TEST REPORT

For

GPS NAVIGATION SYSTEM (For Bluetooth)

In conformity with

FCC CFR 47 Part15 (October 1, 2009) / RSS-210 Issue 7, RSS-Gen Issue 2

Model: KW-NT3HDT / KW-NT3HD

FCC ID/ IC Certification No.: ASIV1A005 / 2320A-V1A005

Test Item: GPS NAVIGATION SYSTEM (For Bluetooth)

Report No: RY1003J09R1

Issue Date: March 09, 2010

Prepared for

Victor Company of Japan, Limited
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Prepared by

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History

Report No.	Date	Revisions	Revised By
RY1003J09R1	March 09, 2010	Initial Issue	R.Kojima

1 General information

1.1 Product description

Test item	: GPS NAVIGATION SYSTEM (For Bluetooth)
Manufacturer	: PT.JVC Electronics Indonesia
Address	: KI.Surya Lestari Kav.I-16B, Suryacipta City of Industry, Kutamekar, Ciampel, Karawang 41361, Jawa Barat, Indonesia.
Model	: KW-NT3HDT / KW-NT3HD
FCC ID	: ASIV1A005
IC Certification No	: 2320A-V1A005
Serial numbers	: 075X0200 (KW-NT3HDT for radiated) 075X0201 (KW-NT3HDT for conducted) 075X0202 (KW-NT3HD for radiated)
Fundamental Operated Frequency	: Tx/Rx Freq. (2402 MHz – 2480 MHz)
Oscillator frequencies	: 32.7680kHz, 12.5000MHz, 16.9340MHz, 26.0000MHz, 27.0000MHz, 28.2240MHz, 33.3333MHz, 41.600MHz
Type of Modulation	: GFSK, π /4DQPSK, 8DPSK
RF Output Power	: 2.52 mW (measured at the antenna terminal)
Antenna Gain	: 0.36 dBi
Receipt date of EUT	: February 05, 2010
Nominal power source voltages	: DC 12 V

1.2 Test(s) performed/ Summary of test result

Test specification(s)	: FCC CFR 47. Part 15 (October 1, 2009) / RSS-210 Issue 7, RSS-Gen Issue 2
Test method(s)	: ANSI C63.4: 2003
Test(s) started	: February 08, 2010
Test(s) completed	: March, 08, 2010
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 : R.Kojima
Engineer
EMC testing Department

Reviewer : K. Ohnishi
K.Ohnishi
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) Each 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;

RF Conducted emission ± 1.0dB (9kHz – 26GHz)
Radiated emission (9 kHz - 30MHz): ± 2.8 dB
Radiated emission (30MHz - 1000MHz): ± 5.7 dB
Radiated emission (1.0GHz – 18.0GHz): ± 5.8 dB
Radiated emission (18.0GHz – 26.0GHz): ± 5.9 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	Sample	Section in this report
Occupied Bandwidth (20 dB/99%)	15.247(a)(1)	A8.1(a)	Complied	A2	2.1
Hopping Carrier Frequency Separation	15.247(a)(1)	A8.1(b)	Complied	A2	2.2
Number of Hopping Channel	15.247(a)(1)(iii)	A8.1(d)	Complied	A2	2.3
Average Time of Occupancy	15.247(a)(1)(iii)	A8.1(d)	Complied	A2	2.4
Peak Output Power	15.247(a)(1)/(b)(1)	A8.4(2)	Complied	A2	2.5
Conducted Spurious Emissions	15.247(d)	A8.5	Complied	A2	2.6
Transmitter Radiated Spurious Emissions	15.205(b)/15.209	RSS-Gen 4.9	Complied	A1, A3	2.7
Receiver Radiated Spurious Emissions	15.109	RSS-Gen 6	Complied	A1, A3	2.8

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.	Remark
A1	GPS NAVIGATION SYSTEM	PT.JVC Electronics Indonesia	KW-NT3HDT	075X0200	For Radiated
A2	GPS NAVIGATION SYSTEM	PT.JVC Electronics Indonesia	KW-NT3HDT	075X0201	For Conducted
A3	GPS NAVIGATION SYSTEM	PT.JVC Electronics Indonesia	KW-NT3HD	075X0202	For Radiated

Note: KW-NT3HDT has traffic information tuner, KW-NT3HD has same tuner, however, KW-NT3HD's traffic information tuner does not work.

Support Equipment(s):

	Item	Manufacturer	Model No.	Serial No.
-	-	-	-	-

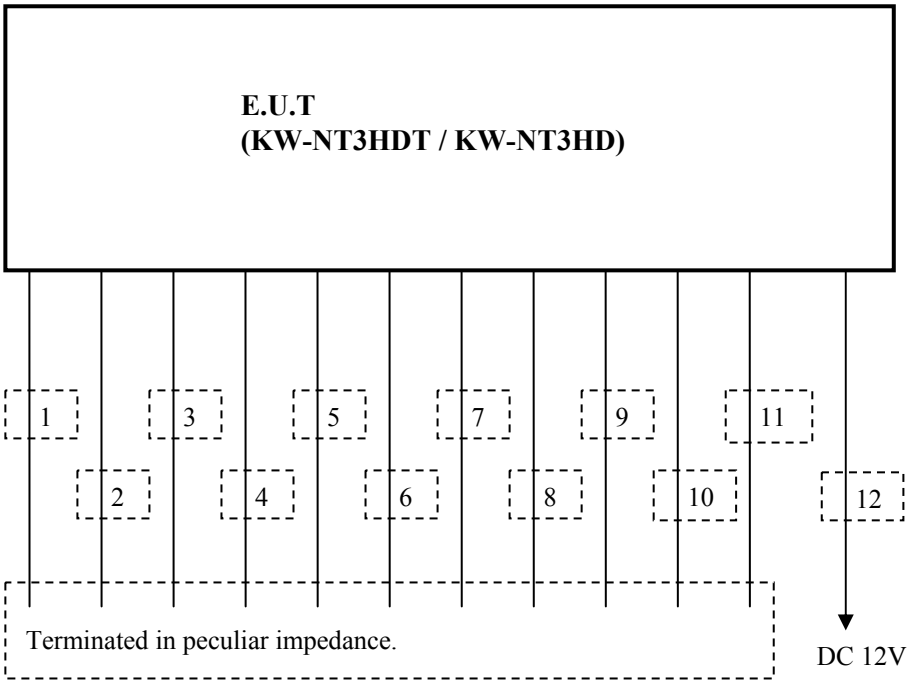
Connected cable(s):

No.	Item	Identification (Manu.e.t.c)	Shielded YES / NO	Ferrite Core YES / NO	Connector Type Shielded YES / NO	Length (m)
1	AV I/O cable	JVC	Yes	No	No	3.0
2	Sub Woofer cable	JVC	Yes	No	No	3.0
3	Car cable	ASAHI BEST	No	No	No	3.0
4	J-BUS cable	JVC	Yes	No	No	5.0
5	Microphone In cable	MERRY ELECTRONICS	Yes	No	No	3.0
6	R-Out cable	JVC	Yes	No	No	3.0
7	F-Out cable	JVC	Yes	No	No	3.0
8	FM Antenna cable	JVC	Yes	No	No	3.0
9	GPS Antenna cable	MITSUMI	Yes	No	No	5.0
10	USB cable	JVC	Yes	No	No	3.0
11	AUX In cable	JVC	Yes	No	No	3.0
12	DC power cable	-	No	No	No	3.0

1.6.2 Operating condition:

Operating mode:
The EUT was tested under the following test mode prepared by the applicant:
(1-1) GFSK, Max continuous transmission with DH1/3/5 PACKET at hopping off (2402MHz)
(1-2) GFSK, Max continuous transmission with DH1/3/5 PACKET at hopping off (2441MHz)
(1-3) GFSK, Max continuous transmission with DH1/3/5 PACKET at hopping off (2480MHz)
(1-4) π/4DQPSK, Max continuous transmission with DH1/3/5 PACKET at hopping off (2402MHz)
(1-5) π/4DQPSK, Max continuous transmission with DH1/3/5 PACKET at hopping off (2441MHz)
(1-6) π/4DQPSK, Max continuous transmission with DH1/3/5 PACKET at hopping off (2480MHz)
(1-7) 8DPSK, Max continuous transmission with DH1/3/5 PACKET at hopping off (2402MHz)
(1-8) 8DPSK, Max continuous transmission with DH1/3/5 PACKET at hopping off (2441MHz)
(1-9) 8DPSK, Max continuous transmission with DH1/3/5 PACKET at hopping off (2480MHz)
(2-10) Continuous transmission with DH1/3/5 PACKET at hopping on
(3-1) Continuous Receiving (2402MHz)
(3-2) Continuous Receiving (2441MHz)
(3-3) Continuous Receiving (2480MHz)

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.

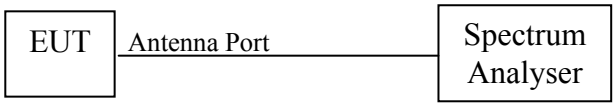
1.8 Deviation from the standard

No deviations from the standards described in clause 1.2.

2 Test procedure and test data

2.1 Occupied Bandwidth (20 dB / 99%)

Test setup
Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure
Measurement procedures were implemented according to the method of ANSI C63.4: 2003 clauses 13.1.7. The EUT antenna port connected to the spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth bandwidth. The VBW is set to 3 times of the RBW. The sweep time is coupled appropriate.

Limitation
There are no limitations. The measurement value is used to calculation of the limitation of the channel separation and the emission designator.

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

SA06	CL27				

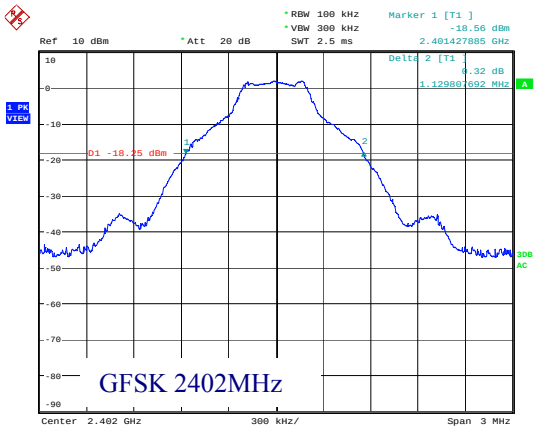
Test results

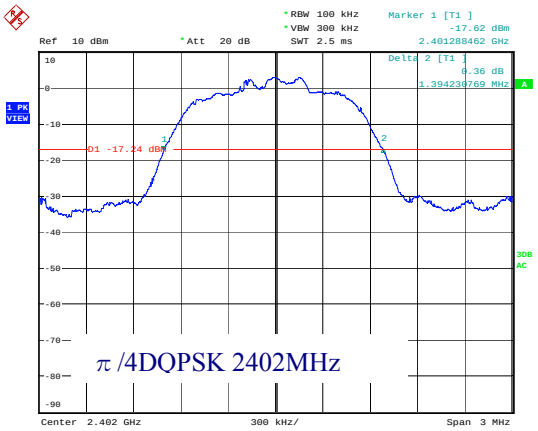
Operating Mode	Transmission Channel	Transmission Frequency [MHz]	Bandwidth [MHz]	
			20dB	99%
GFSK (1Mbps)	Low (0ch)	2402.000	1.130	0.966
	Middle (39ch)	2441.000	1.139	0.962
	High (78ch)	2480.000	1.111	0.966
π/4DQPSK (2Mbps)	Low (0ch)	2402.000	1.394	1.221
	Middle (39ch)	2441.000	1.385	1.207
	High (78ch)	2480.000	1.385	1.207
8DPSK (3Mbps)	Low (0ch)	2402.000	1.394	1.226
	Middle (39ch)	2441.000	1.389	1.216
	High (78ch)	2480.000	1.389	1.216

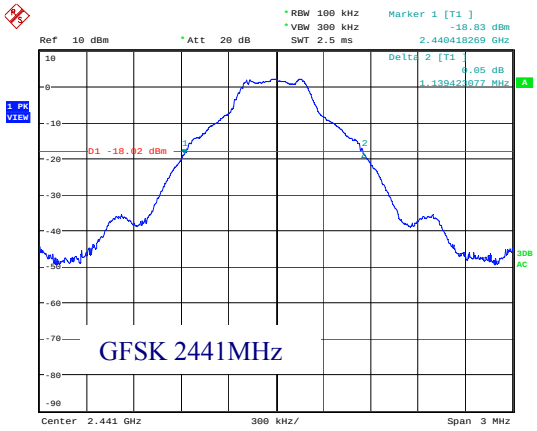
Test Data
Tested Date: February 09, 2010

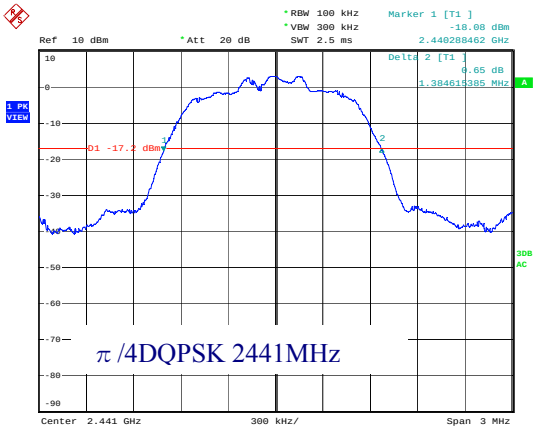
Temperature: 22 ˚C
Humidity: 50 %
Atmos. Press: 1024 hPa

