



TESTING LABORATORY
CERTIFICATE # 4821.01



FCC PART 15.247

TEST REPORT

For

Porta Phone Company Inc

145 Dean Knauss Drive, Narragansett, Rhode Island, United States, 02882

FCC ID: B4HTD900HDM

Report Type: Original Report	Product Type: FULL DUPLEX, HIGH DEFINITION, 900MHZ TRANSCIVER- MASTER
Report Number: <u>RSZ180419830-00</u>	
Report Date: <u>2018-05-25</u>	
Reviewed By: <u>RF Engineer</u>	<i>Rocky Kang</i>
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

Note: This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*”.

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	4
OBJECTIVE.....	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY.....	4
MEASUREMENT UNCERTAINTY.....	4
TEST FACILITY.....	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION.....	6
EQUIPMENT MODIFICATIONS.....	6
SUPPORT EQUIPMENT LIST AND DETAILS.....	7
EXTERNAL I/O CABLE.....	7
BLOCK DIAGRAM OF TEST SETUP.....	7
SUMMARY OF TEST RESULTS.....	8
TEST EQUIPMENT LIST.....	9
FCC§15.247 (i), §1.1307 (b) (1) & §2.1093 – RF EXPOSURE.....	10
APPLICABLE STANDARD.....	10
FCC §15.203 - ANTENNA REQUIREMENT.....	11
APPLICABLE STANDARD.....	11
ANTENNA CONNECTOR CONSTRUCTION.....	11
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS.....	12
APPLICABLE STANDARD.....	12
EUT SETUP.....	12
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP.....	13
TEST PROCEDURE.....	13
CORRECTED AMPLITUDE & MARGIN CALCULATION.....	13
TEST RESULTS SUMMARY.....	13
TEST DATA.....	14
FCC §15.247(a) (1)-CHANNEL SEPARATION TEST.....	21
APPLICABLE STANDARD.....	21
TEST PROCEDURE.....	21
TEST DATA.....	21
FCC §15.247(a) (1) (i) – 20 dB EMISSION BANDWIDTH.....	24
APPLICABLE STANDARD.....	24
TEST PROCEDURE.....	24
TEST DATA.....	24
FCC §15.247(a) (1) (i)-QUANTITY OF HOPPING CHANNEL TEST.....	27
APPLICABLE STANDARD.....	27
TEST PROCEDURE.....	27
TEST DATA.....	27
FCC §15.247(a) (1) (i) - TIME OF OCCUPANCY (DWELL TIME).....	29
APPLICABLE STANDARD.....	29
TEST PROCEDURE.....	29
TEST DATA.....	30

FCC §15.247(b) (2) - MAXIMUM CONDUCTED OUTPUT POWER.....33
 APPLICABLE STANDARD33
 TEST PROCEDURE33
 TEST DATA33

FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE.....34
 APPLICABLE STANDARD34
 TEST PROCEDURE34
 TEST DATA34

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Porta Phone Company Inc*'s product, model number: *TD900HD-SM (FCC ID: B4HTD900HDM)* or the "EUT" in this report was a *FULL DUPLEX, HIGH DEFINITION, 900MHZ TRANSCEIVER- MASTER*, which was measured approximately: 21.0 cm (L) × 20.0 cm (W) × 8.2 cm (H), rated with input voltage: DC 3.7 V battery.

Notes: This series products model: TD900HD-DM, TD900HD SM-SW, TD900HD DM-SW and TD900HD-SM are electrically identical, they have the same or similar structure, PCB, Material and function to the testing products, Model TD 900HD-SM 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: 20180419A for TD900HD-SM, 20180419B for TD900HD-DM, 20180419C for TD900HD SM-SW, 20180419D for TD900HD DM-SW(Assigned by BAACL, shenzhen).The EUT supplied by the applicant was received on 2018-04-19.*

Objective

This report is prepared on behalf of *Porta Phone Company Inc* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS submissions with FCC ID: B4HTD900HDR.

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, conducted		±1.5dB
Unwanted Emission, conducted		±1.5dB
Emissions, radiated	Below 1GHz	±4.70dB
	Above 1GHz	±4.80dB
Temperature		±1 °C
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 engineering mode.

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	903.0	2	903.5	3	904.0	4	904.5
5	905.0	6	905.5	7	906.0	8	906.5
9	907.0	10	907.5	11	908.0	12	908.5
13	909.0	14	909.5	15	910.0	16	910.5
17	911.0	18	911.5	19	912.0	20	912.5
21	913.0	22	913.5	23	914.0	24	914.5
25	915.0	26	915.5	27	916.0	28	916.5
29	917.0	30	917.5	31	918.0	32	918.5
33	919.0	34	919.5	35	920.0	36	920.5
37	921.0	38	921.5	39	922.0	40	922.5
41	923.0	42	923.5	43	924.0	44	924.5
45	925.0	46	925.0	47	926.0	48	926.5
49	927.0						

Equipment Modifications

No modification was made to the EUT tested.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

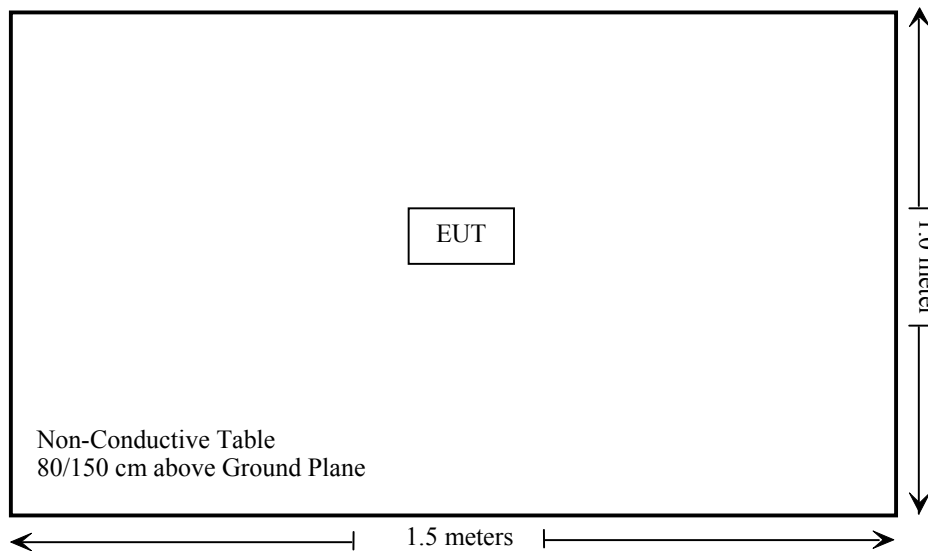
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth	Compliance
§15.247(a)(1)(i)	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

Note:

Not Applicable: The EUT is powered by battery and the battery can be removed to a charger while it's charging

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
A.H.System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2018-04-24	2019-04-24
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	A040904-2	2017-12-17	2020-12-16
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2017-12-07	2018-12-07
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	2017-11-19	2018-05-21
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
Sinoscite	Band Reject Filter	BSF2402-2480MN-0898-001	N/A	2017-05-21	2018-05-21
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-05	2018-12-05
Agilent	Power Meter	N1912A	MY5000492	2018-01-02	2019-01-02
Agilent	Power Sensor	N1921A	MY54210024	2018-01-02	2019-01-02
Ducommun technologies	RF Cable	RG-214	3	2017-11-22	2018-05-22
WEINSCHTEL	10dB Attenuator	5324	AU 3842	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

FCC§1.1310 and §2.1093.

