



Valued Quality. Delivered.

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



TEST REPORT

Report No.: 14011073HKG-001

Hung Tat Electronic Co., Ltd.

Application
For
Certification
(Original Grant)
(FCC ID: GXABTKB14TA059)

Transceiver

Prepared and Checked by:

Wong Kwok Yeung, Kenneth
Lead Engineer

Approved by:

Chan Chi Hung, Terry
Supervisor
Date: April 14, 2014

The test report only allows to be revised within the retention period unless further standard or the requirement was noticed. This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.

**GENERAL INFORMATION****Hung Tat Electronic Co., Ltd.****BRAND NAME: ONN****MODEL: ONA14TA059, ONA14TA062, ONA14TA063, ONA14TA064****BRAND NAME: AROC, MODEL: BTK-059****BRAND NAME: SHARPER IMAGE, MODEL: SBK-059****BRAND NAME: EMERSON, MODEL: EM-059****BRAND NAME: HUNG TAT, MODEL: HTBK-059****FCC ID: GXABTKB14TA059**

Grantee:	Hung Tat Electronic Co., Ltd.
Grantee Address:	Room 205, 2/F., Eastern Centre, 1065 King's Road, Quarry Bay, Hong Kong.
Contact Person:	Angel Li
Tel:	(852) 2565-5627
Fax:	(852) 2565-7597
e-mail:	angel@hunqtat-intl.com
Manufacturer:	Dongguan Hung Tat Electronic Co., Ltd.
Manufacturer Address:	No. 1, 3/F., Tower A, Yifang Industrial Park, Hongye North 2 Road, Hongye Industrial Zone, Tangxia Zhen, Dongguan, China.
Brand Name:	ONN / AROC / SHARPER IMAGE / EMERSON / HUNG TAT
Model:	ONA14TA059, ONA14TA062, ONA14TA063, ONA14TA064 / BTK-059 / SBK-059 / EM-059 / HTBK-059
Type of EUT:	Transceiver
Description of EUT:	Bluetooth Keyboard
Serial Number:	N/A
FCC ID:	GXABTKB14TA059
Date of Sample Submitted:	January 27, 2014
Date of Test:	January 27, 2014 to March 31, 2014
Report No.:	14011073HKG-001
Report Date:	April 14, 2014
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.

**SUMMARY OF TEST RESULT****Hung Tat Electronic Co., Ltd.****BRAND NAME: ONN****MODEL: ONA14TA059, ONA14TA062, ONA14TA063, ONA14TA064****BRAND NAME: AROC, MODEL: BTK-059****BRAND NAME: SHARPER IMAGE, MODEL: SBK-059****BRAND NAME: EMERSON, MODEL: EM-059****BRAND NAME: HUNG TAT, MODEL: HTBK-059****FCC ID: GXABTKB14TA059**

TEST SPECIFICATION	REFERENCE	RESULTS
Radiated Emission	15.249	Pass
Radiated Emission on the Bandedge		
Radiated Emission in Restricted Bands	15.205	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2012 Edition

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.

**Table of Contents**

1.0	<u>General Description</u>	1
1.1	Product Description	1
1.2	Related Submittal(s) Grants	1
1.3	Test Methodology	1
1.4	Test Facility	1
2.0	<u>System Test Configuration</u>	2
2.1	Justification	2
2.2	EUT Exercising Software	2
2.3	Special Accessories	2
2.4	Measurement Uncertainty	3
2.5	Support Equipment List and Description	3
3.0	<u>Emission Results</u>	4
3.1	Field Strength Calculation	4
3.2	Radiated Emission Configuration Photograph	5
3.3	Radiated Emission Data	5
4.0	<u>Equipment Photographs</u>	10
5.0	<u>Product Labelling</u>	10
6.0	<u>Technical Specifications</u>	10
7.0	<u>Instruction Manual</u>	10
8.0	<u>Miscellaneous Information</u>	11
8.1	Radiated Emission on the Bandedge	11
8.2	Discussion of Pulse Desensitization	14
8.3	Calculation of Average Factor	14
8.4	Emissions Test Procedures	15
9.0	<u>Equipment List</u>	17

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.

