

University of Texas
McDonald Observatory
Hobby–Eberly Telescope

Technical Report
No. 300

The HET HRS Th–Ar and Echelle Tilt Atlas

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The Th–Ar Atlas

The thorium–argon spectra were taken in March of 2002 using the MM1 and MM2 chips with the internal calibration system on the High Resolution Spectrograph (HRS) of the Hobby–Eberly Telescope. The HRS was configured with the 316g cross–disperser and with the echelle set to the central tilt position. The chips were binned 2x2 with the 60,000 resolution slit. A number of cross–disperser positions were taken to obtain complete spectral coverage from 390nm to 1.1 μm . The exposure times varied depending upon the setup to optimize the strength of the lines. The spectra were reduced with NOAO IRAF routines for echelle reduction. The lamps were overscan corrected, a bias frame was removed and scattered light was subtracted from each frame.

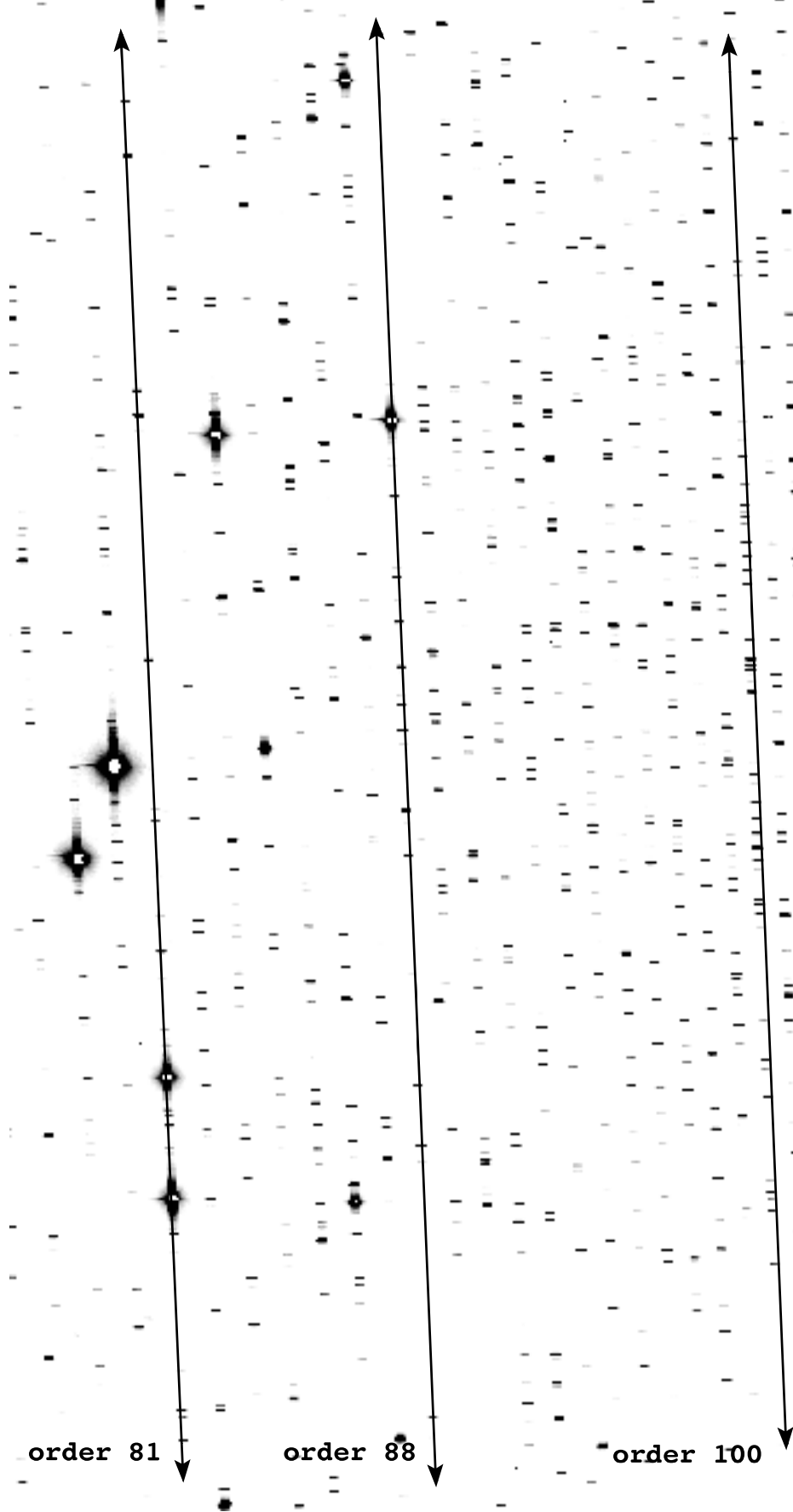
The first two figures show the echellogram for the red and blue CCDs for the 316g5936 setup. Several orders are marked to aid the user in getting oriented.

Subsequent pages of this atlas have one order for every two pages. Not every line is marked to avoid severe blending.

The Echelle Tilts

The HRS has 3 possible echelle tilts available to the users. These are shown after each Th–Ar order as a wavelength calibrated flat field spectrum of each tilt position for that order. The central tilt is well centered at long wavelengths while the red tilt is more centered at the bluest wavelengths. The flat field lamp was extracted in the same manner as the Th–Ar spectra. The severe fringing in the red is clearly prominent redward of 650 nm.

316g5936 red chip

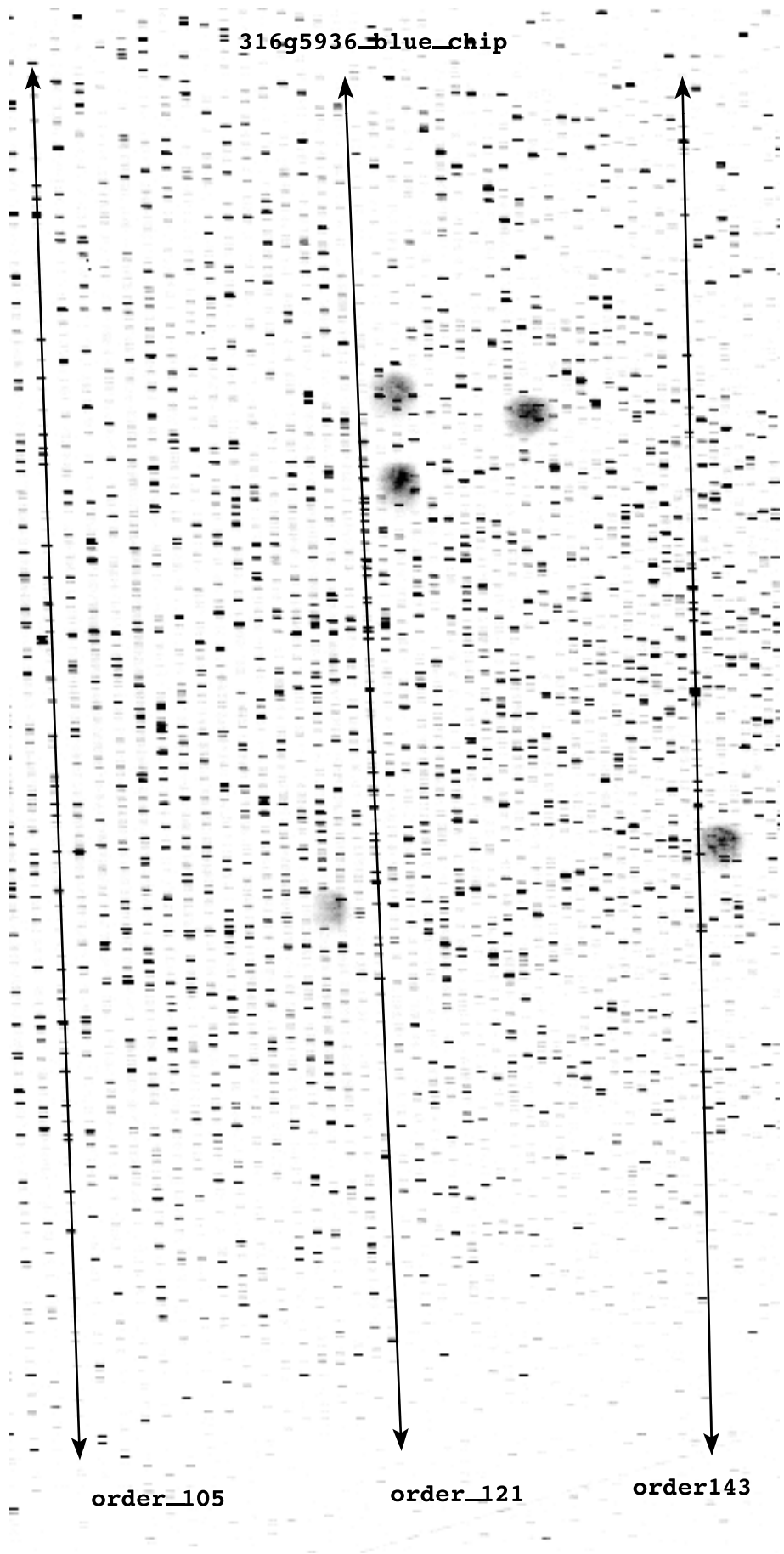


order 81

order 88

order 100

316g5936_blue_chip



order_105

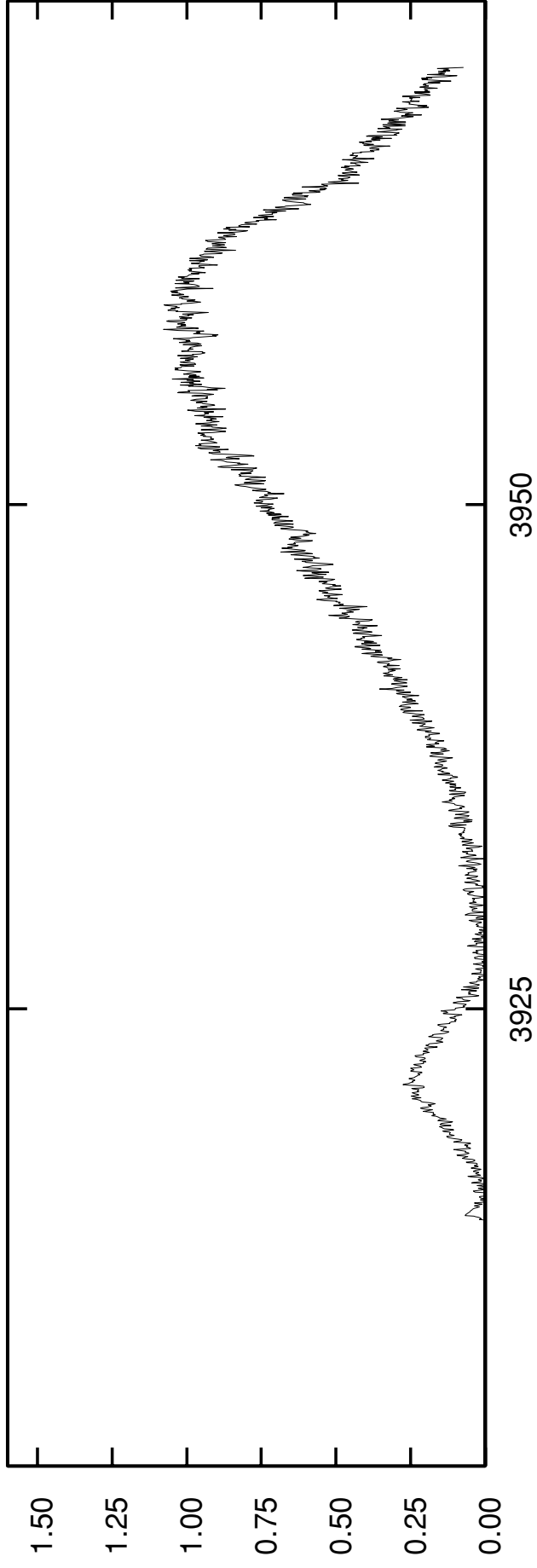
order_121

order_143

Order	Starting (Wavelength)	Ending	Dispersion
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order = 59,	w1 = 10261.730,	w2 = 10435.170,	dw = 0.084729
order = 60,	w1 = 10090.710,	w2 = 10261.060,	dw = 0.083219
order = 61,	w1 = 9925.284,	w2 = 10092.680,	dw = 0.081775
order = 62,	w1 = 9765.190,	w2 = 9929.757,	dw = 0.080394
order = 63,	w1 = 9610.173,	w2 = 9772.037,	dw = 0.079074
order = 64,	w1 = 9459.994,	w2 = 9619.273,	dw = 0.077811
order = 65,	w1 = 9314.430,	w2 = 9471.237,	dw = 0.076603
order = 66,	w1 = 9173.272,	w2 = 9327.713,	dw = 0.075447
order = 67,	w1 = 9036.321,	w2 = 9188.499,	dw = 0.074342
order = 68,	w1 = 8903.340,	w2 = 9053.384,	dw = 0.073300
order = 69,	w1 = 8774.306,	w2 = 8922.153,	dw = 0.072226
order = 70,	w1 = 8648.959,	w2 = 8794.676,	dw = 0.071186
order = 71,	w1 = 8527.144,	w2 = 8670.794,	dw = 0.070176
order = 72,	w1 = 8408.714,	w2 = 8550.356,	dw = 0.069195
order = 73,	w1 = 8293.531,	w2 = 8433.219,	dw = 0.068240
order = 74,	w1 = 8181.463,	w2 = 8319.248,	dw = 0.067311
order = 75,	w1 = 8072.385,	w2 = 8208.316,	dw = 0.066405
order = 76,	w1 = 7966.180,	w2 = 8100.303,	dw = 0.065522
order = 77,	w1 = 7862.736,	w2 = 7995.095,	dw = 0.064660
order = 78,	w1 = 7762.110,	w2 = 7892.826,	dw = 0.063857
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order = 85,	w1 = 7122.899,	w2 = 7242.804,	dw = 0.058576
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order = 117,	w1 = 5174.398,	w2 = 5261.711,	dw = 0.042654
order = 118,	w1 = 5130.550,	w2 = 5217.118,	dw = 0.042290
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order = 150,	w1 = 4035.869,	w2 = 4104.052,	dw = 0.033309
order = 151,	w1 = 4009.136,	w2 = 4076.872,	dw = 0.033090
order = 152,	w1 = 3982.754,	w2 = 4050.050,	dw = 0.032875
order = 153,	w1 = 3956.716,	w2 = 4023.579,	dw = 0.032664
order = 154,	w1 = 3931.015,	w2 = 3997.452,	dw = 0.032456
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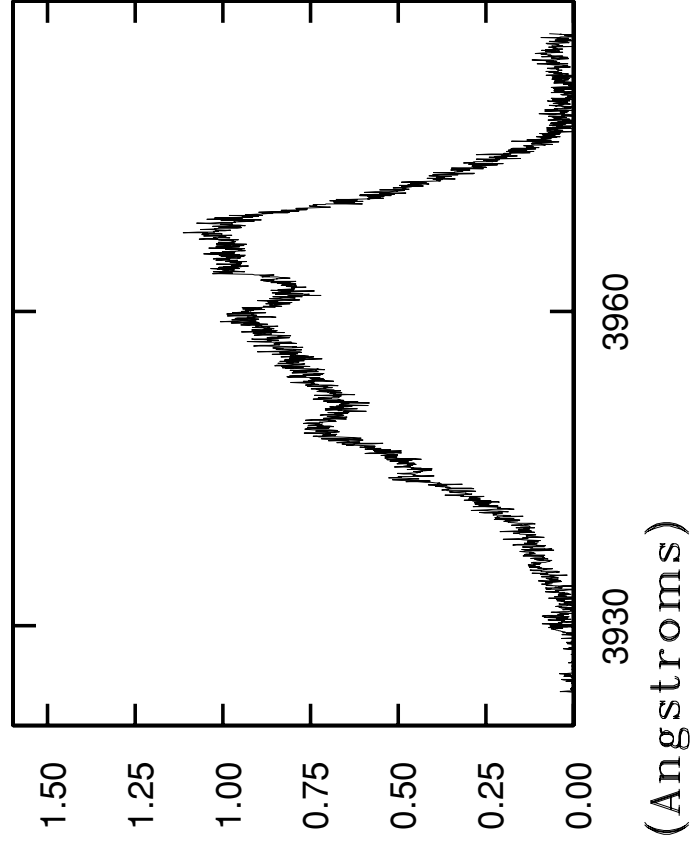
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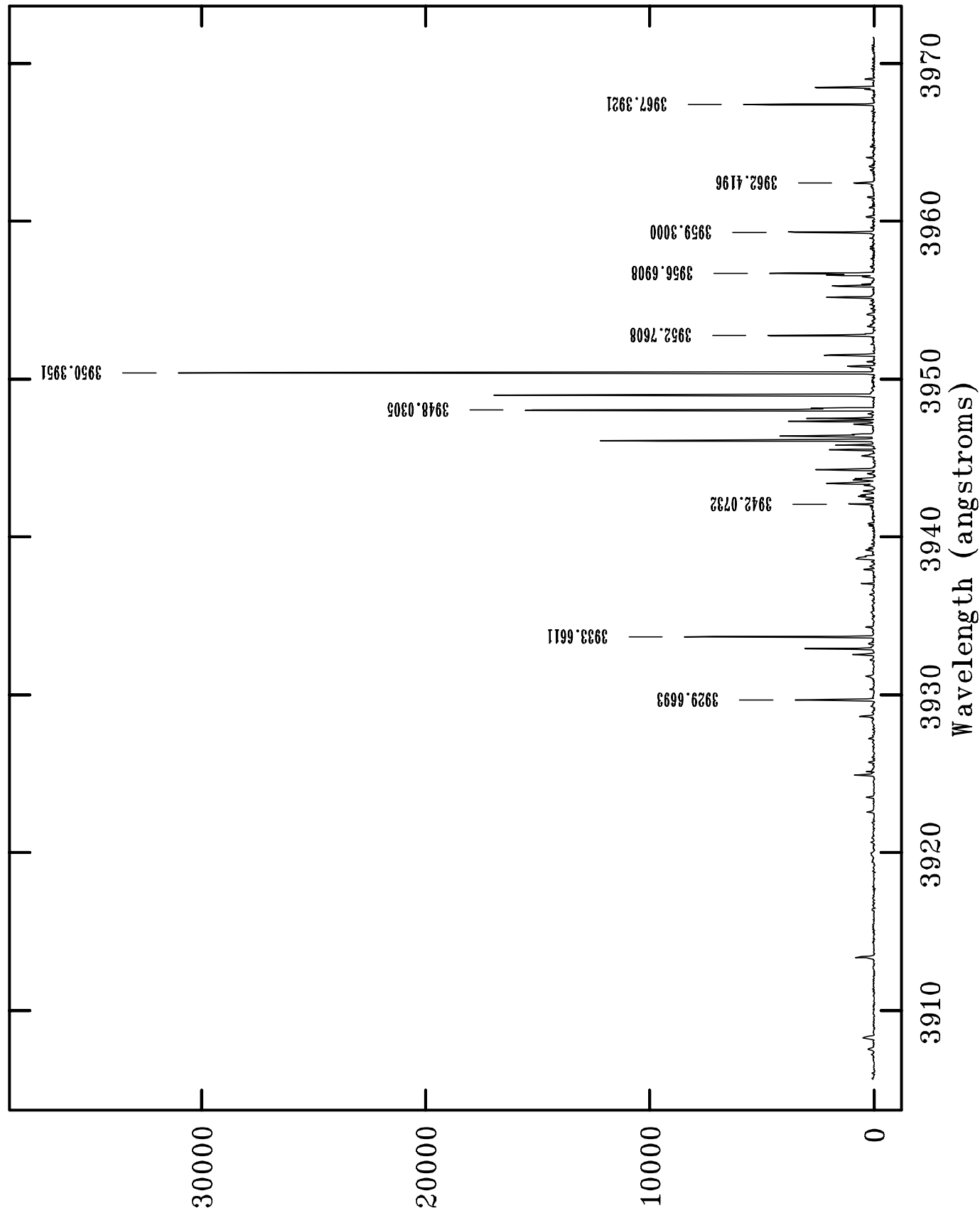
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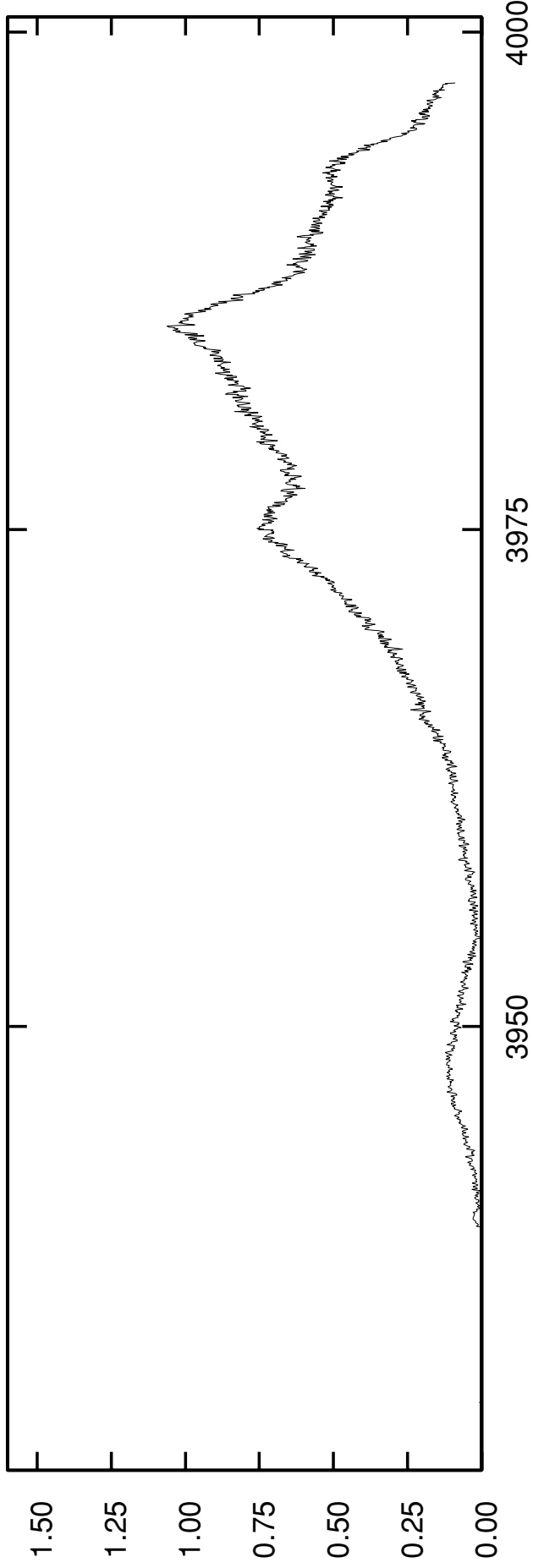
Order 155 - Red



NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:40:49 30-Mar-2002
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identify thar_316g4931_red2: ThAr



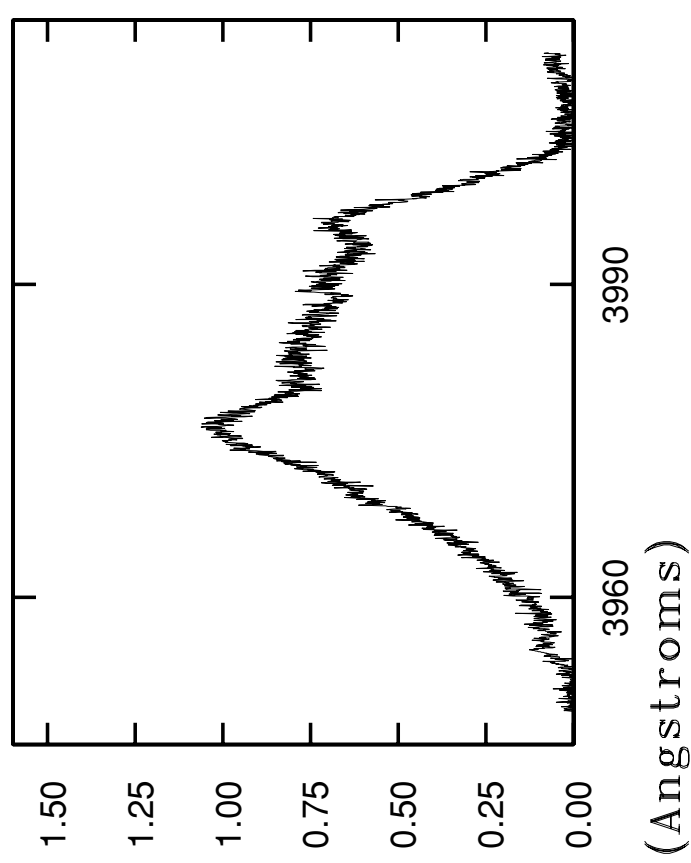
Order 154 - Central



Order 154 - Blue

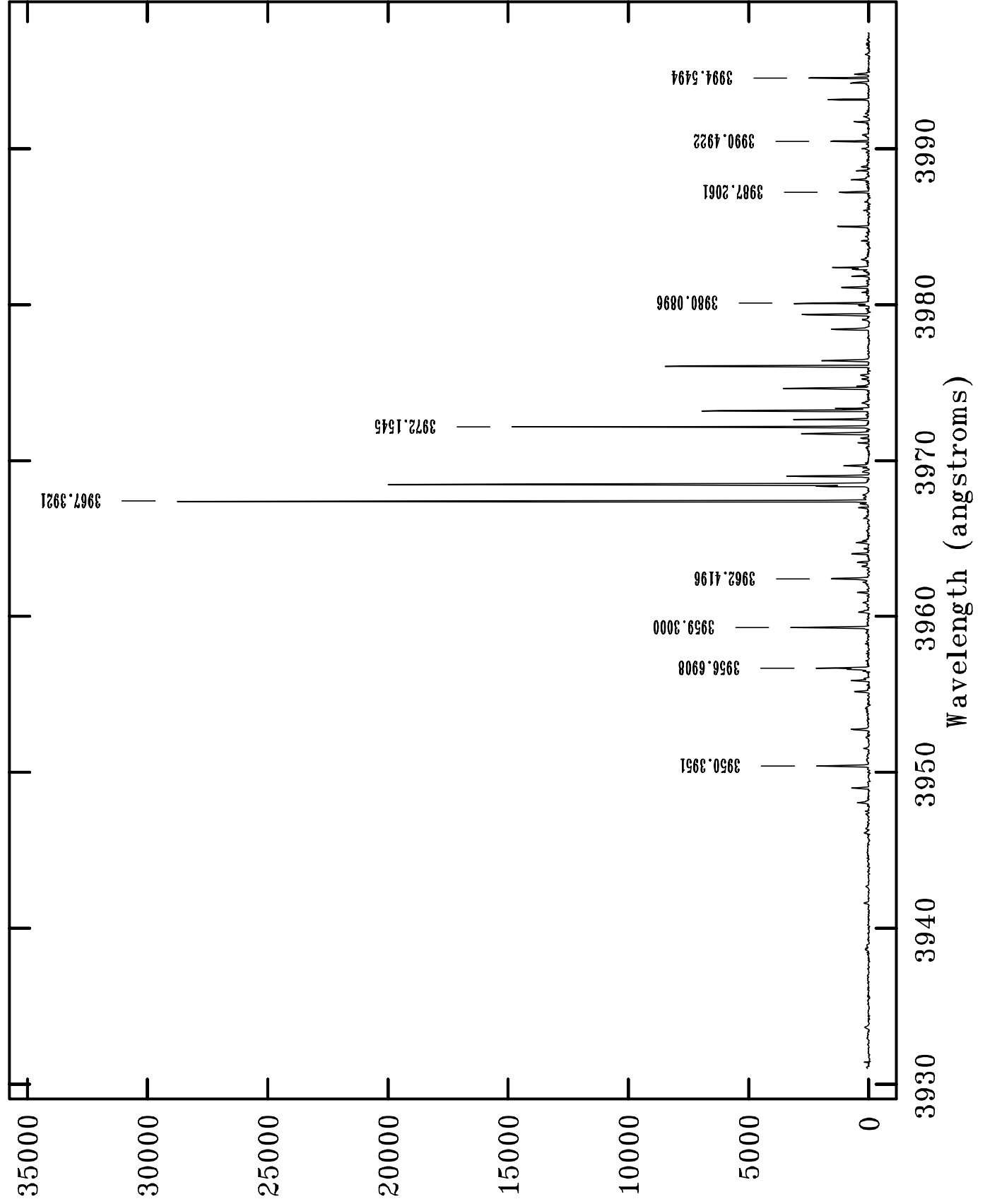
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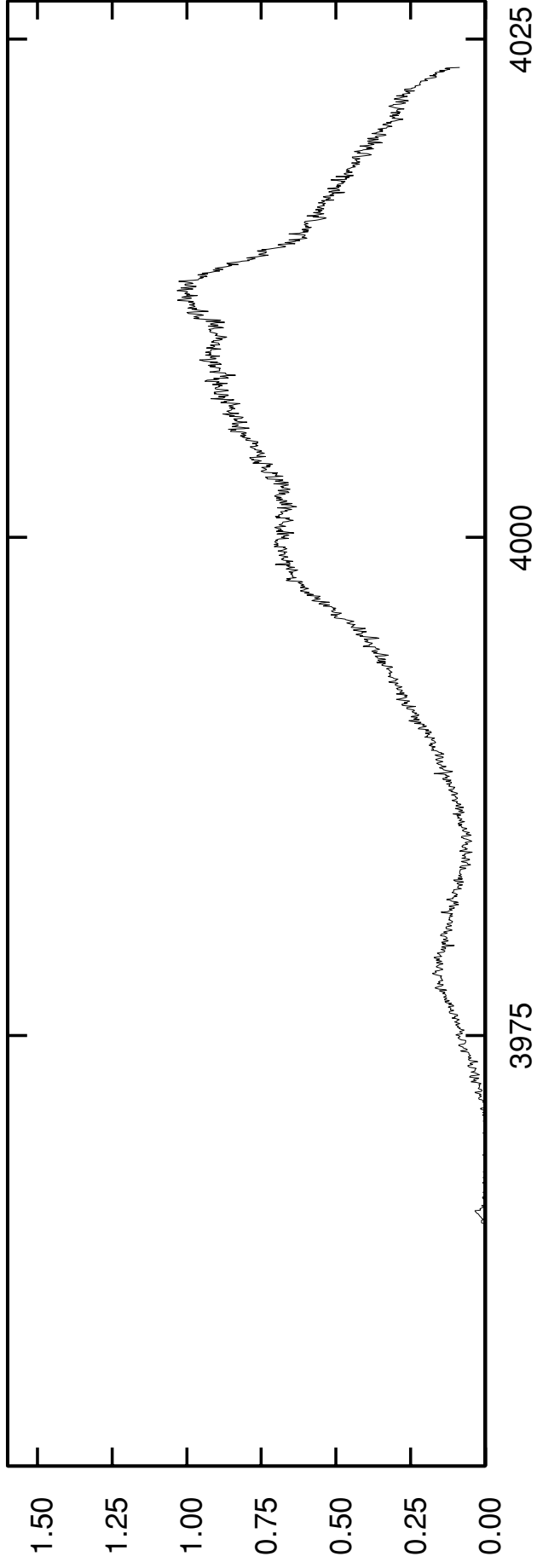


Wavelength (Angstroms)

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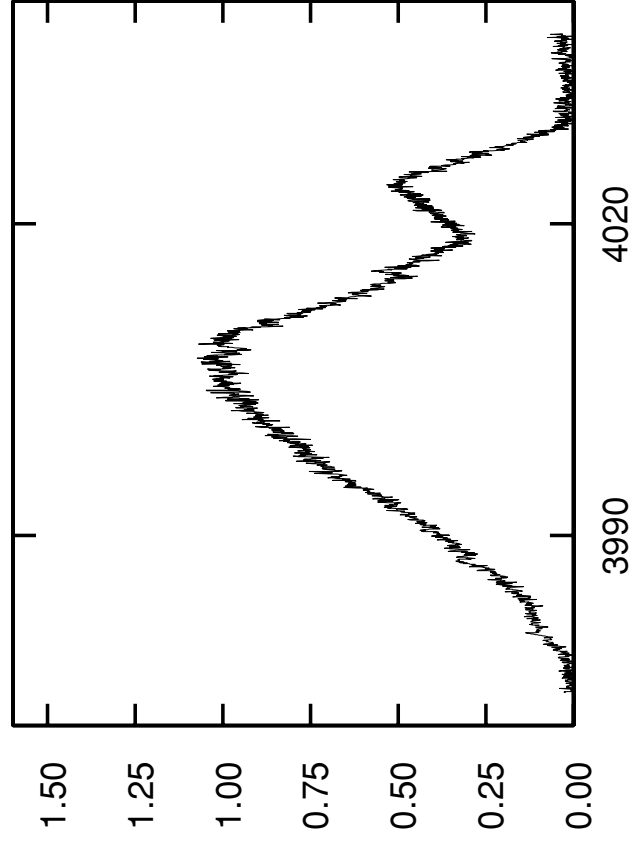
Order 153 - Central



Order 153 - Blue

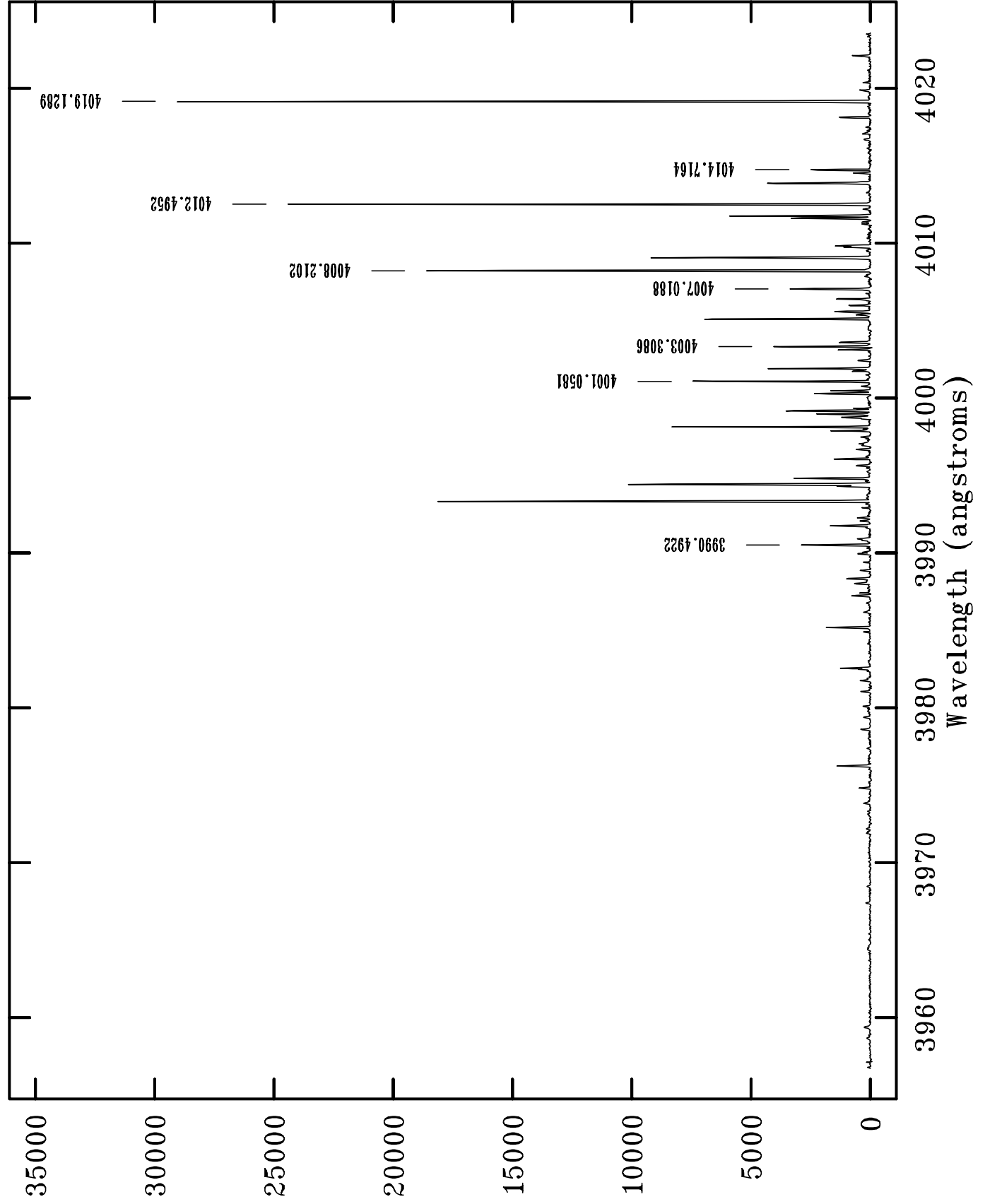
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Order 153 - Red

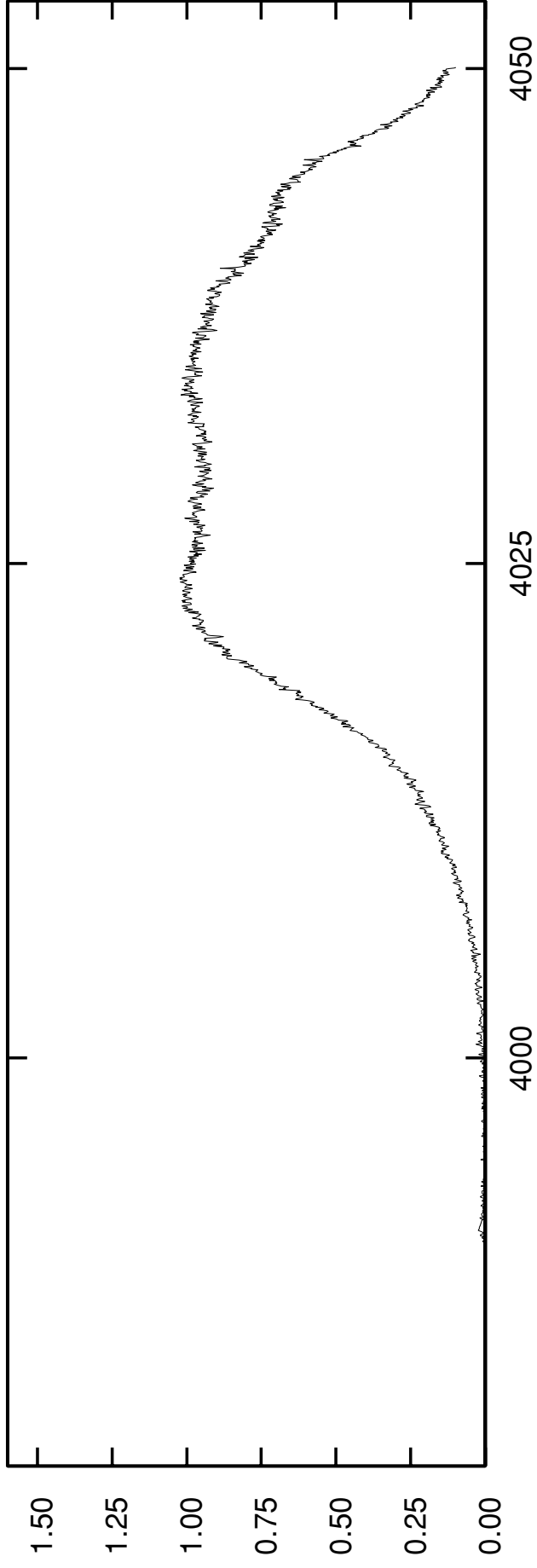


Wavelength (Angstroms)

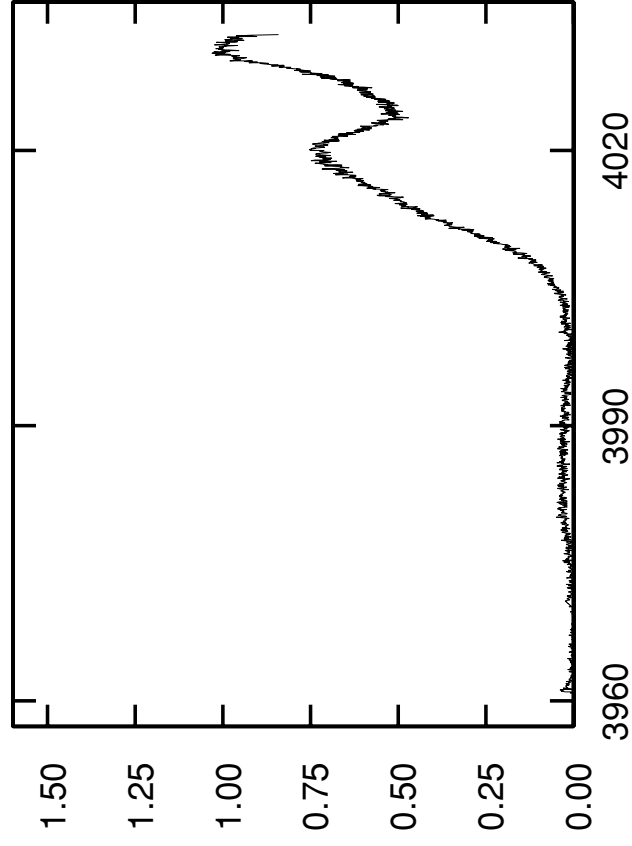
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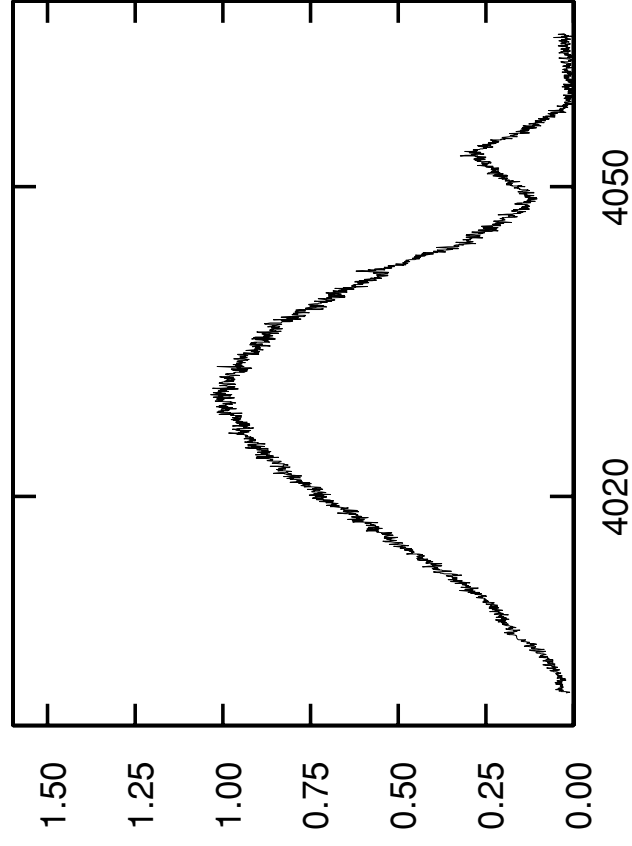
Order 152 - Central



Order 152 - Blue

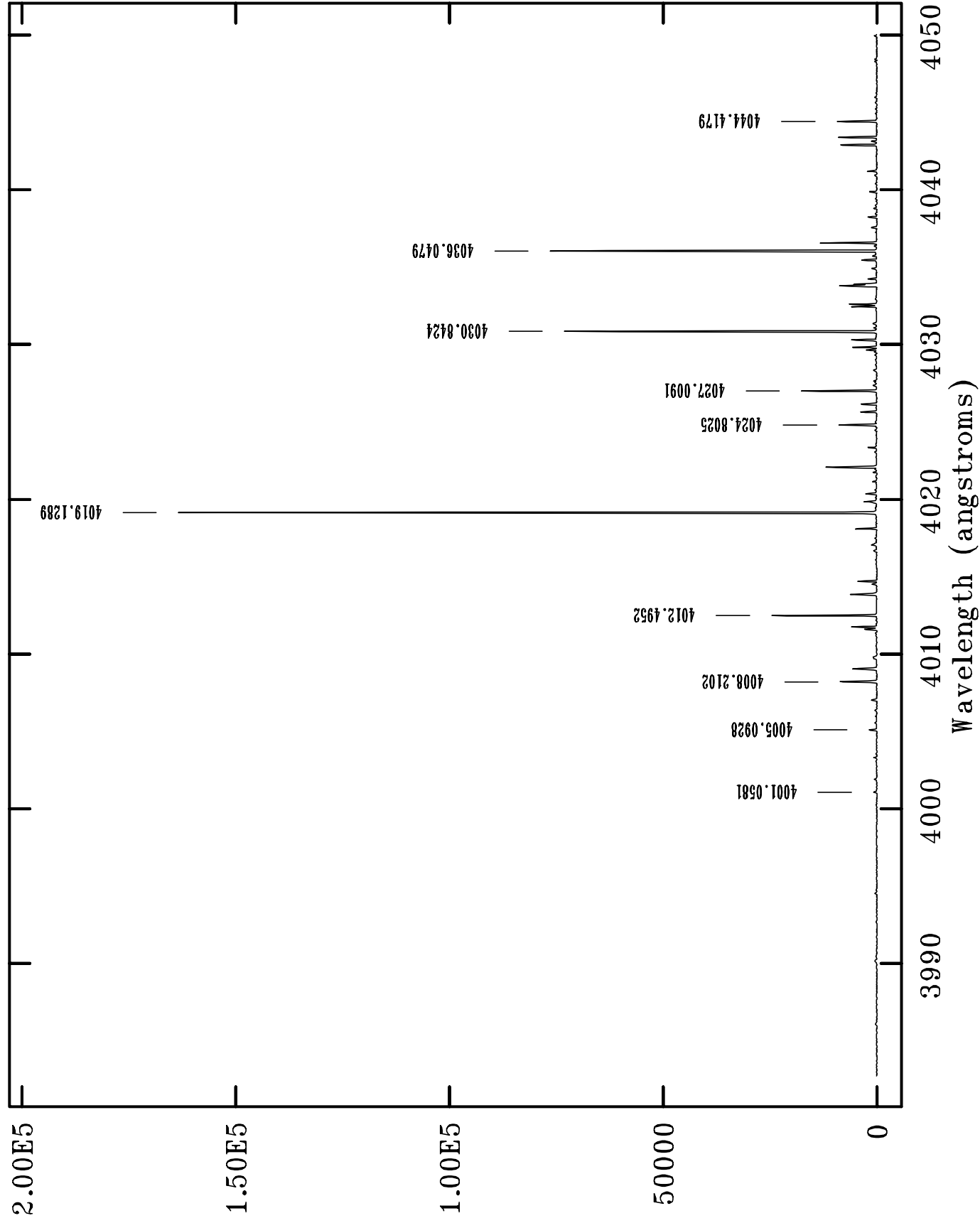


Order 152 - Red

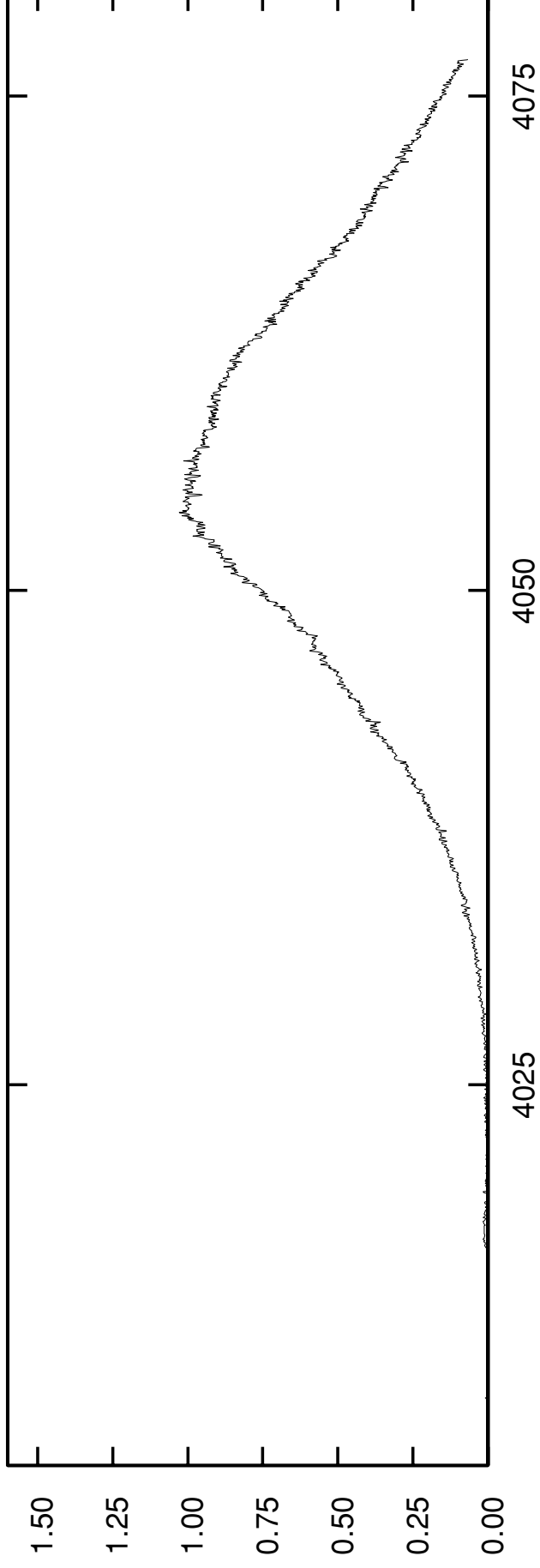


Wavelength (Angstroms)

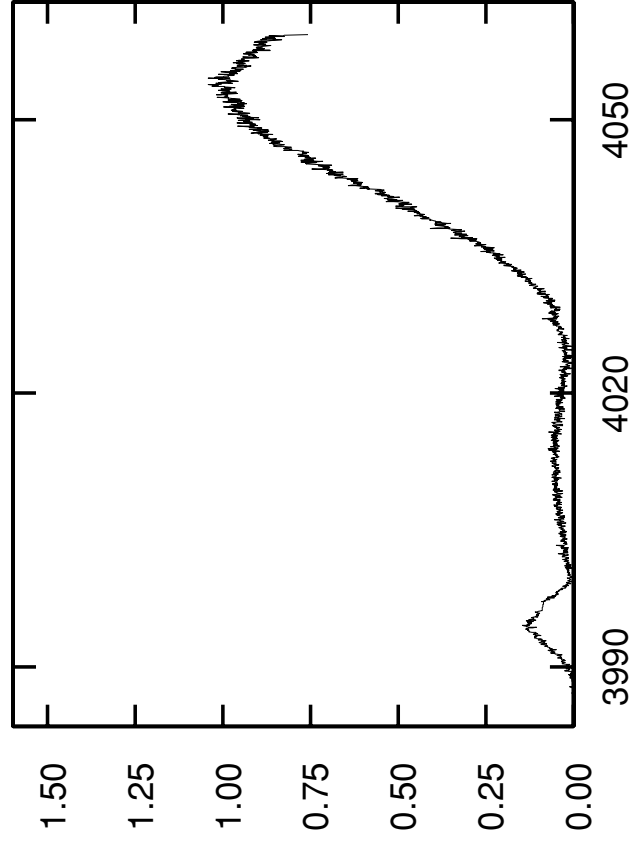
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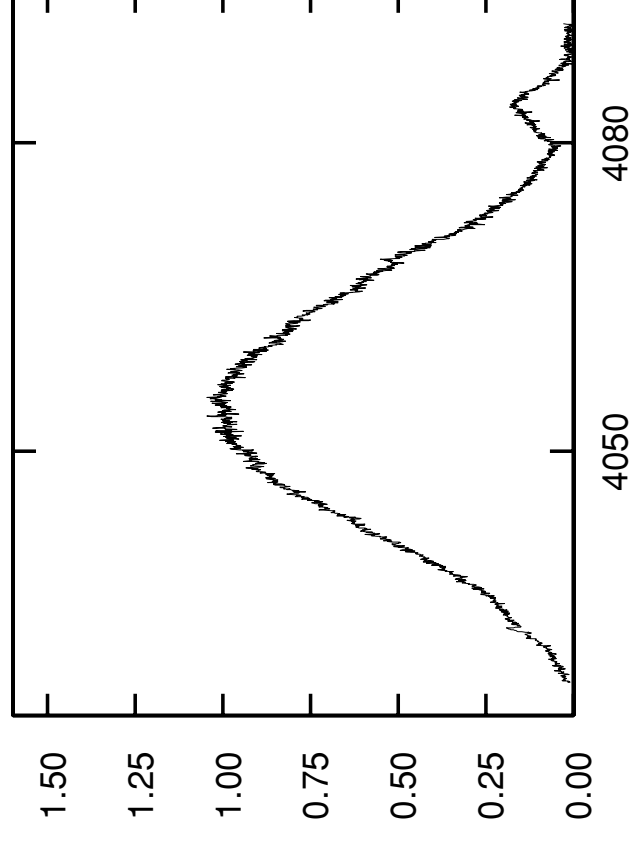
Order 151 - Central



Order 151 - Blue

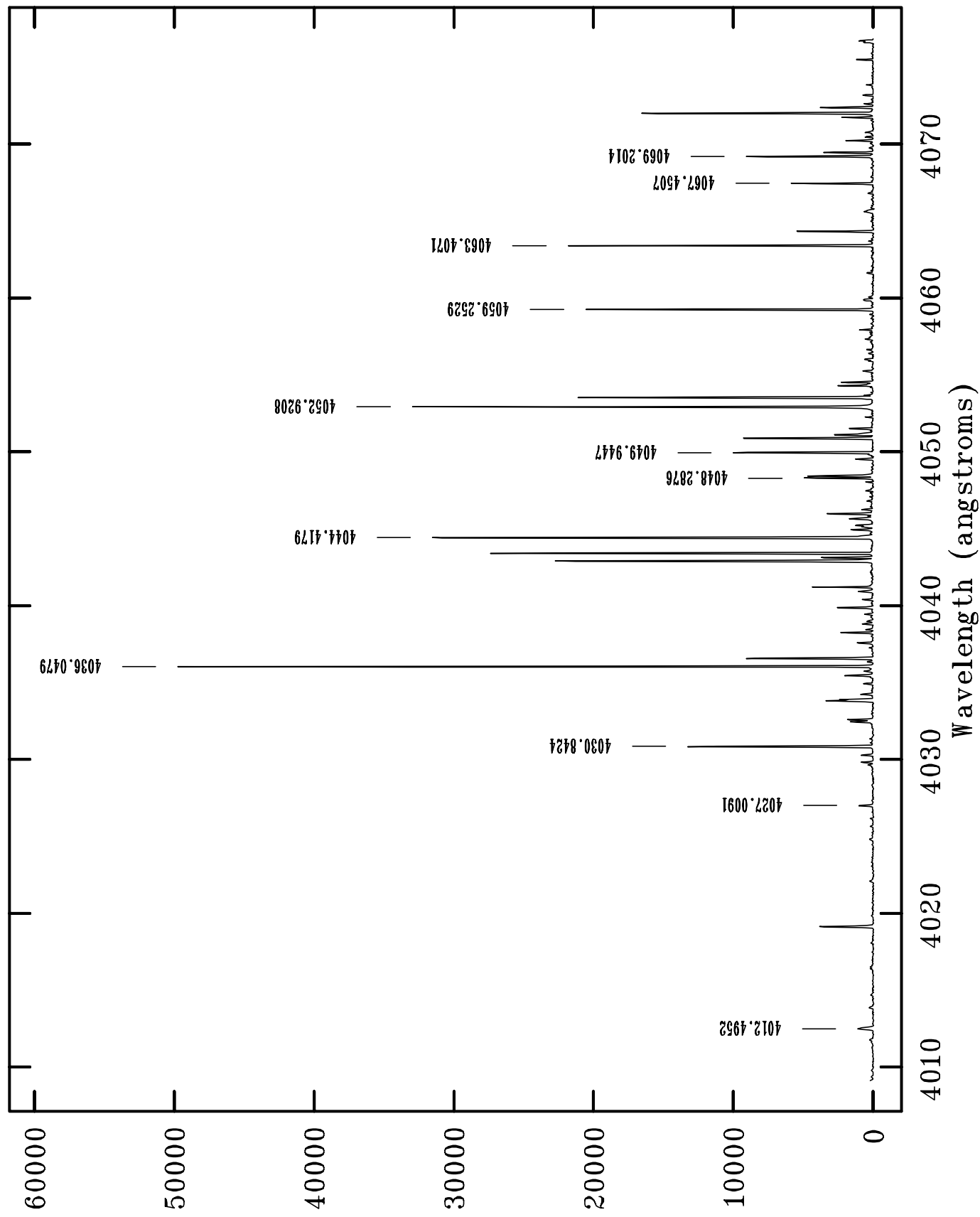


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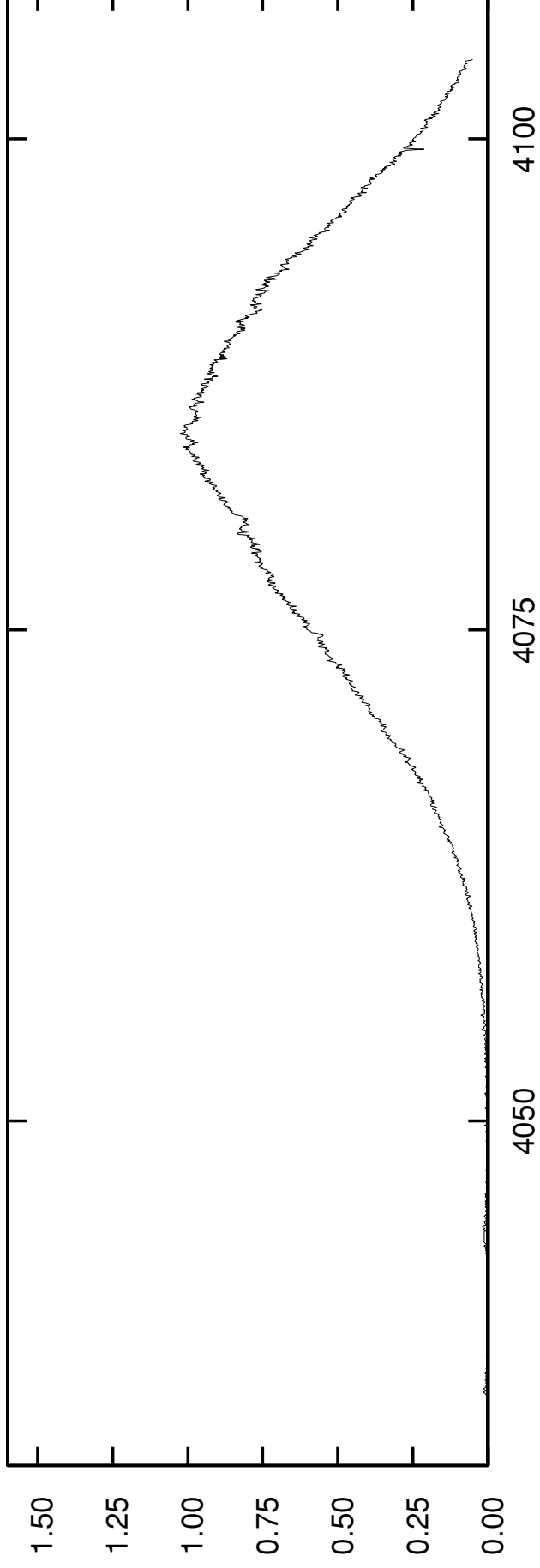


Wavelength (Angstroms)

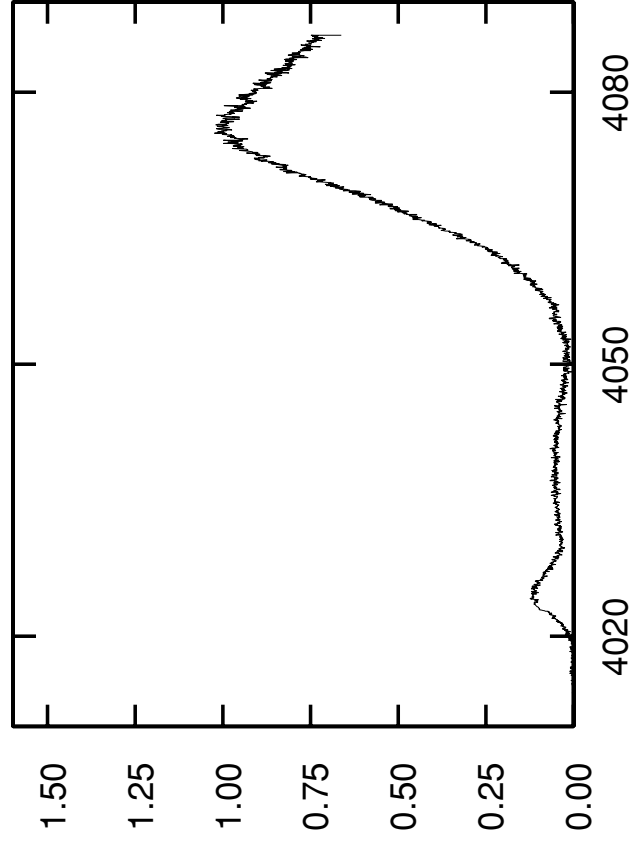
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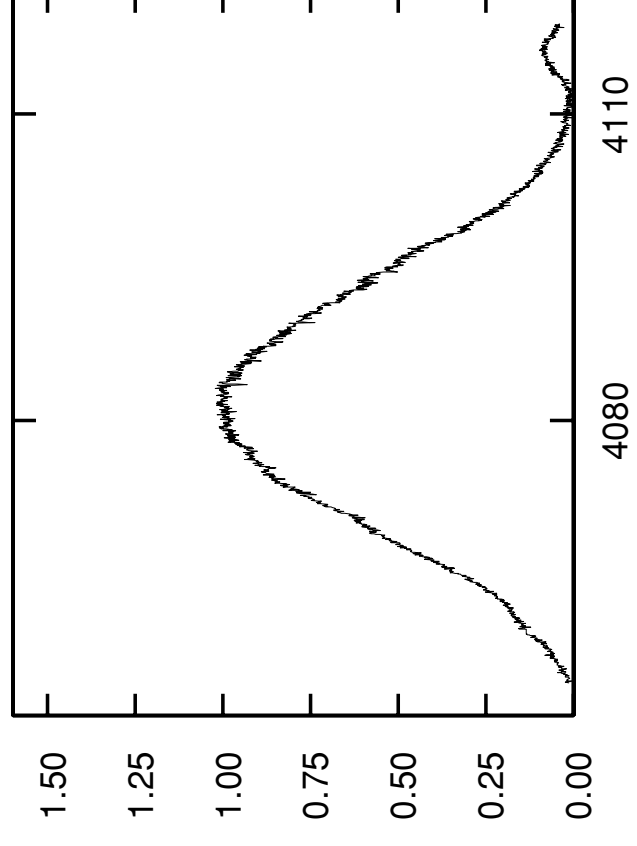
Order 150 - Central



Order 150 - Blue

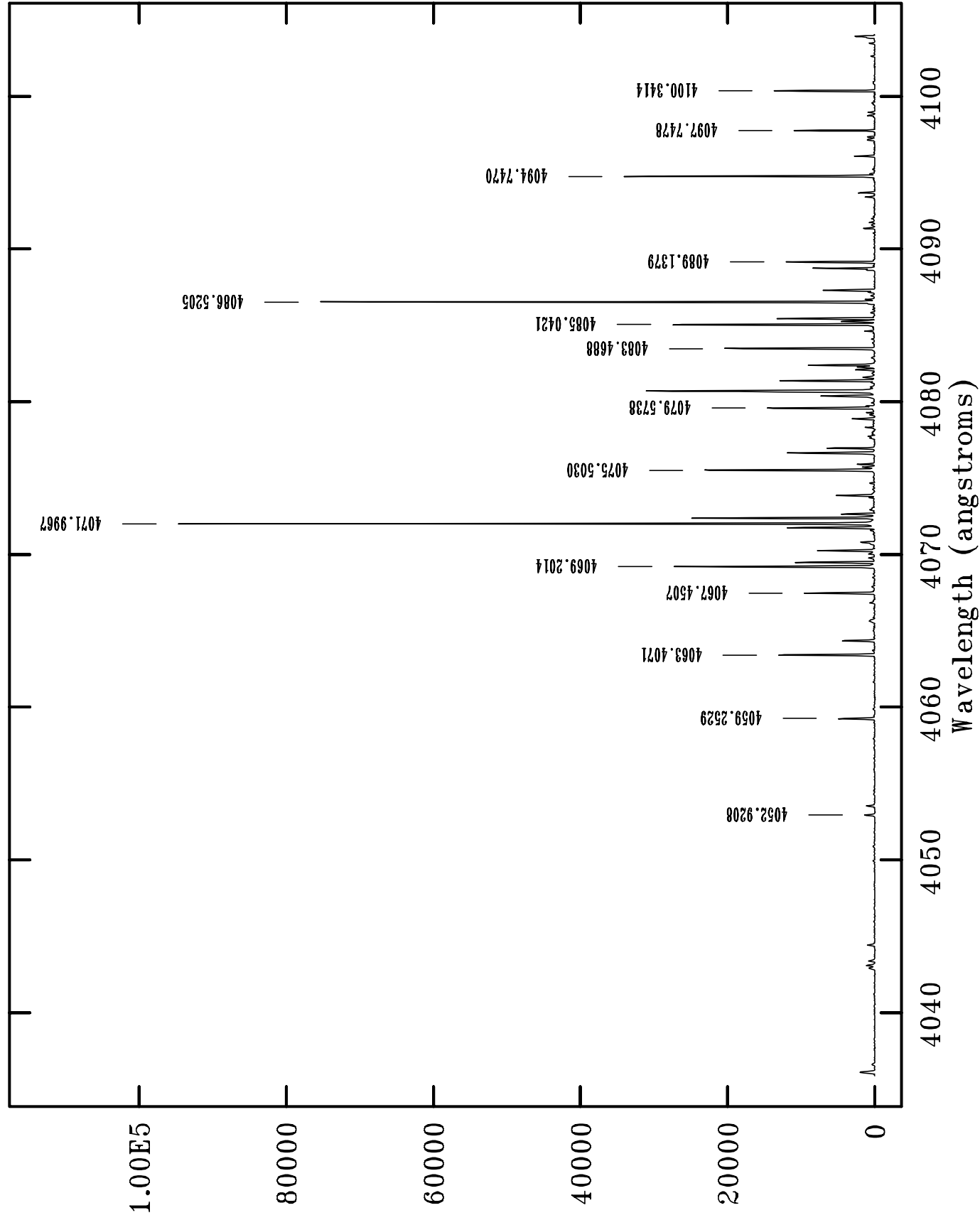


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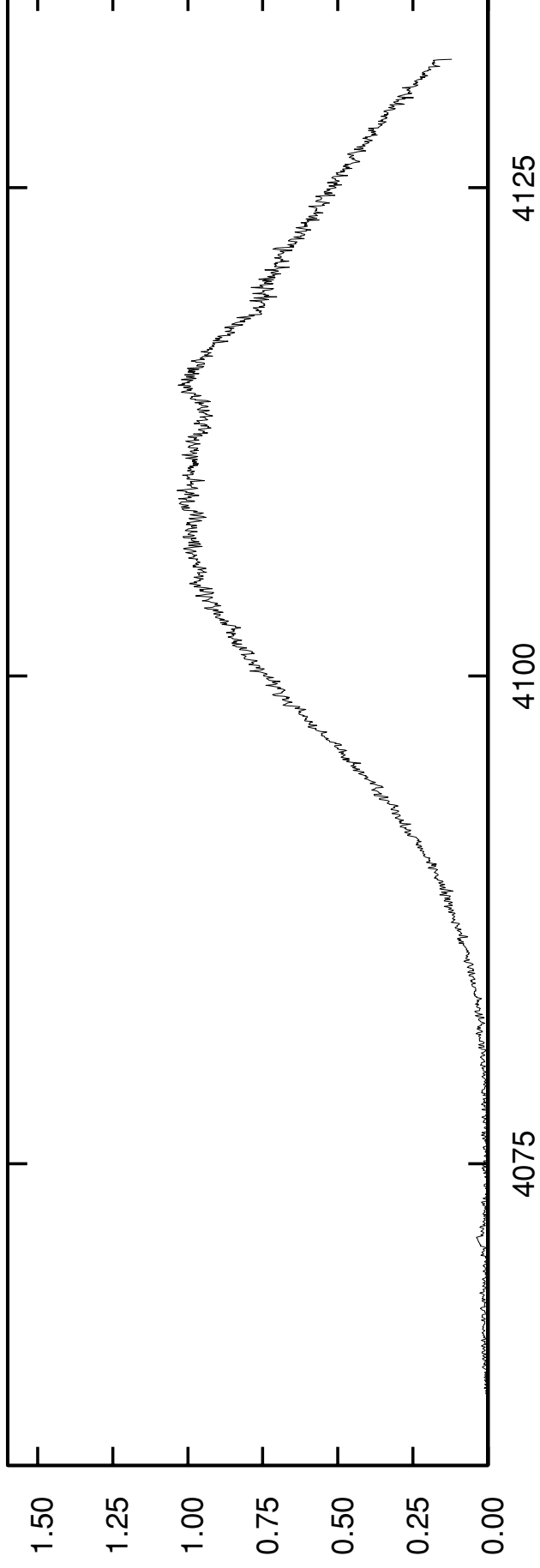


Wavelength (Angstroms)

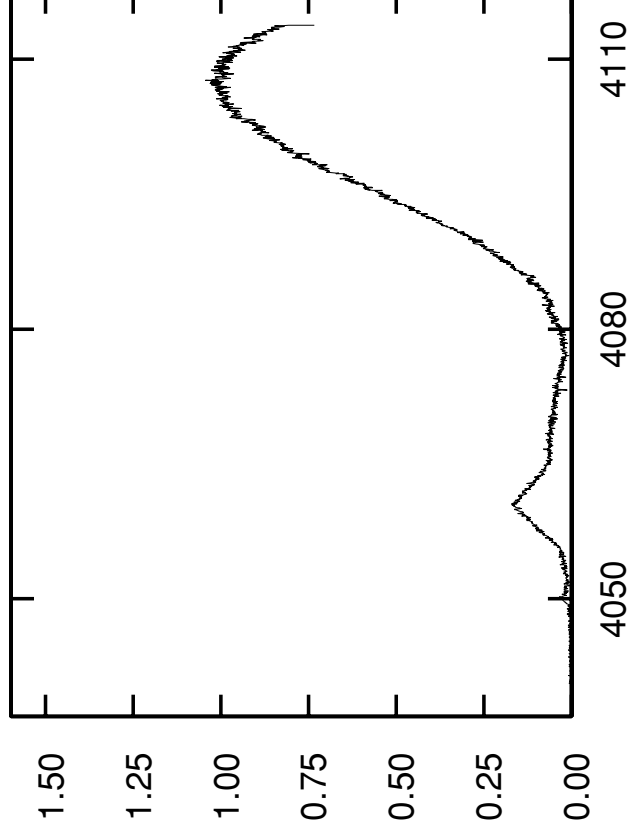
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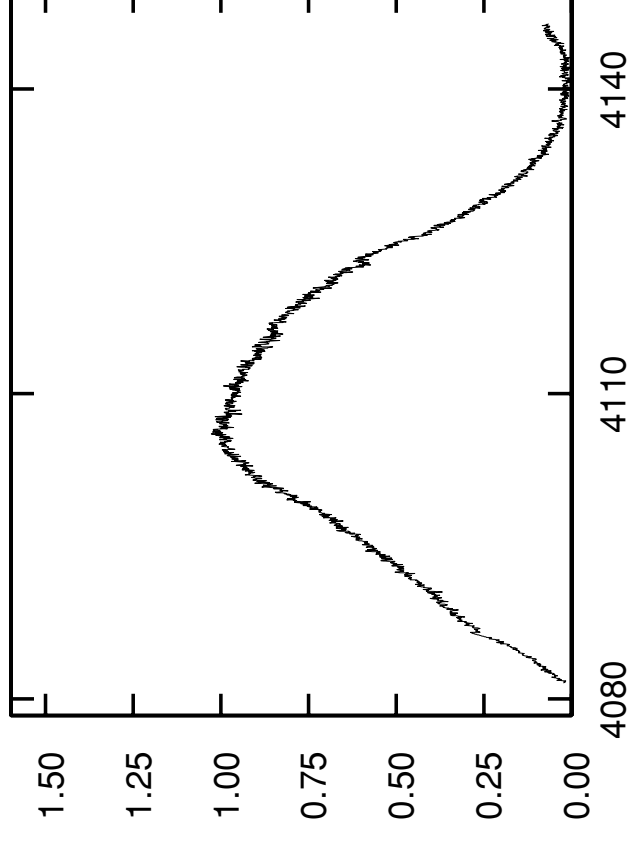
Order 149 - Central



Order 149 - Blue

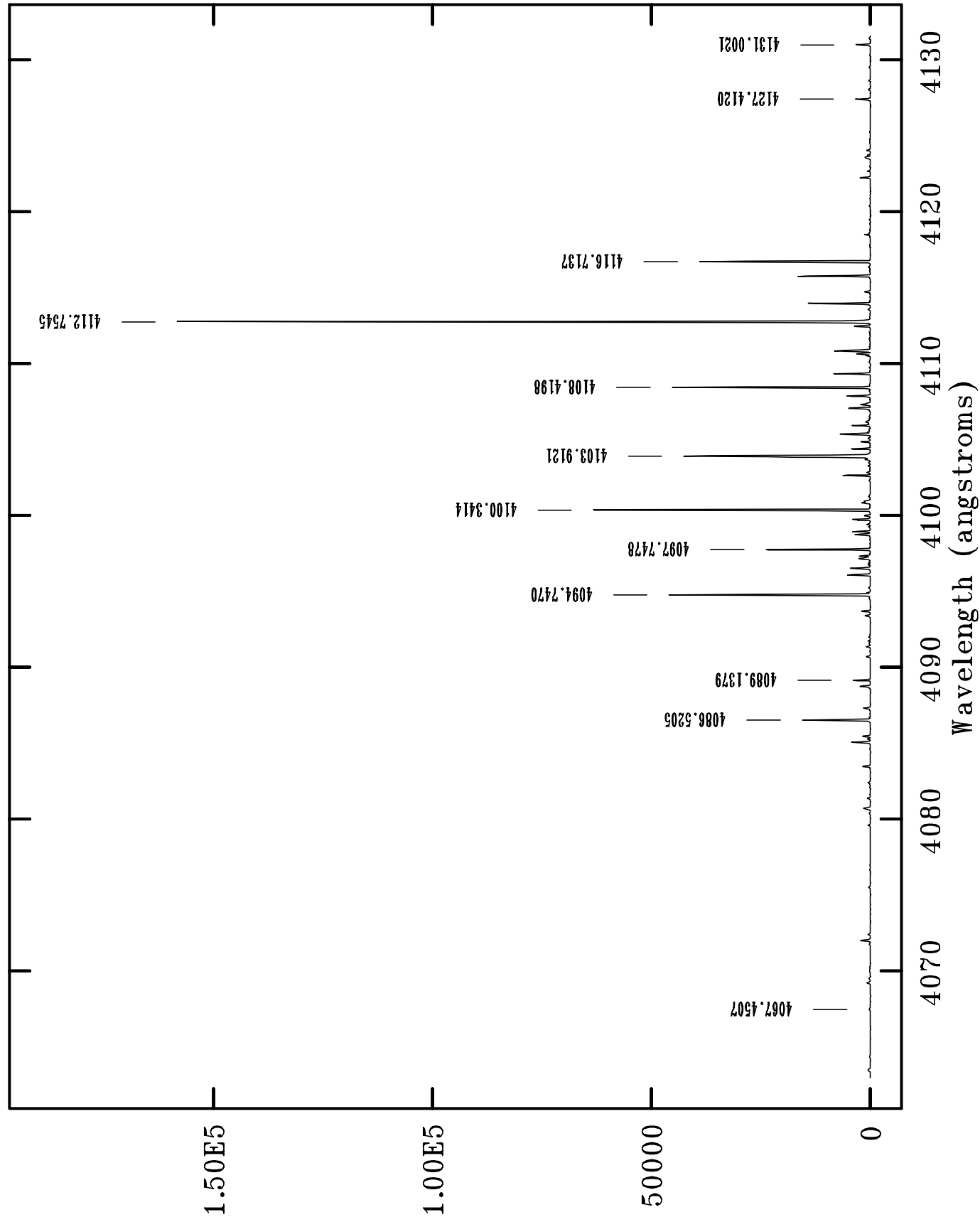


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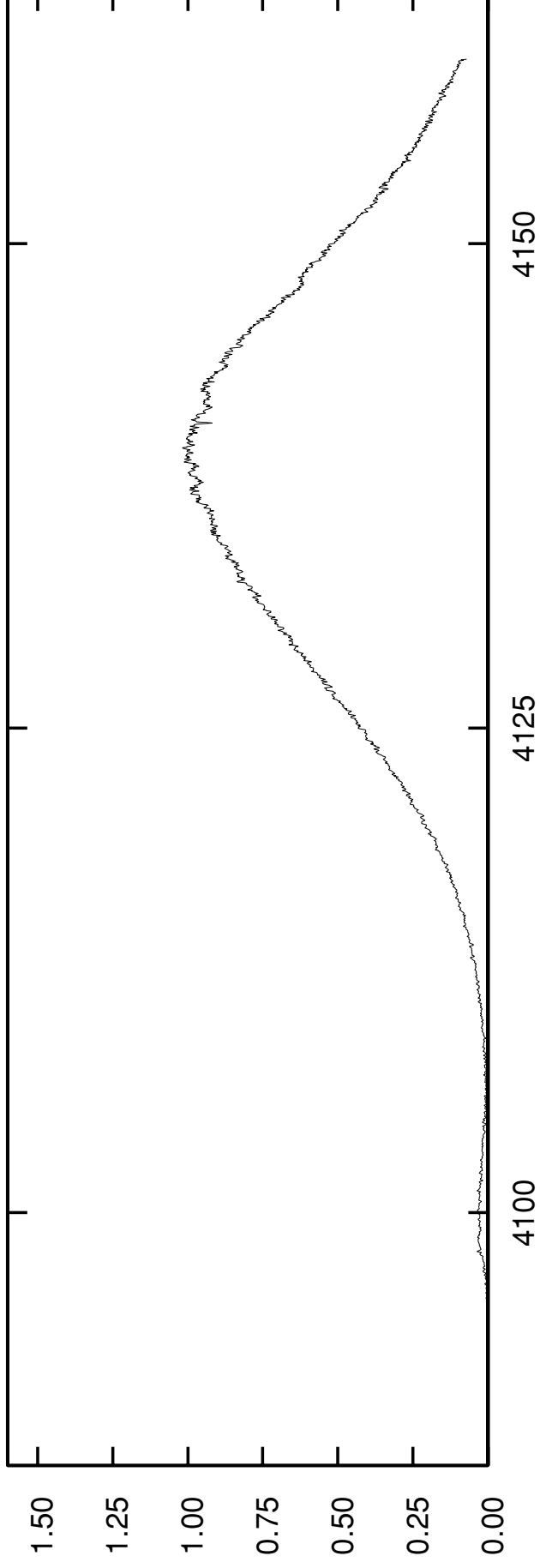


Wavelength (Angstroms)

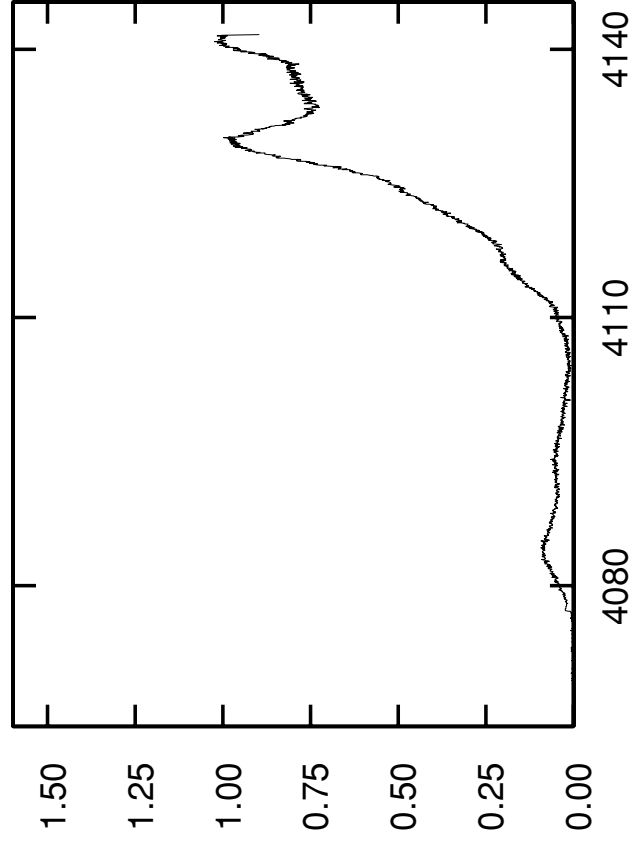
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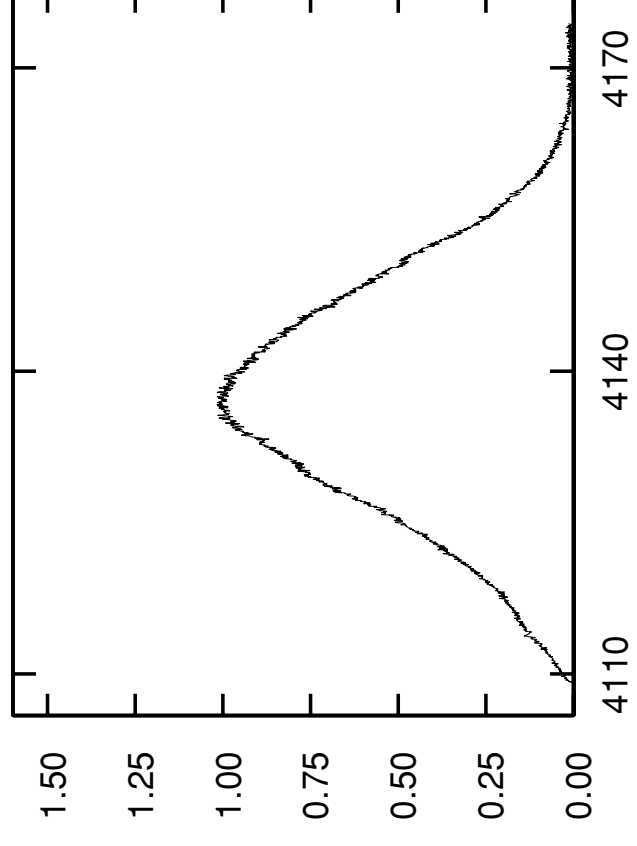
Order 148 - Central



Order 148 - Blue

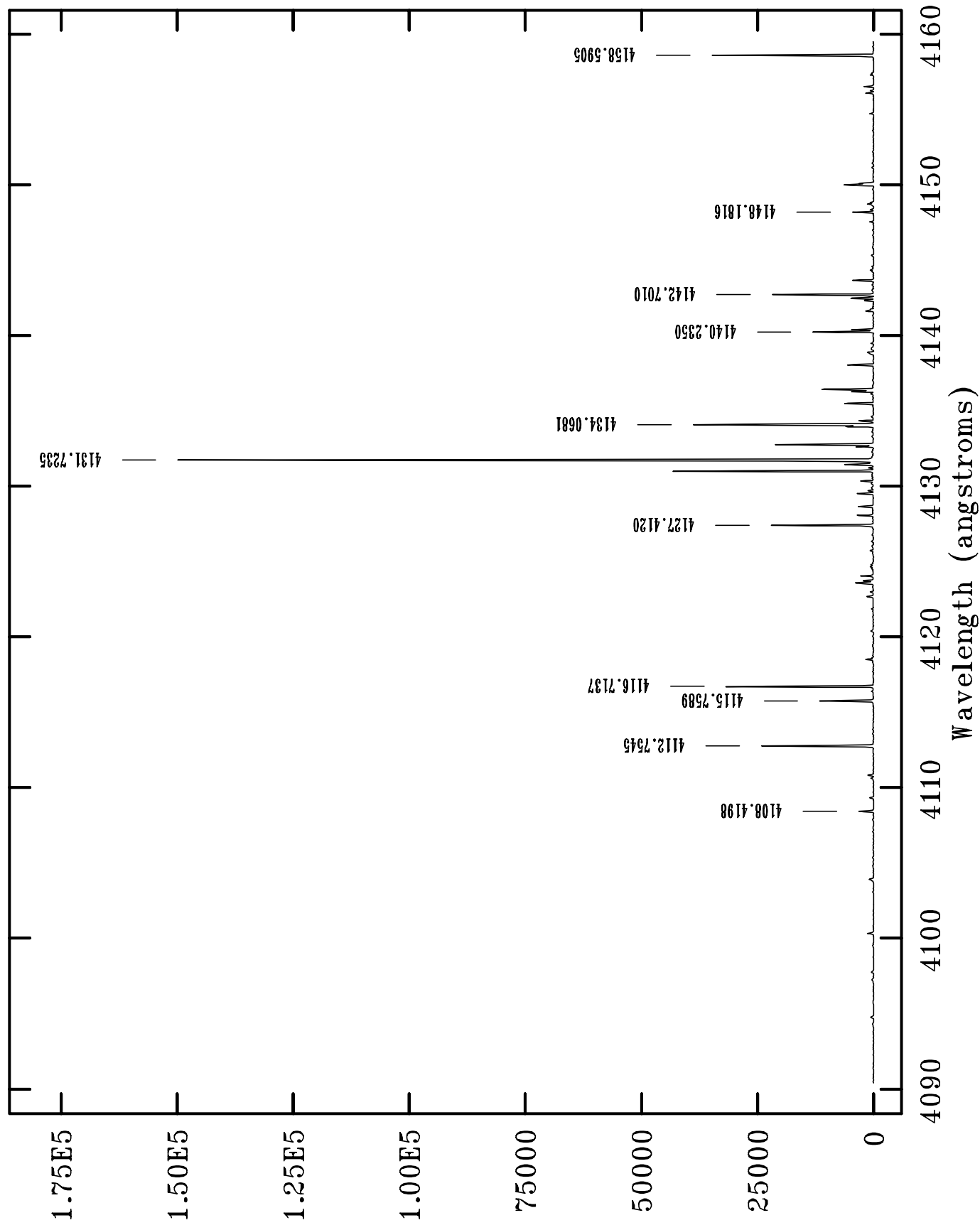


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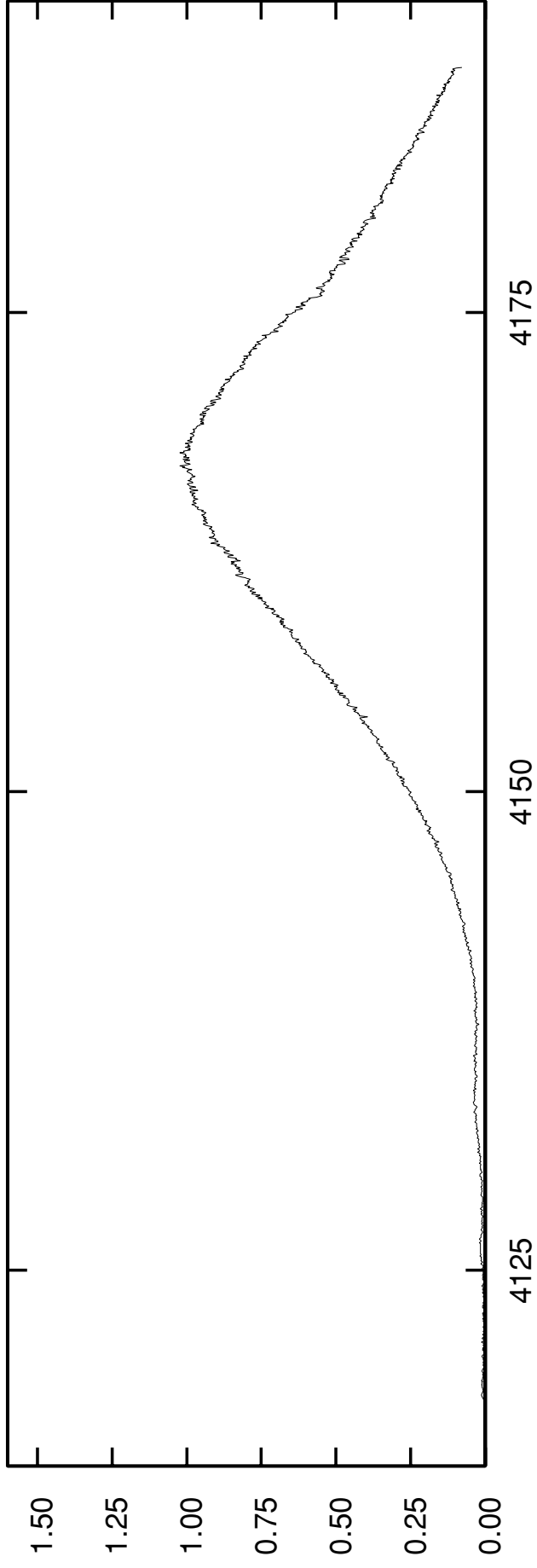


Wavelength (Angstroms)

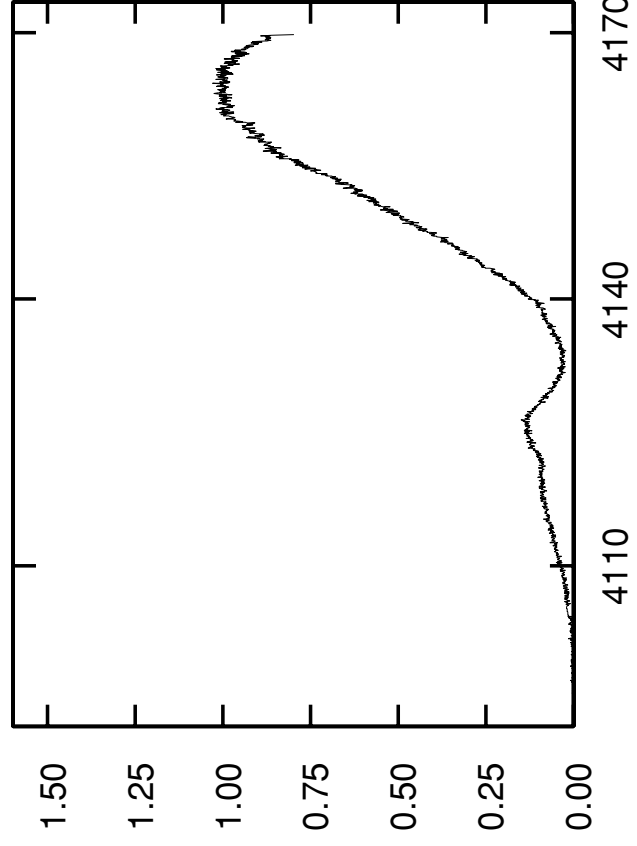
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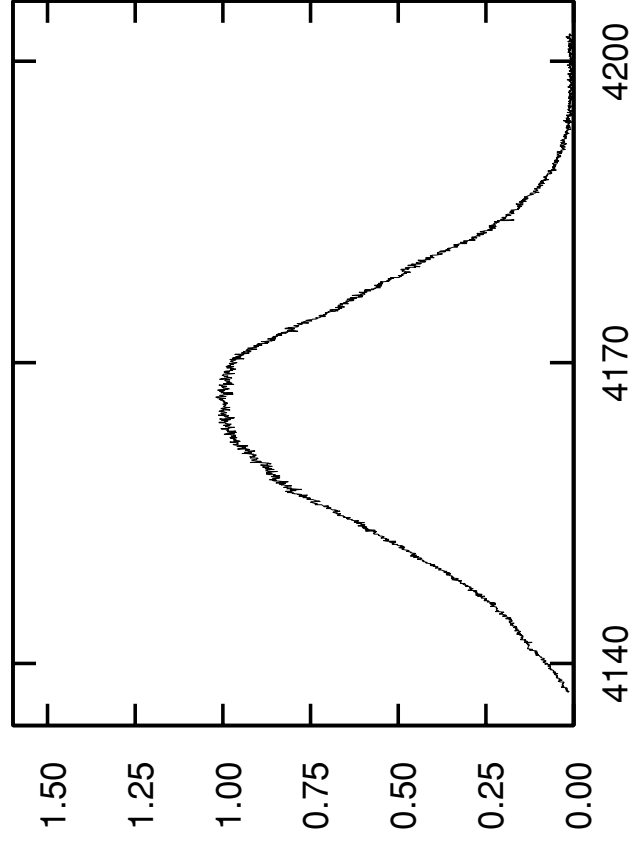
Order 147 - Central



Order 147 - Blue

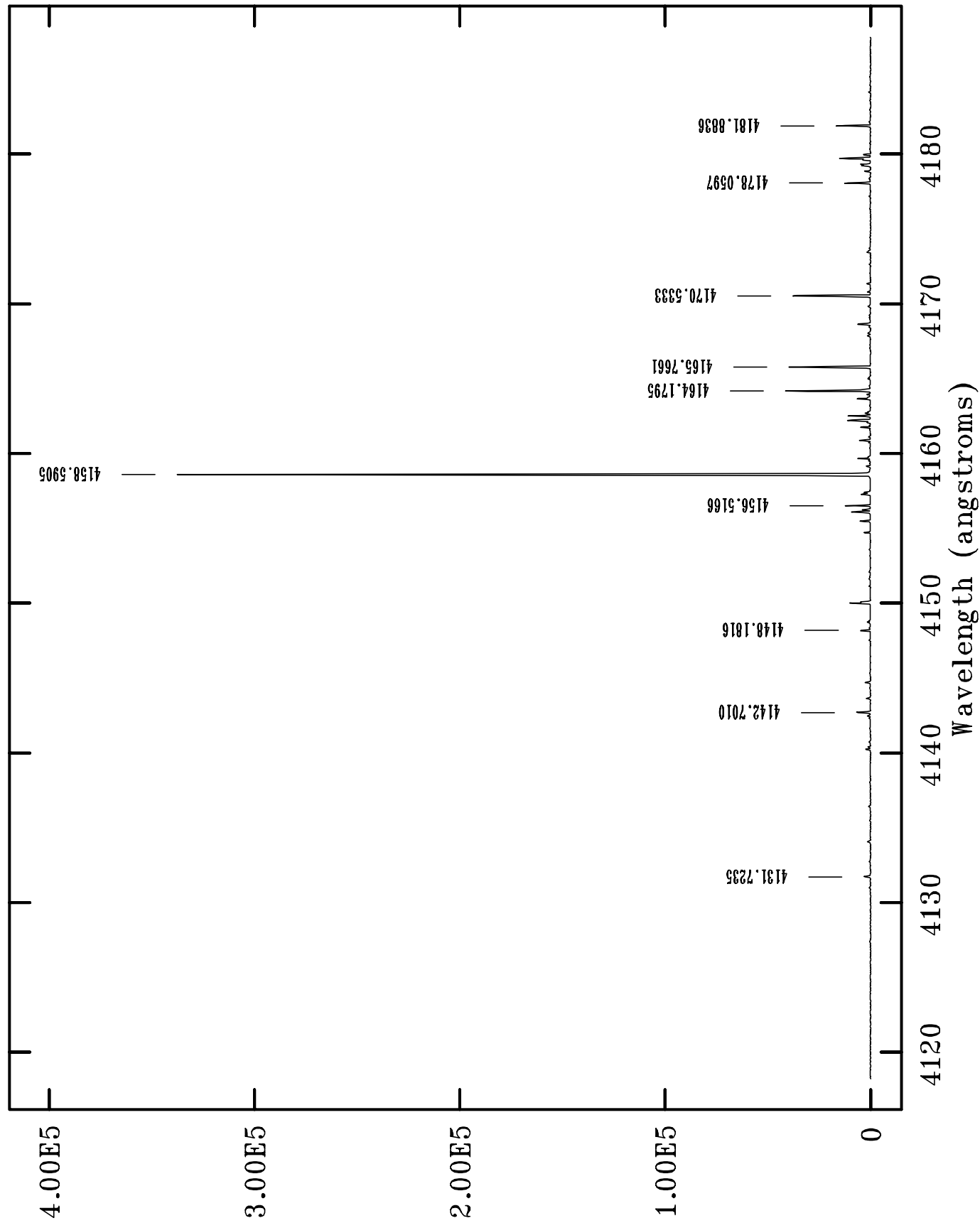


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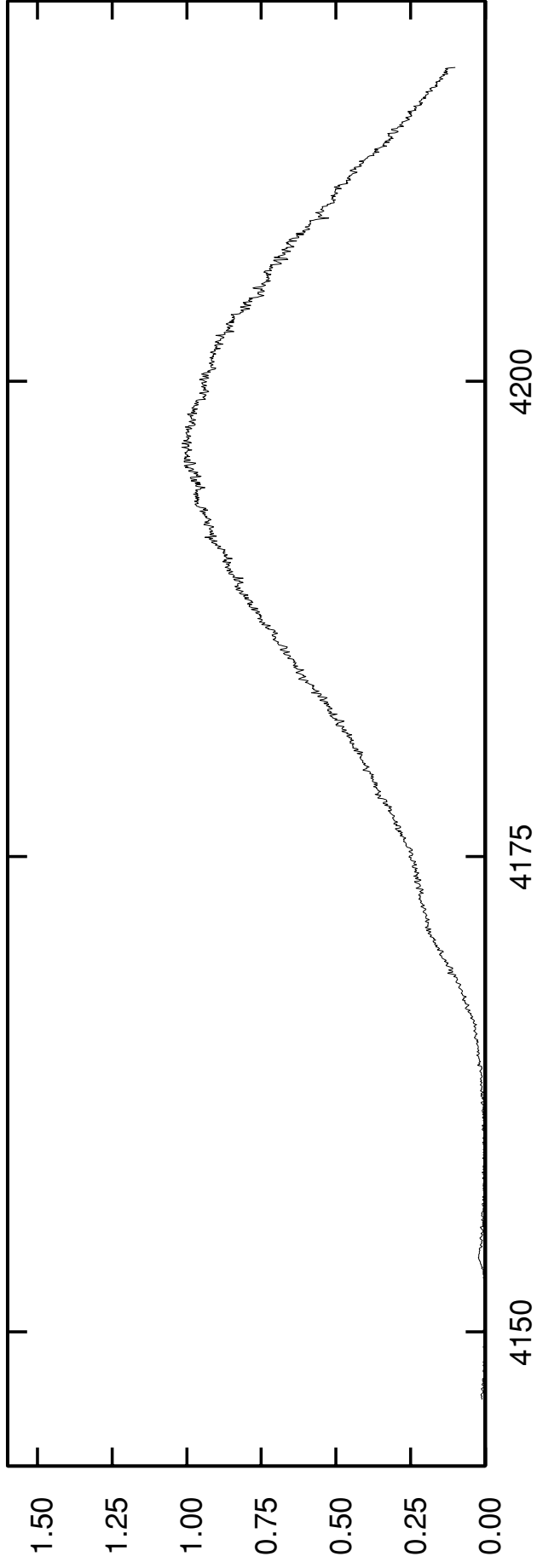


Wavelength (Angstroms)

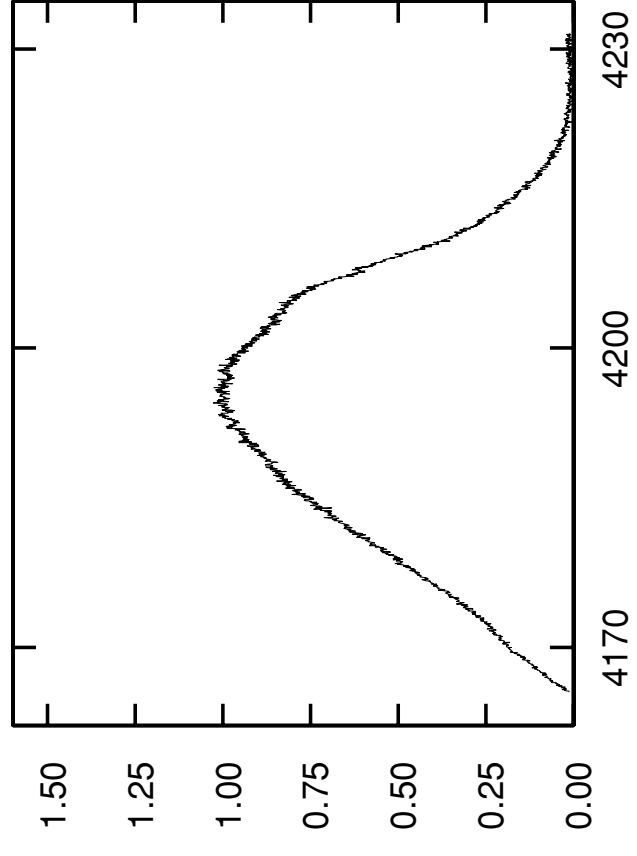
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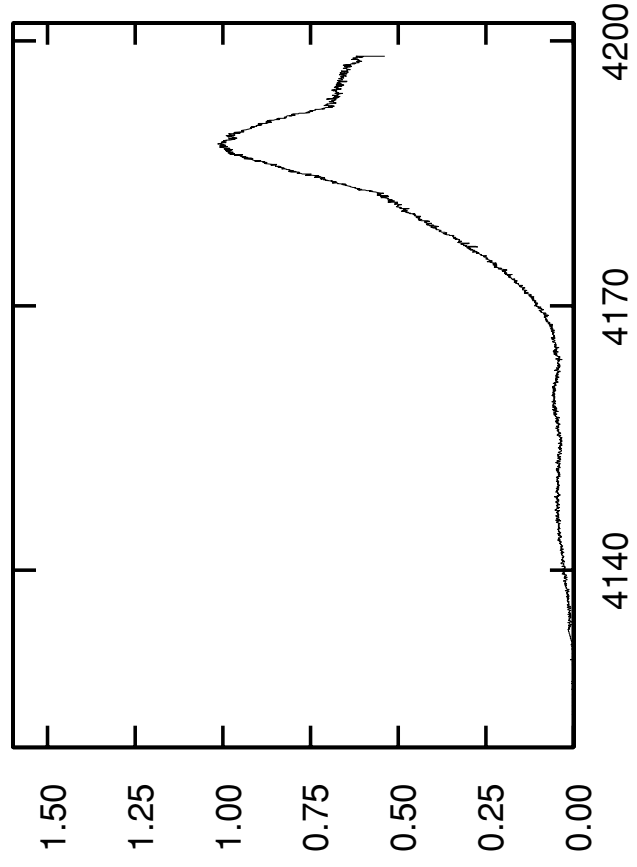
Order 146 - Central



Order 146 - Red

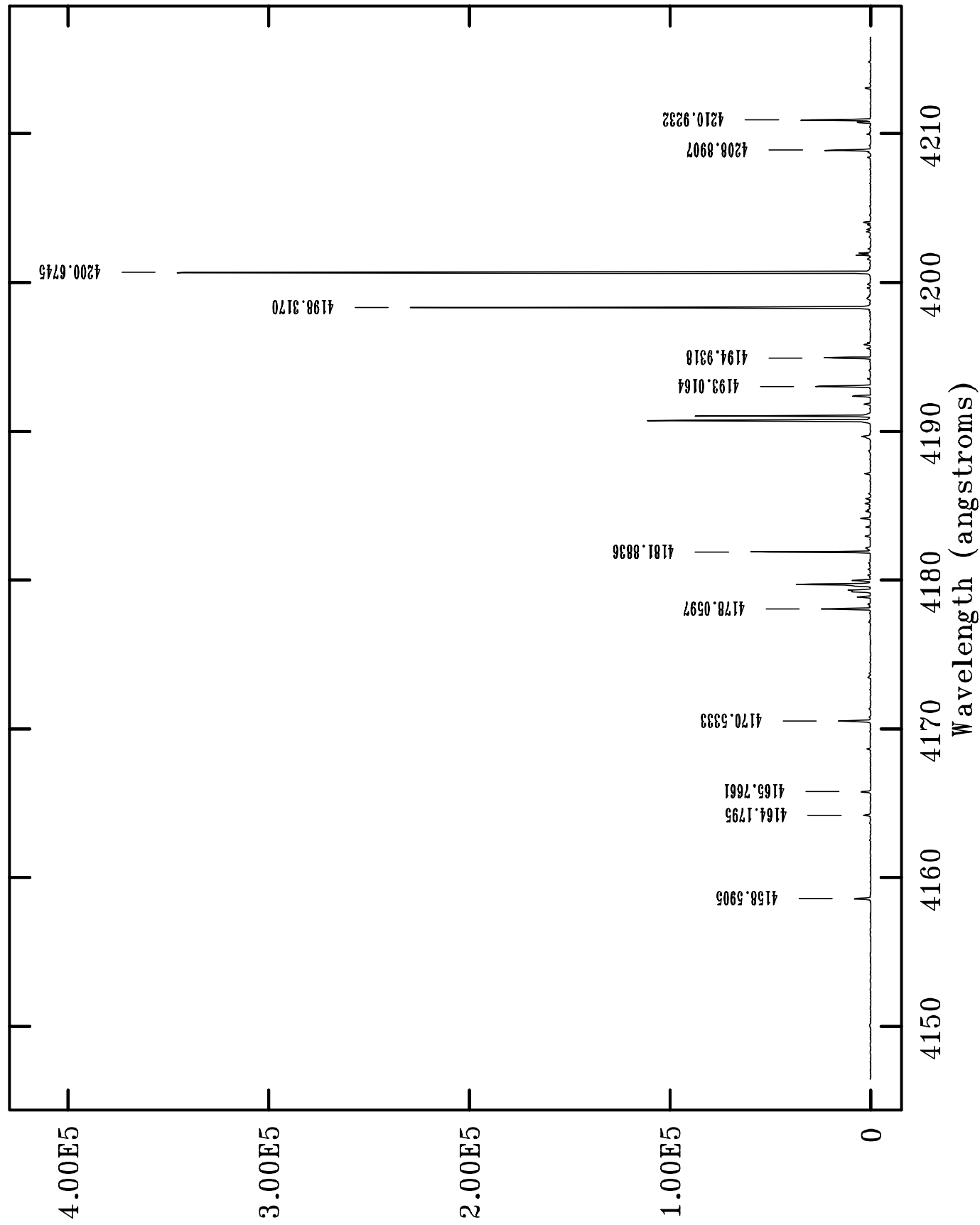


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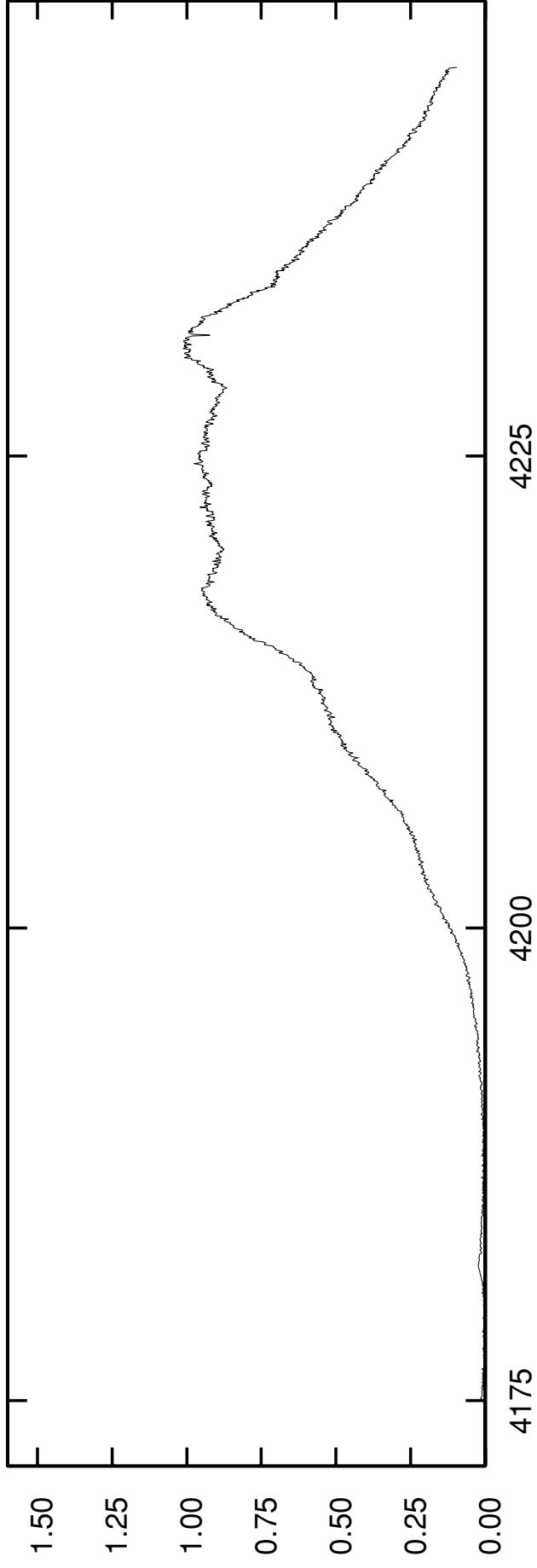


Wavelength (Angstroms)

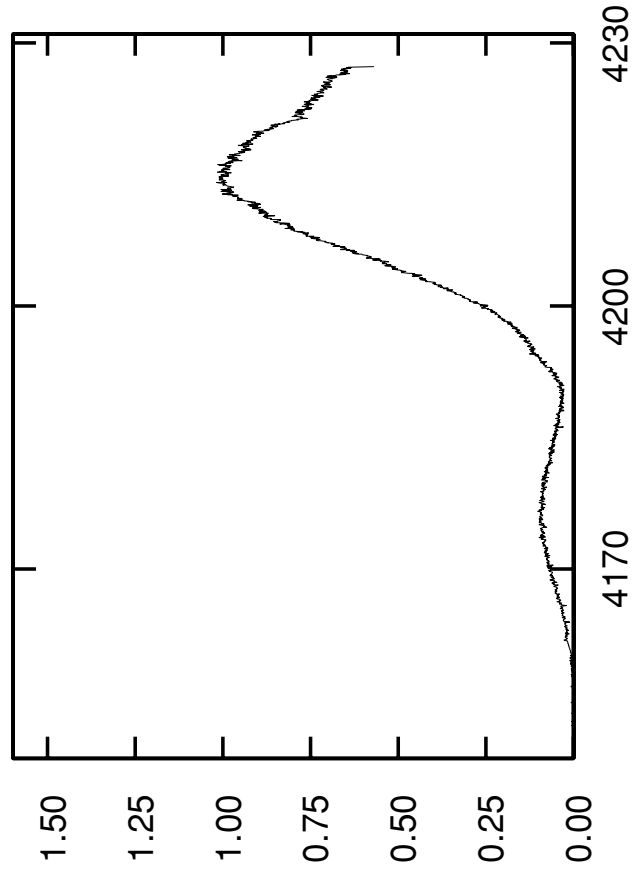
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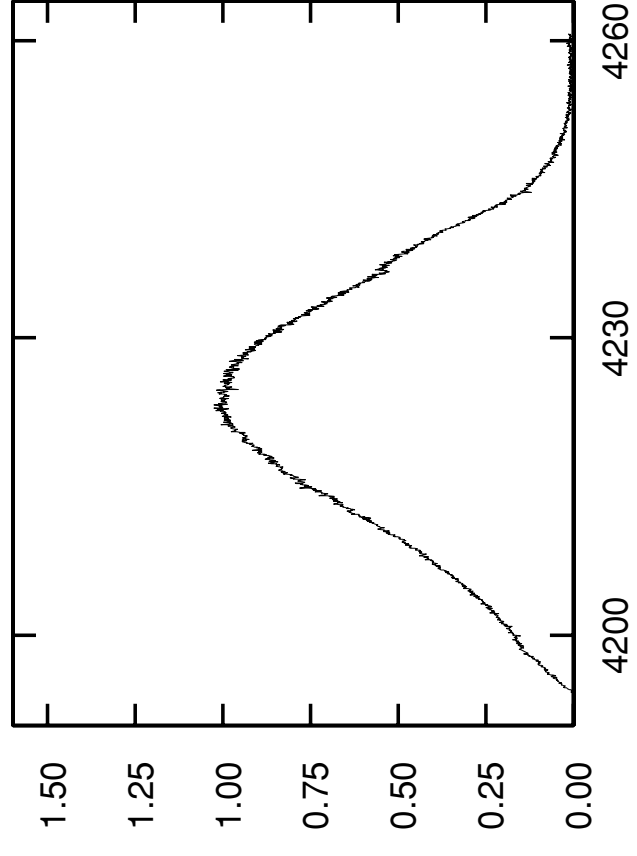
Order 145 - Central



Order 145 - Blue

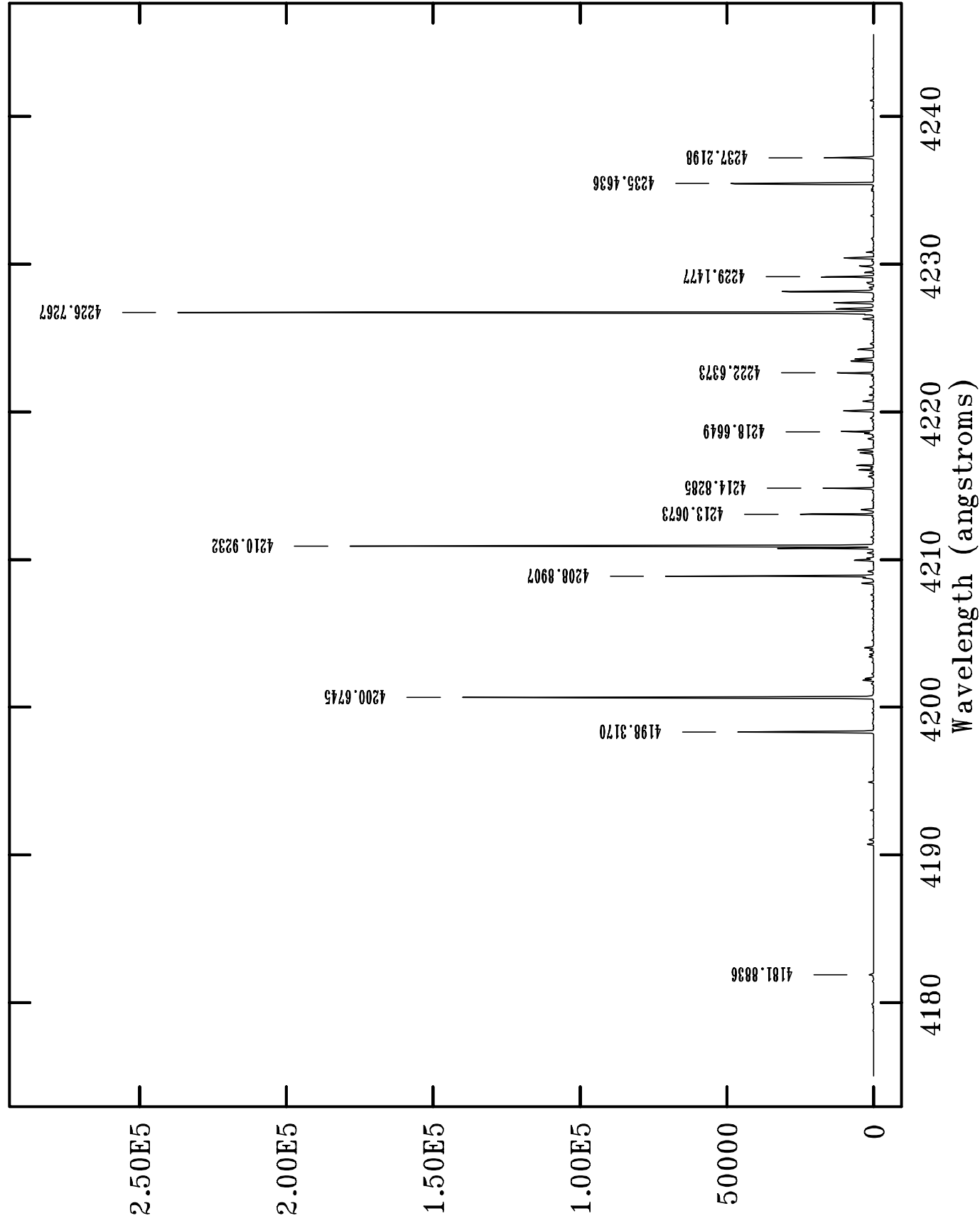


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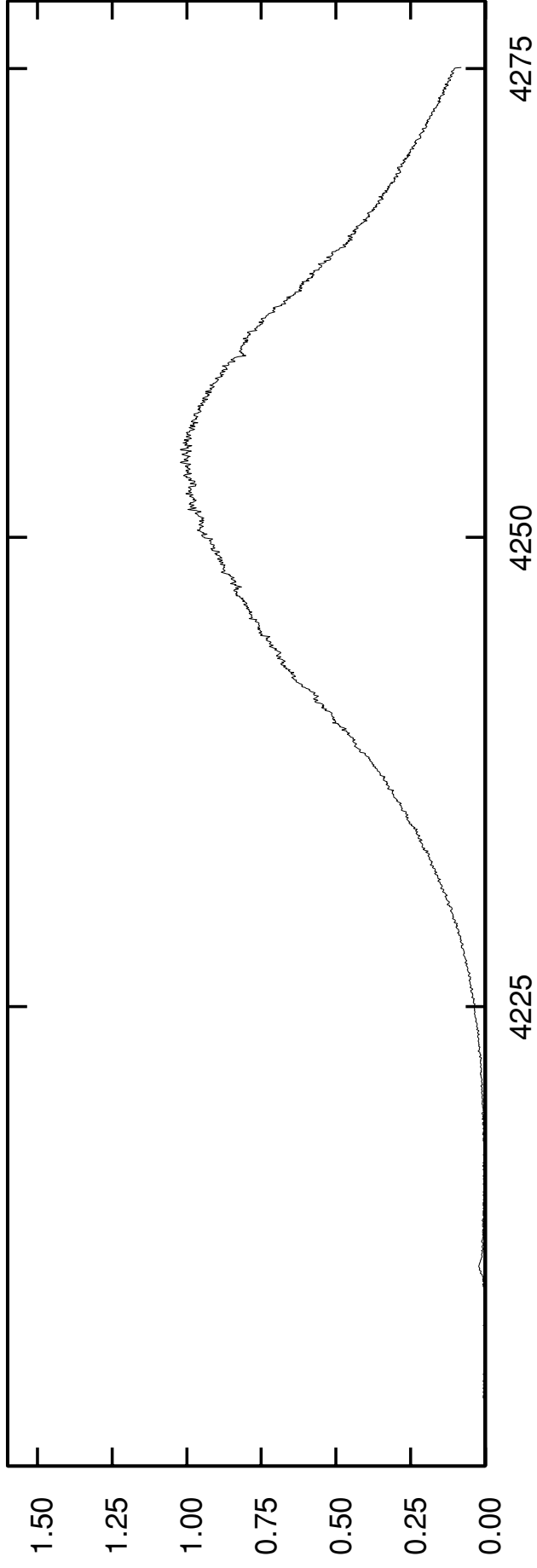


Wavelength (Angstroms)

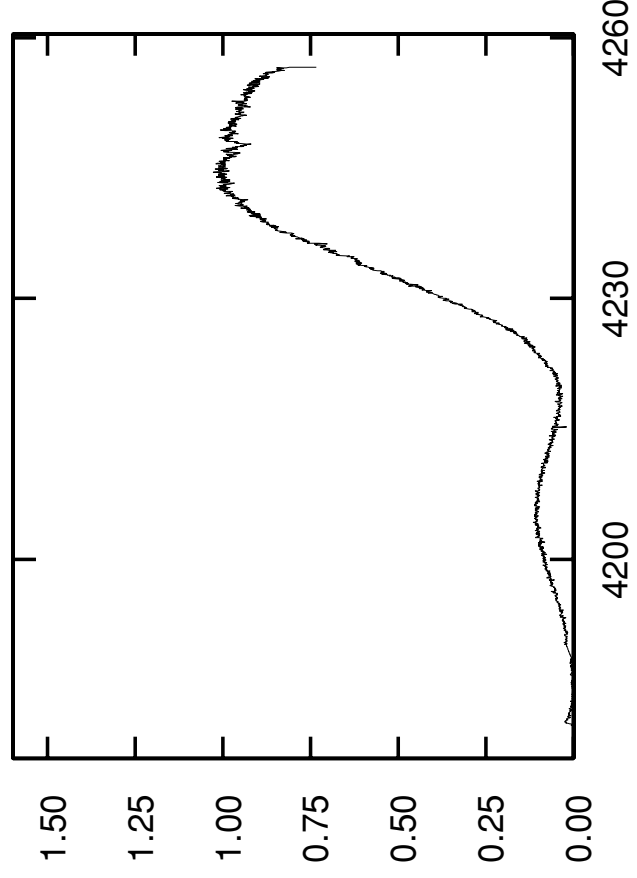
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:35:24 30-Mar-2002
Aperture 20, Image line 20, Order 145
identify thar_316g4931_red2: ThAr



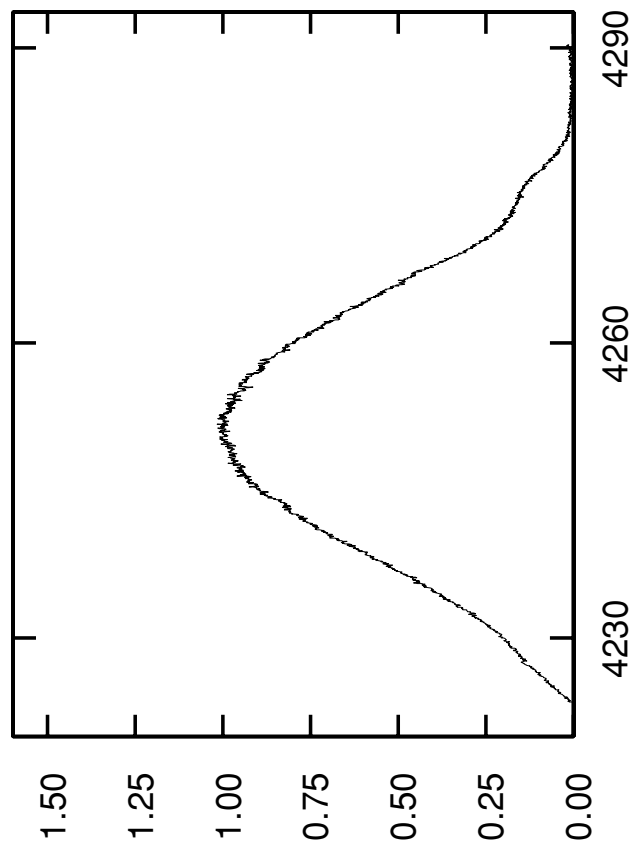
Order 144 - Central



Order 144 - Blue

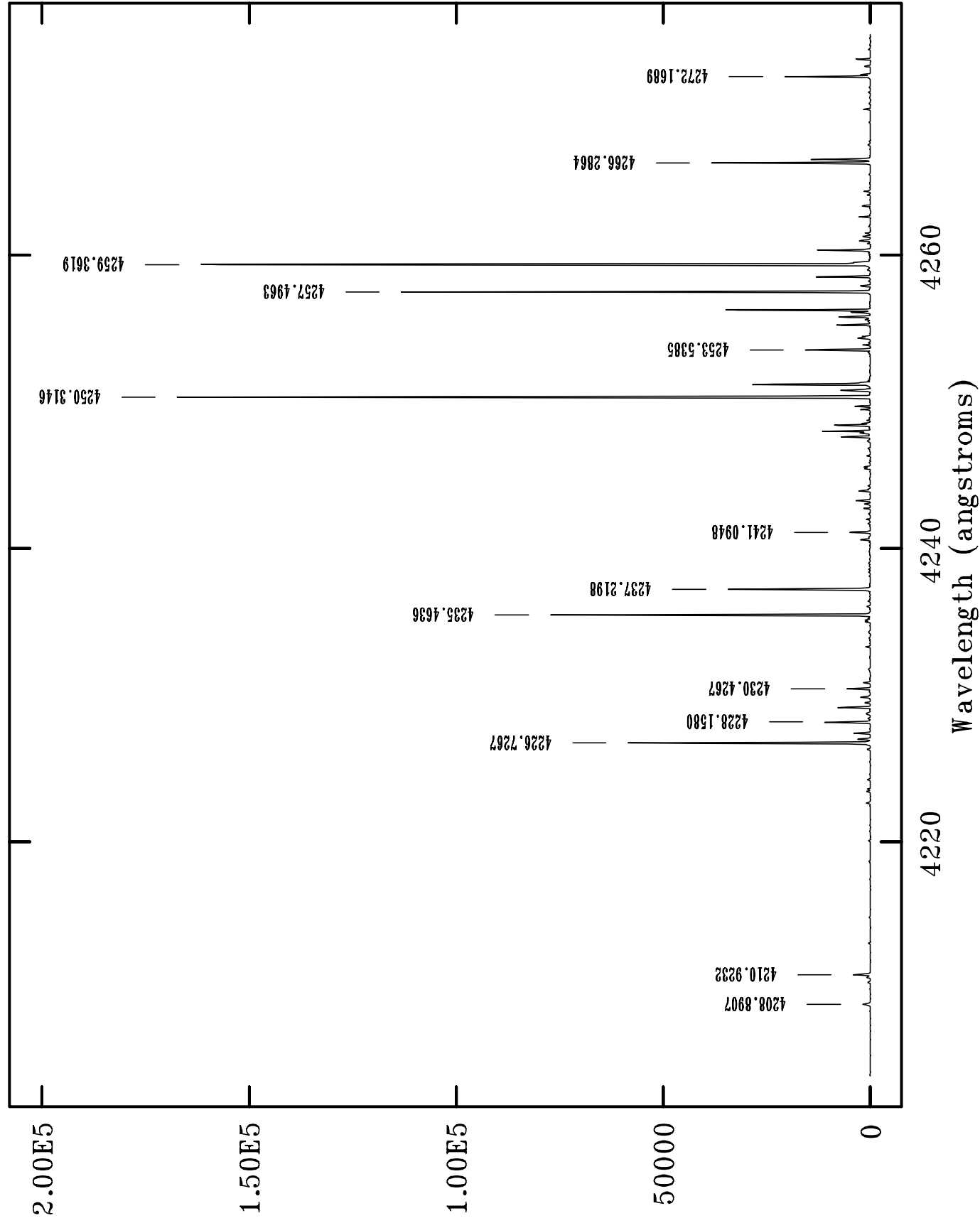


Order 144 - Red

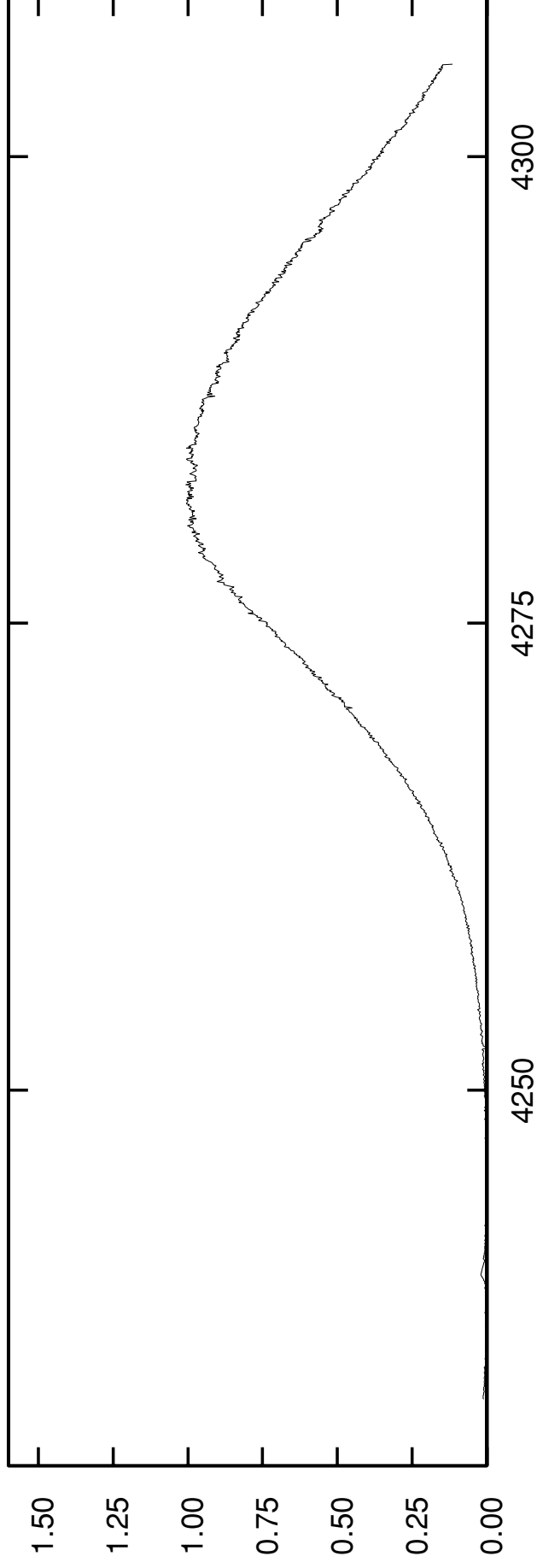


Wavelength (Angstroms)

