CKC LABORATORIES, INC. Testing the Future

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EMC/SAFETY

DAVIS INSTRUMENTS TEST REPORT

FOR THE

INTEGRATED SENSOR SUITE, 6320

FCC PART 15 SUBPART C SECTIONS 15.209 & 15.249

COMPLIANCE

DATE OF ISSUE: JANUARY 24, 2003

PREPARED FOR:

Davis Instruments
3456 Diablo Avenue
Hayward, CA 94545

P.O. No.: 53657(n1)
W.O. No.: 79990

PREPARED BY:

Joyce Walker
CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

Date of test: January 15-20, 2003

Report No.: FC03-008

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ADMINISTRATIVE INFORMATION

DATE OF TEST:	January 15-20, 2003
DATE OF RECEIPT:	January 15, 2003
PURPOSE OF TEST:	To demonstrate the compliance of the Integrated Sensor Suite, 6320 with the requirements for FCC Part 15 Subpart C Sections 15.209 & 15.249 devices.
TEST METHOD:	ANSI C63.4 (1992)
MANUFACTURER:	Davis Instruments 3456 Diablo Avenue Hayward, CA 94545
REPRESENTATIVE:	Perry Dillon
TEST LOCATION:	CKC Laboratories, Inc. 5473A Clouds Rest Mariposa, CA 95338

SUMMARY OF RESULTS

As received, the Davis Instruments Integrated Sensor Suite, 6320 was found to be fully compliant with the following standards and specifications:

United States

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

Canada

RSS-210 using:

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

Industry of Canada File No. IC 3082-B

Canadian RSS210 vs. FCC 15.249 Matrix

FCC	15.249(a)	15.249(b)	15.249(c)	15.249(d)
Canada	6.2.2(m2)(1)	6.2.2(m2)(2)	6.2.2(m2)(3)	6.2.2(m2)(4)

CONDITIONS FOR COMPLIANCE

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

APPROVALS

QUALITY ASSURANCE:

Steve Behm, Director of Engineering Services and Quality Assurance

Joyce Walker, Quality Assurance Administrative Manager

Chuck Kendall, Lab Manager

TEST PERSONNEL:

Randy Clark, EMC Engineer

EQUIPMENT UNDER TEST (EUT) DESCRIPTION
The Weather Station tested by CKC Laboratories was a production unit.

15.31(e) Voltage Variations
Not applicable to this device because it is battery powered.

15.31(m) Number Of Channels
This device operates on a single channel.

15.33(a) Frequency Ranges Tested
15.209 Radiated: 50 kHz – 10 GHz.

FCC SECTION 15.35 TABLE B: ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
RADIATED EMISSIONS	50 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	10 GHz	1 MHz

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.

15.215 Additional Provisions to the General Radiated Emission Limitations
The fundamental frequency was kept within the central 80% of the permitted band in order to minimize the possibility of out-of-band operation. Refer to Appendix B for the test equipment used and Appendix C for the occupied bandwidth plot(s).

EUT Operating Frequency
The EUT was operating at 916.591 MHz.

Temperature and Humidity During Testing
The temperature during testing was within +15°C and + 35°C.
The relative humidity was between 20% and 75%.

EQUIPMENT UNDER TEST

Instruments Integrated Sensor Suite
Manuf: Davis Instruments
Model: 6320
Serial: 6320US-1
FCC ID: (pending)

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device:

Anemometer
Manuf: Davis Instruments
Model: 6410
Serial: NA
FCC ID: DoC

REPORT OF MEASUREMENTS

The following tables report the worst case emissions levels recorded during the tests performed on the Integrated Sensor Suite, 6320. 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: Fundamental Emission Levels

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS Ant dB	Amp dB	Cable dB	Dist dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
916.591	89.8	23.2	-27.0	6.2		92.2	93.9	-1.7	H
916.591	85.5	23.2	-27.0	6.2		87.9	93.9	-6.0	V

Test Method: ANSI C63.4 (1992)
Spec Limit : FCC Part 15 Subpart C Section 15.249
Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization

COMMENTS: EUT is a weather station with an operating frequency of 916MHz. Support equipment ensures all ports are filled. This configuration produces the worst case emissions characteristics.

