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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15 Subpart C on the Polimaster Inc. Transmitter Model: PM1703 SERIES

FCC ID:	UJ6PM1703SERIES
GRANTEE:	Polimaster Inc. 2300 Clarendon Boulevard, Suite 603 Arlington, VA 22201
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Ave Sunnyvale, CA 94086
REPORT DATE:	August 28, 2006
FINAL TEST DATE:	August 23, 2006

AUTHORIZED SIGNATORY: _____

Juan Martinez
Senior EMC Engineer

ACCREDITED
2016-01

REVISION HISTORY

Revision #	Date	Comments	Modified By
1	September 28, 2006	Initial Release	David Guidotti

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SCOPE

An electromagnetic emissions test has been performed on the Polimaster Inc. model PM1703GNB pursuant to the following rules:

FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Polimaster Inc. model PM1703GNB and therefore apply only to the tested sample. The sample was selected and prepared by Arif Mamedov of Polimaster Inc.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Polimaster Inc. model PM1703GNB complied with the requirements of the following regulations:

FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

TEST RESULTS SUMMARY

FREQUENCY HOPPING SPREAD SPECTRUM (2400 – 2483.5 MHz, 75 channels or more)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	850 kHz	Channel spacing > 20dB bandwidth	Complies
15.247 (a) (1)	RSS 210 A8.1 (2)	Channel Separation	1000 kHz		Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (4)	Channel Dwell Time (*average time of occupancy)*	.4 seconds per 31.6 seconds	<0.4 second within a period of 0.4 x number of channels	Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (4)	Number of Channels	79	75 or more	Complies
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization	The system uses the BlueTooth algorithm and, therefore, meets all requirements for channel utilization.	All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 210 A8.4 (2)	Output Power (multipoint systems)	-3.2 dBm EIRP = 0.0005 W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(c)	RSS 210 A8.5	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 25GHz	49 dBuV/m @ 4959.9 MHz	15.207 in restricted bands, all others < -20dBc	Complies (- 5.0 dB)
	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies

Note 1: EIRP calculated using radiated measurement method at 3 meters.

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Permanently Attached		Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	40.0dBµV/m @ 1219.3MHz		Complies (- 14.0 dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	Not Applicable Battery Operated	Refer to standard	N/A
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding non-interference	

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	0.015 to 30	± 3.0
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Polimaster Inc. model PM1703GNB is a radiation monitor (gamma / X-Ray) with an integrated bluetooth transceiver. The EUT would normally be hand-held or worn on a belt clip so the EUT was treated as table-top equipment during testing to simulate the end-user environment. The EUT is powered from an internal 1.5V (AA) battery.

The sample was received on August 23, 2006 and tested on August 23, 2006. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Polimaster	PM1703 GNB	Radiation monitor with Bluetooth transceiver	63116	UJ6PM1703SERIES

OTHER EUT DETAILS

The EUT was configured with an interface cable to facilitate control of Bluetooth test modes via a laptop.

ANTENNA SYSTEM

The antenna is integral to the device.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic . It measures approximately 7cm wide by 10cm deep by 4cm high.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with emissions specifications.

SUPPORT EQUIPMENT

No support equipment was used during emissions testing.
Note: The laptop was used to configure the device into a continuous transmit or continuous receive mode using BlueTest software via the laptop's RS 232 interface. This connection was only used to confiugre the device and the laptop was disconnected during testing.

EUT INTERFACE PORTS

The EUT has no interface ports

EUT OPERATION

During emissions testing the EUT was confiugred using the BlueTest software suite to transmit at full power either on a single channel or across all channels as required. TXDATA1 was used to generate a modulated signal for band-edge, fundamental and bandiwdth measurements. TXDATA mode was used to obtain an unmodulated signal for measurements at harmonics of the fundamental. Receiver spurious emissions were evaluated with the device tuned to the center channel in receive-only mode (RXDATA1 mode).

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on August 23, 2006 at the Elliott Laboratories Open Area Test Site #2 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission.

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003 and RSS 212.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003 and RSS 212. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003 / RSS 212.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.4:2003 and RSS 212 specify that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

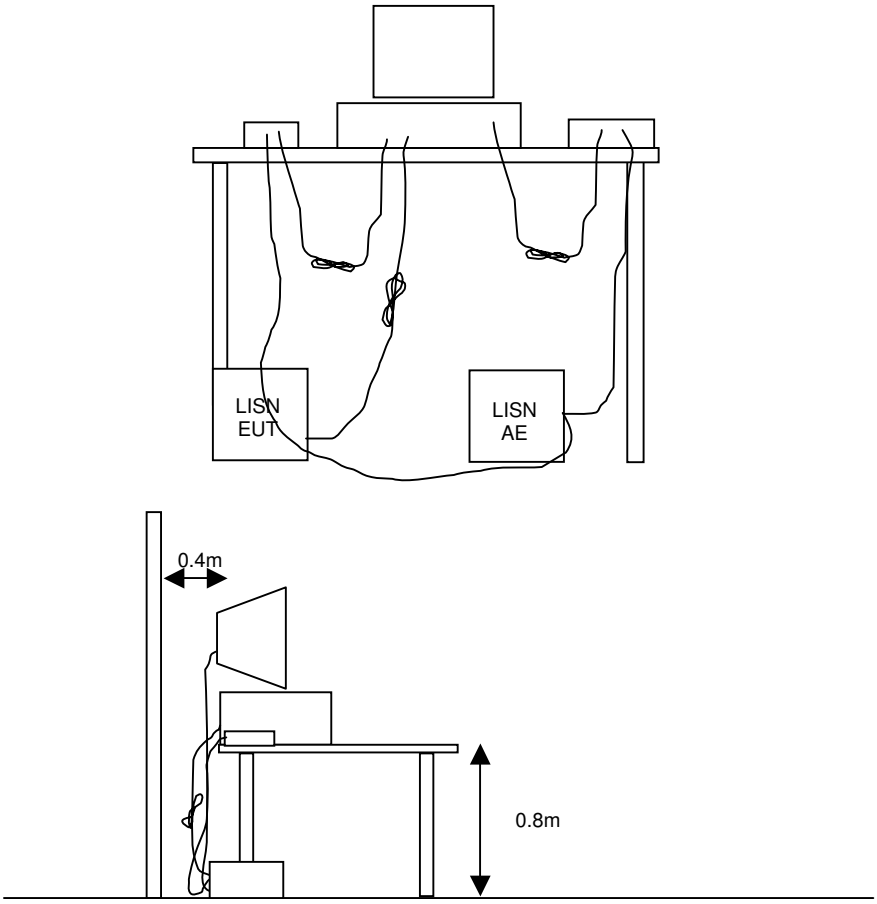
TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4:2003, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

