



## EMC EMISSIONS - TEST REPORT (Full)

Test Report No. **BC400222-1** Issue Date: **Wednesday, June 8, 2004**

Model / Serial No. **MN: Remote 8.1 FSK Converter / SN: FCC 1**

Product Type **Remote Control**

Client **Echostar**

Manufacturer **Echostar**

License holder **Echostar**

Address **9601 S. Meridian Blvd**

**Englewood, CO 80112**

Test Criteria Applied **FCC CFR47 Part 15.231**

Test Result

**PASS**

Title 47 CFR 15.231: RADIO  
FREQUENCY DEVICES operating in the  
frequency range of 40.66-40.70MHz and  
above 70MHz (including 15.205, 15.207,  
15.209 where applicable)

Test Project Number

**BC400222-1**

References

Total Pages

31

Including

Appendices:

*Todd Jackson*

*Robert Crosswell*

Reviewed By :

Approved By :

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Lab Code: 200624-0



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## DIRECTORY

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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: 9-April-2004

Testing Start Date: 9-April-2004

Testing End Date: 29-April-2004

**The tests were performed according to following regulations :**

1. FCC CFR47 Part 15.205
2. FCC CFR47 Part 15.207
3. FCC CFR47 Part 15.209
4. FCC CFR47 Part 15.231
5. ICES-003

**Emission Test Results:**

**Conducted Emissions, Powerline (15.207) - Not Applicable**

**Test Result**

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

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

Remarks: Battery Powered Device

**Radiated Emissions (15.209) / 15.231(b)(3) - PASS**

**Test Result**

Minimum limit margin -1.20 dB at 1185.31 MHz

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

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

**Radiated Emissions (15.205) / 15.231(b)(2) - PASS**

**Test Result**

Minimum limit margin -1.6 dB at 1113.28 MHz

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

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

**Radiated Emissions 15.231(a)(1)&(2) - PASS**

**Test Result**

Remarks: Required measurement for manually and automatic operated transmitter equipment. <5 Sec. after activation

**Radiated Emissions 15.231(b)(1) - PASS**

**Test Result**

Minimum limit margin -0.62 dB at 371.13 MHz

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

Remarks: Measurements were taken utilizing the methods dictated by Part 15.35 for averaging pulsed emissions and for limiting peak emissions

**Radiated Emissions 15.231(c) - PASS**

**Test Result**

Remarks: Devices operated within the frequency band of 70 – 900MHz: **-20dBc Bandwidth** maximum of 0.25% of the center frequency

Devices operated within the frequency band of >900MHz: **-20dBc Bandwidth** maximum of 0.50% of the center frequency

**Radiated Emissions 15.231(d) - Not Applicable**

**Test Result**

Remarks: Devices operated within the frequency band of 40.66 – 40.70MHz: **-20dBc Bandwidth** maximum of 0.01% of the center frequency as measured through the temp range of -20 to +50 deg. C, and at 85 - 115% of the nominal supply voltage at 20 deg. C “a new battery would be used in cases where the device is powered from a battery”

**Radiated Emissions 15.231(e) - Not Applicable**

**Test Result**

Minimum limit margin 00.00 dB at 0000.00 MHz

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

Remarks: Measurements were taken utilizing the methods dictated by Part 15.35 for averaging pulsed emissions and for limiting peak emissions

**GENERAL REMARKS:**

The following remarks are to be considered as “where applicable” and are taken into account while completing any FCC/IC/ETSI radio tests at International Approvals Laboratories, LLC.

Testing was performed in 3 different orthogonal axis to determine the worst case emissions from the device. The worst case emissions measurements are shown in this report.

**FCC CFR47 Part 15.31: Measurement Standards:** In any case where the device is powered off a battery, a fresh battery was used during test. In cases where the device is powered off an AC supply, voltage was varied per Part 15.31 to find worst case emissions.

**FCC CFR47 Part 15.35: Measurement Detector Functions and Bandwidths:** FCC Part 15.35 was utilized when performing the measurements within this report.

