

TEST REPORT

For

Bluetooth headset

In conformity with

FCC CFR 47 Part15 / RSS-210, RSS-Gen

Model: BH-2

FCC ID/ IC Certification No.: K660F444X11 / 511B-0F444X11

Test Item: Bluetooth headset

Report No: RY0902Z02R1

Issue Date: 2 February 2009

Prepared for

VERTEX STANDARD CO., LTD.
4-8-8, NAKAMEGURO MEGURO-KU, TOKYO 153-8644
JAPAN

Prepared by

RF Technologies Ltd.
472, Nippa-cho, Kohoku-ku, Yokohama, 223-0057, Japan
Telephone: +81+(0)45- 534-0645
FAX: +81+(0)45- 534-0646

This report shall not be reproduced, except in full, without the written permission of RF Technologies Ltd. The test results in this report apply only to the sample tested. RF Technologies Ltd. is managed to ISO17025 and has the necessary knowledge and test facilities for testing according to the referenced standards.

Table of contents

1	General information.....	3
1.1	Product description	3
1.2	Test(s) performed/ Summary of test result	3
1.3	Test facility	4
1.4	Measurement uncertainty.....	4
1.5	Summary of test results.....	5
1.5.1	Table of test summary.....	5
1.6	Setup of equipment under test (EUT)	5
1.6.1	Test configuration of EUT	5
1.6.2	Operating condition:	5
1.6.3	Setup diagram of tested system:.....	6
1.7	Equipment modifications	6
1.8	Deviation from the standard	6
2	Test procedure and test data	7
2.1	Transmitter Radiated spurious emissions	7
2.1.1	Below 30 MHz.....	9
2.1.2	Between 30 – 1000 MHz	9
2.1.3	Above 1000 MHz.....	10
2.2	Receiver Radiated spurious emissions.....	12
2.2.1	Between 30 – 1000 MHz	12
2.2.2	Above 1000 MHz.....	12
3	Test setup photographs	13
3.1	Definition of the EUT axis.....	13
3.2	Radiated spurious emissions.....	15
4	List of utilized test equipment/ calibration	16

History

Report No.	Date	Revisions	Revised By
RY0902Z02R1	2 February 2009	Initial Issue	K. Ohnishi

1 General information

1.1 Product description

Test item : Bluetooth headset
Manufacturer : YAESU MUSEN CO., LTD.
Address : 43 UTURODA MORIJUKU, SUKAGAWA-SHI, FUKUSIMA, JAPAN
Model : BH-2
FCC ID : K660F444X11
IC Certification No : 511B-0F444X11
Serial numbers : None
Fundamental Operated Frequency : Tx/Rx Freq. (2402 - 2480 MHz)
Oscillator frequencies : 24 MHz
Type of Modulation : FHSS (GFSK)
RF Output Power : -2.35dBm (measured at the antenna terminal)
Antenna Gain : -0.69 dBi (Inverted F antenna)
Receipt date of EUT : 29 January 2009
Nominal power source voltages : DC 3.7V (Battery)


1.2 Test(s) performed/ Summary of test result

Test specification(s) : FCC CFR 47. Part 15 (October 1, 2007) / RSS-210 Issue 7, RSS-Gen Issue 2
Test method(s) : ANSI C63.4: 2003
Test(s) started : 29 January 2009
Test(s) completed : 2 February 2009
Purpose of test(s) : Grant for Certification of FCC / IC

Summary of test result : Complied

Note: The above judgment is only based on the measurement data and it does not include the measurement uncertainty. Accordingly, the statement below is applied to the test result.
The EUT complies with the limit required in the standard in case that the margin is not less than the measurement uncertainty in the Laboratory.
Compliance of the EUT is more probable than non-compliance is case that the margin is less than the measurement uncertainty in the Laboratory.

Test engineer : 
K. Ohnishi
EMC testing Department

Reviewer : 
T. Ikegami
Manager
EMC testing Department

1.3 Test facility

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at RF Technologies Ltd., located in 472, Nippa-cho, Kohoku-ku, Yokohama, 223-0057, Japan, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948, per October 1, 2007. The description of the test facilities has been filed under registration number 319924 at the Office of the Federal Communications Commission. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at <http://www.fcc.gov>.

