

FCC & ISED RF TEST REPORT No. 180302312SHA-002

Applicant	:	Libratone A/S Sundkaj 9, DK-2150 Nordhavn, Denmark	
Manufacturer	:	Libratone A/S Sundkaj 9, DK-2150 Nordhavn, Denmark	
Factory	:	GOERTEK INC. NO.268 DONGFANG RD, NEW&HIGH-TECH INDUSTRY DEVELOPMENT ZONE, WEIFANG, SHANDONG 261031 CHINA	
Product Name	:	Wireless Speaker	
Type/Model	:	LTH310	
TEST RESULT	:	Pass	

SUMMARY

The equipment complies with the requirements according to the following standard(s) or specification:

47CFR Part 15 (2017): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2014): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-247 Issue 2 (February 2017): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5 (April 2018): General Requirements for Compliance of Radio Apparatus

Date of issue: May 23, 2018

Prepared by:

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Eric Li (Project engineer)

Reviewed by:

Daniel Zhao (Reviewer)

FCC ID: Y2SLTH310 IC: 9452A-LTH310



Description of Test Facility

Name:Intertek Testing Service ShanghaiAddress:Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, P.R. China

FCC Designation Number: CN1175 IC Assigned Code: 2042B-1

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Revision History

Report No.	Version	Description	Date Issued
180302312SHA-002	Rev. 01	Initial issue of report	May 23 <i>,</i> 2018



1 GENERAL INFORMATION

1.1 Identification of the EUT

Product Name	:	Wireless Speaker
Type/model	:	LTH310
FCC ID	:	Y2SLTH310
IC	:	9452A-LTH310
Description of EUT	:	The EUT is a Wireless Speaker, which has WIFI and Bluetooth functions. There is only one model, we tested it and listed the BT EDR results in this report.
Rating	:	19 Vdc,1.8A
Category of EUT	:	Class B
EUT type	:	☐ Table top ☐ Floor standing
Sample received date	:	March 26, 2018
Date of test	:	March 26, 2018 to April 6, 2018

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1.2 Technical Specification

Operation Frequency Band	:	2402 - 2480 MHz
Type of Modulation	:	BT 4.2 (BR+EDR)
EUT Modes of	:	GFSK, π/4 DQPSK, 8DPSK
Modulation		

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Channel Description

:	There are 79 channels in all. The designed channel spacing
	is 1MHz.

Channel	Frequency
Identifier	(MHz)
low	2402
middle	2441
high	2480

frequency

Antenna : Internal PCB antenna, 2.11dBi

Antenna Requirement: 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.

The EUT used an internal monopole antenna and used a no-standard electrical connector, so fulfill these requirements.



1.3 Mode of operation during the test

While testing the transmitter mode of the EUT, the internal modulation is applied. All the functions of the host device except the BT module were set on stand-by mode.

The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Worst Modulation Used for Conformance Testing				
Bluetooth Mode Packet Type Data Rate Worst Mode				
GFSK	BR-1Mbps	DH1, DH3, DH5	BR-1Mbps DH5	
π/4 DQPSK	EDR-2Mbps	2DH1,2DH3,2DH5	EDR-2Mbps 2DH5	
8DPSK	EDR-3Mbps	3DH1,3DH3,3DH5	EDR-3Mbps 3DH5	

The worst case modulation configuration:

The power setting parameter:

The worst case power setting parameter			
Test software Version	CMD Command		
Modulation Mode	2402MHz 2441MHz 2480MHz		
BR-1Mbps	Default	Default	Default
EDR-2Mbps	Default	Default	Default
EDR-3Mbps	Default	Default	Default

There have the following test modes:

Radiated test mode:

Mode 1: EUT transmitted signal with BT antenna;

Conducted test mode:

Mode 2: EUT transmitted signal from BT RF port connected to SA directly;

We have verified all test modes, and choose the mode 1 for radiated RF test and mode 2 for conducted RF test as representatively to list the results in this report.



1.4 Test peripherals list

Item No.	Name	Brand and Model	Description
1	Laptop computer	HP ProBook 6470b	100-240V AC, 50/60Hz
2	AC-DC adaptor		Input: 100-240V AC 50/60Hz Output: 19VDC 1.8A

1.5 Description of Test Facility

Name	:	Intertek Testing Service Shanghai
Address	:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone	:	86 21 61278200
Telefax	:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations	:	CNAS Accreditation Lab
		Registration No. CNAS L0139
		FCC Accredited Lab Designation Number: CN1175 IC Registration Lab
		Registration code No.: 2042B-1
		VCCI Registration Lab
		Registration No.: R-4243, G-845, C-4723, T-2252
		NVLAP Accreditation Lab
		NVLAP LAB CODE: 200849-0
		A2LA Accreditation Lab
		Certificate Number: 3309.02

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2 TEST SPECIFICATIONS

2.1 Instrument list

Condu	ucted Emission				
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
	Test Receiver	R&S	ESCS 30	EC 2107	2018-10-18
	A.M.N.	R&S	ESH2-Z5	EC 3119	2018-12-01
	Shielded room	Zhongyu	-	EC 2838	2019-01-08
Radia	ted Emission				
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
◄	Test Receiver	R&S	ESIB 26	EC 3045	2018-10-18
•	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2018-05-30
•	Horn antenna	R&S	HF 906	EC 3049	2018-09-22
	Horn antenna	ETS	3117	EC 4792-1	2018-08-23
	Horn antenna	ΤΟΥΟ	HAP18-26W	EC 4792-3	2020-07-09
۲	Pre-amplifier	R&S	Pre-amp 18	EC5881	2018-06-19
V	Semi-anechoic chamber	Albatross project	-	EC 3048	2018-09-08
RF tes	t				
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
•	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2018-09-10
	Power sensor	Agilent	U2021XA	EC 5338-1	2019-03-03
	Vector Signal Generator	Agilent	N5182B	EC 5175	2019-03-06
>	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2019-03-03
>	Mobile Test System	Litepoint	lqxel	EC 5176	2019-01-11
K	Test Receiver	R&S	ESCI 7	EC 4501	2019-02-23
Additi	onal instrument				
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2018-06-14
>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3324	2018-04-09
>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2019-03-23
1	Pressure meter	YM3	Shanghai Mengde	EC 3320	2018-06-28



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2.2 Test Standard

47CFR Part 15 (2017) ANSI C63.10 (2014) DA 00-705 RSS-247 Issue 2 (February 2017) RSS-Gen Issue 5 (April 2018)

2.3 Test Summary

This report applies to tested sample only. The test results have been compared directly with the limits, and the measurement uncertainty is recorded. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
20dB Bandwidth	15.247(a)(1)	RSS-247 Issue 2 Clause 5	Pass
Carrier Frequency Separation	15.247(a)(1)	RSS-247 Issue 2 Clause 5	Pass
Output power	15.247(b)(1)	RSS-247 Issue 2 Clause 5	Pass
Radiated Spurious Emissions	15.205 & 15.209	RSS-247 Issue 2 Clause 5	Pass
Conducted Spurious Emissions &Band Edge	15.247(d)	RSS-247 Issue 2 Clause 5	Pass
Power line conducted emission	15.207	RSS-Gen Issue 5 Clause 8.8	Pass
Number of Hopping Frequencies	15.247(a)(1)(iii)	RSS-247 Issue 2 Clause 5	Pass
Dwell time	15.247(a)(1)(iii)	RSS-247 Issue 2 Clause 5	Pass
Occupied bandwidth	-	RSS-Gen Issue 4 Clause 6.6	Tested

Notes: 1: NA =Not Applicable

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2.4 Frequency Hopping System Requirement

Test Requirement: Section 15.247 (a)(1), (g), (h) requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

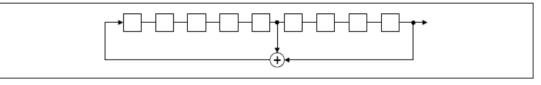
The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1)

According to Bluetooth Core Specification, the pseudorandom sequence may be generated in a nine stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs;

i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: 29-1 = 511 bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence



An example of Pseudorandom Frequency Hopping Sequence as follow:

20 62 46 77	7 64	8 73	16 75 1
	1 1		

Each frequency used equally on the average by each transmitter.

According to Bluetooth Core Specification, Bluetooth receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any Bluetooth transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g)

According to Bluetooth Core Specification, the Bluetooth system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h)

According to Bluetooth Core specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

According to the Bluetooth Core specification, the Bluetooth system is designed not have the ability to coordinate with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

2.5 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.74 dB
Radiated Emissions in restricted frequency bands below 1GHz	\pm 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	\pm 5.02dB
Emission outside the frequency band	\pm 2.89dB
Power line conducted emission	± 3.19dB



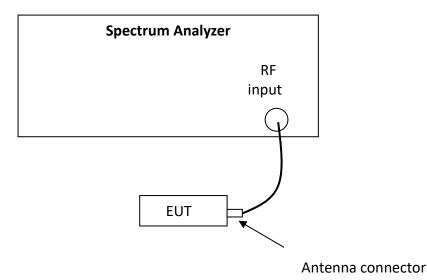
3 20dB Bandwidth&99% Bandwidth

Test result: Pass

3.1 Limit

□ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
 ○ Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

3.2 Test Configuration



3.3 Test Procedure and test setup

The 20 bandwidth per FCC §15.247(a)(1) is measured using the Spectrum Analyzer with Span =2 to 3 times the 20 dB bandwidth, RBW≥1% of the 20 dB bandwidth, VBW≥RBW, Sweep = auto,Detector = peak, Trace = max hold.