Table 2: Highest Radiated Emission Levels: 50kHz-10GHz

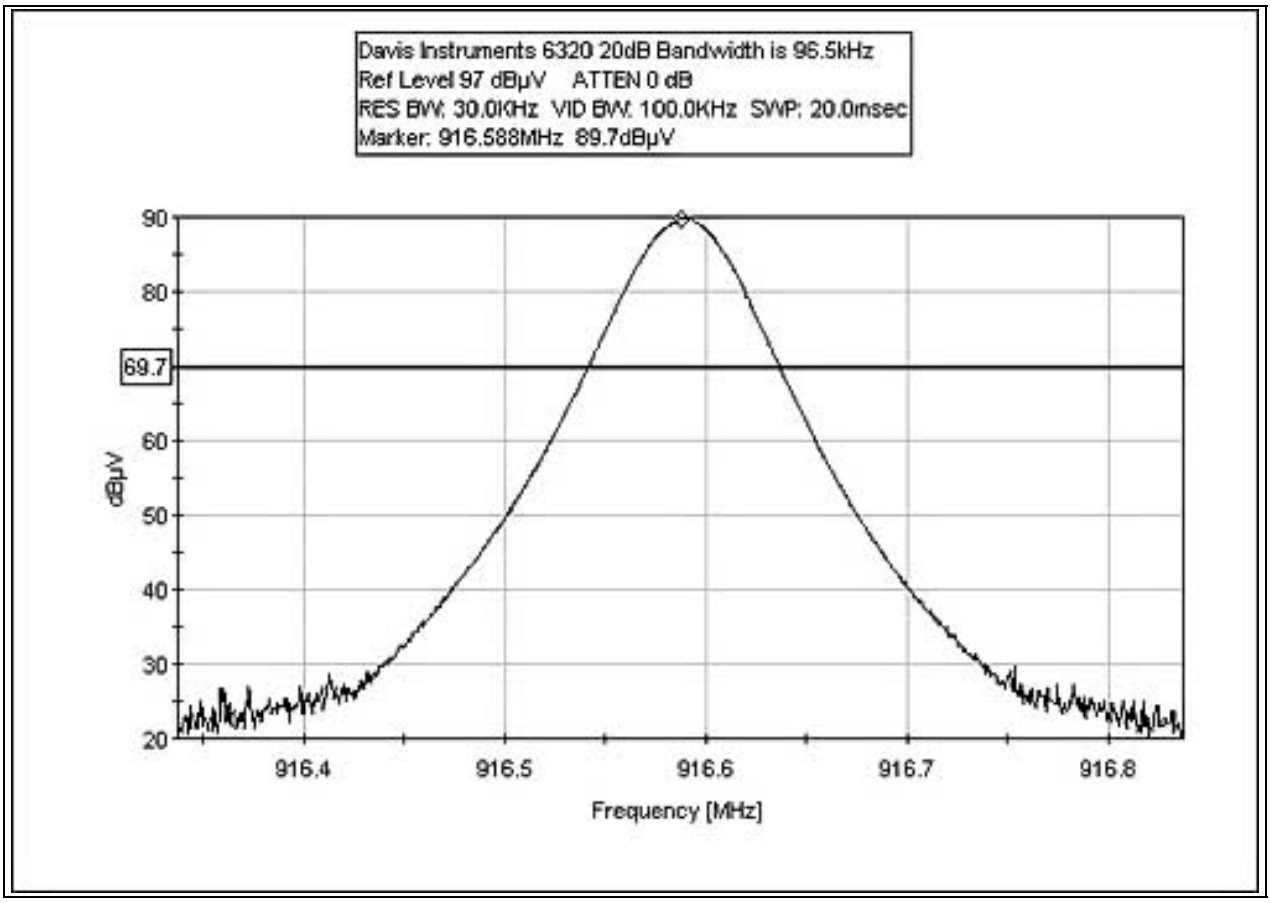
FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS Ant dB	Amp dB	Cable dB	Dist dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
1833.030	48.8	27.3	-34.8	6.9		48.2	54.0	-5.8	V
1833.200	50.4	27.3	-34.8	6.9		49.8	54.0	-4.2	H
2749.730	35.7	26.9	-32.0	13.6		44.2	54.0	-9.8	VA
2749.850	37.3	26.9	-32.0	13.6		45.8	54.0	-8.2	HA
3666.330	31.3	29.2	-32.0	11.7		40.2	54.0	-13.8	VA

Test Method: ANSI C63.4 (1992)
Spec Limit : FCC Part 15 Subpart C Section 15.209
Test Distance: 3 Meters

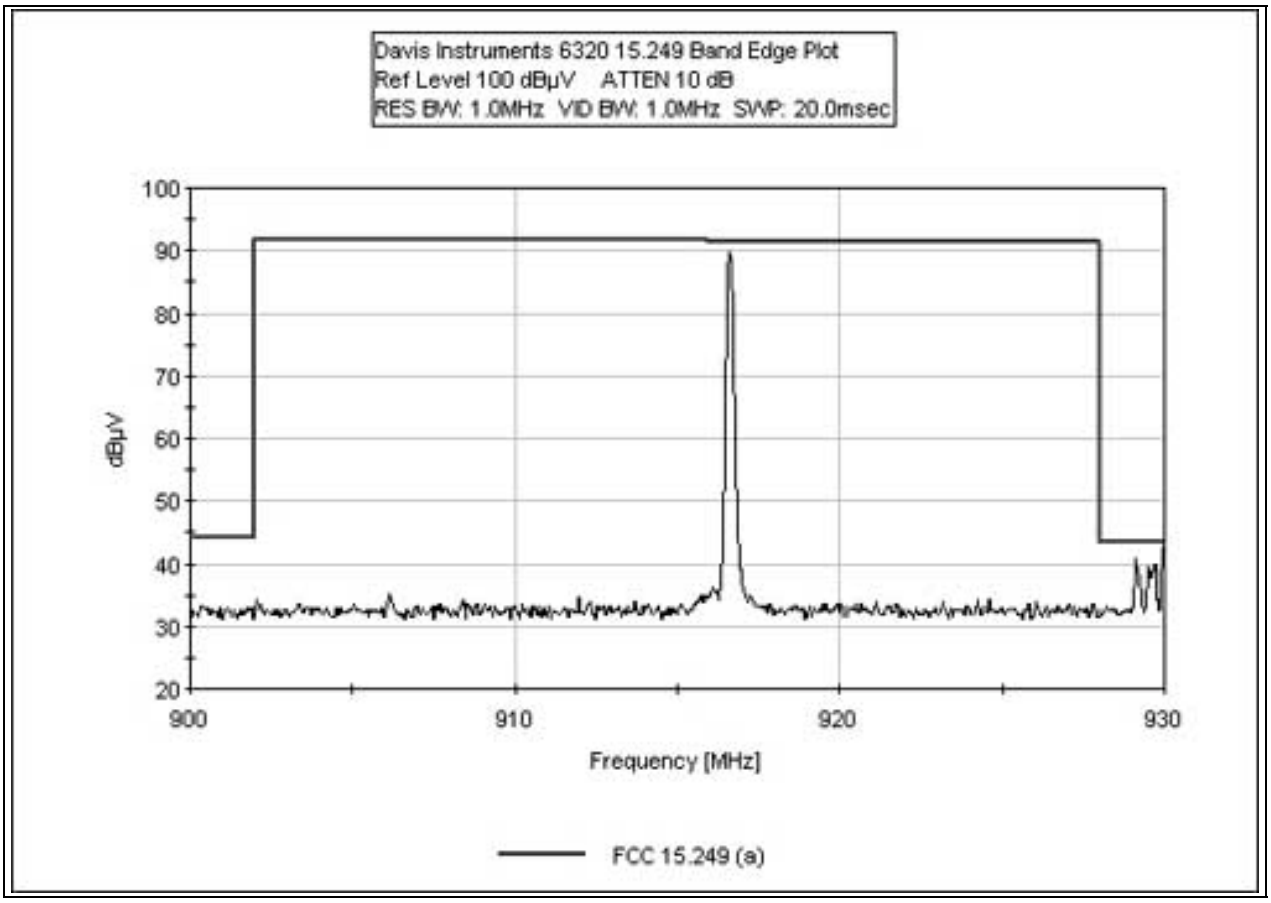
NOTES: H = Horizontal Polarization
V = Vertical Polarization
A = Average Reading

COMMENTS: EUT is a weather station with an operating frequency of 916MHz. Support equipment ensures all ports are filled. This configuration produces the worst case emissions characteristics. Frequency Range Investigated: 50kHz-10 GHz. **No EUT signals found within 20dB of the limit below 1000 MHz.**

BANDWIDTH PLOT



BANDEDGE PLOT



MEASUREMENT UNCERTAINTY

TEST	HIGHEST UNCERTAINTY
Radiated Emissions	+/- 2.94 dB

Note: Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Statements of compliance are based on the nominal values only.

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 radiated emissions data of the Integrated Sensor Suite, 6320, 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 dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula in Table A. This reading was then compared to the applicable specification limit to determine compliance.

TABLE A: SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Appendix B were used to collect the radiated emissions data. For radiated measurements from 50 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 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 dBµV, and a vertical scale of 10 dB per division.

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.

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.

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 test mode. For radiated measurements from 50 kHz to 30 MHz, the magnetic loop antenna was used. The frequency range of 30 MHz - 88 MHz was scanned with the biconilog 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. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and frequency span. The biconilog 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 - 1000 MHz was scanned. The log periodic antenna was changed to the vertical polarity and the frequency range of 300 - 1000 MHz was again scanned. The horn antenna was used to scan for frequencies above 1000 MHz. 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.

APPENDIX A

TEST SETUP PHOTOGRAPHS

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Radiated Emissions - Front View

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Radiated Emissions - Back View

APPENDIX B

TEST EQUIPMENT LIST

Test equipment for Spurs < 1GHz

Description	*Manufacturer*	*Model #*	*Serial #*	*Asset #*	*Cal Date*	*Cal Due*
Antenna, Bicon	A&H	SAS-200/542	156	00225	12/2/02	12/2/03
Antenna, Log Periodic	A&H	SAS-200/510	154	01330	6/19/02	6/19/03
Antenna, Loop	EMCO	6502	1074	00226	6/5/02	6/5/03
Cable, 3/10m	Andrews	Hardline	N/A	N/A	11/18/02	11/18/03
Preamp	HP	8447D	1937A02604	00099	3/21/02	3/21/03
SA - Quasi Peak Adapter	HP	8565OA	2521A00904	02495	10/23/02	10/23/03
SA Display	HP	85662A	2237A04323	00091	10/23/02	10/23/03
SA RF Section	HP	8568B	2235A02425	00092	10/23/02	10/23/03

Test equipment for Spurs >1Ghz

Description	*Manufacturer*	*Model #*	*Serial #*	*Asset #*	*Cal Date*	*Cal Due*
Preamp	HP	8449B	3008A00301	02010	10/18/02	10/18/03
Antenna, Horn 1-18GHz	EMCO	3115	9307-4085	00656	3/19/02	3/19/03
Cable #1 (30')	Andrew	FSJ1-50A	N/A	N/A	4/16/02	4/16/03
Cable #4 (50')	Andrew	FSJ1-50A	N/A	N/A	4/16/02	4/16/03
Cable #8 (6')	Andrew	FSJ1-50A	N/A	N/A	4/16/02	4/16/03
Spectrum Analyzer	HP	8596E	3346A00225	00783	6/24/02	6/24/03