Registered by Voluntary Control Council for Interference by Information Technology Equipment (VCCI)

Each registered facility number is as follows;

Test site (Semi-Anechoic chamber 3m) R-2393

Test site (Shielded room) C-2617

Registered by Industry Canada (IC): The registered facility number is as follows;

Test site No. 1 (Semi-Anechoic chamber 3m): 6974A

Accredited by **National Voluntary Laboratory Accreditation Program (NVLAP)** for the emission tests stated in the scope of the certificate under Certificate Number 200780-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



NVLAP LAB CODE 200780-0

1.4 Measurement uncertainty

The treatment of uncertainty is based on the general matters on the definition of uncertainty in “Guide to the expression of uncertainty in measurement (GUM)” published by ISO. The Lab’s uncertainty is determined by referring UKAS Publication LAB34: 2002 “The Expression of Uncertainty in EMC Testing” and CISPR16-4-2: 2003 “Uncertainty in EMC Measurements”.

The uncertainty of the measurement result in the level of confidence of approximately 95% (k=2) is as follows;

Conducted emission: ± 1.9 dB (10 kHz – 30 MHz)

Radiated emission (9 kHz - 30MHz): ± 2.8 dB

Radiated emission (30MHz - 1000MHz): ± 5.7 dB

Radiated emission (above 1000MHz): ± 5.8 dB

1.5 Summary of test results

1.5.1 Table of test summary

Requirement of;	Section in FCC15	Section in RSS210/ RSS-Gen	Result	Section in this report
1.5.7 Transmitter Radiated Spurious Emissions	15.205(b)/15.209	A8.5	Complied	2.1
1.5.9 Receiver Radiated Spurious Emissions	15.109	RSS-Gen 6	Complied	2.2

1.6 Setup of equipment under test (EUT)

1.6.1 Test configuration of EUT

Equipment(s) under test:

	Item	Manufacturer	Model No.	Serial No.
A	Bluetooth Headset	VERTEX STANDARD CO., LTD.	BH-2	001
B	Battery	VERTEX STANDARD CO., LTD.	-	-

Support Equipment(s):

	Item	Manufacturer	Model No.	Serial No.
C	Test Jig	VERTEX STANDARD CO., LTD.	-	-
D	DC Power supply	ALINCO, INC.	DM-320MV	Z 003317
E	Personal Computer	DELL	TS30T	8416R
F	AC Adaptor	DELTA ELECTRONICS, INC.	PA-5	7832D

Connected cable(s):

No.	Item	Identification (Manu.e.t.c)	Shielded YES / NO	Ferrite Core YES / NO	Connector Type Shielded YES / NO	Length (m)
1	Control cable	-	No	No	No	1.0
2	RS232C cable	-	Yes	No	Yes	1.8
3	LAN cable	FBT	No	No	No	1.9
4	DC power cable	-	No	No	No	0.5
5	AC power cable	SAITO CORD	No	No	No	1.5
6	DC power cable	DELTA ELECTRONICS, INC.	Yes	Yes	No	1.7
7	AC power cable	HIRAKAWA	No	No	No	1.9

