

ELECTROMAGNETIC EMISSIONS TEST REPORT

FCC Part 15, Subpart C, Section 15.209

Name of Appliances : Hearing Hub

Model No. (Type) : WH-0M1101A

Test report No. : CSF-11036

Panasonic EMC Standard Site

Panasonic Corporation

Yashiro Sasayama-City,
Hyogo 669-2356
Japan

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Received : October 6, 2011

Completed : October 7, 2011

This test report with appendix consists of 21 pages.
The test results respond to the tested sample only.
It is not allowed to copy this report even partly without the allowance of the test laboratory.
This test report must not be used to claim product endorsement by
NVLAP or any agency of the U.S. Government.



Masayuki Ueda
Chief Engineer of Panasonic EMC Standard Site
Date: October 12, 2011

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1.0 ENGINEERING TEST REPORT

This report is to certify that the Hearing Hub, WH-0M1101A from which the following data has been derived properly complies with the requirements of "FCC Rules and Regulations Part 15 Subpart C" as of the date the measurements were made. Any modification to the unit as tested may invalidate the data and void this certification. The apparatus contains a 10.597MHz radio and a Bluetooth module. The Bluetooth module is to be covered by an FCC modular approval (FCC ID: ACJ927153TX). This test report covers only aspects related to the 10.597MHz radio.

1. Applicant : Panasonic Healthcare Co., Ltd.
Hearing Instruments Business Unit

Address : 600 Saedo-cho, Tsuzuki-ku, Yokohama, Kanagawa
224-8539, Japan
2. Manufacturer : Panasonic Healthcare Co., Ltd
Hearing Instruments Business Unit

Address : 600 Saedo-cho, Tsuzuki-ku, Yokohama, Kanagawa
224-8539, Japan
3. Factory1 : Panasonic Healthcare Co., Ltd.
Hearing Instruments Business Unit Saijo Seizousyō

Address1 : 247 Fukutake-ko, Saijo, Ehime 793-8510, Japan
4. Factory2 : PT Panasonic Healthcare Indonesia

Address2 : Kawasan Industri MM2100 Blok O-1 Cikarang Barat,
Bekasi 17520, INDONESIA
5. Description of Appliance
 - a. Name of Appliance : Hearing Hub
 - b. Equipment authorization : Certification
 - c. FCC ID. : ACJ927152TX
 - d. Model No : WH-0M1101A
 - e. Serial No. : KSJ0098
 - f. Date of Manufacture : September, 2011
 - g. Power Supply : DC 3.6V via internal battery

(continued)

- h. EUT Condition : Pre-Production (Client samples)
- i. modulation type : CPFSK
- j. Transmit Speed : 298 kbps
- k. Emission designator : F1D
- l. Number of Channels : 1
- m. Antenna type : Coil antenna and Loop antenna
- n. Operation frequency : 10.597MHz
- o. Oscillating Frequency :

Clock Type	Destination	Frequency[MHz]
Analog clock (*A)	Reference Oscillator	26 MHz
Digital clock (*A)	Clock Generation	16 MHz
Digital clock	System controller	8MHz
Digital clock	Audio system MCLK	5.24MHz
Digital clock	Voice record controller	10MHz
Digital clock	Audio I2S I/F BCLK	655.232kHz
Switching clock	Charger DC-DC	1MHz (20%)
Switching clock	3.3V Switching control	0.6MHz (20%)
Switching clock	1.8V Switching control	1.2MHz (15%)
Switching clock	AC Adapter	100 kHz
RF TXVCO1 (*A)	RF Synthesiser	1602~1654MHz
RF TXVCO2 (*A)	RF Synthesiser	801~827MHz
RF RXVCO1 (*A)	RF Synthesiser	1600.33~1652.33MHz
RF RXVCO2 (*A)	RF Synthesiser	800.16~826.16MHz
RF TX1 (*A)	Bluetooth TX	2402~2480MHz
Digital clock	Low power Radio clock	0.298 MHz
RF TX2	Low power Radio TX	10.597MHz

Note : (*A) These clock frequencies are generated inside the Bluetooth module.

