



S&O ELECTRONICS (MALAYSIA) SDN. BHD.

Application
For
Certification

FCC ID: 2AB3N-HTSB603

SOUND BAR HOME THEATER SYSTEM

Model: HT-SB603

2.4GHz Transceiver

Report No.: 151210009SZN-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-14]

Prepared and Checked by:

Approved by:

Sign on file

Hardy Suo
Engineer

Andy Yan
Senior Project Engineer
Date: January 06, 2016

- The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
- 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 copy or distribute this report. 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 referenced from 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.
- For Terms And Conditions of the services, it can be provided upon request.
- The evaluation data of the report will be kept for 3 years from the date of issuance.

TRF No.: FCC 15C_TX_c

Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch
6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751 Website: www.china.intertek-etlsemko.com

INTERTEK TESTING SERVICES

LIST OF EXHIBITS

INTRODUCTION

<i>EXHIBIT 1:</i>	General Description
<i>EXHIBIT 2:</i>	System Test Configuration
<i>EXHIBIT 3:</i>	Emission Results
<i>EXHIBIT 4:</i>	Equipment Photographs
<i>EXHIBIT 5:</i>	Product Labelling
<i>EXHIBIT 6:</i>	Technical Specifications
<i>EXHIBIT 7:</i>	Instruction Manual
<i>EXHIBIT 8:</i>	Miscellaneous Information
<i>EXHIBIT 9:</i>	Test Equipment List

INTERTEK TESTING SERVICES

MEASUREMENT/TECHNICAL REPORT

S&O ELECTRONICS (MALAYSIA) SDN. BHD.

Model: HT-SB603

FCC ID: 2AB3N-HTSB603

This report concerns (check one:) Original Grant X Class II Change _____

Equipment Type: DXX - Part 15 Low Power Communication Device Transmitter

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____ No X

If yes, defer until: _____
date

Company Name agrees to notify the Commission by: _____
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No X

If no, assumed Part 15, Subpart C for intentional radiator – the new 47 CFR [10-1-14 Edition] provision.

Report prepared by:

Hardy Suo
Intertek Testing Services Shenzhen Ltd.
Kejiyuan Branch
6F, Block D, Huahan Building, Langshan Road,
Nanshan District, Shenzhen, P. R. China
Phone: (86 755) 8614 0743
Fax: (86 755) 8601 6751

INTERTEK TESTING SERVICES

Table of Contents

1.0 General Description	2
1.1 Product Description	2
1.2 Related Submittal(s) Grants	2
1.3 Test Methodology	2
1.4 Test Facility	3
2.0 System Test Configuration	5
2.1 Justification	5
2.2 EUT Exercising Software	5
2.3 Special Accessories	5
2.4 Equipment Modification	5
2.5 Measurement Uncertainty	6
2.6 Support Equipment List and Description	6
3.0 Emission Results	8
3.1 Radiated Test Results	9
3.1.1 Field Strength Calculation	9
3.1.2 Radiated Emission Configuration Photograph	10
3.1.3 Radiated Emissions	10
3.1.4 Transmitter Spurious Emissions	13
3.2 Conducted Emission at Mains Terminals	17
3.2.1 Conducted Emissions Configuration Photograph	17
3.2.2 Conducted Emissions	17
4.0 Equipment Photographs	21
5.0 Product Labelling	23
6.0 Technical Specifications	25
7.0 Instruction Manual	27
8.0 Miscellaneous Information	29
8.1 Bandedge Plot	30
8.2 Discussion of Pulse Desensitization	32
8.3 Transmitter Duty Cycle Calculation	33
8.4 Emissions Test Procedures	34
9.0 Test Equipment List	37

INTERTEK TESTING SERVICES

List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
Test Report	Bandedge Plot	bandedge.pdf
Test Report	20dB BW Plot	bw.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidentiality Letter	request.pdf
Cover Letter	Letter of Agency	agency.pdf

EXHIBIT 1

GENERAL DESCRIPTION

INTERTEK TESTING SERVICES

1.0 General Description

1.1 Product Description

The equipment under test (EUT) is a SOUND BAR HOME THEATER SYSTEM HT-SB603 with BT 3.0, 2.1 with EDR function operating in 2402-2480MHz, and BT 4.0 function operating in 2402-2480MHz. The NFC tag is passive. The EUT is powered by AC 100-240, 50/60Hz. HT-SB603 SOUND BAR HOME THEATER SYSTEM consists of HT-SB603 (SOUND BAR HOME THEATER SYSTEM) and CP-SW603 (ACTIVE SUBWOOFER SYSTEM), the sound bar and subwoofer will link automatically wirelessly when turned on as it is already pre-linked at the factory. For more detail information pls. refer to the user manual.