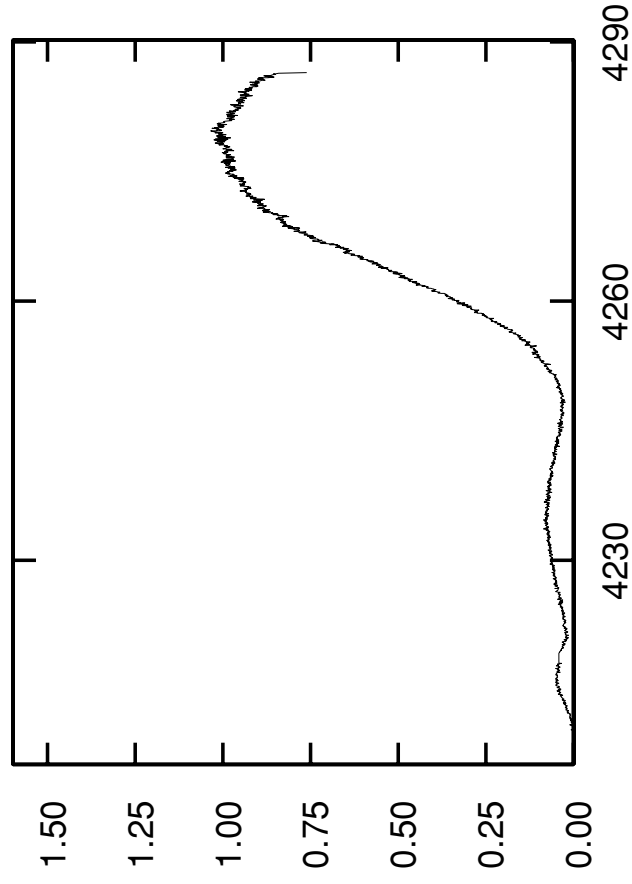
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:34:49 30-Mar-2002
Aperture 19, Image line 19, Order 144
identify thar_316g4931_red2: ThAr



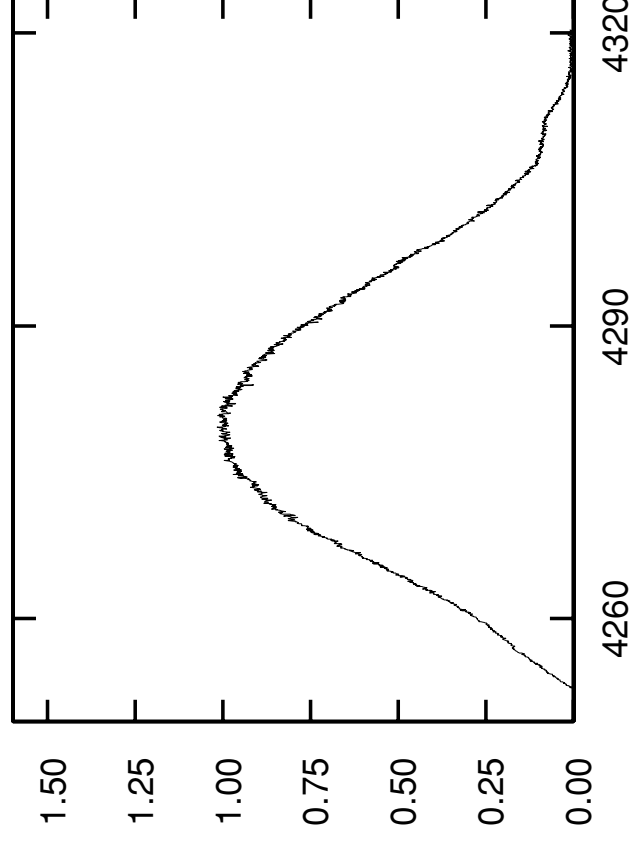
Order 143 - Central



Order 143 - Blue

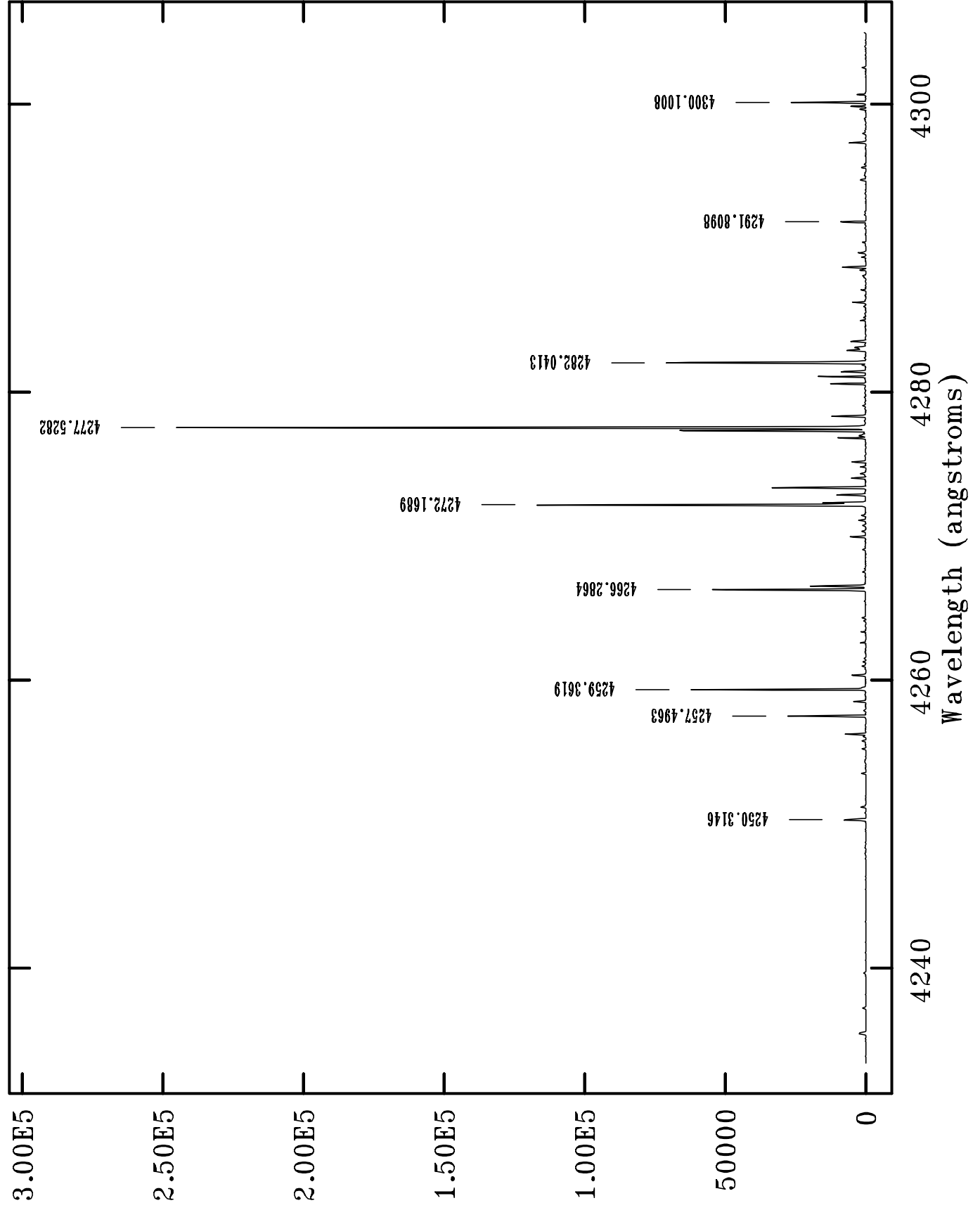


Order 143 - Red

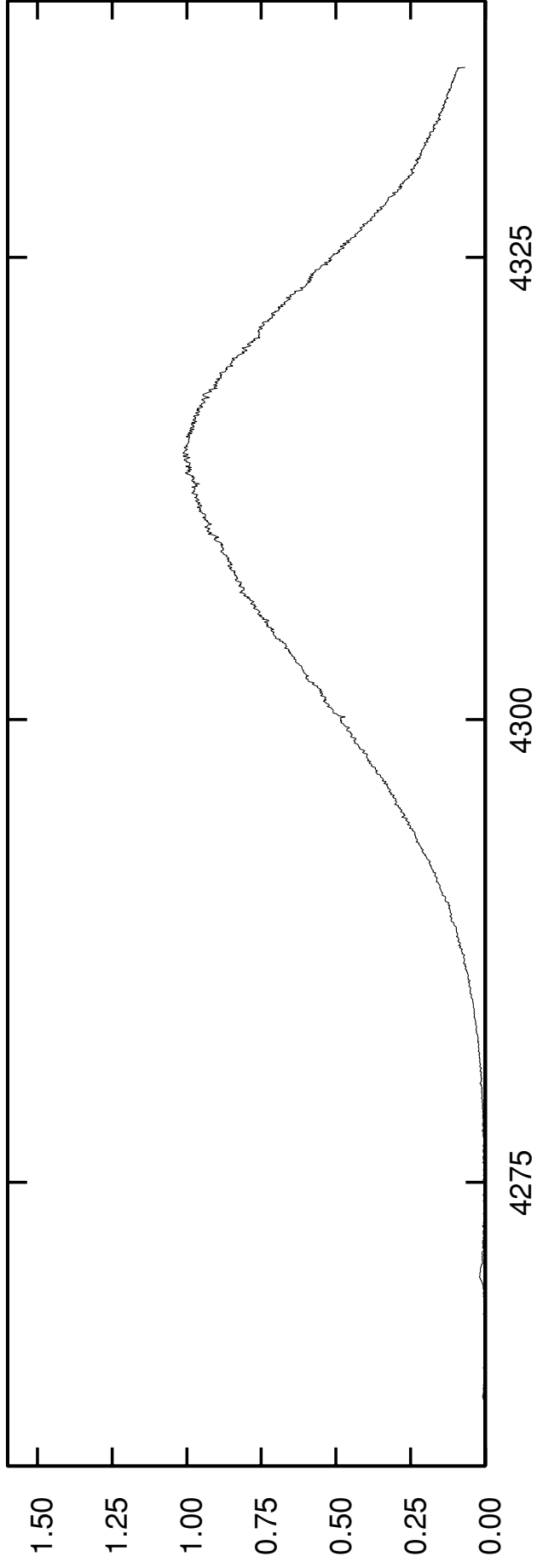


Wavelength (Angstroms)

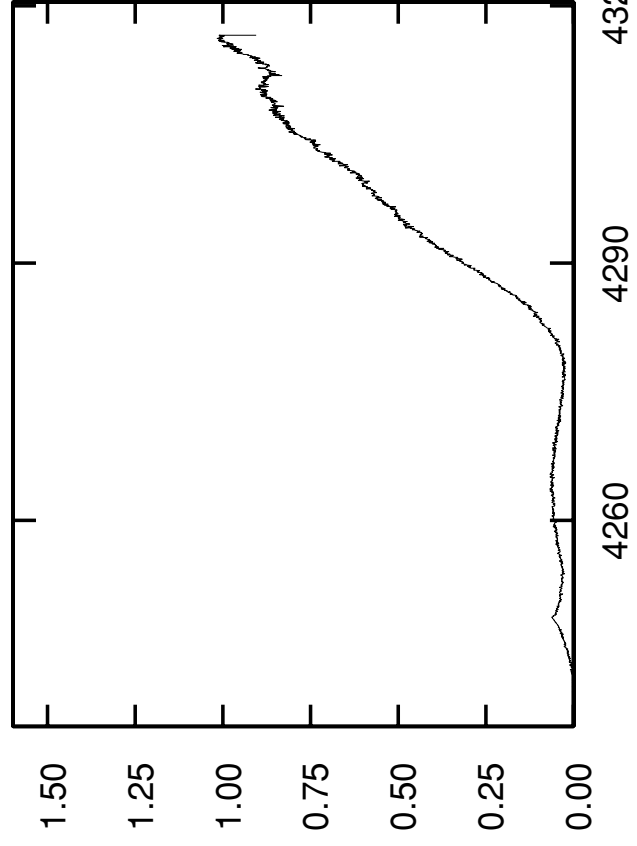
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:34:01 30-Mar-2002
Aperture 18, Image line 18, Order 143
ecidentify thar_316g4931_red2: ThAr



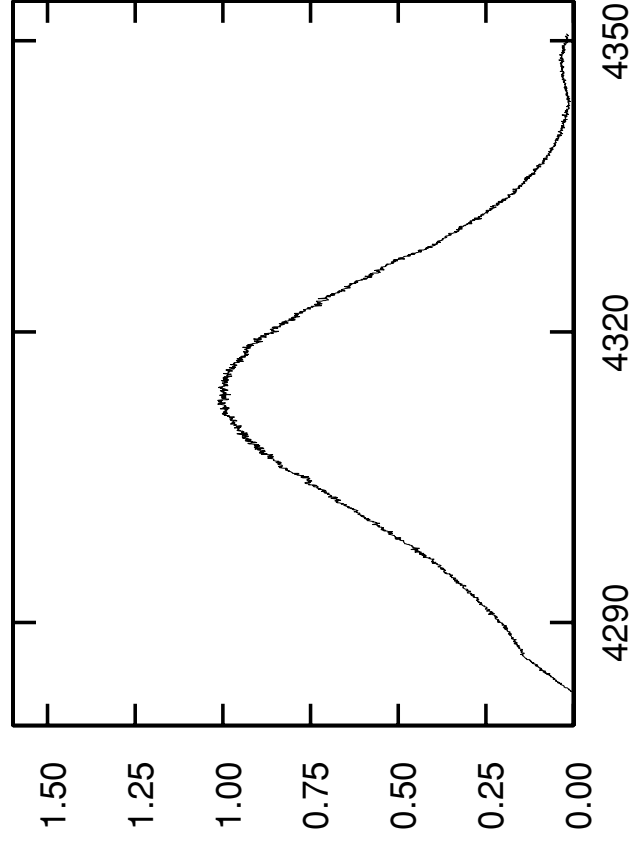
Order 142 - Central



Order 142 - Blue

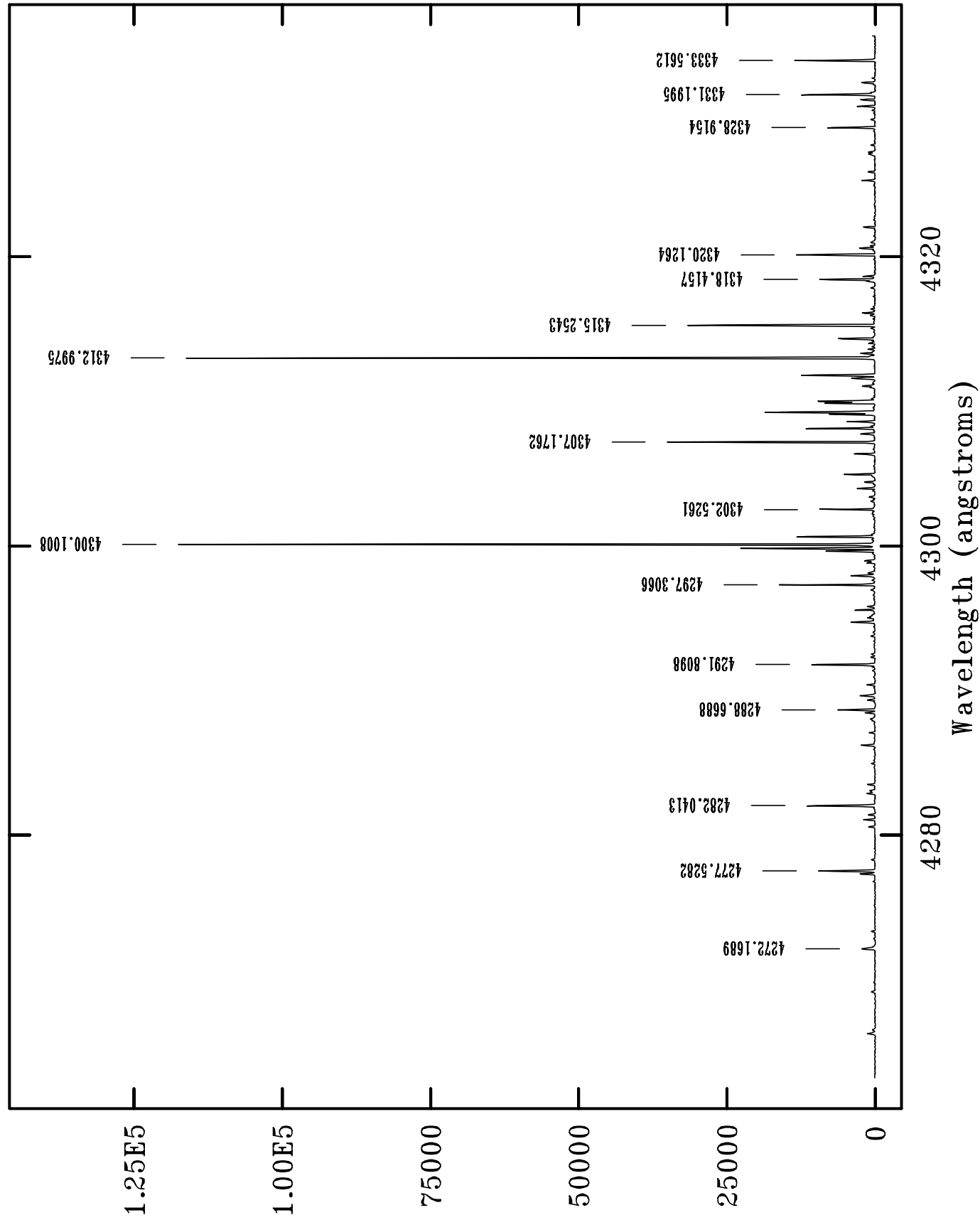


Order 142 - Red

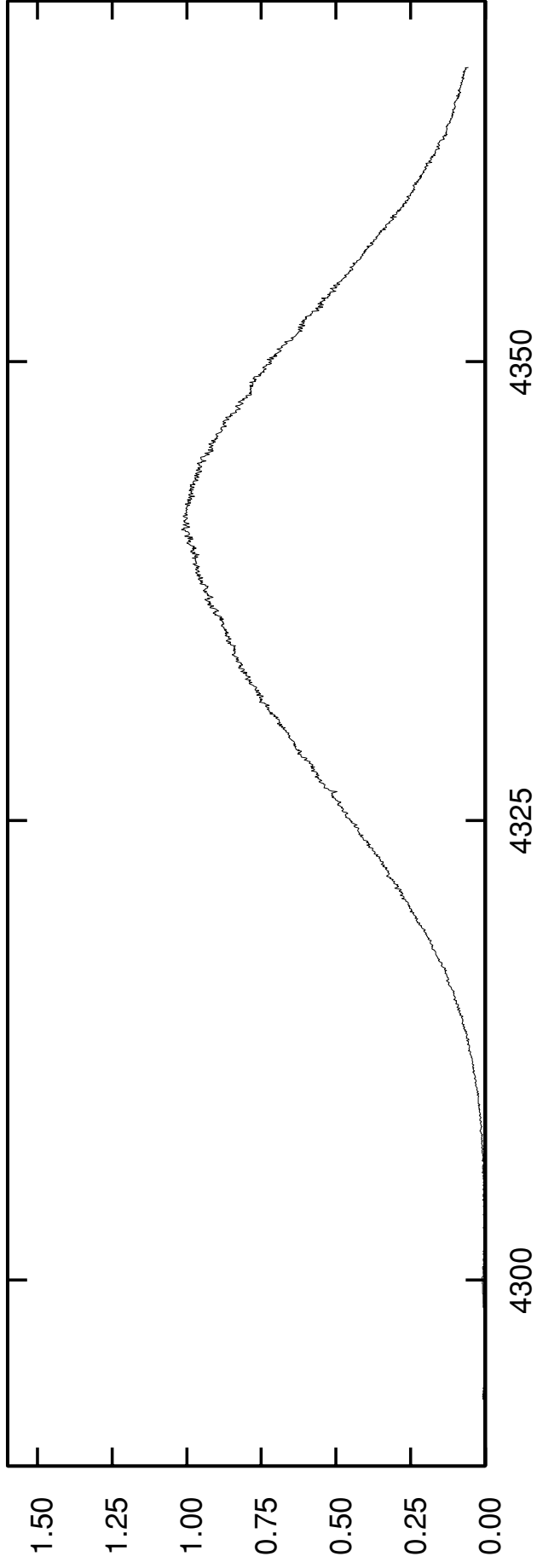


Wavelength (Angstroms)

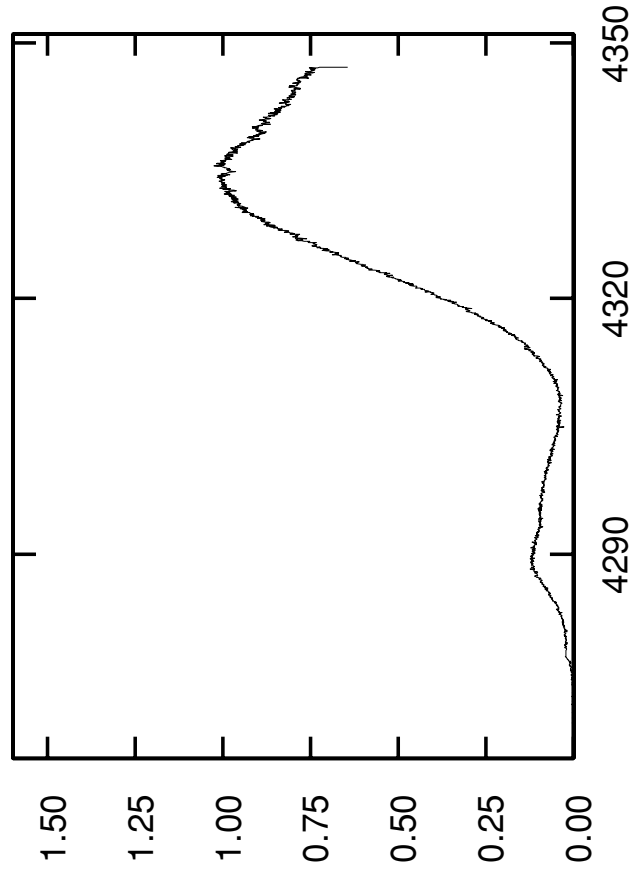
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:33:18 30-Mar-2002
Aperture 17, Image line 17, Order 142
ecidentify thar_316g4931_red2: ThAr



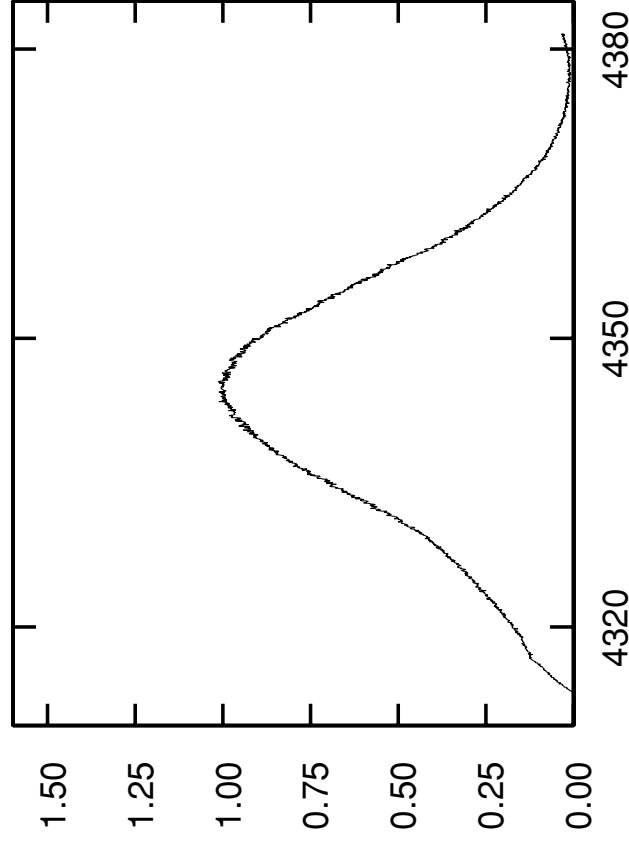
Order 141 - Central



Order 141 - Blue

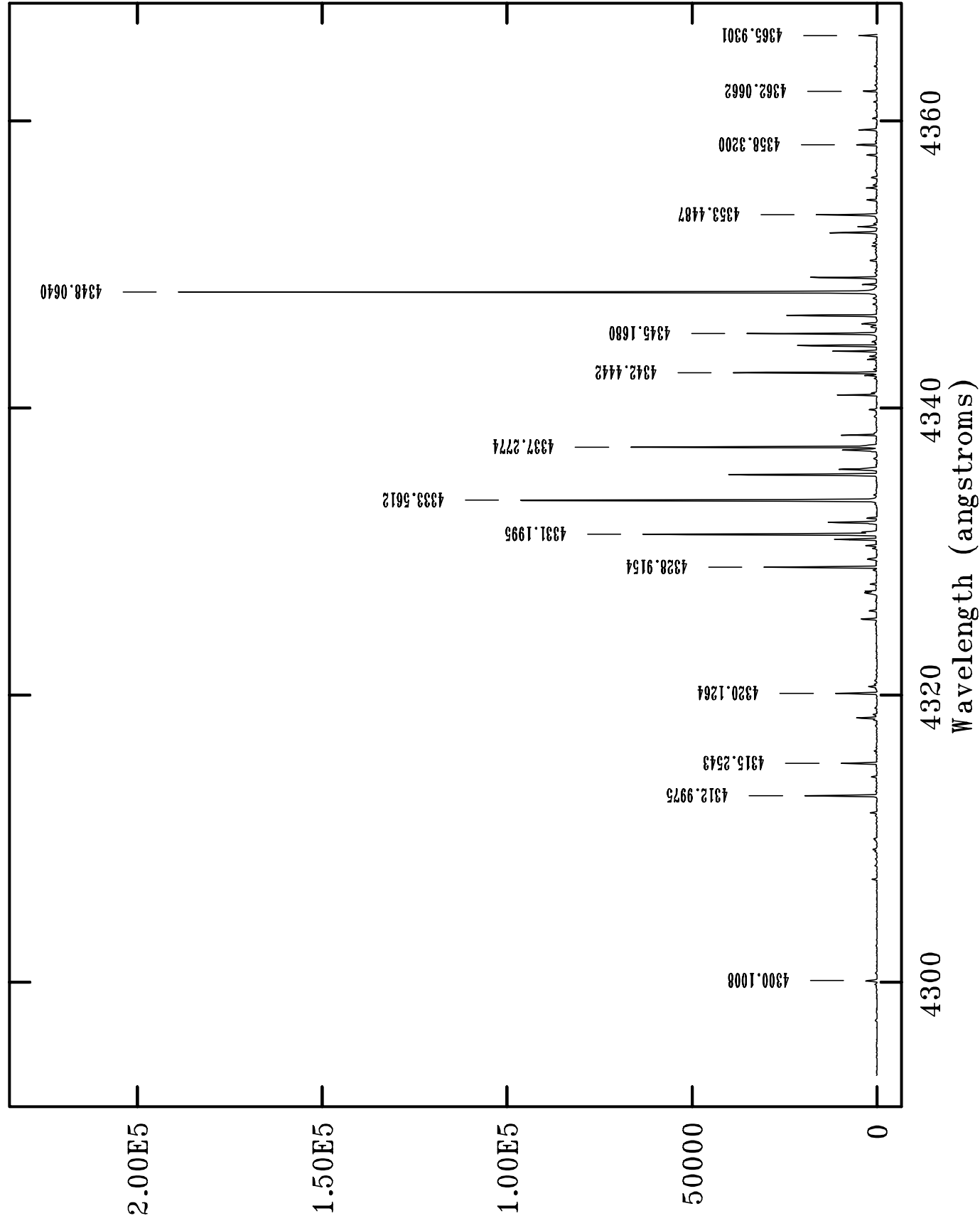


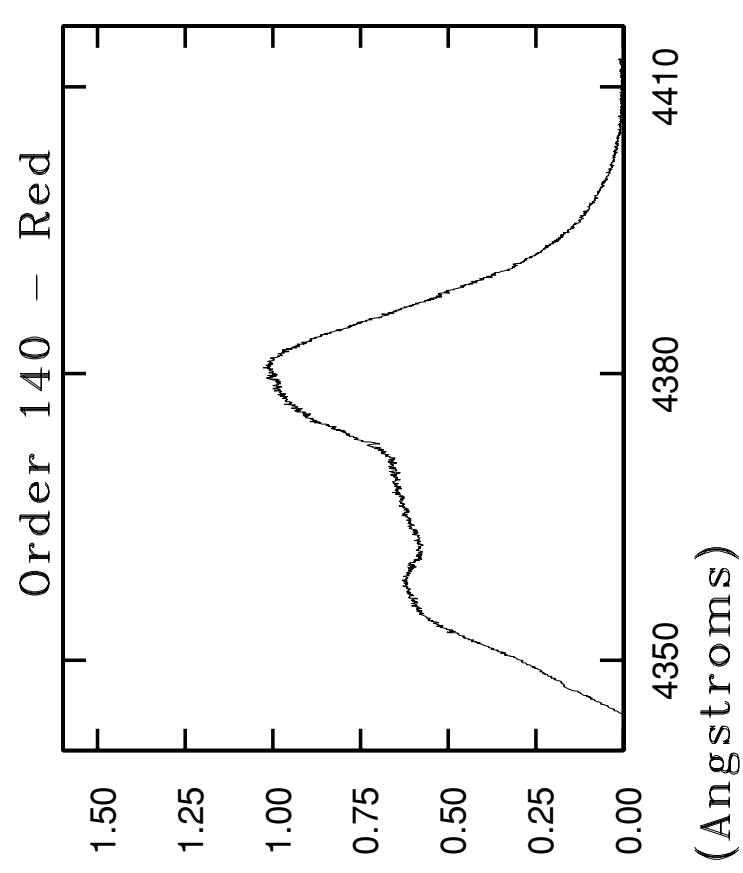
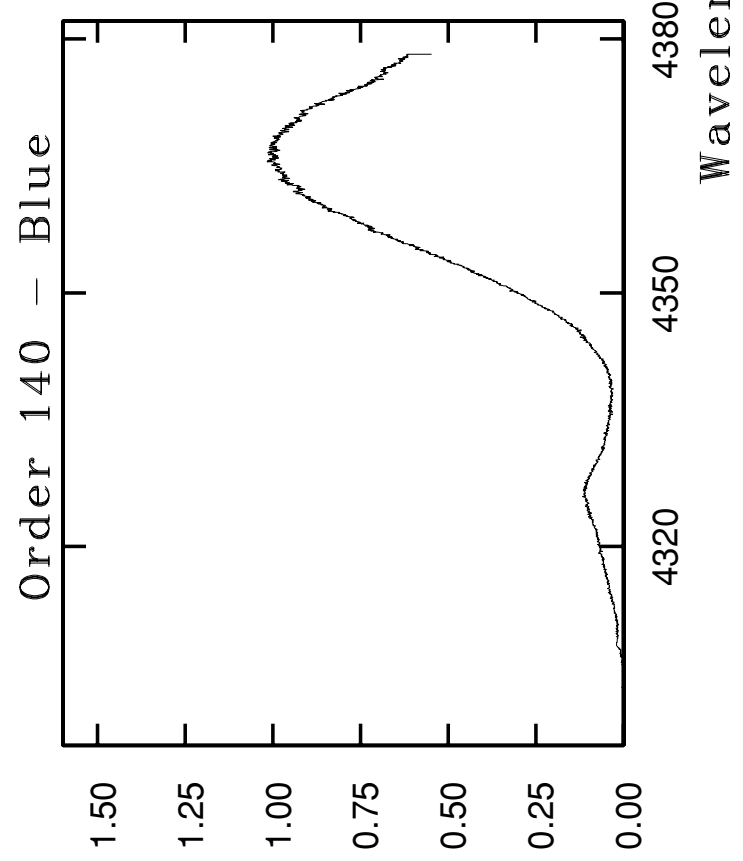
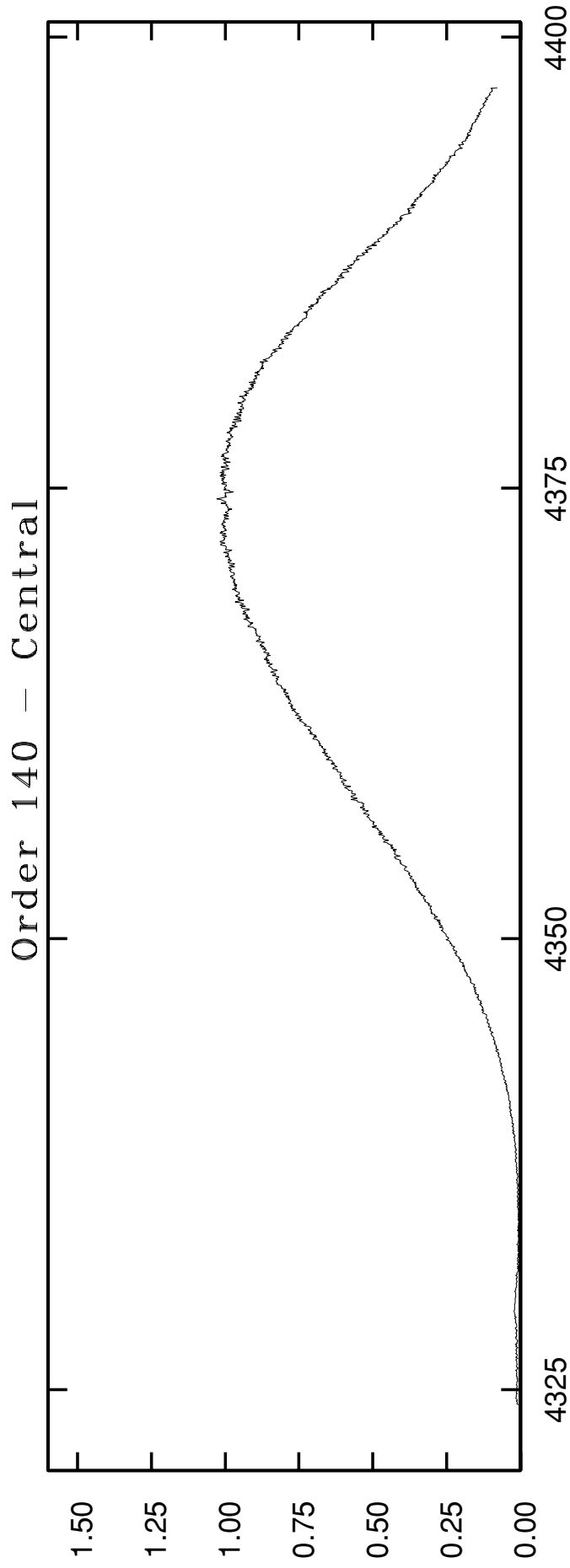
Order 141 - Red



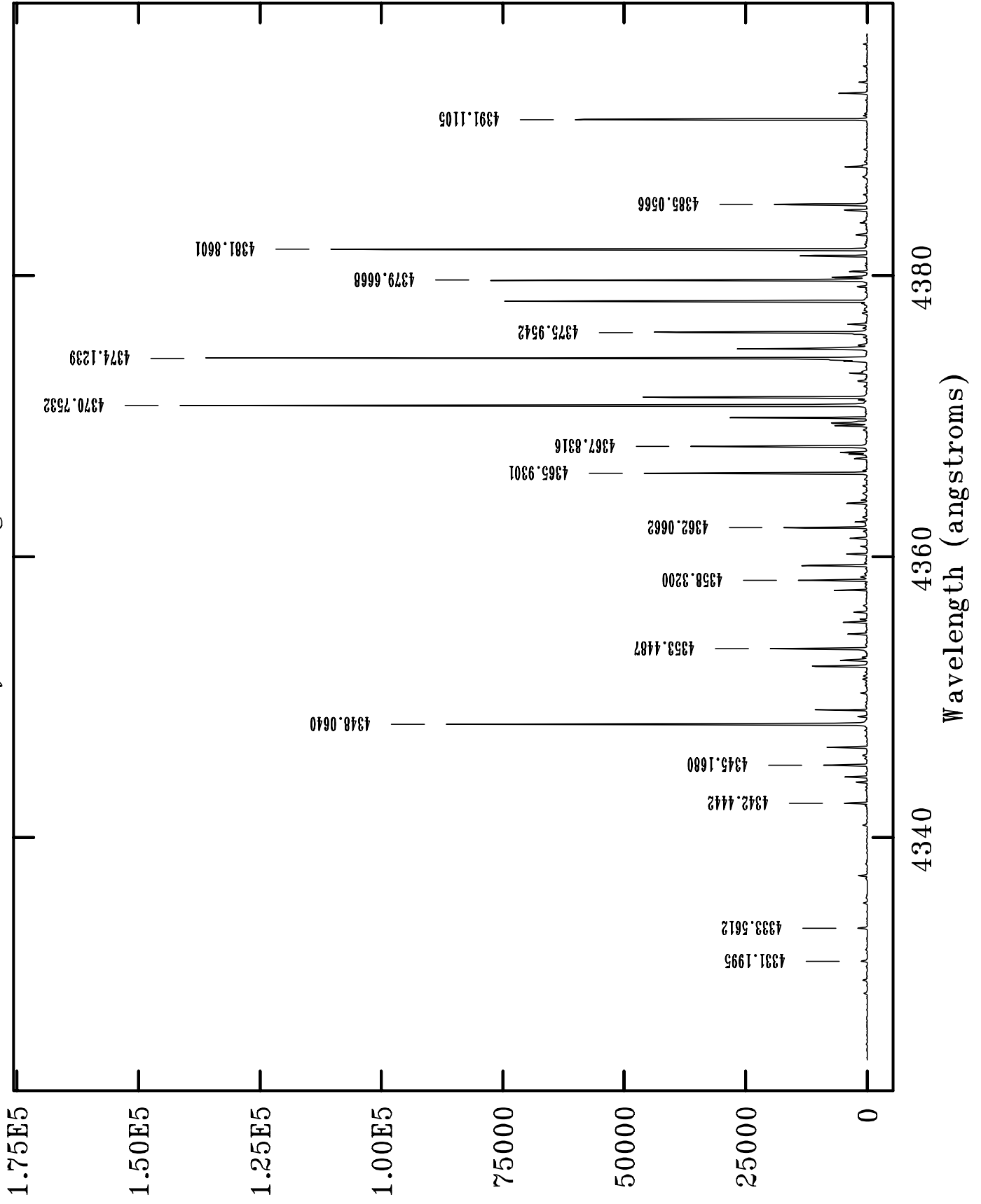
Wavelength (Angstroms)

NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:32:27 30-Mar-2002
Aperture 16, Image line 16, Order 141
identify thar_316g4931_red2: ThAr

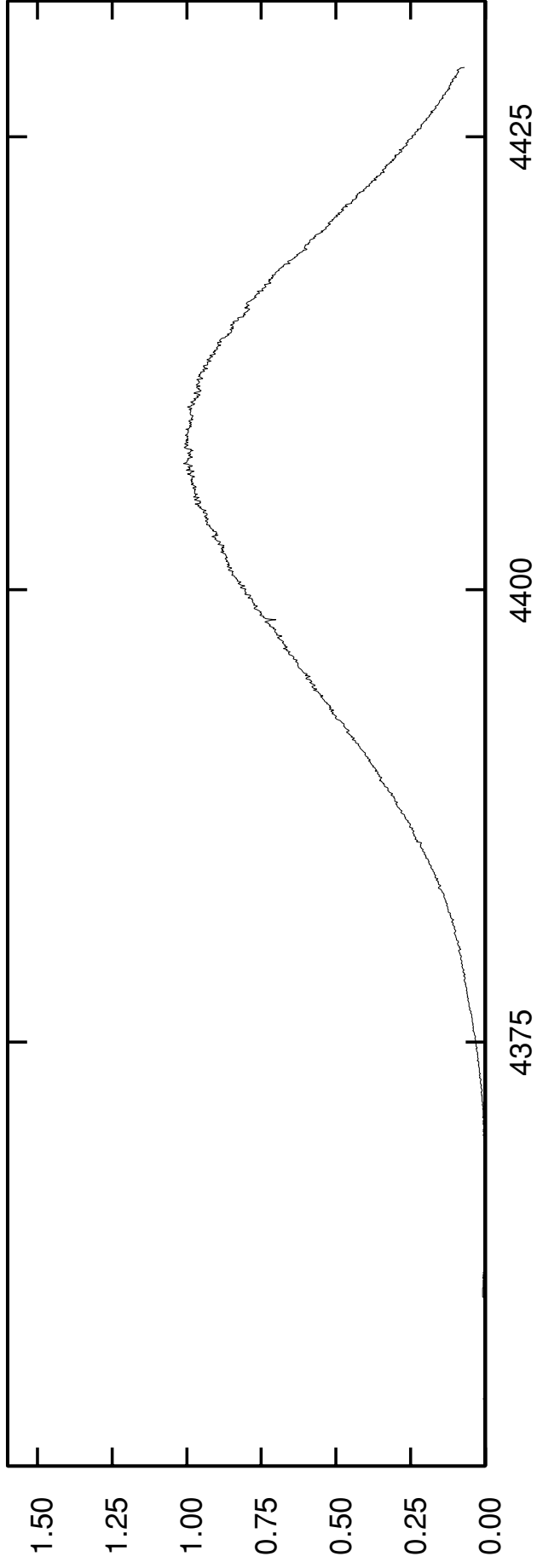




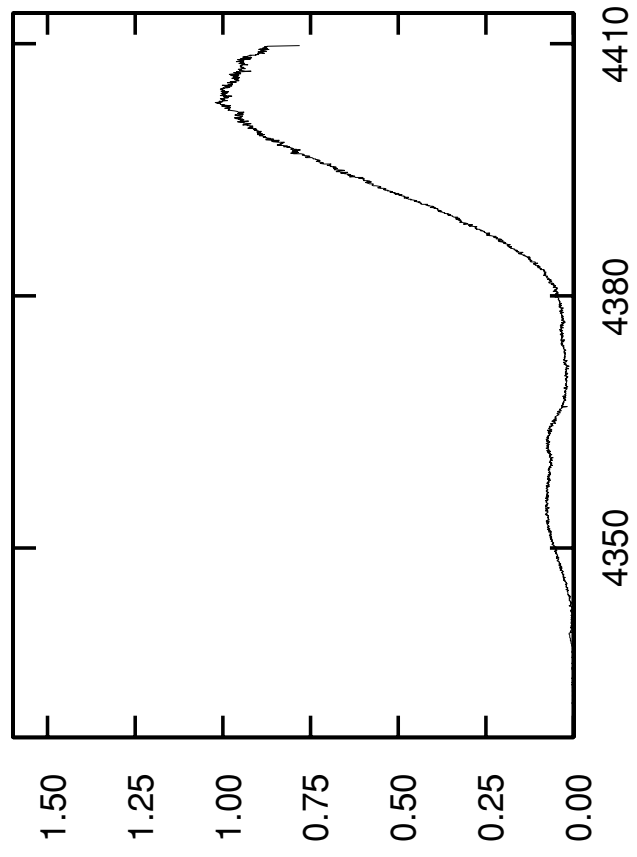
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:31:31 30-Mar-2002
Aperture 15, Image line 15, Order 140
eidentify thar_316g4931_red2: ThAr



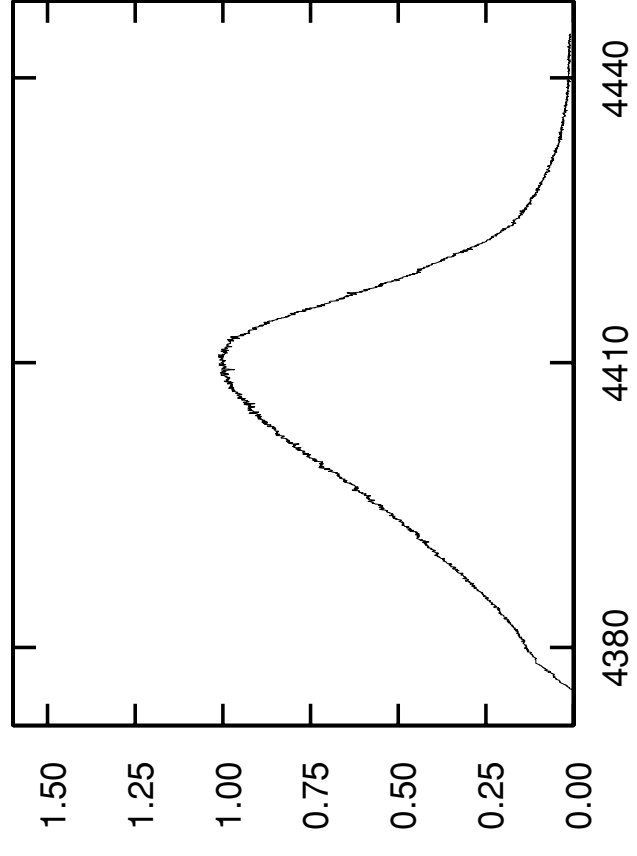
Order 139 - Central



Order 139 - Blue

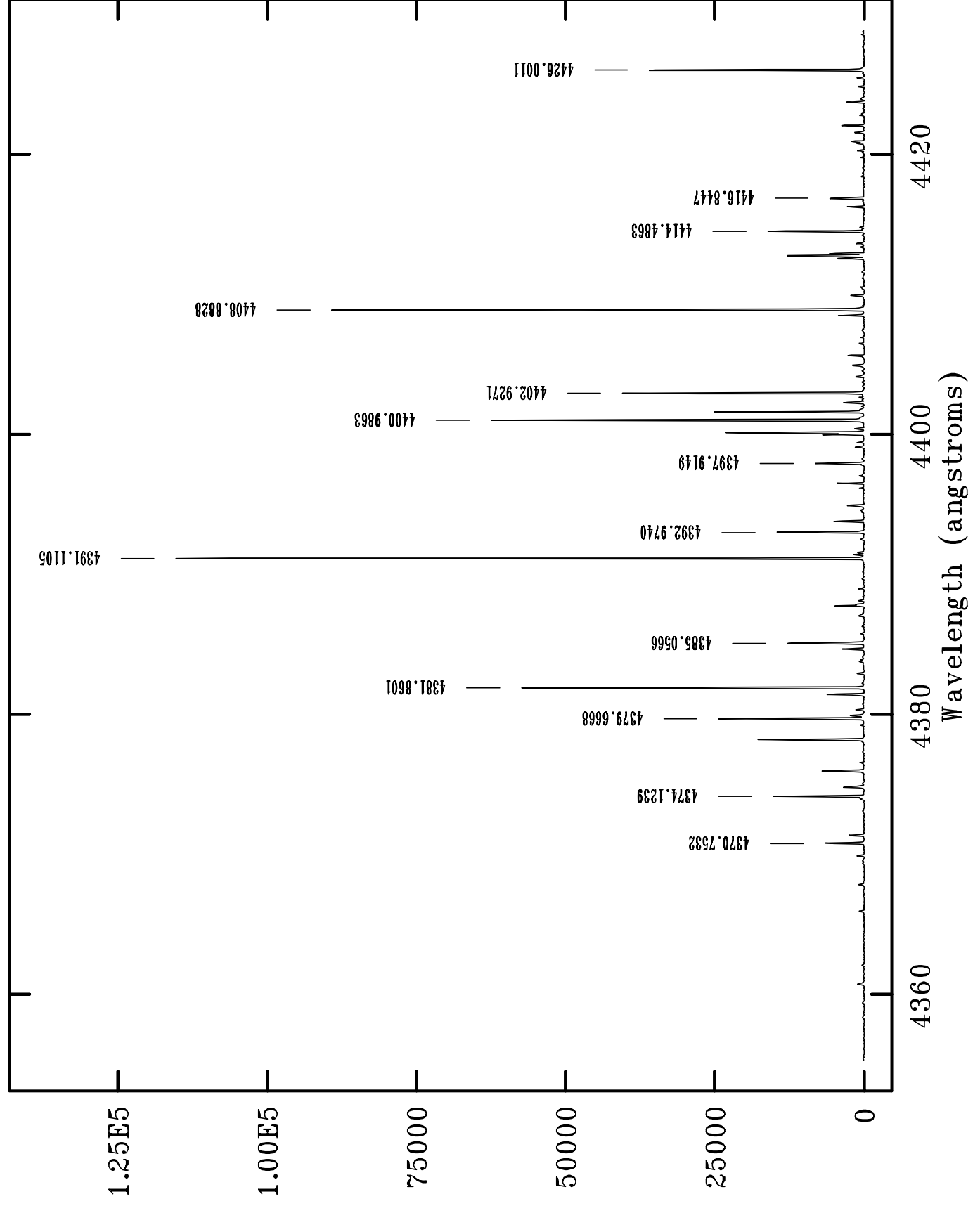


Order 139 - Red

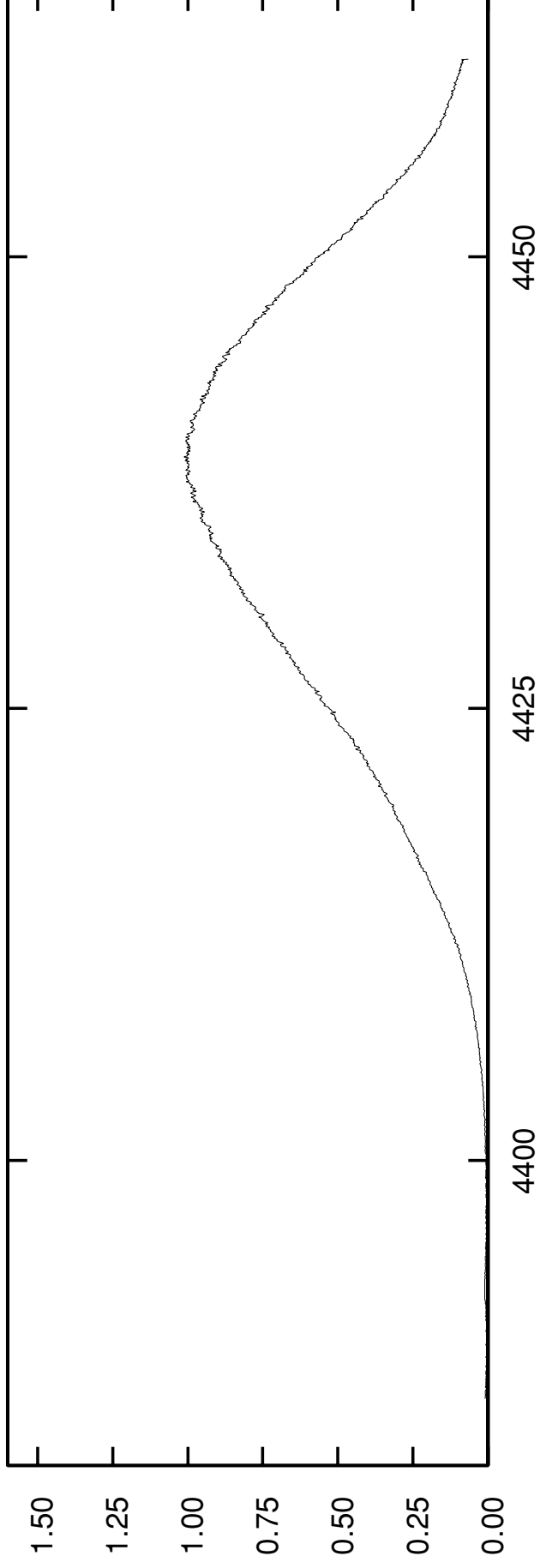


Wavelength (Angstroms)

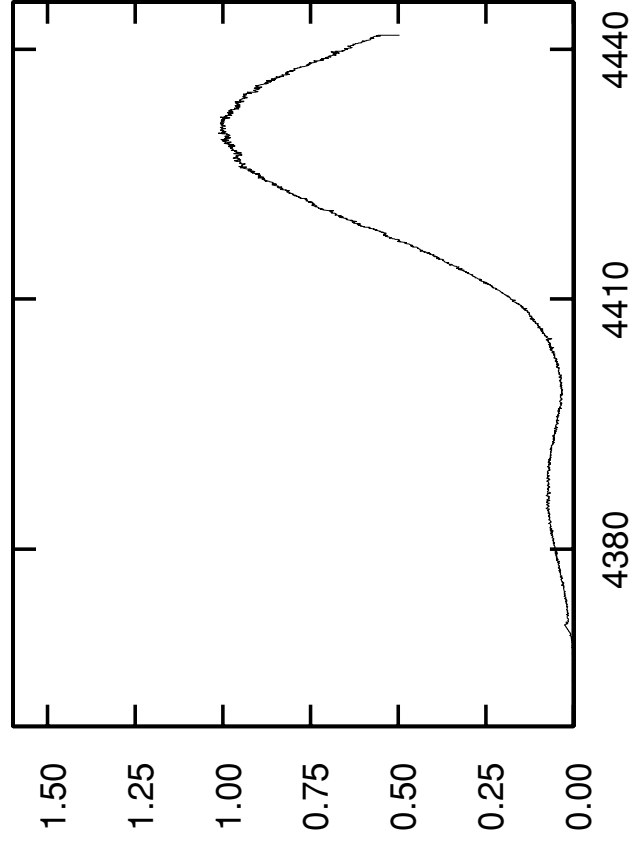
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:28:01 30-Mar-2002
Aperture 14, Image line 14, Order 139
identify thar_316g4931_red2: ThAr



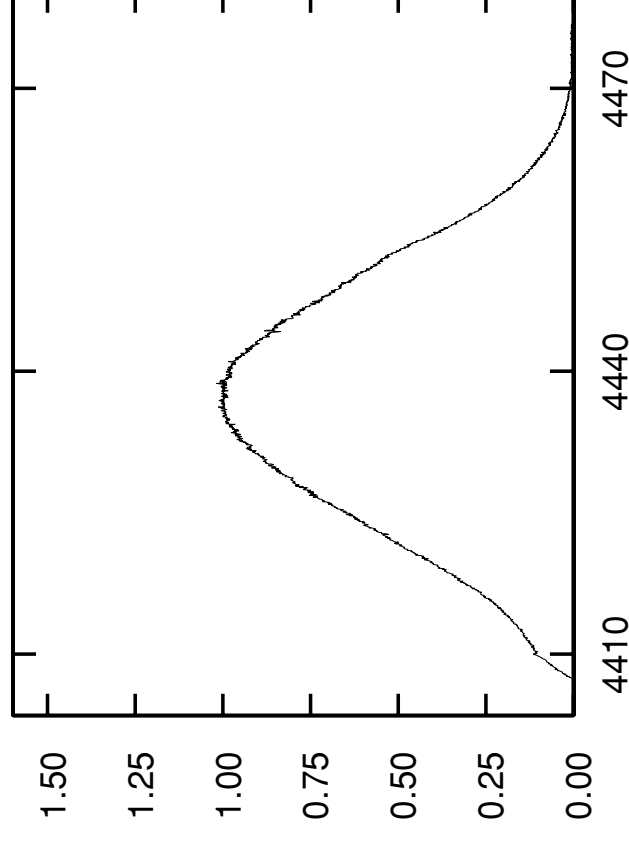
Order 138 - Central



Order 138 - Blue

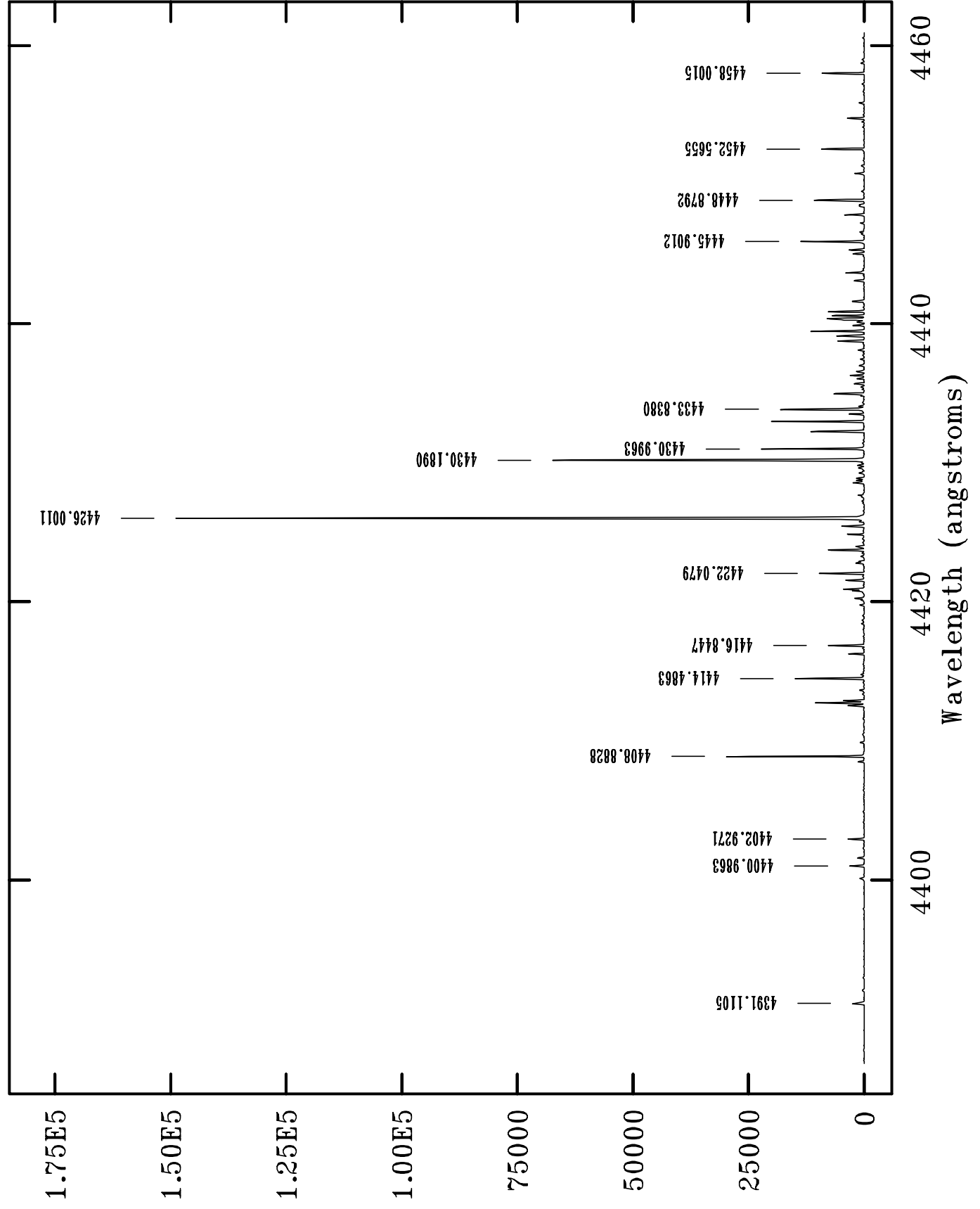


Order 138 - Red

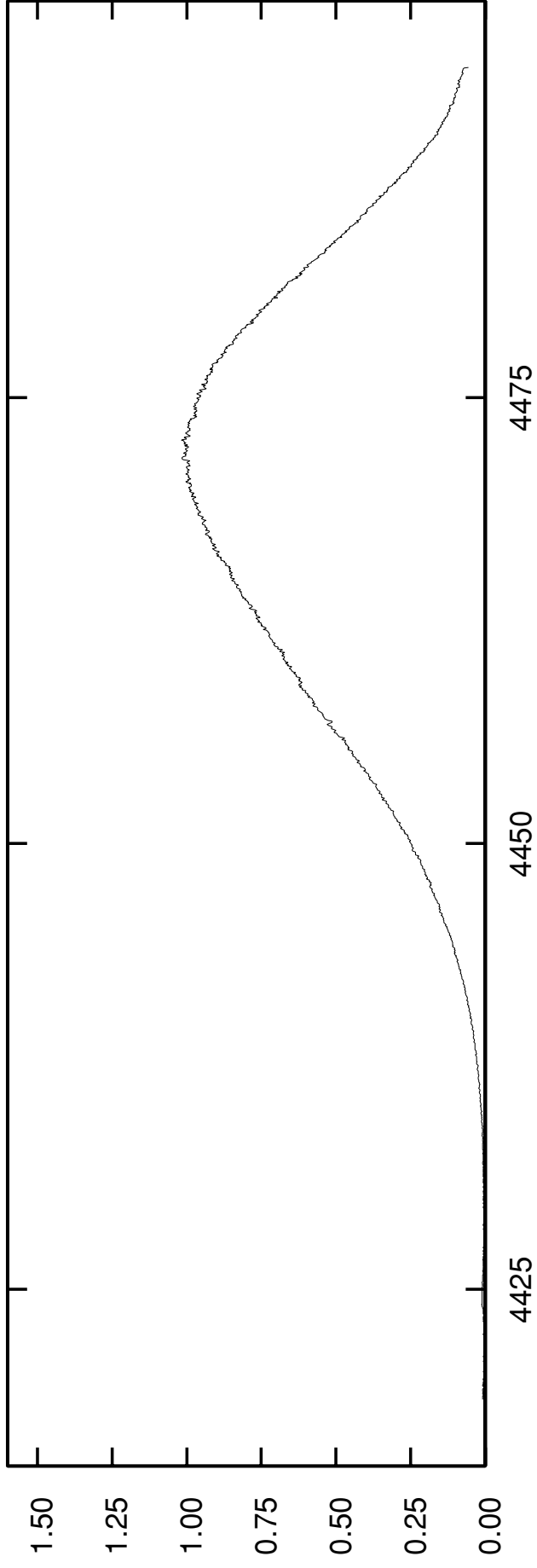


Wavelength (Angstroms)

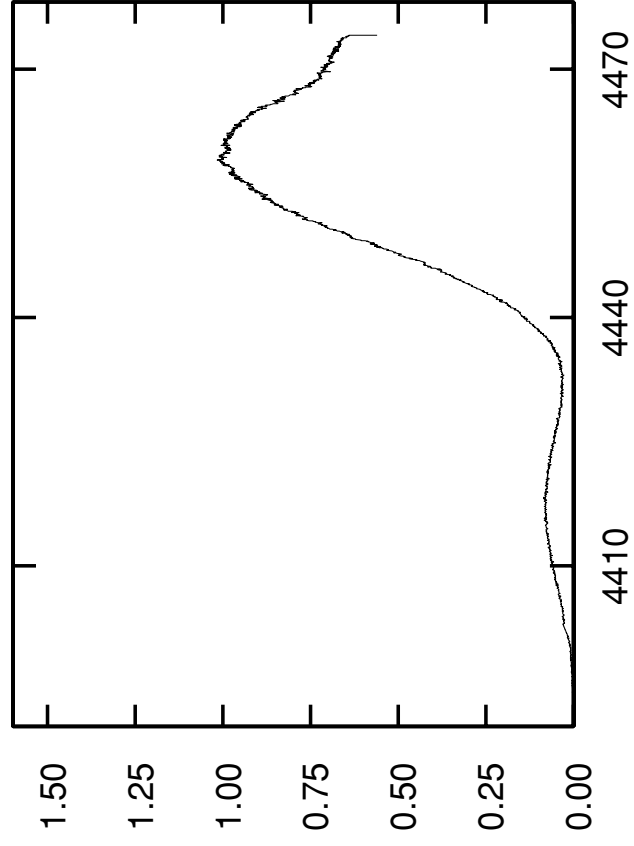
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:27:12 30-Mar-2002
Aperture 13, Image line 13, Order 138
identify thar_316g4931_red2: ThAr



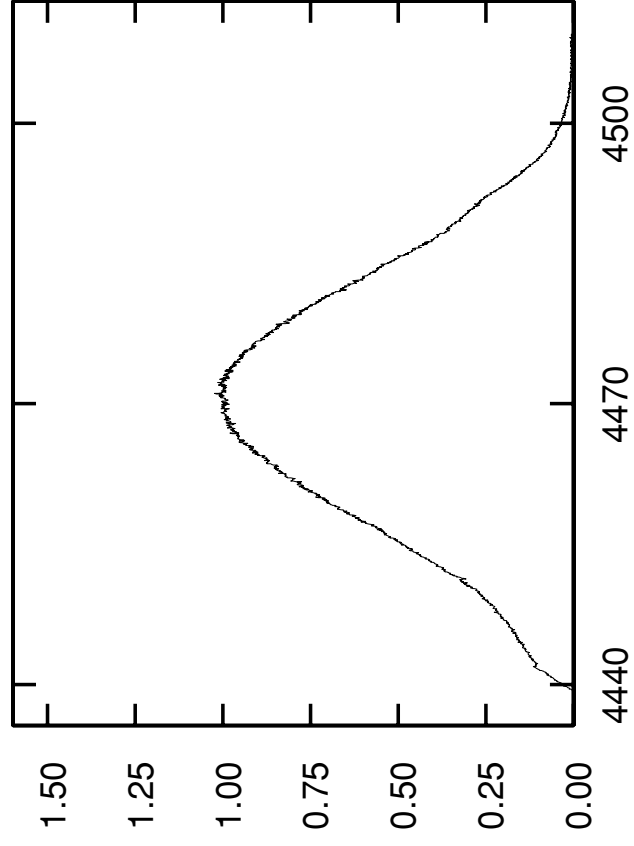
Order 137 - Central



Order 137 - Blue

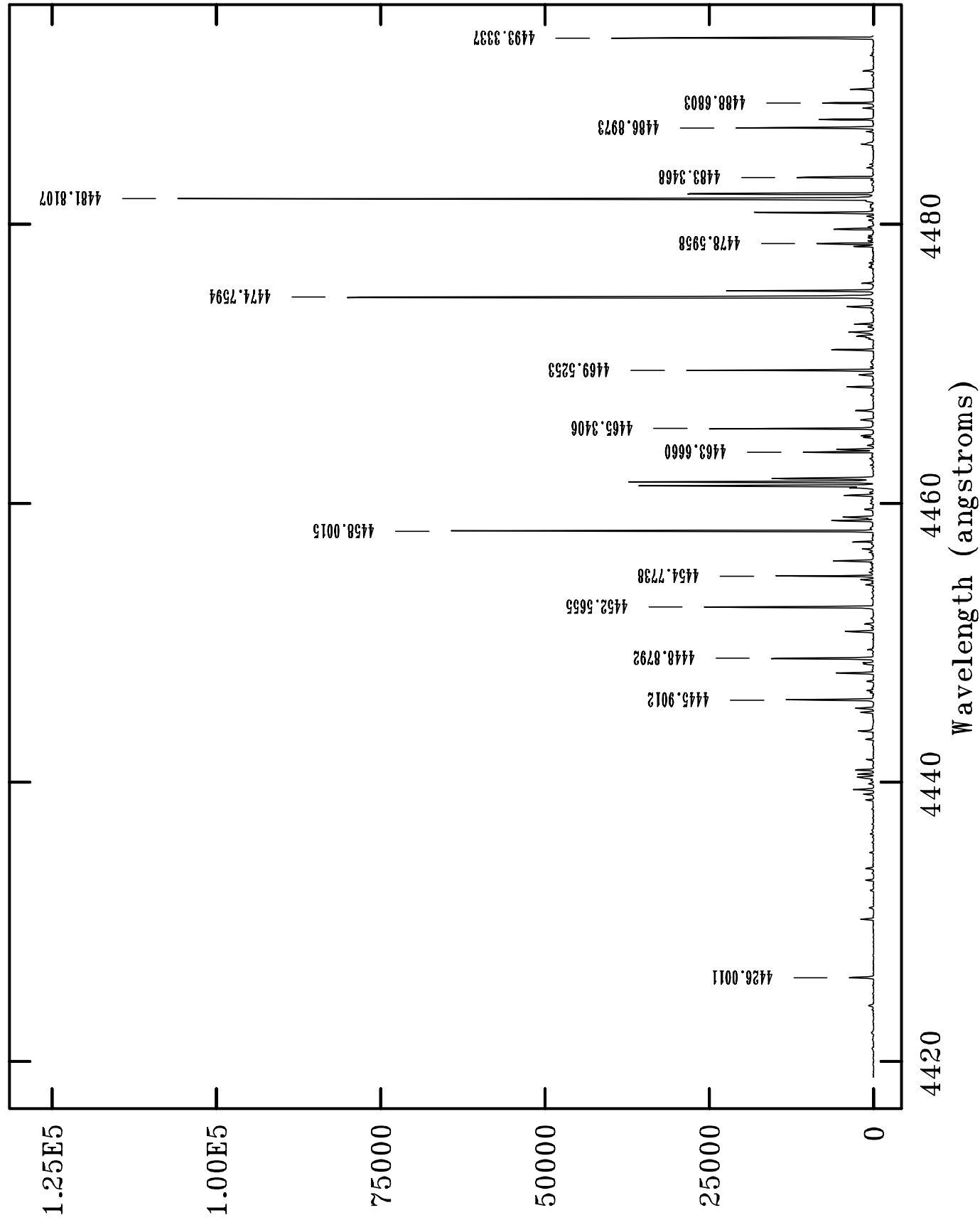


Order 137 - Red

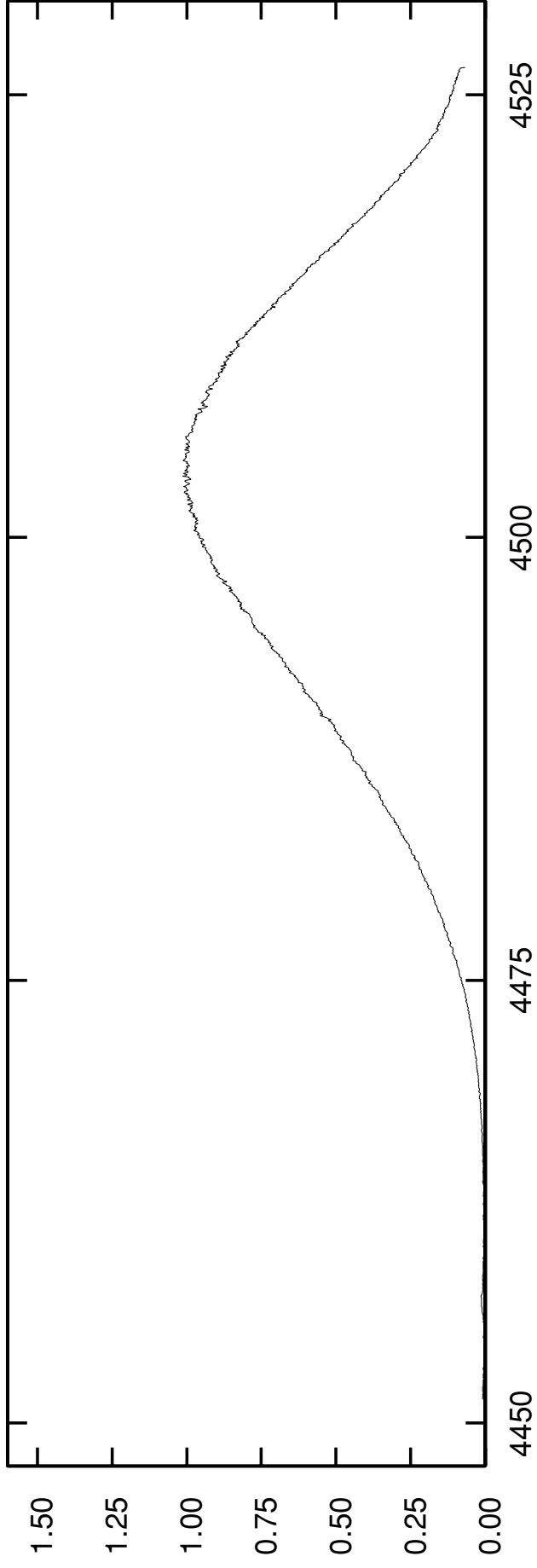


Wavelength (Angstroms)

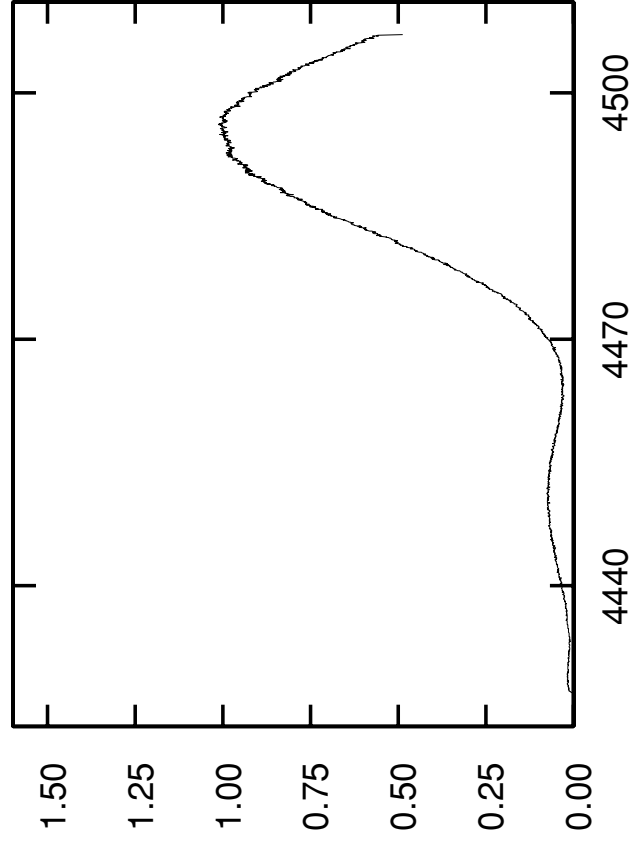
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:26:29 30-Mar-2002
Aperture 12, Image line 12, Order 137
identify thar_316g4931_red2: ThAr



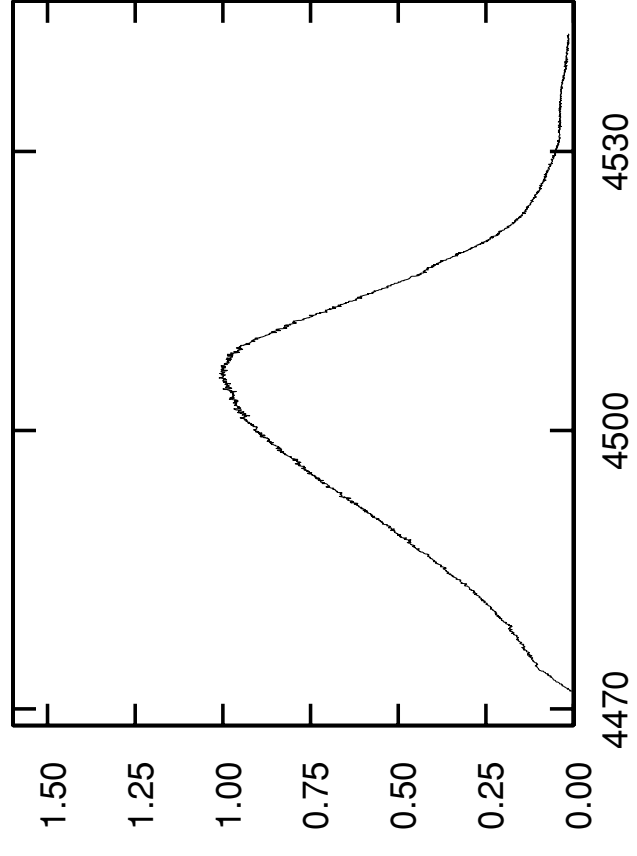
Order 136 - Central



Order 136 - Blue

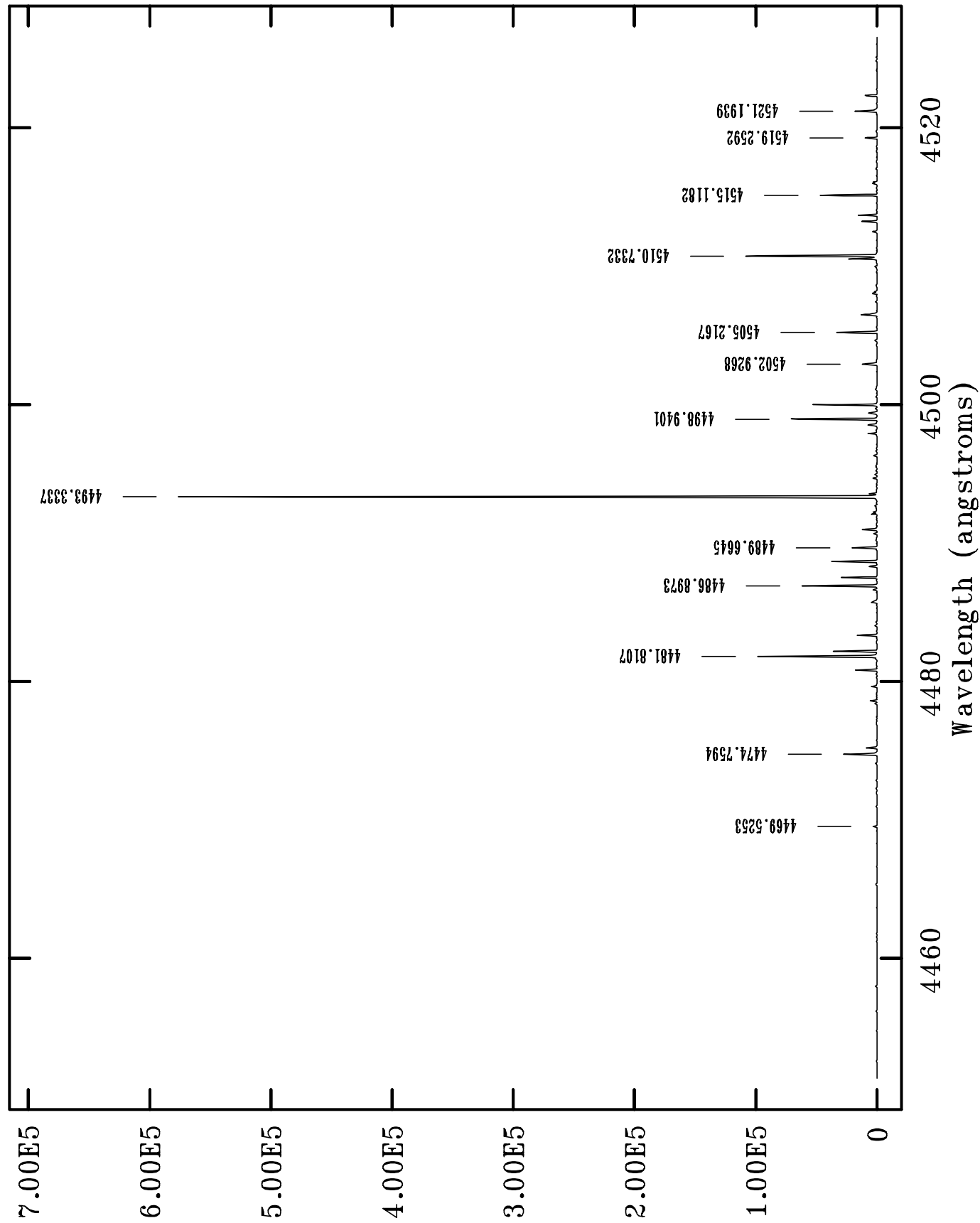


Order 136 - Red

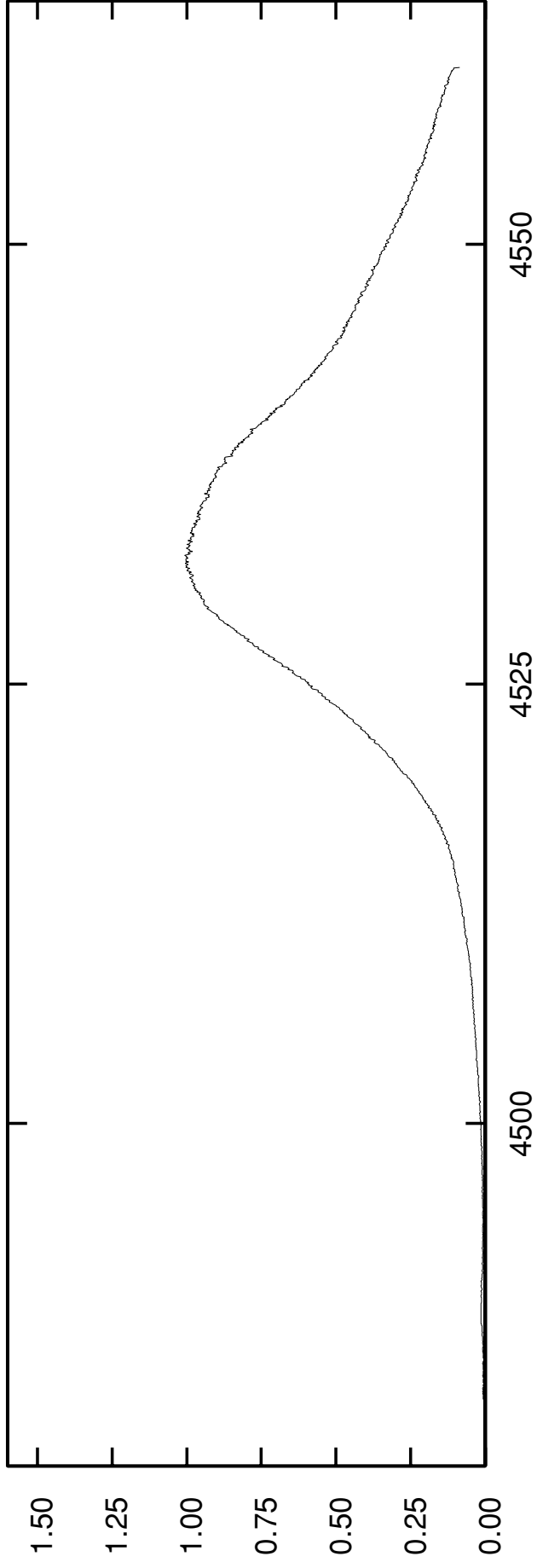


Wavelength (Angstroms)

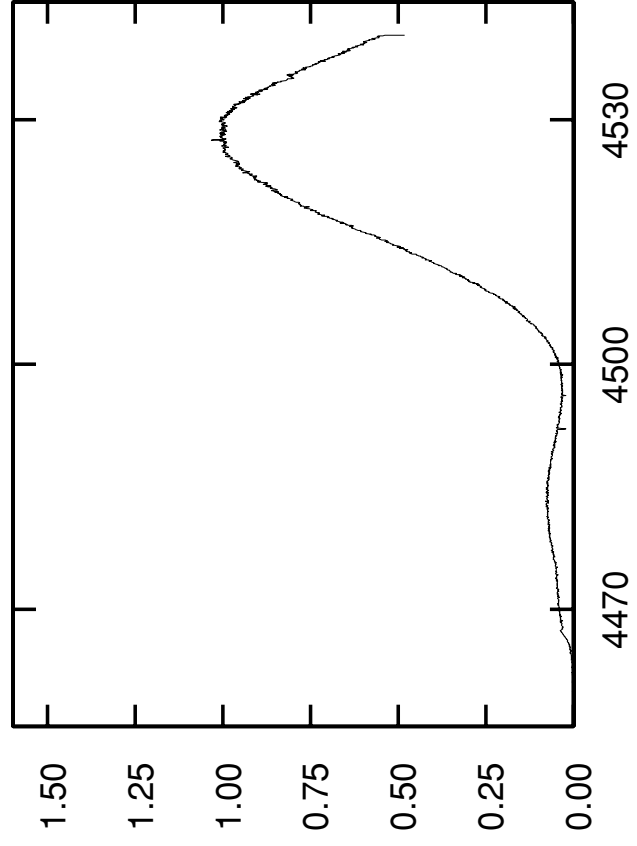
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:25:25 30-Mar-2002
Aperture 11, Image line 11, Order 136
eidentify thar_316g4931_red2: ThAr



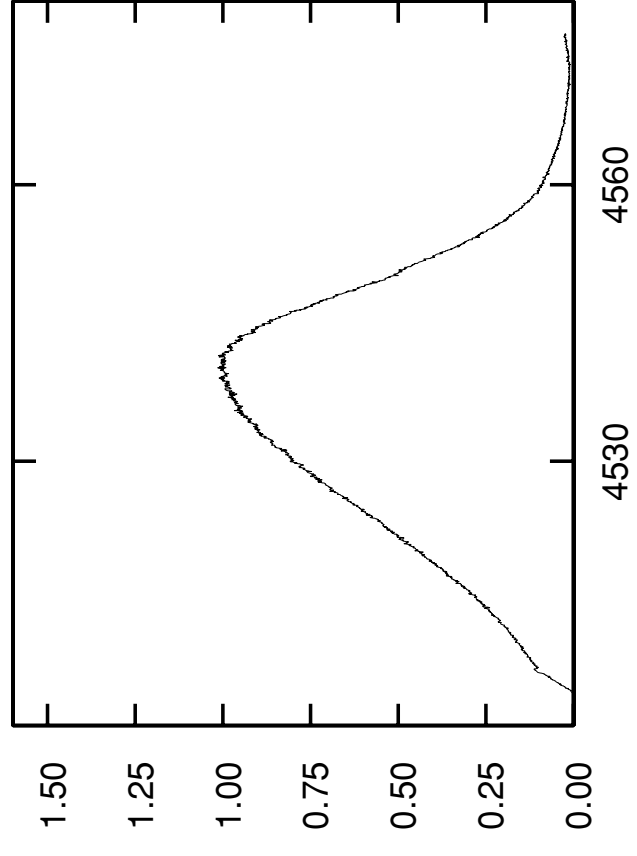
Order 135 - Central



Order 135 - Blue

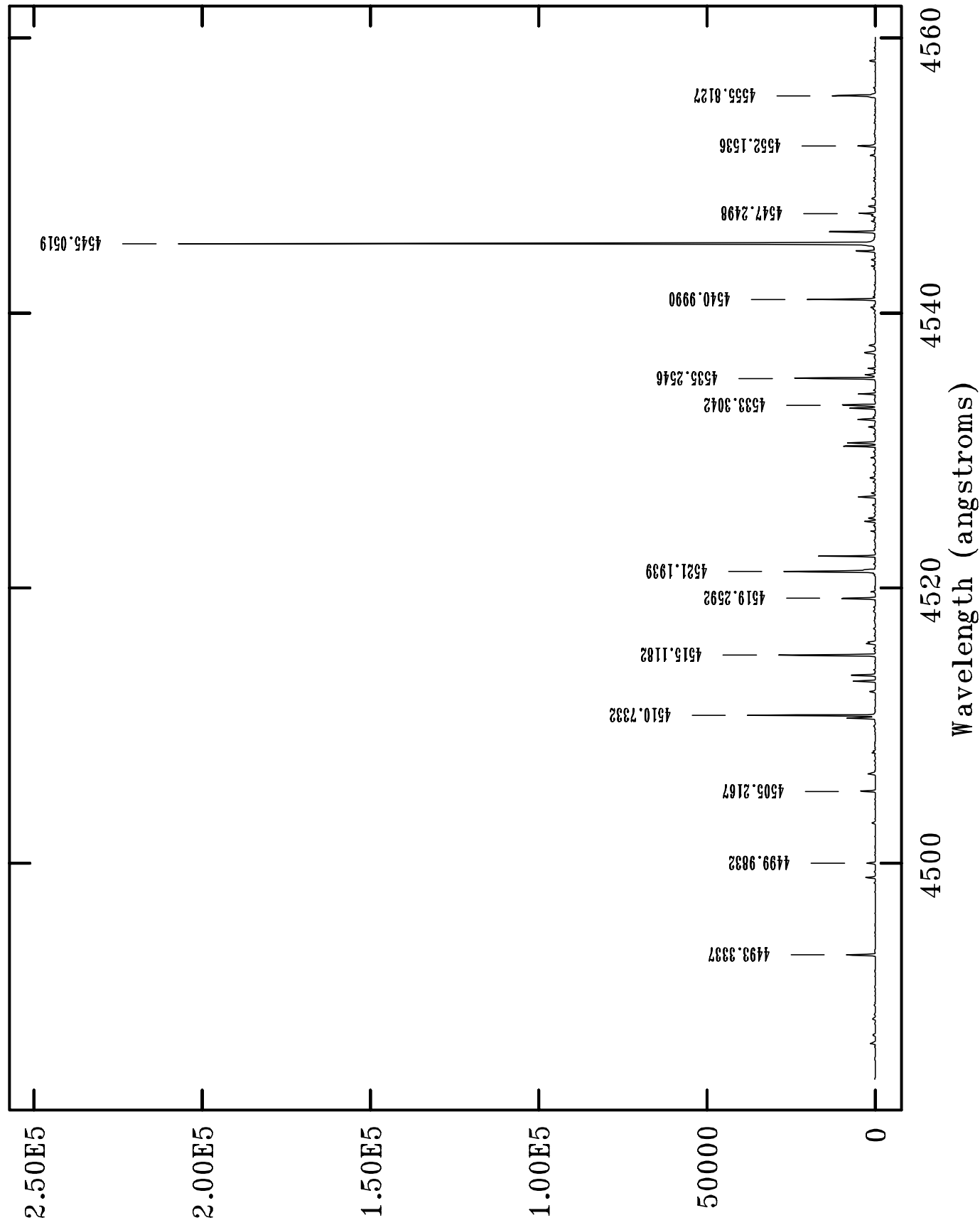


Order 135 - Red

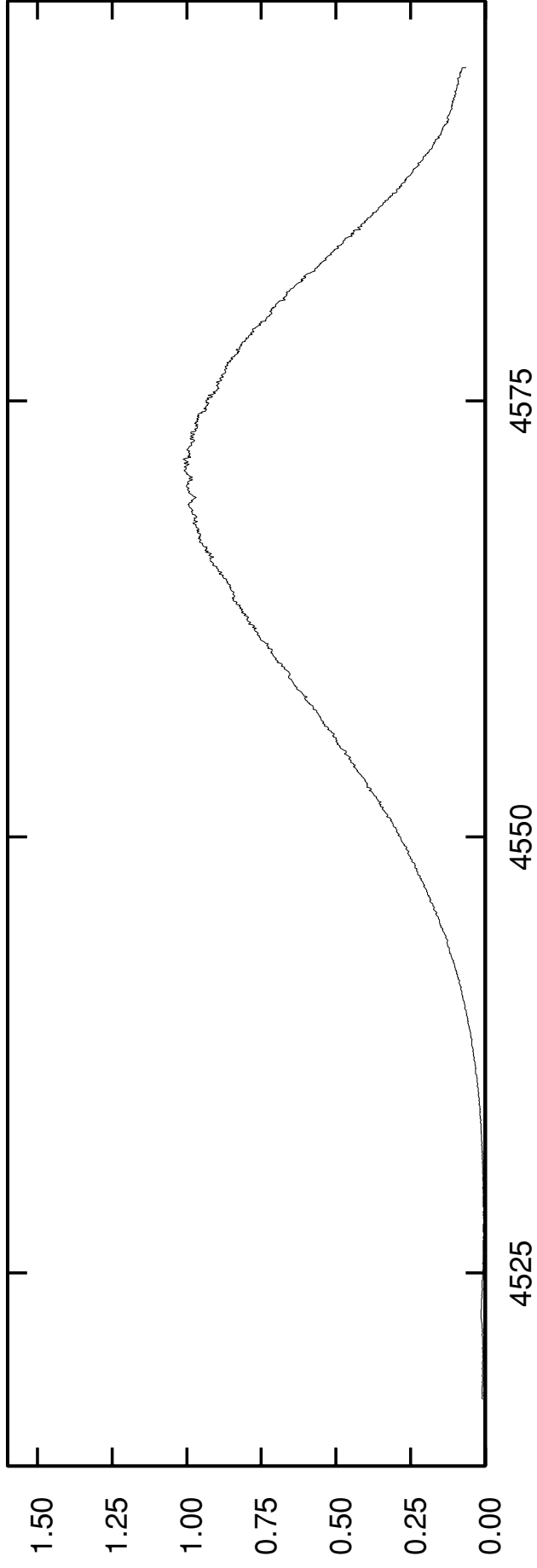


Wavelength (Angstroms)

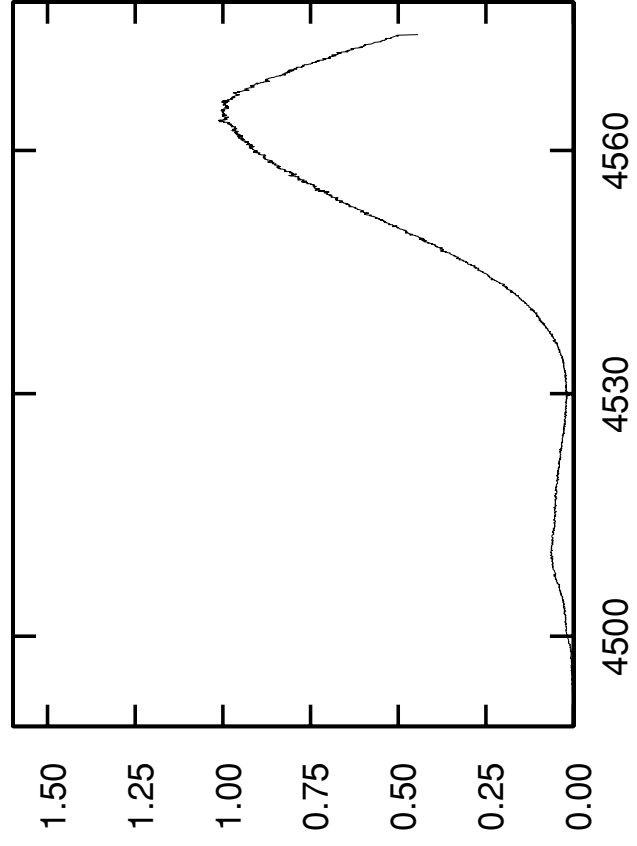
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:24:35 30-Mar-2002
Aperture 10, Image line 10, Order 135
eidentify thar_316g4931_red2: ThAr



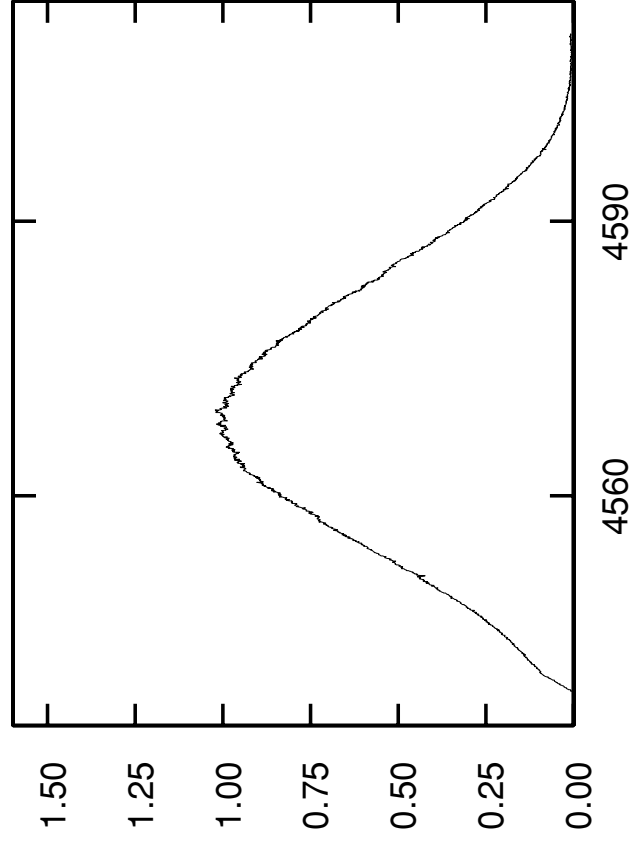
Order 134 - Central



Order 134 - Blue

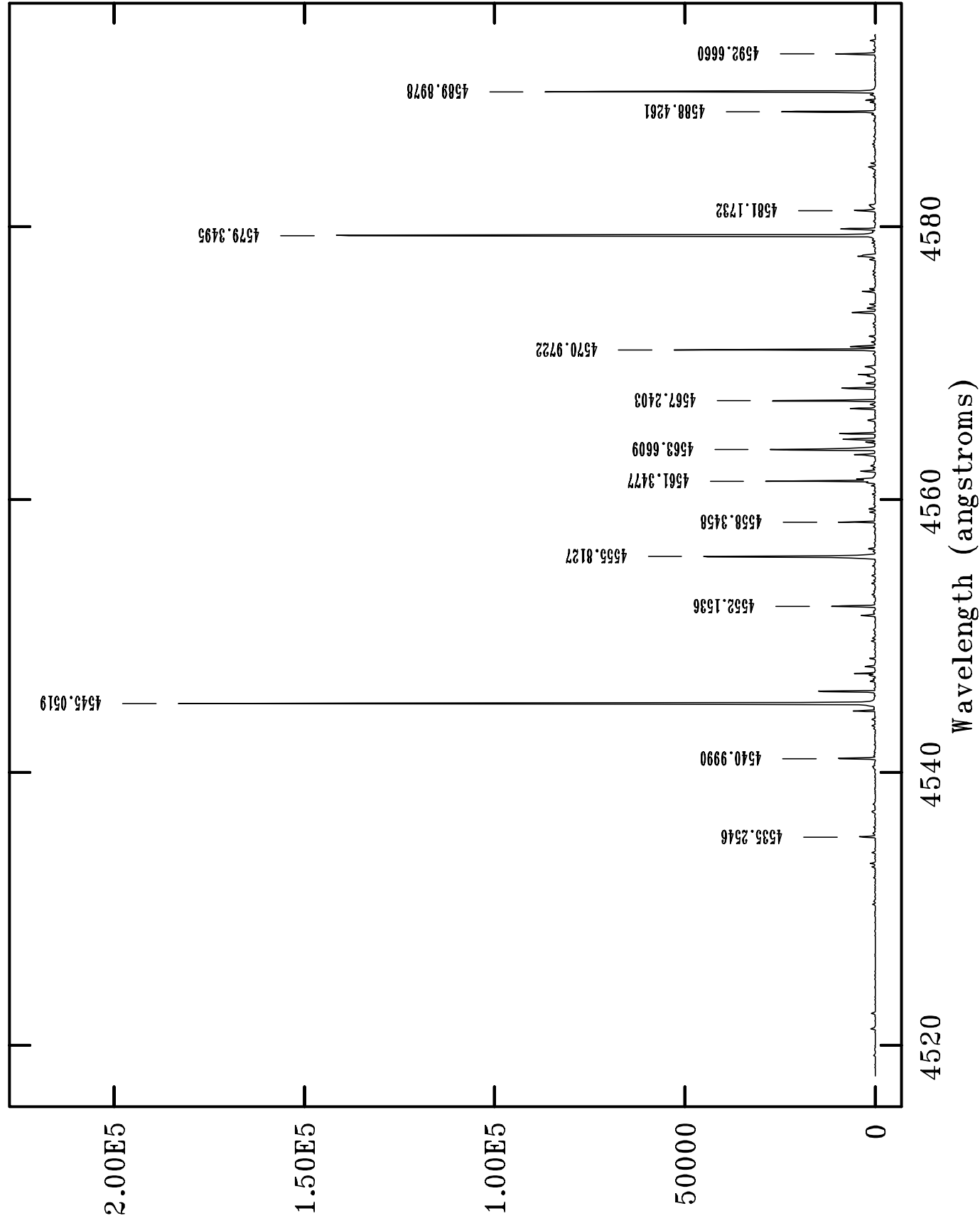


Order 134 - Red

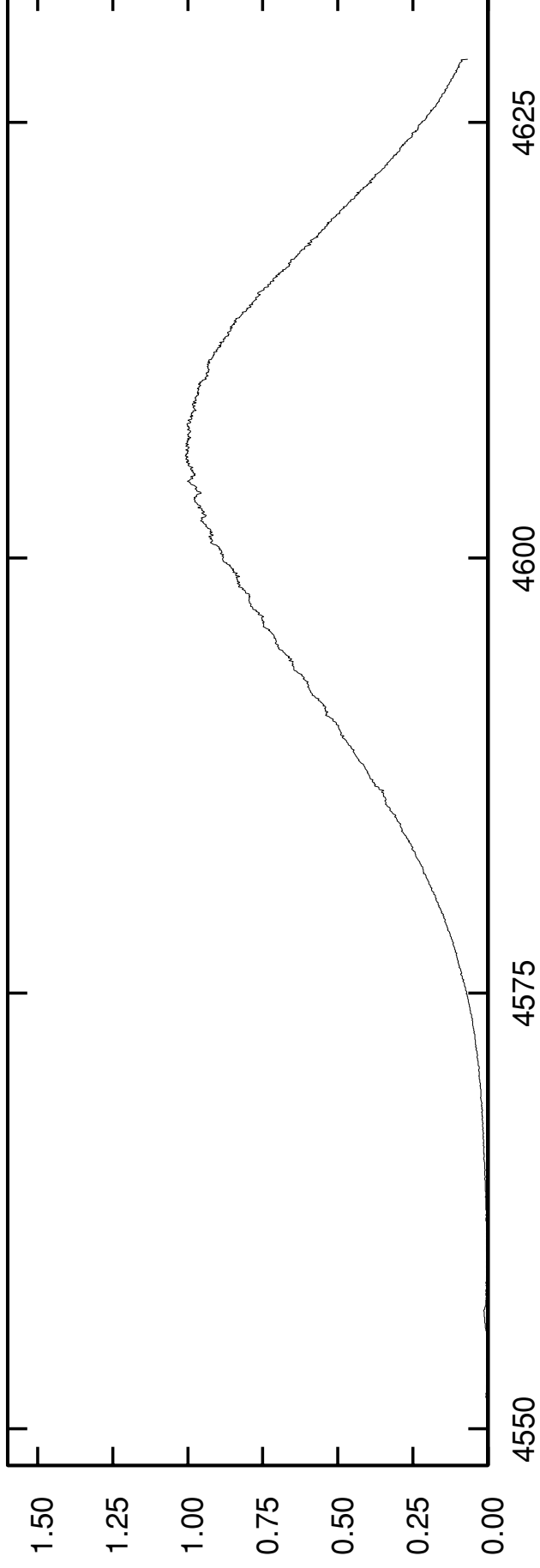


Wavelength (Angstroms)

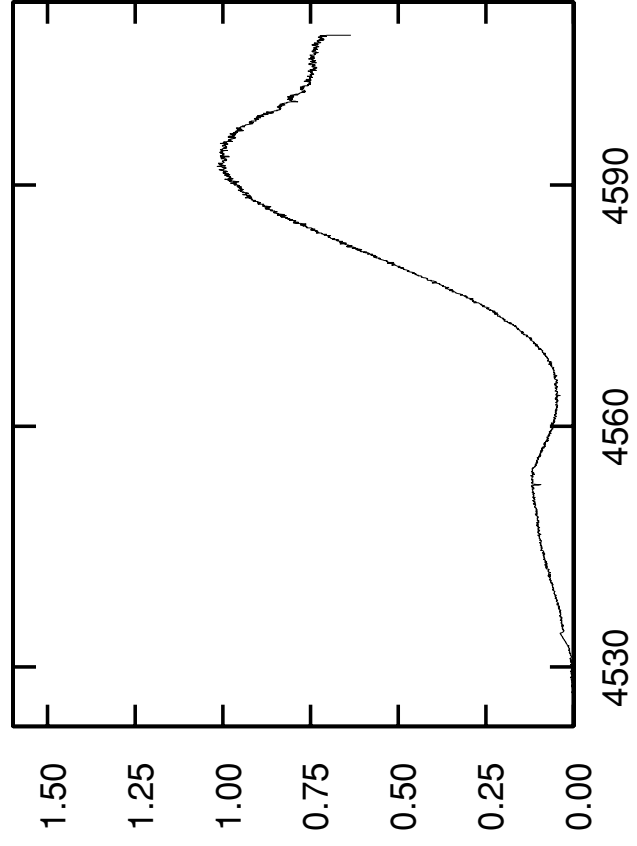
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:23:46 30-Mar-2002
Aperture 9, Image line 9, Order 134
eidentify thar_316g4931_red2: ThAr



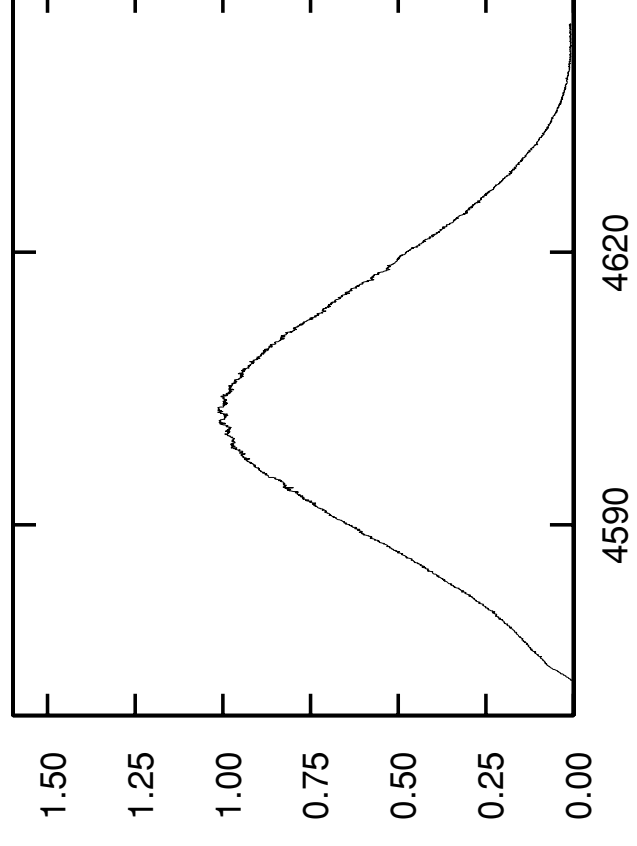
Order 133 - Central



Order 133 - Blue

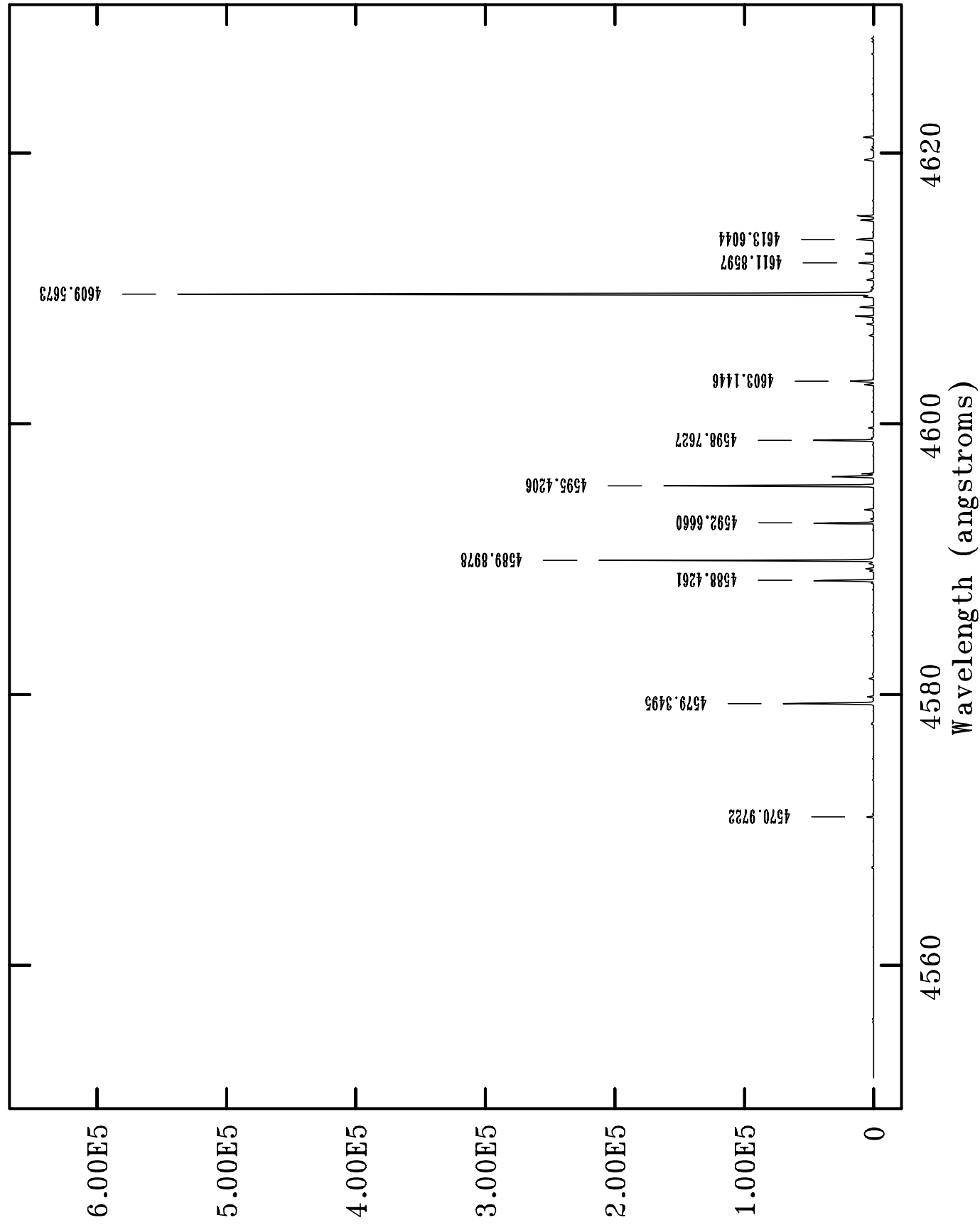


Order 133 - Red

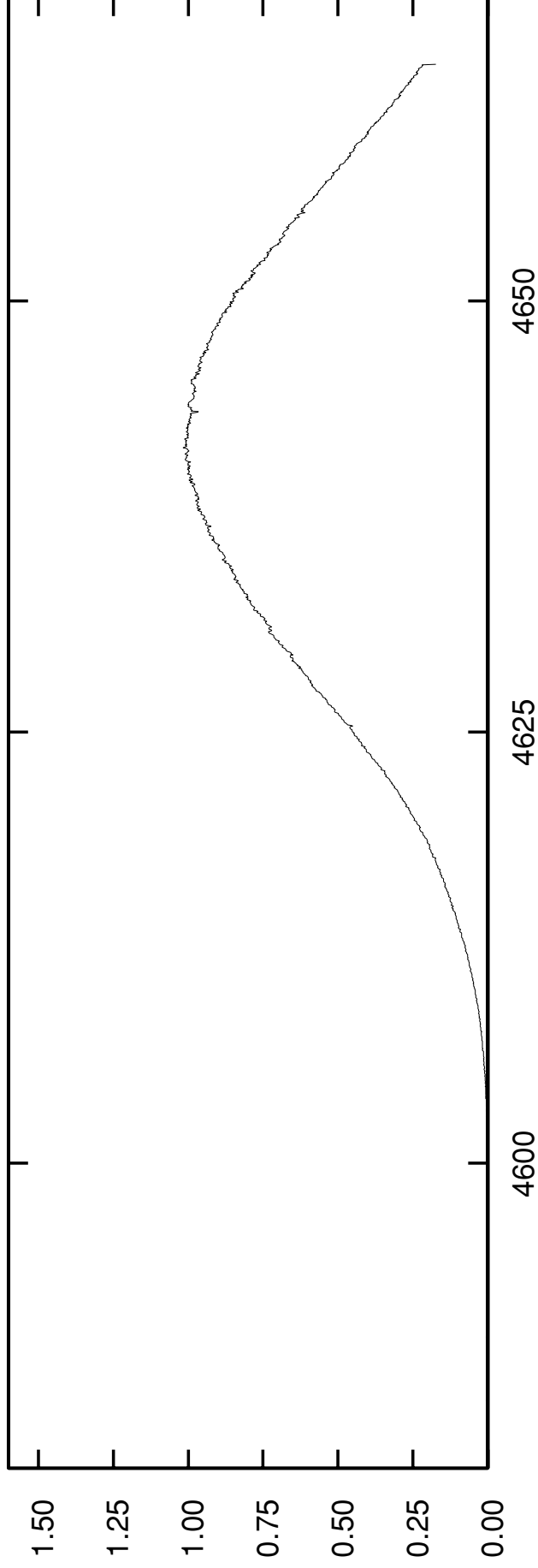


Wavelength (Angstroms)

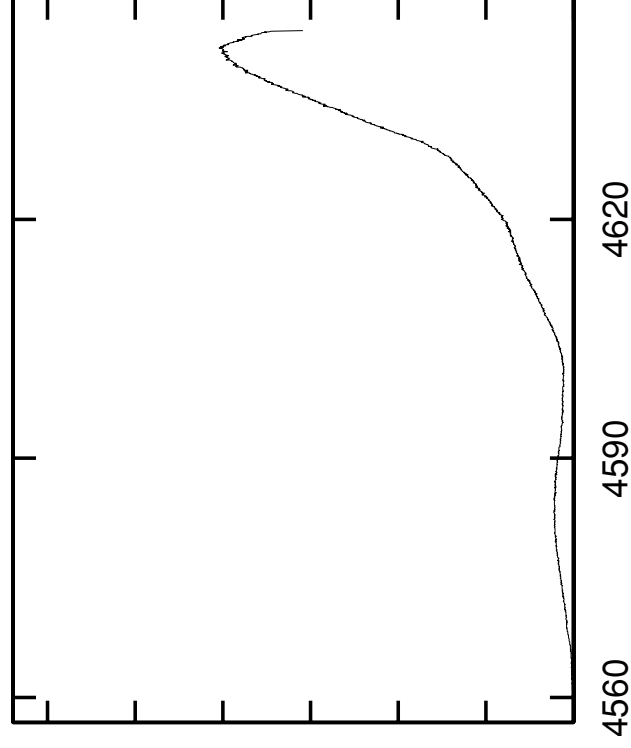
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:22:58 30-Mar-2002
Aperture 8, Image line 8, Order 133
eidentify thar_316g4931_red2: ThAr



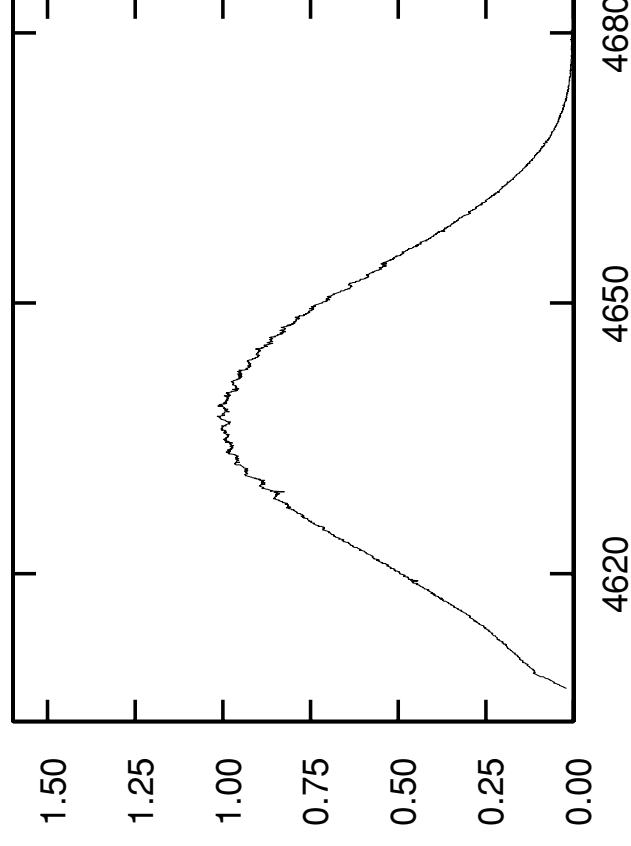
Order 132 - Central



Order 132 - Blue

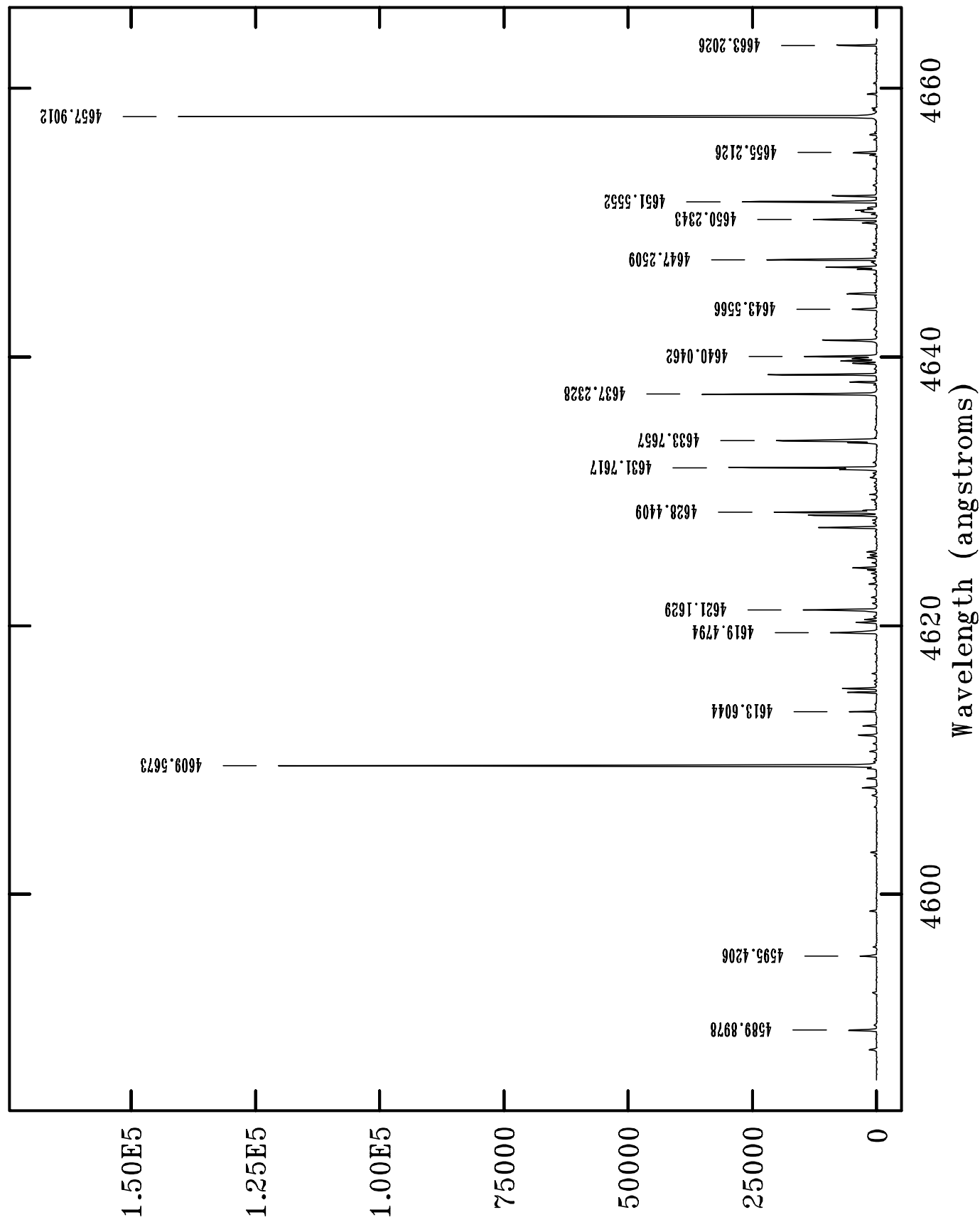


Order 132 - Red

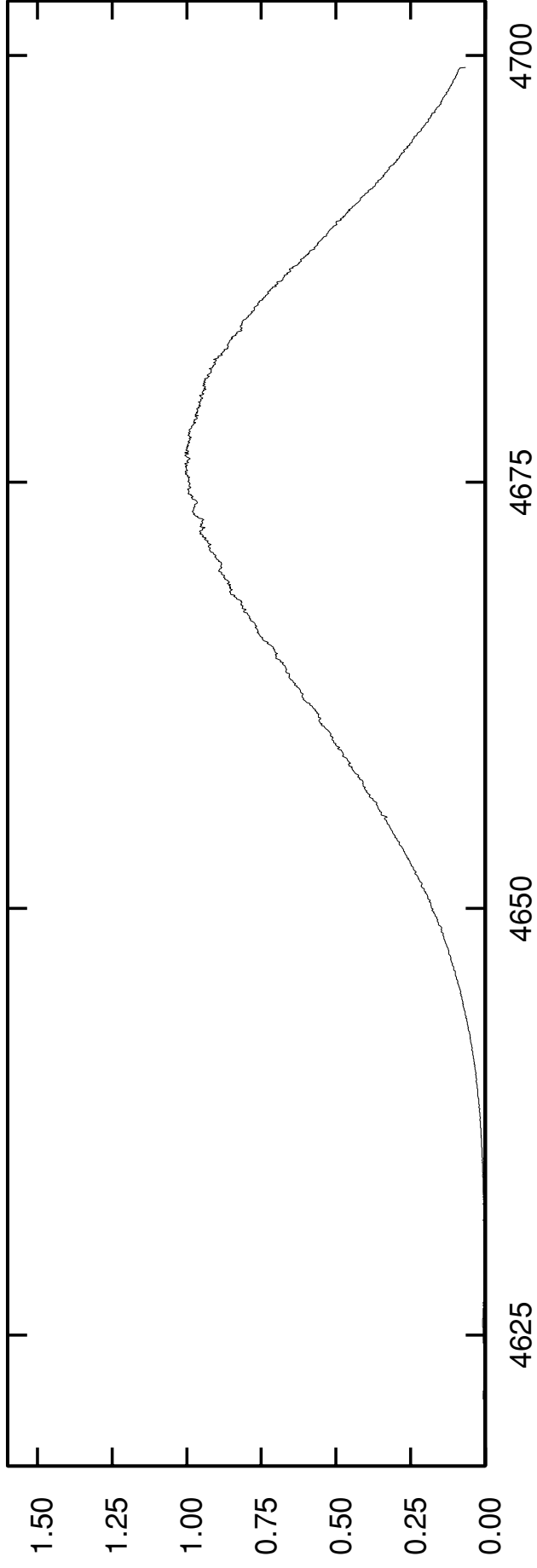


Wavelength (Angstroms)

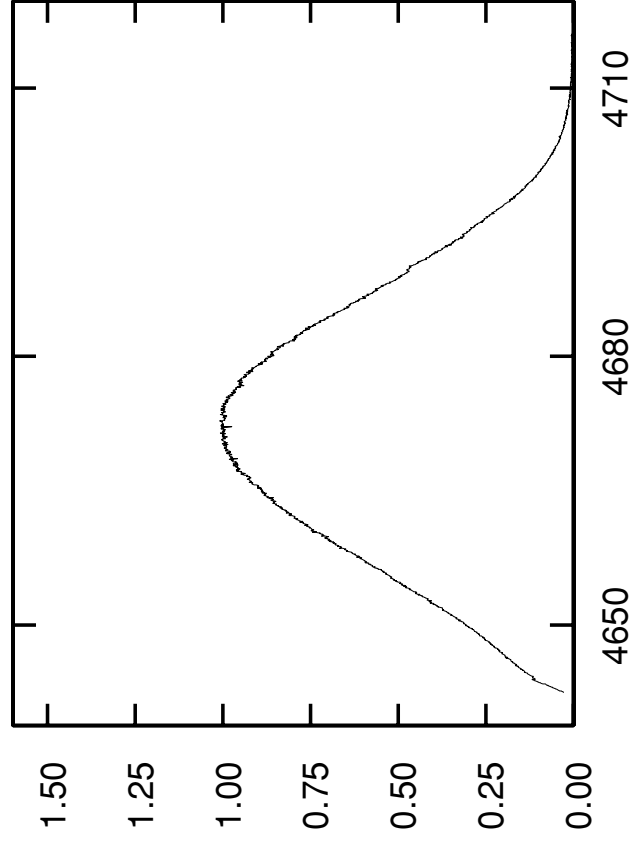
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:22:11 30-Mar-2002
Aperture 7, Image line 7, Order 132
ecidentify thar_316g4931_red2: ThAr



