



FCC ID: WS2-WG3221B Report No.: T191111W02-RP3 Page: 1 / 67 Rev.: 01

RADIO TEST REPORT FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
Product name	WiFi and Bluetooth module
Brand Name	JORJIN
Model No.	WG3221-00
Test Result	Pass
Statements of Conformity	Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)

Approved by:

Komil Tsori

Kevin Tsai Deputy Manager

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. 除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部分複製。

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	March 9, 2020	Initial Issue	ALL	Doris Chu
01	March 26, 2020	 Added S/N, SW Test Tool and SW Tool version in section1.1 Revised section 1.6. Added Support Equipment in section 1.7. Revised Duty cycle data in section 3.3. Added Radiation setup photo. 	P.4, P.7, P.9, P.13, A-1-A-3	Doris Chu



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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Jorjin Technologies Inc. 17F1, NO.239, SEC. 1, DATONG RD., XIZHI DIST. New Taipei City, 22161 Taiwan	
Manufacturer	Jorjin Technologies Inc. 17F1, NO.239, SEC. 1, DATONG RD., XIZHI DIST. New Taipei City, 22161 Taiwan	
Equipment	WiFi and Bluetooth module	
Model No.	WG3221-00	
Model Discrepancy	N/A	
Trade Name	JORJIN	
Received Date	November 11, 2019	
Date of Test	November 26 ~ December 31, 2019	
Output Power (W)	BLE : 0.0050	
Power Supply	Power from host device.	
H/W Version	WG3221-00B-R01	
F/W Version	goldenBoardData_HW_191005	
S/N	00199438FD7E	
SW Test Tool	Qualcomm QRCT	
SW Tool version	3.0.298.0	



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1.2 EUT CHANNEL INFORMATION

Frequency Range	2402MHz-2480MHz
Modulation Type	GFSK for BLE-1Mbps
Number of channel	40 Channels

Remark:

Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested					
Frequency range inNumber ofLocation in frequencywhich device operatesfrequenciesrange of operation					
1 MHz or less	1	Middle			
1 MHz to 10 MHz	2	1 near top and 1 near bottom			
More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom			

1.3 ANTENNA INFORMATION

Antenna Specification	 Unictron / AA077 Chip Antenna / Gain: 1.4 dBi Unictron / AA222 PCB Antenna / Gain: 3.73 dBi JOINSOON ELECTRONICS MFG .CO,LTO / WiFi3dB Antenna Dipole Antenna / Gain: 2.45 dBi
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1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 1.4003
RF output power, conducted	+/- 1.1372
Power density, conducted	+/- 1.4003
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

Remark:

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

2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.



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1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	Dally Hong	
Radiation	Jerry Chang	
RF Conducted	Dally Hong	

Remark: The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.6 INSTRUMENT CALIBRATION

RF Conducted Test Site							
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due		
Power Meter	Anritsu	ML2495A	1149001	02/12/2019	02/11/2020		
Power Seneor	Anritsu	MA2491A	030982	02/12/2019	02/11/2020		
Signal Analyzer	R&S	FSV 40	101073	09/25/2019	09/24/2020		
Software	N/A						
	3M 9	66 Chamber Tes	t Site				
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due		
Band Reject Filters	MICRO TRONICS	BRM 50702	120	02/26/2019	02/25/2020		
Bilog Antenna	Sunol Sciences	SUCOFLEX 20995 (07/26/2019	07/25/2020		
Coaxial Cable	HUBER SUHNER		20995	02/26/2019	02/25/2020		
Coaxial Cable	EMCI	EMC105	190914+25111	09/20/2019	09/19/2020		
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/30/2019	01/29/2020		
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	10/04/2019	10/03/2020		
Loop Ant	COM-POWER	AL-130	121051	03/22/2019	03/21/2020		
Pre-Amplifier	EMEC	EM330	060609	02/26/2019	02/25/2020		
Pre-Amplifier	HP	8449B	3008A00965	02/26/2019	02/25/2020		
Horn Antenna	ETS LINDGREN	3116	00026370	2018/12/26	2019/12/25		
K Type Cable	Huber+Suhner	SUCOFLEX 102	29406/2	12/18/2018	12/17/2019		
K Type Cable	Huber+Suhner	SUCOFLEX 102	22470/2	12/18/2018	12/17/2019		
Pre-Amplifier	EMEC	EM01G26G	060570	06/27/2019	06/26/2020		
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/29/2019	05/28/2020		
Horn Antenna	ETS LINDGREN	3116	00026370	12/18/2019	12/17/2020		
K Type Cable	Huber+Suhner	SUCOFLEX 102	29406/2	12/17/2019	12/16/2020		
K Type Cable	Huber+Suhner	SUCOFLEX 102	22470/2	12/17/2019	12/16/2020		
Pre-Amplifier	EMEC	EM01G26G	060570	06/27/2019	06/26/2020		
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R		
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R		
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R		
Software		e3 6.	11-20180413				



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AC Conducted Emissions Test Site							
Equipment	Equipment Manufacturer Model S/N Cal Date Cal I						
CABLE	EMCI	CFD300-NL	CERF	06/27/2019	06/26/2020		
EMI Test Receiver	R&S	ESCI	100064	07/26/2019	07/25/2020		
LISN	SCHWARZBECK	NSLK 8127	8127-541	01/31/2019	01/30/2020		
LISN	SCHAFFNER NNB 41 03/10013 02/13/2019 02/12						
Software	EZ-EMC(CCS-3A1-CE)						

Remark: Each piece of equipment is scheduled for calibration once a year.



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1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment							
No.	No. Equipment Brand Model Series No. FCC ID						
	N/A						

	Support Equipment						
No.	No. Equipment Brand Model Series No. FCC ID						
1	NB(J)	acer	MS2392	N/A	PPD-QCNFA34AC		
2	NB(J)	Lenovo	T420	N/A	PD97260H		

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, KDB 558074 D01.



2. TEST SUMMERY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	Pass
15.247(a)(2)	4.2	6 dB Bandwidth	Pass
-	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(3)	4.3	Output Power Measurement	Pass
15.247(e)	4.4	Power Spectral Density	Pass
15.247(d)	4.5	Conducted Band Edge	Pass
15.247(d)	4.5	Conducted Spurious Emission	Pass
15.247(d)	4.6	Radiation Band Edge	Pass
15.247(d)	4.6	Radiation Spurious Emission	Pass

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3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Ор	eration mode	BT5.0 Mode (1Mbps)
Tes	st Channel Frequencies	1.Lowest Channel : 2402MHz 2.Middle Channel : 2440MHz 3.Highest Channel : 2480MHz

Remark:

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1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.



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3.2 THE WORST MODE OF MEASUREMENT

Radiated Emission Measurement Above 1G			
Test Condition	Radiated Emission Above 1G		
Power supply Mode	Mode 1: EUT power by DC		
Worst Mode	Mode 1 🗌 Mode 2 🗌 Mode 3 🗌 Mode 4		
Worst Position	 Placed in fixed position. Placed in fixed position at X-Plane (E2-Plane) Placed in fixed position at Y-Plane (E1-Plane) Placed in fixed position at Z-Plane (H-Plane) 		

Radiated Emission Measurement Below 1G			
Test Condition	Test Condition Radiated Emission Below 1G		
Power supply Mode Mode 1: EUT power by DC			
Worst Mode Mode 1 Mode 2 Mode 3 Mode 4			

Remark:

1. The worst mode was record in this test report.

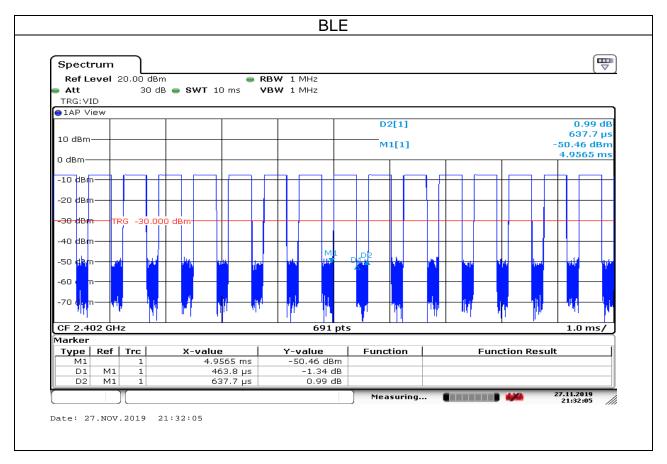
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report



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3.3 EUT DUTY CYCLE

		Duty Cycle		
Configuration	Duty Cycle (%)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
BLE-1Mbps	72.73	1.38	2.16	3.00





4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a),

Frequency Range	Limits(dBµV)		
(MHz)	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	

* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

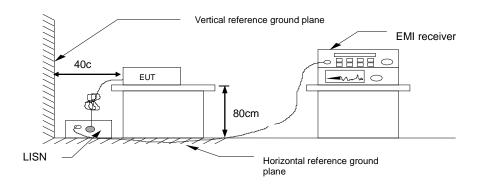
Test method Refer as ANSI C63.10: 2013 clause 6.2,

- 1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
- 2. EUT connected to the line impedance stabilization network (LISN)
- 3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

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5. Recorded Line for Neutral and Line.

4.1.3 Test Setup



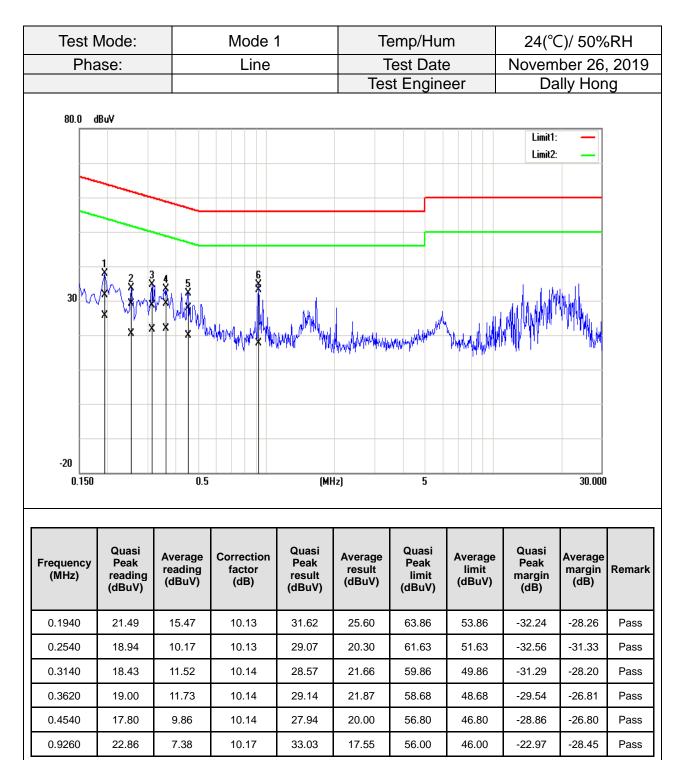
4.1.4 Test Result

Pass

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Test Data





Test N	t Mode: Mode 1			Te	Temp/Hum		24(°C)/ 50%RH			
Pha				est Date		November 26, 2				
					Tes	st Engine	er	Da	Illy Hon	g
80.0 dl	BuV							Limit1: Limit2:		
30 1 *		MAN	5 MM/WW X M/		Antonio	dh Japan		Mp/////		
-20								·		
-20 0.150		0.5		(Mł		5			30.000	
	Quasi Peak reading (dBuV)	0.5 Average reading (dBu □)	Correction factor (dB)			Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	30.000 Average margin (dB)	Remar
0.150	Peak reading	Average reading	factor	Quasi Peak result	łz] Average result	Quasi Peak limit	limit	Peak margin	Average margin	Remar
0.150 Frequency (MHz)	Peak reading (dBuV)	Average reading (dBu⊡)	factor (dB)	Quasi Peak result (dBuV)	łz) Average result (dBuV)	Quasi Peak limit (dBuV)	limit (dBuV)	Peak margin (dB)	Average margin (dB)	
0.150 Frequency (MHz) 0.1580	Peak reading (dBuV) 18.95	Average reading (dBu□) 12.37	factor (dB) 10.02	Quasi Peak result (dBuV) 28.97	Average result (dBuV) 22.39	Quasi Peak limit (dBuV) 65.57	limit (dBuV) 55.57	Peak margin (dB) -36.60	Average margin (dB) -33.18	Pass Pass
0.150 Frequency (MHz) 0.1580 0.2060	Peak reading (dBuV) 18.95 25.67	Average reading (dBu) 12.37 21.00	factor (dB) 10.02 10.02	Quasi Peak result (dBuV) 28.97 35.69	Average result (dBuV) 22.39 31.02	Quasi Peak limit (dBuV) 65.57 63.37	limit (dBuV) 55.57 53.37	Peak margin (dB) -36.60 -27.68	Average margin (dB) -33.18 -22.35	Pass Pass Pass
0.150 Frequency (MHz) 0.1580 0.2060 0.3100	Peak reading (dBuV) 18.95 25.67 16.35	Average reading (dBu) 12.37 21.00 10.08	factor (dB) 10.02 10.02 10.03	Quasi Peak result (dBuV) 28.97 35.69 26.38	Average result (dBuV) 22.39 31.02 20.11	Quasi Peak limit (dBuV) 65.57 63.37 59.97	limit (dBuV) 55.57 53.37 49.97	Peak margin (dB) -36.60 -27.68 -33.59	Average margin (dB) -33.18 -22.35 -29.86	



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4.26dB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

4.2.1 Test Limit

According to §15.247(a)(2)

6 dB Bandwidth :

Limit

Shall be at least 500kHz

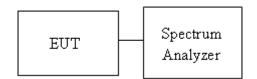
Occupied Bandwidth(99%) : For reporting purposes only.

4.2.2 Test Procedure

Test method Refer as KDB 558074 D01 and ANSI C63.10: 2013 clause 6.9.2.

- 1. The EUT RF output connected to the spectrum analyzer by RF cable.
- 2. Setting maximum power transmit of EUT
- 3. SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth and 99% Bandwidth.
- 4. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

4.2.3 Test Setup

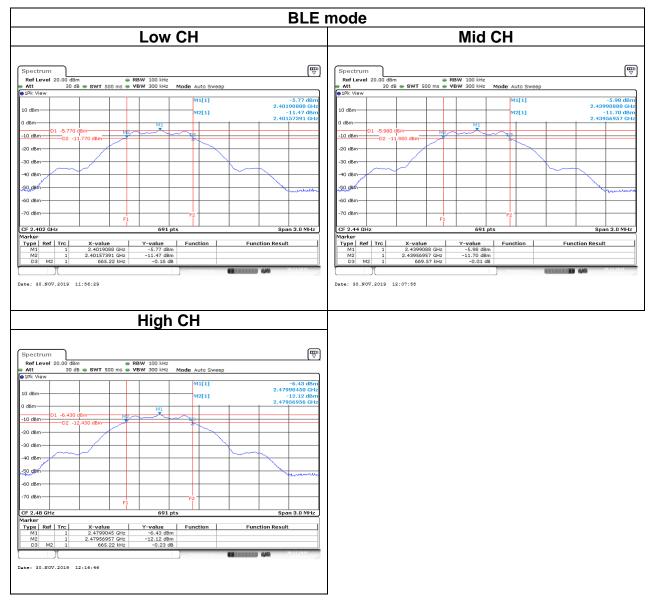


4.2.4 Test Result

Test mode: BLE mode / 2402-2480 MHz						
Channel	Frequency (MHz)	OBW(99%) (MHz)	6dB BW (MHz)	6dB limit (kHz)		
Low	2402	1.0637	0.6652			
Mid	2440	1.0593	0.6696	>500		
High	2480	1.0637	0.6652			



Test Data (6dB BANDWIDTH)

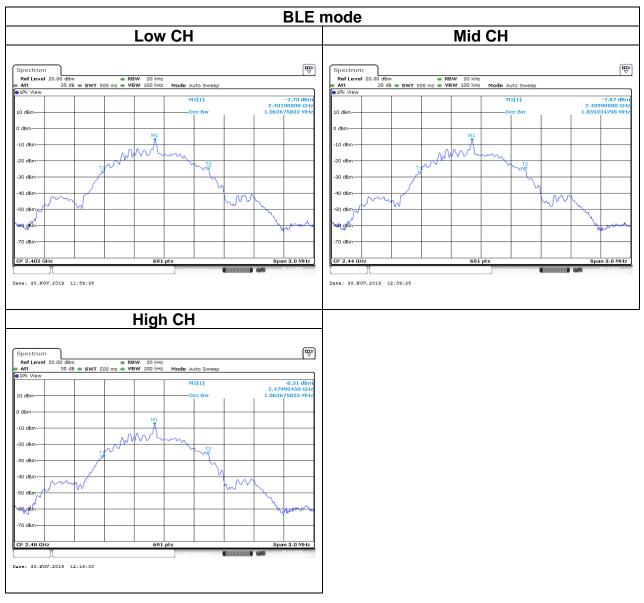


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Test Data (BANDWIDTH 99%)





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4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.247(b)(3)

Peak output power :

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.

Antenna not exceed 6 dBi : 30dBm
[Limit = 30 – (DG – 6)]

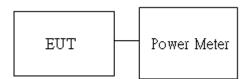
Average output power : For reporting purposes only.

4.3.2 Test Procedure

Test method Refer as KDB 558074 D01

- 1. The EUT RF output connected to the power meter by RF cable.
- 2. Setting maximum power transmit of EUT.
- 3. The path loss was compensated to the results for each measurement.
- 4. Measure and record the result of Peak output power and Average output power. in the test report.

4.3.3 Test Setup





4.3.4 Test Result

Peak output power :

BLE Mode							
Config.	СН	Freq. (MHz)	Power setting	PK Power (dBm)	PK Power (W)	DG (dBi)	Limit (dBm)
BLE	0	2402	Default	6.88	0.0049		
Data rate:	19	2440	Default	6.95	0.0050	3.73	30
1Mbps	39	2480	Default	6.94	0.0049		

Average output power :

BLE Mode					
Config.	СН	Freq. (MHz)	Power setting	AV Power (dBm)	
BLE	0	2402	Default	6.52	
Data rate:	19	2440	Default	6.44	
1Mbps	39	2480	Default	6.59	

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4.4 POWER SPECTRAL DENSITY

4.4.1 Test Limit

According to §15.247(e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

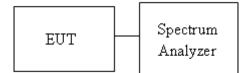
Limit	 Antenna not exceed 6 dBi : 8dBm Antenna with DG greater than 6 dBi [Limit = 8 - (DG - 6)] Point-to-point operation :
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4.4.2 Test Procedure

Test method Refer as KDB 558074 D01

- 1. The EUT RF output connected to the spectrum analyzer by RF cable.
- 2. Setting maximum power transmit of EUT
- 3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
- 4. The path loss was compensated to the results for each measurement by SA.
- 5. Mark the maximum level.
- 6. Measure and record the result of power spectral density. in the test report.

4.4.3 Test Setup



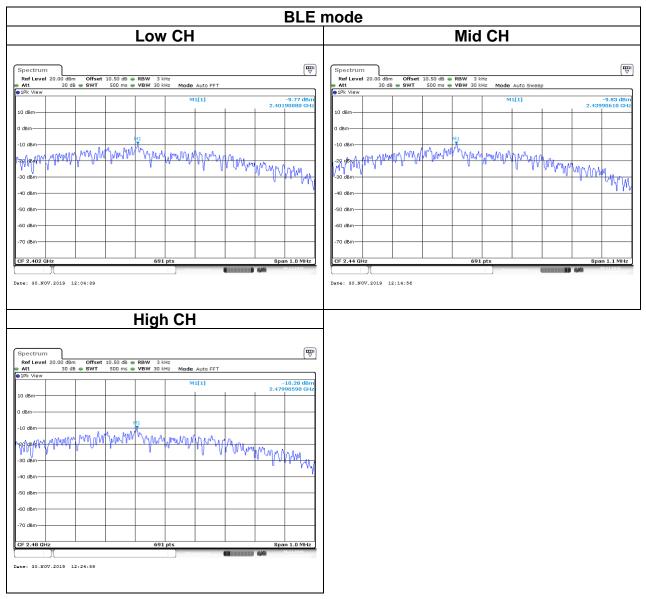
4.4.4 Test Result

	Test mode: BLE mode / 2402-2480 MHz							
Channel	Channel Frequency PSD (dBm)				IC/FCC limit (dBm)			
Low	2402	-9.77						
Mid	2440	-9.83	8					
High	2480	-10.28						



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Test Data





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4.5 CONDUCTED BAND EDGE AND SPURIOUS EMISSION

4.5.1 Test Limit

According to §15.247(d)

In any 100 kHz bandwidth outside the authorized frequency band,

Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement 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).

4.5.2 Test Procedure

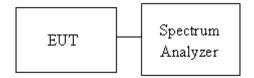
Test method Refer as KDB 558074 D01

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

4.5.3 Test Setup



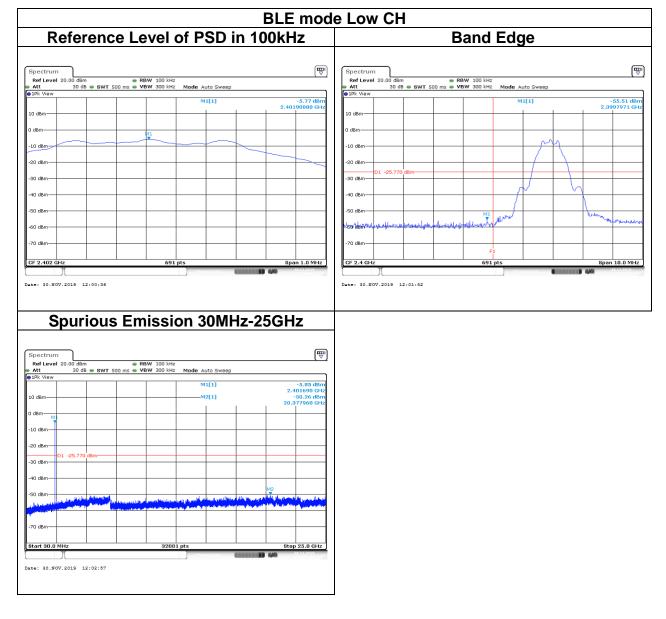


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4.5.4 Test Result

Test Data

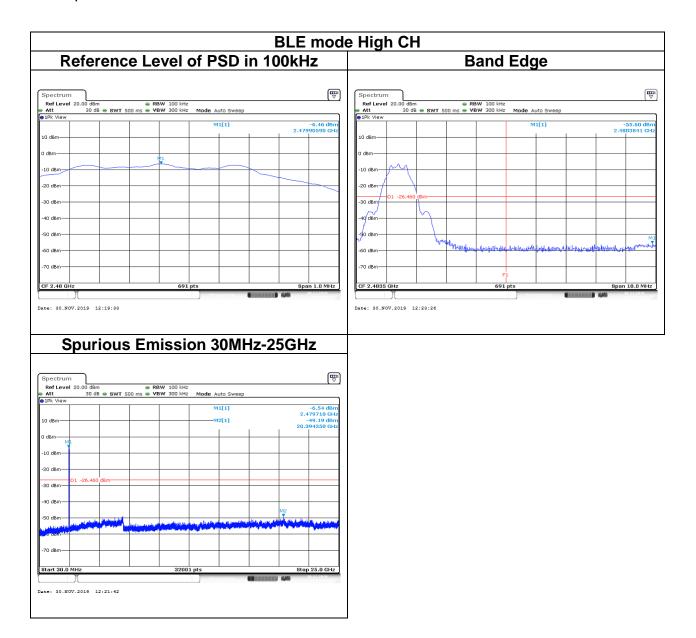




Reference Level of PSD in 100kHz	Spurious Emission 30MHz-25GHz
Spectrum Image: Constraint of the second of th	Spectrum Ref Level 20.00 dBm BBW 100 lHz Att 30 dB = BWT 500 ms VBW 300 lHz Mode Auto Sweep 91/k View M1[1] 2.489 000 10 dBm M2[1] 6.95800 0 dBm M2[1] 6.99800 -0 dBm M2[1] 6.99800 -70 dBm M2[1] 6.99800
F 2.44 GHz 691 pts Span 1.1 MHz	Start 30.0 MHz 32001 pts Stop 25.0 C



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4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

Frequency	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)				
(MHz)	Transmitters	Receivers			
30-88	100 (3 nW)	100 (3 nW)			
88-216	150 (6.8 nW)	150 (6.8 nW)			
216-960	200 (12 nW)	200 (12 nW)			
Above 960	500 (75 nW)	500 (75 nW)			

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.



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4.6.2 Test Procedure

Test method Refer as KDB 558074 D01

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 9KHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

4. No emission found between lowest internal used/generated frequency to 30MHz (9KHz~30MHz)

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

5. The SA setting following :

- (1) Below 1G : RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
- (2) Above 1G:
 - (2.1) For Peak measurement : RBW = 1MHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
 - (2.2) For Average measurement : RBW = 1MHz, VBW

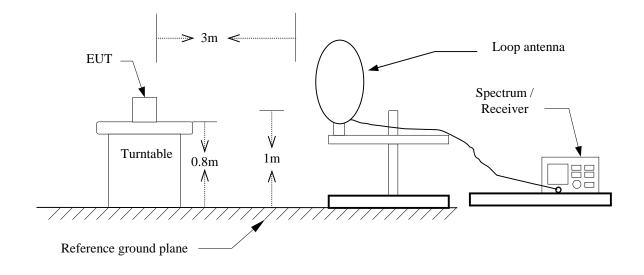
If Duty Cycle \geq 98%, VBW=10Hz.

If Duty Cycle < 98%, VBW=1/T.

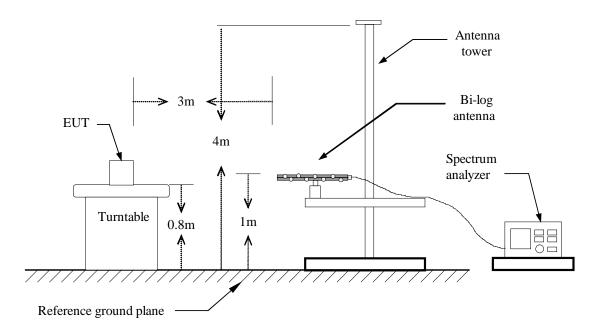


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Report No.: T191111W02-RP3 **4.6.3 Test Setup** <u>9kHz ~ 30MHz</u>

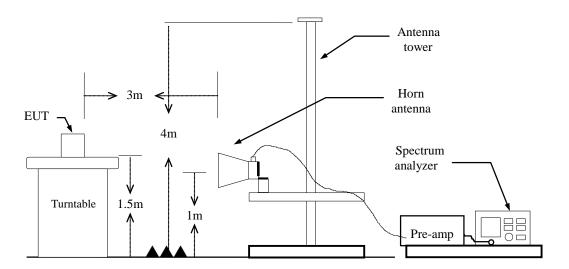


<u>30MHz ~ 1GHz</u>





Report No.: T191111W02-RP3 Above 1 GHz



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4.6.4 Test Result

Band Edge Test Data

PCB Antenna

Test Mode: Test Item		BLE Low CH Band Edge		Temp/Hum	22.5(°C	22.5(°C)/ 59%RH December 27, 201	
				Test Date	Decemb		
Polariz		Vertical		Test Engineer	Jerry	Jerry Chang	
Detect	or	Peak / Averag	ge				
130 Level (dBu	uV/m)					·	
120			 			1 	
100							
80						1	
80							
60	· · · · · · · · · · · · · · · · · · ·		 	· · · · · · · · · · · · · · · · · · ·			
					2		
40							
20			 				
20							
0 2310	2330	. 2350.		2370.	2390.	2410	
2010			Frequency (MH		2000	2	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
•	Mode	Reading Level		FS	@3m		
MHz	PK/QP/A	-	dB	dBµV/m	dBµV/m	dB	
2390.00	Average	38.21	-2.82	35.39	54.00	-18.61	
2390.00	Peak	51.67	-2.82	48.85	74.00	-25.15	
	•		•	1	•	•	

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Test Mo	ode:	BLE Low CH		Temp/Hum	22.5(°C	.)/ 59%RI
Test Ite	Item Band Edge Test Date		Decemb	December 27, 20		
Polariz	ze	Horizontal	Т	Test Engineer		[,] Chang
Detect	or	Peak / Average)			
130 Level (dBu	uV/m)					
120						
100			 			
80						
60					2	
40			 			
20						
0 <mark></mark> 2310	2330.	2350. Fr	requency (MHz)	2370.	2390.	2410
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
2390.00	Average	38.11	-2.82	35.29	54.00	-18.71
2390.00	Peak	52.17	-2.82	49.35	74.00	-24.65



Test Mo	ode:	BLE High CH		Temp/Hum	22.5(°C)/ 59%RI	
Test Ite	em	Band Edge		Test Date	Decemb	er 27, 201
Polariz	ze	Vertical	Te	est Engineer		Chang
Detect	Detector Peak / Average		9			
120 Level (dBi	uV/m)					
120						
110						
90						
70						
10						
50	· · · · · · · · · · · · · · · · · · ·	2			 	1
30						· · · · · · · · · · · · · · · · · · ·
10					 	
0 <mark>2475</mark>	2480.	2485.		2490.	2495.	2500
		F	requency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	5
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	37.14	-2.30	34.84	54.00	-19.16
2483.50	Peak	49.60	-2.30	47.30	74.00	-26.70
		I		I		



Test Mode:		BLE High CH		Temp/Hum	22.5(°C	22.5(°C)/ 59%R	
Test Ite	em	Band Edge		Test Date	Decemb	December 27, 20	
Polariz	ze	Horizontal		est Engineer	Jerry	[,] Chang	
Detect	or	Peak / Average	•				
120 Level (dBu	JV/m)		1		1		
110					·		
90						1 1 1	
70						 	
		2					
50					·		
30					 	1 1 1	
50							
10			·				
0 2475	2480.	2485.	1	2490.	2495.	250	
		FI	requency (MHz)				
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
2483.50	Average	39.26	-2.30	36.96	54.00	-17.04	
2483.50	Peak	61.11	-2.30	58.81	74.00	-15.19	



Chip Antenna

Test Mode: Test Item		BLE Low CH Band Edge		Temp/Hum	22.5(°C	C)/ 59%RH	
				Test Date		November 29, 201	
Polari		Vertical		est Engineer	Jerry	Jerry Chang	
Detec	tor	Peak / Average	e				
130	uV/m)						
120							
100						 	
80							
60							
40							
20							
0 <mark></mark> 2310	2330.	2350.		2370.	2390.	2410	
		F	requency (MHz)				
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
MHz			-3.38	34.26	54.00	-19.74	
MHz 2390.00	Average	37.64	-3.30	54.20	04.00	10111	



Test Mo	ode:	BLE Low CH		Temp/Hum	22.5(°C	C)/ 59%RI	
Test Ite	em	Band Edge		Test Date	Novemb	er 29, 20	
Polariz	ze	Horizontal	Т	est Engineer	Jerry	Jerry Chang	
Detect	or	Peak / Average	;				
130 Level (dBi	uV/m)						
120						1	
120							
100	i i i i i i i i i i i i i i i i i i i i	i i i i i i i i i i i i i i i i i i i i					
80							
60							
60					2	1	
40						 	
20							
0							
0 ^L 2310	2330.	2350. Fr	equency (MHz)	2370.	2390.	2410	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
2390.00	Average	37.67	-3.38	34.29	54.00	-19.71	
2390.00	Peak	50.91	-3.38	47.53	74.00	-26.47	
	-	· ·		-		-	



Test Mo	ode:	BLE High CH		Temp/Hum	22.5(°C)/ 59%RH		
Test Ite	em	Band Edge		Test Date	Novemb	November 29, 20	
Polariz	ze	Vertical	T	est Engineer		Chang	
Detect	or	Peak / Average	9				
Lovel (dB	uV(m)						
120 Level (dBi		1 1	1				
110						1	
90			1		· · · · · · · · · · · · · · · · · · ·	1	
70							
70							
50			 		 	1	
		Ĩ					
30	i i i i i i i i i i i i i i i i i i i i		· · · · · · · · · · · · · · · · · · ·	i i i 			
10						1	
0 2475	2480.	2485.		2490.	2495.	2500	
		F	requency (MHz)				
	_						
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
2483.50	Average	36.27	-2.83	33.44	54.00	-20.56	
2483.50	Peak	49.06	-2.83	46.23	74.00	-27.77	



Test Mo	de:	BLE High CH		Temp/Hum	22.5(°C	.)/ 59%RI	
Test Ite	em	Band Edge		Test Date		November 29, 20	
Polariz	ze	Horizontal		est Engineer	Jerry	Jerry Chang	
Detect	or	Peak / Average	;				
120 Level (dBu	uV/m)		1				
110						 	
90							
70					 		
50		2			 	 	
30		•				 	
10						 	
0 2475	2480.	2485. Fr	equency (MHz)	2490.	2495.	2500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level	1 40101	FS	@3m	margin	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
2483.50	Average	36.26	-2.83	33.43	54.00	-20.57	
2483.50	Peak	48.08	-2.83	45.25	74.00	-28.75	
	•	· ·		•			



Dipole Antenna

Test Mo	ode:	BLE Low CH	-	Temp/Hum	22.5(°C	C)/ 59%RH
Test It	em	Band Edge		Test Date	Decemb	er 27, 201
Polari	ze	Vertical		est Engineer	Jerry	/ Chang
Detec	tor	Peak / Average	e			
130 Level (dB	uV/m)					
120						
100						
80						
60					2	
40						
20						· · ·
0 2310	2330.	2350.		2370.	2390.	2410
		F	requency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
	DICODIAN	dBµV	dB	dBµV/m	dBµV/m	dB
MHz	PK/QP/AV	abpt				
MHz 2390.00	Average	37.95	-2.82	35.13	54.00	-18.87



Test Mo	de:	BLE Low CH		Temp/Hum	22.5(°C	C)/ 59%RI
Test Ite	em	Band Edge		Test Date	Decemb	er 27, 20
Polariz	ze	Horizontal	Т	est Engineer		/ Chang
Detect	or	Peak / Average	;			
130	uV/m)					·1
120						
100						
80						
60					2	
40			 			
20						
0 <mark></mark> 2310	2330.	2350. Fr	equency (MHz)	2370.	2390.	2410
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
2390.00	Average	38.09	-2.82	35.27	54.00	-18.73
2390.00	Peak	53.27	-2.82	50.45	74.00	-23.55



Test Mo	de:	BLE High Cl	-	Temp/Hum	22.5(°C	22.5(°C)/ 59%RH	
Test Ite	em	Band Edge		Test Date	Decemb	er 27, 20 ²	
Polariz	ze	Vertical		Test Engineer		/ Chang	
Detect	or	Peak / Avera	ge				
120 Level (dBu	uV/m)						
110						 	
90				· · · · · · · · · · · · · · · · · · ·		 -	
70						 	
50		-2					
		1					
30					1		
10							
0 <mark>2475</mark>	2480.	2485.	Frequency (M	2490. IHz)	2495.	2500	
-					1		
Freq.	Detector	Spectrum	Facto		Limit	Margin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
2483.50	Average	36.87	-2.30	34.57	54.00	-19.43	
2483.50	Peak	48.83	-2.30	46.53	74.00	-27.47	
	-	•	-	•	-	-	



Test Mo	de:	BLE High CH		Temp/Hum	22.5(°C	.)/ 59%Rl	
Test Ite	em	Band Edge		Test Date		er 27, 20	
Polariz	ze	Horizontal		est Engineer	Jerry	Jerry Chang	
Detect	or	Peak / Average)				
120 Level (dBu	JV/m)				1		
110							
90					+	1	
70					 	1 1 1 1	
		2					
50							
		1					
30							
10							
02475	2480.	2485.		2490.	2495.	250	
		Fi	requency (MHz)				
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
2483.50	Average	38.27	-2.30	35.97	54.00	-18.03	
2483.50	Peak	58.08	-2.30	55.78	74.00	-18.22	
		•					



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Below 1G Test Data

PCB Antenna

Test Mode:		BT Mode	Temp/H		22.5(°C)/ 59%RF
Test Item	30	MHz-1GHz	Test Da		ecember 31, 201
Polarize		Vertical		neer	Jerry Chang
Detector		Peak			
100 Level (dBuV/m)					
90					
80					
70					
60			· · · · · · · · · · · · · · · · · · ·		
50				· · · · · · · · · · · · · · · · · · ·	
40 2 1 3	4	5		6	
30					
20					
10					
0 <mark></mark> 30	224.	418. Freque	612. ncy (MHz)	80	6. 1000

Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
52.31	Peak	47.78	-15.77	32.01	40.00	-7.99
83.35	Peak	50.27	-15.52	34.75	40.00	-5.25
90.14	Peak	47.84	-15.23	32.61	43.50	-10.89
207.51	Peak	43.29	-11.47	31.82	43.50	-11.68
456.80	Peak	37.22	-3.76	33.46	46.00	-12.54
764.29	Peak	31.83	1.70	33.53	46.00	-12.47



912.70

Peak

-12.23

46.00

Test Mo	de:	BT Mode	Т	emp/Hum	22.5(°C	C)/ 59%RI
Test Ite	m	30MHz-1GHz	-	Test Date	December 31, 20	
Polariz	e	Horizontal	Te	st Engineer	Jerry Chang	
Detecto	or	Peak				
100 Level (dBu	V/m)					
90				1 I 1 I 1 I 1 I		
80				T		
70						· · · · · · · · · · · · · · · · · · ·
60					 I I I	
50						
40 12	3	45		i T	 	6
30						
20				1 I 1 1		
10				, , , , , , , , , , , , , , , , , , ,		
0 30	224	418	6	12	806	1000
0 <mark></mark> 30	224.	418. Fre	equency (MHz)	12.	806.	1000
0 ¹ 30	224.			12.	806.	1000
		Fre	equency (MHz)			
Freq.	224. Detector Mode	Fre		Actual FS	Limit @3m	
	Detector	Fre	equency (MHz)	Actual	Limit	
Freq.	Detector Mode	Fre Spectrum Reading Level	equency (MHz) Factor	Actual FS	Limit @3m	Margin
Freq. MHz	Detector Mode PK/QP/AV	Fre Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
Freq. MHz 83.35	Detector Mode PK/QP/AV Peak	Fre Spectrum Reading Level dBµV 50.97	Factor dB -15.52	Actual FS dBµV/m 35.45	Limit @3m dBµV/m 40.00	Margin dB -4.55
Freq. MHz 83.35 90.14	Detector Mode PK/QP/AV Peak Peak	Fre Spectrum Reading Level dBµV 50.97 50.56	Factor dB -15.52 -15.23	Actual FS dBµV/m 35.45 35.33	Limit @3m dBµV/m 40.00 43.50	Margin dB -4.55 -8.17
Freq. MHz 83.35 90.14 211.39	Detector Mode PK/QP/AV Peak Peak Peak	Fre Spectrum Reading Level dBµV 50.97 50.56 47.61	Factor dB -15.52 -15.23 -11.57	Actual FS dBµV/m 35.45 35.33 36.04	Limit @3m dBµV/m 40.00 43.50 43.50	Margin dB -4.55 -8.17 -7.46

Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

29.88

3.89

33.77



Chip Antenna

			equency (MI	lz)			
030	224.	418.	Li	612.		806.	100
10		· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · ·		
20							
30	4 5		6				
40 1 2	[· · · · · · · · · · · · · · · · · · ·				· · · · · · · · · · · · · · · · · · ·	
50	 	· · · · · · · · · · · · · · · · · · ·					
60		· · · · · · · · · · · · · · · · · · ·				, , , , , , , , , , , , , , , , , , ,	
70							
80							
90							
	-						
100 Level (dBuV/	m)						
						•	
Detector		Peak				cony	
Polarize		Vertical					Chang
Test Iten	n i	30MHz-1GHz		Test Da		November 28, 20	
Test Mod	e:	BT Mode		Temp/Hum		22.5(°C)/ 59%R	

Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
42.61	Peak	49.07	-11.25	37.82	40.00	-2.18
83.35	Peak	52.44	-15.52	36.92	40.00	-3.08
105.66	Peak	45.10	-11.02	34.08	43.50	-9.42
143.49	Peak	40.36	-9.86	30.50	43.50	-13.00
231.76	Peak	39.67	-10.75	28.92	46.00	-17.08
500.45	Peak	35.48	-2.93	32.55	46.00	-13.45



Test Mod	de:	BT Mode	-	Temp/Hum	22.5(°C	C)/ 59%Rł
Test Iter	n	30MHz-1GHz		Test Date	Novemb	er 28, 20
Polarize	e	Horizontal	Te	est Engineer	Jerry	/ Chang
Detecto	or	Peak				
100 Level (dBuV	//m)					
90						
80						
70				· · · · · · · · · · · · · · · · · · ·	 	
60				· · · · · · · · · · · · · · · · · · ·		
50						
40	[
30	2 3			5	6	
20	· · · · · · · · · · · · · · · · · · ·					
				· · · · · · · · · · · · · · · · · · ·		·
10				-		
	224.	418. Fre	equency (MHz)	512.	806.	1000
10	224.			512.	806.	1000
10 0 30		Fre	equency (MHz)			
10	Detector	Fre		Actual	Limit	1000 Margin
10 0 30	Detector Mode	Free Spectrum Reading Level	equency (MHz)	Actual FS	Limit @3m	
10 0 30 Freq.	Detector	Fre	equency (MHz) Factor	Actual	Limit	Margin
10 0 30 Freq. MHz	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
10 0 30 Freq. 83.35	Detector Mode PK/QP/AV Peak	Free Spectrum Reading Level dBµV 51.95	Factor dB -15.52	Actual FS dBµV/m 36.43	Limit @3m dBµV/m 40.00	Margin dB -3.57
10 030 Freq. 83.35 151.25	Detector Mode PK/QP/AV Peak Peak	Free Spectrum Reading Level dBµV 51.95 41.55	Factor dB -15.52 -9.90	Actual FS dBµV/m 36.43 31.65	Limit @3m dBµV/m 40.00 43.50	Margin dB -3.57 -11.85
10 030 Freq. 83.35 151.25 231.76	Detector Mode PK/QP/AV Peak Peak Peak	Free Spectrum Reading Level dBµV 51.95 41.55 41.83	Factor dB -15.52 -9.90 -10.75	Actual FS dBμV/m 36.43 31.65 31.08	Limit @3m dBµV/m 40.00 43.50 46.00	Margin dB -3.57 -11.85 -14.92



Dipole Antenna

Test Mode:		BT Mode	Temp/Hu	m	22.5(°C)/ 59%	R⊦
Test Item	30	MHz-1GHz	Test Date	e D	December 31, 20 ⁻	
Polarize		Vertical	Test Engine		Jerry Chang	
Detector		Peak				
100 Level (dBuV/m))					
90				 		
80						
70			 			
60				 		
50						
40 1	2	3		5		6
30			4			
20						
10				· · · · · · · · · · · · · · · · · · ·		
0 <mark></mark>	224.	418. Freque	612. icy (MHz)	8	D6. 1	000

Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
83.35	Peak	49.86	-15.52	34.34	40.00	-5.66
211.39	Peak	44.59	-11.57	33.02	43.50	-10.48
454.86	Peak	37.84	-3.79	34.05	46.00	-11.95
573.20	Peak	31.16	-1.83	29.33	46.00	-16.67
764.29	Peak	33.18	1.70	34.88	46.00	-11.12
987.39	Peak	26.71	5.46	32.17	54.00	-21.83



828.31

Peak

Test Mod	de:	BT Mode	1	ſemp/Hum	22.5(°C	C)/ 59%RH
Test Iter	n	30MHz-1GHz		Test Date	Decemb	er 31, 202
Polarize	е	Horizontal	Te	st Engineer		/ Chang
Detecto	or	Peak				
100 Level (dBuV	//m)					
90						
80						
70						
60					·	
50					·	
40 12	3	4			5 6	
30						
20						
10						
0 <mark></mark>	224.	418.	: 6	12.	806.	1000
		Fre	equency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
•	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
83.35	Peak	48.98	-15.52	33.46	40.00	-6.54
90.14	Peak	48.66	-15.23	33.43	43.50	-10.07
211.39	Peak	46.81	-11.57	35.24	43.50	-8.26
					1	
454.86	Peak	38.31	-3.79	34.52	46.00	-11.48
454.86 767.20	Peak Peak	38.31 31.39	-3.79 1.74	34.52 33.13	46.00 46.00	-11.48 -12.87

Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

27.85

3.26

31.11

46.00

-14.89



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Above 1G Test Data

PCB Antenna

		F	ency (MHz)		
⁰ 1000	6100.	11200.	16300.	21400.	26500
10					
30					
50					
70					
90					
110					
	-				
120 Level (dBuV/n	n)				
Detector		Peak			, onang
Polarize		Vertical	Test Engine		y Chang
Test Item		Harmonic	Test Date		, ber 27, 20 ⁻
Test Mode		BLE Low CH	Temp/Hur		C)/ 59%RF

Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804.00	Peak	43.14	3.56	46.70	74.00	-27.30
N/A						

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	le:	BLE Low CH	Т	emp/Hum	22.5(°C)/ 59%RI
Test Iter	n	Harmonic	7	Test Date	Decembe	er 27, 20
Polarize	e	Horizontal	Tes	st Engineer		Chang
Detecto	or	Peak				
120	/m)					
110	4			+		
90	4			+	+	
70				* • • • • • • • • • • • • • • • • • • •		
50	1					
50						
30	· · · · · · · · · · · · · · · · · · ·					
				· · · · · · · · · · · · · · · · · · ·		
10	· · · · · · · · · · · · · · · · · · ·					
	0400	44000			24400	
10 0 1000	6100.	11200. Free	16 quency (MHz)	300.	21400.	26500
	6100.			300.	21400.	26500
	6100.			300. Actual	21400. Limit	26500 Margin
0 <mark></mark> 1000		Free	quency (MHz)			
0 <mark></mark> 1000	Detector	Free	quency (MHz)	Actual	Limit	
0 1000 Freq.	Detector Mode	Free Spectrum Reading Level	quency (MHz) Factor	Actual FS	Limit @3m	Margin
0 1000 Freq. MHz	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	quency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
0 1000 Freq. MHz 4804.00	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	quency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	le:	BLE Mid CH	Te	emp/Hum	22.5(°C)/ 59%Rł
Test Iter	n	Harmonic	Т	est Date	Decembe	er 27, 20
Polarize	Э	Vertical	Tes	t Engineer		Chang
Detecto	r	Peak				
120	/m)					
110						
110						
90						
50						
70	· · · · · · · · · · · · · · · · · · ·					
50	-					
30						
10		· · · · · · · · · · · · · · · · · · ·				
0 <mark></mark>	<u>6100.</u>	11200.	163	300.	21400.	26500
			quency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
Freq. MHz			Factor dB			Margin dB
	Mode	Reading Level		FS	@3m	-
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
MHz 4880.00	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



i cot mou	e:	BLE Mid CH	Te	emp/Hum	22.5(°C)/ 59%Rł
Test Item	n	Harmonic	Т	est Date	Decembe	er 27, 20
Polarize	;	Horizontal	Tes	st Engineer		Chang
Detector	r	Peak				
120 Level (dBuV/	/m)					
110						
110						
00						
90						
70						
50	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					
50						
30						
	 		 	1 1 1 4		1
10						
	6400	11200	46	200	21400	26500
0 1000	6100.	11200. Free	16: quency (MHz)	300.	21400.	26500
	6100.			300.	21400.	26500
0 <mark></mark>		Free	quency (MHz)			
	Detector	Free		Actual	Limit	26500 Margin
0 1000 Freq.	Detector Mode	Free Spectrum Reading Level	quency (MHz) Factor	Actual FS	Limit @3m	Margin
0 1000 Freq. MHz	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	quency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
0 1000 Freq.	Detector Mode	Free Spectrum Reading Level	quency (MHz) Factor	Actual FS	Limit @3m	Margin
0 1000 Freq. MHz	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	quency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
01000 Freq. MHz 4880.00	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	quency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	e:	BLE High CH	Te	emp/Hum	22.5(°C)/ 59%RI	
Test Iten	n	Harmonic	Т	est Date	Decembe	December 27, 20	
Polarize)	Vertical	Tes	st Engineer	Jerry	Chang	
Detecto	r	Peak					
120 Level (dBuV	/m)]	
110	i i i i i i i i i i i i i i i i i i i	· · · · · · · · · · · · · · · · · · ·		i i i i i			
90	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·			
70							
50	·1						
30							
10							
0 <mark>1000</mark>	6100.	11200. Free	16 quency (MHz)	300.	21400.	2650	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
1104.	Mode	Reading Level	1 40101	FS	@3m	margi	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4960.00	Peak	43.61	4.56	48.17	74.00	-25.83	
N/A							
IN/A							

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	e:	BLE High CH	Te	emp/Hum	22.5(°C)/ 59%Rł
Test Iten	n	Harmonic	Т	est Date	Decembe	er 27, 20 ⁻
Polarize	;	Horizontal	Tes	st Engineer		Chang
Detecto	r	Peak				
120 Level (dBuV	/m)					
110			1			
90				 		
70	· · · · · · · · · · · · · · · · · · ·					
50		· · · · · · · · · · · · · · · · · · ·		I I I I I I I I I I		
30						
10				· · · · · · · · · · · · · · · · · · ·		
	e de la companya de l		16	300.	21400.	26500
0 <mark>1000</mark>	6100.	11200.		500.	21400.	20000
0 <mark>.</mark> 1000	6100.		quency (MHz)	500.	21400.	20500
01000	6100.				21400.	20500
		Free	quency (MHz)			
01000 Freq.	6100. Detector Mode	Free		Actual FS	Limit @3m	Margin
	Detector	Free Spectrum Reading Level	quency (MHz)	Actual FS	Limit @3m	
Freq.	Detector Mode	Free	quency (MHz) Factor	Actual	Limit	Margin
Freq. MHz	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	quency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
Freq. MHz 4960.00	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	quency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Chip Antenna

110			
90		 	
70			
50		 	
50	1		
50			
50			
/0			
70			
70		 	
90			
120 Level (dBuV/m)		 	

Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804.00	Peak	37.43	2.84	40.27	74.00	-33.73
N/A						

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	le:	BLE Low CH	Т	emp/Hum	22.5(°C)/ 59%Rl
Test Iter	n	Harmonic	1	est Date	Novembe	er 29, 20
Polarize	e	Horizontal	Tes	st Engineer		Chang
Detecto	r	Peak				
120 Level (dBuV/	(m)					
110						
110						
90						
50						
70	 			I I I I I I I		
50						
	1					
30		· · · · · · · · · · · · · · · · · · ·				
10					 	
0 <mark></mark>	6100.	11200.	16	300.	21400.	26500
	0100.			500.	21400.	20300
1000		Free	quency (MHz)			
1000		Free	quency (MHz)			
	Detector			Actual	1 ::4	Morain
Freq.	Detector	Spectrum	quency (MHz) Factor	Actual	Limit	Margin
Freq.	Mode	Spectrum Reading Level	Factor	FS	@3m	-
Freq. MHz	Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor	FS dBµV/m	@3m dBµV/m	dB
Freq. MHz 4804.00	Mode	Spectrum Reading Level	Factor	FS	@3m	-
Freq. MHz	Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor	FS dBµV/m	@3m dBµV/m	dB
Freq. MHz 4804.00	Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor	FS dBµV/m	@3m dBµV/m	dB

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Moc	le:	BLE Mid CH	Т	emp/Hum	22.5(°C)/ 59%Rl
Test Iter		Harmonic		Fest Date	Novembe	
Polarize		Vertical	Tes	st Engineer	Jerry	Chang
Detecto	r	Peak				
120 Level (dBuV	/m)					
110	· · · · · · · · · · · · · · · · · · ·		 	1 I 1 I 4 I 4 I 4 I 1		
90	· · · · · · · · · · · · · · · · · · ·			i i i i i		
70			 		 	
50	1					
30						
10						
0 <mark></mark>	<u>6100.</u>	11200.	16	300.	21400.	26500
		Free	quency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	Peak	36.67	3.02	39.69	74.00	-34.31
4880.00	-					
4880.00 N/A						

