FCC ID: NP4MCUB5Q
FCC Correspondence Reference Number: 19852
Form 731 Confirmation Number: EA101316

QUESTION 1) The rated frequency stability shown on FCC Form 731 is 1 ppm. which is acceptable only for mobile units. This device does not appear to be designed for use "while in motion". Please resolve this issue.

RESPONSE:

It is correct that the primary intended use of this equipment is not 'while in motion', but in a 'fixed' application. The measurements for frequency stability in the original report show that the unit is within the 0.5 ppm stability requirement (90.213) for fixed equipment in the 403 – 512 MHz band. The measured worst case stability is 0.348 ppm at 50 °C. Form 731 originally stated 1.0 ppm because that is the manufacturer's specification for the TCXO (Temperature Compensated Xtal Oscillator).

To ensure compliance even with a worst case TCXO stability of ± 1 ppm (± 512 Hz at 512 MHz), our occupied bandwidth is designed to be at least 1200 Hz narrower (± 600 Hz from center) than required by Mask E.

To show compliance, modulated spectrum occupancy was measured at temperatures from –30 °C to 60 °C in 10 °C increments against Mask E for all operational temperatures. This data is shown in the original report.

We request that the Form 731 frequency tolerance be changed to 0.5 ppm to reflect the demonstrated performance of the equipment, and that type acceptance be granted for fixed operation.

QUESTION 2) The attenuation requirement under Section 90.210(e)(3) is 55 + 10Log(P) which equates to 62 dB for this device at high power (5 W) and 55 dB at low power (1 W). Your test data results for radiated spurious emissions show non-compliance with these limits. Please resolve this issue.

RESPONSE:

The test data in the original report was incorrectly measured to the wrong specification limits. Modification was made to the unit to improve shielding of a connector that was causing non-compliance with the correct specification. The radiated spurious data was re-measured and the unit now meets the FCC requirement. The recorded data is included at the end of this response.

QUESTION 3) For FM modulation , we normally use the generic formula of 2M + 2Dk for necessary bandwidth (Bn) as provided under Section 2.202(g)(III-A)(2). For k=1, the necessary bandwidth for operation of this device at 4800 bps would be 6.9 kHz and for operation at 2400 bps would be 8.08 kHz. However, "k" may be variable depending on the conditioning of the waveform. This allows for the reduction of the above values to be 6 kHz and in compliance with the authorized bandwidth limit. The value for "occupied bandwidth", i.e. 99% of the emitted spectrum is used when this value exceeds the Bn value. We propose to list this device with the single entry of 6K00F1D to cover both modes of operation.

RESPONSE:

We agree that a single entry of 6K00F1D is a reasonable representation of the required occupied bandwidth for this device for both modes of operation. Please make the necessary changes to the Form 731 emission designator and grant type acceptance for 6K00F1D.

NAME OF TEST: **Field Strength of Spurious Radiation**

RULE PART NUMBER: 2.1033 c(14), 2.1041, 2.1053, 90.210 (d)(3)

MINIMUM STANDARD: For 5 Watts; $55+10\text{Log}_{10}(5) = -62$ dBc
For 1 Watt; $55+10\text{Log}_{10}(1) = -55$ dBc

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

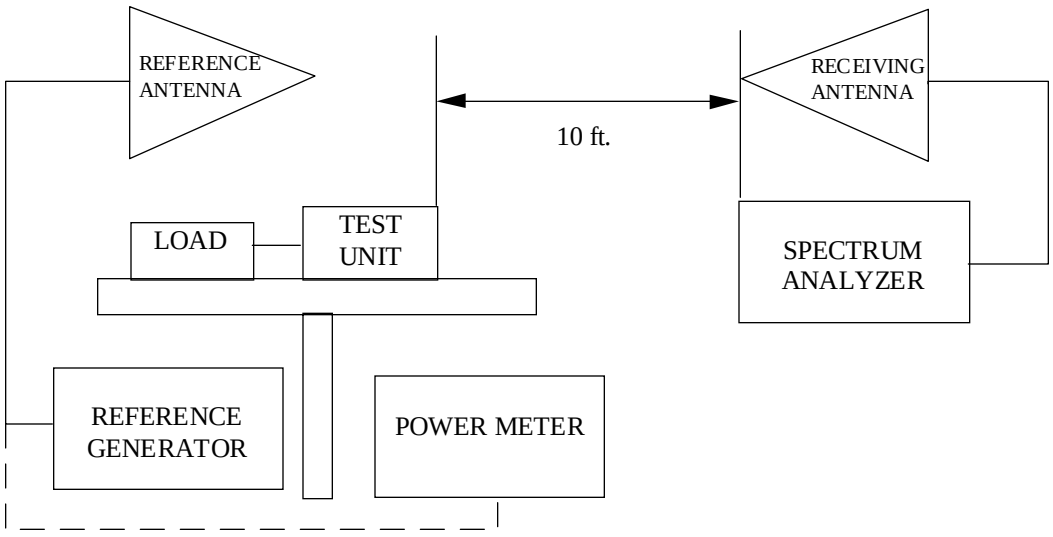
TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.12

