OHKFMT-304

CKC LABORATORIES, INC.
Testing the Future

EXHIBIT D

CKC TEST REPORT

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CKC LABORATORIES, INC. Testing the Future

ACCREDITED

CERTIFICATION TEST REPORT

FOR THE

27.145 MHZ TRANSMITTER, FMT-304

FCC PART 15 SUBPART C

COMPLIANCE

DATE OF ISSUE: MARCH 23, 1999

PREPARED FOR:

Elsema Pty Ltd
Unit 3, 10 Hume Road
Smithield 2164 Australia

P.O. No: G224
W.O. No: 71000

Report No: FC99-017

PREPARED BY:

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5473A Clouds Rest
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Date of test: February 24, 1999

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ADMINISTRATIVE INFORMATION

DATE OF TEST:	February 24, 1999
PURPOSE OF TEST:	To demonstrate the compliance of the 27.145 MHz Transmitter, FMT-304, with the requirements for FCC Part 15 Subpart C devices.
MANUFACTURER:	Elsema Pty Ltd Unit 3, 10 Hume Road Smithield 2164 Australia
REPRESENTATIVE:	Hermann Roesch
TEST LOCATION:	CKC Laboratories, Inc. 5473A Clouds Rest Mariposa, CA 95338
TEST PERSONNEL:	Skip Doyle
TEST METHOD:	ANSI C63.4 1992
FREQUENCY RANGE TESTED:	9 kHz - 1000 MHz
EQUIPMENT UNDER TEST:	**27.145 MHz Transmitter** Manuf: South Pacific Electronics Ltd. Model: FMT-304 Serial: 1 FCC ID: (pending)

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SUMMARY OF RESULTS

The Elsema Pty Ltd 27.145 MHz Transmitter, FMT-304, was tested in accordance with ANSI C63.4 1992 for compliance with FCC Part 15 Subpart C.

As received, the above equipment was found to be fully compliant with the limits of FCC Part 15 Subpart C. The results in this report apply only to the items tested, as identified herein.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Four channel 27 MHz hand held remote control digital transmitter.

MEASUREMENT UNCERTAINTY

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

EUT OPERATING FREQUENCY

The EUT was operating at 27.145.

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 any peripheral devices.

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REPORT OF MEASUREMENTS

The following tables report the highest worst case levels recorded during the tests performed on the 27.145 MHz Transmitter, FMT-304. 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: Highest Fundamental Emission Levels

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS Bicon dB	Amp dB	Cable dB	Dist dB	CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
27.145	80.6	16.5	-27.3	1.0		70.8	80.0	-9.2	H
27.147	82.9	16.5	-27.3	1.0		73.1	80.0	-6.9	VQ
27.165	86.2	16.5	-27.3	1.0		76.4	80.0	-3.6	V

Test Method: ANSI C63.4 1992
Spec Limit : FCC Part 15.227(a)
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 operating on fresh 9V battery. EUT is in continuously transmitting modulated signal at 27.2MHz. Limits are in accordance with FCC 15.227(a).

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Table 2: Six Highest Radiated Emission Levels 9kHz-1GHz

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS Log dB	Amp dB	Cable dB	Dist dB	CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
54.363	47.1	10.3	-27.2	1.3		31.5	40.0	-8.5	V
787.276	38.2	22.1	-27.8	5.7		38.2	46.0	-7.8	H
868.761	41.3	23.1	-27.6	6.0		42.8	46.0	-3.2	VQ
895.865	42.8	23.4	-27.5	6.1		44.8	46.0	-1.2	VQ
923.052	41.2	23.8	-27.4	6.2		43.8	46.0	-2.2	VQ
950.143	39.7	24.1	-27.2	6.3		42.9	46.0	-3.1	VQ

Test Method: ANSI C63.4 1992
Spec Limit : FCC Part 15.227(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 operating on fresh 9V battery. EUT is in continuously transmitting modulated signal at 27.2MHz. Frequency Range scanned from 9kHz to 1GHz. Limits are in accordance with FCC Par 15.227(b)/15.209.

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TABLE A

LIST OF TEST EQUIPMENT

Barn Lab
VCCI Acceptance No. R-565 & C-580

1. Spectrum Analyzer, Hewlett Packard, Model No. 8566B, S/N 2209A01404. Calibration date: June 12, 1998. Calibration due date: June 12, 1999.

2. Preamp, Hewlett Packard, Model No. 8447D, S/N 1937A01933. Calibration date: April 10, 1998. Calibration due date: April 10, 1999.

