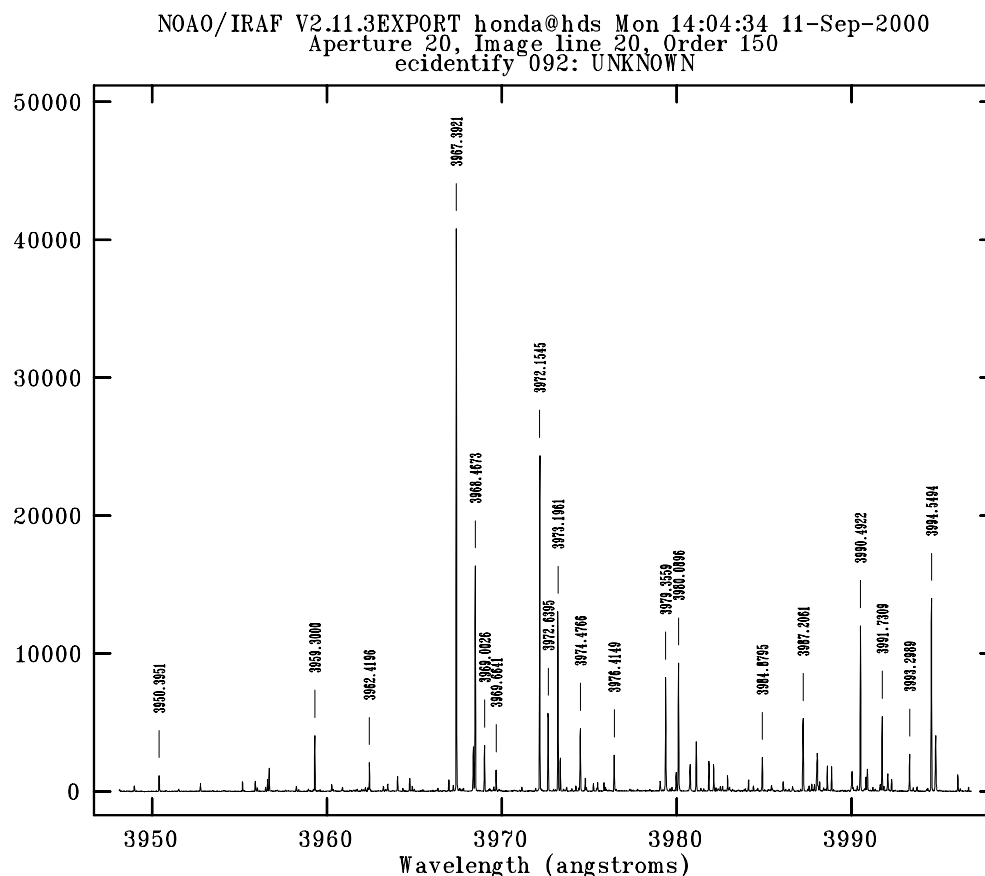


Subaru Telescope High Dispersion Spectrograph

An Atlas of Th-Ar Spectra:

ver. 1.1

Echelle Order = 150



S. Honda & W. Aoki
National Astronomical Observatory of Japan
Feb., 2002

Subaru Telescope High Dispersion Spectrograph

An Atlas of Th-Ar Spectra:

S. Honda & W. Aoki

National Astronomical Observatory of Japan

Feb., 2001 (Revision in Feb., 2002)

1. HDS Th-Ar Spectra

The Th-Ar spectra were obtained with the Subaru/HDS (High Dispersion Spectrograph, Noguchi et al. 1998) for 3000-9700Å. The RGL 31.6 grooves/mm grating is used as the echelle, and the EEV 42-80 CCDs are used as the detector in the HDS.

The data reduction was done with the IRAF¹ 'echelle' package. The echelle blaze profile is not corrected for the Th-Ar spectra, so that the line intensity generally looks decreasing from the center to the both edges in each spectrum. The lines were identified with the IRAF 'ecidentify' routine. The rms fit is typically better than 0.01Å.

2. Line Data

For the line identification, the KPNO Th-Ar Atlas (Willmarth, D. W. 1987) was used for 3200-9500Å. For the wavelength ranges which were not covered by the KPNO Th-Ar Atlas, the Th line data in the atomic line list (Hirata & Horaguchi 1994) are adopted.

3. References

Hirata R. & Horaguchi T., 1995, *Atomic spectral line list*, <ftp://dbc.nao.ac.jp/pub/CDS/cats/VI/69>

Noguchi K., et al., 1999, High Dispersion Spectrograph (HDS) for Subaru Telescope, SPIE, 3355, 354

Willmarth, D. W. 1987, A CCD Atlas of Comparison Spectra, Thorium-Argon Hollow Cathode 3180Å-9540Å, Kitt Peak National Observatory, National Optical Astronomy Observatories

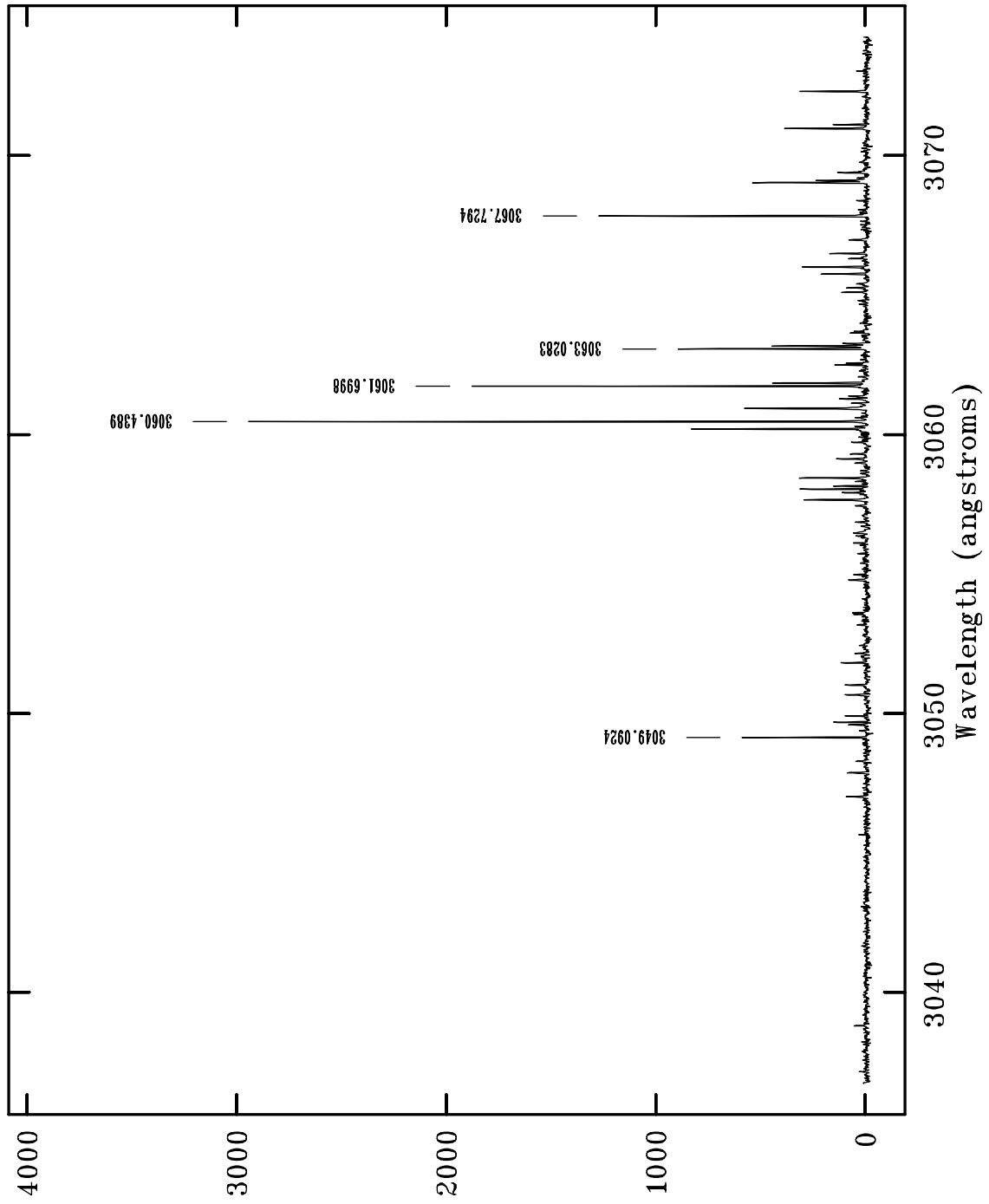
4. Change Redord

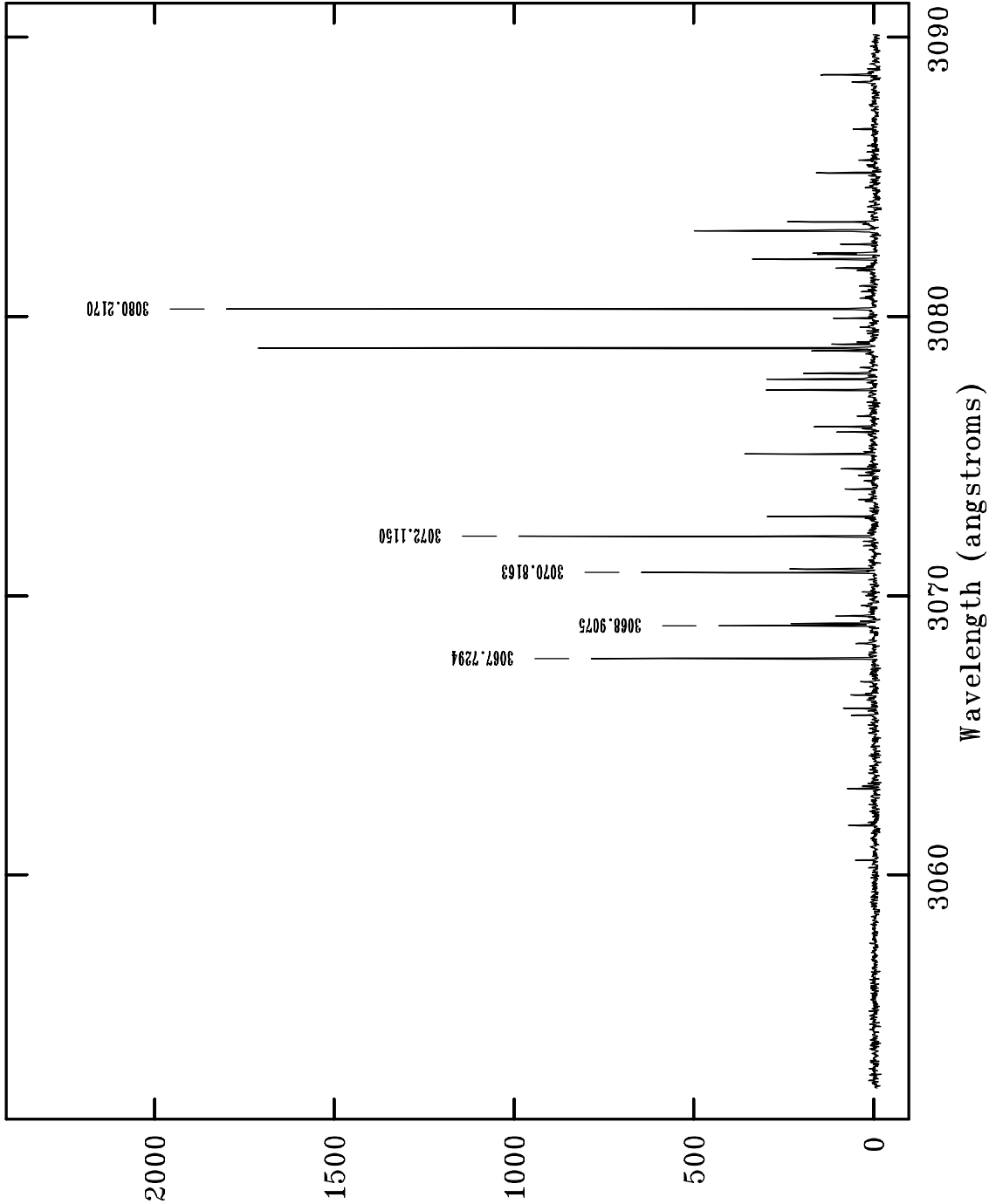
1st release Feb. 2001

2nd release Feb. 2002: change the figure of 90th order (p. 108)

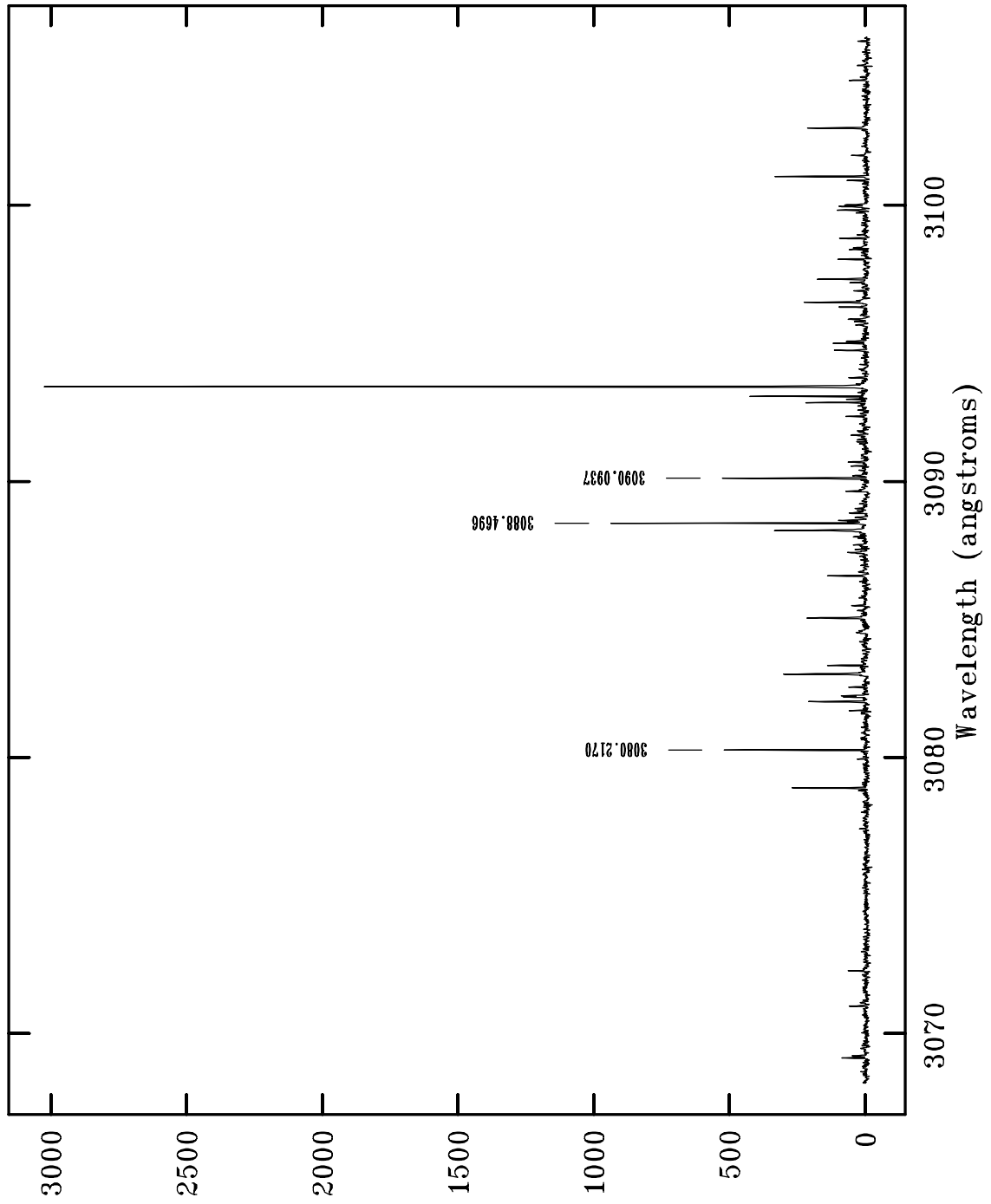
¹IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation

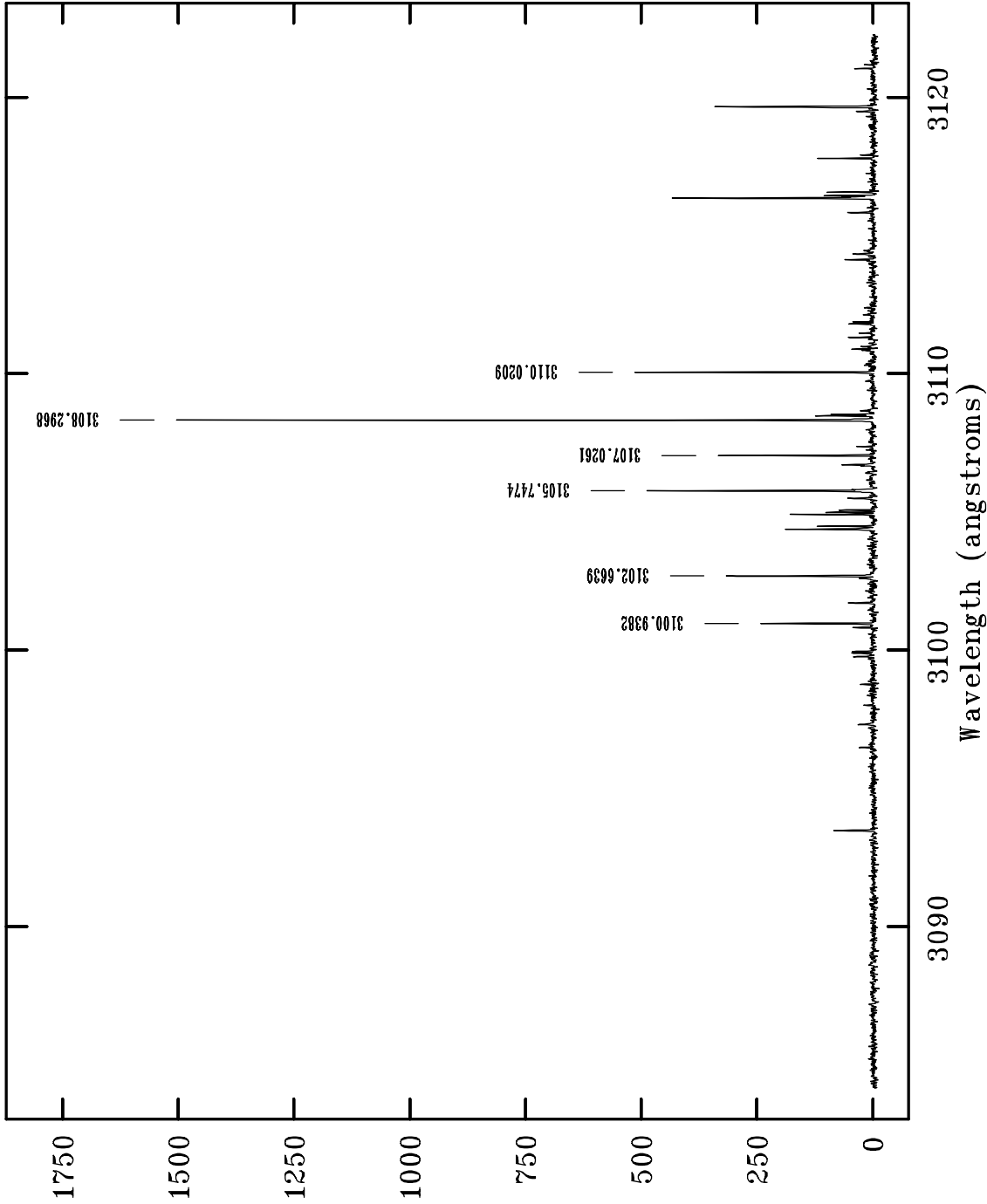
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Aperture 34, Image line 34, Order 194
ecidentify 093: UNKNOWN



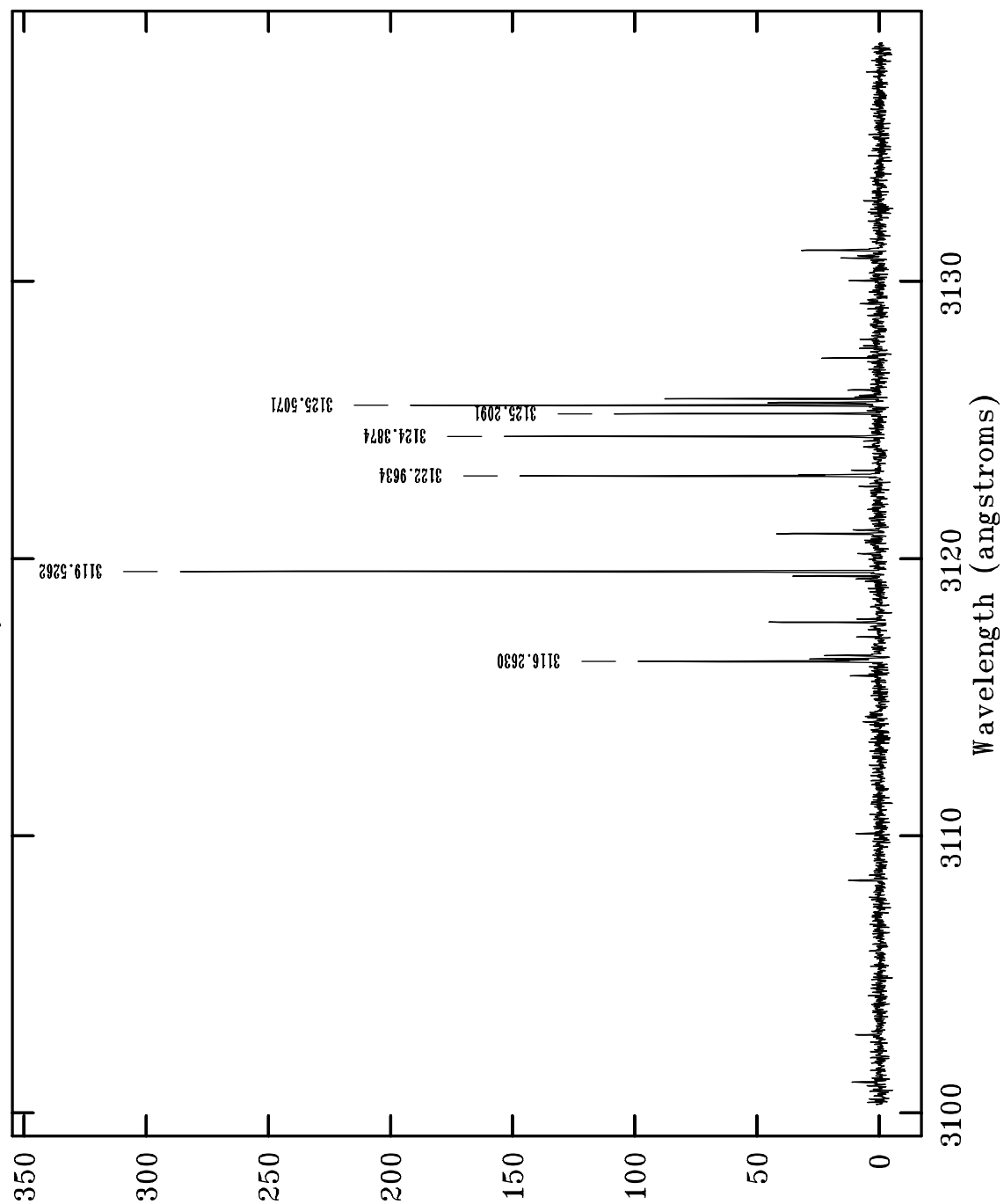


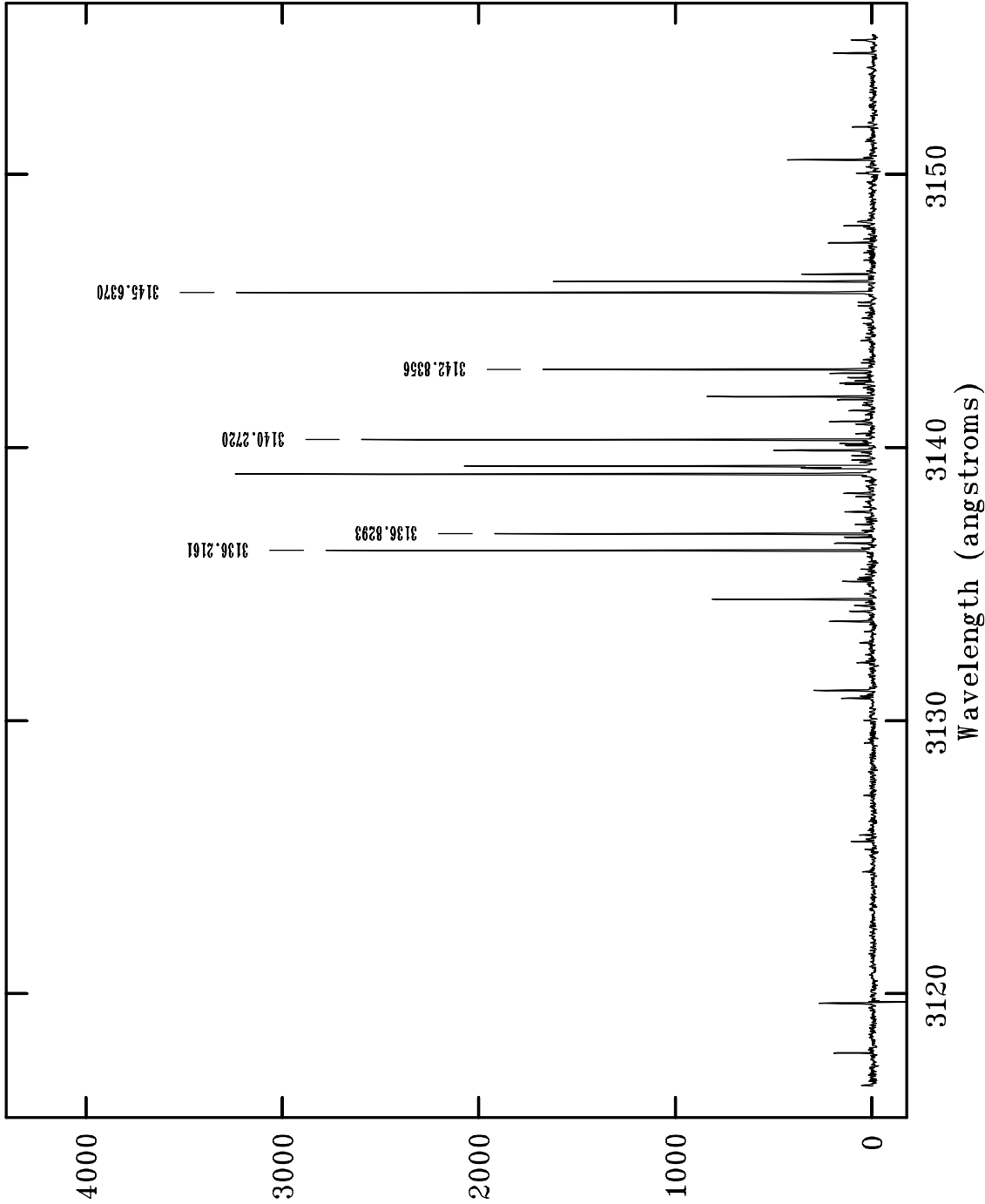
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Aperture 32, Image line 32, Order 192
ecidentify 093: UNKNOWN



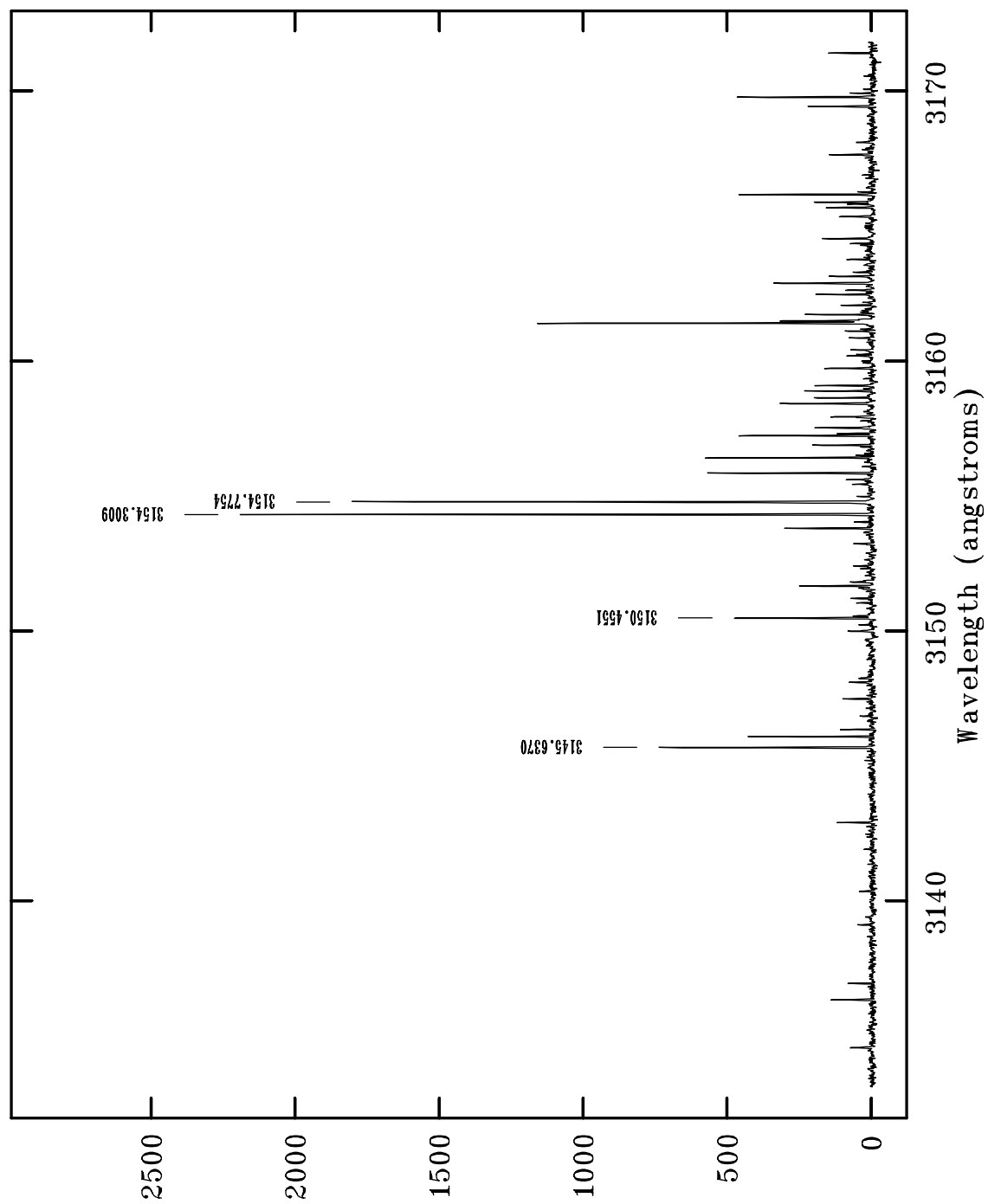


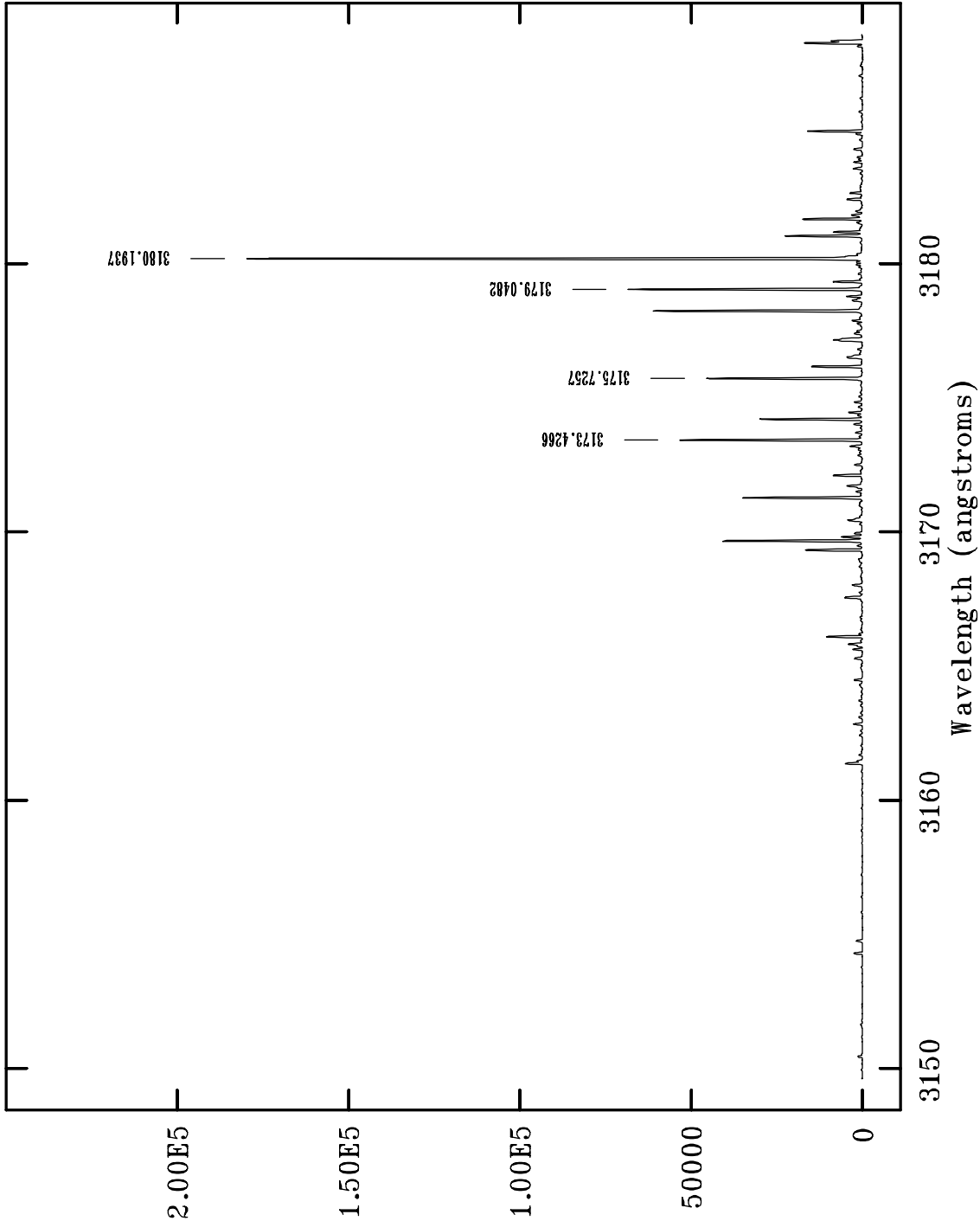
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Aperture 30, Image line 30, Order 190
ecidentify 093: UNKNOWN



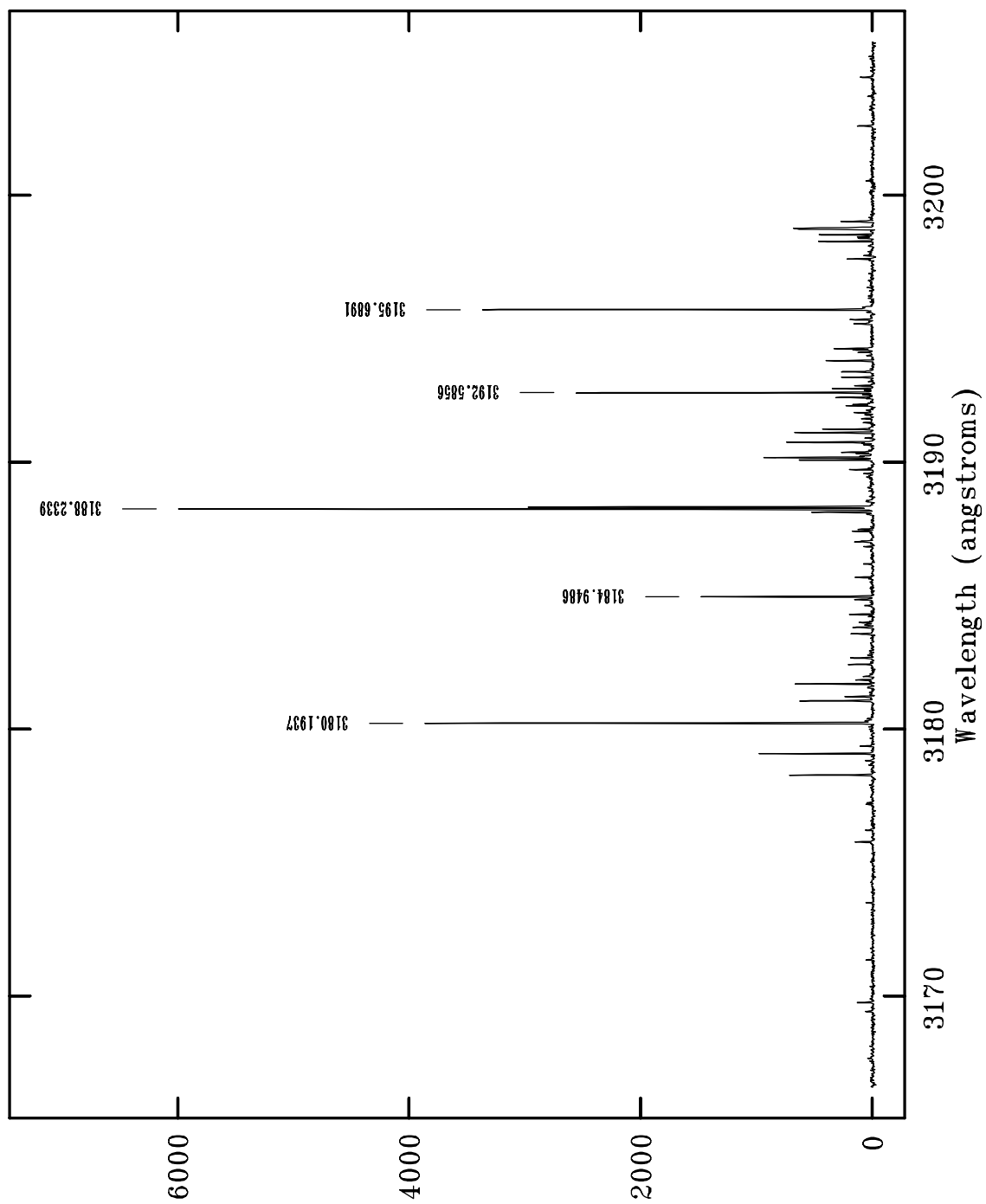


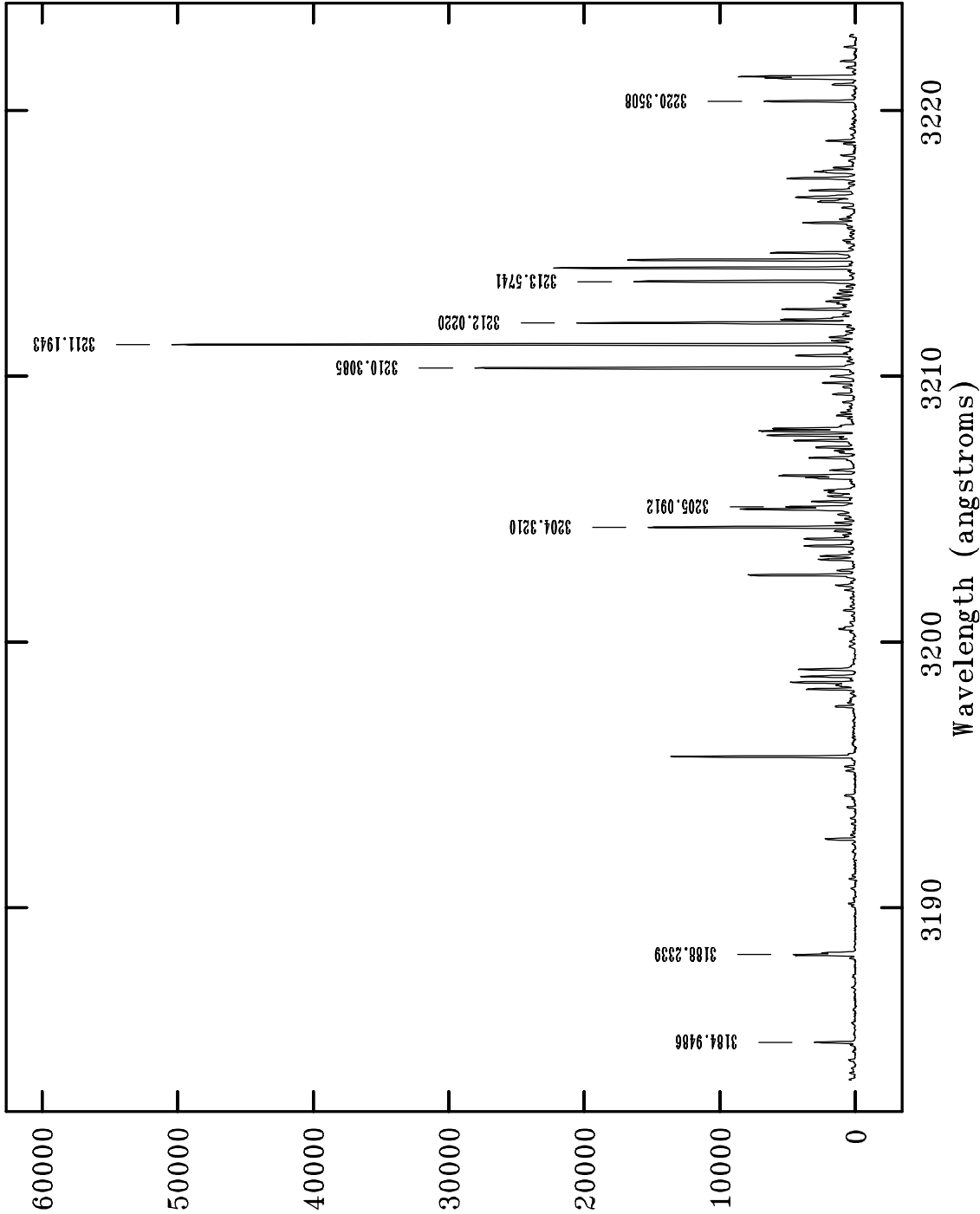
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identify 093: UNKNOWN



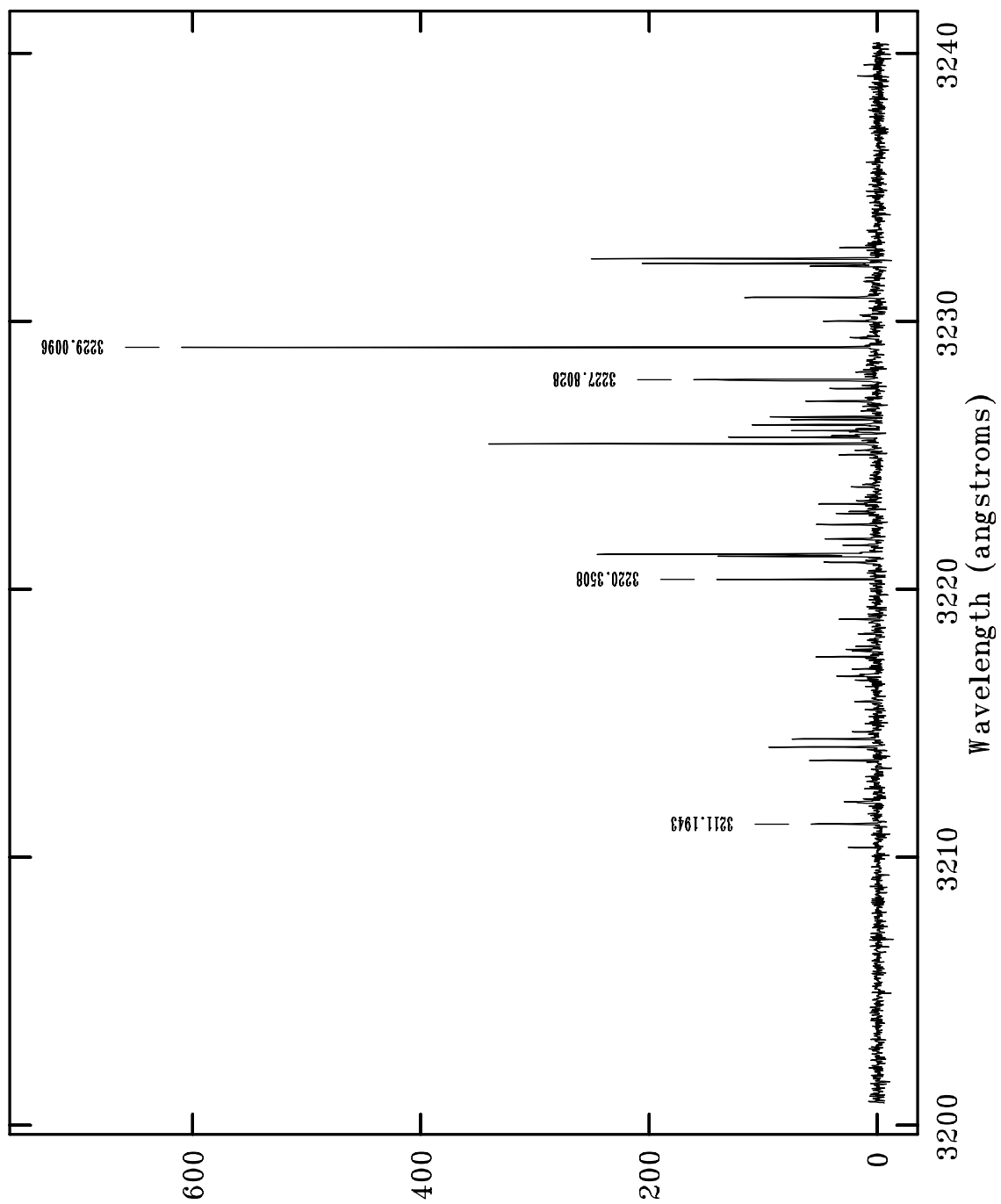


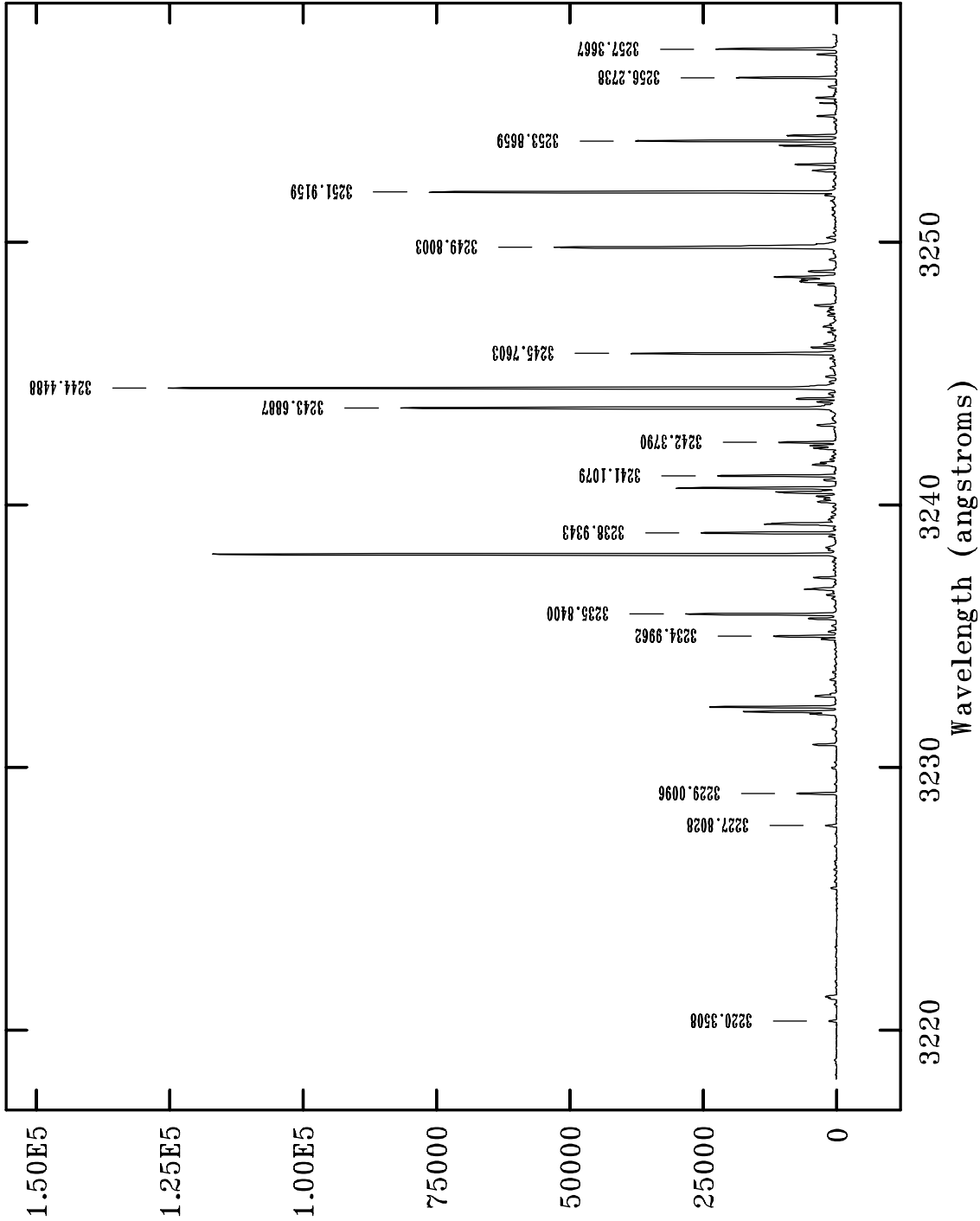
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Aperture 26, Image line 26, Order 186
ecidentify 093: UNKNOWN



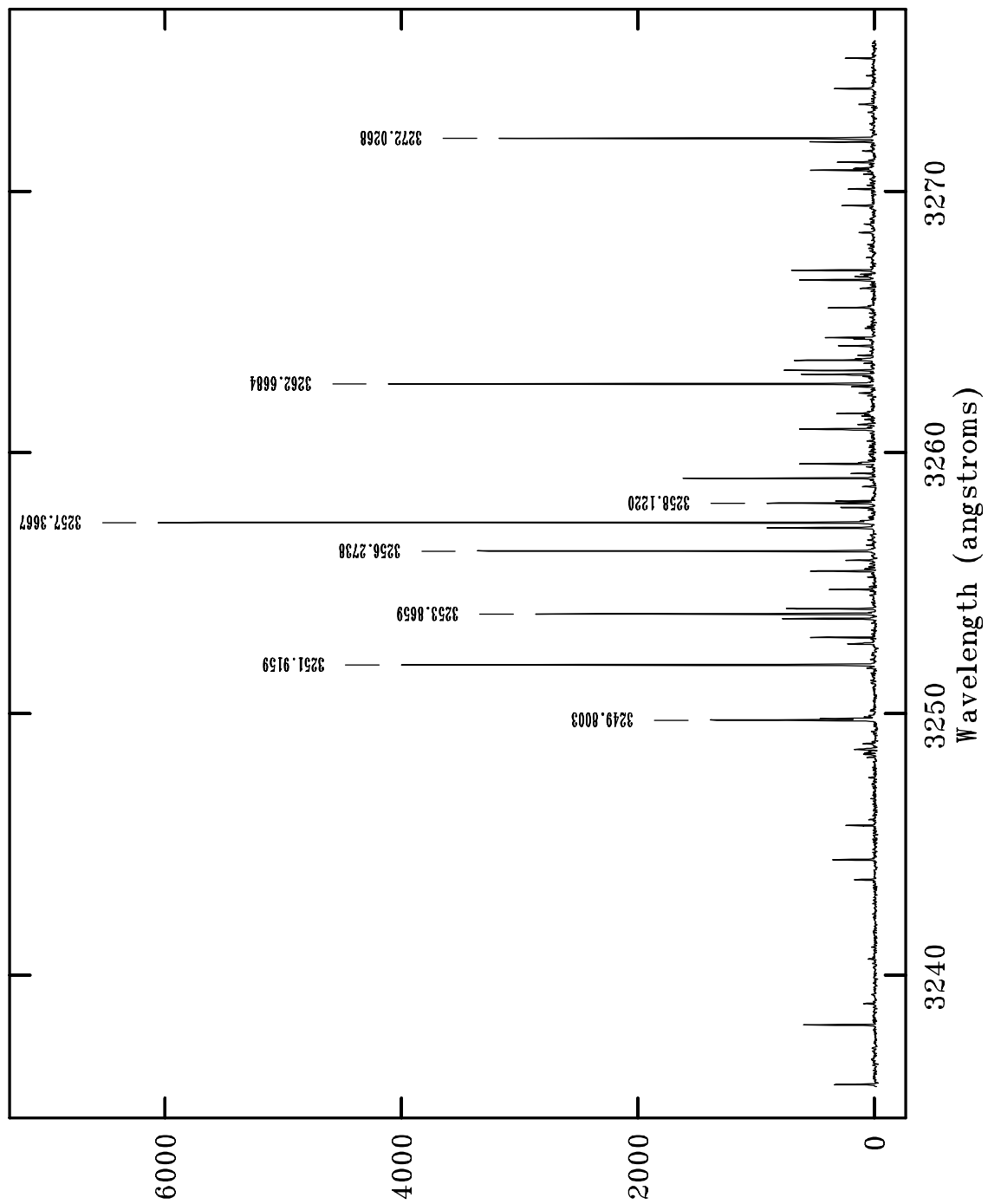


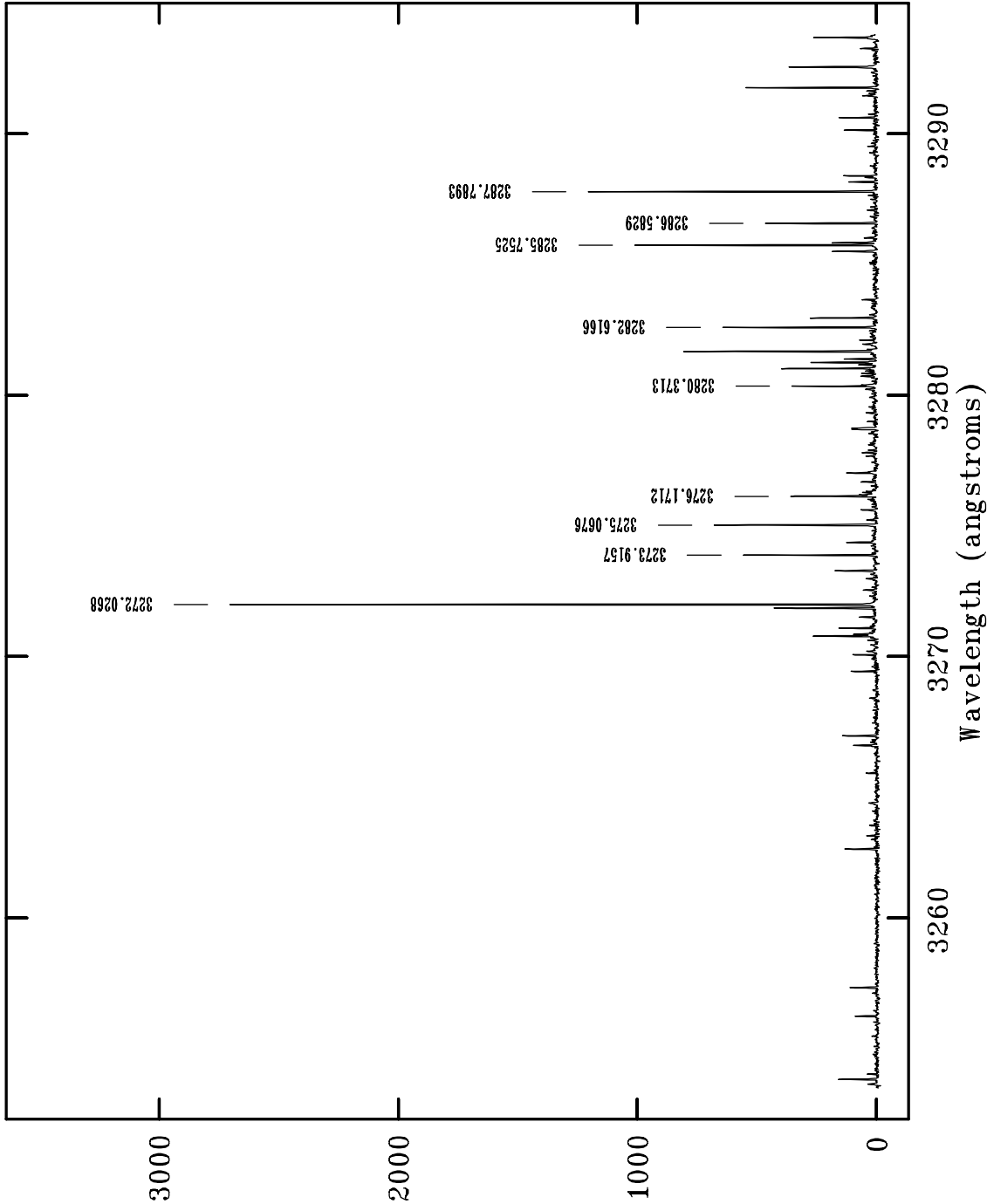
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Aperture 24, Image line 24, Order 184
ecidentify 093: UNKNOWN



