8. RF Antenna Conducted Spurious test

8.1 Operating environment

Temperature:	25	℃
Relative Humidity:	58	%

8.2 Test setup & procedure

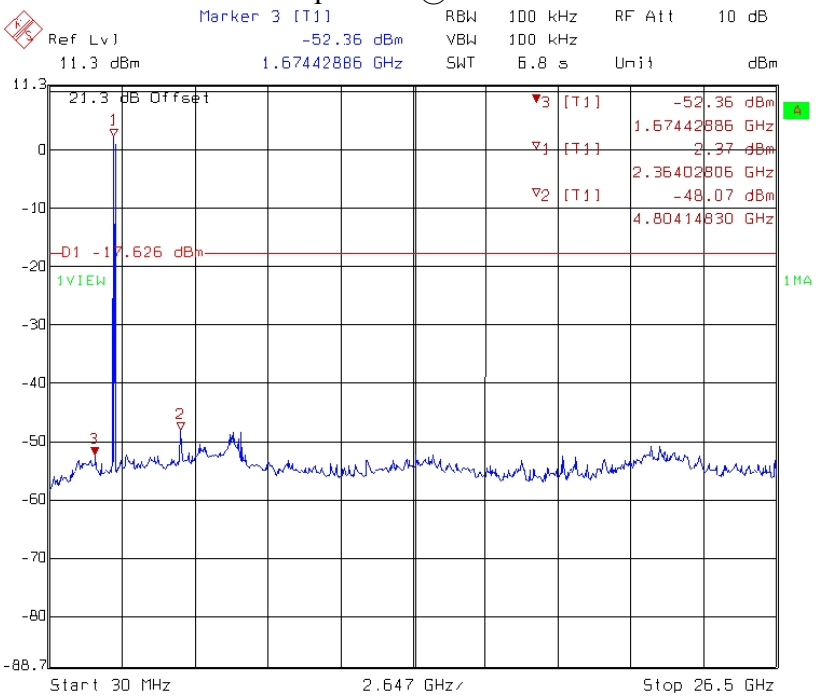
The test procedure was according to FCC measurement guidelines DA 00-705.
The measurements were performed from 30MHz to 25GHz RF antenna conducted per FCC 15.247 (c) was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz.
Harmonics and spurious noise must be at least 20dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The table below is the results from the highest emission for each channel within the authorized band. This table was used to determine the spurious limits for each channel.

8.3 Measured data of the highest RF Antenna Conducted Spurious test result

The test results please see the plot below.

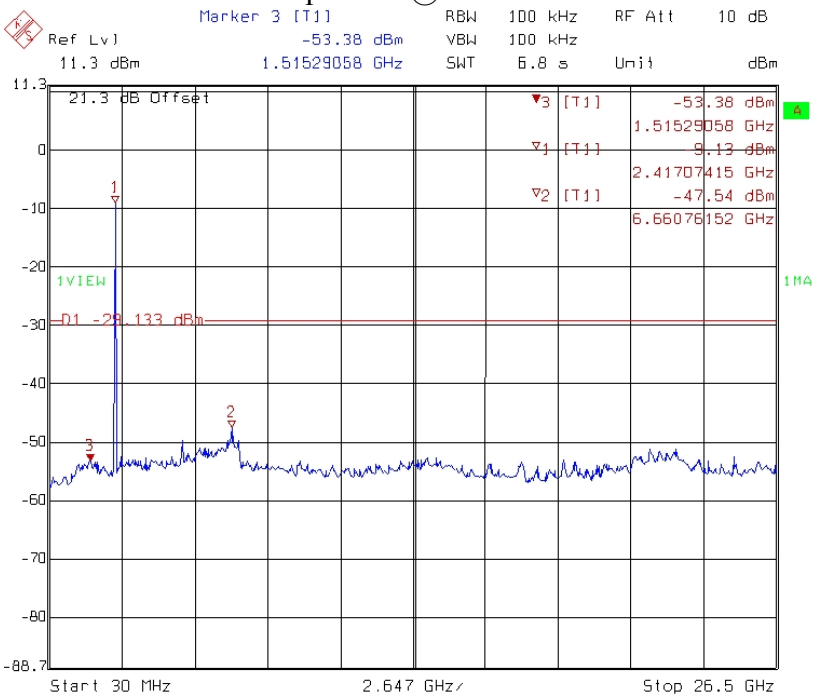
For RB4000HM-a & RB4000HM-c

Conducted spurious @ GFSK channel 0



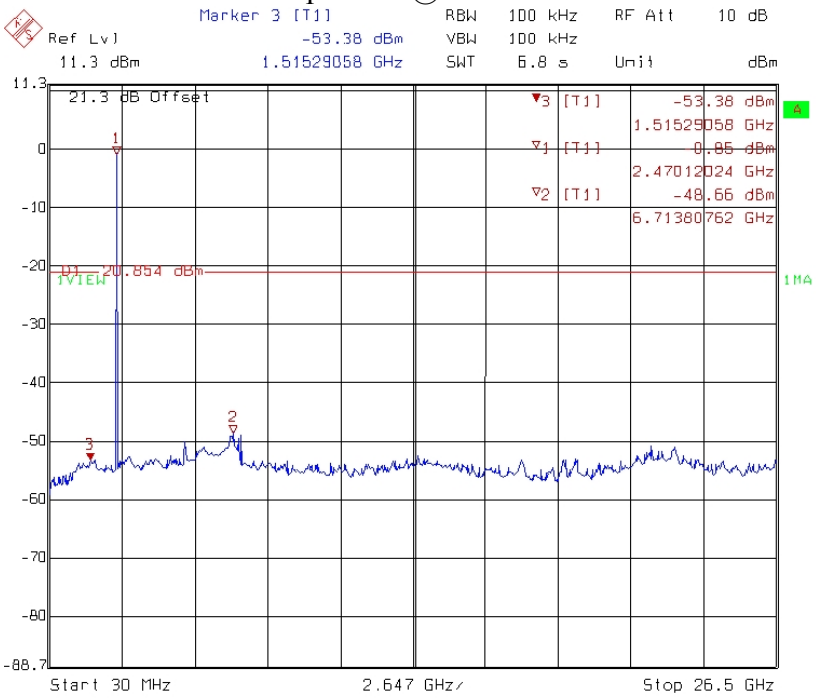
Title: Conductied Spurious
Comment A: GFSK ch0 2402 DH1
Date: 22.FEB.2012 10:29:57

Conducted spurious @ GFSK channel 39



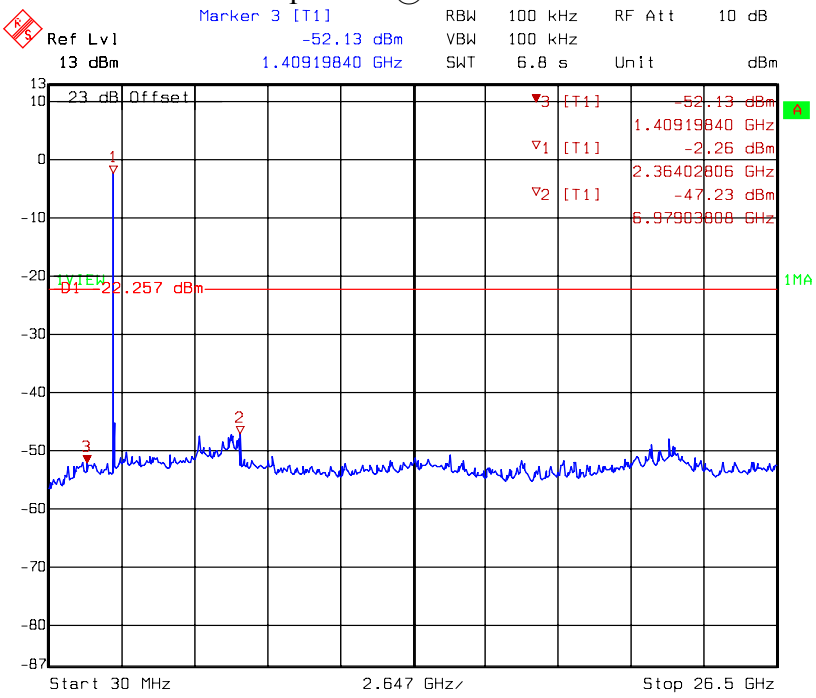
Title: Conductied Spurious
Comment A: GFSK ch39 2441 DH1
Date: 22.FEB.2012 10:45:44

