# FCC TEST REPORT

### FOR

### AZUMI S.A

### Mobile phone

## Model No.: Speed pro 55

### Additional Model No.: Please refer to page 6

Prepared for Address	:	AZUMI S.A Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso 16 of. 16-01, Marbella, Ciudad de Panama
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Tel	:	(+86)755-82591330
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Web	:	www.LCS-cert.com
Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	March 29, 2017
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	March 29, 2017~May 26, 2017
Date of Report	:	May 26, 2017

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SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: QRP-AZUMISPEEDP55 Report No.: LCS170330037AE						
FCC TEST REPORT						
FCC CFR 47 PART 15 C(15.247)						
Report Reference No: : LCS170330037AE						
Date of Issue : May 26, 2017						
Testing Laboratory Name : Shenzhen LCS Compliance Testing Laboratory Ltd.						
Address 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China						
Testing Location/ Procedure : Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □						
Applicant's Name : AZUMI S.A						
Address : Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso 16 of. 16-01, Marbella, Ciudad de Panama						
Test Specification						
Standard : FCC CFR 47 PART 15 C(15.247)						
Test Report Form No : LCSEMC-1.0						
TRF Originator Shenzhen LCS Compliance Testing Laboratory Ltd.						
Master TRF : Dated 2011-03						
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Test Item Description : Mobile phone						
Trade Mark : AZUMI						
Model/ Type reference : Speed pro 55						
Ratings						

Result .....: Positive

Supervised by:

Output: DC 5V, 1.0A

Charging parameter: AC Input: 100~240V, 50/60Hz, 0.2A;

Approved by:

Compiled by: Kyle Tir

les m

Kyle Yin/ File administrators

Glin Lu/ Technique principal

Gavin Liang/ Manager

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### FCC -- TEST REPORT

Test Report No. :	LCS170330037AE	<u>May 26, 2017</u> Date of issue
EUT	: Mobile phone	
Type / Model	: Speed pro 55	
Applicant	: AZUMI S.A	
Address	: Avenida Aquilino de la 16 of. 16-01, Marbella,	Guardia con Calle 47, PH Ocean Plaza, Piso Ciudad de Panama
Telephone	: /	
Fax	: /	
Manufacturer	: AZUMI HK LTD	
Address	: FLAT/RM 18 BLK 1 14/ KWAI TAK STREET KV	F GOLDEN INDUSTRIAL BUILDING 16-26 WAI CHUNG,HK
Telephone	: /	
Fax	: /	
Factory	: LWIN HK CO.,LIMITEI	)
Address	: Room 9C,A Zone,Shen	ye Tairan Hongsong building,Tairan Six liao, FuTian District,Shenzhen,Guangdong
Telephone		
Fax	: /	

|--|

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.

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## **Revision History**

Revision	vision Issue Date Revisions		Revised By
00	2017-05-26	Initial Issue	Gavin Liang

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### **1. GENERAL INFORMATION**

1.1 Description of Device (EUT)

Name of EUT	Mobile phone
Model Number	Speed pro 55
Modulation Type	GMSK for GSM/GPRS, 8-PSK for EDGE,QPSK for UMTS, QPSK, 16QAM for LTE
Antenna Gain	0.5dBi (max.) For GSM 850; 0.5dBi (max.) For GSM 900; 0.5dBi (max.) For DCS 1800; 0.5dBi (max.) For PCS 1900; 0.5dBi (max.) For WCDMA Band II 0.5dBi (max.) For WCDMA Band V 0.5dBi (max.) For LTE FDD Band 2; 0.5dBi (max.) For LTE FDD Band 4; 0.5dBi (max.) For LTE FDD Band 7; 0.5dBi (max.) For BT and WLAN
Hardware version	/
Software version	/
GSM/EDGE/GPRS Operation Frequency Band	GSM850/PCS1900/GPRS850/GPRS1900/EDGE850/EDGE1900
UMTS Operation Frequency Band	UMTS FDD Band II/V
LTE Operation Frequency Band	LTE FDD band 2, FDD band 4, FDD band 7
GSM/EDGE/GPRS	Supported GSM/GPRS/EDGE
GSM Release Version	R99
GSM/EDGE/GPRS Power Class	GSM850:Power Class 4/ PCS1900:Power Class 1
GPRS/EDGE Multislot Class	GPRS/EDGE: Multi-slot Class 12
GPRS operation mode	Class B
WCDMA Release Version	R99
HSDPA Release Version	Release 10
HSUPA Release Version	Release 6
DC-HSUPA Release Version	Not Supported
LTE Release Version	R8
LTE/UMTS Power Class	Level 3
WLAN FCC Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
WLAN FCC Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2412-2462MHz
Antenna Type	Integral Antenna
BT Modulation Type	GFSK,8DPSK,π/4DQPSK(BT V4.0)
Extreme temp. Tolerance	-30°C to +50°C
GPS function	Support and only RX
NFC Function	Not Support
Extreme vol. Limits	3.40VDC to 4.2VDC (nominal: 3.70VDC)

### **1.2. Host System Configuration List and Details**

Manufacturer	Description	Model	Serial Number	Certificate	
AZUMI S.A	Power Adapter	TPA-46050150UU		FCC VoC	

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### 1.3. External I/O Cable

I/O Port Description	Quantity	Cable
USB	1	N/A
Earphone	1	N/A

### **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. 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.

### 1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
		9KHz~30MHz	±3.10dB	(1)
Radiation Uncertainty		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.

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#### 1.7 Description of Test Modes

Bluetooth operates in the unlicensed ISM Band at 2.4GHz. With basic data rate feature, the data rates can be up to 1 Mb/s by modulating the RF carrier using GFSK techniques. The EUT works in the X-axis, Y-axis, Z-axis. The following operating modes were applied for the related test items. All test modes were tested, only the result of the worst case was recorded in the report.

Mode of Operations	Frequency Range (MHz)	Data Rate (Mbps)			
	2402	1/2/3			
BT V 3.0	2441	1/2/3			
	2480	1/2/3			
For Conducted Emission					
Test Mode	-	TX Mode			
For Radiated Emission					
Test Mode	-	TX Mode			

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).

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(1Mbps-Low Channel).

