



DIGITAL EMC CO., LTD.

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Certification of Compliance

Samsin Innotec Co., Ltd.

252-23, Sarihyun-Dong, Ilsandong-Gu, Goyang-City,
Kyonggi-Do, 411-530 Korea

Dates of Tests: February 02 ~ 10, 2009

Test Report S/N: DR50110902L

Test Site : DIGITAL EMC CO., LTD.

FCC ID

QJ8-SWE1000H

APPLICANT

Samsin Innotec Co., Ltd.

FCC Classification	:	Part 15 Low Power Communication Device Transmitter
Device name	:	Wireless 2-channel RF TRANSMIT Module
Manufacturer	:	Samsin Innotec Co., Ltd.
FCC ID	:	QJ8-SWE1000H
Model name	:	HNB-C
Test Device Serial number	:	Identical prototype
FCC Rule Part(s)	:	FCC Part 15.249; ANSI C-63.4-2003
Frequency Range	:	2402 ~ 2478 MHz
Data of issue	:	February 14, 2008

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1. General information

This report contains the result of tests performed by:

DIGITAL EMC CO., LTD.

Address : 683-3, Yubang-Dong, Yongin-Si, Kyunggi-Do, Korea. 449-080

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Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competents of calibration and testing laboratory".

Test operator: engineer

February 14, 2009

D.C. Cha



Data

Name

Signature

Report Reviewed By: manager

February 14, 2009

Harvey Sung



Data

Name

Signature

Ordering party:

Company name : Samsin Innotec Co., Ltd.
Address : 252-23, Sarihyun-Dong, Ilsandong-Gu,
Zip code : 411-530
City/town : Goyang-City, Kyonggi-Do
Country : Korea
Date of order : December 02, 2008

2. Information about test item

QJ8-SWE1000H

2.1 Equipment information

Equipment model name	HNB-C
Type of equipment	Wireless 2-channel RF TRANSMIT Module
Frequency band	2402 MHz ~ 2478 MHz
Type of Modulation	GFSK
Channel Spacing	2 MHz
Type of antenna	PIPA Antenna
Power Supply(Battery)	DC 24V

2.2 Tested frequency

Frequency	TX
Low frequency	2402 MHz
Middle frequency	2440 MHz
High frequency	2478 MHz

2.3 Tested environment

Temperature	: 15 ~ 35 (°C)
Relative humidity content	: 20 ~ 75 %
Air pressure	: 86 ~ 103 kPa
Details of power supply	: DC 24V

2.4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
-	-	-	-
-	-	-	-

2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing -> none

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
I. Transmit mode(Tx)				
15.249 (a)	Field Strength Limits	Refer to the FCC 15.249(a)	Radiated	C
15.205 / 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< FCC 15.209 limits	Radiated	C
15.207	AC Conducted Emissions	< FCC 15.207 limits	Line Conducted	NA
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable				

The sample was tested according to the following specification:

FCC Parts 15.249; ANSI C-63.4-2003

3.2 Transmitter requirements

3.2.1 AC Conducted Emissions

Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT operates at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak detector mode and average detector mode with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

Measurement Data: **Not Applicable**

Conducted emission test is not applicable. Because power input of this device is DC only.

Minimum Standard: FCC Part 15.207(a)/EN 55022

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Measurement Setup

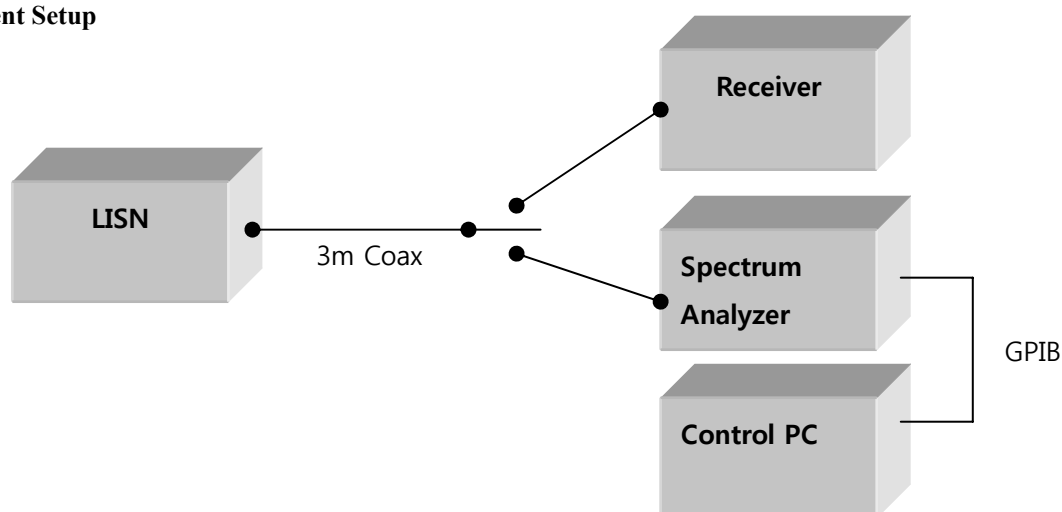


Figure 2: Measurement setup for AC Conducted Emission

3.2.2 Radiated Emission

Procedure:

The EUT was placed on a 0.8m high wooden table inside a semi anechoic chamber. An antenna was placed at 3m distance from the EUT. Measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed on OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions

The spectrum analyzer is set to:

Frequency Range = 30 MHz ~ 10th harmonic.

