Electromagnetic Compatibility Test Report

Tests Performed on a Grayhill, Inc.

Industrial Handheld Computer, Model M1YY1023-2

Radiometrics Document RP-6142A

ACCREDITED
Certification # 1495.01

Product Detail:
FCC ID: **NMAM1YY10232**
Industry Canada ID: **2972A-M1Y10232**
Equipment type: 2.4 GHz Spread Spectrum Transmitter

Test Standards:
US CFR Title 47, Chapter I, FCC Part 15 Subpart C
FCC Part 15 CFR Title 47: 2006
Industry Canada RSS-210, Issue 7 as required for Category I Equipment

This report concerns: Original Grant for Certification
FCC Part 15.247

Tests Performed For:	*Test Facility:*
Grayhill, Inc. 561 Hillgrove Rd. LaGrange, IL 60525	**Radiometrics Midwest Corporation** 12 East Devonwood Romeoville, IL 60446

Test Date(s): (Month-Day-Year)
September 13 thru November 8, 2007

Document RP-6142A Revisions:

Rev.	Issue Date	Affected Pages	Revised By
0	November 1, 2007		
1	November 8, 2007	1 to 7 and 12 to 25	Joseph Strzelecki
2	November 9, 2007	3, 4, and 6	Joseph Strzelecki

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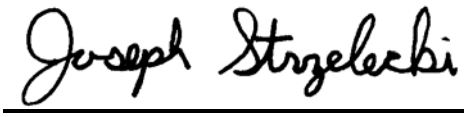
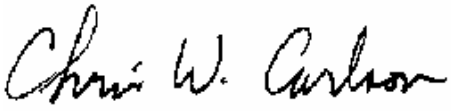
1 ADMINISTRATIVE DATA

Equipment Under Test: A Grayhill, Inc., Industrial Handheld Computer Model: M1YY1023-2, Serial Number: M1YY1021-2QVGA This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics: (Month-Day-Year) September 13, 2007	*Test Date(s): (Month-Day-Year)* September 13 thru November 8, 2007
Test Report Written By: Joseph Strzelecki Senior EMC Engineer	*Test Partially Witnessed By:* Robert Chiocca Grayhill, Inc.
Radiometrics' Personnel Responsible for Test:  Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE Ron Lazarowicz EMC Engineer	*Test Report Approved By*  Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is an Industrial Handheld Computer, Model M1YY1203-2, manufactured by Grayhill, Inc. The detailed test results are presented in a separate section. The following is a summary of the test results.

Emissions Tests Results

Environmental Phenomena	Frequency Range	Basic Standard	Test Result
Unintentional RF Radiated Emissions	30-2,000 MHz	RSS-210 & FCC Part 15	Pass
Conducted Emissions, AC Mains	0.15 - 30 MHz	RSS-210 & FCC Part 15	Pass

Bluetooth FHSS Spread Spectrum Transmitter Requirements

Environmental Phenomena	Frequency Range	FCC Section	RSS-210 Section	Test Result
Carrier Frequency Separation	2400 to 2483 MHz	15.247 a	6.2.2 (o) (a)	Pass
Number of Hopping Frequencies	2400 to 2483 MHz	15.247 a	6.2.2 (o) (a)	Pass
Time of Occupancy (Dwell Time)	2400 to 2483 MHz	15.247 a	6.2.2 (o) (a)	Pass
20 dB Bandwidth Test	2400 to 2483 MHz	15.247 a	6.2.2 (o) (a)	Pass
Peak Output Power	2400 to 2483 MHz	15.247 b	6.2.2 (o) (a)	Pass
Band-edge Compliance of RF Conducted Emissions	2400 to 2483 MHz	15.247 d	6.2.2 (o) (e)	Pass
Spurious RF Conducted Emissions	30 MHz to 25 GHz	15.247 d	6.2.2 (o) (e1)	Pass

Environmental Phenomena	Frequency Range	FCC Section	RSS-210 Section	Test Result
Spurious Radiated Emissions	30 MHz to 25 GHz	15.247 d	6.2.2 (o) (a)	Pass

2.1 RF Exposure Compliance Requirements

Since the power output is 1.7 mW EIRP, The EUT meets the FCC and IC requirements for RF exposure. There are no power level adjustments and the antennas are permanently attached. The detailed calculations for RF Exposure are presented in a separate document.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is an Industrial Handheld Computer, Model M1YY1023-2, manufactured by Grayhill, Inc. The EUT was in good working condition during the tests, with no known defects.

3.2 Related Submittals

Grayhill, Inc. is not submitting any other products simultaneously for equipment authorization related to the EUT.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations.

Power was supplied at 115 VAC, 60 Hz single-phase to its external power supply.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	DuraMaxHG Industrial Handheld Computer	E	Grayhill, Inc.	M1YY1023-2	M1YY1021-2QVGA
2	AC Adaptor	E	Ault, Inc.	PW128RA1503F01	None

* Type: E = EUT, P = Peripheral

List of System Cables

QTY	Length (m)	Cable Description	Connected to (Item #)	Shielded?
1	1.9	AC Cord; Power input	#2,	No

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2006	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2003	2003	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
IC RSS-210 Issue 7	2007	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 2	2007	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)
FCC DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

The test procedures used are in accordance with the FCC DA 00-705, Industry Canada RSS-212, and ANSI document C63.4-2003, "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 1999 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois:

Chamber A: Is an anechoic chamber that measures 24' L X 12' W X 12' H. The walls and ceiling are fully lined with ferrite absorber tiles. The floor has a 10' x 10' section of ferrite absorber tiles located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

Chamber B: Is a shielded enclosure that measures 24' L X 12' W X 8' H. Erik A. Lindgren & Associates of Chicago, Illinois manufactured the enclosure.

Chamber C: Is a shielded enclosure that measures 20' L X 10' W X 8' H. Lindgren RF Enclosures Inc. of Addison, Illinois manufactured the enclosure.

Chamber D: Is a fully anechoic chamber that measures 22' L X 10' W X 10' H. The walls, ceiling and floor are fully lined with ferrite absorber tiles. Braden Shielding Systems of Tulsa, Oklahoma manufactured the chamber.

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

Open Area Test Site (OATS): Is located on 8625 Helmar Road in Newark, Illinois, USA and measures 56' L X 24' W X 17' H. The entire open field test site has a metal ground screen. The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as file number IC3124.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification. The results relate only to the EUT listed herein. Any modifications made to the EUT subsequent to the indicated test date will invalidate the data and void this certification.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	12/27/06
AMP-12	MITEQ	Pre-amplifier	AM-1431	530935	0.01-1000MHz	12 Mo.	12/27/06
AMP-16	MITEQ	Pre-amplifier	AM-1300	608852	0.01-1000MHz	12 Mo.	12/27/06
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo	12/27/06
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	12/29/06
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	10/24/06
ANT-42	EMCO	Bicon Antenna	3104C	9512-4713	25-300MHz	24 Mo.	01/26/06
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	12/12/05
HPF-01	Solar	High Pass Filter	7930-100	HPF-1	0.15-30MHz	24 Mo.	10/04/07
LSN-01	Electrometrics	50 uH LISN	FCC/VDE 50/2	1001	0.01-30MHz	24 Mo.	05/03/07
LSN-03	Farnell	50 uH LISN	1EXLSN30B	000314	0.01-30MHz	24 Mo.	05/03/07
REC-07	Anritsu	Spectrum Analyzer	MS2601A	MT53067	0.01-2200MHz	12 Mo.	01/17/07

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
REC-08	Hewlett Packard	Spectrum Analyzer	8566B	2648A13481 2209A01436	30Hz-22GHz	12 Mo.	07/31/07
THM-01	Extech Inst.	Temp/Humid Meter	4465CF	001106557	N/A	24 Mo.	03/31/06

Note: All calibrated equipment is subject to periodic checks.

10 TEST SECTIONS

10.1 AC Conducted Emissions; Section 15.207

A computer-controlled analyzer was used to perform the conducted emissions measurements. The frequency range was divided into 500 subranges equally spaced on a logarithmic scale. The computer recorded the peak of each subrange. This data was then plotted on semi-log graph paper generated by the computer and plotter. Adjusting the positions of the cables and orientation of the test system then maximizes the highest emissions.

Mains Conducted emission measurements were performed using a 50 Ohm/50 uH Line Impedance Stabilization Network (LISN) as the pick-up device. Measurements were repeated on both leads within the power cord. If the EUT power cord exceeded 80 cm in length, the excess length of the power cord was made into a 30 to 40 cm bundle near the center of the cord. The LISN was placed on the floor at the base of the test platform and electrically bonded to the ground plane.

Broadband conducted emissions may exceed the following limits by no more than 13 dB. An emission is defined as broadband if the average detector amplitude is 6 dB or more under the quasi-peak detector amplitude.

FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBuV)	
	Quasi-Peak	Average
0.150 - 0.50*	66 - 56	56 - 46
0.5 – 5.0	56	46
5.0 - 30	60	50
* The limit decreases linearly with the logarithm of the frequency in this range.		

The initial step in collecting conducted data is a peak detector scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from power cord, after testing all modes of operation both Bluetooth.

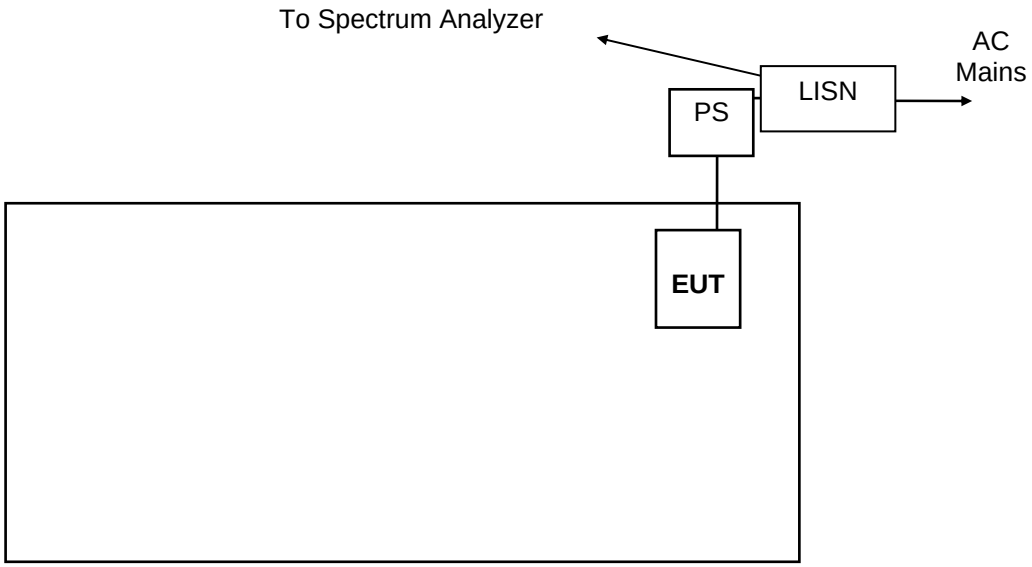
Test Date : October 30, 2007
The Amplitude is the final corrected value with cable and LISN Loss.

Lead Tested	Frequency MHz	QP Amplitude	QP Limit	Average Amplitude	Average Limit
AC Neutral	0.186	43.8	64.2	38.2	54.2
AC Neutral	0.368	38.3	58.5	37.9	48.5
AC Neutral	0.429	39.5	57.3	38.9	47.3
AC Neutral	0.611	39.5	56.0	39.4	46.0
AC Neutral	0.854	38.6	56.0	38.3	46.0
AC Neutral	1.097	38.2	56.0	37.6	46.0
AC Neutral	1.157	38.4	56.0	37.6	46.0
AC Neutral	1.340	37.7	56.0	36.5	46.0
AC Neutral	1.643	37.7	56.0	36.3	46.0
AC Neutral	1.884	37.3	56.0	35.4	46.0
AC Neutral	2.125	36.9	56.0	34.8	46.0
AC Neutral	2.369	36.5	56.0	33.7	46.0
AC Neutral	21.868	34.8	60.0	30.5	50.0
AC Neutral	28.507	35.2	60.0	32.2	50.0
AC Hot	0.152	37.5	65.9	30.7	55.9
AC Hot	0.186	41.5	64.2	33.4	54.2
AC Hot	0.428	36.5	57.3	35.6	47.3
AC Hot	0.672	36.2	56.0	34.9	46.0
AC Hot	0.913	36.2	56.0	35.7	46.0
AC Hot	1.155	36.0	56.0	35.1	46.0
AC Hot	1.398	36.1	56.0	35.0	46.0
AC Hot	1.703	35.7	56.0	32.9	46.0
AC Hot	1.882	35.9	56.0	33.7	46.0
AC Hot	2.184	35.9	56.0	32.1	46.0
AC Hot	3.340	35.7	56.0	28.4	46.0
AC Hot	3.584	35.7	56.0	26.9	46.0
AC Hot	21.468	36.9	60.0	33.3	50.0
AC Hot	28.879	32.3	60.0	28.2	50.0

* QP readings are quasi-peak with a 9 kHz bandwidth.

Judgment: Passed by 6.6 dB

Figure 1. Conducted Emissions Test Setup

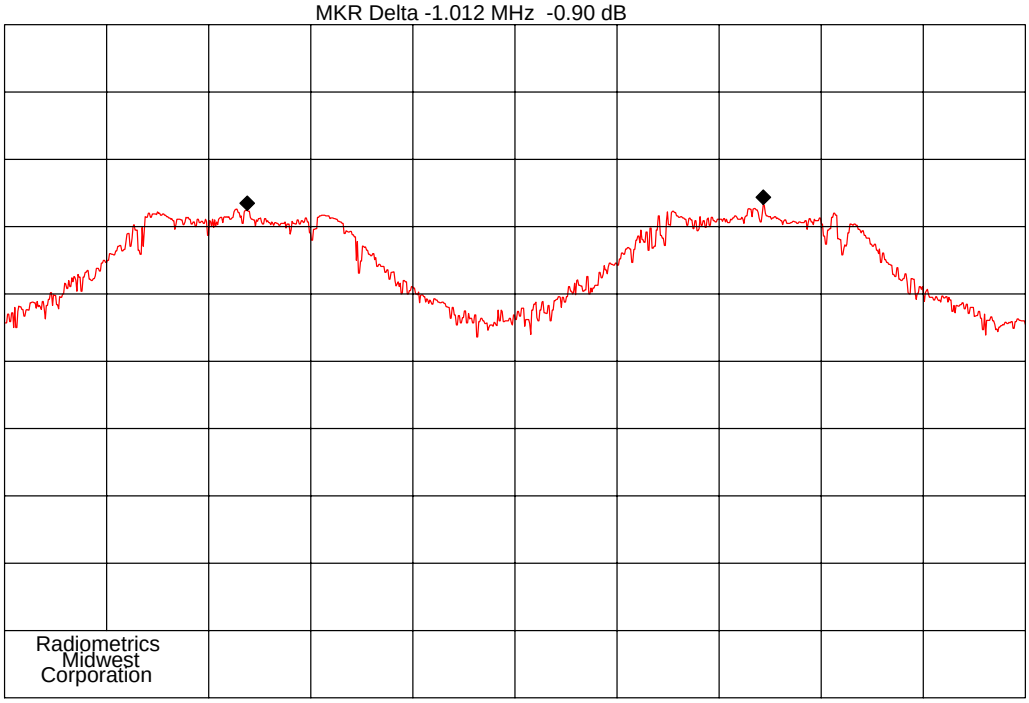


Notes:
- LISN's at least 80 cm from EUT chassis
- Vertical conductive plane 40 cm from rear of table top
- EUT power cord bundled

10.2 Carrier Frequency Separation

The channel separation is 1 MHz for this bluetooth device. The minimum separation required is 0.66 MHz since the power is less than 0.125 Watts.

MKR Delta -1.012 MHz -0.90 dB

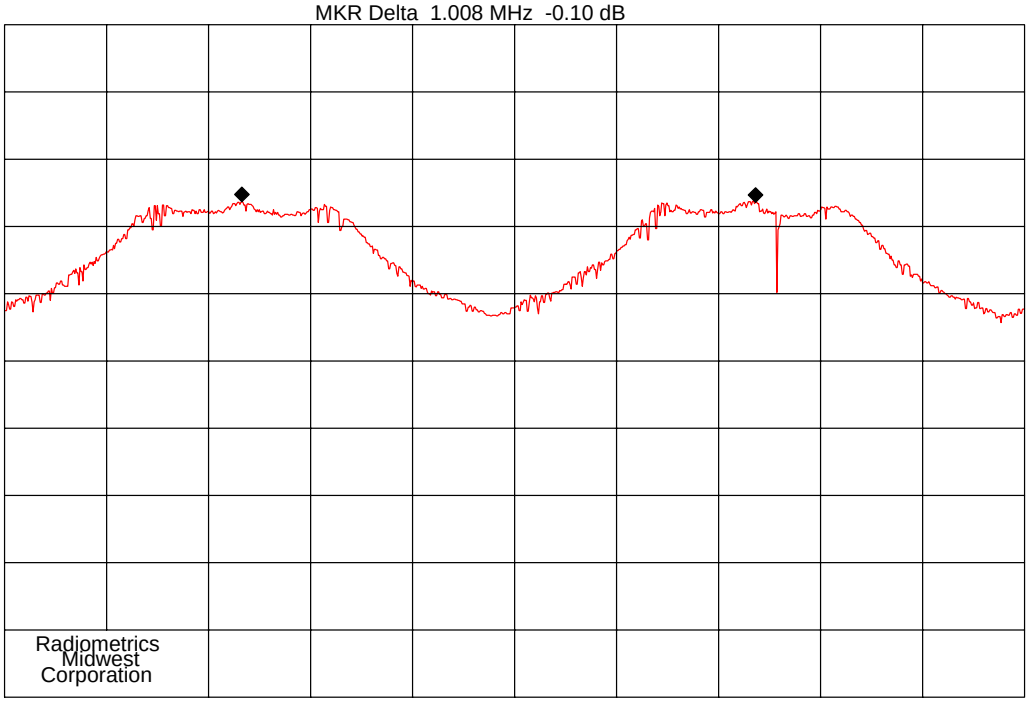


COMPANY : Grayhill
CENTER 2.402 50 GHz
RES BW 100 kHz
10 dB/
NOTES : Carrier Freq Seperation, Low Channels

ITEM : M1YY1023-2
REF 0.0 dBm
VBW 300 kHz
TIME : 17:26

DATE : 10-26-2007
SPAN 2.00 MHz
ATTEN 10 dB
SWP 20.0 msec

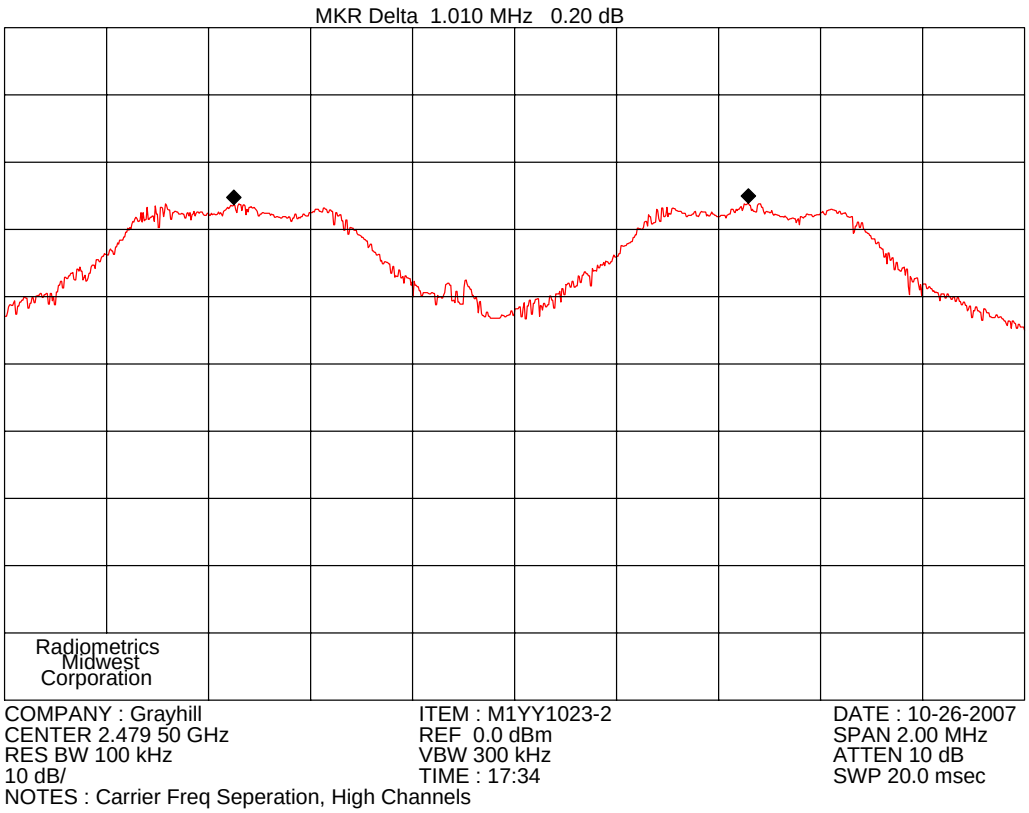
MKR Delta 1.008 MHz -0.10 dB



COMPANY : Grayhill
CENTER 2.440 50 GHz
RES BW 100 kHz
10 dB/
NOTES : Carrier Freq Seperation, Mid Channels

ITEM : M1YY1023-2
REF 0.0 dBm
VBW 300 kHz
TIME : 17:31

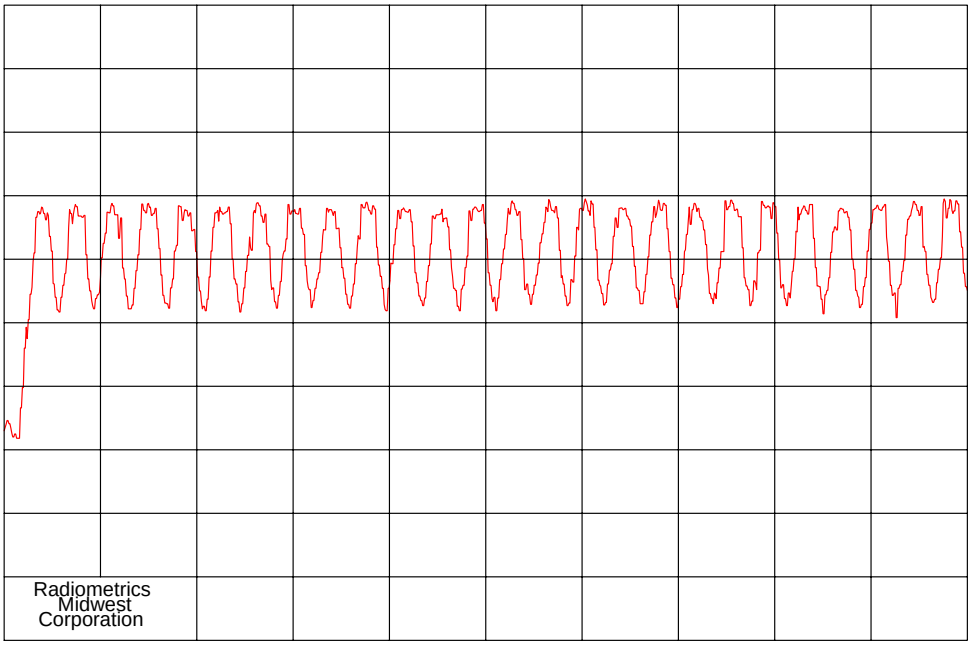
DATE : 10-26-2007
SPAN 2.00 MHz
ATTEN 10 dB
SWP 20.0 msec



10.3 Number of Hopping Frequencies

There are 79 hopping frequencies from 2402 -2480 MHz.

The following plots show all 79 hopping frequencies. There are 26 frequencies in the first plot, 27 in the second and 26 in the third.

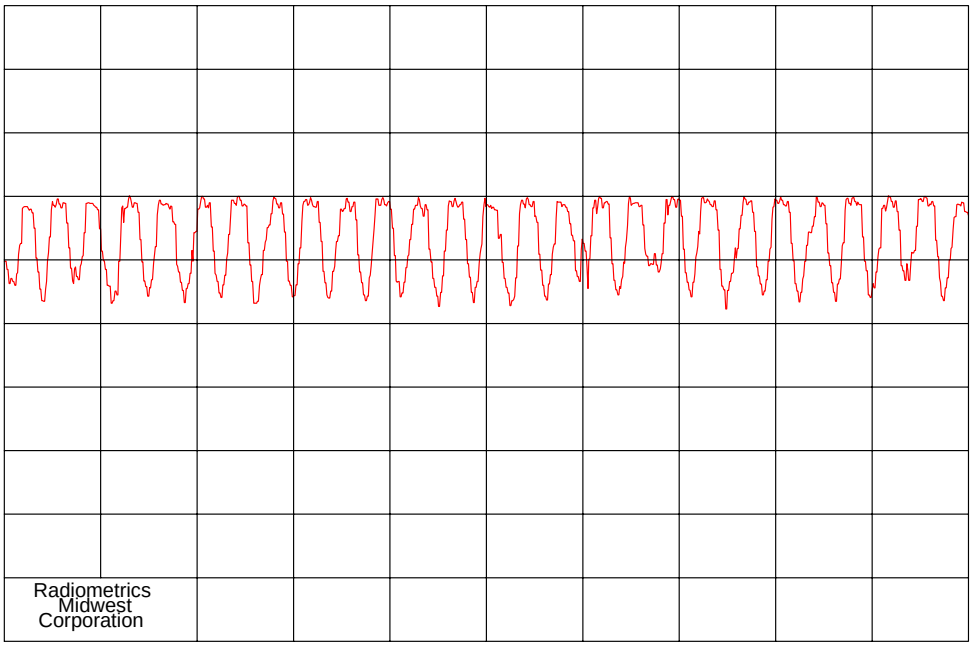


COMPANY : Grayhill
START 2.401 0 GHz
RES BW 100 kHz
10 dB/
NOTES : Number Of Hopping Frequencies, Band 1 of 3

ITEM : M1YY1023-2
REF 0.0 dBm
VBW 300 kHz
TIME : 10:12

DATE : 11-08-2007
STOP 2.427 5 GHz
ATTEN 10 dB
SWP 20.0 msec

This plot shows 26 Frequencies

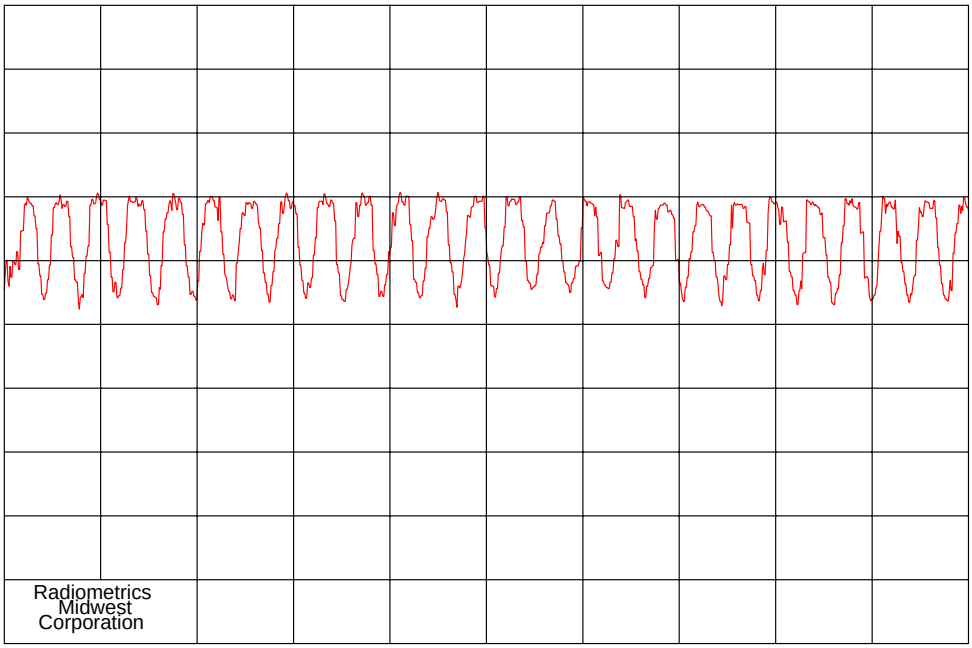


COMPANY : Grayhill
START 2.427 5 GHz
RES BW 100 kHz
10 dB/
NOTES : Number Of Hopping Frequencies, Band 2 of 3

ITEM : M1YY1023-2
REF 0.0 dBm
VBW 300 kHz
TIME : 10:17

DATE : 11-08-2007
STOP 2.454 5 GHz
ATTEN 10 dB
SWP 20.0 msec

This plot shows 27 Frequencies



This plot shows 26 Frequencies

10.4 Time of Occupancy

The dwell time of 0.3797s within a 30 second period in data mode is independent from the packet type (packet length). The calculation for a 30 second period is a follows:
Dwell time = time slot length * hop rate/number of hopping channels *30s
Example for a packet (with a maximum length of one time slot)
Dwell time = 625 us* 1600 1/s/79 * 30s = 0.3797s (in a 30s period)

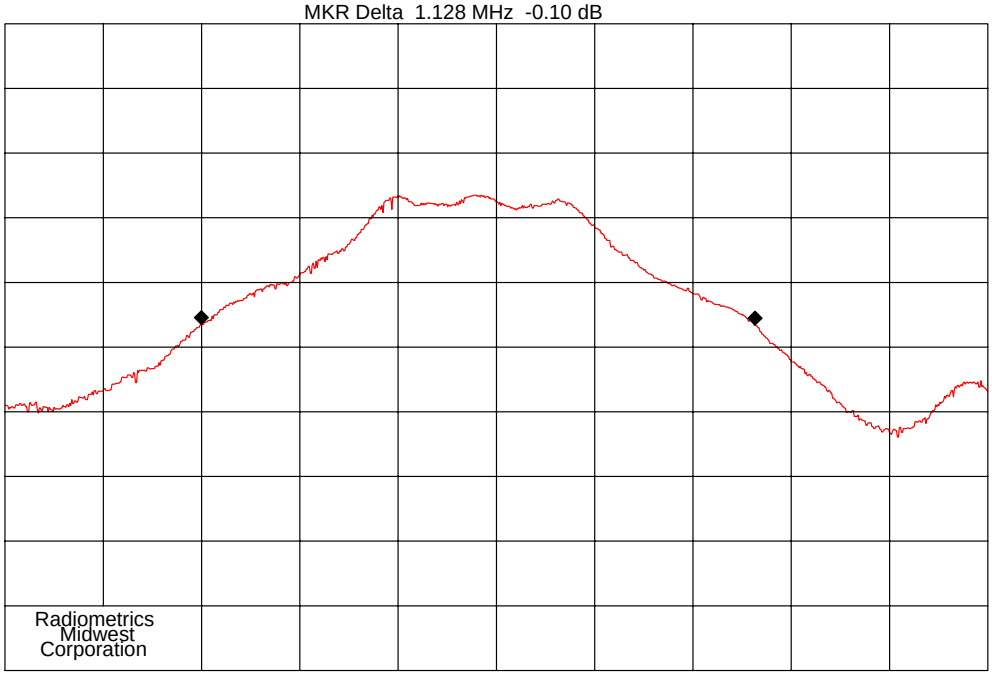
Slot Length	Hopping Rate per 30 Sec	Number of Channels	Time period of Calculation	Dwell Time in a 30 Sec period	Dwell per 100 mS	PKA (dB)
625 uS	1600	79	30 Sec	0.379747 Sec	3.797 mSec	28.4

PKA = peak to average factor in dB.

The Peak to average factor is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100).

10.5 Occupied Bandwidth

	Using 100 kHz RBW	Using 30 kHz RBW
Channel	20 dB EBW MHz	20 dB EBW MHz
2402	1.128	0.806
2441	1.140	0.821
2480	1.114	0.826

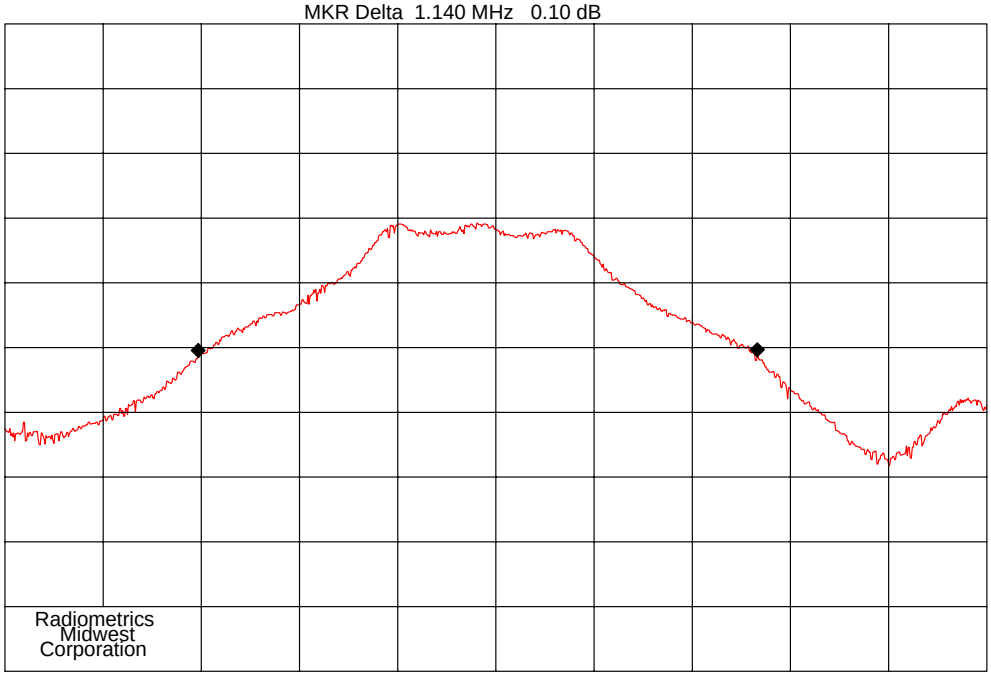


COMPANY : Grayhill
CENTER 2.402 00 GHz
RES BW 100 kHz
10 dB/
NOTES : Bandwidth Test, Low Channel

ITEM : M1YY1023-2
REF 0.0 dBm
VBW 300 kHz
TIME : 16:29

DATE : 10-29-2007
SPAN 2.00 MHz
ATTEN 10 dB
SWP 20.0 msec

MKR Delta 1.140 MHz 0.10 dB

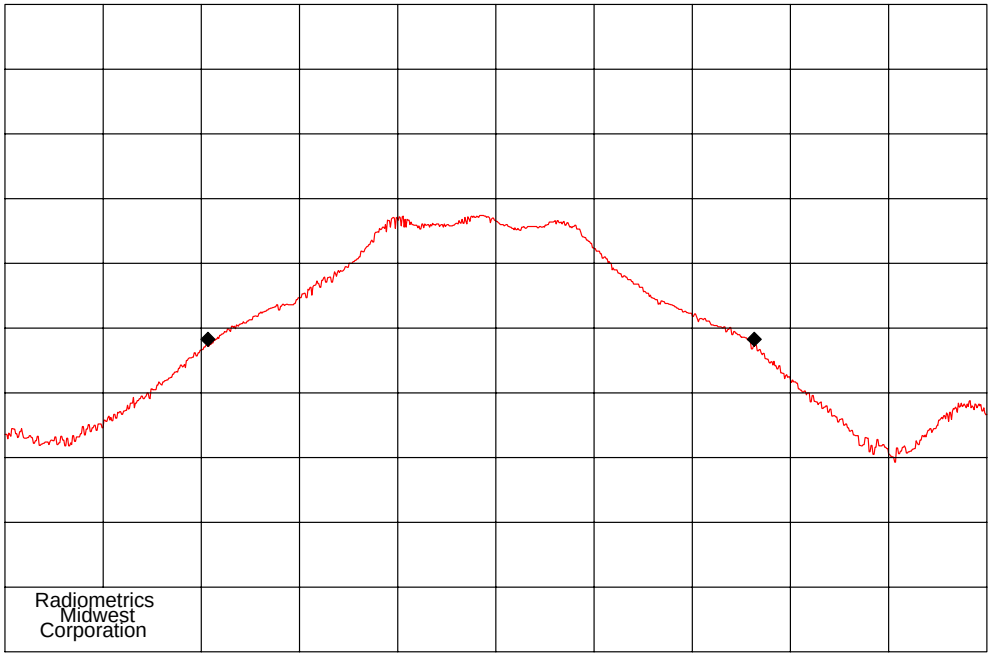


COMPANY : Grayhill
CENTER 2.441 00 GHz
RES BW 100 kHz
10 dB/
NOTES : Bandwidth Test, Mid Channel

ITEM : M1YY1023-2
REF 0.0 dBm
VBW 300 kHz
TIME : 16:25

DATE : 10-29-2007
SPAN 2.00 MHz
ATTEN 10 dB
SWP 20.0 msec

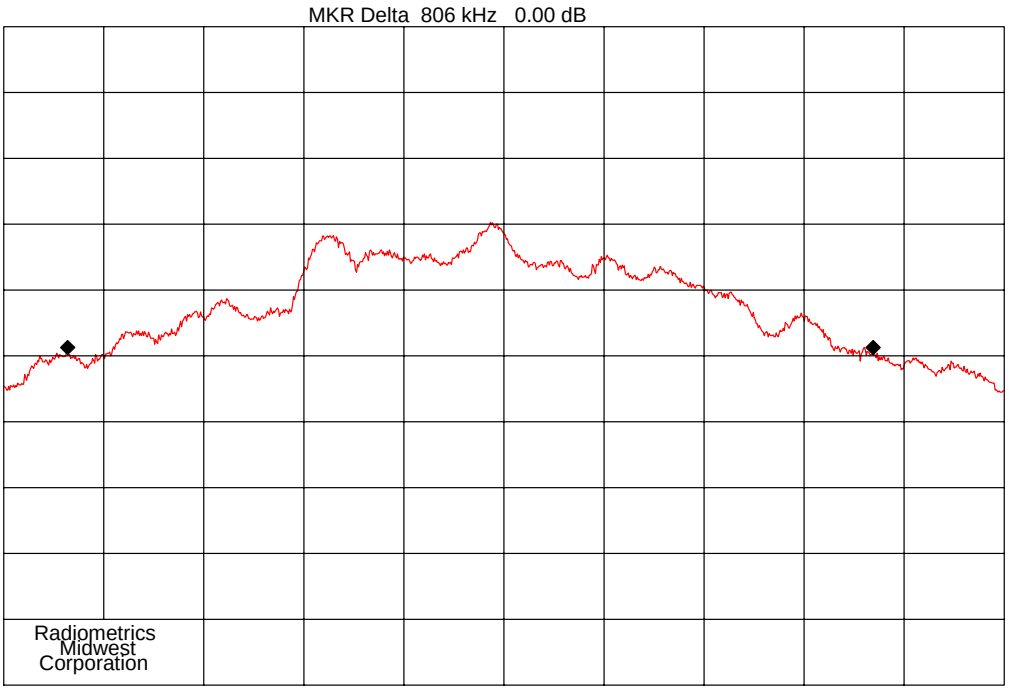
MKR Delta 1.114 MHz 0.00 dB



COMPANY : Grayhill
CENTER 2.480 00 GHz
RES BW 100 kHz
10 dB/
NOTES : Bandwidth Test, High Channel

ITEM : M1YY1023-2
REF 0.0 dBm
VBW 300 kHz
TIME : 16:33

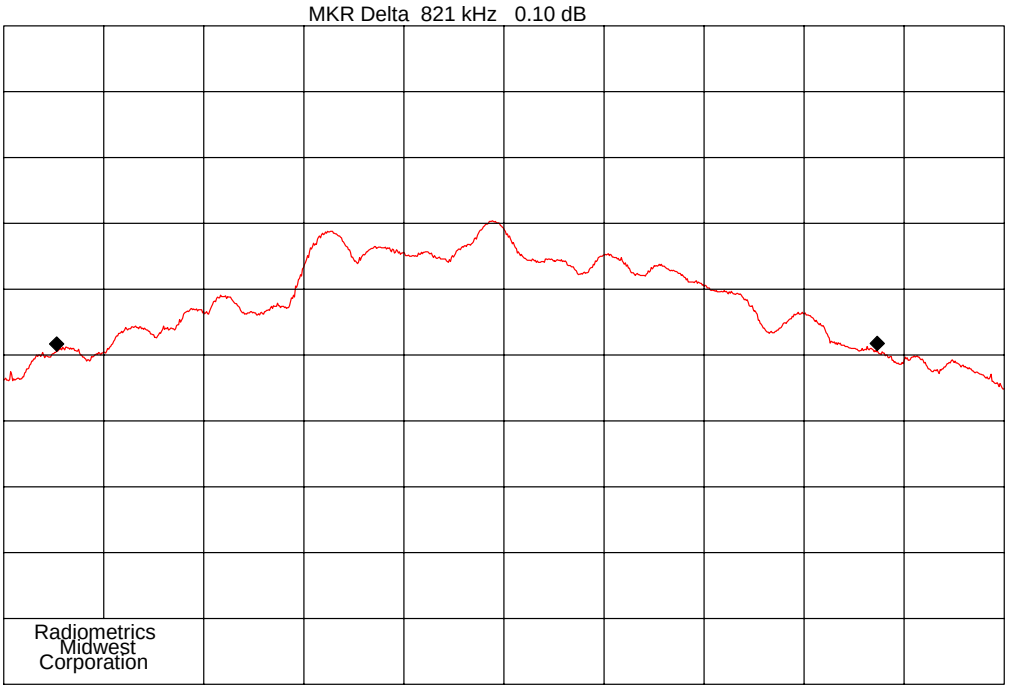
DATE : 10-29-2007
SPAN 2.00 MHz
ATTEN 10 dB
SWP 20.0 msec



COMPANY : Grayhill
CENTER 2.402 00 GHz
RES BW 30 kHz
10 dB/
NOTES : Occupied Bandwidth, Low Channel

