



DAVIS INSTRUMENTS TEST REPORT

FOR THE

SPARS STATION, 6326

FCC PART 15 SUBPART C SECTIONS 15.209 AND 15.249

COMPLIANCE

DATE OF ISSUE: APRIL 3, 2002

PREPARED FOR:

PREPARED BY:

Davis Instruments 3465 Diablo Avenue Hayward, CA 94545 Mary Ellen Clayton CKC Laboratories, Inc. 5473A Clouds Rest Mariposa, CA 95338

P.O. No.: 24073 W.O. No.: 78674 Date of test: March 25-26, 2002

Report No.: FC02-035

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CKC Laboratories, Inc. has received Certificates of Accreditation from the following agencies:

A2LA (USA); BSMI (Taiwan); Nemko (Norway); and GOST (Russia).

CKC Laboratories, Inc has received test site Registration Acceptance from the following agencies:

FCC (USA); VCCI (Japan); and Industry Canada.

CKC Laboratories, Inc. has received Letters of Acceptance through an MRA for the following agencies:

ACA/NATA (Australia); SABS (South Africa); SWEDAC (Sweden); Radio Communications Agency (RA); HOKLAS (Hong Kong); Bakom (Swiss); BIPT (Belgium); Denmark Telestyrelsen; RvA (Netherlands); SEE (Luxembourg) SITTEL (Bolivia); and UKAS (UK).

ADMINISTRATIVE INFORMATION

DATE OF TEST: March 25-26, 2002

DATE OF RECEIPT: March 25, 2002

PURPOSE OF TEST: To demonstrate the compliance of the SPARS

Station, 6326 with the requirements for FCC Part 15 Subpart C Sections 15.209 and 15.249 devices. This testing is for a Class 2 permissive change.

TEST METHOD: ANSI C63.4 (1992)

MANUFACTURER: Davis Instruments

3465 Diablo Avenue Hayward, CA 94545

REPRESENTATIVE: Perry Dillon

TEST LOCATION: CKC Laboratories, Inc.

5473A Clouds Rest Mariposa, CA 95338

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SUMMARY OF RESULTS

As received, the Davis Instruments SPARS Station, 6326 was found to be fully compliant with the following standards and specifications:

United States

- FCC Part 15 Subpart C Sections 15.209 and 15.249
- > ANSI C63.4 (1992) method

Canada

RSS-210 using:

FCC	15.209	15.249(a)	15.249(b)	15.249(c)	15.249(d)	26dB Bandwidth
Canada	6.2.1	6.2.2(m2)(1)	6.2.2(m2)(2)	6.2.2(m2)(3)	6.2.2(m2)(4)	99% Bandwidth

> ANSI C63.4 (1992) method

CONDITIONS FOR COMPLIANCE

No modifications to the EUT were necessary to comply. Conducted emissions not required for this device.

APPROVALS

QUALITY ASSURANCE:

TEST PERSONNEL:

Steve Behm, Manager of Engineering Services

Randy Clark, EMC Engineer

Joyce Walker, Quality Assurance Administrative Manager

Chuck Kendall, EMC/Lab Manager

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EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The EUT tested by CKC Laboratories was a production unit. Transmitter.

15.31(e) Voltage Variations

Not applicable to this device because it is battery and solar powered.

15.31(m) Number Of Channels

This device operates on a single channel.

15.33(a) Frequency Ranges Tested

15.209/15.247 Radiated Emissions: 9 kHz – 10 GHz

15.203 Antenna Requirements

The antenna is an integral part of the EUT and is non-removable; therefore the EUT complies with Section 15.203 of the FCC rules.

15.205 Restricted Bands

The fundamental operating frequency lies outside the restricted bands and therefore complies with the requirements of Section 15.205 of the FCC rules. Any spurious emission coming from the EUT was investigated to determine if any portion lies inside the restricted band. If any portion of a spurious emissions signal was found to be within a restricted band, investigation was performed to ensure compliance with Section 15.209.

Mode Of Operation

The EUT was configured by the manufacturer to operate in a on-off keyed mode. It was tested with both battery power and solar power.

EUT Operating Frequency

The EUT was operating at 916 MHz.

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EQUIPMENT UNDER TEST

SPARS Station

Manuf: Davis Instruments

Model: 6326

Serial: US-00-SP

FCC ID: 1R2DWW6326

PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

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REPORT OF MEASUREMENTS

The following tables report the worst case emissions levels recorded during the tests performed on the SPARS Station, 6326. All readings taken were peak readings unless otherwise stated. The data sheets from which the emissions tables were compiled are contained in Appendix C.

Table 1: Highest Radiated Emission Levels - Fundamental									
FREQUENCY MHz	METER READING dBµV	COR Ant dB	RECTION Amp dB	ON FACT Cable dB	ORS Dist dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
916.470	83.7	23.8	-27.0	7.0		87.5	93.9	-6.4	V
916.471 88.2 23.8 -27.0 7.0 92.0 93.9 -1.9							Н		

Test Method: ANSI C63.4 (1992) NOTES: H = Horizontal Polarization
Spec Limit: FCC Part 15 Subpart C Section 15.249(a) V = Vertical Polarization

Test Distance: 3 Meters

COMMENTS: EUT is a SPARS station. All ports are filled. EUT is solar and battery powered; no difference detected with operating modes. EUT operating in CW mode on 916MHz.

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	Table 2: Six Highest Radiated Emission Levels - 9 kHz - 1000 MHz								
FREQUENCY MHz	METER READING dBµV	COR Ant dB	RECTION Amp dB	ON FACT Cable dB	ORS dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
34.955	39.8	11.0	-26.8	1.2		25.2	40.0	-14.8	V
35.720	41.3	11.0	-26.8	1.2		26.7	40.0	-13.3	V
131.638	37.1	13.9	-26.6	2.3		26.7	43.5	-16.8	V
240.609	36.4	16.1	-26.1	3.2		29.6	46.0	-16.4	V
298.465	30.7	22.7	-26.2	3.7		30.9	46.0	-15.1	V
324.103	31.6	19.8	-26.3	3.9		29.0	46.0	-17.0	Н

Test Method: ANSI C63.4 (1992) NOTES: H = Horizontal Polarization
Spec Limit: FCC Part 15 Subpart C Section 15.209 V = Vertical Polarization

Test Distance: 3 Meters

COMMENTS: EUT is a SPARS station.. All ports are filled. EUT is solar and battery powered; no difference detected with operating modes. EUT operating in CW mode. Frequency Range Investigated: 9kHz-1000 MHz.

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Table 3: Highest Radiated Emission Levels - 1-10 GHz									
FREQUENCY MHz	METER READING dBμV	COR Ant dB	RECTION Amp dB	ON FACT Cable dB	ORS Dist dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
1832.964	42.0	27.3	-34.8	8.6		43.1	54.0	-10.9	Н
1833.203 48.1 27.3 -34.8 8.6 49.2 54.0 -4.8							V		

Test Method: ANSI C63.4 (1992)

FCC Part 15 Subpart C Section 15.209

Test Distance: 3 Meters

Spec Limit:

NOTES: H = Horizontal Polarization

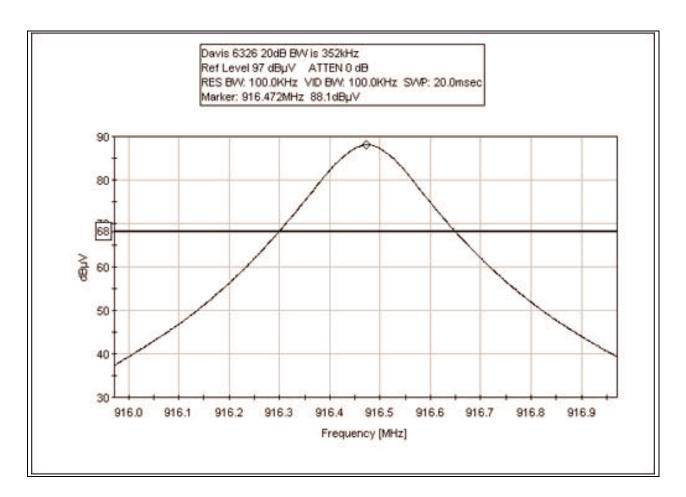
V = Vertical Polarization

COMMENTS: EUT is a SPARS station. All ports are filled. EUT is solar and battery powered; no difference detected with operating modes. EUT operating in CW mode on 916MHz. Frequency Range Investigated: 1-10GHz.

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20dB Occupied Bandwidth Plot

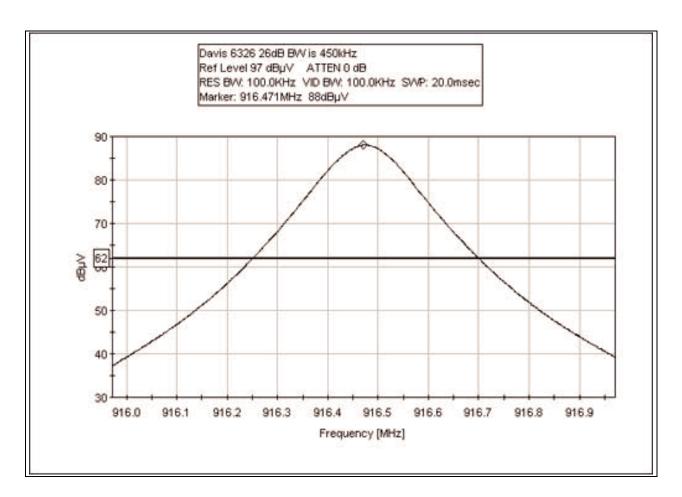


This testing also complies for bandedge.

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26dB Occupied Bandwidth Plot



This testing also complies for bandedge.

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MEASUREMENT UNCERTAINTY

Measurement uncertainty associated with data in this report is a \pm 2.94dB for radiated emissions.

TEMPERATURE AND HUMIDITY DURING TESTING

The temperature during testing was within $+15^{\circ}$ C and $+35^{\circ}$ C.

The relative humidity was between 20% and 75%.

EUT SETUP

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the photographs in Appendix A. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables. The corrected data was then compared to the applicable emission limits to determine compliance.

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available I/O ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. I/O cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected. The interval between different pieces of equipment was approximately 10 centimeters. All excessive interconnecting cable was bundled in 30-40 centimeter lengths.

The radiated emissions data of the SPARS Station, 6326, was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in Table A.

Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in $dB\mu V/m$, the spectrum analyzer reading in $dB\mu V$ was corrected by using the following formula in Table A. This reading was then compared to the applicable specification limit to determine compliance.

TAI	TABLE A: SAMPLE CALCULATIONS							
	Meter reading	$(dB\mu V)$						
+	Antenna Factor	(dB)						
+	Cable Loss	(dB)						
-	Distance Correction	(dB)						
_	Preamplifier Gain	(dB)						
=	Corrected Reading	$(dB\mu V/m)$						

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TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Appendix B were used to collect both the radiated emissions data for the SPARS Station, 6326. For radiated measurements from 9 kHz to 30 MHz, the magnetic loop antenna was used. For radiated measurements below 300 MHz, the biconical antenna was used. For frequencies from 300 to 1000 MHz, the log periodic antenna was used. The horn antenna was used for frequencies above 1000 MHz.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

FCC SECTION 15.35: TABLE B: ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE									
TEST	TEST BEGINNING FREQUENCY ENDING FREQUENCY BANDWIDTH SETTING								
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz						
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz						
RADIATED EMISSIONS	RADIATED EMISSIONS 30 MHz 1000 MHz 120 kHz								
RADIATED EMISSIONS	1000 MHz	10 GHz	1 MHz						

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the Tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the six highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the SPARS Station, 6326.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

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Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

EUT TESTING

Radiated Emissions

The EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters.

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode. For radiated measurements from 9 kHz to 30 MHz, the magnetic loop antenna was used. The frequency range of 30 MHz to 88 MHz was scanned with the biconical antenna located about 1.5 meter above the ground plane in the vertical configuration. During this scan, the turntable was rotated and all peaks at or near the limit were recorded. The frequency range of 100 to 300 MHz was then scanned in the same manner using the biconical antenna and the peaks recorded. Lastly, a scan of the FM band from 88 to 110 MHz was made, using a reduced resolution bandwidth and frequency span. The biconical antenna was changed to the horizontal polarity and the above steps were repeated. After changing to the log periodic antenna in the horizontal configuration, the frequency range of 300 to 1000 MHz was scanned. The log periodic antenna was changed to the vertical polarity and the frequency range of 300 to 1000 MHz was again scanned. For frequencies exceeding 1000 MHz, the horn antenna was used. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

A thorough scan of all frequencies was made manually using a small frequency span, rotating the turntable as needed. The test engineer maximized the readings with respect to the table rotation, antenna height, and configuration of EUT. Maximizing of the EUT was achieved by monitoring the spectrum analyzer on a closed circuit television monitor. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

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APPENDIX A

TEST SETUP DIAGRAM AND PHOTOGRAPHS

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PHOTOGRAPH SHOWING RADIATED EMISSIONS

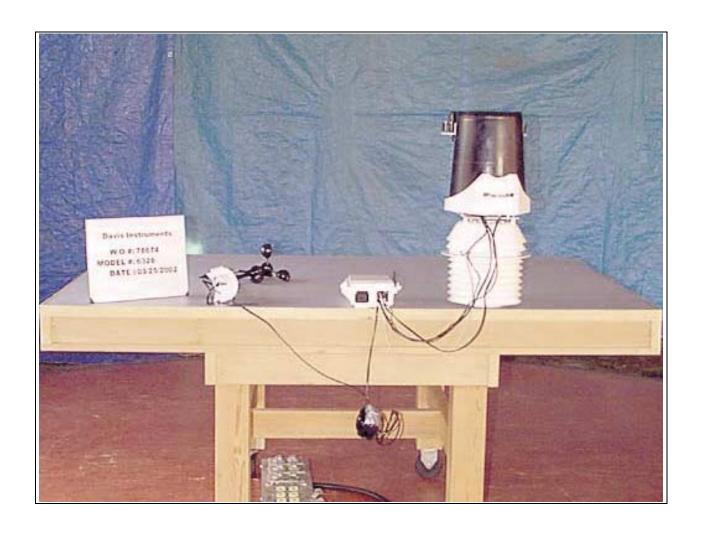


Radiated Emissions - Front View

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PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Back View

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APPENDIX B

TEST EQUIPMENT LIST

Test Equipment used for Emissions testing 30-1000MHz

Equipment	Manufacturer	Model #	Serial #	Asset #	Cal Date	Cal Due
Antenna, Bicon	A&H	SAS-200/542	156	00225	12/06/01	12/6/02
Antenna, Log	A&H	SAS-200/510	154	01330	05/07/01	5/7/02
Preamp	HP	8447D	1937A02604	00099	3/21/02	3/21/03
QP Adapter	HP	85650A	2811A01267	00478	1/30/02	1/30/03
S/A Display	HP	8566B	2403A08241	00489	1/30/02	1/30/03
Spectrum Analyzer	HP	8566B	2209A01404	00490	1/30/02	1/30/03

Test Equipment used for Emissions testing 9kHz – 30MHz

Equipment	Manufacturer	Model #	Serial #	Asset #	Cal Date	Cal Due
QP Adapter	HP	85650A	2811A01267	00478	1/30/02	1/30/03
S/A Display	HP	8566B	2403A08241	00489	1/30/02	1/30/03
Spectrum Analyzer	HP	8566B	2209A01404	00490	1/30/02	1/30/03
Antenna, Loop	EMCO	6502	1074	00226	5/31/2001	5/31/02

Test equipment used for Emissions testing 1-10GHz

Equipment	Manufacturer	Model #	Serial #	Asset #	Cal Date	Cal Due
QP Adapter	HP	85650A	2811A01267	00478	1/30/02	1/30/03
S/A Display	HP	8566B	2403A08241	00489	1/30/02	1/30/03
Spectrum Analyzer	HP	8566B	2209A01404	00490	1/30/02	1/30/03
Preamp	HP	8449B	3008A00301	02010	10/19/01	10/19/02
Antenna, Horn	EMCO	3115	9307-4085	00656	3/19/02	3/19/03
1-18GHz						
Cable #4 (50')	Andrew	FSJ1-50A	N/A	N/A	4/16/01	4/16/02
Cable #7 (25')	Andrew	FSJ1-50A	N/A	N/A	4/16/01	4/16/02
Cable #8 (6')	Andrew	FSJ1-50A	N/A	N/A	4/16/01	4/16/02

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APPENDIX C: MEASUREMENT DATA SHEETS

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Test Location: CKC Laboratories • 5473A Clouds Rest • Mariposa CA, 95338 • 800-500-4EMC (4362)

Customer: Davis Instruments
Specification: FCC 15.249 (a)

 Work Order #:
 78674
 Date:
 03/25/2002

 Test Type:
 Maximized Emissions
 Time:
 15:40:43

Equipment: SPARS Station Sequence#: 2

Manufacturer: Davis Instruments Tested By: Randal Clark

Model: 6326 S/N: US-00-SP

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N	
SPARS Station*	Davis Instruments	6326	US-00-SP	

Support Devices:

Function	Manufacturer	Model #	S/N	

Test Conditions / Notes:

EUT is a SPARS station. All ports are filled. EUT is solar and battery powered; no difference detected with operating modes. EUT operating in CW mode on 916MHz.

Transducer Legend:

8	
T1=Log s/n 154	T2=Amp - S/N 604
T3=Cable - 10 Meter	

Measu	rement Data:	Reading listed by margin.				Test Distance: 3 Meters					
#	Freq	Rdng	T1	T2	T3		Dist	Corr	Spec	Margin	Polar
	MHz	dΒμV	dB	dB	dB	dB	Table	$dB\mu V/m$	$dB\mu V/m$	dB	Ant
1	916.471M	88.2	+23.8	-27.0	+7.0		+0.0	92.0	93.9	-1.9	Horiz
2	916.470M	83.7	+23.8	-27.0	+7.0		+0.0	87.5	93.9	-6.4	Vert

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Test Location: CKC Laboratories • 5473A Clouds Rest • Mariposa CA, 95338 • 800-500-4EMC (4362)

Customer: **Davis Instruments** Specification: **FCC 15.209**

Work Order #:78674Date:03/26/2002Test Type:Maximized EmissionsTime:15:43:30Equipment:SPARS StationSequence#:10

Manufacturer: Davis Instruments Tested By: Randal Clark

Model: 6326 S/N: US-00-SP

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
SPARS Station*	Davis Instruments	6326	US-00-SP

Support Devices:

Function	Manufacturer	Model #	S/N	

Test Conditions / Notes:

EUT is a SPARS station. All ports are filled. EUT is solar and battery powered; no difference detected with operating modes. EUT operating in CW mode. Frequency Range Investigated: 9kHz-1000 MHz.

Transducer Legend:

T1=Amp - S/N 604	T2=Bicon 156
T3=Log s/n 154	T4=Cable - 10 Meter

Measur	rement Data:	Re	eading lis	ted by ma	argin.		Τe	est Distance	e: 3 Meters	1	
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dΒμV	dB	dB	dB	dB	Table	$dB\mu V/m$	$dB\mu V/m$	dB	Ant
1	35.720M	41.3	-26.8	+11.0	+0.0	+1.2	+0.0	26.7	40.0	-13.3	Vert
2	34.955M	39.8	-26.8	+11.0	+0.0	+1.2	+0.0	25.2	40.0	-14.8	Vert
3	298.465M	30.7	-26.2	+22.7	+0.0	+3.7	+0.0	30.9	46.0	-15.1	Vert
4	240.609M	36.4	-26.1	+16.1	+0.0	+3.2	+0.0	29.6	46.0	-16.4	Vert
5	131.638M	37.1	-26.6	+13.9	+0.0	+2.3	+0.0	26.7	43.5	-16.8	Vert
6	324.103M	31.6	-26.3	+0.0	+19.8	+3.9	+0.0	29.0	46.0	-17.0	Horiz
7	265.283M	33.0	-26.1	+18.0	+0.0	+3.4	+0.0	28.3	46.0	-17.7	Vert
8	38.135M	36.2	-26.8	+11.1	+0.0	+1.2	+0.0	21.7	40.0	-18.3	Vert
9	77.220M	39.0	-26.8	+7.1	+0.0	+1.7	+0.0	21.0	40.0	-19.0	Horiz
10	35.212M	34.0	-26.8	+11.0	+0.0	+1.2	+0.0	19.4	40.0	-20.6	Horiz
11	179.852M	29.9	-26.4	+16.4	+0.0	+2.7	+0.0	22.6	43.5	-20.9	Vert
12	260.691M	30.4	-26.1	+17.4	+0.0	+3.3	+0.0	25.0	46.0	-21.0	Vert

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13	395.980M	31.2	-26.8	+0.0	+15.9	+4.3	+0.0	24.6	46.0	-21.4	Vert
14	396.074M	31.1	-26.8	+0.0	+15.9	+4.3	+0.0	24.5	46.0	-21.5	Horiz
15	372.060M	29.6	-26.6	+0.0	+17.1	+4.1	+0.0	24.2	46.0	-21.8	Horiz
16	167.276M	30.7	-26.4	+14.6	+0.0	+2.5	+0.0	21.4	43.5	-22.1	Horiz
17	124.872M	28.6	-26.6	+14.4	+0.0	+2.2	+0.0	18.6	43.5	-24.9	Horiz

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Test Location: CKC Laboratories • 5473A Clouds Rest • Mariposa CA, 95338 • 800-500-4EMC (4362)

Customer: **Davis Instruments** Specification: **FCC 15,209**

 Work Order #:
 78674
 Date:
 03/26/2002

 Test Type:
 Maximized Emissions
 Time:
 09:29:50

Equipment: SPARS Station Sequence#: 6

Manufacturer: Davis Instruments Tested By: Randal Clark

Model: 6326 S/N: US-00-SP

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N	
SPARS Station*	Davis Instruments	6326	US-00-SP	

Support Devices:

Function	Manufacturer	Model #	S/N	

Test Conditions / Notes:

EUT is a SPARS station. All ports are filled. EUT is solar and battery powered; no difference detected with operating modes. EUT operating in CW mode on 916MHz. Frequency Range Investigated: 1-10GHz.

Transducer Legend:

T1=Amp - S/N 301	T2-Horn 1 19 CHz (Marinasa)
11-Amp - 3/19 301	T2=Horn 1-18 GHz (Mariposa)
T3=Cable GHz #4	T4=Cable GHz #7
	TT Guile GILE II /
T5=Cable GHz #6	

Measu	rement Data:	Re	eading lis	ted by ma	argin.		Τe	est Distance	e: 3 Meters	3	
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5								
	MHz	dΒμV	dB	dB	dB	dB	Table	$dB\mu V/m$	$dB\mu V/m$	dB	Ant
1	1833.203M	48.1	-34.8	+27.3	+4.3	+2.1	+0.0	49.2	54.0	-4.8	Vert
			+2.2								
2	1832.964M	42.0	-34.8	+27.3	+4.3	+2.1	+0.0	43.1	54.0	-10.9	Horiz
			+2.2								

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