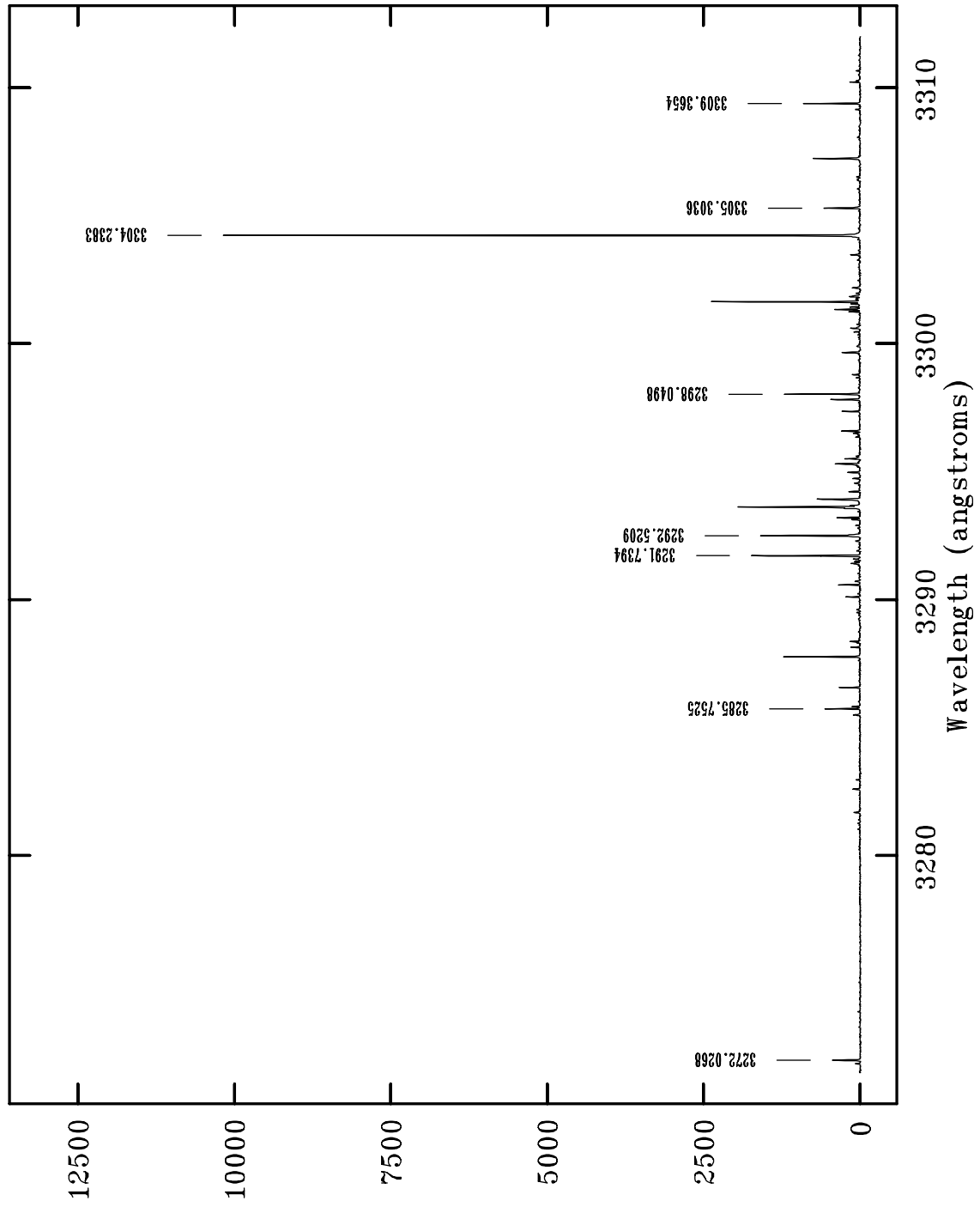


NOAO/IRAF V2.11.3EXPORT honda@hds Thu 19:38:34 12-Oct-2000
Aperture 22, Image line 22, Order 183
ecidentify 093: UNKNOWN

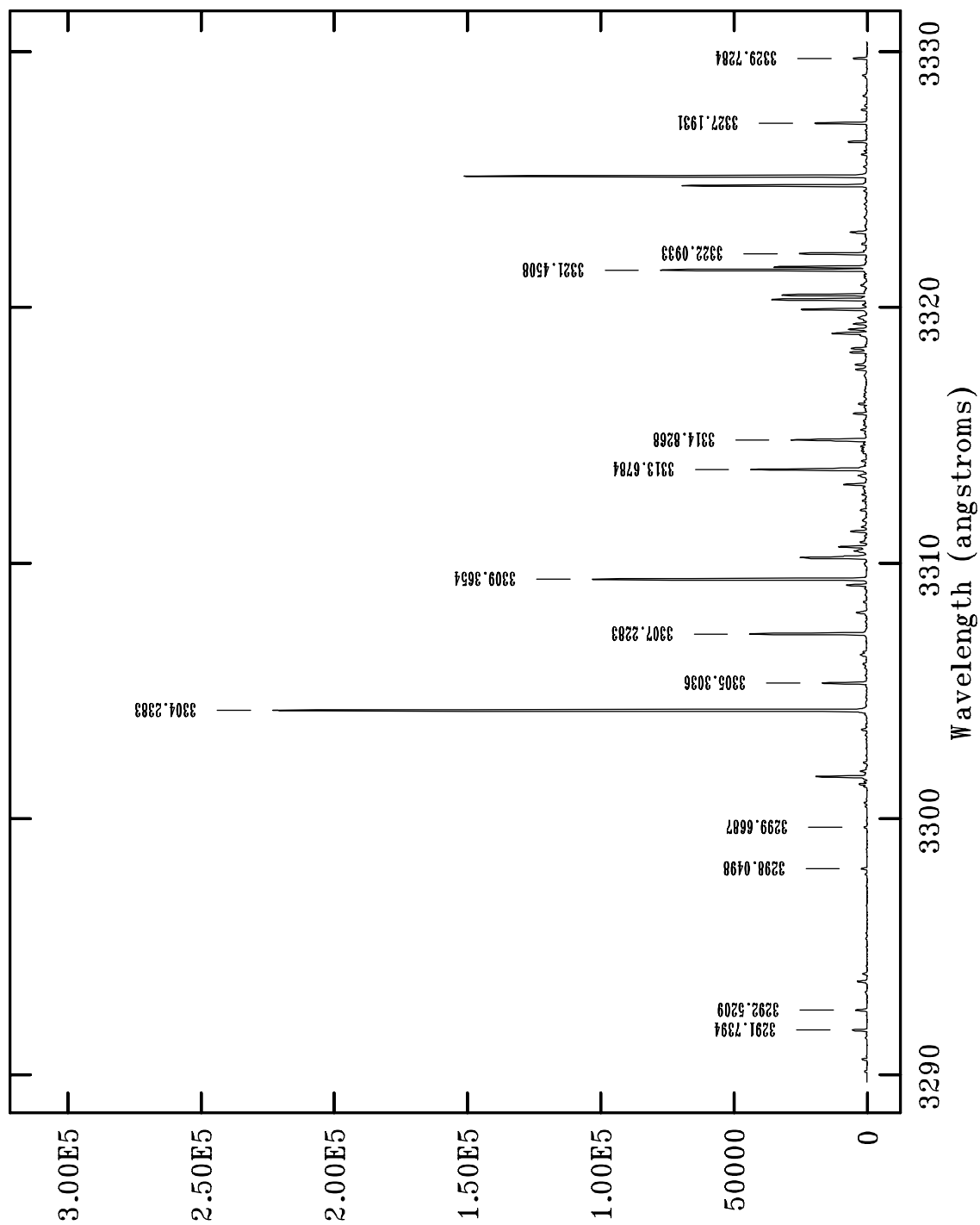




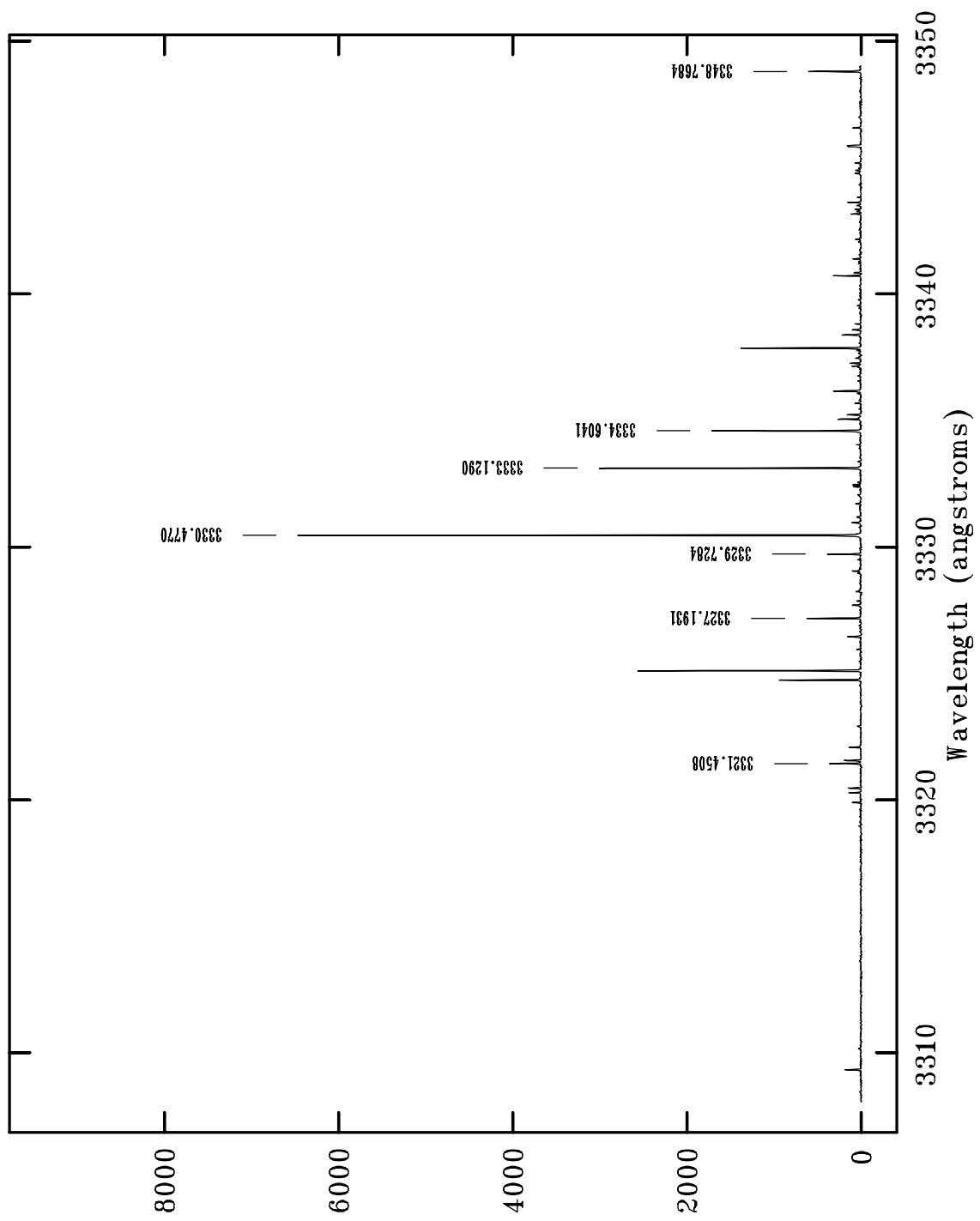
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identify 093: UNKNOWN

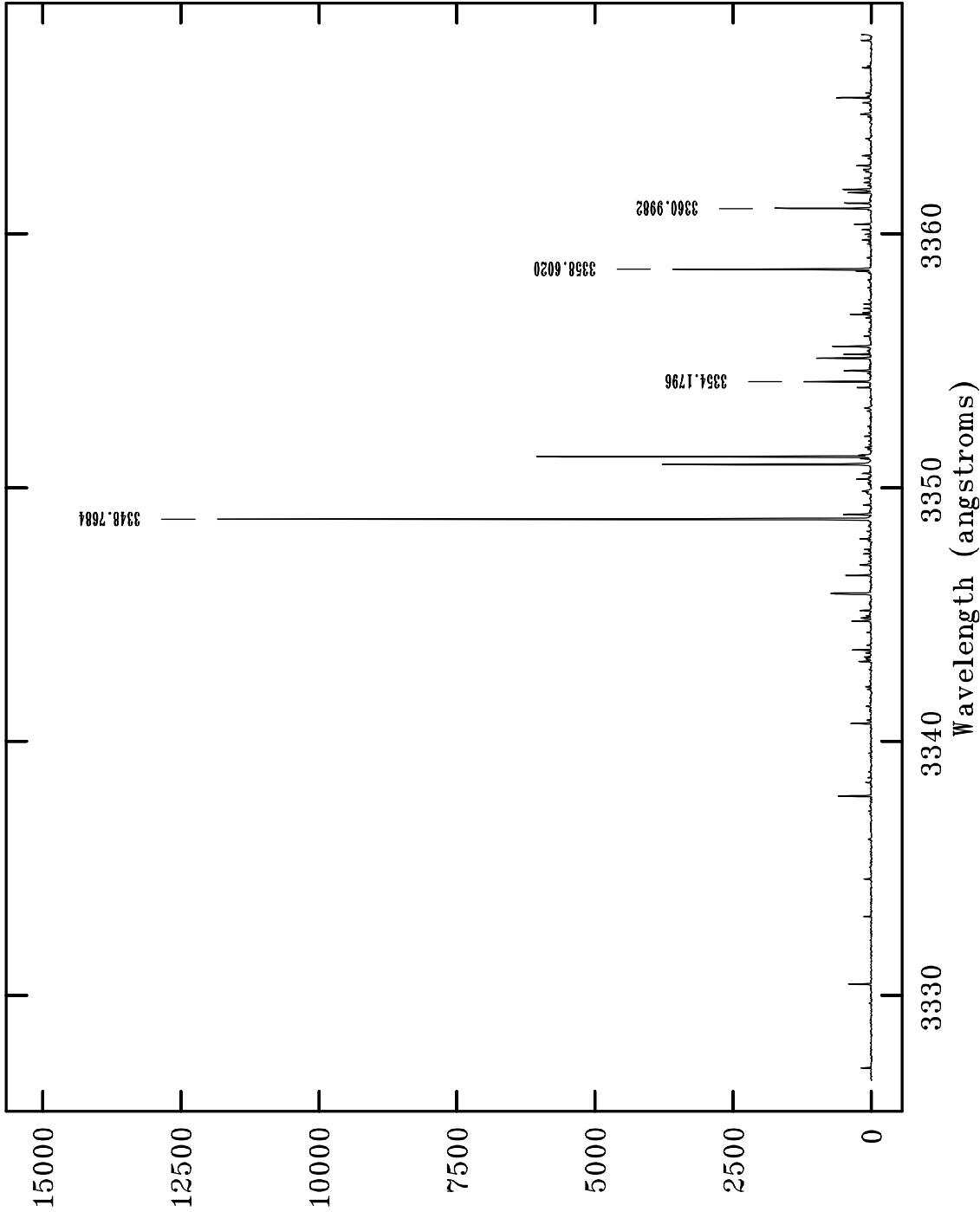


NOAO/IRAF V2.11EXPORT honda@data Fri 23:37:58 19-Jan-2001
Aperture 17, Image line 17, Order 180
ecidntify 093: COMPARISON

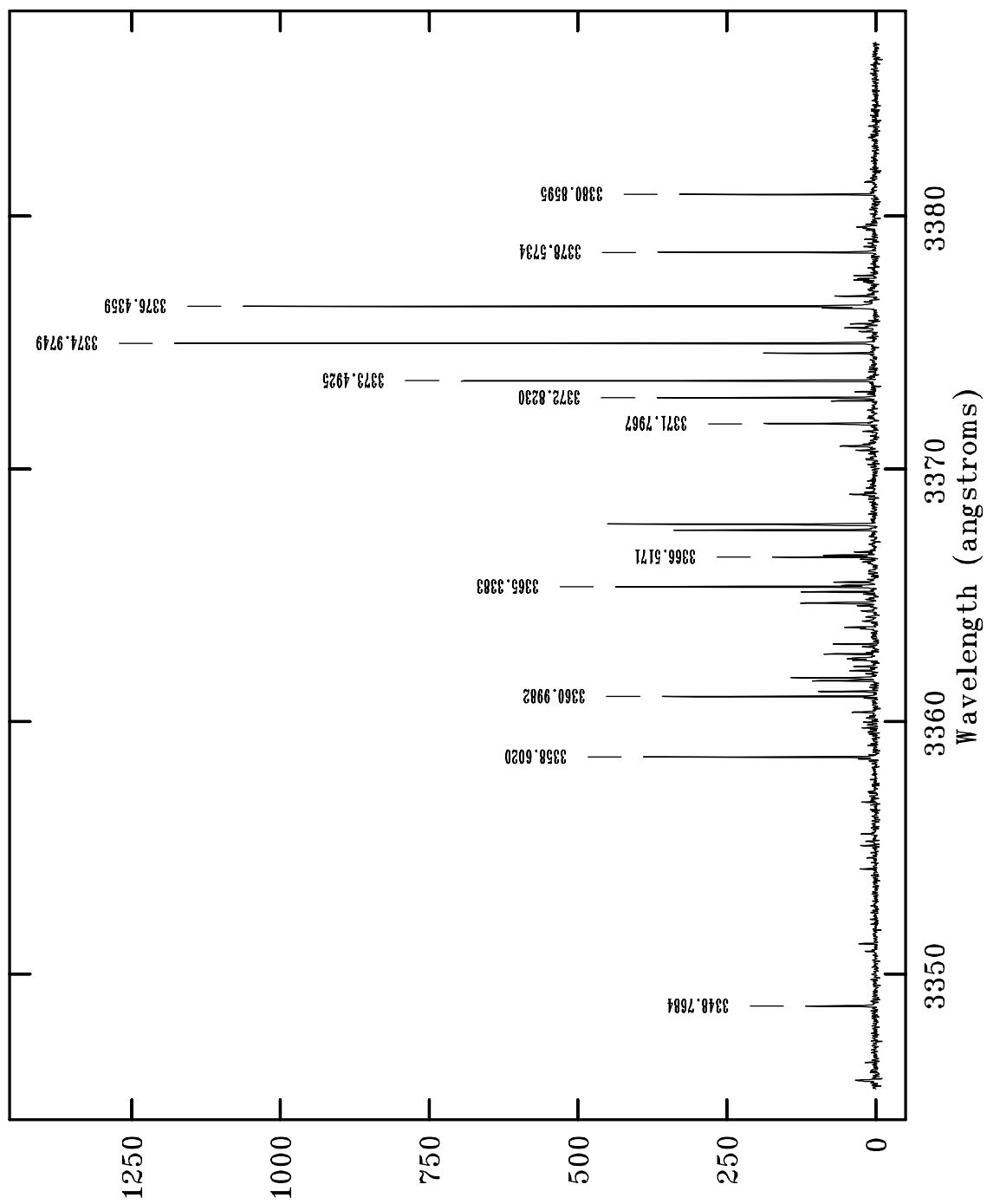


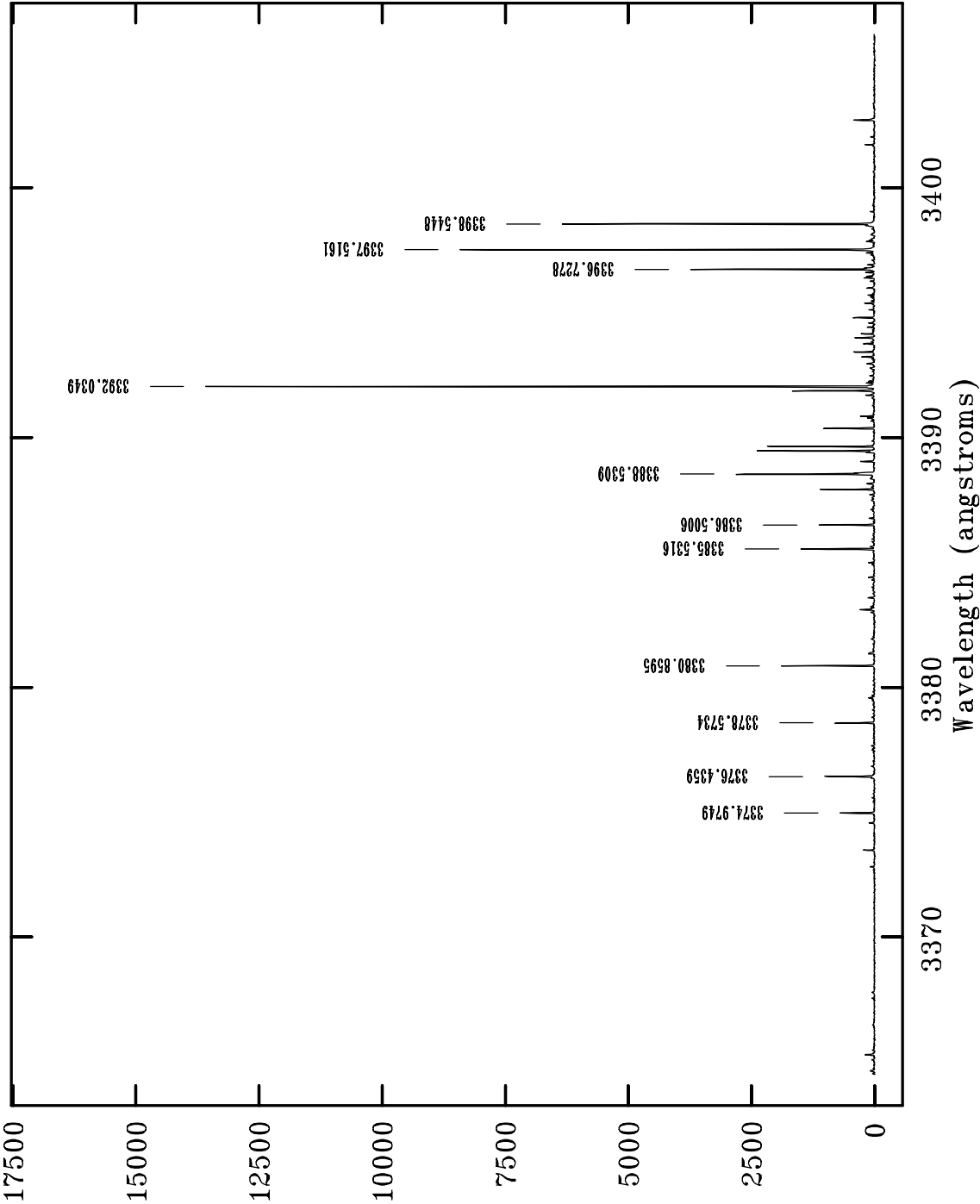
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Aperture 18, Image line 18, Order 179
ecidentify 093: UNKNOWN



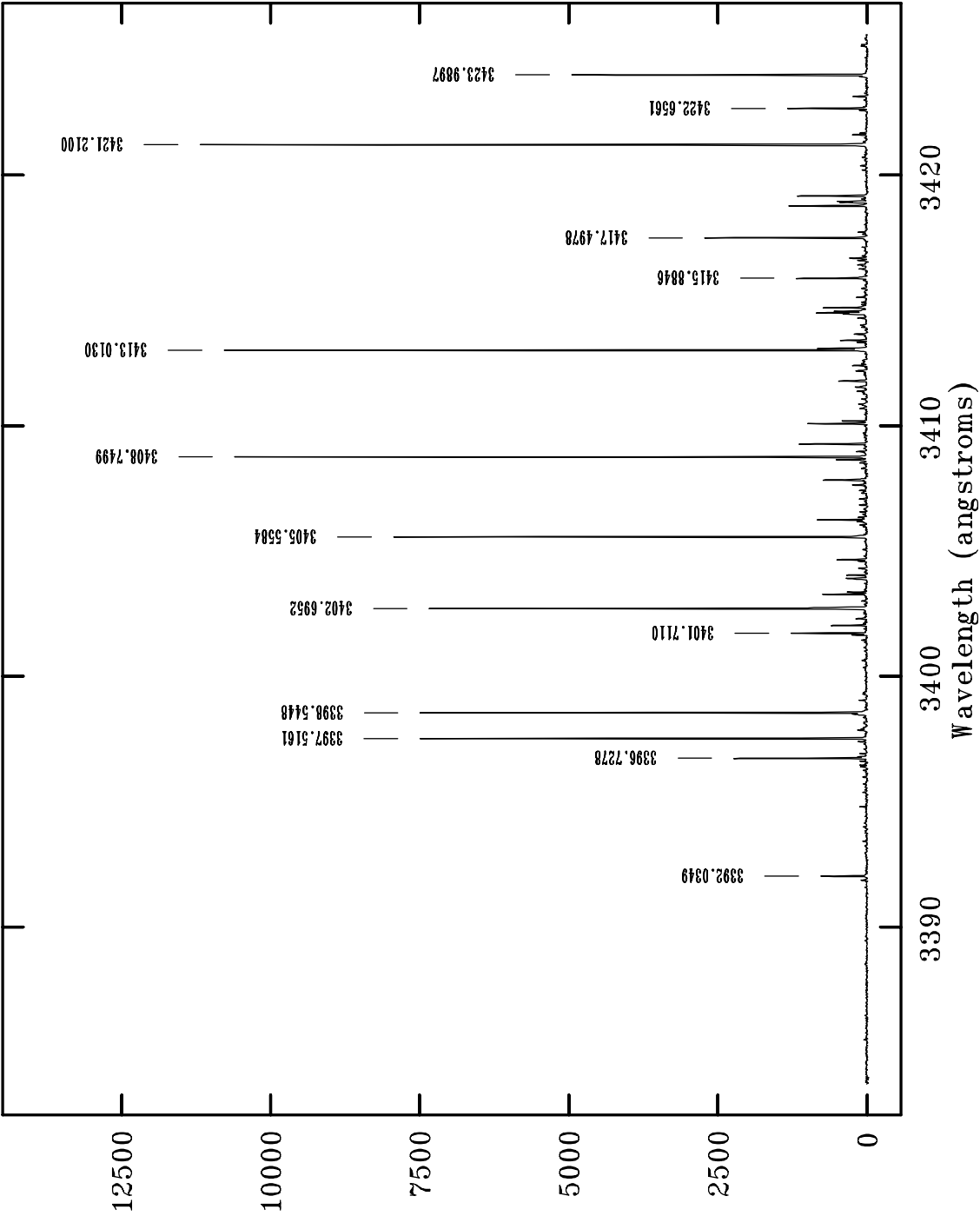


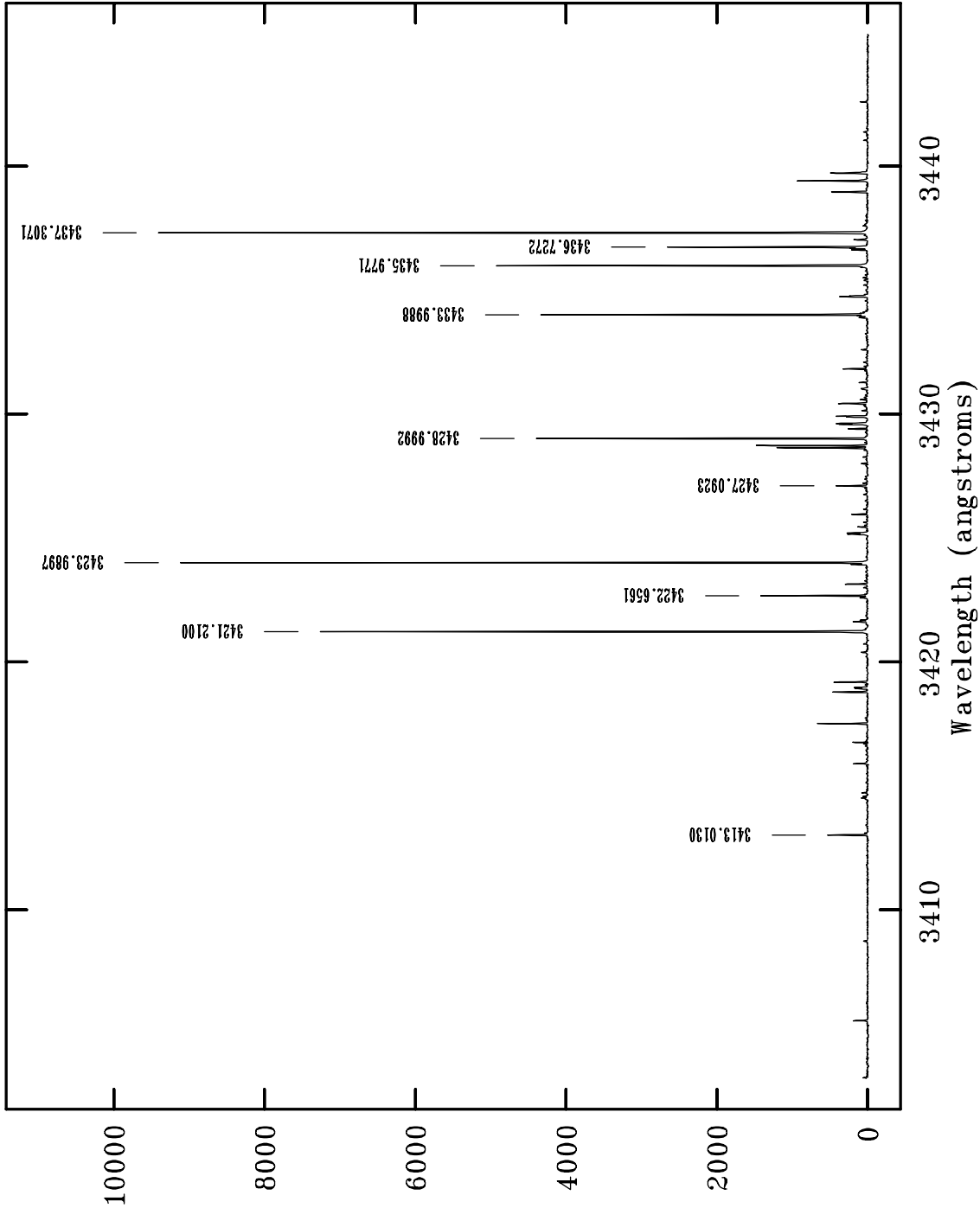
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Aperture 16, Image line 16, Order 177
ecidentify 093: UNKNOWN



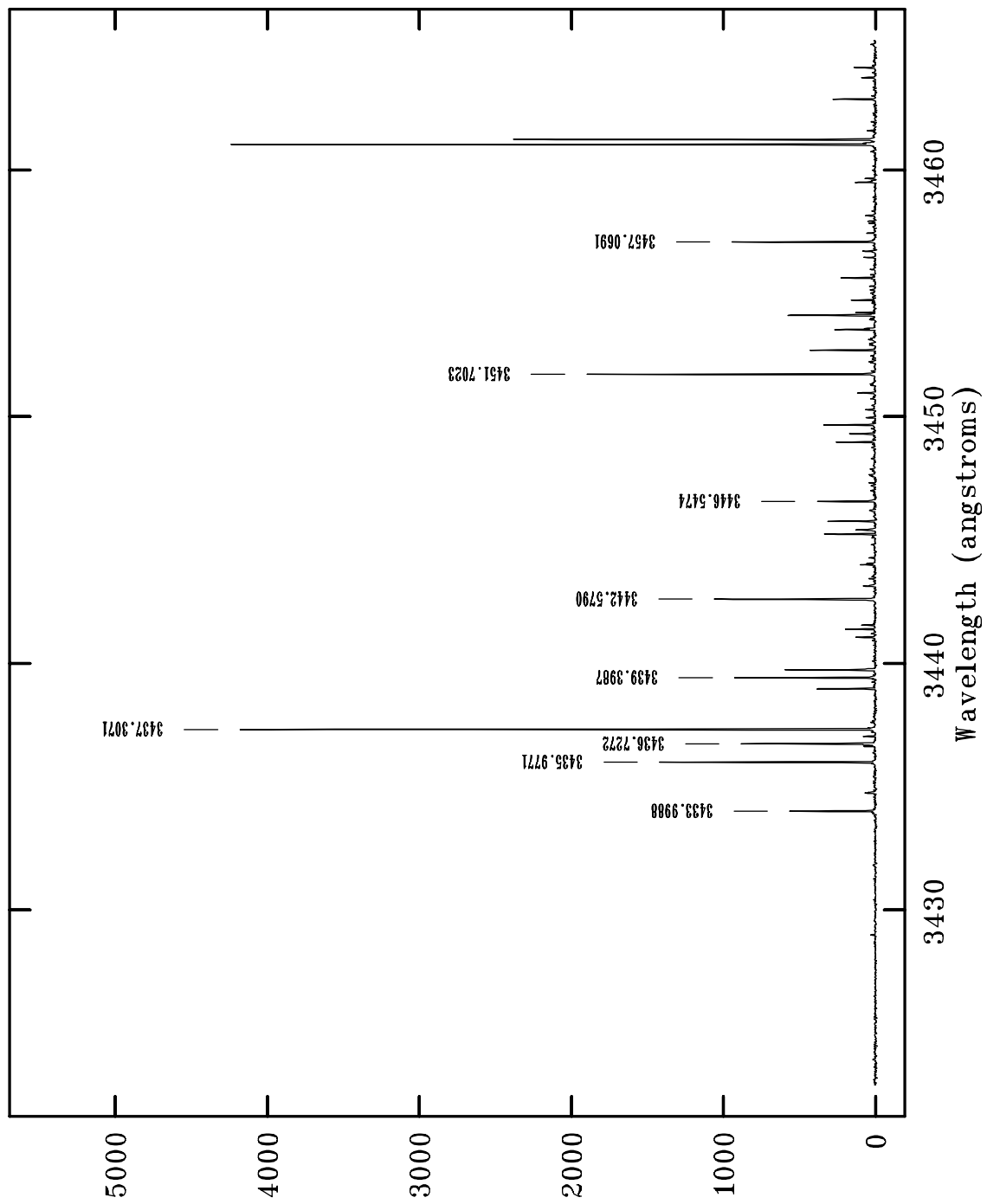


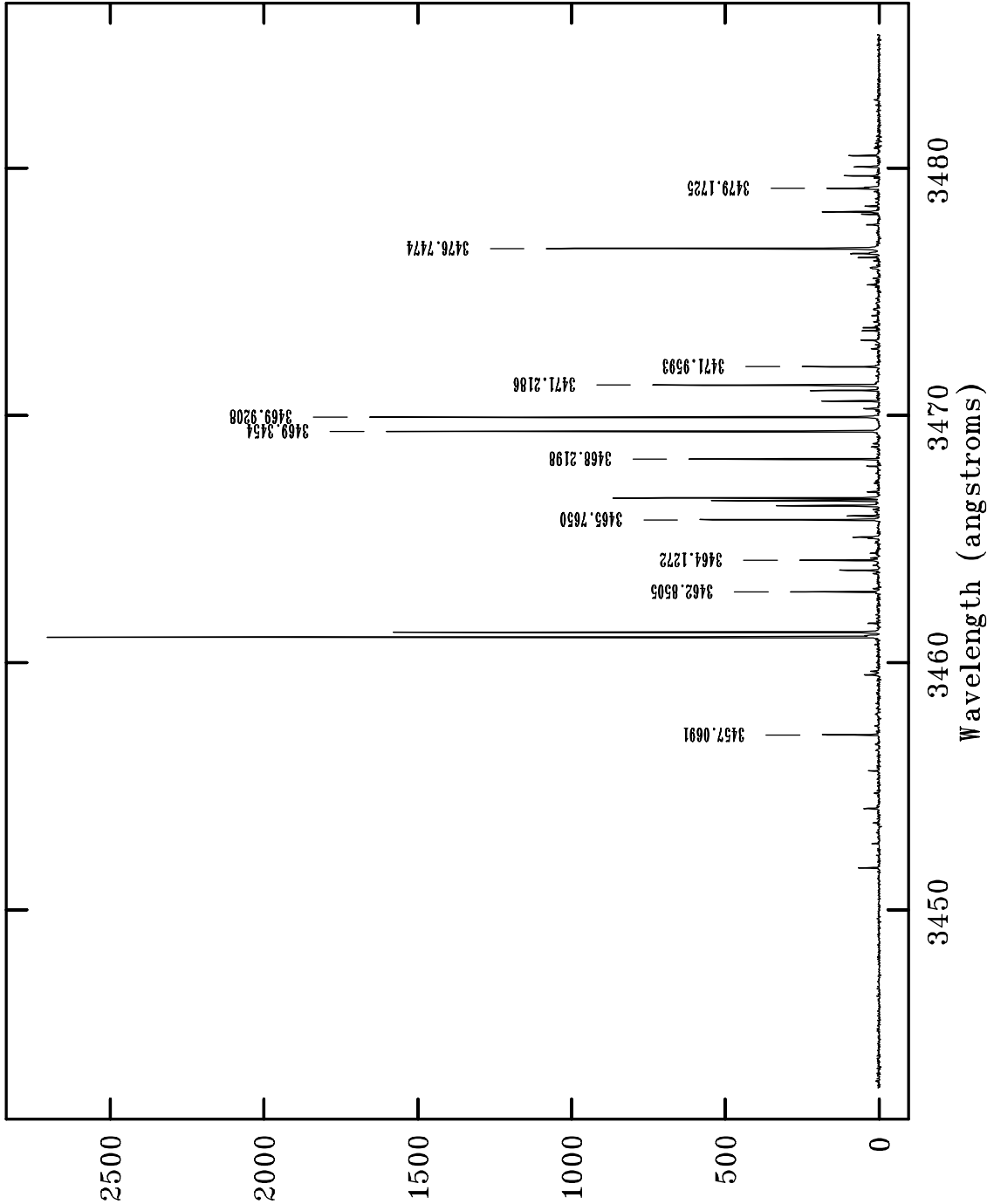
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Aperture 14, Image line 14, Order 175
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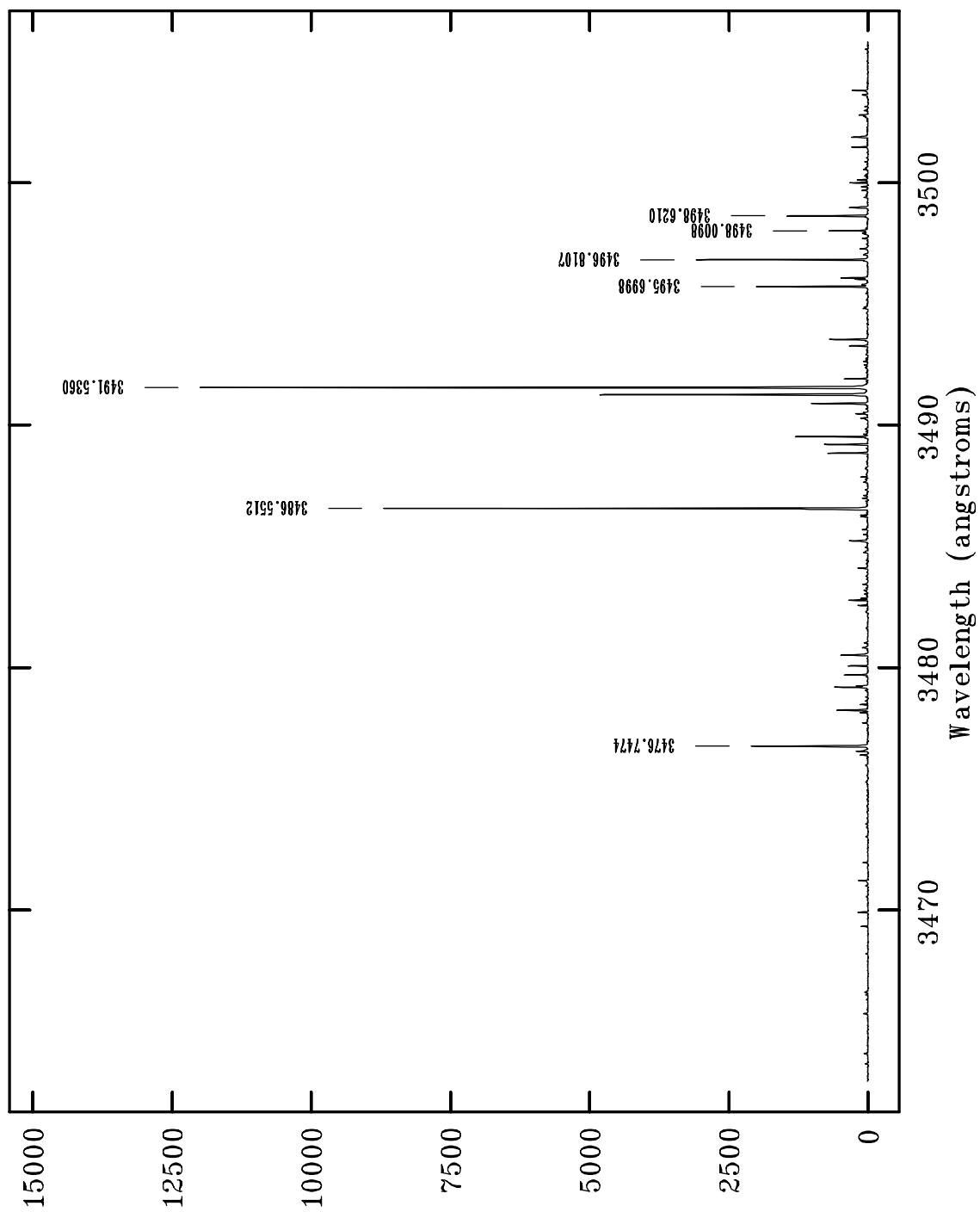


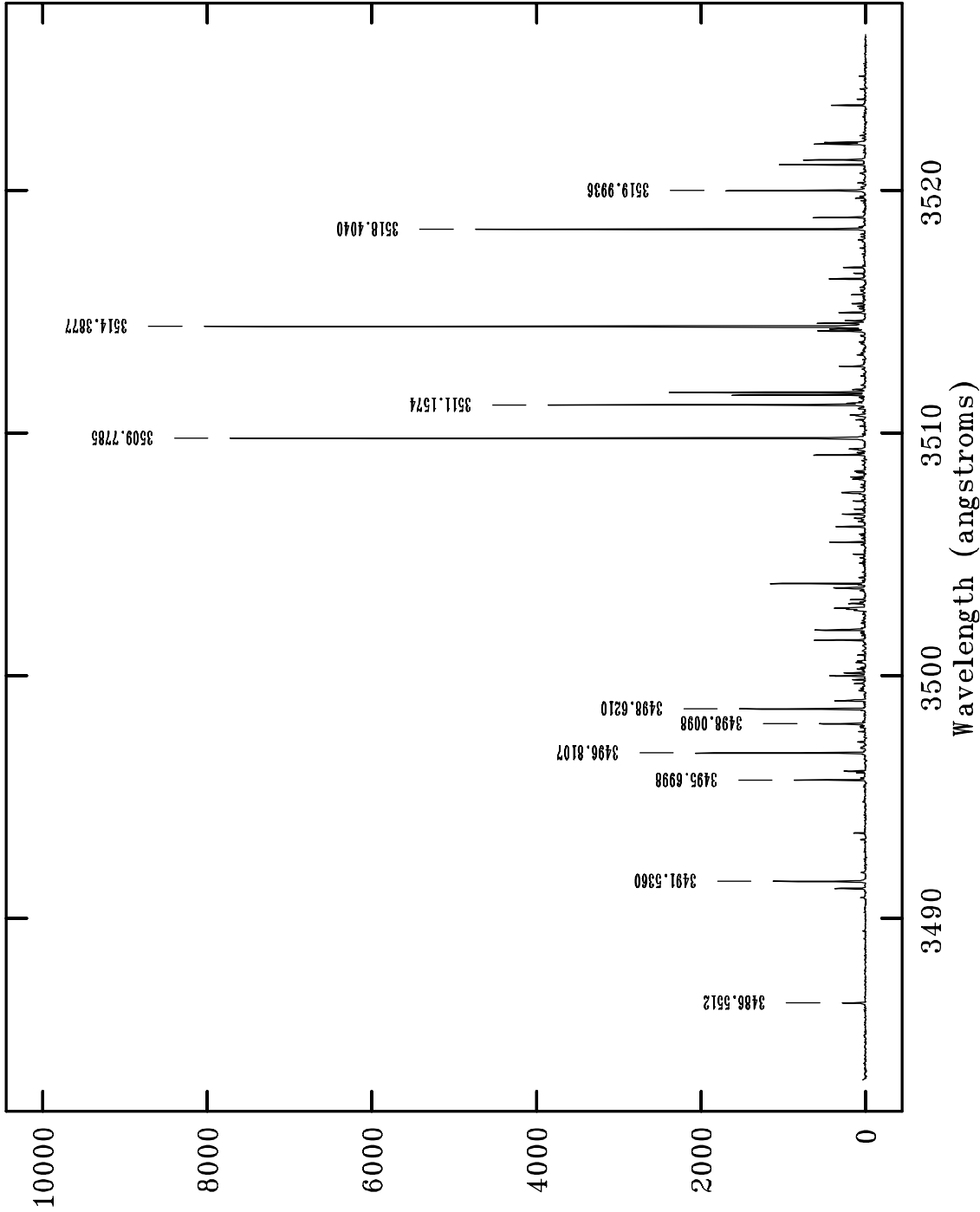
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identify 093: UNKNOWN



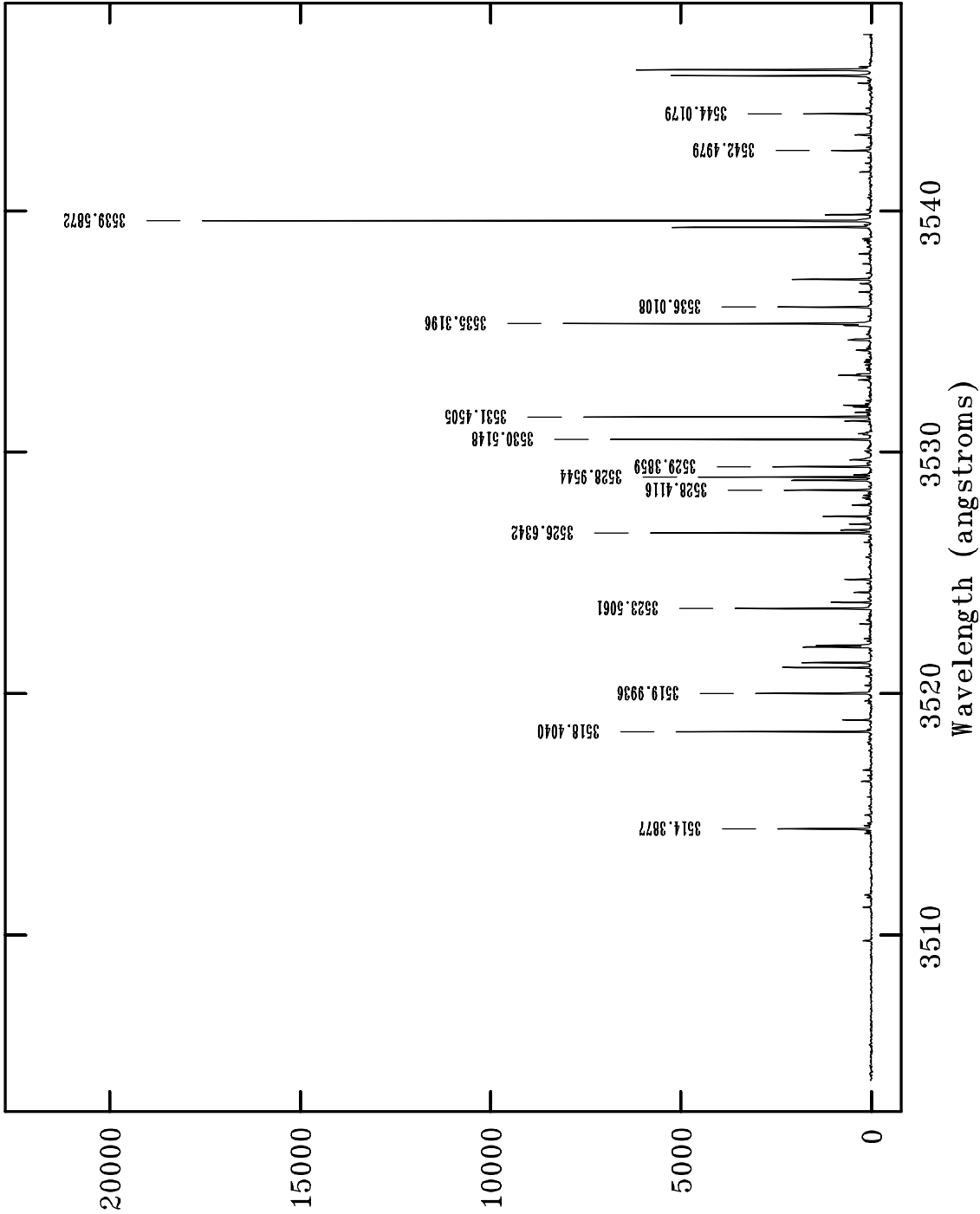


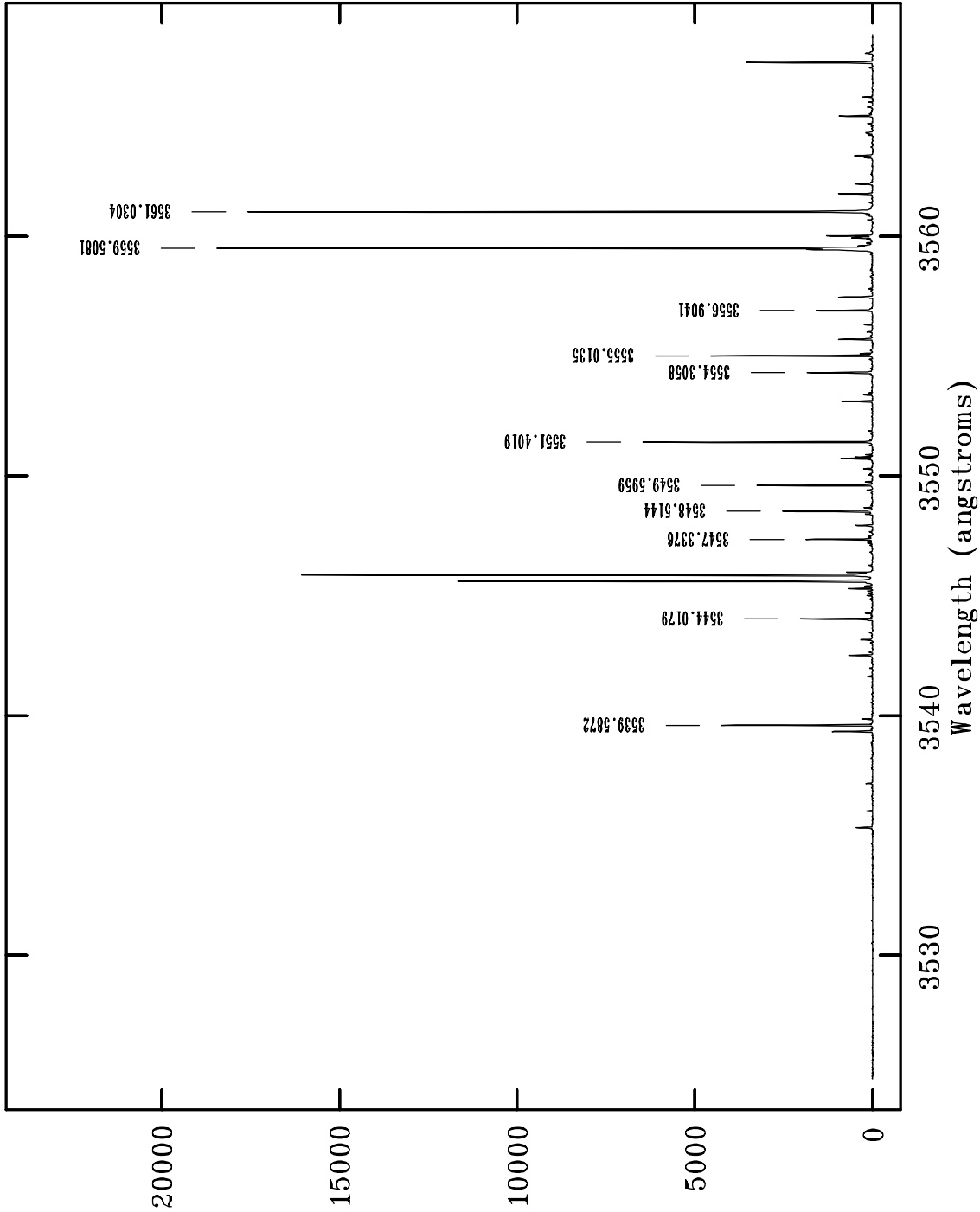
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ecidentify 093: UNKNOWN



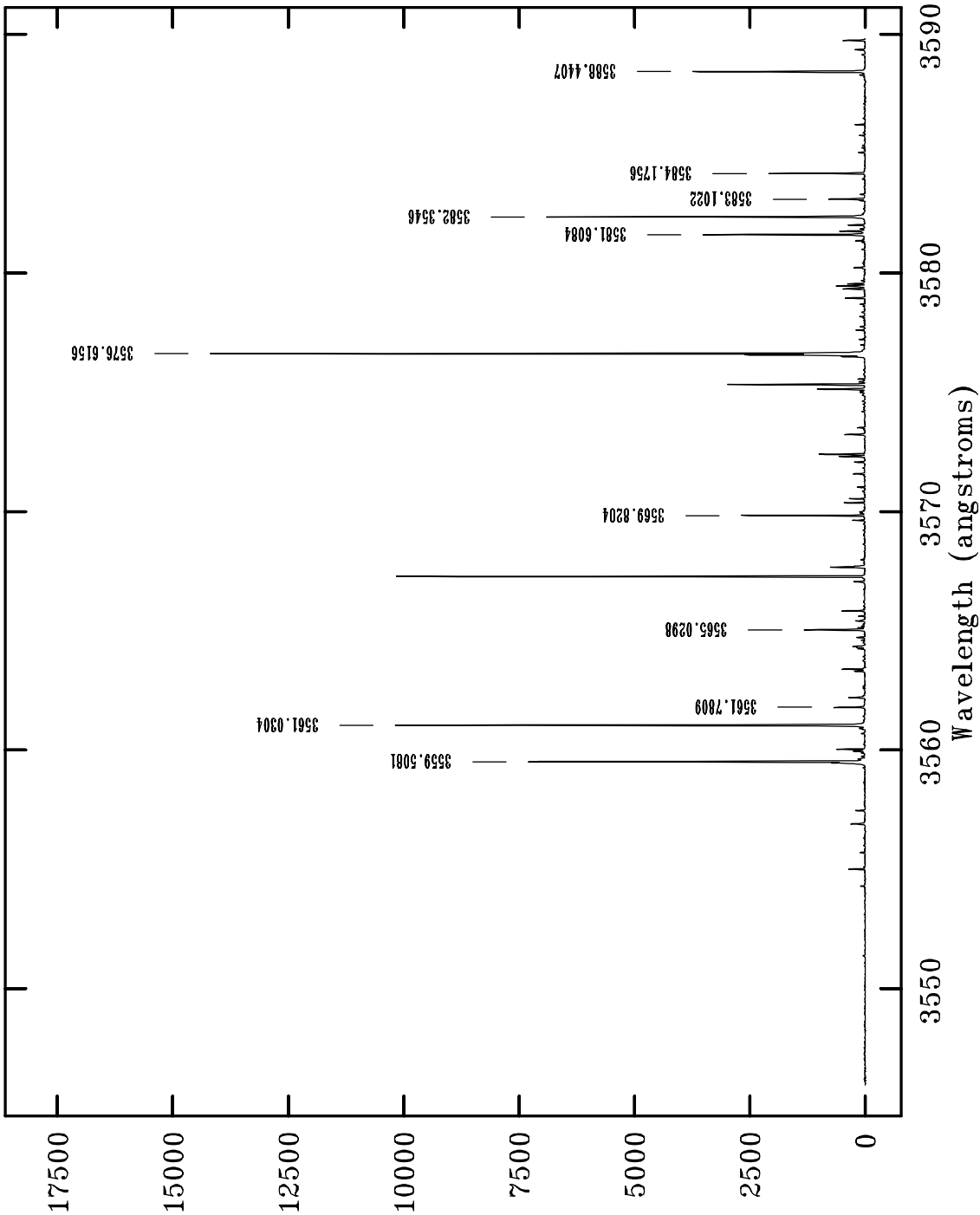


NOAO/IRAF V2.11.3EXPORT honda@hds Thu 18:49:26 12-Oct-2000
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identify 093: UNKNOWN

