Alvarion Inc.
1930-1990 MHz GSM Base Station

FCC ID: OEWAKAD19
Model No.: WAVEXpress M50
FCC Rule Parts: 2, 24

General Overview
A description of the theory of operation and product configuration is found in an attachment to this application and report.

SPECIFICATIONS

Transmitter

TX operating frequency:	1930.2 – 1989.8 MHz
TX output power:	40 watts nominal, 47.3 watts measured
Modulation:	GSM (GMSK) Modulation is internally generated and limited
Power requirements:	110VAC, 30 A/220VAC,15A/-48-60VDC, 40A
Frequency Tolerance	less than 0.001 ppm -30 to +50 C 85%-115% supply voltage at 25C
Test Dates:	11, 14,15, 19, and 26 September 2006

Test Site

Antenna port conducted tests and frequency stability tests were performed at the Alvarion test lab location in Mountain View, CA. Radiated spurious emissions, unintentional radiator emission, and AC line conducted tests were performed at Compliance Certification Services in Morgan Hill, CA.

THOMAS N. COKENIAS
Consultant, EMC&Radio Type Approvals
Agent for Alvarion Inc.

FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2.

2.1033(c)1 Applicant: Alvarion Inc. Inc.
2495 Leghorn St.,
Mountain View, CA 94043

2.1033(c)2 FCC ID: OEWAKAD19

2.1033(c)4,5 Emission type and Frequency range

Modulation: GMSK from internal source
Emission designator: **300KG1D**

2.1033(c) 6 Range of Operating Power

40 watts peak (46.0 dBm) in single configuration
15 watts peak (41.76 dBm) in 2 transmitter combined configuration

2.1033(c) 7 Maximum Power Rating

46.75 dBm measured = 47.3 watts

2.1033(c) 13 Description of Modulation System

GMSK per the GMS standard

2.1033(c) 14 Test Data per 2.1046 – 2.1057

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/07
EMI Receiver, 9kHz - 30 MHz	R&S	ESH 20	827129/006	6/1/07
Line impedance stabilization network	FCC	LISN-50/250-25-2	7/15/05	8/20/07
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/07
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/06
Spectrum analyzer	HP	8593EM	CCS T32	7/26/08
Spectrum analyzer (Alvarion)	HP	8594E	3346A00713	2/3/07
Spectrum analyzer (Alvarion)	R&S	FSEM	849016/022	10/11/06
Attenuator (Alvarion)	Bird	100-SA-MFN-30	N/A	3/3/07
Power meter (Alvarion)	Agilent	E4418B	GB40205110	3/2/07
Power Sensor (Alvarion)	Agilent	E4413A	US37181489	3/2/07
Frequency counter (Alvarion)	HP	53181A	KR91201611	7/6/07
External Frequency refeence	HP	58503A	3504A00133	7/6/07

2.1046 RF Output Power Measurements
Requirement/Limit: 24.232

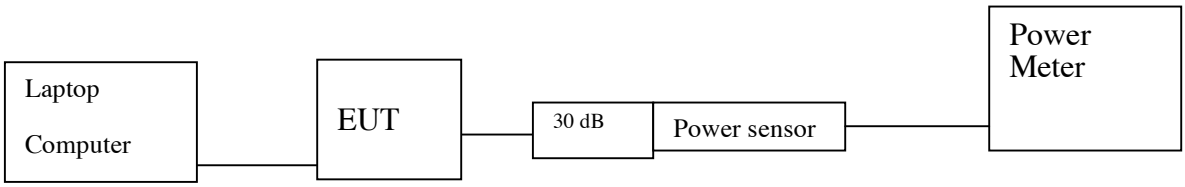
a) Base stations are limited to 1640 watts peak equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below. *See* §24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power; *see* Table 1 of this section. The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.

Table 1_Reduced Power for Base Station Antenna Heights Over 300 Meters

HAAT in meters	Maximum EIRP watts
[le] 300	1640
[le] 500	1070
[le] 1000	490
[le] 1500	270
[le] 2000	160

Test set-up:

Figure 1



Test Procedures

1. Set the transmitter to produce maximum modulated power at the desired frequency
2. Read PEAK output power.

Note: For GMSK modulation, a constant carrier modulation, Pave = Ppk

Test Results

Channel Number	Frequency, MHz	Pout, dBm
512 (low channel)	1930.2	39.02
513 (low ch max P)	1930.4	45.82
661 (mid channel)	1960	46.76
809 (high ch max P)	1989.6	46.48
810 (high channel)	1989.8	39.75

EUT software automatically limits output power to 39 dBm at Low and High channel to meet out of band emissions limits at band edge.

Section 2.1047 Modulation Characteristics
Section 2.1049 Occupied Bandwidth

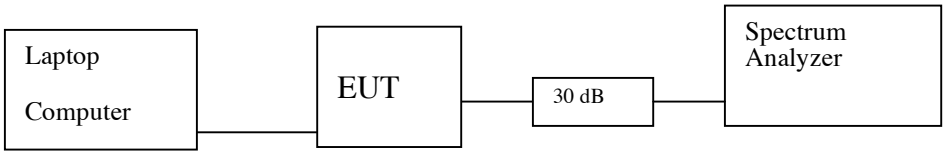
Requirement/Limit: 24.238 Emission limitations for Broadband PCS equipment

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

(b) *Measurement procedure*. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Test set-up:

Figure 2



Ref level offset = cable loss + 30 dB = 31.9 dB

Test Procedures and Results:

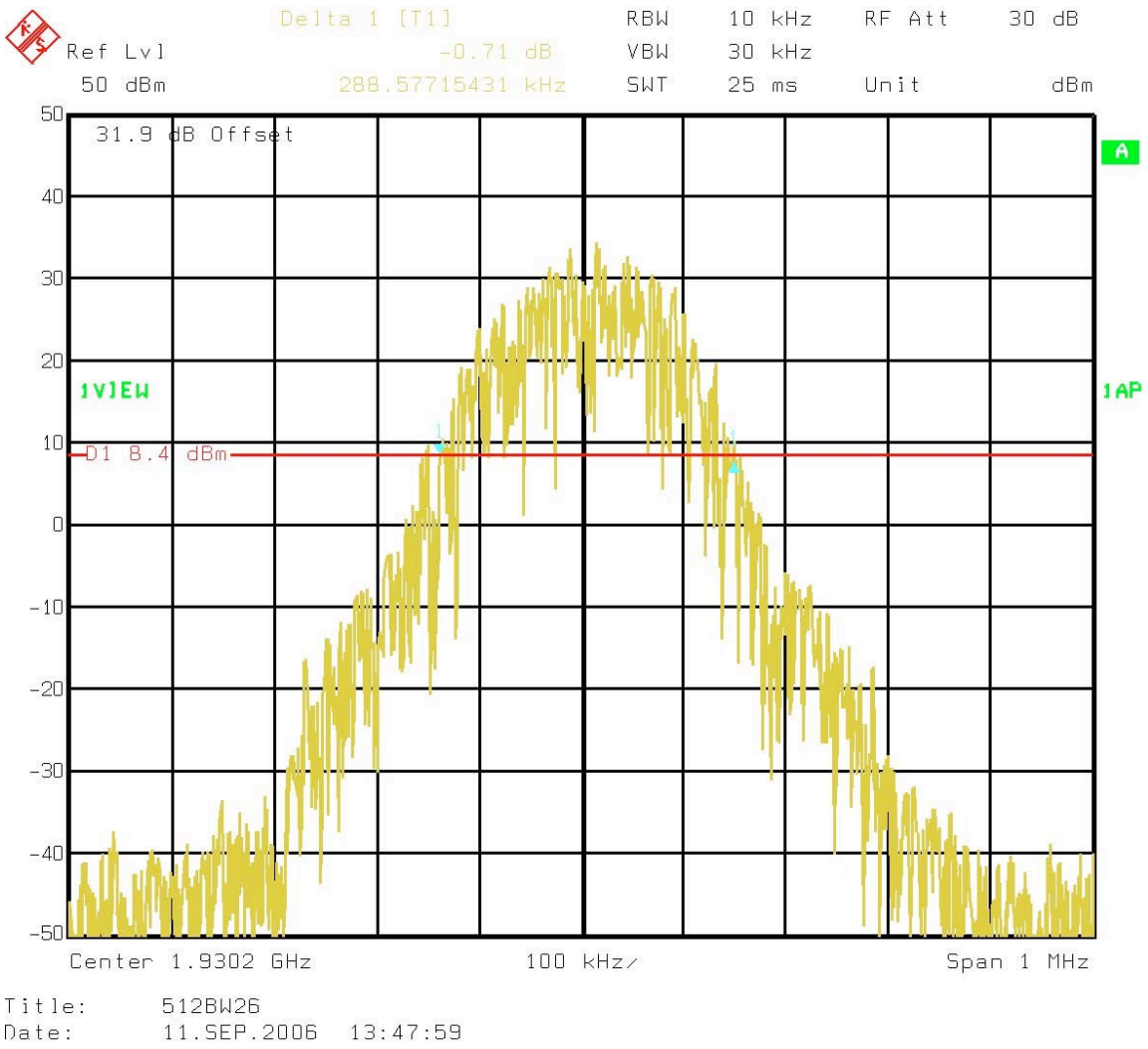
-26 dBc occupied bandwidth was measured using spectrum analyzer display line and delta marker functions.

Test Results

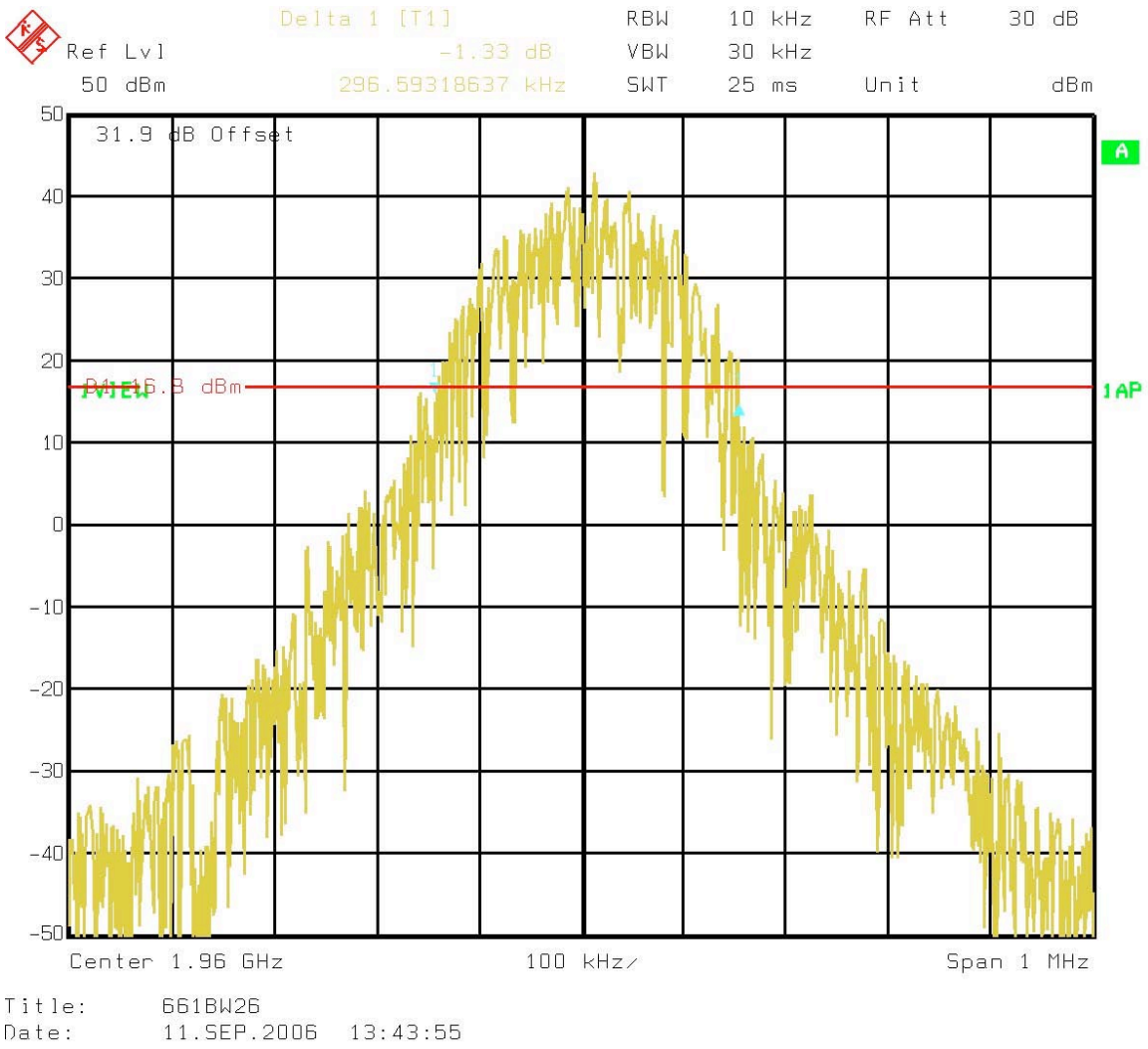
Maximum 26 dB BW: 296.6 kHz.

Refer to spectrum analyzer plots below.

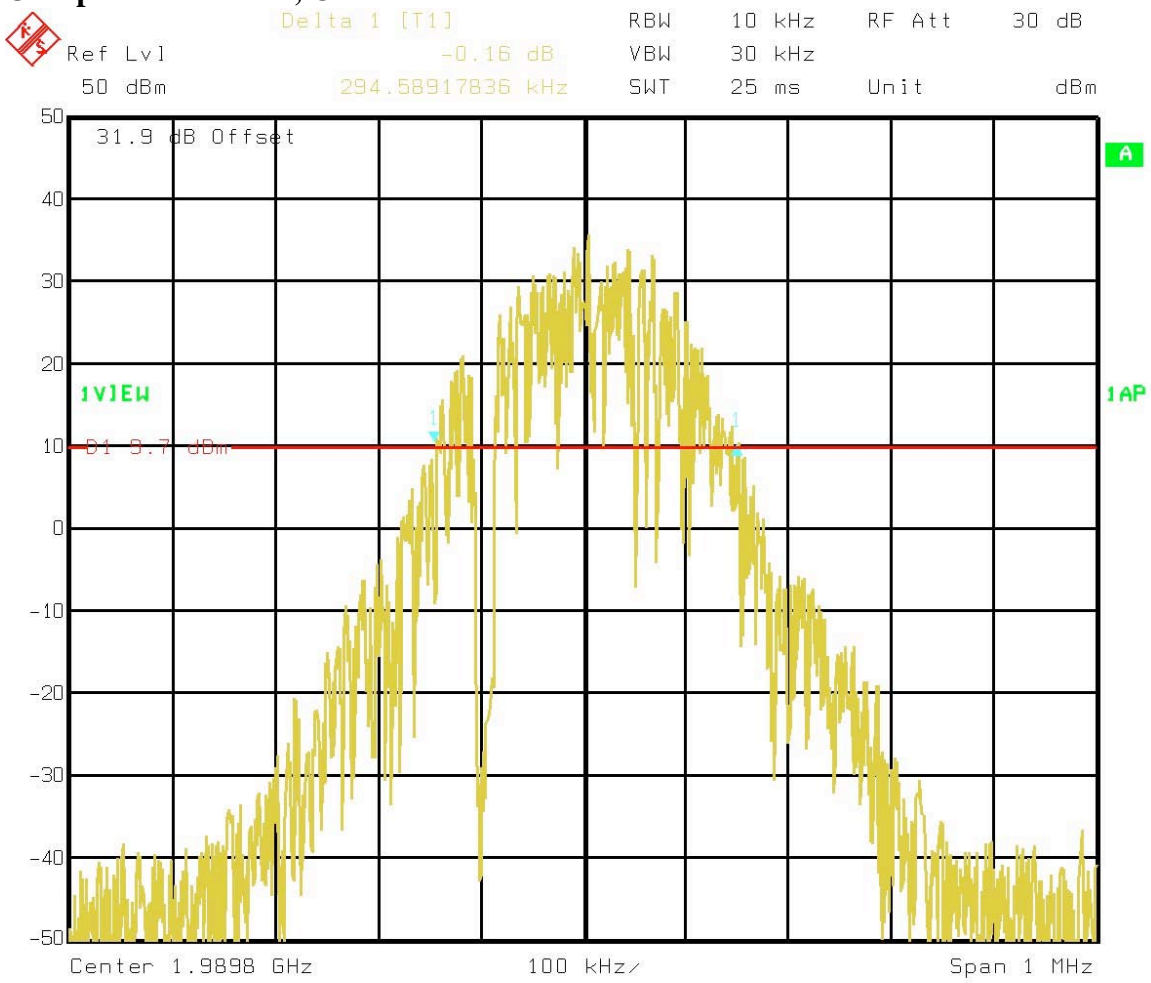
Occupied Bandwidth, Channel 512



Occupied Bandwidth, Channel 661



Occupied Bandwidth, Channel 810



Title: 810BW26
Date: 11.SEP.2006 13:50:28

Section 2.1051 Spurious and Harmonic Emissions at Antenna Terminals
Requirement/Limit: 24.238 Emission limitations for Broadband PCS equipment

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

(b) *Measurement procedure*. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Test set-up:
Refer to Figure 2 above

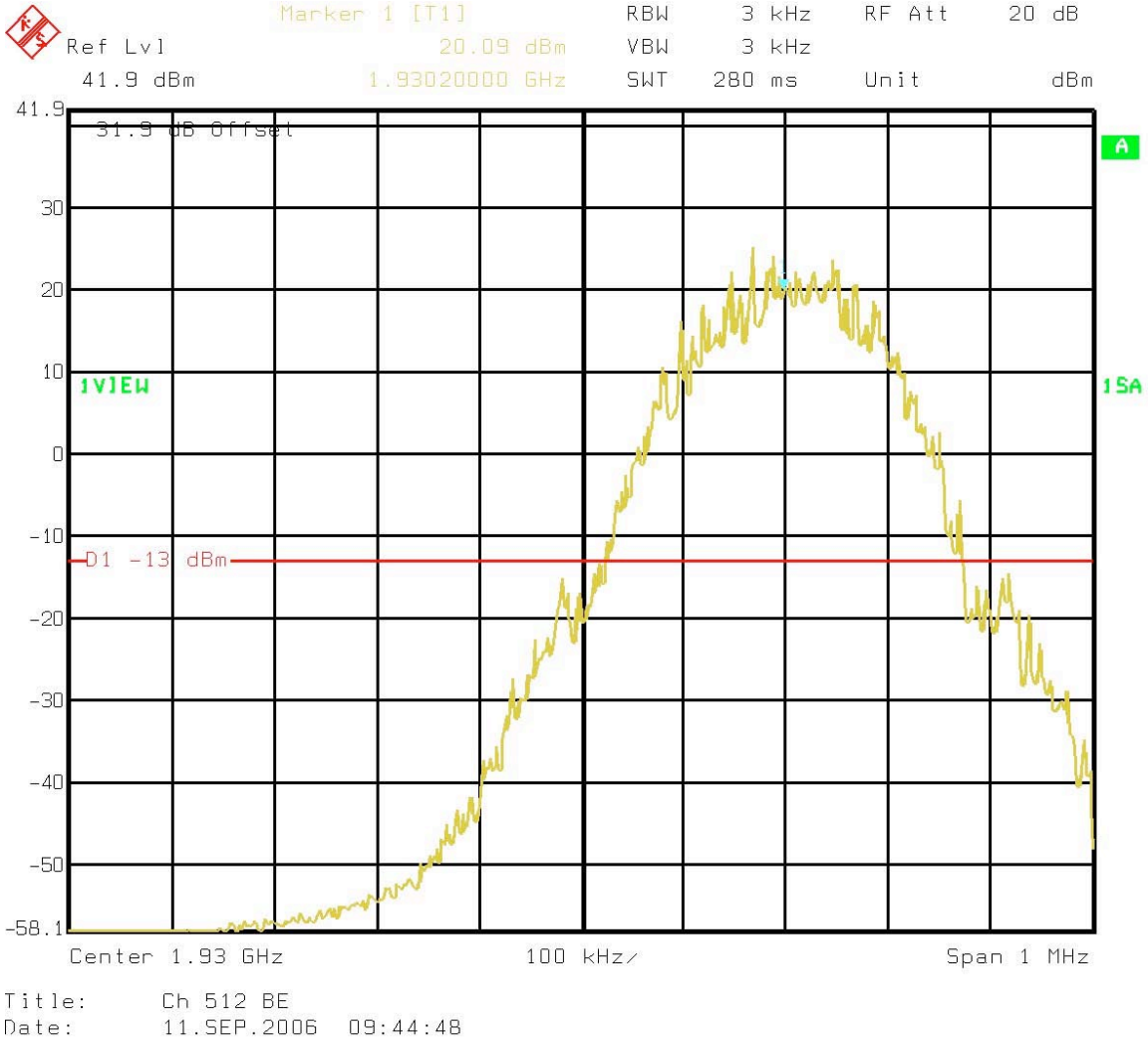
Test Procedures

1. Record band edge emissions using 3 kHz resolution band width (1% emission BW).
2. Record transmitter output spectrum from 1 MHz to 10th harmonic of TX output frequency using 1MHz resolution bandwidth

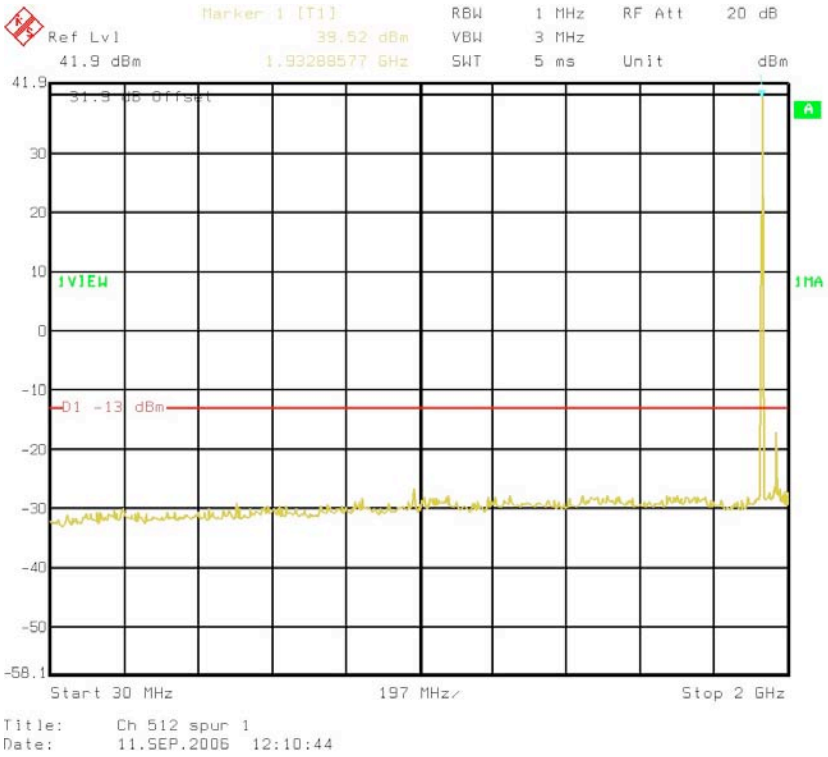
Test Results

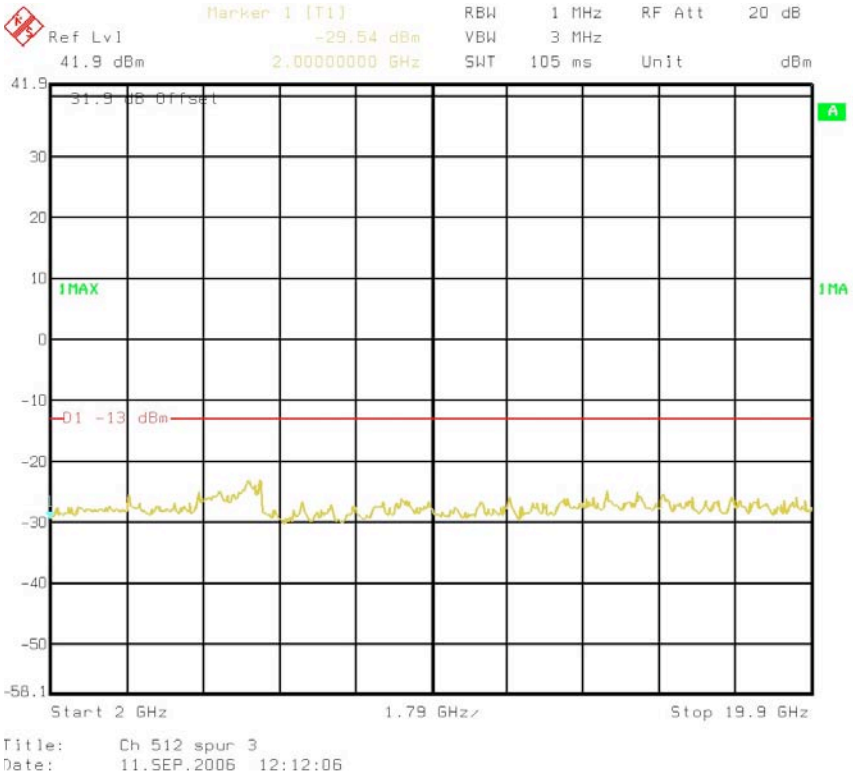
PASS. Refer to data plots below.

Channel 512 Band edge emissions, antenna port (Pout = 39 dBm)

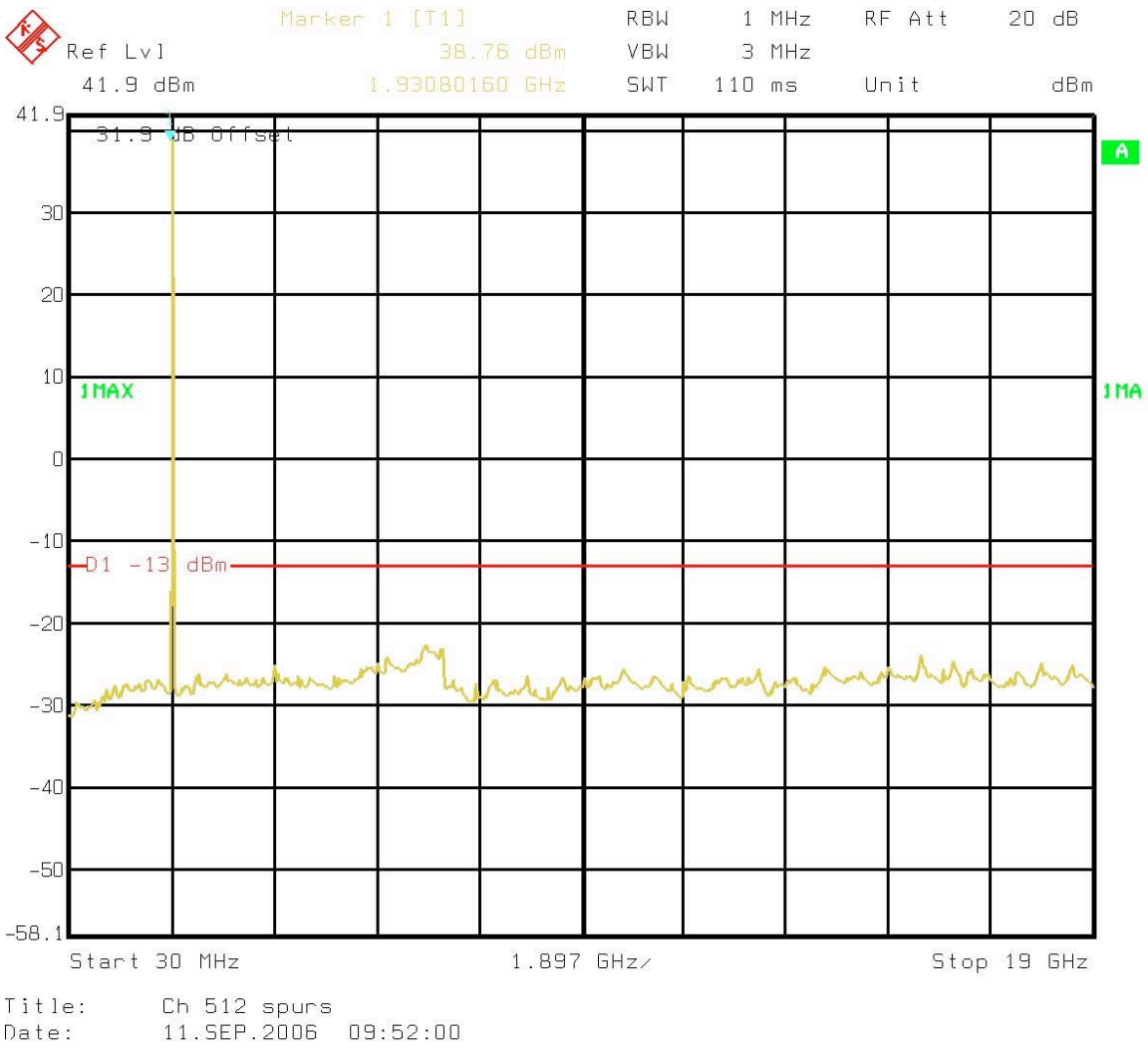


Channel 512 Spurious emissions, antenna port (Pout = 39 dBm)

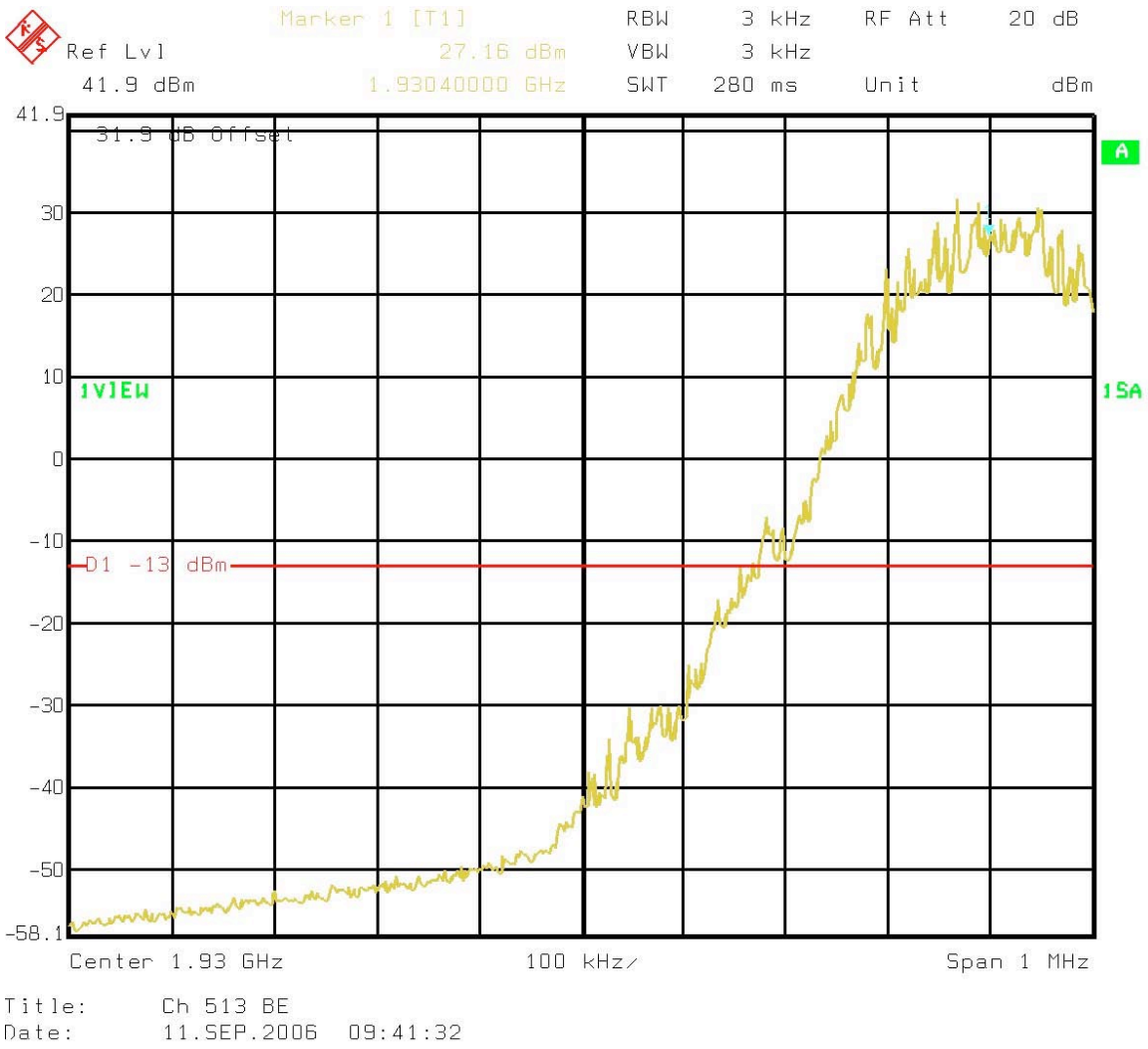




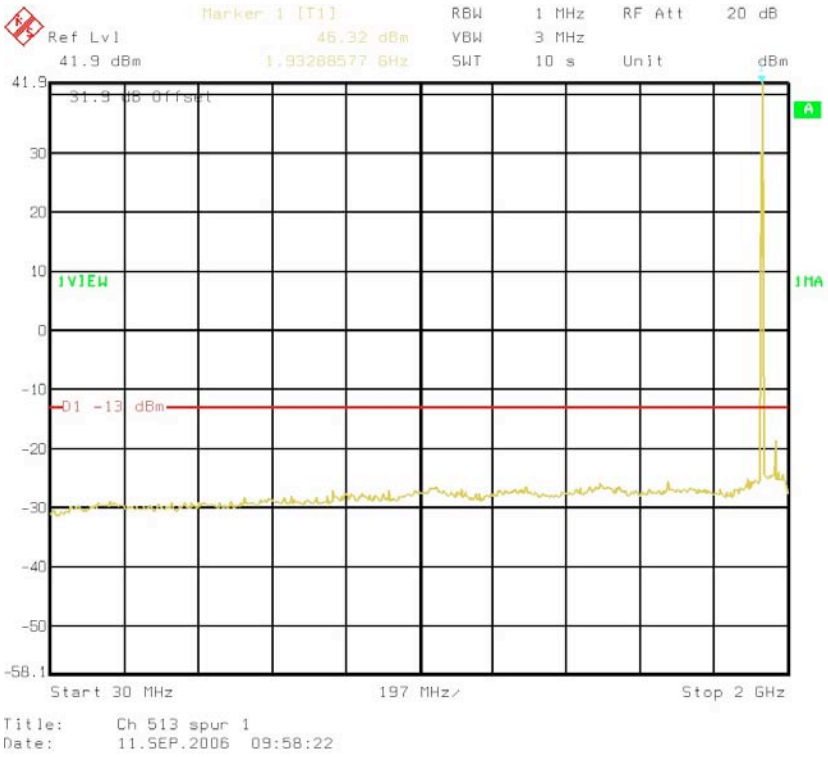
Channel 512 Spurious emissions, antenna port (Pout = 39 dBm)

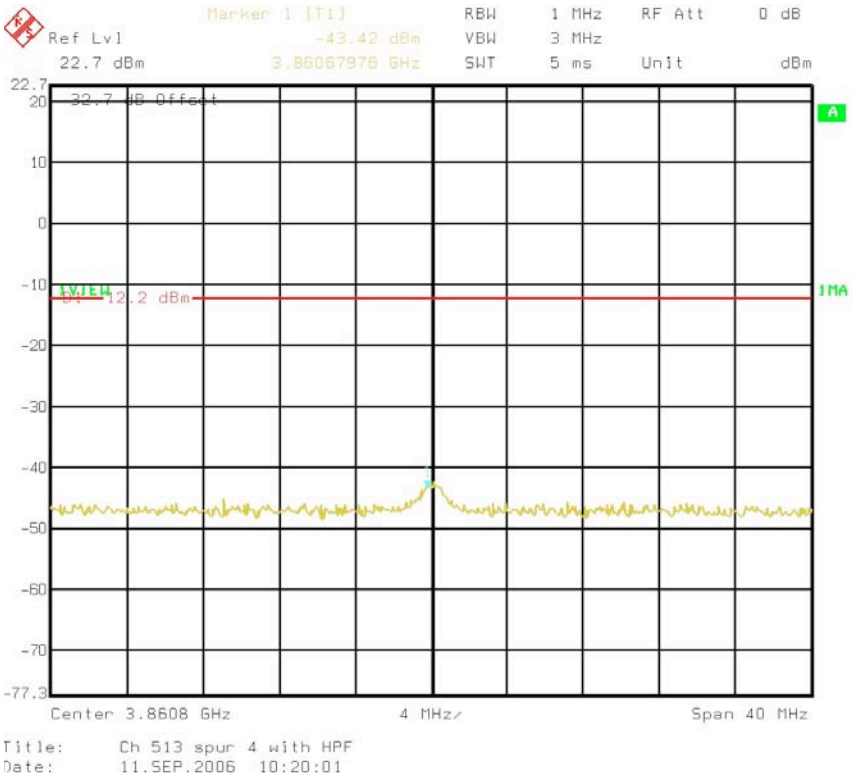


Channel 513 band edge emission, antenna port (Pout = 46 dBm)

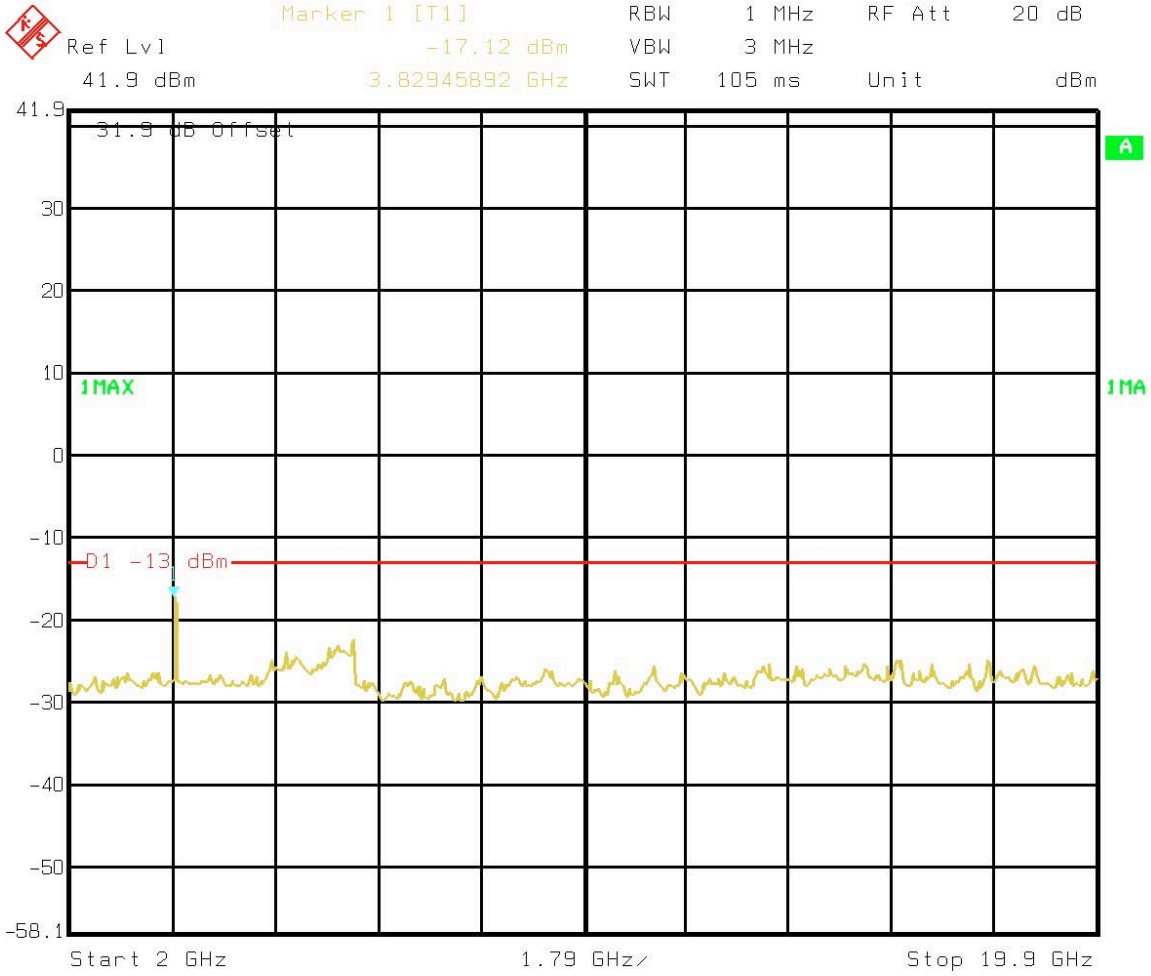


Channel 513 Spurious emissions, antenna port (Pout = 46 dBm)

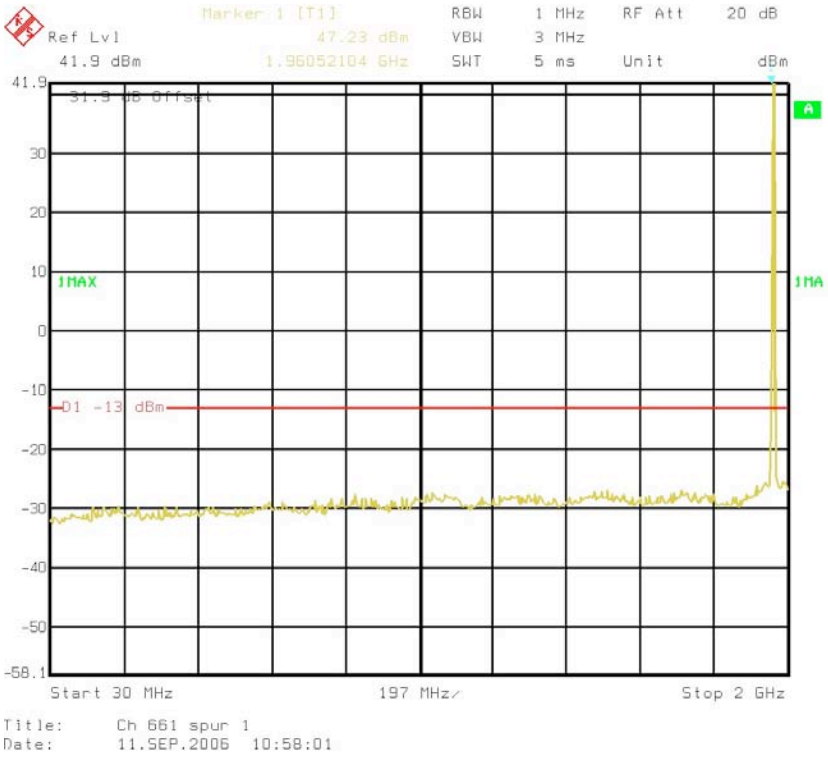


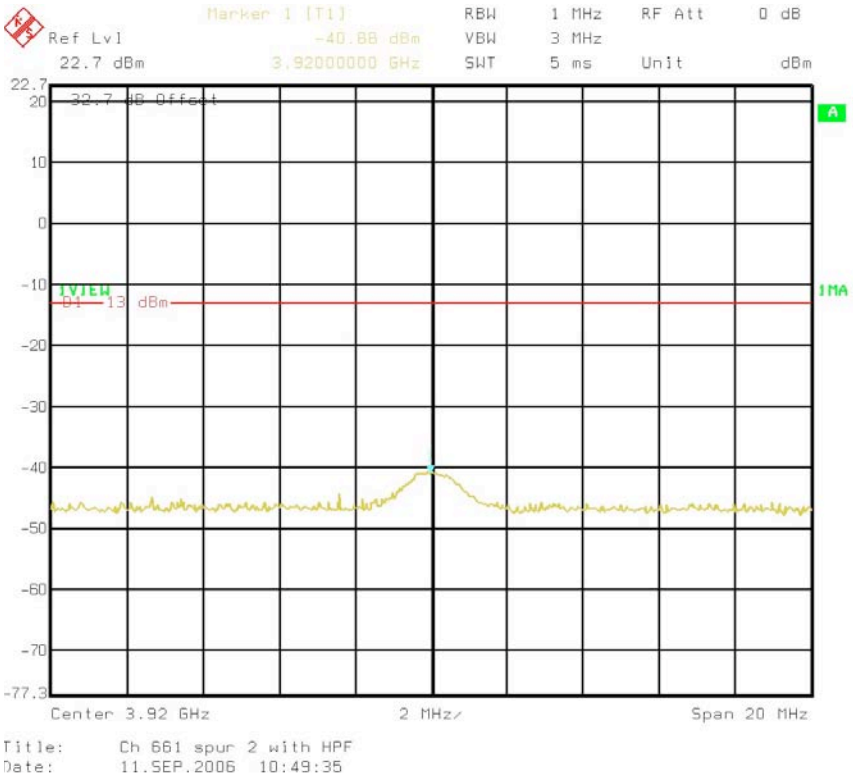


Channel 513 Spurious emissions, antenna port (Pout = 46 dBm)

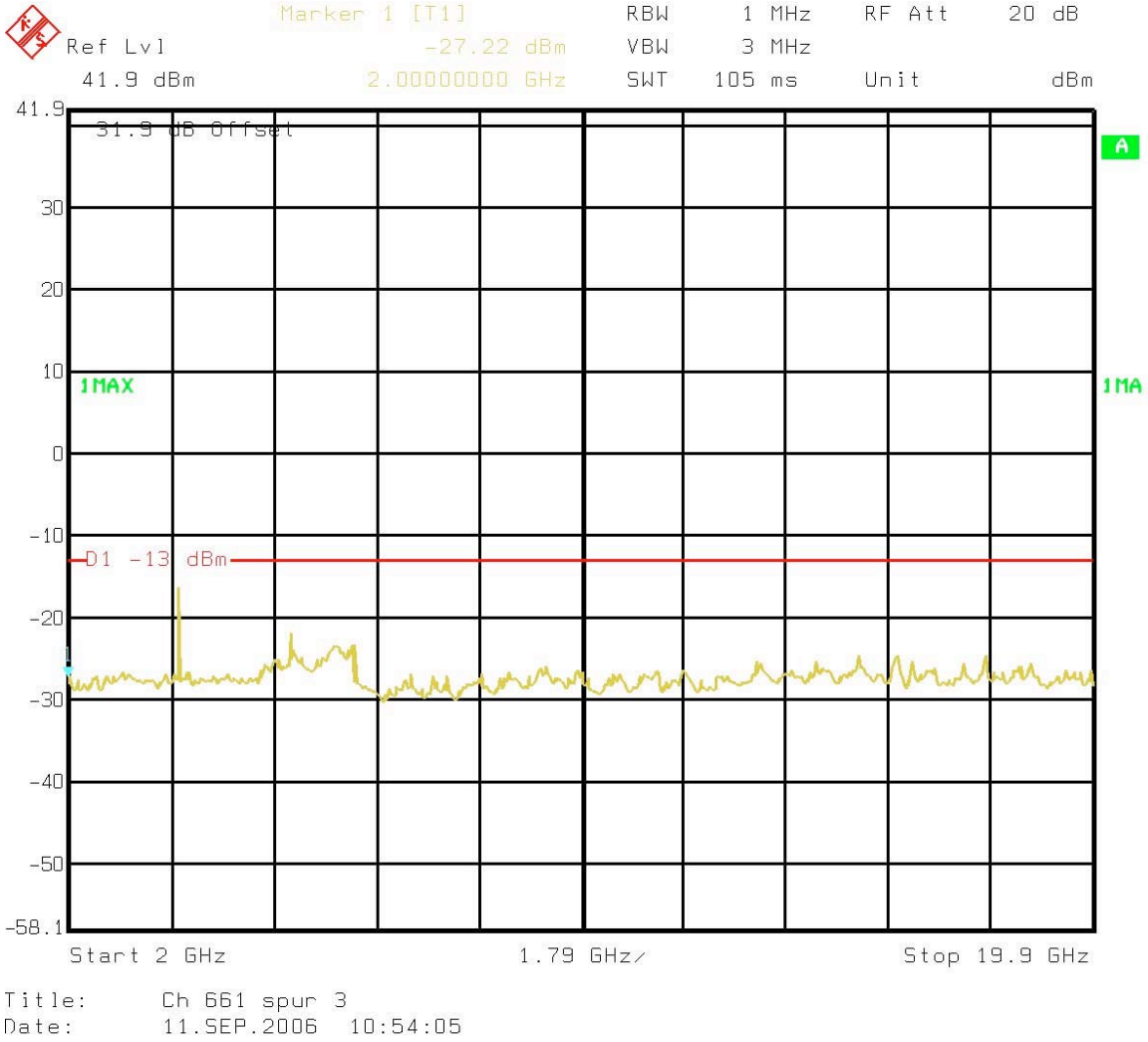


Channel 661 Spurious emissions, antenna port (Pout = 46 dBm)

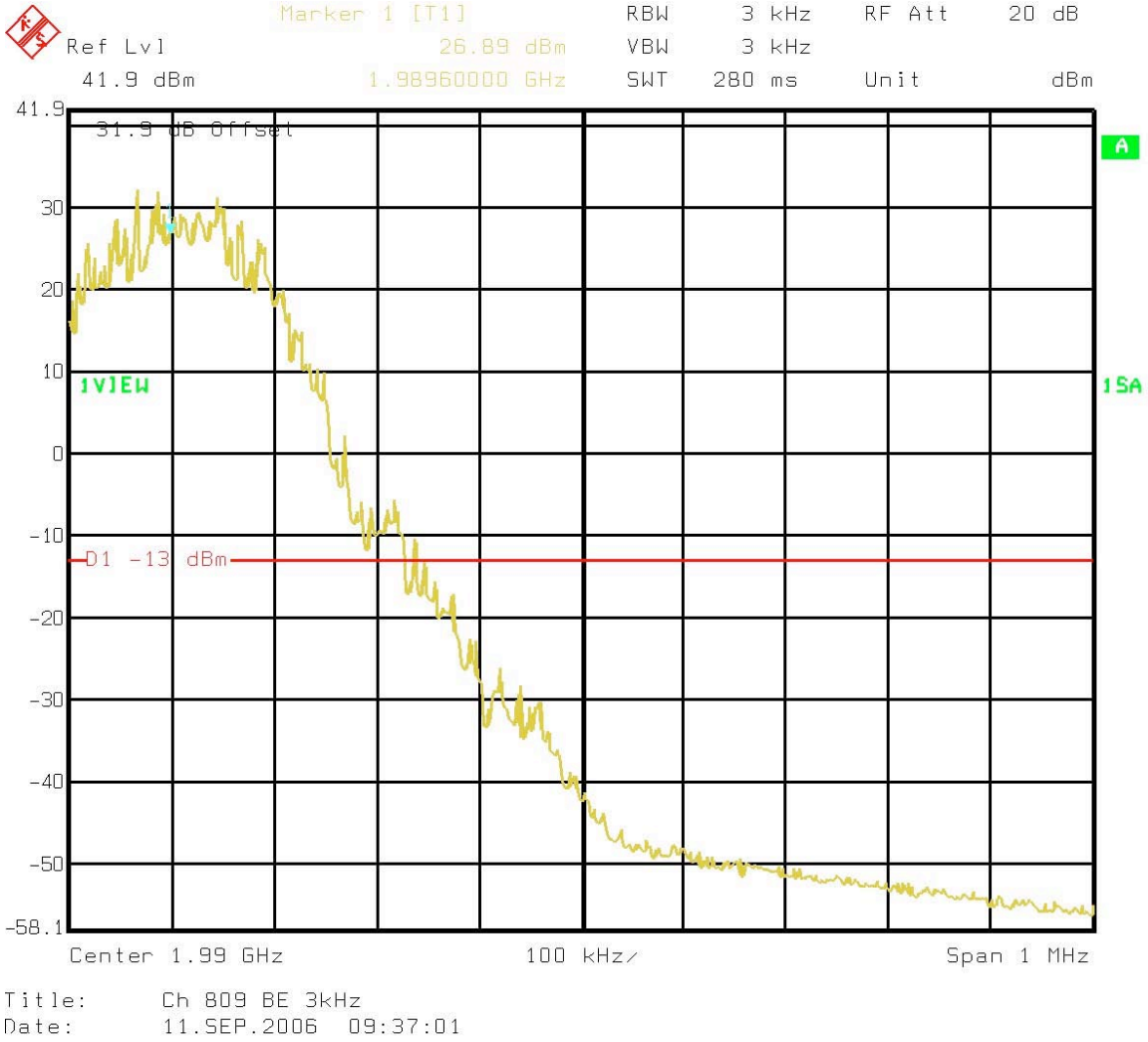




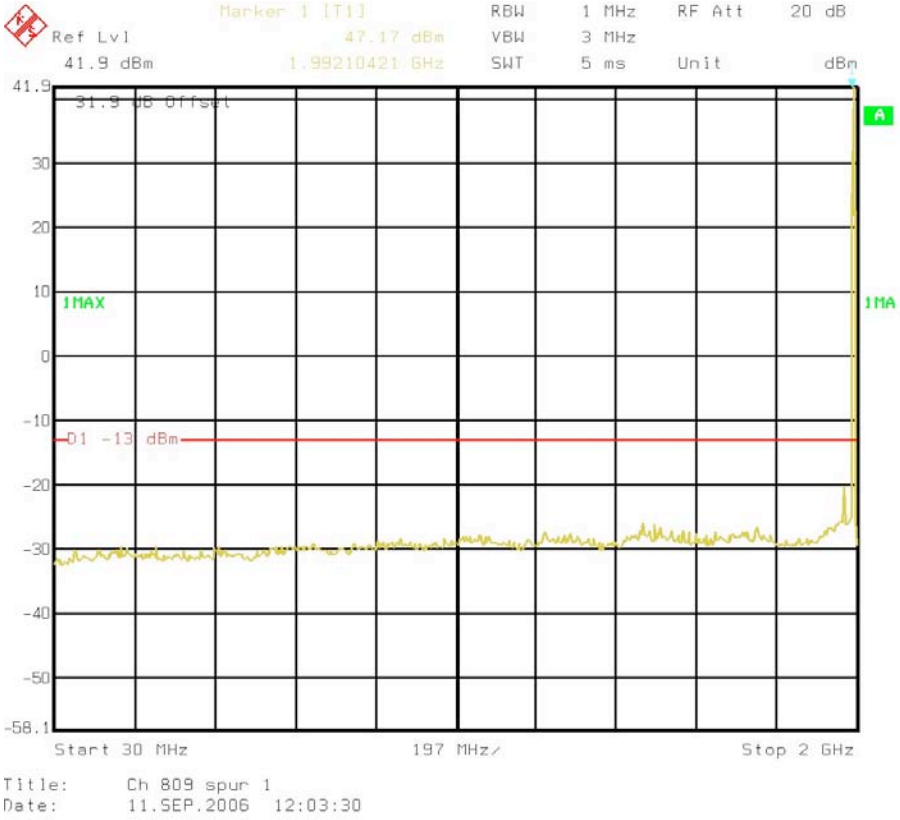
Channel 661 Spurious emissions, antenna port (Pout = 46 dBm)

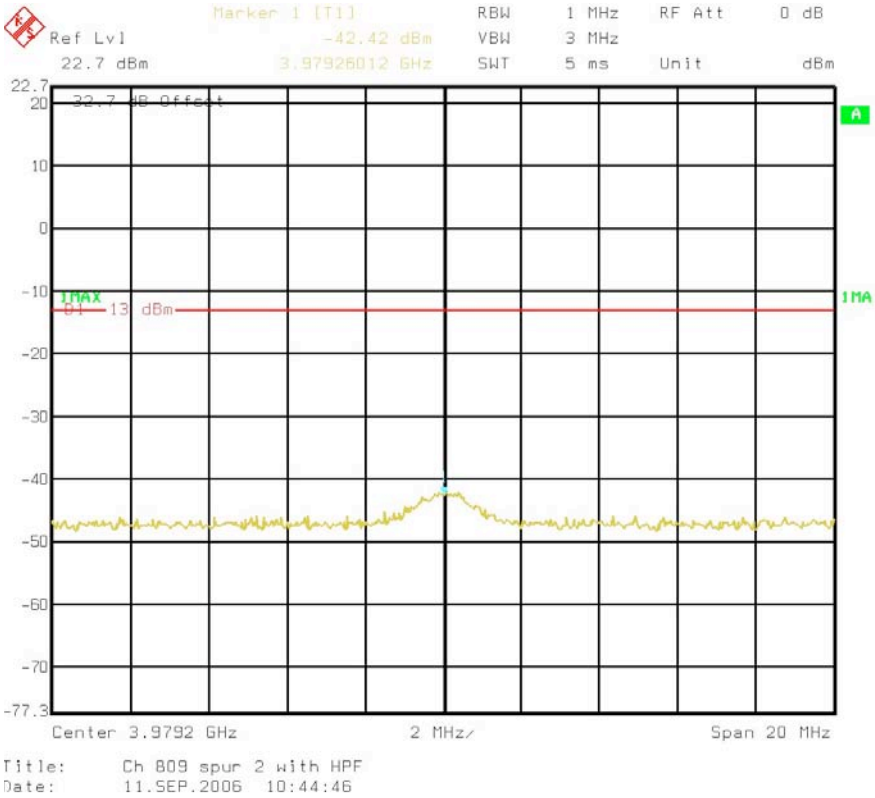


Channel 809 Band edge emissions, antenna port (Pout = 46 dBm)

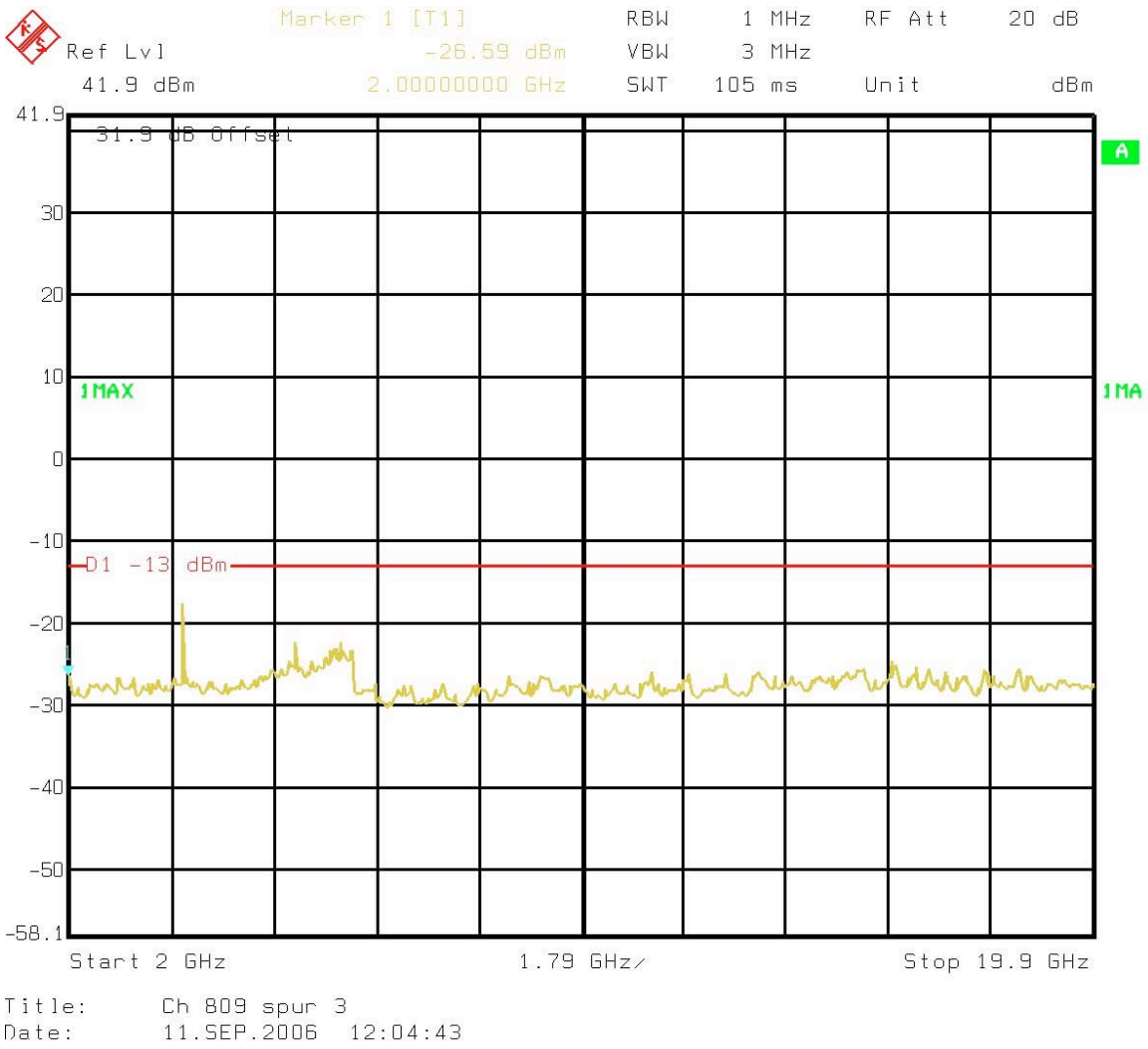


Channel 809 Spurious emissions, antenna port (Pout = 46 dBm)

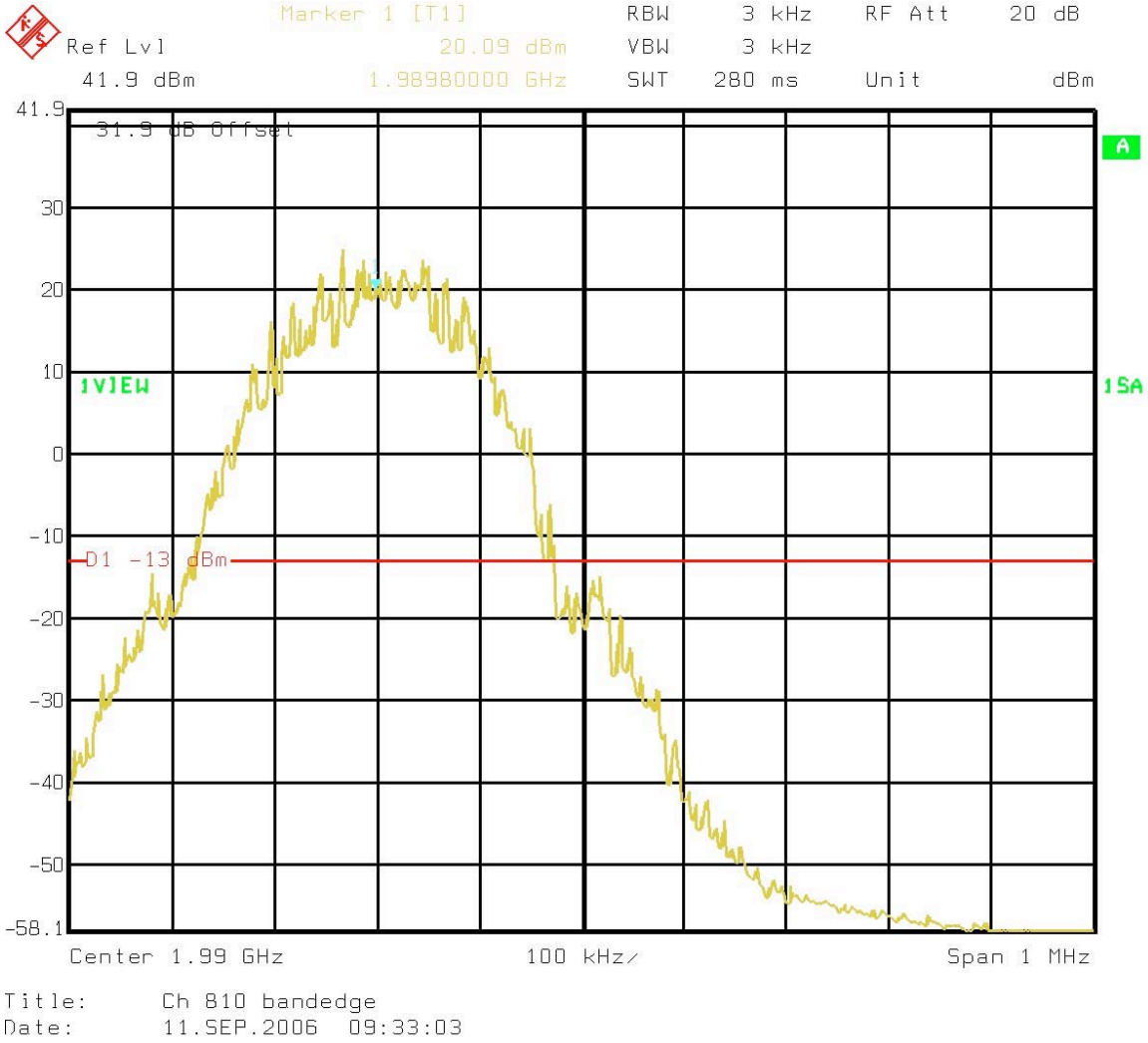




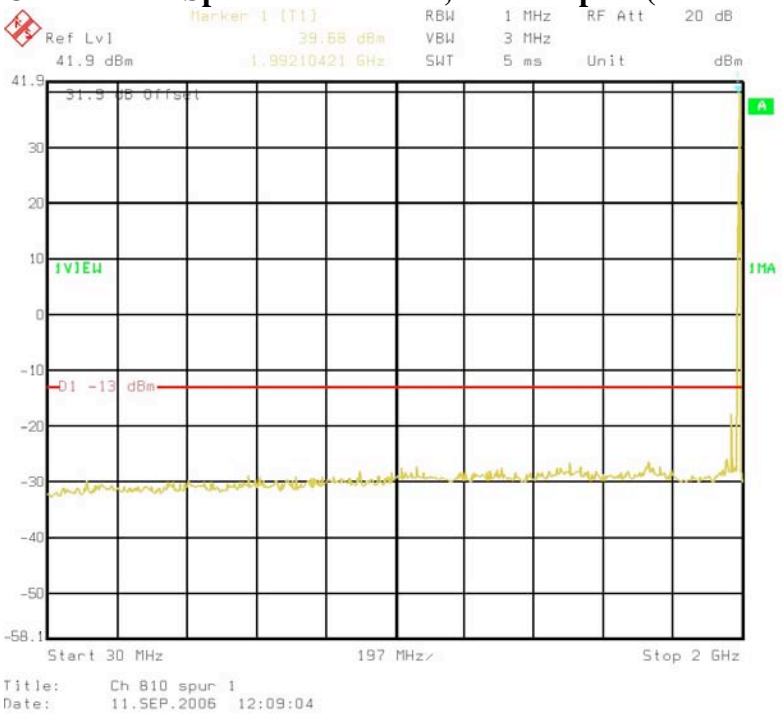
Channel 809 Spurious emissions, antenna port (Pout = 46 dBm)

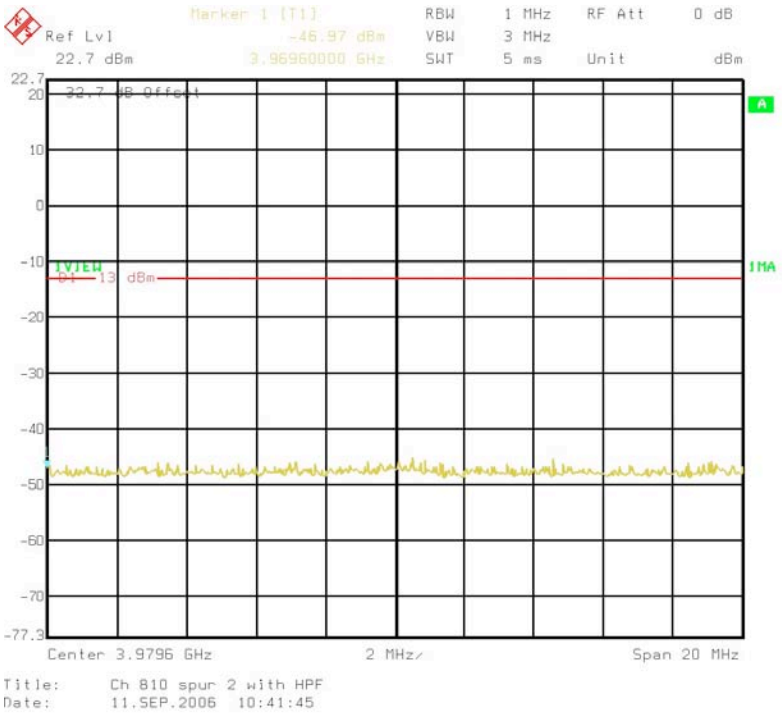


Channel 810 Band edge emissions, antenna port (Pout = 39 dBm)

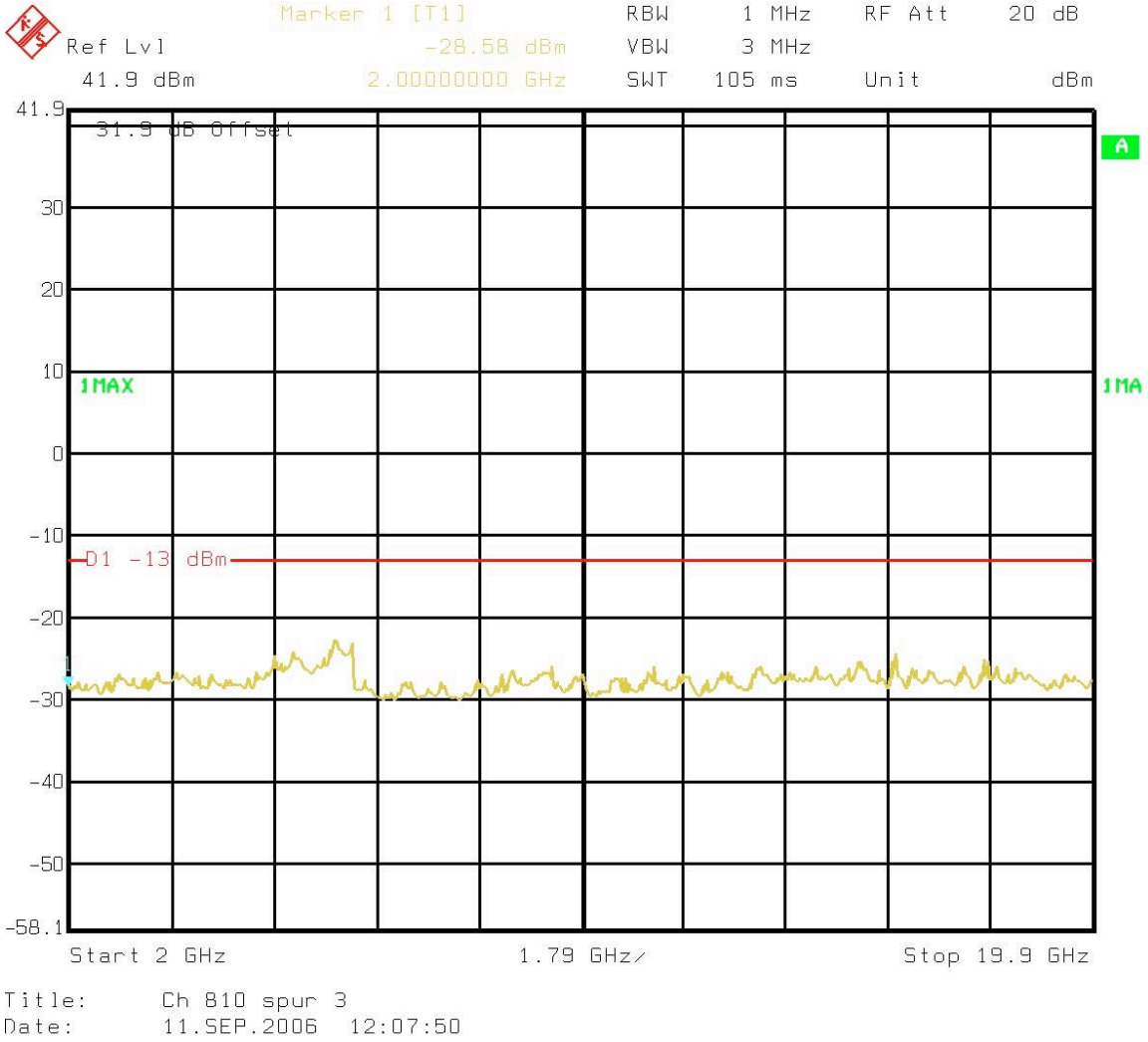


Channel 810 Spurious emissions, antenna port (Pout = 39 dBm)





Channel 810 Spurious emissions, antenna port (Pout = 39 dBm)



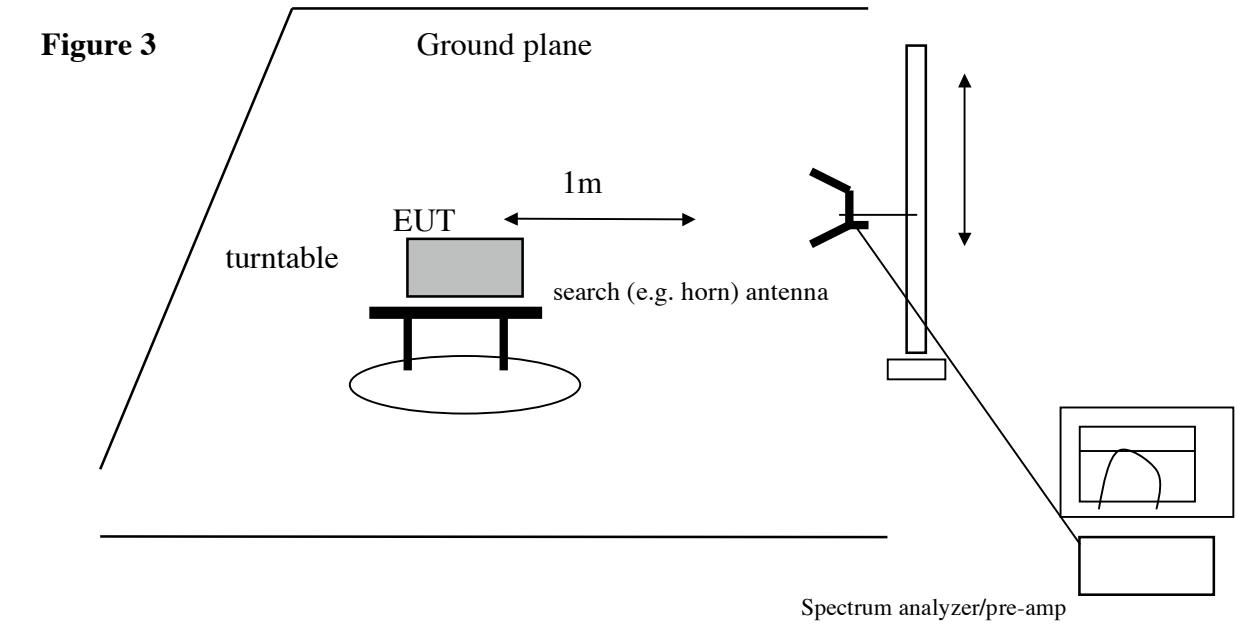
Section 2.1053 Field Strength of Spurious and Harmonic Radiation

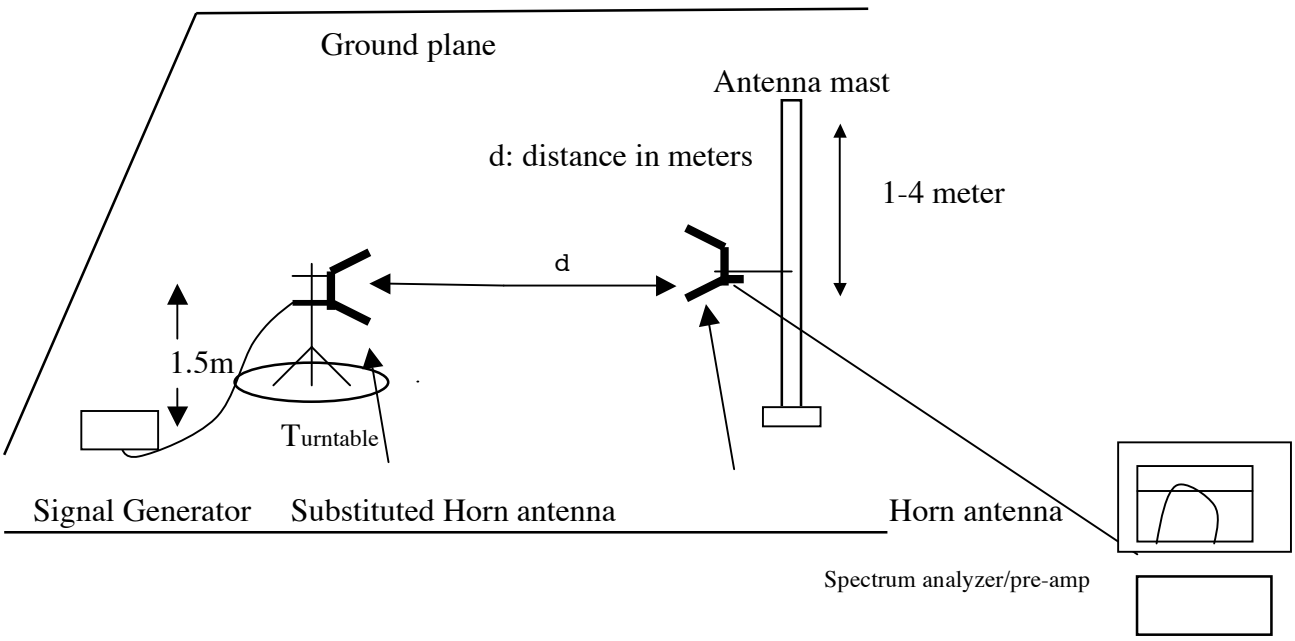
Requirement/Limit: 24.238 Emission limitations for Broadband PCS equipment

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

Test Set-Up

Figure 3





Minimum Requirement

-13 dBm ERP

Test Method

The antenna output port of the EUT was terminated with a 50-ohm load. With the transmitter operating at full power, the EUT was rotated 360° and the search antenna was raised and lowered in both polarities, all in an attempt to maximize the levels of the received emission for each harmonic and spurious emission up to 10 fo.

The EUT was removed and was replaced by a substitution antenna connected via coax to a signal generator. The generator output was set to each emission frequency detected, the search antenna was raised and lowered, the turntable was rotated, and until the maximum emission level was obtained. The signal generator output level was adjusted to match the radiated emission level from the EUT. After correcting for substitution antenna factor and generator cable loss, output power level is compared to the limit.

Test Results

Pass. All emissions detected were at least 11 dB below limits. Refer to worst-case data below.

High Frequency Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Company: Thomes N. Cokenisa RFI/EMI consultant
Project #: 06U10597
Date: 9/19/2006
Test Engineer: Mengistu Mekuria
Configuration: EUT
Mode: TX/RX Mode

Test Equipment:

EMCO Horn 1-18GHz: T60; S/N: 2238 @3m
Horn > 18GHz:
Limit: FCC 24
Hi Frequency Cables: (2 ft) ☑ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☐ (12 ft) ☑
Pre-amplifer 1-26GHz: T144 Miteq 3008A00
Pre-amplifer:

f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Ch (1930.2)									
3.861	59.1	V	-47.2	2.5	9.7	7.6	-40.0	-13.0	-27.0
5.791	56.9	V	-46.0	3.4	11.4	9.3	-38.0	-13.0	-25.0
3.860	60.6	H	-45.6	2.5	9.7	7.6	-38.5	-13.0	-25.5
5.791	56.8	H	-45.1	3.4	11.4	9.3	-37.1	-13.0	-24.1
7.720	60.2	H	-39.4	3.7	12.0	9.8	-31.1	-13.0	-18.1
Mid Ch(1960)									
3.920	74.6	H	-31.5	2.6	9.8	7.6	-24.3	-13.0	-11.3
5.879	58.2	H	-43.7	3.4	11.5	9.4	-35.6	-13.0	-22.6
7.840	66.7	H	-32.8	3.8	12.0	9.8	-24.5	-13.0	-11.5
3.920	74.6	V	-31.5	2.6	9.8	7.6	-24.3	-13.0	-11.3
5.879	57.7	V	-45.2	3.4	11.5	9.4	-37.1	-13.0	-24.1
7.841	63.2	V	-37.0	3.8	12.0	9.8	-28.8	-13.0	-15.8
High Ch(1989.8)									
3.980	65.2	V	-40.7	2.6	9.8	7.6	-33.5	-13.0	-20.5
5.971	56.0	V	-46.9	3.4	11.7	9.5	-38.6	-13.0	-25.6
3.980	68.0	H	-37.9	2.6	9.8	7.6	-30.7	-13.0	-17.7
5.969	57.7	H	-44.2	3.4	11.7	9.5	-36.0	-13.0	-23.0
		Note: No emissin were detected above the noise floor							

Rev. 5.1.6

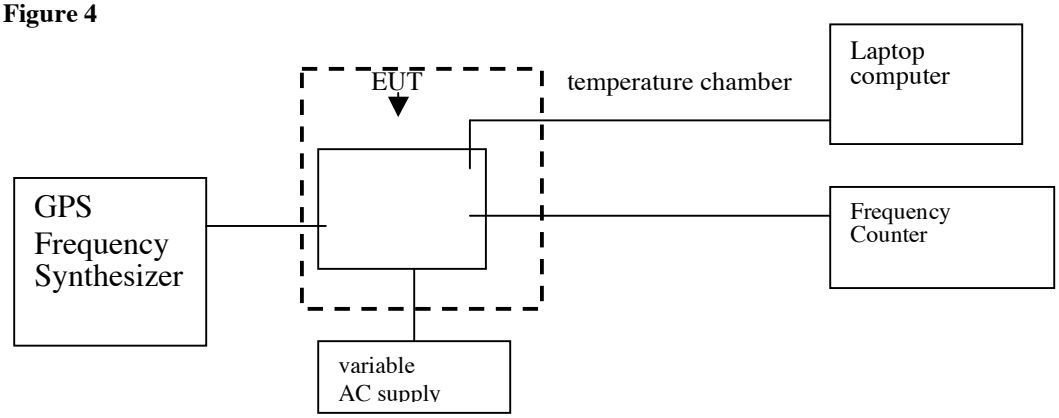
2.1055 Frequency Stability
Requirement/Limit: 24.235 Frequency stability

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Frequency Tolerance: .0001% (1 part per million)
= ±217 Hz at 217.1250MHz
= ±219 Hz at 219.9875 MHz

Temperature Range: -30C to +50 C
Supply Voltage Range: 85% - 115% nominal 13.6 VDC (11.6 - 15.6 VDC)

Test Setup
Figure 4



Note: Measured frequency has +67.7083 kHz offset because it was measured under clock signal modulated condition which shifts the line spectrum with ¼ of clock frequency which is 270.8333 kHz. Therefore, the actual carrier frequency is "Measured frequency" – 67.7083 kHz. This modulation required for accurate frequency count as GMSK waveform is difficult for frequency counter to lock onto.

A. Frequency v Supply Voltage Variation

Temperature: 25ºC
Test date: 9/15/06

Channel 512 Frequency = 1930.2 MHz

Power Supply (VAC)	Temp, ºC	F, MHz	Delta, ppm
120 (100%)	*25*	*1930.2677097*	*0*
108 (85%)	25	1930.2677097	0.00000
138 (115%)	25	1930.2677096	-0.00005

Channel 810 Frequency = 1989.8 MHz

Power Supply (VAC)	Temp, ºC	F, MHz	Delta, ppm
120 (100%)	*25*	*1989.8677097*	*0*
108 (85%)	25	1989.8677097	0.00000
138 (115%)	25	1989.8677098	0.00005

B. Frequency v Temperature

Test date: 9/14/06

Channel 512 Frequency = 1930.2 MHz

Power Supply (VAC)	Temp, ºC	F, MHz	Delta, ppm
120	50	1930.2677104	0.0000
120	40	1930.2677106	0.0001
120	30	1930.2677106	0.0001
120	*25*	*1930.2677104*	*0*
120	20	1930.2677104	0.0000
120	10	1930.2677103	-0.00005
120	0	1930.2677099	-0.00026
120	-10	1930.2677092	-0.00062
120	-20	1930.2677087	-0.00088
120	-30	1930.2677077	-0.0014

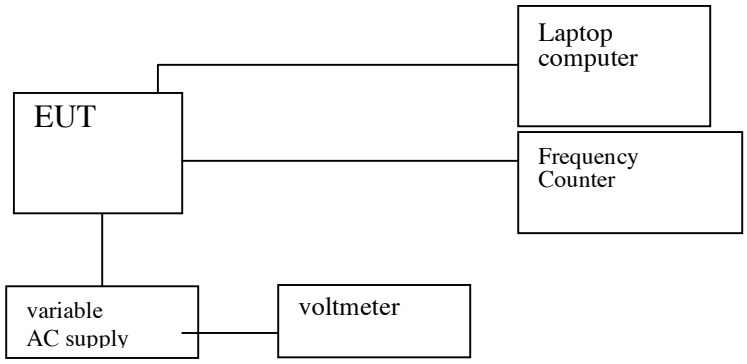
Channel 810 Frequency = 1989.8 MHz

Power Supply (VAC)	Temp, ºC	F, MHz	Delta, ppm
120	50	1989.8677106	0.00005
120	40	1989.8677107	0.0001
120	30	1989.8677107	0.0001
120	*25*	*1989.8677105*	*0*
120	20	1989.8677105	0.00000
120	10	1989.8677103	-0.0001
120	0	1989.8677099	-0.0003
120	-10	1989.8677092	-0.00065
120	-20	1989.8677087	-0.0009
120	-30	1989.8677076	-0.00146

Operating Voltage v Frequency

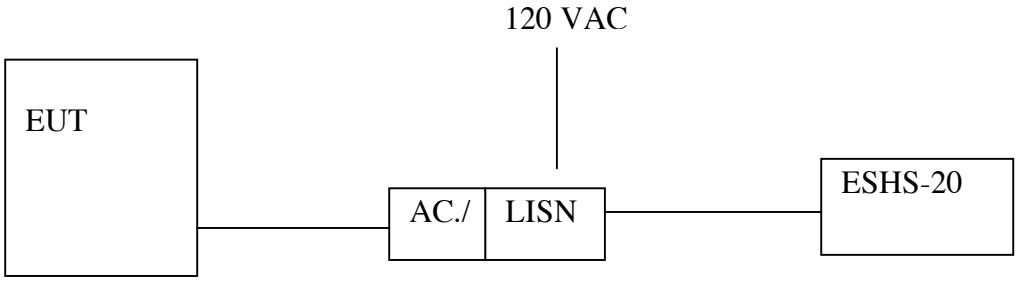
Test Setup

Figure 5



AC Line Conducted Emissions from digital network interface
Test Requirement: 15.107

AC Conducted Set-up



Test Procedure

1. The EUT was placed on a floor with a metal ground plane, 40 cm from a vertical ground plane.
2. The EUT was set to transmit in normally.
3. Line conducted data was recorded for both NEUTRAL and HOT lines.

Test Results

Worst case emissions:

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_A	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.26	55.06	--	48.91	0.00	79.00	66.00	-23.94	-17.09	L1
0.38	53.46	--	42.75	0.00	79.00	66.00	-25.54	-23.25	L1
11.50	50.62	--	43.56	0.00	73.00	60.00	-22.38	-16.44	L1
0.26	54.96	--	48.08	0.00	79.00	66.00	-24.04	-17.92	L2
0.39	55.70	--	43.53	0.00	79.00	66.00	-23.30	-22.47	L2
11.02	49.30	--	43.92	0.00	73.00	60.00	-23.70	-16.08	L2
6 Worst Data									

Radiated emissions from digital network interface
Rule Section: 15.109

Emissions from the digital portion of the EUT were tested to class A limits as the EUT is not sold or used in residences.

Test Set-up

Figure 3 above.

Test Procedures

The EUT was placed on a turntable located in a 5m anechoic chamber. The EUT was tested twice, once with the transmitter ON, the second time with the transmitter off but with the rest of the circuitry active (digital board, GPS receiver, and Bluetooth module).

EUT emissions were maximized by raising the search antenna 1-4 m in both horizontal and vertical polarities, and by rotating the turntable through a full 360 degrees.

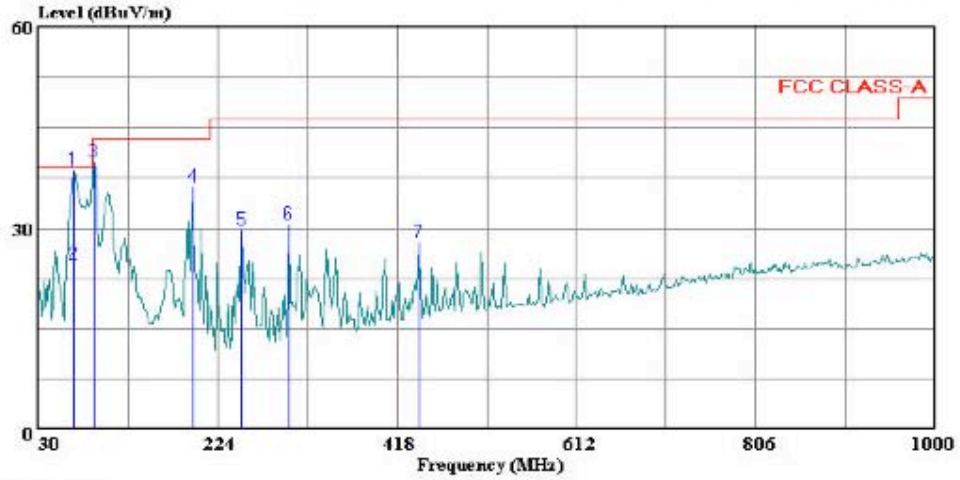
Test Results

Test plots and tabulated data are presented below for two network interface configurations, the standard T1/E1 configuration and the NIB ("Network in a Box") plug-in card configuration. AC line conducted emissions taken for worst-case configuration (NIB).

Standard Network Configurtion, Vertical

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 7 File#: emi.EMI Date: 09-19-2006 Time: 10:33:15



(Audix ATC)

Trace: 5 Ref Trace:

Condition: FCC CLASS-A VERTICAL
Test Operator: : Mengistu Mekuria
Company: : Thomas N. Cokenias RFI/EMI Con.
Project #: : 06U10597
Configuration: : EUT
Mode of Operation: TX/Rx Mode
Model : OEWAKAD19

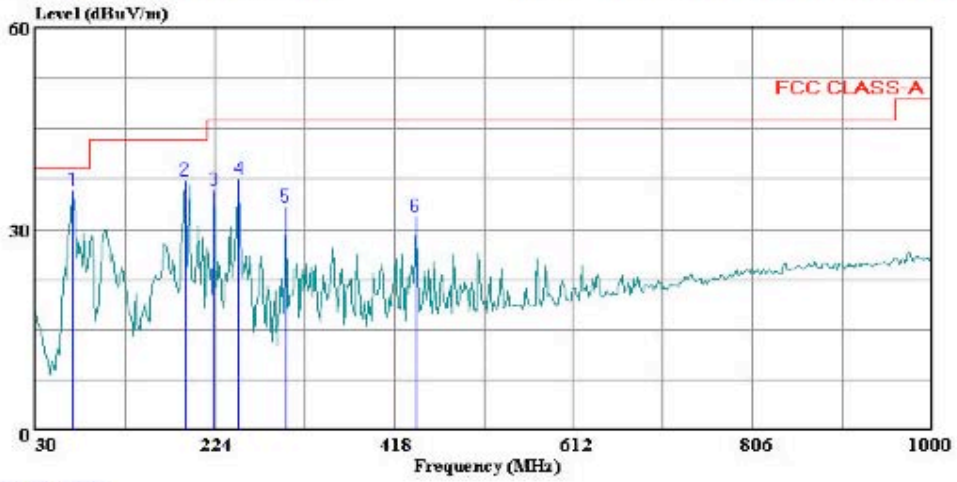
Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	67.830	29.40	9.20	38.60	39.00	-0.40	Peak
2	67.830	15.25	9.20	24.45	39.00	-14.55	QP
3	90.140	31.08	8.79	39.87	43.50	-3.63	Peak
4	196.840	22.19	14.00	36.19	43.50	-7.31	Peak
5	250.190	15.80	13.90	29.70	46.40	-16.70	Peak
6	300.630	14.82	15.67	30.49	46.40	-15.91	Peak
7	441.280	8.74	19.02	27.76	46.40	-18.64	Peak

Standard Network Configuration, Horizontal

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 4 File#: emi.EMI Date: 09-19-2006 Time: 10:24:12



(Audix ATC)

Trace: 3 Ref Trace:

Condition: FCC CLASS-A HORIZONTAL
Test Operator: : Mengistu Mekuria
Company: : Thomas N. Cokenias RFI/EMI Con.
Project #: : 06U10597
Configuration: : EUT
Mode of Operation: TX/Rx Mode
Model : OEWAKAD19

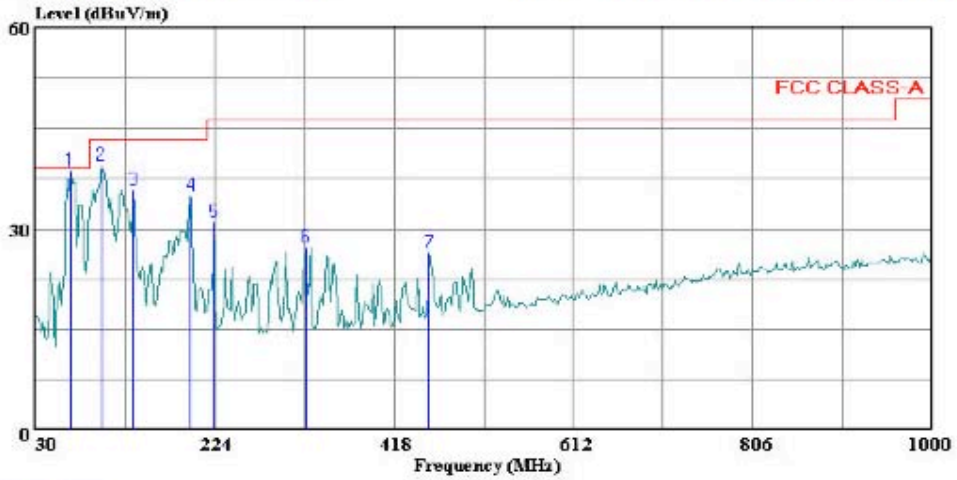
Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	70.740	26.28	9.34	35.62	39.00	-3.38	Peak
2	191.990	23.91	13.25	37.16	43.50	-6.34	Peak
3	223.030	23.00	12.72	35.72	46.40	-10.68	Peak
4	250.190	23.54	13.90	37.44	46.40	-8.96	Peak
5	300.630	17.62	15.67	33.29	46.40	-13.11	Peak
6	441.280	12.70	19.02	31.72	46.40	-14.68	Peak

NIB Network Interface Configuration, Vertical

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 21 File#: emi.EMI Date: 09-26-2006 Time: 14:25:08



(Audix ATC)

Trace: 20 Ref Trace:

Condition: FCC CLASS-A VERTICAL
Test Operator: : Mengistu Mekuria
Company: : Thomas N. Cokenias RFI/EMI Con.
Project #: : 06U10597
Configuration: : EUT
Mode of Operation: TX/Rx Mode
Model : OEWAKAD19 (NIB-1)

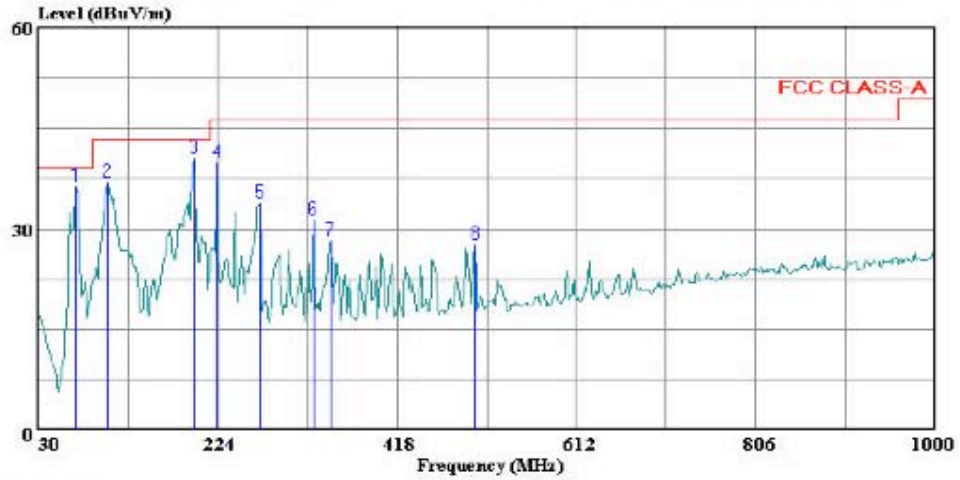
Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	67.830	29.49	9.20	38.69	39.00	-0.31	Peak
2	101.780	27.67	11.77	39.44	43.50	-4.06	Peak
3	135.730	20.82	14.96	35.78	43.50	-7.72	Peak
4	197.810	20.60	14.24	34.84	43.50	-8.66	Peak
5	223.030	18.27	12.72	30.99	46.40	-15.41	Peak
6	322.940	10.96	16.27	27.23	46.40	-19.17	Peak
7	455.830	7.09	19.33	26.42	46.40	-19.98	Peak

NIB Network Interface Configuration, Horizontal

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 19 File#: emi.EMI Date: 09-26-2006 Time: 14:18:23



(Audix ATC)

Trace: 18 Ref Trace:

Condition: FCC CLASS-A HORIZONTAL
Test Operator: : Mengistu Mekuria
Company: : Thomas N. Cokenias RFI/EMI Con.
Project #: : 06U10597
Configuration: : EUT
Mode of Operation: TX/Rx Mode
Model : OEWAKAD19 (NIB-1)

Page: 1

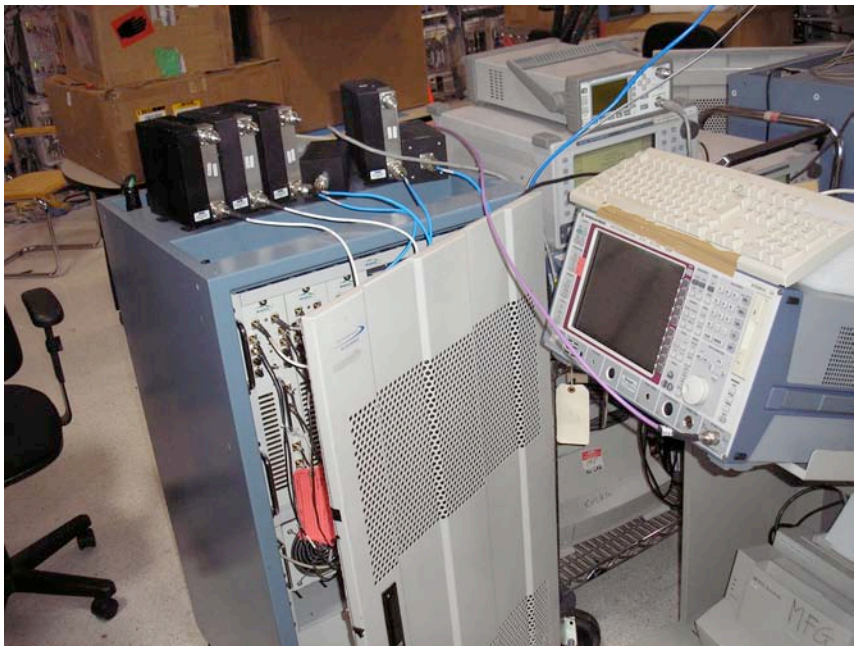
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	70.740	27.02	9.34	36.36	39.00	-2.64	Peak
2	104.690	24.51	12.38	36.89	43.50	-6.61	Peak
3	198.780	26.13	14.37	40.50	43.50	-3.00	Peak
4	223.030	27.06	12.72	39.78	46.40	-6.62	Peak
5	269.590	19.14	14.61	33.75	46.40	-12.65	Peak
6	327.790	14.96	16.35	31.31	46.40	-15.09	Peak
7	346.220	11.31	16.84	28.15	46.40	-18.25	Peak
8	502.390	7.30	20.24	27.54	46.40	-18.86	Peak

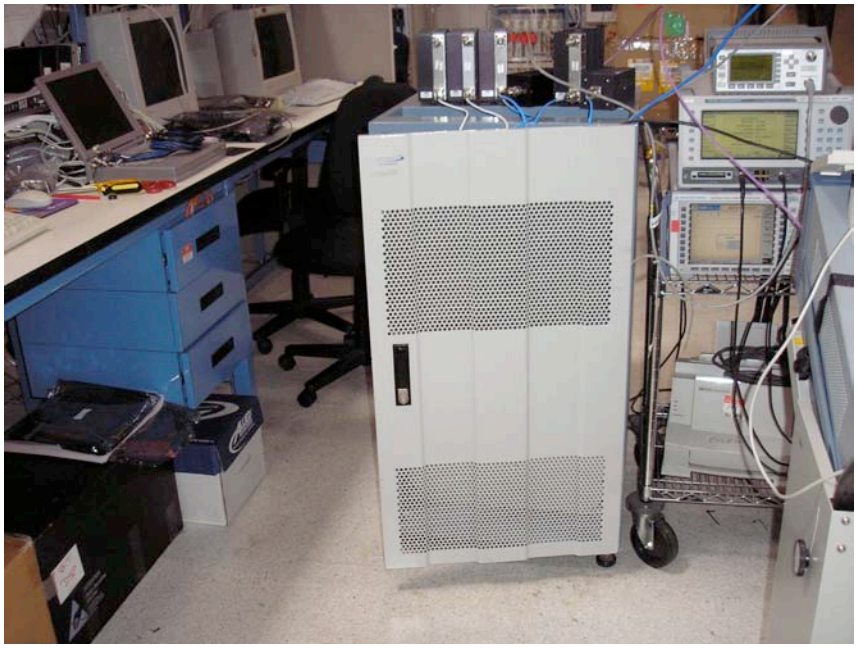
24.52 RF hazards.

Per the requirements of FCC Rule Sections 1.1307 and 1.1310, RF exposure issues will be addressed at time of licensing.

Test Set-up Photographs

Antenna port conducted emissions





Radiated emissions

AC Line Conducted Emissions