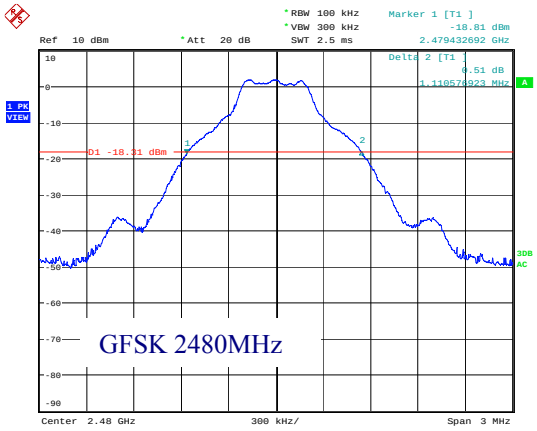
20dB Bandwidth

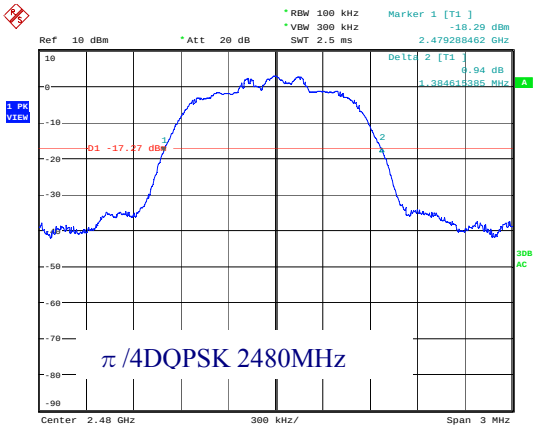




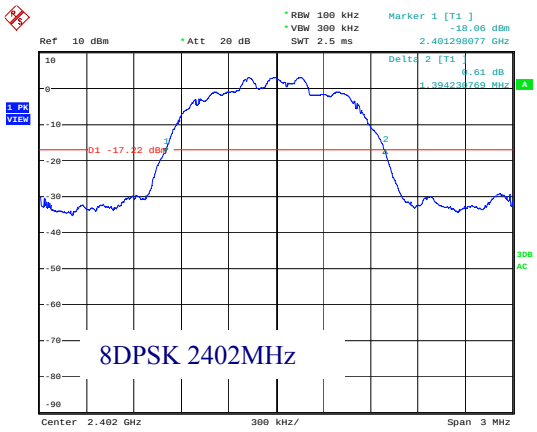


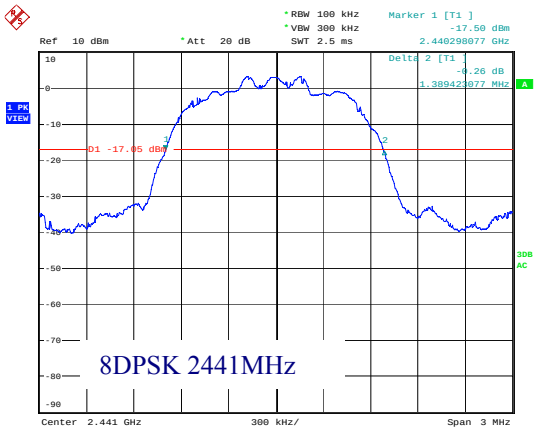


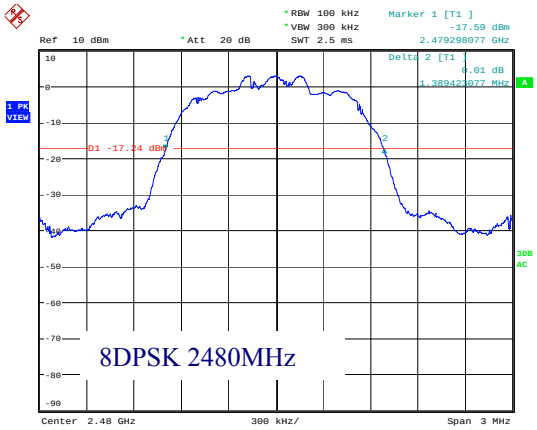




20dB Bandwidth



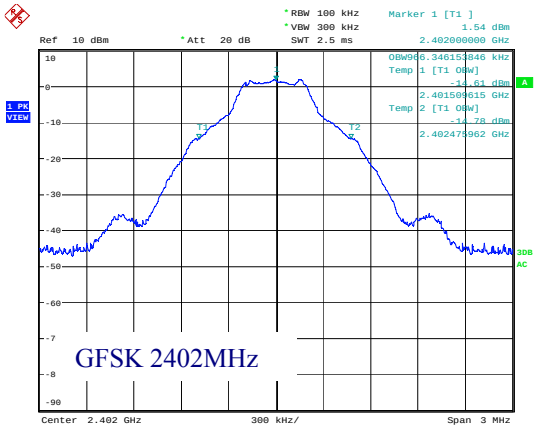


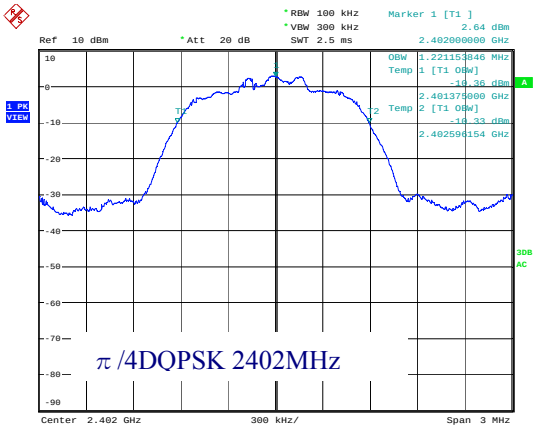


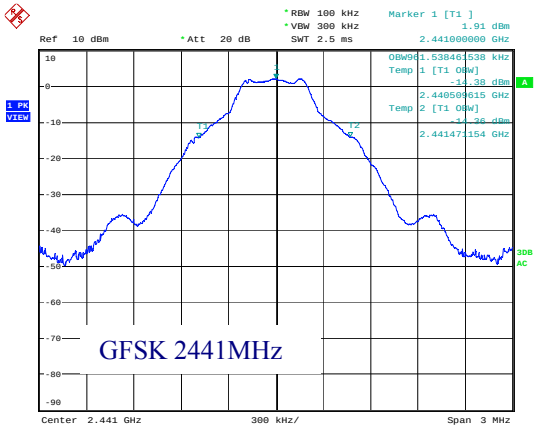
Test Data
Tested Date: February 09, 2010

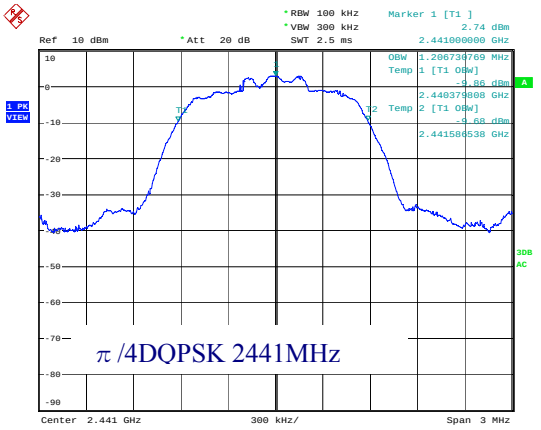
Temperature: 22 ˚C
Humidity: 50 %
Atmos. Press: 1024 hPa

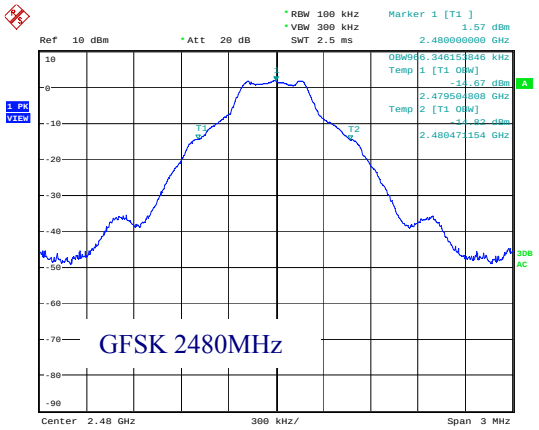
99% Occupied Bandwidth

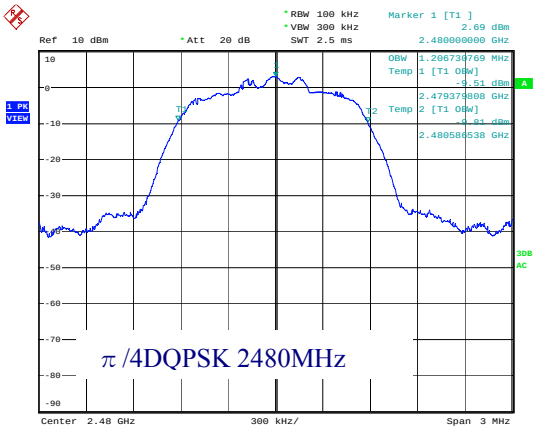




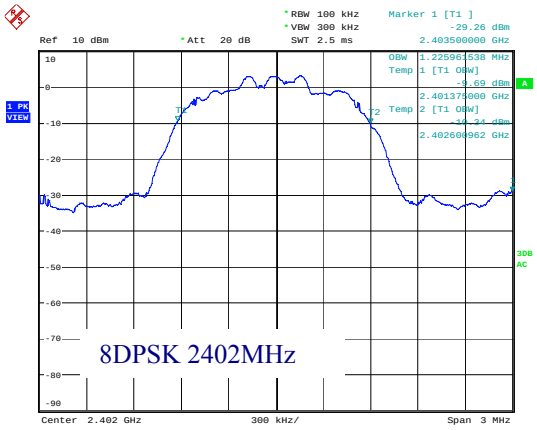


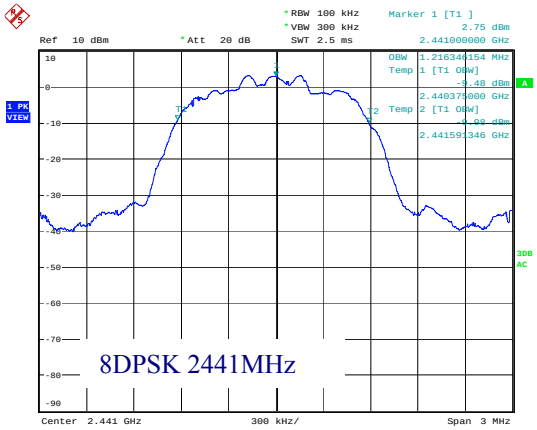


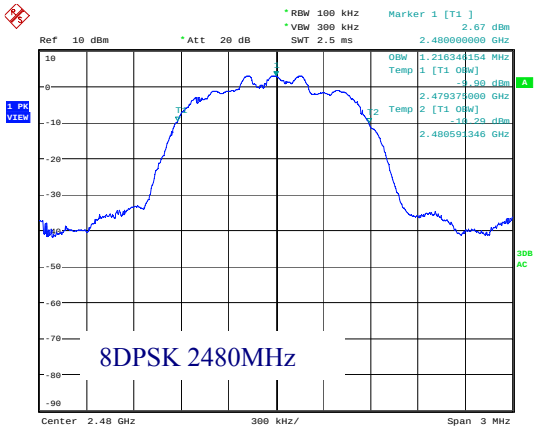




99% Occupied Bandwidth

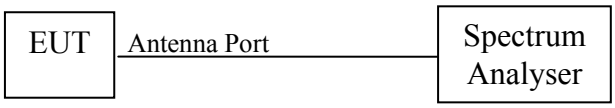






2.2 Hopping Carrier Frequency Separation

Test setup
Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure
The EUT antenna port connected to the spectrum analyzer. The RBW is set to more than 1% of its span. The VBW is set to more than RBW. The sweep time is coupled appropriate.

Limitation
15.247(a)(1) frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

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

SA06	CL27				

Test results – comply with the limitation

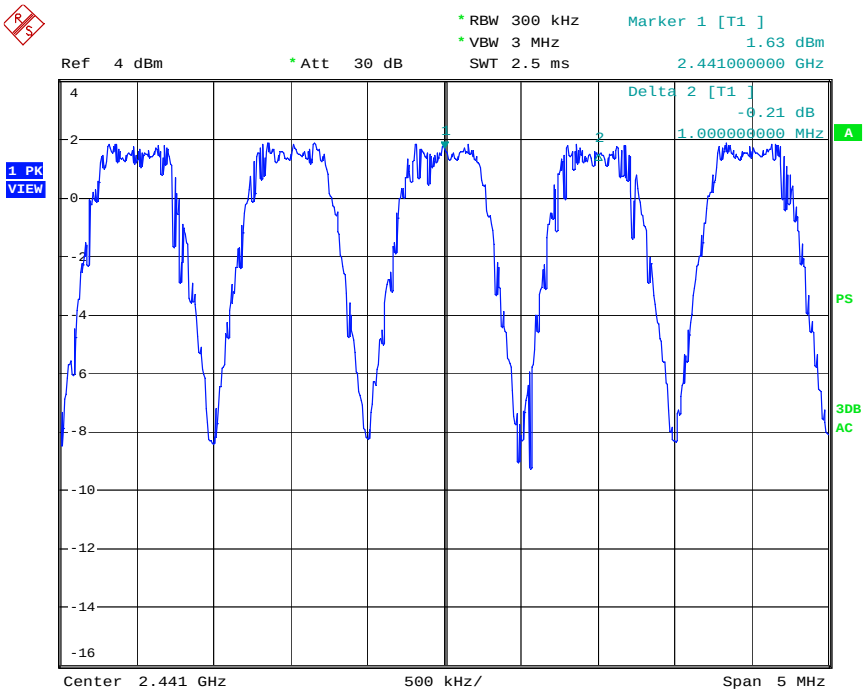
Operating Mode	Measured Channel	Measured Frequency (MHz)	Two-third of the 20dB bandwidth (MHz)	Frequency Separation (MHz)
GFSK	Middle (39ch) Configuration 2	2441	0.759 (worst case)	1.0
π/4DQPSK	Middle (39ch) Configuration 2	2441	0.929 (worst case)	1.0
8DPSK	Middle (39ch) Configuration 2	2441	0.929 (worst case)	1.0