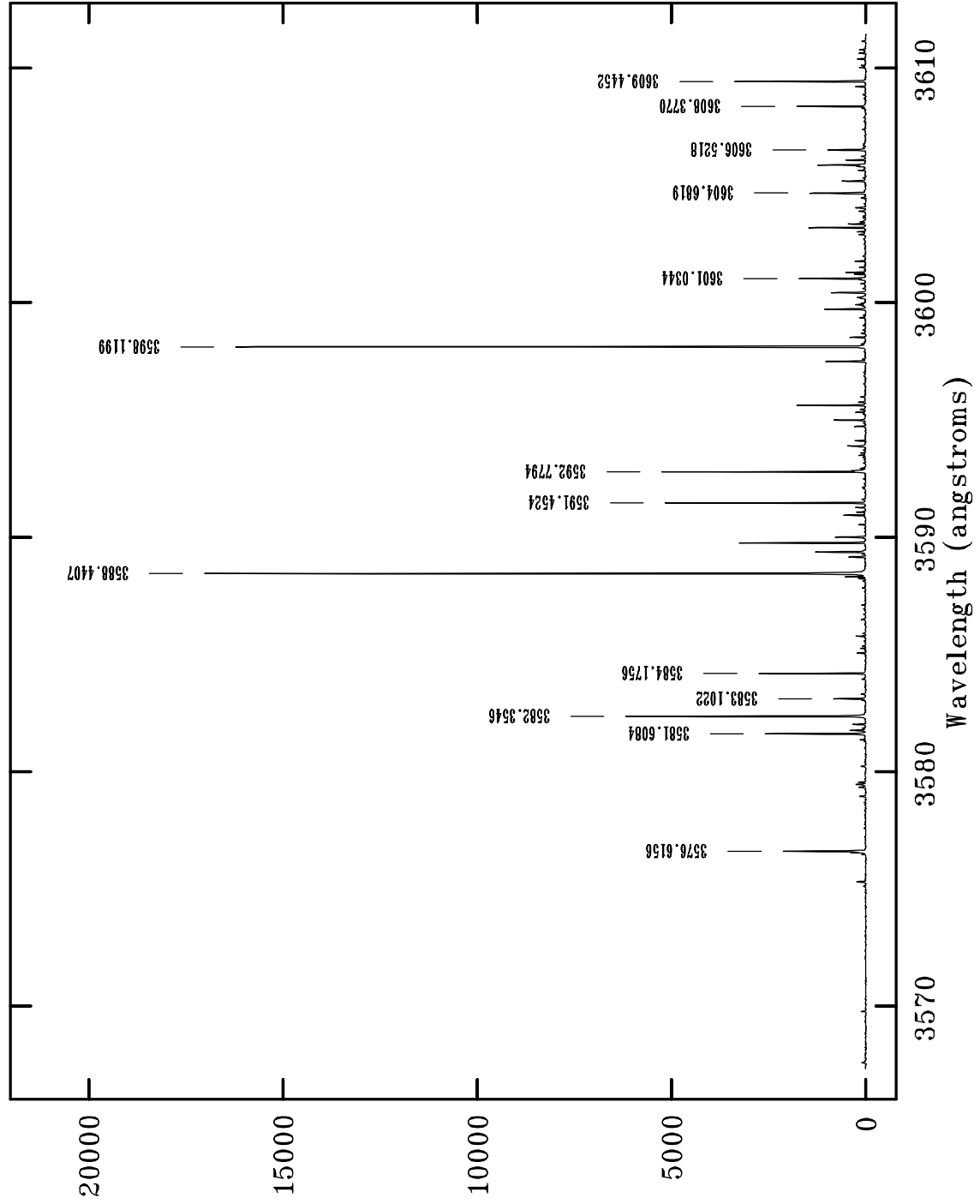




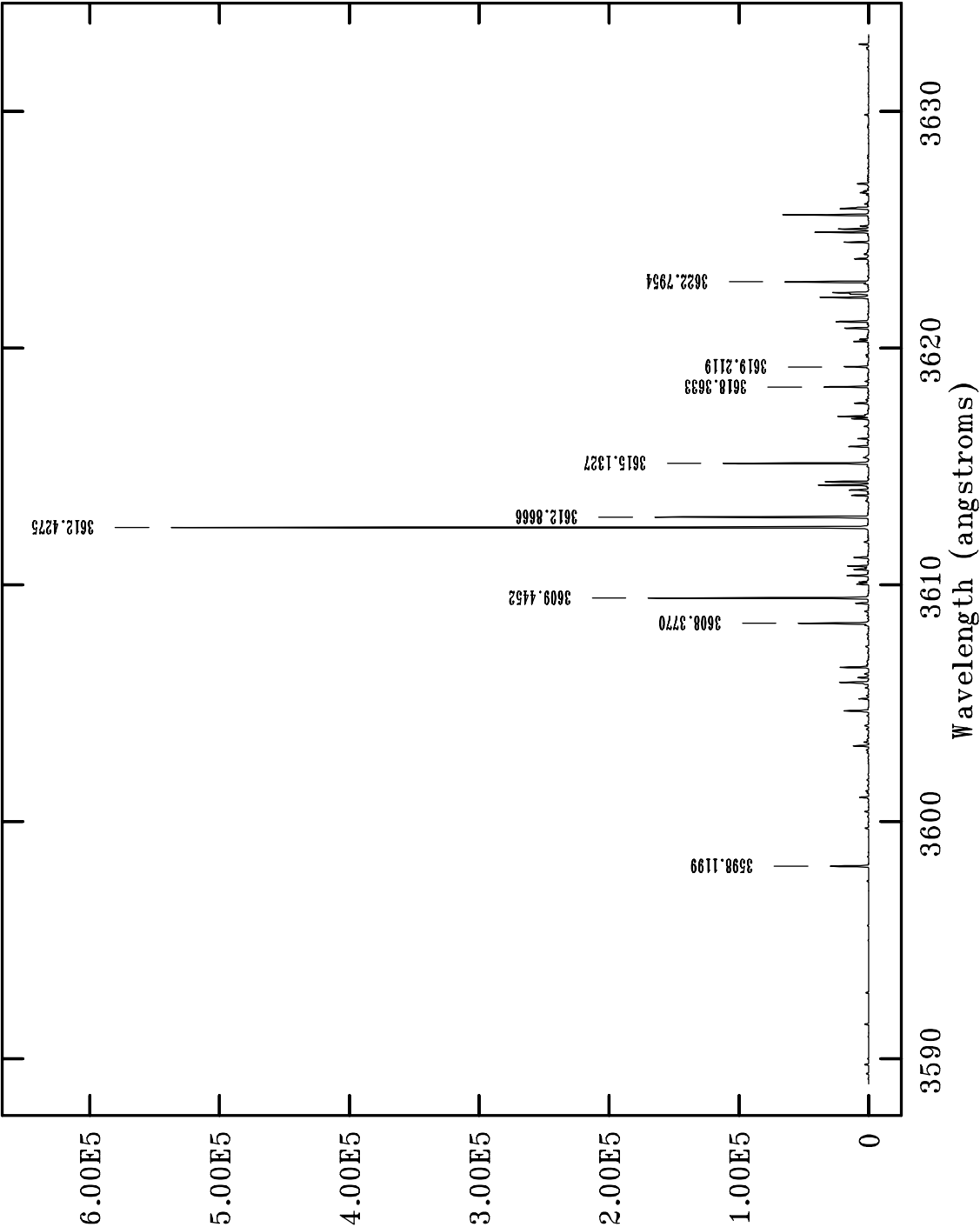
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identify 093: UNKNOWN



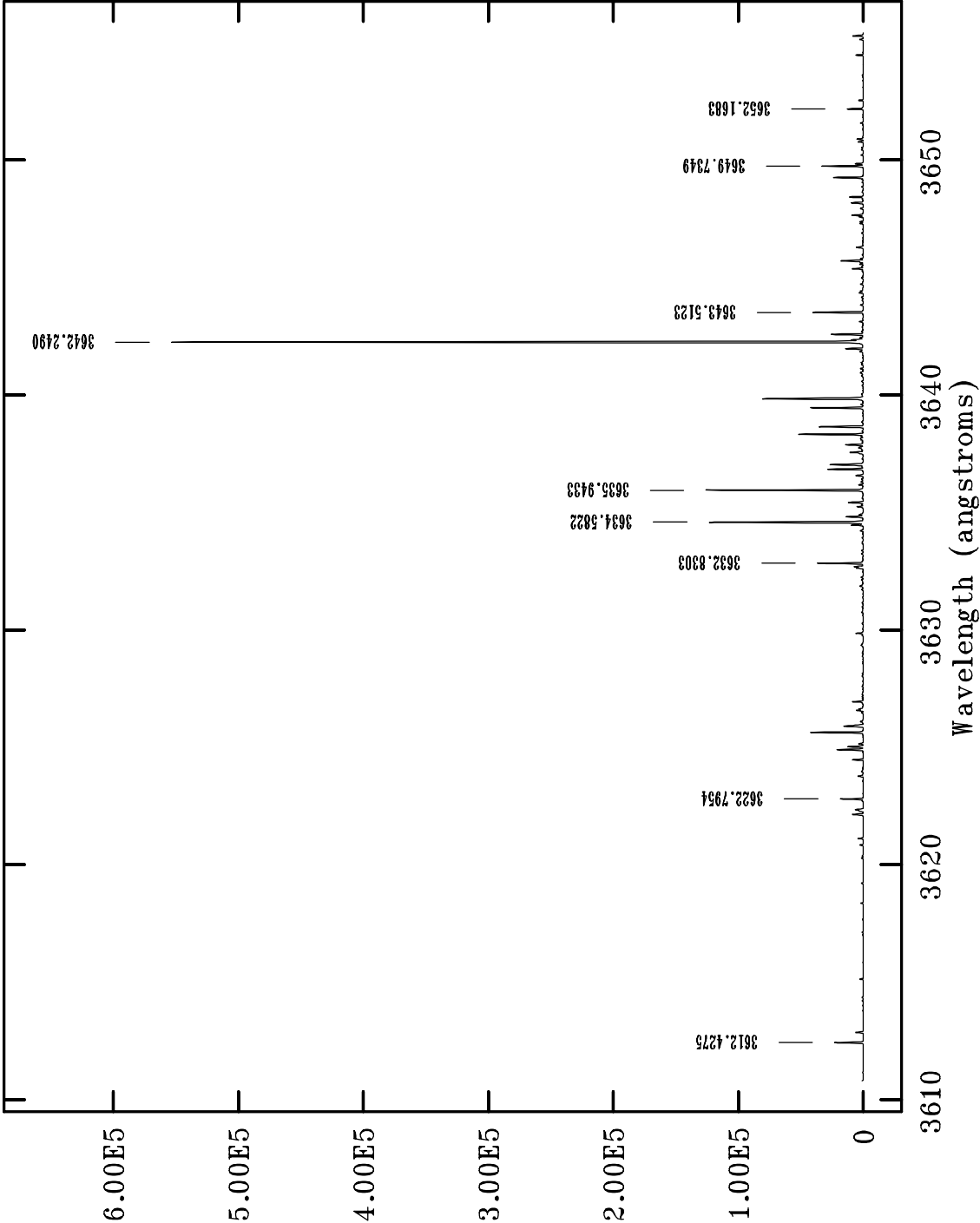
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ecidentify 093: UNKNOWN



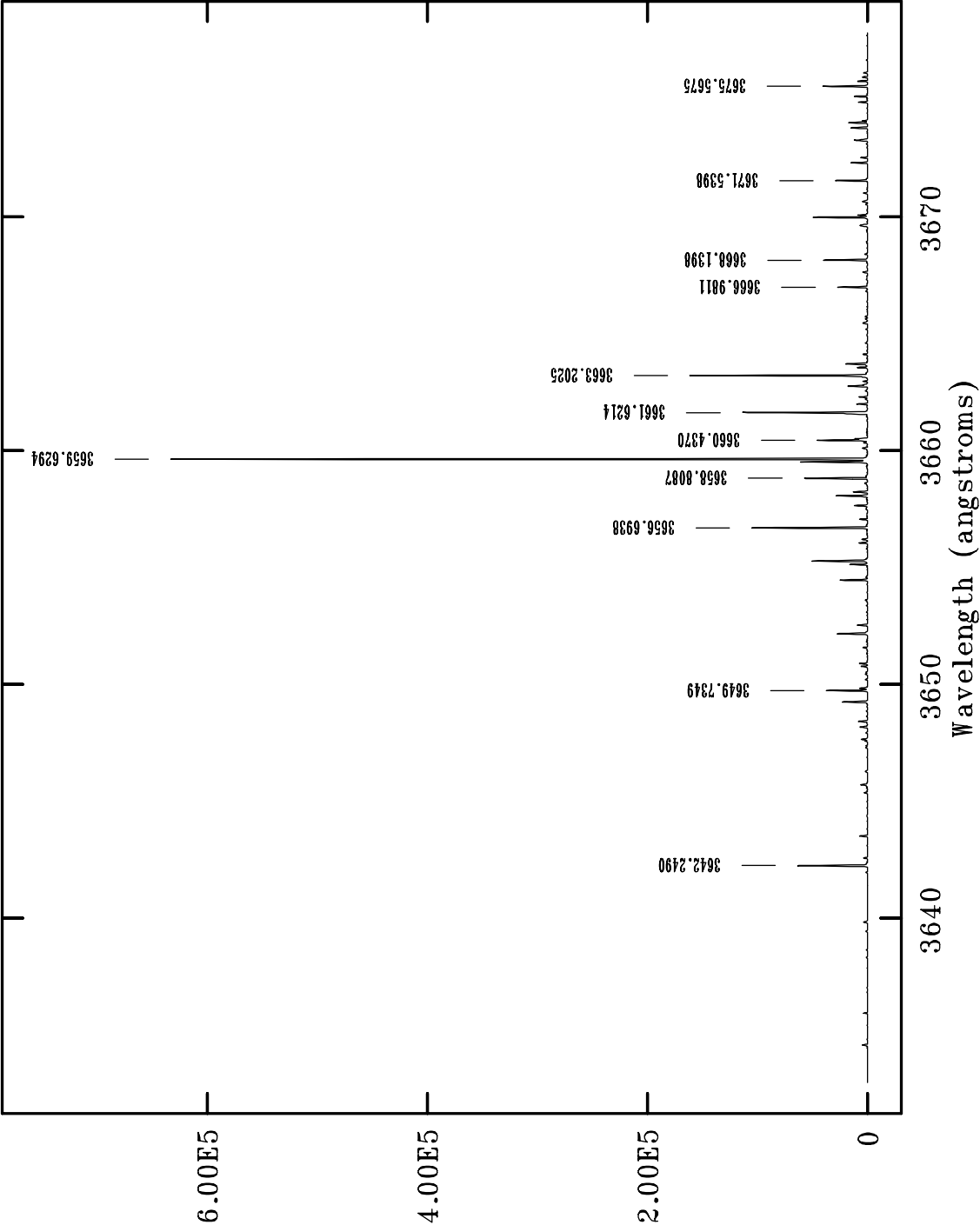
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Aperture 25, Image line 25, Order 165
ec1456: COMPARISON



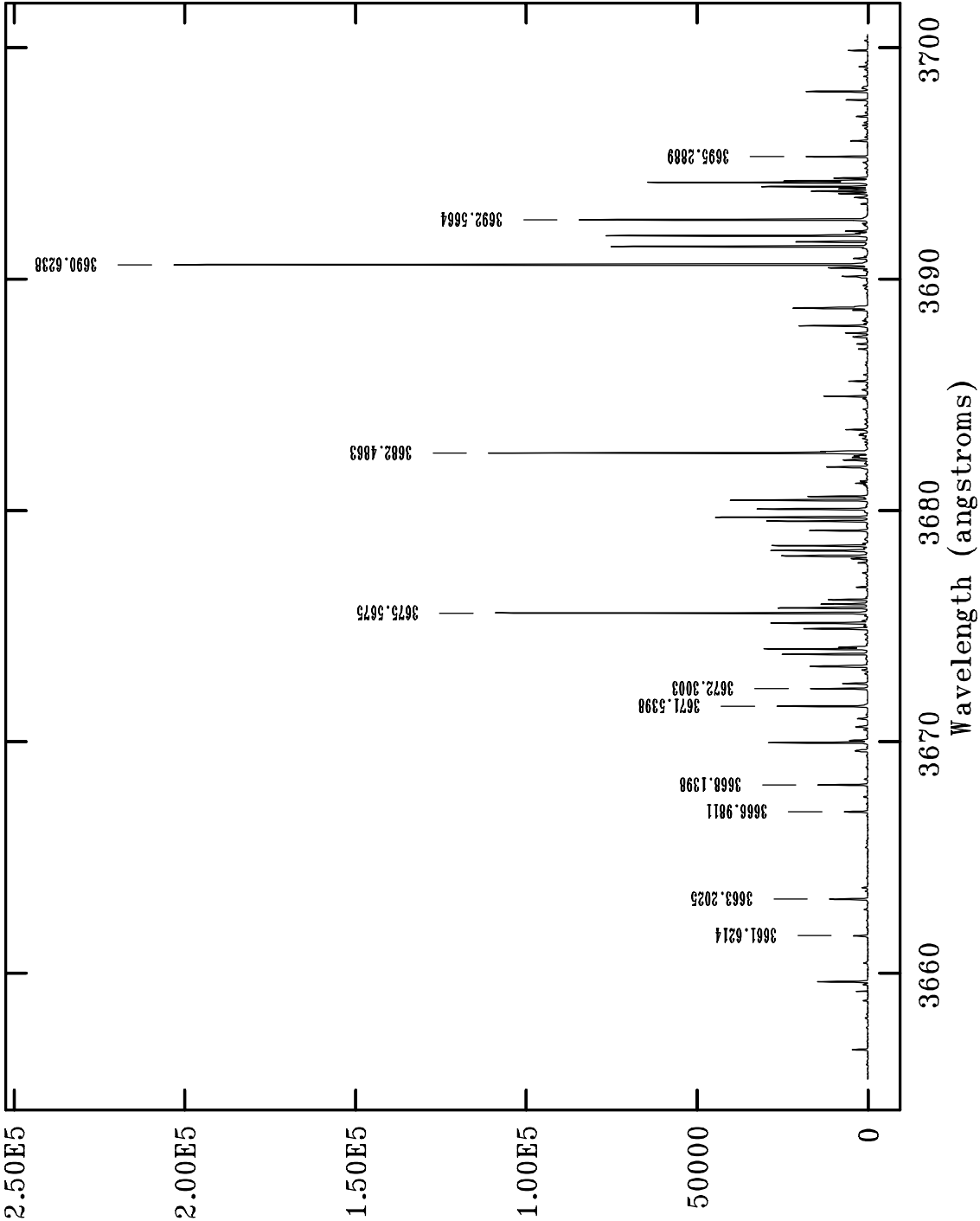
NOAO/IRAF V2.11EXPORT honda@data Wed 18:02:17 13-Dec-2000
Aperture 24, Image line 24, Order 164
ec1456: COMPARISON



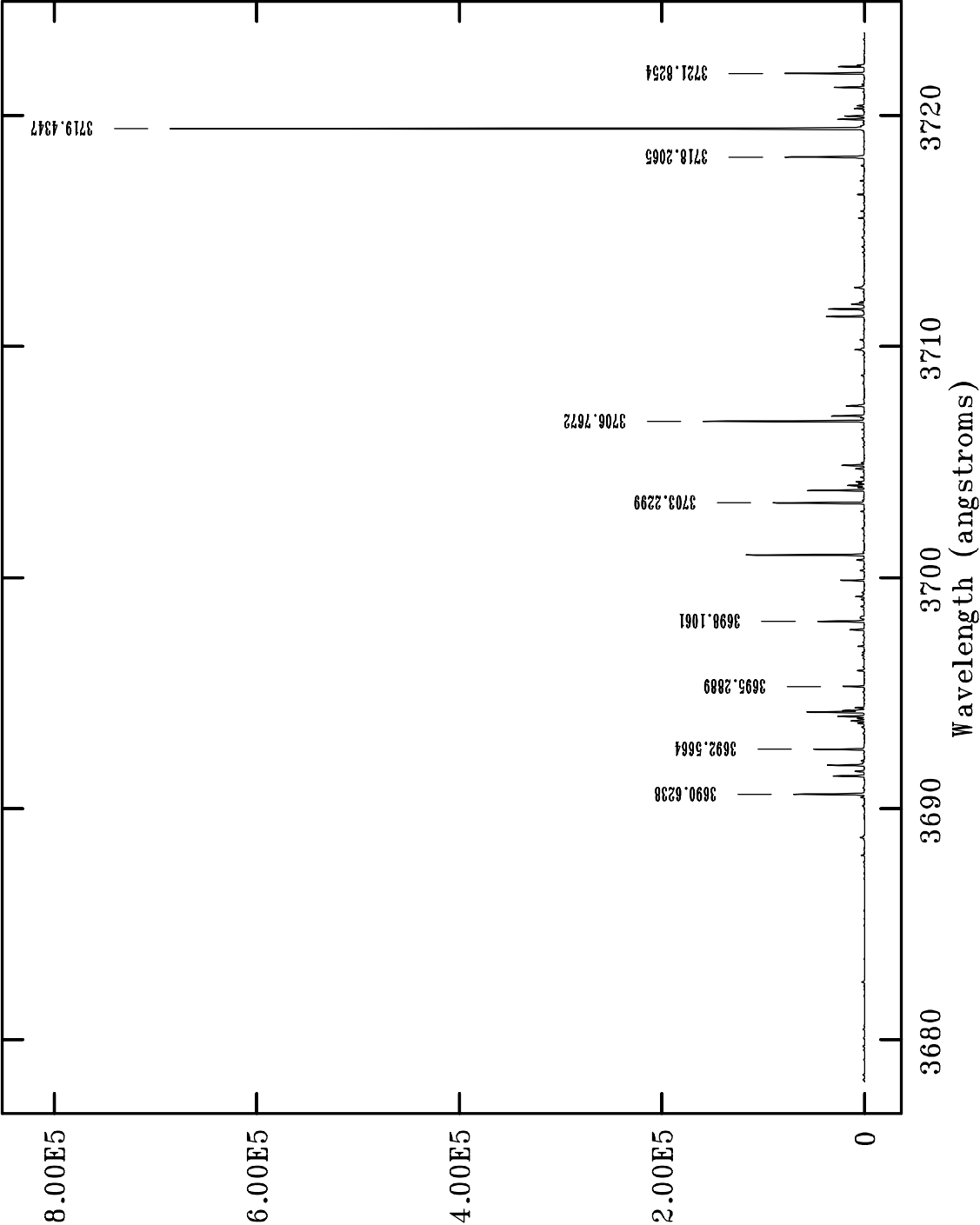
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Aperture 23, Image line 23, Order 163
ec1456: COMPARISON



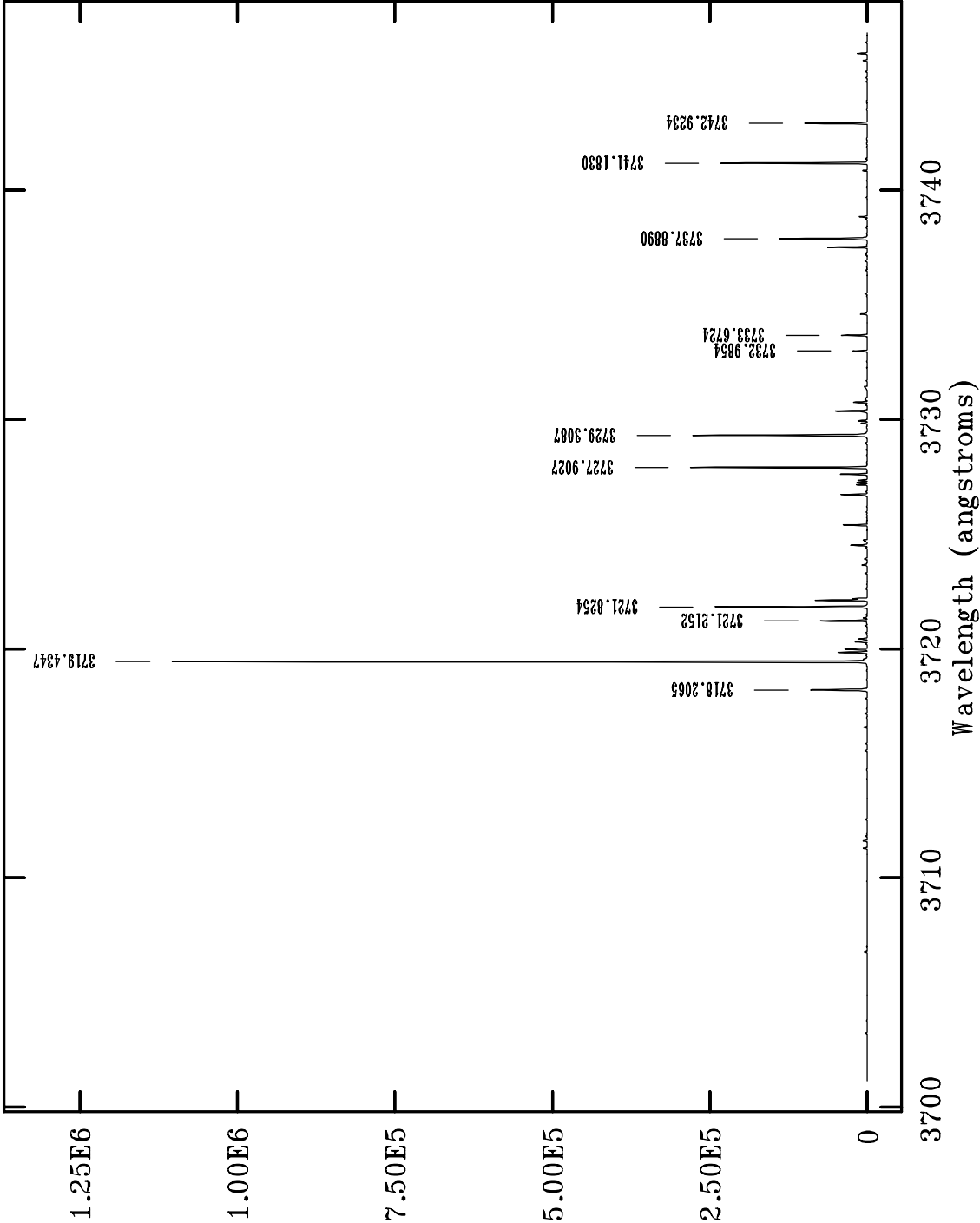
NOAO/IRAF V2.11EXPORT honda@data Wed 17:58:52 13-Dec-2000
Aperture 22, Image line 22, Order 162
ec1456: COMPARISON



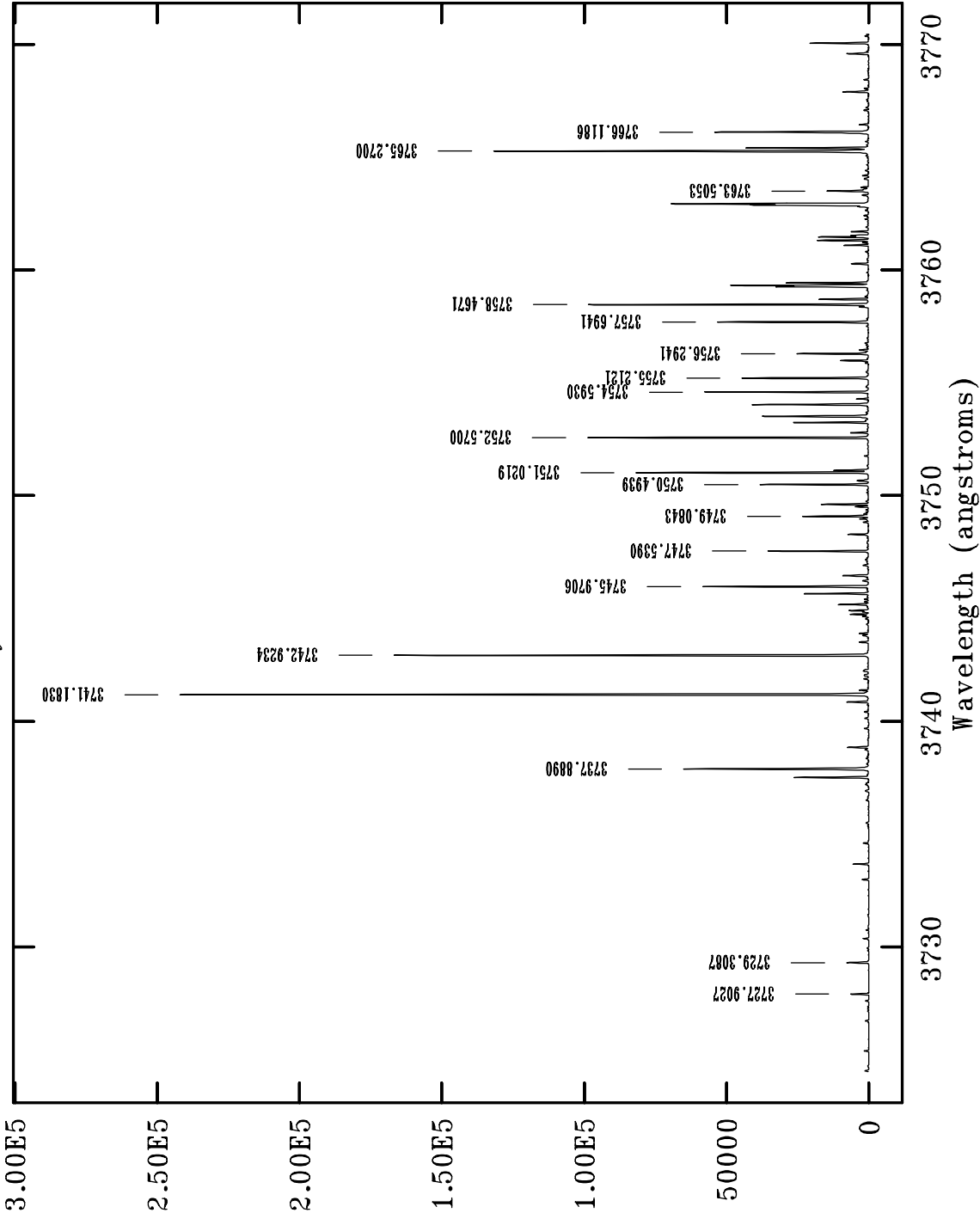
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Aperture 21, Image line 21, Order 161
ec1456: COMPARISON

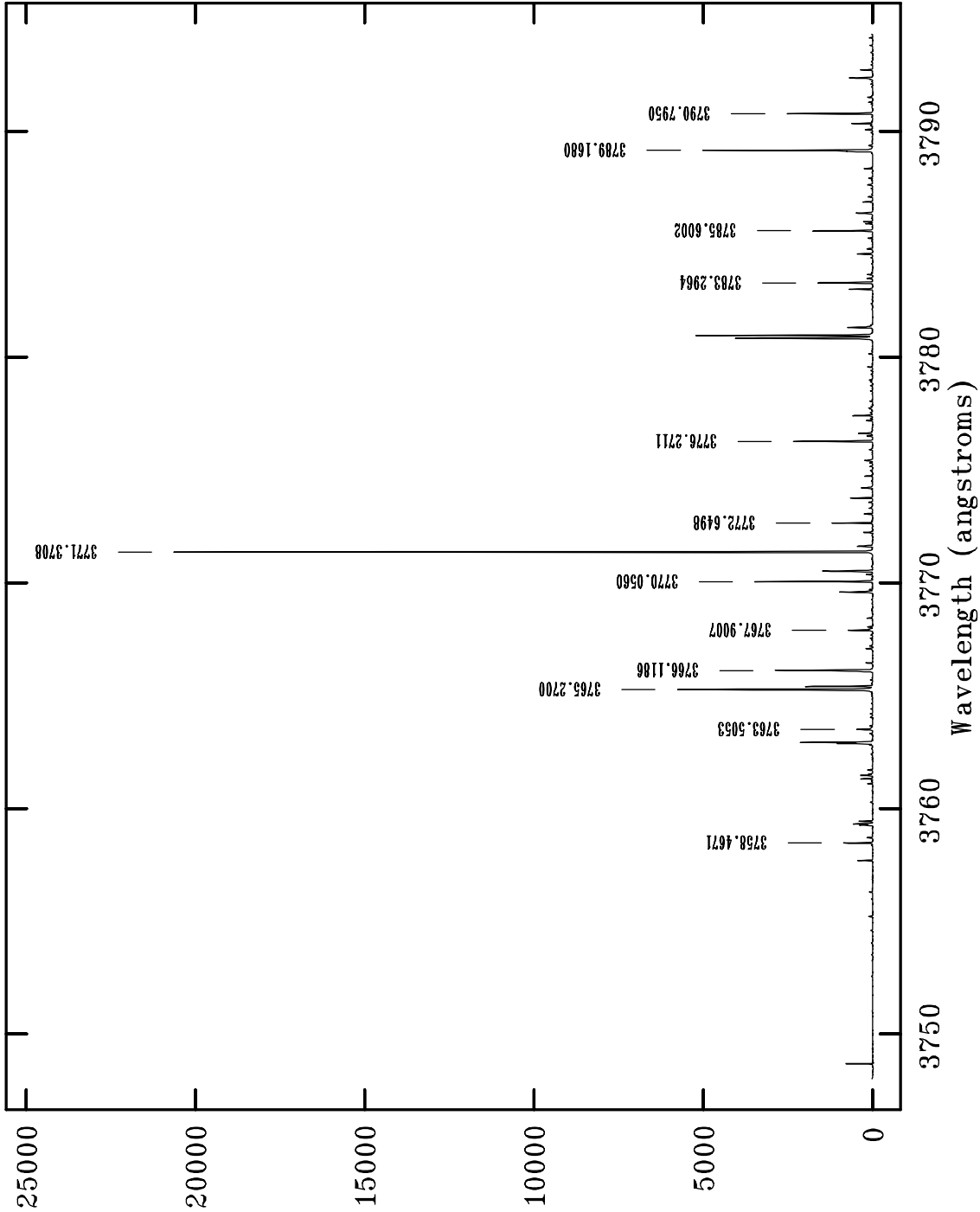


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Aperture 20, Image line 20, Order 160
ec1456: COMPARISON

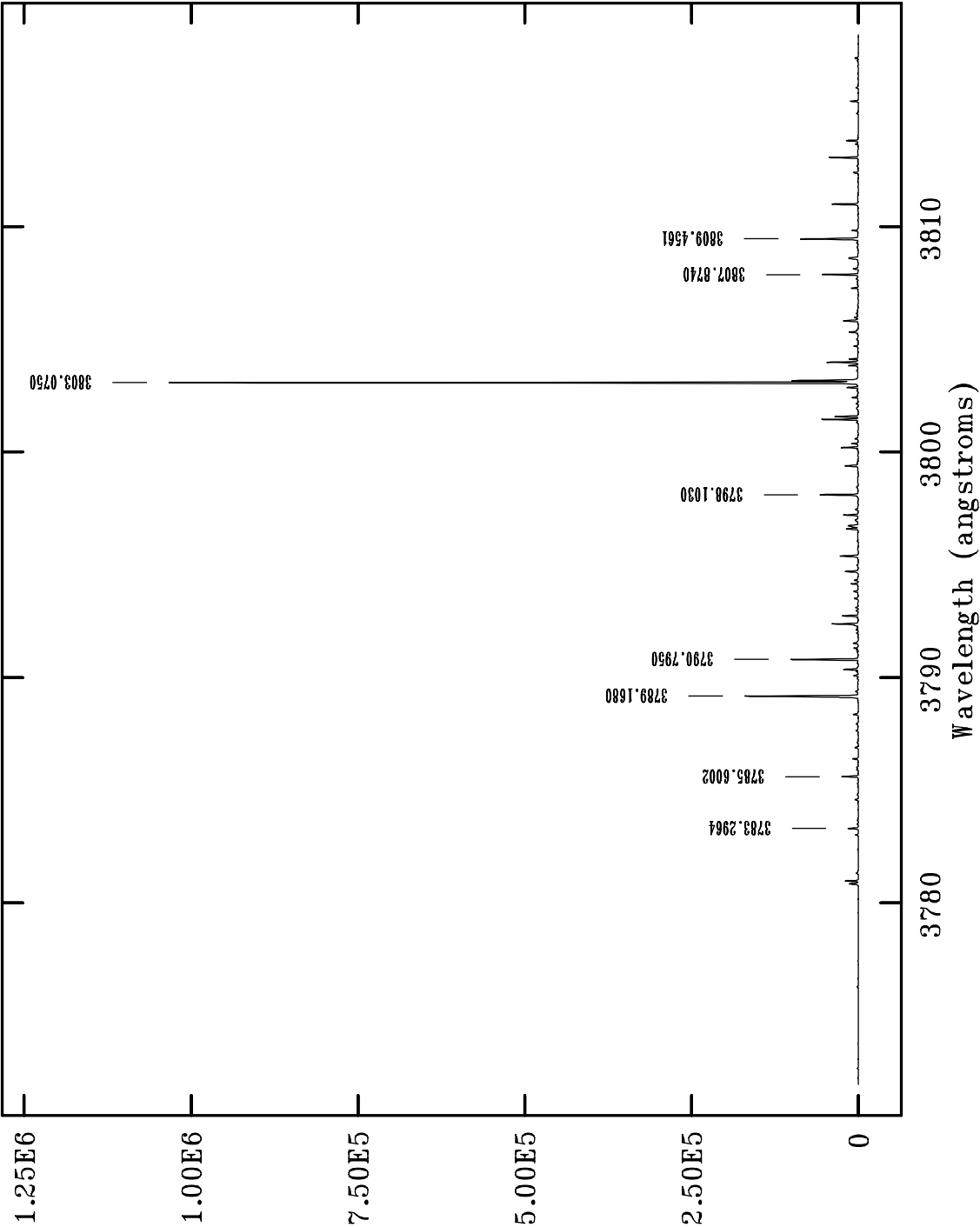


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Aperture 19, Image line 19, Order 159
ec1456: COMPARISON

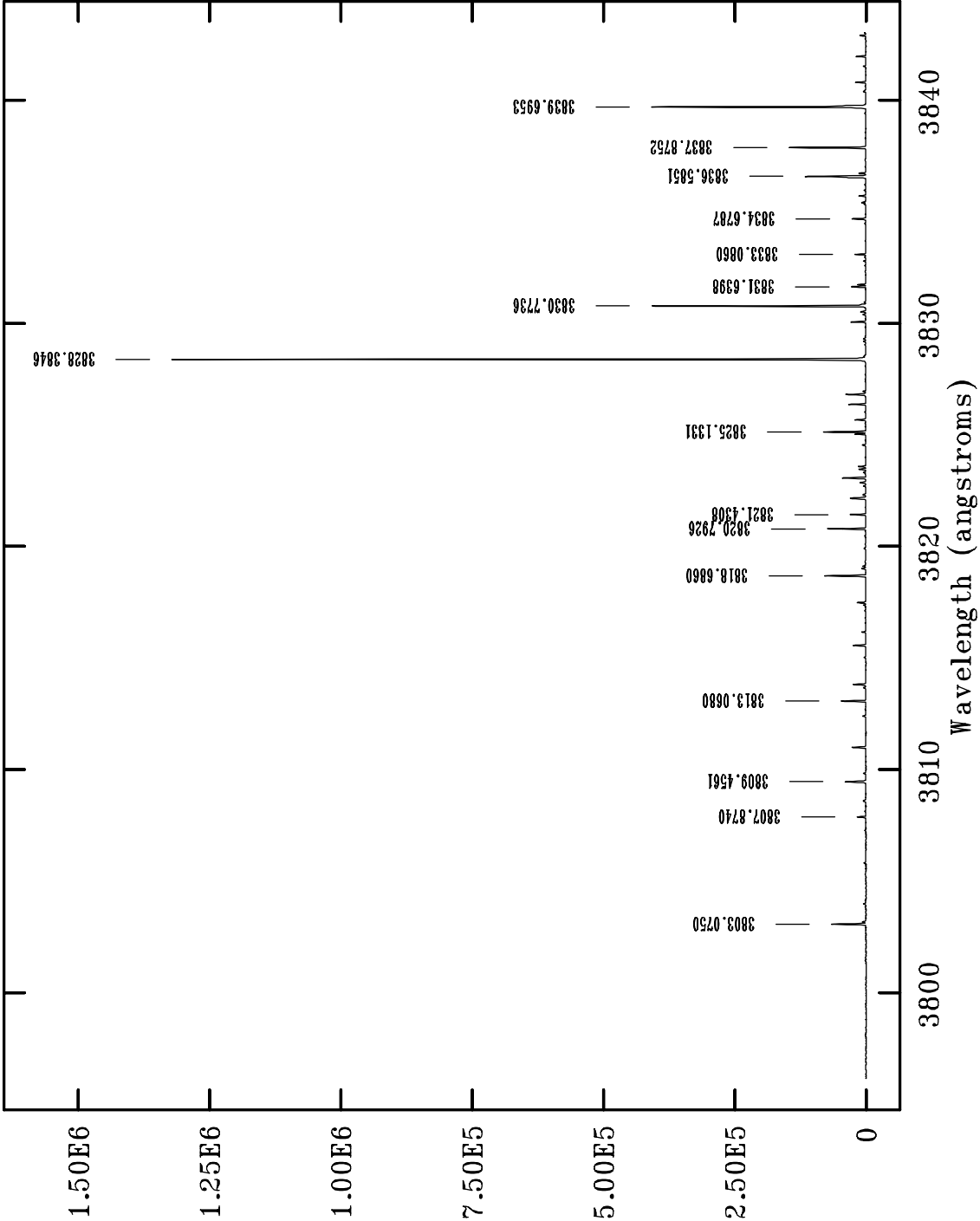




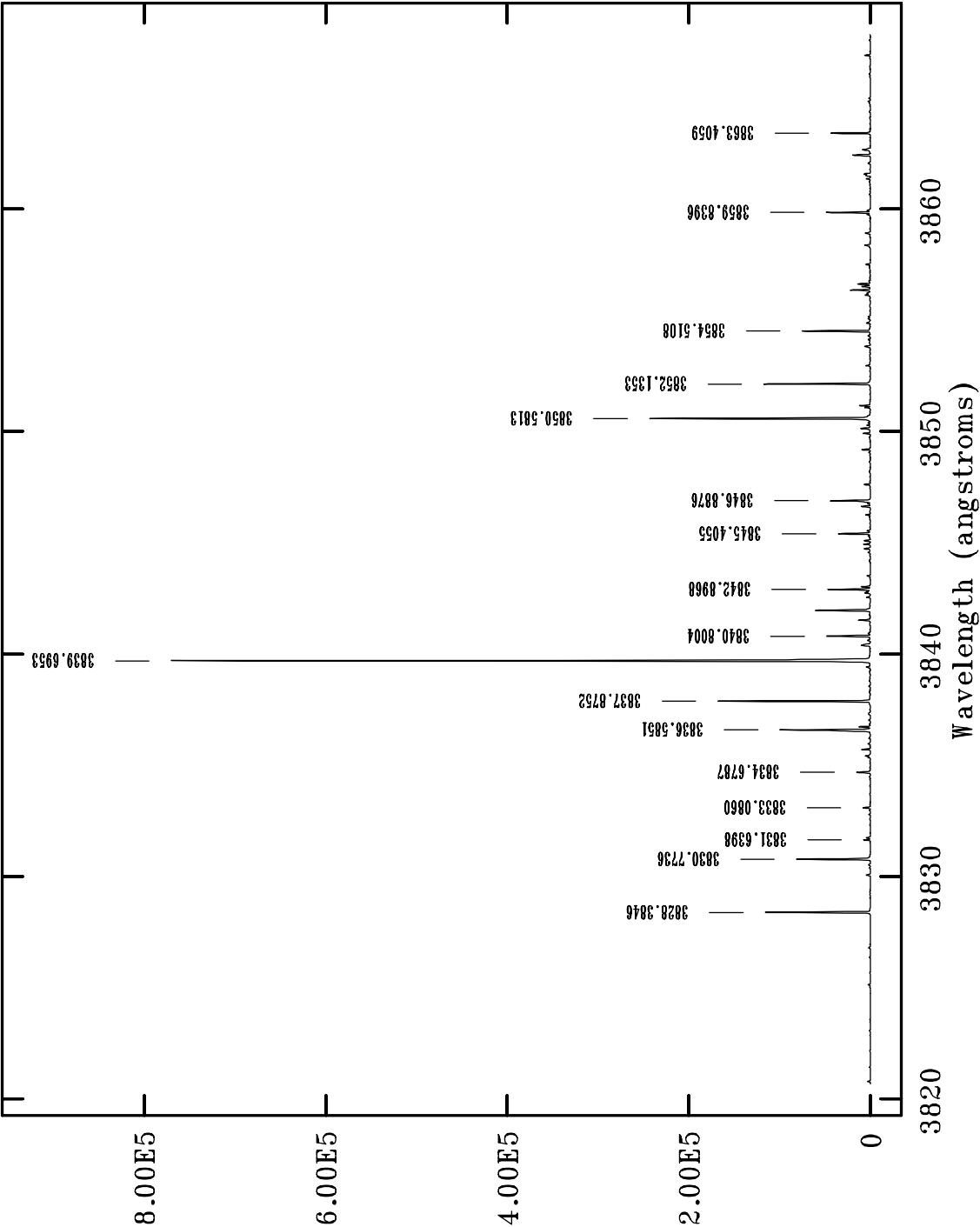
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ecidentify ec1456: COMPARISON



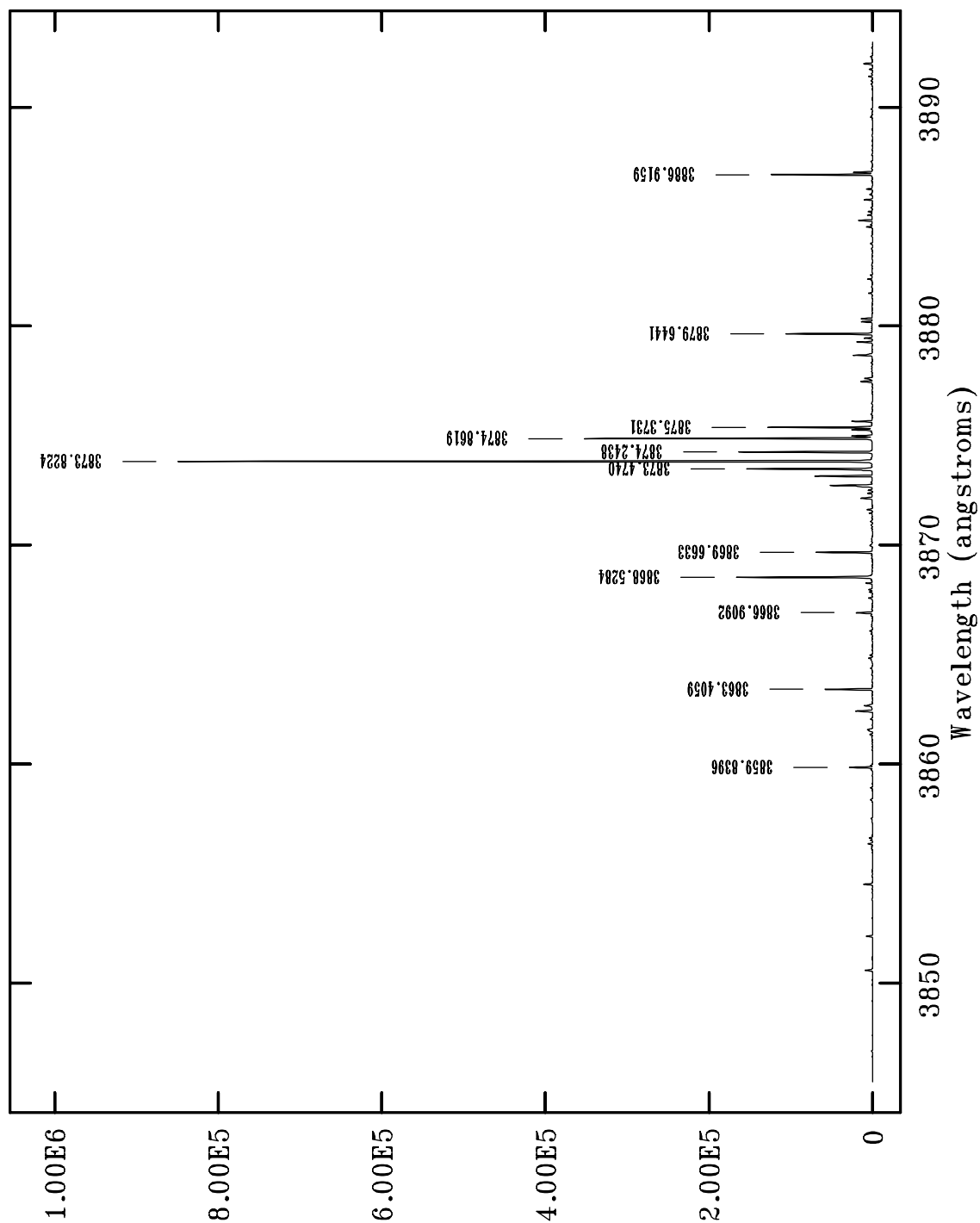
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Aperture 16, Image line 16, Order 156
ec1456: COMPARISON



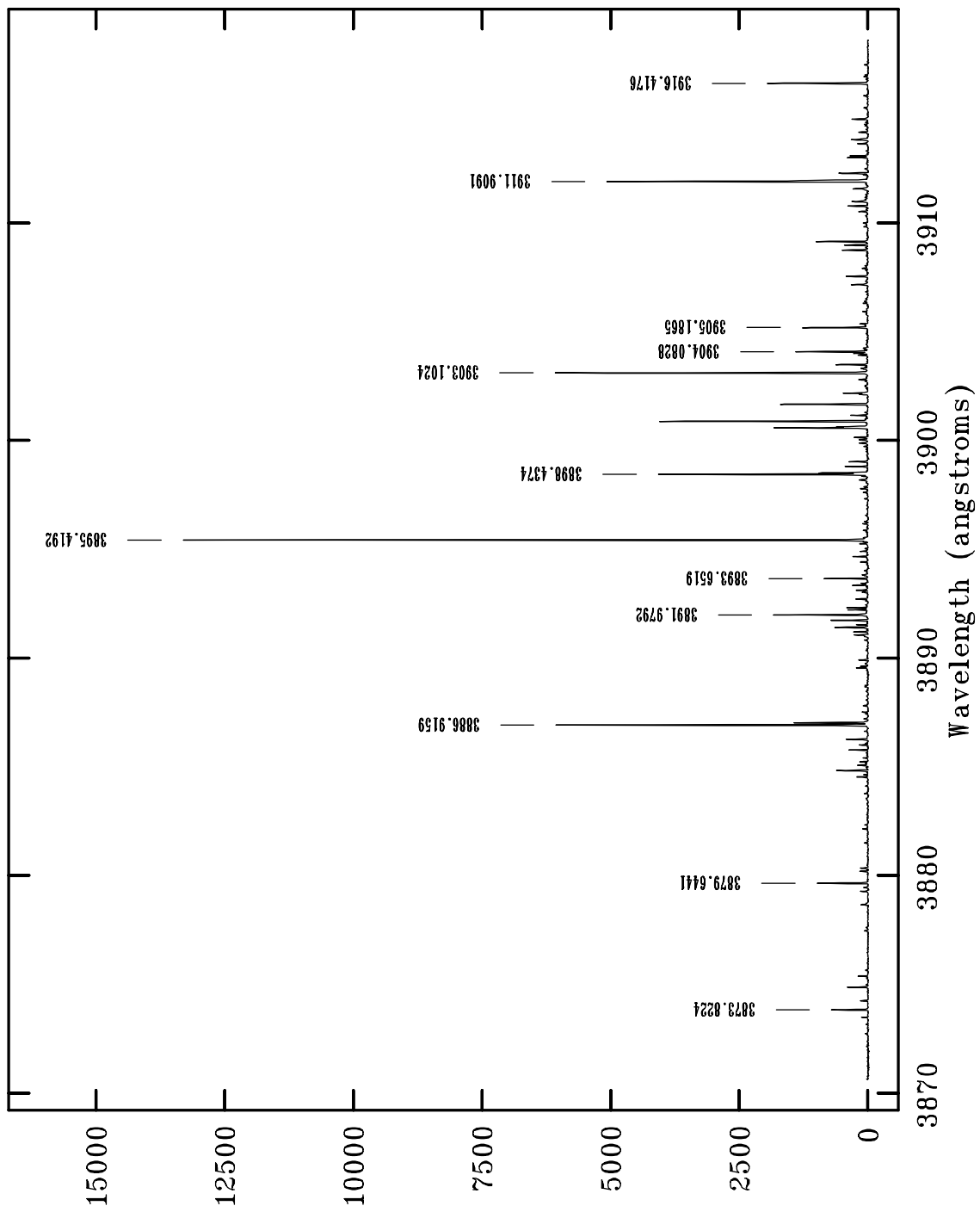
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ec1456: COMPARISON



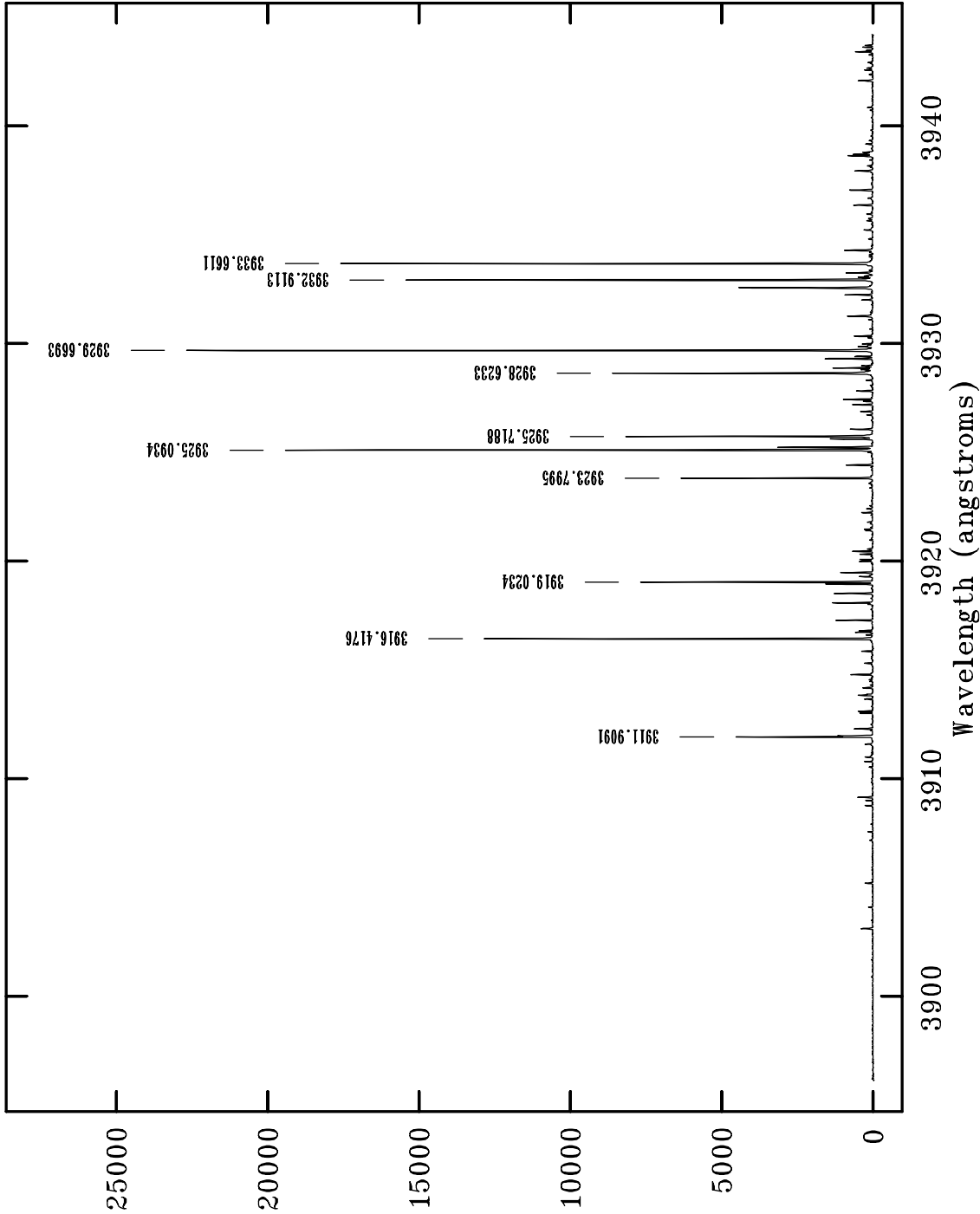
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ec1456: COMPARISON