3. Preamp, Hewlett Packard, Model No. 8449B, S/N 3008A00301. Calibration date: October 15, 1998. Calibration due date: October 15, 1999.

4. Quasi-Peak Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01267. Calibration date: June 12, 1998. Calibration due date: June 12, 1999.

5. Biconical Antenna, A & H Systems, Model No. SAS-200/542, S/N 156. Calibration date: June 9, 1998. Calibration due date: June 9, 1999.

6. Log Periodic Antenna, A & H Systems, Model No. SAS-200/512, S/N 154. Calibration date: June 9, 1998. Calibration due date: June 9, 1999.

7. Magnetic Loop Antenna, EMCO, Model No. 6502, S/N 1074. Calibration date: May 11, 1998. Calibration due date: May 11, 1999.

8. Site B (Barn) Calibration date: June 18, 1998. Site B (Barn) Calibration due date: June 18 1999.

9. Test software, EMI Test 2.91.

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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 emissions and Table 2 for radiated emissions. Additionally, a complete description of all the ports and I/O cables is 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 27.145 MHz Transmitter, FMT-304. For frequencies below 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. 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	40 GHz	1 MHz

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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 27.145 MHz Transmitter, FMT-304.

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.

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TEST METHODS

The radiated emissions data of the 27.145 MHz Transmitter, FMT-304, 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, Subpart C 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 FCC test mode. For frequencies below 30 MHz the magnetic loop antenna was used. The frequency range of 30 MHz - 88 MHz was then 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, which were at or near the limit, were recorded. The frequency range of 100 - 300 MHz was scanned with the biconical antenna in the same manner, and the peaks 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 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 - 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. 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 final 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 15.215(c) - Occupied Bandwidth Measurements

In accordance with Part 15.215(c), the fundamental frequency was kept within the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

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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.	Bicon	Log	Dist	Corr dBuV/m	Spec	Margin	Polar

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.
Bicon is the biconical antenna factor in dB.
Log is the log periodic 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.

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APPENDIX A

INFORMATION ABOUT THE EQUIPMENT UNDER TEST

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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
The EUT has no power cord.	

I/O PORTS	
Type	#
N/A	1

CRYSTAL OSCILLATORS	
Type	Freq. In MHz
Custom made CMOS chip 30ppm Fundamental Crystal	27.145

PRINTED CIRCUIT BOARDS				
Function	Model & Rev	Clocks, MHz	Layers	Location
Transmitter main board	Elsema B44A	N/A	2	N/A

REQUIRED EUT CHANGES TO COMPLY:
None.

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APPENDIX B

MEASUREMENT DATA SHEETS

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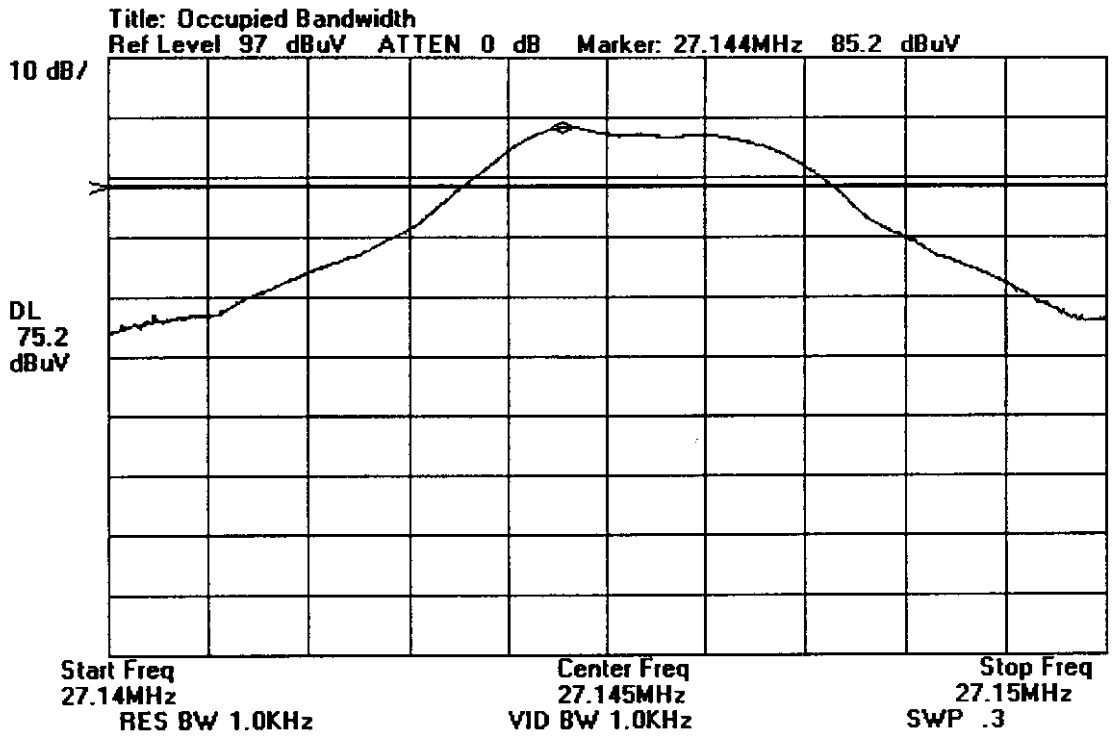
Occupied Bandwidth Plot



