

**Test Report No. 7191174250-EEC17/01**  
**dated 24 Nov 2017**



PSB Singapore

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH  
47 CFR FCC Parts 15B & C & E  
OF A  
**Wireless Speaker System**  
[ Model : SC-GA10 ]  
[ Contains FCC ID : 2AJYB-S810 ]

**TEST FACILITY** TÜV SÜD PSB Pte Ltd  
Electrical & Electronics Centre (EEC), Product Services,  
No. 1 Science Park Drive, Singapore 118221

**FCC REG. NO.** 994109 (Test Firm Registration Number)  
SG0002 (Designation Number)

**IND. CANADA REG. NO.** 2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park)

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**QUOTATION NUMBER** 2191073452

**JOB NUMBER** 7191174250

**TEST PERIOD** 13 Nov 2017 – 14 Nov 2017

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LA-2007-0380-A  
LA-2007-0381-F  
LA-2007-0382-B  
LA-2007-0383-G

LA-2007-0384-G  
LA-2007-0385-E  
LA-2007-0386-C  
LA-2010-0464-D

The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council. Inspections/Calibrations/Tests marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our inspection body/laboratory.

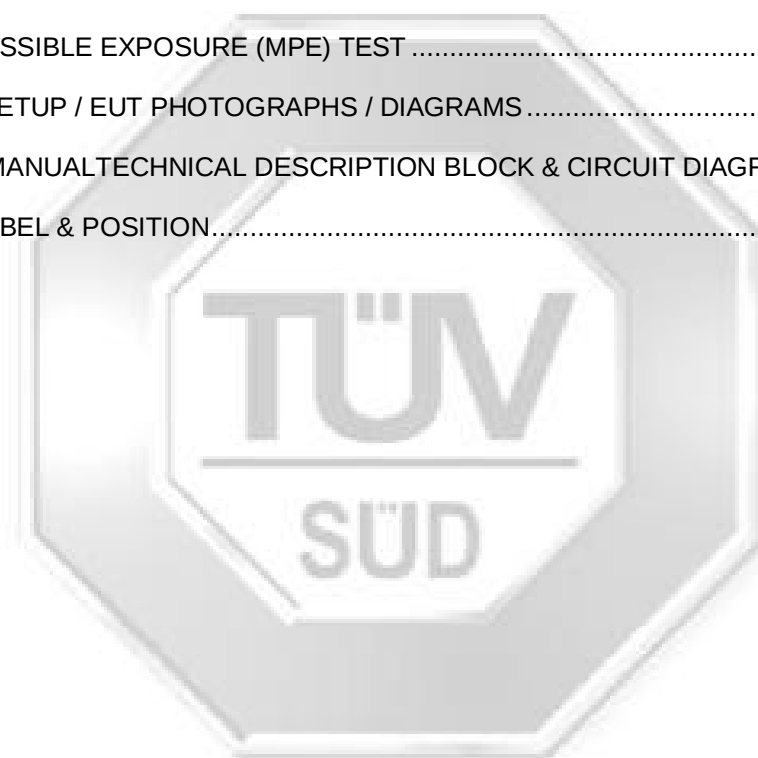
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## TEST SUMMARY

The product was tested in accordance with the customer's specifications.

### Test Results Summary

| Test Standard                  | Description                                                                    | Pass / Fail            |
|--------------------------------|--------------------------------------------------------------------------------|------------------------|
| 47 CFR FCC Part 15 (Bluetooth) |                                                                                |                        |
| 15.107(a), 15.207              | Conducted Emissions                                                            | Pass                   |
| 15.109(a), 15.205, 15.209      | Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement) | Pass                   |
| 15.247(a)(1)                   | Carrier Frequency Separation                                                   | Not Tested *See Note 6 |
|                                | Spectrum Bandwidth (20dB Bandwidth Measurement)                                | Not Tested *See Note 6 |
| 15.247(a)(1)(iii)              | Number of Hopping Frequencies                                                  | Not Tested *See Note 6 |
|                                | Average Frequency Dwell Time                                                   | Not Tested *See Note 6 |
| 15.247(b)(1)                   | Maximum Peak Power                                                             | Not Tested *See Note 6 |
| 15.247(d)                      | RF Conducted Spurious Emissions                                                | Not Tested *See Note 6 |
| 15.247(d)                      | Band Edge Compliance (Conducted)                                               | Not Tested *See Note 6 |
| 15.247(d)                      | Band Edge Compliance (Radiated)                                                | Not Tested *See Note 6 |
| 15.247(e)                      | Peak Power Spectral Density                                                    | Not Tested *See Note 6 |
| 1.1310                         | Maximum Permissible Exposure                                                   | Pass                   |



## TEST SUMMARY

The product was tested in accordance with the customer's specifications.

### Test Results Summary

| Test Standard                     | Description                                                                    | Pass / Fail            |
|-----------------------------------|--------------------------------------------------------------------------------|------------------------|
| 47 CFR FCC Part 15 (2.4GHz Wi-Fi) |                                                                                |                        |
| 15.107(a), 15.207                 | Conducted Emissions                                                            | Pass                   |
| 15.109(a), 15.205, 15.209         | Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement) | Pass                   |
| 15.247(a)(2)                      | Spectrum Bandwidth (6dB Bandwidth Measurement)                                 | Not Tested *See Note 7 |
| 15.247(b)(3)                      | Maximum Peak Power                                                             | Not Tested *See Note 7 |
| 15.247(d)                         | RF Conducted Spurious Emissions (Non-Restricted Bands)                         | Not Tested *See Note 7 |
| 15.247(d)                         | RF Conducted Spurious Emissions (Restricted Bands)                             | Not Tested *See Note 7 |
| 15.247(d)                         | Band Edge Compliance (Conducted)                                               | Not Tested *See Note 7 |
| 15.247(d)                         | Band Edge Compliance (Radiated)                                                | Not Tested *See Note 7 |
| 15.247(e)                         | Peak Power Spectral Density                                                    | Not Tested *See Note 7 |
| 1.1310                            | Maximum Permissible Exposure                                                   | Pass                   |



## TEST SUMMARY

The product was tested in accordance with the customer's specifications.

