# FCC TEST REPORT

### FOR

### AZUMI S.A

### Mobile phone

## Model No.: Speed pro 55

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

| Prepared for<br>Address        | : | AZUMI S.A<br>Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso<br>16 of. 16-01, Marbella, Ciudad de Panama |
|--------------------------------|---|--|
| Prepared by                    | : | Shenzhen LCS Compliance Testing Laboratory Ltd.  |
| Address                        | : | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China                    |
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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,<br>Bao'an District, Shenzhen, Guangdong, China   |  |  |  |  |  |  |
| Testing Location/ Procedure : Full application of Harmonised standards ■<br>Partial application of Harmonised standards □<br>Other standard testing method □   |  |  |  |  |  |  |
| Applicant's Name : AZUMI S.A   |  |  |  |  |  |  |
| Address : Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso<br>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><br>Date of issue   |
|-------------------|---|--|
|                   |   |  |
| EUT               | : Mobile phone                                      |  |
| Type / Model      | : Speed pro 55                                      |  |
| Applicant         | : AZUMI S.A   |  |
| Address           | : Avenida Aquilino de la<br>16 of. 16-01, Marbella, | Guardia con Calle 47, PH Ocean Plaza, Piso<br>Ciudad de Panama                     |
| Telephone         | : /   |  |
| Fax               | : /   |  |
| Manufacturer      | : AZUMI HK LTD                                      |  |
| Address           | : FLAT/RM 18 BLK 1 14/<br>KWAI TAK STREET KV        | F GOLDEN INDUSTRIAL BUILDING 16-26<br>WAI CHUNG,HK                                 |
| Telephone         | : /   |  |
| Fax               | : /   |  |
| Factory           | : LWIN HK CO.,LIMITEI                               | )  |
| Address           | : Room 9C,A Zone,Shen                               | ye Tairan Hongsong building,Tairan Six<br>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,<br>16QAM for LTE   |
| Antenna Gain                              | 0.5dBi (max.) For GSM 850; 0.5dBi (max.) For GSM 900;<br>0.5dBi (max.) For DCS 1800; 0.5dBi (max.) For PCS 1900;<br>0.5dBi (max.) For WCDMA Band II<br>0.5dBi (max.) For WCDMA Band V<br>0.5dBi (max.) For LTE FDD Band 2;<br>0.5dBi (max.) For LTE FDD Band 4;<br>0.5dBi (max.) For LTE FDD Band 7;<br>0.5dBi (max.) For BT and WLAN |
| Hardware version                          | /   |
| Software version                          | /   |
| GSM/EDGE/GPRS Operation<br>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)<br>IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)<br>IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)   |
| WLAN FCC Operation frequency              | IEEE 802.11b:2412-2462MHz<br>IEEE 802.11g:2412-2462MHz<br>IEEE 802.11n HT20:2412-2462MHz<br>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<br>(MHz) | Data Rate<br>(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<br>er | Model No. | Serial No. | Length | shielded/<br>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<br>Edges Test | Compliant |
| §15.209, §15.247(d) | Radiated and Conducted<br>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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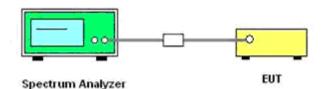
### 5. SUMMARY OF TEST EQUIPMENT