Conducted spurious @ GFSK channel 78



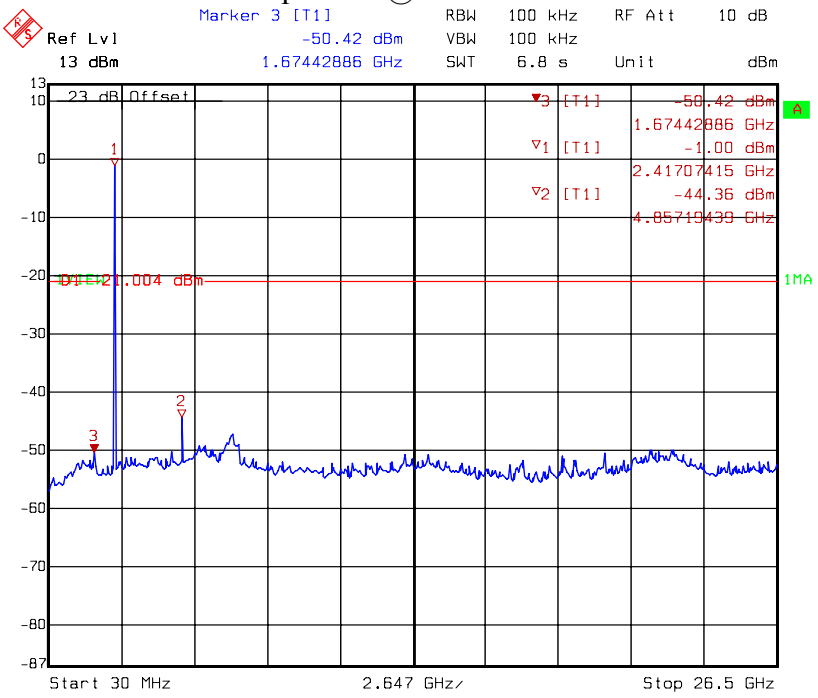
Title: Conductied Spurious
Comment A: GFSK ch78 2480 DH1
Date: 22.FEB.2012 10:51:16

Conducted spurious @π /4 DPSK channel 0



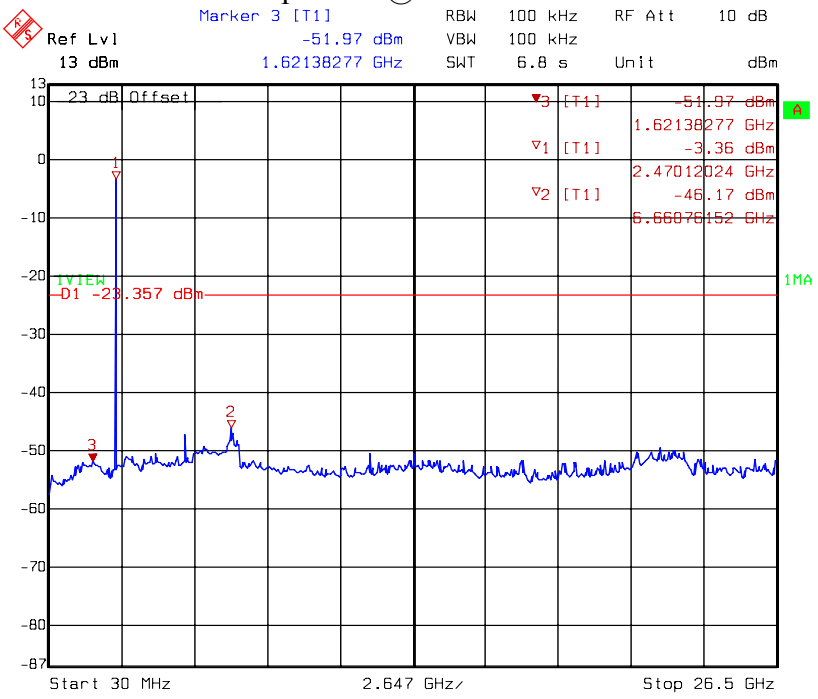
Title: Conductied Spurious
Comment A: pi/4-QPSK ch0 2402 DH1
Date: 26.MAR.2012 12:04:50

Conducted spurious @π /4 DPSK channel 39



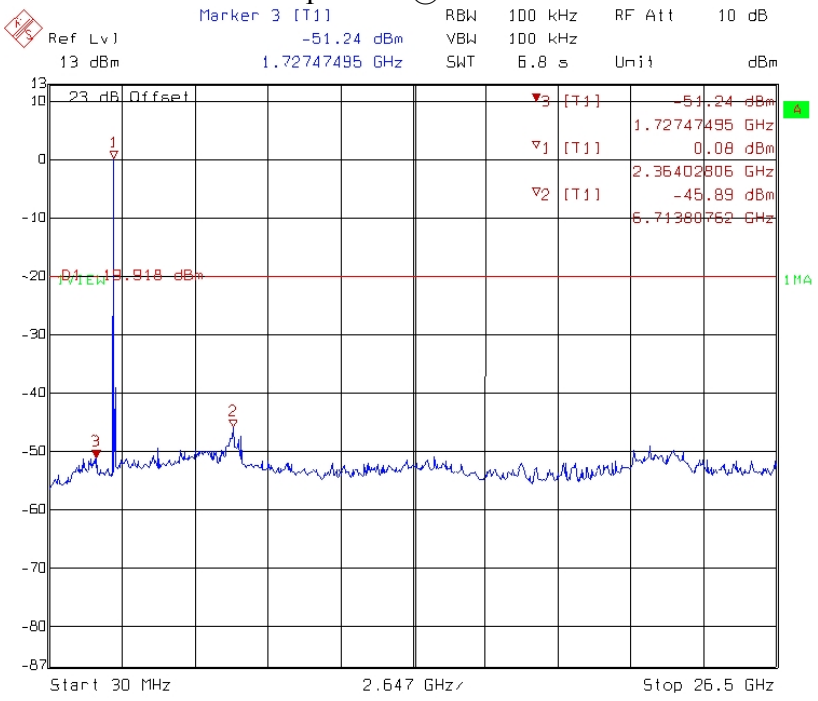
Title: Conductied Spurious
Comment A: pi/4-QPSK ch39 2441 DH1
Date: 26.MAR.2012 11:19:05

Conducted spurious @π /4 DPSK channel 78



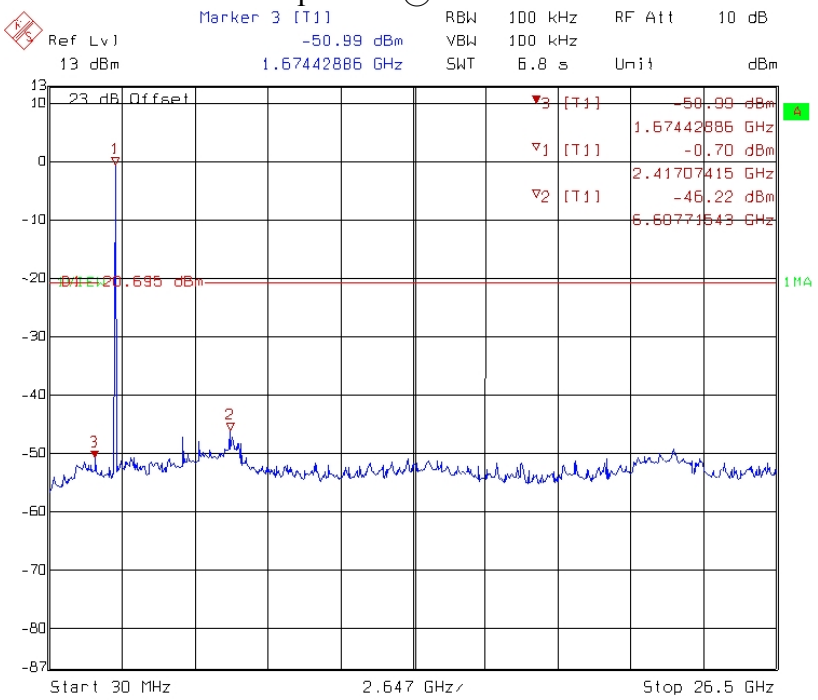
Title: Conductied Spurious
Comment A: pi/4-QPSK ch78 2480 DH1
Date: 26.MAR.2012 11:25:29

Conducted spurious @ 8DPSK channel 0



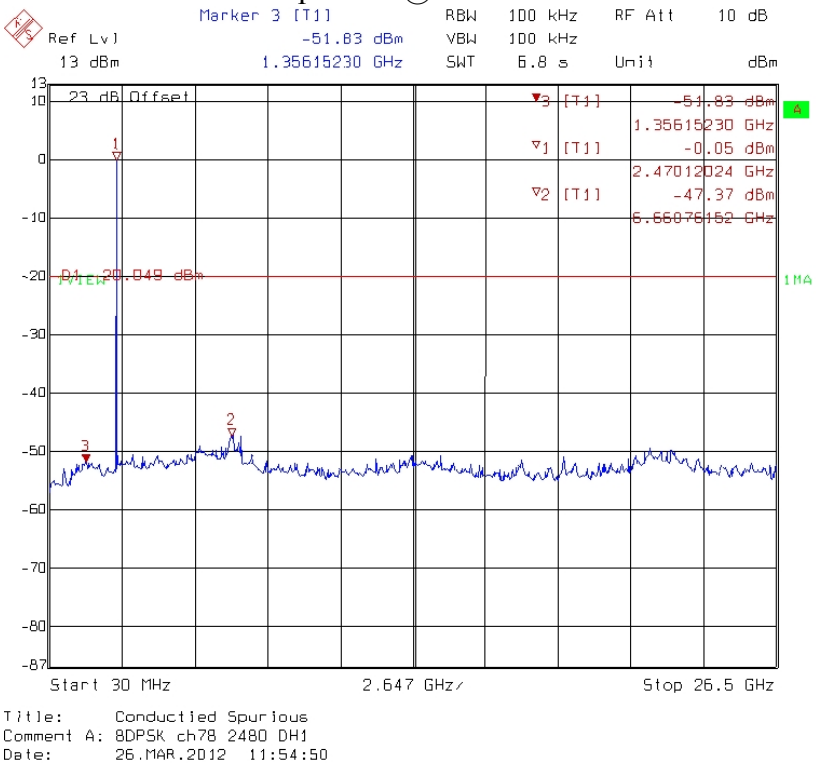
Title: Conductied Spurious
Comment A: 8DPSK ch0 2402 DH1
Date: 26.MAR.2012 11:39:36

