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A2LA ACCREDITED EMC/SAFETY

CERTIFICATION TEST REPORT

FOR THE

CAR ALARM SYSTEM TRANSMITTER, 204301/8

FCC PART 15.231

COMPLIANCE

DATE OF ISSUE: MARCH 2, 2000

PREPARED FOR:

PKF Electronics (PTY) LTD.
P.O. Box 3660 Durban 4000
KWA Zulu, Natal, South Africa

W.O. No: 73326

Report No: FC00-013

PREPARED BY:

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

Date of test: January 31, 2000

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APPROVED BY:

Dennis Ward

Dennis Ward
Director of Laboratories
CKC Laboratories, Inc.

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ADMINISTRATIVE INFORMATION

DATE OF TEST:	January 31, 2000
PURPOSE OF TEST:	To demonstrate the compliance of the Car Alarm System Transmitter, 204301/8, with the requirements for FCC Part 15.231 devices.
MANUFACTURER:	PKF Electronics (PTY) LTD. P.O. Box 3660 Durban 4000 KWA Zulu, Natal, South Africa
REPRESENTATIVE:	M B Parnaby
TEST LOCATION:	CKC Laboratories, Inc. 22105 Wilson River Hwy Tillamook, OR 97141
TEST PERSONNEL:	Mike Wilkinson
TEST METHOD:	ANSI C63.4 1992
FREQUENCY RANGE TESTED:	9 kHz - 5000 MHz
EQUIPMENT UNDER TEST:	**Car Alarm System Transmitter** Manuf: PKF Electronics (PTY) LTD. Model: 204301/8 Serial: None FCC ID: Pending

SUMMARY OF RESULTS

The PKF Electronics (PTY) LTD. Car Alarm System Transmitter, 204301/8, was tested in accordance with ANSI C63.4 1992 for compliance with FCC Part 15.231.

As received, the above equipment was found to be fully compliant with the limits of FCC Part 15.231. The results in this report apply only to the items tested, as identified herein.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Low power remote control transmitter.

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ±4dB measurement uncertainty.

EUT OPERATING FREQUENCY

The EUT was operating at 433 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%.

PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

REPORT OF MEASUREMENTS

The following tables report the highest worst case levels recorded during the tests performed on the Car Alarm System Transmitter, 204301/8. All readings taken are peak readings unless otherwise noted by a "Q" or "A". The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Fundamental Radiated Emission Levels

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS Bilog dB	Amp dB	Cable dB	Adj dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
433.847 Flat configuration	79.0	16.7	-27.4	4.7	5.7	67.3	80.5	-13.2	V
433.848 Side configuration	87.0	16.7	-27.4	4.7	5.7	75.3	80.5	-5.2	V
433.852 Side configuration	90.3	16.7	-27.4	4.7	5.7	78.6	80.5	-1.9	V
433.852 Vertical configuration	85.8	16.7	-27.4	4.7	5.7	74.1	80.5	-6.4	H
433.854 Vertical configuration	91.8	16.7	-27.4	4.7	5.7	80.1	80.5	-0.4	V
433.854 Flat configuration	89.6	16.7	-27.4	4.7	5.7	77.9	80.5	-2.6	V

Test Method: ANSI C63.4 1992
Spec Limit : FCC Part 15.231(b)
Test Distance: 3 Meters

NOTES:
H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: EUT was placed on the test table in 3 orthogonal planes as indicated for each reading. The EUT has a fresh internal battery and is transmitting continuously with modulation. The temperature was 15.3°C and the humidity was 55%. All readings have a 5.7 dB adjustment made to arrive at the average corrected value. This was derived from the 51.89% measured duty cycle (20 Log .5189 = 5.69 dB).

Table 2: Six Highest Radiated Emission Levels

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS Ant dB	Amp dB	Cable dB	Adj dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
867.718	57.9	23.2	-27.6	7.0	5.7	54.8	61.9	-7.1	V
1301.543	62.8	24.9	-35.4	5.7	5.7	52.3	54.0	-1.7	VA
2169.337	58.0	27.6	-32.9	7.6	5.7	54.6	61.9	-7.3	VA
2603.111	59.3	28.8	-32.1	8.7	5.7	59.0	61.9	-2.9	HA
3037.028	56.7	30.5	-30.8	11.0	5.7	61.7	61.9	-0.2	VA
3904.445	46.3	32.5	-33.1	10.2	5.7	50.2	54.0	-3.8	VA

