RF TEST REPORT

GLOBAL TESTING & CERTIFICATIONS
YOUR CHOICE FOR- TCB FCB CB NB CAB RCB

Report No.: 15070077-FCC-R1-FP

Supersede Report No.: N/A

Applicant	DASAN ELECTRON
Product Name	Wireless Headset
Model No.	DW-779U
Serial No.	DW-779
Test Standard	FCC Part 15 Subpart D: 2014; ANSI C63.4: 2014; ANSI C63.17: 2013
Test Date	March 05 to April 03, 2015
Issue Date	July 01, 2015
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Dustin.Wang	Alex.Liu	
Dustin Wang Test Engineer	Alex Liu Checked By	

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Test result presented in this test report is applicable to the tested sample only

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
15070077-FCC-R1-FP	NONE	Original	April 09, 2015
15070077-FCC-E1	NONE	Replacement module photo	July 01, 2015

2. Customer information

Applicant Name	DASAN ELECTRON
Applicant Address	606, GODOWHADONG, KYUNGGI TECHONO PARK 1271-11, SA-DONG, ANSAN-SI, KYUNGGI-DO, ANSAN-SI, South Korea
Manufacturer Name	DASAN ELECTRON CO.,LTD
Manufacturer Address	#307, P1-dong, Gyunggi Techno Park, 1271-11, Sa-dong, Sangnok-Gu, Ansan-si, Gyunggi-Do, 426-901, KOREA

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1

4. Equipment under Test (EUT) Information

Description of EUT:	Wireless Headset
Main Model:	DW-779U
Serial Model:	DW-779
Date EUT received:	Mar 02, 2015
Test Date(s):	March 05 to April 03, 2015
Antenna Type/Gain:	-0.04 dBi
Type of Modulation:	GFSK
RF Operating Frequency (ies):	1921.536 MHz~1928.448 MHz (Tx/Rx)
Channel numbers:	5
ERP/EIRP:	16.471dBm
Port:	Charging port
Hardware Version:	15.0106.1.4.0
Software Version:	15.0106.1.0.0
Input Power:	AC Adapter: Model: WCF0900050A 1BA Input: AC100 ~ 240V, 50/60Hz,0.15A Output: DC 9.0V, 0.5A
Trade Name :	N/A

Note: In this report, we have chosen the main model DW-779U for testing. The difference among models was explained in the declaration letter.

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

GFSK Modulation Product

Test Results Summary for *PP

Test Standard	Description	Result
FCC part 15.203	Antenna Requirement	Compliance
FCC part 15.315, 15.207(a)	AC Power Line Conducted Emission	Compliance
FCC part 15.323(a)	Emission Bandwidth	Compliance
FCC part 15.319(c) (e)	Peak transmit power	Compliance
FCC part 15.319(d)	Power spectral density	Compliance
FCC part 15.323(d)	In-band and Out-of-band emissions	Compliance
FCC part 15.323(f)	Carrier Frequency Stability	Compliance
FCC part 15.323(e)	Frame repetition Stability, period and jitter	Compliance
FCC part 15.319(f)	Automatically discontinue transmission	Compliance
Specific requirements for devices operating in the 1920-1930MHz sub-band		
FCC part 15.323(c)(1)	Monitoring time	Compliance
FCC part 15.323(c)(2)(5)	Monitoring Threshold, Lease Interfered Channel	Compliance
FCC part 15.323(c)(7)	Monitoring Threshold Bandwidth	Compliance
FCC part 15.323(c)(1)(5)(7)	Reaction Time and Monitoring Interval	Compliance
FCC part 15.323(c)(4)(6)	Time and Spectrum Window Access Procedure	Compliance
FCC part 15.323(c)(3)(4)	Acknowledgements and Transmission Duration	Compliance
FCC part 15.323(c)(10)	Dual Access Criteria Check	N/A**
FCC part 15.323(c)(11)	Alternative Monitoring Interval	N/A**
FCC part 15.323(c)(12)	Fair Access	N/A**

All measurement uncertainty is taken into consideration for all presented test result.

Note: *FP: This measurement is necessary only for Fixed Part.

*PP: This measurement is necessary only for Portable Part.

N/A**: The manufacturer declares that this device does not use any mechanisms as provided by Part15.323 (c) (10) or (c) (11) to extend the range of spectrum occupied over space or time for the purpose of denying fail access to spectrum to other device.

6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

6.1 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 antenna of EUT is an integral antenna which permanently attached, and the best case gain of the antenna is -0.22 dBi.

The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 AC Power Line Conducted Emission

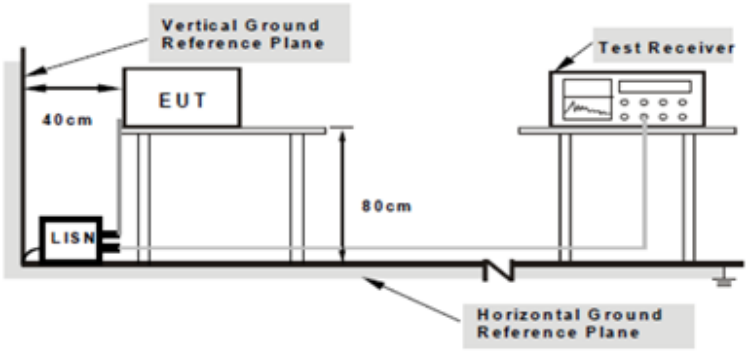
Temperature	21°C
Relative Humidity	60%
Atmospheric Pressure	1019mbar
Test date :	March 20th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.315, 15.207(a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.	☑

Frequency ranges (MHz)	Limit (dBμV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Test Setup



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

Test Procedure

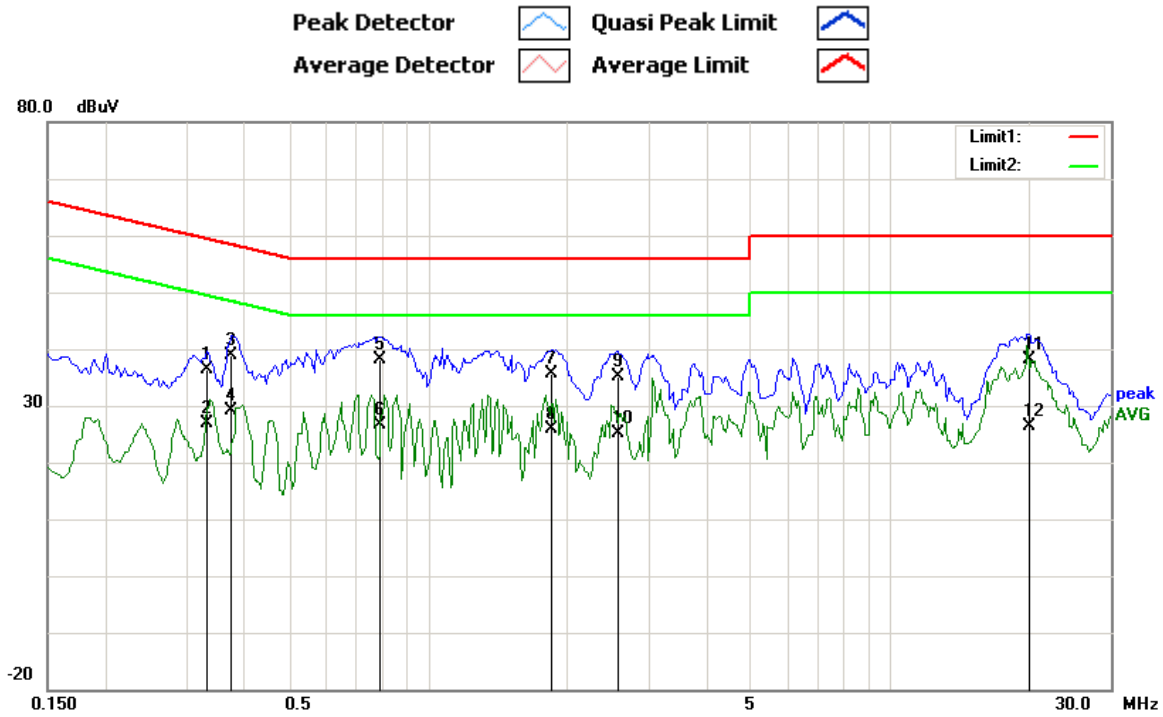
1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.

	3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver. 7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).
Remark	N/A
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Mode:	Transmitting Mode