Measurement Result

Please refer to SAR test report: RSZ180419830-20A.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has an internal antenna arrangement, which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

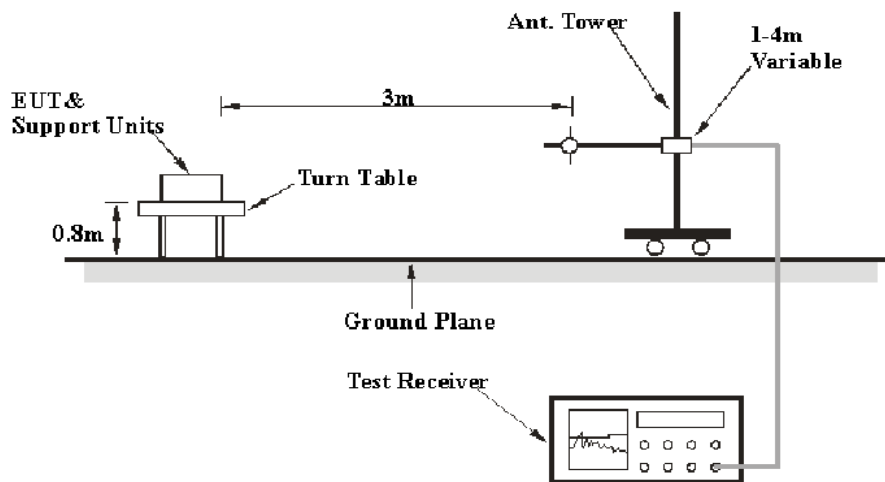
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

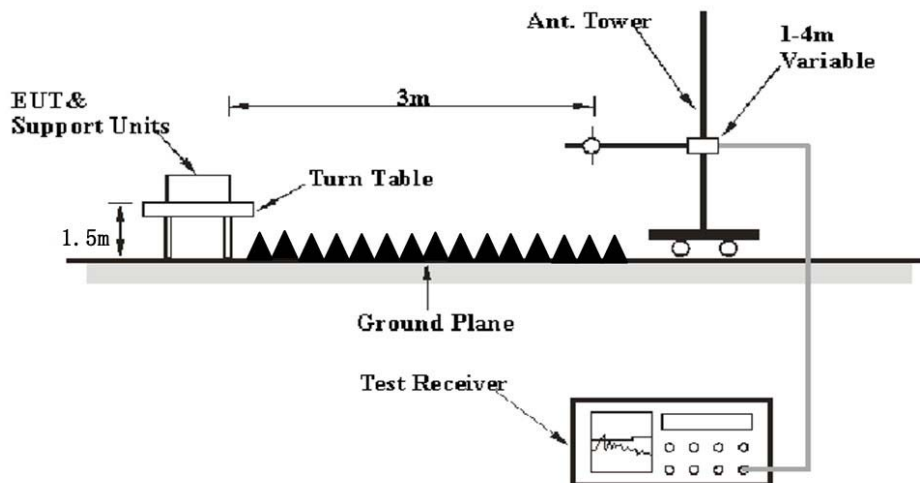
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, 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	Measurements
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

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.

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 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

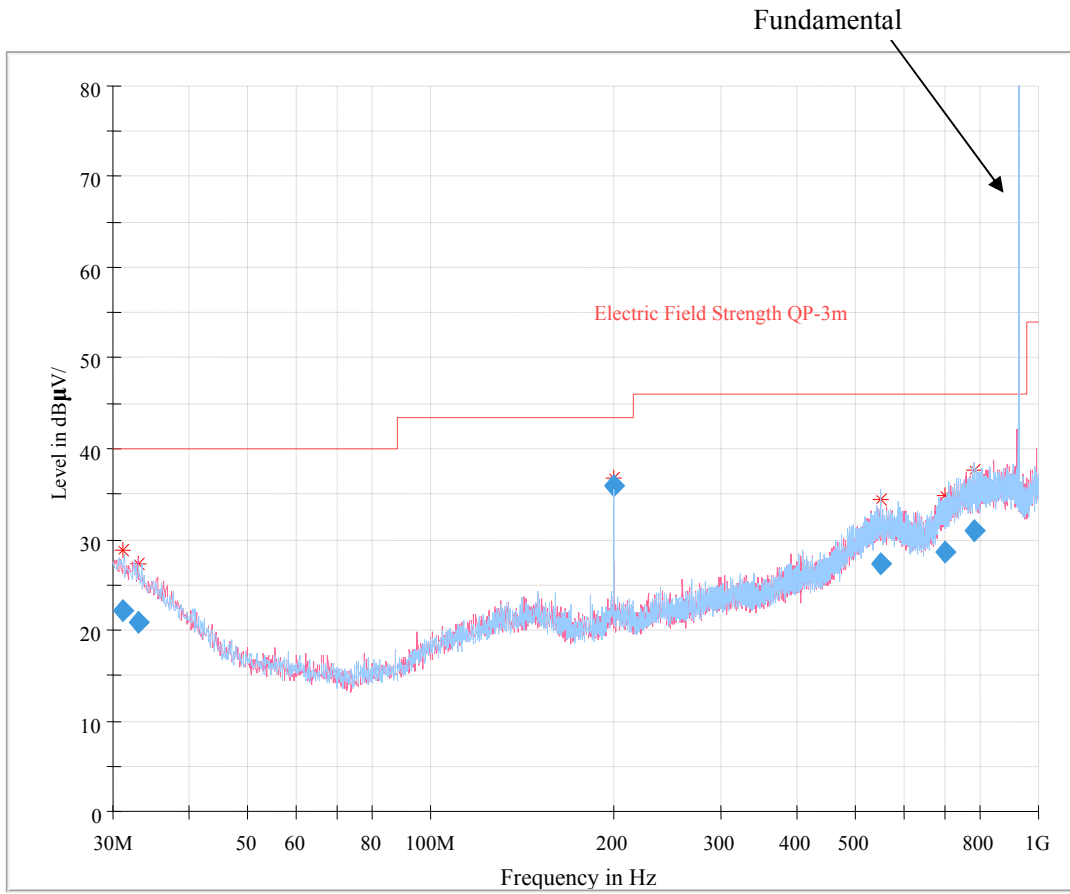
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Hill He on 2018-04-26.