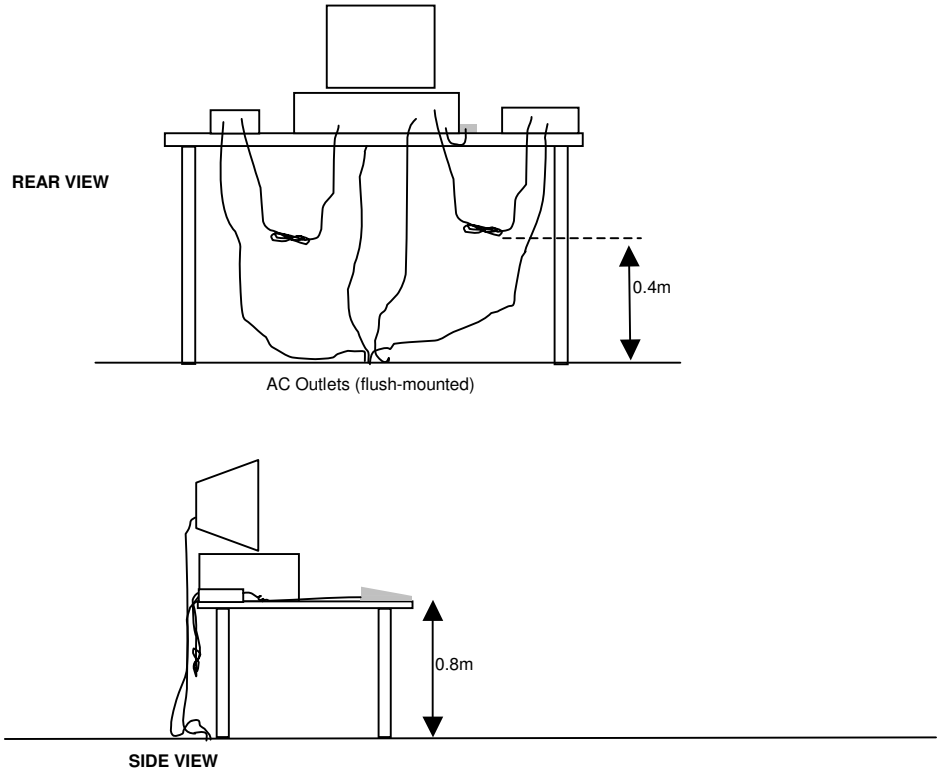


RADIATED EMISSIONS

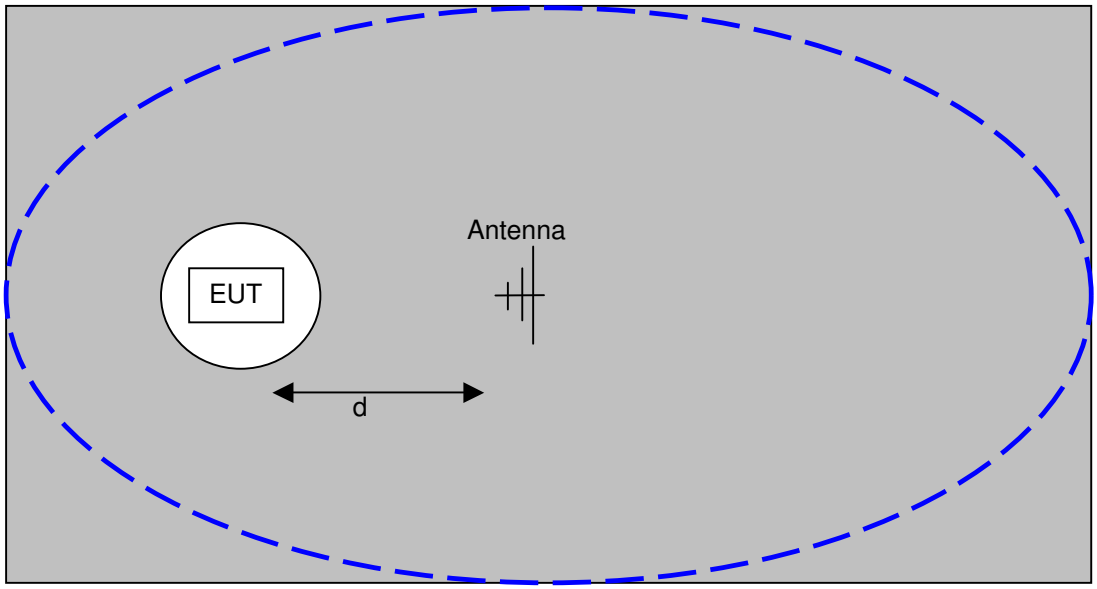
A preliminary scan of the radiated emissions is perfromed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

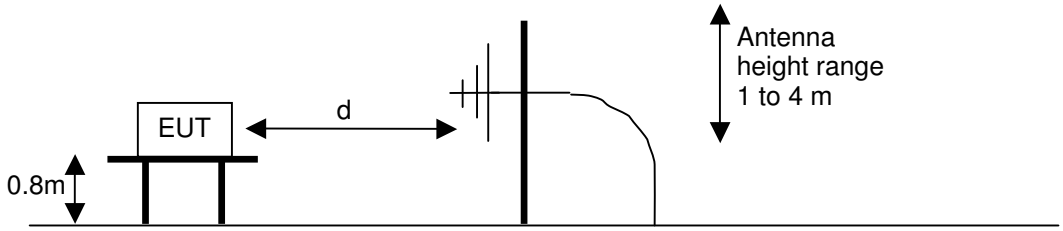
Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.



Typical Test Configuration for Radiated Field Strength Measurements



The ground plane extends beyond the ellipse defined in CISPR 16 / CISPR 22 / ANSI C63.4 and is large enough to accommodate test distances (d) of 3m and 10m. Refer to the test data tables for the actual measurement distance.



Test Configuration for Radiated Field Strength Measurements
OATS- Plan and Side Views

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

OUTPUT POWER LIMITS – FHSS SYSTEMS

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)
2400 – 2483.5	≥ 75	1 Watt (30 dBm)
2400 – 2483.5	< 75	0.125 Watts (21 dBm)
5725 – 5850	75	1 Watt (30 dBm)

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \text{ microvolts per meter}$$

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 25,000 MHz, 23-Aug-06
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	13-Jan-07
Filtek	Filter, 1 GHz High Pass	HP12/1000-5BA	957	24-Apr-07
EMCO	Antenna, Horn, 18-26.5 GHz (SA40 30Hz)	3160-09 (84125C)	1150	12-Sep-06
Hewlett Packard	High Pass filter, 3.5 GHz	P/N 84300-80038	1157	24-Apr-07
EMCO	Antenna, Horn, 1-18 GHz (SA40)	3115	1386	11-Jul-07
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FMT (SA40) Blue	8564E (84125C)	1393	10-Nov-06
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-May-07

EXHIBIT 2: Test Measurement Data

16 Pages

Elliott

EMC Test Data

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	Test-Log Number:	T65093
		Project Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Emissions Spec:	FCC 15.247 / 15.209	Class:	N/A
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Polimaster

Model

PM1703GN/GNA/GNB

Date of Last Test: 8/24/2006

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	Test-Log Number:	T65093
		Project Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Emissions Spec:	FCC 15.247 / 15.209	Class:	N/A
Immunity Spec:	-	Environment:	-

EUT INFORMATION

The following information was collected during the test sessions(s).

General Description

The EUT is a radiation monitor (gamma / X-Ray) with an integrated bluetooth transceiver. The EUT would normally be hand-held or worn on a belt clip so the EUT was treated as table-top equipment during testing to simulate the end-user environment. The EUT is powered from an internal 1.5V (AA) battery.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Polimaster	PM1703 GNB	Radiation monitor with Bluetooth transceiver	63116	UJ6PM1703SERIES

Other EUT Details

The following EUT details should be noted: The EUT was configured with an interface cable to facilitate control of Bluetooth test modes via a laptop.

EUT Antenna (Intentional Radiators Only)

The antenna is integral to the device.

EUT Enclosure

The EUT enclosure is primarily constructed of plastic . It measures approximately 7cm wide by 10cm deep by 4cm high.

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Project Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Emissions Spec:	FCC 15.247 / 15.209	Class:	N/A
Immunity Spec:	-	Environment:	-

Test Configuration #1

The following information was collected during the test sessions(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
-	-	-	-	-

Note: The laptop was used to configure the device into a continuous transmit or continuous receive mode using BlueTest software via the laptop's RS 232 interface. This connection was only used to confiugre the device and the laptop was disconnected during testing.