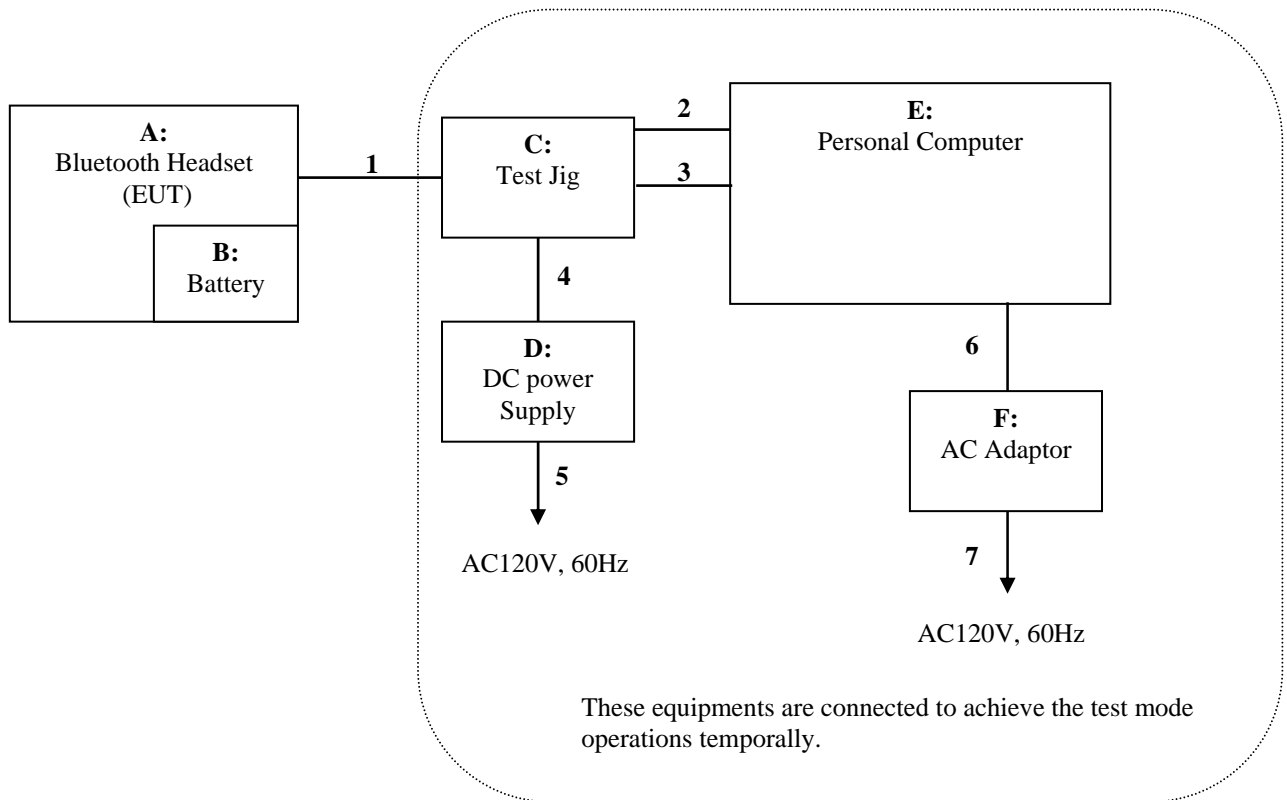
1.6.2 Operating condition:

Operating mode:

The EUT was tested under the following test mode prepared by the applicant;:

- (1-1) Continuous transmission with DH5 PACKET at hopping off (2402MHz)
- (1-2) Continuous transmission with DH5 PACKET at hopping off (2441MHz)
- (1-3) Continuous transmission with DH5 PACKET at hopping off (2480MHz)
- (2-1) Continuous receiving

1.6.3 Setup diagram of tested system:



1.7 Equipment modifications

No modifications have been made to the equipment in order to achieve compliance with the applicable standards described in clause 1.2.