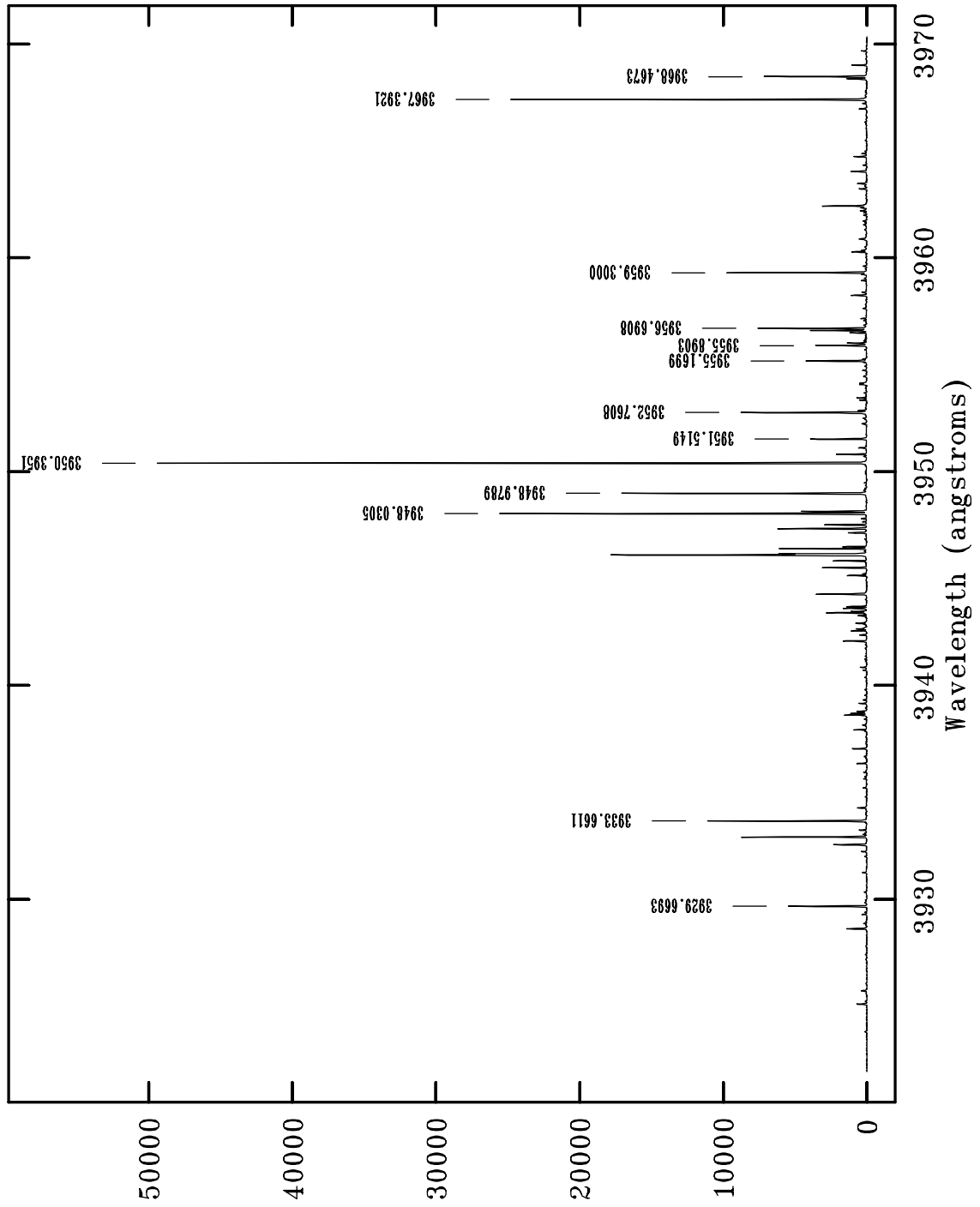
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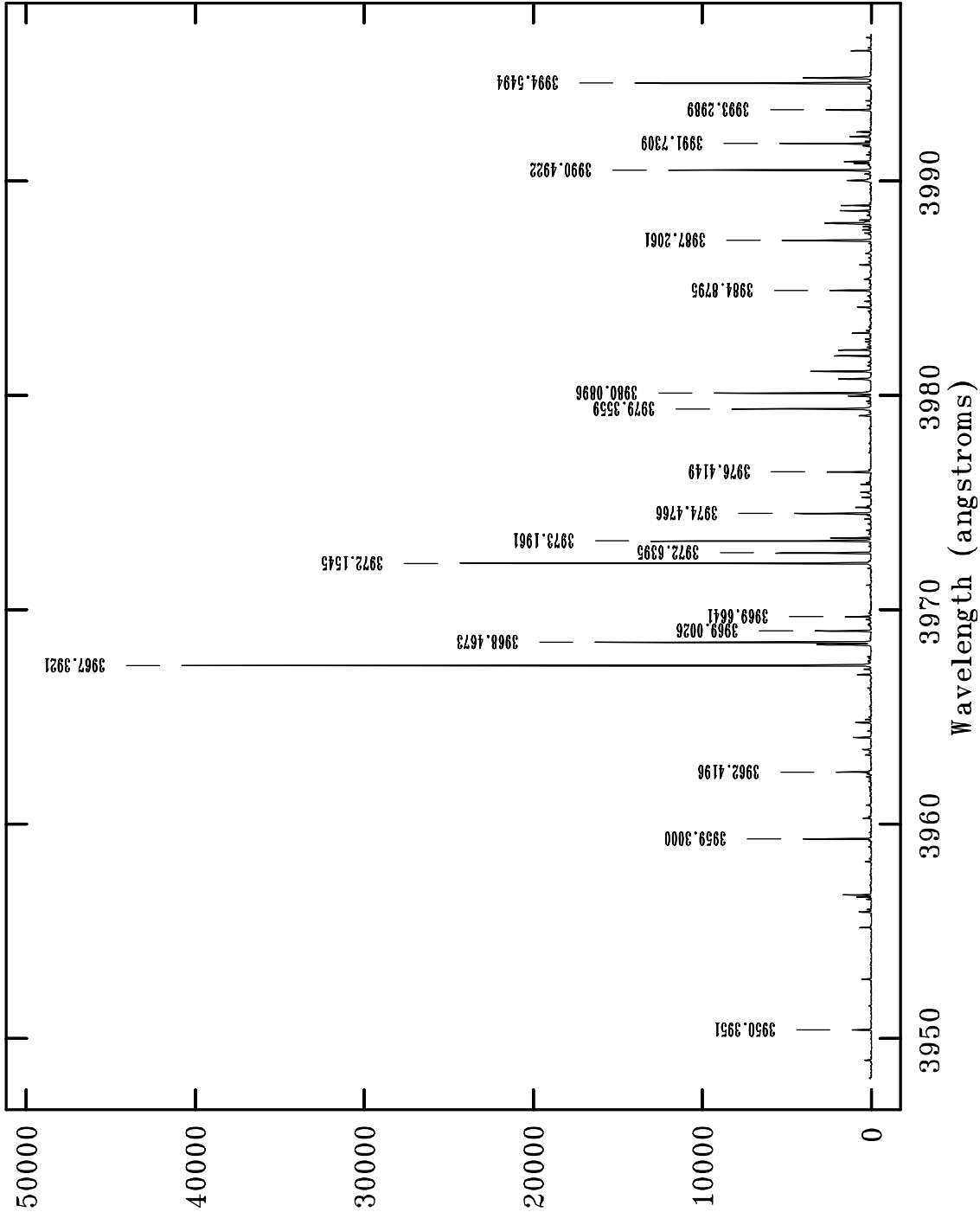


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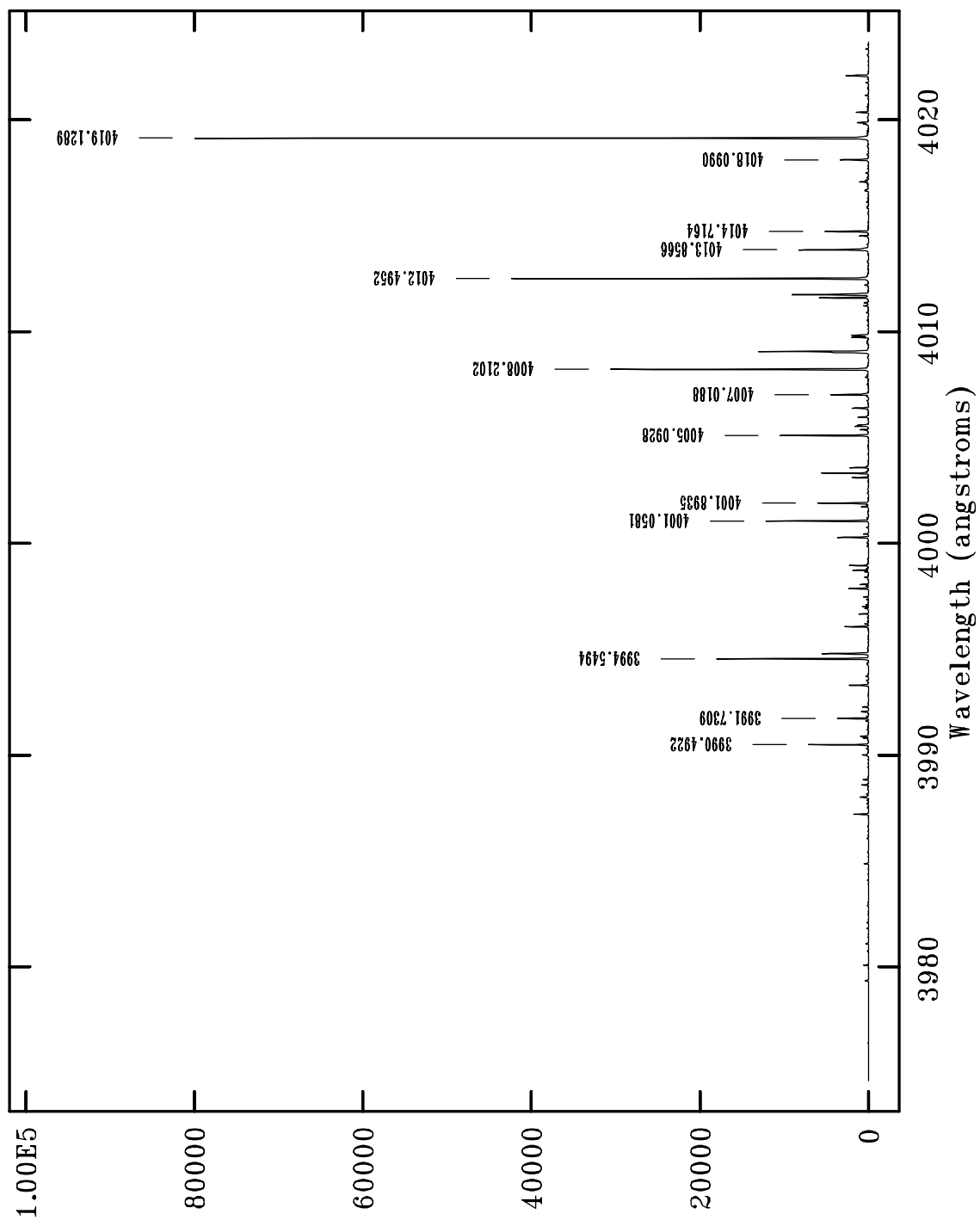


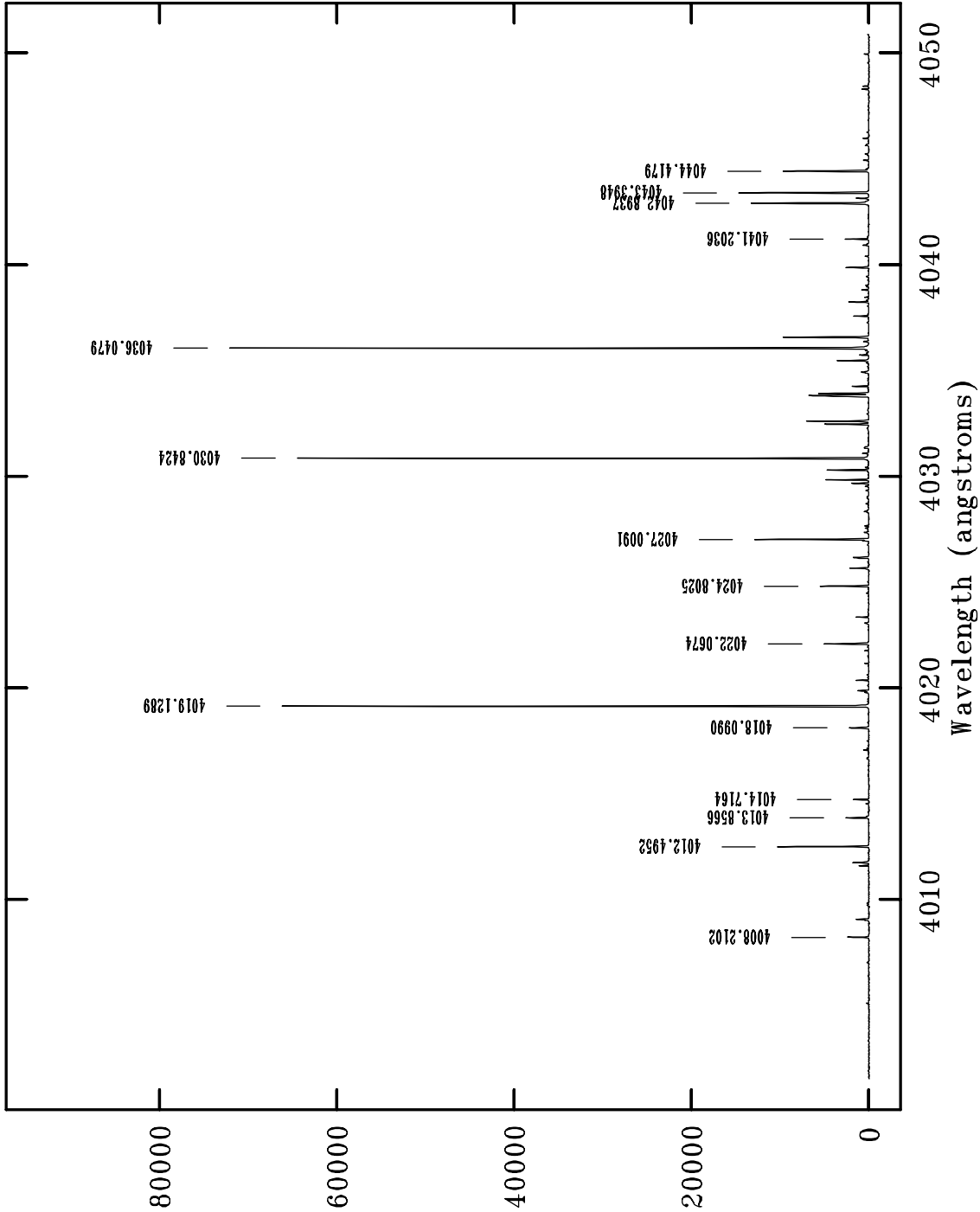
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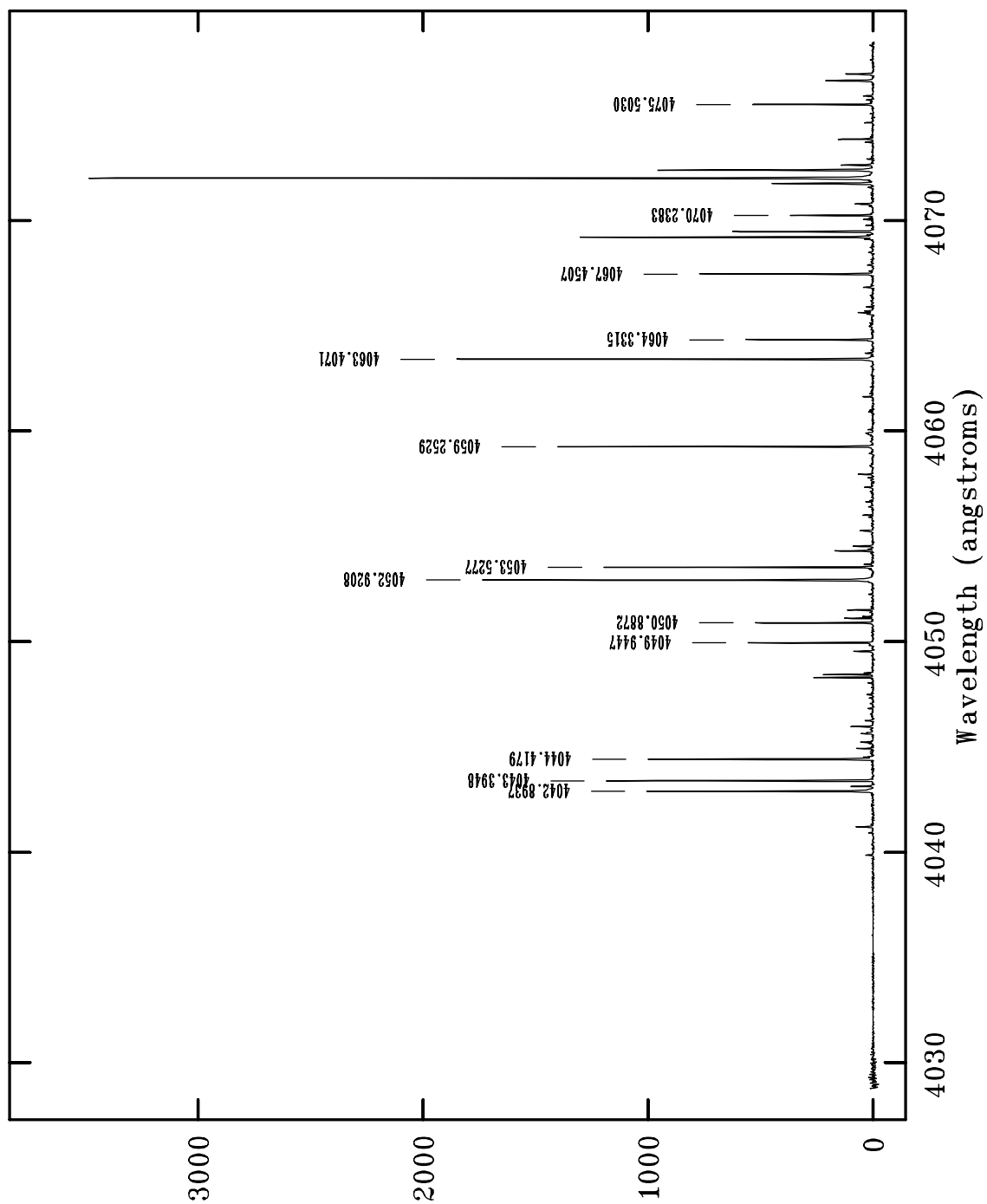


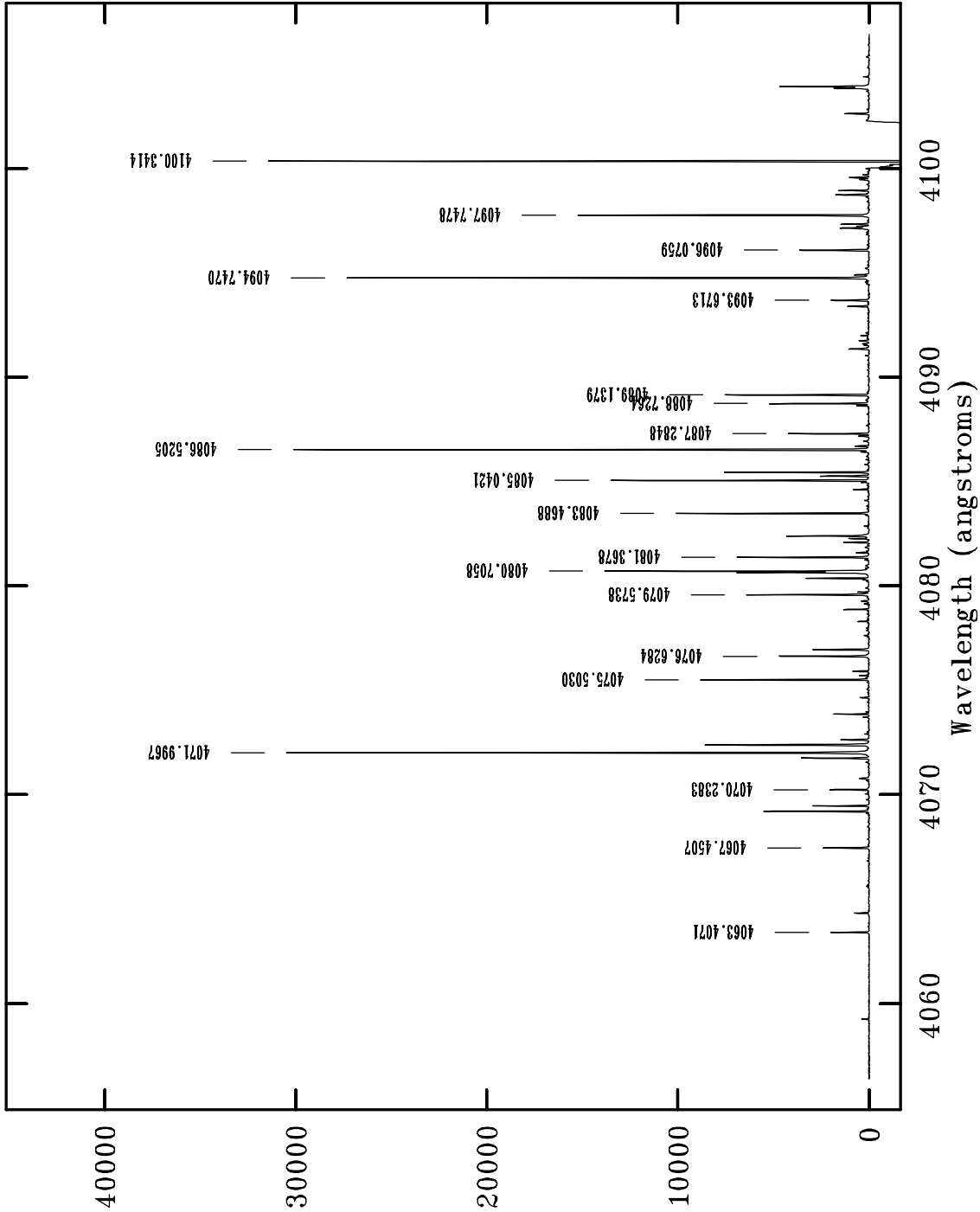
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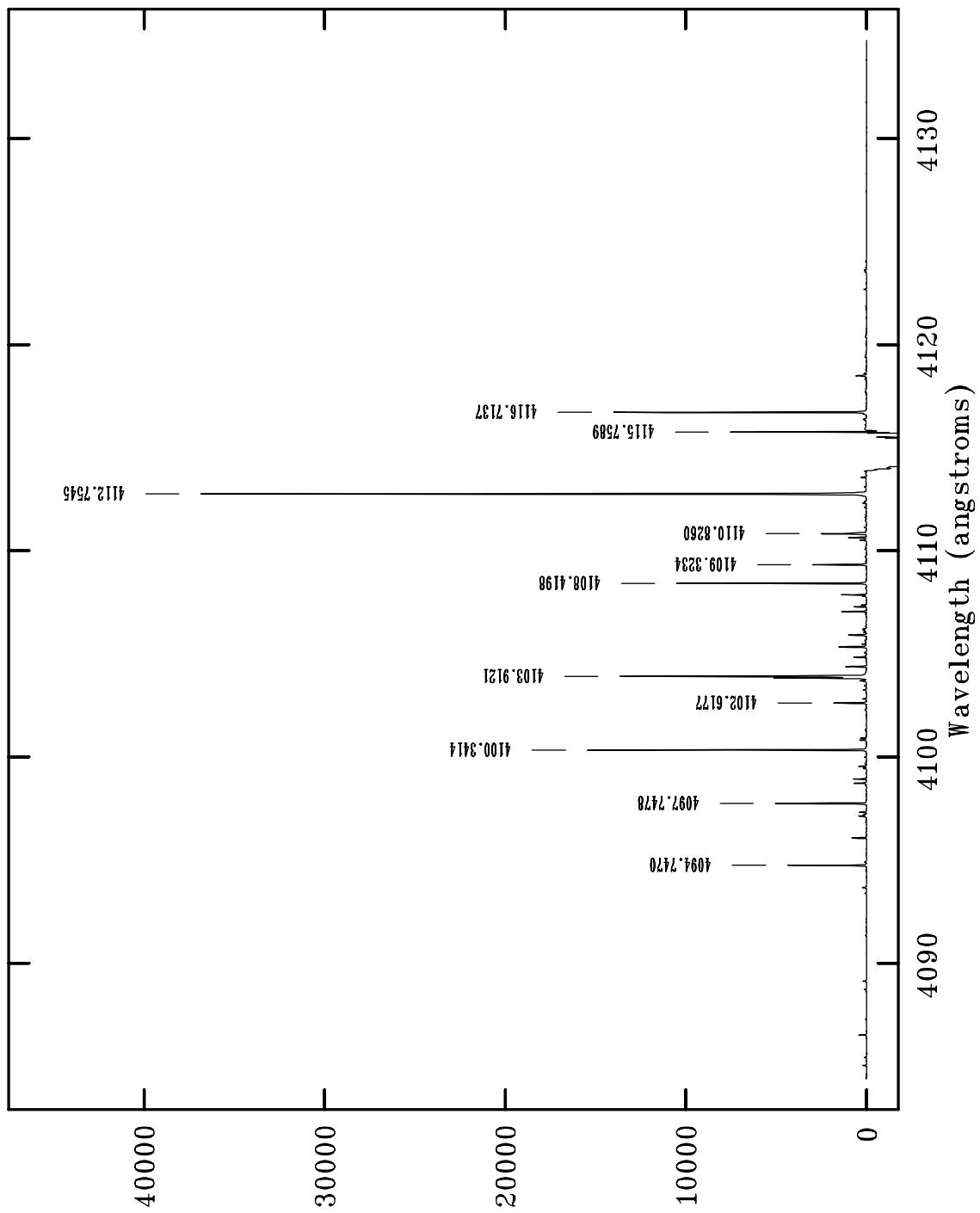


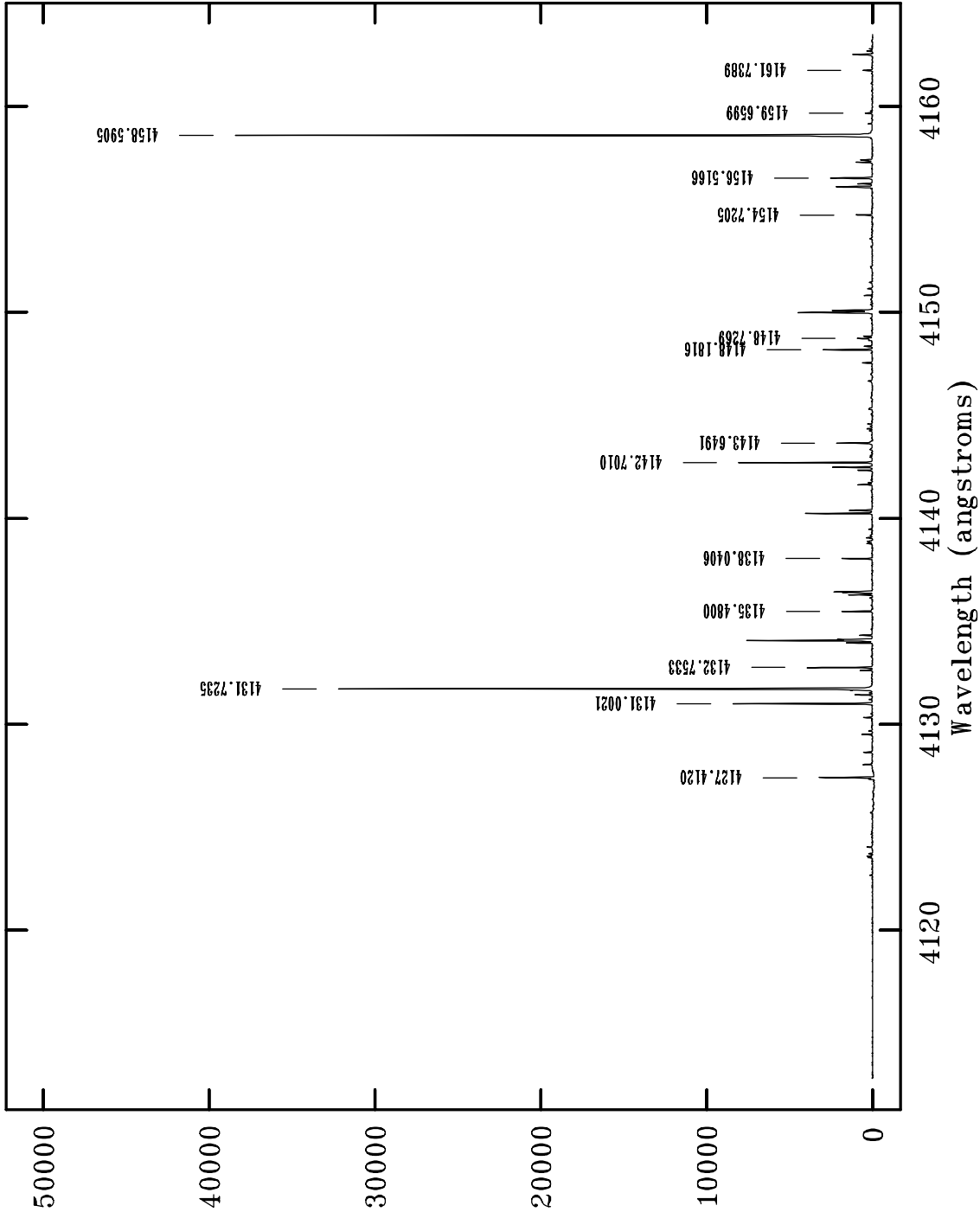
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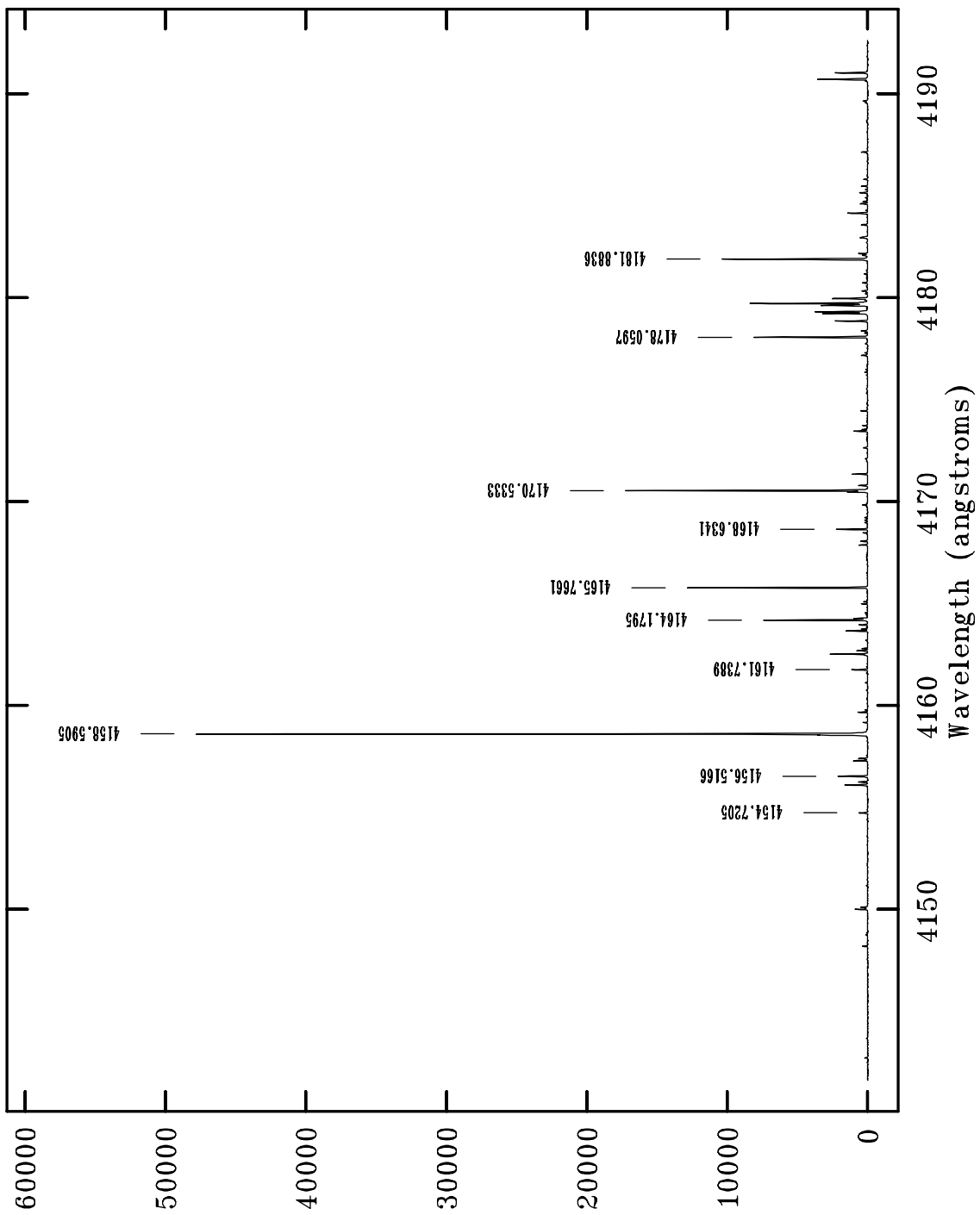


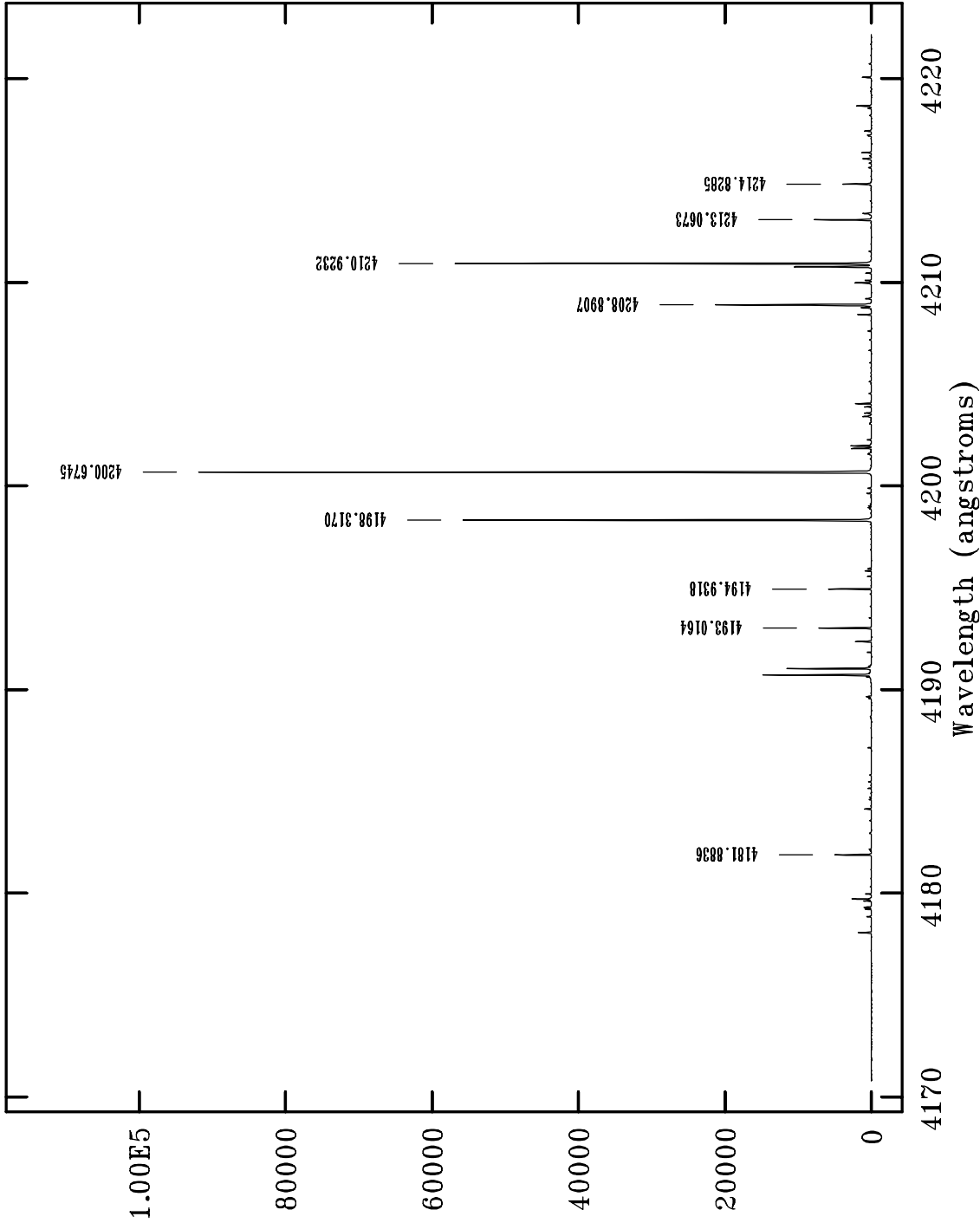
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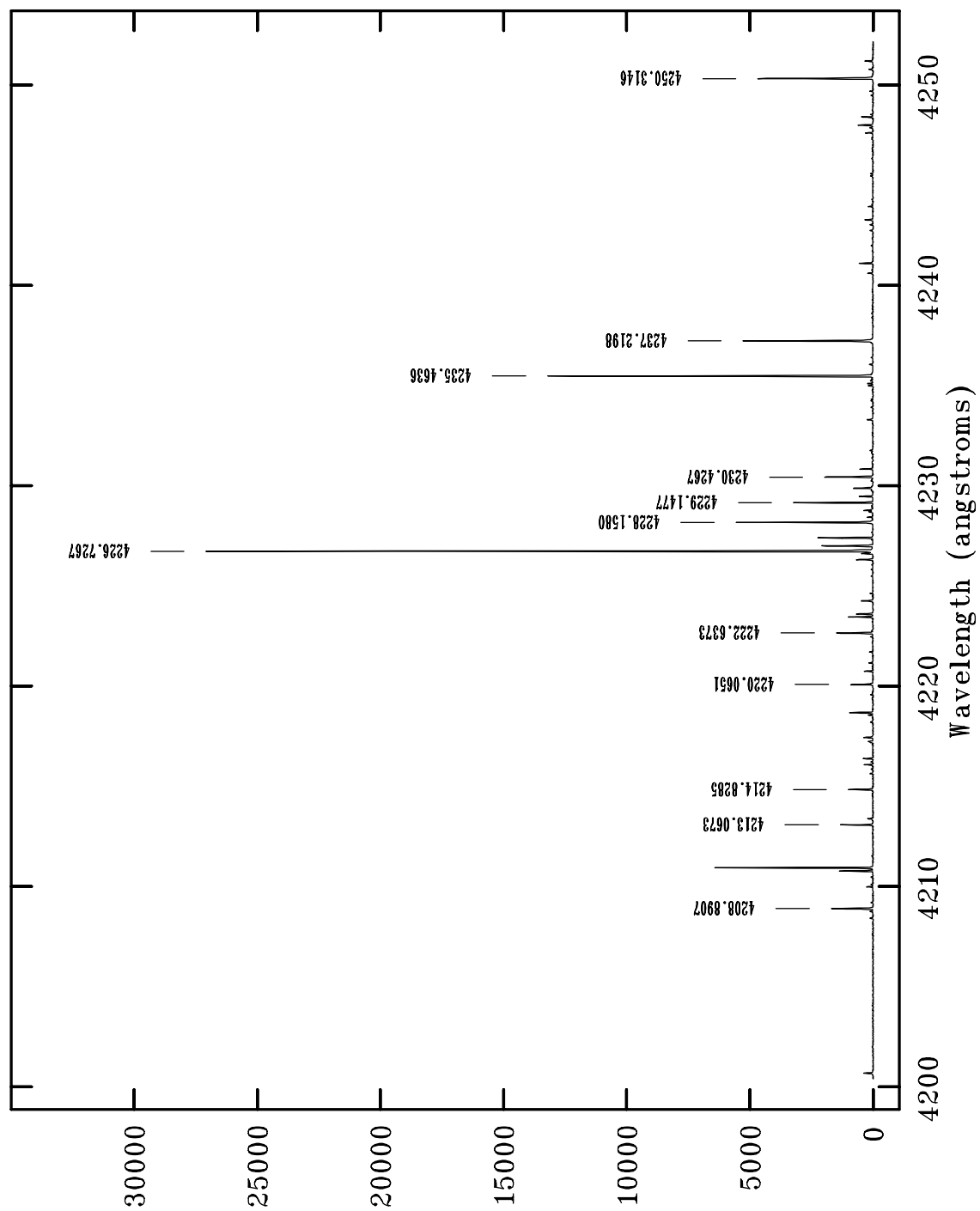


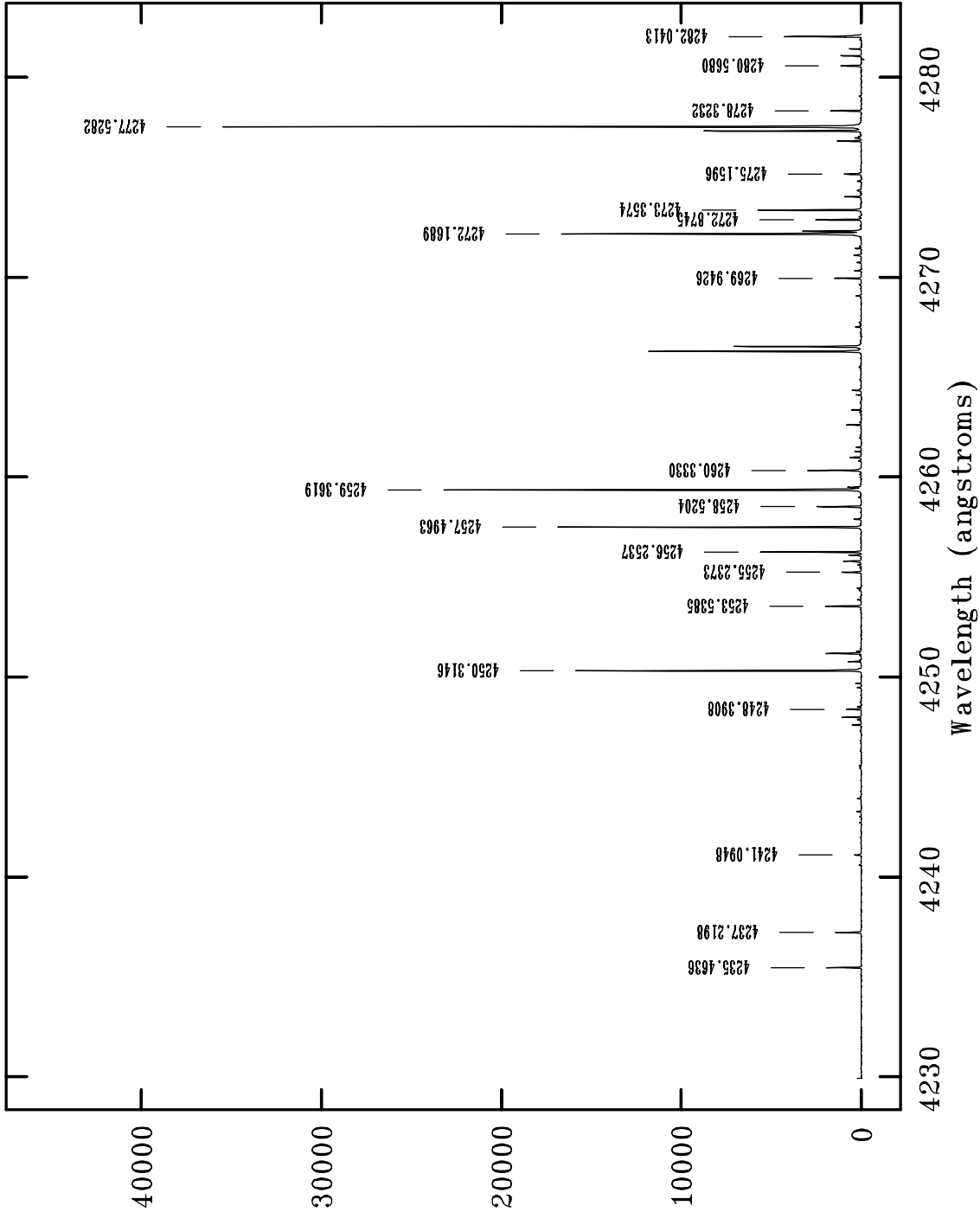
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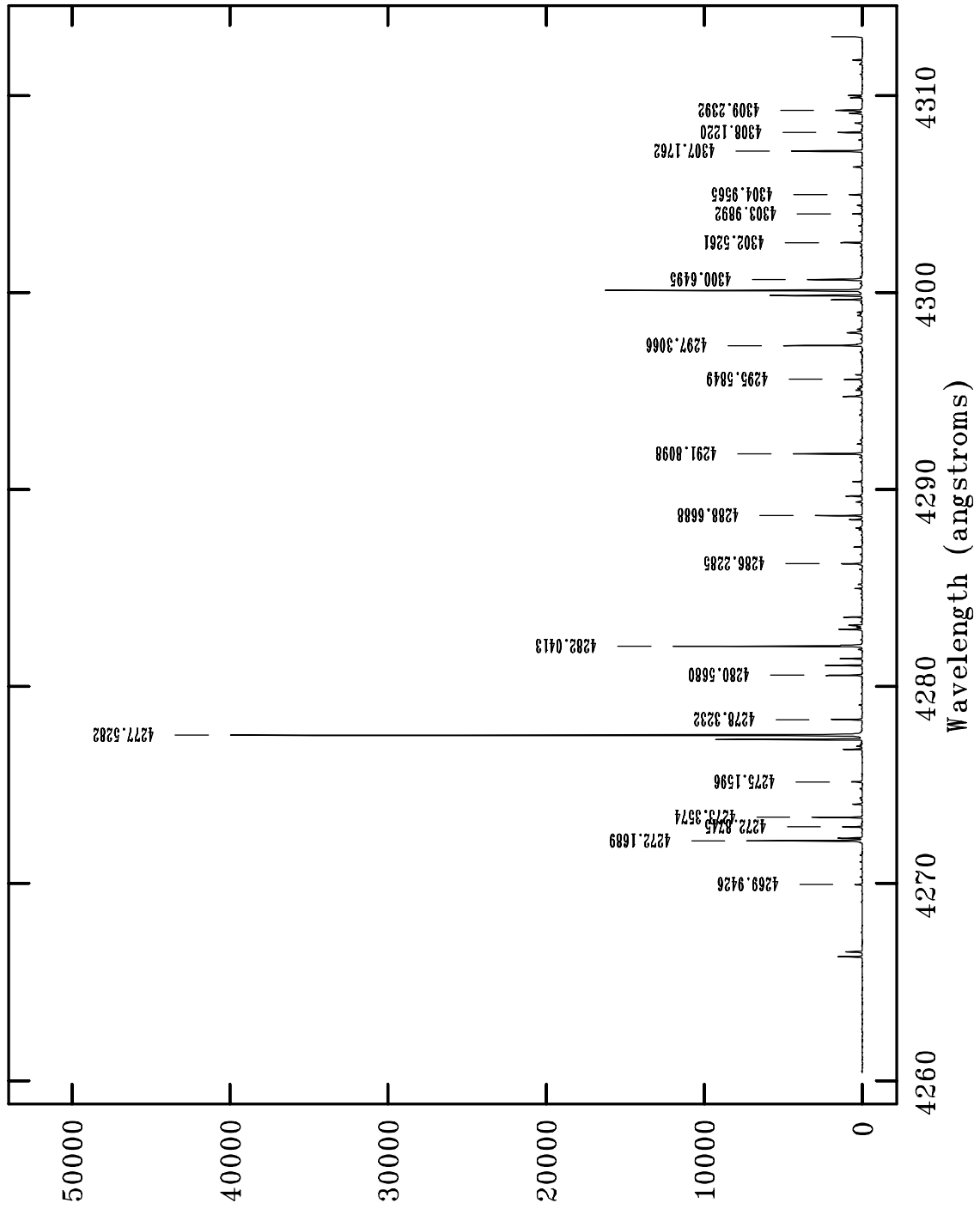


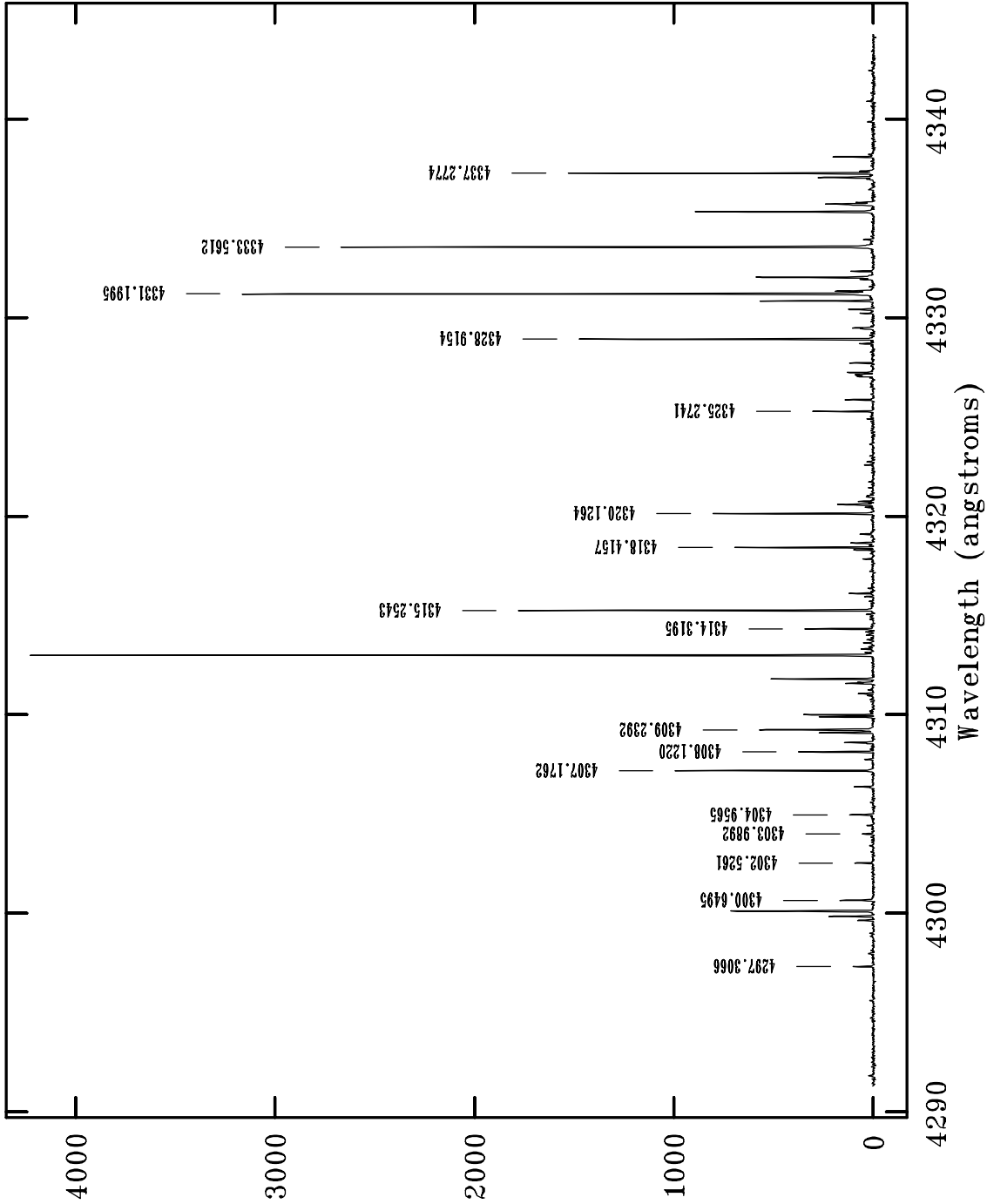
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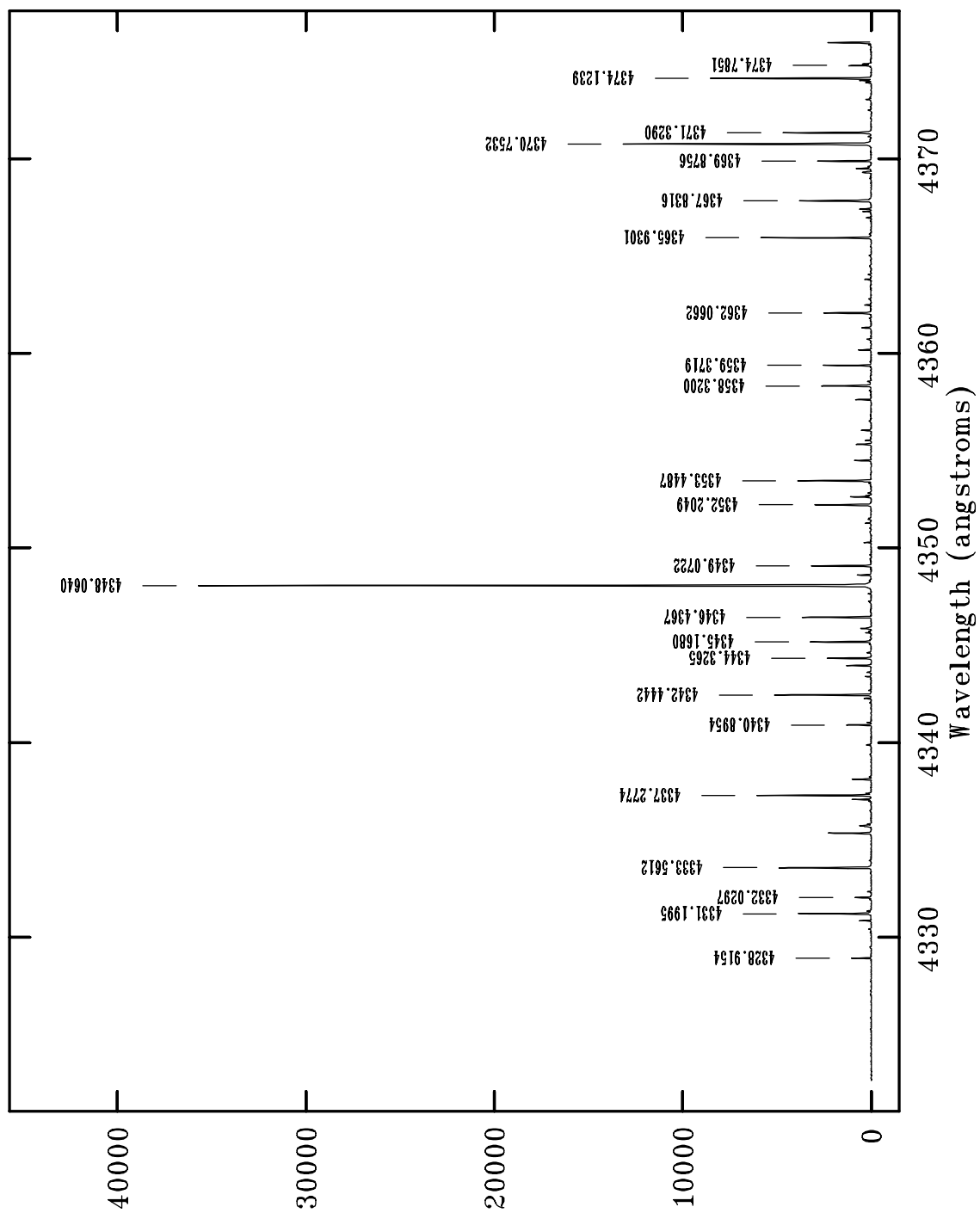