- 6. Measurement Site : Panasonic EMC Standard Site
- 7. Date of Measurement : October 6 - 7, 2011

(continued)

8. Summary of Measurement Results

- a. Voltage Requirements : Compliance
- b. Antenna Requirements : Compliance
- c. Restricted Bands of Operation : Compliance
- d. Conducted Emission : N/A
- e. Radiated Emission : Compliance
minimum Limit Margin 8.2 dB (QP)
at 10.415 MHz

The EUT complied with FCC rules and regulations.

These test results are traceable to the National and International Standards.

Measurement Uncertainty, at time of test, and at least 95% confidence, was estimated to be as follows:

Radiated Emission Measurement : 2.6 dB
Conducted Emission Measurement : 1.9 dB



Masayuki Ueda
Chief Engineer of Panasonic EMC Standard Site
Date: October 12, 2011

2.0 INTRODUCTION

2.1 Purpose

The purpose of this report is to show compliance of the Hearing Hub, WH-0M1101A to the requirement of Part 15 of the FCC Rules and Regulations (47 CFR, PART 15, Subpart C) and FCC Procedure for Measuring RF Emissions from ANSI C63.4-2003.

2.2 Deviation from the standards

Deviations from or additions to the test method: No deviation or addition

2.3 Requirement

The test requirements for an intentional Radiator are as follows.

In the evaluation, limits for the requirements of the FCC Rules and Regulations, Part 15 Subpart C applies Sections 15.31(e), 15.203, 15.205, 15.207 and 15.209.

2.3.1 FCC 15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Verdict: (options and interpretation)

The EUT is battery powered and has an internal voltage regulator to supply the RF circuit. Testing was done with a new battery. Hence the EUT complies with the power supply requirements.

2.3.2 FCC 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Verdict: (options and interpretation)

The EUT has a coil antenna and a loop antenna, which is coupled inductively to the coil antenna. The coil antenna is installed inside the EUT and is not user accessible. The loop antenna is permanently attached to the EUT and cannot be removed by the final user. Hence the EUT complies with the requirements of FCC 15.203.

2.3.3 FCC 15.205

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict: (options and interpretation)

The EUT nominal carrier frequency is 10.597MHz. It was verified during testing that the carrier is fully contained in the unrestricted frequency band 8.41475-12.29MHz. Therefore only spurious emissions are found in the restricted bands of operation and the EUT complies with the restricted frequency band requirement.

(continued)

2.3.4 FCC 15.207

Conducted emission limits

Frequency (MHz)	Conducted limit (dB μ V)	
	OP	AV
0.15 – 0.50	66.0 – 56.0	56.0 – 46.0
0.50 – 5.00	56.0	46.0
5.00 – 30.00	60.0	50.0

Verdict: (options and interpretation)

The EUT is not intended to be connected to the AC power line network during normal operation. (The RF transmitter operates only with battery power. It cannot operate when the EUT is connected to the AC power line network to charge the battery.) Therefore the AC power line conducted emission on any frequency within the band 150kHz to 30MHz in FCC 15.207 is not applicable.

2.3.5 FCC 15.209

Radiated emission limits (Below 1GHz)

Frequency (MHz)	Field Strength (μ V/m)	Measurement Distance (m)
	QP	
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30.0 – 88.0	100	3
88.0 – 216.0	150	3
216.0 – 960.0	200	3
960.0 – 1000.0	500	3

Frequency (MHz)	Field Strength (dB μ V/m)	Measurement Distance (m)
	QP	
0.009 – 0.490	128.5 – 93.8	3
0.490 – 1.705	73.8 – 62.96	3
1.705 – 30.0	69.5	3
30.0 – 88.0	40.0	3
88.0 – 216.0	43.5	3
216.0 – 960.0	46.0	3
960.0 – 1000.0	53.9	3

The 300m limit below 0.490MHz was extrapolated to a 3m distance using a 80dB correction factor.

The 30m limit below 30MHz was extrapolated to a 3m distance using a 40dB correction factor.

2.4 Short Description of the EUT

It receives audio signals either via a wired audio input interface or via Bluetooth. Audio signals are then transferred to hearing aid units by wireless using a 10.597MHz radio in hearing aid system.