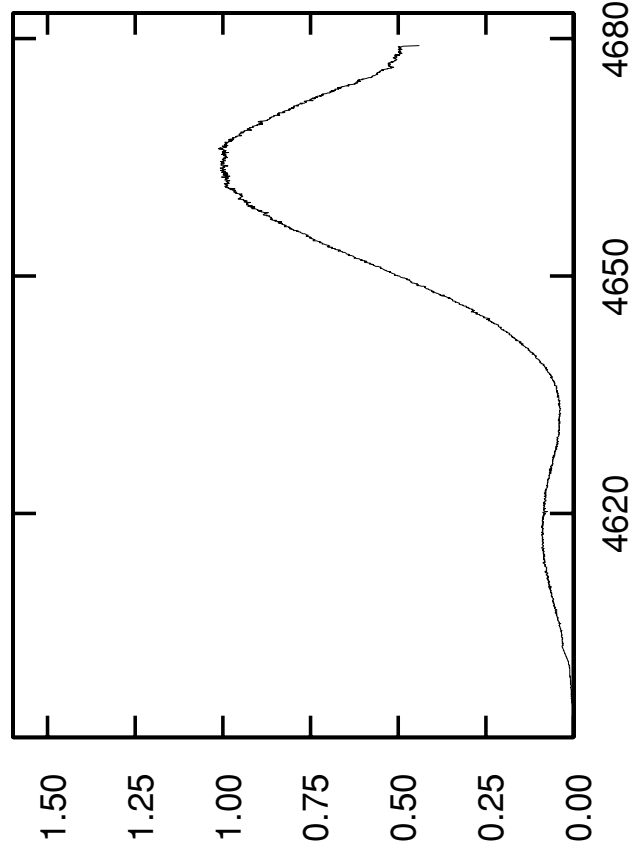
Order 131 - Central



Order 131 - Red

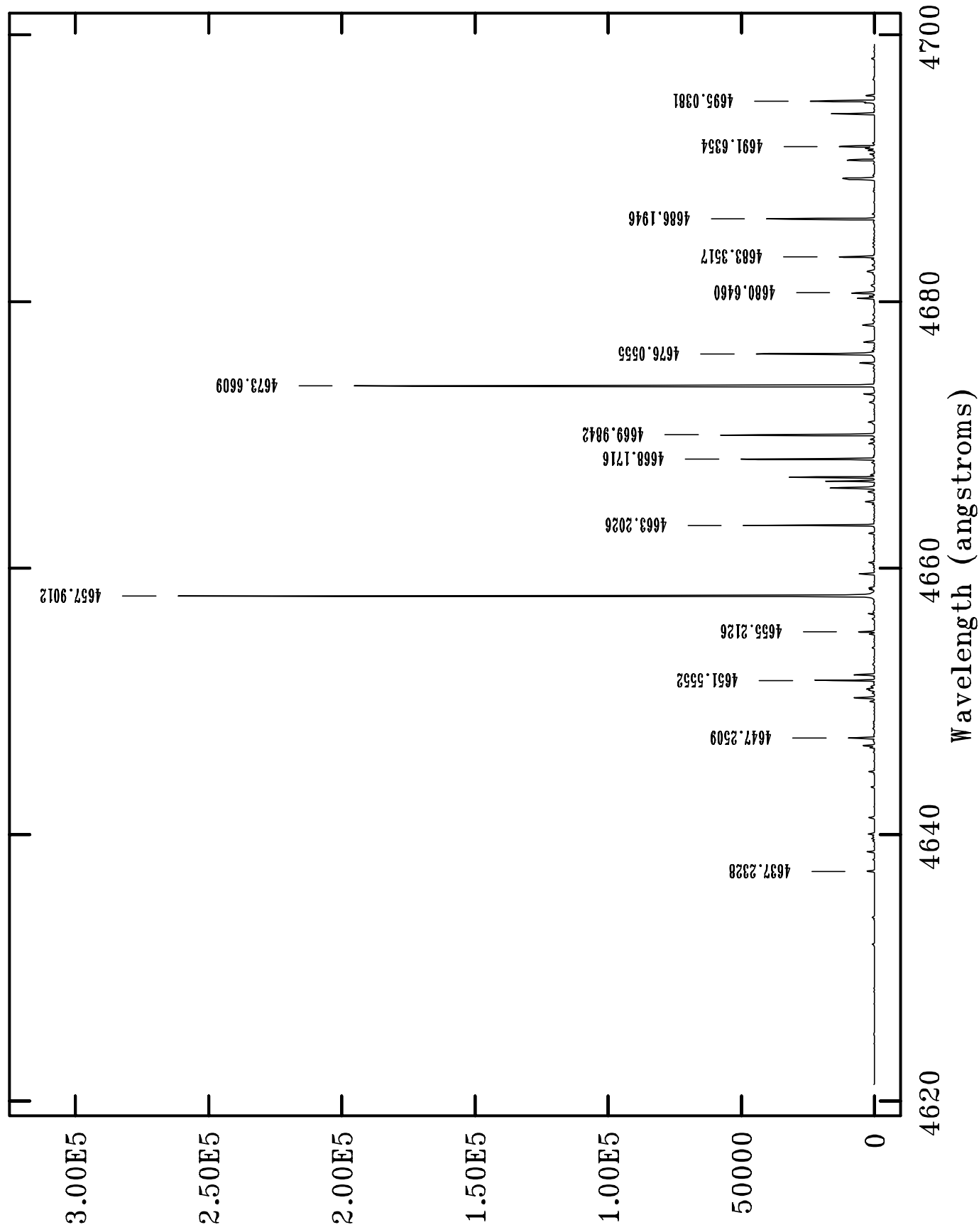


Order 131 - Blue

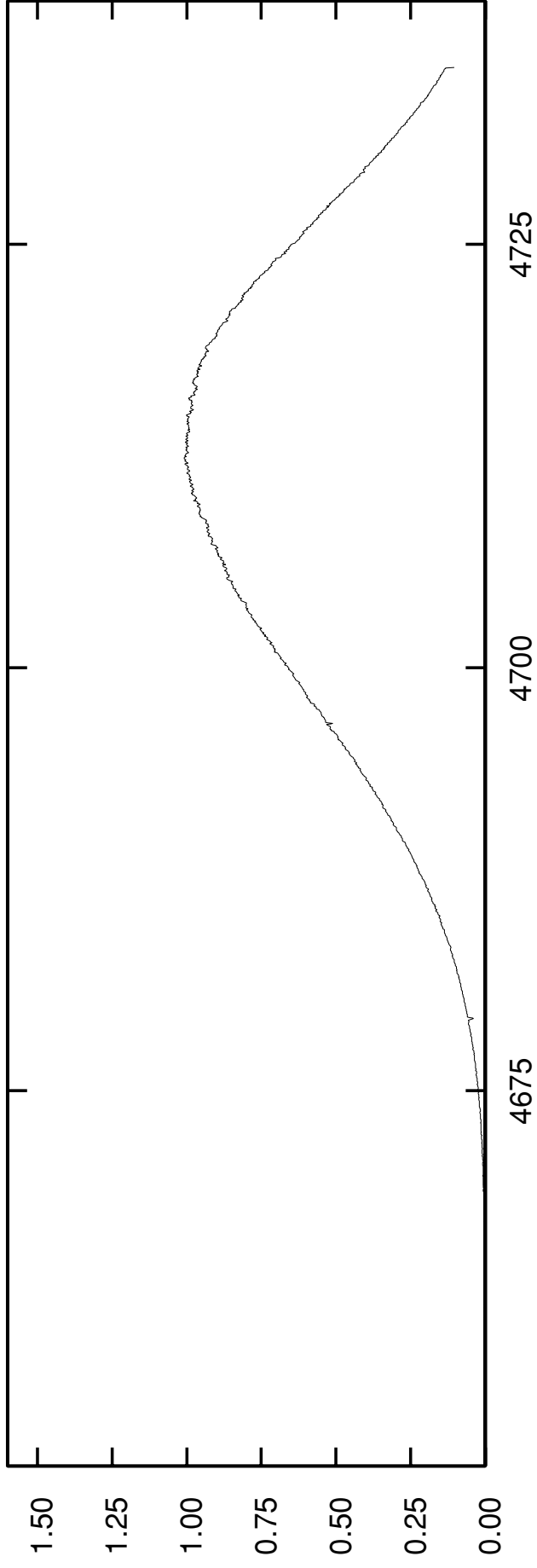


Wavelength (Angstroms)

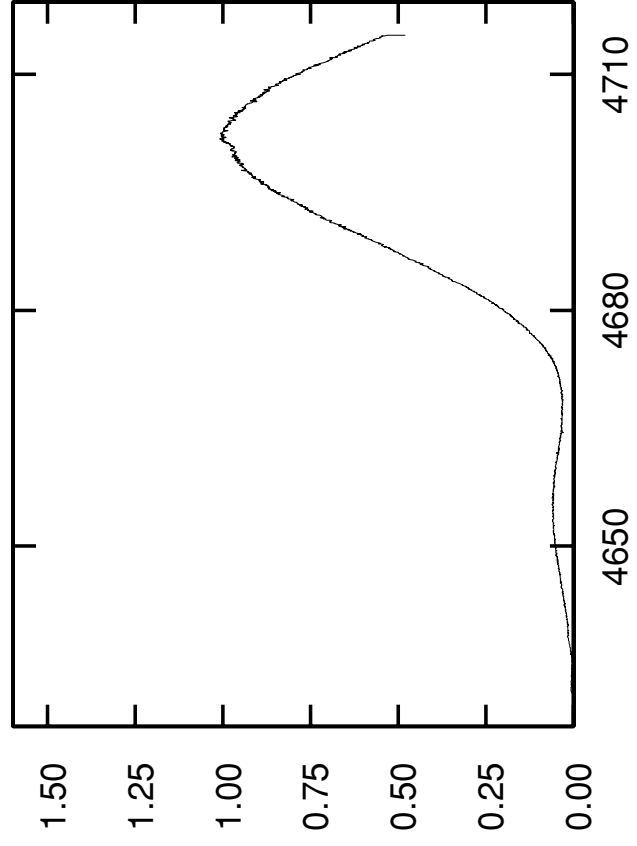
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:21:15 30-Mar-2002
Aperture 6, Image line 6, Order 131
ecidentify thar_316g4931_red2: ThAr



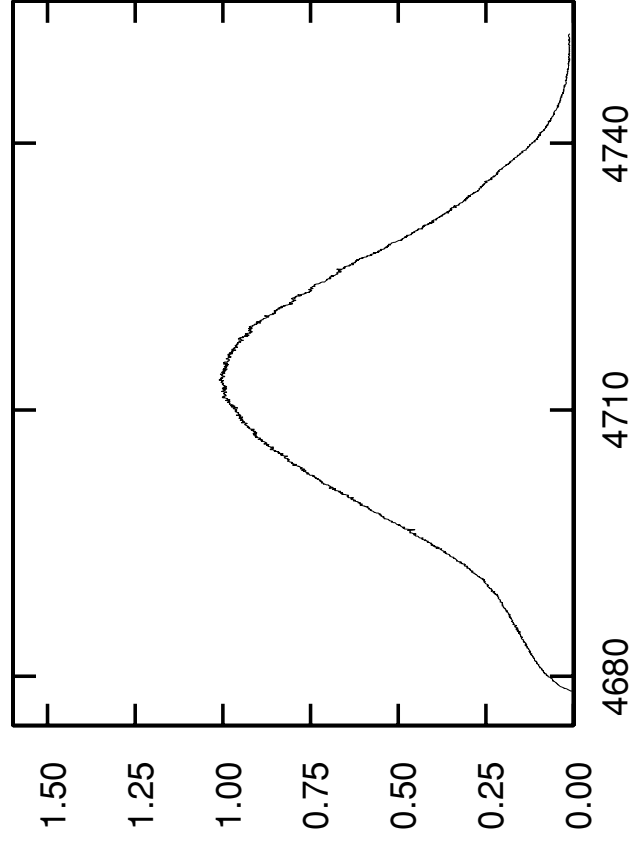
Order 130 - Central



Order 130 - Blue

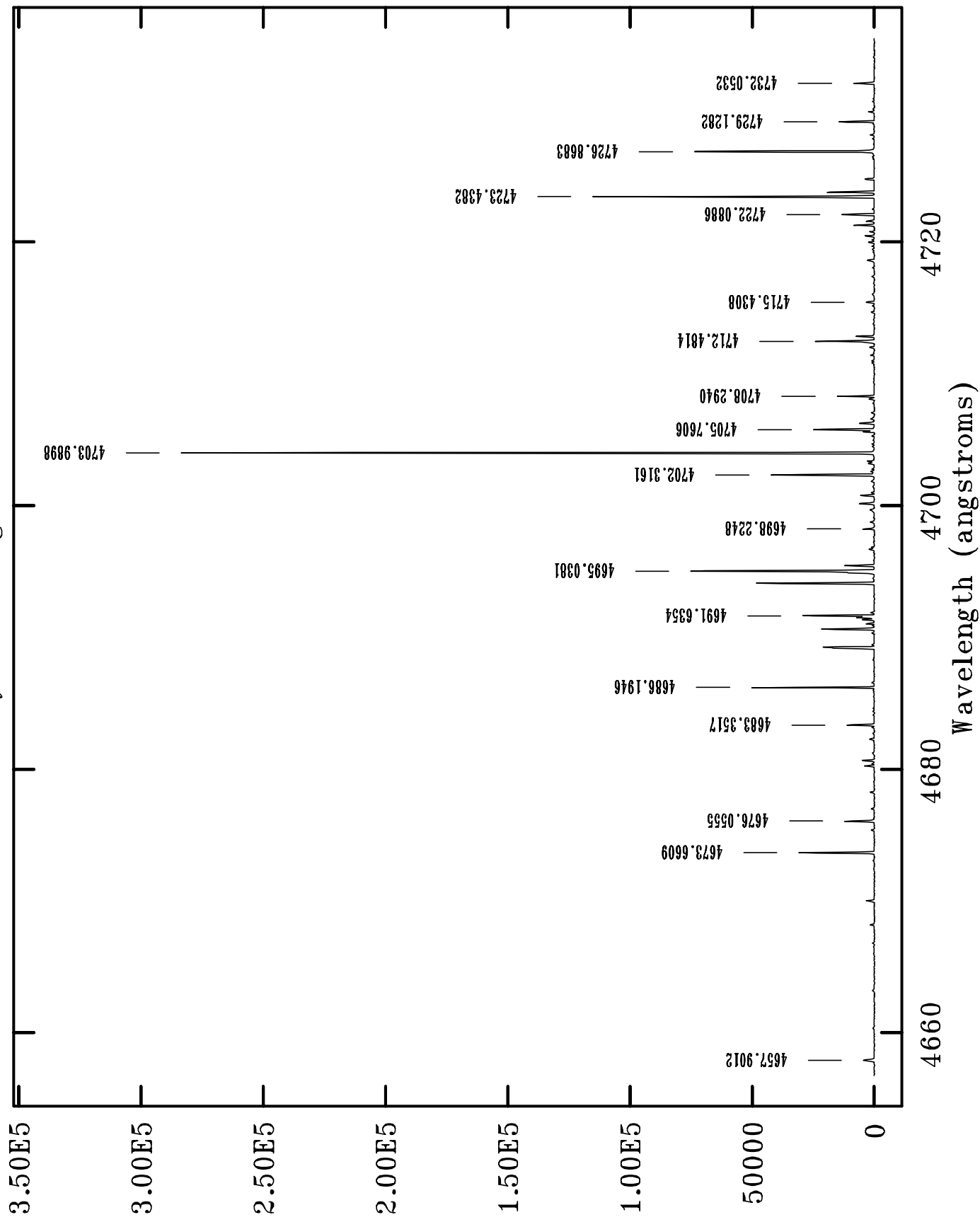


Order 130 - Red

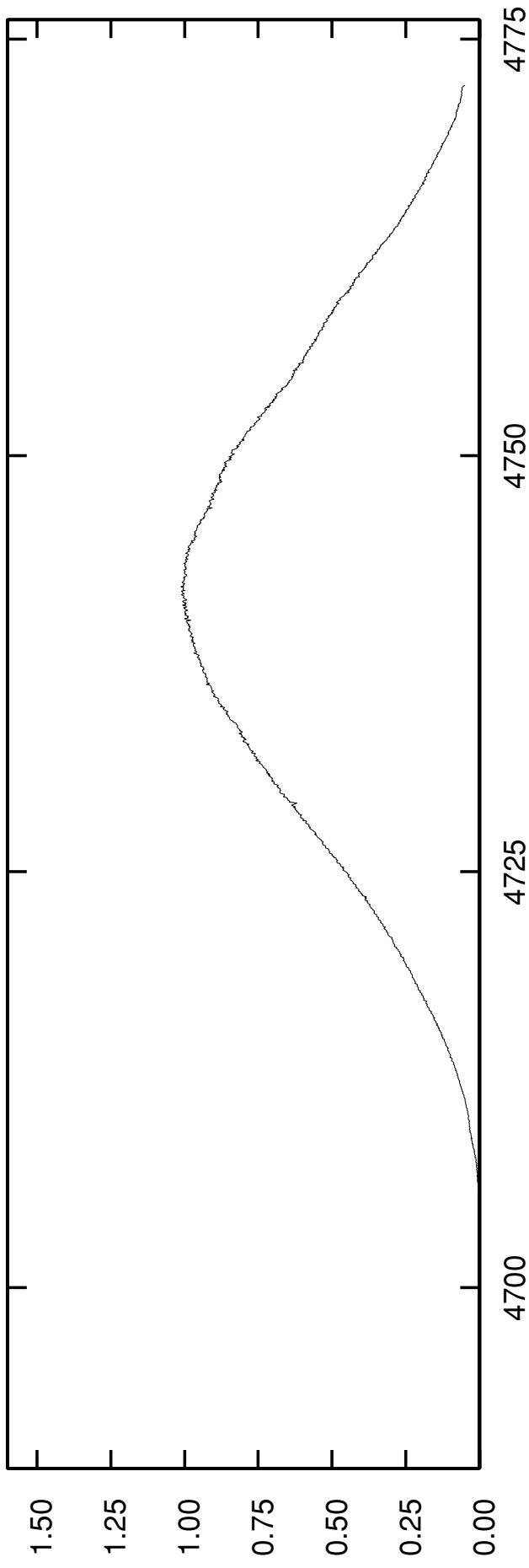


Wavelength (Angstroms)

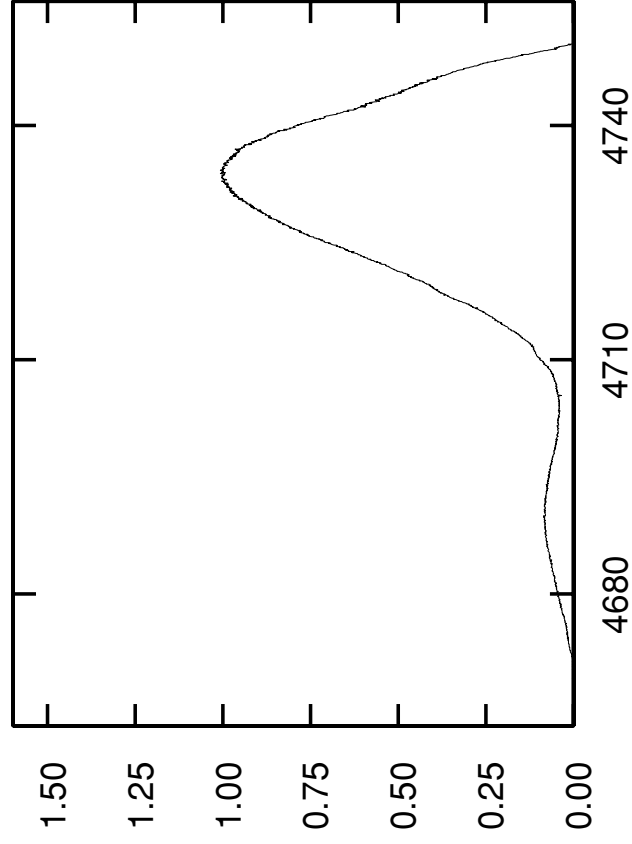
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 03:20:22 30-Mar-2002
Aperture 5, Image line 5, Order 130
eidentify thar_316g4931_red2: ThAr



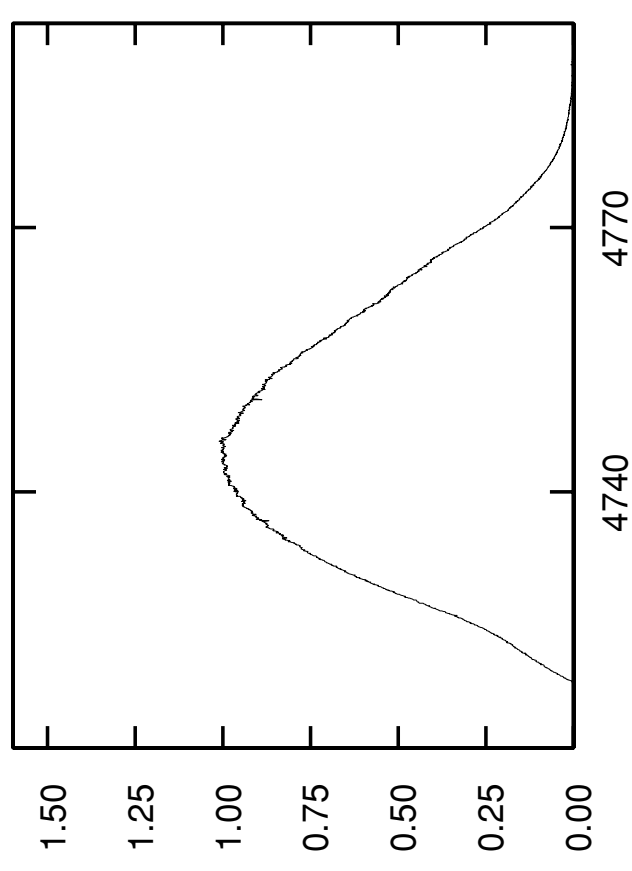
Order 129 - Central



Order 129 - Blue

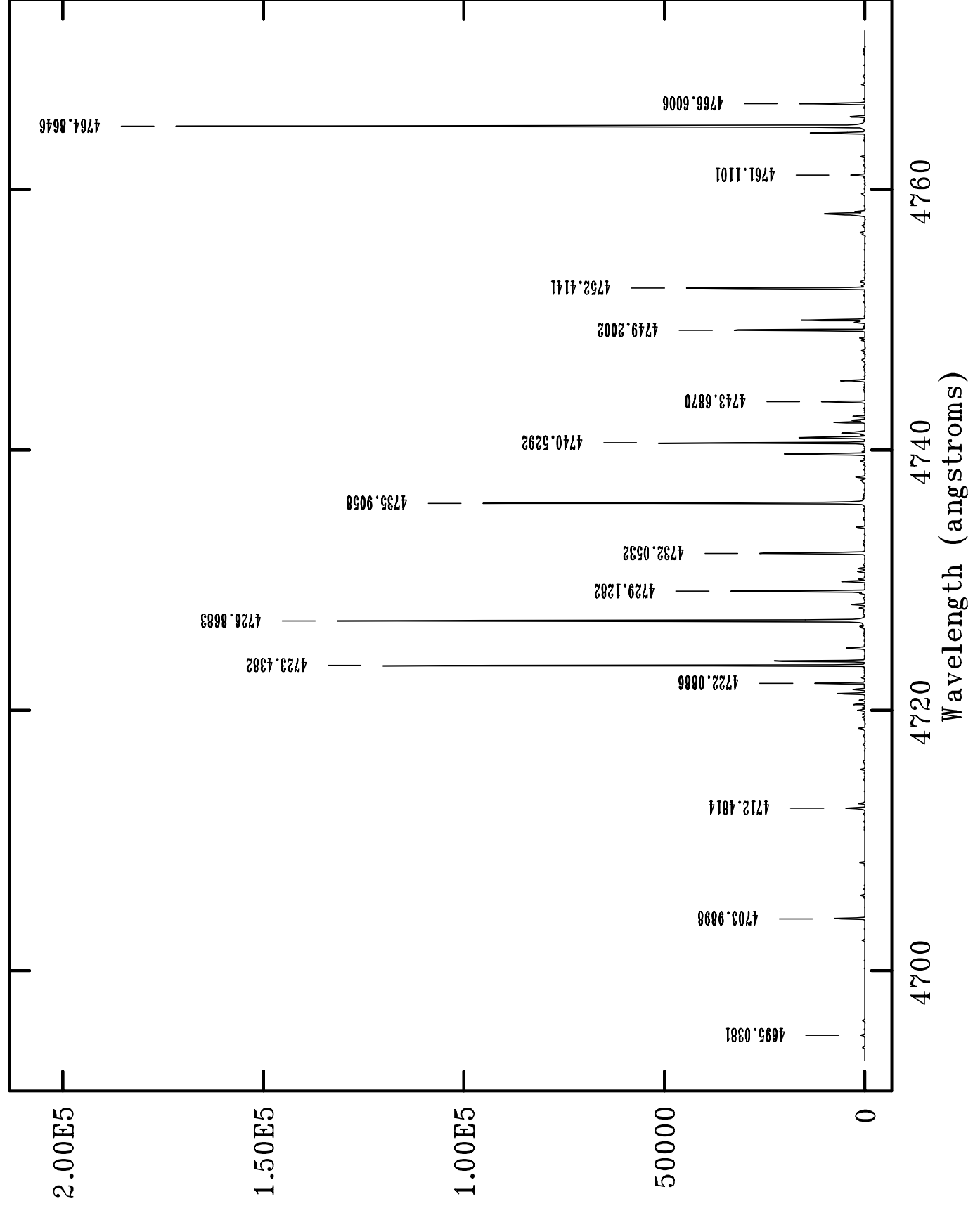


Order 129 - Red

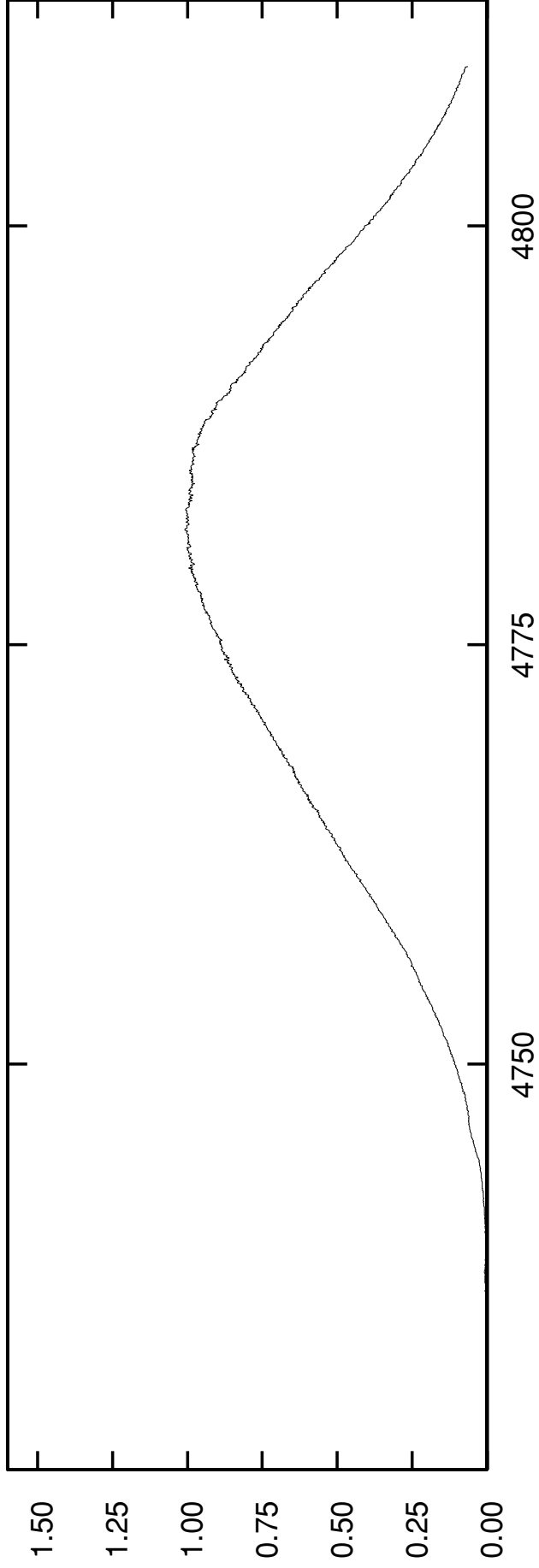


Wavelength (Angstroms)

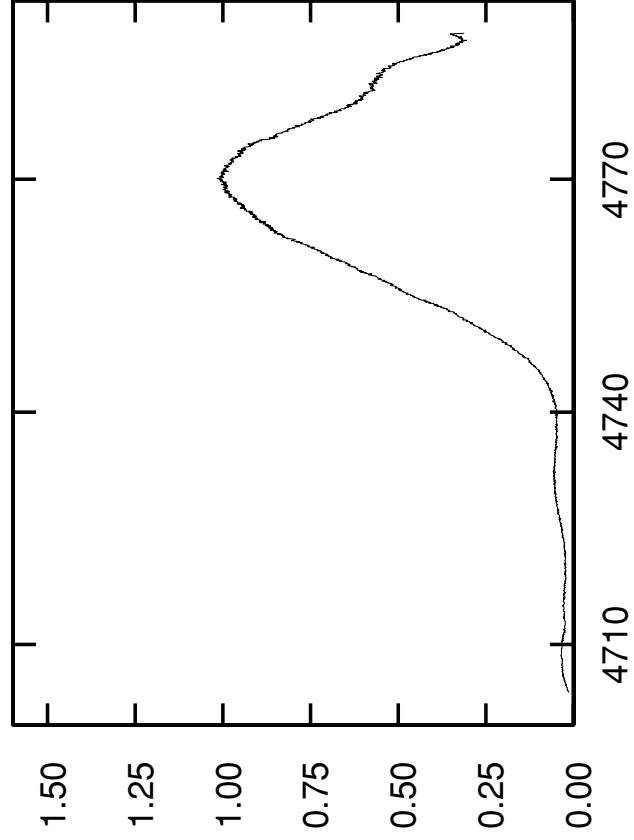
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:15:58 31-Mar-2002
Aperture 26, Image line 26, Order 129
identify thar_316g5936_red2: ThAr



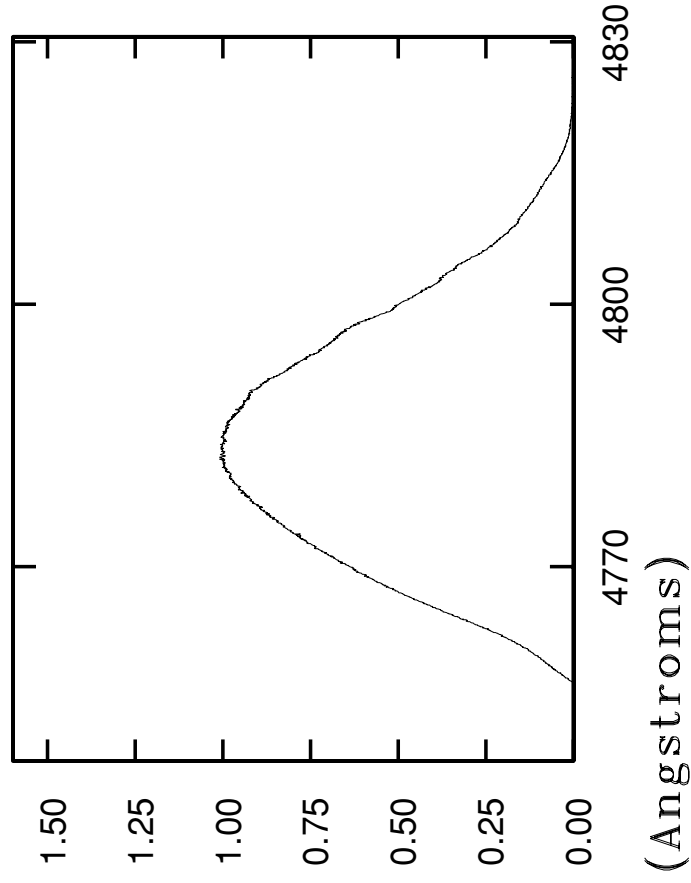
Order 128 - Central



Order 128 - Blue

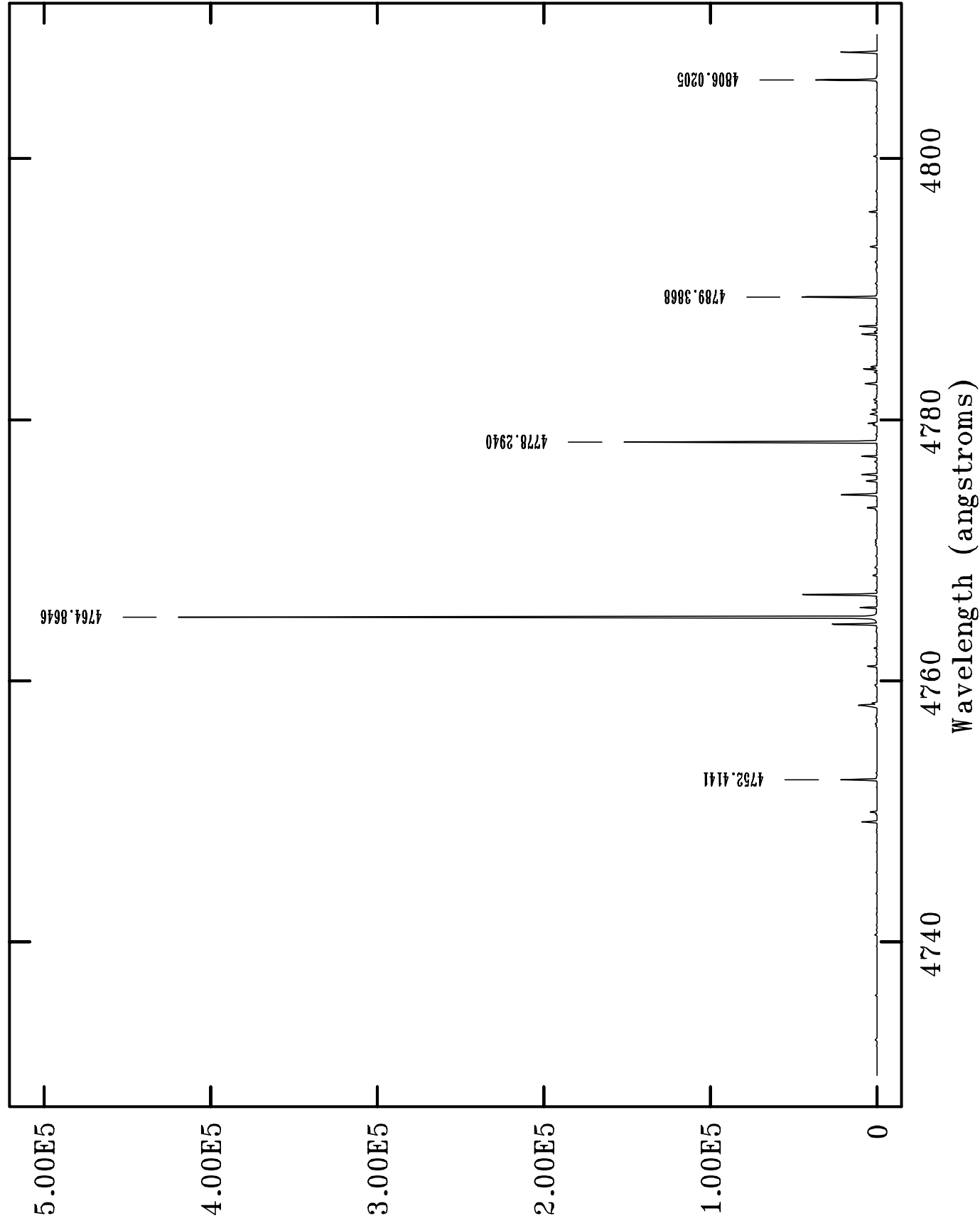


Order 128 - Red

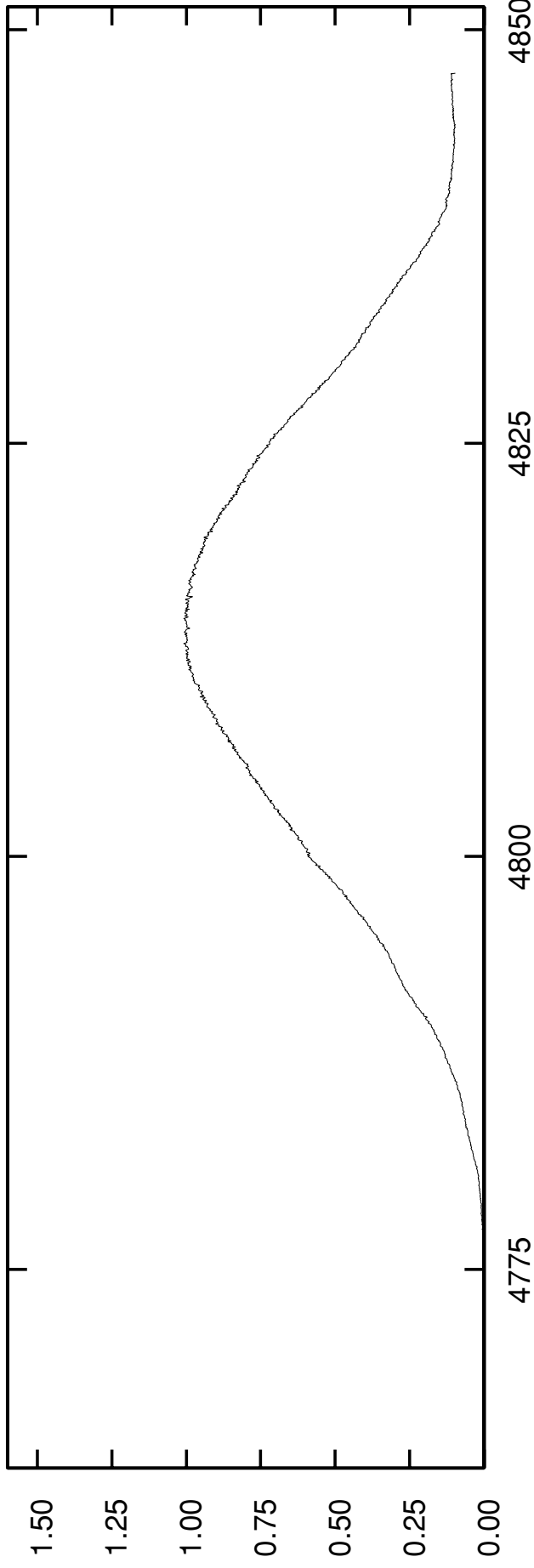


Wavelength (Angstroms)

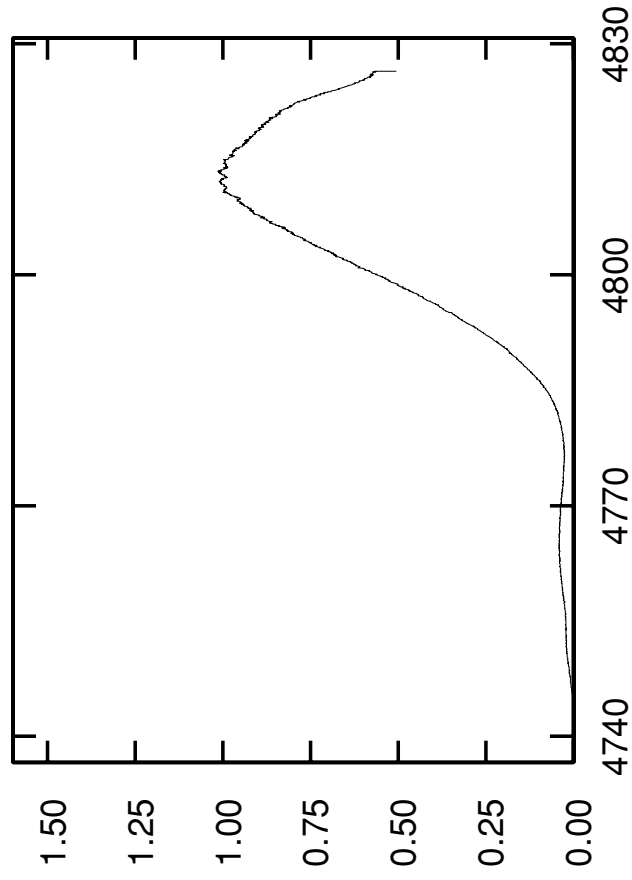
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:50:28 30-Mar-2002
Aperture 25, Image line 25, Order 128
identify thar_316g5936_red2: ThAr



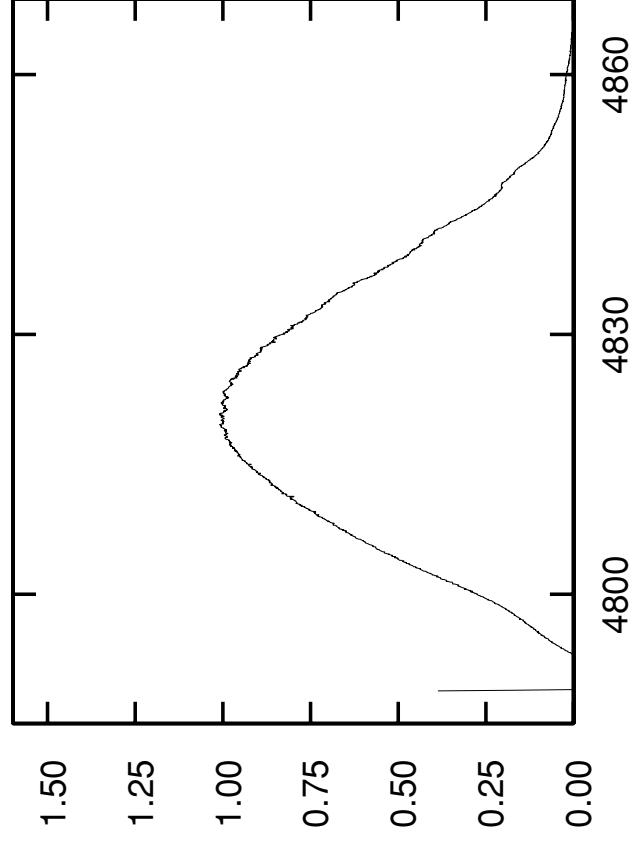
Order 127 - Central



Order 127 - Blue

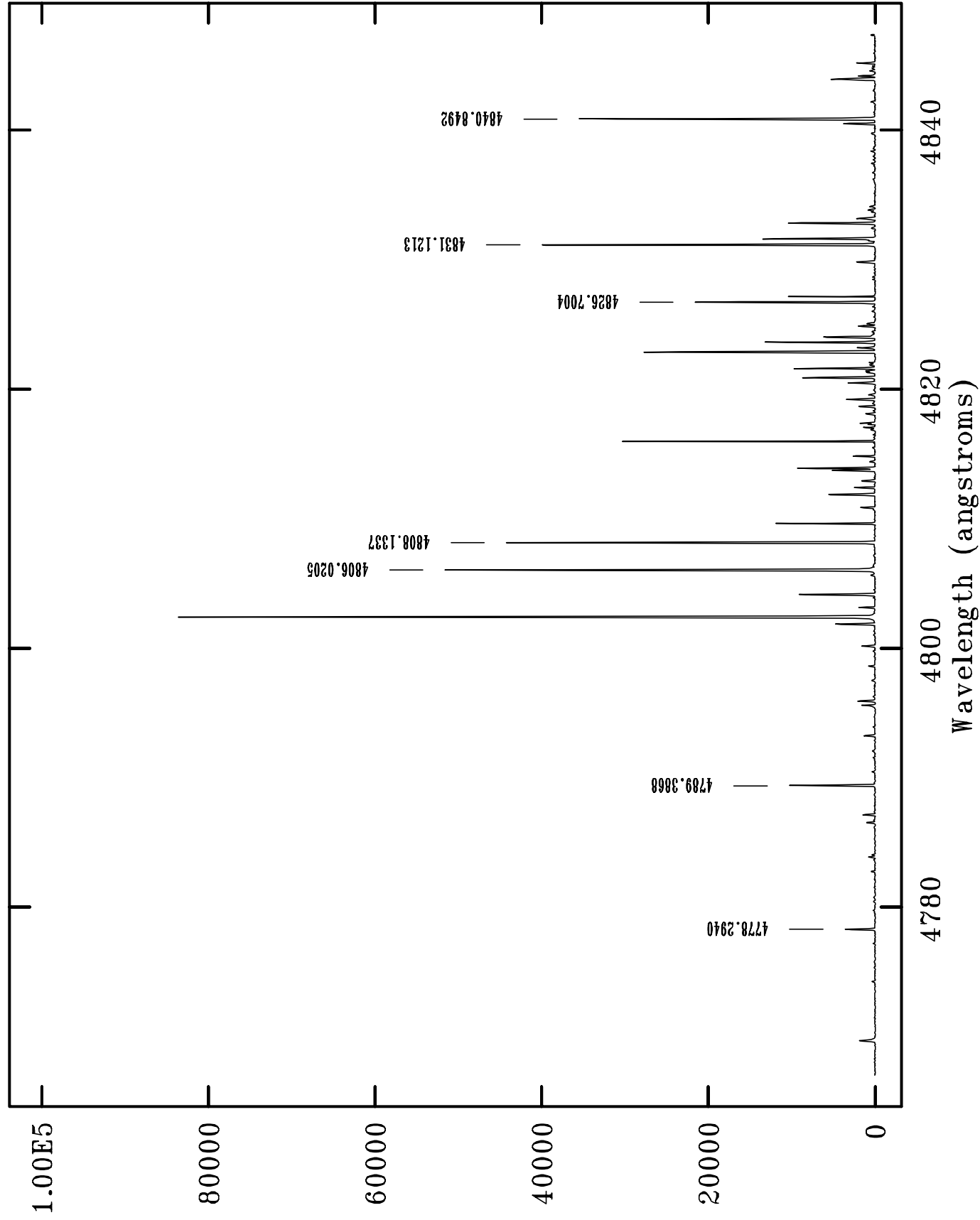


Order 127 - Red

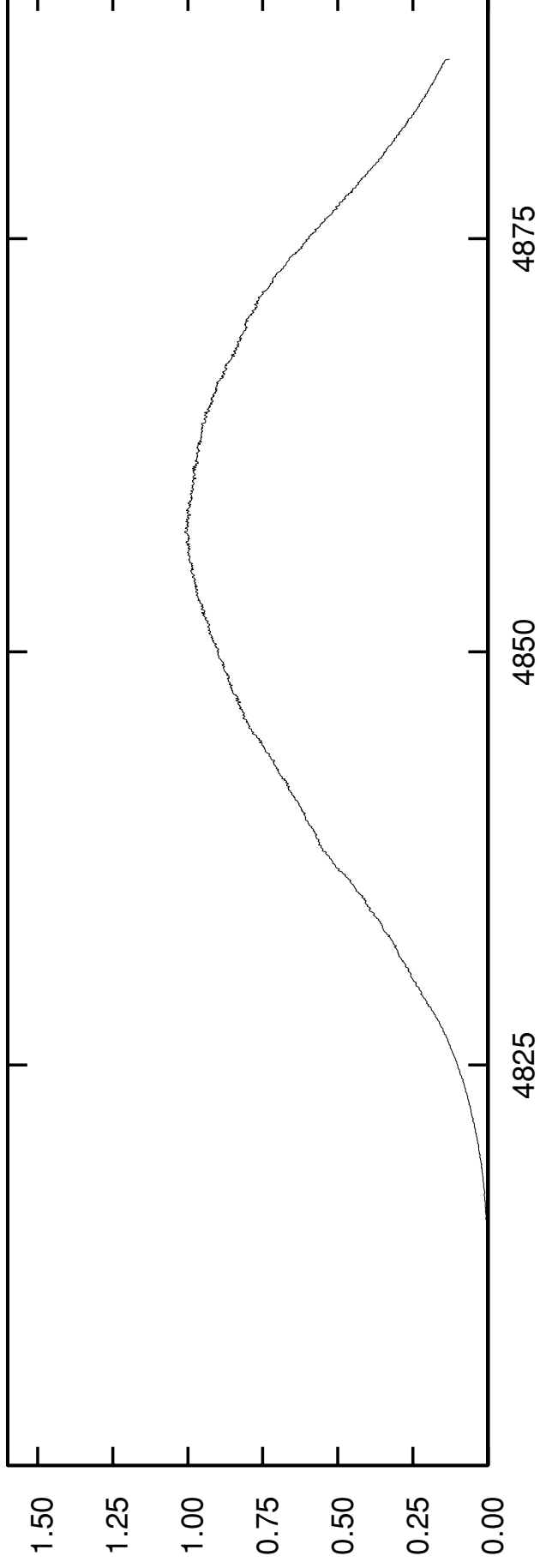


Wavelength (Angstroms)

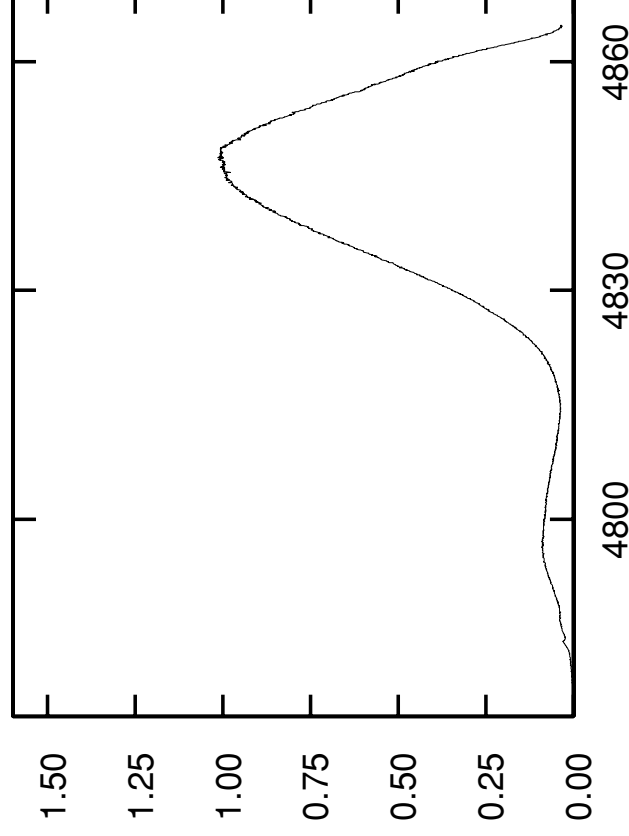
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:49:53 30-Mar-2002
Aperture 24, Image line 24, Order 127
identify thar_316g5936_red2: ThAr



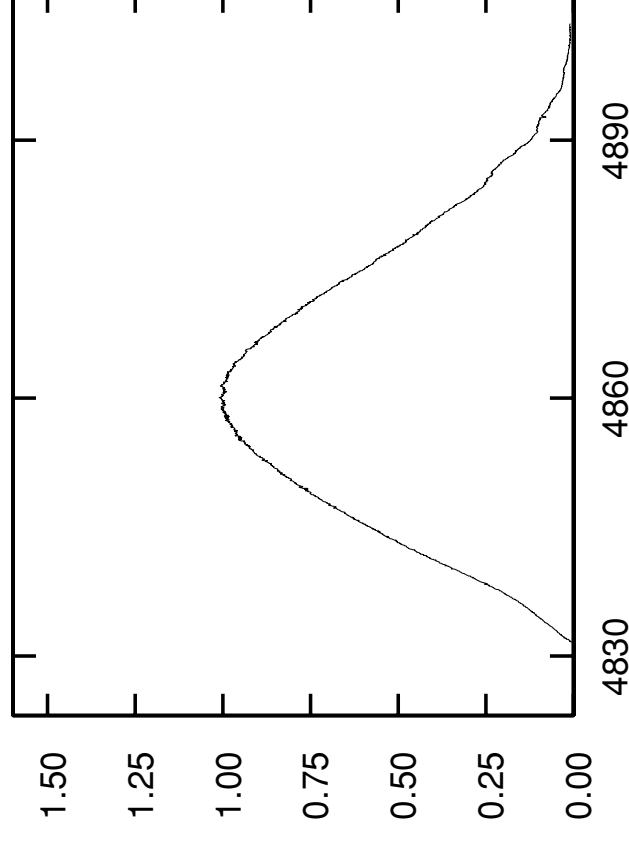
Order 126 - Central



Order 126 - Blue

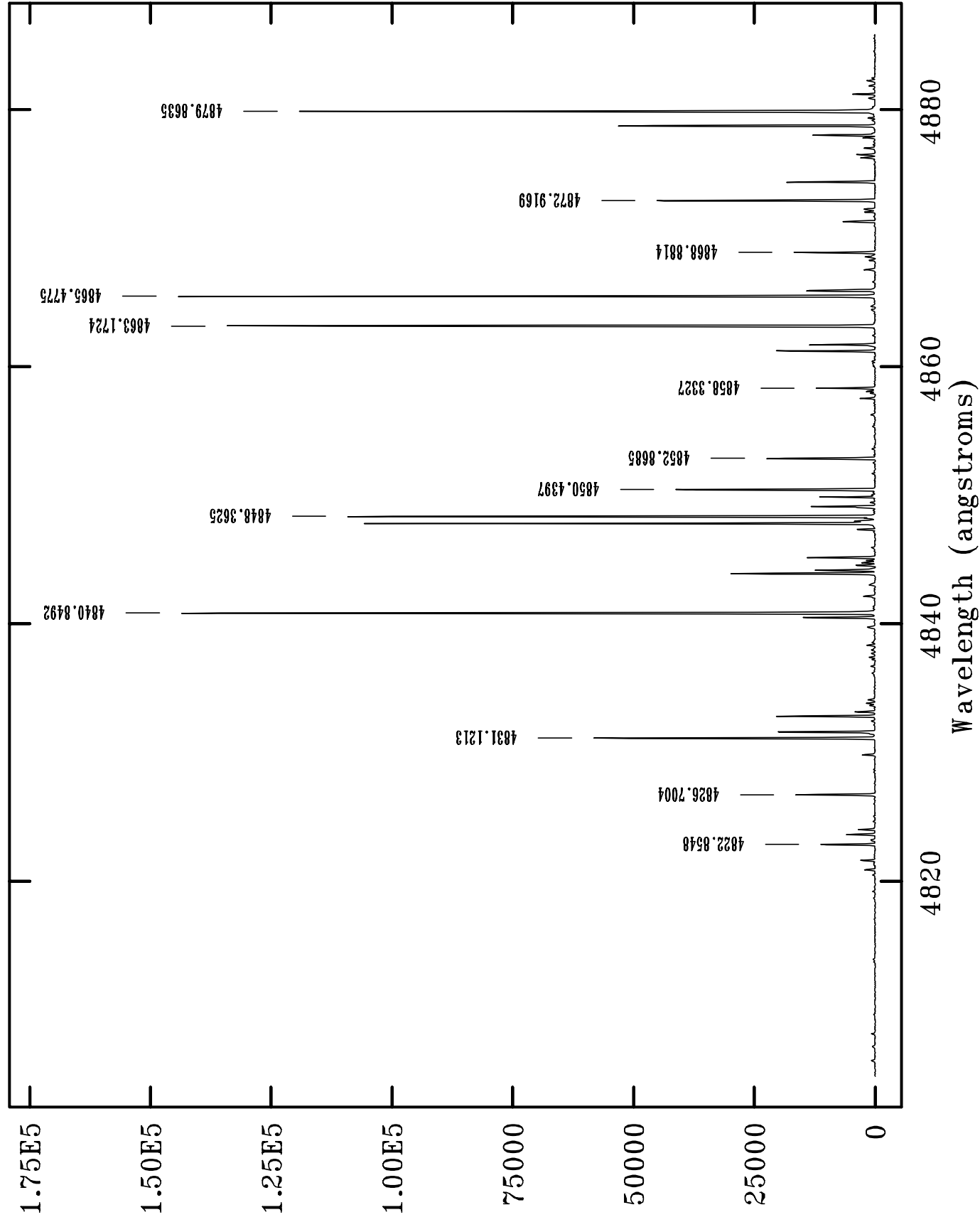


Order 126 - Red

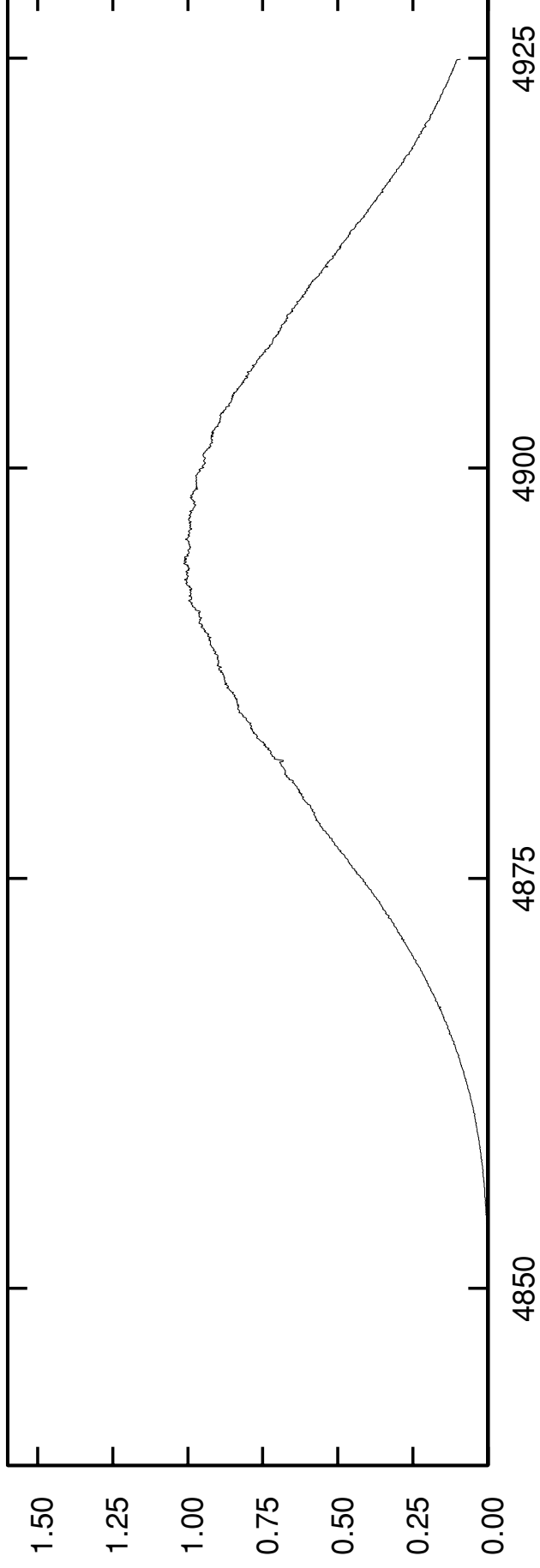


Wavelength (Angstroms)

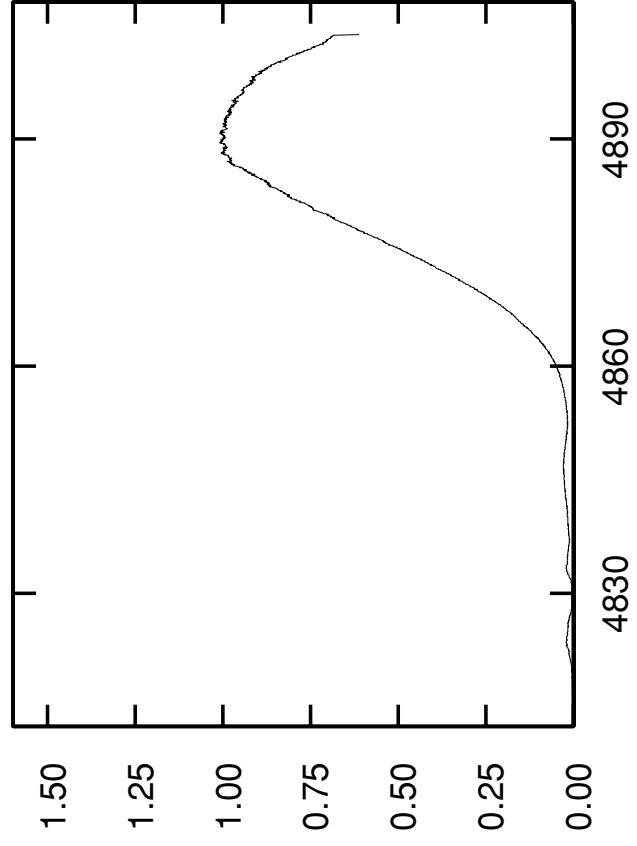
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:49:05 30-Mar-2002
Aperture 23, Image line 23, Order 126
identify thar_316g5936_red2: ThAr



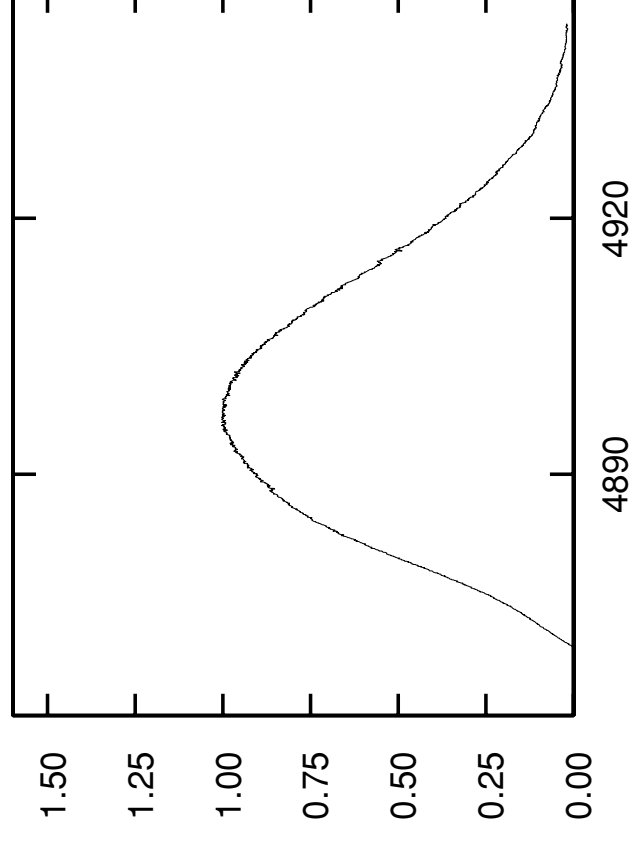
Order 125 - Central



Order 125 - Blue

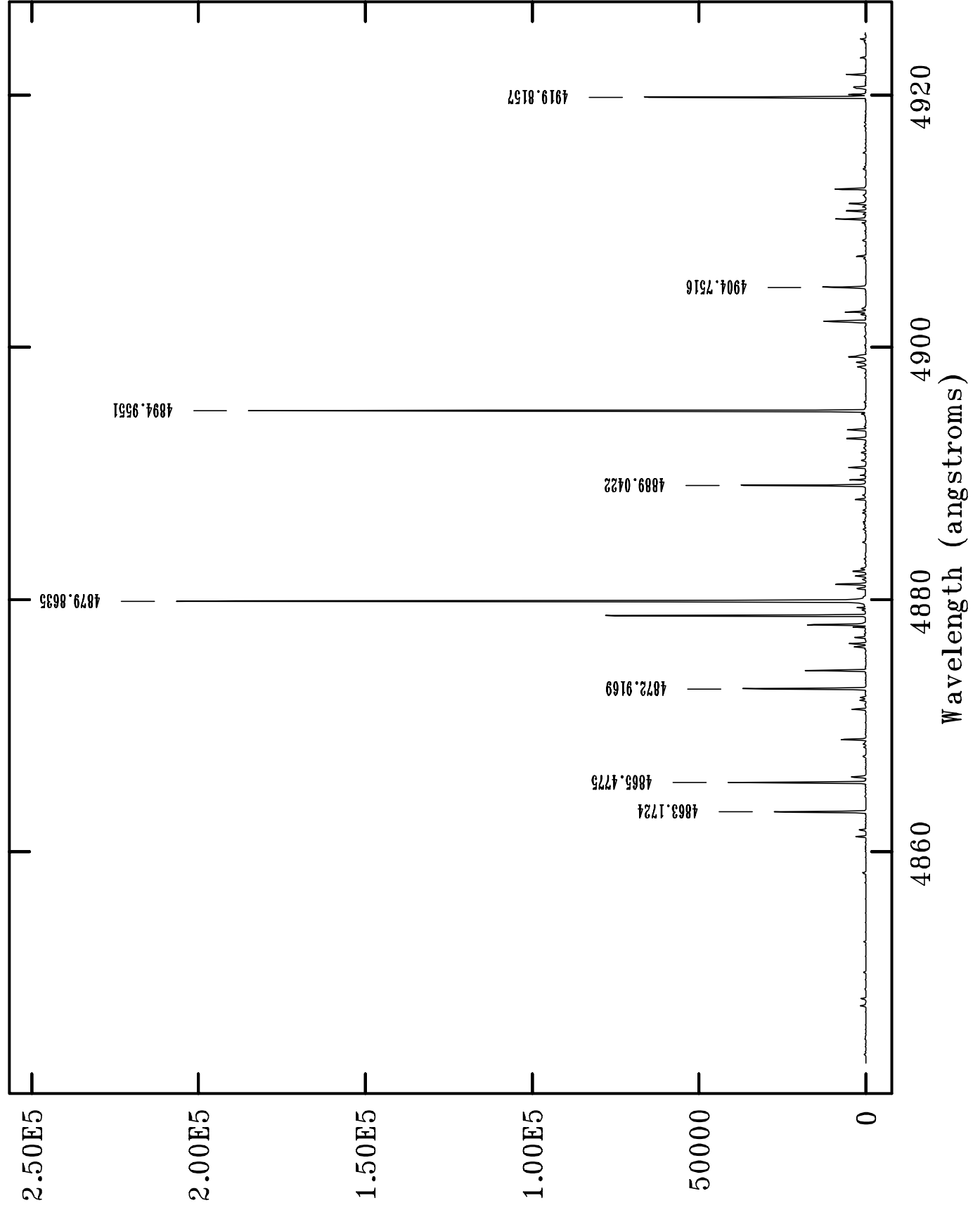


Order 125 - Red

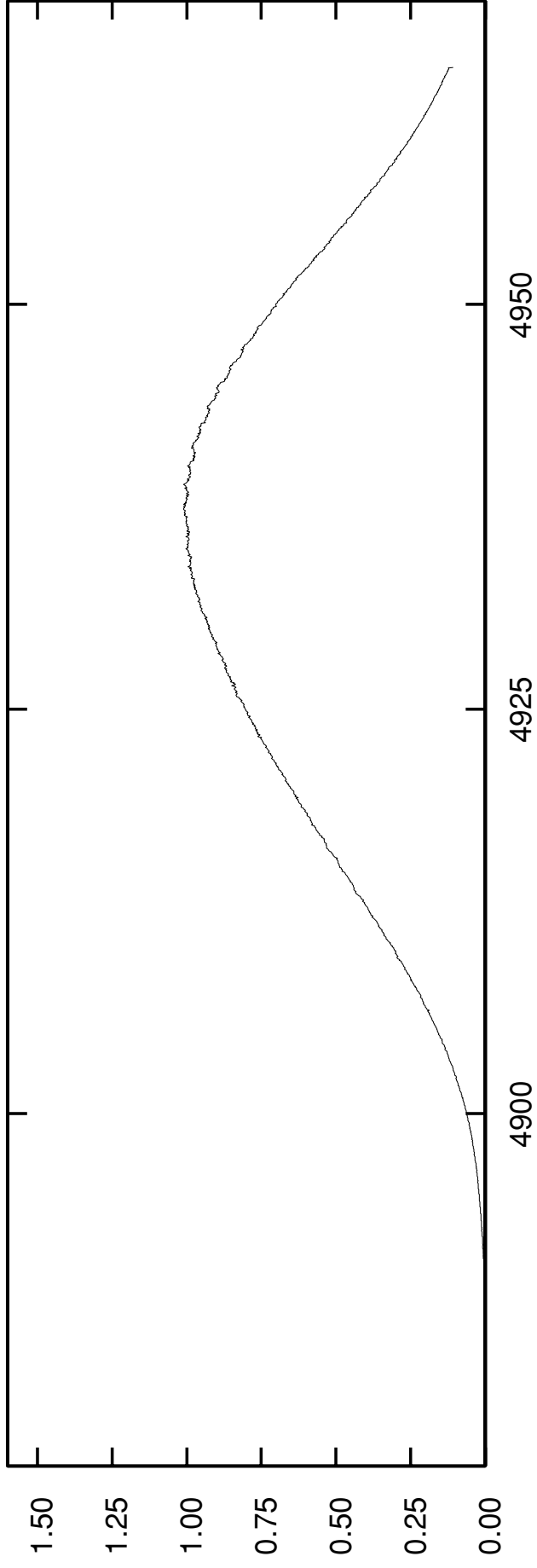


Wavelength (Angstroms)

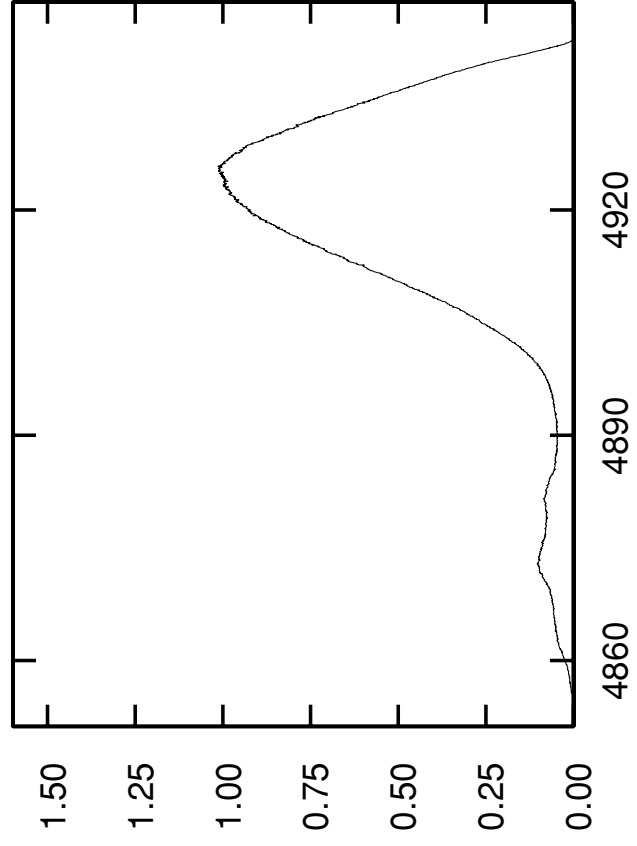
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:48:14 30-Mar-2002
Aperture 22, Image line 22, Order 125
identify thar_316g5936_red2: ThAr



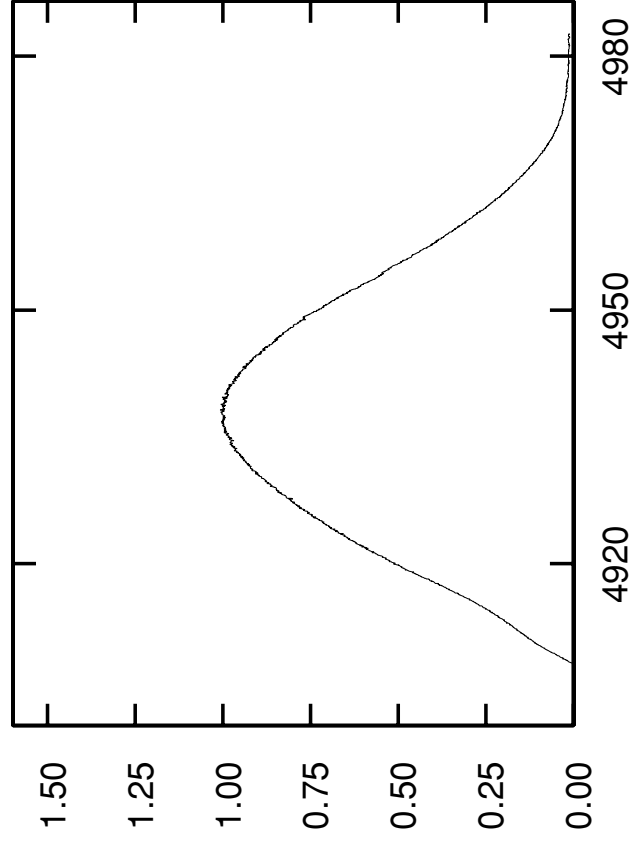
Order 124 - Central



Order 124 - Blue

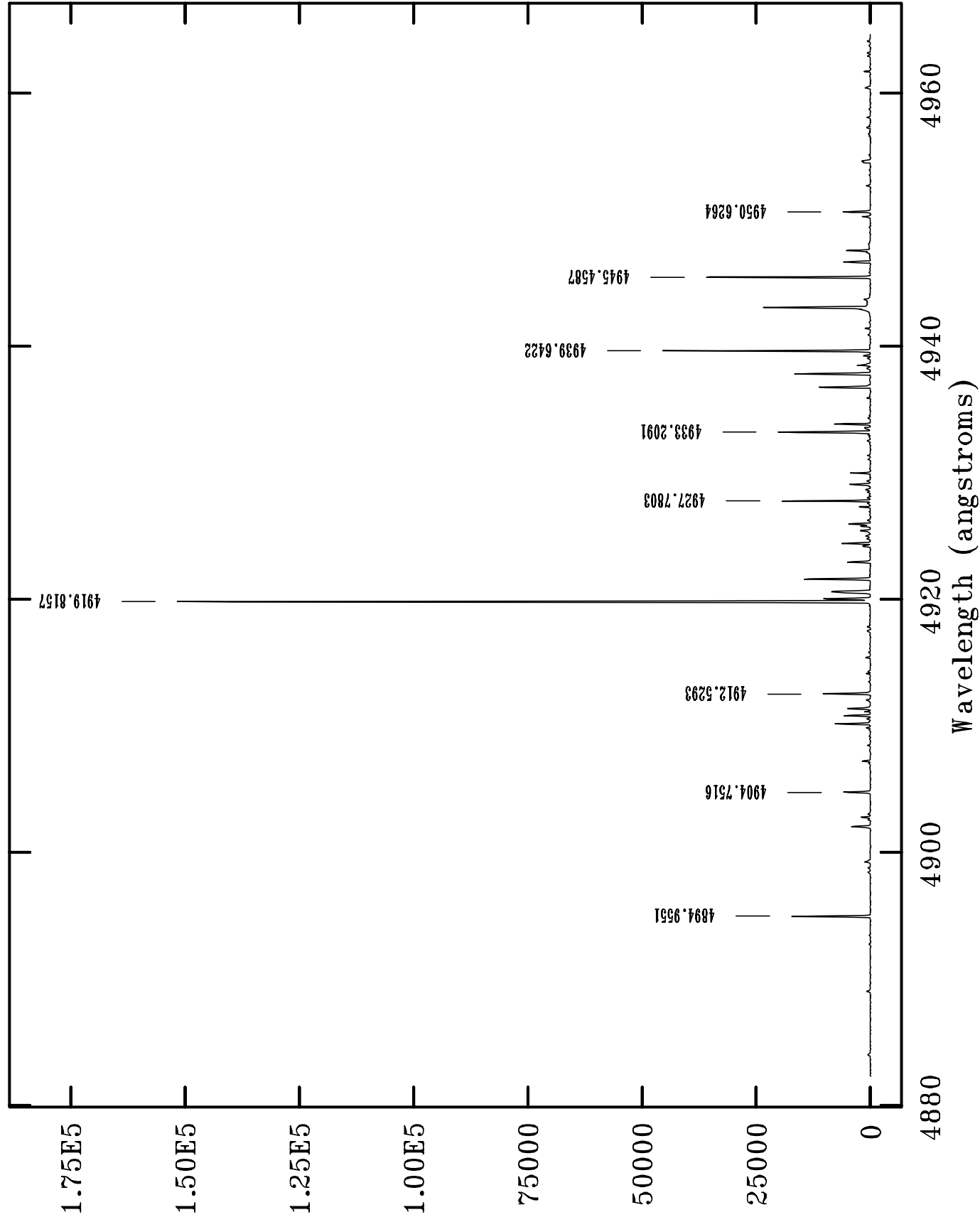


Order 124 - Red

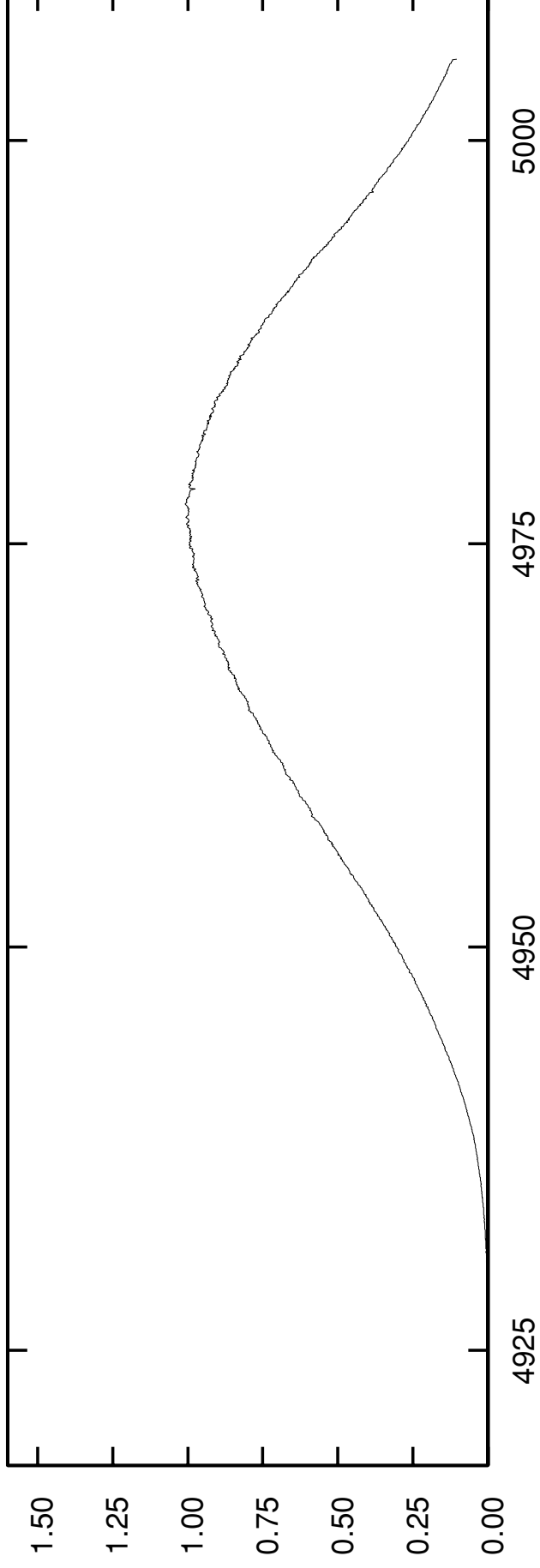


Wavelength (Angstroms)

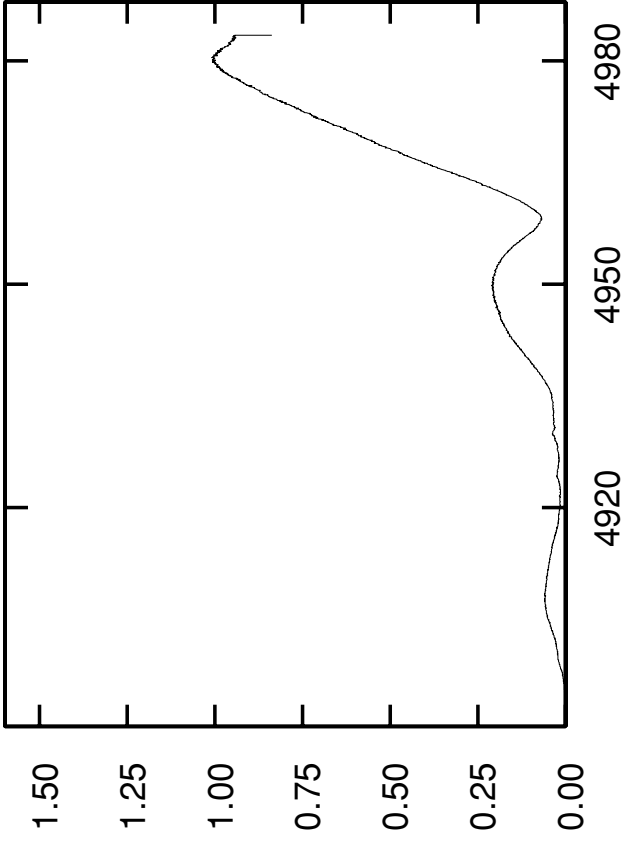
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:47:34 30-Mar-2002
Aperture 21, Image line 21, Order 124
identify thar_316g5936_red2: ThAr



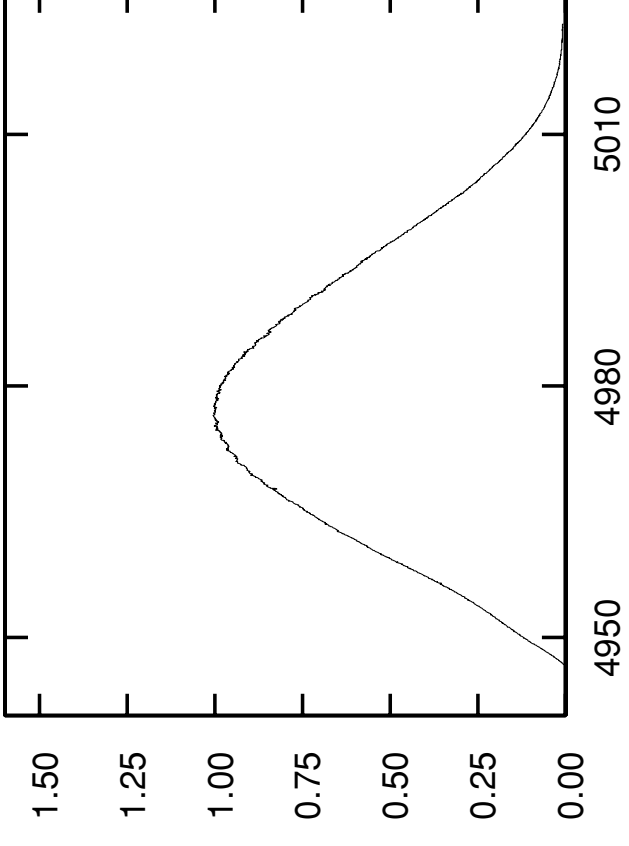
Order 123 - Central



Order 123 - Blue

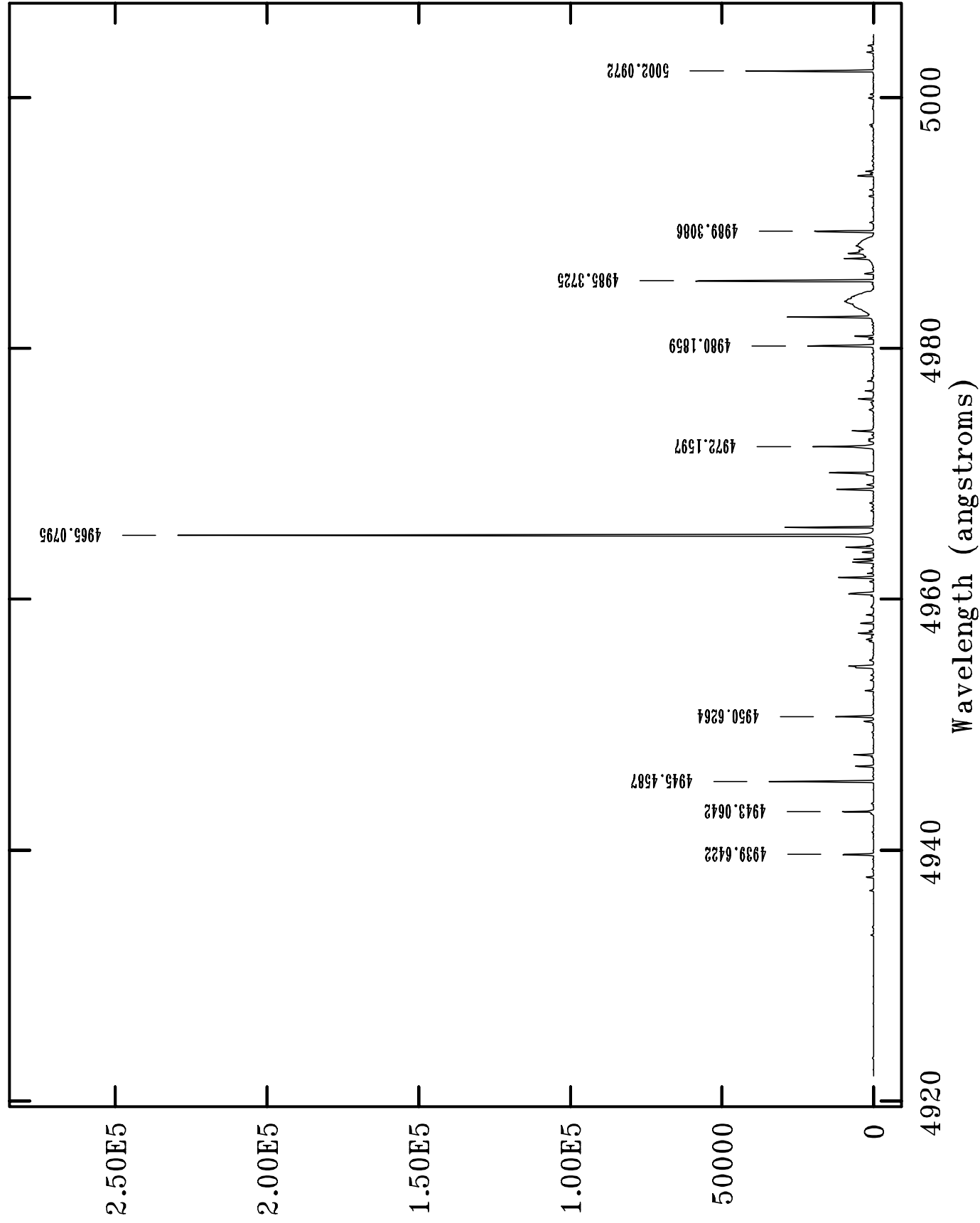


Order 123 - Red

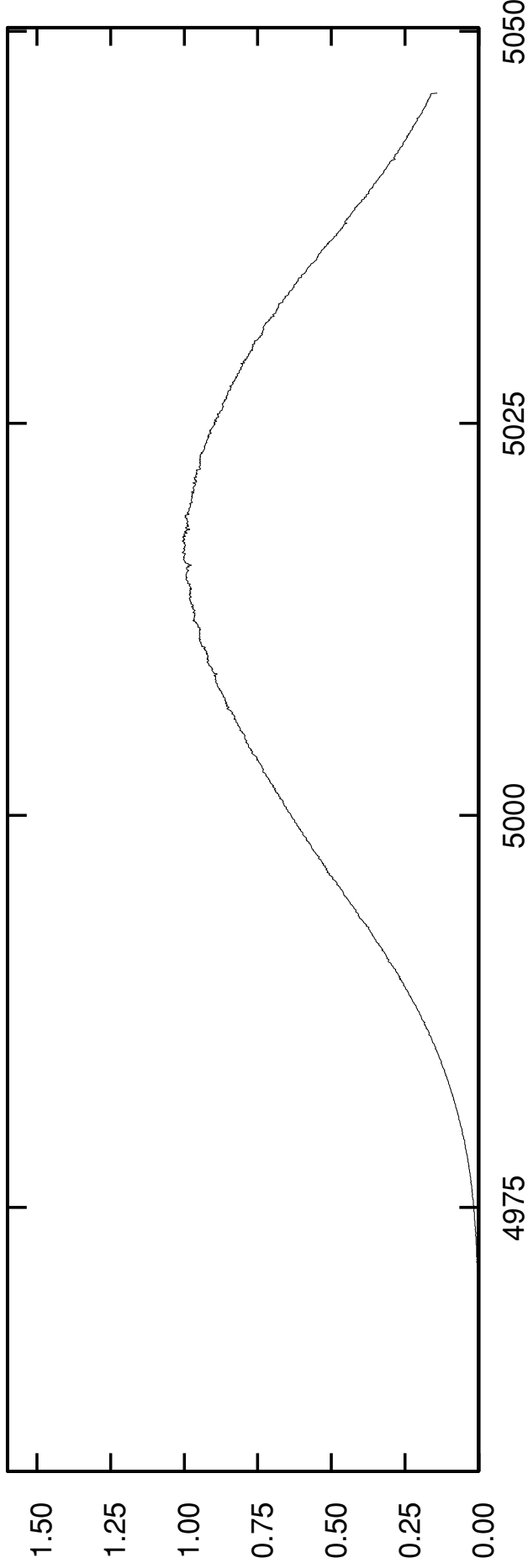


Wavelength (Angstroms)

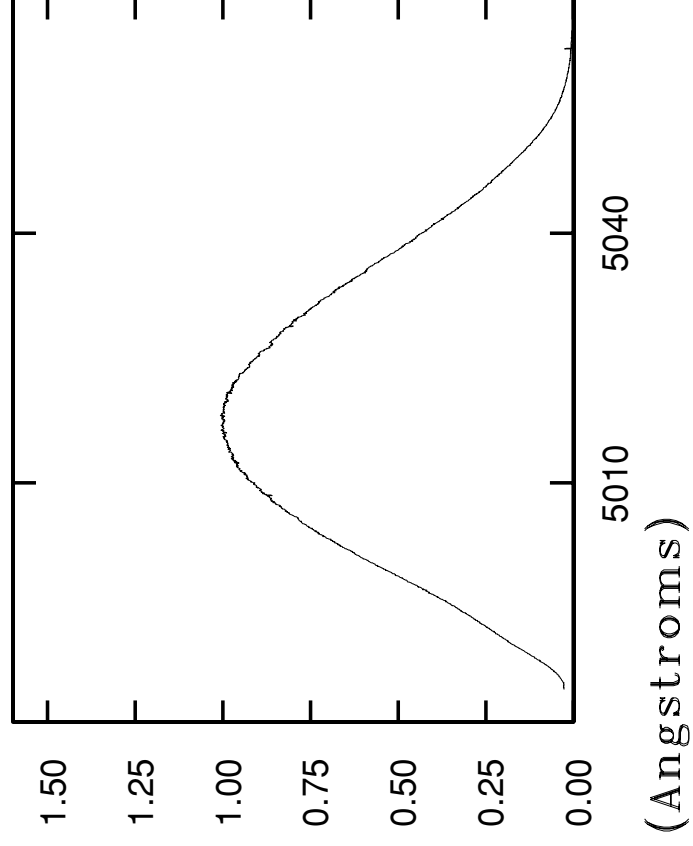
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:46:57 30-Mar-2002
Aperture 20, Image line 20, Order 123
identify thar_316g5936_red2: ThAr



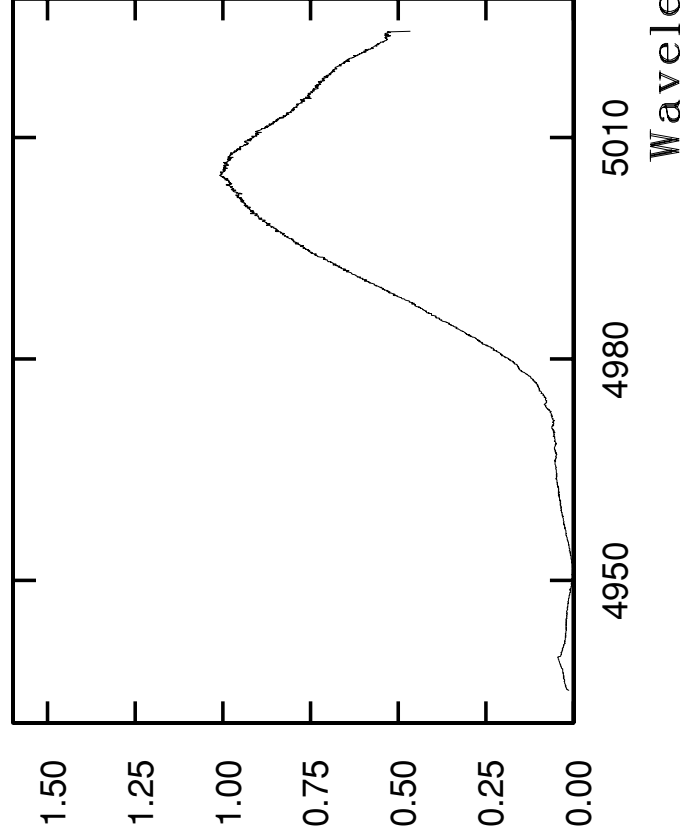
Order 122 - Central



Order 122 - Red

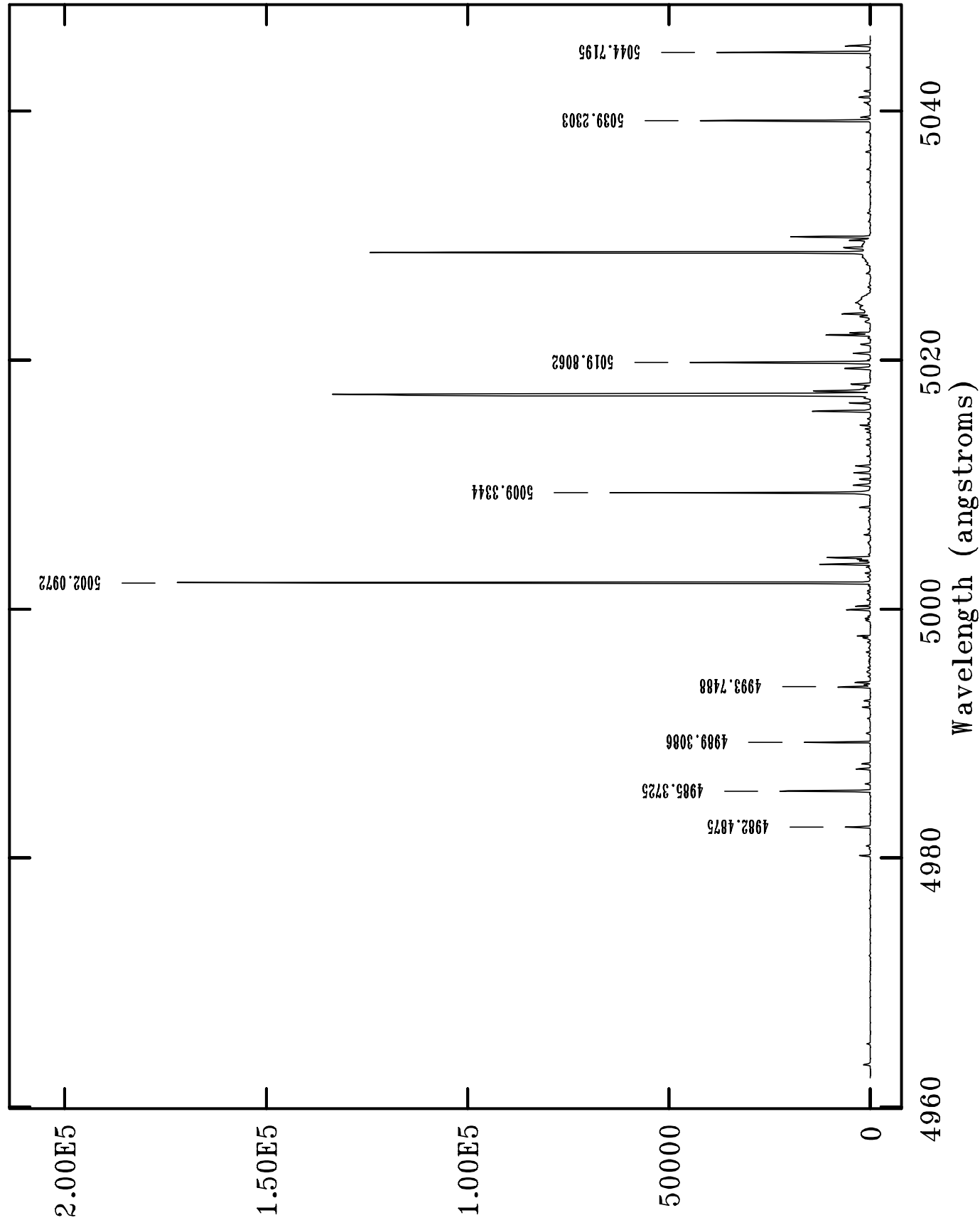


Order 122 - Blue

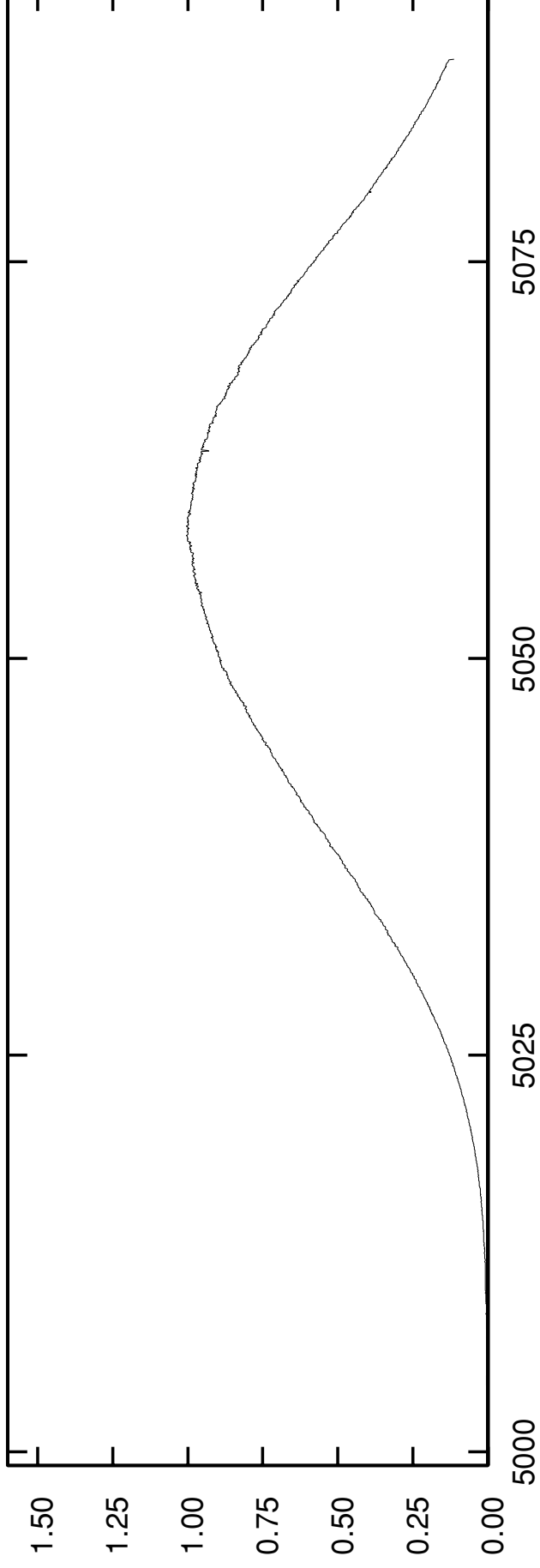


Wavelength (Angstroms)

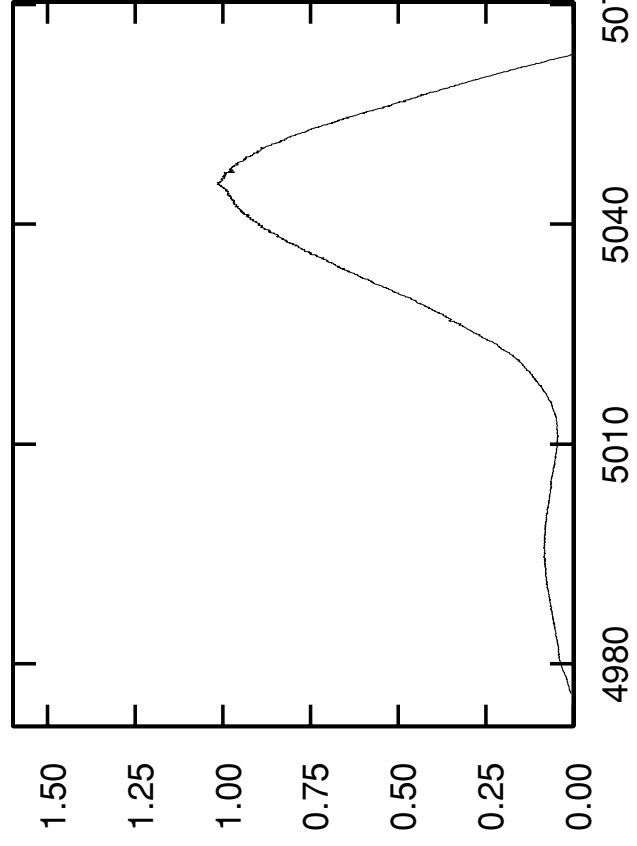
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:46:22 30-Mar-2002
Aperture 19, Image line 19, Order 122
ecidentify thar_316g5936_red2: ThAr



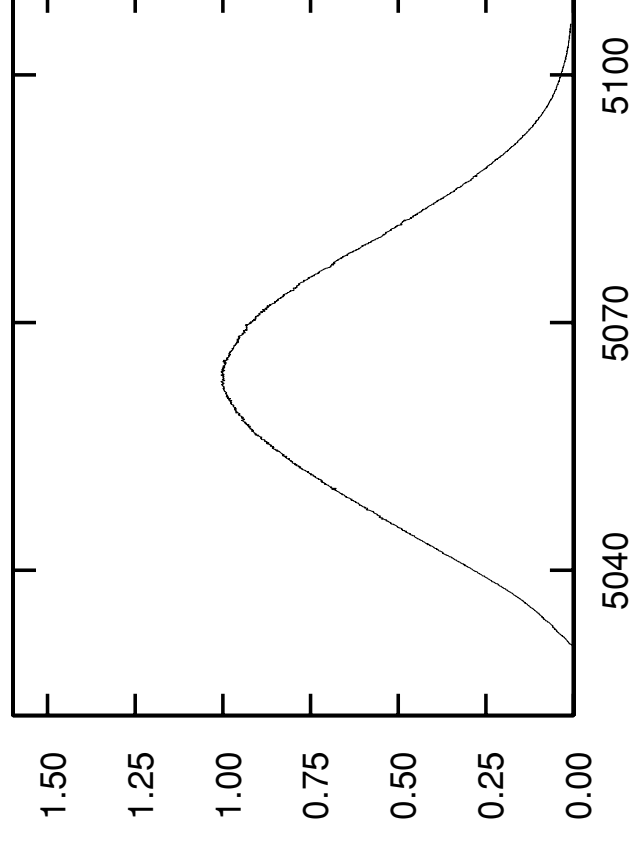
Order 121 - Central



Order 121 - Blue

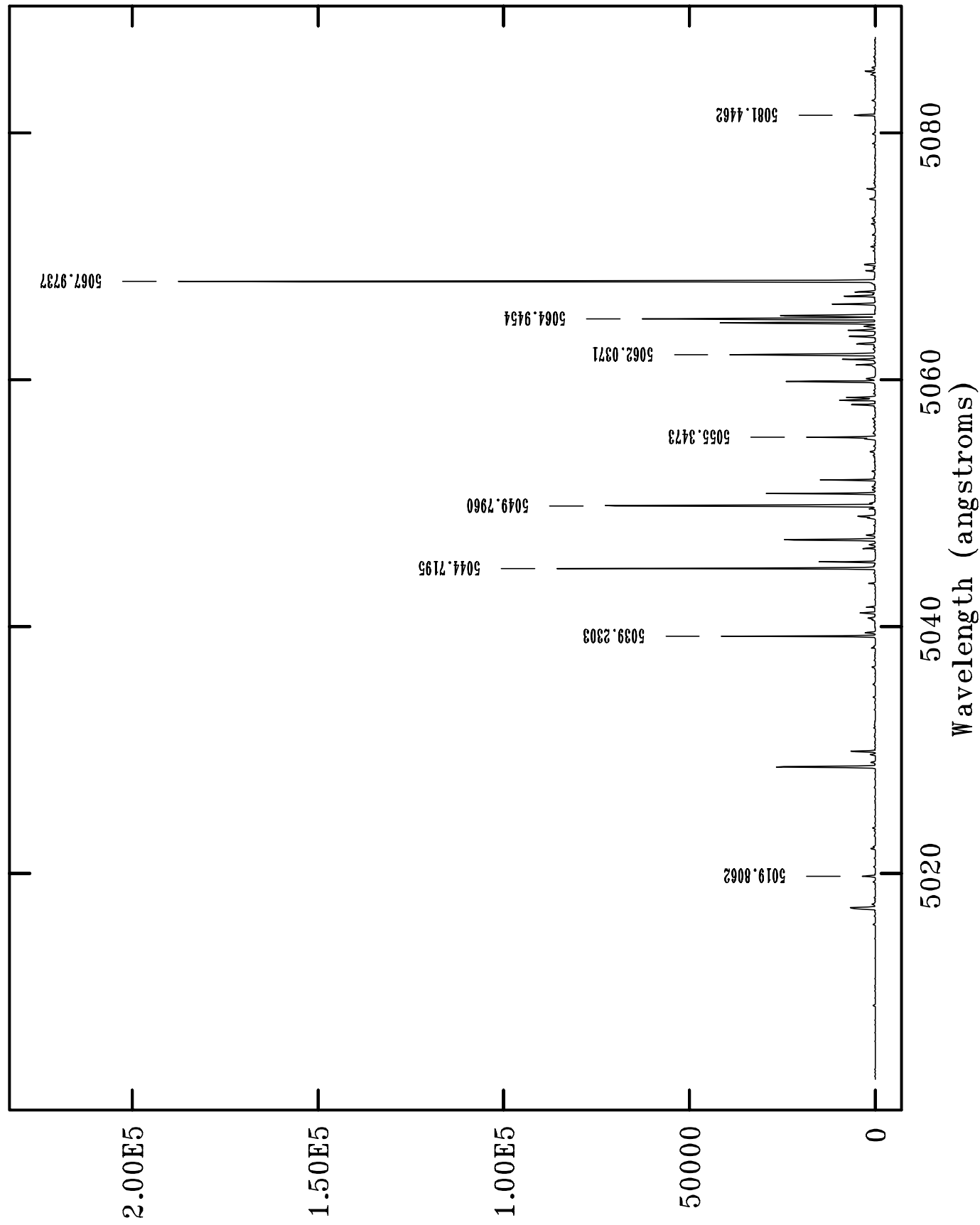


Order 121 - Red

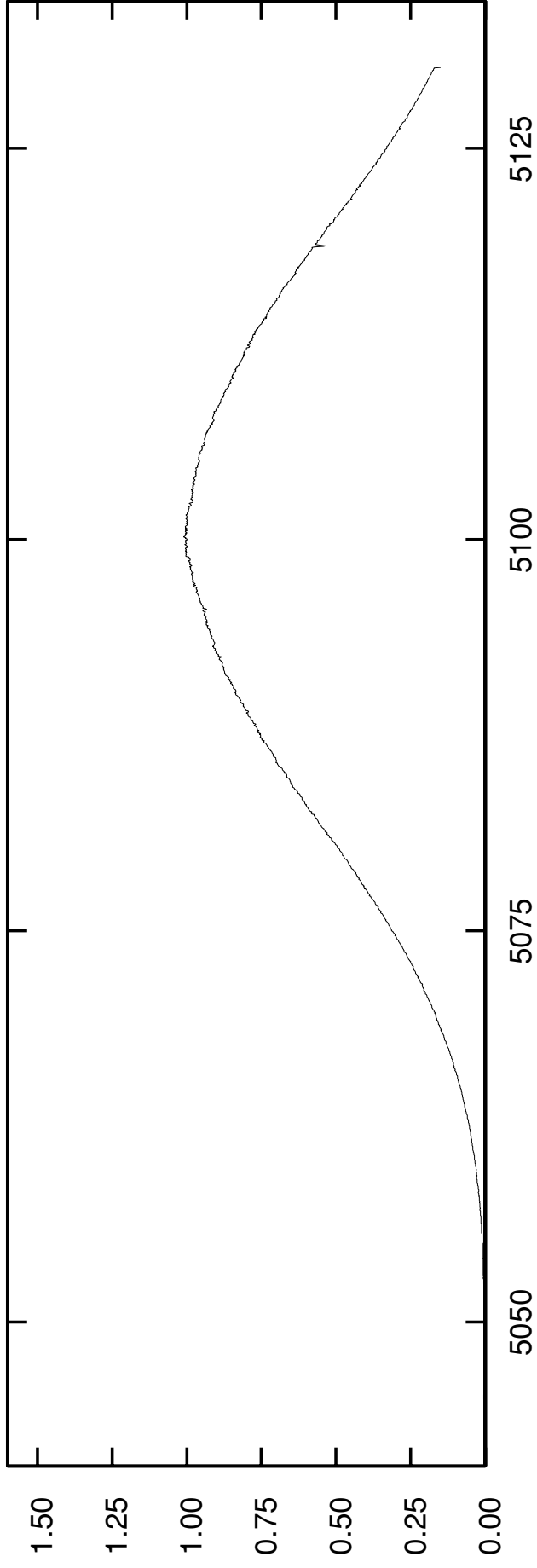


Wavelength (Angstroms)

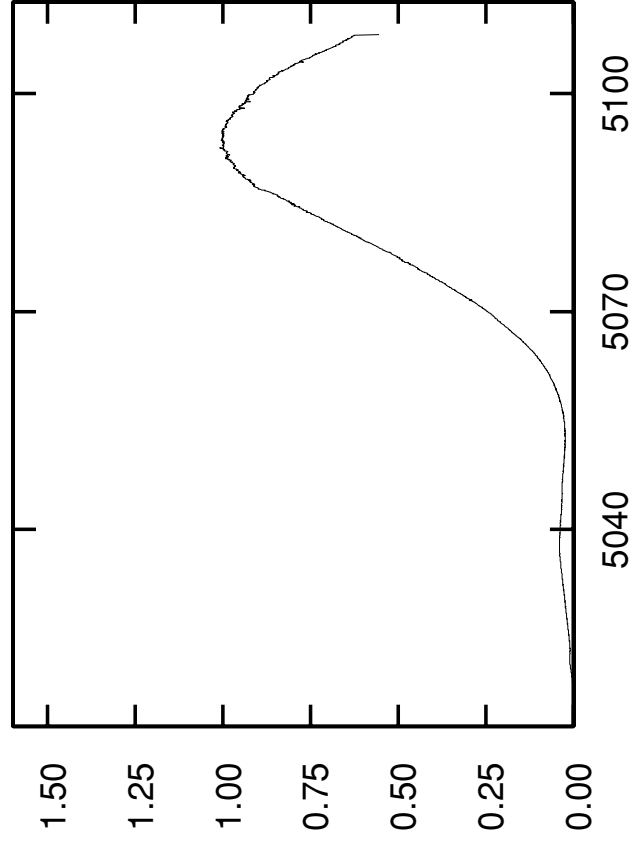
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:45:42 30-Mar-2002
Aperture 18, Image line 18, Order 121
identify thar_316g5936_red2: ThAr



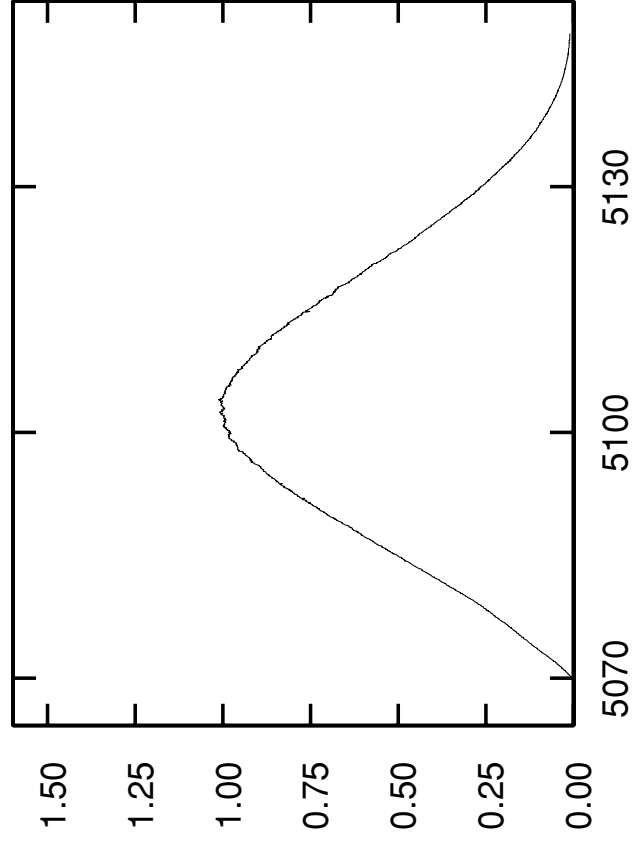
Order 120 - Central



Order 120 - Blue

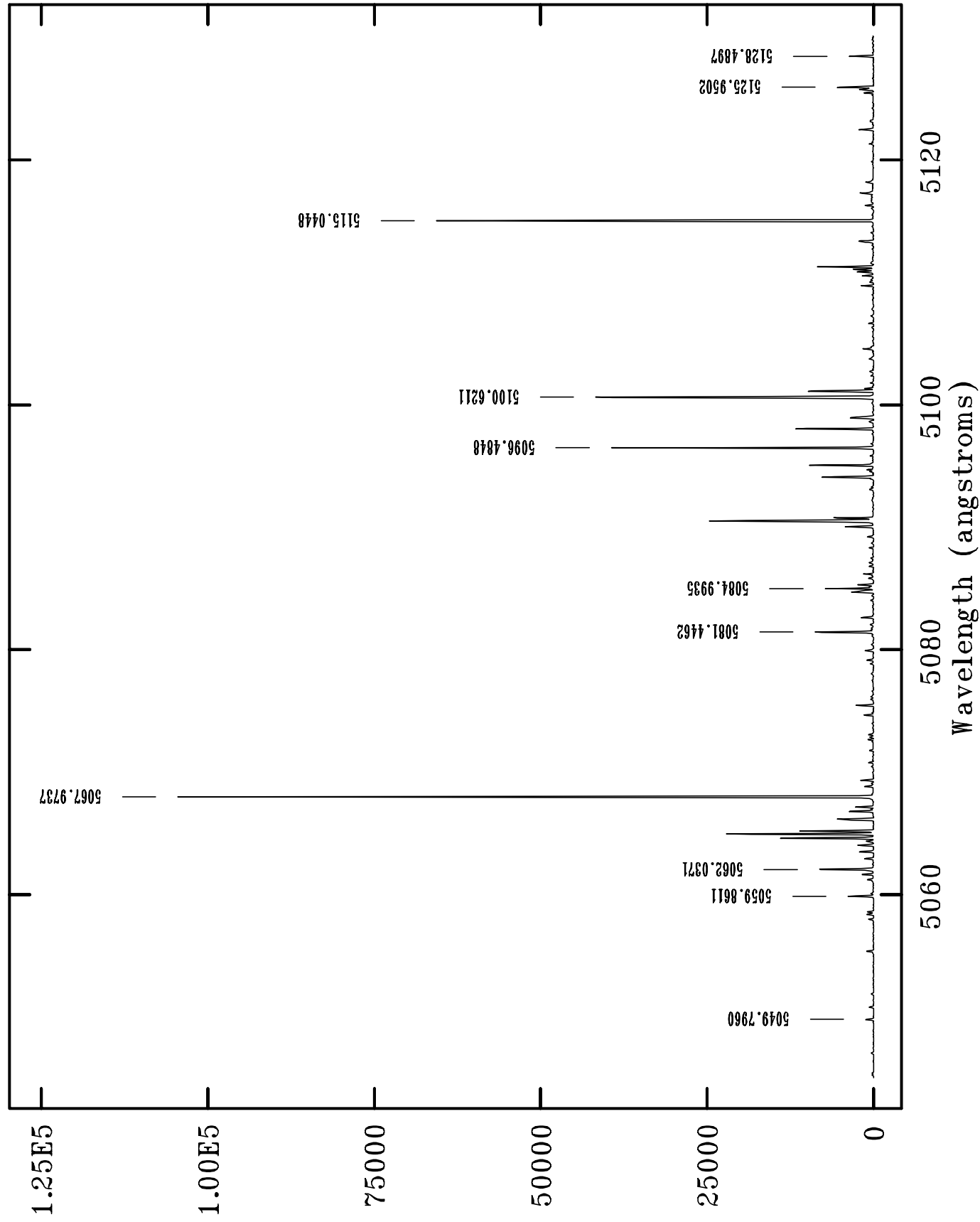


Order 120 - Red

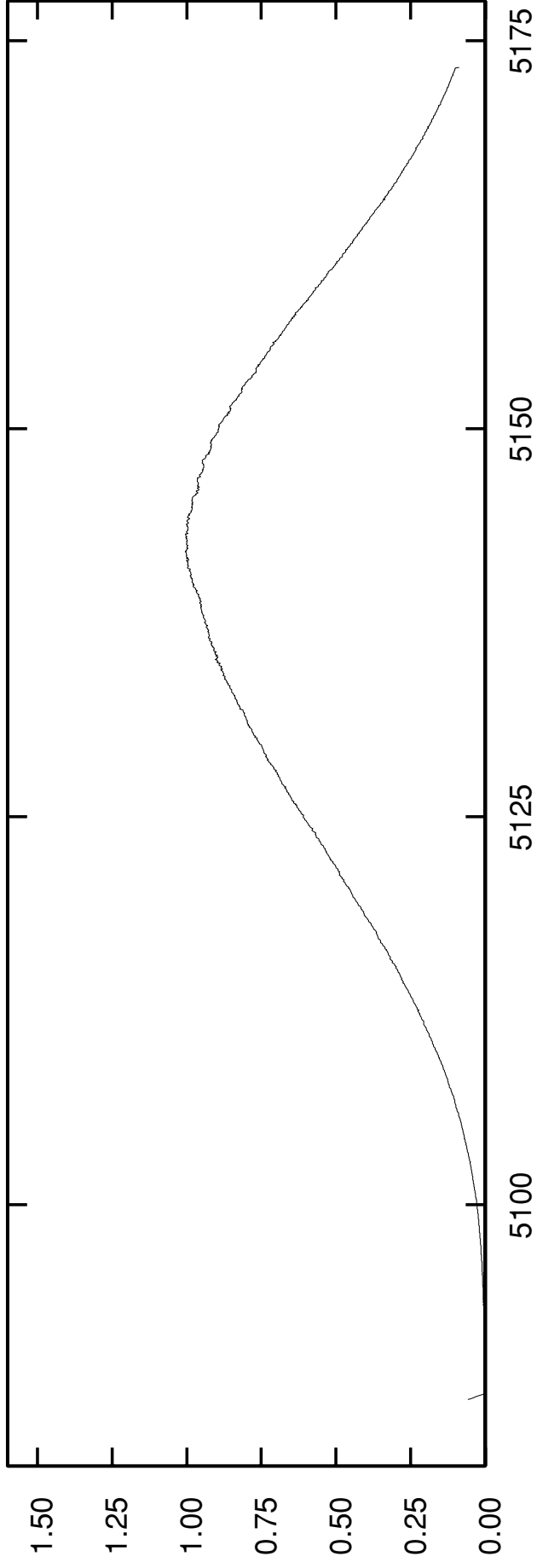


Wavelength (Angstroms)

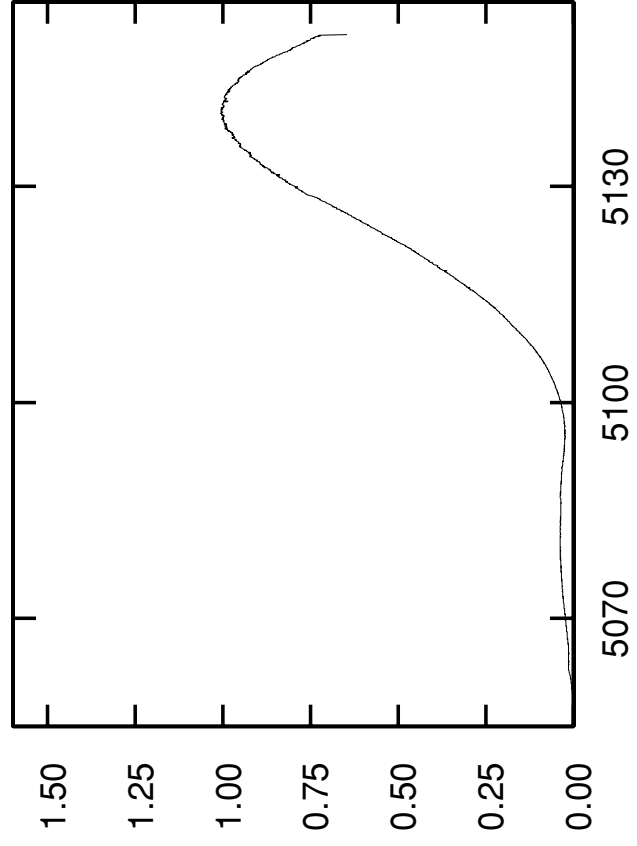
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:45:03 30-Mar-2002
Aperture 17, Image line 17, Order 120
ecidentify thar_316g5936_red2: ThAr



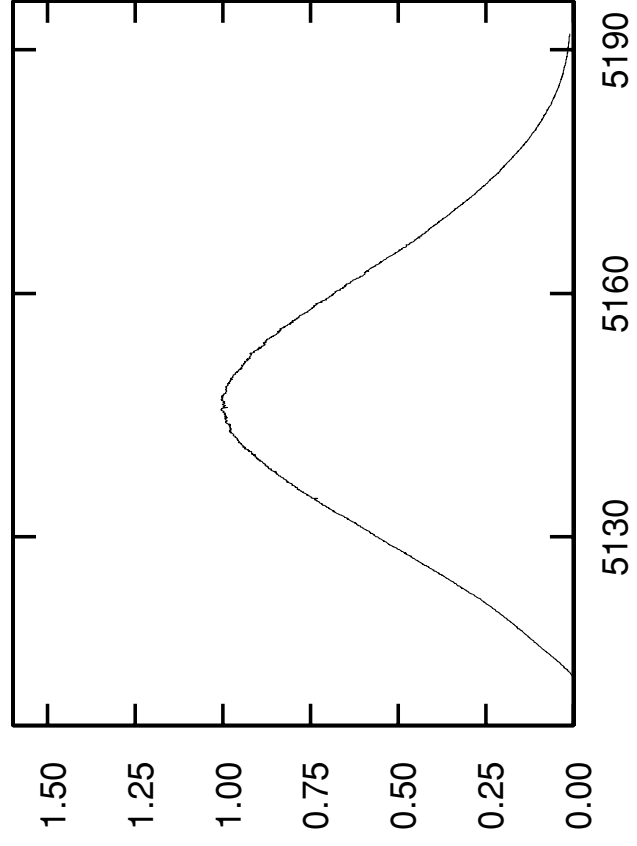
Order 119 - Central



Order 119 - Blue

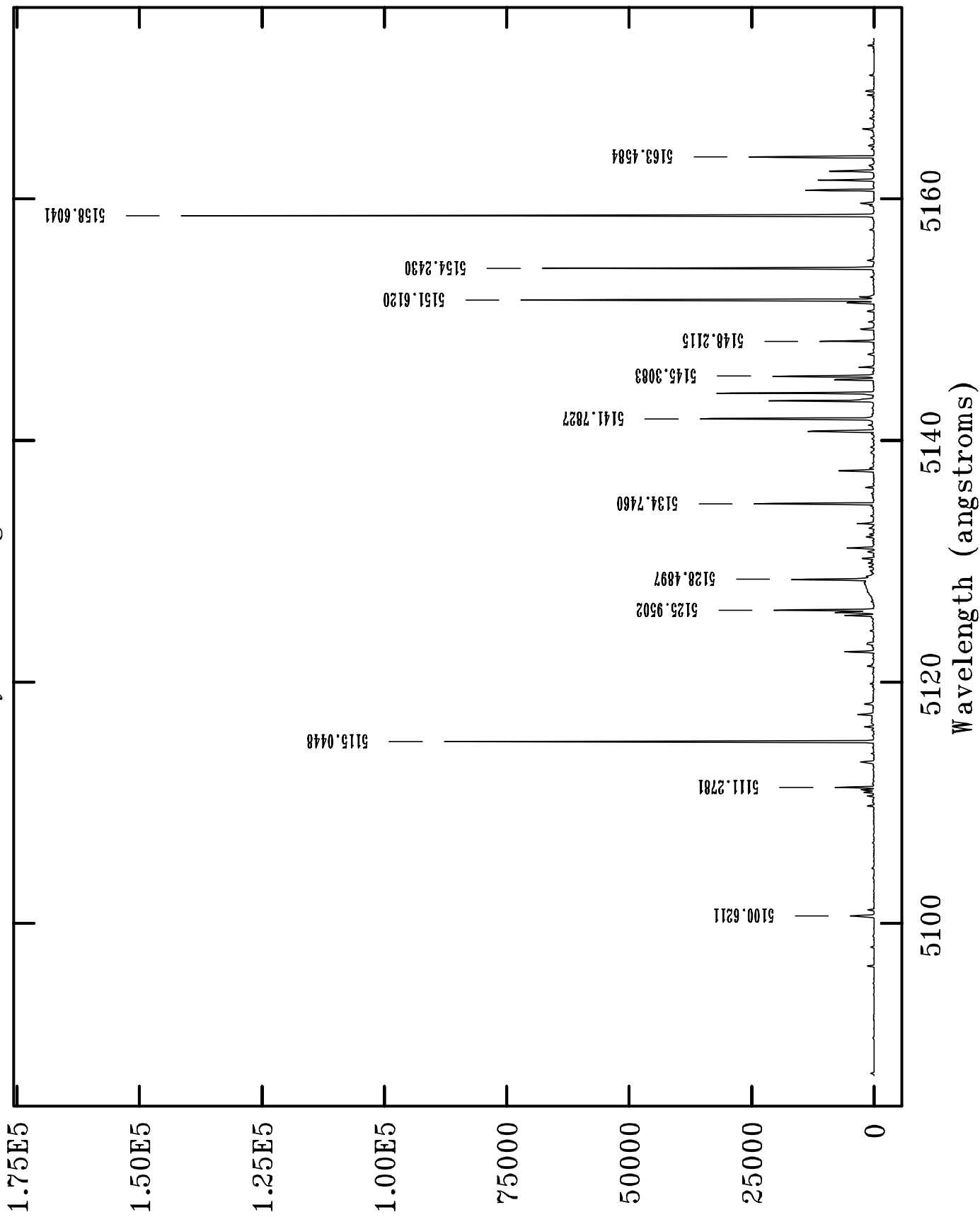


Order 119 - Red

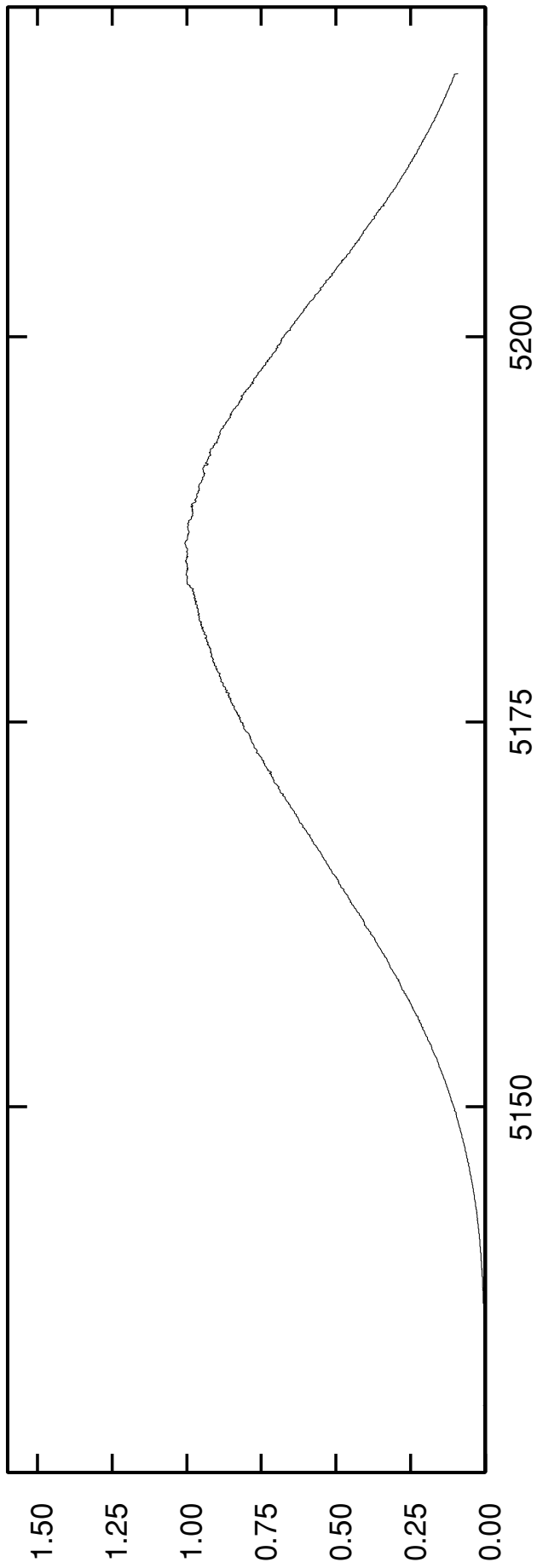


Wavelength (Angstroms)

