TEST REPORT

Client Information:

Applicant:	Hunan GM Innovation Technology Co., Ltd
Applicant add.:	No 46, Jiefang East Road, Furong District,Changsha,China
Manufacturer:	CRYSTAL VIDEO TECHNOLOGY CO.,LTD
Manufacturer add.:	3rd Floor, Bldg. 23, Changxing Technology Park, Shayi Community, Shajing Street, Bao'an District, Shenzhen, China.(R&D Center set on 3rd Floor, Bldg. F12, F518 Idea Land)

Product Information:

Product Name:	VAXIS LITECOMM
Model No.:	L220401,L220403,L220404
Brand Name:	VAXIS
FCC ID:	2AJOF-VAXISLITECOMM
Applicable standards:	FCC CFR Title 47 Part 15 Subpart D

Prepared By:

Dongguan Yaxu (AiT) Technology Limited

No.22, Jinqianling 3rd Street, Jitigang, Huangjiang,Dongguan,
Guangdong, China

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Date of Receipt:	July 12, 2023	Date of Test:	July 12, 2023~September 09, 2023
Date of Issue:	September 10, 2023	Test Result:	Pass

This device described above has been tested by Dongguan Yaxu (AiT) Technology Limited and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Reviewed by: Simba Huang Simba Huang **Approved by:** Seal.chen Seal.chen

1 Contents

Revision History

Revision	Issue Date	Revisions	Revised By
000	September 10, 2023	Initial Issue	Seal Chen

2 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	§ 15.317, § 15.203	Pass
Conducted Emission	§ 15.315, § 15.207	Pass
Emission Bandwidth	§15.323 (a)	Pass
Peak Transmit Power	§ 15.319 (c)	Pass
Power Spectral Density	§ 15.319 (d)	Pass
Emission Inside and Outside the sub-band	§ 15.323 (d)	Pass
Radiated Emission	§ 15.319 (g)	PASS
Frequency Stability Handset	§ 15.323 (f)	Pass
Specific Requirements for UPCS	§ 15.323 (c)(e) § 15.319 (f)	Pass
RF Exposure	§2.1093&§ 15.319 (i)	Note 3

Note

1.Test according to ANSI C63.17-2013.

2.Test results in other test report (SAR Report)

3. Pre-scan with two antennas for conducted peak power, and Antenna 0 for the max power one, which was selected to test conducted items

2.1 Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the AiT quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

2.2 Measurement Uncertainty

Test Item	Measurement Uncertainty
AC Power Lines Conducted Emissions	±1.95dB
RF conducted test with spectrum	±1.5dB
Occupied Bandwidth	±5%
Temperature	±3℃
Humidity	±6%

Supply voltages	±0.4%
All emissions, radiated	±4.56dB
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%	

3 Test Facility

The test facility is recognized, certified or accredited by the following organizations:

.CNAS- Registration No: L6177

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2017 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on April 18, 2022

FCC-Registration No.: 703111 Designation Number: CN1313

Dongguan Yaxu (AiT) technology Limited has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

IC —Registration No.: 6819A CAB identifier: CN0122

The 3m Semi-anechoic chamber of Dongguan Yaxu (AiT) technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 6819A

A2LA-Lab Cert. No.: 6317.01

Dongguan Yaxu (AiT) technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

3.1 Deviation from standard

None

3.2 Abnormalities from standard conditions

None

3.3 Test Location

Dongguan Yaxu (AiT) Technology Limited

Address: No.22, Jinqianling 3rd Street, Jitigang, Huangjiang,Dongguan, Guangdong, China

Tel.: +86-769-8202 0499

Fax.: +86-769-8202 0495

4 General Information

EUT Name:	VAXIS LITECOMM
Test Model:	L220401
Serial Model:	L220403, L220404
Model Declaration	PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Test sample(s) ID:	A071023120-1,A071023120-2
Sample(s) Status:	Engineer sample
Bluetooth	
Operation frequency:	2402MHz-2480MHz
Channel Number:	79 Channels for Bluetooth V5.3(DSS)
Channel separation:	1MHz
Modulation Technology:	GFSK, π/4-DQPSK, 8-DPSK for Bluetooth V5.0(DSS)
Antenna Type:	Internal Antenna
Antenna gain:	0.13dBi
NFC	
Frequency Range	13.56MHz
Modulation Type	ASK
Antenna Description	Internal Antenna, 2.0dBi(Max.)
DECT	
Frequency Range	1921.536~1928.448 MHz
Maximumconducted peak output power	20.34dBm
Modulation Technique	GFSK
Antenna Description	Internal Antenna, 2.0dBi(Max.)
Hardware version.:	V7.0
Software version.:	V1.0.22
Power supply:	Input: DC 5V DC 3.85V by Rechargeable Li-ion Battery, 1800mAh
Note:	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

4.1 Test frequencies

EUT channels and frequencies list:

Channel NO.	Frequency(MHz)
1	**1921.536**
2	1923.264
3	**1924.992**
4	1926.720
5	**1928.448**

4.2 EUT Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	USB Cable	N/A	FCC SDOC	N/A	N/A	N/A	N/A

4.3 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	Power Adapter	SHENZHEN TIANYIN ELECTRONICS CO., LTD	FCC SDOC	TPA-46050200UU	N/A	N/A	N/A

Note: The adapter is supplied by lab and only use tested.

4.4 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.17-2013.

EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

EUT Exercise

The EUT was operated in the normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the section 15.207, 15.315, 15.317, 15.319 and 15.323 under the FCC Rules Part 15 Subpart C

General Test Procedures

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

4.5 Description of Test Modes

The EUT has been tested under operating condition.

AC main conducted emission pre-test at charge from power adapter modes, recorded worst case;

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be TX (1921.536MHz).

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be TX(1921.536MHz).

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

5 Equipment Used during Test

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	R&S	FSV40	101470	2023.09.01	2024.08.31
2	EMI Measuring Receiver	R&S	ESR	101660	2023.09.01	2024.08.31
3	Low Noise Pre Amplifier	HP	HP8447E	1937A01855	2023.09.01	2024.08.31
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2023.09.01	2024.08.31
5	Passive Loop	ETS	6512	00165355	2022.09.04	2024.09.03
6	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2021.08.29	2024.08.28
7	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2021.08.29	2024.08.28
8	SHF-EHF Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170367d	2020.11.24	2023.11.23
9	EMI Test Receiver	R&S	ESCI	100124	2023.09.01	2024.08.31
10	LISN	Kyoritsu	KNW-242	8-837-4	2023.09.01	2024.08.31
11	LISN	R&S	ESH3-Z2	0357.8810.54-101161-S2	2023.09.01	2024.08.31
12	Pro.Temp&Humi.chamber	MENTEK	MHP-150-1C	MAA08112501	2023.09.01	2024.08.31
13	RF Automatic Test system	MW	MW100-RFCB	21033016	2023.09.01	2024.08.31
14	Signal Generator	Agilent	N5182A	MY50143009	2023.09.01	2024.08.31
15	Wideband Radio communication tester	R&S	CMW500	1201.0002K50	2023.09.01	2024.08.31
16	RF Automatic Test system	MW	MW100-RFCB	21033016	2023.09.01	2024.08.31
17	Digital Radio Communication Tester	R&S	CMD60	N/A	2023.09.01	2024.08.31
18	DC power supply	ZHAOXIN	RXN-305D-2	28070002559	N/A	N/A
19	RE Software	EZ	EZ-EMC_RE	Ver.AIT-03A	N/A	N/A
20	CE Software	EZ	EZ-EMC_CE	Ver.AIT-03A	N/A	N/A
21	RF Software	MW	MTS 8310	2.0.0.0	N/A	N/A

21	temporary antenna connector(Note)	NTS	R001	N/A	N/A	N/A
Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.						

6 Test results and Measurement Data

6.1 Antenna requirement

6.1.1 Standard requirement:

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.

6.1.2 EUT Antenna:

The EUT has a internal antenna arrangements which were permanently attached and the gain is 2.0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

6.2 Emission Bandwidth

6.2.1 Standard requirement:

Operation shall be contained within the 1920–1930 MHz band. The emission bandwidth shall be less then 2.5 MHz and greater than 50 kHz.

6.2.2 Measuring Instruments:

Please refer to equipment's list in this report.

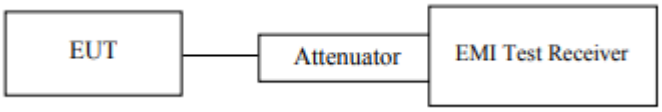
6.2.3 Test Procedures:

The width, in Hz, of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that is 26 dB down relative to the maximum level of the modulated carrier. It is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1% of the emission band-width of the device under measurement. [Extraction from 47 CFR 15, subpart D, 15.303 (C)].

Using the manufacturer's information on occupied bandwidth set the spectrum analyzer as follows:

Resolution bandwidth	1.0% of the emission bandwidth (as close as possible)
Video bandwidth	>3 times the resolution bandwidth
Number of sweeps	sufficient to stability the trace
Detection mode	peak detection with maximum hold

6.2.4 Test Setup Layout

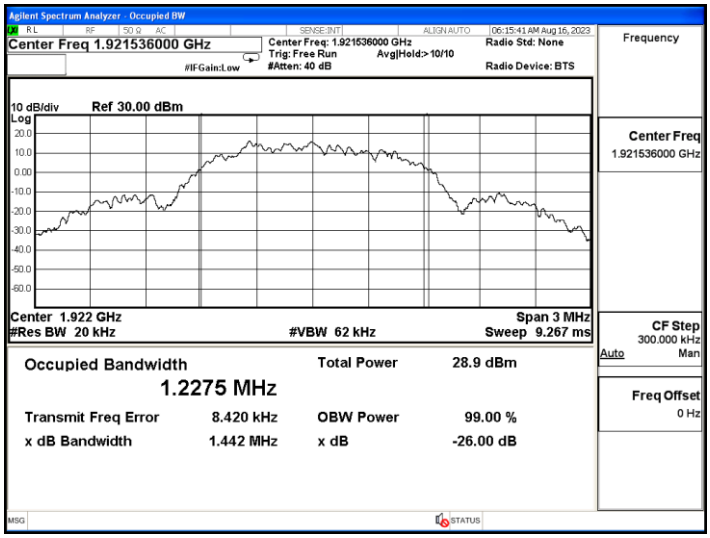


6.2.5 Test result

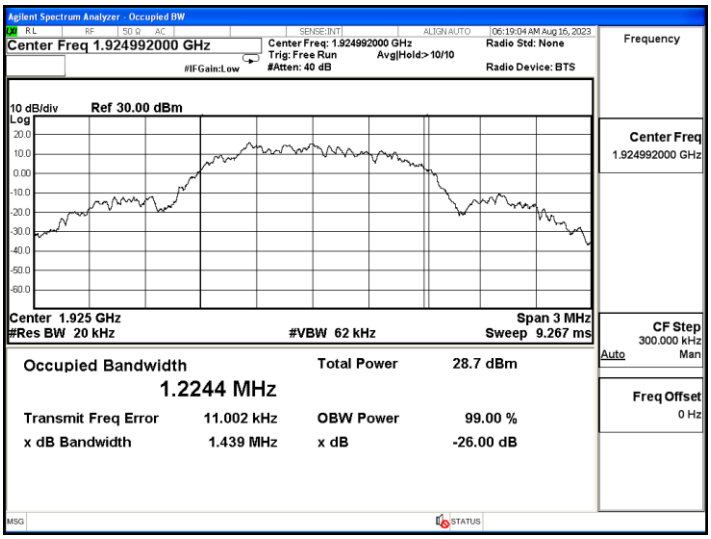
TestMode	Channel （MHz）	-26dB Bandwidth[MHz]	Limit[MHz]	Verdict
DECT	1921.536	1.442	50kHz< OBW < 2.5MHz	PASS
	1924.992	1.439	50kHz< OBW < 2.5MHz	PASS
	1928.448	1.443	50kHz< OBW < 2.5MHz	PASS

Test Graphs

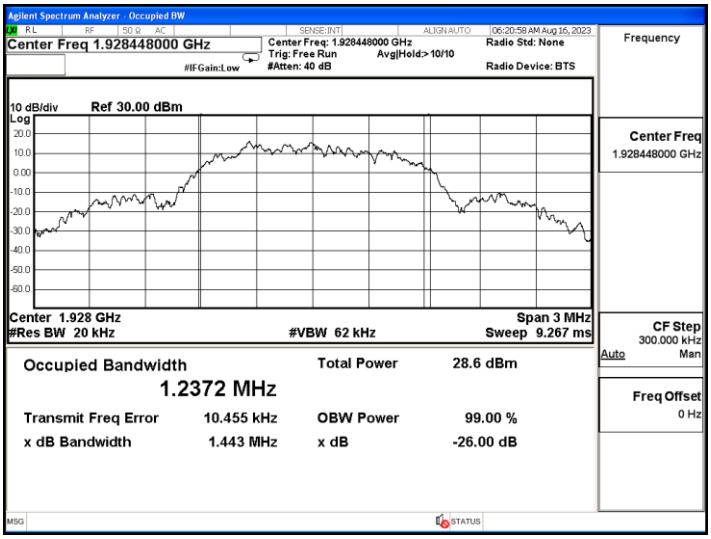
DECT_1921.536MHz



DECT_ 1924.992MHz



DECT_ 1928.448MHz



Remark:

1. *Test results including cable loss;*

6.3 Peak Transmit Power

6.3.1 Standard requirement:

The peak power output as measured over an interval of time equal to the frame rate or transmission burst of the device under all conditions of modulation. Usually this parameter is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used[47 CFR 15, subpart D, 15.303].

The peak transmit power is according to ANSI C63.17-2013 §6.1.2

Per FCC Part15.319 (c) Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

Per FCC Part15.319 (e), the peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

Calculation of Peak Transmit Power Limit: Peak Transmit Power Limit = 100μW×(EBW)1/2 EBW is the transmit emission bandwidth in Hz determined in the other test item:

6.3.2 Measuring Instruments:

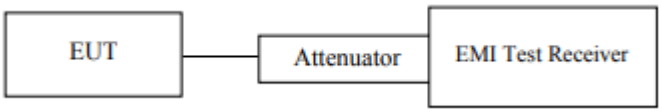
Please refer to equipment's list in this report.

6.3.3 Test Procedures

Using the manufacturer's information on occupied bandwidth set the spectrum analyzer as follows:

RBW	≥ Emission bandwidth
Video bandwidth	≥ RBW
Span	Zero
Center frequency	Nominal center frequency of channels
Amplitude scale	Log (linear may be used if analyzer has sufficient linear dynamic range and accuracy)
Detection	Peak detection
Trigger	Video
Sweep rate	Sufficiently rapid to permit the transmit pulse to be resolved accurately

6.3.4 Test Setup Layout



6.3.5 Test result

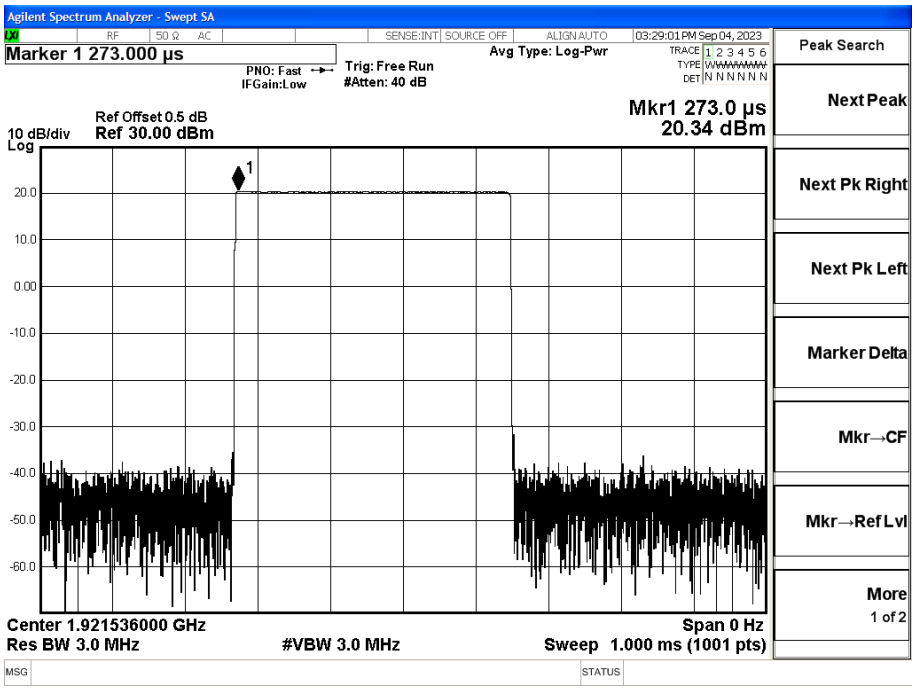
TestMode	Channel （MHz）	Peak Transmit Power (dBm)	Limit (dBm)	Verdict
DECT	1921.536	20.34	20.79	PASS
	1924.992	20.32	20.79	PASS
	1928.448	20.06	20.79	PASS
FCC: EBW Low channel = 1442000Hz, EBW Middle channel = 1439000 Hz, EBW High channel= 1443000 Hz;Peak Transmit Power Limit = 100(EBW)1/2 μW				

Note:

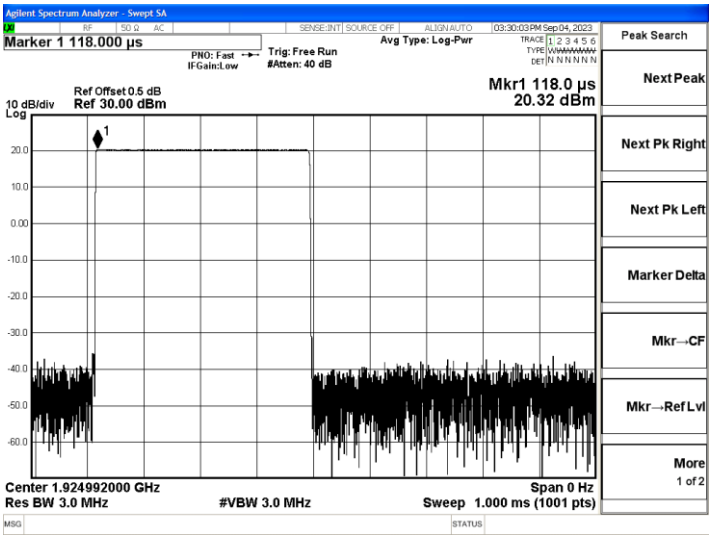
1. Permanent antenna was replaced with temporary antenna connector to enable conducted measurement.
2. Antenna gain < 3dBi and so correction of the limit is not required.
3. Test results including cable loss.

Test Graphs

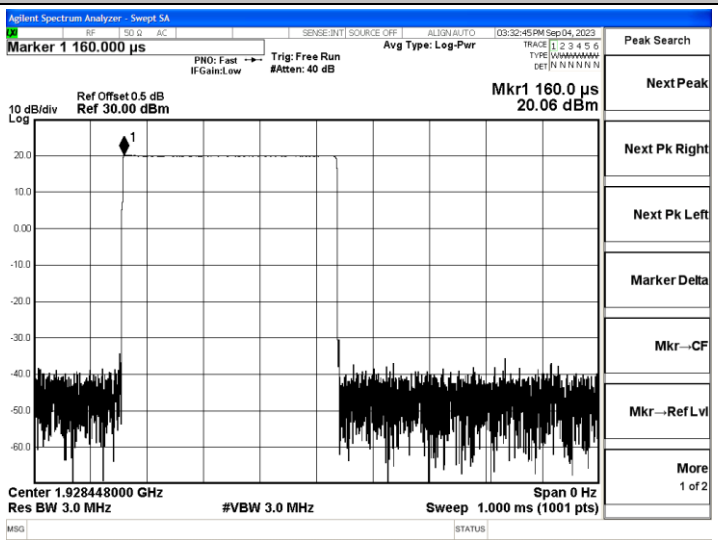
DECT_1921.536MHz



DECT_ 1924.992MHz



DECT_ 1928.448MHz



6.4 Power Spectral Density

6.4.1 Standard requirement:

The average pulse energy in a 3 kHz bandwidth is divided by the pulse duration. The power spectral density shall not exceed 3mW in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz. The power spectral density is measured in accordance with ANSI C63.17-2013 Clause 6.1.5. The peak-hold power spectral density of transmitters shall not exceed 12 mW per any 3 kHz bandwidth. As an alternative to the peak-hold power spectral density, the time-averaged power spectral density may be measured and it shall not exceed 3 mW per any 3 kHz bandwidth.

6.4.2 Measuring Instruments and Setting:

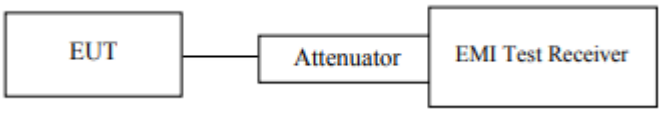
Please refer to equipment's list in this report.

6.4.3 Test Procedures

Using the manufacturer's information on occupied bandwidth set the spectrum analyzer as follows:

RBW	3 kHz
Video bandwidth	≥ 3 × RBW
Span	Zero span at frequency with the maximum level (frequency determined in 6.1.3 if the same type of signal (continuous versus burst) was used in 6.1.3)
Center frequency	Spectral peak as determined in 6.1.3
Sweep time	For burst signals, sufficient to include essentially all of the maximum length burst at the output of a 3 kHz filter (e.g., maximum input burst duration plus 600 µs). For continuous signals, 20 ms.
Amplitude scale	Log power
Detection	Sample detection and averaged for a minimum of 100 sweeps
Trigger	External or internal

6.4.4 Test Setup Layout



6.4.5 Test result

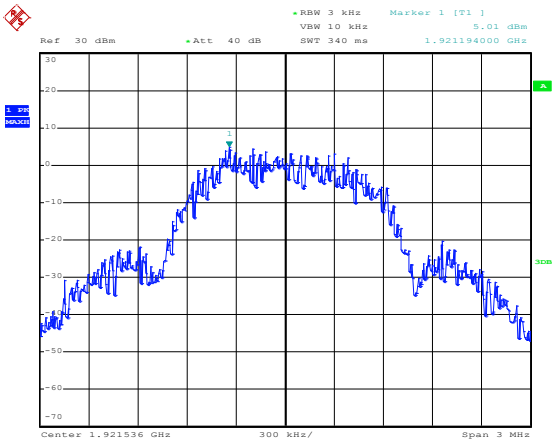
TestMode	Channel (MHz)	Power Spectral Density (mW/3kHz)	Limit (mW/3kHz)	Verdict
DECT	1921.536	-3.66	3	PASS
	1924.992	-2.58	3	PASS
	1928.448	-2.40	3	PASS

Note:

1. Permanent antenna was replaced with temporary antenna connector to enable conducted measurement.
2. Antenna gain < 3dBi and so correction of the limit is not required.
3. Test results including cable loss.

Test Graphs

DECT_1921.536MHz



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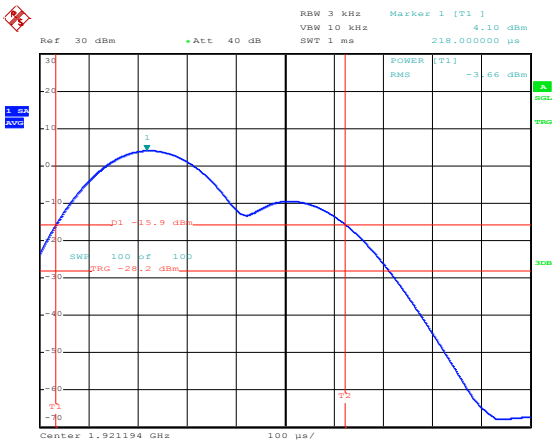

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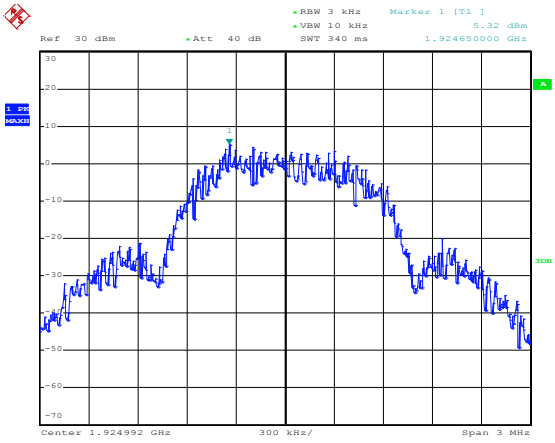
DECT_ 1924.992MHz



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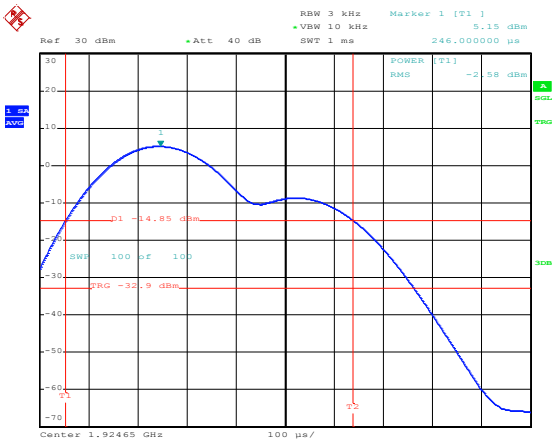

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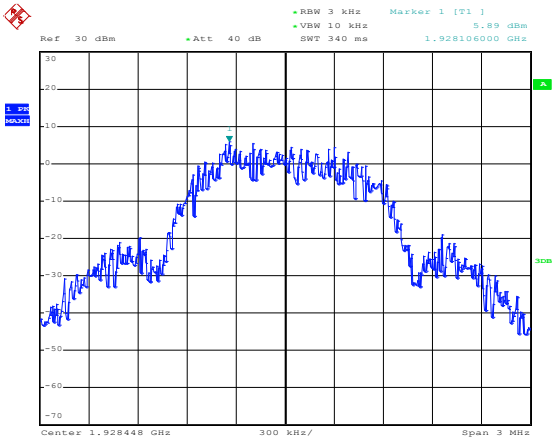
DECT_ 1928.448MHz



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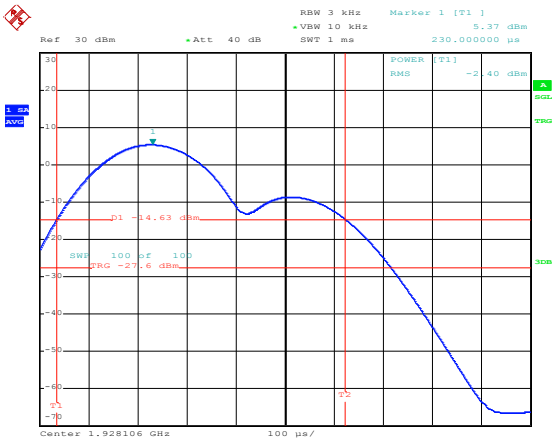

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6.5 Emission Inside And Outside The Sub-Band

6.5.1 Standard requirement:

Emissions inside the sub-band must comply with the following emission mask:

1. In the bands between 1B and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device;

2. in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator;

3. in the bands between 3B and the sub-band edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator.

Where B = emission bandwidth Emission Outside the sub-band shall be attenuated below a reference power of 112 mw (20.5 dBm) as follows:

1. 30 dB between the sub-band and 1.25 MHz above or below the sub-band;

2. 50 dB between 1.25 and 2.5 MHz above or below the sub-band;

3. 60 dB at 2.5 MHz or greater above or below the sub-band.

6.5.2 Measuring Instruments and Setting:

Please refer to equipment's list in this report. The following table is the setting of Spectrum Analyzer.

6.5.3 Test Procedures

According to ANSI C63.17.2013 Clause 6.1.6

In-band emission:

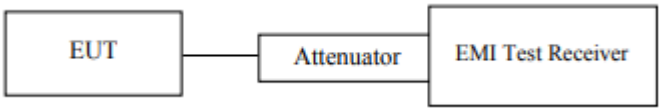
Spectrum analyzer settings for measuring in-band emission

RBW	Approximately 1% of the emission bandwidth (*B*)
Video bandwidth	3 × RBW
Sweep time	The sweep time shall be sufficiently slow that the swept frequency rate shall not exceed one RBW per three transmit bursts.
Number of sweeps	Sufficient to stabilize the trace
Amplitude scale	Log
Detection	Peak detection and max hold enabled
Span	Approximately equal to 3.5 *B*

Out-band emission:

RBW	30kHz
Video bandwidth	100kHz
Center frequency	Nominal center frequency of channels
Amplitude scale	Log (linear may be used if analyzer has sufficient linear dynamic range and accuracy)
Detection	Peak detection

6.5.4 Test Setup Layout

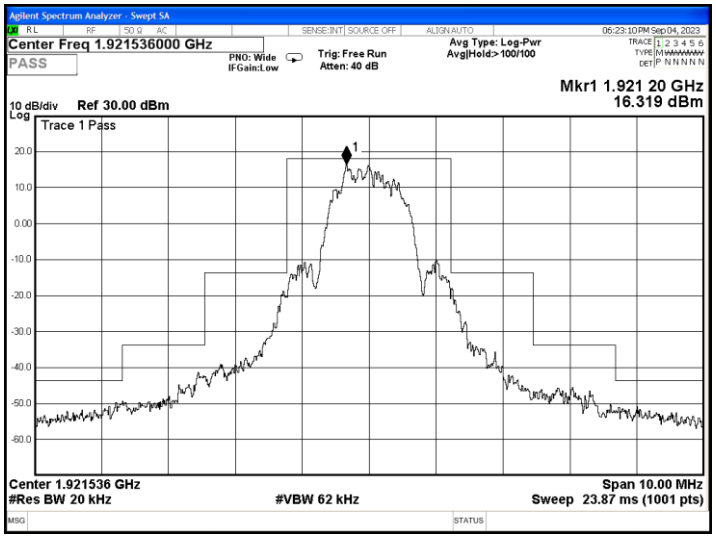


6.5.5 Test result

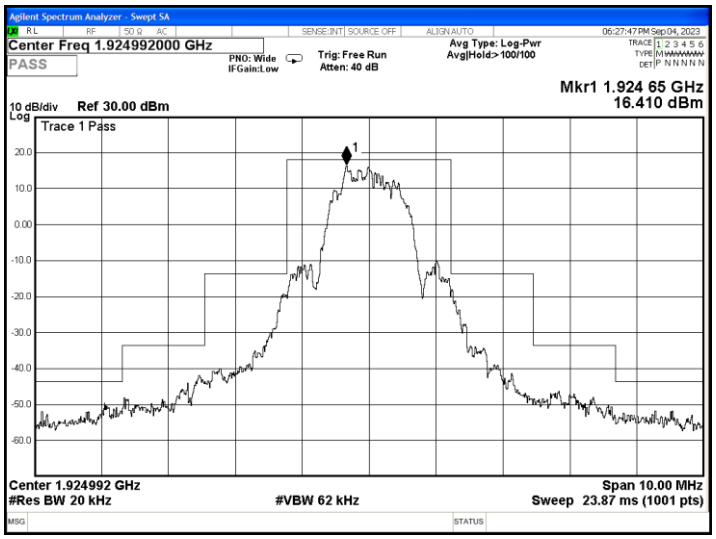
Unwanted Emission inside the Sub-band

Test Graphs

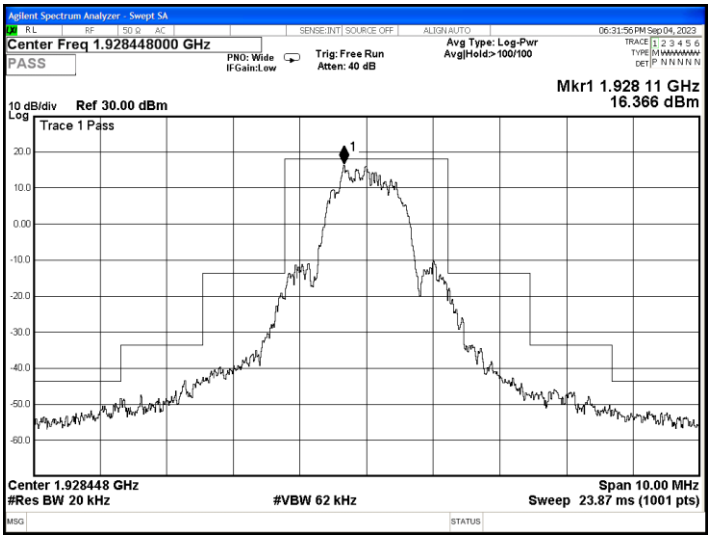
DECT_1921.536MHz



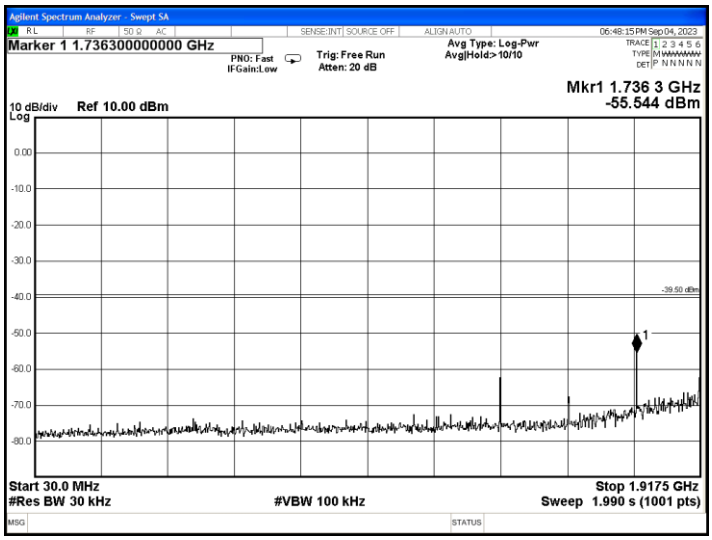
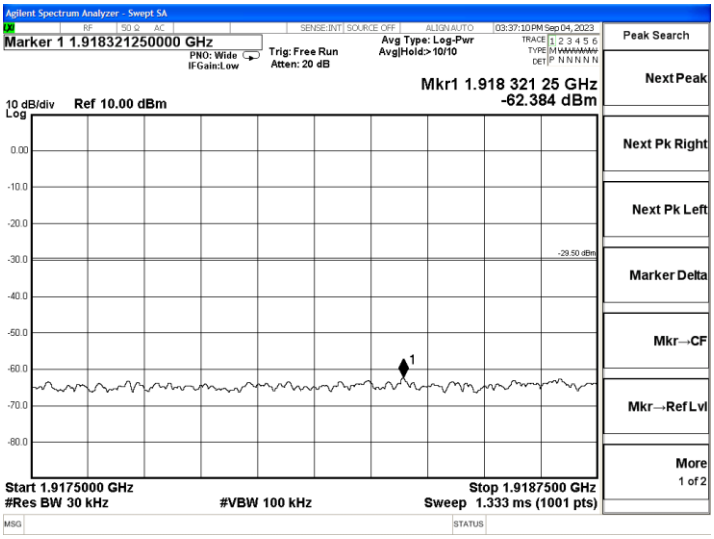
DECT_ 1924.992MHz

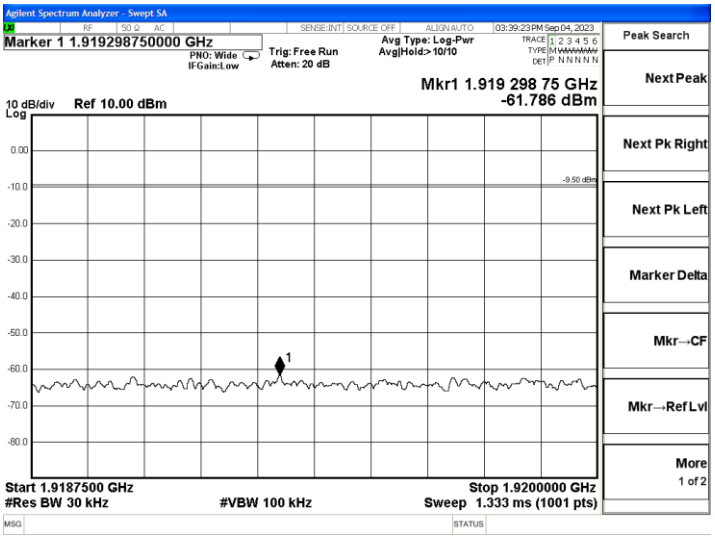


DECT_ 1928.448MHz



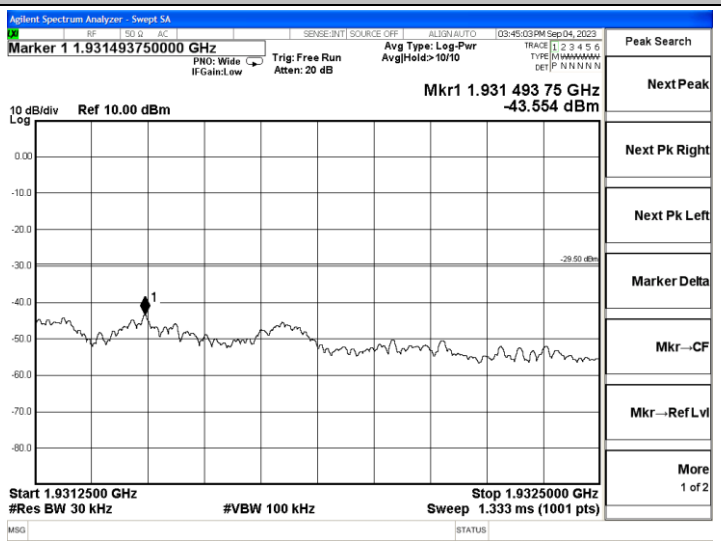
Unwanted Emission outside the Sub-band

DECT_1921.536MHz(30MHz~1917.5MHz)

DECT_1921.536MHz(1917.5MHz~1918.75MHz)

DECT_1921.536MHz(1918.75MHz~1920MHz)

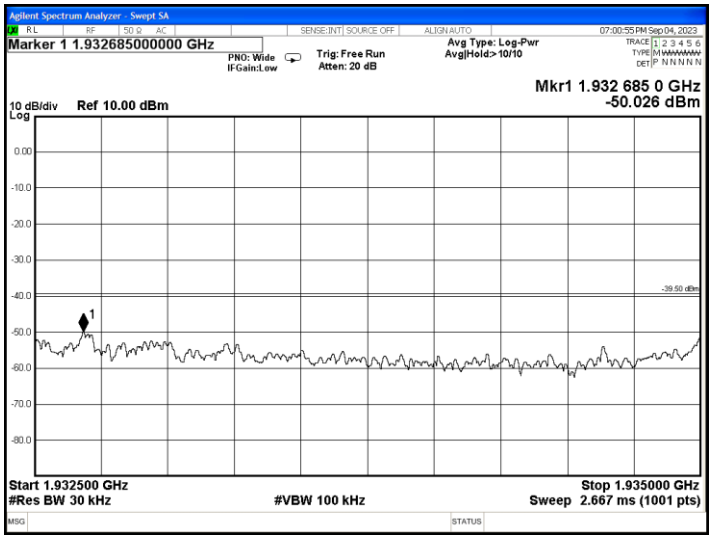


DECT_1921.536MHz(1930MHz~1931.25MHz)

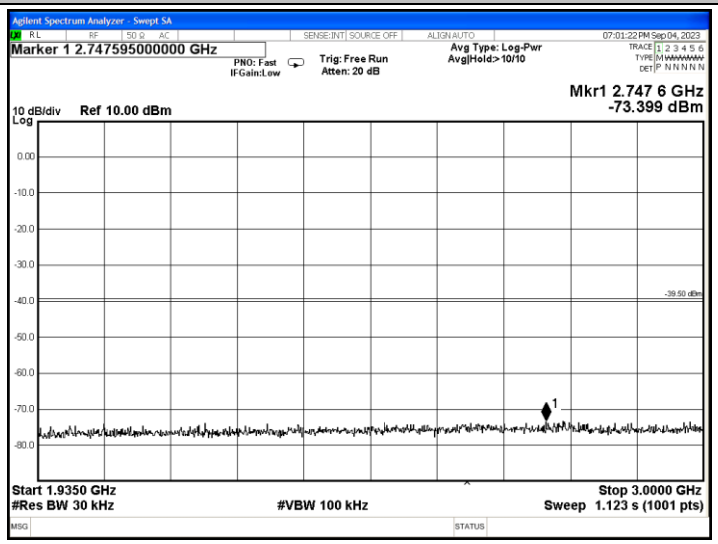
DECT_1921.536MHz(1931.25MHz~1932.5MHz)



DECT_1921.536MHz(1932.5MHz~1935Hz)

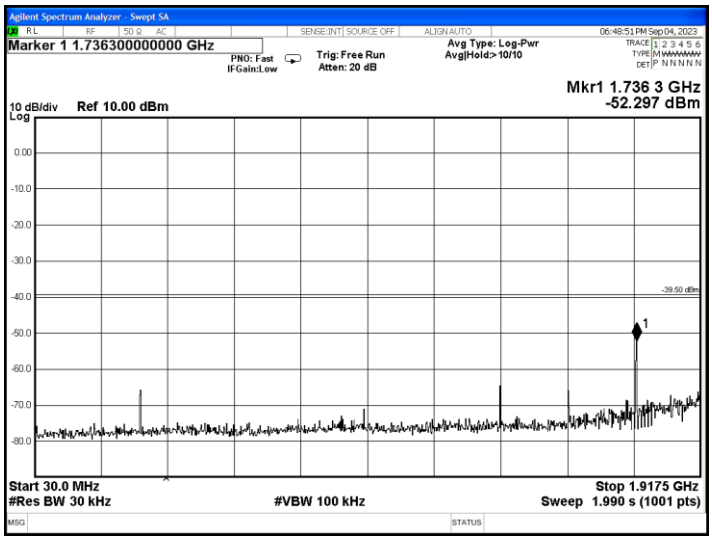


DECT_1921.536MHz(1935Hz~3GHz)

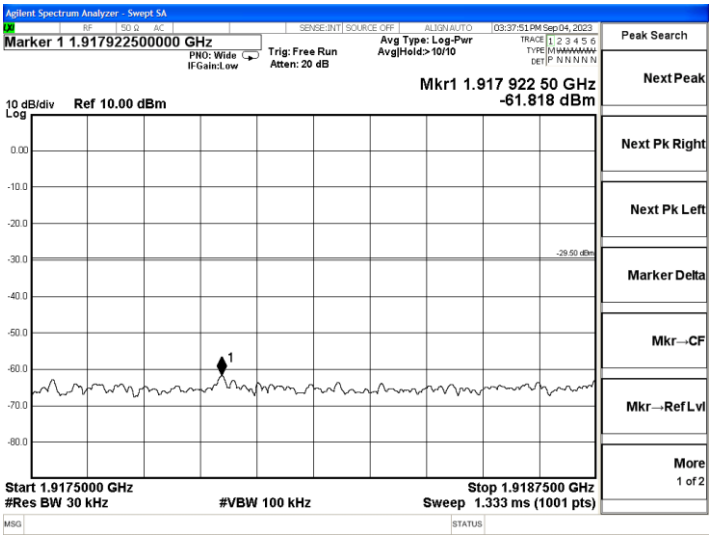


DECT_1921.536MHz(3GHz~20GHz)

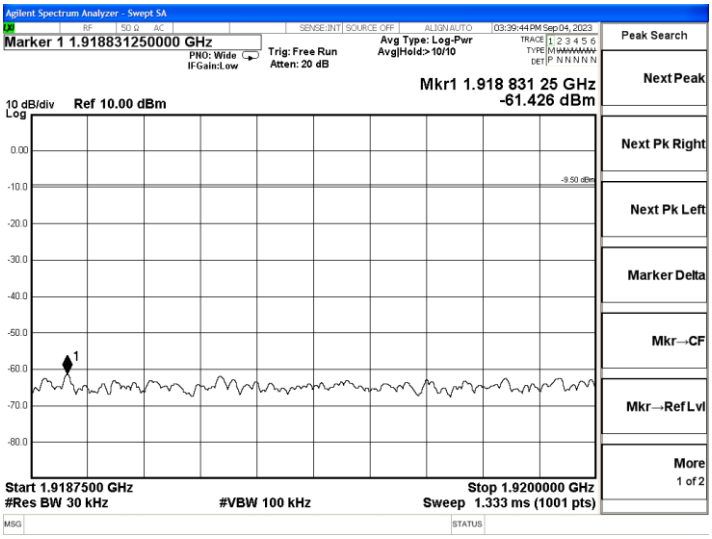
DECT_1924.992MHz(30MHz~1917.5MHz)



DECT_1924.992MHz(1917.5MHz~1918.75MHz)

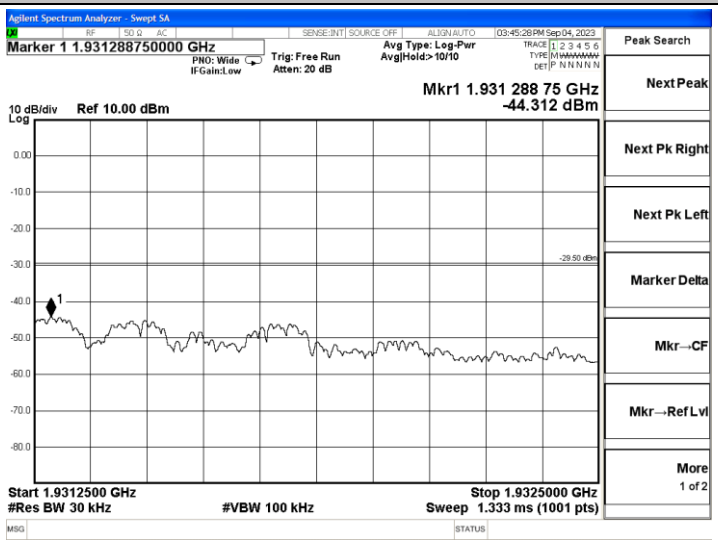


DECT_1924.992MHz(1918.75MHz~1920MHz)

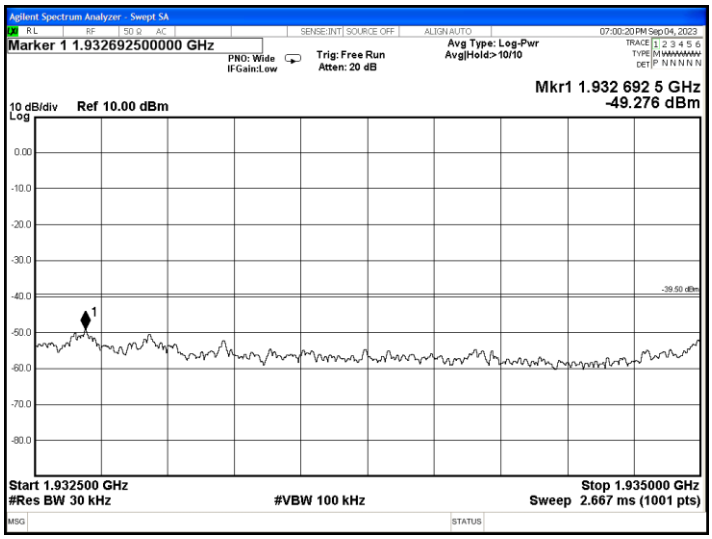


DECT_1924.992MHz(1930MHz~1931.25MHz)

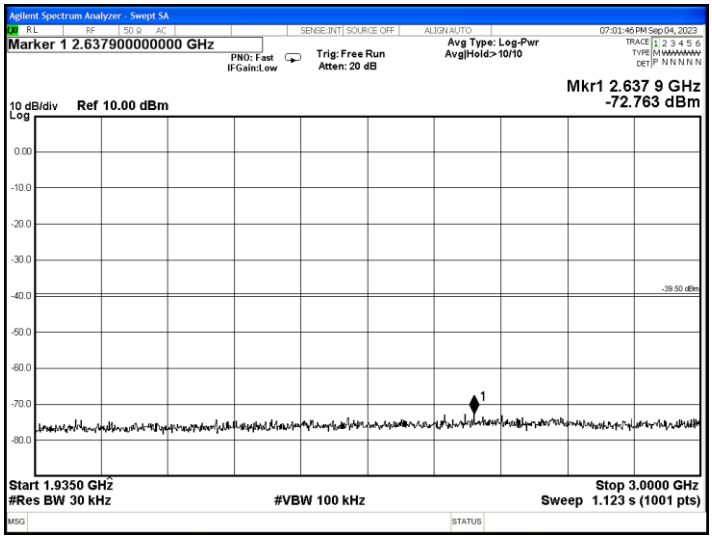
DECT_1924.992MHz(1931.25MHz~1932.5MHz)



DECT_1924.992MHz(1932.5MHz~1935Hz)

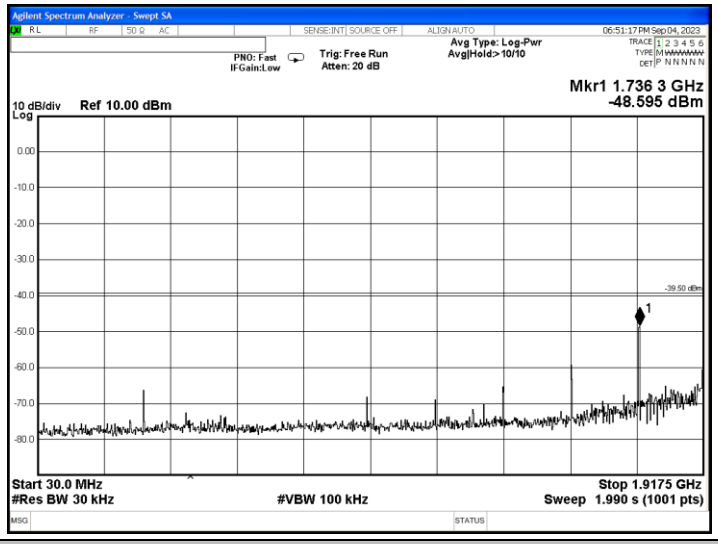


DECT_1924.992MHz(1935Hz~3GHz)

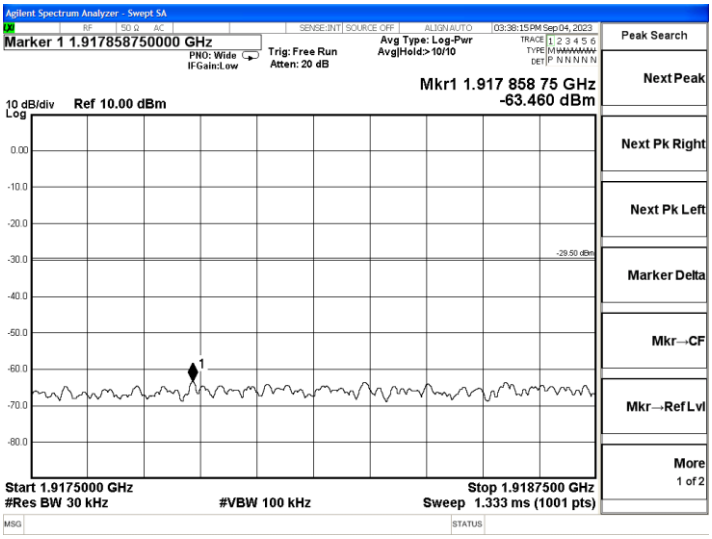


DECT_1924.992MHz(3GHz~20GHz)

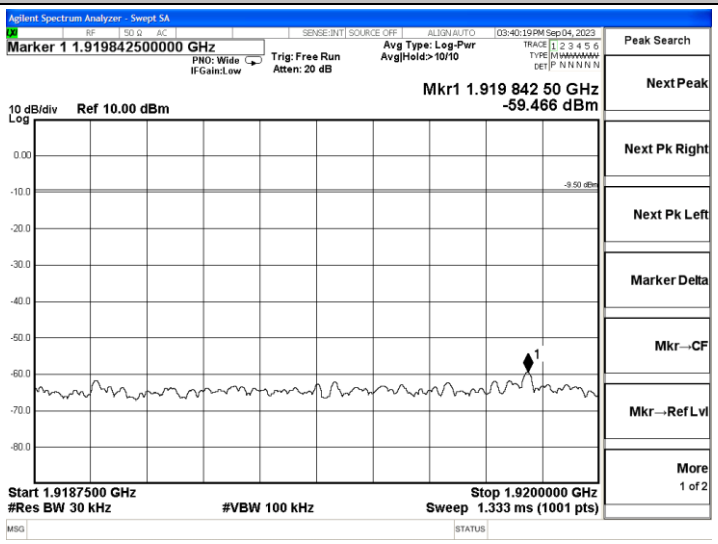
DECT_1928.448MHz(30MHz~1917.5MHz)



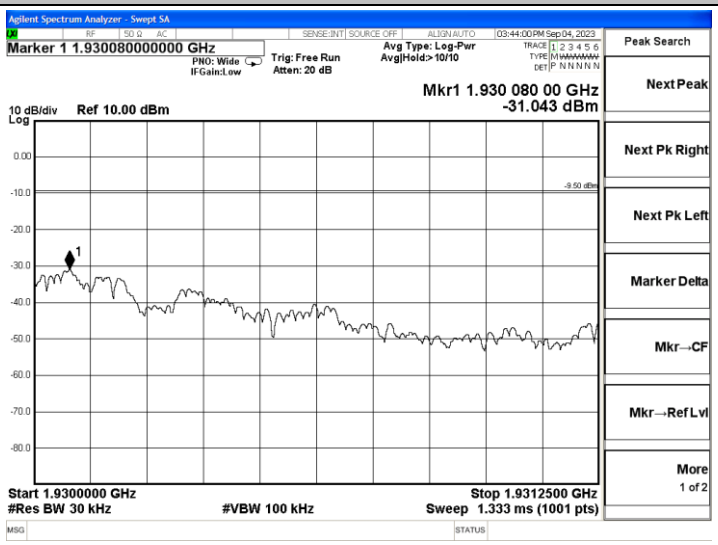
DECT_1928.448MHz(1917.5MHz~1918.75MHz)



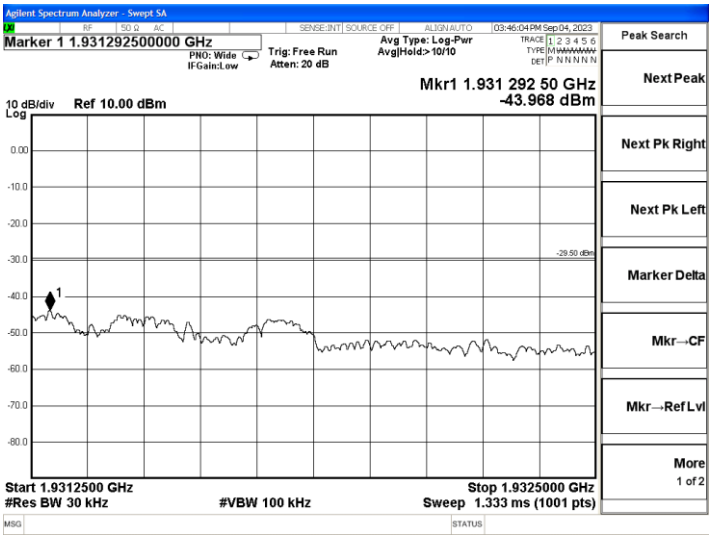
DECT_1928.448MHz(1918.75MHz~1920MHz)



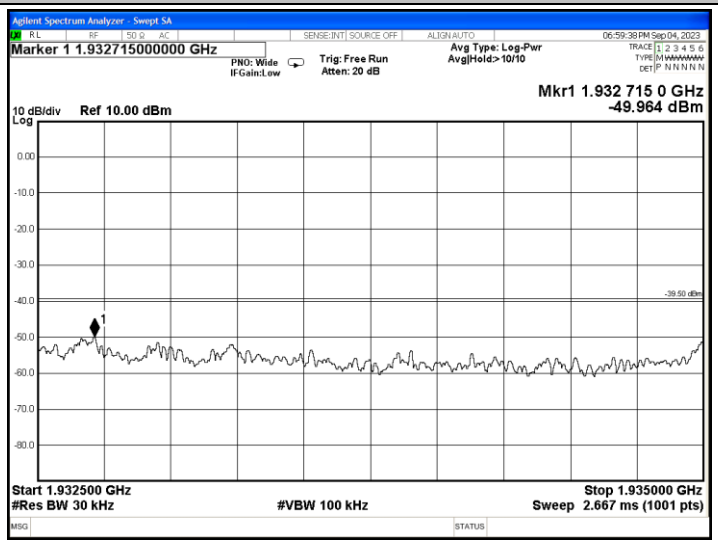
DECT_1928.448MHz(1930MHz~1931.25MHz)



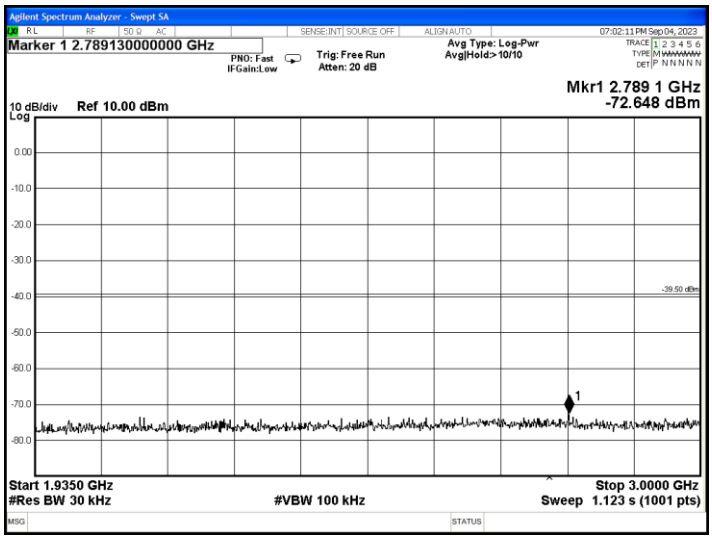
DECT_1928.448MHz(1931.25MHz~1932.5MHz)



DECT_1928.448MHz(1932.5MHz~1935Hz)



DECT_1928.448MHz(1935Hz~3GHz)



DECT_1928.448MHz(3GHz~20GHz)


Agilent Spectrum Analyzer - Swept SA
Marker 1 5.210000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 3/3
07:03:50 PM Sep 04, 2023
Mkr1 5.210 GHz
-65.892 dBm
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-39.50 dBm
Start 3.000 GHz
#Res BW 30 kHz
#VBW 100 kHz
Stop 20.000 GHz
Sweep 17.92 s (1001 pts)

6.6 Frequency Stability

6.6.1 Standard requirement:

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℃ to +50℃ 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 ℃. 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

6.6.2 Measuring Instruments and Setting:

Please refer to equipment list in this report.

6.6.3 Test Procedures

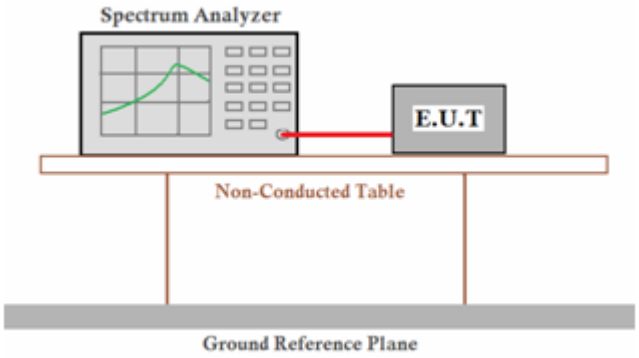
This procedure should be carried out for each of the following test cases:

Temperature	Supply Voltage
20℃	85-115% or new batteries
-20℃	Normal
+50℃	Normal

Note:Use the lowest temperature at which the EUT is specified to operate if it is above -20℃.

During test, the equipment shall be placed in the boxes and set the temperature to the specified requirement until the thermal balance has been reached. Using the mean carrier frequency at 20℃ and at nominal supply voltage as the reference, the mean carrier frequency shall be maintained within ±10 ppm at the two extreme temperatures (or as declared by the manufacturer) and at normal temperature (typically 20℃) at the two extreme supply voltages(Note:This test does not apply because the product only of operating from a battery.)

6.6.4 Test Setup Layout



6.6.5 Test result

Temperature (℃)	Voltage (VDc)	Channel Frequency (MHz)	Measured Frequency Offset (kHz)	Measured Frequency Offset (ppm)	Limit (ppm)
-20	3.85	1924.992	3.9	2.03	±10
20	3.85	1924.992	3.7	1.92	±10
50	3.85	1924.992	3.6	1.87	±10

6.7 Specific Requirements For UPCS Device

6.7.1 Standard requirement:

FCC§15.323(c)(e) & §15.319(f) Specific Requirements for UPCS device.

ANSI C63.17 2013 §6.2 Frequency and time stability and §7.Monitoring tests and §8.Time and spectrum window access procedure.

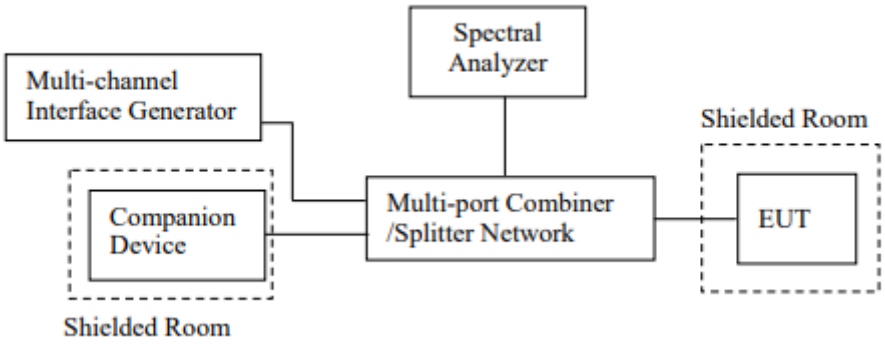
6.7.2 Measuring Instruments:

Please refer to equipment list in this report.

6.7.3 Test Procedures

Measurement method according to ANSI C63.17- 2013

6.7.4 Test Setup Layout



6.7.5 Test result

1) Automatic Discontinuation of Transmission

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 result:

The following tests were performed after a connection had been established with Base

Test condition	Reaction of EUT	Pass/Fail
Adapter removed from Base	Connection break down	Pass
Battery remove from EUT	Connection break down	Pass

2) Monitoring Time

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

Test procedure:

Measurement method is in according to ANSI C63.17 -2013 clause 7.3.3.

RF signal generators apply uniform CW interference on all system carriers except two carriers (designated f1 and f2), each at level TL + UM. EUT can only transmit on these two carriers.

Test result:

This requirement is covered by the results of Least Interfered Channel (LIC).

Interference (Refer to ANSI C63.17 clause 7.3.3)	Reaction of EUT	Results
a) Apply the interference on f1 at level TL+UM+20dB and no interference on f2. Initiate transmission and verify the transmission only on f2. Then terminate it.	EUT transmits on f2	Pass
b) Apply the interference on f2 at level TL+UM+20dB and immediately remove all interference from f1. The EUT should immediately attempt transmission on f1 (but at least 20 ms after the interference on f2 is applied), verify the transmission only on f1	EUT transmission f1	Pass

3) Lower Monitoring Threshold

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

Test procedure:

Measurement method according to ANSI C63.17 -2013 clause 7.3.1

Test result:

Not applicable because the EUT has more 40 defined duplex system access channels and meet the provision of the Least Interfered Channel (LIC).

4) Maximum Transmit Period

If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices **c**ontinuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

Test procedure:

The test procedure is as follows:
a) Activate the EUT and initiate a communication channel with the companion device, and start a timer or frame counter.
b) The centre frequency of spectrum analyzer was set to the carrier frequency and SPAN was set to ZERO. The spectrum analyzer was used to monitor the time and spectrum window of the communication channel.
c) Stop the timer at the end of the EUT transmission on the current time and frequency window (measure the time until the EUT changes to a different slot).

Test result:

Repetition of Access Criteria	Measured Maximum Transmission Time (Second)	Limit (Second)	Results
First	17750	28,800	Pass
Second	17750	28,800	Pass

5) System Acknowledgement

Once access to specific combined time and spectrum windows is obtained an acknowledgment from a system participant must be received by the initiating transmitter within one second or transmission must cease.

Periodic acknowledgments 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 acknowledgment, at which time the access criteria must be repeated.

Test procedure:

Measurement method according to ANSI C63.17 2013 clause 8.1, 8.2, 8.2.1
During testing initial transmission without acknowledgement, the signal from the EUT to the companion device is blocked by the circulator.
The test of the 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.

Test result:

Test	Time taken (second)	Limit (second)	Result
Initial Connection acknowledgement	0.32	1	Pass
0.35 1 Pass.Change of access criteria for control information	N/A	30	N/A
Transmission cease time after loss of acknowledgement	5.20	30	Pass

Note: N/A=Not Applicable

6) Least Interfered Channel (LIC)

If access to spectrum is not available as determined by the above, and a minimum of 20 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level may be accessed.
A device utilizing the provisions of this paragraph (5) must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 millisecond frame period) immediately preceding actual channel access, that the detected power of the selected time and spectrum windows is no higher than the previously detected value.
The power measurement resolution bandwidth for this comparison must be accurate to within 6 dB. No device or group of cooperating devices located within 1 metre of each other shall during any frame period occupy more than 6 MHz of aggregate bandwidth, or alternatively, more than one third of the time and spectrum windows defined by the system.

Calculation of monitoring threshold limits for isochroous devices:

Lower threshold: TL = -174+10Log10B + ML + P MAX-PEUT (dBm) Where: B=Emission bandwidth (Hz) ML = dB the threshold may exceed thermal noise (30 for TL) P MAX = 5Log10B-10(dBm) PEUT = Transmitted power (dBm)

Calculated thresholds:

Monitor Threshold	B(MHz)	ML(dB)	PMAX (dBm)	PEUT (dBm)	Threshold (dBm)
Lower threshold	1.462	30	20.82	20.22	-81.75

Note: 1. The upper threshold is applicable as the EUT utilizes more than 20 duplex system channels

Test procedure:
Measurement method according to ANSI C63.17 clause 7.3.2, 7.3.3

C63.17 clause 7.3.2, LIC procedure test:
a) Allow EUT transmission on only two carrier frequencies, which will be designated f1 and f2.
b) Apply interference to the EUT on f1 at a level of TL + UM + 7 dB and on f2 at a level of TL + UM. Initiate transmission. The EUT should transmit on f2. Terminate the connection. Repeat five times. If the EUT transmits once on f1, the test failed.
c) Apply interference to the EUT on f1 at a level of TL + UM and on f2 at a level of TL + UM + 7 dB. Initiate transmission. The EUT should transmit on f1. Terminate the connection. Repeat five times. If the EUT transmits once on f2, the test failed.
d) Apply interference to the EUT on f1 at a level of TL + UM + 1 dB and on f2 at a level of TL + UM − 6 dB. Initiate transmission. If the EUT transmits on f2, terminate the connection. Repeat five times. If the EUT transmits once on f1, the test failed.
e) Apply interference to the EUT on f1 at a level of TL + UM − 6 dB and on f2 at a level of TL + UM + 1 dB. Initiate transmission. If the EUT transmits on f1, terminate the connection. Repeat five times. If

the EUT transmits once on f2, the test failed.

C63.17 clause 7.3.3, Selected channel confirmation:

a) Allow EUT transmission on only two carrier frequencies, which will be designated f1 and f2. This limitation to carriers f1 and f2 is performed preferably by administration commands for the EUT, or alternatively by applying by a multicarrier interference generator uniform interference on all system carriers except f1 and f2, at a level of TL + UM + 20 dB in-band per carrier. Set the interference level to the EUT on f1 to a level of TL + UM + 20dB, and let there be no interference applied on f2.
b) Initiate transmission and verify that the EUT transmits on f2. If a connection was made, terminate it.
c) Apply interference on f2 at a level of TL + UM + 20 dB 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. The EUT should now transmit on f1, if it transmits.
d) If the EUT transmits on f2, it fails.

Test result:

1) LIC procedure test:

Interference (Refer to ANSI C63.17 clause 7.3.3)	**Reaction of EUT**	**Results**
a) Apply the interference on f1 at level TL+UM+7dB and the interference on f2 at level TL+UM. Initiate transmission and verify the transmission only on f2. Repeat 5 times.	EUT transmits on f2	Pass
b) Apply the interference on f1 at level TL+UM and the interference on f2 at level TL+UM+7dB. Initiate transmission and verify the transmission only on f1. Repeat 5 times	EUT transmits on f1	Pass
c) Apply the interference on f1 at level TL+UM+1dB the interference on f2 at level TL+UM-6dB. Initiate transmission and verify the transmission only on f2. Repeat 5 times.	EUT transmits on f2	Pass
d) Apply the interference on f1 at level TL+UM-6dB and the interference on f2 at level TL+UM+1dB. Initiate transmission and verify the transmission only on f1. Repeat 5 times.	EUT transmits on f1	Pass

2) Selected channel confirmation:

Interference (Refer to ANSI C63.17 clause 7.3.4)	**Reaction of EUT**	**Results**
a) Apply the interference on f1 at level TU+UM and no interference on f2. Initiate transmission and	EUT transmits on f2	Pass

verify the transmission only on f2. Then terminate it.		
b) Apply the interference on f2 at level TL+UM and immediately remove all interference from f1. The EUT should immediately attempt transmission on f1 (but at least 20 ms after the interference on f2 is applied), verify the transmission only on f1	EUT transmission f1	Pass

7) Random waiting

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.

Test procedure:

This test is for EUTs that transmit control and signaling channels and that use the provisions of FCC § 15.323(c)(6), thus to verify that the EUT (if in deferral) waits for a channel to go clear, then implements a 10 ms to 150 ms hold off prior to using the channel. FCC §15.323(c)(6) is not restrictive for EUTs that use the LIC and offer 20 or more duplex communications channels, as a combined time and spectrum window cannot become unavailable as there is no threshold limit. Test method according to ANSI C63.17 2013 clause 8.1.2 or 8.1.3

a) Restrict operation of the EUT to a single carrier designated f1. For TDMA system, further restrict EUT transmission to a single timeslot of the usable timeslots available in the TDMA frame structure and synchronize the interference so as to occur centered within the timeslot.

b) Activate the EUT with no interference present. The EUT must transmit on f1. Then apply CW interference on f1. The interference level shall be at TL + UM as appropriate for EUTs that do or do not meet the requirements for using the upper threshold. The EUT must stop transmitting within 30 s.

c) Cancel the interference. Measure the time interval between the end of the interference transmission and the beginning of transmission by the EUT.

d) Repeat step b) and step c) 100 times. If the measured time intervals vary uniformly between 10 ms and 150 ms, the EUT passes the test.

Note: This is Not Applicable

8) Monitoring Bandwidth and Reaction Time

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.
Note: Testing of the monitoring system bandwidth is not required if the designed bandwidth from the manufacturer is available and given in the test report.
The maximum reaction time of the monitor shall be less than 50 √ (1.25/occupied bandwidth in MHz) μs for signals at the applicable threshold level but shall not be required to be less than 50 μs.
If a signal of 6 dB or more above the threshold level is detected, the maximum reaction time shall be 35 √ (1.25/occupied bandwidth in MHz) μs but shall not be required to be less than 35 μs.

Test procedure:

Measurement method according to ANSI C63.17 2013 clause 7.4 & 7.5

a) Restrict the EUT to a single transmit carrier frequency f1, and verify that the EUT can establish a connection with no interference applied on f1.

b) Apply time-synchronized, pulsed interference on f1 at the pulsed level TL + UM, verify that the EUT does not establish a connection when the width of the interference pulse exceeds the largest of 50 μs and $50\sqrt{1.25/B}$ μs, where B is the emission bandwidth of the EUT in megahertz.

c) With the channel interference level 6 dB above TL + UM, verify that the EUT does not establish a connection when the width of the interference pulse exceeds the largest of 35 μs and $35\sqrt{1.25/B}$ μs, where B is the emission bandwidth of the EUT in megahertz.

Test Pulse width Equation (μs)	B(bandwidth) (MHz)	Pulse width (μs)	Limit (largest) (μs)
$50\ (1.25/B)^{1/2}$	1.452	45.63	50
$50\ (1.25/B)^{1/2}$	1.452	31.23	35

Test result:

1) Monitoring Bandwidth:
The antenna of the EUT used for monitoring is the same interior antenna that used for transmission, so the monitoring system bandwidth is equal to the emission bandwidth of the intended transmission

2) Reaction Time Test:

No.	Interference Pulse width (μs)	Reaction of EUT	Observing time (μs)	Result
1	**50μs with level TL+UM**	No transmission	25.35	**Pass**
2	**35μs with level TL+UM+6dB**	No transmission	20.20	**Pass**

9) Monitoring Antenna

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

Test procedure:

Measurement method according to ANSI C63.17 -2013 paragraph 4

Test result:

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

10) Monitoring threshold relaxation

Devices that have a power output lower 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.

Test procedure:

Measurement method according to ANSI C63.17 -2013 clause 7.4 & paragraph 4

Test result:

This requirement is covered by the results of Least Interfered Channel (LIC).

11) Duplex Connections

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.

Test procedure:

This test validates proper operation of an EUT that operates according to the provisions of FCC § 15.323(c)(10) using a check of both transmit and receive channels on one end of the link to qualify both ends of the link for transmissions. Test method according to ANSI C63.17 clause 8.3.2 Validation of dual access criteria check for EUTs that implement the upper threshold

a) Adjust the path loss between the EUT and its companion device such that the received signal to the EUT from the companion device is at least 40 dB above TL + UM.

b) Restrict the EUT and its companion device to operation at a single carrier f1 for TDMA systems and on f1 and f2 and corresponding duplex carriers for FDMA systems. Verify that the EUT and its companion device can establish a connection on a time/spectrum window on the enabled carrier(s). Terminate the connection.

c) Apply interference to the EUT on the EUT's transmit time/spectrum windows at TL + UM per carrier on all time/spectrum windows except for one, which has interference at least 10 dB below TL. Adjust the interference to the EUT on its receive time/spectrum windows such that a single time/spectrum window has interference at least 10 dB below TL, and the interference on the other time/spectrum windows is at TL + UM + 7 dB. The interference to the companion device should be at least 10 dB below TL on all active time/spectrum windows. The interference-free receive time/spectrum window must not be the duplex mate of the interference-free transmit time/spectrum window.

d) Cause the EUT to attempt to establish a connection. The connection should be made on the interferencefree receive time/spectrum window and its duplex mate. Otherwise, the EUT fails the test.

e) If a connection exists, terminate it. Reduce the interference on the EUT's receive time/spectrum windows to a level of TL + UM per carrier on all time/spectrum windows except for one, which has interference at least 10 dB below TL. Raise the interference on the EUT's transmit time/spectrum windows to a level of TL + UM + 7 dB, maintaining one time/spectrum window with interference at least 10 dB below TL. The interference to the companion device should be at least 10 dB below TL on all active time/spectrum windows. Again, the interference-free transmit and receive time/spectrum windows should not constitute a duplex pair if the system designates a specific duplex pairing for time/spectrum windows.

f) Cause the EUT to attempt to establish a connection. The connection should be made on the interference-free transmit time/spectrum window and its duplex mate. Otherwise, the system fails the test.

g) Terminate the connection and raise the interference to the EUT on all of the EUT's transmit and receive time/spectrum windows to TU + UM per carrier on all time/spectrum windows except for a single transmit time/spectrum window and a single receive time/spectrum window, which shall have interference at least 10 dB below TL. The low-interference transmits and receives time/spectrum windows shall not constitute a duplex pair. Adjust the path loss between the EUT and its companion device such that the received signal to the EUT from the companion device is at least 30 dB above TU. Cause the EUT to attempt to establish a connection. If a connection is established, the test fails.

Test result:

Interference (Refer to ANSI C63.17 §8.3& §8.3.2)	**Reaction of EUT**	**Results**
a) Only a single carrier f1 for EUT TDMA systems and on f1 and f2 and corresponding duplex carriers for FDMA systems.	EUT can transmit	Pass
b) All Tx windows with level TL+UM except one & Rx windows with level TL+UM+7dB except one,	Connected on the target Rx window and its duplex mate.	Pass

which are not the duplex mate		
c) All Tx windows with level TL+UM+7dB except one & Rx windows with level TL+UM except one, which are not duplex mate	Connected on the target Tx window and its duplex mate.	Pass
d) All Tx & Rx windows with level TU+UM, except one for Tx window & one for Rx window, which are not duplex mate.	No connection possible	Pass

12) Alternative monitoring interval

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 procedure:

This test validates the ability of the EUT to distinguish between same-system and other-system interference for purposes of satisfying the requirement of 47CFR15.323(c) (11). Test method according to ANSI C63.17 2013 clause 8.4

a) Adjust the path loss between the EUT and its companion device such that the received signal to the EUT from the companion device is at least 30 dB above TL.

b) Restrict the EUT and its companion device to operation at a single carrier f1 for TDMA systems and on f1 and f2 and corresponding duplex carriers for FDMA systems. Verify that the EUT and its companion device can establish a connection.

c) Apply interference at TL + UM per carrier to the EUT on all transmit time/spectrum windows on the enabled carrier(s). The interference must use the same physical layer parameters (modulation, frame format, etc.) as the EUT transmissions, but with a system identifier different from that used by the EUT and the companion device. Ensure that the interference level at the companion device is at least 10 dB below TL. Apply no interference to the receive time/spectrum windows on the enabled carriers.

d) Cause the EUT to attempt to establish a connection. If a connection is established, the test fails.

Test result:

Interference (Refer to ANSI C63.17 §8.4)	Reaction of EUT	Results
a) Only a single carrier f1 for EUT TDMA systems and on f1 and f2 and corresponding duplex carriers for FDMA systems.	EUT can transmit	Pass
b) Apply interference with same parameters as EUT transmissions on all Tx windows with level TL+UM on the enabled carrier(s) and no interference on the Rx windows on the enabled carriers.	No connection is established	Pass

13) Fair Access

The provisions of FCC §15.323 (c) & paragraphs 5.2 (10) or (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 result:

The manufacturer declares that this device does not use any mechanisms as provided by FCC § 15.323(c)(10) or (11) to extend the range of spectrum occupied over space or time for the purpose of denying fail access to spectrum to other device.

14) Frame Repetition Stability Frame Period and Jitter

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 these sub-bands 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 (timerelated, 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.

Test procedure:

Measurement method according to ANSI C63.17 2013 clause 6.2.2, 6.2.3

Test result:

Frame Period and Jitter:

Max. pos. Jitter (μs)	Max. neg. Jitter (μs)	Frame period (ms)	Limit	
			Frame Period (ms)	Jitter (μs)
0.015	-0.05	10.03	20 or10/X	25

Note: X is a positive whole number.

6.8 Radiated Emissions Measurement

6.8.1 Standard requirement:

According to FCC§15.319(g), notwithstanding other technical requirements specified in this subpart,attenuation of emissions below the general emission limits in §15.209 is not required. l

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

6.8.2 Measuring Instruments and Setting:

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

6.8.3 Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.5 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

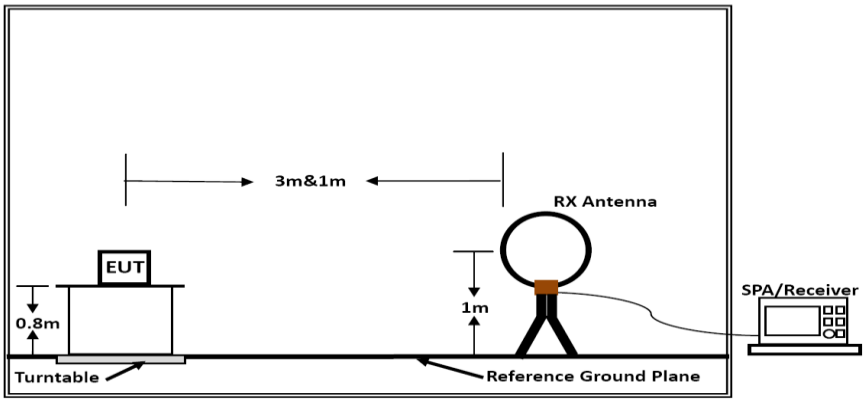
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

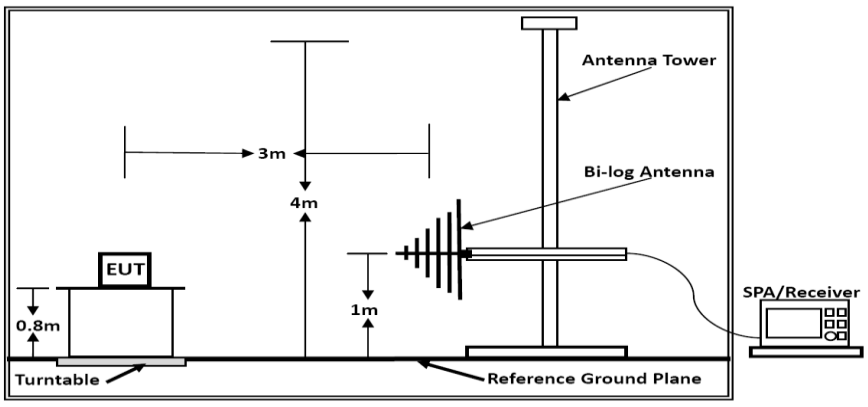
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

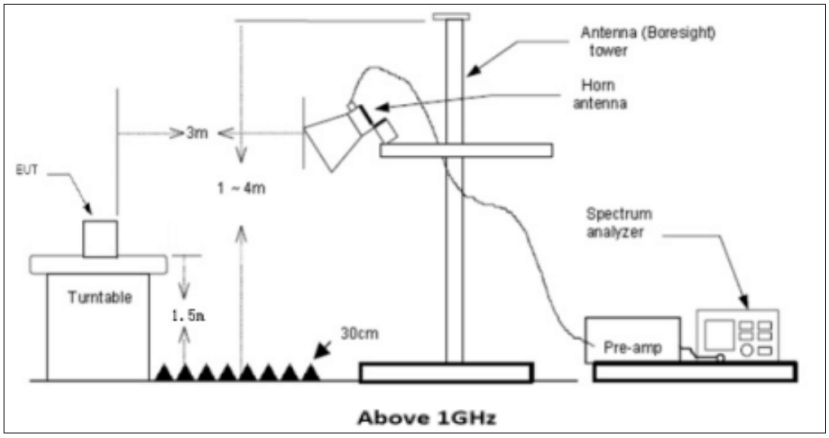
6.8.4 Test Setup Layout



Below 30MHz



Below 1GHz



Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

6.8.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.8.6 Test result

.

Temperature	24.2℃	Humidity	51.2%
Test Engineer	Simba Huang	Configurations	DECT

Remarks:

1. *Only the worst case Main Antenna test data.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

■ **Results of Radiated Emissions (9 KHz~30MHz)**

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

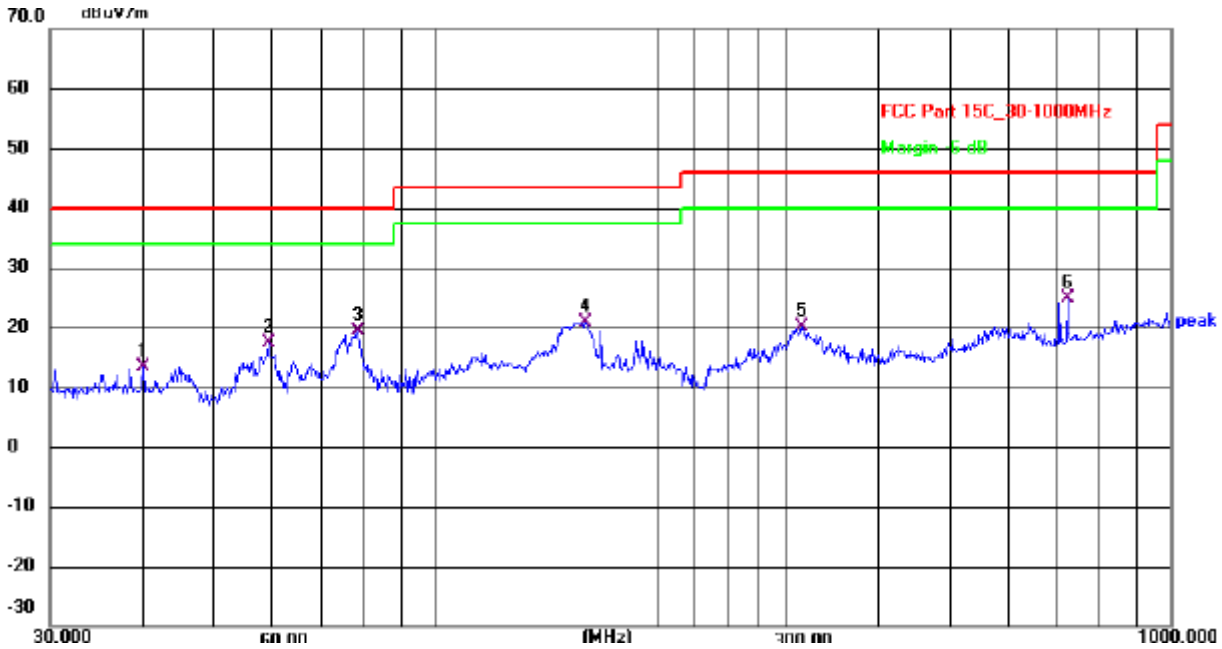
The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

■ **Results of Radiated Emissions (30MHz~1GHz)**

Pre-scan all test modes, found worst case at GFSK (LCH), and so only show the test result of GFSK (1921.536MHz).

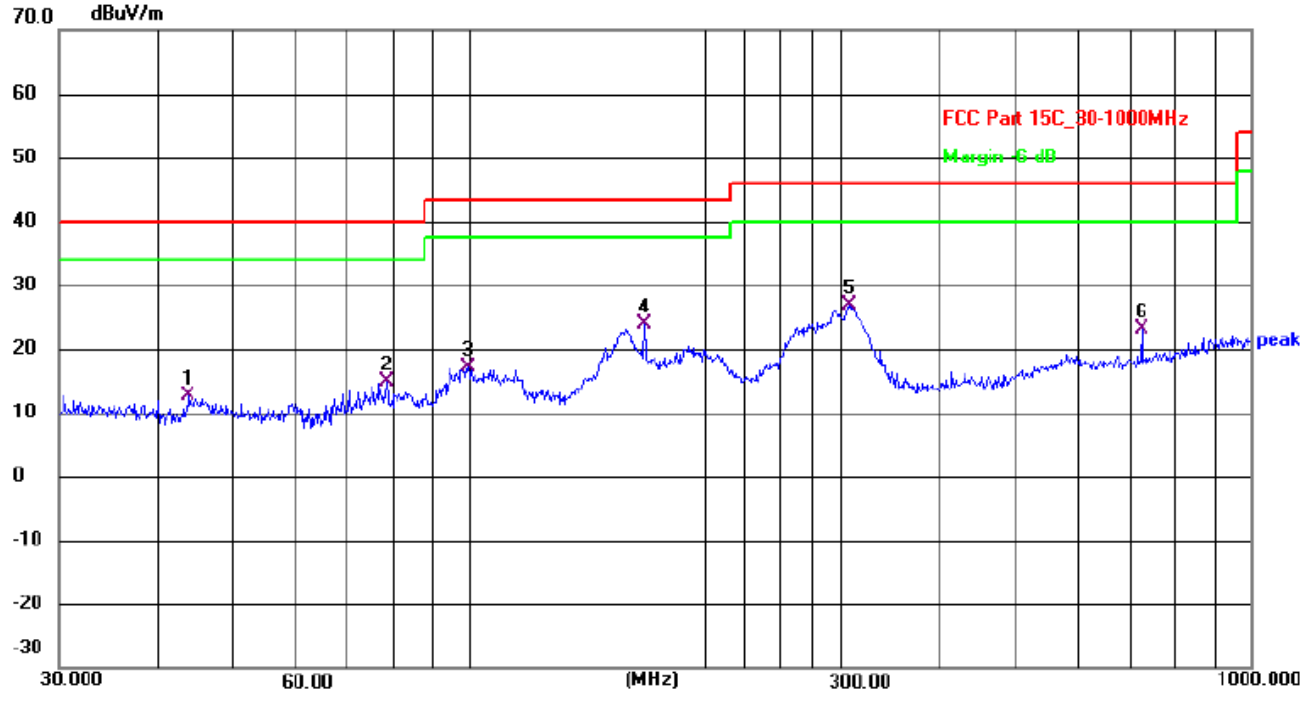
Model name:	L220401	Test Date :	2023-08-18
Polarization :	Vertical	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	40.1347	30.86	-17.52	13.34	40.00	-26.66	QP
2	59.4405	36.03	-18.75	17.28	40.00	-22.72	QP
3	78.6885	39.15	-19.83	19.32	40.00	-20.68	QP
4	160.3454	40.66	-19.68	20.98	43.50	-22.52	QP
5	315.4806	34.97	-14.74	20.23	46.00	-25.77	QP
6	724.2607	35.34	-10.53	24.81	46.00	-21.19	QP

Model name:	L220401	Test Date :	2023-08-18
Polarization :	Horizontal	Test Result:	☒ Pass ☐ Fail



Remark:

1). Pre-scan all modes and recorded the worst case results in this report.