2.5 Equipment Under Test

2.5.1 Operation - mode of the EUT

The equipment under test was operated during the measurement under following conditions:

- A. TX mode: the EUT transmits continuously a modulated signal at 10.597MHz with highest duty cycle available.(88%)

2.5.2 Modification of the EUT

The test laboratory did not modify the EUT during the test.

2.5.3 The Equipment Under Test (EUT) and Peripherals

<EUT>

Symbol	Device	Model	Serial No.	Manufacturer
A	Hearing Hub	WH-0M1101A	KSJ0098	Panasonic

<peripheral devices>

Symbol	Device	Model	Serial No.	Manufacturer	FCC ID / DoC
B	Audio Accessory	iFP-790	802972050501105	iRiver	QDMIFP799

2.5.4 Details of ports

Symbol	Name of port	Connection	status of lines	Analogue/ Digital	Remarks
①	Audio Input	Hearing Hub / Audio Accessory	Passive	Analogue	-

Note:

-The status of lines shows direction of signals on the EUT; “active“ is “OUT” and “passive“ is “IN”.

(continued)

Panasonic EMC Standard Site 231-1 Yashiro, Sasayama, Hyogo 669-2356 Japan Tel 079-552-5681 Fax 079-552-5682(Form12)

2.5.5 Type of Interface Cables

<Interface cables>

No.	Name of Cable	Model	Cable type	Shielded	Ferrite Quantity	Connector Type of shell & Connector Type	
	Name of port	Manufacturer	Length(m)				
1	Audio Cable	K2KYYYY00185	a	Shielded	None	Plastic	φ3.5mm plug
	Audio Input	Panasonic	1.00				

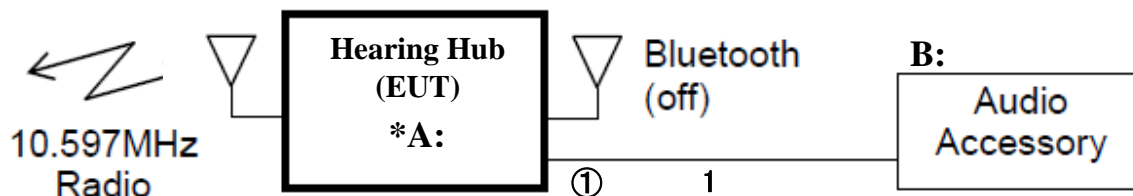
2.5.6 Abbreviations of the Cable type and Ferrite

Abbreviation	Cable type and Ferrite
a	Enclosed cable
b	Available accessory (exclusive cable)
c	Commercially available cable (with no designation)
d	Commercially available cable (The selection and mounting procedure of the cable is designated in the instruction manual).
e	Fixed cable
f	Enclosed Ferrite (Setting up method of the ferrite is designated in the instruction manual.)
g	Commercially available ferrite. (The selection and setting up method of the ferrite is designated in the instruction manual.)
h	Fixed Ferrite (Already fixed)

(continued)

2.5.8 Block diagram of the Equipment Under Test (EUT) :

Drawing:



2.6 Environmental Conditions

Radiated Emission Below 1GHz test effort was performed on October 6 - 7, 2011.

Temperature:	22 - 24 deg. C
Humidity:	50 - 52 %
Barometer:	99.8 – 100.3 kPa

3.0 TEST SITE DESCRIPTION

This testing was performed at:

Name of Test Site: Panasonic EMC Standard Site

Address: Yashiro Sasayama-City, Hyogo 669-2356
Japan

Registration/Accreditation: This test site has been accredited by NVLAP.
NVLAP Lab Code: 100428-0
Effective through: December 31, 2011

4.0 TEST INSTRUMENTATION**4.1 Table 4-1**

Test equipment list used to perform the Radiated emission (Below 1GHz)
in the Open Area Site (3m).