ITEM : M1YY1023-2
REF 0.0 dBm
VBW 100 kHz
TIME : 10:41

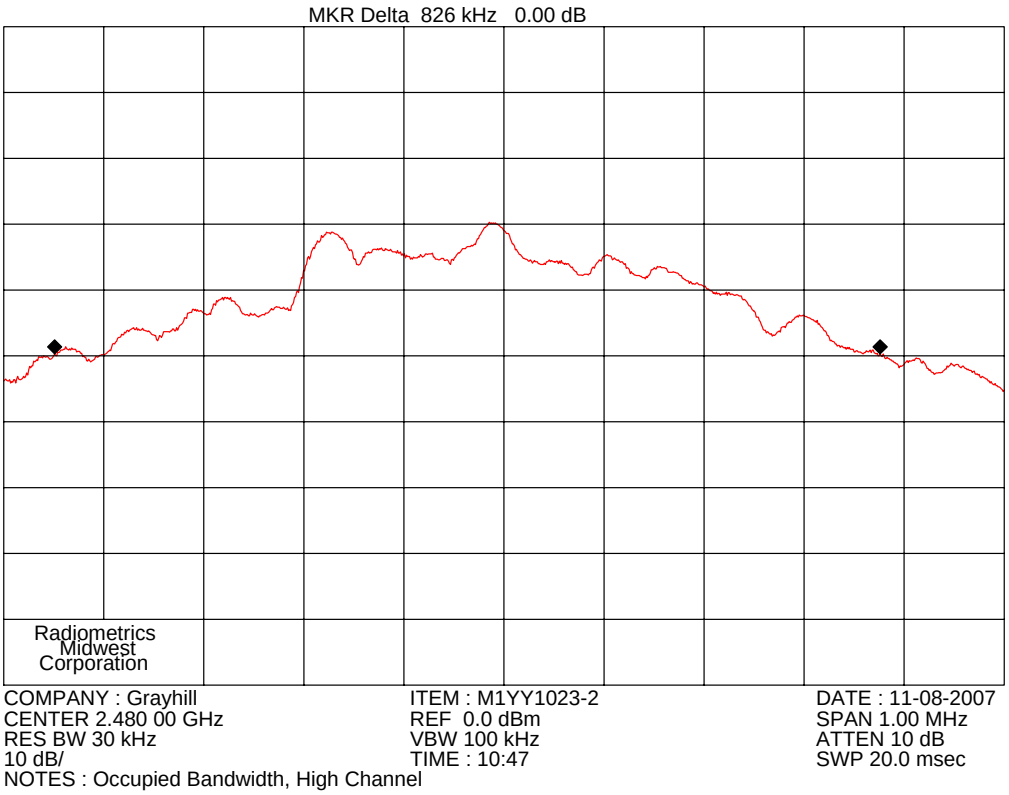
DATE : 11-08-2007
SPAN 1.00 MHz
ATTEN 10 dB
SWP 20.0 msec



COMPANY : Grayhill
CENTER 2.441 00 GHz
RES BW 30 kHz
10 dB/
NOTES : Occupied Bandwidth, Mid Channel

ITEM : M1YY1023-2
REF 0.0 dBm
VBW 100 kHz
TIME : 10:46

DATE : 11-08-2007
SPAN 1.00 MHz
ATTEN 10 dB
SWP 20.0 msec



10.6 Peak Output Power

10.6.1 Output Power

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement. For the 802.11 transmitter, the FCC procedures from power output option 2, Method #3 were used.

The transmitter's peak power was calculated using the following equation:

P = (E x d)^2 / (30 x G)

Where: E = the measured maximum peak field strength in V/m.
G = The numeric gain of the transmitting antenna over an isotropic radiator.
d = Distance in meters from which the field strength was measured. (3 meters)
P = The EUT power in watts

The Field Strength was measured using the procedures described in section 10.9, with the exception of the resolution and video bandwidths. The spectrum analyzer was set to the following settings:

Span = 3 MHz ; RBW = 3 MHz (> the 20 dB bandwidth of the emission being measured)
VBW = 3 MHz; Sweep = auto; Detector function = peak; Trace = max hold

Since the gain of the antenna is always less than 6dB, the limit is not reduced.

	Freq	Peak Field Strength		Ant gain	Test Dist.	BW Corr.	Peak Output power from EUT		Limit
Function	MHz	dBuV/m	V/m	Numeric	Meters	dB	Watts	dBm	dBm
Bluetooth	2402	97.6	0.0759	1	3	0.0	0.00173	2.4	30
Bluetooth	2441	97.1	0.0716	1	3	0.0	0.00154	1.9	30
Bluetooth	2480	96.4	0.0661	1	3	0.0	0.00131	1.2	30

Overall Test result: Pass by 27.6 dB

10.7 Spurious RF Conducted Emissions

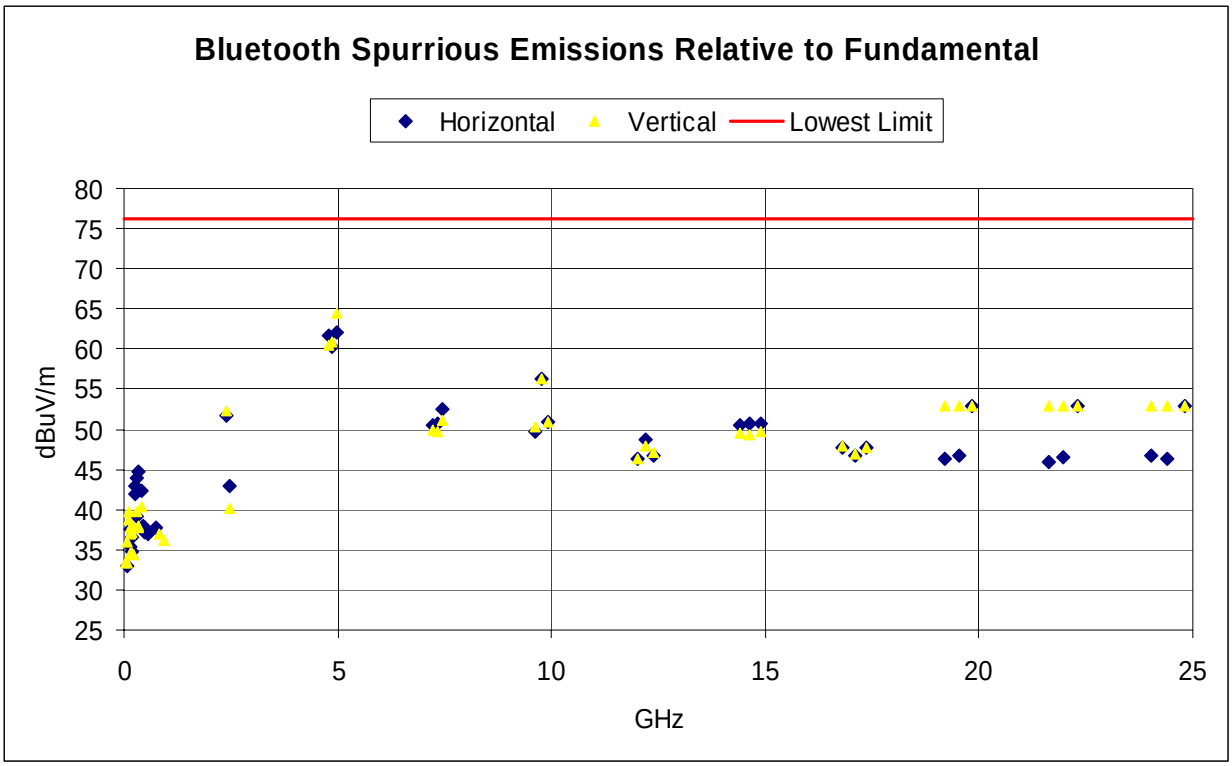
Antenna conducted tests were not performed on the EUT, since the RF connector on the EUT is not standard. Radiated tests were performed to show compliance with this requirement.

The EUT was tested in continous mode and peak readings were made from the lowest frequency generated in the EUT up through the 10th harmonic. The limit is 20 dB lower than the peak of the fundamental. For each polarization and fundamental frequency, there is a separate limit. The data is shown graphically and in tabular form.