EUT operation mode: Transmitting

**For Single Speaker:
30 MHz~1 GHz:**



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
31.020375	22.18	375.0	H	121.0	0.0	40.00	17.82
33.022000	20.77	386.0	V	168.0	-1.3	40.00	19.23
199.993125	35.93	124.0	H	73.0	-4.0	43.50	7.57
549.194125	27.28	118.0	H	0.0	5.3	46.00	18.72
702.379625	28.54	274.0	V	269.0	7.1	46.00	17.46
782.053375	30.96	167.0	H	134.0	9.0	46.00	15.04

1 GHz - 10 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
Low Channel (903MHz)									
903.00	80.75	PK	170	2.4	H	37.57	118.32	/	/
903.00	80.85	PK	106	2.2	V	37.57	118.42	/	/
1806.00	78.09	PK	70	2.4	V	-5.22	72.87	98.42	25.55
2709.00	69.57	PK	108	2.1	V	-0.65	68.92	74	5.08
2709.00	34.55	Ave.	108	2.1	V	-0.65	33.90	54	20.1
6321.00	52.73	PK	335	2.4	V	8.75	61.48	98.42	36.94
Middle Channel(915MHz)									
915.00	80.57	PK	229	1.8	H	37.16	117.73	/	/
915.00	80.87	PK	139	1.7	V	37.16	118.03	/	/
1830.00	80.01	PK	29	1.7	V	-5.22	74.79	98.03	23.24
2745.00	65.89	PK	337	1.4	V	-0.65	65.24	74	8.76
2745.00	33.55	Ave.	337	1.4	V	-0.65	32.90	54	21.1
6405.00	55.22	PK	333	1.5	V	8.93	64.15	98.03	33.88
High Channel (927 MHz)									
927.00	81.21	PK	212	1.6	H	36.75	117.96	/	/
927.00	81.40	PK	256	1.5	V	36.75	118.15	/	/
1854.00	80.31	PK	242	1.5	V	-5.17	75.14	98.15	23.01
2781.00	60.61	PK	173	1.9	V	-0.57	60.04	74	13.96
2781.00	32.53	Ave.	173	1.9	V	-0.57	31.96	54	22.04
6489.00	54.59	PK	57	1.5	V	9.93	64.52	98.15	33.63

Note:

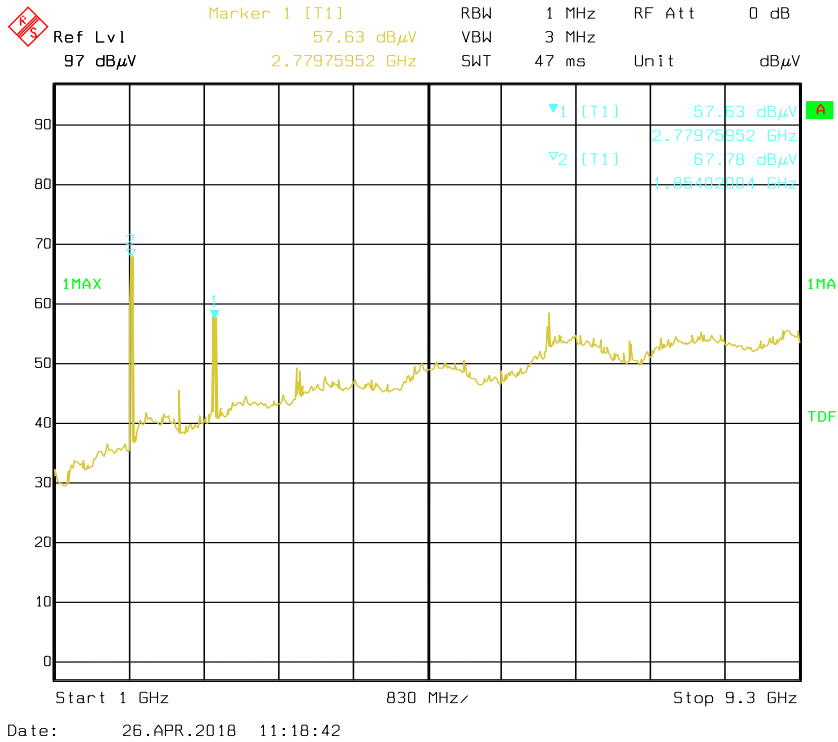
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

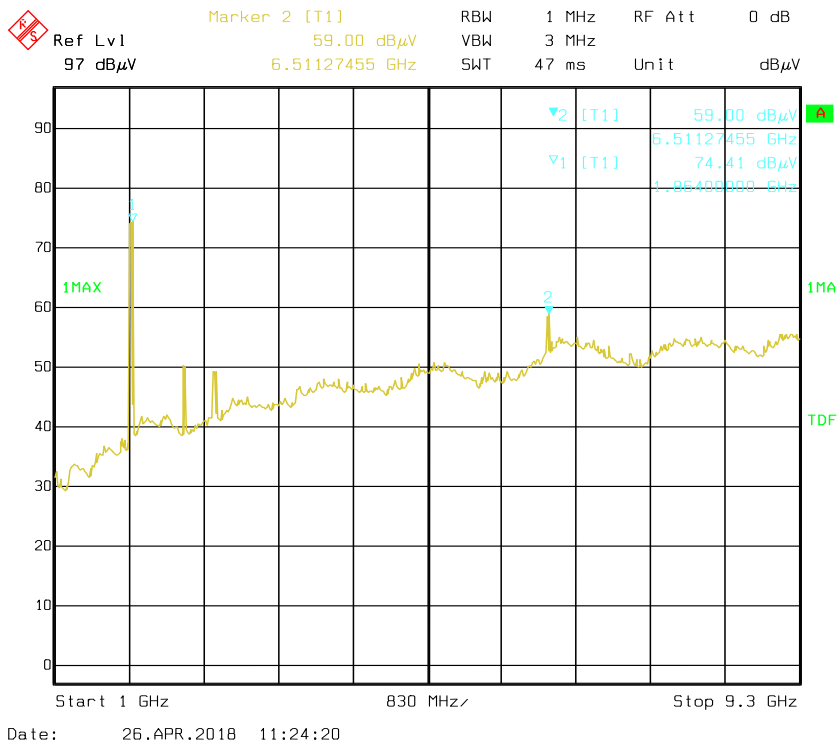
Margin = Limit - Corrected. Amplitude

The other spurious emission which is 20dB to the limit was not recorded.

