

TEST REPORT

Report Number: 3163324ATL-007

January 16, 2009

Product Designation: Halo Wireless Gateway

Standard: FCC 15.249 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz.

Tested by:
Intertek Testing Services NA Inc.
1950 Evergreen Blvd., Suite 100
Duluth, GA 30096

Client:
Halo Monitoring Inc
515 Sparkman Drive
Huntsville, AL 35816
Contact: Chris Otto
Phone: 256.489.0115
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Tests performed by:



Richard C. Bianco
EMC Project Engineer

Report reviewed by:



Jeremy O. Pickens
EMC Department Manager

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1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2.0 Test Summary

Section	Test Full Name	Test Date	Result
4.0	System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)		
5.0	Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)	01/15/2009	
6.0	Conducted emissions on AC power lines (Conducted Emissions)	10/24/2008	PASS
NA	Duty Cycle Determination (FCC 15A - 15.35(c)) was waived due to not required to meet requirement.	01/15/2009	
7.0	Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)	01/15/2009	PASS
8.0	Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)	01/15/2009	PASS
NA	15.249(b): Requirements for fixed, point-to-point operation (FCC 15C - 15.249(b)) was waived due to not applicable to the device under test.	01/15/2009	

3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Medical Monitor	Halo Monitoring	Halo Wireless Gateway	H2D000010
Power Supply	APS	KSAB0500100W1US	NA

EUT receive date:	09/28/2008
EUT receive condition:	Pre-Production

Description of EUT provided by Client:

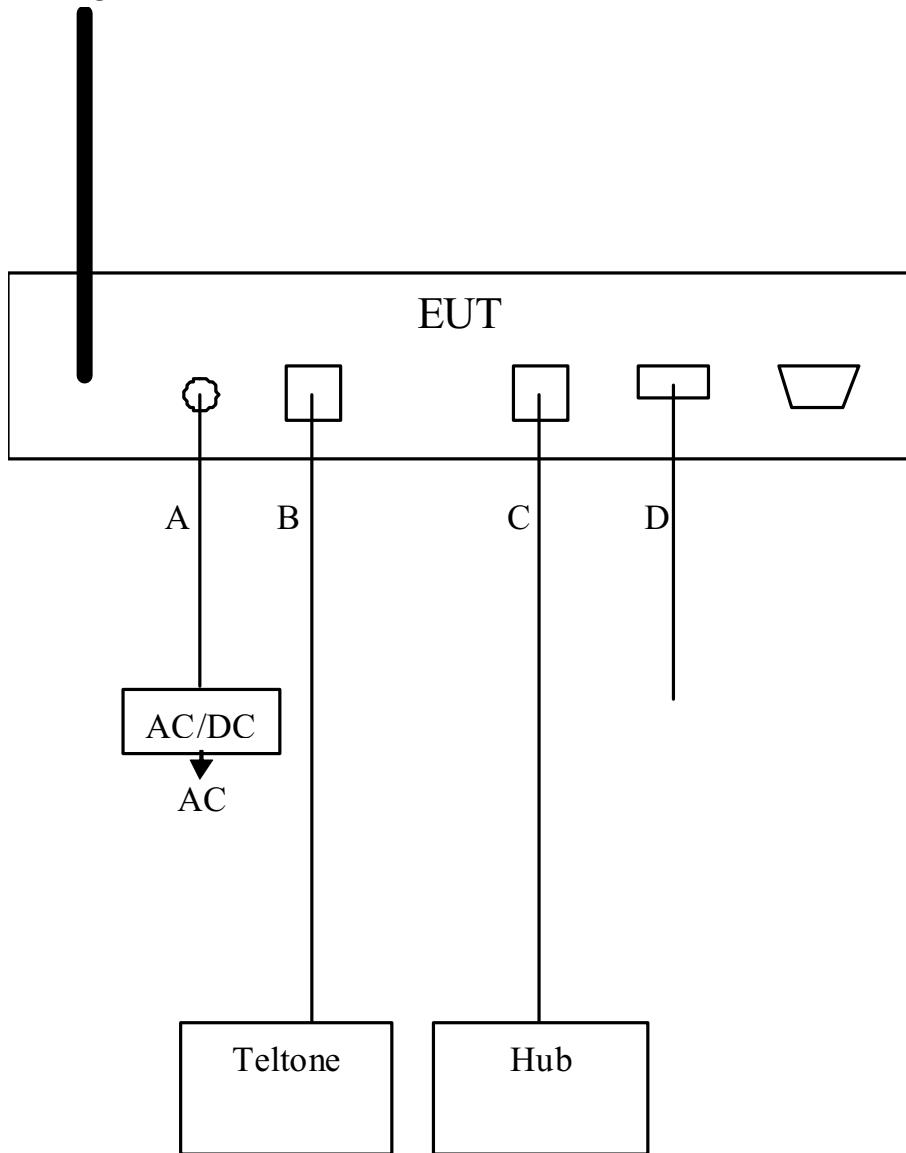
The Wearable Monitoring Device is a Proactive Medical Vital signs monitor system with transmitter and base modem that requires no active input that must be initiated by the wearer. The device is a 24/7 active device with no “sleep” mode. The monitor/transmitter device is in constant communication with the wireless base modem installed in the patient’s home.

