

NAME OF TEST:

Field Strength of Spurious Radiation

RULE PART NUMBER: 2.1053, 90.543(c)(e), 27.53(e)

MINIMUM STANDARD: For 30 Watts: $43 + 10\log_{10}(30) = 58 \text{ dBc}$
For 10 Watts: $43 + 10\log_{10}(10) = 53 \text{ dBc}$

27.53(e);90.543(e): in the band 1559—1610 MHz
-70 dBW/MHz EIRP for wideband signals, and
-80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth

UNIT UNDER TEST

TEST RESULTS: Meets minimum standard (see data on the following page)

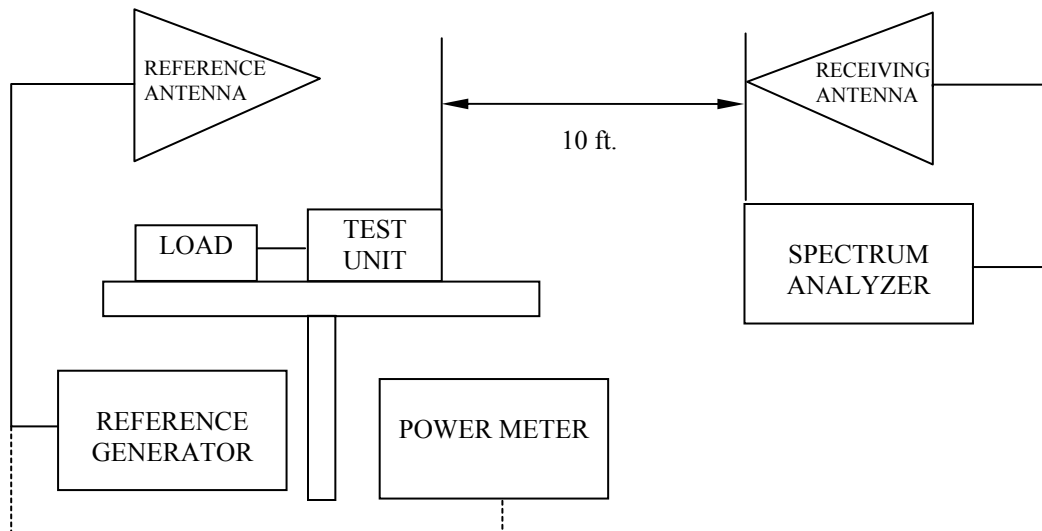
TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.12

TEST EQUIPMENT: Log Spiral Antenna, Model 93491-2
Horn Antenna, Model EMCO 3115
Reference Generator, Model HP83732A
Attenuator, BIRD Model / 100-A-MFN-20 / 20 dB / 100 Watt
Attenuator, BIRD Model / 50-A-MFN-03 / 3 dB / 50 Watt
Spectrum Analyzer, Model HP8563E
Power Meter, Model HP 8901B
Power Supply, Model HP6038A

MEASUREMENT PROCEDURE: Radiated spurious attenuation was measured according to
TIA/EIA Standard 603 Section 2.2.12

TEST SET-UP:



PERFORMED BY:

Allen Frederick

Allen Frederick

Date: Jan 9, 2003

NAME OF TEST: Spurious Radiation Attenuation
(Continued)

Frequency: 800 MHz		Spec =		-57.8		dBc	
Power: 30 Watts		Highest Spur =		-77.1		dBc	
44.8 dBm							
Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Circular Polarization Correction (dB)	Spurious Attenuation dBc
1600	H	-90.8	-45.0	7.00	1.20	3.0	-98.6
	V	-89.8	-45.0	7.00	1.20	3.0	-98.6
2400	H	-71.8	-22.7	7.83	1.20	3.0	-77.1
	V	-76.3	-26.3	7.83	1.20	3.0	-80.7
3200	H	-80.3	-25.3	9.50	1.20	3.0	-81.4
	V	-78.0	-22.7	9.50	1.20	3.0	-78.8
4000	H	-94.2	-32.8	11.83	1.20	3.0	-91.2
	V	-91.7	-29.3	11.83	1.20	3.0	-87.7
4800	H	-97.2	-33.7	12.83	1.20	3.0	-93.1
	V	-93.0	-29.7	12.83	1.20	3.0	-89.1
5600	H	-93.7	-26.3	14.00	1.20	3.0	-86.9
	V	-95.3	-28.5	14.00	1.20	3.0	-89.1
6400	H	-103.2	-28.4	15.33	1.20	3.0	-90.3
	V	-102.2	-27.7	15.33	1.20	3.0	-89.6
7200	H	-104.7	-30.9	16.83	1.20	3.0	-94.3
	V	-105.3	-30.8	16.83	1.20	3.0	-94.2
8000	H	-106.0	-28.8	18.50	1.20	3.0	-93.9
	V	-106.0	-28.5	18.50	1.20	3.0	-93.6

Frequency:		800 MHz		Spec =		-53.0 dBc	
Power:		10 Watts		Highest Spur =		-76.6 dBc	
		40.0 dBm					
Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Circular Polarization Correction (dB)	Spurious Attenuation dBc
1600	H	-89.5	-43.7	7.00	1.20	3.0	-92.5
	V	-89.0	-44.2	7.00	1.20	3.0	-93.0
2400	H	-76.8	-27.7	7.83	1.20	3.0	-77.3
	V	-78.3	-28.3	7.83	1.20	3.0	-78.0
3200	H	-80.3	-25.3	9.50	1.20	3.0	-76.6
	V	-81.8	-26.5	9.50	1.20	3.0	-77.8
4000	H	-95.5	-34.2	11.83	1.20	3.0	-87.8
	V	-90.0	-27.7	11.83	1.20	3.0	-81.3
4800	H	-98.5	-35.0	12.83	1.20	3.0	-89.6
	V	-91.3	-28.0	12.83	1.20	3.0	-82.6
5600	H	-97.0	-29.7	14.00	1.20	3.0	-85.5
	V	-92.7	-25.8	14.00	1.20	3.0	-81.6
6400	H	-105.7	-30.9	15.33	1.20	3.0	-88.0
	V	-101.3	-26.8	15.33	1.20	3.0	-83.9
7200	H	-101.7	-27.9	16.83	1.20	3.0	-86.5
	V	-101.7	-27.2	16.83	1.20	3.0	-85.8
8000	H	-104.8	-27.6	18.50	1.20	3.0	-87.9
	V	-102.8	-25.3	18.50	1.20	3.0	-85.6

NAME OF TEST: Spurious Radiation Attenuation-with Antenna (90.543(e))

Frequency: 800 MHz		Spec = -50.0 dBm					
Power: 30 Watts		Highest Spur = -53.8 dBm					
Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Circular Polarization Correction (dB)	Spurious Attenuation dBm
1600	H	-103.0	-48.0	7.00	1.20	3.0	-56.8
	V	-100.0	-45.0	7.00	1.20	3.0	-53.8

Frequency: 800 MHz		Spec =		-50.0		dBm	
Power: 10 Watts		Highest Spur =		-52.5		dBm	
Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Circular Polarization Correction (dB)	Spurious Attenuation dBm
1600	H	-101.0	-46.0	7.00	1.20	3.0	-54.8
	V	-98.7	-43.7	7.00	1.20	3.0	-52.5

CALCULATIONS FOR FIELD STRENGTH OF SPURIOUS RADIATION TESTS:

The transmitter carrier frequency was set to 800.000 MHz. The reference oscillator frequency of all of the transceivers is 17.50 MHz. The output of the transceivers was searched from 17.50 MHz to the tenth harmonic of the carrier frequencies. The tests were conducted with the transceiver/modem/GPS inside of the enclosure.

Because the antennas used for the measurements recorded above 1 GHz were not flat in gain and differed from a dipole, the generator output was corrected for gain at each spurious frequency. The cable loss in the measurements is the loss in the cable between the signal generator and the substitution antenna. An additional 3 dB correction was also made to the spurious responses measured above 1 GHz to correct for the 3 dB polarization loss in the reference path.

For part 90.543(e), the same procedure as above was used except an 0 dB mag-mount antenna (Maxrad Model: MUF4900 retuned 700MHz band) to was connected to the transmitter port. A notch filter was used in front of the spectrum analyzer to notch the fundamental to extend the dynamic range of the spectrum analyzer.

EXAMPLE:

At 1600 MHz (800 MHz tuned), 30 Watts and horizontal polarization.

$$r = \text{Substitution Gen - Cable Loss} \quad -45.0 - 7.0 \quad = -52.0$$

$$R = \text{Reference Generator (dBm)} \quad -52.0$$

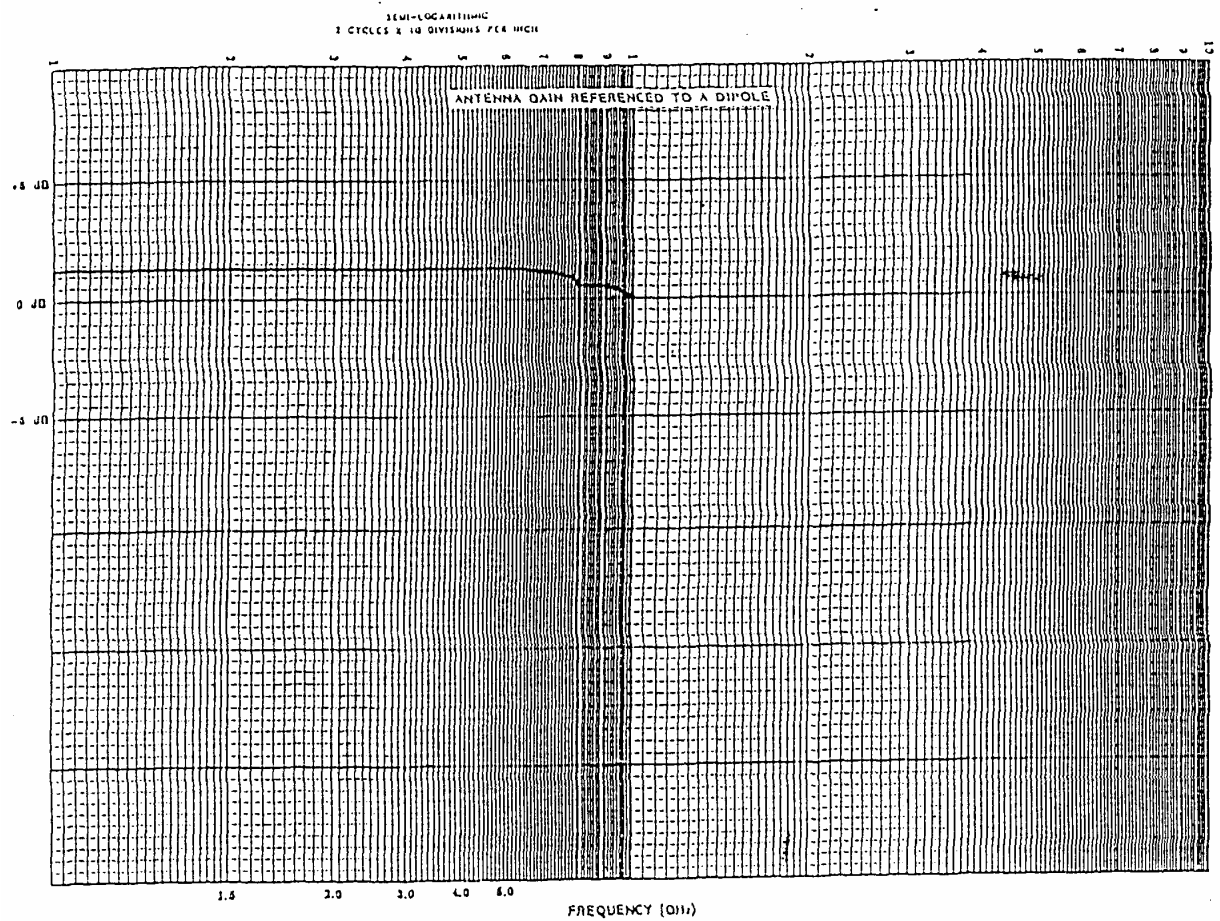
$$A = \text{Antenna Gain (dB)} \quad 1.2$$

$$P = \text{Polarization Correction Factor (dB)} \quad 3.0$$

$$R' \text{ (Corrected Reference (dBm))} = R + A - P \Rightarrow -52.0 + 1.2 - 3.0 = -53.8 \text{ dBm}$$

$$Po = \text{Radiated Carrier Power (dBm)} \quad 30 \text{ Watts} = 44.8 \text{ dBm}$$

$$\text{Radiated Spurious Emission (dBc)} = Po - R' \Rightarrow -53.8 - (+44.8) = \mathbf{-98.6 \text{ dBc}}$$



**ANTENNA GAIN GRAPH OF SUBSTITUTION ANTENNA
REFERENCED TO A DIPOLE**