Annex C: Document # 156-90000-893

NAME OF TEST: Field strength of spurious radiation of the transmitter

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

UNIT UNDER TEST Prototype Gemini 3.5 700/800 MHz

SERIAL NUMBER (S): C10-prototype 16-level FSK Gemini GCU III modem MAC ID#- NA

6085-102 S/N 15120 pilot MDP transceiver – spurious products

TEST CONDITIONS: FCC certified Open Area Test Site of Dataradio COR located at 299 Johnson

Avenue in Waseca, Minnesota

Standard Test Conditions, 25 C.

156-90000-893 Dataradio© FCC submission

NAME OF TEST: Field Strength of Spurious Radiation

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

MINIMUM STANDARD: For 30 Watts: $43+10\text{Log}_{10}(30) = 57.8 \text{ dBc}$

For 10 Watts: $43+10\text{Log}_{10}$ (10) = 53 dBc

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

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 Periodic Antenna, AIL TECH Model 9461

Horn Antenna, Model EMCO 3115

Reference Generator, Model Agilent E8257D

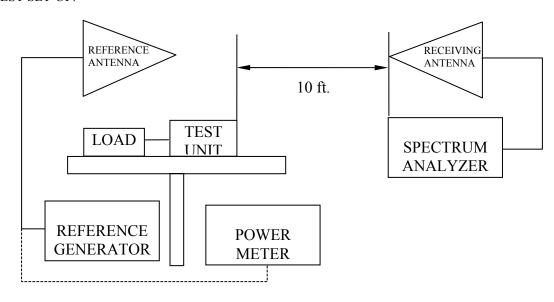
Attenuator, BIRD Model / 50-A-MFN-20 / 20 dB / 50 Watt Attenuator, BIRD Model / 10-A-MFN-10 / 10 dB / 10 Watt

Spectrum Analyzer, Model HP8563E Power Meter, Model HP437B Power Supply, Model HP-6024A

MEASUREMENT PROCEDURE: Radiated spurious attenuation was measured according to

TIA/EIA Standard 603 Section 2.2.12

TEST SET-UP:



PERFORMED BY: Date: 3/28/06

Daniel Hanson

NAME OF TEST:

Spurious Radiation Attenuation (Continued)

