ENGINEERING TEST REPORT

Aastra SIP-DECT Access Point
Model No.: RFP34 US

FCC ID: SDV69134000
IC: 1884A-69134000

Applicant:

Aastra Telecom Inc. / Aastra Corporation
155 Snow Blvd.
Concord, Ontario
Canada L4K 4N9

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart D - Unlicensed Personal Communications Service Devices
&
Industry Canada RSS-213, Issue 2
2 GHz Licence-exempt Personal Communications Service Devices (LE-PCS)

UltraTech's File No.: AAST-022F15DRSS213

This Test report is Issued under the Authority of
Tri M. Luu, Professional Engineer,
Vice President of Engineering
UltraTech Group of Labs

Date: May 15, 2007

Report Prepared by: Dan Huynh Issued Date: May 15, 2007	Tested by: Mr. Hung Trinh, EMI/RFI Technician Test Dates: March 17 & 30, 2007 April 13, 14 & 24, 2007

The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.
This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.

UltraTech

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	▪ FCC Part 15, Subpart D - Unlicensed Personal Communications Service Devices ▪ RSS-213, Issue 2
Title:	▪ Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 ▪ 2 GHz Licence-exempt Personal Communications Service Devices (LE-PCS)
Purpose of Test:	Certification for Unlicensed Personal Communications Service Devices.
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	[x] Commercial, industrial or business environment [ ] Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2006	Code of Federal Regulations – Telecommunication
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.17	2006	American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices
CISPR 22 & EN 55022 +A1 +A2	2006 1998 2000 2003	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
CISPR 16-1-1	2003	Specification for Radio Disturbance and Immunity measuring apparatus and methods
RSS-213, Issue 2	2005	2 GHz Licence-exempt Personal Communications Service Devices (LE-PCS)
ICES-003, Issue 3	2004	Digital Apparatus
RSS-Gen, Issue 1	2005	General Requirements and Information for the Certification of Radiocommunication Equipment
RSS-102, Issue 2	2005	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Aastra Telecom Inc. / Aastra Coporation
Address:	155 Snow Blvd. Concord, Ontario Canada L4K 4N9
Contact Person:	Mr. James Wong Phone #: 905-760-4278 Fax #: 905-760-4235 Email Address: jwong@aastra.com

MANUFACTURER	
Name:	Flextronics International
Address:	Heinz-Nixdorf-Ring 1 D-33106 Paderborn Germany
Contact Person:	Ms. Barbara Wand Phone #: +49 5251 180 1818 Fax #: +49 179 97 95 97 3 Email Address: n/a

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name	Aastra
Product Name	Aastra SIP-DECT Access Point
Model Name or Number	RFP34 US
Serial Number	Test Sample
Type of Equipment	Unlicensed PCS Base Station
Input Power Supply Type	120Vac Injector (Power-Over-Ethernet (PoE), 48V)
Primary User Functions of EUT:	Telephone Communications Device

2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER		
Equipment Type:	Mobile	
Intended Operating Environment:	Commercial, industrial or business environment	
Power Supply Requirement:	Power-Over-Ethernet (PoE), 48V	
RF Output Power Rating:	18.96 dBm (79 mW)	
Operating Frequency Range:	1920 - 1930 MHz	
RF Output Impedance:	50 Ohm	
Modulation Type:	GFSK	
Oscillator Frequency(ies):	25 MHz, 10.368 MHz	
Antenna Connector Type:	TNC	
Antenna Description:	Manufacturer: Type: Model: Frequency Range: Gain:	Procom Elevated Feed ½ wave dipole ELF1800 1700 to 2000 MHz 2 dBi

RECEIVER	
Equipment Type:	Mobile
Power Supply Requirement:	Power-Over-Ethernet (PoE), 48V
Operating Frequency Range:	1920 to 1930 MHz
RF Input Impedance:	50 ohms
Intermediate Frequency(ies):	864 kHz
Oscillator Frequency(ies):	25 MHz, 10.368 MHz

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	LAN	1	RJ45	Non-shielded

2.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	PoE
Brand name:	ITE Power Supply
Model Name or Number:	PW130
Serial Number:	n/a
Connected to EUT's Port:	Ethernet

Ancillary Equipment # 2	
Description:	Laptop
Brand name:	Sony
Model Name or Number:	PCG-612D
Serial Number:	7302148
Connected to EUT's Port:	POE

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	Power-Over-Ethernet (PoE), 48V

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	Each of lowest and highest channel frequencies transmits continuously for emissions measurements.
Special Test Software:	N/A
Special Hardware Used:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as non-integral antenna equipment as described with the test results.
Transmitter Test Antenna:	Non-integral

Transmitter Test Signals	
Frequency Band(s):	1920 - 1930 MHz
Frequency(ies) Tested: (Near lowest and highest frequencies in the frequency range of operation.)	1921.536 MHz and 1928.448 MHz
RF Power Output: (measured maximum output power at antenna terminals)	18.96 dBm (79 mW)
Normal Test Modulation:	GFSK
Modulating Signal Source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049-1). Last Date of Site Calibration: June 20, 2006.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC / Industry Canada Regulations	Test Requirements	Compliance (Yes/No)
FCC 15.309(b) & 15.109(a); ICES-003	Radiated Emissions (for Unintentional Radiators)	Yes
FCC 15.315 & 15.207(a) RSS-213 [4.2 & 6.3] / RSS-Gen [7.2.2] ICES-003	AC Power Line Conducted Emissions	Yes
FCC 15.317 & 15.203	Antenna Requirement	Yes (Note 1)
FCC 15.319(b); RSS-213 [6.1]	Modulation Techniques	Yes (Note 2)
FCC 15.319(c); RSS-213 [4.3.1, 6.5]	Peak Transmit Power	Yes
FCC 15.319(d); RSS-213 [4.3.2, 6.6]	Power Spectral Density	Yes
FCC 15.319(e); RSS-213 [4.1(e)]	Directional Gain of the Antenna	Yes
FCC 15.319(f); RSS-213 4.3.4(a)	Automatic Discontinuation of Transmission	Yes (Note 2)
FCC 15.319(i); RSS-Gen 5.5, RSS-102	RF Exposure	Yes
FCC 15.323(a); RSS-213 [4.3.2 & 6.4]	Emission Bandwidth	Yes
FCC 15.323(c); RSS-213 [4.3.4(b)]	Mechanism for Monitoring the Time and Spectrum Windows that its Transmission is Intended to Occupy	Yes (Note 2)
FCC 15.323 (d); RSS-213 [6.7.1 & 6.7.2]	Emissions Outside and Inside Sub-band	Yes
FCC 15.323 (e); RSS-213 [4.3.4(c)]	Frame Period	Yes (Note 2)
FCC 15.323 (f); RSS-213 [6.2]	Frequency Stability	Yes
RSS-213 [6.8]; RSS-Gen [6(a)]	Receiver Spurious Emissions	Yes

Notes: 1. The device with its antennas will be professionally installed by Service Technician as described in installation guide.
2. The radio integrated in this device is identical to a certified radio under FCC ID: UOU69135RFP32U-01 (where compliance was demonstrated), refer to attached report for details.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

Modification was performed on the RFP34 US in order to pass all regulatory testing. This modification consisted of the addition of a shield around the TI TNETV2020 VOIP gateway chip and associated circuitry as illustrated in the photo below. In addition, a section of the shield was extended and attached to the casing of the 25MHz XTAL

