

Produkte  
Products

<b>Prüfbericht - Nr.:</b> 14040780 001		<b>Seite 1 von 14</b>	
<i>Test Report No.:</i>		<i>Page 1 of 14</i>	
<b>Auftraggeber:</b> <i>Client:</i>	Shing Hing Industrial Limited Rm 2105-06, 21/F, Cheung Tat Centre 18 Cheung Lee Street Chai Wan Hong Kong		
<b>Gegenstand der Prüfung:</b> <i>Test Item:</i>	Short Range Device - Bluetooth Dartboard		
<b>Bezeichnung:</b> <i>Identification:</i>	GDB-AVVIO	<b>Serien-Nr.:</b> <i>Serial No.:</i>	Engineering sample
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>	A000257056-007	<b>Eingangsdatum:</b> <i>Date of Receipt:</i>	18.09.2015
<b>Prüfört:</b> <i>Testing Location:</i>	TÜV Rheinland Hong Kong Ltd. 8/F, First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong  Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong		
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of test item at delivery:</i>	Test samples are not damaged and suitable for testing.		
<b>Prüfgrundlage:</b> <i>Test Specification:</i>	FCC Part 15 Subpart C FCC Part 15 Subpart B ANSI C63.4-2009		
<b>Prüfergebnis:</b> <i>Test Results:</i>	Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.  The above mentioned product was tested and <b>passed</b> .		
<b>Prüflaboratorium:</b> <i>Testing Laboratory:</i>	TÜV Rheinland Hong Kong Ltd. 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong		
<b>geprüft/ tested by:</b>	<b>kontrolliert/ reviewed by:</b>		
17.11.2015	Benny Lau Senior Project Manager	17.11.2015	Sharon Li Department Manager
<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>
			<b>Name/Stellung</b> <i>Name/Position</i>
			<b>Unterschrift</b> <i>Signature</i>
<b>Sonstiges:</b> <i>Other Aspects</i>	FCC ID: 2AFZWGDB-AVVIO		
<b>Abkürzungen:</b>	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	<b>Abbreviations:</b>	P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested
<b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>			

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## Product information

### Manufacturers declarations

	<b>Transceiver</b>
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK
Number of channels	40
Channel separation	2 MHz
Type of antenna	PCB Antenna
Antenna gain (dBi)	-3 dBi
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	No
Nominal voltage	$V_{\text{nom}}$ : 100-240VAC and 6 VDC
Independent Operation Modes	Transmitting

### Product function and intended use

The equipment under test (EUT) is a Bluetooth low energy device.

FCC ID: 2AFZWGDB-AVVIO

<b>Models</b>	<b>Product description</b>
GDB-AVVIO	Bluetooth Dartboard

### Submitted documents

Circuit Diagram  
 Block Diagram  
 Bill of material  
 User manual  
 Label

### Independent Operation Modes

The basic operation modes are:

- Transmitting mode.

For further information refer to User Manual

### Related Submittal(s) Grants

This is a single application for certification of the transmitter.

### Remark

Nil

## Test Set-up and Operation Mode

### Principle of Configuration Selection

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

### Test Operation and Test Software

Test operation should refer to test methodology.

- There was no special software to exercise the device.

### Special Accessories and Auxiliary Equipment

- AC-DC adaptor model: PS1018-050HIB300 (Provided by Appliant)

### Countermeasures to achieve EMC Compliance

- none

## Test Methodology

### Radiated Emission

The radiated emission measurements were performed according to the procedures in ANSI C63.4-2009.

The equipment under test (EUT) was placed at the middle of the 80 cm height turntable, and the turntable is 3 meters far from the measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

### Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$FS = R + AF + CF + FA - PA$$

Where FS = Field Strength in dBuV/m at 3 meters.  
R = Reading of Spectrum Analyzer in dBuV.  
AF = Antenna Factor in dB.  
CF = Cable Attenuation Factor in dB.  
FA = Filter Attenuation Factor in dB.  
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

## List of Test and Measurement Instruments

Hong Kong Productivity Council (Registration number: 90656)

### Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	14-Apr-15	14-Apr-16
New Fully Anchoic Chamber	TDK	N/A	15-Apr-15	15-Apr-16
Cable	Hubersuhner	SUCOFLEX 104	31-Mar-14	31-Mar-16
Test Receiver	R & S	ESU26	12-Feb-15	12-Feb-16
Bi-conical Antenna	R & S	HK116	1-Sep-15	1-Sep-17
Log Periodic Antenna	R & S	HL223	1-Sep-15	1-Sep-17
Coaxial cable	Harbour	LL335	10-Jun-14	10-Jun-16
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	17-Jul-14	17-Jul-16
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	28-Oct-15	28-Oct-17
Horn Antenna	EMCO	3115	26-Aug-15	26-Aug-17
Active Loop Antenna	EMCO	6502	17-May-15	17-May-16

## TÜV Rheinland Hong Kong Ltd

### AC Mains Conducted Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Test Receiver	R & S	ESR3	22-Oct-15	22-Oct-16
LISN	R & S	ENV216	05 Feb 15	05-Feb-16
EMC32	R & S	v9.12	N/A	N/A

## Results FCC Part 15 – Subpart C

<b>FCC 15.203 – Antenna Requirement 1</b>		<b>Pass</b>
<b>FCC Requirement:</b> No antenna other than that furnished by the responsible party shall be used with the device		
<b>Results:</b>	a) Antenna type:	Integral PCB antenna
	b) Manufacturer and model no:	N/A
	c) Peak Gain:	-3 dBi
<b>Verdict:</b>	Pass	

<b>FCC 15.204 – Antenna Requirement 2</b>		<b>N/A</b>
<b>FCC Requirement:</b> An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.		
<b>Results:</b>	Only one integral antenna can be used.	
<b>Verdict:</b>	N/A	

<b>FCC 15.207 – Conducted Emission on AC Mains</b>		<b>Pass</b>				
Test Specification : ANSI C63.4 – 2009 Mode of operation : TX mode Port of testing : AC Mains input port of power supply Detector : Quasi-peak and Average RBW : 9 kHz Supply voltage : 120Vac 60Hz Temperature : 23°C Humidity : 50%						
Requirement:		15.207(a)				
<b>Results:</b>		Pass				
<b>Live measurement</b>						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dB $\mu$ V	Average dB $\mu$ V	Limit QP (dB $\mu$ V)	Limit AV (dB $\mu$ V)	Verdict
0,15 – 0,5	No peak found	---	---	66 - 56	56 - 46	Pass
> 0,5 - 5	0.702	30.4	16.2	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass
<b>Neutral measurement</b>						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dB $\mu$ V	Average dB $\mu$ V	Limit QP (dB $\mu$ V)	Limit AV (dB $\mu$ V)	Verdict
0,15 – 0,5	No peak found	---	---	66 - 56	56 - 46	Pass
> 0,5 - 5	0.734	31.7	16.0	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass



**Results:** Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz does not exceed the limits. For test Results plots refer to Appendix 1, page 2.

FCC 15.247 (a)(2) – 6dB Bandwidth Measurement		Pass	
<b>FCC Requirement:</b> Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.			
Test Specification : KDB 558074 D01 DTS Measurement Guidance v03r02 section 8.1 Option 1			
Mode of operation : TX mode			
Port of testing : Temporary antenna port			
Detector : Peak			
RBW/VBW : 100KHz/ 300KHz			
Supply voltage : 3.7 Vdc			
Temperature : 23°C			
Humidity : 50%			
<b>Results:</b> For test protocols please refer to Appendix 1, page 3-4.			
Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (kHz)
2402	2401.724	2402.288	564
2440	2439.704	2440.252	548
2480	2479.704	2480.256	552

FCC 15.247(b)(3) – Maximum Peak Conducted Output Power		Pass	
<b>FCC Requirement:</b> For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)			
Test Specification : KDB 558074 D01 DTS Measurement Guidance v03r02 section 9.1.1			
Mode of operation : TX mode			
Port of testing : Temporary antenna port			
Detector : Peak			
Supply voltage : 3.7 Vdc			
Temperature : 23°C			
Humidity : 50%			
<b>Results:</b> For test protocols please refer to Appendix 1, page 5-6.			
Frequency (MHz)	Measured Output Power (dBm)	Limit (W/dBm)	Verdict
2402	-4.40	1 / 30.0	Pass
2440	-3.81	1 / 30.0	Pass
2480	-3.88	1 / 30.0	Pass