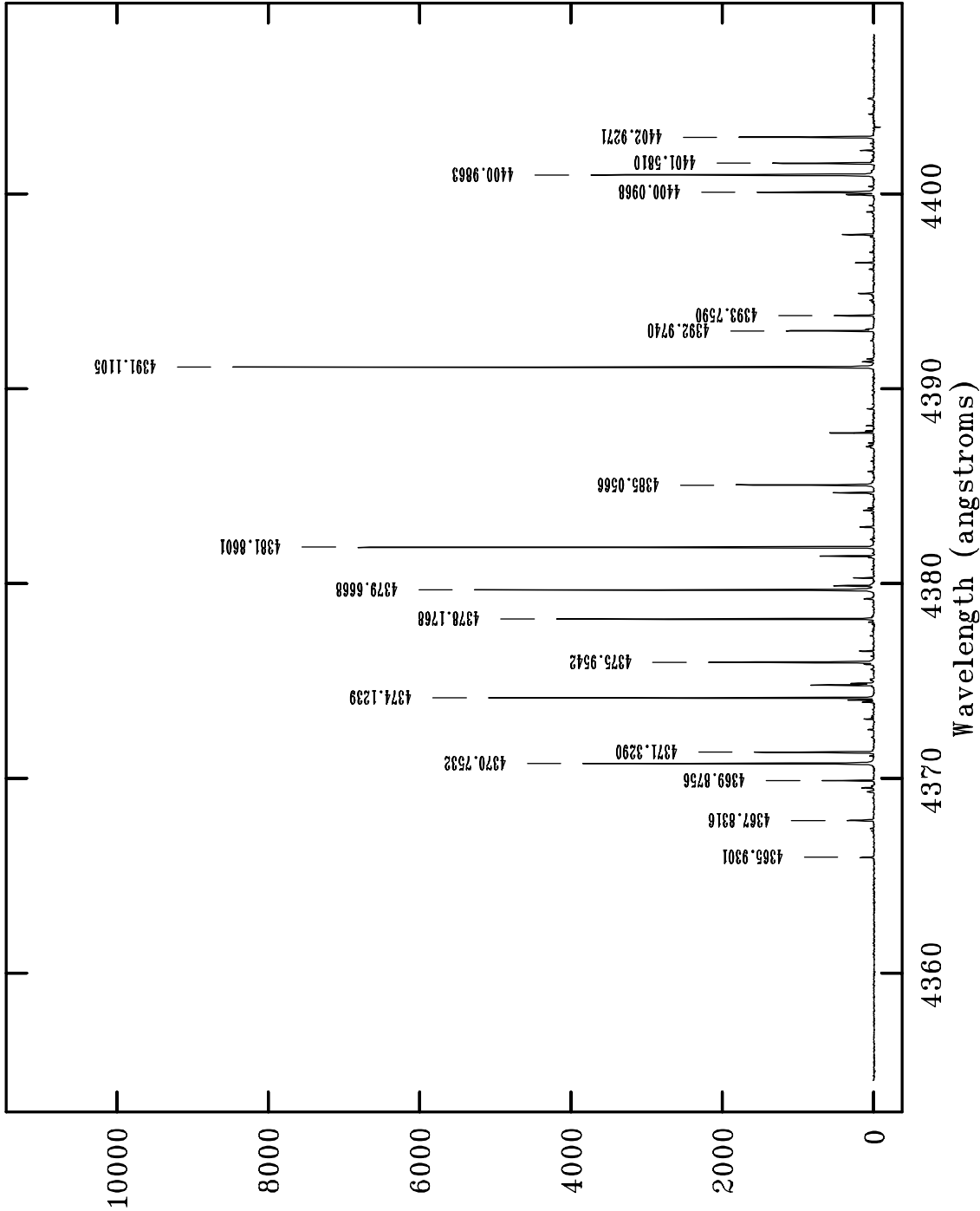
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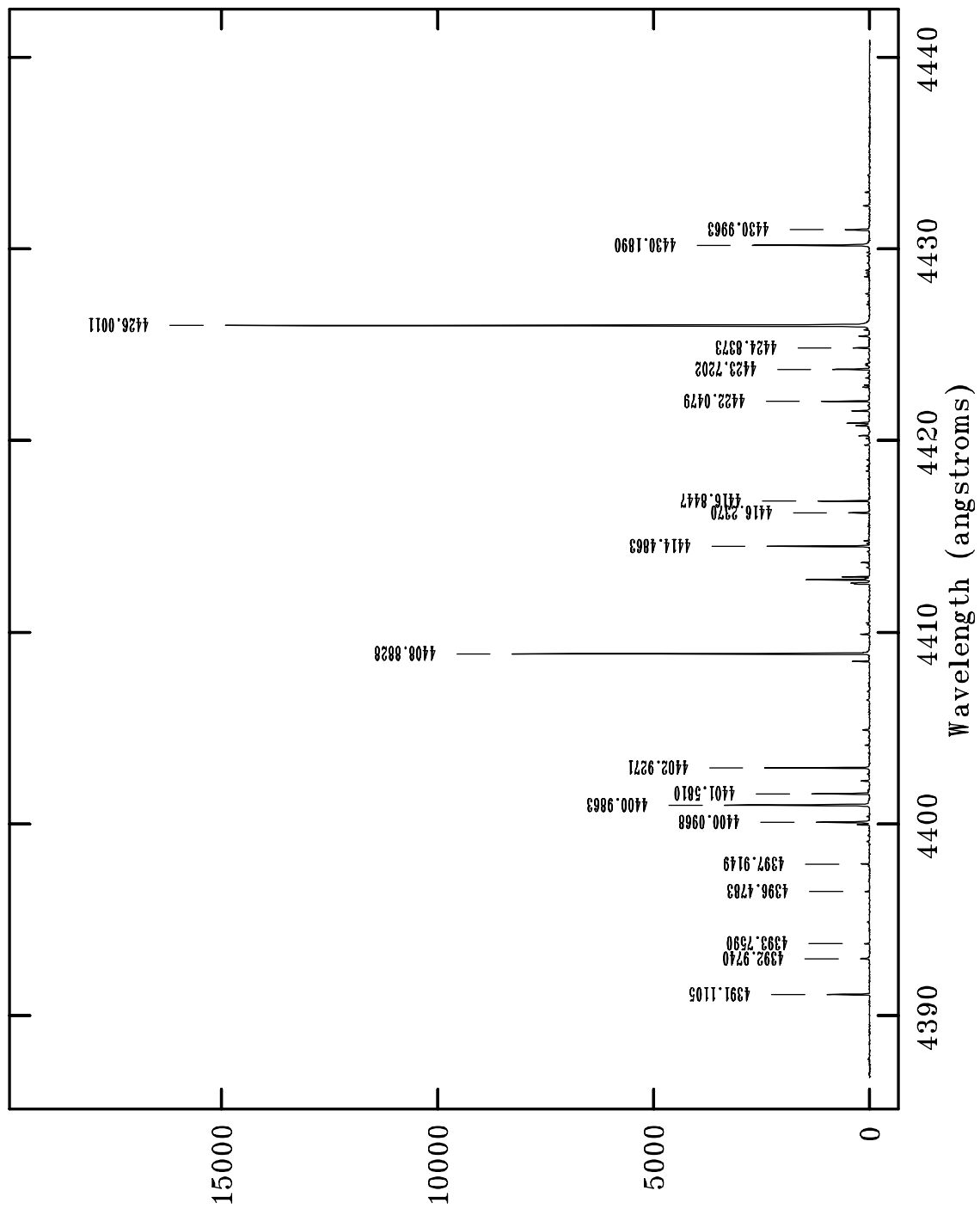


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identify 080: UNKNOWN

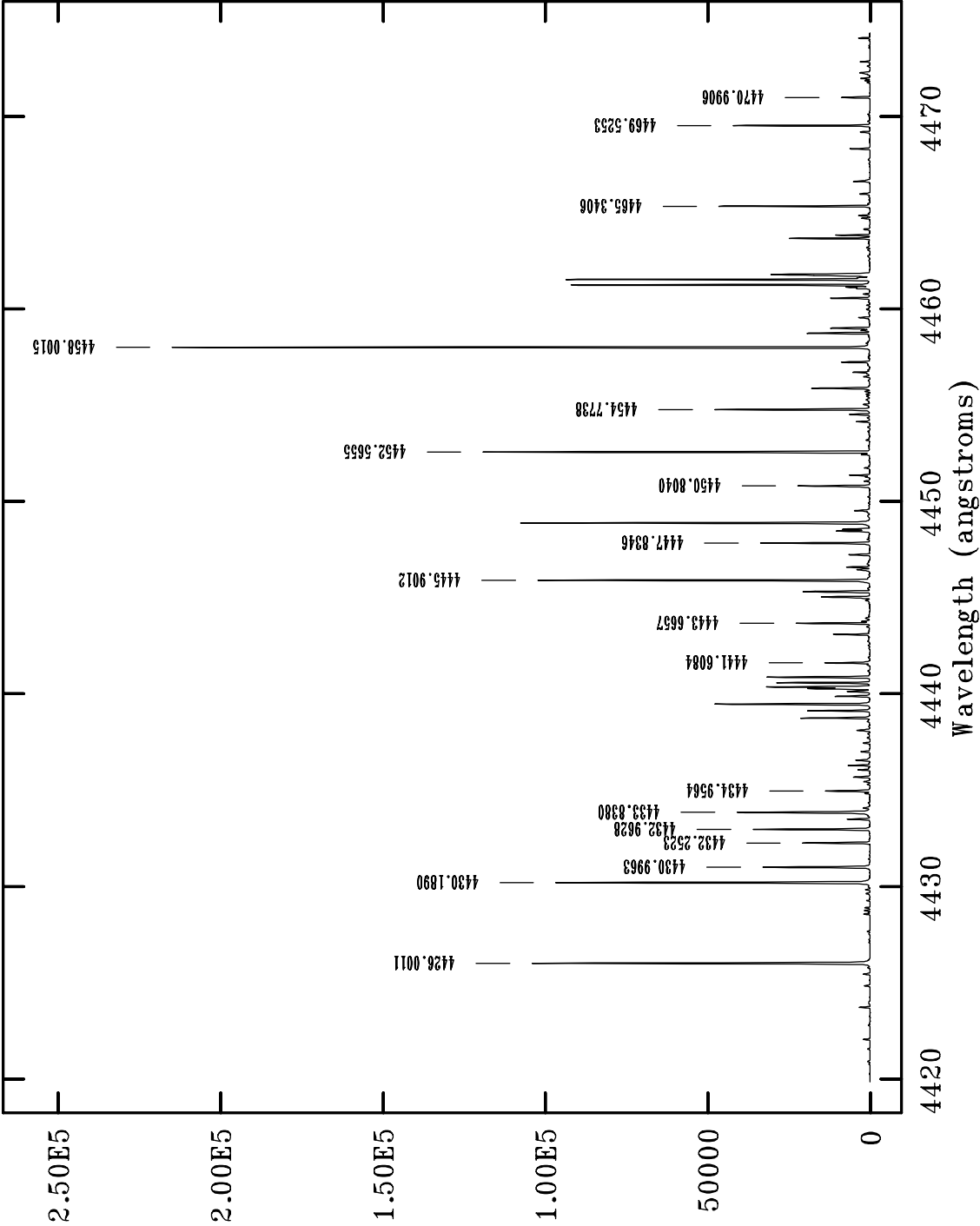




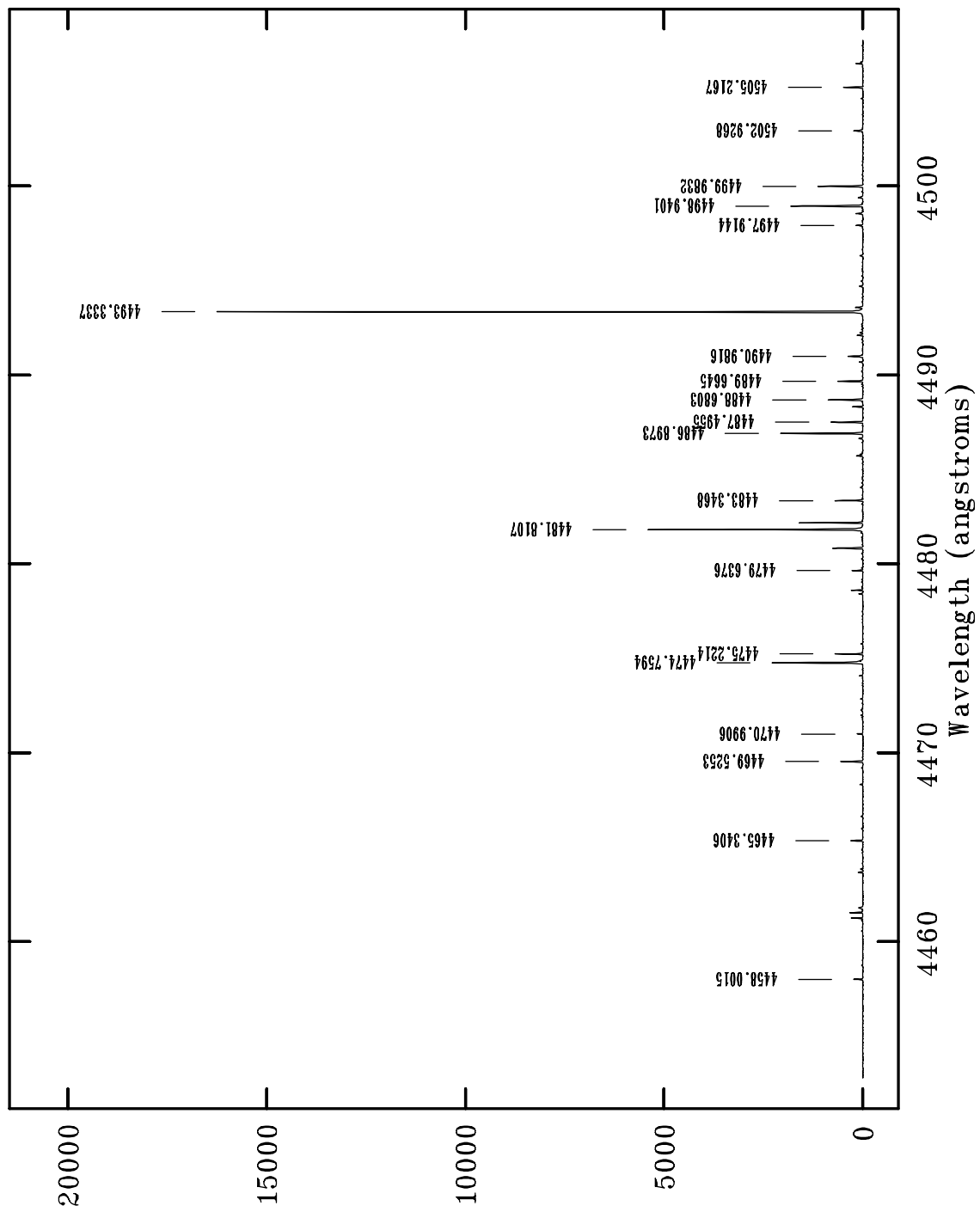
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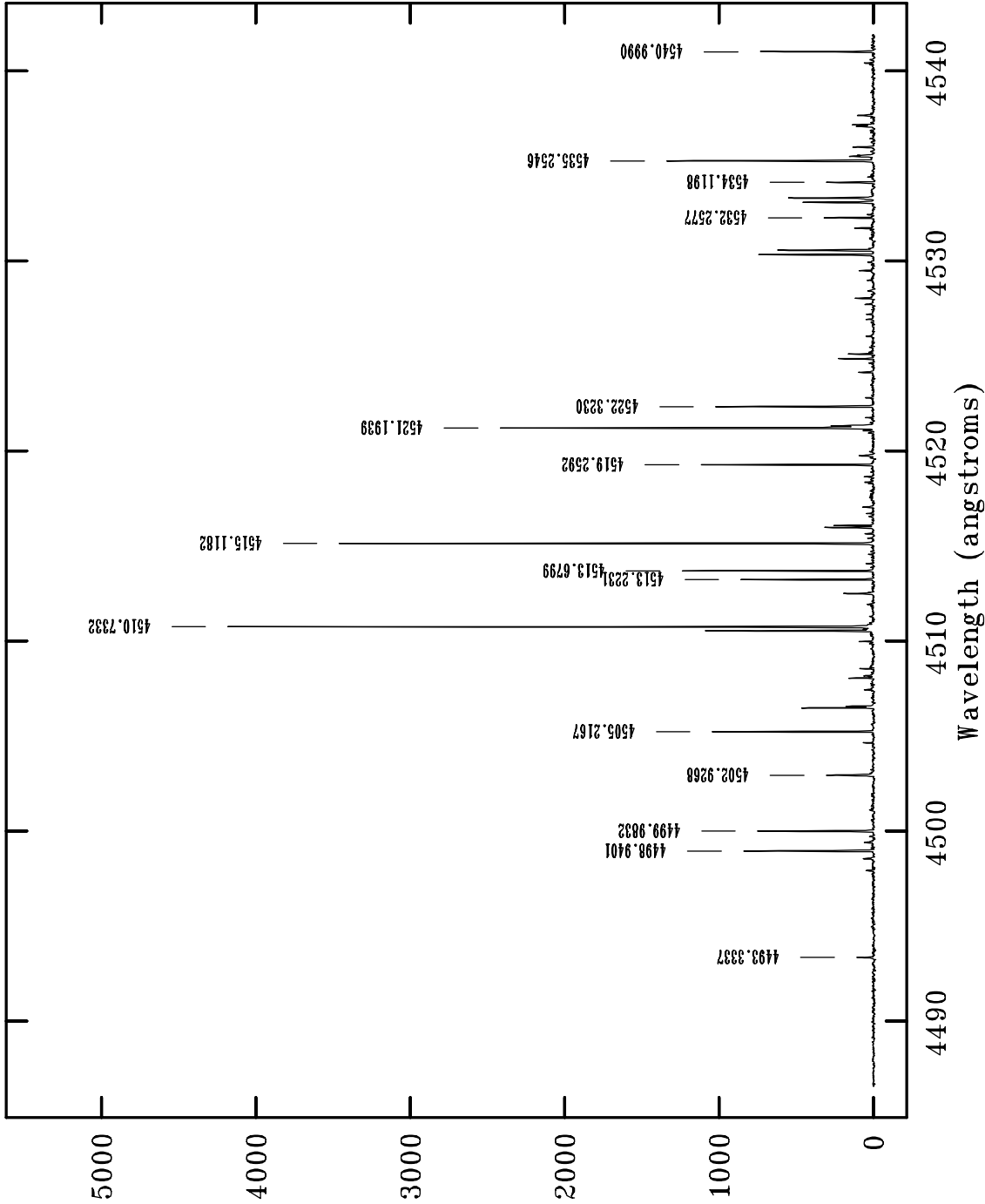


NOAO/IRAF V2.11EXPORT honda@data Wed 16:56:38 13-Dec-2000
Aperture 18, Image line 18, Order 134
ec1455: COMPARISON

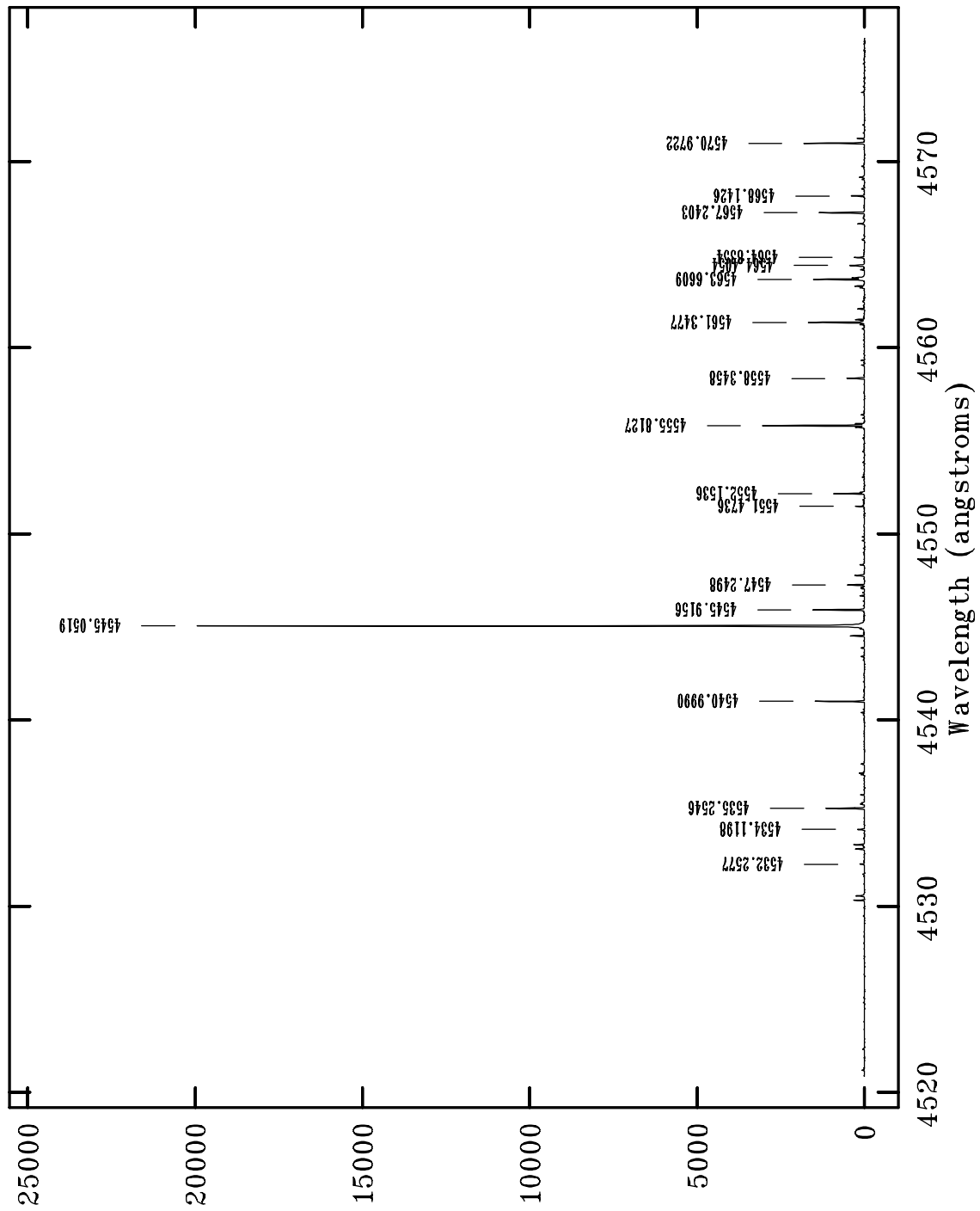


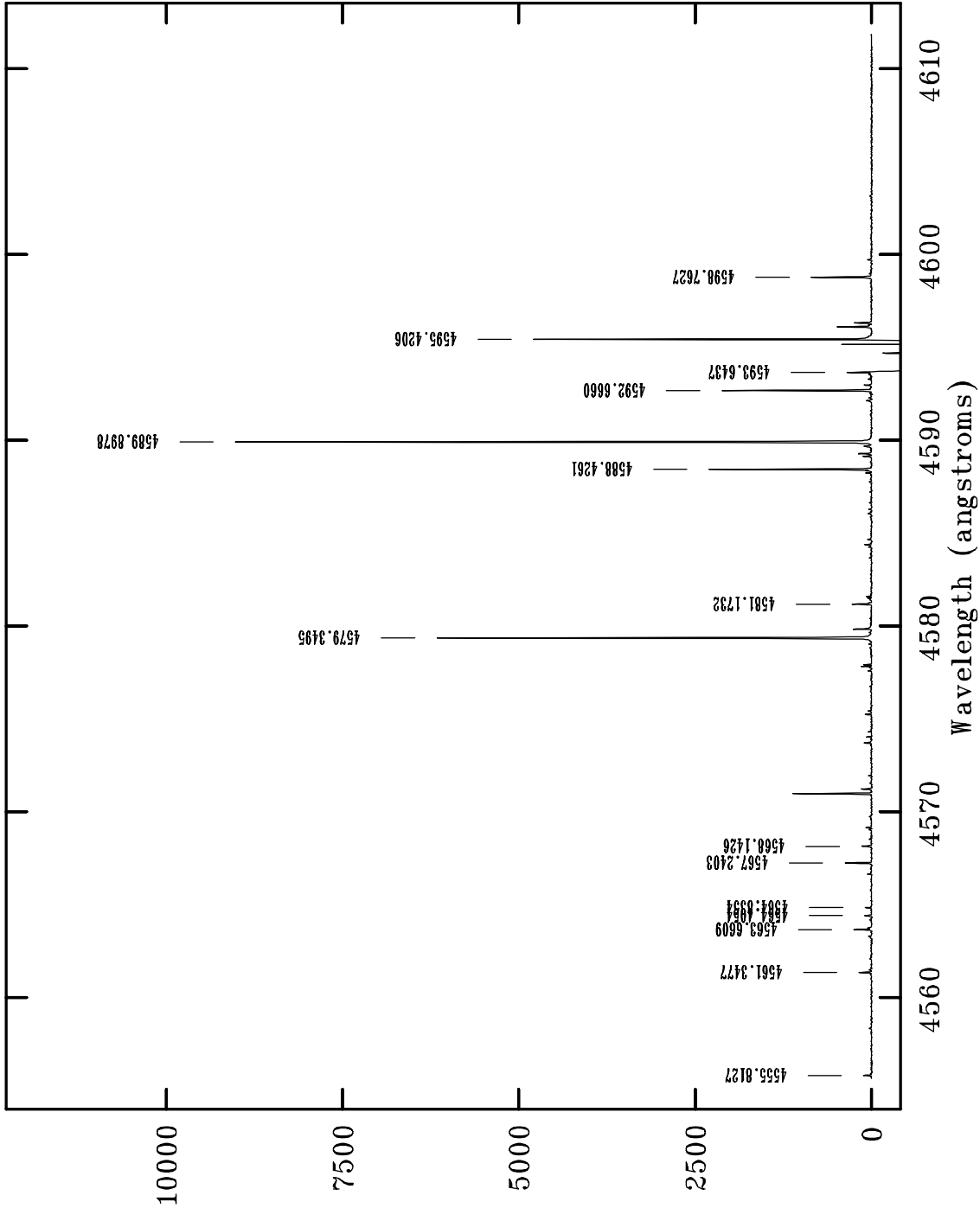
NOAO/IRAF V2.11.3EXPORT honda@hds Mon 14:48:27 18-Sep-2000
Aperture 16, Image line 16, Order 132
identify 080: UNKNOWN



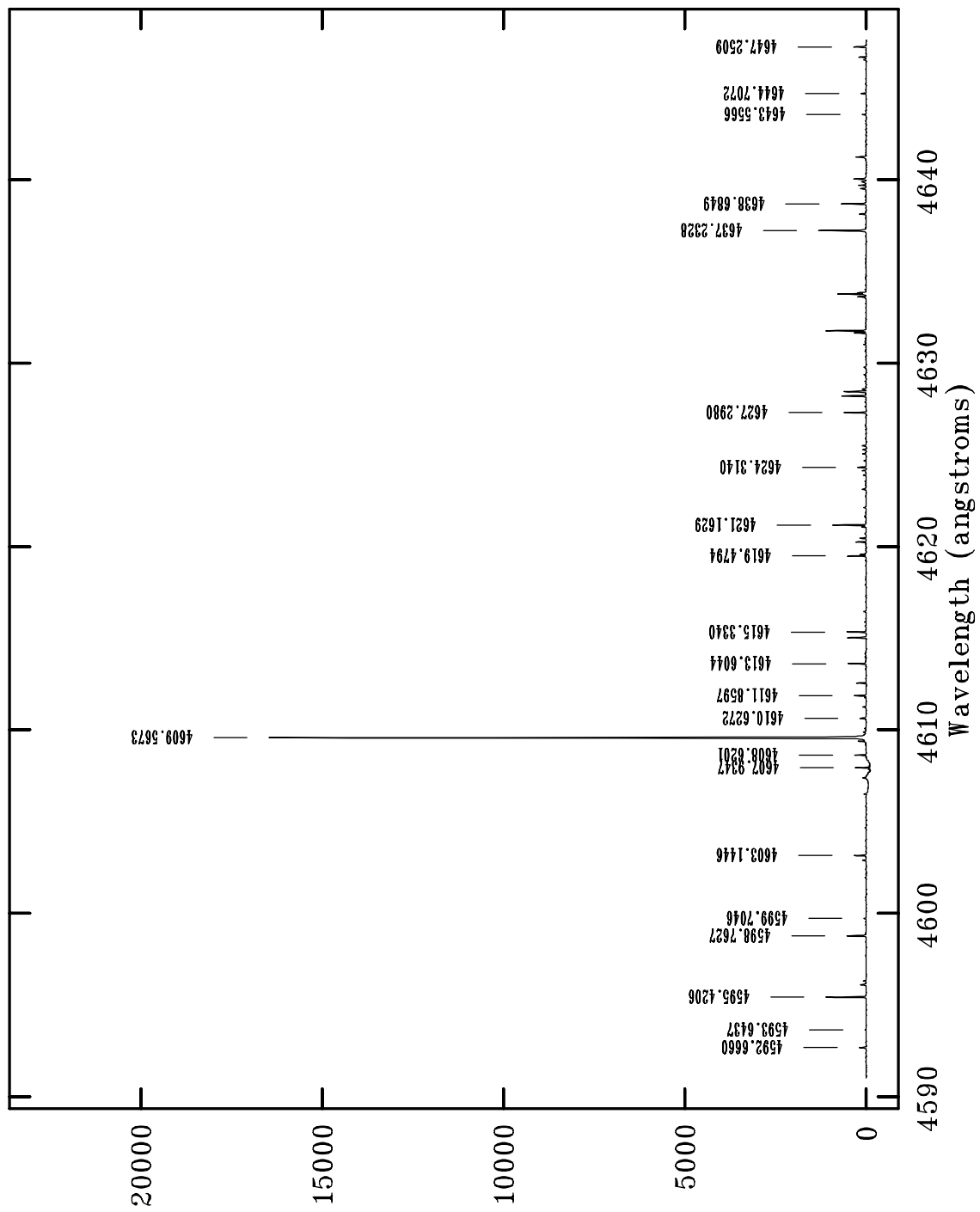


NOAO/IRAF V2.11.3EXPORT honda@hds Mon 14:24:28 18-Sep-2000
 Aperture 14, Image line 14, Order 130
 identify 080: UNKNOWN

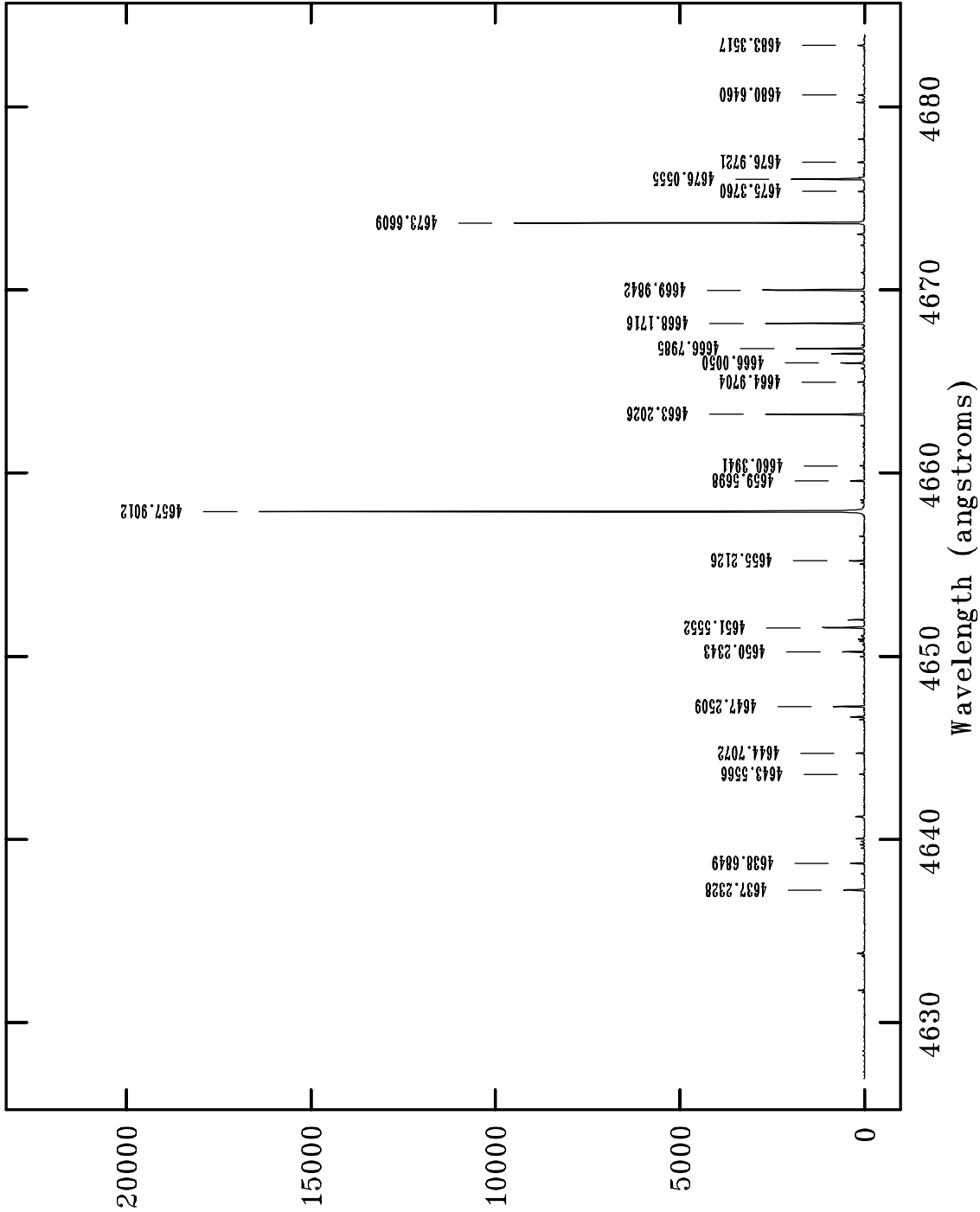




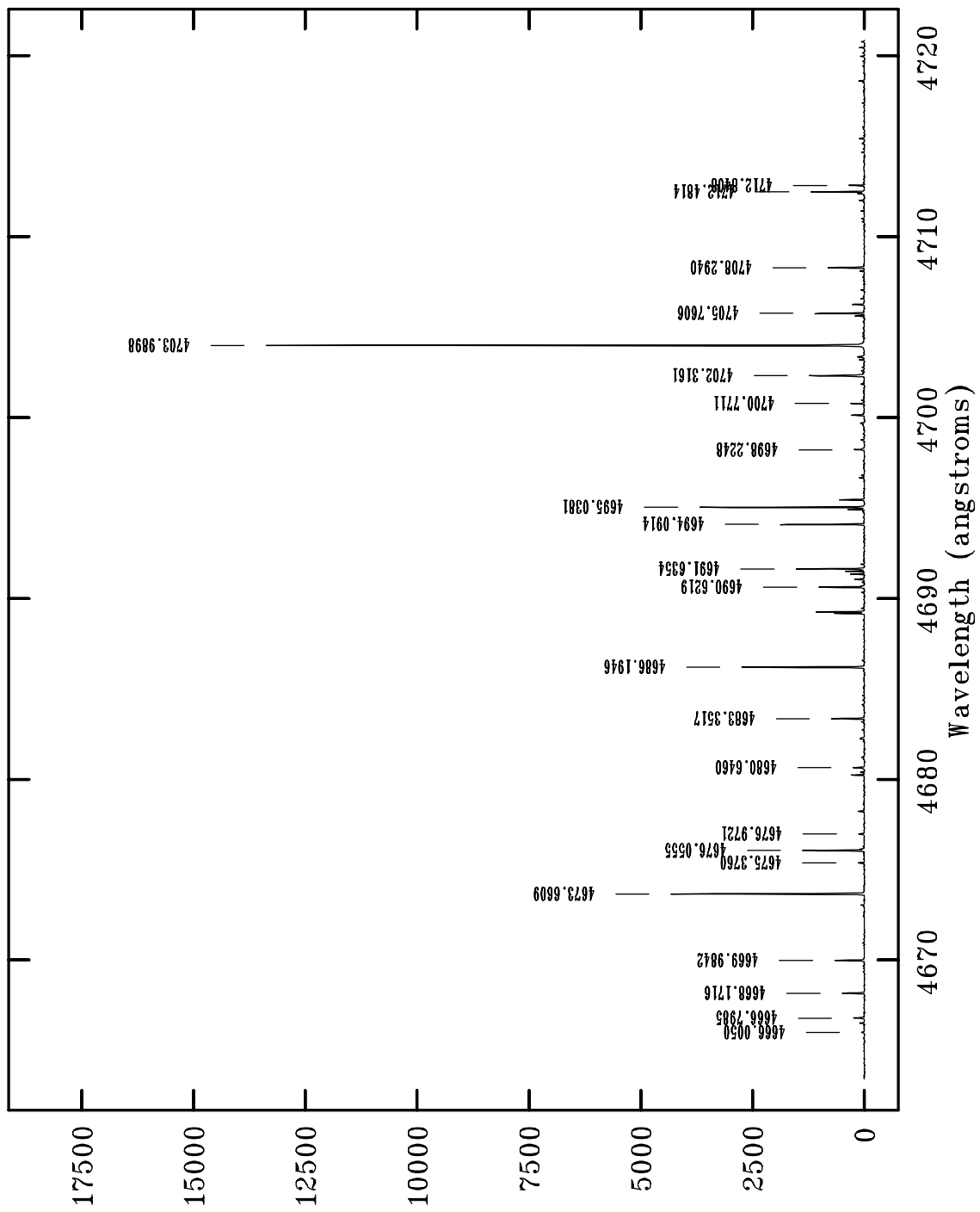
NOAO/IRAF V2.11.3EXPORT honda@hds Mon 14:13:17 18-Sep-2000
Aperture 12, Image line 12, Order 128
identify 080: UNKNOWN

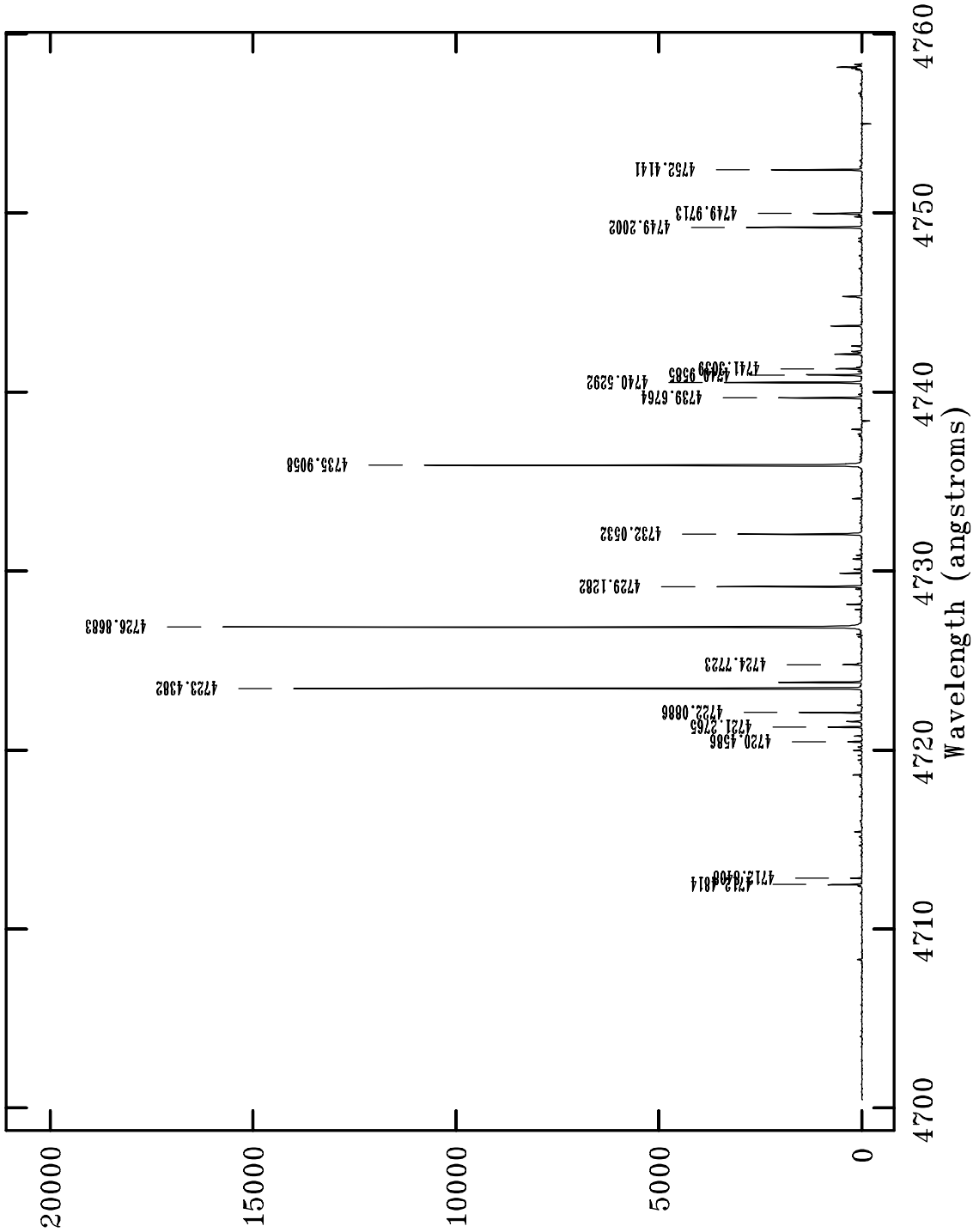


NOAO/IRAF V2.11.3EXPORT honda@hds Mon 14:09:11 18-Sep-2000
Aperture 11, Image line 11, Order 127
ecidentify 080: UNKNOWN

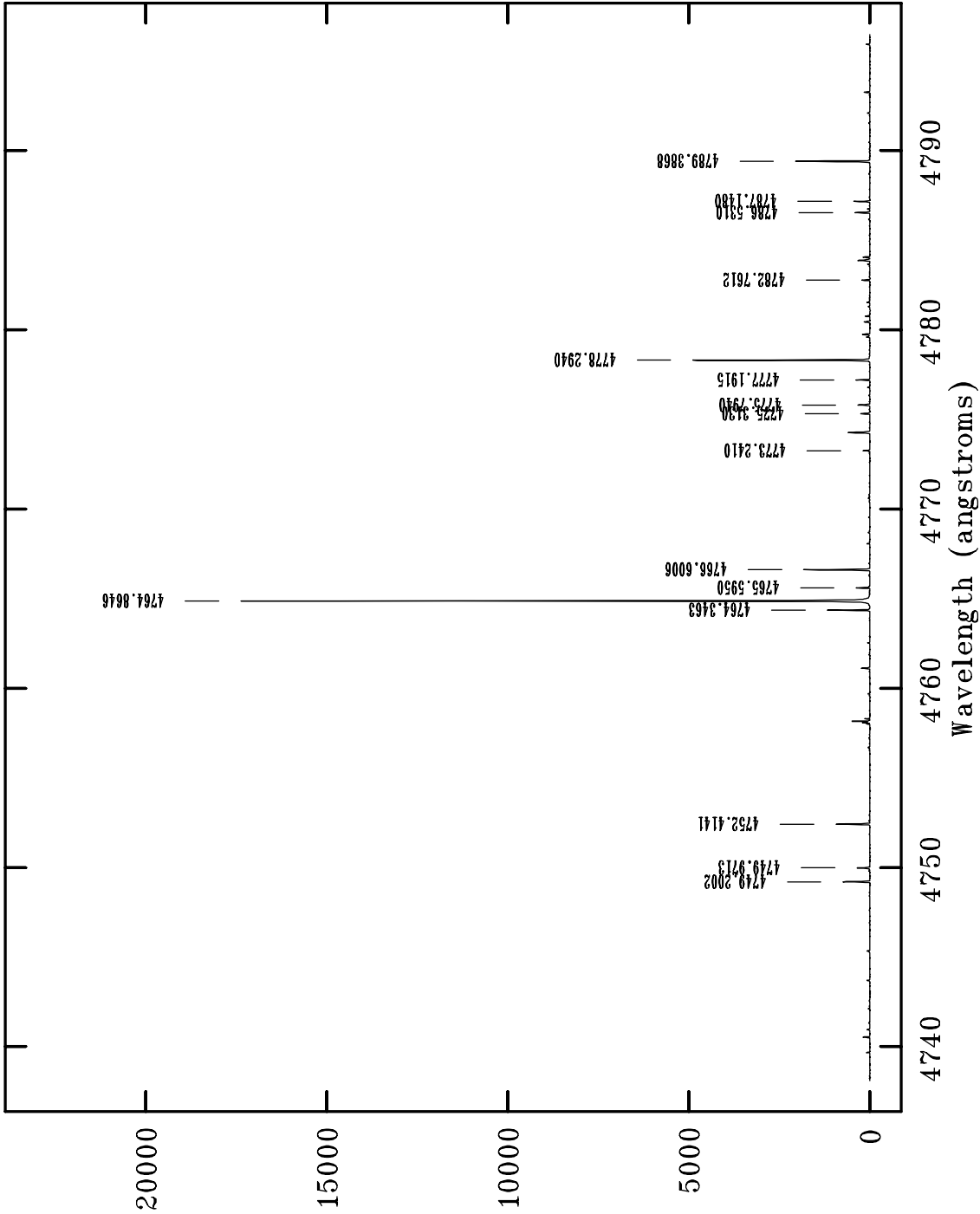


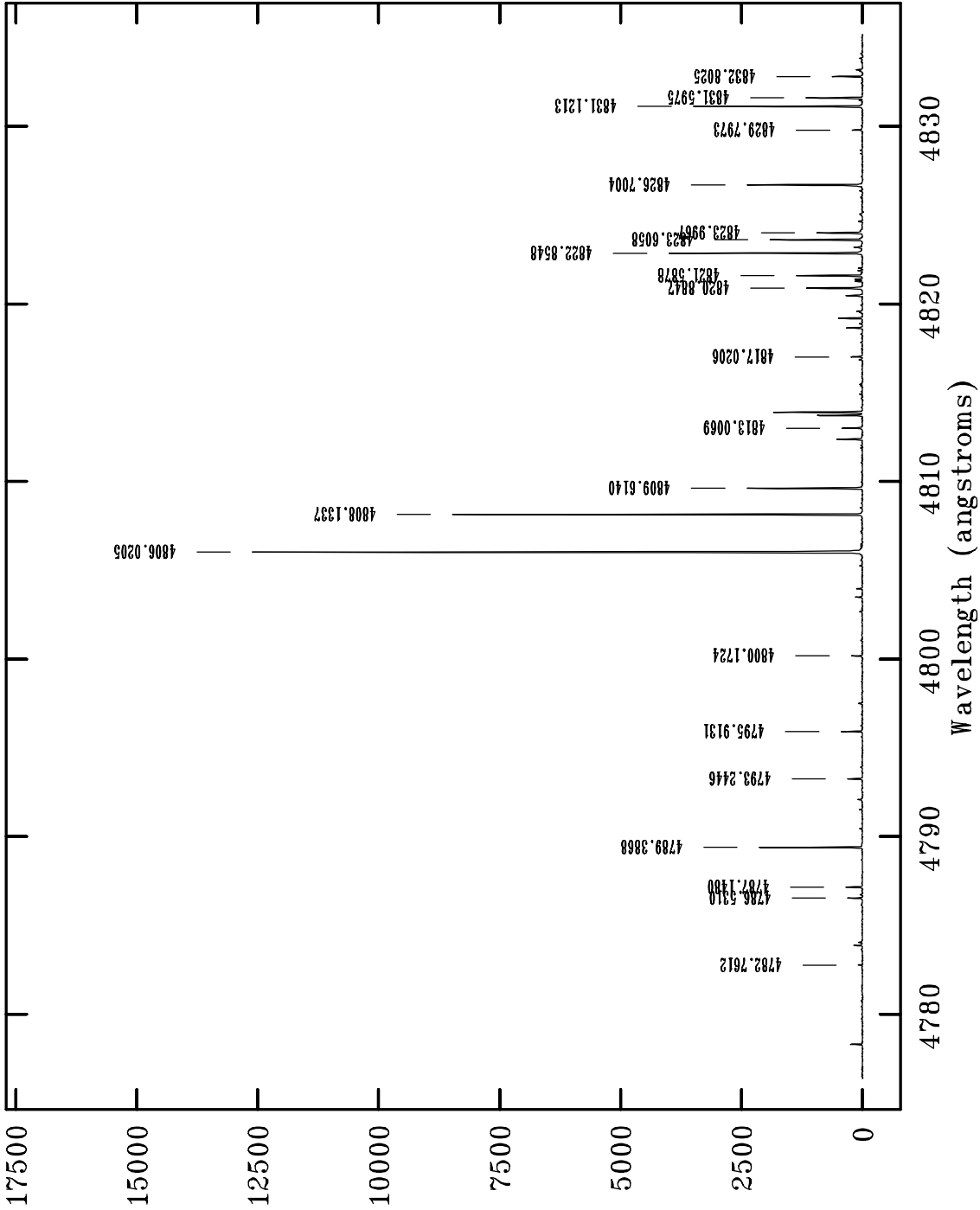
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 00:49:51 14-Sep-2000
 Aperture 10, Image line 10, Order 126
 identify 080: UNKNOWN



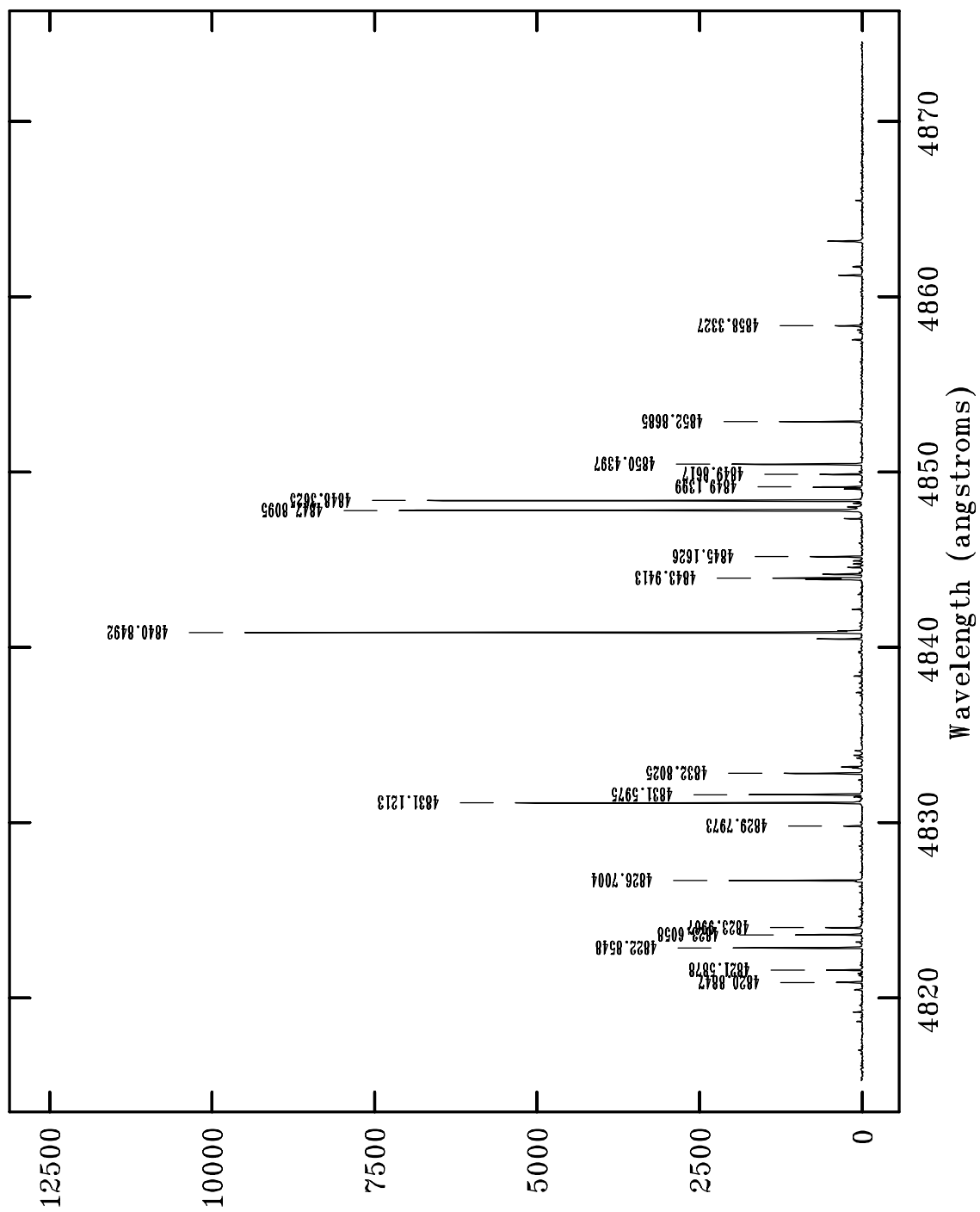


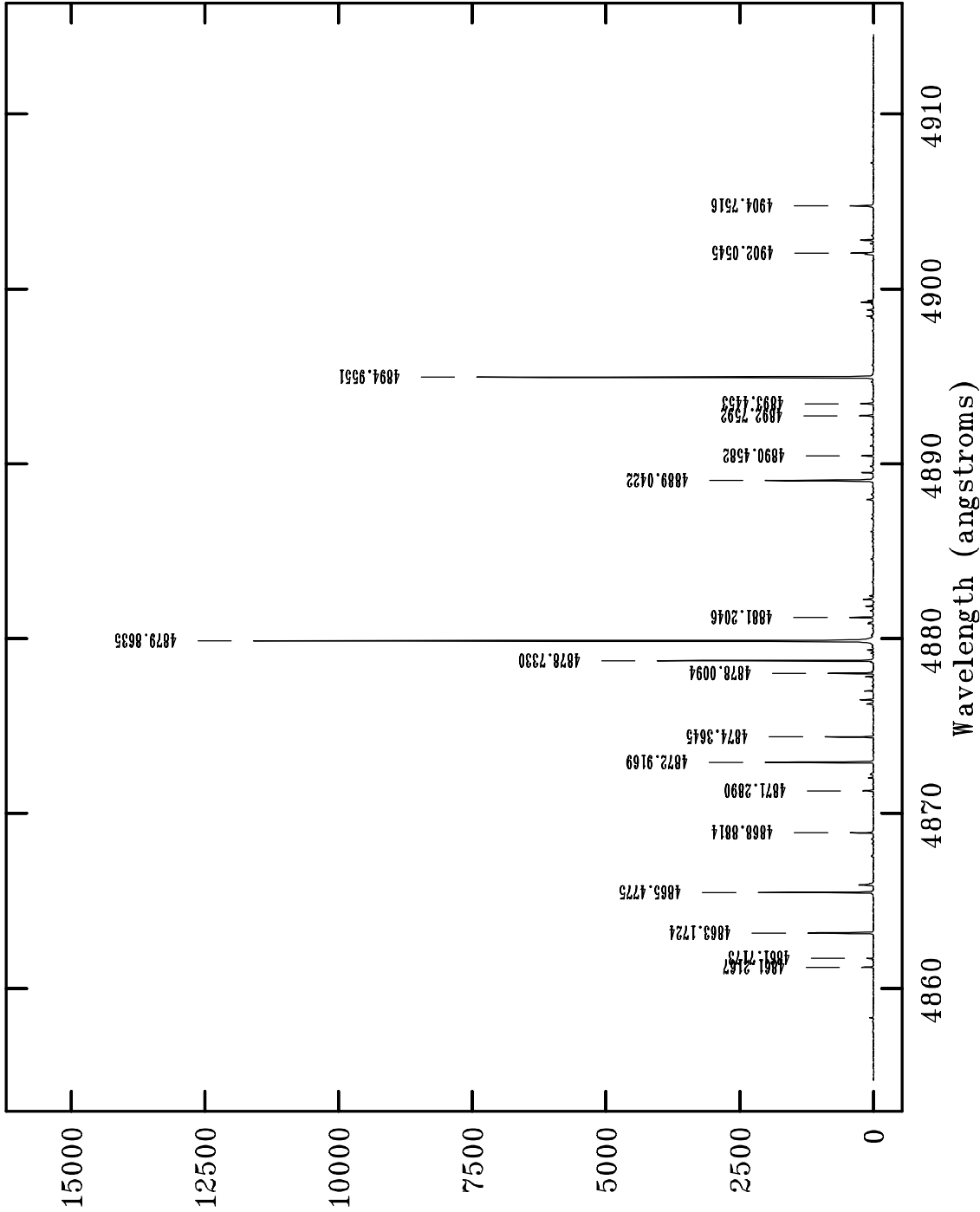
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 00:44:20 14-Sep-2000
Aperture 8, Image line 8, Order 124
identify 080: UNKNOWN