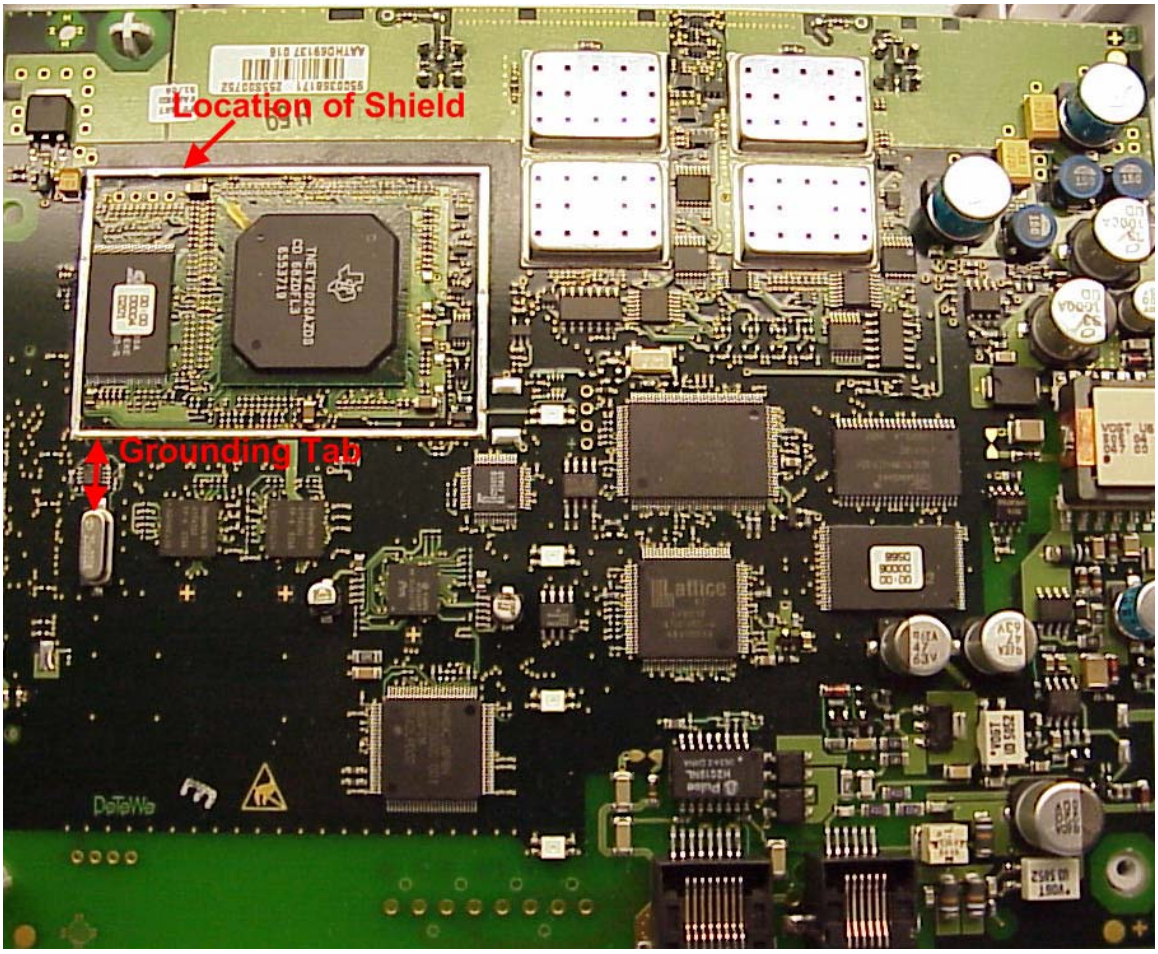


EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in ANSI C63.4 and ANSI C63.17.

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 6 for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1-1.

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUACTURER

Telephone Communications Device.

5.5. RADIATED EMISSIONS FROM UNINTENTIONAL RADIATORS (§§ 15.309(b) & 15.109(a); ICES-003]

5.5.1. Limit(s)

The equipment shall meet the limits of the following table:

Frequency of Emission (MHz)	Field Strength @ 3 m	
	(μV/m)	(dBμV/m)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

5.5.2. Method of Measurements

Refer to Ultratech Test Procedures ULTR-P001-2004 & ANSI C63.4 for method of measurements.
The spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 -1000	5000
Above 1000	5^{th} harmonic of the highest frequency or 40 GHz, whichever is lower

5.5.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz to 32 GHz with external mixer for frequency above 32 GHz
EMI Receiver System/ Spectrum Analyzer	Hewlett Packard	HP 8546A	3520A00248	9KHz-5.6GHz, 50 Ohms
Microwave Amplifier	Hewlett Packard	HP 83017A	311600661	1 GHz to 26.5 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz

5.5.4. Test Data

Remarks:

- The measuring receiver shall be tuned over the frequency range 30 MHz to 10 GHz.
- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- The following test data is worst case measurements in Tx and Rx mode.

Frequency (MHz)	RF Level (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit at 3 m (dBµV/m)	Margin (dB)
35.43	31.97	Peak	V	40.0	-8.0
35.43	26.80	Peak	H	40.0	-13.2
56.78	35.48	Peak	V	40.0	-4.5
56.78	36.57	QP	H	40.0	-3.4
77.43	37.00	QP	V	40.0	-3.0
77.43	36.38	Peak	H	40.0	-3.6
85.83	33.85	Peak	V	40.0	-6.2
85.83	28.88	Peak	H	40.0	-11.1
121.80	33.80	Peak	V	43.5	-9.7
121.80	33.07	Peak	H	43.5	-10.4
150.30	33.14	Peak	V	43.5	-10.4
150.30	40.67	Peak	H	43.5	-2.8
175.30	32.34	Peak	V	43.5	-11.2
175.30	32.99	Peak	H	43.5	-10.5
250.30	36.03	Peak	V	46.0	-10.0
250.30	43.67	QP	H	46.0	-2.3
275.30	27.85	Peak	V	46.0	-18.2
275.30	34.30	Peak	H	46.0	-11.7
300.20	33.54	Peak	V	46.0	-12.5
300.20	38.32	Peak	H	46.0	-7.7
325.20	35.95	Peak	V	46.0	-10.1
325.20	38.17	Peak	H	46.0	-7.8
350.20	33.48	Peak	V	46.0	-12.5
350.20	34.51	Peak	H	46.0	-11.5
375.30	37.71	Peak	V	46.0	-8.3
375.30	34.27	Peak	H	46.0	-11.7
500.40	27.86	Peak	V	46.0	-18.1
500.40	30.07	Peak	H	46.0	-15.9

5.6. AC POWER LINE CONDUCTED EMISSIONS [§§ 15.315 &15.207(a); RSS-213 [4.2 & 6.3] / RSS-Gen [7.2.2]; ICES-003]

5.6.1. Limit(s)

The equipment shall meet the limits of the following table:

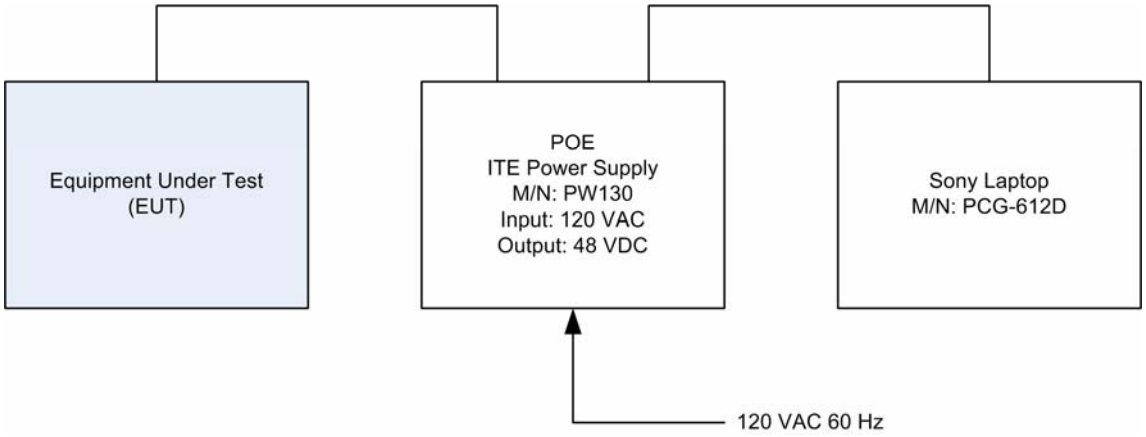
Frequency of emission (MHz)	Conducted Limits (dBμV)	
	Quasi-peak	Average
0.15–0.5 .....……..	66 to 56*	56 to 46*
0.5–5 .....……..	56	46
5-30 ……..	60 ..……..	50

