

6.6 Photograph



7. Radiated Spurious Emissions

7.1 Requirement

47 CFR Section 15.231(b), and 15.209

In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	\1\1,250 to 3,750.	\1\125 to 375
174-260	3,750	375
260-470	\1\3,750 to 12,500	\1\375 to 1,250
Above 470	12,500	1,250

\1\Linear interpolations.

- (1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.
- (2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.
- (3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

7.2 Test Equipment

- ⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2410A00139, Calibrated: 25 November 2002, Calibration Due Date: 25 November 2003
- ⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 25 November 2002, Calibration Due Date: 25 November 2003
- ⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A00689, Calibrated: 25 November 2002, Calibration Due Date: 25 November 2003
- ⇒ Preamplifier (1.0 – 26.5 GHz): Hewlett Packard HP 8449B, Serial Number 3008A00982, Calibrated: 12 October 2003, Calibration Due Date: 12 October 2004
- ⇒ Biconical Antenna (red) (20 MHz to 200 MHz): EMCO 3110, Serial Number 9001-1115, Calibrated: 12 August 2003, Calibration Due Date: 12 August 2004
- ⇒ Log Periodic Antenna (white) (200 MHz to 1000 MHz): EMCO 3146, Serial Number 9402-3773, Calibrated: 13 January 2003, Calibration Due Date: 13 January 2004
- ⇒ Double Ridge Guide Horn Antenna: (1 GHz to 18 GHz): EMCO 3115, Serial Number 9807-5534, Calibrated: 24 September 2003, Calibration Due Date: 24 September 2004
- ⇒ Antenna Mast and Controller: EMCO 1051, Serial Number 9002-1457, No Calibration Required
- ⇒ Turntable and Position Controller: EMCO 1061, Serial Number 9003-1440, No Calibration Required
- ⇒ Open Area Test Site: Acme Testing Co., Test Site Number 2, Normalized Site Attenuation [NSA] Calibrated: 22 June 2003, Calibration Due Date: 22 June 2004

7.3 Test Procedures

The modified EUT was placed on a 1 meter long by 1.5 meters wide by 0.8 meter high nonconductive (wood) table that was, in turn, installed onto a flush-mounted metal turntable.

Testing (detailed in Section 6 of this Test Report) was performed to determine the “worst-case” Duty Cycle. With the EUT operating in “worst-case” Duty Cycle, emissions from the unit were maximized by changing EUT orientation (all three orientations were examined), and by adjusting the polarization and height of the receive antenna, and by rotating the turntable.

Radiated Emissions Test Characteristics

Frequency range	30 MHz – 5,000 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz (30 MHz – 1000 MHz) 1 MHz (1000 MHz – 5,000 MHz)
Receive antenna scan height	1 m – 4 m
Receive antenna polarization	Vertical/Horizontal
Test Date	29 October 2003

7.4 Test Results: Worse-Case EUT Mode (12.5 Hz Acoustic Pulse Rate, 2.0 Volt Output Setting, EUT Orientation = Vertical).

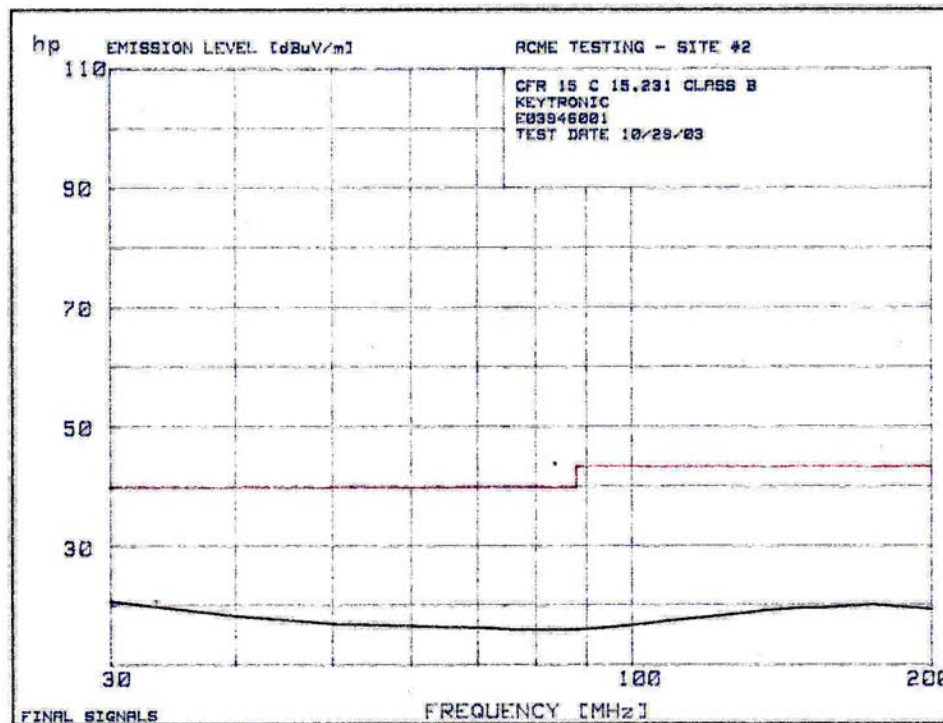
47 CFR Part 15C Section 15.209 Limits applied:

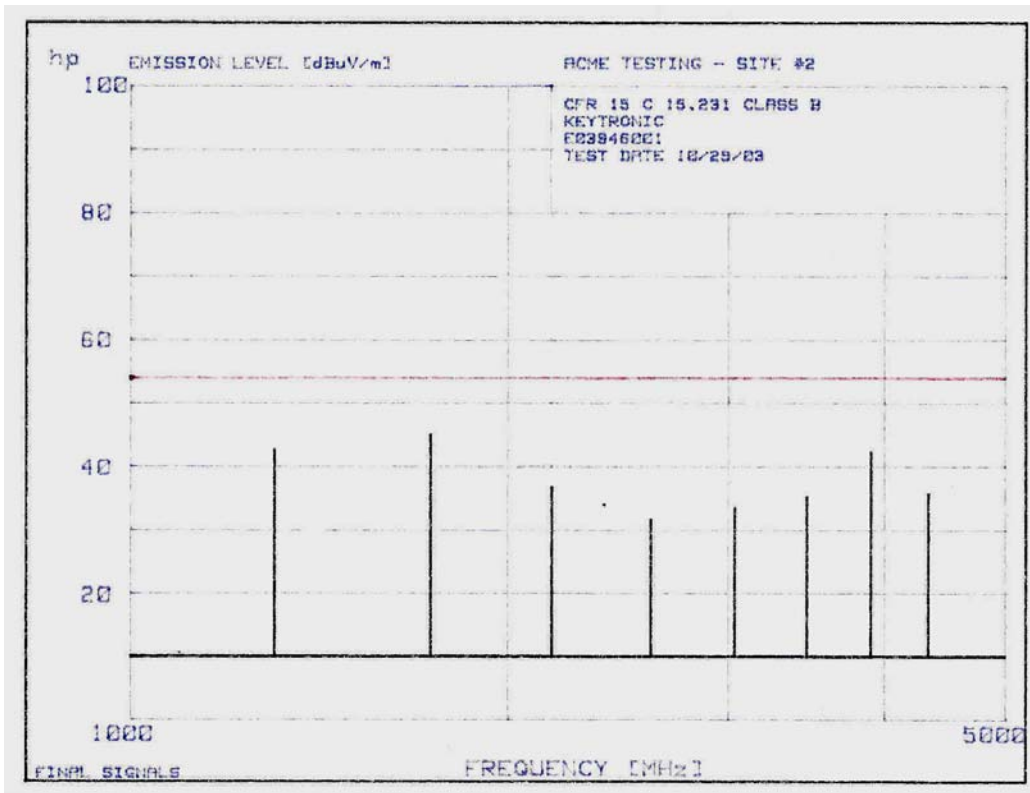
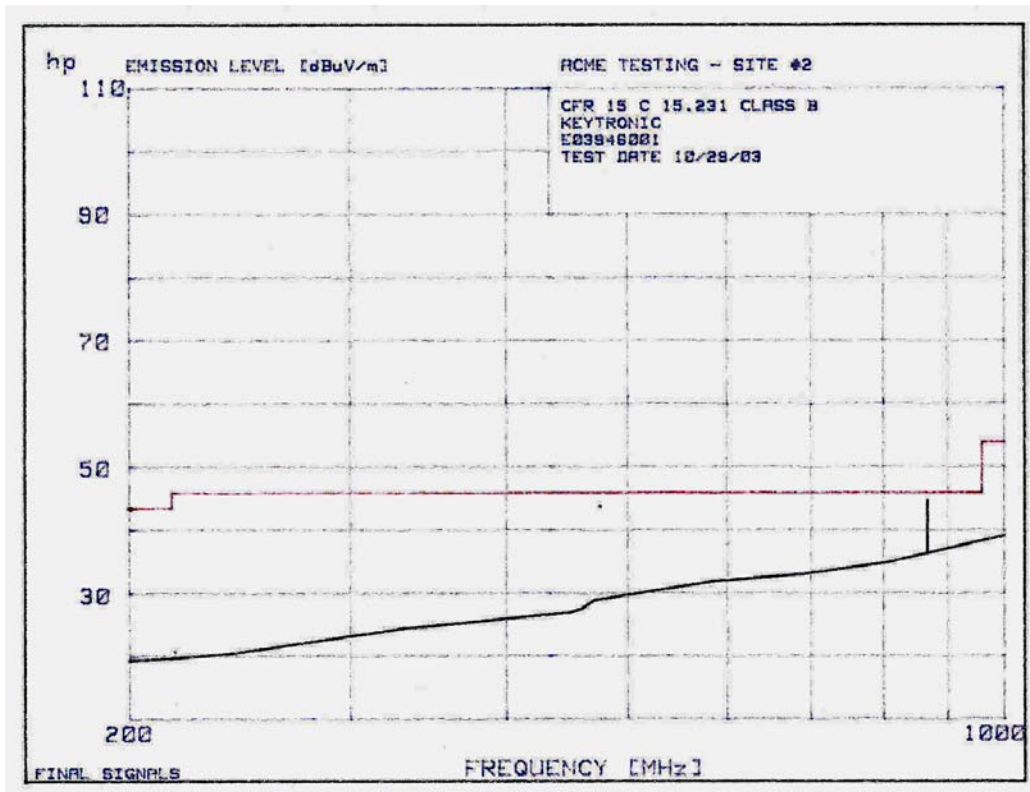
No	EMISSION	SPEC LIMIT	MEASUREMENTS			SITE			CORR FACTOR	COMMENTS
	FREQUENCY MHz*		ABS	dLIM	MODE	POL	HGT	AZM		
		dBuV/m		dB		cm	deg	dB		
1	1301.750	54.0	42.5	-11.5	PK	V	100	91	31.2	3 rd Harmonic
2	3905.160	54.0	42.2	-11.8	PK	V	100	1	-0.5	9 th Harmonic
3	4339.200	54.0	35.7	-18.4	PK	V	100	360	-0.8	10 th Harmonic

