September 25, 2000

Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Attention: Applications Examiner

Applicant: Kyocera Corporation
2-1-1 Kagahara, Tsuzuki-ku,
Yokohama-shi 224 Japan

Equipment: WLL Single Line Subscriber Unit (SLSU), KWS-2000SL
FCC ID: JOYKWS2000S

Specification: for a 47 CFR 24 Licensed Certification

Dear Examiner:

The following application for Grant of Equipment Authorization is presented on behalf of Kyocera Corporation. for the Licensed Certification of their Model: KWS-2000SL.

Enclosed, please find a complete data and documentation package demonstrating that this device complies with the technical requirements of 47 CFR 24.

If you have any questions, please contact the undersigned, who is authorized to act as Agent.

Sincerely,

Chris Harvey, Director
EMC Laboratory
MET Laboratories, Inc.

MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*

914 WEST PATAPSCO AVENUE ! BALTIMORE, MARYLAND 21230-3432 ! PHONE (410) 354-3300 ! FAX (410) 354-3313

ENGINEERING TEST REPORT

in support of the
Application for Grant of Equipment Authorization

EQUIPMENT:	WLL Single Line Subscriber Unit KWS-2000SL
FCC ID:	JOYKWS2000S
Specification:	47 CFR 24
On Behalf of the Applicant:	Kyocera Corporation 2-1-1, Kagahara, Tsuzuki-ku Yokohama-shi 224 Japan
Manufacturer:	Kyocera Corporation 2-1-1, Kagahara, Tsuzuki-ku Yokohama-shi 224 Japan
Manufacturer's Representative	Mr.Nobuyuki hayashida
Test Date(s):	August 14-25, 2000

ENGINEERING STATEMENT

I ATTEST: the measurements shown in this report were made in accordance with the procedures indicated, and that the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements. On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 24 of the FCC Rules under normal use and maintenance.

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Liming Xu
Project Engineer, MET Laboratories

1.0 INTRODUCTION

The following data is presented on behalf of the Applicant, Kyocera Corporation, as verification of the compliance of the Kyocera KWS-2000SL to the requirements of 47 CFR 24.

2.0 TEST SITE

All testing was conducted at AKZO KASHIMA MATSUDA Site. The radiated emissions measurements were performed on a three-meter open area test site (OATS). A complete site description is on file with the FCC Laboratory Division as 31040/SIT/AKZO and also on file with the NVLAP No. 100290-4.

3.0 TEST EQUIPMENT USED

Manufacturer	**Equipment**	**Calibration Due Date @ time of testing**	**Cal. Interval**
Hewlett Packard	8563E Spectrum Analyzer	04/04/01	annual
HP	Pre-Amp 8449B	4/21/01	annual
A.R.A.	BB Antenna LPB-2513/A	05/15/01	annual
EMCO	Double Ridge Guided Horn	04/05/01	annual
SUHNER	3dB Attenuator 6803.17.B	01/14/01	annual
ADVANTEST	R3271A Spectrum Analyzer	01/31/02	annual
ADVANTEST	R5363 Frequency Counter	09/30/01	annual

4.0 EQUIPMENT UNDER TEST CONFIGURATION

The WLL Single Line Subscriber Unit (SLSU) was configured with AC power supply modules and an external PC to program the EUT to output a PHS RF signal. The EUT with host external computer was configured for maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission.

5.0 TEST TYPE(S)

5.1 Radiated Emissions: 47 CFR2.1053, , 24.238(a)
5.2 Occupied Bandwidth: 47 CFR2.1049
5.3 RF Power Output: 47 CFR 2.1046, 24.232(a), (c)
5.4 Spurious Emission at Antenna Terminals: 47 CFR 2.1051, 24.238(a)
5.5 Spurious Emission at Antenna Terminals at Frequency Block edges +/- 1 MHz, 47 CFR 2.1051, 24.238(b)
5.6 Frequency Stability over temperature variations: 47 CFR 2.1055(a)(1)
5.7 Frequency Stability over variations in supply voltage: 47 CFR 2.1055(d)(1)
5.8 AC Line Conducted Emissions: 47 CFR 15.107
5.9 Modulation Characteristics: 47 CFR 2.1047(a)

6.0 TEST RESULTS

6.1 TEST TYPE: Radiated Emissions

6.1.1 TECHNICAL SPECIFICATION: 2.1053; 24.238(a)

6.1.2 TEST DATE(S): 8/21/00

6.1.3 MEASUREMENT PROCEDURES:

As required by §2.1053, *field strength of spurious radiation measurements* were made in accordance with the general procedures of ANSI C63.4-1992 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". Preliminary radiated emission measurements were performed inside a shielded chamber with all digital signal generators on and terminated. The frequency list from the preliminary measurements was used as a guide for making final measurements on a 3 meter open area test site. The unit was scanned over the frequency range of the system operation frequency to 20 GHz. The Radiated Spurious Emissions *Limit* is obtained by the following:
Based on an output power (as measured at the output of the Amplifier) of 0.07 watts:

$$P_o = 0.07\ W$$

As per 2.1053 (a), it is assumed this power is to be fed to a half-wave tuned dipole. Using a conversion formula for distance, the field strength at one meter can be derived:

$$E(V/m)_{1m} = \frac{\sqrt{49.2\ X\ 0.07}}{1}$$
$$E(V/m)_{1m} = 1.8558\ V/m\ or\ 125.4\ db\mu V/m\ @\ 1m$$

As per 24.238(a), the spurious emissions must be attenuated by 43 + 10log(P) which is:

$$43 + 10Log(0.07) = 31.46\ dB$$

Therefore, the limit for spurious emissions is:

$$125.4\ dB\mu V/m - 31.46\ dB = 93.9\ dB\mu V/m\ @\ 1m$$

At 3 meters measurement distance, the limit is;

$$E(V/m)_{3m} = \frac{\sqrt{49.2\ X\ 0.07}}{3}$$
$$E(V/m)_{3m} = 0.6186\ V/m\ or\ 115.4\ db\mu V$$

According to 24.238(a), all signals must be attenuated by 43.41 dB. Therefore, the limit for spurious emissions for a test distance of 3 meters is:

$$115.4 - 31.46 = 83.9\ dB\mu V/m\ @\ 3m$$

6.1.4 RESULTS:

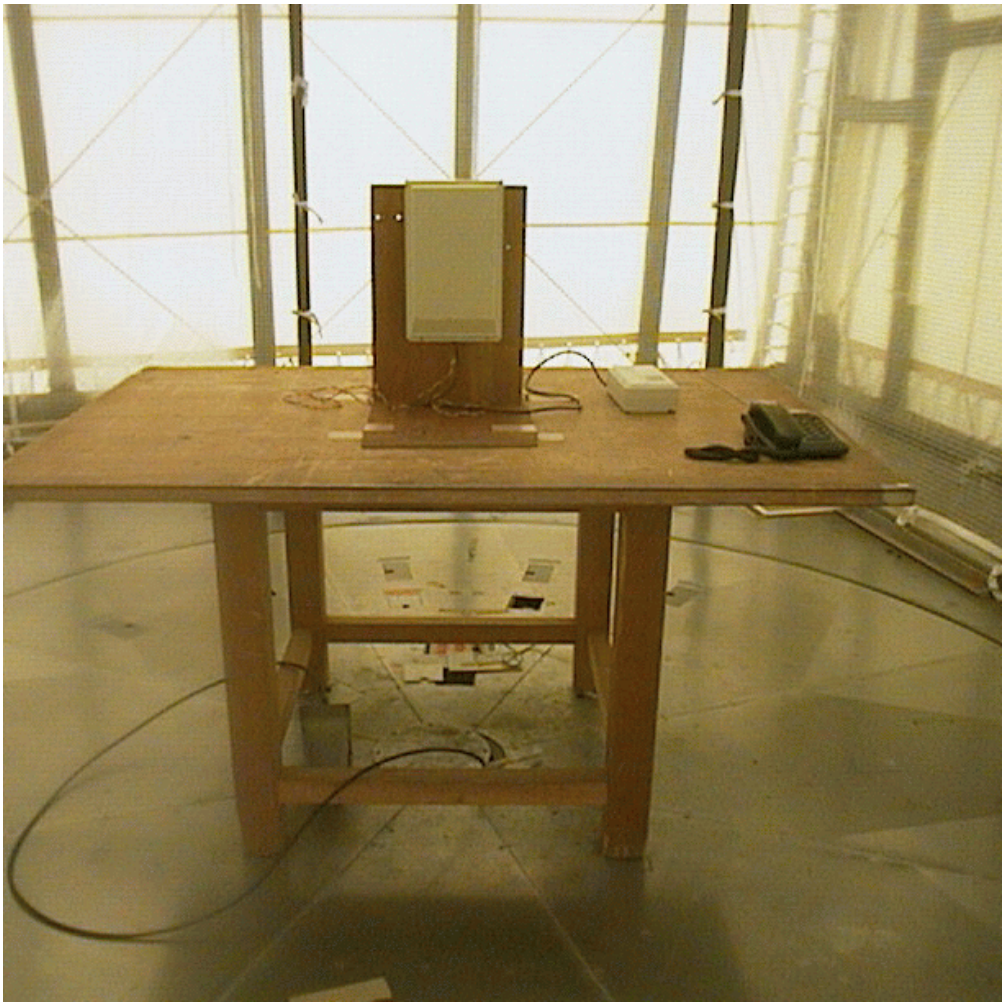
Frequency (MHz)	Polarity	Height (m)	Raw Amplitude (dBµV)	A.C.F. (dB/m)	D.C.F. (dB)	Corrected Amplitude (dBµV/m)	Limint (dBuV/m) at 1 m	Limit (dBµV/m) at 3 m
1646.07	V	1	48.1	-0.5	0	47.6	n/a	83.9
4938.83	H	1	43.0	10.4	0	53.4	n/a	83.9
4938.83	V	1	43.2	10.4	0	53.6	n/a	83.9
3804.66	H	1	32.4	9.5	0	41.9	93.9	n/a
3804.66	V	1	42.7	9.5	0	52.2	93.9	n/a
5707.30	H	1	31.3	13.3	0	44.6	93.9	n/a
5707.30	V	1	31.6	13.3	0	44.9	93.9	n/a
7609.62	H	1	29.5	15.3	0	44.8	93.9	n/a
7609.62	V	1	29.4	15.3	0	44.7	93.9	n/a
13316.31	H	1	28.5	20.5	0	49.0	93.9	n/a
13316.31	V	1	28.8	20.5	0	49.3	93.9	n/a
19023.30	H	1	30.4	21.4	0	51.8	93.9	n/a
19023.30	V	1	30.5	21.4	0	51.9	93.9	n/a

Equipment meets the specifications of 2.1053; 24.238(a)

These emissions were related to the EUT (SLSU), and thus are measured against the 47 CFR 24 limit. These emissions are significantly below the limit for spurious emissions (93.9 dBµV/m @ 1 m or 83.9 dBµV/m @ 3 m).

The spurious emissions measured below 1GHz were not related to the transmitter, and thus not documented in this report.

Photograph of Radiated Emissions Test Configuration



6.2 TEST TYPE: Occupied Bandwidth

6.2.1 TECHNICAL SPECIFICATION: 47CFR2.1049

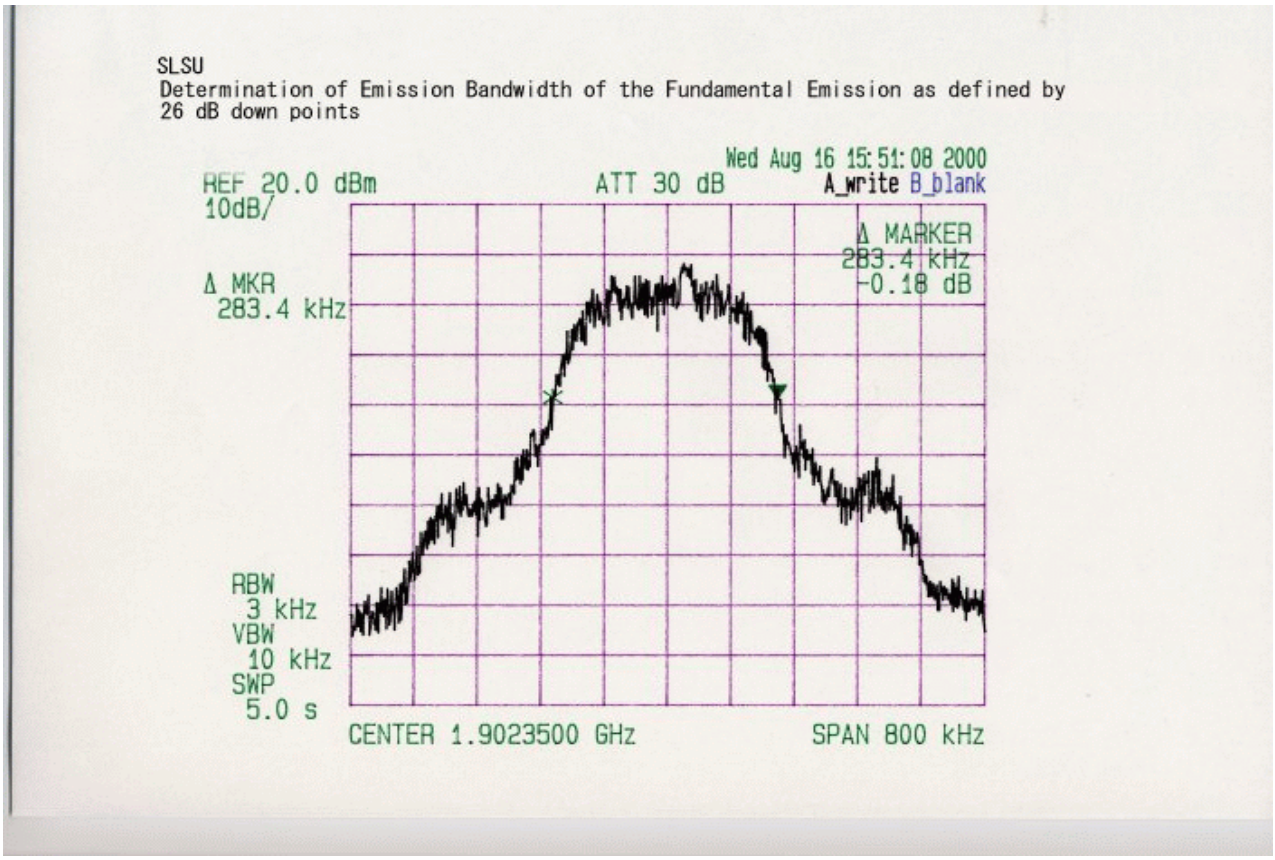
6.2.2 TEST DATE(S): 8/16/00

6.2.3 MEASUREMENT PROCEDURES:

As required by §2.1049 of CFR 47, *occupied bandwidth measurements* were made on the EUT (SLSU). The EUT was configured to transmit an PHS modulated carrier signal. Using a bandwidth of 3kHz, we determined the occupied bandwidth of the emission at the center of the selectable channel range.

6.2.4 RESULTS:

Equipment complies with Section 2.1049. Plots of the occupied bandwidth, as measured at the RF output port follows:



6.3 TEST TYPE: RF Power Output

6.3.1 TECHNICAL SPECIFICATION: 47CFR2.1046 and 24.232(a), (c)

6.3.2 TEST DATE(S): 8/16/00

6.3.3 MEASUREMENT PROCEDURES:

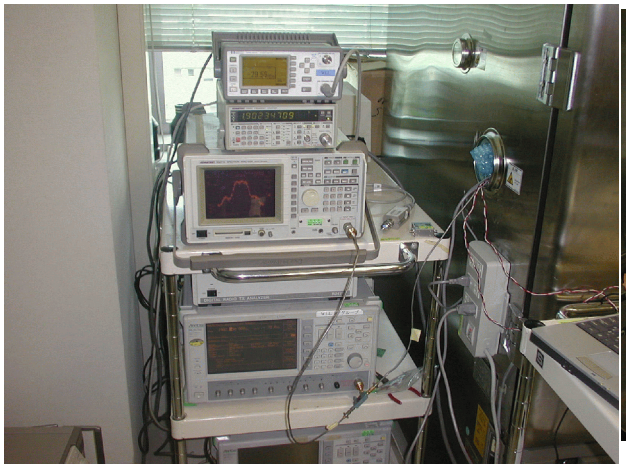
As required by §2.1046 of CFR 47, *RF power output measurements* were made at the RF output terminals using an attenuator and spectrum analyzer. This test was performed with carrier modulated by an PHS modulation signal.

Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output are included on the following page .

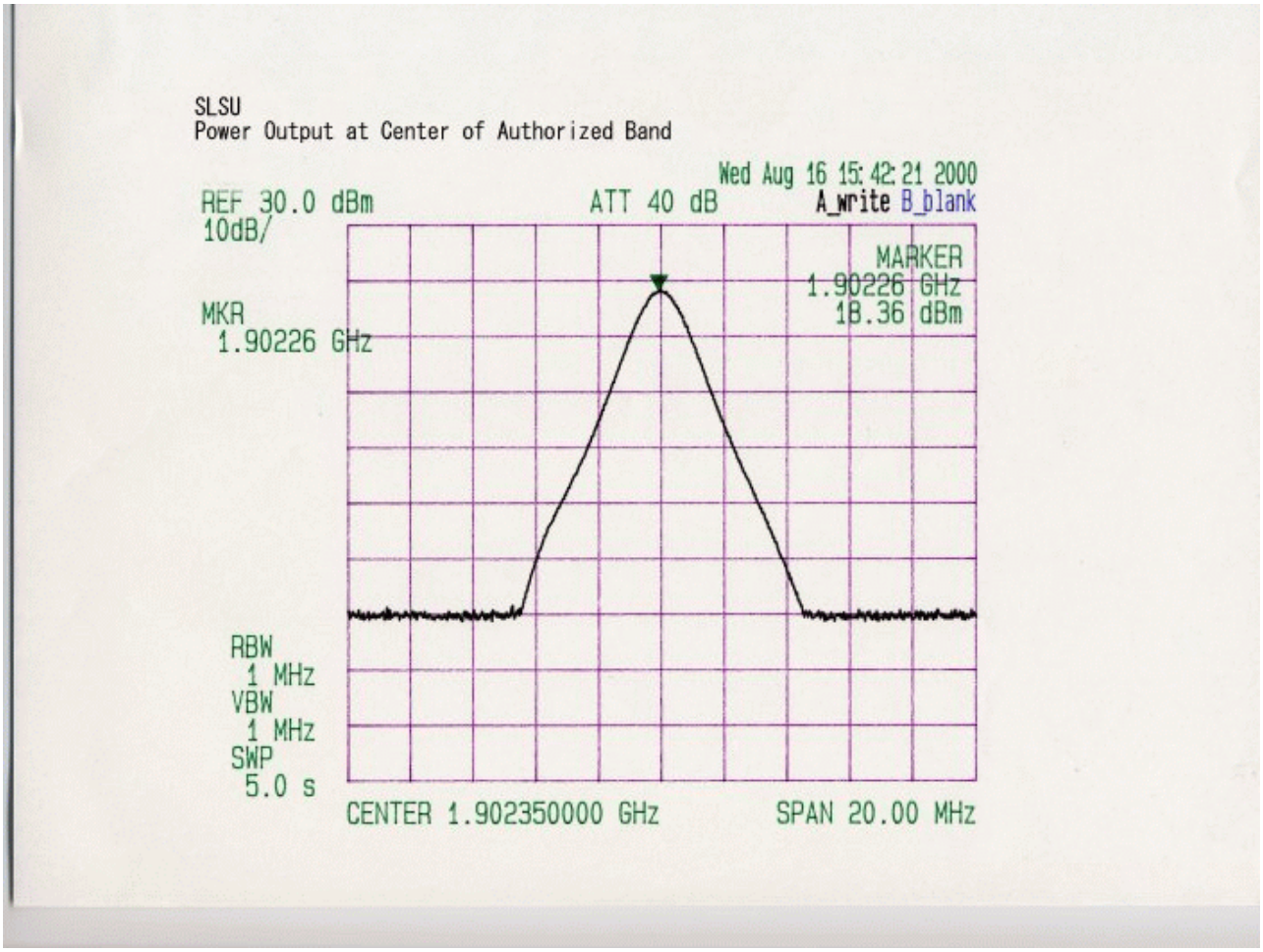
6.3.4 RESULTS:

Equipment complies with 47CFR 2.1046 and 24.232(a). The EUT (SLSU) does not exceed 100 W (or 50 dBm) at the carrier frequency.

Photograph of Antenna Conducted Spurious Emissions and
RF Power Output Test Configuration



SLSU
Power Output at Center of Authorized Band



6.4 TEST TYPE: Spurious Emissions at Antenna Terminals

6.4.1 TECHNICAL SPECIFICATION: 2.1051; 24.238(a)

6.4.2 TEST DATE(S): 8/16/00

6.4.3 MEASUREMENT PROCEDURES:

As required by §2.1051 of CFR 47, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a 50 Ω attenuator and spectrum analyzer set for a 100 kHz bandwidth. This test was performed with Digitally modulated carrier signals. The Digital signal generator was adjusted for continuous transmit on frequencies in both the uplink and down-link frequency bands. The frequency spectrum was investigated from 9.0 KHz to 20.0 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

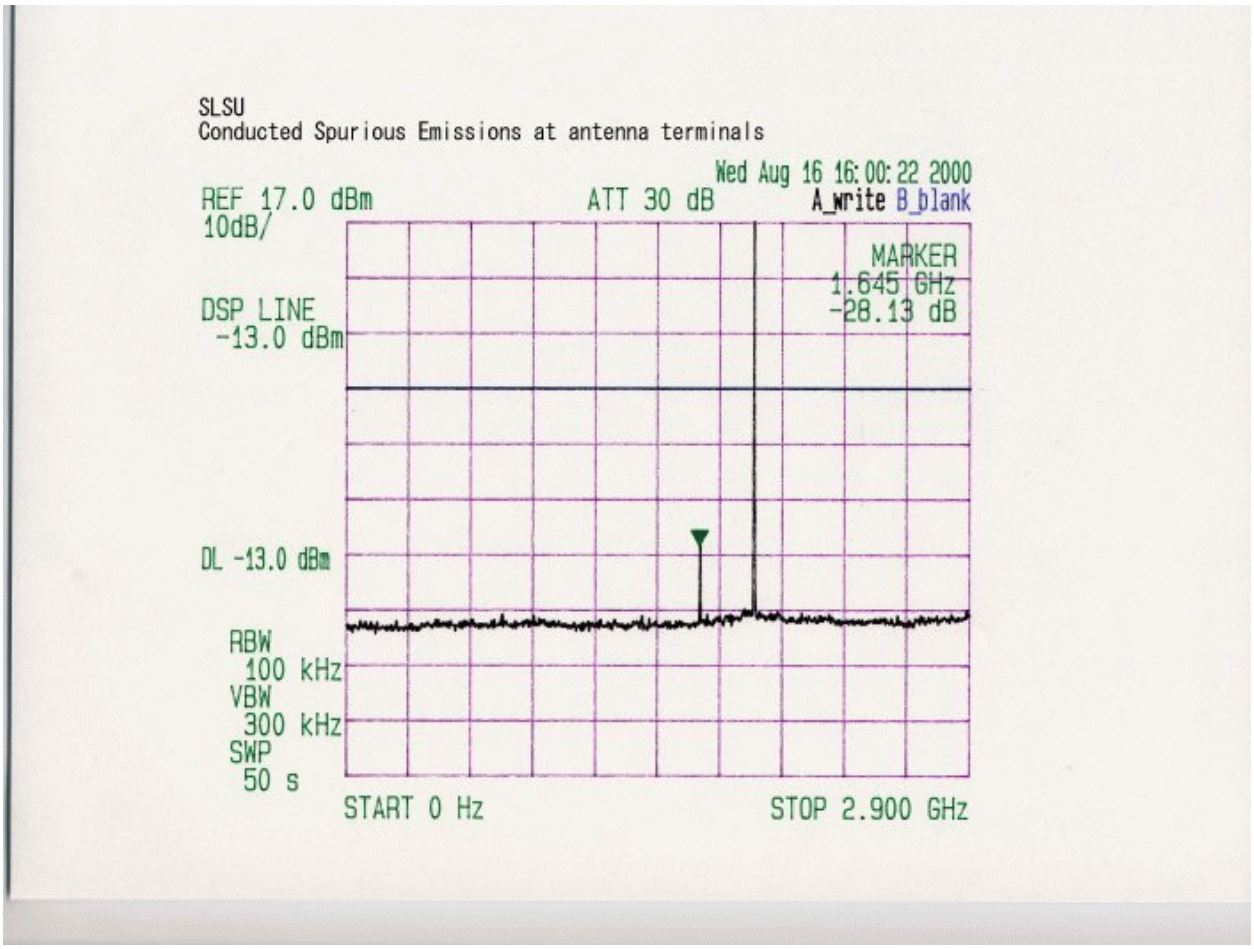
6.4.4 RESULTS:

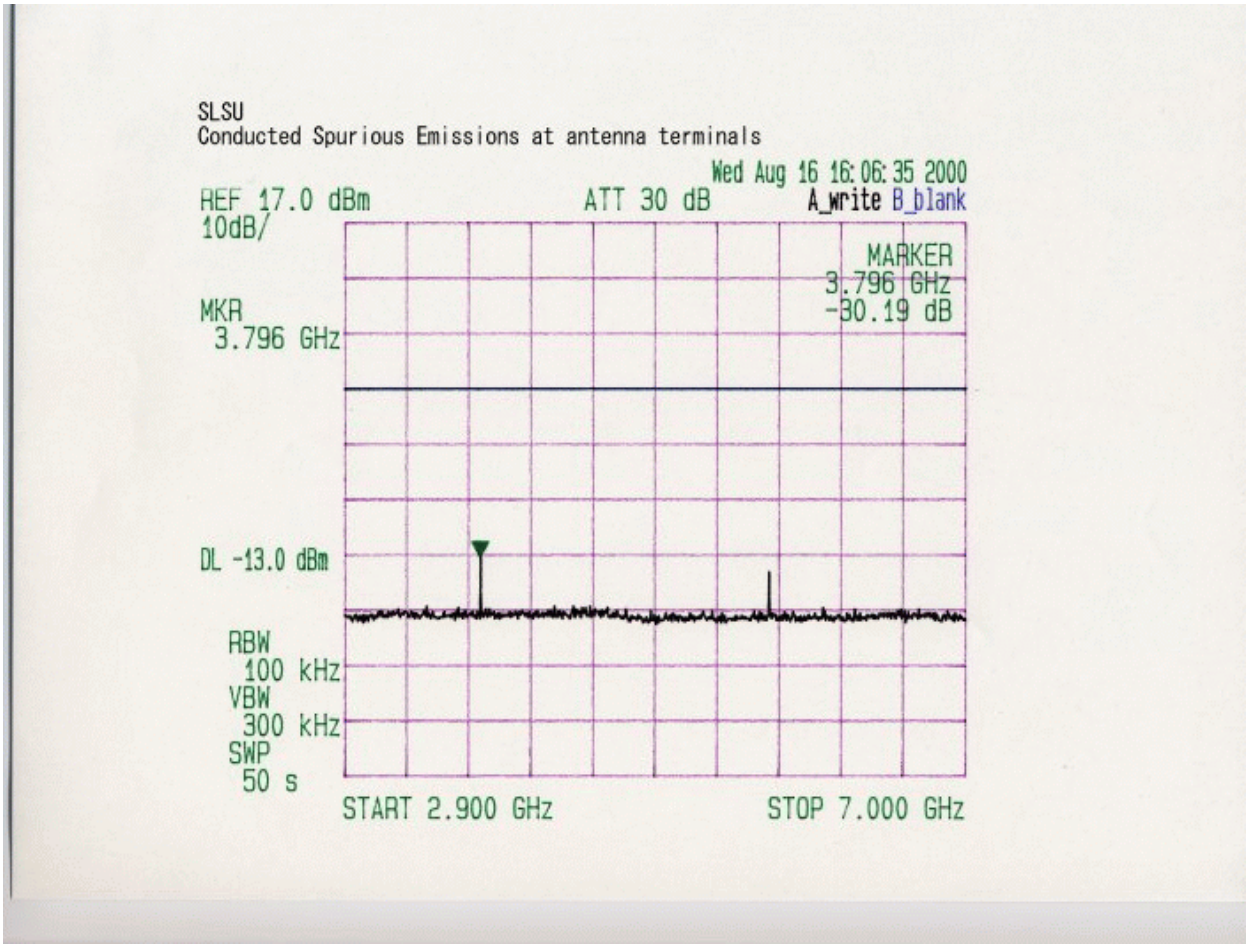
Equipment complies with Section 2.1051and 24.238(a)

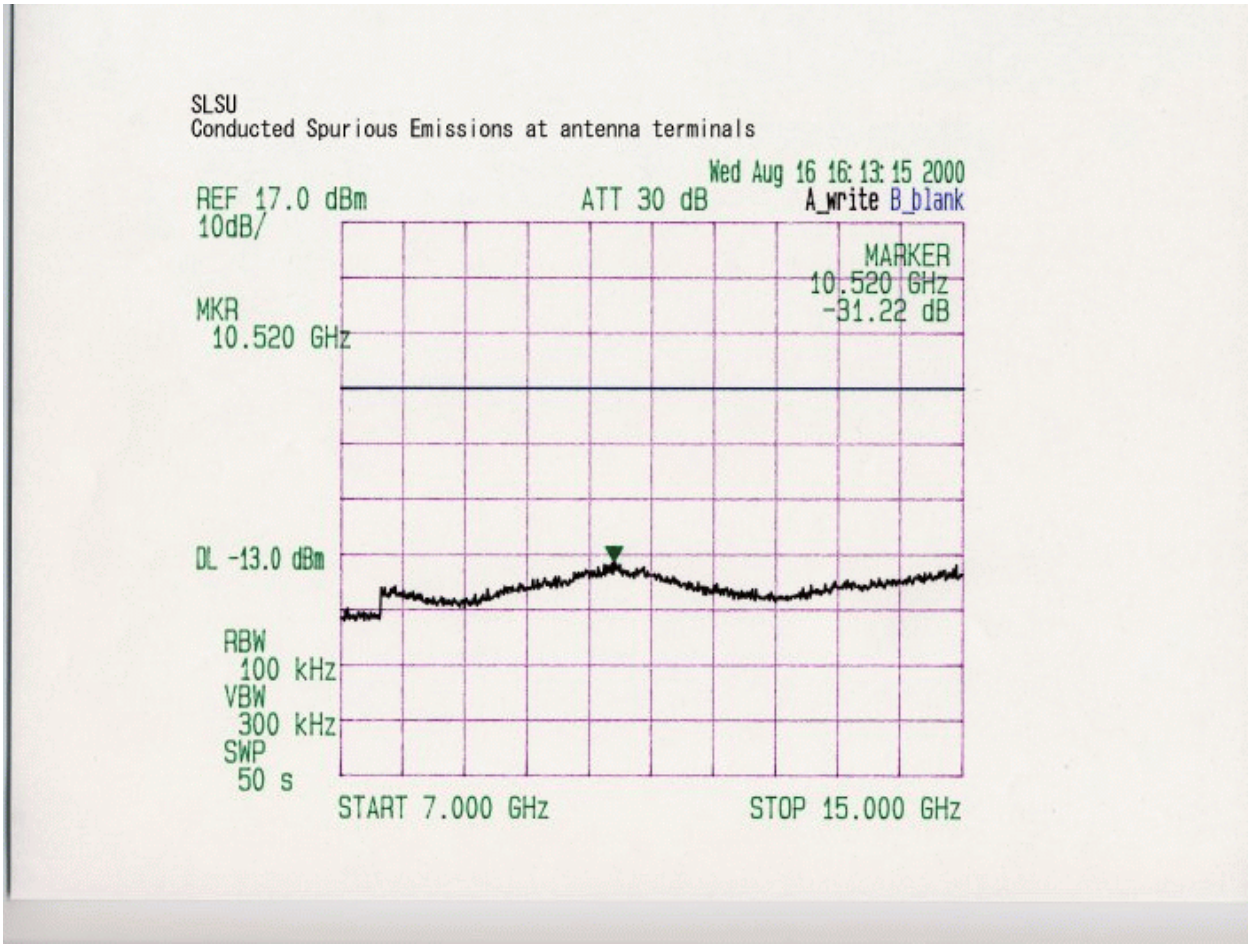
SUMMARY OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS

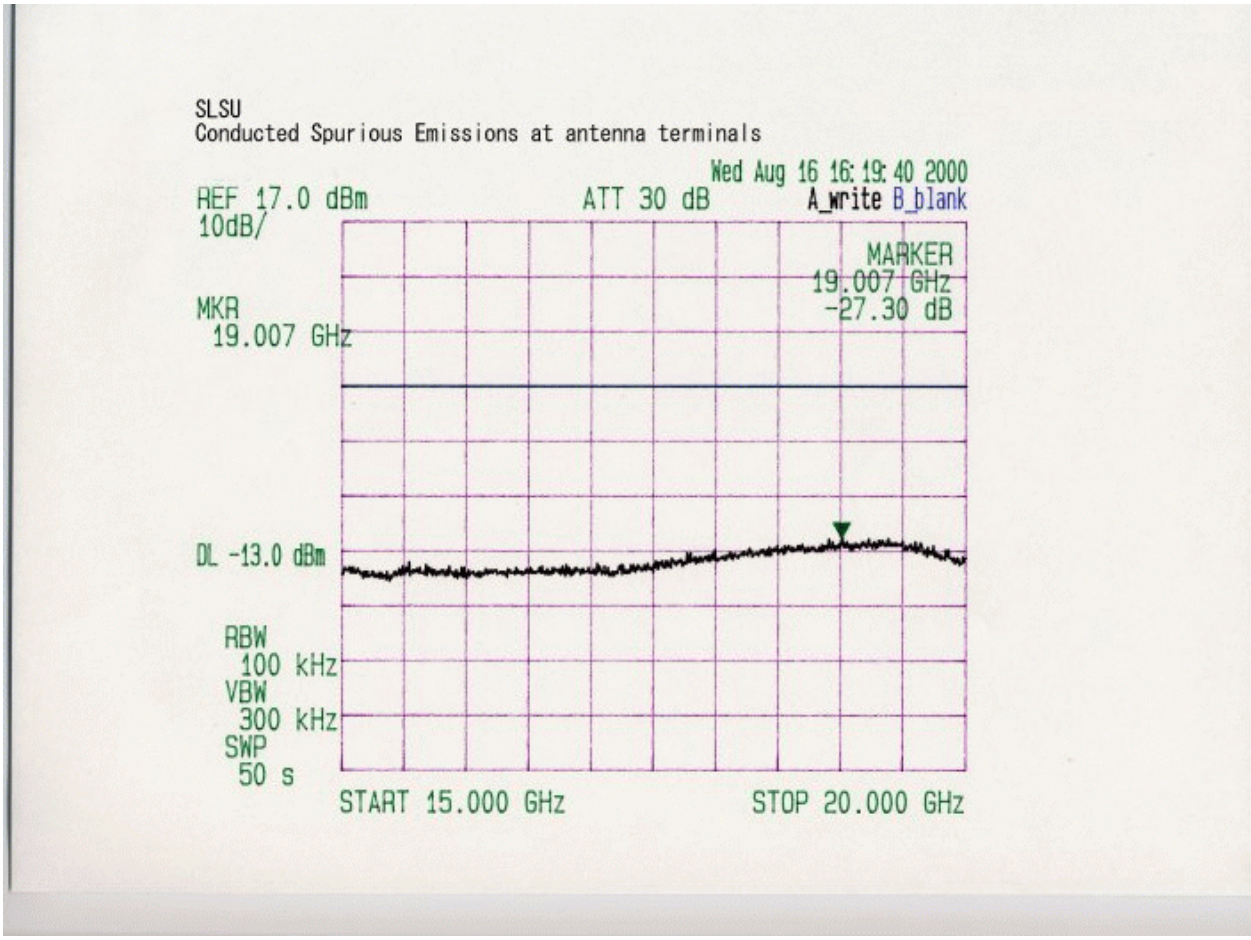
Frequency Range (GHz)	Emission Frequency (GHz)	Emission Level (dBm)	Limit (dBm)
0 - 2.9	1.645	-41.13	-13.1
2.9 - 7.0	3.796	-43.19	-13.1
7.0 - 15.0	10.52	-44.22	-13.1
15.0 - 20.0	19.007	-40.30	-13.1

The following plots are included to illustrate compliance with the requirements of 47 CFR Part 24.238(a):


SLSU
Conducted Spurious Emissions at antenna terminals
Wed Aug 16 16:00:22 2000
REF 17.0 dBm
ATT 30 dB
A_write B_blank
10dB/
MARKER
1.645 GHz
-28.13 dB
DSP LINE
-13.0 dBm
DL -13.0 dBm
RBW
100 kHz
VBW
300 kHz
SWP
50 s
START 0 Hz
STOP 2.900 GHz


SLSU
Conducted Spurious Emissions at antenna terminals
Wed Aug 16 16:06:35 2000
REF 17.0 dBm
ATT 30 dB
A_write B_blank
10dB/
MARKER
3.796 GHz
-30.19 dB
MKR
3.796 GHz
DL -13.0 dBm
RBW
100 kHz
VBW
300 kHz
SWP
50 s
START 2.900 GHz
STOP 7.000 GHz


SLSU
Conducted Spurious Emissions at antenna terminals
Wed Aug 16 16:13:15 2000
REF 17.0 dBm
ATT 30 dB
A_write B_blank
10dB/
MARKER
10.520 GHz
-31.22 dB
MKR
10.520 GHz
DL -13.0 dBm
RBW
100 kHz
VBW
300 kHz
SWP
50 s
START 7.000 GHz
STOP 15.000 GHz


SLSU
Conducted Spurious Emissions at antenna terminals
Wed Aug 16 16:19:40 2000
REF 17.0 dBm
ATT 30 dB
A_write B_blank
10dB/
MARKER
19.007 GHz
-27.30 dB
MKR
19.007 GHz
DL -13.0 dBm
RBW
100 kHz
VBW
300 kHz
SWP
50 s
START 15.000 GHz
STOP 20.000 GHz

6.5 TEST TYPE: Spurious Emissions at Antenna Terminals at Block Edges +/- 1 MHz

6.5.1 TECHNICAL SPECIFICATION: 2.1051; 24.238(b)

6.5.2 TEST DATE(S): 8/16/00

6.5.3 MEASUREMENT PROCEDURES:

As recommended in FCC Part 24, 1% of the 26dB bandwidth was chosen to measure the peak of any emission inside the 1.0 MHz frequency band adjacent to each frequency block edge. All other frequencies were measured using a 1.0 MHz RBW. The unit was exercised using signal types required by §2.1049.

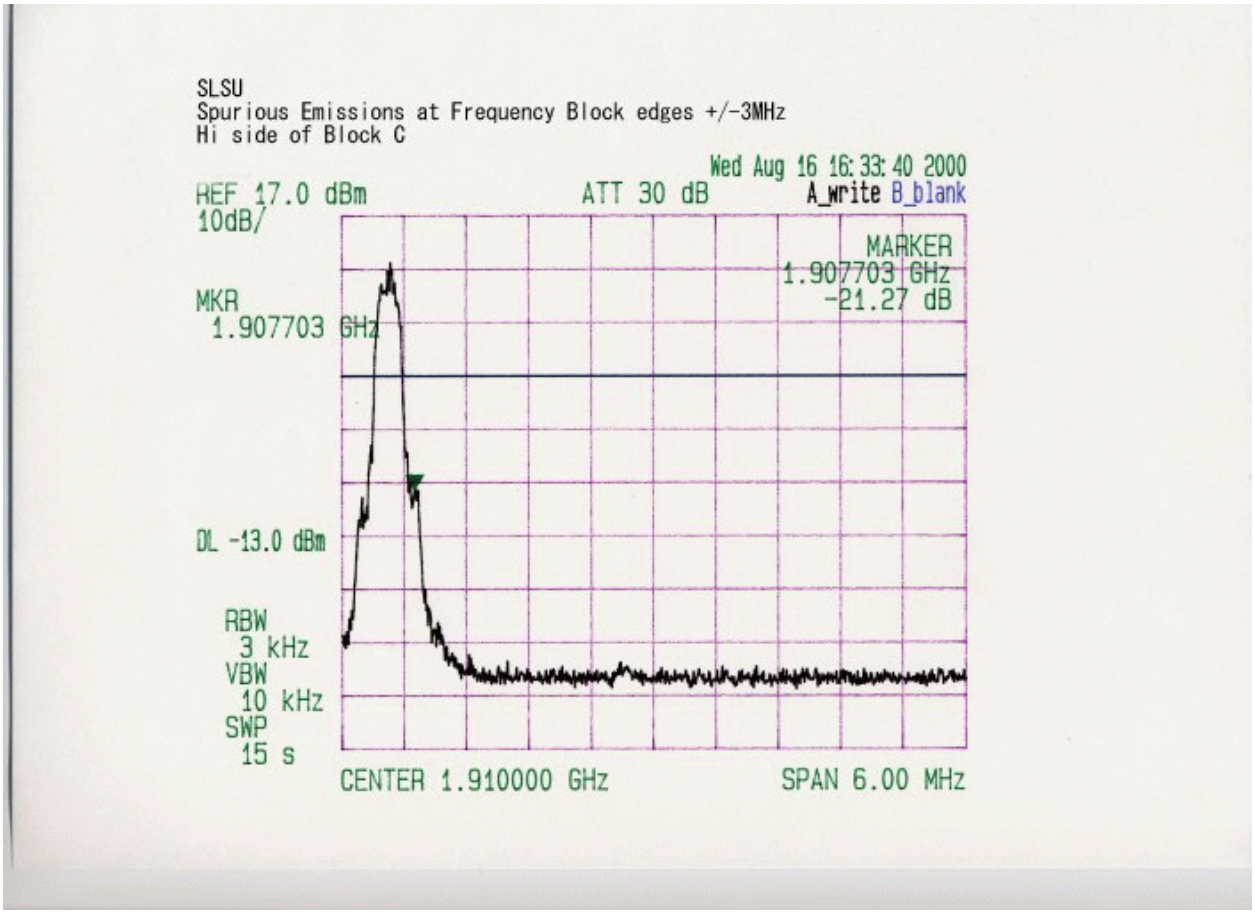
6.5.4 Results:

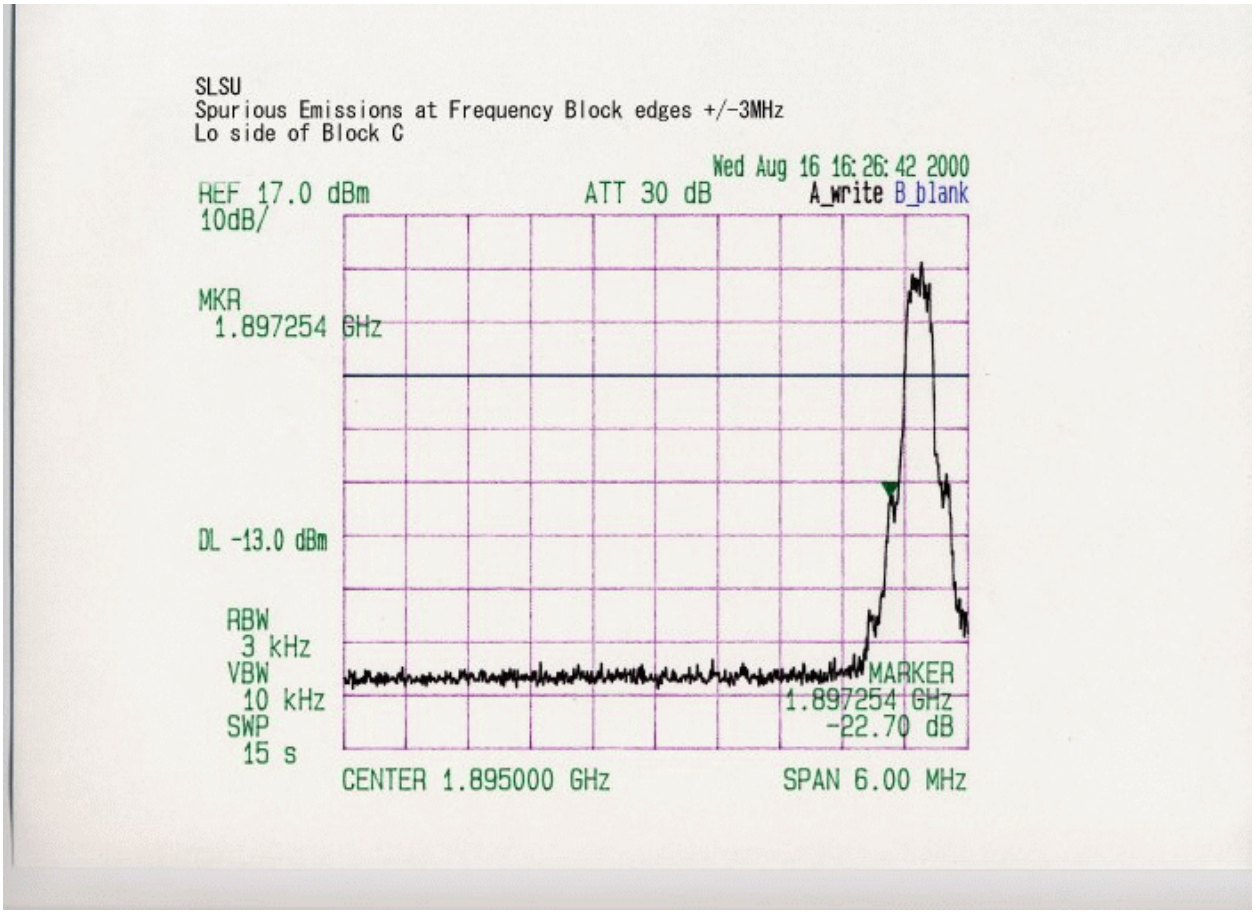
Modulation products outside of this band are attenuated at least 43 + 10 Log (P) below the level of the modulated carrier. A Plot of the spurious emissions at +/- 1 MHz around the transmit frequency, as measured at the antenna port, appears on the following page.

SPURIOUS EMISSION FREQUENCY BLOCKS

1895 MHz-1910 MHz

Plots of the spurious emissions as measured at the extremes of each frequency block appear on the following pages.


SLSU
Spurious Emissions at Frequency Block edges +/-3MHz
Hi side of Block C
Wed Aug 16 16:33:40 2000
REF 17.0 dBm
ATT 30 dB
A_write B_blank
10dB/
MARKER
1.907703 GHz
-21.27 dB
MKR
1.907703 GHz
DL -13.0 dBm
RBW
3 kHz
VBW
10 kHz
SWP
15 s
CENTER 1.910000 GHz
SPAN 6.00 MHz


SLSU
Spurious Emissions at Frequency Block edges +/-3MHz
Lo side of Block C
Wed Aug 16 16:26:42 2000
REF 17.0 dBm
ATT 30 dB
A_write B_blank
10dB/
MKR
1.897254 GHz
DL -13.0 dBm
RBW
3 kHz
VBW
10 kHz
SWP
15 s
MARKER
1.897254 GHz
-22.70 dB
CENTER 1.895000 GHz
SPAN 6.00 MHz

6.6 TEST TYPE: Frequency Stability over Temperature Variations

6.6.1 TECHNICAL SPECIFICATION: 2.1055(a)(1)

6.6.2 TEST DATE(S): 8/17/00

6.6.3 MEASUREMENT PROCEDURES:

As required by §2.1055(a)(1) of CFR 47, *frequency tolerance measurements* were made over the temperature range of -30°C to +50°C. The frequency measurements were made using direct input to a spectrum analyzer. Climatic control was accomplished using an environmental simulation chamber. The temperature was first lowered to -30°C and then raised hourly in 10° increments. The unit remained in the chamber during temperature transitions and during the measurement process.

6.6.4 Results:

Frequency tolerance of carrier signal: +/- 500Hz for a temperature variation from - 30°C to + 50°C at normal supply voltage.

CARRIER FREQUENCY DEVIATIONS DUE TO TEMPERATURE INSTABILITY

Temperature (°C)	Carrier Frequency (1897.55) (MHz)	Frequency Deviation (KHz)	Deviation Limit (kHz)
-30	1897.55338	0.5	± 20
-20	1897.55287	-0.01	± 20
-10	1897.55286	-0.02	± 20
0	1897.55297	0.09	± 20
+10	1897.55288	0	± 20
+20	1897.55280	-0.08	± 20
+30	1897.55282	-0.06	± 20
+40	1897.55300	0.12	± 20
+50	1897.55302	0.14	± 20

The unit meets the requirements of 2.1055 (a)(1)

6.7 TEST TYPE: Frequency Stability over Voltage Variations

6.7.1 TECHNICAL SPECIFICATION: 2.1055(d)(1)

6.7.2 TEST DATE(S): 8/17/00

6.7.3 MEASUREMENT PROCEDURES:

As required by §2.1055(d)(1) of CFR 47, *frequency tolerance measurements* were made over changes in the supply voltage to the EUT from 85% to 115% of the nominal supply voltage using a variac to vary the AC supply. The frequency measurements were made using direct input to a spectrum analyzer or frequency counter.

6.7.5 Results:

Frequency tolerance of carrier signal: ± 50Hz for a variation in primary voltage from 85% to 115% of the **rated supply.**

Percentage of Rated Supply	AC Voltage (VAC @ 50 Hz)	Carrier Frequency (MHz) Low end	Deviation (KHz)	Deviation Limit (kHz)
85 %	102	1897.55283	-0.05	± 20
100 %	120	1897.55288	0	±20
115 %	138	1897.55287	-0.01	± 20

Percentage of Rated Supply	AC Voltage	Carrier Frequency (MHz) High end	Deviation (KHz)	Deviation Limit (kHz)
85 %	102	1907.45296	-0.03	± 20
100 %	120	1907.45299	0	± 20
115 %	138	1907.45297	-0.02	± 20

The unit meets the requirements of 2.1055 (d)(1)

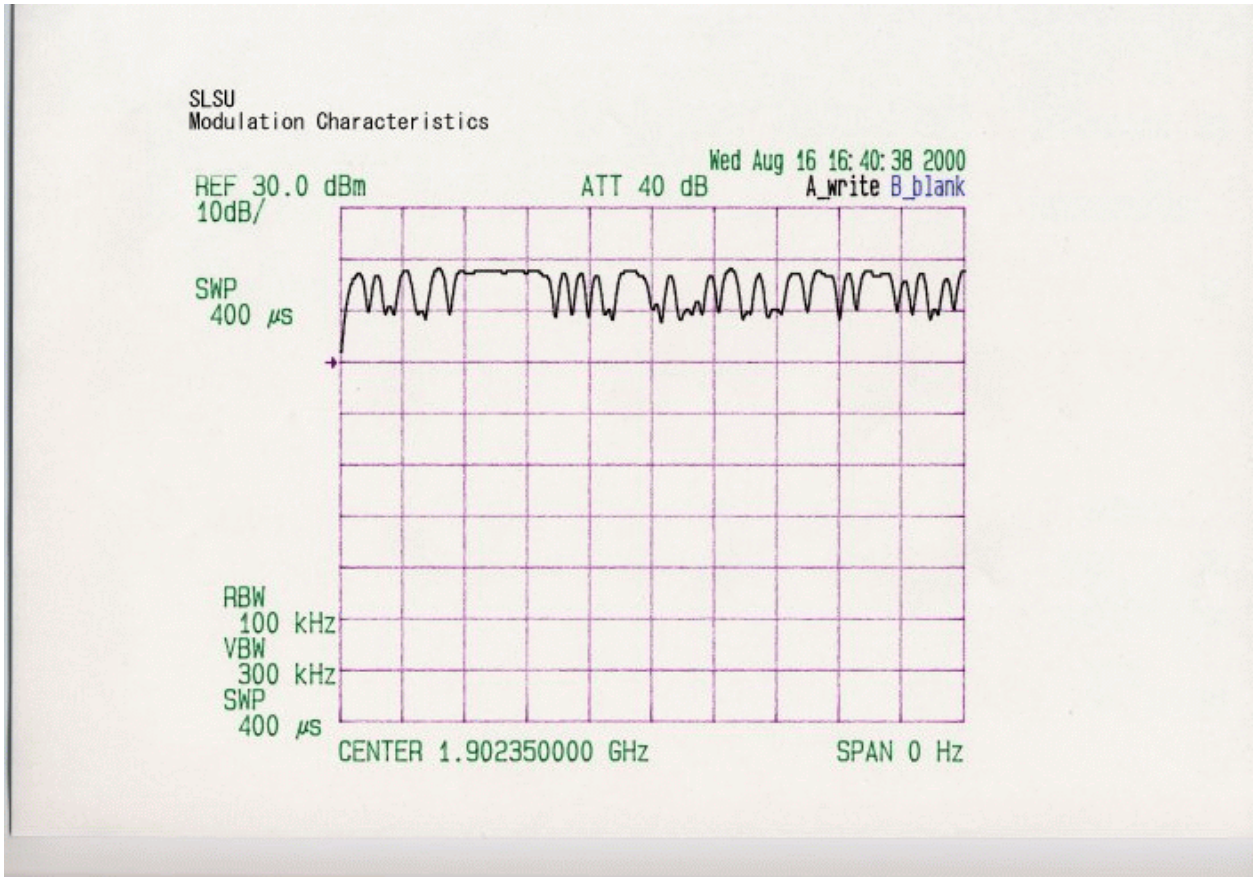
6.9 TEST TYPE: Modulation Characteristics

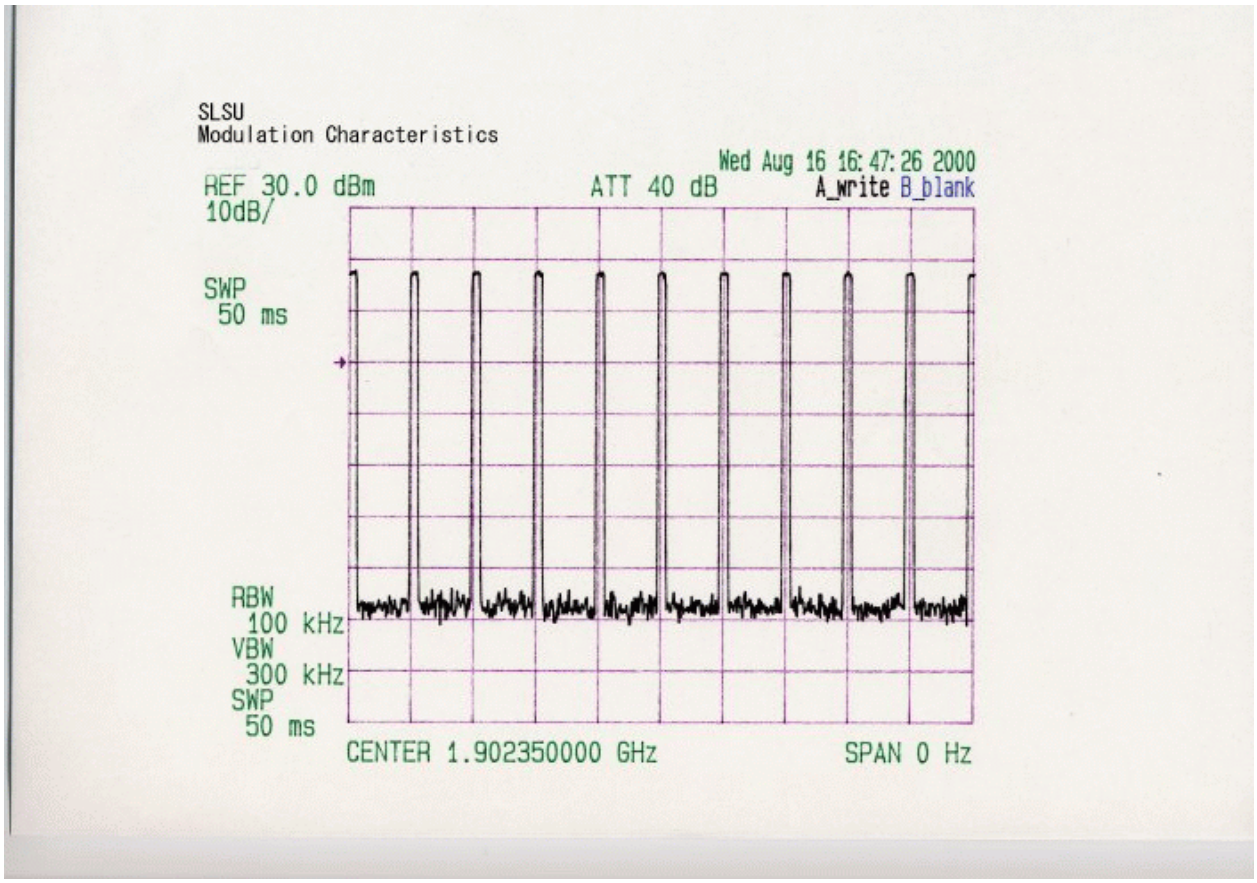
6.9.1 TECHNICAL SPECIFICATION: 2.1047(a)

6.9.2 TEST DATE(S): 8/16/00

6.9.3 MEASUREMENTS REQUIRED:

The following plots give a detailed explanation of the modulation scheme used in the PHS-WLL system (SLSU)..




SLSU
Modulation Characteristics
Wed Aug 16 16:47:26 2000
REF 30.0 dBm
ATT 40 dB
A_write B_blank
10dB/
SWP
50 ms
RBW
100 kHz
VBW
300 kHz
SWP
50 ms
CENTER 1.902350000 GHz
SPAN 0 Hz