*Decreases linearly with the logarithm of the frequency

5.6.2. Method of Measurements

ANSI C63.4

5.6.3. Test Arrangement

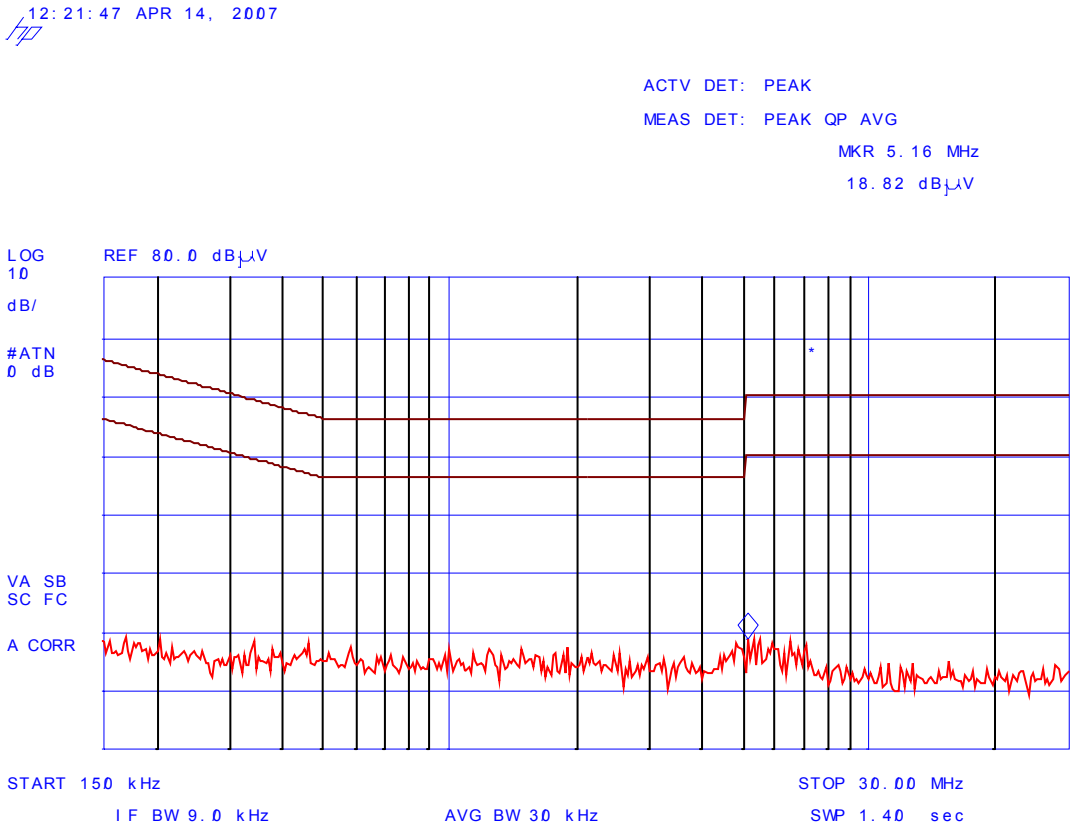


5.6.4. Test Equipment List

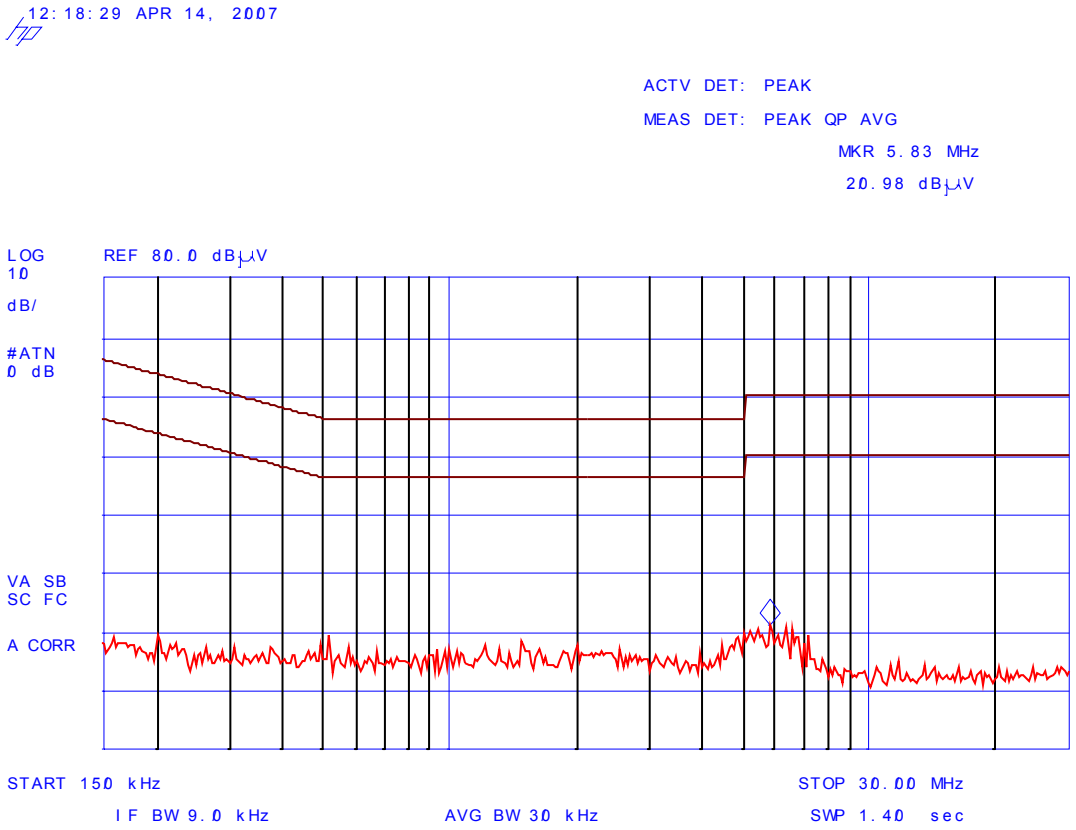
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Transient Limiter	Hewlett Packard	11947A	310701998	9 kHz – 200 MHz 10 dB attenuation
L.I.S.N.	EMCO	3825/2	89071531	9 kHz – 200 MHz 50 Ohms / 50 μH
24'(L) x 16'(W) x 8'(H) RF Shielded Chamber	Braden Shielding	…	…	…

5.6.5. Test Data

Plot 5.6.5.1 AC Power Line Conducted Emissions (Tx and Rx mode)
Line Voltage: 120VAC 60Hz
Line Tested: L1



Plot 5.6.5.2 AC Power Line Conducted Emissions (Tx and Rx mode)
Line Voltage: 120VAC 60Hz
Line Tested: L2



5.7. PEAK TRANSMIT POWER (15.319(c); RSS-213 [4.3.1, 6.5])

5.7.1. Limit(s)

Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

P_{EUT}, the EUT transmit power at the antenna terminals, must be less than a maximum, as shown in the following equation:

$$P_{EUT} \leq P_{limit} \text{ where } P_{limit} = \begin{cases} P_{max} - (G_A - g), \text{ when } G_A > g \\ P_{max}, \text{ when } G_A \leq g \end{cases}$$

Where

P_{max}	is equal to 100µW x √EBW
EBW	is the emission bandwidth (in hertz)
G_A (dBi)	is the EUT transmit antenna maximum gain (declared by the manufacturer)
g	is the allowable excess gain over that of an isotropic antenna without a transmit power reduction (g = 3 dBi)

5.7.2. Method of Measurements & Test Arrangement

ANSI C63.17 sub-clause 6.1.2

5.7.3. Test Arrangement

5.7.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rhode & Schwarz	FSEK20/B4/B21	834157/005	9 kHz - 40 GHz
Attenuator	Narda	4768-10	0702	DC - 40 GHz

5.7.5. Test Data

Remark(s):

1. EBW is equal to 1386774 Hz
2. EUT transmit antenna maximum gain < 3 dBi, $P_{limit} = P_{max}$

P_{limit} = 100μW x √EBW = 100μW x √1386774 = 117.761 mW = 20.71 dBm

Channel	Frequency (MHz)	Peak Transmit Power (dBm)	Limit (dBm)
4	1921.536	18.96	20.71
0	1928.448	18.96	20.71

5.8. POWER SPECTRAL DENSITY (§15.319(d); RSS-213 [4.3.2, 6.6])

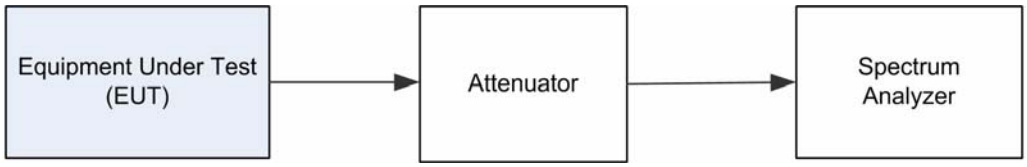
5.8.1. Limit(s)

Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

5.8.2. Method of Measurements & Test Arrangement

ANSI C63.17 sub-clause 6.1.5

5.8.3. Test Arrangement

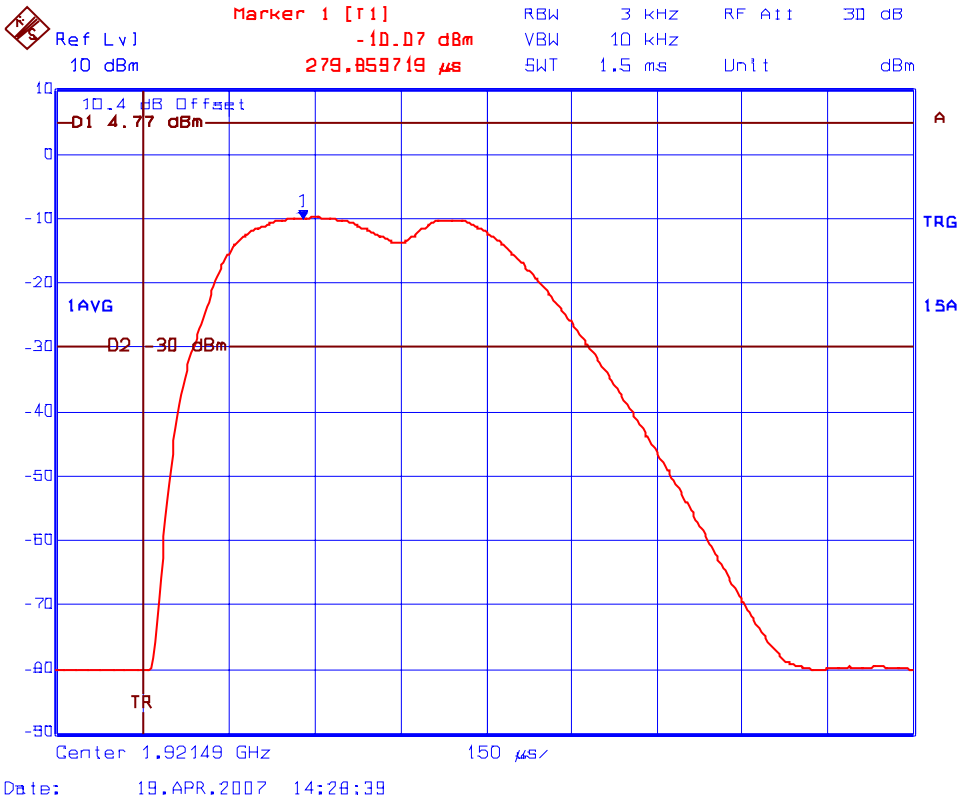


5.8.4. Test Equipment List

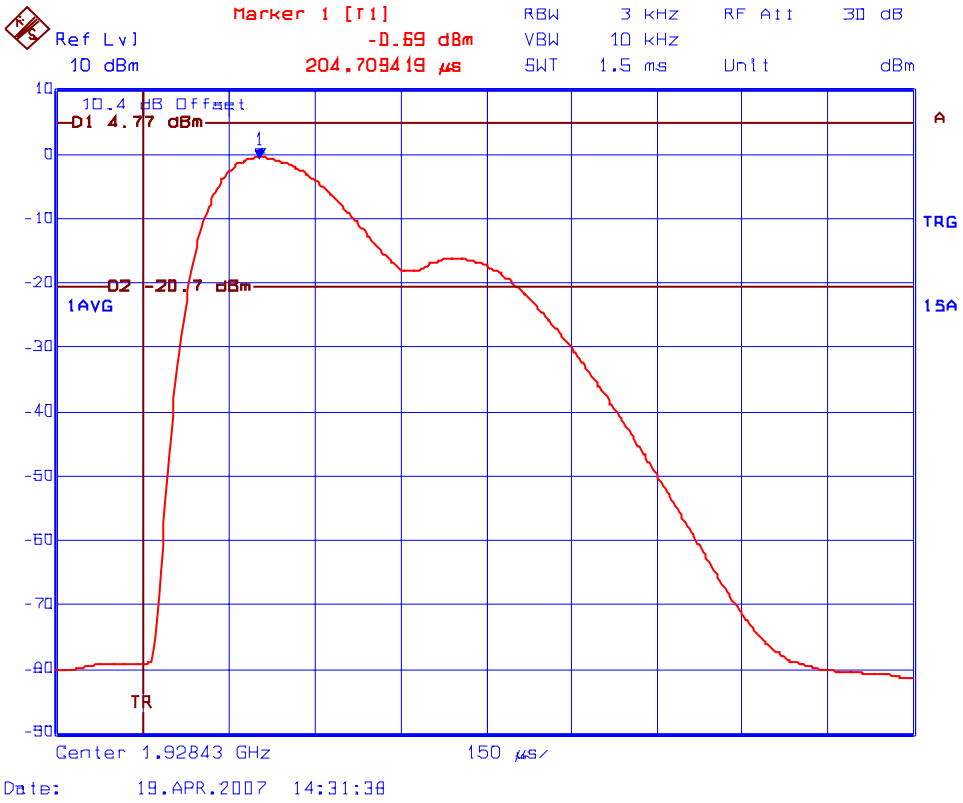
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rhode & Schwarz	FSEK20/B4/B21	834157/005	9 kHz - 40 GHz
Attenuator	Narda	4768-10	0702	DC - 40 GHz

5.8.5. Test Data

Plot 5.8.5.1 Power Spectral Density
Test Frequency: 1921.536 MHz, Ch 4



Plot 5.8.5.2 Power Spectral Density
Test Frequecny: 1928.448 MHz, Ch 0



5.9. RF EXPOSURE REQUIRMENTS (15.319(i); RSS-Gen 5.5 & RSS-102)

5.9.1. Limit(s)

- **§ 15.319(i):** Unlicensed PCS devcies are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request

- **§ 1.1310:**- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.9.2. Method of Measurements

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

(1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
(2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
(3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
(4) Any other RF exposure related issues that may affect MPE compliance

Calculation Method of RF Safety Distance:

$S = PG/4\Pi r^2 = EIRP/4\Pi r^2$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

$r = \sqrt{EIRP/4\Pi S}$

For portable transmitters (see Section 2.1093), or devices designed to operate next to a person's body, compliance is determined with respect to the SAR limit (define in the body tissues) for near-field exposure conditions. If the maximum average output power, operating condition configurations and exposure conditions are comparable to those of existing cellular and PCS phones, SAR evaluation may be required in order to determine if such a device complies with SAR limit. When SAR evaluation data is not available, and the additional supporting information cannot assure compliance, the Commission may request that an SAR evaluation be performed, as provided for in Section 1.1307(d)

5.9.3. Test Data

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with FCC Rules**
Minimum calculated separation distance between antenna and persons required: ***3.2 cm**	Manufacturer's instruction for separation distance between antenna and persons required: **20 cm.**
Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement	Antenna installation and device operating instructions shall be provided to installers to maintain and ensure compliance with RF exposure requirements.
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	Refer to installation guide for RF Exposure Information.
Any other RF exposure related issues that may affect MPE compliance	None.

*The minimum separation distance between the antenna and bodies of users are calculated using the following formula:

RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\Pi S)^{1/2} = (EIRP/4\Pi S)^{1/2}$

$S = 1.0\ mW/cm^2$; P = 18.96 dBm; $G_{transmit\ antenna} = 2$ dBi
$EIRP = P(dBm) + G_{transmit\ antenna}\ (dBi) = 18.96\ dBm + G_{transmit\ antenna} = 20.96\ dBm = 10^{(20.96/10)}\ mW$

$r = (EIRP/4\Pi S)^{1/2} = (10^{(20.96/10)} / 4\Pi(1.0))^{1/2} = 3.2\ cm$

5.10. EMISSION BANDWIDTH (15.323(a); RSS-213 [4.3.2 & 6.4])

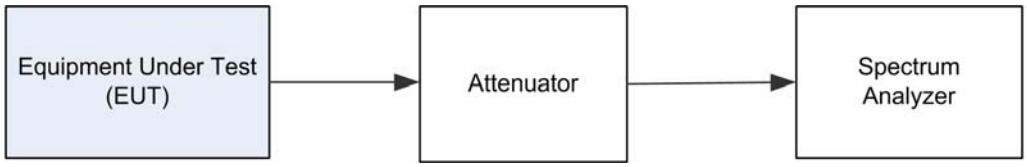
5.10.1. Limit(s)

Operation shall be contained within the 1920-1930 MHz band. The emission bandwidth shall be less then 2.5 MHz, but in no event shall the emission bandwidth be less than 50 kHz.

5.10.2. Method of Measurements

ANSI C63.17 sub-clause 6.1.3

5.10.3. Test Arrangement



5.10.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rhode & Schwarz	FSEK20/B4/B21	834157/005	9 kHz - 40 GHz
Attenuator	Narda	4768-10	0702	DC - 40 GHz

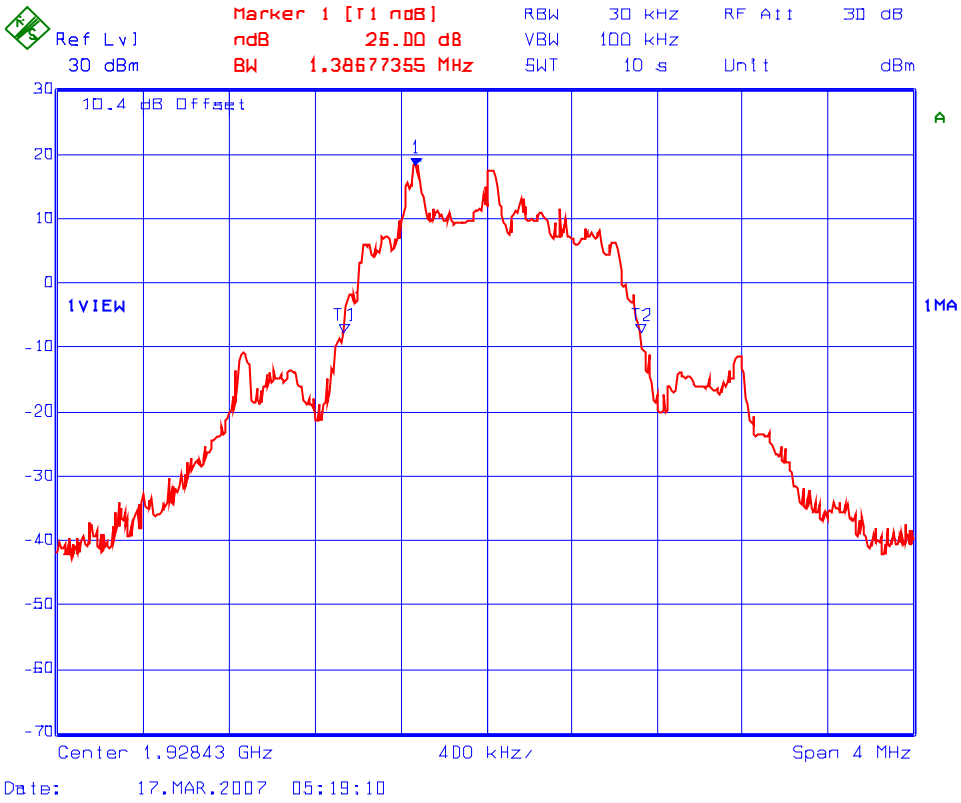
5.10.5. Test Data

Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
1921.536	1.38677355	1.21843687
1928.448	1.38677355	1.21042084

See the following plots for detailed measurements.