The test was performed at 3 channels (lowest, middle and highest channel).

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

Total Quality. Assured.

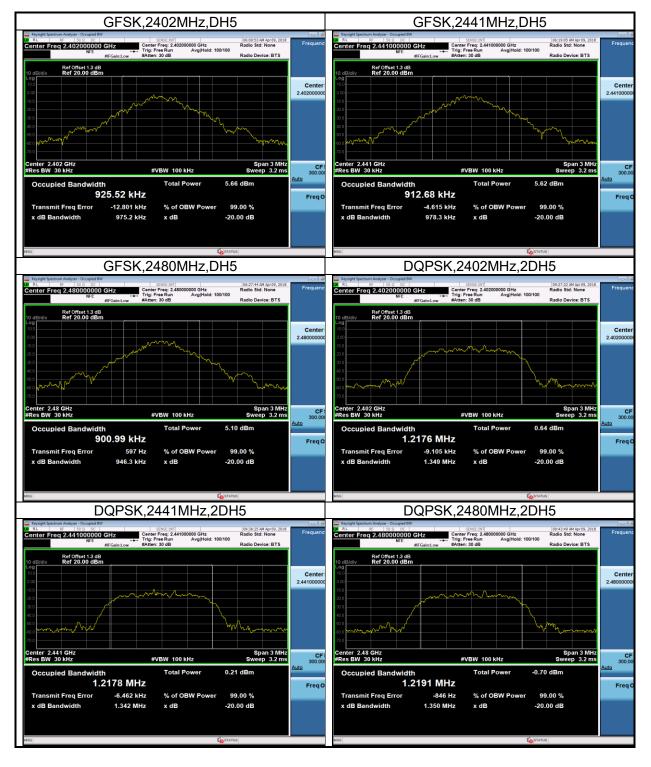
3.4 Test Protocol

Temperature:	25 °C
Relative Humidity:	55 %

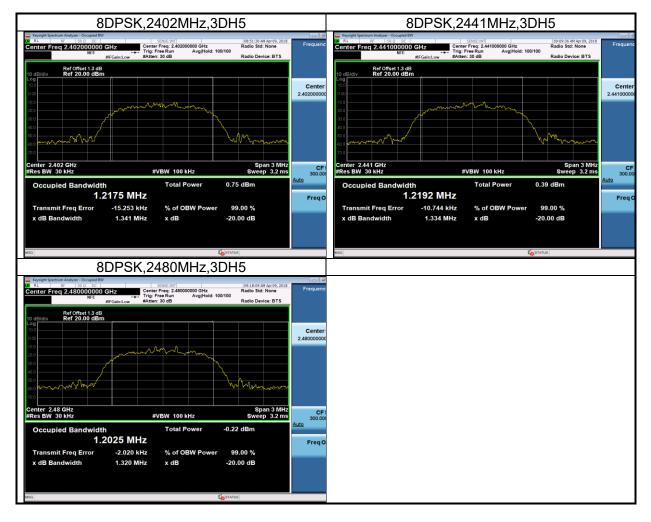
BT Occupied 20dB Bandwidth					
Mode	Test Frequency (MHz)	Packet Type	20dB Bandwidth (kHz)	Two-thirds of Bandwidth(KHz)	Result
GFSK	2402	DH5	975.2	650.13	Pass
GFSK	2441	DH5	978.3	652.20	Pass
GFSK	2480	DH5	946.3	630.87	Pass
DQPSK	2402	2DH5	1349.5	899.67	Pass
DQPSK	2441	2DH5	1341.7	894.47	Pass
DQPSK	2480	2DH5	1350.4	900.27	Pass
8DPSK	2402	3DH5	1340.7	893.80	Pass
8DPSK	2441	3DH5	1334.0	889.33	Pass
8DPSK	2480	3DH5	1319.8	879.87	Pass

BT Occupied 99% Bandwidth					
Mode	Test Frequency (MHz)	Packet Type	99% Bandwidth (kHz)	Result	
GFSK	2402	DH5	925.5	Pass	
GFSK	2441	DH5	912.7	Pass	
GFSK	2480	DH5	901.0	Pass	
DQPSK	2402	2DH5	1217.6	Pass	
DQPSK	2441	2DH5	1217.8	Pass	
DQPSK	2480	2DH5	1219.1	Pass	
8DPSK	2402	3DH5	1217.5	Pass	
8DPSK	2441	3DH5	1219.2	Pass	
8DPSK	2480	3DH5	1202.5	Pass	

Total Quality. Assured.



Total Quality. Assured.





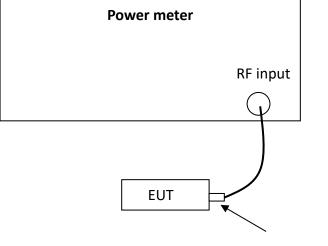
4 Carrier Frequency Separation

Test result: Pass

4.1 Test limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
 Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

4.2 Test Configuration



Antenna connector

4.3 Test procedure and test setup

The Carrier Frequency Separation per FCC §15.247(a)(1) is measured using the Spectrum Analyzer with Span can capture two adjacent channels, RBW≥1% of the span, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.

The test was performed at 3 channels (lowest, middle and highest channel).

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)



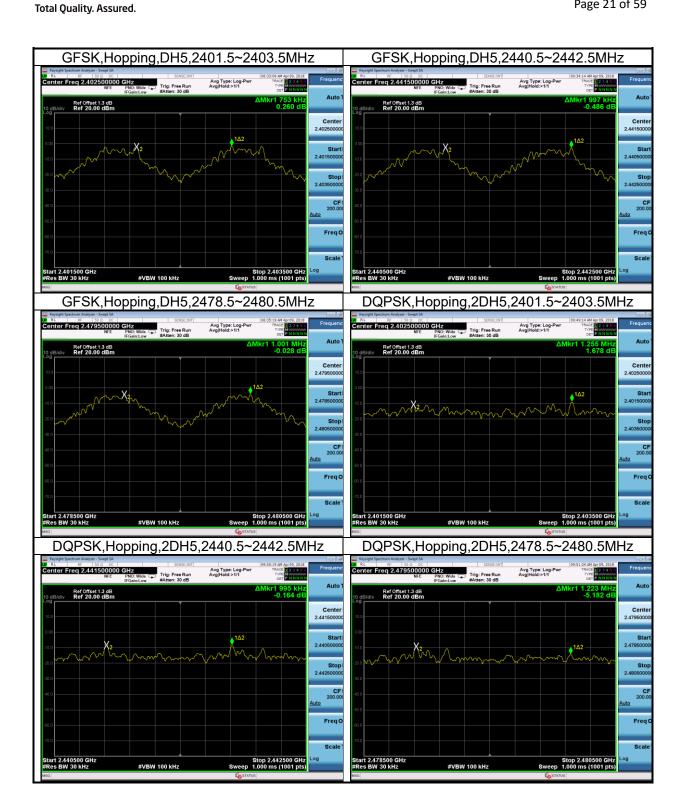
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Total Quality. Assured.

4.4 Test protocol

Temperature:	25 °C
Relative Humidity:	55 %

BT Carrier Frequency Separation					
Mode	Test Frequency (MHz)	Packet Type	Range	Separation (kHz)	Result
GFSK	Hopping	DH5	2401.5MHz~2403.5MHz	753	Pass
GFSK	Hopping	DH5	2440.5Mhz~2442.5Mhz	997	Pass
GFSK	Hopping	DH5	2478.5Mhz~2480.5Mhz	1001	Pass
DQPSK	Hopping	2DH5	2401.5MHz~2403.5MHz	1255	Pass
DQPSK	Hopping	2DH5	2440.5Mhz~2442.5Mhz	995	Pass
DQPSK	Hopping	2DH5	2478.5Mhz~2480.5Mhz	1223	Pass
8DPSK	Hopping	3DH5	2401.5MHz~2403.5MHz	1211	Pass
8DPSK	Hopping	3DH5	2440.5Mhz~2442.5Mhz	767	Pass
8DPSK	Hopping	3DH5	2478.5Mhz~2480.5Mhz	993	Pass



Total Quality. Assured.





5 Maximum peak output power

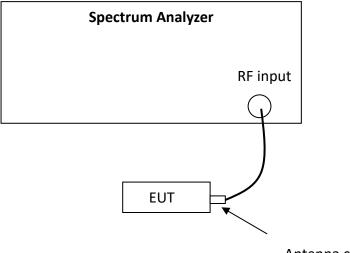
Test result: Pass

5.1 Test limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

5.2 Test Configuration



Antenna connector

5.3 Test procedure and test setup

The power output per FCC 15.247(b) is measured using the Spectrum Analyzer with Span = 5 times the 20 dB bandwidth, RBW the 20 dB bandwidth, VBW RBW, Sweep = auto, Detector = peak, Trace = max hold.

The test was performed at 3 channels (lowest, middle and highest channel).

