



## EMC EMISSIONS - TEST REPORT (Full)

Test Report No. **BC300163** Issue Date: **Tue 04/Mar/2003**

Model / Serial No. **DKNFSK01/ SN: EMC0303**

Product Type **FSK UHF Remote control**

Client **Echostar Technologies**

Manufacturer **Echostar Technologies**

License holder **Echostar Technologies**

Address **P. O. Box 9021**  
**Littleton, Co 80120**

Test Criteria Applied **FCC CFR47 Part 15.231**  
Test Result **PASS**

Test Project Number **BC300163** Title 47 CFR 15: RADIO FREQUENCY DEVICES  
References  
Total Pages **26**  
Including  
Appendices:

*Todd Seeley*

Reviewed By : Todd Seeley

*Robert Cresswell*

Approved By : Robert Cresswell

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Lab Code: 200624-0



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### STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty for Conducted Emissions in the frequency range of 150kHz – 30MHz is calculated to be  $\pm 2.30\text{dB}$  and for Radiated Emissions is calculated to be  $\pm 3.60\text{dB}$  in the frequency range of 30MHz – 200MHz and  $\pm 3.38\text{dB}$  in the frequency range of 200MHz – 1000MHz.

EUT Received Date: 10-Feb-2003

Testing Start Date: 10-Feb-2003

Testing End Date: 5-Mar-2003

The tests were performed according to following regulations :

1. ICES-003

**Emission Test Results:**

**Conducted Emissions, Powerline - N/A**

**Test Result**

Minimum limit margin \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Maximum limit exceeding \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

**Conducted Emissions, Data I/O (Ethernet, RJ11, etc.) - N/A**

**Test Result**

Minimum limit margin \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Maximum limit exceeding \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

**Radiated Emissions (Electric Field) -**

**Test Result**

Minimum limit margin 2.98 dB at 369.54 MHz

Maximum limit exceeding \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

**GENERAL REMARKS:**

Mode of Operation:

For each button press, the main remote control board will send three data packets to the UHF transmitter board at the specified rate. Key code packets contain 26 bit encoded key codes and will be sent every 100 ms after a short preamble. After three packets are sent, a 3 bit Maintain packet (plus preamble) will be sent every 100 ms until the button is released or 3 minutes, whichever is shorter.

Special Operation:

The remote software was modified to remove the 3-minute time out, and to transmit only key code packets. Key code packets represent the worst case emission from the remote.

Modifications required to pass: NONE

Test Specification Deviations: Additions to or Exclusions from: None

Test-setup photo(s):  
Radiated Emissions



Test-setup photo(s):  
Radiated Emissions



Test-setup photo(s):  
Radiated Emissions



Test-setup photo(s):  
Radiated Emissions



**Appendix A**

Test Data Sheets  
and  
Test Equipment Used



# Radiated Electromagnetic Emissions

Test Report #: **Bc300163 Run 02**  
 Test Method: FCC Part 15.209  
 EUT Model #: DKNFSK01  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar  
 EUT Description: FSK UHF Remote control  
 Notes: pass 2 main, pass 4 xmter.

Test Area: Pinewood Site 1 (3m)  
 Test Date: 10-Feb-2003  
 EUT Power: 6VDC

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 1 of 4

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC B (< 1GHz)	FCC B (> 1GHz)
No emissions found: 0 Deg, vertical						
No emissions found: 90 Deg, vertical						
No emissions found: 180 Deg, vertical						
No emissions found: 270 Deg, vertical						
No emissions found: 0 Deg, horizontal						
NO emissions found: 90 Deg, horizontal						
No emissions found: 180 Deg, horizontal						
No emissions found: 270 Deg, horizontal						
No emissions found 30 - 200 MHz						
Rotated table 360 Deg.						
369.50	88.5 Qp	4.7 / 14.5 / 27.9	79.8	V / 1.0 / 0.0	33.8 *	N/A
739.03	53.2 Qp	5.0 / 20.2 / 30.4	48.1	V / 1.0 / 0.0	2.1 *	N/A
369.5 MHz is the transmitt frequency and was deleted from the summary						
739.03 MHz is the 2nd harmonic of the transmitt frequency and was deleted from the summary.						
No higher emissions found 90 Deg, vertical						
No higher emissions found: 180 Deg, vertical						

# Radiated Electromagnetic Emissions

Test Report #: **Bc300163 Run 02**  
 Test Method: FCC Part 15.209  
 EUT Model #: DKNFSK01  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar  
 EUT Description: FSK UHF Remote control  
 Notes: pass 2 main, pass 4 xmter.

Test Area: Pinewood Site 1 (3m)  
 Test Date: 10-Feb-2003  
 EUT Power: 6VDC

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 2 of 4

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC B (< 1GHz)	FCC B (> 1GHz)
No higher emissions found: 270 Deg, vertical						
No higher emissions found: 0 Deg, horizontal						
No higher emissions found: 90 Deg, horizontal						
No higher emissions found: 180 Deg, horizontal						
No higher emissions found: 270 Deg, horizontal						
No emissions found: 200 - 1000 MHz						
The following are noise floor readings.						
224.29	18.8 Qp	5.3 / 10.7 / 28.1	6.7	H / 1.0 / 270.0	-39.3	N/A
354.00	18.9 Qp	4.8 / 14.6 / 27.9	10.3	H / 1.0 / 270.0	-35.7	N/A
416.04	19.3 Qp	4.8 / 15.5 / 27.8	11.8	H / 1.0 / 270.0	-34.2	N/A
561.00	19.1 Qp	4.9 / 18.3 / 28.1	14.3	H / 1.0 / 270.0	-31.7	N/A
612.00	18.9 Qp	5.0 / 17.9 / 28.8	13.0	H / 1.0 / 270.0	-33.0	N/A
750.00	19.1 Qp	5.0 / 20.3 / 29.9	14.5	H / 1.0 / 270.0	-31.5	N/A
NO emissions found: 0 Deg, vertical						
No emissions found: 90 Deg, vertical						
No emissions found: 180 Deg, vertical						
NO emissions found: 270 Deg, vertical						

# Radiated Electromagnetic Emissions

Test Report #: **BC300163 Run 02**  
 Test Method: FCC Part 15.209  
 EUT Model #: DKNFSK01  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar  
 EUT Description: FSK UHF Remote control  
 Notes: pass 2 main, pass 4 xmtr.

Test Area: Pinewood Site 1 (3m)  
 Test Date: 10-Feb-2003  
 EUT Power: 6VDC

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 3 of 4

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC B (< 1GHz)	FCC B (> 1GHz)
No emissions found: 0 Deg, horizontal						
No emissions found: 90 Deg, horizontal						
No emissions found: 180 Deg, horizontal						
No emissions found: 270 Deg, horizontal						
No emissions found 1 - 2 GHz, nothing maximized						

# Radiated Electromagnetic Emissions

Test Report #: Bc300163 Run 02      Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC Part 15.209      Test Date: 10-Feb-2003  
 EUT Model #: DKNFSK01      EUT Power: 6VDC  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar  
 EUT Description: FSK UHF Remote control  
 Notes: pass 2 main, pass 4 xmter.

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 4 of 4

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

		CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	FCC B (< 1GHz)	FCC B (> 1GHz)
<b>***** Measurement Summary *****</b>						
750.00	19.1 Qp	5.0 / 20.3 / 29.9	14.5	H / 1.0 / 270.0	-31.5	N/A
561.00	19.1 Qp	4.9 / 18.3 / 28.1	14.3	H / 1.0 / 270.0	-31.7	N/A
612.00	18.9 Qp	5.0 / 17.9 / 28.8	13.0	H / 1.0 / 270.0	-33.0	N/A
416.04	19.3 Qp	4.8 / 15.5 / 27.8	11.8	H / 1.0 / 270.0	-34.2	N/A
354.00	18.9 Qp	4.8 / 14.6 / 27.9	10.3	H / 1.0 / 270.0	-35.7	N/A
224.29	18.8 Qp	5.3 / 10.7 / 28.1	6.7	H / 1.0 / 270.0	-39.3	N/A

# Radiated Electromagnetic Emissions

Test Report #: **Bc300163 Run 1**  
 Test Method: FCC Part 15.231  
 EUT Model #: DKNFSK01  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar

Test Area: Pinewood Site 1 (3m)  
 Test Date: 03-Mar-2003  
 EUT Power: 6VDC

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 1 of 4

EUT Description: FSK UHF Remote control

Notes: pass 2 main, pass 4 xmter.

Peak Measurements were corrected for Duty Cycle to average the measurement as

Follows: Final measurement was corrected by  $20 \cdot \log_{10}(40.8\text{ms}/100\text{ms}) = -8.326\text{dB}$

\* denotes emission in restricted band in accordance to 15.205

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Corrected	Limit	Margin
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	(dBuV)	(dBuV)	(dBuV)
Remote on its side.							
369.54	92.4 Pk	4.7 / 14.5 / 27.9	83.7	H / 1.0 / 99.0	75.37	78.40	-2.98
Remote upright.							
369.54	77.2 Pk	4.7 / 14.5 / 27.9	68.4	H / 1.0 / 155.0	60.07	78.40	-18.28
369.54	89.5 Pk	4.7 / 14.5 / 27.9	80.8	V / 1.4 / 50.0	72.47	78.40	-5.88
Remote on its side.							
369.54	81.9 Pk	4.7 / 14.5 / 27.9	73.2	V / 3.2 / 199.0	64.87	78.40	-13.48
739.04	49.9 Pk	5.0 / 20.2 / 30.4	44.7	V / 3.2 / 180.0	36.37	58.40	-22.02
739.04	57.3 Pk	5.0 / 20.2 / 30.4	52.2	H / 1.1 / 233.0	43.87	58.40	-14.52
Remote upright.							
739.04	51.1 Pk	5.0 / 20.2 / 30.4	46.0	H / 1.1 / 10.0	37.67	58.40	-20.72
739.04	56.4 Pk	5.0 / 20.2 / 30.4	51.2	V / 1.4 / 191.0	42.87	58.40	-15.52
Remote on its side.							
*1108.54	67.3 Pk	2.4 / 26.1 / 37.3	58.5	V / 1.4 / 5.0	50.17	53.98	-3.81
*1108.54	67.8 Pk	2.4 / 26.1 / 37.3	59.0	H / 1.0 / 118.0	50.67	53.98	-3.31
Remote upright.							
*1108.54	57.8 Pk	2.4 / 26.1 / 37.3	48.9	H / 3.1 / 40.0	40.57	53.98	-13.41
*1108.54	67.8 Pk	2.4 / 26.1 / 37.3	58.9	V / 1.0 / 91.0	50.57	53.98	-3.41
*1478.04	55.8 Pk	3.0 / 26.7 / 36.5	48.9	V / 1.1 / 100.0	40.57	53.98	-13.41

# Radiated Electromagnetic Emissions

Test Report #: BC300163 Run 1      Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC Part 15.231      Test Date: 03-Mar-2003  
 EUT Model #: DKNFSK01      EUT Power: 6VDC  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 2 of 4

EUT Description: FSK UHF Remote control

Notes: pass 2 main, pass 4 xmter.

Peak Measurements were corrected for Duty Cycle to average the measurement as

Follows: Final measurement was corrected by  $20 \cdot \log_{10}(40.8\text{ms}/100\text{ms}) = -8.326\text{dB}$

\* denotes emission in restricted band in accordance to 15.205

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Corrected	Limit	Margin
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV)	(m) (DEG)	(dBuV)	(dBuV)	(dBuV)
*1478.16	50.6 Pk	3.0 / 26.7 / 36.4	43.7	H / 1.1 / 284.0	35.37	53.98	-18.61
Remote on its side.							
*1478.16	56.4 Pk	3.0 / 26.7 / 36.4	49.6	H / 1.1 / 61.2	41.27	53.98	-12.71
*1478.16	49.0 Pk	3.0 / 26.7 / 36.4	42.1	V / 1.1 / 61.2	33.77	53.98	-20.21
1847.70	46.2 Pk	3.4 / 28.5 / 37.0	41.1	V / 1.1 / 208.0	32.77	58.40	-25.62
1847.70	42.7 Pk	3.4 / 28.5 / 37.0	37.6	H / 1.3 / 42.0	29.27	58.40	-29.12
Remote upright.							
1847.70	46.8 Pk	3.4 / 28.5 / 37.0	41.6	H / 1.7 / 118.0	33.27	58.40	-25.12
1847.70	46.1 Pk	3.4 / 28.5 / 37.0	40.9	V / 1.0 / 124.0	32.57	58.40	-25.82
*2217.24	59.8 Pk	3.9 / 29.9 / 36.9	56.6	V / 1.8 / 88.0	48.27	53.98	-5.71
*2217.24	55.2 Pk	3.9 / 29.9 / 36.9	52.1	H / 2.1 / 116.0	43.77	53.98	-10.21
Remote on its side.							
*2217.24	56.0 Pk	3.9 / 29.9 / 36.9	52.8	H / 2.3 / 59.0	44.47	53.98	-9.51
*2217.24	55.8 Pk	3.9 / 29.9 / 36.9	52.6	V / 2.3 / 146.0	44.27	53.98	-9.71
2586.78	52.8 Pk	4.2 / 30.8 / 36.9	50.8	V / 2.3 / 355.0	42.47	58.40	-15.92
2586.78	56.1 Pk	4.2 / 30.8 / 36.9	54.1	H / 2.2 / 87.0	45.77	58.40	-12.62
Remote upright.							
2586.78	56.0 Pk	4.2 / 30.8 / 36.9	54.0	H / 1.7 / 121.0	45.67	58.40	-12.72
2586.78	51.1 Pk	4.2 / 30.8 / 36.9	49.2	V / 1.7 / 121.0	40.87	58.40	-17.52
2956.32	52.4 Pk	3.8 / 31.4 / 36.7	50.9	V / 1.7 / 95.0	42.57	58.40	-15.82

# Radiated Electromagnetic Emissions

Test Report #: Bc300163 Run 1      Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC Part 15.231      Test Date: 03-Mar-2003  
 EUT Model #: DKNFSK01      EUT Power: 6VDC  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 3 of 4

EUT Description: FSK UHF Remote control

Notes: pass 2 main, pass 4 xmter.

Peak Measurements were corrected for Duty Cycle to average the measurement as

Follows: Final measurement was corrected by  $20 \cdot \log_{10}(40.8\text{ms}/100\text{ms}) = -8.326\text{dB}$

\* denotes emission in restricted band in accordance to 15.205

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Corrected	Limit	Margin
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV)	(m) (DEG)	(dBuV)	(dBuV)	(dBuV)
2956.32	57.7 Pk	3.8 / 31.4 / 36.7	56.2	H / 1.8 / 97.0	47.87	58.40	-10.52
Remote on its side.							
2956.32	52.6 Pk	3.8 / 31.4 / 36.7	51.2	H / 2.1 / 56.0	42.87	58.40	-15.52
2956.32	53.3 Pk	3.8 / 31.4 / 36.7	51.8	V / 1.6 / 54.0	43.47	58.40	-14.92
3325.86	47.0 Pk	4.1 / 32.3 / 37.8	45.7	V / 1.7 / 239.0	37.37	58.40	-21.02
3325.86	51.2 Pk	4.1 / 32.3 / 37.8	49.9	H / 1.8 / 57.9	41.57	58.40	-16.82
Remote upright.							
3325.86	44.8 Pk	4.1 / 32.3 / 37.8	43.5	H / 1.0 / 177.0	35.17	58.40	-23.22
3325.86	51.6 Pk	4.1 / 32.3 / 37.8	50.2	V / 1.8 / 92.0	41.87	58.40	-16.52
*3695.40	39.1 Pk	4.6 / 33.4 / 37.9	39.2	V / 1.8 / 65.0	30.87	53.98	-23.11
*3695.40	43.4 Pk	4.6 / 33.4 / 37.9	43.5	H / 1.8 / 65.0	35.17	53.98	-18.81
Remote on its side							
*3695.40	39.8 Pk	4.6 / 33.4 / 37.9	39.9	H / 1.0 / 15.0	31.57	53.98	-22.41
*3695.40	42.0 Pk	4.6 / 33.4 / 37.9	42.0	V / 1.6 / 67.0	33.67	53.98	-20.31

# Radiated Electromagnetic Emissions

Test Report #: Bc300163 Run 1      Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC Part 15.231      Test Date: 03-Mar-2003  
 EUT Model #: DKNFSK01      EUT Power: 6VDC  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 4 of 4

EUT Description: FSK UHF Remote control

Notes: pass 2 main, pass 4 xmter.

Peak Measurements were corrected for Duty Cycle to average the measurement as

Follows: Final measurement was corrected by  $20 \cdot \log_{10}(40.8\text{ms}/100\text{ms}) = -8.326\text{dB}$

\* denotes emission in restricted band in accordance to 15.205

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Corrected	Limit	Margin
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV)	(m) (DEG)	(dBuV)	(dBuV)	(dBuV)
<b>***** Measurement Summary *****</b>							
369.54	92.4 Pk	4.7 / 14.5 / 27.9	83.7	H / 1.0 / 99.0	75.37	78.40	-2.98
739.04	57.3 Pk	5.0 / 20.2 / 30.4	52.2	H / 1.1 / 233.0	43.87	58.40	-14.52
*1108.54	67.8 Pk	2.4 / 26.1 / 37.3	59.0	H / 1.0 / 118.0	50.67	53.98	-3.31
*1478.16	56.4 Pk	3.0 / 26.7 / 36.4	49.6	H / 1.1 / 61.2	41.27	53.98	-12.71
1847.70	46.8 Pk	3.4 / 28.5 / 37.0	41.6	H / 1.7 / 118.0	33.27	58.40	-25.12
*2217.24	59.8 Pk	3.9 / 29.9 / 36.9	56.6	V / 1.8 / 88.0	48.27	53.98	-5.71
2586.78	56.1 Pk	4.2 / 30.8 / 36.9	54.1	H / 2.2 / 87.0	45.77	58.40	-12.62
2956.32	57.7 Pk	3.8 / 31.4 / 36.7	56.2	H / 1.8 / 97.0	47.87	58.40	-10.52
3325.86	51.6 Pk	4.1 / 32.3 / 37.8	50.2	V / 1.8 / 92.0	41.87	58.40	-16.52
*3695.40	43.4 Pk	4.6 / 33.4 / 37.9	43.5	H / 1.8 / 65.0	35.17	53.98	-18.81



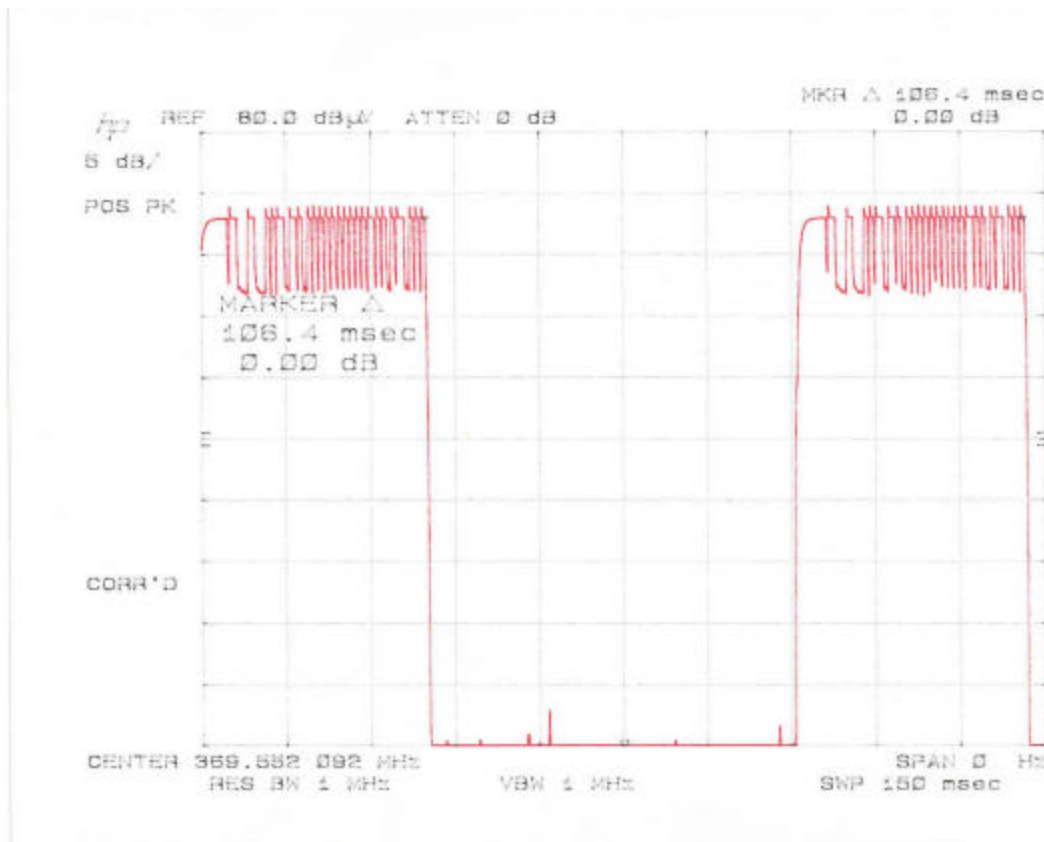
# Radiated Electromagnetic Emissions

Test Report #: **BC300163** Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC Part 15.231 Test Date: 03-Mar-2003  
 EUT Model #: DKNFSK01 EUT Power: 6VDC  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar  
 EUT Description: FSK UHF Remote control  
 Notes: pass 2 main, pass 4 xmtr.  
Duty Cycle Measurements for Emissions Averaging

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 1 of 2

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Duty Cycle Measurement  
 Full Cycle = 106.4ms (time on in 100ms = 40.8ms)



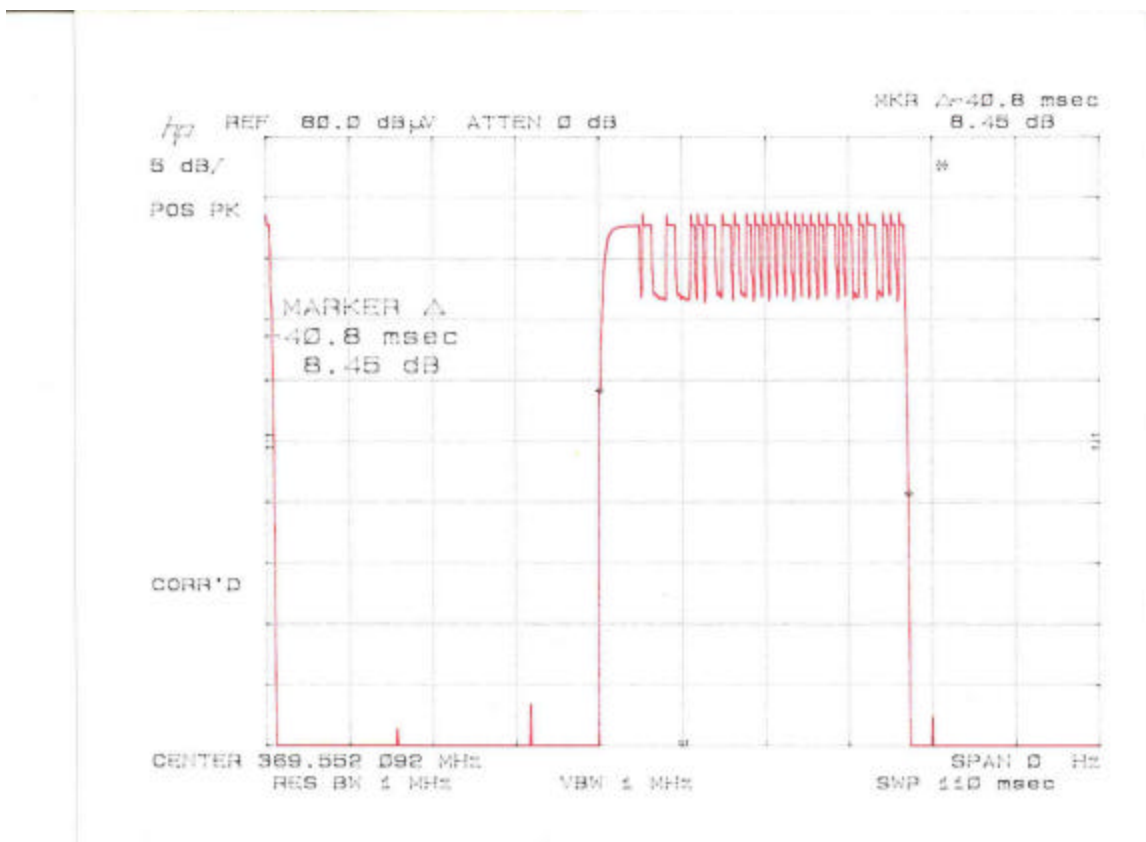
# Radiated Electromagnetic Emissions

Test Report #: **BC300163**      Test Area: Pinewood Site 1 (3m)  
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 EUT Model #: DKNFSK01      EUT Power: 6VDC  
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 EUT Description: FSK UHF Remote control  
 Notes: pass 2 main, pass 4 xmtr.  
Duty Cycle Measurements for Emissions Averaging

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 2 of 2

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Transmission Time of Duty Cycle  
 40.8ms in 100ms period = 40.8% Duty Cycle



# Radiated Electromagnetic Emissions

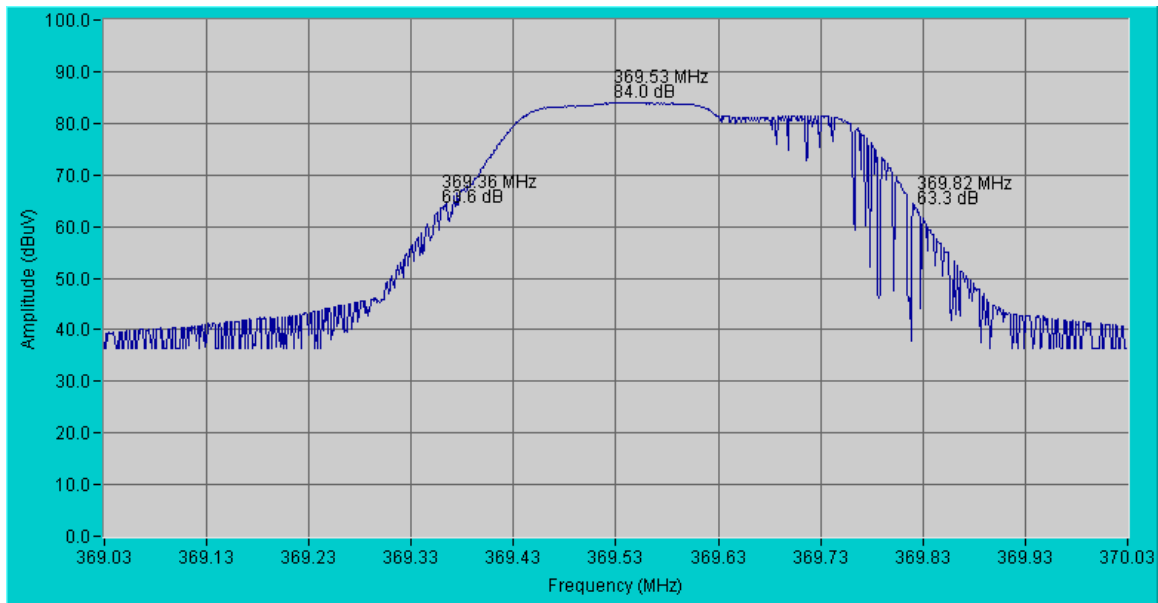
Test Report #: **BC300163**  
 Test Method: FCC Part 15.231  
 EUT Model #: DKNFSK01  
 EUT Serial #: EMC0303  
 Manufacturer: Echostar  
 EUT Description: FSK UHF Remote control  
 Notes: pass 2 main, pass 4 xmtr.  
 Transmission Bandwidth

Test Area: Pinewood Site 1 (3m)  
 Test Date: 03-Mar-2003  
 EUT Power: 6VDC

Temperature: 24.2 °C  
 Relative Humidity: <26 %  
 Air Pressure: 80 kPa  
 Page: 1 of 1

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Transmission Bandwidth  
 Peak Hold Measurement  
 20dB Bandwidth = 460kHz



**Project: BC300163**

**Client: Echostar**

**Date: March 4, 2003**

**Radiated Emissions**

Equipment ID #	Description	Cal Date	Cal Due
7637	Miteq Pre-amp	5-11-02	5-11-03
8014	EMCO Log Periodic Antenna	9-11-02	9-11-03
7617	Mini Circuits Amplifier	4-15-2002	4-15-2003
8264	Emco Horn antenna	8-1-02	8-1-03
8213	HP Spectrum Analyzer	10-21-02	10-21-03
8214	HP Display Section	10-21-02	10-21-03
8215	HP Quasi Peak Adapter	9-30-02	9-30-03

**Appendix B**

Test Plan

and

Constructional Data Form: To be supplied by Customer

Appendix C

Measurement Protocol

And

Test Procedures



## MEASUREMENT PROTOCOL

### GENERAL INFORMATION

#### Test Methodology

Conducted and radiated emission testing is performed according to the procedures in ANSI C63.4 & CNS13438.

#### Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

#### CONDUCTED EMISSIONS

The final level, expressed in dB $\mu$ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the applicable limit.

To convert between dB $\mu$ V and  $\mu$ V, the following conversions apply:

- $\text{dB}\mu\text{V} = 20(\log \mu\text{V})$
- $\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$

#### RADIATED EMISSIONS

The final level, expressed in dB $\mu$ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB $\mu$ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the applicable limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

*Example: At a Test Frequency of 30 MHz, with a peak reading on the spectrum analyzer or measuring receiver of 14 dB $\mu$ V:*

Measured Level		Transducer & Cable Loss factor		Corrected Reading	Specification Limit		Corrected Reading		Delta Specification
(dB $\mu$ V)	+	(dB)	=	(dB $\mu$ V/m)	(dB $\mu$ V/m)	-	(dB $\mu$ V/m)	=	
<b>14.0</b>		<b>14.9</b>		<b>28.9</b>	<b>40.0</b>		<b>28.9</b>		<b>-11.1</b>

## DETAILS OF TEST PROCEDURES

### *General Standard Information*

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

### **Conducted Emissions**

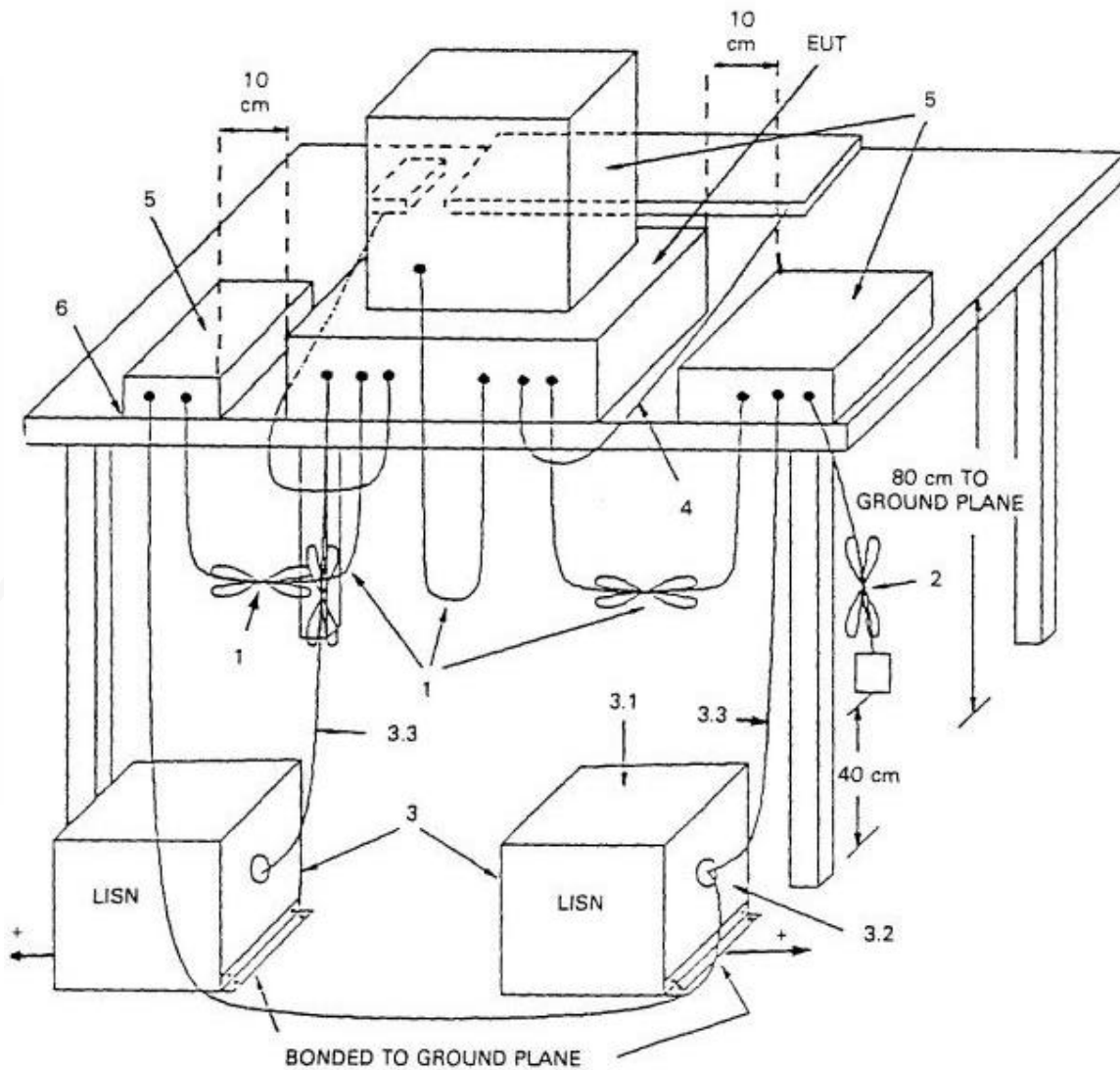
Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50  $\Omega$ /50  $\mu$ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

### **Radiated Emissions**

Radiated emissions from the EUT are measured in the frequency range of 30 to 22GHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.



**Conducted Emissions Diagram:**



**Radiated Emissions Diagram:**