Frequency:	800	MHz			Spec =	-57.8 dBc
Power:	30	Watts		Highes	t Spur =	-70.1 dBc
1 01101.	44.8	dBm			p	70.1 020
Spurious			Substitution		Antenna	Spurious
Frequency	Polarization	Spurious Level	Generator	Cable Loss	Gain	Attenuation
(MHz)	(Horz/Vert)	(dBm)	(dBm)	(dB)	(dBd)	dBc
1600	Н	-91.2	-54.2	3.33	3.65	-98.6
	V	-86.0	-49.8	3.33	3.65	-94.3
2400	Н	-83.7	-41.5	4.50	3.19	-87.6
	V	-82.8	-39.5	4.50	3.19	-85.6
3200	Н	-69.2	-23.8	5.50	3.46	-70.6
	V	-68.8	-23.3	5.50	3.46	-70.1
4000	Н	-89.0	-39.5	5.83	3.61	-86.5
.550	V	-81.5	-30.8	5.83	3.61	-77.8
4800	Н	-86.5	-33.5	7.33	3.64	-82.0
	V	-82.8	-29.2	7.33	3.64	-77.6
5600	Н	-81.3	-22.8	8.50	3.39	-72.7
	V	-81.2	-22.7	8.50	3.39	-72.5
6400	Н	-97.2	-37.2	9.17	3.61	-87.5
	V	-96.3	-36.3	9.17	3.61	-86.7
7200	Н	-93.8	-30.2	10.50	3.40	-82.0
	i		-31.5	10.50	3.40	-83.4
	V	-95.2				
8000	V H	-95.2 -95.5			4.66	-80.3
8000 Frequency:		-95.2 -95.5 -94.0	-28.5 -26.8	11.67 11.67	4.66 4.66 Spec =	-80.3 -78.6
8000 Frequency: Power:	H V 800 10	-95.5 -94.0 MHz Watts	-28.5	11.67 11.67		-78.6
Frequency: Power:	H V	-95.5 -94.0 MHz	-28.5 -26.8	11.67 11.67	4.66 Spec = t Spur =	-78.6 -53.0 dBc -65.4 dBc
Frequency:	H V 800 10	-95.5 -94.0 MHz Watts dBm	-28.5	11.67 11.67	4.66 Spec =	-78.6 -53.0 dBc
Frequency: Power:	800 10 40.0	-95.5 -94.0 MHz Watts dBm	-28.5 -26.8 Substitution	11.67 11.67 Highes	4.66 Spec = t Spur =	-78.6 -53.0 dBc -65.4 dBc Spurious
Frequency: Power: Spurious Frequency	H V 800 10 40.0 Polarization	-95.5 -94.0 MHz Watts dBm Spurious Level	-28.5 -26.8 Substitution Generator	11.67 11.67 Highes	4.66 Spec = t Spur = Antenna Gain	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation
Frequency: Power: Spurious Frequency (MHz)	H V 800 10 40.0 Polarization (Horz/Vert)	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm)	-28.5 -26.8 Substitution Generator (dBm)	11.67 11.67 Highes Cable Loss (dB)	4.66 Spec = t Spur = Antenna Gain (dBd)	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc
Frequency: Power: Spurious Frequency (MHz)	800 10 40.0 Polarization (Horz/Vert)	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6	-28.5 -26.8 Substitution Generator (dBm) -49.6	11.67 11.67 Highes Cable Loss (dB) 3.33	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3
Frequency: Power: Spurious Frequency (MHz) 1600	800 10 40.0 Polarization (Horz/Vert) H	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5	11.67 11.67 Highes Cable Loss (dB) 3.33 3.33	4.66 Spec = .t Spur = Antenna Gain (dBd) 3.65 3.65	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2
Frequency: Power: Spurious Frequency (MHz) 1600	800 10 40.0 Polarization (Horz/Vert) H	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0	11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3
Frequency: Power: Spurious Frequency (MHz) 1600	800 10 40.0 Polarization (Horz/Vert) H V	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3	11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50 4.50	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.19	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3
Frequency: Power: Spurious Frequency (MHz) 1600	H V 800 10 40.0 Polarization (Horz/Vert) H V H V H	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0	11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50 4.50 5.50	4.66 Spec = tt Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.19 3.46	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3
Frequency: Power: Spurious Frequency (MHz) 1600 2400 3200	800 10 40.0 Polarization (Horz/Vert) H V H V	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8	11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50 4.50 5.50	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.19 3.46 3.46	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9
Frequency: Power: Spurious Frequency (MHz) 1600 2400 3200	800 10 40.0 Polarization (Horz/Vert) H V H V H V H	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3 -87.5	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8 -38.0	11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50 4.50 5.50 5.50 5.83	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.19 3.46 3.46 3.61	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9 -80.2
Frequency: Power: Spurious Frequency (MHz) 1600 2400 3200 4000	H V 800 10 40.0 Polarization (Horz/Vert) H V H V H V H V	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3 -87.5 -85.2	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8 -38.0 -34.5	11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50 4.50 5.50 5.50 5.83 5.83	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.46 3.46 3.61 3.61	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9 -80.2 -76.7
Frequency: Power: Spurious Frequency (MHz) 1600 2400 3200 4000	H V 800 10 40.0 Polarization (Horz/Vert) H V H V H V H V H	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3 -87.5 -85.2 -95.0	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8 -38.0 -34.5 -42.0	11.67 11.67 Highes Cable Loss (dB) 3.33 4.50 4.50 5.50 5.50 5.83 7.33	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.19 3.46 3.46 3.61 3.61 3.64	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9 -80.2 -76.7 -85.7
Frequency: Power: Spurious Frequency (MHz) 1600 2400 3200 4000 4800	H V 800 10 40.0 Polarization (Horz/Vert) H V H V H V H V H V H V	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3 -87.5 -85.2 -95.0 -93.8	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8 -38.0 -34.5 -42.0 -40.2	11.67 11.67 11.67 Highes Cable Loss (dB) 3.33 4.50 4.50 5.50 5.50 5.83 7.33 7.33	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.19 3.46 3.46 3.61 3.61 3.64 3.64	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9 -80.2 -76.7 -85.7 -83.9
Frequency: Power: Spurious Frequency (MHz) 1600 2400 3200 4000 4800	H V 800 10 40.0 Polarization (Horz/Vert) H V H V H V H V H V H V H H V	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3 -87.5 -85.2 -95.0 -93.8 -94.3	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8 -38.0 -34.5 -42.0 -40.2 -35.8	11.67 11.67 11.67 Highes Cable Loss (dB) 3.33 4.50 4.50 5.50 5.50 5.83 7.33 7.33 8.50	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.19 3.46 3.61 3.61 3.61 3.64 3.64 3.39	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9 -80.2 -76.7 -85.7 -83.9 -80.9
Frequency: Power: Spurious Frequency (MHz) 1600 2400 3200 4000 4800 5600	H V 800 10 40.0 Polarization (Horz/Vert) H V H V H V H V H V H V H V H V	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3 -87.5 -85.2 -95.0 -93.8 -94.3 -92.5	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8 -38.0 -34.5 -42.0 -40.2 -35.8 -34.0	11.67 11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50 4.50 5.50 5.83 5.83 7.33 7.33 8.50 8.50	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.19 3.46 3.61 3.61 3.64 3.64 3.39 3.39	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9 -80.2 -76.7 -85.7 -83.9 -80.9 -79.1
Frequency: Power: Spurious Frequency (MHz) 1600 2400 3200 4000 4800 5600	H V 800 10 40.0 Polarization (Horz/Vert) H V H V H V H V H V H V H V H	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3 -87.5 -85.2 -95.0 -93.8 -94.3 -92.5 -96.8	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8 -38.0 -34.5 -42.0 -40.2 -35.8 -34.0 -36.8	11.67 11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50 4.50 5.50 5.83 5.83 7.33 7.33 8.50 8.50 9.17	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.46 3.46 3.61 3.61 3.64 3.64 3.39 3.39 3.61	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9 -80.2 -76.7 -85.7 -83.9 -80.9 -79.1 -82.4
Frequency: Power: Spurious Frequency (MHz) 1600 2400 4000 4800 5600 6400	H V 800 10 40.0 Polarization (Horz/Vert) H V H V H V H V H V H V H V H	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3 -87.5 -85.2 -95.0 -93.8 -94.3 -92.5 -96.8 -97.7	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8 -38.0 -34.5 -42.0 -40.2 -35.8 -34.0 -36.8 -37.7	11.67 11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50 4.50 5.50 5.83 5.83 7.33 7.33 8.50 8.50 9.17 9.17	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.46 3.61 3.61 3.64 3.64 3.39 3.39 3.61 3.61	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9 -80.2 -76.7 -85.7 -83.9 -80.9 -79.1 -82.4 -83.2
Frequency: Power: Spurious Frequency (MHz) 1600 2400 4000 4800 5600 6400	H V 800 10 40.0 Polarization (Horz/Vert) H V H V H V H V H V H V H V H V H V H	-95.5 -94.0 MHz Watts dBm Spurious Level (dBm) -86.6 -86.7 -78.2 -79.3 -68.7 -69.3 -87.5 -85.2 -95.0 -93.8 -94.3 -92.5 -96.8 -97.7 -101.7	-28.5 -26.8 Substitution Generator (dBm) -49.6 -50.5 -36.0 -36.0 -23.3 -23.8 -38.0 -34.5 -42.0 -40.2 -35.8 -34.0 -36.8 -37.7 -38.0	11.67 11.67 11.67 11.67 Highes Cable Loss (dB) 3.33 3.33 4.50 4.50 5.50 5.50 5.83 7.33 7.33 8.50 8.50 9.17 9.17 10.50	4.66 Spec = t Spur = Antenna Gain (dBd) 3.65 3.65 3.19 3.46 3.61 3.64 3.64 3.64 3.39 3.39 3.61 3.61 3.40	-78.6 -53.0 dBc -65.4 dBc Spurious Attenuation dBc -89.3 -90.2 -77.3 -77.3 -65.4 -65.9 -80.2 -76.7 -85.7 -83.9 -80.9 -79.1 -82.4 -83.2 -85.1