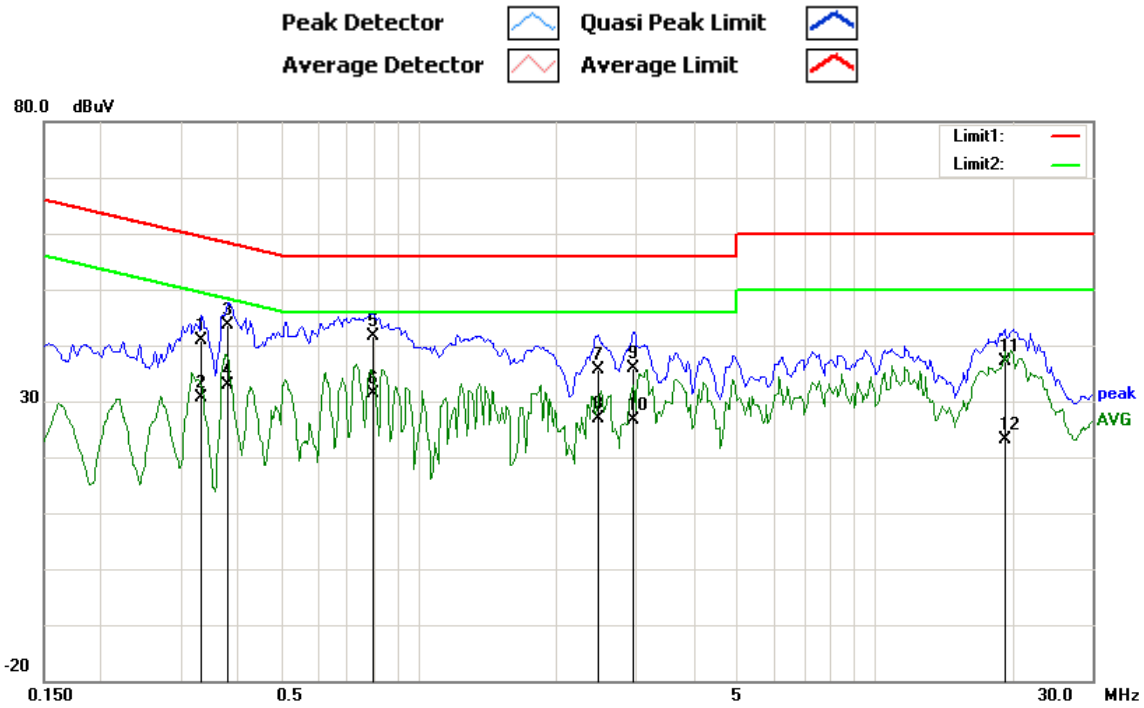


Test Data

Phase Line Plot at 120Vac, 60Hz

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB}	Result (dBuV)	Limit (dBuV)	Margin (dB)
0.3336	25.14	QP	11.21	36.35	59.36	-23.01
0.3336	15.65	AVG	11.21	26.86	49.36	-22.50
0.3766	27.77	QP	11.19	38.96	58.35	-19.39
0.3766	17.97	AVG	11.19	29.16	48.35	-19.19
0.7906	27.11	QP	11.00	38.11	56.00	-17.89
0.7906	15.54	AVG	11.00	26.54	46.00	-19.46
1.8570	24.65	QP	10.90	35.55	56.00	-20.45
1.8570	14.99	AVG	10.90	25.89	46.00	-20.11
2.5719	24.27	QP	10.90	35.17	56.00	-20.83
2.5719	14.14	AVG	10.90	25.04	46.00	-20.96
20.0195	27.19	QP	10.90	38.09	60.00	-21.91
20.0195	15.60	AVG	10.90	26.50	50.00	-23.50

Test Mode:	Transmitting Mode



Test Data

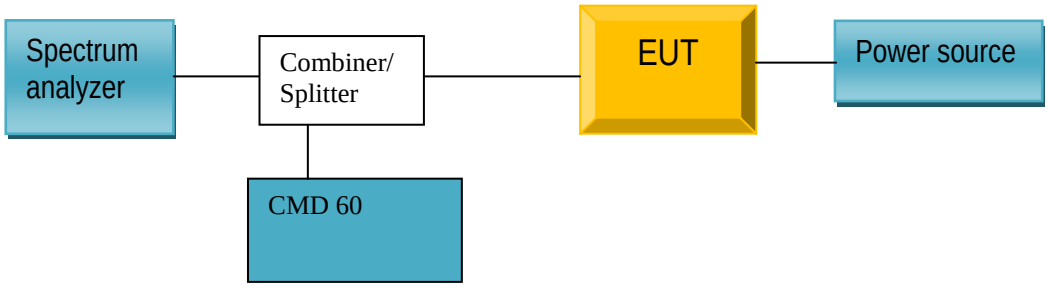
Phase Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB}	Result (dBuV)	Limit (dBuV)	Margin (dB)
0.3336	40.92	QP	0.00	40.92	59.36	-18.44
0.3336	30.68	AVG	0.00	30.68	49.36	-18.68
0.3805	43.65	QP	0.00	43.65	58.27	-14.62
0.3805	32.89	AVG	0.00	32.89	48.27	-15.38
0.7945	41.67	QP	0.00	41.67	56.00	-14.33
0.7945	31.38	AVG	0.00	31.38	46.00	-14.62
2.4742	35.69	QP	0.00	35.69	56.00	-20.31
2.4742	26.89	AVG	0.00	26.89	46.00	-19.11
2.9508	35.99	QP	0.00	35.99	56.00	-20.01
2.9508	26.57	AVG	0.00	26.57	46.00	-19.43
19.2266	37.04	QP	0.00	37.04	60.00	-22.96
19.2266	23.22	AVG	0.00	23.22	50.00	-26.78

6.3 Emission Bandwidth

Temperature	21°C
Relative Humidity	60%
Atmospheric Pressure	1019mbar
Test date :	March 20th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(a)	The 26 dB and 99% Bandwidth B shall be larger than 50 kHz and less than 2.5 MHz	☑
Test Setup		
Test method	According to ANSI 63.17: 2013 clause 6.1.3	
Remark	N/A	
Result	☑ Pass ☐ Fail	

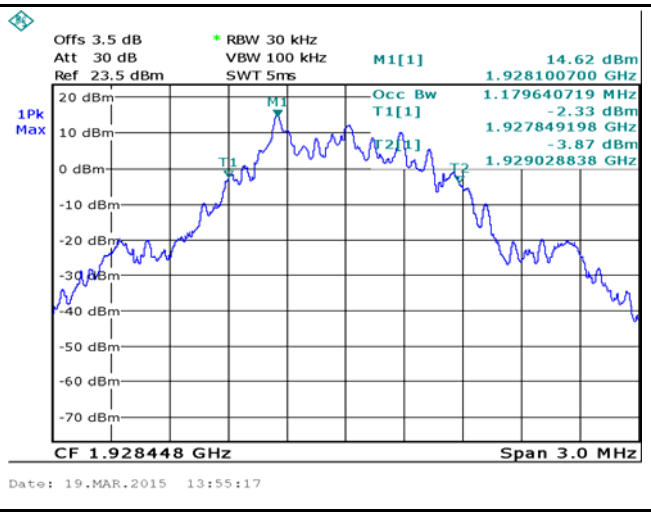
Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

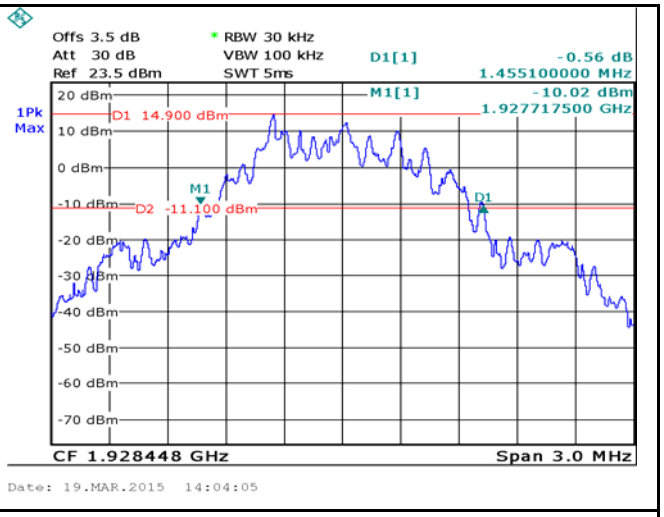
Test data

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
4	1921.536	1.1677	1.4371
2	1924.992	1.1796	1.4371
0	1928.448	1.1796	1.4551

