

i.Tech Dynamic Ltd.

Application
For
Certification

Bluetooth Headset With FM Radio Function

(FCC ID: RKIC51-B802-XX)

HK09090159-1
MN/cl
September 25, 2009

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MEASUREMENT/TECHNICAL REPORT

I.Tech Dynamic Ltd. - Model: C51-B802-XX
FCC ID: RKIC51-B802-XX

This report concerns (check one:) Original Grant ☒ Class II Change ☐

Equipment Type : DXX - Lower Power Transmitter

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes ☐ No ☒

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 ☒

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-01-08
Edition] Provision.

Report prepared by:

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EXHIBIT 1 GENERAL DESCRIPTION

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1.0 General Description

1.1 Product Description

The C51-B802-XX is a Bluetooth Headset Portable Handsfree Communication Device with FM radio function. This headset is designed and manufactured in accordance with Bluetooth v2.1 with EDR. It operates from 2402MHz to 2480MHz, receiving FM radio from 87.5MHz to 108.0MHz. Its product name is i.Tech Clip Music 802. The battery for this headset is internal and rechargeable using either a switching power adaptor (100-240VAC to 5VDC 500mA, model: SSA-3P 050050US) or an USB port. After pairing and connecting the headset with the mobile phone, it can make and receive call from the mobile. Besides, it can receive FM radio from stored station after turning on FM function and scanning radio station.

The antenna used in headset is integral, and the tested sample is a prototype.

The suffix, XX, indicates different color of enclosure. The difference in model number serves as marketing strategy.

The circuit description is saved with filename: descri.pdf

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1.2 Test Methodology

Radiated emission measurement was performed according to the procedures in ANSI C63.4 (2003). Preliminary radiated scans were performed in the Open Area Test Site only to determine worst case modes. All radiated measurements were performed in Open Area Test Sites. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.3 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 fully placed on file with the FCC.

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EXHIBIT 2 SYSTEM TEST CONFIGURATION

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2.0 System Test Configuration

2.1 Justification

For emissions testing, the equipment under test (EUT) was setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables (if any) were manipulated to produce worst case emissions. The headset was powered by a fully charged battery.

For the measurements, the EUT is attached to a plastic stand if necessary and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

Measurements of the radiated signal level of the fundamental frequency component of the emission was performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz.

Radiated emission measurement were performed 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 to 40 GHz, whichever is lower.

Determination of pulse desensitization was made according to *Hewlett Packard Application Note 150-2, Spectrum Analysis... Pulsed RF*. The effective period (τ_{eff}) was 625 μ s for Bluetooth. With the resolution bandwidth 1MHz and spectrum analyzer IF bandwidth 3 dB, the pulse desensitization factor was 0 dB.

User manual warns that EUT can't be connected to a charger during operation, therefore AC Power Line Conducted Emissions is not conducted.

2.2 EUT Exercising Software

The EUT exercise program used during radiated testing was designed to exercise the various system components in a manner similar to a typical use.

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2.3 Details of EUT and Description of Peripherals

Description of Peripherals:

- (1) Nokia Mobile Phone, Model: 5300, FCC ID: PPIRM-146 (Supplied by Intertek)
- (2) Earphone with 3.5mm socket (Supplied by Client)

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2.4 Measurement Uncertainty

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

2.5 Equipment Modification

Any modifications installed previous to testing by i.Tech Dynamic Ltd. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Commercial & Electrical Division, Intertek Testing Services Hong Kong Ltd.

All the items listed under section 2.0 of this report are confirmed by:

Confirmed by:

*Nip Ming Fung, Melvin
Supervisor
Intertek Testing Services
Agent for i.Tech Dynamic Ltd.*



_____. Signature

_____. September 25, 2009 Date

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EXHIBIT 3 EMISSION RESULTS

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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.

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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) from the measured reading. The basic equation with a sample calculation is as follows:

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

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

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 $\text{dB}\mu\text{V/m}$
 $RR = RA - AG$ 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 is added. The amplifier gain of 29 dB is subtracted, giving a field strength of $32 \text{ dB}\mu\text{V/m}$. This value in $\text{dB}\mu\text{V/m}$ was converted to its corresponding level in $\mu\text{V/m}$.

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

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

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

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

$$FS = RR + LF$$

$$FS = 23 + 9 = 32 \text{ dB}\mu\text{V/m}$$

$$RR = 23.0 \text{ dB}\mu\text{V}$$

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

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

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3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission

at 36.400 MHz

The worst case radiated emission configuration photographs are saved with filename: config photos.pdf

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3.3 Radiated Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Judgement : Passed by 6.2 dB margin

TEST PERSONNEL:



Tester Signature

Koo Wai Ip, Engineer
Typed/Printed Name

September 25, 2009
Date

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Company: i.Tech Dynamic Ltd.
Model: C51-B802-XX
Mode : TX-Channel 0

Date of Test: September 10, 2009

Table 1

Radiated Emissions Pursuant to FCC Part 15 Section 15.249(a) Requirements

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (dB)	Calculated at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
V	2402.000	99.0	33	29.4	43.9	51.5	94.0	-42.5
H	4804.000	48.5	33	34.9	43.9	6.5	54.0	-47.5
H	7206.000	45.3	33	37.9	43.9	6.3	54.0	-47.7
H	9608.000	42.2	33	40.4	43.9	5.7	54.0	-48.3
H	12010.000	40.9	33	40.5	43.9	4.5	54.0	-49.5

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
V	2402.000	99.0	33	29.4	95.4	114.0	-18.6
H	4804.000	48.5	33	34.9	50.4	74.0	-23.6
H	7206.000	45.3	33	37.9	50.2	74.0	-23.8
H	9608.000	42.2	33	40.4	49.6	74.0	-24.4
H	12010.000	40.9	33	40.5	48.4	74.0	-25.6

- NOTES: 1. 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. 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 part 15.205.