RBW = 120 kHz (30MHz ~ 1 GHz)

= 1 MHz (1 GHz ~ 10th harmonic)

Distance = 3m

Trace = max hold

VBW ≥ RBW

Detector function = peak

Sweep = auto

Measurement Data: **Complies**

- Refer to the next page.
- Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Fundamental / Harmonics emission: FCC Part 15.249(a)

Frequency (MHz)	Limit @ 3m	
	Fundamental (mV/m)	Harmonics (uV/m)
2400 ~ 2483.5	50	500

General Standard: FCC Part 15.209(a)

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

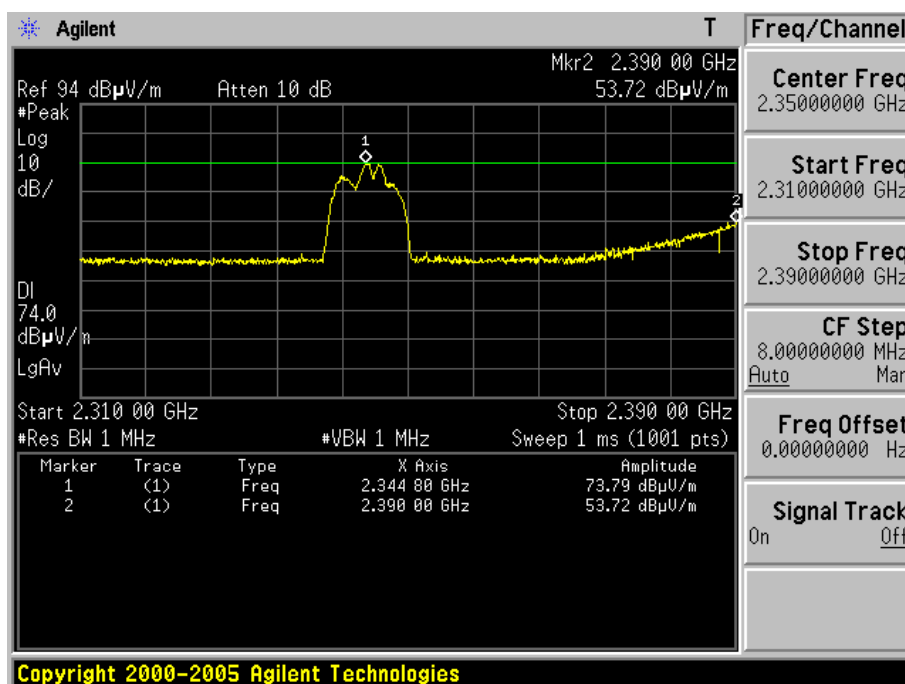
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	12.29 ~ 12.293	149.9 ~ 150.05	1645.5 ~ 1646.5	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.51975 ~ 12.52025	156.52475 ~ 156.52525	1660 ~ 1710	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.57675 ~ 12.57725	156.7 ~ 156.9	1718.8 ~ 1722.2	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	13.36 ~ 13.41	162.0125 ~ 167.17	2200 ~ 2300	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	16.42 ~ 16.423	167.72 ~ 173.2	2310 ~ 2390	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.69475 ~ 16.69525	240 ~ 285	2483.5 ~ 2500	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.80425 ~ 16.80475	322 ~ 335.4	2655 ~ 2900	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	25.5 ~ 25.67	399.90 ~ 410	3260 ~ 3267	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	37.5 ~ 38.25	608 ~ 614	3332 ~ 3339		
8.291 ~ 8.294	73 ~ 74.6	960 ~ 1240	3345.8 ~ 3358		
8.362 ~ 8.366	74.8 ~ 75.2	1300 ~ 1427	3600 ~ 4400		
8.37625 ~ 8.38675	108 ~ 121.94	1435 ~ 1626.5			
8.41425 ~ 8.41475	123 ~ 138				

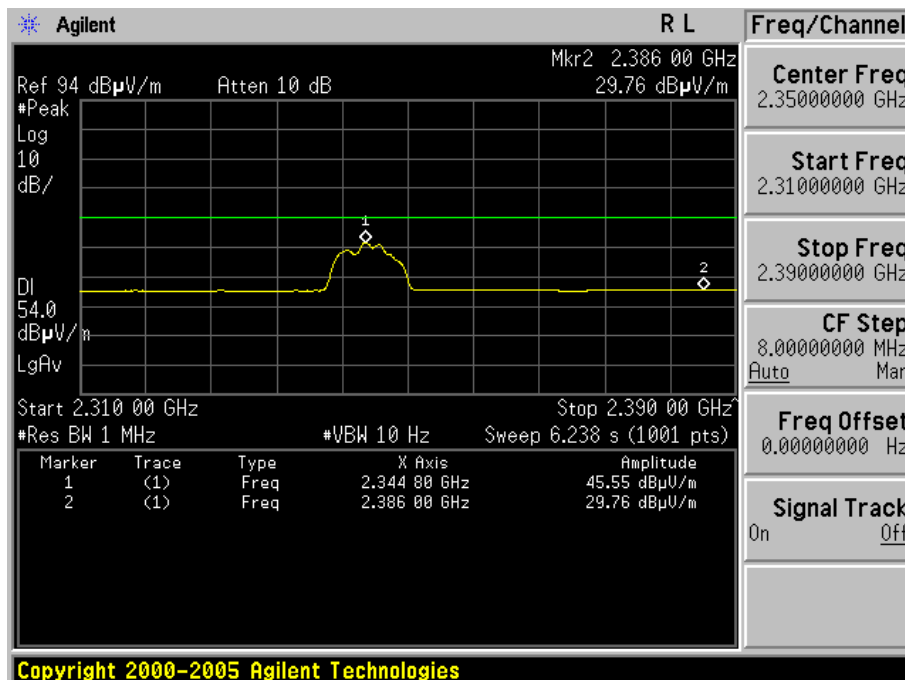
▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR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