Modifications required to pass: **NONE**

Test Specification Deviations: **NONE**

**Required Information In Accordance to FCC CFR 47 Part 2.1033:**

<i>Rule Part 11, 15 &amp; 18 Devices</i>	<i>Other Rule Part Devices</i>	<i>Description</i>	<i>Comments</i>
2.1033(b)(1)	2.1033(c)(1)	Manu. Contact	See Page 1 of this report
2.1033(b)(2)	2.1033(c)(2)	FCC Identifier	
2.1033(b)(3)	2.1033(c)(3)	Users Manual to include Operating, installation	Attached as Exhibit
	2.1033(c)(4)	Emissions Designator per 2.	
	2.1033(c)(5)	Frequency Range	Not Applicable to Part 15 Devcies
	2.1033(c)(6)	Power range and controls	Not Applicable to Part 15 Devcies
	2.1033(c)(7)	Maximum power ouput rating	Not Applicable to Part 15 Devcies
	2.1033(c)(8)	DC Voltage and Current suplying final RF stages	Not Applicable to Part 15 Devcies
2.1033(b)(3)	2.1033(c)(9)	Tune –up procedure	Please refer to the users manual for applicability
2.1033(b)(4&5)	2.1033(c)(10)	Complete Circuit Diagrams and circuit operation description	Attached as Exhibit
2.1033(b)(7)	2.1033(c)(11)	Photographs/drawings of the identification label & its location on the device	Attached as Exhibit
2.1033(b)(7)	2.1033(c)(12)	Photographs of the external and internal surfaces, and construction	Attached as Exhibit
	2.1033(c)(13)	Digital Modulation	Not Applicable
2.1033(b)(6)	2.1033(c)(14)	Report of Measurement Data Required by 2.1046 – 2.1057	See Data Below (This report consists of the testing required under Part 15.231)
2.1033(b)(8)		Description of publicly available support equipment used during test	Refer to Exhibit B of this report (Client Test Plan)
2.1033(b)(9)		Statement of Autorization to Part 15.37 of CFR47	The equipment herein is being authorized in accordance to 15.37 of the CFR47 Rules.
2.1033(b)(10)		Direct Sequence Spread Spectrum Devices (DSSS)	Exhibit of compliance to 15.247(e)
2.1033(b)(10)		Frequency Hopping Devices	Exhibit of compliance to 15.247(a)(1)
2.1033(b)(11)		Scanning receiver constructon	Exhibit stating compliance to construction in accordance to 15.121.
15.31	15.31	Transmitter Supply Voltage	Testing herein was completed in accordance to FCC CFR47 Part 15.31

**Exhibits Including (where applicable):**

- |                                    |   |
|------------------------------------|---|
| 1. Users Manual                    | 7. Parts List   |
| 2. Operation Description           | 8. Tuning Procedure (if applicable)                     |
| 3. Block Diagram                   | 9. Test Setup Photograph                                |
| 4. Report of Measurement           | 10. Label Drawings and or Photograpghs                  |
| 5. External & Internal Photographs | 11. Description of Support Equipment (where Applicable) |
| 6. Schematic                       |   |

**Required Information in Accordance to Industry Canada Regulations (In addition to the above):**

<i>Information Required</i>	<i>Description</i>	<i>Comments</i>
<b>Modulation Type</b>	(i.e. ASK, NON, FSK, DSSS, FHSS, etc.)	
<b>Emissions Designator</b>	Per TRC-49	
<b>In Country Representative</b>	Contact Information	
<b>99% Bandwidth Measurement</b>	Per RSS-210	0.927 MHz

Test-setup photo(s):  
Radiated Emissions





Test-setup photo(s):  
Radiated Emissions







## Appendix A

### Test Data Sheets and Test Equipment Used

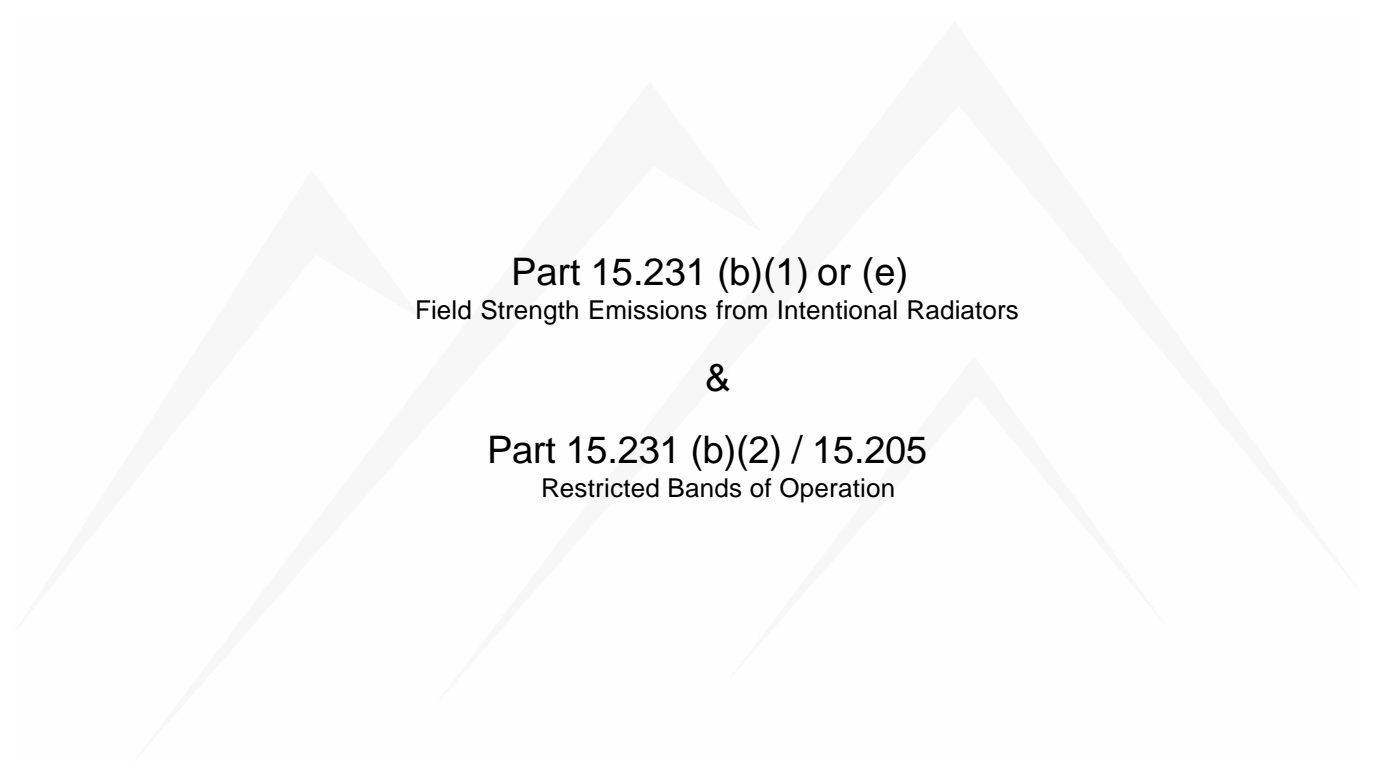
**Part 15.231 (a) (1&2)**

Device must cease to function after manual or automatic activation.

