

EXHIBIT 8

Radiated Spurious Emissions

Exhibit Summary:

EXHIBIT 8 contains measurement data pertaining to radiated spurious emissions.

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Measurement Procedure:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The data were collected by Elite Electronic Engineering Company at their Open Field Test Site located at 1516 Centre Circle, Downers Grove, Illinois. The site is constructed in accordance with ANSI C63 requirements and is recognized by the FCC to be in compliance with section 2.948 for a 3 meter site.

The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238.

The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid, and high channels of the USPCS band. The spectrum was first scanned from 30 MHz to 20 GHz with the mobile station inside a shielded enclosure to determine all spurs to be examined under the open field conditions. 30 MHz to 5 GHz was investigated and plotted using a peak detector function. 5 GHz to 20 GHz was investigated by examining 1 GHz windows and recording all significant peaks.

The spectrum was then scanned under the open field conditions at the frequencies found as described above, with attention given to looking for any other spurs that may not have been seen in the enclosed environment. The testing was conducted at both maximum and minimum transmit power levels.

A substitution method was used for measuring the absolute level of radiated spurs. Once a potential spur is identified and measured at the open air test site, its absolute level is calibrated by substituting a signal generator and an antenna for the unit under test. A dipole or double ridged waveguide (depending on the frequency of concern) is set in place of the unit under test and driven by a signal generator. The level, and frequency, of the generator is adjusted to duplicate the spur radiated from the unit under test as measured previously with a receiving spectrum analyzer. Finally, the absolute level of the radiated spur is arrived at by correcting the signal generator output level to account for cable losses and antenna gains.

Following is a copy of the test procedure as submitted to Motorola by Elite Electronic Engineering, along with an equipment list. Also attached are plots of the relevant radiated emission spurs that are within 20 dB of the FCC limit of $43+10 \text{ Log}(P)$ or -13 dBm. Detailed data taken by Elite is available upon request.

Measurement Limit:

Sec. 24.238 Emission Limits.

- (a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43+10\text{Log}(P)$ dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, translates in the relevant power range (1 to 0.01 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.01 W (10 dBm) the minimum attenuation is 23 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Measurement Results:

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (1850.2 MHz, 1880.2 MHz and 1909.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

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FIELD STRENGTH OF SPURIOUS EMISSIONS:

PRELIMINARY RADIATED MEASUREMENTS:

REQUIREMENTS: Because emission levels in the open field may be masked by interference from sources other than the test item, preliminary radiated measurements are first performed in the low ambient environment of a shielded enclosure. Radiated emissions from the test item were therefore first measured and automatically plotted using a peak detector. The frequencies with significant emission levels were measured in the open field.

PROCEDURES: All preliminary tests were performed in a 17ft. x 20ft. x 8ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

The broadband measuring antenna was positioned at a 1 meter distance from the test item. The entire frequency range from 30MHz to 10GHz was investigated using a peak detector function. The field intensity levels were then plotted.

OPEN FIELD RADIATED EMISSIONS:

REQUIREMENTS FOR FCC-15: All emanations from an unintentional radiator shall be below the levels shown on Table II.

TABLE II - RADIATION LIMITS FOR UNINTENTIONAL RADIATORS

Frequency MHz	Distance between Test Item and Antenna in Meters	Field Strength uV/m
30-88	3	100
88-216	3	150
216-960	3	200
Above 960	3	500

Note: The tighter limit shall apply at the edge between the two frequency bands.

PROCEDURES FOR FCC-15: Final open field measurements were manually performed at Elite's open field test site located in Downers Grove, Illinois. The open field test site is located in a clear area and is equipped with a 1/4-inch wire mesh ground plane.

The measurements were made over the frequency range of 1000MHz to 10000MHz. A double ridged waveguide antenna was used for all frequencies. Both horizontal and vertical polarizations of the receive antenna were measured.

To ensure that maximum emission levels were measured, the following steps were taken:

- (a) The test item was rotated so that all of its sides were exposed to the receiving antenna.
- (b) Since the measuring antennas are linearly polarized, both horizontal and vertical field components were measured.
- (c) The measuring antenna was raised and lowered from 1 to 6 meters for each antenna polarization to maximize the readings.

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-15: The final open field radiated levels are presented on data page 107. The emission levels from the open field measurements were below the specification requirements.

REQUIREMENTS FOR FCC-24: The radiated emissions outside the authorized bandwidth shall be attenuated by $43 + 10\log(P)$ where P is in watts. This requirement equates to an effective radiated power of -13dBm in a tuned dipole antenna.

PROCEDURES FOR FCC-24: Final open field measurements were manually performed at Elite's open field test site located in Downers Grove, Illinois. The open field test site is located in a clear area and is equipped with a 1/4-inch wire mesh ground plane. The test was performed at a 3 meter test distance between the test item and the measurement antenna.

The final open field emission test procedure is as follows:

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load.
- c) A tuned dipole, or double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded.

The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.

The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:

$$P_g = E^2 4\pi d^2 / 120\pi = E^2 d^2 / 30$$

where

- P = power in watts
- g = arithmetic gain of transmitting antenna over isotropic radiator.
- E = maximum field strength in volts/meter
- d = measurement distance in meter

Using a dipole gain of 1.67 or 2.2 dB and a test distance of 3 meters, this equation reduces to:

$$P(\text{dBm}) = E(\text{dBuV/m}) - 97.2\text{dB}$$

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24: The final open field radiated levels are presented on data pages 108 through 110. As can be seen from this data, the emissions from the test item were within the specification limit.