Restricted Band Edge: Low Channel (Peak, Horizontal)



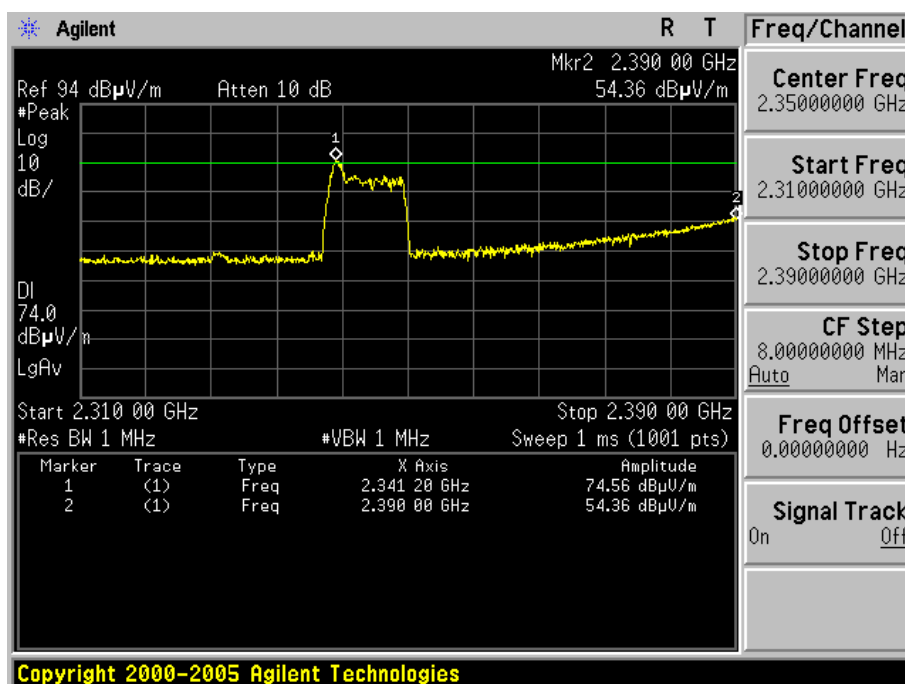
Note : Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea

Restricted Band Edge: Low Channel (Average, Horizontal)



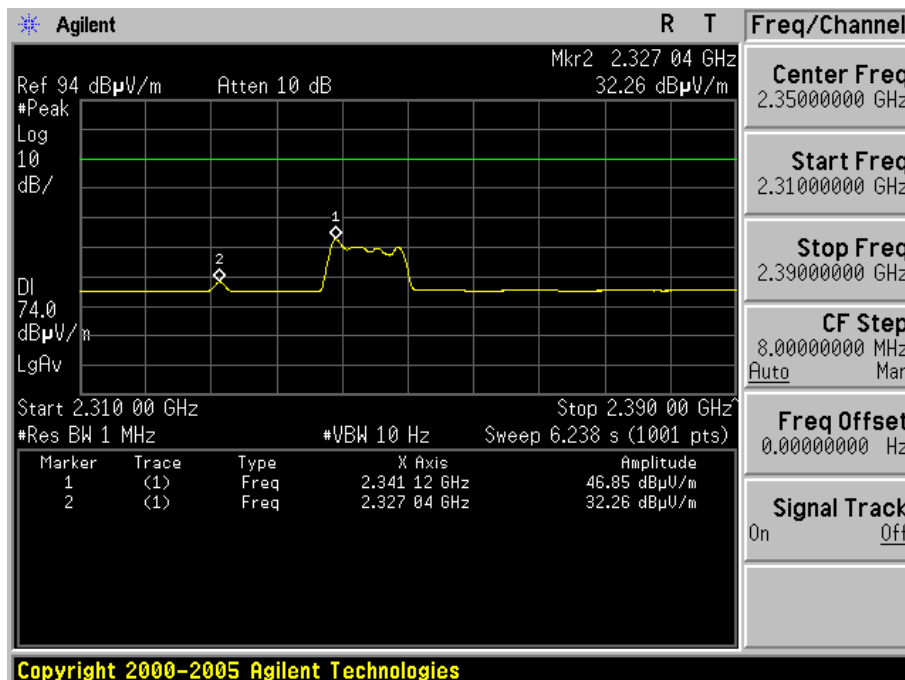
Note : Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea

Restricted Band Edge: Low Channel (Peak, Vertical)



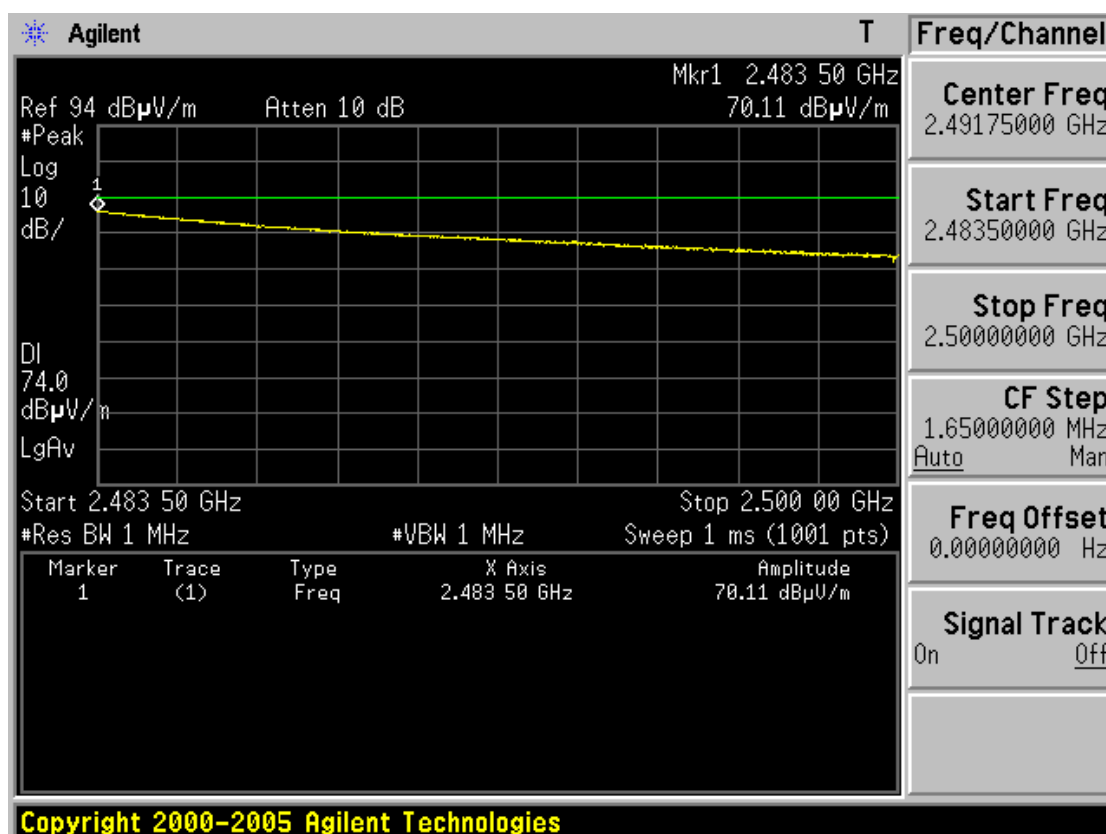
Note : Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea

Restricted Band Edge: Low Channel (Average, Vertical)