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
-	-	-	-	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
None	-	-	-	-

Note: The EUT has no interface ports.

EUT Operation During Emissions Tests

During emissions testing the EUT was confiugred using the BlueTest software suite to transmit at full power either on a single channel or across all channels as required. TXDATA1 was used to generate a modulated signal for band-edge, fundamental and bandiwdth measurements. TXDATA mode was used to obtain an unmodulated signal for measurements at harmonics of the fundamental. Receiver spurious emissions were evaluated with the device tuned to the center channel in receive-only mode (RXDATA1 mode).

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

RSS 210, FCC 15.247 FHSS
Power, Bandwidth and Spurious Emissions

Test standard(s)ifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 8/23/2006 8:10
Test Engineer: Mark Briggs / Mehran Birgani
Test Location: SVOATS #2
Config. Used: 1
Config Change: -
EUT Voltage: Internal battery

General Test Configuration

The EUT was located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.
Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 21 °C
Rel. Humidity: 59 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	30-24,800 MHz - Transmitter Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	49.0dBµV/m @ 4959.9MHz (-5.0dB)
2	30-8,000 MHz - Radiated Spurious Emissions	RSS 210	Pass	40.0dBµV/m @ 1219.3MHz (-14.0dB)
3	Output Power	15.247(b)	Pass	-3.2 dBm (0.0005 W)
4	20dB Bandwidth / Channel Spacing	15.247(a)	Pass	850kHz / 1000kHz
4	99% bandwidth	15.247(a)	N/A	1193kHz
4	Channel Occupancy	15.247(a)	Pass	< 0.4s
4	Number of Channels	15.247(a)	Pass	79

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Note: Power setting are base on 255 and 50 per software setting.

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 24020 MHz. Low Channel @ 2402 MHz

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

EUT Flat

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2401.890	91.9	H	-	-	PK	283	2.2	RB=VB=1MHz
2402.000	91.3	H	-	-	Avg	283	2.2	RB = 1MHz, VB=3kHz (note 1)
2402.030	91.5	H	-	-	Pk	283	2.2	RB = 100kHz
2401.940	88.0	V	-	-	PK	92	1.7	RB = VB = 1MHz
2401.940	87.3	V	-	-	AVG	92	1.7	RB = 1MHz, VB=3kHz (note 1)
2401.840	87.7	V	-	-	Pk	91	1.7	RB = VB = 100kHz

EUT Upright

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2402.020	89.2	H	-	-	PK	27	2.2	RB=VB=1MHz
2402.100	91.6	V	-	-	PK	131	1.5	RB=VB=1MHz

EUT Side

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2402.210	91.8	H	-	-	PK	304	2.0	RB=VB=1MHz
2401.970	90.9	H	-	-	Avg	304	2.0	RB=1MHz, VB=3kHz (note 1)
2402.020	91.4	H	-	-	Pk	304	2.0	RB=100kHz
2401.930	82.0	V	-	-	PK	131	1.5	RB=VB=1MHz

Note 1:	Average measurements made with VB=3kHz to avoid pulse desensitization as the modulated signal was pulsed.

Fundamental emission level @ 3m in 100kHz RBW:	91.5 dBµV/m	
Limit for emissions outside of restricted bands:	71.5 dBµV/m	**Limit is -20dBc**

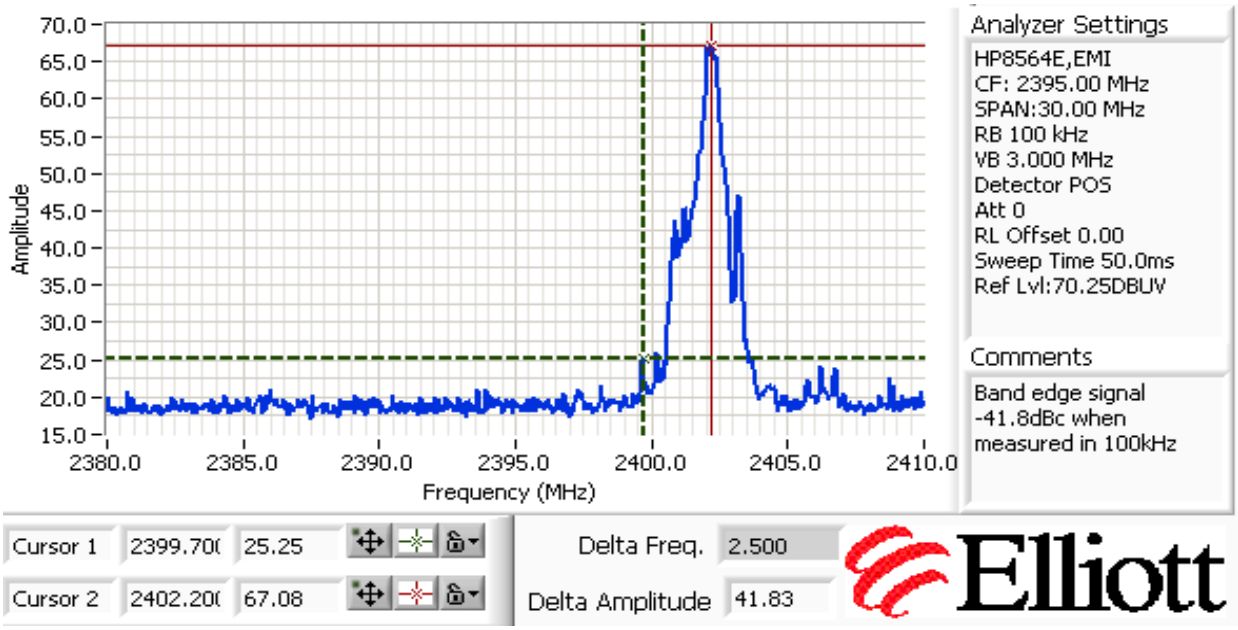
Band Edge Signal and 2390 MHz Restricted Band Signal Level

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.990	45.2	H	54.0	-8.8	Avg	283	2.2	RB=1MHz,VB=3kHz (note 2)
2389.490	57.3	H	74.0	-16.7	Pk	283	2.2	RB=VB=1MHz

Note 1:	Field strength measured directly - refer also to plots showing compliance with -20dBc limit between 2390 MHz and 2400 MHz. Measured with EUT upright - orientation with highest fundamental field strength.
Note 2:	Average measurements made with VB=3kHz to avoid pulse desensitization as the modulated signal was pulsed.

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

Band Edge Signal and 2390 MHz Restricted Band Signal Level



Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4803.940	45.3	H	54.0	-8.7	AVG	163	1.4	Upright
4804.050	44.8	H	54.0	-9.2	AVG	336	1.7	Flat
4803.970	44.7	V	54.0	-9.3	AVG	107	1.0	Side
4803.980	44.4	V	54.0	-9.6	AVG	291	1.2	Upright
4803.930	44.4	V	54.0	-9.6	AVG	106	1.0	Flat
4804.040	39.0	H	54.0	-15.0	AVG	346	1.7	Side
7205.960	37.2	H	54.0	-16.8	AVG	243	1.0	Upright
4803.940	49.4	H	74.0	-24.6	PK	163	1.4	Upright
4803.970	48.8	V	74.0	-25.2	PK	107	1.0	Side
4804.050	48.6	H	74.0	-25.4	PK	336	1.7	Flat
4803.930	48.2	V	74.0	-25.8	PK	106	1.0	Flat
4803.980	48.1	V	74.0	-25.9	PK	291	1.2	Upright
7205.960	46.4	H	74.0	-27.6	PK	243	1.0	Upright
4804.040	45.9	H	74.0	-28.1	PK	346	1.7	Side