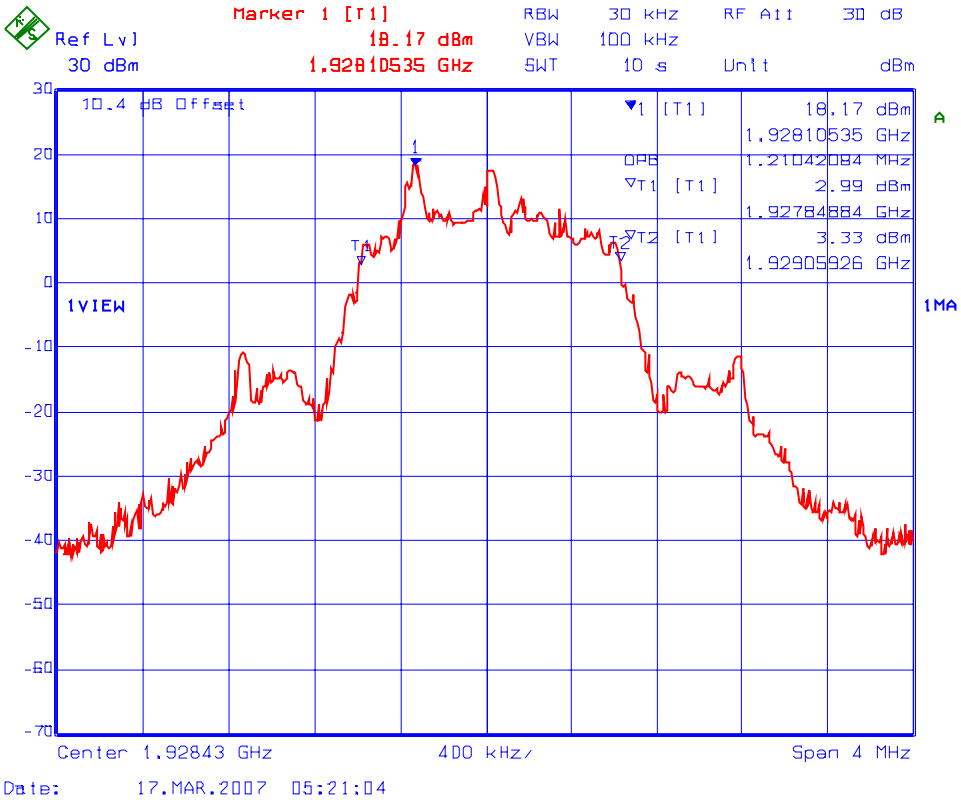
Plot 5.10.5.1 26 dB Bandwidth
Frequency: 1921.536 MHz

Plot 5.10.5.2 26 dB Bandwidth
Frequency: 1928.448 MHz



Plot 5.10.5.3 99% Occupied Bandwidth
Frequency: 1921.536 MHz

Plot 5.10.5.4 99% Occupied Bandwidth
Frequency: 1928.448 MHz



5.11. EMISSIONS OUTSIDE AND INSIDE SUB-BAND (15.323 (d); RSS-213 [6.7.1 & 6.7.2])

5.11.1. Limit(s)

Emissions outside the sub-band shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the sub-band and 1.25 MHz above or below the sub-band; 50 dB between 1.25 and 2.5 MHz above or below the sub-band; and 60 dB at 2.5 MHz or greater above or below the sub-band.

Emissions inside the sub-band must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the sub-band edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator. “B” is defined as the emission bandwidth of the device in hertz.

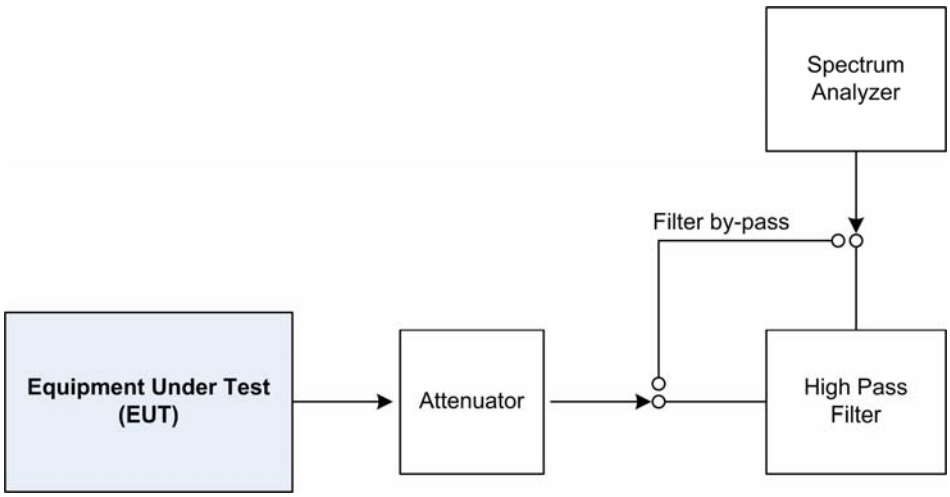
Compliance with the emission limits is based on the use of measurement instrumentation employing peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

5.11.2. Method of Measurements

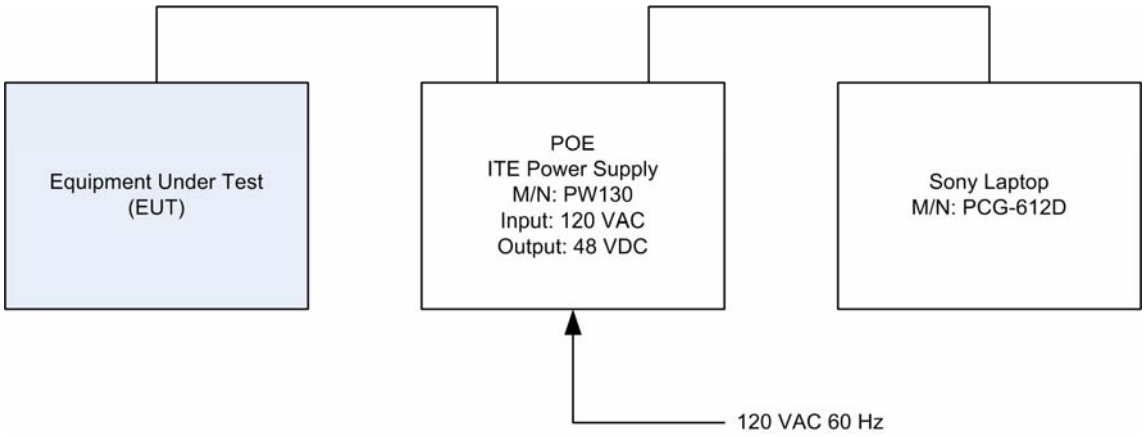
ANSI C63.17 sub-clauses 6.1.6.1 and 6.1.6.2.

5.11.3. Test Arrangement

Conducted Method



Radiated Method



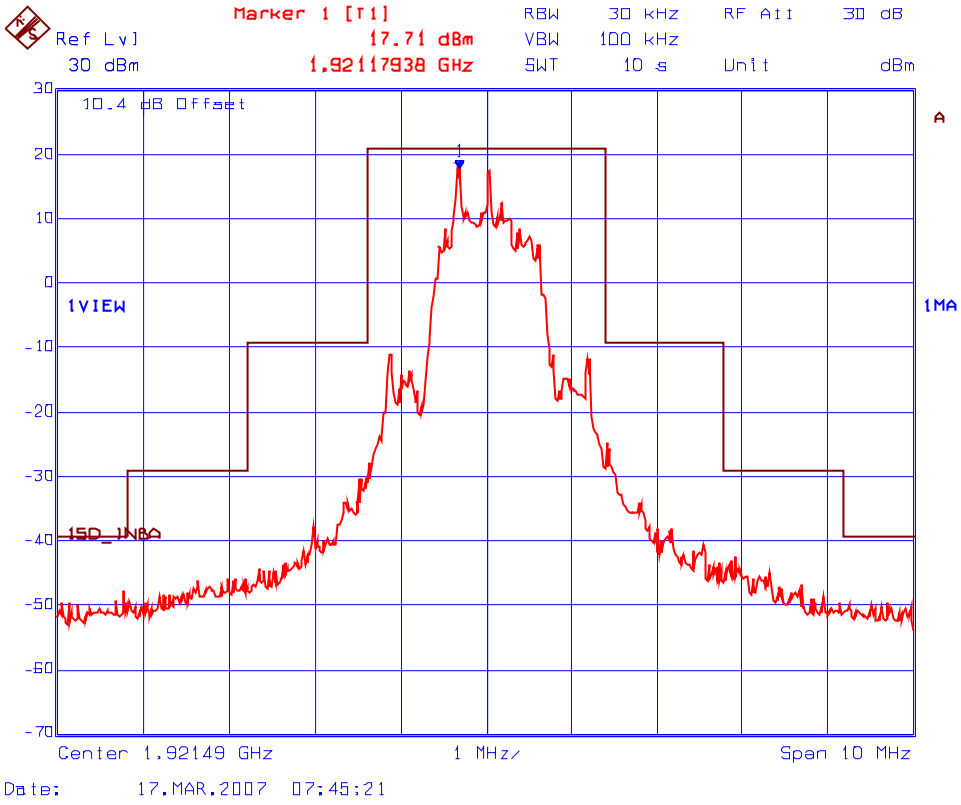
5.11.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rhode & Schwarz	FSEK20/B4/B21	834157/005	9 kHz – 40 GHz
High Pass Filter	K & L	11SH10-3000/T18000	4	3dB cutoff at 3 GHz
Microwave Amplifier	Hewlett Packard	HP 83017A	311600661	1 GHz to 26.5 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz

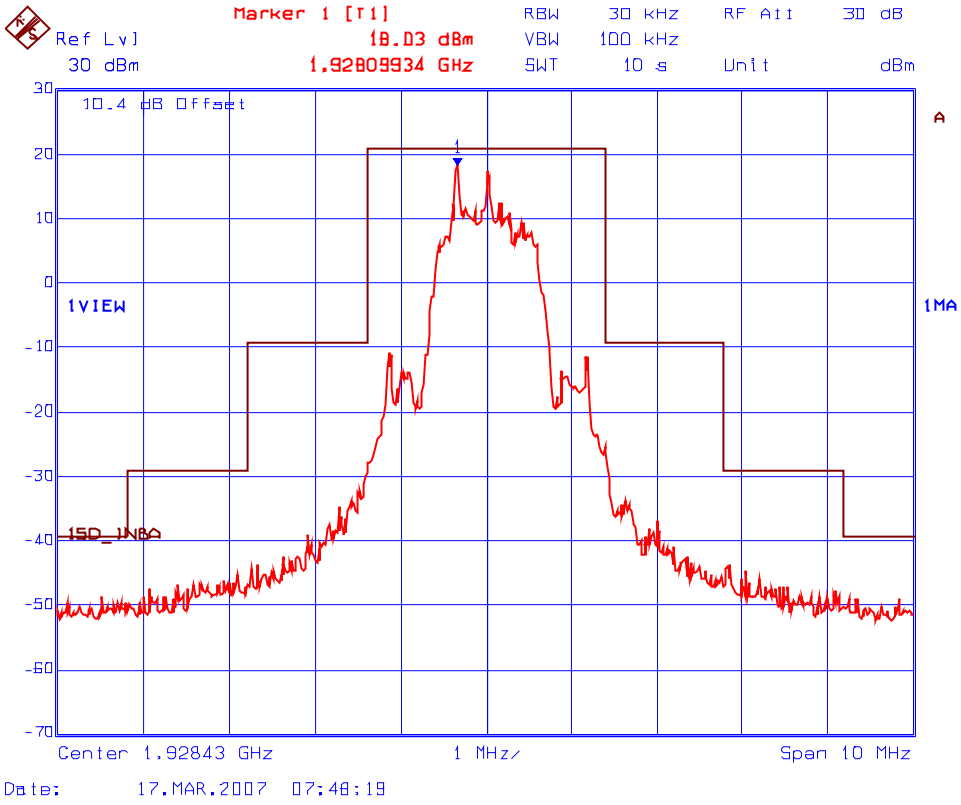
5.11.5. Test Data

5.11.5.1. Emissions Inside Sub-band (Conducted Method)

Plot 5.11.5.1.1 Emissions Inside Sub-band
Test Frequency: 1921.536 MHz, CH 4

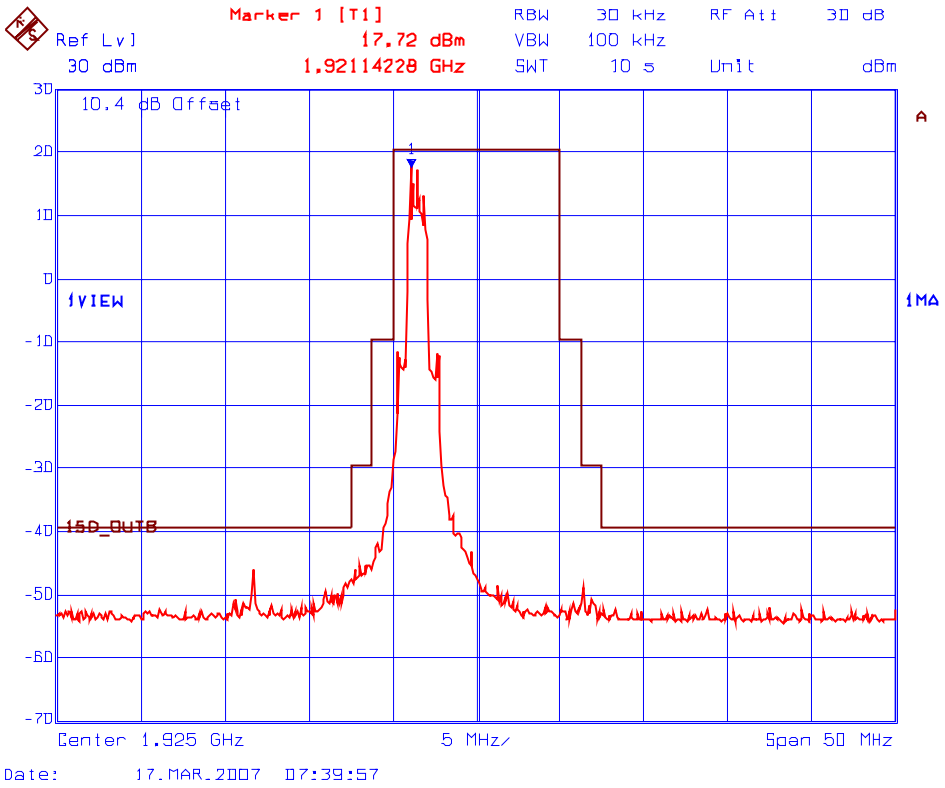


Plot 5.11.5.1.2 Emissions Inside Sub-band
Test Frequency: 1928.448 MHz, CH 0

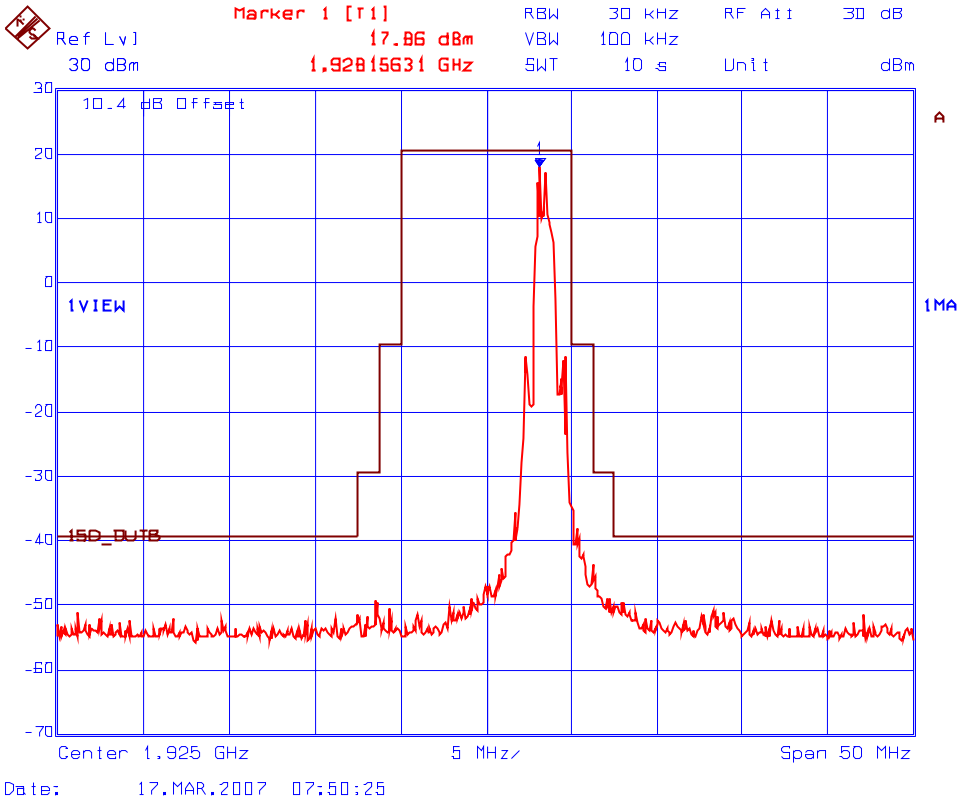


5.11.5.2. Emissions Outside Sub-band (Conducted Method)

Plot 5.11.5.2.1 Emissions Outside Sub-band
Test Frequency: 1921.536 MHz, CH 4



Plot 5.11.5.2.2 Emissions Outside Sub-band
Test Frequency: 1928.448 MHz, CH 0



5.11.5.3. Emissions Outside Sub-band (Radiated Method)

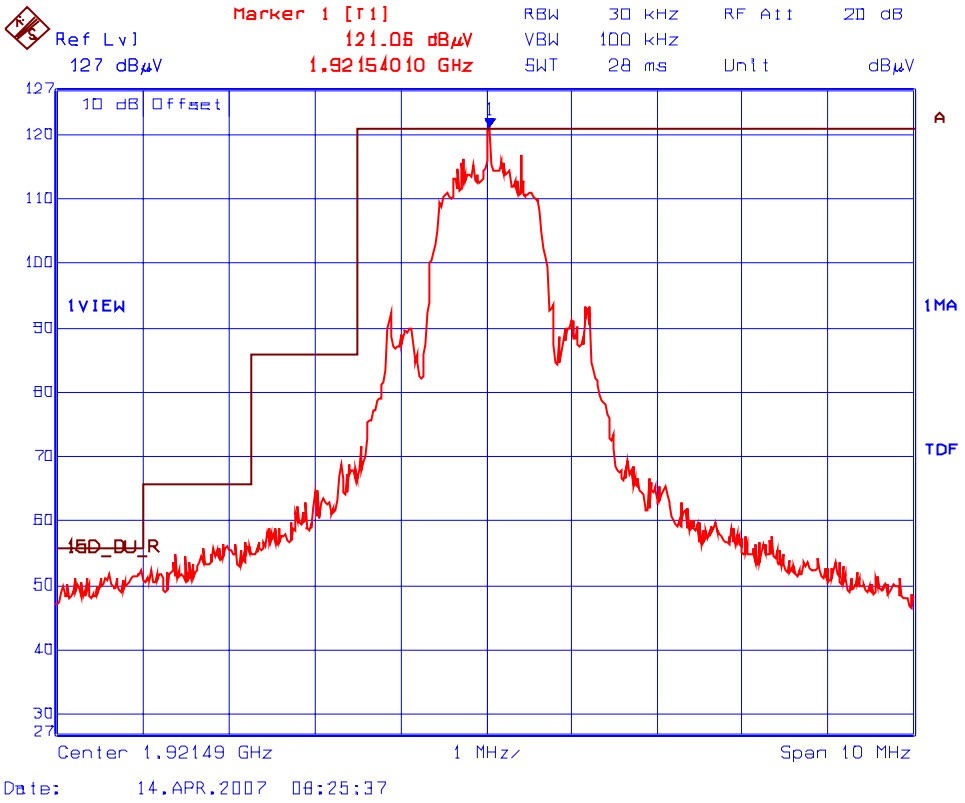
Remarks:

- The measuring receiver shall be tuned over the frequency range 30 MHz to 20 GHz.
- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- In the region at 2.5 MHz or greater below and above the lower and upper band edges, respectively, the measured emission level shall not exceed the limits of 47CFR15.209.

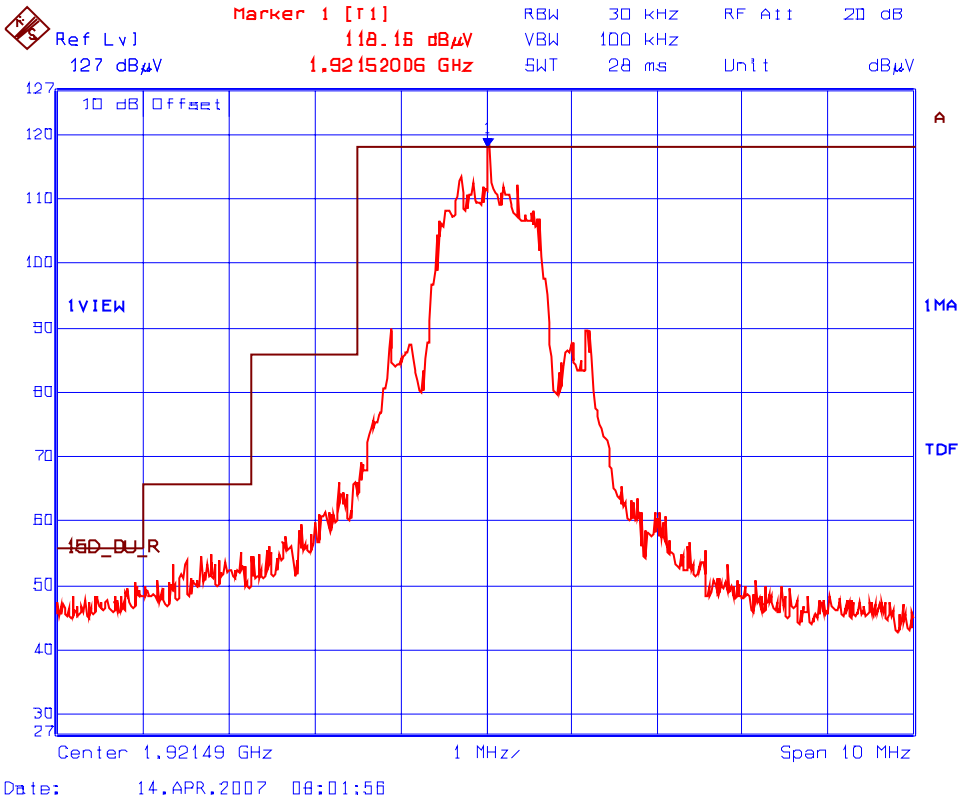
