

## EMC EMISSIONS - TEST REPORT (Full)

**Test Report No.** 3169110DEN-002      **Issue Date:** Friday 26/December/2008  
**Model / Serial No.** Model: ViP922 / SN: P3B19  
**Product Type** Satellite Receiver with 2.4 GHz Transceiver  
**Client** Echostar Data Networks/ DISH Network  
**Manufacturer** Echostar Data Networks/ Dish Network  
**License holder** Echostar Data Networks/ DISH Network  
**Address** 94 - Inverness Drive East

**FCC CFR47 Part 15.247**  
**IC RSS-210 issue 7**  
PASS  
**3169110**  
  
**42**


Title 47 CFR 15C: RADIO FREQUENCY DEVICES – Intentional Radiators  
  
 Low-power License-exempt Radio Communication Devices (All Frequency Bands): Category I Equipment

**Test Criteria Applied**  
**Test Result**  
**Test Project Number**  
**References**  
**Total Pages**  
**Including**  
**Appendices:**

  
 Tested By : Randy Thompson

  
 Reviewed By: Michael Spataro

**REVISION SUMMARY - The following changes have been made to this Report:**

Rev.	Revision Statement	Author	Revision Date	Reviewer
	Initial Release of Document	See above	See above	
A	Corrected RF Conducted Port Data and added comments to page 3 and 25.	Randy Thompson	1-15-09	

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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  $\pm 3.14$ dB and for Radiated Emissions is calculated to be  $\pm 4.4$ dB in the frequency range of 10kHz – 1000MHz at 3m and  $\pm 4.9$ dB in the frequency range of 1 – 18GHz at 3m. For testing at 10m  $\pm 4.8$ dB in the frequency range of 30 – 1000MHz. For Disturbance Power,  $\pm 3.3$ dB in the frequency range of 30 – 1000MHz. For Flicker and Harmonics testing the equipment used is calibrated by the manufacture and is with in the tolerances specified in 61000-3-2/3. These uncertainties have been calculated using CISPR 16-4-2:2003 and represent a 95% confidence level ( $k=2$ ).

EUT Received Date: 16-Dec-2008

Testing Start Date: 16-Dec-2008

Testing End Date: 19-Dec-2008

The tests were performed according to following regulations:

1. FCC 47 CFR part 15 subpart C
2. IC RSS-210e Issue 7 2007
3. IC RSS-GEN Issue 2 2007

**Emission Test Results:**

**Conducted Emissions, Powerline - PASS**

**Test Result**

Minimum limit margin - 11.1 dB at 0.651 MHz

Remarks: Average Measurement - Line

**Radiated Emissions 15.209/15.109 - PASS**

**Test Result**

Minimum limit margin - 3.5 dB at 493.89 MHz

Remarks: Quasi-Peak Measurement - Horizontal

**Peak Output Power 15.247 (b)(3) - PASS**

**Test Result**

Minimum limit margin - 33.0 dB at 2425.01 MHz

Remarks: Low Channel: Fundamental – Peak Conducted Port Measurement

**Radiated Emissions 15.205/15.247(d) - PASS**

**Test Result**

Minimum limit margin - 5.0 dB at 4949.64 MHz

Remarks: High Channel: Harmonic – Peak Radiated Measurement - Vertical

**6dB Bandwidth 15.247 (a)(2) - PASS**

**Test Result**

Remarks: Worst-Case High Channel 6dB Bandwidth > 500 kHz

**Power Spectral Density 15.247 (e) - PASS**

**Test Result**

Remarks: Worst-Case Low Channel < 8dBm

**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 Intertek.

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.

Whenever possible the approved test procedures specified in FCC KDB 558074 for DTS devices was used for testing.

The EUT was placed in a constant transmit mode in order to make the most accurate measurements and for time consideration. For all tests that require modulation to be turned on it was, with the EUT still transmitting continuously.

GENERAL REMARKS: None

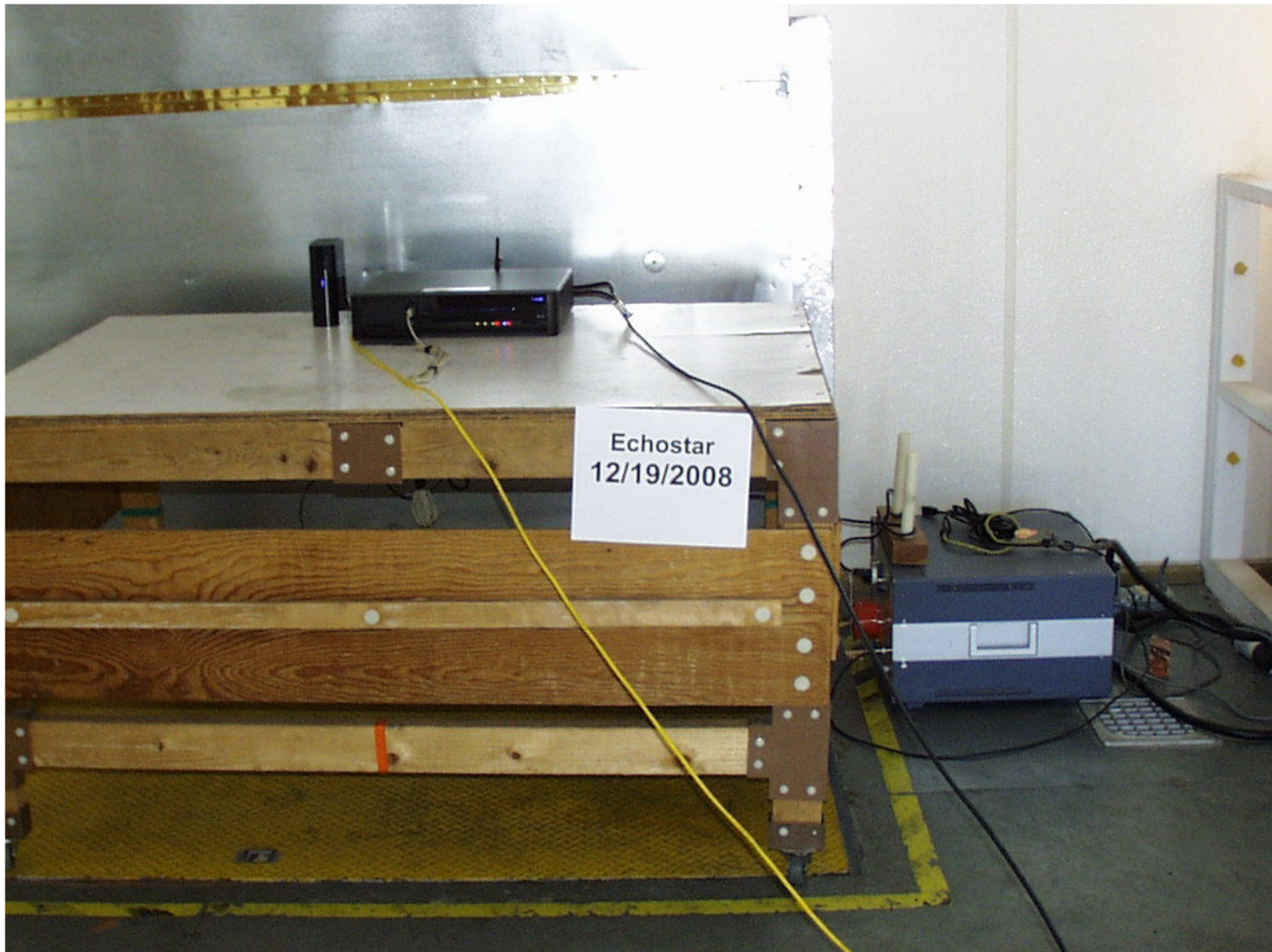
Sample:

Production     Prototype     See Appendix B

Modifications required to pass: None

Test Specification Deviations: Additions to or Exclusions from: None

Test-setup photo(s):  
Conducted Emissions



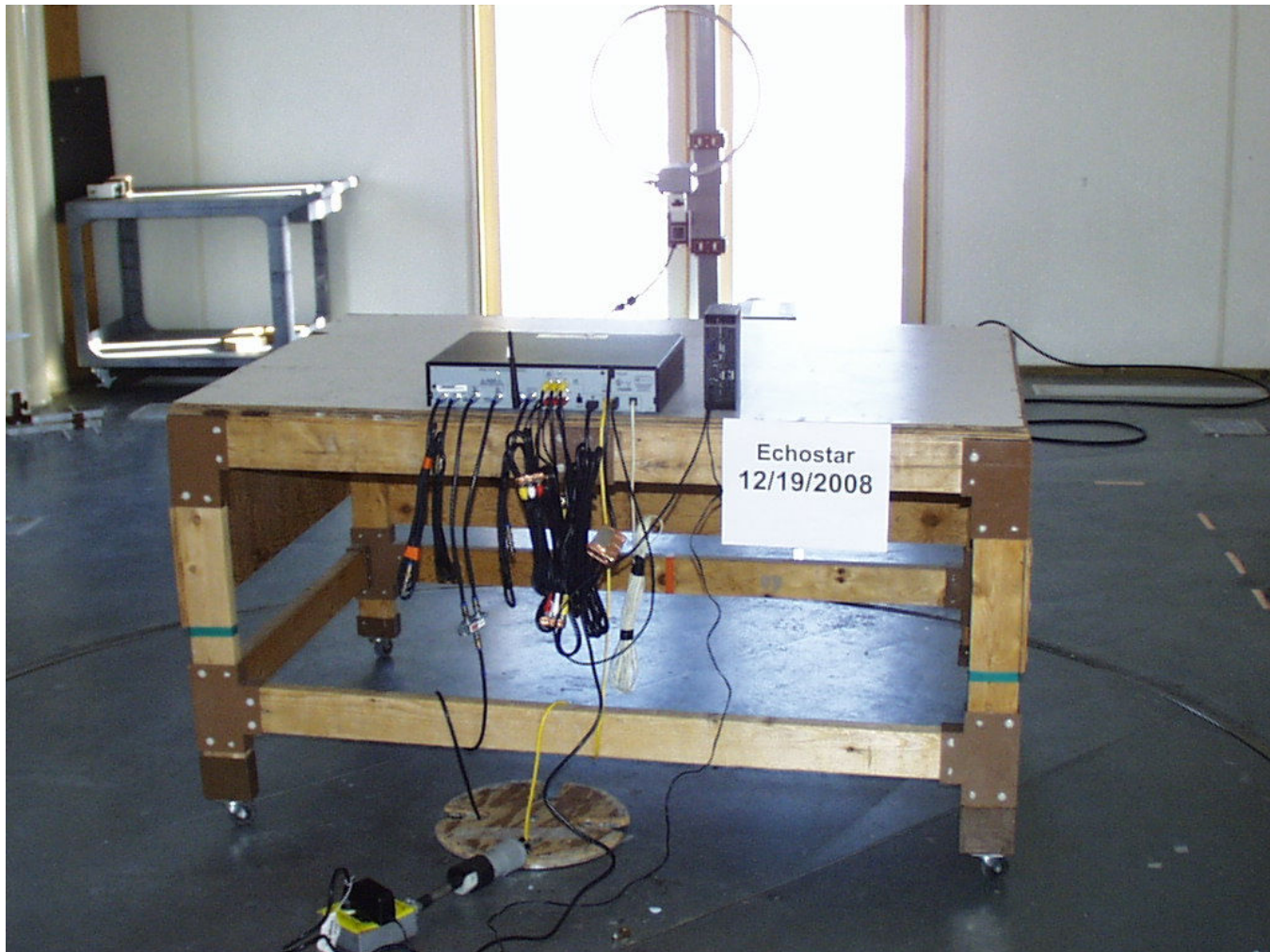
Test-setup photo(s):  
Conducted Emissions