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

Run #1b: Radiated Spurious Emissions, 30 - 24800 MHz. Center Channel @ 2440 MHz
Fundamental Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2439.870	86.5	H	-	-	Pk	116	1.9	RB=VB=1MHz
2440.220	83.2	H	-	-	Pk	318	1.9	RB=VB=1MHz
2439.960	88.0	H	-	-	Pk	290	2.1	RB=VB=1MHz
2439.960	87.2	H	-	-	Pk	290	2.1	RB=100kHz
2439.820	82.2	V	-	-	Pk	266	1.2	RB=VB=1MHz
2439.970	83.7	V	-	-	Pk	319	1.6	RB=VB=1MHz

Fundamental emission level @ 3m in 100kHz RBW:	87.2 dBµV/m
Limit for emissions outside of restricted bands:	67.2 dBµV/m

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4880.040	47.1	H	54.0	-6.9	AVG	176	1.3	Upright
4880.000	45.9	V	54.0	-8.1	AVG	14	1.2	Side
4879.960	45.7	V	54.0	-8.3	AVG	76	1.0	Upright
4879.970	44.6	H	54.0	-9.4	AVG	12	1.6	Flat
4879.980	43.8	V	54.0	-10.2	AVG	79	1.2	Flat
4880.000	41.7	H	54.0	-12.3	AVG	171	2.2	Side
7320.030	37.2	H	54.0	-16.8	AVG	124	1.6	Upright
4880.040	49.9	H	74.0	-24.1	PK	176	1.3	Upright
4880.000	49.8	V	74.0	-24.2	PK	14	1.2	Side
4879.960	49.3	V	74.0	-24.7	PK	76	1.0	Upright
4879.970	48.7	H	74.0	-25.3	PK	12	1.6	Flat
4879.980	48.1	V	74.0	-25.9	PK	79	1.2	Flat
7320.030	47.4	H	74.0	-26.6	PK	124	1.6	Upright
4880.000	47.2	H	74.0	-26.8	PK	171	2.2	Side

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30 - 24800 MHz. High Channel @ 2480 MHz

EUT Flat

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2479.890	84.1	H	-	-	PK	269	1.6	RB=VB=1MHz
2479.830	79.5	V	-	-	PK	234	1.4	RB=VB=1MHz

EUT Upright

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2479.920	86.6	H	-	-	PK	120	1.9	RB=VB=1MHz
2479.980	85.9	H	-	-	Avg	120	1.9	RB=1MHz,VB=3kHz (note 1)
2480.020	86.5	H	-	-	PK	120	1.9	RB=100kHz
2480.020	79.8	V	-	-	PK	115	1.1	RB=VB=1MHz

EUT Side

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.030	83.2	H	-	-	PK	142	1.6	
2480.030	80.7	V	-	-	PK	160	1.4	

Note 1:	Average measurements made with VB=3kHz to avoid pulse desensitization as the modulated signal was pulsed.

Fundamental emission level @ 3m in 100kHz RBW:	86.5 dBµV/m	
Limit for emissions outside of restricted bands:	66.5 dBµV/m	**Limit is -20dBc**

Band Edge Signal and 2483.5 MHz Restricted Band Signal Level

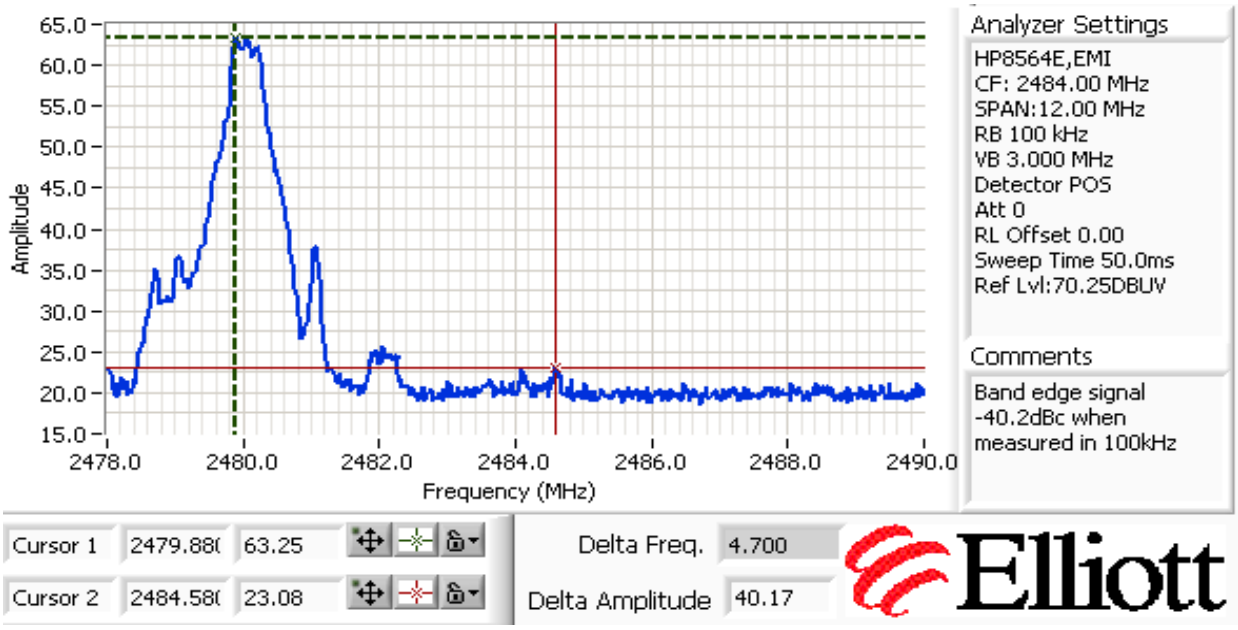
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2484.320	46.4	H	54.0	-7.6	Avg	120	1.9	RB=1MHz,VB=3kHz (note 2)
2486.020	57.6	H	74.0	-16.4	PK	120	1.9	RB=VB=1MHz

Note 1:	Field strength measured directly - refer also to plots showing compliance with -20dBc limit between 2390 MHz and 2400 MHz. Measured with EUT upright - orientation with highest fundamental field strength.
Note 2:	Average measurements made with VB=3kHz to avoid pulse desensitization as the modulated signal was pulsed.

Elliott — EMC Test Data

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

Band Edge Signal and 2483.5 MHz Restricted Band Signal Level



Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4959.940	49.0	H	54.0	-5.0	AVG	47	1.6	Flat
4959.940	48.1	H	54.0	-5.9	AVG	141	1.4	Upright
4960.020	48.0	V	54.0	-6.0	AVG	118	1.0	Side
4959.910	46.5	V	54.0	-7.5	AVG	48	1.0	Upright
4959.960	45.7	V	54.0	-8.3	AVG	99	1.7	Flat
4960.010	45.5	H	54.0	-8.5	AVG	247	1.3	Side
7439.950	44.2	H	54.0	-9.8	AVG	86	1.3	Flat
4959.940	51.7	H	74.0	-22.3	PK	47	1.6	Flat
4960.020	51.2	V	74.0	-22.8	PK	118	1.0	Side
7439.950	51.1	H	74.0	-22.9	PK	86	1.3	Flat
4959.940	51.0	H	74.0	-23.0	PK	141	1.4	Upright
4959.910	50.8	V	74.0	-23.2	PK	48	1.0	Upright
4960.010	49.4	H	74.0	-24.6	PK	247	1.3	Side
4959.960	49.3	V	74.0	-24.7	PK	99	1.7	Flat
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.							

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

Run #2: Radiated Spurious Emissions, 30 - 8000 MHz.

Frequency	Level	Pol	RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1219.250	40.0	V	54.0	-14.0	AVG	18	1.1	Upright
1219.250	36.7	V	54.0	-17.3	AVG	352	1.0	Flat
1219.210	35.6	V	54.0	-18.4	AVG	7	1.0	Side
1219.220	35.4	H	54.0	-18.6	AVG	144	1.0	Side
1219.250	33.5	H	54.0	-20.5	AVG	333	1.1	Flat
1219.260	30.4	H	54.0	-23.6	AVG	50	1.1	Upright
1219.250	42.8	V	74.0	-31.2	PK	18	1.1	Upright
1219.250	41.1	V	74.0	-32.9	PK	352	1.0	Flat
1219.220	40.3	H	74.0	-33.7	PK	144	1.0	Side
1219.210	40.2	V	74.0	-33.8	PK	7	1.0	Side
1219.250	39.3	H	74.0	-34.7	PK	333	1.1	Flat
1219.260	38.5	H	74.0	-35.5	PK	50	1.1	Upright

Run #3: Output Power

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2401.470	92.1	H	-	-	Peak	283	2.2	EUT Flat
2439.960	88.8	H	-	-	Peak	290	2.1	EUT Side
2479.360	86.7	H	-	-	Peak	120	1.9	EUT Upright

Note 1:	Field strength measurements made with RB=2MHz, VB=3MHz with the EUT and measurement antenna oriented in the positions that gave the highest field strength in run #1.

Channel	Frequency (MHz)	Field Strength at 3m (dBuV/m)	Antenna Pol. (H/V)	Res BW (kHz)	Signal Bandwidth (kHz)	Bandwidth Correction	Power (dBm)	Power (Watts)
Low	2402	92.1	H	2000	850	0	-3.2	0.00048
Mid	2440	88.8	H	2000	850	0	-6.5	0.00022
High	2480	86.7	H	2000	850	0	-8.6	0.00014

Note 1:	Output power calculated from field strength at 3m based on free space path loss formula E = √(30PG) / d, where E is the field strength (V/m), PG is the effective isotropic radiated power (W) and d is the distance (3m). Additional correction to the calculated power is made to account for the difference between the measurement bandwidth and signal bandwidth.

Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

Run #4: Bandwidth, Channel Occupancy, Spacing and Number of Channels

Channel	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	835	1193
Mid	2440	850	1093
High	2480	845	923

Note 1:	20dB bandwidth measured using RB = 30kHz, VB = 100kHz (VB > RB)
Note 2:	99% bandwidth measured using RB = 30kHz, VB = 100kHz (VB >=3RB)

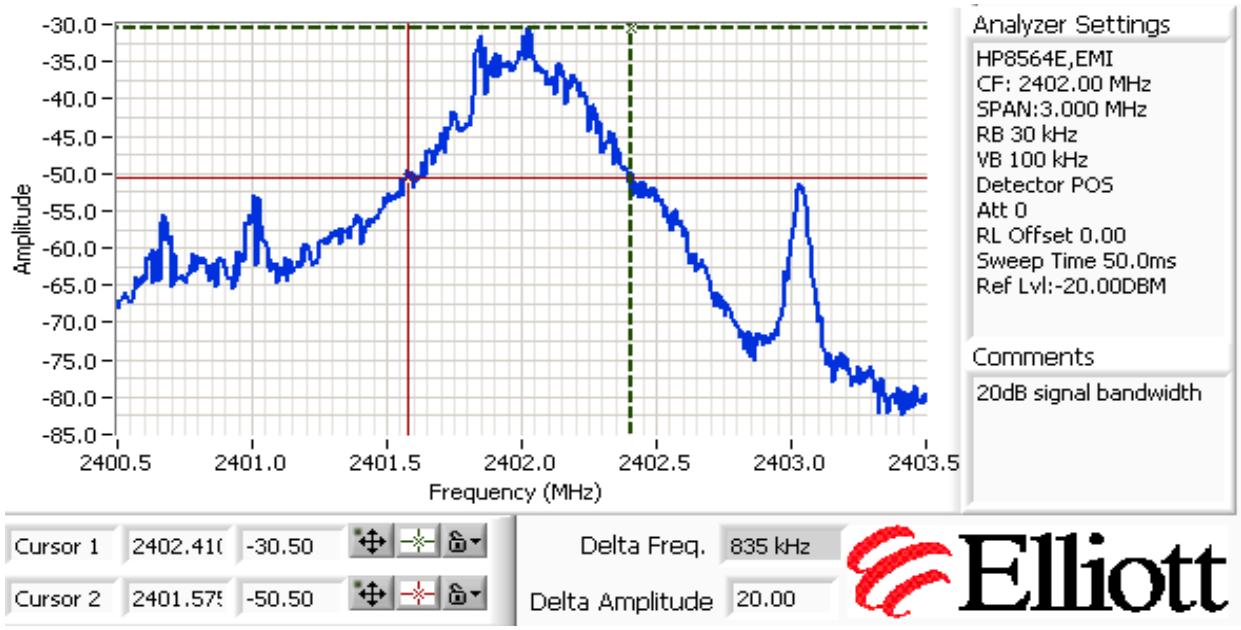
Frequency hopping systems in the **2400-2483.5 MHz** band shall use at least 15 channels.
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)
The channel dwell time is calculated from the transmit time on a channel mulitplied by the number of times a channel could be used in a period of 0.4 times the number of channels, N (i.e. 0.4N divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds 0.4N, in which case the channel dwell time is the transmit time on a channel.

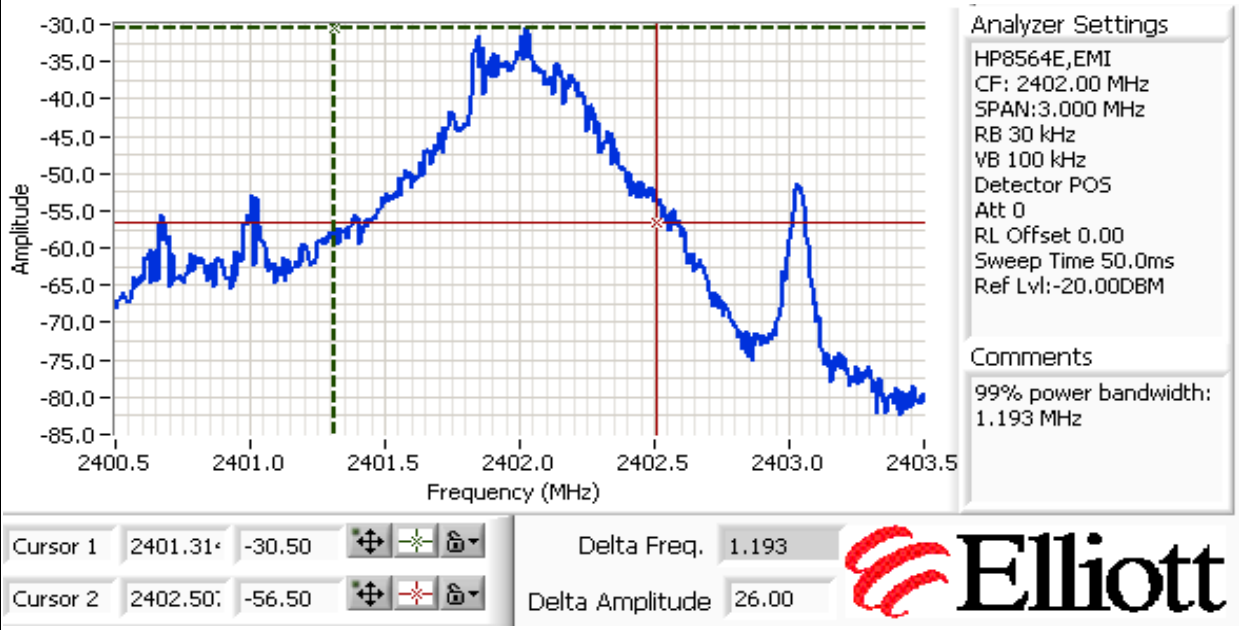
Maximum 20dB bandwidth:	850	kHz	
Channel spacing:	1000	kHz	**Pass**
Transmission time per hop:	0.001253	s	Calculated based on 79 channels
The time between successive hops on a channel:	0.099	s	
Number of channels (N):	79		**Pass**
Channel dwell time in 31.6 seconds:	0.40	ms	**Pass**

Note: The device operates using the Bluetooth hopping algorithm which complies with the hopping timing requirements of 15.247. Measurements described aboveand plots shown below are provided to support this fact.