No.	Device	Model No.	Serial. No.	Reg. No.	Frequency Range	Last Cal.	Next Cal.
01	Panasonic EMC Standard Site OATS No.1	3m 10m	None	NVLAP Lab Code 100428-0	30MHz-1GHz	July 2011 (Maintenance)	October 2011 (Maintenance)
02	EMI Test Receiver	Rohde & Schwarz ESCS	100365	675	9kHz-2750MHz	March 2011	March 2012
03	Spectrum Analyzer	ADVANTEST R3365	35550049	322	100Hz-8GHz	March 2011	March 2012
04	Biconical Antenna	Schwarzbeck VHA9103B & BBA9106	9103-1847	510	30MHz-300MHz	July 2011	July 2012
05	Logperiodic Antenna	Schwarzbeck UHALP9108A	9108-0313	507-1	300MHz-1GHz	July 2011	July 2012
06	Amplifier	Hewlett Packard 8447D	2944A08559	397	100kHz-1.3GHz	November 2010	November 2011
07	Cable O1-01	Fujikura 10D-2W	None	834-1	9kHz-1GHz	August 2011	August 2012
08	Cable O1-02	Fujikura 10D-2W	None	834-2	9kHz-1GHz	August 2011	August 2012
09	Loop Antenna	EMCO 6502	2123	176	9k-30MHz	May 2011	May 2012

5.0 TEST EUT SETUP AND CONFIGURATIONS

5.1 Technical Requirements

5.1.1 Radiated Emission

FCC 15.209

Radiated emissions must comply with the limits specified in FCC 15.209(a).

Test procedure: ANSI C63.4-2003

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 9kHz to 1GHz. Final radiated emission measurements were made at 3m distance.

For frequencies between 9kHz and 30MHz, measurements were performed with a loop antenna. At each frequency selected for final measurement, the EUT was rotated 360° and the measuring loop antenna was rotated around its vertical axis in order to determine the emission's maximum level.

For frequencies between 30MHz and 1GHz, measurements were performed with a Biconical and Logperiodic antenna.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

Pre-check: Radiated emission levels (Peak value) which have small margin for the regulation were measured by means of spectrum analyzer changing Antenna movement (1-4m) and table rotation (0-360degree).

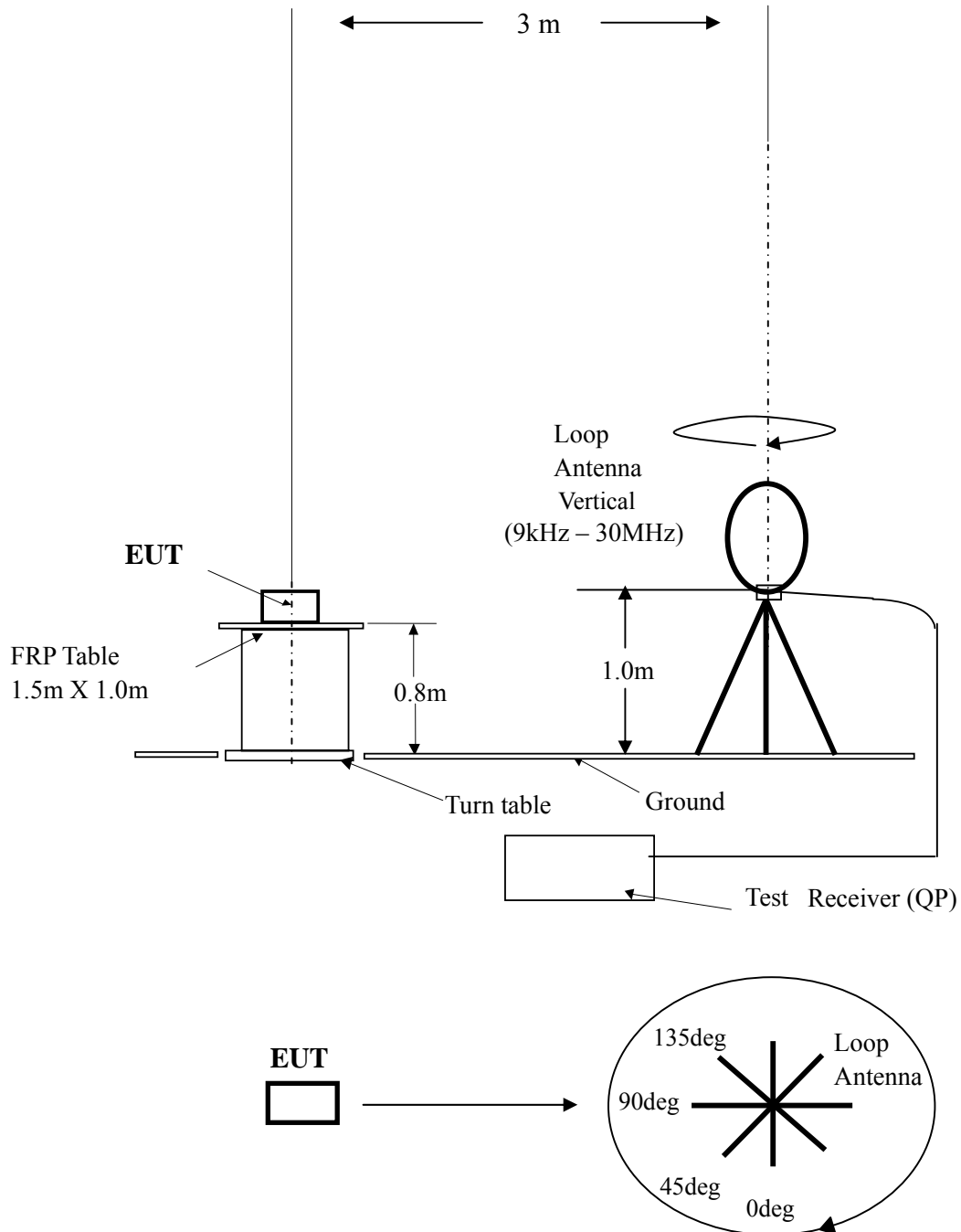
Final measurements were made with a receiver operating in the CISPR quasi-peak detection mode. For frequencies between 150kHz and 30MHz, the spectrum analyzer's 6 dB bandwidth was set to 9kHz. For frequencies between 30MHz and 1GHz, the spectrum analyzer's 6 dB bandwidth was set to 120kHz.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