2). Emission level (dBuV/m) = 20 log Emission level (uV/m).

3). Level = Reading + Factor, Margin = Level–Limit, Factor = Antenna Factor + Cable Loss - Preamp Factor.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	43.9658	29.65	-17.03	12.62	40.00	-27.38	QP
2	78.6885	34.71	-19.83	14.88	40.00	-25.12	QP
3	99.8777	35.44	-18.19	17.25	43.50	-26.25	QP
4	167.8240	43.39	-19.56	23.83	43.50	-19.67	QP
5	306.7536	42.11	-15.23	26.88	46.00	-19.12	QP
6	724.2607	33.76	-10.53	23.23	46.00	-22.77	QP

Results for Radiated Emissions (1- 26 GHz)

Test channel:	Lowest channel(1921.536MHz)

H

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
3843.072	50.23	5.06	55.29	74.00	-18.71	PEAK
3843.072	24.524	5.06	29.58	54.00	-24.42	AVG
5764.608	52.61	7.03	59.64	74.00	-14.36	PEAK
5764.608	26.31	7.03	33.34	54.00	-20.66	AVG

V

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
3843.072	52.32	5.06	57.38	74.00	-16.62	PEAK
3843.072	27.52	5.06	32.58	54.00	-21.42	AVG
5764.608	51.32	7.03	58.35	74.00	-15.65	PEAK
5764.608	25.89	7.03	32.92	54.00	-21.08	AVG

Test channel:	Middle channel (1924.992MHz)

H

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
3849.984	51.63	5.14	56.77	74.00	-17.23	PEAK
3849.984	25.34	5.14	30.48	54.00	-23.52	AVG
5774.976	51.62	7.52	59.14	74.00	-14.86	PEAK
5774.976	26.01	7.52	33.53	54.00	-20.47	AVG

V

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
3849.984	52.35	5.14	57.49	74.00	-16.51	PEAK
3849.984	27.04	5.14	32.18	54.00	-21.82	AVG
5774.976	51.45	7.52	58.97	74.00	-15.03	PEAK
5774.976	26.88	7.52	34.40	54.00	-19.60	AVG

Test channel:	Highest channel (1928.448MHz)

H

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
3856.896	51.03	5.22	56.25	74.00	-17.75	PEAK
3856.896	26.41	5.22	31.63	54.00	-22.37	AVG
5785.344	51.00	8.06	59.06	74.00	-14.94	PEAK
5785.344	25.78	8.06	33.84	54.00	-20.16	AVG

V

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	
3856.896	52.36	5.22	57.58	74.00	-16.42	PEAK
3856.896	27.63	5.22	32.85	54.00	-21.15	AVG
5785.344	51.41	8.06	59.47	74.00	-14.53	PEAK
5785.344	26.36	8.06	34.42	54.00	-19.58	AVG

Remarks:

1). Measuring frequencies from 9 KHz - 10th harmonic or 26.5GHz (which is less), at least have 20dB margin found between lowest internal used/generated frequency to 30 MHz.
2). Radiated emissions *measured in frequency range from 9 KHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.*
3). Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4). Margin= Final Level – Limit
5).Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
6). All the modes have been tested and the only shows the worst case GFSK mode

6.9 Conducted Emissions

6.9.1 Standard requirement:

FCC §15.315, an unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in §15.207.

According to §15.207 (a): For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

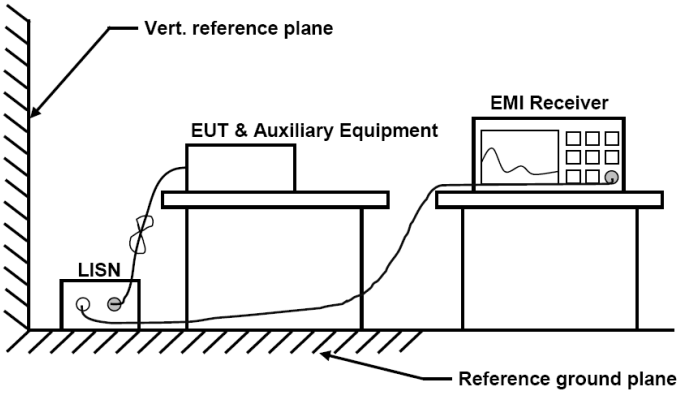
* Decreasing linearly with the logarithm of the frequency

6.9.2 Test Procedures

The transmitter output is connected to EMI receiver. The resolution bandwidth is set to 9 kHz. The video bandwidth is set to 30 kHz, Sweep time=Auto

The spectrum from 150 kHz to 30MHz is investigated with the transmitter set to the lowest, middle, and highest channels.

6.9.3 Test Setup Layout



6.9.4 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.9.5 Test result

PASS

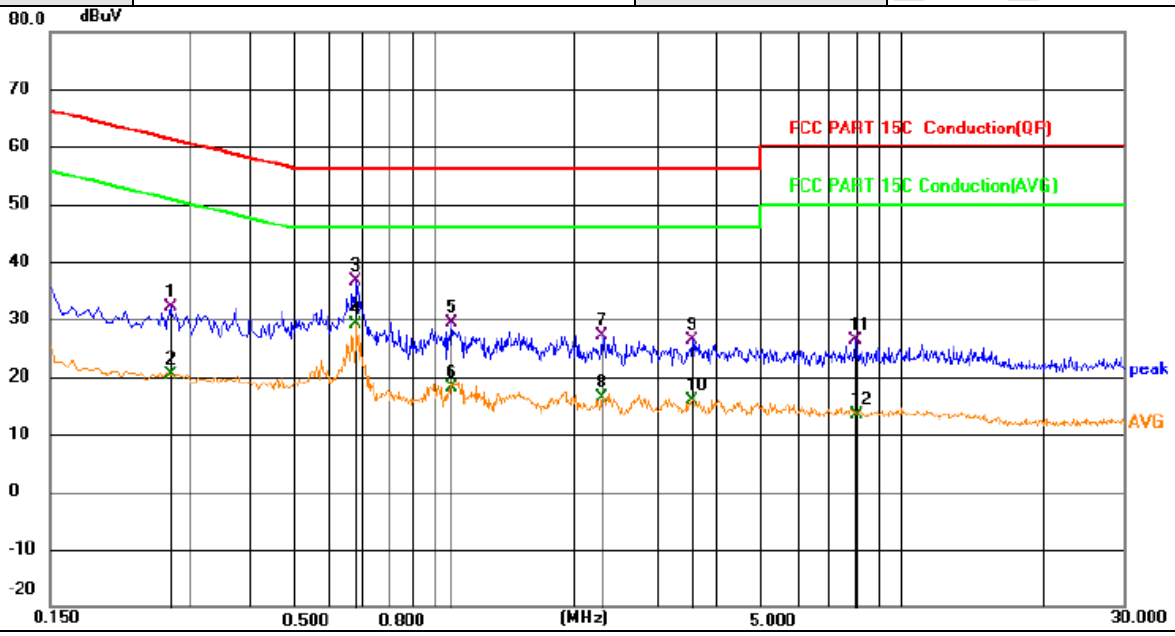
The test data please refer to following page.

Temperature	25.2℃	Humidity	51.2%
Test Engineer	Simba Huang	Configurations	DECT

Measurement data:

Pre-scan all test modes, found worst case at GFSK 1921.536MHz, and so only show the test result of Lowest channel(1921.536MHz)

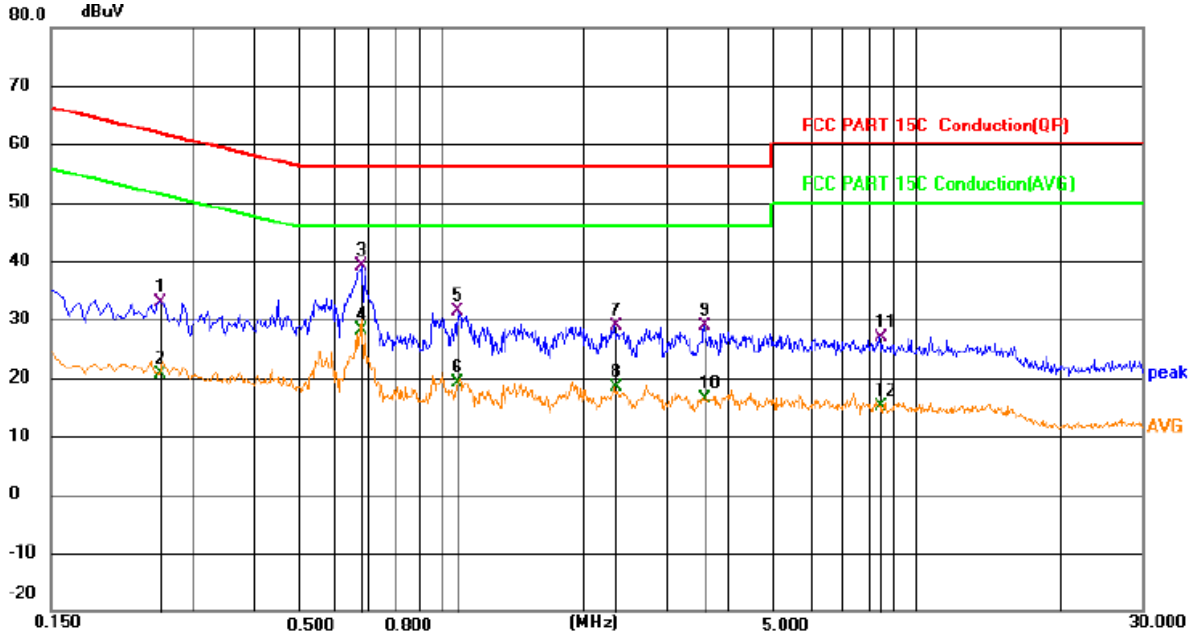
Model name:	L220401	Test Date :	2023-08-18
ATM Pressure:	101 kPa	Test by:	Simba Huang
Phase :	Line	Test Result:	☒ Pass ☐ Fail



***Note: Pre-scan all modes and recorded the worst case results in this report.
Measurement = Reading + Correct, Margin = Measurement – Limit.
Correct Factor= Lisn Factor+Cable Factor

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2716	12.47	19.63	32.10	61.07	-28.97	QP	
2		0.2716	0.79	19.63	20.42	51.07	-30.65	AVG	
3		0.6809	16.93	19.65	36.58	56.00	-19.42	QP	
4	*	0.6809	9.43	19.65	29.08	46.00	-16.92	AVG	
5		1.0905	9.84	19.65	29.49	56.00	-26.51	QP	
6		1.0905	-1.54	19.65	18.11	46.00	-27.89	AVG	
7		2.2875	7.47	19.68	27.15	56.00	-28.85	QP	
8		2.2875	-3.39	19.68	16.29	46.00	-29.71	AVG	
9		3.5701	6.79	19.70	26.49	56.00	-29.51	QP	
10		3.5701	-3.83	19.70	15.87	46.00	-30.13	AVG	
11		7.9846	6.60	19.77	26.37	60.00	-33.63	QP	
12		8.0431	-6.39	19.77	13.38	50.00	-36.62	AVG	

Model name:	L220401	Test Date :	2023-08-18
ATM Pressure:	101 kPa	Test by:	Simba Huang
Phase :	Neutral	Test Result:	☒ Pass ☐ Fail



***Note: Pre-scan all modes and recorded the worst case results in this report.
Measurement = Reading + Correct, Margin = Measurement – Limit.
Correct Factor= Lisn Factor+Cable Factor

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2536	13.37	19.63	33.00	61.64	-28.64	QP	
2		0.2536	1.00	19.63	20.63	51.64	-31.01	AVG	
3	*	0.6809	19.50	19.65	39.15	56.00	-16.85	QP	
4		0.6809	8.51	19.65	28.16	46.00	-17.84	AVG	
5		1.0815	11.71	19.65	31.36	56.00	-24.64	QP	
6		1.0815	-0.50	19.65	19.15	46.00	-26.85	AVG	
7		2.3280	9.26	19.70	28.96	56.00	-27.04	QP	
8		2.3280	-1.43	19.70	18.27	46.00	-27.73	AVG	
9		3.5791	9.20	19.78	28.98	56.00	-27.02	QP	
10		3.5791	-3.33	19.78	16.45	46.00	-29.55	AVG	
11		8.3941	6.97	19.84	26.81	60.00	-33.19	QP	
12		8.3941	-4.67	19.84	15.17	50.00	-34.83	AVG	

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

7 Test Setup Photographs of EUT

Please refer to separated files for Test Setup Photos of the EUT.

8 External Photographs of EUT

Please refer to separated files for External Photos of the EUT.

9 Internal Photographs of EUT

Please refer to separated files for Internal Photos of the EUT.

------End------