### Test Results Summary

| Test Standard                   | Description                                                                    | Pass / Fail            |
|---------------------------------|--------------------------------------------------------------------------------|------------------------|
| 47 CFR FCC Part 15 (5GHz Wi-Fi) |                                                                                |                        |
| 15.107(a), 15.207               | Conducted Emissions                                                            | Pass                   |
| 15.109(a), 15.205, 15.209       | Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement) | Pass                   |
| 15.407(e)                       | Spectrum Bandwidth (6dB Bandwidth Measurement)                                 | Not Tested *See Note 8 |
| 15.407(a)(1)(2)(3)              | Maximum Peak Power                                                             | Not Tested *See Note 8 |
| 15.407(b)                       | RF Conducted Spurious Emissions (Non-Restricted Bands)                         | Not Tested *See Note 8 |
| 15.209                          | RF Conducted Spurious Emissions (Restricted Bands)                             | Not Tested *See Note 8 |
| 15.407(a)(1)(2)(3)              | Peak Power Spectral Density                                                    | Not Tested *See Note 8 |
| 1.1310                          | Maximum Permissible Exposure                                                   | Pass                   |

## TEST SUMMARY

### Notes

1. Three channels as listed below, which respectively represent the lower, middle and upper channels of the Equipment Under Test (EUT) during Bluetooth mode were chosen and tested. For each channel, the EUT was configured to operate in the test mode.

| <u>Transmit Channel</u>     | <u>Frequency (GHz)</u> |
|-----------------------------|------------------------|
| Channel 0 (Lower Channel)   | 2.402                  |
| Channel 39 (Middle Channel) | 2.441                  |
| Channel 78 (Upper Channel)  | 2.480                  |

2. Three channels as listed below, which respectively represent the lower, middle and upper channels of the Equipment Under Test (EUT) during Wi-Fi 2.4GHz mode were chosen and tested. For each channel, the EUT was configured to operate in the test mode.

| <u>Transmit Channel</u>    | <u>Frequency (GHz)</u> |
|----------------------------|------------------------|
| Channel 1 (Lower Channel)  | 2.412                  |
| Channel 7 (Middle Channel) | 2.437                  |
| Channel 13 (Upper Channel) | 2.462                  |

3. Three channels as listed below, which respectively represent the lower, middle and upper channels of the Equipment Under Test (EUT) during Wi-Fi 5GHz mode were chosen and tested. For each channel, the EUT was configured to operate in the test mode.

| <u>Transmit Channel</u>      | <u>Frequency (GHz)</u> |
|------------------------------|------------------------|
| Channel 36 (Lower Channel)   | 5.180                  |
| Channel 100 (Middle Channel) | 5.500                  |
| Channel 149 (Upper Channel)  | 5.745                  |

4. The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.
5. All test measurement procedures are according to ANSI C63.4: 2014, ANSI C63.10: 2013 and KDB 558074 D01 DTS Measurement Guidance V04.
6. The EUT contains FCC (FCC ID: 2AJYB-S810) certified Bluetooth module model Stream 810 from StreamUnlimited Engineering GmbH. The module was integrated into the EUT without any modification as per information from Panasonic AVC Networks Singapore. This RF module was tested by TÜV AUSTRIA SERVICES GMBH, and reported in M/FG-16/134, dated 19 Dec 2016.
7. The EUT contains FCC (FCC ID: 2AJYB-S810) certified 2.4GHz Wi-Fi module model Stream 810 from StreamUnlimited Engineering GmbH. The module was integrated into the EUT without any modification as per information from Panasonic AVC Networks Singapore. This RF module was tested by TÜV AUSTRIA SERVICES GMBH, and reported in M/FG-16/135, dated 19 Dec 2016.
8. The EUT contains FCC (FCC ID: 2AJYB-S810) certified 5GHz Wi-Fi module model Stream 810 from StreamUnlimited Engineering GmbH. The module was integrated into the EUT without any modification as per information from Panasonic AVC Networks Singapore. This RF module was tested by TÜV AUSTRIA SERVICES GMBH, and reported in M/FG-16/136, dated 19 Dec 2016.

### Modifications

No modifications were made.

## PRODUCT DESCRIPTION

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description                  | : The Equipment Under Test (EUT) is a <b>Wireless Speaker System</b> .                                                                                                                                                                                                                                                                                                                                               |
| Applicant                    | : StreamUnlimited Engineering GmbH                                                                                                                                                                                                                                                                                                                                                                                   |
| Manufacturer                 | : Panasonic Corporation<br>1006 Oaza Kadoma, Kadoma-City,<br>Osaka 571 8501, Japan                                                                                                                                                                                                                                                                                                                                   |
| Factory                      | : Panasonic AVC Networks Johor Malaysia Sdn. Bhd.<br>IE. PLO 460, Jalan Bandar,<br>81700 Pasir Gudang, Johor, Malaysia                                                                                                                                                                                                                                                                                               |
| Model Number(s)              | : (Host) SC-GA10                                                                                                                                                                                                                                                                                                                                                                                                     |
| FCC ID                       | : (Modular) 2AJYB-S810; manufacturer: StreamUnlimited Engineering GmbH, Gutheil Schoder Gasse 10, 1100 Vienna, Austria                                                                                                                                                                                                                                                                                               |
| Serial Number(s)             | : Nil                                                                                                                                                                                                                                                                                                                                                                                                                |
| Microprocessor(s)            | : Marvell 88W8897P                                                                                                                                                                                                                                                                                                                                                                                                   |
| Operating Frequency          | : i. 2402MHz – 2480MHz (Bluetooth)<br>ii. 2412MHz – 2472MHz (Wi-Fi)<br>iii. 5180MHz – 5320MHz (Wi-Fi)<br>iv. 5500MHz – 5825MHz (Wi-Fi)                                                                                                                                                                                                                                                                               |
| Clock / Oscillator Frequency | : 40MHz, 16MHz                                                                                                                                                                                                                                                                                                                                                                                                       |
| Modulation                   | : Bluetooth<br>i. Gaussian Frequency Shift Keying (GFSK)<br>ii. $\pi/4$ Differential-Quadrature Phase Shift Keying (DQPSK)<br>iii. 8 Differential Phase-Shift Keying (DPSK)<br><br>Wi-Fi<br>i. Complementary Code Keying (CCK)<br>ii. Binary Phase Shift Keying (BPSK)<br>iii. Quadrature Phase Shift Keying (QPSK)<br>iv. 16Quadrature Amplitude Modulation (16QAM)<br>v. 64Quadrature Amplitude Modulation (64QAM) |
| Occupied Channel Bandwidth   | : 1339.9MHz (as declared by the manufacturer)                                                                                                                                                                                                                                                                                                                                                                        |
| Antenna Gain                 | : 1.0 dBi                                                                                                                                                                                                                                                                                                                                                                                                            |
| Port / Connectors            | : AUX, AC Power, UFL.                                                                                                                                                                                                                                                                                                                                                                                                |
| Rated Input Power            | : 100V – 240V, 50/60Hz, 19.5V 3.34A                                                                                                                                                                                                                                                                                                                                                                                  |
| Accessories                  | : Refer to manufacturer's user manual / operating manual                                                                                                                                                                                                                                                                                                                                                             |