Test Data

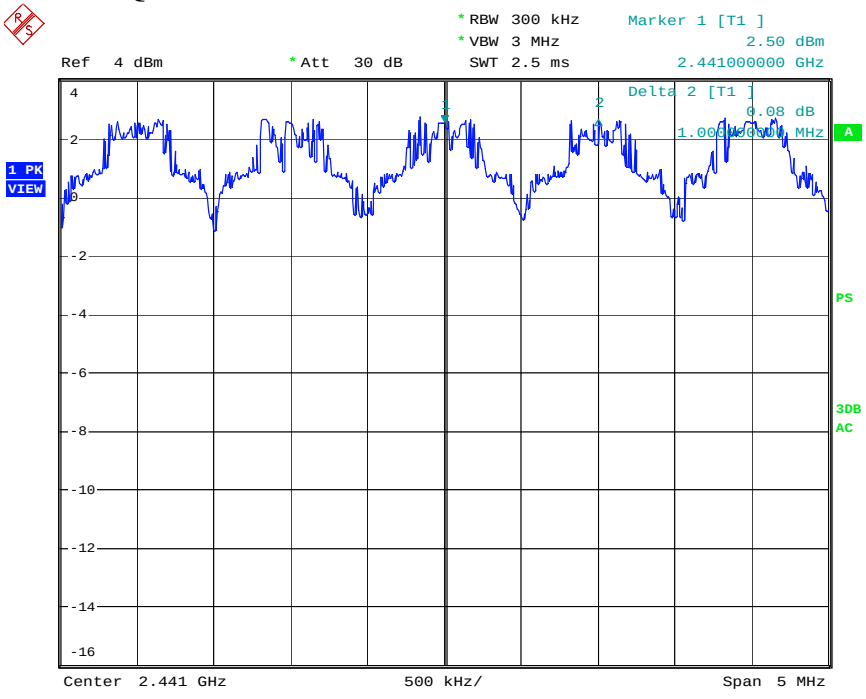
Tested Date: February 09, 2010

Temperature: 22 ˚C
Humidity: 50 %
Atmos. Press: 1024 hPa

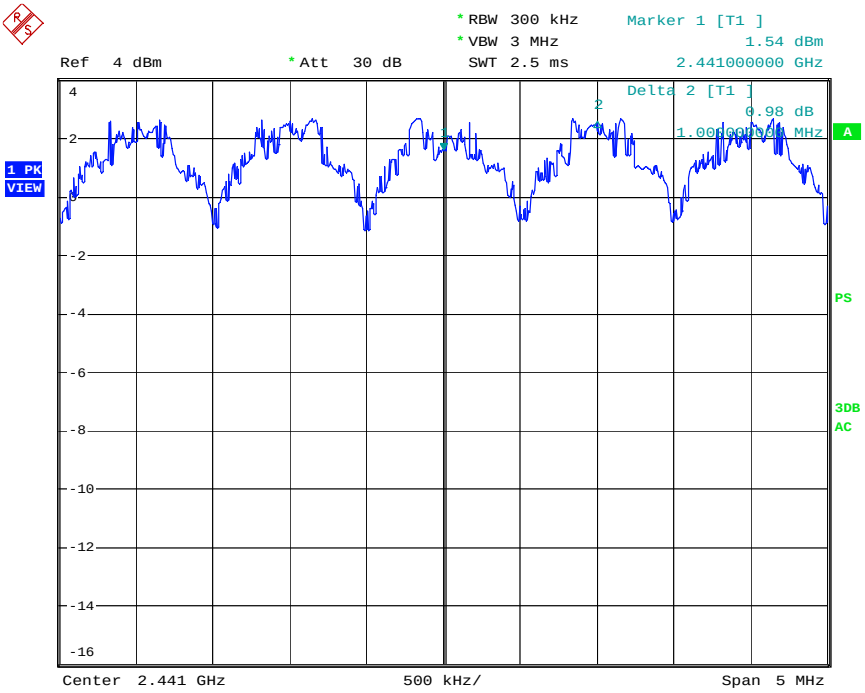
Operating mode: GFSK



Operating mode: π/4DQPSK

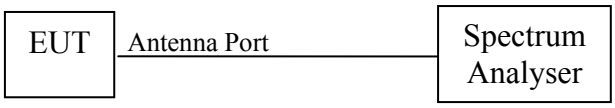


Operating mode: 8DPSK



2.3 Number of Hopping Channel

Test setup
Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure
The EUT antenna port connected to the spectrum analyzer. The RBW is set to more than 1% of its span. The VBW is set to more than RBW. The sweep time is coupled appropriate. The span is set to cover the authorized band. The analyzer is set to MAX HOLD. The EUT is hopping operation.

Limitation
15.247(a) (1) (iii) (iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

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

SA06	CL27				

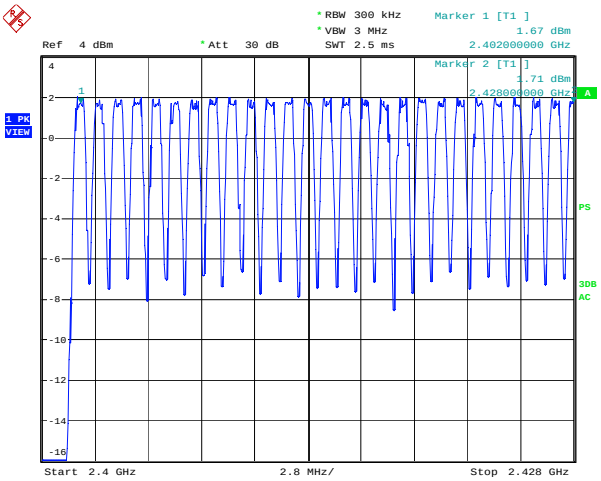
Test results – Comply with the limitation
Hopping channel: 79 channels

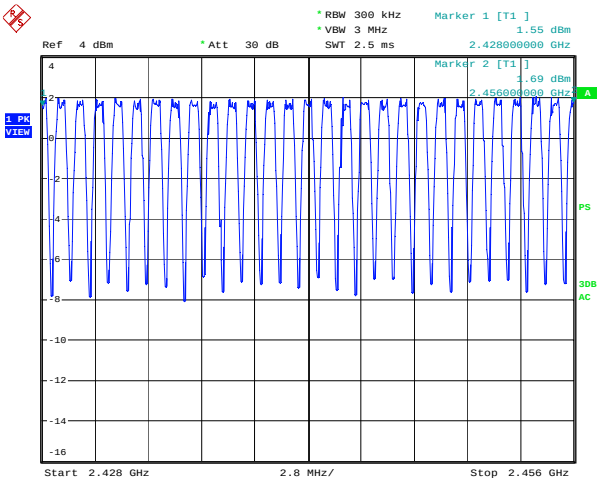
Test Data

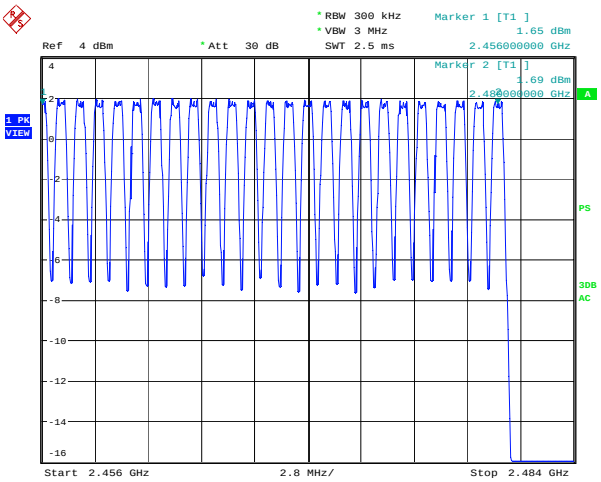
Tested Date: February 09, 2010

Temperature: 22 ˚C
Humidity: 50 %
Atmos. Press: 1024 hPa

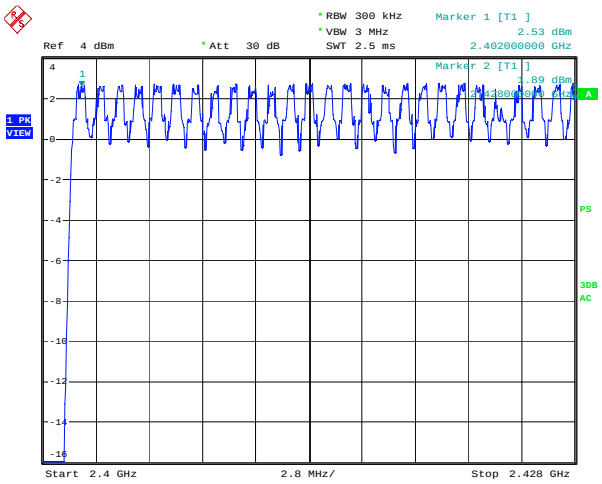
Operating mode: GFSK

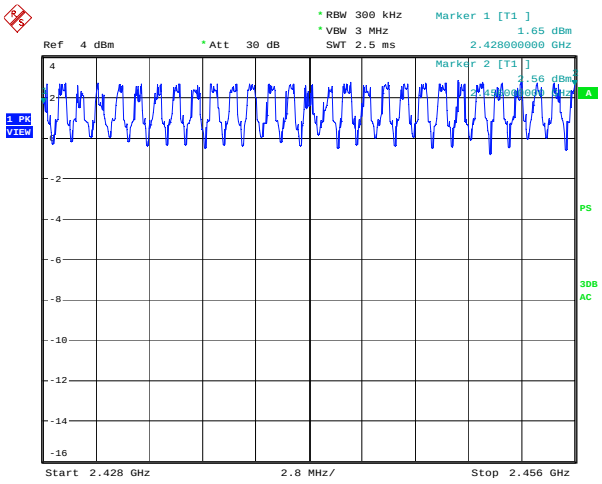


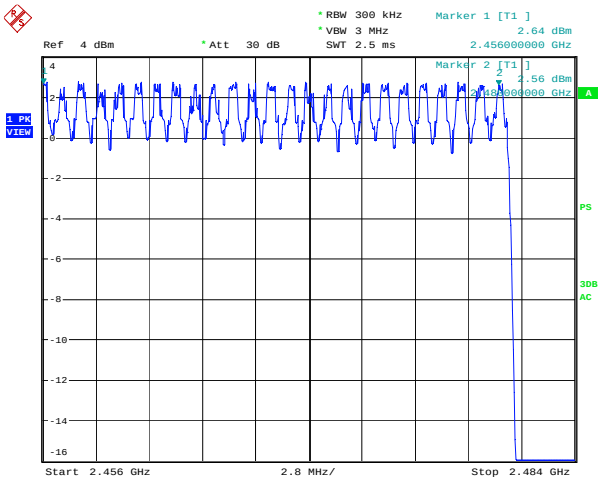




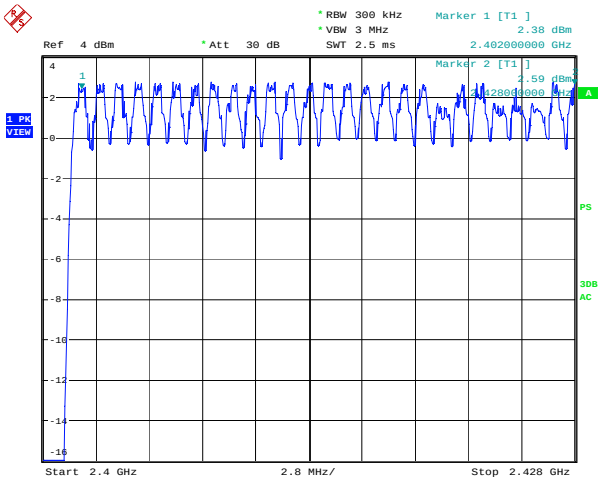
Operating mode: π/4DQPSK

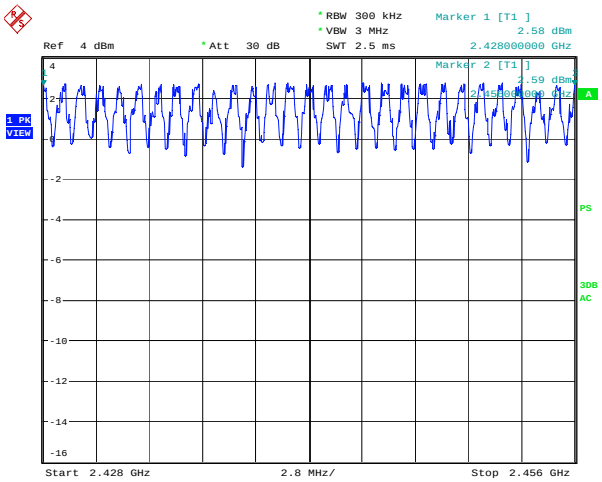


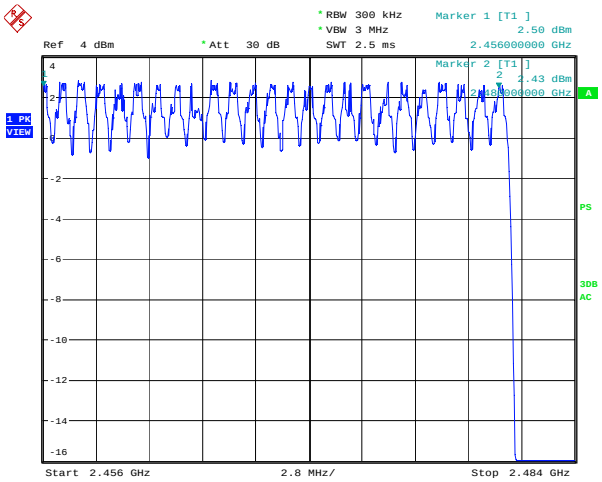




Operating mode: 8DPSK

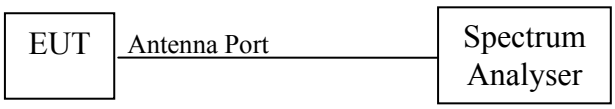






2.4 Average Time of Occupancy

Test setup
Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure
The EUT antenna port connected to the spectrum analyzer. The RBW is set to 1 MHz. The VBW is set to more than RBW. The sweep time is coupled appropriate. The span is set to 0 MHz and single sweep with video triggered. The EUT is hopping operation.
The average time of occupancy within the 31.6 seconds (79 channels * 0.4) is calculated as follows in accordance with Bluetooth formula;
In case of DH1: (average time of occupancy) = (pulse width) * (1600 / 2) / 79 * 31.6
In case of DH3: (average time of occupancy) = (pulse width) * (1600 / 4) / 79 * 31.6
In case of DH5: (average time of occupancy) = (pulse width) * (1600 / 6) / 79 * 31.6

Limitation
15.247(a)(1)(iii) The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

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

SA06	CL27				

Test results – comply with the limitation.