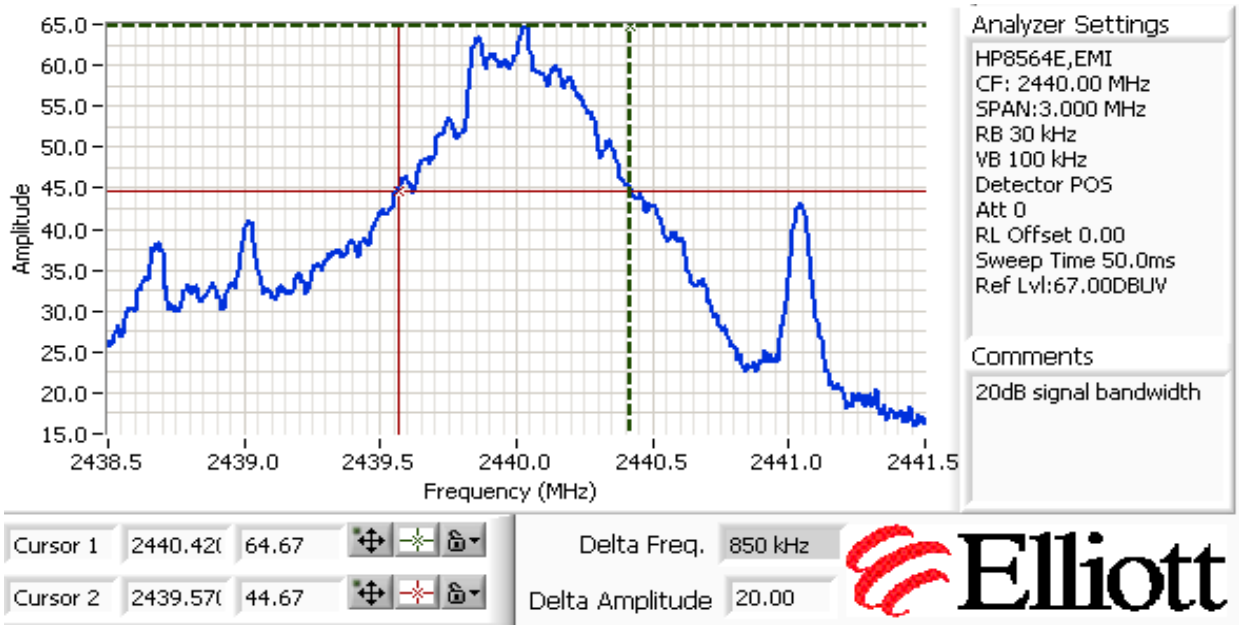
Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

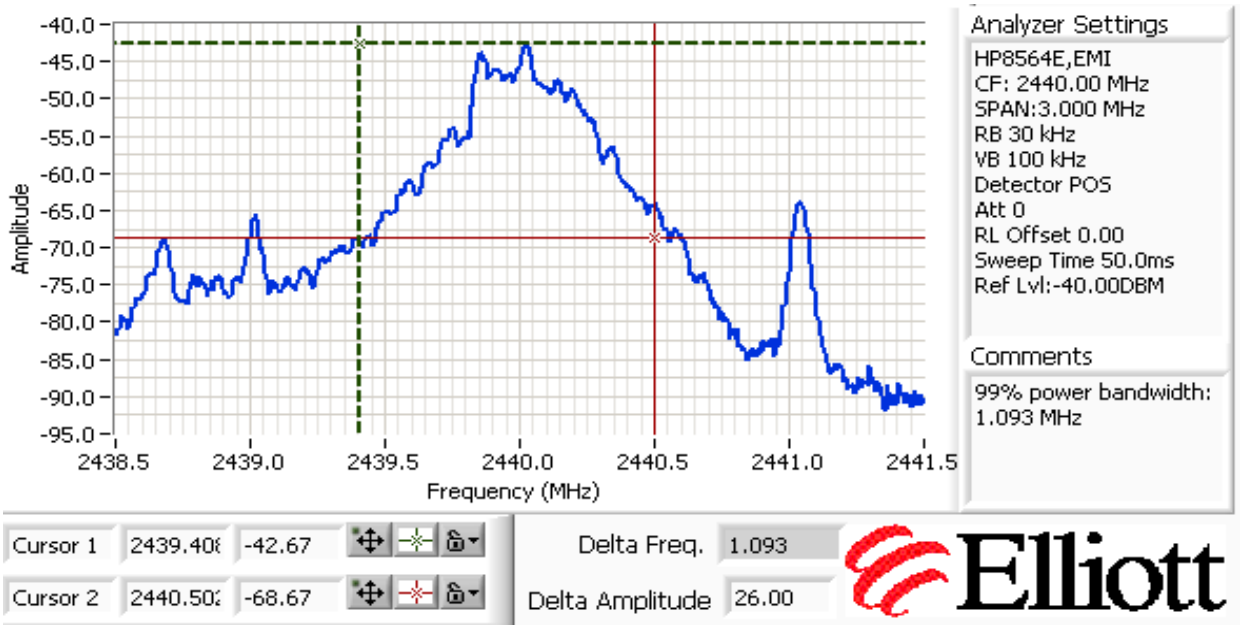
Bandwidth Plots



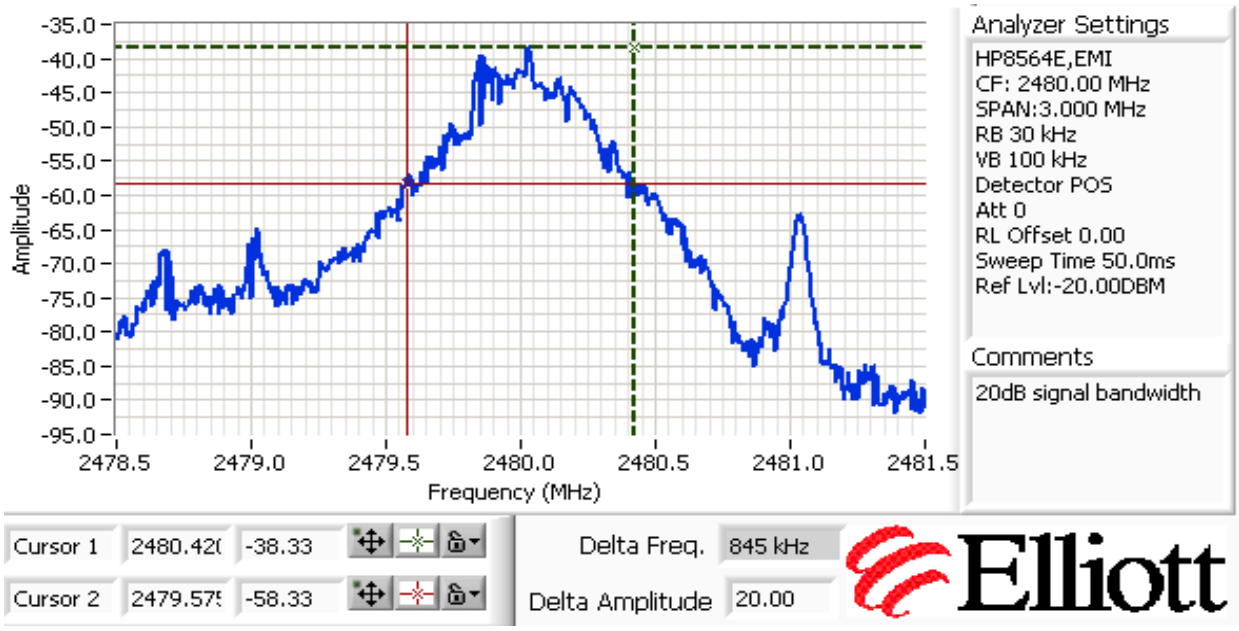


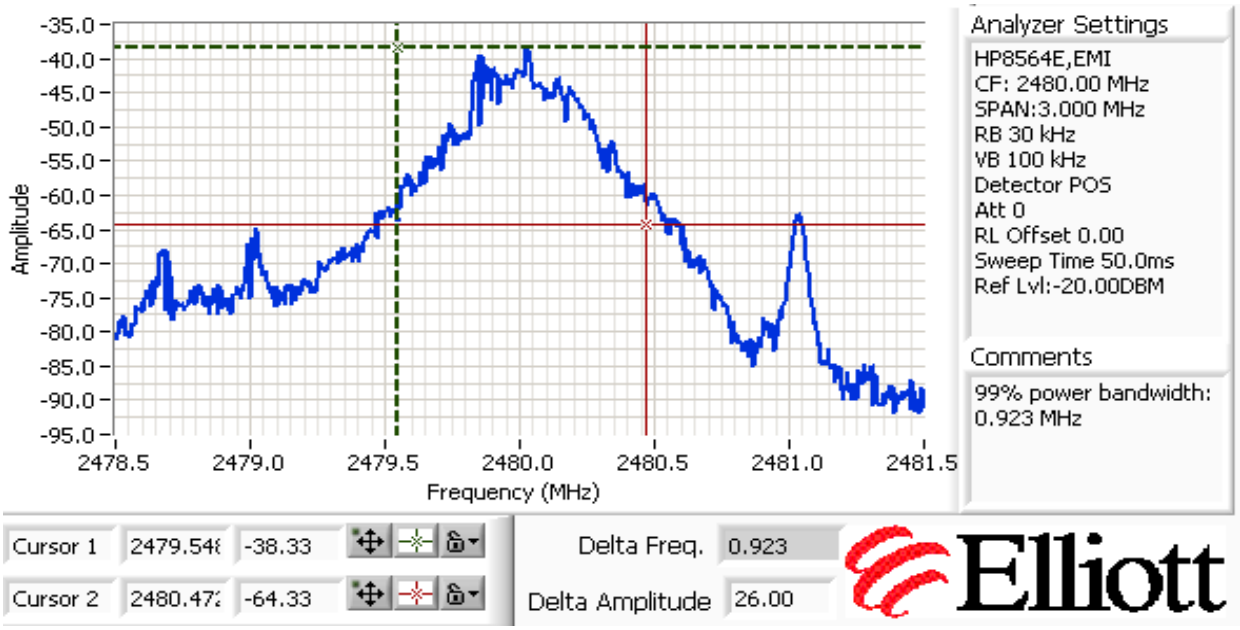
Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A





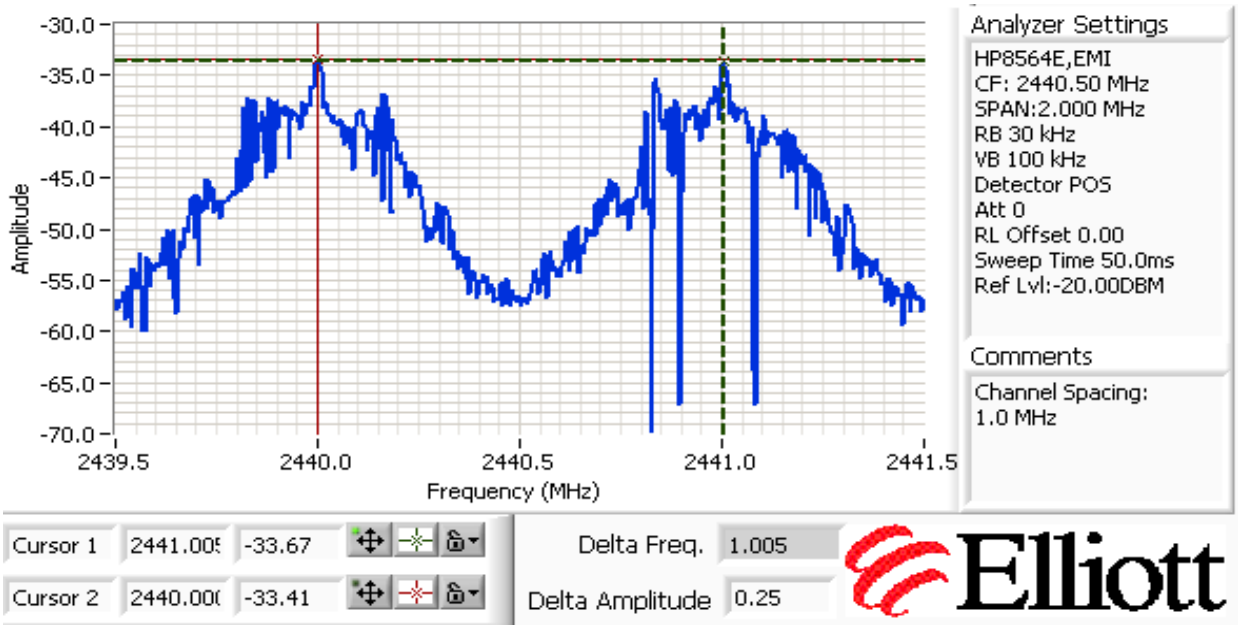
Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