AC conducted emission pre-test at both at AC 120V/60Hz and AC 240V/50Hz modes, recorded worst case;

AC conducted emission pre-test at both at power adapter and power from PC modes, recorded worst case;

### 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

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

#### 2.3.2 Radiated Emissions

The EUT is placed on a turntable, which is directly placed on the ground. 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

The sample will control by special test software (RF Test Tool) to control sample change channel, modulation provided by application;

#### 3.3 Special Accessories

No.	Equipment	Manufactur er	Model No.	Serial No.	Length	shielded/ unshielded	Notes
1	PC	Lenovo	Ideapad	A131101550	/	/	DOC
2	Power adapter	Lenovo	CPA-A090	36200414	1.00m	unshielded	DOC

#### 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

	Applied Standard: FCC Part 15 Subpart C	
FCC Rules	Description of Test	Result
§15.247(b)(1)	Maximum Conducted Output Power	Compliant
§15.247(c)	Frequency Separation And 20 dB Bandwidth	Compliant
§15.247(a)(1)(ii)	Number Of Hopping Frequency	Compliant
§15.247(a)(1)(iii)	Time Of Occupancy (Dwell Time)	Compliant
§15.209, §15.205	Conducted Spurious Emissions and Band Edges Test	Compliant
§15.209, §15.247(d)	Radiated and Conducted Spurious Emissions	Compliant
§15.205	Emissions at Restricted Band	Compliant
§15.207(a)	§15.207(a) Conducted Emissions	
§15.203	§15.203 Antenna Requirements	
§15.247(i)§2.1093	RF Exposure	Compliant

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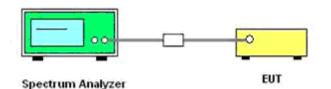
### 5. SUMMARY OF TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Sensor	R&S	NRV-Z51	100458	2016-06-18	2017-06-17
2	Power Sensor	R&S	NRV-Z32	10057	2016-06-18	2017-06-17
3	Power Meter	R&S	NRVS	100444	2016-06-18	2017-06-17
4	DC Filter	MPE	23872C	N/A	2016-06-18	2017-06-17
5	RF Cable	Harbour Industries	1452	N/A	2016-06-18	2017-06-17
6	SMA Connector	Harbour Industries	9625	N/A	2016-06-18	2017-06-17
7	Spectrum Analyzer	Agilent	N9020A	MY50510140	2016-10-27	2017-10-26
8	Signal analyzer	Agilent	E4448A(Exter nal mixers to 40GHz)	US44300469	2016-06-16	2017-06-15
9	RF Cable	Hubersuhne	Sucoflex104	FP2RX2	2016-06-18	2017-06-17
10	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2016-06-18	2017-06-17
11	Amplifier	SCHAFFNER	COA9231A	18667	2016-06-18	2017-06-17
12	Amplifier	Agilent	8449B	3008A02120	2016-06-16	2017-06-15
13	Amplifier	MITEQ	AMF-6F-2604 00	9121372	2016-06-16	2017-06-15
14	Loop Antenna	R&S	HFH2-Z2	860004/001	2016-06-18	2017-06-17
15	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2016-06-10	2017-06-09
16	Horn Antenna	EMCO	3115	6741	2016-06-10	2017-06-09
17	Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	2016-06-10	2017-06-09
18	RF Cable-R03m	Jye Bao	RG142	CB021	2016-06-18	2017-06-17
19	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2016-06-18	2017-06-17
20	EMI Test Receiver	R&S	ESCI	101142	2016-06-18	2017-06-17
21	Artificial Mains	R&S	ENV216	101288	2016-06-18	2017-06-17
22	EMI Test Software	AUDIX	E3	N/A	2016-06-18	2017-06-17

### 6. ANTENNA PORT MEASUREMENT

#### 6.1 Peak Power

6.1.1 Block Diagram of Test Setup



#### 6.1.2 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: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

#### 6.1.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

 $\mathsf{VBW} \geq \mathsf{RBW}$ 

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

#### 6.1.4 Test Results

Test Mode	Channel	Frequency (MHz)	Measured Maximum Power (dBm)	Limits (dBm)	Verdict
	0	2402	1.508		
GFSK	39	2441	2.513	30.00	PASS
	78	2480	1.535		
	0	2402	0.790		
π/4DQPSK	39	2441	1.667	30.00	PASS
	78	2480	0.036		
	0	2402	0.603		
8DPSK	39	2441	1.764	30.00	PASS
	78	2480	0.095		

Remark:

1. Test results including cable loss;

- 2. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.
- 3. Worst case data at DH1 for GFSK, 2DH1 for  $\pi$ /4DQPSK, 3DH1 for 8DPSK modulation type;