Frequency (MHz)	Peak E-Field @3m (dBµV/m)	Average E-Field @3m (dBµV/m)	Antenna Plane (V/H)	§15.209(a) Limits (dBµV/m)	Margin (dB)
Carrier Frequency: 1921.536 MHz (lowest carrier)					
3842.98	52.76	34.99	V	54.0	-19.0
3842.98	52.50	35.12	H	54.0	-18.9
5764.47	54.26	37.61	V	54.0	-16.4
5764.47	55.80	37.85	H	54.0	-16.2
Carrier Frequency: 1928.448 MHz (highest carrier)					
3856.86	54.76	34.56	V	54.0	-19.4
3856.86	56.34	34.57	H	54.0	-19.4
5785.29	53.37	37.10	V	54.0	-16.9
5785.29	55.60	37.25	H	54.0	-16.8

See the following plots for out-of-band emissions in the region between the band edges and 2.5 MHz below and above the lower and the upper band edges, respectively.

Plot 5.11.5.3.1 Out-of-band Emissions
In the region between lower band edge and 2.5 MHz below the lower band edge
Test Frequency: 1921.536 MHz, Ch 4
Horizontal Polarization

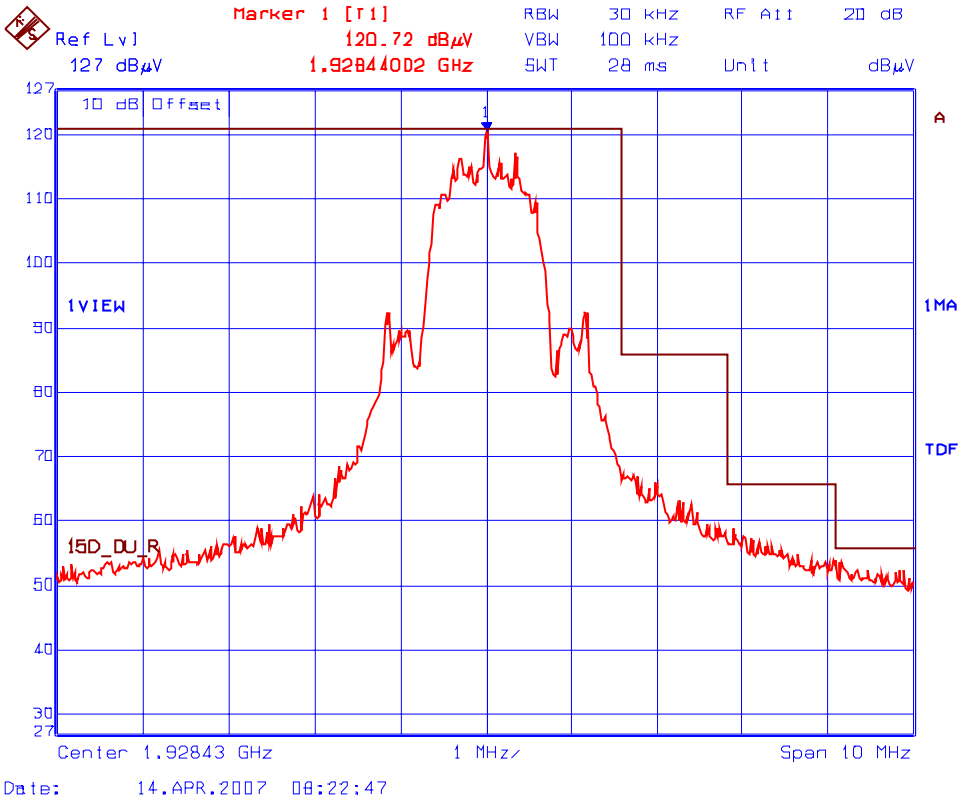


Plot 5.11.5.3.2 Out-of-band Emissions
In the region between lower band edge and 2.5 MHz below the lower band edge
Test Frequency: 1921.536 MHz, Ch 4
Vertical Polarization