## Verification of 5 second Deactivation

The deactivation was verified at the time of test.  
The device meets the requirements of this section.





**Part 15.231 (b)(1) or (e)**  
Field Strength Emissions from Intentional Radiators

**&**

**Part 15.231 (b)(2) / 15.205**  
Restricted Bands of Operation

# Field Strength Measurements Fundamental and Spurious of the Transmitter

Test Report #: **BC400222**      Test Area: Pinewood Site 1 (3m)

Test Method: FCC CFR47 Part 15.231/205      Test Date: 09-Apr-2004

EUT Model #: Remote 8.1 FSK Converter      EUT Power: 4 AAA batteries, new

EUT Serial #: FCC 1

Manufacturer: Echostar

EUT Description: Remote Control

Notes: fundamental frequency is 371.1 MHz

Temperature: 22 °C

Relative Humidity: 48 %

Air Pressure: 80 kPa

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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 Correction	Final Corrected	Limit	DELTA
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	(dB)	(dBuV/m)	(dBuV/m) 15.231(b)- 15.205	(dB)

The following duty cycle was declared by the manufacturer.

Duty Cycle = active / 100ms. = 37.5%

**Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.**

The testing performed in accordance to FCC CFR47 Part 15.205 (restricted bands of operation) and 15.231 emissions and delta limits were calculated as follows:

Final Corrected Peak Measurement – Duty Cycle Correction Factor\* = Final Calculated Emission

The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.209 and 15.231 and the emission/limit delta was calculated.

the DTCF is calculated as follows  $20 \cdot \log_{10}(\text{duty cycle in 100ms})$  "not to exceed 20dB"

**Part 15.231 (b) and 15.205 Respectively**

EUT flat on the table

371.13	59.0 Pk	2.1 / 15.5 / 0.0	76.7	H / 1.0 / 0.0	-8.52	68.18	70.30	-2.12
371.13	51.7 Pk	2.1 / 15.5 / 0.0	69.4	V / 3.0 / 81.0	-8.52	60.88	70.30	-9.42

EUT is in it's side

371.13	50.0 Pk	2.1 / 15.5 / 0.0	67.6	V / 3.4 / 67.0	-8.52	59.08	70.30	-11.22
371.12	60.5 Pk	2.1 / 15.5 / 0.0	78.2	H / 1.0 / 347.0	-8.52	69.68	70.30	-0.62

EUT standing up

371.12	52.0 Pk	2.1 / 15.5 / 0.0	69.6	H / 1.0 / 78.0	-8.52	61.08	70.30	-9.22
371.12	57.6 Pk	2.1 / 15.5 / 0.0	75.2	V / 1.7 / 196.0	-8.52	66.68	70.30	-3.62

all the following readings are with the EUT on its side

742.26	24.7 Pk	2.3 / 20.8 / 0.0	47.8	V / 1.5 / 126.0	-8.52	39.28	53.98	-14.62
742.26	31.3 Pk	2.3 / 20.8 / 0.0	54.4	H / 1.2 / 323.0	-8.52	45.88	53.98	-8.10
1113.28	69.8 Pk	2.4 / 25.3 / 37.8	59.7	V / 1.3 / 268.0	-8.52	51.18	53.98	-2.8
1113.28	71.0 Pk	2.4 / 25.3 / 37.8	60.9	H / 1.0 / 321.0	-8.52	52.38	53.98	-1.6

# Field Strength Measurements Fundamental and Spurious of the Transmitter

Test Report #: **BC400222**      Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC CFR47 Part 15.231/205      Test Date: 09-Apr-2004  
 EUT Model #: Remote 8.1 FSK Converter      EUT Power: 4 AAA batteries, new  
 EUT Serial #: FCC 1

Temperature: 22 °C  
 Relative Humidity: 48 %  
 Air Pressure: 80 kPa  
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Manufacturer: Echostar  
 EUT Description: Remote Control