Description of EUT exercising:

The Wearable Monitoring Device base modem was operating in transmit mode linked to an Ethernet hub. A telephone line simulator was connected to the telephone jack on the base modem and was used to “Key” the device.

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)**Method:**

Record the details of EUTcabling, document the support equipment, and show the interconnections in a block diagram.

Drawing:

System Block Diagram

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)**Data:**

EUT Cabling						
ID	Description	Length	Shielding	Ferrites	Connection	
					From	To
A	DC Power	1.5m	None	None	EUT	AC/DC Supply
B	RJ-11 Phone	15m	None	None	EUT	Teltone
C	RJ-45 Ethernet	15m	None	None	EUT	Switch
D	USB	1m	Foil	None	EUT	Unterminated

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Phone Simulator	Teltone	TLS-5	99784
10/100/1000 Switch	Netgear	GS605	1FE1775S00C08

5.0 Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)

Method:

Complete the overview spreadsheet.

Related Submittal(s) Grants: This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.

Data:

Applicant	Halo Monitoring, Inc. 515 Sparkman Drive Huntsville, AL 35816
Trade Name & Model No.	Halo Chest Strap Transmitter
FCC Identifier	WS91006
Frequency Range (MHz)	2405
Antenna Type (15.203)	Proprietary Antenna
Manufacturer name & address	Halo Monitoring, Inc. 515 Sparkman Drive Huntsville, AL 35816

Related Submittals and Grants:	This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.
Additions, deviations and exclusions from standards	None

6.0 Conducted emissions on AC power lines (Conducted Emissions)

Method:

Equipment setup for conducted disturbance tests shall follow the guidelines of ANSI C63.4:2003.

Measurements in the frequency range of 150kHz to 30 MHz shall be performed with a quasi-peak or average detector instrument that meets the requirements of Section One of CISPR 16. An AMN shall be used to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN defined in CISPR 16 shall be used.

In the frequency range of 150 kHz to 30 MHz, a resolution/video bandwidth of 9kHz/30kHz or greater shall be used.

The EUT shall be located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

If a flexible mains cord is provided by the manufacturer that is in excess of 1m, the excess cable shall be folded back and forth as far as possible to form a bundle not exceeding 0.4m in length.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance shall be measured between each current carrying conductor and the reference ground. Each measured values shall be reported.

If EUT is intended for tabletop use, the EUT shall be placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is to be placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table shall be constructed of non-conductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the floor standing EUT shall be placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material. The metal ground plane shall extend at least 0.5m beyond the boundaries of the EUT and had minimum dimensions of 2m by 2m.

TEST SITE

The test site for conducted emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096. The VCCI Registration Number for this site is C-2818.

MEASUREMENT UNCERTAINTY

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

150 kHz to 30 MHz: +/- 2.8 dB

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Cable TT1, 6ft, N(Male) to N(Male)	Mini-Circuits	CBL-6FT-NMNM	TT1	05/05/2008	05/05/2009
Cable TT4	Andrews	Cable TT4	TT4 211404	05/05/2008	05/05/2009
EMI Receiver	Hewlett Packard	8546A	213109	09/29/2008	09/29/2009
EMI Receiver, Preselector section	Hewlett Packard	85460A	213108	09/29/2008	09/29/2009
Excel spreadsheet for conducted emissions tests	Software	Excel - CE Worksh	SW002	12/08/2008	12/08/2009
LISN (TT4)	Fischer Custom Comm	FCC-LISN-50-50-M	211406	10/18/2008	10/18/2009
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/11/2008	10/11/2009
Tile - software profile for radiated and conducted emissions testing.	Software	Tile - Emissions	SW006	12/08/2008	12/08/2009
Transient Limiter	Hewlett Packard	11947A	213100	08/05/2008	08/05/2009

Results: The sample tested was found to Comply.