Pre-scan with 10M Mode, High channel for Peak Horizontal

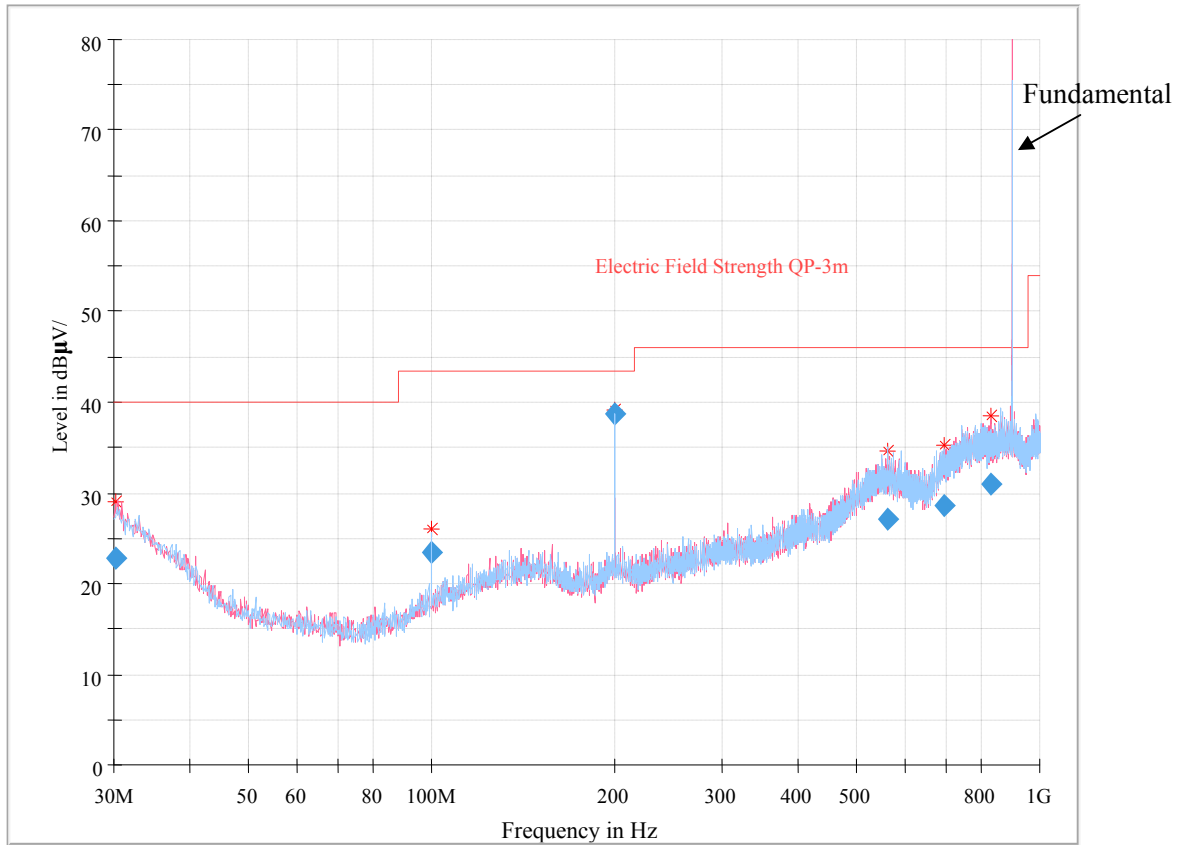


Vertical



For Dual Speaker:

30 MHz-1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
30.172498	22.80	400.0	V	25.0	0.6	40.00	17.20
100.023625	23.47	267.0	H	138.0	-8.4	43.50	20.03
199.996125	38.76	142.0	H	92.0	-4.0	43.50	4.74
561.511875	26.99	241.0	H	230.0	5.2	46.00	19.01
697.103250	28.54	246.0	H	273.0	6.8	46.00	17.46
832.785875	31.07	299.0	V	266.0	9.4	46.00	14.93

1 GHz - 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)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
Low Channel (903MHz)									
903.00	80.39	PK	204	1.9	H	37.57	117.96	/	/
903.00	79.65	PK	226	1.7	V	37.57	117.22	/	/
1806.00	73.20	PK	254	1.9	H	-5.22	67.98	97.96	29.98
2709.00	69.39	PK	309	1.1	H	-0.65	68.74	74	5.26
2709.00	34.21	Ave.	309	1.1	H	-0.65	33.56	54	20.44
6321.00	50.32	PK	343	2.4	H	8.75	59.07	97.96	38.89
Middle Channel (915MHz)									
915.00	80.93	PK	351	2.2	H	37.16	118.09	/	/
915.00	80.85	PK	160	2.4	V	37.16	118.01	/	/
1830.00	72.63	PK	350	2.4	H	-5.22	67.41	98.09	30.68
2745.00	65.77	PK	199	2.2	H	-0.65	65.12	74	8.88
2745.00	33.79	Ave.	199	2.2	H	-0.65	33.14	54	20.86
6405.00	48.94	PK	14	2.2	H	8.93	57.87	98.09	40.22
High Channel (927 MHz)									
927.00	81.46	PK	306	2.2	H	36.75	118.21	/	/
927.00	81.27	PK	276	1.9	V	36.75	118.02	/	/
1854.00	75.05	PK	336	2.1	H	-5.17	69.88	98.26	28.38
2781.00	60.00	PK	306	1.1	H	-0.57	59.43	74	14.57
2781.00	33.79	Ave.	306	1.1	H	-0.57	33.22	54	20.78
6489.00	55.15	PK	106	1.3	H	9.93	65.08	98.26	33.18

Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

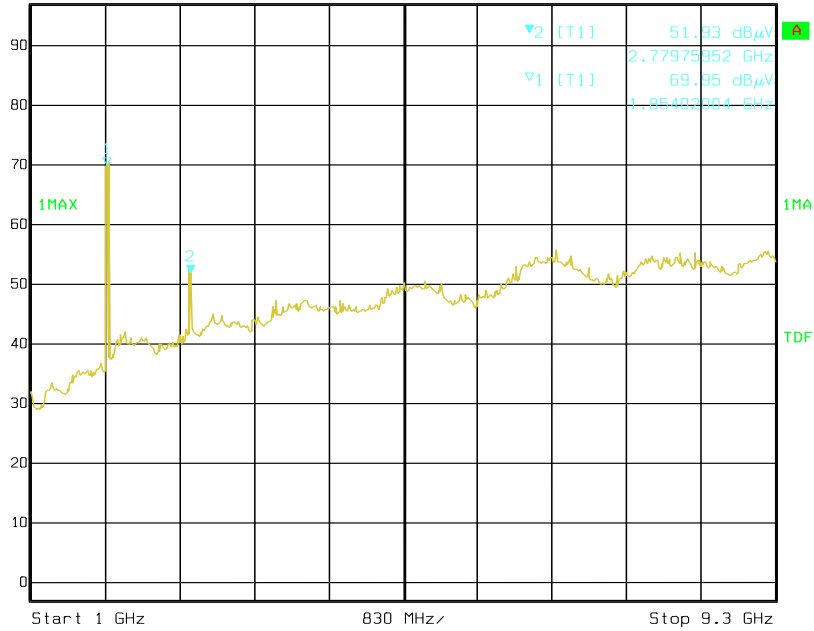
Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

The other spurious emission which is 20dB to the limit was not recorded.