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#### SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: QRP-AZUMISPEEDP55 Report No.: LCS170330037AE Peak Output Power GFSK π/4-DQPSK Marker 1 2.401920000000 GHz Trig: Free Run PH0: Example PH0: Example Atten: 20 dB № 50 Q AC 1 2.402165000000 GHz Trig: Free Run PN0: Fast \_\_\_\_\_\_ PN0: Fast \_\_\_\_\_\_ Atten: 20 dB ALIGN OFF Avg Type: Log-Pw Avg|Hold>100/100 Aug Type: Log-Pw Avg Hold>100/100 Peak Searc Peak Sear DET Mkr1 2.402 165 GHz 1.508 dBm Next Mkr1 2.401 92 GHz 0.790 dBm Next Ref Offset 0.5 dB Ref 10.00 dBm Ref Offset 0.5 dB Ref 10.00 dBm div **♦**<sup>1</sup> **≜**<sup>1</sup> Next Pk Rig Next Pk R ihi Next Pk Next Pk eft Marker Marker Mki Mkr Mkr →R ore of 2 Center 2.402000 GHz #Res BW 1.0 MHz Center 2.402000 GHz #Res BW 3.0 MHz Span 5.000 MH Sweep 1.000 ms (1001 pts Span 10.00 MHz Sweep 1.000 ms (1001 pts) #VBW 1.0 MHz #VBW 3.0 MHz Channel 0 / 2402 MHz Channel 0 / 2402 MHz Agtenting so target and the solution of the s Image: Non-State State Non-State Trig: Free Run IFGaint.ow ALIGN OFF Avg Type: Log-Pw Avg|Hold>100/100 Peak Searc Avg Type: Log-Pwr Avg|Hold>100/100 Peak Searc TYPE NNNN DET PNNNN TYPE MWWWW DET P NNNN Next Next Mkr1 2.441 125 GHz 2.513 dBm Mkr1 2.440 86 GHz 1.667 dBm Ref Offset 0.5 dB Ref 10.00 dBm Ref Offset 0.5 dB Ref 10.00 dBm **♦**<sup>1</sup> **♦**<sup>1</sup> Next Pk R Next Pk R h Next Pk Next Pk efi Marker D Marker Mkı Mkr Mkr. P ore Center 2.441000 GHz #Res BW 1.0 MHz Center 2.441000 GHz #Res BW 3.0 MHz of 2 Span 5.000 MHz Sweep 1.000 ms (1001 pts Span 10.00 MHz Sweep 1.000 ms (1001 pts) #VBW 1.0 MHz #VBW 3.0 MHz Channel 39 / 2441 MHz Channel 39 / 2441 MHz Action reported to a first state of the first stat Marker 1 2.479720000000 GHz PNO: Fast IFGain:Low Atten: 20 dB Avg Type: Log-Pw Avg|Hold>100/100 Peak Searc Peak Sear Avg Type: Log-Pw Avg|Hold>100/100 TYPE N DET P Mkr1 2.479 830 GHz 1.535 dBm NextF Mkr1 2.479 72 GHz 0.036 dBm Next Ref Offset 0.5 dB Ref 10.00 dBm Ref Offset 0.5 dB Ref 10.00 dBm 10 dB/div ¢¹ **♦**<sup>1</sup> Next Pk F Next Pk P Next Pk Next Pk efi Marker De Marker Mkı Mkr Mkr →Re More 1 of 2 <sup>of C</sup>Center 2.480000 GHz #Res BW 3.0 MHz Center 2.480000 GHz #Res BW 1.0 MHz Span 5.000 MHz Sweep 1.000 ms (1001 pts Span 10.00 MHz Sweep 1.000 ms (1001 pts) #VBW 1.0 MHz #VBW 3.0 MHz Channel 78 / 2480 MHz Channel 78 / 2480 MHz

Peak Output Power

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SHENZHEN LCS COMPLIANCE T	ESTING LABORATORY	LTD. F	FCC ID: QRP-AZUMISPEEDP55 Report No.: LCS170330037AE
8DPS	SK		
Agilent.Spectrum Analyzer - Swept SA           Det         RF         50 Q         AC         SENSE:ENT	ALIGN OFF 10:46:39 AM Apr 14, 2017		
Marker 1 2.401940000000 GHz PN0: Fast IFGain:Low Atten: 20 dB	Avg Type: Log-Pwr Avg Hold>100/100 Det P N N N N	Peak Search	
Ref Offset 0.5 dB 10 dB/div Ref 10.00 dBm Log	Mkr1 2.401 94 GHz 0.603 dBm	Next Pea	eak
0.00		Next Pk Rig	bht
-10.0			
autore		Next Pk Le	left
20.0			
-300 gff		Marker Del	eita
-50.0		Mkr-C	
-60.0			
-70.0		Mkr→RefL	
-80.0			
Center 2 402000 GHz	Span 10.00 MHz	<b>M</b> o 1 of	ore of 2
Center 2.402000 GHz #Res BW 3.0 MHz #VBW 3.0 MHz MSG	Span 10.00 MHz Sweep 1.000 ms (1001 pts)		1
Channel 0 / 2			
Agilent: Spectrum Analyzer - Swept SA         Sever State         Sever State	▲ ALIGN OFF 10:46:05 AM Apr 14, 2017 Avg Type: Log-Pwr Avg Hold>100/100 Det P NINNN Det P NINNN	Peak Search	
IFGain:Low Atten: 20 dB	Mkr1 2.440 84 GHz	NextP	
10 dB/div Ref 10.00 dBm	1.764 dBm	Next Pk Ri	
10.0			
-20.0		Next Pk I	
-30.0		Marker D	
-40.0		Markerb	
-50.0		Mkr-	
-60.0		1	
-70.0		Mkr→Ref	
-80.0		M	
Center 2.441000 GHz #Res BW 3.0 MHz #VBW 3.0 MHz MSG	Span 10.00 MHz Sweep 1.000 ms (1001 pts)		
Channel 39 /			
Agilent Spectrum Analyzer - Swept SA           μ         RF         50 Ω         AC         SENSE:INT           Marker 1 2.479800000000 GHz	ALIGN OFF 10:47:12 AM Apr 14, 2017 Avg Type: Log-Pwr TRACE 1 2 3 4 5 6	Peak Search	
PN0: Fast Trig: Free Run IFGain:Low Atten: 20 dB Ref Offset 0.5 dB	Avg Type: Log-Pwr Avg Hold>100/100 Mkr1 2.479 80 GHz 0.095 dBm	NextP	
Log		Next Pk Ri	
0.00		NEAL PK R	
-10.0		Next Pk L	
-20.0			
30.0		Marker D	
-40.0			
-60.0		Mkr–	
-70.0		Mkr→Ref	
-80.0		м	
Center 2.480000 GHz #Res BW 3.0 MHz #VBW 3.0 MHz	Span 10.00 MHz Sweep 1.000 ms (1001 pts)	1	
Channel 78 /	STATUS		
Gildilliei 787			

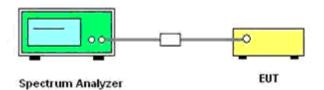
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#### 6.2 Frequency Separation and 20 dB Bandwidth

#### 6.2.1 Limit

According to §15.247(c) or A8.1(a), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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 in15.209(a).

6.2.2 Block Diagram of Test Setup



#### 6.2.3 Test Procedure

Frequency separation test procedure :

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

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = middle of hopping channel.

4). Set the Spectrum Analyzer as RBW = 100 KHz, VBW = 300 KHz, Span = wide enough to capture the peaks of two adjacent channels, Sweep = auto.

5). Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

20dB bandwidth test procedure :

1). Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel.

2). RBW = 30 KHz, VBW = 100 KHz.

- 3). Detector function = peak.
- 4). Trace = max hold.