Test-setup photo(s):  
Radiated Emissions-Unintentional



Test-setup photo(s):  
Radiated Emissions - Unintentional





Test-setup photo(s):  
Radiated Emissions - Intentional



**Appendix A**

Test Data Sheets  
and  
Test Equipment Used

# Conducted Emissions

## 15.207

# Conducted Electromagnetic Emissions

Test Report #: **3169110 Run 01**      Test Area: Pinewood Site 1 Cond      Temperature: 21.6 °C  
 Test Method: FCC Part 15.207      Test Date: 19-Dec-2008      Relative Humidity: 38.7 %  
 EUT Model #: ViP922      EUT Power: 120VAC/60Hz      Air Pressure: 79 kPa  
 EUT Serial #: P3B19  
 Manufacturer: Echostar  
 EUT Description: Satellite receiver with 2.4 GHz Transceiver  
 Notes: Video Decoding, USB, and Ethernet Active

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

FREQ (MHz)	LEVEL (dBuV)	CABLE / LISN / ATTEN (dB)	FINAL (dBuV)	TEST POINT	DELTA1 (dB) QP15.207	DELTA2 (dB) AV15.207
0.150	28.7 Qp	0.1 / -0.2 / -9.7	38.3	Neutral	-27.7	N/A
0.150	1.2 Av	0.1 / -0.2 / -9.7	10.8	Neutral	N/A	-45.2
0.260	25.4 Qp	0.1 / -0.2 / -9.7	35.0	Neutral	-26.4	N/A
0.260	20.0 Av	0.1 / -0.2 / -9.7	29.6	Neutral	N/A	-21.8
0.651	25.5 Qp	0.1 / -0.2 / -9.7	35.1	Neutral	-20.9	N/A
0.651	24.9 Av	0.1 / -0.2 / -9.7	34.5	Neutral	N/A	-11.5
1.69	19.1 Qp	0.3 / -0.2 / -9.7	28.9	Neutral	-27.1	N/A
1.69	18.3 Av	0.3 / -0.2 / -9.7	28.1	Neutral	N/A	-17.9
17.56	19.4 Qp	0.9 / -0.8 / -9.7	29.2	Neutral	-30.8	N/A
17.56	11.6 Av	0.9 / -0.8 / -9.7	21.4	Neutral	N/A	-28.6
20.00	5.9 Qp	1.0 / -1.2 / -9.8	15.5	Neutral	-44.5	N/A
30.00	12.0 Qp	1.2 / -2.2 / -9.9	20.9	Neutral	-39.1	N/A
0.150	28.9 Qp	0.1 / -0.2 / -9.7	38.5	Line 1	-27.5	N/A
0.150	1.3 Av	0.1 / -0.2 / -9.7	10.9	Line 1	N/A	-45.1
0.260	29.0 Qp	0.1 / -0.2 / -9.7	38.6	Line 1	-22.8	N/A
0.260	25.1 Av	0.1 / -0.2 / -9.7	34.7	Line 1	N/A	-16.7
0.651	25.9 Qp	0.1 / -0.2 / -9.7	35.5	Line 1	-20.5	N/A
0.651	25.3 Av	0.1 / -0.2 / -9.7	34.9	Line 1	N/A	-11.1
1.69	23.5 Qp	0.3 / -0.2 / -9.7	33.3	Line 1	-22.7	N/A
1.69	22.4 Av	0.3 / -0.2 / -9.7	32.2	Line 1	N/A	-13.8
17.56	10.0 Qp	0.9 / -0.8 / -9.7	19.8	Line 1	-40.2	N/A
17.56	5.6 Av	0.9 / -0.8 / -9.7	15.5	Line 1	N/A	-34.5
20.00	6.0 Qp	1.0 / -1.2 / -9.8	15.6	Line 1	-44.4	N/A
30.00	11.7 Qp	1.2 / -2.2 / -9.9	20.6	Line 1	-39.4	N/A

FREQ	LEVEL	CABLE / LISN / ATTEN	FINAL	TEST POINT	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB)	(dBuV)		QP15.207	AV15.207
<b>***** Measurement Summary *****</b>						
<b>0.651</b>	<b>25.3 Av</b>	<b>0.1 / -0.2 / -9.7</b>	<b>34.9</b>	<b>Line 1</b>	<b>N/A</b>	<b>-11.1</b>
1.69	22.4 Av	0.3 / -0.2 / -9.7	32.2	Line 1	N/A	-13.8
0.260	25.1 Av	0.1 / -0.2 / -9.7	34.7	Line 1	N/A	-16.7
0.150	28.9 Qp	0.1 / -0.2 / -9.7	38.5	Line 1	-27.5	N/A
17.56	11.6 Av	0.9 / -0.8 / -9.7	21.4	Neutral	N/A	-28.6
17.56	19.4 Qp	0.9 / -0.8 / -9.7	29.2	Neutral	-30.8	N/A
30.00	12.0 Qp	1.2 / -2.2 / -9.9	20.9	Neutral	-39.1	N/A
20.00	6.0 Qp	1.0 / -1.2 / -9.8	15.6	Line 1	-44.4	N/A

**Radiated Unintentional Emission  
15.209**

**And**

**Spurious Emission  
15.247 (d)**

# Radiated Electromagnetic Emissions

Test Report #: **3169110 un-Intentional Run 1**      Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC Part 15.209      Test Date: 19-Dec-2008  
 EUT Model #: ViP922      EUT Power: 120Vac/60Hz  
 EUT Serial #: P3B19  
 Manufacturer: Echostar  
 EUT Description: Satellite receiver with 2.4 GHz Transceiver  
 Notes: Video Decoding, USB, and Ethernet Active

Temperature: 16.6 °C  
 Relative Humidity: 18.9 %  
 Air Pressure: 78.5 kPa

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) (DEG)	15.209 <1GHz	15.209 >1GHz
No emissions found: 100kHz to 30MHz.						
Noise floor.						
0.100	31.1 Qp	0.1 / 10.9 / 0.0	42.1	V / 1.0 / 0.0	-65.5	N/A
4.50	9.9 Qp	0.2 / 10.6 / 0.0	20.7	V / 1.0 / 0.0	-48.8	N/A
0.500	28.8 Qp	0.1 / 10.6 / 0.0	39.5	H / 1.0 / 0.0	-34.1	N/A
25.00	5.4 Qp	0.5 / 9.1 / 0.0	15.0	H / 1.0 / 0.0	-54.5	N/A
30 – 200MHz Vertical 0 degrees						
30.00	36.9 Qp	0.5 / 13.0 / 28.2	22.2	V / 1.0 / 0.0	-17.8	N/A
34.66	38.2 Qp	0.6 / 12.3 / 28.2	22.8	V / 1.0 / 0.0	-17.2	N/A
40.07	38.2 Qp	0.6 / 11.7 / 28.2	22.4	V / 1.0 / 0.0	-17.6	N/A
51.82	42.9 Qp	0.7 / 9.9 / 28.2	25.3	V / 1.0 / 0.0	-14.7	N/A
58.78	41.1 Qp	0.7 / 8.9 / 28.2	22.6	V / 1.0 / 0.0	-17.4	N/A
62.98	41.0 Qp	0.7 / 8.5 / 28.2	22.0	V / 1.0 / 0.0	-18.0	N/A
141.22	41.0 Qp	1.3 / 12.8 / 27.7	27.3	V / 1.0 / 0.0	-16.2	N/A
143.29	40.9 Qp	1.3 / 12.7 / 27.8	27.1	V / 1.0 / 0.0	-16.4	N/A
150.00	39.5 Qp	1.3 / 12.6 / 27.7	25.8	V / 1.0 / 0.0	-17.7	N/A
30 – 200MHz Vertical 90 degrees						
30.00	36.6 Qp	0.5 / 13.0 / 28.2	22.0	V / 1.0 / 90.0	-18.0	N/A
34.66	40.1 Qp	0.6 / 12.3 / 28.2	24.7	V / 1.0 / 90.0	-15.3	N/A
40.07	38.8 Qp	0.7 / 11.7 / 28.2	22.9	V / 1.0 / 90.0	-17.1	N/A
62.98	41.0 Qp	0.7 / 8.5 / 28.2	22.0	V / 1.0 / 90.0	-18.0	N/A
36.15	41.1 Qp	0.6 / 12.1 / 28.2	25.7	V / 1.0 / 90.0	-14.3	N/A
40.01	40.9 Qp	0.6 / 11.7 / 28.2	25.0	V / 1.0 / 90.0	-15.0	N/A
69.98	39.1 Qp	0.8 / 8.7 / 28.2	20.5	V / 1.0 / 90.0	-19.5	N/A
30 – 200MHz Vertical 180 degrees						
40.01	43.9 Qp	0.6 / 11.7 / 28.2	28.0	V / 1.0 / 180.0	-12.0	N/A
58.78	41.1 Qp	0.7 / 8.9 / 28.2	22.6	V / 1.0 / 180.0	-17.4	N/A
69.98	44.2 Qp	0.8 / 8.7 / 28.2	25.6	V / 1.0 / 180.0	-14.4	N/A
141.22	41.1 Qp	1.3 / 12.8 / 27.7	27.5	V / 1.0 / 180.0	-16.0	N/A
143.29	40.1 Qp	1.3 / 12.7 / 27.8	26.4	V / 1.0 / 180.0	-17.1	N/A
150.00	41.5 Qp	1.3 / 12.6 / 27.7	27.8	V / 1.0 / 180.0	-15.7	N/A