Pre-scan for Peak Horizontal

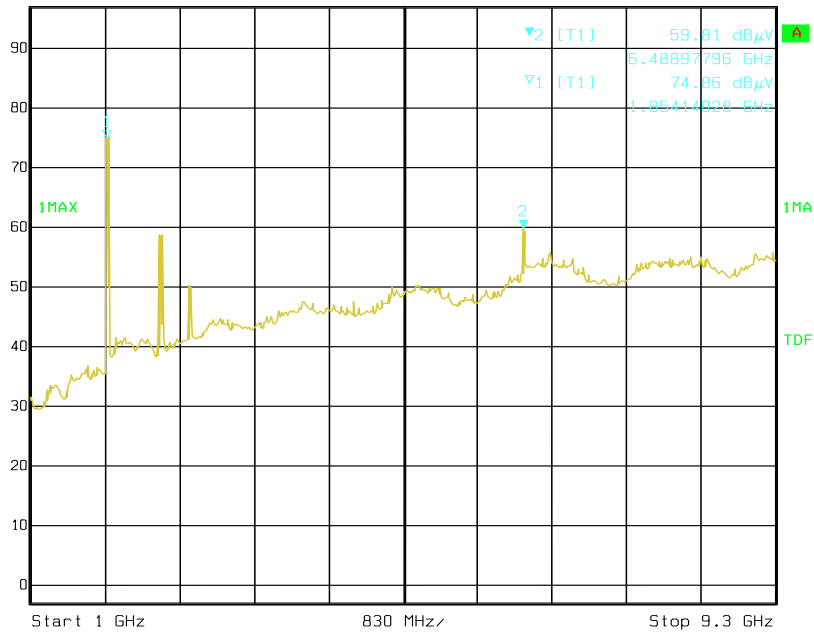

Ref Lvl 97 dB μ V
 Marker 2 [T1] 51.93 dB μ V
 RBW 1 MHz RF Att 0 dB
 VBW 3 MHz
 SWT 47 ms Unit dB μ V
 2.77975952 GHz



Date: 26.APR.2018 12:49:39

Vertical


Ref Lvl 97 dB μ V
 Marker 2 [T1] 59.81 dB μ V
 RBW 1 MHz RF Att 0 dB
 VBW 3 MHz
 SWT 47 ms Unit dB μ V
 6.48897796 GHz



Date: 26.APR.2018 12:41:34

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

Applicable Standard

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.

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:	24 °C
Relative Humidity:	51 %
ATM Pressure:	110.0 kPa

The testing was performed by Hill He on 2018-04-24.

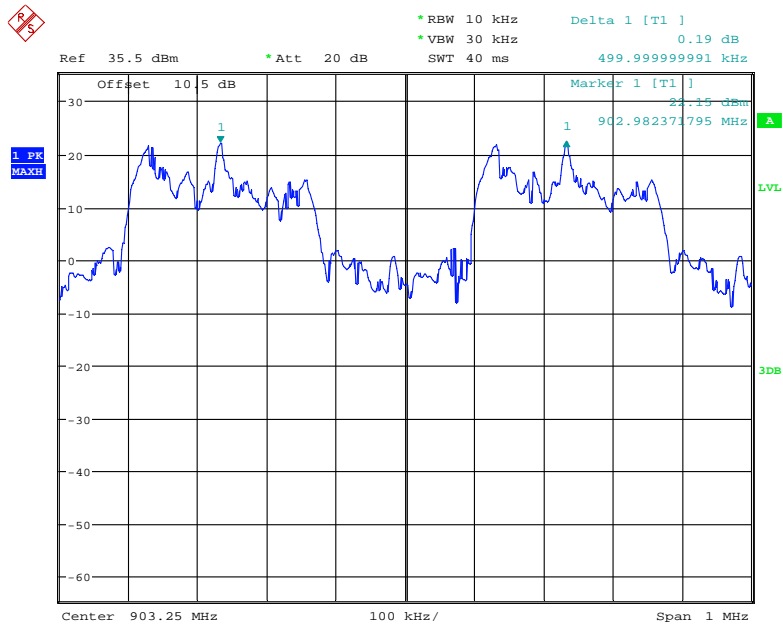
EUT operation mode: Transmitting

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

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	≥Limit (MHz)	Result
GFSK	Low	903	0.500	0.309	Pass
	Adjacent	903.5			
	Middle	915	0.503	0.312	Pass
	Adjacent	915.5			
	High	927.0	0.500	0.311	Pass
	Adjacent	926.5			

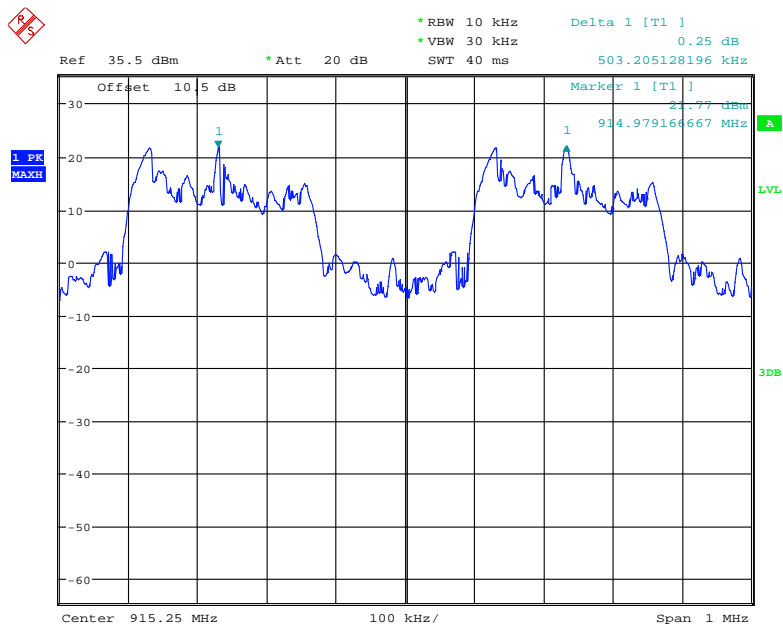
Note: Limit = 20 dB bandwidth

Low Channel



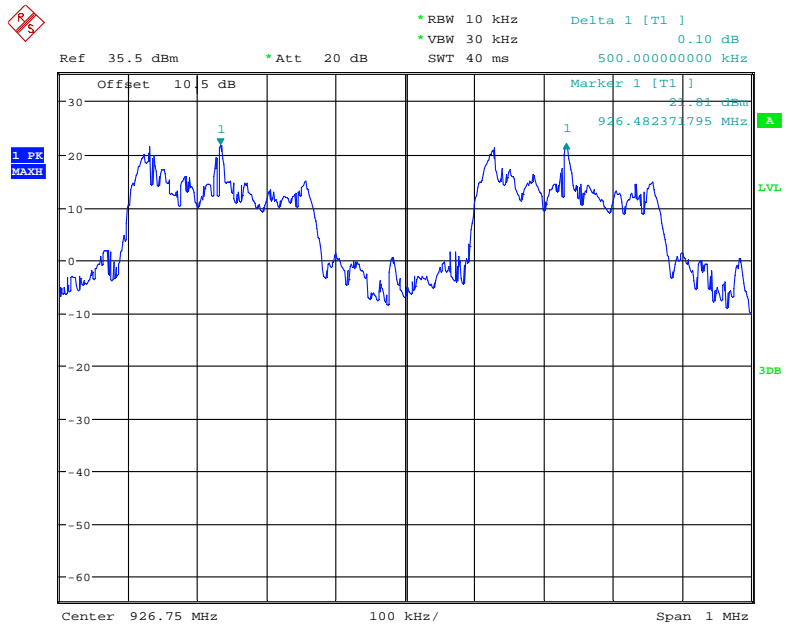
Date: 24.APR.2018 17:08:20

Middle Channel



Date: 24.APR.2018 17:14:52

High Channel



Date: 24.APR.2018 17:20:22

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

Applicable Standard

According to §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.