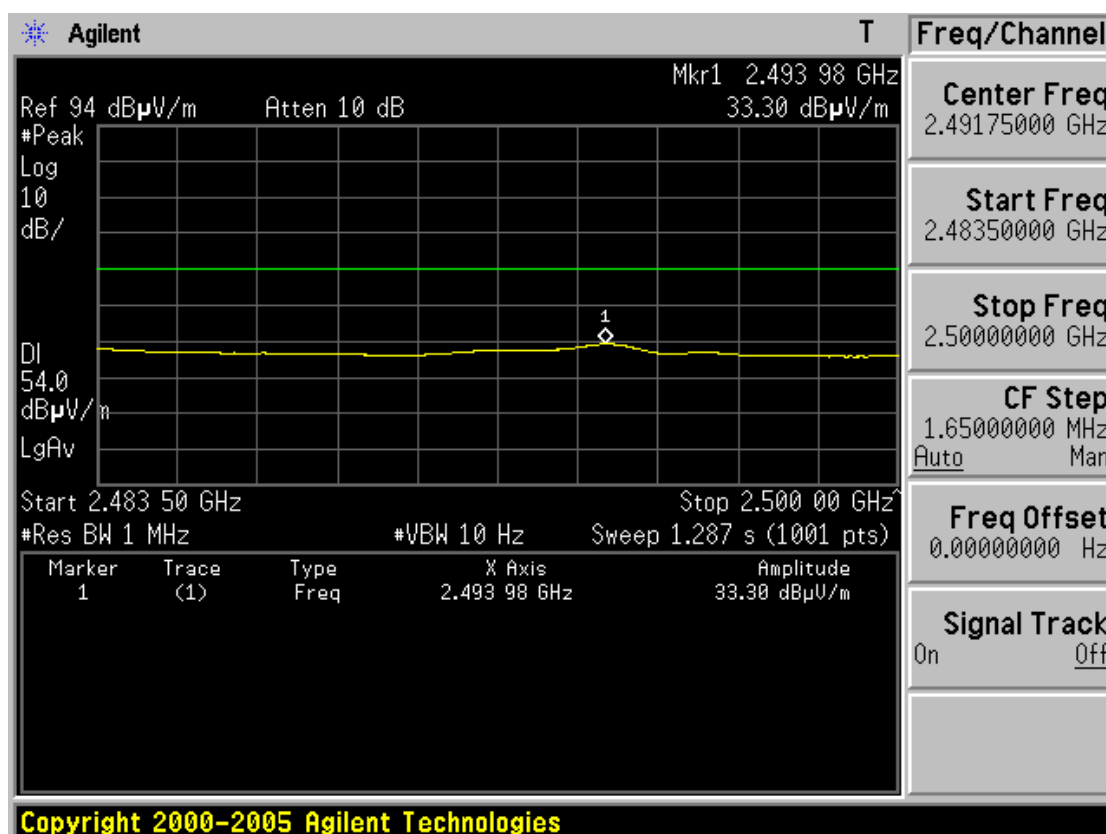


Note : Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea

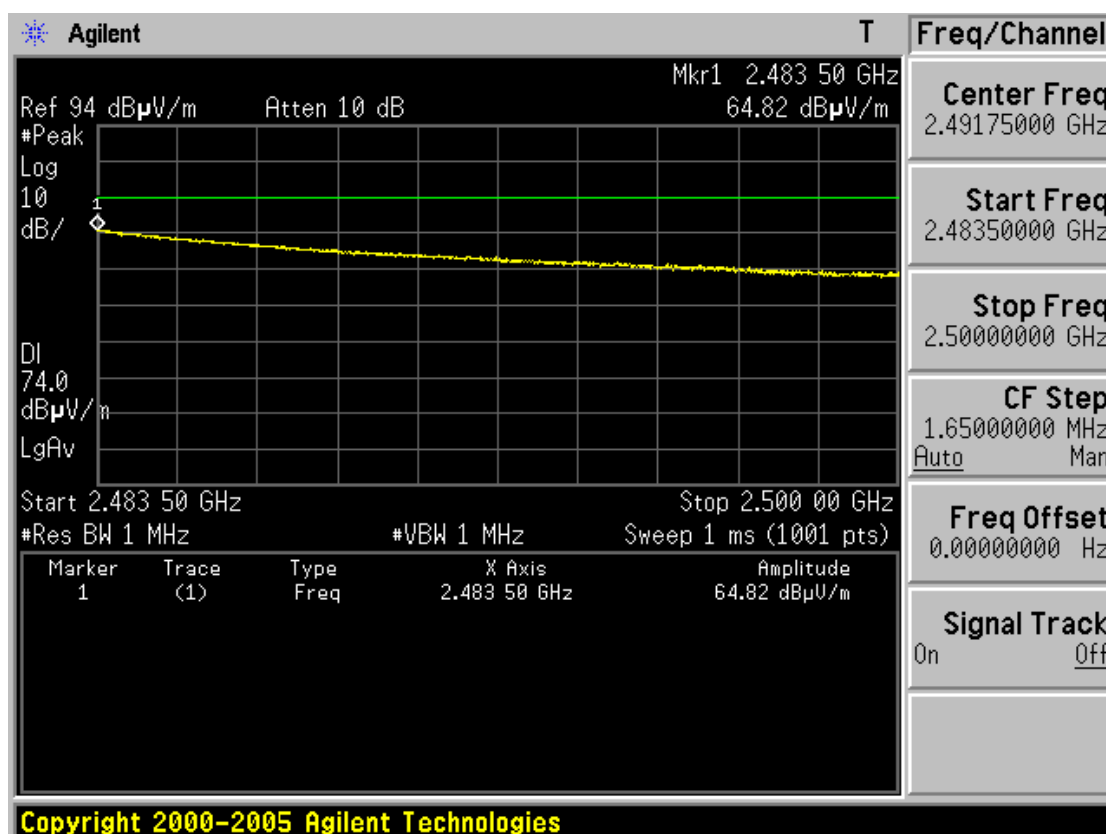
Restricted Band Edge: High Channel (Peak, Horizontal)