*Note: There were no non-spurious (i.e. Digital Device) emissions from the EUT within 20 dB of the applicable limits.

47 CFR Part 15C Section 15.231(b) Spurious Emissions Limits applied:

No	EMISSION	SPEC LIMIT	MEASUREMENTS			SITE			CORR FACTOR	COMMENTS
	FREQUENCY MHz		ABS	dLIM	MODE	POL	HGT	AZM		
		dBuV/m		dB		cm	deg	dB		
1	867.912	60.8	44.5	-16.3	QP	V	100	160	27.9	2 nd Harmonic
2	1735.200	60.8	44.9	-15.9	PK	V	100	360	34.8	4 th Harmonic
3	2169.440	60.8	36.6	-24.2	PK	V	100	182	-6.1	5 th Harmonic
4	2603.520	60.8	31.6	-29.2	PK	V	100	0	-4.7	6 th Harmonic
5	3036.200	60.8	33.4	-27.4	PK	V	100	360	-3.0	7 th Harmonic
6	3470.800	60.8	35.1	-25.7	PK	V	100	116	-1.8	8 th Harmonic





7.5 Test Setup Photographs





8. Occupied Bandwidth

8.1 Requirement

47 CFR Section 15.231(c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

8.2 Determination of the Applicable Limit:

The EUT's fundamental emissions were centered at 433.94 MHz. Therefore, the required 20 dB bandwidth must be less than or equal to $0.0025 \times 433.94 \text{ MHz} \approx 1.085 \text{ MHz}$.

8.3 Test Equipment

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- ⇒ Antenna Mast and Controller: EMCO 1051, Serial Number 9002-1457, No Calibration Required
- ⇒ Turntable and Position Controller: EMCO 1061, Serial Number 9003-1440, No Calibration Required
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8.4 Test Procedures

The modified EUT was set to transmit at its worst-case Duty Cycle (i.e. it was set to output 2 Volts at a 12.5 Hz acoustic pulse rate). The Radiated Emissions from the EUT's fundamental were then measured using the Log Periodic Antenna and the Spectrum Analyzer.

Note: The "Air Interface" was used because it was not possible to directly access the EUT's internally-mounted, (etched into the printed circuit board) antenna.