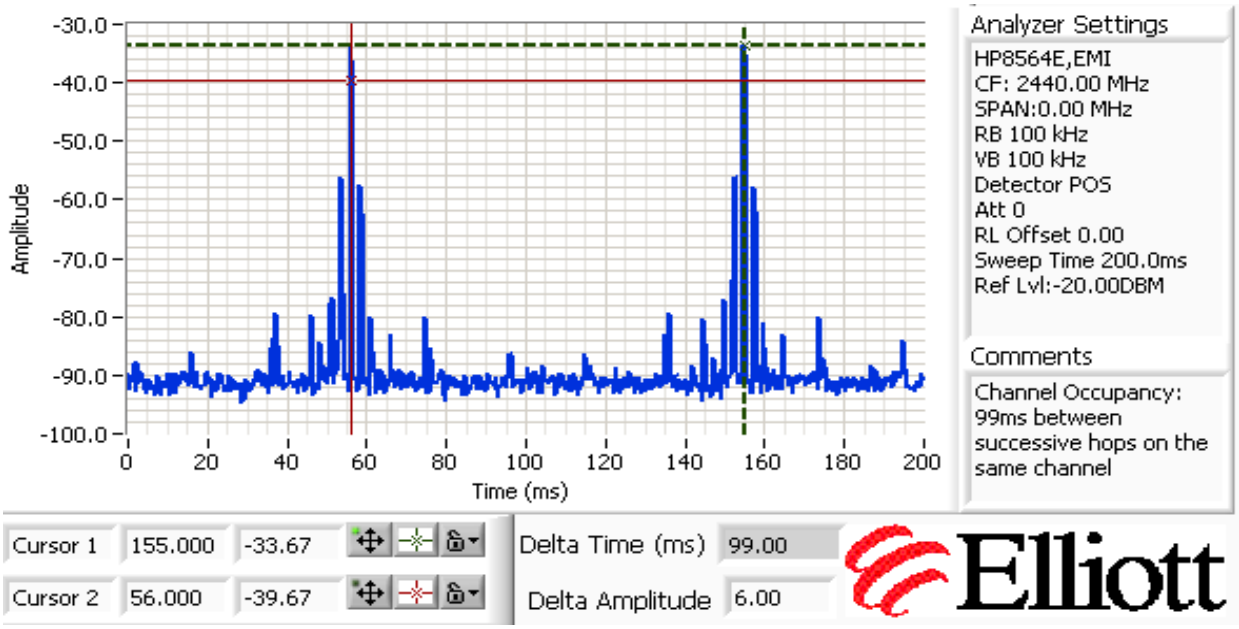




Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

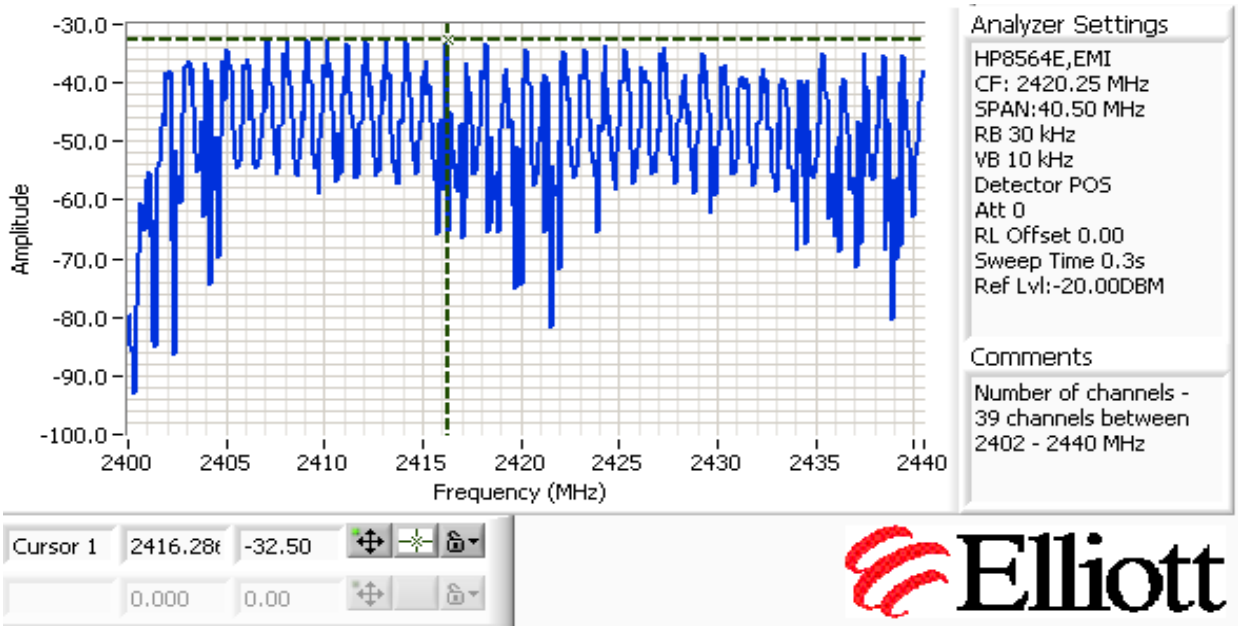
Channel Spacing and Channel Occupancy Plots





Client:	Polimaster	Job Number:	J64753
Model:	PM1703GN/GNA/GNB	T-Log Number:	T65093
		Account Manager:	-
Contact:	Aliaksandr Kratsko/Arif Mamedov		
Standard:	FCC 15.247 / 15.209	Class:	N/A

Plots Showing Number of Channels



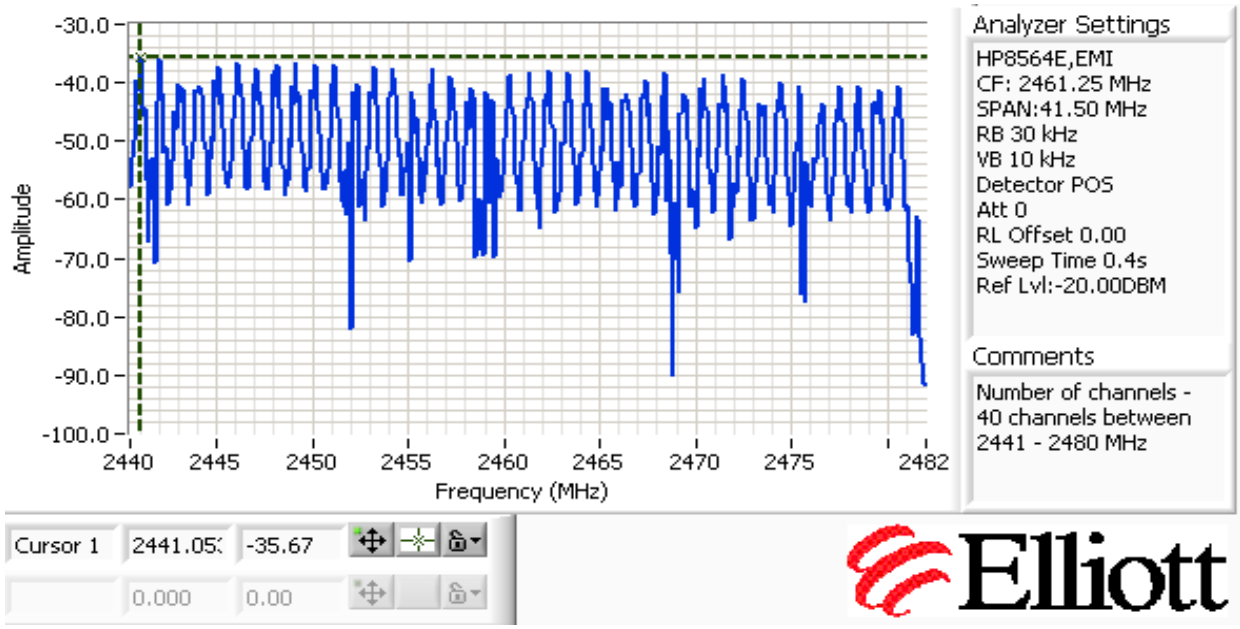


EXHIBIT 3: Photographs of Test Configurations

2 Pages

EXHIBIT 4: Proposed FCC ID Label & Label Location

2 Pages

EXHIBIT 5: Detailed Photographs of Polimaster Inc. Model PM1703 SERIESConstruction

4 Pages

EXHIBIT 6: Operator's Manual for Polimaster Inc. Model PM1703 SERIES

28 Pages

EXHIBIT 7: Block Diagram of Polimaster Inc. Model PM1703 SERIES

2 Pages

EXHIBIT 8: Schematic Diagrams for Polimaster Inc. Model PM1703 SERIES

2 Pages

EXHIBIT 9: Theory of Operation for Polimaster Inc. Model PM1703 SERIES

1 Page

EXHIBIT 10: RF Exposure Information

1 Page