6.0 Conducted emissions on AC power lines (Conducted Emissions)

Photo:



Test Setup - Front View

6.0 Conducted emissions on AC power lines (Conducted Emissions)

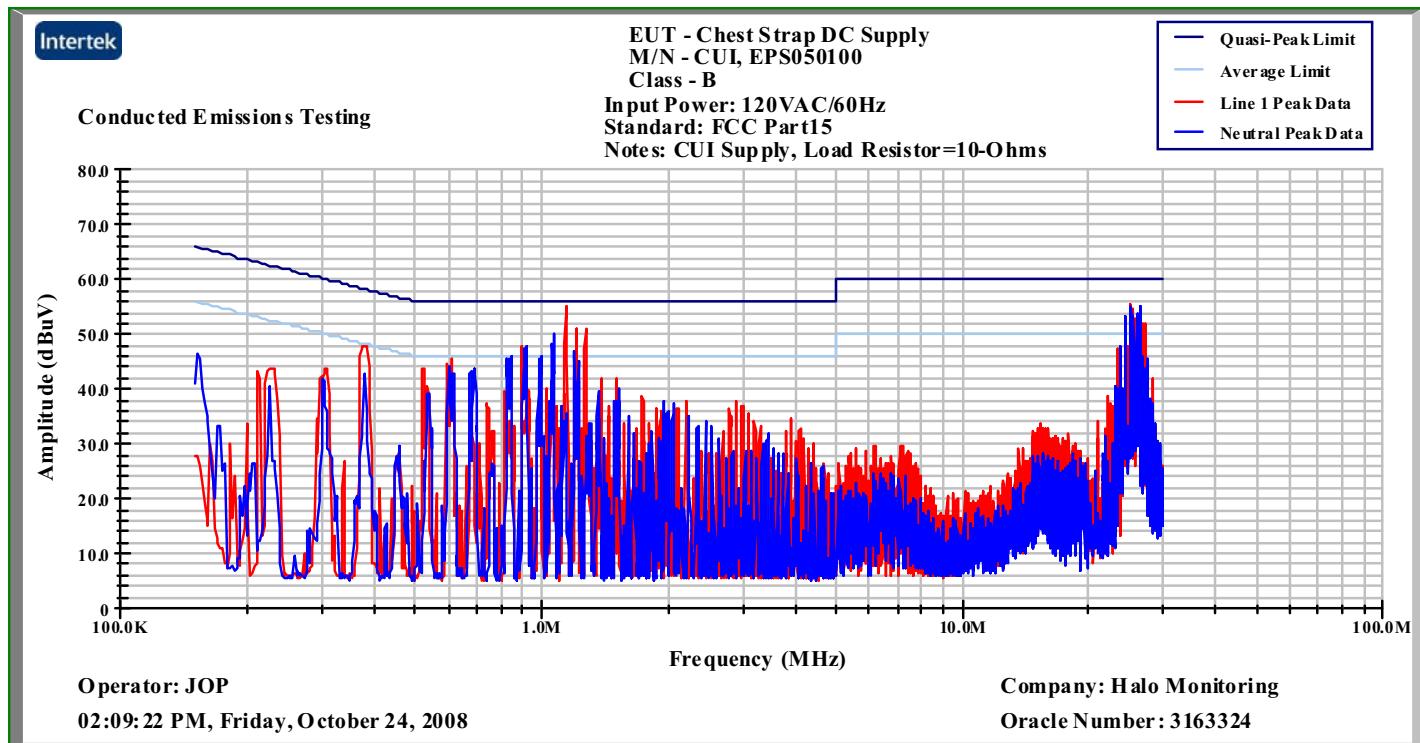
Photo:



Test Setup - Rear View

6.0 Conducted emissions on AC power lines (Conducted Emissions)

Plot:



Peak Plot

6.0 Conducted emissions on AC power lines (Conducted Emissions)

Data:

Date: 10/24/2008

Frequency Range (MHz): 0.15-30

Limit: CISPR Class B

Input power: 120VAC/60Hz

Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I
LISN Number 1,2	Detector (P, QP, A)	Frequency MHz	Reading dBuV	Cable Loss dB	LISN Ins. Loss dB	Net dBuV	Limit dBuV	Margin dB
1	QP	0.570	44.4	0.2	0.2	44.8	56.0	-11.2
1	A	0.570	30.2	0.2	0.2	30.6	46.0	-15.4
1	QP	1.170	43.1	0.2	0.1	43.4	56.0	-12.6
1	A	1.170	25.6	0.2	0.1	25.9	46.0	-20.1
1	QP	2.285	44.5	0.2	0.1	44.8	56.0	-11.2
1	A	2.285	30.8	0.2	0.1	31.1	46.0	-14.9
1	QP	3.100	50.7	0.2	0.1	51.0	56.0	-5.0
1	A	3.100	37.5	0.2	0.1	37.8	46.0	-8.2
1	QP	4.885	43.5	0.2	0.2	43.9	56.0	-12.1
1	A	4.885	29.8	0.2	0.2	30.2	46.0	-15.8
1	QP	6.118	43.5	0.2	0.2	43.9	60.0	-16.1
1	A	6.118	29.5	0.2	0.2	29.9	50.0	-20.1
2	QP	0.571	39.6	0.2	0.1	39.9	56.0	-16.1
2	A	0.571	29.1	0.2	0.1	29.4	46.0	-16.6
2	QP	1.170	38.1	0.2	0.0	38.3	56.0	-17.7
2	A	1.170	21.5	0.2	0.0	21.7	46.0	-24.3
2	QP	2.353	40.5	0.2	0.0	40.7	56.0	-15.3
2	A	2.353	27.9	0.2	0.0	28.1	46.0	-17.9
2	QP	3.178	44.4	0.2	0.0	44.6	56.0	-11.4
2	A	3.178	33.3	0.2	0.0	33.5	46.0	-12.5
2	QP	4.895	38.1	0.2	0.1	38.4	56.0	-17.6
2	A	4.895	25.9	0.2	0.1	26.2	46.0	-19.8
2	QP	5.998	39.8	0.2	0.1	40.1	60.0	-19.9
2	A	5.998	27.8	0.2	0.1	28.1	50.0	-21.9
Calculations		G=D+E+F		I=G-H				

Note: Peak measurements are compared to the average limit.

Tabular Data

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Method:

Measurements shall be performed with a quasi-peak detector instrument that meets the requirements of Section One of CISPR 16.

Bandwidths:

30 MHz to 1000 MHz: 120 kHz RBW and 1 MHz VBW

Above 1000 MHz: 1 MHz RBW and 3 MHz VBW

Detectors:

Equal to or less than 1000 MHz: CISPR quasi-peak detector (alternative: peak detector)

Above 1000 MHz: Average detector (applies to average limit)

Above 1000 MHz: Peak detector (applies to peak limit)

Limits:

Equal to or less than 1000 MHz, the limits are specified as quasi-peak. If a peak detector is used, the limit does not change.

Above 1000 MHz, the limits are specified as average. The peak limit is 20 dB above the average limit. Both peak and average measurements are required to be reported.

Frequency range of radiated measurements

For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

- (1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
- (2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
- (3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.
- (4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

Measurement antenna requirements:

Below 30 MHz - Loop antenna

30 to 1000 MHz - Biconical, Log Periodic, or equivalent

Above 1000 MHz - Horn or equivalent

Measurements of the radiated field are made with the antenna located at a distance of 3 or 10 meters from the EUT. The limit applied to the measurement shall be appropriate for the test distance. The test distance shall be indicated in the results section.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Exploratory tests should be carried out while varying the cable positions to determine the maximum or near-maximum emission level. During manipulation, cables shall not be placed under or on top of the system test components unless such placement is required by the inherent equipment design.

The antenna shall be adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth shall be varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) shall be varied during the measurements to find the maximum field-strength readings.

If the EUT is handheld, it shall be oriented in each of its orthogonal axes.

If the EUT is intended for tabletop use, it shall be placed on a table whose top is 0.8m above the ground plane. The table shall be constructed of non-conductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the EUT was placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4:2003.

TEST SITE

The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, BiLog, 20-2000MHz	Chase	CBL6112B	211386	09/26/2008	09/26/2009

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)**Test Equipment Used:**

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Horn, <18 GHz	EMCO	3115	213061	04/18/2008	04/18/2009
Antenna, Horn, <18 GHz	EMCO	3115	BOX-HORN1	08/08/2008	08/08/2009
Antenna, Horn, 18-40 GHz	EMCO	3116	213023	04/29/2008	04/29/2009
Cable E01, <18GHz	Pasternack	RG214/U	E01	05/05/2008	05/05/2009
Cable E05, <18GHz	Huber-Suhner	Sucoflex 104PEA	E05	05/05/2008	05/05/2009
Cable E402, 40 GHz, 2.9, 9"	Megaphase	TM40 K1K1 9	E402	06/04/2008	06/04/2009
Cable E404, 40 GHz, 2.9, 2m	Megaphase	TM40 K1K1 80	E404	06/04/2008	06/04/2009
Cable E405, 40 GHz, 2.9, 2m	Megaphase	TM40 K1K1 80	E405	06/04/2008	06/04/2009
Cable MP3, 18 GHz, N, 10m	Megaphase	G919-NKNK-394	MP3	05/05/2008	05/05/2009
EMI Receiver	Hewlett Packard	8546A	213109	09/29/2008	09/29/2009
EMI Receiver, Preselector section	Hewlett Packard	85460A	213108	09/29/2008	09/29/2009
Excel spreadsheet for radiated emissions	Software	Excel - RE Worksh	SW004	12/08/2008	12/08/2009
Preamplifier, 10 MHz to 2000 MHz, 27 dB gain	Mini-Circuits	ZKL-2	200074	10/20/2008	10/20/2009
Preamplifier, 18-40GHz, 29 dB Gain	Miteq	JS41800400-30-5P	200080	02/19/2008	02/19/2009
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	03/27/2008	03/27/2009
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/11/2008	10/11/2009