**SUPPORTING EQUIPMENT DESCRIPTION**

| <b>Equipment Description<br/>(Including Brand Name)</b> | <b>Model, Serial &amp; FCC ID Number</b>                   | <b>Cable Description<br/>(List Length, Type &amp; Purpose)</b> |
|---------------------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------|
| Fujitsu LifeBook S Series Laptop                        | M/N: S6410<br>S/N: C071200719<br>FCC ID: DoC               | 1.80m unshielded RJ45 Cable                                    |
| Fujitsu Limited AC Adapter                              | M/N: SEC100P3-19.0<br>S/N: 08903690B<br>FCC ID: DoC        | 1.80m unshielded power cable                                   |
| D-Link Router                                           | M/N: DIR-850L<br>S/N: R3XU2D4000130<br>FCC ID: KA2IR850LA1 | Nil                                                            |
| Channel Well Technology AC Adapter                      | M/N: SAG024F 4 EU<br>S/N: Nil<br>FCC ID: DoC               | 1.80m unshielded power cable                                   |
| Logitech M100 Optical Mouse                             | M/N: M-U0004<br>S/N: Nil<br>FCC ID: DoC                    | 1.80m unshielded cable                                         |
| Apple iPod Nano                                         | M/N: MC062ZP<br>S/N: YM9517XB72R<br>FCC ID: DoC            | 1.00m unshielded auxiliary cable                               |
| Samsung Galaxy S4 Mobile Phone                          | M/N: GT-I9505<br>S/N: R21D53LTSHJ<br>FCC ID: A3LGTI9505    | Nil                                                            |

**EUT OPERATING CONDITIONS**

**47 CFR FCC Part 15**

- 1. Conducted Emissions**
- 2. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)**
- 3. Maximum Permissible Exposure**

The EUT was exercised by operating in maximum continuous transmission in test mode, i.e transmitting at lower, middle and upper channels respectively at one time.



## CONDUCTED EMISSION TEST

### 47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Limits

| Frequency Range<br>(MHz) | Limit Values (dBμV) |              |
|--------------------------|---------------------|--------------|
|                          | Quasi-peak (Q-P)    | Average (AV) |
| 0.15 - 0.5               | 66 – 56 *           | 56 – 46 *    |
| 0.5 - 5.0                | 56                  | 46           |
| 5.0 - 30.0               | 60                  | 50           |

\* Decreasing linearly with the logarithm of the frequency

### 47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Test Instrumentation

| Instrument                         | Model   | S/No       | Cal Due Date |
|------------------------------------|---------|------------|--------------|
| Schaffner EMI Receiver             | SMR4503 | 040        | 22 Mar 2018  |
| Agilent EMC Analyzer-SA7           | E7403A  | US41160167 | 03 Aug 2018  |
| Schaffner LISN –LISN10 (EUT)       | NNB42   | 04/10055   | 04 Oct 2018  |
| EMCO LISN (for supporting) – LISN6 | 3825/2  | 9309-2127  | 06 Oct 2018  |



## CONDUCTED EMISSION TEST

### 47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Test Setup

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50 $\Omega$ /50 $\mu$ H EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another LISN.

### 47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 9kHz. Both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line.

### **Sample Calculation Example**

At 20 MHz

Q-P limit = 60.0 dB $\mu$ V

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.2 dB

Q-P reading obtained directly from EMI Receiver = 40.0 dB $\mu$ V  
(Calibrated for system losses)

Therefore, Q-P margin = 60.0 - 40.0 = 20.0

i.e. 20.0 dB below Q-P limit



**CONDUCTED EMISSION TEST**

**47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Results**

|                  |                          |                      |             |
|------------------|--------------------------|----------------------|-------------|
| Test Input Power | 120V 60Hz                | Temperature          | 22°C        |
| Line Under Test  | AC Mains                 | Relative Humidity    | 55%         |
| Mode             | Bluetooth Audio Playback | Atmospheric Pressure | 1030mbar    |
|                  |                          | Tested By            | Lim Kay Tak |

| Frequency (MHz) | Q-P Value (dBμV) | Q-P Limit (dBμV) | Q-P Margin (dB) | AV Value (dBμV) | AV Limit (dBμV) | AV Margin (dB) | Line |
|-----------------|------------------|------------------|-----------------|-----------------|-----------------|----------------|------|
| 0.1527          | 42.9             | 65.9             | 23.0            | 30.2            | 55.9            | 25.7           | Live |
| 0.5207          | 43.7             | 56.0             | 12.3            | 36.5            | 46.0            | 9.5            | Live |
| 0.9380          | 29.8             | 56.0             | 26.2            | 23.6            | 46.0            | 22.4           | Live |
| 2.1250          | 30.3             | 56.0             | 25.7            | 23.9            | 46.0            | 22.1           | Live |
| 2.5601          | 30.4             | 56.0             | 25.6            | 22.8            | 46.0            | 23.2           | Live |
| 2.8111          | 29.8             | 56.0             | 26.2            | 21.2            | 46.0            | 24.8           | Live |

|                  |                             |                      |             |
|------------------|-----------------------------|----------------------|-------------|
| Test Input Power | 120V 60Hz                   | Temperature          | 22°C        |
| Line Under Test  | AC Mains                    | Relative Humidity    | 55%         |
| Mode             | Wi-Fi 2.4GHz Audio Playback | Atmospheric Pressure | 1030mbar    |
|                  |                             | Tested By            | Lim Kay Tak |

| Frequency (MHz) | Q-P Value (dBμV) | Q-P Limit (dBμV) | Q-P Margin (dB) | AV Value (dBμV) | AV Limit (dBμV) | AV Margin (dB) | Line    |
|-----------------|------------------|------------------|-----------------|-----------------|-----------------|----------------|---------|
| 0.1502          | 42.5             | 66.0             | 23.5            | 27.2            | 56.0            | 28.8           | Live    |
| 0.1806          | 38.2             | 64.5             | 26.3            | 21.3            | 54.5            | 33.2           | Live    |
| 0.2585          | 34.4             | 61.5             | 27.1            | 16.7            | 51.5            | 34.8           | Live    |
| 0.5236          | 44.0             | 56.0             | 12.0            | 34.0            | 46.0            | 12.0           | Live    |
| 2.6978          | 30.0             | 56.0             | 26.0            | 18.7            | 46.0            | 27.3           | Live    |
| 2.7757          | 28.7             | 56.0             | 27.3            | 16.6            | 46.0            | 29.4           | Neutral |