1.8 Deviation from the standard

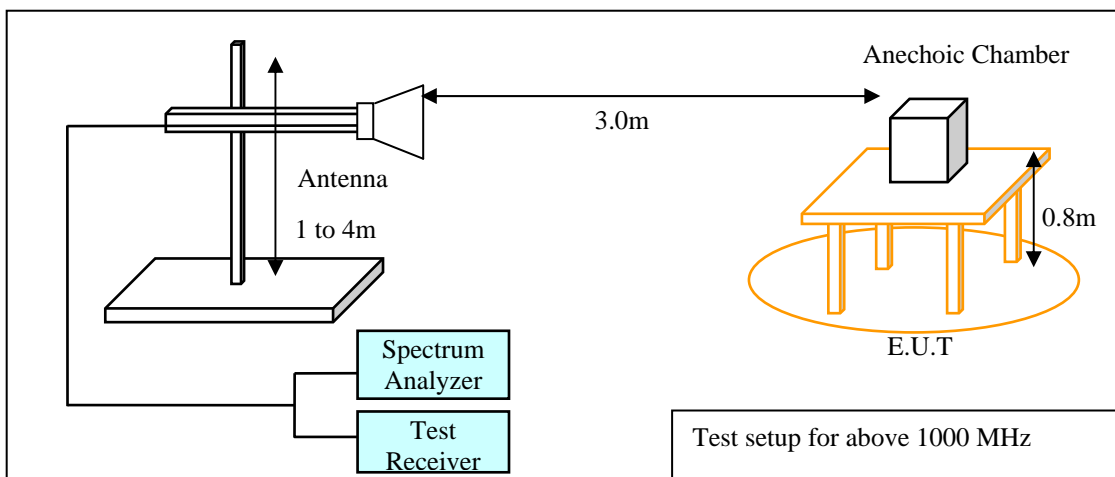
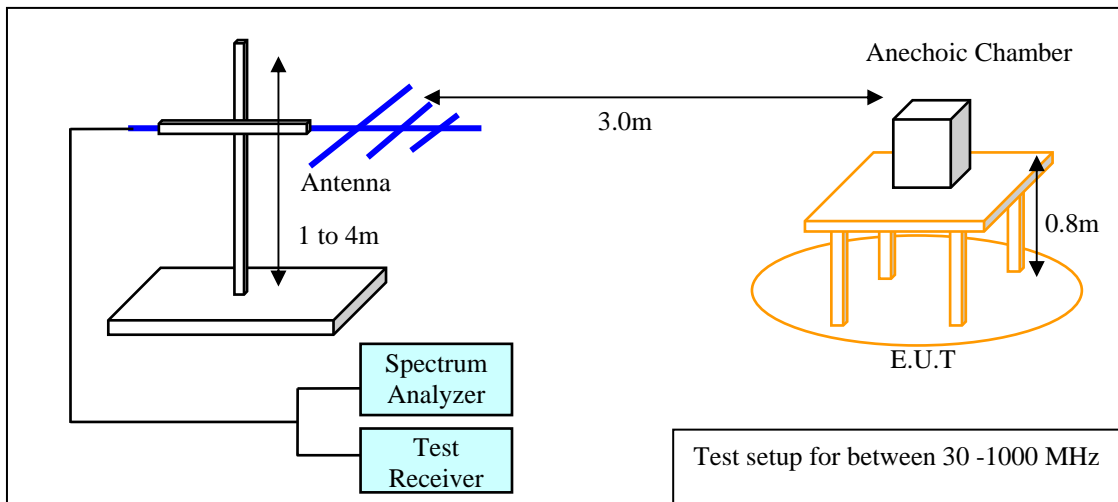
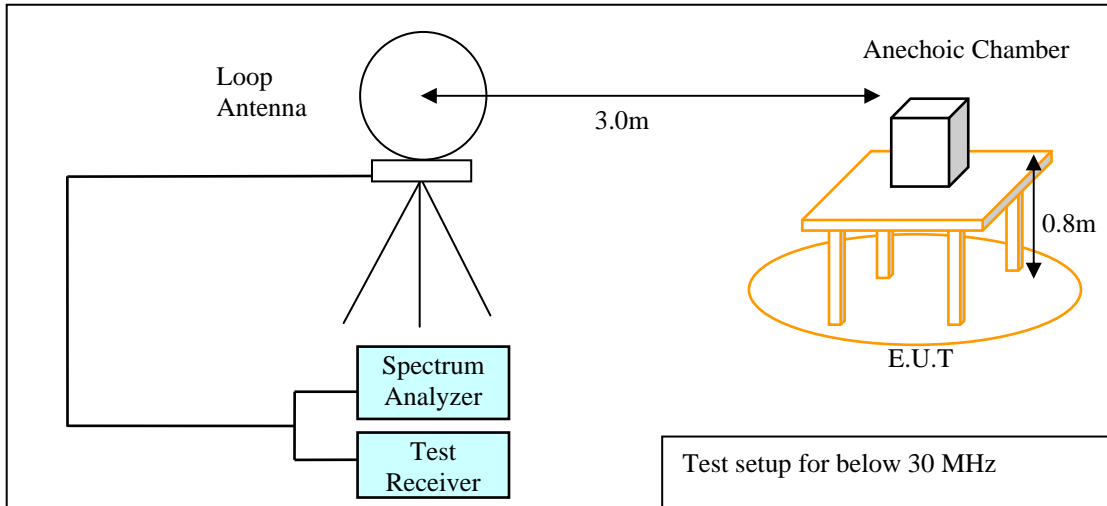
No deviations from the standards described in clause 1.2.

2 Test procedure and test data

2.1 Transmitter Radiated spurious emissions

Test setup

Test setup was implemented according to the method of ANSI C63.4: 2003 clause 6 “General requirements for EUT equipment arrangements and operation”, clause 8.2 and Annex H.3 “Radiated emission measurements setup”.



Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2003 clauses 8.2. The EUT is placed on a non-conducted table which is 0.8m height from a ground plane and the measurement antenna to EUT distance is 3 meters. The turn table is rotated for 360 degrees to determine the maximum emission level. In the frequency range of 9 kHz to 30 MHz, a calibrated loop antenna was positioned with its plane vertical at the distance 3m from the EUT with an extrapolation of corrected distance factor and rotated about its vertical axis for maximum response at each azimuth about the EUT. For certain applications, the loop antenna also needs to be positioned horizontally. The center of the loop shall be 1 m above the ground. In the frequency above 30 MHz, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. EUT is placed at three different orientations (X, Y and Z axis) in order to find the worst orientation. The spectrum analyzer and receiver is set to the followings;

- Below 30 MHz: RBW=10 kHz, VBW= 30 kHz
Final measurement is carried out with a receiver RBW of 9 kHz (QP)
- Between 30 - 1000 MHz: RBW=100 kHz, VBW= 300 kHz
Final measurement is carried out with a receiver RBW of 120 kHz (QP)
- Above 1000 MHz: Peak measurement- RBW=1 MHz, VBW= 1 MHz
Average measurement- RBW=1 MHz, VBW=10 Hz

Applicable rule and limitation

§15.205 restricted bands of operation

Except as shown in paragraph 15.205 (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.490 - 0.510	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(1)

15.205(b) except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

In the emission table above, the tighter limit applies at the band edges.

The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz.

Radiated emission limits in the above bands are based on measurements employing an average detector.

Test results - Complied with requirement.

2.1.1 Below 30 MHz

Test equipment used (refer to List of utilized test equipment)

LP01	CL11	TR04	
------	------	------	--

Tested Date: February 2, 2009

Temperature: 19 °C
 Humidity: 28 %
 Atmos. Press: 1026 hPa

Result

The spectrum was checked from 9 kHz to 30MHz. There were no spurious emissions greater than noise floor or with the level of more than 20dB below the applicable limit.

2.1.2 Between 30 – 1000 MHz

Test equipment used (refer to List of utilized test equipment)

BA03	CL11	PR03	TR04
------	------	------	------

Tested Date: February 2, 2009

Temperature: 19 °C
 Humidity: 28 %
 Atmos. Press: 1026 hPa

Result

The spectrum was checked from 30 MHz to 1000MHz. There were no spurious emissions greater than noise floor or with the level of more than 20dB below the applicable limit.

2.1.3 Above 1000 MHz

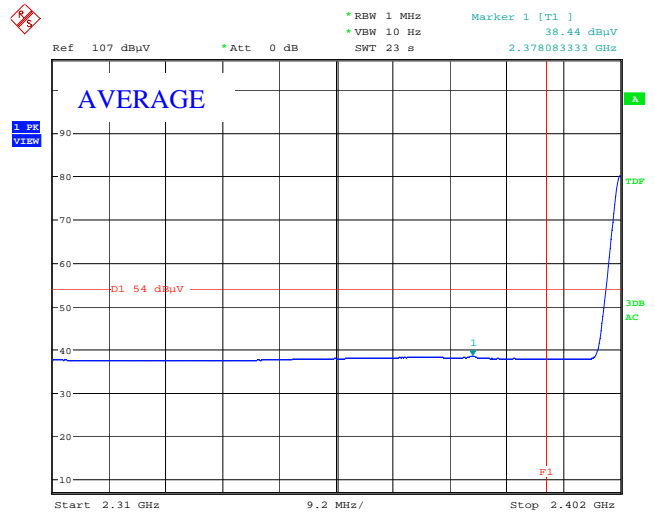
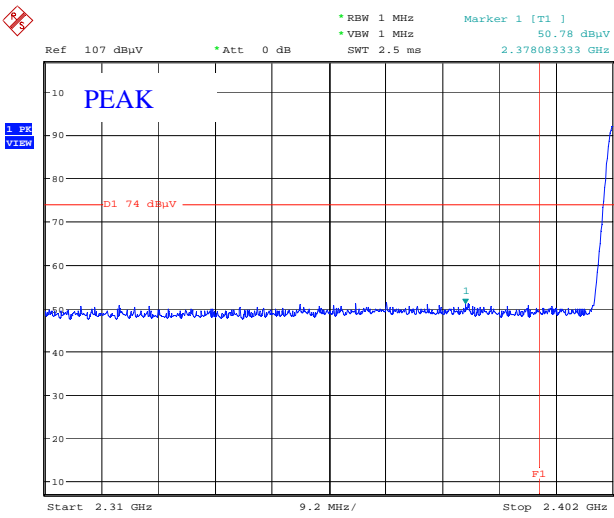
Test equipment used (refer to List of utilized test equipment)

PR12	SH01	TR06	CL23	CL24	HPF1	DH01	AC01
------	------	------	------	------	------	------	------

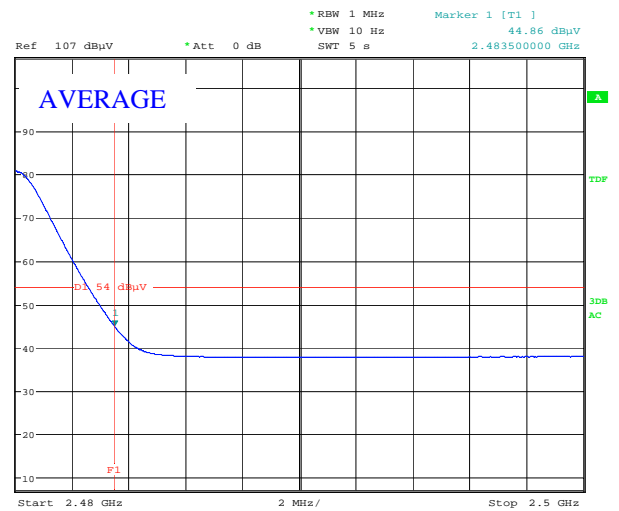
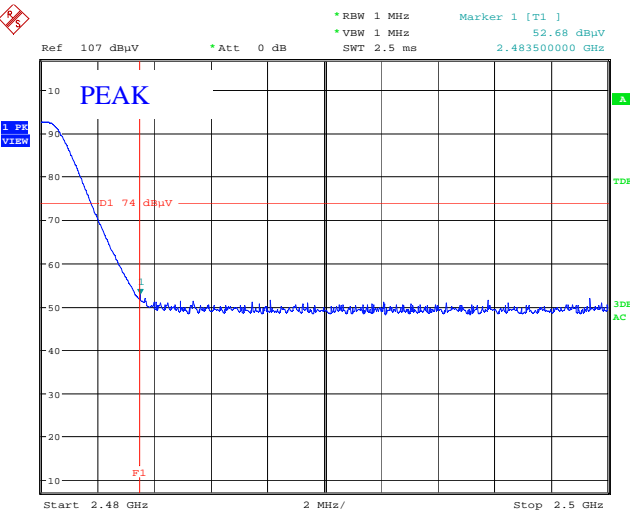
Tested Date: January 29, 2009

Temperature: 19 °C
 Humidity: 35 %
 Atmos. Press: 1030 hPa

Restricted Band Edge (GFSK, Low channel, Worst Configuration (Horizontal, Z-plane))



Restricted Band Edge (GFSK, High channel, Worst Configuration (Vertical, Z-plane))



Harmonics and Spurious Emission above 1000 MHz

There are no spurious emissions other than listed below;

Operating mode: Continuous Communication (GFSK)

Measurement distance: 3 m

TX CH (MHz)	Frequency [MHz]	Reading [dBuV]		C.F. [dB]	Result [dBuV/m]		Limit [dBuV/m]		Margin [dB]		Polarization
		Peak	Ave.		Peak	Ave.	Peak	Ave.	Peak	Ave.	
0ch 2402	4804.083	60.3	51.9	2.0	62.3	53.9	73.9	53.9	11.6	0	Hori.
	4803.951	57.0	49.1	2.0	59.0	51.1	73.9	53.9	14.9	2.8	Vert.
39ch 2441	4882.012	54.5	46.5	2.2	56.7	48.7	73.9	53.9	17.2	5.2	Hori.
	4881.967	57.9	49.8	2.2	60.1	52.0	73.9	53.9	13.8	1.9	Vert.
79ch 2480	4959.935	54.2	46.3	2.5	56.7	48.8	73.9	53.9	17.2	5.1	Hori.
	4959.972	57.9	49.9	2.5	60.4	52.4	73.9	53.9	13.5	1.5	Vert.