Conducted spurious @ 8DPSK channel 39



Title: Conductied Spurious
Comment A: 8DPSK ch39 2441 DH1
Date: 26.MAR.2012 11:49:43

Conducted spurious @ 8DPSK channel 78



Title: Conductied Spurious
Comment A: 8DPSK ch78 2480 DH1
Date: 26.MAR.2012 11:54:50

9. Radiated Emission test

9.1 Operating environment

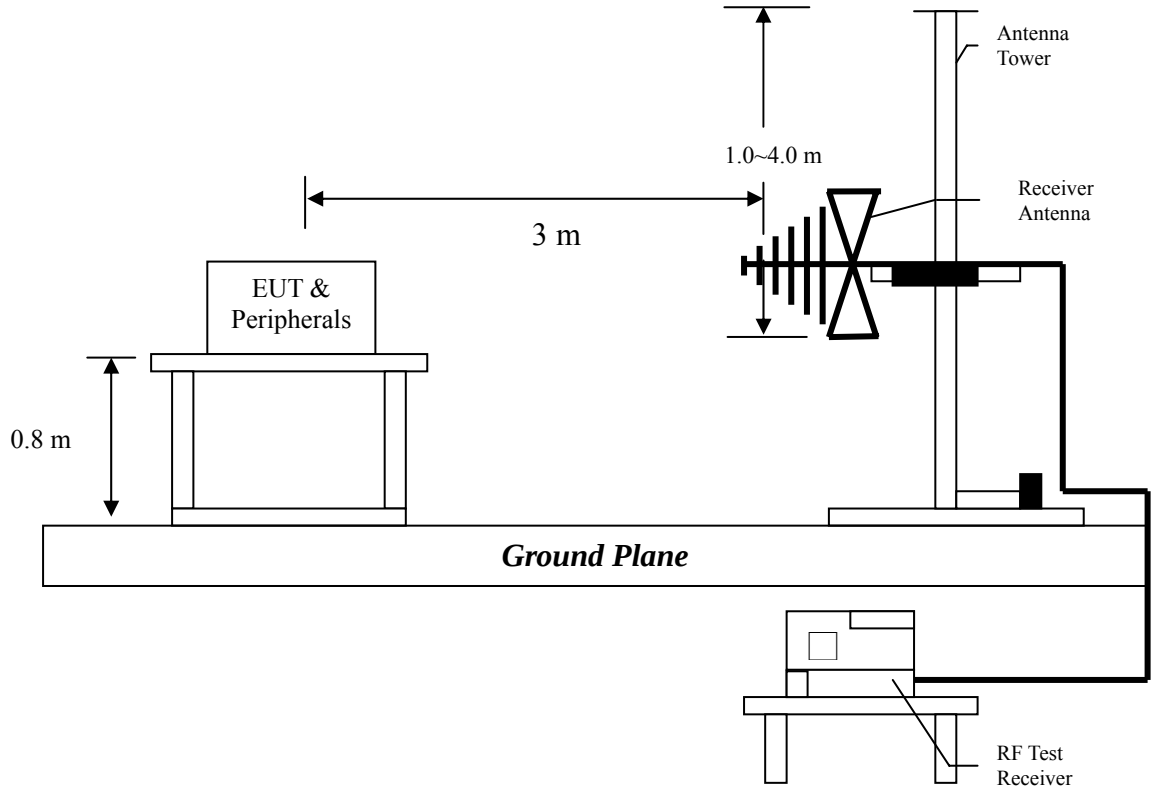
Temperature:	23	℃
Relative Humidity:	53	%
Atmospheric Pressure:	1008	hPa

9.2 Test setup & procedure

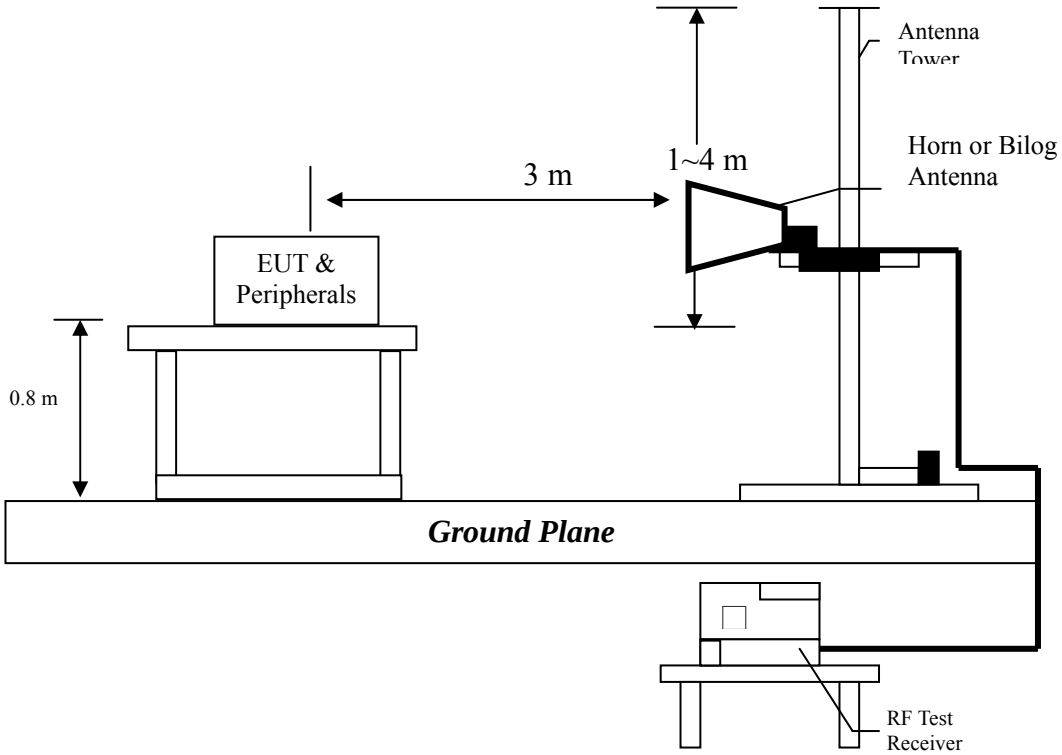
The test procedure was according to FCC measurement guidelines DA 00-705 and ANSI C63.4/2003.

The Diagram below shows the test setup, which is utilized to make these measurements.

The frequency spectrum from 30MHz to 1000MHz was investigated.



The frequency spectrum from over 1GHz was investigated.

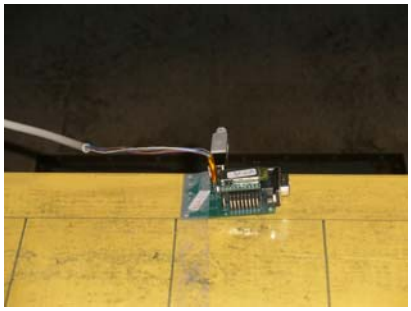


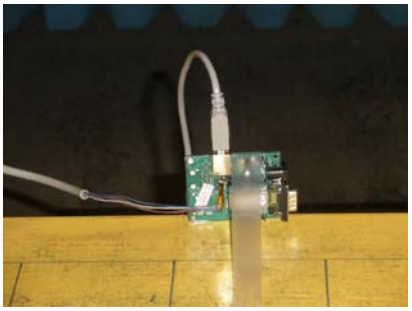
The signal is maximized through rotation and placement in the three orthogonal axes.
Radiated emission measurements were performed from 30 MHz to 25 GHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1 GHz, 1MHz – for frequencies above 1 GHz.
The EUT for testing is arranged on a fiberglass turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

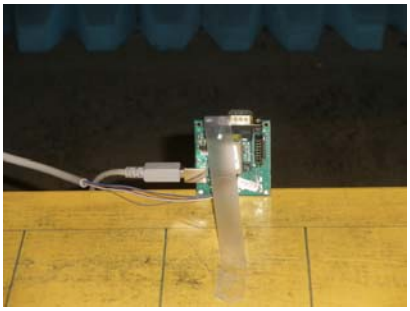
The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent 3 meter reading using inverse scaling with distance.

For the signal from USB WiFi Module is maximized through rotation and placement in the three orthogonal axes.

EUT : RB4000HM-a

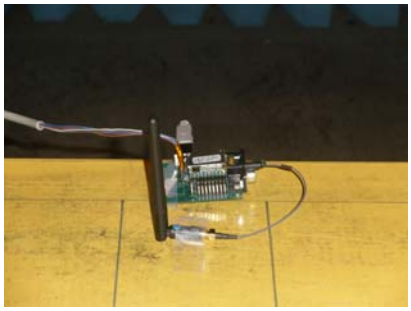

X axis

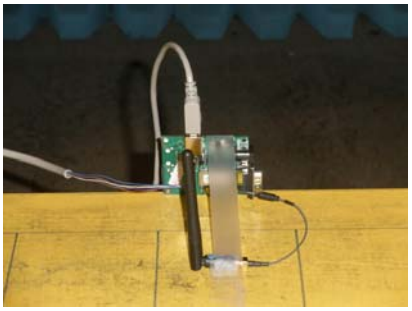

Y axis

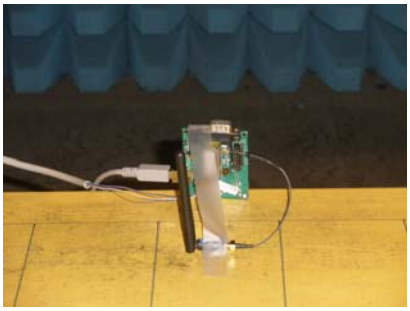

Z axis

After verifying three axes, we found the maximum electromagnetic field was occurred at X axis. The final test data was executed under this configuration.