Test Equipment: Dipole Antenna Kit, Electro-Mechanics Model 3121C
Load, Tenuline Model 8340-200 (20 dB)
Spectrum Analyzer, HP 8563E
Reference Generator, HP83732A
Power Meter, HP437A

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

TEST SET-UP:



PERFORMED BY: Allen Frederick DATE: 7/10/01

Allen Frederick

Freqency: 450 MHz Minimum Spec = -55.0 dBc
Power: 1 Watt=30.0dBm Worse Case = -65.9 dBc

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
900	H	-66.3	-29.6	5.17	-1.15	0.0	-65.9
	V	-69.4	-29.9	5.17	-1.15	0.0	-66.2
1350	H	-76.7	-32.3	6.00	1.20	3.0	-70.1
	V	-74.7	-29.3	6.00	1.20	3.0	-67.1
1800	H	-91.7	-45.5	6.67	1.20	3.0	-84.0
	V	-94.4	-46.5	6.67	1.20	3.0	-85.0
2250	H	-85.2	-33.7	8.00	1.20	3.0	-73.5
	V	-90.7	-40.5	8.00	1.20	3.0	-80.3
2700	H	-88.0	-33.1	8.67	1.20	3.0	-73.6
	V	-94.2	-41.2	8.67	1.20	3.0	-81.7
3150	H	-88.5	-30.6	10.00	1.20	3.0	-72.4
	V	-89.9	-32.4	10.00	1.20	3.0	-74.2
3600	H	-93.0	-33.2	11.30	1.20	3.0	-76.3
	V	-93.5	-34.6	11.30	1.20	3.0	-77.7
4050	H	-95.0	-32.0	12.50	1.20	3.0	-76.3
	V	-94.2	-32.3	12.50	1.20	3.0	-76.6
4500	H	-95.7	-31.5	12.50	1.20	3.0	-75.8
	V	-97.5	-34.1	12.50	1.20	3.0	-78.4

Freqency: 450 MHz Minimum Spec = -62.0 dBc
Power: 5 Watts=37.0dBm Worse Case = -65.9 dBc

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
900	H	-60.6	-23.9	5.67	-1.15	0.0	-67.7
	V	-63.7	-24.2	5.67	-1.15	0.0	-68.0
1350	H	-68.1	-23.7	6.50	1.20	3.0	-69.0
	V	-66.0	-20.6	6.50	1.20	3.0	-65.9
1800	H	-87.4	-41.2	7.00	1.20	3.0	-87.0
	V	-90.2	-42.3	7.00	1.20	3.0	-88.1
2250	H	-80.6	-29.1	8.67	1.20	3.0	-76.6
	V	-84.9	-34.7	8.67	1.20	3.0	-82.2
2700	H	-83.2	-28.3	9.33	1.20	3.0	-76.4
	V	-89.4	-36.4	9.33	1.20	3.0	-84.5
3150	H	-86.9	-29.0	11.00	1.20	3.0	-78.8
	V	-88.5	-31.0	11.00	1.20	3.0	-80.8
3600	H	-85.4	-25.6	12.50	1.20	3.0	-76.9
	V	-86.0	-27.1	12.50	1.20	3.0	-78.4
4050	H	-89.7	-26.7	13.33	1.20	3.0	-78.8
	V	-89.0	-27.1	13.33	1.20	3.0	-79.2
4500	H	-93.7	-29.5	14.00	1.20	3.0	-82.3
	V	-95.7	-32.3	14.00	1.20	3.0	-85.1