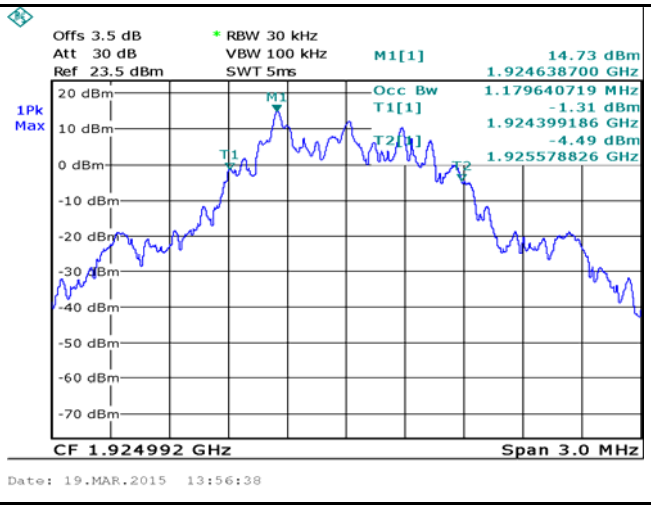
Test Plots



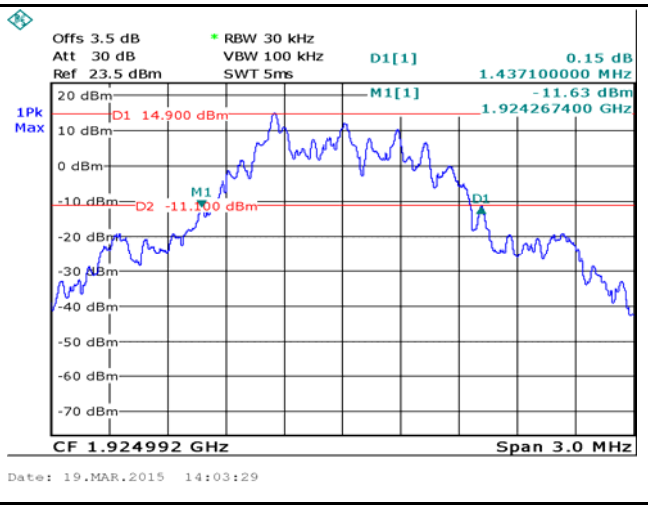
GFSK - Low Channel 99%



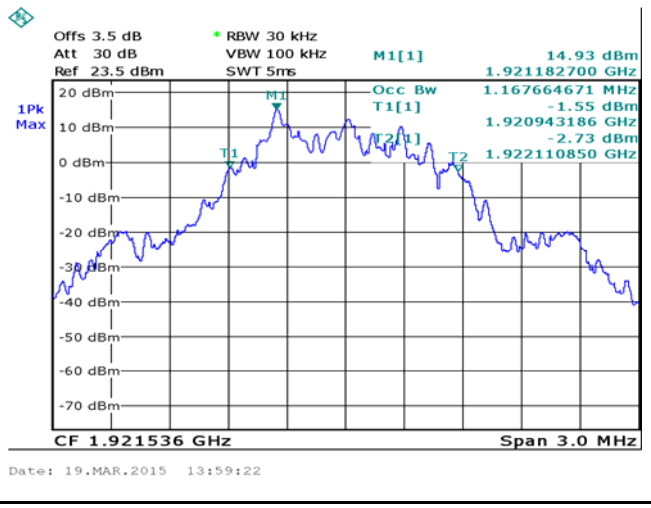
GFSK - Low Channel 26dB



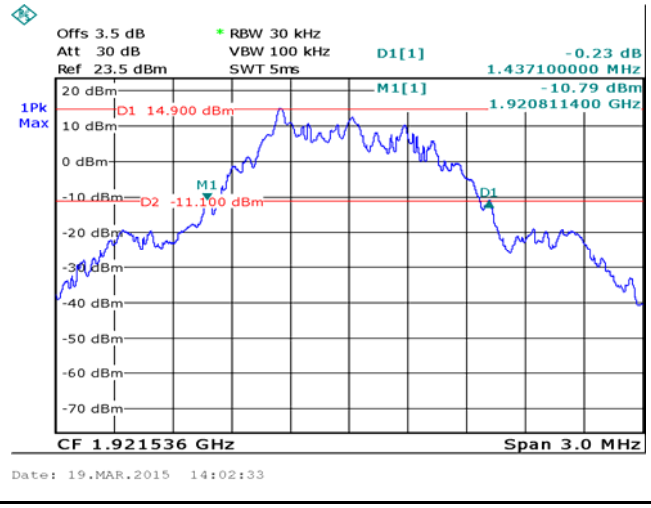
GFSK - Middle Channel 99%



GFSK - Middle Channel 26dB



GFSK - High Channel 99%

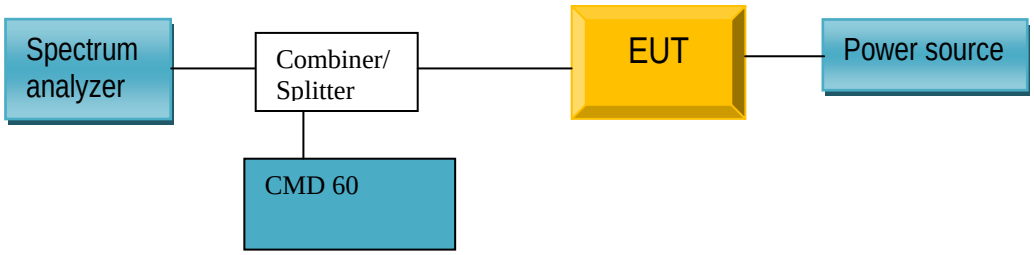


GFSK - High Channel 26dB

6.4 Peak transmit power

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 21th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.319(c) (e)	Conducted: 100μ W x SQRT (B) where B is the measured Emission Bandwidth in Hz FCC 15.319(c)(e): 20.87dBm (122.23mW) The antenna gain is below 3dBi, no reduction in transmit power is necessary	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 6.1.2	
Remark	N/A	
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

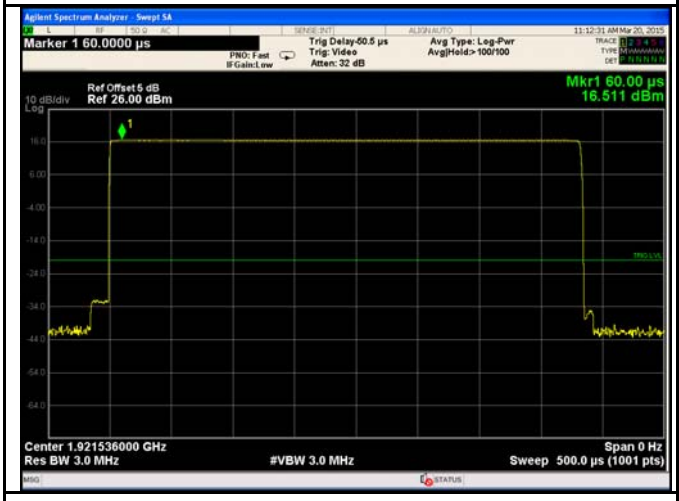
Test data

Type	CH	Freq (MHz)	Power (dBm)	Limit (dBm)	Result
Power	High	1921.536	16.511	20.87	Pass
	Mid	1924.992	16.312	20.87	Pass
	Low	1928.448	16.384	20.87	Pass

Test Plots

GFSK - Low Channel

GFSK - Middle Channel

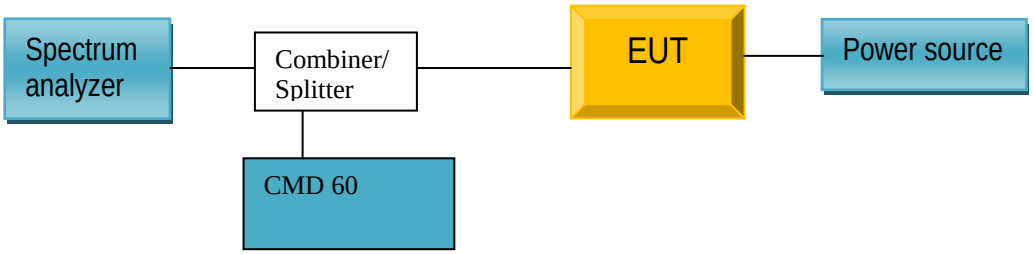


GFSK - High Channel

6.5 Power spectral density

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 21th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.319(d)	The Power Spectral Density shall be less than 3mW (4.77dBm) when averaged over at least 100 sweeps.	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 6.1.5	
Remark	N/A	
Result	☑ Pass ☐ Fail	

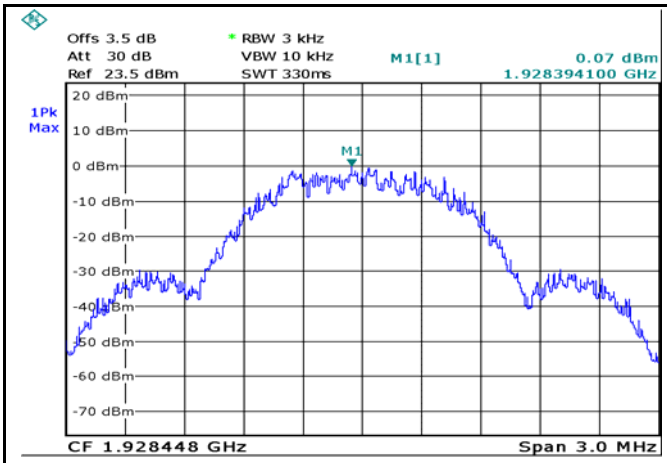
Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

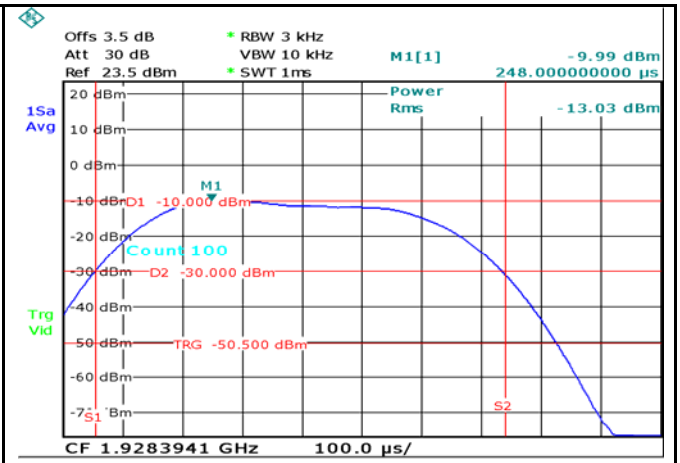
Test data

Type	CH	Freq (MHz)	PSD (dBm)	Limit (dBm)	Result
PSD	High	1921.536	-13.03	4.77	Pass
	Mid	1924.992	-10.67	4.77	Pass
	Low	1928.448	-12.56	4.77	Pass