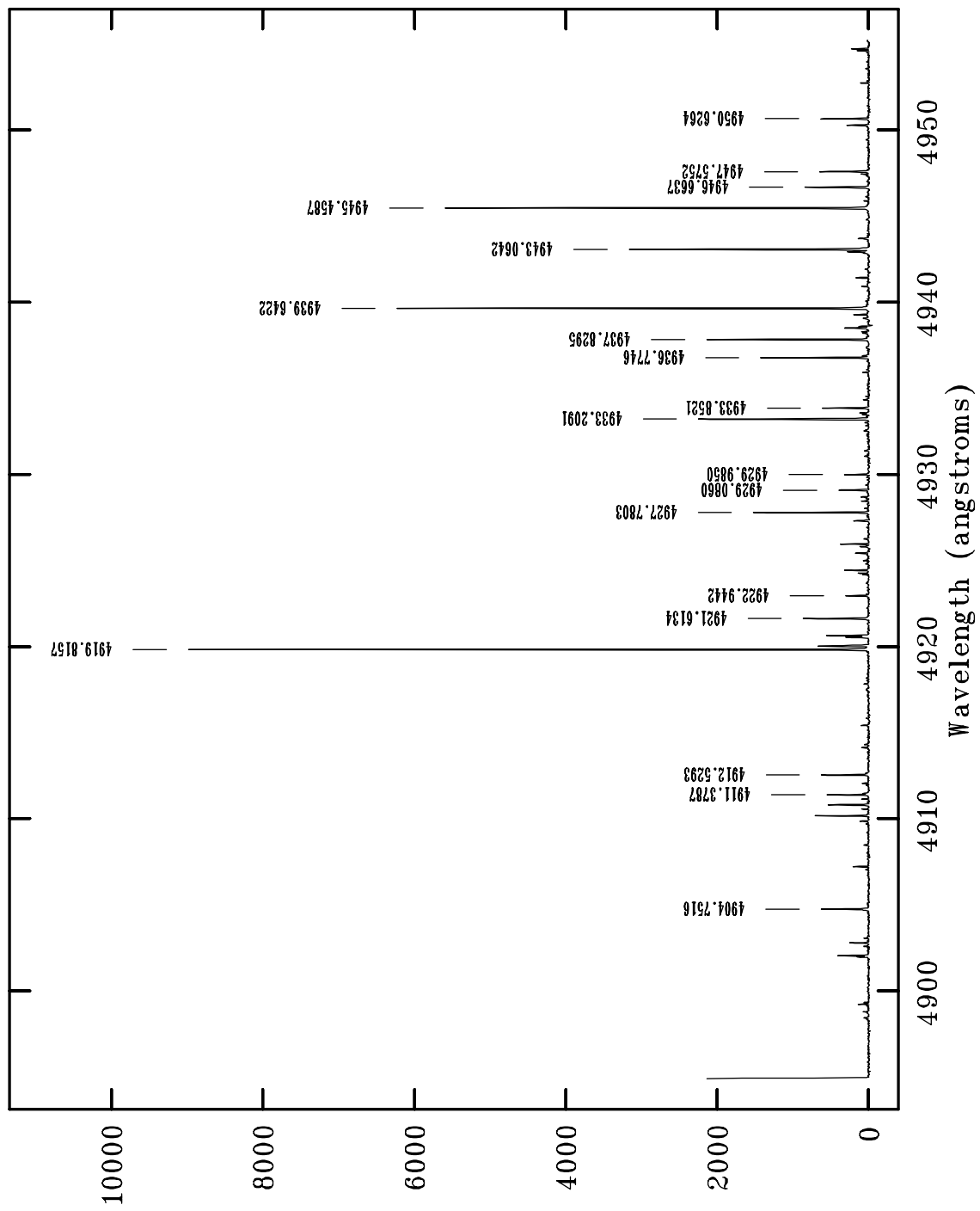


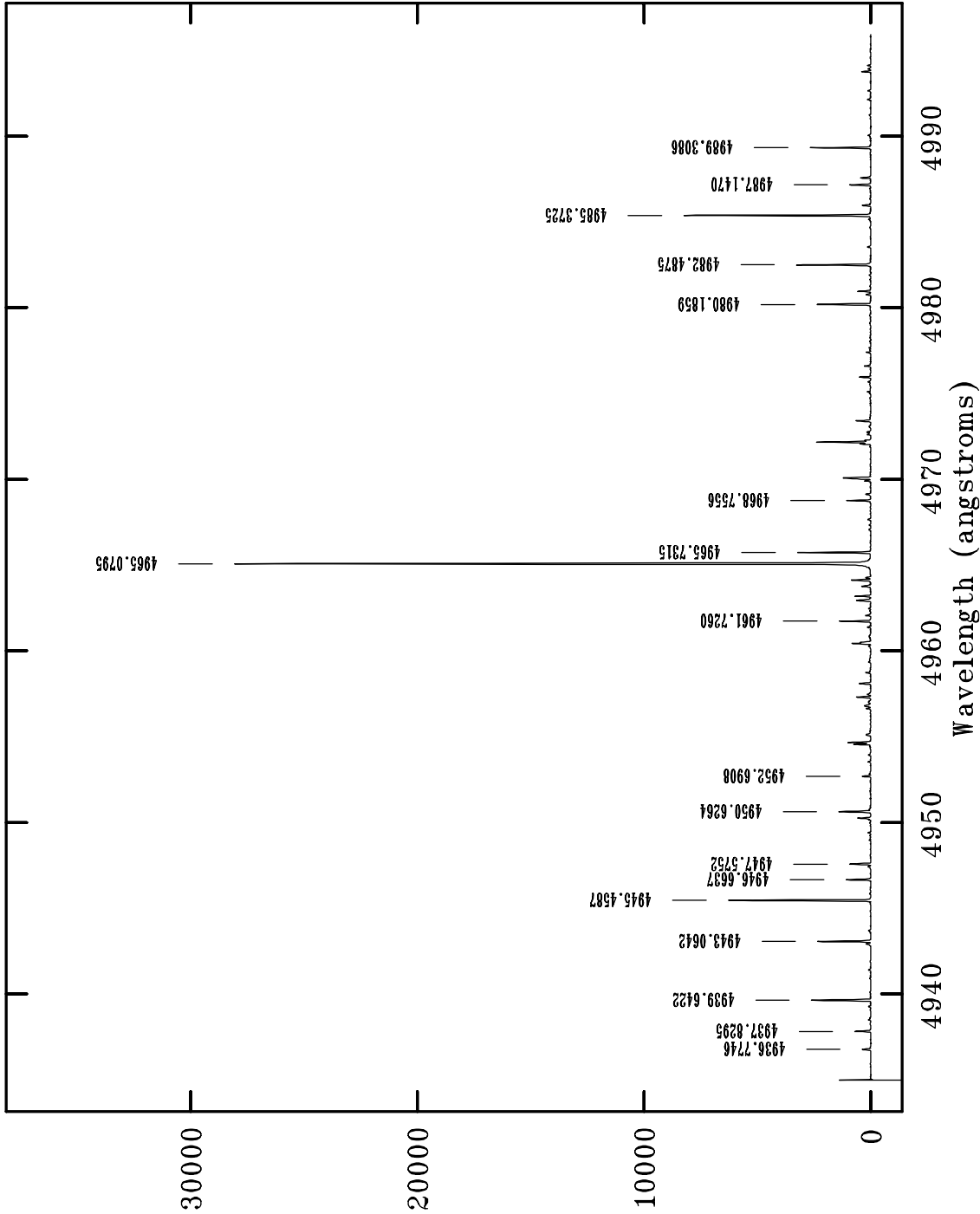
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 00:36:47 14-Sep-2000
Aperture 6, Image line 6, Order 122
identify 080: UNKNOWN



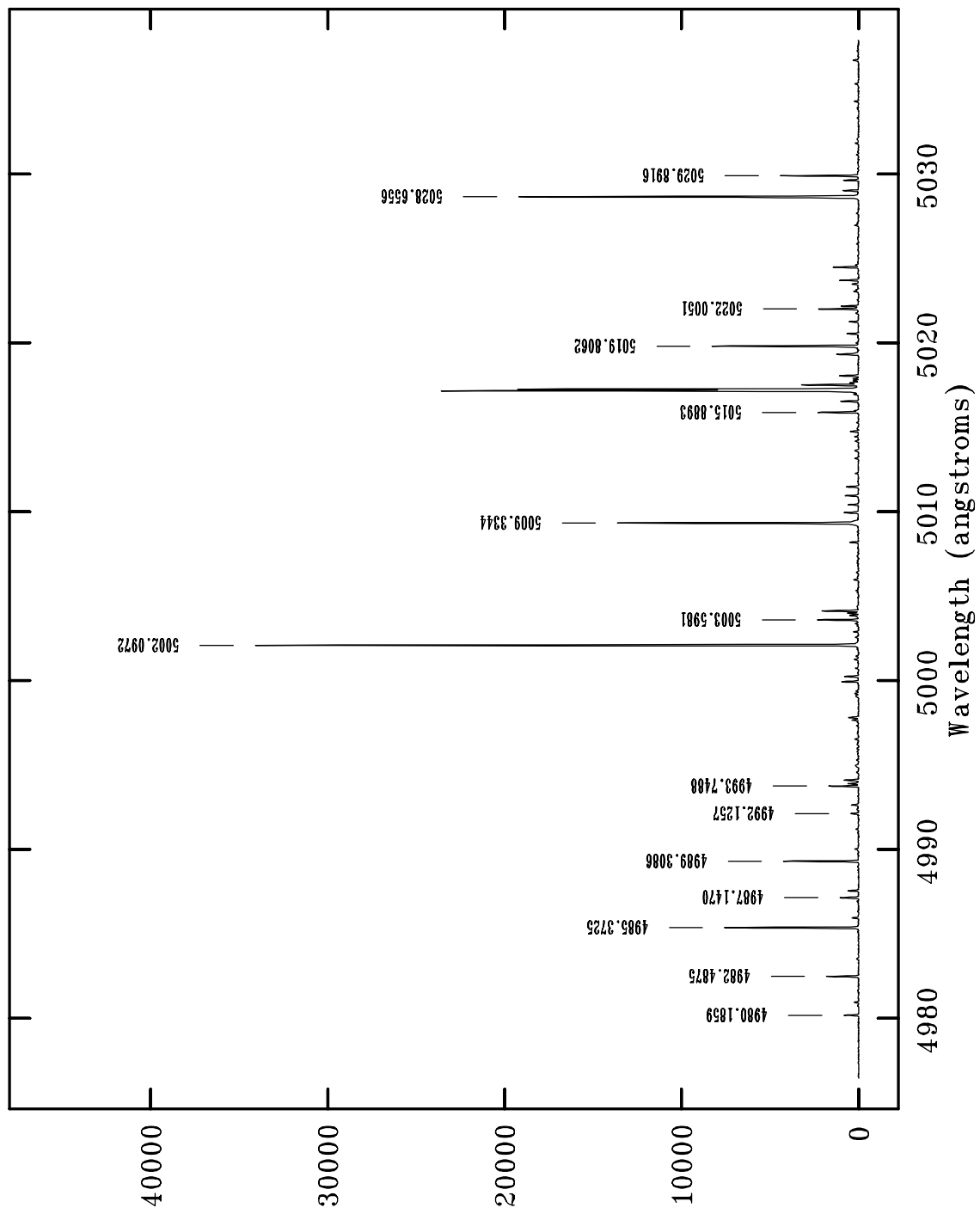


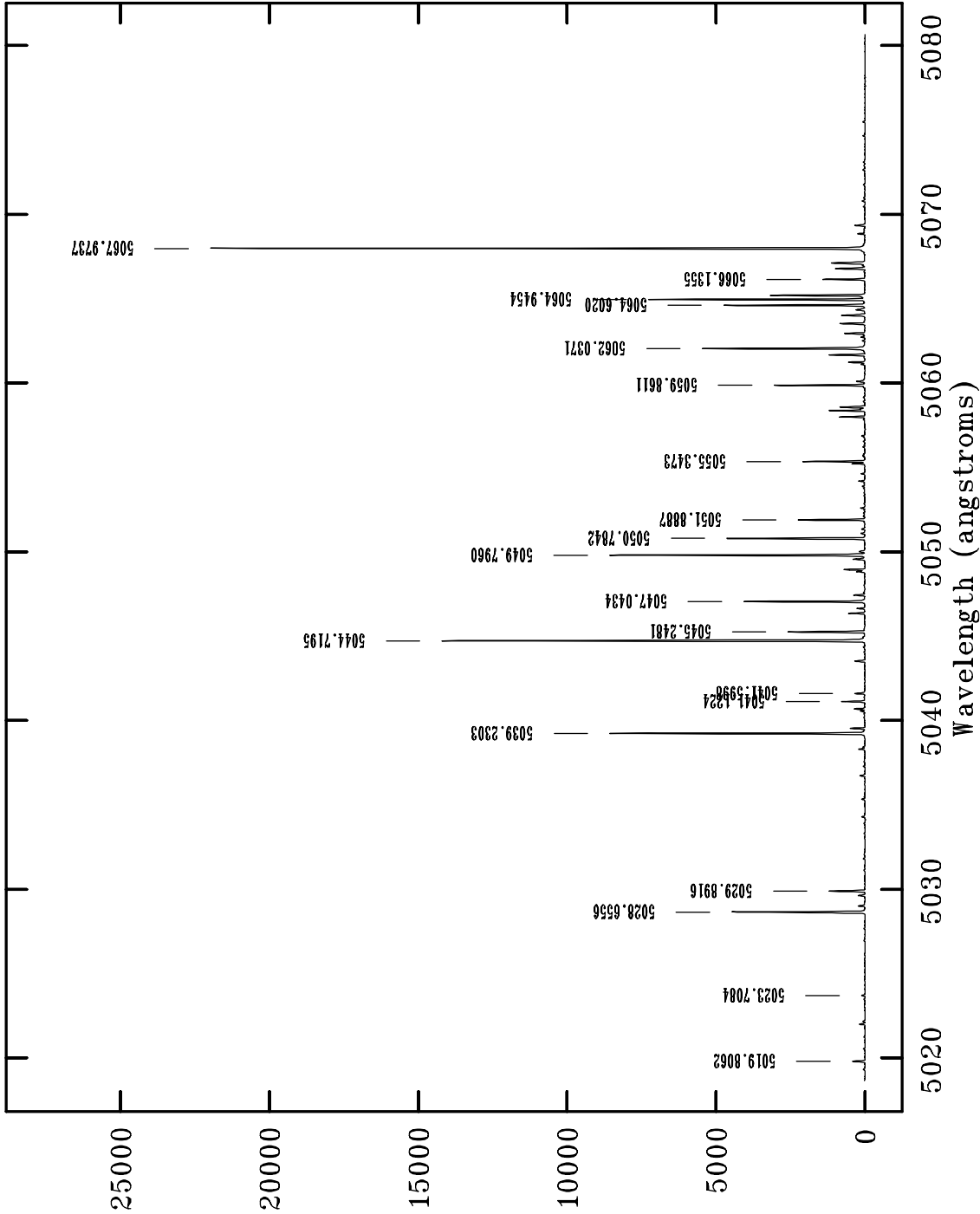
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 00:30:38 14-Sep-2000
Aperture 4, Image line 4, Order 120
identify 080: UNKNOWN



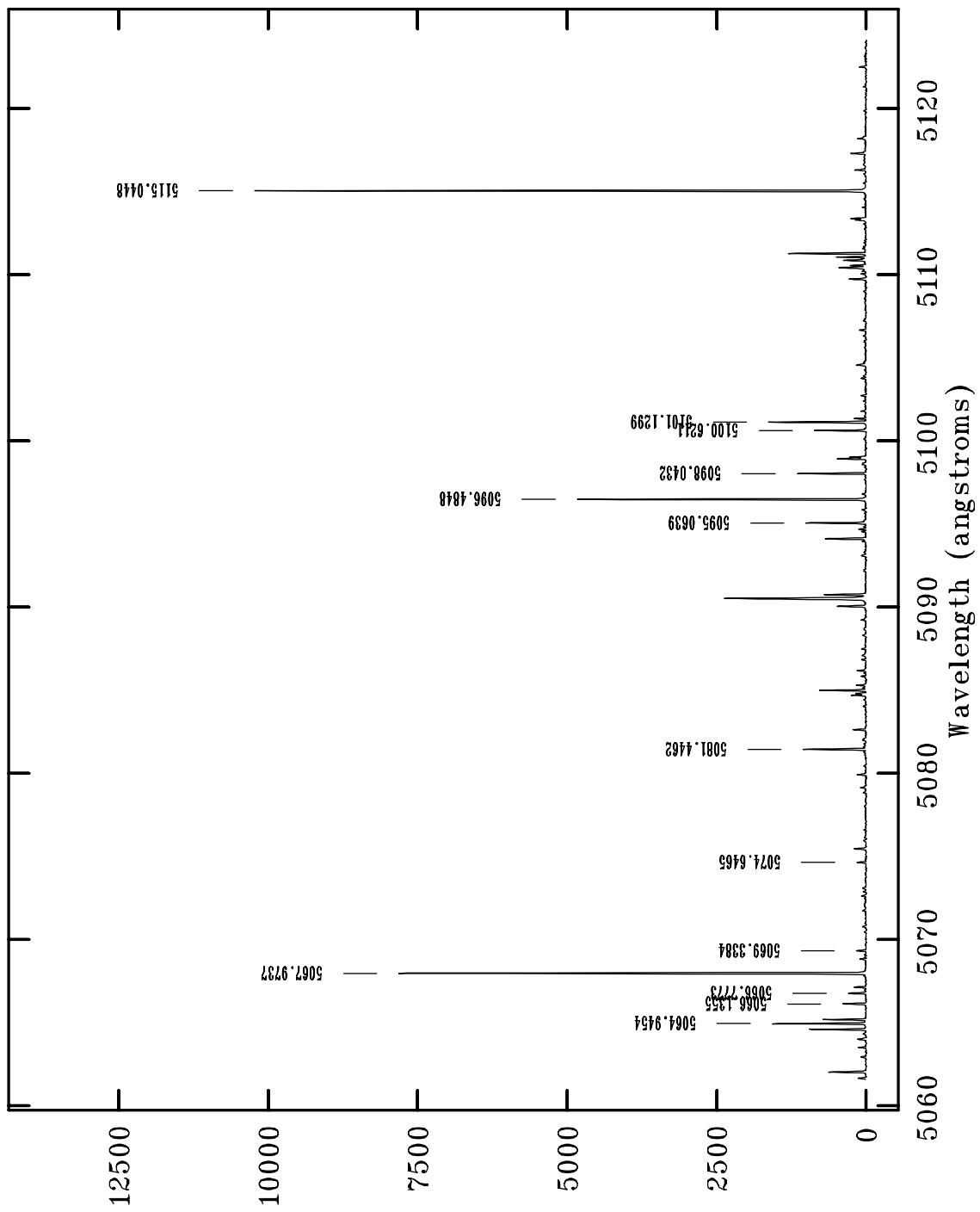


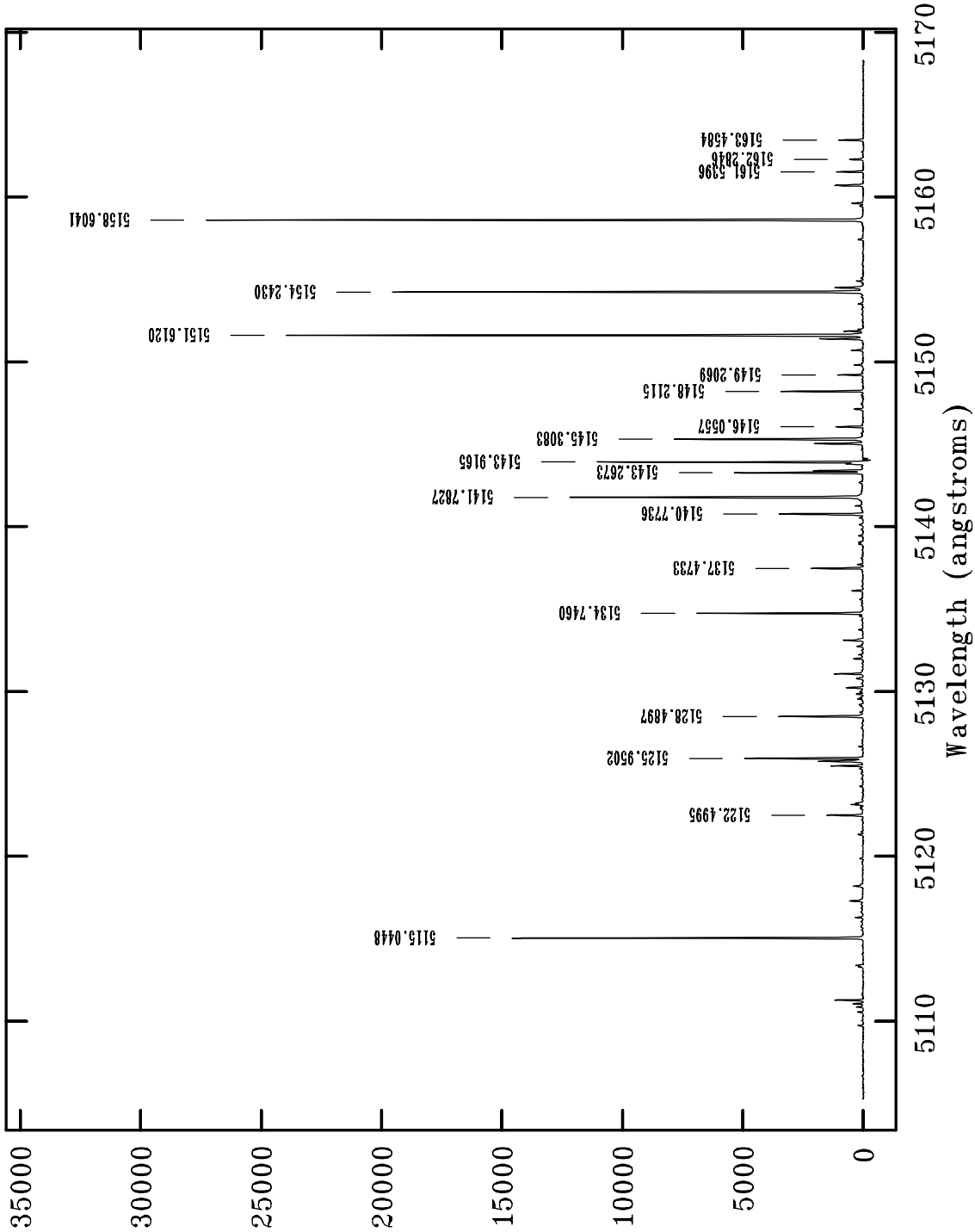
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 21:50:57 30-Nov-2000
 Aperture 24, Image line 24, Order 119
 identify 077: UNKNOWN



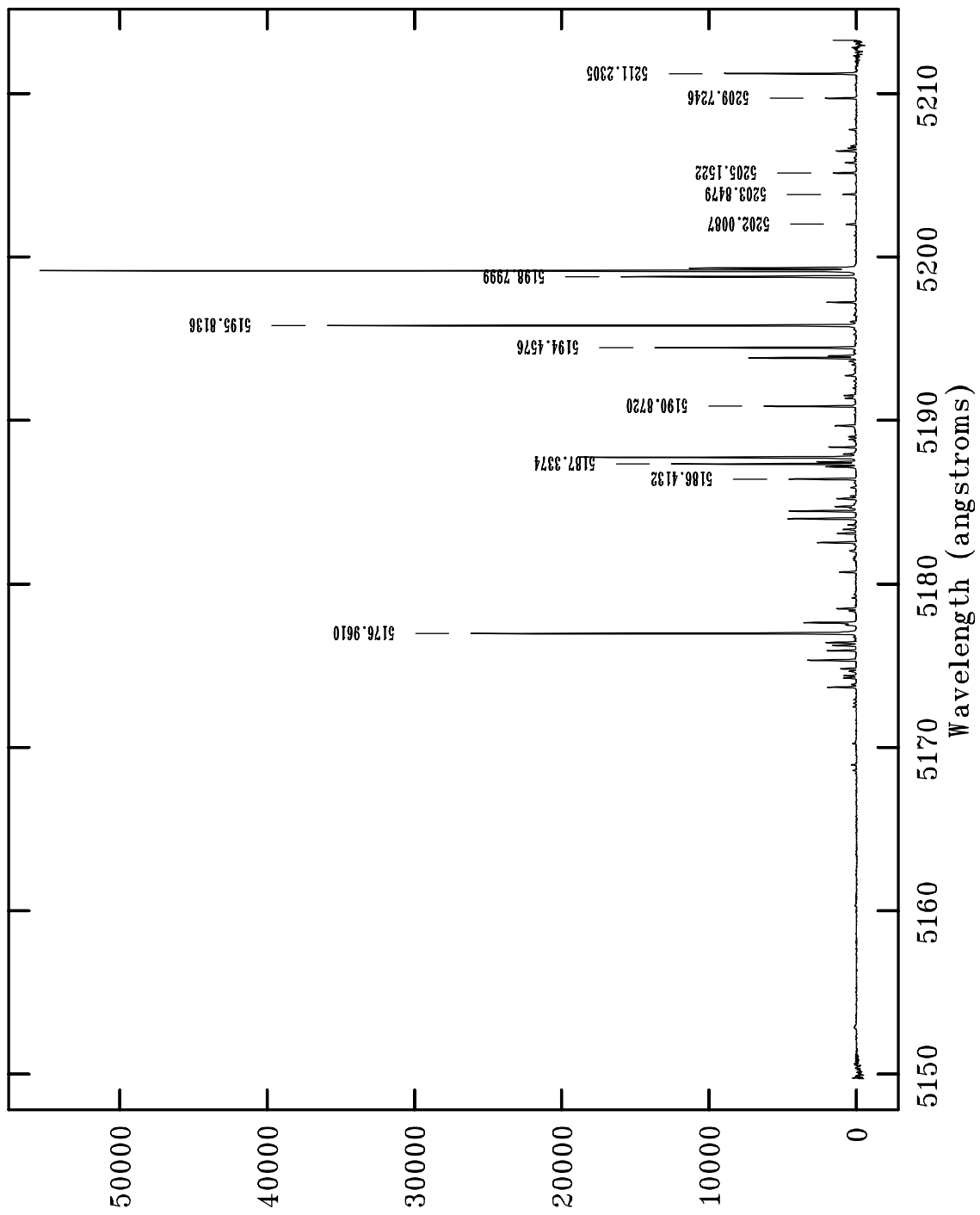


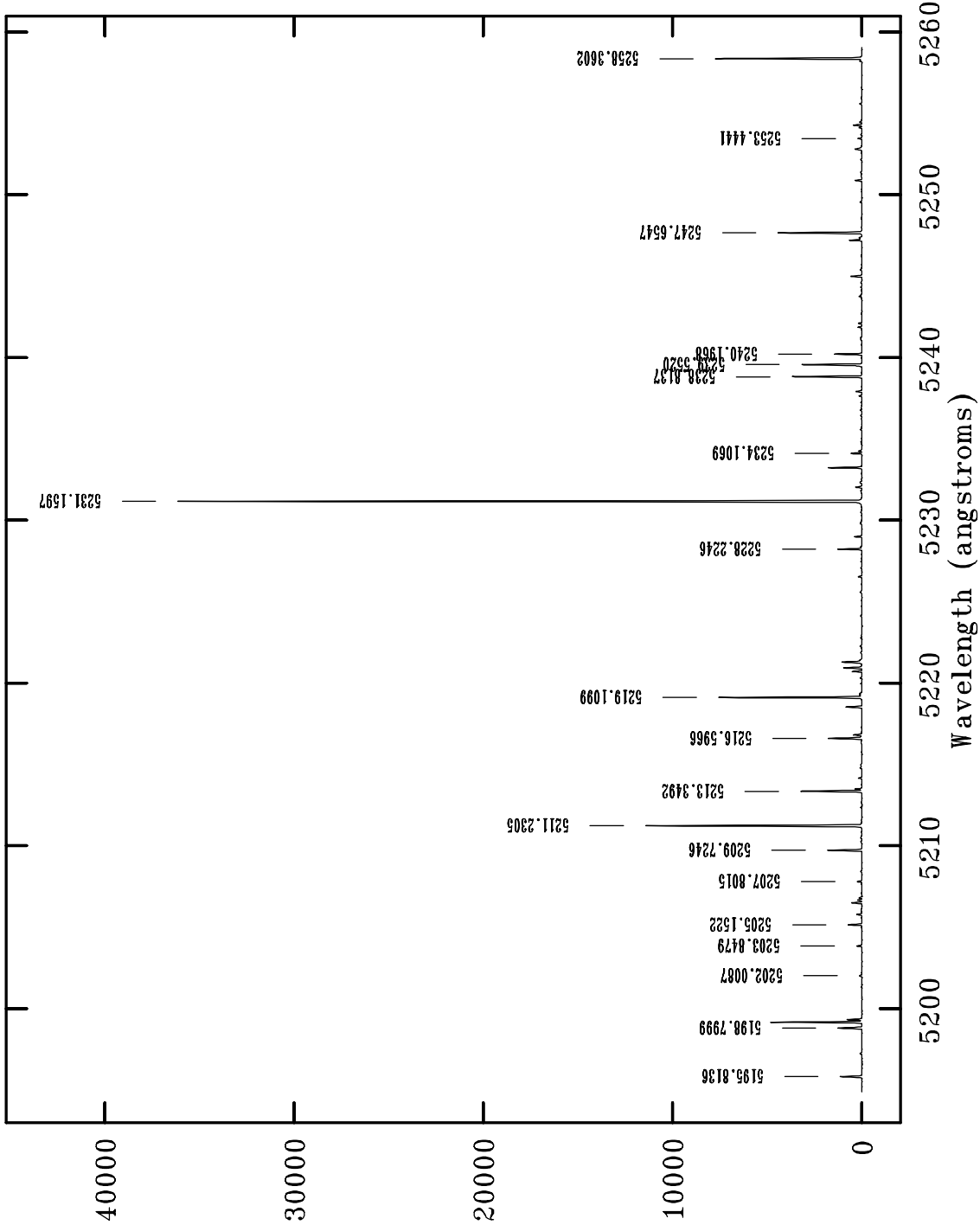
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 00:10:14 14-Sep-2000
Aperture 22, Image line 22, Order 117
ecidentify 077: UNKNOWN



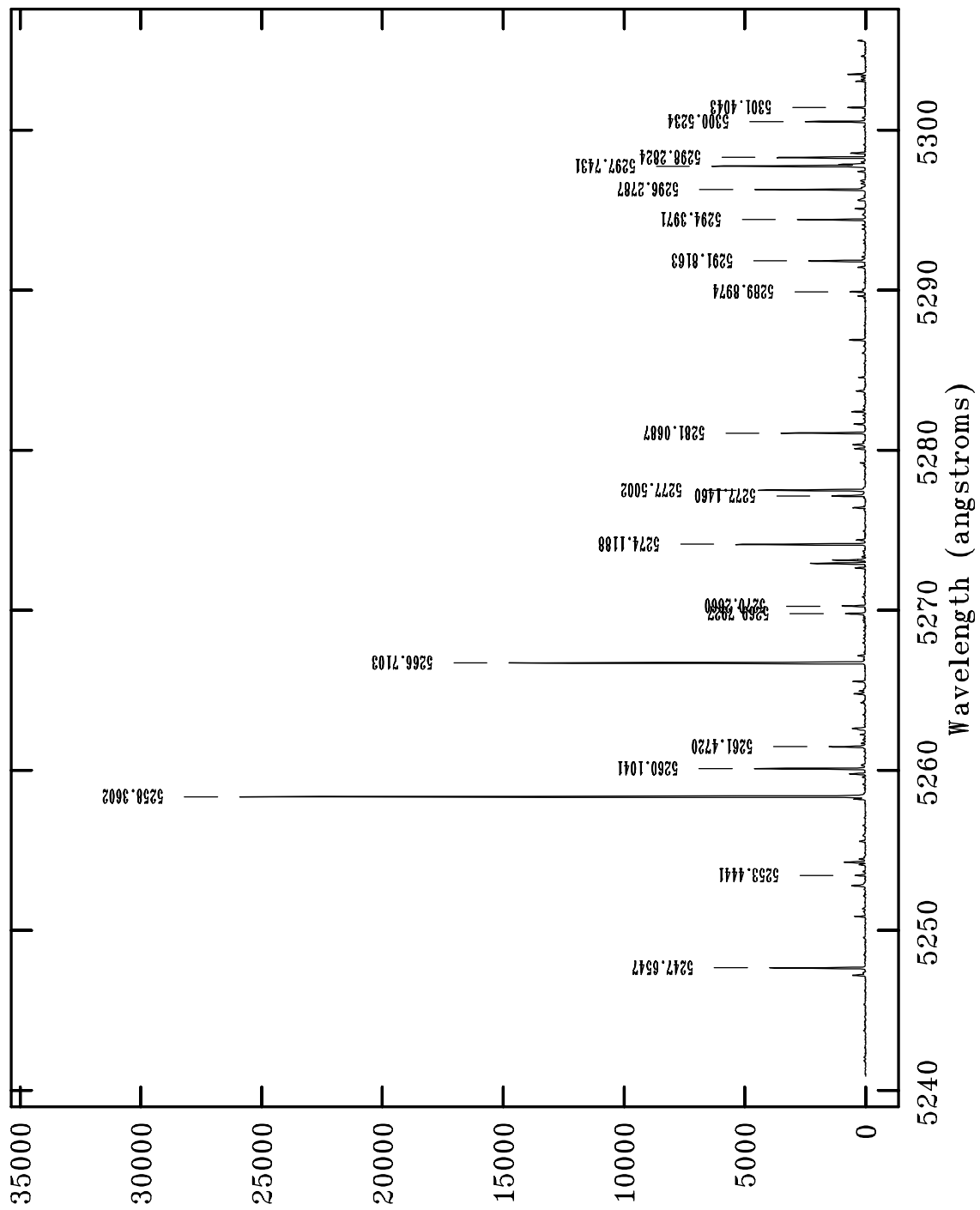


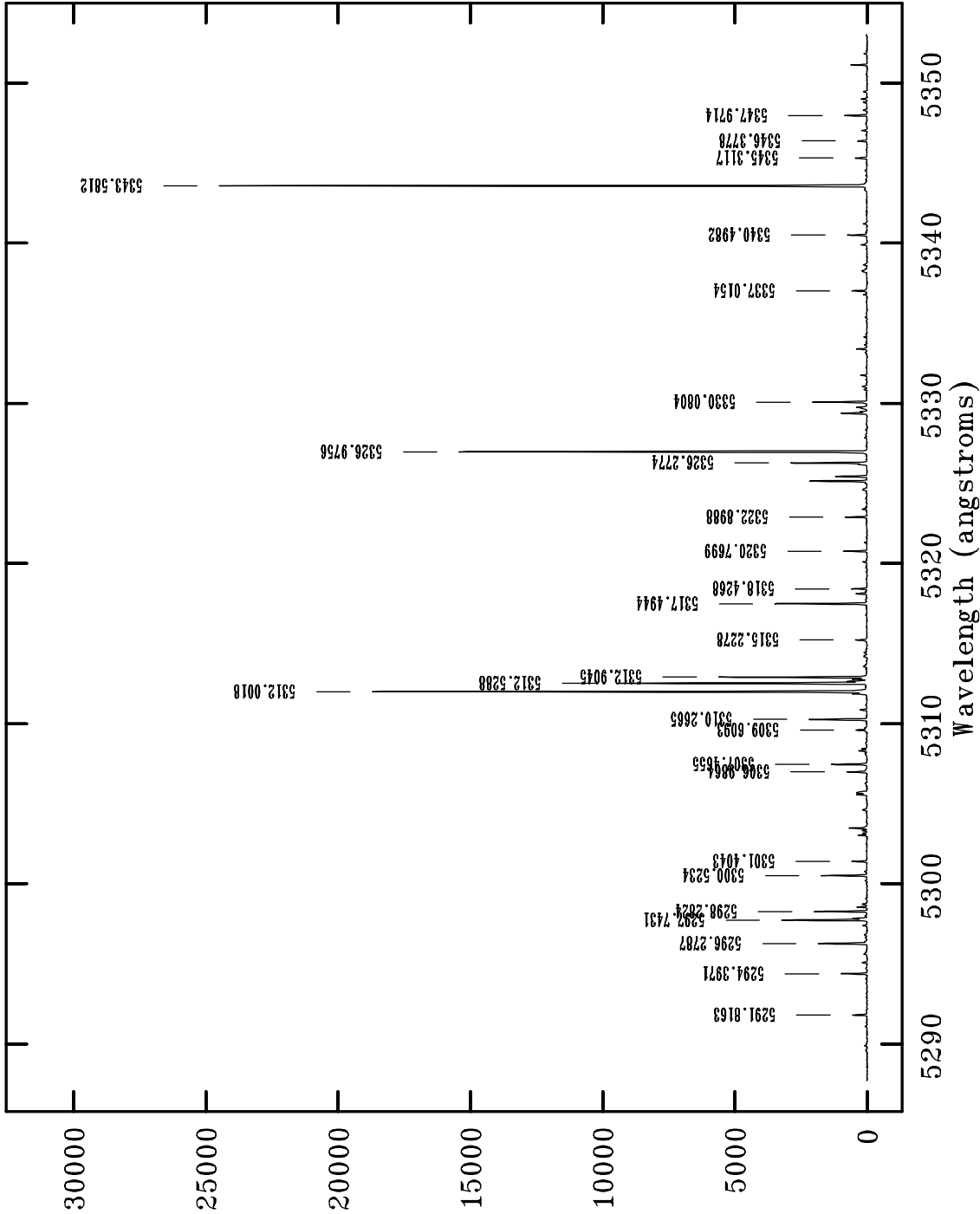
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 21:49:58 30-Nov-2000
Aperture 20, Image line 20, Order 115
ecidentify 077: UNKNOWN



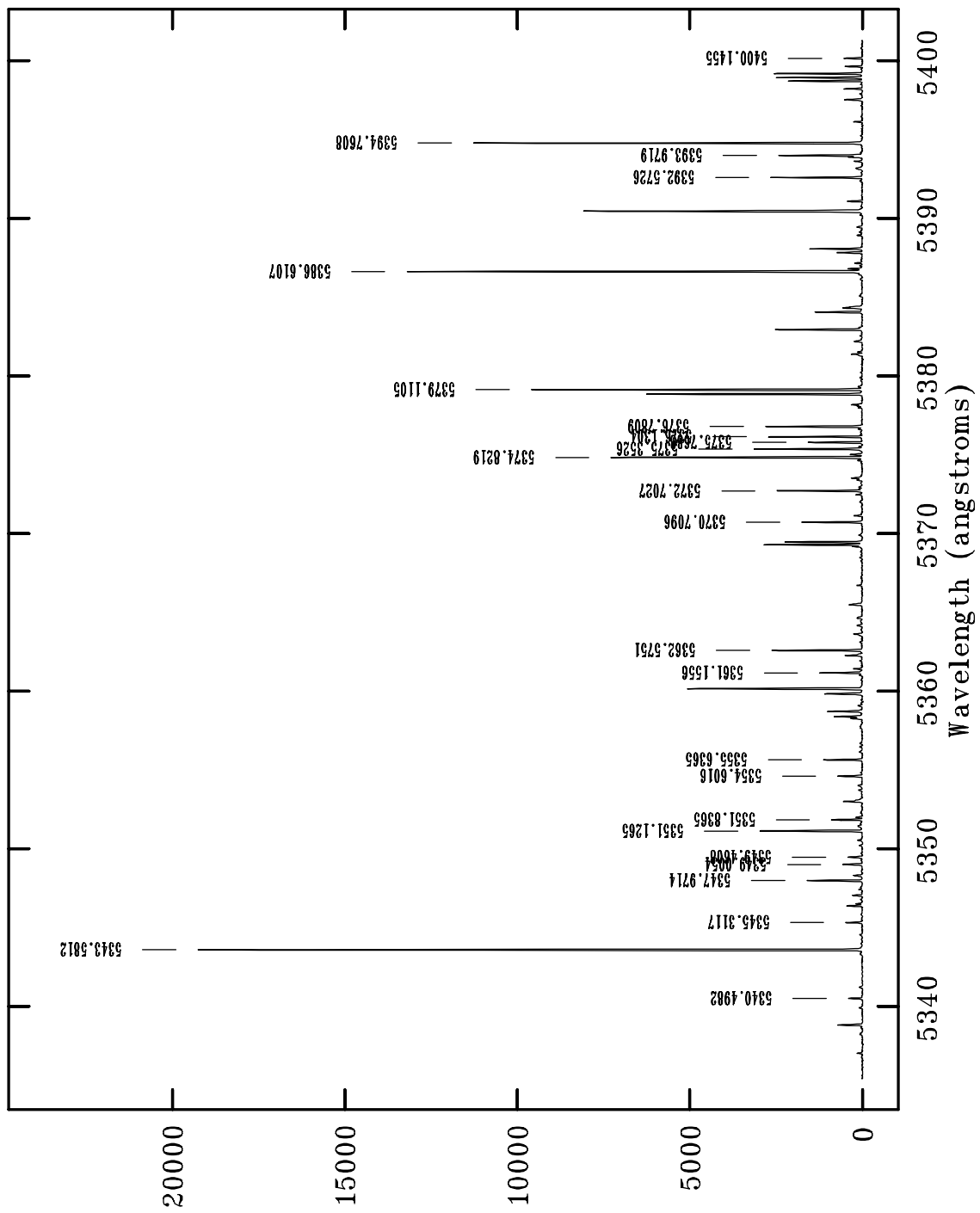


NOAO/IRAF V2.11.3EXPORT honda@hds Wed 23:48:42 13-Sep-2000
Aperture 18, Image line 18, Order 113
ecidentify 077: UNKNOWN



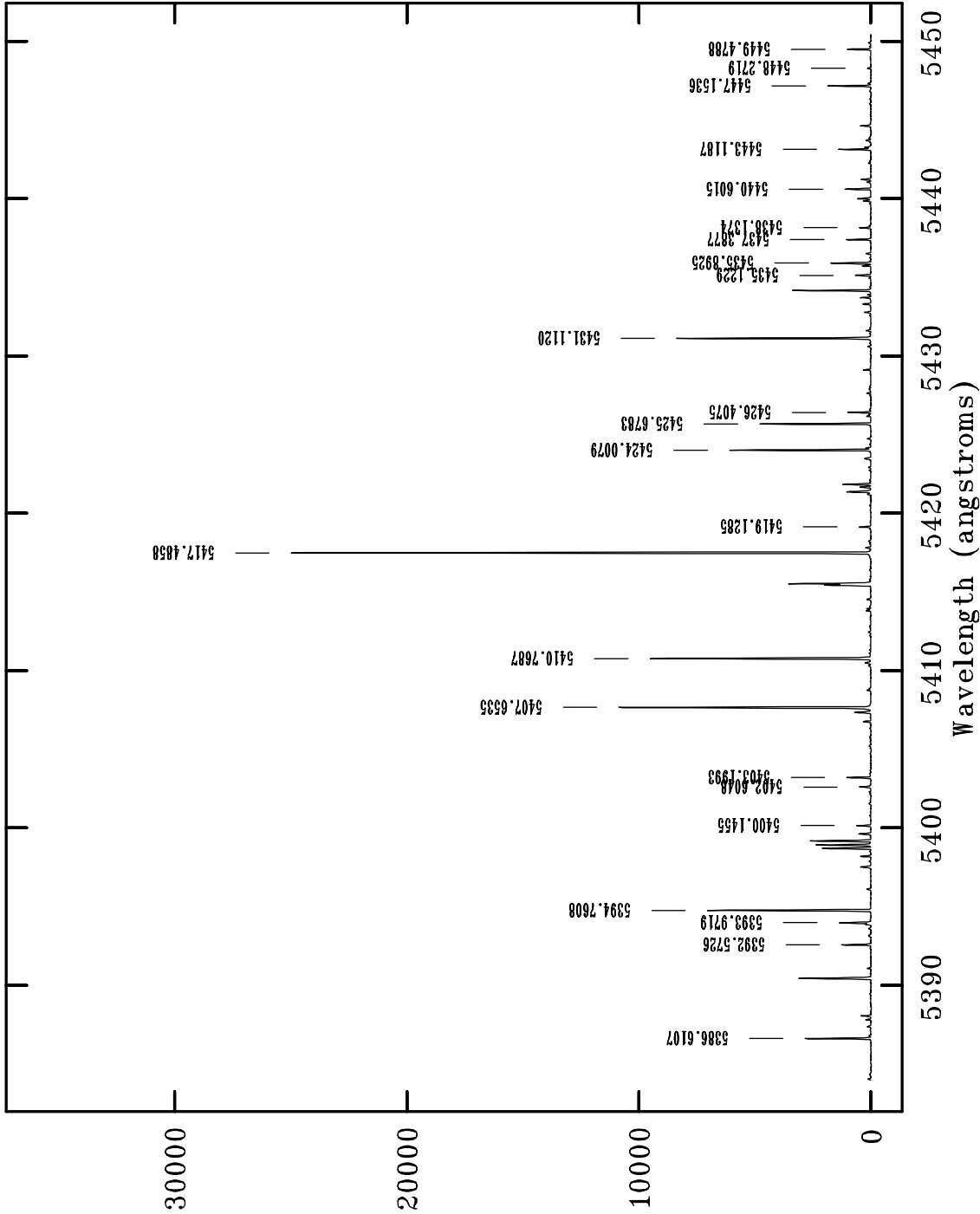


NOAO/IRAF V2.11.3EXPORT honda@hds Thu 21:47:55 30-Nov-2000
Aperture 16, Image line 16, Order 111
identify 077: UNKNOWN

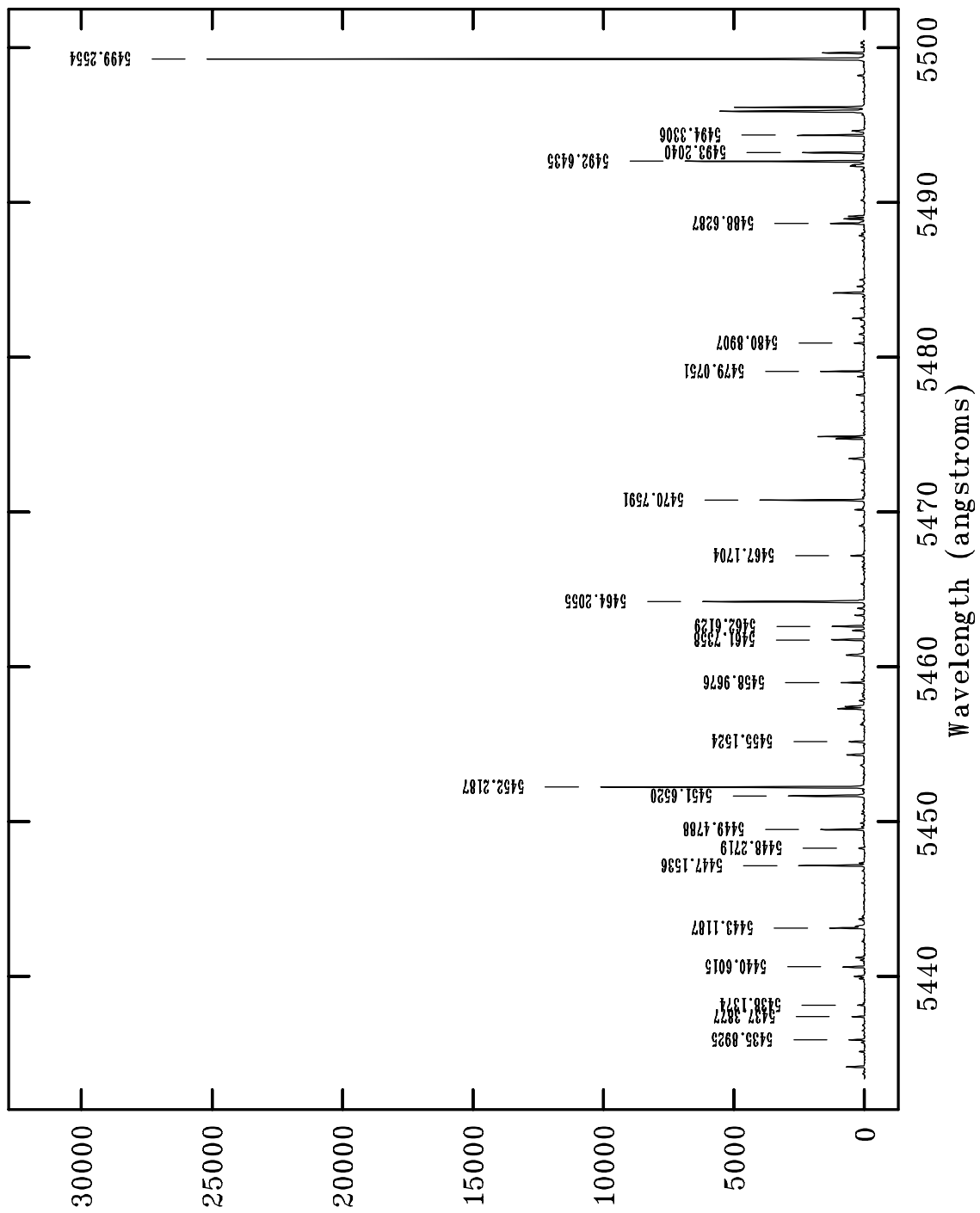


NOAO/IRAF V2.11.3EXPORT honda@hds Wed 23:32:20 13-Sep-2000
Aperture 15, Image line 15, Order 110
ecidentify 077: UNKNOWN

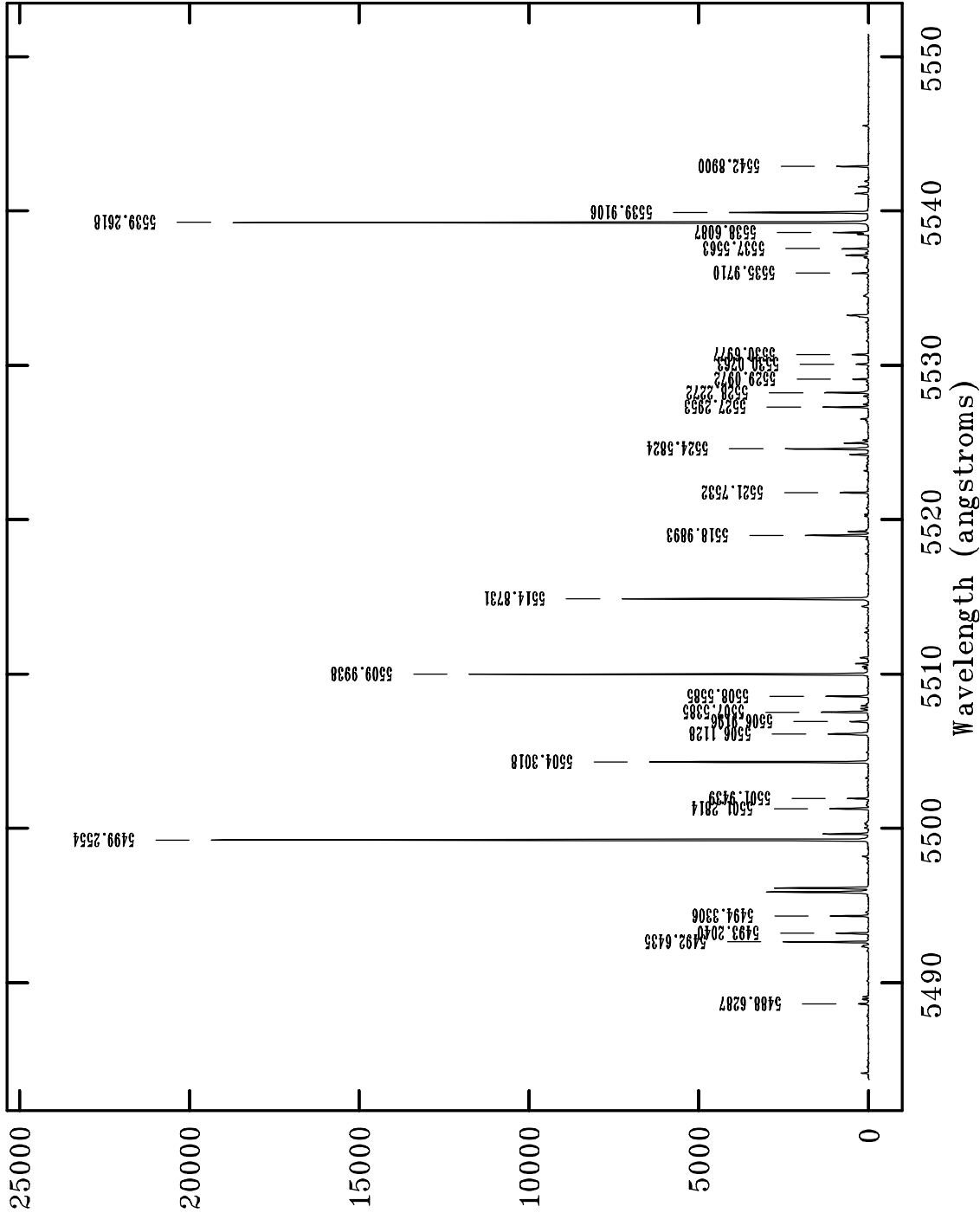
Echelle Order = 110



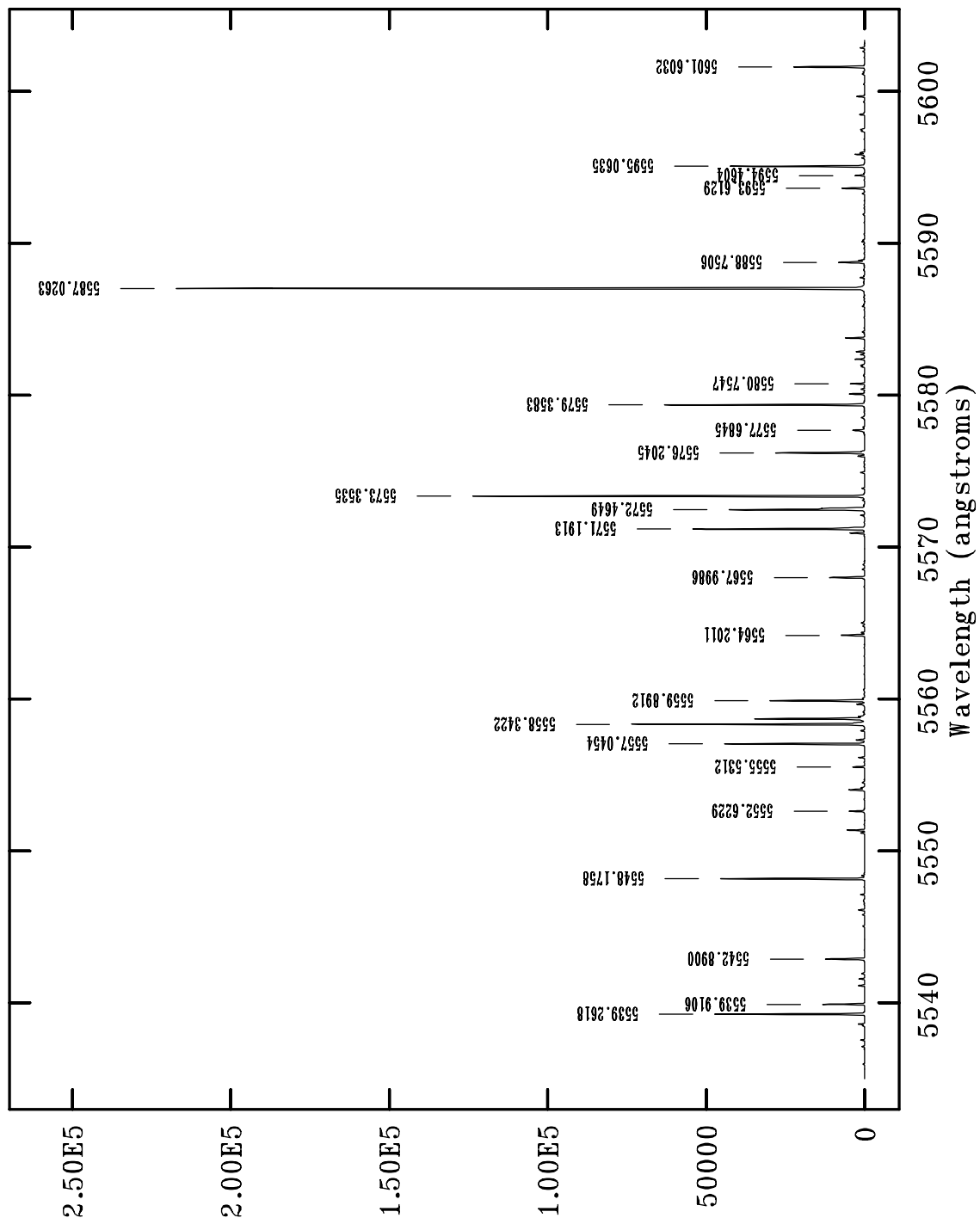
NOAO/IRAF V2.11.3EXPORT honda@hds Wed 23:29:41 13-Sep-2000
Aperture 14, Image line 14, Order 109
ecidentify 077: UNKNOWN