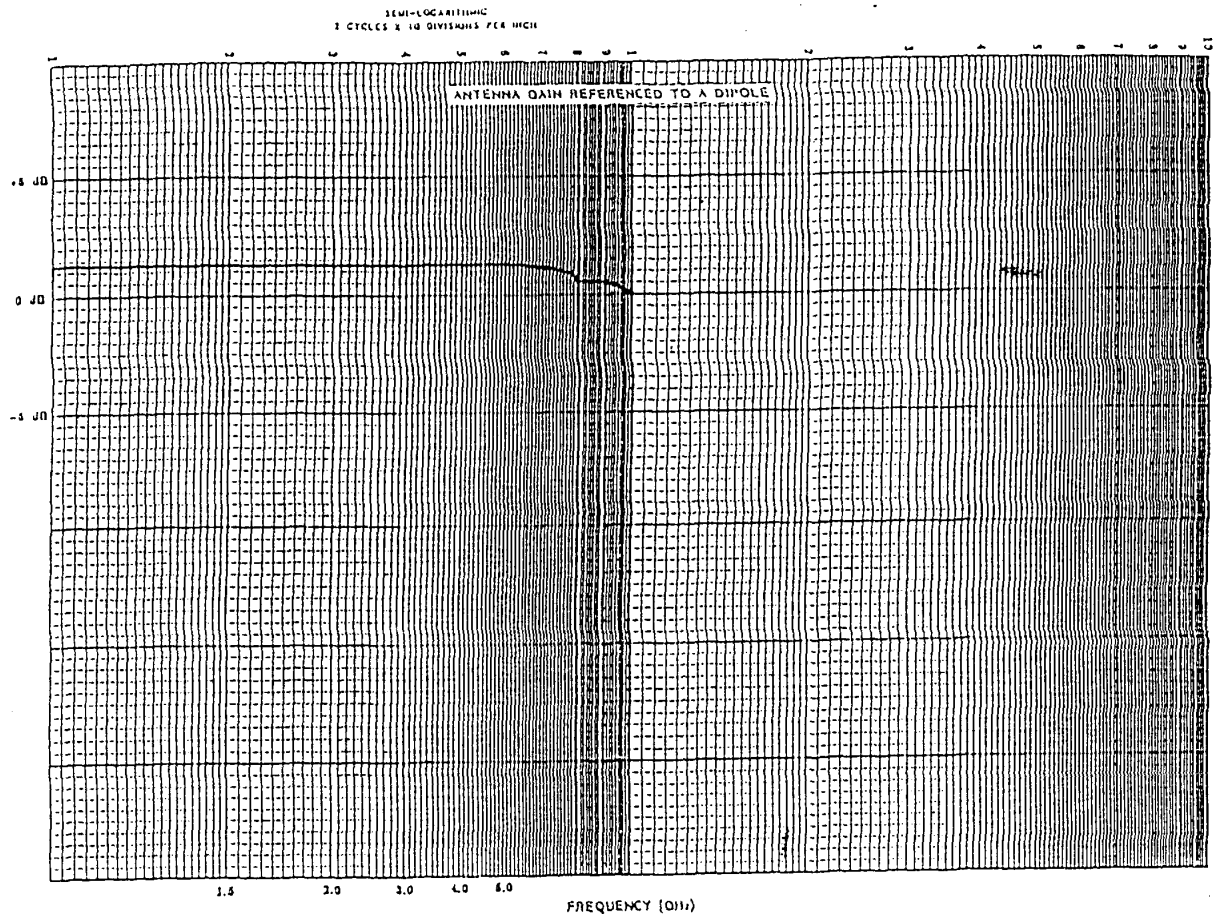
CALCULATIONS FOR FIELD STRENGTH OF SPURIOUS RADIATION TESTS:

The transmitter carrier frequency was 450.000 MHz. The reference oscillator frequency of all the transceivers used is 17.50 MHz. The output of the transceiver was searched from 17.50 MHz to the tenth harmonic of the carrier frequencies. The tests were conducted with the transceiver and modem 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.

EXAMPLE:
At 900 MHz (450 MHz tuned), 5 Watts and horizontal polarization.

r = Substitution Gen - Cable Loss	-23.9 – 5.67	= -29.57
R - Reference Generator (dBm)	-29.57	
A - Antenna Gain (dB)	-1.15	
P - Polarization Correction Factor (dB)	0.0	
R' (Corrected Reference (dBm)) = R + A - P	= -29.57 -1.15 - 0.0	= **-30.72 dBm**
Po - Radiated Carrier Power (dBm)	5 Watts = 37 dBm	
Radiated Spurious Emission (dBc) = Po - R'	= -30.72 - (+37)	= **-67.72 dBc**



ANTENNA GAIN GRAPH OF SUBSTITUTION ANTENNA
REFERENCED TO A DIPOLE