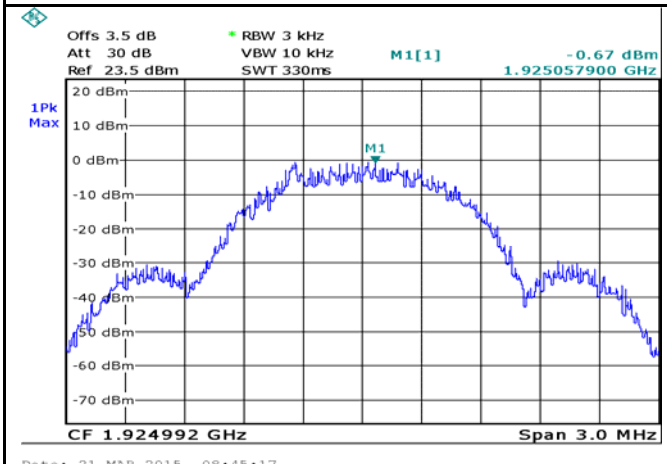
Test Plots



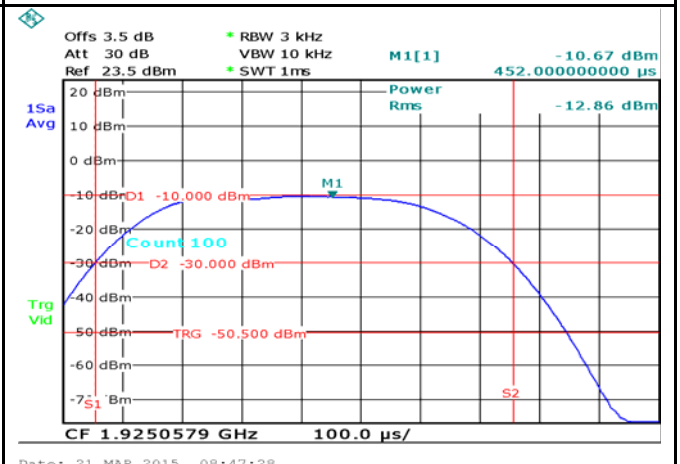
GFSK - Low Channel 1



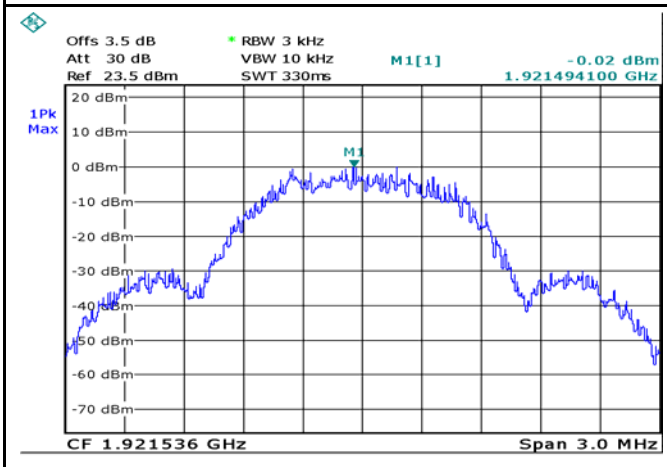
GFSK - Low Channel 2



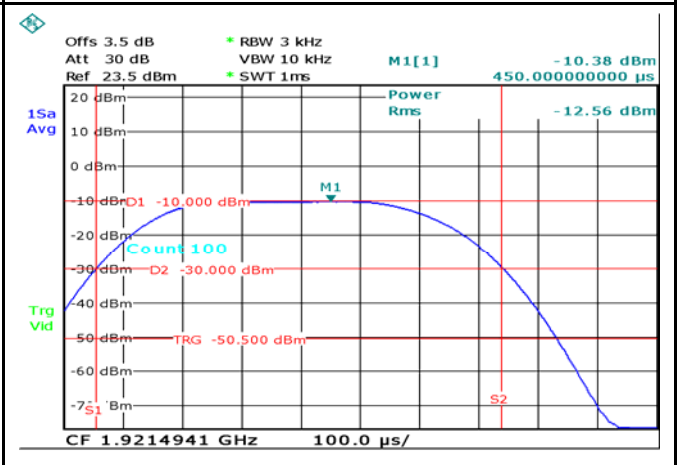
GFSK - Middle Channel 1



GFSK - Middle Channel 2



GFSK - High Channel 1

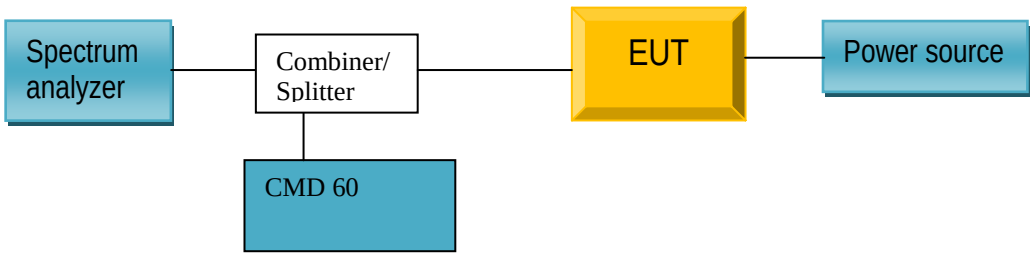


GFSK - High Channel 2

6.6 In-band and Out-of-band emissions

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(d)	In-Band Emissions: B < f ≤ 2B: at least 30 dB below max. permitted peak power 2B < f ≤ 3B: at least 50 dB below max. permitted peak power 3B < f ≤ UPCS Band Edge: at least 60 dB below max. permitted peak power Out-of-Band Emissions: f ≤ 1.25MHz outside UPCS band: ≤ -9.5dBm 1.25MHz ≤ f ≤ 2.5MHz outside UPCS band: ≤ -29.5 dBm f ≥ 2.5MHz outside UPCS band: ≤ -39.5 dBm	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 6.1.6	
Result	☑ Pass ☐ Fail	

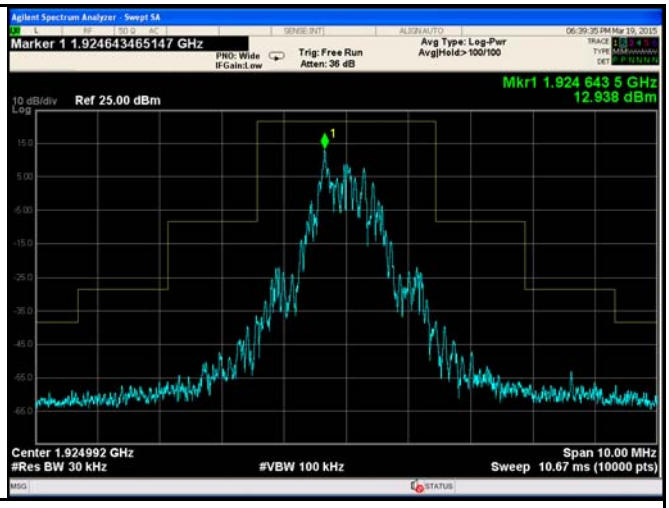
Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Plots