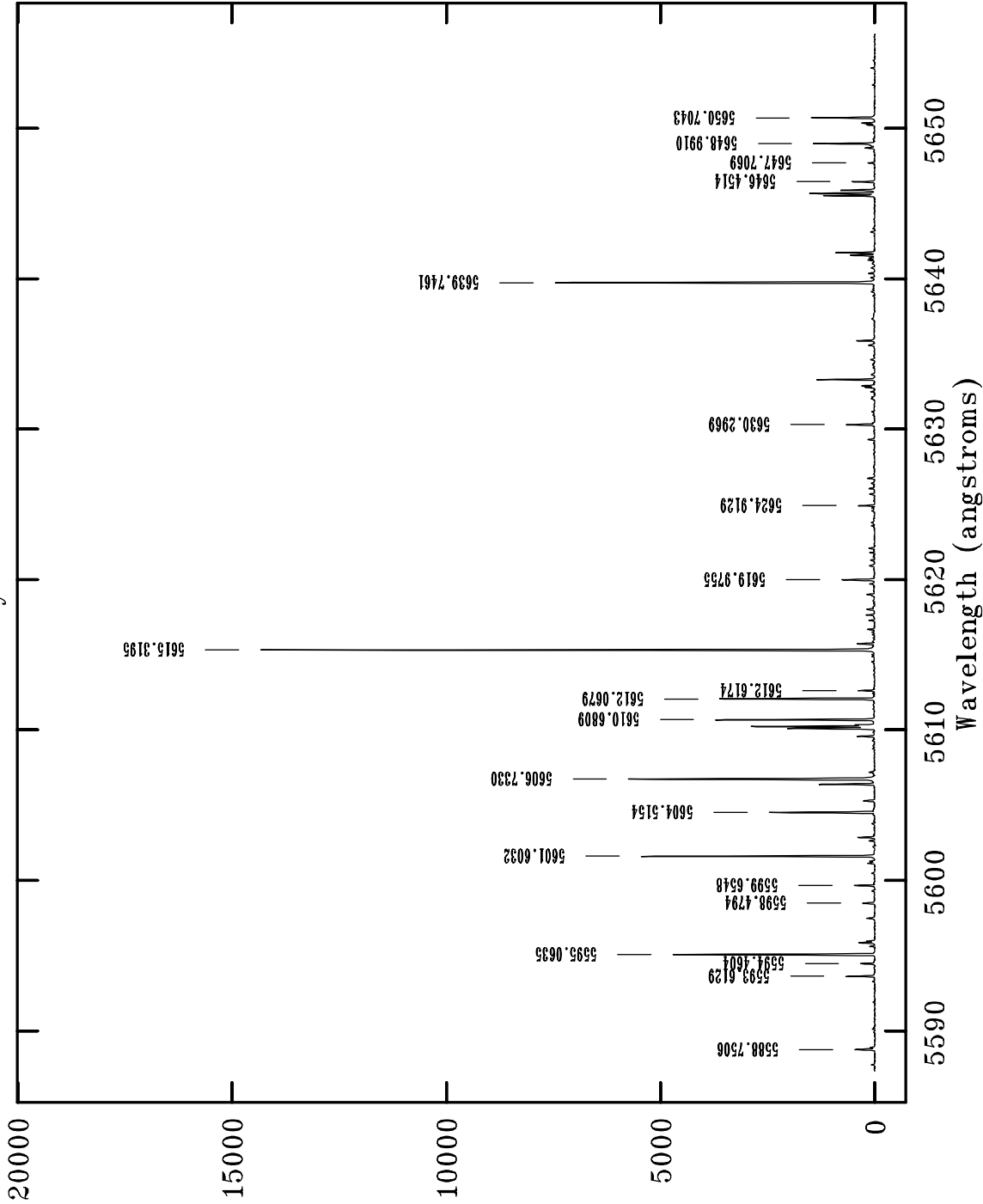


NOAO/IRAF V2.11.3EXPORT honda@hds Wed 23:26:01 13-Sep-2000
Aperture 13, Image line 13, Order 108
ecidentify 077: UNKNOWN

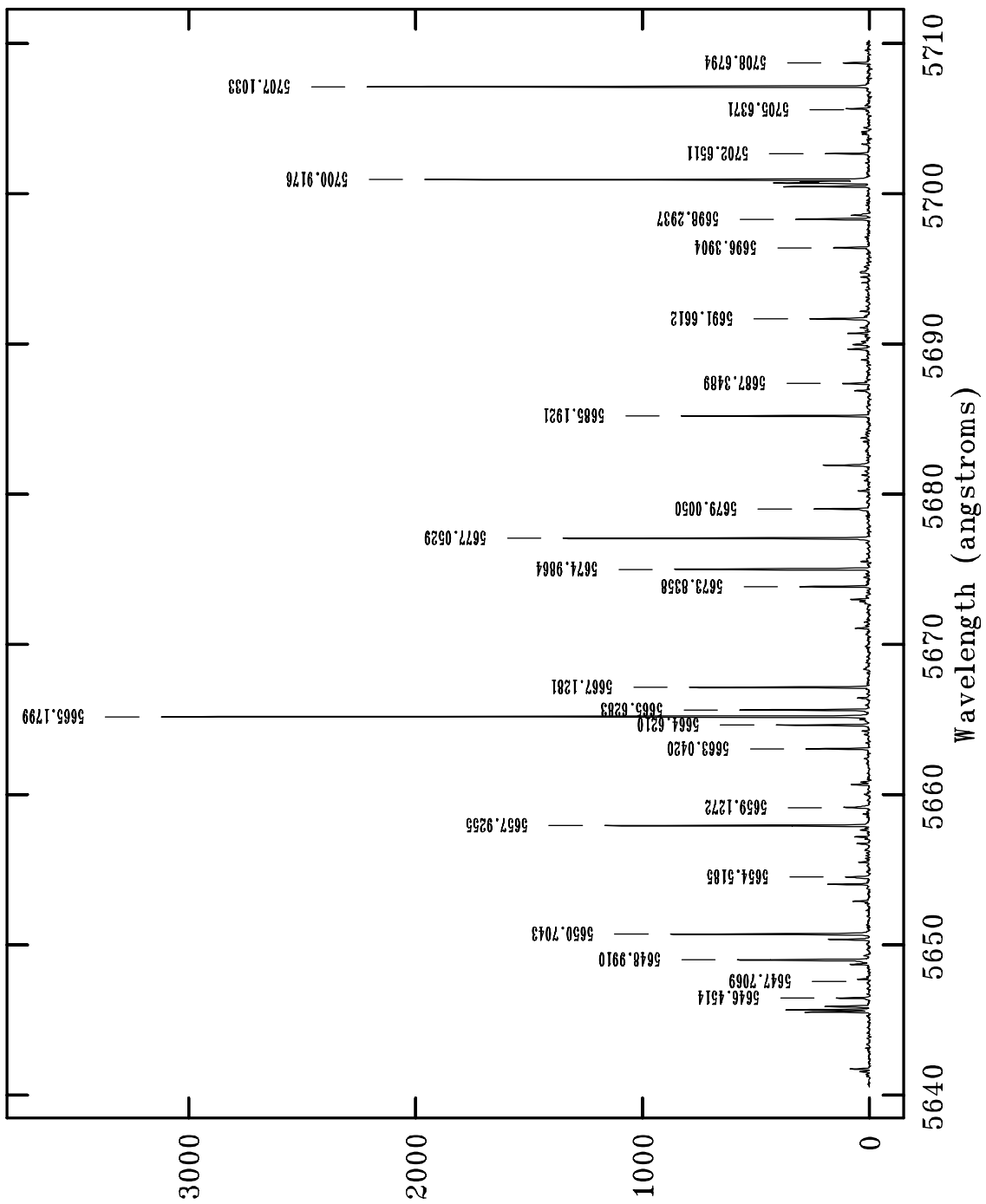


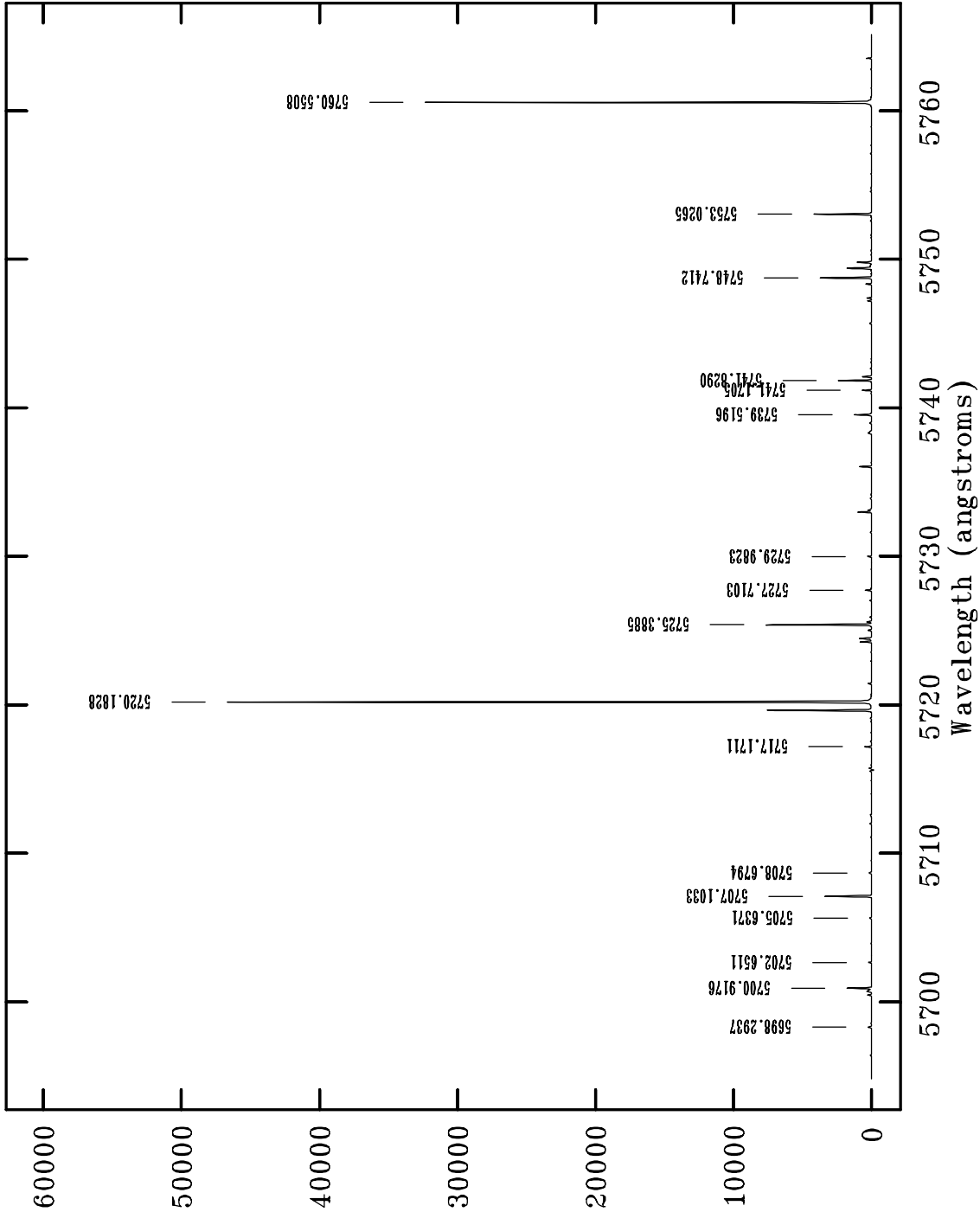
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 21:46:55 30-Nov-2000
Aperture 12, Image line 12, Order 107
ecidentify 077: UNKNOWN



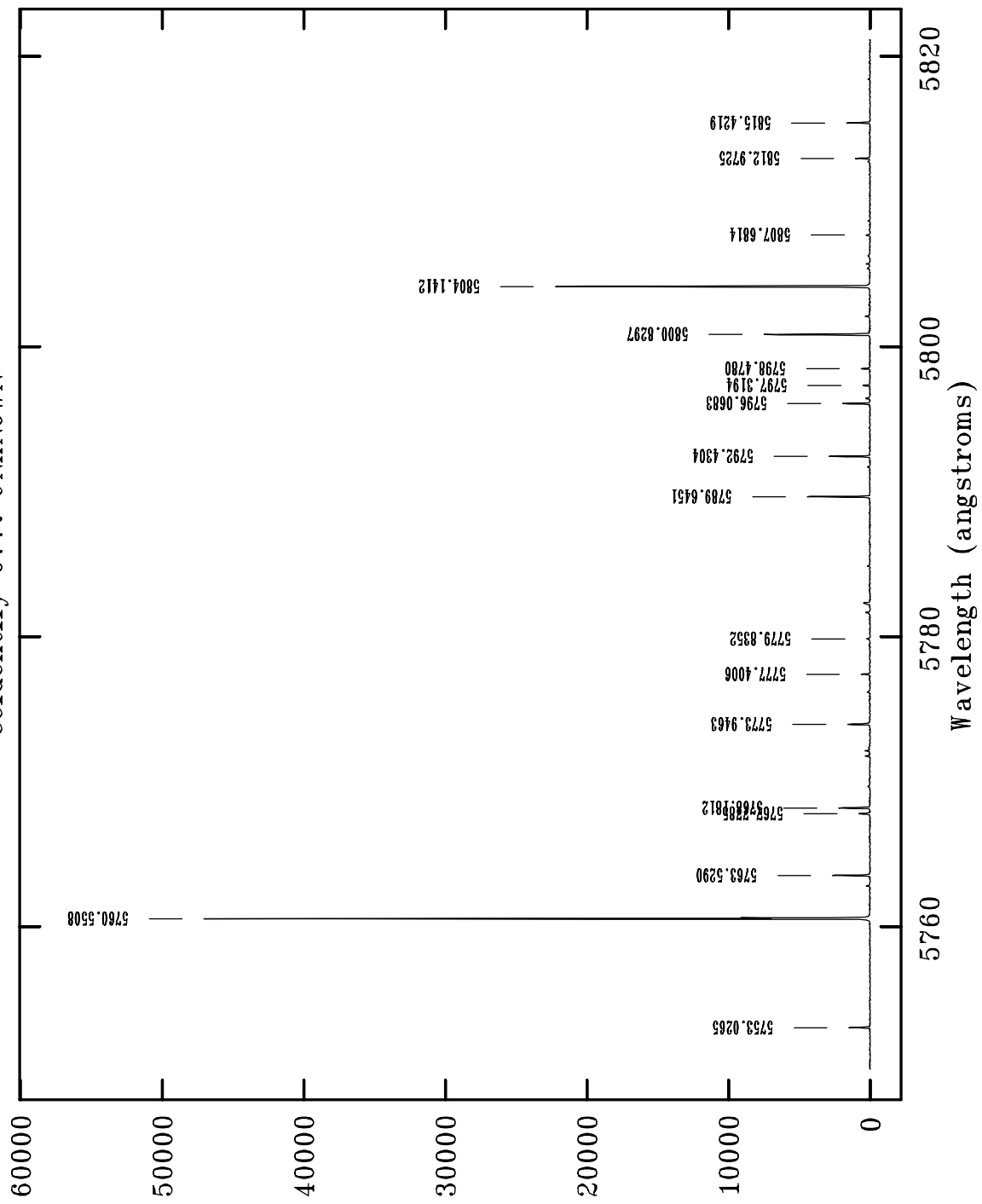


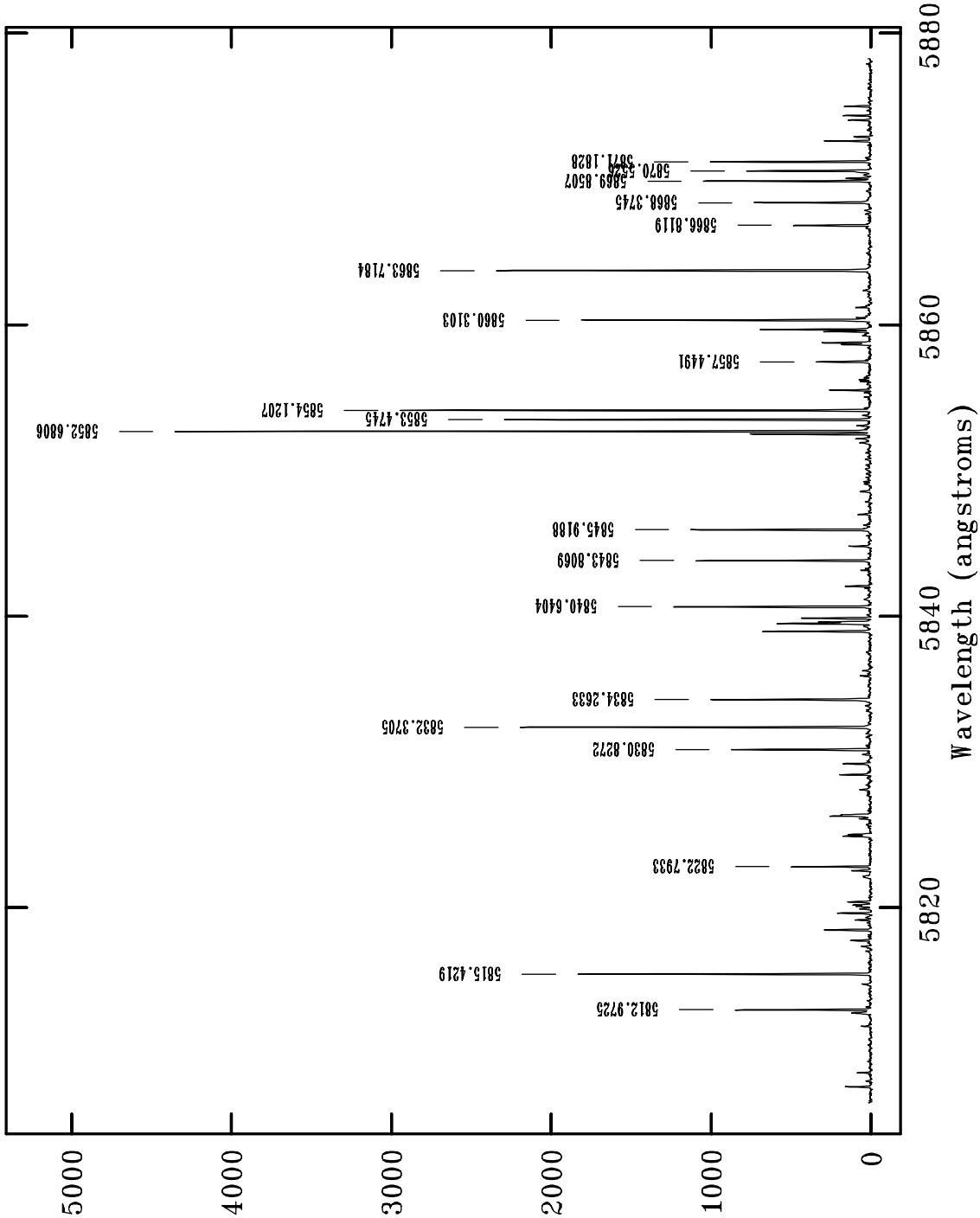
NOAO/IRAF V2.11.3EXPORT honda@hds Wed 23:15:27 13-Sep-2000
Aperture 10, Image line 10, Order 105
ecidentify 077: UNKNOWN



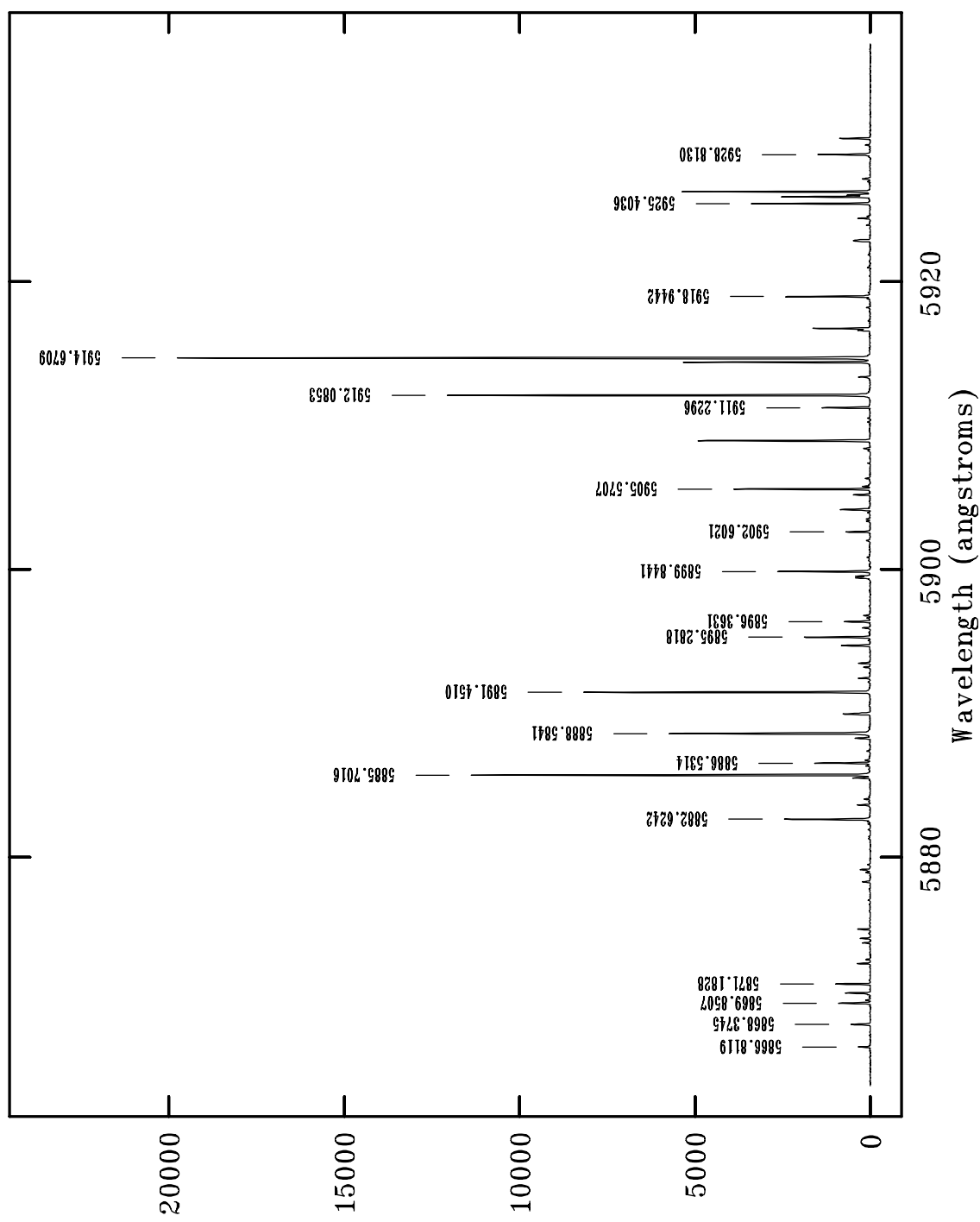


NOAO/IRAF V2.11.3EXPORT honda@hds Wed 23:10:48 13-Sep-2000
Aperture 8, Image line 8, Order 103
identify 077: UNKNOWN



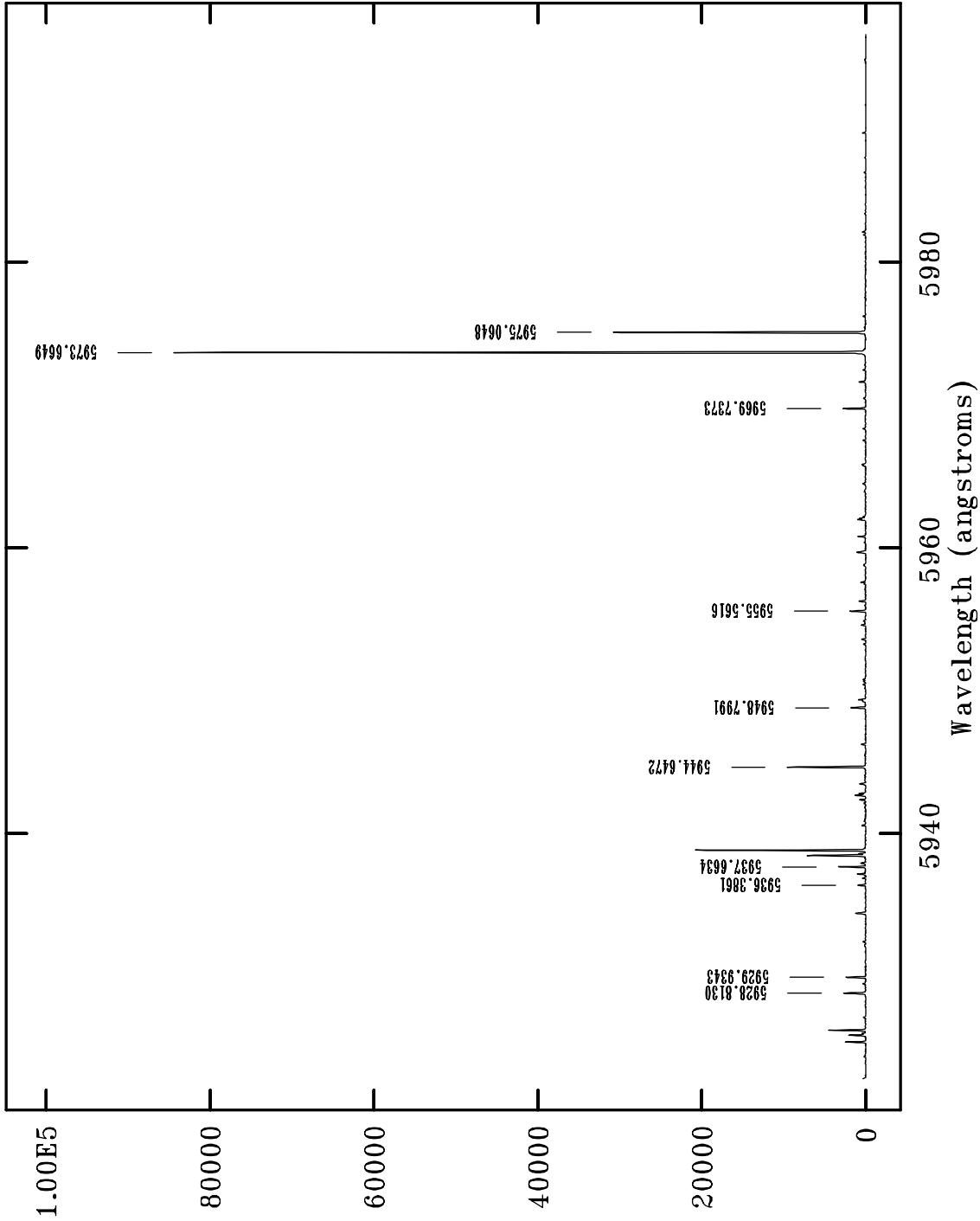


NOAO/IRAF V2.11.3EXPORT honda@hds Wed 23:06:20 13-Sep-2000
Aperture 6, Image line 6, Order 101
identify 077: UNKNOWN

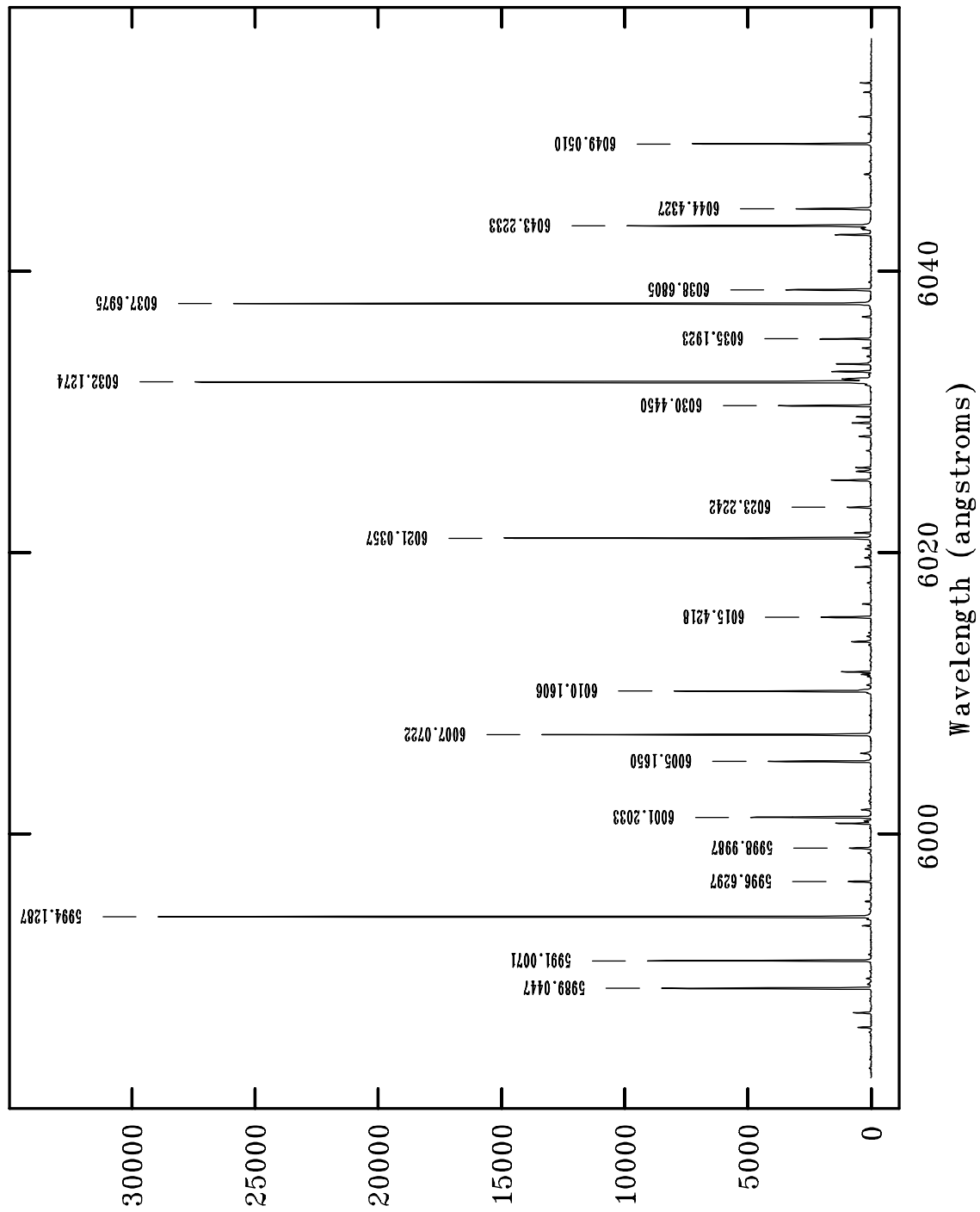


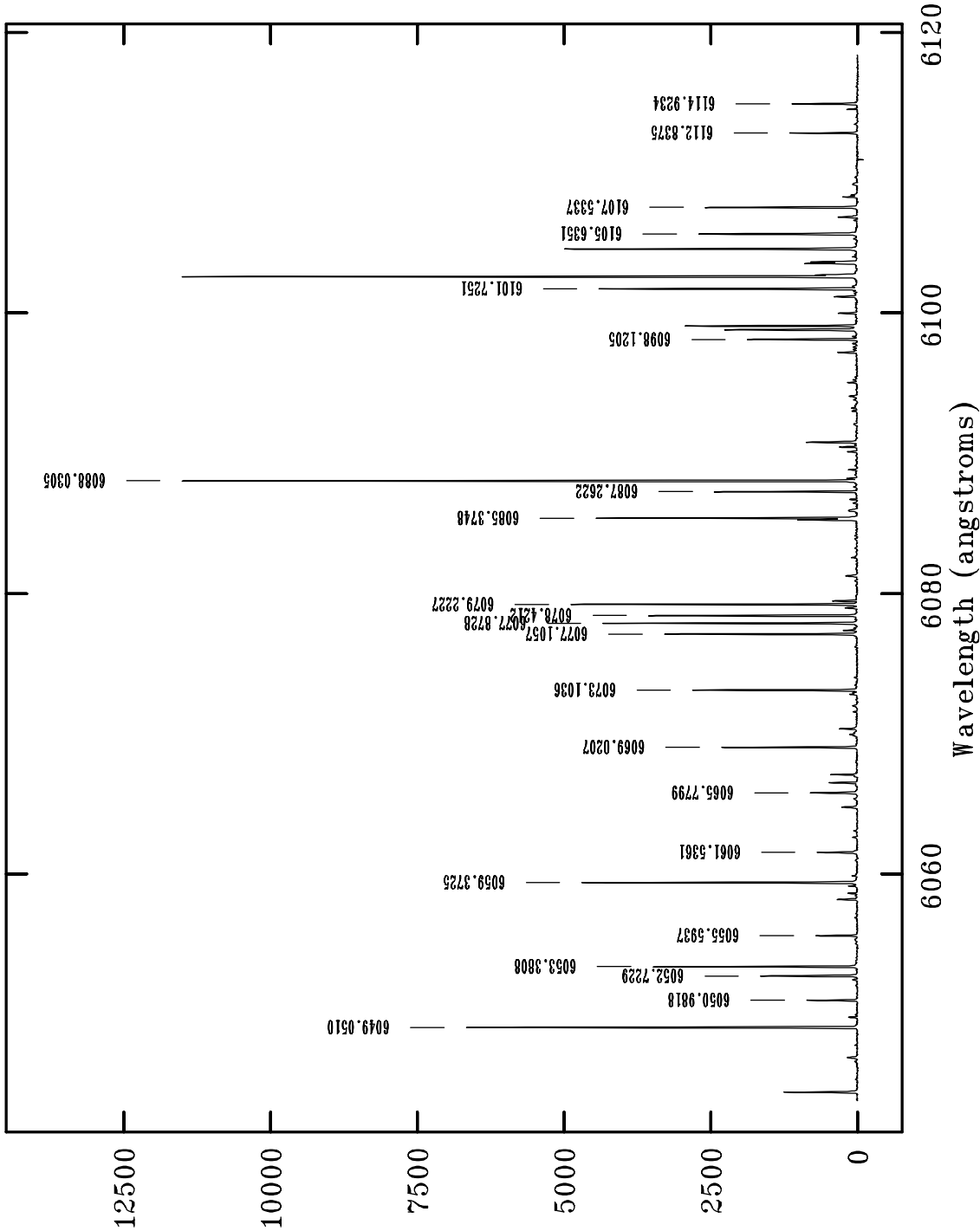
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 21:45:44 30-Nov-2000
Aperture 5, Image line 5, Order 100
ecidentify 077: UNKNOWN

Echelle Order = 100

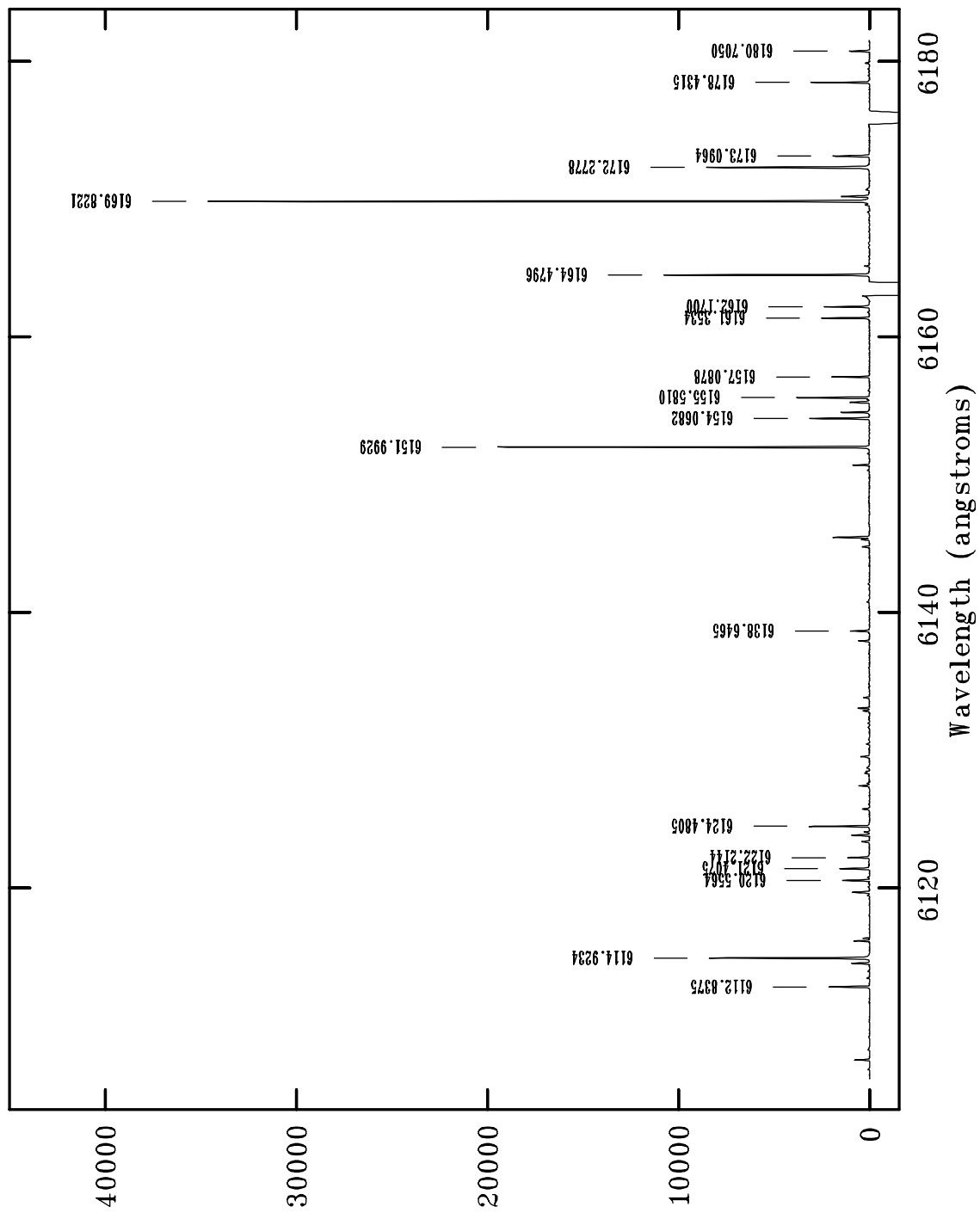


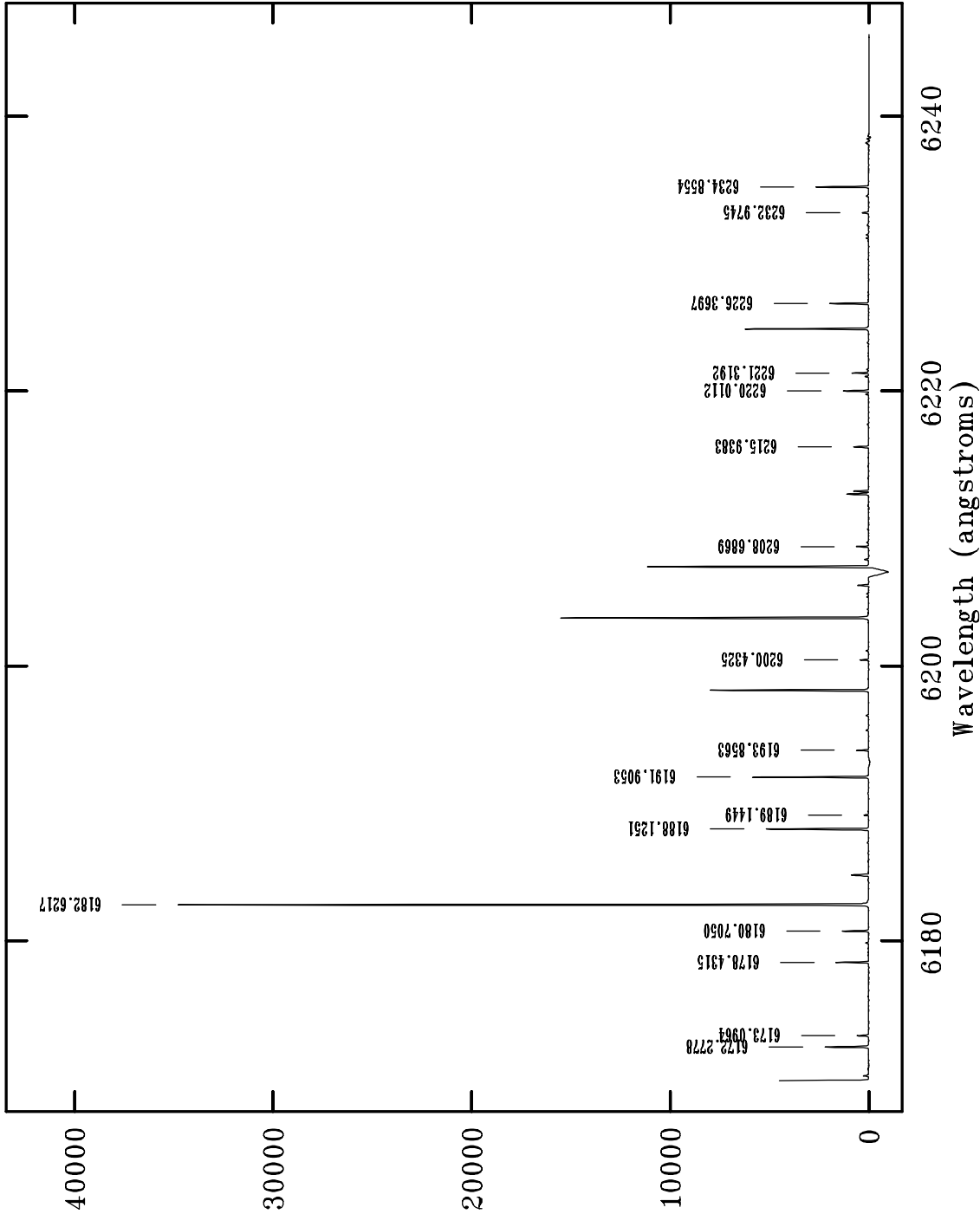
NOAO/IRAF V2.11.3EXPORT honda@hds Wed 22:56:55 13-Sep-2000
Aperture 4, Image line 4, Order 99
ecidentify 077: UNKNOWN



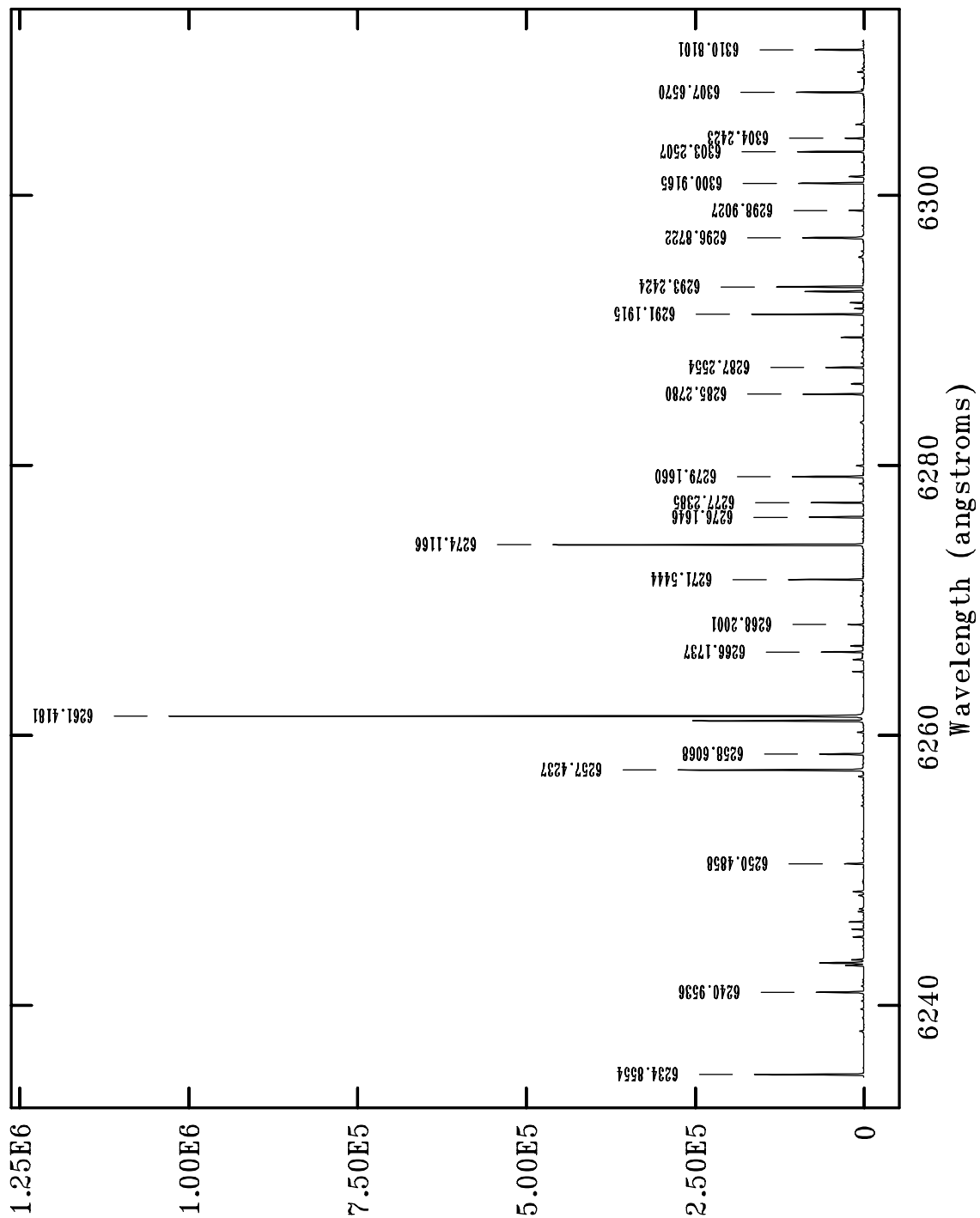


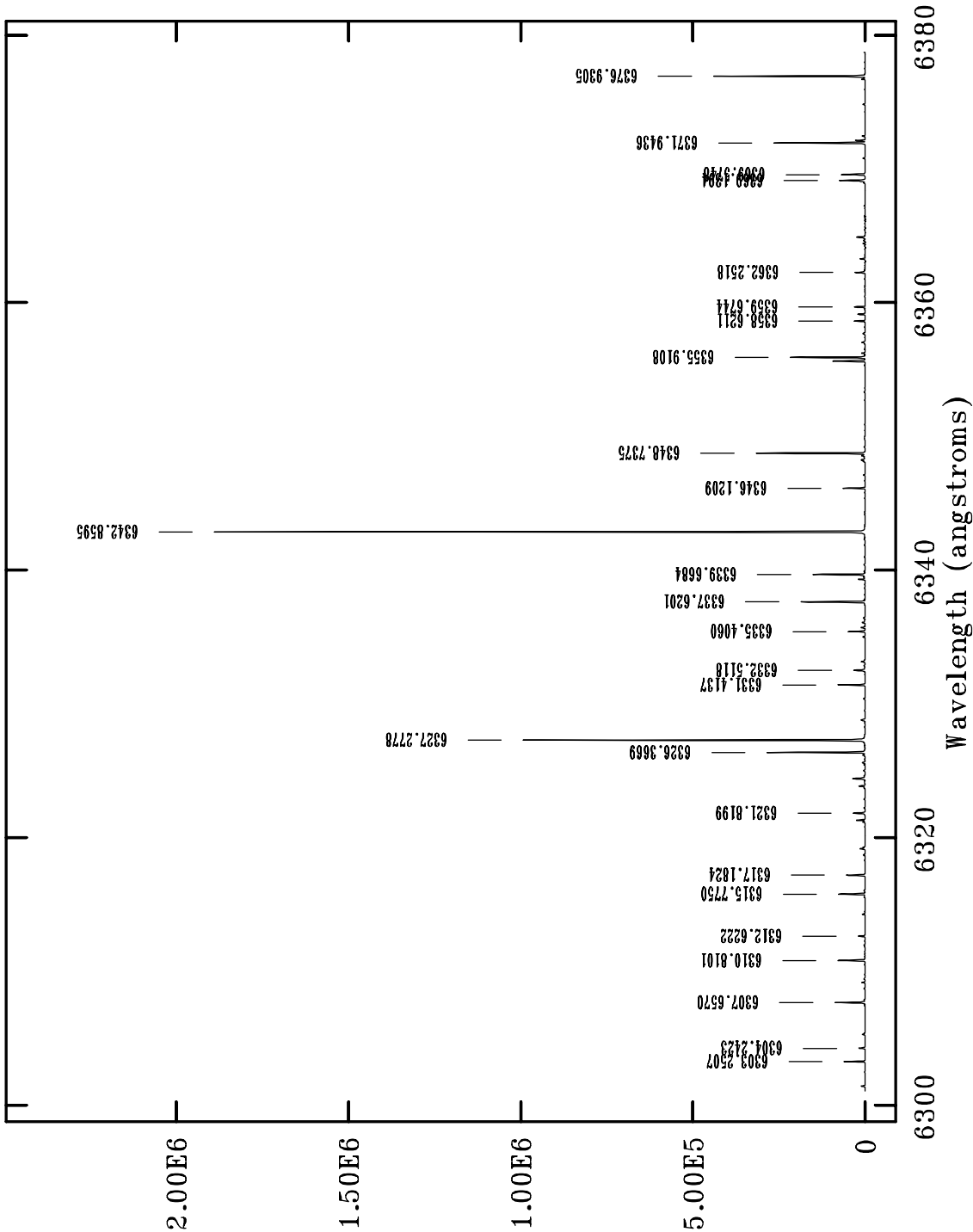
NOAO/IRAF V2.11.3EXPORT honda@hds Wed 22:49:19 13-Sep-2000
 Aperture 2, Image line 2, Order 97
 identify 077: UNKNOWN



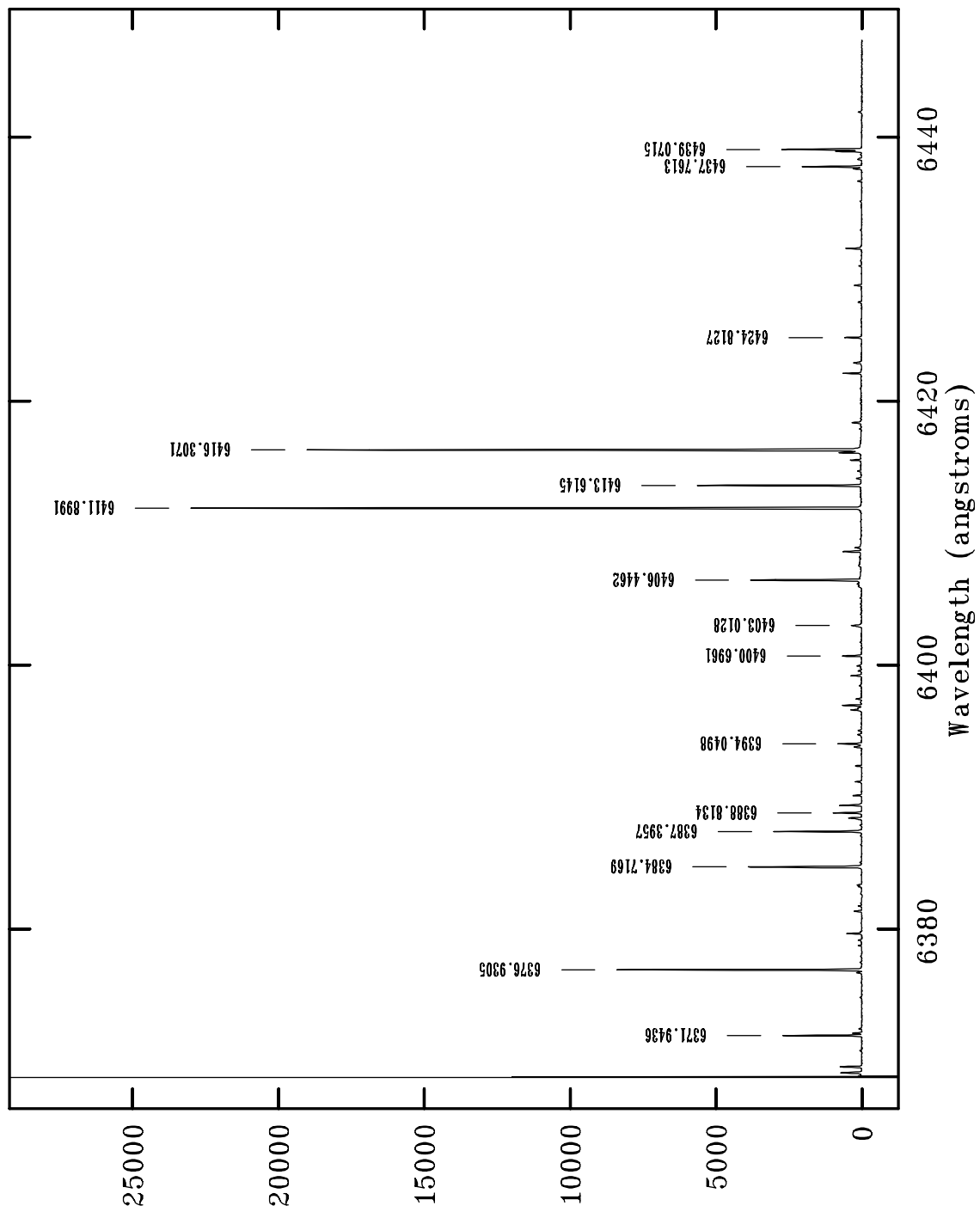


NOAO/IRAF V2.11.3EXPORT honda@hds Sun 18:07:53 17-Dec-2000
Aperture 3, Image line 3, Order 97
ecidentify COMPARISON_B_F_02.ec: COMPARISON