10.7.1 Spurious RF Conducted Emissions

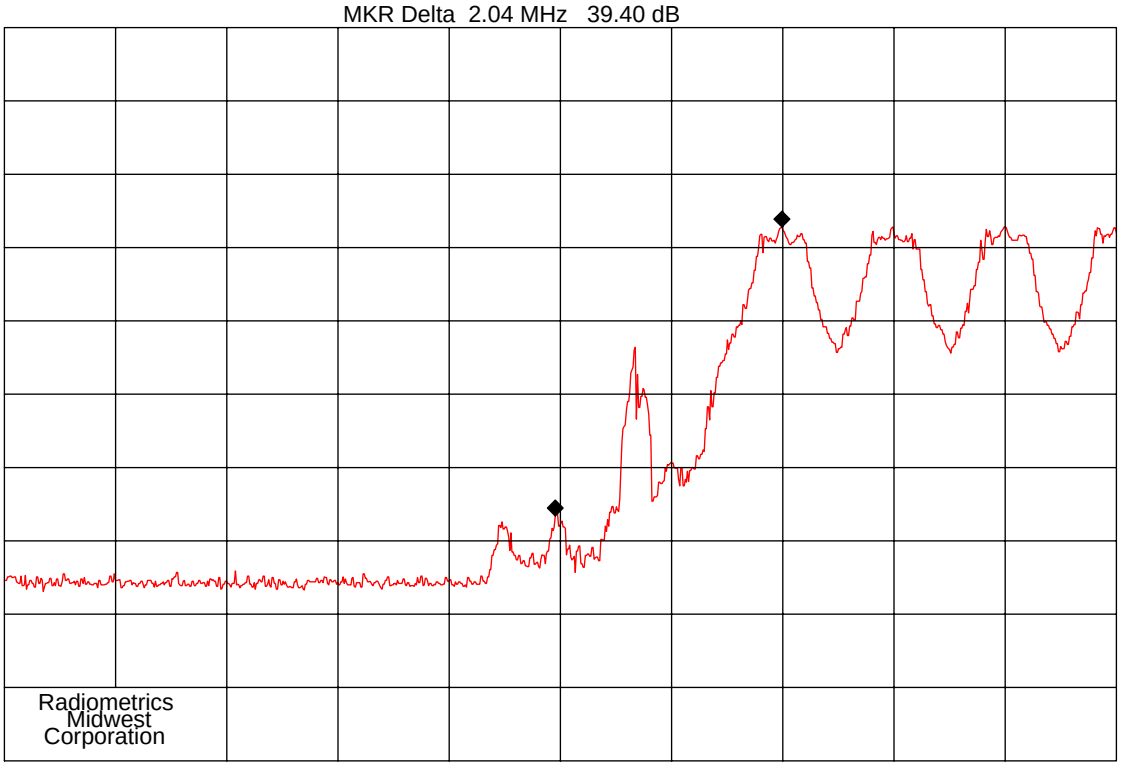
Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement.

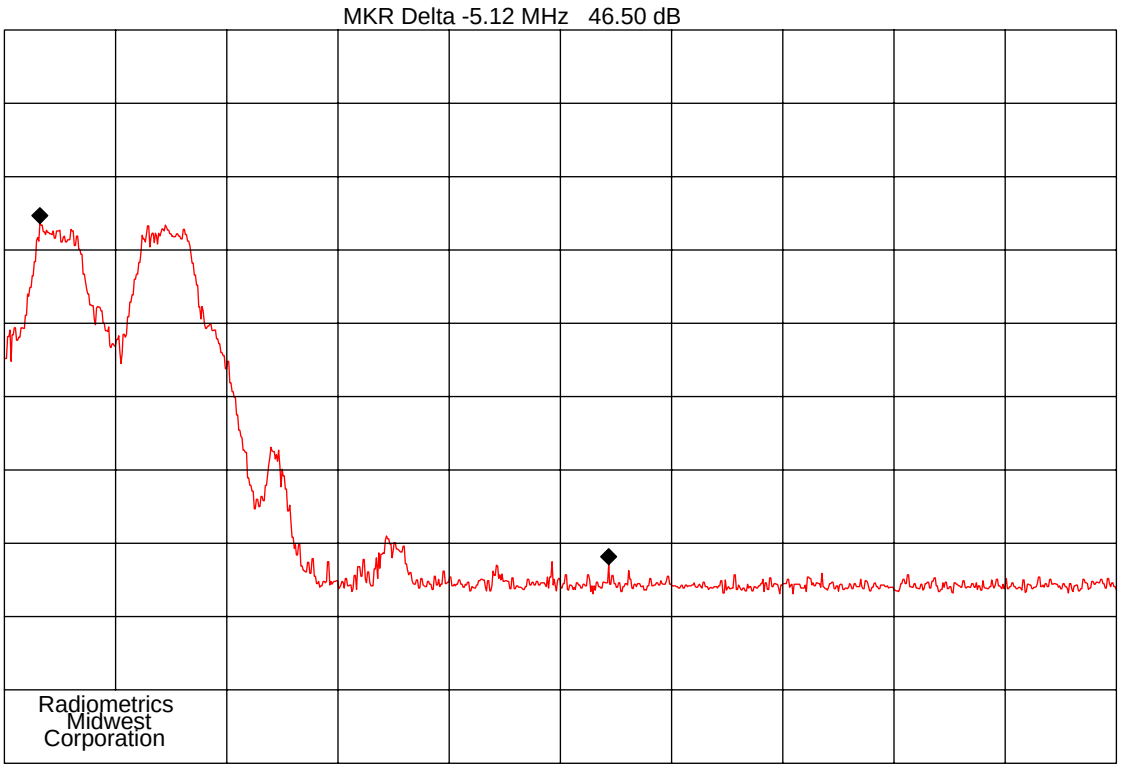
The Bluetooth was tested in continous mode and peak readings were made from the lowest frequency generated in the EUT up through the 10th harmonic. The red limit is 20 dB lower than the lowest peak reading of the fundamental.



Judgement: Pass by 11.8 dB

10.7.2 Band edge emissions





Judgement: pass by 19.4 dB

10.8 Spurious Radiated Emissions

Radiated emission measurements in the restricted bands were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. Below 1 GHz, when a radiated emission is detected approaching the specification limit, the measurement of the emission is repeated using a tuned dipole antenna with a Roberts Balun. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists.

From 30 to 1000 MHz, an Anritsu spectrum analyzer and a preamplifier were used. The out of band emissions and the ambient emissions were below the level of input overload (80 dBuV).

For tests from 1 to 25 GHz, an HP8566A spectrum analyzer was used with a preamplifier. A harmonic mixer was used from 20 to 25 GHz. The out of band emissions and the ambient emissions were below the level of input overload (72 dBuV). In addition, a high pass filter was used to reduce the fundamental emission.

Radiated emission measurements are performed with linearly polarized broadband antennas. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded.

Final radiated emissions measurements were performed in Chamber E at a test distance of 3 meters. The entire frequency range from 30 MHz to 25 GHz was slowly scanned and the emissions in the restricted frequency bands were recorded. Measurements were performed using the peak detector function. The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground. The anechoic test chamber has a metal ground screen.

The was device was rotated through three orthogonal axis as per 13.1.4.1 of ANSI C63.4 during the prescans and during final radiated tests.