#### 6.2.4 Test Results

#### 6.2.4.1 20dB Bandwidth

Tost Modo	Test Mode Channel		Measured Ba	Measured Bandwidth (KHz)		Verdict
Test Mode	Channer	(MHz)	99%	20dB	(KHz)	veruici
	0	2402	842.71	746.3		
GFSK	39	2441	839.56	744.7	No Limits	PASS
	78	2480	845.53	747.2		
	0	2402	1065.50	1117.00		
π/4DQPSK	39	2441	1061.00	1116.00	No Limits	PASS
	78	2480	1064.00	1117.00		
	0	2402	1104.80	1163.00		
8DPSK	39	2441	1102.40	1160.00	No Limits	PASS
	78	2480	1104.80	1163.00		

#### Remark:

1. Test results including cable loss;

2. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.

3. Worst case data at DH1 for GFSK, 2DH1 for  $\pi$ /4DQPSK, 3DH1 for 8DPSK modulation type;

4. Please refer following test plots;

20dB Bandw	idth ar	nd 99% Bandwidth	
GFSK		π/4DQPSK	
Slent Spectrum Analyzer - Occupied BW 16 50.0 a.C SENSEINT ▲10.01 CPF 10.3645/AM Apr 14,2017 16 - 20.0.0 GB Conter Freq: 2.4/2020000 GHz Radio Std: None	Trace/Detecto	Agitant Spectrum Analyzer - Decupied BW         Spectrum Analyzer - Decupied BW           66         59 0.9         A.C.         SPINEE/NT         Aut JNN OFF         10.490.05 AM Apr 14, 2007           7         69.0         2.4020000000 GHz         Center Free; 2.402000000 GHz         Radie Std: None         T	Trace/Dete
dB -20.00 dB         Center Freq: 2.40200000 GHz         Radio Std: None           miFGain:Luw         Trig: Freq: Num         Avg Hold>10/10           miFGain:Luw         \$Atten: 20 dB         Radio Device: BTS		Center Freq 2.402000000 GHz Trig: Freq X.40200000 GHz Radio Std: None Trig: Freq X.40200000 GHz Radio Std: None Radio Std: None Radio Std: None Radio Std: None Radio Std: None Radio Std: None Radio Std: None	
D dB/div Ref 10.00 dBm		10 dB/div Ref 10.00 dBm	
	Clear W		Clear
	Avera		Ave
	Max H	1 700 800	Max
enter 2.402 GHz Span 3 MHz Res BW 30 KHz #VBW 100 kHz Sweep 3.2 ms		Center 2.402 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms	
Occupied Bandwidth Total Power 8.07 dBm	Min H	Occupied Bandwidth Total Power 7.15 dBm	Min
842.71 kHz	Dete	ak la	Det
Transmit Freq Error         2.296 kHz         OBW Power         99.00 %           x dB Bandwidth         746.3 kHz         x dB         -20.00 dB	Auto	ter Transmit Freq Error -457 Hz OBW Power 99.00 % Aut x dB Bandwidth 1.117 MHz x dB -20.00 dB	to
STATUS		MSG STATUS	
Channel 0 / 2402 MHz		Channel 0 / 2402 MHz	
Inf         Spectrum Analyzer : Decupied BW         SPEEINT         Aulum OFF         1050:30 AM Apr 14, 2017           Inf         50 a. AC         SPEEINT         Aulum OFF         1050:30 AM Apr 14, 2017           Infer Freq: 2.441000000 GHz         Center Freq: 2.441000000 GHz         Radio Std: None	Trace/Detecto	Agilunt Spectrum Analyzer - Discupied BW SEXEENT ALSO (FF 10.49-26 AM Apr 14, 2017) F 10 0 0 A A C Center Freq: 2.44 1000000 GHz Radio Std: None Radio Std: None	Trace/Dete
enter Freq 2.441000000 GHz ///FGaint.uw ///FGaint.uw ////////////////////////////////////		Unite Trig Free Run Avg Hold>10/10 #/FGain:Low #Atten: 20 dB Radio Device: BTS	
dB/div Ref 10.00 dBm		10 dB/div Ref 10.00 dBm	
	Clear W		Clear
	Avera		Av
	Max H	<b>1</b> 700	Max
Res BW 30 kHz Sweep 3.2 ms		Center 2.441 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms	
Occupied Bandwidth Total Power 8.89 dBm		Occupied Bandwidth Total Power 8.22 dBm	Min
839.56 kHz		ak	Det
Transmit Freq Error         -313 Hz         OBW Power         99.00 %           x dB Bandwidth         744.7 kHz         x dB         -20.00 dB	Auto	In Transmit Freq Error         802 Hz         OBW Power         99.00 %         Aut           x dB Bandwidth         1.116 MHz         x dB         -20.00 dB         -20.	to
STATUS		MSG STATUS	
Channel 39 / 2441 MHz		Channel 39 / 2441 MHz	
Int Spectrum Analyzer - Occupied 8W INF 509 A C SPREINT ▲LIDY CVF 125009 AM Apr 14, 2017 INTER FFreq 2,48000000 GHz Carter Freq 2,48000000 GHz Radio Std: None Center Freq 2,48000000 GHz Radio Std: None	Trace/Detecto		Trace/Det
Trig: Free Run Avg Hold>10/10 #IFGain:Low #Atten: 20 dB Radio Device: BTS		Trig: Free Run Avg Hold>10/10 #FGainLow #Atten: 20 dB Radio Device: BTS	
dB/div Ref 10.00 dBm		10 dB/div Ref 10.00 dBm	
	ClearW	0.00	Clear
	Avera		Av
	MaxH		Max
	Maxin		Ma
enter 2.48 GHz Span 3 MHz Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms	Min H	Center 2.48 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms	Mir
Occupied Bandwidth Total Power 6.86 dBm 845.53 kHz		Occupied Bandwidth Total Power 6.13 dBm	_
643.33 KTLZ Transmit Freq Error -1.572 kHz OBW Power 99.00 %	Detec Per Auto		De
x dB Bandwidth 747.2 kHz x dB -20.00 dB		x dB Bandwidth 1.117 MHz x dB -20.00 dB	
Channel 78 / 2480 MHz		Channel 78 / 2480 MHz	_