Antenna type of BT 3.0, 2.1 with EDR: Integral antenna

Modulation Type of BT 3.0, 2.1 with EDR: GFSK, $\pi/4$ DQPSK, 8DPSK

Antenna gain of BT 3.0, 2.1 with EDR: 0dBi Max

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

1.2 Related Submittal(s) Grants

This is an application for certification of a transceiver for the SOUND BAR HOME THEATER SYSTEM HT-SB603 which has Bluetooth function (BT 3.0, 2.0+EDR portion), and related report for Bluetooth 4.0 is subjected to report: 151210009SZN-002. And there has ACTIVE SUBWOOFER SYSTEM (Model No.: CP-SW603) which associated with this EUT, is filed at the same time.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in Semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the 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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

INTERTEK TESTING SERVICES

1.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

EXHIBIT 2
SYSTEM TEST CONFIGURATION

INTERTEK TESTING SERVICES

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 C63.10 (2013).

The EUT was powered by 120Vac/60Hz during the test.

All packets DH1, DH3 & DH5 mode in modulation type GFSK, $\pi/4$ DQPSK, 8DPSK were tested and only the worst data was reported in this report.

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.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on a turn table, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

The rear of unit shall be flushed with the rear of the table up to 1GHz and placed in the centre of turntable above 1GHz.

2.2 EUT Exercising Software

The EUT exercise program (provided by client) used during testing was designed to exercise the various system components in a manner similar to a typical use.

2.3 Special Accessories

No special accessory attached.

2.4 Equipment Modification

Any modifications installed previous to testing by S&O ELECTRONICS (MALAYSIA) SDN. BHD. will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd Kejiyuan Branch.

INTERTEK TESTING SERVICES

2.5 Measurement Uncertainty

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

2.6 Support Equipment List and Description

Description	Manufacturer	Model No.
iPod	Apple	A1367
USB Disk	TOSHIBA	UHYBS-004G-BL
IR Transmitter with Cable	S&O	Unshielded, Length 60cm
Audio In Cable	S&O	Unshielded, Length 230cm
HDMI Cable x3	N/A	Unshielded, Length 120cm
Optical Cable with Load	N/A	Unshielded, Length 100cm
Dummy Load	N/A	N/A

EXHIBIT 3
EMISSION RESULTS

INTERTEK TESTING SERVICES

3.0 Emission Results

Data is included worst-case configuration (the configuration which resulted in the highest emission levels).

INTERTEK TESTING SERVICES

3.1 Radiated Test Results

A sample calculation, configuration photographs and data tables of the emissions are included.

3.1.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

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

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB
- PD = Pulse Desensitization in dB
- AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

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

Assume a receiver reading of 62.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$\begin{aligned} RA &= 62.0 \text{ dB}\mu\text{V} \\ AF &= 7.4 \text{ dB} \\ CF &= 1.6 \text{ dB} \\ AG &= 29.0 \text{ dB} \\ PD &= 0 \text{ dB} \\ AV &= -10 \text{ dB} \\ FS &= 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m} \end{aligned}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

INTERTEK TESTING SERVICES

3.1.2 Radiated Emission Configuration Photograph

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

3.1.3 Radiated Emissions

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. Simultaneous transmission was considered.

Worst Case Radiated Emission
at
252.004 MHz

Judgement: Passed by 6.5 dB

TEST PERSONNEL:

Sign on file

Hardy Suo, Engineer
Typed/Printed Name

December 20, 2015
Date

INTERTEK TESTING SERVICES

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD.