Results: The sample tested was found to Comply.

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)**Photo:**

Test Setup - Front View

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

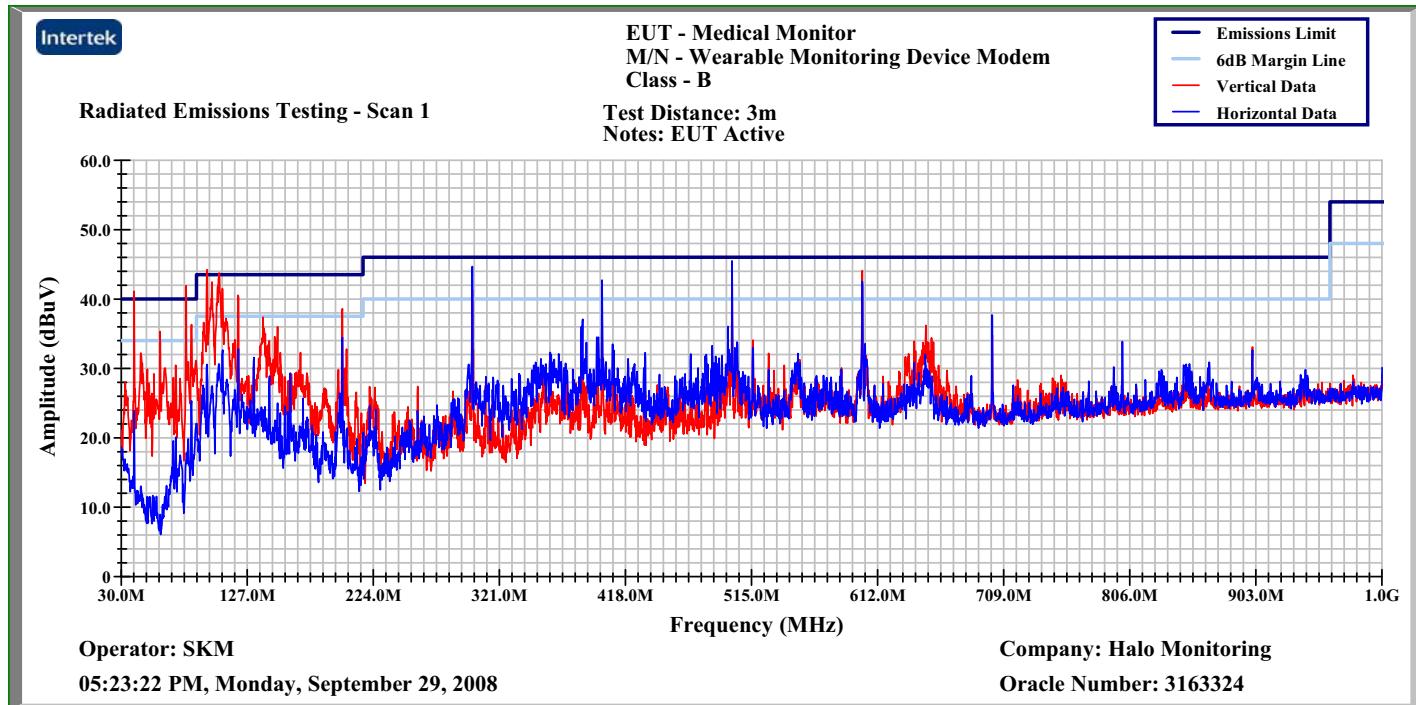
Photo:



Test Setup - Rear View

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

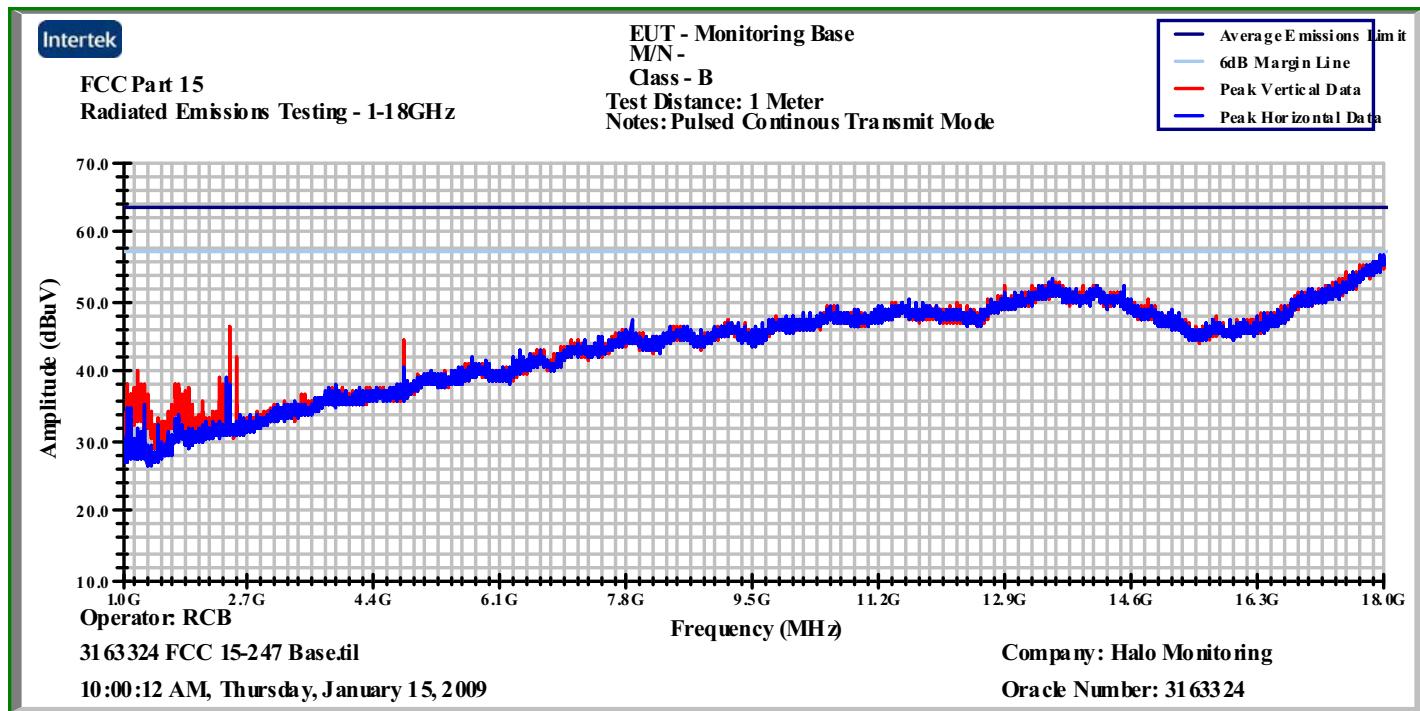
Plot:



30-1000MHz

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

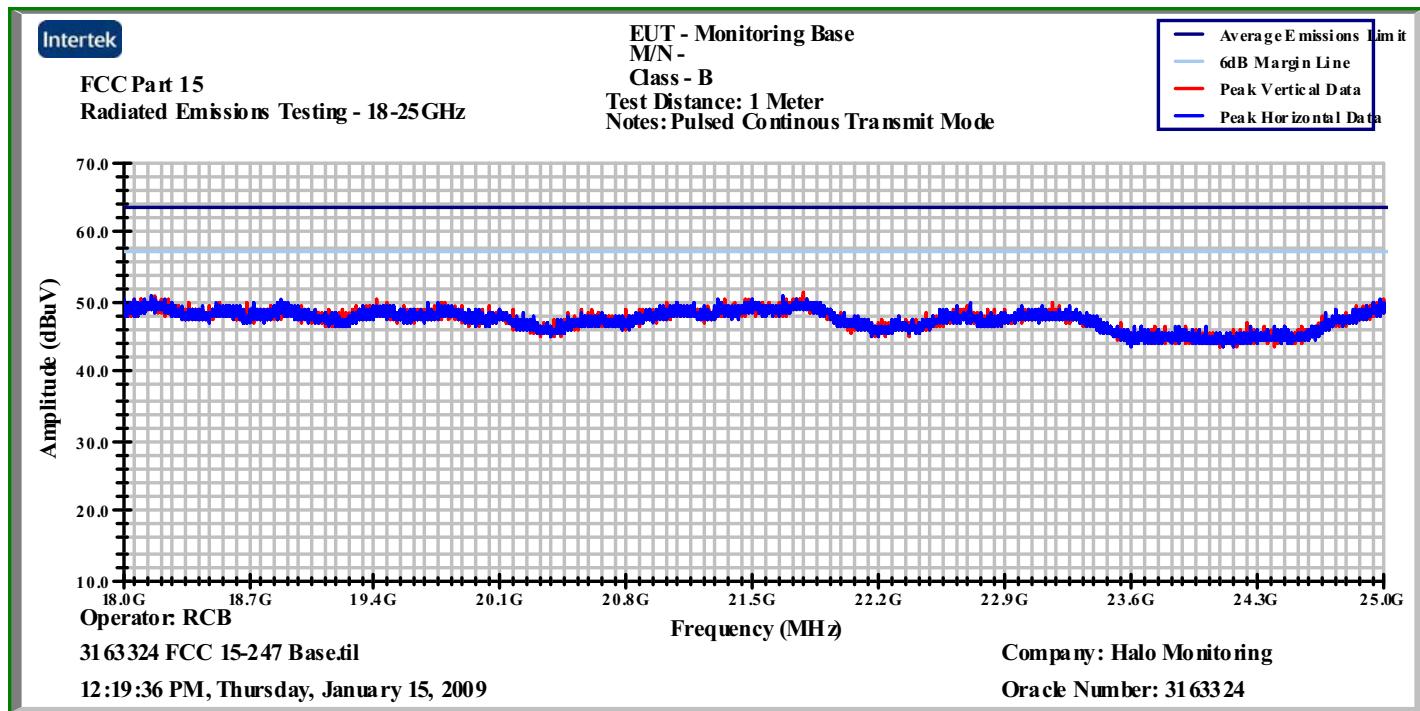
Plot:



1000-18000MHz

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

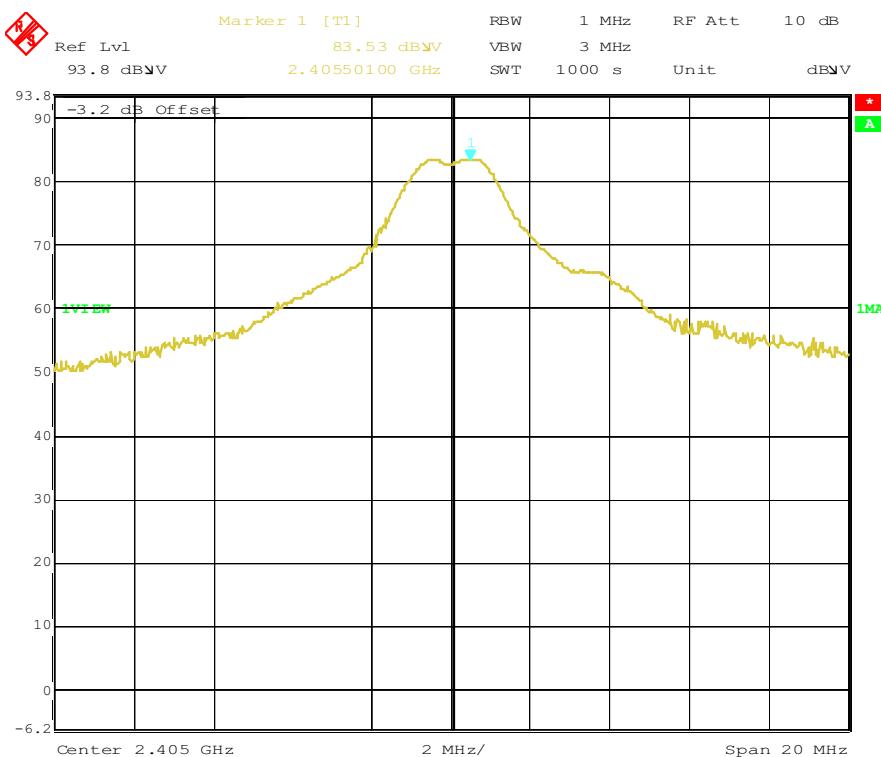
Plot:



18-25GHz

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Plot:



Date: 15.JAN.2009 13:07:05

Peak Output Power

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Data:

Frequency Range (MHz): 30 to 1000

Test Distance (m): 3

Input power: 120VAC/60Hz

Limit: FCC15 Class B-3m

Modifications for compliance (y/n):

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Net dB(uV/m)	3m Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
EUT Fully Active									
v	40.025	44.8	11.8	1.3	31.0	27.0	40.0	-13.0	QP 120K/300K
v	60.013	50.2	7.6	1.6	30.9	28.5	40.0	-11.5	QP 120K/300K
v	80.018	54.5	6.9	1.8	31.0	32.3	40.0	-7.7	QP 120K/300K
v	96.008	60.6	10.2	1.9	30.9	41.8	43.5	-1.7	QP 120K/300K
v	105.540	57.8	13.0	2.0	30.9	41.9	43.5	-1.6	QP 120K/300K
v	120.020	55.3	12.7	2.0	30.9	39.1	43.5	-4.4	QP 120K/300K
v	200.019	56.6	10.4	2.0	30.9	38.1	43.5	-5.4	QP 120K/300K
h	300.035	58.5	13.9	2.9	30.8	44.4	46.0	-1.6	QP 120K/300K
h	400.035	52.6	16.4	3.5	30.8	41.7	46.0	-4.3	QP 120K/300K
h	500.045	54.3	18.0	4.2	30.8	45.7	46.0	-0.3	QP 120K/300K
v	600.054	51.5	19.1	4.6	30.7	44.5	46.0	-1.5	QP 120K/300K
Calculations	$G=C+D+E-F$			$I=G-H$					

30-1000MHz

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Data:

Frequency Range (MHz): 1000-25000

Test Distance (m): 3

Input power: 120VAC/60Hz

Limit: 15_219a-3m

Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Net dB(uV/m)	3m Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
H	2405.541	77.6	27.8	9.7	40.9	74.2	94.0	-19.8	Pk/120k/300k
V	2405.541	86.7	27.9	9.7	40.9	83.5	94.0	-10.5	Pk/120k/300k
H	4809.113	40.1	32.9	14.3	41.2	46.0	54.0	-7.9	Pk/120k/300k
V	4809.113	45.2	32.8	14.3	41.2	51.1	54.0	-2.9	Pk/120k/300k
H	7844.330	25.5	36.6	18.9	38.8	42.1	54.0	-11.9	Pk/120k/300k
V	7844.330	28.7	36.6	18.9	38.8	45.4	54.0	-8.6	Pk/120k/300k
Calculations		$G=C+D+E-F$			$I=G-H$				

1000-25000MHz

8.0 Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)

Method:

§ 15.215 Additional provisions to the general radiated emission limitations.

(a) The regulations in §§15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in §15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.

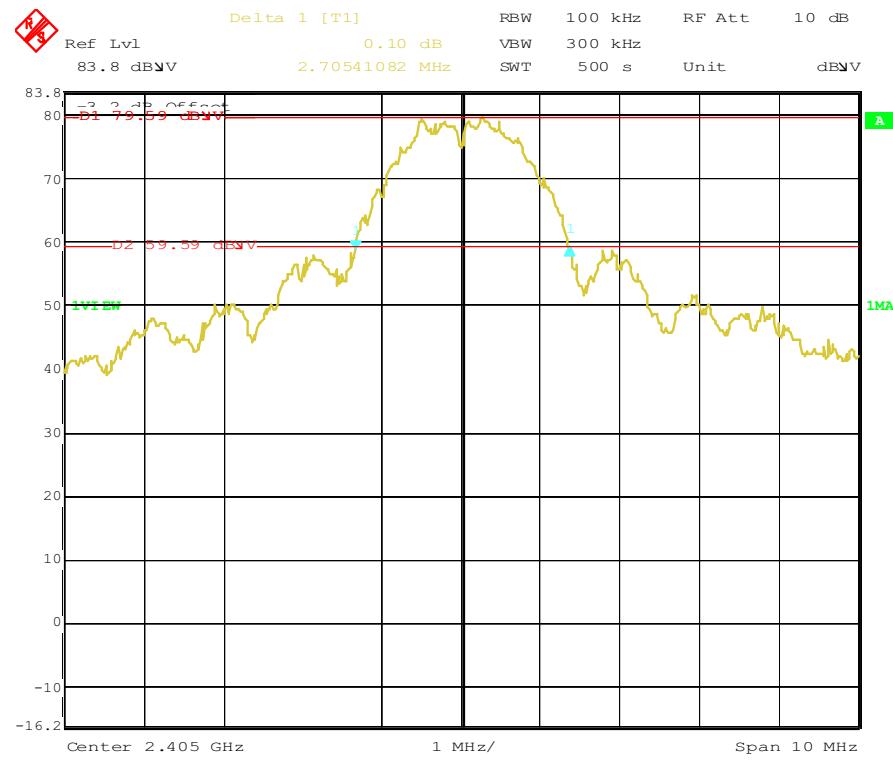
(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/11/2008	10/11/2009

Results: The sample tested was found to Comply.

Plot:



Date: 15.JAN.2009 13:24:28

Bandwidth Plot