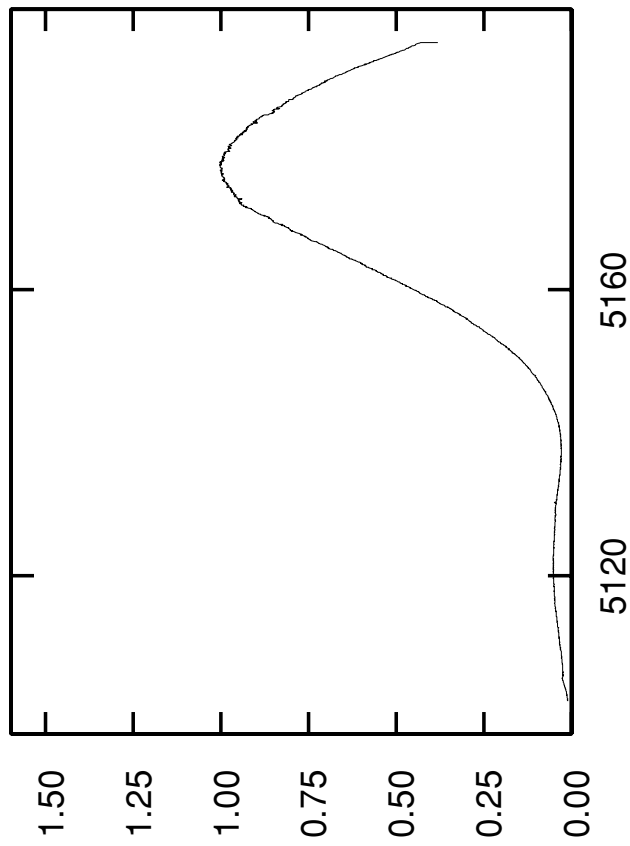
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:44:32 30-Mar-2002
Aperture 16, Image line 16, Order 119
identify thar_316g5936_red2: ThAr



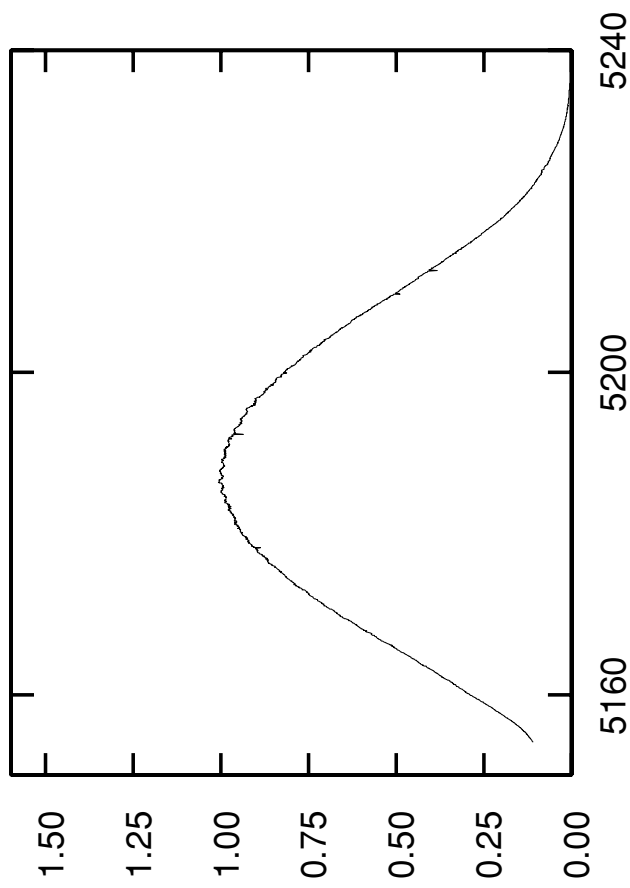
Order 118 - Central



Order 118 - Blue

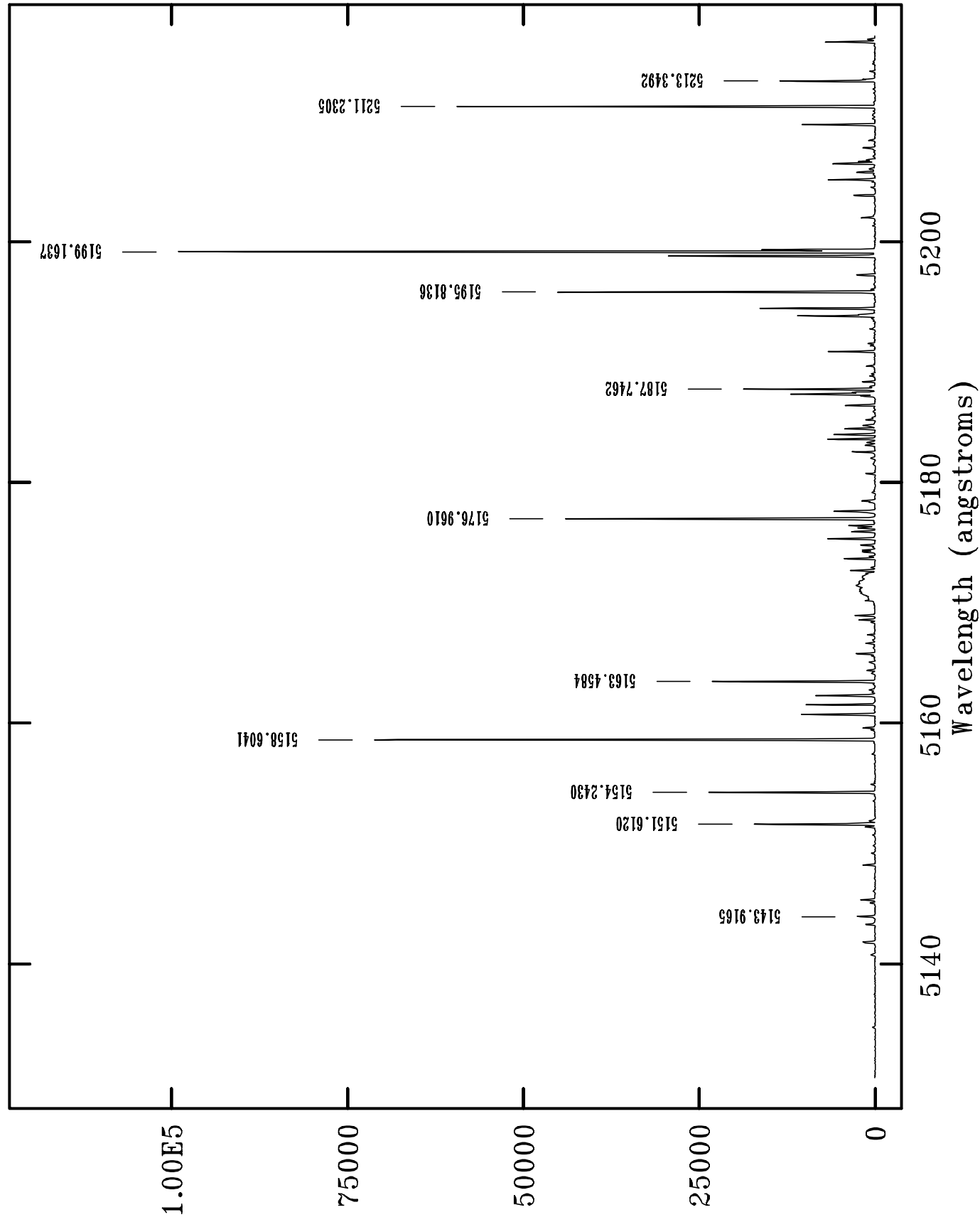


Order 118 - Red

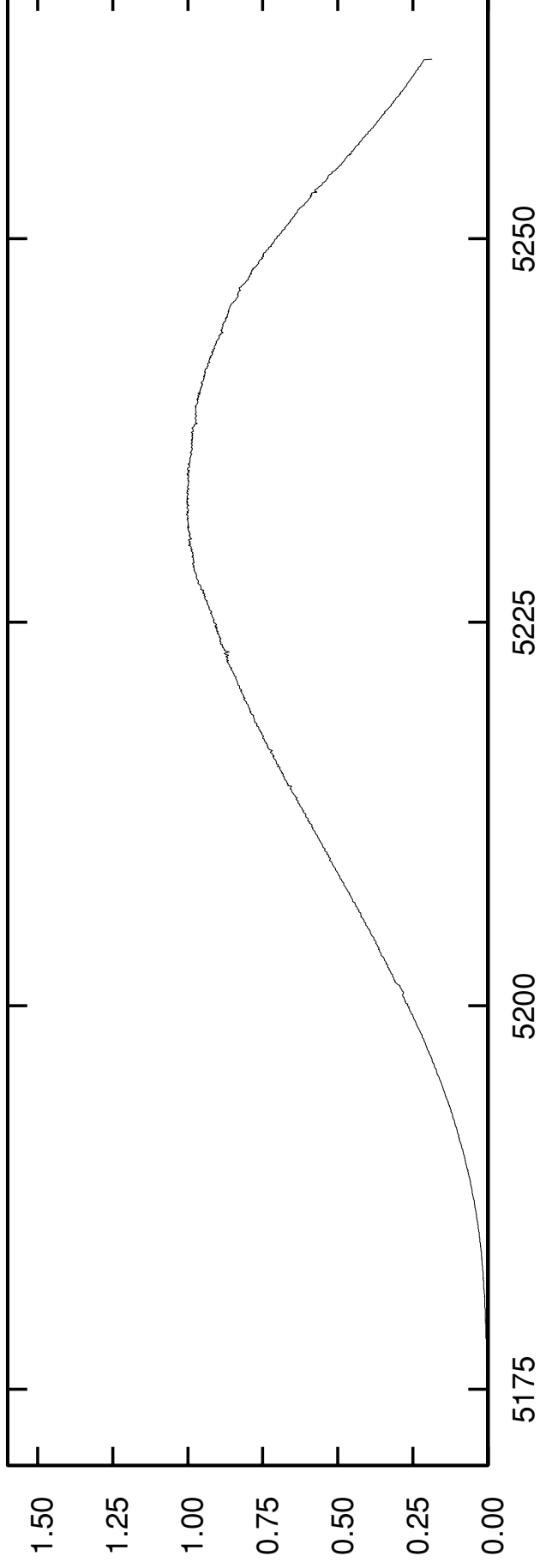


Wavelength (Angstroms)

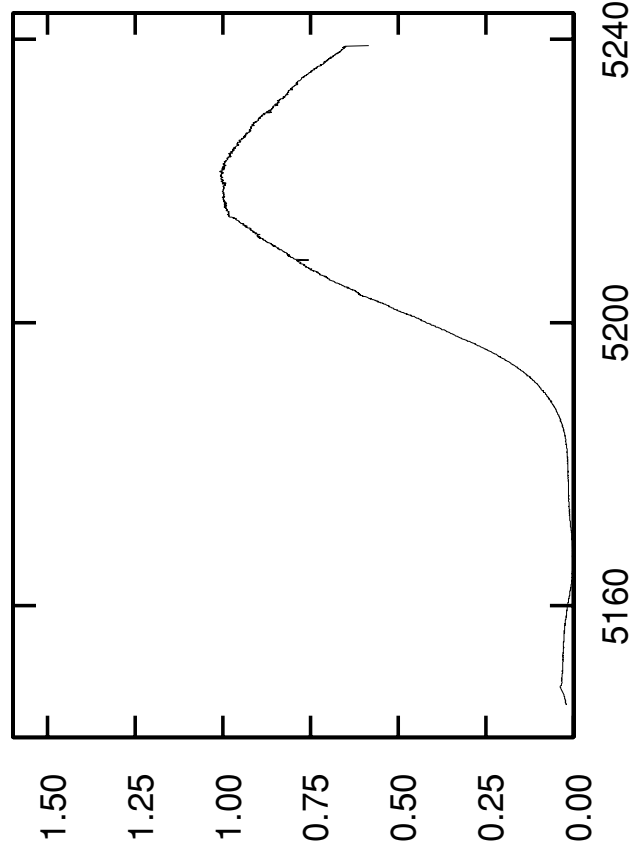
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:43:59 30-Mar-2002
Aperture 15, Image line 15, Order 118
ecidentify thar_316g5936_red2: ThAr



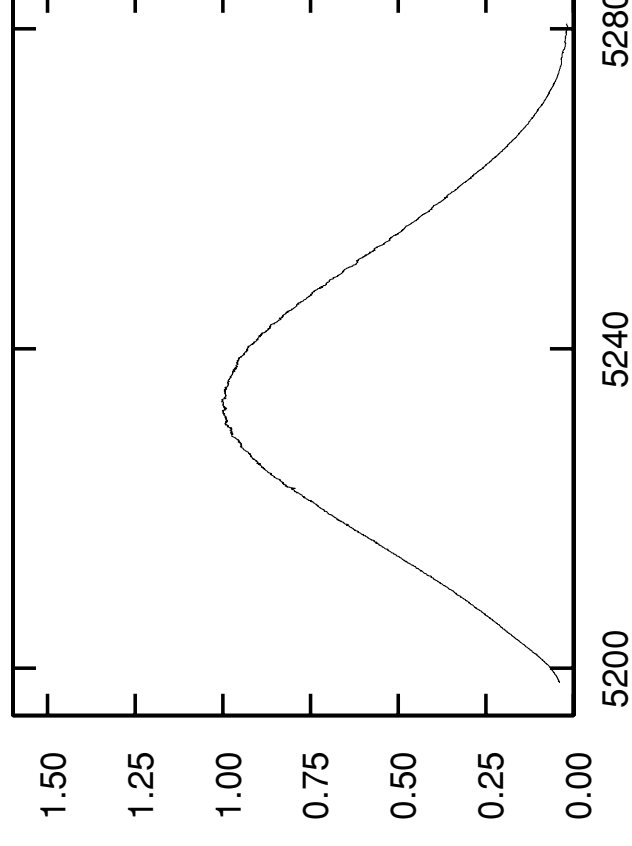
Order 117 - Central



Order 117 - Blue

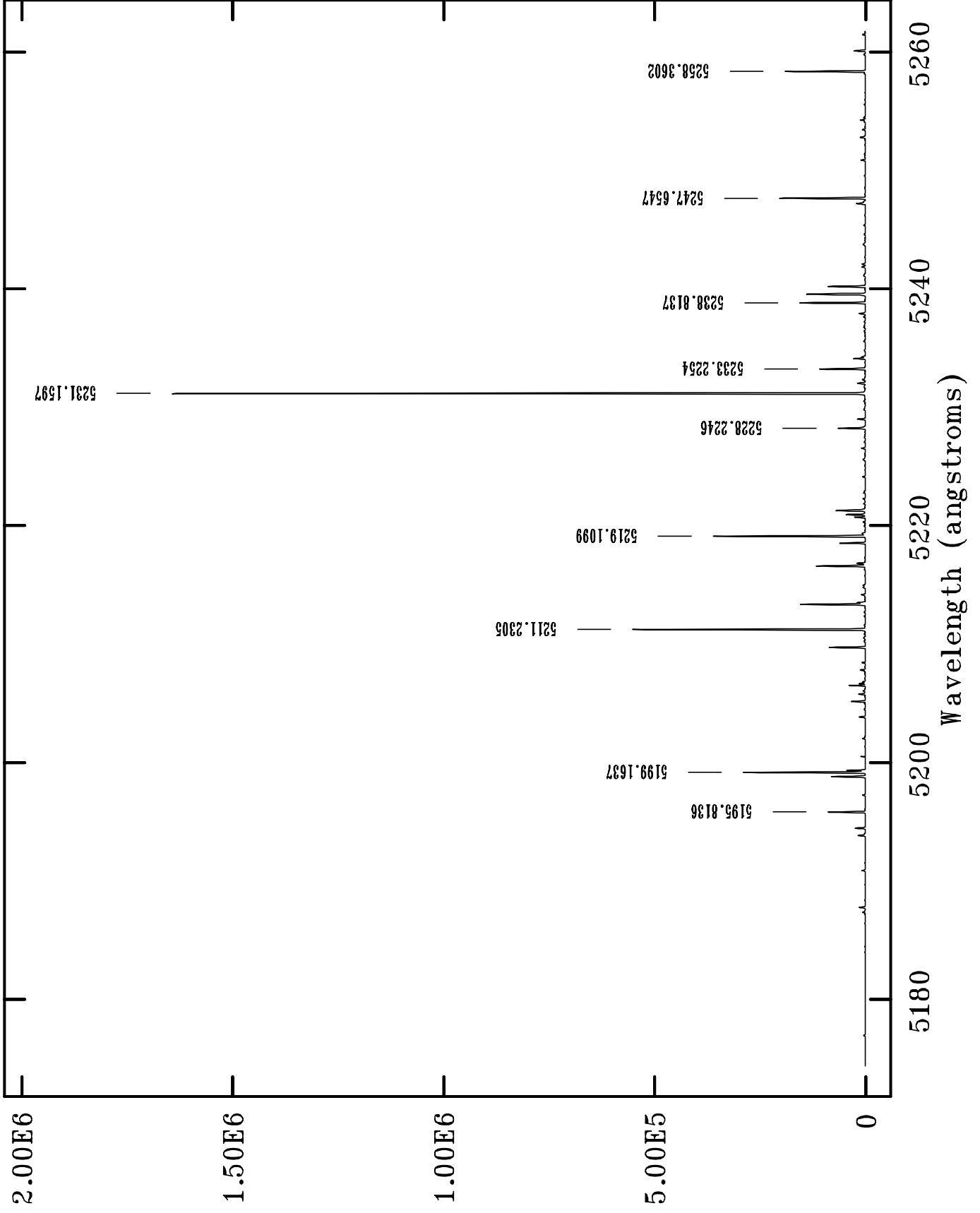


Order 117 - Red

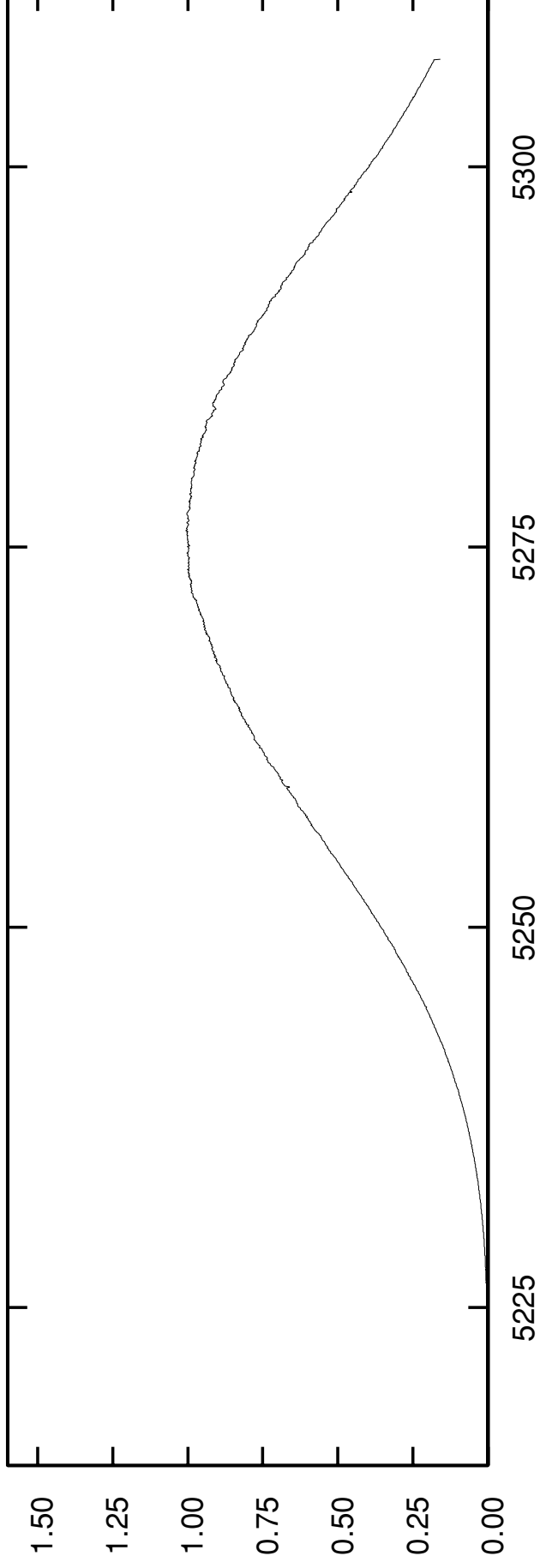


Wavelength (Angstroms)

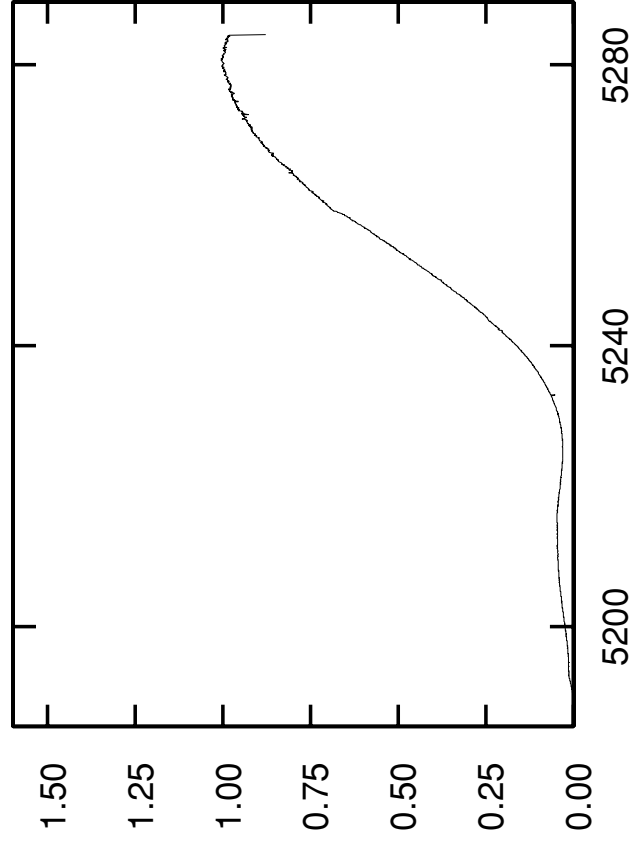
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Thu 02:42:28 06-Feb-2003
Aperture 14, Image line 14, Order 117
ecidentify thar_316g5936_red2: ThAr



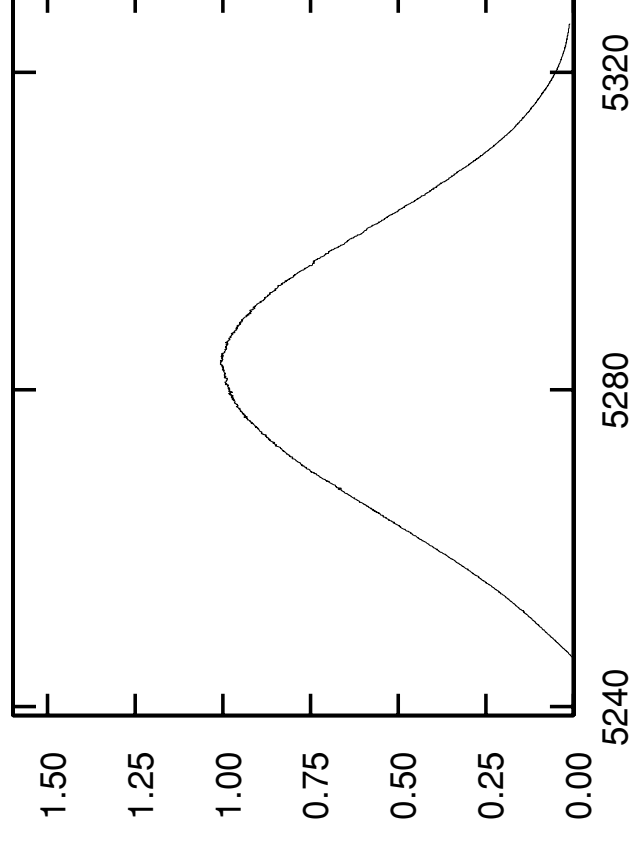
Order 116 - Central



Order 116 - Blue

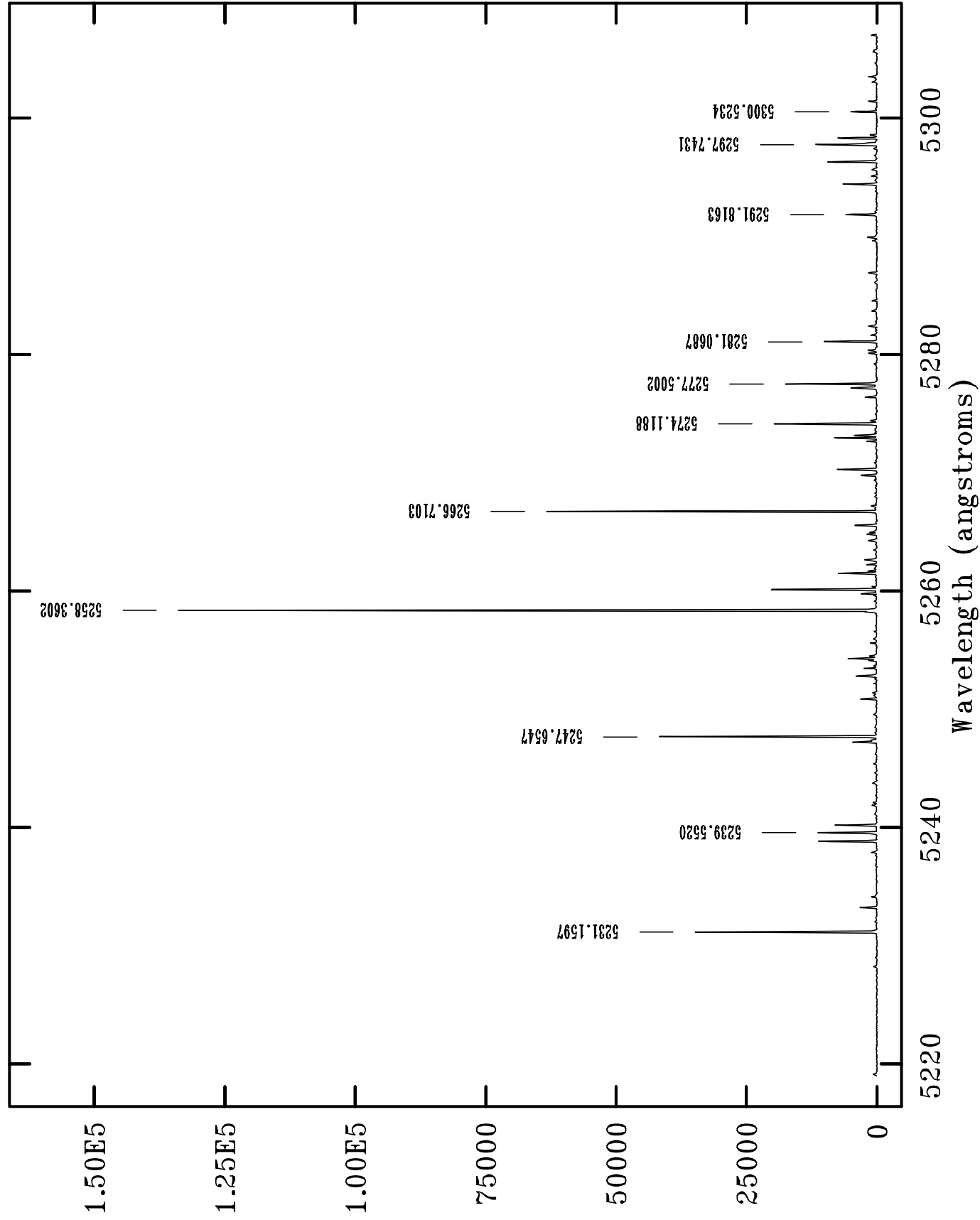


Order 116 - Red

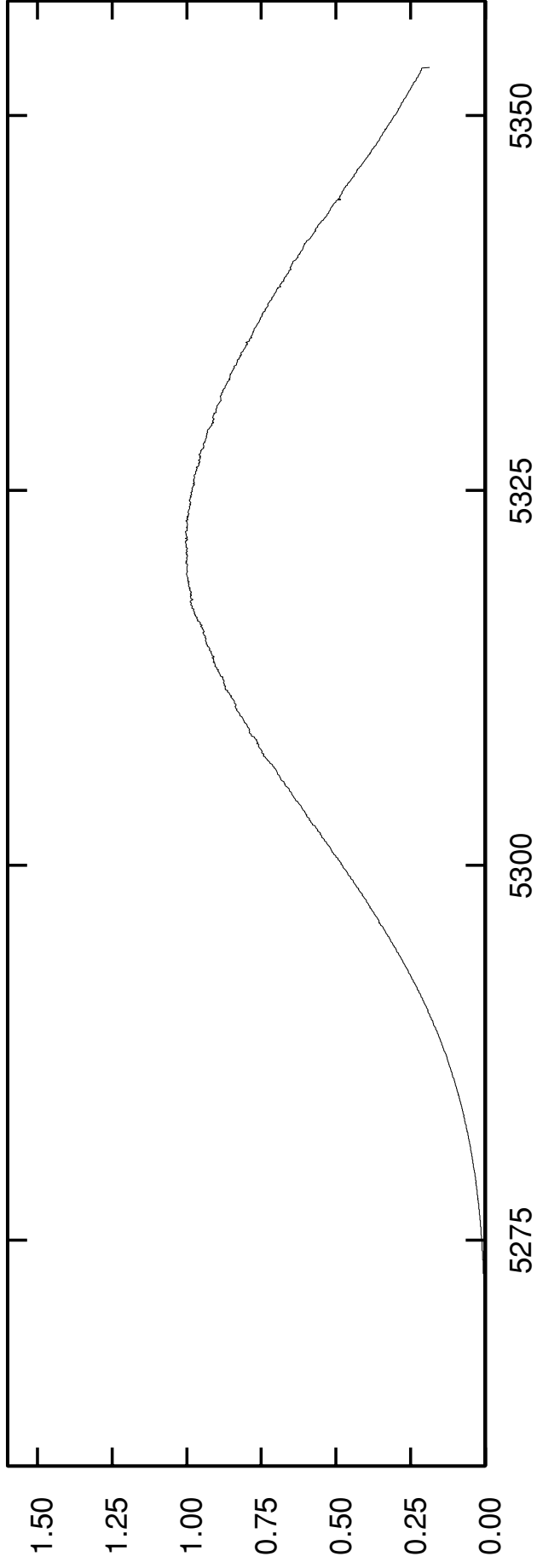


Wavelength (Angstroms)

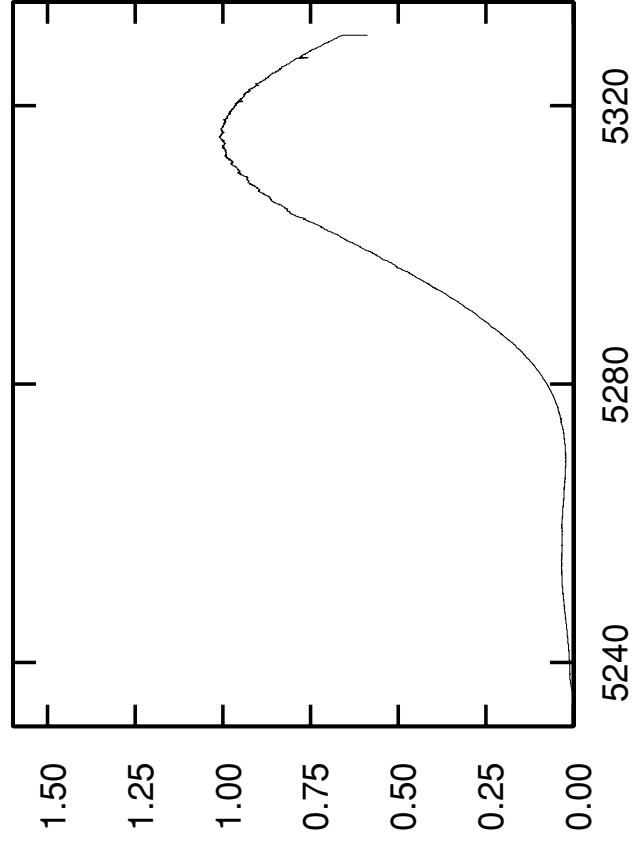
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:42:52 30-Mar-2002
Aperture 13, Image line 13, Order 116
identify thar_316g5936_red2: ThAr



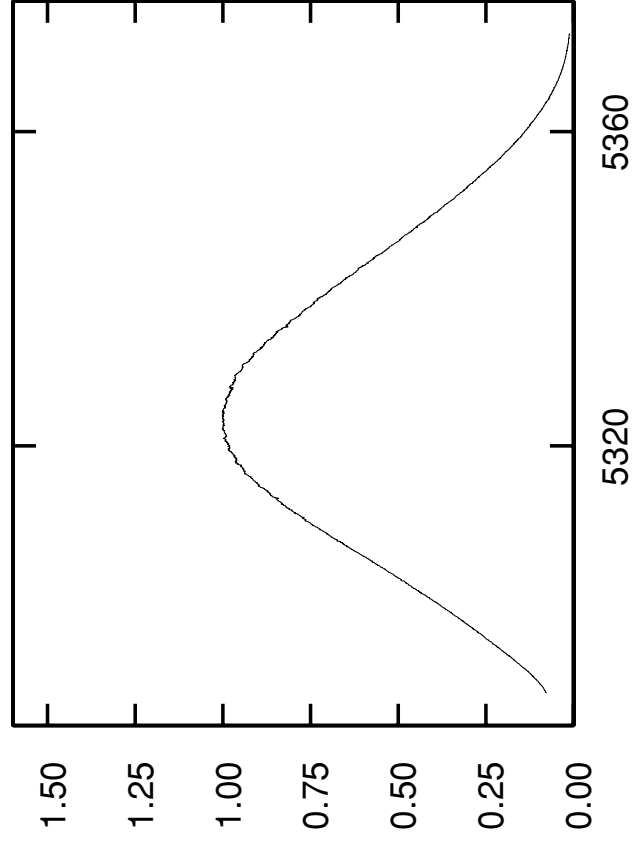
Order 115 - Central



Order 115 - Blue

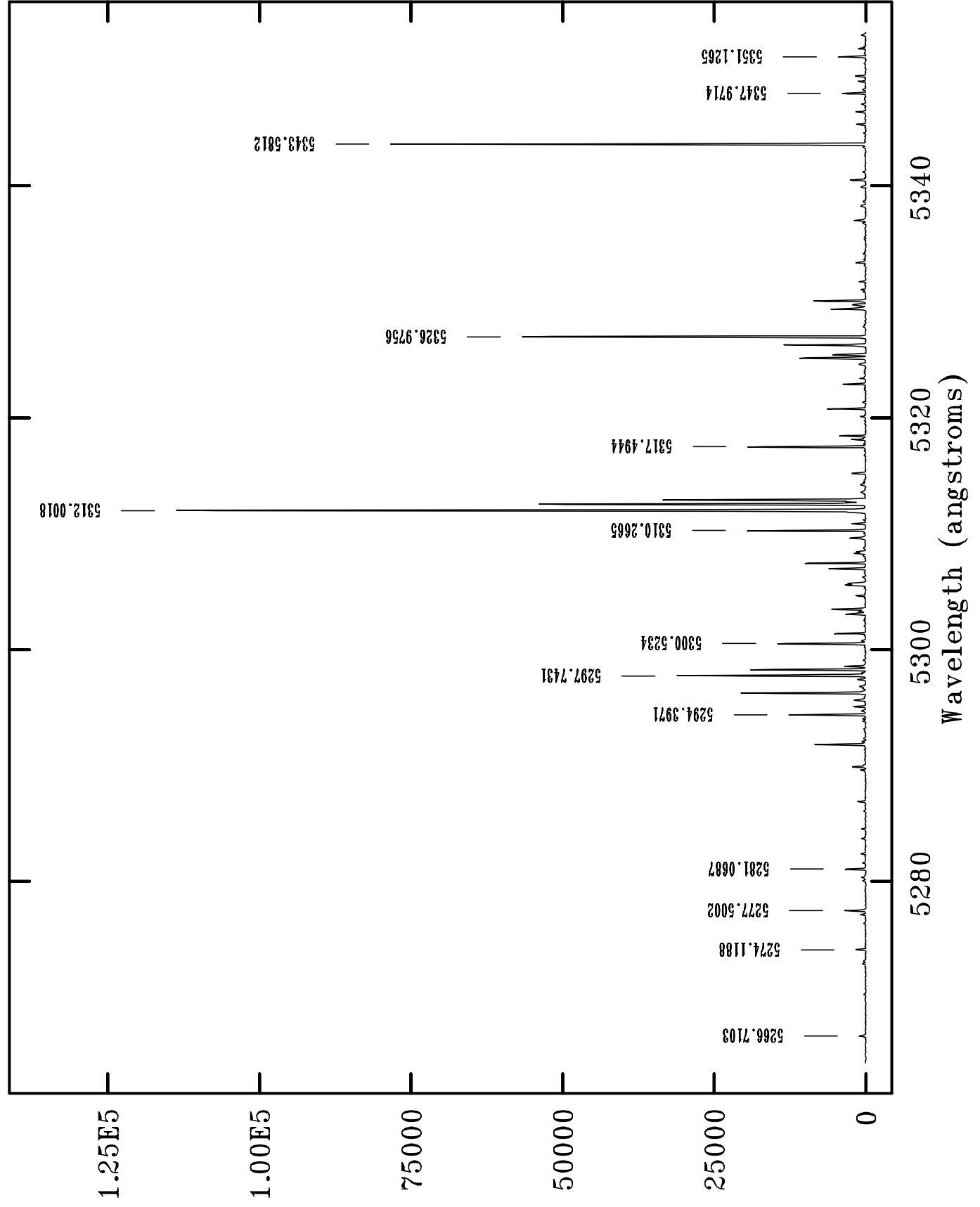


Order 115 - Red

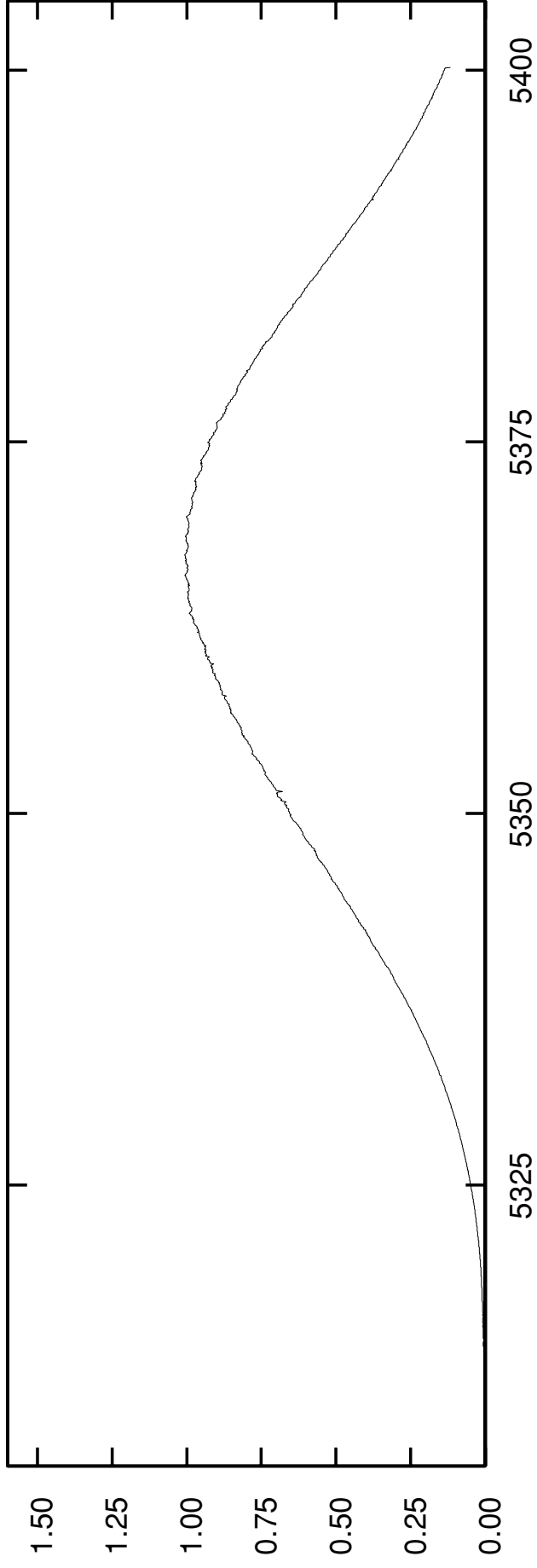


Wavelength (Angstroms)

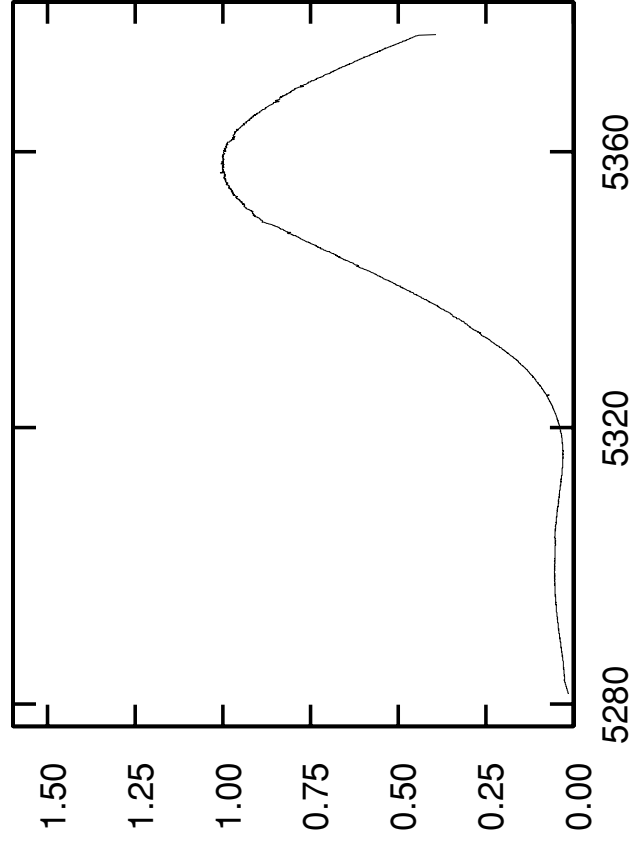
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:42:15 30-Mar-2002
Aperture 12, Image line 12, Order 115
eidentify thar_316g5936_red2: ThAr



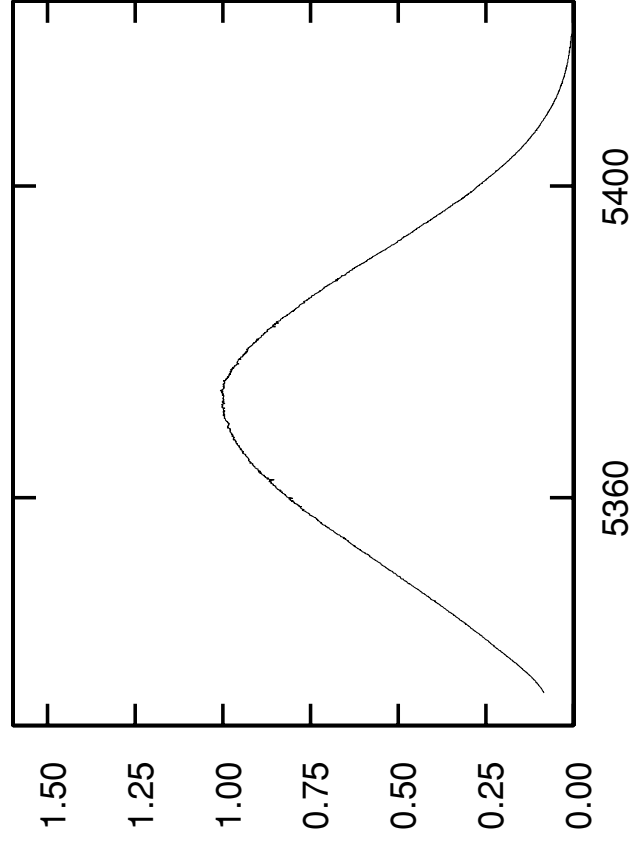
Order 114 - Central



Order 114 - Blue

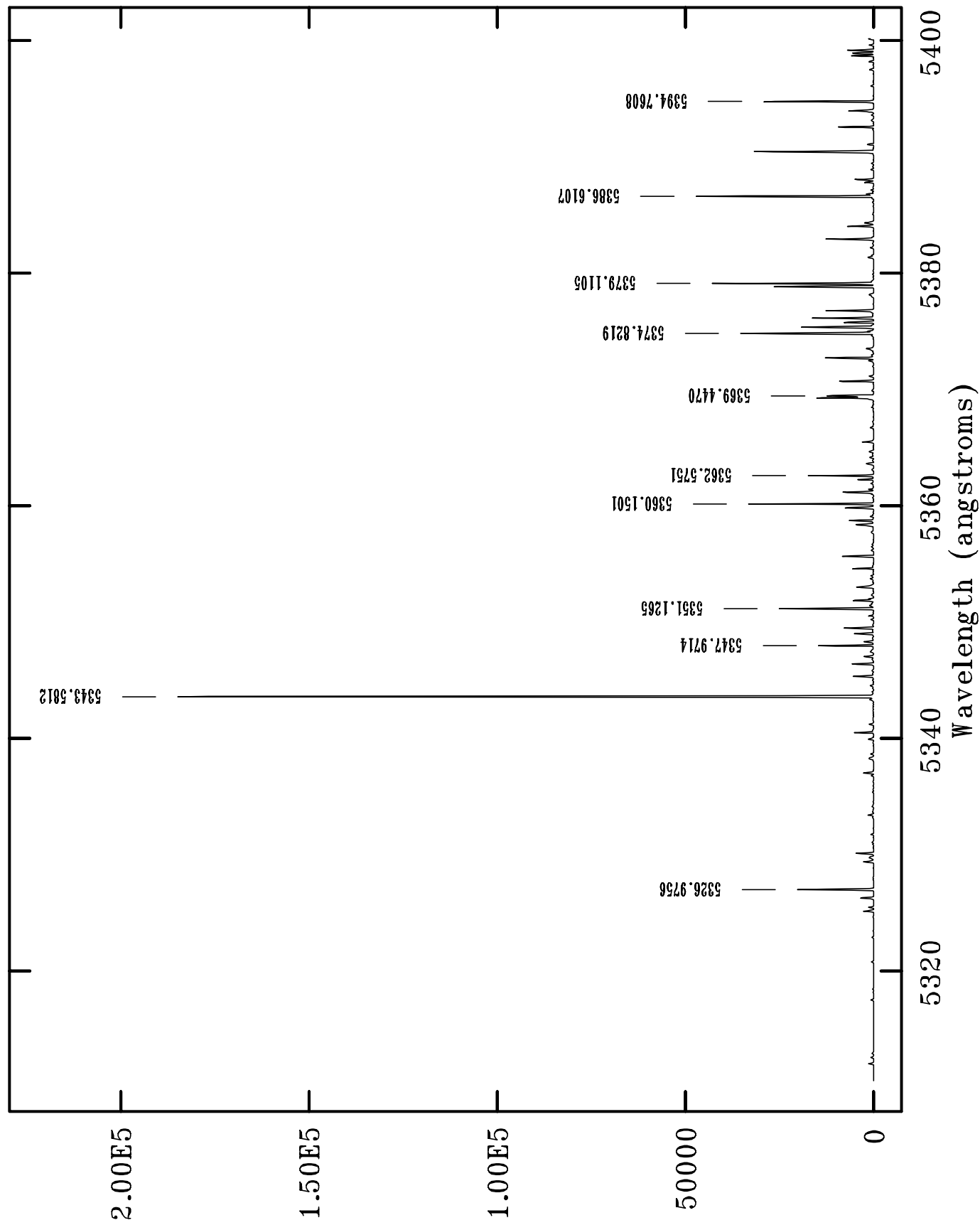


Order 114 - Red

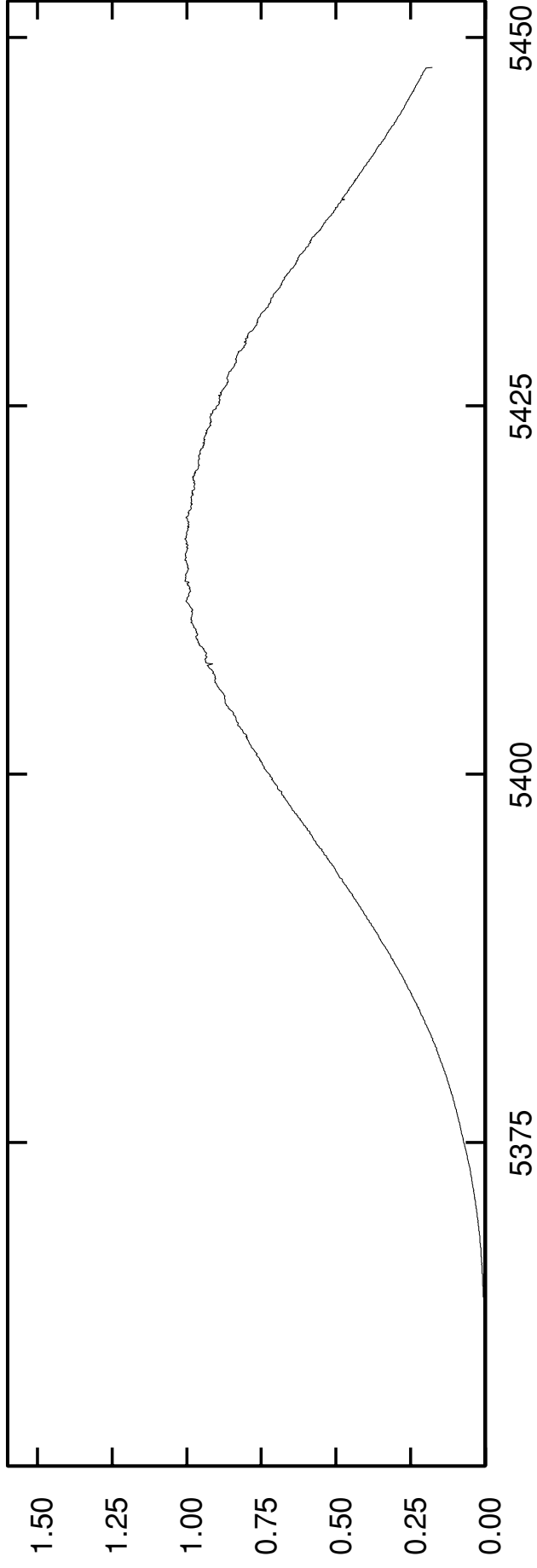


Wavelength (Angstroms)

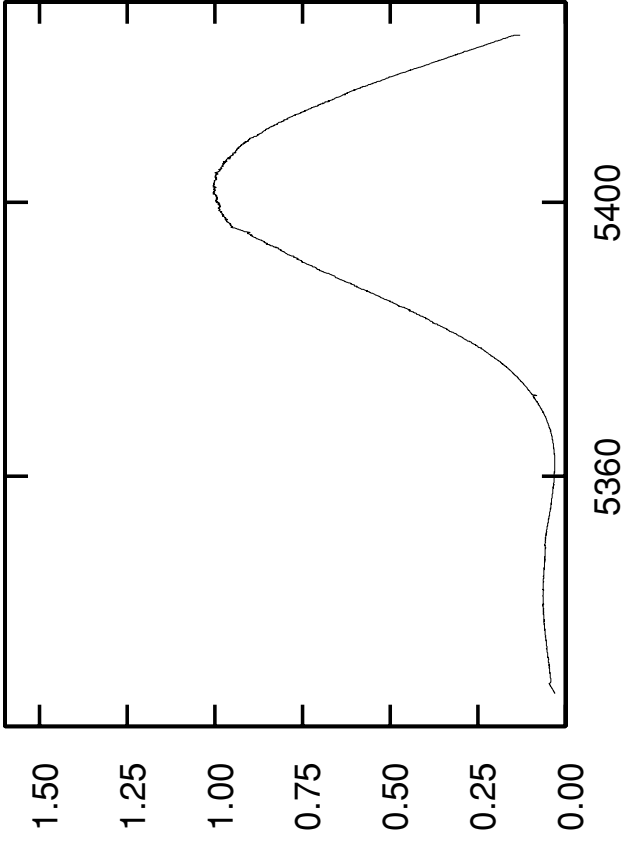
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:41:31 30-Mar-2002
Aperture 11, Image line 11, Order 114
identify thar_316g5936_red2: ThAr



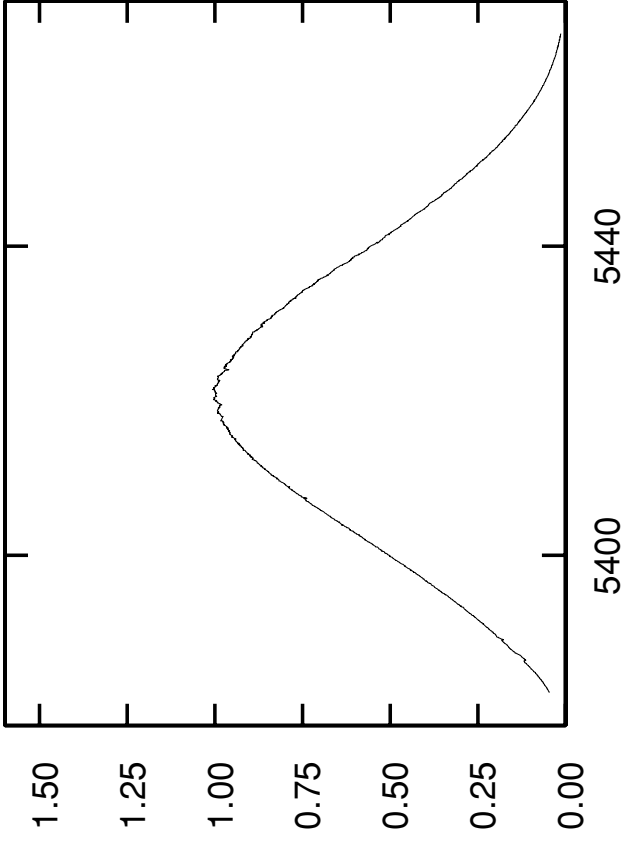
Order 113 - Central



Order 113 - Blue

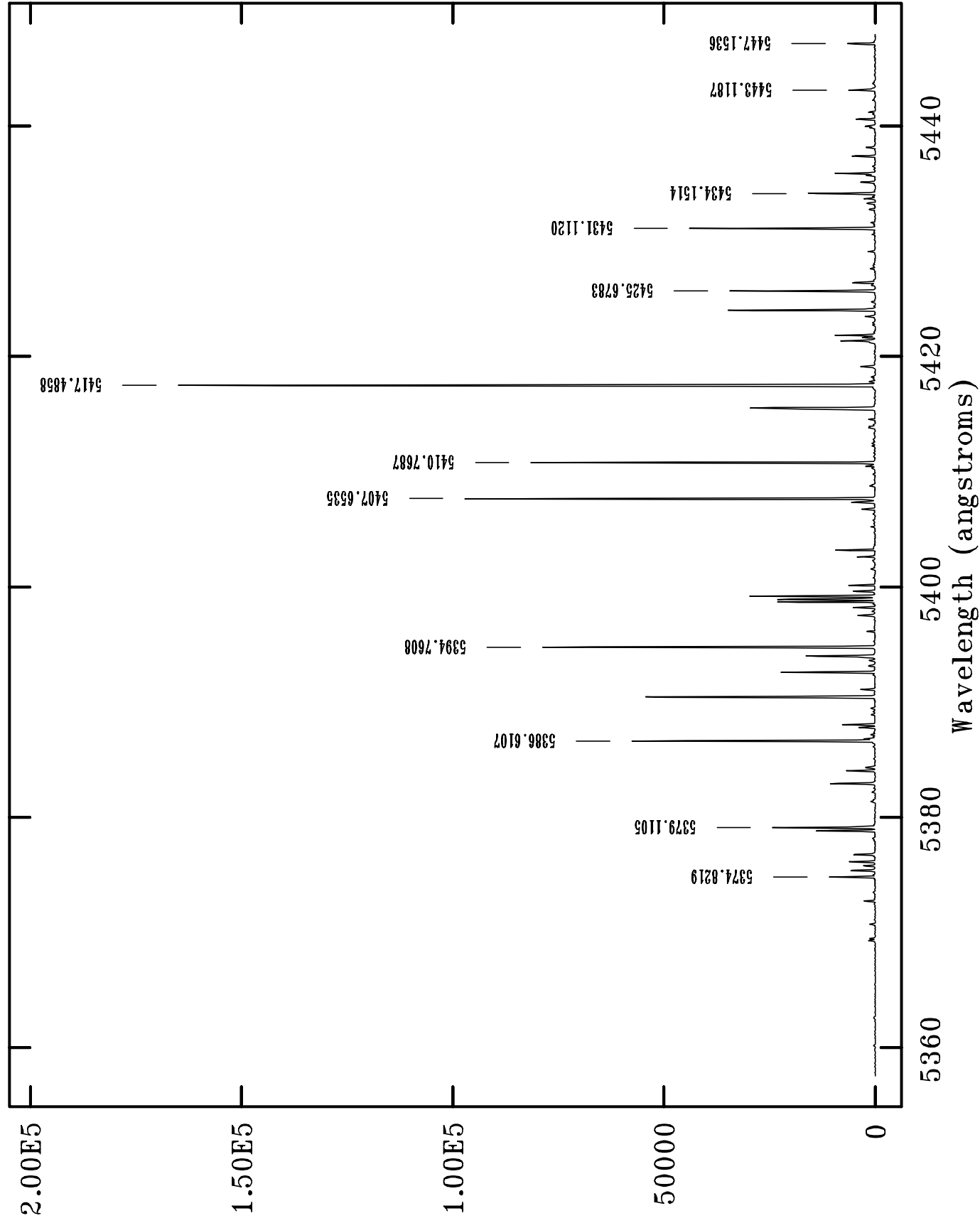


Order 113 - Red

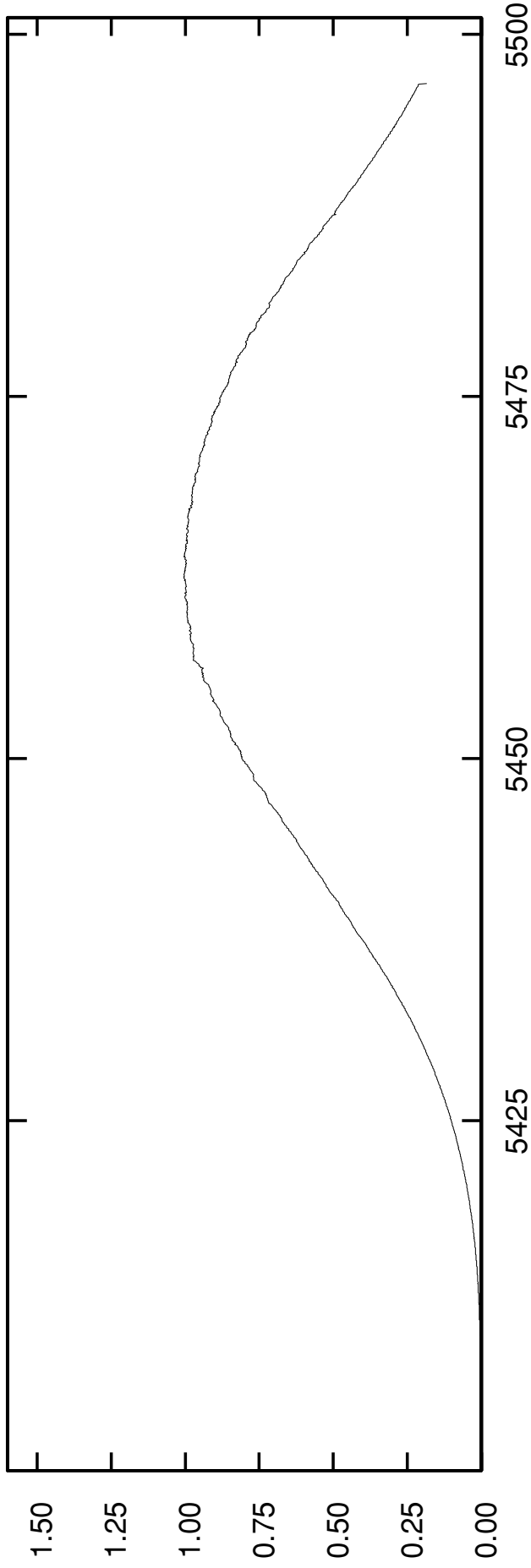


Wavelength (Angstroms)

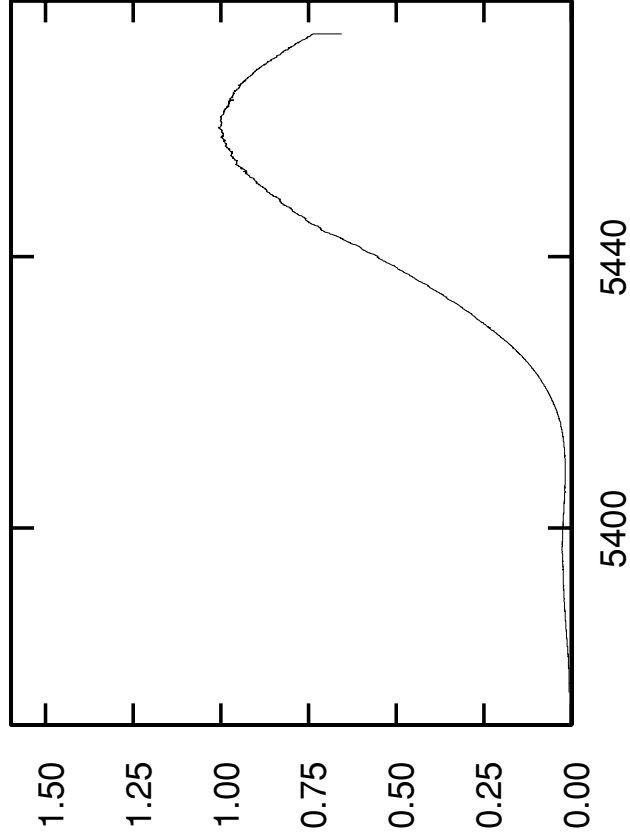
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:40:50 30-Mar-2002
Aperture 10, Image line 10, Order 113
eidentify thar_316g5936_red2: ThAr



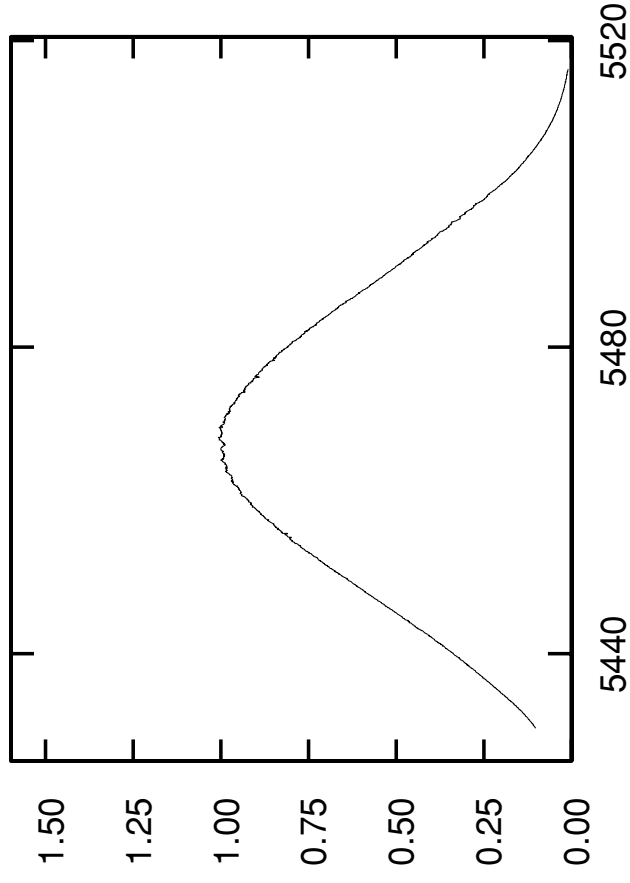
Order 112 - Central



Order 112 - Blue

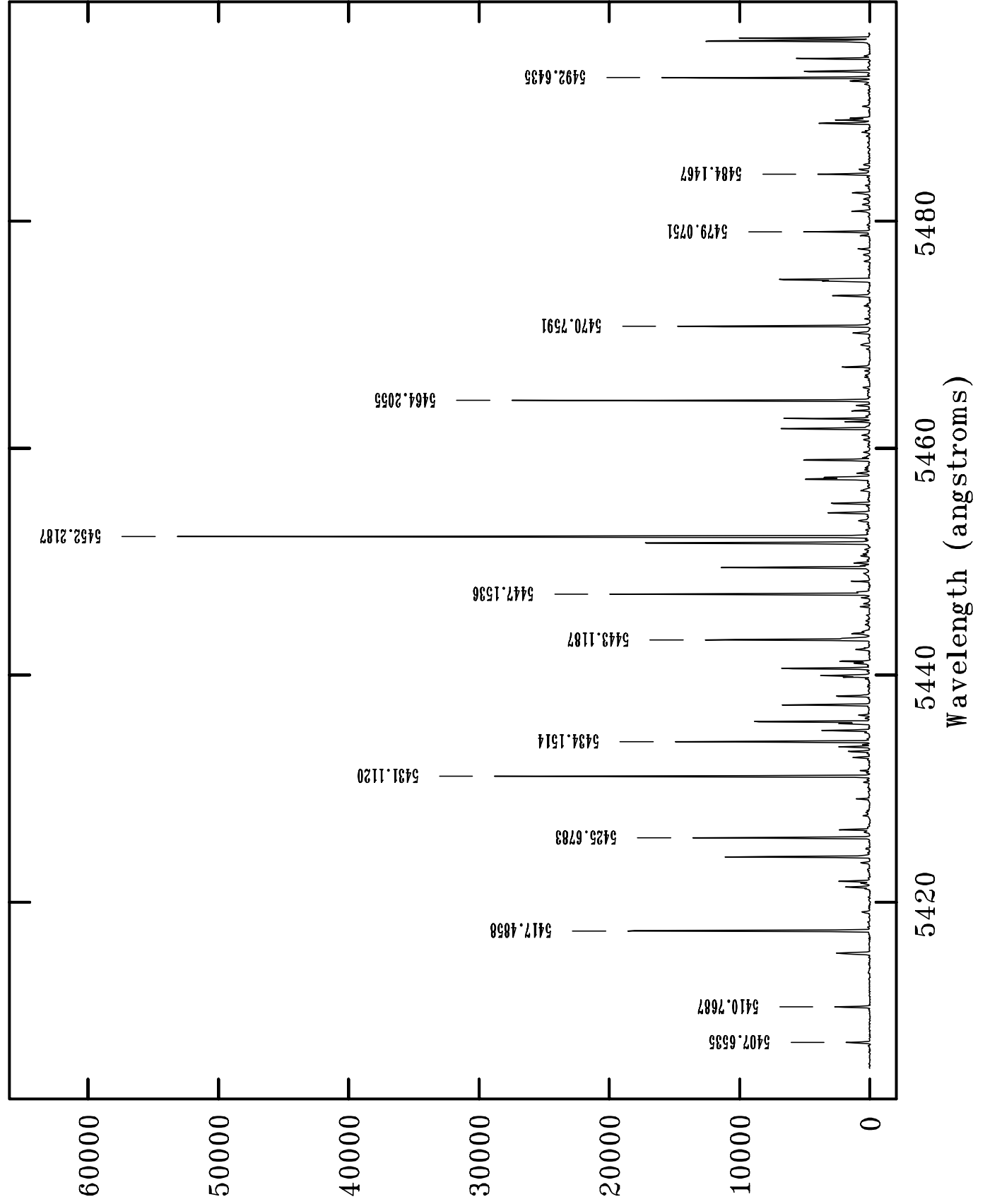


Order 112 - Red

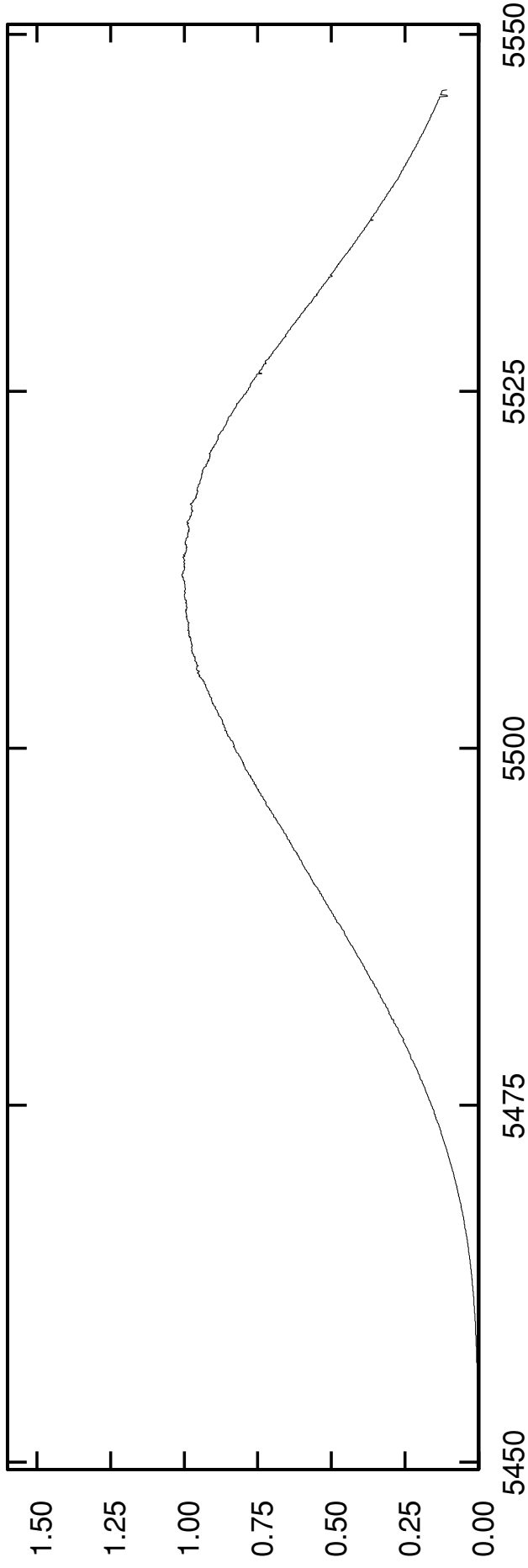


Wavelength (Angstroms)

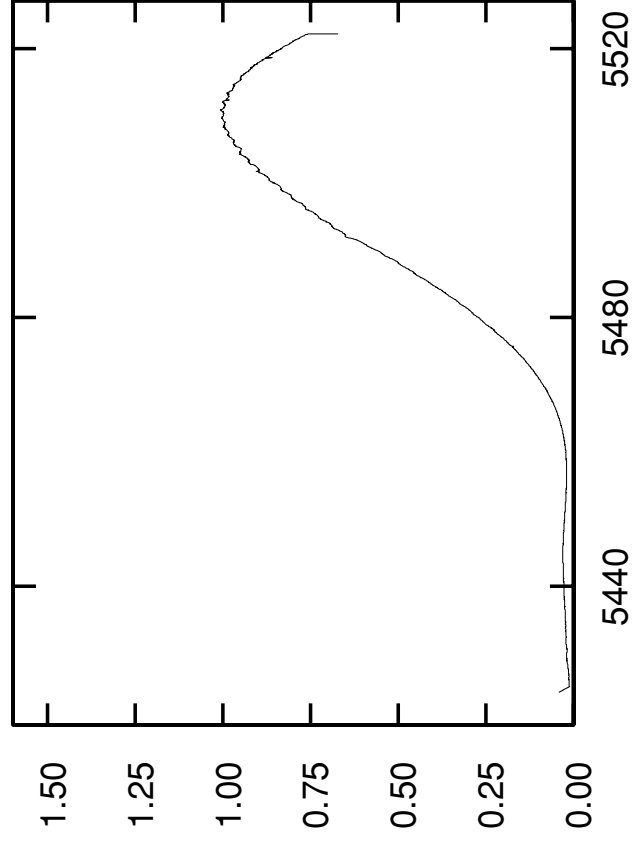
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:39:31 30-Mar-2002
Aperture 9, Image line 9, Order 112
ecidentify thar_316g5936_red2: ThAr



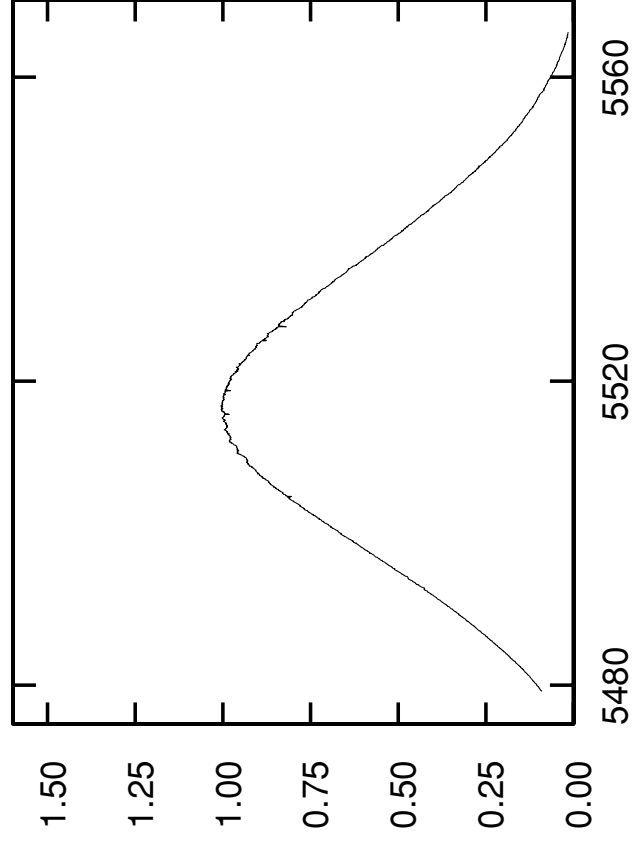
Order 111 - Central



Order 111 - Blue

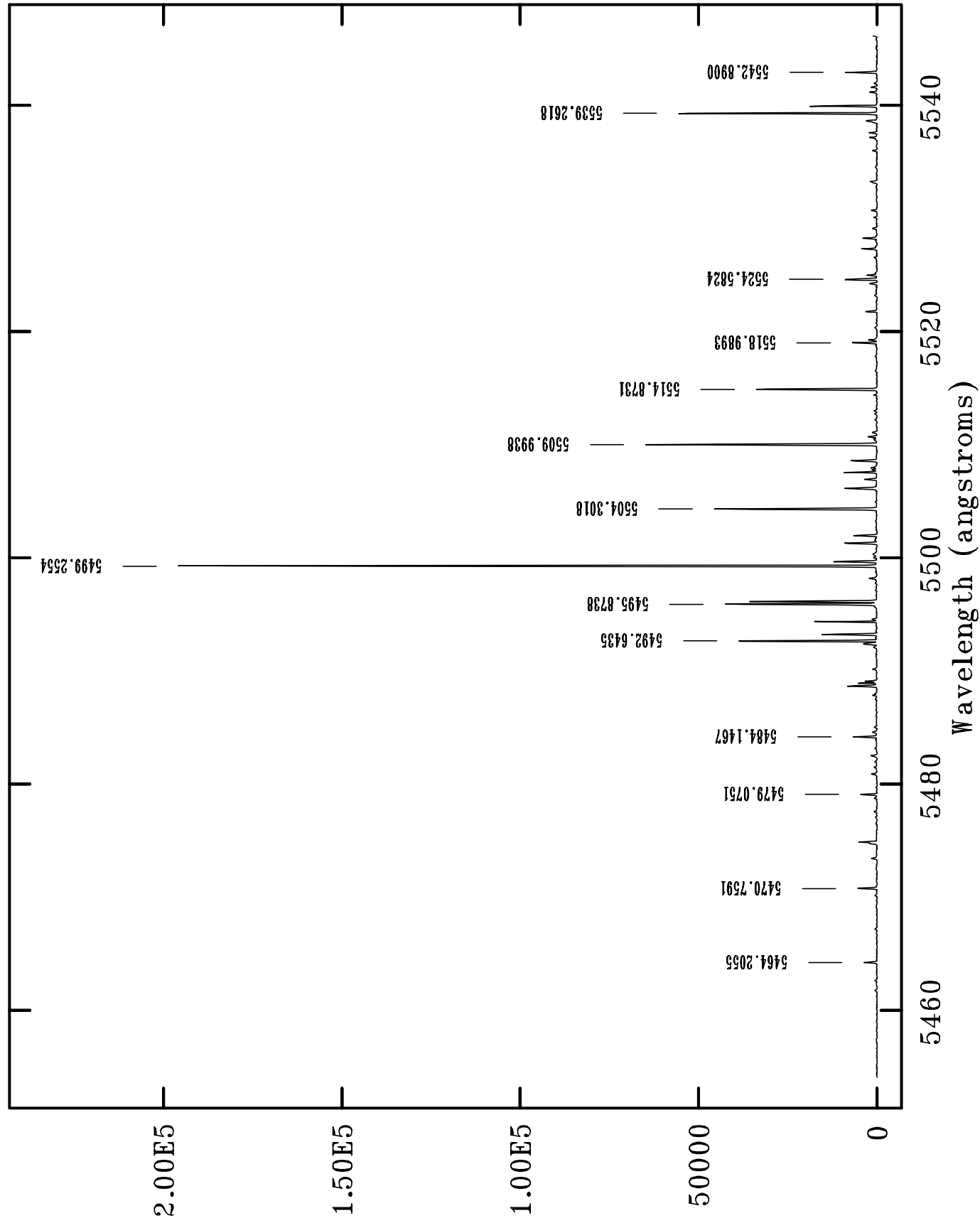


Order 111 - Red

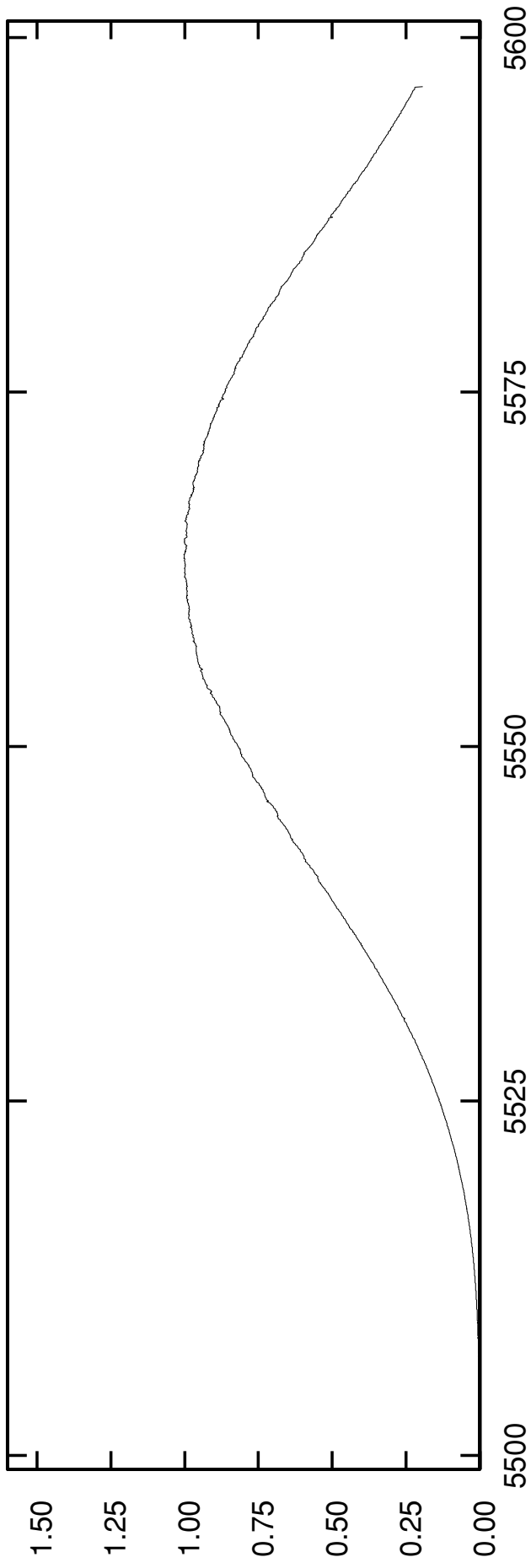


Wavelength (Angstroms)

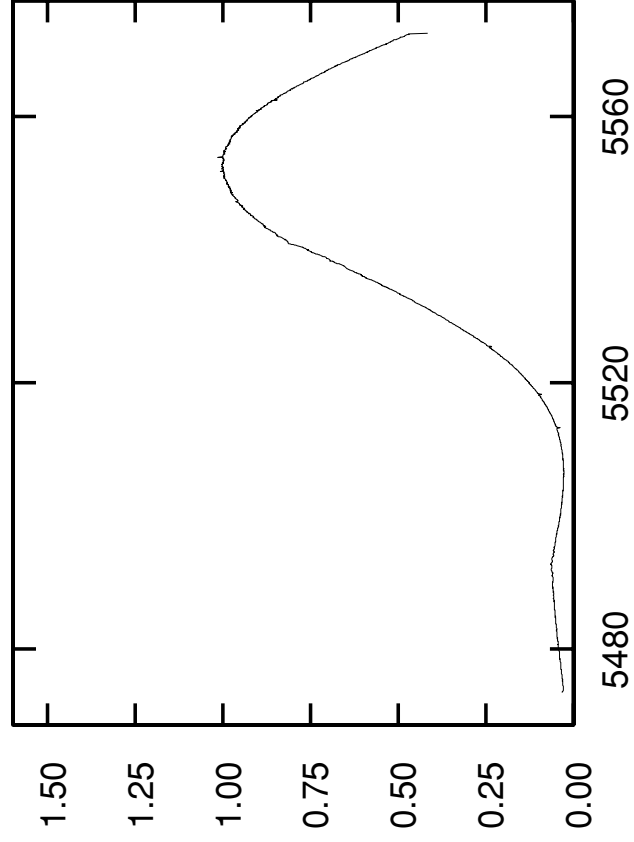
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:38:43 30-Mar-2002
Aperture 8, Image line 8, Order 111
ecidentify thar_316g5936_red2: ThAr



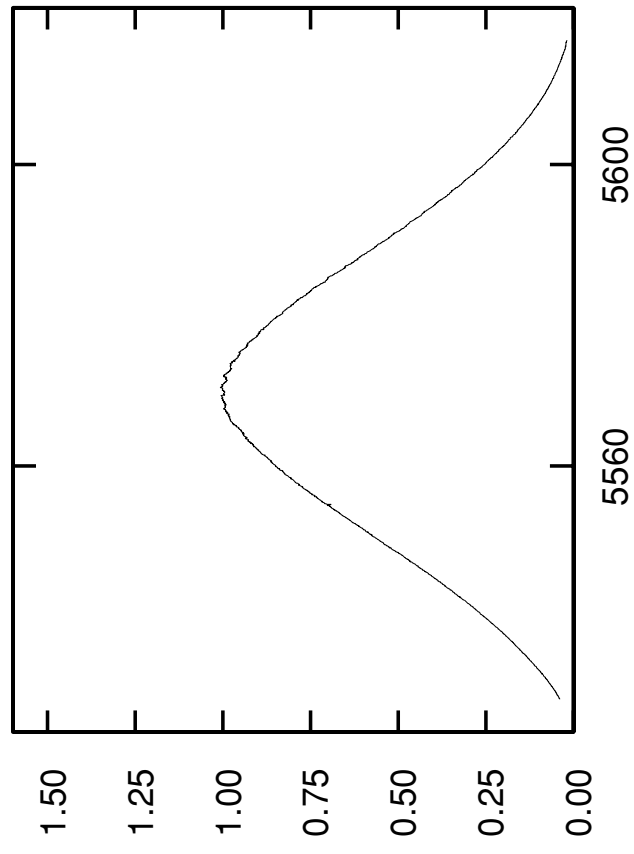
Order 110 - Central



Order 110 - Blue

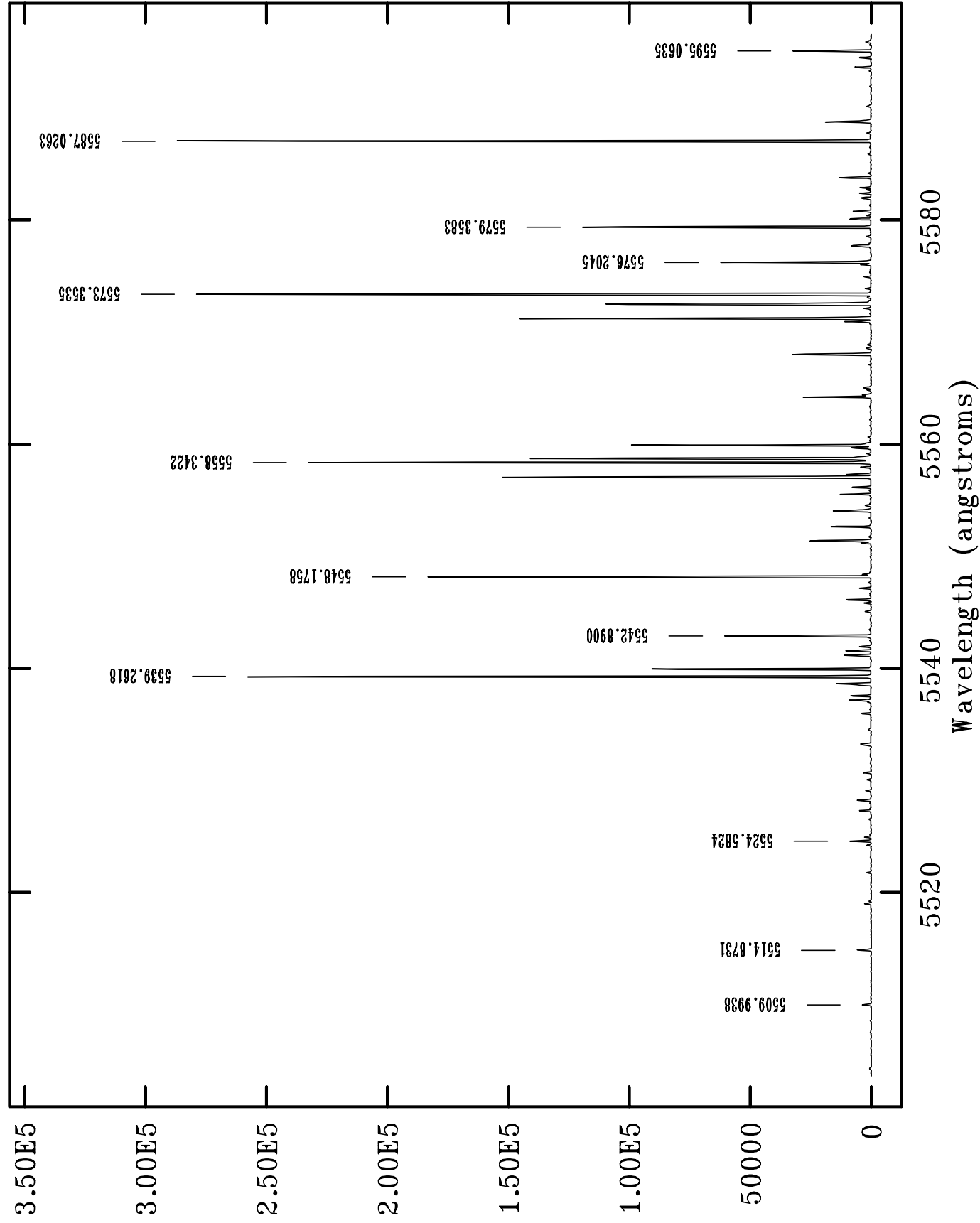


Order 110 - Red

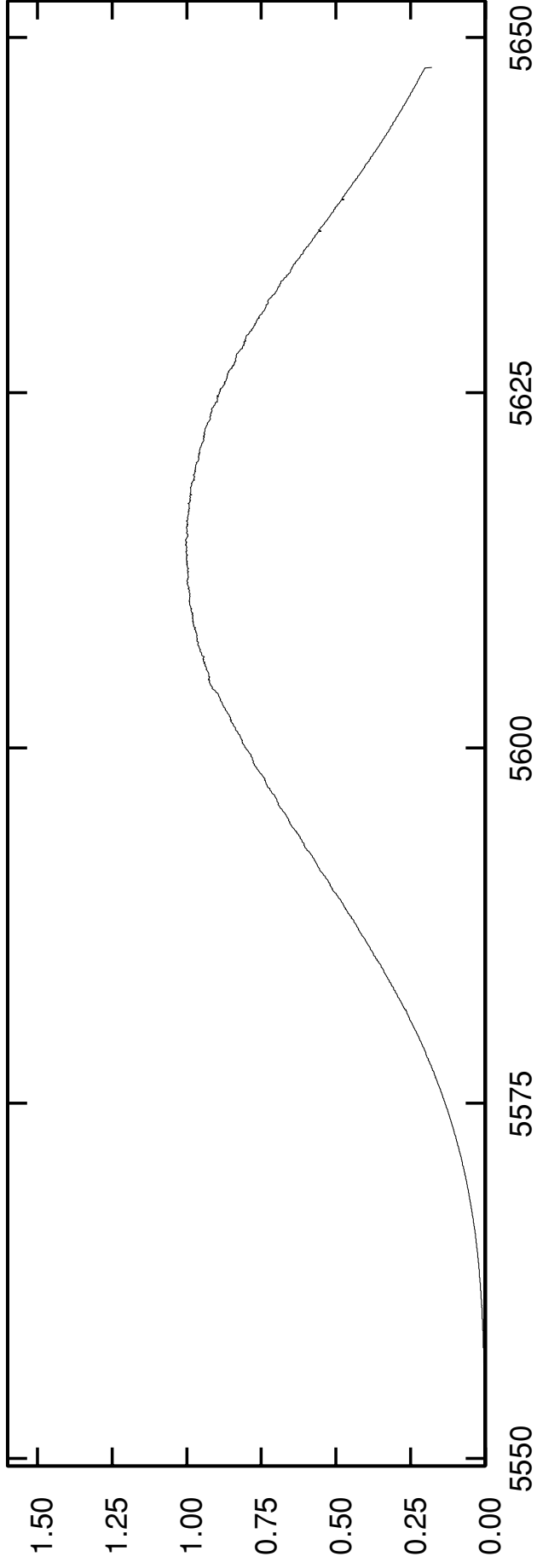


Wavelength (Angstroms)

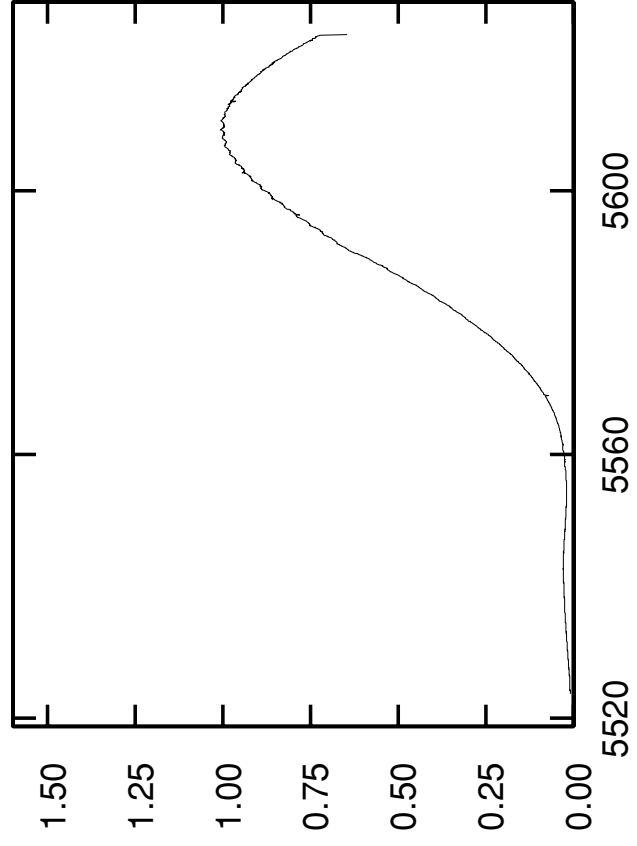
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:38:05 30-Mar-2002
Aperture 7, Image line 7, Order 110
eidentify thar_316g5936_red2: ThAr



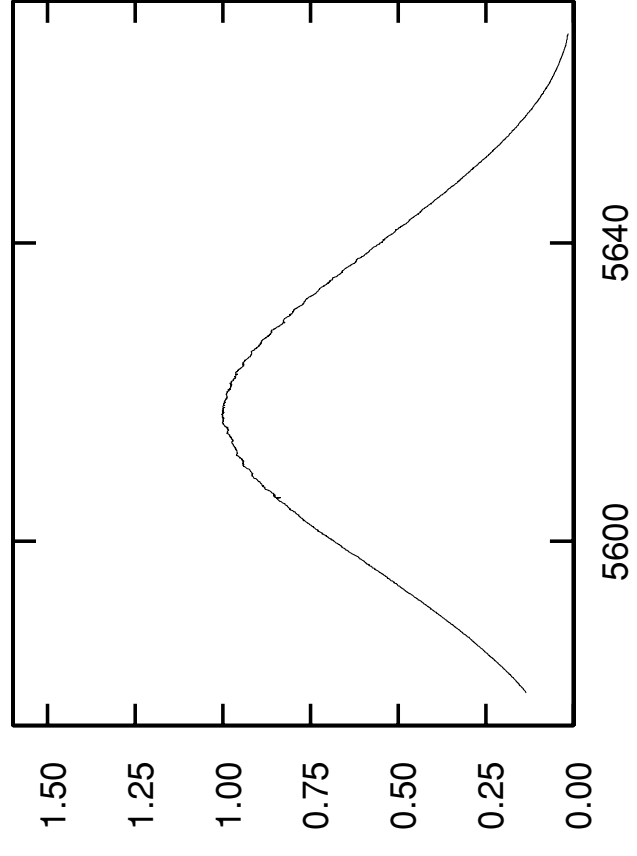
Order 109 - Central



Order 109 - Blue

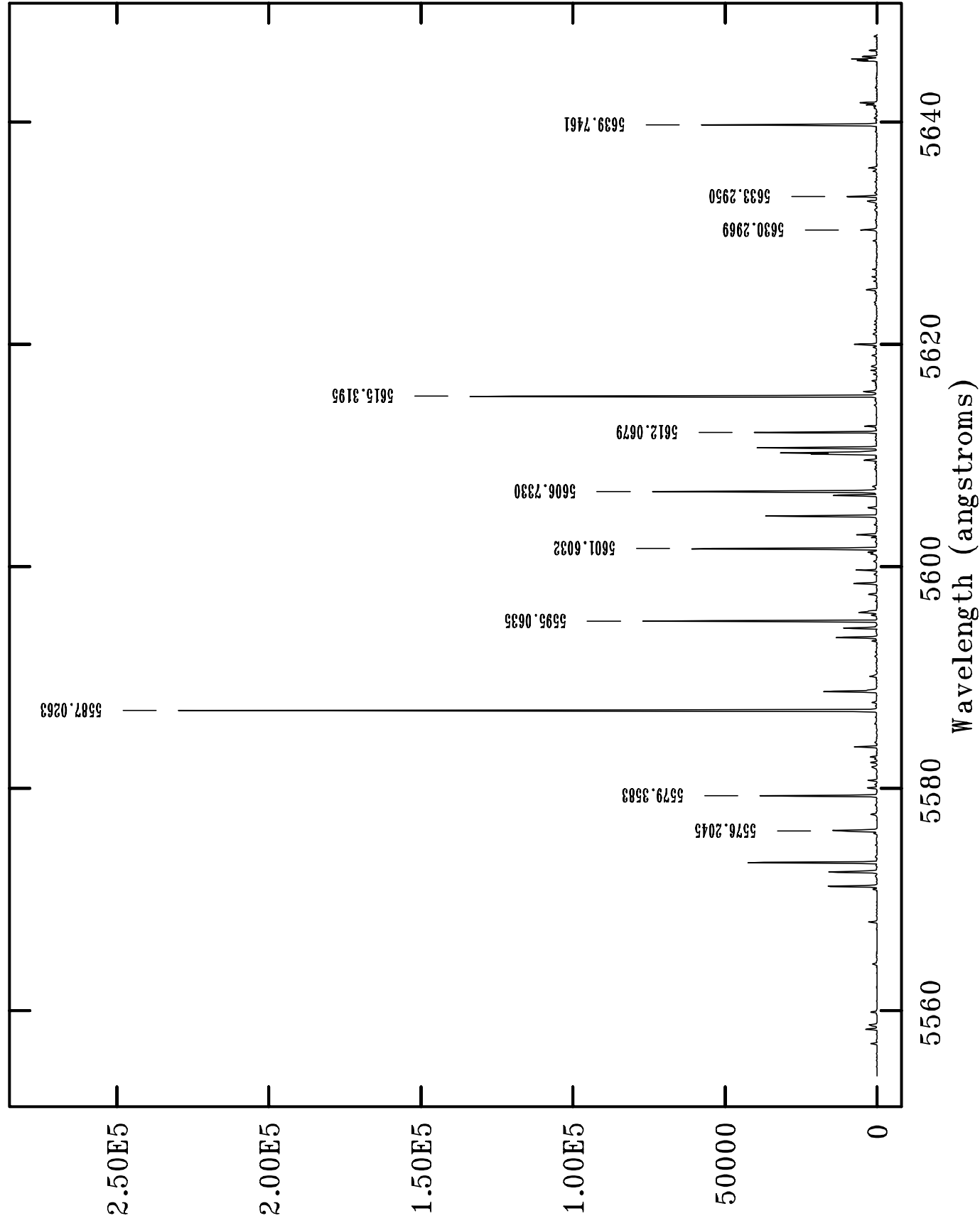


Order 109 - Red

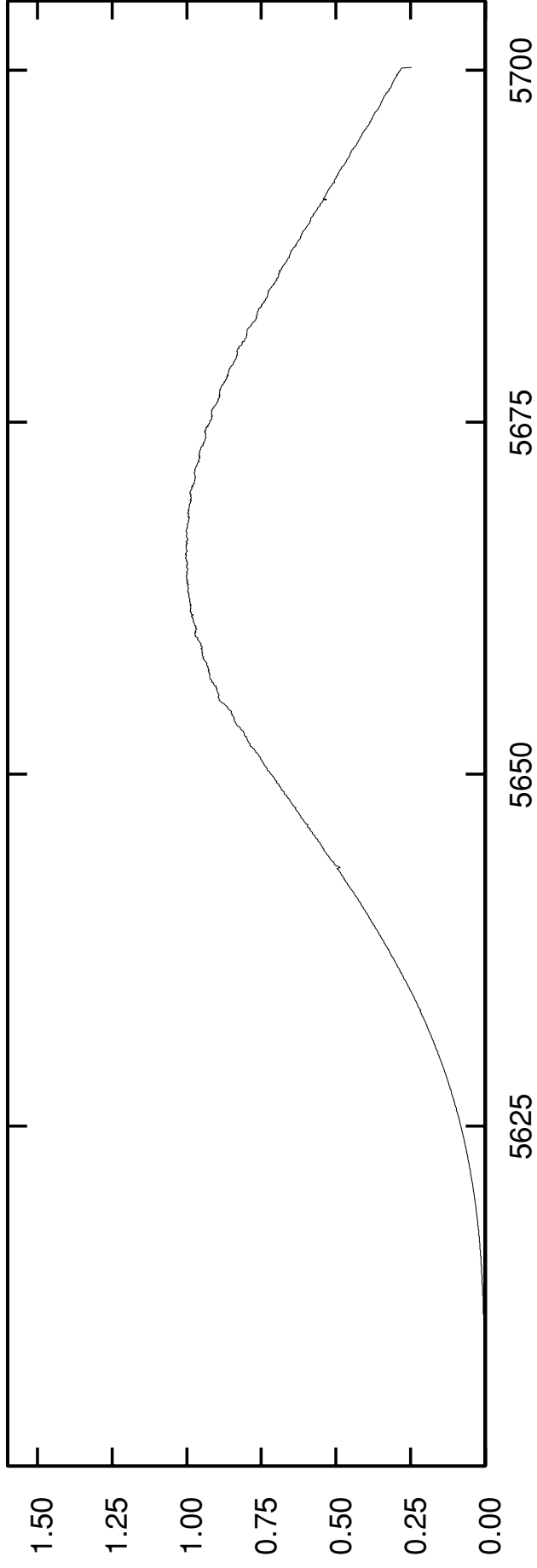


Wavelength (Angstroms)

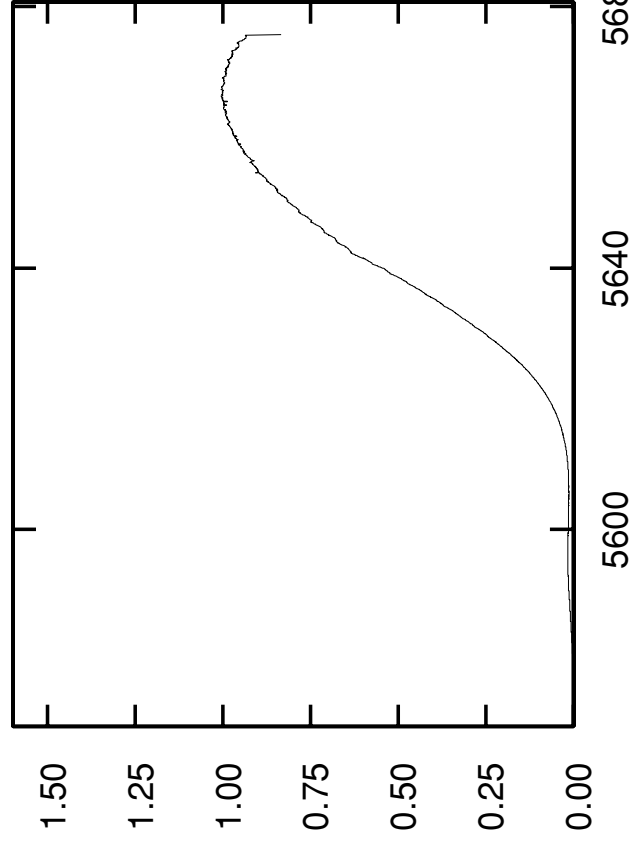
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:37:20 30-Mar-2002
Aperture 6, Image line 6, Order 109
ecidentify thar_316g5936_red2: ThAr



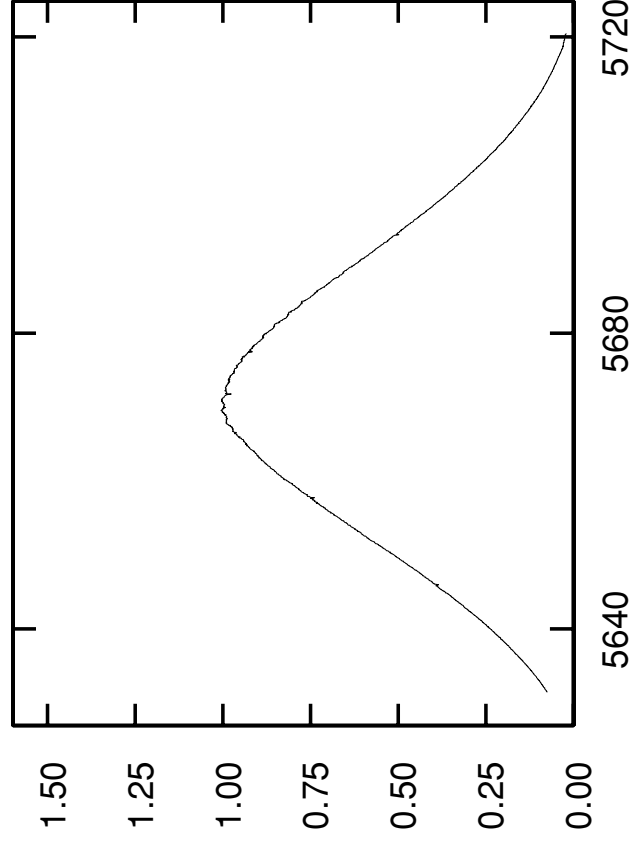
Order 108 - Central



Order 108 - Blue

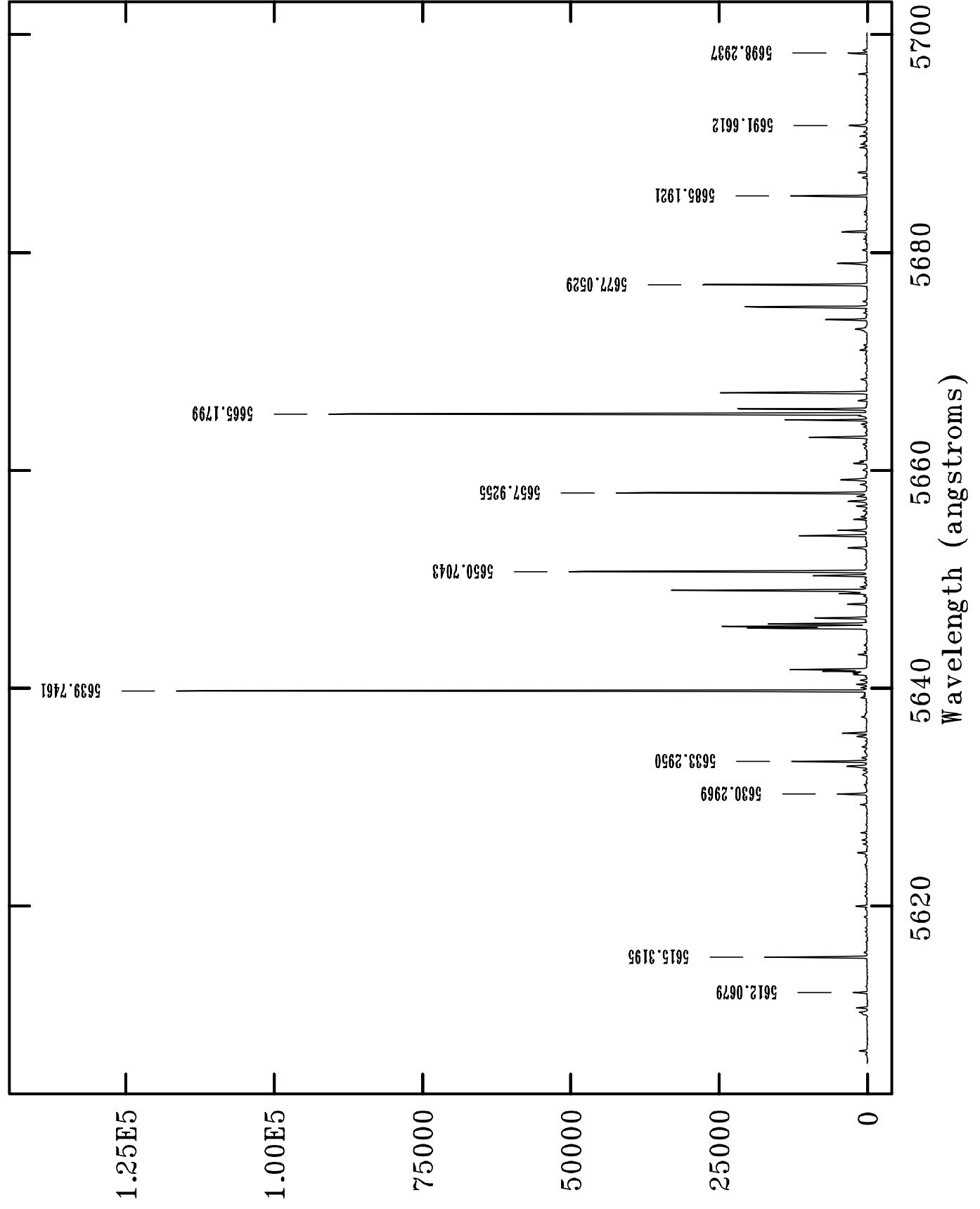


Order 108 - Red

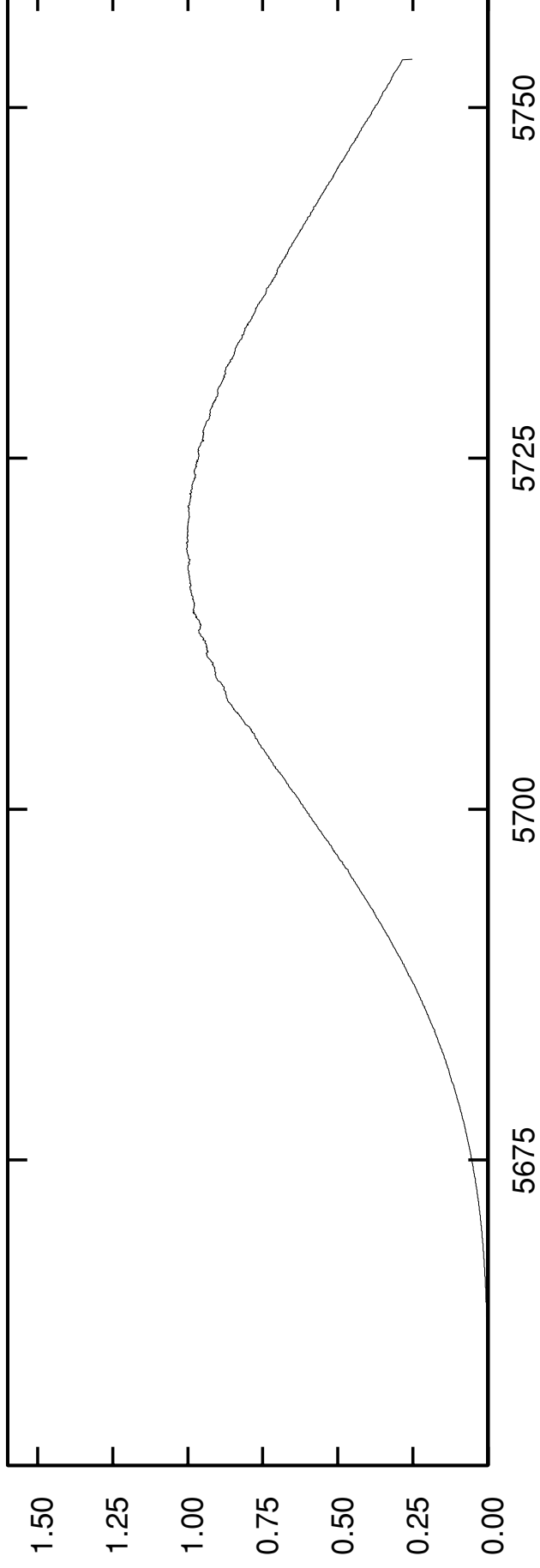


Wavelength (Angstroms)

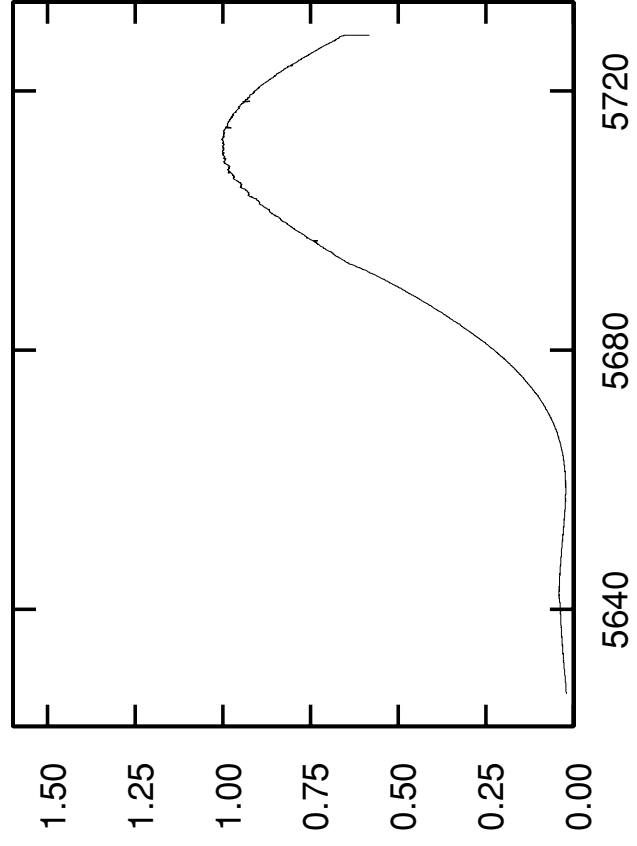
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:36:31 30-Mar-2002
Aperture 5, Image line 5, Order 108
ecidentify thar_316g5936_red2: ThAr



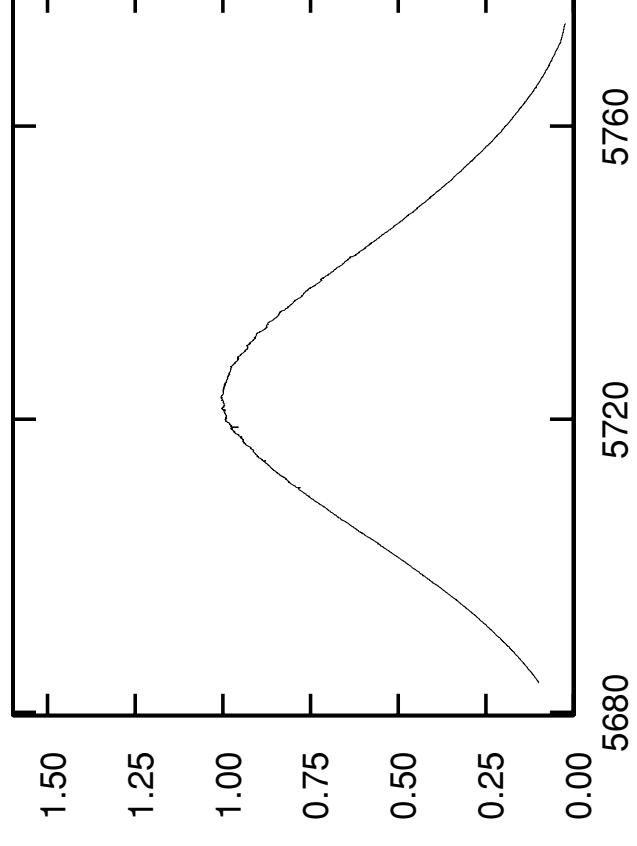
Order 107 - Central



Order 107 - Blue

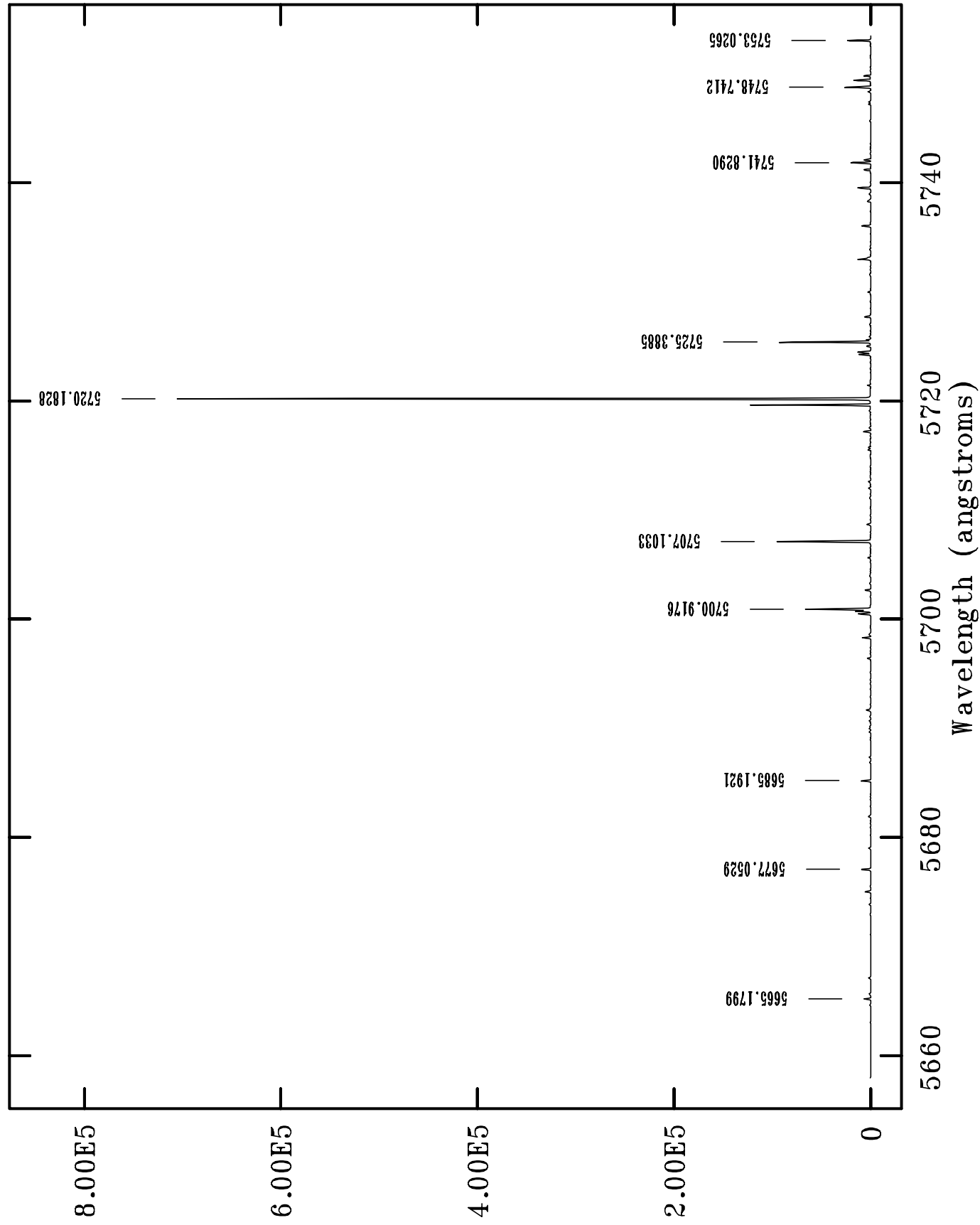


Order 107 - Red

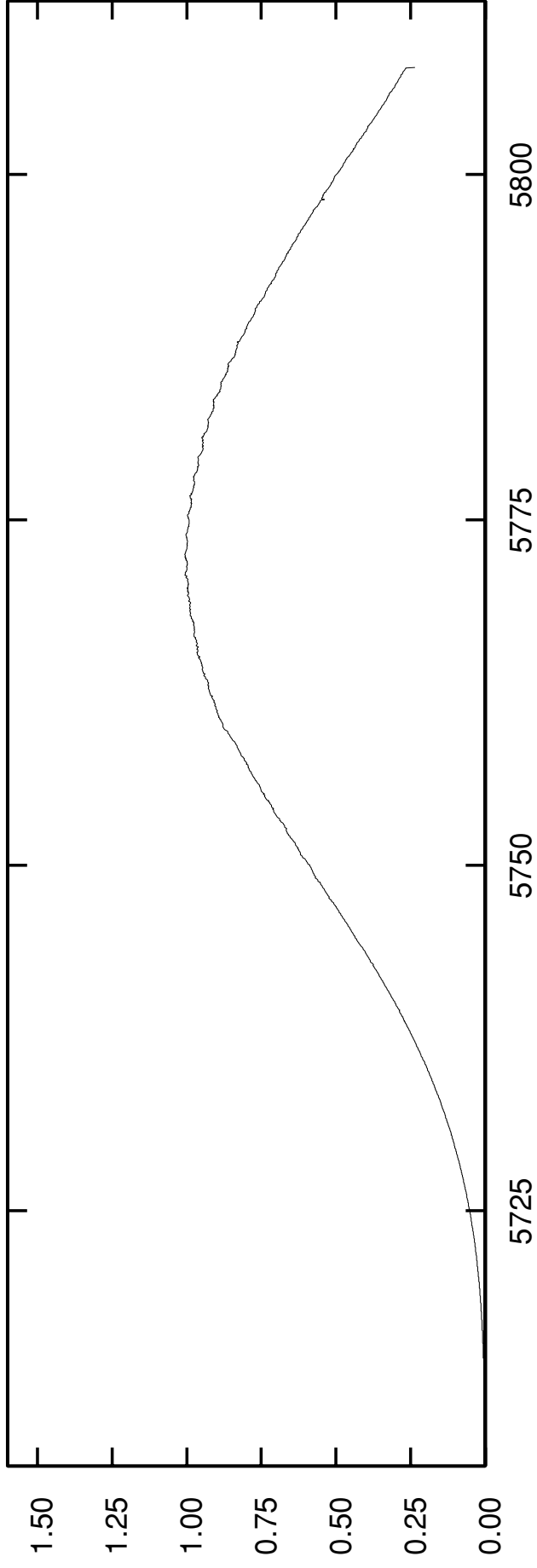


Wavelength (Angstroms)

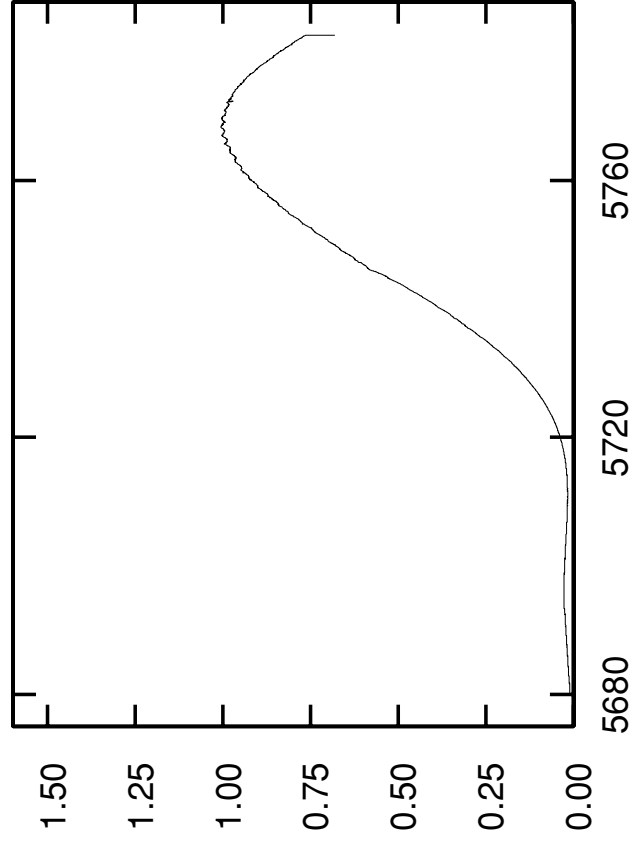
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:35:29 30-Mar-2002
Aperture 4, Image line 4, Order 107
ecidentify thar_316g5936_red2: ThAr



