TEST REPORT

Report Number: 3184625ATL-001

July 21, 2009

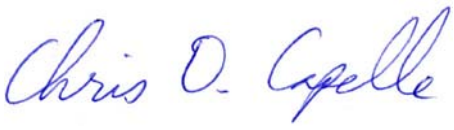
Product Designation: AFDT (Base)

Standard: FCC 15.249 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz.
RSS-210, Issue 7, 2007

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

Client:
Siemens Energy & Automation
100 Technology Drive
Alpharetta, GA 30005
Contact: Kevin Miller
Phone: 770.326.2476
Fax: 770.326.2091

Tests performed by:



Chris D. Capelle
Senior Project Engineer

Report reviewed by:

Jeremy O. Pickens
EMC Department Manager

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 verbatum 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)	07/07/2009	
6.0	Duty Cycle Determination (FCC 15A - 15.35(c))	07/07/2009	
7.0	Conducted emissions on AC power lines (Conducted Emissions)	07/07/2009	PASS
8.0	Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)	07/07/2009	PASS
NA	15.249(b): Requirements for fixed, point-to-point operation (FCC 15C - 15.249(b)) was waived due to requirement not applicable.		
NA	Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215) was waived due to requirement not applicable.		

3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Base Unit	Siemens Energy & Automation, Inc.	AFDT	EMC Unit

EUT receive date:	7/7/2009
EUT receive condition:	Good

Description of EUT provided by Client:
This Arc Fault Diagnostic Tool (AFDT) is used on a residential service panel and must be installed and used by a qualified electrician. Also, this device is to be installed only on a single phase 120VAC grounded system. This device is used to determine if there are arcs on a electrical circuit branch and transmit a reading to the handheld unit.

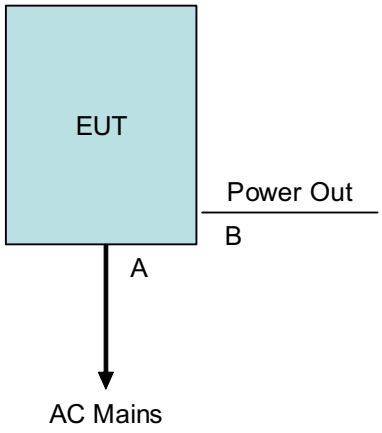
Description of EUT exercising:
EUT was powered at 120Vac-60Hz, once powered EUT operated as intended.

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:



Setup Diagram

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

Data:

EUT Cabling						
					Connection	
ID	Description	Length	Shielding	Ferrites	From	To
A	AC Power In	1.5m	none	none	AC Mains	EUT
B	Power Out	2m	none	none	EUT	Unterminated

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

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	Siemens Energy & Automation
	100 Technology Drive
	Alpharetta, GA. 30005
Trade Name & Model No.	AFDT (Base Unit)
FCC Identifier	TBD
Frequency Range (MHz)	2400-2483.5 MHz
Antenna Type (15.203)	External
Manufacturer name & address	Siemens Energy & Automation
	100 Technology Drive
	Alpharetta, GA. 30005

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 Duty Cycle Determination (FCC 15A - 15.35(c))

Method:

(c) Unless otherwise specified, e.g. §15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Determine the period of the pulse train, T, in mSec and record the results. T is defined as the time from the beginning of one pulse train to the beginning of the next pulse train.

Count the number of different types of pulses, N and record the results.

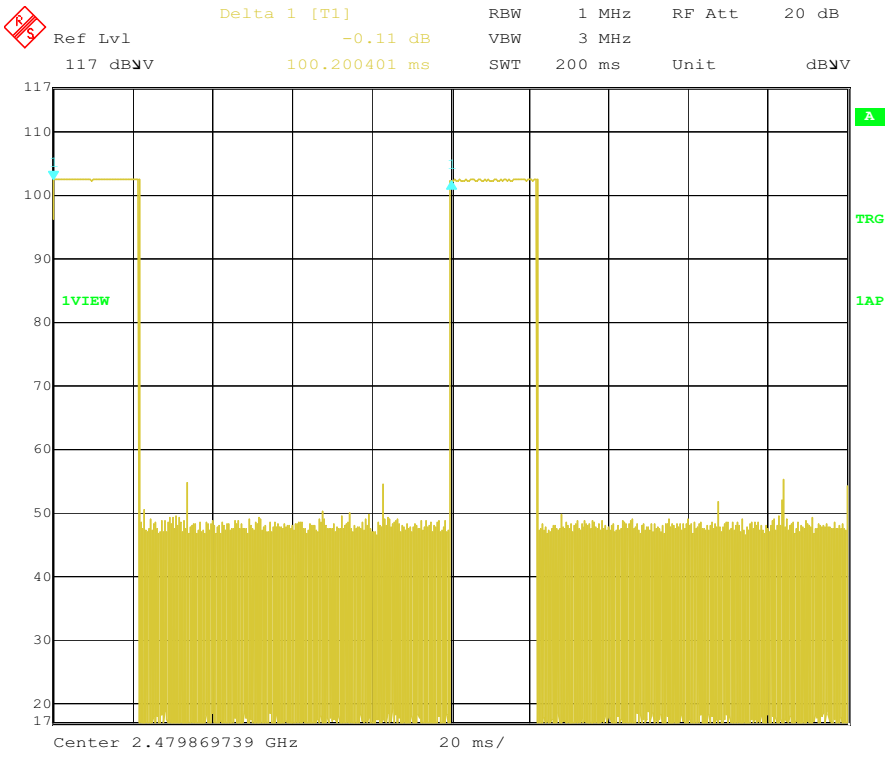
For each of the different types of pulses, count the number of occurrences within one pulse train.

Use the Duty Cycle Correction Factor, DCCF, from the results table and use it to adjust the field strength measurements recorded for radiated emissions.

Test Equipment Used:

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

Plot:

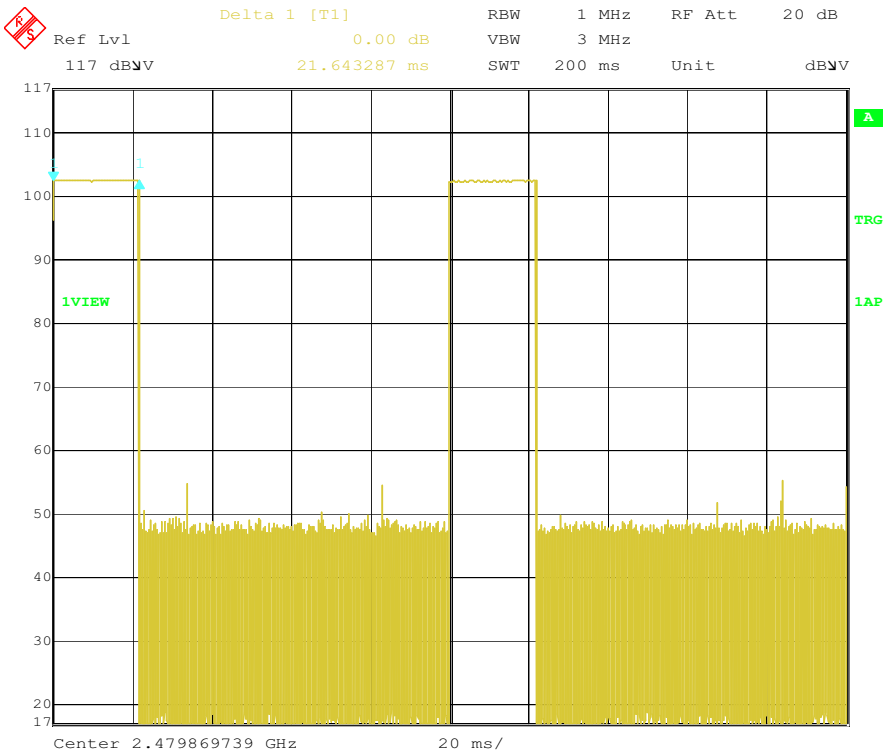


Date: 7.JUL.2009 09:03:34

Total Time

6.0 Duty Cycle Determination (FCC 15A - 15.35(c))

Plot:



On Time

6.0 Duty Cycle Determination (FCC 15A - 15.35(c))

Data:

Duration of Pulse Train, T (mSec):	100.2
Averaging Interval, A_I (mSec):	100
Number of different Pulses, N:	1

	Number ($\#P_x$)	Pulse Width, mSec (PW_x)	Product ($\#P_x$)*(PW_x)
Pulse Width 1	1	21.64	21.64
Pulse Width 2			
Pulse Width 3			
Pulse Width 4			
Pulse Width 5			
Pulse Width 6			
Pulse Width 7			
Pulse Width 8			
Pulse Width 9			
Pulse Width 10			

Duty Cycle:	0.2164
Duty Cycle Correction Factor, dB:	-13.3

$$T_{on} = (PW_1 * \#P)_1 + (PW_{2*} * \#P_2) + \cdots + (PW_n * \#P_n)$$

$$DutyCycle = T_{on} \div A_I$$

$$DCCF = 20 * Log_{10}(DutyCycle)$$

7.0 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 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	05/04/2009	05/04/2010
Cable TT5	Andrews	Cable TT5	TT5 211405	05/04/2009	05/04/2010
EMI Receiver	Hewlett Packard	8546A	211505	01/12/2009	01/12/2010
EMI Receiver, Preselector section	Hewlett Packard	85460A	015762	01/12/2009	01/12/2010
Excel spreadsheet for conducted emissions tests	Software	Excel - CE Worksh	SW002	12/08/2008	12/08/2009
LISN (TT5)	Fischer Custom Comm	FCC-LISN-50-50-M	211407	08/25/2008	08/25/2009
Tile - software profile for radiated and conducted emissions testing.	Software	Tile - Emissions	SW006	12/08/2008	12/08/2009

Results: The sample tested was found to Comply.

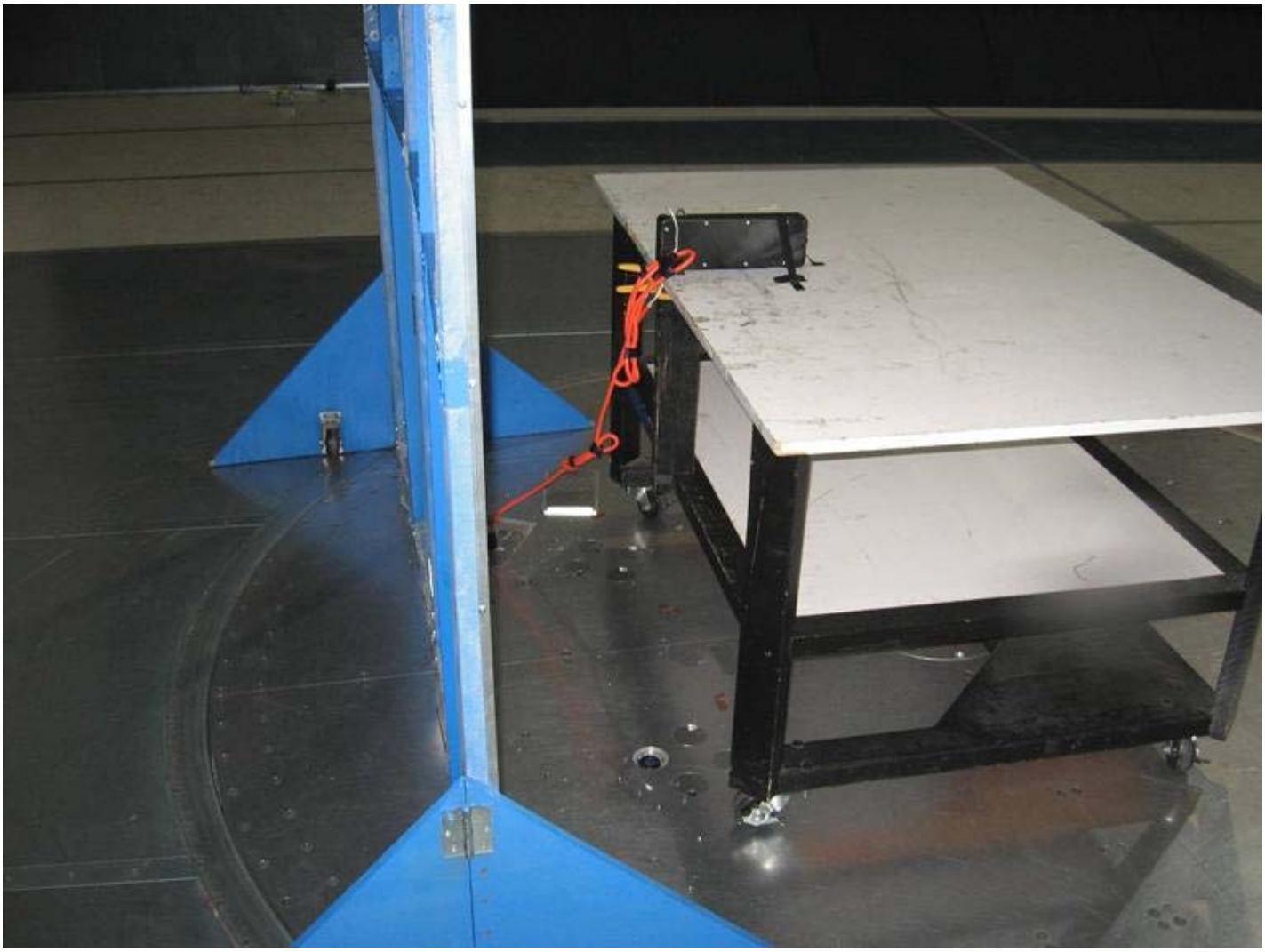
7.0 Conducted emissions on AC power lines (Conducted Emissions)

Photo:

Front View

7.0 Conducted emissions on AC power lines (Conducted Emissions)

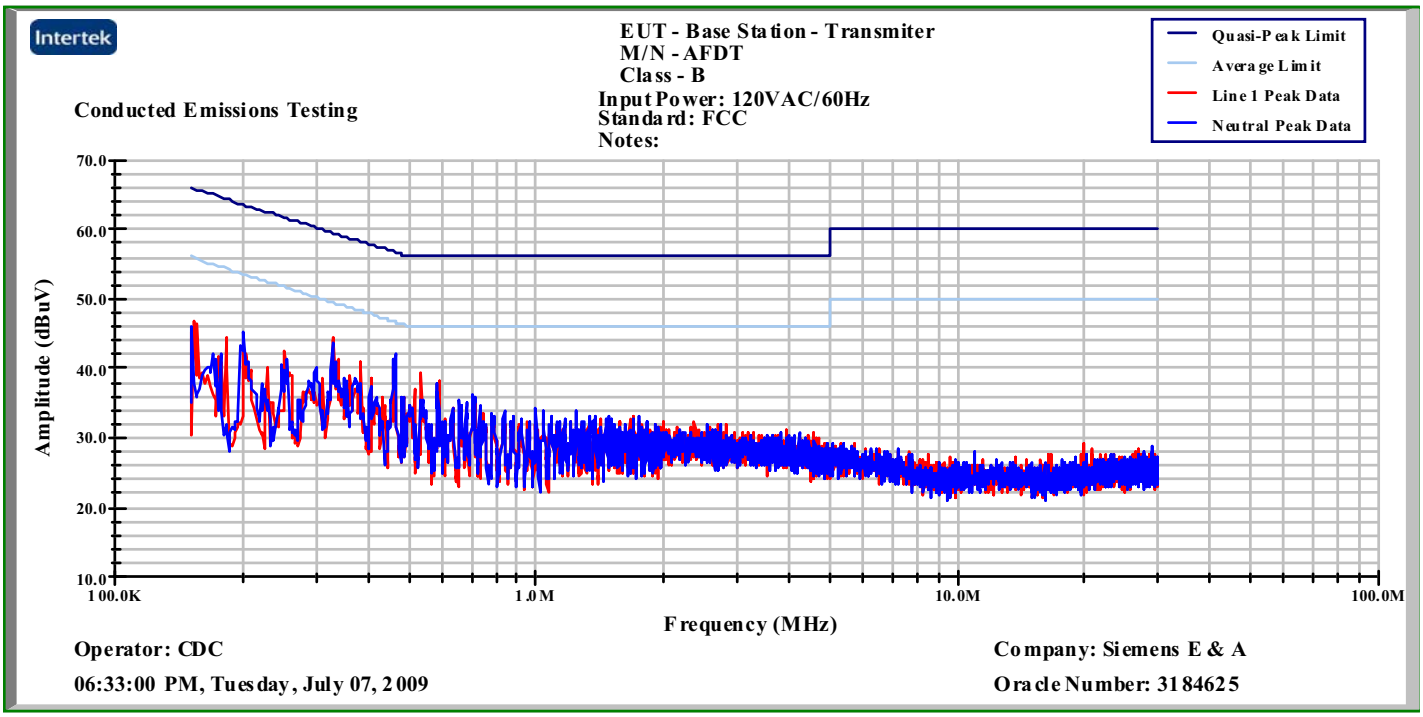
Photo:



Rear View

7.0 Conducted emissions on AC power lines (Conducted Emissions)

Plot:



Peak Plot

7.0 Conducted emissions on AC power lines (Conducted Emissions)

Data:

Date: 07/07/2009

Frequency Range (MHz): .150-30 **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	P	0.154	40.3	0.0	6.2	46.5	56.0	-9.5
1	P	0.200	39.6	0.0	6.2	45.8	53.6	-7.8
1	P	0.248	36.9	0.0	6.2	43.1	51.9	-8.8
1	P	0.322	38.0	0.0	6.2	44.2	49.7	-5.5
1	P	0.460	36.1	0.0	6.2	42.3	46.7	-4.4
1	P	0.585	32.2	0.0	6.2	38.4	46.0	-7.6
2	P	0.153	40.2	0.0	6.0	46.2	56.0	-9.8
2	P	0.201	39.3	0.0	6.0	45.4	53.6	-8.2
2	P	0.242	36.7	0.0	6.0	42.7	52.1	-9.4
2	P	0.330	38.3	0.0	6.0	44.4	49.5	-5.2
2	P	0.460	36.2	0.0	6.0	42.2	46.7	-4.5
2	P	0.586	32.4	0.0	6.0	38.4	46.0	-7.6
Calculations		G=D+E+F		I=G-H				

Note: Peak measurements are compared to the average limit.

8.0 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 othogonal 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

8.0 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	04/30/2009	04/30/2010
Antenna, Horn, 18-40 GHz	EMCO	3116	213023	05/29/2009	05/29/2010
Cable E201, 18 GHz, N, 3m	Megaphase	TM18 NKNK 118	E201	01/29/2009	01/29/2010
Cable E402, 40 GHz, 2.9, 9"	Megaphase	TM40 K1K1 9	E402	06/08/2009	06/08/2010
Cable E404, 40 GHz, 2.9, 2m	Megaphase	TM40 K1K1 80	E404	06/08/2009	06/08/2010
Cable MP3, 18 GHz, N, 10m	Megaphase	G919-NKNK-394	MP3	05/04/2009	05/04/2010
Cable ST1, 7m, N-N, 18 GHz	Storm Products Co.	PR90-206-7MTR	ST1	01/23/2009	01/23/2010
EMI Receiver	Hewlett Packard	8546A	211505	01/12/2009	01/12/2010
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	03/06/2009	03/06/2010
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	04/07/2009	04/07/2010
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/10/2008	10/10/2009

Results: The sample tested was found to Comply.

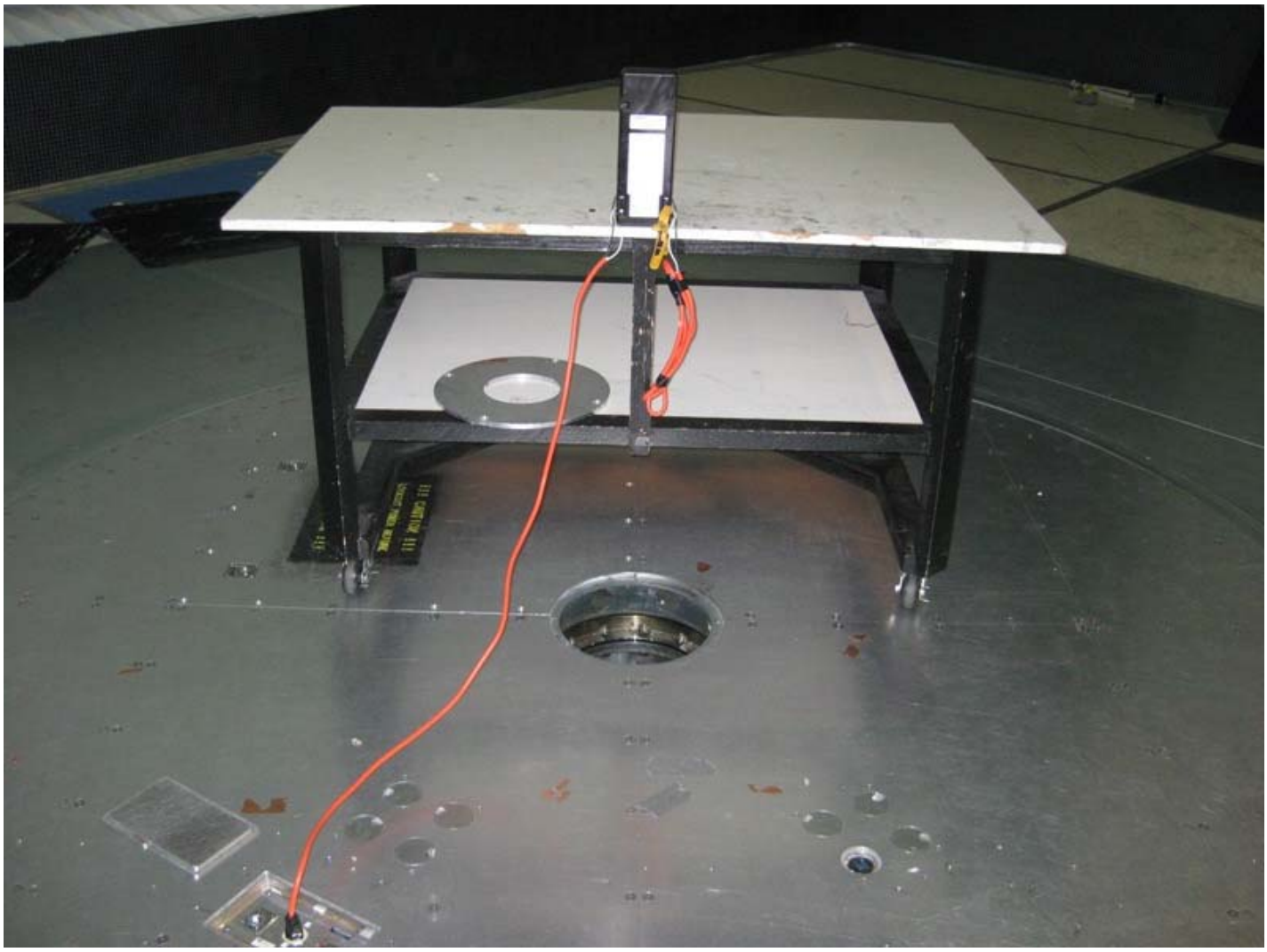
8.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Photo:

Test Setup

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

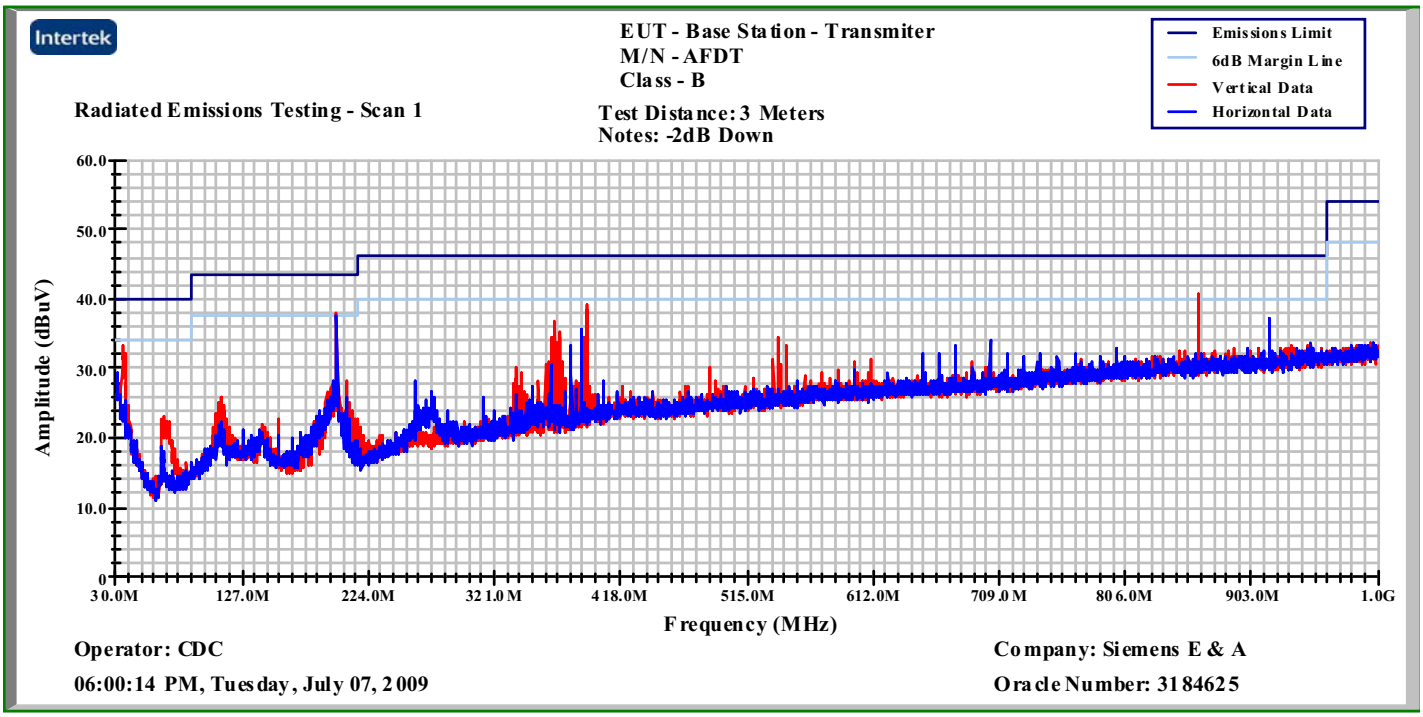
Photo:



Test Setup

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

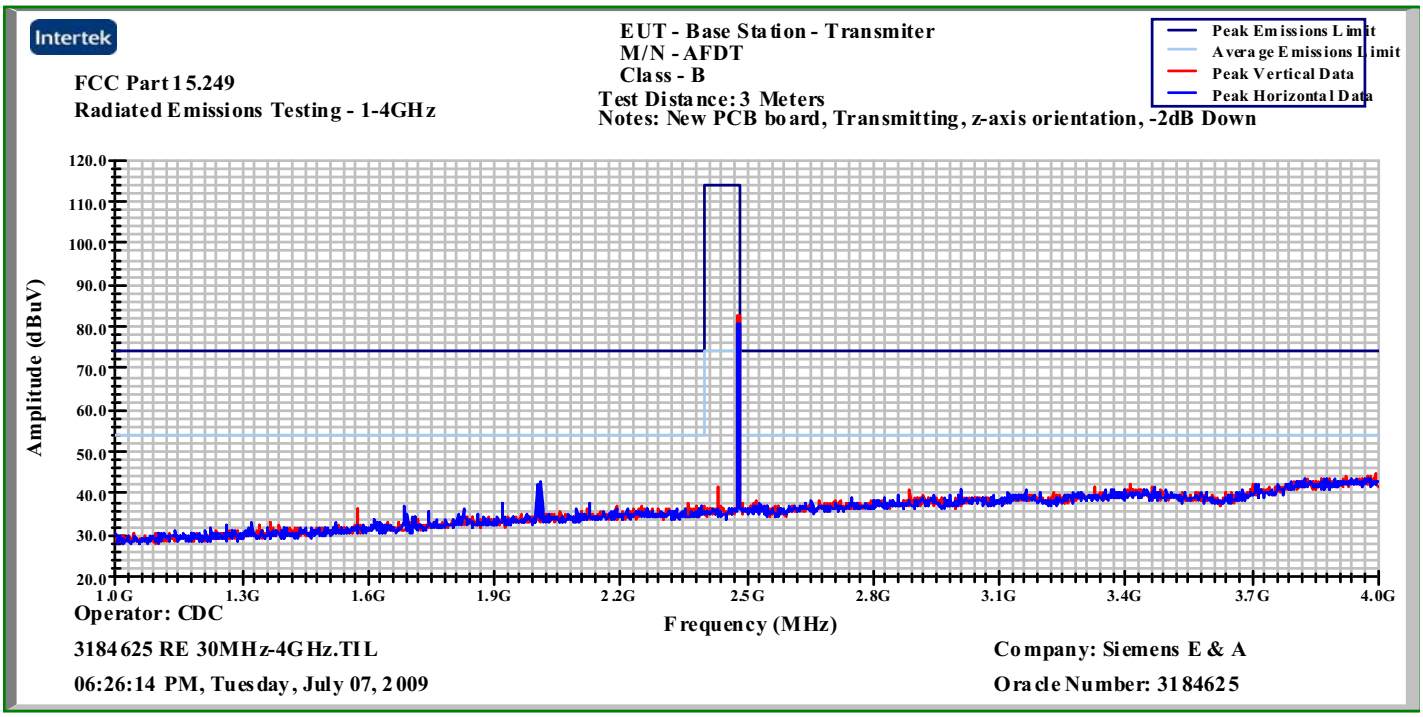
Plot:



Peak Plot (30 MHz - 1 GHz)

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

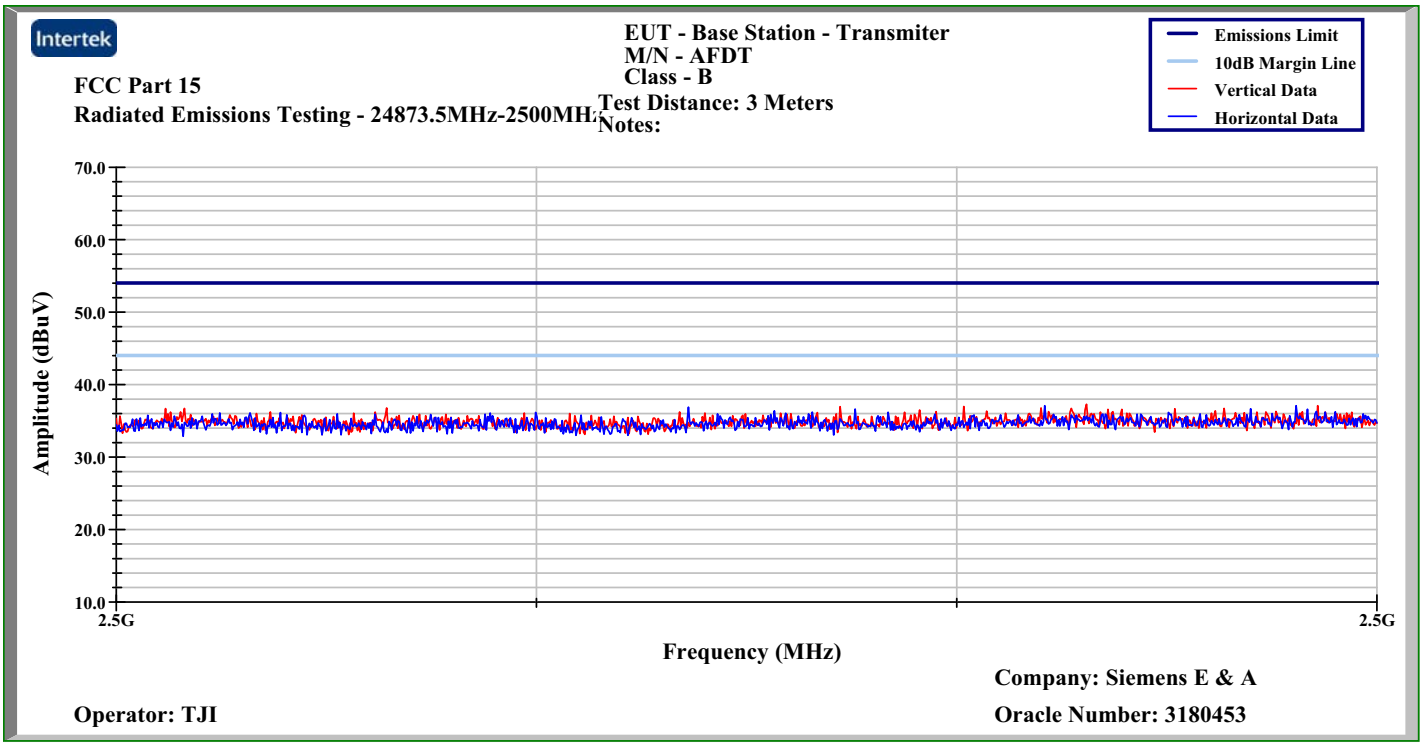
Plot:



Peak Plot (1 GHz - 4 GHz)

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

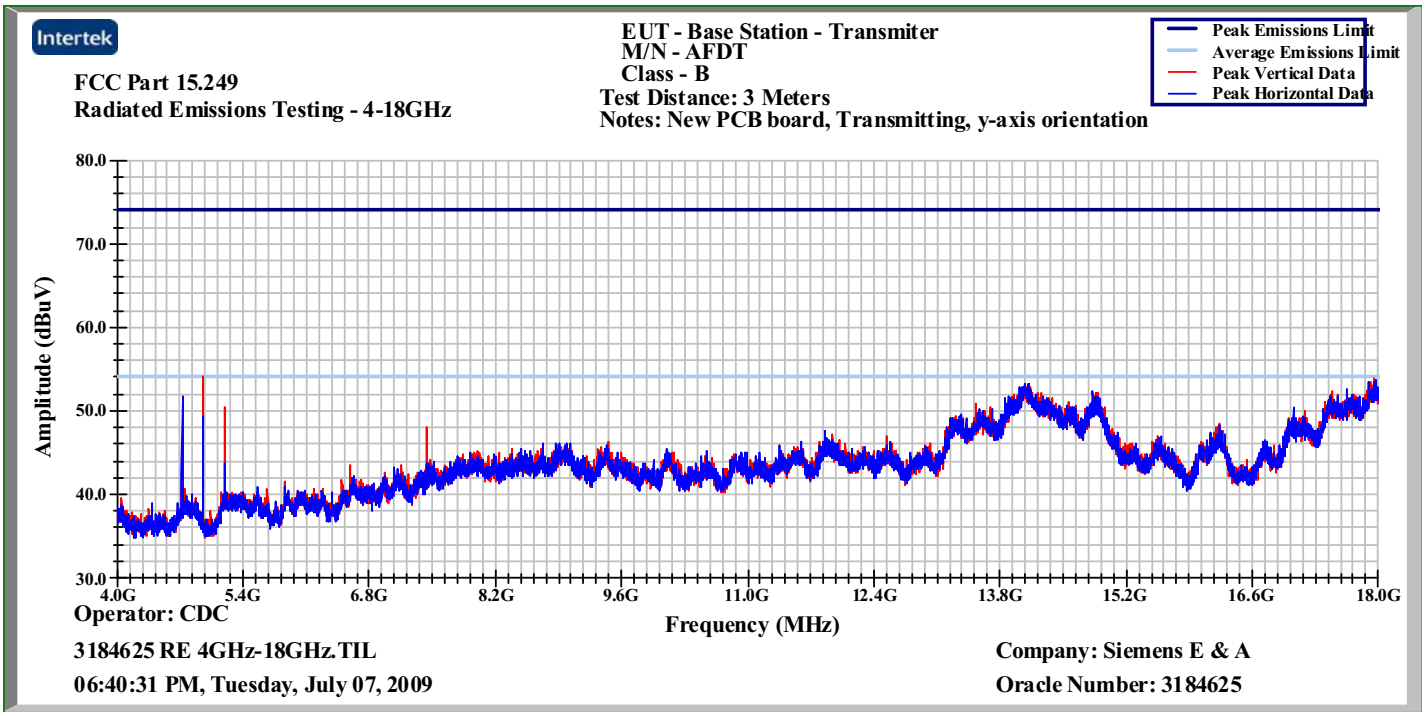
Plot:



Band-edge Plot (2483.5 MHz - 2500 MHz)

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

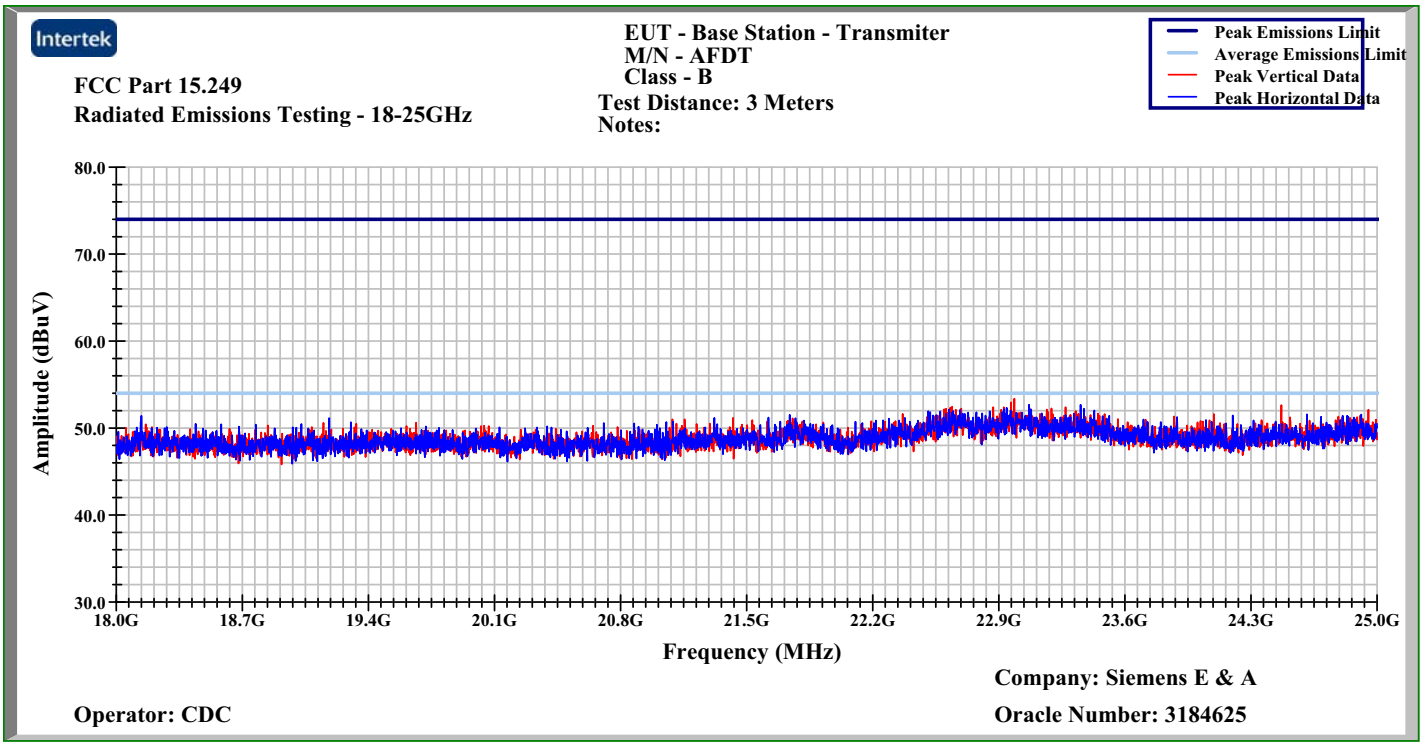
Plot:



Peak Plot (4 GHz - 18 GHz)

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

Plot:



Peak Plot (18 GHz - 25 GHz)

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

Data:

Date: 07/07/2009 **Test Distance (m):** 3

Frequency Range (MHz): 30-1000 **Limit:** FCC15 Class B-3m

Input power: 120VAC, 60Hz **Modifications for compliance (y/n):** y

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**
V	35.950	42.6	16.7	1.2	28.2	32.2	40.0	-7.8	QP/120k300k
V	199.986	53.1	10.2	3.0	28.0	38.3	43.5	-5.2	QP/120k300k
V	367.847	42.6	15.6	4.1	27.9	34.4	46.0	-11.6	QP/120k300k
V	391.368	44.6	16.4	4.3	27.9	37.4	46.0	-8.6	QP/120k300k
V	862.761	36.8	21.3	6.5	27.4	37.2	46.0	-8.8	QP/120k300k
Calculations		G=C+D+E-F		I=G-H					

Tabular Data (30 - 1000 MHz)

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

Data:

Date: 7/7/2009 **Limit:** FCC Part 15.249
Frequency Range (MHz): 1000 - 25000 **Test Distance (m):** 3
Input power: 120VAC, 50Hz **Modifications for compliance (y/n):** N

A	B	C	D	E	F	G	H	I	J	K
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Duty Cycle Factor dB**	**Net dB(uV/m)**	**Limit dB(uV/m)**	**Margin dB**	**Axis / Detector**
V	2479.880	66.2	27.1	3.1	0.0	0.0	96.4	114.0	-17.7	Y / P
V	2479.880	66.2	27.1	3.1	0.0	13.3	83.1	94.0	-11.0	Y / P
H	2479.950	64.6	27.3	3.1	0.0	0.0	95.0	114.0	-19.0	Z / P
H	2479.950	64.6	27.3	3.1	0.0	13.3	81.7	94.0	-12.3	Z / P
H	4723.740	52.3	32.2	12.7	40.9	0.0	56.4	74.0	-17.6	Y / P
H	4723.740	52.3	32.2	12.7	40.9	13.3	43.1	54.0	-10.9	Y / P
H	4724.220	49.7	32.2	12.7	40.9	0.0	53.7	74.0	-20.3	Z / P
H	4724.220	49.7	32.2	12.7	40.9	13.3	40.4	54.0	-13.6	Z / P
V	4724.220	52.1	32.3	12.7	40.9	0.0	56.2	74.0	-17.8	Y / P
V	4724.220	52.1	32.3	12.7	40.9	13.3	42.9	54.0	-11.1	Y / P
V	4726.320	48.4	32.3	12.7	40.9	0.0	52.6	74.0	-21.4	X / P
V	4726.320	48.4	32.3	12.7	40.9	13.3	39.3	54.0	-14.7	X / P
V	4959.770	62.4	32.3	5.6	41.1	0.0	59.1	74.0	-14.9	Y / P
V	4959.770	62.4	32.3	5.6	41.1	13.3	45.8	54.0	-8.2	Y / P
H	4959.900	60.2	32.2	5.6	41.1	0.0	56.8	74.0	-17.2	Y / P
H	4959.900	60.2	32.2	5.6	41.1	13.3	43.5	54.0	-10.5	Y / P
V	5186.910	48.8	33.3	14.6	41.0	0.0	55.7	74.0	-18.3	Y / P
V	5186.910	48.8	33.3	14.6	41.0	13.3	42.4	54.0	-11.6	Y / P
V	5192.800	48.7	33.3	14.6	41.0	0.0	55.6	74.0	-18.4	X / P
V	5192.800	48.7	33.3	14.6	41.0	13.3	42.3	54.0	-11.7	X / P
V	5195.290	47.4	33.3	14.6	41.0	0.0	54.3	74.0	-19.7	Z / P
V	5195.290	47.4	33.3	14.6	41.0	13.3	41.0	54.0	-13.0	Z / P
H	5195.640	48.4	33.2	14.6	41.0	0.0	55.1	74.0	-18.9	Z / P
H	5195.640	48.4	33.2	14.6	41.0	13.3	41.8	54.0	-12.2	Z / P
H	7439.570	57.0	35.1	6.7	39.1	0.0	59.8	74.0	-14.2	Z / P
H	7439.570	57.0	35.1	6.7	39.1	13.3	46.5	54.0	-7.5	Z / P
V	7439.950	55.5	35.0	6.7	39.1	0.0	58.2	74.0	-15.8	Y / P
V	7439.950	55.5	35.0	6.7	39.1	13.3	44.9	54.0	-9.1	Y / P
Calculations		G=C+D+E-F		I=G-H						

* Three axes investigated at each frequency - only worst-case axis reported.

** No emissions detected above 18GHz

Tabular Data (1 GHz - 25GHz)