.00	0.00034	1.0

Note: the conducted output power including turn up tolerance for 915MHz radio is 25.5dBm, the maximum antenna gain is 9.7dBi for AY-U920BT-US, 8.5 dBi for AY-U915BT-US, that declared by manufacturer.

The mximum EIRP is model: AY-U920BT-US, 25.5+ 9.7=35.2 dBm

The 915MHz radio and Bluetooth can transmit simultaneously:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$$= S_{915}/Limit_{915} + S_{BT}/Limit_{BT}$$

$$= 0.42/0.6 + 0.00034/1.0$$

$$= 0.7$$

Result: Compliance, The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at distance ≥ 25 cm.

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, and the antenna gain is 9.7 dBi for AY-U920BT-US, 8.5 dBi for AY-U915BT-US fulfill the requirement of this section. Please refer to the EUT photos.

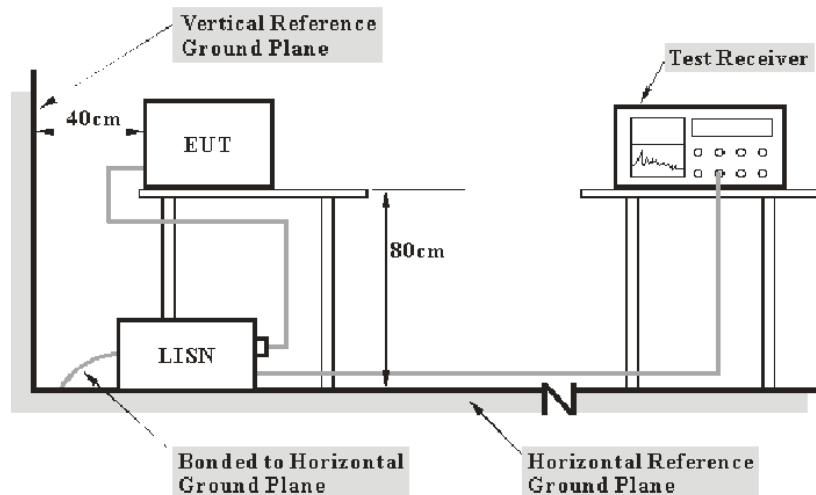
Result: Compliance.

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 setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with a 120 V/60 Hz AC power source.

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 first LISN.

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

V_C : corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF : voltage division factor of AMN or ISN

The “**Margin**” column of the following data tables indicates the degree of compliance within 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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2017-12-11	2018-12-11
R&S	Two-line V-network	ENV 216	101614	2017-12-08	2018-12-08
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-09-05	2018-09-05

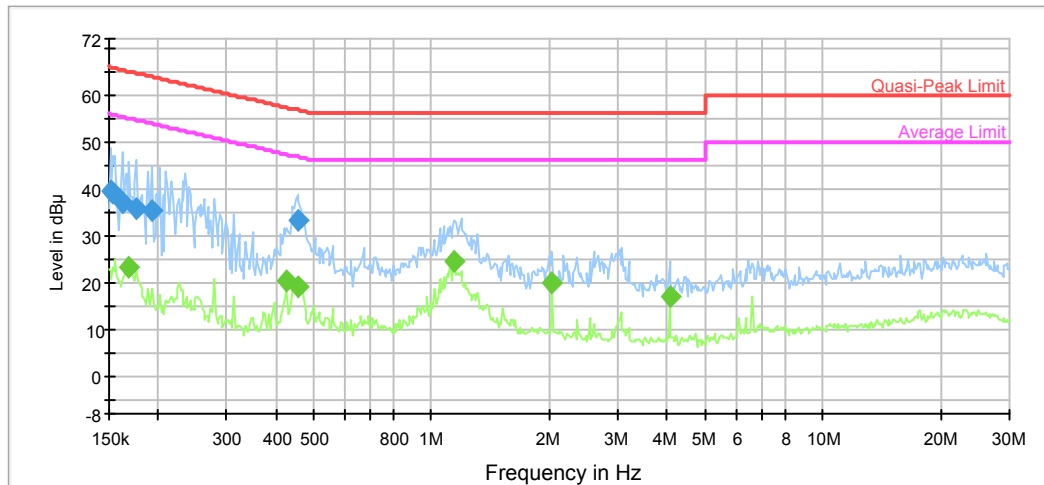
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

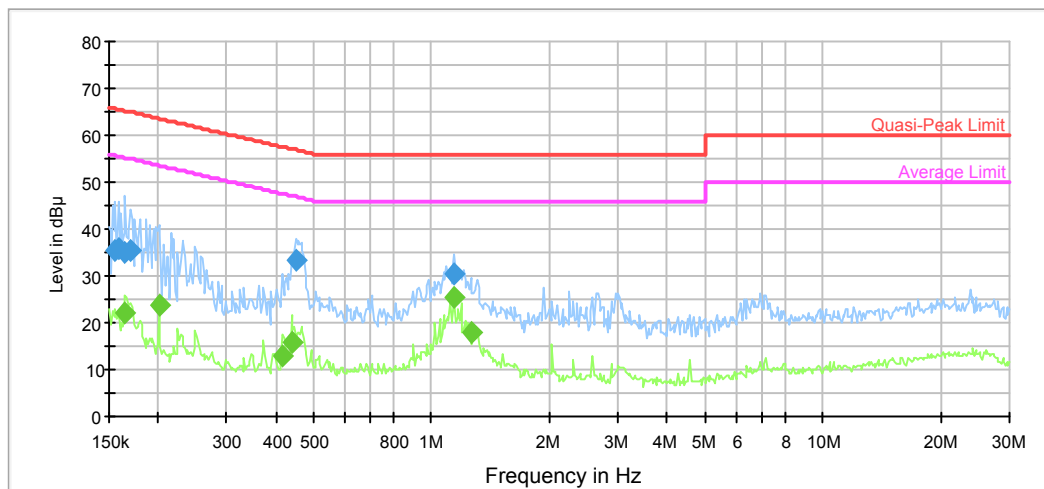
Temperature:	28.5 °C
Relative Humidity:	61 %
ATM Pressure:	101.3 kPa

The testing was performed by Sider Huang on 2018-04-24.

Test Mode: Transmitting**Model:** AY-U920BT-US**AC120V, 60 Hz, Line:**

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.151200	39.7	9.000	L1	11.2	26.2	65.9	Compliance
0.153629	39.2	9.000	L1	11.1	26.6	65.8	Compliance
0.162441	37.2	9.000	L1	11.0	28.1	65.3	Compliance
0.175915	35.6	9.000	L1	10.9	29.1	64.7	Compliance
0.193566	35.1	9.000	L1	10.7	28.8	63.9	Compliance
0.454052	33.4	9.000	L1	9.9	23.4	56.8	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.169044	23.3	9.000	L1	10.9	31.7	55.0	Compliance
0.426011	20.4	9.000	L1	9.9	26.9	47.3	Compliance
0.454052	19.1	9.000	L1	9.9	27.7	46.8	Compliance
1.144267	24.7	9.000	L1	9.8	21.3	46.0	Compliance
2.030886	20.0	9.000	L1	9.7	26.0	46.0	Compliance
4.062112	16.9	9.000	L1	9.8	29.1	46.0	Compliance

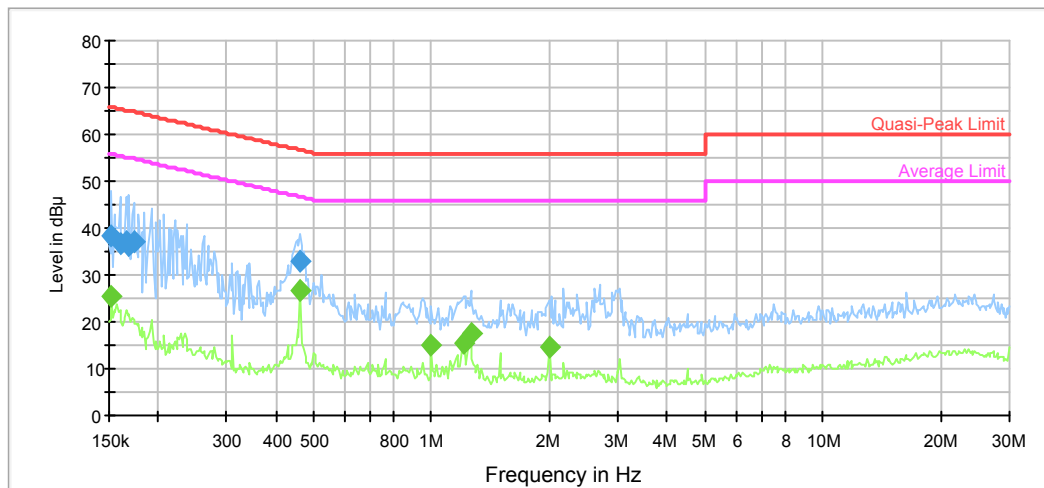
AC120V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.156097	35.4	9.000	N	11.1	30.3	65.7	Compliance
0.158604	35.9	9.000	N	11.1	29.6	65.5	Compliance
0.165051	35.0	9.000	N	11.0	30.2	65.2	Compliance
0.170396	35.5	9.000	N	10.9	29.4	64.9	Compliance
0.450448	33.5	9.000	N	9.9	23.4	56.9	Compliance
1.144267	30.5	9.000	N	9.8	25.5	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.165051	22.1	9.000	N	11.0	33.1	55.2	Compliance
0.201433	23.6	9.000	N	10.6	30.0	53.6	Compliance
0.415949	13.0	9.000	N	10.0	34.5	47.5	Compliance
0.439808	15.8	9.000	N	9.9	31.3	47.1	Compliance
1.144267	25.6	9.000	N	9.8	20.4	46.0	Compliance
1.259081	18.0	9.000	N	9.8	28.0	46.0	Compliance

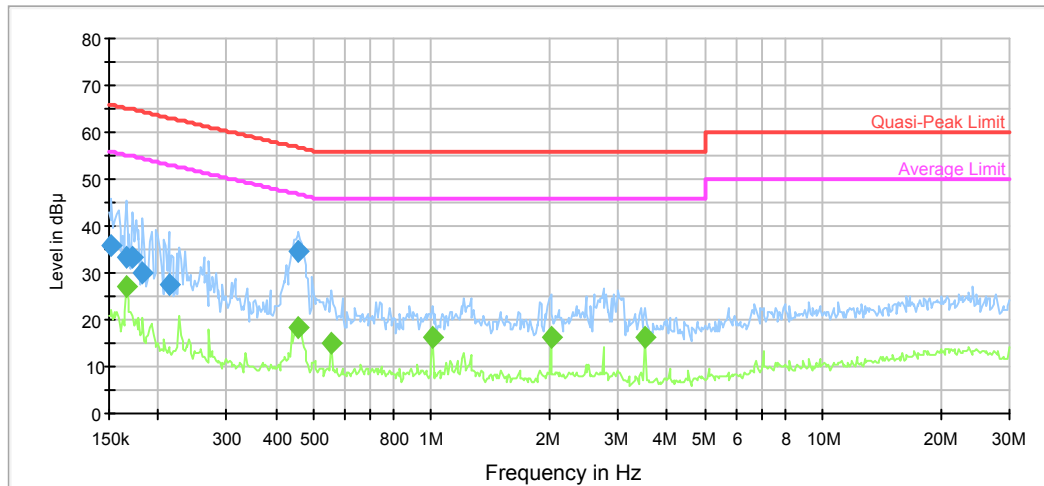
Model: AY-U915BT-US

AC120V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.152410	38.4	9.000	L1	11.2	27.5	65.9	Compliance
0.159873	36.6	9.000	L1	11.1	28.9	65.5	Compliance
0.166371	37.1	9.000	L1	11.0	28.0	65.1	Compliance
0.169044	36.4	9.000	L1	10.9	28.6	65.0	Compliance
0.173134	37.0	9.000	L1	10.9	27.8	64.8	Compliance
0.461346	32.9	9.000	L1	9.9	23.8	56.7	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.152410	25.5	9.000	L1	11.2	30.4	55.9	Compliance
0.461346	26.7	9.000	L1	9.9	20.0	46.7	Compliance
0.999305	14.9	9.000	L1	9.8	31.1	46.0	Compliance
1.209904	15.6	9.000	L1	9.8	30.4	46.0	Compliance
1.259081	17.4	9.000	L1	9.8	28.6	46.0	Compliance
1.998778	14.5	9.000	L1	9.7	31.5	46.0	Compliance

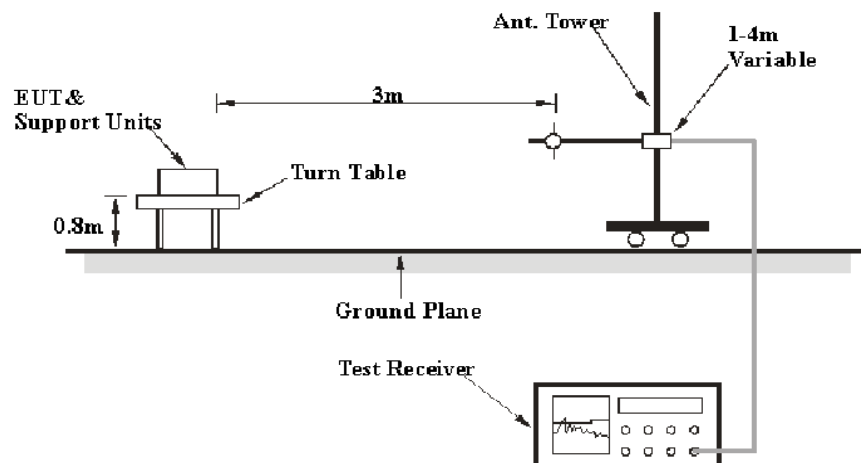
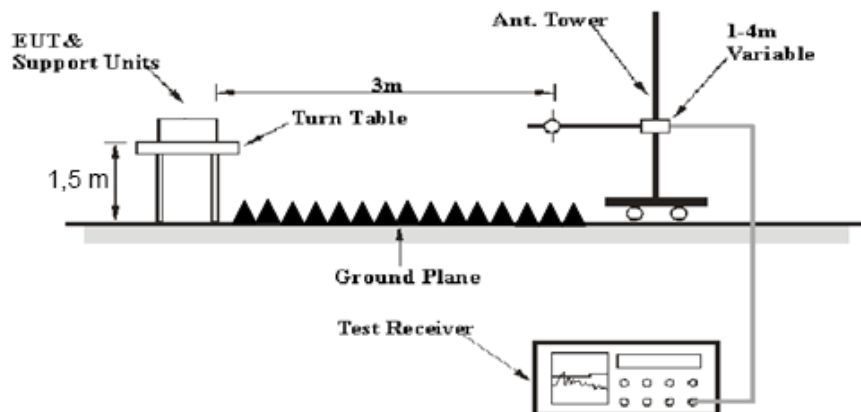
AC120V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.152410	35.9	9.000	N	11.1	30.0	65.9	Compliance
0.166371	33.2	9.000	N	10.9	31.9	65.1	Compliance
0.171759	33.5	9.000	N	10.9	31.4	64.9	Compliance
0.183065	30.1	9.000	N	10.8	34.2	64.3	Compliance
0.212988	27.7	9.000	N	10.5	35.4	63.1	Compliance
0.457684	34.7	9.000	N	9.9	22.0	56.7	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.166371	27.1	9.000	N	10.9	28.0	55.1	Compliance
0.454052	18.2	9.000	N	9.9	28.6	46.8	Compliance
0.554139	14.9	9.000	N	9.9	31.1	46.0	Compliance
1.007300	16.4	9.000	N	9.8	29.6	46.0	Compliance
2.014768	16.1	9.000	N	9.8	29.9	46.0	Compliance
3.519348	16.1	9.000	N	9.8	29.9	46.0	Compliance

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS**Applicable Standard**

FCC §15.247 (d); §15.209; §15.205;

EUT Setup**Below 1GHz:****Above 1GHz:**

The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site A, above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

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	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

Note: If the maximized peak measured value complies with the limit, then it is unnecessary to perform an QP measurement

Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz - 1 GHz, peak and average detection modes for frequencies above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2018-01-04	2019-01-04
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2017-06-27	2018-06-27
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

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

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data

Environmental Conditions

Temperature:	24.5~26.1°C
Relative Humidity:	44~50 %
ATM Pressure:	100.8~100.9 kPa

* The testing was performed by Blake Yang & Sunny Cen on 2018-04-28 and 2018-05-17.

Test Mode: Transmitting

1) 30MHz-10GHz**Model: AY-U920BT-US**

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 903.24 MHz									
903.24	105.03	PK	H	22.36	4.28	0.00	131.67	N/A	N/A
903.24	88.83	PK	V	22.36	4.28	0.00	115.47	N/A	N/A
902.00	35.40	PK	H	22.34	4.29	0.00	62.03	111.67	49.64
1806.48	50.87	PK	V	26.49	1.66	35.90	43.12	74.00	30.88
1806.48	35.07	AV	V	26.49	1.66	35.90	27.32	54.00	26.68
2709.72	46.34	PK	V	29.05	1.88	36.47	40.80	74.00	33.20
2709.72	32.27	AV	V	29.05	1.88	36.47	26.73	54.00	27.27
Middle Channel: 915.24 MHz									
915.24	102.74	PK	H	22.40	4.21	0.00	129.35	N/A	N/A
915.24	91.90	PK	V	22.40	4.21	0.00	118.51	N/A	N/A
1830.48	51.10	PK	V	26.59	1.66	35.95	43.40	74.00	30.60
1830.48	35.22	AV	V	26.59	1.66	35.95	27.52	54.00	26.48
2745.72	47.18	PK	V	29.18	1.91	36.51	41.76	74.00	32.24
2745.72	33.57	AV	V	29.18	1.91	36.51	28.15	54.00	25.85
High Channel: 926.76 MHz									
926.76	105.48	PK	H	22.54	4.35	0.00	132.37	N/A	N/A
926.76	90.16	PK	V	22.54	4.35	0.00	117.05	N/A	N/A
928.00	33.60	PK	H	22.56	4.34	0.00	60.50	112.37	51.87
1853.52	50.72	PK	V	26.68	1.66	35.99	43.07	74.00	30.93
1853.52	34.51	AV	V	26.68	1.66	35.99	26.86	54.00	27.14
2780.28	46.75	PK	V	29.31	1.93	36.55	41.44	74.00	32.56
2780.28	32.68	AV	V	29.31	1.93	36.55	27.37	54.00	26.63

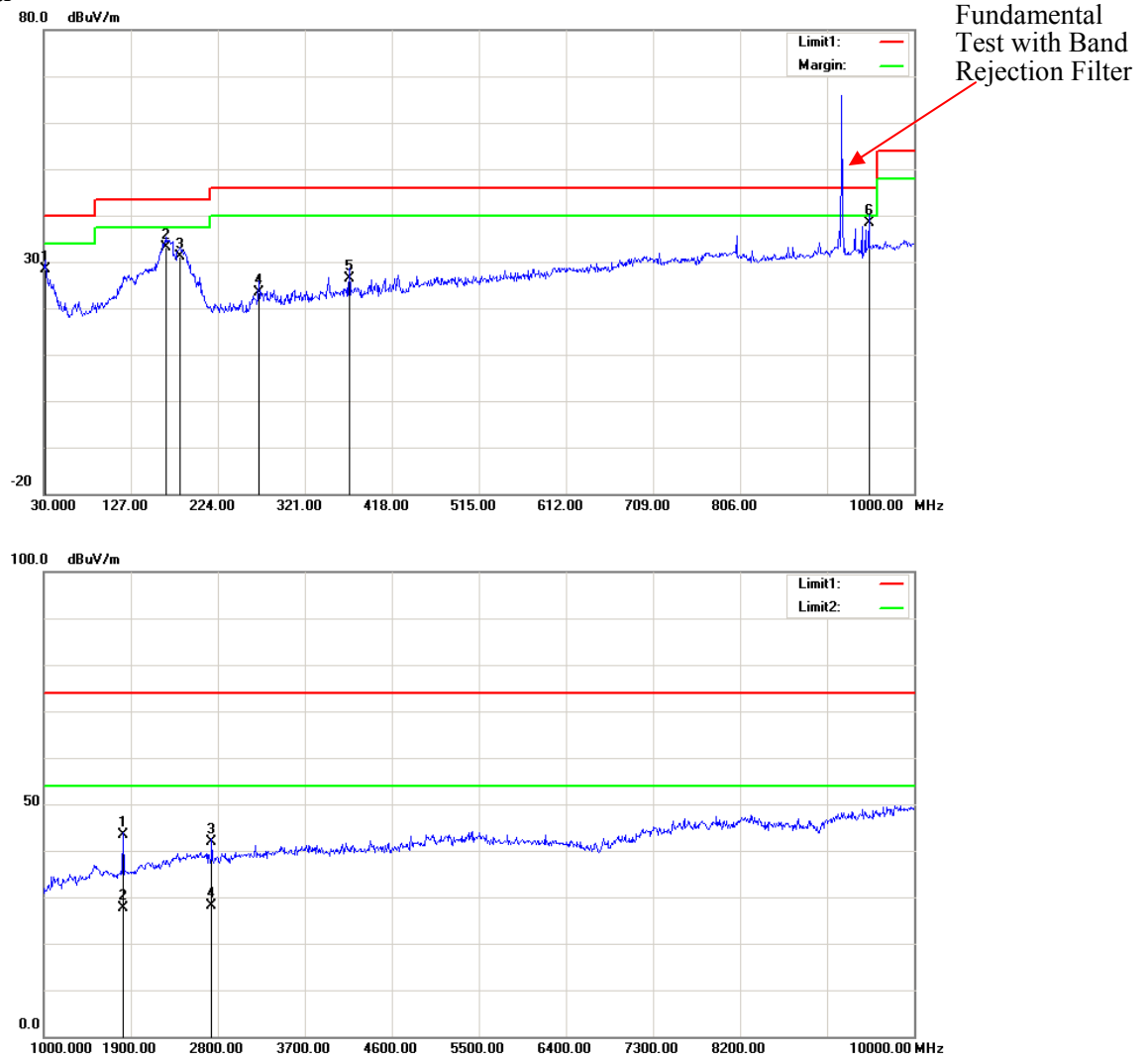
Model: AY-U915BT-US

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 903.24 MHz									
903.24	102.74	PK	H	22.36	4.28	0.00	129.38	N/A	N/A
903.24	91.90	PK	V	22.36	4.28	0.00	118.54	N/A	N/A
902.00	32.80	PK	H	22.34	4.29	0.00	59.43	109.38	49.95
1806.48	49.63	PK	V	26.49	1.66	35.90	41.88	74.00	32.12
1806.48	32.67	AV	V	26.49	1.66	35.90	24.92	54.00	29.08
2709.72	45.73	PK	V	29.05	1.88	36.47	40.19	74.00	33.81
2709.72	31.15	AV	V	29.05	1.88	36.47	25.61	54.00	28.39
Middle Channel: 915.24 MHz									
915.24	101.73	PK	H	22.40	4.21	0.00	128.34	N/A	N/A
915.24	92.12	PK	V	22.40	4.21	0.00	118.73	N/A	N/A
1830.48	48.35	PK	V	26.59	1.66	35.95	40.65	74.00	33.35
1830.48	32.69	AV	V	26.59	1.66	35.95	24.99	54.00	29.01
2745.72	45.56	PK	V	29.18	1.91	36.51	40.14	74.00	33.86
2745.72	31.37	AV	V	29.18	1.91	36.51	25.95	54.00	28.05
High Channel: 926.76 MHz									
926.76	103.88	PK	H	22.54	4.35	0.00	130.77	N/A	N/A
926.76	92.65	PK	V	22.54	4.35	0.00	119.54	N/A	N/A
928.00	34.12	PK	H	22.56	4.34	0.00	61.02	110.77	49.75
1853.52	47.83	PK	V	26.68	1.66	35.99	40.18	74.00	33.82
1853.52	32.56	AV	V	26.68	1.66	35.99	24.91	54.00	29.09
2780.28	45.47	PK	V	29.31	1.93	36.55	40.16	74.00	33.84
2780.28	31.24	AV	V	29.31	1.93	36.55	25.93	54.00	28.07

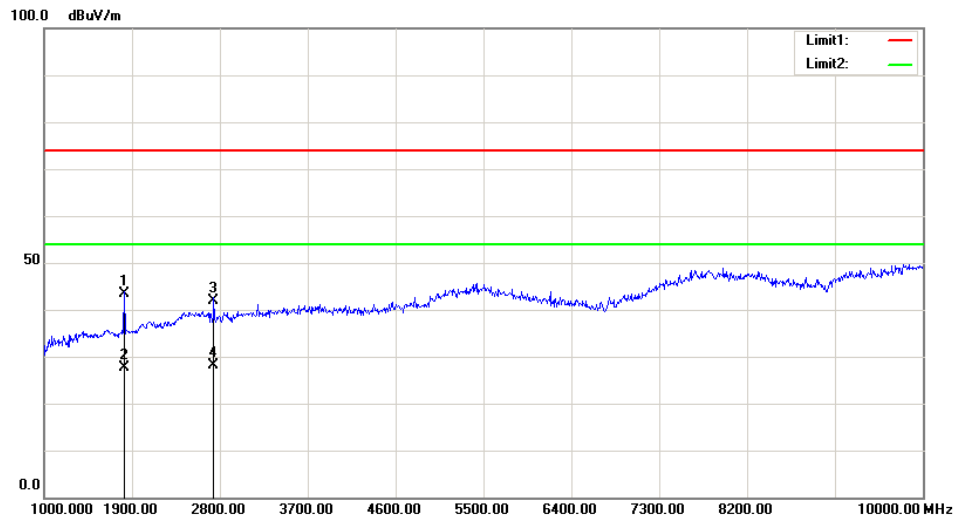
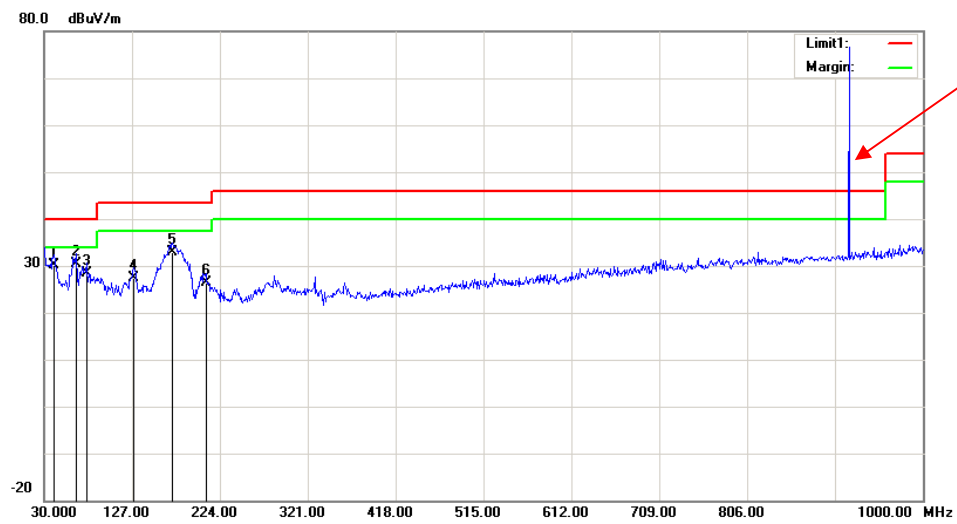
Worst plots(Middle channel)

Model: AY-U920BT-US

Horizontal

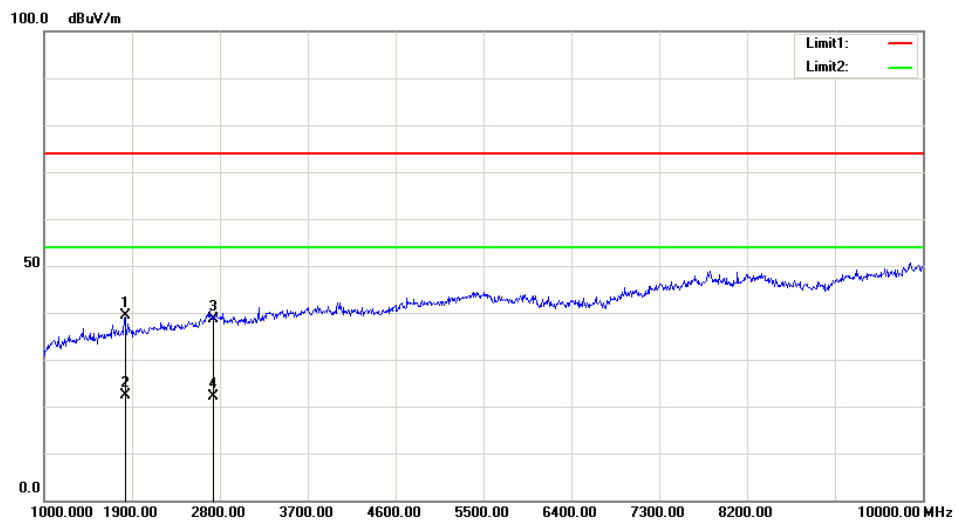
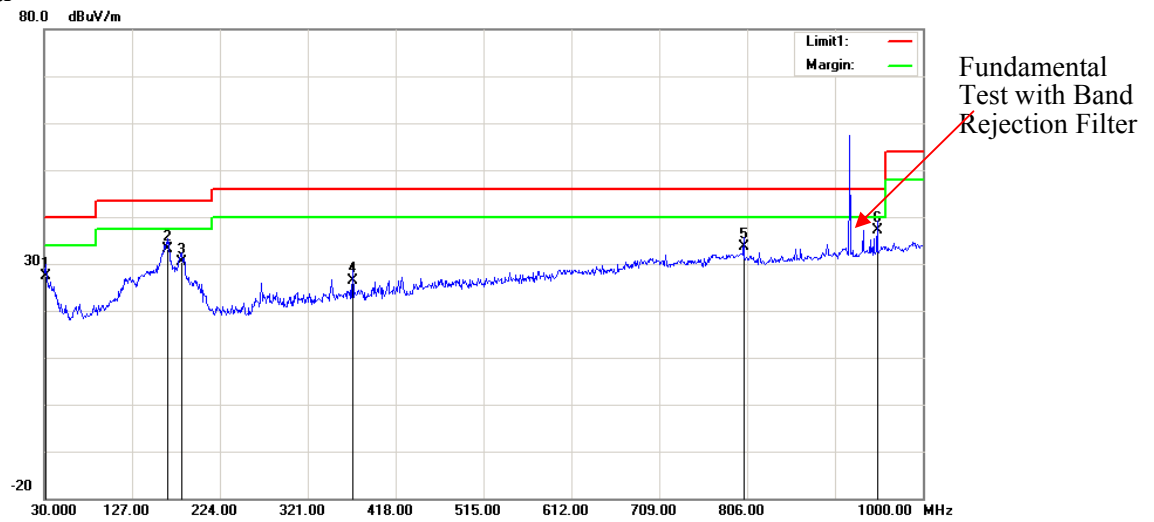


Vertical

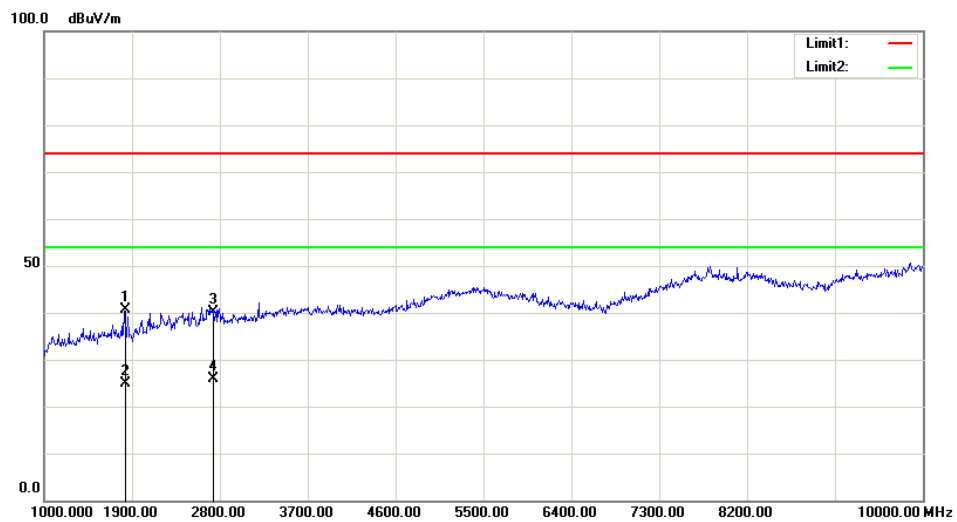
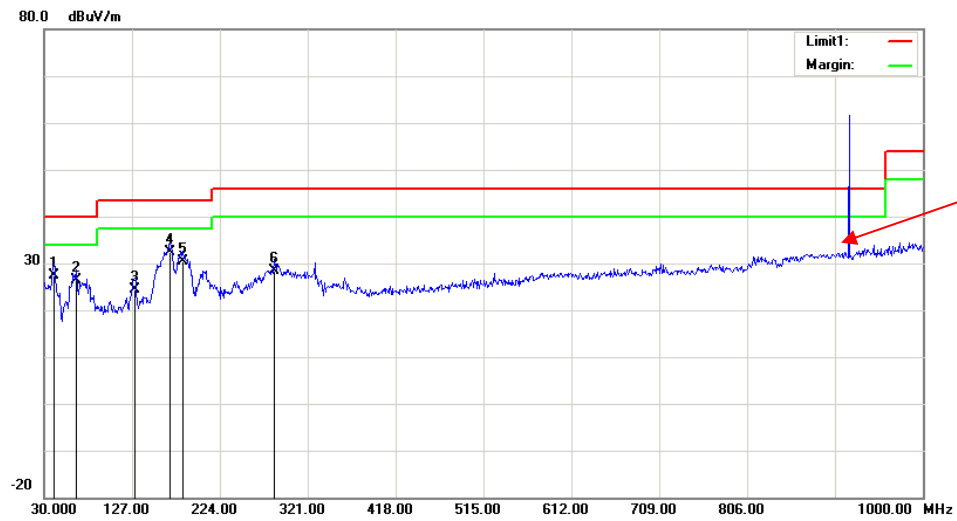


Model: AY-U915BT-US

Horizontal



Vertical



FCC §15.247(a) (1) - CHANNEL SEPARATION TEST**Applicable Standard**

(1) 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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	/

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

Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 10 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace.
3. Measure the channel separation.

Test Data**Environmental Conditions**

Temperature:	26.9 °C
Relative Humidity:	54 %
ATM Pressure:	100.7 kPa

* The testing was performed by Kami Zhou on 2018-04-25.

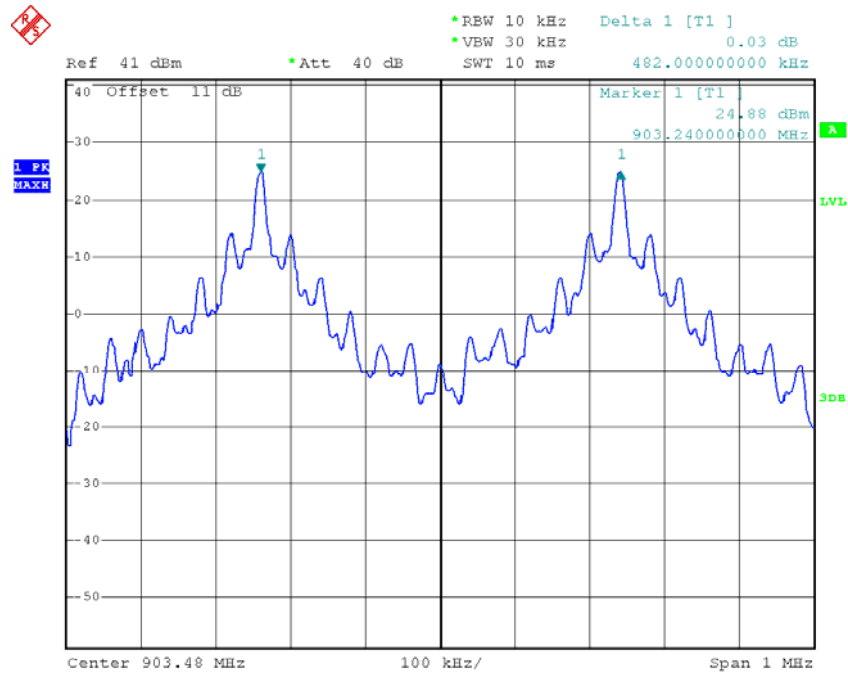
Test Result: Compliance.

Please refer to following tables and plots

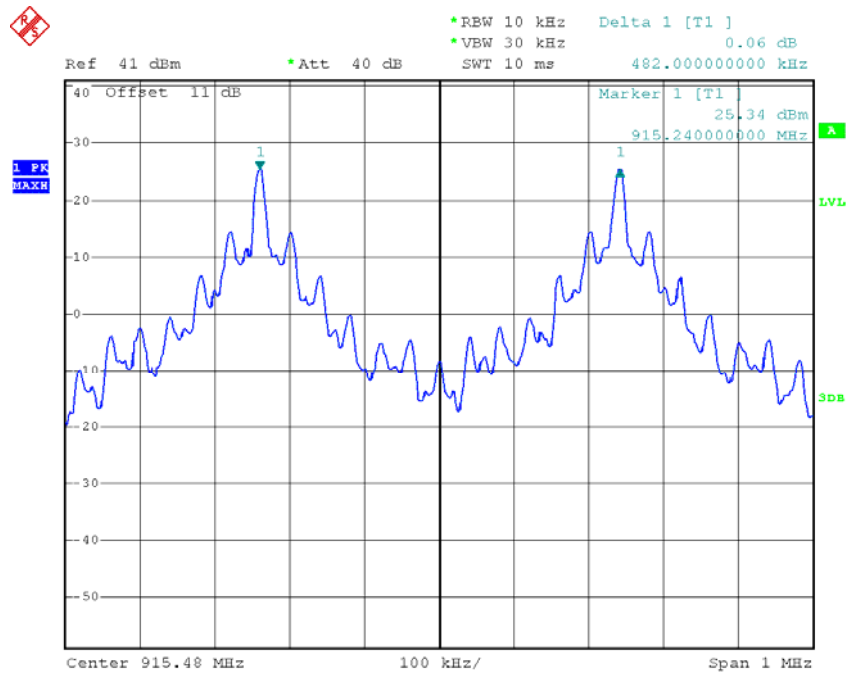
Test Mode: Transmitting

Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
Low	903.24	0.482	≥ 0.168
Middle	915.24	0.482	≥ 0.168
High	926.76	0.480	≥ 0.166

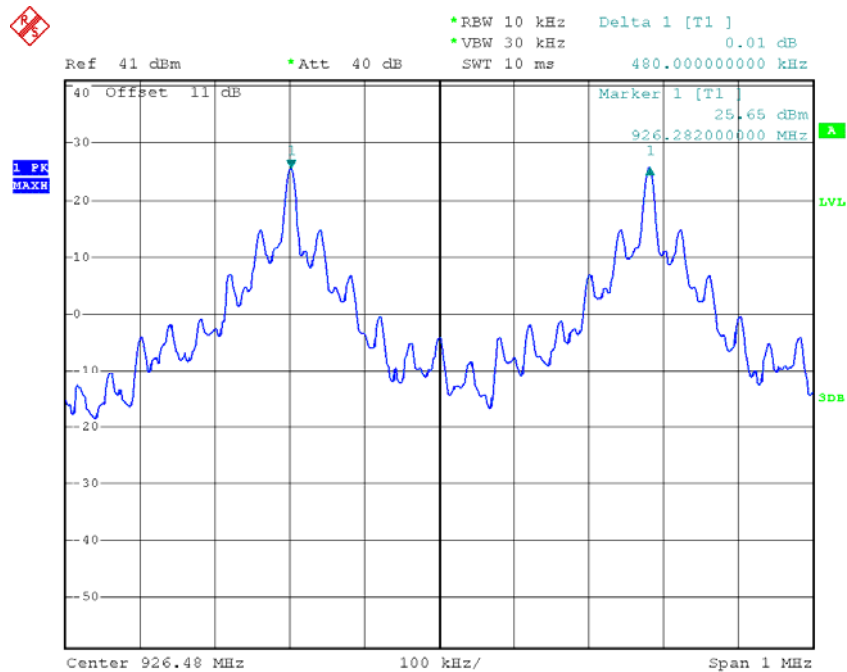
Low Channel



Date: 25.APR.2018 14:09:40

Middle Channel

Date: 25.APR.2018 14:10:43

High Channel

Date: 25.APR.2018 14:12:07

FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING

Applicable Standard

(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.

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 on the test table without connection to measurement instrument. Turn on the EUT. 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	/

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

Test Data

Environmental Conditions

Temperature:	26.9 °C
Relative Humidity:	54 %
ATM Pressure:	100.7 kPa

* The testing was performed by Kami Zhou on 2018-04-25.

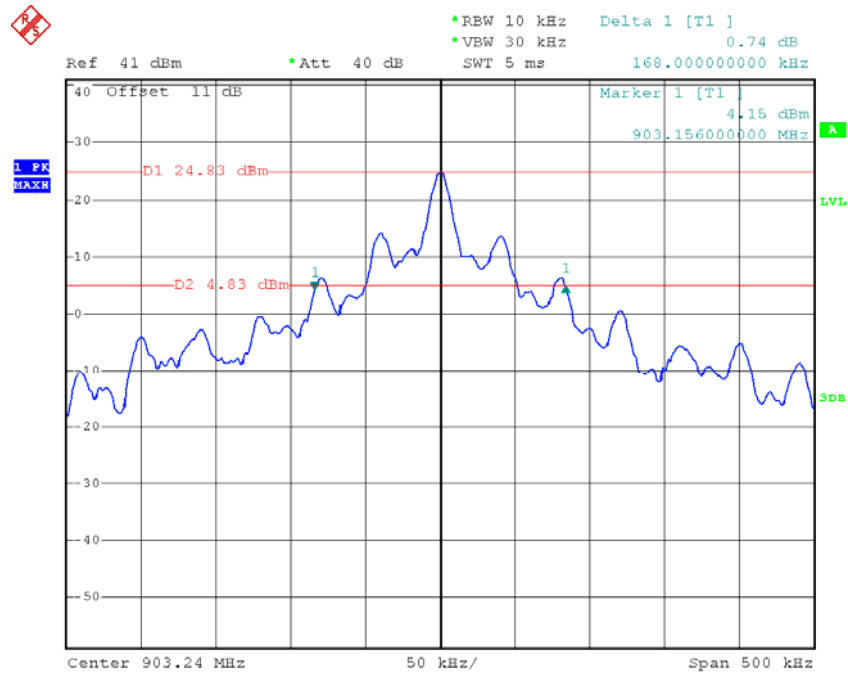
Test Result: Compliance.

Please refer to following tables and plots

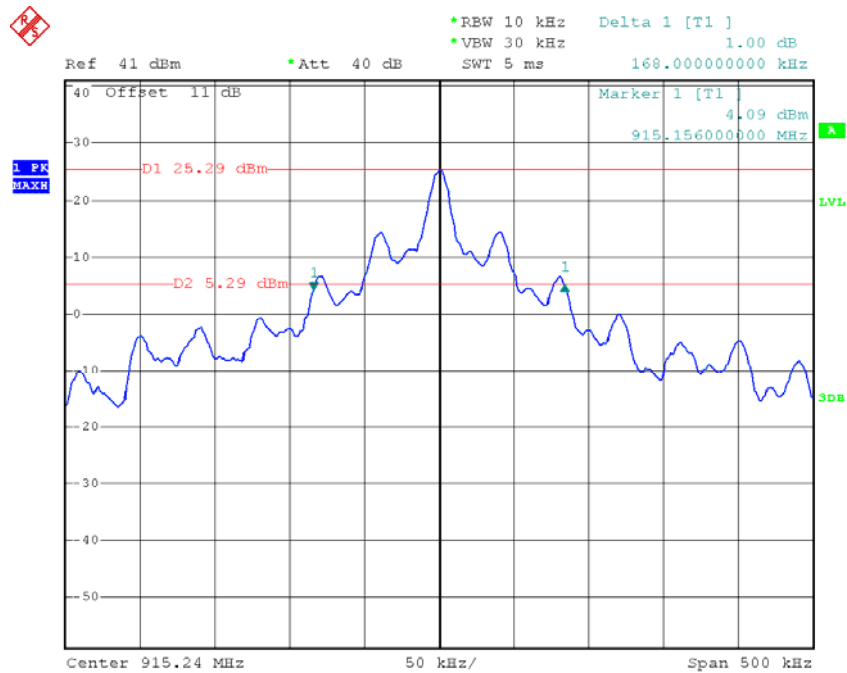
Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	Limit (MHz)
Low	903.24	0.168	≤ 0.25
Middle	915.24	0.168	≤ 0.25
High	926.76	0.166	≤ 0.25

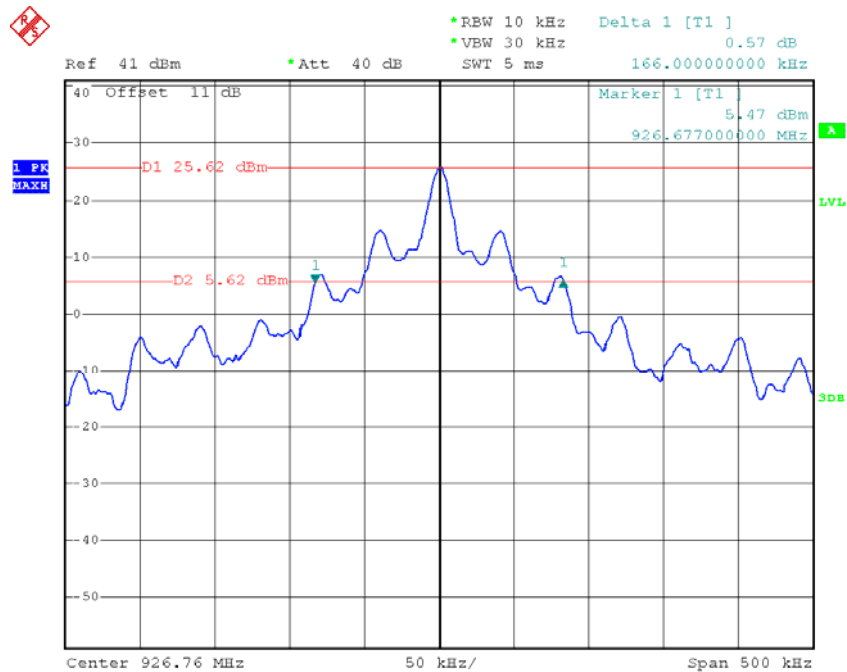
Low Channel



Date: 25.APR.2018 13:50:06

Middle Channel

Date: 25.APR.2018 13:49:20

High Channel

Date: 25.APR.2018 13:48:16

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

Applicable Standard

(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.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	/

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

Test Data

Environmental Conditions

Temperature:	26.9 °C
Relative Humidity:	54 %
ATM Pressure:	100.7 kPa

* The testing was performed by Kami Zhou on 2018-04-25.