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)



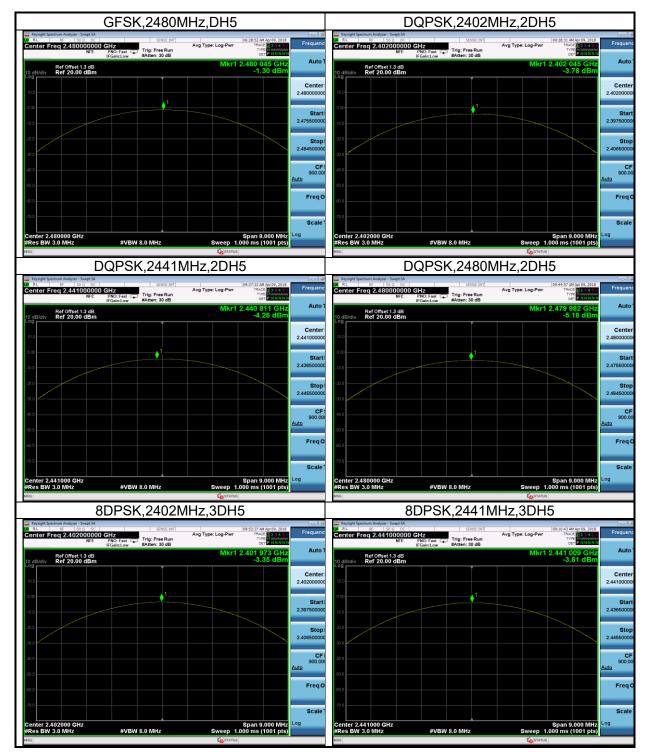
5.4 Test Protocol

Temperature:	25 °C
Relative Humidity:	55 %

BT Maximum Output Power						
Mode	Test Frequency (MHz)	Packet Type	Power (dBm)	Result		
GFSK	2402	DH5	-0.11	Pass		
GFSK	2441	DH5	-0.65	Pass		
GFSK	2480	DH5	-1.30	Pass		
DQPSK	2402	2DH5	-3.78	Pass		
DQPSK	2441	2DH5	-4.26	Pass		
DQPSK	2480	2DH5	-5.18	Pass		
8DPSK	2402	3DH5	-3.35	Pass		
8DPSK	2441	3DH5	-3.81	Pass		
8DPSK	2480	3DH5	-4.69	Pass		

GFSK,2402N	/IHz,DH5	GFSK,2441MHz,DH5	
Keynight Spectrum Analyzer - Swept SA R R B PF S0 20 DC Center Freq 2.402000000 GHz NFE PNC: Fast Trig: Free Run Keynight Spectrum Analyzer - Swept SA DF State: 30 dB	Avg Type: Log-Pwr TRACE 2 2 3 5 0 TYPE Pure Pure Pure Pure Pure Pure Pure Pure	Center Freq 2.441000000 GHz Avg Type: Log-Pwr NFE PNO: Fast C Trig: Free Run	109 AM Apr09, 2018 TRACE 1 2 3 4 5 0 TYPE NNNNN
IFGain:Low #Atten: 30 dB Ref Offset 1.3 dB 10 dB/div Ref 20.00 dBm	Mkr1 2.402 126 GHz -0.11 dBm	Mkr1 2.44	1 054 GHz Auto -0.65 dBm
10.0	Center 2.40200000		Center 2.44100000
-10.0	Start 2.39750000		Start 2.43650000
300	Stop 2.40650000		Stop 2.44550000
40.0	CF 900.00 <u>Auto</u>		CF 900.00 <u>Auto</u>
60.0	Freq	600	Freq
	Span 9 000 MHz		Scale
Center 2.402000 GHz #Res BW 3.0 MHz #VBW 8.0 MHz M8G	Span 9.000 MHz Log Sweep 1.000 ms (1001 pts)	Center 2.441000 GHz Spa #Res BW 3.0 MHz #VBW 8.0 MHz Sweep 1.000 m #IC Sweep 1.000 m	nn 9.000 MHz ns (1001 pts)

Total Quality. Assured.



Total Quality. Assured.

Private Jack 100 CC 100
Ref Offset 13 dB IMM 1 2.90 000 CH2 4,53 d Bm -4,53 d Bm Center Freq 2.48000000 GH2 100 -1 101 -1 102 -1 103 -1 104 -1 105 -1 106 -1 107 -1 108 -1 109 -1 100 -1
Center Freq 2.48000000 GHz 300 300 300 300 300 300 300 300 300 30
100 2.47550000 GH2 200 2.47550000 GH2 2.48450000 GH2 CF Step
2.48450000 GHz
CF Step
900.000 kHz Auto Man
600 FreqOffset
Scale Type
Senter 2.480000 GHz Span 9.000 MHz Since 1.000 mS (1001 pts)

Conclusion: The maximum EIRP =- 0.11dBm+2.11dBi =2dBm = 0.00158W which is lower than the limit of 4W listed in RSS-247.



6 Radiated Emissions

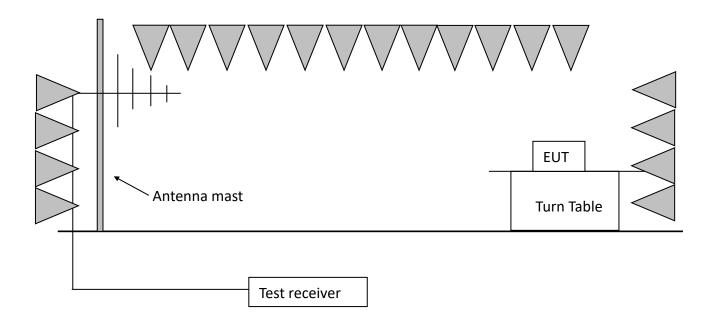
Test result: Pass

6.1 Test limit

The radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

6.2 Test Configuration





6.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m.

The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz) RBW = 1MHz, VBW = 3MHz (>1GHz for PK);

Remark: 1. For fundamental emission, no amplifier is employed.

- 2. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
- 3. Corrected Reading = Original Receiver Reading + Correct Factor
- 4. Margin = limit Corrected Reading
- 5. If the PK reading is lower than AV limit, the AV test can be elided.
- 6. The emission was conducted from 30MHz to 25GHz.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,

Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.

Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m

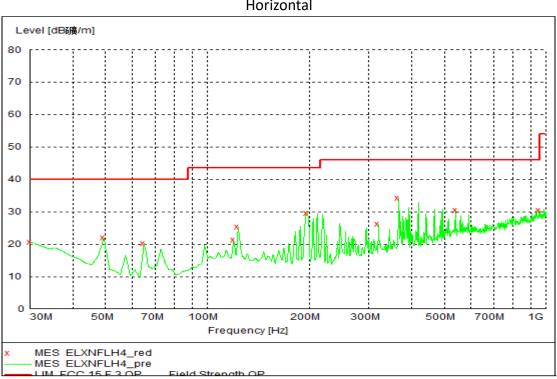
Assuming limit = 54dBuV/m, Corrected Reading = 10.20dBuV/m, then Margin = 54 -10.20 = 43.80dBuV/m



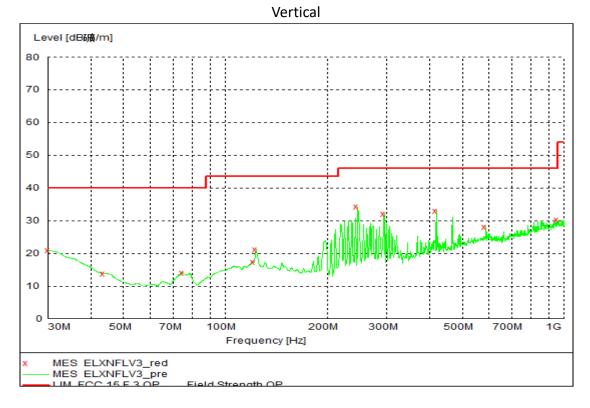
6.4 Test Protocol

Temperature:	25 °C
Relative Humidity:	55 %

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.







FCC ID: Y2SLTH310 IC: 9452A-LTH310



Test data 30MHz~1GHz:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Limits (dBµV/m)	Margin (dB)	Detector
	30.00	20.70	40.00	19.30	РК
	49.44	22.00	40.00	18.00	РК
	64.99	20.30	40.00	19.70	РК
	119.42	21.30	43.50	22.20	РК
	123.31	25.30	43.50	18.20	РК
Н	197.17	29.60	43.50	13.90	РК
	344.91	26.00	46.00	20.00	РК
	368.24	35.90	46.00	10.10	РК
	541.24	30.60	46.00	15.40	РК
	955.29	30.40	46.00	15.60	РК
	30.00	20.90	40.00	19.10	РК
	43.61	13.80	40.00	26.20	РК
	74.71	14.00	40.00	26.00	РК
	121.36	17.30	43.50	26.20	РК
V	123.31	21.20	43.50	22.30	РК
v	245.77	34.20	46.00	11.80	РК
	294.37	32.00	46.00	14.00	РК
	418.78	33.00	46.00	13.00	РК
	585.95	28.00	46.00	18.00	РК
	955.29	30.20	46.00	15.80	РК

Test Data (>1GHz):

GFSK (DH5) Modulation:

Н	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Reading (dBuV/m)		Detector
	Н	2402.00	84.70	Fundamental	/	РК
	Н	2399.98	48.10	74.00	25.90	РК
L	Н	7206.00	46.70	74.00	27.30	РК
	Н	9608.00	46.60	74.00	27.40	РК
N /	V	2442.00	84.30	Fundamental	/	РК
М	V	4882.00	45.80	74.00	28.20	РК
	Н	2480.00	83.20	Fundamental	/	РК
Н	V	2483.50	51.60	74.00	22.40	РК
	V	4960.00	45.30	74.00	28.70	РК