EUT : RB4000HM-c


X axis


Y axis


Z axis

After verifying three axes, we found the maximum electromagnetic field was occurred at X axis. The final test data was executed under this configuration.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

9.3 Emission limits

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Measurement uncertainty was calculated in accordance with TR 100 028-1.

Parameter	Uncertainty
Radiated Emission	±5.056 dB

9.4 Radiated spurious emission test data

9.4.1 Measurement results: frequencies equal to or less than 1 GHz

EUT : RB4000HM-a
Worst Case : GFSK Channel 0

Antenna Polarization	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	106.63	QP	7.64	26.84	34.48	43.50	-9.02
V	131.85	QP	11.39	24.16	35.55	43.50	-7.95
V	167.74	QP	15.70	20.69	36.39	43.50	-7.11
V	399.57	QP	16.40	18.40	34.80	46.00	-11.20
V	719.67	QP	22.29	12.80	35.08	46.00	-10.92
V	798.00	QP	23.19	19.06	42.25	46.00	-3.75
H	128.94	QP	11.62	16.31	27.92	43.50	-15.58
H	184.23	QP	12.08	15.21	27.29	43.50	-16.21
H	399.57	QP	16.74	13.55	30.29	46.00	-15.71
H	599.39	QP	20.84	10.23	31.06	46.00	-14.94
H	749.74	QP	22.95	11.33	34.28	46.00	-11.72
H	796.30	QP	23.52	20.43	43.95	46.00	-2.05

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

EUT : RB4000HM-c
Worst Case : GFSK Channel 0

Antenna Polarization	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	106.63	QP	7.64	28.67	36.31	43.50	-7.19
V	130.88	QP	11.39	26.35	37.74	43.50	-5.76
V	365.62	QP	15.06	17.21	32.27	46.00	-13.73
V	399.57	QP	16.40	18.40	34.80	46.00	-11.20
V	749.74	QP	22.74	13.67	36.41	46.00	-9.59
V	797.27	QP	23.19	21.88	45.07	46.00	-0.93
H	43.58	QP	14.20	9.51	23.71	40.00	-16.29
H	129.91	QP	11.62	20.29	31.90	43.50	-11.60
H	364.65	QP	15.48	11.36	26.83	46.00	-19.17
H	399.57	QP	16.74	17.18	33.92	46.00	-12.08
H	719.67	QP	22.44	10.24	32.68	46.00	-13.32
H	798.00	QP	23.52	15.93	39.45	46.00	-6.55

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

9.4.2 Measurement results: frequency above 1GHz

EUT : RB4000HM-a
Test Condition : GFSK at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804.00	PK	V	35.1	38.54	56.94	-	60.38	74	-13.62
4804.00	AV	V	35.1	38.54	26.22	-30.72	29.66	54	-24.34
7206.00	PK	V	33	44.6	38.74	-	50.34	54	-3.66
4804.00	PK	H	35.1	38.54	50.41	-	53.85	54	-0.15
7206.00	PK	H	33	44.6	39.84	-	51.44	54	-2.56

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a
Test Condition : GFSK at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882.00	PK	V	35.1	38.54	49.07	-	52.51	54	-1.49
4882.00	PK	H	35.1	38.54	46.82	-	50.26	54	-3.74

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a
Test Condition : GFSK at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	45.88	-	49.32	54	-4.68
4960.00	PK	H	35.1	38.54	45.82	-	49.26	54	-4.74

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a
Test Condition : π /4 DPSK at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804.00	PK	V	35.1	38.54	43.61	-	47.05	54	-6.95
4804.00	PK	H	35.1	38.54	46.06	-	49.50	54	-4.50

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a
Test Condition : π /4 DPSK at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882.00	PK	V	35.1	38.54	47.15	-	50.59	54	-3.41
4882.00	PK	H	35.1	38.54	43.29	-	46.73	54	-7.27

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a
Test Condition : π /4 DPSK at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	40.57	-	44.01	54	-9.99
4960.00	PK	H	35.1	38.54	38.37	-	41.81	54	-12.19

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a
Test Condition : 8DPSK at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804.00	PK	V	35.1	38.54	44.99	-	48.43	54	-5.57
4804.00	PK	H	35.1	38.54	46.88	-	50.32	54	-3.68

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a
Test Condition : 8DPSK at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882.00	PK	V	35.1	38.54	43.29	-	46.73	54	-7.27
4882.00	PK	H	35.1	38.54	47.7	-	51.14	54	-2.86

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a
Test Condition : 8DPSK at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	40.21	-	43.65	54	-10.35
4960.00	PK	H	35.1	38.54	43.24	-	46.68	54	-7.32

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c
Test Condition : GFSK at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804.00	PK	V	35.1	38.54	53.7	-	57.14	74	-16.86
4804.00	AV	V	35.1	38.54	22.98	-30.72	26.42	54	-27.58
7206.00	PK	V	33	44.6	37.87	-	49.47	54	-4.53
4804.00	PK	H	35.1	38.54	48.18	-	51.62	54	-2.38
7206.00	PK	H	33	44.6	38.31	-	49.91	54	-4.09

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c
Test Condition : GFSK at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882.00	PK	V	35.1	38.54	49	-	52.44	54	-1.56
4882.00	PK	H	35.1	38.54	46.59	-	50.03	54	-3.97

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c
Test Condition : GFSK at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	48.35	-	51.79	54	-2.21
4960.00	PK	H	35.1	38.54	44.89	-	48.33	54	-5.67

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c
Test Condition : π /4 DPSK at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804.00	PK	V	35.1	38.54	49.23	-	52.67	54	-1.33
4804.00	PK	H	35.1	38.54	45.24	-	48.68	54	-5.32

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c
Test Condition : π /4 DPSK at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882.00	PK	V	35.1	38.54	50.55	-	53.99	74	-20.01
4882.00	PK	V	35.1	38.54	19.85	-30.7	23.29	54	-30.71
4882.00	PK	H	35.1	38.54	46.18	-	49.62	54	-4.38

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c
Test Condition : π /4 DPSK at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	44.29	-	47.73	54	-6.27
4960.00	PK	H	35.1	38.54	39.61	-	43.05	54	-10.95

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c
Test Condition : 8DPSK at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804.00	PK	V	35.1	38.54	46.24	-	49.68	54	-4.32
4804.00	PK	H	35.1	38.54	44.25	-	47.69	54	-6.31

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c
Test Condition : 8DPSK at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4882.00	PK	V	35.1	38.54	48.26	-	51.70	54	-2.30
4882.00	PK	H	35.1	38.54	44.57	-	48.01	54	-5.99

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c
Test Condition : 8DPSK at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	44.64	-	48.08	54	-5.92
4960.00	PK	H	35.1	38.54	40.65	-	44.09	54	-9.91

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor + Duty Cycle Correction Factor
3. The frequency measured ranges from 1GHz to 25GHz.
4. Duty Cycle Correction Factor: Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

10. Emission on the band edge §FCC 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

10.1 Test setup & procedure

Please refer to the clause 9.2 of this report.

Please see the plot below.

10.2 Test Result

EUT : RB4000HM-a

Test Mode: GFSK mode

Channel	Measurement Freq. Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
0 (lowest)	2310-2390	PK	58.41	74	-15.59
		AV	27.69	54	-26.31
78 (highest)	2483.5-2500	PK	59.26	74	-14.74
		AV	28.54	54	-25.46

Remark: Duty Cycle Correction Factor = -30.72 dB
Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a

Test Mode: π /4 DPSK mode

Channel	Measurement Freq. Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
0 (lowest)	2310-2390	PK	64.59	74	-9.41
		AV	33.89	54	-20.11
78 (highest)	2483.5-2500	PK	64.10	74	-9.9
		AV	-33.40	54	-20.6

Remark: Duty Cycle Correction Factor = -30.7 dB
Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-a

Test Mode: 8DPSK mode

Channel	Measurement Freq. Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
0 (lowest)	2310-2390	PK	64.56	74	-9.44
		AV	33.84	54	-20.16
78 (highest)	2483.5-2500	PK	64.46	74	-9.54
		AV	33.74	54	-20.26

Remark: Duty Cycle Correction Factor = -30.72 dB
Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c

Test Mode: GFSK mode

Channel	Measurement Freq. Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
0 (lowest)	2310-2390	PK	57.48	74	-16.52
		AV	26.76	54	-27.24
78 (highest)	2483.5-2500	PK	58.78	74	-15.22
		AV	28.06	54	-25.94

Remark: Duty Cycle Correction Factor = -30.72 dB
Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c