In-band emissions

In-band emissions - Low Channel

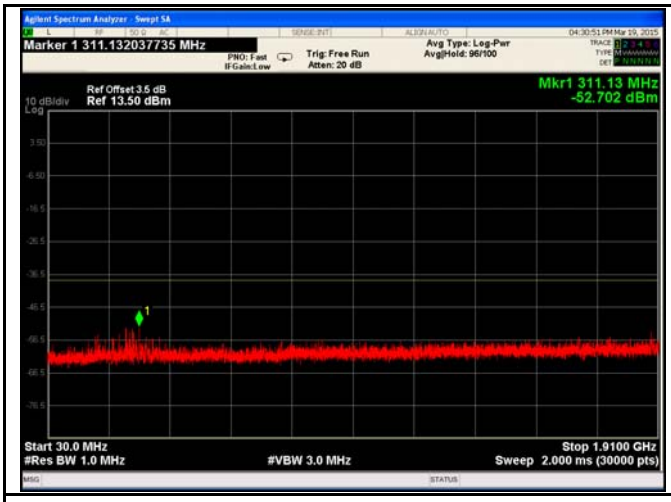


In-band emissions - Middle Channel

In-band emissions - High Channel

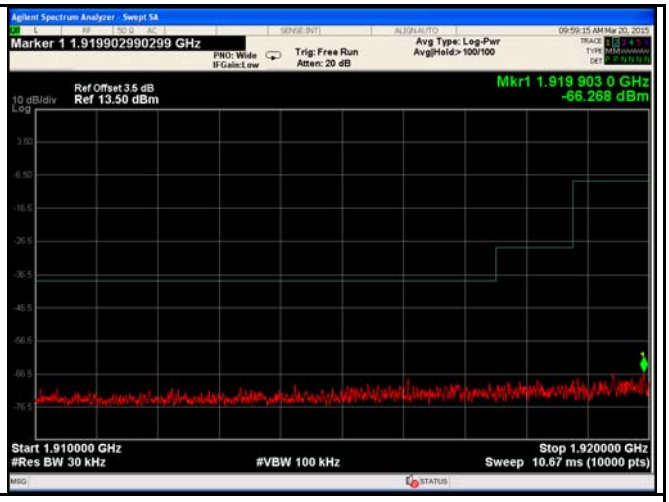
Test Plots

Out of band emissions



Out of band emission - 30-1915 MHz

Low Channel



Out of band emission - 1915-1920 MHz

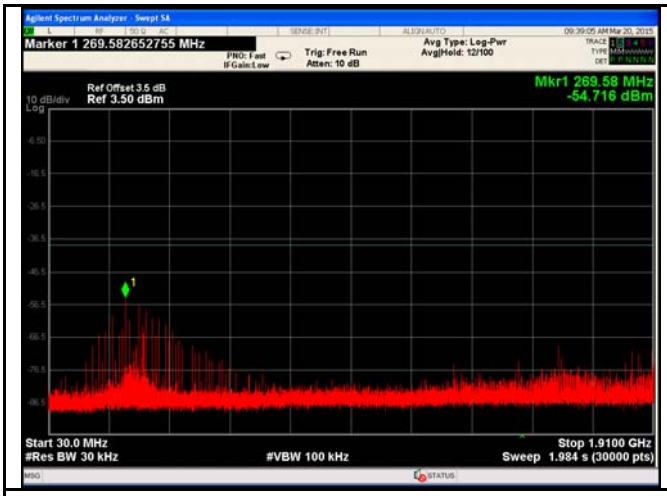
Low Channel

Out of band emission - 1930-1935 MHz

Low Channel

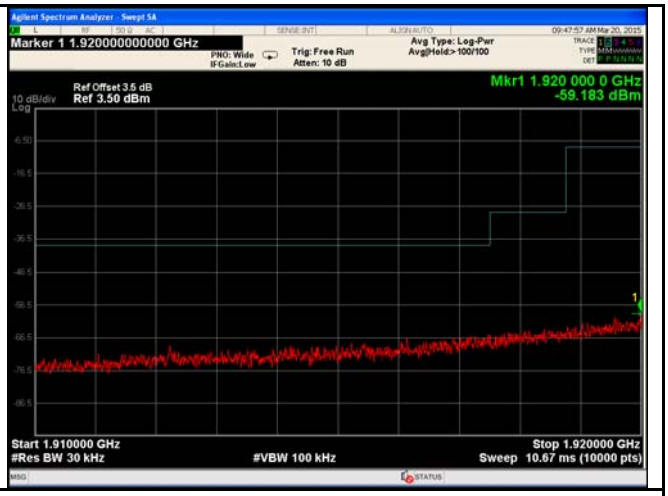
Out of band emission - 1935-20000 MHz

Low Channel



Out of band emission - 30-1915 MHz

Middle Channel

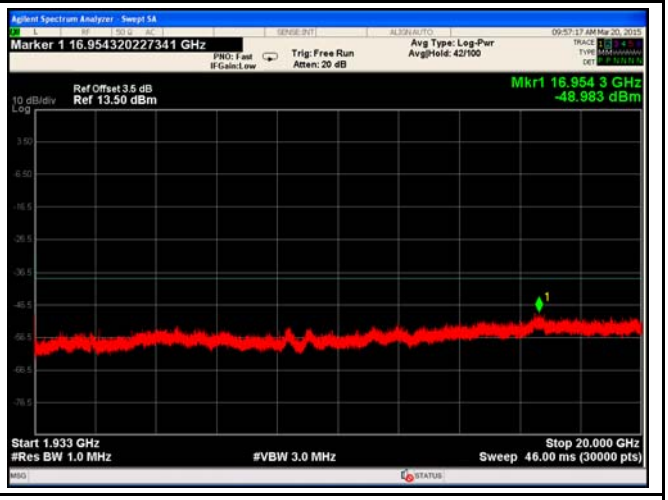


Out of band emission - 1915-1920 MHz

Middle Channel

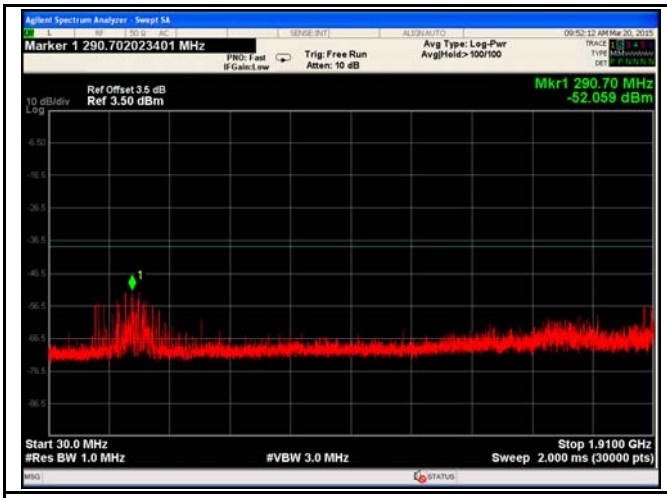
Out of band emission - 1930-1935 MHz

Middle Channel



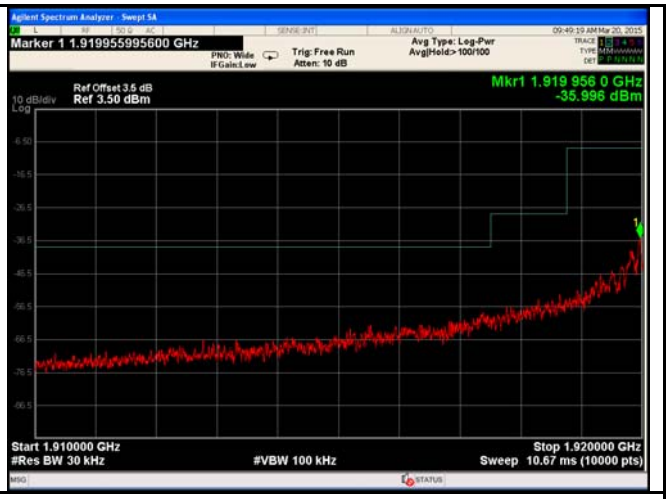
Out of band emission - 1935-20000 MHz

Middle Channel



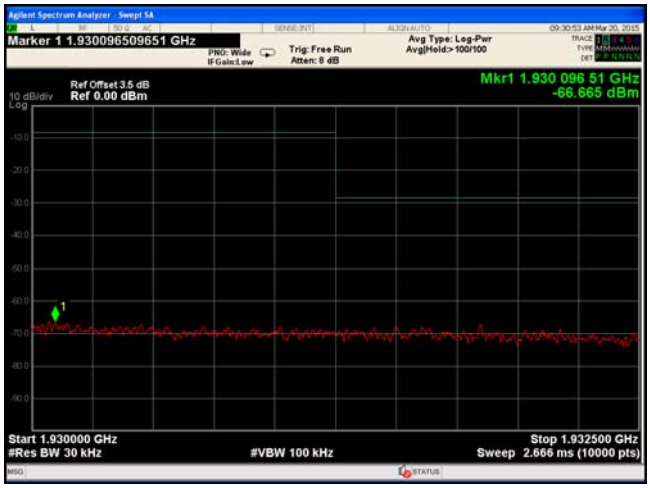
Out of band emission - 30-1915 MHz

High Channel



Out of band emission - 1915-1920 MHz

High Channel



Out of band emission - 1930-1935 MHz

High Channel

Out of band emission - 1935-20000 MHz

High Channel

Test data:

Test Mode:	Transmitting Mode

(Above 1GHz)

Note: Other modes were verified, only the result of worst case basic rate mode was presented.

Low Channel (1928.448 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
3856.9	35.32	AV	V	31.66	3.86	28.72	42.12	54	-11.88
3856.9	34.05	AV	H	31.66	3.86	28.72	40.85	54	-13.15
3856.9	47.95	PK	V	31.66	3.86	28.72	54.75	74	-19.25
3856.9	46.27	PK	H	31.66	3.86	28.72	53.07	74	-20.93

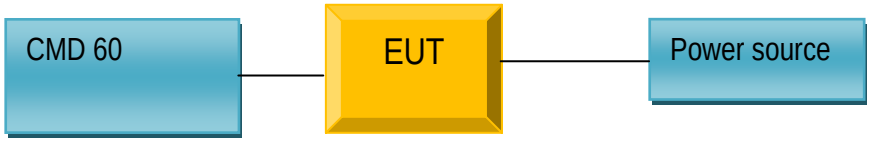
High Channel (1921.536 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
3843.07	34.88	AV	V	31.66	3.86	28.72	41.68	54	-12.32
3843.07	35.15	AV	H	31.66	3.86	28.72	41.95	54	-12.05
3843.07	48.22	PK	V	31.66	3.86	28.72	55.02	74	-18.98
3843.07	47.09	PK	H	31.66	3.86	28.72	53.89	74	-20.11

6.7 Carrier Frequency Stability

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(f)	±10 ppm	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 6.2.1	
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Test Data:

Frequency Stability over Power Supply Voltage at Nominal Temperature

Voltage	Channel Frequency	Difference	Deviation	Limits
Vnom	1924.992 MHz	3 kHz	1.38 ppm	±10 ppm
85% of Vnom	1924.992 MHz	-3 kHz	1.6 ppm	
115% of Vnom	1924.992 MHz	4 kHz	1.6 ppm	

Note: Deviation ppm = ((Mean - Measured Frequency) / Mean) x 10^6

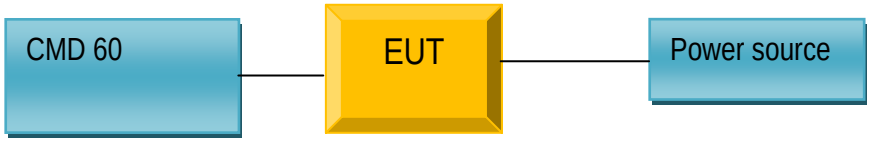
Frequency Stability over Temperature

Temp.	Channel Frequency	Difference	Deviation	Limits
+20°C	1924.992 MHz	3 kHz	1.38 ppm	±10 ppm
-20°C	1924.992 MHz	-2 kHz	1.48ppm	
+50°C	1924.992 MHz	5 kHz	1.53ppm	

6.8 Frame repetition Stability, period and jitter

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(e)	±10 ppm for Frame Repetition Stability, 20 or 10 ms for frame period, 25 μ s for max jitter.	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 6.2.2	
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

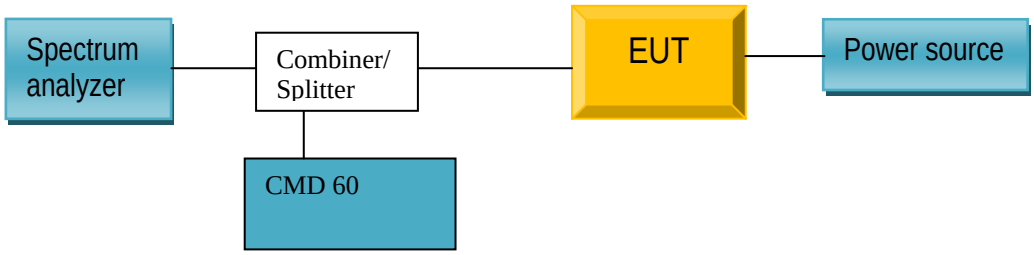
Test Data:

Carrier Frequency (MHz)	Frame repetition (ppm)	Frame period (ms)	Max. pos. jitter (μ s)	Max. neg.jiter (μ s)
1924.992	1.98	10	0.01	-0.05

6.9 Automatically discontinue transmission

VTemperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.319(f)	The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. The provisions in this section are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.	☑
Test Setup		
Test Procedure		
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Measurement Data:

The EUT is a responding device, and can transmit control and signaling information. The following tests simulate the reaction of the EUT in case of either absence of information to transmit or operational failure after a connection with the companion device is established.

Number	Test Items	EUT Reaction	Verdict
1	Power removed from EUT	A	Pass
2	Switch off EUT	N/A	Pass
3	Hook-on by EUT	N/A	Pass
4	Power removed from companion device	B	Pass
5	Swithch off companion device	B	Pass
6	Hook-on by companion device	B	Pass

A - Connection breakdown, cease of all transmissions

B - Connection breakdown, EUT transmits control and signaling information

C - Connection breakdown, companion device transmits control and signaling information

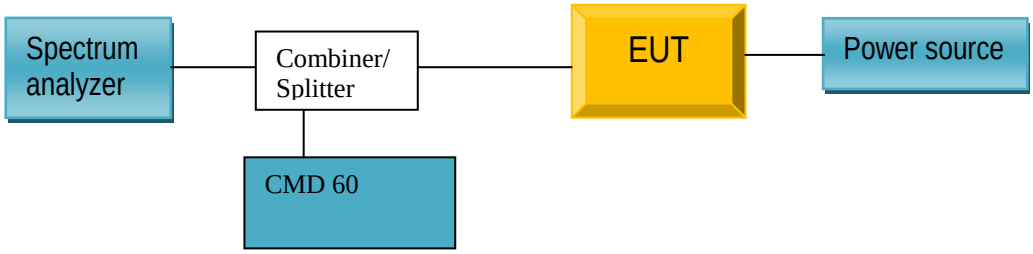
N/A - Not Applicable (EUT does not have On/ Off switch and cannot perform Hook-on)

6.10 Specific requirements for devices operating in the 1920-1930MHz sub-band

6.10.1 Monitoring time

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(c) (1)	Immediately prior to initiating transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period.	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 7.3.4	
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Measurement Data:

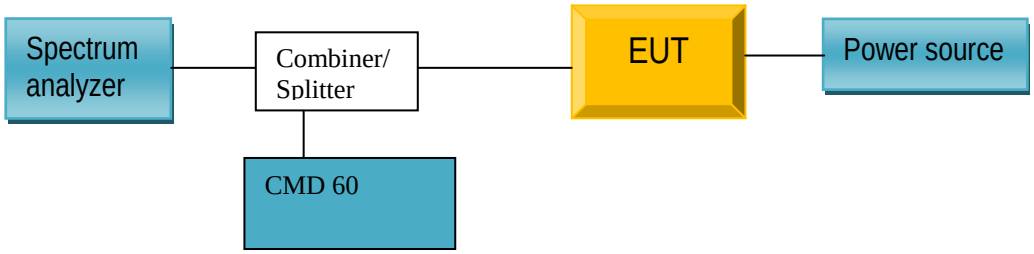
EUT monitors the combined time and spectrum window prior to initiation of transmission. The observation results as below