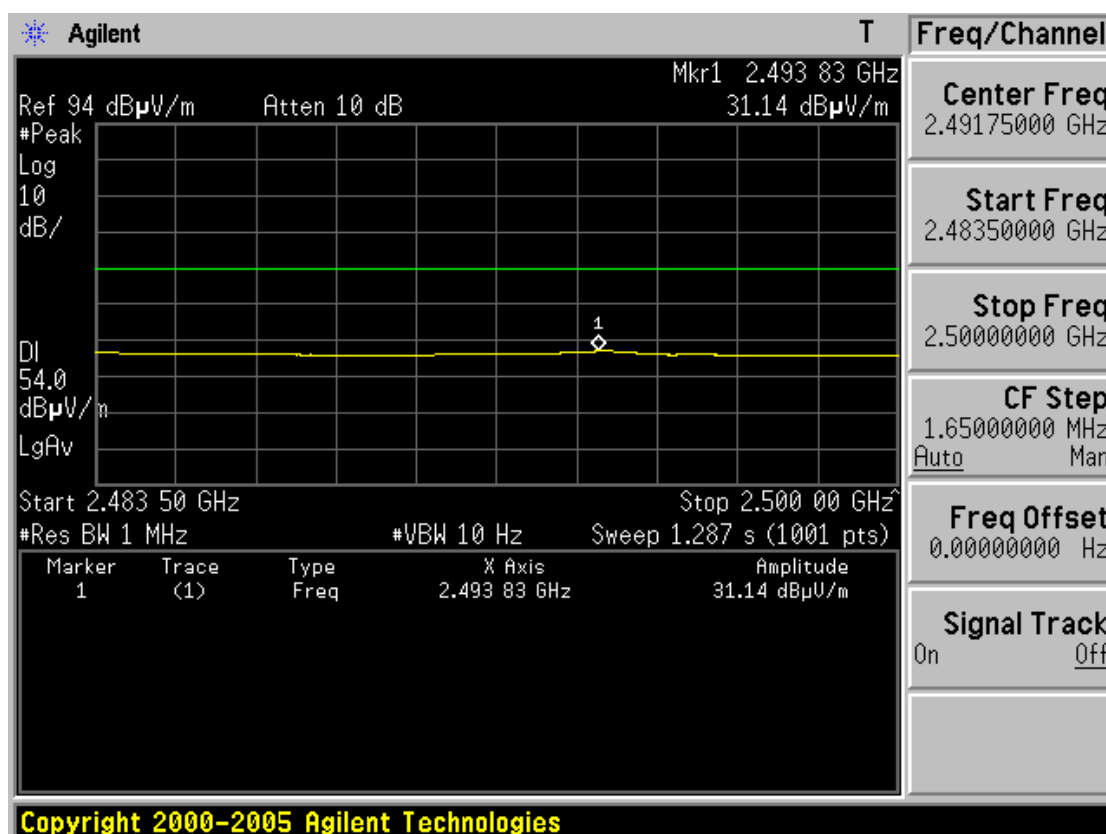
Restricted Band Edge: High Channel (Average, Horizontal)



Restricted Band Edge: High Channel (Peak, Vertical)



Restricted Band Edge: High Channel (Average, Vertical)



Fundamental Measurement Data:

Frequency (MHz)	ANT Pol	Reading(dBuV)		T.F (dB/m)	Result(dBuV/m)		Limit(dBuV/m)		Margin(dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
2402	H	94.63	74.97	-1.41	93.22	73.56	114	94	20.78	20.44
2402	V	93.71	74.40	-1.41	92.30	72.99	114	94	21.70	21.01
2440	H	97.92	77.10	-1.02	96.90	76.08	114	94	17.10	17.92
2440	V	94.57	74.91	-1.02	93.55	73.89	114	94	20.45	20.11
2478	H	98.59	77.66	-1.09	97.50	76.57	114	94	16.50	17.43
2478	V	95.77	75.85	-1.09	94.68	74.76	114	94	19.32	19.24

Note.

1. If peak result meet AV limit, AV measurement is omitted.
2. Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

Harmonic and other emissions Measurement Data: Fundamental Frequency = 2402 MHz

Frequency (MHz)	ANT Pol	Reading(dBuV)			T.F (dB/m)	Result(dBuV/m)			Limit(dBuV/m)			Margin(dB)		
		QP	PK	AV		QP	PK	AV	QP	PK	AV	QP	PK	AV
41.250	V	41.60	-	-	-10.40	31.20	-	-	40.00	-	-	8.80	-	-
76.491	H	44.60	-	-	-17.20	27.40	-	-	40.00	-	-	12.6	-	-
76.500	V	54.80	-	-	-17.20	37.60	-	-	40.00	-	-	2.40	-	-
94.600	V	48.80	-	-	-14.70	34.10	-	-	43.50	-	-	9.40	-	-
122.864	V	43.70	-	-	-12.60	31.10	-	-	43.50	-	-	12.40	-	-
166.522	H	44.50	-	-	-13.80	30.70	-	-	43.50	-	-	12.80	-	-
175.582	V	53.60	-	-	-13.90	39.70	-	-	43.50	-	-	3.80	-	-
189.153	V	47.60	-	-	-13.30	34.30	-	-	43.50	-	-	9.20	-	-
4804	H	-	45.50	32.99	6.37	-	51.87	39.36	-	74.00	54.00	-	22.13	14.64
4804	V	-	46.36	33.65	6.37	-	52.73	40.02	-	74.00	54.00	-	21.27	13.98