APPENDIX C: MEASUREMENT DATA SHEETS

Test Location: CKC Laboratories Inc. •5473A Clouds Rest • Mariposa CA 95338 • 1 800 500 4EMC (4362)

Customer: **Davis Instruments**
Specification: **FCC 15.249 (a)**
Work Order #: **79990** Date: 1/15/03
Test Type: **Maximized Emissions** Time: 14:24:16
Equipment: **ISS** Sequence#: 2
Manufacturer: Davis Instruments Tested By: Randal Clark
Model: 6320
S/N: 6320US-1

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
ISS*	Davis Instruments	6320	6320US-1

Support Devices:

Function	Manufacturer	Model #	S/N
Anemometer	Davis Instruments	6410	

Test Conditions / Notes:

EUT is a weather station with an operating frequency of 916MHz. Support equipment ensures all ports are filled. This configuration produces the worst case emissions characteristics.

Transducer Legend:

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

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	916.591M	89.8	-27.0	+23.2	+6.2		+0.0	92.2	93.9 Note 3	-1.7	Horiz
2	916.591M	85.5	-27.0	+23.2	+6.2		+0.0	87.9	93.9	-6.0	Vert

Test Location: CKC Laboratories Inc. •5473A Clouds Rest • Mariposa CA 95338 • 1 800 500 4EMC (4362)

Customer: **Davis Instruments**
Specification: **FCC 15.209**
Work Order #: **79990** Date: 1/15/03
Test Type: **Maximized Emissions** Time: 15:34:56
Equipment: **ISS** Sequence#: 4
Manufacturer: Davis Instruments Tested By: Randal Clark
Model: 6320
S/N: 6320US-1

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
ISS*	Davis Instruments	6320	6320US-1

Support Devices:

Function	Manufacturer	Model #	S/N
Anemometer	Davis Instruments	6410	

Test Conditions / Notes:

EUT is a weather station with an operating frequency of 916MHz. Support equipment ensures all ports are filled. This configuration produces the worst case emissions characteristics. Frequency Range Investigated: 50kHz-10GHz. **No EUT signals found within 20dB of the limit below 1000 MHz.**

Transducer Legend:

T1=Amp - S/N 301 T2=Horn 1-18 GHz (Mariposa)
T3=Cable GHz #8 T4=Cable GHz #1
T5=Cable GHz #4

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1833.200M	50.4	-34.8 +3.8	+27.3	+0.7	+2.4	+0.0	49.8	54.0	-4.2	Horiz
2	1833.030M	48.8	-34.8 +3.8	+27.3	+0.7	+2.4	+0.0	48.2	54.0	-5.8	Vert
3	2749.850M Ave	37.3	-32.0 +7.3	+26.9	+1.1	+5.2	+0.0	45.8	54.0	-8.2	Horiz
^	2749.850M	46.9	-32.0 +7.3	+26.9	+1.1	+5.2	+0.0	55.4	54.0	+1.4	Horiz
5	2749.730M Ave	35.7	-32.0 +7.3	+26.9	+1.1	+5.2	+0.0	44.2	54.0	-9.8	Vert
^	2749.730M	45.7	-32.0 +7.3	+26.9	+1.1	+5.2	+0.0	54.2	54.0	+0.2	Vert
7	3666.330M Ave	31.3	-32.0 +6.5	+29.2	+1.0	+4.2	+0.0	40.2	54.0	-13.8	Vert
^	3666.330M	43.7	-32.0 +6.5	+29.2	+1.0	+4.2	+0.0	52.6	54.0	-1.4	Vert