**1.0 General Description****1.1 Product Description**

The equipment under test (EUT) is a portable keypad. The EUT equipped with a USB interface and contains a Bluetooth module. The Bluetooth module in the EUT is operating in the frequency range from 2402MHz to 2480MHz (79 channels with 1MHz channel spacing). The EUT is powered by USB 5.0VDC or / and 3.7 VDC (1 X 3.7V rechargeable battery). The EUT is using adaptive frequency hopping in the Bluetooth module. The USB interface of the EUT does not contain PC Connectivity which is for charging use only.

The Model(s): ONA14TA062, ONA14TA063, ONA14TA064, BTK-059, SBK-059, EM-059 and HTBK-059 are the same as the Model(s): ONA14TA059 in hardware aspect. The difference in model number and brand name serves as marketing strategy.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **“Justification Section”** of this Application.

1.4 Test Facility

The open area test site used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

Issuing Laboratory:**Intertek Testing Services Hong Kong Limited**

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2009).

The device was powered by a fully charged battery (1 x 3.7V Lithium rechargeable battery pack).

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

Issuing Laboratory:**Intertek Testing Services Hong Kong Limited**

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.

**2.4 Measurement Uncertainty**

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.5 Support Equipment List and Description

N/A.

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG - AV$$

where FS = Field Strength in $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in $\text{dB}\mu\text{V}$

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where FS = Field Strength in $\text{dB}\mu\text{V}/\text{m}$

RR = $RA - AG - AV$ in $\text{dB}\mu\text{V}$

LF = $CF + AF$ in dB

Assume a receiver reading of 52.0 $\text{dB}\mu\text{V}$ is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 32 $\text{dB}\mu\text{V}/\text{m}$. This value in $\text{dB}\mu\text{V}/\text{m}$ was converted to its corresponding level in $\mu\text{V}/\text{m}$.

$$RA = 52.0 \text{ dB}\mu\text{V}/\text{m}$$

$$AF = 7.4 \text{ dB}$$

$$RR = 18.0 \text{ dB}\mu\text{V}$$

$$CF = 1.6 \text{ dB}$$

$$LF = 9.0 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$AV = 5.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 18 + 9 = 27 \text{ dB}\mu\text{V}/\text{m}$$

$$\text{Level in } \mu\text{V}/\text{m} = \text{Common Antilogarithm } [(27 \text{ dB}\mu\text{V}/\text{m})/20] = 22.4 \mu\text{V}/\text{m}$$

Issuing Laboratory:**Intertek Testing Services Hong Kong Limited**

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 37.940 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 6.3 dB

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



Applicant: Hung Tat Electronic Co., Ltd.

Date of Test: March 31, 2014

Model: ONA14TA059

Worst-Case Operating Mode: Transmitting (Bluetooth)

Table 1

**Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement**

Lowest Channel

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Average Factor (dB)	Calculated at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
V	2402.000	80.6	33	29.4	77.0	24	53.0	94.0	-41.0
V	4804.000	41.3	33	34.9	43.2	24	19.2	54.0	-34.8
V	7206.000	39.7	33	37.9	44.6	24	20.6	54.0	-33.4
V	9608.000	39.1	33	40.4	46.5	24	22.5	54.0	-31.5
V	12010.000	40.5	33	40.5	48.0	24	24.0	54.0	-30.0
V	14412.000	43.4	33	40.0	50.4	24	26.4	54.0	-27.6

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
V	2402.000	80.6	33	29.4	77.0	114.0	-37.0
V	4804.000	41.3	33	34.9	43.2	74.0	-30.8
V	7206.000	39.7	33	37.9	44.6	74.0	-29.4
V	9608.000	39.1	33	40.4	46.5	74.0	-27.5
V	12010.000	40.5	33	40.5	48.0	74.0	-26.0
V	14412.000	43.4	33	40.0	50.4	74.0	-23.6

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



Applicant: Hung Tat Electronic Co., Ltd.

