	FCC TEST REPORT
	FOR
SI	nenzhen Linpa Technology Co.,Ltd
	Bluetooth Speaker
	Test Model: LBS63
	Additional model: LBT503
Prepared for Address	 Shenzhen Linpa Technology Co.,Ltd 114,C8, Flavor Commercial Street, Vanke Dream Town Longgang District,Shenzhen City, China
Prepared by Address Tel Fax Web Mail	 Shenzhen LCS Compliance Testing Laboratory Ltd. 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China (+86)755-82591330 (+86)755-82591332 www.LCS-cert.com webmaster@LCS-cert.com
Date of receipt of test sample Number of tested samples Sample number Date of Test Date of Report	 May 23, 2016 1 16051613 May 23, 2016~May 25, 2016 May 25, 2016

This report shall not be reproduced except in full, without the written approval of Shenzhen LCS Compliance Testing Laboratory Ltd. Page 1 of 46 SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: GTOLBS63 Report No.: LCS1605161229E

	FCC TEST REPORT	
I	FCC CFR 47 PART 15 C(15.247): 201	15
Report Reference No	: LCS1605161229E	
Date of Issue	: May 25, 2016	
Testing Laboratory Name	: Shenzhen LCS Compliance Tes	sting Laboratory Ltd.
Address	: 1/F., Xingyuan Industrial Park, T Bao'an District, Shenzhen, Guang	5
Testing Location/ Procedure	: Full application of Harmonised s	tandards
	Partial application of Harmonised	d standards \Box
	Other standard testing method \square]
Applicant's Name	: Shenzhen Linpa Technology Co	o.,Ltd
Address	: 114,C8, Flavor Commercial Stree Longgang District,Shenzhen City	<i>c</i>
Test Specification		
Standard	: FCC CFR 47 PART 15 C(15.247): 2015 / ANSI C63.10: 2013
Test Report Form No.	: LCSEMC-1.0	
TRF Originator	: Shenzhen LCS Compliance Testi	ng Laboratory Ltd.
Master TRF	: Dated 2011-03	
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Shenzhen LCS Compliance Tes of the material. Shenzhen LCS	uced in whole or in part for non-comm sting Laboratory Ltd. is acknowledged Compliance Testing Laboratory Ltd. ta nages resulting from the reader's interp ad context.	as copyright owner and source kes no responsibility for and
Test Item Description	: Bluetooth Speaker	
Trade Mark	: LIMITED TOO/ Linpa World	
Test Model	: LBS63	
Ratings	: DC 12V,1A by adapter	
	Adapter input: 100-240VAC, 50/	60Hz, 0.5A
	Adapter output: 12VDC, 1A	
Result	: Positive	
Compiled by:	Supervised by:	Approved by:

Calvin Weng

à

Calvin Weng / Administrators

Glin Lu/ Technique principal

Gavin Liang/ Manager

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	SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.	FCC ID: GTOLBS63	Report No.: LCS1605161229E
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FCC -- TEST REPORT

Test Report No. : LCS1605161229E

May 25, 2016 Date of issue

Test Model	: LBS63
EUT	: Bluetooth Speaker
	: Shenzhen Linpa Technology Co.,Ltd
Address	: 114,C8, Flavor Commercial Street, Vanke Dream Town
	Longgang District, Shenzhen City, China
Telephone	:/
Fax	:/
Manufacturer	: LINPA WORLD., Ltd
	: Rm C of 3rd floor, B building, No. 178 Jiaozhong Road, Shigu
	Bridge, Tangxia, Dongguan, Guangdong
Telephone	
Fax	
Г ал	. /
Factory	: Auto Medium Limited
	: Rm C of 3rd floor, B building, No. 178 Jiaozhong Road, Shigu
	Bridge, Tangxia, Dongguan, Guangdong
Telephone	
Fax	

Test Result Positive

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: GTOLBS63 Report No.: LCS1605161229E

Revision History

Revision	Issue Date	Revisions	Revised By
00	2016-05-25	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT	:	Bluetooth Speaker
Test Model	:	LBS63
Additional Model	:	LBT503
Model Declaration	:	PCB board, structure and internal of the related model(s) are the same, So no additional models were tested.
Hardware Version	:	BLF-SG-V15-160426
Software Version	:	BLF-SG-V25-160419
Power Supply	:	DC 12V,1A by adapter
		Adapter input: 100-240VAC, 50/60Hz, 0.5A
		Adapter output: 12VDC, 1A
Bluetooth Technology	:	
Frequency Range	:	2402.00-2480.00MHz
Channel Spacing	:	1MHz for Bluetooth V2.1+EDR (DSS)
Channel Number	:	79 channels for Bluetooth V2.1+EDR (DSS)
Modulation Type	:	GFSK, $\pi/4$ -DQPSK for Bluetooth V2.1 (DSS)
Bluetooth Version	:	V2.1+EDR
Antenna Description	:	PCB Antenna, 0dBi (Max.)

1.2 Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate

1.3 External I/O

I/O Port Description	Quantity	Cable
DC power Port	1	1.5m

1.4 Description of Test Facility

CNAS Registration Number. is L4595.

FCC Registration Number. is 899208.

Industry Canada Registration Number. is 9642A-1.

VCCI Registration Number. is C-4260 and R-3804.

ESMD Registration Number. is ARCB0108.

UL Registration Number. is 100571-492.

TUV SUD Registration Number. is SCN1081.

TUV RH Registration Number. is UA 50296516-001

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Cal Date	Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	June 18,2015	June 17,2016
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	July 16,2015	July 15,2016
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	June 18,2015	June 17,2016
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	June 18,2015	June 17,2016
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	June 18,2015	June 17,2016
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	June 18,2015	June 17,2016
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-1GHz 3m	June 18,2015	June 17,2016
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHzz	June 18,2015	June 17,2016
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	July 16,2015	July 15,2016
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16,2015	July 15,2016
Spectrum Analyzer	Agilent	E4407B	MY41440292	9k-26.5GHz	July 16,2015	July 15,2016
MAX Signal Analyzer	Agilent	N9020A	MY50510140	20Hz~26.5GHz	Oct. 27, 2015	Oct. 26, 2016
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	June 18,2015	June 17,2016
By-log Antenna	SCHWARZBECK	VULB9163	9163-470	30MHz-1GHz	June 10,2015	June 09,2010
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	June 10,2015	June 09,2016
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz-40GHz	June 10,2015	June 09,2016
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	June 18,2015	June 17,2016
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	June 18,2015	June 17,2016
Power Meter	R&S	NRVS	100444	DC-40GHz	June 18,2015	June 17,2016
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	June 18,2015	June 17,2016
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	June 18,2015	June 17,2016
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	June 18,2015	June 17,2016
RF CABLE-2m	JYE Bao	RG142	CB035-2m	20MHz-1GHz	June 18,2015	June 17,2010

1.6 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 LCS 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.

1.7 Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty		9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
	:	200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	3.80dB	(1)
		26.5GHz~40GHz	3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.8 Description of Test Modes

Bluetooth operates in the unlicensed ISM Band at 2.4GHz. With the introduction of the enhanced data rate (EDR) feature, the data rates can be up to 3 Mb/s. An increase in the peak data rate beyond the basic rate of 1 Mb/s is achieved by modulating the RF carrier using GFSK techniques, resulting in an increase of two to three times the number of bits per symbol. The 2 Mb/s EDR packets use a π /4-DQPSK modulation and the 3 Mb/s EDR packets use 8DPSK modulation. The following operating modes were applied for the related test items. For radiated measurement, the test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position. All test modes were tested, only the result of the worst case was recorded in the report.

Mode of Operations	Freque	ncy Range	Data Rate
_	(N	/Hz)	(Mbps)
	2	402	1
GFSK	2	441	1
	2	480	1
	2	402	2
$\pi/4$ DQPSK	2441		2
	2	480	2
H	For Conduct	ed Emission	
Test Mode		Т	TX Mode
	For Radiate	d Emission	
Test Mode		Г	TX Mode

For pre-testing, when performed with AC ADAPTER, the input Voltage/Frequency AC 120V/60Hz and AC 240V/60Hz were used. Only recorded the worst case in this report.

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 (1Mbps-Hopping Mode).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be TX(2Mbps-Mid Channel).

***Note: Using a temporary antenna connector for the EUT when conducted measurements are performed.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013, FCC CFR PART 15C 15.207, 15.209, 15.247 and DA 00-705.

2.1 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.

2.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C.

2.3 General Test Procedures

2.3.1 Conducted Emissions

According to the requirements in Section 6.2 of ANSI C63.10: 2013, AC power-line conducted emissions shall be measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table and 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

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a continuous transmits condition.

3.2 EUT Exercise Software

N/A.

3.3 Special Accessories

N/A.

3.4 Block Diagram/Schematics

Please refer to the related document.

3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6 Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

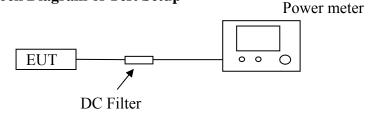
Арр	lied Standard: FCC Part 15 Subpart C	
FCC Rules	Description of Test	Result
§15.247(b)(1)	Maximum Conducted Output Power	Compliant
§15.247(a)(1)	Frequency Separation And 20 dB Bandwidth	Compliant
§15.247(a)(1)(iii)	Number Of Hopping Frequency	Compliant
§15.247(a)(1)(iii)	Time Of Occupancy (Dwell Time)	Compliant
§15.209, §15.247(d)	Radiated and Conducted Spurious Emissions	Compliant
§15.205	Emissions at Restricted Band	Compliant
§15.207(a)	Line Conducted Emissions	Compliant
§15.203	Antenna Requirements	Compliant

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5. ANTENNA PORT MEASUREMENT

5.1 Conducted Peak Output Power

5.1.1 Block Diagram of Test Setup



5.1.2 Limit

According to §15.247(b)(1), 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: 1watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

5.1.3 Test Procedure

The transmitter output is connected to the Power Meter.

5.1.4 Test Results

Mode	Frequency (MHz)	Output Power (dBm, Peak)	Limit (dBm)	Result
	2402	-3.61	30	Pass
GFSK	2441	-3.21	30	Pass
	2480	-3.59	30	Pass
-/4	2402	-3.15	21	Pass
$\pi/4$	2441	-2.73	21	Pass
DQPSK	2480	-3.09	21	Pass

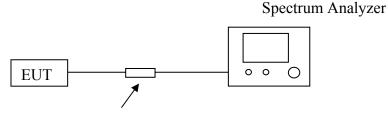
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5.2 Frequency Separation and 20 dB Bandwidth

5.2.1 Limit

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

5.2.2 Block Diagram of Test Setup



DC Filter

5.2.3 Test Procedure

A. Place the EUT on the table and set it in transmitting mode.

- B. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
- C. Set to the maximum power setting and enable the EUT transmit continuously.
- D. For carrier frequency separation measurement, use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels; RBW / VBW=100 KHz/ 300KHz; Sweep = auto; Detector function = peak; Trace = max hold.

 E. For 20dB bandwidth measurement, use the following spectrum analyzer settings: Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW/VBW=30 KHz/ 100KHz; Sweep = auto; Detector function = peak; Trace = max hold.

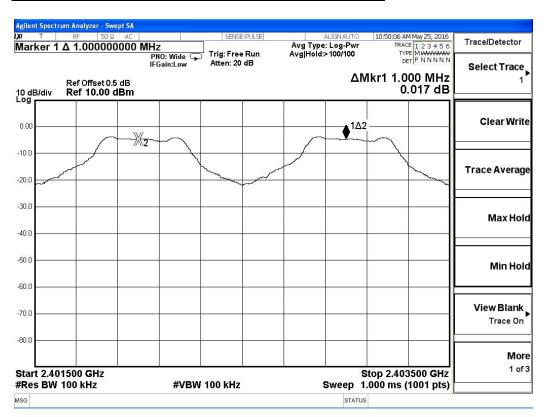
5.2.4 Test Results

	The Measurement Result With 1Mbps For GFSK Modulation									
20dB Bandwidth Measurement										
C	Channel20dB Bandwidth (MHz)Limit									
	Low	().896	Non-spe	ecified					
l	Middle	ldle		Non-spe	vecified					
	High	().890	Non-specified						
	Cl	hannel Separa	tion Measurement	t						
Channel	Channel Separ	ation (MHz)	Limit (MHz)		Result					
Low	1.00	0	>=0.549		Pass					
Middle	1.000		>=0.556		Pass					
High	1.00	0	>=0.555		Pass					

T	The Measurement Result With 2Mbps For $\pi/4$ DQPSK Modulation									
20dB Bandwidth Measurement										
C	hannel	20dB Ban	dwidth (MHz)	Lin	nit					
	Low]	1.256	Non-spe	ecified					
l	Middle]	.260 Non-sp		ecified					
	High]	1.260	Non-spe	ecified					
	Cl	nannel Separa	tion Measuremen	t						
Channel	Channel Separ	ation (MHz)	Limit (N	IHz)	Result					
Low	1.00	0	>=0.758		Pass					
Middle	1.000		>=0.755		Pass					
High	1.00	0	>=0.7:	56	Pass					

The test data refer to the following page.

For Frequency Separation Measurement, the Low, Mid and High channels were performed and only recorded the worst test plots for Low in this report.



The Worst Test Plot of Frequency Separation (1Mbps)

Test Plot of Frequency Separation (2Mbps)

Agilent Spectrum A					1	• •				
μαrker 1 Δ΄	າະ 1.0000000	000 MHz	2 10: Wide 😱	Trig: Free			ALIGN AUTO :: Log-Pwi >100/100	TRAC	M May 25, 2016 ^{3E} 1 2 3 4 5 6 ^{PE} M WWWWW T P N N N N N	Trace/Detector
	ef Offset 0.5 ef 10.00 dl	IFO dB	Gain:Low	Atten: 20	dB		Δ	Mkr1 1.0	<u>.</u>	Select Trace
0.00		~ <u>%</u> 2~	\sim				12	12		Clear Write
-10.0									and the second s	Trace Average
-30.0										Max Hold
-50.0										Min Hold
70.0										View Blank Trace On
-80.0	0 GHz							Stop 2.403	3500 GHz	More 1 of 3
#Res BW 100			#VBW	100 kHz)	Sweep	1.000 ms (
MSG							STAT	US		

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Measurement of 20dB Bandwidth

Test frequency: 2402MHz (1Mbps)

LXI T	RF 50 Ω AC		SENSE:PULSE		ALIGN AUTO		M May 25, 2016	Tree	e/Detector
x dB -20	.00 dB		Center Freq: 2.40 Trig: Free Run		ld:>10/10	Radio Sto	l: None	Irac	e/Detector
		#IFGain:Low	#Atten: 20 dB	Avgino	IG.2 10/10	Radio De	vice: BTS		
	/								
10 dB/div	Ref 0.00 dBm								
Log									
-10.0									Clear Write
-20.0				h				1 1	Jicui Mine
-30.0		~		~	h				
-40.0					~~~~				
-50.0						m			Average
-60.0					-	-			
-70.0					-	_		-	
-80.0					-	-			Max Hold
-90.0									Max Hold
								<u> </u>	
	.402 GHz		(1) (m 141 - 4 o				an 3 MHz		
#Res BW	JU KHZ		#VBW 10	UKHZ		Swee	ep 3.2 ms		Min Hold
Occu	pied Bandwidth	1	Tota	Power	3.7	3 dBm			
0000			1-						
	84	42.12 k⊦	12						Detector Peak►
Trans	mit Freq Error	7.410 k	Hz OBV	Power	9	9.00 %		Auto	Man
v dB F	Bandwidth	895.9 k	Hz xdB		-20	.00 dB		-	
AUDE	Janawiath	000.0 1			-20				
MSG					STATU	JS			

Test frequency: 2441MHz (1Mbps)

UT	RF 50 Ω AC			SE:PULSE		ALIGN AUTO		AM May 25, 2016	Trac	e/Detector
Center Fr	eq 2.441000000	GHz	Center F	req: 2.44100 e Run	0000 GHz Avg Hold	>10/10	Radio Sto	l: None	mac	CIDELECTO
		#IFGain:Low	#Atten: 2		0.	u takan	Radio De	vice: BTS		
IO dB/div _og	Ref 0.00 dBm				- 1					
10.0		_	pm	man-						
20.0			\sim		\sim			-		Clear Write
30.0		- Martin		_	- man					
40.0		- man				m				
50.0		_				<u></u>	- Marine	man		Average
60.0										50 -0
70.0		_								
80.0		_								Max Hold
90.0		_								Μάλ Πυιί
Center 2.4								on 2 Mila		
Res BW			#VBW 100 kHz				Span 3 MHz Sweep 3.2 ms			Min Hold
Occup	ied Bandwidth	<u>ו</u>		Total Po	ower	3.89	9 dBm			
1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -	84	13.99 kl	Hz							Detector
										Peak
Transm	nit Freq Error	8.101	kHz	OBW P	ower	99	9.00 %		Auto	Mar
x dB Ba	andwidth	894.4	kHz	x dB		-20.	00 dB			
						STATU				

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	ım Analyzer - Occupied BW									
w, ⊤ Center Fr	RF 50 Ω AC eq 2.480000000	GHz #IFGain:Low	Center F		0000 GHz Avg Holo	ALIGN AUTO d:>10/10	10:46:44 A Radio Std Radio Dev		Trac	e/Detector
10 dB/div	Ref 0.00 dBm									
-10.0 -20.0 -30.0			\sim		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					Clear Write
-30.0						Monora Commo	~~~~	-		Average
-70.0 -80.0 -90.0										Max Hold
Center 2.4 #Res BW			#VE	3W 100 ki	Hz			an 3 MHz p 3.2 ms		Min Hold
Occup	ied Bandwidth 84	, 12.15 ki	H7	Total Po	ower	3.56	ð dBm			Detector
	o- nit Freq Error andwidth	9.107 889.9	kHz	OBW Po x dB	ower		9.00 % 00 dB		Auto	Detector Peak▶ <u>Man</u>
MSG						STATUS	3			

Test frequency: 2480MHz (1Mbps)

Test frequency: 2402MHz (2Mbps)

Agilent Spectrum Analyzer - Occupied B					
ບ T RF 50 Q AC Center Freq 2.402000000	GHz Center	NSE:PULSE Freq: 2.402000000 GHz ree Run Avg Hol : 20 dB	Radio St d:>10/10	AM May 25, 2016 d: None evice: BTS	Trace/Detector
10 dB/div Ref 0.00 dBm Log -10.0 -20.0 -30.0		-			Clear Write
-40.0 -50.0				- marken	Average
-70.0					Max Hold
Center 2.402 GHz #Res BW 30 kHz Occupied Bandwidt		/BW 100 kHz	Si Swe 3.77 dBm	pan 3 MHz ep 3.2 ms	Min Hold
	1542 MHz 7.197 kHz	OBW Power	99.00 %	I	Detector Peak► Auto <u>Man</u>
x dB Bandwidth	1.256 MHz	x dB	-20.00 dB		
MSG			STATUS		

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Agilent Spectrum Analyzer - Occupied						
0,/// Τ RF 50 Ω AC Center Freq 2.44100000	0 GHz Cento Trig:	sense:PULse er Freq: 2.441000000 GHz Free Run Avg Hol n: 20 dB	Radio St d:>10/10	AM May 25, 2016 d: None evice: BTS	Trace/	Detector
10 dB/div Ref 0.00 dBr	n					
-10.0		m			CI	lear Write
-30.0 -40.0 -50.0 -60.0			June	my more thank		Average
-00.0						Max Hold
Center 2.441 GHz #Res BW 30 kHz	#	≇VBW 100 kHz		pan 3 MHz ep 3.2 ms		Min Hold
Occupied Bandwic		Total Power	4.10 dBm			
1 Transmit Freq Error	. 1560 MH z 7.314 kHz	OBW Power	99.00 %		Auto	Detector Peak► <u>Man</u>
x dB Bandwidth	1.260 MHz	x dB	-20.00 dB			
MSG			STATUS		¢	

Test frequency: 2441MHz (2Mbps)

Test frequency: 2480MHz (2Mbps)

Agilent Spectrum Analyzer - Occupi					
0,20 T RF 50 Ω A Center Freq 2.4800000	000 GHz Cen	sense:PULSE tter Freq: 2.480000000 GHz : Free Run Avg Hol en: 20 dB	Radio Sto d:>10/10	AM May 25, 2016 d: None vice: BTS	Trace/Detector
10 dB/div Ref 0.00 dE Log -10.0 -20.0 -30.0	3m				Clear Write
-40.0			human		Average
-70.0					Max Hold
Center 2.48 GHz #Res BW 30 kHz		#VBW 100 kHz	Swee	oan 3 MHz ep 3.2 ms	Min Hold
Occupied Bandw Transmit Freg Error	1.1553 MHz	Total Power OBW Power	4.06 dBm 99.00 %		Detector Peak▶ Auto Man
x dB Bandwidth	1.260 MHz	x dB	-20.00 dB	l	
MSG			STATUS		

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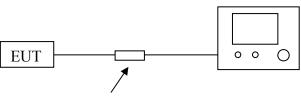
5.3 Number of Hopping Frequency

5.3.1 Limit

According to §15.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

5.3.2 Block Diagram of Test Setup

Spectrum Analyzer



DC Filter

5.3.3 Test Procedure

- A. Place the EUT on the table and set it in transmitting mode.
- B. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
- C. Set Spectrum Analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
- D. Set the Spectrum Analyzer as RBW, VBW=1MHz.
- E. Max hold, view and count how many channel in the band.

5.3.4 Test Results

Test Mode	Measurement Result (No. of Ch)	Limit (No. of Ch)	Result
Hopping(GFSK)	79	≥15	Pass
Hopping(π /4-DQPSK)	79	≥15	Pass

The worst test data refer to the following page.

Marker	10:53:29 AM May 25, 2016 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N	ALIGN AUTO e: Log-Pwr i:>100/100			Hz PNO: Fast 😱	F	κ 50 Ω 78.00000	
Select Marke	78.000 0 MHz 0.072 dB	∆Mkr1			Guineow	dB	ef Offset 0.5 ef 10.00 c	
Norm	102		 		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mm	·····	Kom
De								
Fixed								
c								-
Propertie								
Мо								
1 0	Stop 2.48350 GHz 000 ms (1001 pts)	Sweep 1.	z	1.0 MHz	#VBW			t 2.4000 s BW 1.0

Test Plot For Number of Hopping Channel (GFSK)

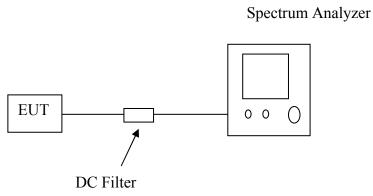
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5.4 Time of Occupancy (Dwell Time)

5.4.1 Limit

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy 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.

5.4.2 Block Diagram of Test Setup



5.4.3 Test Procedure

- A. Place the EUT on the table and set it in transmitting mode.
- B. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
- C. Set center frequency of Spectrum Analyzer = operating frequency.
- D. Set the Spectrum Analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.
- E. Repeat above procedures until all frequency measured were complete.

The Measuremen	nt Result With The Wo	orst Case of 2Mbps F	or π/4-DQPSK	Modulation
Channel	Time of Pulse for 2DH5 (ms)	Period Time (s)	Sweep Time (ms)	Limit (ms)
Low	2.87	31.6	306.13	400
Middle	2.87	31.6	306.13	400
High	2.87	31.6	306.13	400

5.4.4 Test Results

Low Channel

2.87*(1600/6)/79*31.6=307.2ms

Middle Channel

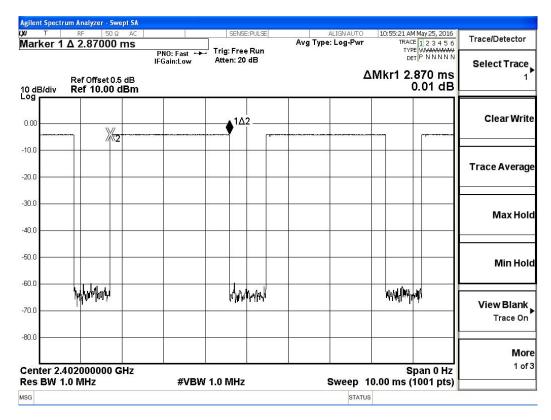
2.87*(1600/6)/79*31.6=304ms

High Channel

2.87*(1600/6)/79*31.6=304ms

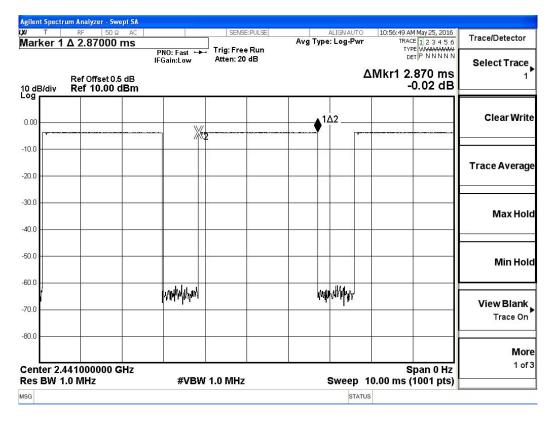
The test data refer to the following:

Low Channel



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Middle Channel



High Channel

Agilent Spectrum Analyzer - Swept SA								
ματία με ματά		SENSE:PULSE	ALIGNAUTO Avg Type: Log-Pwr	10:57:38 AM May 25, 2016 TRACE 1 2 3 4 5 6	Marker			
Ref Offset 0.5 dB 10 dB/div Ref 10.00 dBm	PNO: Fast ↔ IFGain:Low	Trig: Free Run Atten: 20 dB	۵	ΔMkr1 2.870 ms 0.02 dB				
		×2 ····	•1∆2		Norma			
-10.0					Delta			
-30.0					Fixed			
-50.0					Of			
-70.0	Mirhulph	W	adalahan ang ang ang ang ang ang ang ang ang a		Properties			
-80.0 Center 2.480000000 GHz				Span 0 Hz	More 1 of 2			
Res BW 1.0 MHz	#VBW	1.0 MHz	Sweep 1	0.00 ms (1001 pts)				

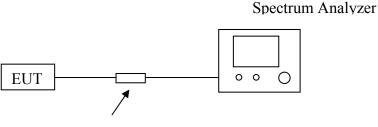
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5.5 Conducted Spurious Emissions and Band Edges Test

5.5.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a)is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see§15.205(c)).

5.5.2 Block Diagram of Test Setup



DC Filter

5.5.3 Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 300 KHz.

Measurements are made over the 9 kHz to 26.5GHz range with the transmitter set to the lowest, middle, and highest channels

5.5.4 Test Results of Conducted Spurious Emissions

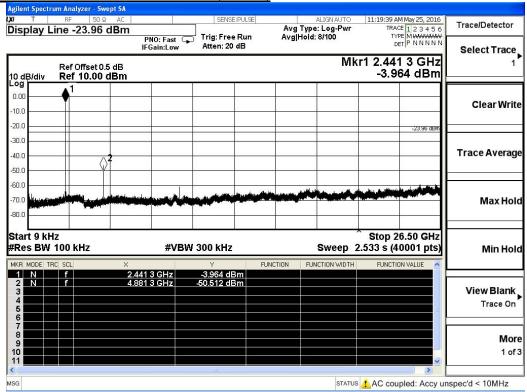
No non-compliance noted. Only record the worst test result (TX- π /4-DQPSK) in this report. The test data refer to the following page.

Test Plot

9KHz-26.5GHz Low Channel (GFSK)

	PNO: Fast C IFGain:Low	Trig: Free R Atten: 20 dE		Hold: 11/100		MWWWWW PNNNNN	
10.00 dBm				Mk	r1 2.402	2 GHz	Select Trace
					-4.30	3 dBm	Clear Wri
						-24.30 dBm	
²							Trace Avera
	www.						Max Ho
Hz	#VB			-	2.533 s (40	001 pts)	Min He
2.40	2 2 GHz 3 8 GHz	-4.303 dBm		FUNCTION WIDTH	FUNCTION	VALUE	View Blan Trace O
							M c 1 c
	× 2.40		× Y 2.402 2 GHz -4.303 dBm	X Y FUNCTION 2.402.2 GHz 4.303 dBm	X Y FUNCTION FUNCTION WIDTH 2402 2 GHz 4.303 dBm	Hz #VBW 300 kHz Sweep 2.533 s (40 X Y FUNCTION FUNCTION WIDTH 2.402.2 GHz -4.303 dBm FUNCTION FUNCTION WIDTH 4.803 8 GHz -44.417 dBm FUNCTION FUNCTION	Z Z <thz< th=""> <thz< th=""> <thz< th=""> <thz< th=""></thz<></thz<></thz<></thz<>

9KHz-26.5GHz Middle Channel (GFSK)



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9KHz-26.5GHz High Channel	(GFSK)

gilent Spectrum Analyze	r - Swept SA 50 Ω AC	SENSE:PI	195	ALIGN AUTO	11:08:52 AM May 25,	2016	
splay Line -24	.27 dBm		Avg T	ype: Log-Pwr old: 29/100	TRACE 1 2 3 TYPE MWM	456	Trace/Detector
	PNO: Fa: IFGain:Lo				DET P N N	NNN	Select Trace
dB/div Ref 10	set 0.5 dB 9.00 dBm			MK	r1 2.480 4 G -4.266 dE		1
0.0						-11	Clear Wri
0.0				_	-24.2	dBm	
0.0							Trace Avera
0.0	\Diamond^2						TTACE AVEIA
1.0				72			
D.O. Hilling and street pointing.	and the second	A March March	الإرتبان الالريان				Max Ho
0.0	-			-		-	
tart 9 kHz				~	Stop 26.50 G	Hz	
Res BW 100 kHz	2 #	VBW 300 kHz		Sweep 2	2.533 s (40001 j	ots)	Min Ho
R MODE TRC SCL	× 2.480 4 GHz	-4.266 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	^	
2 N f	4.959 5 GHz	-49.397 dBm					View Blank
4							Trace Or
							Mo
0						~	1 of
					Tak.	>	
3				STATUS	AC coupled: A	ccy un	specia < 10MHz

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5.5.5 Test Results of Band Edges Test

No non-compliance noted. Only record the worst test result in this report. The test data refer to the following page.

Test Plot

Hopping On - (GFSK)

Trace/Detector	M May 25, 2016 E 1 2 3 4 5 6 E M WWWWWW	TRAC	ALIGN AUTO : Log-Pwr >100/100		E:PULSE		PNO: Fast (α ac dBm	RF 50 Ie -24.33	⊤ olay Li
Select Trace	06 GHz 27 dBm	2.403 9	a tertenoriata			Atten: 20	FGain:Low	IF 1.5 dB	Ref Offset (Ref 10.00	3/div
Clear Wri										
Trace Avera	-24.33 (dem)									
Max Ho	MI.	3 A	e-indering	h.www.h	w.l.l.	w	monthe	mpullant	U. W. Antonia and	n turn shely
Min Ho	0400 GHz 1001 pts)	.000 ms (CTION		↓ √ 300 kHz Y	#VB	×		t 2.310 s BW 1
View Blani Trace Or					3m 3m	-4.327 df -38.598 df -65.117 df	00 GHz	2.403 90 2.400 00 2.390 00	f f f	N N N
M o 1 o	~									
			STATUS							

ent Spectrum Analyzer - Swept SA				
T RF 50 Ω AC	SENSE:PULSE	ALIGNAUTO Avg Type: Log-Pwr	11:03:34 AM May 25, 2016 TRACE 1 2 3 4 5 6	Trace/Detector
PNO: Fas IFGain:Lo		Avg Hold>100/100	TYPE MWWWWW P	Select Trace
Ref Offset 0.5 dB dB/div Ref 10.00 dBm		Mkr1	2.478 000 GHz -4.412 dBm	1
				ClearWrite
			-24.41 dBm	
				Trace Averag
-				indeentrenag
1 Mary Joseph Marines	armon man with the way	mannetermannet	and have any war and	
0				Max Hol
0				
art 2.47800 GHz			Stop 2.50000 GHz	
es BW 100 kHz #\	/BW 300 kHz	Sweep 2	.133 ms (1001 pts)	Min Hol
MODE TRC SCL X		INCTION FUNCTION WIDTH	FUNCTION VALUE	
N f 2.478 000 GHz N f 2.483 500 GHz				
				View Blank
				Trace On
				Mor
				1 of
			~	

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Hopping Off - (GFSK)

									Analyzer - Sv		
Trace/Detector	May 25, 2016 E 1 2 3 4 5 6 E M MMMMM	TRAC	ALIGNAUTO : Log-Pwr		:PULSE				e -23.75		" Disp
Select Trace		DE	>100/100	AvgiHold		Trig: Free Atten: 20	NO: Fast G Gain:Low			29 	
1	38 GHz 41 dBm		Mkr1						Ref Offset 0 Ref 10.00		
Clear Writ	1						0				. og 0.00
	-23.75 ptem										10.0 20.0
Trace Averag					5		-				30.0 40.0
	\int	3 / 1					2				50.0 60.0
Max Ho	4	an warden and	asamanulaan	for the main that	and the second	~Partnal ^a ****	Commenter & Barrid	un ann an a	L. Himport	han an a	70.0
	0400 GHz									t 2.3100	
Min Hol	1001 pts)		Sweep 9.	TION FL	FU	Y 300 kHz	#VBV	×		BW 10	
View Blank					m	-3.741 dE -38.432 dE -65.437 dE	0 GHz	2.401 83 2.400 00 2.390 00	f f f	N I	1 2 3
Trace On											4 5 6
Мо											7 8 9
1 of	~					111					10
<u>.</u>			STATUS								sg

	um Analyzer - S									
uxu ⊤ Display L	RF 50			SENSE:P		Avg Type	ALIGNAUTO : Log-Pwr	TRA	M May 25, 2016 E 1 2 3 4 5 6	Trace/Detector
10 dB/div	Ref Offset 0 Ref 10.00	IFC 0.5 dB	NO: Fast 🕞 Gain:Low	∫ Trig: Free F Atten: 20 d		Avg Hold:	s ordered	D 2.479 8	70 GHz 96 dBm	Select Trace
Log 0.00 -10.0 -20.0										Clear Write
-30.0 -40.0									-23:60 dBm	Trace Average
-60.0 -70.0 -80.0		Lunder	Yv-?Le ^{rt} a#ft ^{ry m} tt*	Lywork Marine Contraction	um Leun hak	᠆᠆᠆᠆ᢞᡀᡅ᠕᠈᠘᠒	y www.	vin Anna anna anna anna anna anna anna an	www.	Max Hold
Start 2.47 #Res BW	100 kHz	×		7 300 kHz	FUNCT			.133 ms (0000 GHz 1001 pts)	Min Hold
1 N 2 N 3 4 5 6	f f	2.479 870 2.483 500		-3.596 dBn -64.144 dBn						View Blank Trace On
7 8 9 10 11									~	More 1 of 3
MSG							STATUS	6		

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Hopping On - (π/4-DQPSK)

								rept SA	alyzer - Sw	ectrum Ar	ilent Sp
Trace/Detector	M May 25, 2016 E 1 2 3 4 5 6	TRAC	ALIGNAUTO		E:PULSE			dBm	-24.00	y Line	⊺ ispla
Select Trace		Di	>100/100	AVGING		Atten: 20	NO: Fast 😱 Gain:Low				
	26 GHz 04 dBm		Mkr1						f Offset 0 f 10.00) dB/d
											og).00
Clear Wri	Ал				6						0.0
	-24.00 dBm										0.0
Trace Avera	AN AN AN										.0.0
	, / ¹	_∧3 ♪			1						0.0
Max Ho	Ψ		maganerilessah	- Lupon Diglo		41ªnoabbahatan	mangener	harrow and a start	abrand log		0.0
Max Hu					-						0.0
	0400 GHz	Stop 2.40			6				GHz	.31000	L tart 2
Min Ho	1001 pts)			0.0		300 kHz	#VBW		kHz	SW 100	Res E
	IN VALUE	FUNCTIO	NCTION WIDTH	CTION		Y -4.004 dl		× 2.402.0		E TRC SC	KR MOD
View Blan						-40.125 di -64.872 di		2.400 0		f f	2 N 3 N
Trace Or									3		4 5 6
											7
Mo 1 o									2		9
	>					mil					1
0			STATUS								G

Igilent Spectrum Analyzer - Swept SA			· · · · · · · · · · · · · · · · · · ·	
X/ T RF 50 Ω AC Display Line -23.90 dBm	SENSE:PULSE	ALIGNAUTO Avg Type: Log-Pwr	11:06:42 AM May 25, 2016 TRACE 1 2 3 4 5 6	Trace/Detector
Ref Offset 0.5 dB 10 dB/div Ref 10.00 dBm	PNO: Fast 🖵 Trig: Free Run IFGain:Low Atten: 20 dB	Avg Hold>100/100	2.480 024 GHz -3.903 dBm	Select Trace
-0.00 -10.0				Clear Write
-30.0			-23:90 aBm	Trace Average
-60.0 -70.0 -80.0	2 materiality and a second se	-mansaran when when	mmunternal portunations	Max Hold
Start 2.47800 GHz #Res BW 100 kHz	#VBW 300 kHz		Stop 2.50000 GHz 133 ms (1001 pts)	Min Hold
	0 024 GHz -3.903 dBm 3 500 GHz -63.429 dBm			View Blank Trace On
7 8 9 10 11			~	More 1 of 3
MSG		STATUS		

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Hopping Off - (π/4-DQPSK)

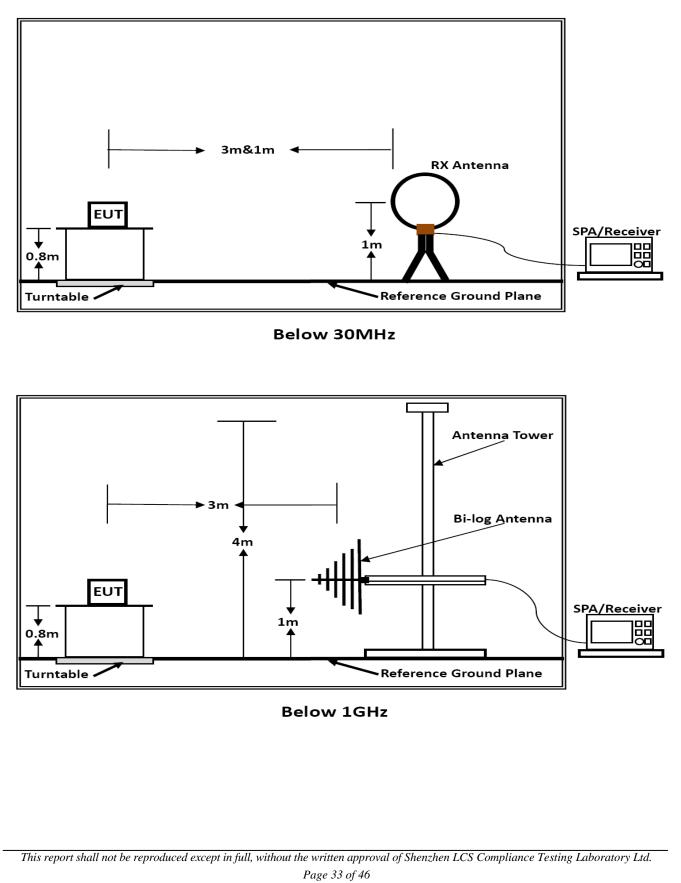
						1.000			1 Analyzer -	Spectru	Agilen XI
Trace/Detector	M May 25, 2016 E 1 2 3 4 5 6 E M MMMMMM	TRAC	ALIGNAUTO			SENSE		οΩ AC 0 dBm	RF 50	lay Li	
Select Trace		Di	>100/100	AVgiH		Trig: Free Atten: 20	PNO: Fast C IFGain:Low				
1	38 GHz 99 dBm		Mkr1						Ref Offset Ref 10.0		
Clear Writ											_ og 0.00
	-23.80 dBm										10.0
Trace Averag	2										-30.0
										-	-50.0
Max Hol	4	Arminer	****	word know	natur Anala		mhumman	-martine realized	Ar hay by a source	والأر المراجع الم	-60.0 -70.0
									_		-80.0
Min Hole	0400 GHz 1001 pts)	.000 ms (06		300 kHz	#VB		00 GHz 00 kHz	5 BW 1	#Re
	IN VALUE	FUNCTIO	ICTION WIDTH	CTION		Y -3.799 dB	838 GHz	× 2.401	SCL	IODE TRC	MKR I
View Blank Trace On						-38.540 dB -62.497 dB	000 GHz 000 GHz		f	N N	2 3 4 5 6
Mor											7 8 9
1 of	~										10 11
			STATUS								ISG

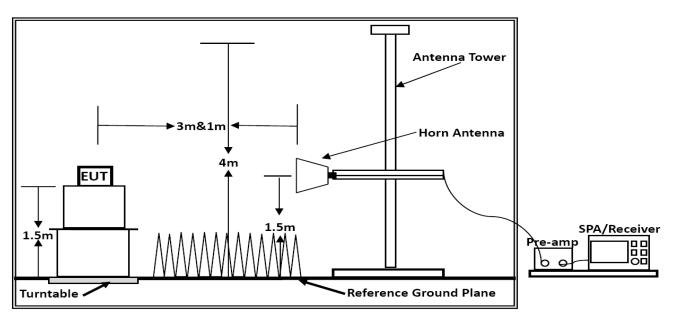
Agilent Spectr	um Analyzer - Sv								
ux/ ⊤ Displav L	RF 50 s	α AC dBm		SENSE:P	Av	ALIGNAUTO g Type: Log-Pwr	11:05:09 AM TRACE	123456	Trace/Detector
10 dB/div	Ref Offset 0 Ref 10.00	Pr IFG I.5 dB	¥0: Fast ⊂⊾ Gain:Low	j Trig: Free F Atten: 20 d		j Hold⇒100/100 Mkr1	DET	0 GHz 8 dBm	Select Trace
0.00 -10.0 -20.0									Clear Write
-30.0 -40.0 -50.0								-23:57 dBm	Trace Average
-60.0 -70.0 -80.0		2 2		her have a feature and a fe	mpump	wnfhweliefyd-aconoraethau	n burn with the for	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Max Hold
Start 2.47 #Res BW	100 kHz	×		7 300 kHz Y	FUNCTION	Sweep 2	Stop 2.500 2.133 ms (1	001 pts)	Min Hold
1 N 2 N 3 4 5 6		2.479 87(2.483 50(-3.568 dBn -65.007 dBn					View Blank Trace On
7 8 9 10 11								×	More 1 of 3
MSG						STATU	s		

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6. RADIATED MEASUREMENT

6.1 Block Diagram of Test Setup





Above 1GHz

6.2 Radiated Emission Limit

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510MHz.

\2\ Above 38.6

Part 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in

This report shall not be reproduced except in full, without the written approval of Shenzhen LCS Compliance Testing Laboratory Ltd. Page 34 of 46 Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector.

Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

Part 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (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

6.3 Instruments Setting

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 / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

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

6.4 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 0.8 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 $(\pm 45^\circ)$ 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 (\pm 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 polarizations 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.

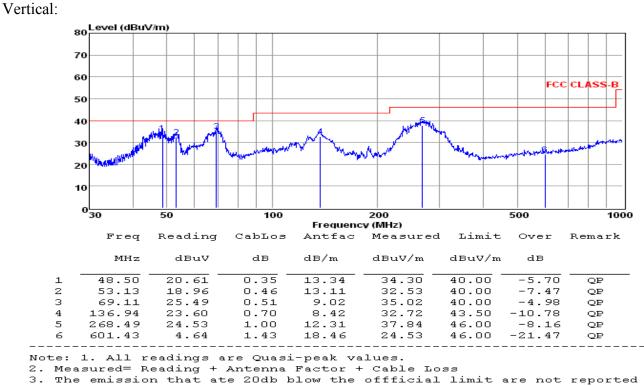
6.5 Results for Radiated Emissions

PASS.

Only record the worst test result in this report. The radiated emissions from 9 kHz to 30MHz are at least 20dB below the official limit and no need to report.

The test data please refer to following page:

Below 1GHz



Horizontal:

80 Level (dBuV/m) 70 60 FCC CLASS-B 50 40 30 dan 20 10 0<u>∟</u> 30 1000 50 100 500 200 Frequency (MHz) Freq Reading CabLos Antfac Measured Limit Over Remark MHz dBuV dВ dB/m dBuV/m dBuV/m dB 15.17 -11.36 1 55.22 0.46 13.01 28.64 40.00 QP 2 68.15 21.67 0.51 9.41 31.59 40.00 -8.41 QP з 136.46 14.97 0.70 8.45 24.12 43.50 -19.38QP 4 250.30 22.42 1.02 12.07 35.51 46.00 -10.49 QP 5 275.16 22.89 1.00 12.52 36.41 46.00 -9.59 QP 6 747.48 9.00 1.65 19.40 30.05 46.00 -15.95 QP

Note: 1. All readings are Quasi-peak values. 2

. Measured= Reading + Antenna Factor + Cable Loss 3. The emission that ate 20db blow the offficial limit are not reported ***Note:

Pre-scan all modes and recorded the worst case results in this report (TX-High Channel (1Mbps)). Emission level $(dBuV/m) = 20 \log Emission level (uV/m)$.

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

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Above 1GHz

Note: Only recorded the worst test result. The worst test result for $\pi/4$ -DQPSK, TX-High Channel:

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4804.21	46.71	33.06	35.04	3.94	48.67	74	-25.33	Peak	Horizontal
4804.23	36.89	33.06	35.04	3.94	38.85	54	-15.15	Average	Horizontal
4804.21	47.15	33.06	35.04	3.94	49.11	74	-24.89	Peak	Vertical
4804.23	37.61	33.06	35.04	3.94	39.57	54	-14.43	Average	Vertical

The worst test result for $\pi/4$ -DQPSK, TX-Middle Channel:

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4882.11	47.73	33.16	35.15	3.96	49.70	74	-24.30	Peak	Horizontal
4882.13	37.86	33.16	35.15	3.96	39.83	54	-14.17	Average	Horizontal
4882.11	48.69	33.16	35.15	3.96	50.66	74	-23.34	Peak	Vertical
4882.13	39.11	33.16	35.15	3.96	41.08	54	-12.92	Average	Vertical

The worst test result for $\pi/4$ -DQPSK, TX-High Channel:

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4960.17	47.13	33.26	35.14	3.98	49.23	74	-24.77	Peak	Horizontal
4960.20	36.97	33.26	35.14	3.98	39.07	54	-14.93	Average	Horizontal
4960.17	48.15	33.26	35.14	3.98	50.25	74	-23.75	Peak	Vertical
4960.20	38.43	33.26	35.14	3.98	40.53	54	-13.47	Average	Vertical

Notes:

1. Measuring frequencies from 9k~10th harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30MHz.

2. Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 26GHz) were made with an instrument using Peak detector mode.

3. 18~25GHz at least have 20dB margin. No recording in the test report.

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6.6 Results for Band edge Testing (Radiated)

Note: Only recorded the worst test result.

TX-Low Channel, $\pi/4$ -DQPSK, Non-hopping

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2375.64	47.66	32.89	35.16	3.51	48.90	74	-25.10	Peak	Horizontal
2375.66	36.89	32.90	35.16	3.51	38.14	54	-15.86	Average	Horizontal
2390.00	44.16	32.92	35.16	3.54	45.46	74	-28.54	Peak	Horizontal
2389.97	33.89	32.92	35.16	3.54	35.19	54	-18.81	Average	Horizontal
2400.00	46.78	32.92	35.16	3.54	48.08	74	-25.92	Peak	Horizontal
2399.97	36.94	32.92	35.16	3.54	38.24	54	-15.76	Average	Horizontal
2375.64	48.15	32.89	35.16	3.51	49.39	74	-24.61	Peak	Vertical
2375.66	37.41	32.90	35.16	3.51	38.66	54	-15.34	Average	Vertical
2390.00	44.61	32.92	35.16	3.54	45.91	74	-28.09	Peak	Vertical
2389.97	34.87	32.92	35.16	3.54	36.17	54	-17.83	Average	Vertical
2400.00	48.51	32.92	35.16	3.54	49.81	74	-24.19	Peak	Vertical
2399.97	39.16	32.92	35.16	3.54	40.46	54	-13.54	Average	Vertical

TX-High Channel, $\pi/4$ -DQPSK, Non-hopping

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2483.50	45.31	33.06	35.18	3.60	46.79	74	-27.21	Peak	Horizontal
2483.53	35.54	33.08	35.18	3.60	37.04	54	-16.96	Average	Horizontal
2486.71	44.87	33.08	35.18	3.62	46.39	74	-27.61	Peak	Horizontal
2486.74	35.01	33.08	35.18	3.62	36.53	54	-17.47	Average	Horizontal
2483.50	45.16	33.06	35.18	3.60	46.64	74	-27.36	Peak	Vertical
2483.53	35.47	33.08	35.18	3.60	36.97	54	-17.03	Average	Vertical
2486.71	45.01	33.08	35.18	3.62	46.53	74	-27.47	Peak	Vertical
2486.74	35.64	33.08	35.18	3.62	37.16	54	-16.84	Average	Vertical

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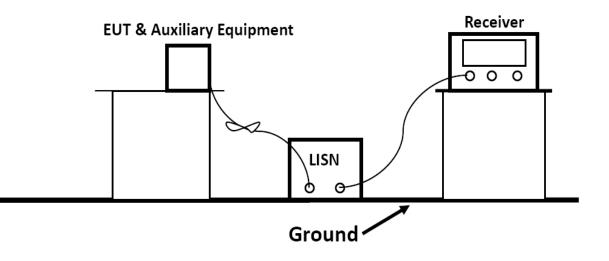
7. LINE CONDUCTED EMISSIONS

7.1 Standard Applicable

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 microvolt (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 are 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	

7.2 Block Diagram of Test Setup

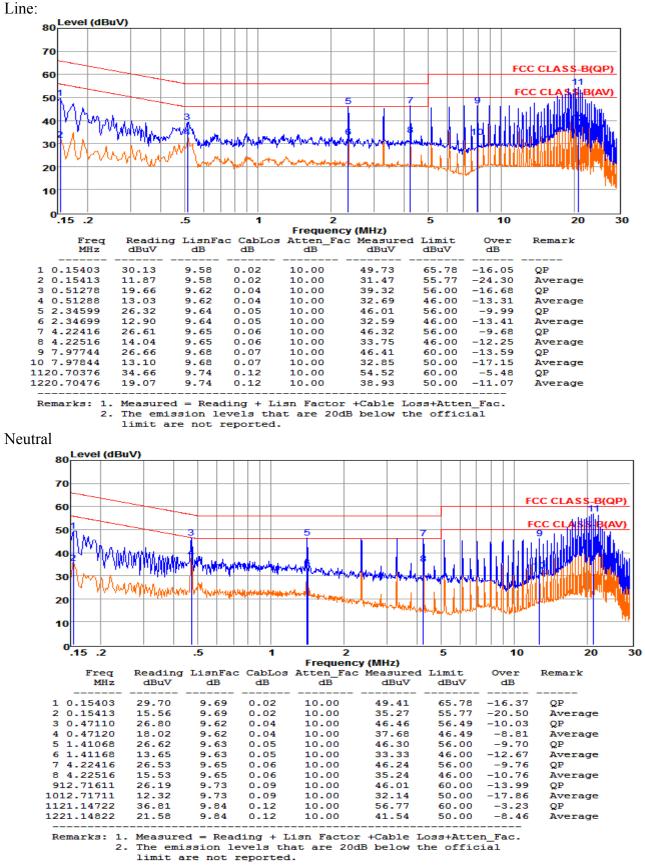


7.3 Test Results

PASS.

The test data please refer to following page. only the worst test data was recorded.

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Test Result for Line Power Input AC 120V/60Hz

Note: Pre-scan all modes and recorded the worst case results in this report.

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8. ANTENNA REQUIREMENT

8.1 Standard Applicable

According to antenna requirement of §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 re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

8.2 Antenna Connected Construction

8.2.1. Standard Applicable

According to § 15.203 & RSS-Gen, 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.

8.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 0dBi, and the antenna is connect to PCB board and no consideration of replacement. Please see EUT photo for details.

8.2.3. Results: Compliance.

Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Conducted power refers ANSI C63.10:2013 Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices.

Radiated power refers to ANSI C63.10:2013 Radiated emissions tests.

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Measurement parameters:

Measurement parameter			
Detector:	Peak		
Sweep time:	Auto		
Resolution bandwidth:	3 MHz		
Video bandwidth:	3 MHz		
Trace-Mode:	Max hold		

Note: The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal Bluetooth devices, the GFSK mode is used.

Limits:

FCC	IC				
Antenna Gain					
6.0dBi					

Tnom	Vnom	lowest channel 2402 MHz	middle channel 2441 MHz	highest channel 2480 MHz
Measu	power [dBm] red with nodulation	-3.46	-3.33	-3.74
Measu	oower [dBm] red with odulation	-5.18	-4.49	-5.91
Gain [dBi]	Calculated	-1.72	-1.16	-2.17
Measurement uncertainty		± 1.6 dB (cond.) / ± 3.8 dB (rad.)		

Result: -/-

-----THE END OF REPORT-----