Test Method: ANSI C63.4 1992
Spec Limit : FCC Part 15.231(b)
Test Distance: 3 Meters

NOTES:
H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: The EUT has a fresh internal battery and is transmitting continuously with modulation. The temperature was 15.3°C and the humidity was 55%. The orthogonal position of the EUT is vertical. This is the worst case position as determined by the fundamental measurements and preliminary spurious investigation. All readings are harmonics of the fundamental and have a 5.7 dB adjustment made to arrive at the average corrected value. This was derived from the 51.89% measured duty cycle (20 Log .5189 = 5.69 dB). The frequency range investigated was 9 kHz to 5.0 GHz

TABLE A

LIST OF TEST EQUIPMENT

Tillamook site C

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP 8568A	2235A02426	04/21/1999	04/21/2000	202
HP 85650A	2043A00433	04/21/1999	04/21/2000	29
HP 8447D	2727A05432	06/01/1999	06/01/2000	282
Chase CBL6111C	2456	08/30/1999	08/30/2000	1991
HP8564E	3623A00539	12/07/1999	12/07/2000	1406
Cable 125 ft.	n/a	02/04/1999	02/04/2000	2086
Cable 10 ft.	n/a	02/05/1999	02/05/2000	1016
EMCO 3115	9006-3414	02/24/1999	02/24/2000	327
HP 83051A	3332A00309	10/19/1999	10/19/2000	2115
EMCO 6502	2078	06/17/1999	06/17/2000	432

Test software, EMI Test 3.09.

EUT SETUP

The equipment under test (EUT) was set up in a manner that represented its normal use. Any special conditions required for the EUT to operate normally are identified in the comments that accompany Table 1 for fundamental radiated emissions and Table 2 for radiated emissions. Additionally, a complete description of the crystals and printed circuit boards are included on the information sheets contained in Appendix A.

During radiated emissions testing, 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. This configuration is typical for radiated emissions testing of table top devices.

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect the radiated emissions data for the Car Alarm System Transmitter, 204301/8. For radiated measurements below 30 MHz, the magloop antenna was used. For radiated measurements from 30 to 1000 MHz, the biconilog antenna was used. For frequencies above 1000 MHz, the horn antenna was used. All antennas were located at a distance of 3 meters from the edge of the EUT.

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.

TABLE B : ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE

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	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	5 GHz	1 MHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1 and 2 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 Car Alarm System Transmitter, 204301/8.

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

When the frequencies exceed 1 GHz, 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.

TEST METHODS

The radiated emissions data of the Car Alarm System Transmitter, 204301/8, 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 the "Sample Calculations". The corrected data was then compared to the FCC Part 15.231 emissions limits to determine compliance.

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

Radiated Emissions Testing

During the preliminary radiated scan, the EUT was powered up and operating in its defined test mode. Frequencies below 30 MHz were tested using a loop antenna. The frequency range of 30 MHz - 1000 MHz was then scanned with the biconilog antenna located about 1.5 meter above the ground plane in the vertical polarity. During this scan, the turntable was rotated and all peaks, which were 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 a reduced frequency span. The biconilog antenna was changed to the horizontal polarity and the above steps were repeated. 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.

For the final radiated scan, the equipment was again positioned facing the antenna. A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation and antenna. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

FCC Part 15.231(c) - Occupied Bandwidth Measurements

In accordance with Part 15.231(c), the fundamental frequency was kept within 0.25% of the center frequency for devices operating >70 MHz and < 900 MHz.

SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the emissions readings in Tables 1 and 2. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula:

Meter reading (dBµV)
+ Antenna Factor (dB)
+ Cable Loss (dB)
- Distance Correction (dB)
- Pre-amplifier Gain (dB)

= Corrected Reading (dBµV/m)

This reading was then compared to the applicable specification limit to determine compliance.

A typical data sheet will display the following in column format:

#	Freq MHz	Rdng dBuV	Cable	Amp	Bilog	Horn	Log	Dist	Corr dBuV/m	Spec	Margin	Polar
	Adj											

means reading number
Freq MHz is the frequency in MHz of the obtained reading.
Rdng dBuV is the reading obtained on the spectrum analyzer in dBµV.
Amp is short for the preamplifier factor or gain in dB.
Bilog is the biconilog antenna factor in dB.
Log is the log periodic antenna factor in dB.
Horn is the horn antenna factor in dB.
Cable is the cable loss in dB of the coaxial cable on the OATS.
Dist is the distance factor (in dB). It is used when testing at a different test distance than the one stated in the spec.
Corr dBµV/m is the corrected reading which is now in dBµV/m (field strength).
Spec is the specification limit (dB) stated in the agency's regulations.
Margin is the closeness to the specified limit in dB; + is over and - is under the limit.
Polar is the Polarity of the antenna with respect to earth.
Adj is the 5.7 dB adjustment made to arrive at the average corrected value