FCC 15.247(e) – Power Spectral Density			Pass
<b>FCC Requirement:</b> For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.			
Test Specification : KDB 558074 D01 DTS Measurement Guidance v03r02 section 10.2 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : $\geq 100$ KHz / $\geq 3 \times$ RBW span : $\geq 1.5 \times$ DTS BW Supply voltage : 3.7 Vdc Temperature : 23°C Humidity : 50%			
<b>Results:</b> For test protocols please refer to Appendix 1, page 7-8.			
Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2402	-4.23	8.0	Pass
2440	-3.90	8.0	Pass
2480	-3.72	8.0	Pass

FCC 15.247(d) – Spurious Conducted Emissions			Pass		
Test Specification : KDB 558074 D01 DTS Measurement Guidance v03r02 section 11.1 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 3.7 Vdc Temperature : 23 °C Humidity : 50 %					
<b>FCC Requirement:</b> In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.					
<b>Results:</b> Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.  Only the worst cases is shown below. For test protocols refer to Appendix 1, page 9-14.					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	2400	-44.06	-4.23	-48.29	Pass
2440	21328	-31.80	-3.90	-35.70	Pass
2480	22720	-32.05	-3.72	-35.77	Pass

<b>FCC 15.247(d) or 15.205 – Radiated Emissions in Restricted Frequency Bands</b>		<b>Pass</b>
Test Specification : ANSI C63.4 – 2009 Mode of operation : TX mode Port of testing : Enclosure Detector : Peak RBW/VBW : 100 kHz / 300 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz Supply voltage : 3.7 Vdc Temperature : 23°C Humidity : 50%		
<b>FCC Requirement:</b> In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).		
<b>Results:</b> Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.  All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.		
Mode: 2402MHz TX		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	45.29	74.0 / PK
2390.000	33.23	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Mode: 2402 MHz TX		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	45.68	74.0 / PK
2390.000	33.20	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Mode: 2440 MHz TX		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Mode: 2440 MHz TX		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Mode: 2480MHz TX		Vertical Polarization
Freq	Level	Limit/ Detector

<b>MHz</b>	<b>dBuV/m</b>	<b>dBuV/m</b>
2483.500	50.83	74.0 / PK
2483.500	46.75	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Mode: 2480 MHz TX		
Horizontal Polarization		
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2483.500	52.10	74.0 / PK
2483.500	41.14	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV

## Results FCC Part 15 – Subpart B

FCC 15.107 – Conducted Emission on AC Mains						Pass
Test Specification : ANSI C63.4 – 2009 Mode of operation : Normal Operating mode Port of testing : AC Mains input port of power supply Detector : Quasi-peak and Average RBW : 9 kHz Supply voltage : 120Vac 60Hz Temperature : 23°C Humidity : 50%						
Requirement: 15.107(a)						
<b>Results:</b> Pass						
<b>Live measurement</b>						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	No peak found	---	---	66 - 56	56 - 46	Pass
> 0,5 - 5	0.772	39.3	36.7	56	46	Pass
> 5 - 30	24.002	44.3	40.5	60	50	Pass
<b>Neutral measurement</b>						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	No peak found	---	---	66 - 56	56 - 46	Pass
> 0,5 - 5	0.758	40.4	31.3	56	46	Pass
> 5 - 30	23.998	43.7	39.1	60	50	Pass

<b>FCC 15.109 – Radiated Emission</b>		<b>Pass</b>
Test Specification : ANSI C63.4 – 2009 Mode of operation : Normal Operating mode Port of testing : Enclosure Detector : QP RBW/VBW : 120 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz Supply voltage : 120VAC Temperature : 23°C Humidity : 50%		
<b>FCC Requirement:</b> 15.109(a)		
<b>Results:</b> Pass		
Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
30.360	39.7*	40.0 / QP
37.200	30.4	40.0 / QP
43.770	20.4	40.0 / QP
400.030	25.9	46.0 / QP
Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
30.420	25.3	40.0 / QP
43.770	9.5	40.0 / QP
169.470	16.9	43.5 / QP
289.340	22.0	46.0 / QP

Remark\*) Marginal Pass