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

Frequency:	800	MHz			Spec =	-50.0 dBm	
Power:	30	Watts	Highest Spur = -53.2				
	44.8	dBm					
Spurious			Substitution		Antenna	Spurious	
Frequency	Polarization	Spurious Level	Generator	Cable Loss	Gain	Attenuation	
(MHz)	(Horz/Vert)	(dBm)	(dBm)	(dB)	(dBd)	dBm	
1600	Н	-93.2	-53.5	3.33	3.65	-53.2	
	V	-92.7	-54.3	3.33	3.65	-54.0	
Frequency:	800	MHz			Spec =	-50.0 dBm	
Power:	10	Watts		Highes	t Spur =	-55.7 dBm	
	40.0	dBm					
Spurious			Substitution		Antenna	Spurious	
Frequency	Polarization	Spurious Level	Generator	Cable Loss	Gain	Attenuation	
(MHz)	(Horz/Vert)	(dBm)	(dBm)	(dB)	(dBd)	dBm	
1600	Н	-95.7	-56.0	3.33	3.65	-55.7	
	V	-96.5	-58.2	3.33	3.65	-57.8	

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 transceiver 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.

For part 90.543(e), the same procedure as above was used except a 0 dB mag-mount antenna (Maxrad Model: MUF4900 re-tuned to the 700MHz band) 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.

Radiated Spurious Emission (dBc) = Po - R' =>

 $44.8 - (-53.85) = 98.65 \, dBc$