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#### 20dB Bandwidth and 99% Bandwidth 8DPSK Center Freq: 2.40200000 GHz Trig: Free Run Avg|Hold>10/10 10:48:40 AM Apr 14, 2017 Radio Std: None Trace/Detect enter Freq 2.402000000 GHz Radio Device: BTS #IFGain:Lo Ref 10.00 dBm Clear W Ave Max enter 2.402 GHz Res BW 30 kHz Span 3 MH Sweep 3.2 m #VBW 100 kHz Min Total Power 6.64 dBm Occupied Bandwidth 1.1048 MHz Dete -140 Hz OBW Power 99.00 % Transmit Freg Error x dB Bandwidth 1.163 MHz x dB -20.00 dB Channel 0 / 2402 MHz SENSEINT] ▲ALGN C Center Freq: 2.441000000 GHz Trig: Free Run Avg|Hold>10/10 10:48:19 AM Apr 14, 2017 Radio Std: None ALIGN OFF Trace/Detec Center Freq 2.441000000 GHz Radio Device: BTS #IFGain:Low Ref 10.00 dBm Clear W Ave Max Center 2.441 GHz #Res BW 30 kHz Span 3 MH Sweep 3.2 m #VBW 100 kHz Min Total Power 7.40 dBm Occupied Bandwidth 1.1024 MHz Dete Transmit Freq Error -942 Hz OBW Power 99.00 % x dB Bandwidth 1.160 MHz x dB -20.00 dB Channel 39 / 2441 MHz 10:47:43 AM Apr 14, 2 Radio Std: None Center Freq: 2.4 Trig: Free Run #Atten: 20 dB Trace/Detec Center Freq 2.480000000 GHz 000 GHz Avg|Hold>10/10 Radio Device: BTS #IFGain:Low Ref 10.00 dBn Clear W Ave Max Center 2.48 GHz #Res BW 30 kHz Span 3 MH #VBW 100 kHz Sweep 3.2 ms Min Occupied Bandwidth Total Power 5.73 dBm 1.1048 MHz Det OBW Power Transmit Freq Error -3.643 kHz 99.00 % x dB Bandwidth 1.163 MHz -20.00 dB x dB

Channel 78 / 2480 MHz

#### 6.2.4.2 Frequency Separation

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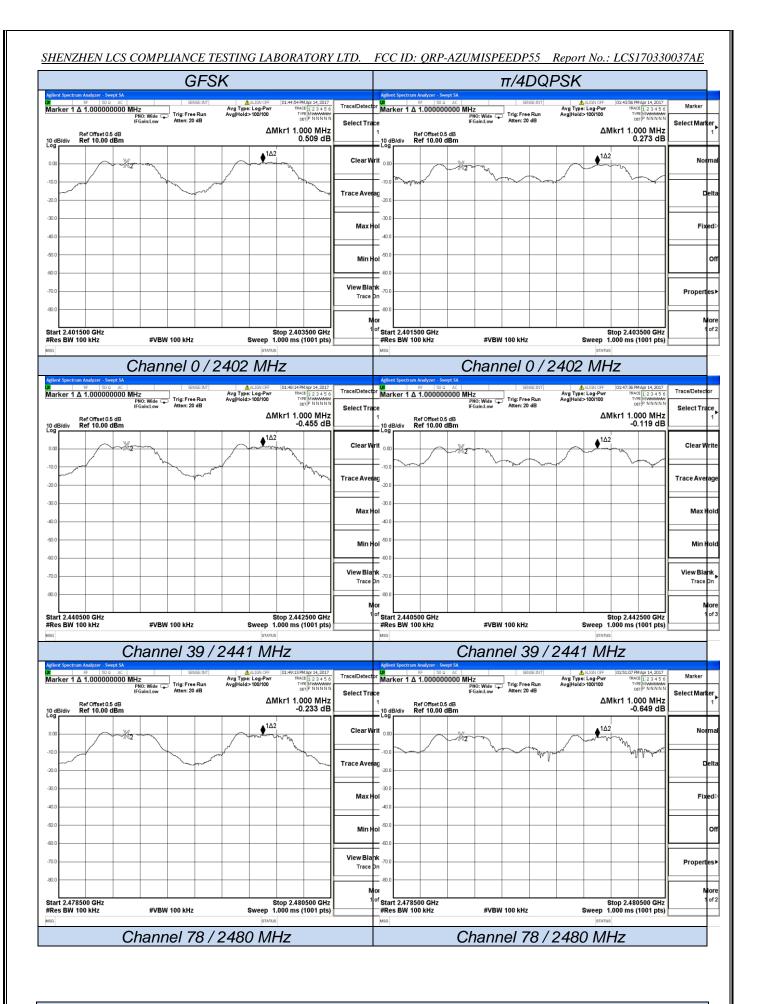
The Measurement Result With 1Mbps For GFSK Modulation								
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result				
Low	746.3		746.3	Pass				
Middle	744.7	1.000	744.7	Pass				
High	747.2		747.2	Pass				
The	The Measurement Result With 2Mbps For $\pi/4$ -DQPSK Modulation							
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result				
Low	1117.00		744.67	Pass				
Middle	1116.00	1.000	744.00	Pass				
High	1117.00		744.67	Pass				
Th	e Measurement Res	ult With 3Mbps For 8	-DPSK Modulatior	า				
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result				
Low	1163.00		775.33	Pass				
Middle	1160.00	1.000	773.33	Pass				
High	1163.00		775.33	Pass				

Remark:

- Test results including cable loss;
   Please refer to following plots;
- 3. Measured at difference Packet Type for each mode and recorded worst case for each mode.
- 4. Worst case data at DH1 for GFSK, 2DH1 for  $\pi/4$ -DQPSK, 3DH1 for 8DPSK modulation type;