Software for the measurement: PTT EMI96 Rev. E26

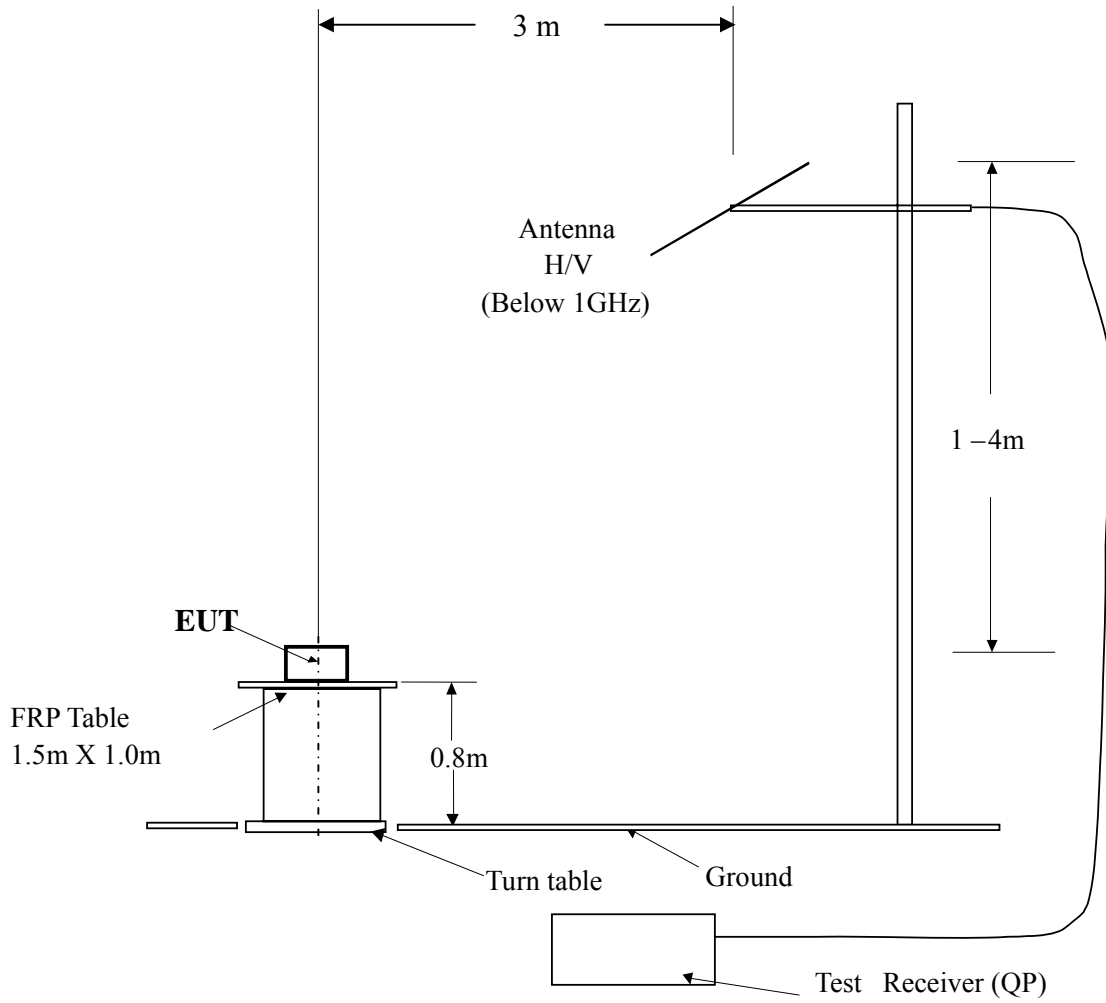
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From 9kHz to 30MHz Measurement layout.