Date of Test: December 20, 2015

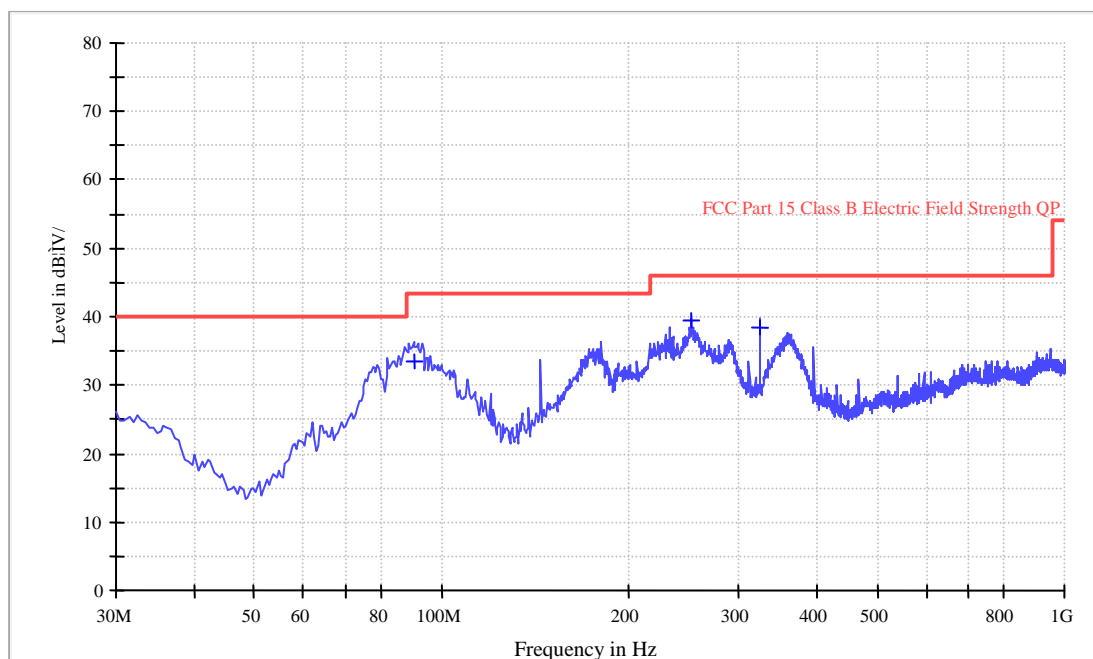
Model: HT-SB603

Sample: 1/1

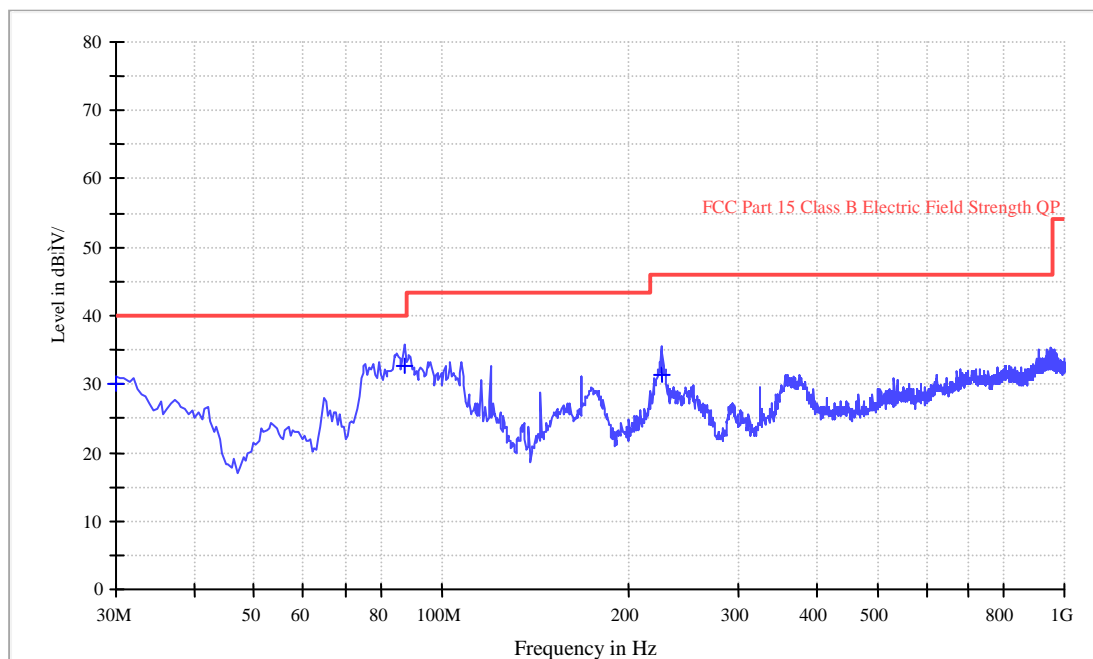
Worst Case Operating Mode: BT Link

Modulation type: GFSK

ANT Polarity: Horizontal



ANT Polarity: Vertical



INTERTEK TESTING SERVICES

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD.
Model: HT-SB603
Sample: 1/1
Worst Case Operating Mode: BT Link
Modulation type: GFSK

Date of Test: December 20, 2015

Table 1

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	90.140	44.5	20.0	9.1	33.6	43.5	-9.9
Horizontal	252.004	45.2	20.0	14.3	39.5	46.0	-6.5
Horizontal	323.996	42.2	20.0	16.3	38.5	46.0	-7.5
Vertical	30.000	40.2	20.0	9.9	30.1	40.0	-9.9
Vertical	87.240	45.4	20.0	7.3	32.7	40.0	-7.3
Vertical	224.970	36.8	20.0	14.6	31.4	46.0	-14.6

- NOTES: 1. Quasi-Peak detector is used except for others 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 value in the margin column shows emission below limit.
4. All emissions are below the QP limit.

INTERTEK TESTING SERVICES

3.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission
at
2402.000 MHz

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

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.

Judgement: Passed by 17.9 dB

TEST PERSONNEL:

Sign on file

Hardy Suo, Engineer
Typed/Printed Name

December 20, 2015
Date

INTERTEK TESTING SERVICES

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD.
Model: HT-SB603
Sample: 1/1
Worst Case Operating Mode: Transmitting

Date of Test: December 20, 2015

Table 2

Radiated Emissions

(2402MHz)

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2402.000	104.3	36.7	28.5	96.1	114.0	-17.9
Horizontal	4804.000	62.8	36.7	28.5	54.6	74.0	-19.4
Horizontal	7206.000	58.8	36.1	33.1	55.8	74.0	-18.2

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2402.000	104.3	36.7	28.5	22.5	73.6	94.0	-20.4
Horizontal	4804.000	62.8	36.7	28.5	22.5	32.1	54.0	-21.9
Horizontal	7206.000	58.8	36.1	33.1	22.5	33.3	54.0	-20.7