Result = Reading + C. F (C.F = Antenna Factor + Cable Loss + AMP Gain [dB])

Note1: This frequency is not in the restriction band therefore this spurious emission shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power (15.247 (d)).

The radiated carrier level of each frequency is follows (RBW = 100 kHz);

< 91.7 dBuV/m at 2402 MHz

< 92.4 dBuV/m at 2441 MHz

< 92.4 dBuV/m at 2480 MHz

2.2 Receiver Radiated spurious emissions

Test setup - Same as clause 2.1

Test procedure - Same as clause 2.1

Applicable rule and limitation at 3m

§15.109 radiated emission limitation

Frequency (MHz)	Measurement Distance (m)	Field Strength (uV/m)	Field Strength (dBuV/m)
30 – 88	3	100	40.0
88 – 216	3	150	43.5
216 – 960	3	200	46.0
Above 960	3	500	54.0

In the emission table above, the tighter limit applies at the band edges.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector.

Test results - Complied with requirement.

2.2.1 Between 30 – 1000 MHz

Test equipment used (refer to List of utilized test equipment)

BA03	CL11	PR03	TR04
------	------	------	------

Tested Date: November 3, 2008

Temperature: 21 °C
 Humidity: 48 %
 Atmos. Press: 1014 hPa

Result

The spectrum was checked from 30 MHz to 1000MHz. There were no spurious emissions greater than noise floor or with the level of more than 20dB below the applicable limit.

2.2.2 Above 1000 MHz

Test equipment used (refer to List of utilized test equipment)

PR12	TR06	CL23	CL24	DH01		
------	------	------	------	------	--	--

Tested Date: January 29, 2009

Temperature: 19 °C
 Humidity: 35 %
 Atmos. Press: 1030 hPa

Operating mode: Receiving

Result

There were no spurious emissions greater than noise floor or with the level of more than 20dB below the applicable limit.

RX CH [MHz]	Frequency [MHz]	Reading [dBuV]	C.F. [dB/m]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
2402	12010	32.0	9.5	< 41.5	53.9	> 12.4
2441	12205	30.8	10.2	< 41.0	53.9	> 12.9
2480	12400	31.0	10.7	< 41.7	53.9	> 12.2

C. F. [dB/m] = FACTOR [dB/m] + LOSS [dB] – GAIN [dB]

4 List of utilized test equipment/ calibration

RFT ID No.	Kind of Equipment and Precision	Manufacturer	Model No.	Serial Number	Calibration Date	Calibrated until
AC01	Anechoic Chamber (1st test room)	JSE	203397C	-	2008/07/04	2009/07/03
BA03	Biological Antenna	CHASE	CBL6111	1309	2008/05/07	2009/05/06
CL11	Antenna Cable	RFT	-	-	2008/06/11	2009/06/10
CL23	RF Cable 0.5m	SUCOFLEX	SF104PE	48773/4PE	2008/06/10	2009/06/09
CL24	RF Cable 5.0m	SUCOFLEX	SF104PE	48775/4PE	2008/06/10	2009/06/09
PR03	Pre. Amplifier	Anritsu	MH648A	M41984	2008/05/12	2009/05/11
PR12	Pre. Amplifier (1-26G)	Agilent Technologies	8449B	3008A02513	2009/01/13	2010/01/12
HPF1	High Pass Filter (3500MHz)	TOKIMEC	TF323DCA	603	2008/06/09	2009/06/08
SH01	Standard Horn Antenna (18-26G)	A.H. Systems	SAS-572	208	2008/07/23	2011/07/22
TR04	Test Receiver (F/W : 3.82 SP1)	Rohde & Schwarz	ESCI	100447	2008/09/16	2009/09/15
TR06	Test Receiver (F/W : 3.93 SP2)	Rohde & Schwarz	ESU26	100002	2008/09/02	2009/09/01
DH01	DRG Horn Antenna	A.H. Systems	SAS-571	785	2008/01/31	2010/01/29

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.