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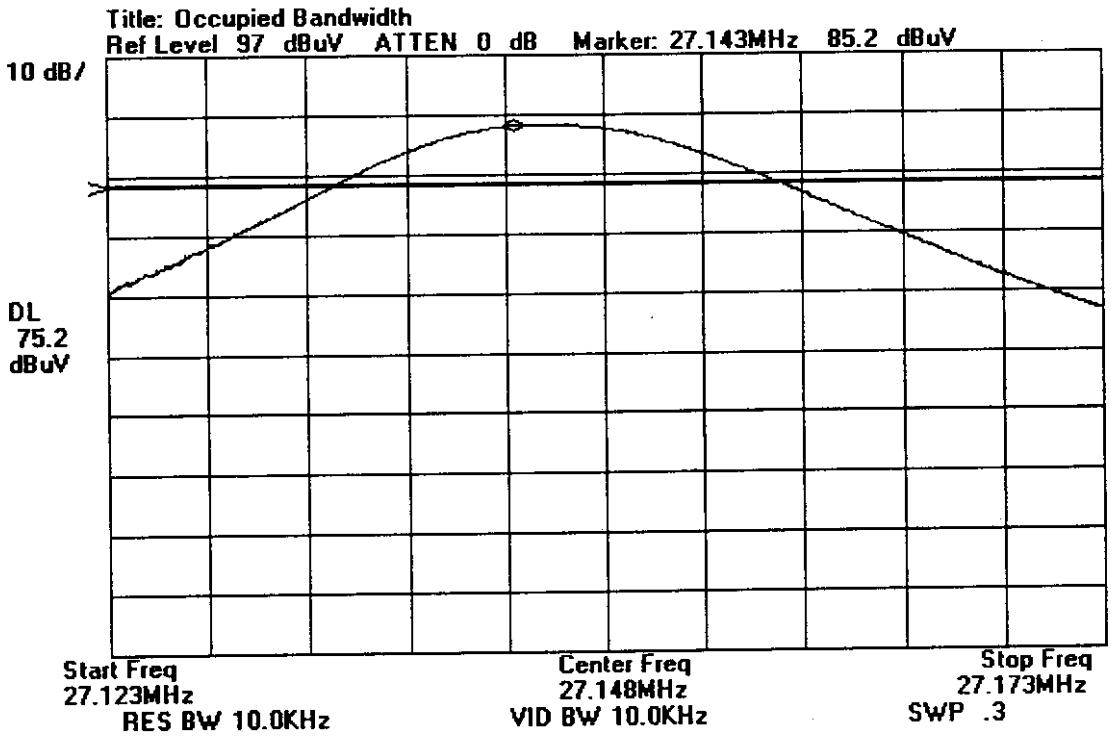
Occupied Bandwidth Plot



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

Customer:	**Elsema**	Date:	Feb-24-99
Specification:	**FCC 15.227(a)**	Time:	16:30
Test Type:	**Maximized Emissions**	Sequence#:	3
Equipment:	**Transmitter**		
Manufacturer:	Elsema	Tested By:	Skip Doyle
Model:	FMT-304		
S/N:			

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

Function	Manufacturer	Model #	S/N
Transmitter	Elsema	FMT-304	1

Support Devices:

Function	Manufacturer	Model #	S/N
None			

Test Conditions / Notes:

EUT operating on fresh 9V battery. EUT is in continuously transmitting modulated signal at 27.2MHz. Limits are in accordance with FCC 15.227(a).

Measurement Data: Sorted by Margin Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	Amp dB	Bicon dB	dB	Cable dB	Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
1	27.165	86.2	-27.3	+16.5		+1.0	+0.0	76.4	80.0	-3.6	Vert
2	27.147 Quasi Peak	82.9	-27.3	+16.5		+1.0	+0.0	73.1	80.0	-6.9	Vert
3	27.145	80.6	-27.3	+16.5		+1.0	+0.0	70.8	80.0	-9.2	Horiz

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

Customer: **Elsema**
Specification: **FCC 15.227(b) / 15.209**
Test Type: **Maximized Emissions**
Equipment: **Transmitter**
Manufacturer: Elsema
Model: FMT-304
S/N:

Date: Mar-24-99
Time: 16:48
Sequence#: 2

Tested By: Skip Doyle

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

Function	Manufacturer	Model #	S/N
Transmitter	Elsema	FMT-304	1

Support Devices:

Function	Manufacturer	Model #	S/N
None			

Test Conditions / Notes:

EUT operating on fresh 9V battery. EUT is in continuously transmitting modulated signal at 27.2MHz. Frequency Range scanned from 9kHz to 1GHz. Limits are in accordance with FCC pt 15.227(b).

Measurement Data: Sorted by Margin Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	Amp DB	Bicon dB	Log dB	Cable dB	Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
1	895.865 Quasi Peak	42.8	-27.5	+0.0	+23.4	+6.1	+0.0	44.8	46.0	-1.2	Vert
^	895.860	44.5	-27.5	+0.0	+23.4	+6.1	+0.0	46.5	46.0	+0.5	Vert
3	923.052 Quasi Peak	41.2	-27.4	+0.0	+23.8	+6.2	+0.0	43.8	46.0	-2.2	Vert
^	923.058	43.0	-27.4	+0.0	+23.8	+6.2	+0.0	45.6	46.0	-0.4	Vert
5	950.143 Quasi Peak	39.7	-27.2	+0.0	+24.1	+6.3	+0.0	42.9	46.0	-3.1	Vert
^	950.137	41.5	-27.2	+0.0	+24.1	+6.3	+0.0	44.7	46.0	-1.3	Vert
7	868.761 Quasi Peak	41.3	-27.6	+0.0	+23.1	+6.0	+0.0	42.8	46.0	-3.2	Vert
^	868.762	43.0	-27.6	+0.0	+23.1	+6.0	+0.0	44.5	46.0	-1.5	Vert
9	923.051	36.3	-27.4	+0.0	+23.8	+6.2	+0.0	38.9	46.0	-7.1	Horiz
10	895.825	36.7	-27.5	+0.0	+23.4	+6.1	+0.0	38.7	46.0	-7.3	Horiz
11	787.276	38.2	-27.8	+0.0	+22.1	+5.7	+0.0	38.2	46.0	-7.8	Horiz

12	950.117	34.8	-27.2	+0.0	+24.1	+6.3	+0.0	38.0	46.0	-8.0	Horiz
13	54.363	47.1	-27.2	+10.3	+0.0	+1.3	+0.0	31.5	40.0	-8.5	Vert
14	352.949	39.8	-26.9	+0.0	+19.9	+3.6	+0.0	36.4	46.0	-9.6	Vert
15	841.565	34.8	-27.6	+0.0	+22.8	+6.0	+0.0	36.0	46.0	-10.0	Horiz
16	732.968	36.4	-27.7	+0.0	+21.4	+5.5	+0.0	35.6	46.0	-10.4	Vert
17	244.398	42.8	-26.6	+16.3	+0.0	+3.0	+0.0	35.5	46.0	-10.5	Vert
18	407.238	39.6	-27.3	+0.0	+18.0	+4.0	+0.0	34.3	46.0	-11.7	Vert
19	271.535	38.8	-26.6	+18.7	+0.0	+3.2	+0.0	34.1	46.0	-11.9	Vert
20	977.256	38.2	-27.0	+0.0	+24.4	+6.4	+0.0	42.0	54.0	-12.0	Vert
21	380.115	38.1	-27.1	+0.0	+18.7	+3.8	+0.0	33.5	46.0	-12.5	Vert
22	325.832	35.6	-26.8	+0.0	+21.2	+3.5	+0.0	33.5	46.0	-12.5	Vert
23	461.533	37.9	-27.8	+0.0	+18.8	+4.4	+0.0	33.3	46.0	-12.7	Vert
24	488.692	37.4	-27.8	+0.0	+19.2	+4.4	+0.0	33.2	46.0	-12.8	Vert

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