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:	24 °C
Relative Humidity:	51 %
ATM Pressure:	110.0 kPa

The testing was performed by Hill He on 2018-04-24.

EUT operation mode: Transmitting

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

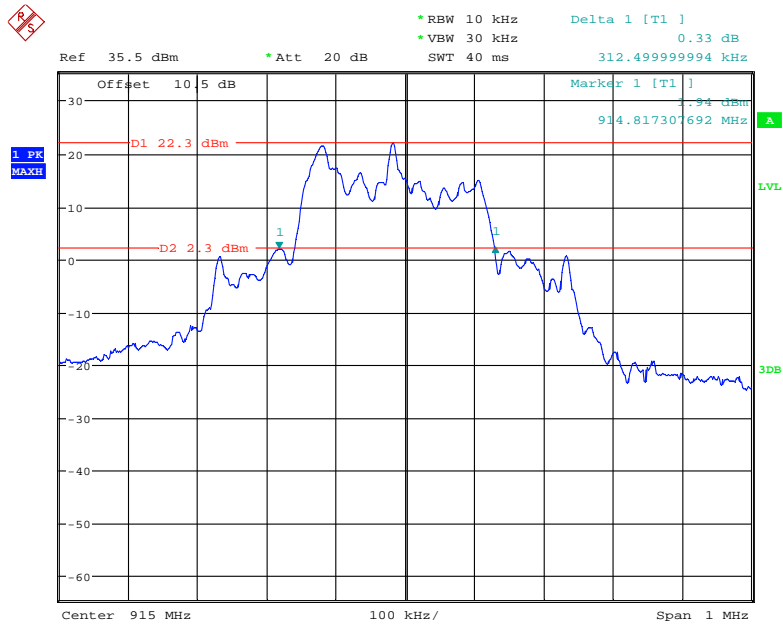
Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)	Limit (MHz)
Low	903	0.309	0.25-0.5
Middle	915	0.312	0.25-0.5
High	927	0.311	0.25-0.5

Low Channel



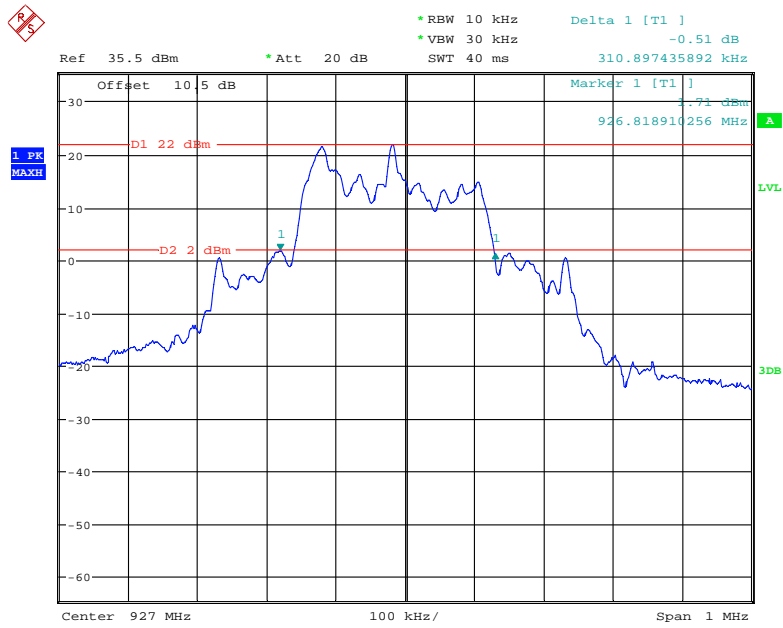
Date: 24.APR.2018 11:51:45

Middle Channel



Date: 24.APR.2018 11:53:38

High Channel



Date: 24.APR.2018 11:55:00

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

Applicable Standard

According to §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.

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:	24 °C
Relative Humidity:	51 %
ATM Pressure:	110.0 kPa

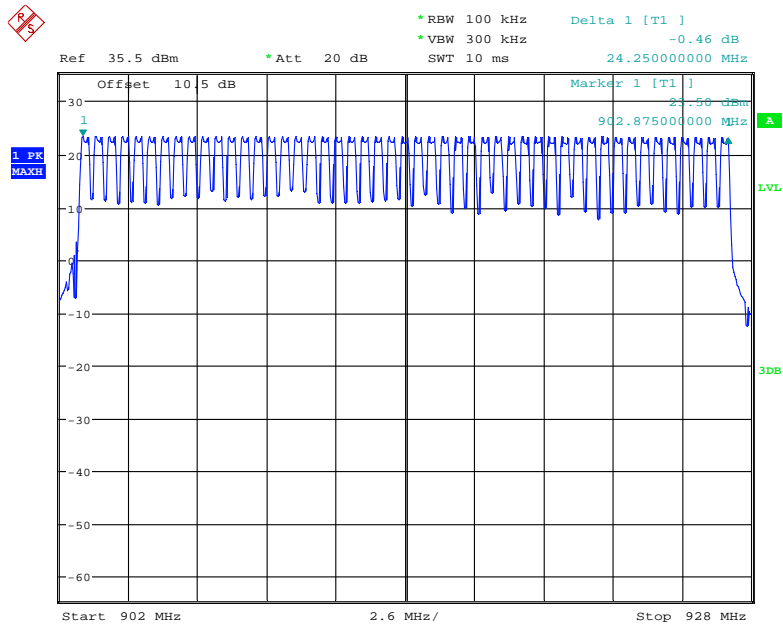
The testing was performed by Hill He on 2018-04-24.

EUT operation mode: Transmitting

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

Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
GFSK	903-927	49	25

(GFSK): Number of Hopping Channels



Date: 24.APR.2018 13:08:04

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

Applicable Standard

According to §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.

Test Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: Zero span, centered on a hopping channel.
- b) RBW shall be \leq channel spacing and where possible RBW should be set $\gg 1 / T$, where T is the expected dwell time per channel.
- c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
- d) Detector function: Peak.
- e) Trace: Max hold.