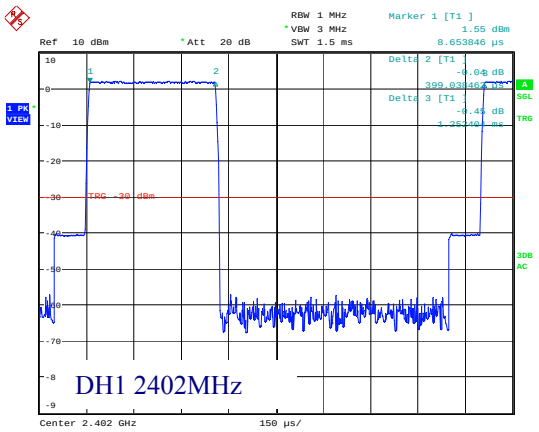
Operating Mode	Frequency [MHz]	Transmission Packet Type	Pulse width (msec)	Time of occupancy (msec)
GFSK	2402	DH1	0.399	127.680
		DH3	1.675	268.000
		DH5	2.930	312.533
	2441	DH1	0.401	128.320
		DH3	1.675	268.000
		DH5	2.930	312.533
	2480	DH1	0.401	128.320
		DH3	1.675	268.000
		DH5	2.930	312.533
π /4DQPSK	2402	DH1	0.416	133.120
		DH3	1.684	269.440
		DH5	2.937	313.280
	2441	DH1	0.411	131.520
		DH3	1.679	268.640
		DH5	2.937	313.280
	2480	DH1	0.411	131.520
		DH3	1.684	269.440
		DH5	2.937	313.280
8DPSK	2402	DH1	0.413	132.160
		DH3	1.679	268.640
		DH5	2.937	313.280
	2441	DH1	0.413	132.160
		DH3	1.679	268.640
		DH5	2.930	312.533
	2480	DH1	0.413	132.160
		DH3	1.679	268.640
		DH5	2.930	312.533

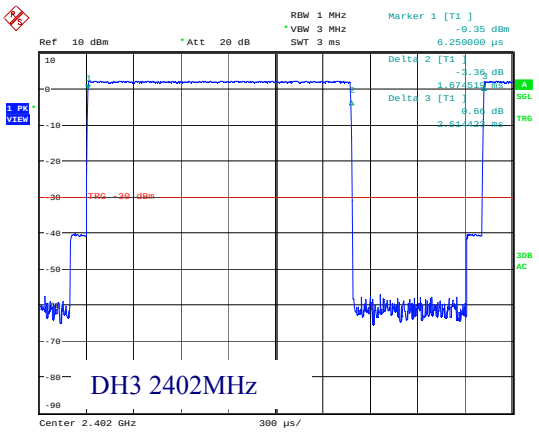
Test Data

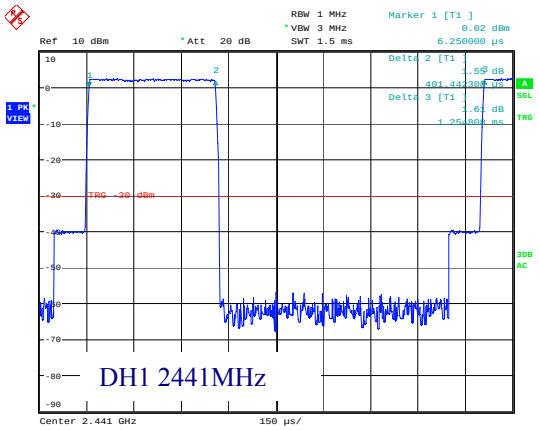
Tested Date: February 09, 2010

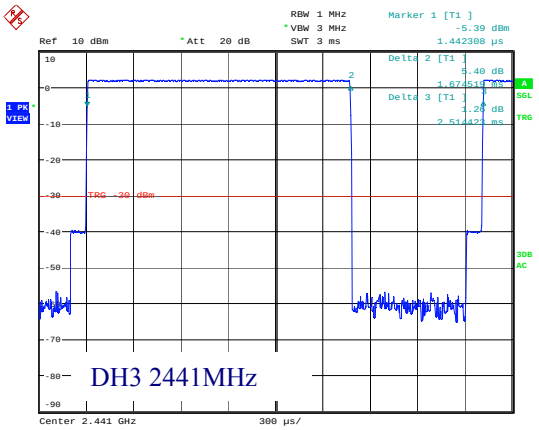
Temperature: 22 ˚C
Humidity: 50 %
Atmos. Press: 1024 hPa