APPENDIX A

INFORMATION ABOUT THE EQUIPMENT UNDER TEST

INFORMATION ABOUT THE EQUIPMENT UNDER TEST	
Test Software/Firmware:	N/A
CRT was displaying:	N/A
Power Supply Manufacturer:	N/A
Power Supply Part Number:	N/A
AC Line Filter Manufacturer:	N/A
AC Line Filter Part Number:	N/A
Line voltage used during testing:	N/A

I/O PORTS	
Type	#
N/A	

CRYSTAL OSCILLATORS	
Type	Freq In MHz
SAW CONTROLLED RESONATOR	433,92

PRINTED CIRCUIT BOARDS				
Function	Model & Rev	Clocks, MHz	Layers	Location
LOW POWERED TRANMITTER WITH ON/OF AM MODULATION	204-312	SAW CONTROLLED 433,92	2	SINGLE BOARD LOCATED IN PLASTIC HOUSING

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Radiated Emissions - Front Side

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Radiated Emissions - Flat View

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Radiated Emissions - Vertical View

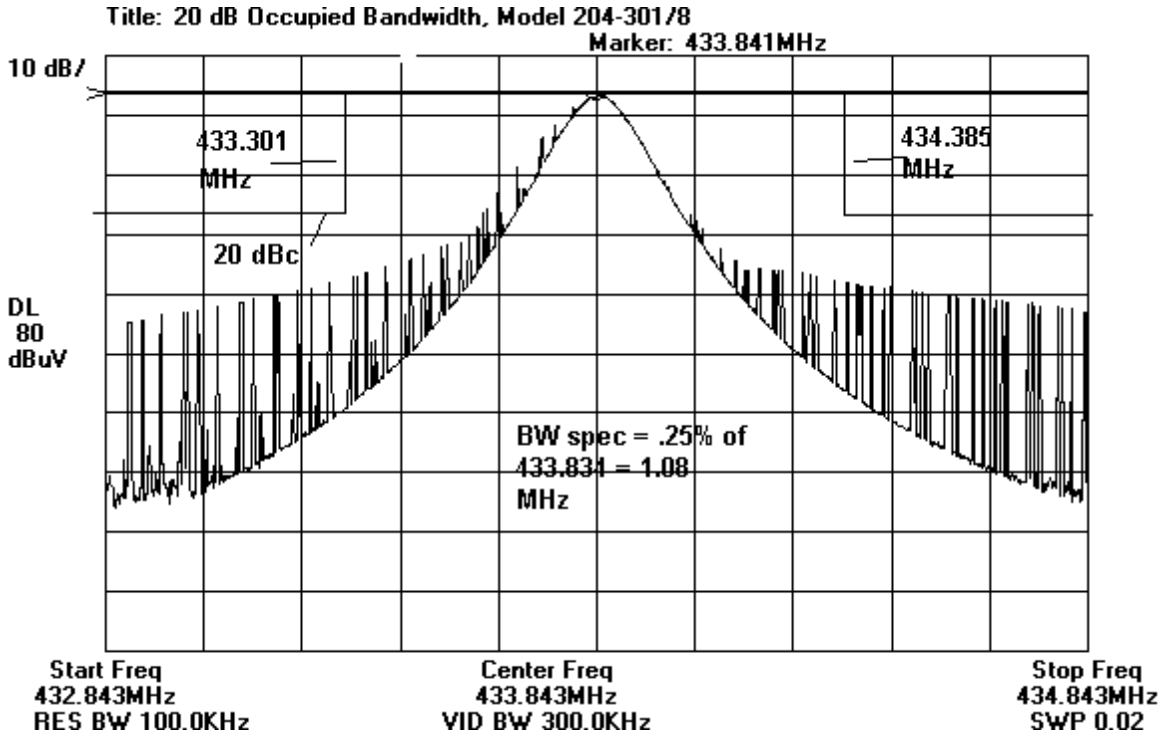
PHOTOGRAPH SHOWING RADIATED EMISSIONS

Radiated Emissions - Back View

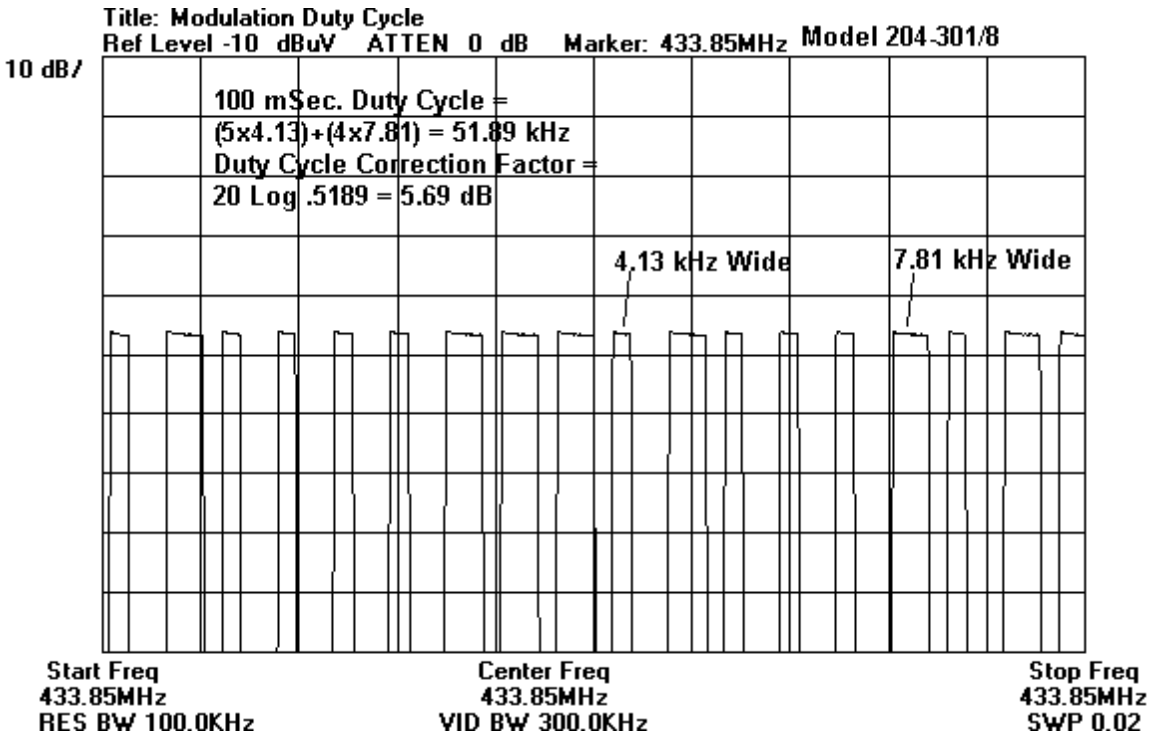
APPENDIX B

MEASUREMENT DATA SHEETS

Occupied Bandwidth Plot



Duty Cycle Plot Configuration



Test Location: CKC Laboratories. Inc. • 22105 Wilson River Hwy • Tillamook, OR 97141 • 800 500-4EMC

Customer: **Knightwatch, LTD**
Specification: **15.231 Fundamental**
Work Order #: **73326** Date: 1/31/2000
Test Type: **Maximized Emissions** Time: 17:16:54
Equipment: **Vehicle Security Transmitter** Sequence#: 1
Manufacturer: Knightwatch, LTD Tested By: Mike Wilkinson
Model: 204-301/8
S/N: None

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

Function	Manufacturer	Model #	S/N
Vehicle Security Transmitter*	Knightwatch, LTD	204-301/8	None

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

EUT was placed on the test table in 3 orthogonal planes as indicated for each reading. The EUT has a fresh internal battery and is transmitting continuously with modulation. The temperature was 15.3°C and the humidity was 55%. All readings have a 5.7 dB adjustment made to arrive at the average corrected value. This was derived from the 51.89% measured duty cycle (20 Log .5189 = 5.69 dB).