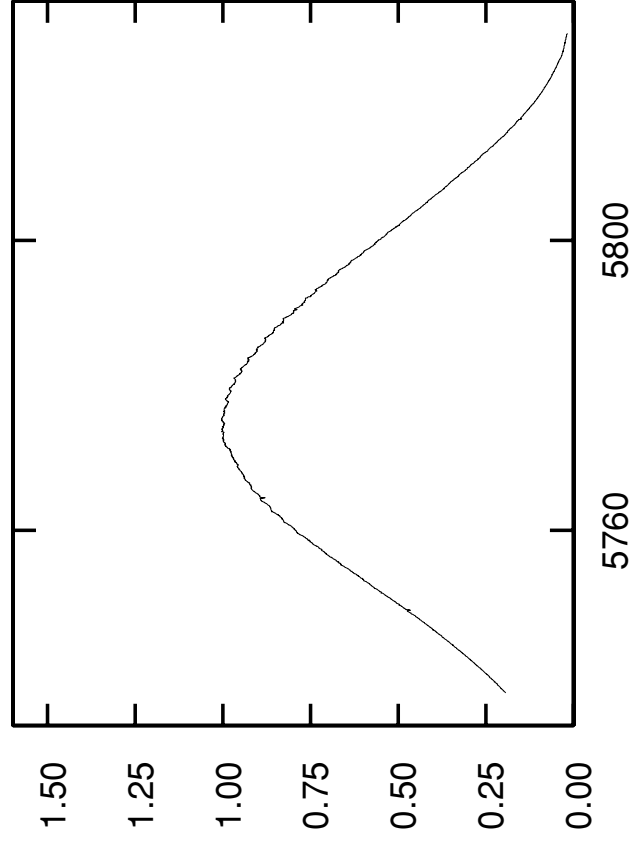
Order 106 - Central



Order 106 - Blue

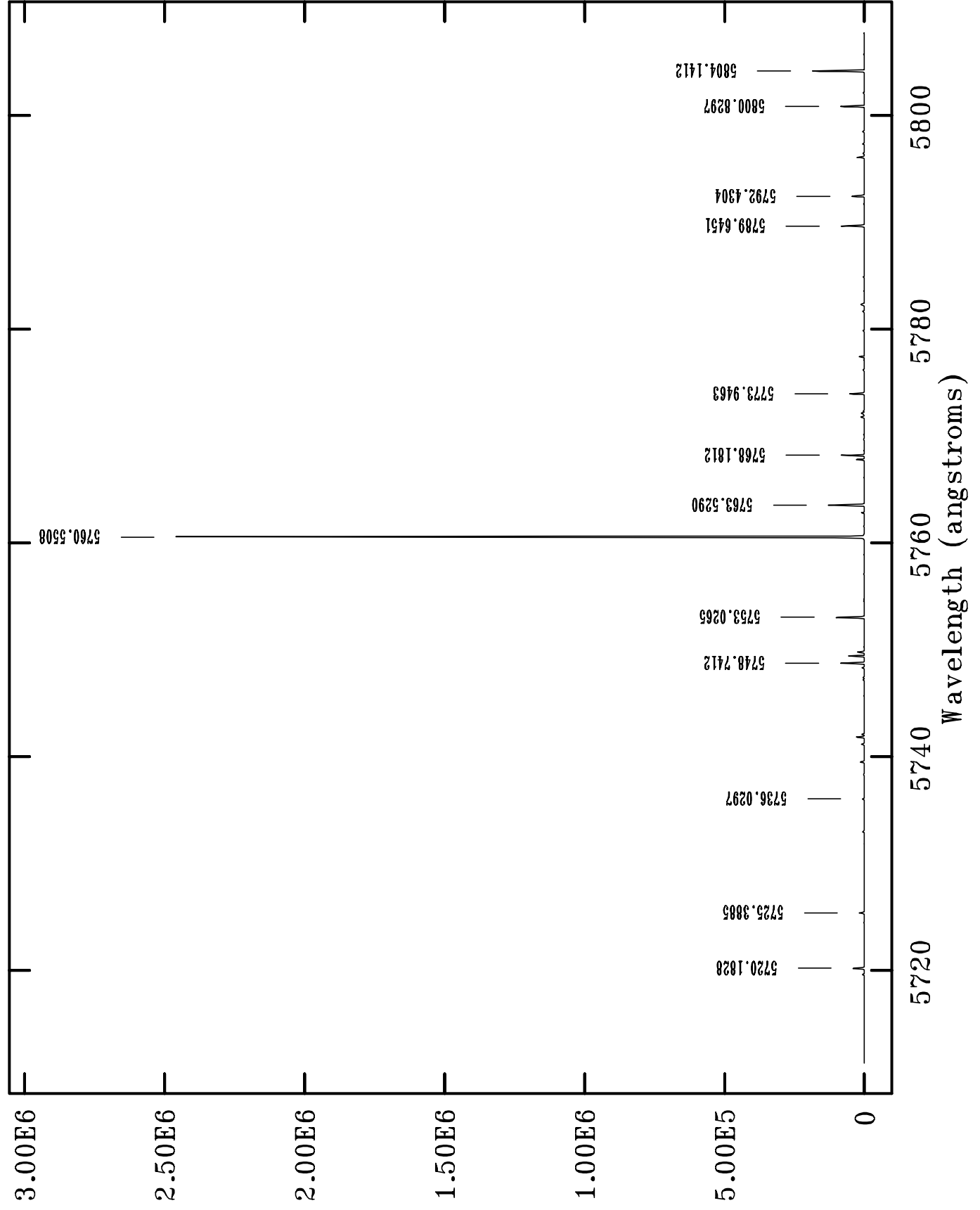


Order 106 - Red

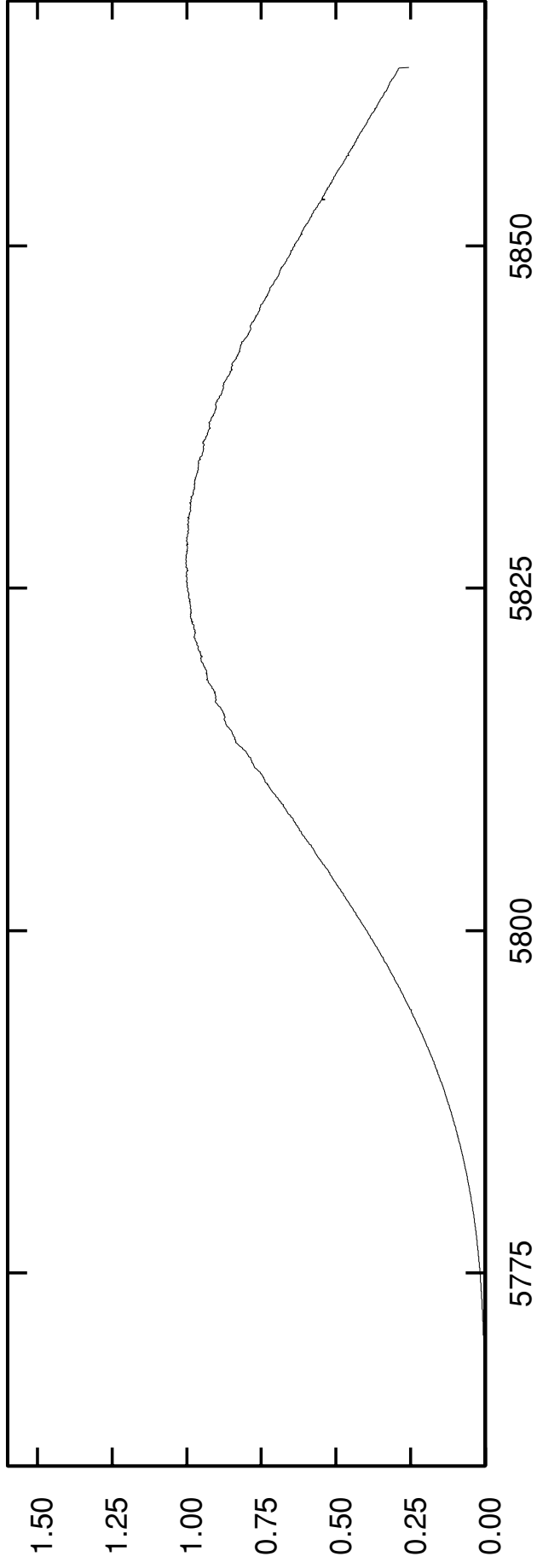


Wavelength (Angstroms)

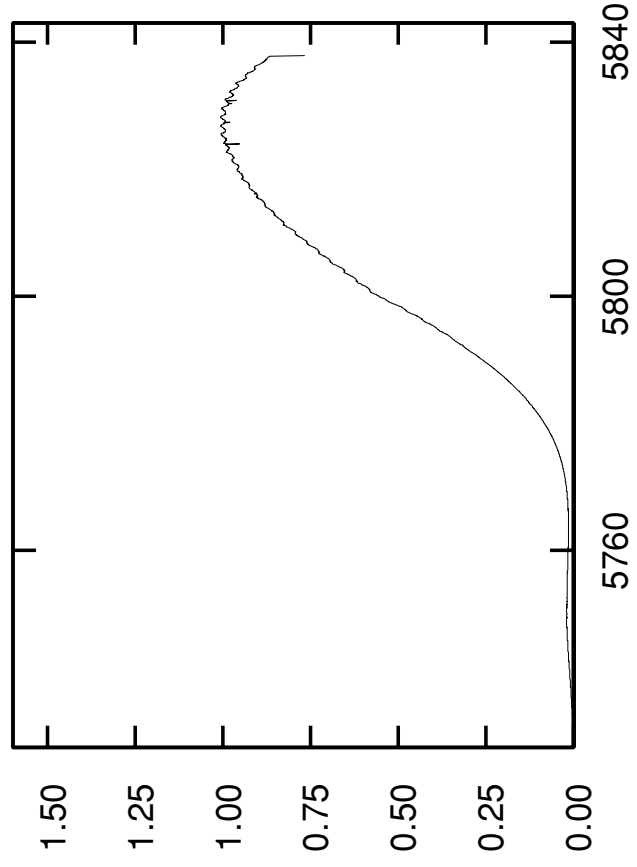
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:34:51 30-Mar-2002
Aperture 3, Image line 3, Order 106
eidentify thar_316g5936_red2: ThAr



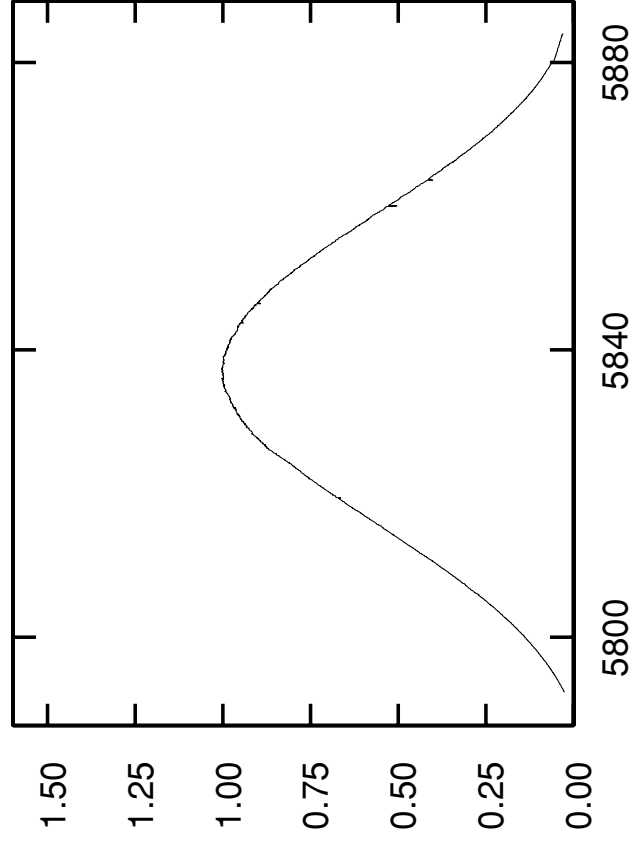
Order 105 - Central



Order 105 - Blue

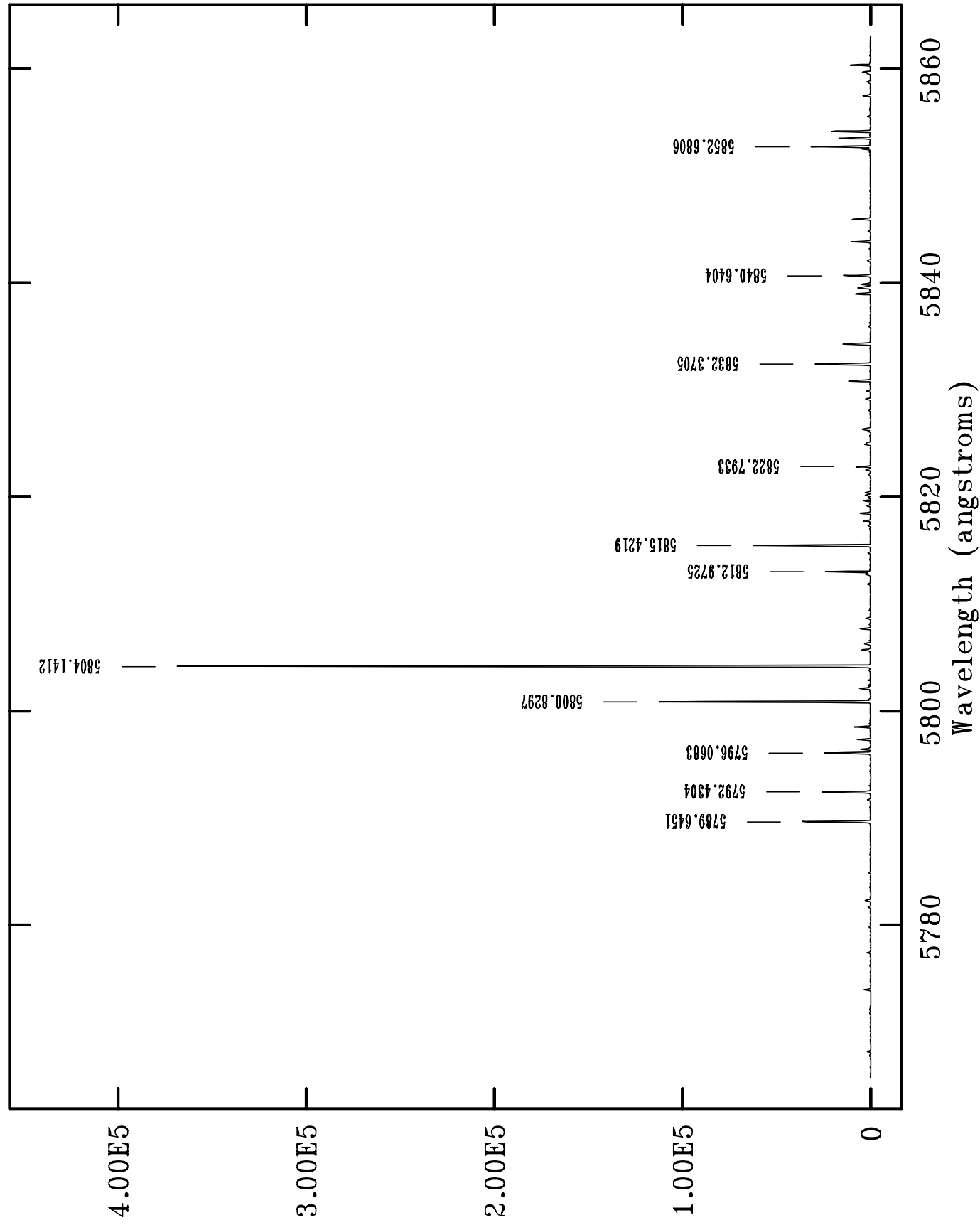


Order 105 - Red

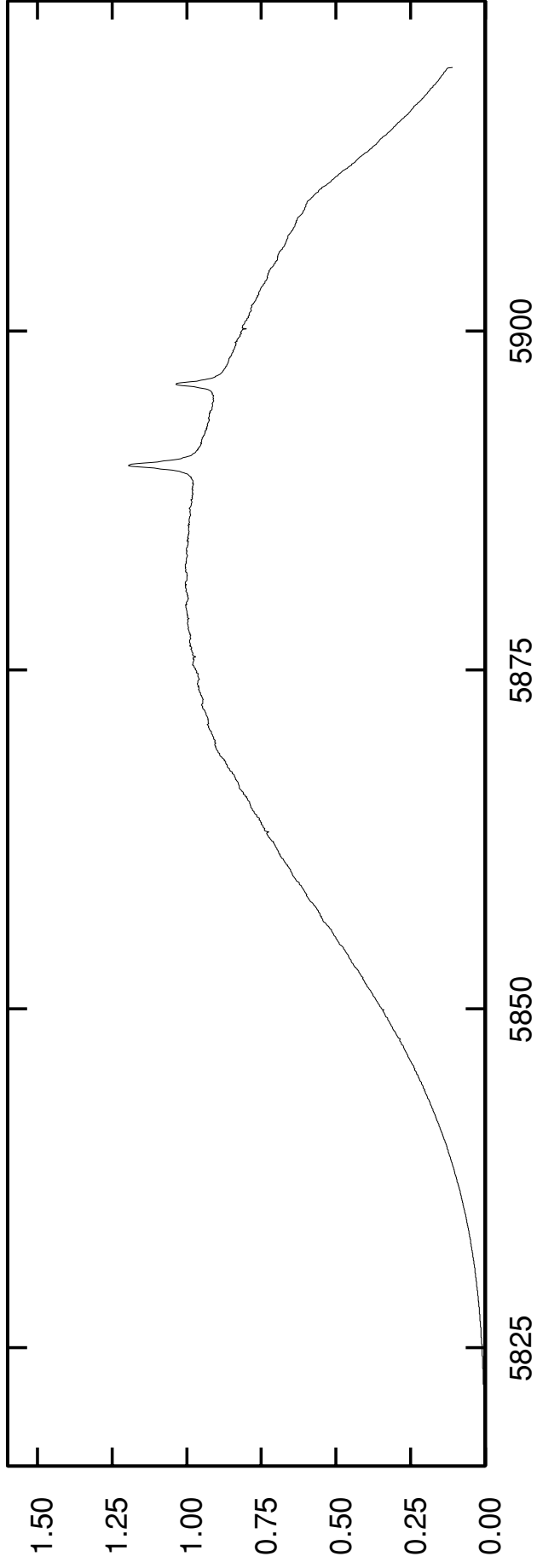


Wavelength (Angstroms)

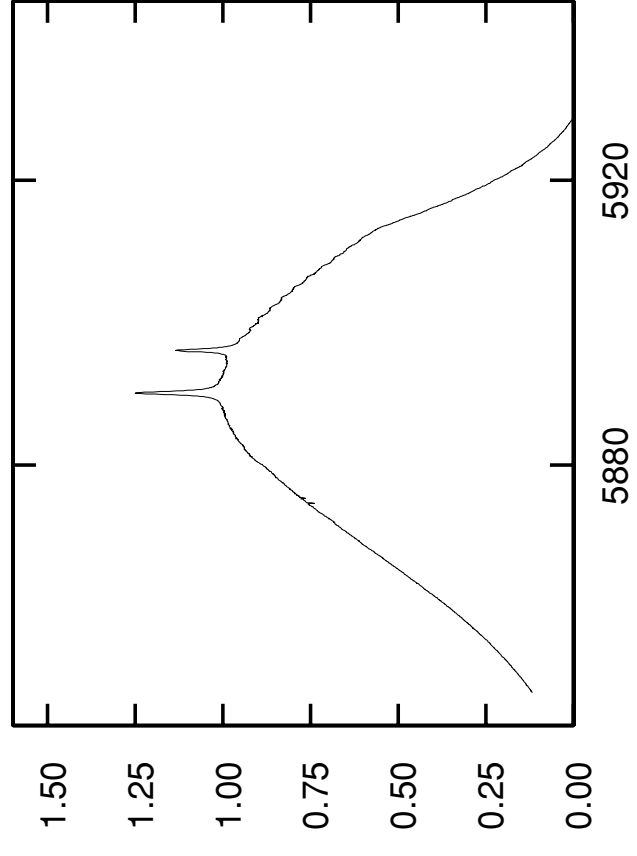
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:34:24 30-Mar-2002
Aperture 2, Image line 2, Order 105
ecidentify thar_316g5936_red2: ThAr



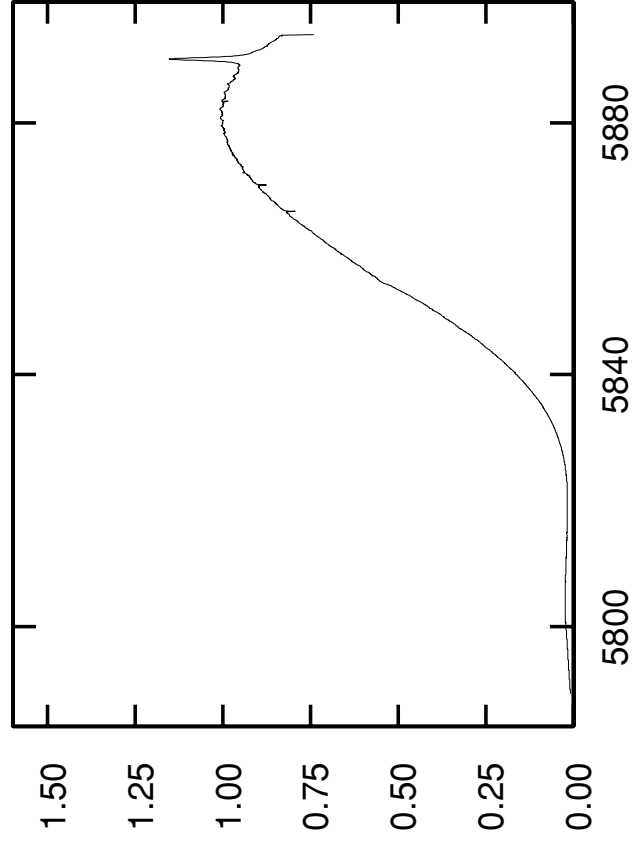
Order 104 - Central



Order 104 - Red

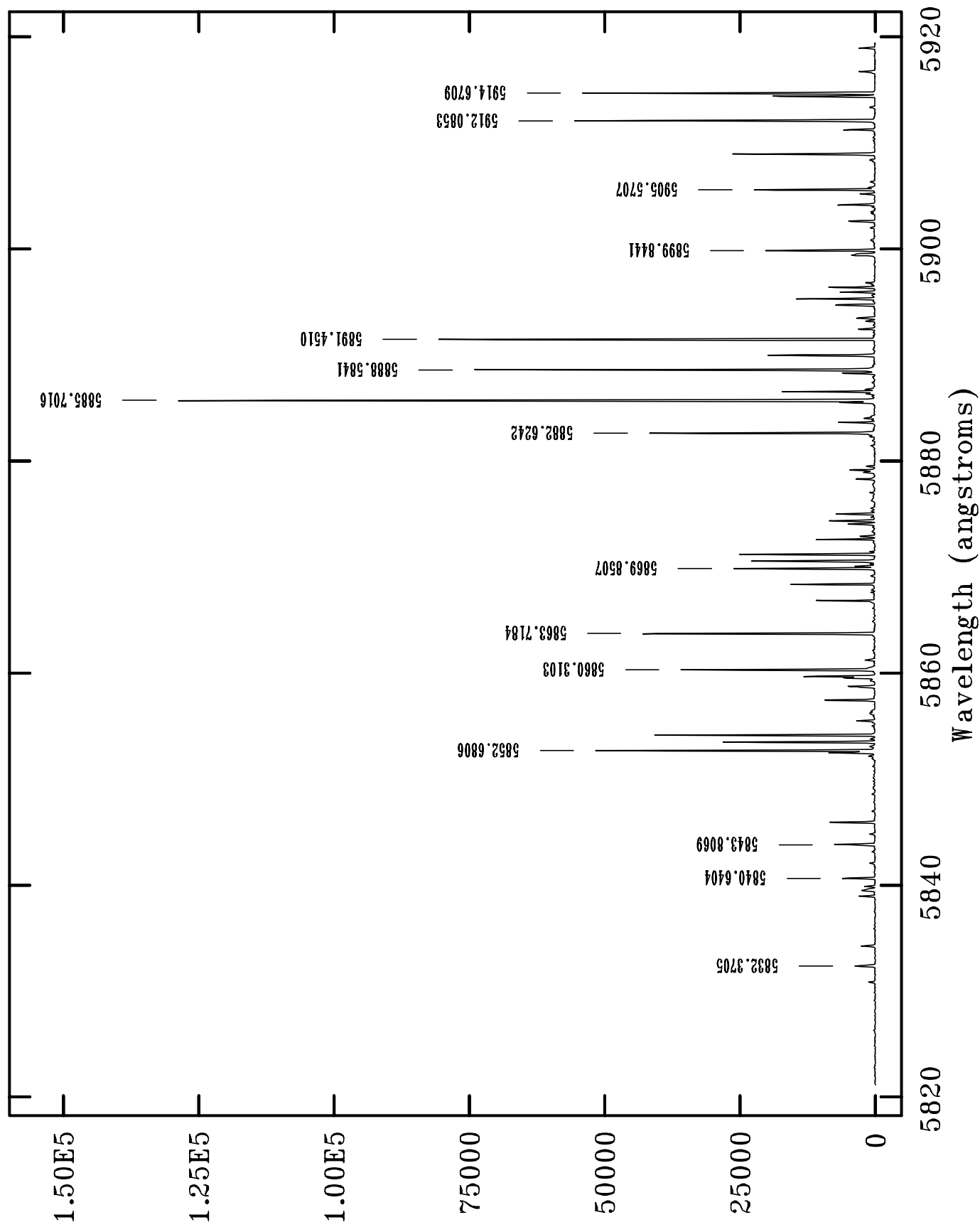


Order 104 - Blue

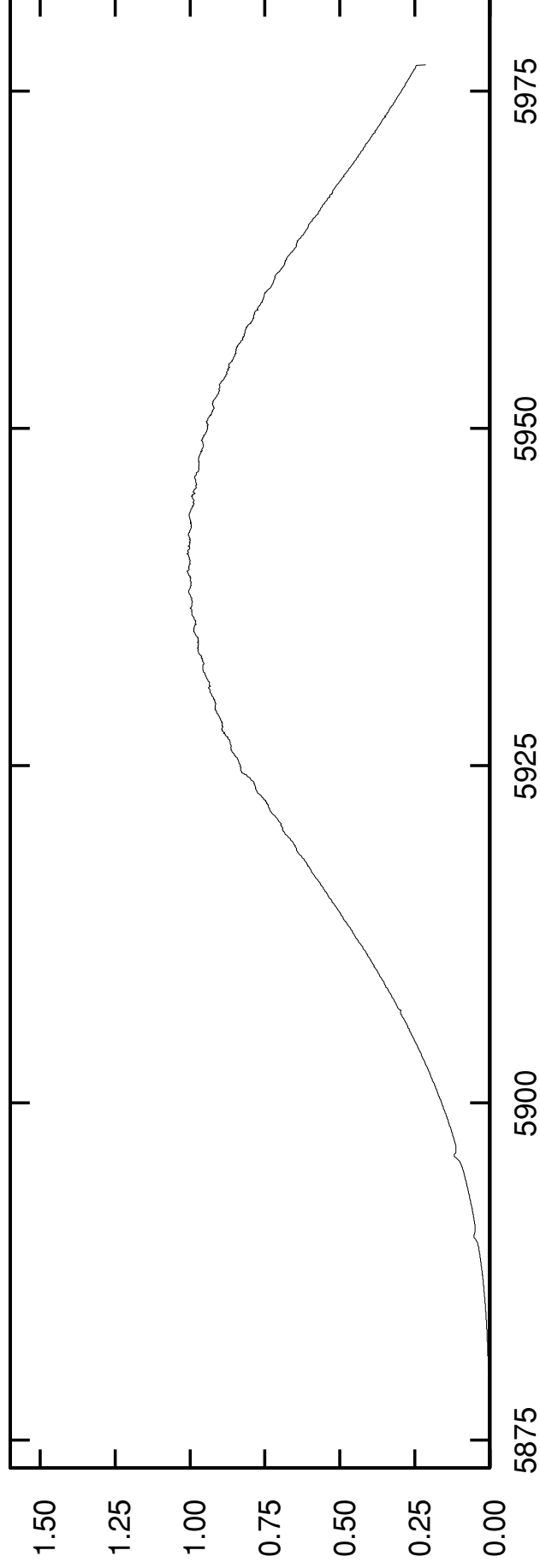


Wavelength (Angstroms)

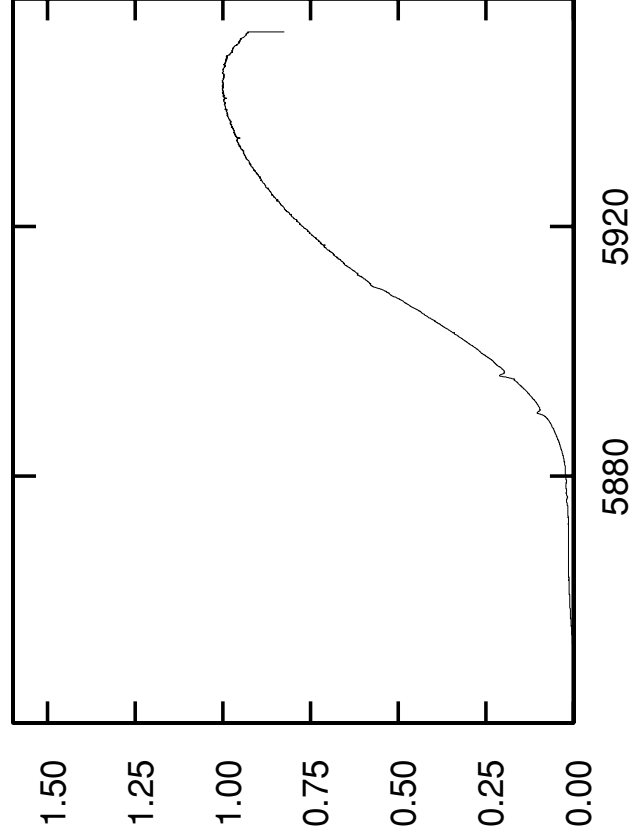
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 05:33:59 30-Mar-2002
Aperture 1, Image line 1, Order 104
ecidentify thar_316g5936_red2: ThAr



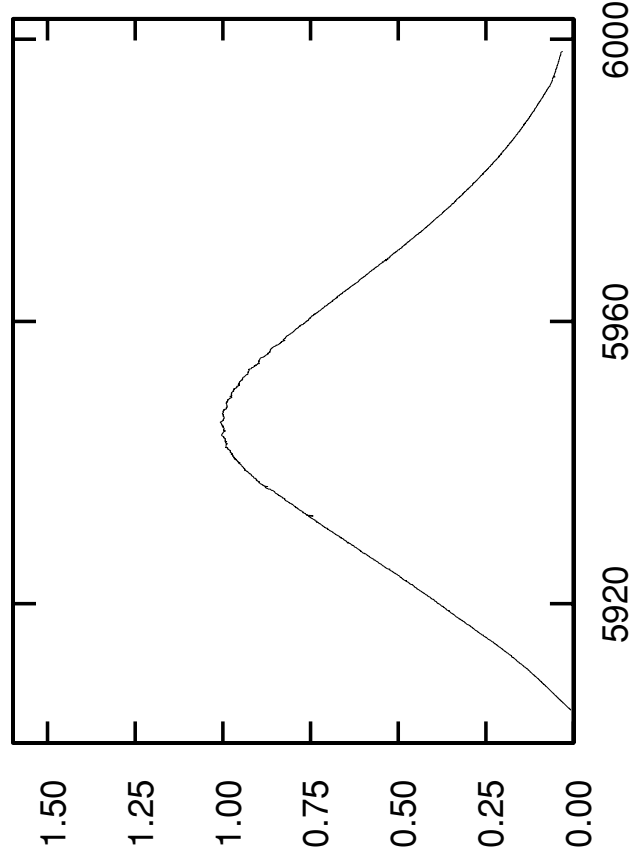
Order 103 - Central



Order 103 - Blue

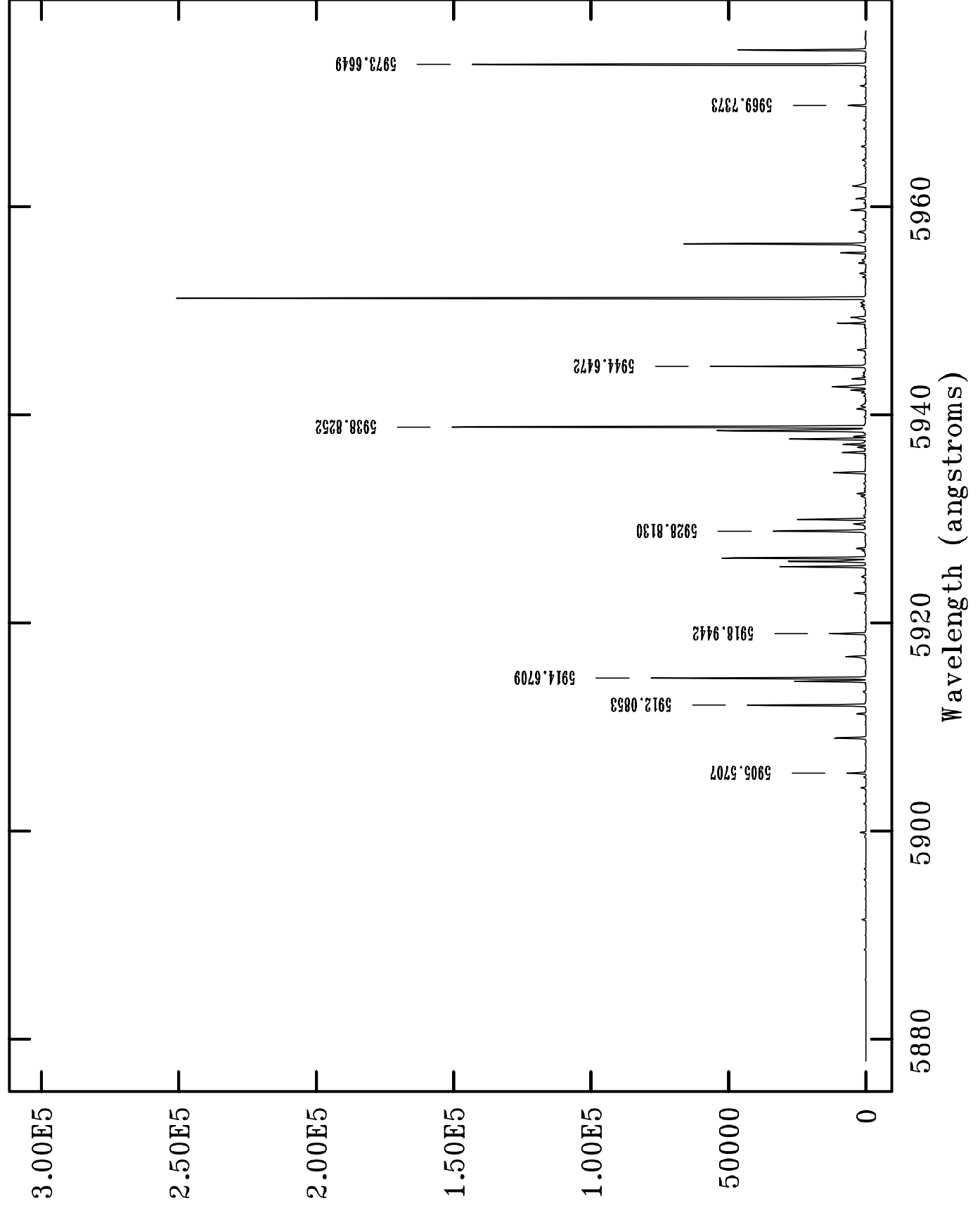


Order 103 - Red

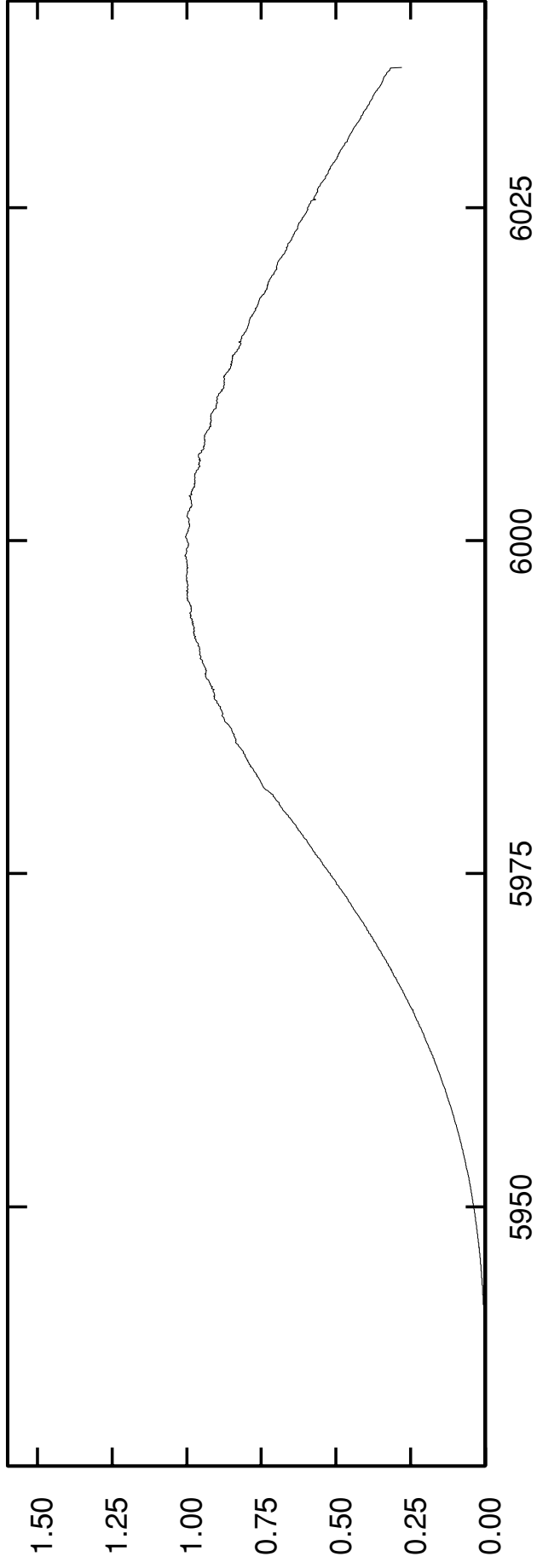


Wavelength (Angstroms)

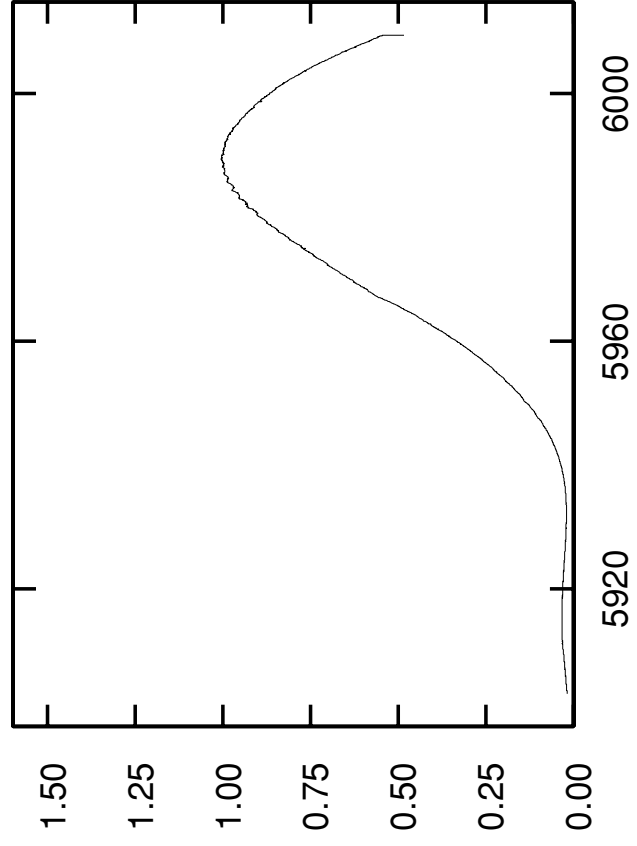
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:21:44 30-Mar-2002
Aperture 15, Image line 15, Order 103
identify thar_316g6948_red2: ThAr



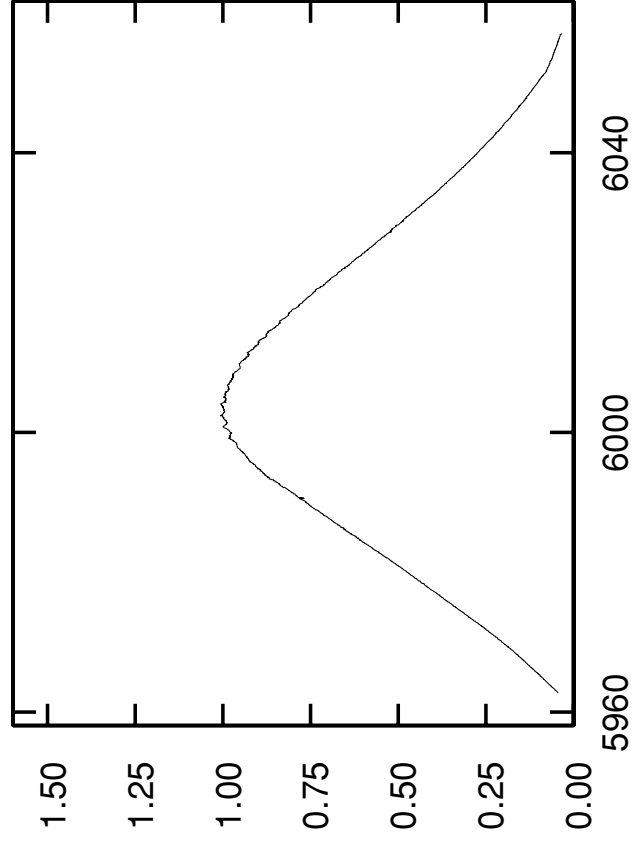
Order 102 - Central



Order 102 - Blue

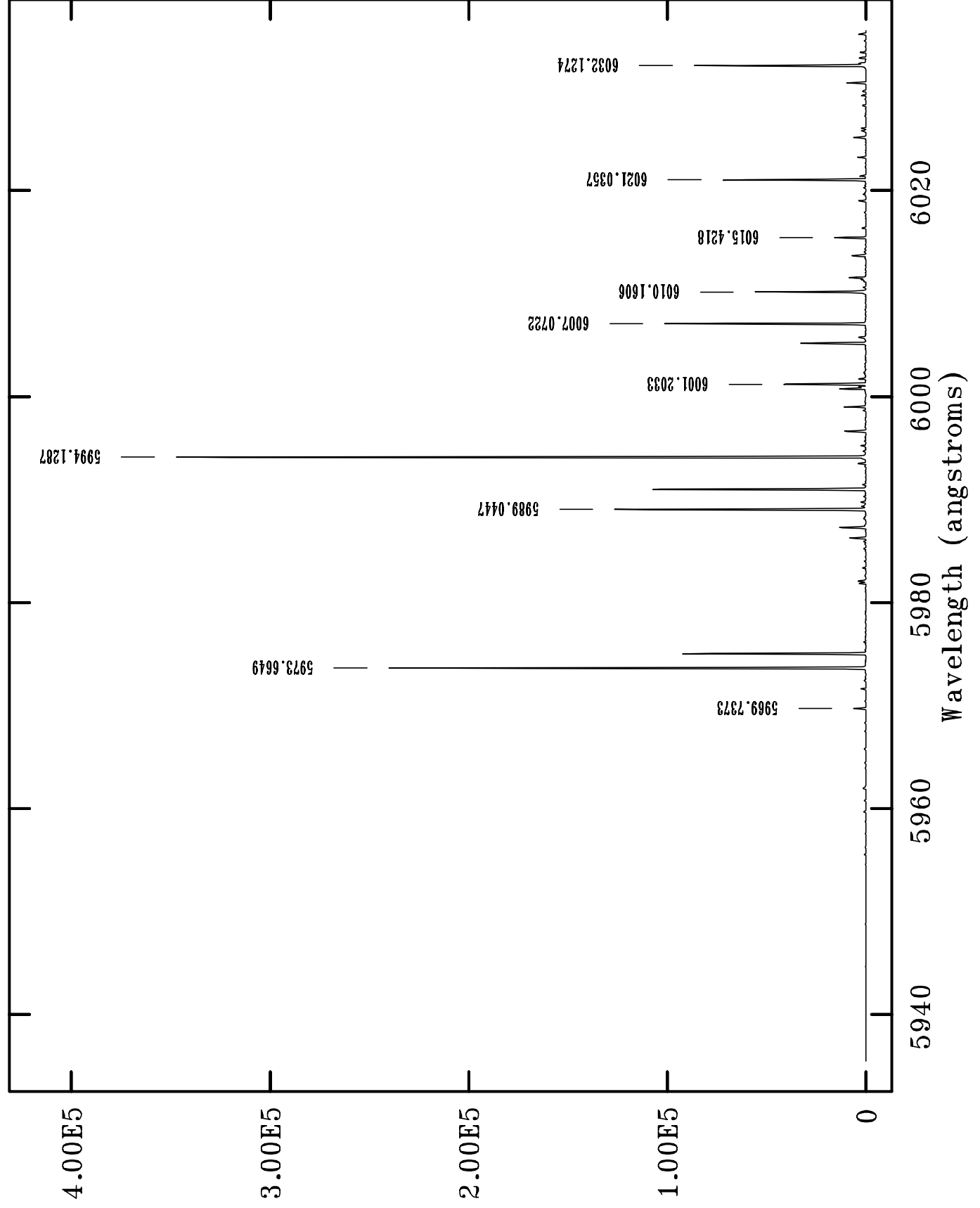


Order 102 - Red

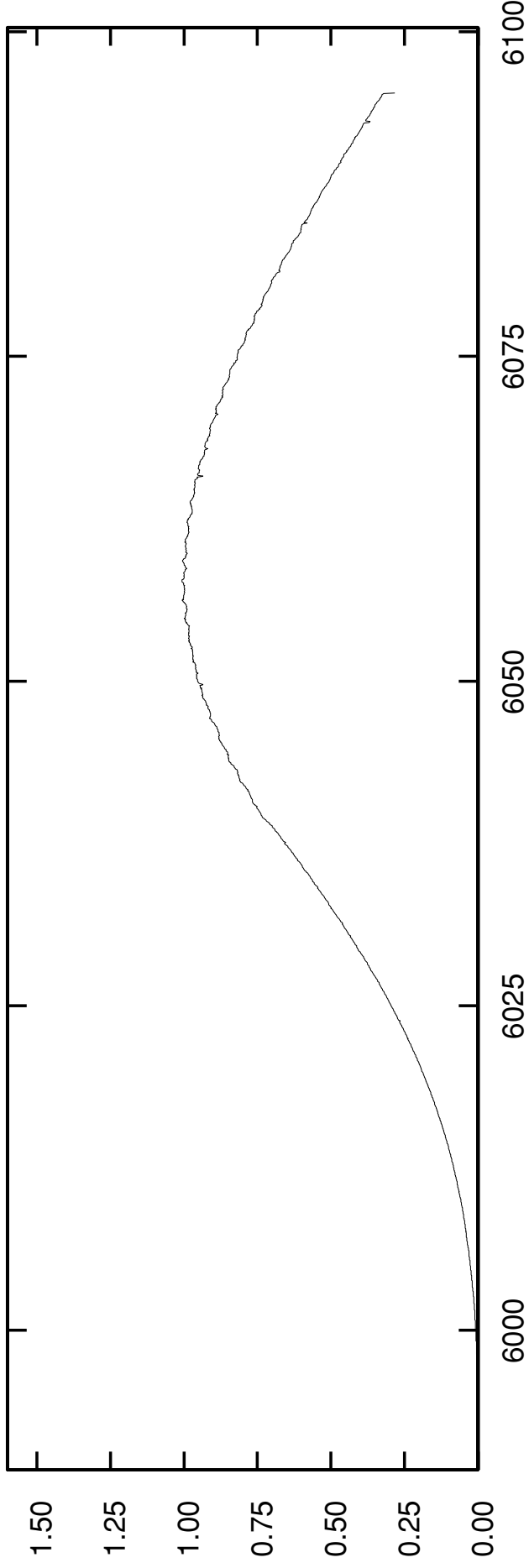


Wavelength (Angstroms)

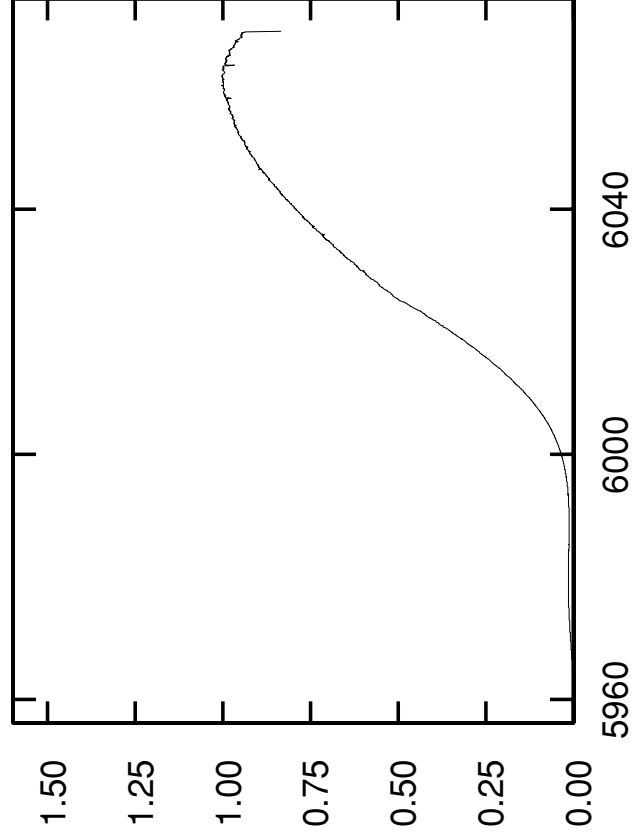
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:21:08 30-Mar-2002
Aperture 14, Image line 14, Order 102
identify thar_316g6948_red2: ThAr



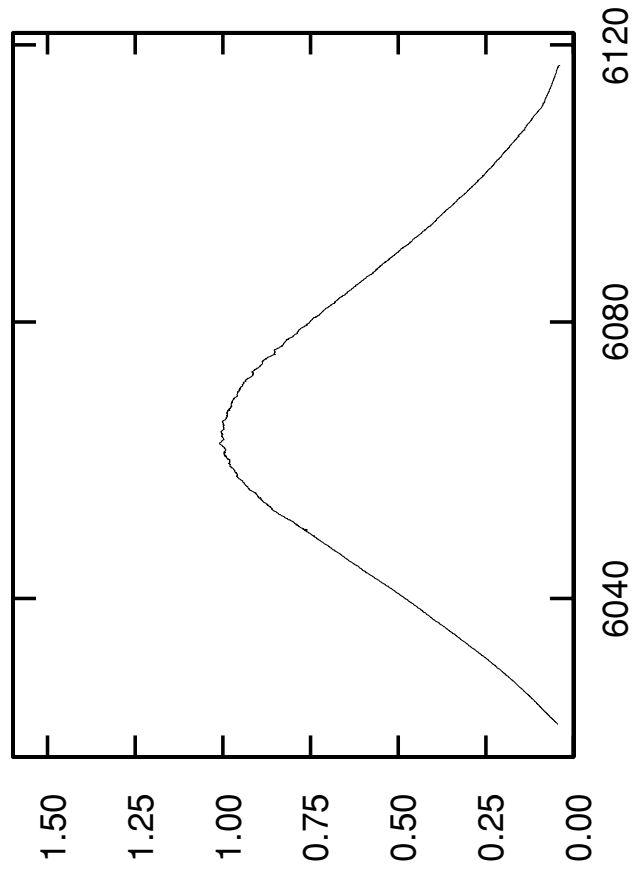
Order 101 - Central



Order 101 - Blue

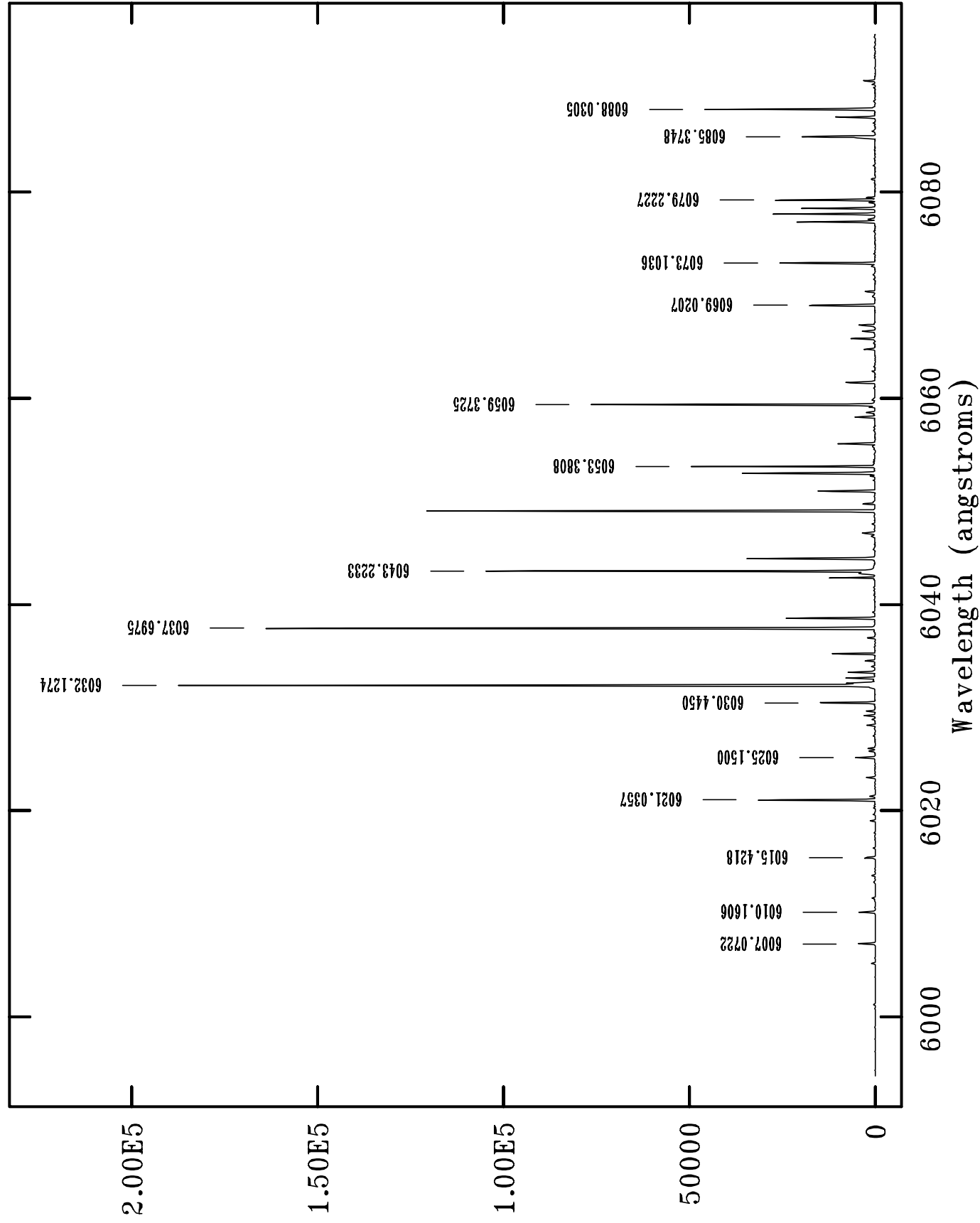


Order 101 - Red

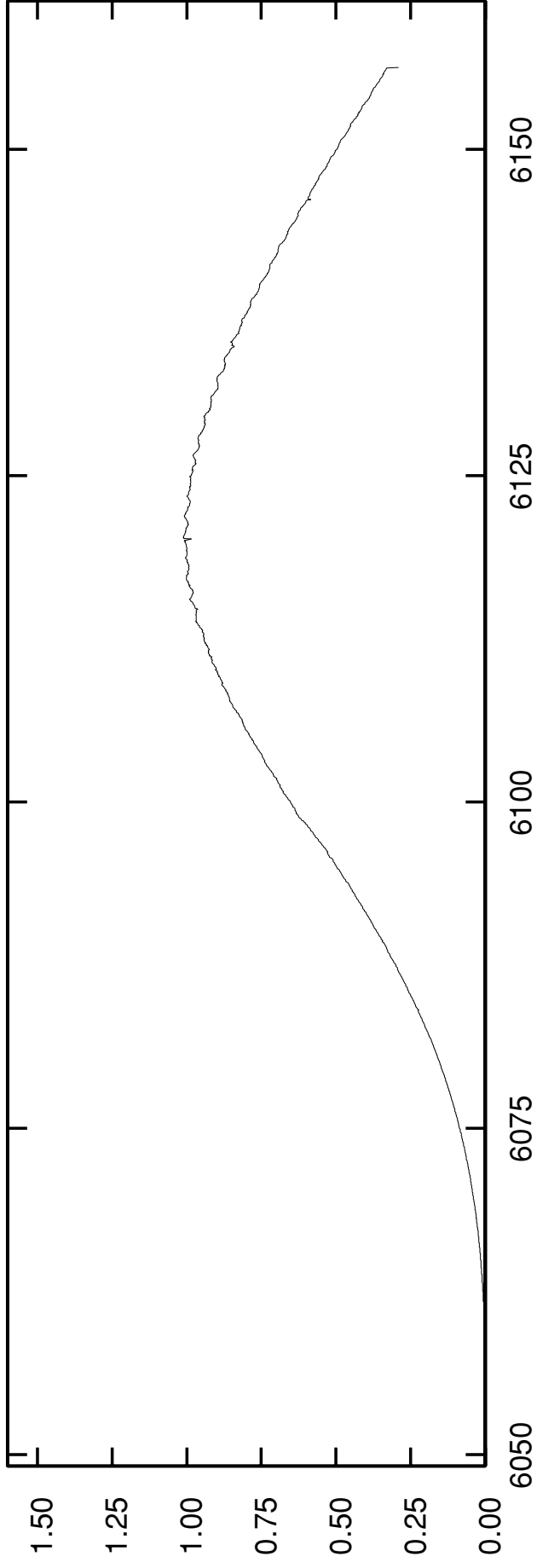


Wavelength (Angstroms)

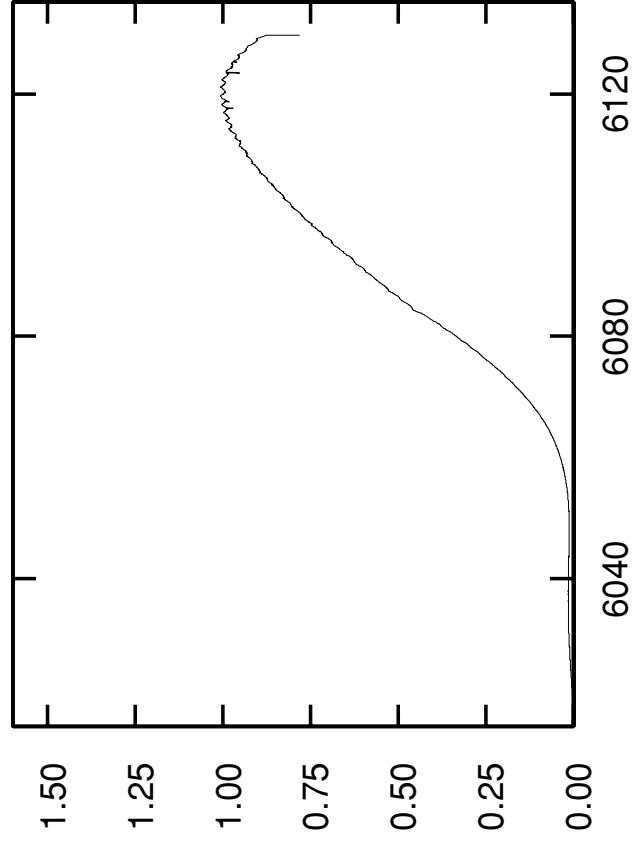
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:20:33 30-Mar-2002
Aperture 13, Image line 13, Order 101
identify thar_316g6948_red2: ThAr



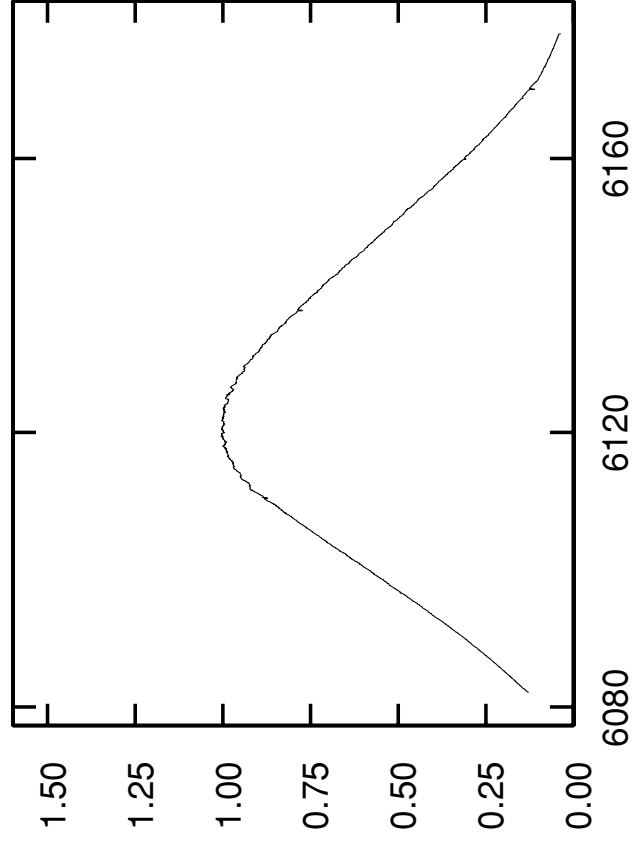
Order 100 - Central



Order 100 - Blue

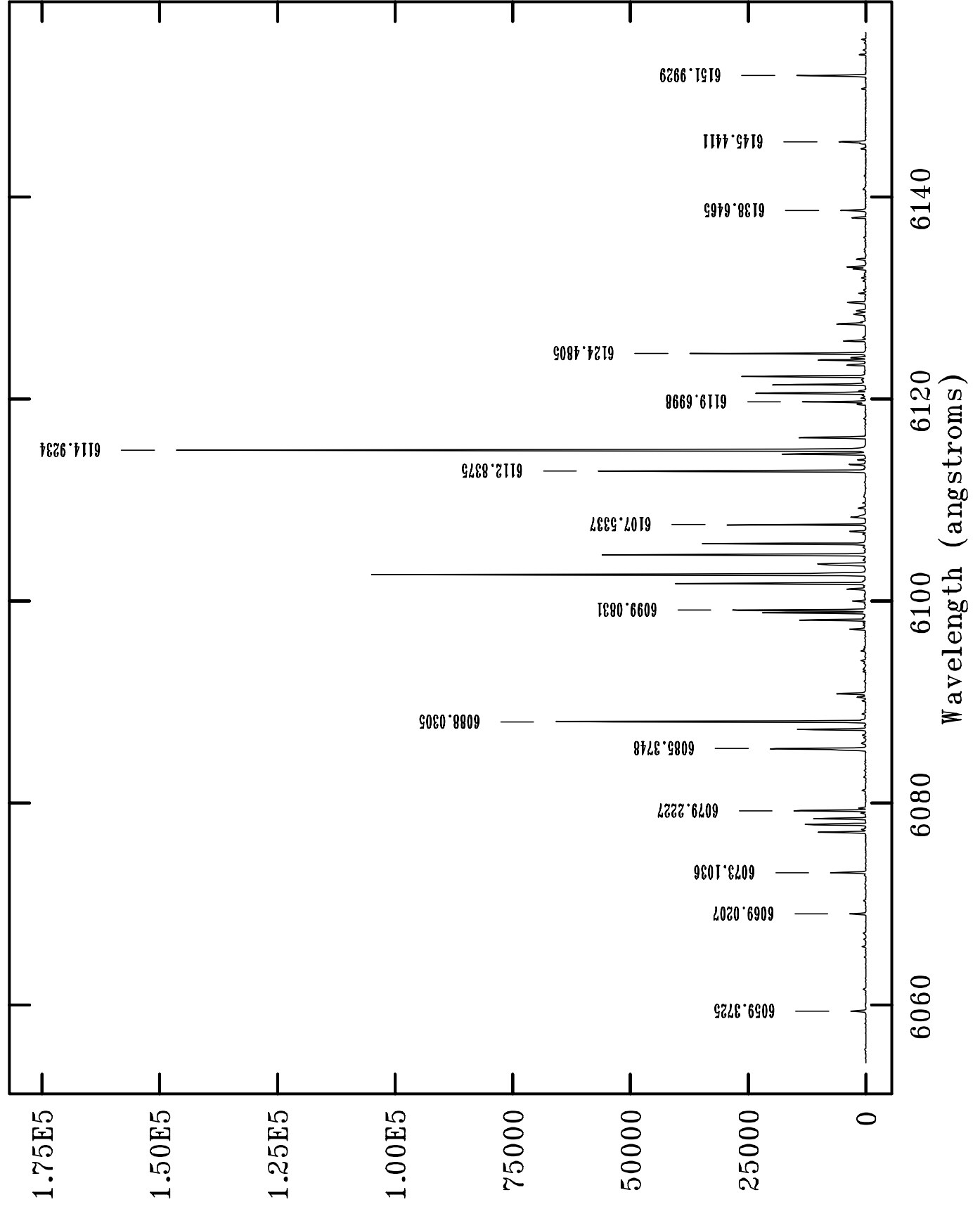


Order 100 - Red

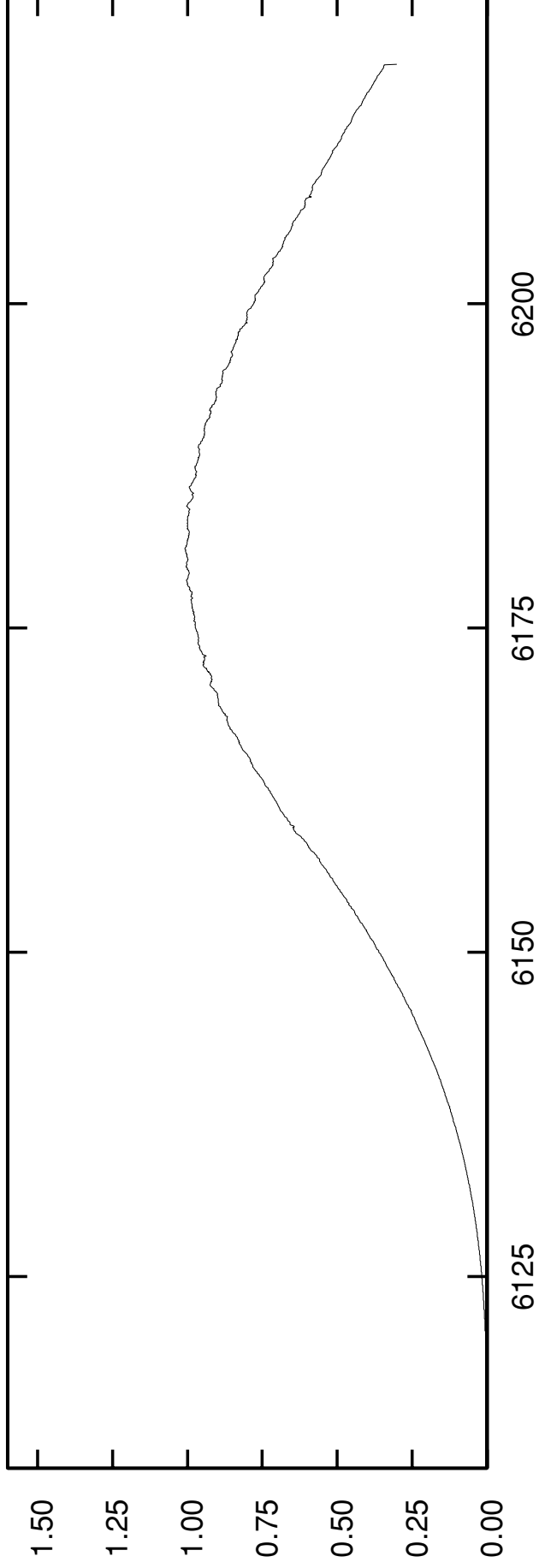


Wavelength (Angstroms)

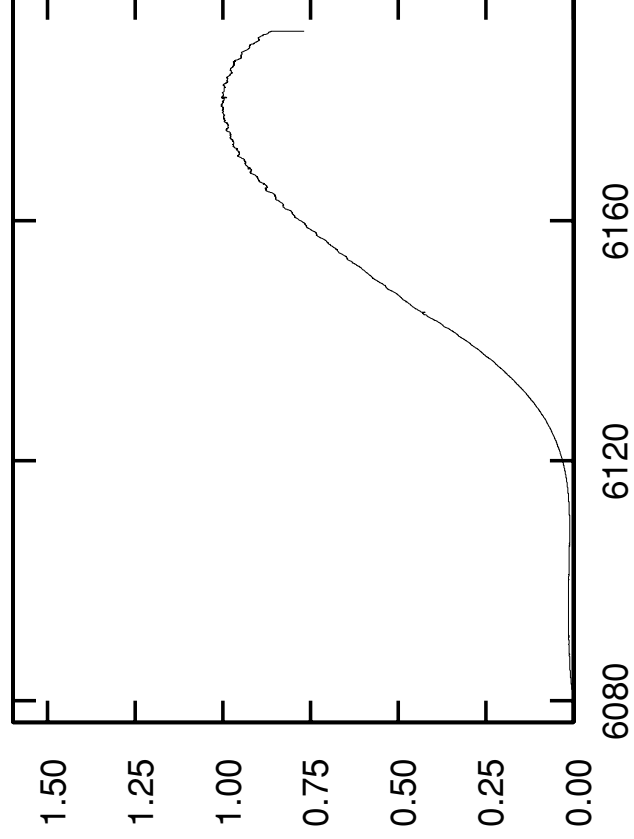
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:19:52 30-Mar-2002
Aperture 12, Image line 12, Order 100
ecidentify thar_316g6948_red2: ThAr



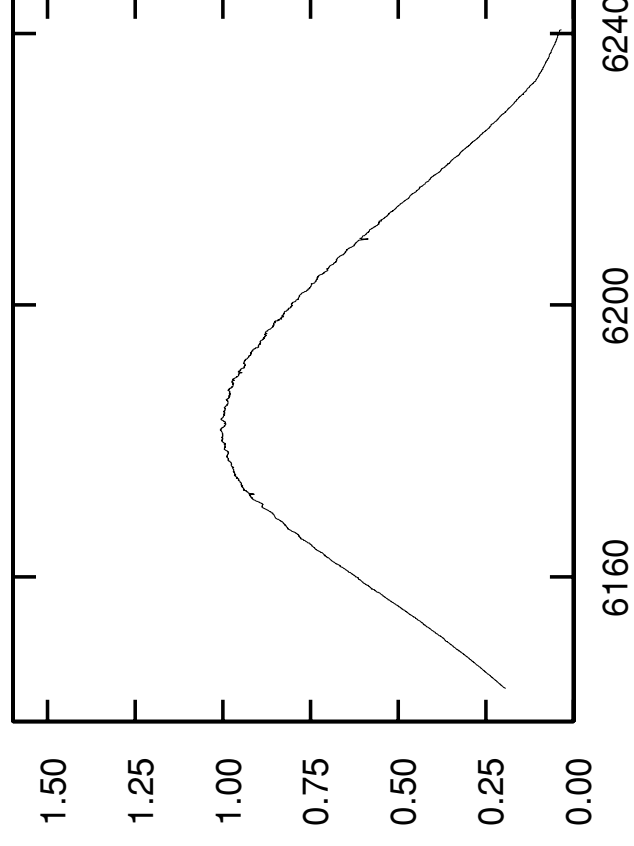
Order 99 - Central



Order 99 - Blue

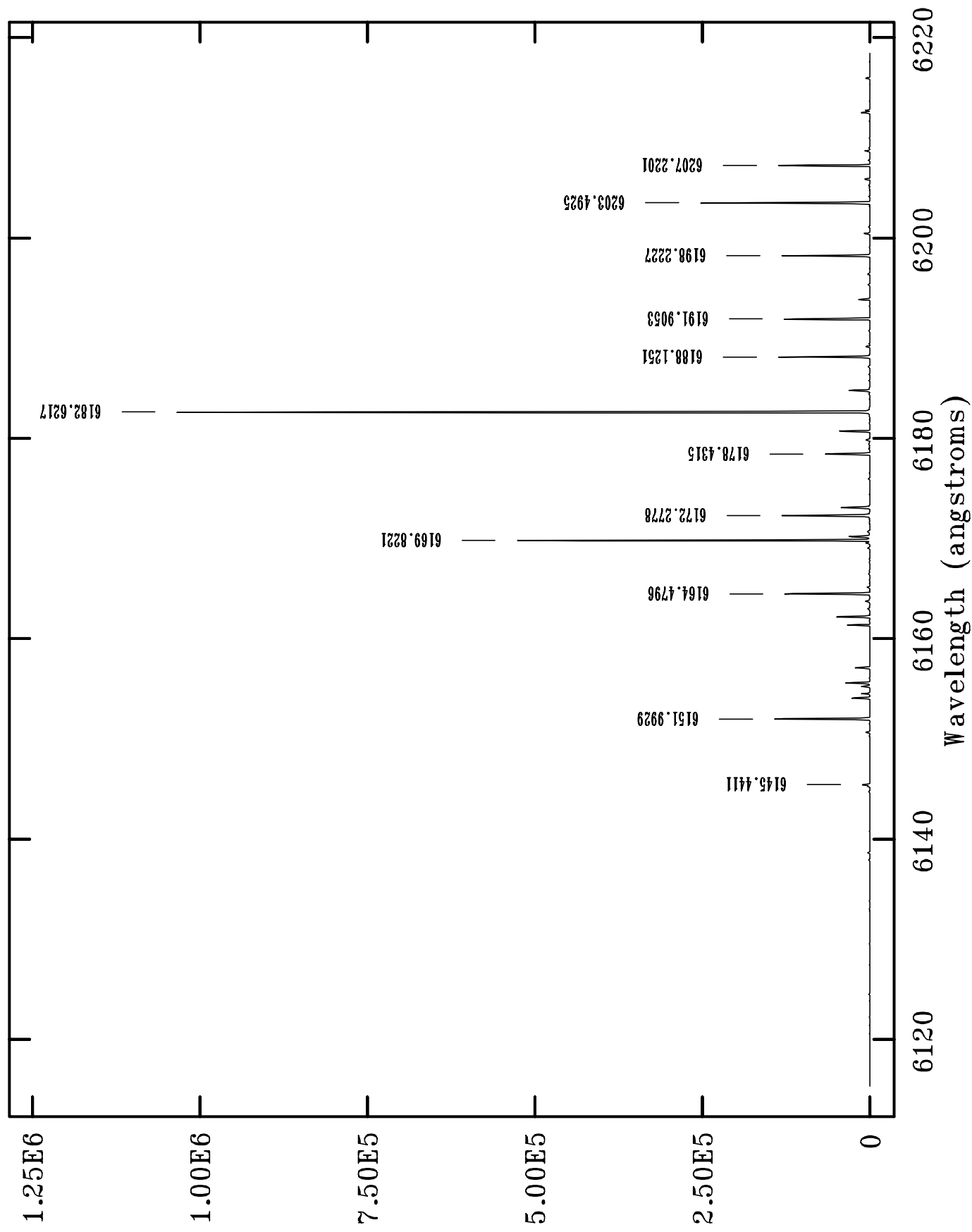


Order 99 - Red

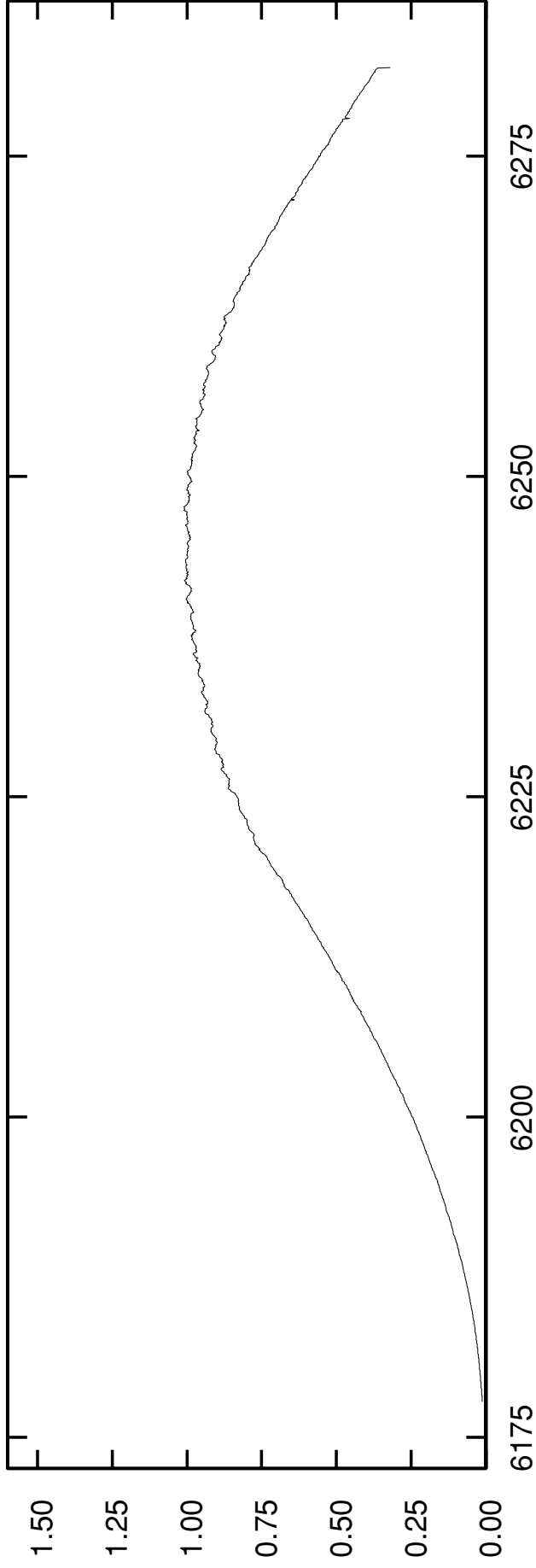


Wavelength (Angstroms)

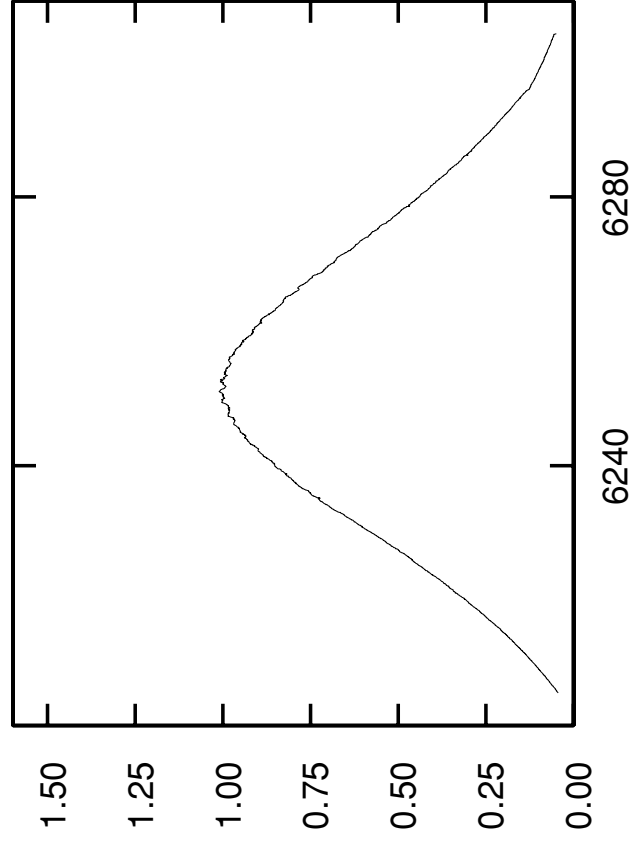
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:19:00 30-Mar-2002
Aperture 11, Image line 11, Order 99
eidentify thar_316g6948_red2: ThAr



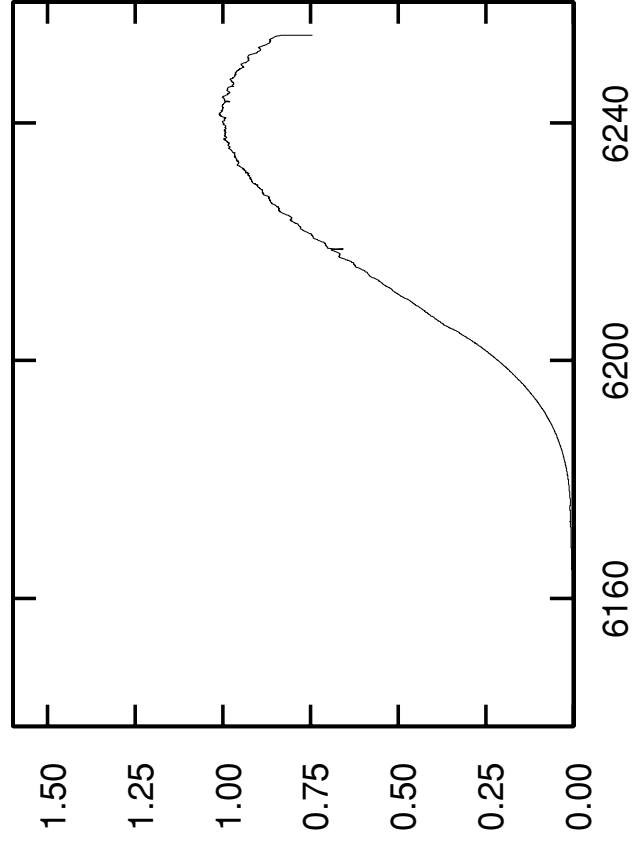
Order 98 - Central



Order 98 - Red

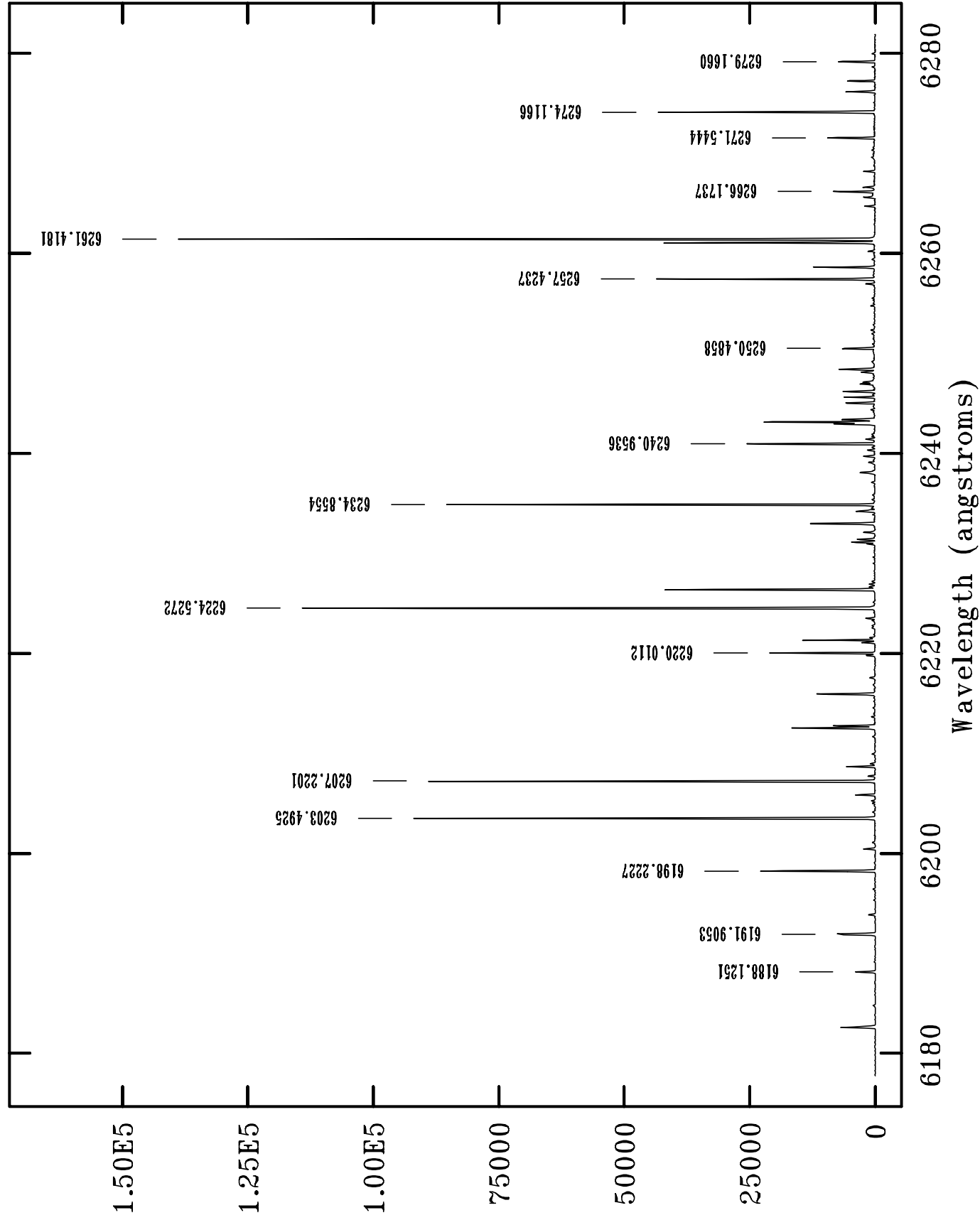


Order 98 - Blue

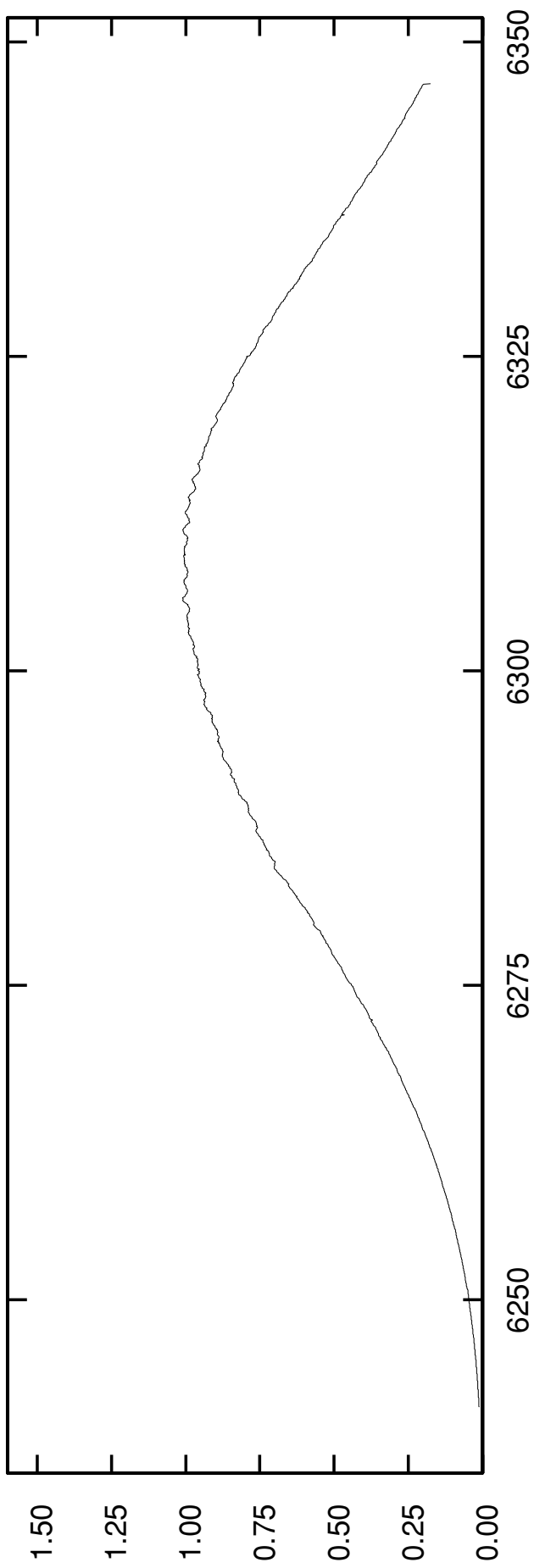


Wavelength (Angstroms)

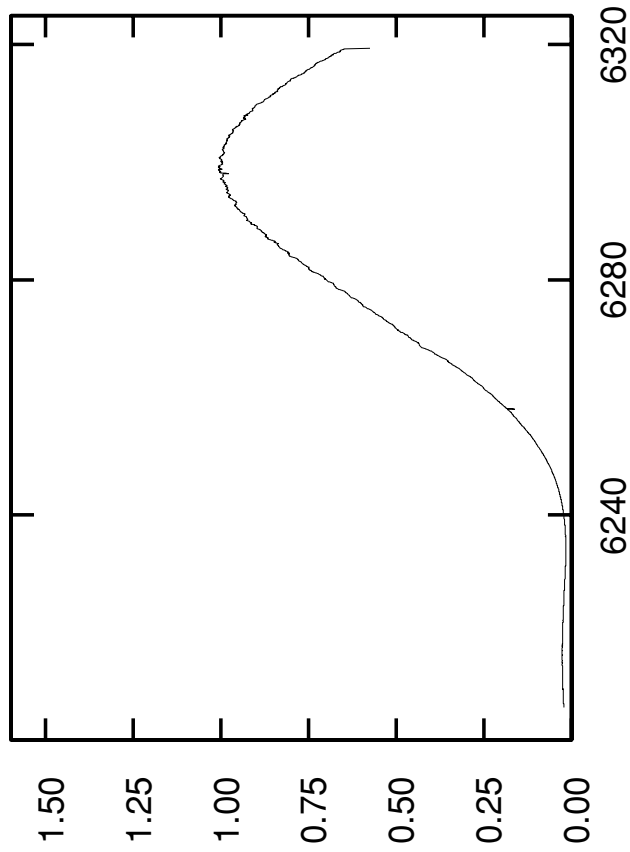
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:18:28 30-Mar-2002
Aperture 10, Image line 10, Order 98
identify thar_316g6948_red2: ThAr



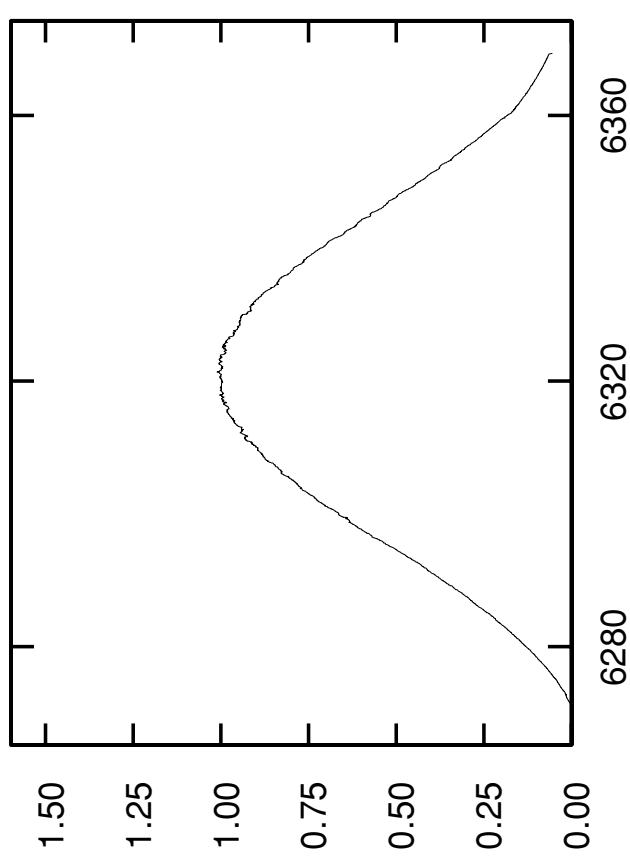
Order 97 - Central



Order 97 - Blue

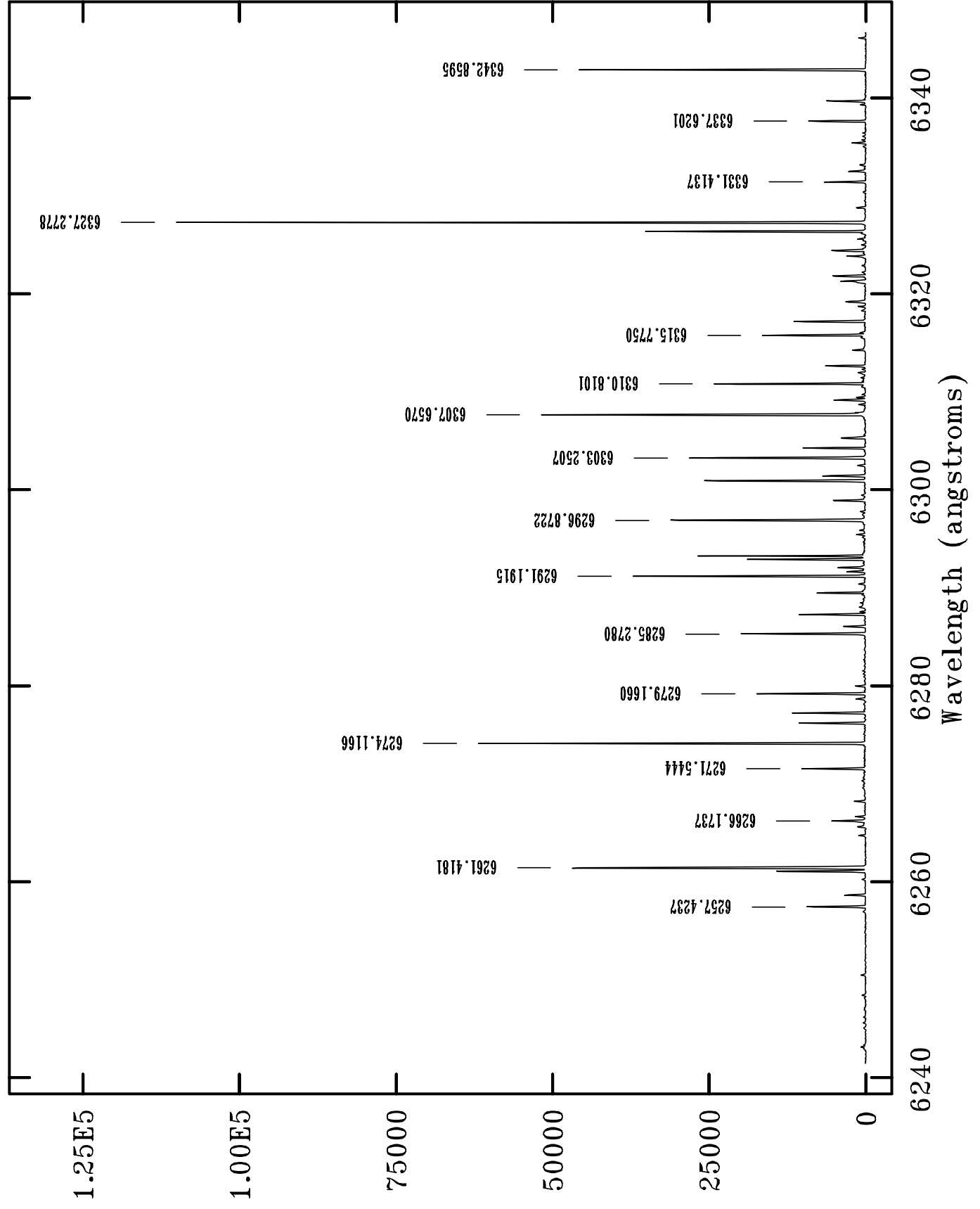


Order 97 - Red

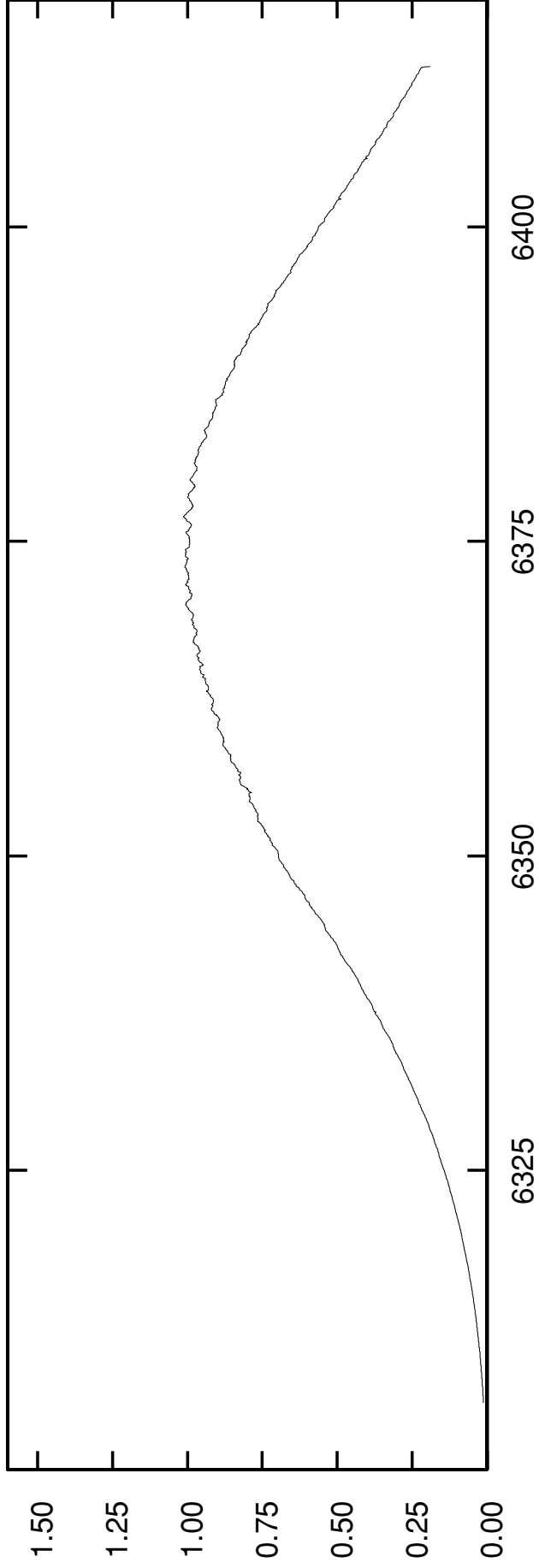


Wavelength (Angstroms)

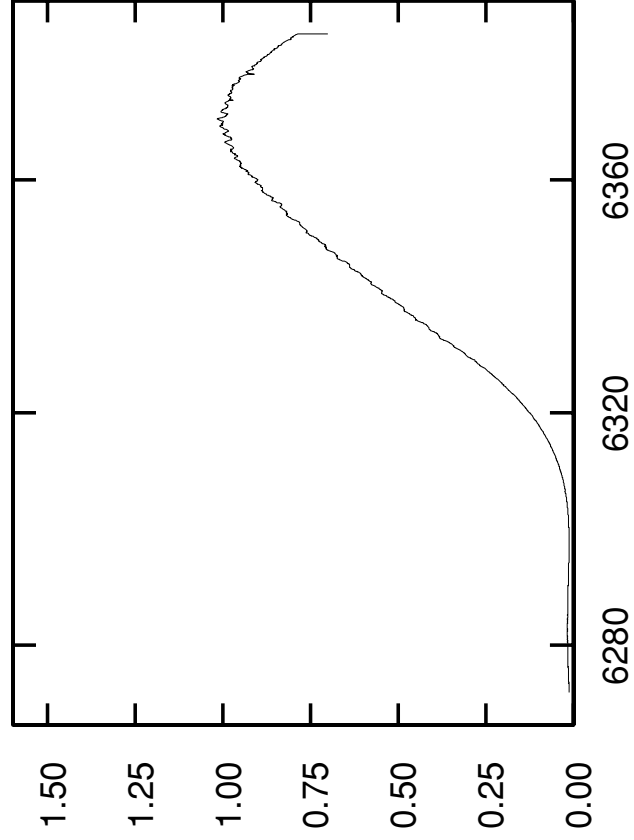
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:17:53 30-Mar-2002
Aperture 9, Image line 9, Order 97
ecidentify thar_316g6948_red2: ThAr



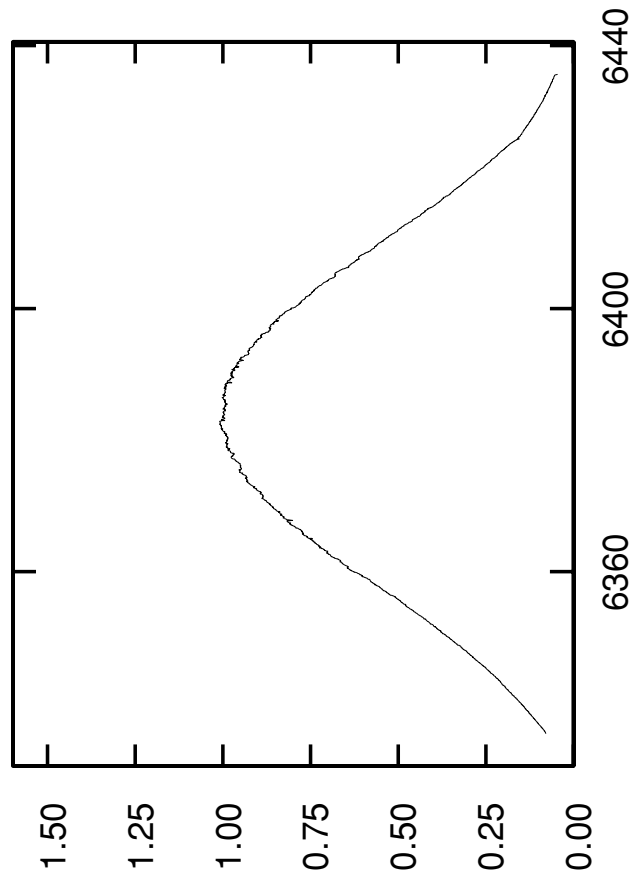
Order 96 - Central



Order 96 - Blue

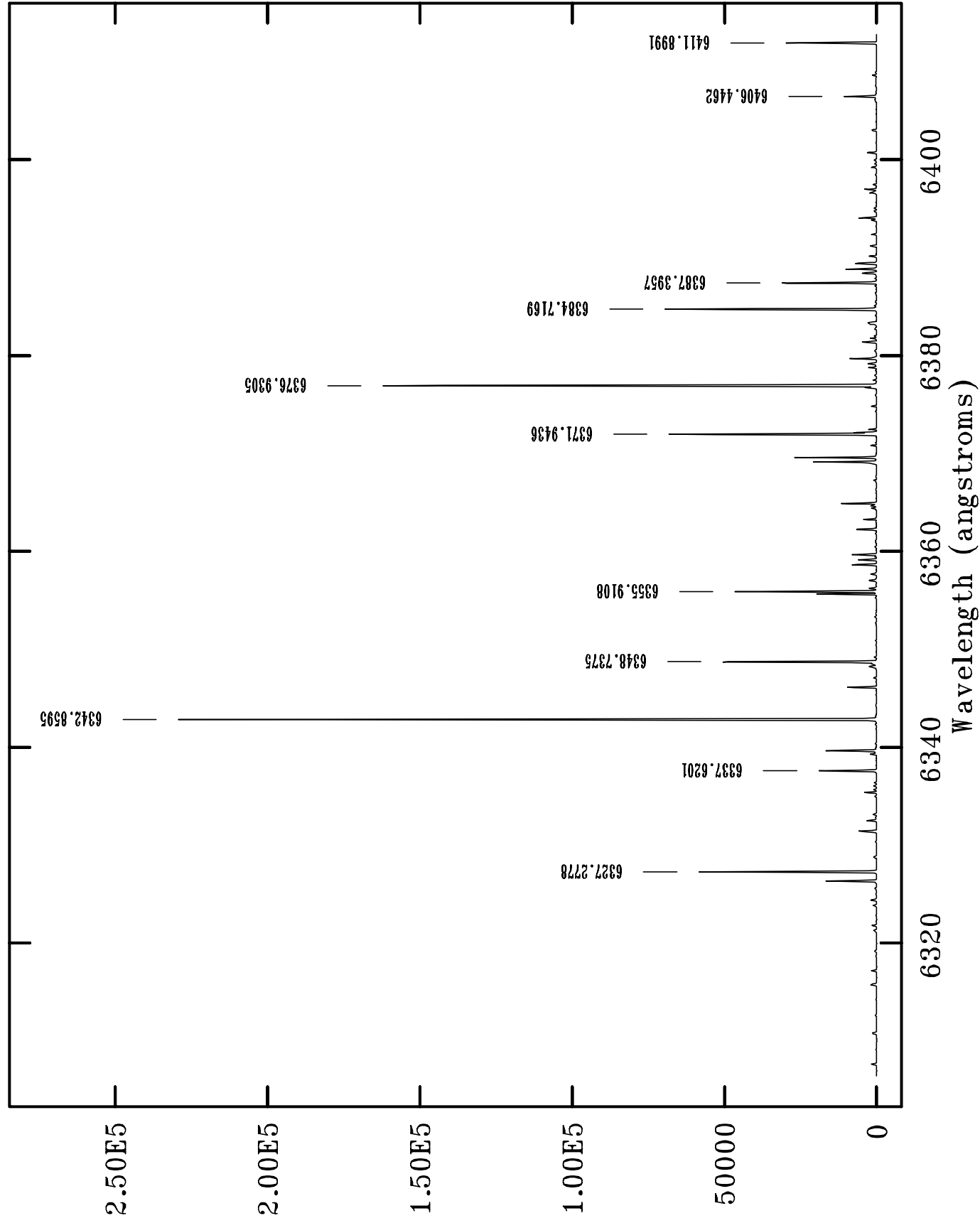


Order 96 - Red

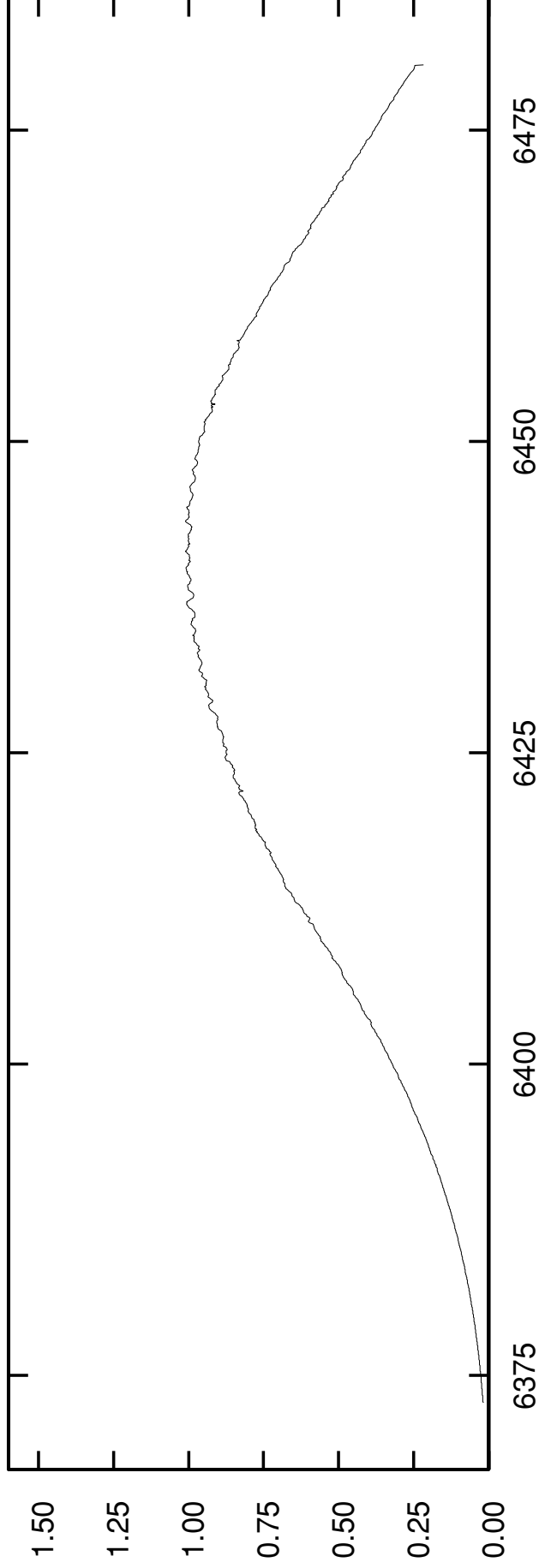


Wavelength (Angstroms)

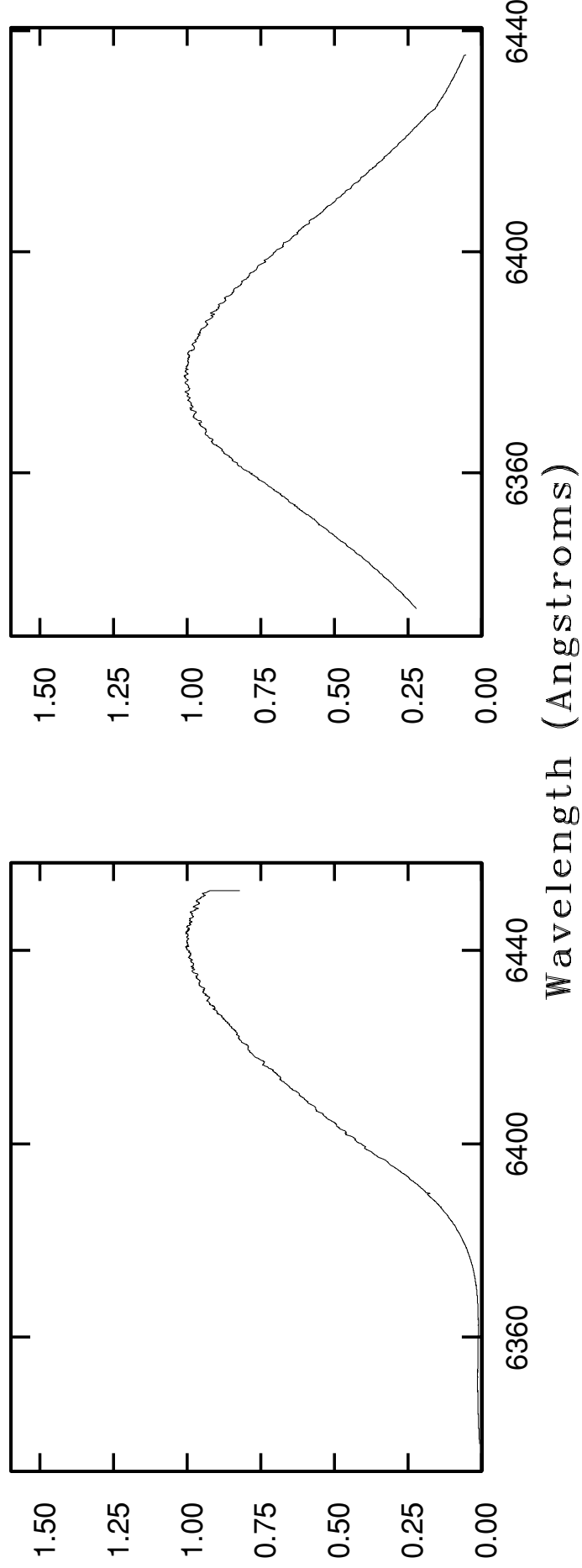
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:17:10 30-Mar-2002
Aperture 8, Image line 8, Order 96
ecidentify thar_316g6948_red2: ThAr



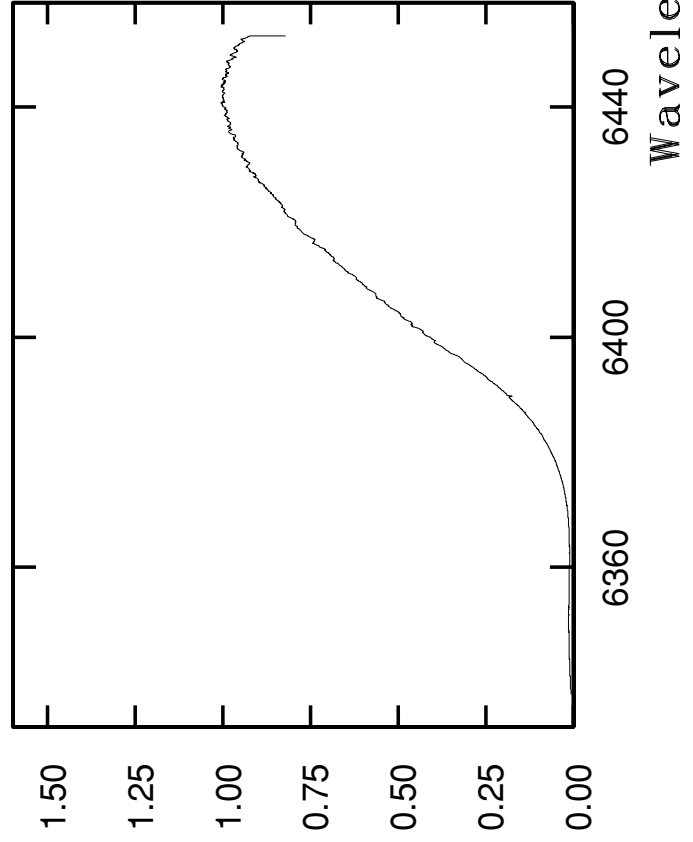
Order 95 - Central



Order 95 - Red

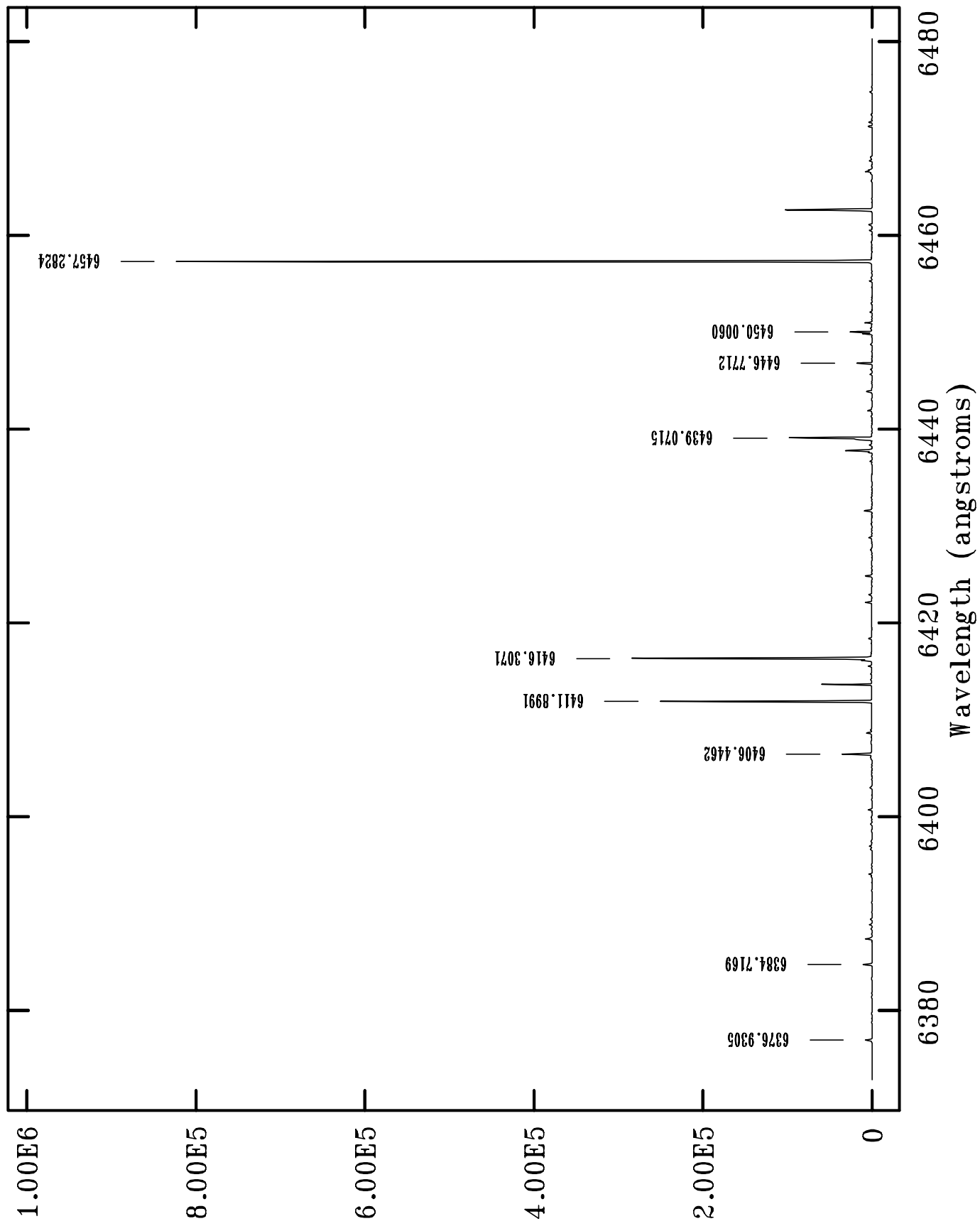


Order 95 - Blue

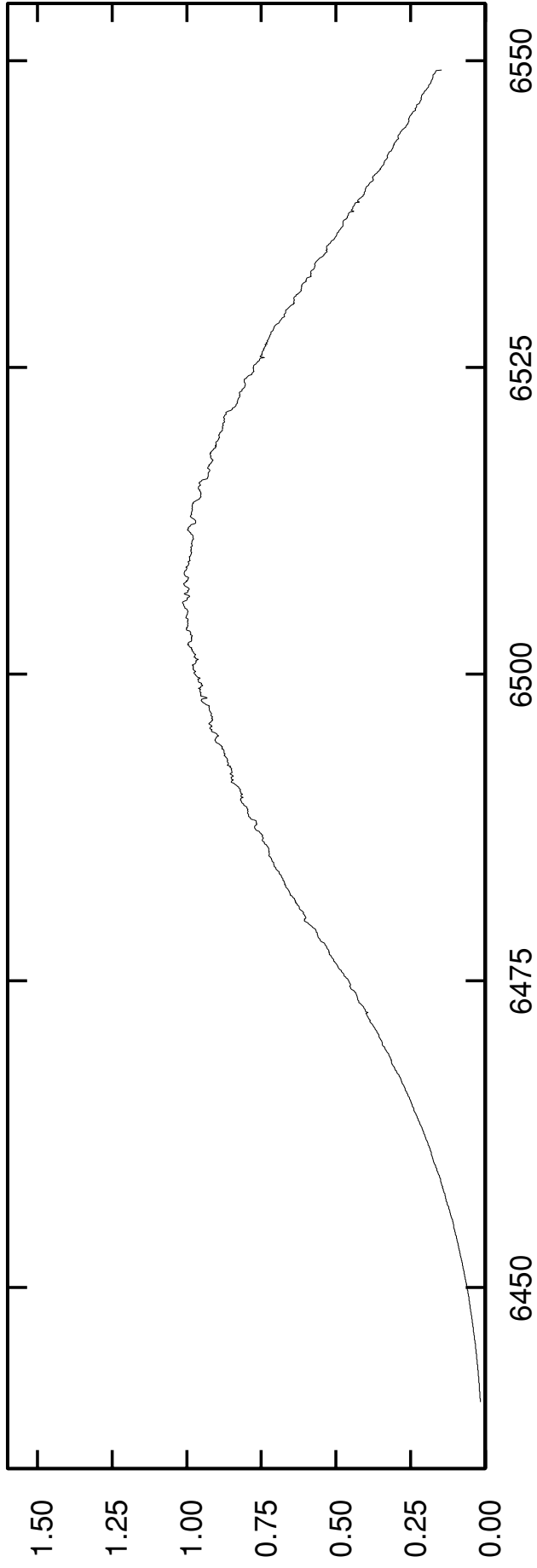


Wavelength (Angstroms)

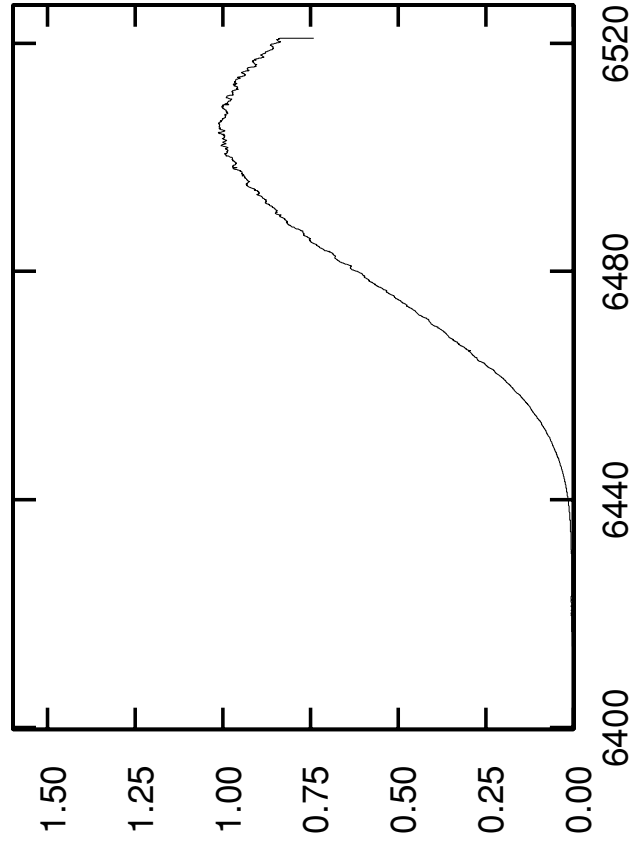
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:16:37 30-Mar-2002
Aperture 7, Image line 7, Order 95
ecidentify thar_316g6948_red2: ThAr



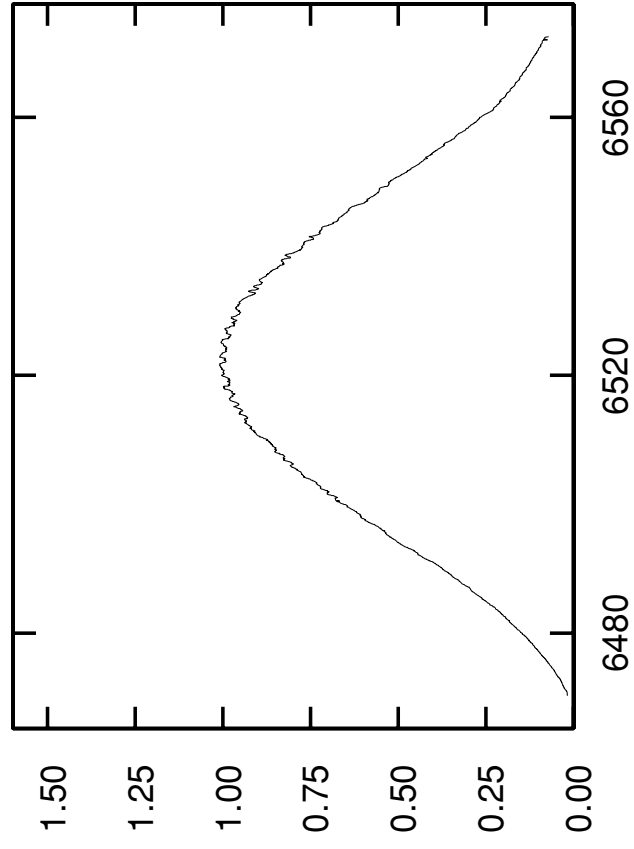
Order 94 - Central



Order 94 - Blue

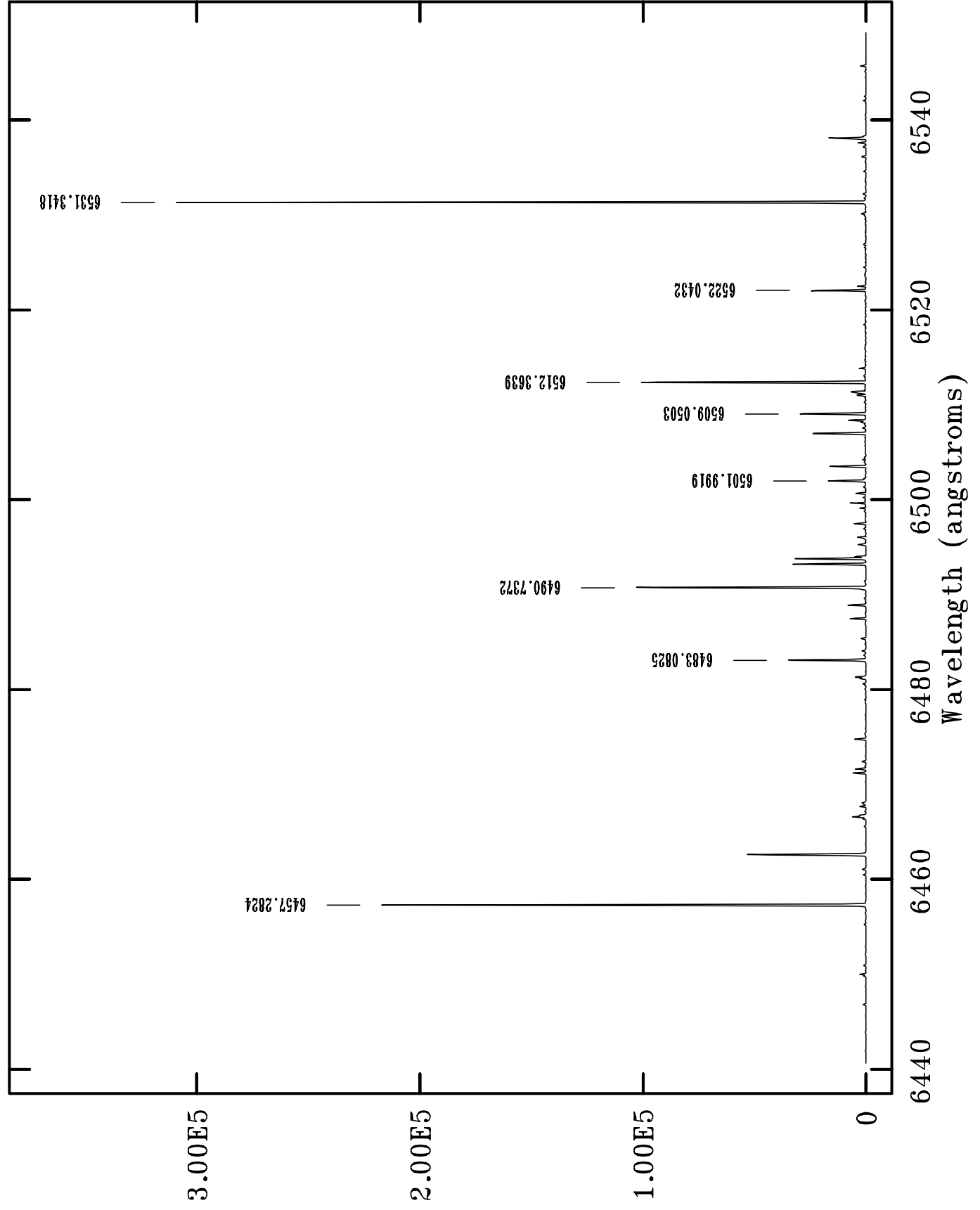


Order 94 - Red

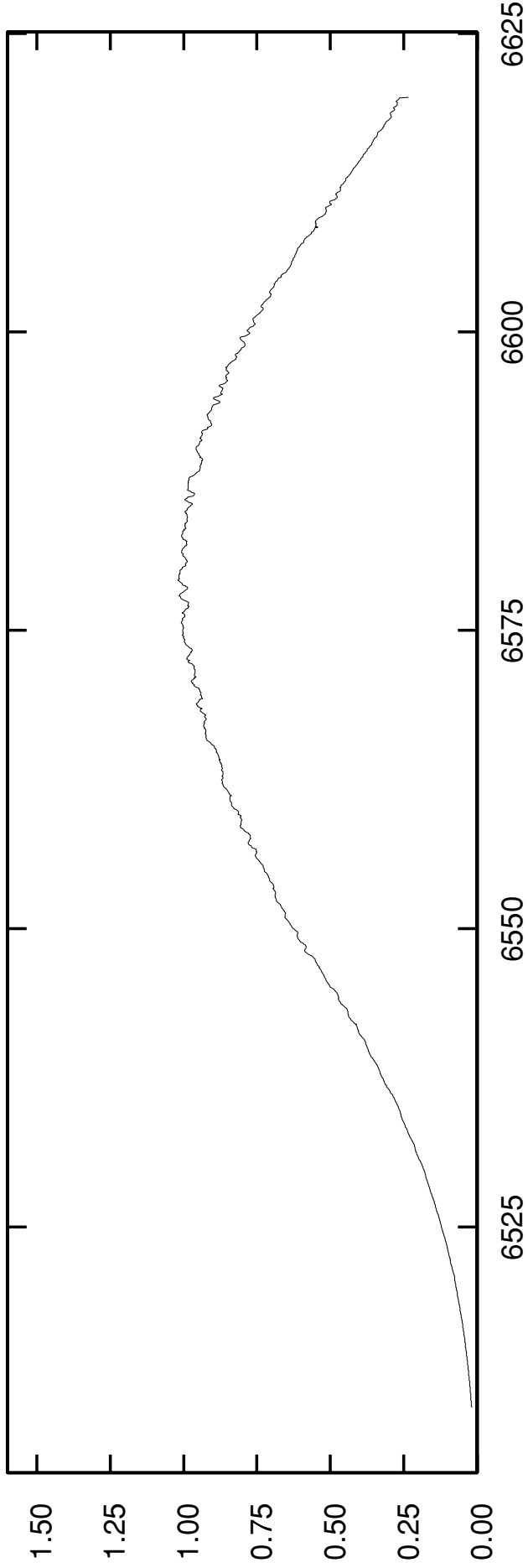


Wavelength (Angstroms)

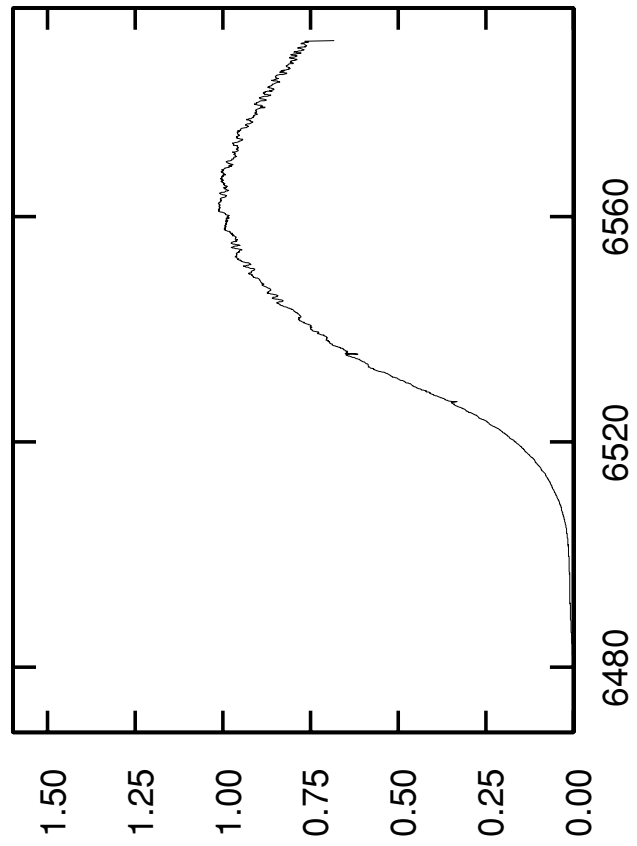
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:15:45 30-Mar-2002
Aperture 6, Image line 6, Order 94
ecidentify thar_316g6948_red2: ThAr



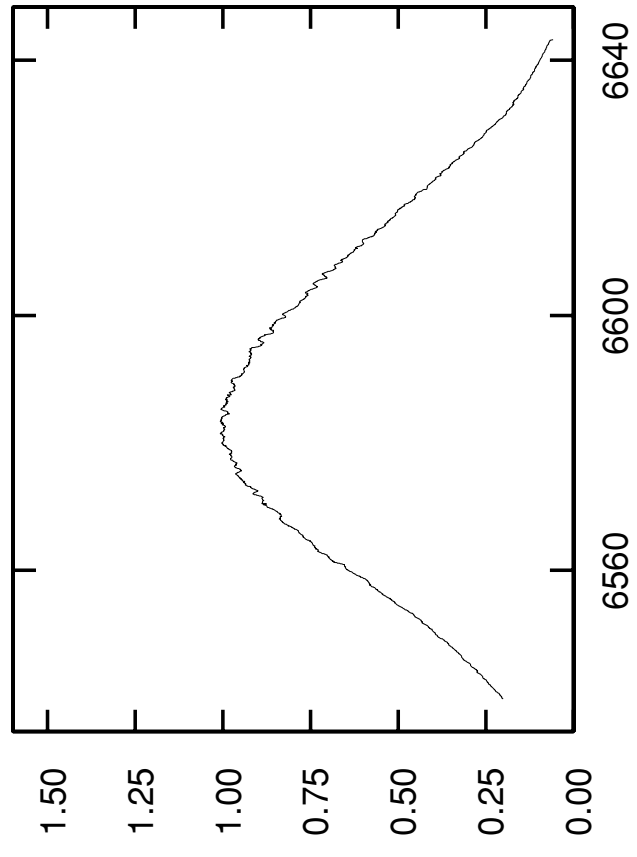
Order 93 - Central



Order 93 - Blue

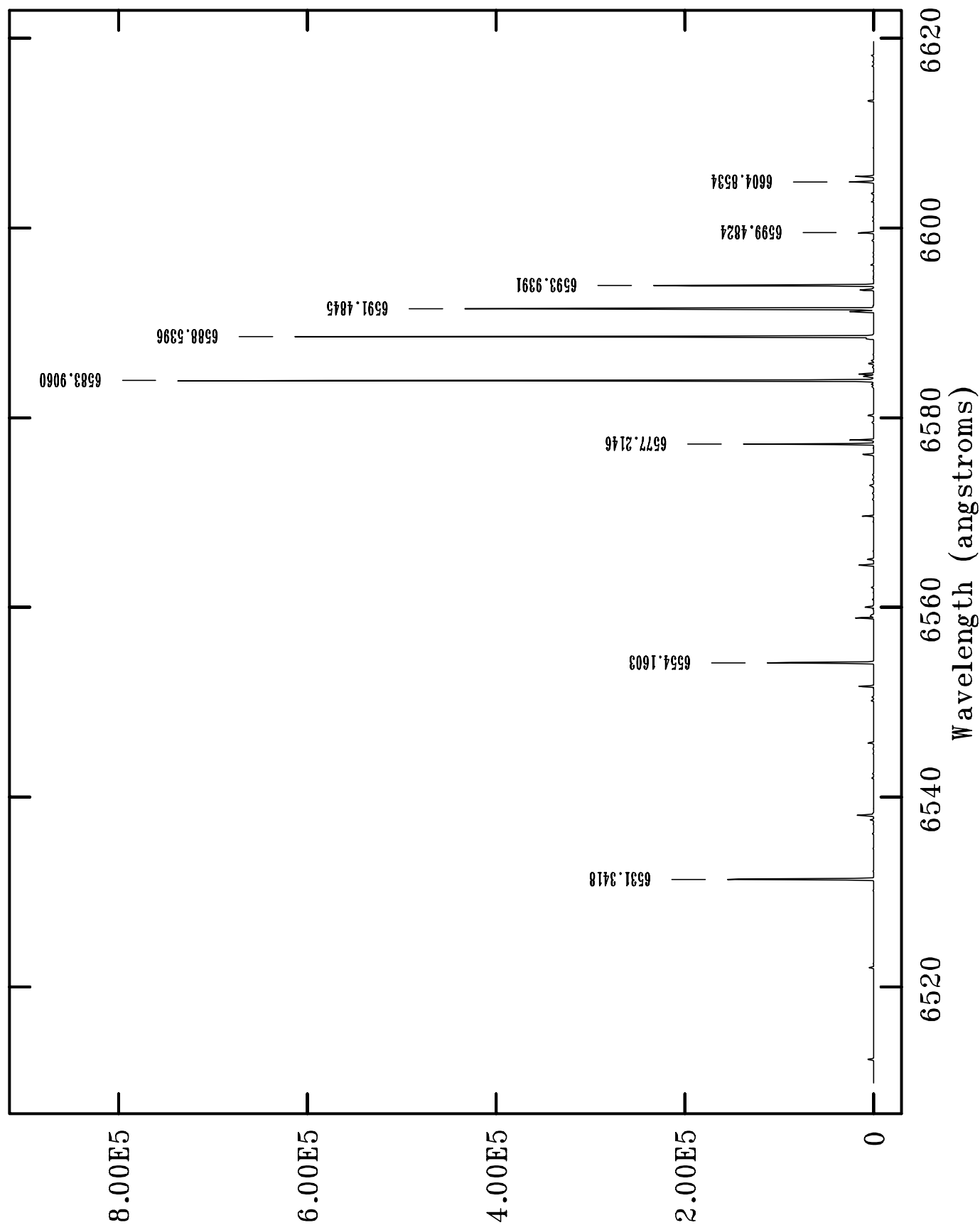


Order 93 - Red

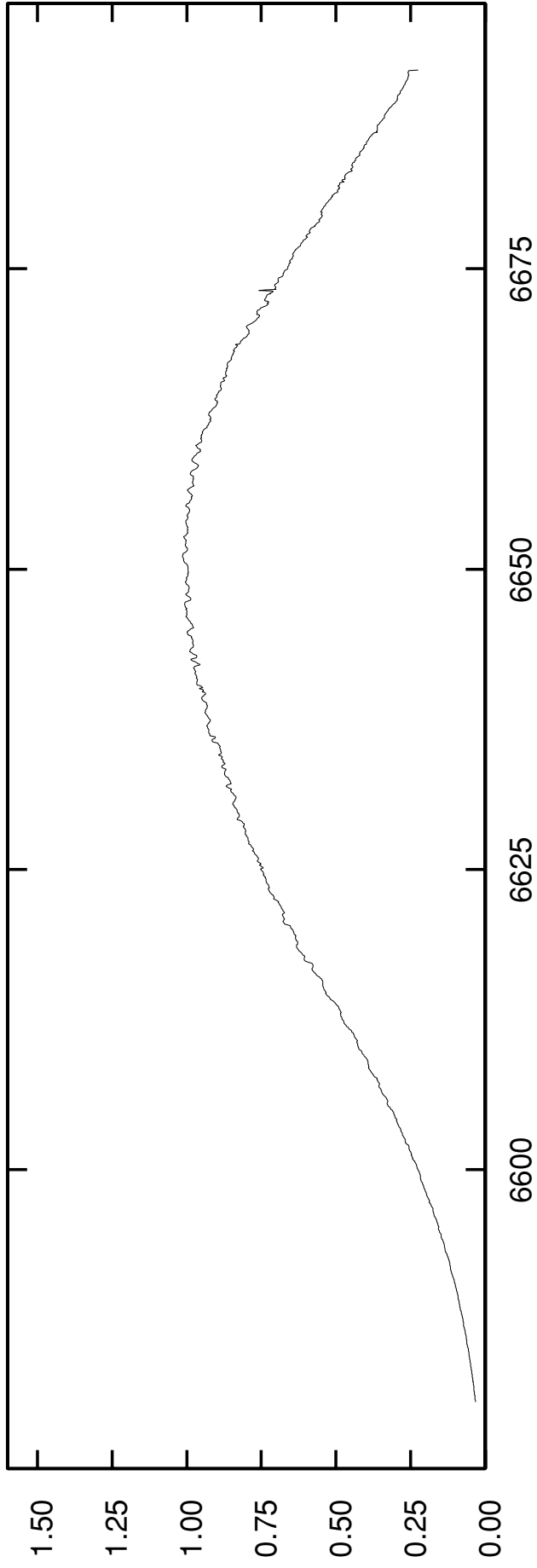


Wavelength (Angstroms)

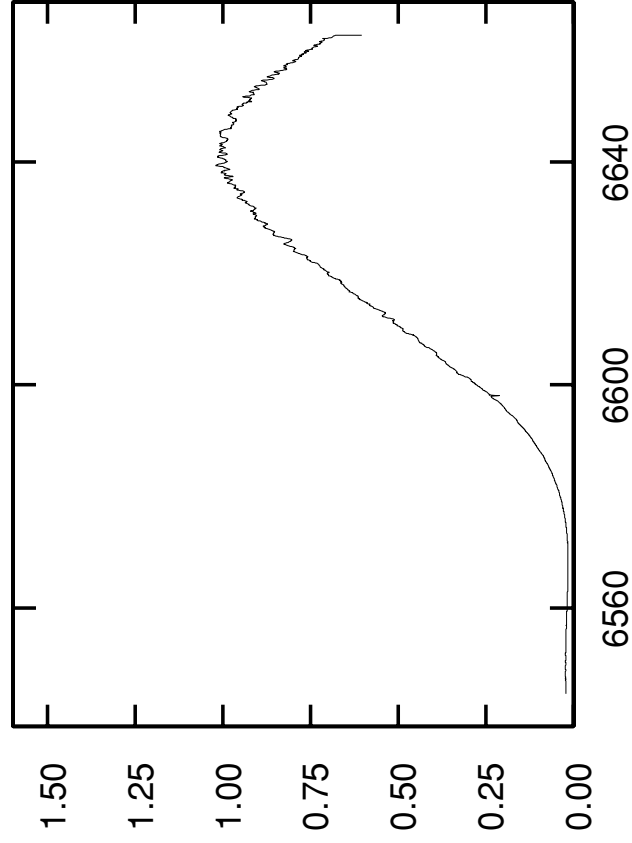
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:15:11 30-Mar-2002
Aperture 5, Image line 5, Order 93
ecidentify thar_316g6948_red2: ThAr



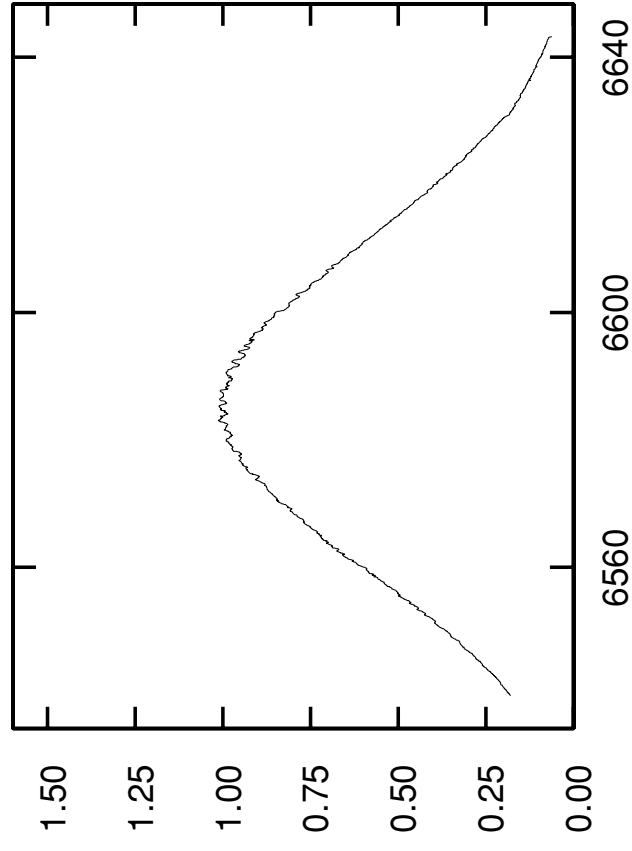
Order 92 - Central



Order 92 - Blue

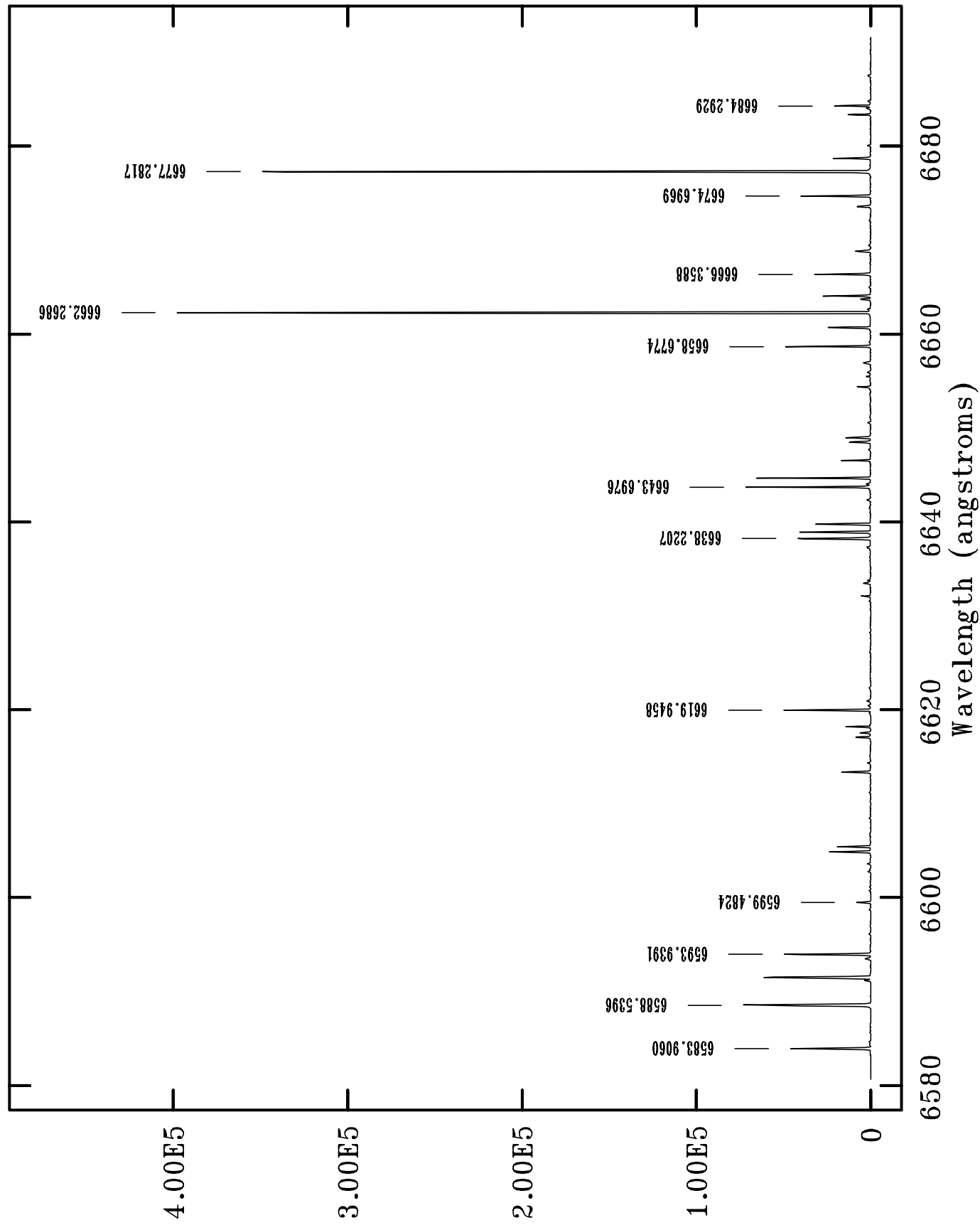


Order 92 - Red

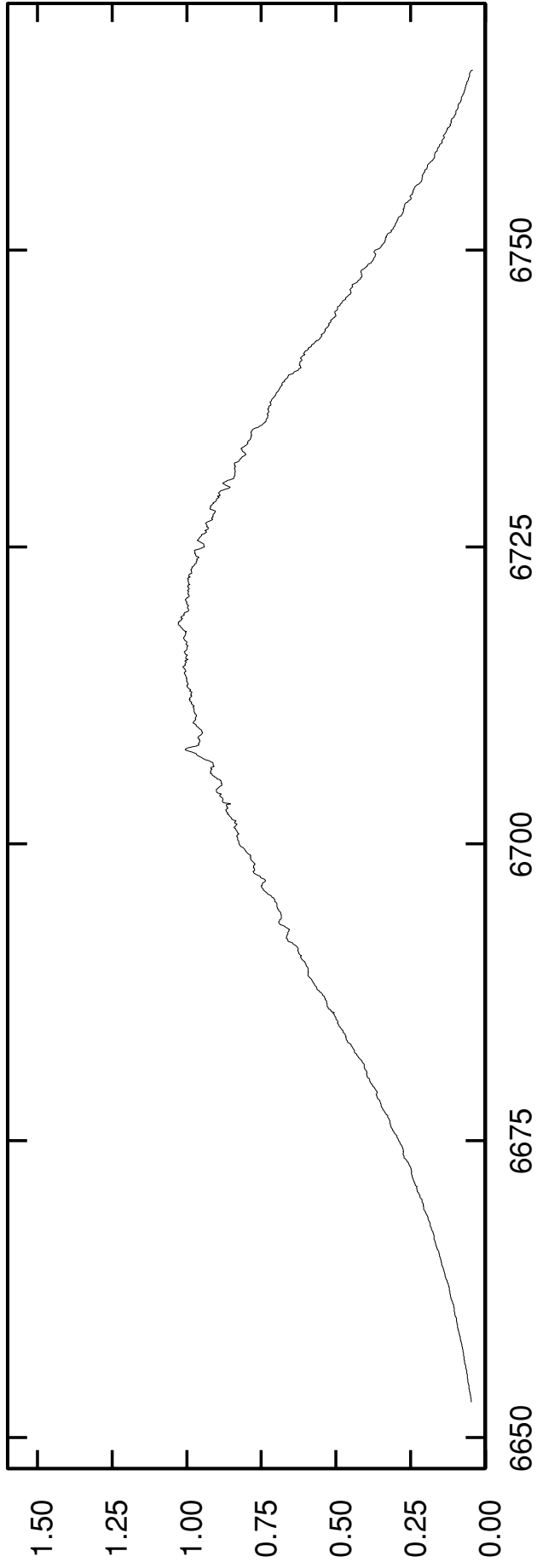


Wavelength (Angstroms)

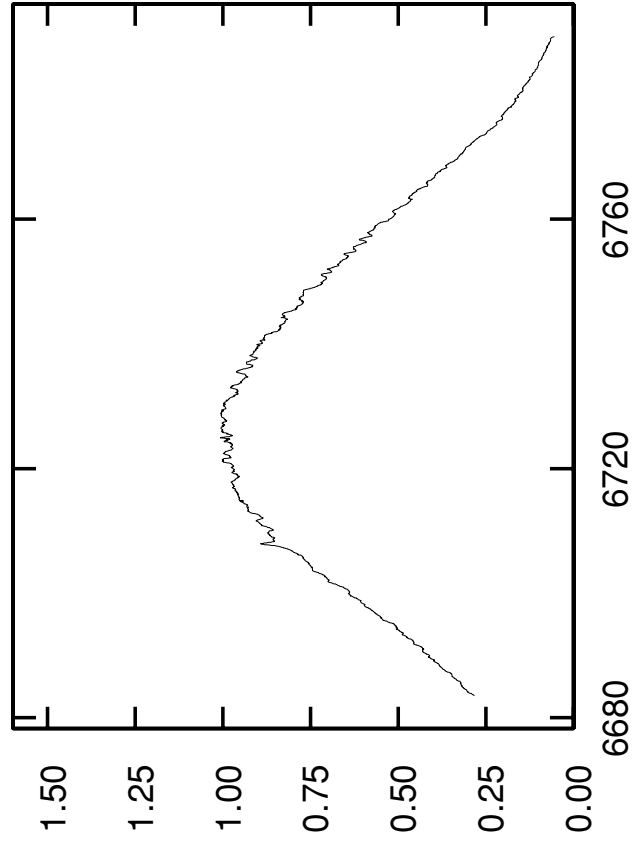
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:14:42 30-Mar-2002
Aperture 4, Image line 4, Order 92
ecidentify thar_316g6948_red2: ThAr



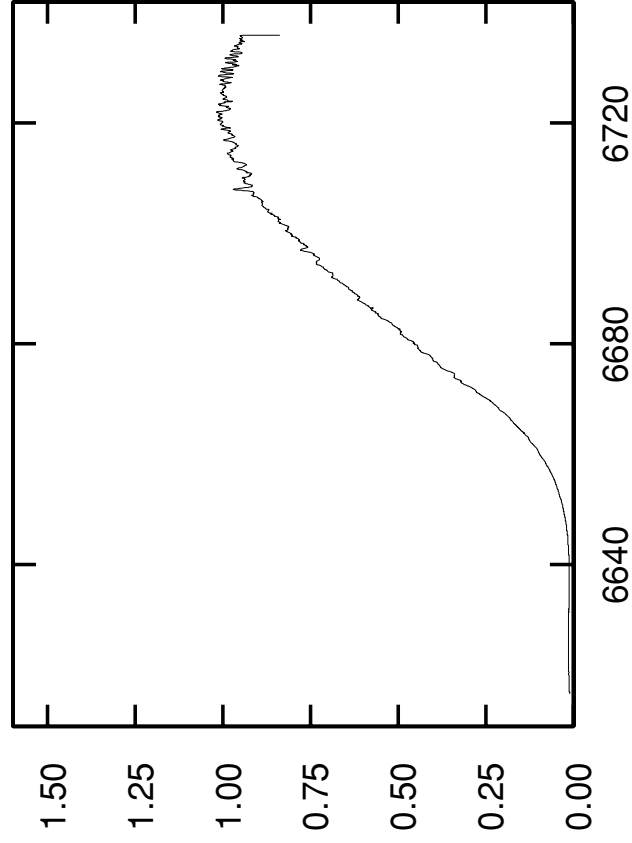
Order 91 - Central



Order 91 - Red

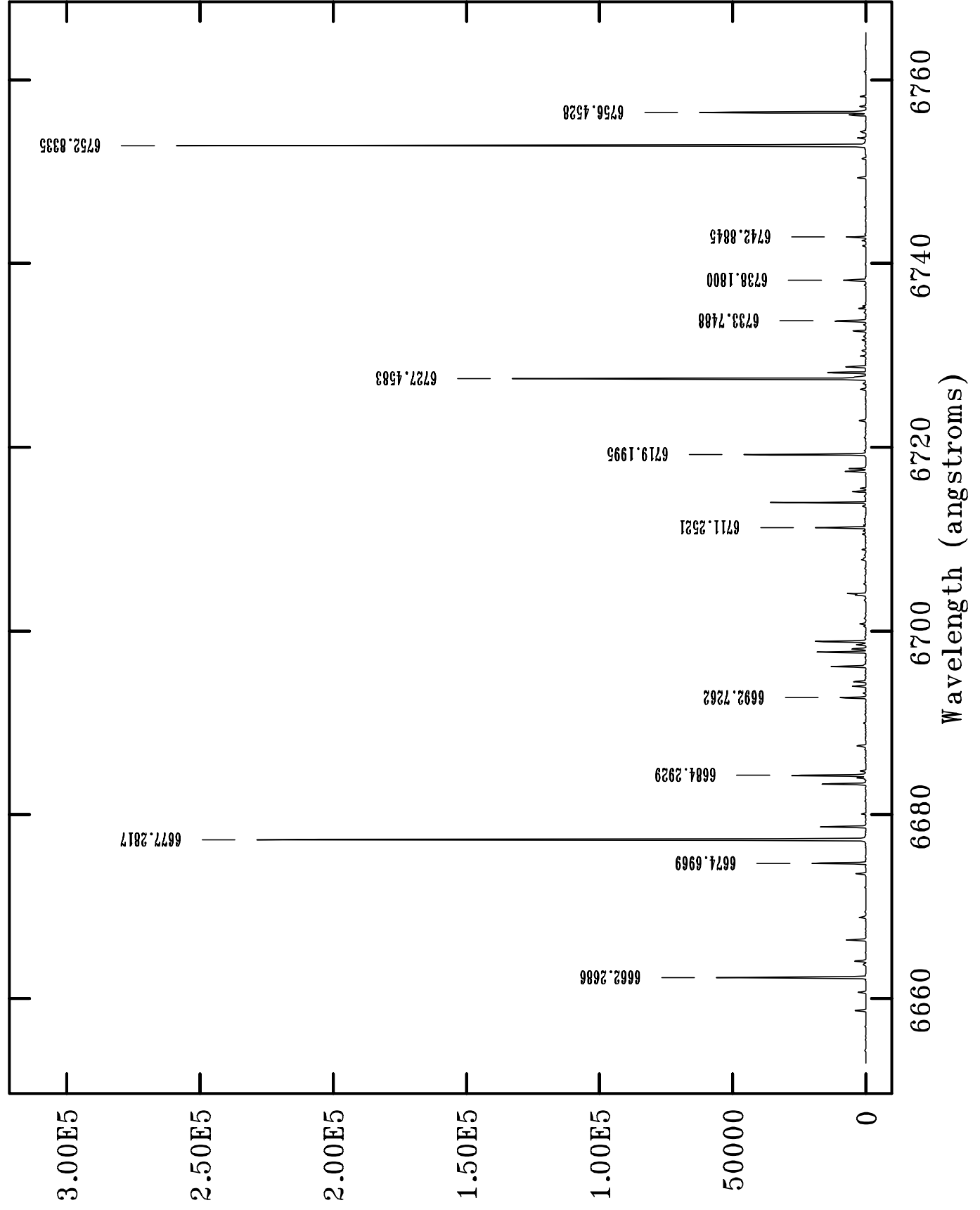


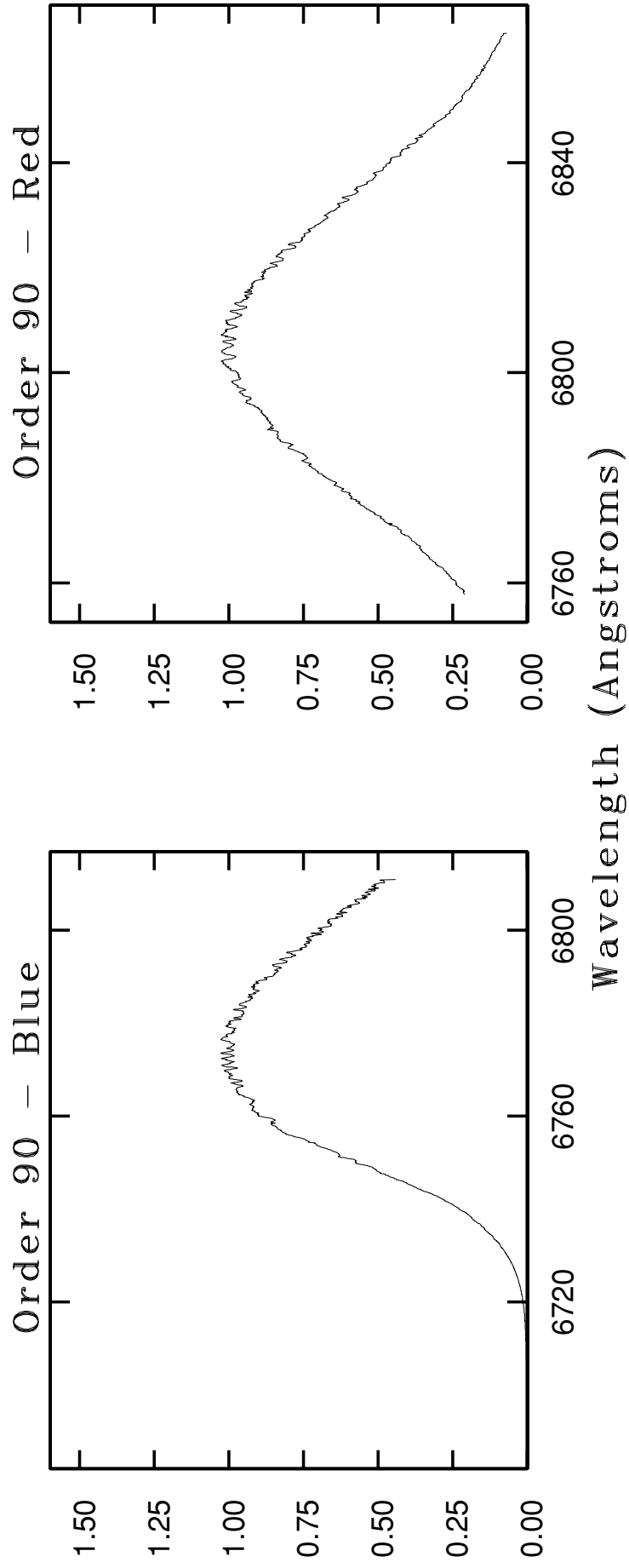
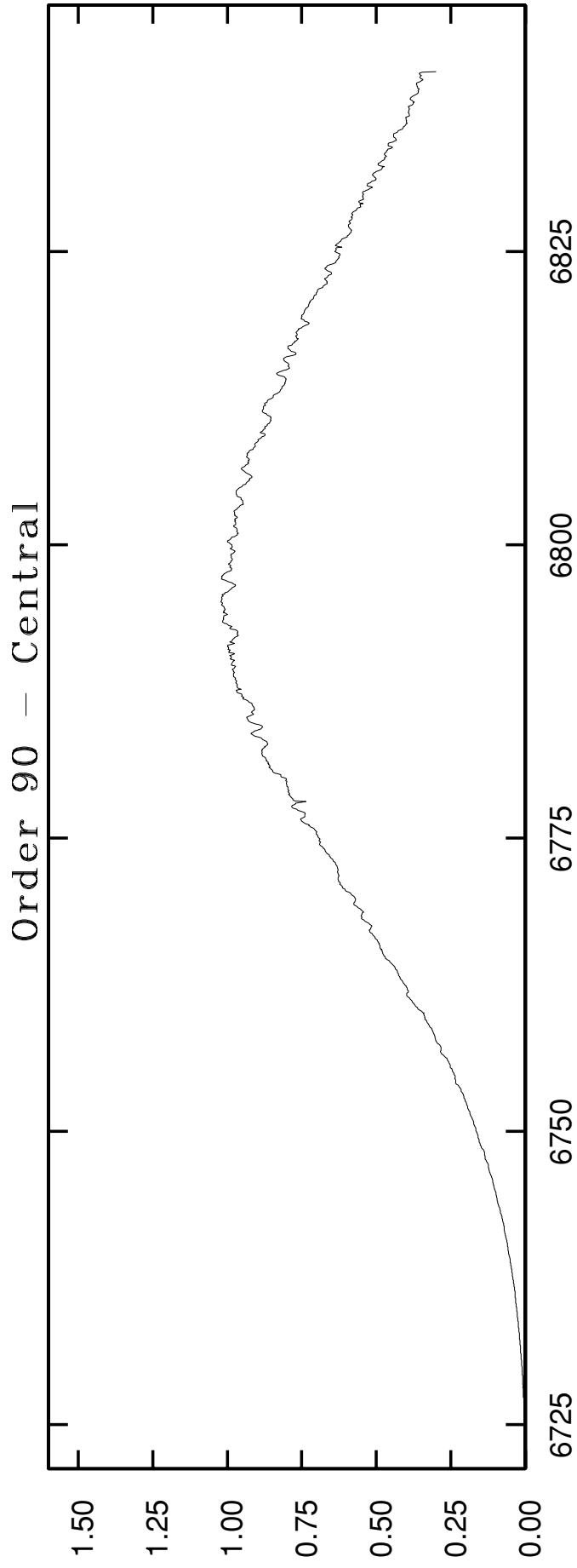
Order 91 - Blue



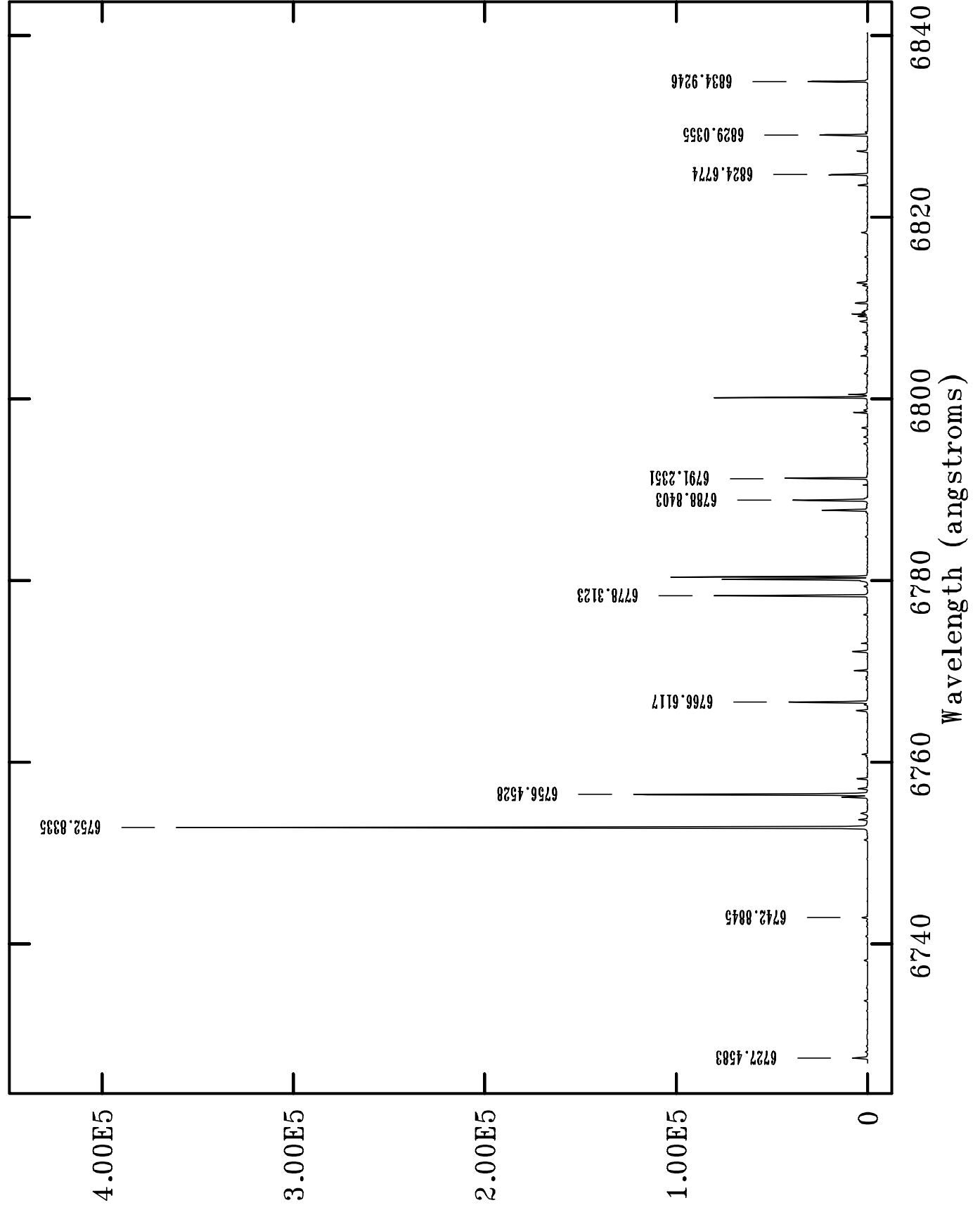
Wavelength (Angstroms)

NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:14:05 30-Mar-2002
Aperture 3, Image line 3, Order 91
ecidentify thar_316g6948_red2: ThAr

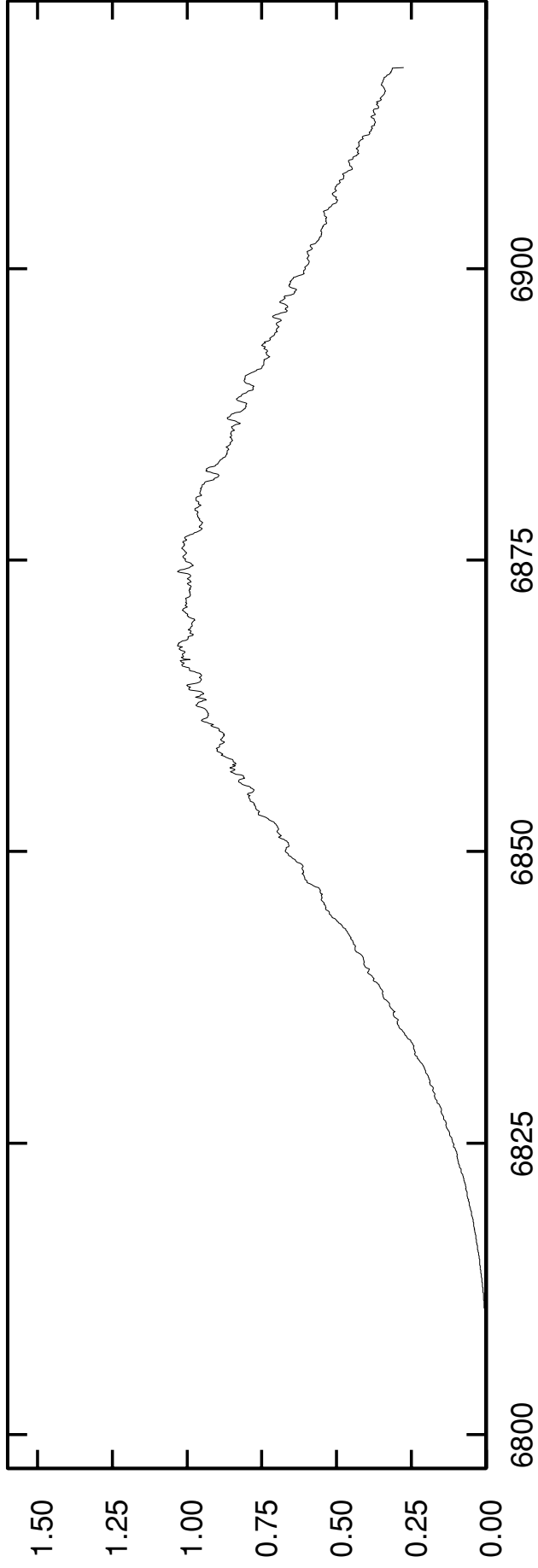




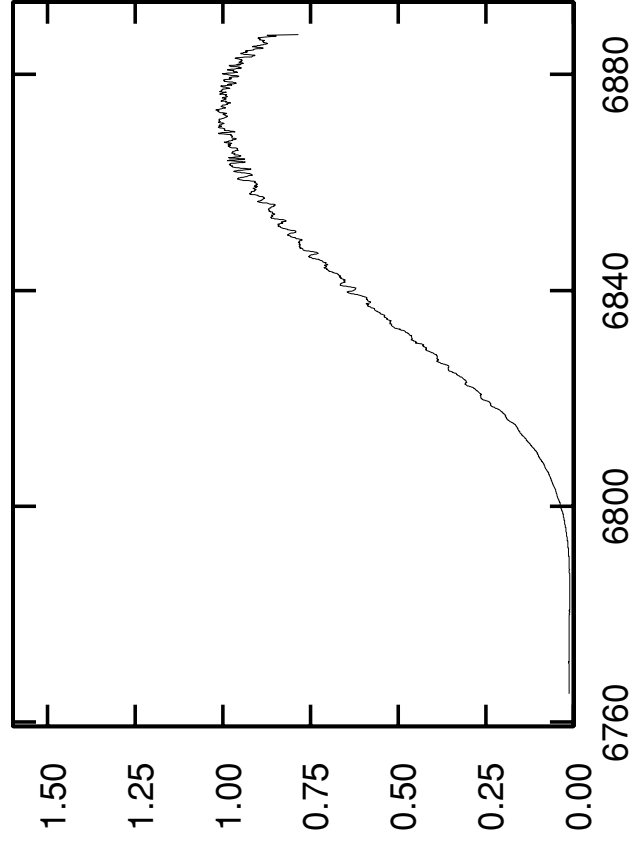
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:13:34 30-Mar-2002
Aperture 2, Image line 2, Order 90
ecidentify thar_316g6948_red2: ThAr



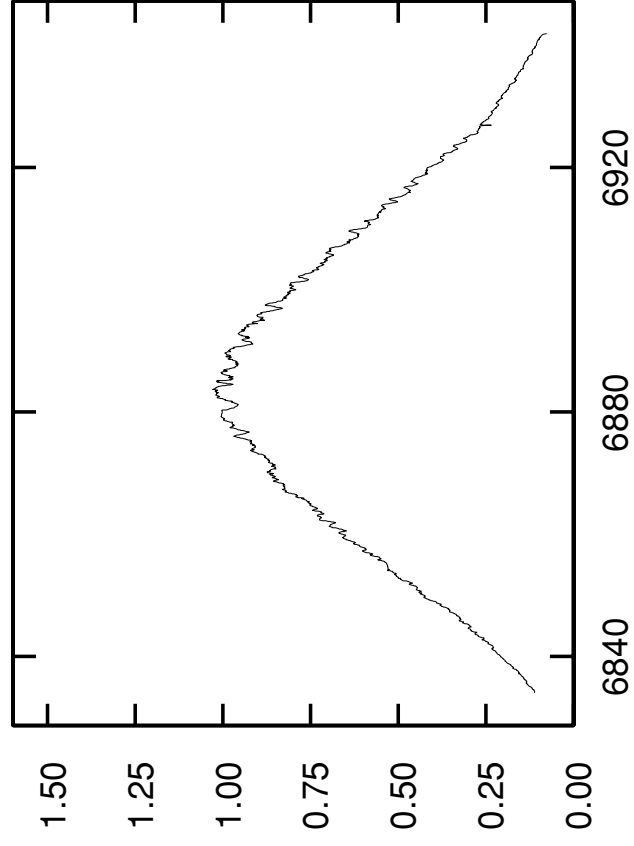
Order 89 - Central



Order 89 - Blue

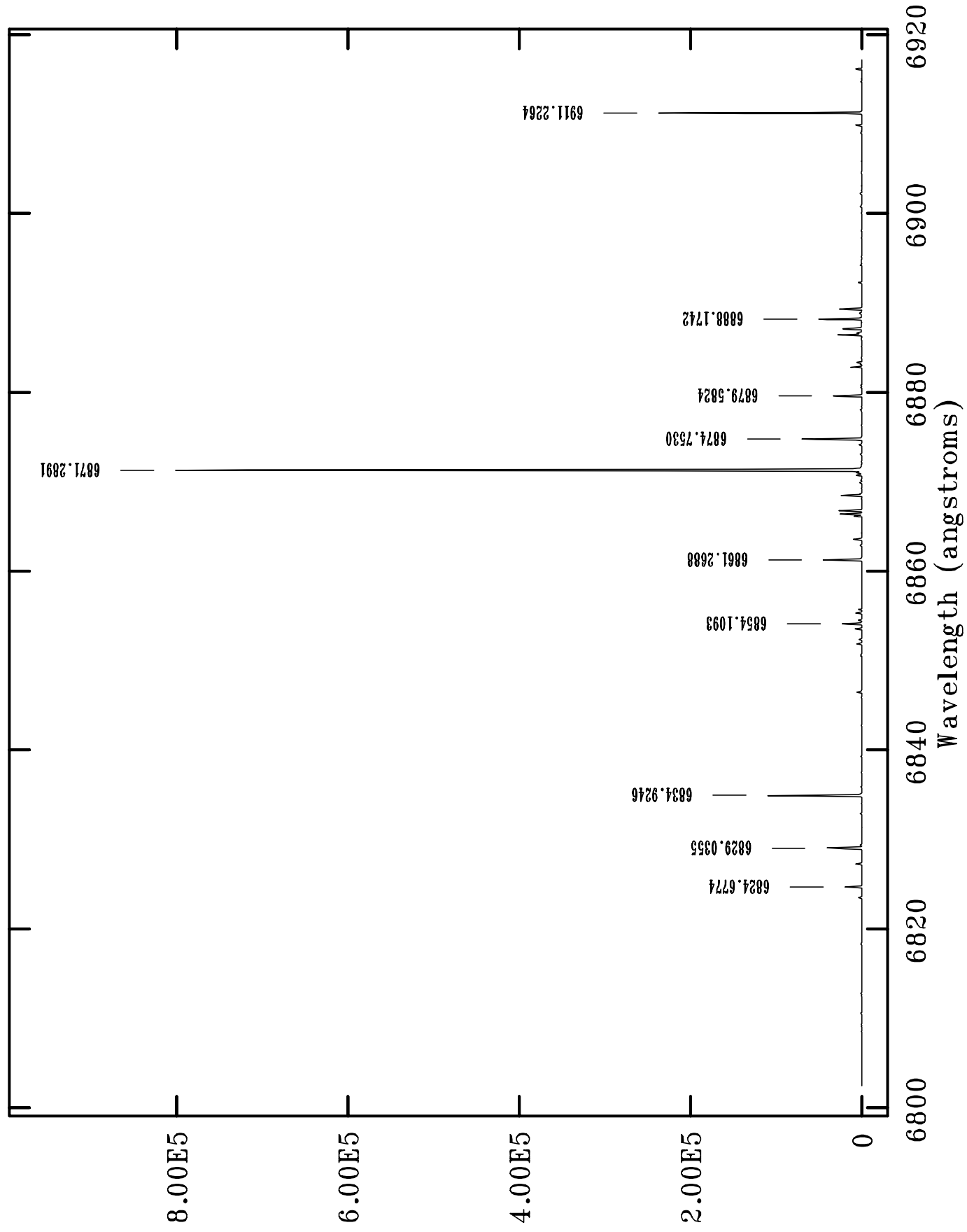


Order 89 - Red

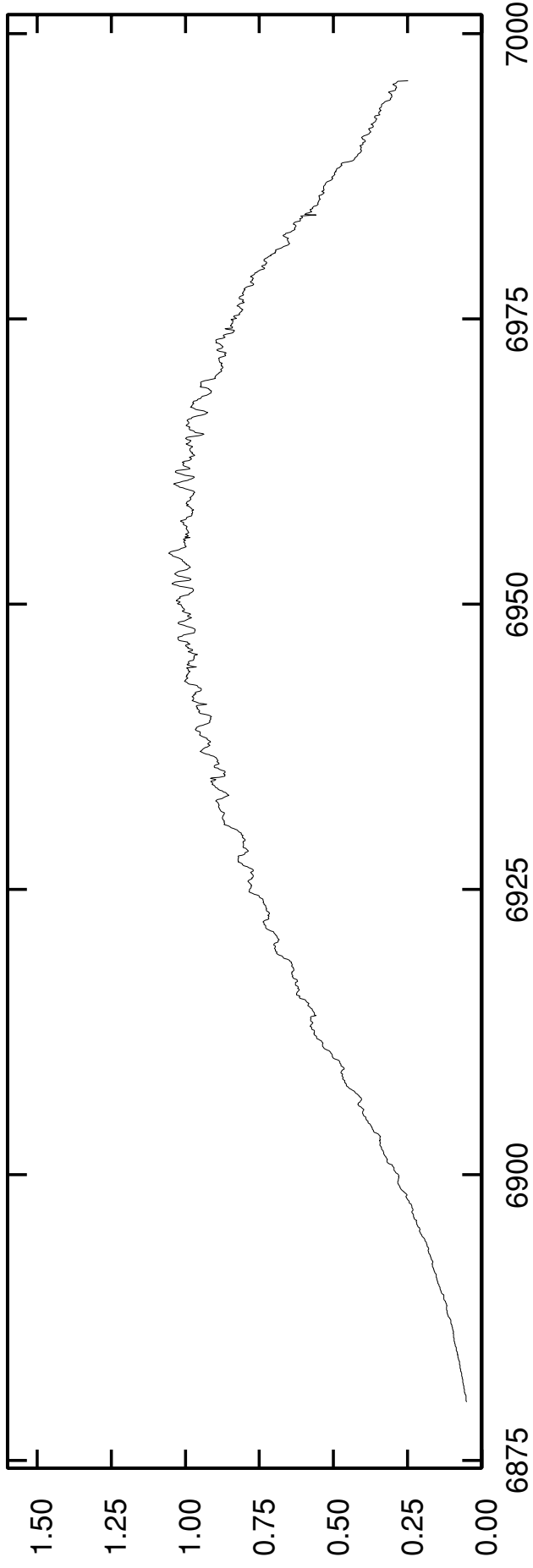


Wavelength (Angstroms)

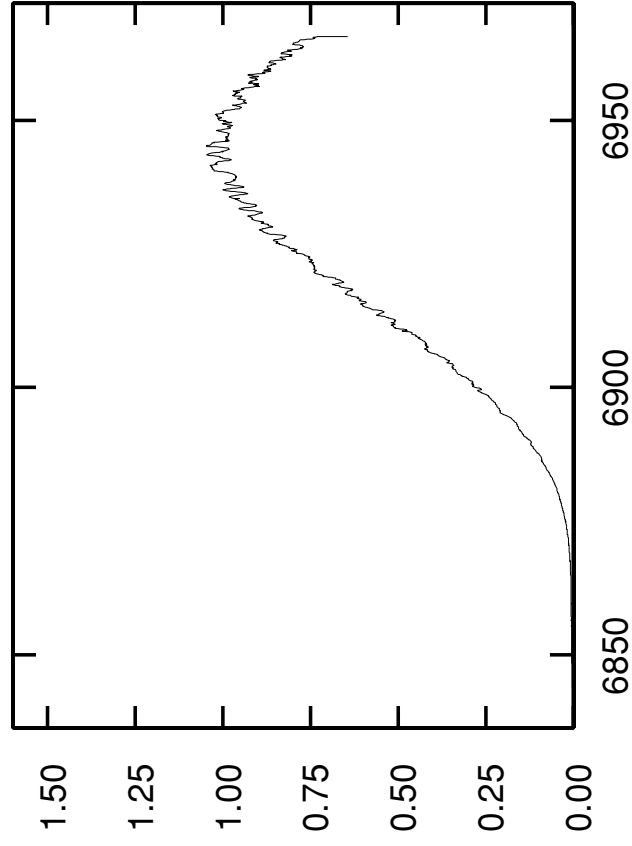
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:12:56 30-Mar-2002
Aperture 1, Image line 1, Order 89
ecidentify thar_316g6948_red2: ThAr



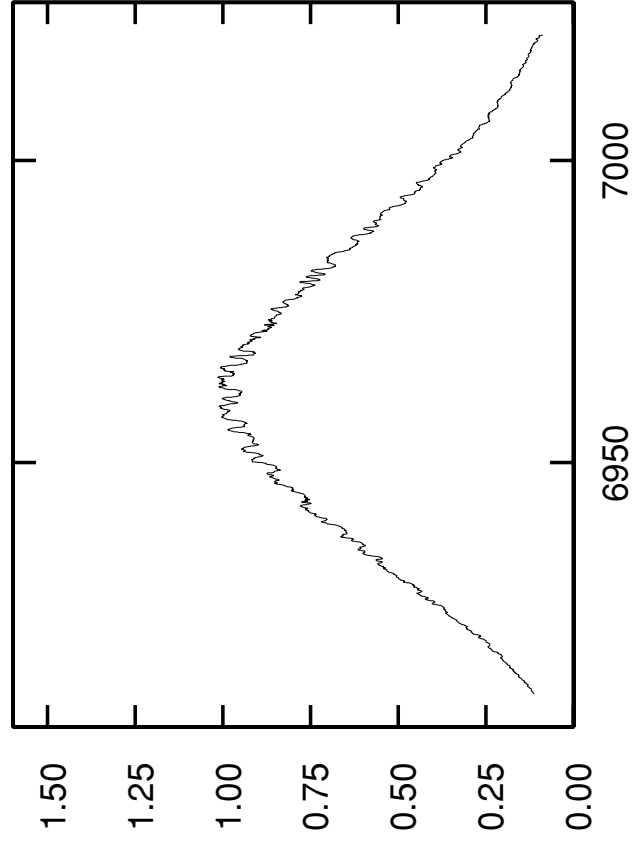
Order 88 - Central



Order 88 - Blue

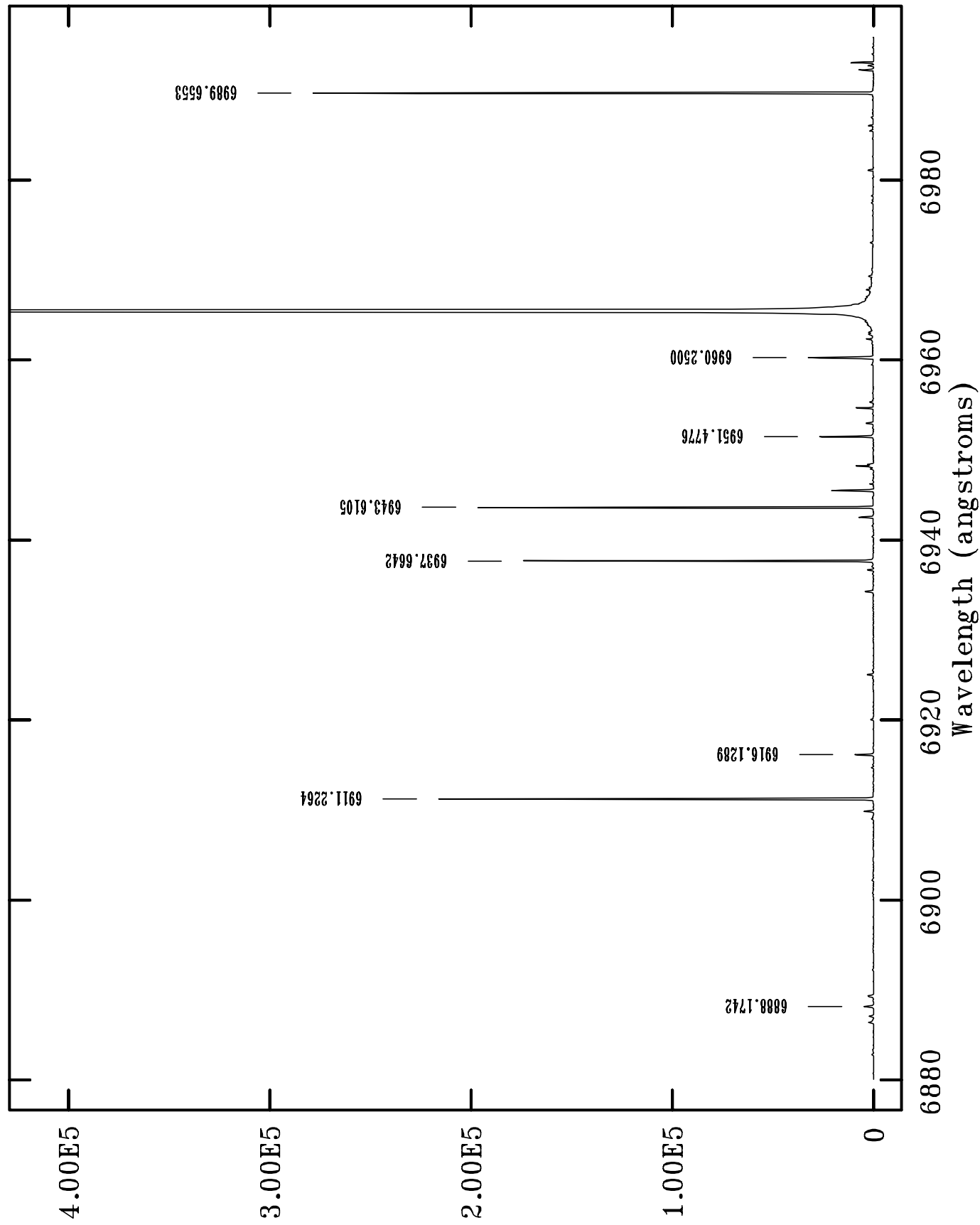


Order 88 - Red

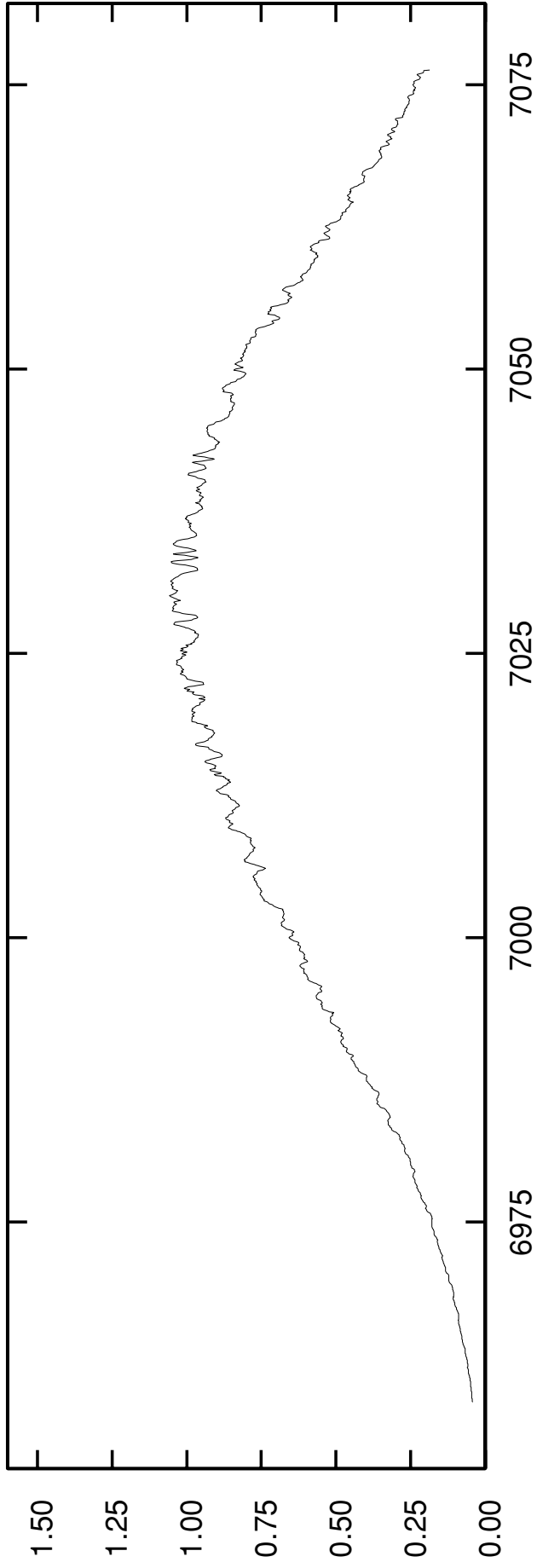


Wavelength (Angstroms)

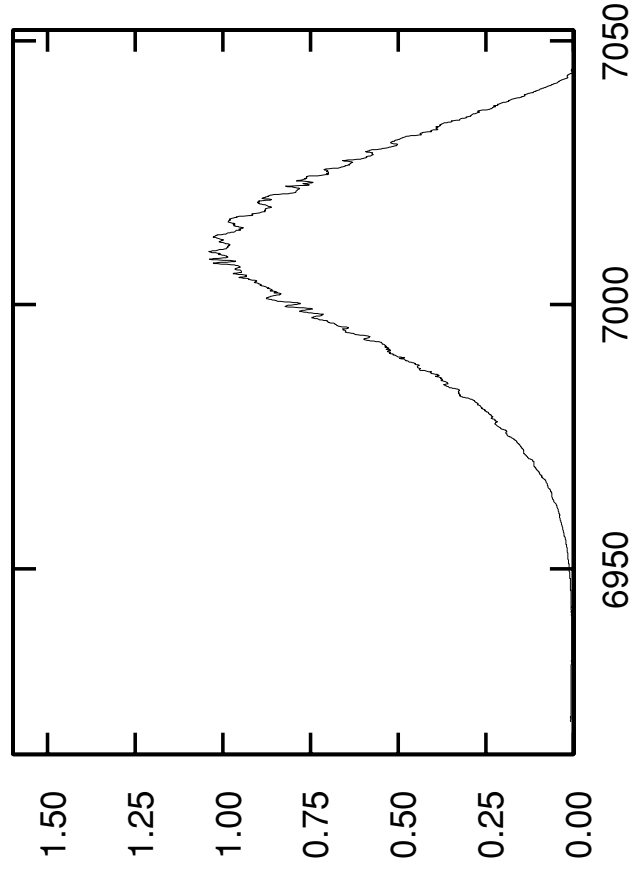
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:29:39 30-Mar-2002
Aperture 12, Image line 12, Order 88
ecidentify thar_316g7940_red2: ThAr



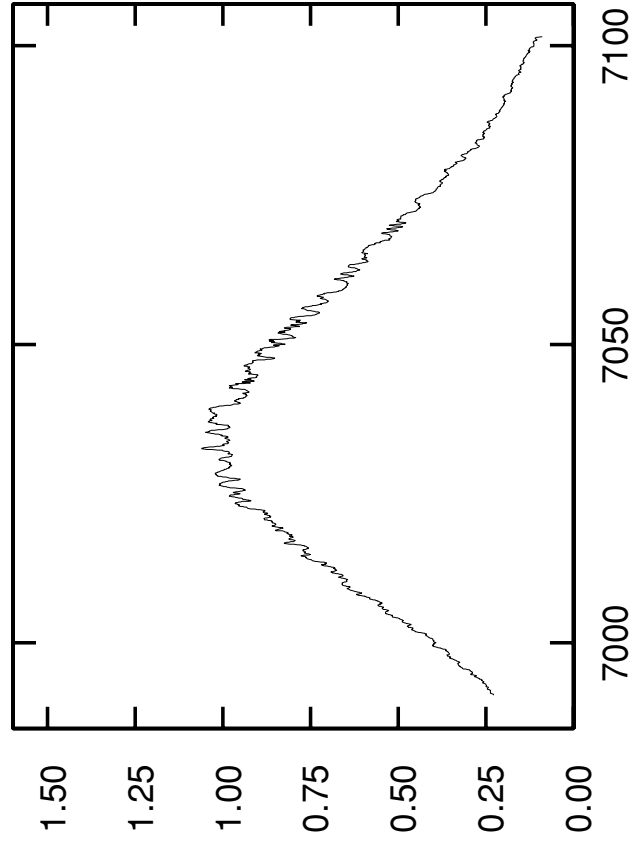
Order 87 - Central



Order 87 - Blue

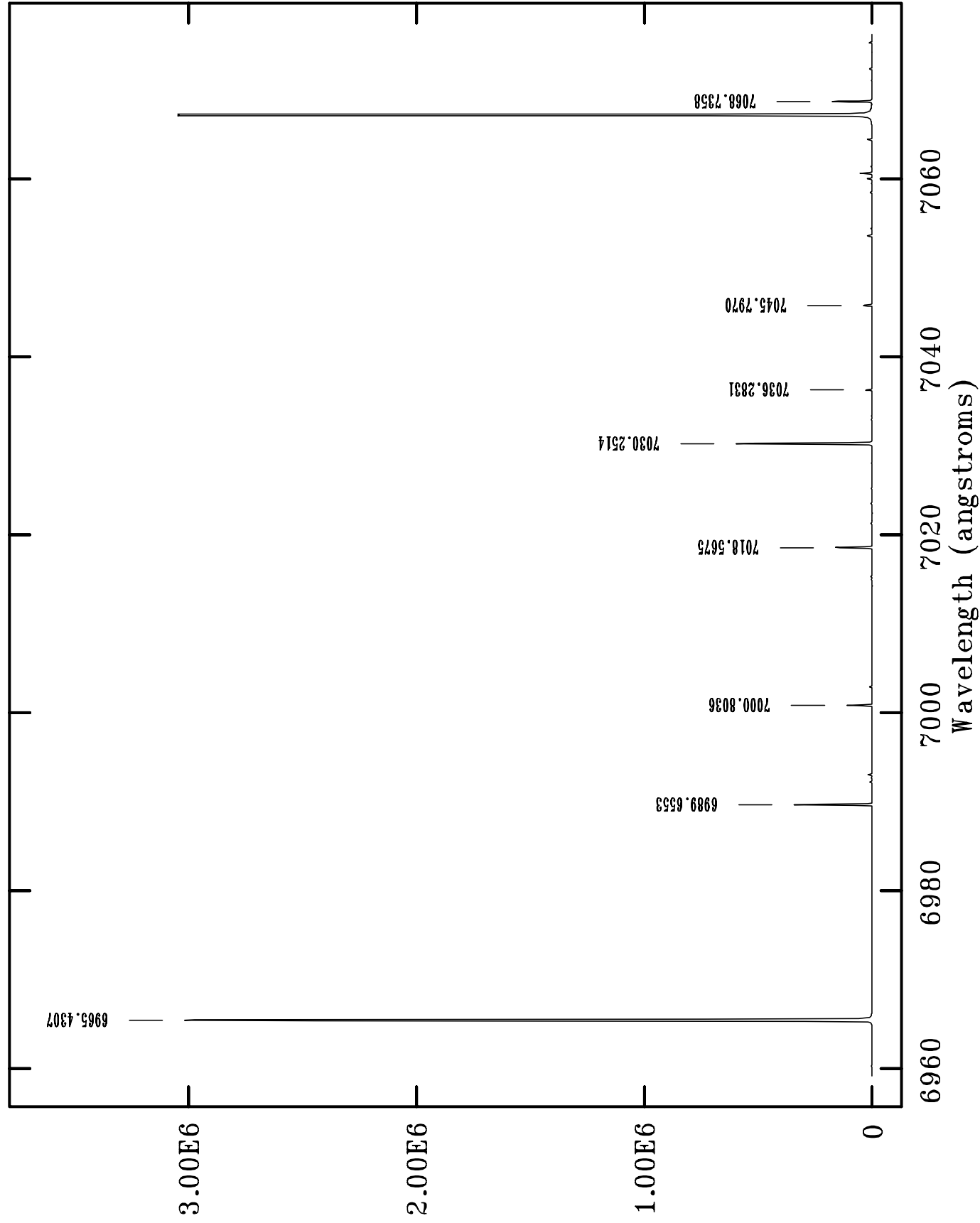


Order 87 - Red

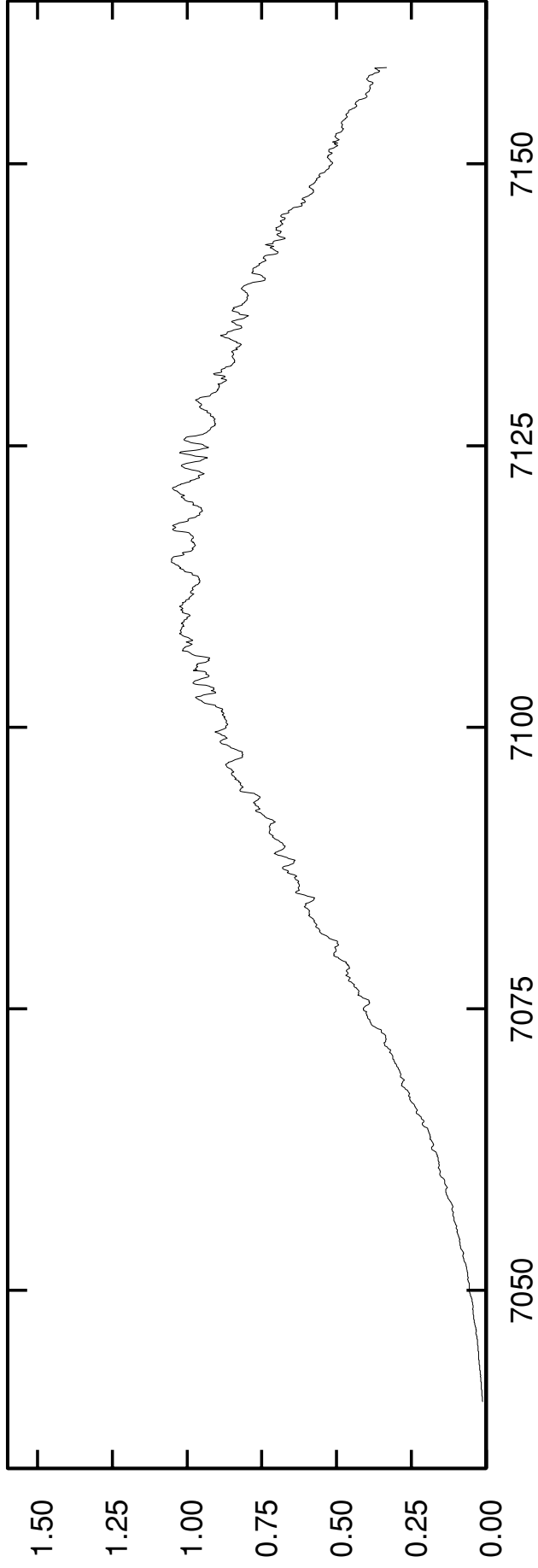


Wavelength (Angstroms)

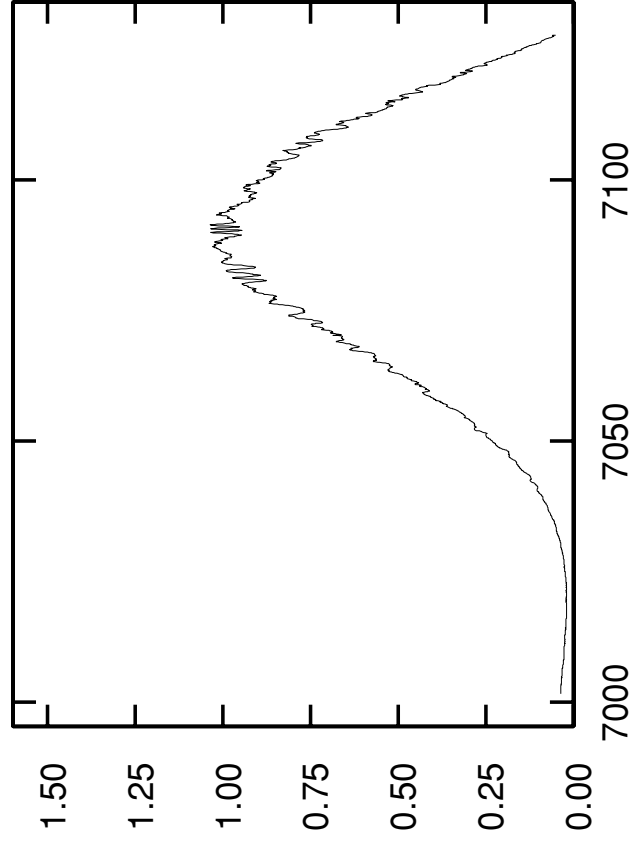
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:29:05 30-Mar-2002
Aperture 11, Image line 11, Order 87
identify thar_316g7940_red2: ThAr



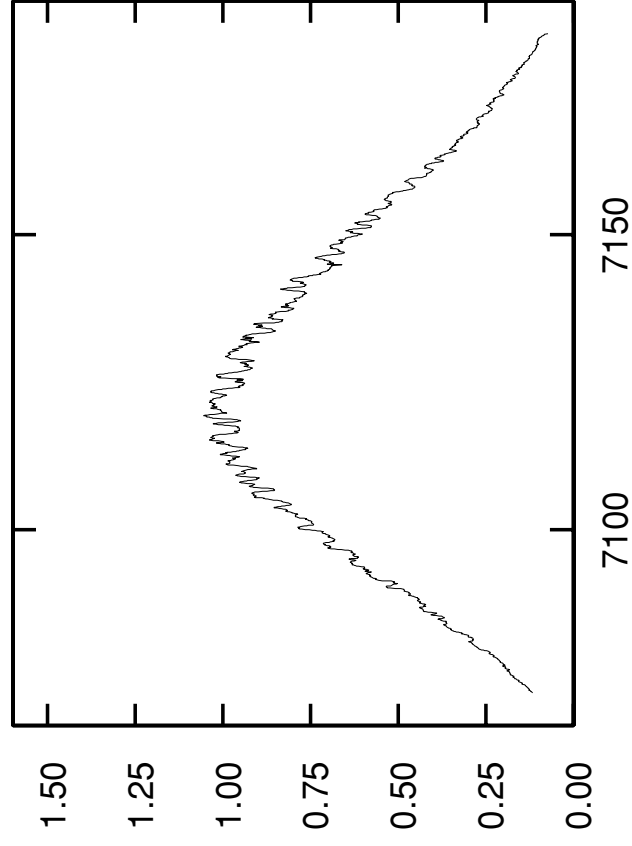
Order 86 - Central



Order 86 - Blue

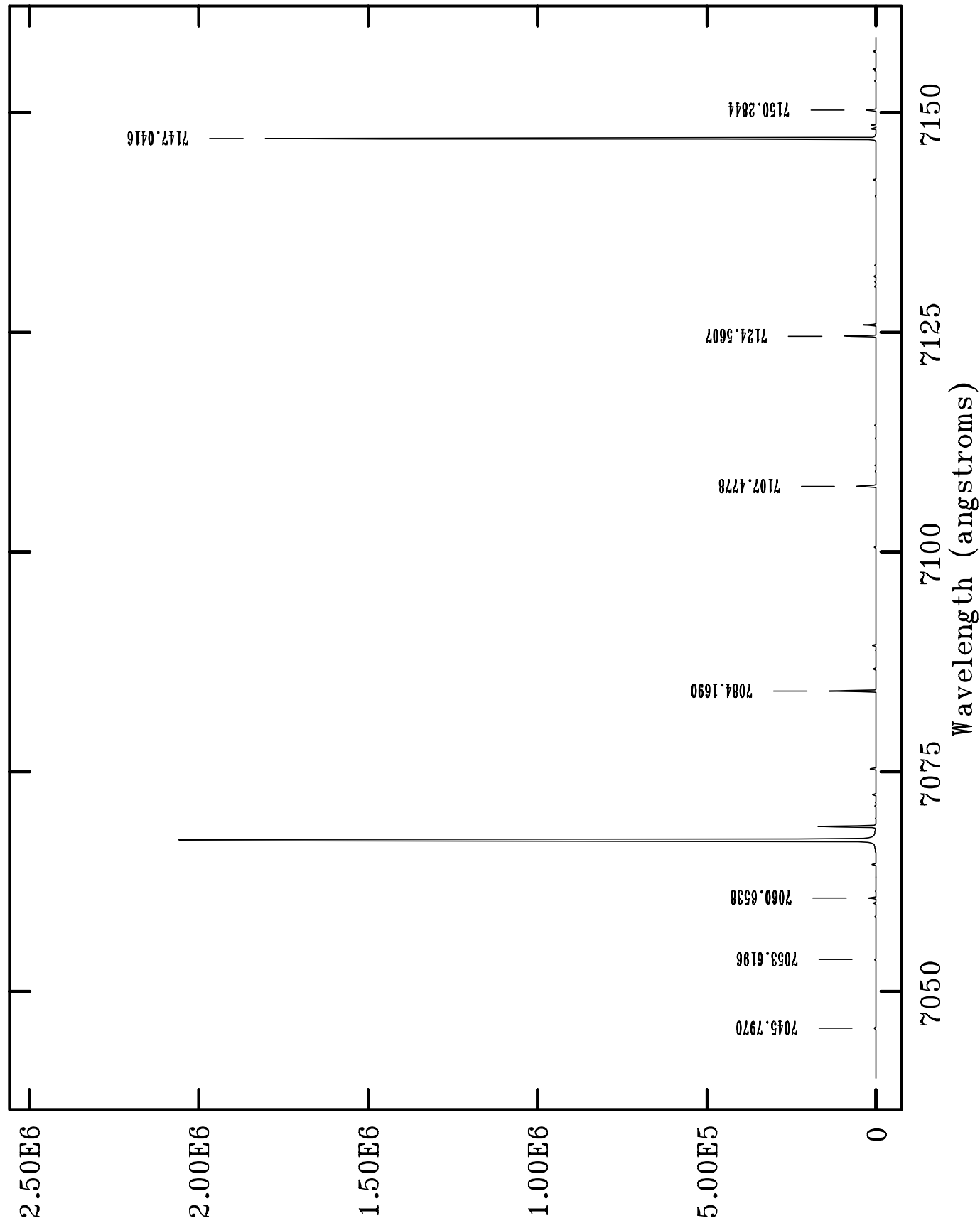


Order 86 - Red

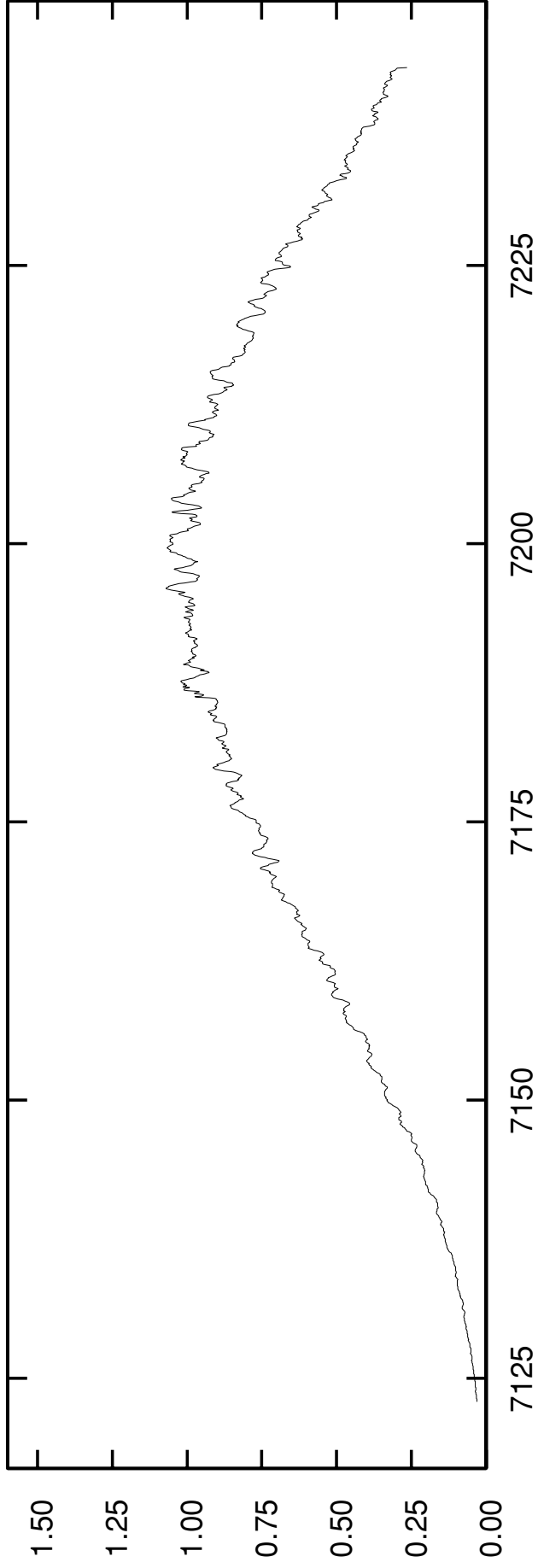


Wavelength (Angstroms)

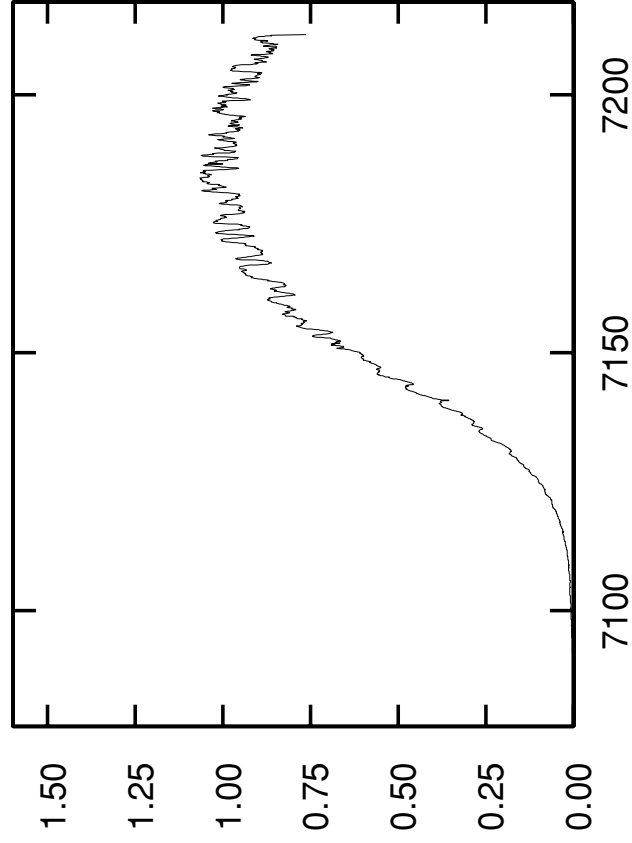
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:28:33 30-Mar-2002
Aperture 10, Image line 10, Order 86
eidentify thar_316g7940_red2: ThAr



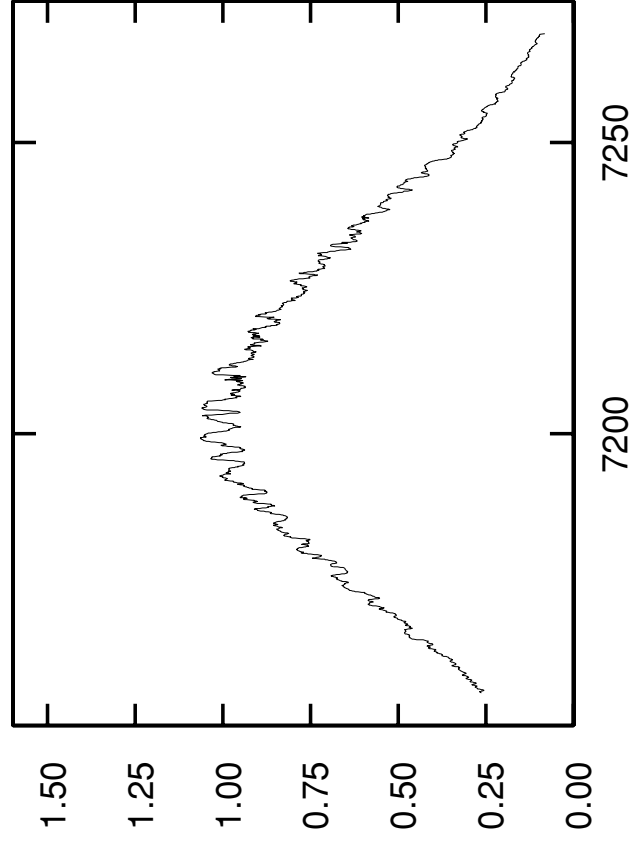
Order 85 - Central



Order 85 - Blue

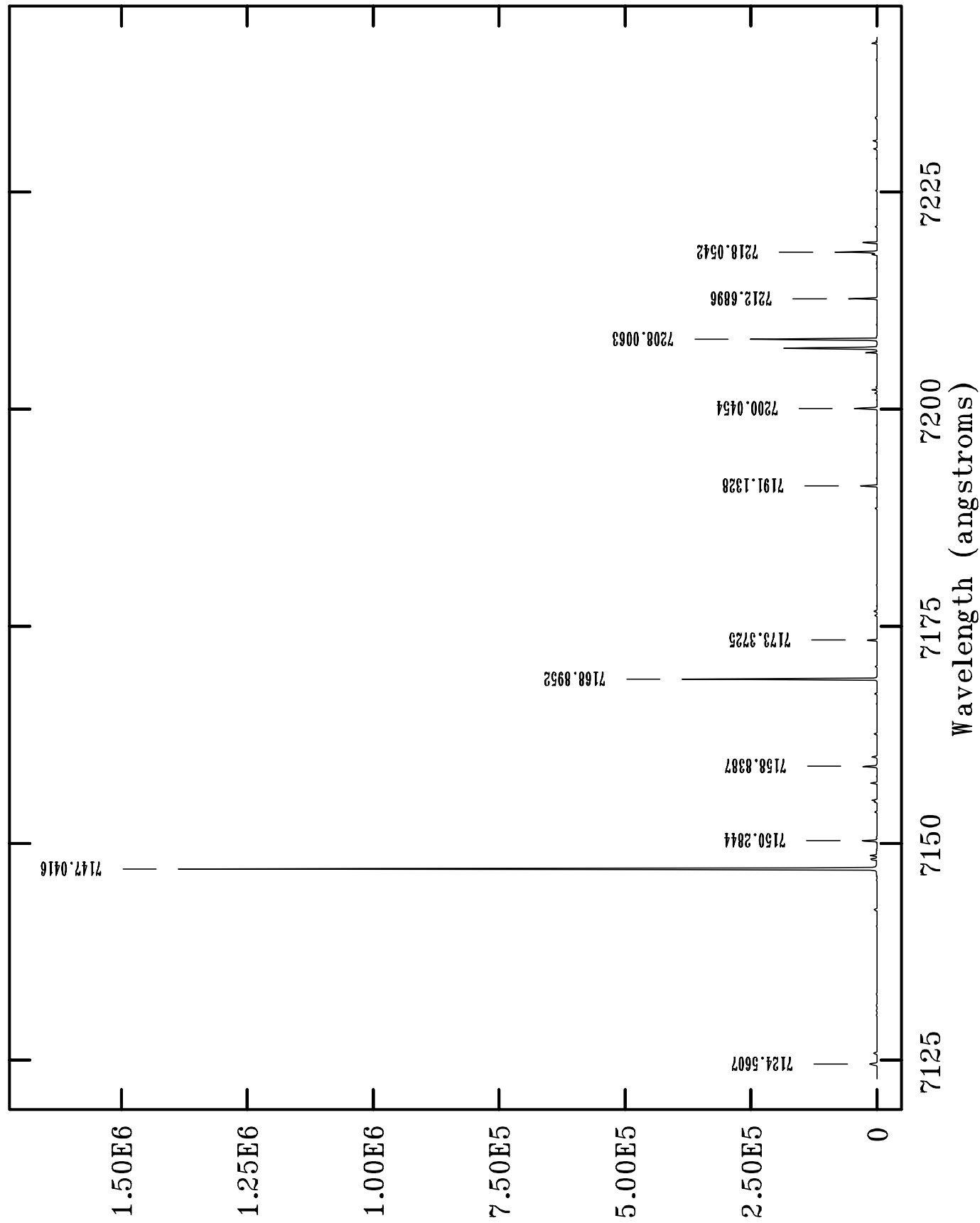


Order 85 - Red

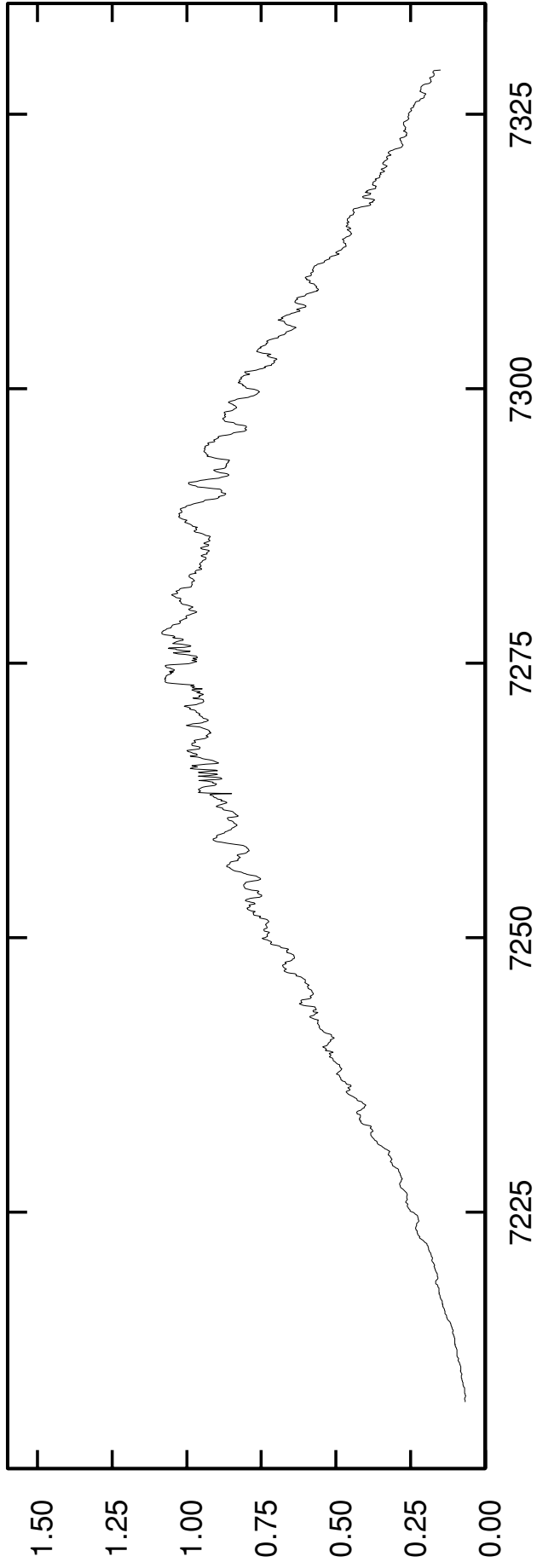


Wavelength (Angstroms)

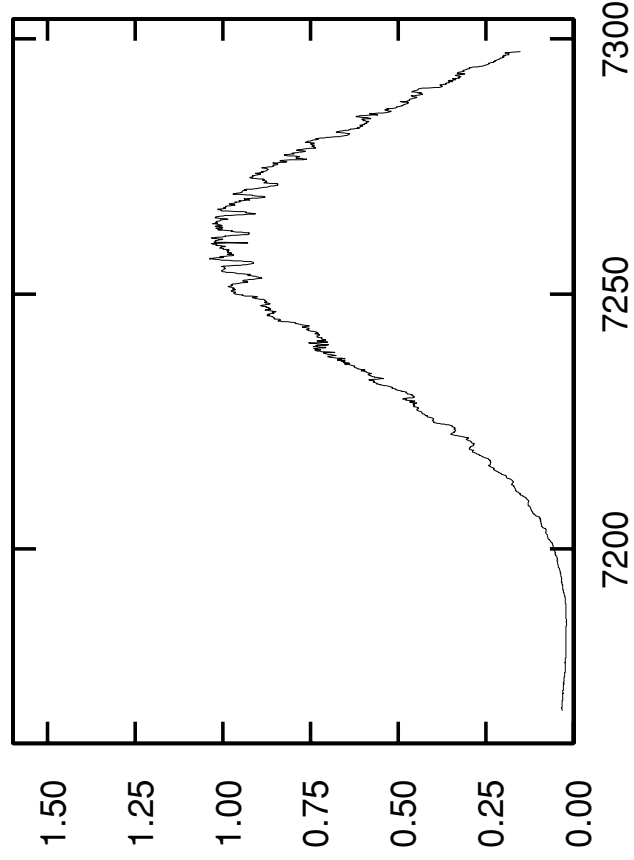
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:28:02 30-Mar-2002
Aperture 9, Image line 9, Order 85
ecidentify thar_316g7940_red2: ThAr



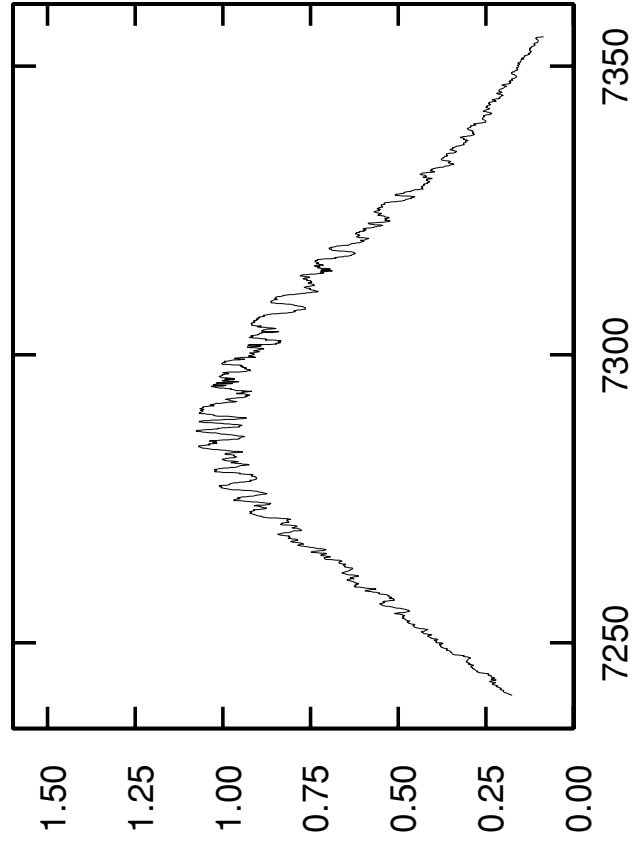
Order 84 - Central



Order 84 - Blue

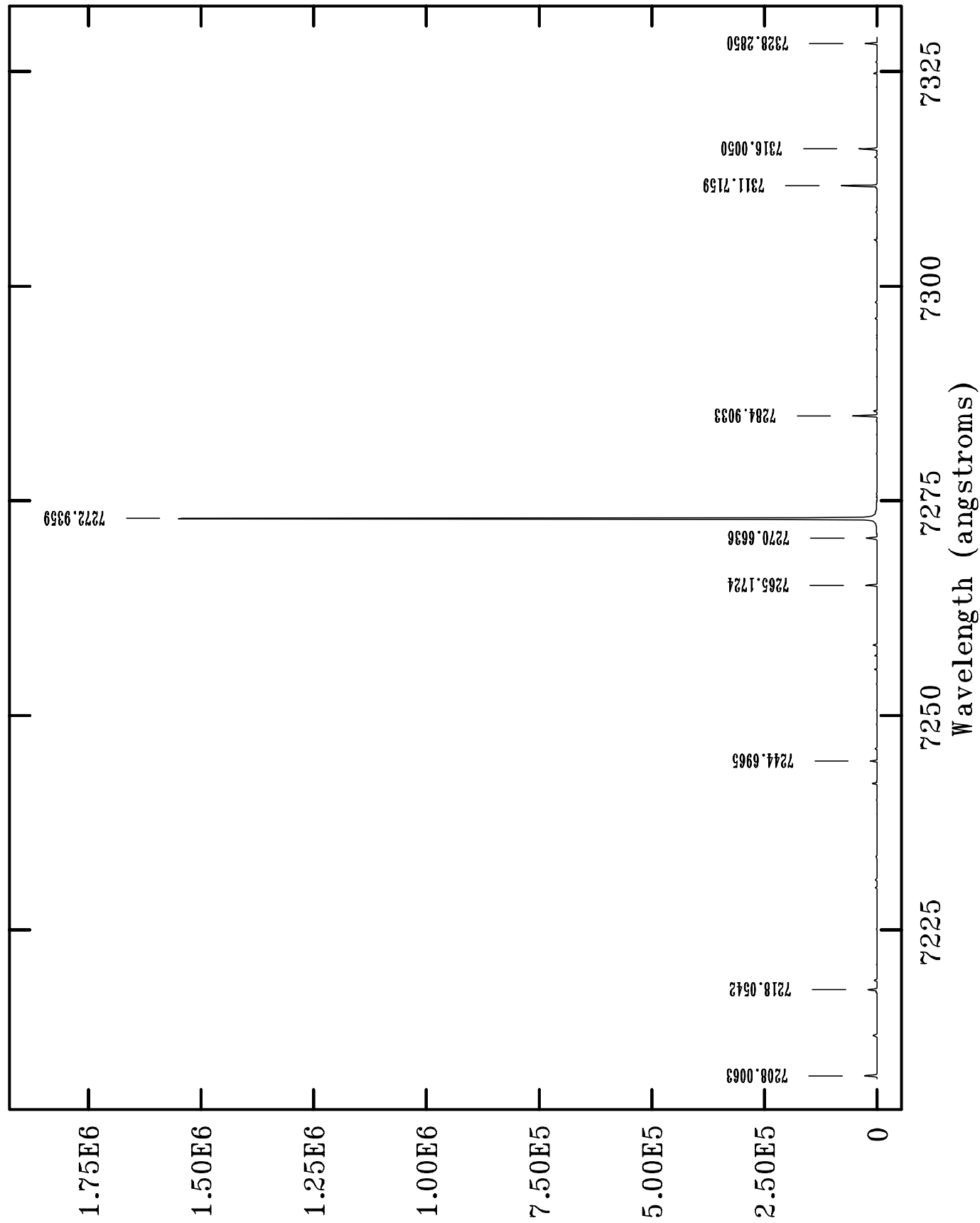


Order 84 - Red

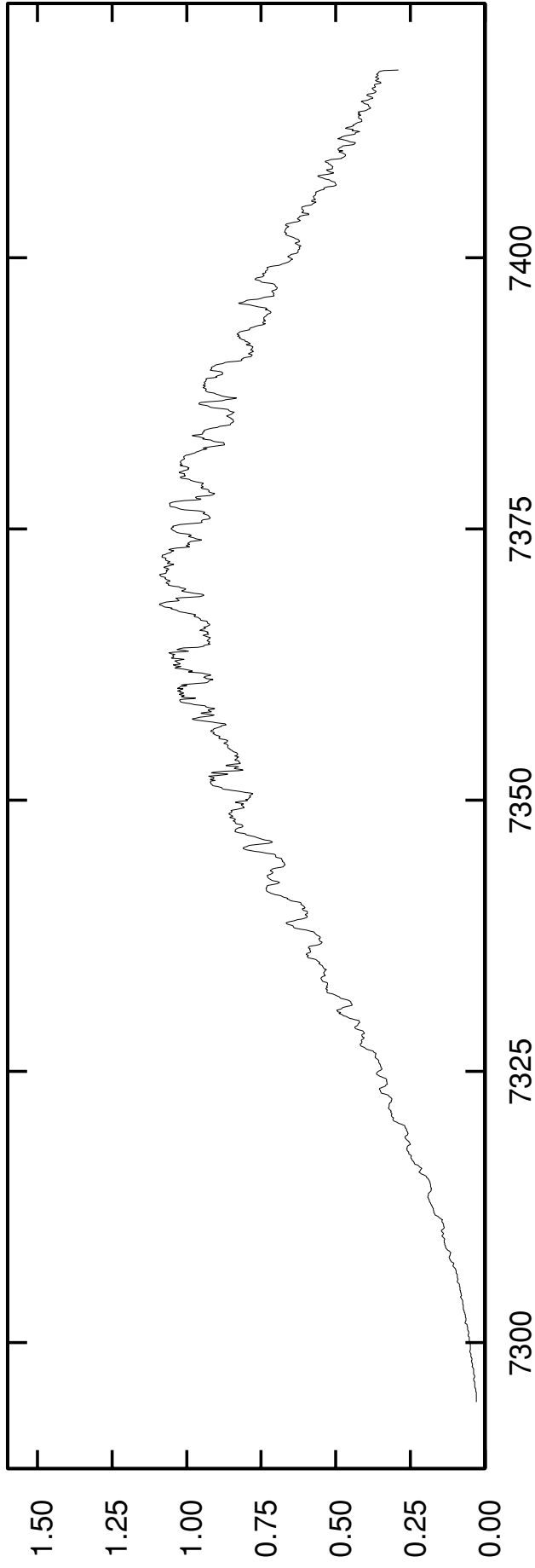


Wavelength (Angstroms)

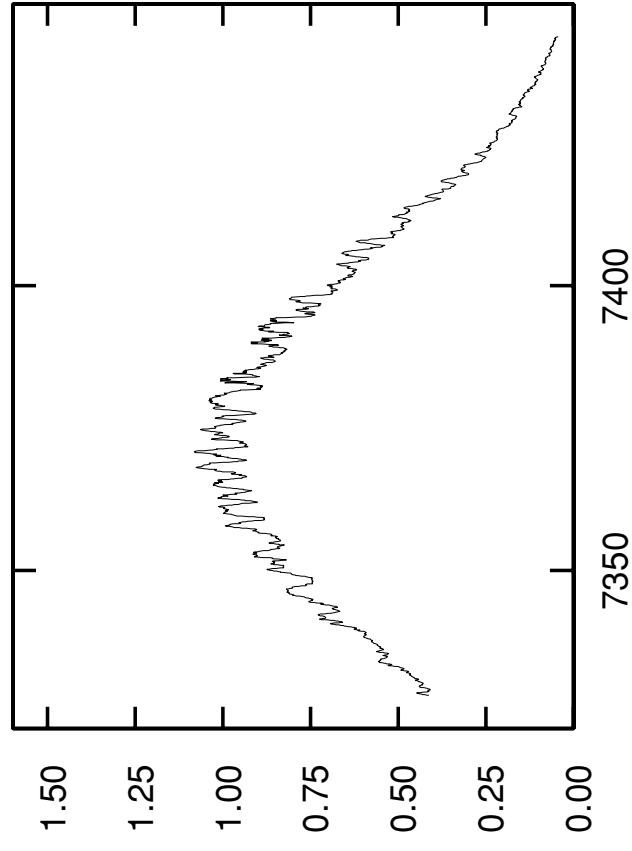
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:27:34 30-Mar-2002
Aperture 8, Image line 8, Order 84
ecidentify thar_316g7940_red2: ThAr



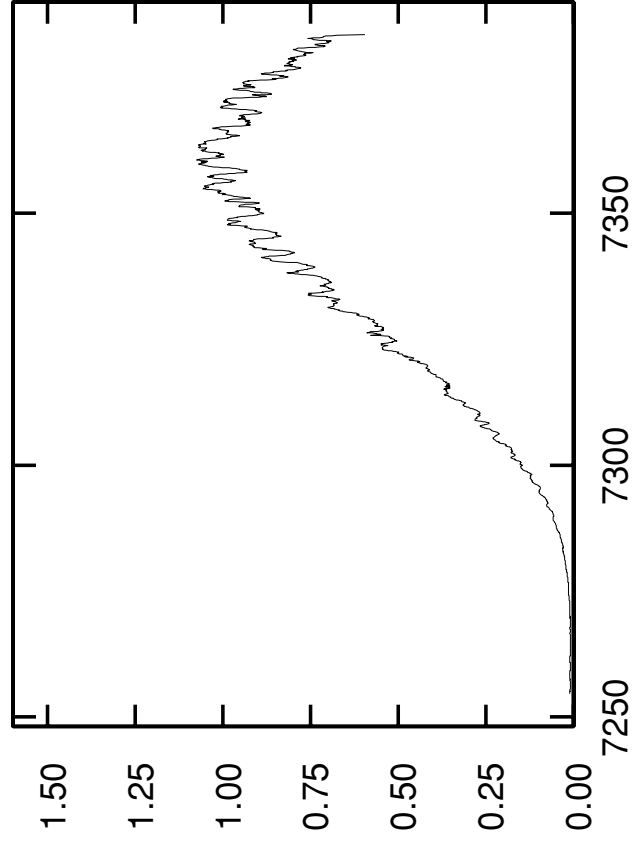
Order 83 - Central



Order 83 - Red

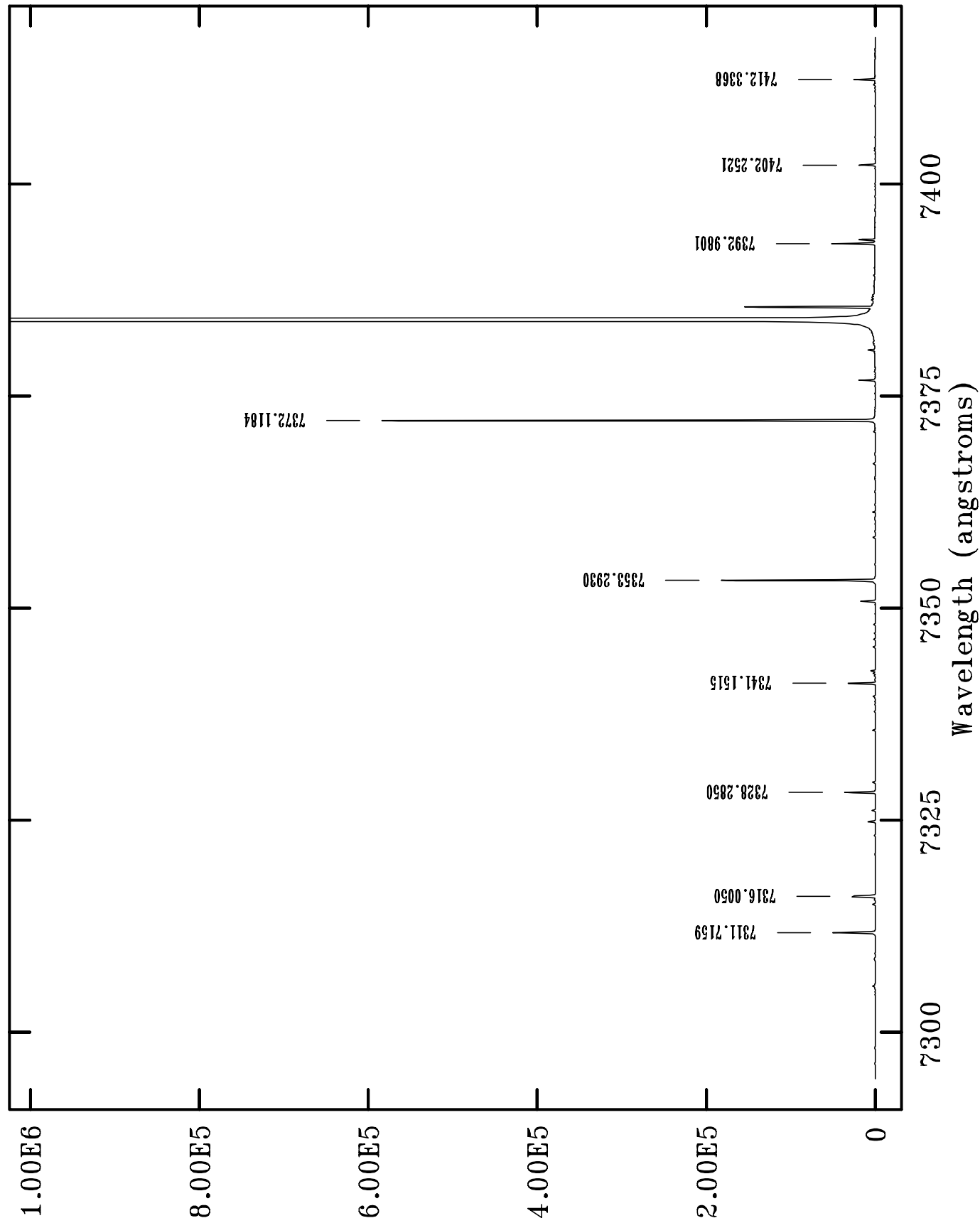


Order 83 - Blue

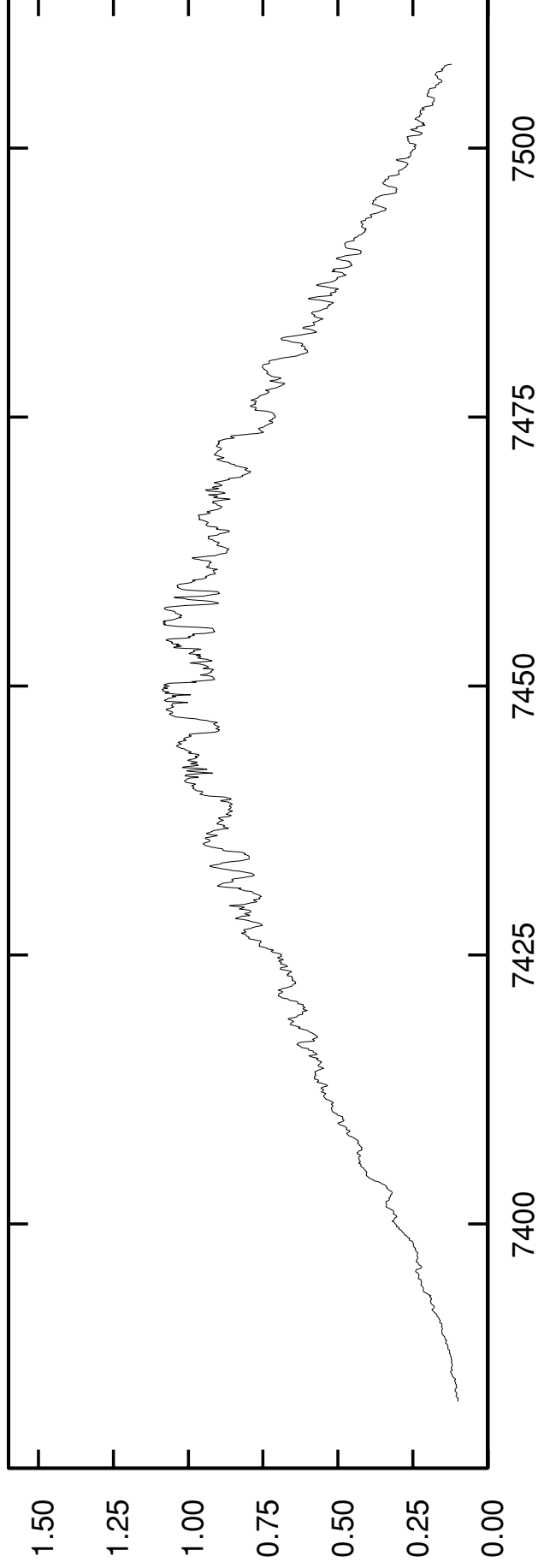


Wavelength (Angstroms)

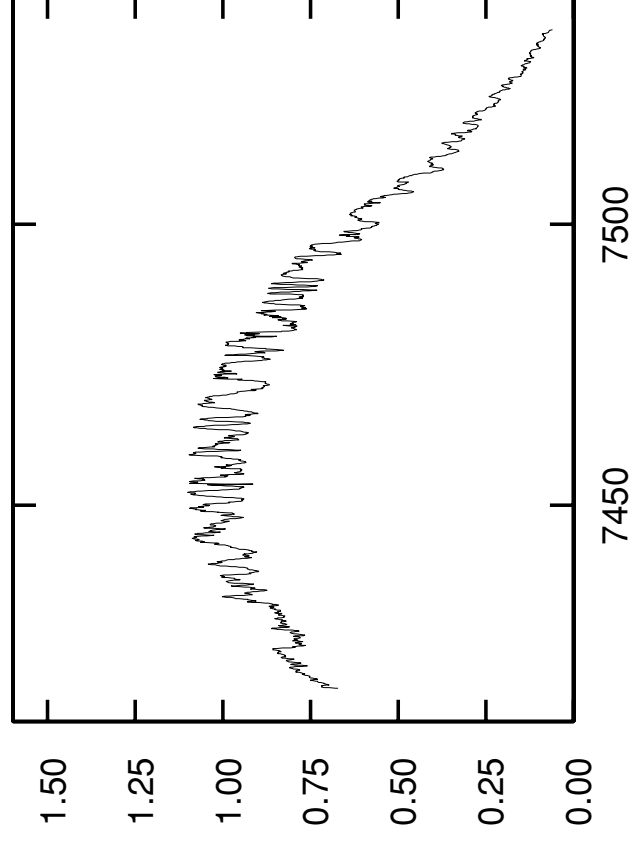
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:27:06 30-Mar-2002
Aperture 7, Image line 7, Order 83
eidentify thar_316g7940_red2: ThAr



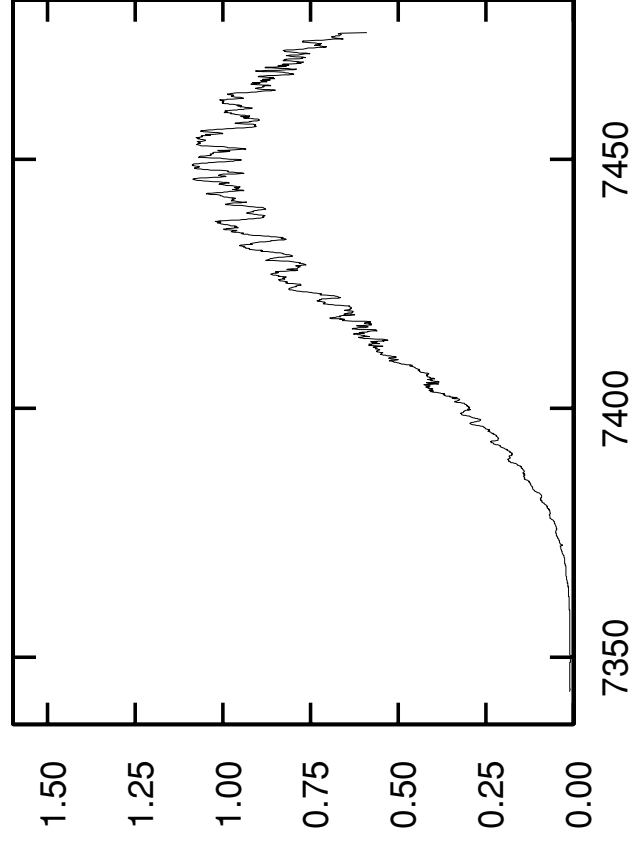
Order 82 - Central



Order 82 - Red

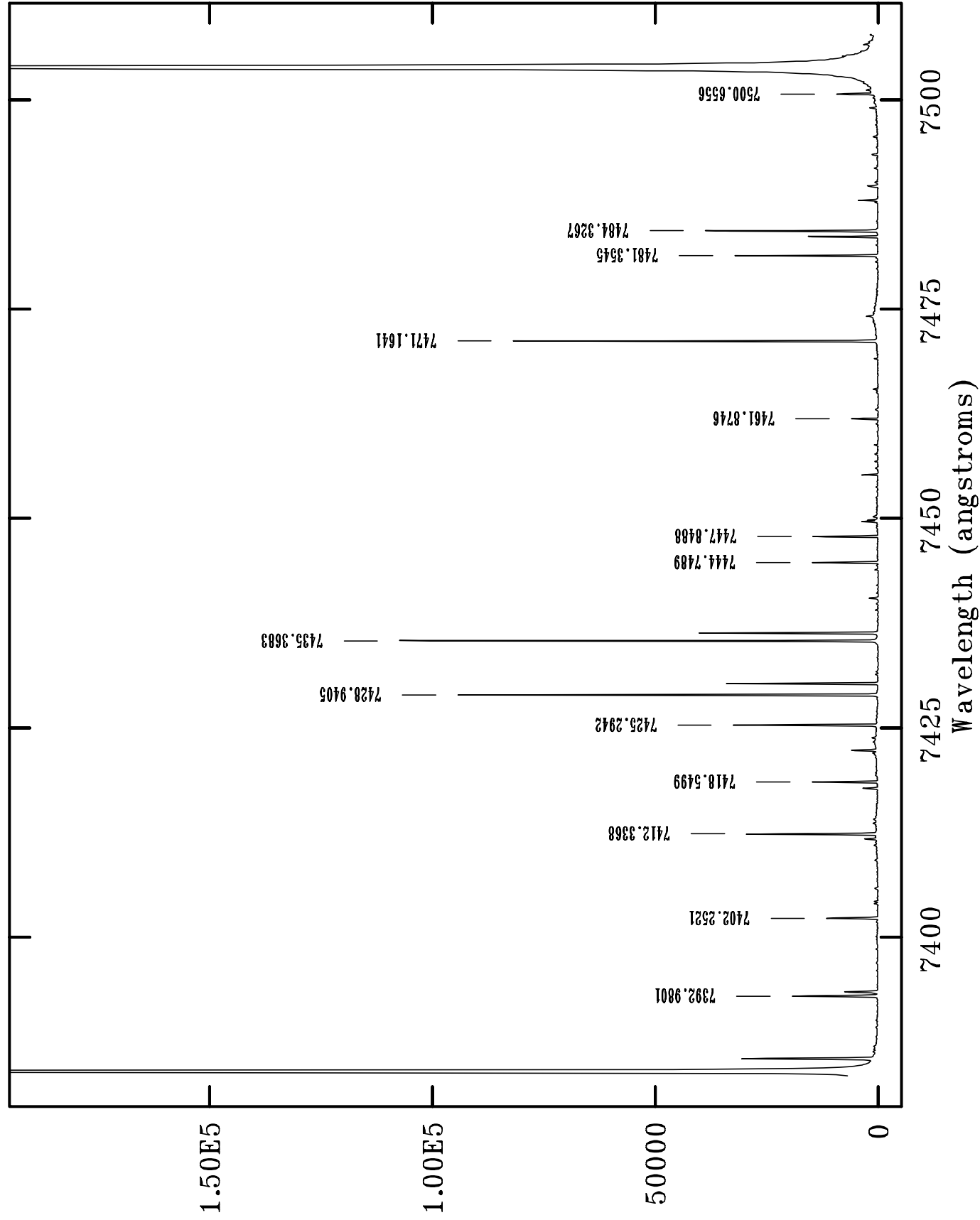


Order 82 - Blue

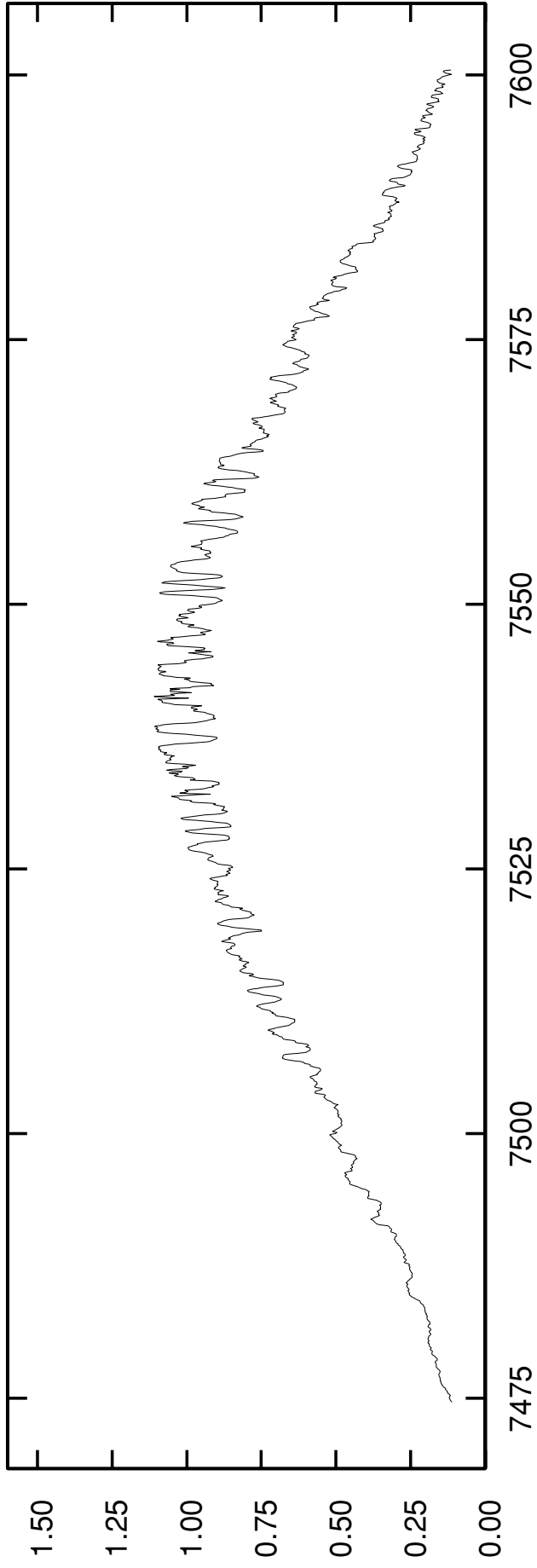


Wavelength (Angstroms)

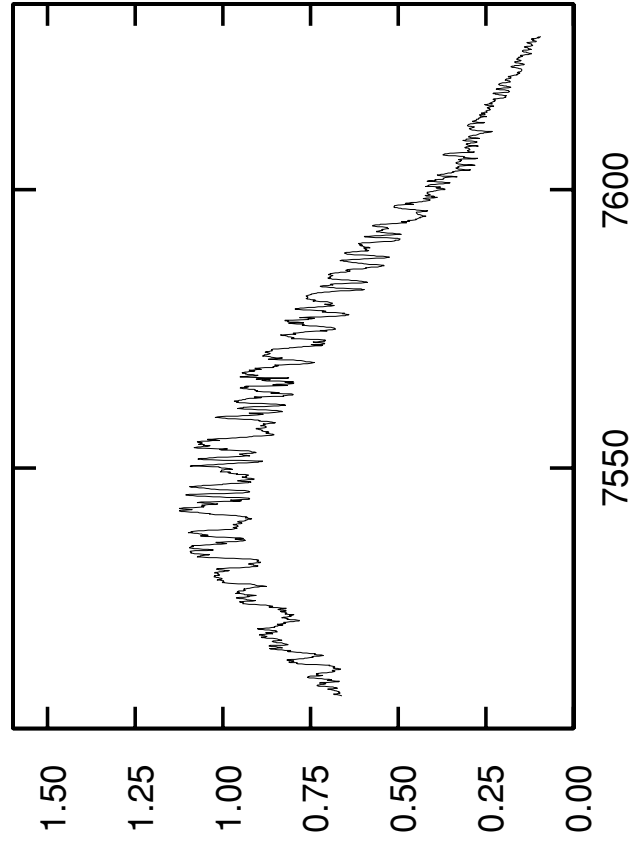
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:26:36 30-Mar-2002
Aperture 6, Image line 6, Order 82
ecidentify thar_316g7940_red2: ThAr



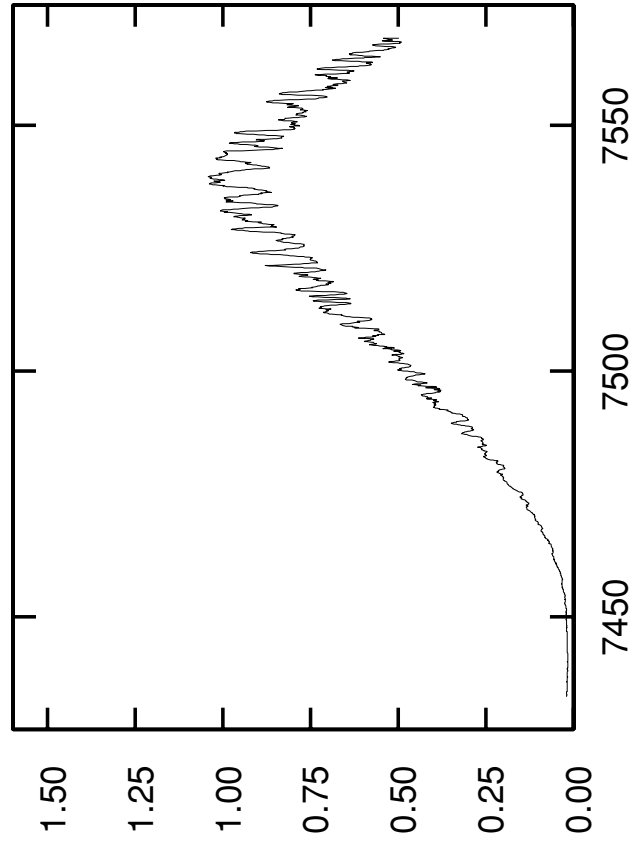
Order 81 - Central



Order 81 - Red

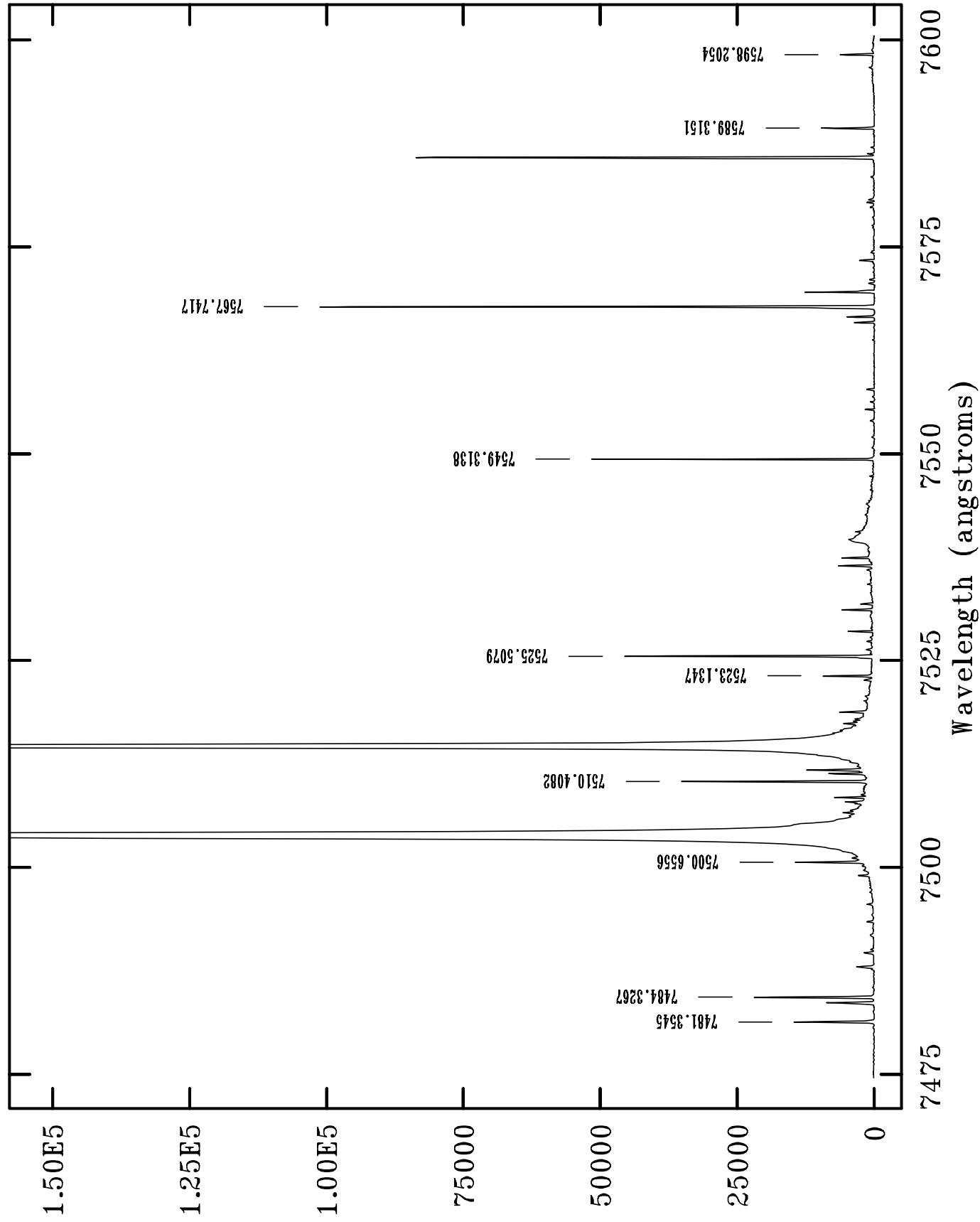


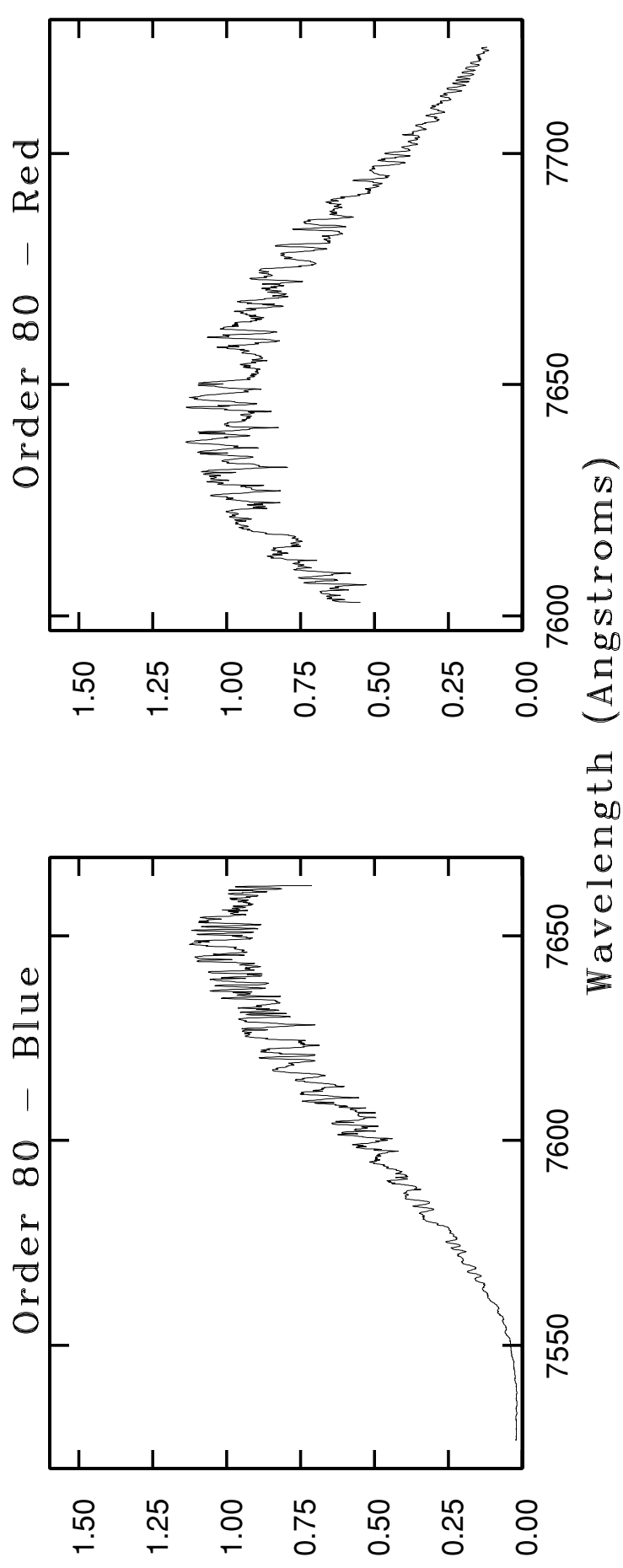
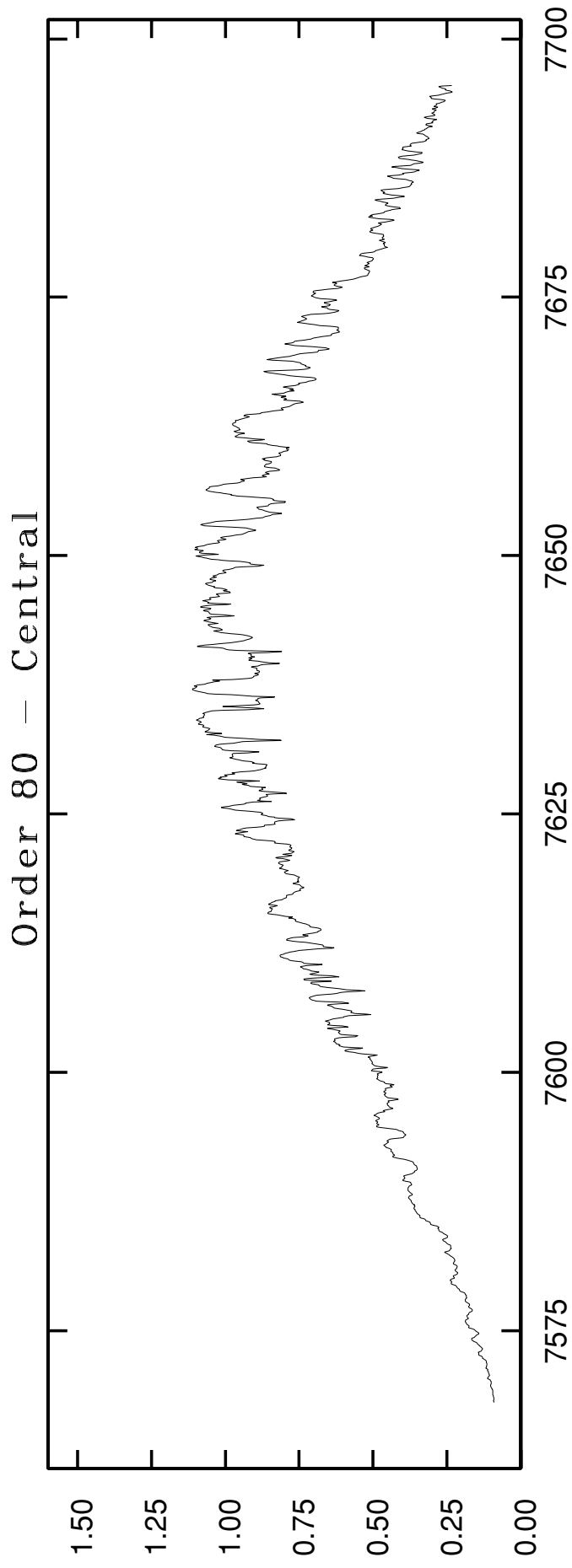
Order 81 - Blue



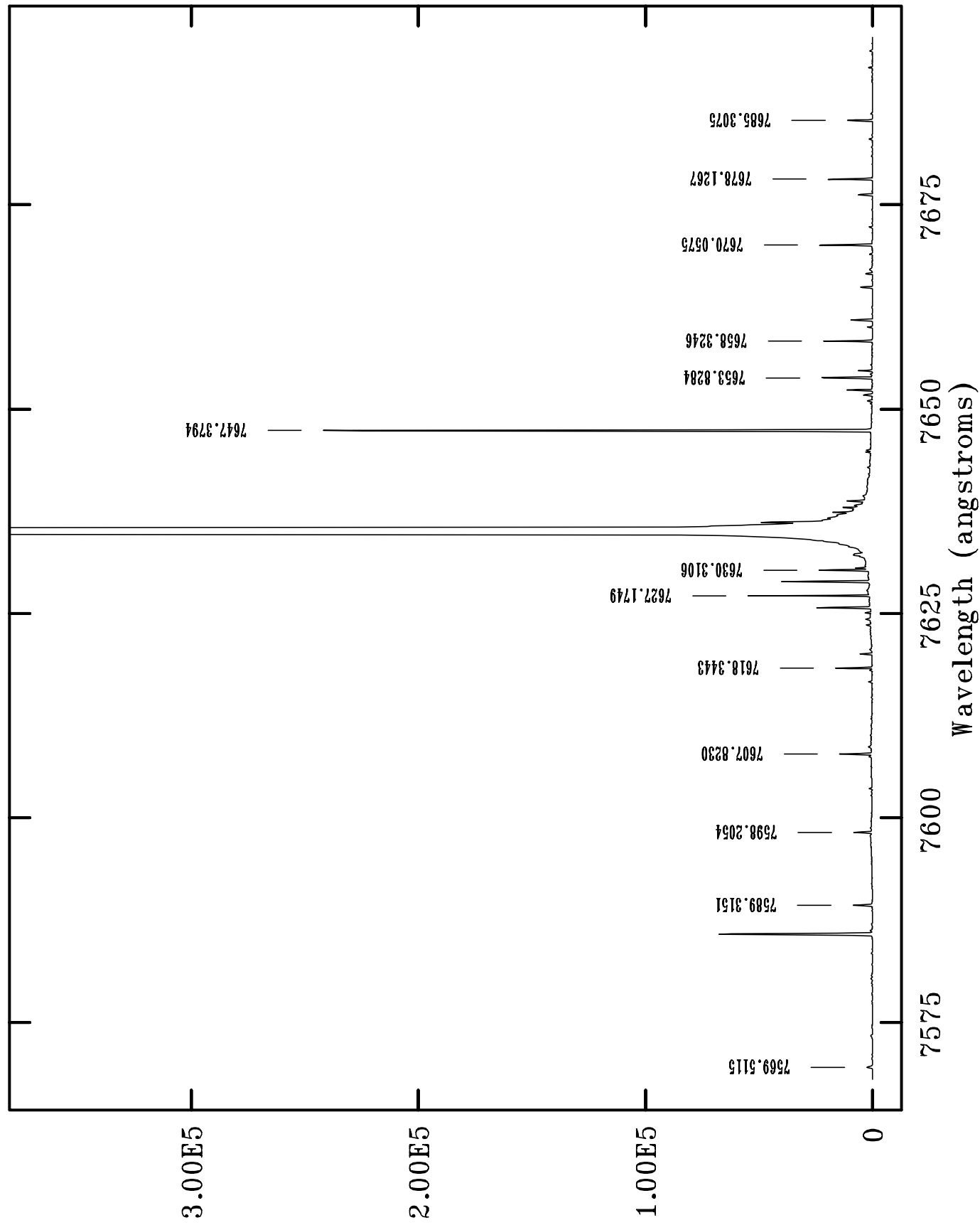
Wavelength (Angstroms)

NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:26:04 30-Mar-2002
Aperture 5, Image line 5, Order 81
ecidentify thar_316g7940_red2: ThAr

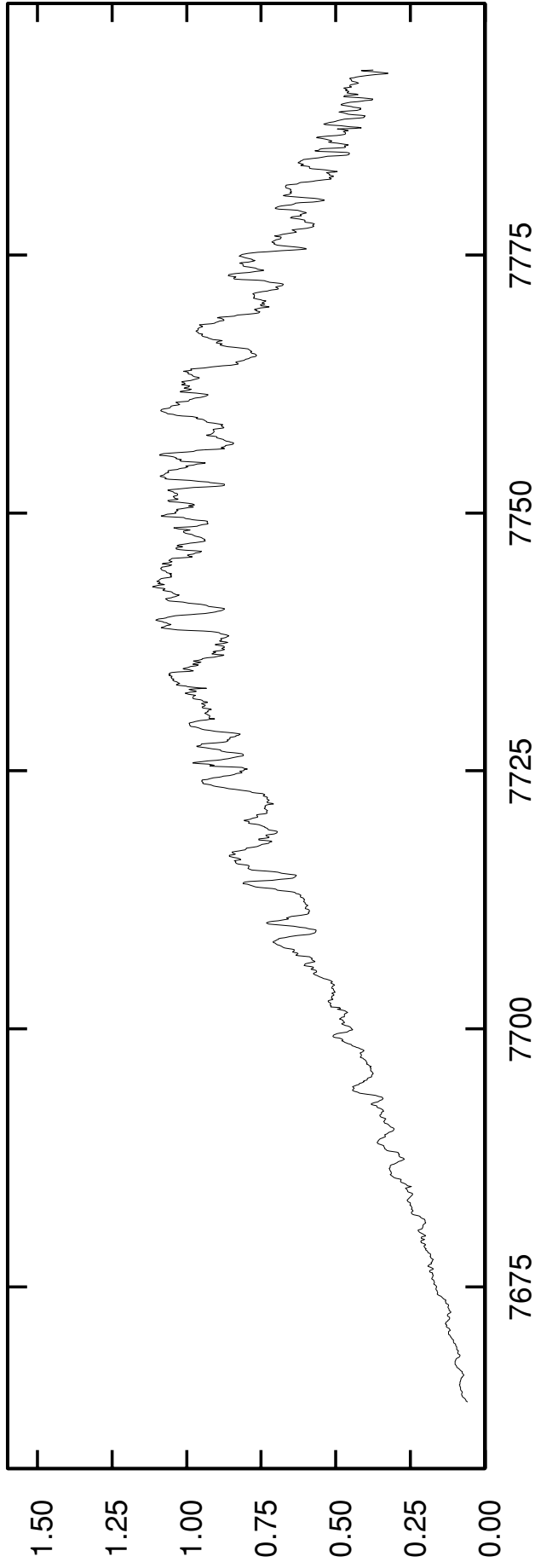




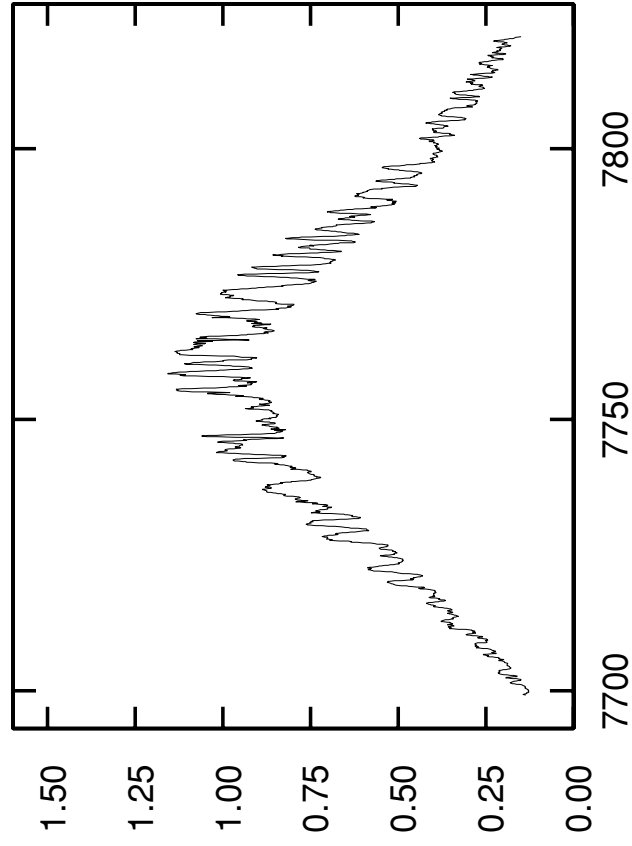
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:25:25 30-Mar-2002
Aperture 4, Image line 4, Order 80
ecidentify thar_316g7940_red2: ThAr



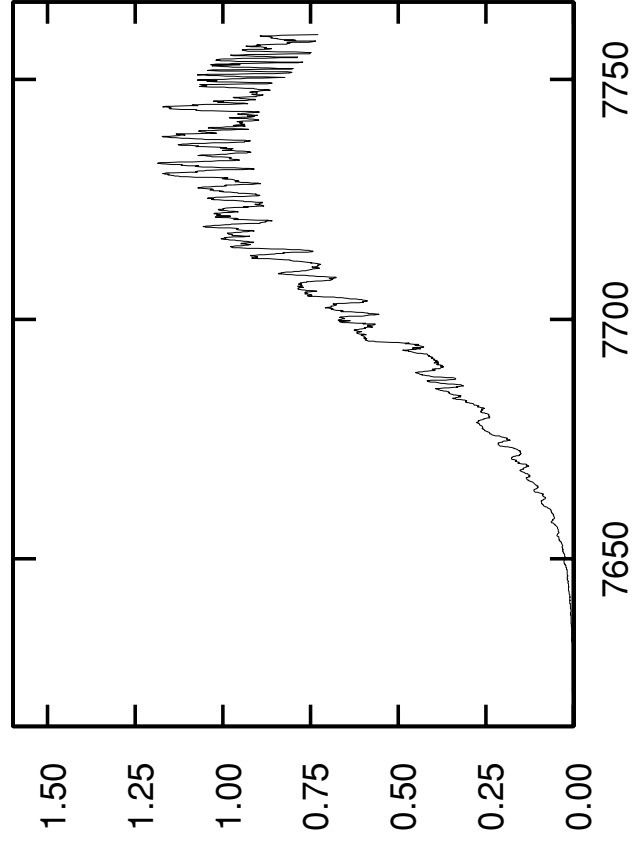
Order 79 - Central



Order 79 - Red

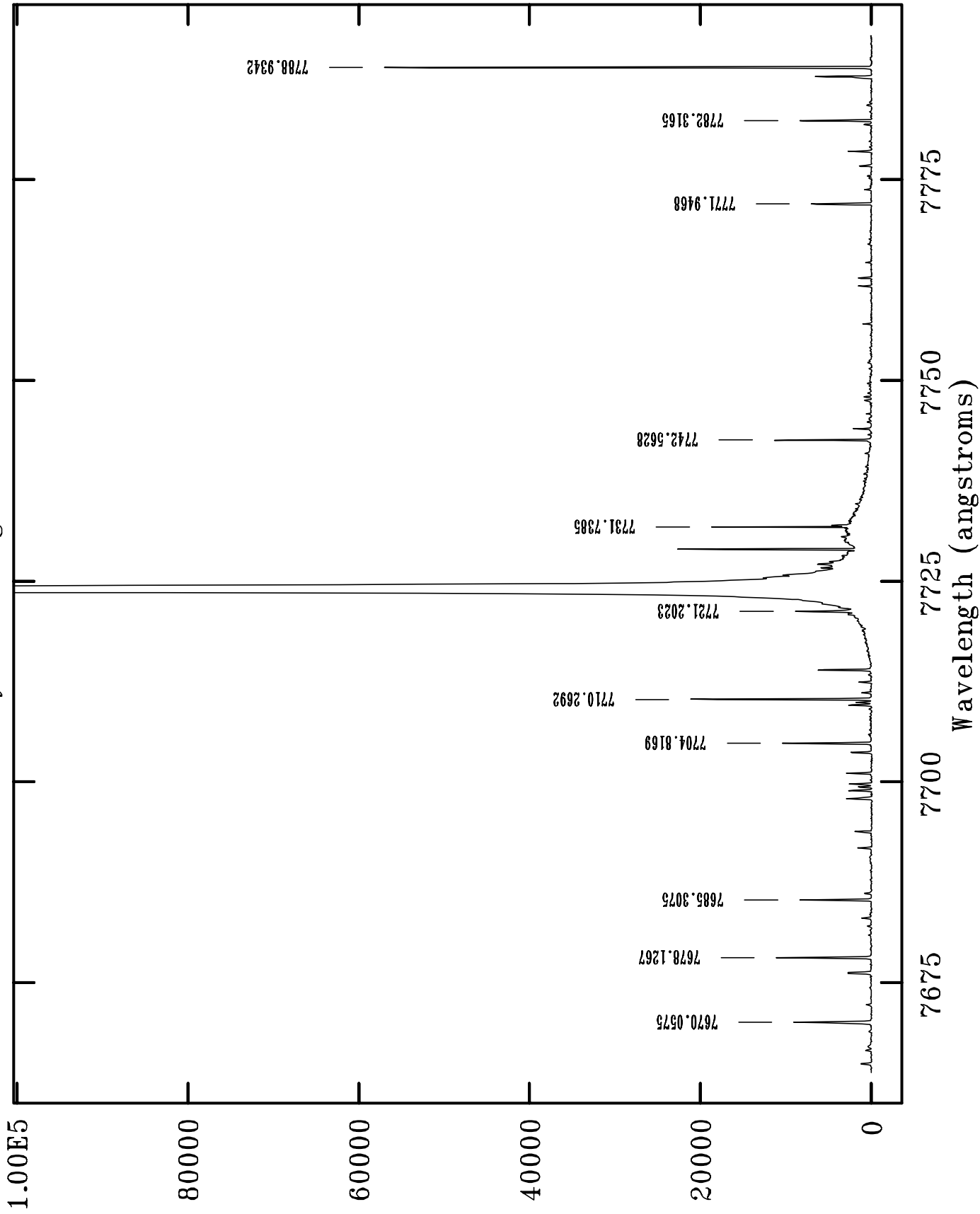


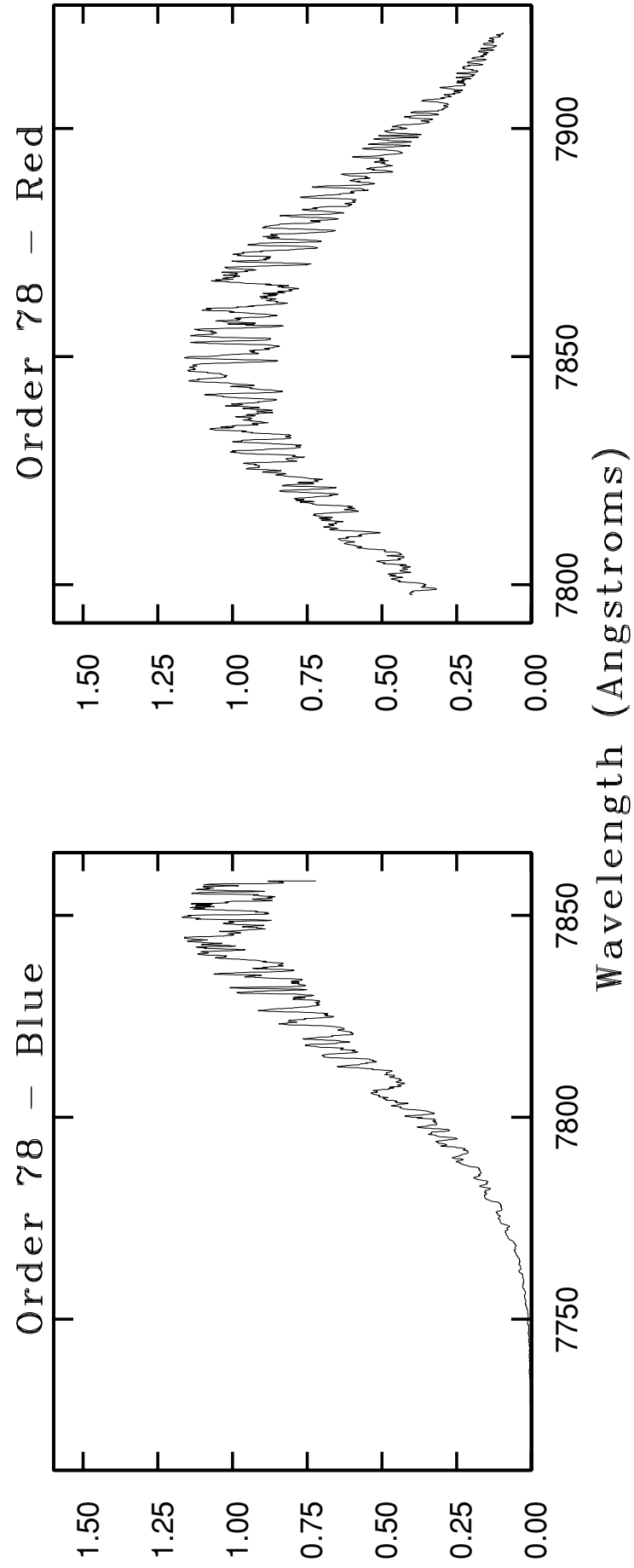
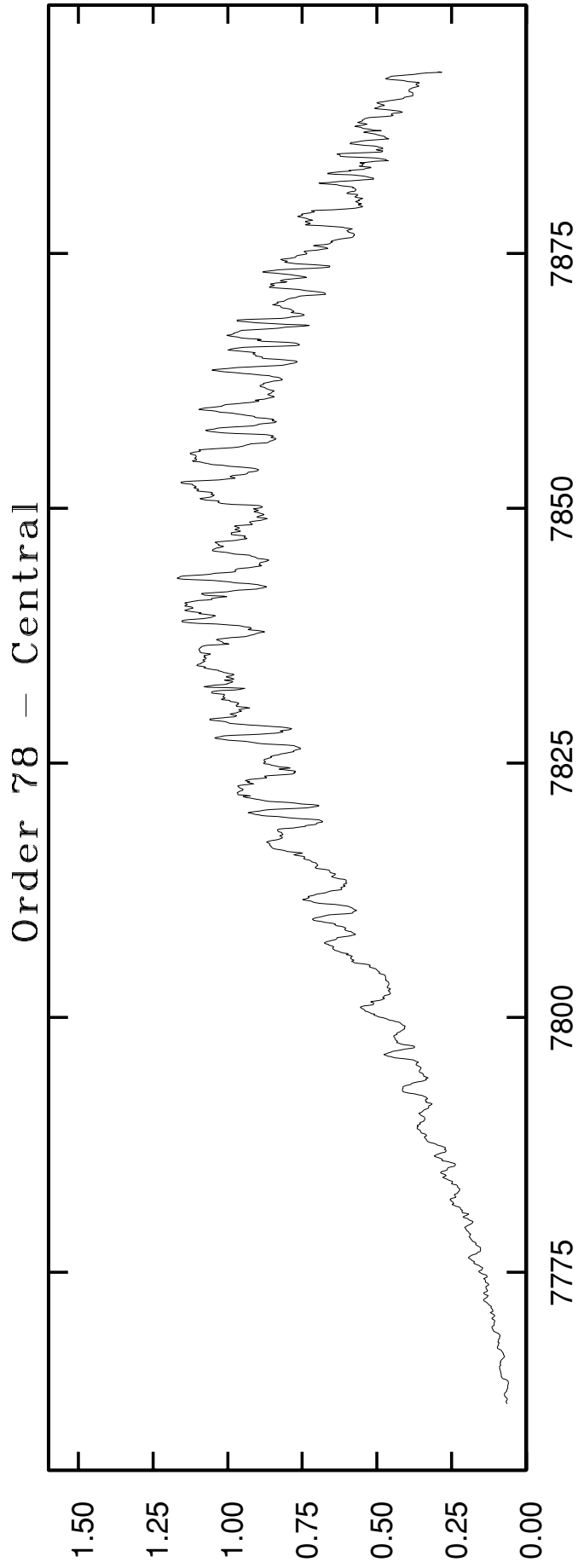
Order 79 - Blue



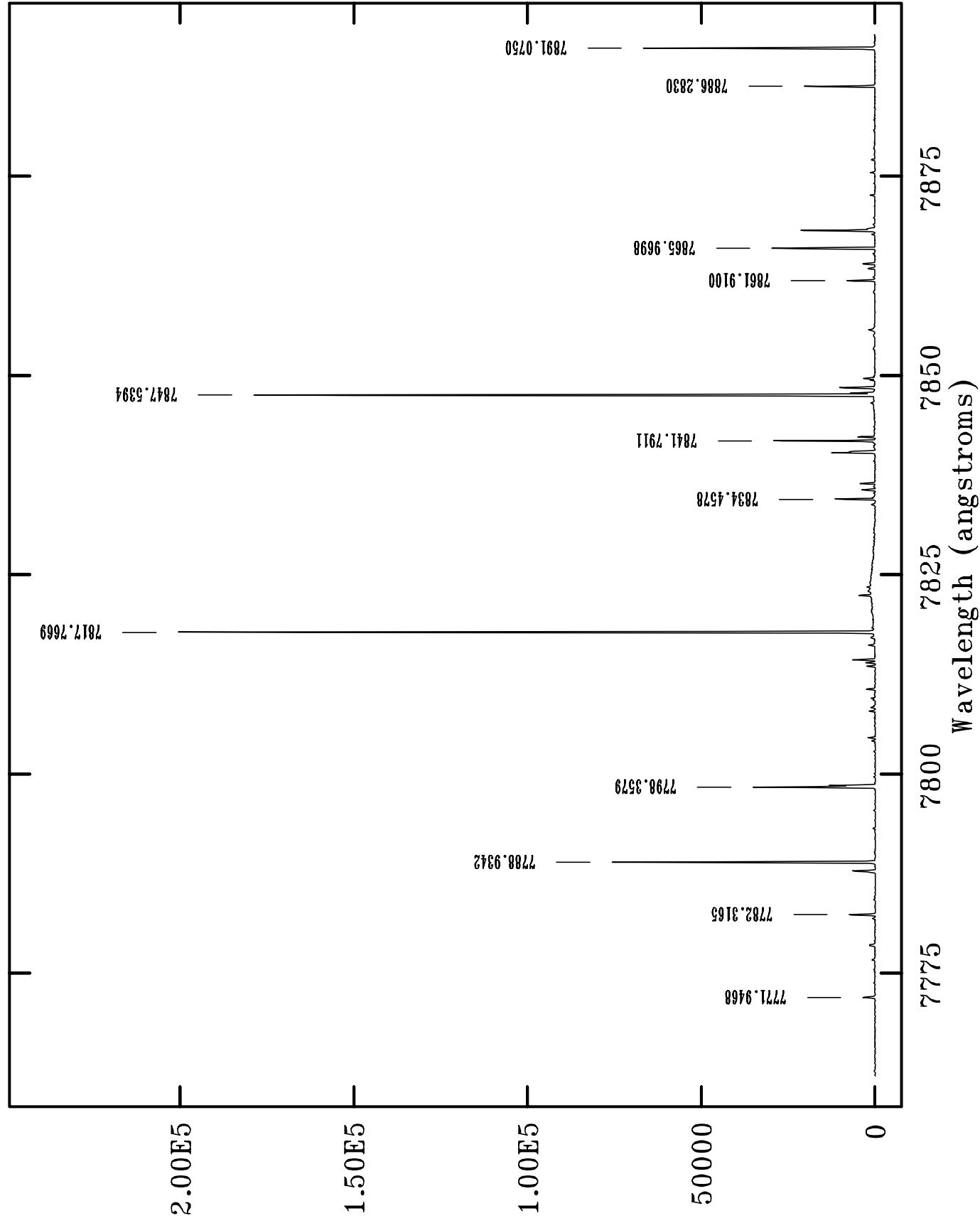
Wavelength (Angstroms)

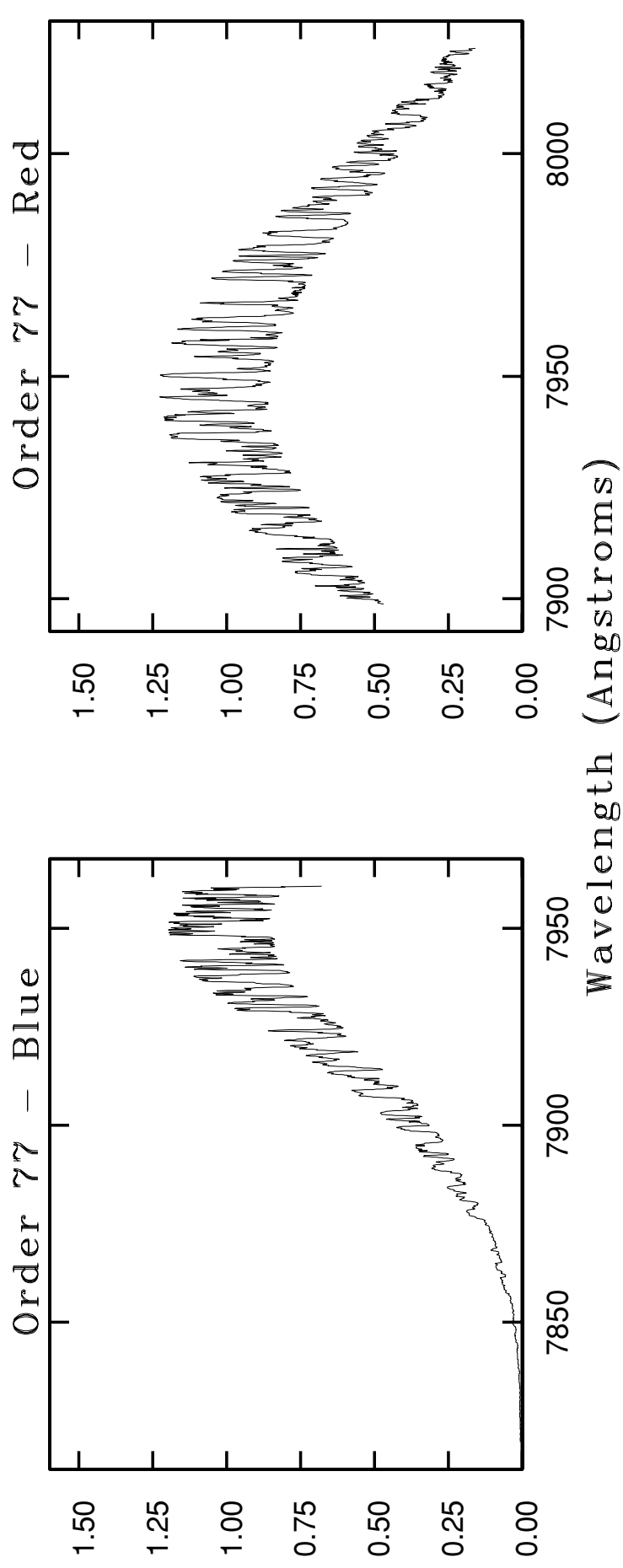
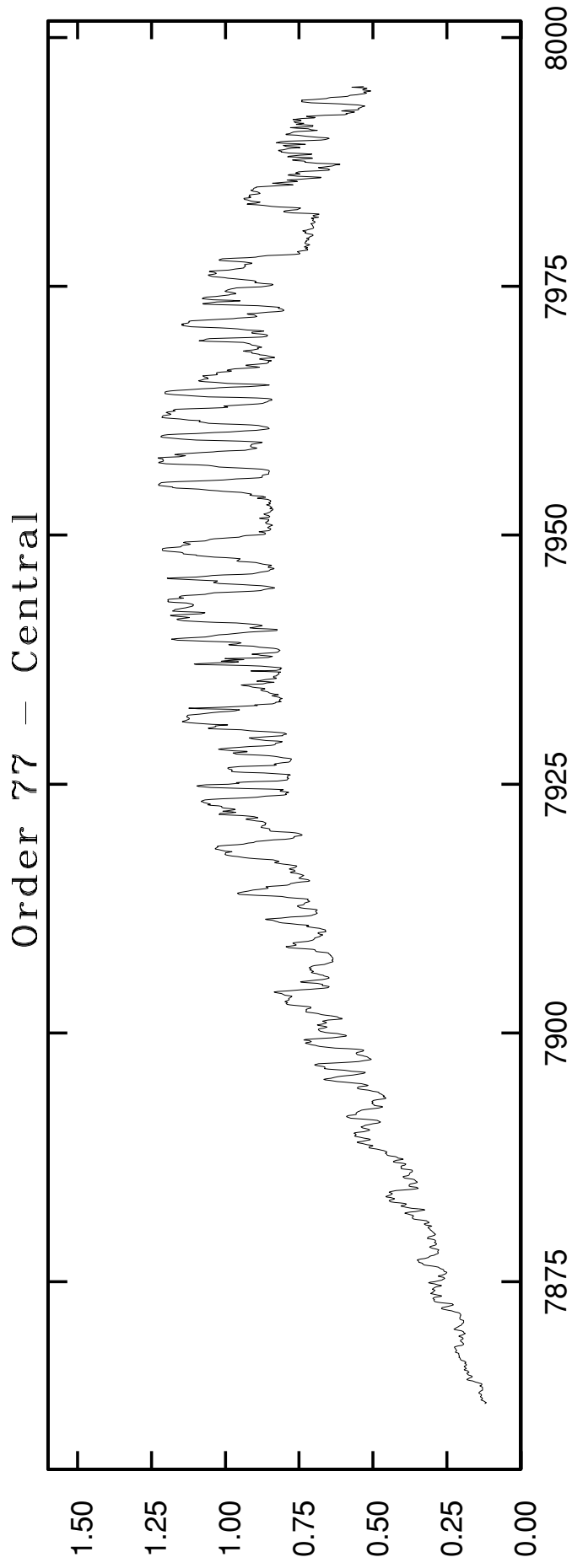
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:24:11 30-Mar-2002
Aperture 3, Image line 3, Order 79
ecidentify thar_316g7940_red2: ThAr



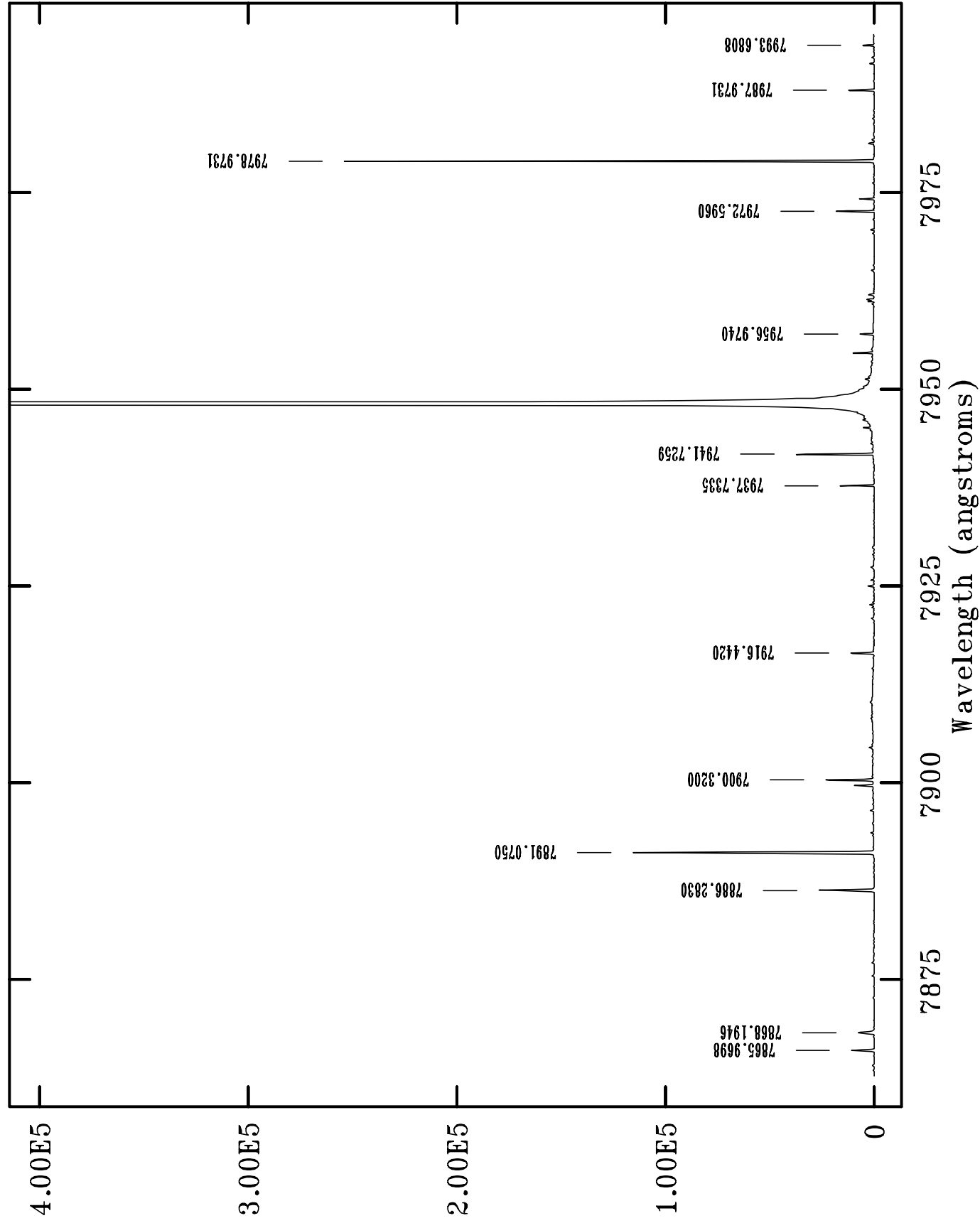


NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sat 08:23:07 30-Mar-2002
Aperture 2, Image line 2, Order 78
ecidentify thar_316g7940_red2: ThAr

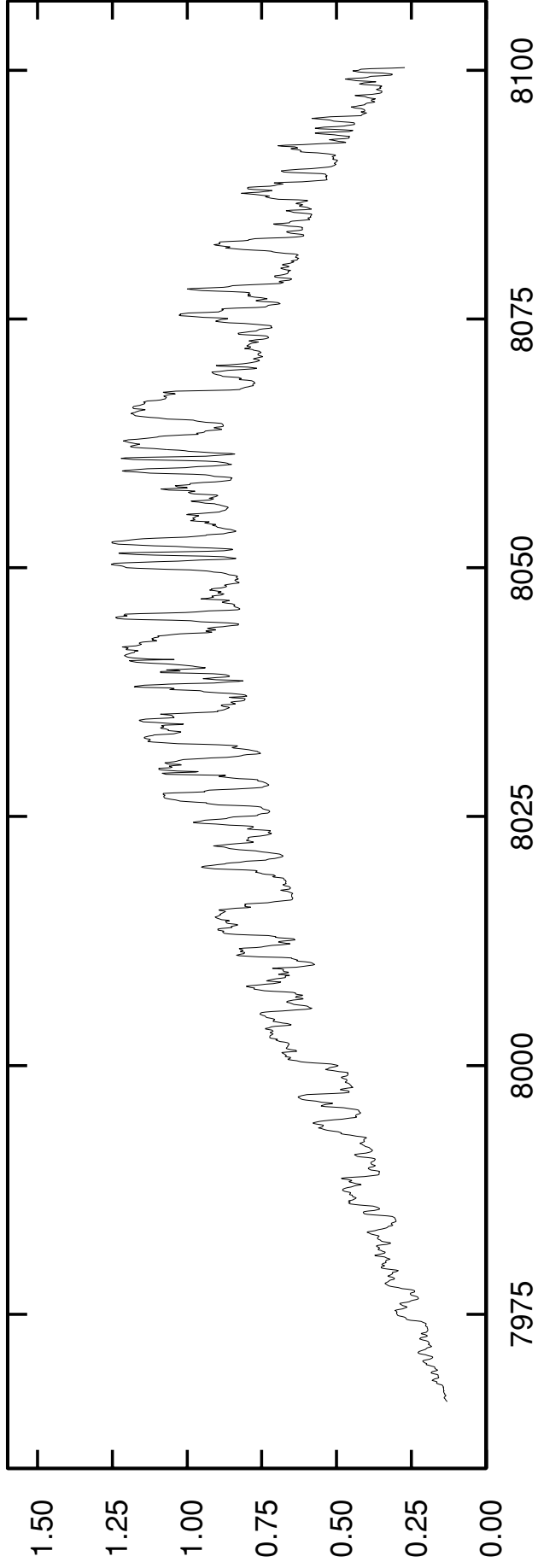




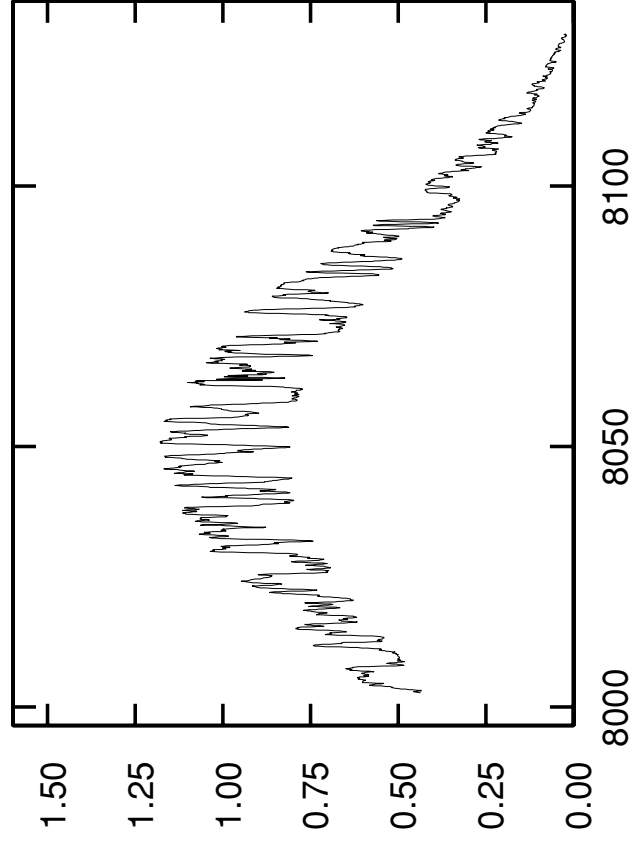
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:42:34 31-Mar-2002
Aperture 10, Image line 10, Order 77
identify thar_316g8991_red2: ThAr



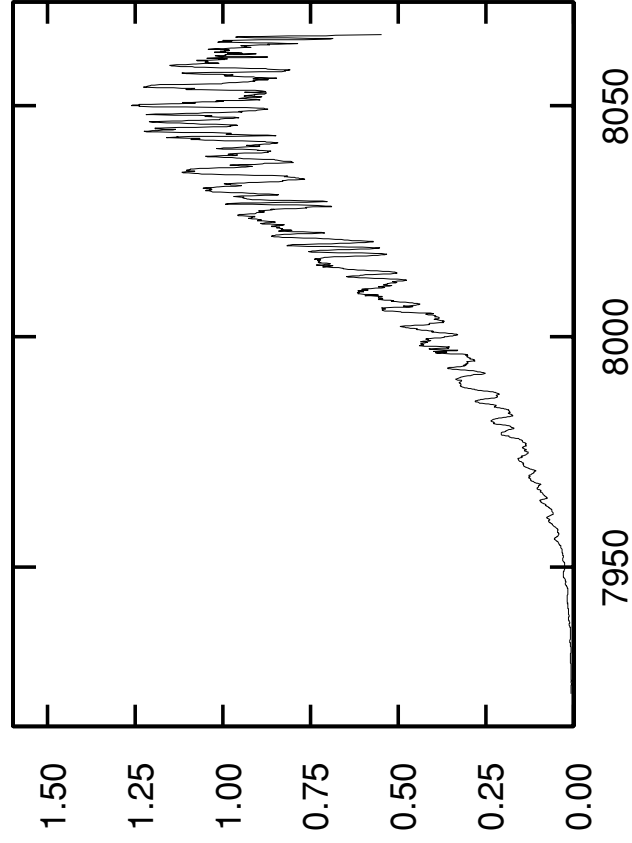
Order 76 - Central



Order 76 - Red

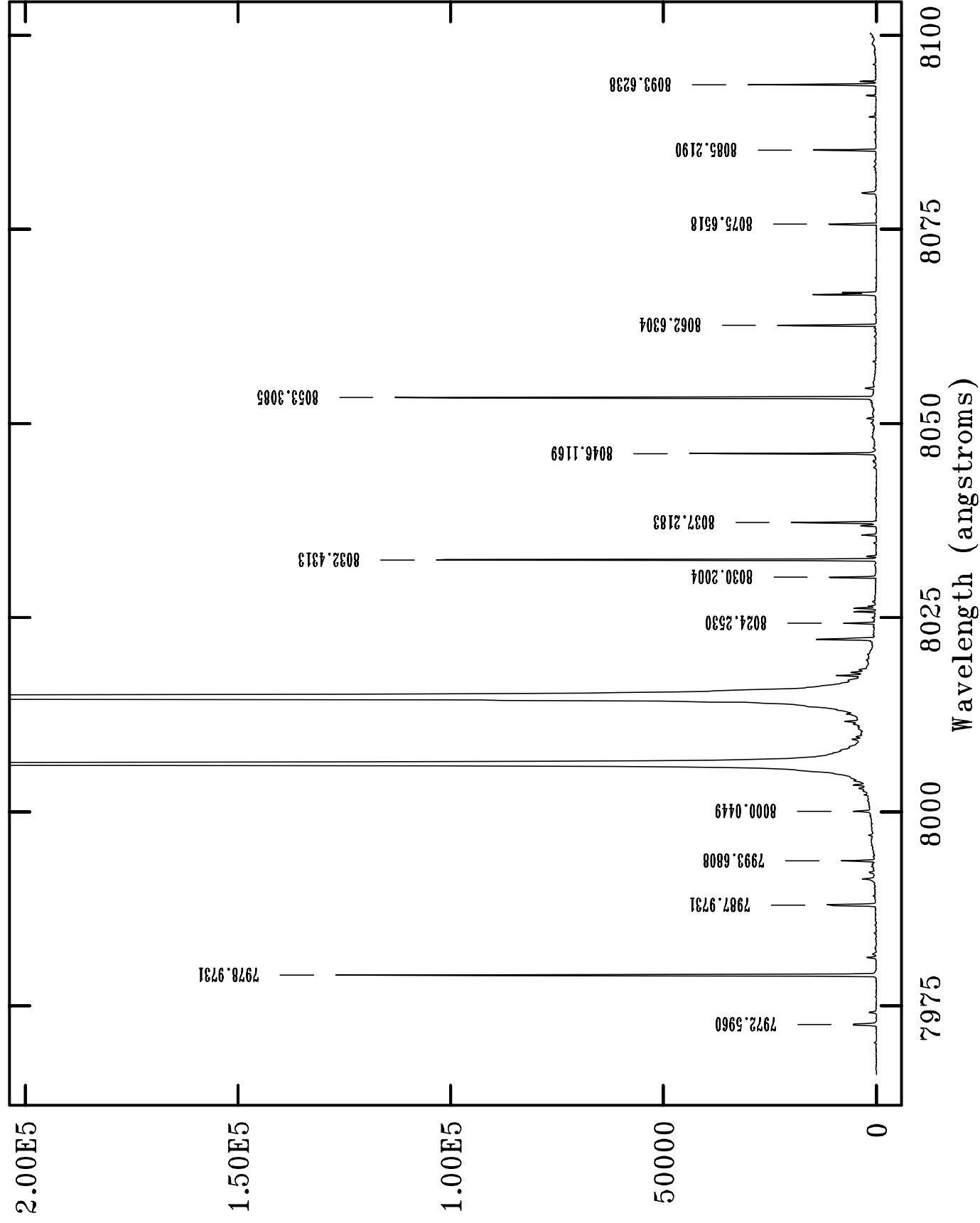


Order 76 - Blue

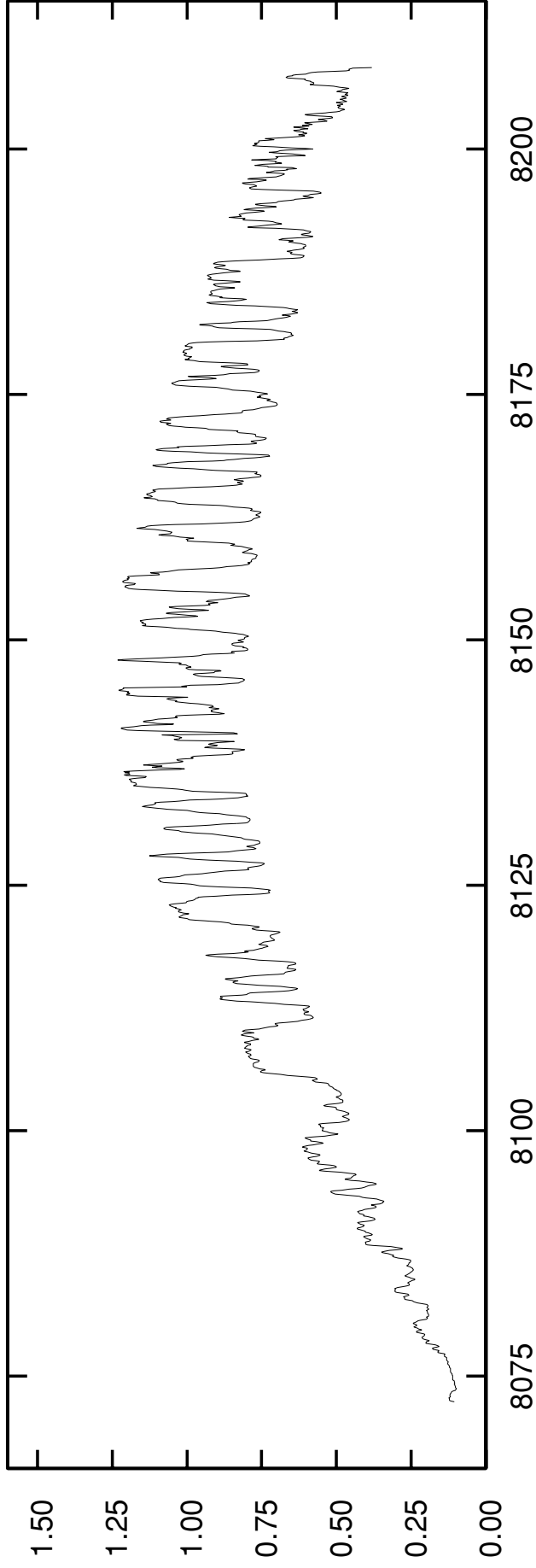


Wavelength (Angstroms)

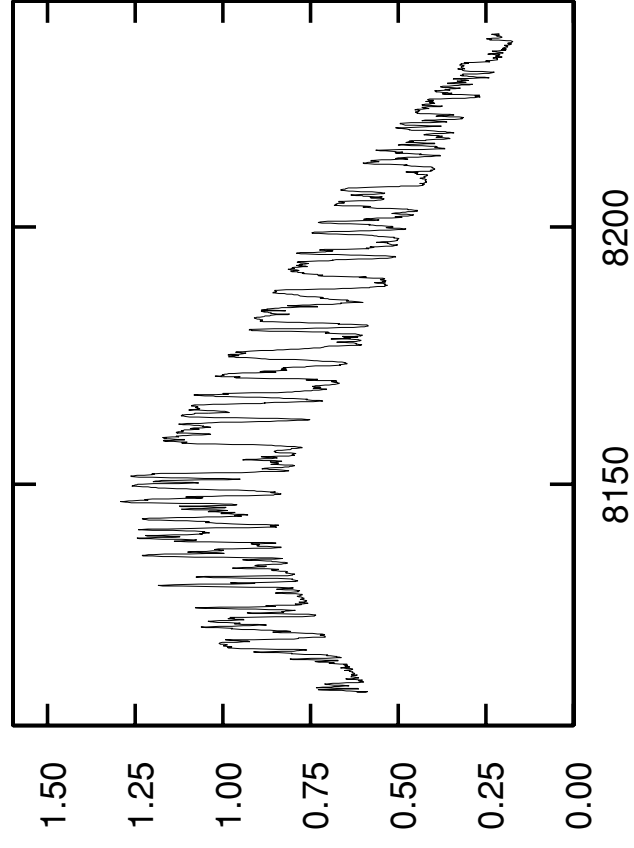
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:42:04 31-Mar-2002
Aperture 9, Image line 9, Order 76
ecidentify thar_316g8991_red2: ThAr



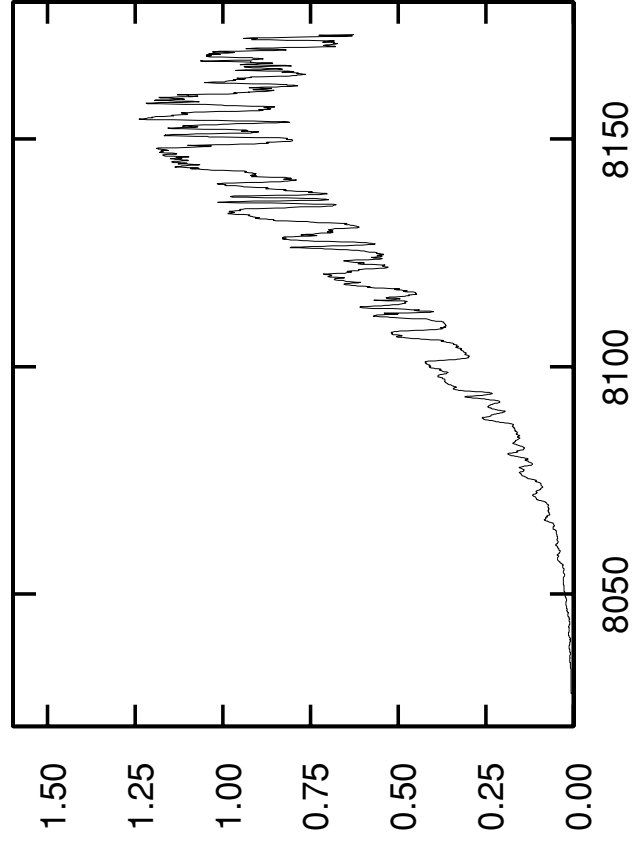
Order 75 - Central



Order 75 - Red

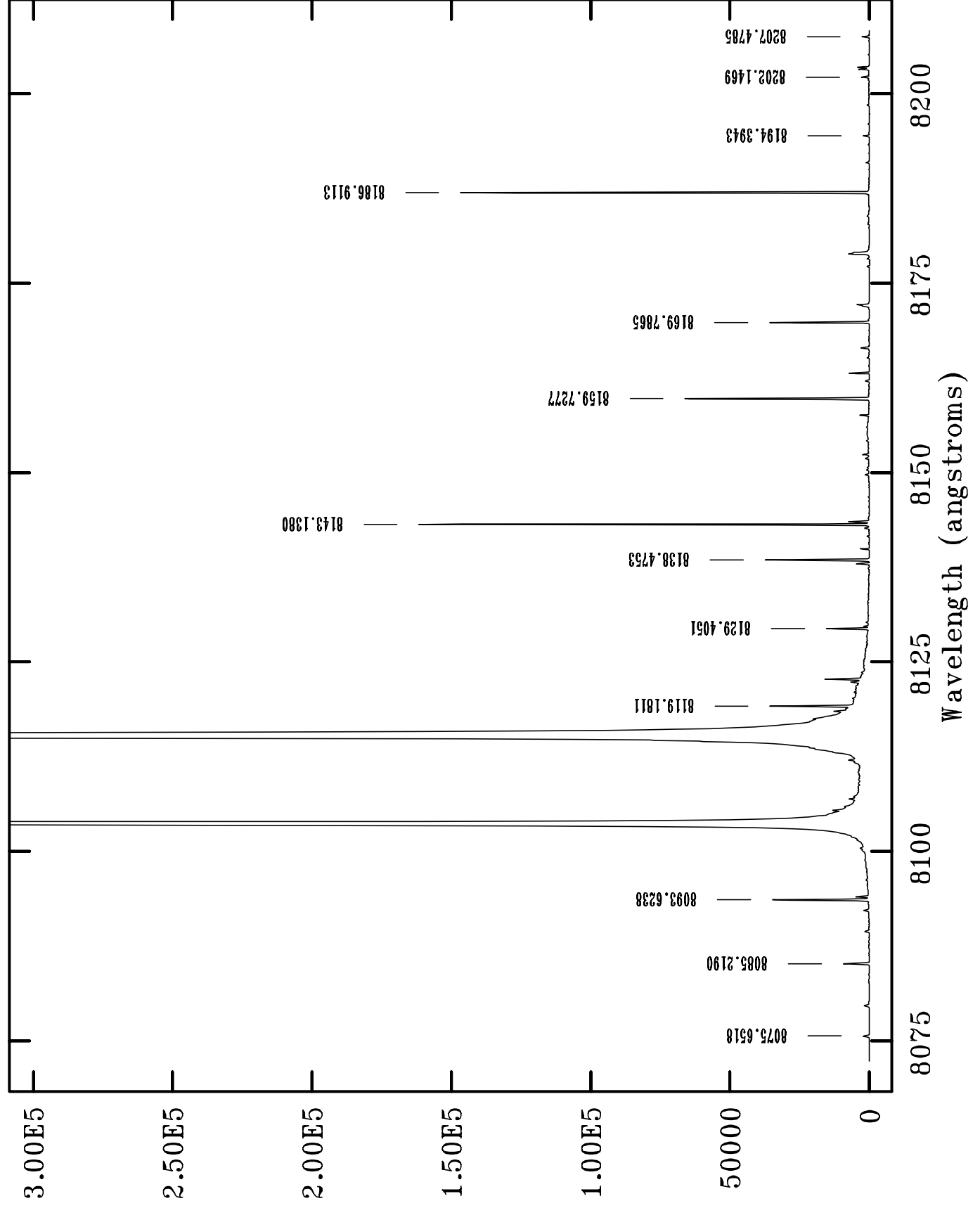


Order 75 - Blue

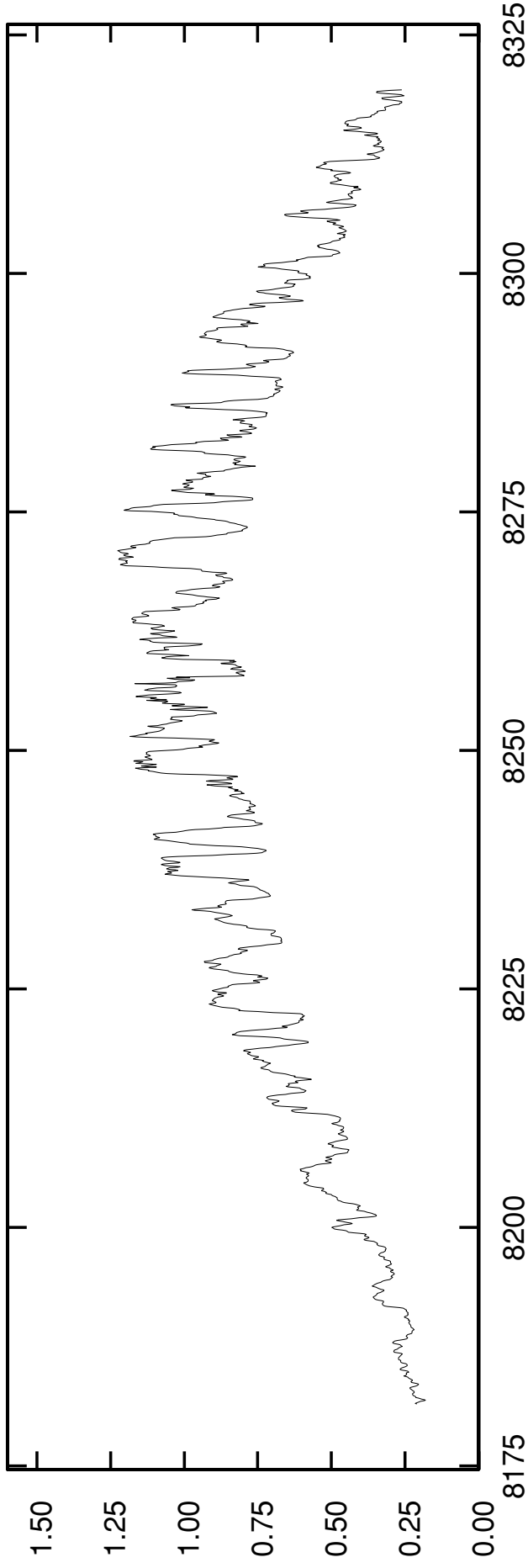


Wavelength (Angstroms)

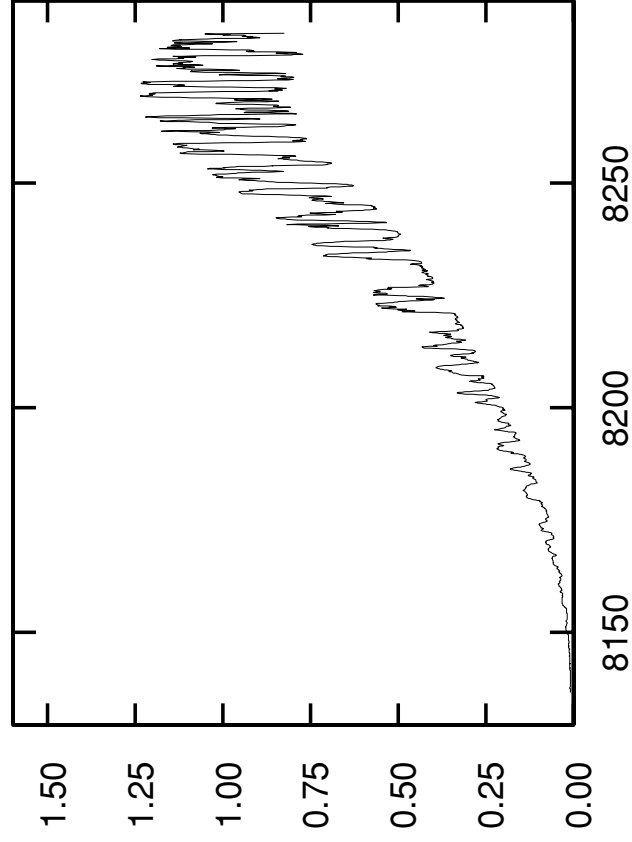
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:41:34 31-Mar-2002
Aperture 8, Image line 8, Order 75
ecidentify thar_316g8991_red2: ThAr



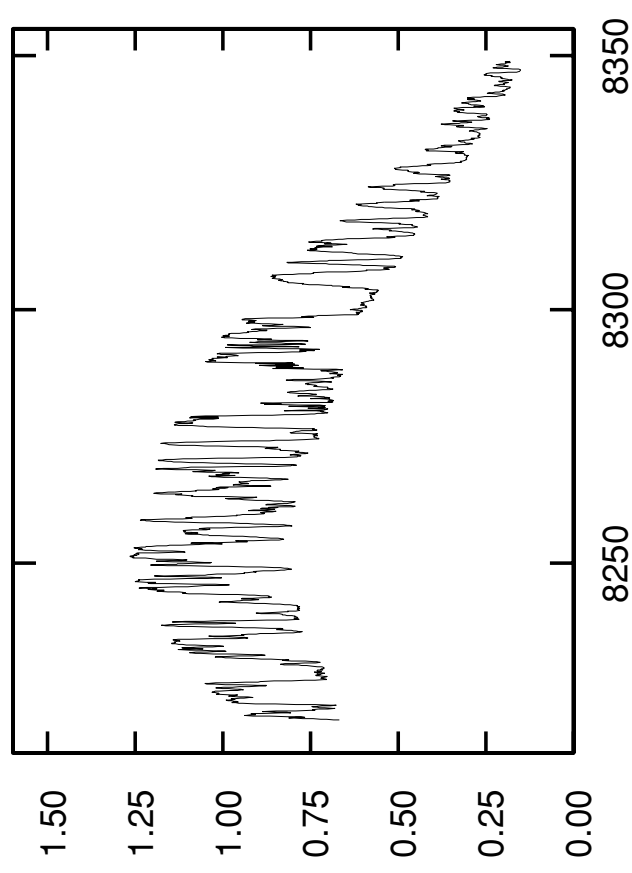
Order 74 - Central



Order 74 - Blue

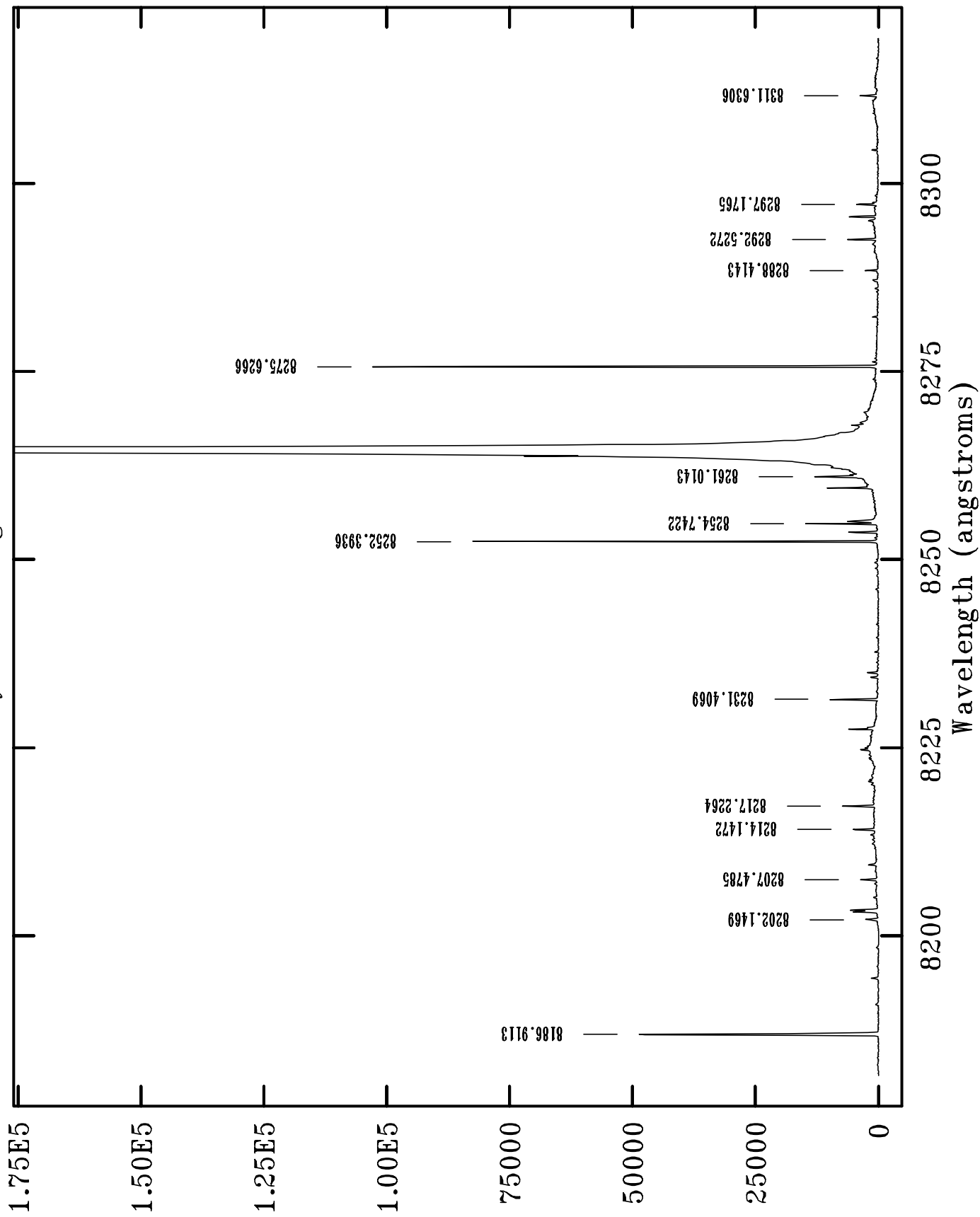


Order 74 - Red

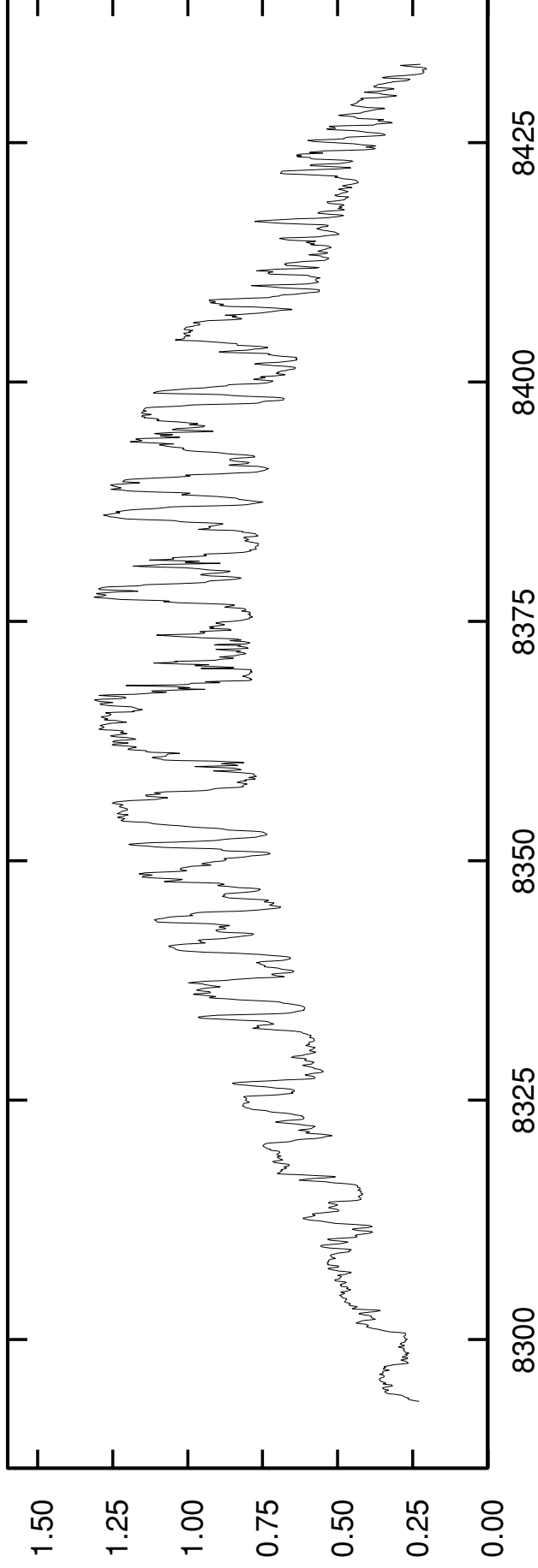


Wavelength (Angstroms)

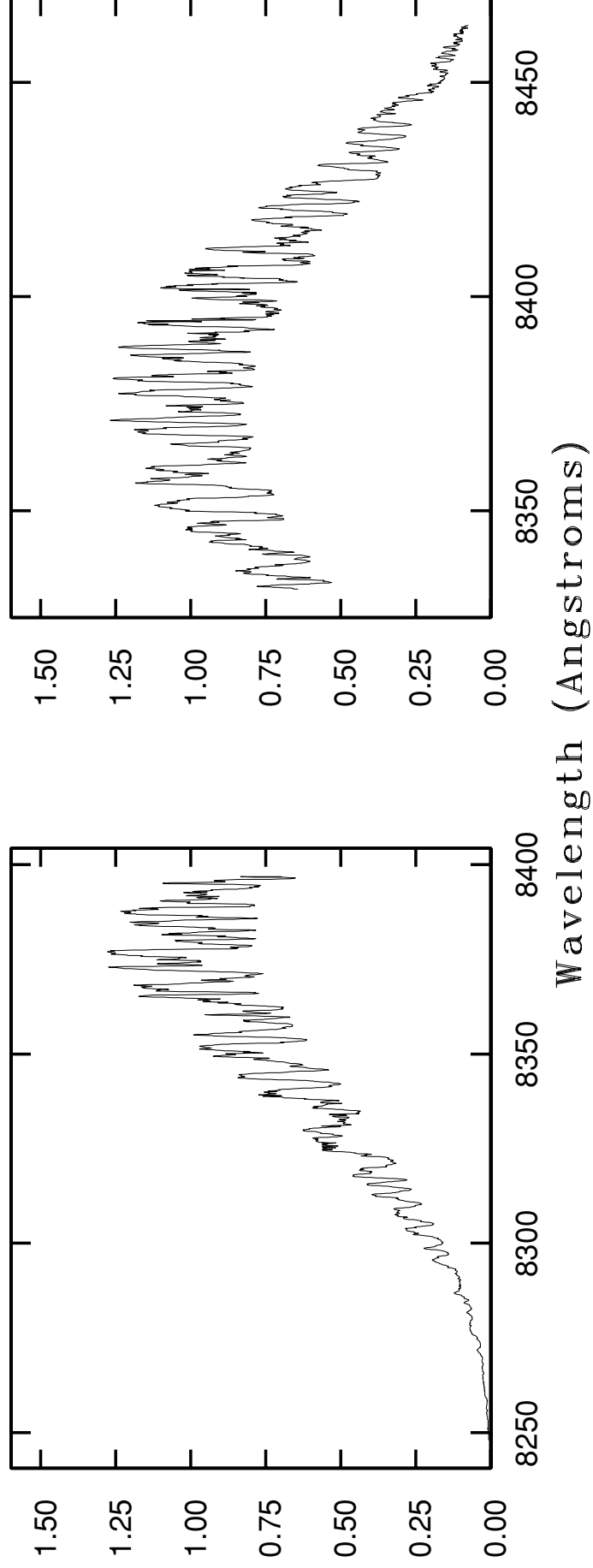
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:40:33 31-Mar-2002
Aperture 7, Image line 7, Order 74
eidentify thar_316g8991_red2: ThAr



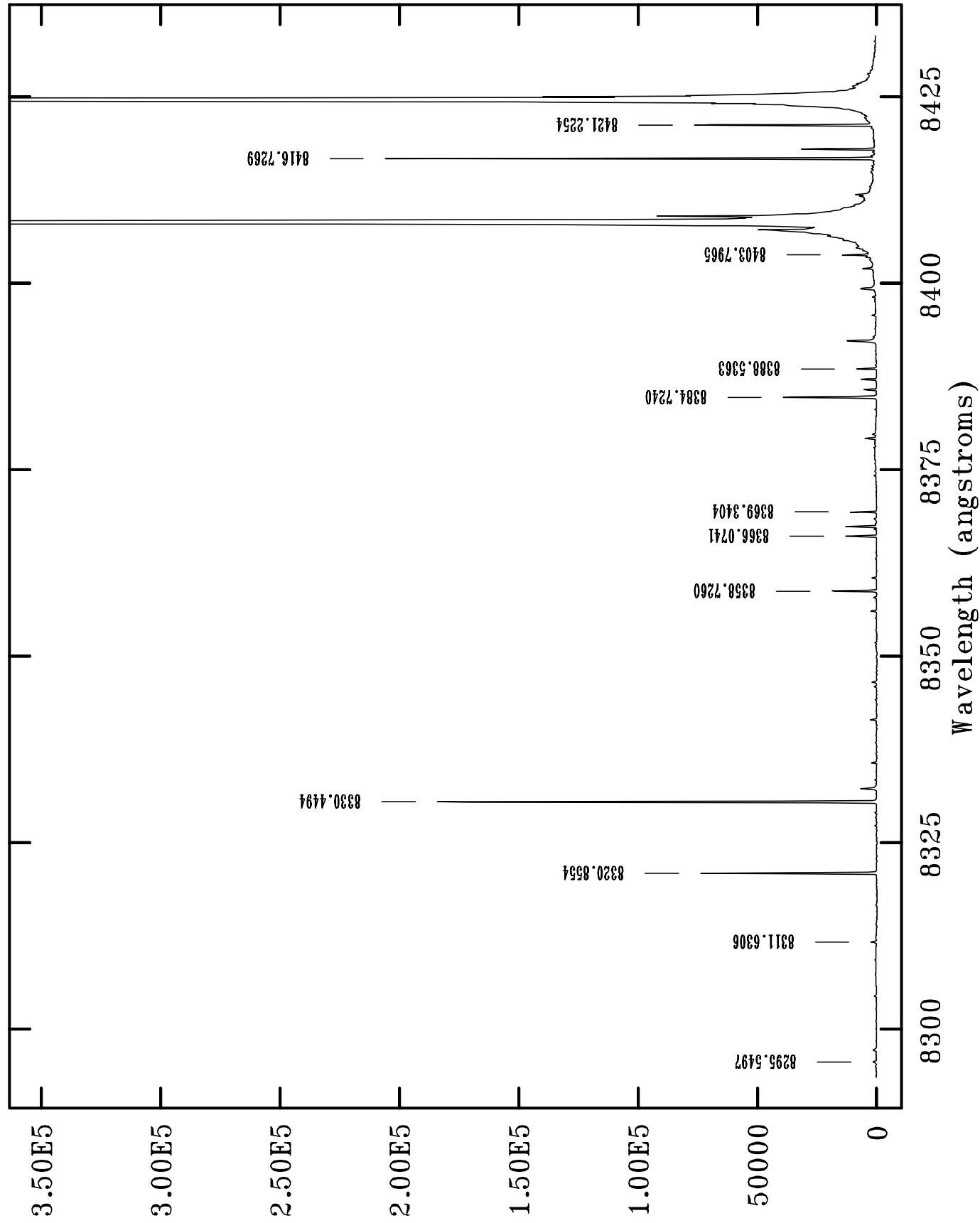
Order 73 - Central



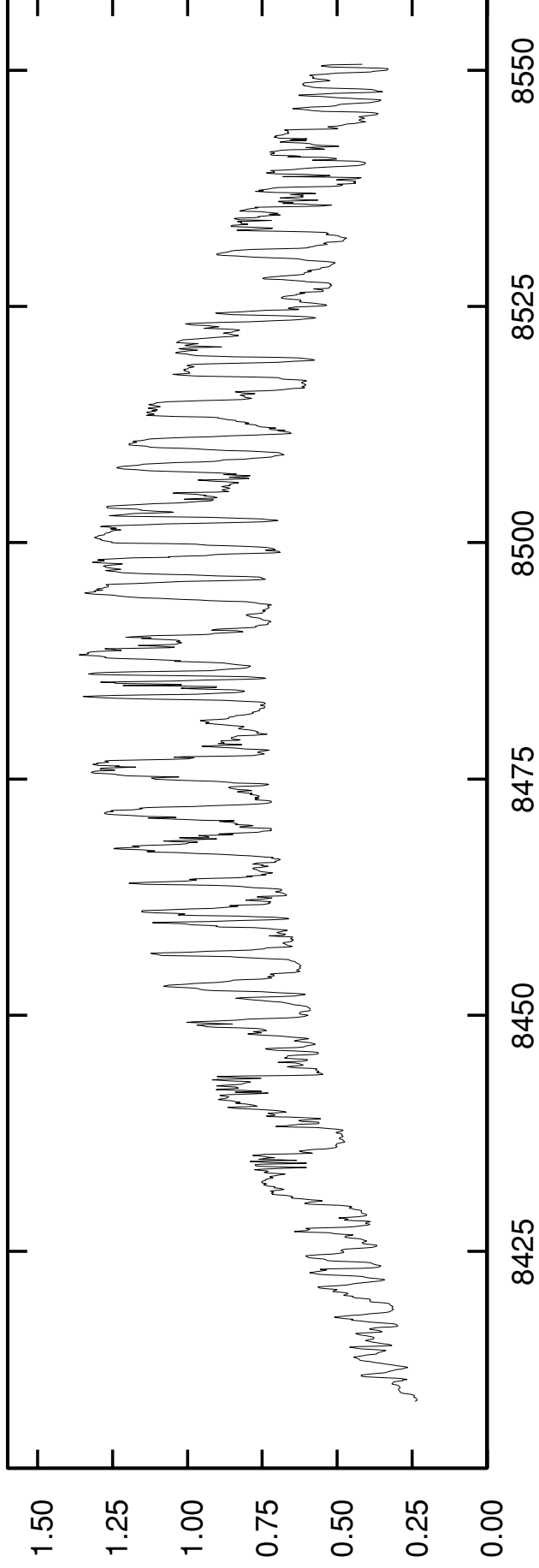
Order 73 - Red



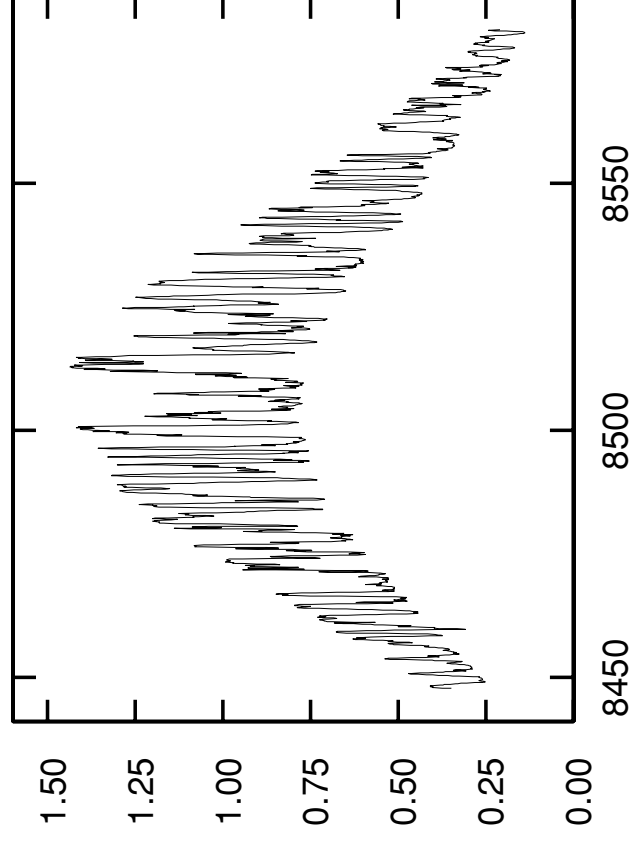
N0A0/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:39:57 31-Mar-2002
Aperture 6, Image line 6, Order 73
ecidentify thar_316g8991_red2: ThAr



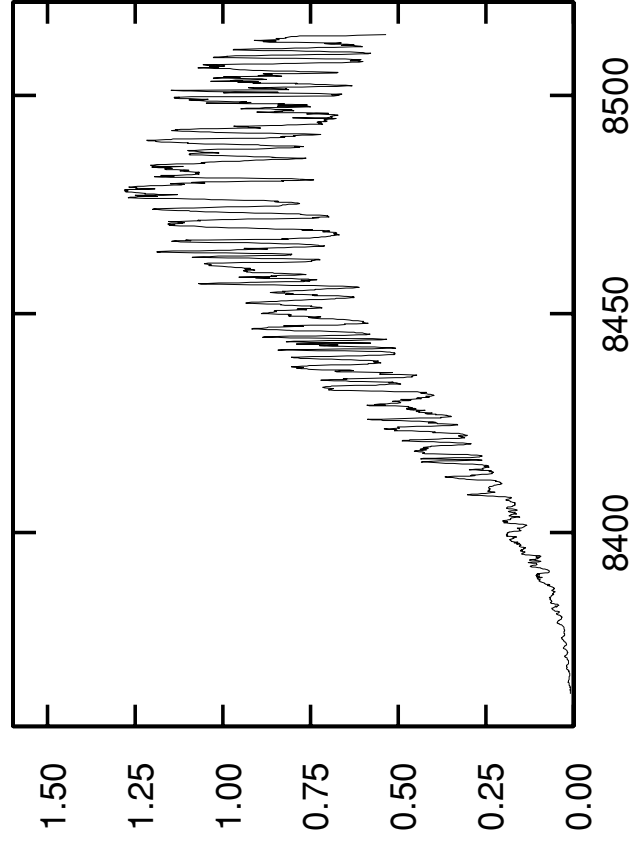
Order 72 - Central



Order 72 - Red

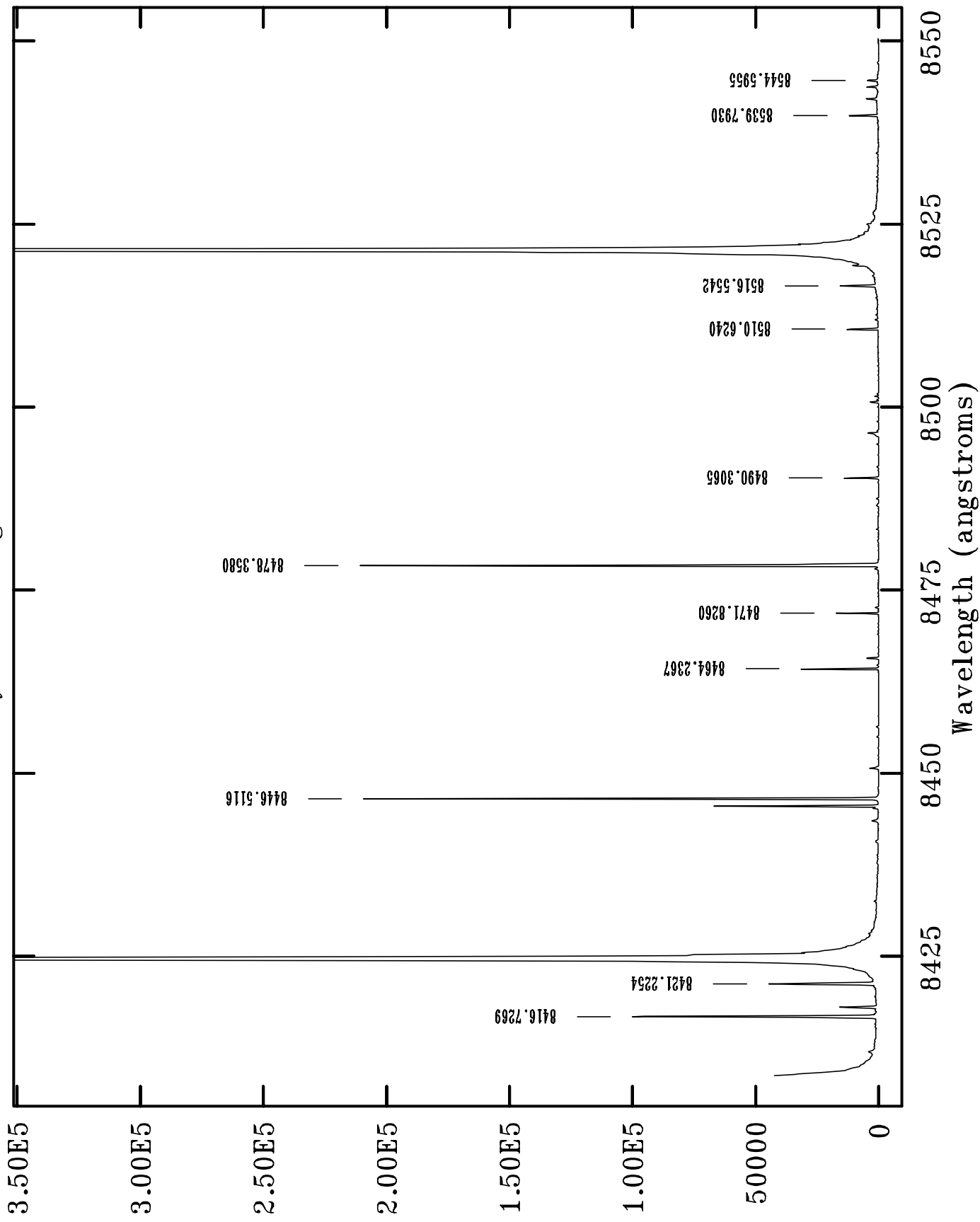


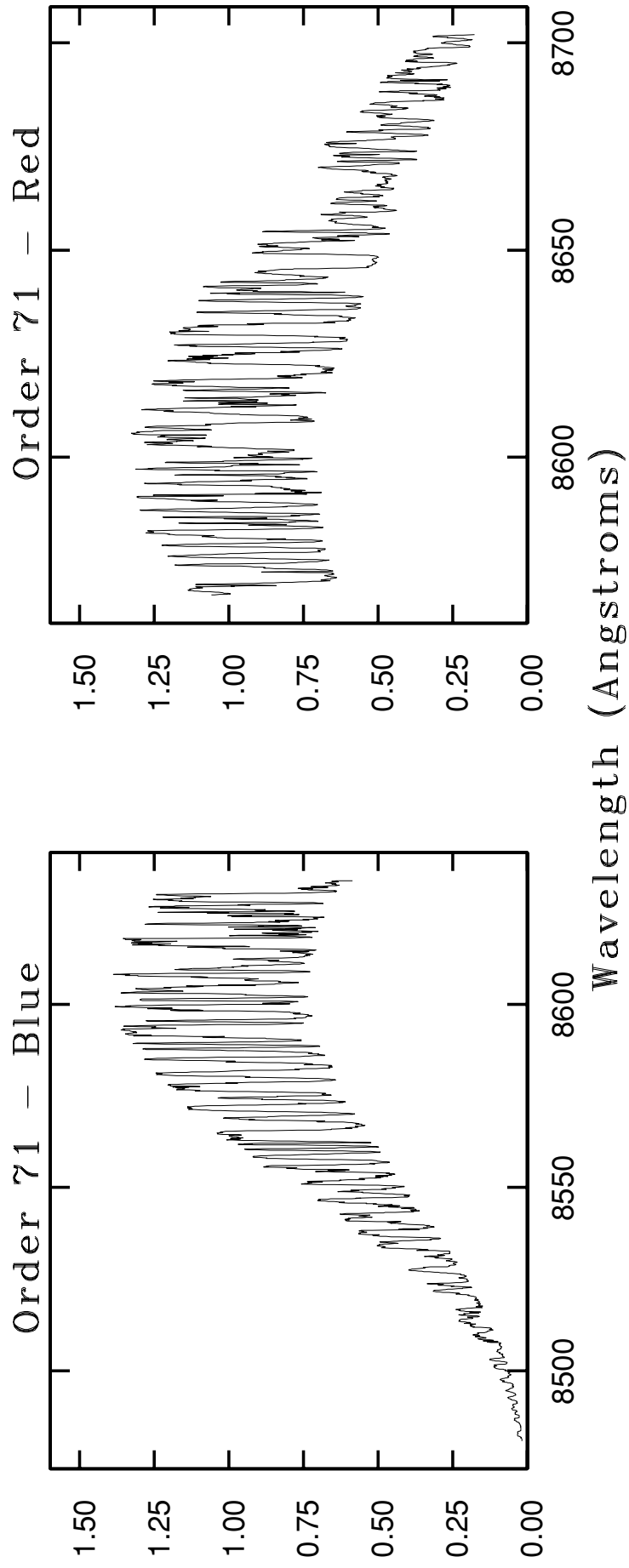
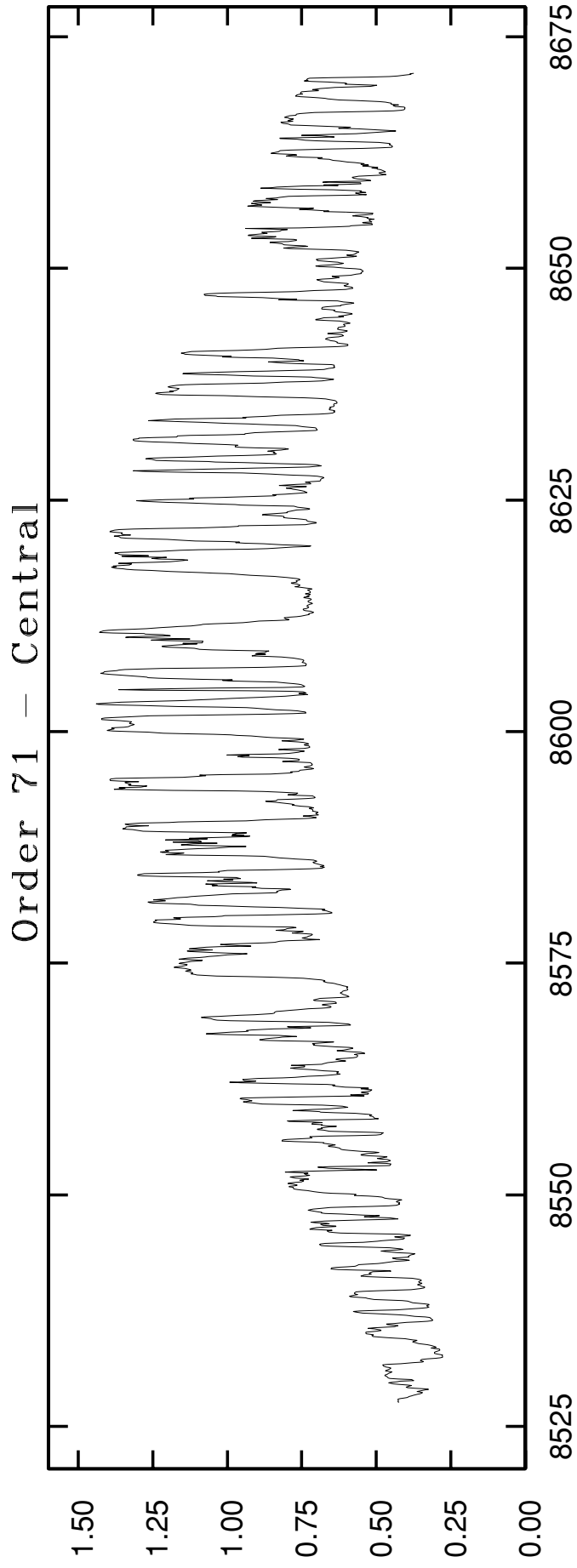
Order 72 - Blue



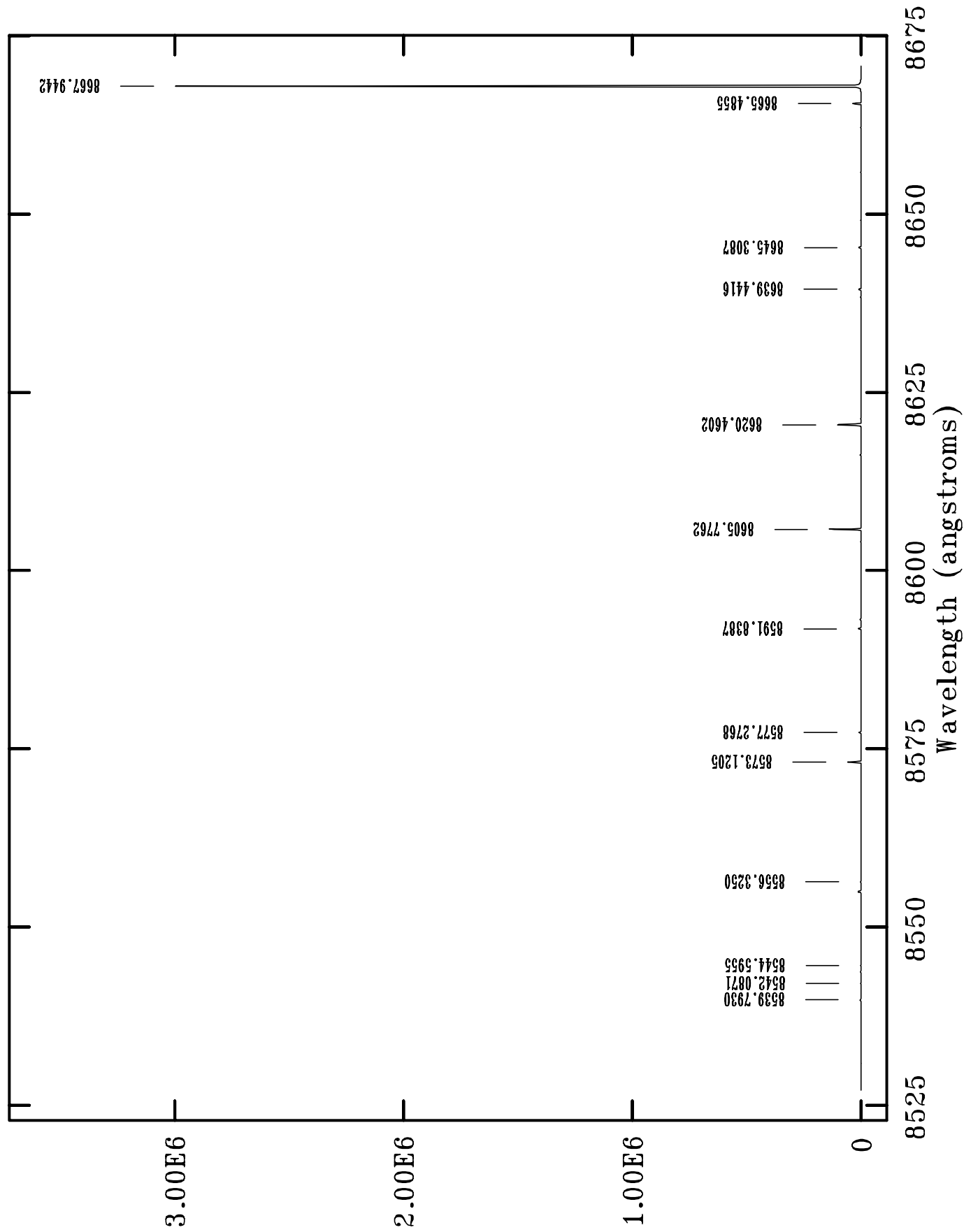
Wavelength (Angstroms)

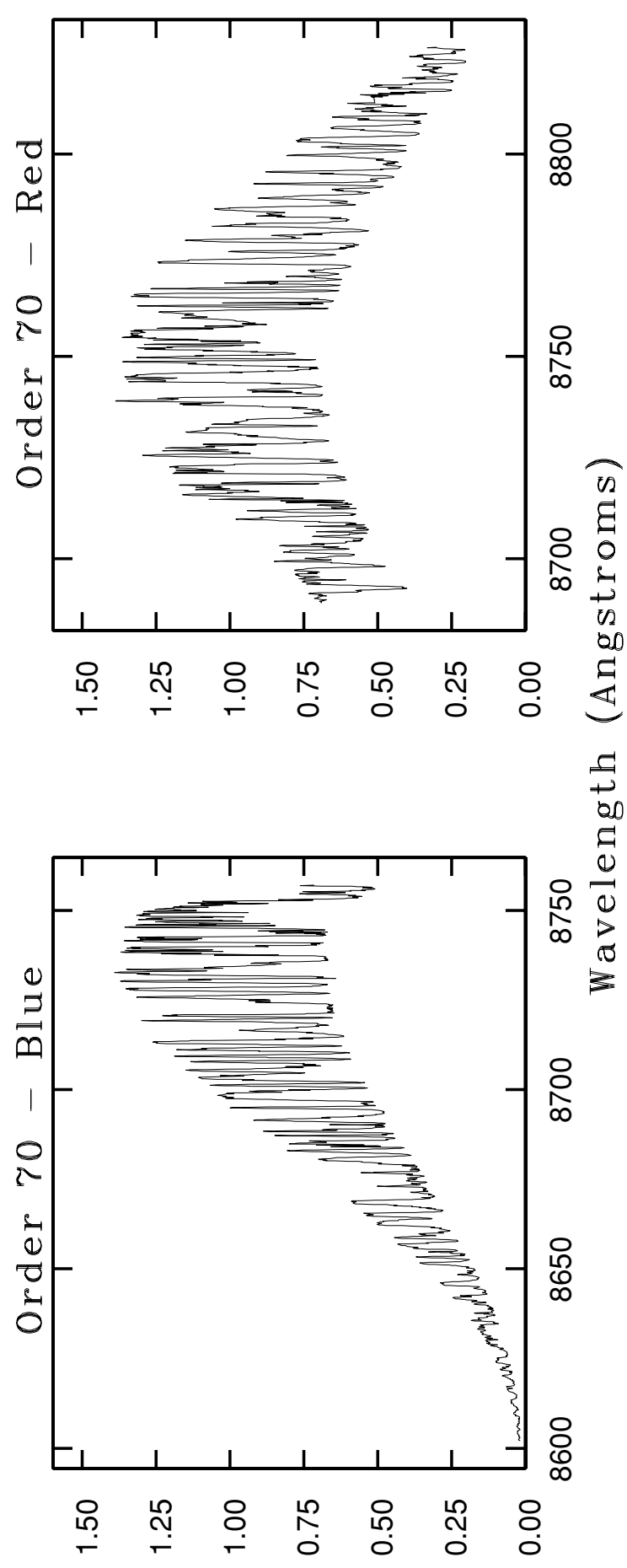
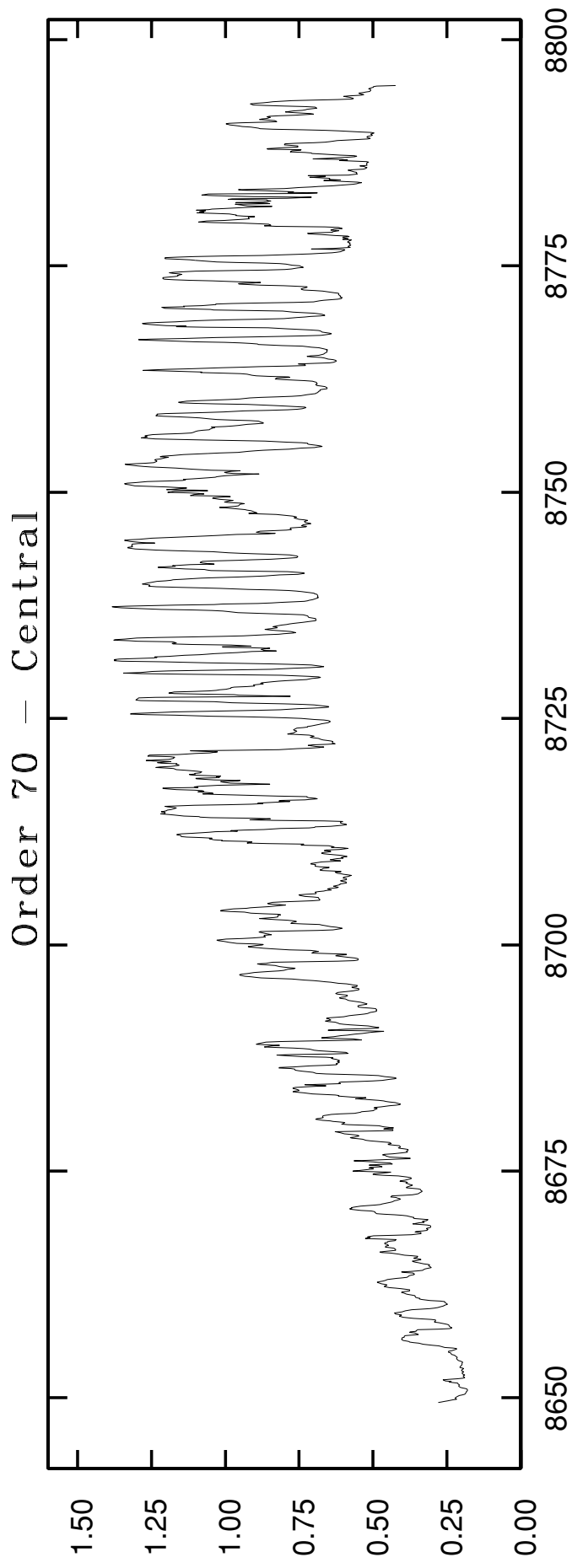
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:39:17 31-Mar-2002
Aperture 5, Image line 5, Order 72
ecidentify thar_316g8991_red2: ThAr



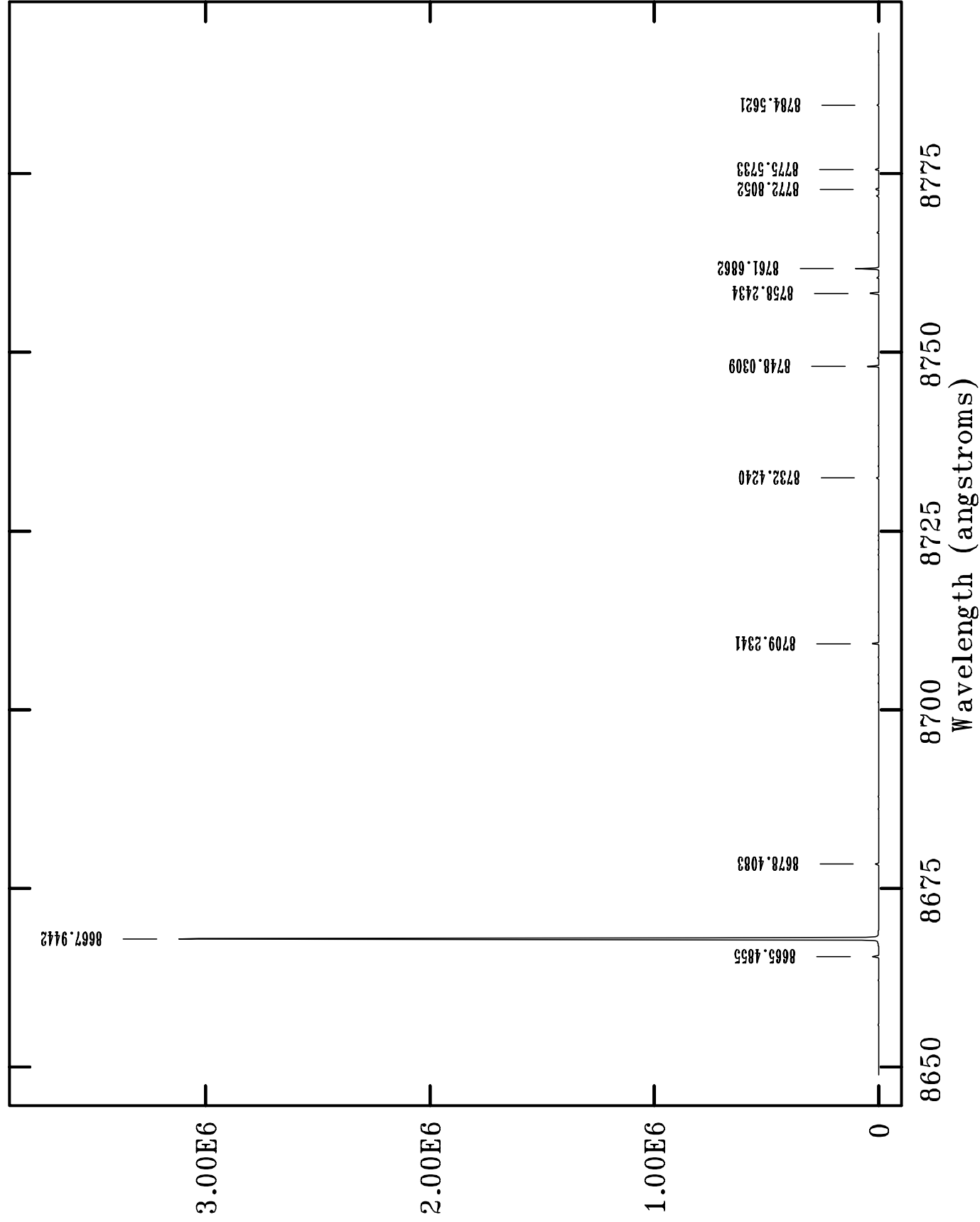


NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:38:47 31-Mar-2002
Aperture 4, Image line 4, Order 71
ecidentify thar_316g8991_red2: ThAr

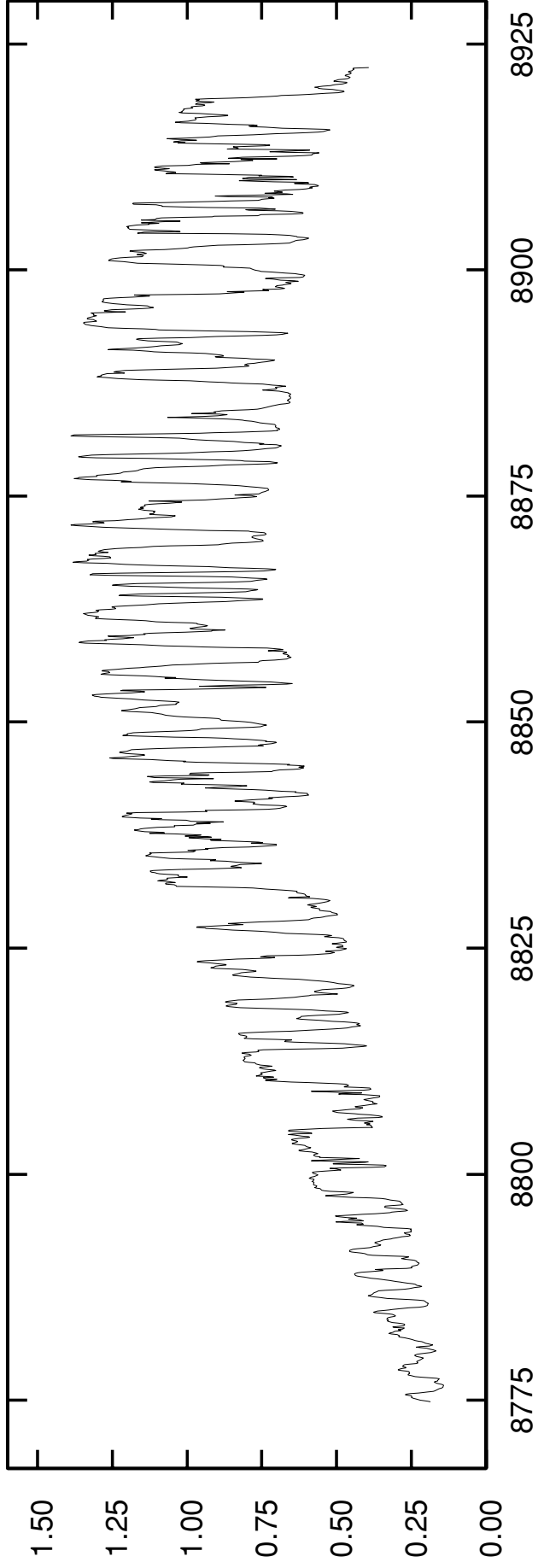




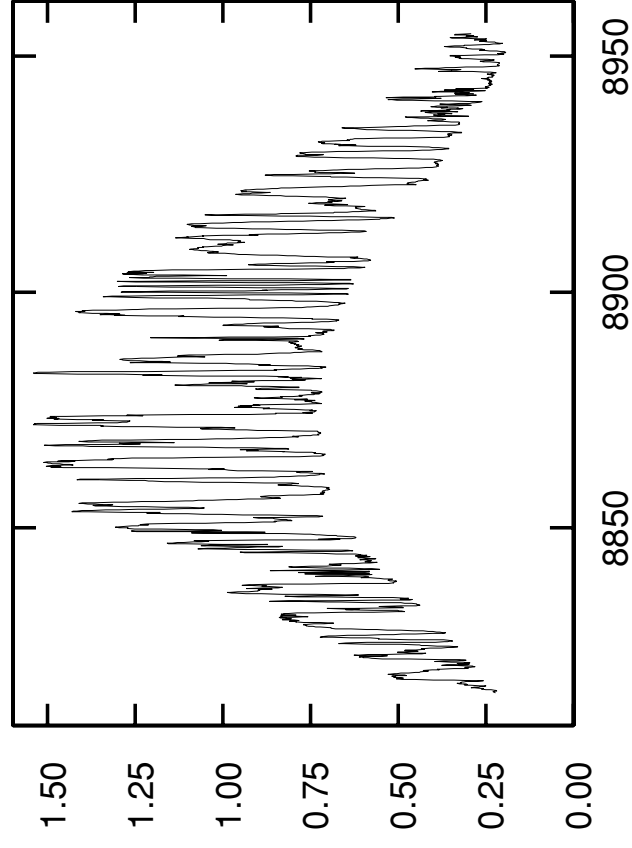
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:38:17 31-Mar-2002
Aperture 3, Image line 3, Order 70
ecidentify thar_316g8991_red2: ThAr



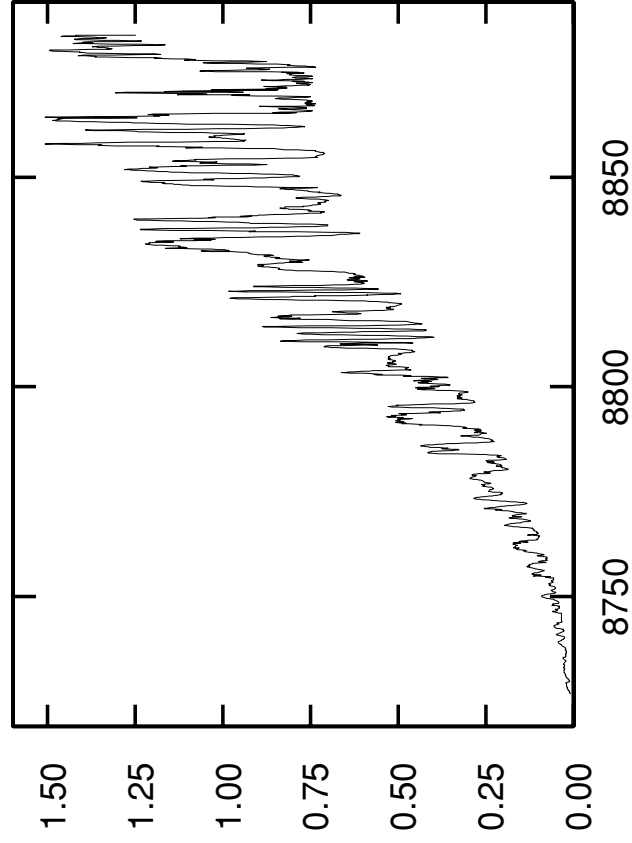
Order 69 - Central



Order 69 - Red

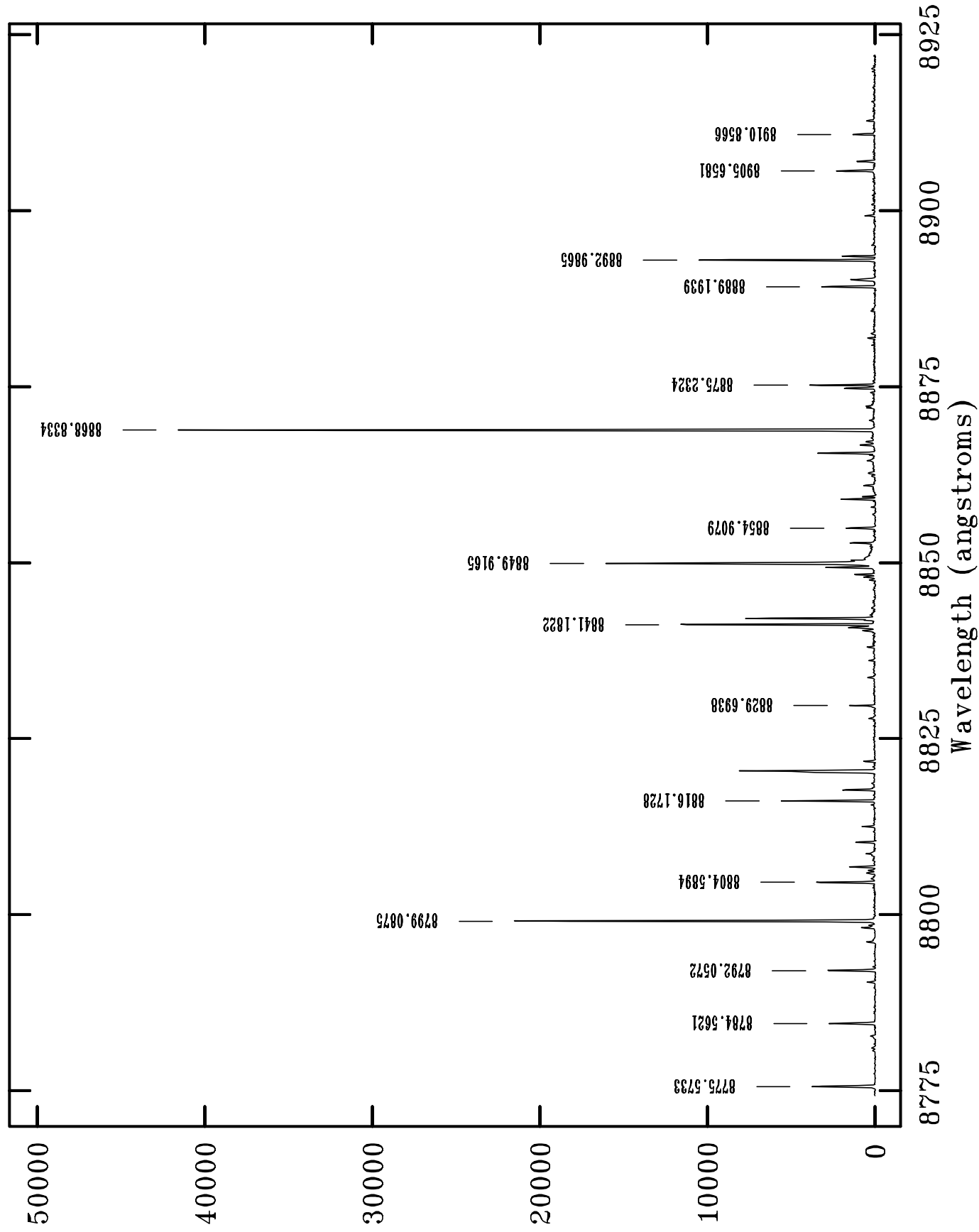


Order 69 - Blue

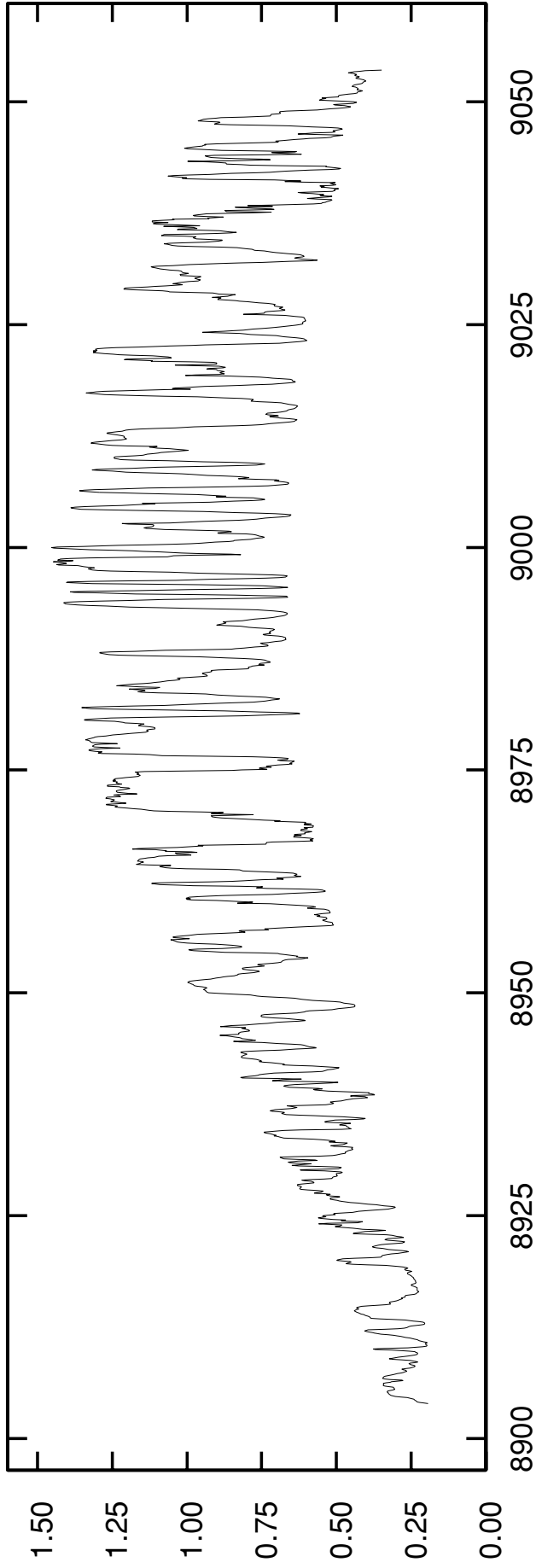


Wavelength (Angstroms)

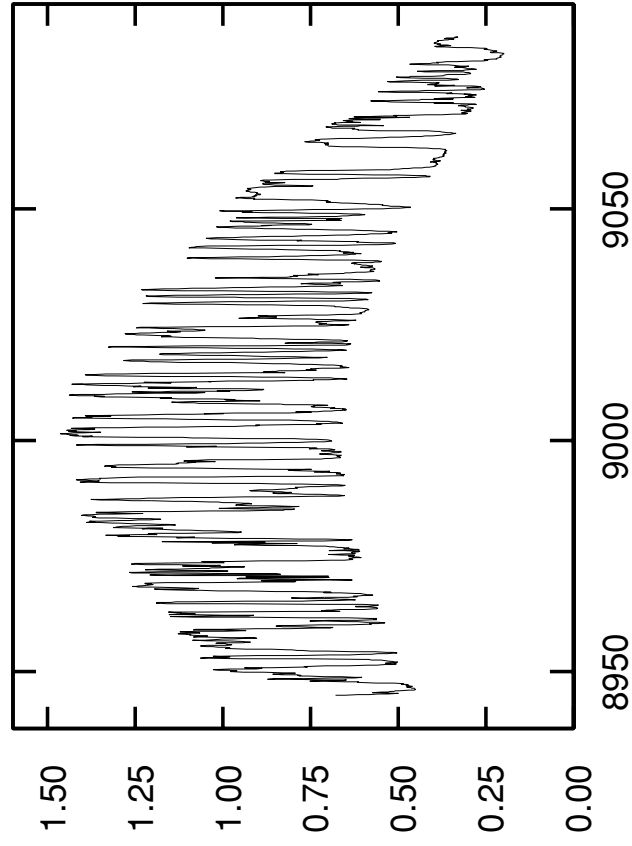
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:37:51 31-Mar-2002
Aperture 2, Image line 2, Order 69
ecidentify thar_316g8991_red2: ThAr



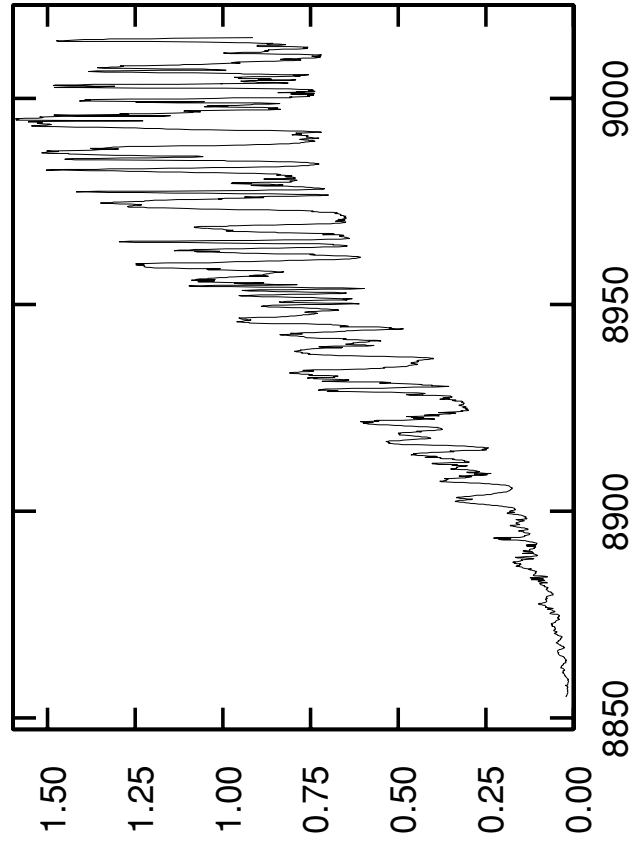
Order 68 - Central



Order 68 - Red

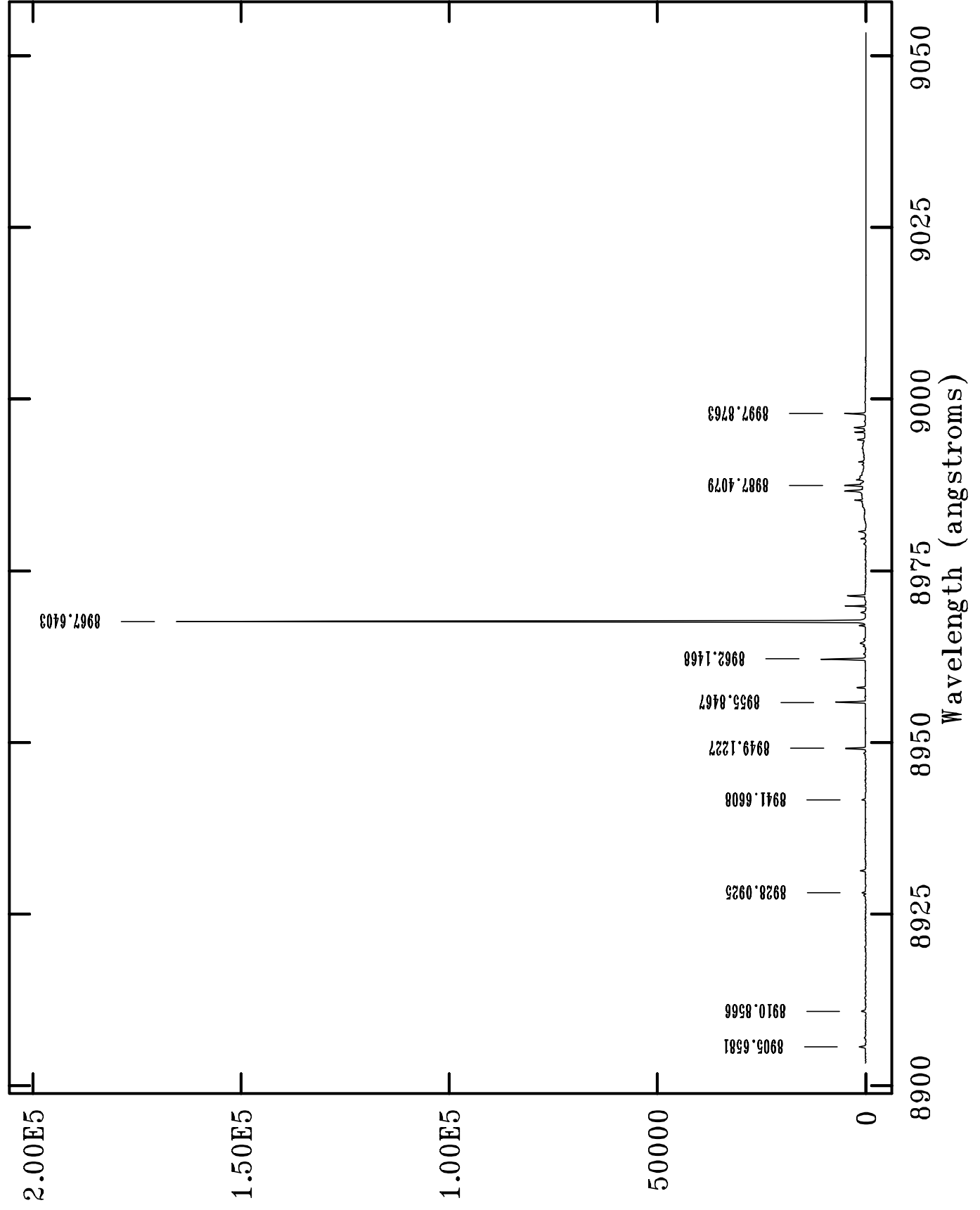


Order 68 - Blue

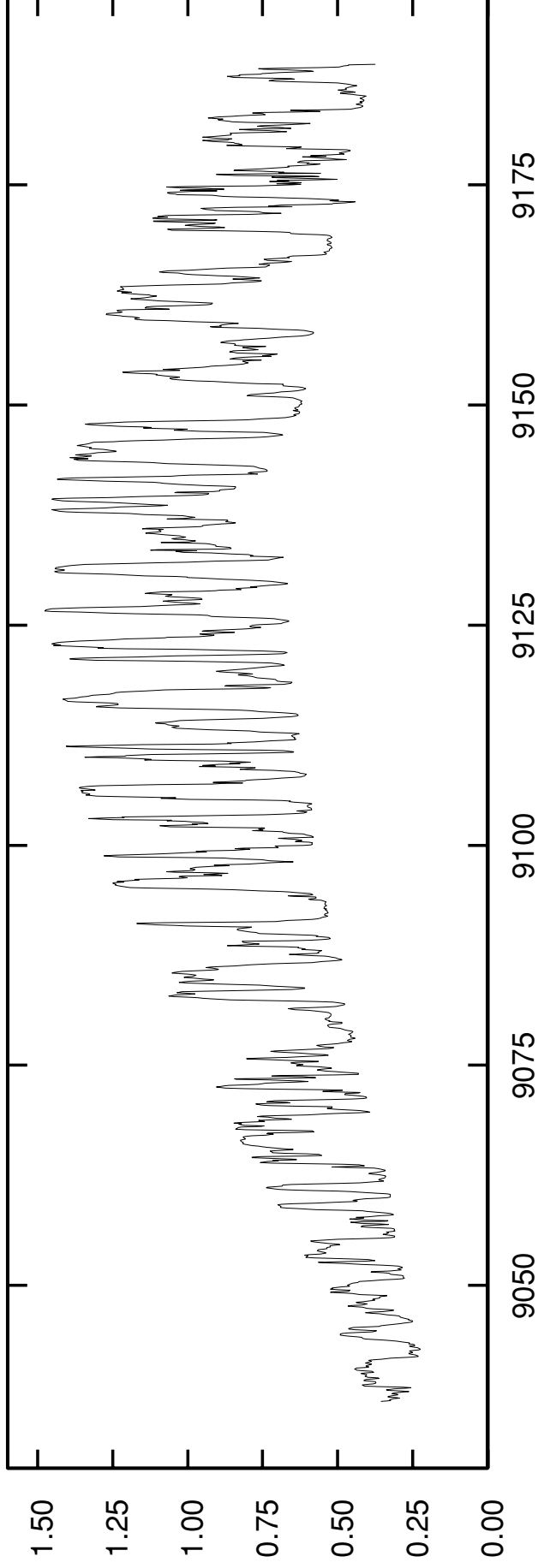


Wavelength (Angstroms)

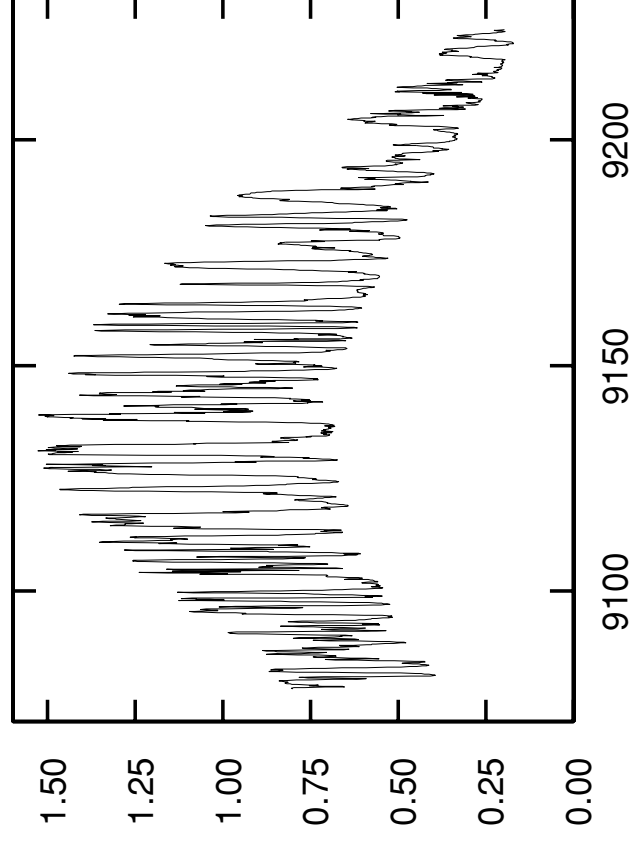
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 02:37:29 31-Mar-2002
Aperture 1, Image line 1, Order 68
ecidentify thar_316g8991_red2: ThAr



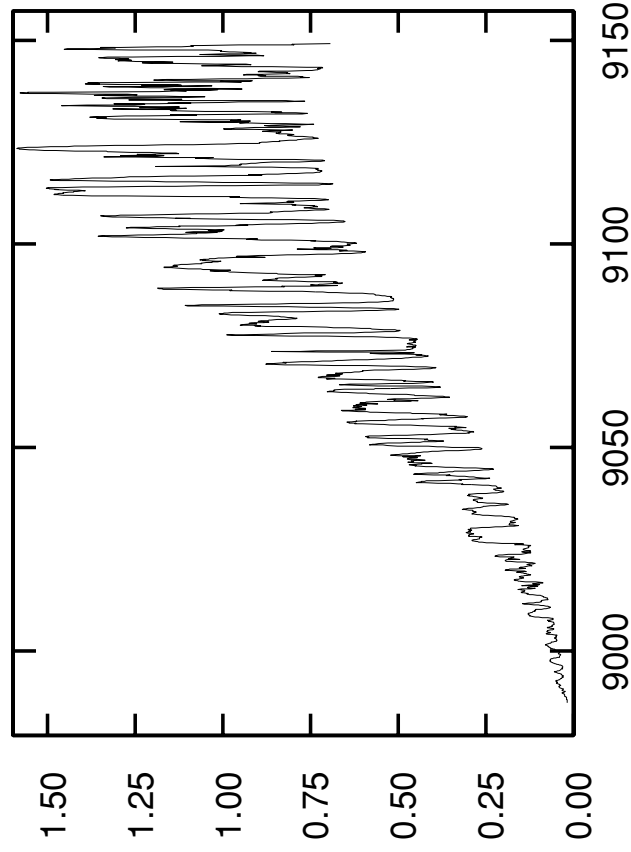
Order 67 - Central



Order 67 - Red

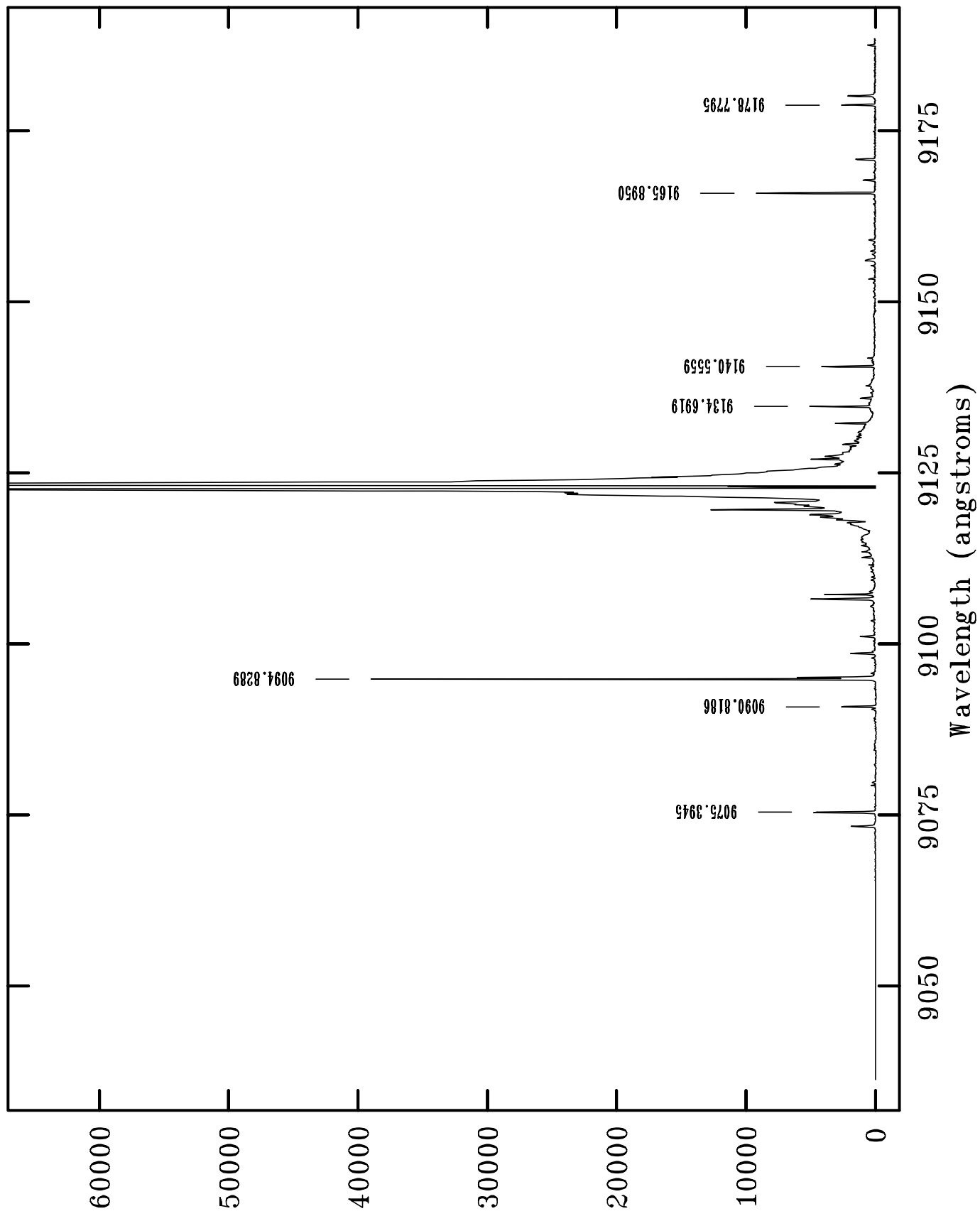


Order 67 - Blue

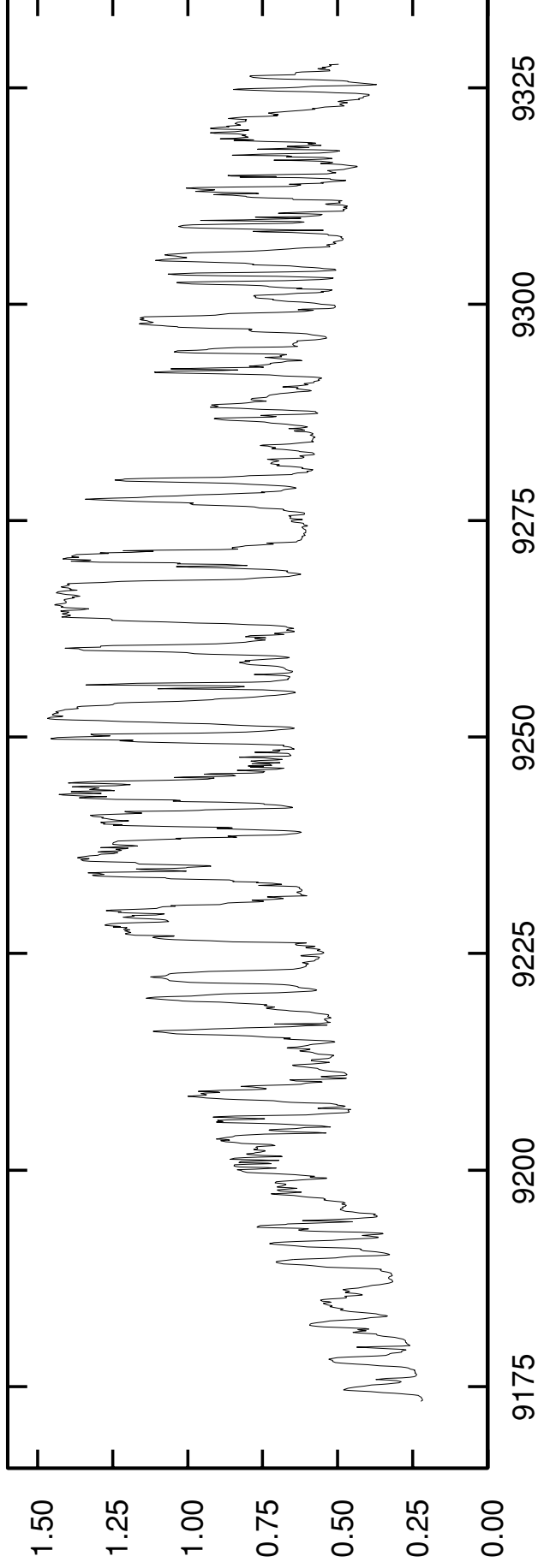


Wavelength (Angstroms)

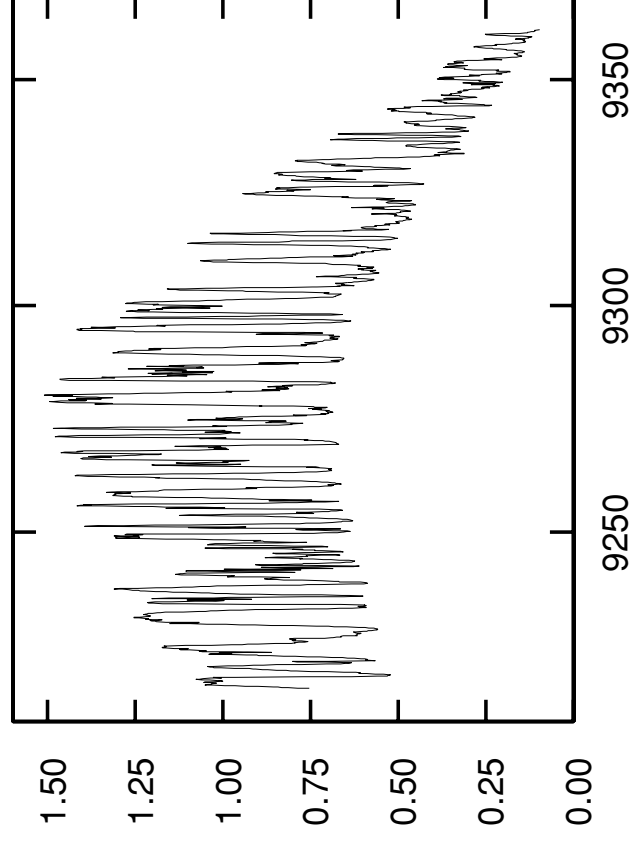
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:03:15 31-Mar-2002
Aperture 12, Image line 12, Order 67
identify thar_516g8991_red1: ThAr



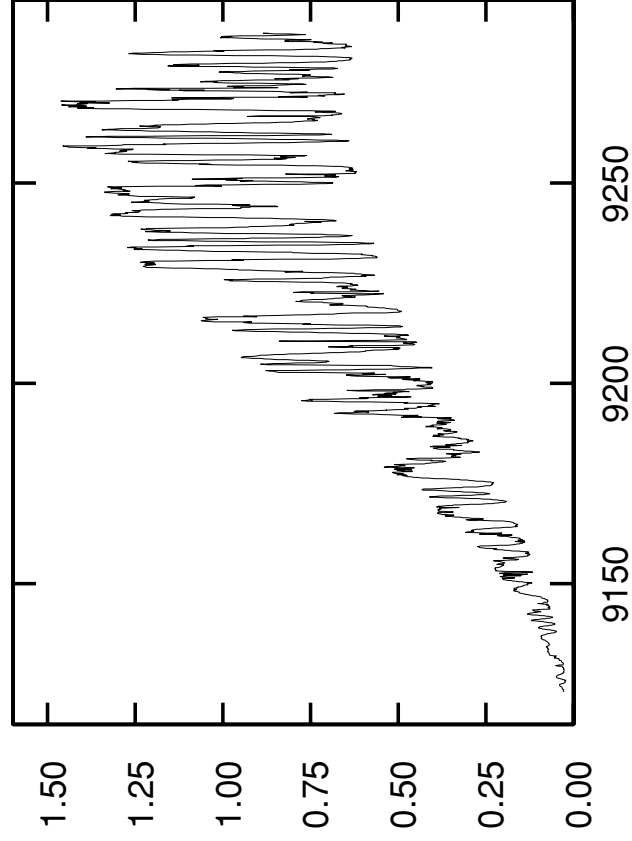
Order 66 - Central



Order 66 - Red

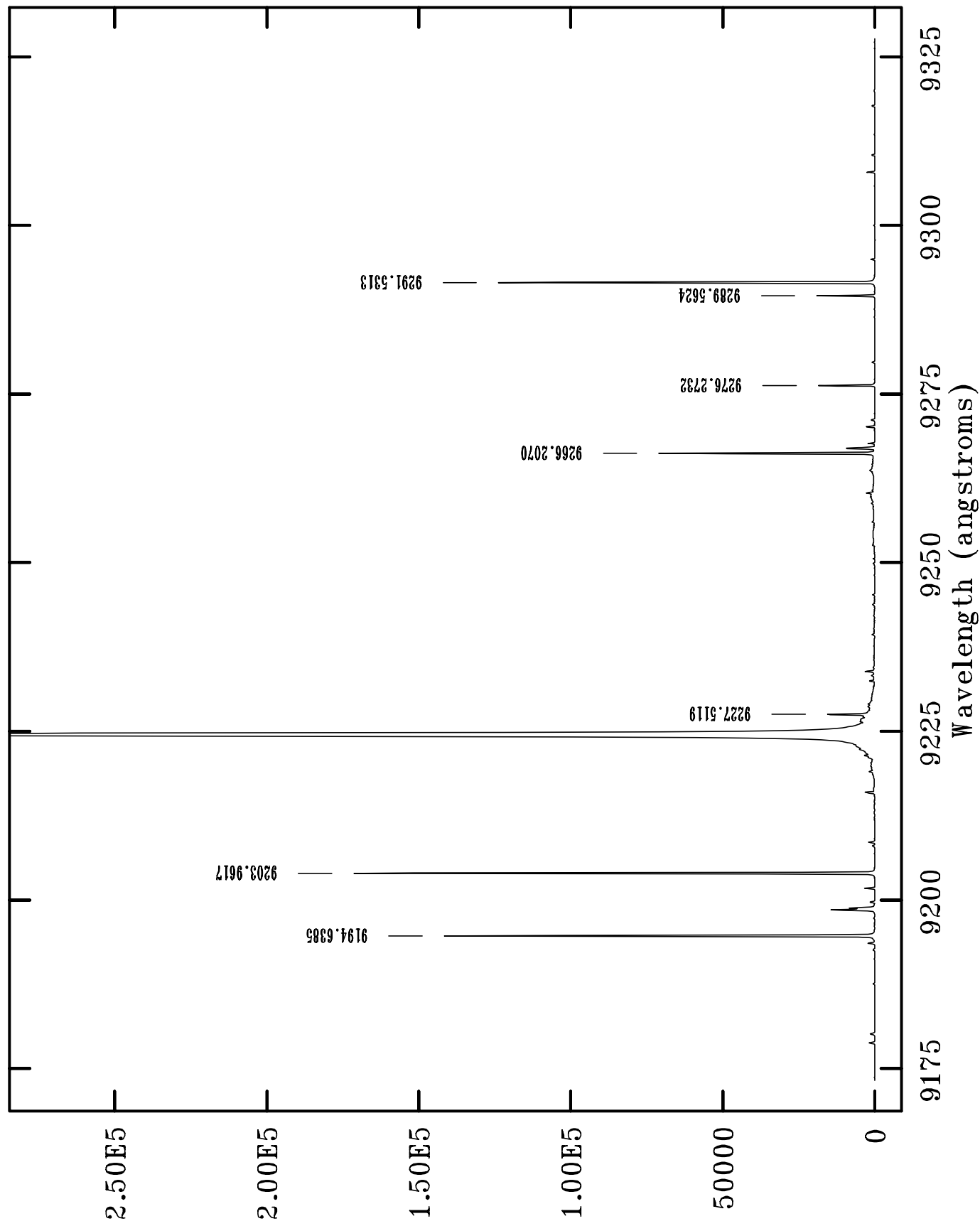


Order 66 - Blue

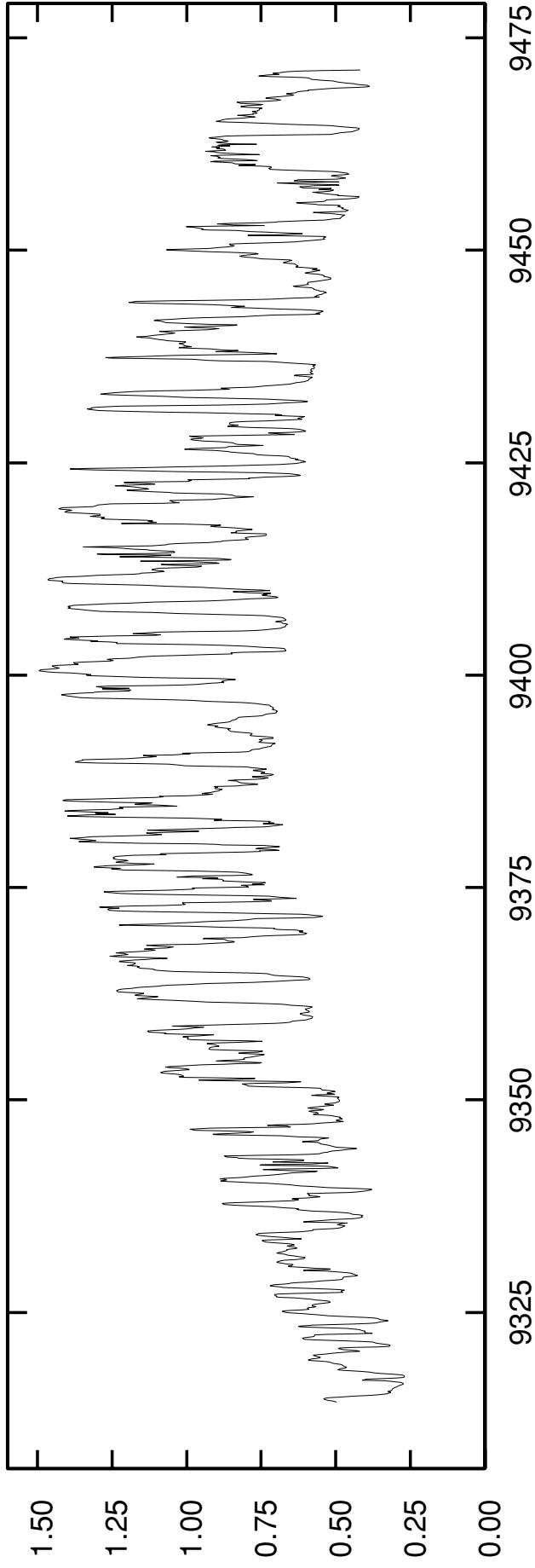


Wavelength (Angstroms)

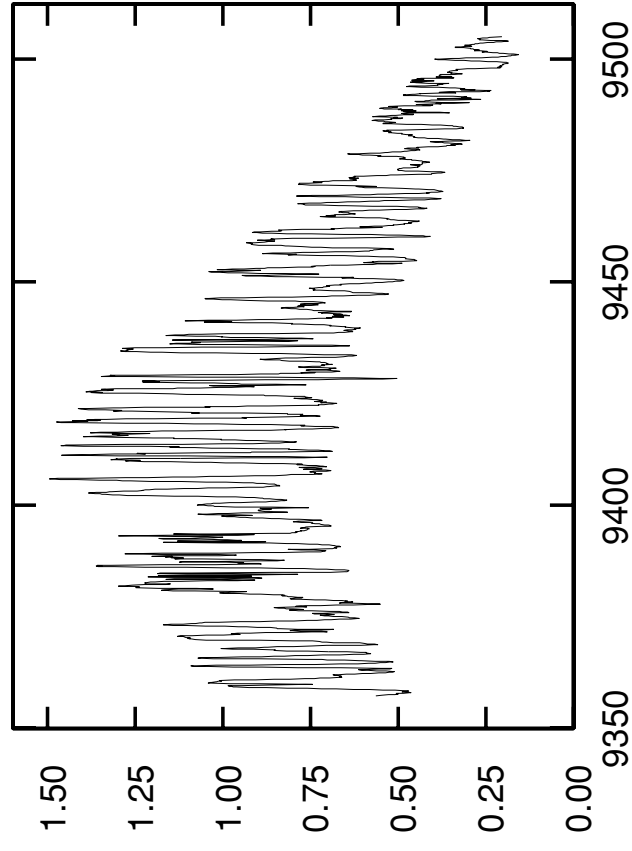
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:02:57 31-Mar-2002
Aperture 11, Image line 11, Order 66
identify thar_316g8991_red1: ThAr



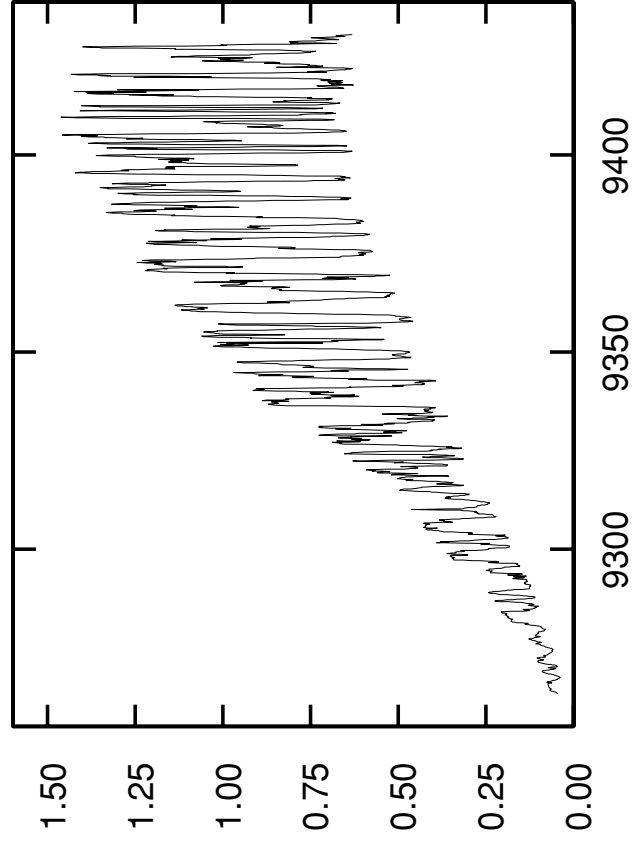
Order 65 - Central



Order 65 - Red

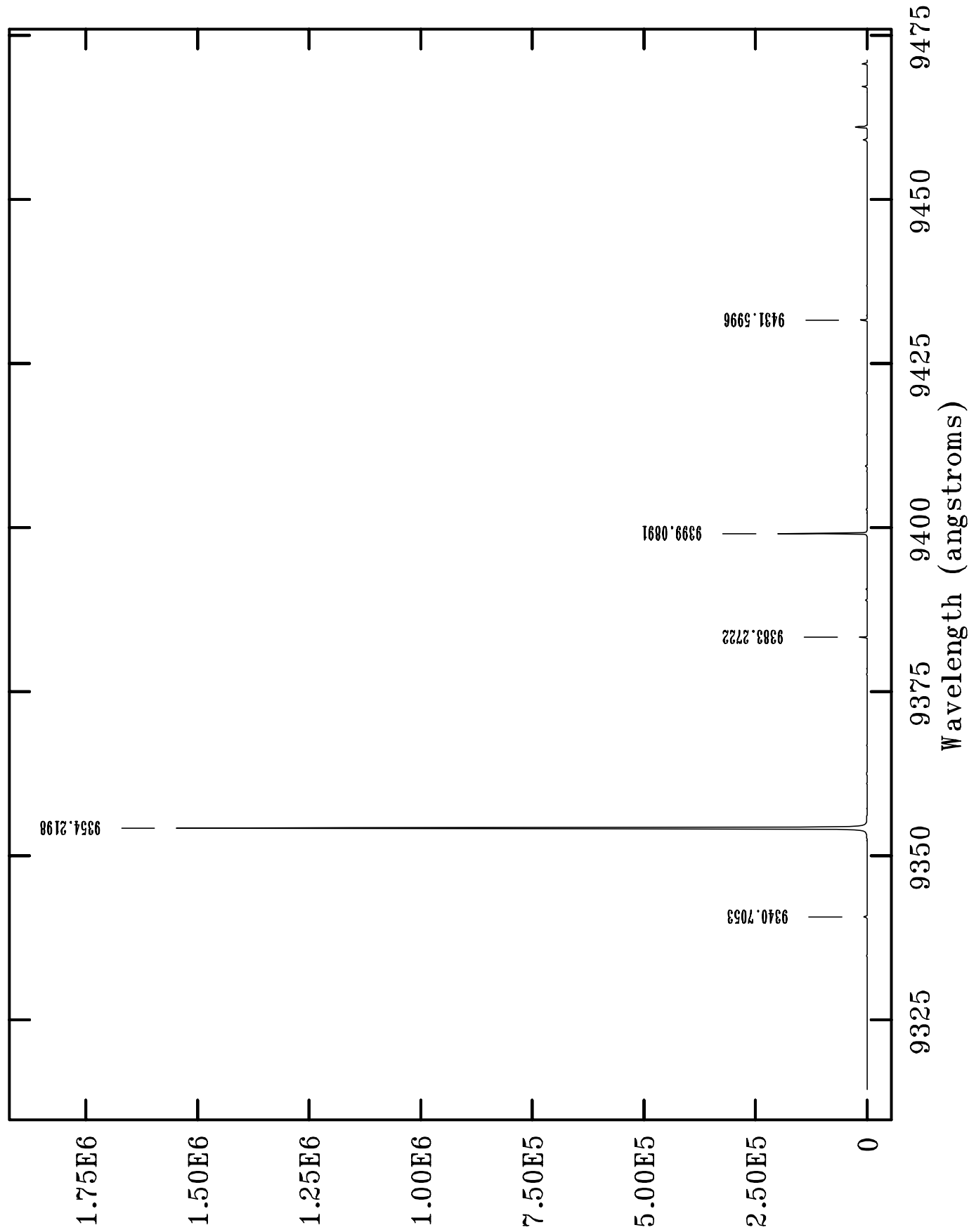


Order 65 - Blue

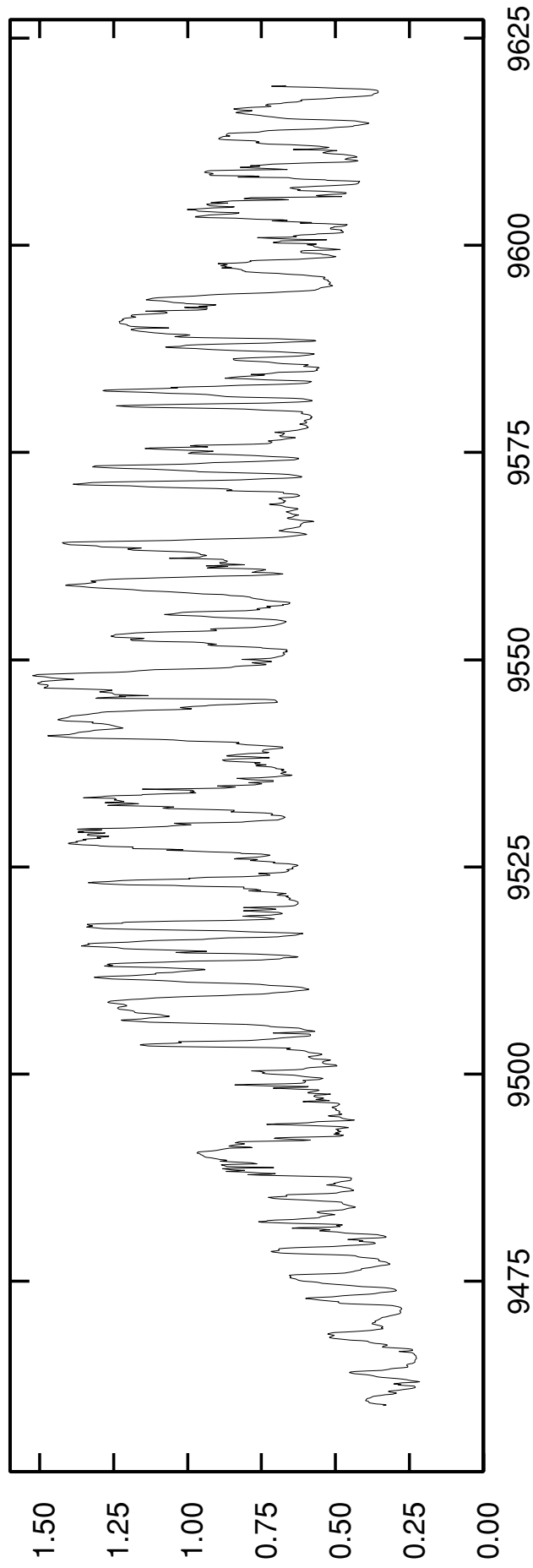


Wavelength (Angstroms)

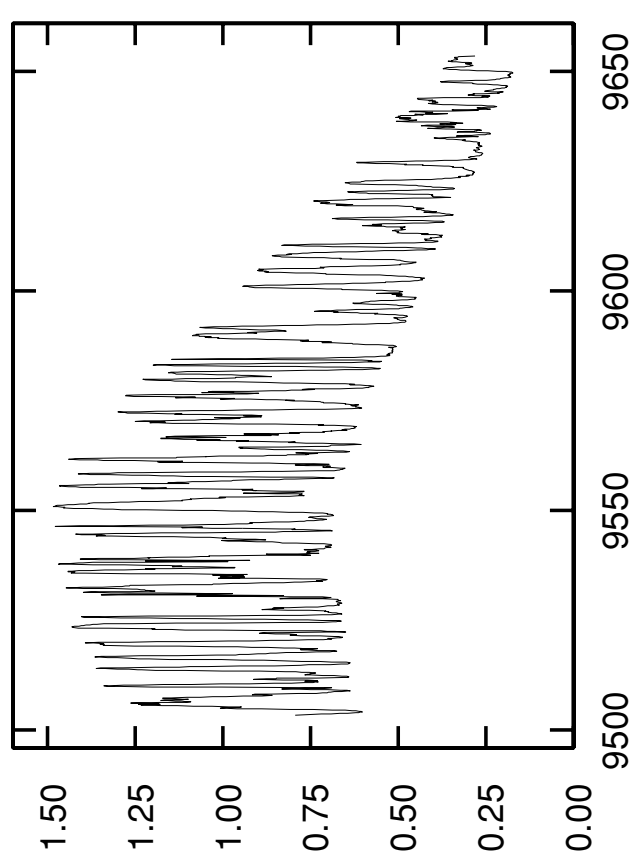
N0A0/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:02:37 31-Mar-2002
Aperture 10, Image line 10, Order 65
identify thar_316g8991_red1: ThAr



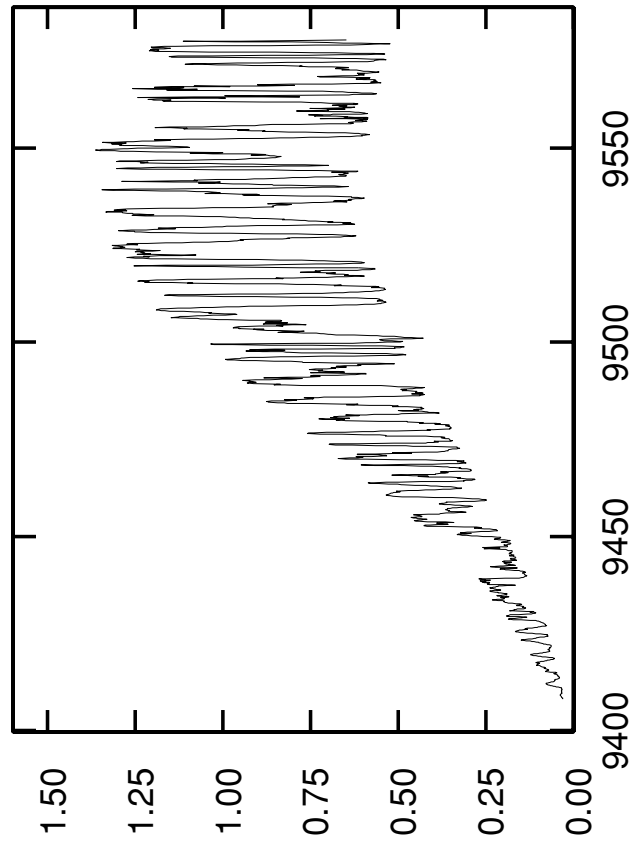
Order 64 - Central



Order 64 - Red

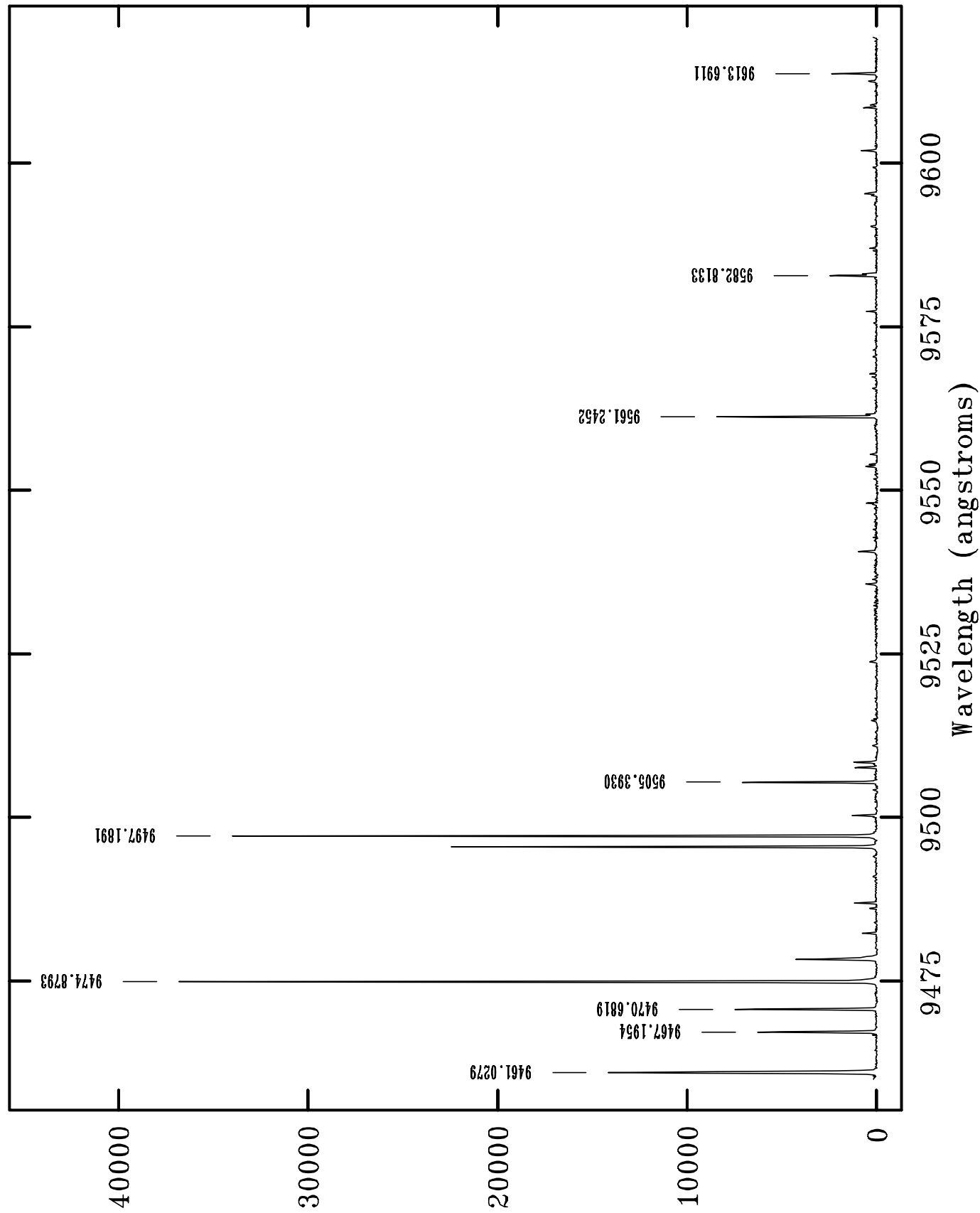


Order 64 - Blue

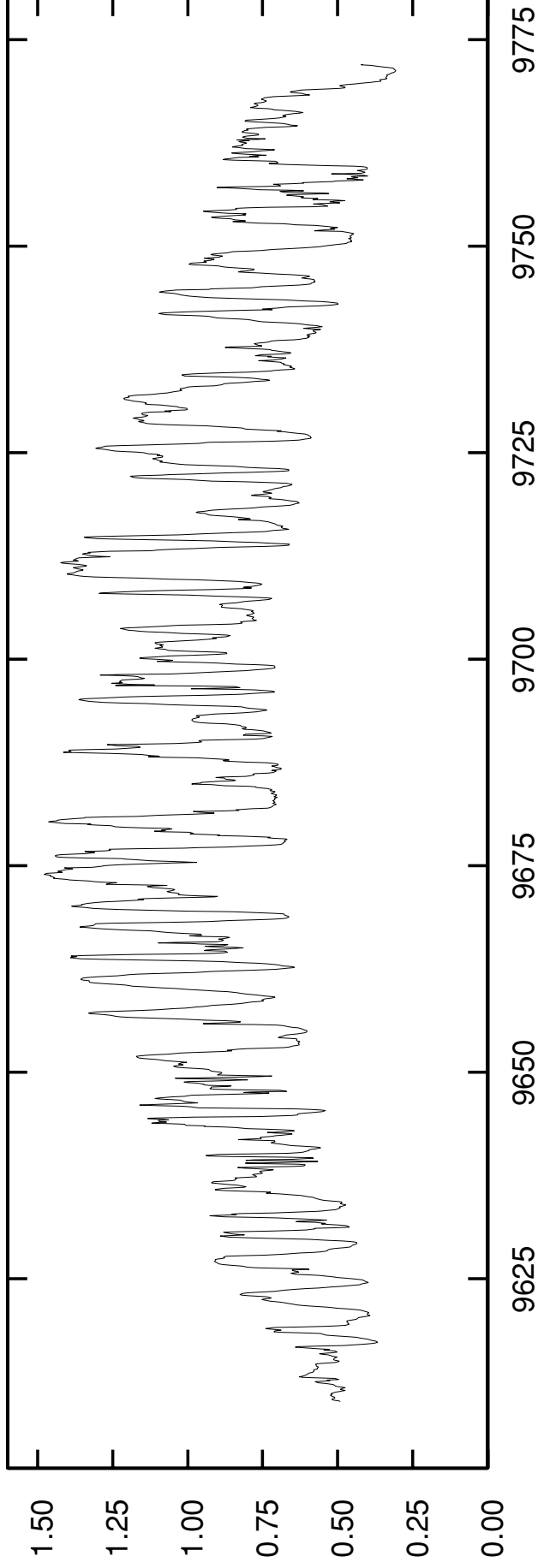


Wavelength (Angstroms)

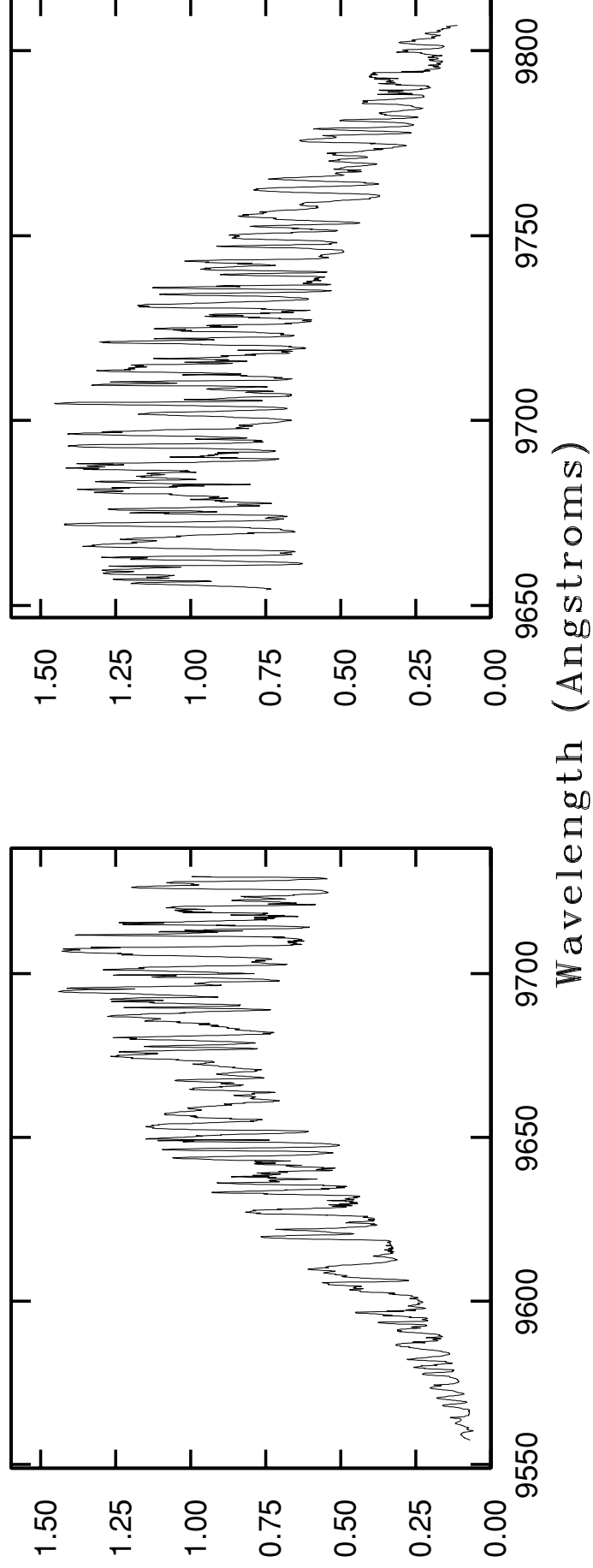
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:02:20 31-Mar-2002
Aperture 9, Image line 9, Order 64
ecidentify thar_516g8991_red1: ThAr



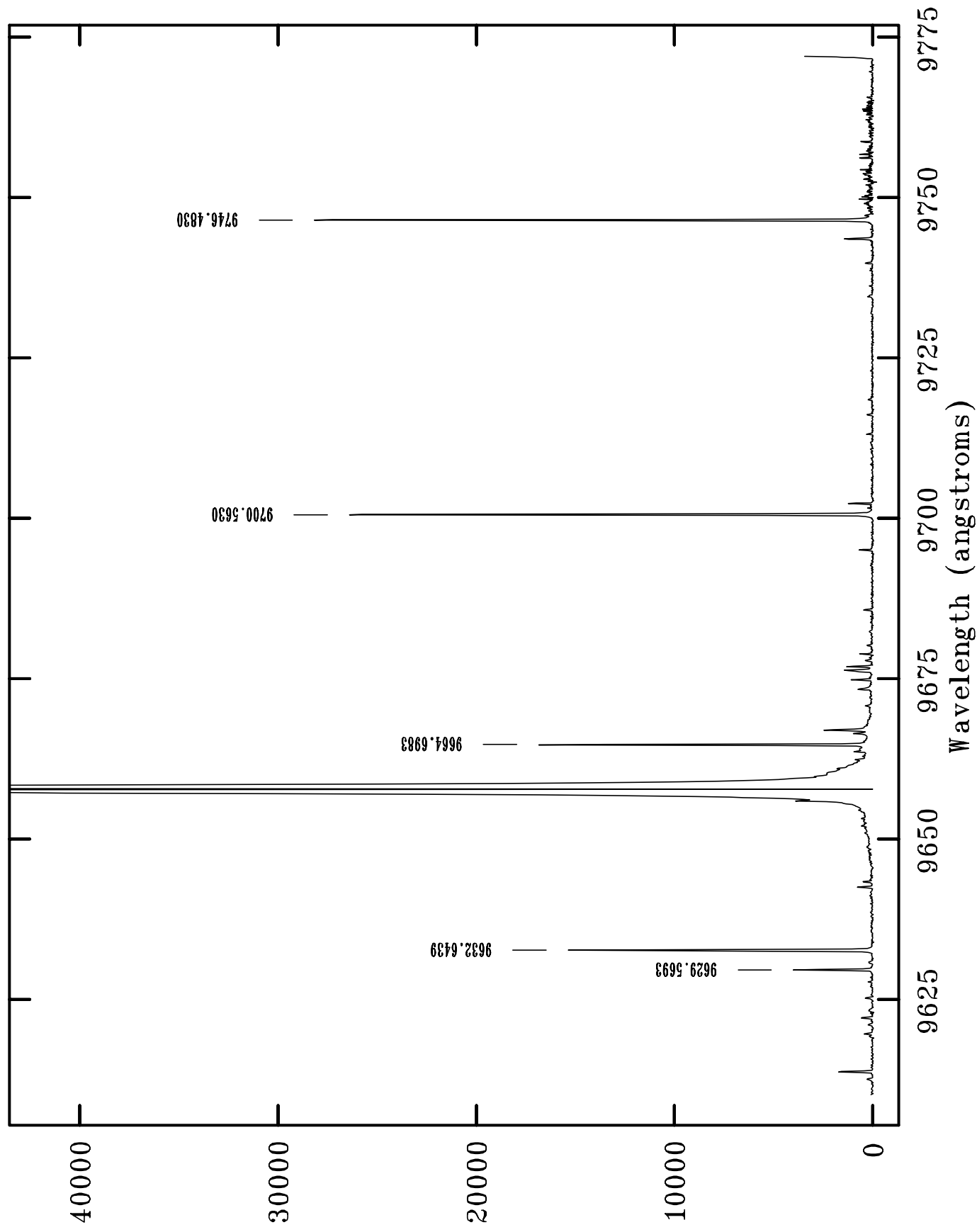
Order 63 - Central



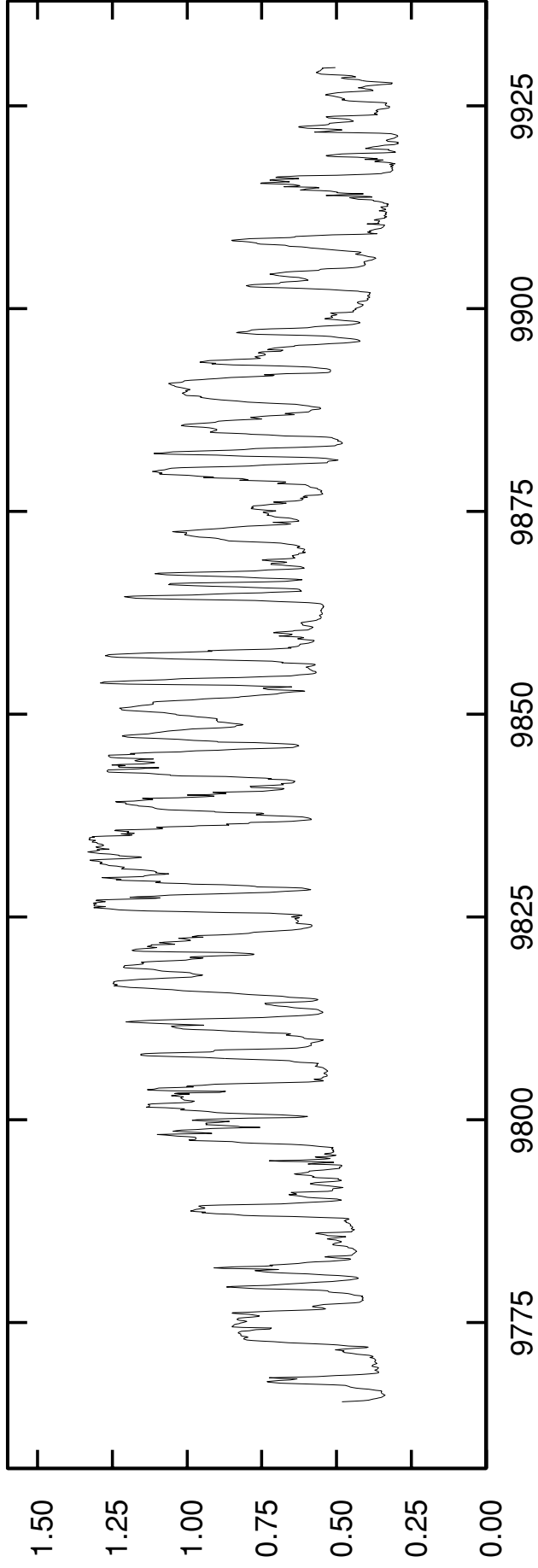
Order 63 - Red



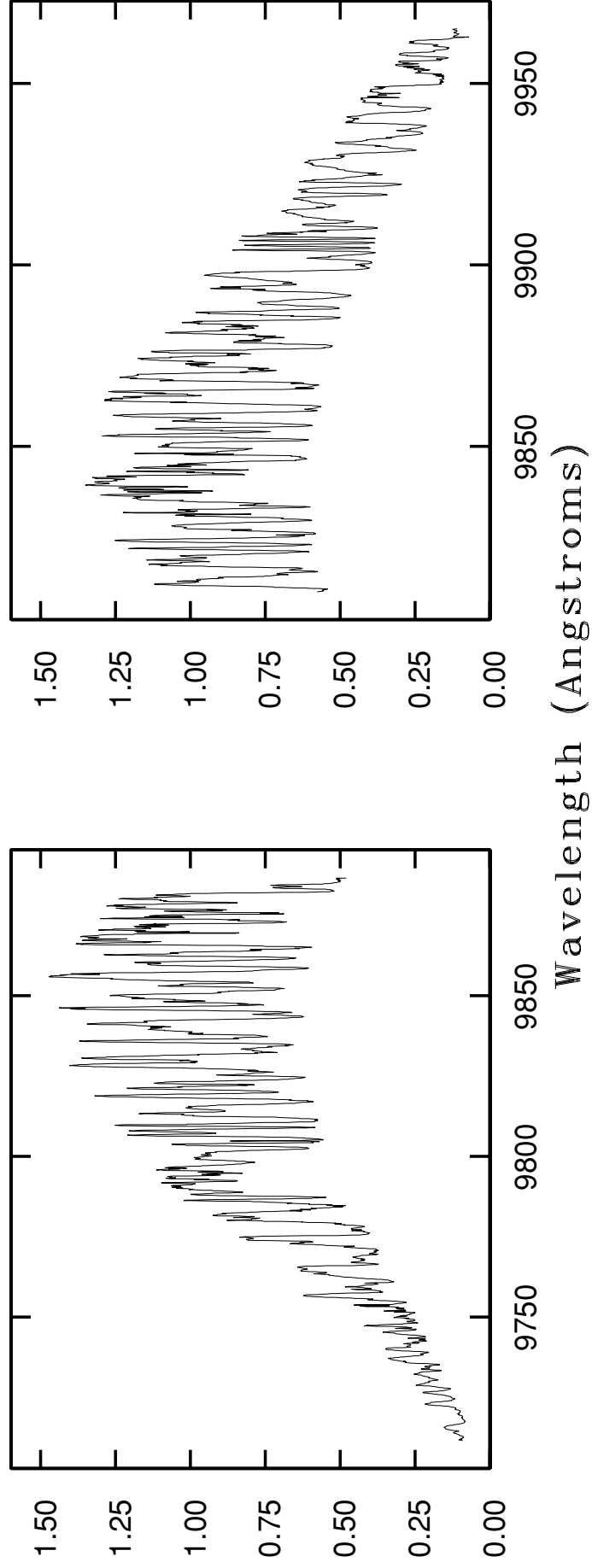
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:02:00 31-Mar-2002
Aperture 8, Image line 8, Order 63
ecidentify thar_516g8991_red1: ThAr



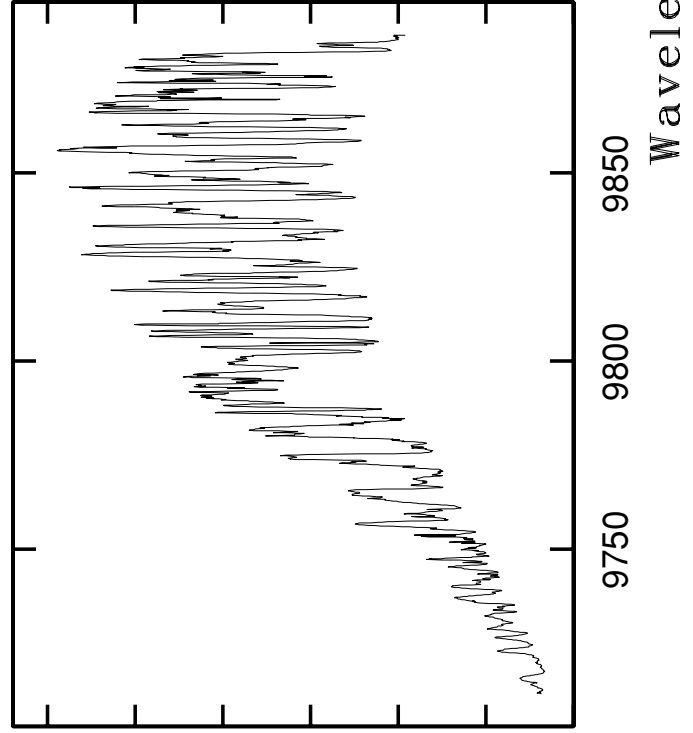
Order 62 - Central



Order 62 - Red

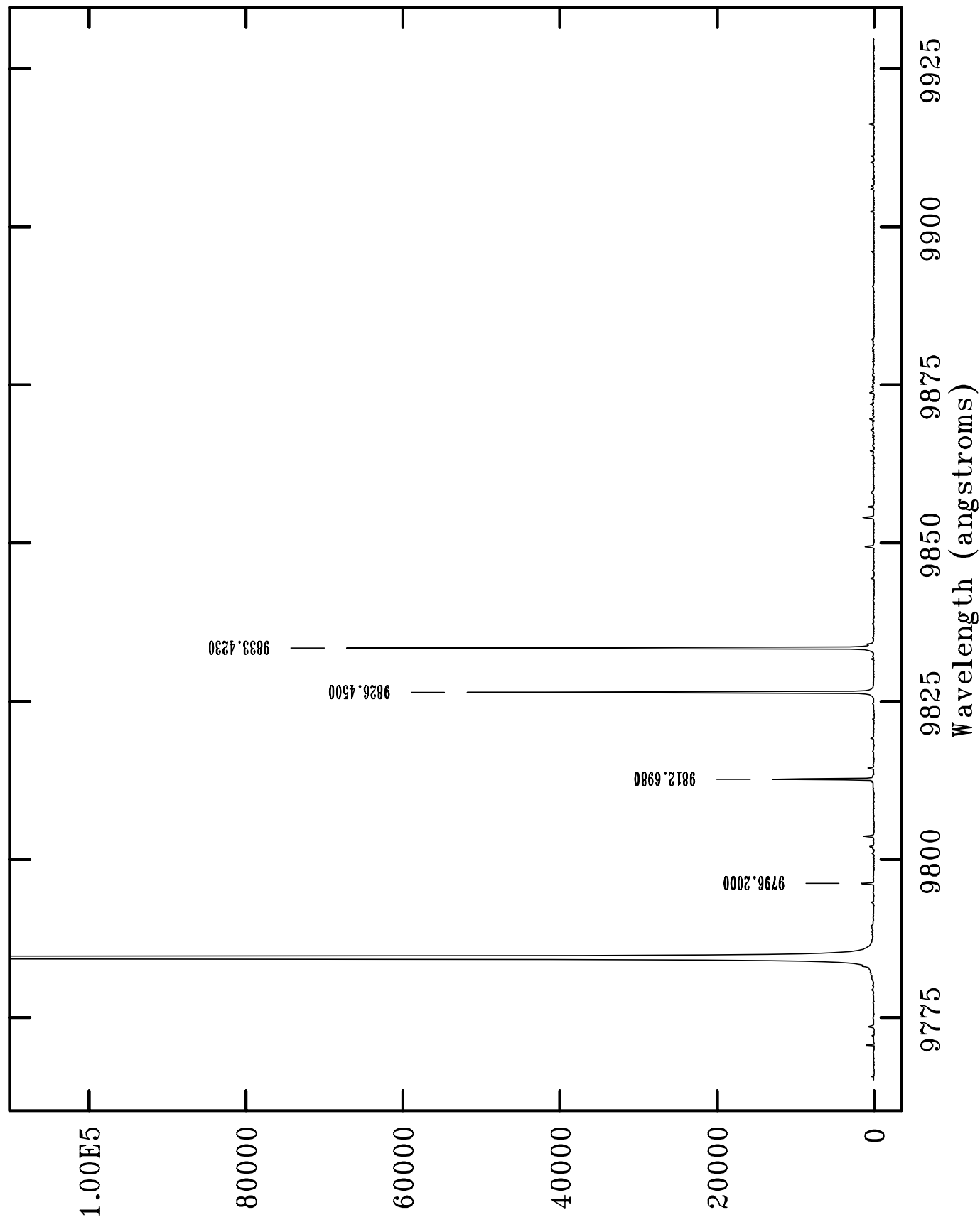


Order 62 - Blue

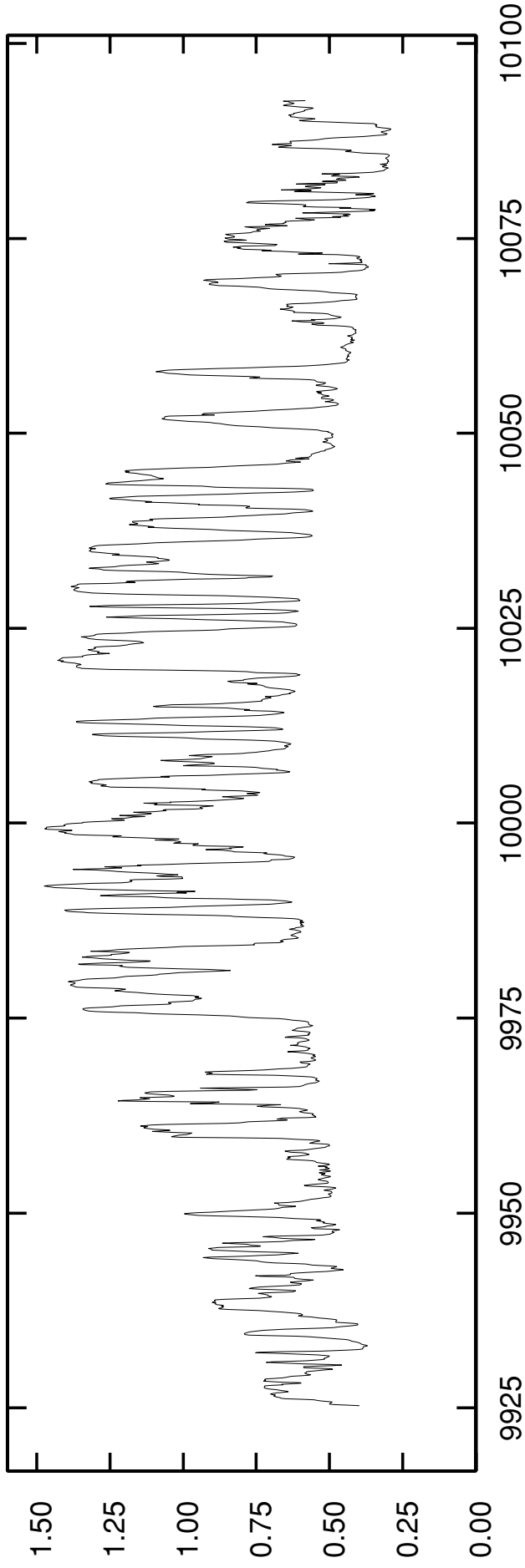


Wavelength (Angstroms)

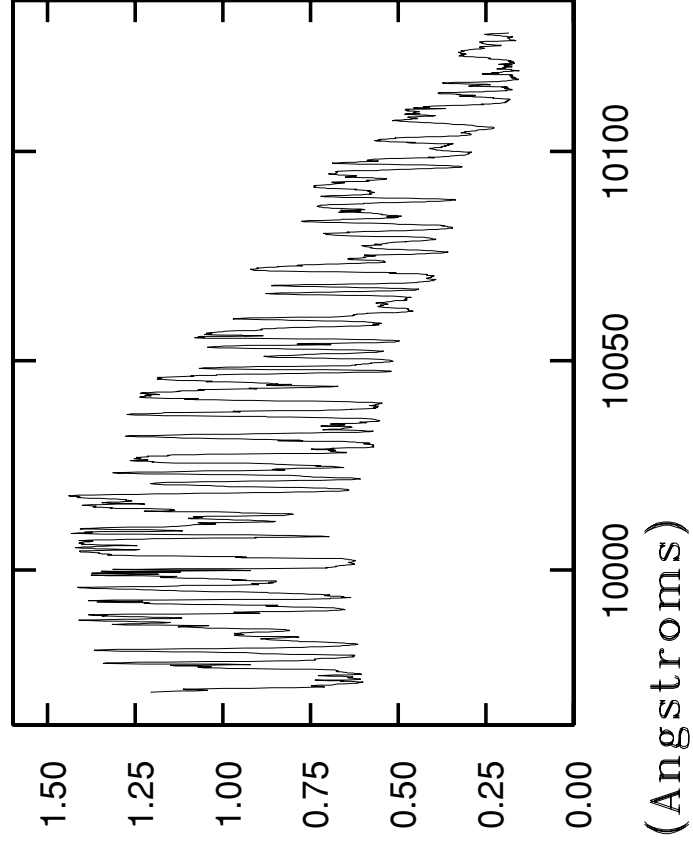
N/AO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:01:38 31-Mar-2002
Aperture 7, Image line 7, Order 62
ecidentify thar_516g8991_red1: ThAr



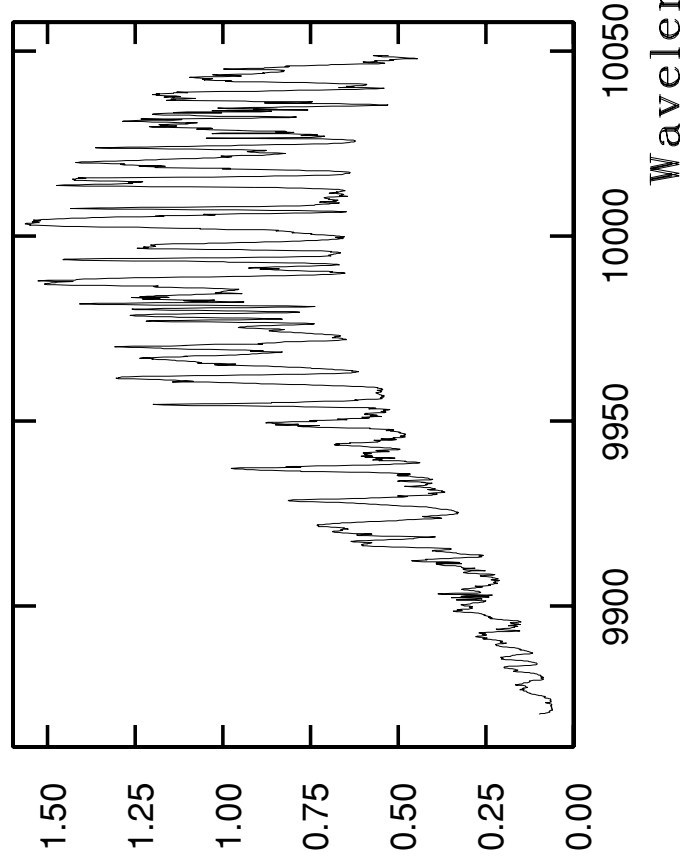
Order 61 - Central



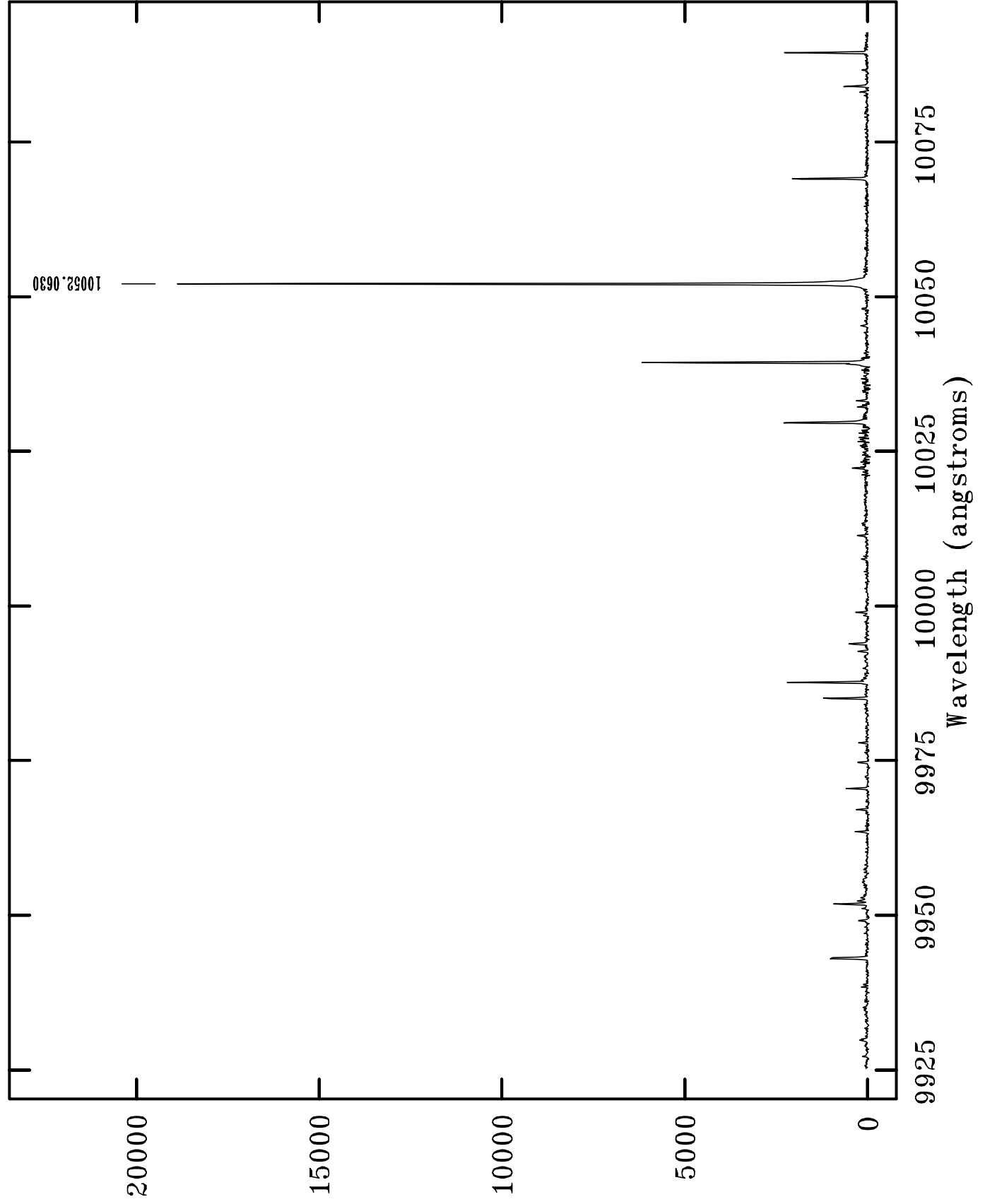
Order 61 - Red



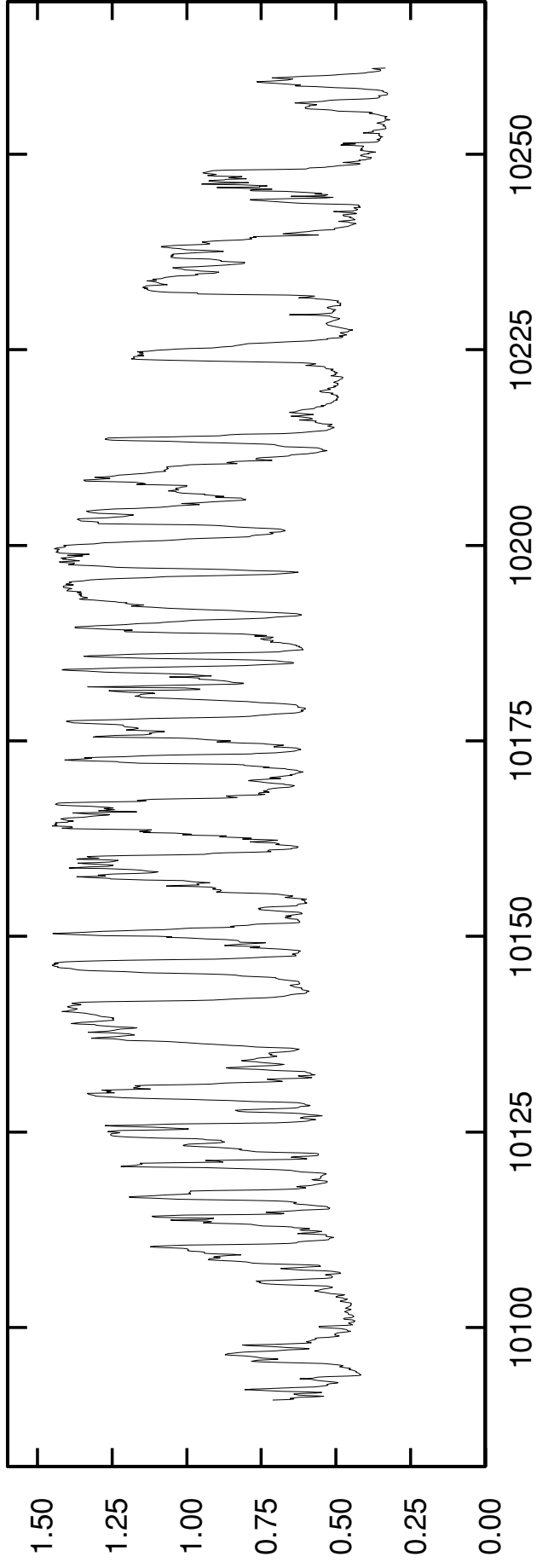
Order 61 - Blue



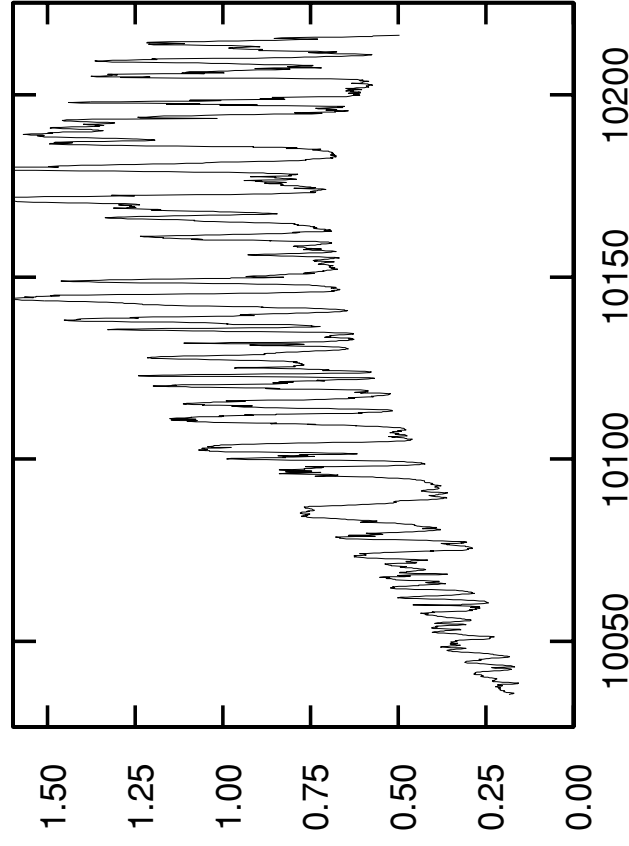
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:01:17 31-Mar-2002
Aperture 6, Image line 6, Order 61
ecidentify thar_316g8991_red1: ThAr



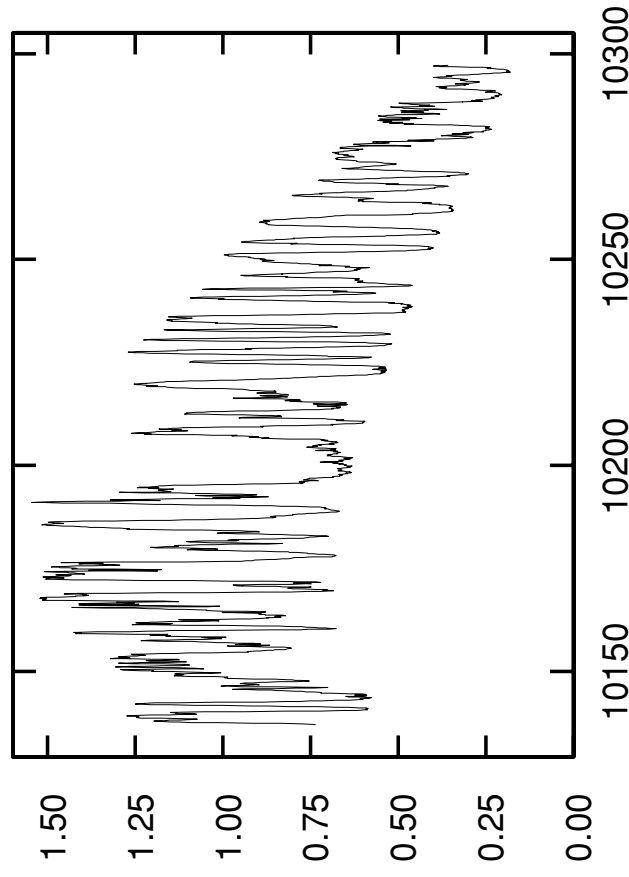
Order 60 - Central



Order 60 - Blue

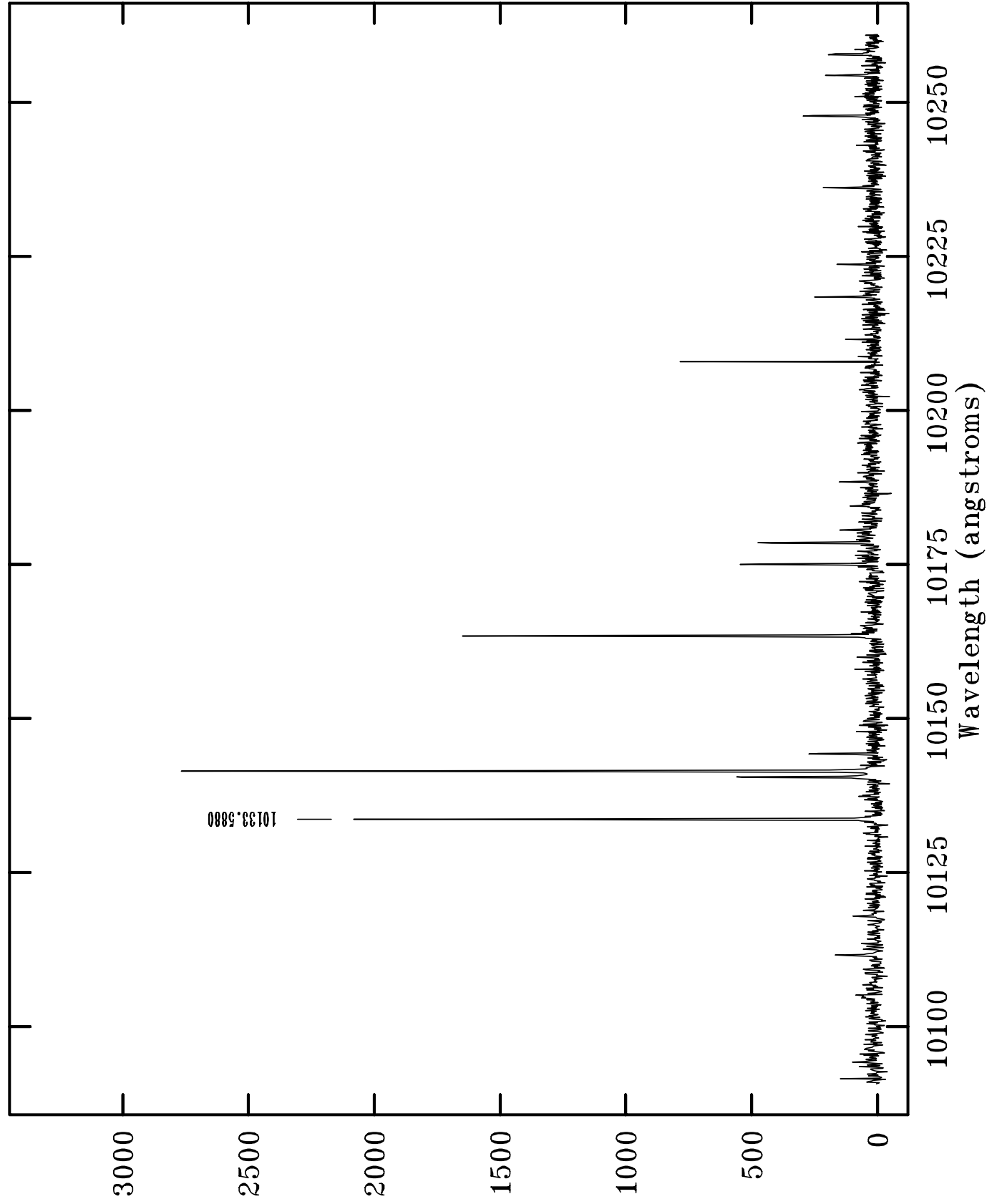


Order 60 - Red

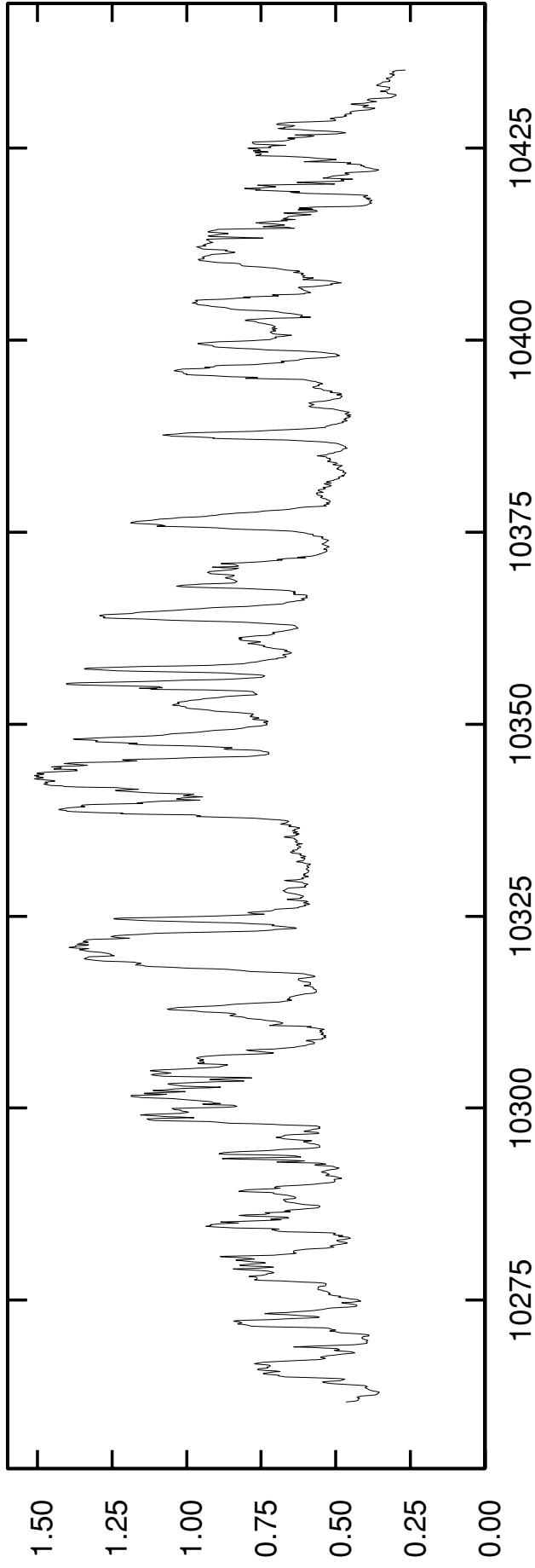


Wavelength (Angstroms)

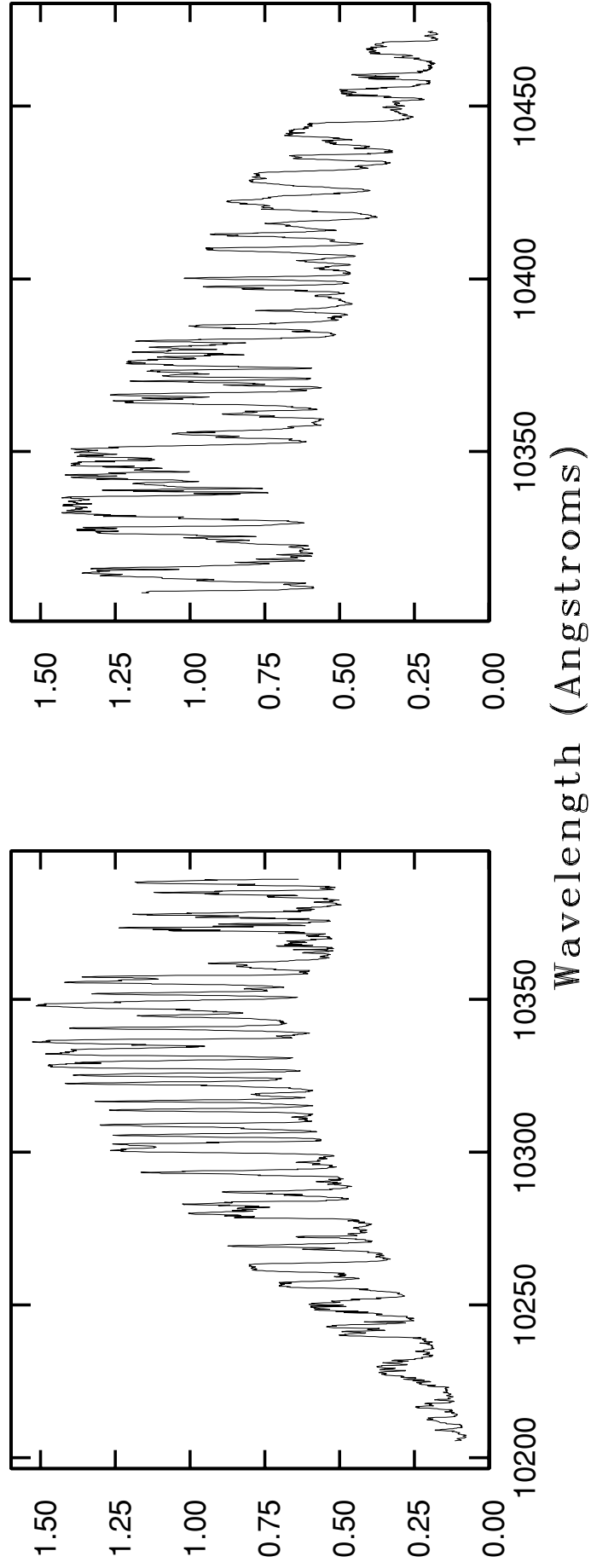
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:01:00 31-Mar-2002
Aperture 5, Image line 5, Order 60
ecidentify thar_516g8991_red1: ThAr



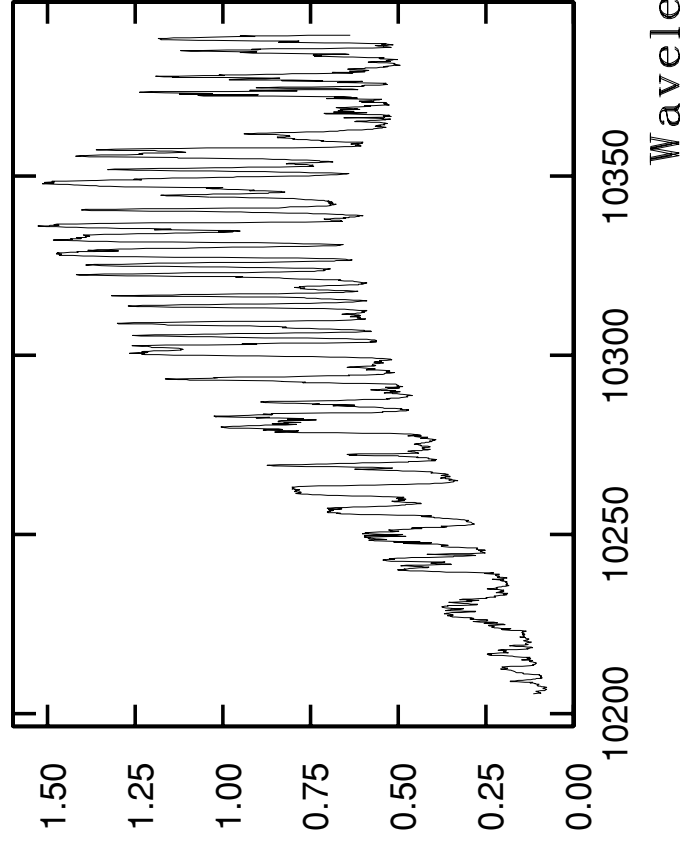
Order 59 - Central



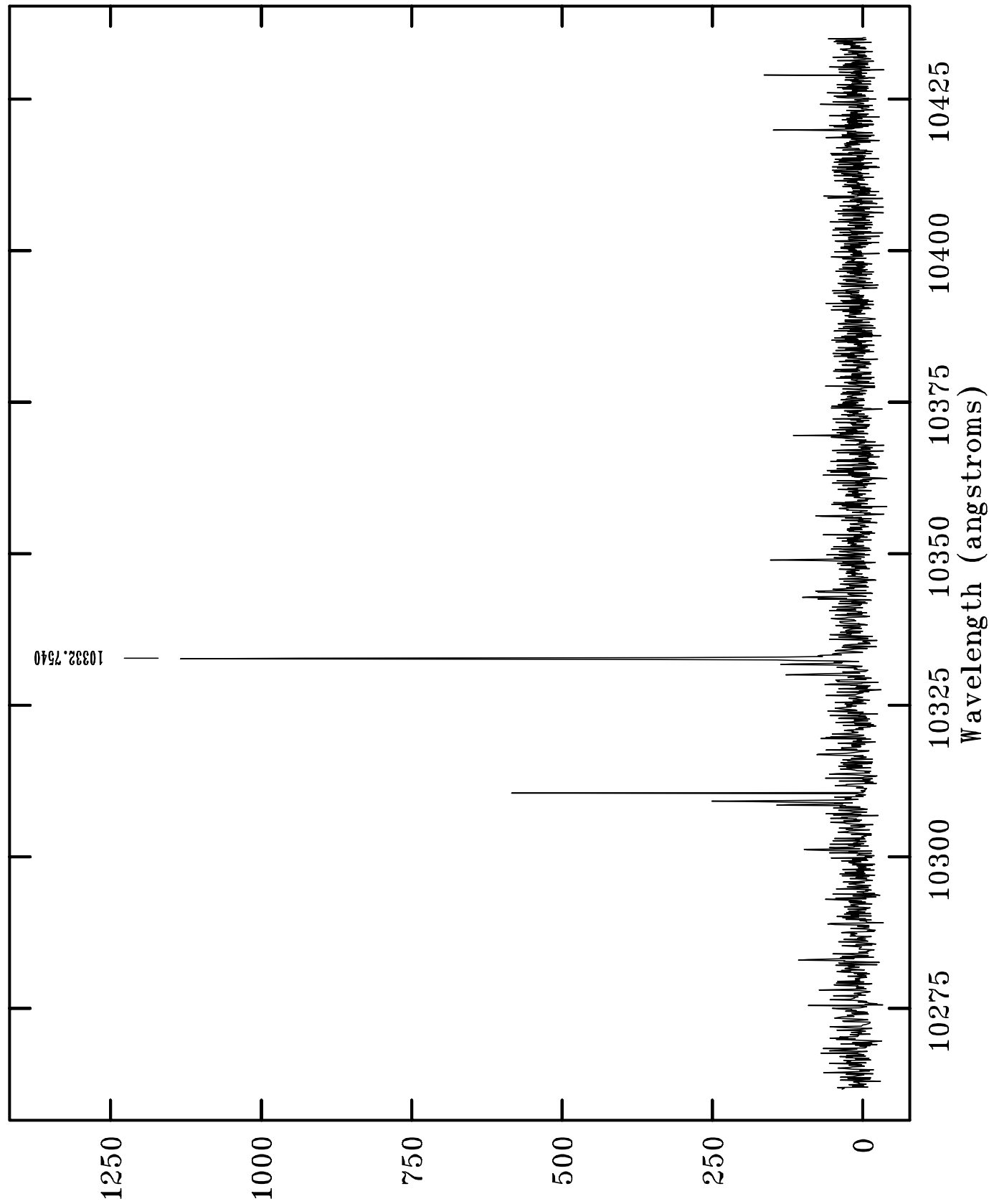
Order 59 - Red



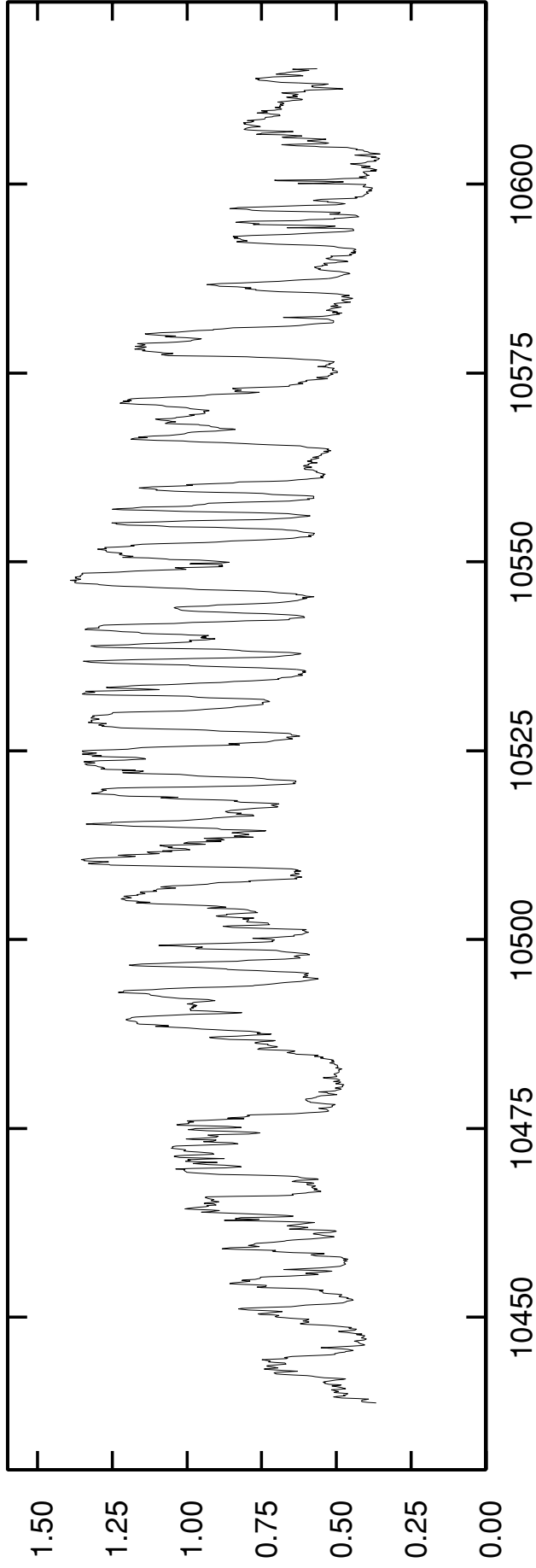
Order 59 - Blue



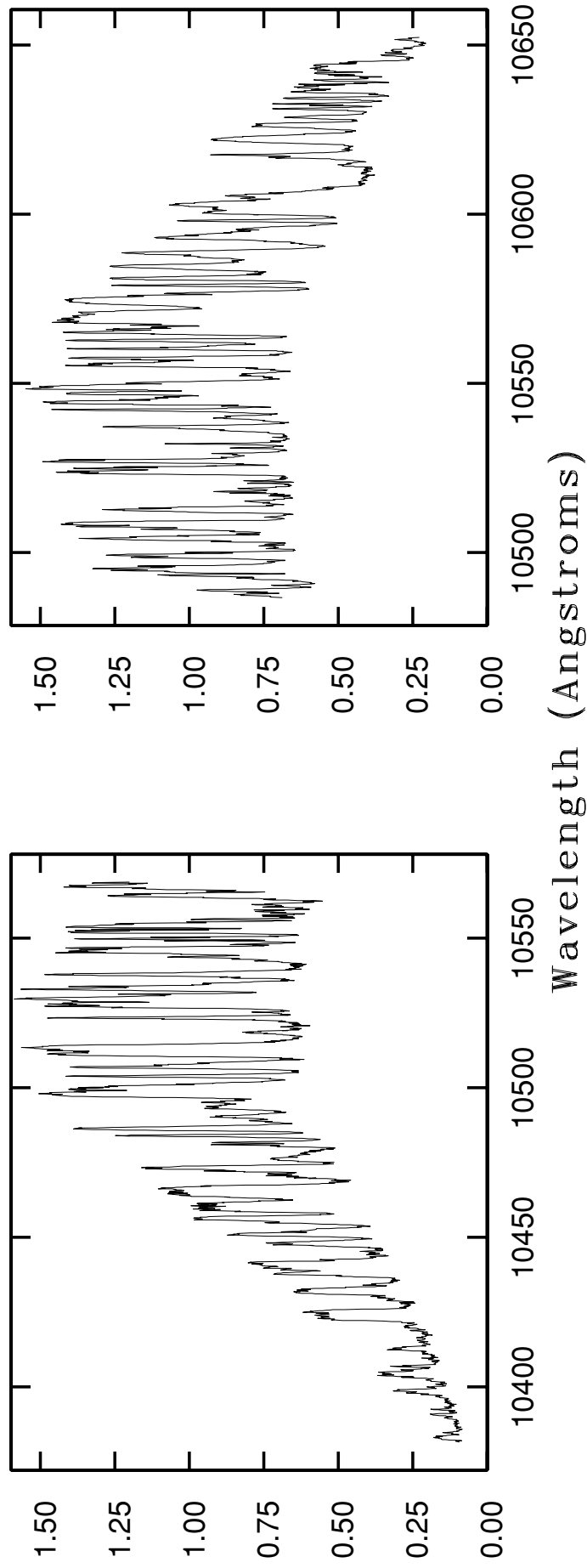
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:00:48 31-Mar-2002
Aperture 4, Image line 4, Order 59
ecidentify thar_516g8991_red1: ThAr



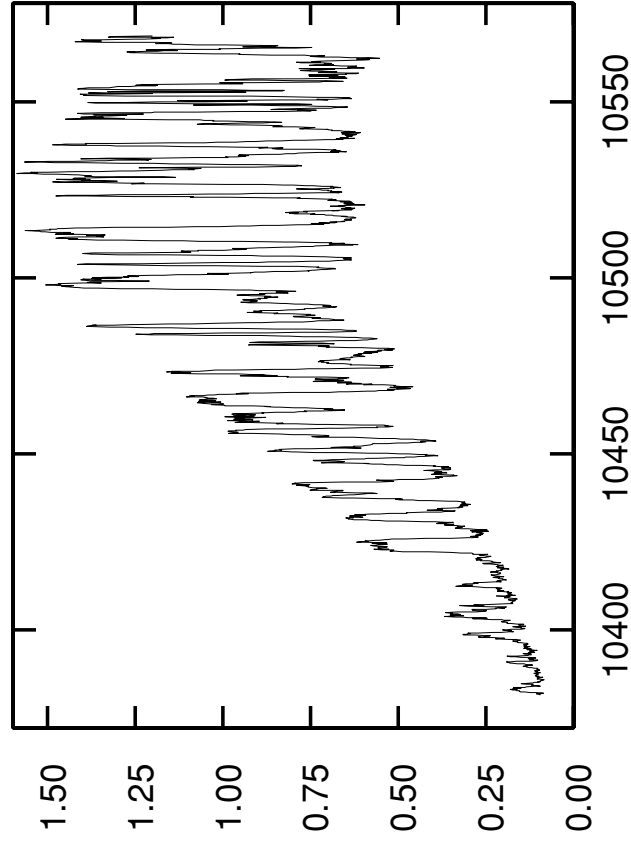
Order 58 - Central



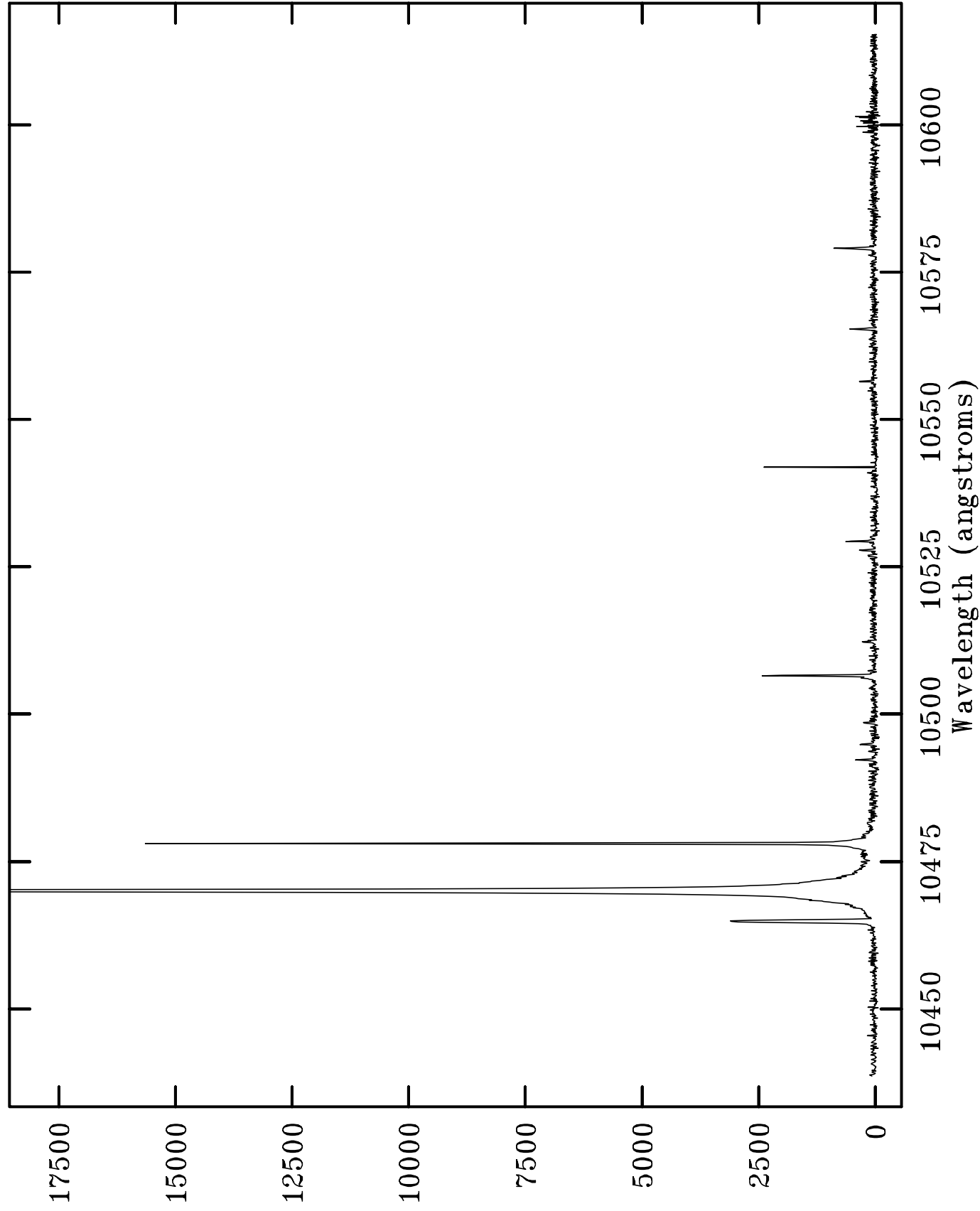
Order 58 - Red



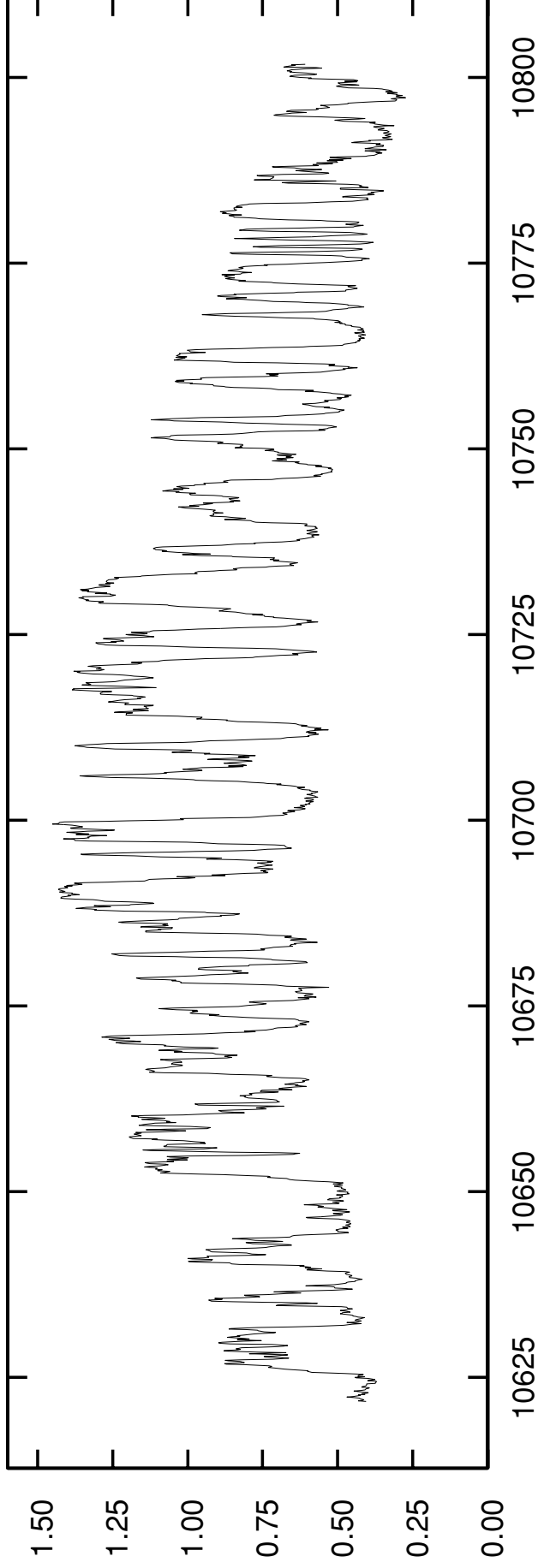
Order 58 - Blue



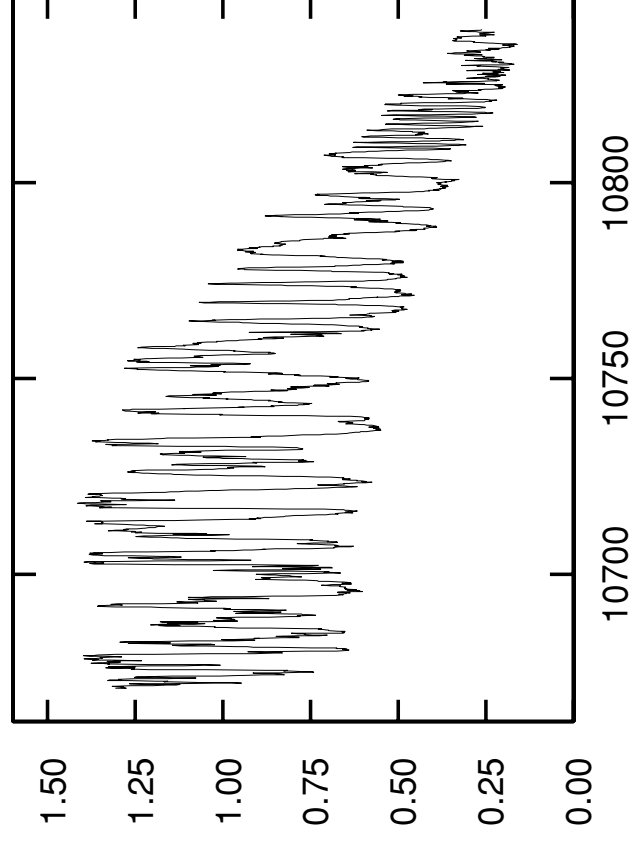
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:26:58 05-May-2002
Aperture 3, Image line 3, Order 58
ecidentify thar_316g8991_red1: ThAr



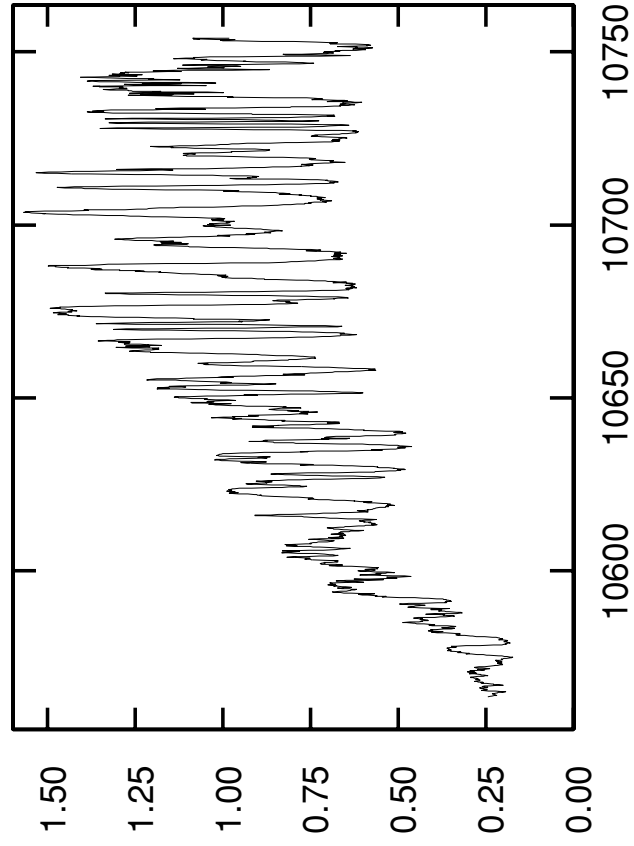
Order 57 - Central



Order 57 - Red

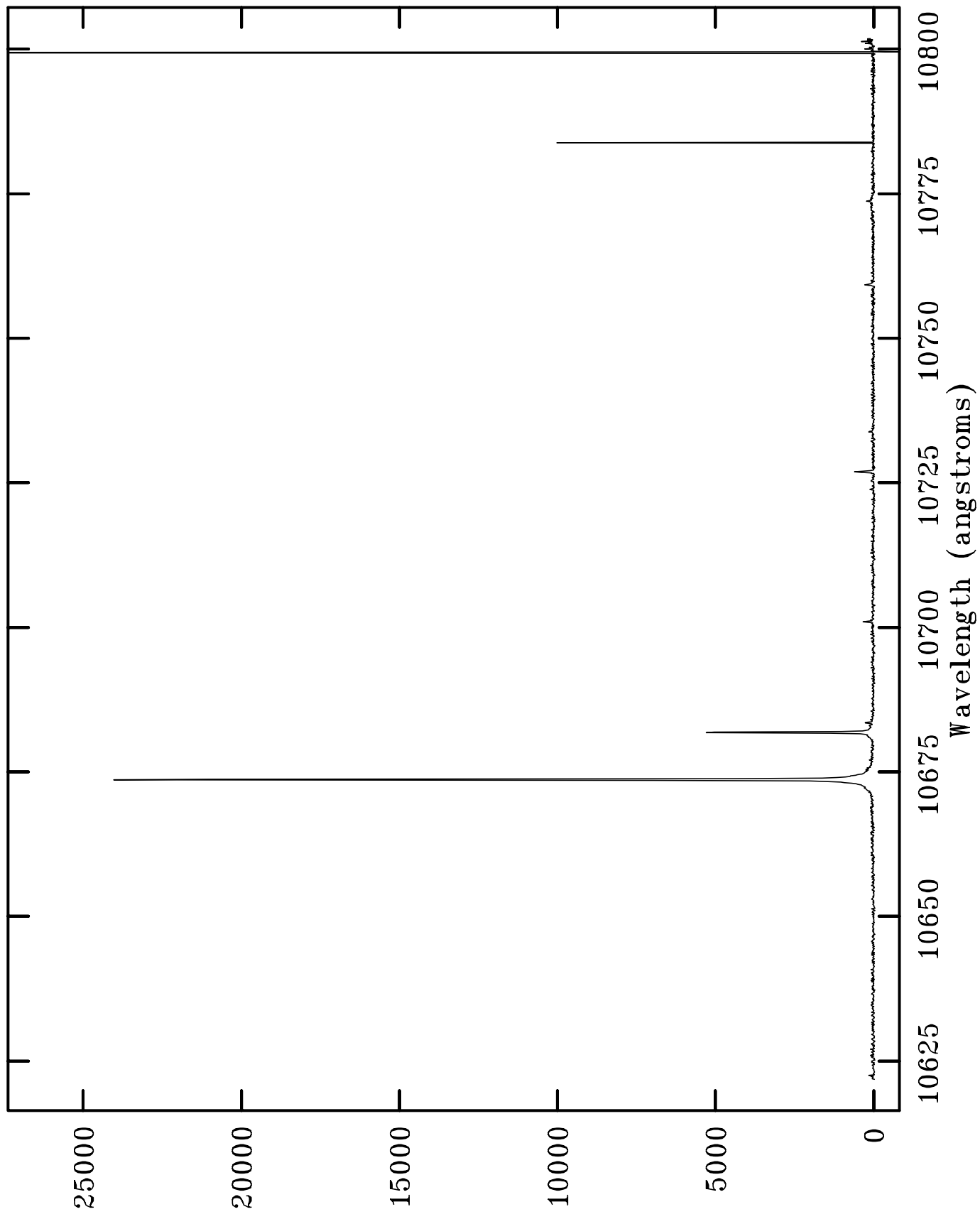


Order 57 - Blue

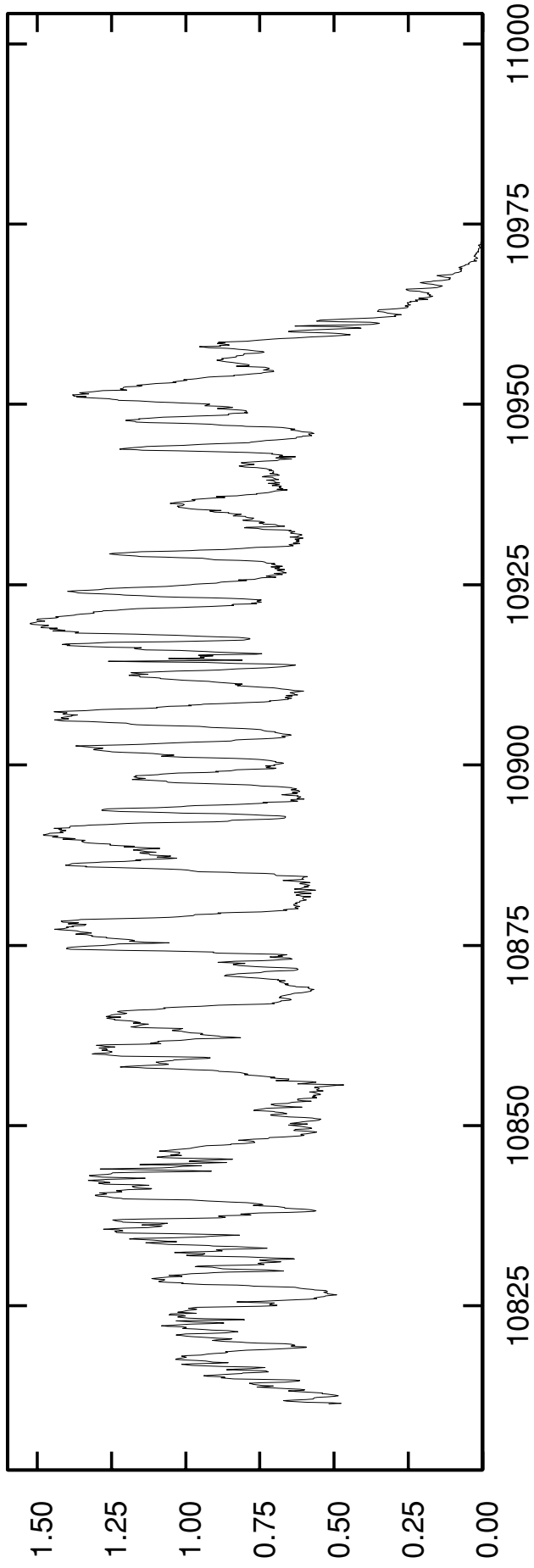


Wavelength (Angstroms)

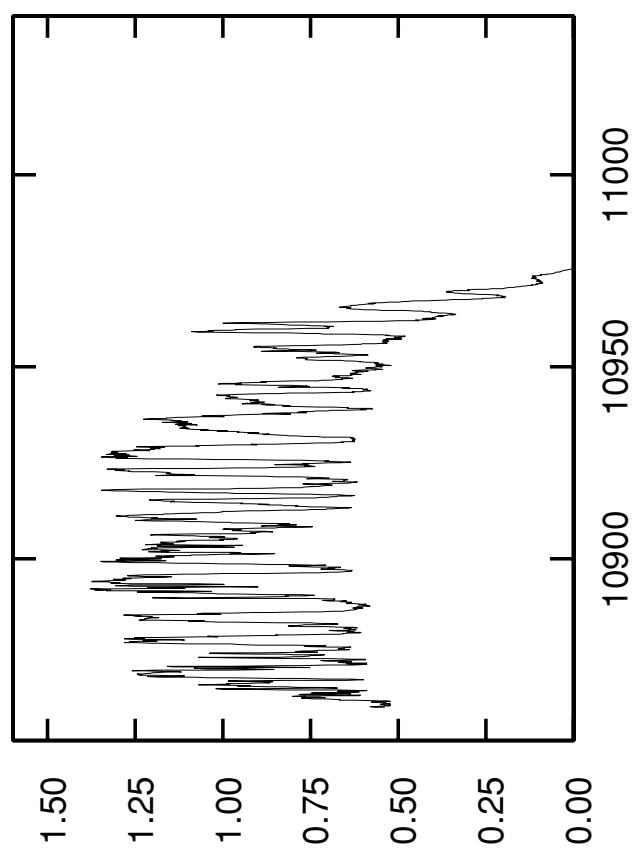
NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:26:45 05-May-2002
Aperture 2, Image line 2, Order 57
ecidentify thar_316g8991_red1: ThAr



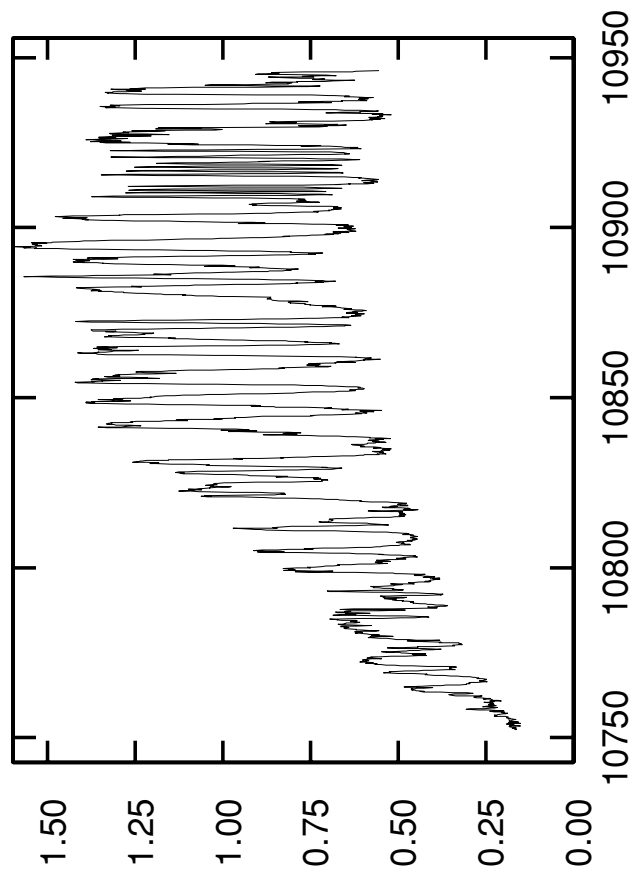
Order 56 - Central



Order 56 - Red



Order 56 - Blue



Wavelength (Angstroms)

NOAO/IRAF V2.11.3EXPORT astronomer@hrs Sun 03:26:23 05-May-2002
Aperture 1, Image line 1, Order 56
ecidentify thar_516g8991_red1: ThAr