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

$$\begin{aligned} & \text{(Number of hops in the period specified in the requirements)} = \\ & \text{(number of hops on spectrum analyzer)} \times \text{(period specified in the requirements / analyzer sweep time)} \end{aligned}$$

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

Test Data

Environmental Conditions

Temperature:	21~24 °C
Relative Humidity:	45~51 %
ATM Pressure:	101~110.0 kPa

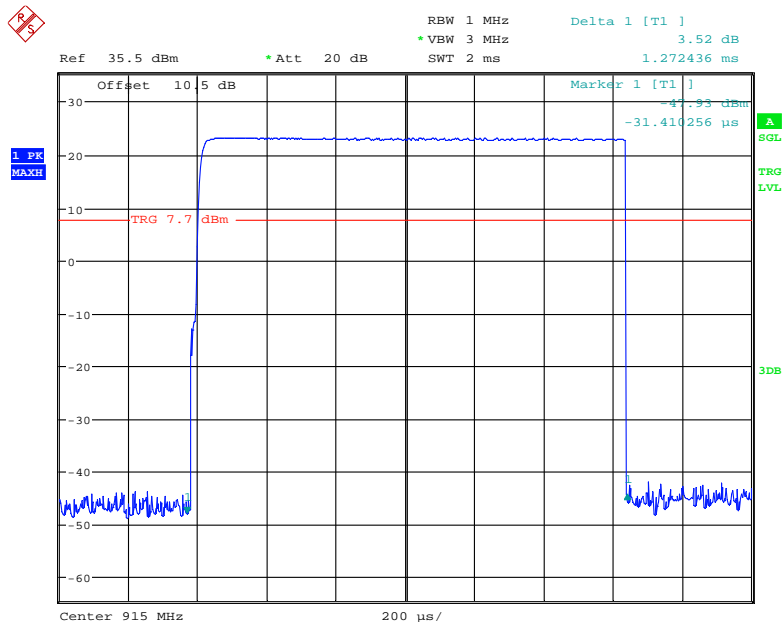
The testing was performed by Hill He on 2018-04-24 and 2018-05-25.

EUT operation mode: Transmitting

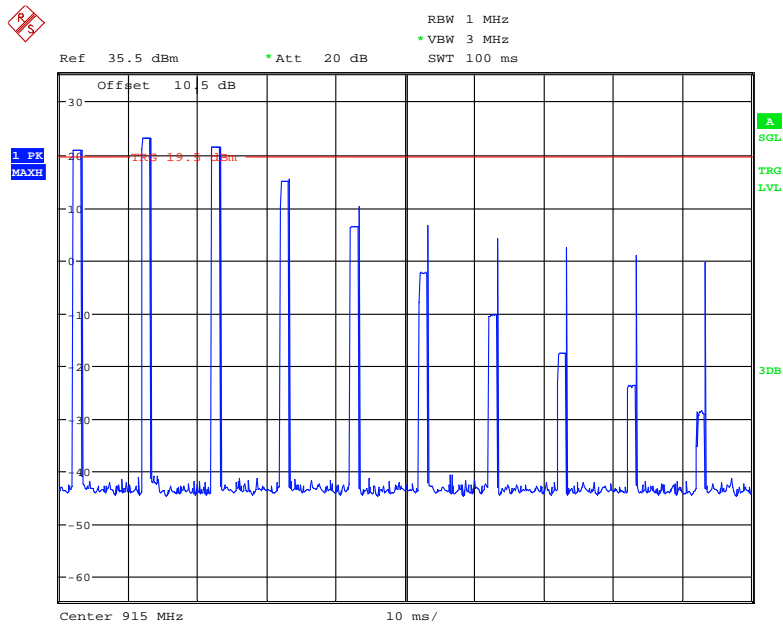
Test Result: Compliance. Please refer to following table and plots.

Mode	Number of hops in the period	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
GFSK	21	3.816	0.080136	0.4	Pass
Note: Pulse time=1.272*3=3.816ms Dwell time = Pulse time*(Number of hops in the period) =3.816*21=80.136ms					

Pulse time

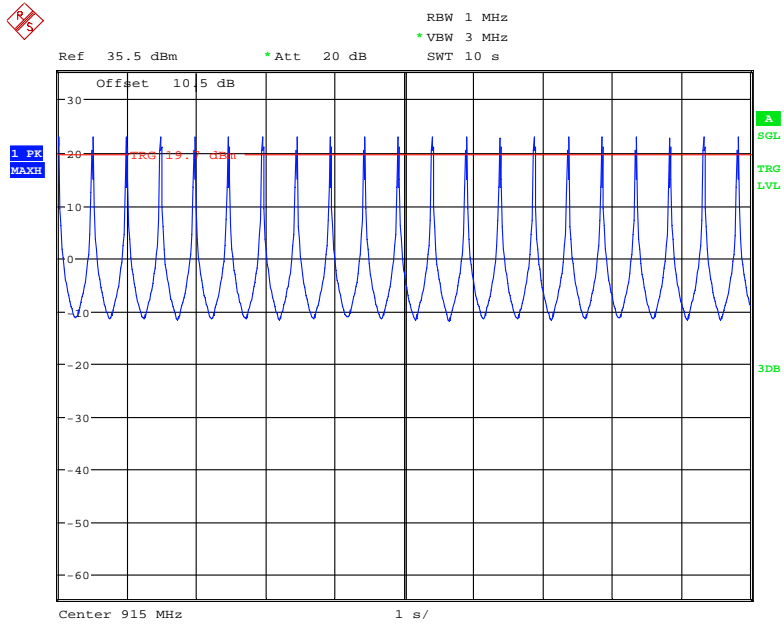


Date: 24.APR.2018 13:25:32



Date: 24.APR.2018 13:28:02

Number of hops on spectrum analyzer



Date: 25.MAY.2018 14:54:22

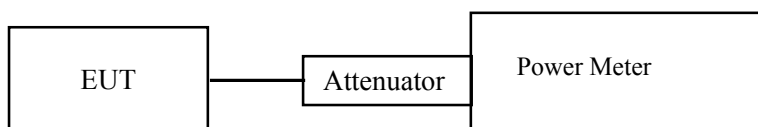
FCC §15.247(b) (2) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §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 it 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:	24 °C
Relative Humidity:	51 %
ATM Pressure:	110.0 kPa

The testing was performed by Hill He on 2018-04-24.

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

EUT operation mode: Transmitting

Channel	Frequency (MHz)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (mW)
Low	903	23.56	226.987	250
Middle	915	23.40	218.776	250
High	927	23.27	212.324	250

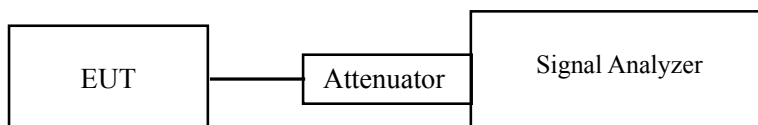
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

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. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 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 Data

Environmental Conditions

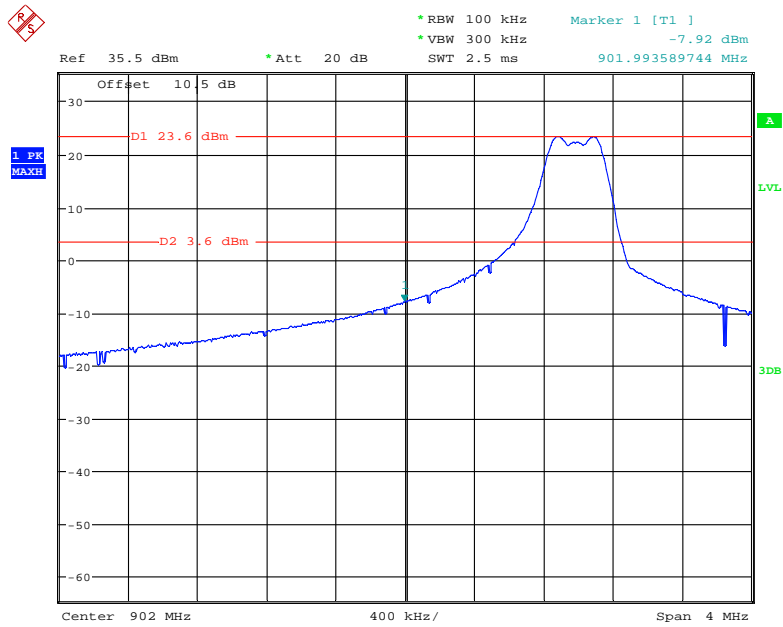
Temperature:	24~26 °C
Relative Humidity:	51~56 %
ATM Pressure:	109.0~110.0 kPa

The testing was performed by Hill He from 2018-04-24 to 2018-04-26.

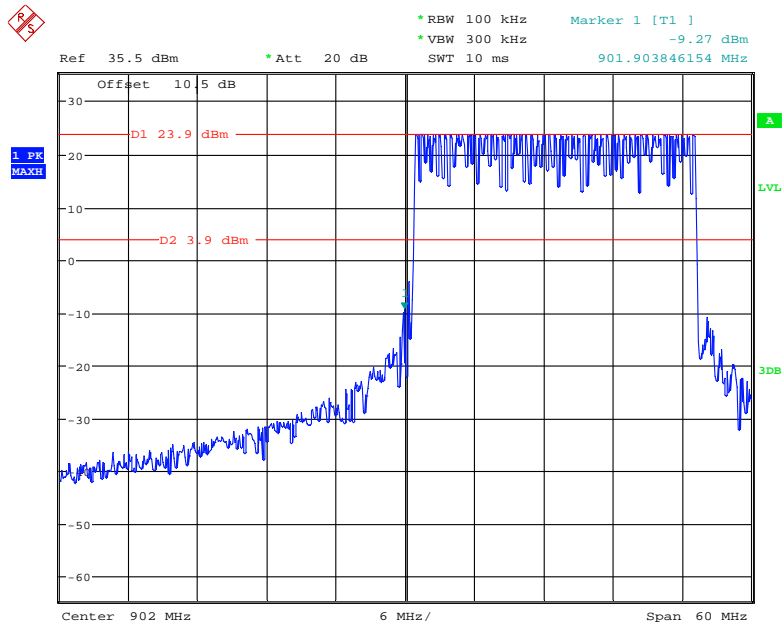
Test Result: Compliance. Please refer to following table and plots.

EUT operation mode: Transmitting

Band Edge, Left Side

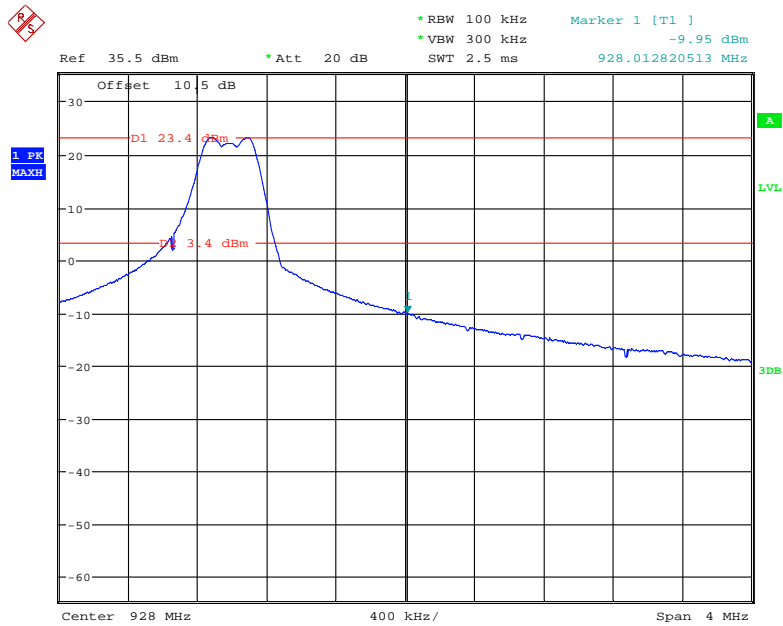


Date: 24.APR.2018 13:45:00

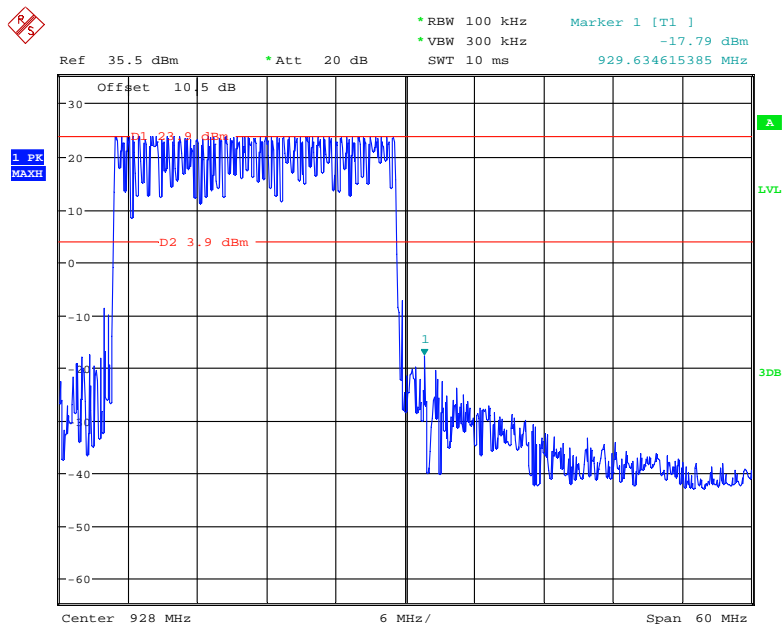


Date: 26.APR.2018 13:52:20

Band Edge, Right Side



Date: 24.APR.2018 17:27:43



Date: 26.APR.2018 13:53:29

**** END OF REPORT ****