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

#	Freq MHz	Rdng dBµV	Amp dB	Bilog dB	Cable dB	Adj dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	433.854M	91.8	-27.4	+16.7	+4.7	+5.7	+0.0	80.1	80.5	-0.4	Vert
									Vertical Position		
2	433.852M	90.3	-27.4	+16.7	+4.7	+5.7	+0.0	78.6	80.5	-1.9	Vert
									Side Position		
3	433.854M	89.6	-27.4	+16.7	+4.7	+5.7	+0.0	77.9	80.5	-2.6	Vert
4	433.848M	87.0	-27.4	+16.7	+4.7	+5.7	+0.0	75.3	80.5	-5.2	Vert
									Side Position		
5	433.852M	85.8	-27.4	+16.7	+4.7	+5.7	+0.0	74.1	80.5	-6.4	Horiz
									Vertical Position		
6	433.847M	79.0	-27.4	+16.7	+4.7	+5.7	+0.0	67.3	80.5	-13.2	Vert
7	433.843M	76.7	-27.4	+16.7	+4.7	+5.7	+0.0	65.0	80.5	-15.5	Vert

Test Location: CKC Laboratories. Inc. • 22105 Wilson River Hwy • Tillamook, OR 97141 • 800 500-4EMC

Customer: **Knightwatch, LTD**
Specification: **15.231 spurs**
Work Order #: **73326** Date: 02/01/2000
Test Type: **Radiated Scan** Time: 16:27:06
Equipment: **Vehicle Security Transmitter** Sequence#: 2
Manufacturer: Knightwatch, LTD Tested By: Mike Wilkinson
Model: 204-301/8
S/N: None

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

Function	Manufacturer	Model #	S/N
Vehicle Security Transmitter*	Knightwatch, LTD	204-301/8	None

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

The EUT has a fresh internal battery and is transmitting continuously with modulation. The temperature was 15.3°C and the humidity was 55%. The orthogonal position of the EUT is vertical. This is the worst case position as determined by the fundamental measurements and preliminary spurious investigation. All readings are harmonics of the fundamental and have a 5.7 dB adjustment made to arrive at the average corrected value. This was derived from the 51.89% measured duty cycle (20 Log .5189 = 5.69 dB). The frequency range investigated was 9 kHz to 5.0 GHz

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

#	Freq MHz	Rdng dBµV	Amp Cable dB	Bilog Cable dB	Cable Horn dB	Amp Adj dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	3037.028M	56.7	+0.0	+0.0	+0.0	-30.8	+0.0	61.7	61.9	-0.2	Vert
	Ave		+8.7	+2.3	+30.5	+5.7					
2	1301.543M	62.8	+0.0	+0.0	+0.0	-35.4	+0.0	52.3	54.0	-1.7	Vert
	Ave		+4.9	+0.8	+24.9	+5.7					
3	1301.503M	62.5	+0.0	+0.0	+0.0	-35.4	+0.0	52.0	54.0	-2.0	Horiz
	Ave		+4.9	+0.8	+24.9	+5.7					
4	2603.111M	59.3	+0.0	+0.0	+0.0	-32.1	+0.0	59.0	61.9	-2.9	Horiz
	Ave		+7.5	+1.2	+28.8	+5.7					
5	3904.445M	46.3	+0.0	+0.0	+0.0	-33.1	+0.0	50.2	54.0	-3.8	Vert
	Ave		+9.1	+1.1	+32.5	+5.7					
6	2603.078M	58.3	+0.0	+0.0	+0.0	-32.1	+0.0	58.0	61.9	-3.9	Vert
	Ave		+7.5	+1.2	+28.8	+5.7					
7	3036.958M	52.7	+0.0	+0.0	+0.0	-30.8	+0.0	57.7	61.9	-4.2	Horiz
	Ave		+8.7	+2.3	+30.5	+5.7					
8	867.718M	57.9	-27.6	+23.2	+7.0	+0.0	+0.0	54.8	61.9	-7.1	Vert
			+0.0	+0.0	+0.0	+5.7					
9	2169.337M	58.0	+0.0	+0.0	+0.0	-32.9	+0.0	54.6	61.9	-7.3	Vert
	Ave		+6.4	+1.2	+27.6	+5.7					
10	2169.288M	53.3	+0.0	+0.0	+0.0	-32.9	+0.0	49.9	61.9	-12.0	Horiz
	Ave		+6.4	+1.2	+27.6	+5.7					

11	1735.222M Ave	55.7	+0.0 +5.7	+0.0 +0.9	+0.0 +26.6	-34.3 +5.7	+0.0	48.9	61.9	-13.0	Horiz
12	867.721M Ave	50.3	-27.6 +0.0	+23.2 +0.0	+7.0 +0.0	+0.0 +5.7	+0.0	47.2	61.9	-14.7	Horiz
13	1735.287M Ave	50.8	+0.0 +5.7	+0.0 +0.9	+0.0 +26.6	-34.3 +5.7	+0.0	44.0	61.9	-17.9	Vert