**CONDUCTED EMISSION TEST**

**47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Results**

|                  |                           |                      |             |
|------------------|---------------------------|----------------------|-------------|
| Test Input Power | 120V 60Hz                 | Temperature          | 22oC        |
| Line Under Test  | AC Mains                  | Relative Humidity    | 55%         |
| Mode             | Wi-Fi 5GHz Audio Playback | Atmospheric Pressure | 1030mbar    |
|                  |                           | Tested By            | Lim Kay Tak |

| Frequency (MHz) | Q-P Value (dBμV) | Q-P Limit (dBμV) | Q-P Margin (dB) | AV Value (dBμV) | AV Limit (dBμV) | AV Margin (dB) | Line    |
|-----------------|------------------|------------------|-----------------|-----------------|-----------------|----------------|---------|
| 0.1522          | 43.0             | 65.9             | 22.9            | 27.0            | 55.9            | 28.9           | Live    |
| 0.1701          | 39.9             | 65.0             | 25.1            | 21.8            | 55.0            | 33.2           | Neutral |
| 0.2007          | 36.2             | 63.6             | 27.4            | 21.5            | 53.6            | 32.1           | Live    |
| 0.5384          | 43.6             | 56.0             | 12.4            | 33.8            | 46.0            | 12.2           | Live    |
| 1.8710          | 28.7             | 56.0             | 27.3            | 19.5            | 46.0            | 26.5           | Live    |
| 2.7246          | 30.1             | 56.0             | 25.9            | 19.4            | 46.0            | 26.6           | Live    |

**Notes**

1. All possible modes of operation were investigated from 150kHz to 30MHz. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
3. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
9kHz - 30MHz  
RBW: 9kHz VBW: 30kHz
4. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 9kHz – 30MHz is ±2.2dB.

**RADIATED EMISSION TEST**

**47 CFR FCC Part 15.205 Restricted Bands**

| MHz      |   |          | MHz       |   |           | MHz    |   |        | GHz        |   |       |
|----------|---|----------|-----------|---|-----------|--------|---|--------|------------|---|-------|
| 0.090    | - | 0.110    | 16.42     | - | 16.423    | 399.9  | - | 410    | 4.5        | - | 5.15  |
| 0.495    | - | 0.505    | 16.69475  | - | 16.69525  | 608    | - | 614    | 5.35       | - | 5.46  |
| 2.1735   | - | 2.1905   | 16.80425  | - | 16.80475  | 960    | - | 1240   | 7.25       | - | 7.75  |
| 4.125    | - | 4.128    | 25.5      | - | 25.67     | 1300   | - | 1427   | 8.025      | - | 8.5   |
| 4.17725  | - | 4.17775  | 37.5      | - | 38.25     | 1435   | - | 1626.5 | 9.0        | - | 9.2   |
| 4.20725  | - | 4.20775  | 73        | - | 74.6      | 1645.5 | - | 1646.5 | 9.3        | - | 9.5   |
| 6.215    | - | 6.218    | 74.8      | - | 75.2      | 1660   | - | 1710   | 10.6       | - | 12.7  |
| 6.26775  | - | 6.26825  | 108       | - | 121.94    | 1718.8 | - | 1722.2 | 13.25      | - | 13.4  |
| 6.31175  | - | 6.31225  | 123       | - | 138       | 2200   | - | 2300   | 14.47      | - | 14.5  |
| 8.291    | - | 8.294    | 149.9     | - | 150.05    | 2310   | - | 2390   | 15.35      | - | 16.2  |
| 8.362    | - | 8.366    | 156.52475 | - | 156.52525 | 2483.5 | - | 2500   | 17.7       | - | 21.4  |
| 8.37625  | - | 8.38675  | 156.7     | - | 156.9     | 2690   | - | 2900   | 22.01      | - | 23.12 |
| 8.41425  | - | 8.41475  | 162.0125  | - | 167.17    | 3260   | - | 3267   | 23.6       | - | 24.0  |
| 12.29    | - | 12.293   | 167.72    | - | 173.2     | 3332   | - | 3339   | 31.2       | - | 31.8  |
| 12.51975 | - | 12.52025 | 240       | - | 285       | 3345.8 | - | 3358   | 36.43      | - | 36.5  |
| 12.57675 | - | 12.57725 | 322       | - | 335.4     | 3600   | - | 4400   | Above 38.6 |   |       |
| 13.36    | - | 13.41    |           |   |           |        |   |        |            |   |       |

**47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Limits**

| Frequency Range (MHz) | Quasi-Peak Limit Values (dBµV/m) |
|-----------------------|----------------------------------|
| 0.009 - 0.490         | 20 log [2400 / F (kHz)] @ 300m   |
| 0.490 - 1.705         | 20 log [24000 / F (kHz)] @ 30m   |
| 1.705 - 30.0          | 30.0 @ 30m                       |
| 30 - 88               | 40.0 @ 3m                        |
| 88 - 216              | 43.5 @ 3m                        |
| 216 - 960             | 46.0 @ 3m                        |
| Above 960             | 54.0* @ 3m                       |

\* For frequency bands 9kHz – 90kHz, 110kHz – 490kHz and above 1GHz, average detector was used. A peak limit of 20dB above the average limit does apply.

**47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Test Instrumentation**

| Instrument                                    | Model       | S/No                   | Cal Due Date |
|-----------------------------------------------|-------------|------------------------|--------------|
| ESU 40 EMI Test Receiver                      | ESU 40      | 1302.6005k40-100355-wq | 29 Sep 2018  |
| Schaffner Bilog Antenna –(30MHz-2GHz) BL4     | CBL6112B    | 2593                   | 18 Jan 2018  |
| EMCO Horn Antenna(1GHz-18GHz)                 | 3115        | 0003-6088              | 24 Mar 2018  |
| ETS Horn Antenna(18GHz-40GHz) (Ref)           | 3116        | 0004-2474              | 18 Oct 2018  |
| EMCO Loop Ant (ext) red 00134413              | 6502        | 134413                 | 28 Oct 2018  |
| Com-Power Preamplifier (1MHz-1GHz)            | PAM-103     | 441096                 | 25 Sep 2018  |
| R&S Preamplifier (1GHz -18GHz)                | SCU18       | 102191                 | 10 Mar 2018  |
| Agilent Preamplifier(1GHz-26.5GHz) (PA18)     | 8449D       | 3008A02305             | 02 Oct 2018  |
| Toyo Preamplifier (26.5GHz-40GHz)             | HAP26-40W   | 00000005               | 18 Oct 2018  |
| Micro-tronics Bandstop Filter (2.4GHz)        | BRM50701-02 | 007                    | 13 Aug 2018  |
| Micro-Tronics Bandstop Filter (5.15-5.25GHz)  | BRC14719    | 001                    | 13 Dec 2017  |
| Micro-Tronics Bandstop Filter (5.25-5.35GHz)  | BRC14720    | 001                    | 13 Dec 2017  |
| Micro-Tronics Bandstop Filter (5.47-5.725GHz) | BRC50704    | 006                    | 13 Dec 2017  |



**RADIATED EMISSION TEST**

**47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Test Setup**

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table for measurement up to 1GHz. For measurement above 1GHz, 1.5m height table was used.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

**47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Test Method**

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces such emissions.
3. The test was carried out at the selected frequency points obtained from the prescan in step 2. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
4. A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point in the range of 9kHz – 90kHz, 110kHz – 490kHz and above 1GHz, both Peak and Average measurements were carried out.
5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured.
6. The frequency range covered was from the lowest radio frequency signal generated from the EUT, without going below 9kHz to 10<sup>th</sup> harmonics of the EUT fundamental frequency, using the loop antenna for frequency below 30MHz, Bi-log antenna for frequencies from 30MHz up to 1GHz, and the Horn antenna above 1GHz.

**Sample Calculation Example**

|                                                                                                                                    |                               |
|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| At 300 MHz                                                                                                                         | Q-P limit = 46.0 dB $\mu$ V/m |
| Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB                                                                      |                               |
| Q-P reading obtained directly from EMI Receiver = 40.0 dB $\mu$ V/m<br>(Calibrated level including antenna factors & cable losses) |                               |
| Therefore, Q-P margin = 46.0 - 40.0 = 6.0                                                                                          | i.e. 6.0 dB below Q-P limit   |



**RADIATED EMISSION TEST**

**47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results**

|                  |                                           |                      |                                        |
|------------------|-------------------------------------------|----------------------|----------------------------------------|
| Test Input Power | 120V 60Hz                                 | Temperature          | 24°C                                   |
| Test Distance    | 3m ( $\geq 30\text{MHz} - 25\text{GHz}$ ) | Relative Humidity    | 60%                                    |
| Mode             | Bluetooth Audio Playback                  | Atmospheric Pressure | 1030mbar                               |
|                  |                                           | Tested By            | Dylan Lin<br>Li Chelmin<br>Lim Kay Tak |

Spurious Emissions ranging from 9kHz – 30MHz (for 9kHz – 90kHz, 110kHz – 490kHz) \*See Note 5

| Freq (GHz) | Peak Value (dB $\mu\text{V/m}$ ) | Peak Limit (dB $\mu\text{V/m}$ ) | Peak Margin (dB) | AV Value (dB $\mu\text{V/m}$ ) | AV Limit (dB $\mu\text{V/m}$ ) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|------------|----------------------------------|----------------------------------|------------------|--------------------------------|--------------------------------|----------------|-------------|-------------------|-----------|
| --         | --                               | --                               | --               | --                             | --                             | --             | --          | --                | --        |
| --         | --                               | --                               | --               | --                             | --                             | --             | --          | --                | --        |
| --         | --                               | --                               | --               | --                             | --                             | --             | --          | --                | --        |
| --         | --                               | --                               | --               | --                             | --                             | --             | --          | --                | --        |
| --         | --                               | --                               | --               | --                             | --                             | --             | --          | --                | --        |
| --         | --                               | --                               | --               | --                             | --                             | --             | --          | --                | --        |

Spurious Emissions ranging from 9kHz – 30MHz \*See Note 5

| Frequency (MHz) | Q-P Value (dB $\mu\text{V/m}$ ) | Q-P Limit (dB $\mu\text{V/m}$ ) | Q-P Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|-----------------|---------------------------------|---------------------------------|-----------------|-------------|-------------------|-----------|
| --              | --                              | --                              | --              | --          | --                | --        |
| --              | --                              | --                              | --              | --          | --                | --        |
| --              | --                              | --                              | --              | --          | --                | --        |
| --              | --                              | --                              | --              | --          | --                | --        |
| --              | --                              | --                              | --              | --          | --                | --        |
| --              | --                              | --                              | --              | --          | --                | --        |

Spurious Emissions ranging from 30MHz – 1GHz

| Frequency (MHz) | Q-P Value (dB $\mu\text{V/m}$ ) | Q-P Limit (dB $\mu\text{V/m}$ ) | Q-P Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|-----------------|---------------------------------|---------------------------------|-----------------|-------------|-------------------|-----------|
| 36.7030         | 27.1                            | 40.0                            | 12.9            | 100         | 315               | V         |
| 48.2700         | 25.4                            | 40.0                            | 14.6            | 124         | 126               | V         |
| 51.2820         | 28.1                            | 40.0                            | 11.9            | 131         | 62                | V         |
| 97.5110         | 32.3                            | 43.5                            | 11.2            | 100         | 124               | V         |
| 124.2020        | 32.4                            | 43.5                            | 11.1            | 100         | 100               | V         |
| 712.9640        | 34.7                            | 46.0                            | 11.3            | 100         | 86                | H         |

**RADIATED EMISSION TEST**

**47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results**

Spurious Emissions above 1GHz – 25GHz

| Freq (GHz) | Peak Value (dBμV/m) | Peak Limit (dBμV/m) | Peak Margin (dB) | AV Value (dBμV/m) | AV Limit (dBμV/m) | AV Margin (dB)      | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|------------|---------------------|---------------------|------------------|-------------------|-------------------|---------------------|-------------|-------------------|-----------|
| 1.5989     | 41.0                | 74.0                | 33.0             | --<br>*See Note 2 | 54.0              | 14.9<br>*See Note 3 | 101         | 359               | V         |
| 2.1330     | 43.5                | 74.0                | 30.5             | --<br>*See Note 2 | 54.0              | 10.5<br>*See Note 3 | 399         | 353               | V         |
| 3.1942     | 42.3                | 74.0                | 31.7             | --<br>*See Note 2 | 54.0              | 11.7<br>*See Note 3 | 101         | 111               | H         |
| 4.2625     | 47.3                | 74.0                | 26.7             | --<br>*See Note 2 | 54.0              | 6.7<br>*See Note 3  | 101         | 306               | H         |
| 4.8306     | 58.8                | 74.0                | 15.2             | 53.9              | 54.0              | 0.1                 | 101         | 328               | V         |
| 7.2722     | 54.3                | 74.0                | 19.7             | 48.0              | 54.0              | 6.0                 | 399         | 332               | V         |





**RADIATED EMISSION TEST**

**47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results**

|                  |                             |                      |                                        |
|------------------|-----------------------------|----------------------|----------------------------------------|
| Test Input Power | 120V 60Hz                   | Temperature          | 24°C                                   |
| Test Distance    | 3m ( $\geq 30$ MHz – 25GHz) | Relative Humidity    | 60%                                    |
| Mode             | 2.4GHz Wi-Fi Audio Playback | Atmospheric Pressure | 1030mbar                               |
|                  |                             | Tested By            | Dylan Lin<br>Li Chelmin<br>Lim Kay Tak |

Spurious Emissions ranging from 9kHz – 30MHz (for 9kHz – 90kHz, 110kHz – 490kHz) \*See Note 5

| Freq (GHz) | Peak Value (dB $\mu$ V/m) | Peak Limit (dB $\mu$ V/m) | Peak Margin (dB) | AV Value (dB $\mu$ V/m) | AV Limit (dB $\mu$ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |

Spurious Emissions ranging from 9kHz – 30MHz \*See Note 5

| Frequency (MHz) | Q-P Value (dB $\mu$ V/m) | Q-P Limit (dB $\mu$ V/m) | Q-P Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|-----------------|--------------------------|--------------------------|-----------------|-------------|-------------------|-----------|
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |

Spurious Emissions ranging from 30MHz – 1GHz

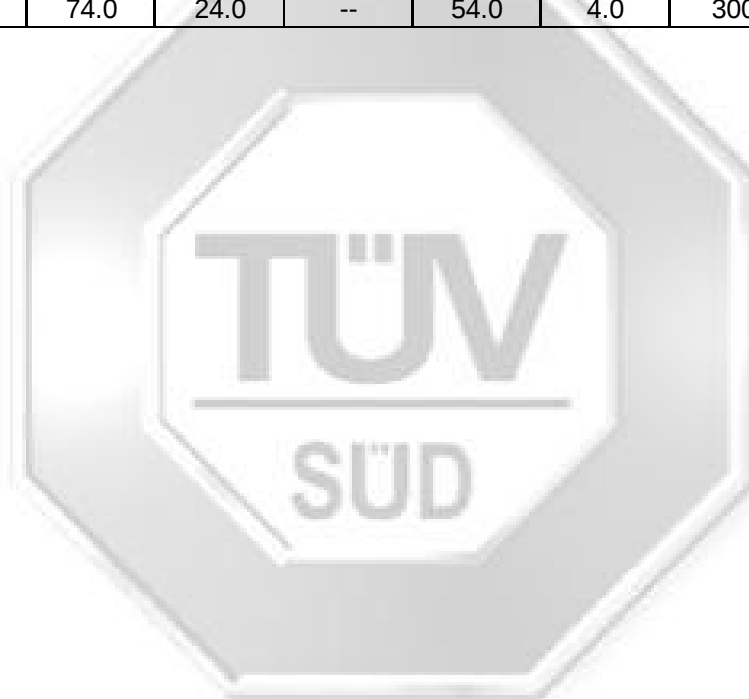
| Frequency (MHz) | Q-P Value (dB $\mu$ V/m) | Q-P Limit (dB $\mu$ V/m) | Q-P Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|-----------------|--------------------------|--------------------------|-----------------|-------------|-------------------|-----------|
| 34.7100         | 30.3                     | 40.0                     | 9.7             | 100         | 90                | V         |
| 51.1640         | 30.0                     | 40.0                     | 10.0            | 100         | 90                | V         |
| 91.6190         | 34.2                     | 43.5                     | 9.3             | 134         | 129               | V         |
| 124.7880        | 35.8                     | 43.5                     | 7.7             | 100         | 81                | V         |
| 138.3320        | 32.5                     | 43.5                     | 11.0            | 100         | 199               | V         |
| 179.1530        | 34.5                     | 43.5                     | 9.0             | 100         | 269               | H         |

**RADIATED EMISSION TEST**

**47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results**

Spurious Emissions above 1GHz – 25GHz

| Freq<br>(GHz) | Peak<br>Value<br>(dBμV/m) | Peak<br>Limit<br>(dBμV/m) | Peak<br>Margin<br>(dB) | AV<br>Value<br>(dBμV/m)<br>*See Note 2 | AV<br>Limit<br>(dBμV/m) | AV Margin<br>(dB)<br>*See Note 3 | Height<br>(cm) | Azimuth<br>(Degrees) | Pol (H/V) |
|---------------|---------------------------|---------------------------|------------------------|----------------------------------------|-------------------------|----------------------------------|----------------|----------------------|-----------|
| 2.9342        | 42.9                      | 74.0                      | 31.1                   | --                                     | 54.0                    | 11.1                             | 100            | 188                  | H         |
| 3.2013        | 43.9                      | 74.0                      | 30.1                   | --                                     | 54.0                    | 10.1                             | 100            | 63                   | H         |
| 3.4683        | 45.9                      | 74.0                      | 28.1                   | --                                     | 54.0                    | 8.1                              | 100            | 68                   | H         |
| 3.7354        | 49.1                      | 74.0                      | 24.9                   | --                                     | 54.0                    | 4.9                              | 100            | 275                  | H         |
| 4.2696        | 48.3                      | 74.0                      | 25.7                   | --                                     | 54.0                    | 5.7                              | 100            | 317                  | H         |
| 7.3985        | 50.0                      | 74.0                      | 24.0                   | --                                     | 54.0                    | 4.0                              | 300            | 180                  | V         |