| 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<br>nal mixers to<br>40GHz) | US44300469  | 2016-06-16 | 2017-06-15 |
| 9    | RF Cable                    | Hubersuhne         | Sucoflex104                             | FP2RX2      | 2016-06-18 | 2017-06-17 |
| 10   | 3m Semi Anechoic<br>Chamber | SIDT<br>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<br>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<br>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<br>(MHz) | Measured Maximum Power<br>(dBm) | Limits<br>(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<br>PN0: Fast<br>IFGain:Low Atten: 20 dB   | Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Det P N N N N  | Peak Search        |  |
| Ref Offset 0.5 dB<br>10 dB/div Ref 10.00 dBm<br>Log   | Mkr1 2.401 94 GHz<br>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<br>1 of | ore<br>of 2  |
| Center 2.402000 GHz<br>#Res BW 3.0 MHz #VBW 3.0 MHz<br>MSG  | Span 10.00 MHz<br>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<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Det P NINNN<br>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<br>#Res BW 3.0 MHz #VBW 3.0 MHz<br>MSG  | Span 10.00 MHz<br>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<br>Avg Type: Log-Pwr TRACE 1 2 3 4 5 6                                   | Peak Search        |  |
| PN0: Fast Trig: Free Run<br>IFGain:Low Atten: 20 dB<br>Ref Offset 0.5 dB  | Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1 2.479 80 GHz<br>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<br>#Res BW 3.0 MHz #VBW 3.0 MHz   | Span 10.00 MHz<br>Sweep 1.000 ms (1001 pts)   | 1                  |  |
| Channel 78 /  | STATUS  |                    |  |
| Gildilliei 787  |   |                    |  |

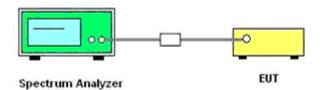
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#### 6.2 Frequency Separation and 20 dB Bandwidth

#### 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<br>16 50.0 a.C SENSEINT ▲10.01 CPF 10.3645/AM Apr 14,2017<br>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<br>Trig: Freq X.40200000 GHz<br>Radio Std: None<br>Trig: Freq X.40200000 GHz<br>Radio Std: None<br>Radio Std: None<br>Radio Std: None<br>Radio Std: None<br>Radio Std: None<br>Radio Std: None<br>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<br>800   | Max        |
| enter 2.402 GHz Span 3 MHz<br>Res BW 30 KHz #VBW 100 kHz Sweep 3.2 ms   |                      | Center 2.402 GHz Span 3 MHz<br>#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<br>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)<br>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<br>///FGaint.uw<br>///FGaint.uw<br>////////////////////////////////////  |                      | Unite Trig Free Run Avg Hold>10/10<br>#/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<br>#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<br>INF 509 A C SPREINT ▲LIDY CVF 125009 AM Apr 14, 2017<br>INTER FFreq 2,48000000 GHz Carter Freq 2,48000000 GHz Radio Std: None<br>Center Freq 2,48000000 GHz Radio Std: None  | Trace/Detecto        |  | Trace/Det  |
| Trig: Free Run Avg Hold>10/10<br>#IFGain:Low #Atten: 20 dB Radio Device: BTS  |                      | Trig: Free Run Avg Hold>10/10<br>#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<br>Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms  | Min H                | Center 2.48 GHz Span 3 MHz<br>#Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms   | Mir        |
| Occupied Bandwidth Total Power 6.86 dBm<br>845.53 kHz   |                      | Occupied Bandwidth Total Power 6.13 dBm  | _          |
| 643.33 KTLZ<br>Transmit Freq Error -1.572 kHz OBW Power 99.00 %   | Detec<br>Per<br>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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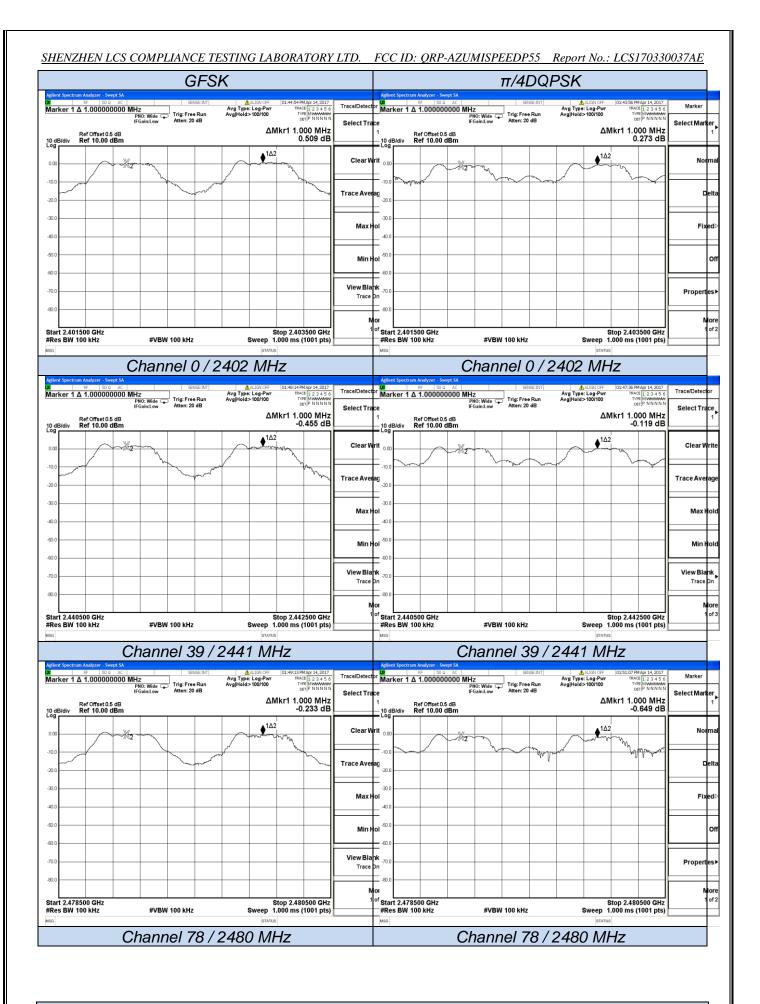
| The Measurement Result With 1Mbps For GFSK Modulation |   |                             |                  |        |  |  |  |  |
|---|---|-----------------------------|------------------|--------|--|--|--|--|
| Channel   | 20dB Bandwidth<br>(KHz)   | Channel Separation<br>(MHz) | Limit<br>(KHz)   | 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<br>(KHz)   | Channel Separation<br>(MHz) | Limit<br>(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<br>(KHz)   | Channel Separation<br>(MHz) | Limit<br>(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;

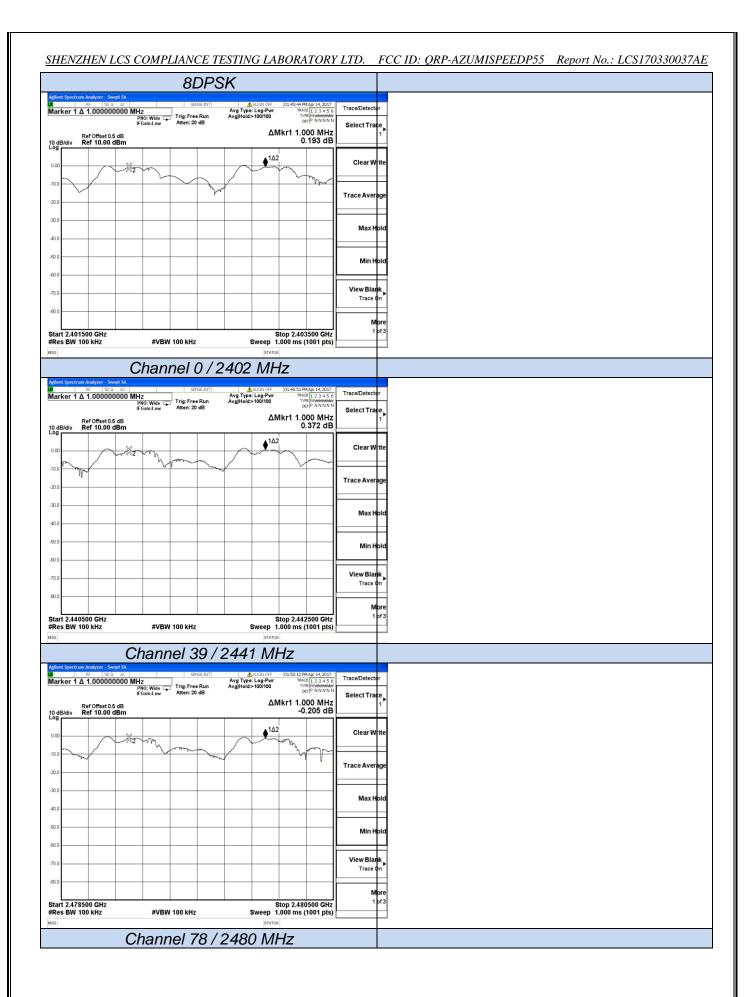
#### Frequency Separation

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Frequency Separation

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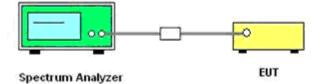
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### 6.3 Number of Hopping Frequency

#### 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<br>(No. of Channels) | Limit<br>(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,<br>Trace On   |
| Max Hold       Max Hold       Max Hold       Min Hold  |
| Min Hold   |
| View Blank,<br>Trace On<br>More  |
|  |
|  |
| s BW 1.0 MHz #VBW 1.0 MHz Sweep 1.000 ms (1001 pts)  |

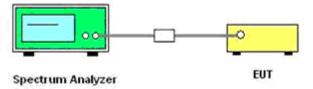
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### 6.4 Time of Occupancy (Dwell Time)

#### 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<br>(MHz) | Burst Type | Pulse Width<br>(ms) | Dwell Time<br>(S) | Limit<br>(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    |

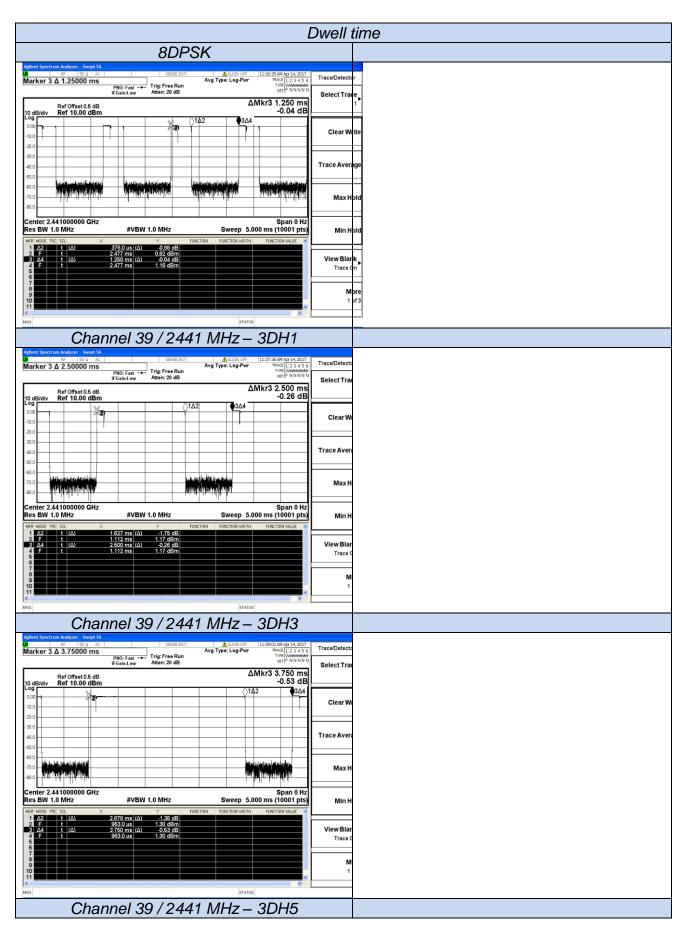
#### Remark:

- 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<br>BFGBIncLow         Avg Type: Log-Pwr<br>Atten: 20 dB         More Training Free Run<br>Atten: 20 dB         Avg Type: Log-Pwr<br>Atten: 20 dB         MAK 73 1.2500 ms<br>Training Free Run<br>Atten: 20 dB         ΔMK 73 1.2500 ms<br>-0.17 dB  | Trace/Detecto                | 1 <sup>1</sup> Ref Offset 0.5 dB ΔMkr3 1.250 ms  | Trace/Detector<br>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<br>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<br>4 F t 1.796 ms 1.94 dBm<br>6<br>7<br>8<br>9<br>9   | View Blan<br>Trace C<br>Mi   | n 4 F t 707.5 us 0.72 dBm<br>6 6 7   | View Blank<br>Trace On<br>More<br>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<br>Select Trac | Marker 3 Δ 2.50000 ms         Store ± 1,000         Aug Type: Log-Pwr         Tites: Free Run<br>Tree: Free Run<br>Atten: 20 dB         Avg Type: Log-Pwr         Tites: Free Run<br>(KMNNM)           Ref Offset 0.5 dB         ΔMkr3 2.5000 ms         -0.18 dBm         -0.18 dBm   | Trace/Detector<br>Select Trace          |  |  |
|  | ClearWi                      |  | ClearWrite                              |  |  |
|  | Trace Avera                  |  | Trace Average                           |  |  |
| -700<br>-800<br>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<br>3) Δ4 t (Δ) 2.500 ms (Δ) -176 dB<br>4 F t 1.780 ms 1.92 dBm<br>5 1.02 dBm<br>6 1.000000000000000000000000000000000000  | View Blan<br>Trace C         | 2 F t 1926 ms 2.35 dBm<br>3 Δ4 t (Δ) 2.500 ms (Δ) 0.18 dB<br>4 F t 1.926 ms 2.35 dBm<br>6 5 7 7 8  | View Blank<br>Trace On<br>More          |  |  |
| 9  | 1                            | 9<br>10<br>11<br>c<br>starus   | 1 of 3                                  |  |  |
| Channel 39 / 2441 MHz – DH3<br>Addres Spectrum Analyzer 3 Sweet SM   |                              | Channel 39 / 2441 MHz - 2DH3   |   |  |  |
| Marker 3 Δ 3.75050 ms         PHO: East<br>IFGaint.ow         Trig: Free Run<br>Atten: 20 dB         ΔMUR0 OFF         11:43:44Mar(13:42017)<br>Marker 13:2017           Ref Offset 0.5 dB         PHO: East<br>IFGaint.ow         Trig: Free Run<br>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<br>IFGainLew         Trig: Free Run<br>Atten: 20 dB         ΔMLI30.0FF         II ±1208 Mark 1, 2027<br>Trig: Trig: Free Run<br>Atten: 20 dB           Ref Offset0.5 dB         ΔMkr3 3.750 ms<br>-0.29 dB   | Marker<br>Select Marker<br>3            |  |  |
|  | ClearWi                      |  | Norina                                  |  |  |
| -300<br>-400<br>-500<br>-500<br>-500<br>-500<br>-500<br>-500<br>-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<br>Trace C         | More Note Tree Status         X         Y         Function         Practice         Function   | Properties                              |  |  |
|  | Mi<br>1                      | 5 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7  | More<br>1 of 2                          |  |  |
| Channel 39 / 2441 MHz – DH5  |                              | Channel 39 / 2441 MHz - 2DH5   |   |  |  |

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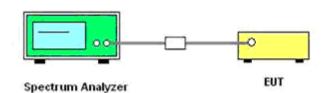
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### 6.5 Conducted Spurious Emissions and Band Edges Test

#### 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

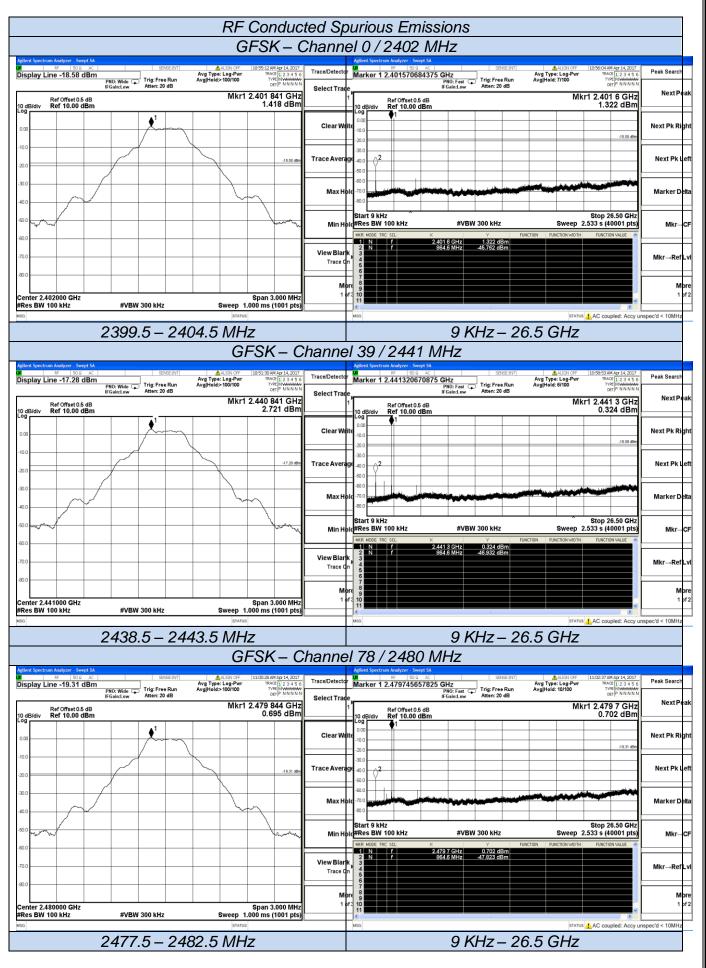
No non-compliance noted. Only record the worst test result (TX-GFSK) in this report. The test data refer to the following page.

| Test Mode | Channel | Frequency<br>(MHz) | Spurious RF Conducted<br>Emission<br>(dBc) | Limits<br>(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                                       |                 |         |

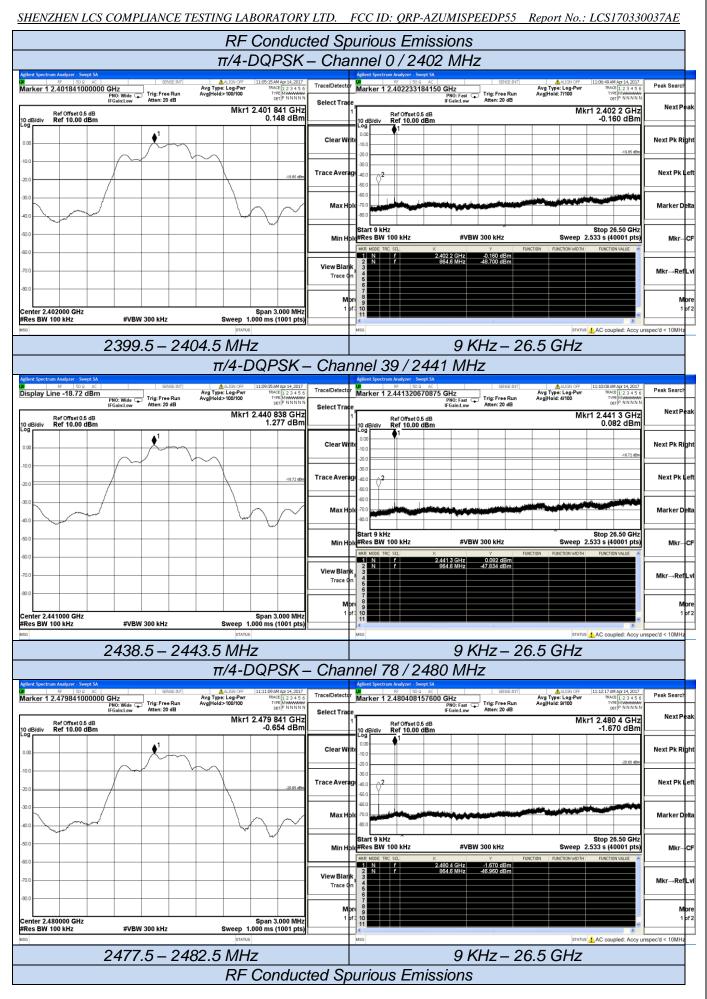
Remark:

- 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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