Date of Test: March 31, 2014

Model: ONA14TA059

Worst-Case Operating Mode: Transmitting (Bluetooth)

Table 2

**Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement**

Middle Channel

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Average Factor (dB)	Calculated at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
V	2441.000	78.9	33	29.4	75.3	24	51.3	94.0	-42.7
V	4882.000	41.7	33	34.9	43.6	24	19.6	54.0	-34.4
V	7323.000	40.0	33	37.9	44.9	24	20.9	54.0	-33.1
V	9764.000	39.3	33	40.4	46.7	24	22.7	54.0	-31.3
V	12205.000	41.1	33	40.5	48.6	24	24.6	54.0	-29.4
V	14646.000	45.5	33	38.4	50.9	24	26.9	54.0	-27.1

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
V	2441.000	78.9	33	29.4	75.3	114.0	-38.7
V	4882.000	41.7	33	34.9	43.6	74.0	-30.4
V	7323.000	40.0	33	37.9	44.9	74.0	-29.1
V	9764.000	39.3	33	40.4	46.7	74.0	-27.3
V	12205.000	41.1	33	40.5	48.6	74.0	-25.4
V	14646.000	45.5	33	38.4	50.9	74.0	-23.1

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative sign in the column shows value below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



Applicant: Hung Tat Electronic Co., Ltd.

Date of Test: March 31, 2014

Model: ONA14TA059

Worst-Case Operating Mode: Transmitting (Bluetooth)

Table 3

**Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement**

Highest Channel

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Average Factor (dB)	Calculated at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
V	2480.000	80.4	33	29.4	76.8	24	52.8	94.0	-41.2
V	4960.000	42.0	33	34.9	43.9	24	19.9	54.0	-34.1
V	7440.000	39.9	33	37.9	44.8	24	20.8	54.0	-33.2
V	9920.000	39.5	33	40.4	46.9	24	22.9	54.0	-31.1
V	12400.000	41.2	33	40.5	48.7	24	24.7	54.0	-29.3
V	14880.000	45.7	33	38.4	51.1	24	27.1	54.0	-26.9

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
V	2480.000	80.4	33	29.4	76.8	114.0	-37.2
V	4960.000	42.0	33	34.9	43.9	74.0	-30.1
V	7440.000	39.9	33	37.9	44.8	74.0	-29.2
V	9920.000	39.5	33	40.4	46.9	74.0	-27.1
V	12400.000	41.2	33	40.5	48.7	74.0	-25.3
V	14880.000	45.7	33	38.4	51.1	74.0	-22.9

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



Applicant: Hung Tat Electronic Co., Ltd.

Date of Test: March 31, 2014

Model: ONA14TA059

Worst-Case Operating Mode: Operating

Table 4

**Radiated Emissions
Pursuant to FCC Part 15 Section 15.209 Requirement**

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	33.856	38.8	16	10.0	32.8	40.0	-7.2
V	37.940	39.7	16	10.0	33.7	40.0	-6.3
H	45.690	39.6	16	10.0	33.6	40.0	-6.4
H	120.590	36.0	16	14.0	34.0	43.5	-9.5
H	135.900	35.5	16	14.0	33.5	43.5	-10.0
H	160.221	34.9	16	16.0	34.9	43.5	-8.6

NOTES: 1. Quasi-Peak detector is used for the emission measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Emission (the row indicated by bold) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



4.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 Product Labelling

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 Technical Specifications

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

Issuing Laboratory:**Intertek Testing Services Hong Kong Limited**

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



8.0 Miscellaneous Information

The miscellaneous information includes details of the test procedure and measured bandwidth / calculation of factor such as pulse desensitization and averaging factor (calculation and timing diagram).