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	e:	BLE Mid CH	Te	emp/Hum	22.5(°C)/ 59%RH
Test Iten	n	Harmonic	Т	Test Date	Novembe	er 29, 20 ⁻
Polarize		Horizontal		st Engineer		Chang
Detecto	r	Peak				
120	(m)					
	,					
110						
90						
70						
50						
50	1					
30						
10			 			
0 1000	6100.	11200.	16	300.	21400.	26500
1000	5100.		quency (MHz)		21700	20300
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
-	Mode	Reading Level		FS	@3m	-
		dBµV	dB	dBµV/m	dBµV/m	dB
MHz	PK/QP/AV	ubμv				
MHz 4880.00	PK/QP/AV Peak	36.65	3.02	39.67	74.00	-34.33
			3.02	39.67	74.00	-34.33
4880.00			3.02	39.67	74.00	-34.33

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	e:	BLE High CH	Te)/ 59%Rł
Test Iten	n	Harmonic	Т	est Date	Novembe	er 29, 20
Polarize	9	Vertical	Tes	st Engineer		Chang
Detecto	r	Peak				
120 Level (dBuV	/m)					
110						
90						
50						
70	1 1 1 1 1	· · · · · · · · · · · · · · · · · · ·		 		
	· · ·	1				·
50	 			I I I I I I I I		
50	1					
50 30	1					
	1					
	1					
30	6100	11200	16	300	21400.	26500
30	6100.	11200. Free	16: juency (MHz)	300.	21400.	26500
30	6100.			300.	21400.	26500
30 10 0 1000		Free	quency (MHz)			
30	Detector	Free		Actual	Limit	26500 Margin
30 10 0 1000 Freq.	Detector Mode	Free Spectrum Reading Level	iuency (MHz) Factor	Actual FS	Limit @3m	Margin
30 10 0 1000 Freq. MHz	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	puency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
30 10 0 1000 Freq. MHz 4960.00	Detector Mode	Free Spectrum Reading Level	iuency (MHz) Factor	Actual FS	Limit @3m	Margin
30 10 0 1000 Freq. MHz	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	puency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
30 10 0 1000 Freq. MHz 4960.00	Detector Mode PK/QP/AV	Free Spectrum Reading Level dBµV	puency (MHz) Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	e:	BLE High CH	Т	emp/Hum	22.5(°C)/ 59%RH
Test Iten	n	Harmonic	1	Fest Date	Novemb	er 29, 20 ⁻
Polarize	;	Horizontal	Tes	st Engineer		Chang
Detecto	r	Peak				
Level (dBuV	(m)					
120 Level (dBuV						1
110			 			
						1
90						
70						
						1 1 1 1
50	1					
30						
50						
10						
0 <mark></mark>	6100.	11200.	46	300.	21400.	26500
1000	6100.		quency (MHz)	500.	21400.	20000
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
•	Mode	Reading Level		FS	@3m	Ū
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Peak	36.29	3.85	40.14	74.00	-33.86
N/A						

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Dipole Antenna

	26500	
10	·	
30	1 1 1 1	
50		
50		
70		
90		
110		
110		
120 Level (dBu)		
Detecto	iny onlang	
	erry Chang	
	December 27, 20 ²	
Test Moo Test Iter Polarizo		

Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804.00	Peak	43.23	3.56	46.79	74.00	-27.21
N/A						

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	le:	BLE Low CH	Te	emp/Hum	22.5(°C)/ 59%Rł
Test Iter	n	Harmonic	Т	est Date	Decemb	er 27, 20
Polarize	Э	Horizontal	Tes	st Engineer		Chang
Detecto	r	Peak				
Lovel (dBu)	(m)					
120 Level (dBuV	(11)					
110	 	· · · · · · · · · · · · · · · · · · ·				
90	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			
70	1 		 	 		
50	· · · · · · · · · · · · · · · · · · ·	 				
30	· · · · · · · · · · · · · · · · · · ·					
10						
0 <mark></mark>	6100.	11200.	163	300.	21400.	26500
		Fre	quency (MHz)			
_	Detector	Spectrum	Factor	Actual	Limit	Margin
Freq.				50	@3m	J
Freq.	Mode	Reading Level		FS	@3III	
Freq. MHz		Reading Level dBµV	dB	FS dBµV/m	dBµV/m	dB
	Mode	-	dB 3.56	_	-	dB -25.55
MHz	Mode PK/QP/AV	dBµV		dBµV/m	dBµV/m	
MHz 4804.00	Mode PK/QP/AV	dBµV		dBµV/m	dBµV/m	

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Te	est Mode	e:	BLE Mid CH	Т	emp/Hum	22.5(°C)/ 59%Rł
٦	Test Item	l .	Harmonic	1	Test Date	Decembe	er 27, 20 ⁻
	Polarize		Vertical	Tes	st Engineer	Jerry Chang	
	Detector		Peak				
120	Level (dBuV/n	n)			: :		
110							
90							
70	 		1 1 	 			
50		1				 	
30			· · · · · · · · · · · · · · · · · · ·				
10							
0	1000	6100.	11200.		300.	21400.	26500
			Fre	quency (MHz)			
F	req.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
Ν	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
48	80.00	Peak	40.37	3.77	44.14	74.00	-29.86
1	N/A						

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	le:	BLE Mid CH	Te	emp/Hum	22.5(°C)/ 59%R	
Test Iter	n	Harmonic	Т	est Date	Decemb	
Polarize	Э	Horizontal	Tes	t Engineer	Jerry	Chang
Detecto	r	Peak				
120 Level (dBuV	//m)					
110						
			1			
90						
50						
70			 	 	 	
50	-				 	
				· · · · · · · · · · · · · · · · · · ·		
30	· · · · · · · · · · · · · · · · · · ·				 	
10		·		· · · · · · · · · · · · · · · · · · ·	 	
0 <mark></mark>	<u>6100.</u>	11200.	16	: 300.	21400.	26500
			quency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	-
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4880.00	Peak	41.73	3.77	45.50	74.00	-28.50
N/A						
N/A						
4000.00	Feak	41.75	5.77	45.50	74.00	-20.50

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mo		BLE High CH		emp/Hum)/ 59%RI
Test Ite	m	Harmonic		est Date	Decemb	
Polariz	e	Vertical	Tes	st Engineer	Jerry	Chang
Detecto	or	Peak				
120 Level (dBu	V/m)					
110			 			
90				·		
70		· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·		
50		 	 	 	 	
30						
						1
10						
0 <mark></mark>	6100 .	11200.		300 .	21400.	26500
		Fre	quency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Peak	42.31	4.56	46.87	74.00	-27.13
N/A						

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	e:	BLE High CH		emp/Hum	22.5(°C)/ 59%Rł	
Test Item		Harmonic		est Date	December 27, 20	
Polarize		Horizontal	Tes	st Engineer	Jerry Chang	
Detector		Peak				
120 Level (dBuV	(m)		i			
110		· · · · · · · · · · · · · · · · · · ·				
90		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	·	 		
70						
50						
30	 		 		 	
10						
0 <mark></mark>	6100.	11200.		300.	21400.	26500
		Fre	quency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
i ieq.	Mode	Reading Level	I actor	FS	@3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Peak	46.20	4.56	50.76	74.00	-23.24
		+				
N/A						

Remark:

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit

--End of Test Report--