10.8.1 Radiated Emissions Field Strength Sample Calculation

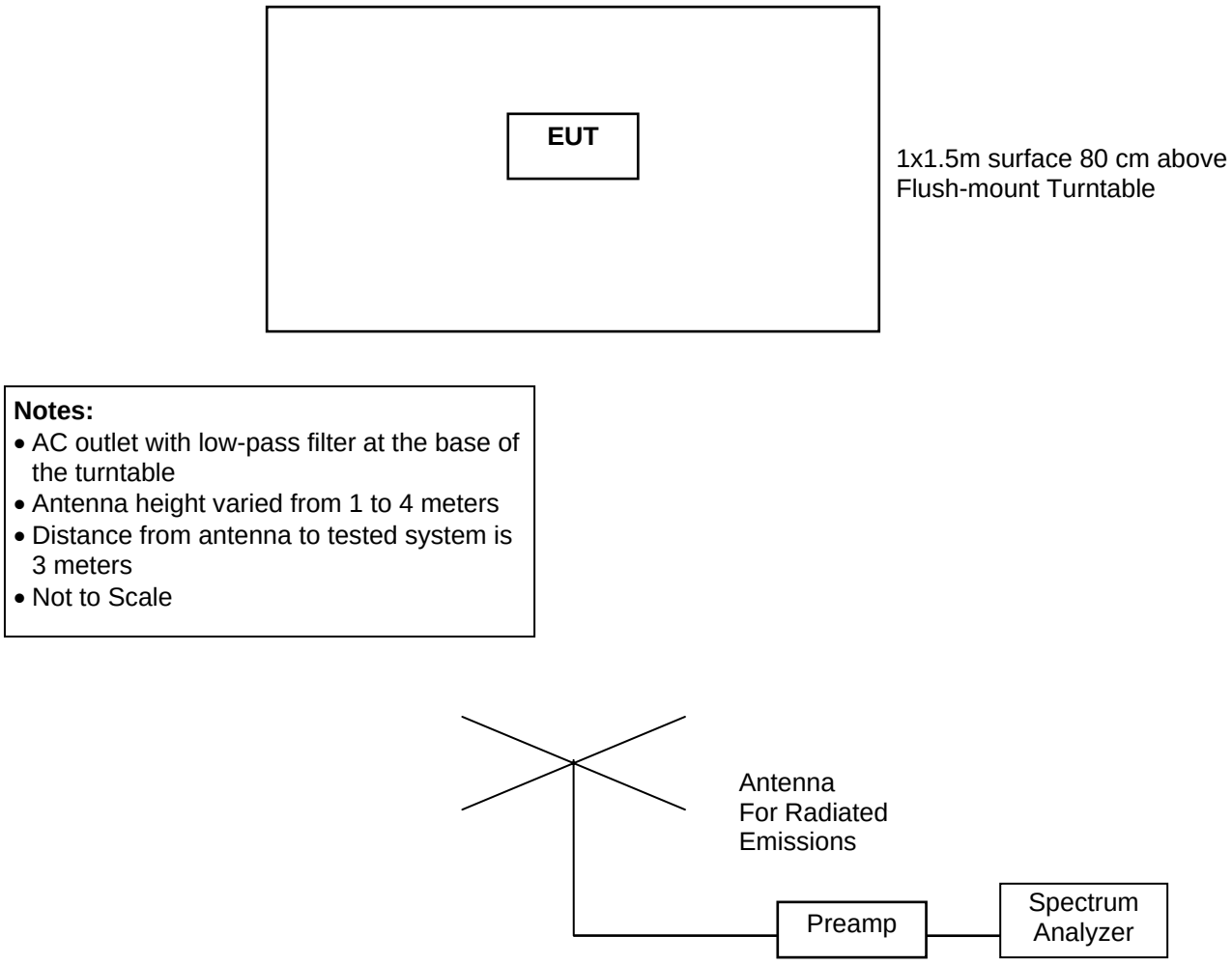
The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + CF - AG

Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain
HPF = High pass Filter Loss
PKA = Peak to Average Factor (This is used for Bluetooth Average measurements only. All other measurements, it was zero)

The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100).

Figure 2. Drawing of Radiated Emissions Setup



10.8.2 Spurious Radiated emissions results above 2 GHz

hrm #	Tx Freq	Ant. Pol.	Analyzer RDG dBuV		Corr. Fact. dB	EUT Emission Freq MHz	Field Strength (dBuV/m)				Margin Under Limit dB
			Peak	Average			Peak Total	Ave Total	Peak Limit	Ave Limit	
1	2402	V	91.4	63.0	5.3	2402	96.7	68.3	125.2	105.2	28.5
1	2402	H	92.3	60.2	5.3	2402	97.6	65.5	125.2	105.2	27.6
be	2402	V	35	6.6	5.3	2390	40.3	11.9	74	54	33.7
be	2402	H	35	6.6	5.3	2390	40.3	11.9	74	54	33.7
2	2402	V	48.1	17.9	12.3	4804	60.4	30.2	74	54	13.6
2	2402	H	49.3	18.3	12.3	4804	61.6	30.6	74	54	12.4
3	2402	V	34.6	5.2	15.3	7206	49.9	20.5	74	54	24.1
3	2402	H	35.2	1.6	15.3	7206	50.5	16.9	74	54	23.5
1	2441	V	91.5	59.1	5.6	2441	97.1	64.7	125.2	105.2	28.1
1	2441	H	91	58.5	5.6	2441	96.6	64.1	125.2	105.2	28.6
2	2441	V	48.5	17.3	12.3	4882	60.8	29.6	74	54	13.2
2	2441	H	47.9	19.5	12.3	4882	60.2	31.8	74	54	13.8
3	2441	V	34.1	4.1	15.7	7323	49.8	19.8	74	54	24.2
3	2441	H	35	1.6	15.7	7323	50.7	17.3	74	54	23.3
1	2480	V	90.7	60.2	5.7	2480	96.4	65.9	125.2	105.2	28.8
1	2480	H	90.5	58.1	5.7	2475	96.2	63.8	125.2	105.2	29.0
be	2480	V	52.4	24.0	5.7	2483.5	58.1	29.7	125.2	105.2	67.1
be	2480	H	51.2	22.8	5.7	2483.5	56.9	28.5	125.2	105.2	68.3
2	2480	V	51.6	19.2	12.8	4960	64.4	32	74	54	9.6
2	2480	H	49.3	19.6	12.8	4960	62.1	32.4	74	54	11.9
3	2480	V	34.7	5.2	16.5	7440	51.2	21.7	74	54	22.8
3	2480	H	36	1.6	16.5	7440	52.5	18.1	74	54	21.5

Notes: 1. hrm = Harmonic; BE = Band Edge emissions; V = Vertical; H = Horizontal
2. The margin (last column) is the worst case margin under the peak or average limits for that row.
3. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
4. The Average reading is the peak reading – PKA (Peak to average factor) as defined in section 10.4 herein

Judgment: Passed by 9.6 dB
No other emissions were detected in the restricted bands from 2 to 25 GHz.

10.8.3 Spurious Radiated Emissions Below 2 GHz

Manufacturer	Grayhill, Inc.	Specification	FCC Part 15 Subpart C & RSS-210
Model	M1YY1203-3	Test Date	09-13-2007
Serial Number	M1YY1021-2QVGA	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain		

The following is the worst case emissions from EUT below 2 GHz. The results include intentional and unintentional emissions.

Freq. MHz	Meter Reading dBuV	Antenna Factor dB	Antenna Pol/ Type	Corr. Factors dB	Field Strength dBuV/m EUT	Field Strength dBuV/m Limit	Margin Under Limit dB
56.2	39.0 P	13.1	H/44	-19.2	32.9	40.0	7.1
131.0	39.8 P	13.9	H/44	-18.4	35.3	43.5	8.2
163.6	45.7 P	9.9	H/44	-18.1	37.5	43.5	6.0
169.4	45.2 P	9.3	H/44	-18.0	36.5	43.5	7.0
195.2	42.3 P	10.3	H/44	-17.8	34.8	43.5	8.7
260.3	46.4 P	12.9	H/44	-17.4	41.9	46.0	4.1
277.4	47.3 P	12.9	H/44	-17.3	42.9	46.0	3.1
301.2	42.6 P	13.7	H/44	-17.1	39.2	46.0	6.8
312.0	46.9 Q	14.0	H/44	-17.0	43.9	46.0	2.1
335.0	46.4 Q	15.3	H/44	-16.9	44.8	46.0	1.2
415.6	42.7 P	16.1	H/44	-16.5	42.3	46.0	3.7
450.8	37.5 P	16.7	H/44	-16.2	38.0	46.0	8.0
468.4	35.9 P	17.6	H/44	-16.1	37.4	46.0	8.6
485.5	35.1 P	18.1	H/44	-16.1	37.1	46.0	8.9
554.6	33.9 P	18.9	H/44	-15.7	37.0	46.0	9.0
745.5	31.8 P	20.8	H/44	-14.8	37.8	46.0	8.2
48.4	38.2 P	14.5	V/44	-19.3	33.4	40.0	6.6
66.1	42.9 Q	9.6	V/44	-19.1	33.4	40.0	6.6
72.5	47.9 P	7.2	V/44	-19.1	36.0	40.0	4.0
96.0	46.8 P	10.8	V/44	-18.8	38.7	43.5	4.8
120.1	43.3 P	15.0	V/44	-18.6	39.8	43.5	3.7
141.5	40.8 P	12.0	V/44	-18.3	34.5	43.5	9.0
150.4	44.3 P	10.9	V/44	-18.3	36.9	43.5	6.6
163.6	44.8 P	11.0	V/44	-18.1	37.7	43.5	5.8
179.6	45.2 P	9.9	V/44	-17.9	37.1	43.5	6.4
195.2	42.0 P	10.3	V/44	-17.8	34.5	43.5	9.0
206.9	41.2 Q	10.9	V/44	-17.7	34.4	43.5	9.1
208.3	44.3 P	11.1	V/44	-17.7	37.7	43.5	5.8
312.2	42.8 P	14.0	V/44	-17.0	39.8	46.0	6.2
332.0	38.7 P	16.0	V/44	-17.0	37.7	46.0	8.3
351.8	38.0 P	16.7	V/44	-16.8	37.9	46.0	8.1
415.6	40.4 P	16.5	V/44	-16.5	40.4	46.0	5.6
832.0	30.3 P	21.1	V/44	-14.3	37.0	46.0	9.0
935.2	27.7 P	22.0	V/44	-13.7	36.1	46.0	9.9

Judgment: Passed by 1.2 dB