Channel Selection	Observation result	Verdict
1. Apply the interference on f1 at level TU +UM, and no interference on f2. Initiate transmission and verify the transmission on f2.	EUT transmission on f2	Pass
2. Apply interference on f2 at a level of TU + UM, in-band, and immediately remove all interference from f1 and immediately (but not sooner than 20 ms after the interference on f2 is applied) cause the EUT to attempt transmission.	EUT transmission on f1	Pass

6.10.2 Monitoring Threshold, Lease Interfered Channel

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(c) (2) (5)	The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device. If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed.	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 7.3.1, 7.3.2, 7.3.3 and 7.3.4	
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Measurement Data:

Lower threshold: TL = -174 + 10log10B + MU + PMAX-PEUT (dBm)

Upper threshold: TU = -174 + 10log10B + Mu + PMAX-PEUT (dBm)

Where: B=Emission bandwidth (Hz)

MU=dB the threshold may exceed thermal noise (30 for TL & 50 for TU)

Calculated values

Threshold	FCC part 15D	RSS-213
Lower threshold	-81.8	-83.1
Upper threshold	N/A	-63.1

The Lower Threshold is applicable for systems which have defined less than 40 duplex system access channels. The Upper Threshold is applicable for systems with more than 40 duplex system access channels and that implements the Least Interfered Channel Procedure (LIC).

Upper Threshold has been removed from FCC 15D but still exists in the current Industry Canada RSS-213.

Limit

Threshold	FCC part 15D	RSS-213
Lower threshold + 6 dB	-75.8	-77.1
Upper threshold + 6 dB	N/A	-57.1

The Upper or Lower Threshold is found by the procedure defined in ANSI C63.17: 2013 clause 7.3.1 or 7.3.2.

Monitor Threshold	Measured level	FCC part 15D	RSS-213
Lower threshold	N/A	-75.8	-77.1
Upper threshold	-61.3	N/A	-57.1

For the EUT which support LIC there is no need to measure lower threshold because it is automatically met by LIC procedure

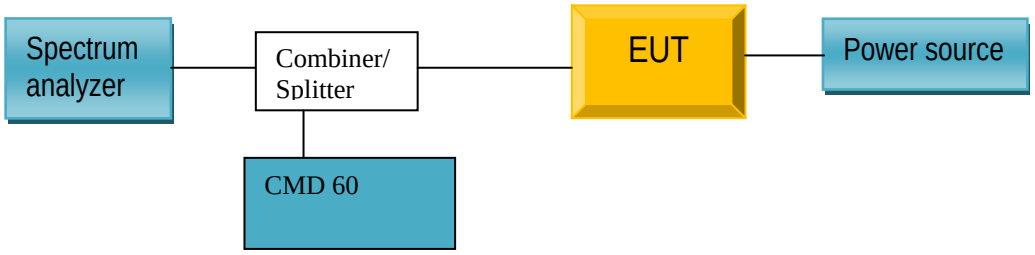
Least Interfered Channel (LIC) Procedure Test, FCC 15.323(c)(2) and (c)(5)

ANSI C63.17: 2013 clause 7.3.3 ref. Observation Verdict	ANSI C63.17: 2013 clause 7.3.3 ref. Observation Verdict	ANSI C63.17: 2013 clause 7.3.3 ref. Observation Verdict
b) f1 TL + 13 dB, f2 at TL + 6 dB	Transmission always on f2	Pass
c) f1TL + 6 dB, f2 at TL + 13 dB	Transmission always on f1	Pass
d) f1 TL + 7 dB, f2 at TL	Transmission always on f1	Pass
e) f1 TL, f2 at TL + 7 dB	Transmission always on f1	Pass

6.10.3 Monitoring Threshold Bandwidth

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(c) (7)	The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission.	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 7. 4	
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Measurement Data:

The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission.

Test performed	Observation result	Verdict
Simple Compliance test, at ±30% of B	No transmissions	Pass
More Detailed Test, at -6 dB points	N/A	N/A
More Detailed Test, at -12 dB points	N/A	N/A

Notes:

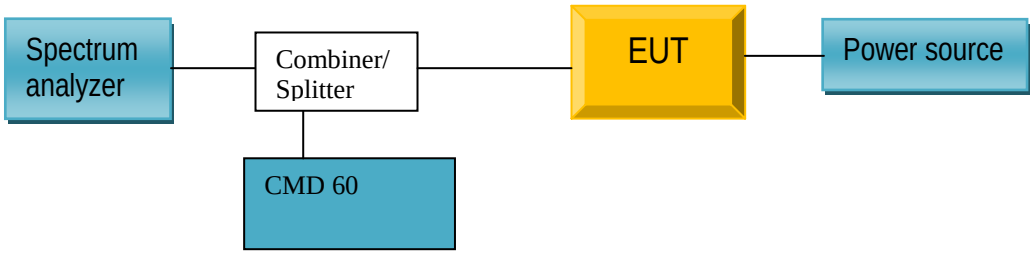
1. The more detailed test must be pass at both the -6 and -12 dB points if the Simple Compliance test fails.
2. The Simple Compliance Test was performed with the level at $T_U + U_M + 10$ dB to check that the EUT did not transmit at all.

3. The tested EUT uses the same receiver for monitoring and communication, this test is therefore not required. However the test has been performed nonetheless and the test is passed.

6.10.4 Reaction Time and Monitoring Interval

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(c) (1) (5) (7)	The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than 50xSQRT (1.25/emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35xSQRT (1.25/emission bandwidth in MHz) microseconds but shall not be required to be less than 35 microseconds.	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 7.5	
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Measurement Data:

By administrative commands and out-of-operating region interference, the EUT is restricted to operate on a single carrier frequency.

Time-synchronized pulsed interference was then applied on the carrier at pulsed levels $T_U + U_M$ to check that the EUT does not transmit at all. The level was raised 6 dB for part d) with 35 μ s pulses.

The pulses are synchronized with the EUT timeslots and applied centered within all timeslots.

Pulse Width, ref. to ANSI C63.17: 2013 clause 7.5	Observation result	Verdict
c) > largest of 50 μ s and 50*SQRT(1.25/B)	No transmissions	Pass
d) > largest of 35 μ s and 35*SQRT(1.25/*B*), and with interference level raised 6 dB	No transmissions	Pass

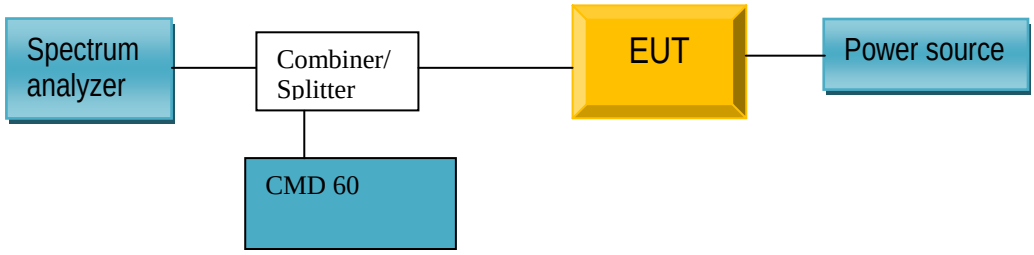
Notes:

Since *B* is larger than 1.25 MHz the test was performed with pulse lengths of 50 μ s and 35 μ s.

6.10.5 Time and Spectrum Window Access Procedure

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(c) (4) (6)	**FCC 15.323(c)(4):** Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated. **FCC 15.323(c)(6):** If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 8.1	
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Measurement Data:

This requirement is only for EUTs which transmit unacknowledged control and signaling information.

Access Criteria, ref. to ANSI C63.17: 2013 clause 8.1.1	Observation result	Verdict
b) Check that the EUT transmits on the interference free time-slot	N/A	N/A
b) The EUT must terminate or pause in its repetitive transmission of the control and signaling channel on the open channel to repeat the access criteria not less frequently than every 30 s	N/A	N/A

If FCC 15.323(c)(6) option, **If Random Waiting Interval is NOT implemented**

Access Criteria, ref. to ANSI C63.17: 2013 clause 8.1.1	Observation result	Verdict
b) Check that the EUT transmits on the interference free time-slot	N/A	N/A
b) The EUT must terminate or pause in its repetitive transmission of the control and signaling channel on the open channel to repeat the access criteria not less frequently than every 30 s	N/A	N/A

If FCC 15.323(c)(6) option, **Only if Random Waiting Interval is implemented**

Access Criteria, ref. to ANSI C63.17: 2013 clause 8.1.1	Observation result	Verdict
b) Check that the EUT transmits on the interference free time-slot	N/A	N/A
b) The EUT must terminate or pause in its repetitive transmission of the control and signaling channel on the open channel to repeat the access criteria not less frequently than every 30 s	N/A	N/A

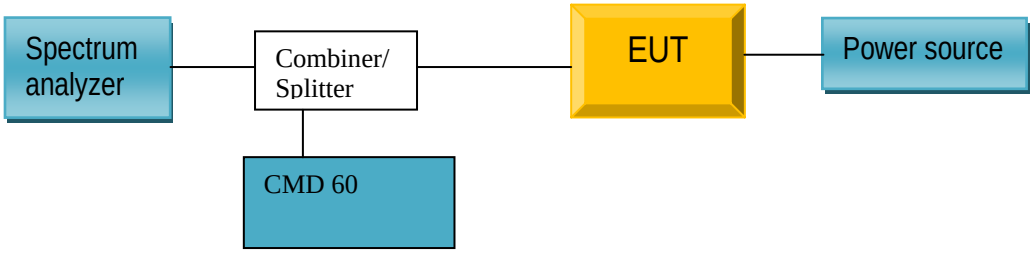
Notes:

The tested EUT does not transmit unacknowledged control and signaling information.

6.10.6 Acknowledgements and Transmission Duration

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	March 22th, 2015
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(c) (3) (4)	Occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria. Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 8.2	
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Measurement Data:

During the test **Initial transmission without acknowledgements** the signal from the EUT to the companion device is blocked by circulators in addition to the tunable attenuator.

The test **Transmission time after loss of acknowledgements** is performed by cutting-off the signal from the companion device by a RF switch and measuring the time until the EUT stops transmitting.

The **Transmission Duration** test is performed by monitoring the slot in use and measuring the time until the EUT changes to a different slot.

Acknowledgements

Test ref. to ANSI C63.17: 2013 clause 8.2.1	Observation result	Verdict
a) Initial transmission without acknowledgements	0.68s	Pass
c) Transmission time after loss of acknowledgements	10s	Pass

Transmission Duration

Test ref. to ANSI C63.17: 2013 clause 8.2.2	Observation	Verdict
b) Transmission duration on same time and frequency window	1 hour	Pass

6.10.7 Dual Access Criteria Check

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(c) (10)	An initiating device may attempt to establish a duplex connection by monitoring both its intended transmits and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 8.3	
Result	☐ Pass ☐ Fail	

Test Data ☐ Yes ☑ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Not tested.

The manufacturer declares that this provision is not utilized by the EUT.

6.10.8 Alternative Monitoring Interval

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	----
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(c) (11)	An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within 1.25 MHz of the center frequency of channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.	☑
Test Setup		
Test Procedure	According to ANSI 63.17: 2013 clause 8.4	
Result	☐ Pass ☐ Fail	

Test Data ☐ Yes ☑ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Not tested.

The manufacturer declares that this provision is not utilized by the EUT.

6.10.9 Fair Access

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1017mbar
Test date :	----
Tested By :	Dustin Wang

Requirement(s):

Spec	Requirement	Applicable
FCC part 15.323(c) (12)	The provisions of (c)(10) or (c)(11) shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.	☑
Test Setup		
Test Procedure		
Result	☑ Pass ☐ Fail	

Test Data ☐ Yes ☑ N/A

Test Plot ☐ Yes (See below) ☑ N/A

Test Result:

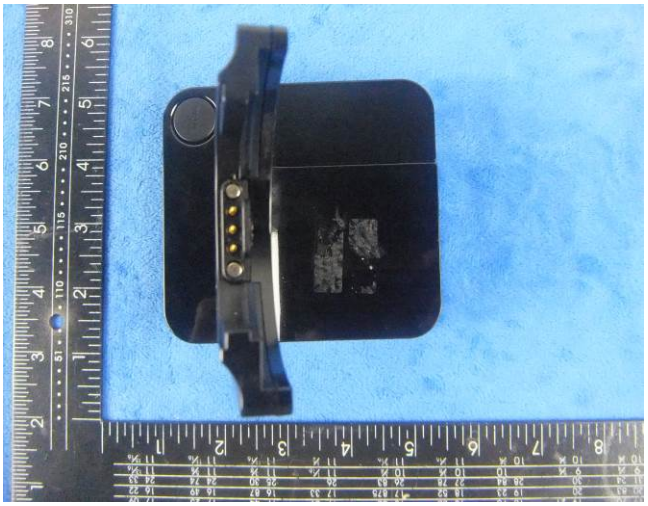
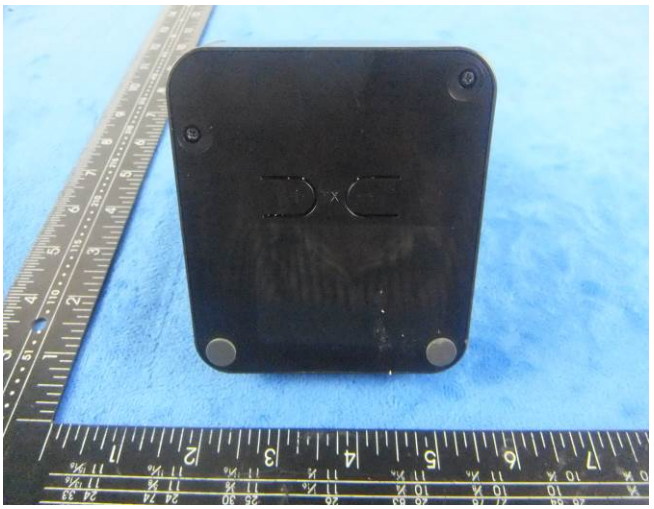
The manufacturer declares that this device does not use any mechanisms as provided by Part15.323 (c) (10) or (c) (11) to extend the range of spectrum occupied over space or time for the purpose of denying fail access to spectrum to other device.

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	09/18/2014	09/17/2015	☑
EMI test receiver	ESL6	100262	09/18/2014	09/17/2015	☑
Power Splitter	1#	1#	09/02/2014	09/01/2015	☑
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	09/18/2014	09/17/2015	☑
DC Power Supply	E3640A	MY40004013	09/18/2014	09/17/2015	☑
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	☑
Bilog Antenna (30MHz~2GHz)	JB1	A112017	09/22/2014	09/21/2015	☑
A-INFOMW Horn Antenna (1~18GHz)	AH-118	71259	09/25/2014	09/24/2015	☑
EMCO Horn Antenna (1~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☑
OPT 010 AMPLIFIER(0.1~1300MHz)	8447E	2727A02430	09/02/2014	09/01/2015	☑
Microwave Preamplifier(0.5 ~ 18GHz)	PAM-118	443008	09/02/2014	09/01/2015	☑
Temperature/Humidity Chamber	UHL-270	001	10/10/2014	10/09/2015	☑
R&S Digital Radio communication Tester	CMD60	CCIS0149	09/17/2014	09/16/2015	☑

Annex B. EUT and Test Setup Photographs

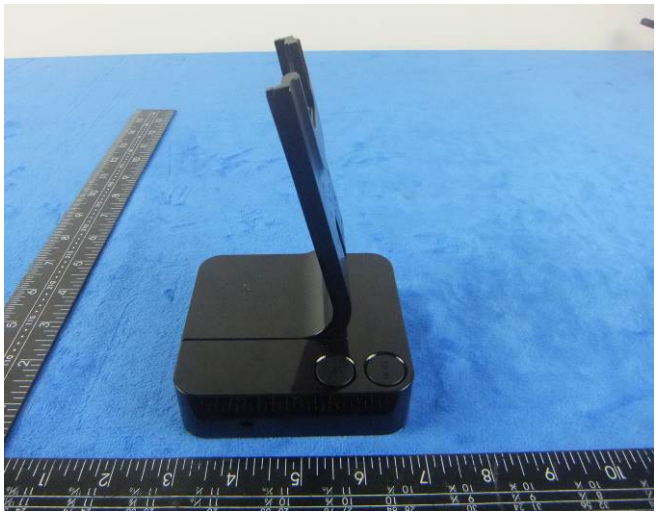
Annex B.i. Photograph: EUT External Photo

Whole Package-Top View	Adapter-Front View
	
EUT – Top View	EUT – Bottom View

EUT -Front View

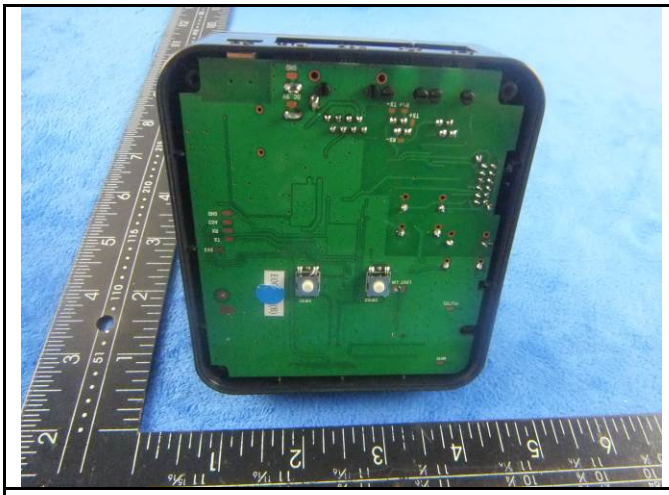
EUT -Rear View

EUT – Left View

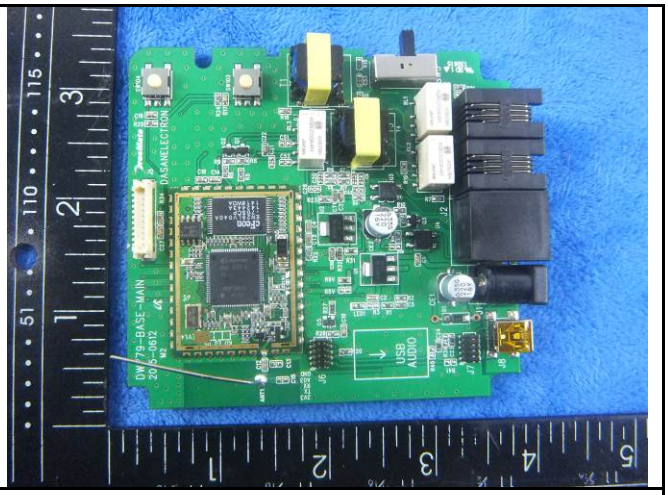


EUT – Right View

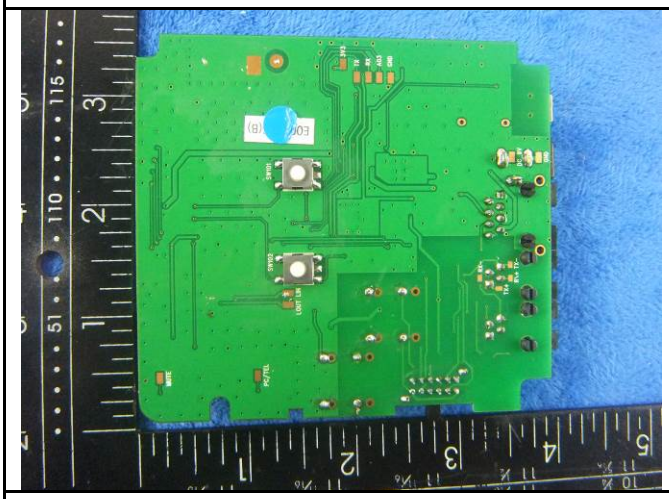
Annex B.ii. Photograph: EUT Internal Photo



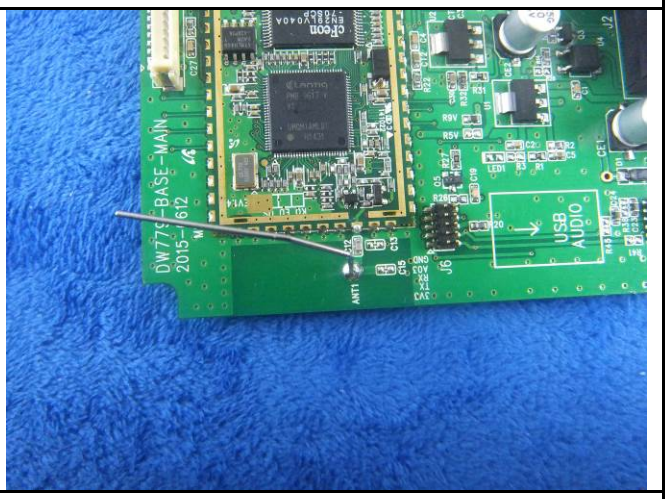
EUT – Uncover View



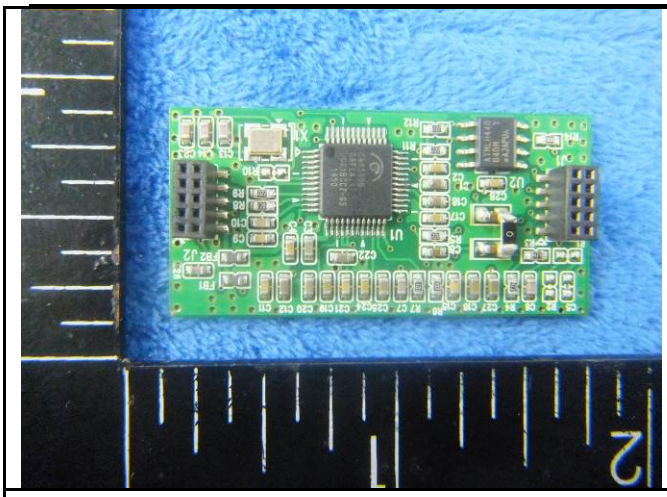
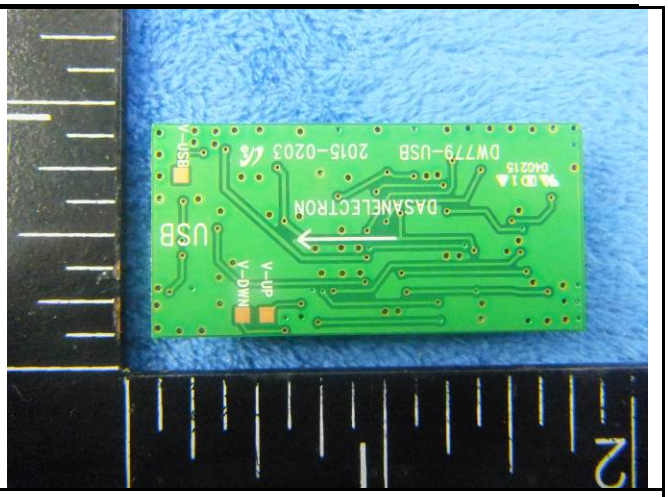
EUT – Mainboard Front View



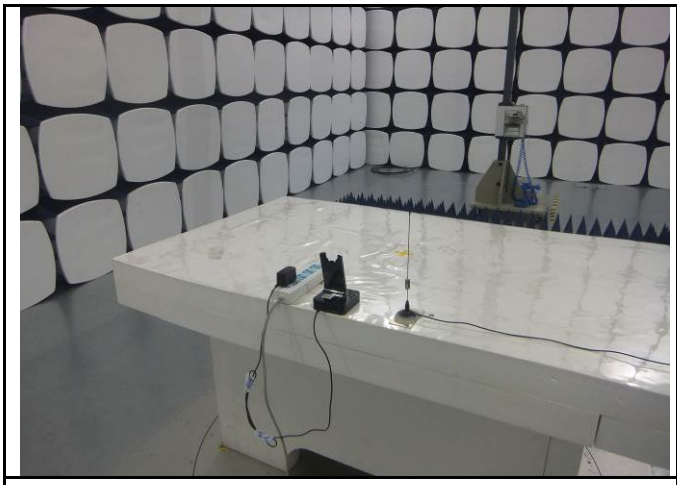
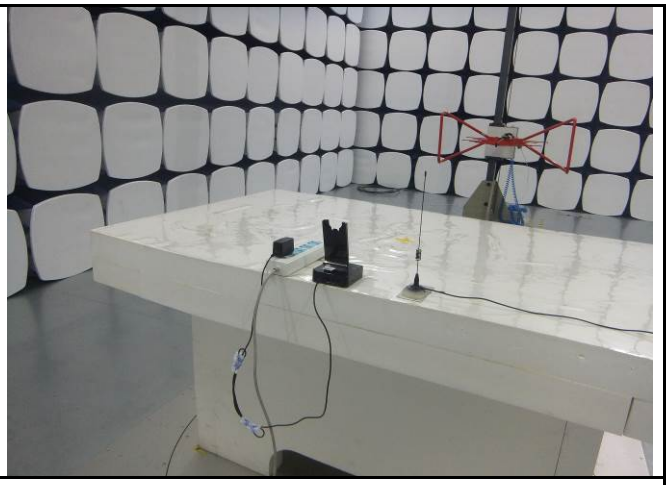
EUT – Mainboard Rear View



Antenna View

	
EUT – Subplat Front View	EUT – Subplat Rear View

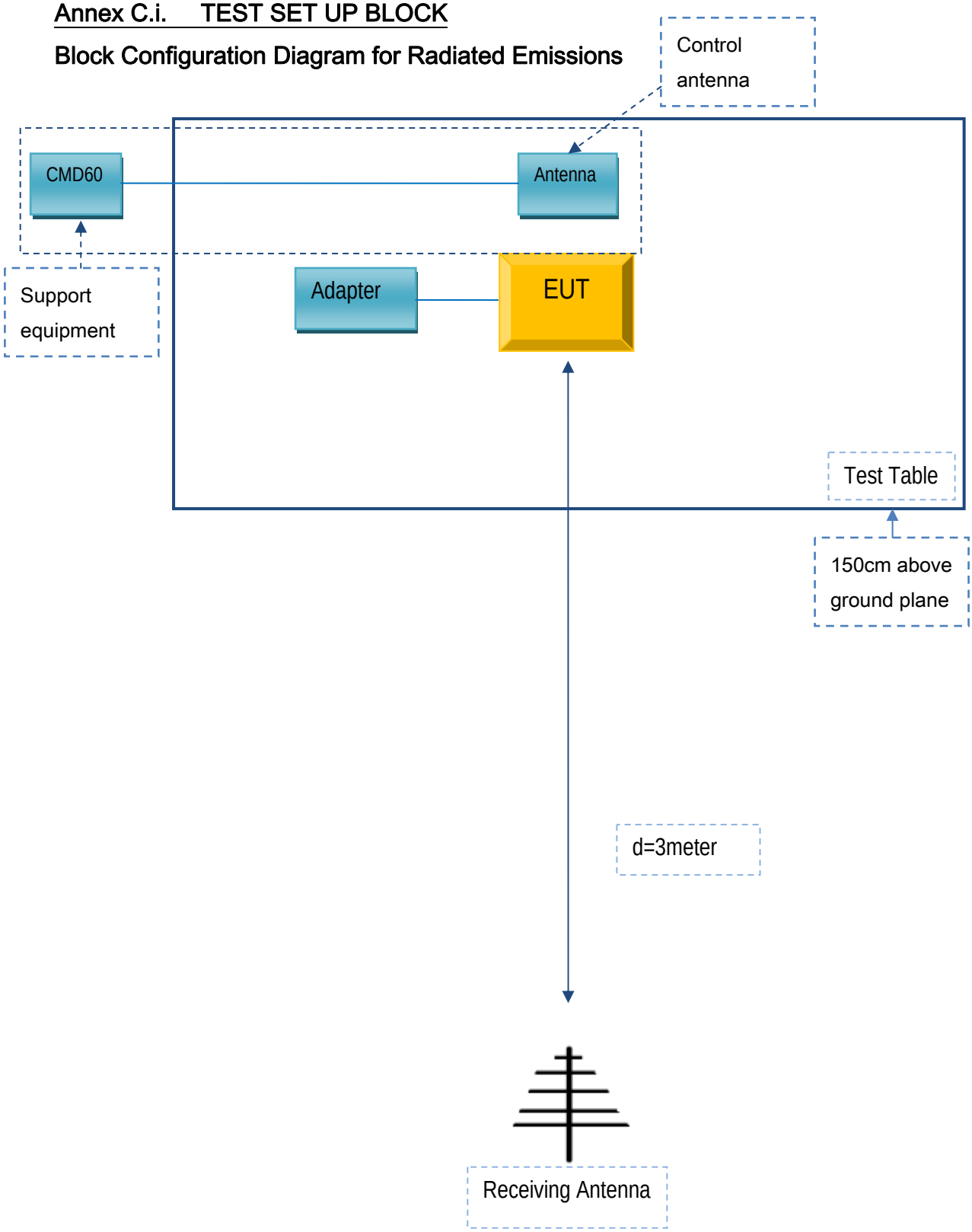
Annex B.iii. Photograph: Test Setup Photo

	
Radiated Spurious Emissions Test Setup Above 1GHz	Radiated Spurious Emissions Test Setup Below 1GHz
Conducted Emissions Test Setup View 1	Conducted Emissions Test Setup View 2

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emissions



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

Annex E. Declaration of Similarity

Declaration Letter

To whom it may concern,

For our business issue and marketing requirement, we would like to list 2 model numbers on the FCC certificates and reports, as following:

Model No.: DW-779U; DW-779

We declare that there is no electrical change has been made to the equipment that alters the compliance characteristics. The differences of these models are different logo and different model name. Please handle on the project.

Signature:

Printed name/title: Kyung Ryong Hong /Director
Tel: 82-31-500-3422
Fax:
Applicant: DASAN ELECTRON
Address: 606, GODOWHADONG, KYUNGGI TECHONO PARK 1271-11, SA-DONG, ANSAN-SI, KYUNGGI-DO, ANSAN-SI, South Korea