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic 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 harmonic 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. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Hardy Suo

INTERTEK TESTING SERVICES

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD.
Model: HT-SB603
Sample: 1/1
Worst Case Operating Mode: Transmitting

Date of Test: December 20, 2015

Table 3

Radiated Emissions

(2441MHz)

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2441.000	102.2	36.7	28.5	94.0	114.0	-20.0
Horizontal	4882.000	63.1	36.7	28.5	54.9	74.0	-19.1
Horizontal	7323.000	58.7	36.1	33.1	55.7	74.0	-18.3

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2441.000	102.2	36.7	28.5	22.5	71.5	94.0	-22.5
Horizontal	4882.000	63.1	36.7	28.5	22.5	32.4	54.0	-21.6
Horizontal	7323.000	58.7	36.1	33.1	22.5	33.2	54.0	-20.8

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic 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 harmonic 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. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Hardy Suo

INTERTEK TESTING SERVICES

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD.
Model: HT-SB603
Sample: 1/1
Worst Case Operating Mode: Transmitting

Date of Test: December 20, 2015

Table 4

Radiated Emissions

(2480MHz)

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2480.000	102.9	36.7	28.6	94.8	114.0	-19.2
Horizontal	4960.000	61.9	36.7	28.6	53.8	74.0	-20.2
Horizontal	7440.000	58.3	36.1	33.4	55.6	74.0	-18.4

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2480.000	102.9	36.7	28.6	22.5	72.3	94.0	-21.7
Horizontal	4960.000	61.9	36.7	28.6	22.5	31.3	54.0	-22.7
Horizontal	7440.000	58.3	36.1	33.4	22.5	33.1	54.0	-20.9

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic 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 harmonic 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. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Hardy Suo

INTERTEK TESTING SERVICES

3.2 Conducted Emission at Mains Terminal

3.2.1 Conducted Emissions Configuration Photograph

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

3.2.2 Conducted Emissions

Worst Case Conducted Configuration
At

0.174 MHz

Judgement: Passed by 15.7 dB margin

TEST PERSONNEL:

Sign on file

Hardy Suo, Engineer
Typed/Printed Name

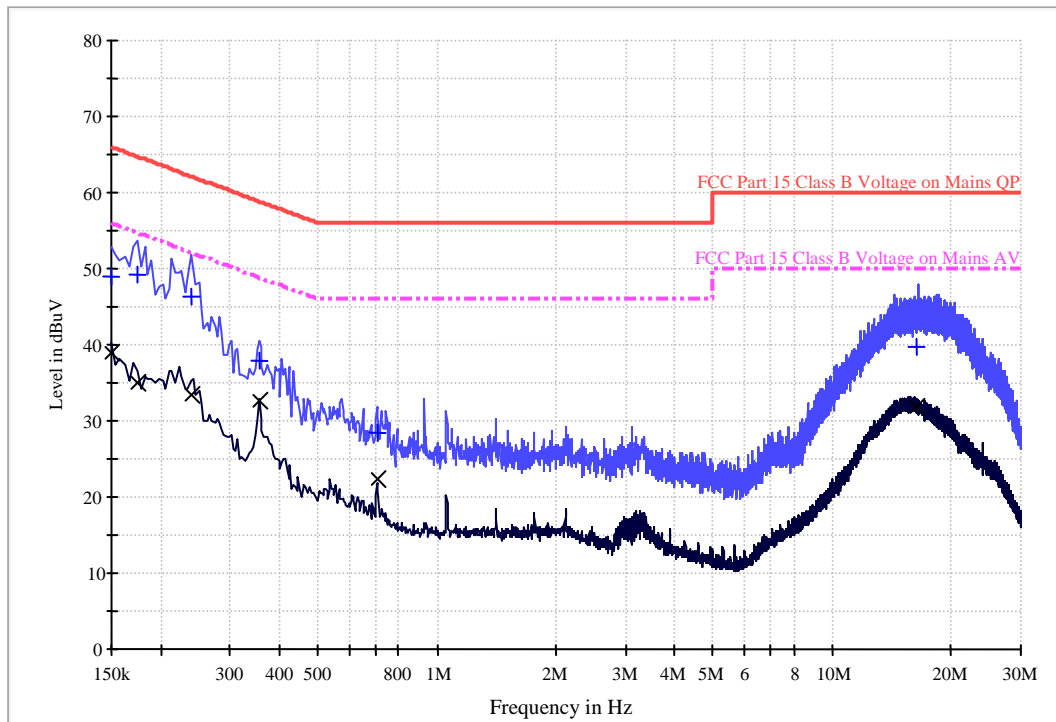
December 20, 2015
Date

INTERTEK TESTING SERVICES

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD.
Model: HT-SB603
Sample: 1/1
Worst Case Operating Mode: BT Link
Modulation type: GFSK
Phase: Live

Date of Test: December 20, 2015

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150	48.9	L1	9.8	17.1	66.0
0.174	49.1	L1	9.8	15.7	64.8
0.238	46.2	L1	9.9	16.0	62.2
0.354	37.8	L1	9.9	21.1	58.9
0.706	28.4	L1	10.1	27.6	56.0
16.358	39.7	L1	10.1	20.3	60.0

Result Table AV

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150	38.9	L1	9.8	17.1	56.0
0.174	35.0	L1	9.8	19.8	54.8
0.238	33.4	L1	9.9	18.8	52.2
0.354	32.5	L1	9.9	16.4	48.9
0.706	22.3	L1	10.1	23.7	46.0
16.358	31.9	L1	10.1	18.1	50.0

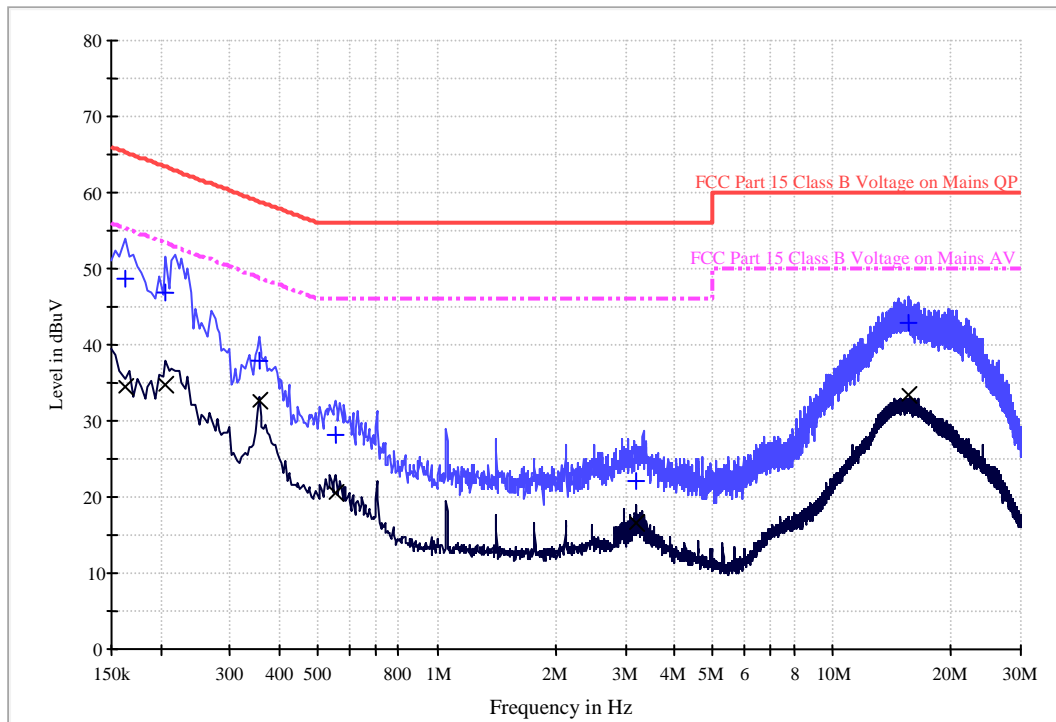
TRF No.: FCC 15C_TX_c
FCC ID: 2AB3N-HTSB603

INTERTEK TESTING SERVICES

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD.
Model: HT-SB603
Sample: 1/1
Worst Case Operating Mode: BT Link
Modulation type: GFSK
Phase: Neutral

Date of Test: December 20, 2015

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.162	48.8	N	10.2	16.6	65.4
0.206	46.9	N	10.1	16.5	63.4
0.354	37.9	N	10.2	21.0	58.9
0.554	28.1	N	10.3	27.9	56.0
3.186	22.0	N	10.3	34.0	56.0
15.658	42.8	N	10.4	17.2	60.0

Result Table AV

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.162	34.6	N	10.2	20.8	55.4
0.206	34.8	N	10.1	18.6	53.4
0.354	32.7	N	10.2	16.2	48.9
0.554	20.6	N	10.3	25.4	46.0
3.186	16.6	N	10.3	29.4	46.0
15.658	33.4	N	10.4	16.6	50.0

TRF No.: FCC 15C_TX_c
FCC ID: 2AB3N-HTSB603

INTERTEK TESTING SERVICES

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

INTERTEK TESTING SERVICES

4.0 Equipment Photographs

For electronic filing, the photographs of the tested EUT are saved with filename: external photos.pdf & internal photos.pdf.

INTERTEK TESTING SERVICES

EXHIBIT 5

PRODUCT LABELLING

INTERTEK TESTING SERVICES

5.0 Product Labelling

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

INTERTEK TESTING SERVICES

EXHIBIT 6

TECHNICAL SPECIFICATIONS

INTERTEK TESTING SERVICES

6.0 Technical Specifications

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

INTERTEK TESTING SERVICES

EXHIBIT 7

INSTRUCTION MANUAL

INTERTEK TESTING SERVICES

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.

INTERTEK TESTING SERVICES

EXHIBIT 8

MISCELLANEOUS INFORMATION

INTERTEK TESTING SERVICES

8.0 Miscellaneous Information

This miscellaneous information includes details of the measured bandedge, the test procedure and calculation of factor such as pulse desensitization.

INTERTEK TESTING SERVICES

8.1 Bandedge Plot

For electronic filing, the plot shows the fundamental emission when modulated is saved with filename: bandedge.pdf. From the plot, the field strength of any emissions outside of the specified frequency band are attenuated to the general radiated emission limits in section 15.209. It fulfils the requirement of 15.249(d).

Peak Measurement

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

(i) Lower channel 2402MHz:

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

$$\begin{aligned} &= 96.1 \text{ dB}\mu\text{v/m} - 52.1 \text{ dB} \\ &= 44.0 \text{ dB}\mu\text{v/m} \end{aligned}$$

(ii) Upper channel 2480MHz:

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

$$\begin{aligned} &= 94.8 \text{ dB}\mu\text{v/m} - 62.1 \text{ dB} \\ &= 32.7 \text{ dB}\mu\text{v/m} \end{aligned}$$

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

INTERTEK TESTING SERVICES

8.1 Bandedge Plot (cont'd)

Pursuant to FCC part 15 Section 15.215(c), the 20dB 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.

Figure 8.1 Bandwidth

INTERTEK TESTING SERVICES

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (T_{eff}) is approximately 625 μ s for Bluetooth. With a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

INTERTEK TESTING SERVICES

8.3 Transmitter Duty Cycle Calculation, FCC Rule 15.35 (b, c)

Based on the Bluetooth Specification Version 3.0, 2.1 with EDR and worst case AFH mode, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length, the AFH mode Duty cycle connection factor as below:

Channel hop rate = 800 hops/second (AFH Mode)

Adjusted channel hop rate for DH5 mode = 133.33 hops/second

Time per channel hop = $1 / 133.33 \text{ hops/second} = 7.5 \text{ ms}$

Time to cycle through all channels = $7.5 \times 20 \text{ channels} = 150 \text{ ms}$

Number of times transmitter hits on one channel = $100 \text{ ms} / 150 \text{ ms} = 1 \text{ time(s)}$

Worst case dwell time = 7.5 ms

Duty cycle connection factor = $20\log_{10}(7.5\text{ms} / 100\text{ms}) = -22.5 \text{ dB}$

INTERTEK TESTING SERVICES

8.4 Emissions Test Procedures

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

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.10 - 2013.

The transmitting equipment under test (EUT) is placed on a styrene turntable which is four feet in diameter, up to 1GHz 0.8m and above 1GHz 1.5m 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 adjusting through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

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.

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.

Detector function for conducted emissions is in QP & AV mode and IFBW setting is 9 kHz from the frequency band 150 kHz to 30MHz.

INTERTEK TESTING SERVICES

8.4 Emissions Test Procedures (cont'd)

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

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements are made as described in ANSI C63.10 - 2013.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 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. Above 1000 MHz, a resolution bandwidth of 1 MHz is used (RBW 3MHz used for fundamental emission).

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted 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, but those measurements taken at a closer distance are so marked.

INTERTEK TESTING SERVICES

EXHIBIT9

TEST EQUIPMENT LIST

INTERTEK TESTING SERVICES

9.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	15-Sep-2015	15-Sep-2016
SZ185-01	EMI Receiver	R&S	ESCI	100547	7-Feb-2015	7-Feb-2016
SZ061-08	Horn Antenna	ETS	3115	00092346	17-Oct-2015	17-Oct-2016
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	3-Sep-2015	3-Sep-2016
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	29-Apr-2015	29-Apr-2016
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	8-Jun-2015	8-Jun-2016
EM031-03	Spectrum Analyzer	R&S	FSV 40	101506	6-Jun-2015	6-Jun-2016
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	7-Feb-2015	7-Feb-2016
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	19-Apr-2014	19-Apr-2016
SZ062-02	RF Cable	RADIAL	RG 213U	--	27-Jun-15	27-Dec-2015
SZ062-05	RF Cable	RADIAL	0.04-26.5GHz	--	8-Oct-2015	8-Apr-2016
SZ062-12	RF Cable	RADIAL	0.04-26.5GHz	--	8-Oct-2015	8-Apr-2016
SZ067-04	Notch Filter	Micro-Tronics	BRM5070 2-02	--	20-May-2015	20-May-2016
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	3-Nov-2015	3-Nov-2016
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	3-Nov-2015	3-Nov-2016
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	24-Jun-2015	24-Jun-2016
SZ188-03	Shielding Room	ETS	RFD-100	4100	23-Aug-2014	23-Aug-2016