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <1GHz	DELTA2 (dB) 15.209 >1GHz
30 – 200MHz Vertical 270 degrees						
36.15	41.8 Qp	0.6 / 12.1 / 28.2	26.3	V / 1.0 / 270.0	-13.7	N/A
40.01	44.0 Qp	0.6 / 11.7 / 28.2	28.2	V / 1.0 / 270.0	-11.8	N/A
The following were maximized between 30 and 200 MHz.						
69.98	44.6 Qp	0.8 / 8.7 / 28.2	26.0	V / 1.0 / 237.0	-14.0	N/A
40.01	45.9 Qp	0.6 / 11.7 / 28.2	30.1	V / 1.0 / 208.0	-9.9	N/A
36.15	46.9 Qp	0.6 / 12.1 / 28.2	31.4	V / 1.0 / 244.0	-8.6	N/A
141.22	39.8 Qp	1.3 / 12.8 / 27.7	26.1	H / 1.0 / 0.0	-17.4	N/A
143.29	38.7 Qp	1.3 / 12.7 / 27.8	25.0	H / 1.0 / 0.0	-18.5	N/A
159.75	43.1 Qp	1.4 / 12.3 / 27.7	29.0	H / 1.0 / 0.0	-14.5	N/A
184.32	41.9 Qp	1.4 / 12.8 / 27.5	28.6	H / 1.0 / 0.0	-14.9	N/A
159.75	43.5 Qp	1.4 / 12.3 / 27.7	29.4	H / 1.0 / 90.0	-14.1	N/A
No higher emissions found: 180 Deg Horizontal.						
184.32	43.6 Qp	1.4 / 12.8 / 27.5	30.4	H / 1.0 / 270.0	-13.1	N/A
The following were maximized between 30 and 200 MHz vertical.						
184.32	44.6 Qp	1.4 / 12.8 / 27.5	31.4	H / 1.8 / 275.0	-12.1	N/A
159.75	44.1 Qp	1.4 / 12.3 / 27.7	30.0	H / 2.2 / 61.0	-13.5	N/A
200 – 1000MHz Vertical 0 degrees						
222.52	36.5 Qp	1.6 / 10.3 / 27.3	21.1	V / 1.0 / 0.0	-24.9	N/A
225.02	30.5 Qp	1.6 / 10.4 / 27.3	15.2	V / 1.0 / 0.0	-30.8	N/A
250.02	39.5 Qp	1.7 / 11.6 / 27.2	25.6	V / 1.0 / 0.0	-20.4	N/A
266.69	32.6 Qp	1.8 / 12.3 / 27.1	19.5	V / 1.0 / 0.0	-26.5	N/A
370.88	31.1 Qp	2.1 / 16.4 / 27.5	22.1	V / 1.0 / 0.0	-23.9	N/A
375.00	35.1 Qp	2.1 / 15.3 / 27.6	25.0	V / 1.0 / 0.0	-21.0	N/A
400.01	36.1 Qp	2.2 / 17.2 / 27.7	27.8	V / 1.0 / 0.0	-18.2	N/A
500.01	35.7 Qp	2.6 / 21.3 / 28.2	31.5	V / 1.0 / 0.0	-14.5	N/A
625.01	36.0 Qp	3.0 / 18.9 / 28.3	29.6	V / 1.0 / 0.0	-16.4	N/A
657.26	28.9 Qp	3.0 / 19.7 / 28.2	23.5	V / 1.0 / 0.0	-22.5	N/A
675.02	32.1 Qp	3.1 / 20.4 / 28.1	27.4	V / 1.0 / 0.0	-18.6	N/A
750.00	35.6 Qp	3.2 / 20.4 / 28.1	31.2	V / 1.0 / 0.0	-14.8	N/A
800.01	27.4 Qp	3.3 / 21.0 / 27.8	23.9	V / 1.0 / 0.0	-22.1	N/A
900.00	27.2 Qp	3.6 / 22.3 / 27.6	25.6	V / 1.0 / 0.0	-20.4	N/A
200 – 1000MHz Vertical 90 degrees						
222.52	41.4 Qp	1.6 / 10.3 / 27.3	25.9	V / 1.0 / 90.0	-20.1	N/A
250.02	41.8 Qp	1.7 / 11.6 / 27.2	27.9	V / 1.0 / 90.0	-18.1	N/A
375.00	37.4 Qp	2.1 / 15.3 / 27.6	27.2	V / 1.0 / 90.0	-18.8	N/A
657.26	29.6 Qp	3.0 / 19.7 / 28.2	24.2	V / 1.0 / 90.0	-21.8	N/A
800.01	28.8 Qp	3.3 / 21.0 / 27.8	25.2	V / 1.0 / 90.0	-20.8	N/A
900.00	27.6 Qp	3.6 / 22.3 / 27.6	25.9	V / 1.0 / 90.0	-20.1	N/A
200.00	39.0 Qp	1.5 / 11.3 / 27.3	24.5	V / 1.0 / 90.0	-19.0	N/A
216.01	35.2 Qp	1.6 / 10.5 / 27.3	19.9	V / 1.0 / 90.0	-26.1	N/A
200-1000MHz Vertical 180 degrees						



FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <1GHz	DELTA2 (dB) 15.209 >1GHz
216.01	39.1 Qp	1.6 / 10.5 / 27.3	23.9	V / 1.0 / 180.0	-22.1	N/A
375.00	37.1 Qp	2.1 / 15.3 / 27.6	27.0	V / 1.0 / 180.0	-19.0	N/A
657.26	31.2 Qp	3.0 / 19.7 / 28.2	25.8	V / 1.0 / 180.0	-20.2	N/A
675.02	32.2 Qp	3.1 / 20.4 / 28.1	27.6	V / 1.0 / 180.0	-18.4	N/A
750.00	35.8 Qp	3.2 / 20.4 / 28.1	31.3	V / 1.0 / 180.0	-14.7	N/A
800.01	29.4 Qp	3.3 / 21.0 / 27.8	25.9	V / 1.0 / 180.0	-20.1	N/A
900.00	30.4 Qp	3.6 / 22.3 / 27.6	28.7	V / 1.0 / 180.0	-17.3	N/A
233.47	34.8 Qp	1.6 / 10.6 / 27.2	19.8	V / 1.0 / 180.0	-26.2	N/A
469.39	30.1 Qp	2.5 / 17.7 / 28.2	22.1	V / 1.0 / 180.0	-23.9	N/A
473.48	29.9 Qp	2.5 / 17.9 / 28.2	22.1	V / 1.0 / 180.0	-23.9	N/A
825.03	33.4 Qp	3.3 / 21.4 / 27.8	30.3	V / 1.0 / 180.0	-15.7	N/A
200-1000MHz Vertical 270 degrees						
370.88	32.5 Qp	2.1 / 16.4 / 27.5	23.5	V / 1.0 / 270.0	-22.5	N/A
469.39	30.8 Qp	2.5 / 17.7 / 28.2	22.8	V / 1.0 / 270.0	-23.2	N/A
500.01	35.0 Qp	2.6 / 21.3 / 28.2	30.8	V / 1.0 / 270.0	-15.2	N/A
657.26	32.9 Qp	3.0 / 19.7 / 28.2	27.5	V / 1.0 / 270.0	-18.5	N/A
The following maximized between 200 and 1000 MHz vertical.						
500.01	36.3 Qp	2.6 / 21.3 / 28.2	32.1	V / 1.7 / 356.0	-13.9	N/A
750.00	39.6 Qp	3.2 / 20.4 / 28.1	35.1	V / 1.1 / 348.0	-10.9	N/A
825.03	36.9 Qp	3.3 / 21.4 / 27.8	33.8	V / 1.9 / 313.0	-12.2	N/A
200 – 1000MHz Horizontal 0 degrees						
200.00	42.6 Qp	1.5 / 11.3 / 27.3	28.1	H / 1.7 / 0.0	-15.4	N/A
216.01	43.2 Qp	1.6 / 10.5 / 27.3	28.0	H / 1.7 / 0.0	-18.0	N/A
233.47	39.5 Qp	1.6 / 10.6 / 27.2	24.5	H / 1.7 / 0.0	-21.5	N/A
469.39	40.5 Qp	2.5 / 17.7 / 28.2	32.6	H / 1.7 / 0.0	-13.4	N/A
657.26	32.4 Qp	3.0 / 19.7 / 28.2	27.0	H / 1.7 / 0.0	-19.0	N/A
750.00	37.2 Qp	3.2 / 20.4 / 28.1	32.7	H / 1.7 / 0.0	-13.3	N/A
900.00	30.9 Qp	3.6 / 22.3 / 27.6	29.3	H / 1.7 / 0.0	-16.7	N/A
206.05	35.9 Qp	1.5 / 11.0 / 27.3	21.0	H / 1.7 / 0.0	-22.5	N/A
243.01	33.1 Qp	1.7 / 11.1 / 27.2	18.7	H / 1.7 / 0.0	-27.3	N/A
258.05	33.5 Qp	1.8 / 11.9 / 27.1	20.1	H / 1.7 / 0.0	-25.9	N/A
469.82	45.2 Qp	2.5 / 17.7 / 28.2	37.3	H / 1.7 / 0.0	-8.7	N/A
493.89	45.0 Qp	2.6 / 19.4 / 28.3	38.7	H / 1.7 / 0.0	-7.3	N/A
518.00	40.8 Qp	2.6 / 19.1 / 28.3	34.2	H / 1.7 / 0.0	-11.8	N/A
200 – 1000MHz Horizontal 90 degrees						
200.00	45.6 Qp	1.5 / 11.3 / 27.3	31.0	H / 1.7 / 90.0	-12.5	N/A
206.05	36.0 Qp	1.5 / 11.0 / 27.3	21.2	H / 1.7 / 90.0	-22.3	N/A
216.01	45.6 Qp	1.6 / 10.5 / 27.3	30.3	H / 1.7 / 90.0	-15.7	N/A
233.47	37.1 Qp	1.6 / 10.6 / 27.2	22.2	H / 1.7 / 90.0	-23.8	N/A
258.05	33.4 Qp	1.8 / 11.9 / 27.1	20.0	H / 1.7 / 90.0	-26.0	N/A
370.88	32.9 Qp	2.1 / 16.4 / 27.5	23.9	H / 1.7 / 90.0	-22.1	N/A
750.00	35.5 Qp	3.2 / 20.4 / 28.1	31.1	H / 1.7 / 90.0	-14.9	N/A
800.01	30.4 Qp	3.3 / 21.0 / 27.8	26.9	H / 1.7 / 90.0	-19.1	N/A
208.90	43.8 Qp	1.5 / 10.8 / 27.3	28.8	H / 1.7 / 90.0	-14.7	N/A
675.02	33.8 Qp	3.1 / 20.4 / 28.1	29.1	H / 1.7 / 180.0	-16.9	N/A

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV)	(m) (DEG)	15.209 <1GHz	15.209 >1GHz
200-1000MHz Horizontal 270 degrees						
208.90	43.5 Qp	1.5 / 10.8 / 27.3	28.6	H / 1.7 / 270.0	-14.9	N/A
216.01	45.2 Qp	1.6 / 10.5 / 27.3	30.0	H / 1.7 / 270.0	-16.0	N/A
250.02	42.8 Qp	1.7 / 11.6 / 27.2	28.9	H / 1.7 / 270.0	-17.1	N/A
258.05	33.6 Qp	1.8 / 11.9 / 27.1	20.2	H / 1.7 / 270.0	-25.8	N/A
473.48	29.6 Qp	2.5 / 17.9 / 28.2	21.9	H / 1.7 / 270.0	-24.1	N/A
675.02	34.2 Qp	3.1 / 20.4 / 28.1	29.5	H / 1.7 / 270.0	-16.5	N/A
The following were maximized between 200 and 1000 MHz horizontal.						
208.90	45.8 Qp	1.5 / 10.8 / 27.3	30.8	H / 1.3 / 257.0	-12.7	N/A
750.00	44.8 Qp	3.2 / 20.4 / 28.1	40.3	H / 1.0 / 130.0	-5.7	N/A
493.89	48.8 Qp	2.6 / 19.4 / 28.3	42.5	H / 1.6 / 5.0	-3.5	N/A
1-4 GHz Vertical 0 Deg						
1000.02	35.8 Av	2.0 / 23.2 / 38.2	22.8	V / 1.0 / 0.0	N/A	-31.2
1112.63	38.2 Av	2.1 / 23.9 / 38.3	25.9	V / 1.0 / 0.0	N/A	-28.1
1125.01	39.5 Av	2.1 / 23.7 / 38.3	27.1	V / 1.0 / 0.0	N/A	-26.9
1200.01	36.5 Av	2.2 / 24.1 / 38.3	24.5	V / 1.0 / 0.0	N/A	-29.5
1260.99	38.6 Av	2.3 / 24.3 / 38.0	27.2	V / 1.0 / 0.0	N/A	-26.8
1275.02	35.8 Av	2.3 / 24.2 / 37.9	24.4	V / 1.0 / 0.0	N/A	-29.6
1350.02	35.2 Av	2.4 / 24.1 / 37.7	23.9	V / 1.0 / 0.0	N/A	-30.1
1409.35	35.2 Av	2.4 / 24.6 / 37.5	24.8	V / 1.0 / 0.0	N/A	-29.2
1500.01	42.5 Av	2.5 / 24.3 / 37.3	31.9	V / 1.0 / 0.0	N/A	-22.1
1575.00	43.0 Av	2.6 / 24.6 / 37.3	32.7	V / 1.0 / 0.0	N/A	-21.3
1650.01	37.2 Av	2.7 / 25.2 / 37.5	27.6	V / 1.0 / 0.0	N/A	-26.4
1725.01	36.7 Av	2.7 / 25.9 / 37.8	27.5	V / 1.0 / 0.0	N/A	-26.5
1780.21	35.9 Av	2.8 / 26.4 / 38.0	27.1	V / 1.0 / 0.0	N/A	-26.9
1800.03	35.2 Av	2.8 / 26.5 / 38.1	26.4	V / 1.0 / 0.0	N/A	-27.6
1854.39	37.2 Av	2.9 / 26.6 / 38.0	28.7	V / 1.0 / 0.0	N/A	-25.3
2024.98	35.1 Av	3.0 / 27.0 / 38.1	27.0	V / 1.0 / 0.0	N/A	-27.0
2100.01	35.0 Av	3.1 / 26.6 / 38.2	26.5	V / 1.0 / 0.0	N/A	-27.5
3000.00	35.8 Av	3.8 / 29.7 / 38.1	31.2	V / 1.0 / 0.0	N/A	-22.8
1-4 Ghz Vertical 90 Deg						
1000.02	36.1 Av	2.0 / 23.2 / 38.2	23.2	V / 1.0 / 0.0	N/A	-30.8
1038.45	35.7 Av	2.0 / 23.7 / 38.2	23.2	V / 1.0 / 0.0	N/A	-30.8
1112.63	37.0 Av	2.1 / 23.9 / 38.3	24.7	V / 1.0 / 0.0	N/A	-29.3
1275.02	36.9 Av	2.3 / 24.2 / 37.9	25.5	V / 1.0 / 0.0	N/A	-28.5
1409.35	35.8 Av	2.4 / 24.6 / 37.5	25.3	V / 1.0 / 0.0	N/A	-28.7
1425.02	35.6 Av	2.4 / 24.6 / 37.4	25.2	V / 1.0 / 0.0	N/A	-28.8
1440.07	35.2 Av	2.4 / 24.6 / 37.4	24.9	V / 1.0 / 0.0	N/A	-29.1
1499.97	39.2 Av	2.5 / 24.3 / 37.4	28.7	V / 1.0 / 0.0	N/A	-25.3
1598.41	35.9 Av	2.6 / 24.7 / 37.4	25.8	V / 1.0 / 0.0	N/A	-28.2
1600.04	35.2 Av	2.6 / 24.7 / 37.4	25.1	V / 1.0 / 0.0	N/A	-28.9
1620.06	36.3 Av	2.6 / 24.9 / 37.5	26.4	V / 1.0 / 0.0	N/A	-27.6
1854.39	35.5 Av	2.9 / 26.6 / 38.0	26.9	V / 1.0 / 0.0	N/A	-27.1
2024.98	35.6 Av	3.0 / 27.0 / 38.1	27.5	V / 1.0 / 0.0	N/A	-26.5
3000.00	37.0 Av	3.8 / 29.7 / 38.1	32.3	V / 1.0 / 0.0	N/A	-21.7
1-4 Ghz Vertical 180 deg						

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dBm) (dB)	(dBuV)	(m) (DEG)	15.209 <1GHz	15.209 >1GHz
1000.02	40.6 Av	2.0 / 23.2 / 38.2	27.7	V / 1.0 / 0.0	N/A	-26.3
1038.45	36.6 Av	2.0 / 23.7 / 38.2	24.1	V / 1.0 / 0.0	N/A	-29.9
1260.08	31.0 Av	2.3 / 24.3 / 38.0	19.5	V / 1.0 / 0.0	N/A	-34.5
1409.35	38.8 Av	2.4 / 24.6 / 37.5	28.3	V / 1.0 / 0.0	N/A	-25.7
1425.02	36.2 Av	2.4 / 24.6 / 37.4	25.8	V / 1.0 / 0.0	N/A	-28.2
1500.01	39.1 Av	2.5 / 24.3 / 37.3	28.6	V / 1.0 / 0.0	N/A	-25.4
1557.70	35.2 Av	2.6 / 24.4 / 37.3	25.0	V / 1.0 / 0.0	N/A	-29.0
1854.39	36.9 Av	2.9 / 26.6 / 38.0	28.3	V / 1.0 / 0.0	N/A	-25.7
2100.01	35.7 Av	3.1 / 26.6 / 38.2	27.2	V / 1.0 / 0.0	N/A	-26.8
1-4 GHz Vertical 270 deg						
1125.01	41.6 Av	2.1 / 23.7 / 38.3	29.1	V / 1.0 / 0.0	N/A	-24.9
1200.01	38.3 Av	2.2 / 24.1 / 38.3	26.3	V / 1.0 / 0.0	N/A	-27.7
1425.02	36.5 Av	2.4 / 24.6 / 37.4	26.1	V / 1.0 / 0.0	N/A	-27.9
1500.01	44.0 Av	2.5 / 24.3 / 37.3	33.4	V / 1.0 / 0.0	N/A	-20.6
1620.06	37.2 Av	2.6 / 24.9 / 37.5	27.3	V / 1.0 / 0.0	N/A	-26.7
1725.01	36.5 Av	2.7 / 25.9 / 37.8	27.3	V / 1.0 / 0.0	N/A	-26.7
1800.03	36.6 Av	2.8 / 26.5 / 38.1	27.8	V / 1.0 / 0.0	N/A	-26.2
Following signals maximized – 1-4 GHZ Vertical						
1125.01	41.7 Av	2.1 / 23.7 / 38.3	29.3	V / 1.0 / 180.0	N/A	-24.7
1500.01	52.2 Av	2.5 / 24.3 / 37.3	41.7	V / 1.1 / 302.0	N/A	-12.3
1575.02	41.9 Av	2.6 / 24.6 / 37.3	31.6	V / 1.1 / 303.0	N/A	-22.4
3000.00	41.6 Av	3.8 / 29.7 / 38.1	36.9	V / 1.0 / 300.0	N/A	-17.1
1-4 GHz Horizontal 0 deg						
1000.02	35.5 Av	2.0 / 23.2 / 38.2	22.5	V / 1.0 / 0.0	N/A	-31.5
1038.45	37.0 Av	2.0 / 23.7 / 38.2	24.5	V / 1.0 / 0.0	N/A	-29.5
1112.63	36.1 Av	2.1 / 23.9 / 38.3	23.8	V / 1.0 / 0.0	N/A	-30.2
1125.01	36.6 Av	2.1 / 23.7 / 38.3	24.2	V / 1.0 / 0.0	N/A	-29.8
1186.84	35.5 Av	2.2 / 23.9 / 38.3	23.3	V / 1.0 / 0.0	N/A	-30.7
1200.01	35.8 Av	2.2 / 24.1 / 38.3	23.8	V / 1.0 / 0.0	N/A	-30.2
1275.02	35.6 Av	2.3 / 24.2 / 37.9	24.2	V / 1.0 / 0.0	N/A	-29.8
1500.04	38.5 Av	2.5 / 24.3 / 37.3	28.0	V / 1.0 / 0.0	N/A	-26.0
1557.70	34.8 Av	2.6 / 24.4 / 37.3	24.5	V / 1.0 / 0.0	N/A	-29.5
1575.00	35.2 Av	2.6 / 24.6 / 37.3	25.0	V / 1.0 / 0.0	N/A	-29.0
1650.01	35.5 Av	2.7 / 25.2 / 37.5	25.8	V / 1.0 / 0.0	N/A	-28.2
1725.01	35.5 Av	2.7 / 25.9 / 37.8	26.3	V / 1.0 / 0.0	N/A	-27.7
1780.21	36.4 Av	2.8 / 26.4 / 38.0	27.6	V / 1.0 / 0.0	N/A	-26.4
1854.39	37.7 Av	2.9 / 26.6 / 38.0	29.1	V / 1.0 / 0.0	N/A	-24.9
2002.76	35.5 Av	3.0 / 26.9 / 38.1	27.3	V / 1.0 / 0.0	N/A	-26.7
1-4 GHz Horizontal 90 deg						
1000.02	35.5 Av	2.0 / 23.2 / 38.2	22.5	V / 1.0 / 90.0	N/A	-31.5
1038.45	36.5 Av	2.0 / 23.7 / 38.2	24.0	V / 1.0 / 90.0	N/A	-30.0
1112.63	36.8 Av	2.1 / 23.9 / 38.3	24.5	V / 1.0 / 90.0	N/A	-29.5

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dBm) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <1GHz	DELTA2 (dB) 15.209 >1GHz
1125.01	36.8 Av	2.1 / 23.7 / 38.3	24.4	V / 1.0 / 90.0	N/A	-29.6
1200.01	35.8 Av	2.2 / 24.1 / 38.3	23.8	V / 1.0 / 90.0	N/A	-30.2
1275.02	35.6 Av	2.3 / 24.2 / 37.9	24.2	V / 1.0 / 90.0	N/A	-29.8
1500.03	38.5 Av	2.5 / 24.3 / 37.3	28.0	V / 1.0 / 90.0	N/A	-26.0
1557.70	34.8 Av	2.6 / 24.4 / 37.3	24.5	V / 1.0 / 90.0	N/A	-29.5
1575.00	35.2 Av	2.6 / 24.6 / 37.3	25.0	V / 1.0 / 90.0	N/A	-29.0
1650.01	35.5 Av	2.7 / 25.2 / 37.5	25.8	V / 1.0 / 90.0	N/A	-28.2
1725.01	35.6 Av	2.7 / 25.9 / 37.8	26.4	V / 1.0 / 90.0	N/A	-27.6
1780.21	36.5 Av	2.8 / 26.4 / 38.0	27.7	V / 1.0 / 90.0	N/A	-26.3
1854.39	37.0 Av	2.9 / 26.6 / 38.0	28.4	V / 1.0 / 90.0	N/A	-25.6
2002.76	35.6 Av	3.0 / 26.9 / 38.1	27.4	V / 1.0 / 90.0	N/A	-26.6
3000.00	36.0 Av	3.8 / 29.7 / 38.1	31.3	V / 1.0 / 90.0	N/A	-22.7
1-4 GHz Horizontal 180 deg						
1000.02	36.6 Av	2.0 / 23.2 / 38.2	23.6	V / 1.0 / 180.0	N/A	-30.4
1038.45	37.2 Av	2.0 / 23.7 / 38.2	24.7	H / 1.0 / 180.0	N/A	-29.3
1112.63	36.6 Av	2.1 / 23.9 / 38.3	24.2	H / 1.0 / 180.0	N/A	-29.8
1409.35	36.1 Av	2.4 / 24.6 / 37.5	25.6	H / 1.0 / 180.0	N/A	-28.4
3000.00	39.1 Av	3.8 / 29.7 / 38.1	34.5	H / 1.0 / 180.0	N/A	-19.5
1-4 GHz Horizontal 270 deg						
1000.02	38.8 Av	2.0 / 23.2 / 38.2	25.8	H / 1.0 / 270.0	N/A	-28.2
1038.45	36.7 Av	2.0 / 23.7 / 38.2	24.2	H / 1.0 / 270.0	N/A	-29.8
1112.63	43.6 Av	2.1 / 23.9 / 38.3	31.3	H / 1.0 / 270.0	N/A	-22.7
1409.35	37.6 Av	2.4 / 24.6 / 37.5	27.1	H / 1.0 / 270.0	N/A	-26.9
Following signals maximized 1-4GHz Horizontal						
1500.01	46.9 Av	2.5 / 24.3 / 37.3	36.4	H / 1.0 / 227.0	N/A	-17.6
3000.07	39.4 Av	3.8 / 29.7 / 38.1	34.7	H / 1.1 / 164.0	N/A	-19.3
4-8 Ghz Horizontal 0 deg						
6000.05	33.4 Av	6.3 / 34.2 / 39.9	33.9	H / 1.0 / 0.0	N/A	-20.1
4-8 Ghz Horizontal 90 deg						
4000.00	32.9 Av	4.8 / 31.4 / 39.9	29.2	H / 1.0 / 0.0	N/A	-24.8
6000.05	32.8 Av	6.3 / 34.2 / 39.9	33.3	H / 1.0 / 0.0	N/A	-20.7
8000.00	33.8 Av	7.6 / 36.4 / 39.9	37.9	H / 1.0 / 0.0	N/A	-16.1
4-8Ghz Horizontal 180 deg						
4000.00	32.8 Av	4.8 / 31.4 / 39.9	29.1	H / 1.0 / 180.0	N/A	-24.9
4-8 Ghz Horizontal 270 deg						
No significant signals found						
4-8 Ghz Vertical 0 deg						
4949.66	35.3 Av	5.7 / 32.4 / 40.4	33.0	V / 1.0 / 0.0	N/A	-21.0
4-8Ghz Vertical 90 deg						

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <1GHz	DELTA2 (dB) 15.209 >1GHz
4949.66	39.5 Av	5.7 / 32.4 / 40.4	37.2	V / 1.0 / 90.0	N/A	-16.8
7500.06	32.5 Av	7.5 / 36.1 / 39.5	36.6	V / 1.0 / 90.0	N/A	-17.4
4-8Ghz Vertical 180 deg						
4949.66	39.4 Av	5.7 / 32.4 / 40.4	37.1	V / 1.0 / 180.0	N/A	-16.9
6000.05	33.0 Av	6.3 / 34.2 / 39.9	33.5	V / 1.0 / 180.0	N/A	-20.5
7500.06	32.4 Av	7.5 / 36.1 / 39.5	36.5	V / 1.0 / 180.0	N/A	-17.5
4500.00	34.4 Av	5.2 / 31.3 / 40.7	30.2	V / 1.0 / 180.0	N/A	-23.8
4-8 Ghz Vertical 270 deg						
7500.06	32.7 Av	7.5 / 36.1 / 39.5	36.8	V / 1.0 / 270.0	N/A	-17.2
Following Signal Maximized – 4-8GHz Vertical						
7500.06	35.2 Av	7.5 / 36.1 / 39.5	39.4	V / 1.0 / 270.0	N/A	-14.6
8000.00	33.7 Av	7.6 / 36.4 / 39.9	37.8	V / 1.0 / 270.0	N/A	-16.2
8 -18 Ghz Vertical 0 degrees						
9000.06	43.6 Av	8.4 / 36.7 / 48.5	40.2	V / 1.0 / 0.0	N/A	-13.8
15000.0	42.0 Av	12.1 / 42.2 / 47.2	49.1	V / 1.0 / 0.0	N/A	-4.9
18000.0	39.2 Av	0.0 / 42.0 / 46.3	34.9	V / 1.0 / 0.0	N/A	-19.1
No higher signals found: 8- 18 Ghz Vertical						
8-18GHz Horizontal						
No higher signals found: 8 – 18 Ghz Horizontal						

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dBm) (dB)	(dBuV)	(m) (DEG)	15.209 <1GHz	15.209 >1GHz
<b>***** Measurement Summary *****</b>						
<b>493.89</b>	<b>48.8 Qp</b>	<b>2.6 / 19.4 / 28.3</b>	<b>42.5</b>	<b>H / 1.6 / 5.0</b>	<b>-3.5</b>	<b>N/A</b>
15000.0	42.0 Av	12.1 / 42.2 / 47.2	49.1	V / 1.0 / 0.0	N/A	-4.9
750.00	44.8 Qp	3.2 / 20.4 / 28.1	40.3	H / 1.0 / 130.0	-5.7	N/A
36.15	46.9 Qp	0.6 / 12.1 / 28.2	31.4	V / 1.0 / 244.0	-8.6	N/A
469.82	45.2 Qp	2.5 / 17.7 / 28.2	37.3	H / 1.7 / 0.0	-8.7	N/A
40.01	45.9 Qp	0.6 / 11.7 / 28.2	30.1	V / 1.0 / 208.0	-9.9	N/A
518.00	40.8 Qp	2.6 / 19.1 / 28.3	34.2	H / 1.7 / 0.0	-11.8	N/A
184.32	44.6 Qp	1.4 / 12.8 / 27.5	31.4	H / 1.8 / 275.0	-12.1	N/A
825.03	36.9 Qp	3.3 / 21.4 / 27.8	33.8	V / 1.9 / 313.0	-12.2	N/A
1500.01	52.2 Av	2.5 / 24.3 / 37.3	41.7	V / 1.1 / 302.0	N/A	-12.3
200.00	45.6 Qp	1.5 / 11.3 / 27.3	31.0	H / 1.7 / 90.0	-12.5	N/A
208.90	45.8 Qp	1.5 / 10.8 / 27.3	30.8	H / 1.3 / 257.0	-12.7	N/A
469.39	40.5 Qp	2.5 / 17.7 / 28.2	32.6	H / 1.7 / 0.0	-13.4	N/A
159.75	44.1 Qp	1.4 / 12.3 / 27.7	30.0	H / 2.2 / 61.0	-13.5	N/A
9000.06	43.6 Av	8.4 / 36.7 / 48.5	40.2	V / 1.0 / 0.0	N/A	-13.8
500.01	36.3 Qp	2.6 / 21.3 / 28.2	32.1	V / 1.7 / 356.0	-13.9	N/A
69.98	44.6 Qp	0.8 / 8.7 / 28.2	26.0	V / 1.0 / 237.0	-14.0	N/A
7500.06	35.2 Av	7.5 / 36.1 / 39.5	39.4	V / 1.0 / 270.0	N/A	-14.6
51.82	42.9 Qp	0.7 / 9.9 / 28.2	25.3	V / 1.0 / 0.0	-14.7	N/A
34.66	40.1 Qp	0.6 / 12.3 / 28.2	24.7	V / 1.0 / 90.0	-15.3	N/A
150.00	41.5 Qp	1.3 / 12.6 / 27.7	27.8	V / 1.0 / 180.0	-15.7	N/A
216.01	45.6 Qp	1.6 / 10.5 / 27.3	30.3	H / 1.7 / 90.0	-15.7	N/A
141.22	41.1 Qp	1.3 / 12.8 / 27.7	27.5	V / 1.0 / 180.0	-16.0	N/A
8000.00	33.8 Av	7.6 / 36.4 / 39.9	37.9	H / 1.0 / 0.0	N/A	-16.1
143.29	40.9 Qp	1.3 / 12.7 / 27.8	27.1	V / 1.0 / 0.0	-16.4	N/A
625.01	36.0 Qp	3.0 / 18.9 / 28.3	29.6	V / 1.0 / 0.0	-16.4	N/A
675.02	34.2 Qp	3.1 / 20.4 / 28.1	29.5	H / 1.7 / 270.0	-16.5	N/A
900.00	30.9 Qp	3.6 / 22.3 / 27.6	29.3	H / 1.7 / 0.0	-16.7	N/A
4949.66	39.5 Av	5.7 / 32.4 / 40.4	37.2	V / 1.0 / 90.0	N/A	-16.8
250.02	42.8 Qp	1.7 / 11.6 / 27.2	28.9	H / 1.7 / 270.0	-17.1	N/A
3000.00	41.6 Av	3.8 / 29.7 / 38.1	36.9	V / 1.0 / 300.0	N/A	-17.1
58.78	41.1 Qp	0.7 / 8.9 / 28.2	22.6	V / 1.0 / 180.0	-17.4	N/A
30.00	36.9 Qp	0.5 / 13.0 / 28.2	22.2	V / 1.0 / 0.0	-17.8	N/A
62.98	41.0 Qp	0.7 / 8.5 / 28.2	22.0	V / 1.0 / 90.0	-18.0	N/A
400.01	36.1 Qp	2.2 / 17.2 / 27.7	27.8	V / 1.0 / 0.0	-18.2	N/A
657.26	32.9 Qp	3.0 / 19.7 / 28.2	27.5	V / 1.0 / 270.0	-18.5	N/A
375.00	37.4 Qp	2.1 / 15.3 / 27.6	27.2	V / 1.0 / 90.0	-18.8	N/A
800.01	30.4 Qp	3.3 / 21.0 / 27.8	26.9	H / 1.7 / 90.0	-19.1	N/A
18000.0	39.2 Av	0.0 / 42.0 / 46.3	34.9	V / 1.0 / 0.0	N/A	-19.1
222.52	41.4 Qp	1.6 / 10.3 / 27.3	25.9	V / 1.0 / 90.0	-20.1	N/A
6000.05	33.4 Av	6.3 / 34.2 / 39.9	33.9	H / 1.0 / 0.0	N/A	-20.1
1575.00	43.0 Av	2.6 / 24.6 / 37.3	32.7	V / 1.0 / 0.0	N/A	-21.3
233.47	39.5 Qp	1.6 / 10.6 / 27.2	24.5	H / 1.7 / 0.0	-21.5	N/A
370.88	32.9 Qp	2.1 / 16.4 / 27.5	23.9	H / 1.7 / 90.0	-22.1	N/A
206.05	36.0 Qp	1.5 / 11.0 / 27.3	21.2	H / 1.7 / 90.0	-22.3	N/A
1112.63	43.6 Av	2.1 / 23.9 / 38.3	31.3	H / 1.0 / 270.0	N/A	-22.7

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dBm) (dB)	(dBuV)	(m) (DEG)	15.209 <1GHz	15.209 >1GHz
4500.00	34.4 Av	5.2 / 31.3 / 40.7	30.2	V / 1.0 / 180.0	N/A	-23.8
473.48	29.9 Qp	2.5 / 17.9 / 28.2	22.1	V / 1.0 / 180.0	-23.9	N/A
1125.01	41.7 Av	2.1 / 23.7 / 38.3	29.3	H / 1.0 / 180.0	N/A	-24.7
4000.00	32.9 Av	4.8 / 31.4 / 39.9	29.2	H / 1.0 / 0.0	N/A	-24.8
1854.39	37.7 Av	2.9 / 26.6 / 38.0	29.1	V / 1.0 / 0.0	N/A	-24.9
1409.35	38.8 Av	2.4 / 24.6 / 37.5	28.3	V / 1.0 / 0.0	N/A	-25.7
258.05	33.6 Qp	1.8 / 11.9 / 27.1	20.2	H / 1.7 / 270.0	-25.8	N/A
1800.03	36.6 Av	2.8 / 26.5 / 38.1	27.8	V / 1.0 / 0.0	N/A	-26.2
1000.02	40.6 Pk	2.0 / 23.2 / 38.2	27.7	V / 1.0 / 0.0	N/A	-26.3
1780.21	36.5 Av	2.8 / 26.4 / 38.0	27.7	V / 1.0 / 90.0	N/A	-26.3
1650.01	37.2 Av	2.7 / 25.2 / 37.5	27.6	V / 1.0 / 0.0	N/A	-26.4
266.69	32.6 Qp	1.8 / 12.3 / 27.1	19.5	V / 1.0 / 0.0	-26.5	N/A
1725.01	36.7 Av	2.7 / 25.9 / 37.8	27.5	V / 1.0 / 0.0	N/A	-26.5
2024.98	35.6 Av	3.0 / 27.0 / 38.1	27.5	V / 1.0 / 0.0	N/A	-26.5
2002.76	35.6 Av	3.0 / 26.9 / 38.1	27.4	V / 1.0 / 90.0	N/A	-26.6
1620.06	37.2 Av	2.6 / 24.9 / 37.5	27.3	V / 1.0 / 0.0	N/A	-26.7
1260.99	38.6 Av	2.3 / 24.3 / 38.0	27.2	V / 1.0 / 0.0	N/A	-26.8
2100.01	35.7 Av	3.1 / 26.6 / 38.2	27.2	V / 1.0 / 0.0	N/A	-26.8
243.01	33.1 Qp	1.7 / 11.1 / 27.2	18.7	H / 1.7 / 0.0	-27.3	N/A
1200.01	38.3 Av	2.2 / 24.1 / 38.3	26.3	V / 1.0 / 0.0	N/A	-27.7
1425.02	36.5 Av	2.4 / 24.6 / 37.4	26.1	V / 1.0 / 0.0	N/A	-27.9
1598.41	35.9 Av	2.6 / 24.7 / 37.4	25.8	V / 1.0 / 0.0	N/A	-28.2
1275.02	36.9 Av	2.3 / 24.2 / 37.9	25.5	V / 1.0 / 0.0	N/A	-28.5
1600.04	35.2 Av	2.6 / 24.7 / 37.4	25.1	V / 1.0 / 0.0	N/A	-28.9
1557.70	35.2 Av	2.6 / 24.4 / 37.3	25.0	V / 1.0 / 0.0	N/A	-29.0
1440.07	35.2 Av	2.4 / 24.6 / 37.4	24.9	V / 1.0 / 0.0	N/A	-29.1
1038.45	37.2 Av	2.0 / 23.7 / 38.2	24.7	H / 1.0 / 180.0	N/A	-29.3
1350.02	35.2 Av	2.4 / 24.1 / 37.7	23.9	V / 1.0 / 0.0	N/A	-30.1
1186.84	35.5 Av	2.2 / 23.9 / 38.3	23.3	V / 1.0 / 0.0	N/A	-30.7
225.02	30.5 Qp	1.6 / 10.4 / 27.3	15.2	V / 1.0 / 0.0	-30.8	N/A
0.500	28.8 Qp	0.1 / 10.6 / 0.0	39.5	H / 1.0 / 0.0	-34.1	N/A
1260.08	31.0 Pk	2.3 / 24.3 / 38.0	19.5	V / 1.0 / 0.0	N/A	-34.5
4.50	9.9 Qp	0.2 / 10.6 / 0.0	20.7	V / 1.0 / 0.0	-48.8	N/A
25.00	5.4 Qp	0.5 / 9.1 / 0.0	15.0	H / 1.0 / 0.0	-54.5	N/A
0.100	31.1 Qp	0.1 / 10.9 / 0.0	42.1	V / 1.0 / 0.0	-65.5	N/A

**Fundamental Field Strength  
&  
Harmonics of the Fundamental**

**15.247 (b)(3), (d)/15.205**



# Fundamental & Harmonics

## (Conducted Port & Radiated Restricted Band)

Test Report #: <b>3169110</b>	Test Area: Pinewood Site 1 (3m)	Temperature: 26.1 °C
Test Method: FCC Part 15.209/ 15.247	Test Date: 16-Dec-2008	Relative Humidity: 18.2 %
EUT Model #: VIP922	EUT Power: 110VAC/ 60 Hz	Air Pressure: 78.5 kPa
EUT Serial #: P3B19		
Manufacturer: Echostar		

EUT Description: 2.4 GHz Transceiver

Notes: For conducted port measurements of the fundamental a RBW of 3MHz was used.  
For all spurious emissions a RBW of 100KHz was used.

**Conducted Port Measurements of Fundamental & Harmonics – 15.247 (b)(3)**

**Radiated Measurements of Harmonics in Restricted Band per 15.205/ 15.209**

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)	(dB)

The following duty cycle was declared by the manufacturer.

100mS [No Duty Cycle Correction]

**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 15.247 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 15.247 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 15.247 and 15.205

All Measurements Worst-Case Axis [EUT Flat on Table]

**Fundamental - Low Channel**

<b>2425</b>	<b>103.7 Pk</b>	<b>0.3 / 0.0 / 0.0</b>	<b>104.0</b>	<b>RF Port</b>	<b>0</b>	<b>104.0</b>	<b>137.0</b>	<b>-33.0</b>
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**Harmonics – Low Channel**

4849.66	44.0 Av	5.6 / 32.2 / 40.5	41.3	V / 1.9 / 5.0	0	41.3	54.0	-12.7
4849.66	34.0 Av	5.6 / 32.2 / 40.5	31.3	H / 1.8 / 12.0	0	31.3	54.0	-22.7
7274.46	32.8 Av	7.3 / 36.0 / 40.1	36.1	V / 1.9 / 352.0	0	36.1	54.0	-17.9
7274.46	32.5 Av	7.3 / 36.0 / 40.1	35.8	H / 1.9 / 352.0	0	35.8	54.0	-18.2
9700	65.2 Pk	0.9 / 0.0 / 0.0	66.1	RF Port	0	66.1	84.0	-17.9
12124.1	41.2 Pk	9.7 / 39.8 / 46.1	44.6	H / 1.4 / 12.0	0	44.6	54.0	-9.4
12124.1	41.1 Pk	9.7 / 39.8 / 46.1	44.5	V / 1.4 / 12.0	0	44.5	54.0	-9.5
14550	65.1 Pk	2.2 / 0.0 / 0.0	67.3	RF Port	0	67.3	84.0	-16.7
16975	64.3 Pk	3.4 / 0.0 / 0.0	67.7	RF Port	0	67.7	84.0	-16.3

Following signal not found: noise floor – Harmonic Mixer

19400.4	11.3 Pk	0.0 / 22.4 / 0.0	33.7	V / 1.0 / 0.0	0	33.7	54	-20.3
21825	63.9 Pk	5.1 / 0.0 / 0.0	69.1	RF Port	0	69.1	84.0	-14.9
24250	63.2 Pk	6.1 / 0.0 / 0.0	69.3	RF Port	0	69.3	84.0	-14.7

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)	(dB)
<b>Fundamental - Mid Channel</b>								
2450	103.4 Pk	0.3 / 0.0 / 0.0	103.7	RF Port	0	103.7	137.0	-33.3
<b>Harmonics – Mid Channel</b>								
4899.66	46.0 Pk	5.6 / 32.4 / 40.5	43.5	V / 1.7 / 320.0	0	43.5	54.0	-10.5
4899.66	38.0 Pk	5.6 / 32.4 / 40.5	35.6	H / 1.4 / 23.0	0	35.6	54.0	-18.4
7349.46	35.5 Pk	7.4 / 36.2 / 40.0	39	V / 1.7 / 320.0	0	39.0	54.0	-15.0
7349.46	33.9 Pk	7.4 / 36.2 / 40.0	37.4	H / 1.7 / 320.0	0	37.4	54.0	-16.6
9800	64.2 Pk	0.9 / 0.0 / 0.0	65.1	RF Port	0	65.1	83.7	-18.6
12249.1	41.9 Pk	9.8 / 40.9 / 45.9	46.7	H / 1.4 / 23.0	0	46.7	54.0	-7.3
12249.1	39.6 Pk	9.8 / 40.9 / 45.9	44.4	V / 1.4 / 23.0	0	44.4	54.0	-9.6
14700	64.7 Pk	2.2 / 0.0 / 0.0	66.9	RF Port	0	66.9	83.7	-16.8
17150	64.9 Pk	3.4 / 0.0 / 0.0	68.3	RF Port	0	68.3	83.7	-15.4
Following signal not found: noise floor – Harmonic Mixer								
19600.8	10.8 Pk	0.0 / 21.7 / 0.0	32.5	V / 1.0 / 0.0	0	32.5	54	-21.5
Following signal not found: noise floor – Harmonic Mixer								
22050.1	11.3 Pk	0.0 / 21.9 / 0.0	33.2	V / 1.0 / 0.0	0	33.2	54	-20.8
24500	64.4 Pk	6.2 / 0.0 / 0.0	70.6	RF Port	0	70.6	83.7	-13.1
<b>Fundamental – High channel</b>								
2475	103.2 Pk	0.3 / 0.0 / 0.0	103.5	RF Port	0	103.5	137.0	-33.5
<b>Harmonics – High Channel</b>								
4949.64	42.0 Pk	5.7 / 32.4 / 40.4	39.6	V / 1.4 / 54.0	0	39.6	54.0	-14.4
<b>4949.64</b>	<b>51.3 Pk</b>	<b>5.7 / 32.4 / 40.4</b>	<b>49</b>	<b>H / 1.3 / 8.0</b>	<b>0</b>	<b>49.0</b>	<b>54.0</b>	<b>-5.0</b>
7424.44	35.2 Pk	7.4 / 36.2 / 39.8	39	V / 1.4 / 54.0	0	39.0	54.0	-15.0
7424.44	32.7 Pk	7.4 / 36.2 / 39.8	36.5	H / 1.4 / 54.0	0	36.5	54.0	-17.5
9900	64.9 Pk	0.9 / 0.0 / 0.0	65.8	RF Port	0	65.8	83.5	-17.7
12374	42.3 Pk	9.9 / 41.3 / 46.2	47.3	H / 1.3 / 8.0	0	47.3	54.0	-6.7
12374	40.4 Pk	9.9 / 41.3 / 46.2	45.4	V / 1.4 / 8.0	0	45.4	54.0	-8.6
14850	65.2 Pk	2.3 / 0.0 / 0.0	67.5	RF Port	0	67.5	83.5	-16.0
17325	64.8 Pk	3.5 / 0.0 / 0.0	68.2	RF Port	0	68.2	83.5	-15.3
Following signal not found: noise floor – Harmonic Mixer								
19800.3	11.2 Pk	0.0 / 22.4 / 0.0	33.6	V / 1.0 / 0.0	0	33.6	54	-20.4
Following signal not found: noise floor – Harmonic Mixer								
22275.9	11.1 Pk	0.0 / 21.9 / 0.0	32.9	V / 1.0 / 0.0	0	32.9	54	-21.1
24750	65.2 Pk	6.3 / 0.0 / 0.0	71.5	RF Port	0	71.5	83.5	-12.0

## **6dB Bandwidth**

**15.247 (a)(2)**

# Bandwidth

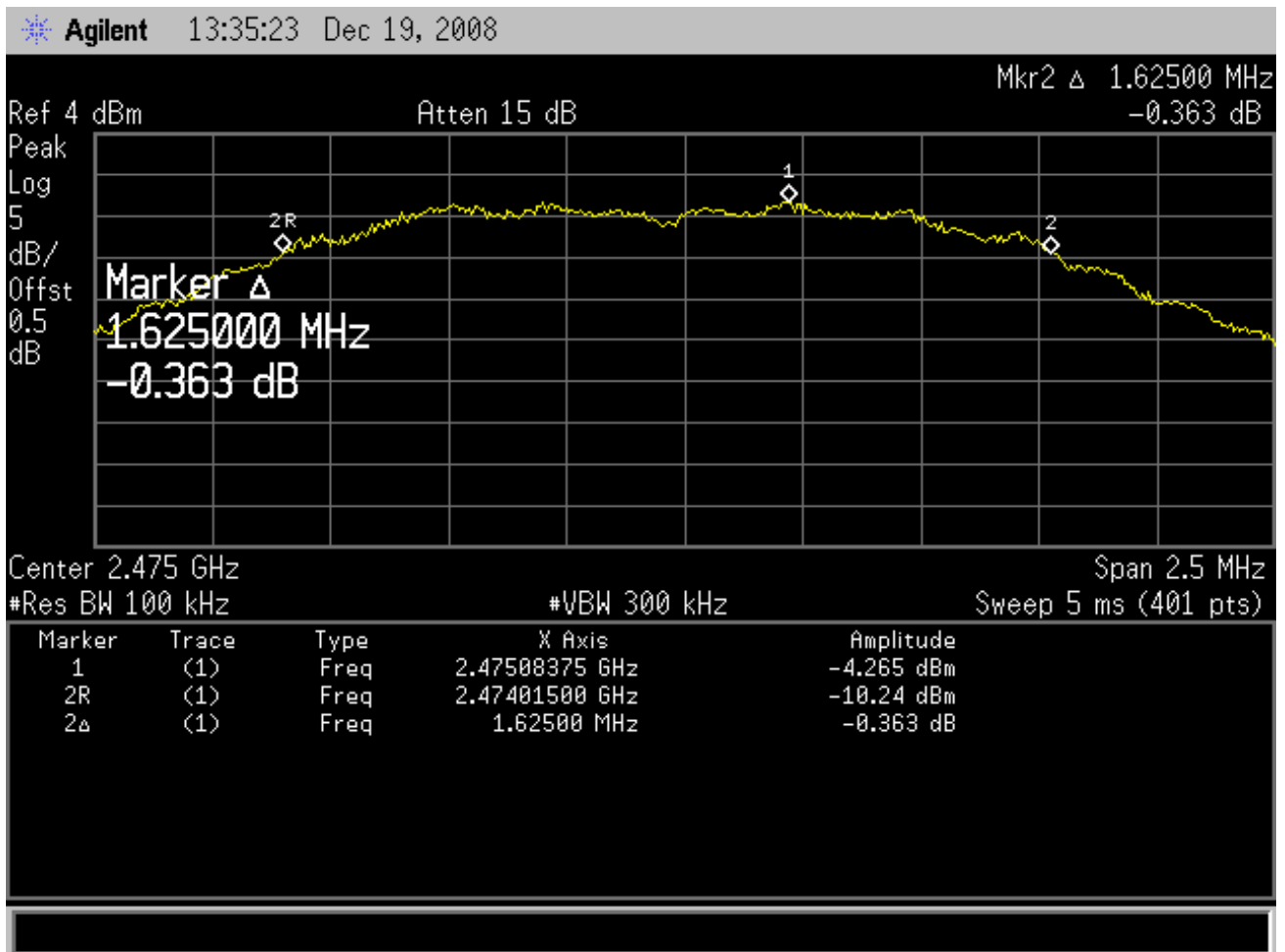
Test Report #: **3169110**  
 Test Method: 15.247  
 EUT Model #: VIP922 DVR  
 EUT Serial #: P3B19  
 Manufacturer: Echostar  
 EUT Description: 2.4 GHz Transceiver  
 Notes: 6dB Bandwidth

Test Area: Conducted Port  
 Test Date: 19-Dec-2008  
 EUT Power: 120VAC 60Hz

Temperature: 16.6 °C  
 Relative Humidity: 18.8 %  
 Air Pressure: 79 kPa

Page:

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



# Power Spectral Density

**15.247 (e)**

# Power Spectral Density

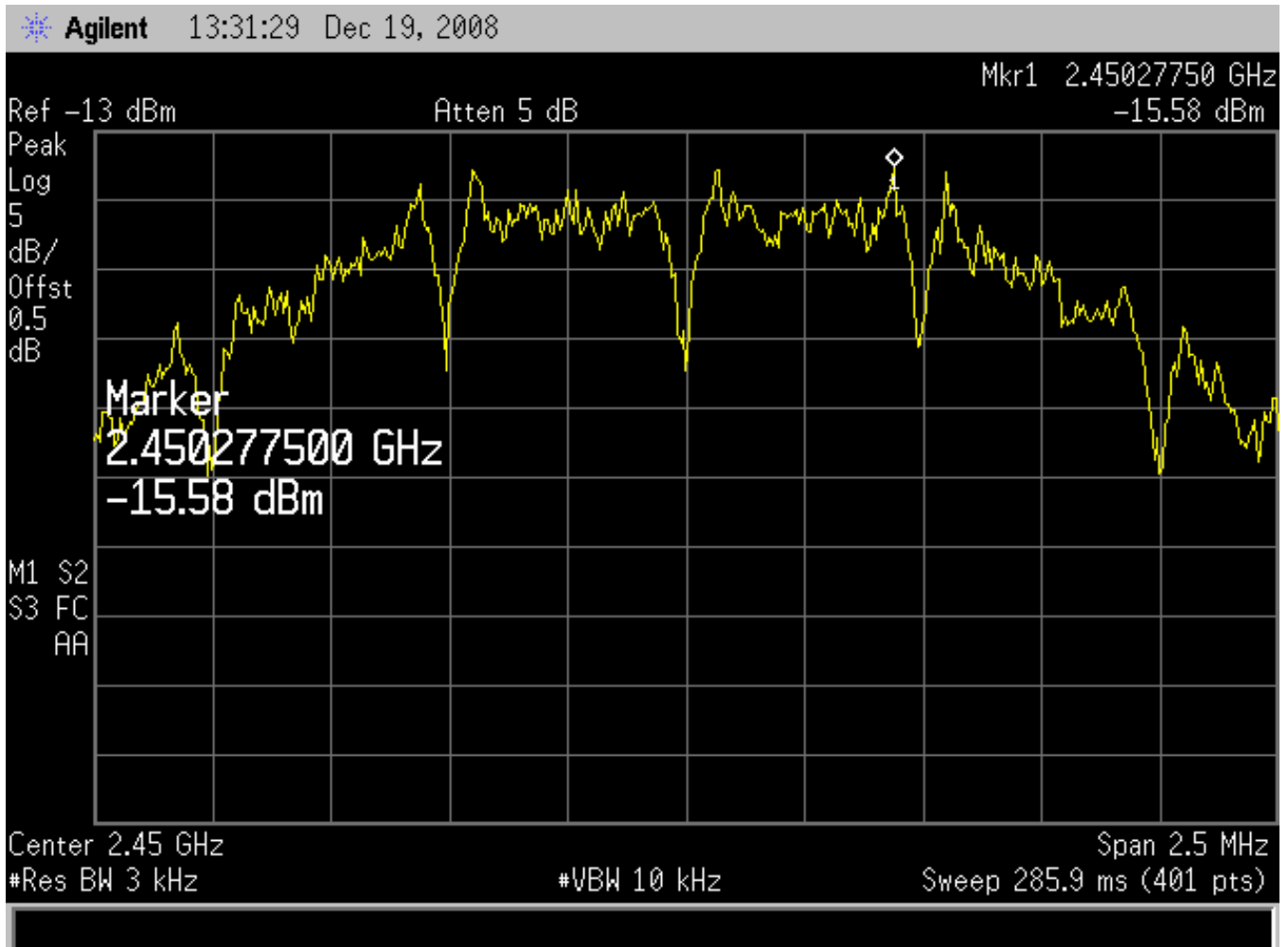
Test Report #: **3169110**  
 Test Method: 15.247  
 EUT Model #: VIP922 DVR  
 EUT Serial #: P3B19  
 Manufacturer: Echostar  
 EUT Description: 2.4 GHz Transceiver  
 Notes: Mid Channel

Test Area: Conducted Port  
 Test Date: 19-Dec-2008  
 EUT Power: 120VAC 60Hz

Temperature: 16.6 °C  
 Relative Humidity: 18.8 %  
 Air Pressure: 79 kPa

Page:

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



# List of Equipment Utilized for Final Test

# Project Report

Technician Randall Thompson

Project 3169110

Begin Date: 12/16/2008 End Date: 12/19/2008

Capital Asset ID	Manufacturer	Model #	Serial #	Description	Test Performed	Service Type	Service Date	Service Due
18805	Hewlett-Packard	11970K	2332A01280	Harmonic Mixer	R Radiated Emissions	For Cal	3/12/2008	3/12/2011
18882	Hewlett-Packard	8566B	2410A00154	Spectrum Analyzer (dc-22 GHz)	R Radiated Emissions	For Cal	12/14/2007	12/14/2009
18886	TENSOR	4105	2020	Ridged Guide Antenna 1-18GHz	R Radiated Emissions	For Cal	3/6/2008	3/6/2009
18900	Avantek	AFT97-8434-10F	1007	RF Pre-Amplifier (4-8 GHz)	R Radiated Emissions	For Ver	5/2/2008	5/2/2009
18901	Avantek	AWT-18037	1002	RF Pre-Amplifier (8-18 GHz)	R Radiated Emissions	For Ver	5/2/2008	5/2/2009
18906	Mini-Circuits Lab	ZHL-42	N052792-2	Amplifier (1-4 GHz)	R Radiated Emissions	For Ver	5/2/2008	5/2/2009
18912	Hewlett-Packard	8447F	3113A05545	9 kHz- 1.3GHz Pre Amp	R Radiated Emissions	For Ver	5/2/2008	5/2/2009
18913	Hewlett-Packard	E7405A	My44211889	Spectrum Analyzer	R Radiated Emissions	For Cal	2/22/2008	2/22/2009
18888	EMCO	3146	9402-3775	Log Periodic Antenna (200-1000MHz)	R Radiated Emissions	For Cal	10/21/2008	10/21/2009
18889	EMC Test Systems	3109	3142	Biconical Antenna 30-300MHz	R Radiated Emissions	ForCal	10/11/2008	10/11/2009

Intertek Testing Services NA, Inc.

5541 Central Avenue, Suite 110  
Boulder, Colorado 80301

Voice: 303 786 7999 Fax: 303 449 6160



**Appendix B**

Test Plan

and

Constructional Data Form

[To be provided by Client]

# Request for Estimate & Test Plan

## Client Information:

License Holder:	EchoStar Technologies Corporation
Address:	94 Inverness Terrace East, Englewood, CO 80112
Contact:	Jordan Belliston
Phone Number:	(303) 706-4387
Fax Number:	(303) 799-6222
Email Address:	Jordan.belliston@echostar.com

Please fill out the pertinent pages within this document and email this Form to Bryant and Sonya at [Bryant.Hart@Intertek.com](mailto:Bryant.Hart@Intertek.com) and [Sonya.Cooper@intertek.com](mailto:Sonya.Cooper@intertek.com) for a quotation. Other pages that do not pertain to your device can be left blank.

*I.E. EMC Quote – Pages 1,2 & 3, Add Safety – add Page 4, If a radio is part of the device add page 5 etc.*

This document is compiled as a WORD FORM. To enable the FORM tool, right click on the tool bar and select FORMS. You will then be able to add attachments, drawings etc by clicking on the “Lock” Graphic to unlock the FORM document. To make all the check boxes work within the FORM, the “Lock” graphic must be selected. Thank you for all your time and effort on this matter.

### Estimates Requested: (Required for all devices)

EMC Testing/Services	
<input checked="" type="checkbox"/> Requesting Estimate	<input type="checkbox"/> On-site/In-Situ Testing
<input type="checkbox"/> Pre-Compliance Scans / Engineering test	<input type="checkbox"/> TCF Compilation/Review Service

Radio Device Testing and Certification	
<input checked="" type="checkbox"/> FCC Certification	<input type="checkbox"/> Industry Canada Certification (Receivers required)
<input type="checkbox"/> Class 2 Notification Under the R&TTED	<input type="checkbox"/> TCF Compilation/Review Service

Safety Testing and Certification	
<input type="checkbox"/> NRTL Listing	<input type="checkbox"/> 1 Day Pre-Assessment (conducted at your facility)
<input type="checkbox"/> Letter of Findings	<input type="checkbox"/> CB Report Covering all country Deviations
<input type="checkbox"/> CE Report to Cover the LVD/MDD	<input type="checkbox"/> CB Report Covering - Specify Countries:

Any Additional Interest(s)	
<input type="checkbox"/> ISO Certification (Another RFQ is required)	<input type="checkbox"/> Energy Star Compliance
<input type="checkbox"/> FDA 510K Services (Another RFQ is required)	<input type="checkbox"/> NEBS
<input type="checkbox"/> International Approvals Management	<input type="checkbox"/> Wire and Cable
<input type="checkbox"/> Product Verification and Integrity Testing	<input type="checkbox"/> Other:

**General Product Information:** (Required for all Devices)

Product/Model Number(s):	ViP922
Description of product(s):	Satellite Receiver with 2.4GHz Transceiver
Intended Location:	<input checked="" type="checkbox"/> Dry <input type="checkbox"/> Damp <input type="checkbox"/> Wet <input type="checkbox"/> Hazardous Location
Product Type:	<input checked="" type="checkbox"/> Prototype <input type="checkbox"/> Production Sample <input type="checkbox"/> Manufacturing Design Change: Please Describe
Is it a stand-alone device or part of a system?	<input checked="" type="checkbox"/> Stand Alone Device <input type="checkbox"/> Component of a System
Intended Use:	<input checked="" type="checkbox"/> Household/Office <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Hospital <input type="checkbox"/> Life Supporting
If there is more than one product/model what are the differences? NO	
Is the Product Enclosure:	<input checked="" type="checkbox"/> Metal <input type="checkbox"/> Plastic <input type="checkbox"/> Both
What Voltages/Current does the EUT operate at	Rated Voltage: 120 VAC/60 Hz Rated Current: # of Phases/Conductors: # of Power Cords:
Are their multiple suppliers of power supplies?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes Please Describe:
If part of a system, please describe system parts and accessories: Subsystem of a Satellite Receiver.	
Are there Multiple Modes of Operation?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes Please Describe:
Is there programmable software?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Can all modes of operation be operated simultaneously?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Explain: Different channels will have to be evaluated individually
In which countries will you be selling the product?	U.S. and Canada
When can you supply samples of the device and all pertinent documentation (where applicable) to Intertek for testing? Thursday 12/4/2008	

**Radio Information:** (Required only if the device contains an intentional transmitter)

What Radio certifications are desired?	
<input checked="" type="checkbox"/> FCC (USA) <input checked="" type="checkbox"/> Industry Canada <input type="checkbox"/> ETSI (R&TTE)	<input type="checkbox"/> Notified or Competent Body TCF Review <input type="checkbox"/> Other: Please Specify
Please list the particular radio standards that apply. FCC 15.247	
Operating Frequency:	2.425, 2.450, 2.475 GHz
RF Output Power:	unknown
Is there an RF Conducted Port?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No      Description:
Number of Antennas & Description: (Internal, External, Known Gain, etc.)	1 External Dipole antenna
Modulation Technique:	CW
Number of Channels/Number of Discrete frequencies per Channel:	3/1
Can the device be operated in CW Mode?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
What is the lowest utilized frequency within the device?	unknown

**Notes: Please ensure to bring a notch filter covering your fundamental operating frequency.**

### Additional Information:

This information is required to be filled in to act as a test plan and constructional data form required to be supplied as part of the test report in accordance to the required standards. This information is not required to obtain a quote but should be filled out to show a completed report under the applicable standards for EMC etc. Thank you for your time in effort in completing this section of the RFQ/Test Plan.

#### Support Equipment:

Intertek requires our customers provide all support equipment necessary to fully operate the device undergoing testing. This includes any filters required for testing radio devices, computer equipment, etc.

Item

Description

Manufacturer

Model No.

#### Cabling Information:

Cable

Function\*

Type of Shield

Length

Connectors

Connection\*\*

\* Function examples (Ethernet, RS232, USB, Analog, physiological parameter, etc.)

\*\* Connection examples (Outside Plant, Patient Coupled, Ring Voltage, etc.)

#### Monitoring the EUT:

Please provide instructions below on how to observe the EUT to verify proper operation in all modes. (including software revision)

#### Any other information required: (Notes, Photos, Block Diagrams, Drawings, etc.)

A minimum of a block diagram showing the equipment under test and its support equipment.

#### Test Reports Requested

##### EMC Reports:

- Emissions
- Immunity
- Engineering Data Only
- FCC/Industry Canada "Radio"
- ETSI "Radio"

##### Safety Reports:

- Product Evaluation
- Listing Report
- CB Certificate/Report

Misc. Deliverables:

- Other:

#### Overall Scheduling Time:

##### Electromagnetic Compatibility:

Emissions:

Immunity:

Radio:

Safety:

Testing/Reports:

- Other/special notes:

**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.

*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 C63.4-2003 - "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:

