APPLICATION FOR FCC CERTIFICATION

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

Samsung Electro-Mechanics
314, Maetan-3Dong, Paldal-Gu, Suwon,
Kyunggi-Do, Korea, 442-743
+82-331-210-6662

Model: PCI Board SWL-2000P

FCC ID: E2XSWL-2000P

August 4, 1999

This report concerns (check one): **Equipment Type**: **PCI Board**	**Original Grant:** X	**Class II Change:**
Deferred grant requested per 47 CFR 0.457 (d) (1) (ii)? **If yes, defer until:**	**Yes:** ____________ ***Date***	**No**: X
Company name agrees to notify the Commission by: ______________(date) of the intended date of announcement of the product so that the grant can be issued on that date.		
Transition Rules Request per 15.37? Yes: **If no, assumed Part 15, subpart B for unintentional radiators - the new 47 CFR [10-1-90 Edition] provision..**	**No:** X	

REPORT PREPARED BY:

EMI Technician:	**Daniel W. Baltzell**
Administrative Writer:	**Melissa Fleming**

Rhein Tech Laboratories, Inc.

Document Number: 990363

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1.0 GENERAL INFORMATION

The following Application for FCC Certification for a Direct Sequence Spread Spectrum transmitter is prepared on behalf of Samsung Electro-Mechanics in accordance with Part 15.247 of the Federal Communications Commissions rules and regulations. The Equipment Under Test (EUT) was the Samsung Electro-Mechanics PCI Board SWL-2000P, FCC ID: E2XSWL-2000P. The test results reported in this document relate only to the item that was tested.

All measurements contained in this Application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instrument. These are explained in the appendix of this report. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

All radiated and conducted emissions measurement were performed manually at Rhein Tech, Incorporated. The radiated emissions measurements required by the rules were performed on the three meter, open field, test range maintained by Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. Complete description and site attenuation measurement data have been placed on file with the Federal Communications Commission. The power line conducted emission measurements were performed in a shielded enclosure also located at the Herndon, Virginia facility. Rhein Tech, Labs, Inc. is on the FCC accepted lab list as a Facility available to do measurement work for others on a contract basis.

1.2 RELATED SUBMITTAL(S)/GRANT(S)

This is an application for an original grant.

1.3 TEST SYSTEM DETAILS

The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

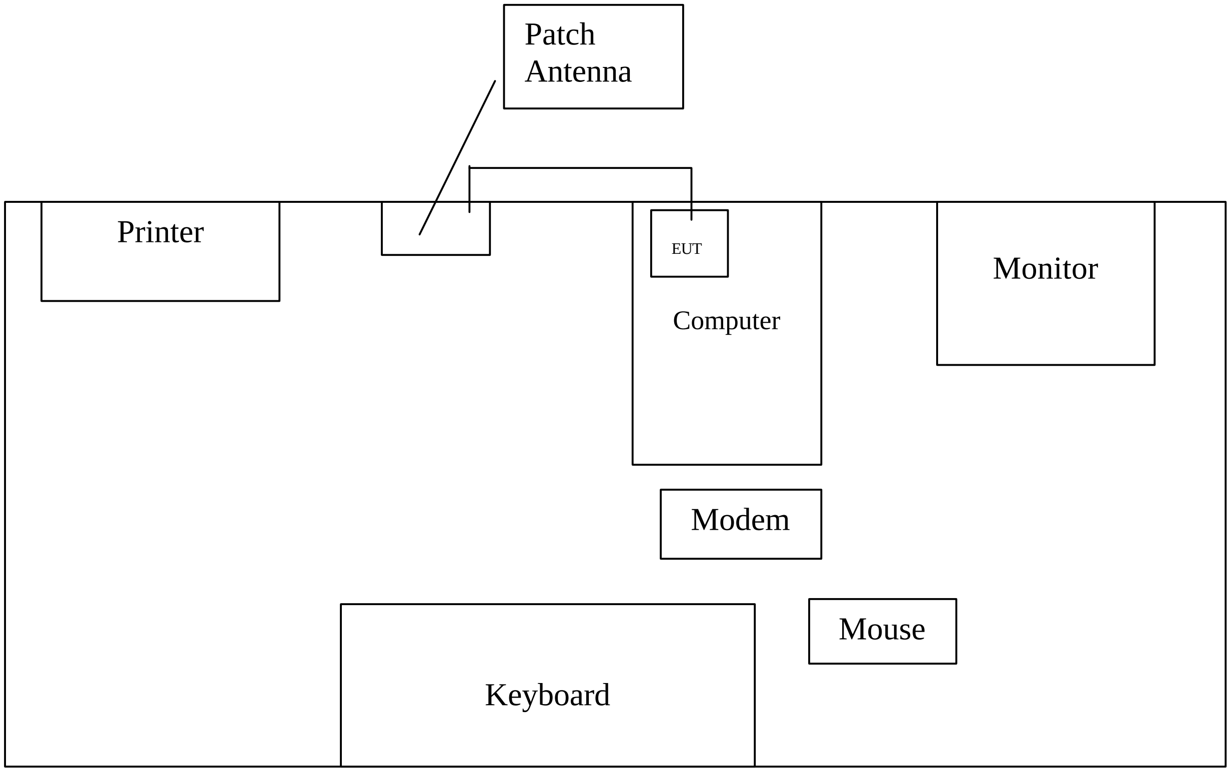
External Components

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
PCI WIRELESS LAN	**SAMSUNG**	**11M PCI WLAN**	**11**	**E2XSWL-2000P**	**UNSHIELDED I/O**	**N/A**
ANTENNA	SAMSUNG	STUB	N/A	SAMPLE	N/A	N/A
ANTENNA	SAMSUNG	PATCH	N/A	SAMPLE	N/A	N/A
TERMINATION	GATEWAY 2000, INC.	USB HIGH/LOW SPEED	N/A	N/A	SHIELDED I/O	006835
AUDIO DEVICE	RADIO SHACK	SCP-63	N/A	N/A	SHIELDED I/O	900699
MICROPHONE	GATEWAY 2000, INC.	MODEM SPEAKERPHONE	N/A	N/A	SHIELDED I/O	010154
SPEAKER	CAMBRIDGE SOUNDWORKS	HUTTON	SBS52	N/A	UNSHIELDED I/O UNSHIELDED POWER	010840
SPEAKER	CAMBRIDGE	SBS52	SW00528412037019	N/A	UNSHIELDED I/O	010683
JOYSTICK	MICROSOFT	SIDEWINDER 3D PRO PLUS	97462-579-0680340-00000	C3KJ3	SHIELDED I/O	009577
MODEM	US ROBOTICS	0413	8390364645141	DOC	SHIELDED I/O UNSHIELDED POWER	900421
MOUSE	PRIMAX	MOSXK	3872B328	SAMPLE	SHIELDED I/O	010441
KEYBOARD	MAXI SWITCH	2196003-XX-XX	03110044	D7J2196003-XX	SHIELDED I/O	006324
PRINTER	HEWLETT PACKARD	C3990A	JPHG006828	DOC	SHIELDED I/O SHIELDED POWER	009905
MONITOR	LG ELECTRONICS	500-069EV (EV500)	15009A662026	BEJCS592	SHIELDED, FERRITE BOTH ENDS I/O UNSHIELDED POWER	009657
SYSTEM	DELL	8BKWW	STB B/C 12326	NA		007038

Internal Components

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
CPU	INTEL	PENTIUM 200MHZ	FV80503200	N/A	N/A	007048
MOTHERBOARD	DELL	00058220-12461-6VC-001S	AA-666244-700	N/A	INTERNAL I/O INTERNAL POWER	007047
VIDEO CARD	STB	S3 VIRGE/GX	210-0262-001	CE	SHIELDED I/O	008223
CD-ROM DRIVE	MITSUMI	CRMC-FX120T	DQF203131	EW4CRMC-FX120T	INTERNAL I/O INTERNAL POWER	007040
POWER SUPPLY	DELL	PS-5201-10	F6260982	N/A	SHIELDED POWER	007039
HARD DRIVE	WESTERN DIGITAL	AC12100-00LC	WM3801254814	N/A	INTERNAL I/O INTERNAL POWER	009743
FLOPPY DRIVE	SONY	MPF920-F	10406524	N/A	INTERNAL I/O INTERNAL POWER	007041

1.4 CONFIGURATION OF TESTED SYSTEM



1.5 TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 1992. Radiated testing was performed at an antenna to EUT distance of 3 meters. Emissions above 1 GHz were video averaged.

1.6 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report dated March 3, 1994, submitted to and approved by the Federal Communication Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

3.0 SYSTEM TEST CONFIGURATION

3.1 JUSTIFICATION

The EUT was tested in all three orthogonal planes in order to determine worst case emission. Channel 1 at 2.411GHz, Channel 6 at 2.437GHz and Channel 11 at 2.462GHz were tested and investigated from 9kHz to 24GHz. All three channels were found to exhibit the same signature. Data was presented for Channel 1, 6, and 11 used for final testing join antenna conducted spurious emissions measurement, radiated spurious noise measurement, and conducted emissions measurement.

To complete the configuration required by the FCC, the transmitter was tested in a mini-tower computer with the patch antenna connected to the antenna port similar to its intended use.

The transmitter antenna connector is a unique reverse-thread and is non-interchangeable.

3.2 EUT EXERCISE SOFTWARE

The EUT was enabled to continuously transmit, which was verified by a receiving unit during testing. The carrier was also checked to verify that the information was being transmitted.

3.3 SPECIAL ACCESSORIES

N/A.

3.4 MODULATED BANDWIDTH

The minimum 6 dB bandwidth per FCC 15.247(a)(2) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The Minimum 6 dB modulated bandwidth are the following:

Channel 1= 10.02 MHz
Channel 6= 10.64 MHz
Channel 11=10.44 MHz

The 6dB bandwidth is listed in figures 3, 4 and 5.

3.5 POWER OUTPUT

The power output per FCC 15.247(b) was measured on the EUT using an HP Peak power meter model number 437B and power sensor HP 8481B. The Peak power measured for modulated output power are the following:

Channel 1=9.1dBm
Channel 6=2.4dBm
Channel 11=-1.4dBm

3.6 ANTENNA CONDUCTED SPURIOUS EMISSIONS

Antenna spurious emission per FCC 15.247(c) was measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The modulated carrier were identified at 2.411GHz for Channel 1, 2.437GHz for Channel 6 and 2.462GHz for Channel 11. No other harmonics or spurs were found within 20 dB of the carrier level, and from 9kHz to the carriers 10th harmonic. See antenna conducted spurious noise plots, figures 9 through 15.

3.7 RADIATED SPURIOUS EMISSIONS

Radiated Spurious Emissions applies to harmonics and spurious emissions that fall in the restricted and non-restricted bands. The restricted bands are listed in Section 15.205. The maximum permitted average field strength for the restricted band is listed in Section 15.209.

Please, refer to section 8 for data test results.

3.8 POWER SPECTRAL DENSITY

The Power spectral density per FCC 15.247(d) was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 3kHz, and the sweep time set at 17 second. The spectral lines were resolved for the modulated carriers at 2.411GHz, 2.437GHz and 2.462GHz with amplitudes of –16.1dBm, -20.8dBm and –24.8dBm, respectively. These levels are well below the +8 dBm limit. See power spectral density plots, figures 4, 11 and 19.

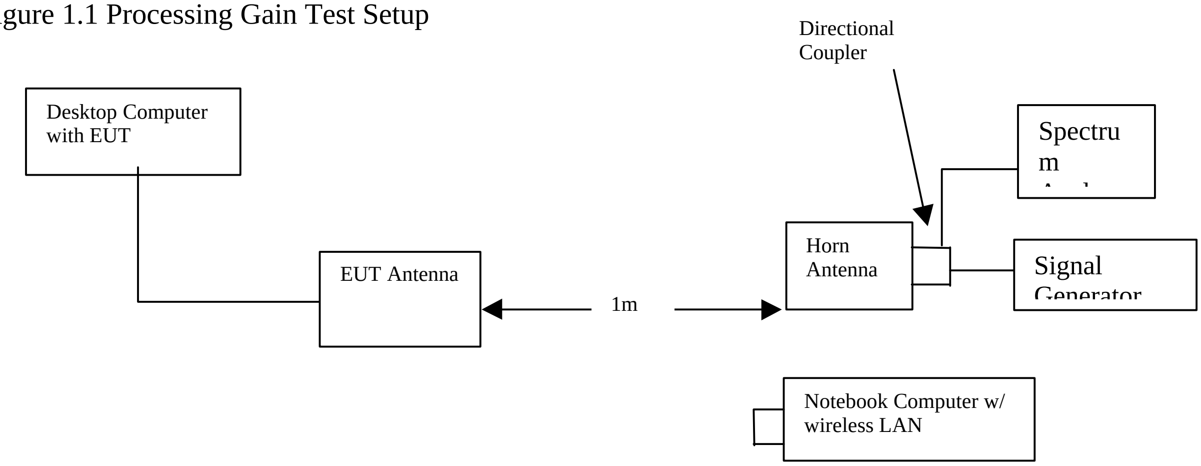
3.9 PROCESSING GAIN:

The Processing Gain was measured using the CW jamming margin method. Figure 1.1 shows the test configuration.

The test consists of stepping a signal generator in 50 kHz increments across the passband of the system. At each frequency, the generator level required to produce the recommended Bit Error Rate (BER) is recorded. This level is the jammer level. The output power of the transmitting unit is measured at the same point. The Jammer to Signal (J/S) ratio is then calculated. The worst 20% of the J/S data points were Discard. The lowest remaining J/S ratio is used when calculating the Processing Gain.

Since the spreading/despreading function of the EUT remains constant at all channels, the measurement was performed at a mid point within the operating band. Implementation losses of the system are limited to 2dB Max as permitted by the FCC guidelines.

Figure 1.1 Processing Gain Test Setup



The Notebook computer was sending data. The desktop computer was receiving information using wireless communications and continuously monitoring the Bit Error Rate. Since a radiated test was performed, the effective radiated peak power from an equivalent isotropic source was calculated using the following equation:

$$\text{Equation \#1:} \quad P=\frac{(Ed)^2}{30}$$

Where: E= measured maximum field strength in V/m using a wide band peak power meter.
G= the numeric gain of the notebook transmitting antenna over isotropic.
D= 3.0 meters is the distance in meters from which the field strength was measured.
P= Power in watts.

(Processing gain (Gp) is thus defined by the following equation:

$Gp=(S/N)_0+Mj+Lsys$

Where $(S/N)_0$=signal/noise ratio=21.64dB

Mj=J/S ration, selected as described = 22dB for the following frequency:

Freq. (GHz)	J Level EIRP	S. EIRP	J/S (dB)
2.43106	.007843	.000566	13.85

Lsys = System losses (dB) with Lsys = 2dB

The signal to noise ratio, $(S/N)_0$, is related to the receivers bit error rate. Although the precise relationship will vary with the demodulation scheme used, for an ideal non-coherent receiver, the probability of error (bit error rate) is related to $(S/N)_0$ by:

Probability of bit error = .5 x e(-5 x $(S/N)_0$

Conclusion: Processing gain = 37.49 dB

See processing gain plot at 2.43106 GHz

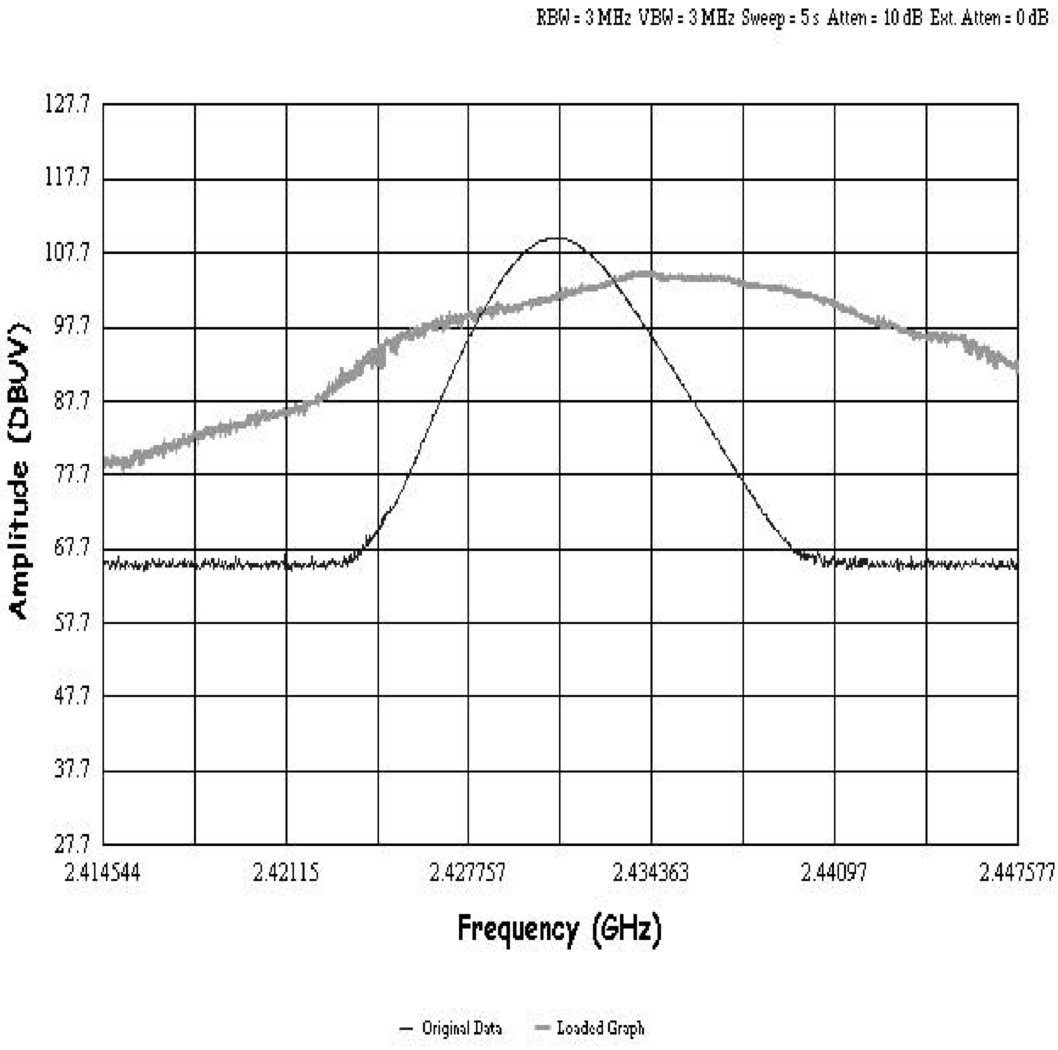


FIGURE 2: Processing Gain Plot

3.10 Compliance with the restricted band edge 2.4850 to 2.5000 GHz

Compliance with the restricted band edge 2.4850 to 2.5000 GHz.

The conducted carrier power was measured at –10.3dBm for channel 11, at 2.4618 GHz by setting the resolution/video bandwidth to 100kHz/300kHz. The highest spurious emission within 2.4835 GHz and 2.5000 GHz was measured –52.1dBm at 2.4836 GHz. The difference between the two measurements was subtracted from the radiated 3 meter field strength of the carrier at channel 11. The emission was in the restricted band at 2.4836 GHz = 90.8dBuV/m – 41.8dB=49.0dBuV/m.

3.12 CONFORMANCE STATEMENT

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. No modifications were made during testing to the equipment in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to or exclusions from the ANSI C63.4 test methodology.

Typed/Printed Name: Desmond A. Fraser
Signature

Date: August 4, 1999
Position: President, (NVLAP Signatory)

Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 20061-0.

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

6.0 Conducted Field Strength Calculation, and Radiated Test Methodology

6.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FI(dBuV/m) = SAR(dBuV) + SCF(dB/m)$$

FI = Field Intensity
SAR = Spectrum Analyzer Reading
SCF = Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

$$SCF(dB/m) = -PG(dB) + AF(dB/m) + CL(dB)$$

SCF = Site Correction Factor
PG = Pre-amplifier Gain
AF = Antenna Factor
CL = Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(uV/m) = 10^{FI(dBuV/m)/20}$$

For example, assume a signal at a frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is -11.5 dB/m. The actual radiated field strength is calculated as follows:

$$49.3 \text{ dBuV} - 11.5 \text{ dB/m} = 37.8 \text{ dBuV/m}$$

$$10^{37.8/20} = 10^{1.89} = 77.6 \text{ uV/m}$$

6.2 Radiated measurement

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one meter and three meter distances if necessary in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three-meter, open-field test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to 10GHz MHz (10^{th} harmonic of carrier frequency) using a Hewlett Packard 8566B spectrum analyzer, a Hewlett Packard 85650A quasi-peak adapter, HP11790 mixers, and EMCO log periodic, EMCO horn antennas and biconical antenna. In order to gain sensitivity, a cougar preamplifier (from 30 to 2GHZ), and an HP preamplifier (from 1GHz to 26.5 GHz) was connected in series between the antenna and the input of the spectrum analyzer.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The spectrum analyzer's 6 dB resolution bandwidth was set to 120 kHz for measurements below 1GHz, and 1MHz for measurements above 1GHz. The analyzer was operated in peak detection mode below 1GHz and in the peak mode with 10Hz video averaging above 1 GHz. No video filter less than 10 times the resolution bandwidth was used when measuring below 1GHz. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as daily calibration methods, technician training, and emphasis to employees on avoiding error.

7.0 CONDUCTED EMISSION DATA

The following table lists worst case conducted emission date. Specifically: Emission Frequency, Test Detector, Analyzer Reading, Site Correction Factor, corrected Emission Level, Quasi Peak Limit and Margin, and the Average Limit and Margin.

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and HOT SIDE, herein referred to as L1 and L2, respectively.

TABLE 1: CONDUCTED EMISSIONS (CHANNEL 1 WITH THE STUB ANTENNA)

NEUTRAL SIDE (Line 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.545	Pk	31.3	0.5	31.8	48.0	-16.2
7.930	Pk	32.1	1.9	34.0	48.0	-14.0
7.999	Pk	31.9	1.9	33.8	48.0	-14.2
8.203	Pk	31.9	1.9	33.8	48.0	-14.2
16.728	Pk	29.8	3.1	32.9	48.0	-15.1
25.106	Pk	33.4	3.2	36.6	48.0	-11.4

HOT SIDE (Line 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.544	Pk	30.1	0.5	30.6	48.0	-17.4
7.998	Pk	35.2	2.0	37.2	48.0	-10.8
8.138	Pk	35.4	2.0	37.4	48.0	-10.6
8.209	Pk	35.4	2.0	37.4	48.0	-10.6
16.733	Pk	30.7	3.0	33.7	48.0	-14.3
25.088	Pk	32.8	3.0	35.8	48.0	-12.2

(1)Pk = Peak; QP = Quasi-Peak; Av = Average

<u>TEST PERSONNEL:</u>

Typed/Printed Name: Daniel W. Baltzell **Date:** July 31, 1999

Signature:

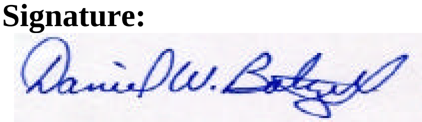


TABLE 2: CONDUCTED EMISSIONS (CHANNEL 6 WITH THE STUB ANTENNA)

NEUTRAL SIDE (Line 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.523	Pk	29.8	0.5	30.3	48.0	-17.7
7.995	Pk	32.1	1.9	34.0	48.0	-14.0
8.133	Pk	32.3	1.9	34.2	48.0	-13.8
8.197	Pk	32.4	1.9	34.3	48.0	-13.7
16.728	Pk	29.9	3.1	33.0	48.0	-15.0
25.092	Pk	33.7	3.2	36.9	48.0	-11.1

HOT SIDE (Line 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.527	Pk	29.5	0.5	30.0	48.0	-18.0
7.997	Pk	35.6	2.0	37.6	48.0	-10.4
8.131	Pk	35.4	2.0	37.4	48.0	-10.6
8.197	Pk	35.5	2.0	37.5	48.0	-10.5
16.728	Pk	31.3	3.0	34.3	48.0	-13.7
25.094	Pk	33.1	3.0	36.1	48.0	-11.9

[(1)]Pk = Peak; QP = Quasi-Peak; Av = Average

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell **Date:** July 31, 1999

Signature:

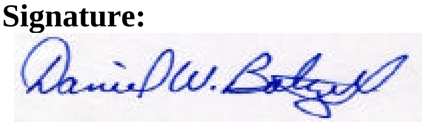


TABLE 3: CONDUCTED EMISSIONS (CHANNEL 11 WITH THE STUB ANTENNA)

NEUTRAL SIDE (Line 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.527	Pk	29.9	0.5	30.4	48.0	-17.6
7.993	Pk	32.0	1.9	33.9	48.0	-14.1
8.129	Pk	32.1	1.9	34.0	48.0	-14.0
8.199	Pk	32.3	1.9	34.2	48.0	-13.8
16.732	Pk	30.1	3.1	33.2	48.0	-14.8
25.089	Pk	34.1	3.2	37.3	48.0	-10.7

HOT SIDE (Line 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.537	Pk	30.0	0.5	30.5	48.0	-17.5
7.997	Pk	35.2	2.0	37.2	48.0	-10.8
8.065	Pk	35.3	2.0	37.3	48.0	-10.7
8.204	Pk	35.3	2.0	37.3	48.0	-10.7
16.724	Pk	31.0	3.0	34.0	48.0	-14.0
25.089	Pk	33.7	3.0	36.7	48.0	-11.3

(1)Pk = Peak; QP = Quasi-Peak; Av = Average

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell **Date:** July 31, 1999

Signature:

TABLE 4: CONDUCTED EMISSIONS (CHANNEL 1 WITH THE PATCH ANTENNA)

NEUTRAL SIDE (Line 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.537	Pk	31.1	0.5	31.6	48.0	-16.4
7.993	Pk	32.5	1.9	34.4	48.0	-13.6
8.059	Pk	32.2	1.9	34.1	48.0	-13.9
8.197	Pk	31.9	1.9	33.8	48.0	-14.2
16.727	Pk	29.3	3.1	32.4	48.0	-15.6
25.090	Pk	32.9	3.2	36.1	48.0	-11.9

HOT SIDE (Line 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.542	Pk	29.5	0.5	30.0	48.0	-18.0
7.925	Pk	35.1	2.0	37.1	48.0	-10.9
7.993	Pk	35.4	2.0	37.4	48.0	-10.6
8.195	Pk	35.2	2.0	37.2	48.0	-10.8
16.732	Pk	29.8	3.0	32.8	48.0	-15.2
25.090	Pk	32.2	3.0	35.2	48.0	-12.8

(1)Pk = Peak; QP = Quasi-Peak; Av = Average

<u>TEST PERSONNEL:</u>

Typed/Printed Name: Daniel W. Baltzell **Date:** July 31, 1999

Signature:

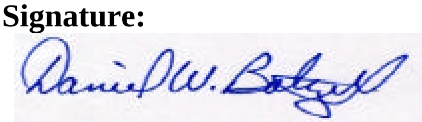


TABLE 5: CONDUCTED EMISSIONS (CHANNEL 6 WITH THE PATCH ANTENNA)

NEUTRAL SIDE (Line 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.539	Pk	30.4	0.5	30.9	48.0	-17.1
8.130	Pk	32.8	1.9	34.7	48.0	-13.3
8.200	Pk	31.7	1.9	33.6	48.0	-14.4
8.334	Pk	32.1	1.9	34.0	48.0	-14.0
16.725	Pk	29.3	3.1	32.4	48.0	-15.6
25.081	Pk	32.9	3.2	36.1	48.0	-11.9

HOT SIDE (Line 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.537	Pk	29.7	0.5	30.2	48.0	-17.8
7.924	Pk	35.2	2.0	37.2	48.0	-10.8
7.996	Pk	34.8	2.0	36.8	48.0	-11.2
8.132	Pk	35.2	2.0	37.2	48.0	-10.8
16.727	Pk	30.2	3.0	33.2	48.0	-14.8
25.091	Pk	32.6	3.0	35.6	48.0	-12.4

[1]Pk = Peak; QP = Quasi-Peak; Av = Average

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell **Date:** July 31, 1999

Signature:

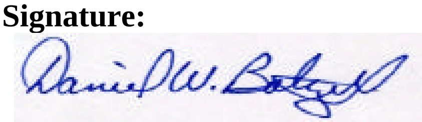


TABLE 7: CONDUCTED EMISSIONS (CHANNEL 11 WITH THE PATCH ANTENNA)

NEUTRAL SIDE (Line 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.537	Pk	30.4	0.5	30.9	48.0	-17.1
7.927	Pk	32.2	1.9	34.1	48.0	-13.9
7.991	Pk	32.0	1.9	33.9	48.0	-14.1
8.059	Pk	31.9	1.9	33.8	48.0	-14.2
16.711	Pk	29.4	3.1	32.5	48.0	-15.5
25.085	Pk	33.0	3.2	36.2	48.0	-11.8

HOT SIDE (Line 2)

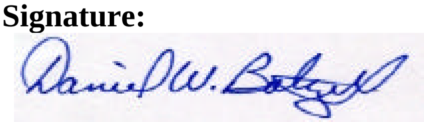
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)
0.539	Pk	29.4	0.5	29.9	48.0	-18.1
7.995	Pk	35.3	2.0	37.3	48.0	-10.7
8.129	Pk	35.4	2.0	37.4	48.0	-10.6
8.199	Pk	35.3	2.0	37.3	48.0	-10.7
16.721	Pk	30.1	3.0	33.1	48.0	-14.9
25.080	Pk	32.8	3.0	35.8	48.0	-12.2

[(1)]Pk = Peak; QP = Quasi-Peak; Av = Average

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell **Date:** July 31, 1999

Signature:



8.0 RADIATED EMISSION DATA

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit. Explanation of the Correction Factor is given in paragraph 6.3.

TABLE 8: RADIATED EMISSIONS (CHANNEL 1 WITH THE STUB ANTENNA)

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV/m)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
132.000	Qp	V	90	1.0	43.6	-18.2	25.4	43.5	-18.1	Pass	
220.000	Qp	V	90	1.0	42.4	-17.8	24.6	46.0	-21.4	Pass	
308.000	Qp	V	310	1.0	41.3	-14.0	27.3	46.0	-18.7	Pass	
484.000	Qp	V	125	1.8	52.7	-9.0	43.7	46.0	-2.3	Pass	
572.000	Qp	V	250	1.4	43.7	-6.7	37.0	46.0	-9.0	Pass	
660.000	Qp	V	110	1.2	57.2	-6.3	50.9	73.8	-22.9	Pass	
748.000	Qp	V	140	1.0	52.0	-4.8	47.2	73.8	-26.6	Pass	
836.000	Qp	V	120	1.0	43.2	-4.3	38.9	46.0	-7.1	Pass	
924.000	Qp	H	115	1.0	36.9	-3.5	33.4	46.0	-12.6	Pass	
2038.000	Av	V	150	1.6	47.0	-3.0	44.0	73.8	-29.8	Pass	
2412.328	Av	V	150	1.1	94.6	-0.8	93.8				Fundamental
2569.004	Av	V	165	1.1	50.8	1.9	52.7	73.8	-21.1	Pass	
2580.007	Av	V	170	1.1	56.5	2.1	58.6	73.8	-15.2	Pass	
2591.002	Av	V	167	1.1	48.5	2.2	50.7	73.8	-23.1	Pass	
2791.991	Av	V	163	1.1	34.6	2.1	36.7	54.0	-17.3	Pass	
4076.008	Av	V	150	1.1	41.7	-4.2	37.5	54.0	-16.5	Pass	
6114.002	Av	V	140	1.2	32.5	-1.9	30.6	73.8	-43.2	Pass	
8152.008	Av	V	145	1.2	32.9	2.6	35.5	54.0	-18.5	Pass	

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell Date**:** July 31, 1999

Signature**:**

TABLE 9: RADIATED EMISSIONS (CHANNEL 6 WITH THE STUB ANTENNA)

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV/m)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
132.000	Qp	V	95	1.0	44.1	-18.2	25.9	43.5	-17.6	Pass	
220.000	Qp	V	100	1.0	43.0	-17.8	25.2	46.0	-20.8	Pass	
308.000	Qp	H	340	1.0	41.2	-13.9	27.3	46.0	-18.7	Pass	
484.000	Qp	H	125	1.8	52.5	-8.3	44.2	46.0	-1.8	Pass	
572.000	Qp	H	220	1.4	43.0	-6.4	36.6	46.0	-9.4	Pass	
660.000	Qp	H	115	1.2	57.2	-6.2	51.0	79.4	-28.4	Pass	
748.000	Qp	H	130	1.0	51.9	-4.8	47.1	79.4	-32.3	Pass	
836.000	Qp	H	130	1.0	44.1	-4.1	40.0	46.0	-6.0	Pass	
924.000	Qp	H	130	1.0	36.1	-3.5	32.6	46.0	-13.4	Pass	
2062.998	Av	V	160	1.1	49.1	-3.0	46.1	79.4	-33.3	Pass	
2435.415	Av	V	150	1.1	99.8	-0.4	99.4				Fundamental
2619.002	Av	V	167	1.1	41.9	2.3	44.2	79.4	-35.2	Pass	
2630.003	Av	V	160	1.1	50.5	2.3	52.8	79.4	-26.6	Pass	
2641.001	Av	V	165	1.1	44.1	2.3	46.4	79.4	-33.0	Pass	
2791.987	Av	V	163	1.2	34.5	2.1	36.6	54.0	-17.4	Pass	
4126.003	Av	V	130	1.2	44.5	-4.0	40.5	54.0	-13.5	Pass	
4871.247	Av	V	177	1.5	30.5	-3.5	27.0	54.0	-27.0	Pass	
6189.003	Av	V	180	1.8	30.8	-2.3	28.5	79.4	-50.9	Pass	
8252.012	Av	V	160	1.2	26.2	4.1	30.3	54.0	-23.7	Pass	

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell Date: July 31, 1999

Signature:

TABLE 10: RADIATED EMISSIONS (CHANNEL 11 WITH THE STUB ANTENNA)

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV/m)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
132.000	Qp	V	90	1.0	43.2	-18.2	25.0	43.5	-18.5	Pass	
220.000	Qp	V	95	1.0	41.9	-17.8	24.1	46.0	-21.9	Pass	
308.000	Qp	H	350	1.0	40.9	-13.9	27.0	46.0	-19.0	Pass	
484.000	Qp	H	140	2.0	52.7	-8.3	44.4	46.0	-1.6	Pass	
572.000	Qp	H	240	1.4	44.1	-6.4	37.7	46.0	-8.3	Pass	
660.000	Qp	H	110	1.2	57.4	-6.2	51.2	70.8	-19.6	Pass	
748.000	Qp	H	110	1.0	51.6	-4.8	46.8	70.8	-24.0	Pass	
748.000	Qp	V	350	1.0	47.6	-4.8	42.8	46.0	-3.2	Pass	
836.000	Qp	H	130	1.0	44.0	-4.1	39.9	46.0	-6.1	Pass	
924.000	Qp	H	130	1.0	35.9	-3.5	32.4	46.0	-13.6	Pass	
2087.999	Av	V	155	1.6	49.8	-2.8	47.0	70.8	-23.8	Pass	
2460.476	Av	V	155	1.1	90.8	0.0	90.8				Fundamental
2669.002	Av	V	170	1.5	41.0	2.3	43.3	54.0	-10.7	Pass	
2680.001	Av	V	177	1.3	49.5	2.3	51.8	54.0	-2.2	Pass	
2691.000	Av	V	147	1.5	41.9	2.3	44.2	54.0	-9.8	Pass	
2791.987	Av	V	165	1.2	34.5	2.1	36.6	54.0	-17.4	Pass	
4176.003	Av	H	140	1.5	50.4	-3.9	46.5	54.0	-7.5	Pass	
6264.007	Av	V	155	1.1	30.1	-1.9	28.2	70.8	-42.6	Pass	
8352.012	Av	V	135	1.1	25.6	4.7	30.3	54.0	-23.7	Pass	
10440.014	Av	V	155	1.2	23.1	4.0	27.1	70.8	-43.7	Pass	
12528.014	Av	V	200	1.0	13.5	8.4	21.9	54.0	-32.1	Pass	

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell   Date: July 31, 1999

Signature:

TABLE 11: RADIATED EMISSIONS (CHANNEL 1 WITH THE PATCH ANTENNA)

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV/m)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
44.000	Qp	H	225	4.0	45.7	-18.0	27.7	46	-18.3	Pass	
132.000	Qp	V	110	1.0	52.9	-15.5	37.4	46	-8.6	Pass	
220.000	Qp	V	120	1.0	50.2	-17.5	32.7	46	-13.3	Pass	
308.000	Qp	H	170	2.2	43.3	-13.9	29.4	46	-16.6	Pass	
396.000	Qp	H	170	2.0	44.6	-11.4	33.2	46	-12.8	Pass	
484.000	Qp	H	184	1.0	55.9	-8.3	47.6	67.9	-20.3	Pass	
572.000	Qp	H	185	2.0	42.8	-6.4	36.4	46	-9.6	Pass	
660.000	Qp	V	120	1.0	45.0	-5.8	39.2	46	-6.8	Pass	
748.000	Qp	V	130	1.0	44.4	-4.3	40.1	46	-5.9	Pass	
836.000	Qp	V	100	1.0	42.8	-3.6	39.2	46	-6.8	Pass	
880.000	Qp	V	120	1.0	36.5	-3.5	33	46	-13	Pass	
913.000	Qp	V	100	1.0	31.8	-4.0	27.8	46	-18.2	Pass	
924.000	Qp	V	95	1.0	39.1	-3.6	35.5	46	-10.5	Pass	
2038.003	Av	V	145	1.6	40.9	-3.2	37.7	67.9	-30.2	Pass	
2413.310	Av	V	125	1.0	88.7	-0.8	87.9				Fundamental
2568.997	Av	V	115	1.4	44.0	1.9	45.9	67.9	-22	Pass	
2580.002	Av	V	115	1.4	50.1	2.1	52.2	67.9	-15.7	Pass	
2591.005	Av	V	115	1.4	40.7	2.2	42.9	67.9	-25	Pass	
2791.982	Av	V	115	1.2	38.4	2.1	40.5	54.0	-13.5	Pass	
4175.998	Av	H	135	1.0	49.4	-3.9	45.5	54.0	-8.5	Pass	
4825.780	Av	V	135	1.3	42.9	-3.6	39.3	54.0	-14.7	Pass	
6264.004	Av	V	180	1.3	29.6	-1.9	27.7	67.9	-40.2	Pass	

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell Date**:** July 31, 1999

Signature**:**

TABLE 12: RADIATED EMISSIONS (CHANNEL 6 WITH THE PATCH ANTENNA)

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV/m)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
44.000	Qp	H	225	4.0	45.7	-18.0	27.7	40.0	-12.3	Pass	
132.000	Qp	V	150	1.0	52.9	-18.2	34.7	43.5	-8.8	Pass	
220.000	Qp	V	150	1.0	50.0	-17.8	32.2	46.0	-13.8	Pass	
308.000	Qp	H	170	2.4	43.3	-13.9	29.4	46.0	-16.6	Pass	
396.000	Qp	H	165	2.0	44.5	-11.4	33.1	46.0	-12.9	Pass	
484.000	Qp	H	180	1.0	55.8	-8.3	47.5	74.3	-26.8	Pass	
572.000	Qp	H	185	2.0	43.6	-6.4	37.2	46.0	-8.8	Pass	
660.000	Qp	V	100	1.0	44.4	-6.3	38.1	46.0	-7.9	Pass	
748.000	Qp	V	130	1.6	47.2	-4.8	42.4	46.0	-3.6	Pass	
836.000	Qp	V	120	1.4	45.0	-4.3	40.7	46.0	-5.3	Pass	
880.000	Qp	V	105	1.0	36.5	-3.2	33.3	46.0	-12.7	Pass	
913.000	Qp	V	110	1.0	32.1	-3.2	28.9	46.0	-17.1	Pass	
924.000	Qp	V	100	1.0	39.1	-2.9	36.2	46.0	-9.8	Pass	
2063.001	Av	V	145	1.6	40.9	-3.0	37.9	74.3	-36.4	Pass	
2435.500	Av	V	125	1.0	94.7	-0.4	94.3				Fundamental
2618.998	Av	V	115	1.1	32.3	2.4	29.9	74.3	-44.4	Pass	
2630.003	Av	V	120	1.3	43.6	2.4	41.2	74.3	-33.1	Pass	
2640.998	Av	V	135	1.2	38.5	2.3	36.2	74.3	-38.1	Pass	
2792.000	Av	V	165	1.1	38.5	2.1	36.4	54.0	-17.6	Pass	
4126.004	Av	V	125	1.2	42.5	-4.0	38.5	54.0	-15.5	Pass	
4872.065	Av	V	125	1.0	54.1	-3.5	50.6	54.0	-3.4	Pass	
6189.011	Av	V	175	1.6	29.2	-2.3	26.9	74.3	-47.4	Pass	

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell Date: July 31, 1999

Signature:

TABLE 13: RADIATED EMISSIONS (CHANNEL 11 WITH THE PATCH ANTENNA)

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV/m)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
44.000	Qp	H	225	4.0	45.4	-18.0	27.4	40.0	-12.6	Pass	
132.000	Qp	V	130	1.0	53.8	-18.2	35.6	43.5	-7.9	Pass	
220.000	Qp	V	140	1.0	50.0	-17.8	32.2	46.0	-13.8	Pass	
308.000	Qp	H	165	2.4	43.1	-13.9	29.2	46.0	-16.8	Pass	
396.000	Qp	H	170	2.0	43.8	-11.4	32.4	46.0	-13.6	Pass	
484.000	Qp	H	180	1.0	56.4	-8.3	48.1	66.3	-18.2	Pass	
572.000	Qp	H	190	2.0	42.6	-6.4	36.2	46.0	-9.8	Pass	
660.000	Qp	V	120	1.0	44.2	-6.3	37.9	46.0	-8.1	Pass	
748.000	Qp	V	130	1.6	47.5	-4.8	42.7	46.0	-3.3	Pass	
836.000	Qp	V	130	1.4	45.3	-4.3	41.0	46.0	-5.0	Pass	
880.000	Qp	V	130	1.2	36.0	-3.2	32.8	46.0	-13.2	Pass	
913.000	Qp	V	120	1.2	31.3	-3.2	28.1	46.0	-17.9	Pass	
924.000	Qp	V	105	1.2	38.2	-2.9	35.3	46.0	-10.7	Pass	
2087.999	Av	V	145	1.8	47.9	-2.8	45.1	66.3	-21.2	Pass	
2460.670	Av	V	125	1.0	86.3	0.0	86.3				fundamental
2669.002	Av	V	110	1.1	34.1	2.3	36.4	54.0	-17.6	Pass	
2679.999	Av	V	105	1.1	42.4	2.3	44.7	54.0	-9.3	Pass	
2690.998	Av	V	110	1.1	34.2	2.3	36.5	54.0	-17.5	Pass	
2791.992	Av	V	165	1.5	38.4	2.1	40.5	54.0	-13.5	Pass	
4176.004	Av	V	140	1.2	47.9	-3.9	44.0	54.0	-10.0	Pass	
4922.070	Av	V	130	1.2	34.6	-3.5	31.1	54.0	-22.9	Pass	
6264.000	Av	V	140	1.2	29.0	-1.9	27.1	66.3	-39.2	Pass	

TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell Date: July 31, 1999

Signature:

APPENDIX A: Emissions Equipment List

DESCRIPTION	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. LAB
Amplifier	Hewlett Packard	11975A	2304A00348	TEST EQUITY
Amplifier (s/a 1)	Rhein Tech	PR-1040	00001	RTL
Amplifier (s/a 2)	Rhein Tech	RTL2	900723	RTL
Amplifier (s/a 3)	Rhein Tech	8447F	2944A03783	RTL
Amplifier (s/a 4)	Rhein Tech	8447D	2727A05397	RTL
Biconical/Log Antenna 1	Antenna Research	LPB-2520	1037	LIBERTY LABS
Biconical/Log Antenna 2	Antenna Research	LPB-2520	1036	LIBERTY LABS
Field Site Source	EMCO	4610	9604-1313	RTL
Filter (Room 1)	Solar	8130	947305	RTL
Filter (Room 2)	Solar	8130	947306	RTL
Harmonic Mixer 1	Hewlett Packard	11970K	2332A00563	TELOGY
Harmonic Mixer 2	Hewlett Packard	11970A	2332A01199	TELOGY
Horn Antenna 1	EMCO	3160-10	9606-1033	EMCO
Horn Antenna 2	EMCO	3160-9	9605-1051	EMCO
Horn Antenna 3	EMCO	3160-7	9605-1054	EMCO
Horn Antenna 4	EMCO	3160-8	9605-1044	EMCO
Horn Antenna 5	EMCO	3160-03	9508-1024	EMCO
LISN (Room 1/L1)	Solar	7225-1	900727	ACUCAL
LISN (Room 1/L2)	Solar	7225-1	900726	ACUCAL
LISN (Room 2/L1)	Solar	7225-1	900078	ACUCAL
LISN (Room 2/L2)	Solar	7225-1	900077	ACUCAL
Pre-Amplifier	Hewlett Packard	8449B OPT	3008A00505	TELOGY
Quasi-Peak Adapter (S/A 1)	Hewlett Packard	85650A	3145A01599	ACUCAL
Quasi-Peak Adapter (S/A 2)	Hewlett Packard	85650A	2811A01276	ACUCAL
Quasi-Peak Adapter (S/A 3)	Hewlett Packard	85650A	2521A00473	ACUCAL
Quasi-Peak Adapter (S/A 4)	Hewlett Packard	85650A	2521A01032	ACUCAL
RF Preselector (S/A 1)	Hewlett Packard	85685A	3146A01309	ACUCAL
Signal Generator (HP)	Hewlett Packard	8660C	1947A02956	ACUCAL
Signal Generator (Wavetek)	Wavetek	3510B	4952044	ACUCAL
Spectrum Analyzer 1	Hewlett Packard	8566B	3138A07771	ACUCAL
Spectrum Analyzer 2	Hewlett Packard	8567A	2841A00614	ACUCAL
Spectrum Analyzer 4	Hewlett Packard	8567A	2727A00535	ACUCAL
Tunable Dipole	EMCO	3121	274	LIBERTY LABS
Antenna	ATM	WR08	08443-6	ATM
Mixer	Oleson	M08HW	F80814-1	Oleson
Mixer	Oleson	M05HW	G80814-1	Oleson
Diplexer	Oleson	M05HW	G80814-1	Oleson
Mixer	Hewlett Packard	11970U	2332A01110	ACUCAL
Mixer	Hewlett Packard	11970V	2521A00512	Telogy
Mixer	Hewlett Packard	11970W	2521A00710	Telogy
Antenna	ATM	WR15	15-443-6	ATM
Antenna	ATM	WR10	10-443-6	ATM
Antenna	ATM	WR05	05-443-6	ATM
Sweep Generator	Hewlett Packard	83752A	3610A00866	Hewlett Packard

Calibration Certification available upon request.

APPENDIX B:

USER'S MANUAL