(Continued)

From 30MHz to 1GHz Measurement layout.



6.0 TEST RESULTS**6.1 Radiated Emission**

6.1.1 Test Data

Test Equipment: Refer to Table 4-1 (Below 1GHz).

Test Condition of Instrument

EUT Warm-up Time: 30 minutes

Resolution Bandwidth: 200Hz(9k-150kHz) / 9kHz(150k-30M) / 120kHz (30M-1000MHz)

Detector Function : QP (9k-1000MHz)

Date : October 6 - 7, 2011

Temp. : 22 - 24 deg.C

Humid. : 50 - 52 %

The measurements were performed with the maximized emissions condition.

X axis

Frequency (MHz)	*Correction Factor (dB/m)	Reading Value (dB μ V)	Limits Value (dB μ V/m)	*Correction Value (dB μ V/m)	Table Angle (deg)	Antenna Angle (deg)	Margin Value (dB)
		Ver.		Ver.			Ver.
10.420	12.6	44.9	69.5	57.5	273	0	12.0
10.715	12.5	44.6	69.5	57.1	264	0	12.4
10.420	12.6	42.9	69.5	55.5	250	45	14.0
10.715	12.5	42.3	69.5	54.8	247	45	14.7
10.420	12.6	38.4	69.5	51.0	192	90	18.5
10.715	12.5	38.1	69.5	50.6	189	90	18.9
10.420	12.6	43.3	69.5	55.9	304	135	13.6
10.715	12.5	42.7	69.5	55.2	304	135	14.3

Y axis

Frequency (MHz)	*Correction Factor (dB/m)	Reading Value (dB μ V)	Limits Value (dB μ V/m)	*Correction Value (dB μ V/m)	Table Angle (deg)	Antenna Angle (deg)	Margin Value (dB)
		Ver.		Ver.			Ver.
10.415	12.6	48.1	69.5	60.7	343	0	8.8
10.713	12.5	47.7	69.5	60.2	328	0	9.3
10.415	12.6	47.0	69.5	59.6	317	45	9.9
10.713	12.5	46.4	69.5	58.9	311	45	10.6
10.415	12.6	43.8	69.5	56.4	271	90	13.1
10.713	12.5	43.2	69.5	55.7	271	90	13.8
10.415	12.6	46.1	69.5	58.7	13	135	10.8
10.713	12.5	45.5	69.5	58.0	355	135	11.5

(Continued)

Z axis

Frequency (MHz)	*Correction Factor (dB/m)	Reading Value (dB μ V)		Limits Value (dB μ V/m)		*Correction Value (dB μ V/m) Ver.	Table Angle (deg)	Antenna Angle (deg)	Margin Value (dB)	
		Ver.							Ver.	
10.415	12.6	48.7		69.5		61.3	142	0	8.2	
10.715	12.5	48.1		69.5		60.6	140	0	8.9	
10.415	12.6	46.4		69.5		59.0	120	45	10.5	
10.715	12.5	45.8		69.5		58.3	119	45	11.2	
10.415	12.6	42.7		69.5		55.3	238	90	14.2	
10.715	12.5	42.1		69.5		54.6	245	90	14.9	
10.415	12.6	46.9		69.5		59.5	173	135	10.0	
10.715	12.5	46.5		69.5		59.0	180	135	10.5	