**RADIATED EMISSION TEST**

**47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results**

|                  |                             |                      |                                        |
|------------------|-----------------------------|----------------------|----------------------------------------|
| Test Input Power | 120V 60Hz                   | Temperature          | 24°C                                   |
| Test Distance    | 3m ( $\geq 30$ MHz – 40GHz) | Relative Humidity    | 60%                                    |
| Mode             | 5GHz Wi-Fi Audio Playback   | Atmospheric Pressure | 1030mbar                               |
|                  |                             | Tested By            | Dylan Lin<br>Li Chelmin<br>Lim Kay Tak |

Spurious Emissions ranging from 9kHz – 30MHz (for 9kHz – 90kHz, 110kHz – 490kHz) \*See Note 5

| Freq (GHz) | Peak Value (dB $\mu$ V/m) | Peak Limit (dB $\mu$ V/m) | Peak Margin (dB) | AV Value (dB $\mu$ V/m) | AV Limit (dB $\mu$ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |
| --         | --                        | --                        | --               | --                      | --                      | --             | --          | --                | --        |

Spurious Emissions ranging from 9kHz – 30MHz \*See Note 5

| Frequency (MHz) | Q-P Value (dB $\mu$ V/m) | Q-P Limit (dB $\mu$ V/m) | Q-P Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|-----------------|--------------------------|--------------------------|-----------------|-------------|-------------------|-----------|
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |
| --              | --                       | --                       | --              | --          | --                | --        |

Spurious Emissions ranging from 30MHz – 1GHz

| Frequency (MHz) | Q-P Value (dB $\mu$ V/m) | Q-P Limit (dB $\mu$ V/m) | Q-P Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|-----------------|--------------------------|--------------------------|-----------------|-------------|-------------------|-----------|
| 34.7100         | 29.6                     | 40.0                     | 10.4            | 100         | 283               | V         |
| 36.2800         | 29.2                     | 40.0                     | 10.8            | 100         | 274               | V         |
| 47.2700         | 30.4                     | 40.0                     | 9.6             | 199         | 26                | V         |
| 91.6190         | 34.5                     | 43.5                     | 9.0             | 109         | 109               | V         |
| 124.7370        | 35.8                     | 43.5                     | 7.7             | 100         | 101               | V         |
| 126.3770        | 35.8                     | 43.5                     | 7.7             | 100         | 103               | V         |

**RADIATED EMISSION TEST**

**47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results**

Spurious Emissions above 1GHz – 40GHz

| Freq<br>(GHz) | Peak<br>Value<br>(dBμV/m) | Peak<br>Limit<br>(dBμV/m) | Peak<br>Margin<br>(dB) | AV<br>Value<br>(dBμV/m) | AV<br>Limit<br>(dBμV/m) | AV Margin<br>(dB)  | Height<br>(cm) | Azimuth<br>(Degrees) | Pol (H/V) |
|---------------|---------------------------|---------------------------|------------------------|-------------------------|-------------------------|--------------------|----------------|----------------------|-----------|
| 2.6671        | 49.0                      | 74.0                      | 25.0                   | --<br>*See Note 2       | 54.0                    | 5.0<br>*See Note 3 | 200            | 171                  | H         |
| 3.7354        | 49.3                      | 74.0                      | 24.7                   | --<br>*See Note 2       | 54.0                    | 4.7<br>*See Note 3 | 101            | 275                  | H         |
| 4.2615        | 48.3                      | 74.0                      | 25.7                   | --<br>*See Note 2       | 54.0                    | 5.7<br>*See Note 3 | 101            | 311                  | H         |
| 4.2696        | 48.3                      | 74.0                      | 25.7                   | --<br>*See Note 2       | 54.0                    | 5.7<br>*See Note 3 | 101            | 316                  | H         |
| 6.0486        | 56.8                      | 74.0                      | 17.2                   | 37.1                    | 54.0                    | 16.9               | 200            | 306                  | H         |
| 10.4382       | 48.5                      | 74.0                      | 25.5                   | --<br>*See Note 2       | 54.0                    | 5.5<br>*See Note 3 | 300            | 76                   | V         |

## RADIATED EMISSION TEST

### Notes

1. All possible modes of operation were investigated. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. As the measured peak shows compliance to the average limit, as such no average measurement was required.
3. The average margin indicates the margin of the measured peak value below the average limit.
4. "--" indicates no emissions were found and shows compliance to the limits.
5. The measurement was done at 3m. The measured results were extrapolated to the specified test limits as specified in § 15.209 (a) based on 40dB/decade.
6. Quasi-peak measurement was used for frequency measurement up to 1GHz. Average and peak measurements were used for emissions above 1GHz. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
7. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
8. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
30MHz - 1GHz  
RBW: 120kHz                      VBW: 1MHz  
>1GHz  
RBW: 1MHz                        VBW: 3MHz
9. The upper frequency of radiated emission investigations was according to requirements stated in Section 15.33(a) for intentional radiators & Section 15.33(b) for unintentional radiators.
10. The channel in the table refers to the transmit channel of the EUT.
11. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 1GHz is  $\pm 3.8\text{dB}$  and >1GHz – 40GHz is  $\pm 4.5\text{dB}$ .

## MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST

### 47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Limits

The EUT shows compliance to the requirements of this section, which states the MPE limits for general population / uncontrolled exposure are as shown below:

| Frequency Range (MHz)                  | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> )    | Average Time (min) |
|----------------------------------------|-------------------------------|-------------------------------|----------------------------------------|--------------------|
| 0.3 - 1.34                             | 614                           | 1.63                          | 100 <sup>Note 2</sup>                  | 30                 |
| 1.34 - 30                              | 824 / f                       | 2.19 / f                      | 180 / f <sup>2</sup> <sup>Note 2</sup> | 30                 |
| 30 - 300                               | 27.5                          | 0.073                         | 0.2                                    | 30                 |
| 300 - 1500                             | -                             | -                             | f / 1500                               | 30                 |
| 1500 - 100000                          | -                             | -                             | 1.0                                    | 30                 |
| Notes                                  |                               |                               |                                        |                    |
| 1. f = frequency in MHz                |                               |                               |                                        |                    |
| 2. Plane wave equivalent power density |                               |                               |                                        |                    |

### 47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Instrumentation

| Instrument                    | Model | S/No       | Cal Due Date |
|-------------------------------|-------|------------|--------------|
| PMM 8053 Portable Field Meter | 8053  | 0220J10308 | 20 Jan 2019  |
| PMM Electric Field Probe      | EP330 | 1010J10301 | 20 Jan 2019  |

### 47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Setup

- The EUT and supporting equipment were set up as shown on the setup photo.
- The relevant field probe was positioned at least 20cm away from the EUT and supporting equipment boundary.

### 47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Method

- The EUT was switched on and allowed to warm up to its normal operating condition.
- The test was first carried out at one of the positions / sides of the EUT.
- Power density measurement (mW/cm<sup>2</sup>) was made using the field meter set to the required averaging time.
- Steps 2 and 3 were repeated for the next position and its associate EUT operating mode, until all possible positions and modes were measured.

### Sample Calculation Example

At 2400 MHz, limit = 1.0 mW/cm<sup>2</sup>

Power density reading obtained directly from field meter = 0.3 mW/cm<sup>2</sup> averaged over the required 30 minutes.

Therefore, margin = 0.3 – 1.0 = -0.7 mW/cm<sup>2</sup> i.e. 0.7 mW/cm<sup>2</sup> below limit



MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST

47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Results

|                  |           |                      |            |
|------------------|-----------|----------------------|------------|
| Test Input Power | 120V 60Hz | Temperature          | 24°C       |
| Test Distance    | 20cm      | Relative Humidity    | 60%        |
|                  |           | Atmospheric Pressure | 1030mbar   |
|                  |           | Tested By            | Li Chelmin |

Bluetooth

| Channel       | Channel Frequency (GHz) | Power Density Value (mW/cm <sup>2</sup> ) | Averaging Time (min) | Limit (mW/cm <sup>2</sup> ) |
|---------------|-------------------------|-------------------------------------------|----------------------|-----------------------------|
| 0 (lower ch)  | 2.402                   | 0.002                                     | 30                   | 1.0                         |
| 39 (mid ch)   | 2.441                   | 0.001                                     | 30                   | 1.0                         |
| 78 (upper ch) | 2.480                   | 0.001                                     | 30                   | 1.0                         |

2.4GHz Wi-Fi

| Channel       | Channel Frequency (GHz) | Power Density Value (mW/cm <sup>2</sup> ) | Averaging Time (min) | Limit (mW/cm <sup>2</sup> ) |
|---------------|-------------------------|-------------------------------------------|----------------------|-----------------------------|
| 1 (lower ch)  | 2.412                   | 0.003                                     | 30                   | 1.0                         |
| 6 (mid ch)    | 2.437                   | 0.002                                     | 30                   | 1.0                         |
| 11 (upper ch) | 2.462                   | 0.001                                     | 30                   | 1.0                         |

5GHz Wi-Fi

| Channel        | Channel Frequency (GHz) | Power Density Value (W/m <sup>2</sup> ) | Averaging Time (min) | Limit (W/m <sup>2</sup> ) |
|----------------|-------------------------|-----------------------------------------|----------------------|---------------------------|
| 36 (lower ch)  | 5.180                   | 0.002                                   | 30                   | 1.0                       |
| 100 (mid ch)   | 5.500                   | 0.001                                   | 30                   | 1.0                       |
| 149 (upper ch) | 5.745                   | 0.001                                   | 30                   | 1.0                       |

Notes

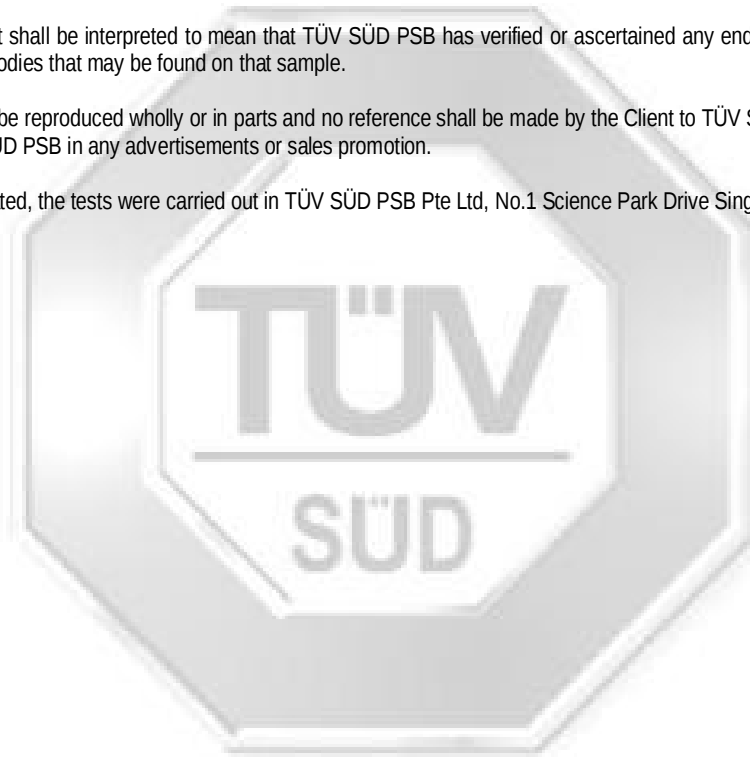
1. All possible modes of operation were investigated. Only the worst case highest radiation levels were measured. Measurements were taken at the required averaging time. All other radiation levels were relatively insignificant.
2. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
3. Maximum Permissible Exposure Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 0.1MHz – 3GHz is ±15.0%.



Please note that this Report is issued under the following terms :

1. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way "guarantees" the later performance of the product/equipment. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.
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July 2011



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**ANNEX A TEST SETUP / EUT PHOTOGRAPHS / DIAGRAMS**



**ANNEX A**  
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