Test Engineer: Koo Wai Ip

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Company: i.Tech Dynamic Ltd.
Model: C51-B802-XX
Mode : TX-Channel 39

Date of Test: September 10, 2009

Table 2

Radiated Emissions Pursuant to FCC Part 15 Section 15.249(a) Requirements

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (dB)	Calculated at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
V	2441.000	98.9	33	29.4	43.9	51.4	94.0	-42.6
H	4882.000	48.9	33	34.9	43.9	6.9	54.0	-47.1
H	7323.000	45.3	33	37.9	43.9	6.3	54.0	-47.7
H	9764.000	42.0	33	40.4	43.9	5.5	54.0	-48.5
H	12205.000	41.0	33	40.5	43.9	4.6	54.0	-49.4

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
V	2441.000	98.9	33	29.4	95.3	114.0	-18.7
H	4882.000	48.9	33	34.9	50.8	74.0	-23.2
H	7323.000	45.3	33	37.9	50.2	74.0	-23.8
H	9764.000	42.0	33	40.4	49.4	74.0	-24.6
H	12205.000	41.0	33	40.5	48.5	74.0	-25.5

- NOTES:
1. 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. 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 part 15.205.

Test Engineer: Koo Wai Ip

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Company: i.Tech Dynamic Ltd.
Model: C51-B802-XX
Mode : TX-Channel 78

Date of Test: September 10, 2009

Table 3

Radiated Emissions Pursuant to FCC Part 15 Section 15.249(a) Requirements

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (dB)	Calculated at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
V	2480.000	99.2	33	29.4	43.9	51.7	94.0	-42.3
H	4960.000	48.7	33	34.9	43.9	6.7	54.0	-47.3
H	7440.000	45.5	33	37.9	43.9	6.5	54.0	-47.5
H	9920.000	42.2	33	40.4	43.9	5.7	54.0	-48.3
H	12400.000	40.9	33	40.5	43.9	4.5	54.0	-49.5

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
V	2480.000	99.2	33	29.4	95.6	114.0	-18.4
H	4960.000	48.7	33	34.9	50.6	74.0	-23.4
H	7440.000	45.5	33	37.9	50.4	74.0	-23.6
H	9920.000	42.2	33	40.4	49.6	74.0	-24.4
H	12400.000	40.9	33	40.5	48.4	74.0	-25.6

- NOTES: 1. 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. 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 part 15.205.

Test Engineer: Koo Wai Ip

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Company: i.Tech Dynamic Ltd.
Model: C51-B802-XX
Mode : Talk

Date of Test: September 10, 2009

Table 4

Radiated Emissions
Pursuant to FCC Part 15 Section 15.209 Requirements

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
V	36.400	39.8	16	10.0	33.8	40.0	-6.2
V	72.800	42.6	16	7.0	33.6	40.0	-6.4
V	109.200	36.1	16	14.0	34.1	43.5	-9.4
H	145.600	36.2	16	14.0	34.2	43.5	-9.3
H	182.000	29.5	16	20.0	33.5	43.5	-10.0
H	218.400	31.8	16	17.0	32.8	46.0	-13.2

- NOTES:
1. 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 italic***) within the restricted band meets the requirement of part 15.205.

Test Engineer: Koo Wai Ip

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3.4 Radiated Emission on the Bandedge , FCC Rule 15.249(d)

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 (2003) for frequency being measured.

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

Please refer to the following plots for radiated emission on the bandedge:

Low Channel Emissions

High Channel Emissions

The above plots are saved with filename: emission.pdf

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 expected variations in temperature and supply voltage were considered.

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

Based on the Bluetooth Specification Version 2.1 + EDR, transmitter ON time is independent of the packet type (DH1, DH3 and DH5) and packet length (single-slot and multi-slot). The maximum transmitter ON time for the Bluetooth is 625 μ s.

Each TX and RX time slot is 625 μ s in length. A TDD scheme is used where master and slave alternately transmit. For one period for a pseudo-random hopping through all 79 RF channels, it takes: $79 \times (0.625 \times 2)\text{ms} = 98.75\text{ms}$.

Therefore,

$$\begin{aligned}\text{Average Factor (AF) of Bluetooth in dB} &= 20 \log_{10} (0.625/98.75) \text{ dB} \\ &= 20 \log_{10} (0.00633) \text{ dB} \\ &= -43.9\text{dB}\end{aligned}$$

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EXHIBIT 4 EQUIPMENT LIST

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4.0 Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	Biconical Antenna
Registration No.	EW-0014	EW-2188	EW-0954
Manufacturer	R&S	AGILENTTECH	EMCO
Model No.	ESVS30	E4407B	3104C
Calibration Date	Jun. 01, 2009	Dec. 18, 2008	Sep. 30, 2008
Calibration Due Date	Jun. 01, 2010	Dec. 18, 2009	Mar. 30, 2010

Equipment	Log Periodic Antenna	Double Ridged Guide Antenna
Registration No.	EW-0446	EW-1015
Manufacturer	EMCO	EMCO
Model No.	3146	3115
Calibration Date	Oct. 02, 2008	Jul. 28, 2008
Calibration Due Date	Apr. 02, 2010	Jan. 28, 2010

Equipment	Broad-Band Horn Antenna	Digital Multimeter
Registration No.	EW-1679	EW-1237
Manufacturer	SCHWARZBECK	FLUKE
Model No.	BBHA9170	179
Calibration Date	Feb. 10, 2009	Sep. 01, 2008
Calibration Due Date	Feb. 10, 2010	Oct. 01, 2009