Test Mode: π /4 DPSK mode

Channel	Measurement Freq. Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
0 (lowest)	2310-2390	PK	64.07	74	-9.93
		AV	33.37	54	-20.63
78 (highest)	2483.5-2500	PK	64.60	74	-9.40
		AV	33.90	54	-20.10

Remark: Duty Cycle Correction Factor = -30.7 dB

Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

EUT : RB4000HM-c

Test Mode: 8DPSK mode

Channel	Measurement Freq. Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
0 (lowest)	2310-2390	PK	64.24	74	-9.74
		AV	33.52	54	-20.48
78 (highest)	2483.5-2500	PK	64.11	74	-9.89
		AV	33.39	54	-20.61

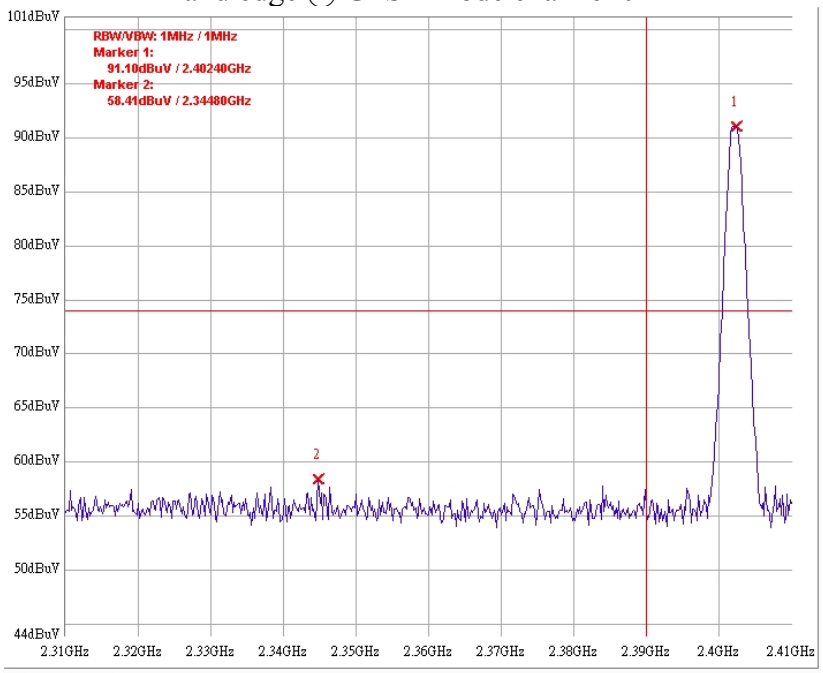
Remark: Duty Cycle Correction Factor = -30.72 dB

Please refer Time of Occupancy (dwell time) test in clause 6 of this report.

10.2.1 Band edge

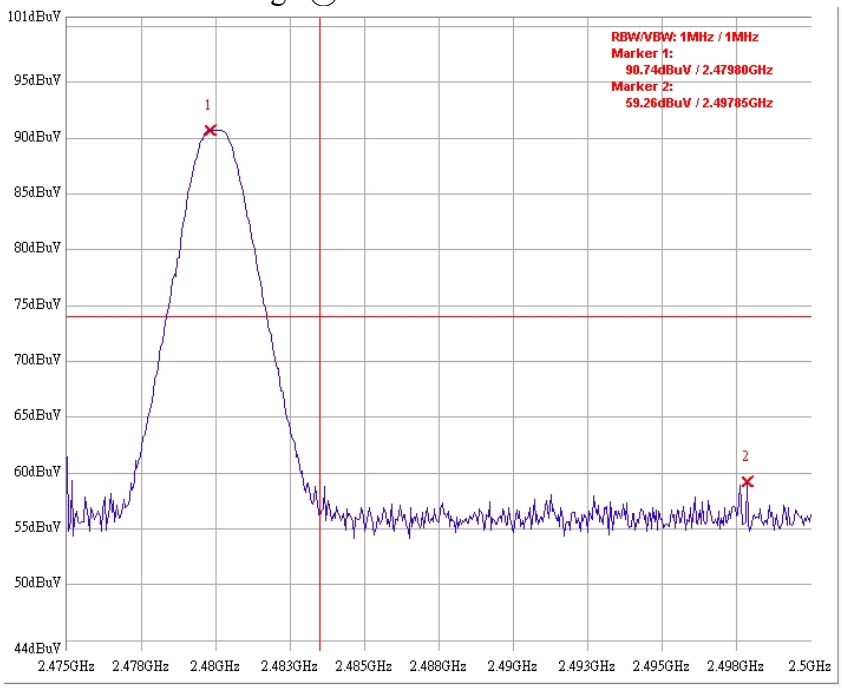
For RB4000HM-a

Band edge @ GFSK mode channel 0 PK



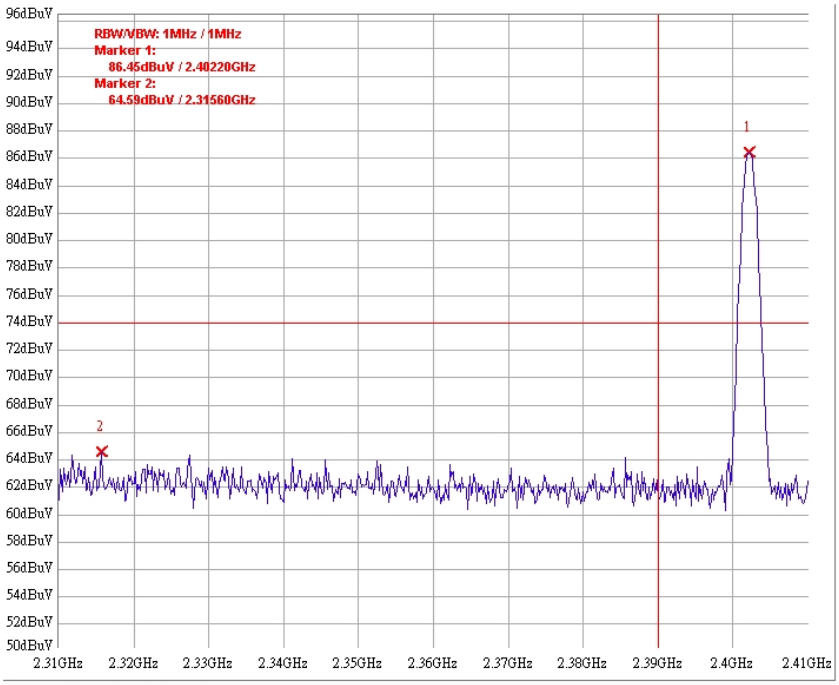
Brand / Model :成欣 / RB4000
Remark :Internal antenna, GFSK DH1 ch0 pw:63, pk vertical swt:2.5ms
Tested by : Terry

Band edge @ GFSK mode channel 78 PK



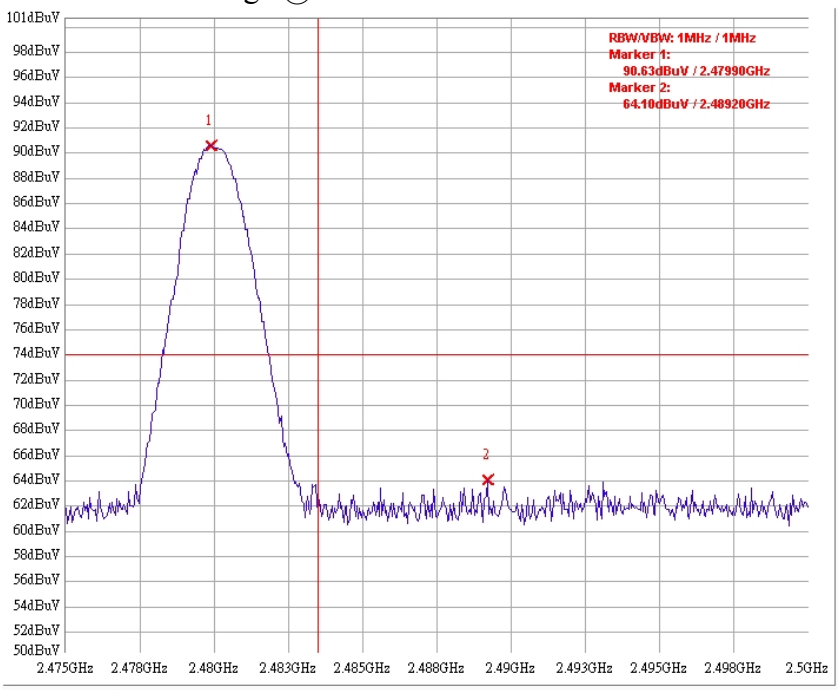
Brand / Model :成欣 / RB4000
Remark :Internal antenna, GFSK DH1 ch78 pw:63, pk vertical swt:2.5ms
Tested by : Terry

Band edge @ π /4DPSK mode channel 0 PK



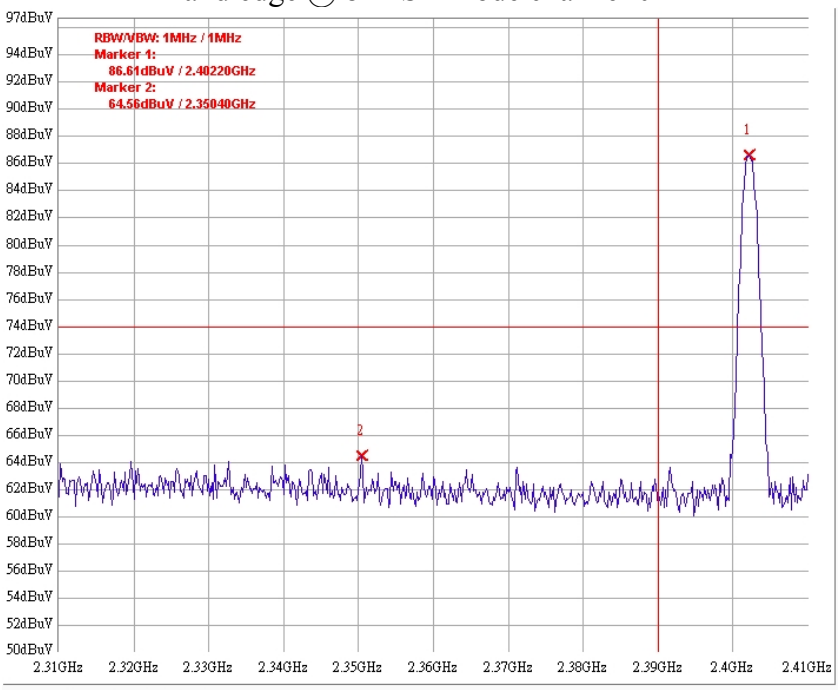
Brand / Model : 成欣_RB4000HM-a
Remark : internal antenna, π/4-DPSK DH1 ch0 pw:120 pk vertical swt:2.5ms
Tested by : hugo

Band edge @ π /4DPSK mode channel 78 PK



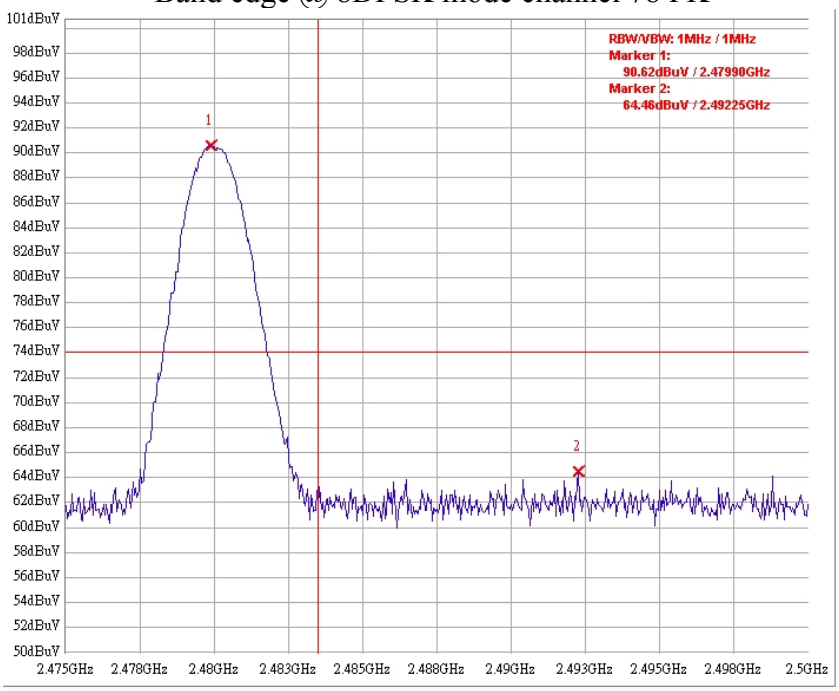
Brand / Model : 成欣_RB4000HM-a
Remark : internal antenna, π/4-DPSK DH1 ch78 pw:120 pk vertical swt:2.5ms
Tested by : hugo

Band edge @ 8DPSK mode channel 0 PK



Brand / Model : 成欣_RB4000HM-a
Remark : internal antenna, 8-DPSK DH1 ch0 pw:120 pk vertical swt:2.5ms
Tested by : hugo

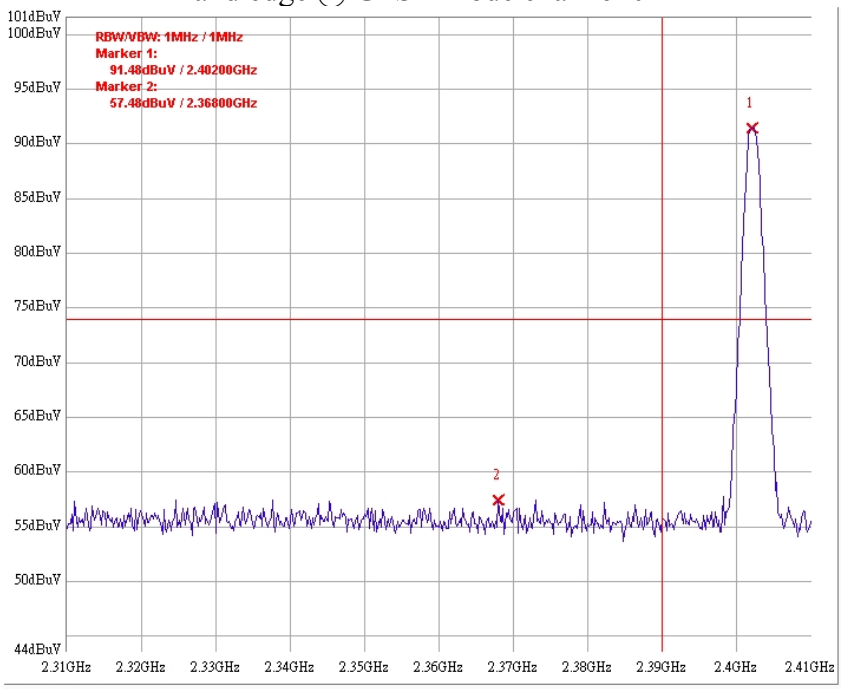
Band edge @ 8DPSK mode channel 78 PK



Brand / Model : 成欣_RB4000HM-a
Remark : internal antenna, 8-DPSK DH1 ch78 pw:120 pk vertical swt:2.5ms
Tested by : hugo

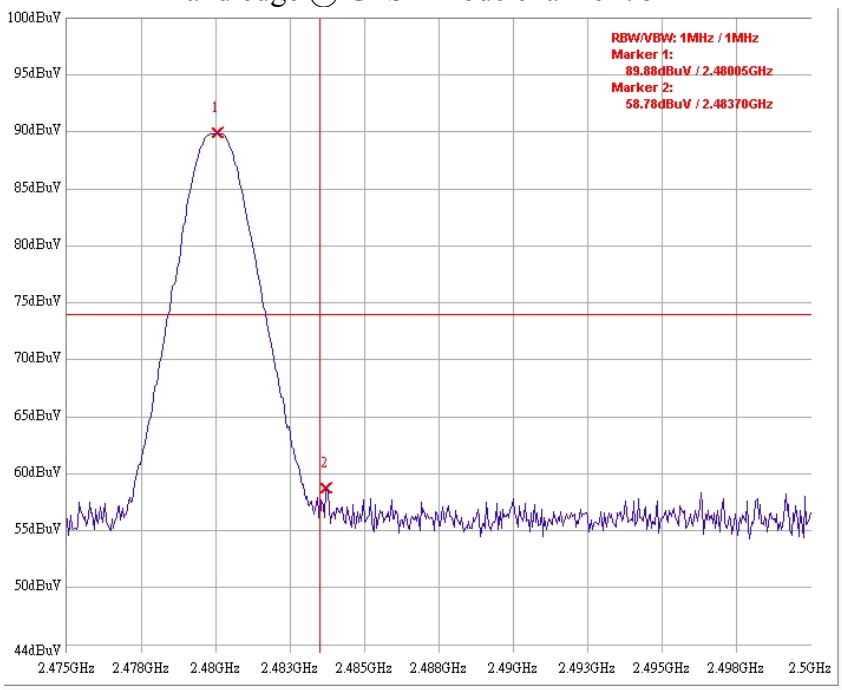
For RB4000HM-c

Band edge @ GFSK mode channel 0 PK



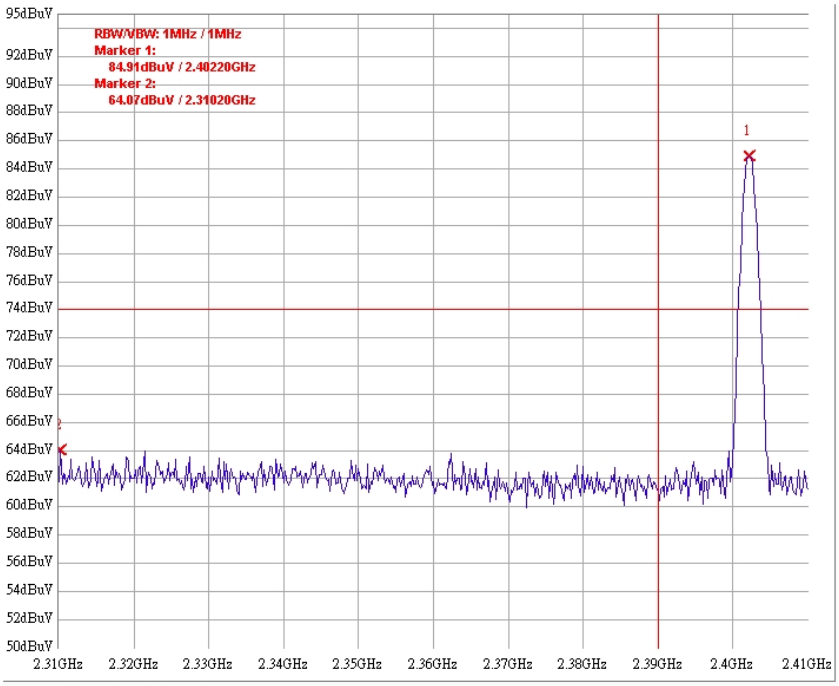
Brand / Model :成欣 / RB4000
Remark :External antenna, GFSK DH1 ch0 pw:63, pk vertical swt:2.5ms
Tested by : Terry