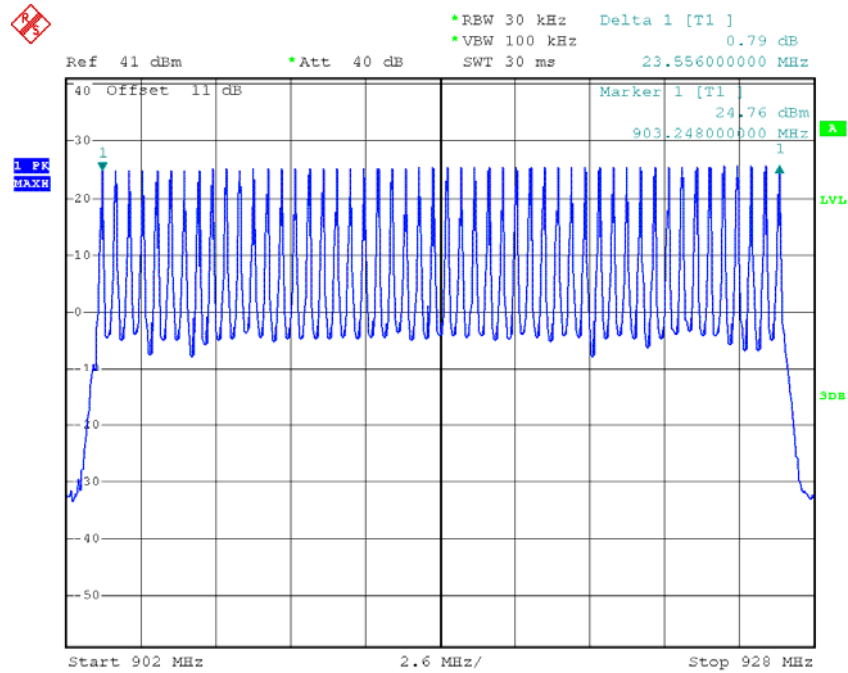
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

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

Number of Hopping Channels



Date: 25.APR.2018 14:20:55

FCC §15.247(a) (1) (i) - TIME OF OCCUPANCY (DWELL TIME)**Applicable Standard**

(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.

Test Procedure

The EUT was worked in channel hopping; the time of single pulses was tested.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	/

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

Test Data**Environmental Conditions**

Temperature:	26.9 °C
Relative Humidity:	54 %
ATM Pressure:	100.7 kPa

* The testing was performed by Kami Zhou on 2018-04-25.

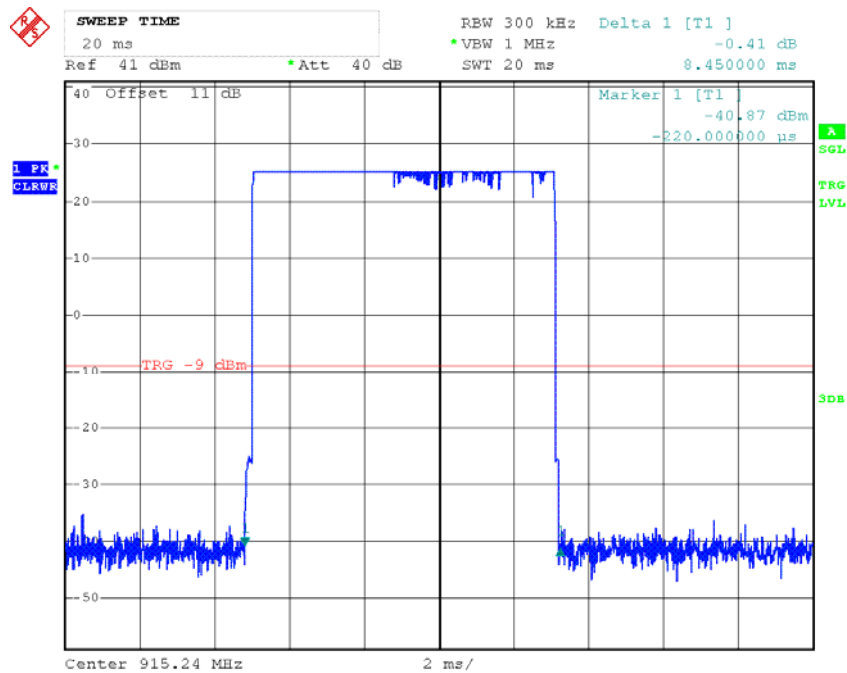
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

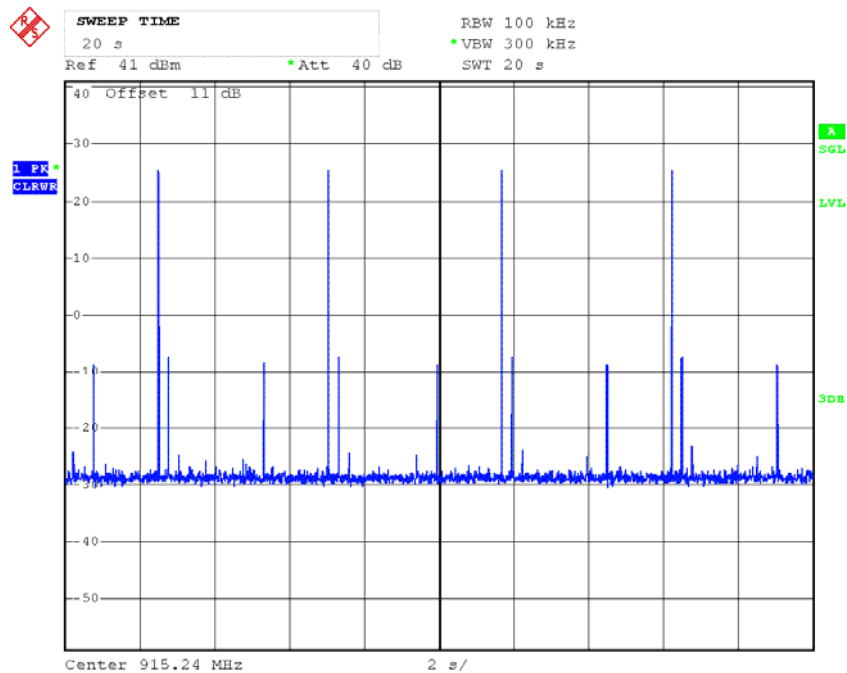
Channel	Occupancy Time For Single Hop (ms)	Hops in Observed Period (20s)	Dwell time (s)	Limit (s)	Result
Middle	8.45	4	0.0338	0.4	Compliance
Dwell time=Pulse time (ms) × hopping number per channel in Observed Period Observed Period=20S					

Middle Channel



Date: 25.APR.2018 14:28:41

20S: Middle Channel



Date: 25.APR.2018 14:36:33

FCC §15.247(b) (2) - PEAK OUTPUT POWER MEASUREMENT**Applicable Standard**

According to §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.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54170013	2017-11-03	2018-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2017-11-03	2018-11-03
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	/

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

Test Data**Environmental Conditions**

Temperature:	26.9 °C
Relative Humidity:	54 %
ATM Pressure:	100.7 kPa

* The testing was performed by Kami Zhou on 2018-04-25.

Test Result: Compliance.

Test Mode: Transmitting

Channel	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
Low	903.24	24.67	26.3
Middle	915.24	25.18	26.3
High	926.76	25.47	26.3

Note: The data above was tested in conducted mode.

The antenna gain is 9.7 dBi for AY-U920BT-US, 8.5 dBi for AY-U915BT-US. The limit was reduced by 3.7dB.

