

**FCC Testing for the SX1115 UNII Customer Premise Equipment Transceiver  
Addition of 8' Dish Antenna**

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This document presents the latest calculations for the WJ Communication's SX1115 transceiver. Customer requirements have required the addition of an 8-foot dish antenna. The FCC specifications as a function of antenna gain are listed in tables below:

Table 1. Summary data for a 6 MHz OFDM signal.

Antenna Gain (dBi)	Maximum Allowed PSD (dBm/MHz)	Maximum Allowed Peak Transmit Power (dBm)	Minimum Allowed Bandedge PSD (dBm/MHz)	Maximum Measured Bandedge PSD (dBm/MHz)
40	0	7.8	-57	<-58
34	6	13.8	-51	-58
26	14	21.8	-43	-48
● 22	17	24.8	-39	-43

Table 2. Summary data for a 12 MHz OFDM signal.

Antenna Gain (dBi)	Maximum Allowed PSD (dBm/MHz)	Maximum Allowed Peak Transmit Power (dBm)	Minimum Allowed Bandedge PSD (dBm/MHz)	Maximum Measured Bandedge PSD (dBm/MHz)
40	0	10.8	-57	<-58
34	6	16.8	-51	-58
26	14	24.8	-43	-43
● 22	17	27.8	-39	-43

Based upon earlier measurements (November 5, 1999) the unit conforms to the maximum bandedge power spectral density at a power level greater than the operational limit for the 8' dish.

### 15.407(c)6 Field Strength of Spurious and Harmonic Radiation

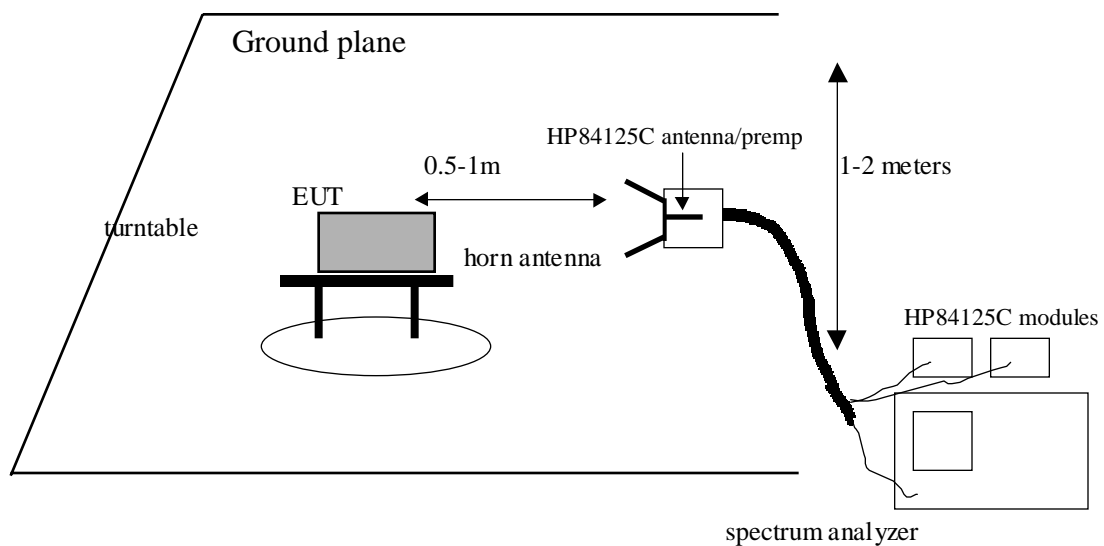
Radiated tests for unwanted out of band transmitter emissions were performed at three different operating frequencies.

5727 MHz (LOW)  
5775 MHz (MID)  
5823 MHz (HIGH)

#### Measurement Equipment Used:

HP 8565E Spectrum Analyzer  
HP 84125C Microwave EMI Measurement System

#### Test Set-Up



#### Requirement

For restricted band emissions listed in 15.205 that are above 1 GHz, the limit of each spurious and harmonic emission detected shall be no more than

54 dBuV/m at 3m separation, using an average detector

74 dBuV/m at 3m separation, using a peak detector

#### Test Method

With the transmitter operating at full power, the EUT was rotated 360° and the search antenna was slowly raised and lowered by hand in both polarities, all in an attempt to maximize the levels of the received emission for each harmonic and spurious emission up to 40 GHz.

#### NOTE:

Measurements were made with CW signal at full power. This improved signal to noise level over 6 MHz signal by  $10 \log(6/1) = 8$  dB, and CW would produce worst case harmonics. Upper and lower frequencies

were chosen so as to fall at the lowest and highest edge of a 6 MHz channel centered on lowest frequency (5730 MHz) and highest frequency (5820). This simulates worst-case emission scenario at bandedge for this product.

## **Test Results**

The HP84125C, when used with the memory card, applies all corrections such as cable loss, antenna factor, and amplifier gains to the received signal and displays a corrected field strength level on the spectrum analyzer screen. System operation is verified per user manual by connecting a signal generator to where the antenna port would normally connect, and comparing the displayed emission level with the theoretical level calculated for the system loss/gain parameters.

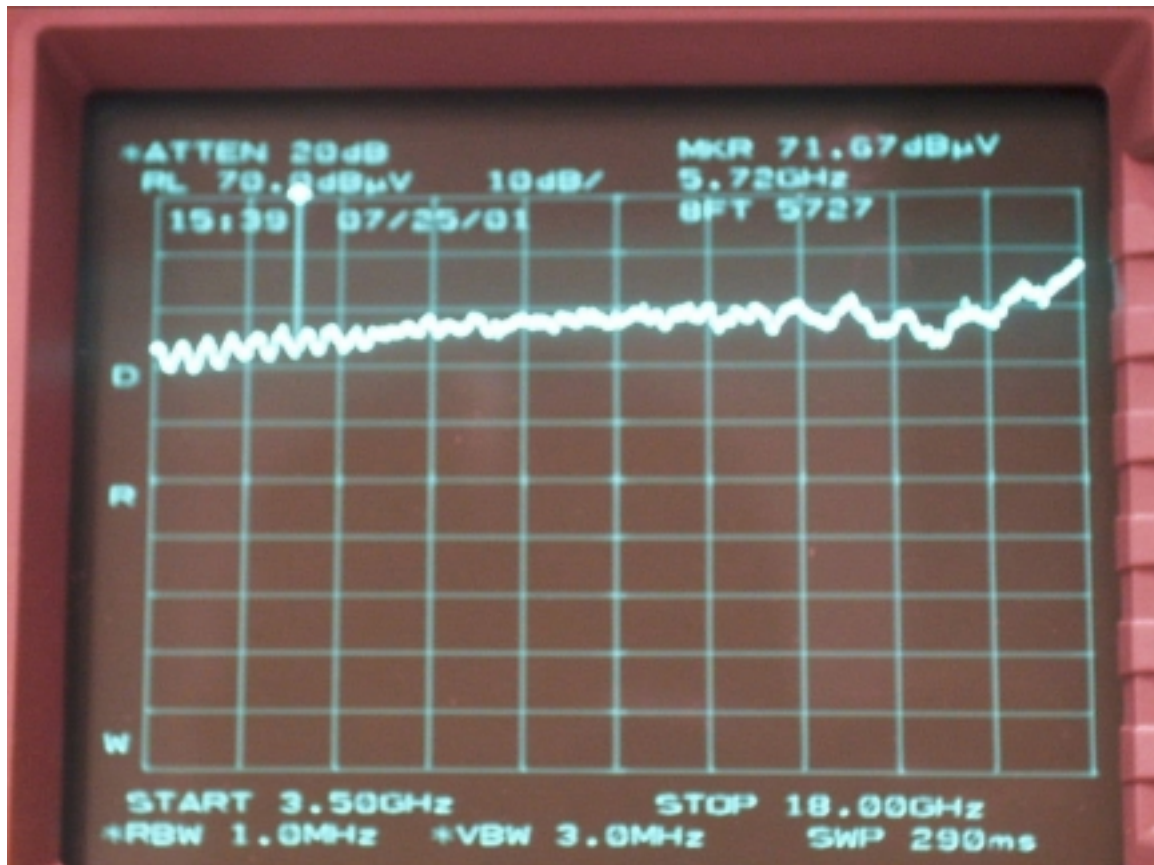
When checked in this manner, the HP84125C system readings were within +/- 2 dB of calculated values.

**Note:** Measurements were performed at 1 ft from antennas. Readings extrapolated to 3 meters are therefore 20 dB below levels shown on spectrum analyzer screens.

No emissions were detected within 20 dB of FCC Limits.

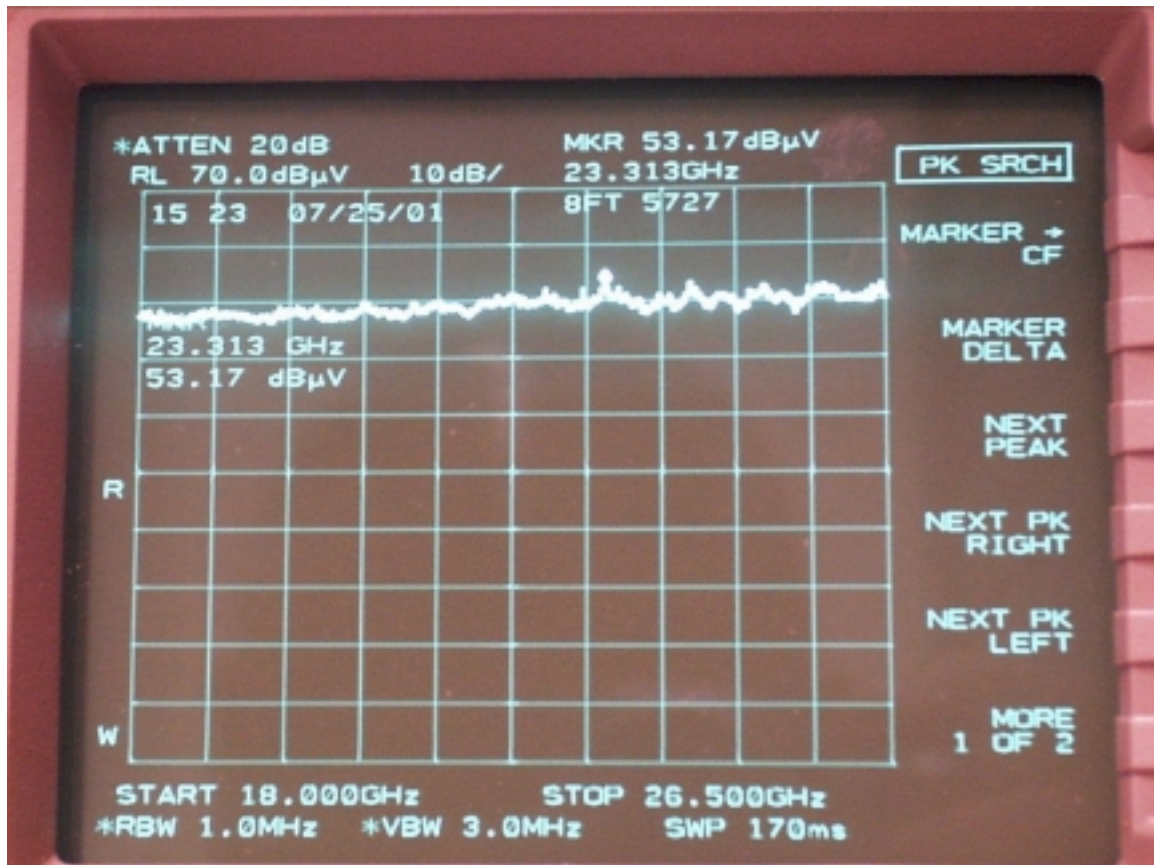
NTTSX1115 Radiated Emissions, Radiowaves 8ft dish, 1ft separation  
 $f_0 = 5727 \text{ MHz}$

Emissions: 3.5 - 18 GHz



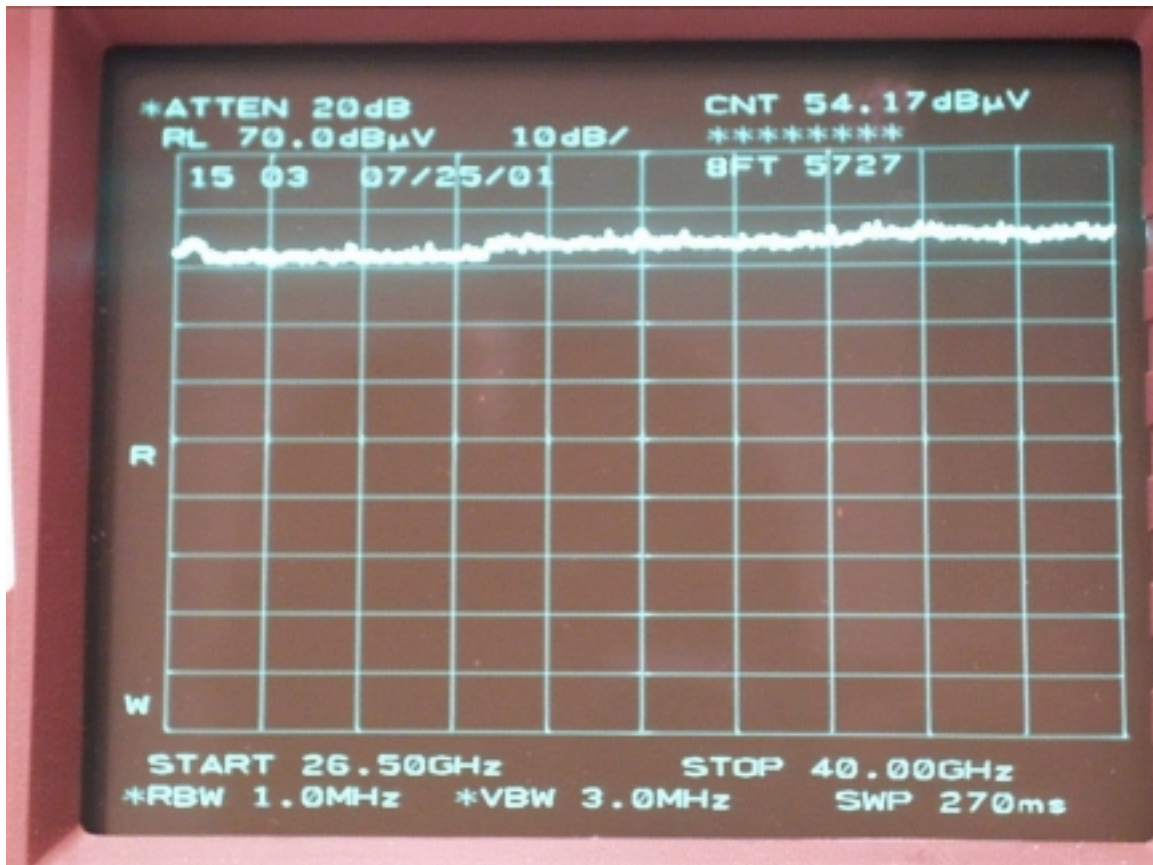
NTTSX1115 Radiated Emissions, Radiowaves 8ft dish 1ft separation  
 $f_0 = 5727 \text{ MHz}$

Emissions: 18-26.5 GHz



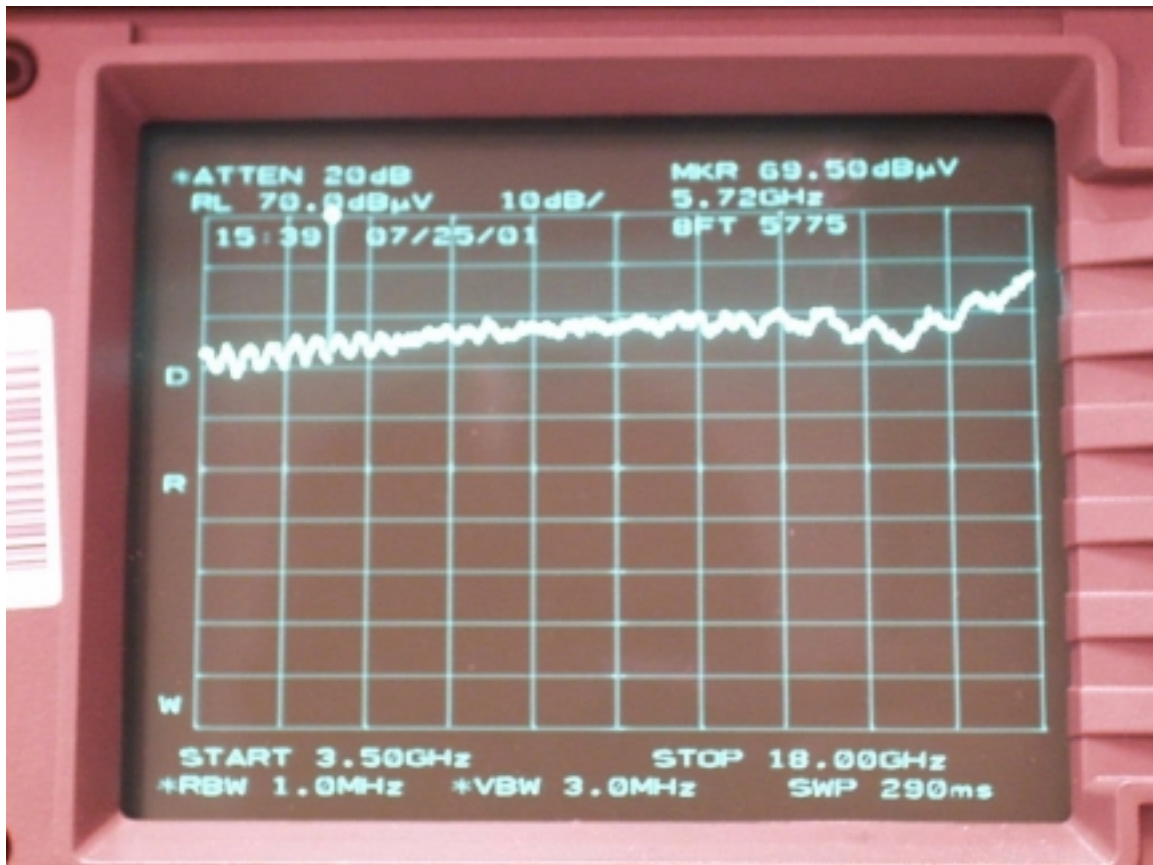
NTTSX1115 Radiated Emissions, Radiowaves 8ft dish, 1ft separation  
 $f_0 = 5727 \text{ MHz}$

Emissions: 26.5 - 40 GHz



NTTSX1115 Radiated Emissions, Radiowaves 8ft dish, 1ft separation  
 $f_0 = 5775 \text{ MHz}$

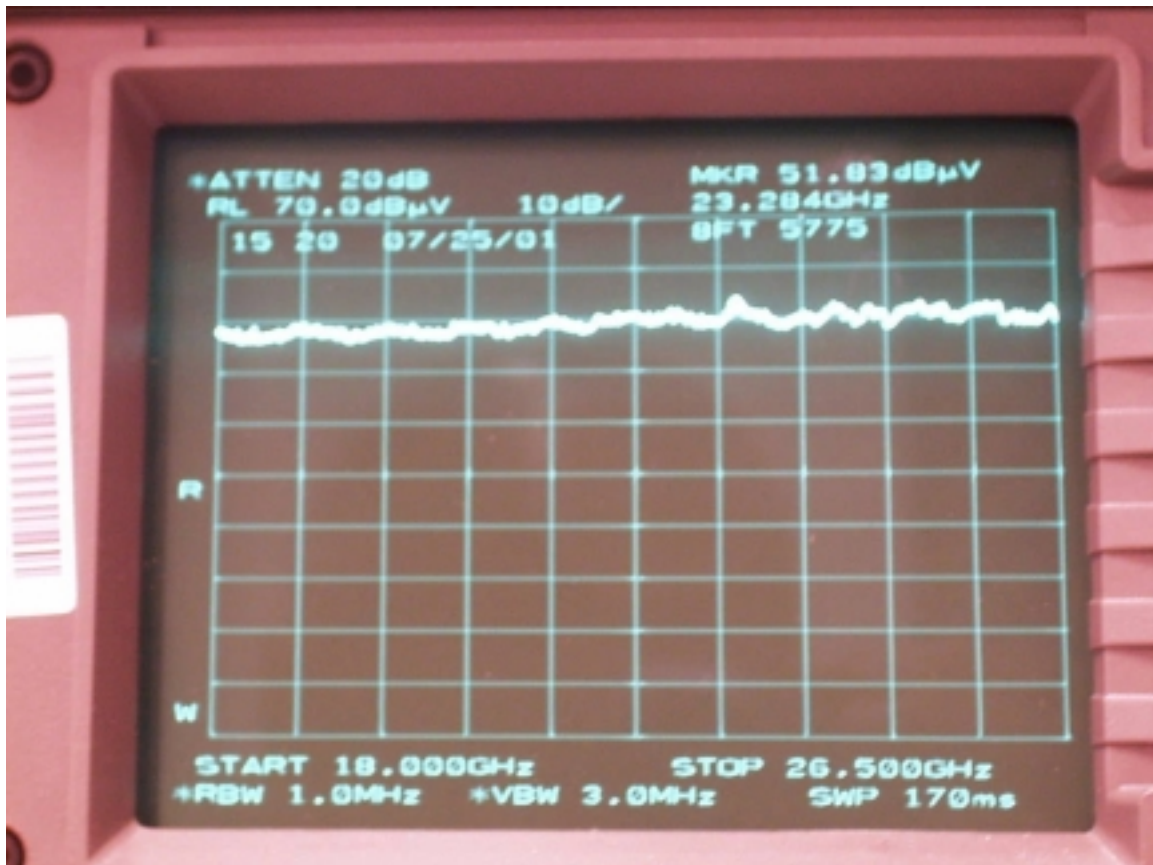
Emissions: 3.5 - 18 GHz





NTTSX1115 Radiated Emissions, Radiowaves 8ft dish, 1ft separation  
 $f_0 = 5775 \text{ MHz}$

Emissions: 18 - 26.5 GHz





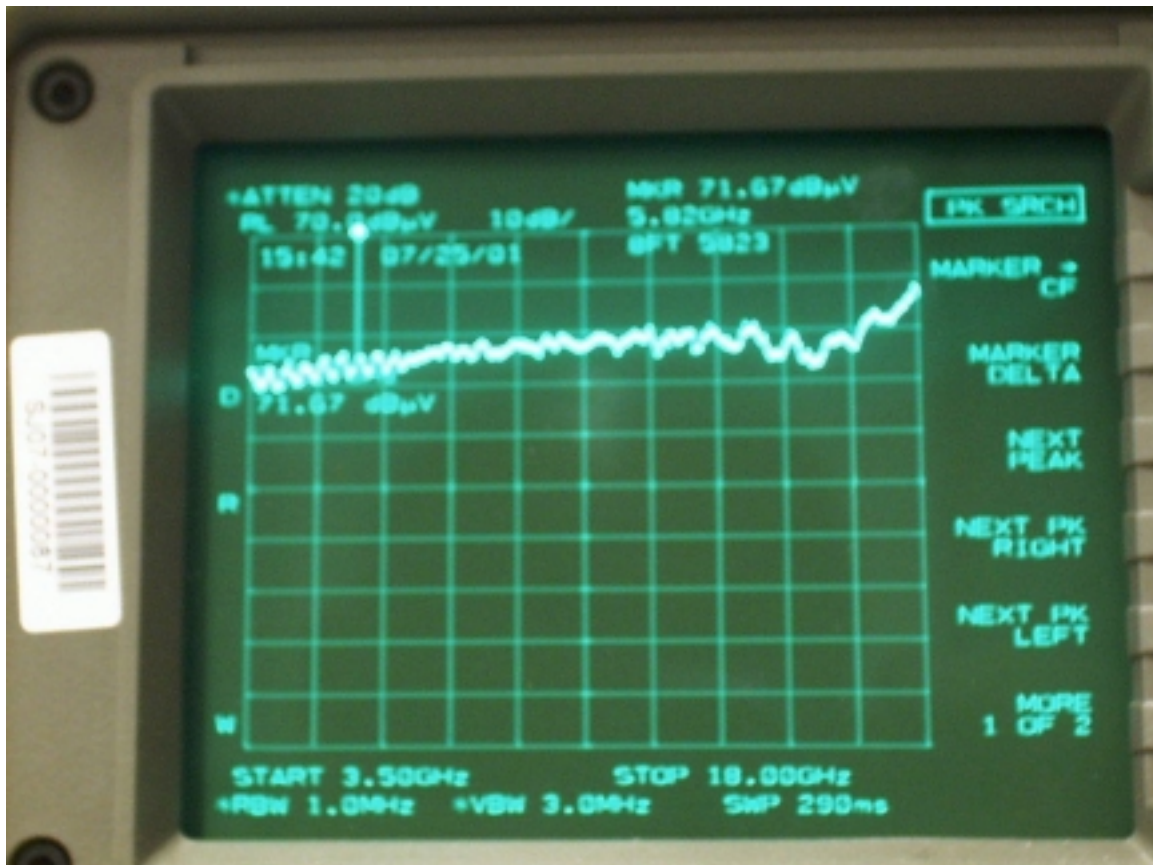
NTTSX1115 Radiated Emissions, Radiowaves 8ft dish, 1ft separation  
 $f_0 = 5775 \text{ MHz}$

Emissions: 26.5 - 40 GHz



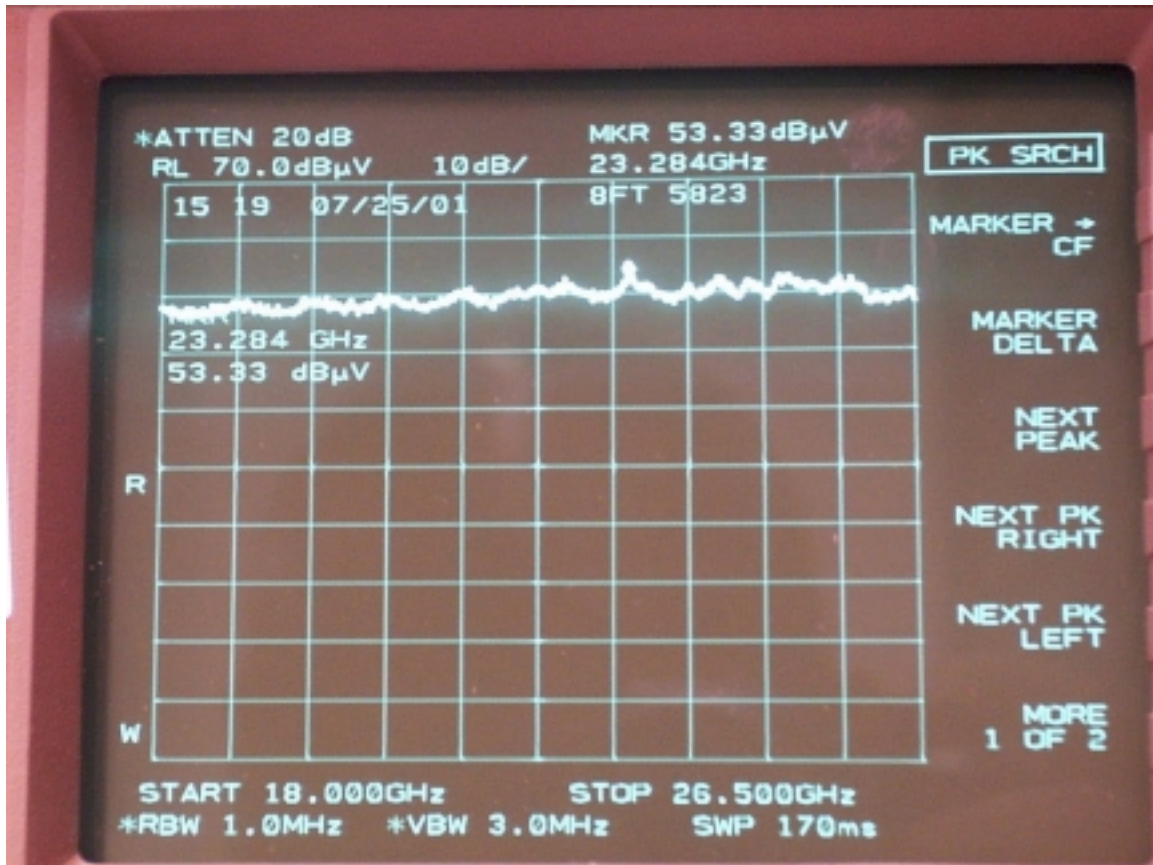
NTTSX1115 Radiated Emissions, Radiowaves 8ft dish, 1ft separation  
 $f_0 = 5823 \text{ MHz}$

Emissions: 3.5 - 18 GHz



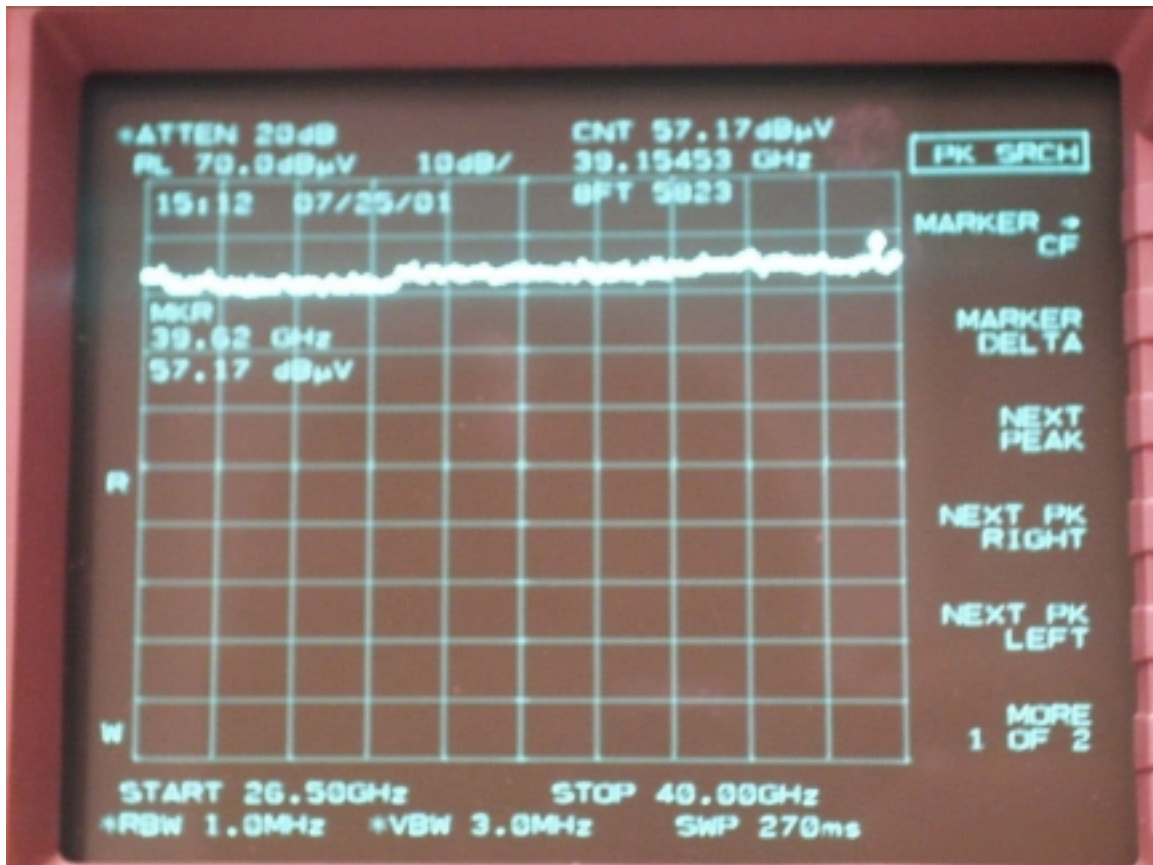
NTTSX1115 Radiated Emissions, Radiowaves 8ft dish, 1ft separation  
 $f_0 = 5823 \text{ MHz}$

Emissions: 18-26.5 GHz



NTTSX1115 Radiated Emissions, Radiowaves 8ft dish, 1ft separation  
fo = 5823 MHz

Emissions 26.5 - 40 GHz



## **Part 15 Digital Device Emissions**

Tests were performed to measure radiated emissions per 15.109 of the Rules.  
Test procedures were per ANSI C63.2.

### **Test Site**

All radiated testing was performed at Cisco Systems by me or under my supervision. Antenna conducted RF emissions were performed at Watkins Johnson and at Cisco. Conducted and radiated emissions were performed using test equipment with calibration traceable to NIST, and following test procedures accepted by the industry.

THOMAS N. COKENIAS  
Consultant, EMC&Radio Type Approvals