Band edge @ GFSK mode channel 78 PK



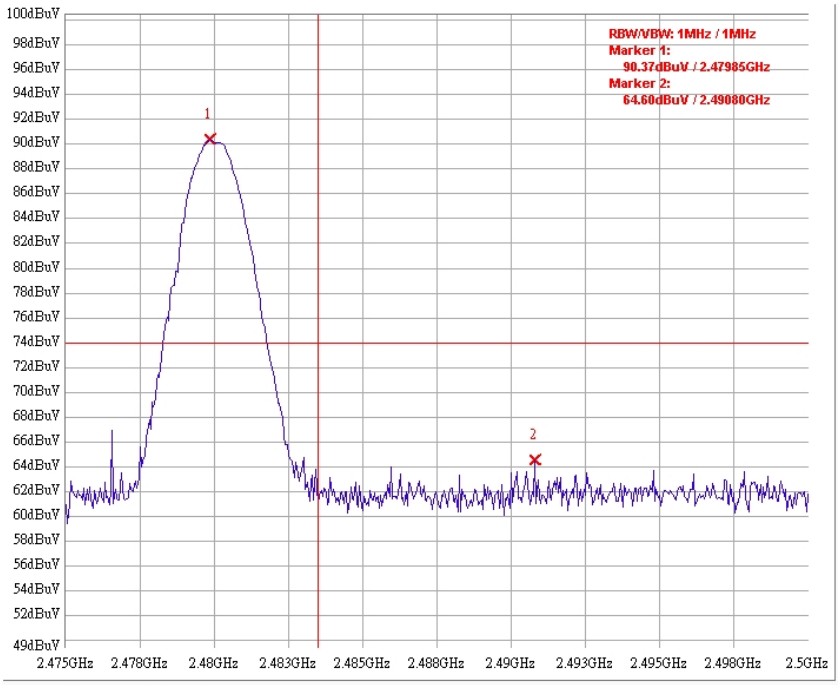
Brand / Model :成欣 / RB4000
Remark :External antenna, GFSK DH1 ch78 pw:63, pk vertical swt:2.5ms
Tested by : Terry

Band edge @ π /4DPSK mode channel 0 PK



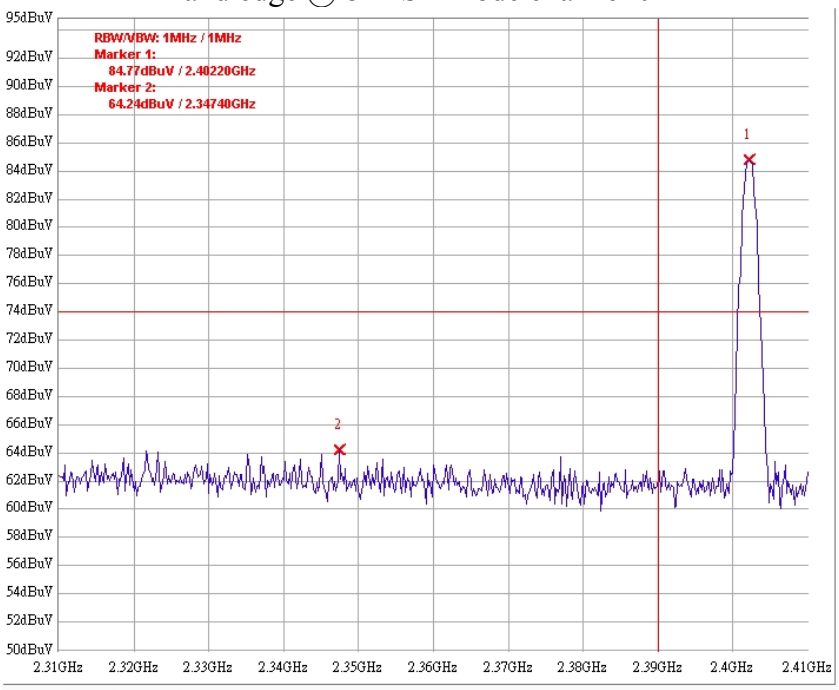
Brand / Model : 成欣_RB4000HM-a
Remark : external antenna, π 4-DPSK DH1 ch0 pw:120 pk vertical swt:2.5ms
Tested by : hugo

Band edge @ π /4DPSK mode channel 78 PK



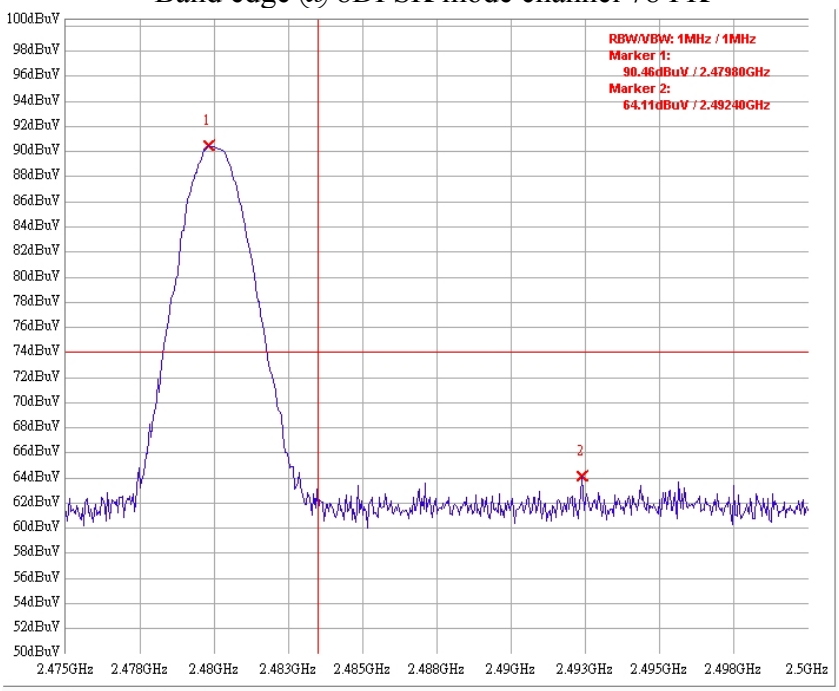
Brand / Model : 成欣_RB4000HM-a
Remark : external antenna, π /4-DPSK DH1 ch78 pw:120 pk vertical swt:2.5ms
Tested by : hugo

Band edge @ 8DPSK mode channel 0 PK



Brand / Model : 成欣_RB4000HM-a
Remark : external antenna,8-DPSK DH1 ch0 pw:120 pk vertical swt:2.5ms
Tested by : hugo

Band edge @ 8DPSK mode channel 78 PK



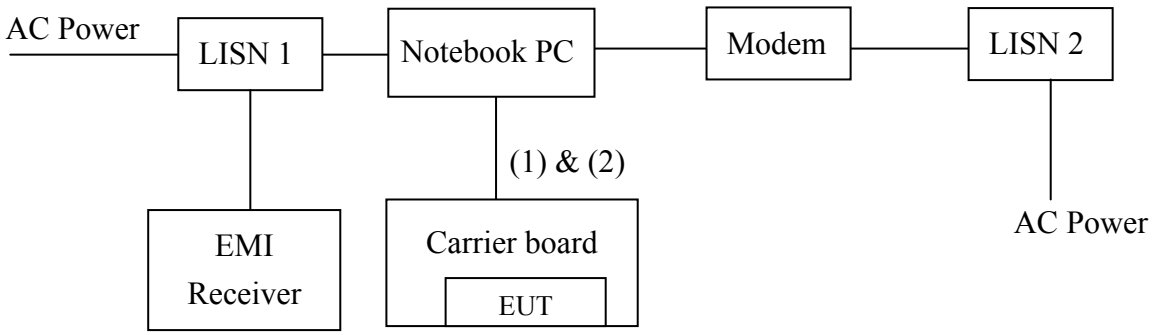
Brand / Model : 成欣_RB4000HM-a
Remark : external antenna,8-DPSK DH1 ch78 pw:120 pk vertical swt:2.5ms
Tested by : hugo

11. Power Line Conducted Emission test §FCC 15.207

11.1 Operating environment

Temperature:	25	℃
Relative Humidity:	60	%
Atmospheric Pressure	1008	hPa

11.2 Test setup & procedure



The test procedure was according to ANSI C63.4/2003.

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/50uH coupling impedance with 50 ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9 kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.

11.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

*Decreases with the logarithm of the frequency.