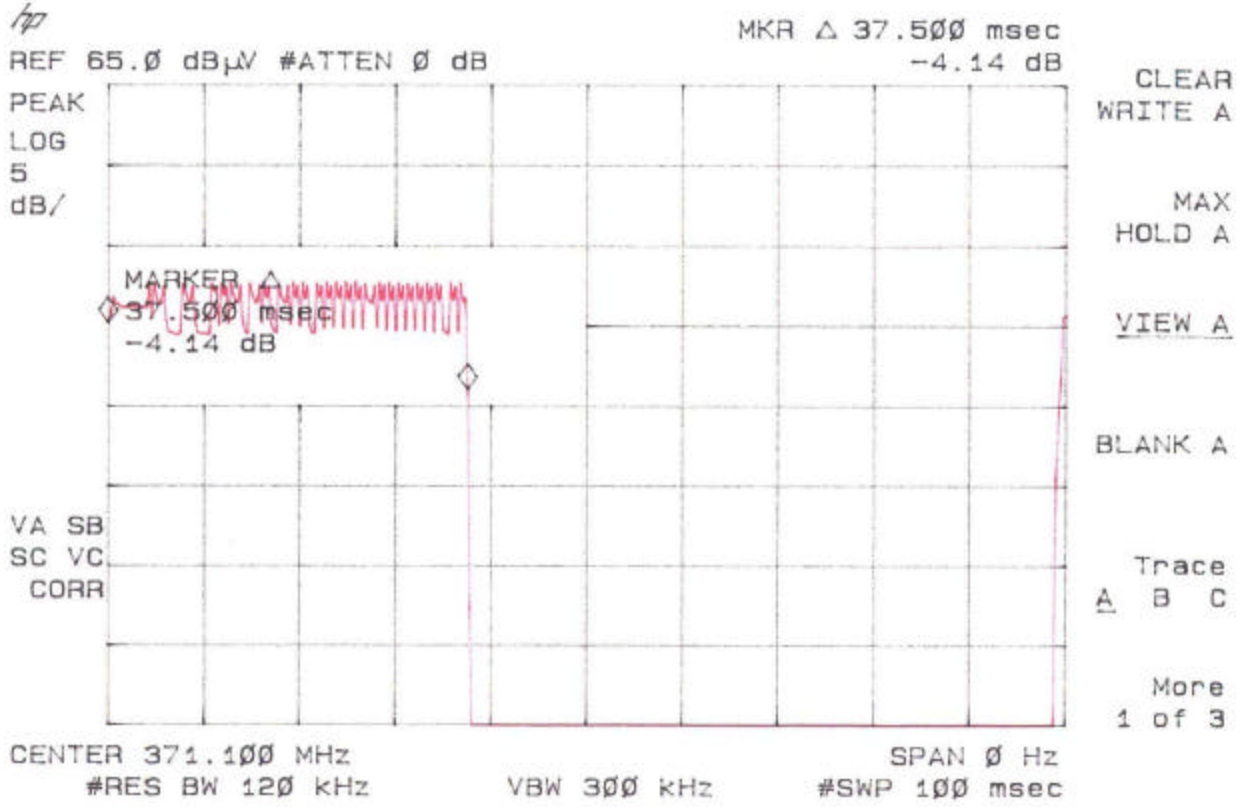
Notes: fundamental frequency is 371.1 MHz


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 Correction	Final Corrected	Limit	DELTA
(MHz)	(dBuV)	(dB) (dBm) (dB)	(dBuV)	(m) (DEG)	(dB)	(dBuV/m)	(dBuV/m) 15.231(b)- 15.205	(dB)
1484.09	57.9 Pk	2.9 / 26.5 / 37.4	49.9	H / 1.0 / 235.0	-8.52	41.38	53.98	-12.6
1484.22	62.5 Pk	2.9 / 26.5 / 37.4	54.5	V / 1.0 / 273.0	-8.52	45.98	53.98	-8
1855.26	61.9 Pk	3.1 / 27.9 / 37.8	55.1	H / 1.0 / 83.0	-8.52	46.58	53.98	-7.40
1855.31	68.1 Pk	3.1 / 27.9 / 37.8	61.3	V / 1.0 / 24.0	-8.52	52.78	53.98	-1.20
2226.34	63.0 Pk	3.6 / 28.7 / 37.7	57.6	H / 1.0 / 169.0	-8.52	49.08	53.98	-4.9
2226.35	62.2 Pk	3.6 / 28.7 / 37.7	56.8	V / 1.4 / 20.0	-8.52	48.28	53.98	-5.7
2597.94	61.1 Pk	4.1 / 29.4 / 36.5	58.1	H / 2.1 / 271.0	-8.52	49.58	53.98	-4.40
2597.99	62.1 Pk	4.1 / 29.4 / 36.5	59.0	V / 1.2 / 23.0	-8.52	50.48	53.98	-3.50
2968.32	58.6 Pk	4.6 / 30.3 / 37.6	55.9	H / 1.6 / 301.0	-8.52	47.38	53.98	-6.60
2969.04	56.1 Pk	4.6 / 30.3 / 37.6	53.4	V / 1.2 / 239.0	-8.52	44.88	53.98	-9.10
3339.88	49.6 Pk	4.7 / 31.3 / 37.4	48.2	H / 1.6 / 0.0	-8.52	39.68	53.98	-14.30
3339.98	50.1 Pk	4.7 / 31.3 / 37.4	48.8	V / 1.3 / 15.0	-8.52	40.28	53.98	-13.70
3711.29	50.2 Pk	5.2 / 32.2 / 36.8	50.9	H / 1.8 / 94.0	-8.52	42.38	53.98	-11.6
3711.24	49.4 Pk	5.2 / 32.2 / 36.8	50.1	V / 1.2 / 7.0	-8.52	41.58	53.98	-12.4



Duty Cycle Verification Plot





Part 15.231 (b)(3) / 15.209  
Spurious and Unintentional Emissions

# Radiated Electromagnetic Emissions

Test Report #: **BC400222 Run 04**  
 Test Method: FCC Part 15.209  
 EUT Model #: Remote 8.1 FSK  
 EUT Serial #: FCC 1  
 Manufacturer: Echostar  
 EUT Description: Remote Control  
 Notes: fundamental frequency is 371.1 MHz

Test Area: Pinewood Site 1 (3m)  
 Test Date: 28-Apr-2004  
 EUT Power: 4 AAA batteries, new

Temperature: 22 °C  
 Relative Humidity: 35 %  
 Air Pressure: 80 kPa  
 Page: 1 of 6

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

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B < 1 GHz	DELTA2 (dB) FCC B > 1 GHz
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Testing was completed from 5MHz (the lowest clock frequency within the device to 30MHz. No emissions were observed within this frequency range. This testing was completed on 6-8-04.

Bicon Antenna, vertical, 0 degrees turntable azimuth

32.13	29.5 Qp	0.6 / 12.9 / 28.3	14.7	V / 1.0 / 0.0	-25.3	N/A
40.17	30.8 Qp	0.7 / 12.1 / 28.3	15.3	V / 1.0 / 0.0	-24.7	N/A
56.23	28.8 Qp	0.8 / 9.4 / 28.3	10.7	V / 1.0 / 0.0	-29.3	N/A
64.26	32.1 Qp	0.9 / 9.0 / 28.2	13.8	V / 1.0 / 0.0	-26.2	N/A
80.33	30.8 Qp	0.9 / 7.5 / 28.2	11.0	V / 1.0 / 0.0	-29.0	N/A
144.62	26.8 Qp	1.2 / 12.8 / 27.9	13.0	V / 1.0 / 0.0	-30.5	N/A
180.01	24.2 Qp	1.4 / 13.1 / 27.7	11.0	V / 1.0 / 0.0	-32.5	N/A

90 degrees

32.13	29.9 Qp	0.6 / 12.9 / 28.3	15.1	V / 1.0 / 90.0	-24.9	N/A
40.17	31.0 Qp	0.7 / 12.1 / 28.3	15.5	V / 1.0 / 90.0	-24.5	N/A
72.30	31.0 Qp	0.9 / 8.5 / 28.2	12.2	V / 1.0 / 90.0	-27.8	N/A
180.01	24.2 Qp	1.4 / 13.1 / 27.7	11.1	V / 1.0 / 90.0	-32.4	N/A

180 degrees

40.17	30.6 Qp	0.7 / 12.1 / 28.3	15.1	V / 1.0 / 180.0	-24.9	N/A
72.30	31.0 Qp	0.9 / 8.5 / 28.2	12.1	V / 1.0 / 180.0	-27.9	N/A
80.33	31.3 Qp	0.9 / 7.5 / 28.2	11.5	V / 1.0 / 180.0	-28.5	N/A
180.01	24.1 Qp	1.4 / 13.1 / 27.7	10.9	V / 1.0 / 180.0	-32.6	N/A

270 degrees

40.17	30.5 Qp	0.7 / 12.1 / 28.3	15.0	V / 1.0 / 270.0	-25.0	N/A
64.26	25.0 Qp	0.9 / 9.0 / 28.2	6.6	V / 1.0 / 270.0	-33.4	N/A
180.01	24.1 Qp	1.4 / 13.1 / 27.7	10.9	V / 1.0 / 270.0	-32.6	N/A

No signals within 20 dB of the limit, Vertical, from 30-200 MHz

Changing to Horizontal

0 degrees

# Radiated Electromagnetic Emissions

Test Report #: BC400222 Run 04      Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC Part 15.209      Test Date: 28-Apr-2004  
 EUT Model #: Remote 8.1 FSK      EUT Power: 4 AAA batteries, new  
 EUT Serial #: FCC 1  
 Manufacturer: Echostar  
 EUT Description: Remote Control  
 Notes: fundamental frequency is 371.1 MHz

Temperature: 22 °C  
 Relative Humidity: 35 %  
 Air Pressure: 80 kPa  
 Page: 2 of 6

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

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dBm) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B < 1 GHz	DELTA2 (dB) FCC B > 1 GHz
32.13	23.0 Qp	0.6 / 12.9 / 28.3	8.2	H / 2.0 / 0.0	-31.8	N/A
40.17	25.3 Qp	0.7 / 12.1 / 28.3	9.8	H / 2.0 / 0.0	-30.2	N/A
56.23	24.8 Qp	0.8 / 9.4 / 28.3	6.8	H / 2.0 / 0.0	-33.2	N/A
64.26	25.8 Qp	0.9 / 9.0 / 28.2	7.4	H / 2.0 / 0.0	-32.6	N/A
72.30	24.8 Qp	0.9 / 8.5 / 28.2	6.0	H / 2.0 / 0.0	-34.0	N/A
80.33	24.4 Qp	0.9 / 7.5 / 28.2	4.7	H / 2.0 / 0.0	-35.3	N/A
144.62	21.5 Qp	1.2 / 12.8 / 27.9	7.7	H / 2.0 / 0.0	-35.8	N/A
152.63	22.0 Qp	1.2 / 12.8 / 27.8	8.2	H / 2.0 / 0.0	-35.3	N/A
180.01	22.2 Qp	1.4 / 13.1 / 27.7	9.0	H / 2.0 / 0.0	-34.5	N/A
90 degrees						
nothing higher						
180 degrees						
nothing higher						
270 degrees						
nothing higher						
Changing to the Log Antenna, Horizontal						
0 degrees						
229.13	19.4 Qp	1.6 / 11.0 / 27.3	4.6	H / 2.0 / 0.0	-41.4	N/A
440.00	19.0 Qp	2.2 / 16.4 / 28.2	9.5	H / 2.0 / 0.0	-36.5	N/A
480.03	25.3 Qp	2.3 / 17.6 / 28.3	16.9	H / 2.0 / 0.0	-29.1	N/A
600.03	26.6 Qp	2.3 / 18.5 / 28.5	19.0	H / 2.0 / 0.0	-27.0	N/A
90 degrees						
229.13	19.1 Qp	1.6 / 11.0 / 27.3	4.4	H / 2.0 / 90.0	-41.6	N/A
480.03	25.2 Qp	2.3 / 17.6 / 28.3	16.8	H / 2.0 / 90.0	-29.2	N/A
619.23	22.7 Qp	2.3 / 18.8 / 28.4	15.4	H / 2.0 / 90.0	-30.6	N/A
180 degrees						
229.13	19.4 Qp	1.6 / 11.0 / 27.3	4.7	H / 2.0 / 180.0	-41.3	N/A

# Radiated Electromagnetic Emissions

Test Report #: **BC400222 Run 04**  
 Test Method: FCC Part 15.209  
 EUT Model #: Remote 8.1 FSK  
 EUT Serial #: FCC 1  
 Manufacturer: Echostar  
 EUT Description: Remote Control  
 Notes: fundamental frequency is 371.1 MHz

Test Area: Pinewood Site 1 (3m)  
 Test Date: 28-Apr-2004  
 EUT Power: 4 AAA batteries, new

Temperature: 22 °C  
 Relative Humidity: 35 %  
 Air Pressure: 80 kPa  
 Page: 3 of 6

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

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B < 1 GHz	DELTA2 (dB) FCC B > 1 GHz
270 degrees						
nothing higher						
Nothing within 20 dB of the limit, Horizontal, from 200-1,000 MHz						
Changing to Vertical, 0 degrees						
229.13	19.2 Qp	1.6 / 11.0 / 27.3	4.5	V / 1.0 / 0.0	-41.5	N/A
440.00	19.5 Qp	2.2 / 16.4 / 28.2	9.9	V / 1.0 / 0.0	-36.1	N/A
90 degrees						
nothing higher						
180 degrees						
nothing higher						
270 degrees						
nothing higher						
Nothing within 20 dB of the limit, Vertical, from 200-1,000 MHz						
Changing to the Horn Antenna, Vertical						
0 degrees						
1107.58	38.0 Av	2.4 / 25.3 / 37.9	27.7	V / 1.0 / 0.0	N/A	-26.3
1101.78	36.4 Av	2.3 / 25.2 / 37.5	26.5	V / 1.0 / 0.0	N/A	-27.5
1119.16	35.7 Av	2.4 / 25.3 / 38.1	25.3	V / 1.0 / 0.0	N/A	-28.7
1101.62	33.0 Av	2.3 / 25.2 / 37.5	23.1	V / 1.0 / 0.0	N/A	-30.9
90 degrees						
1107.58	32.9 Av	2.4 / 25.3 / 37.9	22.6	V / 1.0 / 90.0	N/A	-31.4
1861.25	33.4 Av	3.1 / 27.9 / 37.7	26.7	V / 1.0 / 90.0	N/A	-27.3

# Radiated Electromagnetic Emissions

Test Report #: **BC400222 Run 04**  
 Test Method: FCC Part 15.209  
 EUT Model #: Remote 8.1 FSK  
 EUT Serial #: FCC 1  
 Manufacturer: Echostar  
 EUT Description: Remote Control  
 Notes: fundamental frequency is 371.1 MHz

Test Area: Pinewood Site 1 (3m)  
 Test Date: 28-Apr-2004  
 EUT Power: 4 AAA batteries, new

Temperature: 22 °C  
 Relative Humidity: 35 %  
 Air Pressure: 80 kPa  
 Page: 4 of 6

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

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B < 1 GHz	DELTA2 (dB) FCC B > 1 GHz
180 degrees						
1000.03	32.7 Av	2.2 / 24.9 / 37.1	22.7	V / 1.0 / 180.0	N/A	-31.3
1101.78	35.1 Av	2.3 / 25.2 / 37.5	25.2	V / 1.0 / 180.0	N/A	-28.8
1107.58	36.4 Av	2.4 / 25.3 / 37.9	26.1	V / 1.0 / 180.0	N/A	-27.9
270 degrees						
nothing higher						
Nothing within 20 dB of the limit, Vertical, from 1-4 GHz						
Changing to Horizontal						
0 degrees						
1849.62	33.3 Av	3.1 / 27.9 / 37.8	26.5	H / 1.0 / 0.0	N/A	-27.5
90 degrees						
1107.58	33.4 Av	2.4 / 25.3 / 37.9	23.1	H / 1.0 / 90.0	N/A	-30.9
1119.16	34.7 Av	2.4 / 25.3 / 38.1	24.3	H / 1.0 / 90.0	N/A	-29.7
1490.38	34.7 Av	2.9 / 26.6 / 37.1	27.1	H / 1.0 / 90.0	N/A	-26.9
180 degrees						
1107.58	34.6 Av	2.4 / 25.3 / 37.9	24.3	H / 1.0 / 180.0	N/A	-29.7
1478.75	34.2 Av	2.9 / 26.5 / 37.4	26.2	H / 1.0 / 180.0	N/A	-27.8
1490.38	34.3 Av	2.9 / 26.6 / 37.1	26.7	H / 1.0 / 180.0	N/A	-27.3
270 degrees						
1101.78	35.7 Av	2.3 / 25.2 / 37.5	25.8	H / 1.0 / 270.0	N/A	-28.2
1107.58	36.5 Av	2.4 / 25.3 / 37.9	26.2	H / 1.0 / 270.0	N/A	-27.8
1119.16	37.0 Av	2.4 / 25.3 / 38.1	26.6	H / 1.0 / 270.0	N/A	-27.4
1478.75	36.7 Av	2.9 / 26.5 / 37.4	28.7	H / 1.0 / 270.0	N/A	-25.3
1490.38	37.3 Av	2.9 / 26.6 / 37.1	29.7	H / 1.0 / 270.0	N/A	-24.3
No emissions within 20 dB of the limit, Horizontal, from 1-4 GHz						



# Radiated Electromagnetic Emissions

Test Report #: **BC400222 Run 04**  
 Test Method: FCC Part 15.209  
 EUT Model #: Remote 8.1 FSK  
 EUT Serial #: FCC 1  
 Manufacturer: Echostar  
 EUT Description: Remote Control  
 Notes: fundamental frequency is 371.1 MHz

Test Area: Pinewood Site 1 (3m)  
 Test Date: 28-Apr-2004  
 EUT Power: 4 AAA batteries, new

Temperature: 22 °C  
 Relative Humidity: 35 %  
 Air Pressure: 80 kPa  
 Page: 6 of 6

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

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B < 1 GHz	DELTA2 (dB) FCC B > 1 GHz
<b>***** Measurement Summary *****</b>						
1490.38	37.3 Av	2.9 / 26.6 / 37.1	29.7	H / 1.0 / 270.0	N/A	-24.3
40.17	31.0 Qp	0.7 / 12.1 / 28.3	15.5	V / 1.0 / 90.0	-24.5	N/A
32.13	29.9 Qp	0.6 / 12.9 / 28.3	15.1	V / 1.0 / 90.0	-24.9	N/A
1478.75	36.7 Av	2.9 / 26.5 / 37.4	28.7	H / 1.0 / 270.0	N/A	-25.3
64.26	32.1 Qp	0.9 / 9.0 / 28.2	13.8	V / 1.0 / 0.0	-26.2	N/A
1107.58	38.0 Av	2.4 / 25.3 / 37.9	27.7	V / 1.0 / 0.0	N/A	-26.3
600.03	26.6 Qp	2.3 / 18.5 / 28.5	19.0	H / 2.0 / 0.0	-27.0	N/A
1861.25	33.4 Av	3.1 / 27.9 / 37.7	26.7	V / 1.0 / 90.0	N/A	-27.3
1119.16	37.0 Av	2.4 / 25.3 / 38.1	26.6	H / 1.0 / 270.0	N/A	-27.4
1101.78	36.4 Av	2.3 / 25.2 / 37.5	26.5	V / 1.0 / 0.0	N/A	-27.5
1849.62	33.3 Av	3.1 / 27.9 / 37.8	26.5	H / 1.0 / 0.0	N/A	-27.5
72.30	31.0 Qp	0.9 / 8.5 / 28.2	12.2	V / 1.0 / 90.0	-27.8	N/A
80.33	31.3 Qp	0.9 / 7.5 / 28.2	11.5	V / 1.0 / 180.0	-28.5	N/A
480.03	25.3 Qp	2.3 / 17.6 / 28.3	16.9	H / 2.0 / 0.0	-29.1	N/A
56.23	28.8 Qp	0.8 / 9.4 / 28.3	10.7	V / 1.0 / 0.0	-29.3	N/A
144.62	26.8 Qp	1.2 / 12.8 / 27.9	13.0	V / 1.0 / 0.0	-30.5	N/A
619.23	22.7 Qp	2.3 / 18.8 / 28.4	15.4	H / 2.0 / 90.0	-30.6	N/A
1000.03	32.7 Av	2.2 / 24.9 / 37.1	22.7	V / 1.0 / 180.0	N/A	-31.3
180.01	24.2 Qp	1.4 / 13.1 / 27.7	11.1	V / 1.0 / 90.0	-32.4	N/A
152.63	22.0 Qp	1.2 / 12.8 / 27.8	8.2	H / 2.0 / 0.0	-35.3	N/A
440.00	19.5 Qp	2.2 / 16.4 / 28.2	9.9	V / 1.0 / 0.0	-36.1	N/A
229.13	19.4 Qp	1.6 / 11.0 / 27.3	4.7	H / 2.0 / 180.0	-41.3	N/A