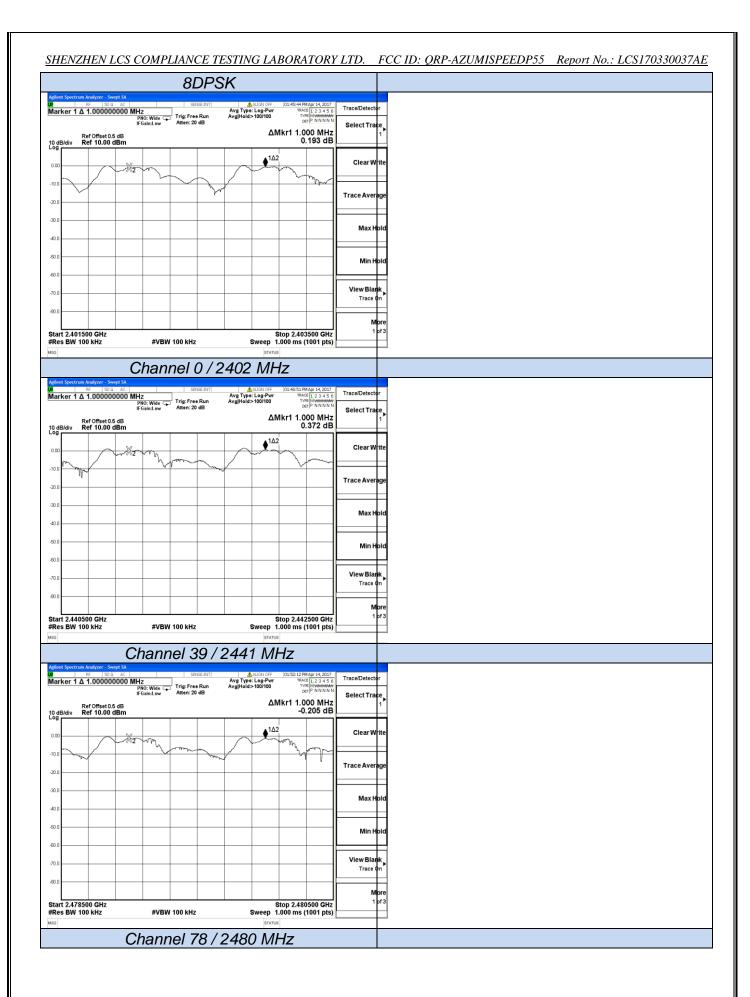
#### Frequency Separation

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Frequency Separation

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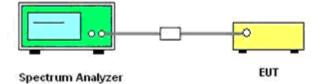
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### 6.3 Number of Hopping Frequency

#### 6.3.1 Limit

According to §15.247(a)(1)(ii) or A8.1 (d), Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels.

6.3.2 Block Diagram of Test Setup



#### 6.3.3 Test Procedure

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

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

- 3). Set Spectrum Analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
- 4). Set the Spectrum Analyzer as RBW = 1 MHz, VBW=1MHz.
- 5). Max hold, view and count how many channel in the band.

#### 6.3.4 Test Results

Test Mode	Measurement Result (No. of Channels)	Limit (No. of Channels)	Result
GFSK	79	≥15	PASS
π/4DQPSK	79	≥15	PASS
8DPSK	79	≥15	PASS

#### Remark:

- 1. Test results including cable loss;
- 2. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.
- 3. Worst case data at DH1 for GFSK, 2DH1 for  $\pi$ /4DQPSK, 3DH1 for 8DPSK modulation type;
- 4. Record test plots only for GFSK;
- 5. Please refer following test plots;

at System Vallyer - Swg SA           (at - 20 - at -
Max Hold       Max Hold       Min Hold       View Blank, Trace On
Max Hold       Max Hold       Max Hold       Min Hold
Min Hold
View Blank, Trace On More
s BW 1.0 MHz #VBW 1.0 MHz Sweep 1.000 ms (1001 pts)

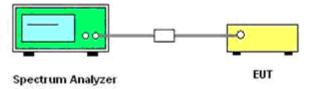
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### 6.4 Time of Occupancy (Dwell Time)

#### 6.4.1 Limit

According to §15.247(a)(1)(iii) or A8.1 (d), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

6.4.2 Block Diagram of Test Setup



#### 6.4.3 Test Procedure

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

### 6.4.4 Test Results

The Dwell Time=Burst Width\*Total Hops. The detailed calculations are showed as follows:

The duration for dwell time calculation: 0.4[s]\*hopping number=0.4[s]\*79[ch]=31.6[s\*ch];

The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop. The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a hopping

rate of 1600 [ch\*hop/s] for all channels. So the final hopping rate for all channels is 1600/6=266.67 [ch\*hop/s] The hops per second on one channel: 266.67 [ch\*hops/s]/79 [ch]=3.38 [hop/s];

The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]\*31.6[s\*ch]=106.67 [hop\*ch];

The dwell time for all channels hopping: 106.67 [hop\*ch]\*Burst Width [ms/hop/ch].

Mode	Frequency (MHz)	Burst Type	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Verdict
		DH1	0.368	0.1178	0.4	PASS
GFSK	2441	DH3	1.625	0.2600	0.4	PASS
		DH5	2.873	0.3065	0.4	PASS
		2DH1	0.376	0.1203	0.4	PASS
π/4-DQPSK	2441	2DH3	1.624	0.2598	0.4	PASS
		2DH5	2.876	0.3068	0.4	PASS
		3DH1	0.376	0.1203	0.4	PASS
8DPSK	2441	3DH3	1.627	0.2603	0.4	PASS
		3DH5	2.878	0.3070	0.4	PASS

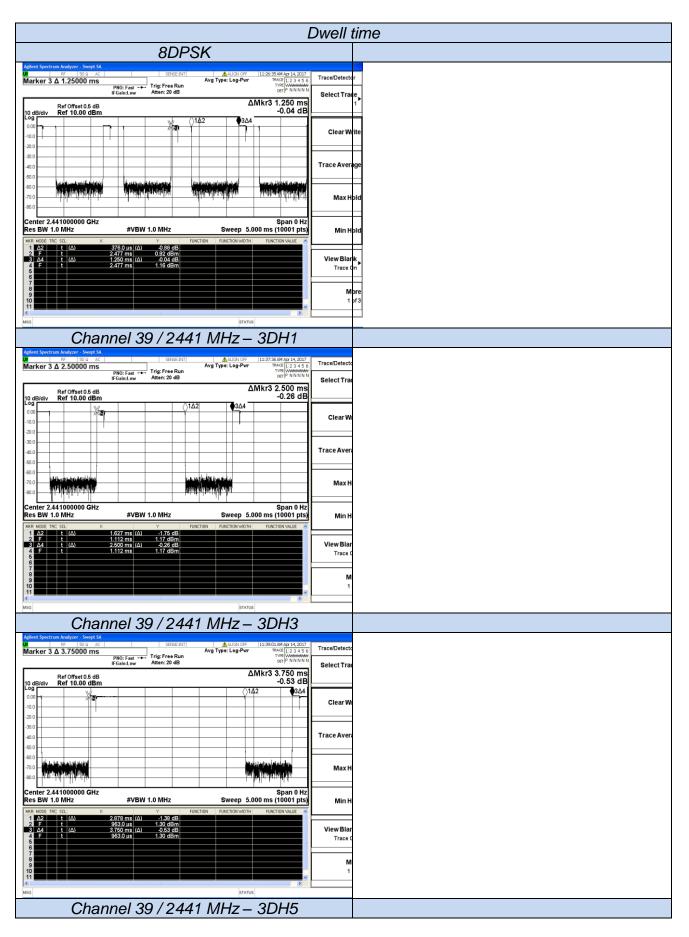
#### Remark:

- 1. Test results including cable loss;
- 2. Please refer to following plots;
- 3. Measured at difference Packet Type for each mode and recorded worst case for each mode.
- 4. Dwell Time Calculate formula: DH1: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second DH3: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second DH5: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second
- 5. Measured at low, middle and high channel, recorded worst at middle channel;

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Dwell time					
GFSK		π/4-DQPSK			
Aller Spectrum Analyzer - Swept SA         SPACE         SPACE         SPACE         SPACE         III 22+43 AM Apr 14, 2017         III 22+43 AM Apr 14, 2017         III 22+43 AM Apr 14, 2017         Marker 3 Δ 1.25000 ms         More Training Free Run BFGBIncLow         Avg Type: Log-Pwr Atten: 20 dB         More Training Free Run Atten: 20 dB         Avg Type: Log-Pwr Atten: 20 dB         MAK 73 1.2500 ms Training Free Run Atten: 20 dB         ΔMK 73 1.2500 ms -0.17 dB	Trace/Detecto	1 <sup>1</sup> Ref Offset 0.5 dB ΔMkr3 1.250 ms	Trace/Detector Select Trace		
	ClearWi		ClearWrite		
	Trace Avera		Trace Average		
Tool         Topped         Topped <thtopped< th=""> <thtopped< th=""> <thtopped< th=""></thtopped<></thtopped<></thtopped<>	Max H	Old         Old <thold< th=""> <thold< th=""> <thold< th=""></thold<></thold<></thold<>	Max Hold Min Hold		
MRR MODE         TRC SCL         X         Y         PUNCTION         PUNCTION WIDTH         PUNCTION WIDTH           1         Δ2         t         t(Δ)         383.0 us (Δ)         O D6 dB         24         F         t         1.795 ms         1.94 dBm		MRR         MODE         TRC         X         Y         FUNCTION         FUNCTION WIDTH         FUNCTION VALUE           1         Δ2         1 (Δ)         375.0 μs (Δ)         -1.06 dB         FUNCTION VIDTH         FUNCTION VALUE           2         F         707.5 μs         0.72 dB         707.5 μs         0.72 dB			
3) Δ4 t (Δ) 1250 ms (Δ) -0.17 dB 4 F t 1.796 ms 1.94 dBm 6 7 8 9 9	View Blan Trace C Mi	n 4 F t 707.5 us 0.72 dBm 6 6 7	View Blank Trace On More 1 pf3		
S STATUS		MSG STATUS			
Channel 39 / 2441 MHz – DH1		Channel 39 / 2441 MHz - 2DH1			
m         s         sold ≥ 2.         sold ≥ 2.         sold ≥ 2.         sold ≥ 2.         marker 3 Δ 2.49950 ms         Avg Type: Log-Pwr         modifie 2 = 3.5 G or training = 2.5 G or	Trace/Detecto Select Trac	Marker 3 Δ 2.50000 ms         Store ± 1,000         Aug Type: Log-Pwr         Tites: Free Run Tree: Free Run Atten: 20 dB         Avg Type: Log-Pwr         Tites: Free Run (KMNNM)           Ref Offset 0.5 dB         ΔMkr3 2.5000 ms         -0.18 dBm         -0.18 dBm	Trace/Detector Select Trace		
	ClearWi		ClearWrite		
	Trace Avera		Trace Average		
-700 -800 Center 2.441000000 GHz Span 0 Hz	Max H	One         Drive dramati         Hittprediction           800         Drive dramatic dramatic         Gramatic dramatic           Center 2.441000000 GHz         Span 0 Hz	Max Hold		
Res BW 1.0 MHz         #VBW 1.0 MHz         Sweep 5.000 ms (10001 pts)           MRI MODE TRC SCL         X         Y         Parction         Fanction worth         Fanction	Min H	Res BW 1.0 MHz         #VBW 1.0 MHz         Sweep 5.000 ms (10001 pts)           MMR MODE TRC SCL         X         Y         Flaction         Flaction         Flaction         Flaction value         Flaction           1         22         X         Y         Flaction         Flaction         Flaction value         Flaction	Min Hold		
2. F t 1780 ms 192 dBm 3) Δ4 t (Δ) 2.500 ms (Δ) -176 dB 4 F t 1.780 ms 1.92 dBm 5 1.02 dBm 6 1.000000000000000000000000000000000000	View Blan Trace C	2 F t 1926 ms 2.35 dBm 3 Δ4 t (Δ) 2.500 ms (Δ) 0.18 dB 4 F t 1.926 ms 2.35 dBm 6 5 7 7 8	View Blank Trace On More		
9	1	9 10 11 c starus	1 of 3		
Channel 39 / 2441 MHz – DH3 Addres Spectrum Analyzer 3 Sweet SM		Channel 39 / 2441 MHz - 2DH3			
Marker 3 Δ 3.75050 ms         PHO: East IFGaint.ow         Trig: Free Run Atten: 20 dB         ΔMUR0 OFF         11:43:44Mar(13:42017) Marker 13:2017           Ref Offset 0.5 dB         PHO: East IFGaint.ow         Trig: Free Run Atten: 20 dB         ΔMkr3 3.750 ms           0 dB/div         Ref Offset 0.5 dB         0.08 dB         0.08 dB	Trace/Detecto	Marker 3 Δ 3.75000 ms         PH0: Fast IFGainLew         Trig: Free Run Atten: 20 dB         ΔMLI30.0FF         II ±1208 Mark 1, 2027 Trig: Trig: Free Run Atten: 20 dB           Ref Offset0.5 dB         ΔMkr3 3.750 ms -0.29 dB	Marker Select Marker 3		
	ClearWi		Norina		
-300 -400 -500 -500 -500 -500 -500 -500 -5	Trace Avera		Delta		
Total         Comparison         Comparison </td <td>Max H</td> <td>70.0         Monthly for the second seco</td> <td>Fixed</td>	Max H	70.0         Monthly for the second seco	Fixed		
Mark Model TRC Sci.         X         Y         Punction         Reaction width         Function width         Fu	View Blan Trace C	More Note Tree Status         X         Y         Function         Practice         Function	Properties		
	Mi 1	5 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	More 1 of 2		
Channel 39 / 2441 MHz – DH5		Channel 39 / 2441 MHz - 2DH5			

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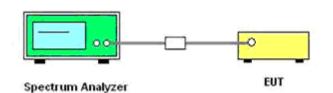
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### 6.5 Conducted Spurious Emissions and Band Edges Test

#### 6.5.1 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. Attenuation below the general limits specified in Section 15.209(a) is not required.

6.5.2 Block Diagram of Test Setup



#### 6.5.3 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

6.5.4 Test Results of Conducted Spurious Emissions

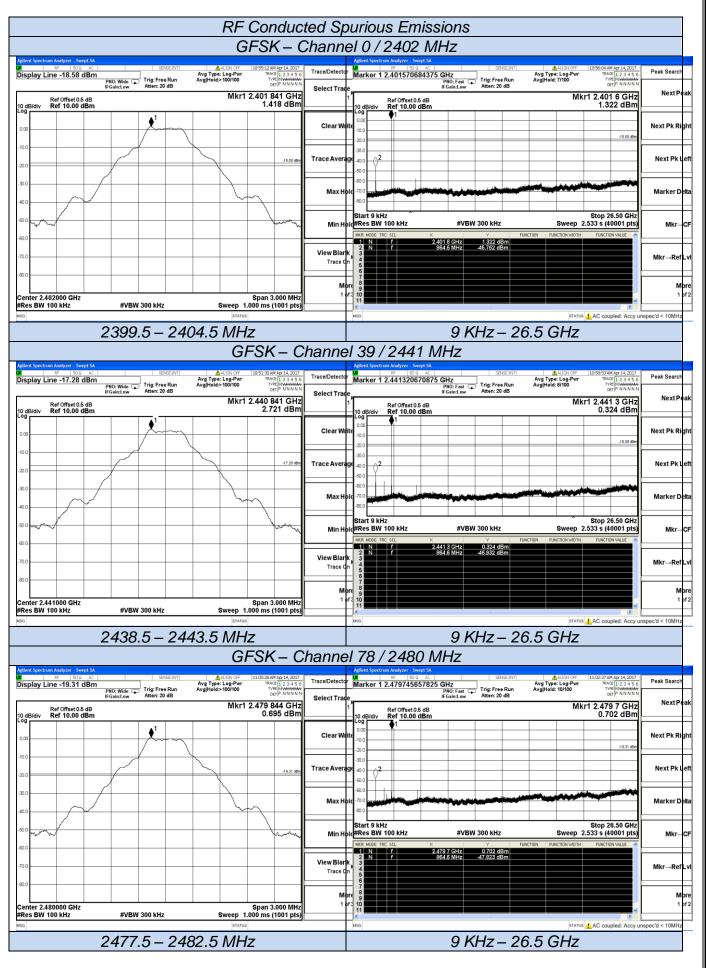
No non-compliance noted. Only record the worst test result (TX-GFSK) in this report. The test data refer to the following page.

Test Mode	Channel	Frequency (MHz)	Spurious RF Conducted Emission (dBc)	Limits (dBc)	Verdict
	0	2402	<-20		
GFSK	39	2441	<-20	-20	PASS
	78	2480	<-20		
	0	2402	<-20		
π/4-DQPSK	39	2441	<-20	-20	PASS
	78	2480	<-20		
	0	2402	<-20		
8DPSK	39	2441	<-20	-20	PASS
	78	2480	<-20		

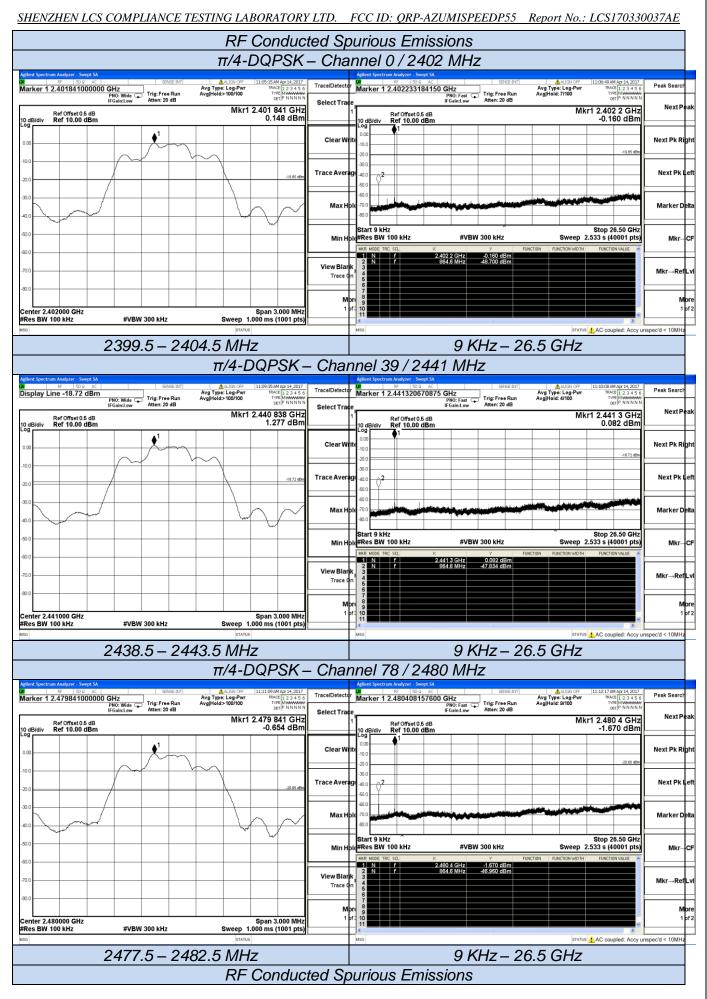
Remark:

- 1. Test results including cable loss;
- 2. Please refer to following plots;
- 3. Measured at difference Packet Type for each mode and recorded worst case for each mode.
- 4. Worst case data at DH1 for GFSK, 2DH1 for  $\pi/4$ -DQPSK, 3DH1 for 8DPSK modulation type;

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