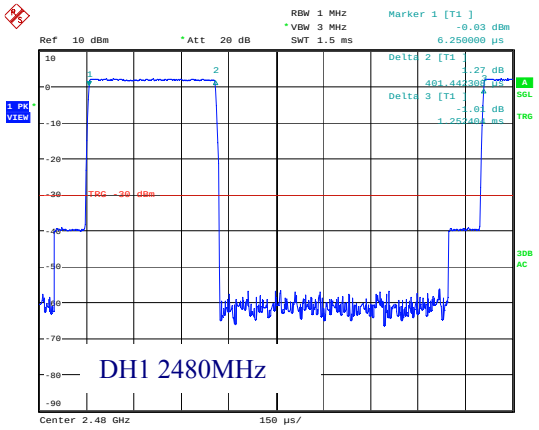
Operating mode: GFSK

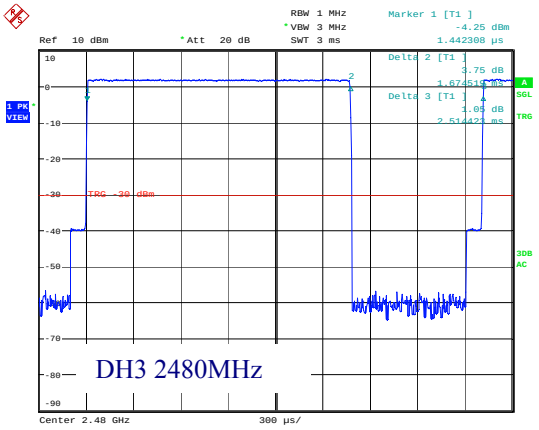




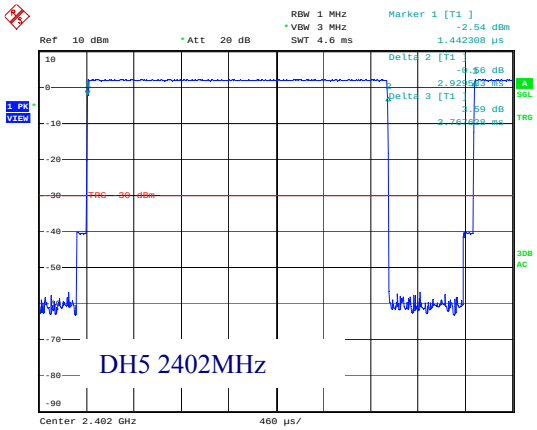


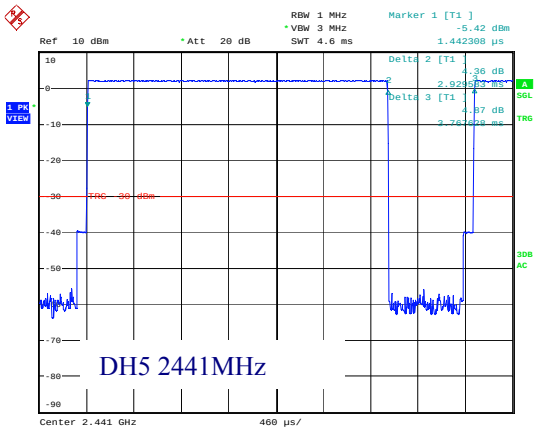


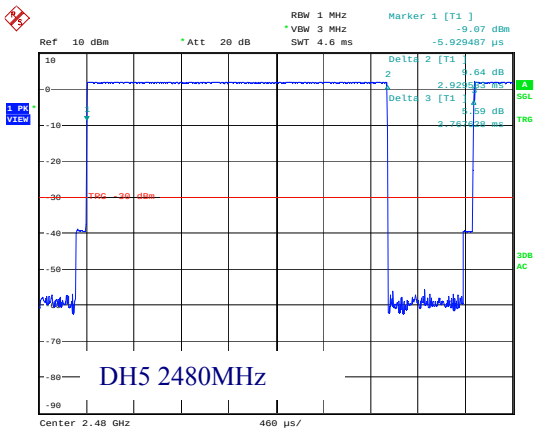




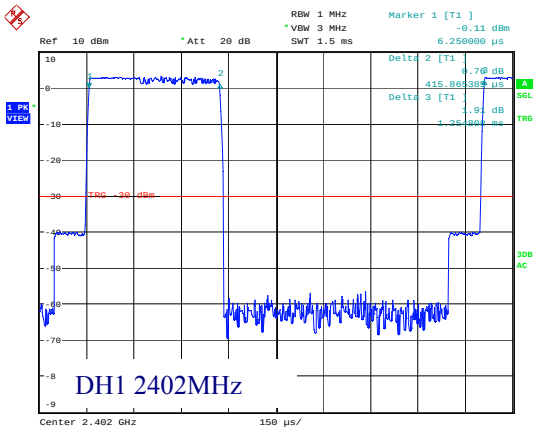
Operating mode: GFSK

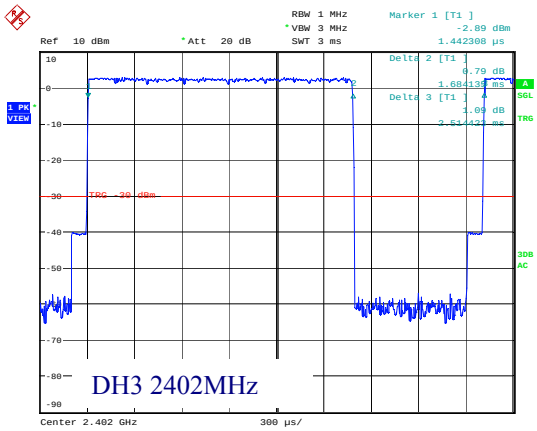


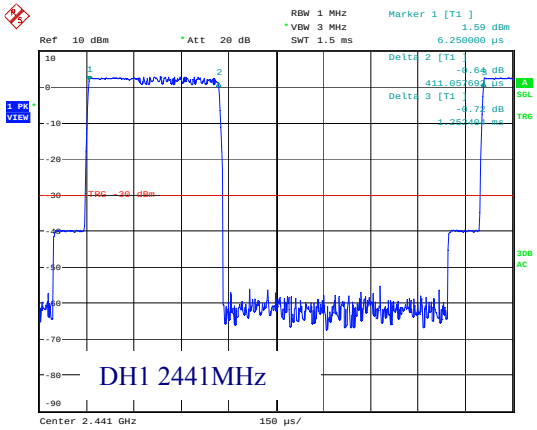


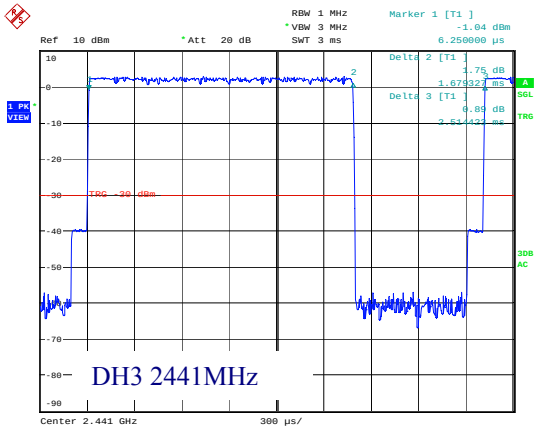


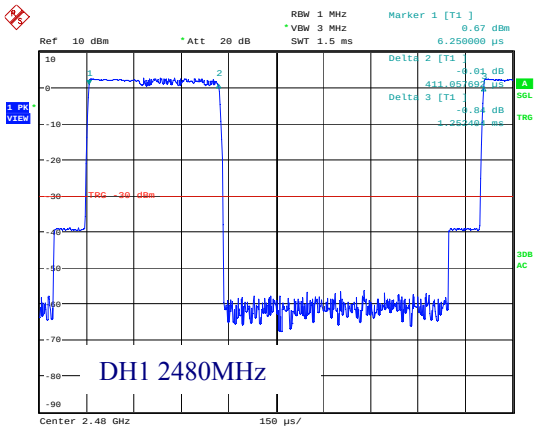
Operating mode: π /4DQPSK

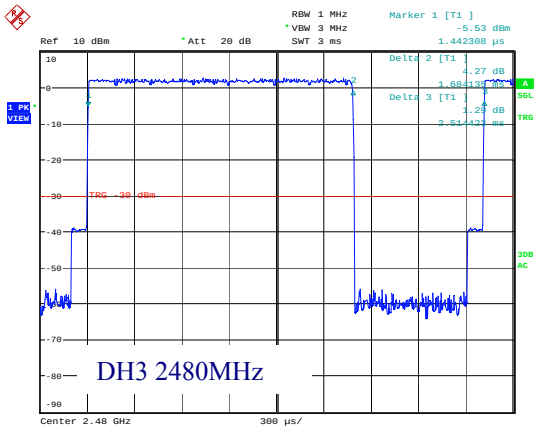




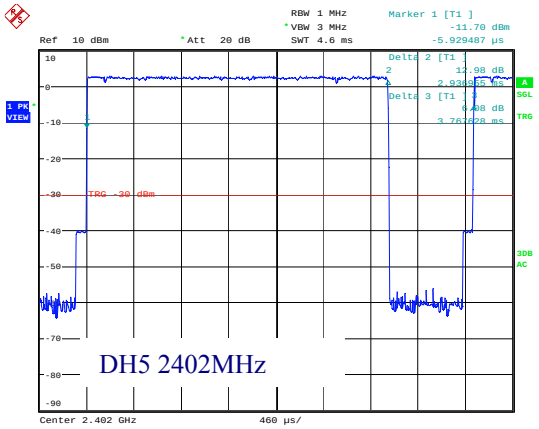


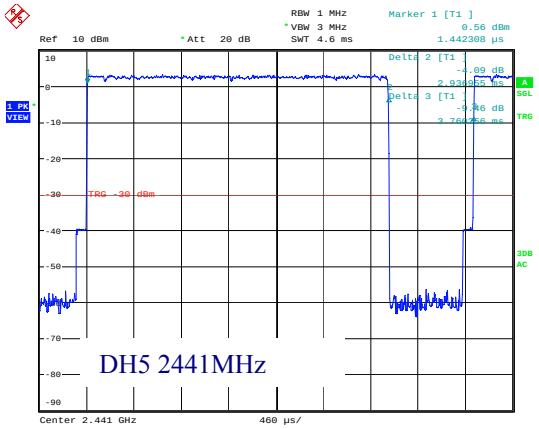


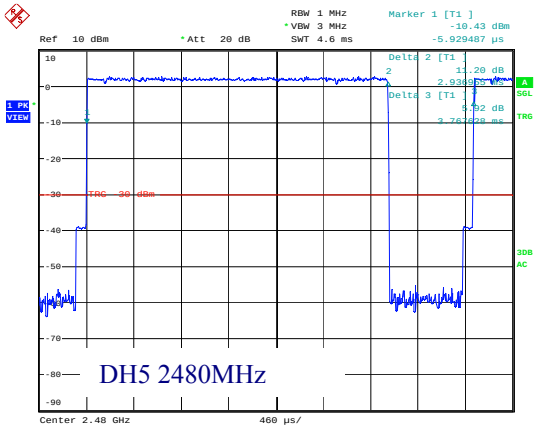




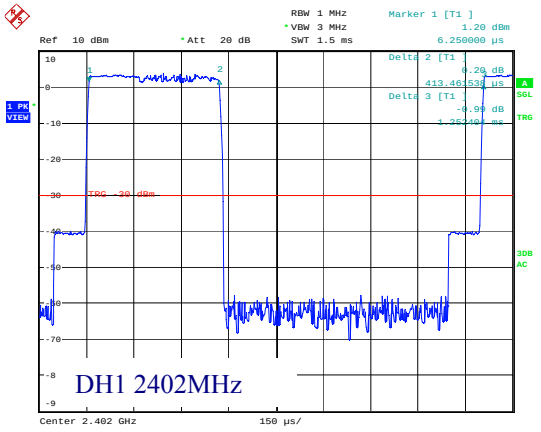
Operating mode: π /4DQPSK

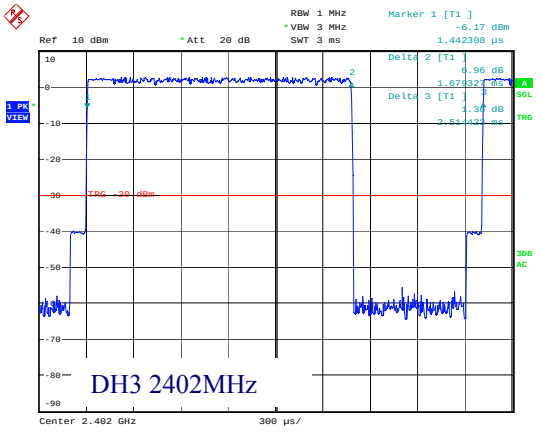


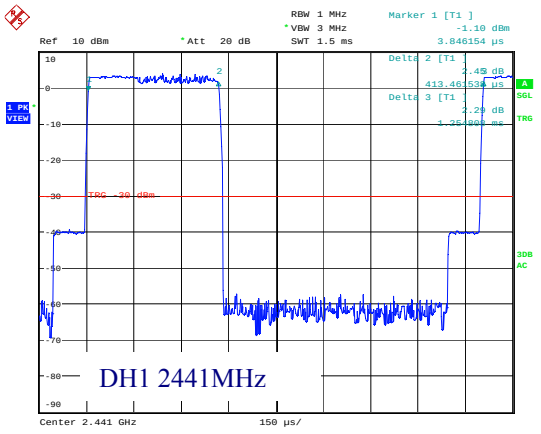


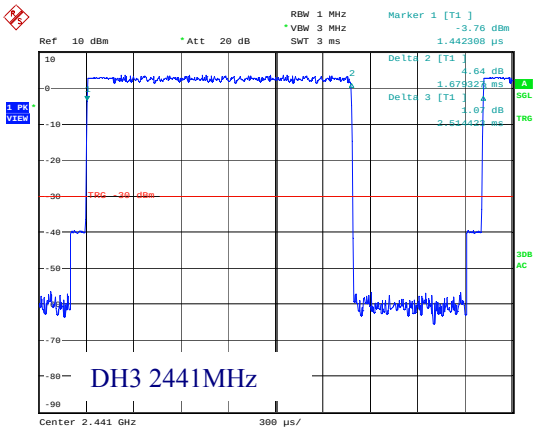


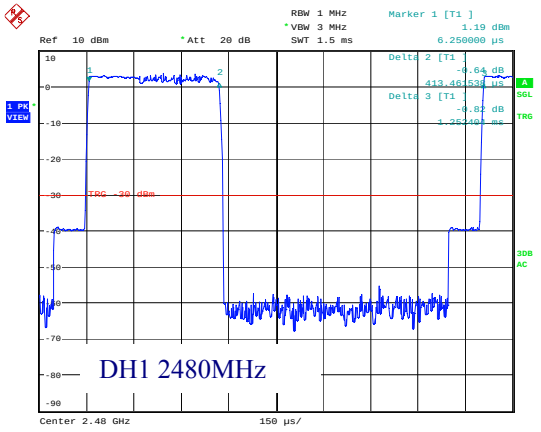
Operating mode: 8DPSK

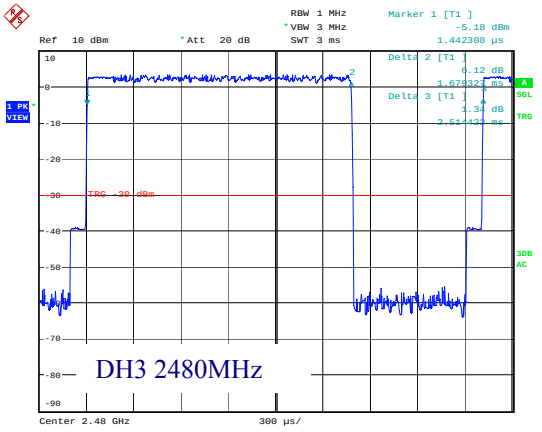




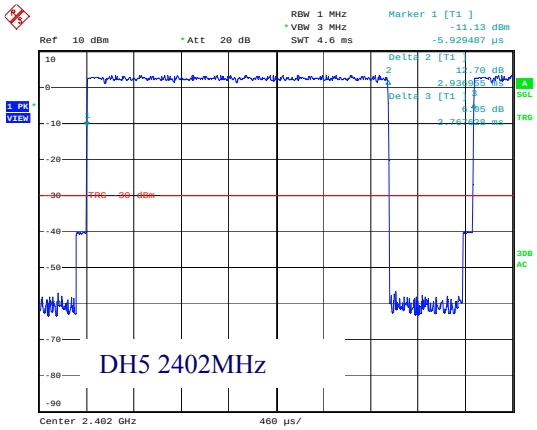


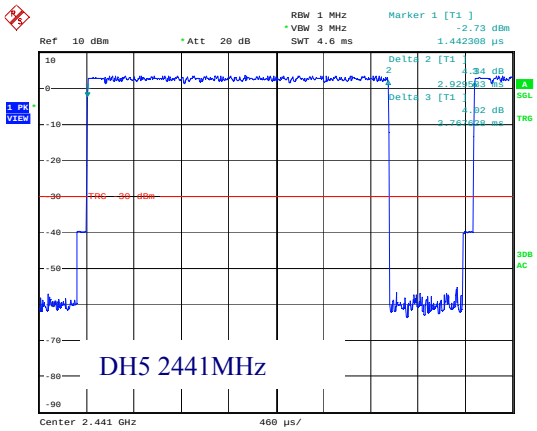


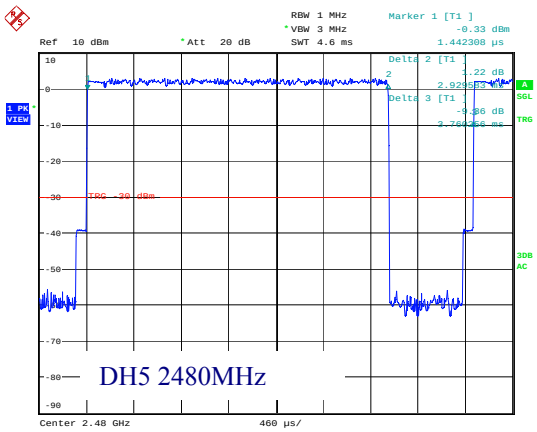




Operating mode: 8DPSK

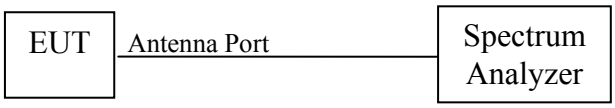






2.5 Peak Output Power

Test setup
Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure
The EUT antenna port connected to the spectrum analyzer. The RBW is set to the greater than 20dB bandwidth. The VBW is set to three times of RBW. The sweep time is coupled appropriate. The span is set to cover the carrier output spectrum. The analyzer is set to MAX HOLD. The EUT is set measured transmission channel under hopping off mode.

Limitation
15.247(a) (1) Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW(21dBm).

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

SA06	CL27				

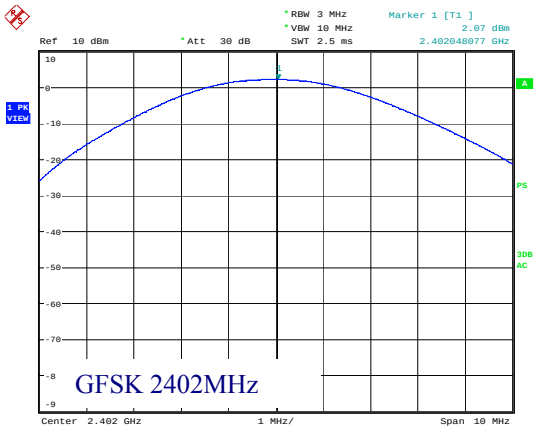
Test results – comply with the limitation.

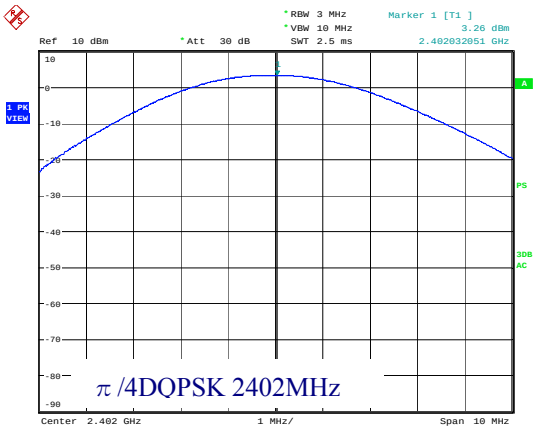
Operating Mode	Transmission Channel (Frequency: MHz)	Cable loss (dB)	Output power (dBm) [Reading]	Output power (dBm) [Result]	Output power (mW) [Result]
GFSK	Low (2402)	0.30	2.07	2.37	1.73
	Middle (2441)	0.30	1.96	2.26	1.68
	High (2480)	0.30	1.94	2.24	1.67
π/4DQPSK	Low (2402)	0.30	3.26	3.56	2.27
	Middle (2441)	0.30	3.50	3.80	2.40
	High (2480)	0.30	3.43	3.73	2.36
8DPSK	Low (2402)	0.30	3.37	3.67	2.33
	Middle (2441)	0.30	3.67	3.97	2.49
	High (2480)	0.30	3.71	4.01	2.52

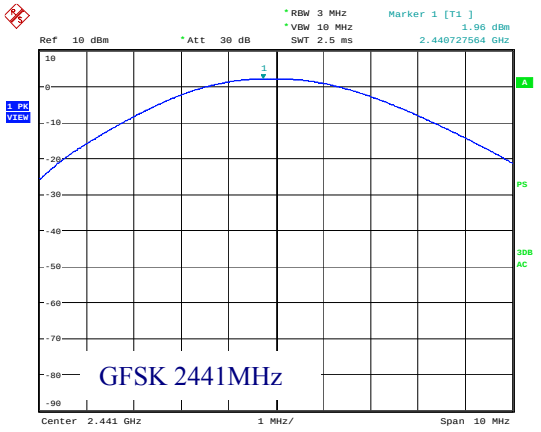
Test Data

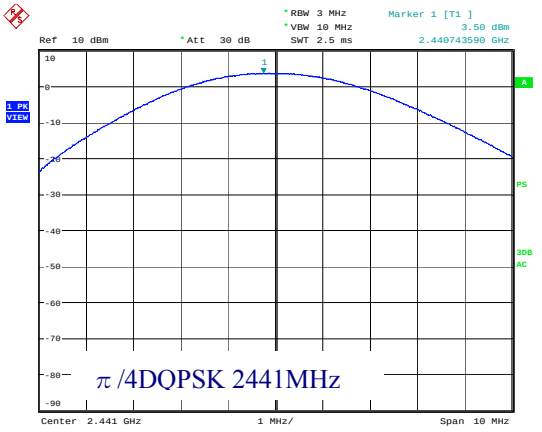
Tested Date: February 09, 2010

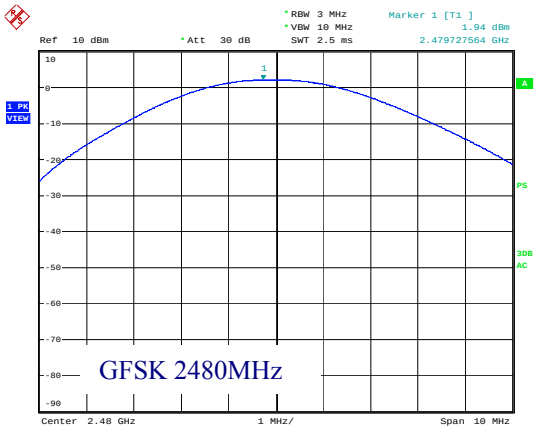
Temperature: 22 ˚C
Humidity: 50 %
Atmos. Press: 1024 hPa

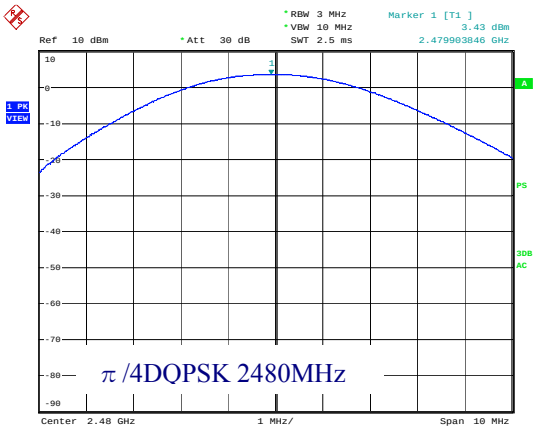


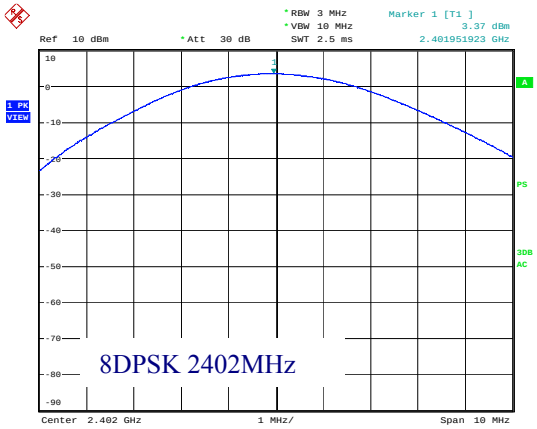


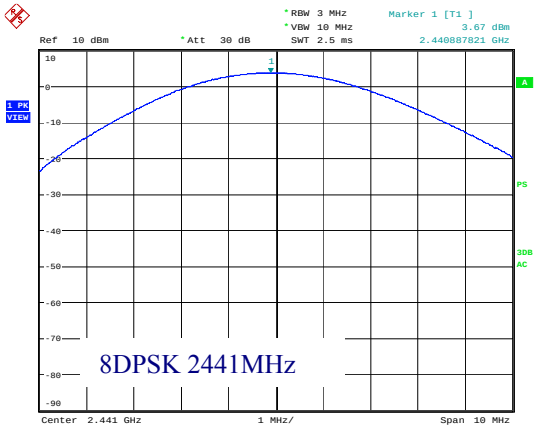


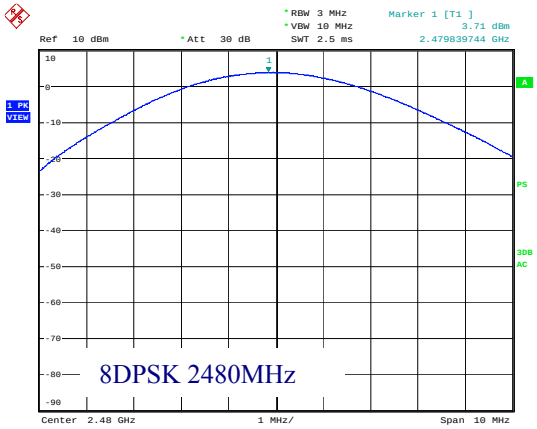






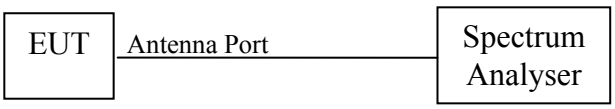

RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
3.37 dBm
2.401951923 GHz
Ref 10 dBm
Att 30 dB
1 PK VIEW
8DPSK 2402MHz
Center 2.402 GHz
1 MHz/
Span 10 MHz


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
3.67 dBm
2.440887821 GHz
Ref 10 dBm
Att 30 dB
1 PK VIEW
8DPSK 2441MHz
Center 2.441 GHz
1 MHz/
Span 10 MHz


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
3.71 dBm
2.479839744 GHz
Ref 10 dBm
Att 30 dB
1 PK VIEW
8DPSK 2480MHz
Center 2.48 GHz
1 MHz/
Span 10 MHz

2.6 Conducted Spurious Emissions (Antenna Port)

Test setup
Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure
The EUT antenna port connected to the spectrum analyzer. The RBW is set to 100 kHz. The VBW is set to 300 kHz. The sweep time is set to the coupled. The spectrum is cheated from 30 MHz to 26 GHz.
The EUT is set measured transmission channel under hopping off mode.

Limitation
15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

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

SA06	CL27				

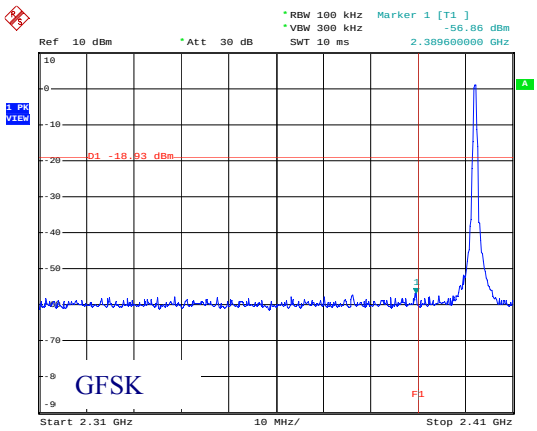
Test results – comply with the limitation.
There were no conducted spurious emissions with levels of more than 20 dB below the applicable limit.

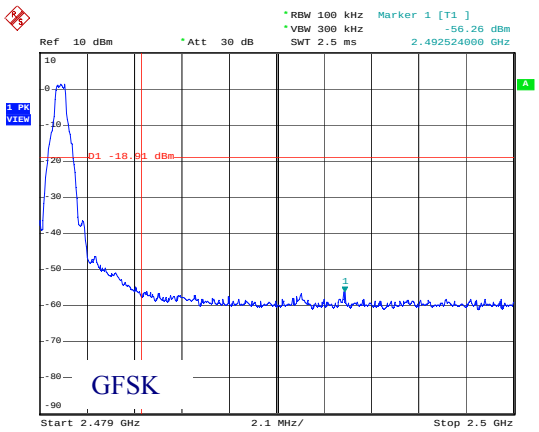
Test Data

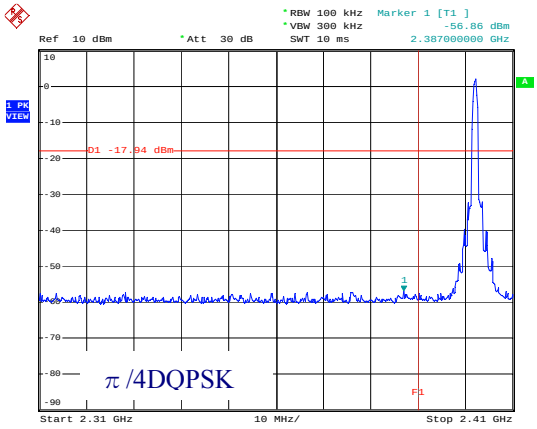
Tested Date: February 09, 2010

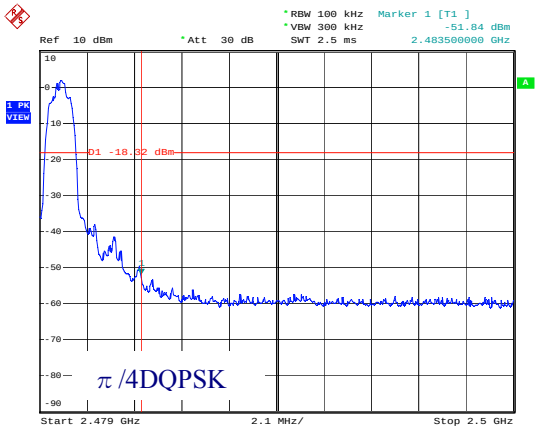
Temperature: 22 ˚C
Humidity: 50 %
Atmos. Press: 1024 hPa

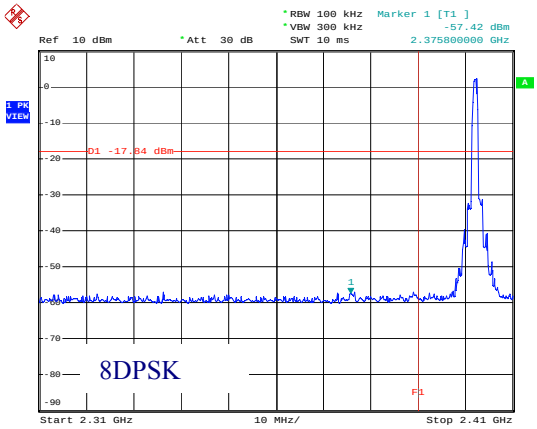
Restricted Band Edge

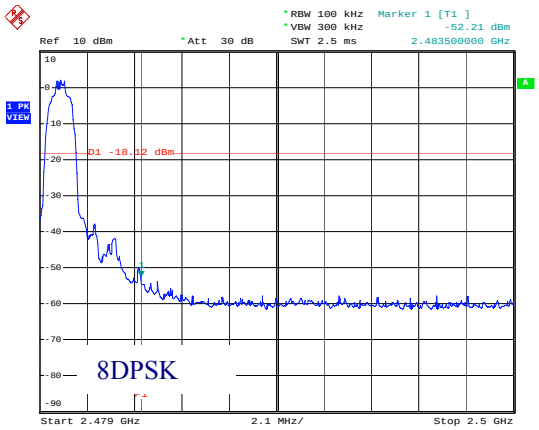




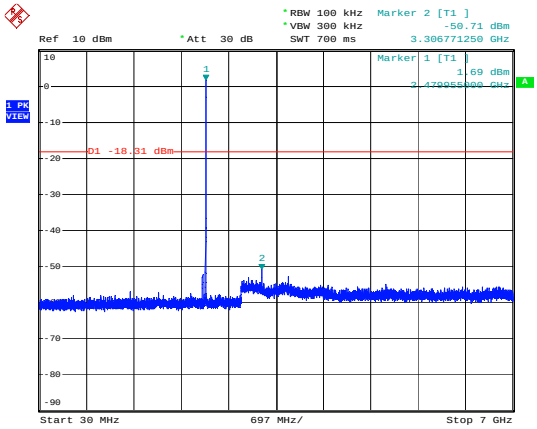




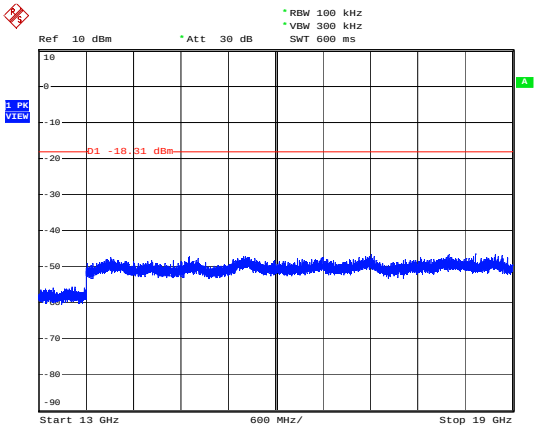




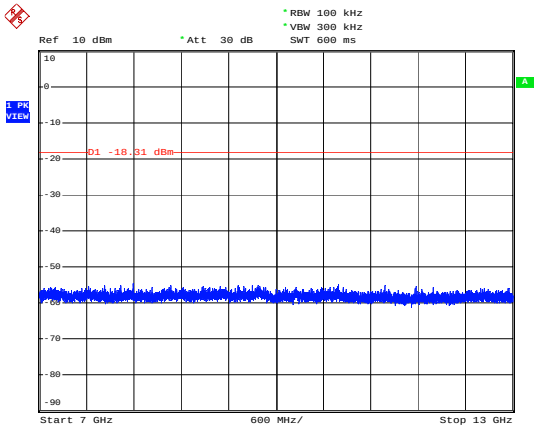
Worst Configuration (2480MHz, 8DPSK)



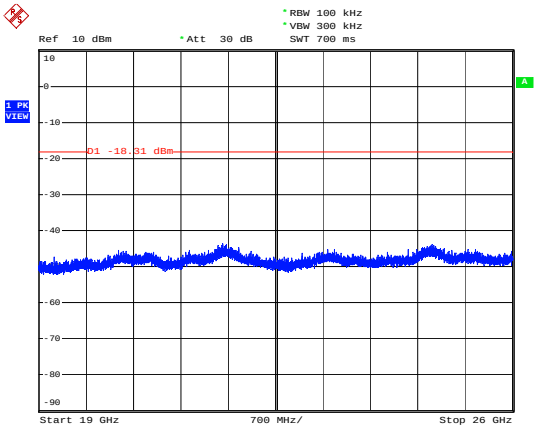
30MHz to 7GHz



13GHz to 19GHz



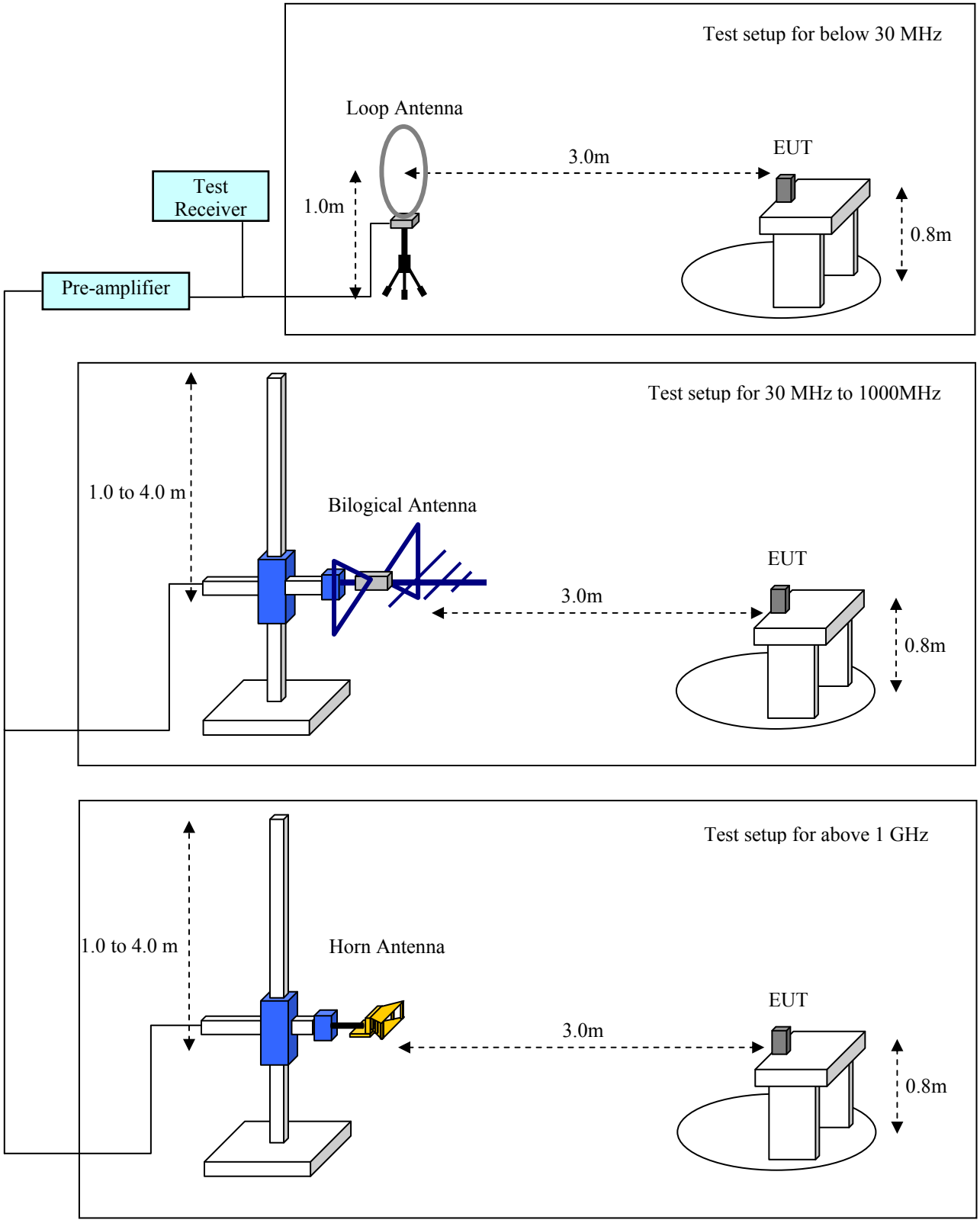
7GHz to 13GHz



19GHz to 25GHz

2.7 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 place 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.

Test Data

2.7.1 Below 30 MHz

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

LP01	CL11	TR06	AC01(EM)

Tested Date: March 08, 2010

Temperature: 17 ˚C
Humidity: 42 %
Atmos. Press: 1026 hPa

Result

There is no spurious emission with levels of more than 20 dB below the applicable limit or floor noise.

2.7.2 Between 30 – 1000 MHz

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

BA04	CL11	PR03	TR06	AC01(EM)

Tested Date: March 08, 2010

Temperature: 17 ˚C
Humidity: 42 %
Atmos. Press: 1026 hPa

Operating mode: Continuous Communication (GFSK, 2402MHz,: Worst configuration)
EUT position: X-plane (Maximum position)
Measurement distance: 3 m

No.	Frequency [MHz]	Reading [dBuV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna Polarization
1	112.915	49.2	11.6	8.5	29.6	39.7	43.5	3.8	Vert.
2	159.997	46.0	9.9	9.0	29.5	35.4	43.5	8.1	Vert.
3	183.995	46.7	9.0	9.3	29.5	35.5	43.5	8.0	Hori.
4	184.321	40.8	9.0	9.3	29.5	29.6	43.5	13.9	Hori.
5	191.975	48.5	9.1	9.3	29.5	37.4	43.5	6.1	Hori.
6	242.998	51.0	11.7	9.9	29.5	43.1	46.0	2.9	Hori.
7	319.966	47.0	14.0	10.9	29.6	42.3	46.0	3.7	Hori.

Calculation method

The Correction Factors and RESULT are calculated as followings.

Correction Factor [dB/m] = FACTOR [dB/m] + LOSS [dB] – GAIN [dB]

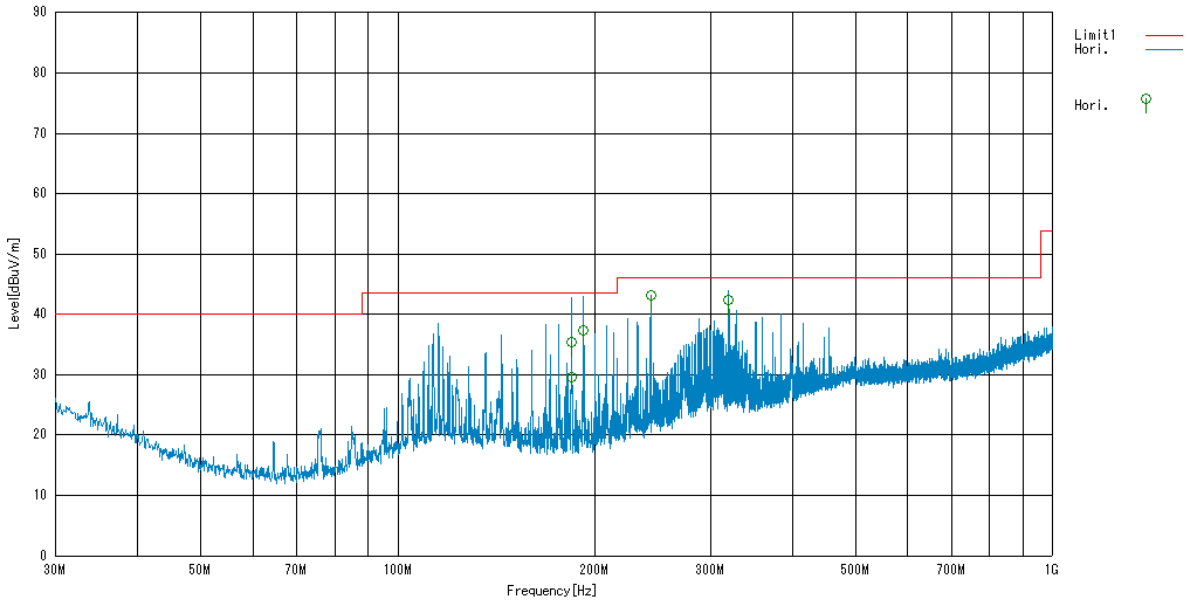
RESULT [dBuV/m] =READING [dBuV] + Correction Factor [dB/m]

Sample calculation at 242.998 MHz horizontal result as follow:

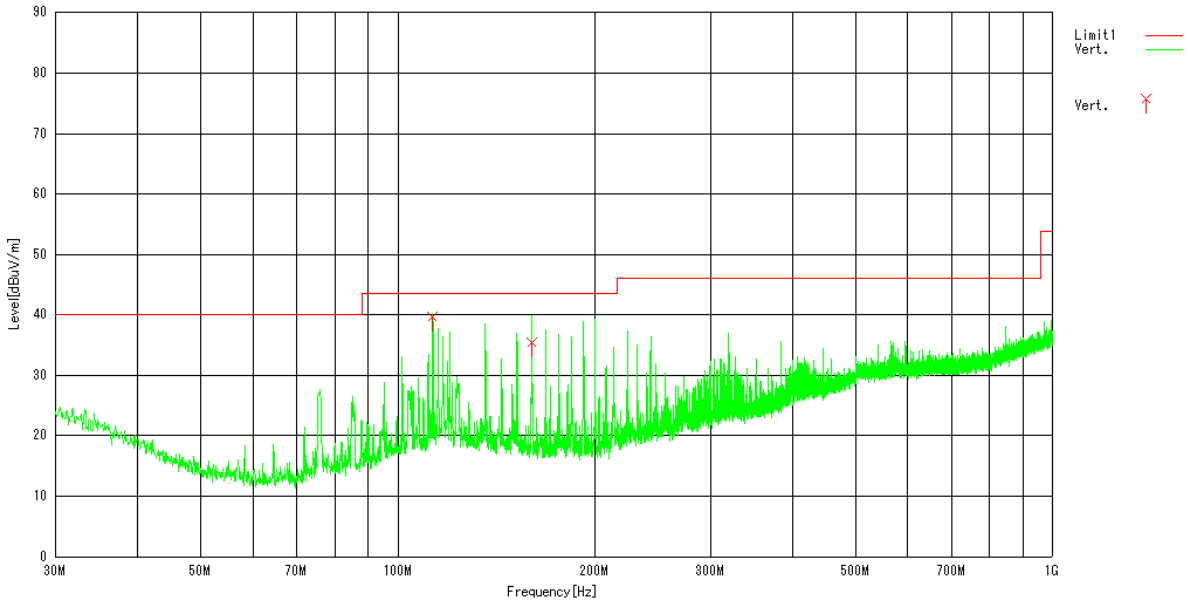
Result [dBuV/m] = Reading + C.F = 51.0 + 11.7 + 9.9 - 29.5 = 43.1
Margin = Limit – Result = 46.0 – 43.1 = 2.9 [dB]

Graphical express of test result (30MHz-1000MHz)

Antenna polarization: Horizontal



Antenna polarization: Vertical



2.7.3 Above 1000 MHz

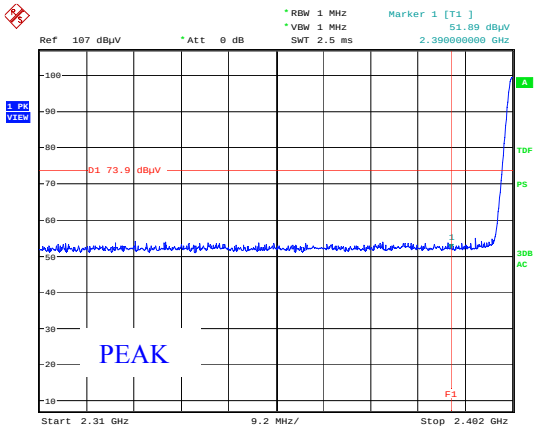
Test equipment used (refer to List of utilized test equipment)

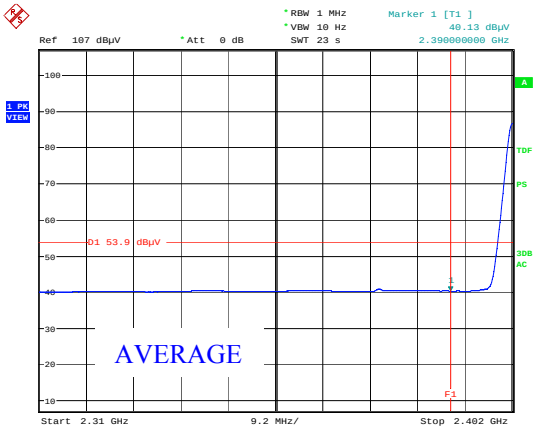
PR12	SH01	TR06	CL23	CL24	HPF1	DH02	AC01(EG)

Tested Date: February 09, 2010

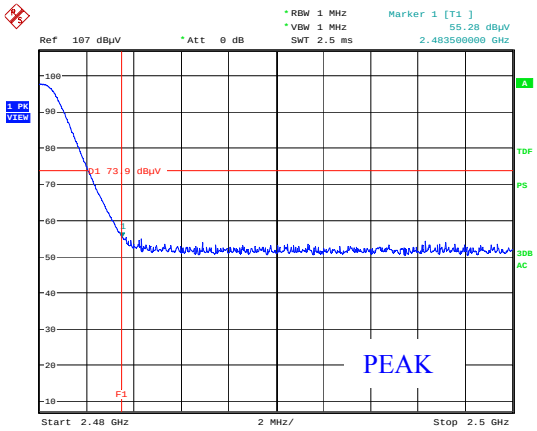
Temperature: 19 ˚C
Humidity: 30 %
Atmos. Press: 1015 hPa

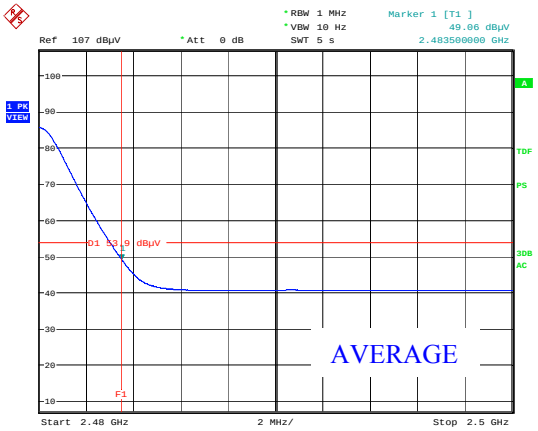
Restricted Band Edge (GFSK, 2402MHz : Worst configuration)



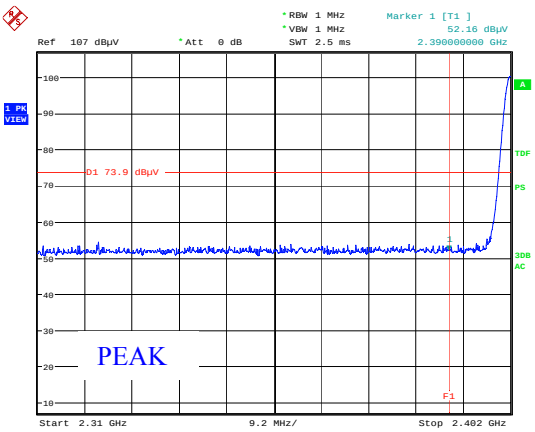


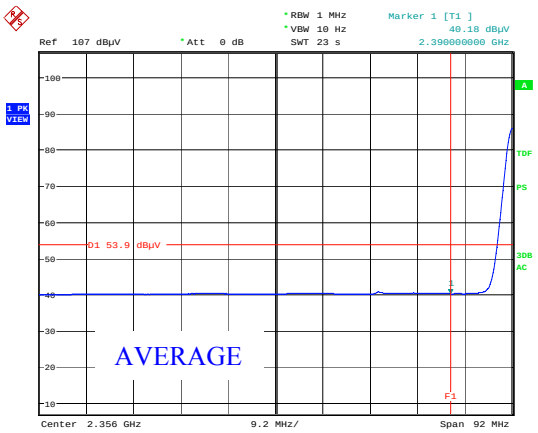
Restricted Band Edge (GFSK, 2480MHz : Worst configuration)



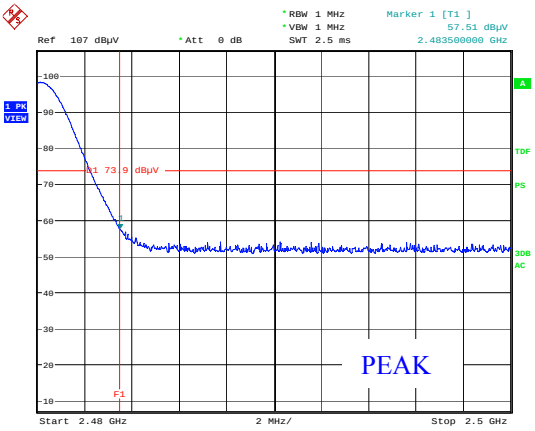


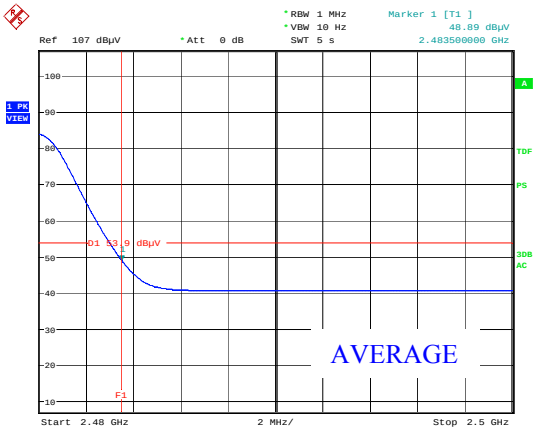
Restricted Band Edge (π/4DQPSK, 2402MHz : Worst configuration)



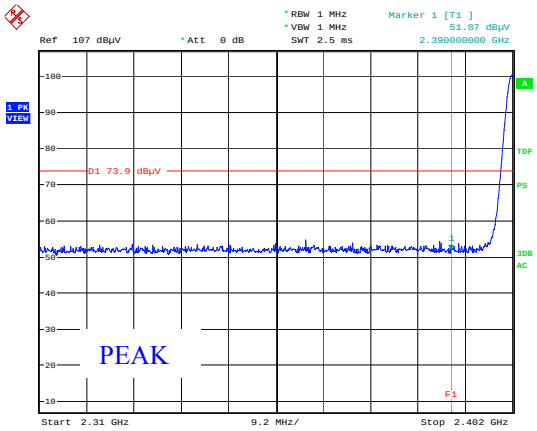


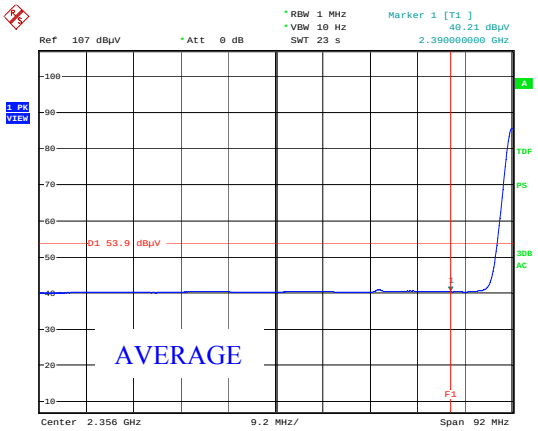
Restricted Band Edge (π/4DQPSK, 2480MHz : Worst configuration)



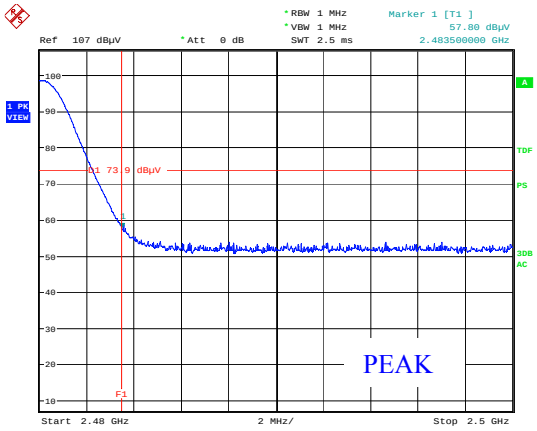


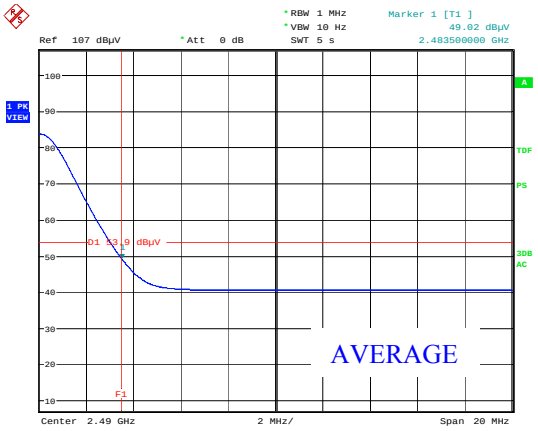
Restricted Band Edge (8DPSK, 2402MHz : Worst configuration)





Restricted Band Edge (8DPSK, 2480MHz : Worst configuration)





Harmonics and Spurious Emission above 1000 MHz (1GHz - 4GHz)

Tested Date: February 09, 2010

Temperature: 19 ˚C
Humidity: 30 %
Atmos. Press: 1015 hPa

Operating mode: Continuous Communication (GFSK, 2402MHz,: Worst configuration)
EUT position: Z-plane (Maximum position)
Measurement distance: 3 m

No	Frequency MHz	Reading [Pk] dBuV	Reading [Av] dBuV	C.Fac dB	Result [Pk] dBuV/m	Result [Av] dBuV/m	Limit [Pk] dBuV/m	Limit [Av] dBuV/m	Margin [Pk] dB	Margin [Av] dB	Antenna
1	1601.320	47.9	38.3	1.0	48.9	39.3	73.9	53.9	25.0	14.6	Vert.
2	1601.321	48.6	39.2	1.0	49.6	40.2	73.9	53.9	24.3	13.7	Hori.
3	3321.634	47.5	33.5	8.3	55.8	41.8	73.9	53.9	18.1	12.1	Hori.
4	3406.330	48.1	34.2	7.9	56.0	42.1	73.9	53.9	17.9	11.8	Vert.
5	3465.617	47.7	38.6	7.9	55.6	46.5	73.9	53.9	18.3	7.4	Vert.
6	3465.627	48.1	39.8	7.9	56.0	47.7	73.9	53.9	17.9	6.2	Hori.

Calculation method

The Correction Factors and RESULT are calculated as followings.

Correction Factor [dB/m] = Antenna Factor [dB/m] + Cable loss [dB] – GAIN [dB]

RESULT [dBuV/m] =READING [dBuV] + Correction Factor [dB/m]

Sample calculation at 3465.627 MHz, horizontal, average result as follow:

Result [dBuV/m] = Reading + C.F = 39.8 + 7.9 = 47.7
Margin = Limit – Result = 53.9 – 47.7 = 6.2 [dB]

Harmonics and Spurious Emission above 1000 MHz (4GHz - 26GHz)

Tested Date: February 09, 2010

Temperature: 19 ˚C
Humidity: 30 %
Atmos. Press: 1015 hPa

Operating mode: Continuous Communication (8DPSK, 2402MHz,: Worst configuration)
EUT position: Z-plane (Maximum position)
Measurement distance: 3 m

No	Frequency MHz	Reading [Pk] dBuV	Reading [Av] dBuV	C.Fac dB	Result [Pk] dBuV/m	Result [Av] dBuV/m	Limit [Pk] dBuV/m	Limit [Av] dBuV/m	Margin [Pk] dB	Margin [Av] dB	Antenna
1	4803.991	46.3	34.9	2.8	49.1	37.7	73.9	53.9	24.8	16.2	Hori.
2	4803.991	48.8	38.1	2.8	51.6	40.9	73.9	53.9	22.3	13.0	Vert.

Calculation method

The Correction Factors and RESULT are calculated as followings.

Correction Factor [dB/m] = Antenna Factor [dB/m] + Cable loss [dB] – GAIN [dB]

RESULT [dBuV/m] =READING [dBuV] + Correction Factor [dB/m]

Sample calculation at 4803.991 MHz, vertical, average result as follow:

Result [dBuV/m] = Reading + C.F = 38.1 + 2.8 = 40.9
Margin = Limit – Result = 53.9 – 40.9 = 13.0 [dB]

2.8 Receiver Radiated spurious emissions

Test setup - Same as clause 2.7

Test procedure - Same as clause 2.7

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	3.0	100	40.0
88 –216	3.0	150	43.5
216 – 960	3.0	200	46.0
Above 960	3.0	500	53.9

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

Test results - Complied with requirement.

2.8.1 Between 30 – 1000 MHz

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

BA04	CL11	PR03	TR06	AC01(EM)

Tested Date: March 08, 2010

Temperature: 17 ˚C
Humidity: 42 %
Atmos. Press: 1026 hPa

Operating mode: Continuous Receiving (2402MHz,: Worst configuration)
EUT position: X-plane (Maximum position)
Measurement distance: 3 m

No.	Frequency [MHz]	Reading [dBuV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna Polarization
1	112.913	44.1	11.6	8.5	29.6	34.6	43.5	8.9	Vert.
2	112.917	38.1	11.6	8.5	29.6	28.6	43.5	14.9	Hori.
3	115.551	40.5	11.8	8.5	29.6	31.2	43.5	12.3	Vert.
4	115.559	42.1	11.8	8.5	29.6	32.8	43.5	10.7	Hori.
5	242.999	41.2	11.7	9.9	29.5	33.3	46.0	12.7	Vert.
6	243.002	46.2	11.7	9.9	29.5	38.3	46.0	7.7	Hori.

Calculation method
The Correction Factors and RESULT are calculated as followings.

Correction Factor [dB/m] = FACTOR [dB/m] + LOSS [dB] – GAIN [dB]

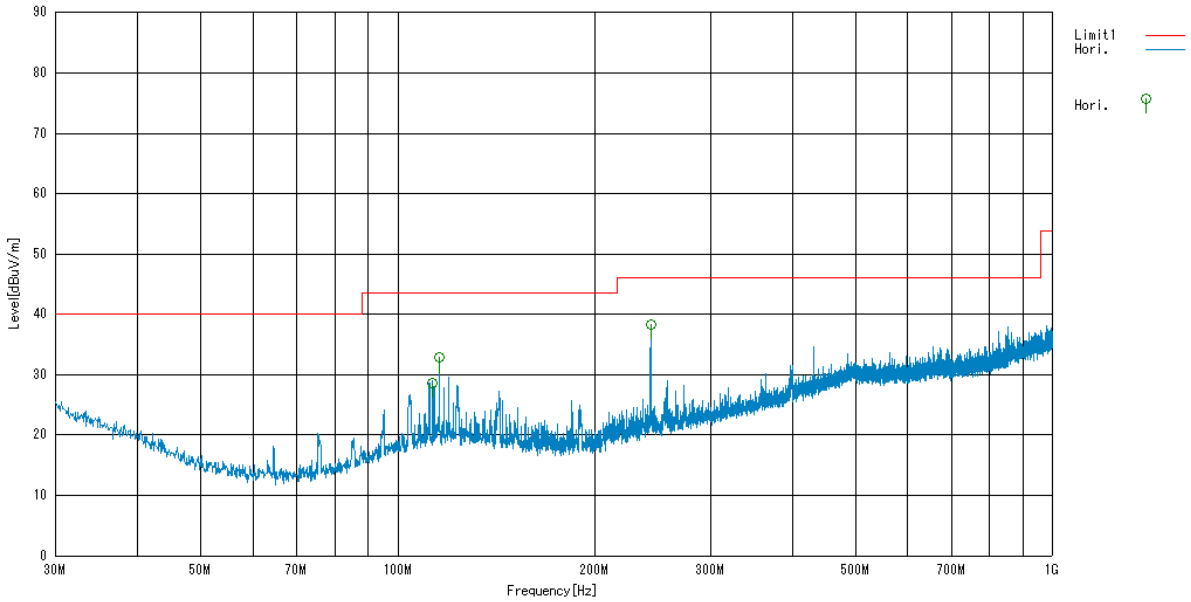
RESULT [dBuV/m] =READING [dBuV] + Correction Factor [dB/m]

Sample calculation at 243.002 MHz, horizontal result as follow:

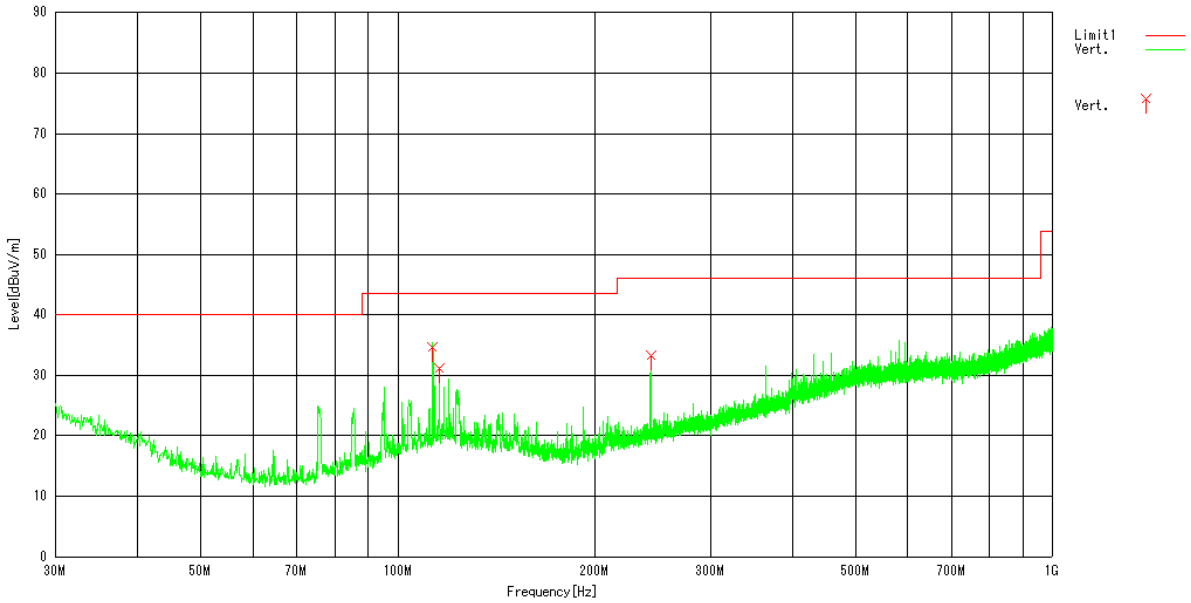
Result [dBuV/m] = Reading + C.F = 46.2 + 11.7 + 9.9 - 29.5 = 38.3
Margin = Limit – Result = 46.0 – 38.3 = 7.7 [dB]

Graphical express of test result (30MHz-1000MHz)

Antenna polarization: Horizontal



Antenna polarization: Vertical



2.8.2 Above 1000 MHz

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

PR12	TR06	CL23	CL24	DH02	AC01(EG)	

Tested Date: February 09, 2010

Temperature: 19 ˚C
Humidity: 30 %
Atmos. Press: 1015 hPa

Operating mode: Continuous Receiving (2441MHz,: Worst configuration)
EUT position: Y-plane (Maximum position)
Measurement distance: 3 m

No	Frequency MHz	Reading dBuV	C.Fac dB	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna
1	3265.631	30.7	-1.6	29.1	53.9	24.8	Hori.
2	3432.278	29.9	-2.1	27.8	53.9	26.1	Hori.
3	3465.621	52.4	-2.1	50.3	53.9	3.6	Hori.
4	3465.621	47.8	-2.1	45.7	53.9	8.2	Vert.
5	12195.440	26.2	11.7	37.9	53.9	16.0	Hori.
6	12200.240	26.2	11.7	37.9	53.9	16.0	Vert.

Calculation method

The Correction Factors and RESULT are calculated as followings.

Correction Factor [dB/m] = Antenna Factor [dB/m] + Cable loss [dB] – GAIN [dB]

RESULT [dBuV/m] =READING [dBuV] + Correction Factor [dB/m]

Sample calculation at 3465.621 MHz, horizontal, result as follow:

Result [dBuV/m] = Reading + C.F = 52.4 – 2.1 = 50.3
Margin = Limit – Result = 53.9 – 50.3 = 3.6 [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(EM)	Anechoic Chamber (1st test room)	JSE	203397C	-	2009/4/9	2010/4/30
AC01(EG)	Anechoic Chamber (1st test room)	JSE	203397C	-	2009/11/14	2010/11/30
BA04	Bilogical Antenna	SCHAFFNER	CA2855	2903	2010/1/19	2011/1/31
CL11	Antenna Cable for RE	RFT	-	-	2009/4/13	2010/4/30
CL23	RF Cable 0.5m	SUCOFLEX	SF104PE	48773/4PE	2009/6/25	2010/6/30
CL24	RF Cable 5.0m	SUCOFLEX	SF104PE	48775/4PE	2009/6/25	2010/6/30
CL27	RF Cable 0.5m	SUCOFLEX	SF104	230286/4	2009/6/29	2010/6/30
PR03	Pre. Amplifier	Anritsu	MH648A	M41984	2009/5/26	2010/5/31
PR12	Pre. Amplifier (1-26G)	Agilent Technologies	8449B	3008A02513	2010/1/25	2011/1/31
TR06	Test Receiver (F/W : 3.93 SP2)	Rohde & Schwarz	ESU26	100002	2009/9/16	2010/9/30
DH02	DRG Horn Antenna	A.H. Systems	SAS-200/571	239	2009/4/13	2011/4/30
SA06	Spectrum Analyzer (F/W: 3.60 SP1)	Rohde & Schwarz	FSP40	100071	2009/11/10	2010/11/30
HPF1	High Pass Filter (3500MHz)	TOKIMEC	TF323DCA	603	2009/6/25	2010/6/30
SH01	Standard Horn Antenna (18-26G)	A.H. Systems	SAS-572	208	2008/7/23	2010/7/31

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.