Harmonic and other emissions Measurement Data: Fundamental Frequency = 2440 MHz

Frequency (MHz)	ANT Pol	Reading(dBuV)			T.F (dB/m)	Result(dBuV/m)			Limit(dBuV/m)			Margin(dB)		
		QP	PK	AV		QP	PK	AV	QP	PK	AV	QP	PK	AV
42.288	V	44.90	-	-	-10.30	34.60	-	-	40.00	-	-	5.40	-	-
76.480	V	54.40	-	-	-17.20	37.20	-	-	40.00	-	-	2.80	-	-
76.488	H	44.30	-	-	-17.20	27.10	-	-	40.00	-	-	12.90	-	-
94.620	V	47.70	-	-	-14.70	33.00	-	-	43.50	-	-	10.50	-	-
122.844	V	42.50	-	-	-12.60	29.90	-	-	43.50	-	-	13.60	-	-
137.448	V	41.50	-	-	-13.10	28.40	-	-	43.50	-	-	15.10	-	-
165.724	H	43.80	-	-	-13.80	30.00	-	-	43.50	-	-	13.50	-	-
175.416	V	53.50	-	-	-13.90	39.60	-	-	43.50	-	-	3.90	-	-
189.112	V	46.50	-	-	-13.30	33.20	-	-	43.50	-	-	10.30	-	-
210.420	V	42.40	-	-	-12.30	30.10	-	-	43.50	-	-	13.40	-	-
4882	H	-	43.30	31.28	6.69	-	49.99	37.97	-	74.00	54.00	-	24.01	16.03
4882	V	-	43.87	31.08	6.69	-	50.56	37.77	-	74.00	54.00	-	23.44	16.23

Harmonic and other emissions Measurement Data: Fundamental Frequency = 2478 MHz (Continued...)

Frequency (MHz)	ANT Pol	Reading(dBuV)			T.F (dB/m)	Result(dBuV/m)			Limit(dBuV/m)			Margin(dB)		
		QP	PK	AV		QP	PK	AV	QP	PK	AV	QP	PK	AV
42.300	V	45.40	-	-	-10.30	35.10	-	-	40.00	-	-	4.90	-	-
76.500	H	44.30	-	-	-17.20	27.10	-	-	40.00	-	-	12.90	-	-
76.500	V	54.40	-	-	-17.20	37.20	-	-	40.00	-	-	2.80	-	-
94.620	H	41.50	-	-	-14.70	26.80	-	-	43.50	-	-	16.70	-	-
94.620	V	48.10	-	-	-14.70	33.40	-	-	43.50	-	-	10.10	-	-
122.860	V	43.50	-	-	-12.60	30.90	-	-	43.50	-	-	12.60	-	-
137.460	V	41.30	-	-	-13.10	28.20	-	-	43.50	-	-	15.30	-	-
175.400	V	53.90	-	-	-13.90	40.00	-	-	43.50	-	-	3.50	-	-
176.240	H	44.70	-	-	-13.90	30.80	-	-	43.50	-	-	12.70	-	-
189.160	V	47.90	-	-	-13.30	34.60	-	-	43.50	-	-	8.90	-	-
210.160	V	43.40	-	-	-12.40	31.00	-	-	43.50	-	-	12.50	-	-
4960	H	-	45.53	32.82	7.18	-	52.71	40.00	-	74.00	54.00	-	21.29	14.00
4960	V	-	43.49	31.57	7.18	-	50.67	38.75	-	74.00	54.00	-	23.33	15.25

Note.

1. No other spurious were detected at a level greater than 20dB below limit.
2. If peak result meet AV limit, AV measurement is omitted.
3. Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} / \text{Result} = \text{Reading} + \text{T.F} / \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

APPENDIX

TEST EQUIPMENT USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	Next.Due.Date (dd/mm/yy)	S/N
☒	Spectrum Analyzer	Agilent	E4440A	06/11/08	06/11/09	MY45304199
☐	Spectrum Analyzer(RE)	H.P	8563E	13/10/08	13/10/09	3551A04634
☐	Spectrum Analyzer	Rohde Schwarz	FSP	09/09/08	09/09/09	100385
☐	Power Meter	H.P	EMP-442A	10/07/08	10/07/09	GB37170413
☐	Power Sensor	H.P	8481A	14/07/08	14/07/09	3318A96332
☐	Power Divider	Agilent	11636B	04/12/08	04/12/09	56471
☐	Power Splitter	Anritsu	K241B	14/10/08	14/10/09	020611
☐	Frequency Counter	H.P	5342A	16/09/08	16/09/09	2119A04450
☐	TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	10/10/08	10/10/09	30604493/021031
☐	Digital Multimeter	H.P	34401A	20/03/08	20/03/09	3146A13475
☐	Thermo hygrometer	BODYCOM	BJ5478	06/02/09	06/02/10	090205-3
☐	Thermo hygrometer	BODYCOM	BJ5478	06/02/09	06/02/10	090205-2
☐	Thermo hygrometer	BODYCOM	BJ5478	06/02/09	06/02/10	090205-4
☐	Multifuction Synthesizer	HP	8904A	06/10/08	06/10/09	3633A08404
☒	Signal Generator	Rohde Schwarz	SMR20	02/04/08	02/04/09	101251
☒	Signal Generator	H.P	ESG-3000A	09/07/08	09/07/09	US37230529
☐	Vector Signal Generator	Rohde Schwarz	SMJ100A	02/02/09	02/02/10	100148
☐	Audio Analyzer	H.P	8903B	09/07/08	09/07/09	3011A09448
☐	Modulation Analyzer	H.P	8901B	18/07/08	18/07/09	3028A03029
☐	8960 Series 10 Wireless Comms. Test Set	Agilent	E5515C	31/07/08	31/07/09	GB43461134
☐	Universal Radio communication Tester	Rohde Schwarz	CMU 200	02/04/08	02/04/09	107631
☐	Bluetooth Tester	TESCOM	TC-3000A	16/12/08	16/12/09	3000A4A0121
☐	BAND Reject Filter	Microwave Circuits	N0308372	06/10/08	06/10/09	3125-01DC0352
☐	BAND Reject Filter	Wainwright	WRCG1750	06/10/08	06/10/09	2
☐	High-Pass Filter	ANRITSU	MP526D	06/10/08	06/10/09	MP27756
☐	High-pass filter	Wainwright	WHKX2.1	N/A	N/A	1
☒	High-Pass Filter	Wainwright	WHKX3.0	N/A	N/A	9
☐	Tunable Notch Filter	Wainwright	WRCT800.0 /960.0-0.2/40-8SSK	N/A	N/A	10
☐	Tunable Notch Filter	Wainwright	WRCD1700.0 /2000.0-0.2/40-10SSK	N/A	N/A	27
☐	Tunable Notch Filter	Wainwright	WRCT1900.0/ 2200.0-5/40-10SSK	N/A	N/A	7
☐	AC Power supply	DAEKWANG	5KVA	20/03/08	20/03/09	20060321-1
☐	DC Power Supply	HP	6622A	20/03/08	20/03/09	3448A03760
☒	DC Power Supply	HP	6633A	20/03/08	20/03/09	3524A06634
☐	HORN ANT	ETS	3115	13/06/08	13/06/09	6419
☒	HORN ANT	ETS	3115	10/09/08	10/09/09	21097
☐	HORN ANT	A.H.Systems	SAS-574	13/06/08	13/06/09	154
☐	HORN ANT	A.H.Systems	SAS-574	13/06/08	13/06/09	155

