

EXHIBIT 14

RADIATED SPURIOUS EMISSIONS MEASUREMENTS

Measurements of radiated spurious emissions were performed in accordance with the requirements and conditions of § 24.238 and § 2.1053; requirements, procedures and results are described in this exhibit.

Requirements

Broadband PCS equipment operating under the authority of Part 24, Subpart E, must comply with the emissions limits given in § 24.238(a): "On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB."

Section 2.1053(a) of the FCC Rules specifies that measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified. Furthermore, § 2.1057 requires that measurements be made from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency (approximately 20 GHz for PCS 1900 terminals).

Per § 2.1053(a), the allowable field strength of radiated spurious emissions is found by referencing the relative radiated power of each emissions to the rated RF output power of the Eagle II, assuming that each is radiated from a halfwave dipole antenna. At a distance R from an ideal dipole antenna excited by a 1 W (30.0 dBm) signal, the electric field strength is (see, for example, Antennas, John D. Kraus, 2nd Edition, pg. 49):

$$E = \frac{1}{R} \times \sqrt{30 \times P_T \times G}$$

Where:

- E = Field Strength in Volts/meter
- R = Measurement distance in meters
- P_T = Transmitter Rated Power in Watts (30 dBm nominal = 1 W)
- G = Gain of an Ideal Dipole (1.64x or 2.15 dBi)

Therefore, at a distance of 3 m from the transmitter / dipole:

$$E = \frac{1}{3} \times \sqrt{30 \times 1.0 \times 1.64}$$
$$E = 2.34 \frac{V}{m} \text{ or } 127.34 \text{ dB}\mu\frac{V}{m}$$

As required by § 24.238(a), spurious emissions must be attenuated by at least $43+10\log(P)$ dB; for a rated RF output power of 1 W, the required attenuation is thus 43 dB. Therefore, at 3 meters from the device, the radiated spurious emissions field strength limit is:

$$E = 127.34 - 43.0 \text{ dB}\mu\frac{V}{m}$$

$$E = 84.4 \text{ dB}\mu\frac{V}{m}$$

Note that, for any rated transmitter output power P, the absolute level of spurious emissions is found to be -13 dBm (the same absolute power level requirement for conducted spurious emissions). At a distance of 3 meters, a power of -13 dBm into an ideal dipole produces an equivalent field strength of 84.4 dBμV/m, giving the same result using the field strength equation previously presented.

Additionally, because Part 24 applies only to PCS transmissions, only transmitter and transmitter-related spurious emissions are subject to the limits given in § 24.238. Radiated spurious emissions from receivers which operate above 960 MHz are not regulated, per § 15.101(b). All other emissions, including those originating from digital control, processing, and other circuitry, and power supplies, and whether radiated or conducted onto the AC powerline, are regulated as unintentional emissions by Part 15 of the FCC rules. In accordance with the guidance given in § 15.101, this category of emissions is subject to the verification process.

Measurement Procedure and Results Summary

Measurements of radiated spurious emissions were performed at and by Criterion Technology of Rollinsville, CO. Criterion Technology is accredited through the national Voluntary Laboratory Accreditation Program (NVLAP) and a description of its open air test site (OATS) has been filed with the FCC. Measurement procedures and results are described in the test report prepared by Criterion Technology, which is on file.

For all radiated and AC powerline conducted emissions measurements, the Eagle II was mounted to a shielded break-out box as is shown in Figure E14.1. This box provided a conditioned interface for the DC power and RS-232 signals to the Eagle II. Measurements of unintentional (non transmitter related) emissions, both radiated and AC powerline conducted, were performed to ensure that these emissions from the Eagle II are well below the Class B limits. When incorporated into an OEM product, unintentional emissions from the Eagle II will thus not contribute excessively to the emission from the combined product; Class B performance will also enable the Eagle II to be incorporated into any type of end product.

Similarly, measurements of transmitter-related (above 1 GHz) emissions II demonstrated that the Eagle II complies with the radiated spurious limits given in § 24.238 without any allowance for additional shielding from the host product.

Measurements performed by Criterion Technologies were in accordance with the procedures given in ANSI C63.4-1992, "*Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz*" over the frequency range of 30 MHz to 20 GHz. For measurements below 1 GHz, emissions were measured per standard practice. Above 1 GHz, peak (versus average) measurements were made.

The Criterion Test Report indicates that the Eagle II meets the transmitter radiated emissions requirements and limit given in §§ 24.238 and 2.1053. Furthermore, all other emissions, both radiated and conducted, and from all sources excluding the Eagle II transmitter (i.e., receiver, digital, etc.) comply with FCC Part 15, Class B limits.

Representative values for the field strength of transmitter spurious radiated emissions are presented in Tables E14.1 and E14.2, for measurements below and above 1 GHz, respectively. For these measurements, the transmitter was tuned to a mid-band PCS 1900 channel at 1880.0 MHz (channel 661). Similar results were measured with the transmitter tuned to the low (channel 512, 1850.2 MHz) and high (channel 810, 1909.8 MHz) PCS 1900 channels in the licensed PCS spectrum.



Figure E14.1. Radiated Emissions set-up at Criterion Technologies.

Table E14.1. Representative radiated spurious emissions results below 1GHz

Frequency (MHz)	Field Strength at 10 m (dB μ V/m)	Limit at 10 m (dB μ V/m)	Margin (dB)
36.0085	15.80	29.5	13.74
40.0000	12.99	29.5	16.55
43.4990	13.29	29.5	16.25
48.9821	16.52	29.5	13.02
49.8999	15.62	29.5	13.92
51.4060	18.13	29.5	11.41
56.0802	19.71	29.5	9.83
57.5619	19.48	29.5	10.06
58.3538	11.22	29.5	18.32
60.7361	17.34	29.5	12.20
62.0738	19.34	29.5	13.69
64.5221	13.69	29.5	15.85
65.8329	12.62	29.5	16.92
67.8640	19.18	29.5	10.36
69.0279	17.57	29.5	11.97
72.1722	12.25	29.5	17.29
72.6094	15.30	29.5	14.24
74.1460	6.95	29.5	22.59
76.7499	15.95	29.5	13.59
77.7999	13.36	29.5	16.18
80.8662	12.54	29.5	17.00
82.7080	11.94	29.5	17.60
83.8419	16.70	29.5	12.84
85.7920	10.56	29.5	18.98
87.4540	6.67	29.5	22.87
88.1378	9.10	33.1	23.96
88.9598	13.74	33.1	19.32
90.7180	8.13	33.1	24.93
97.6781	8.79	33.1	24.27
101.3922	9.98	33.1	23.17
113.4383	11.21	33.1	21.85
120.3047	15.87	33.1	17.19
135.3668	11.92	33.1	21.14
137.5492	17.11	33.1	15.95
143.3697	12.86	33.1	20.20
145.8721	12.53	33.1	20.53
148.1399	13.71	33.1	19.35
151.0922	14.83	33.1	18.23
153.1669	18.17	33.1	14.89
157.0191	8.47	33.1	24.59
170.2377	9.00	33.1	24.06
201.0357	7.49	33.1	25.57
250.3533	15.74	35.5	19.82
252.1592	14.28	35.5	21.28
260.4755	14.67	35.5	20.89
262.3945	15.26	35.5	20.30
263.6796	13.58	35.5	21.98
299.9975	15.31	35.5	20.25

360.0813	12.32	35.5	23.24
489.2352	20.03	35.5	15.53

Table E14.2. Representative radiated spurious emissions results above 1 GHz

Frequency (MHz)	Field Strength at 3 m (dB μ V/m)	Limit at 3 m (dB μ V/m)	Margin (dB)
1451.9895	49.44	84.4	34.96
1600.0000	44.65	84.4	39.75
1603.3551	44.46	84.4	39.94
1879.9494	89.4	84.4	NA - FUNDAMENTAL
2903.9815	50.36	84.4	34.04
3199.9820	52.04	84.4	32.36
3206.7643	51.88	84.4	32.52
3759.9833	54.89	84.4	29.51
4355.9643	53.17	84.4	31.23
4799.9700	54.96	84.4	29.44
4810.2511	54.93	84.4	29.47
5630.4781	50.12	84.4	34.28
5640.0065	53.68	84.4	30.72
6400.0000	48.82	84.4	35.58
6413.6282	52.45	84.4	31.95
7519.9618	59.3	84.4	25.1
7999.9551	52.49	84.4	31.91
8106.8000	52.35	84.4	32.05
9400.0000	63.22	84.4	21.18