11.4 Uncertainty of Conducted Emission

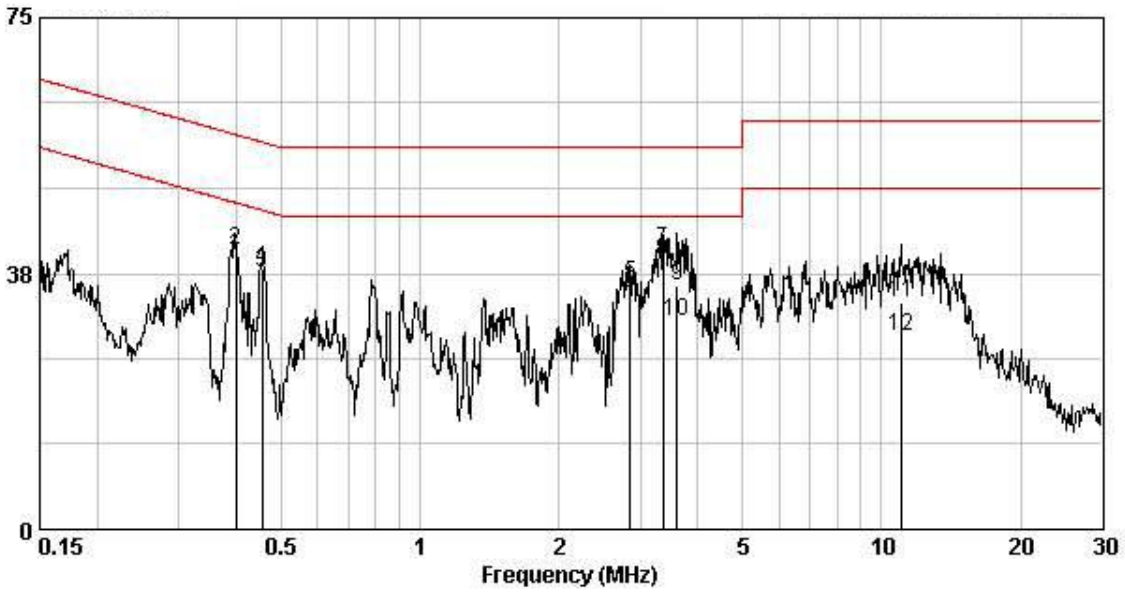
Expanded uncertainty (k=2) of conducted emission measurement is ±2.786 dB.

11.5 Power Line Conducted Emission test data

Phase: Line
Model No.: RB4000HM-a
Operating mode: Normal operating mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.400	0.13	41.02	57.86	40.17	47.86	-16.83	-7.68
0.454	0.14	37.76	56.80	38.24	46.80	-19.04	-8.56
2.848	0.25	36.01	56.00	34.63	46.00	-19.99	-11.37
3.357	0.26	41.03	56.00	39.33	46.00	-14.97	-6.67
3.603	0.27	35.81	56.00	30.53	46.00	-20.19	-15.47
11.021	0.59	33.32	60.00	28.21	50.00	-26.68	-21.79

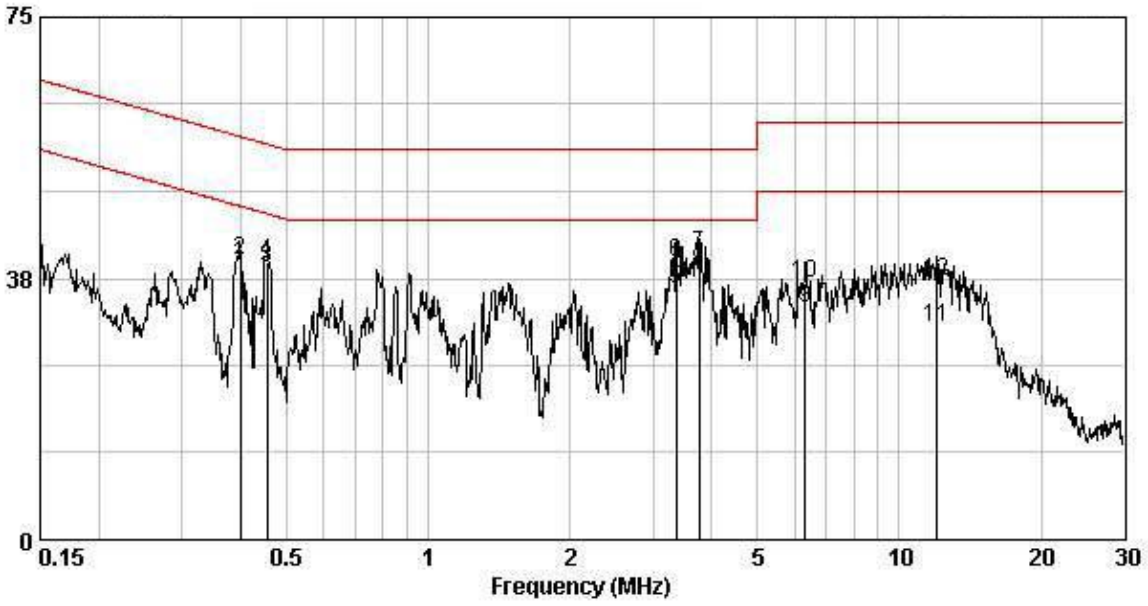
Remark:
1. Corr. Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral
Model No.: RB4000HM-a
Operating mode: Normal operating mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.400	0.17	39.68	57.86	40.02	47.86	-18.17	-7.83
0.454	0.18	39.12	56.80	39.77	46.80	-17.68	-7.03
3.364	0.29	39.72	56.00	36.02	46.00	-16.28	-9.98
3.759	0.30	40.92	56.00	38.51	46.00	-15.08	-7.49
6.319	0.37	36.89	60.00	33.33	50.00	-23.11	-16.67
12.060	0.56	37.14	60.00	30.60	50.00	-22.86	-19.40

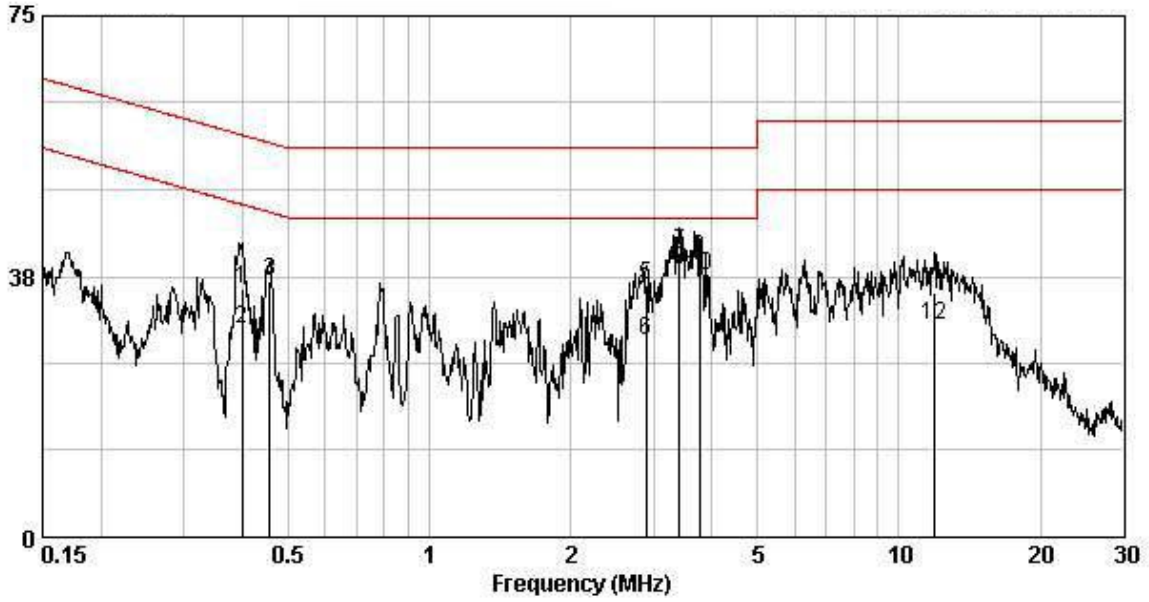
Remark:
1. Corr. Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Line
Model No.: RB4000HM-c
Operating mode: Normal operating mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.400	0.13	35.83	57.86	30.03	47.86	-22.02	-17.82
0.456	0.14	36.76	56.76	36.44	46.76	-20.00	-10.32
2.888	0.25	36.29	56.00	28.27	46.00	-19.71	-17.73
3.412	0.27	40.92	56.00	38.57	46.00	-15.08	-7.43
3.754	0.27	40.08	56.00	37.73	46.00	-15.92	-8.27
11.933	0.66	35.20	60.00	30.37	50.00	-24.80	-19.63

Remark:
1. Corr. Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral
Model No.: RB4000HM-c
Operating mode: Normal operating mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.308	0.17	33.21	60.02	25.52	50.02	-26.81	-24.50
0.391	0.17	37.51	58.03	31.65	48.03	-20.52	-16.38
3.399	0.29	40.75	56.00	39.11	46.00	-15.25	-6.89
3.740	0.30	41.23	56.00	35.08	46.00	-14.77	-10.92
6.698	0.38	35.83	60.00	27.07	50.00	-24.17	-22.93
11.139	0.51	35.56	60.00	30.23	50.00	-24.44	-19.77

Remark:
1. Corr. Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)