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	Next.Due.Date (dd/mm/yy)	S/N
☐	Dipole Antenna	Schwarzbeck	VHA9103	25/11/08	25/11/09	2116
☐	Dipole Antenna	Schwarzbeck	VHA9103	25/11/08	25/11/09	2117
☐	Dipole Antenna	Schwarzbeck	UHA9105	25/11/08	25/11/09	2261
☐	Dipole Antenna	Schwarzbeck	UHA9105	25/11/08	25/11/09	2262
☐	Coaxial Fixed Attenuators	Agilent	8491B	01/08/08	01/08/09	MY39260700
☐	Coaxial Fixed Attenuators	Agilent	8491B	15/07/08	15/07/09	MY39260699
☐	Attenuator (10dB)	WEINSCHL	23-10-34	01/10/08	01/10/09	BP4386
☐	Attenuator (20dB)	WEINSCHL	86-20-11	06/10/08	06/10/09	432
☐	Attenuator (10dB)	WEINSCHL	86-10-11	06/10/08	06/10/09	446
☐	Attenuator (10dB)	WEINSCHL	86-10-11	06/10/08	06/10/09	408
☐	Attenuator (40dB)	WEINSCHL	57-40-33	01/10/08	01/10/09	NN837
☐	Attenuator (30dB)	JFW	50FH-030-300	24/03/08	24/03/09	060320-1
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0088CAN	11/07/08	11/07/09	788
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0185CAN	11/07/08	11/07/09	790
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0215CAN	11/07/08	11/07/09	112
☒	Amplifier (30dB)	Agilent	8449B	13/10/08	13/10/09	3008A01590
☐	RF Power Amplifier	OPHIRRF	5069F	09/07/08	09/07/09	1006
☐	Software	Agilent	Benchlink	N/A	N/A	A.01.09 021211
☐	EMI TEST RECEIVER	R&S	ESU	02/02/09	02/02/10	100014
☒	BILOG ANTENNA	SCHAFFNER	CBL6112B	13/06/08	13/06/09	2737
☐	Amplifier (22dB)	H.P	8447E	27/02/08	27/02/09	2945A02865
☒	Position Controller	TOKIN	5905A	N/A	N/A	N/A
☒	Software	ToYo EMI	EP5/RE	N/A	N/A	Ver 2.0.800
☒	EMI TEST RECEIVER	R&S	ESCI	13/05/08	13/05/09	100364
☒	Log Periodic Antenna	Schwarzbeck	UHALP9108A1	30/09/08	30/09/09	1098
☒	Biconical Antenna	Schwarzbeck	VHA9103	13/06/08	13/06/09	2233
☒	Amplifier (25dB)	Agilent	8447D	21/05/08	21/05/09	2944A10144
☒	Position Controller	TOKIN	5901T	N/A	N/A	14173
☐	Software	AUDIX	e3	N/A	N/A	Ver 3.0
☐	Driver	TOKIN	5902T2	N/A	N/A	14174
☐	Spectrum Analyzer(CE)	H.P	8591E	26/04/08	26/04/09	3649A05889
☐	LISN	Kyorits	KNW-407	04/08/08	04/08/09	8-317-8
☐	LISN	Kyorits	KNW-242	11/09/08	11/09/09	8-654-15
☐	CVCF	NF Electronic	4420	21/03/08	21/03/09	304935/337980
☐	Software	ToYo EMI	EP5/CE	N/A	N/A	Ver 2.0.801
☐	DC BLOCK	Hyuplip	KEL-007	N/A	N/A	7-1581-5
☐	50 ohm Terminator	HME	CT-01	22/01/09	22/01/10	N/A
☐	RFI/FIELD Intensity Meter	Kyorits	KNW-2402	11/09/08	11/09/09	4N-170-3