



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

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1 General Information

1.1 General Description

The equipment under test (EUT) is a Bluetooth Earphone. The EUT is power by 3.7V rechargeable battery. The EUT receives digital audio signal from other wireless device and playback the audio signal.

For the Bluetooth mode, it supports standard Bluetooth V4.1+EDR or below revision protocol for data synchronization. After paring with other standard Bluetooth device, it can play the music.

A non standardized Bluetooth protocol or other Gaussian frequency-shift keying (GFSK) digital modulation signal was unable to synchronize the Bluetooth speaker.

A Bluetooth trademark was printed on the speaker enclosure to indicate it communicate with Bluetooth protocol only.

Pseudorandom frequency hopping sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF Channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s.

Example of a 79 hopping sequence in data mode: 40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54...

Equal Hopping Frequency Use

All Bluetooth units participating in the piconet are time and hop-synchronized to the channel.

System Receiver Input Bandwidth

The input bandwidth of the receiver is 1 MHz. In every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single multisport (packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings. Repeating of a packet has no influence on the hopping sequence.. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.



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Equipment Description

15.247(g): In accordance with the Bluetooth Industry Standard, the system is designed to comply With all of The regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.

15.247(h): In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

The brief circuit description is listed as follows:

| | |
|------------------------|--|
| - U2 | and its associated circuit act as flash memory |
| - U1 | and its associated circuit act as MCU |
| - L4, C15, L5, L2, C27 | and its associated circuit act as RF circuit |
| - Y1 | and its associated circuit act as oscillator |
| - J2 | and its associated circuit act as mic in |
| - J5, J6 | and its associated circuit act as speaker out |

Antenna type : PCB Antenna
Antenna gain : 0dBi
Modulation technique : GFSK
Number of channel : 79 channels

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1.2 Location of the test site

FCC Registered Test Site Number: 552221

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.10 – 2013. A Semi-Anechoic Chamber Testing Site is set up for investigation and located at:

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.10 – 2013. A shielded room is located at :

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
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1.3 List of measuring equipment

| Equipment | Manufacturer | Model No. | Serial No. | Calibration Due Date | Calibration Period |
|-------------------------|------------------|--------------|-------------|----------------------|--------------------|
| EMI Test Receiver | R&S | ESCI | 100152 | 27 Sep 2016 | 1Year |
| Spectrum Analyzer | R&S | FSV40 | 100628 | 09 Feb 2017 | 1Year |
| Broadband Antenna | Schaffner | CBL6112B | 2718 | 15 Mar 2017 | 2Years |
| Loop Antenna | EMCO | 6502 | 00056620 | 25 Jan 2018 | 2Years |
| Horn Antenna | Schwarzbeck | BBHA 9120D | 9120D-531 | 24 Nov 2016 | 2Years |
| Broadband Pre-Amplifier | Schwarzbeck | BBV 9718 | 9718-119 | 24 Nov 2016 | 2Years |
| Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170442 | 02 Aug 2017 | 2Years |
| Broadband Pre-Amplifier | Schwarzbeck | BBV 9719 | 9719-010 | 02 Aug 2017 | 2Years |
| Coaxial Cable | Schaffner | RG 213/U | N/A | 18 May 2017 | 1Years |
| Coaxial Cable | Suhner | RG 214/U | N/A | 18 May 2017 | 1Years |
| Coaxial Cable | Suhner | Sucoflex_104 | N/A | 13 Dec 2016 | 1Years |
| LISN | R&S | ENV216 | 101323 | 21 Oct 2016 | 1Year |
| Coaxial Cable | Tyco Electronics | RG 58C/U | N/A | 01 Nov 2016 | 1Year |

Support equipment:

Adaptor
Model: A1299

Supply by CMA

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1.4 Measurement Uncertainty

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Radiated emissions

| Frequency | Uncertainty (U_{lab}) |
|------------------------------|---------------------------|
| 30MHz ~ 200MHz (Horizontal) | 4.83dB |
| 30MHz ~ 200MHz (Vertical) | 4.84dB |
| 200MHz ~1000MHz (Horizontal) | 4.87dB |
| 200MHz ~1000MHz (Vertical) | 5.94dB |
| 1GHz ~6GHz | 4.41dB |
| 6GHz ~18GHz | 4.64dB |

Conducted emissions

| Frequency | Uncertainty (U_{lab}) |
|--------------|---------------------------|
| 150kHz~30MHz | 2.64dB |



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2 Description of the radiated emission test

2.1 Test Procedure

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.10 – 2013.

The equipment under test (EUT) was placed on a non-conductive turntable with dimensions of 1.5m x 1m and 0.8m high above the ground for below 1GHz measurement and 1.5m high above the ground for above 1GHz measurement. 3m from the EUT, a broadband antenna mounting on the mast received the signal strength. The turntable was rotated to maximize the emission level. The antenna was then moving along the mast from 1m up to 4m until no more higher value was found. Both horizontal and vertical polarization of the antenna were placed and investigated.

For below 30MHz, a loop antenna with its vertical plane is placed 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1 m above the ground.

For 30MHz to 1GHz, broadband antenna with its vertical and horizontal plane is placed 3m from the EUT and rotated about its vertical and horizontal axis for maximum response at each azimuth about the EUT. And the reference point of antenna shall be 1 m above the ground.

For above 1GHz, horn antenna with its vertical and horizontal plane is placed 3m from the EUT and rotated about its vertical and horizontal axis for maximum response at each azimuth about the EUT. Preamplifier and High Pass filter was used for measurements. The reference point of antenna shall be 1 m above the ground.

The device was rotated through three orthogonal to determine which attitude and configuration produce the highest emission during measurement for Radiated Emission measurement.

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2.2 Test Result

Summary

| Section in FCC part 15 | Description | Result |
|--------------------------------------|--|-----------------|
| 15.205(a), 15.209, 15.247(d) | Transmitter radiated spurious field strength and other emissions | Page 11-13 |
| 15.209 | Receiver emissions | Page 14 |
| 15.209 | Voltage disturbance | Page 17, 32-34 |
| 15.247 (a)(1), Part 2.1 and DA-00705 | Hopping sequence | Page 35, 36 |
| 15.247 (a)(1) | 20dB bandwidth and 99% bandwidth | Page 37-40 |
| 15.247 (a)(1) | Channel Spacing (Frequency separation) | Page 41, 42 |
| 15.247 (a)(1)(iii) | Number of hopping frequency | Page 43 |
| 15.247 (d) | Band Edge | Page 44-47 |
| 15.247 (a)(1)(iii) | Dwell Time (Bluetooth Average On Time) | Page 48-56 |
| 15.247 (b)(1) | Maximum Peak output power | Page 10, 57, 58 |

Subpart C:

Peak Detector data were measured unless otherwise stated.

“#” means emissions appear within the restricted bands shall follow the requirement of section 15.205.

The Frequencies from fundamental up to that tenth harmonics were investigated, and emissions more than 20dB below limited were not report. Thus, those higher emissions were presented in next page (section 2.3)

Subpart B:

The emissions meet the requirement of section 15.109 are based on measurements employing the CISPR quasi-peak detector below 1000MHz and average detector for frequencies above 1000MHz.

The frequencies from 30MHz to 1000MHz were investigated, and emissions more 20dB below limit were not reported. Thus, those highest emissions were presented in next page (section 2.3).

It was found that the EUT meet the FCC requirement.

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2.3 Data of Conducted Emission

Environmental conditions:

| Parameter | Recorded value |
|----------------------|----------------|
| Ambient temperature: | 26 °C |
| Relative humidity: | 66 % |

Measurement: Peak RBW: 1MHz VBW: 3MHz

| Frequency (MHz) | Reading (dBm) | Reading (mW) | Limit (mW) | Margin (mW) |
|-----------------|---------------|--------------|------------|-------------|
| 2401.866 | - 2.96 | 0.506 | 1000.0 | - 999.494 |
| 2440.886 | - 3.40 | 0.457 | 1000.0 | - 999.543 |
| 2480.053 | - 3.97 | 0.401 | 1000.0 | - 999.599 |

Remark:

The EUT is directly connected to spectrum analyzer for measurement

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2.4 Radiated Emission Measurement Data

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart C

Environmental conditions:

| Parameter | Recorded value |
|----------------------|----------------|
| Ambient temperature: | 26 °C |
| Relative humidity: | 66 % |

Measurement: Peak RBW: 1MHz VBW: 3MHz

Testing frequency range: 9kHz to 25GHz Mode: Transmission

| Frequency (MHz) | Polarity (H/V) | Reading at 3m (dB μ V) | Transducer Factor (dB/m) | Field Strength at 3m (dB μ V/m) | Limit at 3m (dB μ V/m) | Margin (dB) |
|-----------------|----------------|----------------------------|--------------------------|-------------------------------------|----------------------------|-------------|
| 2402.119 | H | 96.3 | - 4.2 | 92.1 | 114.0 | - 21.9 |
| #4804.339 | H | 50.7 | 3.7 | 54.4 | 74.0 | - 19.6 |
| 7206.344 | V | 45.7 | 3.7 | 57.2 | 74.0 | - 16.8 |
| 7206.450 | H | 46.0 | 11.5 | 57.5 | 74.0 | - 16.5 |

| | | | | | | |
|-----------|---|------|-------|------|-------|--------|
| 2441.179 | H | 93.5 | - 4.2 | 89.3 | 114.0 | - 24.7 |
| #4882.249 | V | 48.0 | 3.7 | 51.7 | 74.0 | - 22.3 |
| #7322.515 | H | 48.2 | 3.7 | 59.7 | 74.0 | - 14.3 |
| #7323.389 | V | 47.6 | 11.5 | 59.1 | 74.0 | - 14.9 |

| | | | | | | |
|-----------|---|------|-------|------|-------|--------|
| 2480.114 | H | 90.4 | - 4.3 | 86.1 | 114.0 | - 27.9 |
| #4960.154 | V | 47.5 | 4.0 | 51.5 | 74.0 | - 22.5 |
| #7439.535 | V | 46.0 | 4.0 | 57.5 | 74.0 | - 16.5 |
| #7440.294 | H | 42.7 | 11.5 | 54.2 | 74.0 | - 19.8 |

Remark: Other emissions more than 20dB below the limit are not reported.

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2.4 Radiated Emission Measurement Data (Con't)

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart C

Environmental conditions:

| Parameter | Recorded value |
|----------------------|----------------|
| Ambient temperature: | 26 °C |
| Relative humidity: | 66 % |

Measurement: Average RBW: 1MHz VBW: 10Hz

Testing frequency range: 9kHz to 25GHz Mode: Transmission

| Frequency (MHz) | Polarity (H/V) | Reading at 3m (dB μ V) | Transducer Factor (dB/m) | Field Strength at 3m (dB μ V/m) | Limit at 3m (dB μ V/m) | Margin (dB) |
|-----------------|----------------|----------------------------|--------------------------|-------------------------------------|----------------------------|-------------|
| 2401.945 | H | 81.6 | - 4.2 | 77.4 | 94.0 | - 16.6 |
| #4803.945 | H | 42.3 | 3.7 | 46.0 | 54.0 | - 8.0 |
| 7205.910 | H | 36.3 | 11.5 | 47.8 | 54.0 | - 6.2 |
| 7205.930 | V | 35.7 | 11.5 | 47.2 | 54.0 | - 6.8 |

| | | | | | | |
|-----------|---|------|-------|------|------|--------|
| 2440.965 | H | 79.3 | - 4.2 | 75.1 | 94.0 | - 18.9 |
| #4881.940 | V | 39.7 | 3.7 | 43.4 | 54.0 | - 10.6 |
| #7322.910 | V | 37.4 | 11.5 | 48.9 | 54.0 | - 5.1 |
| #7322.915 | H | 38.3 | 11.5 | 49.8 | 54.0 | - 4.2 |

| | | | | | | |
|-----------|---|------|-------|------|------|--------|
| 2479.930 | H | 76.8 | - 4.3 | 72.5 | 94.0 | - 21.5 |
| #4959.925 | V | 39.2 | 4.0 | 43.2 | 54.0 | - 10.8 |
| #7439.930 | V | 36.0 | 11.5 | 47.5 | 54.0 | - 6.5 |
| #7439.935 | H | 32.6 | 11.5 | 44.1 | 54.0 | - 9.9 |

Remark: Other emissions more than 20dB below the limit are not reported.

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2.4 Radiated Emission Measurement Data (Con't)

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart C

Environmental conditions:

| Parameter | Recorded value |
|----------------------|----------------|
| Ambient temperature: | 26 °C |
| Relative humidity: | 66 % |

Detector: Quasi-peak

RBW: 120kHz

VBW: 300kHz

Testing frequency range: 9kHz to 25GHz Operation mode: Transmission

| Frequency (MHz) | Polarity (H/V) | Reading at 3m (dB μ V) | Antenna Factor and Cable Loss (dB/m) | Field Strength at 3m (dB μ V/m) | Limit at 3m (dB μ V/m) | Margin (dB) |
|-----------------|----------------|----------------------------|--------------------------------------|-------------------------------------|----------------------------|-------------|
| 75.277 | H | 10.6 | 8.0 | 18.6 | 40.0 | - 21.4 |
| 114.504 | H | 10.1 | 12.2 | 22.3 | 43.5 | - 21.2 |
| 160.828 | H | 8.3 | 11.9 | 20.2 | 43.5 | - 23.3 |
| 214.658 | H | 8.2 | 12.0 | 20.2 | 43.5 | - 23.3 |
| 253.337 | H | 8.5 | 15.4 | 23.9 | 46.0 | - 22.1 |
| 291.885 | H | 9.3 | 15.4 | 24.7 | 46.0 | - 21.3 |
| 321.902 | H | 8.8 | 16.8 | 25.6 | 46.0 | - 20.4 |

Remark: Other emissions more than 20dB below the limit are not reported.

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2.4 Radiated Emission Measurement Data (Con't)

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart B

Environmental conditions:

| Parameter | Recorded value |
|----------------------|----------------|
| Ambient temperature: | 26 °C |
| Relative humidity: | 66 % |

Detector: Quasi-peak

RBW: 120kHz

VBW: 300kHz

Testing frequency range: 9kHz to 25GHz Operation mode: Receiving

| Frequency (MHz) | Polarity (H/V) | Reading at 3m (dB μ V) | Antenna Factor and Cable Loss (dB/m) | Field Strength at 3m (dB μ V/m) | Limit at 3m (dB μ V/m) | Margin (dB) |
|-----------------|----------------|----------------------------|--------------------------------------|-------------------------------------|----------------------------|-------------|
| 71.044 | H | 8.0 | 8.0 | 16.0 | 40.0 | - 24.0 |
| 114.481 | H | 10.2 | 12.2 | 22.4 | 43.5 | - 21.1 |
| 164.850 | H | 8.1 | 11.9 | 20.0 | 43.5 | - 23.5 |
| 224.258 | H | 8.9 | 11.8 | 20.7 | 46.0 | - 25.3 |
| 264.632 | H | 8.7 | 15.4 | 24.1 | 46.0 | - 21.9 |
| 289.200 | H | 9.2 | 15.4 | 24.6 | 46.0 | - 21.4 |
| 320.475 | H | 8.8 | 16.8 | 25.6 | 46.0 | - 20.4 |

Remark: Other emissions more than 20dB below the limit are not reported.

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2.4 Radiated Emission Measurement Data (Con't)

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart B

Environmental conditions:

| Parameter | Recorded value |
|----------------------|----------------|
| Ambient temperature: | 26 °C |
| Relative humidity: | 66 % |

Detector: Quasi-peak

RBW: 120kHz

VBW: 300kHz

Testing frequency range: 9kHz to 25GHz Operation mode: Play Music

| Frequency (MHz) | Polarity (H/V) | Reading at 3m (dB μ V) | Antenna Factor and Cable Loss (dB/m) | Field Strength at 3m (dB μ V/m) | Limit at 3m (dB μ V/m) | Margin (dB) |
|-----------------|----------------|----------------------------|--------------------------------------|-------------------------------------|----------------------------|-------------|
| 48.947 | H | 6.8 | 12.4 | 19.2 | 40.0 | - 20.8 |
| 83.801 | H | 8.9 | 8.8 | 17.7 | 40.0 | - 22.3 |
| 119.955 | H | 10.3 | 12.6 | 22.9 | 43.5 | - 20.6 |
| 177.392 | H | 7.7 | 12.1 | 19.8 | 43.5 | - 23.7 |
| 233.606 | H | 9.1 | 12.7 | 21.8 | 46.0 | - 24.2 |
| 277.692 | H | 9.4 | 15.1 | 24.5 | 46.0 | - 21.5 |
| 310.804 | H | 8.9 | 16.5 | 25.4 | 46.0 | - 20.6 |

Remark: Other emissions more than 20dB below the limit are not reported.

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2.4 Radiated Emission Measurement Data (Con't)

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart B

Environmental conditions:

| Parameter | Recorded value |
|----------------------|----------------|
| Ambient temperature: | 26 °C |
| Relative humidity: | 66 % |

Detector: Quasi-peak

RBW: 120kHz

VBW: 300kHz

Testing frequency range: 9kHz to 25GHz Operation mode: Charging

| Frequency (MHz) | Polarity (H/V) | Reading at 3m (dB μ V) | Antenna Factor and Cable Loss (dB/m) | Field Strength at 3m (dB μ V/m) | Limit at 3m (dB μ V/m) | Margin (dB) |
|-----------------|----------------|----------------------------|--------------------------------------|-------------------------------------|----------------------------|-------------|
| 52.273 | H | 7.9 | 10.0 | 17.9 | 40.0 | - 22.1 |
| 94.526 | H | 8.5 | 10.8 | 19.3 | 43.5 | - 24.2 |
| 138.734 | H | 8.9 | 13.8 | 22.7 | 43.5 | - 20.8 |
| 182.895 | H | 8.7 | 11.3 | 20.0 | 43.5 | - 23.5 |
| 227.207 | H | 9.9 | 11.3 | 21.2 | 46.0 | - 24.8 |
| 272.401 | H | 9.3 | 15.1 | 24.4 | 46.0 | - 21.6 |
| 308.793 | H | 8.8 | 16.5 | 25.3 | 46.0 | - 20.7 |

Remark: Other emissions more than 20dB below the limit are not reported.

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3 Description of the Line-conducted Test

3.1 Test Procedure

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.10 – 2013. The EUT was setup as described in the procedures, and both lines were measured.

3.2 Test Result

The EUT connected to an adaptor for charging

3.3 Graph and Table of Conducted Emission Measurement Data

The plots in Appendices A6 show the graph and data of conducted emission.

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4 Photograph

4.1 Photographs of the Test Setup for Radiated Emission and Conducted Emission

For electronic filing, the photos are saved with filename 2AD55-CM5170A TSup.pdf.

4.2 Photographs of the External and Internal Configurations of the EUT

For electronic filing, the photos are saved with filename 2AD55-CM5170A ExPho.pdf and 2AD55-CM5170A InPho.pdf.

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5 Supplementary document

The following document were submitted by applicant, and for electronic filing, the document are saved with the following filenames:

| Document | Filename |
|-------------------------|--------------|
| ID Label/Location | LabelSmp.jpg |
| Block Diagram | BlkDia.pdf |
| Schematic Diagram | Schem.pdf |
| Users Manual | UserMan.pdf |
| Operational Description | OpDes.pdf |

5.1 Bandwidth

The plots in Appendices A8 and A9 show the 20dB bandwidth and 99% bandwidth:

| Frequency Channel (MHz) | 20dB bandwidth (kHz) | 99% bandwidth (kHz) |
|-------------------------|----------------------|---------------------|
| 2402 | 1138.9 | 1033.9 |
| 2441 | 1133.9 | 1038.9 |
| 2480 | 1138.9 | 1088.9 |

The plots in Appendices A10 show the channel spacing has minimum 25 kHz or two-third of 20dB bandwidth of hopping channel.

| Frequency (MHz) | Channel spacing (kHz) | Two-third of 20dB bandwidth (kHz) | Minimum bandwidth (kHz) |
|-----------------|-----------------------|-----------------------------------|-------------------------|
| 2402 | 1001.0 | 667.3 | 25 |
| 2441 | 989.0 | 659.3 | 25 |
| 2480 | 994.5 | 663.0 | 25 |

The plots in Appendices A11 show the frequency hopping channel over 75 hopping frequency.

The plots in Appendices A12 show the fundamental emission is confined in the specified band. It shows the 20dB bandwidth and band edge meet the 15.247(d) and 15.205 requirement.

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5.2 Hopping sequence

The plots in Appendices A7 show the hopping sequence is pseudorandom randomly distributed. Four example of continuous fundamental frequency hopping pattern was as below:

The 1st example of fundamental frequency = 2.4522600GHz

The 2nd example of fundamental frequency = 2.4061310GHz

The 3rd example of fundamental frequency = 2.4310730GHz

The 4th example of fundamental frequency = 2.4696110GHz

Result:

Fc 1 – Fc 2 = +46.129MHz

Fc 2 – Fc 3 = -24.942MHz

Fc 3 – Fc 4 = -38.538MHz

It was found the hopping pattern is pseudorandom random.

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5.3 Average on time

The plots in Appendices A13 show the average on time for frequency hopping channel is within 0.4 seconds.

The calculation for average on time as below:

Average hopping channel = Number of transmitted carrier / Sweep time

Average on time = Packet on time x Average hopping channel

Dwell time = Average on time x Total frequency hopping channel x 0.4

Test result:

| Frequency Channel (MHz) | Packet | Dwell Time (Seconds) | Limit (Seconds) | Margin (Seconds) |
|-------------------------|--------|----------------------|-----------------|------------------|
| 2402 | DH1 | 0.135 | 0.4 | - 0.265 |
| 2402 | DH3 | 0.265 | 0.4 | - 0.135 |
| 2402 | DH5 | 0.315 | 0.4 | - 0.085 |
| 2441 | DH1 | 0.135 | 0.4 | - 0.265 |
| 2441 | DH3 | 0.265 | 0.4 | - 0.135 |
| 2441 | DH5 | 0.315 | 0.4 | - 0.085 |
| 2480 | DH1 | 0.135 | 0.4 | - 0.265 |
| 2450 | DH3 | 0.265 | 0.4 | - 0.135 |
| 2480 | DH5 | 0.315 | 0.4 | - 0.085 |

5.4 Antenna requirement

Appendices A4 shows the antenna is permanently attached and cannot be changed. Therefore it fulfils the section 15.203 requirement

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TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

6 Appendices

| | | | |
|-----|---|---|-------|
| A1 | Photos of the set-up of Radiated Emissions | 3 | pages |
| A2 | Photos of the set-up of Conducted Emissions | 1 | page |
| A3 | Photos of External Configurations | 2 | pages |
| A4 | Photos of Internal Configurations | 2 | pages |
| A5 | ID Label/Location | 1 | page |
| A6 | Conducted Emission Measurement Data | 3 | pages |
| A7 | Hopping sequence | 2 | pages |
| A8 | 20 dB bandwidth | 2 | pages |
| A9 | 99% bandwidth | 2 | pages |
| A10 | Bluetooth Channel Spacing | 2 | pages |
| A11 | Bluetooth Hopping Channel | 1 | page |
| A12 | Band Edge | 4 | pages |
| A13 | Bluetooth Average on time | 9 | pages |
| A14 | Transmission Power | 2 | pages |

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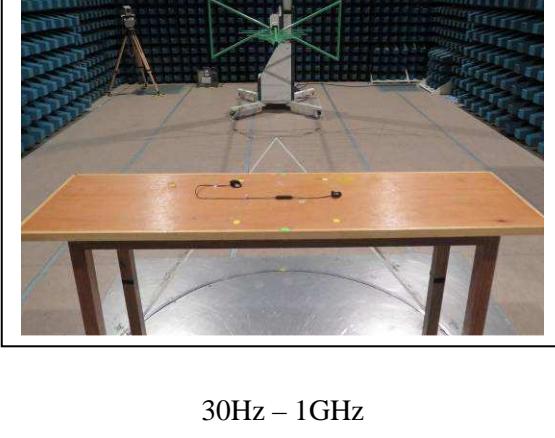
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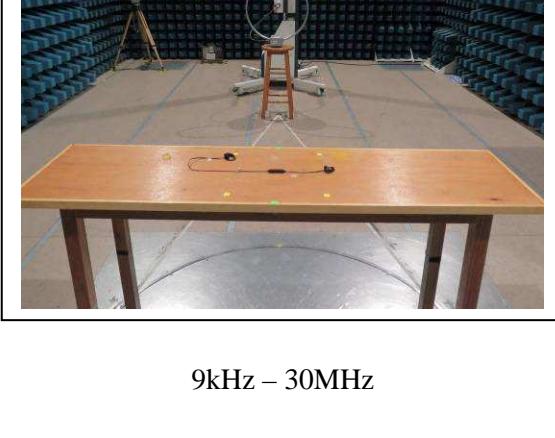
Report No. : AU0049859(2)

Date : 09 Aug 2016

A1. Photos of the set-up of Radiated Emissions



30Hz – 1GHz



9kHz – 30MHz

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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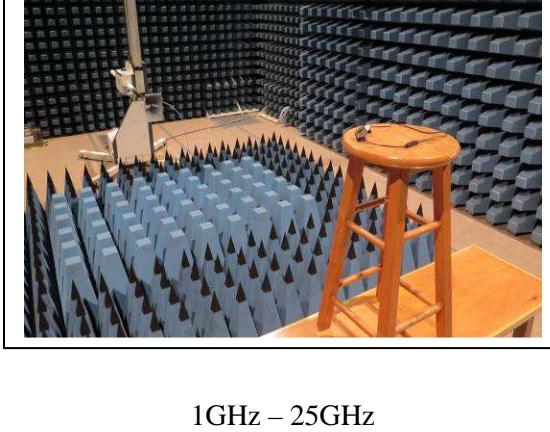
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Date : 09 Aug 2016

A1. Photos of the set-up of Radiated Emissions



1GHz – 25GHz

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Reviewed by:

Mr. WONG Lap-pong, Andrew

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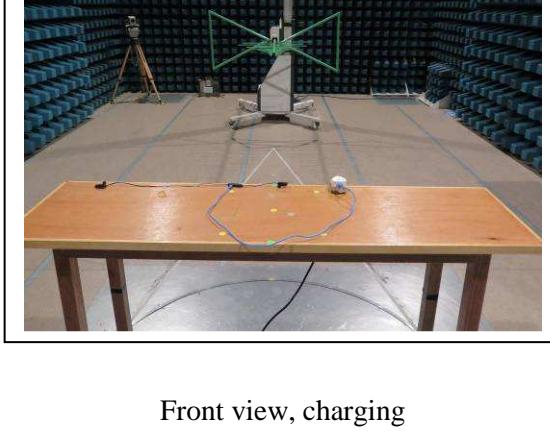
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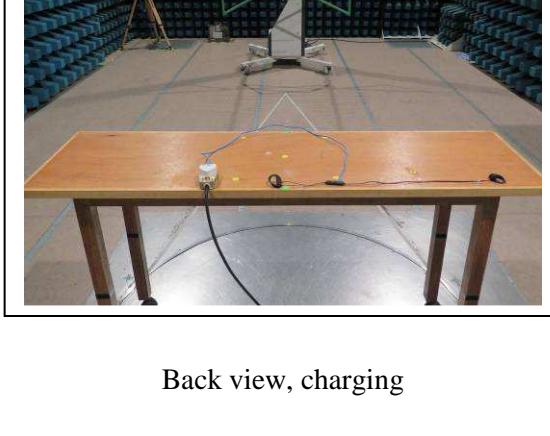
Report No. : AU0049859(2)

Date : 09 Aug 2016

A1. Photos of the set-up of Radiated Emissions



Front view, charging



Back view, charging

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Reviewed by:

Mr. WONG Lap-pong, Andrew

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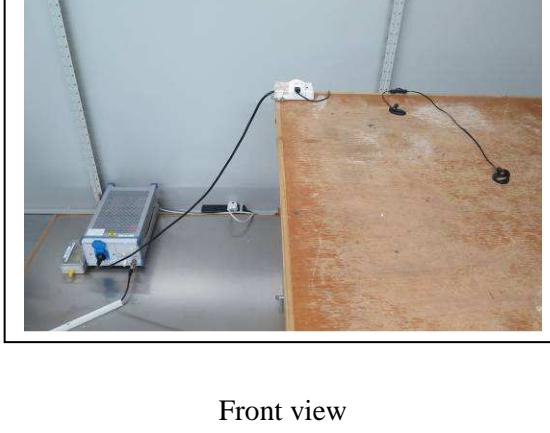
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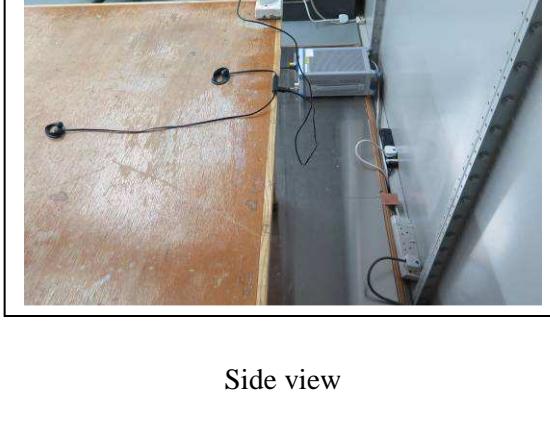
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Date : 09 Aug 2016

A2. Photos of the set-up of Conducted Emissions



Front view



Side view

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Reviewed by:

Mr. WONG Lap-pong, Andrew

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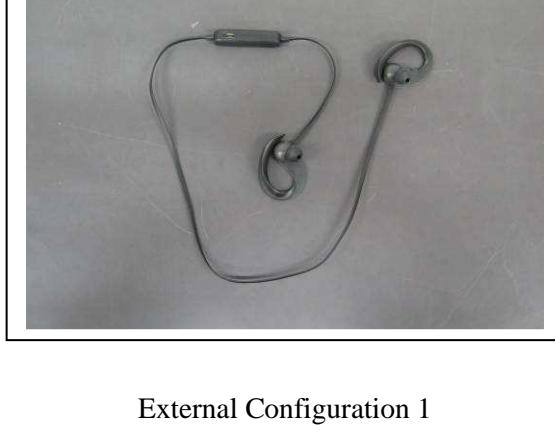
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Report No. : AU0049859(2)

Date : 09 Aug 2016

A3 Photos of External Configurations



External Configuration 1



External Configuration 2

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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Date : 09 Aug 2016

A3 Photos of External Configurations



External Configuration 3

Tested by:

A handwritten signature in black ink, appearing to read 'Ken'.

Mr. LEUNG Shu-kan, Ken

Reviewed by:

A handwritten signature in black ink, appearing to read 'R.L.'.

Mr. WONG Lap-pong, Andrew

Page 28 of 58

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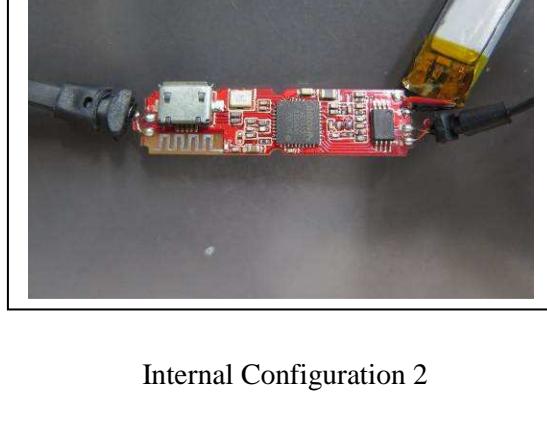
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A4 Photos of Internal Configurations



Internal Configuration 1



Internal Configuration 2

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Reviewed by:

Mr. WONG Lap-pong, Andrew

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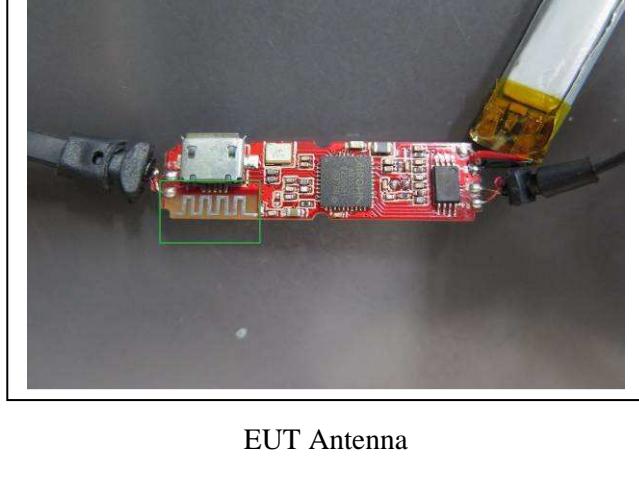
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A4 Photos of Internal Configurations



EUT Antenna

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Reviewed by:

Mr. WONG Lap-pong, Andrew

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A5 ID Label / Location



ID Label 1

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Reviewed by:

Mr. WONG Lap-pong, Andrew

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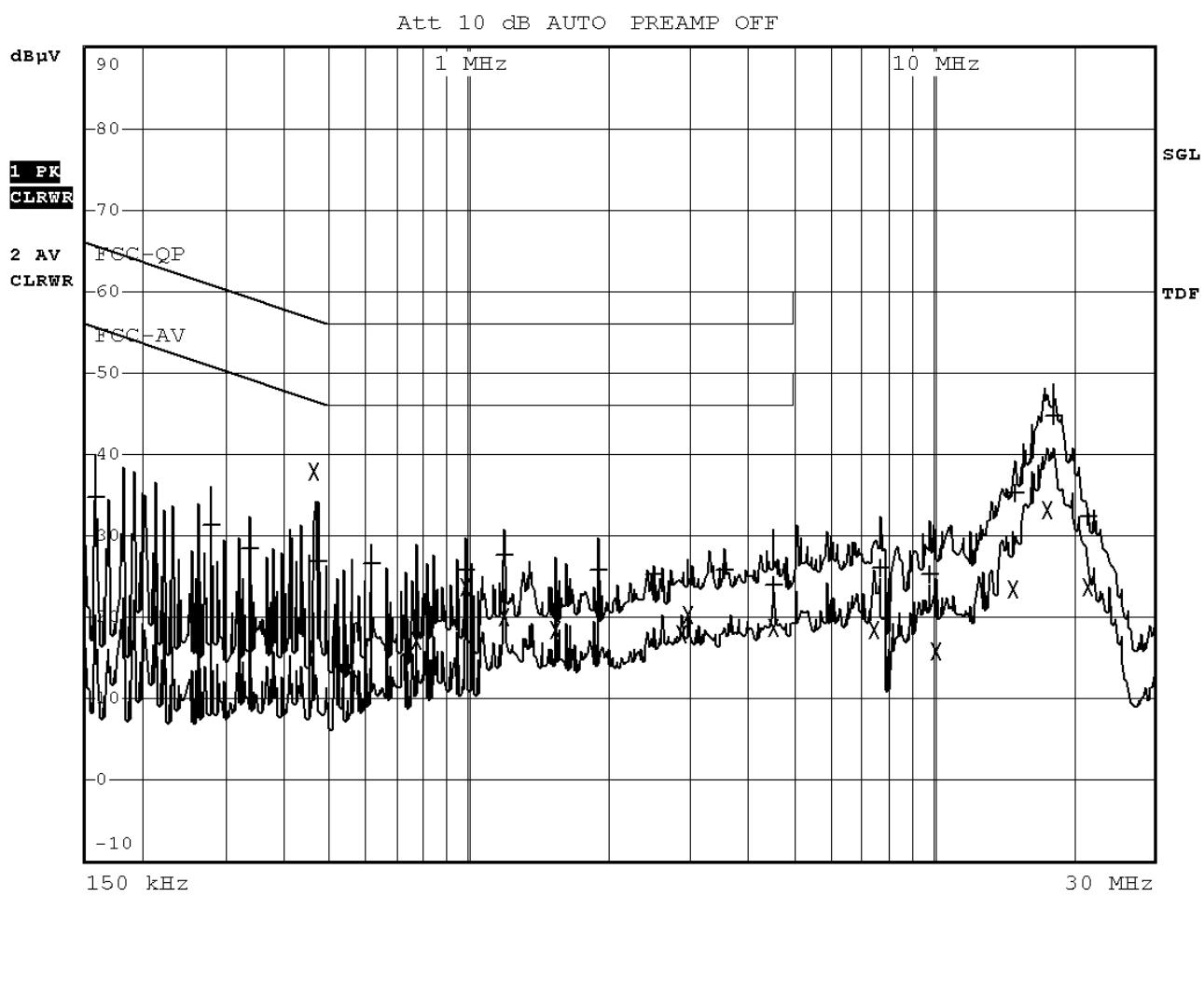


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A6 Con

Event Date

RBW 9 kHz



MR. LEON

AD55-CM5170A

MR. WONG

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TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

A6 Conducted Emission Measurement Data

| EDIT PEAK LIST (Final Measurement Results) | | | | | |
|--|------------|------------------|--------|----------|--|
| Trace1: | FCC-QP | | | | |
| Trace2: | FCC-AV | | | | |
| Trace3: | --- | | | | |
| TRACE | FREQUENCY | LEVEL dB μ V | DELTA | LIMIT dB | |
| 1 Quasi Peak | 159 kHz | 34.68 | N gnd | -30.83 | |
| 1 Quasi Peak | 280.5 kHz | 31.26 | N gnd | -29.54 | |
| 1 Quasi Peak | 339 kHz | 28.47 | N gnd | -30.75 | |
| 2 Average | 465 kHz | 37.85 | N gnd | -8.74 | |
| 1 Quasi Peak | 478.5 kHz | 26.91 | N gnd | -29.45 | |
| 1 Quasi Peak | 617 kHz | 26.69 | N gnd | -29.30 | |
| 2 Average | 774.5 kHz | 17.16 | N gnd | -28.83 | |
| 1 Quasi Peak | 981.5 kHz | 25.87 | N gnd | -30.13 | |
| 2 Average | 981.5 kHz | 23.78 | N gnd | -22.22 | |
| 1 Quasi Peak | 1.193 MHz | 27.57 | N gnd | -28.42 | |
| 2 Average | 1.193 MHz | 19.96 | N gnd | -26.03 | |
| 2 Average | 1.5395 MHz | 18.49 | N gnd | -27.50 | |
| 1 Quasi Peak | 1.904 MHz | 25.72 | N gnd | -30.27 | |
| 1 Quasi Peak | 2.5205 MHz | 25.27 | N gnd | -30.72 | |
| 2 Average | 2.8805 MHz | 18.03 | N gnd | -27.97 | |
| 2 Average | 2.984 MHz | 20.28 | N gnd | -25.71 | |
| 1 Quasi Peak | 3.5555 MHz | 25.71 | N gnd | -30.28 | |
| 1 Quasi Peak | 4.523 MHz | 24.11 | L1 gnd | -31.88 | |
| 2 Average | 4.523 MHz | 18.68 | N gnd | -27.31 | |
| 2 Average | 7.4615 MHz | 18.36 | L1 gnd | -31.63 | |

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew



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TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

A6 Conducted Emission Measurement Data

| EDIT PEAK LIST (Final Measurement Results) | | | | | |
|--|-------------|------------------|-------|----------|--------|
| Trace1: | FCC-QP | | | | |
| Trace2: | FCC-AV | | | | |
| Trace3: | --- | | | | |
| TRACE | FREQUENCY | LEVEL dB μ V | DELTA | LIMIT dB | |
| 1 Quasi Peak | 7.7 MHz | 26.01 | L1 | gnd | -33.98 |
| 1 Quasi Peak | 9.8825 MHz | 25.34 | N | gnd | -34.66 |
| 2 Average | 10.1255 MHz | 15.80 | L1 | gnd | -34.19 |
| 2 Average | 14.8955 MHz | 23.51 | L1 | gnd | -26.49 |
| 1 Quasi Peak | 14.9945 MHz | 35.30 | N | gnd | -24.69 |
| 2 Average | 17.7395 MHz | 33.24 | N | gnd | -16.75 |
| 1 Quasi Peak | 18.2255 MHz | 44.73 | N | gnd | -15.26 |
| 2 Average | 21.596 MHz | 23.65 | N | gnd | -26.34 |
| 1 Quasi Peak | 21.6365 MHz | 32.50 | N | gnd | -27.49 |

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew



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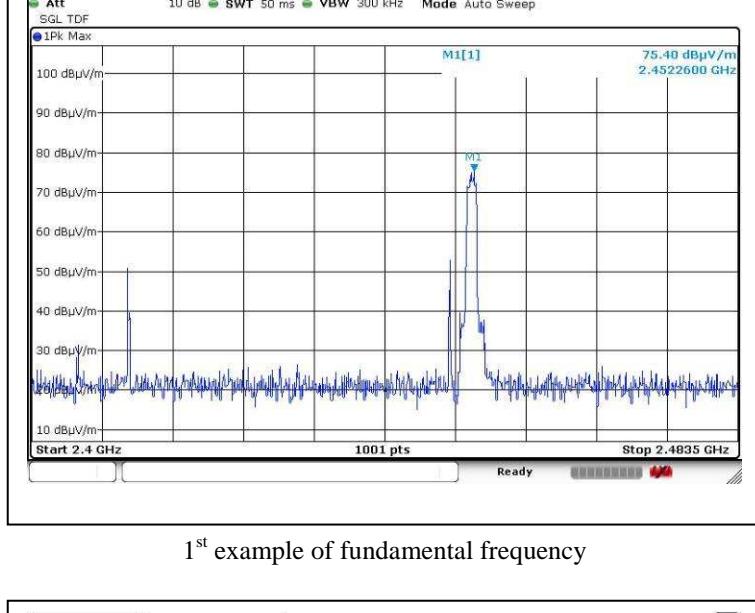
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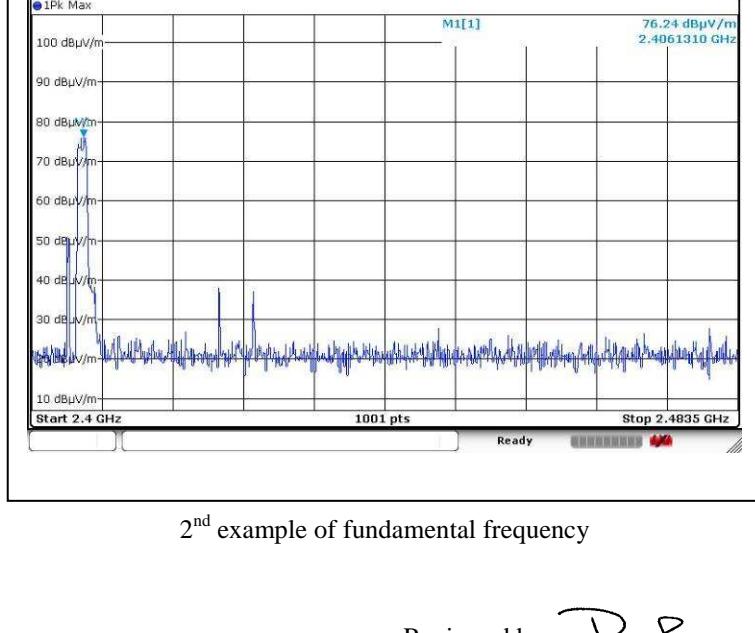
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A7. Hopping sequence



1st example of fundamental frequency



2nd example of fundamental frequency

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Reviewed by:

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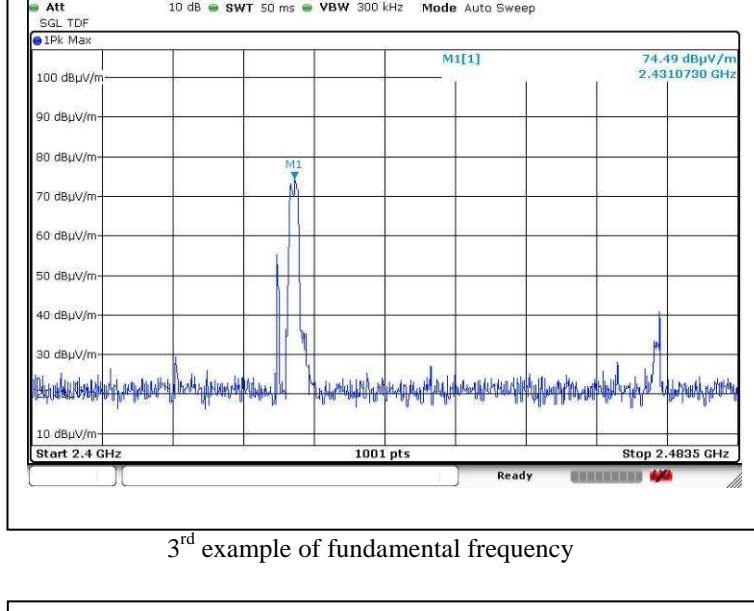
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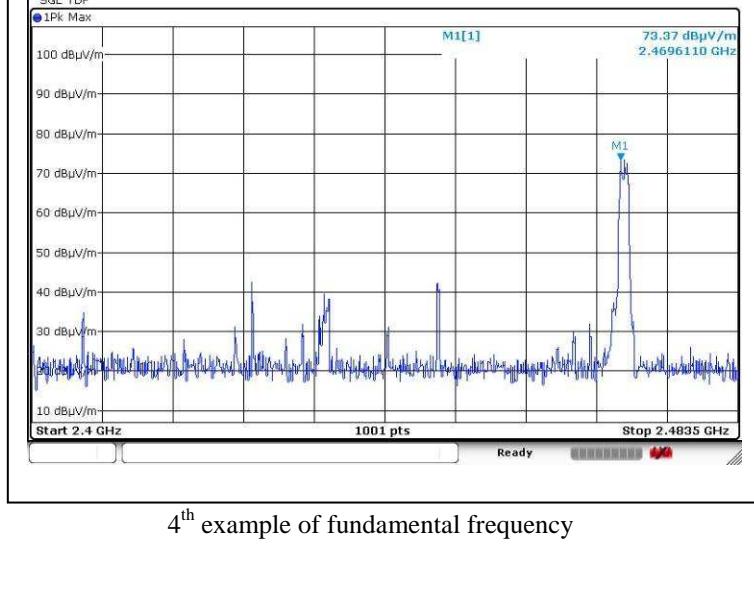
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A7. Hopping sequence