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/ VBW of spectrum analyzer to 100/300 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	/

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

Test Data**Environmental Conditions**

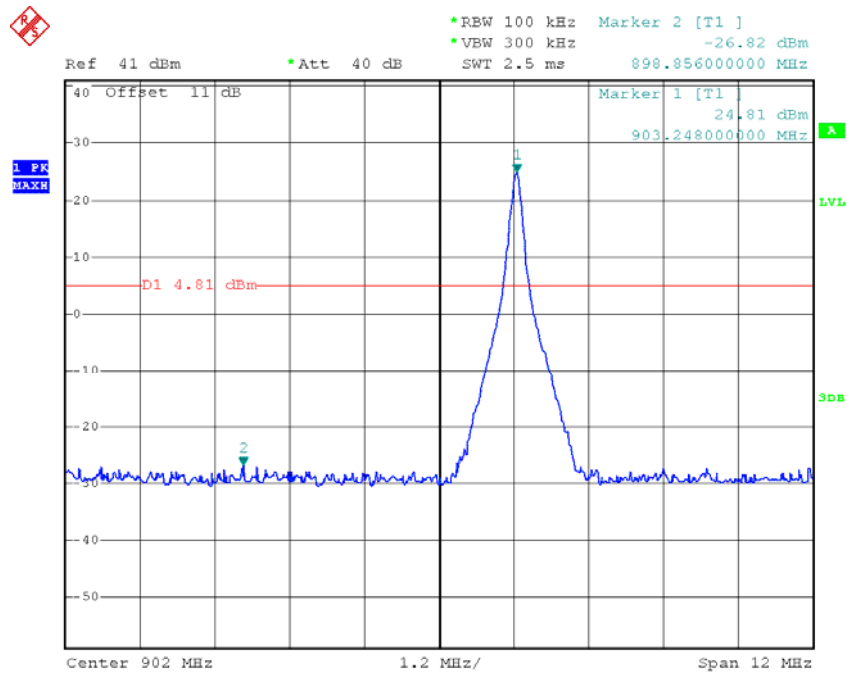
Temperature:	26.9 °C
Relative Humidity:	54 %
ATM Pressure:	100.7 kPa

** The testing was performed by Kami Zhou on 2018-04-25.*

Test Result: Compliance

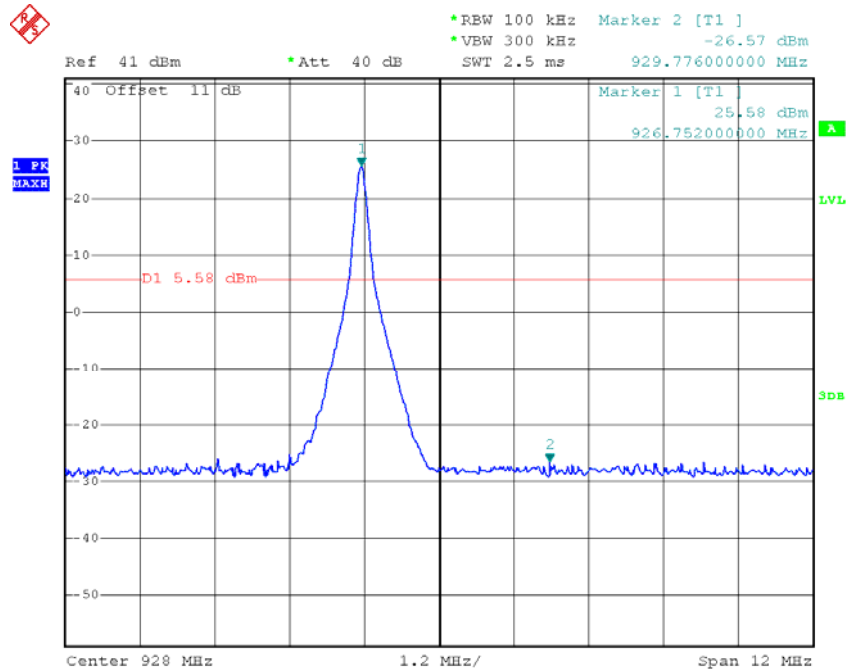
Single Mode:

Band Edge, Left Side



Date: 25.APR.2018 14:08:19

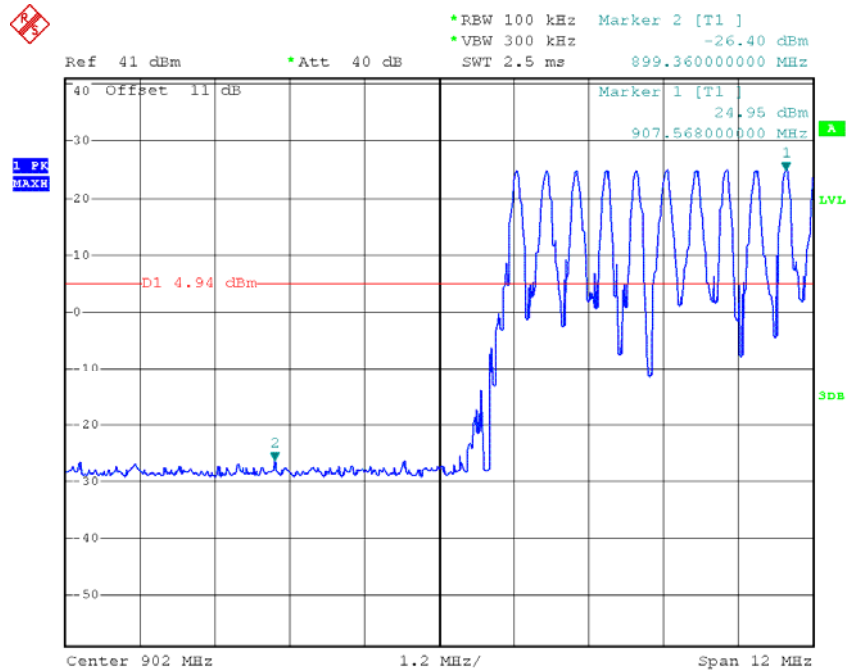
Band Edge, Right Side



Date: 25.APR.2018 14:07:31

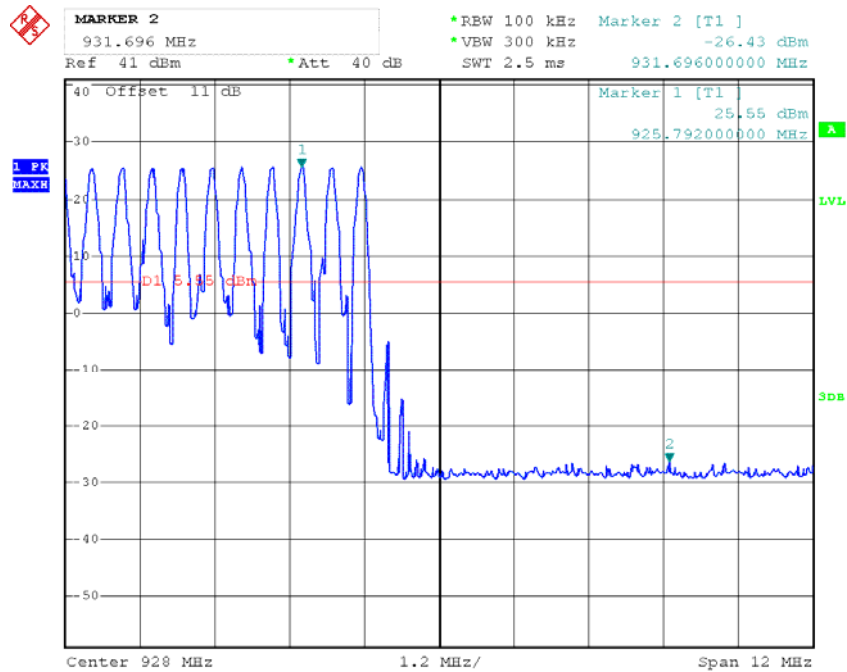
Hopping Mode:

Band Edge, Left Side



Date: 25.APR.2018 14:24:07

Band Edge, Right Side



Date: 25.APR.2018 14:26:06

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