ENGINEERING TEST REPORT NO. 20696

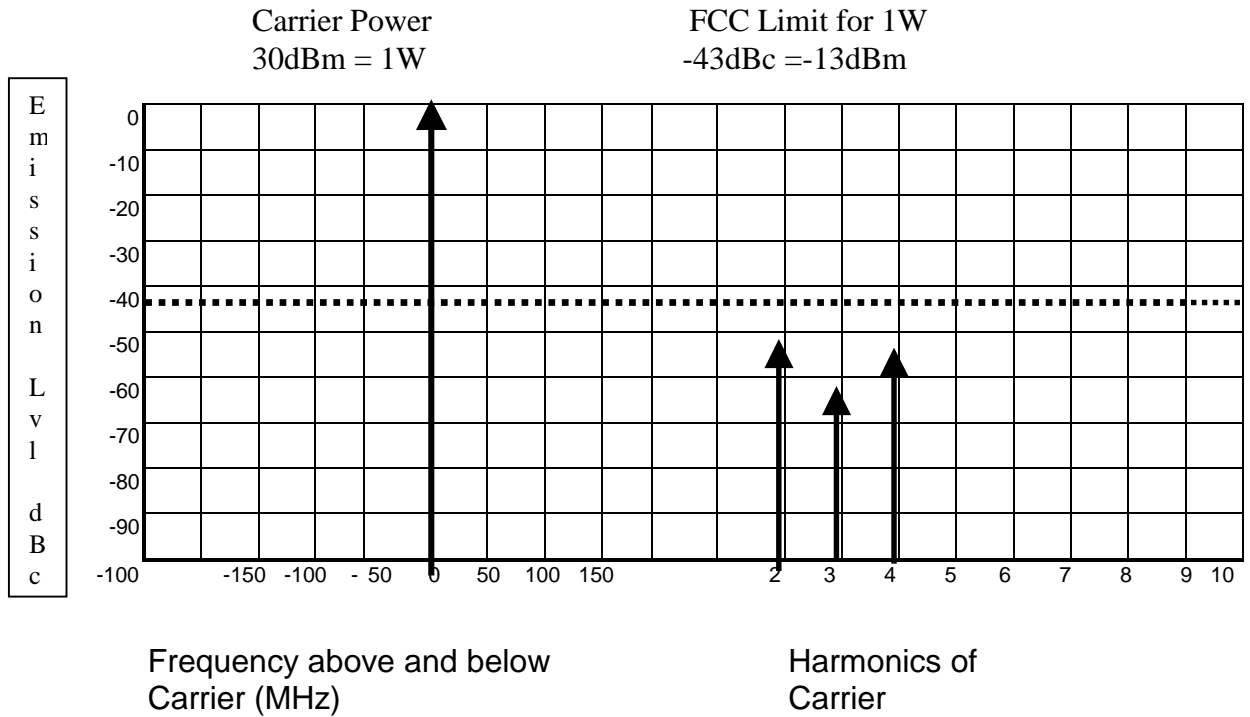
TABLE 1: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENGINEERING

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Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Intv	Due Date
Equipment Type: ACCESSORIES, MISCELLANEOUS								
KPQ1	HIGH PASS FILTER	KEL MICROWAVE	41R30-1804/T	002	1.8-10GHZ	02/23/98	12	02/23/99
KZG0	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A00325	---	01/24/98	12	01/24/99
Equipment Type: AMPLIFIERS								
APK0	PREAMPLIFIER	HEWLETT PACKARD	8449B	300BA00662	1-26.5GHZ	01/27/98	12	01/27/99
Equipment Type: ANTENNAS								
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	.03-2GHZ	03/15/98	13	04/18/99
NV11	DOUBLE RIDGED WAVEGUIDE	AGL	R1498	154	2-18GHZ	11/04/97	12	08/14/98
Equipment Type: CONTROLLERS								
OD02	COMPUTER	HEWLETT PACKARD	D4171A#ABA	SJ361654645	N/A			N/A
Equipment Type: PRINTERS AND PLOTTERS								
HRE1	LASER JET 5P	HEWLETT PACKARD	C3150A	U8HB061052	---			N/A
Equipment Type: RECEIVERS								
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3407A08369	100HZ-22GHZ	01/24/98	12	01/24/99
RACB	RF PRESELECTOR	HEWLETT PACKARD	85685A	3506A01491	20HZ-2GHZ	01/24/98	12	01/24/99
RAF5	QUASIPeAK ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	01/26/98	12	01/26/99

Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable
 Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.



TRANSMITTED RADIATED SPURIOUS AND HARMONIC EMISSIONS.

Transmitter type: IHDT6YH1

Carrier Power: 1W to 1mW in 2 dB steps.

Carrier Frequency: 1850.2mHz to 1909.8mHz in 200kHz steps.

Each spur and Harmonic reflects its level at the channel, polarization, and power level it is worst at.

All emissions not reflected are greater than 20dB below the carrier, the FCC specs.

Frequency spectrum from 30mHz to 19.1GHz(10th harmonic of the carrier) was searched at 30 dBm.