* Correction Factor = Antenna Factor + Cable loss

* Correction Value= Reading Value + Correction Factor

X axis

Frequency [MHz]	*Correction Factor [dB/m]	Reading Value [dB μ V]		Limits Value [dB μ V/m]	*Correction Value [dB μ V/m]		Margin Value [dB]	
		Hor.	Ver.		Hor.	Ver.	Hor.	Ver.
31.25	-10.1	31.2	34.3	40.0	21.1	24.2	18.9	15.8
32.14	-10.5	32.2	35.3	40.0	21.7	24.8	18.3	15.2
52.08	-16.6	28.5	31.5	40.0	11.9	14.9	28.1	25.1
53.57	-17.0	28.8	31.9	40.0	11.8	14.9	28.2	25.1
72.92	-20.2	33.2	34.6	40.0	13.0	14.4	27.0	25.6
75.00	-20.2	33.3	33.3	40.0	13.1	13.1	26.9	26.9
93.75	-17.5	39.6	38.0	43.5	22.1	20.5	21.4	23.0
96.43	-17.2	37.6	37.2	43.5	20.4	20.0	23.1	23.5

(continued)

Y axis

Frequency [MHz]	*Correction Factor [dB/m]	Reading Value [dB μ V]		Limits Value [dB μ V/m]	*Correction Value [dB μ V/m]		Margin Value [dB]	
		Hor.	Ver.		Hor.	Ver.	Hor.	Ver.
31.25	-10.1	32.7	35.9	40.0	22.6	25.8	17.4	14.2
32.14	-10.5	33.4	37.0	40.0	22.9	26.5	17.1	13.5
52.08	-16.6	29.6	32.9	40.0	13.0	16.3	27.0	23.7
53.57	-17.0	29.6	33.2	40.0	12.6	16.2	27.4	23.8
72.92	-20.2	33.4	35.1	40.0	13.2	14.9	26.8	25.1
75.00	-20.2	33.6	34.3	40.0	13.4	14.1	26.6	25.9
93.75	-17.5	41.5	43.2	43.5	24.0	25.7	19.5	17.8
96.43	-17.2	41.1	43.6	43.5	23.9	26.4	19.6	17.1

Z axis

Frequency [MHz]	*Correction Factor [dB/m]	Reading Value [dB μ V]		Limits Value [dB μ V/m]	*Correction Value [dB μ V/m]		Margin Value [dB]	
		Hor.	Ver.		Hor.	Ver.	Hor.	Ver.
31.25	-10.1	32.6	38.8	40.0	22.5	28.7	17.5	11.3
32.14	-10.5	33.4	39.9	40.0	22.9	29.4	17.1	10.6
52.08	-16.6	27.7	35.7	40.0	11.1	19.1	28.9	20.9
53.57	-17.0	27.8	35.8	40.0	10.8	18.8	29.2	21.2
72.92	-20.2	29.4	37.3	40.0	9.2	17.1	30.8	22.9
75.00	-20.2	30.2	36.4	40.0	10.0	16.2	30.0	23.8
93.75	-17.5	38.1	45.4	43.5	20.6	27.9	22.9	15.6
96.43	-17.2	35.2	43.6	43.5	18.0	26.4	25.5	17.1

* Correction Factor = Antenna Factor + Cable loss - AMP Gain

* Correction Value= Reading Value + Correction Factor

Sample of calculated result at 10.415 MHz, as the Minimum Margin point (X axis):

$$\begin{array}{rcl}
 & \text{Correction Factor} & = 12.6 \text{ dB/m} \\
 +) & \text{Reading Value} & = 48.7 \text{ dB}\mu\text{V} \\
 \hline
 & \text{Correction Value} & = 61.3 \text{ dB}\mu\text{V/m}
 \end{array}$$

Minimum Margin: 69.5 – 61.3 = 8.2 dB

The bold character in the table shows the Minimum Margin Point.

Note:

Simultaneous transmission of 10.597MHz radio and Bluetooth radio was investigated and no new emissions were found.