8.1 Radiated Emission on the Bandedge

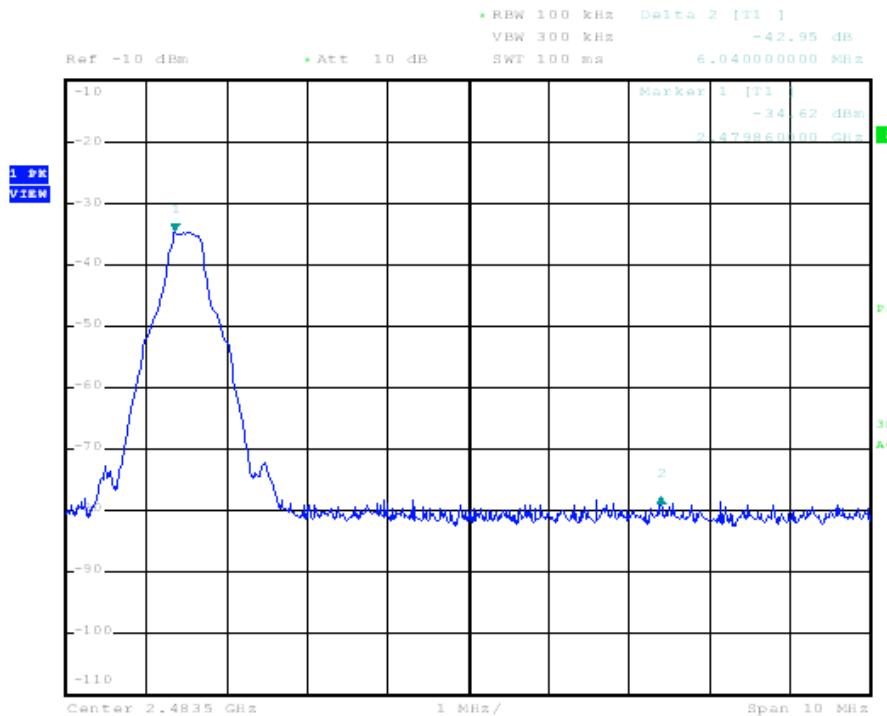
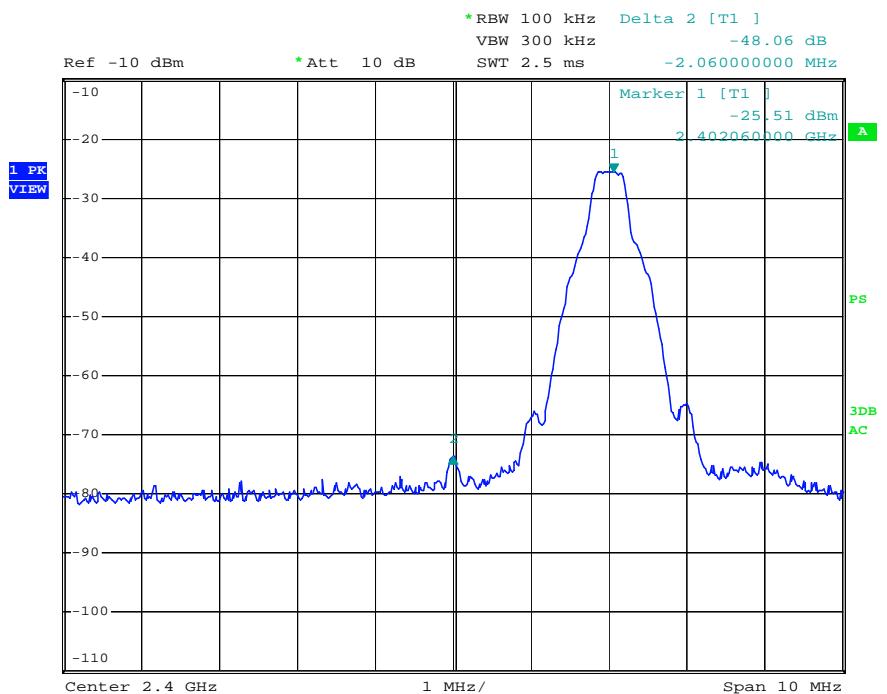
From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.4 (2009) for frequency being measured.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209, whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.