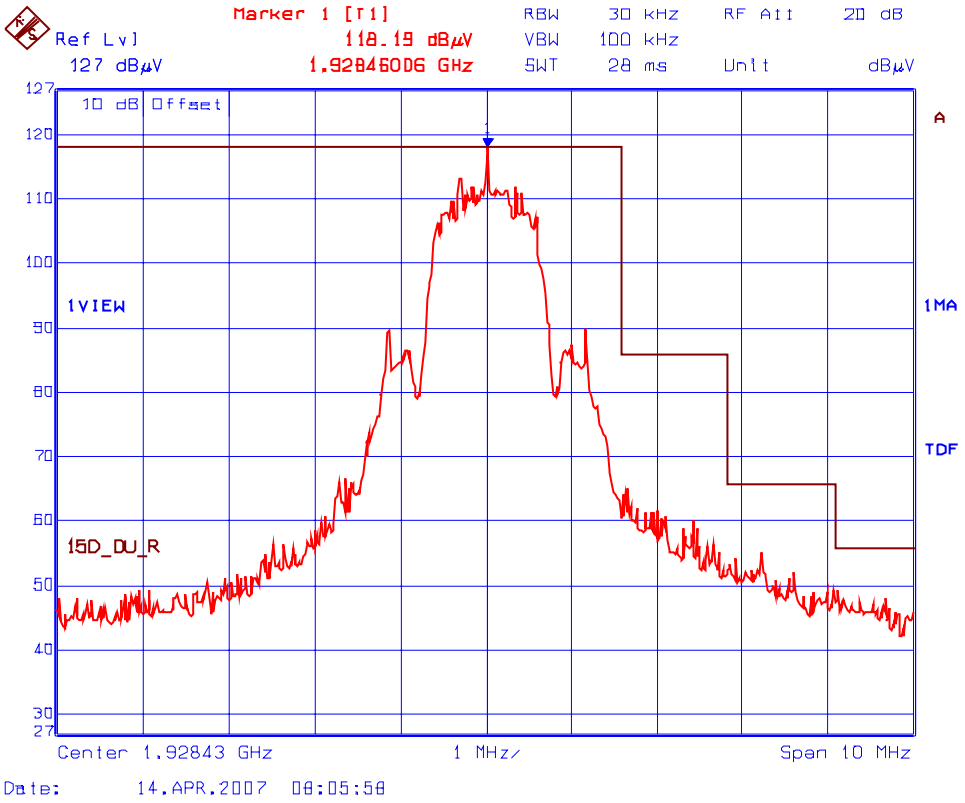


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.11.5.3.3 Out-of-band Emissions
In the region between upper band edge and 2.5 MHz above the upper band edge
Test Frequency: 1928.448 MHz, Ch 0
Horizontal Polarization



Plot 5.11.5.3.4 Out-of-band Emissions
In the region between upper band edge and 2.5 MHz above the upper band edge
Test Frequency: 1928.448 MHz, Ch 0
Vertical Polarization



5.12. FREQUENCY STABILITY (15.323 (f); RSS-213 [6.2])

5.12.1. Limit(s)

The frequency stability of the carrier frequency of the intentional radiator shall be maintained within ± 10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter.

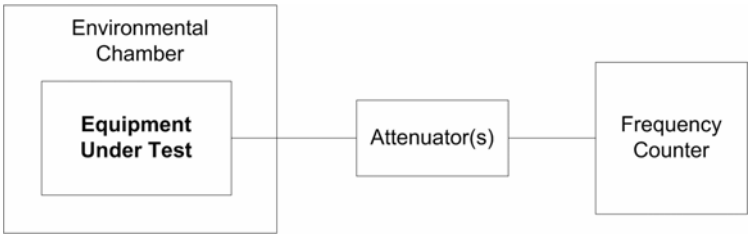
5.12.2. Method of Measurements

ANSI C63.17 sub-clause 6.2.1.

5.12.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Frequency Counter	EIP	545A	02683	10 Hz-18 GHz
Attenuator	Weinschel Corp	48-30-34	BM5354	DC - 18 GHz
Temperature & Humidity Chamber	Tenney	T5	9723B	-40° to +60° C range

5.12.4. Test Arrangement



5.12.5. Test Data

Center Frequency:	1921.536 MHz
Full Power Level:	18.96 dBm
Frequency Tolerance Limit:	±10 ppm or ± 19214.9 Hz
Max. Frequency Tolerance Measured:	+15000 Hz or 7.8 ppm
Input Voltage Rating:	120 VAC

Ambient Temperature (°C)	**CENTER FREQUENCY & RF POWER OUTPUT VARIATION**		
	Supply Voltage (Nominal) 120 VAC	**Supply Voltage (Battery End Point) 102 VAC**	**Supply Voltage (Battery Fully Charged) 138 VAC**
	Hz	**Hz**	**Hz**
-30	+15000	N/A	N/A
-20	+15000	N/A	N/A
-10	+15000	N/A	N/A
0	+15000	N/A	N/A
+10	-5000	N/A	N/A
+20	0	+10000	+10000
+30	0	N/A	N/A
+40	-7000	N/A	N/A
+50	-7000	N/A	N/A

5.13. RADIATED RECEIVER SPURIOUS EMISSIONS (RSS-213 [6.8] & RSS-Gen [6(a)])

5.13.1. Limit(s)

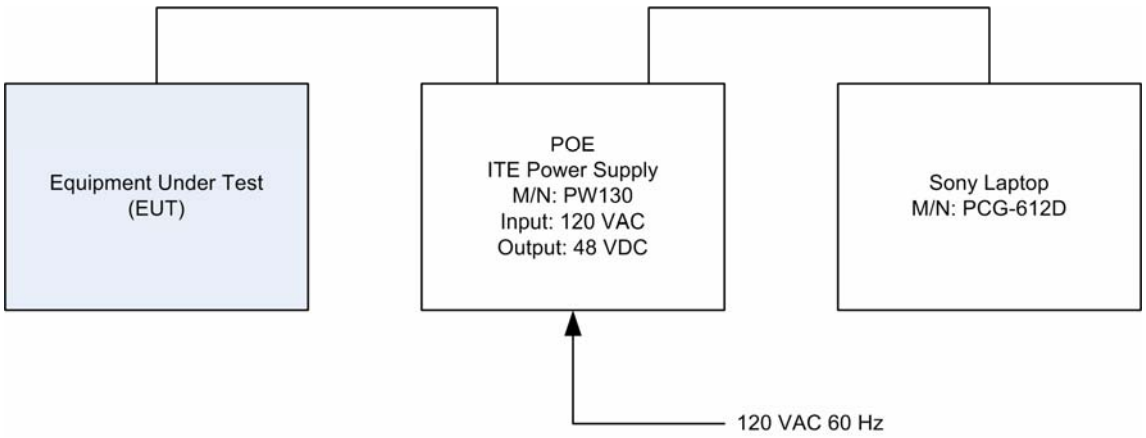
The equipment shall meet the limits of the following table:

Spurious Frequency (MHz)	Field Strength	
	(μV/m at 3 metres)	(dBμV/m at 3 metres)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

5.13.2. Method of Measurements

RSS-Gen and ANSI C63.4

5.13.3. Test Arrangement



5.13.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rhode & Schwarz	FSEK20/B4/B21	834157/005	9 kHz- 40 GHz
Microwave Amplifier	Hewlett Packard	HP 83017A	311600661	1 GHz to 26.5 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz

5.13.5. Test Data

Remarks:

- The measuring receiver shall be tuned over the frequency range 30 MHz to 10 GHz.
- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.

5.13.5.1. Lowest Frequency (1921.536 MHz)

Frequency (MHz)	RF Level (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit (dBµV/m)	Margin (dB)	Pass/ Fail
All receiver spurious emissions are more than 20 dB below the specified limit.						

5.13.5.2. Highest Frequency (1928.448 MHz)

Frequency (MHz)	RF Level (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit (dBµV/m)	Margin (dB)	Pass/ Fail
All receiver spurious emissions are more than 20 dB below the specified limit.						

EXHIBIT 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

6.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Line Conducted)	PROBABILITY DISTRIBUTION	UNCERTAINTY (dB)	
		9-150 kHz	0.15-30 MHz
EMI Receiver specification	Rectangular	±1.5	±1.5
LISN coupling specification	Rectangular	±1.5	±1.5
Cable and Input Transient Limiter calibration	Normal (k=2)	±0.3	±0.5
Mismatch: Receiver VRC Γ_1 = 0.03 LISN VRC Γ_R = 0.8(9 kHz) 0.2 (30 MHz) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	±0.2	±0.3
System repeatability	Std. deviation	±0.2	±0.05
Repeatability of EUT	--	--	--
Combined standard uncertainty	Normal	±1.25	±1.30
Expanded uncertainty U	Normal (k=2)	±2.50	±2.60

Sample Calculation for Measurement Accuracy in 450 kHz to 30 MHz Band:

$u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)} = \pm \sqrt{(1.5^2 + 1.5^2)/3 + (0.5/2)^2 + (0.05/2)^2 + 0.35^2} = \pm 1.30$ dB

$U = 2u_c(y) = \pm 2.6$ dB

6.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivit	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k = 2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB