MEASUREMENT REPORT

FCC PART 15 Subpart D / Industry Canada RSS 213

FCC ID:	XCO-DECT
IC:	7756A-DECT
APPLICANT:	Hansong (Nanjing) Technology Ltd
Application Type:	Certification
Product:	Wireless Module
Model No.:	DECT
Brand Name:	Hansong
FCC Classification:	Unlicensed PCS Base Station (PUB)
FCC Rule Part(s):	FCC Part 15, Subpart D
IC Rule(s):	RSS-213 Issue 3, RSS-Gen Issue 5
Test Procedure(s):	ANSI C63.17-2013
Test Date:	March 12 ~ May 4, 2018

Reviewed By : Sunny Sun
(Sunny Sun)

Approved By : Marlin Chen
(Marlin Chen)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.17. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
1803RSU009-U1	Rev. 01	Initial Report	05-14-2018	Valid

CONTENTS

§2.1033 General Information

Applicant:	Hansong (Nanjing) Technology Ltd
Applicant Address:	8th Kangping Road, Jiangning Economy and Technology Development Zone, Nanjing, 211106, China
Manufacturer:	Hansong (Nanjing) Technology Ltd
Manufacturer Address:	8th Kangping Road, Jiangning Economy and Technology Development Zone, Nanjing, 211106, China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
FCC Registration No.:	893164
IC Registration No.:	11384A-1
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

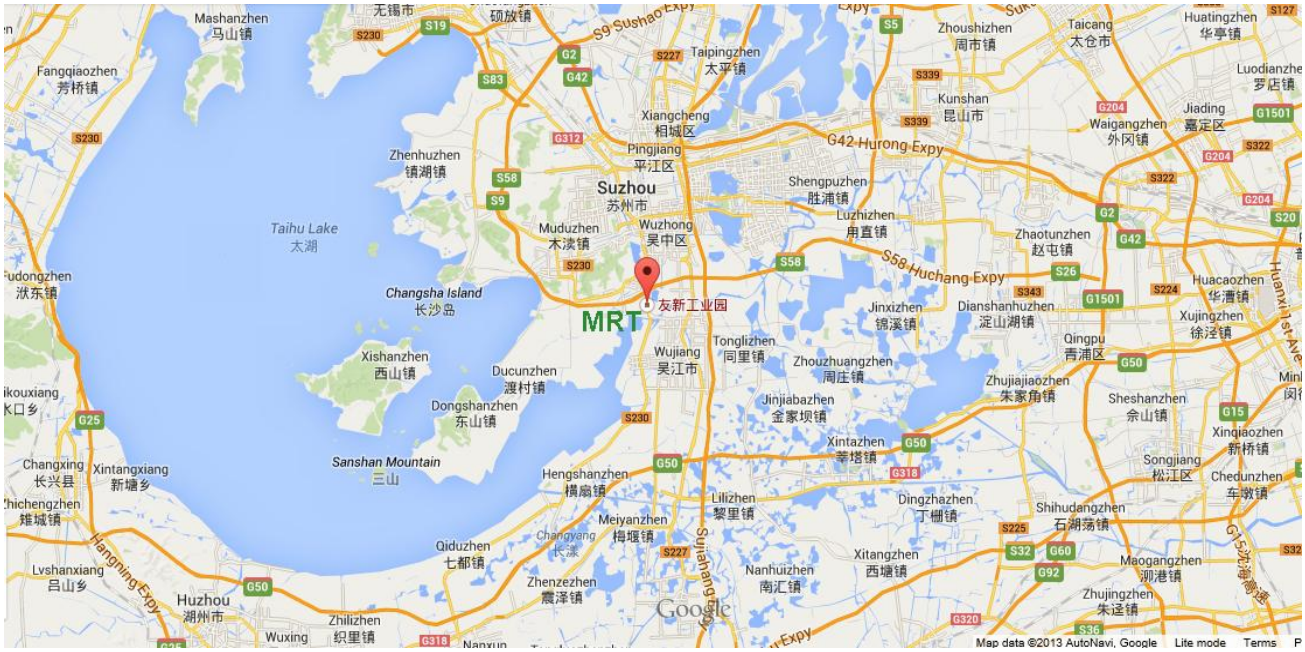
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Feature of Equipment under Test

Product Name:	Wireless Module
Model No.:	DECT
Brand Name:	Hansong

2.2. Product Specification Subjective to this Report

Frequency Range:	1921.536 ~ 1928.448MHz
Number of Channels:	5
Maximum Output Power:	18.025dBm
Type of Modulation:	Digital (Gaussian Frequency Shift Keying)

2.3. Antenna Information

Antenna Type	Part No.	Peak Antenna Gain
Dipole Antenna	N/A	2dBi
Monopole Antenna	45-2-000272	2dBi
PCB Antenna	RC12WFI0283A1	2dBi

2.4. Working Frequencies

UPCS CHANNEL	FREQUENCY (MHz)
Upper Band Edge	1930.000
0 (Highest)	1928.448
1	1926.720
2	1924.992
3	1923.264
4 (Lowest)	1921.536
Lowest Band Edge	1920.000

Requirement: FCC 15.303

Within 1920 -1930 MHz band for isochronous devices

2.5. Test Mode

Test Mode	Mode 1: Transmit by FP

2.6. Device Capabilities

DECT Device.

2.7. Test Software

The test utility software used during testing was “Jigsaw”.

2.8. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.9. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

RSP-100 Issue 11 Section 3

The manufacturer, importer or distributor shall meet the labelling requirements set out in this section for every unit:

(i) prior to marketing in Canada, for products manufactured in Canada

(ii) prior to importation into Canada, for imported products

For information regarding the e-labelling option, see Notice 2014–DRS1003. The label for the certified product represents the manufacturer’s or importer’s compliance with Innovation, Science and Economic Development Canada’s (ISED) regulatory requirements.

Please see attachment for IC label and label location.

2.10. Automatic Discontinuation of Transmission

Does the EUT transmit Control and Signaling Information?	☒YES	☐NO
TYPE OF EUT :	☐INITIATING DEVICE	☒RESPONDING DEVICE

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	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	Switch 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)

Requirements, FCC 15.319(f)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions 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.

3. DESCRIPTION of TEST

3.1. Evaluation Procedure

All measurements are traceable to national standards.
The tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC CFR47 Part 15D for Isochronous UPCS Devices and Industry Canada RSS-213 Issue 3 / RSS-GEN Issue 5 / RSP-100 Issue 11.
All tests were conducted is accordance with ANSI C63.4-2014 and ANSI C63.17-2013. Antenna Gain tests were made in a 3m fully-anechoic chamber.

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.
The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.
Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.
An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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."

- There are provisions for special connecter to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTTWA00045	1 year	2019/03/17
Digital Radio Communication Tester	RTX Products A/S	RTX	MRTSUE06399	1 year	2019/03/06
Two-Line V-Network	R&S	ENV216	MRTTWA00019	1 year	2019/03/23
Two-Line V-Network	R&S	ENV216	MRTTWA00020	1 year	2019/03/23
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTTWA00033	1 year	2018/06/08

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2019/04/25
Digital Radio Communication Tester	RTX Products A/S	RTX	MRTSUE06399	1 year	2019/03/06
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06184	1 year	2018/12/22

Software	Version	Function
e3	V8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: ± 3.46dB
Output Power - TR4
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ± 0.52dB
Power Spectral Density - TR4
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ± 0.52dB
Out of Band Emissions - TR4
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ± 0.75dB
Emission Bandwidth - TR4
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 3.8%
Frequency error - TR4
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ± 0.5ppm
Acknowledgements and Transmission Duration - TR4
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ± 1.9ns
Timing and Jitter Measurements - TR4
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ± 1.9ns
Frame Timing Measurements - TR4
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ± 0.8ppm

7. TEST RESULT

7.1. Summary

Test Item	FCC CFR 47 Paragraph	IC RSS-213 Paragraph	Verdict
Power Line Conducted Emission	15.107(a) 15.207(a)	5.4 RSS-GEN 8.8	Complies
Digital Modulation Techniques	15.319(b)	5.1	Complies
Labeling requirements	15.19(a)(3)	RSP-100 3.1	Complies
Antenna Requirement	15.317, 15.203	RSS-GEN 8.3	Complies
Channel Frequencies	15.303	5.1	Complies
Automatic discontinuation of transmission	15.319(f)	5.2 (4)	Complies
Emission Bandwidth	15.323(a)	5.5	Complies
In-band emissions	15.323(d)	5.8.2	Complies
Out-of-band emissions	15.323(d)	5.8.1	Complies
Peak Transmit Power and Antenna Gain	15.319(c) & 15.319(e)	5.6 RSS-Gen Clause 6.8	Complies
Power Spectral Density	15.319(d)	5.7	Complies
Carrier frequency stability	15.323(f)	5.3	Complies
Spurious Emissions (Radiated)	15.319(g) 15.109(a) 15.209(a)	RSS-GEN 8.9	Note
Specific Requirements for UPCS	15.323(c)(e)	5.2	Complies

Note 1: Not required if the Conducted Out-of-Band Emissions test is passed, and assessed in the FCC 15B test report.

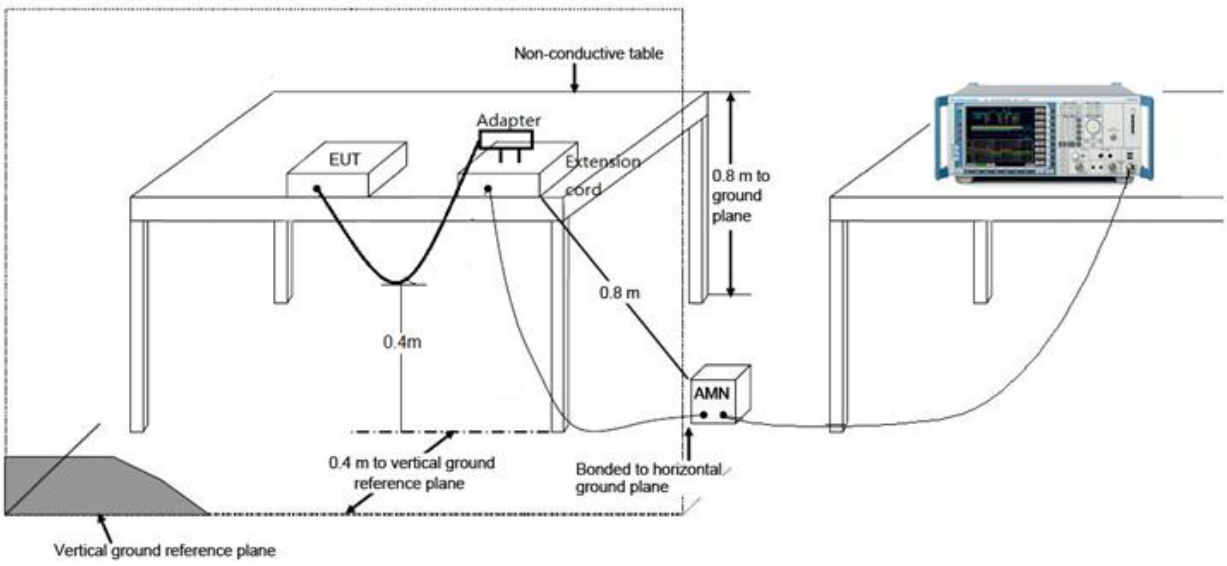
Note 2: For the “Specific Requirements for UPCS Device”, the test report had presented the worst test data of antenna connectors.

7.2. Power Line Conducted Emissions

7.2.1.Test Limit

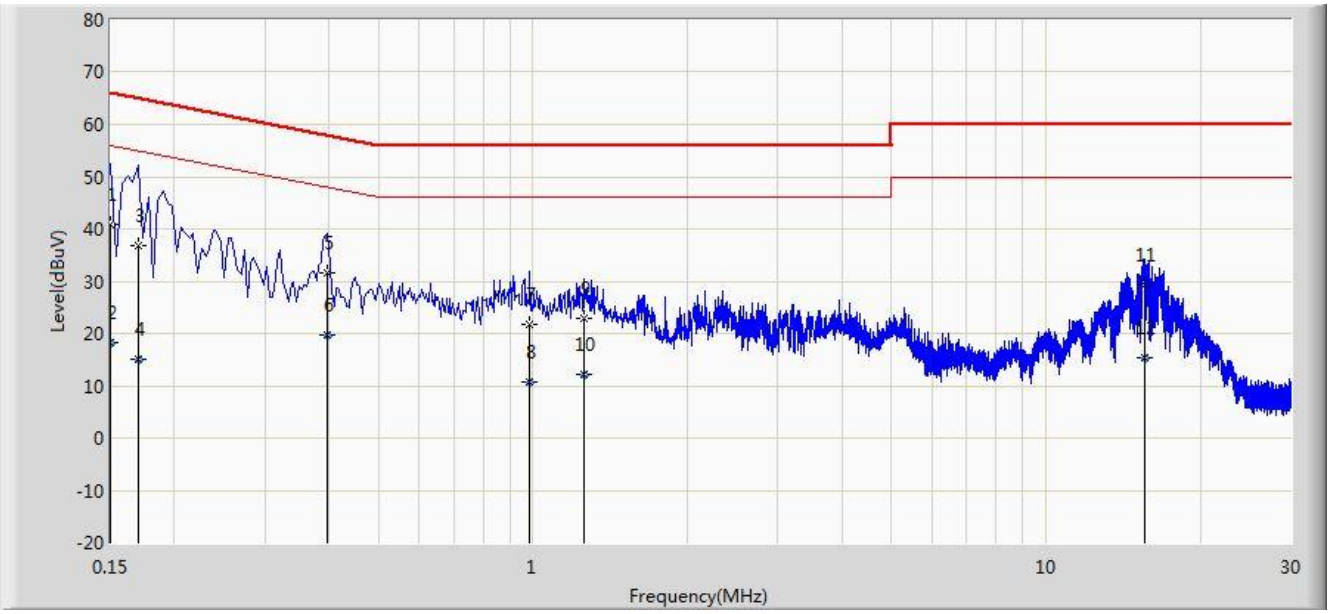
FCC Part 15.107 Limits		
Frequency (MHz)	QP (dBμV)	AV (dBμV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50
Note 1: The lower limit shall apply at the transition frequencies. Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.		

7.2.2.Test Setup



7.2.3.Test Result

Site: SR2	Time: 2018/04/25 - 14:41
Limit: FCC_Part15.107_Class B	Engineer: Polly Zong
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: Wireless Module	Power: AC 120V/60Hz
Test Mode: Mode 1	

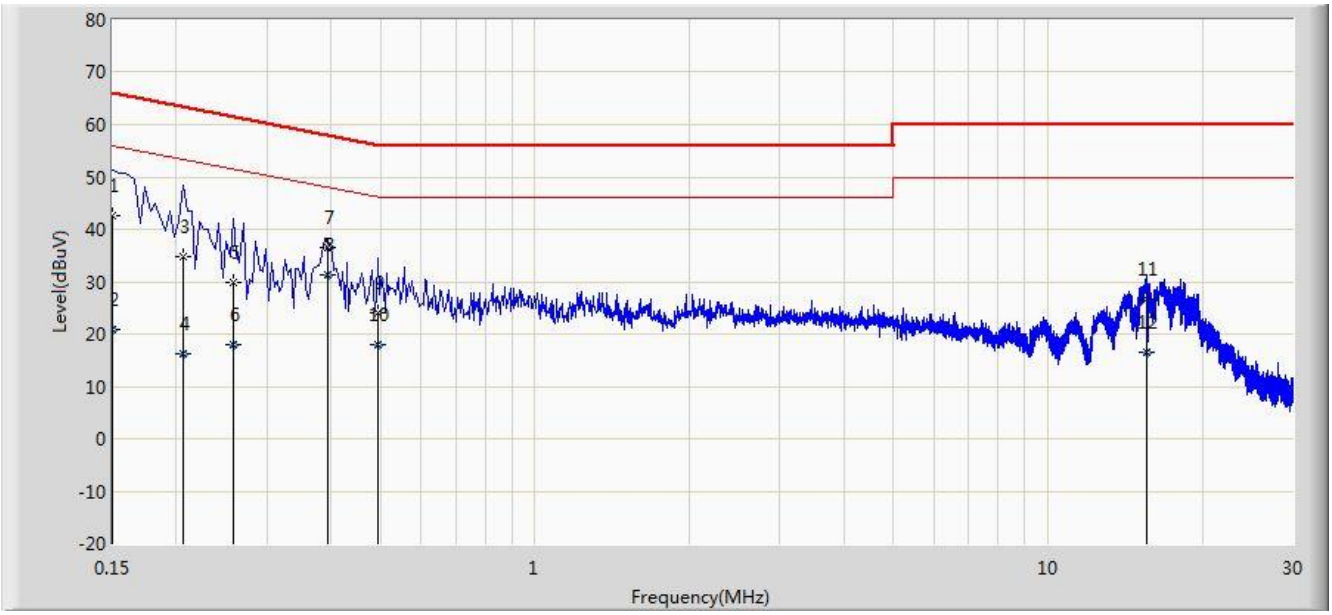


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.150	40.841	29.673	-25.159	66.000	11.168	QP
2			0.150	18.263	7.095	-37.737	56.000	11.168	AV
3			0.170	36.686	26.608	-28.275	64.960	10.078	QP
4			0.170	15.172	5.094	-39.789	54.960	10.078	AV
5			0.398	31.704	21.620	-26.191	57.895	10.084	QP
6			0.398	19.638	9.554	-28.257	47.895	10.084	AV
7			0.986	21.625	11.709	-34.375	56.000	9.916	QP
8			0.986	10.855	0.939	-35.145	46.000	9.916	AV
9			1.258	23.008	13.109	-32.992	56.000	9.899	QP
10			1.258	12.198	2.298	-33.802	46.000	9.899	AV
11			15.590	29.189	19.129	-30.811	60.000	10.060	QP
12			15.590	15.505	5.445	-34.495	50.000	10.060	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

Site: SR2	Time: 2018/04/25 - 14:46
Limit: FCC_Part15.107_Class B	Engineer: Polly Zong
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: Wireless Module	Power: AC 120V/60Hz
Test Mode: Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.150	42.736	31.594	-23.264	66.000	11.142	QP
2			0.150	20.911	9.769	-35.089	56.000	11.142	AV
3			0.206	34.708	24.707	-28.657	63.365	10.001	QP
4			0.206	16.212	6.211	-37.153	53.365	10.001	AV
5			0.258	29.842	19.835	-31.654	61.496	10.007	QP
6			0.258	17.927	7.920	-33.569	51.496	10.007	AV
7			0.394	36.421	26.313	-21.558	57.979	10.108	QP
8		*	0.394	31.217	21.109	-16.762	47.979	10.108	AV
9			0.494	24.051	13.873	-32.049	56.100	10.178	QP
10			0.494	17.941	7.762	-28.159	46.100	10.178	AV
11			15.530	26.680	16.568	-33.320	60.000	10.113	QP
12			15.530	16.552	6.439	-33.448	50.000	10.113	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

7.3. Emission Bandwidth Measurement

7.3.1.Test Limit

Requirement: FCC 15.323(a)

The 26 dB Bandwidth B shall be larger than 50 kHz and less than 2.5MHz.

Requirement: RSS-213 Issue 3, clause 5.5

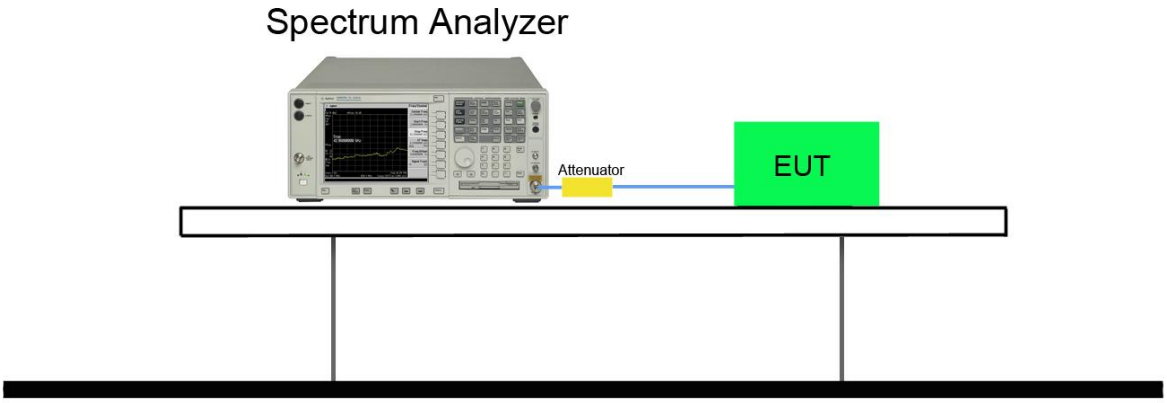
The 20 dB Bandwidth B shall be larger than 50 kHz and less than 2.5MHz.

No requirement for 6 dB and 12 dB Bandwidth. These values are only used for testing Monitoring Bandwidth if the Simple Compliance test fails (ANSI C63.17, clause 7.4).

7.3.2.Test Procedure used

ANSI C63.17, Clause 6.1.3

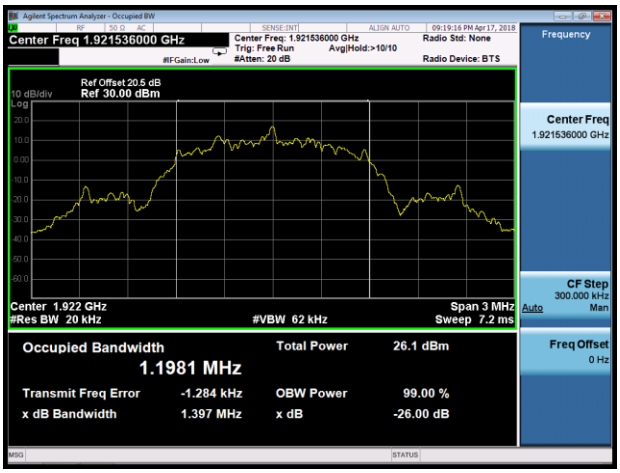
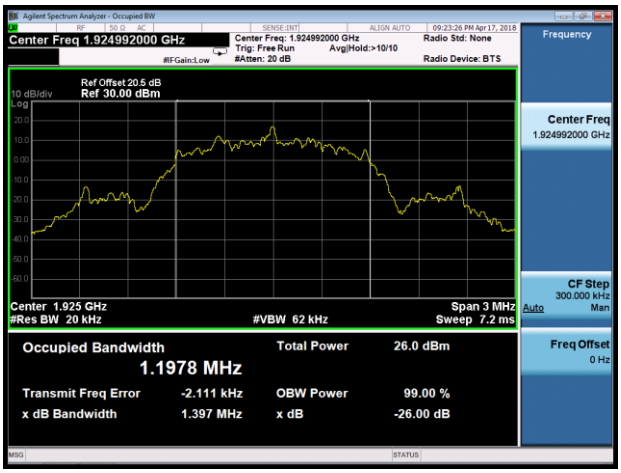
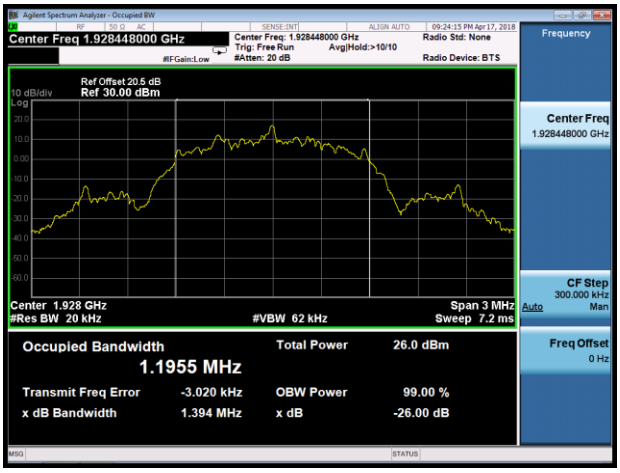
7.3.3.Test Setup

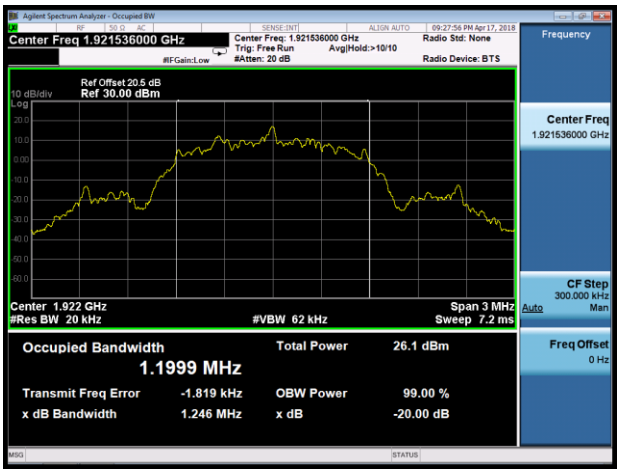
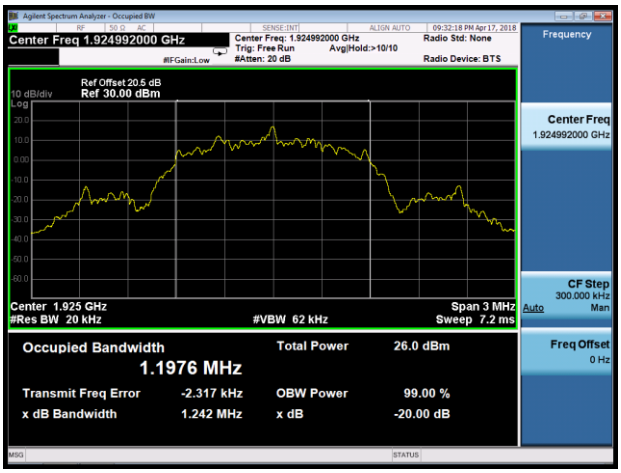
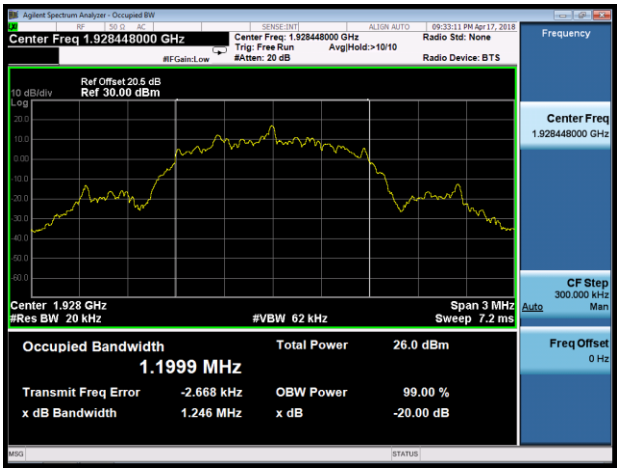


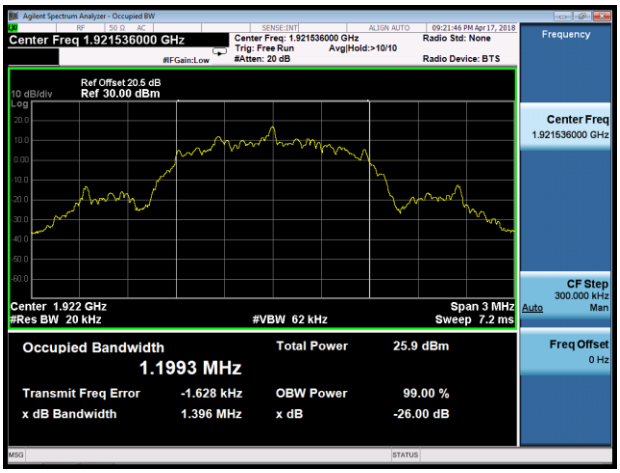
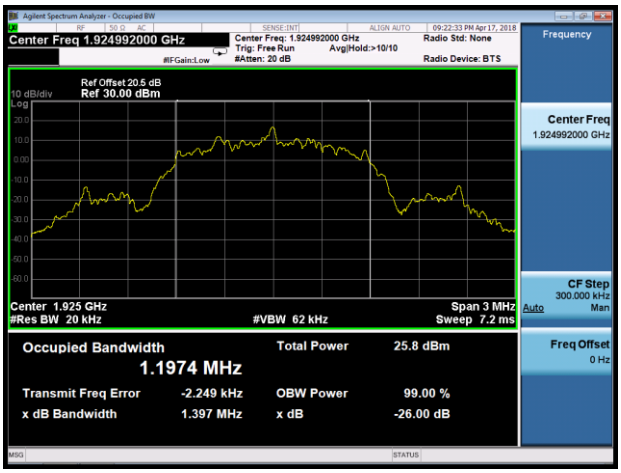
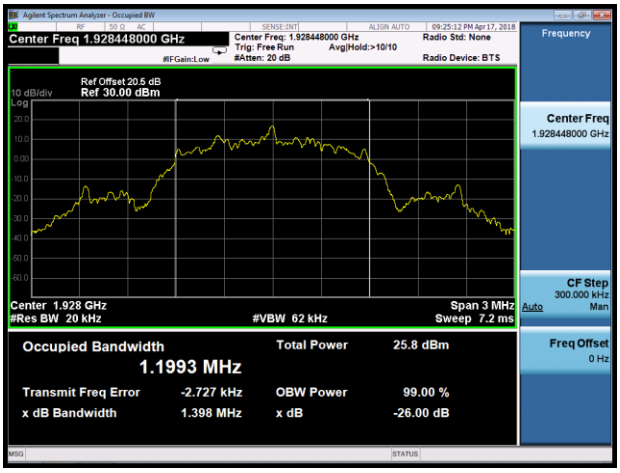
7.3.4.Test Result

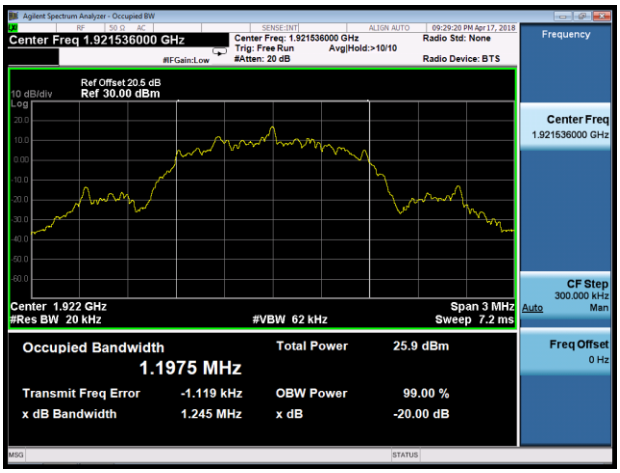
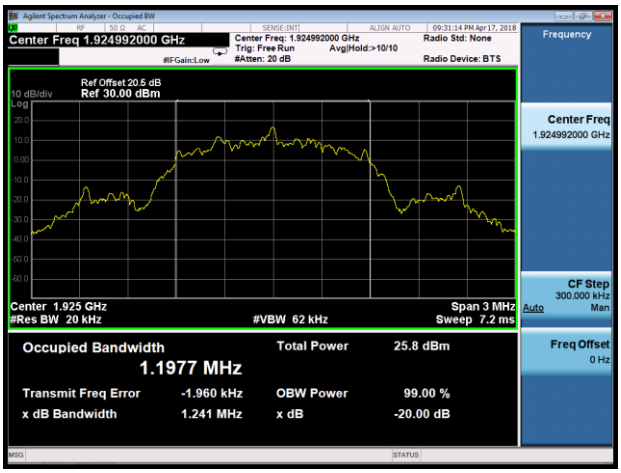
Product	Wireless Module	Temperature	24°C
Test Engineer	Dandy Li	Relative Humidity	51%
Test Site	TR3	Test Date	2018/04/17
Test Mode	Mode 1		

Channel No.	Frequency (MHz)	Emission Bandwidth (MHz)	Result
26dB Bandwidth – Ant 0			
4	1921.536	1.397	Pass
2	1924.992	1.397	Pass
0	1928.448	1.394	Pass
20dB Bandwidth – Ant 0			
4	1921.536	1.246	Pass
2	1924.992	1.242	Pass
0	1928.448	1.246	Pass
26dB Bandwidth – Ant 1			
4	1921.536	1.396	Pass
2	1924.992	1.397	Pass
0	1928.448	1.398	Pass
20dB Bandwidth – Ant 1			
4	1921.536	1.245	Pass
2	1924.992	1.241	Pass
0	1928.448	1.246	Pass

Mode 1 - 26dB Emission Bandwidth-Ant 0	
Lowest Channel	Middle Channel
	
Upper Channel	
	

Mode 1 - 20dB Emission Bandwidth-Ant 0	
Lowest Channel	Middle Channel
	
Upper Channel	
	

Mode 1 - 26dB Emission Bandwidth-Ant 1	
Lowest Channel	Middle Channel
	
Upper Channel	
	

Mode 1 - 20dB Emission Bandwidth-Ant 1	
Lowest Channel	Middle Channel
	
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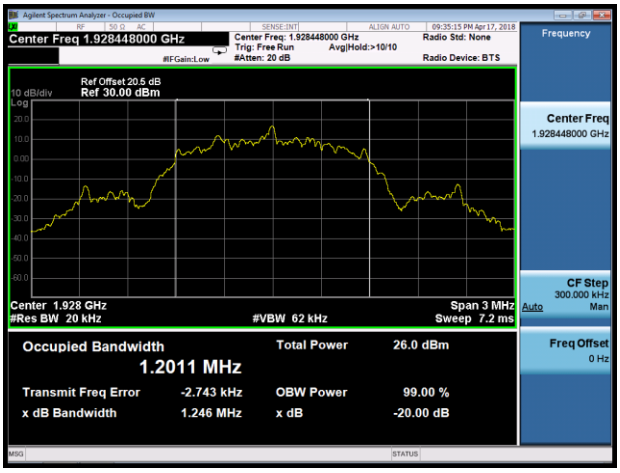
	

7.4. Peak Power Output

7.4.1.Test Limit

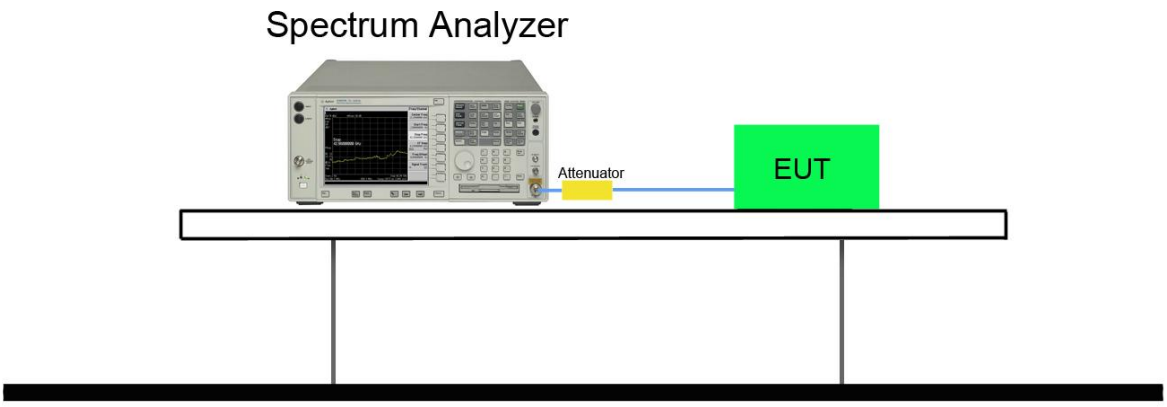
Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in Hertz.

The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3dBi.

7.4.2.Test Procedure Used

ANSI C63.17, Clause 6.1.2

7.4.3.Test Setup



7.4.4.Test Result

Product	Wireless Module	Temperature	24°C
Test Engineer	Dandy Li	Relative Humidity	51%
Test Site	TR3	Test Date	2018/04/17
Test Mode	Mode 1		

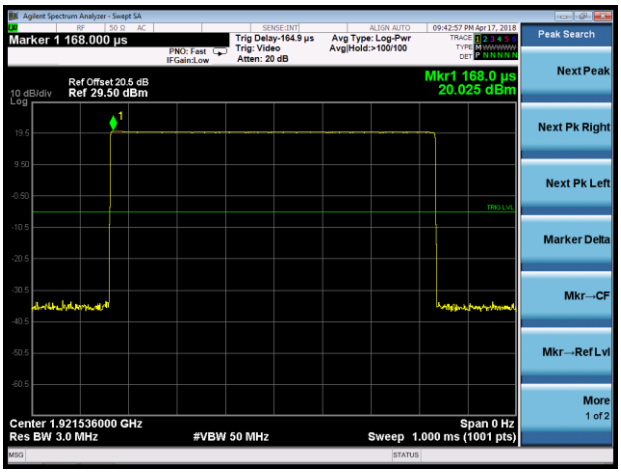
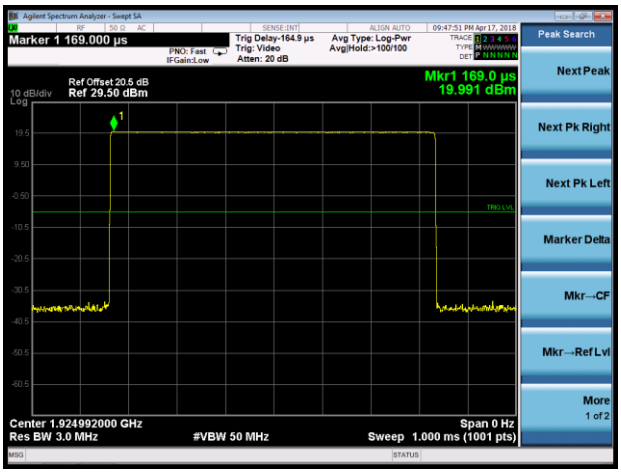
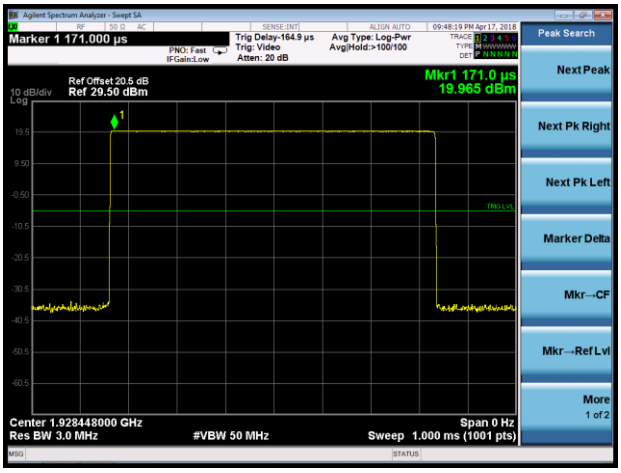
Channel No.	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Maximum Antenna Gain (dBi)	Maximum Radiated Output Power (dBm)	Limit (dBm)
Ant 0					
4	1921.536	18.025	2.0	20.025	≤ 20.72
2	1924.992	17.991	2.0	19.991	≤ 20.72
0	1928.448	17.965	2.0	19.965	≤ 20.72
Ant 1					
4	1921.536	17.819	2.0	19.819	≤ 20.72
2	1924.992	17.784	2.0	19.784	≤ 20.72
0	1928.448	17.771	2.0	19.771	≤ 20.72

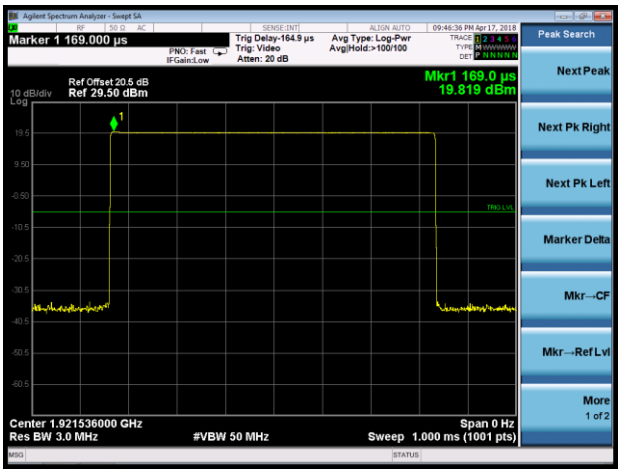
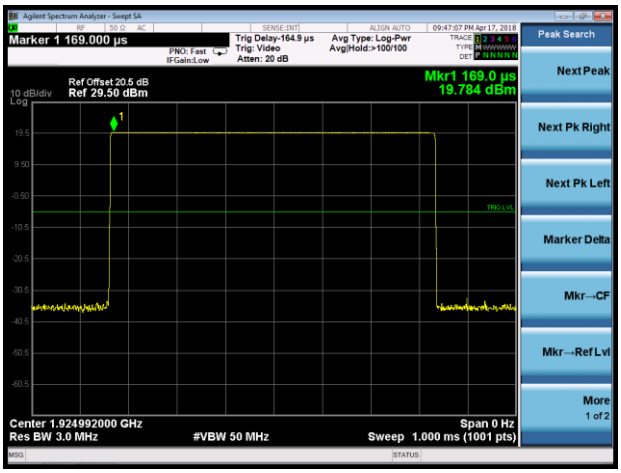
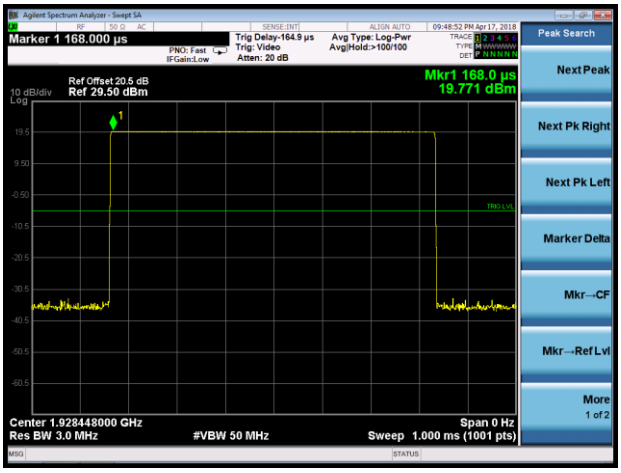
Note: Ant 0: The min EBW = 1394000Hz

Peak Transmit Power Limit = 10*log(100μW x $(EBW)^{1/2}$ ÷ 1000) = 20.72dBm

Ant 1: The min EBW = 1396000Hz

Peak Transmit Power Limit = 10*log(100μW x $(EBW)^{1/2}$ ÷ 1000) = 20.72dBm

Mode 1 - Ant 0 Peak Output Power	
Lowest Channel	Middle Channel
	
Upper Channel	
	

Mode 1 - Ant 1 Peak Output Power	
Lowest Channel	Middle Channel
	
Upper Channel	
	

7.5. Power Spectral Density

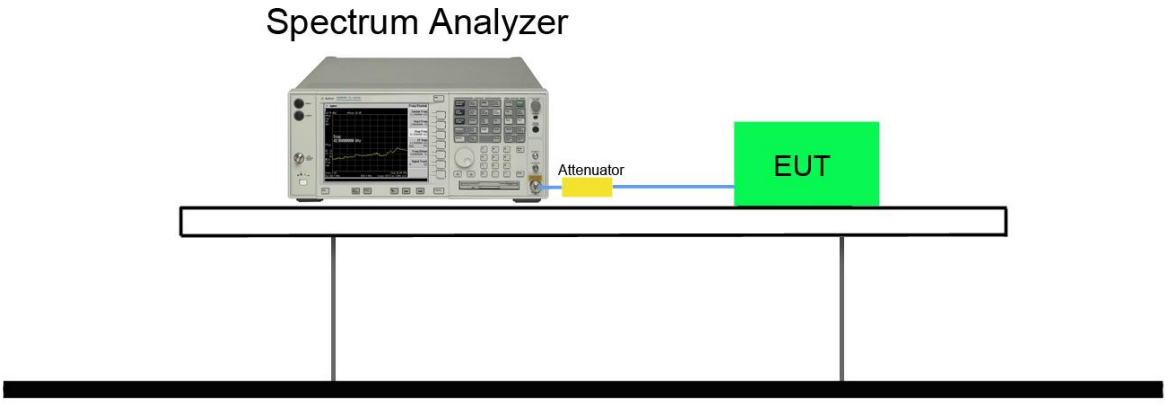
7.5.1.Test Limit

Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

7.5.2.Test Procedure Used

ANSI C63.17, Clause 6.1.5

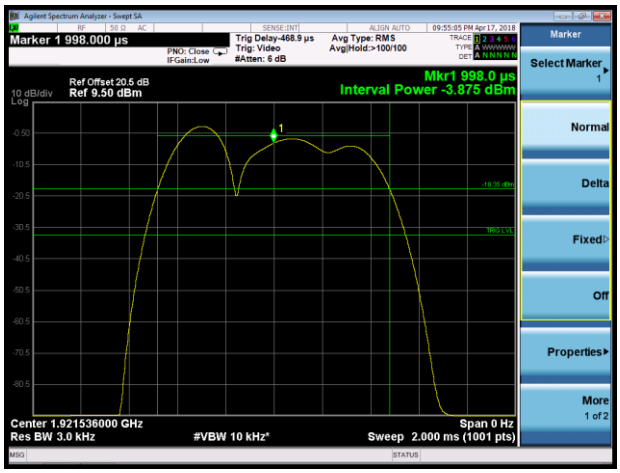
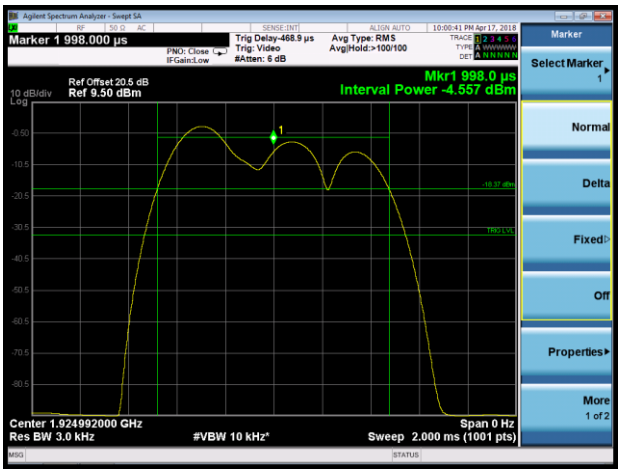
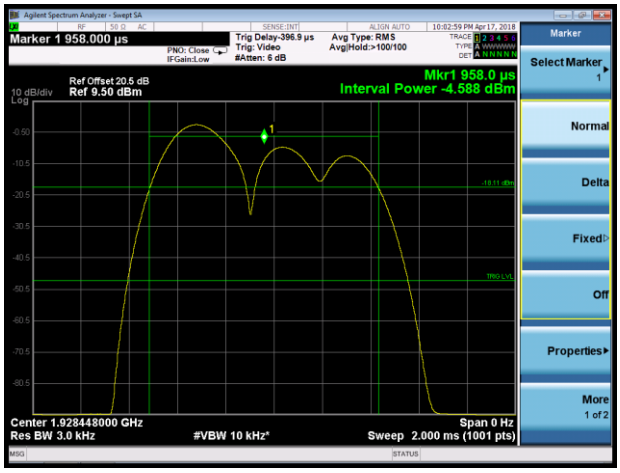
7.5.3.Test Setup

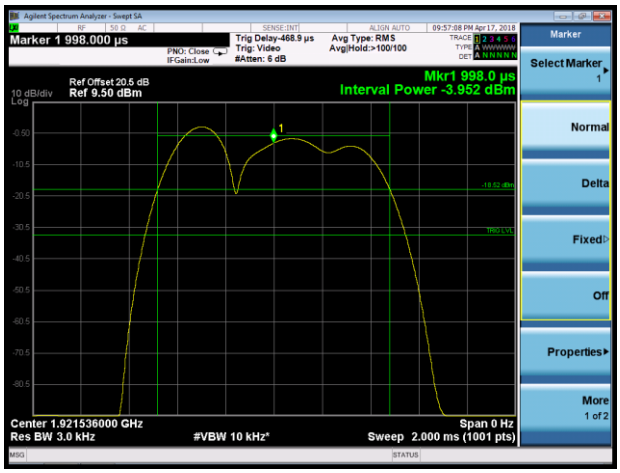
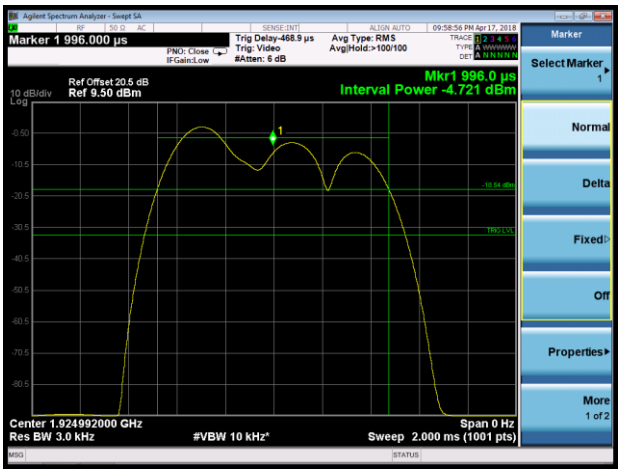
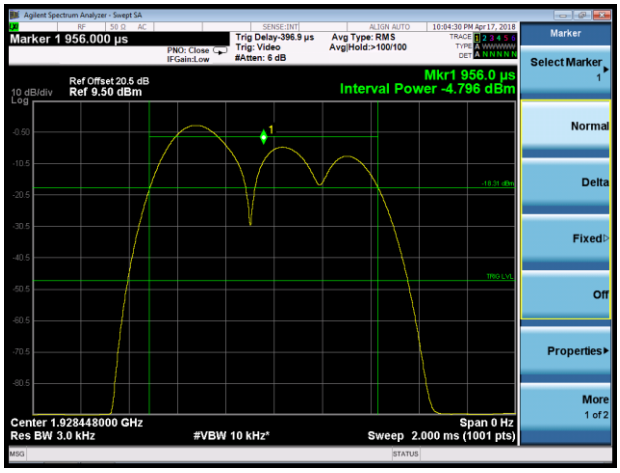


7.5.4.Test Result

Product	Wireless Module	Temperature	24°C
Test Engineer	Dandy Li	Relative Humidity	51%
Test Site	TR3	Test Date	2018/04/17
Test Mode	Mode 1		

Channel No.	Frequency (MHz)	Measured PSD (dBm / 3kHz)	Limit (mW / 3kHz)	Result
Ant 0				
4	1921.536	-3.875	≤ 3.00	Pass
2	1924.992	-4.557	≤ 3.00	Pass
0	1928.448	-4.588	≤ 3.00	Pass
Ant 1				
4	1921.536	-3.952	≤ 3.00	Pass
2	1924.992	-4.721	≤ 3.00	Pass
0	1928.448	-4.796	≤ 3.00	Pass

Mode 1 - Ant 0 Power Spectral Density	
Lowest Channel	Middle Channel
	
Upper Channel	
	

Mode 1 - Ant 1 Power Spectral Density	
Lowest Channel	Middle Channel
	
Upper Channel	
	

7.6. In-Band Unwanted Emissions

7.6.1.Test Limit

B < f2 _2B: less than or equal to 30 dB below maximum permitted peak power level

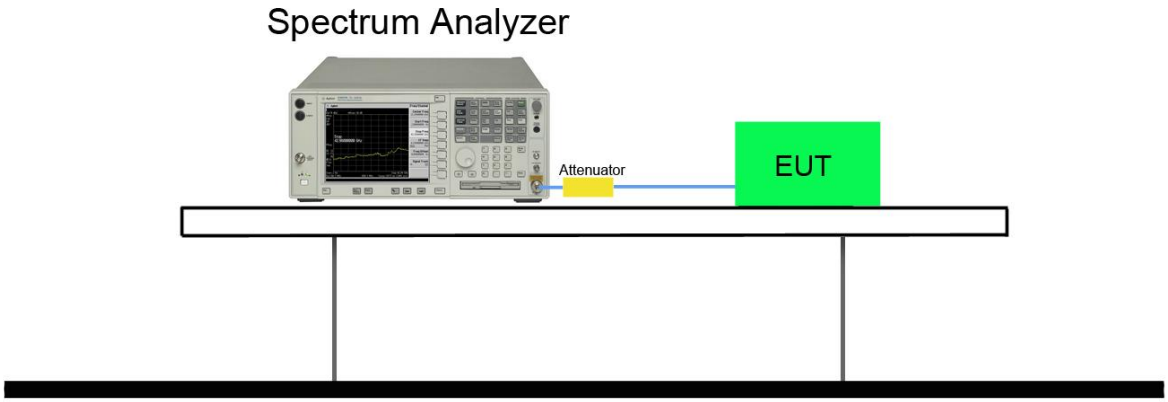
2B < f2 _3B: less than or equal to 50 dB below maximum permitted peak power level

3B < f2 _UPCS Band Edge: less than or equal to 60 dB below maximum permitted peak power level.

7.6.2.Test Procedure Used

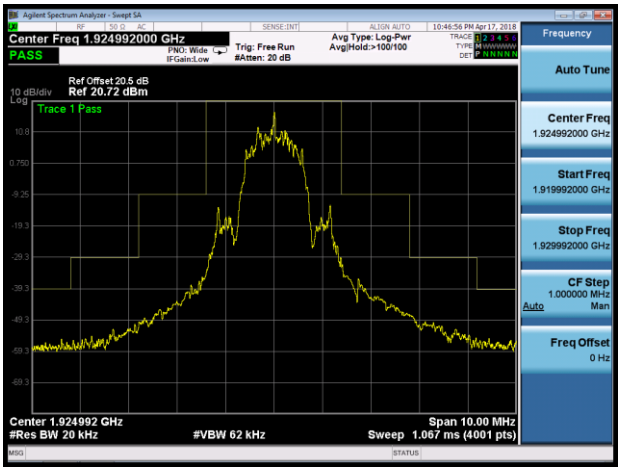
ANSI C63.17, Clause 6.1.6.1

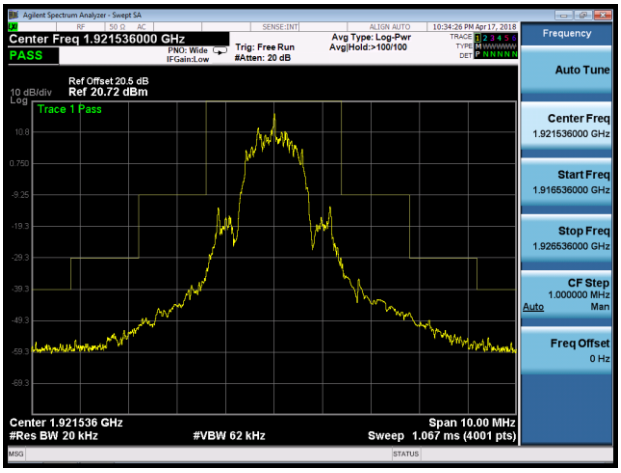
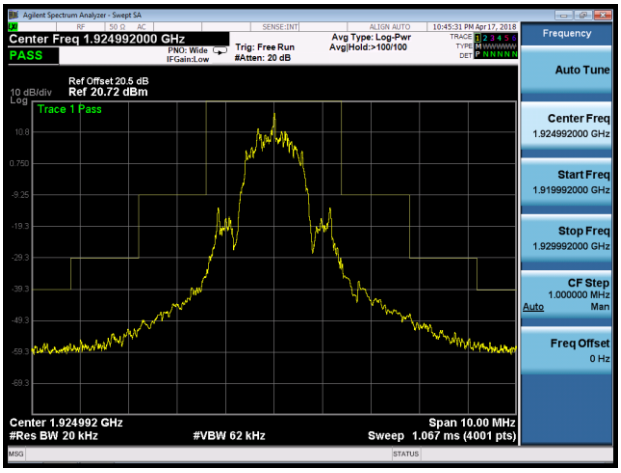
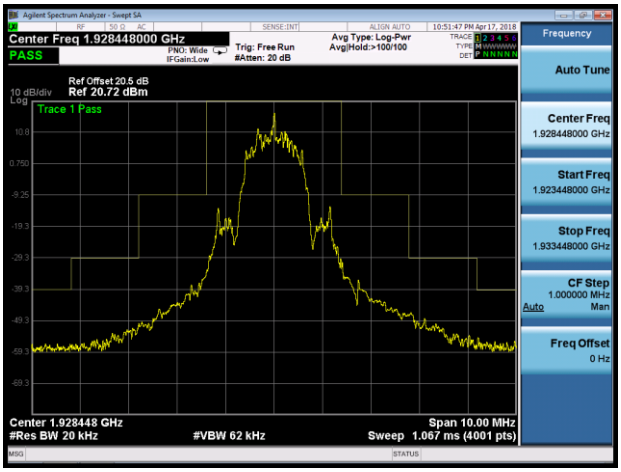
7.6.3.Test Setup



7.6.4.Test Result

Product	Wireless Module	Temperature	24°C
Test Engineer	Dandy Li	Relative Humidity	51%
Test Site	TR3	Test Date	2018/04/17
Test Mode	Mode 1		

Mode 1 - Ant 0	
Lowest Channel	Middle Channel
	
Upper Channel	
	

Mode 1 - Ant 1	
Lowest Channel	Middle Channel
	
Upper Channel	
	

Note: The BS spurious in-band of Middle Channel transmission level is below the indicated limit.

7.7. Out-of-Band Emissions, Conducted

7.7.1.Test Limit

f ≤ 1.25 MHz outside UPCS band: ≤ -9.5dBm

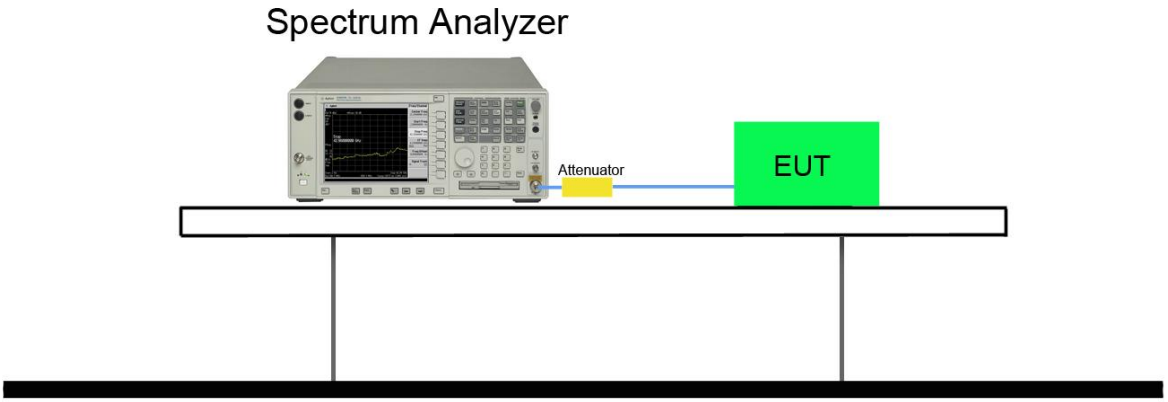
1.25 MHz ≤ f ≤ 2.5 MHz outside UPCS band: ≤ -29.5dBm

f ≤ 2.5 MHz outside UPCS band: ≤ -39.5dBm

7.7.2.Test Procedure Used

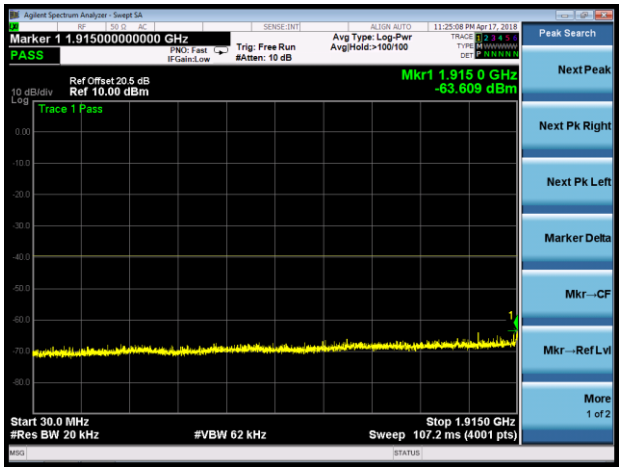
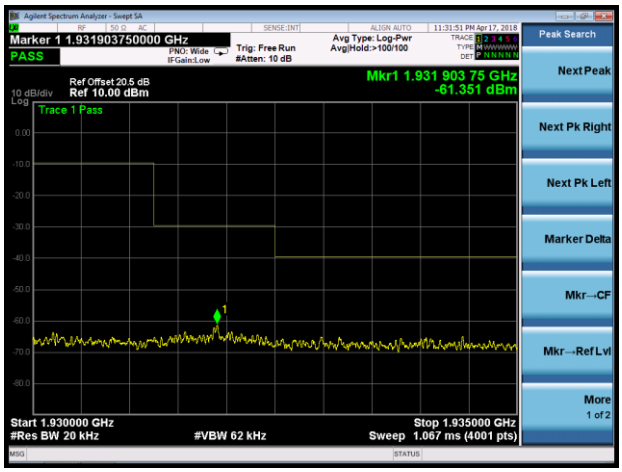
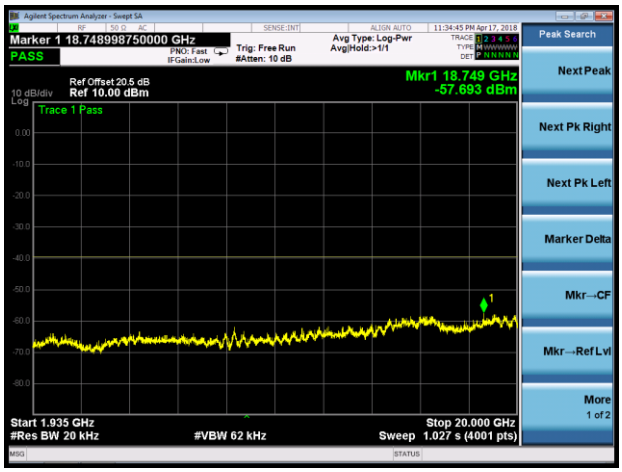
ANSI C63.17, Clause 6.1.6.2

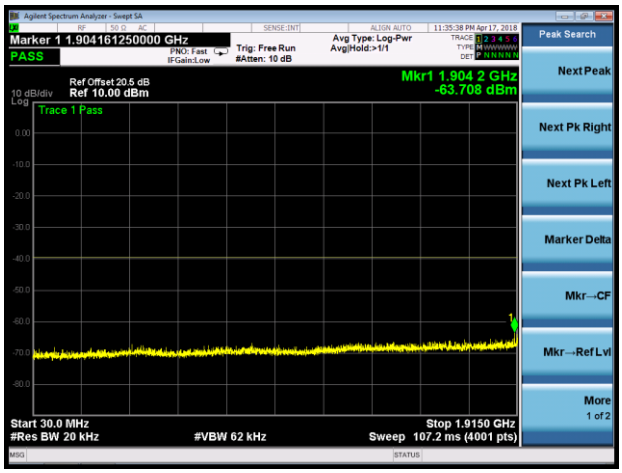
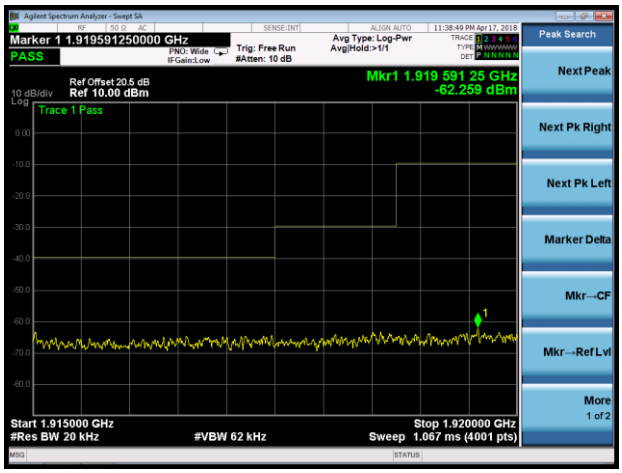
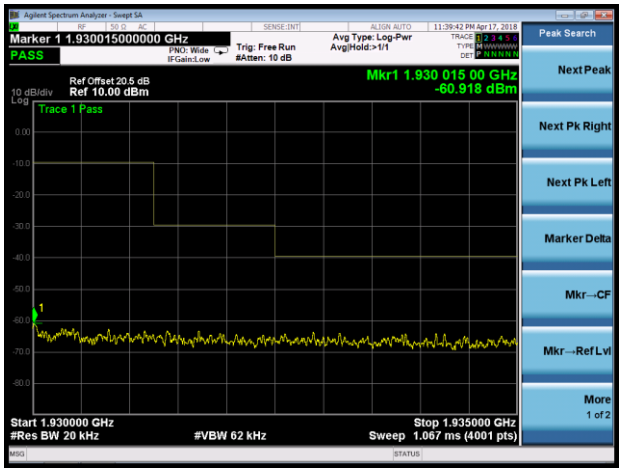
7.7.3.Test Setup

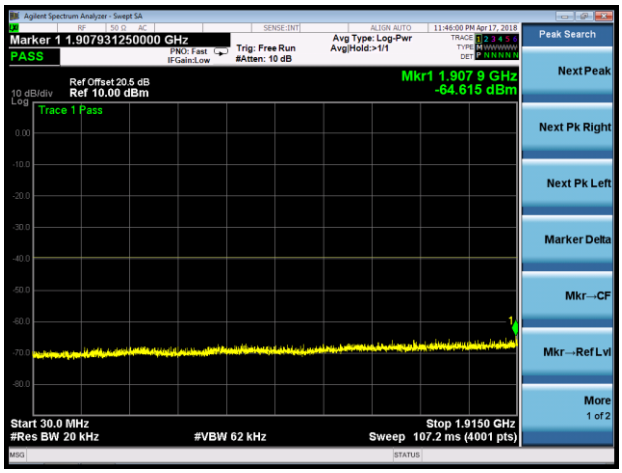
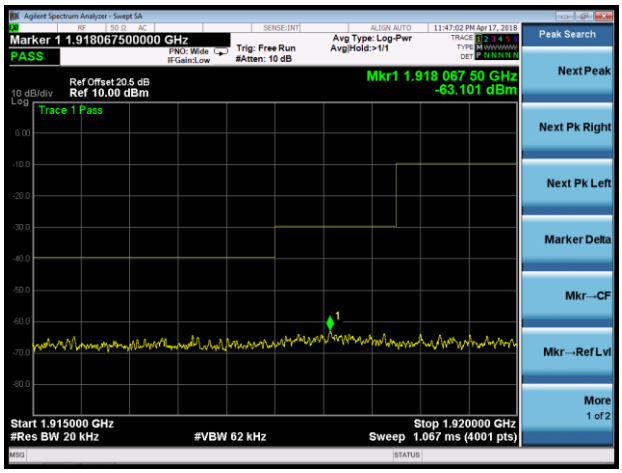


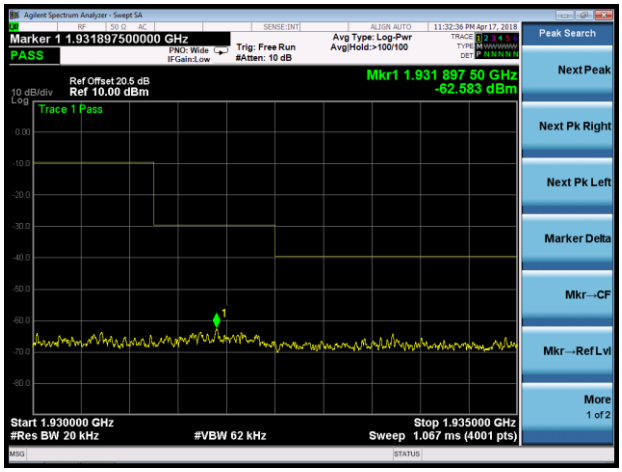
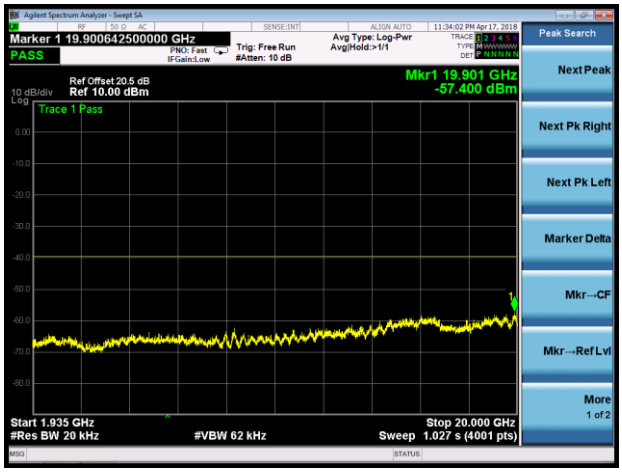
7.7.4.Test Result

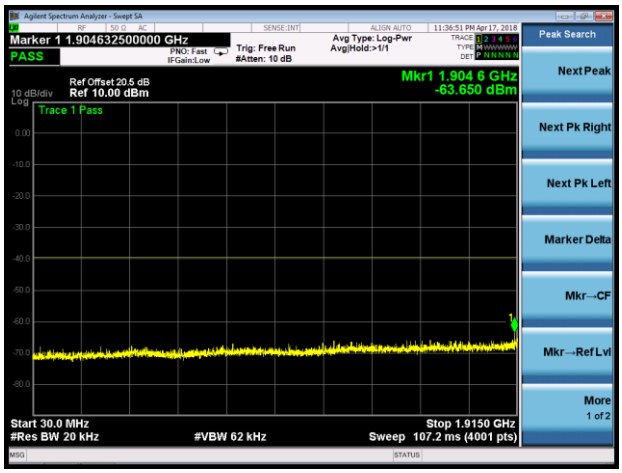
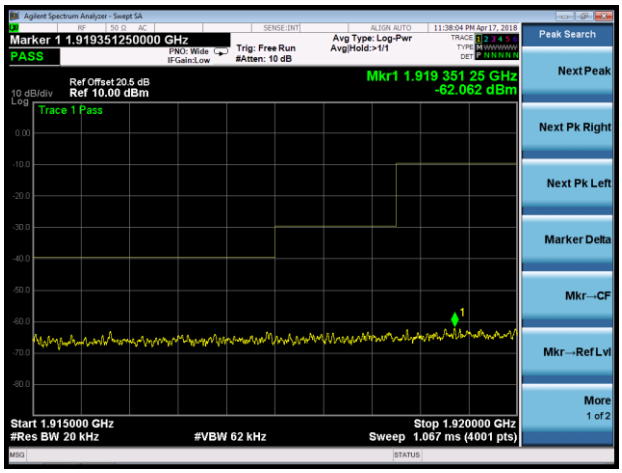
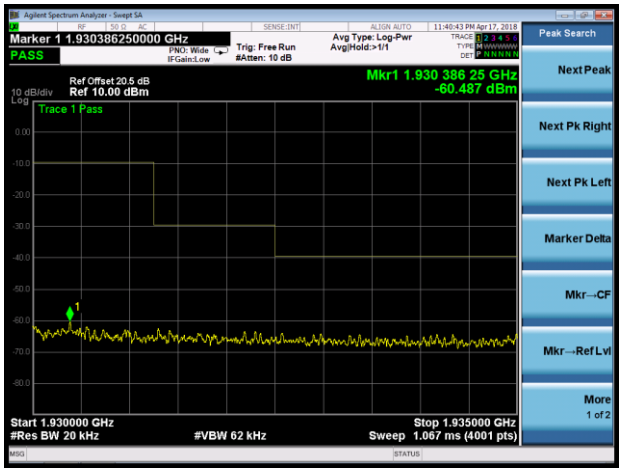
Product	Wireless Module	Temperature	24°C
Test Engineer	Dandy Li	Relative Humidity	51%
Test Site	TR3	Test Date	2018/04/17
Test Mode	Mode 1		

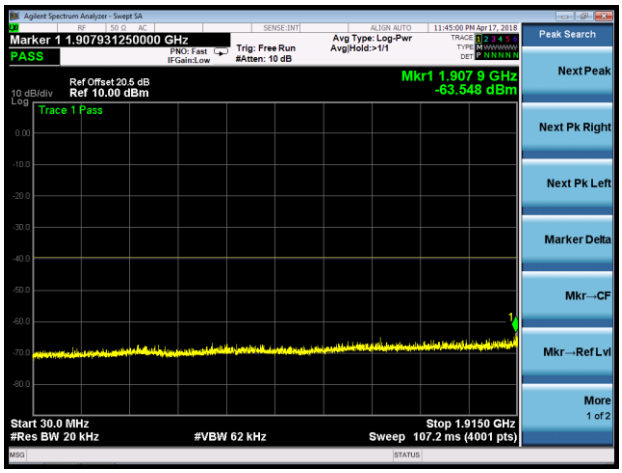
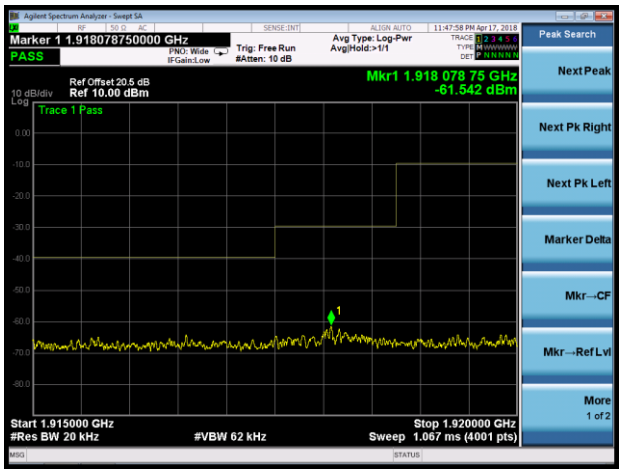
Mode 1 – Ant 0 Lowest Channel	
30MHz ~ 1.915GHz	1.915GHz ~ 1.92GHz
	
1.93GHz ~ 1.935GHz	1.935GHz ~ 20GHz
	

Mode 1 – Ant 0 Middle Channel	
30MHz ~ 1.915GHz	1.915GHz ~ 1.92GHz
	
1.93GHz ~ 1.935GHz	1.935GHz ~ 20GHz
	

Mode 1 – Ant 0 Highest Channel	
30MHz ~ 1.915GHz	1.915GHz ~ 1.92GHz
	
1.93GHz ~ 1.935GHz	1.935GHz ~ 20GHz
	

Mode 1 – Ant 1 Lowest Channel	
30MHz ~ 1.915GHz	1.915GHz ~ 1.92GHz
	
1.93GHz ~ 1.935GHz	1.935GHz ~ 20GHz
	

Mode 1 – Ant 1 Middle Channel	
30MHz ~ 1.915GHz	1.915GHz ~ 1.92GHz
	
1.93GHz ~ 1.935GHz	1.935GHz ~ 20GHz
	

Mode 1 – Ant 1 Highest Channel	
30MHz ~ 1.915GHz	1.915GHz ~ 1.92GHz
	
1.93GHz ~ 1.935GHz	1.935GHz ~ 20GHz
	

Note: The BS spurious out-of-band transmission level is below the indicated limit.

7.8. Carrier Frequency Stability

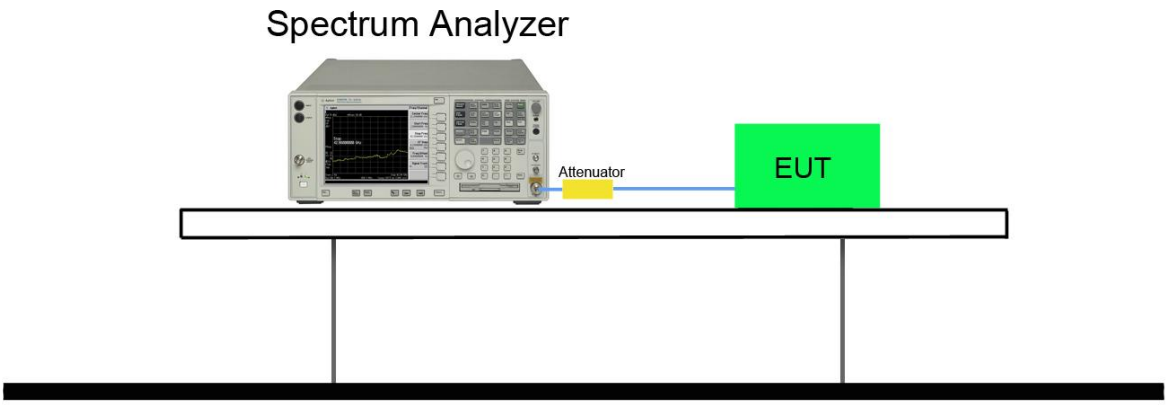
7.8.1.Test Limit

Per §15.323(f), the frequency stability of the carrier frequency of the intentional radiator shall be maintained within ±10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of −20°C to +50°C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

7.8.2.Test Procedure Used

ANSI C63.17, Clause 6.2.1

7.8.3.Test Setup



7.8.4.Test Result

The Frequency Stability is measured with the RTX. The RTX was logged by a computer programmed to get the new readings as fast as possible (about 3 readings per second) over the noted time period or number of readings. The peak-to-peak difference was recorded and the mean value and deviation in ppm was calculated.

The Carrier Frequency Stability over power Supply Voltage and over Temperature is measured also with the RTX.

Carrier Frequency Stability over Time at Nominal Temperature

Average Mean Carrier Frequency (MHz)	Max. Diff. (kHz)	Min. Diff. (kHz)	Max Dev. (ppm)	Limit (ppm)
Mode 1				
1924.992395	3.7	0.5	1.7	±10

Deviation ppm = ((Max. Diff. - Mean. Diff.) / Mean Carrier Freq.) x 10^6

Deviation (ppm) is calculated from 3000 readings with the RTX.

Carrier Frequency Stability over Time at Nominal Temperature

Voltage	Measured Carrier Frequency (MHz)	Difference (kHz)	Deviation (ppm)	Limit (ppm)
Mode 1				
Vnom	1924.9925	3.7	1.9	±10
85% of Vnom	1924.9922	3.9	2.0	
115% of Vnom	1924.9924	3.4	1.8	

Deviation ppm = ((Mean - Measured frequency) / Mean) x 10^6

Carrier Frequency Stability over Temperature

Voltage	Measured Carrier Frequency (MHz)	Difference (kHz)	Deviation (ppm)	Limit (ppm)
Mode 1				
T = +20°C	1924.9925	Ref	Ref	±10
T = -20°C	1924.9927	3.0	1.6	
T = +50°C	1924.9926	2.8	1.5	

Deviation ppm = ((Mean - Measured frequency) / Mean) x 10^6

7.9. Specific Requirements for UPCS Device

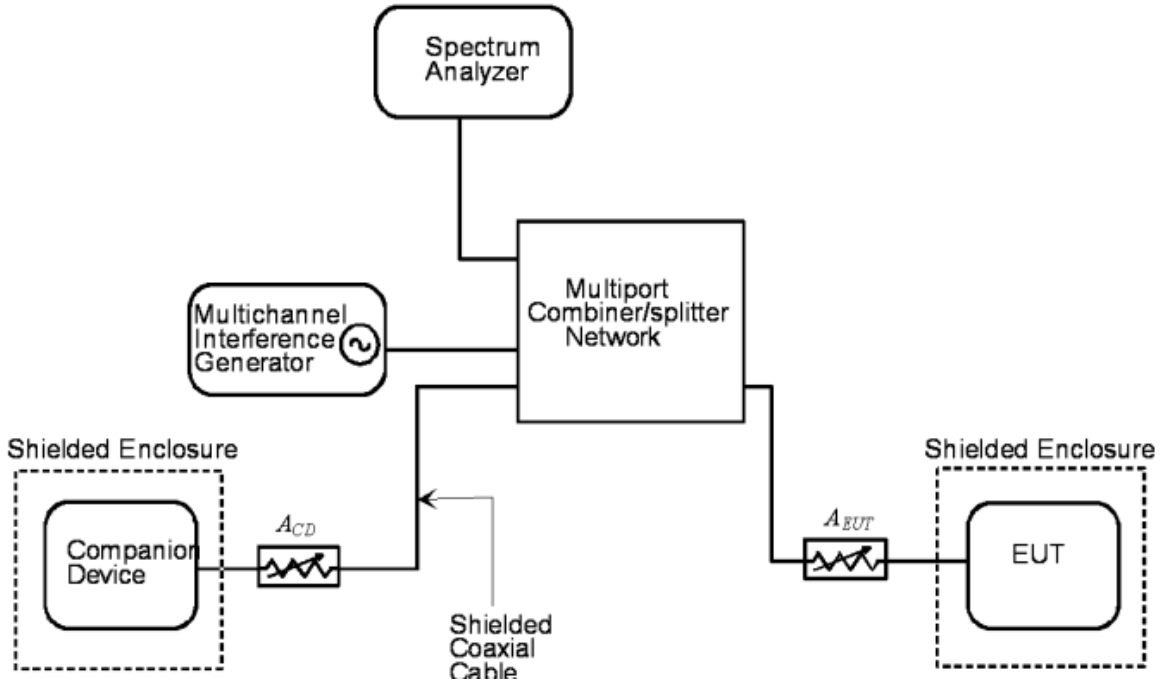
7.9.1.Monitoring Time Requirements

Immediately prior to initiating transmission, devices must monitor the combined time and spectrum window 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

7.9.1.1. Test Procedure Used

ANSI C63.17, Clause 7.5

7.9.1.2. Test Setup



7.9.1.3. Test Reslut

Interference (Refer to ANSIC63.17 clause 7.3.4)	Reaction of EUT	Results
Apply the interference on f1 at level TU+UM, and no interference on f2. Initiate transmission and verify the transmission on f2.	EUT transmits on f2	Pass
Apply the interference on f2 at level TU+UM, at the same time, no interference on f1. After about 20ms, initiate transmission and verify the transmission on f1.	EUT transmits on f1	Pass

7.9.2.Lowest Monitoring Threshold Requirements

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.

7.9.2.1. Test Procedure Used

ANSI C63.17, Clause 7.3.1

7.9.2.2. Test Reslut

Not Apply

7.9.3.Acknowledgements and Transmission Duration Requirements

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.

7.9.3.1. Test Procedure Used

ANSI C63.17, Clause 8.2.1 & 8.2.2

7.9.3.2. Test Reslut

Test ref. to ANSI C63.17 clause 8.2.1	Observation	Verdict
Initial transmission without acknowledgements	Not applicable for EUT that transmits control and signaling information	N/A
Transmission time after loss of acknowledgements	10.0	Pass

Test ref. to ANSI C63.17 clause 8.2.2	Observation	Verdict
Transmission duration on same time and frequency window	Only for initiating device that controls which time slot is used	N/A

7.9.4.Least Interfered Channel (LIC) Selection Requirements

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.

Calculation of monitoring threshold limits for isochroous devices:

Lowest threshold: TL = $-174+10Log_{10}B + M_u + P_{MAX}-P_{EUT}$(dBm)

Upper threshold: TU = $-174+10Log_{10}B + M_u + P_{MAX}-P_{EUT}$(dBm)

Where: B=Emission bandwidth (Hz)

M_u=dB the threshold may exceed thermal noise (30 for T_L& 50 for T_U)

$P_{MAX}=5*Log_{10}B-10$(dBm)

P_{EUT}=Transmitted power (dBm)

Monitor Threshold	B (MHz)	M_U (dB)	P_{MAX} (dBm)	P_{EUT} (dBm)	Threshold (dBm)
Mode 1					
TL	1.394	30	20.72	20.03	-81.87
TU	1.394	50	20.72	20.03	-61.87

The EUT must not transmit until the interference level is less than or equal to:

Measured Threshold Level ≤TU

Where: TU=Upper threshold level

7.9.4.1. Test Procedure Used

ANSI C63.17, Clause 7.3.2 & 7.3.3 & 7.3.4

7.9.4.2. Test Reslut

Monitor threshold	Measured Threshold Level	Limit (dBm)
Mode 1		
Lowest Threshold (dBm)	N/A	-81.29
Upper Threshold (dBm)	N/A	-61.29
Mode 2		
Lowest Threshold (dBm)	N/A	-83.02
Upper Threshold (dBm)	N/A	-63.02

Note: N/A Not applicable- EUT which supports at least of 40 duplex system access channels and implements Least Interfered Channel (LIC) algorithm is permitted to use an upper monitoring threshold.

7.9.5.Random waiting Requirements

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 window after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

7.9.5.1. Test Procedure Used

ANSI C63.17, Clause 8.1.3

7.9.5.2. Test Reslut

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

7.9.6.Monitoring Bandwidth Requirements

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

7.9.6.1. Test Procedure Used

ANSI C63.17, Clause 7.5

7.9.6.2. Test Reslut

Test Equation (μs)	B (MHz)	Pulse width(μs)	Limit (us)	Result
Mode 1				
50 $(1.25/B)^{1/2}$	1.394	47.35	50	Pass
25 $(1.25/B)^{1/2}$	1.394	23.67	35	Pass

7.9.7.Monitoring Antenna Requirements

The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

7.9.7.1. Test Procedure Used

ANSI C63.17 paragraph 4

7.9.7.2. Test Reslut

The antenna of the EUT used for transmission is the same interior antenna that used for monitoring.

7.9.8.Monitoring Antenna Requirements

Devices that have a power output Lowest than the maximum permitted under the rules can increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted

7.9.8.1. Test Procedure Used

ANSI C63.17 paragraph 4

7.9.8.2. Test Reslut

Not apply

7.9.9.Dual Access Criteria Check Requirements

An initiating device may attempt to establish a duplex connection by monitors both its intended transmit 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.

7.9.9.1. Test Procedure Used

ANSI C63.17, Clause 8.3.1 & 8.3.2

7.9.9.2. Test Reslut

EUT that do NOT implements the LIC procedure:

Test ref. to ANSI C63.17 clause 8.3.1	Observation	Verdict
b) EUT is restricted to a single carrier *f1* for TDMA systems. The Test is Pass if EUT can transmit	EUT can transmit	Pass
c) d) Interference at level T_L+ U_M on all timeslots except one receive slot where interference is at least 10 dB below TL	No connection possible	N/A
e) f) Interference at level T_L+ U_M on all timeslots except one transmit slot where interference is at least 10 dB below T_L	No connection possible	N/A

EUTs that implements the LIC procedure:

Test ref. to ANSI C63.17 clause 8.3.1	Observation	Verdict
b) EUT is restricted to a single carrier *f1* for TDMA systems. The Test is Pass if EUT can transmit	EUT can transmit	Pass
c) d) Transmission on interference-free receive time/spectrum window	Connected on the target Rx window and its duplex mate.	Pass
e) f) Transmission on interference-free transmit time/spectrum window	Connected on the target Tx window and its duplex mate.	Pass

7.9.10. Alternative monitoring interval for co-located devices Requirements

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.

7.9.10.1. Test Procedure Used

ANSI C63.17, Clause 8.4

7.9.10.2. Test Reslut

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

7.9.11.Frame Repetition Stability and Period and Jitter

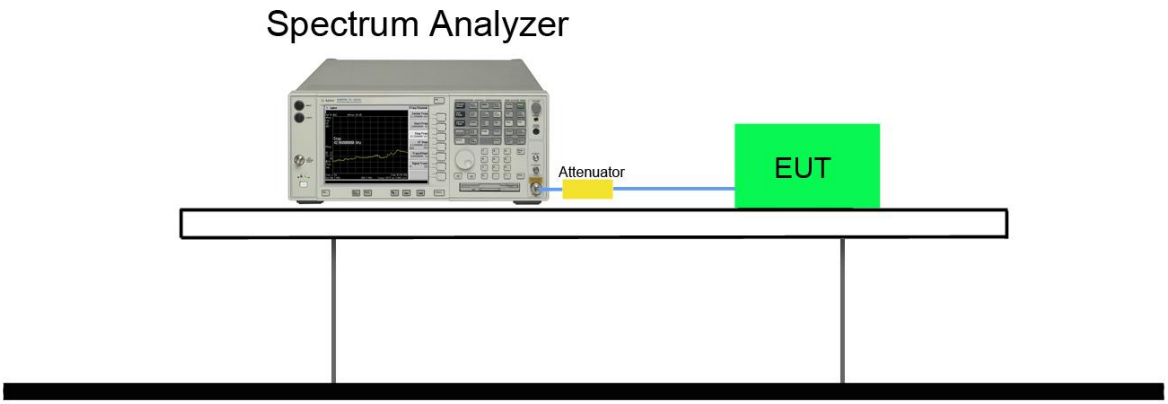
7.9.11.1. Test Limit

The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in this band shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per million (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm. The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

7.9.11.2. Test Procedure Used

ANSI C63.17, Clause 6.2.2 & 6.2.3

7.9.11.3. Test Setup



7.9.12. Test Result

Carrier Frequency (MHz)	Frame Jitter (us)					Limit of △
	min	mean	max	△min	△max	
1924.992	-0.1	0	0.1	-0.1	0.1	±25

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **Wireless Module FCC ID:**

XCO-DECT is in compliance with Part 15C of the FCC Rules & ISED Rules.

The End