

2.9 Peak Radiated Spurious Emission in the Frequency Range 30 -25000 MHz (FCC Section 15.247(c))

The EUT was hop-stopped and when possible placed into a continuous transmit mode of operation. A preliminary scan was performed on the EUT to determine frequencies that were caused by the transmitter portion of the product. Significant emissions that fell within restricted bands were then measured on an OAT's site. Radiated measurements below 1 GHz were tested with a RBW = 120 kHz. Radiated measurements above 1 GHz were measured using a RBW = VBW = 1 MHz. The results of peak radiated spurious emissions falling within restricted bands are given in Table 4a (low), Table 4b, (mid), Table 4c (high) and Figure 5a-5c (low), Figure 5d-5e (mid) and Table 5f-5g (high).

Figure 5a
Peak Radiated Spurious Emission 15.247(c) Low

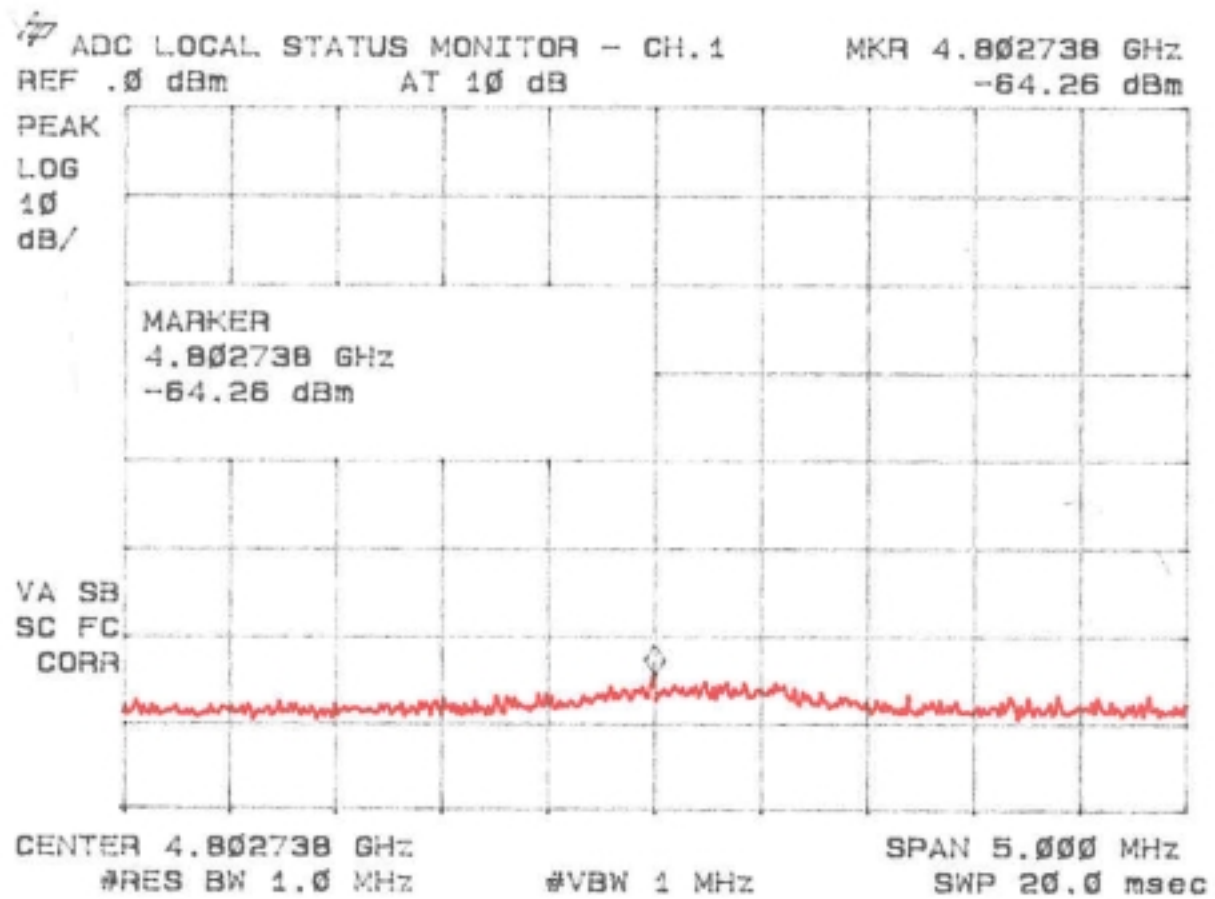


Figure 5b
Peak Radiated Spurious Emission 15.247(c) Low

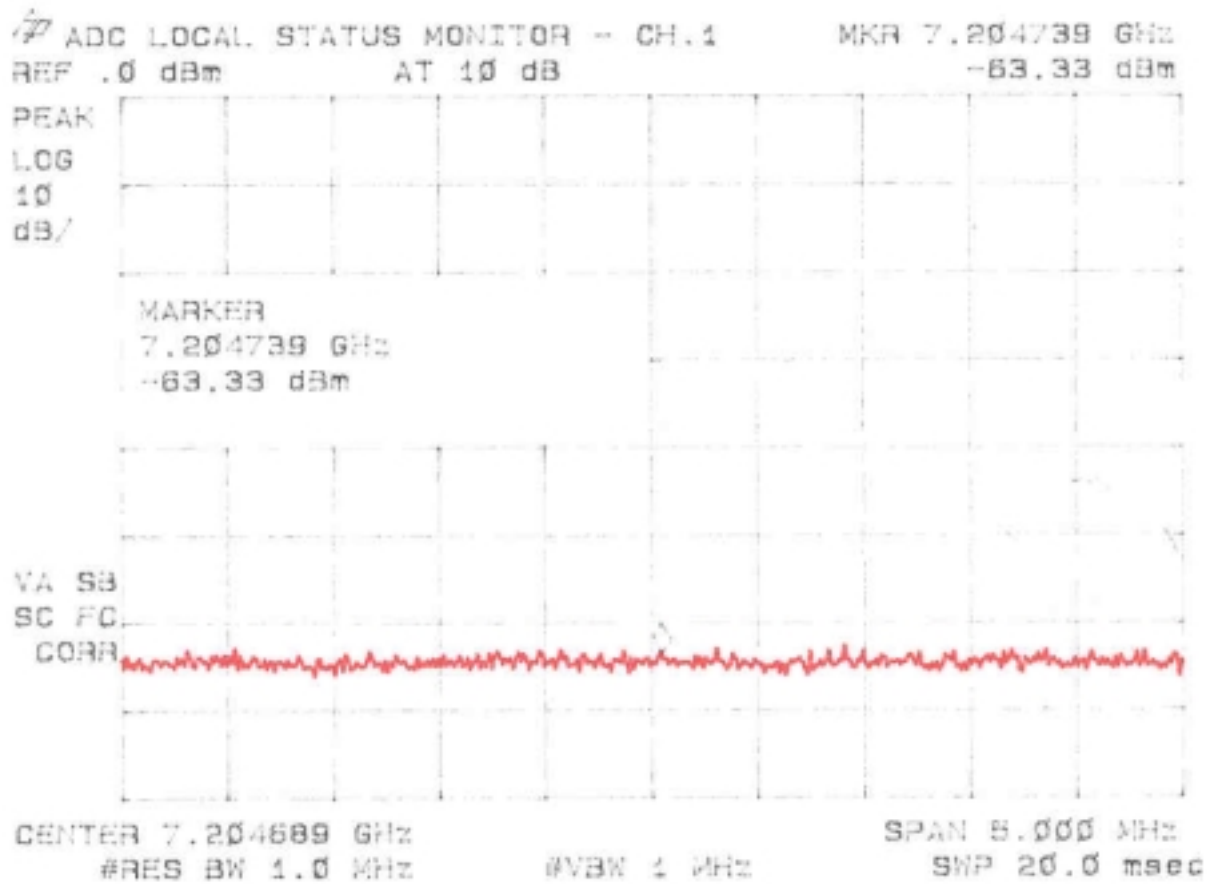


Figure 5c
Peak Radiated Spurious Emission 15.247(c) Low

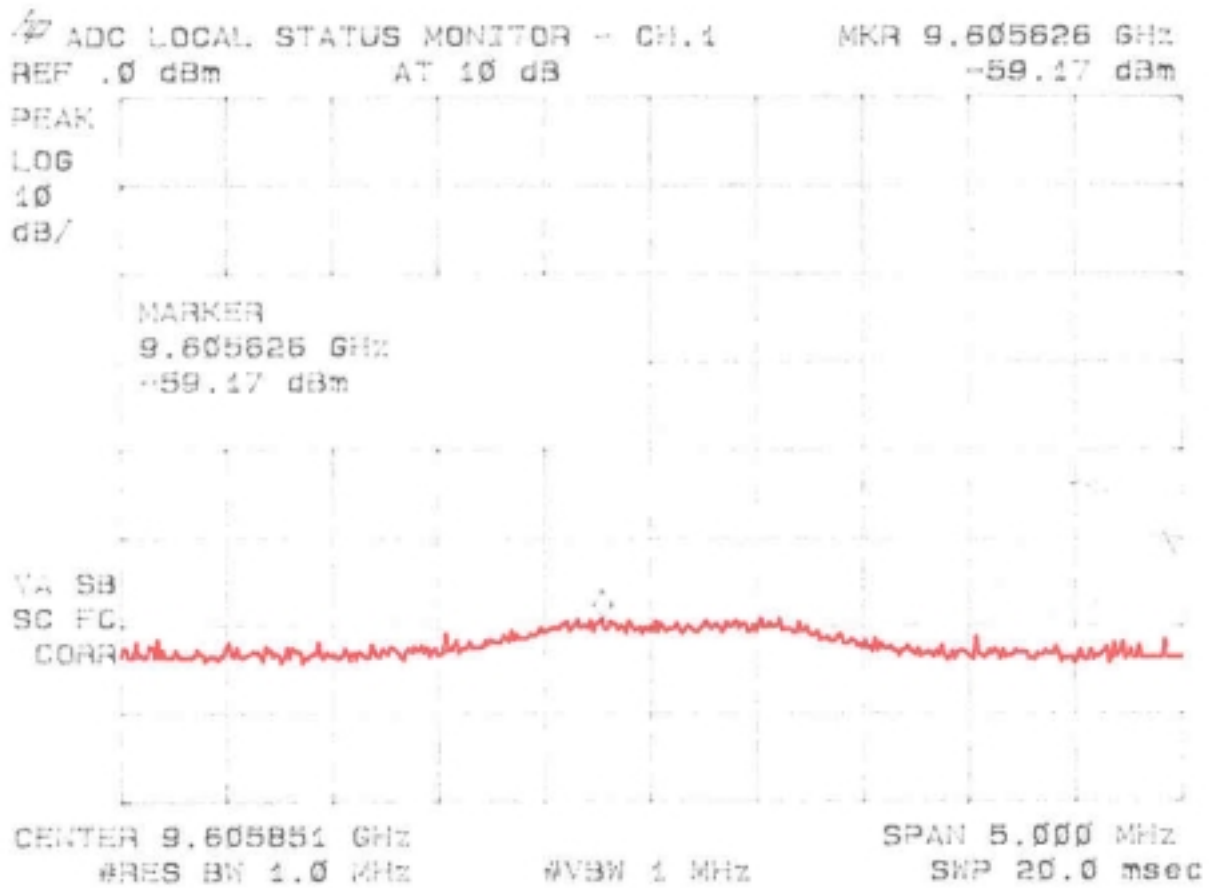


Figure 5d
Peak Radiated Spurious Emission 15.247(c) Mid

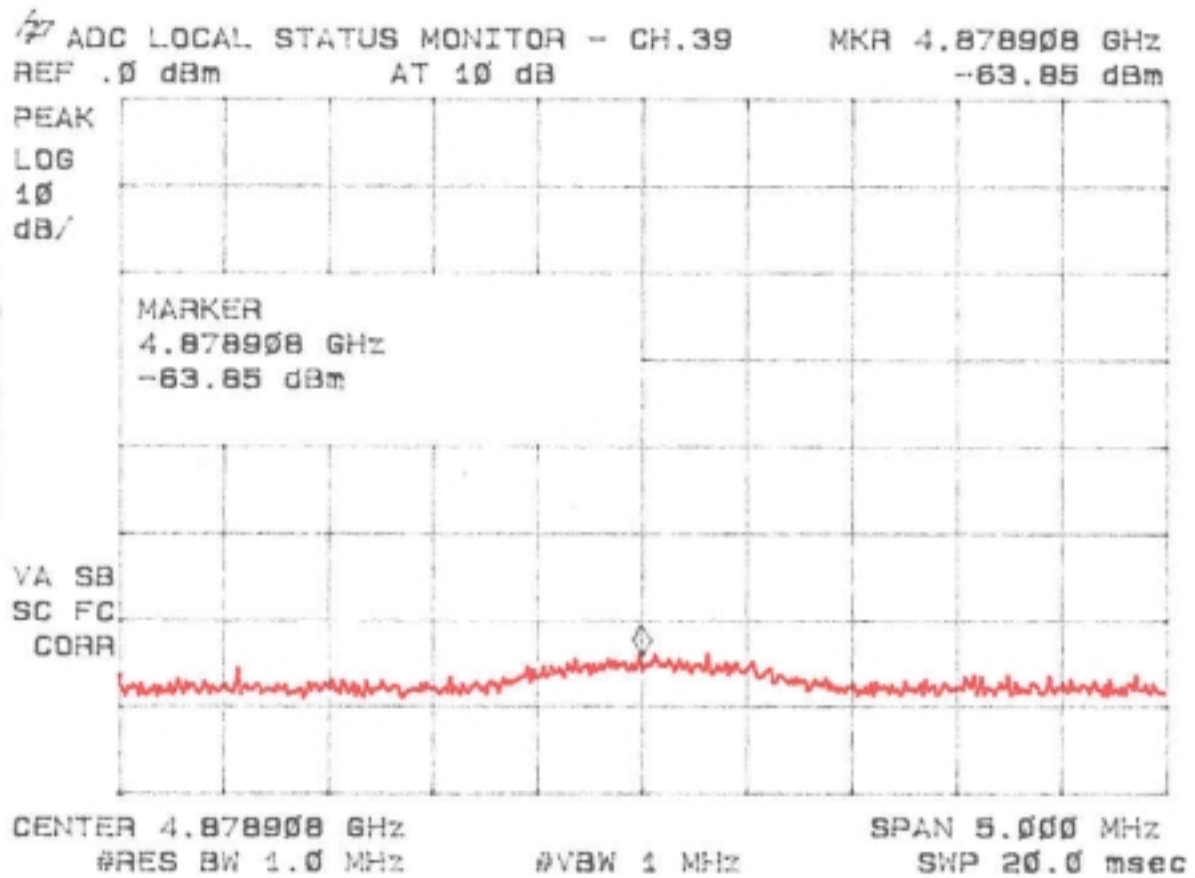


Figure 5e
Peak Radiated Spurious Emission 15.247(c) Mid

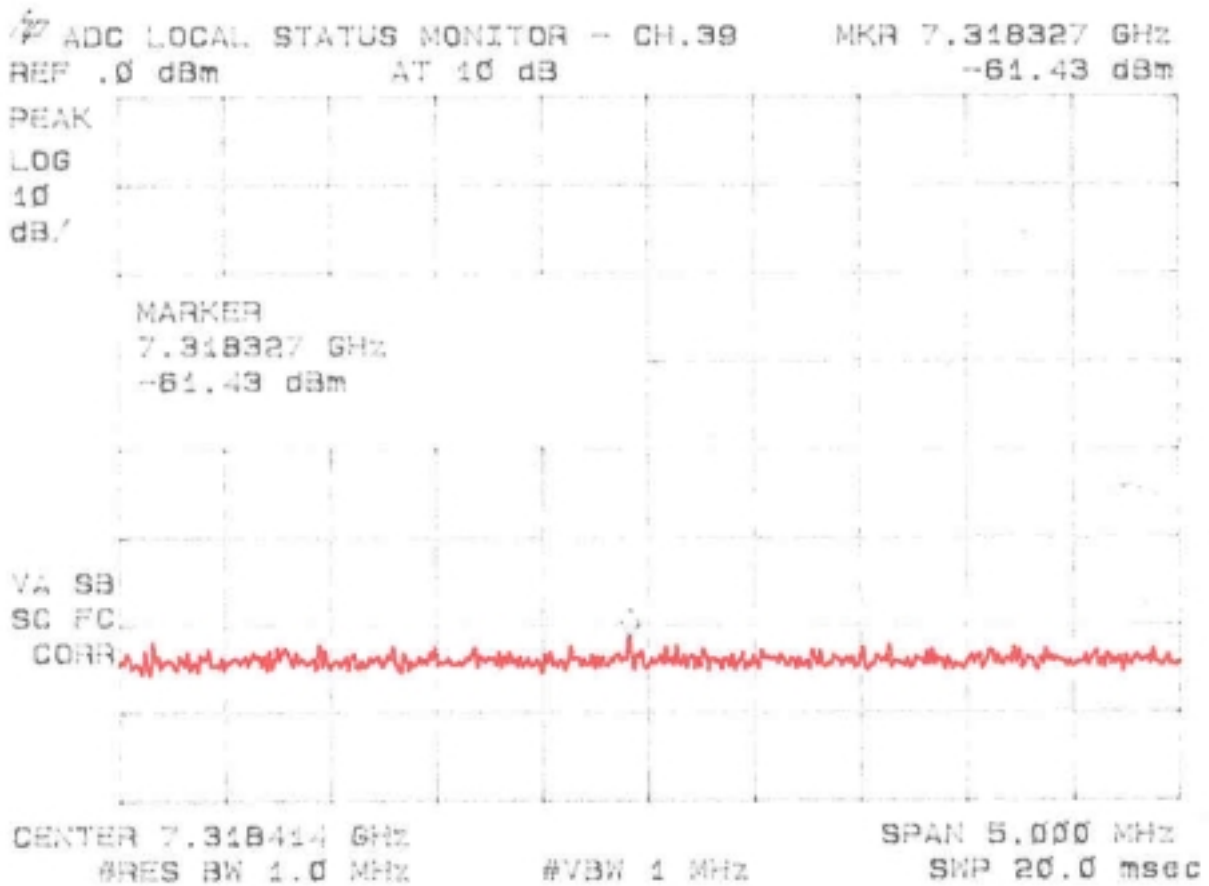


Figure 5f
Peak Radiated Spurious Emission 15.247(c) Mid

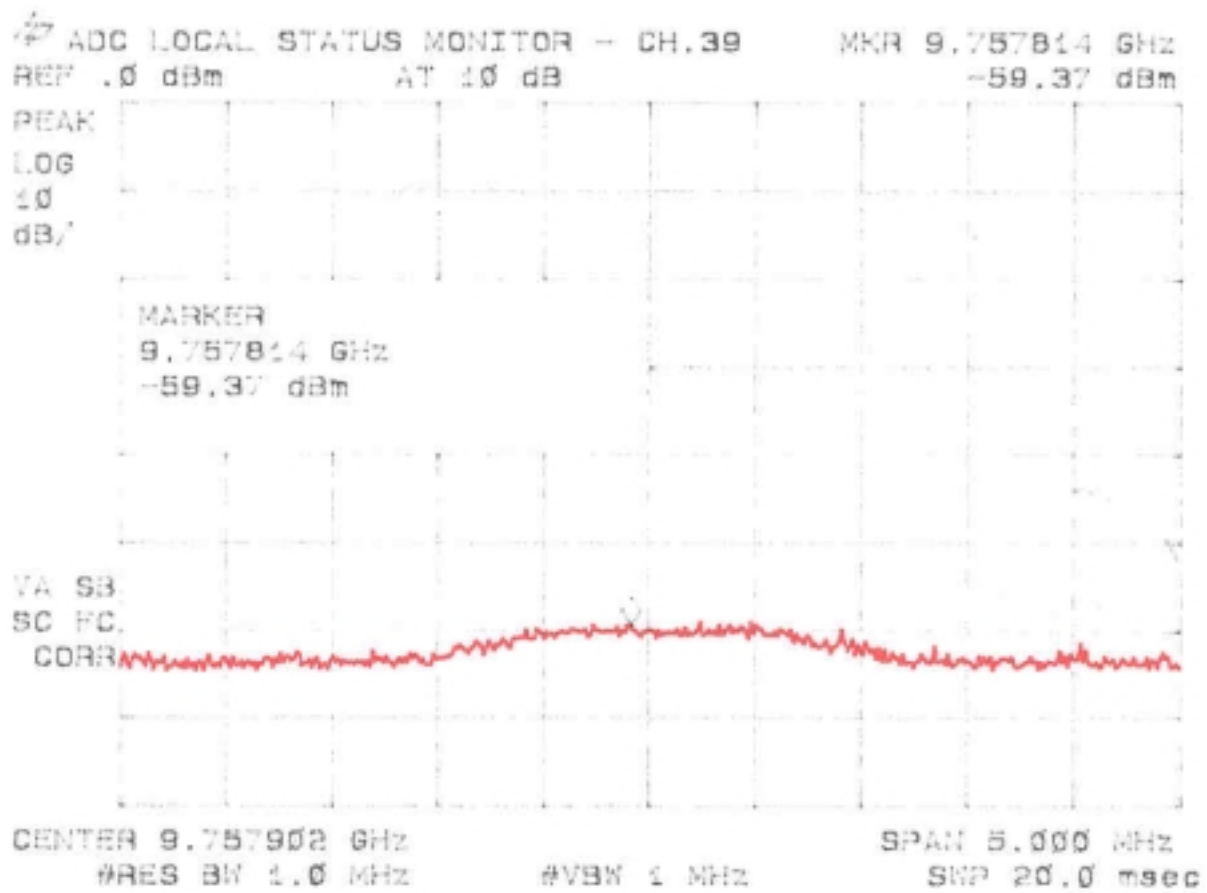


Figure 5g
Peak Radiated Spurious Emission 15.247(c) High

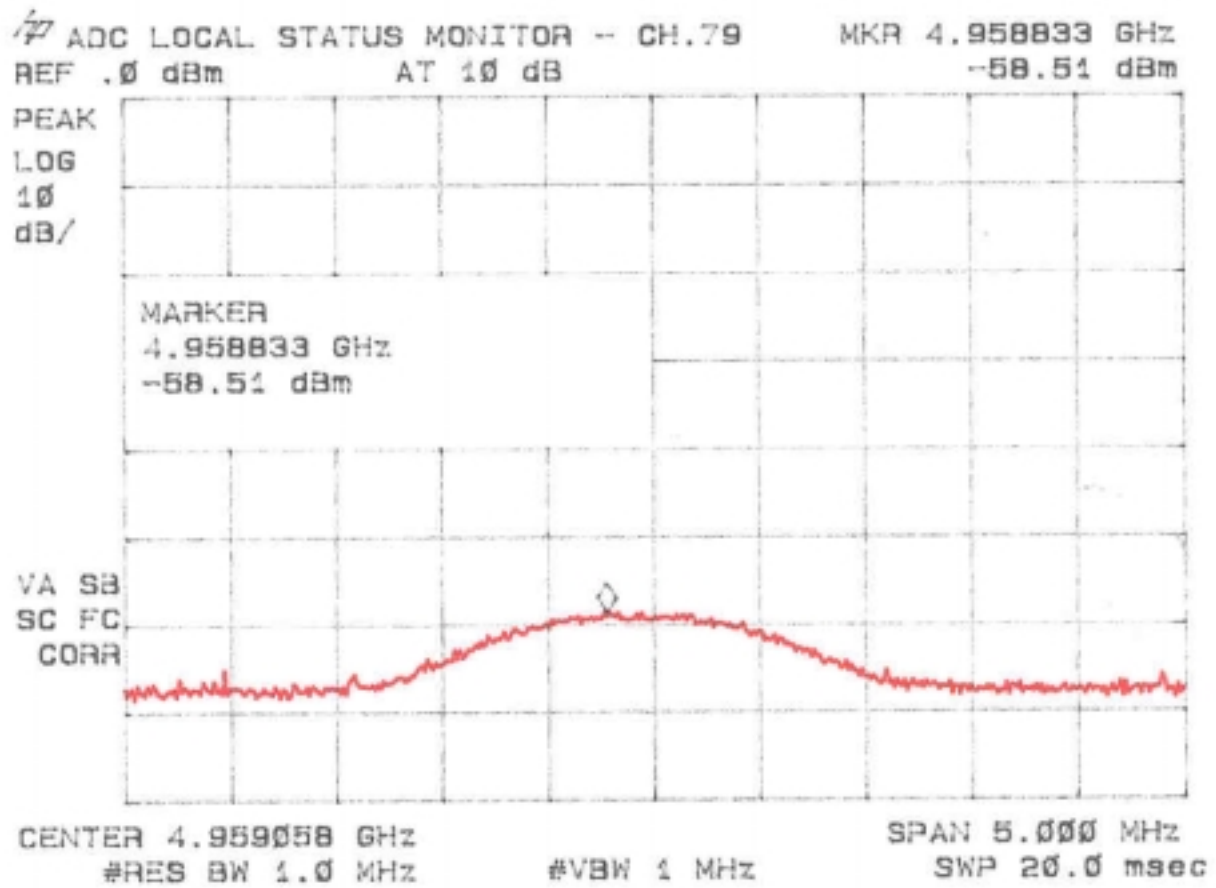


Figure 5h
Peak Radiated Spurious Emission 15.247(c) High

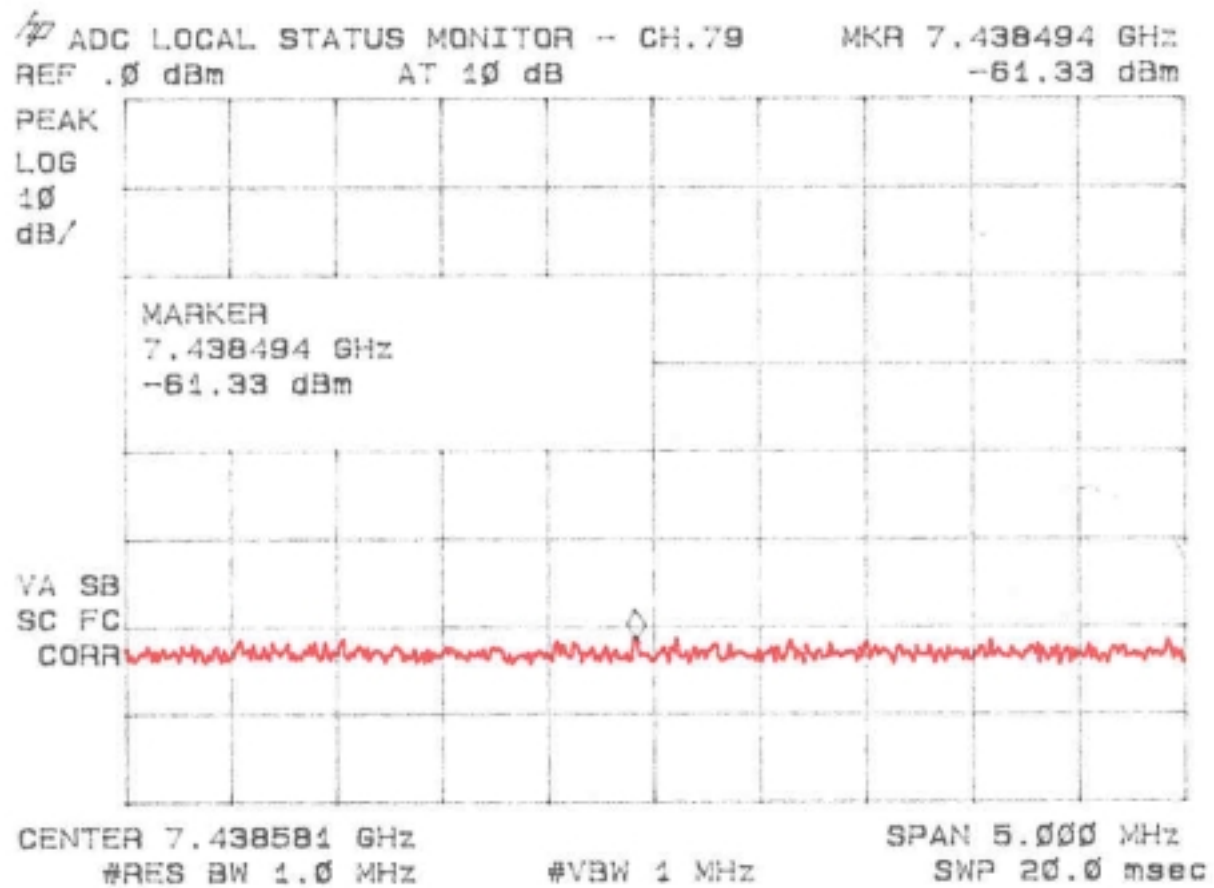


Figure 5i
Peak Radiated Spurious Emission 15.247(c) High

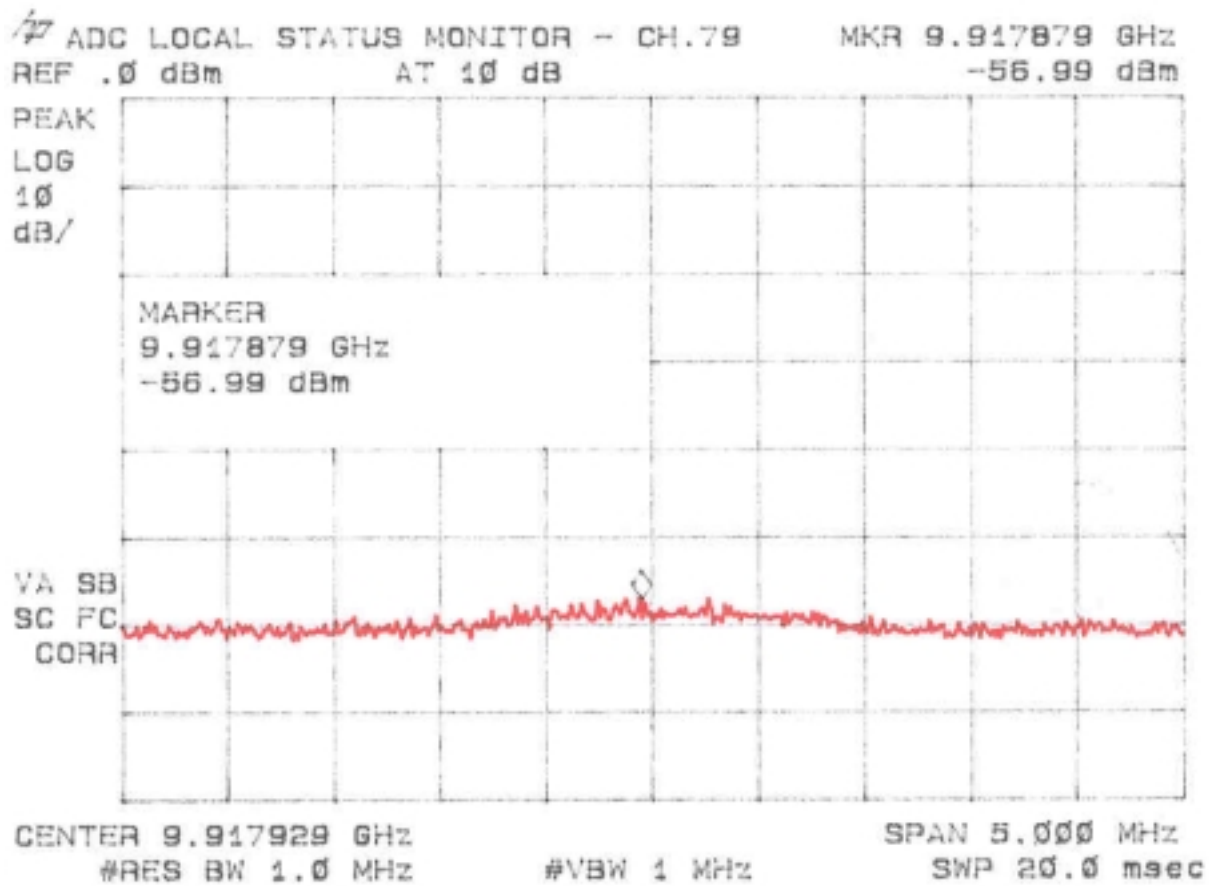


TABLE 4a PEAK RADIATED SPURIOUS EMISSIONS (Low)

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
4.803	-63.2	34.2	34.6	7.9	402.7	5000
7.204	-71.8**	33.8	37.1	7.8	207.2	5000
9.606	-67.7**	34.3	38.5	9.4	444.8	5000

TABLE 4b PEAK RADIATED SPURIOUS EMISSIONS (Mid)

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
4.879	-62.9	34.1	34.8	8.1	438.9	5000
7.318	-69.9**	33.8	37.2	7.9	263.3	5000
9.759	-67.9**	34.4	38.6	9.5	439.3	5000

TABLE 4c PEAK RADIATED SPURIOUS EMISSIONS (High)

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
4.959	-57.5	34.1	35.0	8.3	858.9	5000
7.438	-69.8**	33.8	37.4	7.9	272.3	5000
9.918	-65.5**	34.5	38.7	9.6	585.5	5000

* = Data adjusted by + 1 dB for high pass filter

** = Measurement Made at 1 meter for better dynamic range. Therefore this reading has been adjusted by $20 \log (1/3) = -9.54$ dB.

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog $((-63.2 - 34.2 + 34.6 + 7.9 + 107)/20) = 402.7$

CONVERSION FROM dBm TO dBuV = 107 dB

Tester

Signature: _____ **Name:** Tim R. Johnson

2.10 Average Spurious Emission in the Frequency Range 30 - 25000 MHz (FCC Section 15.247(c))

Any peak emissions exceeding the average limits were also investigated to ensure that the average emission met with the average limit. The results of average radiated spurious emissions falling within restricted bands are given in Table 5a (low), Table 5b, (mid), Table 5c (high) and Figure(s) 6a-6b.

Radiated measurements below 1 GHz were tested with a RBW = 120 kHz. Radiated measurements above 1 GHz were measured using a RBW = 1 MHz and VBW = 10 Hz. The measurements were also adjusted for any applicable duty cycle.

Figure 6a
Average Radiated Spurious Emission 15.247(c) High

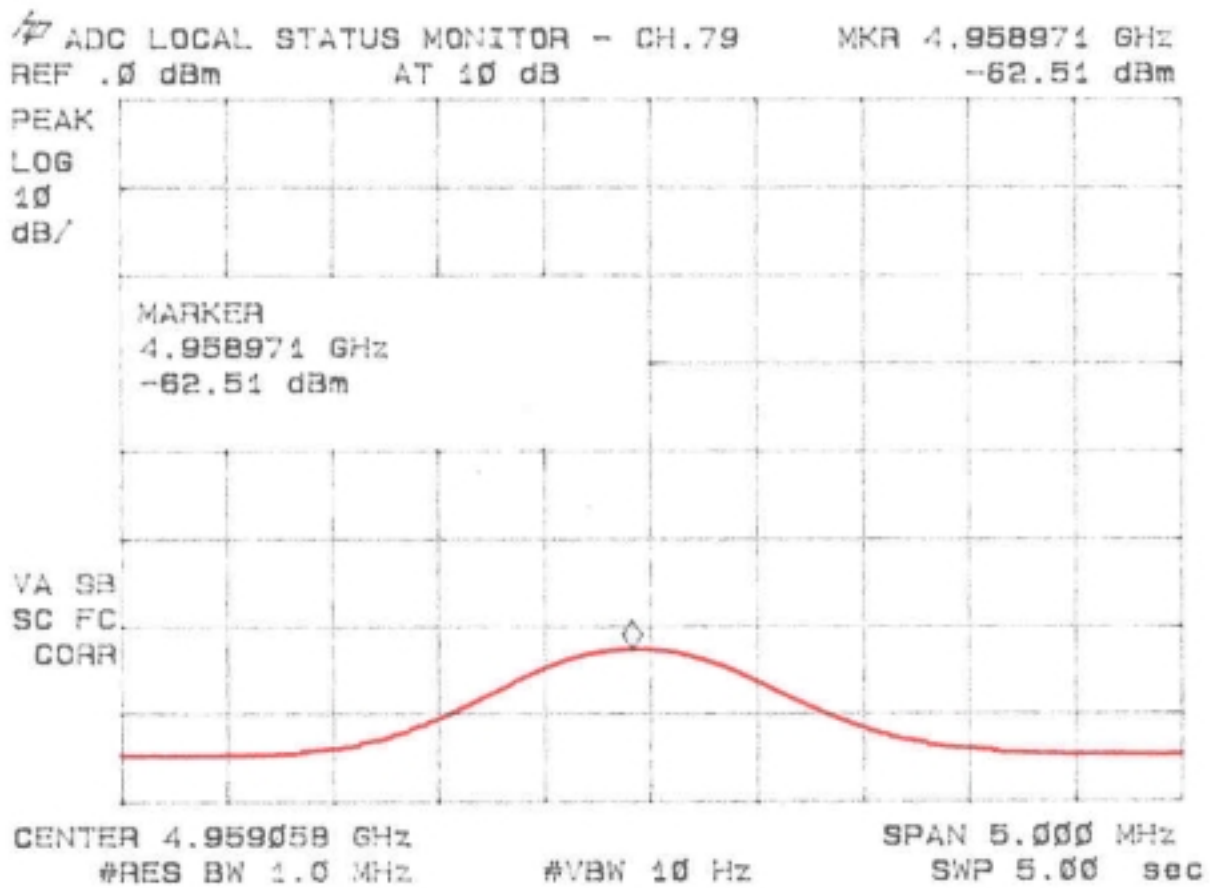


Figure 6b
Average Radiated Spurious Emission 15.247(c) High

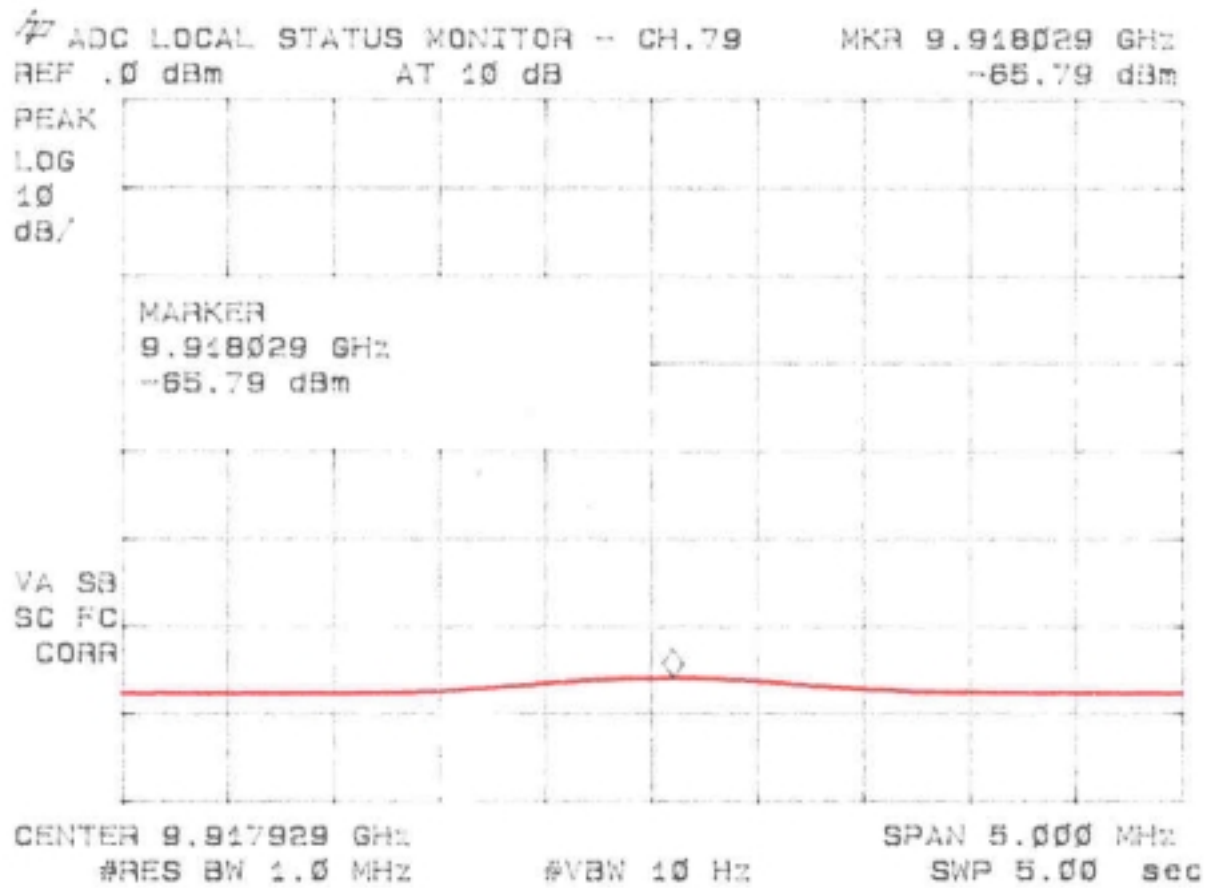


TABLE 4a AVERAGE RADIATED SPURIOUS EMISSIONS (Low)

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
Peak Emissions did not exceed Average Limits						

TABLE 4b AVERAGE RADIATED SPURIOUS EMISSIONS (Mid)

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
Peak Emissions did not exceed Average Limits						

TABLE 4c AVERAGE RADIATED SPURIOUS EMISSIONS (High)

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
4.959	-63.4	34.1	35.0	8.3	436.5	500
9.918	-76.2	34.5	38.7	9.6	169.8	500

* = Data adjusted by + 1 dB for high pass filter

** = Measurement Made at 1 meter for better dynamic range. Therefore this reading has been adjusted by $20 \log (1/3) = -9.54$ dB and worse case duty cycle of $20 \log (0.80) = -1.9$.

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) =

$$\text{Antilog } ((-63.4 - 34.1 + 35.0 + 8.3 + 107)/20) = 436.5$$

CONVERSION FROM dBm TO dBuV = 107 dB

Tester

Signature: _____ **Name:** Tim R. Johnson

2.11 20 dB Bandwidth per FCC Section 15.247(a)(1)(ii)

The antenna port was connected to a spectrum analyzer that was set for a 50 Ω impedance with the RBW = approximately 1/100 of the manufacturers claimed RBW or greater, and a VBW > RBW. The results of the 20 dB bandwidth test are given in Table 6 and Figure 7a through 7c. The channel separation is shown in Figure 7d.

TABLE 6
20 dB BANDWIDTH

Test Date: February 23, 2000 and March 3, 2000
 UST Project: 99-968
 Customer: ADC Broadband Communications
 Model: Local Status Monitor (LSM)

Frequency (GHz)	20 dB Bandwidth (MHz)	Maximum FCC Limit (MHz)
2.4015	0.300	1.0
2.4405	0.305	1.0
2.4795	0.308	1.0

(Measured Channel Separation)

Frequency of Channel Separation (kHz)	Minimum FCC Limit (kHz)
1000.0	300.0

Note: The minimum channel separation limit is 25 kHz or the 20 dB bandwidth, whichever is greater

Tester

Signature: _____ Name: Tim R. Johnson

Figure 7a.
20 dB Bandwidth per FCC Section 15.247(a)(1)(ii) (low)

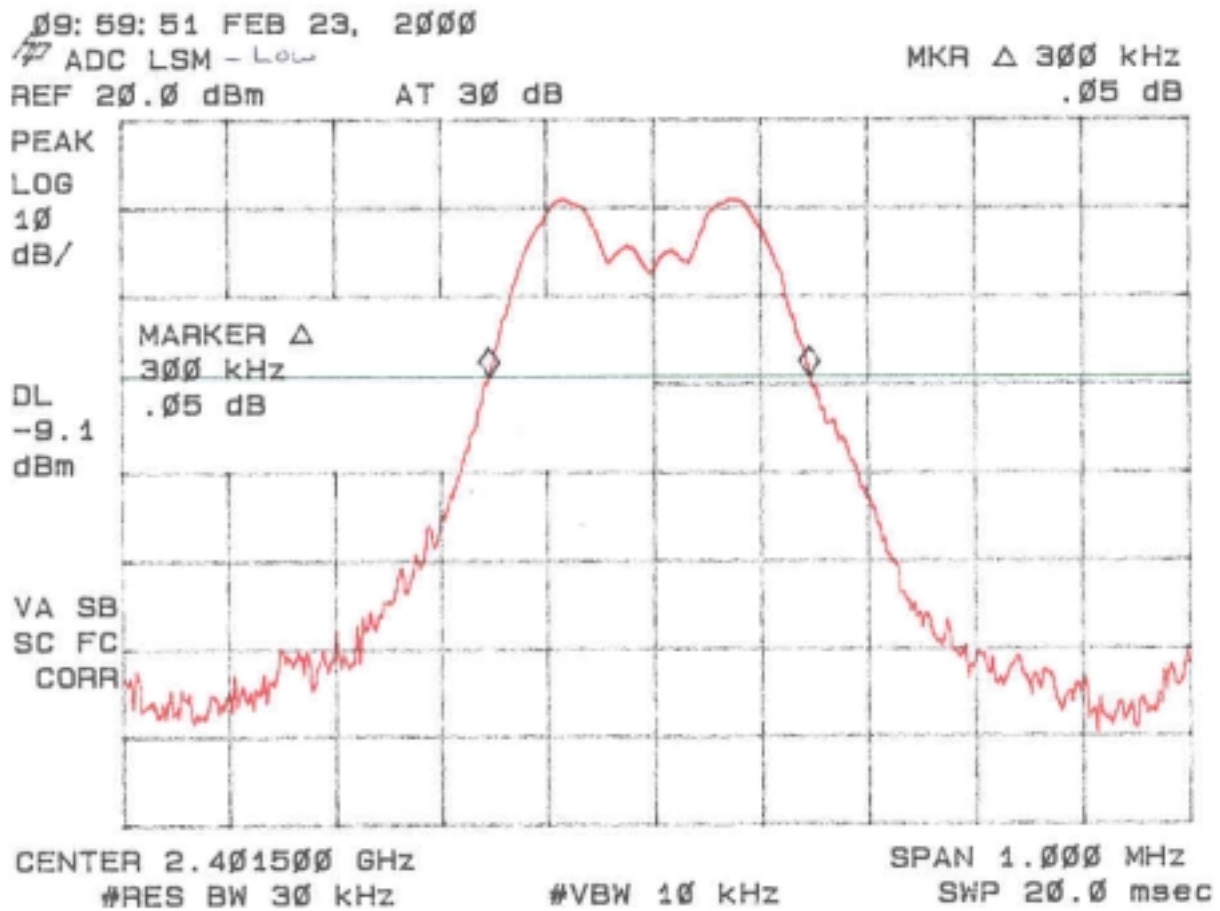


Figure 7b.
20 dB Bandwidth per FCC Section 15.247(a)(1)(ii) (Mid)

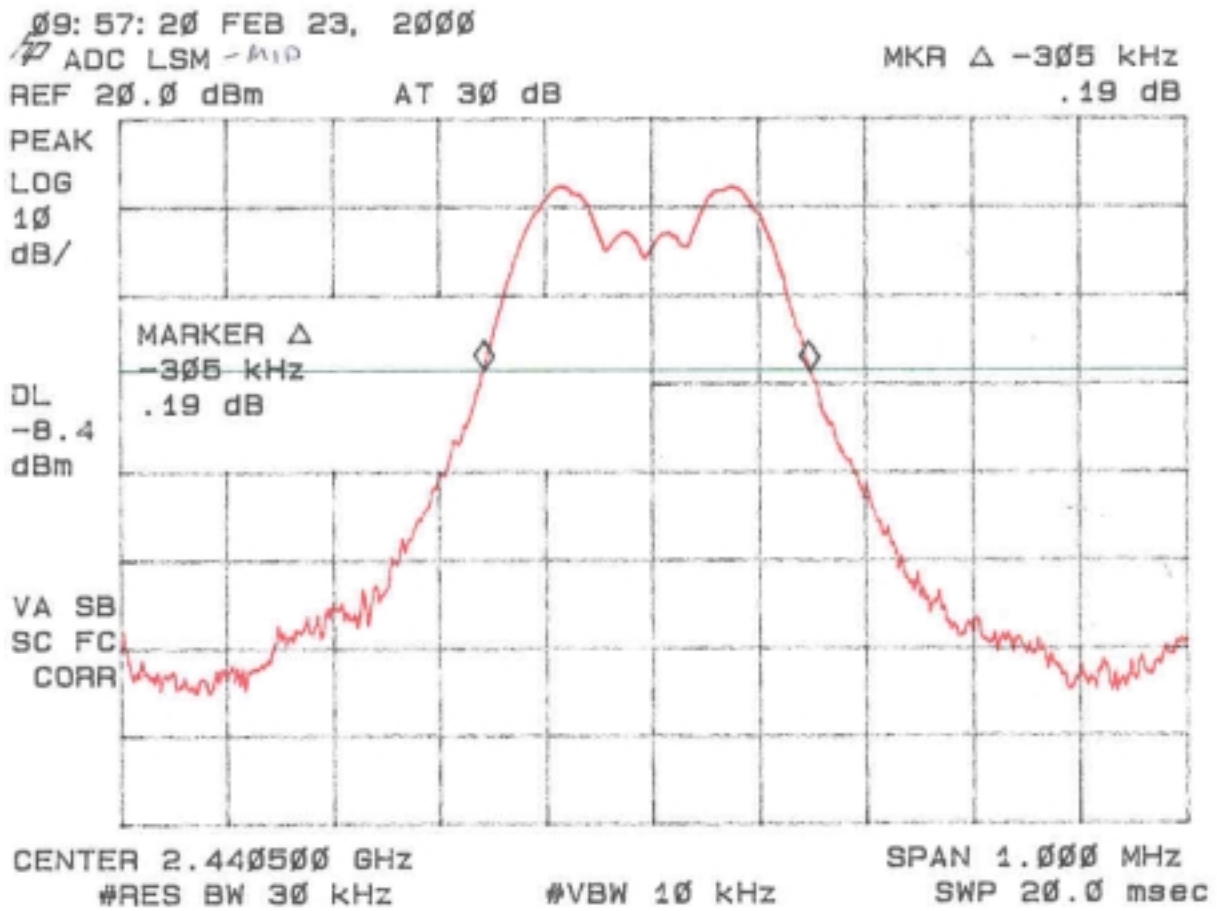


Figure 7c.
20 dB Bandwidth per FCC Section 15.247(a)(1)(ii) (High)

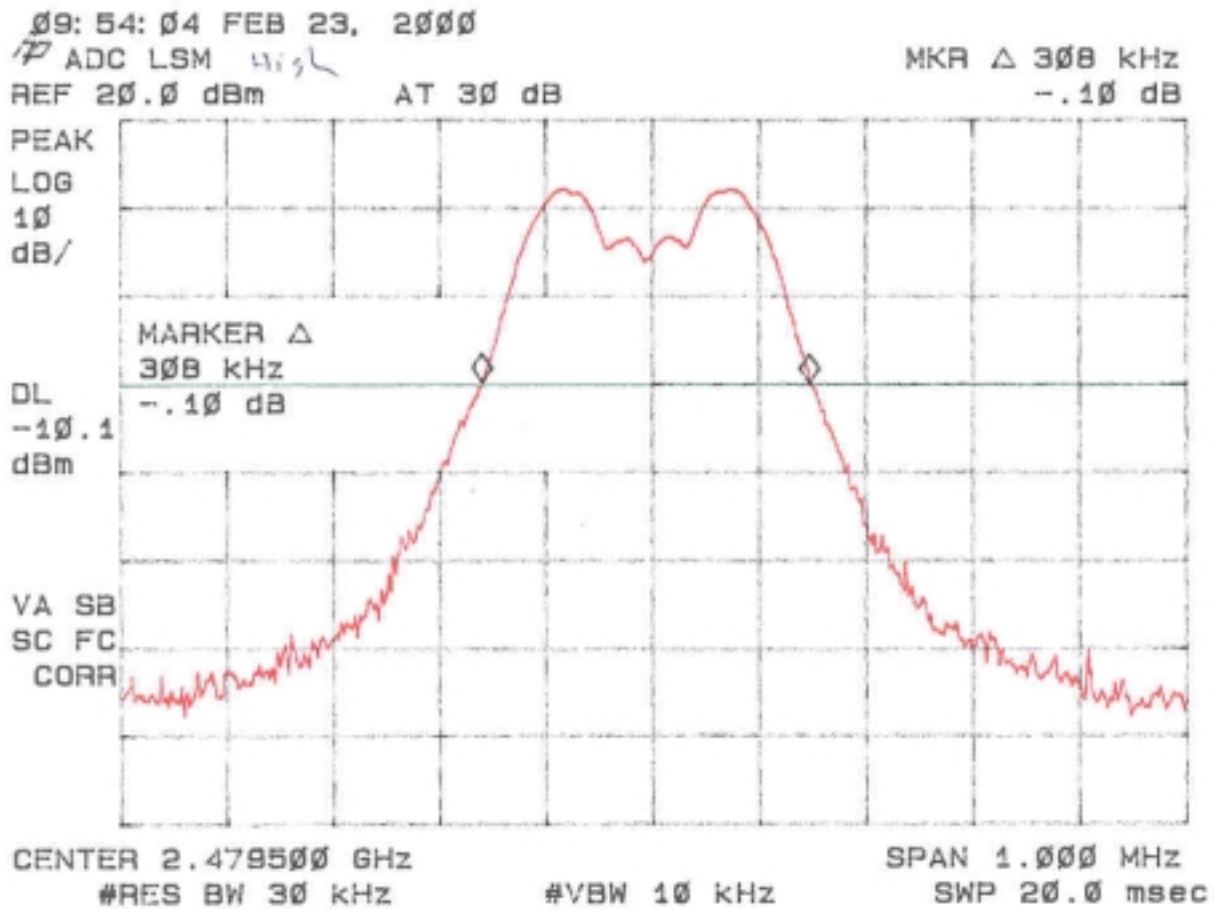
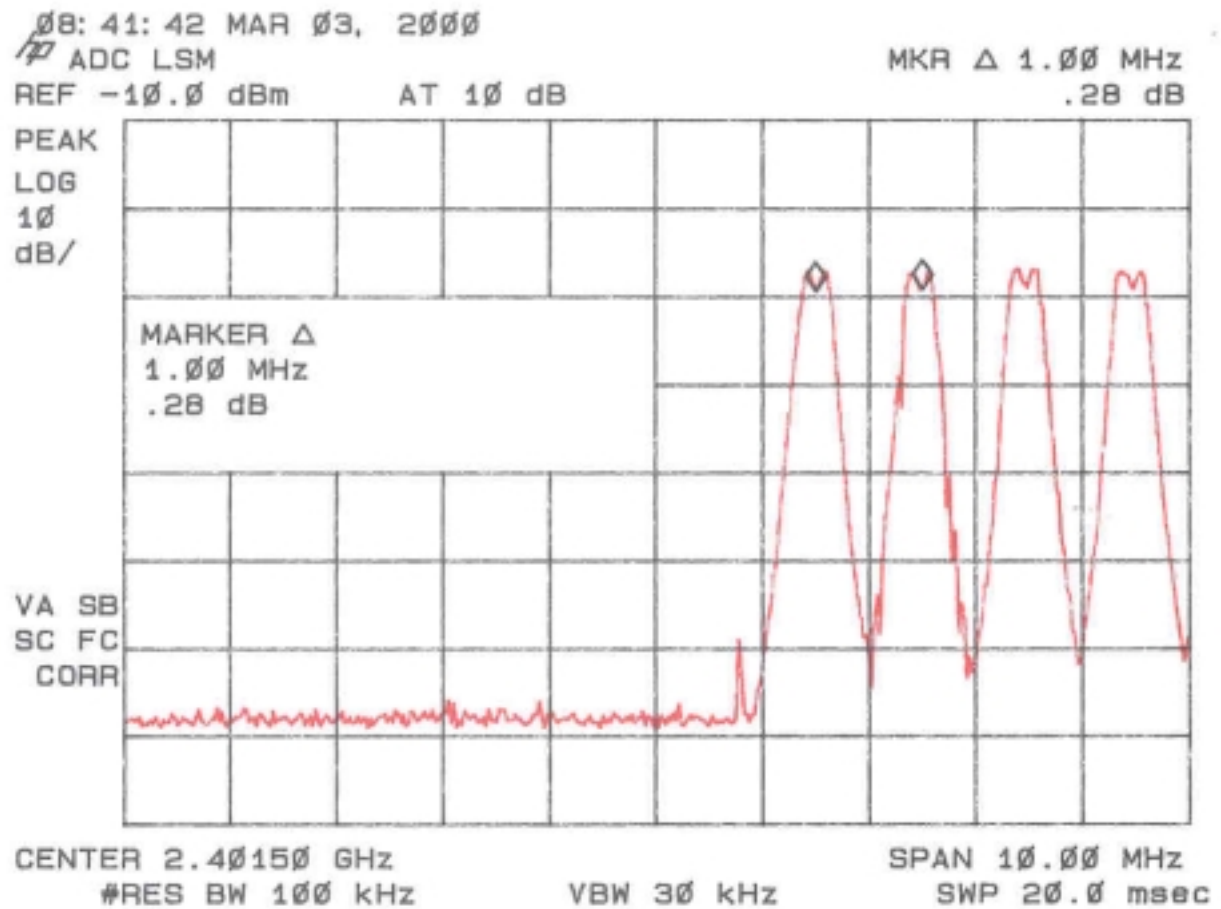


Figure 7d.
Channel Separation per FCC Section 15.247(a)(1)



2.12 Number of Hopping Channels FCC Section 15.247(a)(1)(ii)

The transmitter was placed into a typical frequency hopping mode of operation. The 2400 – 2483.5 MHz band was centered on the screen and the RBW and VBW chosen such that the individual channels could be discerned. The trace capture time was a minimum of 5 minutes.

The results of this test are given in Table 7 and Figure 8.

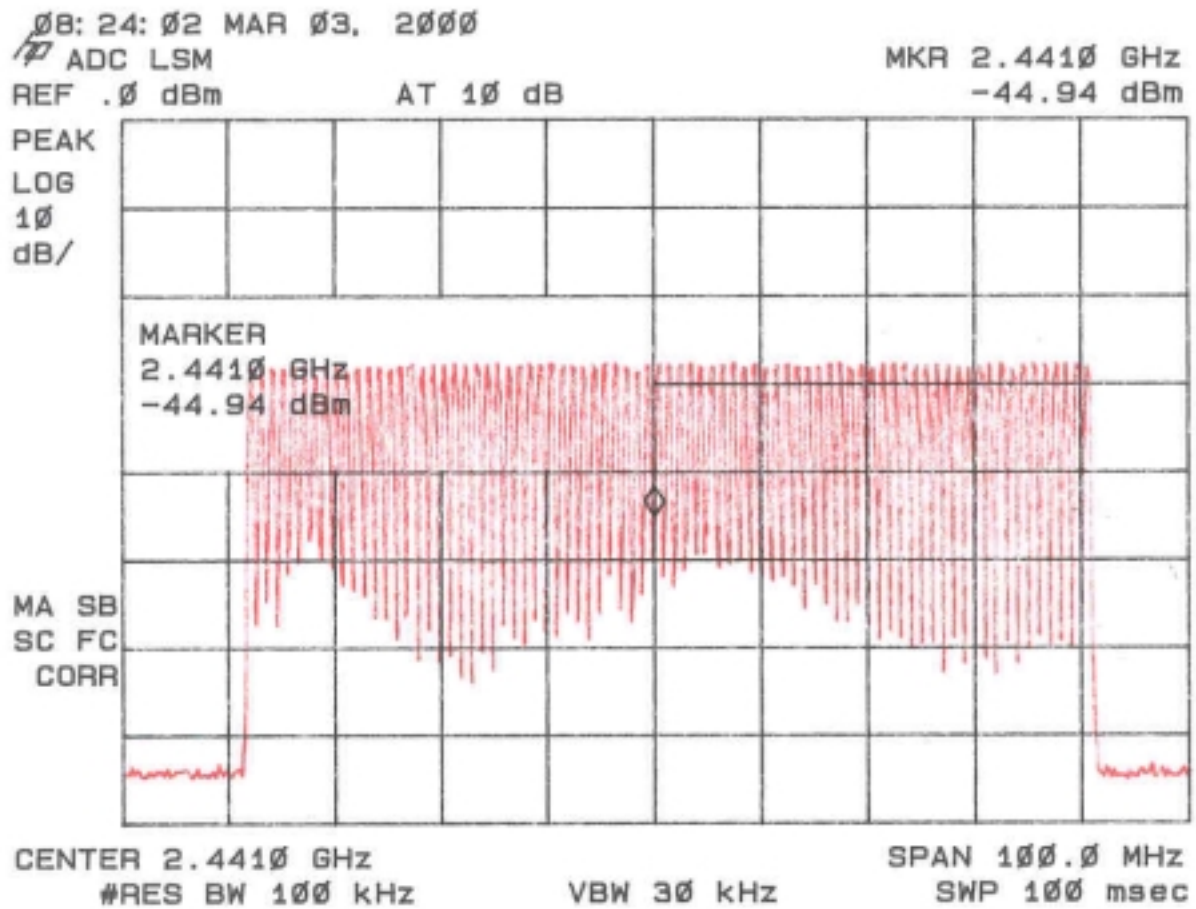
TABLE 7
NUMBER OF HOPPING CHANNELS

Test Date: March 3, 2000
UST Project: 99-968
Customer: ADC Broadband Communications
Model: Local Status Monitor (LSM)

Number of Hopping Frequencies Measured	FCC Limit (Minimum Number of Channels)
79	75

Tester
Signature: _____ **Name:** Tim R. Johnson

Figure 8
Number of Hopping Channels FCC Section 15.247(a)(1)(ii)



2.13 Average Time of Occupancy per Channel FCC Section 15.247(a)(1)(ii)

The transmitter was placed into a typical frequency hopping mode of operation. Characteristics of the time of occupancy were measured for a single channel within the 2400 – 2483.5 MHz band.

The results of this test are given in Table 8 and Figure 9.

Please note that the time of occupancy may change during operation. Please refer to the details contained in the “Theory of Operation” portion of this report.

TABLE 8
AVERAGE TIME OF OCCUPANCY PER CHANNEL

Test Date: February 16, 2000
UST Project: 99-968
Customer: ADC Broadband Communications
Model: Local Status Monitor (LSM)

Measured Average Time of Occupancy per Channel During 30 Seconds Period (seconds)	FCC Limit (seconds per 30 seconds of time)
0.171	0.4

Tester
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Figure 9a
Average Time of Occupancy per Channel FCC Section 15.247(a)(1)(ii)

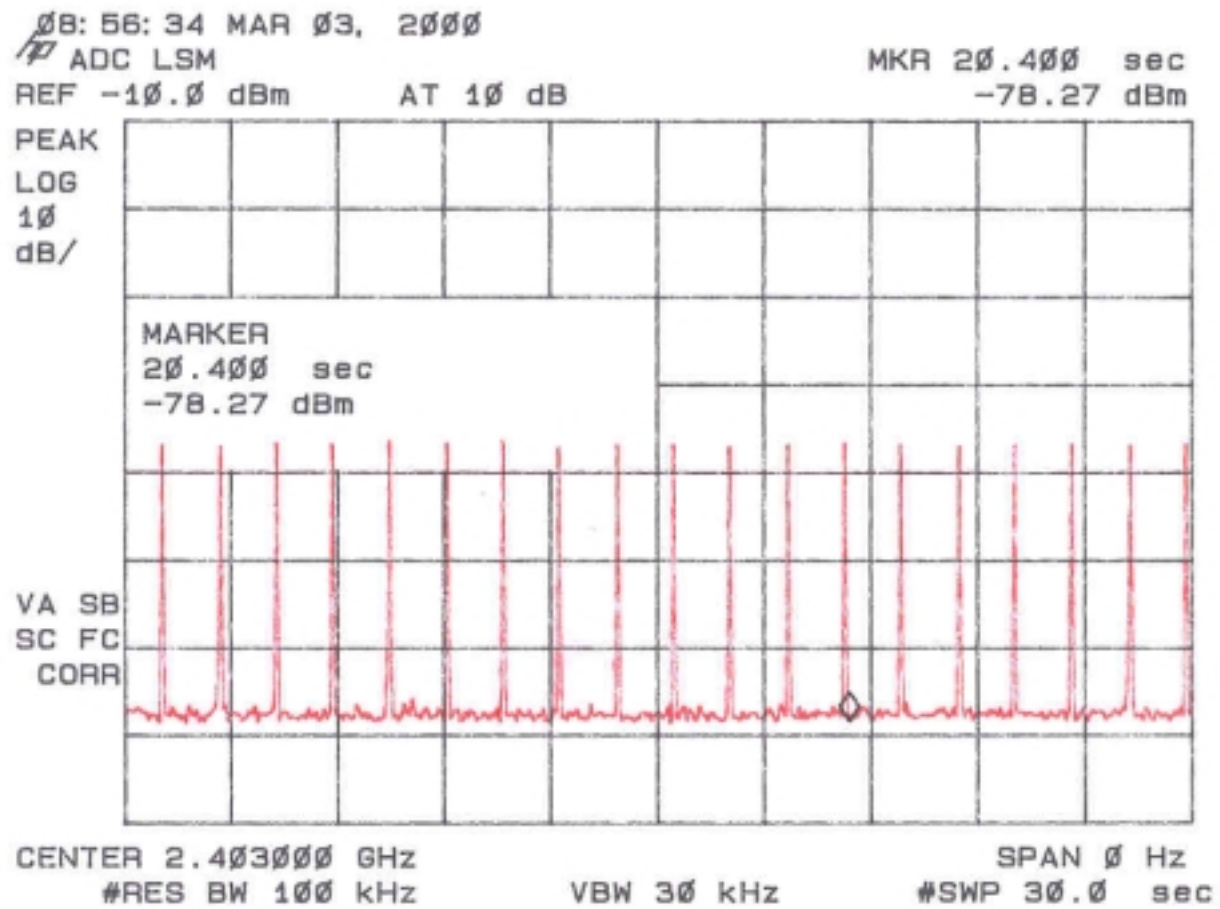
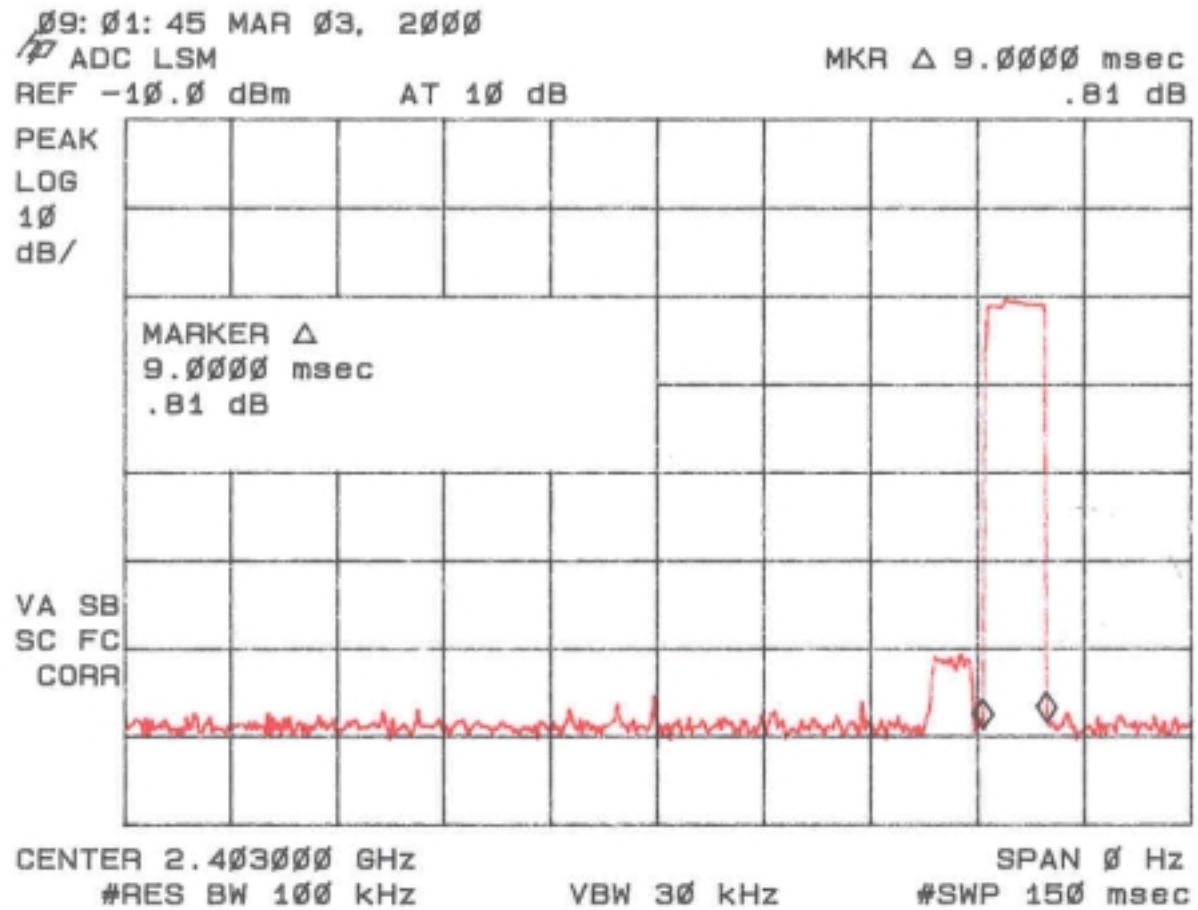


Figure 9b
Average Time of Occupancy per Channel FCC Section 15.247(a)(1)(ii)



2.14 Power Line Conducted Emissions for Transmitter FCC Section 15.207

The conducted voltage measurements have been carried out in accordance with FCC Section 15.207, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmit. The results are given in Table 9.

**TABLE 9. CONDUCTED EMISSIONS DATA (Transmit Mode)
CLASS B**

Test Date: February 16, 2000
 UST Project: 99-968
 Customer: ADC Broadband Communications
 Product: Local Status Monitor (LSM)

Worse Case Mode = High Channel

FREQUENCY (MHz)	TEST DATA (dBm)		RESULTS (uV)		FCC LIMITS (uV)	MARGIN BELOW LIMIT (dB)	
	PHASE	NEUTRAL	PHASE	NEUTRAL		PHASE	NEUTRAL
0.46	-63.0	-63.0	158.5	158.5	250	4.0	4.0
3.5	-79.0	-88.0	25.1	8.9	250	20.0	29.0
4.0	-80.0	-88.0	22.4	8.9	250	21.0	29.0
9.5	-80.0	-89.0	22.4	7.9	250	21.0	30.0
9.8	-77.0	-88.0	31.6	8.9	250	18.0	29.0
11.0	-79.0	-90.0	25.1	7.1	250	20.0	31.0
13.7	-71.0	-82.0	63.1	17.8	250	12.0	23.0

SAMPLE CALCULATIONS:

RESULTS uV =

Antilog $((-63.0 + 107)/20) = 158.5$

CONVERSION FROM dBm TO dBuV = 107 dB

Test Results

Reviewed By

Signature: _____

Name: Tim R. Johnson

2.15 Radiated Emissions for Digital Device (47 CFR 15.109a)

Radiated emissions were evaluated from 30 to 5000 MHz while the EUT was placed into a Receive mode of operation. Measurements were made with the analyzer's bandwidth set to 120 kHz measurements made less than 1 GHz and 1 MHz for measurements made greater than or equal to 1 GHz. The results for less than 1 GHz are shown in Table 10a. Measurements made over 1 GHz results are shown in Table 10b.

**TABLE 10a. RADIATED EMISSIONS DATA
(Digital Device)****CLASS A**

Test Date: January 13, 2000
UST Project: 99-968
Customer: ADC Broadband Communications
Product: Local Status Monitor (LSM)

Frequency (MHz)	Receiver Reading (dBm) @10m	Correction Factor (dB)	Corrected Reading (uV/m)	FCC Limit (uV/m) @10m
No Measurable Signals Recorded Within 10 dB of the FCC Limit				

Test Results
Reviewed By
Signature: _____

Name: Tim R. Johnson

TABLE 10b

**CLASS A
RADIATED EMISSIONS
(Digital Device)**

Test Date: February 20, 2000
 UST Project: 99-968
 Customer: ADC Broadband Communications
 Model: Local Status Monitor (LSM)

Worse Case Mode = RX high Channel

Measurements >1GHz (Peak vs. Average Limits)

FREQ. (GHz)	TEST DATA (dBm) @ 3m	AMP GAIN (dB)	ANT. FACTOR (dB)	CABLE LOSS (dB)	RESULTS (uV/m) @ 10m	FCC LIMITS (uV/m) @ 10m
2.200	-57.3	34.8	30.0	3.8	80.8	300.0

SAMPLE CALCULATIONS:

Results uV/m @10m = Antilog ((-57.3 - 34.8 + 30.0 + 3.8 - 10.46 + 107)(20) = 80.8

Conversion from dB to dBuV = 107 dB

Correction for 3m to 10m = 20log (3/10) = -10.46

Test Results

Reviewed By

Signature: _____ Name: Tim R. Johnson

2.16 Power Line Conducted Emissions for Digital Device and Receiver FCC Section 15.107

The conducted voltage measurements have been carried out in accordance with FCC Section 15.107, with a spectrum analyzer connected to a LISN and the EUT placed into an idle condition or a continuous mode of receive. The results are given in Table 11.

**TABLE 11. CONDUCTED EMISSIONS DATA (DIGITAL DEVICE & RECEIVE MODE)
CLASS A**

Test Date: February 16, 2000
UST Project: 99-968
Customer: ADC Broadband Communications
Product: Local Status Monitor (LSM)

Worse Case Mode = High Channel

FREQUENCY (MHz)	TEST DATA (dBm)		RESULTS (uV)		FCC LIMITS (uV)	MARGIN BELOW LIMIT (dB)	
	PHASE	NEUTRAL	PHASE	NEUTRAL		PHASE	NEUTRAL
0.46	-63.0	-63.0	158.5	158.5	1000	4.0	4.0
3.5	-79.0	-88.0	25.1	8.9	3000	20.0	29.0
4.0	-80.0	-88.0	22.4	8.9	3000	21.0	29.0
9.5	-80.0	-89.0	22.4	7.9	3000	21.0	30.0
9.8	-77.0	-88.0	31.6	8.9	3000	18.0	29.0
11.0	-79.0	-90.0	25.1	7.1	3000	20.0	31.0
13.7	-71.0	-82.0	63.1	17.8	3000	12.0	23.0

SAMPLE CALCULATIONS:

RESULTS uV =

Antilog $((-63.0 + 107)/20) = 158.5$

CONVERSION FROM dBm TO dBuV = 107 dB

Test Results

Reviewed By

Signature: _____

Name: Tim R. Johnson