$\pi/4DQPSK$ (2DH5) Modulation:

СН	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	н	2402.00	82.60	Fundamental	/	РК
L	Н	2390.96	48.90	74.00	25.10	РК
	Н	4804.00	45.70	74.00	28.30	РК
М	V	2442.00	82.20	Fundamental	/	РК
IVI	V	4882.00	46.30	74.00	27.70	РК
	Н	2480.00	81.10	Fundamental	/	РК
н	V	2483.50	50.50	74.00	23.50	РК
	V	4960.00	45.70	74.00	28.30	РК

8DPSK (3DH5) Modulation:

СН	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	Н	2402.00	82.70	Fundamental	/	PK
L	Н	2390.90	47.80	74.00	26.20	РК
	Н	4804.00	45.20	74.00	28.80	РК
NA	V 2442.00		81.90	Fundamental	/	РК
M	V	4882.00	45.30	74.00	28.70	РК
	Н	2480.00	80.60	Fundamental	/	РК
н	V	2483.50	52.00	74.00	22.00	PK
	V	4960.00	45.70	74.00	28.30	PK



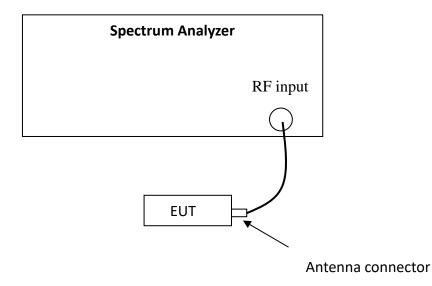
7 Conducted Spurious Emissions & Band Edge

Test result: Pass

7.1 Test limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

7.2 Test Configuration



7.3 Test procedure and test setup

The Conducted Spurious Emissions per FCC §15.247(d) is measured using the Spectrum Analyzer with Span wide enough capturing all spurious from the lowest emission frequency of the EUT up to 10th harmonics, RBW = 100kHz, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.

The test was performed at 2 channels (lowest and highest channel).

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)



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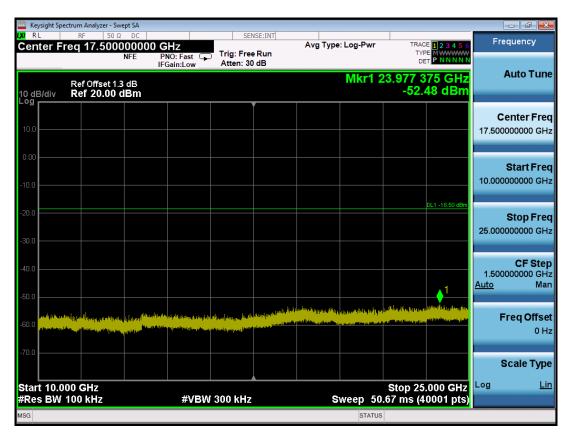
7.4 Test Protocol	
Temperature:	25 °C
Relative Humidity:	55 %

				GFS	K Cha	innel- l	_				
	ctrum Analyzer -										
Center Fr			47	SENS	SE:INT		e: Log-Pwr	TRAC	DE 1 2 3 4 5 6	F	requency
Genter m	eq 2.335	NFE F	PNO: Wide G Gain:Low	Trig: Free Atten: 30				TY			
10 dB/div Log	Ref Offset Ref 20.0						Mkr4 2 .3	385 277 -45.	00 GHz 81 dBm		Auto Tune
10.0 0.00							1				Center Freq 95000000 GHz
-20.0 -20.0 -30.0 -40.0		4			(- di			Porte Minterior	DL1 -18.50 dBm	2.38	Start Freq 30000000 GHz
-50.0 <mark>Admonton</mark> -60.0	anteration and disconding	lada ta consulta da ta consulta da ta		er-pel-baltilitytechillet	HWWW/PA			•••••UV (Ind)(A)		2.4	Stop Freq 10000000 GHz
Start 2.38 #Res BW			#VB	W 300 kHz		S	weep 2.		1000 GHz 0001 pts)	Auto	CF Step 3.000000 MHz Man
MKR MODE TR	IC SCL	× 2.402 161		۲ 1.50 dB	m	CTION FUI	NCTION WIDTH	FUNCTI	ON VALUE	Auto	Inari
2 N 1 3 N 1 4 N 1 5 6	f f f	2.400 000 2.390 000 2.385 277	00 GHz	-37.25 dB -47.92 dB -45.81 dB	m				E		Freq Offset 0 Hz
7 8 9 10										Log	Scale Type
11				III							
MSG							STATU	s			

	ectrum Analyzer - Swept S								
Center F	RF 50 Ω D req 1.1900045 NFE	500 GHz			Avg Type	: Log-Pwr	TYP	E 1 2 3 4 5 6 E M WWW T P N N N N N	Frequency
10 dB/div	Ref Offset 1.3 dE Ref 20.00 dBr	3	Autor of the			Mkr	1 2.376 -47.	91 GHz 04 dBm	Auto Tu
10.0									Center Fr 1.190004500 G
-10.0									Start Fr 9.000 k
-20.0								DL1 -18.50 dBm	Stop Fr 2.380000000 G
-40.0								1	CF St 237.999100 M <u>Auto</u> M
50.0 60.0	han area to factor i filon and the filon and	ang partil filoso ng tanàna ang ang ang ang ang ang ang ang ang a	al grad gradiif og stand for	رو المرابع والمرابع. وي المرابع والمرابع المرابع الم		ng né pakalan pang di kasé	en ga a la ser d'i fan de la ser	lle ik grafera ki a dar	Freq Offs 0
-70.0							Stop 2	.380 GHz	Scale Ty
#Res BW	100 kHz	#VBW	300 kHz		S		000 ms (4	0001 pts)	
ISG						STATUS			

intertek Total Quality. Assured.

Keysight Spectrum Analyzer - Swept SA RL SENSE:INT Frequency Center Freq 6.205000000 GHz TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P NNNN Avg Type: Log-Pwr Trig: Free Run Atten: 30 dB PNO: Fast 😱 IFGain:Low NFE Auto Tune Mkr1 4.803 70 GHz -47.32 dBm Ref Offset 1.3 dB Ref 20.00 dBm 10 dB/div Log r **Center Freq** 6.205000000 GHz Start Freq 2.410000000 GHz Stop Freq 10.00000000 GHz CF Step 759.00000 MHz ø Man Auto **Freq Offset** 0 Hz Scale Type Stop 10.000 GHz Sweep 26.67 ms (40001 pts) Lin Log Start 2.410 GHz #Res BW 100 kHz #VBW 300 kHz MSG STATUS



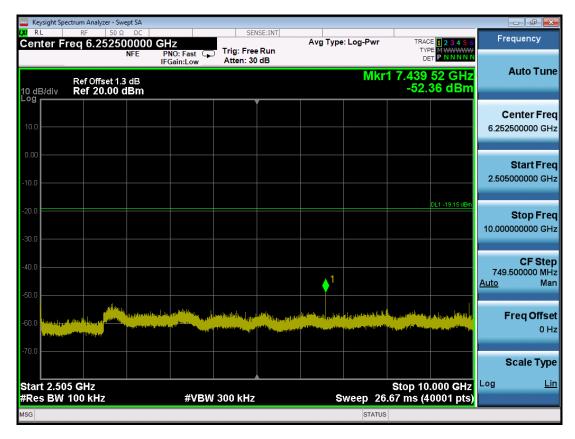
intertek Total Quality. Assured.

GFSK Channel- H

	ectrum Analyzer								
(X) RL Center F	^{RF} 5 req 2.490			Trig: Free R	Av	g Type: Log-Pwr	TRACE 1 2 3 4 5 TYPE M WWWWW		equency
10 dB/div	Ref Offsel Ref 20.0		PNO: Wide IFGain:Low	Atten: 30 d		Mkr4 2.4	183 553 75 GHz -41.27 dBm		Auto Tune
10.0 0.00 -10.0		∧ ¹							Center Freq 0000000 GHz
-20.0			4 2 2				DL1 -19.15 dBm	2.475	Start Freq 5000000 GHz
-50.0 /11//// -60.0 -70.0			I T NTERLANNA	heritalingeringen in the second s	andrigent from the second s	hihandharhallyk renaryanaethilykuni	annandriteriteriteriteriteriteriteriteriterite	2.505	Stop Freq 5000000 GHz
Start 2.47 #Res BW	100 kHz	X		300 kHz	FUNCTION	Sweep 2.0	Stop 2.50500 GHz 667 ms (40001 pts) FUNCTION VALUE	3 <u>Auto</u>	CF Step .000000 MHz Man
1 N 2 2 N 3 3 N 4 5 6		2.483 50 2.500 00	0 00 GHz 0 00 GHz 0 00 GHz 3 75 GHz	0.85 dBn -45.05 dBn -53.41 dBn -41.27 dBn	1 1			P	F req Offset 0 Hz
7 8 9 10 11								Log	Scale Type <u>Lin</u>
MSG						STATUS	s		

								ctrum Analyzer - Sw	
6 Frequency	Avg Type: Log-Pwr TRACE 123456			GHz			RL RF 50 Ω DC Senter Freq 1.237504500 GHz		
	DET PNNNN				Trig: Free Atten: 30	PNO: Fast 🕞 Gain:Low			
z Auto Tune n	2.475 00 GHz -43.69 dBm	Mkr1						Ref Offset 1.3 Ref 20.00 (10 dB/div Log
Center Freq									209
1.237504500 GHz									10.0
Start Freq									0.00
9.000 kHz									-10.0
	DL1 -19.15 dBm								
Stop Freq 2.475000000 GHz									-20.0
2.473000000 GH2									-30.0
CF Step 247.499100 MHz	1								-40.0
Auto Man	→ 								-50.0
Freq Offset									
0 Hz		<mark>, girgə hərə həşə^li Di^lgərədə</mark> Asərə Asila Asi	n li biqologi nga ana bina a	رور و مرکز اور و مرکز و مر مرکز و مرکز و مرکز و مرکز و	and any relation of the second	ار مالغ بعد ما ين اطله ان الأسلار و الله ا	and a first first from a second	ayyaayaayaayaa dha	-60.0
								Nerras III. Sile beren et i distant	-70.0
Scale Type									
z Log <u>Lin</u> S)	rt 9 kHz							Start 9 kl #Res BW	
									MSG

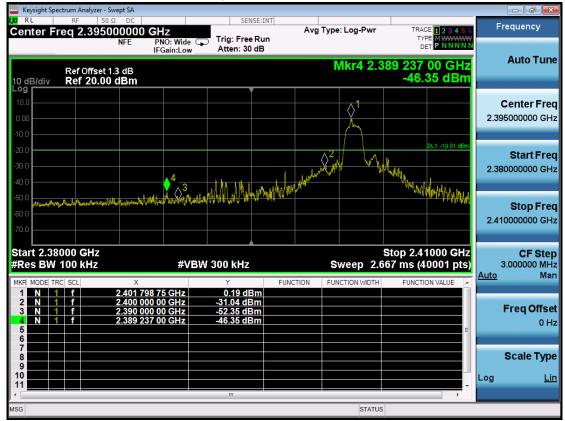




- F <mark>-</mark> ×								rum Analyzer - Sw	
Frequency	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNN	Log-Pwr	Avg Type			Hz NO:Fast ⊂ Gain:Low	NFE P	RF 50 Ω cq 17.5000	XI RL Center F
Auto Tune	4.082 750 GHz -52.48 dBm	Ref Offset 1.3 dB 0 dB/div Ref 20.00 dBm							
Center Fre 17.500000000 GH									10.0
Start Free 10.000000000 GH									-10.0
Stop Free 25.000000000 GH	DL1 -19.15 dBm								30.0
CF Step 1.500000000 GH <u>Auto</u> Mar	1								-40.0
Freq Offse 0 H		and a second	a din ter _{bise d} aktor yang seben kang s	The second second	la contra por contra di partico da la contra da la contra Contra da contra da contra da contra da contra da la contra da contra da contra da contra da la contra da contra	ne provinsk krystaljy dagenisti stranjenska		And the second	-60.0
Scale Type	310p 23.000 3112								-70.0 Start 10.0
	67 ms (40001 pts)	status	S		300 kHz	#VBW		00 kHz	#Res BW

Total Quality. Assured.

$\pi/4$ DQPSK Channel- L

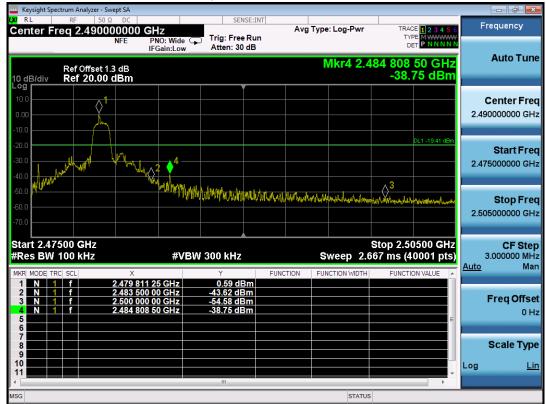




Total Quality. Assured.

🔤 Keysight Spectrum Analyzer - Swept	SA				
X RL RF 50 Ω Center Freq 6.205000 NF	E PNO: Fast 😱 🗖	g: Free Run	g Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	Frequency
Ref Offset 1.3 d 10 dB/div Ref 20.00 dB	B	ten: 30 dB	Mkr1	4.803 70 GHz -51.23 dBm	Auto Tune
10.0					Center Freq 6.205000000 GHz
-10.0					Start Freq 2.410000000 GHz
-20.0				DL1 -19.81 dBm	Stop Freq 10.000000000 GHz
-40.0	1				CF Step 759.000000 MHz <u>Auto</u> Man
-50.0		na lika kana da sa kana kana kana kana kana kana kana		pp a line filter on the same of the state of the state of the same	Freq Offset 0 Hz
-70.0				Stop 10.000 GHz	Scale Type
#Res BW 100 kHz	#VBW 300	kHz	Sweep 26.6	7 ms (40001 pts)	





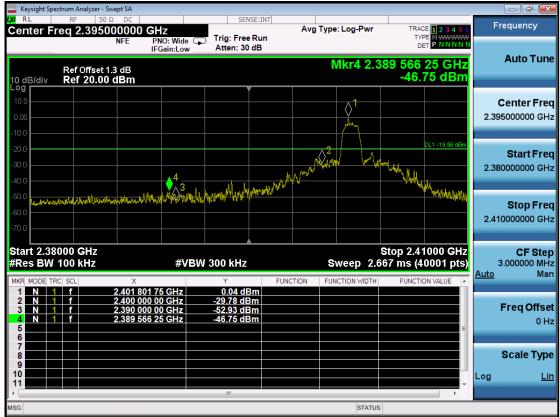
	ectrum Analyzer - Swept					
Center F	RF 50 Ω req 1.237504 NF	500 GHz E PNO: Fast	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr	TRACE 123456 TYPE M WWWWW DET P N N N N N	Frequency
10 dB/div	Ref Offset 1.3 d Ref 20.00 dB	IFGain:Low	Atten: 30 db	Mk	r1 2.474 38 GHz -43.35 dBm	Auto Tune
10.0						Center Fred 1.237504500 GHz
-10.0						Start Fred 9.000 kH
-20.0					DL1 -19.41 dBm	Stop Free 2.475000000 GH:
-40.0					1	CF Step 247.499100 MH <u>Auto</u> Mar
	n Marya (Hurdan marina si marina) (Hurdan marina Marina da mang di Kang manana di Kamata da marina d	ng na ang at gun ga ang ang ang ang ang ang ang ang ang	(द्युं गुरुषु १९९४ म् १९९४ त्या विश्व प्रतार विश्व प्रतार विश्व प्रतार विश्व प्रतार विश्व प्रतार विश्व प्रतार व स्वतंत्र प्रतार क्रम्प्स क्रम्प	alle f se all second faite and fait generalized a second fait a company and a state of the second fait of the second second second second second second second second second	edig ting providence and the fill of the second second	Freq Offse 0 H:
-70.0						Scale Type
Start 9 kH #Res BW		#VBW	300 kHz	Sweep 1	Stop 2.475 GHz 0.67 ms (40001 pts)	Log <u>Lir</u>
MSG				STATU	JS	

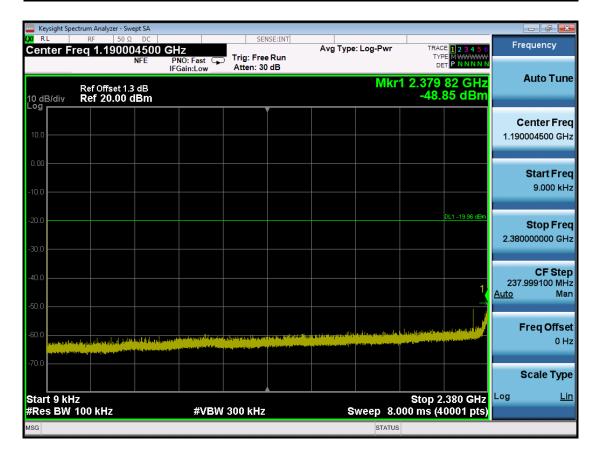
Total Quality. Assured.

		trum Analyzer - S									
<mark>⊮</mark> ⊓ Cer		RF 50 9				NSE:INT	Avg Type	: Log-Pwr		DE 1 2 3 4 5 6 PE M WWWW	Frequency
	B/div	Ref Offset 1 Ref 20.00	.3 dB	PNO: Fast 🖵 IFGain:Low	Atten: 3			Mk	□ r1 4.959	61 GHz 45 dBm	Auto Tune
Log 10.0						•					Center Freq 6.252500000 GHz
0.00 -10.0											Start Freq 2.505000000 GHz
-20.0 -30.0										DL1 -19.41 dBm	Stop Freq 10.000000000 GHz
-40.0 -50.0				↓ ¹							CF Step 749.500000 MHz <u>Auto</u> Mar
-60.0	Line base				a Hartsbergen († 1996) 1995 - Henrik Henry, 1997	a the balance and the second	a an		r fa bayiye dha baad	e fordinal _{e la c} ontra d ^{an} tria y e 1 al envenen per t ^{a della tra da}	Freq Offset 0 Hz
-70.0											Scale Type
	rt 2.505 s BW 1	GHz 00 kHz		#VBW	/ 300 kHz		s	weep 2	Stop 10 6.67 ms (4	.000 GHz 0001 pts)	Log <u>Lin</u>
MSG								STATU	IS		

	ectrum Analyzer - Sw									
Center Fi	RF 50 Ω req 17.5000	000000	GHz		ISE:INT	Avg Type	: Log-Pwr		E 1 2 3 4 5 6	Frequency
			PNO: Fast 🕞 Gain:Low	Trig: Free Atten: 30				DE		
10 dB/div Log	Ref Offset 1.3 Ref 20.00 (Mkr1 2	4.138 2. -52.4	50 GHz 48 dBm	Auto Tune
209										Center Freq
10.0										17.500000000 GHz
0.00										Start Freq
-10.0										10.00000000 GHz
-20.0									DL1 -19.41 dBm	Stop Fred
-30.0										25.00000000 GHz
-40.0										CF Step
									1	1.500000000 GHz <u>Auto</u> Mar
-50.0	المراجع وملاح	Net block	iki ka akisatai da amata.	atanat kuu mikadé	(heles and a street of the	a hadded game of the	Alfa har al al ana ana an	palitication (and the state of the	-	Freq Offset
-60.0	data and the second stands		an a		and the second	i silikiden (n. Konden a	in a state of the second state	sant dirikt für besechtigt som at at	an of a training at	0 Hz
-70.0										Scale Type
Start 10.0	00 CHz			<u> </u>				Stop 25	.000 GHz	Log <u>Lin</u>
#Res BW			#VBW	/ 300 kHz		s	weep 50	.67 ms (4		
MSG							STATUS			

8DPSK Channel- L





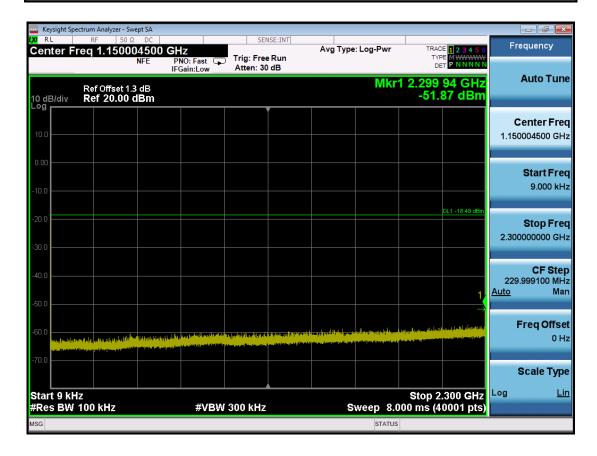


	ectrum Analyzer - Sw				 		-		
Center F	RF 50 Ω req 6.25250	00000 GI	lz		Avg Type	: Log-Pwr		E 1 2 3 4 5 6 E M WWWW	Frequency
10 dB/div Log	Ref Offset 1.3 Ref 20.00	IF B dB	NO: Fast 🕞 Gain:Low	Atten: 30		Mkr	DE 1 4.959		Auto Tune
10.0									Center Freq 6.252500000 GHz
0.00									Start Freq 2.505000000 GHz
-20.0								DL1 -21.77 dBm	Stop Fred 10.000000000 GHz
-40.0			∮ ¹						CF Step 749.500000 MH: <u>Auto</u> Mar
-60.0 (1999) (1997) 170.0		chan Albert Head Anna Ar Tanan ann an Anna Anna Anna Anna Anna An		al Trend Control (1979)	(Martin Connection) (1999) - Antonio Connection (Martine Connection (Martine (Martine Connection (Martine Connection (Martine Connection (Martine Connection (Martine Connection (Martine Con	l y ny polozie (bisto Na zaklada (bisto)	alugunga na ^{lan} anang Banggan ^{dalama} nanga	na na mana amin'na fan an a	Freq Offsel 0 Hz
Start 2.50	15 GHz						Stop 10	.000 GHz	Scale Type
#Res BW			#VBW	/ 300 kHz	s	weep 26.	.67 ms (4		
MSG					 	STATUS			

	ectrum Analyzer - Sv										t X
Center F	8F 50 s req 17.500	000000 G	iHz		NSE:INT	Avg Type	: Log-Pwr		E 1 2 3 4 5 6	Frequen	су
		NFE P	NO: Fast 🕞 Gain:Low	Trig: Free Atten: 30				DE			
10 dB/div Log	Ref Offset 1. Ref 20.00						Mkr1 2	23.665 7 -52.2	50 GHz 21 dBm	Auto	Tune
-09				,						Center	r Freq
10.0										17.5000000	00 GHz
0.00											tFreq
-10.0										10.0000000	JU GHZ
-20.0									DL1 -23.85 dBm	· · · · · · · · · · · · · · · · · · ·	o Freq
-30.0										25.00000000	00 GHz
-40.0											Step
-50.0									▲1	1.50000000 <u>Auto</u>	00 GHz Man
	Lines - Landa Marak I m.,	مىللەردەر يار	lander and see a strategic of the	للاساناني ورايتون		adaha jina a			at interaction	Freg	Offeet
-60.0		la pina peri	Canadid Managarian and a	and the second	and a second	and Witten and Adda .	and the second	, maa İldəni mətdə ilə ərədi tərəkə	ahin history and a second s	Trequ	0 Hz
-70.0										Scale	туре
Start 10.0								Stop 25	000 GHz	Log	Lin
#Res BW	100 kHz		#VBW	300 kHz		S	weep 50).67 ms (4	0001 pts)		
Mod							STATUS	,			

8DPSK Channel- H

	rum Analyzer - Swept S	A					- F ×
Center Fre	q 2.490000		SENSE:	Avg	Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE MWWWW	Frequency
	Ref Offset 1.3 dl Ref 20.00 dB	IFGain:Low	Atten: 30 dE		Mkr4 2.4	83 500 50 GHz -34.05 dBm	Auto Tune
10.0 0.00 -10.0							Center Freq 2.490000000 GHz
-20.0	marked for	man all a				DL1 -21.77 dBm	Start Freq 2.475000000 GHz
-50.0			All Wald Hill and All Wald and a second	HyM/III.hathyboger, switterson	Marcaded Analytics (Second Second	den Serendelte ter en de la destante	Stop Freq 2.505000000 GHz
Start 2.475 #Res BW 1	00 kHz	#V × 79 856 25 GHz	BW 300 kHz Y -1.77 dBm	FUNCTION	Sweep 2.6	Stop 2.50500 GHz 67 ms (40001 pts) FUNCTION VALUE	CF Step 3.000000 MHz <u>Auto</u> Man
2 N 1 3 N 1 4 N 1 5 6	f 2.5	83 500 00 GHz 00 000 00 GHz 83 500 50 GHz	-34.06 dBm -54.94 dBm -34.05 dBm				Freq Offset 0 Hz
7 8 9 10 11							Scale Type Log <u>Lin</u>
MSG			m		STATUS	•	



Total Quality. Assured.

		um Analyzer - Sw										
(XI R Cen	-	RF <u>50 Ω</u> q 6.25250				ISE:INT	Avg Type	: Log-Pwr	TRAC	E 1 2 3 4 5 6	F	requency
40.4		Ref Offset 1.3 Ref 20.00 (IF 3 dB	NO: Fast 🕞 Gain:Low	Trig: Free Atten: 30			Mk	r1 4.959			Auto Tune
10.0	B/div											Center Freq 52500000 GHz
0.00 -10.0											2.50	Start Freq 05000000 GHz
-20.0 -30.0										DL1 -21.77 dBm	10.00	Stop Freq 00000000 GHz
-40.0 -50.0				↓1							749 <u>Auto</u>	CF Step 9.500000 MHz Man
-60.0	antalian yaƙƙƙ		an ya afala barbara da a		a ta ^b inan ka da da wa ya ya ka sa a sa a sa a sa a sa a sa a	a balan da bayan da baharan	ang title _{tanang p} apakan P ^{alantin d} inang nagatan t	l <mark>y han balanta ba</mark>	Alanda (tangkala) Pertanangkalan (tangkala)	n an the photon of the photon		Freq Offset 0 Hz
-70.0												Scale Type
	t 2.505 (s BW 10			#VBW	/ 300 kHz		s	weep 2	Stop 10 6.67 ms (4	.000 GHz 0001 pts)	Log	<u>Lin</u>
MSG								STATU	JS			