3rd example of fundamental frequency



4th example of fundamental frequency

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Mr. WONG Lap-pong, Andrew



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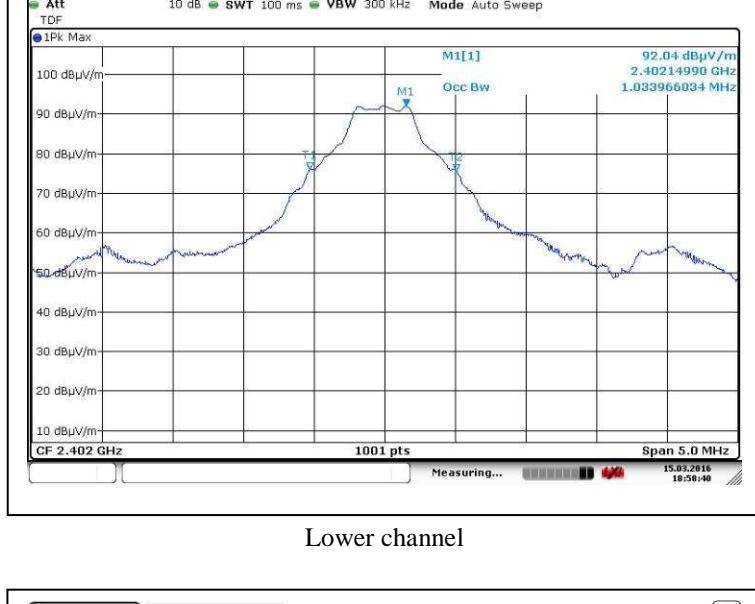
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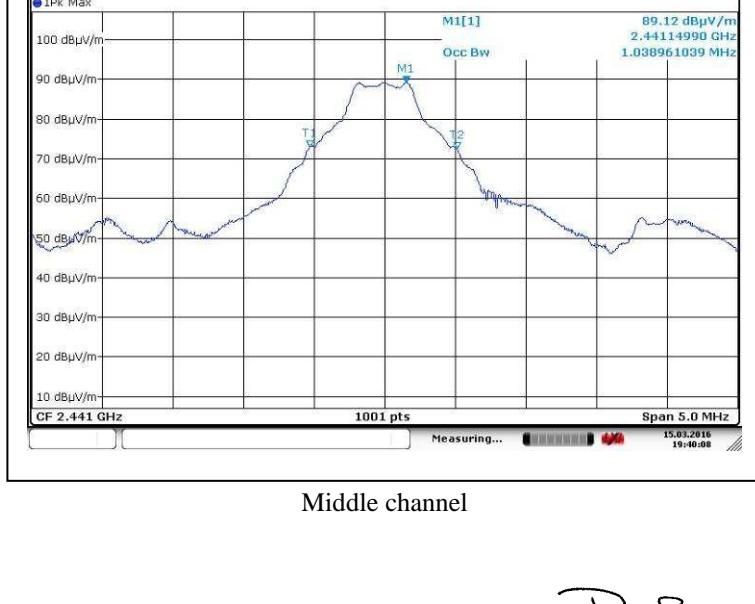
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A9. 99% bandwidth



Lower channel



Middle channel

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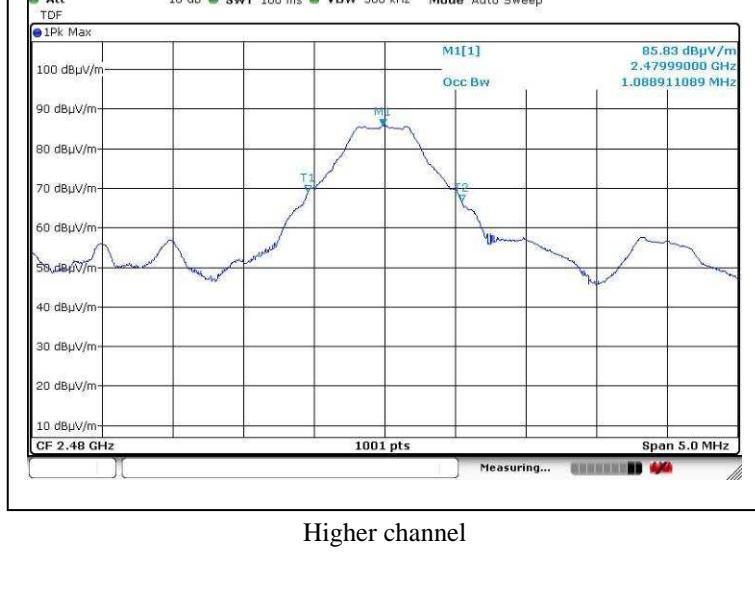
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Date : 09 Aug 2016

A9. 99% bandwidth



Higher channel

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Reviewed by:

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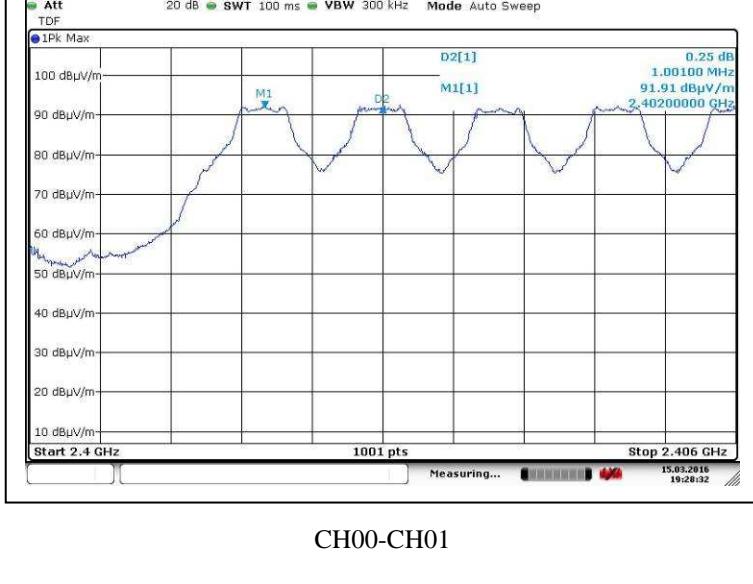
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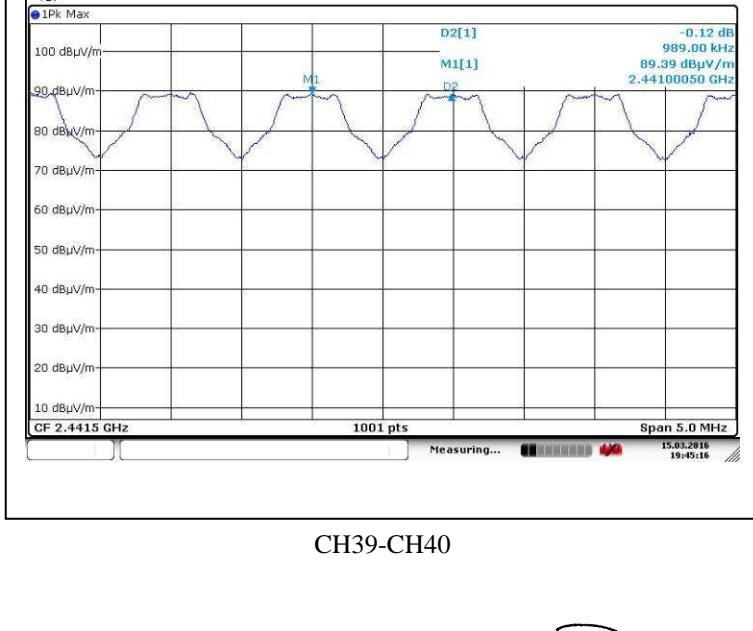
Report No. : AU0049859(2)

Date : 09 Aug 2016

A10. Bluetooth Channel Spacing



CH00-CH01



CH39-CH40

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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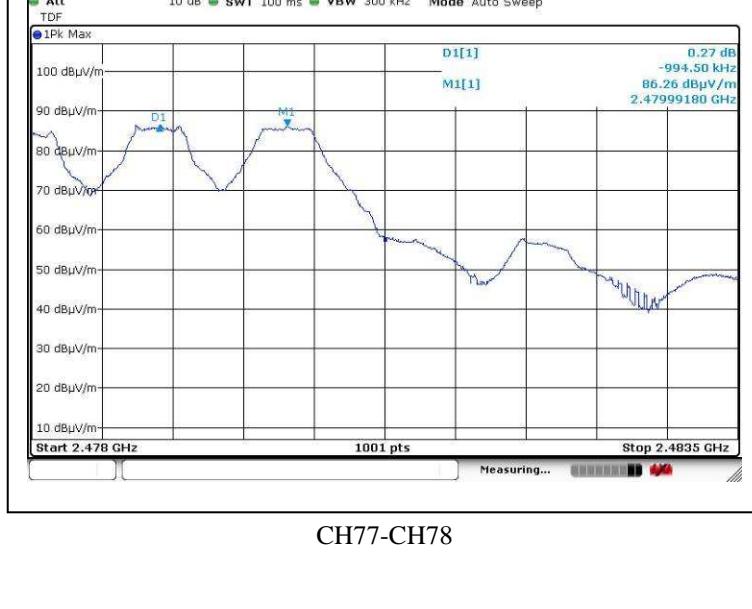
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Report No. : AU0049859(2)

Date : 09 Aug 2016

A10. Bluetooth Channel Spacing



CH77-CH78

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Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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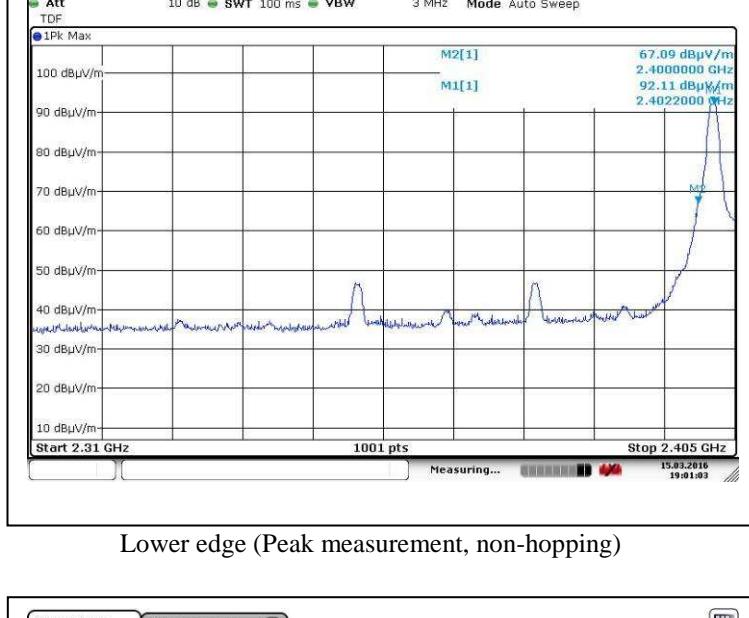
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TEST REPORT

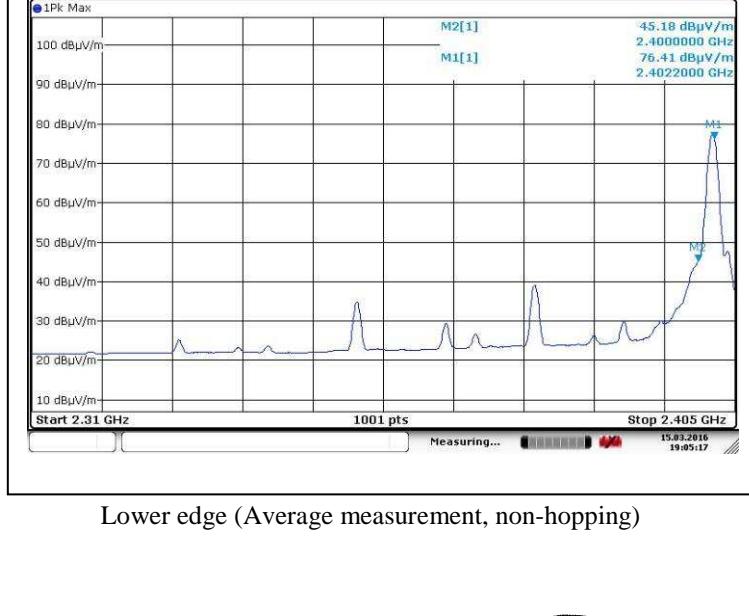
Report No. : AU0049859(2)

Date : 09 Aug 2016

A12. Band Edge



Lower edge (Peak measurement, non-hopping)



Lower edge (Average measurement, non-hopping)

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

FCC ID: 2AD55-CM5170A

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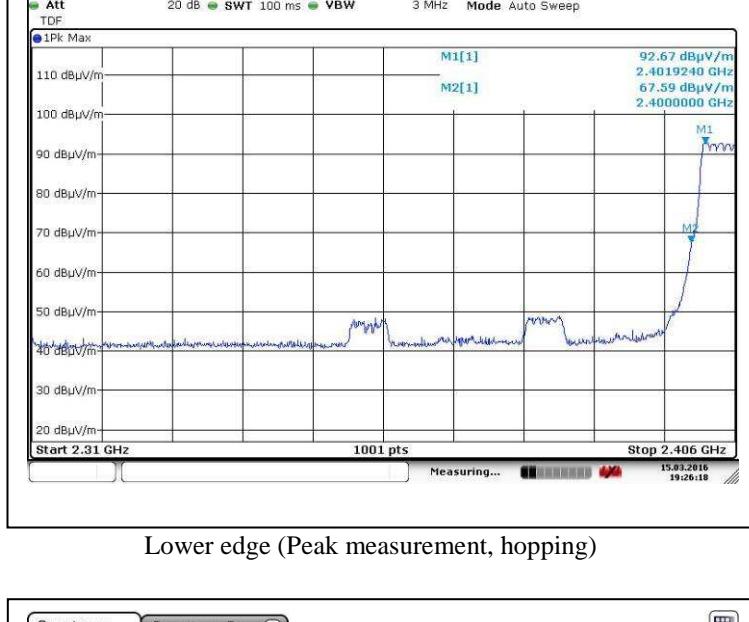
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TEST REPORT

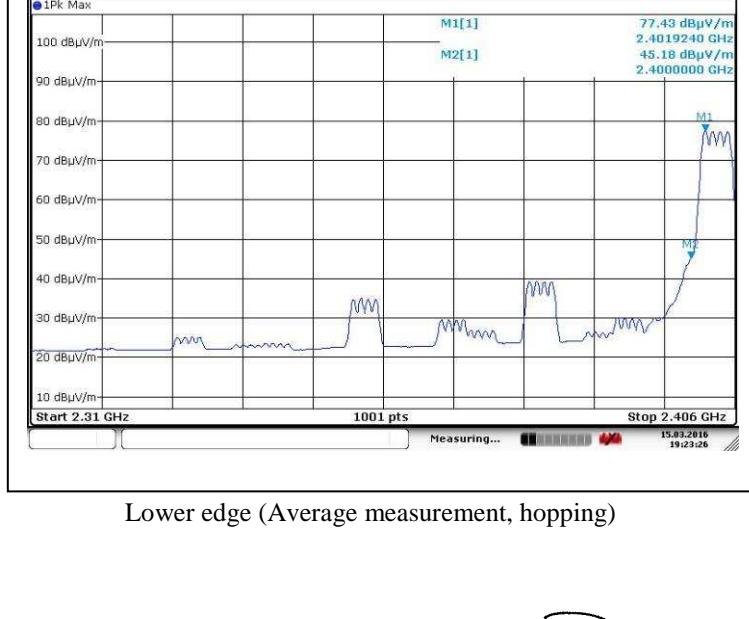
Report No. : AU0049859(2)

Date : 09 Aug 2016

A12. Band Edge



Lower edge (Peak measurement, hopping)



Lower edge (Average measurement, hopping)

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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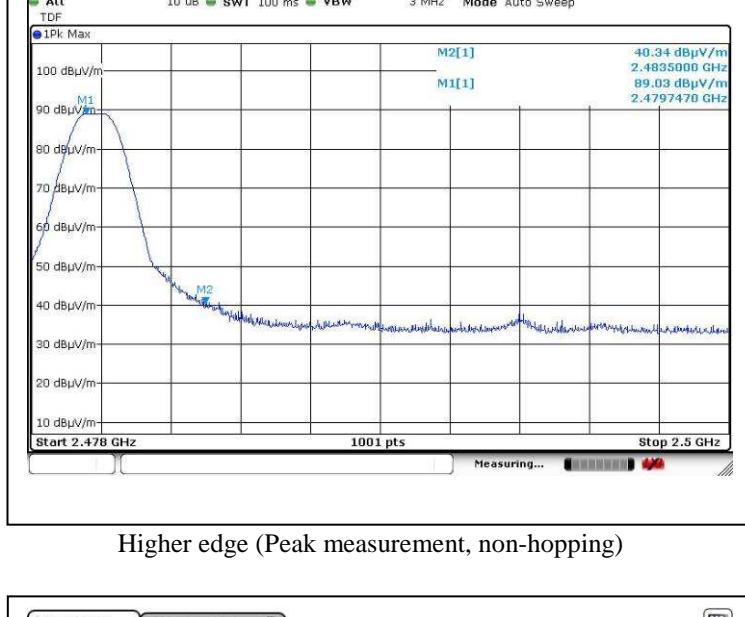
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TEST REPORT

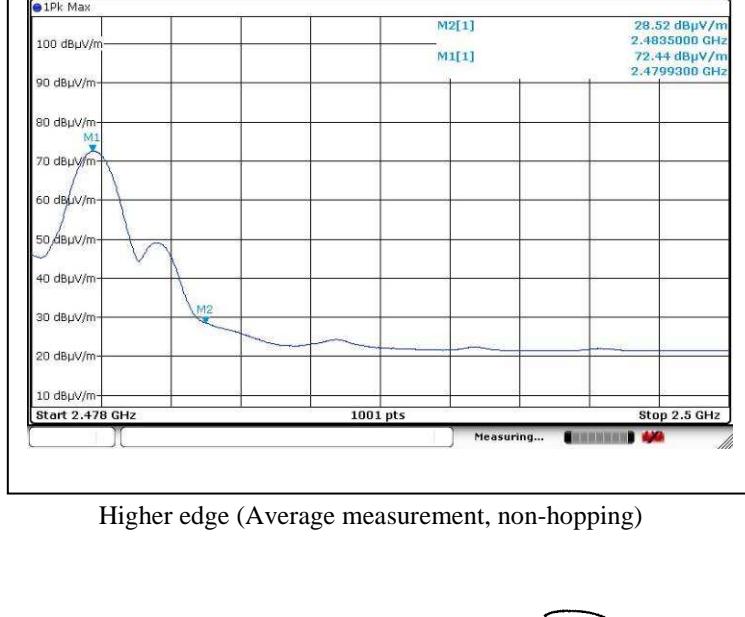
Report No. : AU0049859(2)

Date : 09 Aug 2016

A12. Band Edge



Higher edge (Peak measurement, non-hopping)



Higher edge (Average measurement, non-hopping)

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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Page 46 of 58

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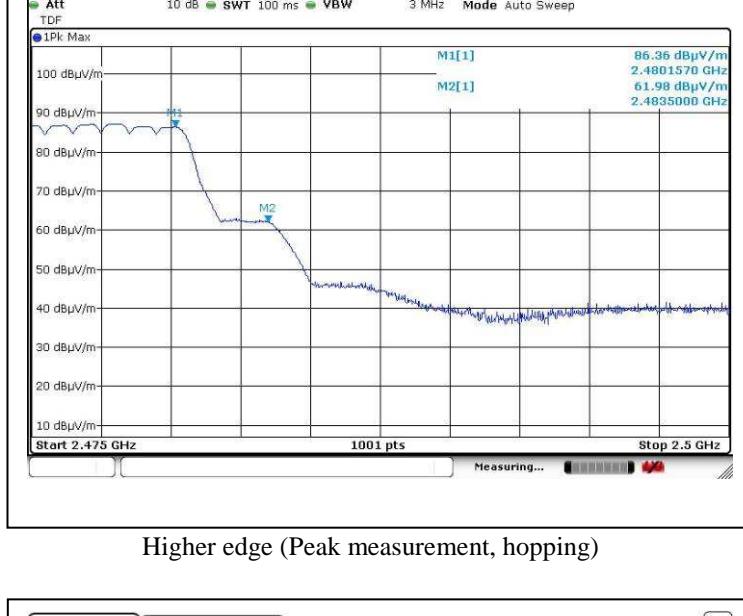
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TEST REPORT

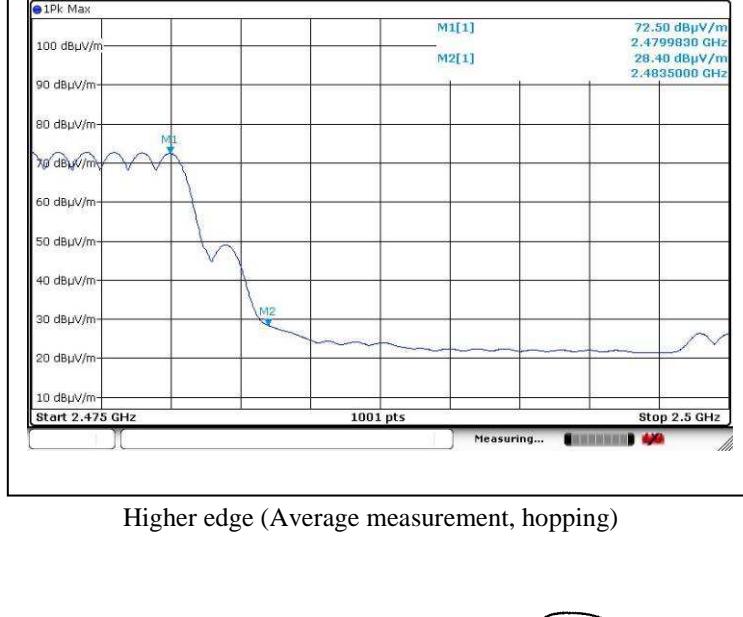
Report No. : AU0049859(2)

Date : 09 Aug 2016

A12. Band Edge



Higher edge (Peak measurement, hopping)



Higher edge (Average measurement, hopping)

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

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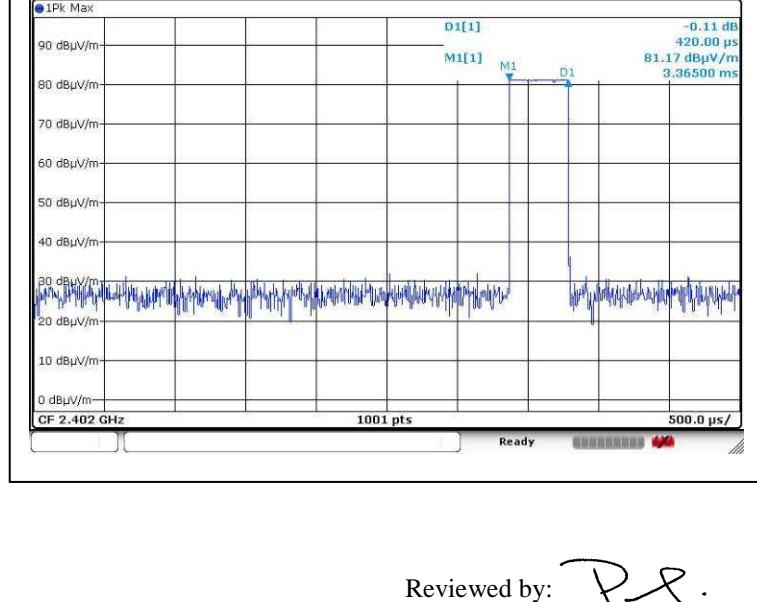
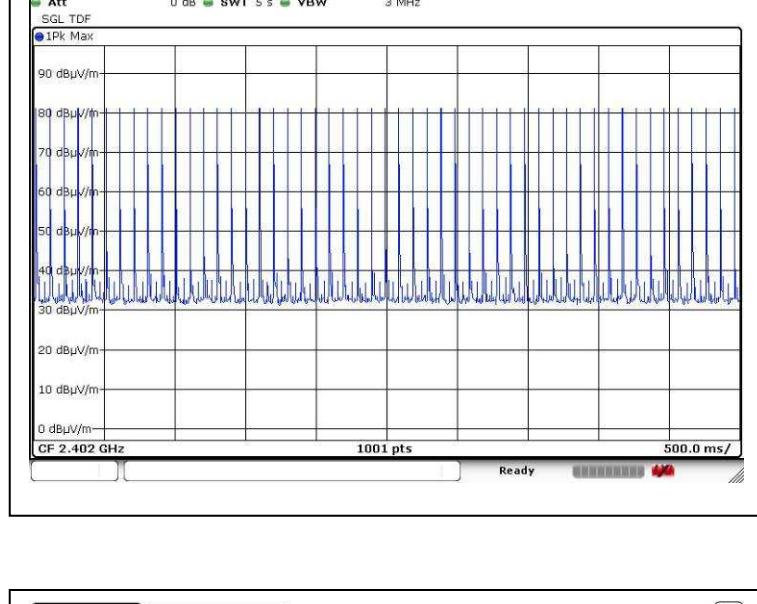
TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

A13. Bluetooth Average On Time

Channel: 00
Packet: DH1



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Reviewed by:

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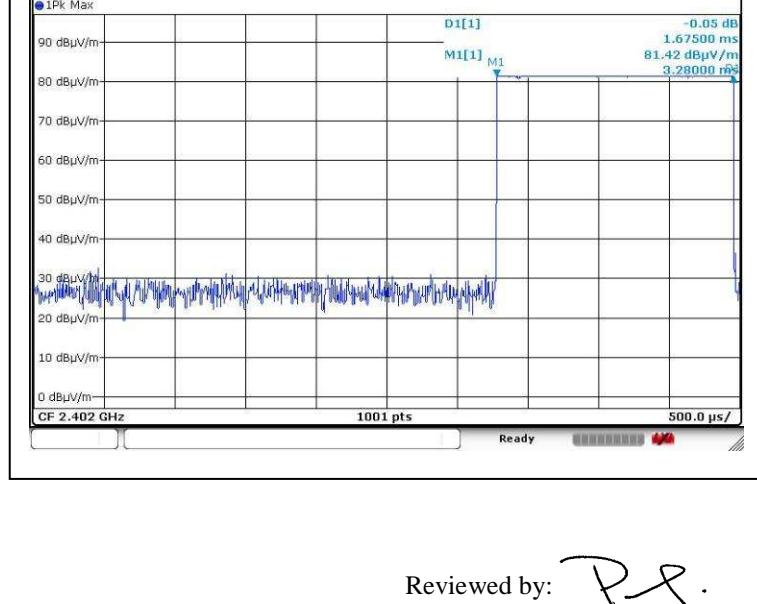
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A13.

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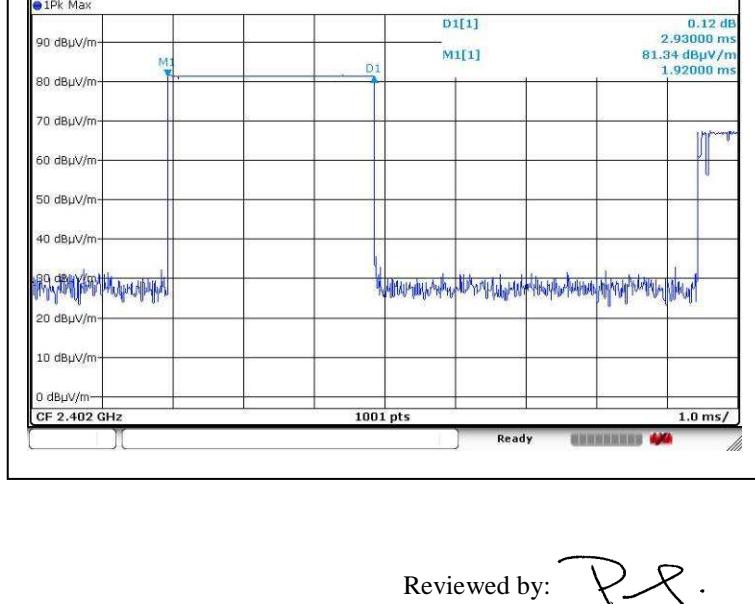
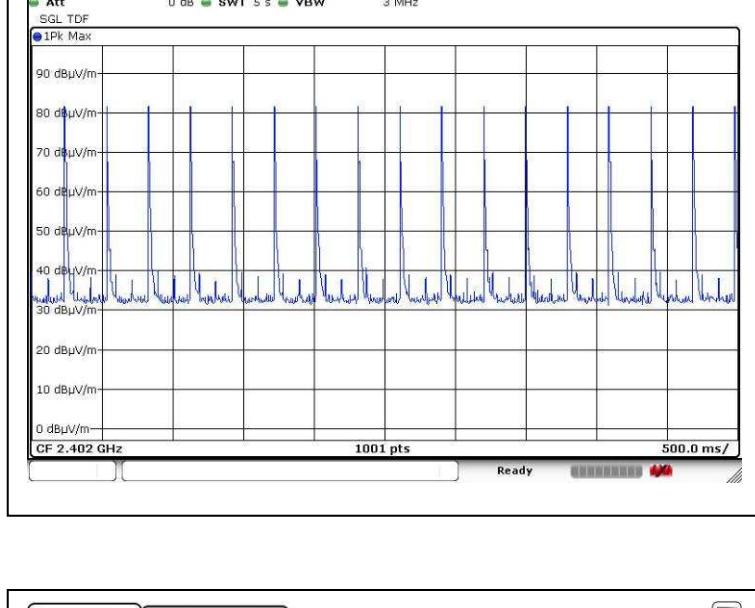
TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

A13. Bluetooth Average On Time

Channel: 00
Packet: DH5



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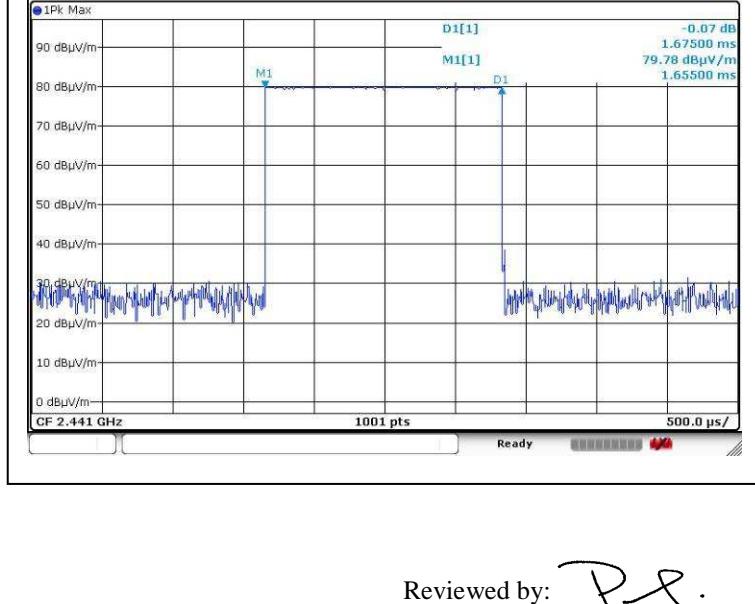
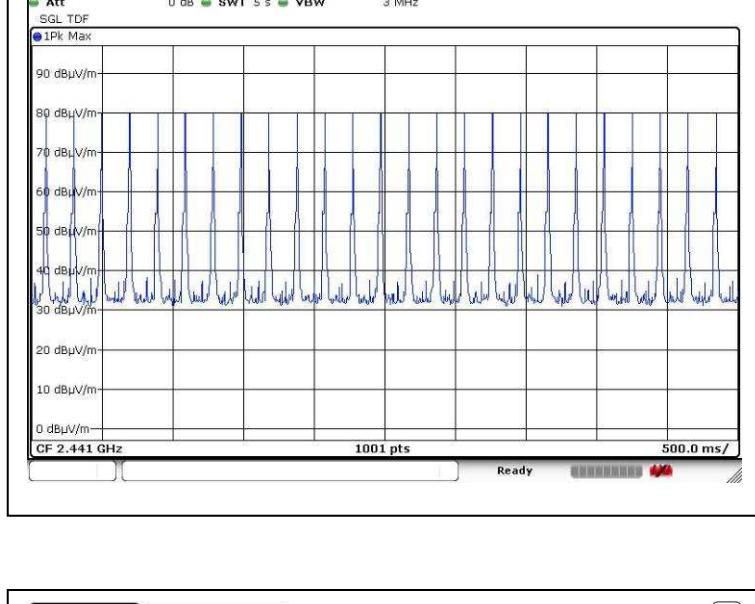
TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

A13. Bluetooth Average On Time

Channel: 39
Packet: DH3



Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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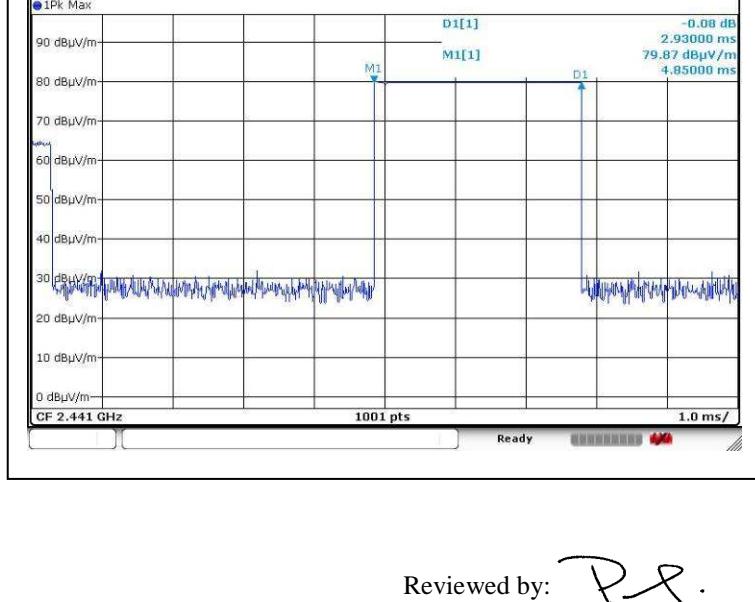
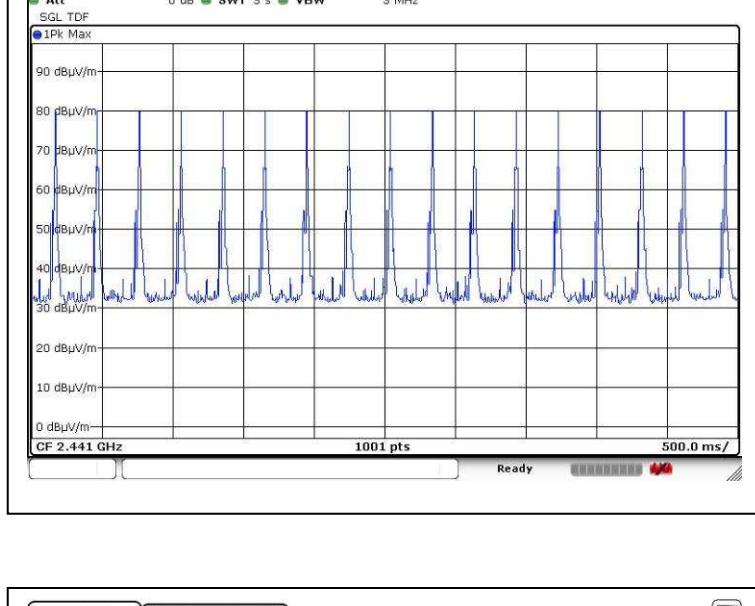
TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

A13. Bluetooth Average On Time

Channel: 39
Packet: DH5



Tested by:

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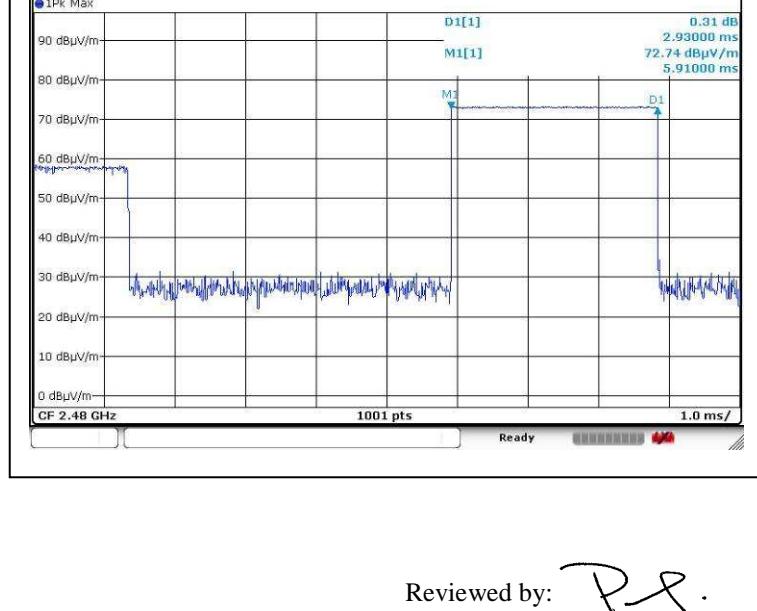
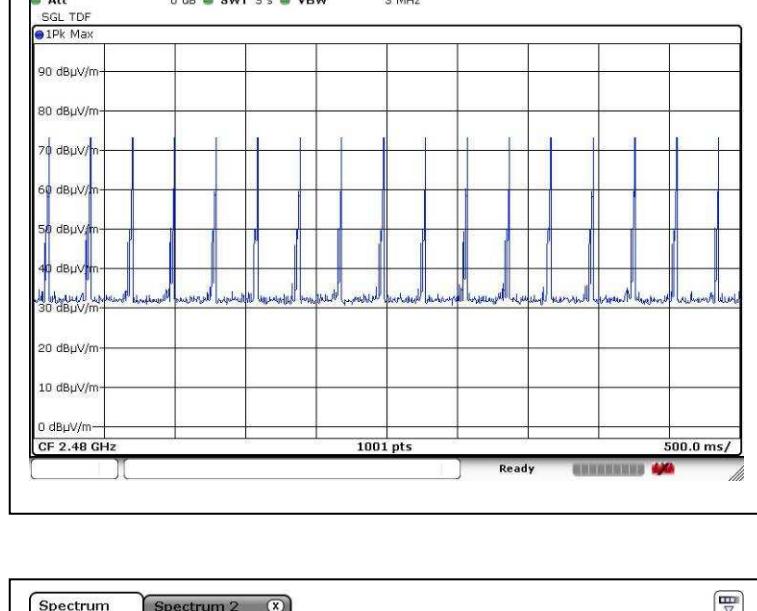
TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

A13. Bluetooth Average On Time

Channel: 78
Packet: DH5



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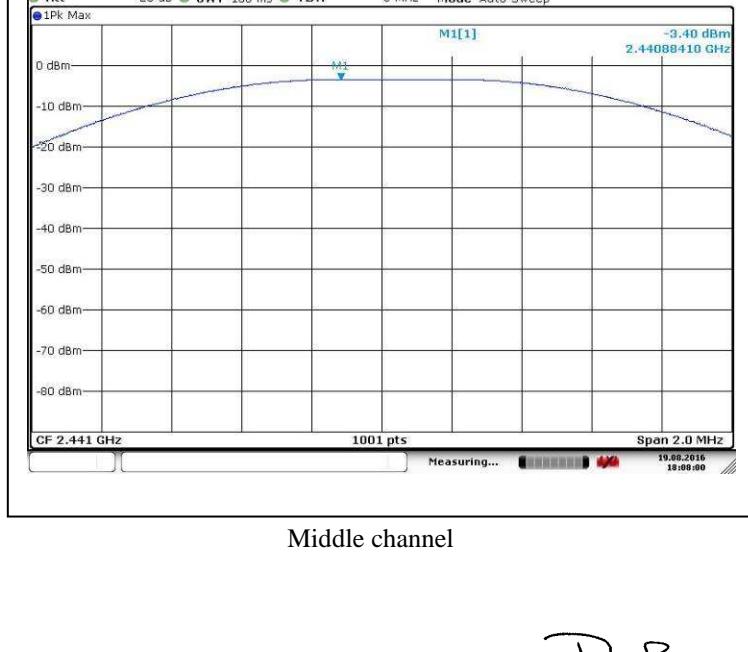
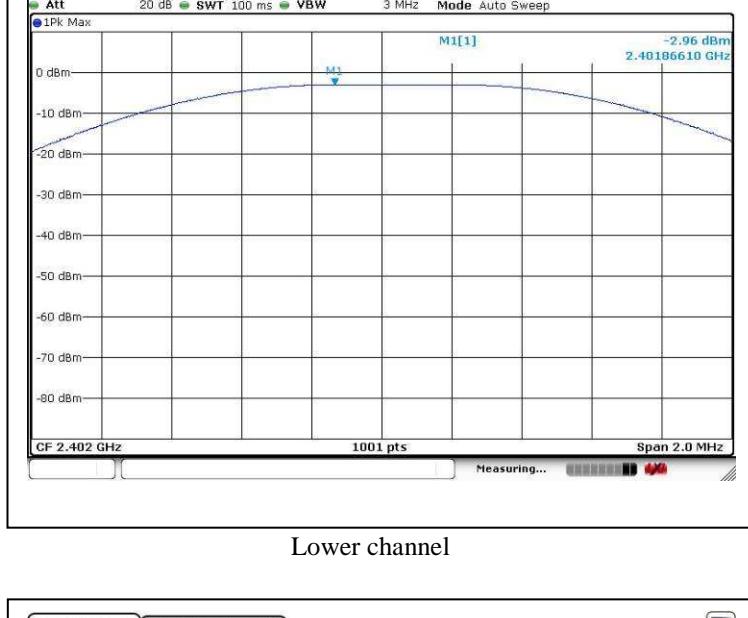
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TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

A14. Transmission Power



Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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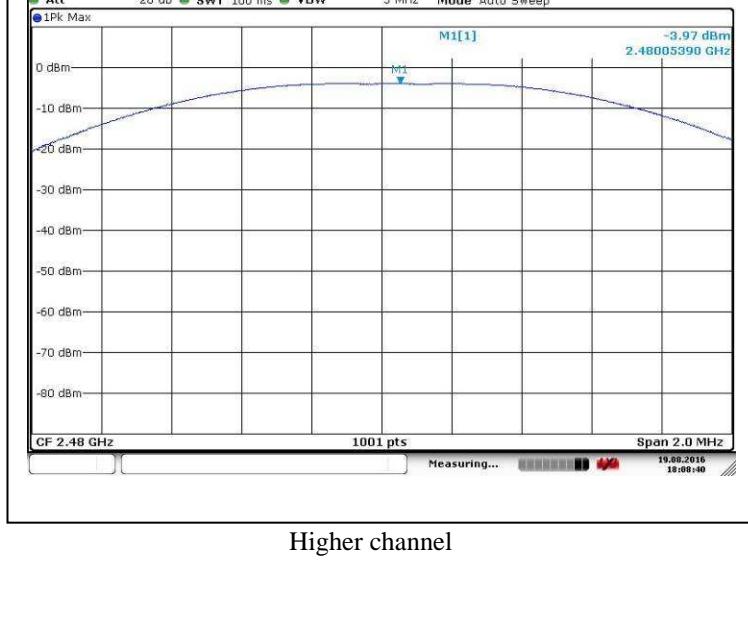
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TEST REPORT

Report No. : AU0049859(2)

Date : 09 Aug 2016

A14. Transmission Power



Higher channel

***** End of Report *****

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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