Part 15.231 (c) or (d)  
-20dBc Bandwidth

# -20dB Bandwidth Measurement

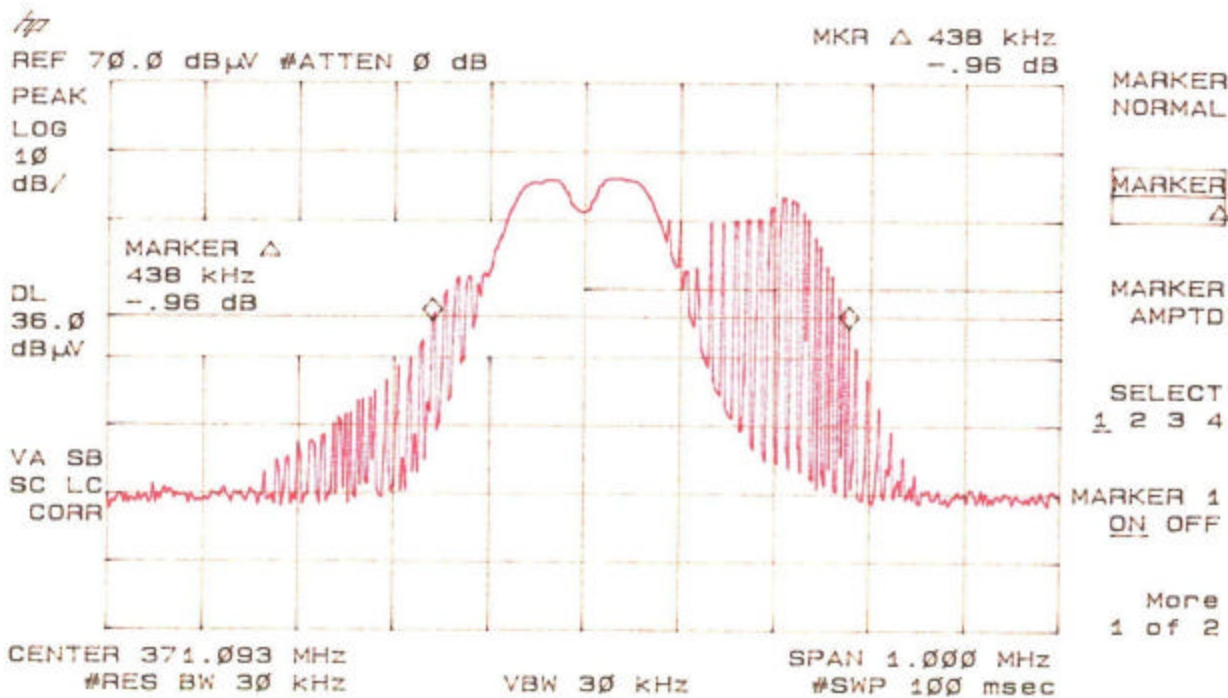
Test Report #: <b>BC400222</b>	Test Area: Pinewood Site 1 (3m)	Temperature: 25.5 °C
Test Method: 15.231 (c)	Test Date: 09-Apr-2004	Relative Humidity: 31 %
EUT Model #: Remote 8.1 FSK Converter	EUT Power: 4 AAA batteries, new	Air Pressure: 80 kPa
EUT Serial #: FCC 1		Page: 23 of 31

Manufacturer: Echostar

EUT Description: Remote Control

Notes: Measurements were taken in accordance to FCC CFR47 Part 15.231(c).

FREQ of Fundamental (MHz)	LEVEL Low Edge (-20dBuV)	LEVEL High Edge (-20dBuV)	Bandwidth Measured (MHz)	Bandwidth Limit 0.25% / 0.50 Fc (MHz)	DELTA2 (dB)
See Plot Below			0.438	.927	0.486





## Equipment Utilized During Test

# Project Report

**Begin Date:**      **End Date:**      4/1/2004 6/8/2004

**Technician**      Eliza Flug

**Project:** BC400222

Capital Asset ID	Manufacturer	Model #	Serial #	Description	Test Performed	Service Type	Service Date	Service Due
6	Hewlett-Packard	8594E	3223A00145	Spectrum Analyzer	R Radiated Emissions	For Cal	1/16/2004	1/16/2005
106	TENSOR	4105	2020	Ridged Guide Antenna 1-18GHz	R Radiated Emissions	For Cal	7/11/2003	7/11/2004
135	EMCO	3146	9402-3775	Log Periodic Antenna (200-1000MHz)	R Radiated Emissions	For Cal	9/10/2003	9/10/2004
171	Hewlett-Packard	85662A	1928A01169	Spectrum Analyzer - Display Section	R Radiated Emissions	For Cal	1/21/2004	1/21/2005
172	Hewlett-Packard	8566B	2430A00759	Spectrum Analyzer	R Radiated Emissions	For Cal	1/21/2004	1/21/2005
189	EMCO	3109	9801-3142	Bicon Antenna 30 - 300 MHz	R Radiated Emissions	For Cal	9/9/2003	9/9/2004
213	Mini-Circuits Lab	ZHL-42	N052792-2	Amplifier	R Radiated Emissions	For Ver	6/20/2003	6/20/2004
248	Hewlett-Packard	8447F	3113A05545	9 kHz- 1.3GHz Pre Amp	R Radiated Emissions	For Ver	6/5/2003	6/5/2004
195	EMCO	6502	9205-2738	Magnetic loop	R Radiated Emissions	For Cal	6/2/2004	6/2/2005

## Appendix B

# Test Plan and Constructional Data Form





**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:**