**Peak Measurement**

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

$$\begin{aligned} &= 77.0 \text{ dB}\mu\text{V/m} - 48.1 \text{ dB} \\ &= 28.9 \text{ dB}\mu\text{V/m} \end{aligned}$$

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

$$\begin{aligned} &= 53.0 \text{ dB}\mu\text{V/m} - 48.1 \text{ dB} \\ &= 4.9 \text{ dB}\mu\text{V/m} \end{aligned}$$

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

$$\begin{aligned} &= 76.8 \text{ dB}\mu\text{V/m} - 43.0 \text{ dB} \\ &= 33.8 \text{ dB}\mu\text{V/m} \end{aligned}$$

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

$$\begin{aligned} &= 52.8 \text{ dB}\mu\text{V/m} - 43.0 \text{ dB} \\ &= 9.8 \text{ dB}\mu\text{V/m} \end{aligned}$$

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74 dB μ V/m (Peak Limit) and 54 dB μ V/m (Average Limit).

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 0.625ms for a digital "1" bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

8.3 Calculation of Average Factor

Based on the Bluetooth Specification Version 2.1 + EDR, the transmitter ON time for each timeslot of Bluetooth is 625 μ s. DH5 has the maximum duty cycle, which consists of 5 continuous Tx slots and 1 Rx slot. Therefore one hopset take $(5+1) \times 625\mu\text{s} = 3.75\text{ms}$. For one period for a pseudo-random hopping through at least 20 RF channels in adaptive mode (worst case), it takes: $20 \times 3.75\text{ms} = 75\text{ms}$.

The dwell time for DH5 is $5 \times 625\mu\text{s} = 3.125\text{ms}$.

For the worst case calculation, there are two transmissions might occur in 100ms. Therefore,

$$\begin{aligned}\text{Duty Cycle (DC)} &= \text{Maximum On time in 100ms/100ms} \\ &= 3.125\text{ms} \times 2/100\text{ms} \\ &= 0.0625\end{aligned}$$

$$\begin{aligned}\text{Average Factor (AF) of Bluetooth in dB} &= 20 \log_{10} (0.0625) \\ &= -24 \text{ dB}\end{aligned}$$

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

Issuing Laboratory:**Intertek Testing Services Hong Kong Limited**

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.

**9.0 Equipment List****1) Radiated Emissions Test**

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-2666	EW-0954	EW-0446
Manufacturer	R&S	EMCO	EMCO
Model No.	ESCI7	3104C	3146
Calibration Date	Jun. 20, 2013	Apr. 30, 2013	Apr. 30, 2013
Calibration Due Date	Jun. 20, 2014	Oct. 30, 2014	Oct. 30, 2014

Equipment	Spectrum Analyzer	Double Ridged Guide Antenna
Registration No.	EW-2253	EW-1133
Manufacturer	R&S	EMCO
Model No.	FSP40	3115
Calibration Date	Apr. 24, 2013	Oct. 05, 2012
Calibration Due Date	Apr. 24, 2014	Apr. 05, 2014

Equipment	Broad-Band Horn Antenna
Registration No.	EW-1679
Manufacturer	SCHWARZBECK
Model No.	BBHA9170
Calibration Date	Apr. 01, 2013
Calibration Due Date	Apr. 01, 2014

2) Bandedge Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2329
Manufacturer	R&S
Model No.	FSP3
Calibration Date	Jan. 30, 2013
Calibration Due Date	Apr. 30, 2014

END OF TEST REPORT