Hopping

		t Spect	rum /	Analyzer - Sv	vept SA									×
<mark>w</mark> ℝ Cen		Fre	RF PC	50 s 2.4000	00000 G			NSE:INT	Avg Typ	e: Log-Pwr	TRA	CE 123456	F	requency
10 d	B/di	V		Offset 1. f 20.00	3 dB	PNO: Fast IFGain:Low	Atten: 3			Mkr6	2.484 1	40 GHz 23 dBm		Auto Tune
Log 10.0 0.00 -10.0														Center Freq 00000000 GHz
-20.0 -30.0 -40.0							43	12		Tuluran (tál-títa)		DL1 -18.48 dBm	2.30	Start Freq 00000000 GHz
-50.0 -60.0 -70.0													2.50	Stop Freq
Star #Re	s B	W 1	00			#VE	300 kHz			Sweep 2.	667 ms (4	5000 GHz 0001 pts)	2 <u>Auto</u>	CF Step 0.000000 MHz Man
MKR	MODE	1 RC	SCL		X 2 410 1	60 GHz	۲ 1.52 d		CTION FL	JNCTION WIDTH	FUNCT	ON VALUE		
2 3 4 5	N N N N	1 1 1	f f f		2.400 0 2.390 0 2.388 0 2.483 5	000 GHz 000 GHz 080 GHz 500 GHz	-46.94 d -51.88 d -48.25 d -50.52 d	Bm Bm Bm Bm				=		Freq Offset 0 Hz
6 7 8 9	N	1	f		2.484 1	I40 GHz	-49.23 d	Bm						Scale Type
10												-	Log	Lin
•							m					E E		
MSG			-							STATU	s			





		ctrum Analyzer -										
(X/ R Cen		RF 50 eq 6.250	ΩΩ 000000	GHz		NSE:INT	Avg Type	: Log-P	wr TRA		Fr	equency
10 di Log	B/div	Ref Offset Ref 20.0	NFE 1.3 dB 0 dBm	PNO: Fast G	Trig: Free Atten: 30			M	kr1 4.901	69 GHz 86 dBm		Auto Tune
10.0												Center Freq 0000000 GHz
0.00 -10.0											2.50	Start Freq 0000000 GHz
-20.0 -30.0										DL1 -23.85 dBm	10.00	Stop Freq 0000000 GHz
-40.0 -50.0											750 <u>Auto</u>	CF Step 0.000000 MHz Man
-60.0 -70.0	ya Mariatay I.				a de la parte d La parte de la p	an Malana an Angelan Angelan Manana ang kanana Ang	ang santa ta sa _{ta} panta ta	an a		n Milling Landson.		Freq Offset 0 Hz
												Scale Type
	t 2.50 s BW	0 GHz 100 kHz		#VBW	/ 300 kHz		s	weep	Stop 10 26.67 ms (4	0000 GHz 00001 pts)	Log	<u>Lin</u>
MSG								ST	ATUS			

	ectrum Analyzer - Sw									
Center F	RF 50 Ω req 17.5000	000000	GHz PNO: Fast	Trig: Free		Avg Type	: Log-Pwr	TYPE	123456 M WWWW	Frequency
10 dB/div	Ref Offset 1.3 Ref 20.00 (IF B dB	Gain:Low	Atten: 30	dB		Mkr1 2	24.224 87	75 GHz 0 dBm	Auto Tu
10.0										Center Fr 17.500000000 G
-10.0										Start Fr 10.000000000 G
-20.0								C	9 <u>L1 -21.77 d</u> Bm	Stop Fr 25.000000000 G
-40.0									1	CF St 1.500000000 G <u>Auto</u> M
-50.0	s fa belg or for every good by boy by a		A post house propagations Provid Million (second page	a dissind property (Chedre 1999 (Internal) Ind. a conditional 1999 (Internal) Ind. a conditional		a Districting of proving a	n an	yngdyng (U <mark>ngnyng)</mark> ur geddingdeigenen (indegene <mark>alle blever</mark> t. Mår flevere av andere av	Freq Offs 0
-70.0								0 ton 25		Scale Ty
Start 10.0 #Res BW			#VBW	300 kHz		S	weep 50	Stop 25.0 .67 ms (40		
MSG							STATUS			

FCC ID: Y2SLTH310 IC: 9452A-LTH310



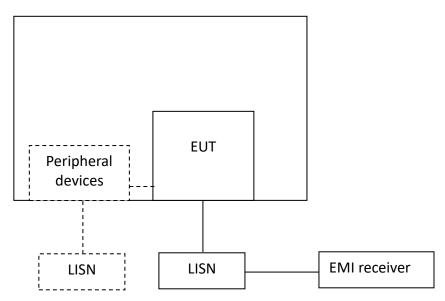
8 Power line conducted emission

Test result: Pass

8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)					
	QP	AV				
0.15-0.5	66 to 56*	56 to 46 *				
0.5-5	56	46				
5-30	60	50				
* Decreases with the logarithm of the frequency.						

8.2 Test configuration



For table top equipment, wooden support is 0.8m height table

For floor standing equipment, wooden support is 0.1m height rack.



8.3 Test procedure and test set up

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

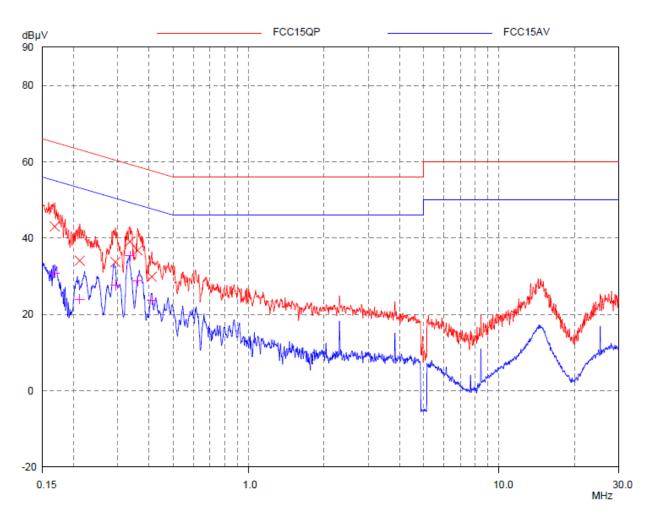
Total Quality. Assured.

intertek

8.4 Test protocol

Temperature:	22 °C
Relative Humidity:	52 %

L line

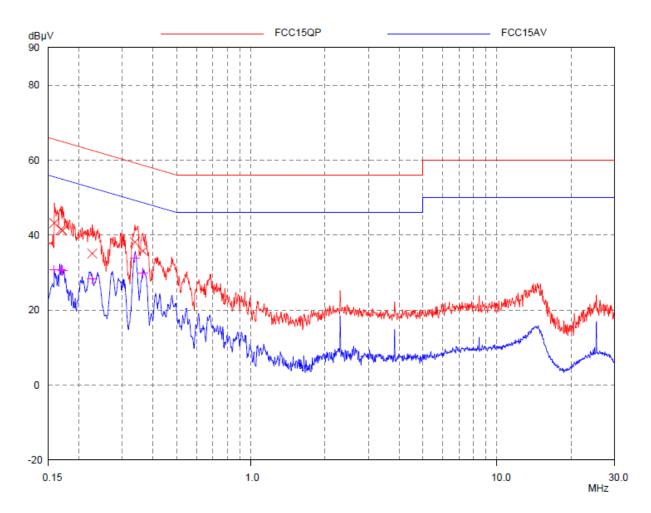


Test Data:

	(Quasi-peak		Average		
Frequency (MHz)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)
0.17	43.03	65.07	22.04	30.85	55.07	24.22
0.21	34.08	63.15	29.07	24.01	53.15	29.14
0.29	33.75	60.43	26.68	27.73	50.43	22.7
0.33	39.09	59.34	20.25	35.38	49.34	13.96
0.36	36.75	58.74	21.99	28.81	48.74	19.93
0.41	29.88	57.64	27.76	23.78	47.64	23.86
Note: All possible modes of operation were investigated. Only the worst case emissions measured.						







Test Data:

	(Quasi-peak		Average		
Frequency (MHz)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)
0.16	43.22	65.54	22.32	30.70	55.54	24.84
0.17	41.54	65.01	23.47	30.77	55.01	24.24
0.17	41.22	64.91	23.69	30.54	54.91	24.37
0.23	35.09	62.59	27.50	28.29	52.59	24.30
0.34	38.12	59.27	21.15	33.97	49.27	15.30
0.36	35.79	58.64	22.85	29.90	48.64	18.74
Note: All possible modes of operation were investigated. Only the worst case emissions measured.						



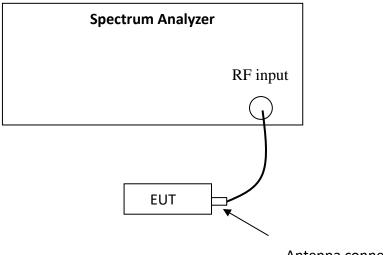
9 Number of Hopping Frequencies

Test result: Pass

9.1 Limit

Number of Hopping Frequencies in the 2400-2483.5 MHz band shall use at least 15 channels.

9.2 Test Configuration



Antenna connector

9.3 Test procedure and test setup

The channel number per FCC 15.247(a)(1)(iii) is measured using the Spectrum Analyzer with RBW=100kHz, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold. The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

9.4 Test protocol

Temperature	:	25 °C
Relative Humidity	:	55 %

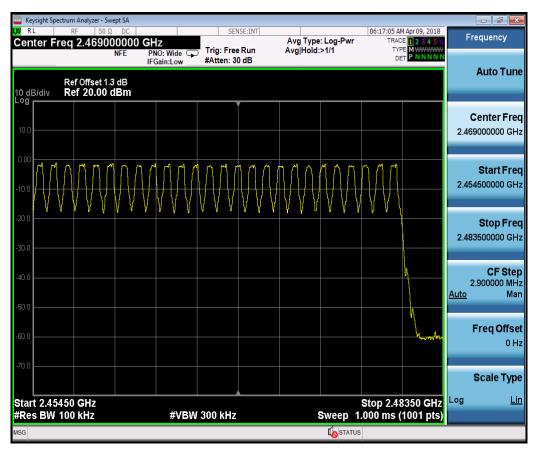
Channel Number	Limit	
79	≥15	

Total Quality. Assured.

Keysight Spectrum Analyzer - Swept S/				
KF 50 Ω D Center Freq 2.4417500	000 GHz	Avg Type: Log-Pwr	06:13:56 AM Apr 09, 2018 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 1.3 dB 10 dB/div Ref 20.00 dBr	PNO: Fast Irig: Free IFGain:Low #Atten: 30		TYPE MWWWW DET PNNNNN	Auto Tune
10.0				Center Freq 2.441750000 GHz
			1000110011001000 111111111111111111111	Start Freq 2.400000000 GHz
-30.0				Stop Freq 2.483500000 GHz
-40.0				CF Step 8.350000 MHz <u>Auto</u> Man
-60.0				Freq Offset 0 Hz
-70.0				Scale Type
Start 2.40000 GHz #Res BW 100 kHz	#VBW 300 kHz	Sweep 1	Stop 2.48350 GHz .000 ms (1001 pts)	
MSG				

Keysight Spectrum Analyzer - Swept SA				
RL RF 50 Ω DC Center Freq 2.413250000 Center Freq 7.4132500000 Center Freq 7.4132500000	GHz SENSE:INT	Avg Type: Log-Pwr	06:14:59 AM Apr 09, 2018 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 1.3 dB	PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB	Avg Hold:>1/1	TYPE MWWWW DET PNNNN	Auto Tune
10.0				Center Freq 2.413250000 GHz
-10.0	VVVVV			Start Freq 2.400000000 GHz
-20.0				Stop Freq 2.426500000 GHz
-40.0				CF Step 2.650000 MHz <u>Auto</u> Man
-60.0				Freq Offset 0 Hz
				Scale Type
Start 2.40000 GHz #Res BW 100 kHz	#VBW 300 kHz	Sweep_1	Stop 2.42650 GHz .000 ms (1001 pts)	Log <u>Lin</u>
MSG				

Key:		Analyzer - Swe F 50 Ω			CEN.	ISE:INT			06:16:02 0	M Apr 09, 2018		- 6 -
		2.44050	0000 G	Hz PNO: Wide 🖵		Run	Avg Type Avg Hold:	: Log-Pwr :>1/1	TRAC	E 1 2 3 4 5 6 E MWWWW T P N N N N N	Fre	equency
0 dB		f Offset 1.3 ef 20.00 d	dB	IFGam:Low	written. or							Auto Tur
og 10.0 -												enter Fre
).00 - 10.0 -											2.426	Start Fr 500000 GI
20.0 - 30.0 -											2.454	Stop Fr 500000 G
0.0											2. <u>Auto</u>	CF St 800000 M M
0.0 -											F	F req Off s 0
0.0												Scale Ty
	2.42650 BW 100			#VBW	300 kHz			Sweep_1	Stop 2.4: .000 m <u>s (</u>	5450 GHz 1001 pts)	Log	L
SG												





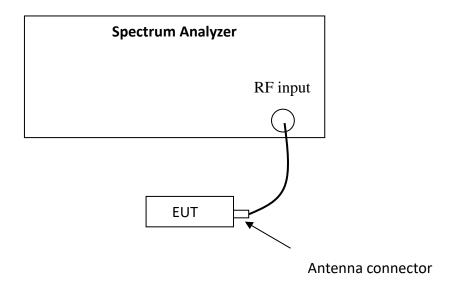
10 Dwell Time

Test result: Pass

10.1 Limit

The dwell time on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

10.2 Test Configuration



10.3 Test procedure and test setup

Dwell time per FCC \$15.247(a)(1)(iii) is measured using the Spectrum Analyzer with Span = 0, RBW=1MHz, VBW≥RBW, Sweep can capture the entire dwell time, Detector = peak, Trace = max hold.

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

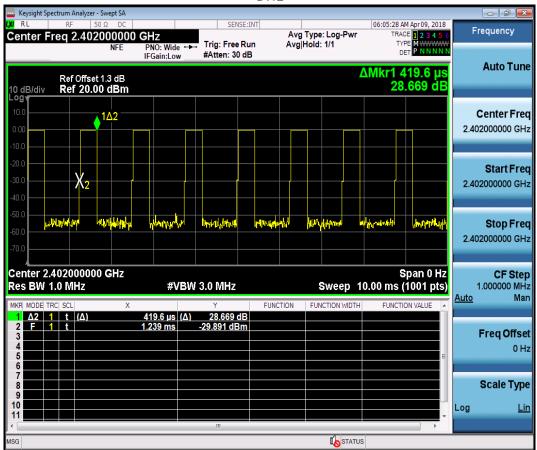
10.4 Test protocol

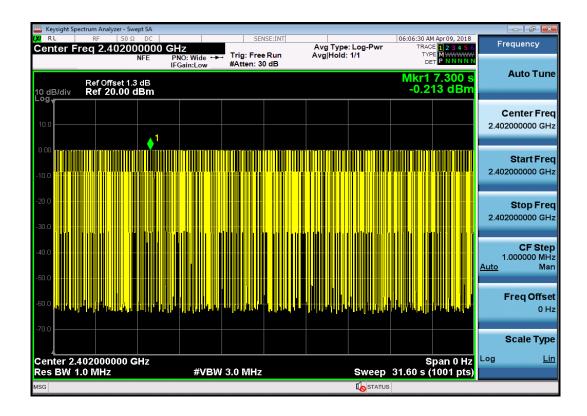
Temperature	:	23 °C
Relative Humidity	:	51 %

Packet	Occupancy time for single hop (ms) O	Real observed period (s) P	Hops among Observed period I	Dwell time (ms) T	Limit (s)
DH1	0.420	31.6	226	94.83	
DH3	1.658	31.6	143	237.14	≤0.4
DH5	2.887	31.6	100	288.71	

Remark: 1. There are 79 channels in all. So the complete observed period P = 0.4 * 79 = 31.6 s.



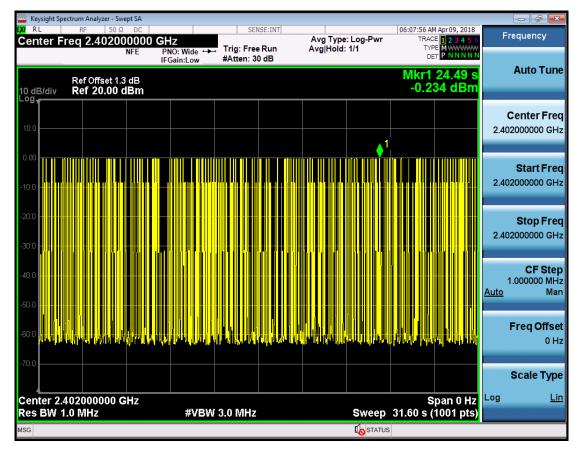




FCC ID: Y2SLTH310 IC: 9452A-LTH310 DH1



			DH3		
	ctrum Analyzer - Swept SA				
Center Fi	RF 50 Ω DC		Avg Type		Apr 09, 2018 1 2 3 4 5 6 Frequency
	NFE	PNO: Wide ↔ Trig: Fre		1/1 TYP	
		IFGain:Low #Atten:		ΔMkr1 1.	Auto Tune
10 dB/div	Ref Offset 1.3 dB Ref 20.00 dBm				.548 dB
10.0		1Δ2			Center Freq
0.00					2.402000000 GHz
-10.0					
-20.0					Start Freq
-30.0	X2				2.402000000 GHz
-40.0	7 12				2.402000000 0112
-50.0					
-60.0	Sur Malinus	www.	Jun Walant	hutte	
-70.0					2.402000000 GHz
Center 2.4 Res BW 1	402000000 GHz	#VBW 3.0 MH;		S) Sweep 10.00 ms	pan 0 Hz CF Step 1001 pts) 1.000000 MHz
				· · ·	Auto Man
	t (Δ)	1.658 ms (Δ) 29.548		CTION WIDTH FUNCTIO	
2 F 1 3	t	1.618 ms -29.838 d	Bm		Freq Offset
4					0 Hz
5 6					
7					Scale Type
9					
10					Log <u>Lin</u>
•				-	
MSG				STATUS	



FCC ID: Y2SLTH310 IC: 9452A-LTH310



	Dł	45	
Keysight Spectrum Analyzer - Swept SA K RL RF S0 Ω DC	OFNICE JUIT	00-00-00 AM AT-00-00	
Center Freq 2.402000000 NFE	GHz PNO: Wide ↔ Trig: Free Run IFGain:Low #Atten: 30 dB	06:08:20 AM Apr 09, 20 Avg Type: Log-Pwr TRACE 12 3 4 Avg Hold: 1/1 TYPE M DET P	Frequency
Ref Offset 1.3 dB 10 dB/div Ref 20.00 dBm		ΔMkr1 2.887 m -0.014 d	
10.0 0.00	X2	1Δ2	Center Freq 2.402000000 GHz
-20.0			Start Freq 2.402000000 GHz
-50.0 -60.0 -70.0	alumini.	djurrigenigen	Stop Freq 2.402000000 GHz
Center 2.402000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Span 0 - Sweep 10.00 ms (1001 pt	IZ CF Step s) 1.000000 MHz Auto Man
MKR MODE TRC SCL X 1 A2 1 t (A) 2 F 1 t	2.887 ms (Δ) -0.014 dB 4.286 ms -0.317 dBm	JNCTION FUNCTION WIDTH FUNCTION VALUE	
2 F 1 C 3 4 5 6	4.200 ms -0.317 dBm		Freq Offset 0 Hz
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9			Scale Type
	m		Log <u>Lin</u>
MSG		I STATUS	