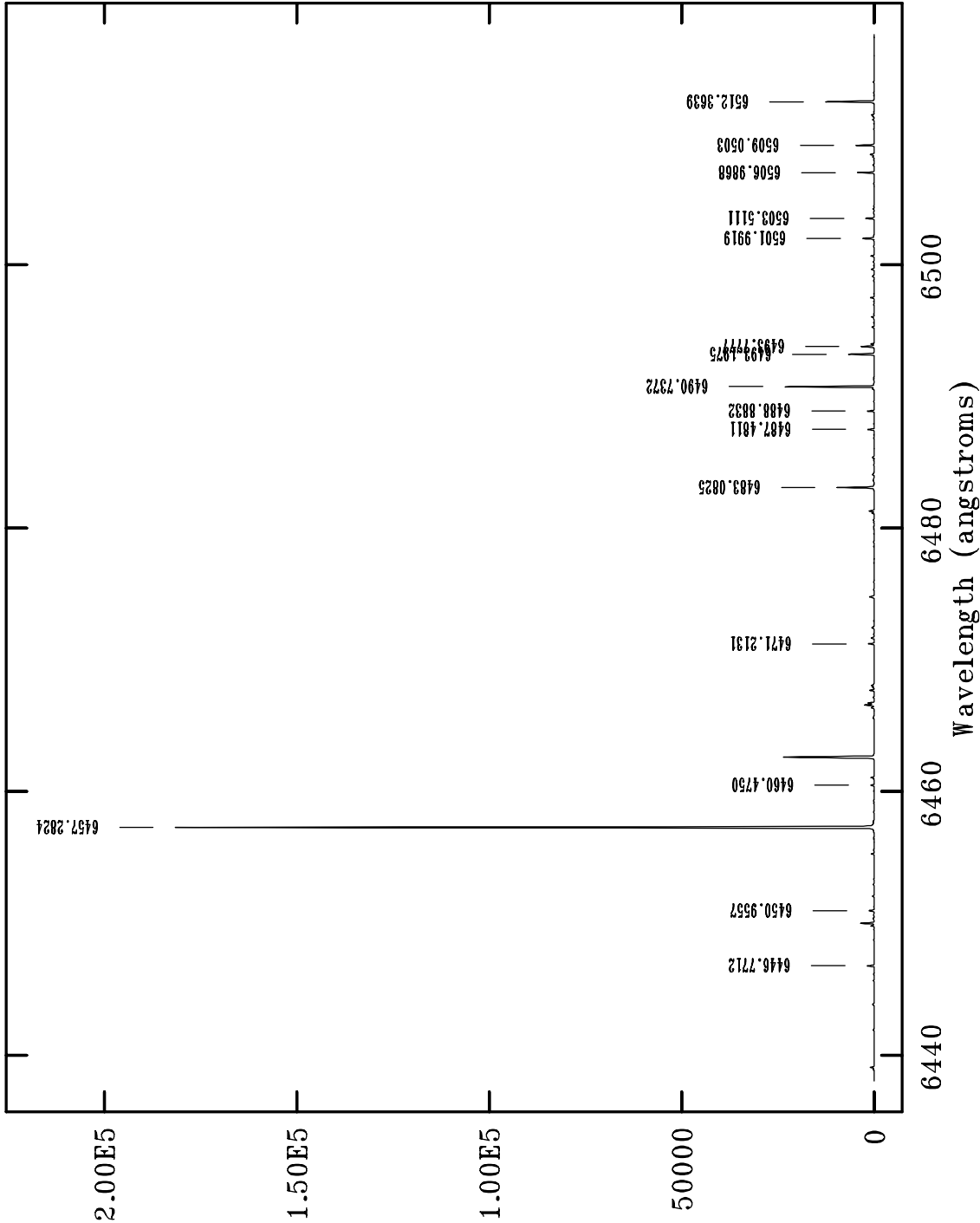




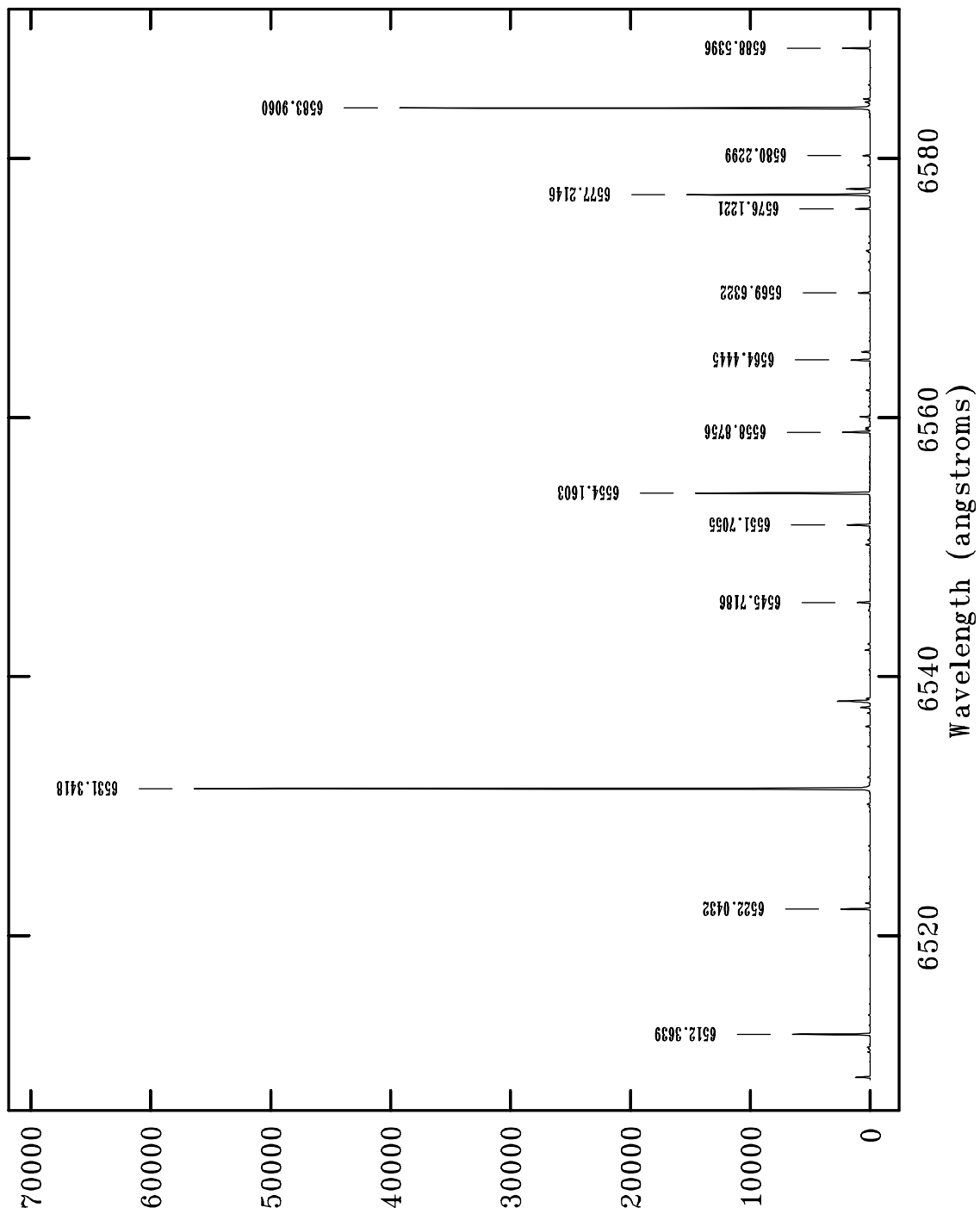
NOAO/IRAF V2.11.3EXPORT honda@hds Wed 18:37:05 13-Sep-2000
Aperture 16, Image line 16, Order 95
identify 076: UNKNOWN

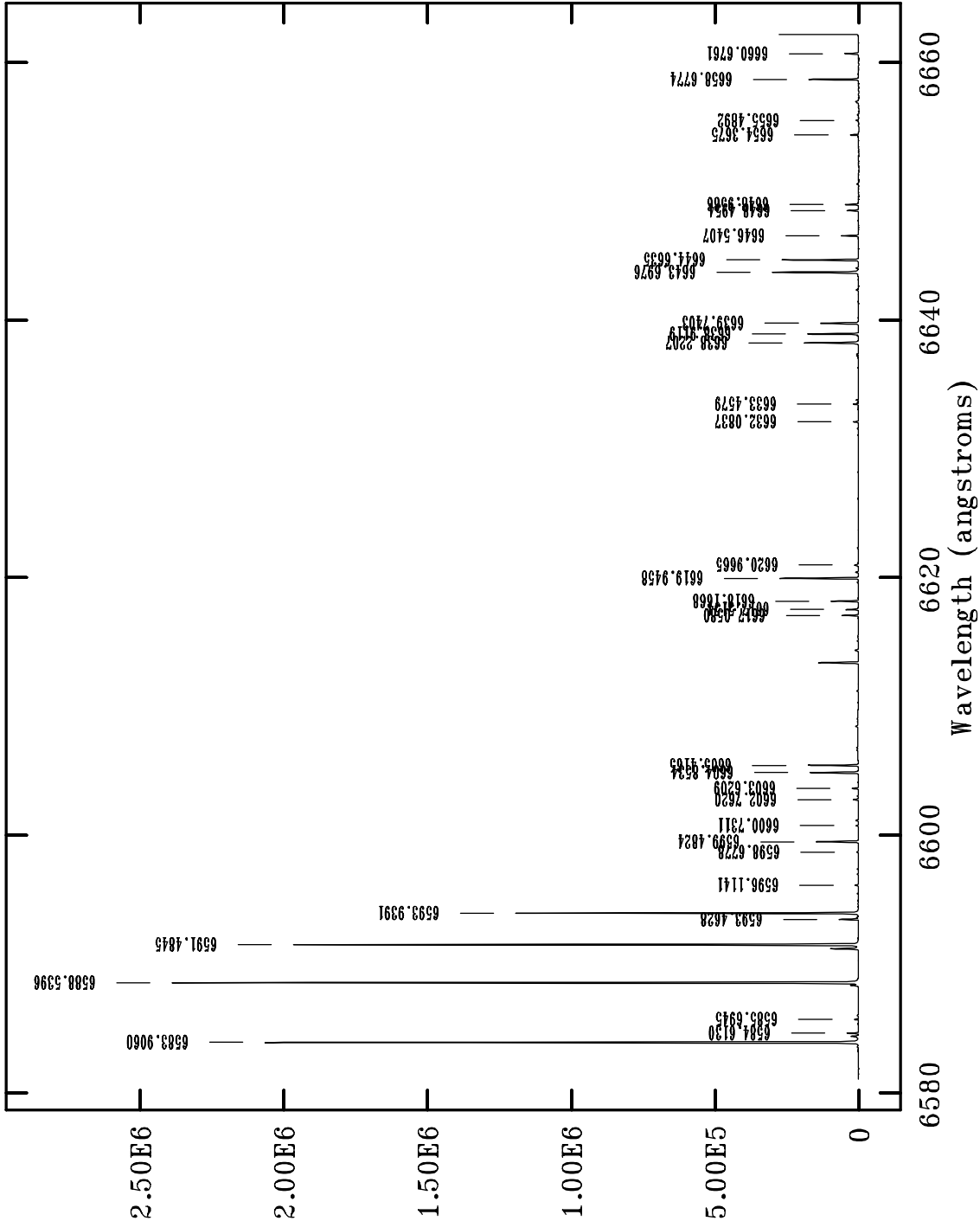


NOAO/IRAF V2.11.3EXPORT honda@hds Wed 18:33:39 13-Sep-2000
Aperture 15, Image line 15, Order 94
ecidentify 076: UNKNOWN

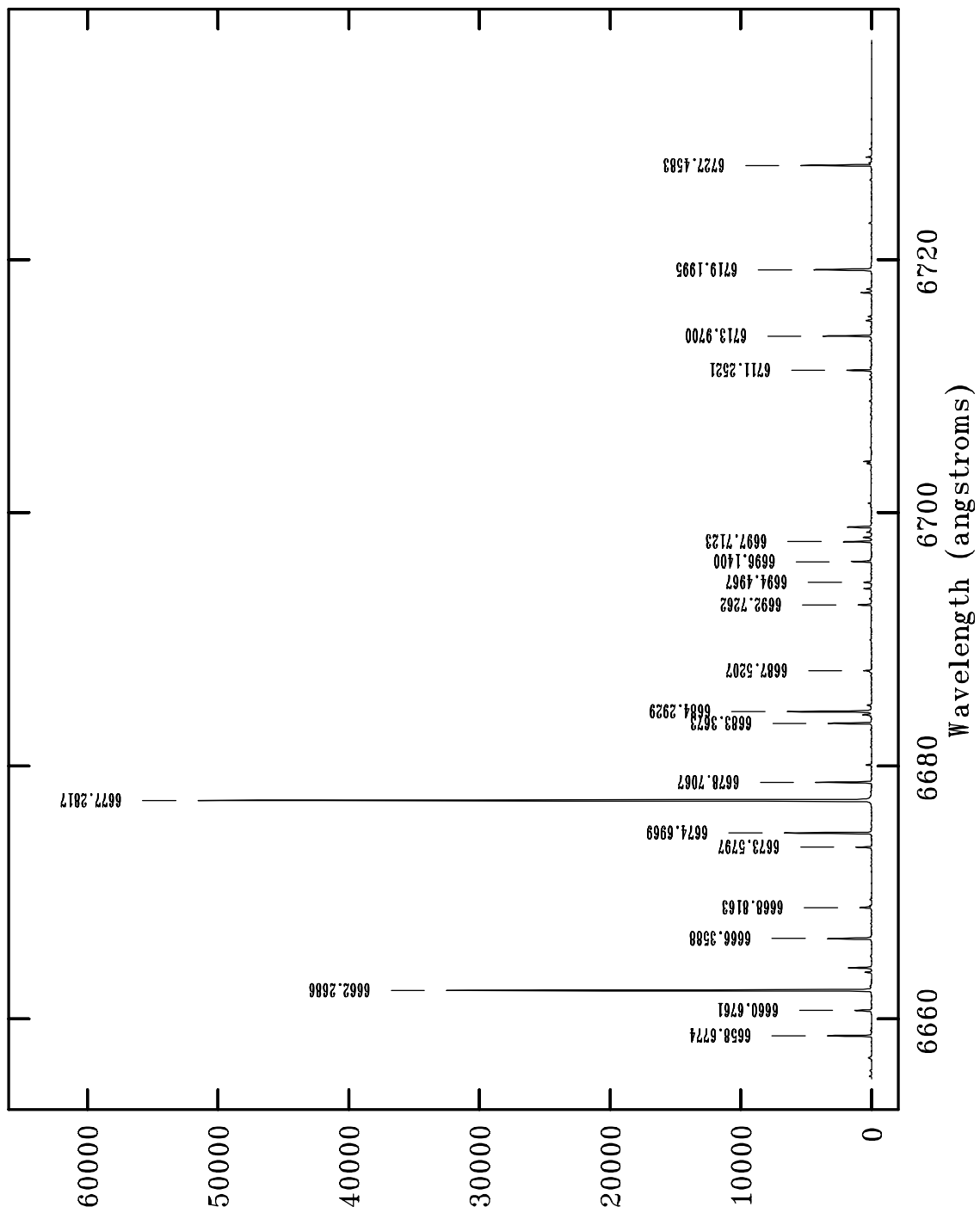


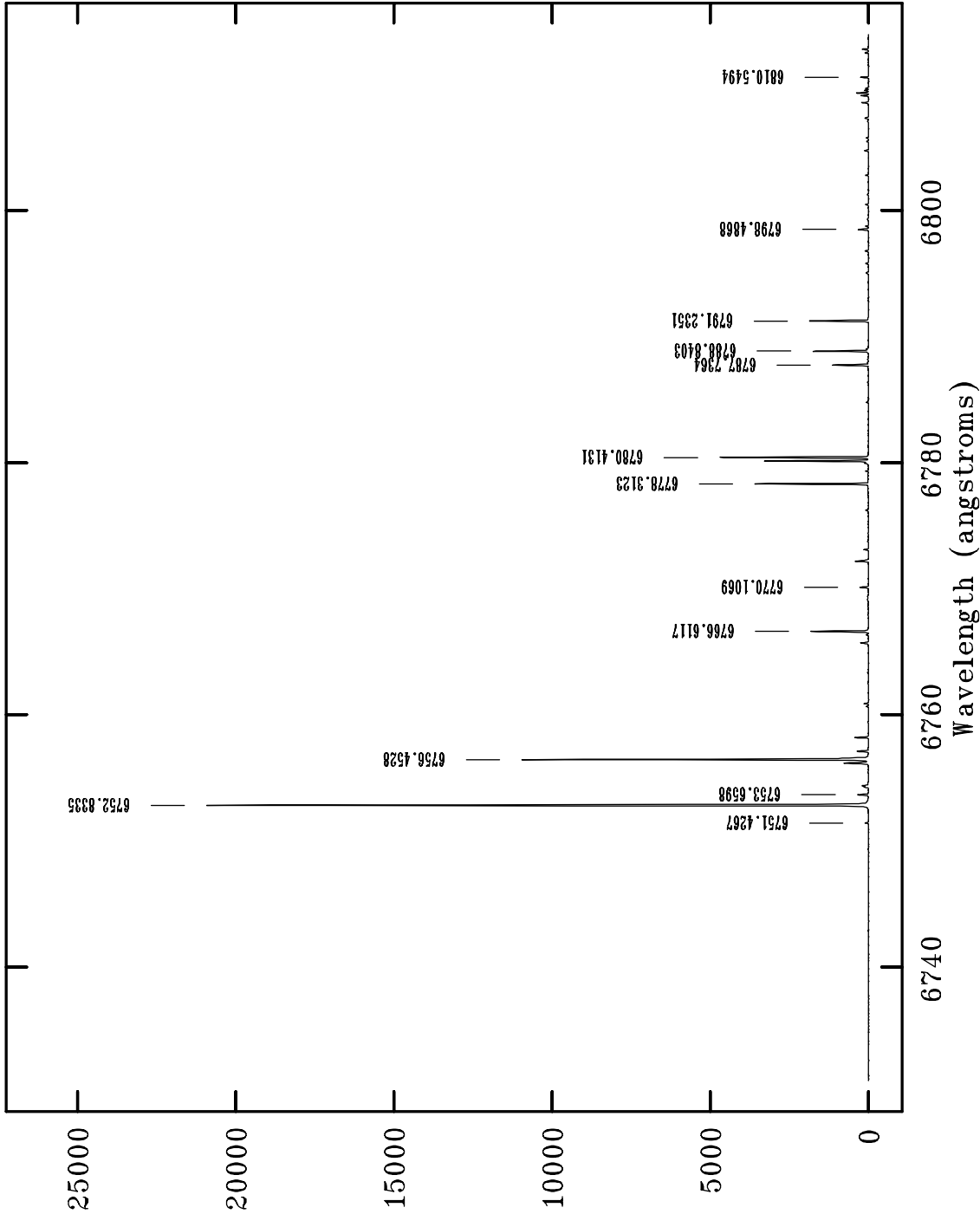
NOAO/IRAF V2.11.3EXPORT honda@hds Wed 18:29:54 13-Sep-2000
Aperture 14, Image line 14, Order 91
ecidentify 076: UNKNOWN



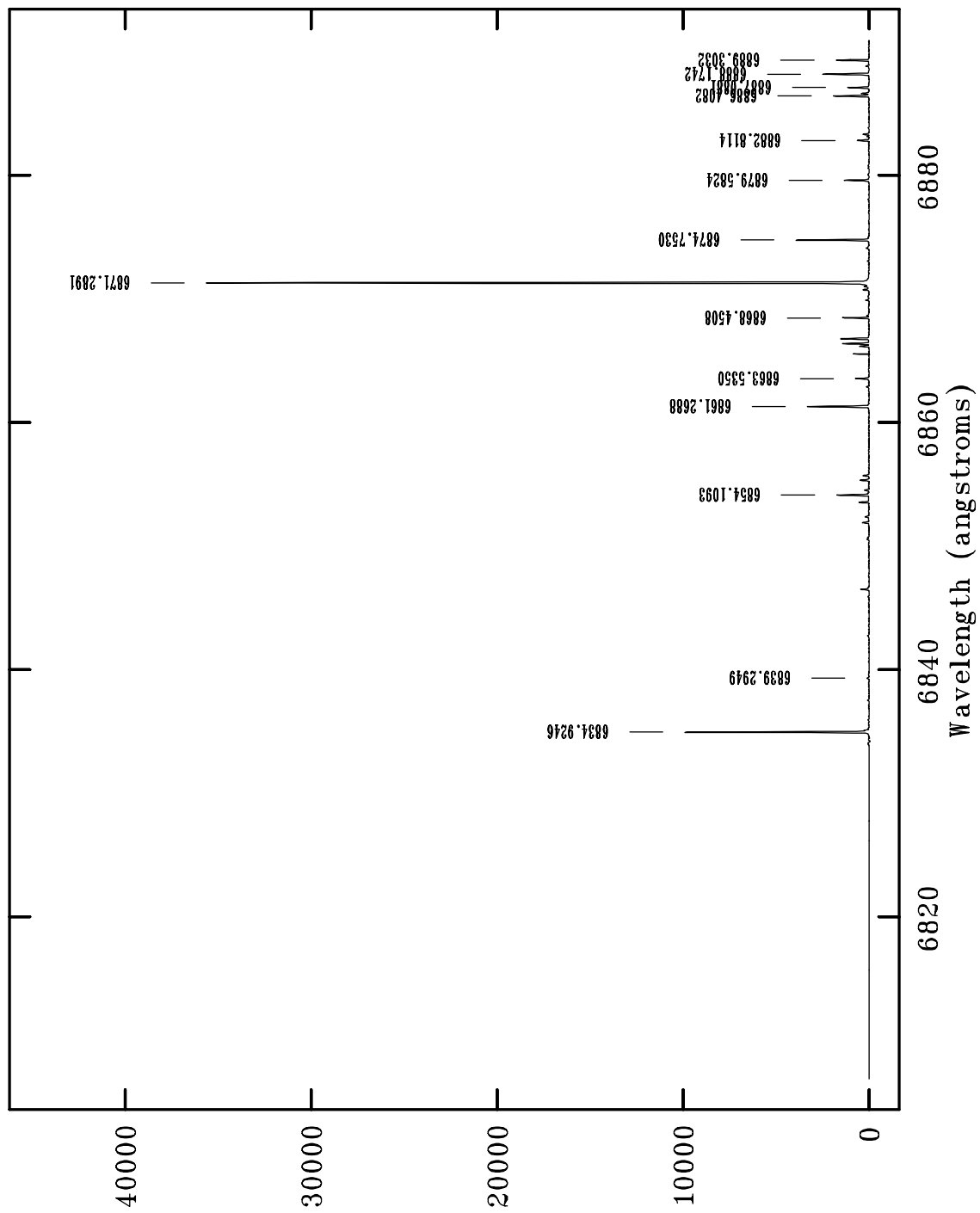


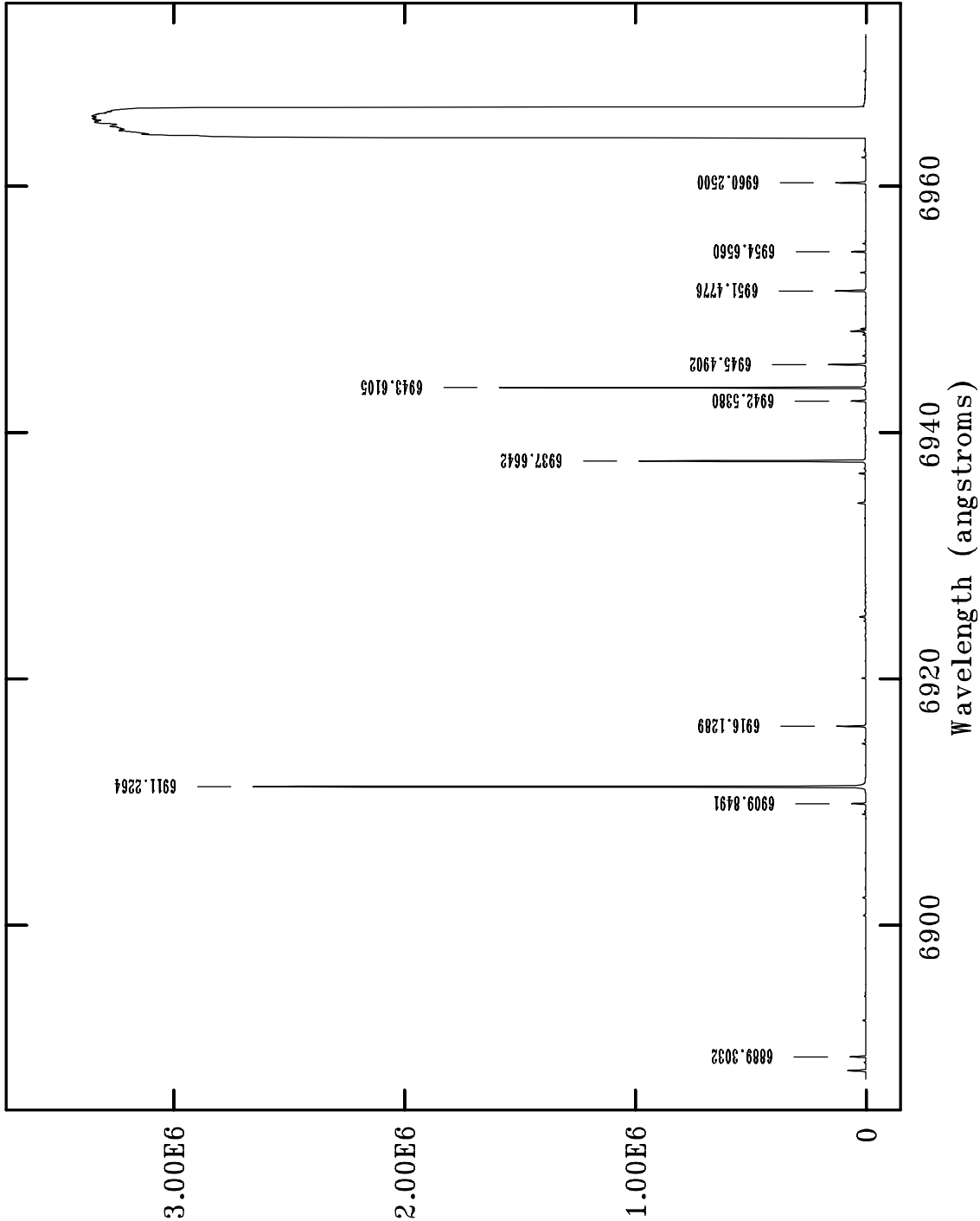
NOAO/IRAF V2.11.3EXPORT honda@hds Wed 18:24:28 13-Sep-2000
Aperture 12, Image line 12, Order 89
identify 076: UNKNOWN



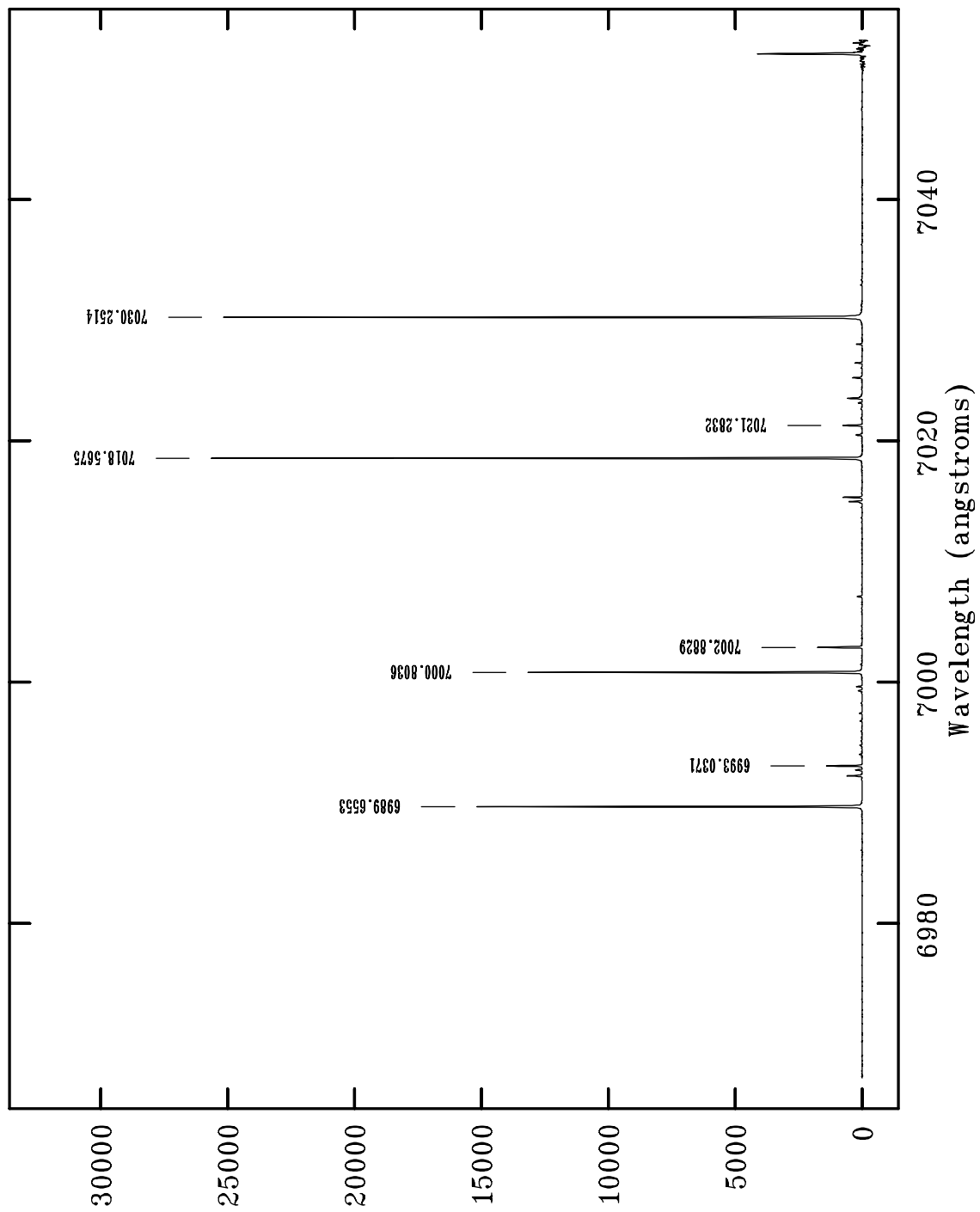


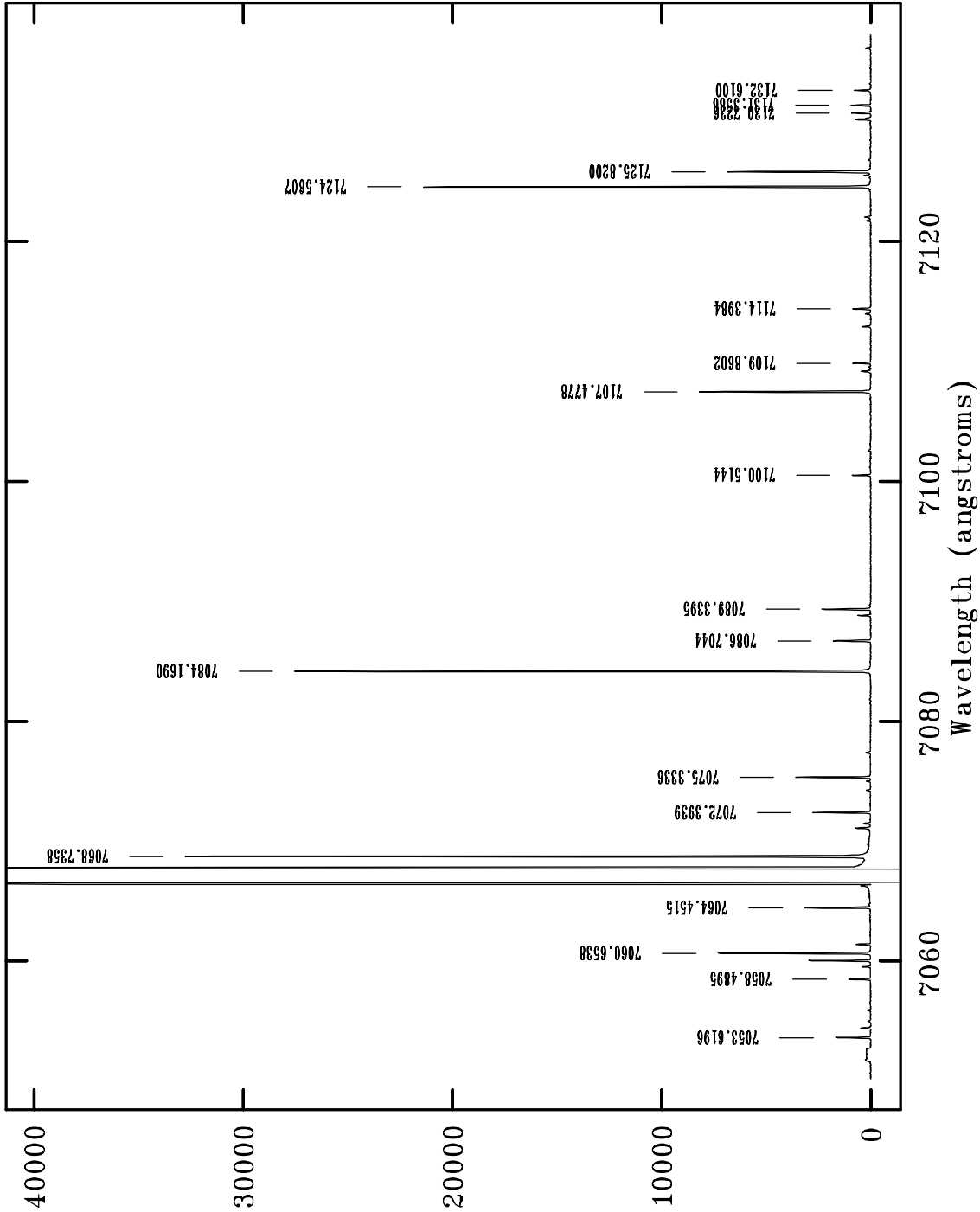
NOAO/IRAF V2.11.3EXPORT honda@hds Wed 18:05:59 13-Sep-2000
 Aperture 15, Image line 15, Order 87
 identify 063: UNKNOWN



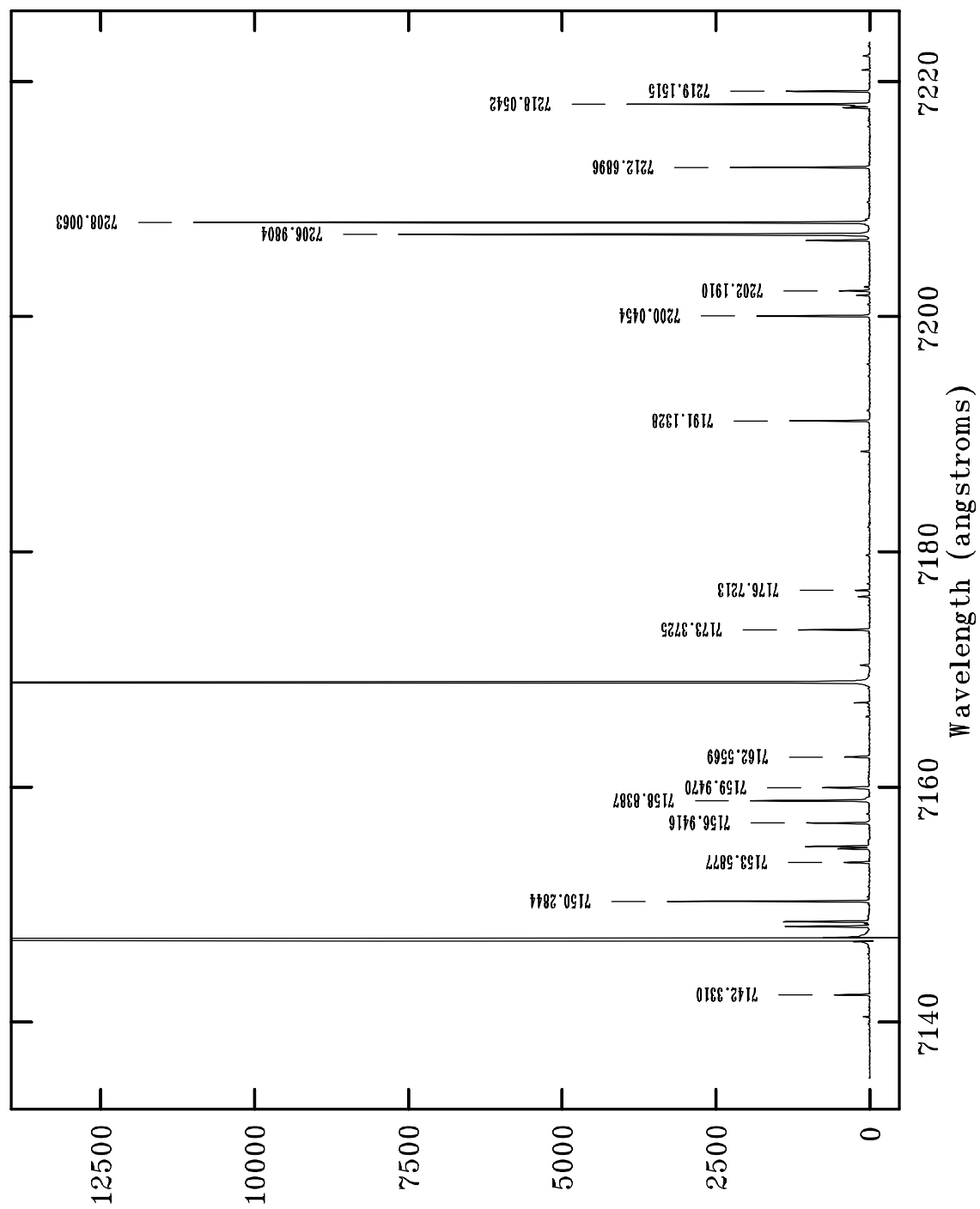


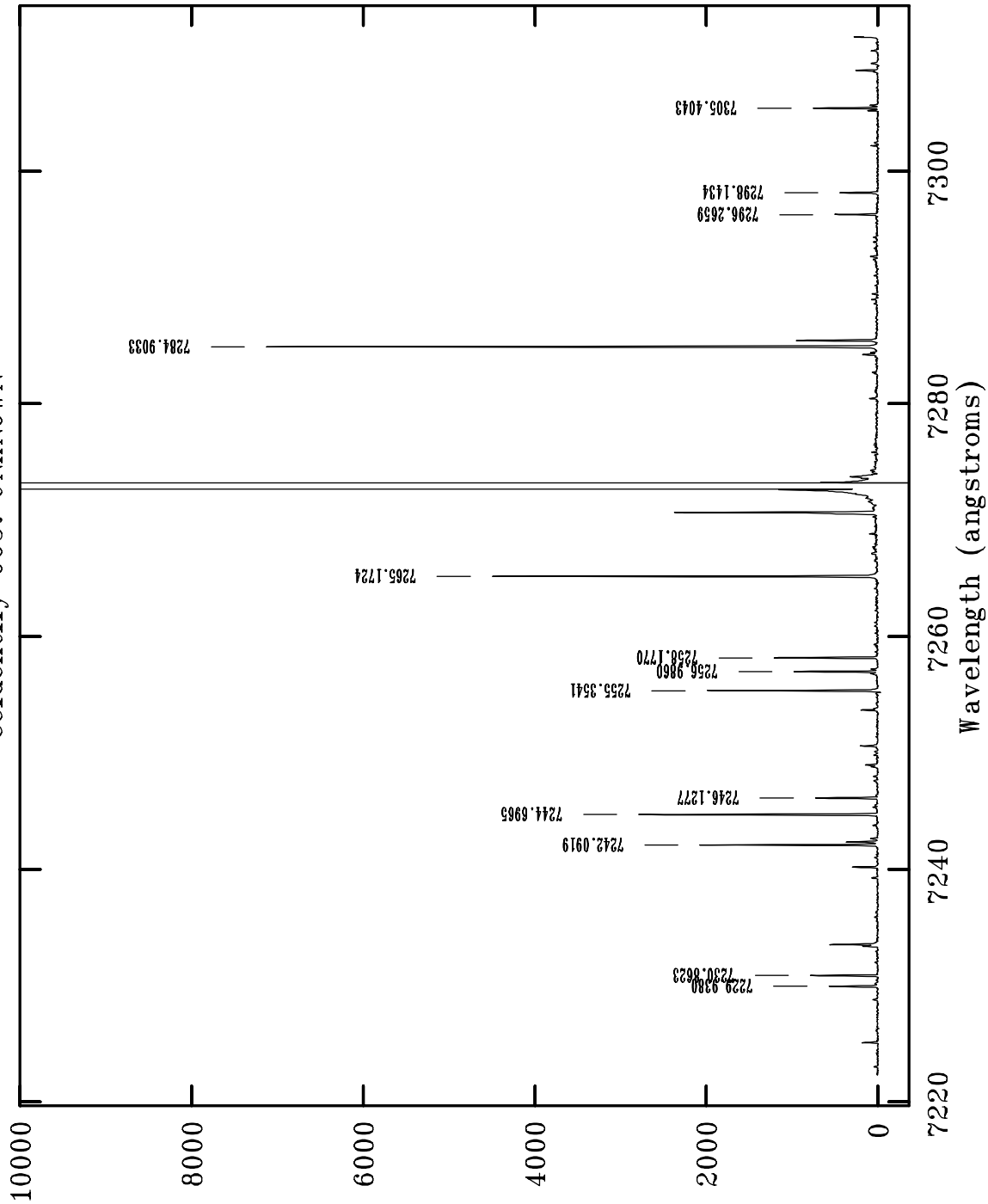
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 15:59:32 30-Nov-2000
Aperture 13, Image line 13, Order 85
identify 063: UNKNOWN



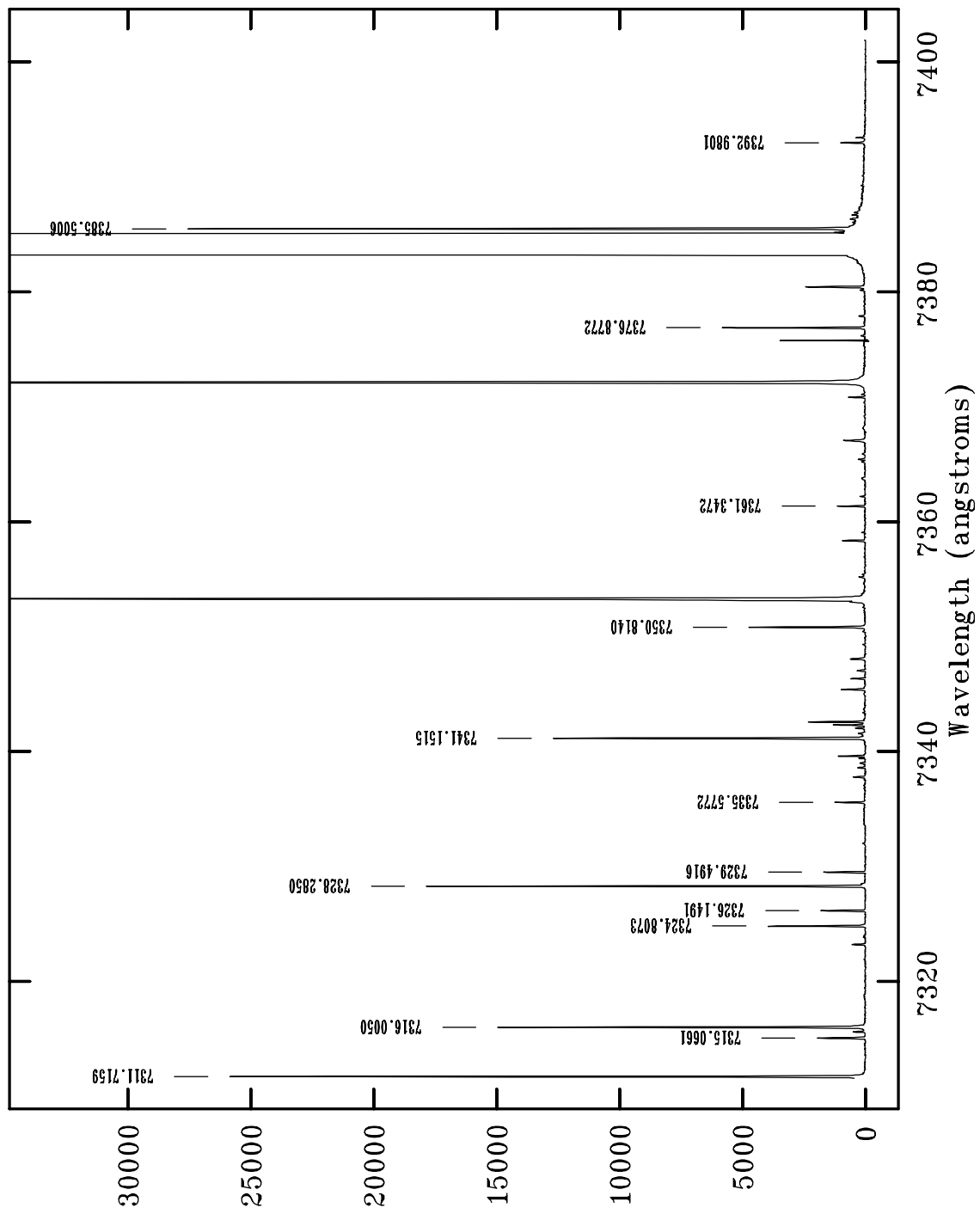


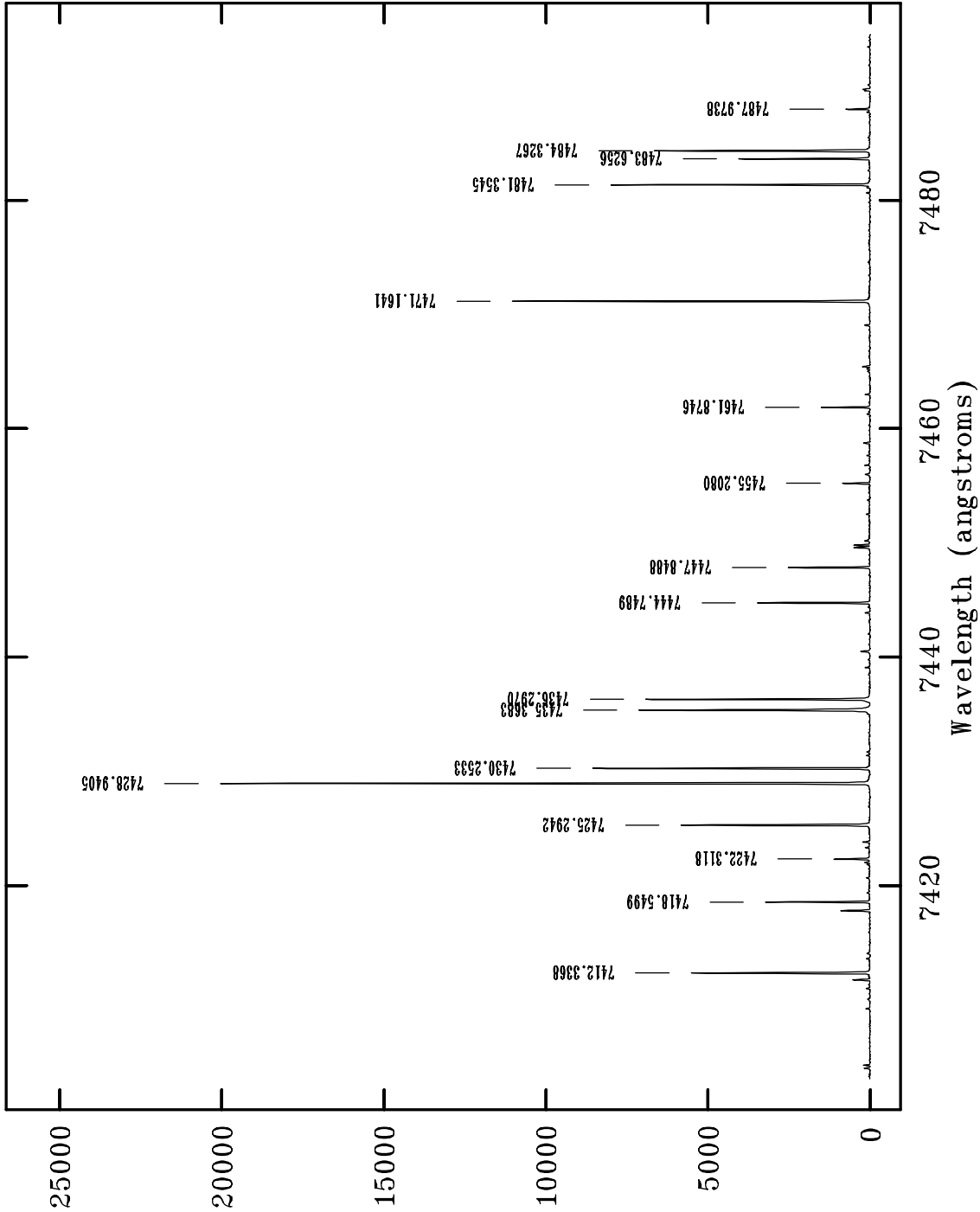
NOAO/IRAF V2.11.3EXPORT honda@hds Wed 18:01:07 13-Sep-2000
Aperture 11, Image line 11, Order 83
identify 063: UNKNOWN



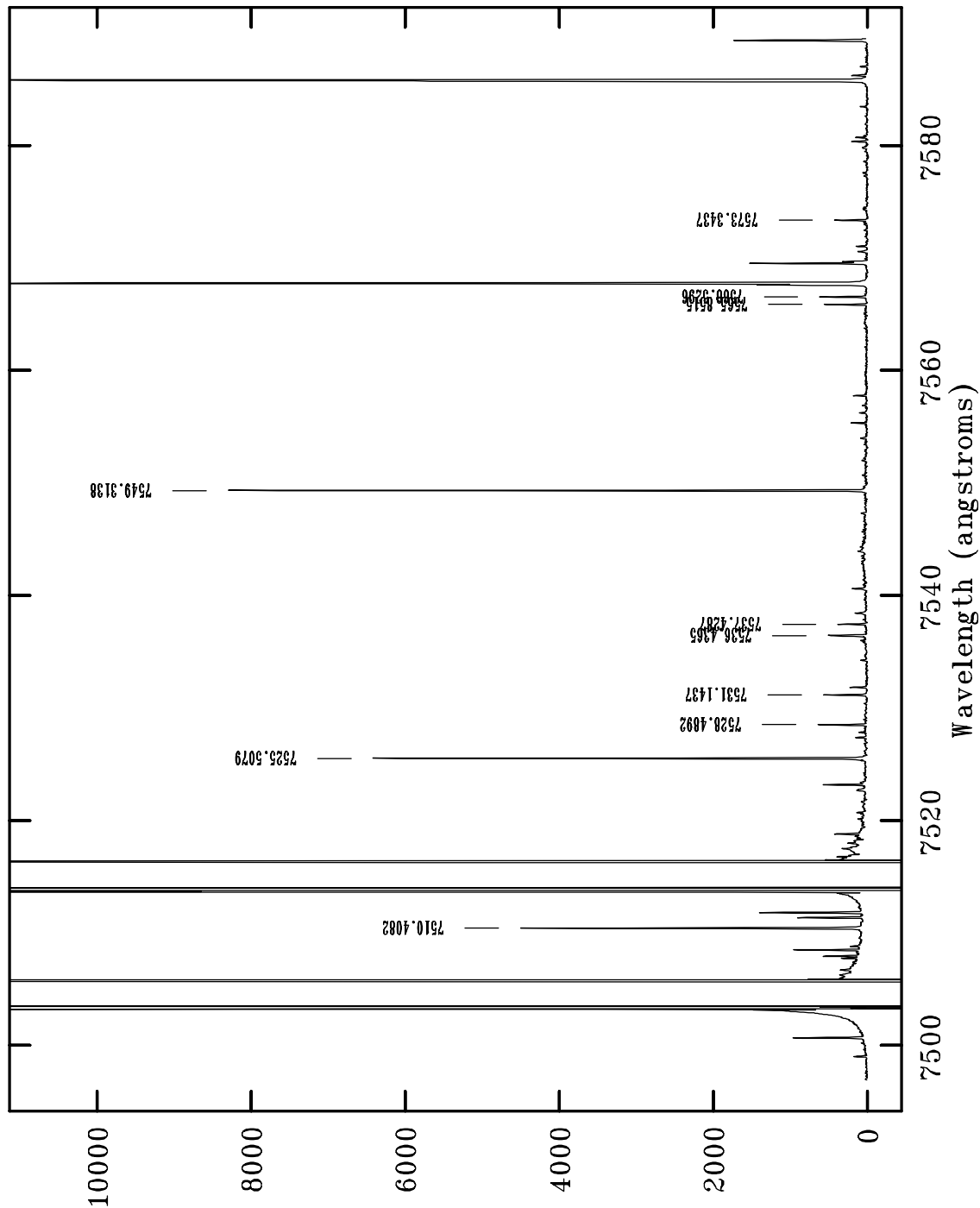


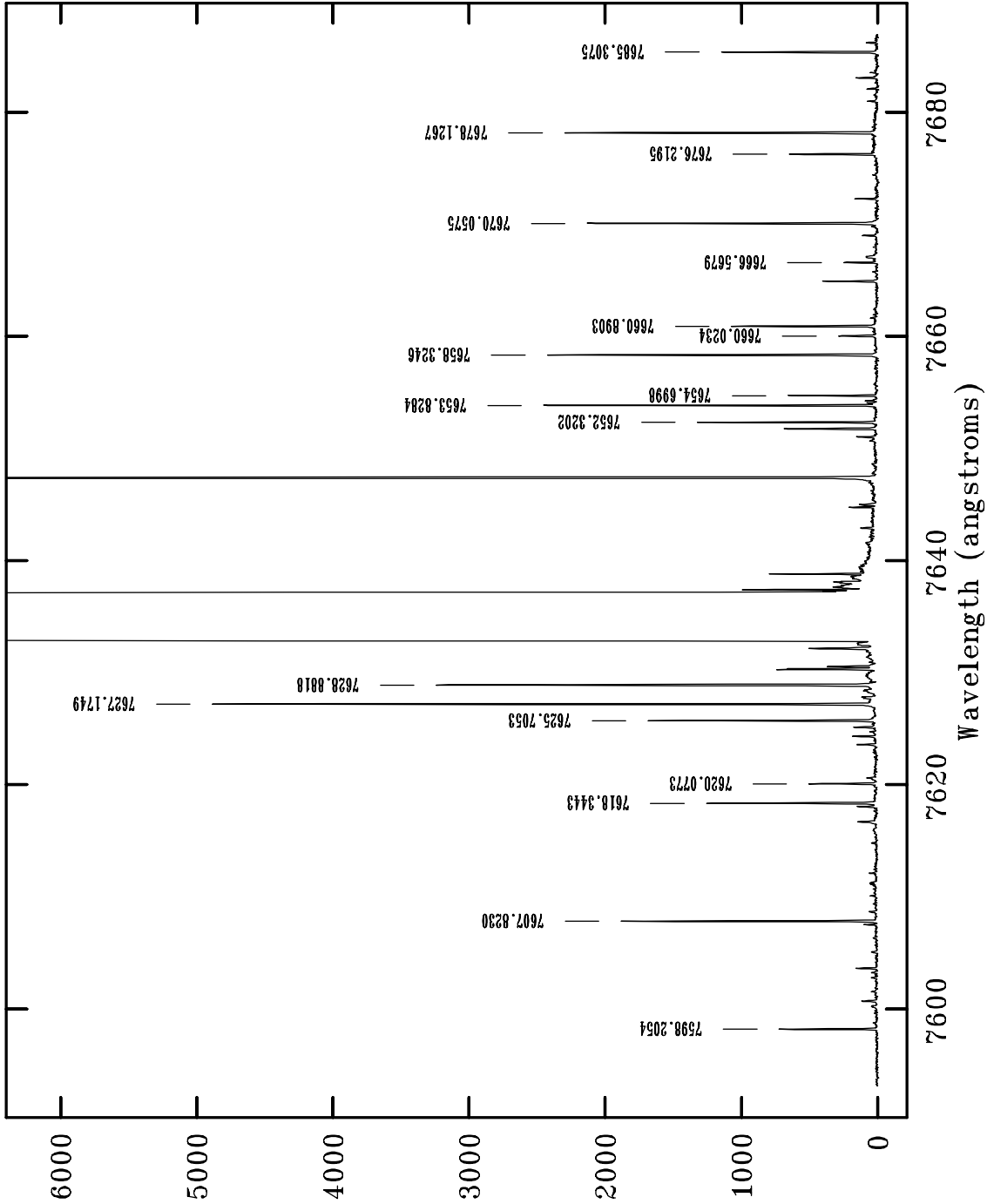
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 15:47:37 30-Nov-2000
Aperture 9, Image line 9, Order 81
identify 063: UNKNOWN



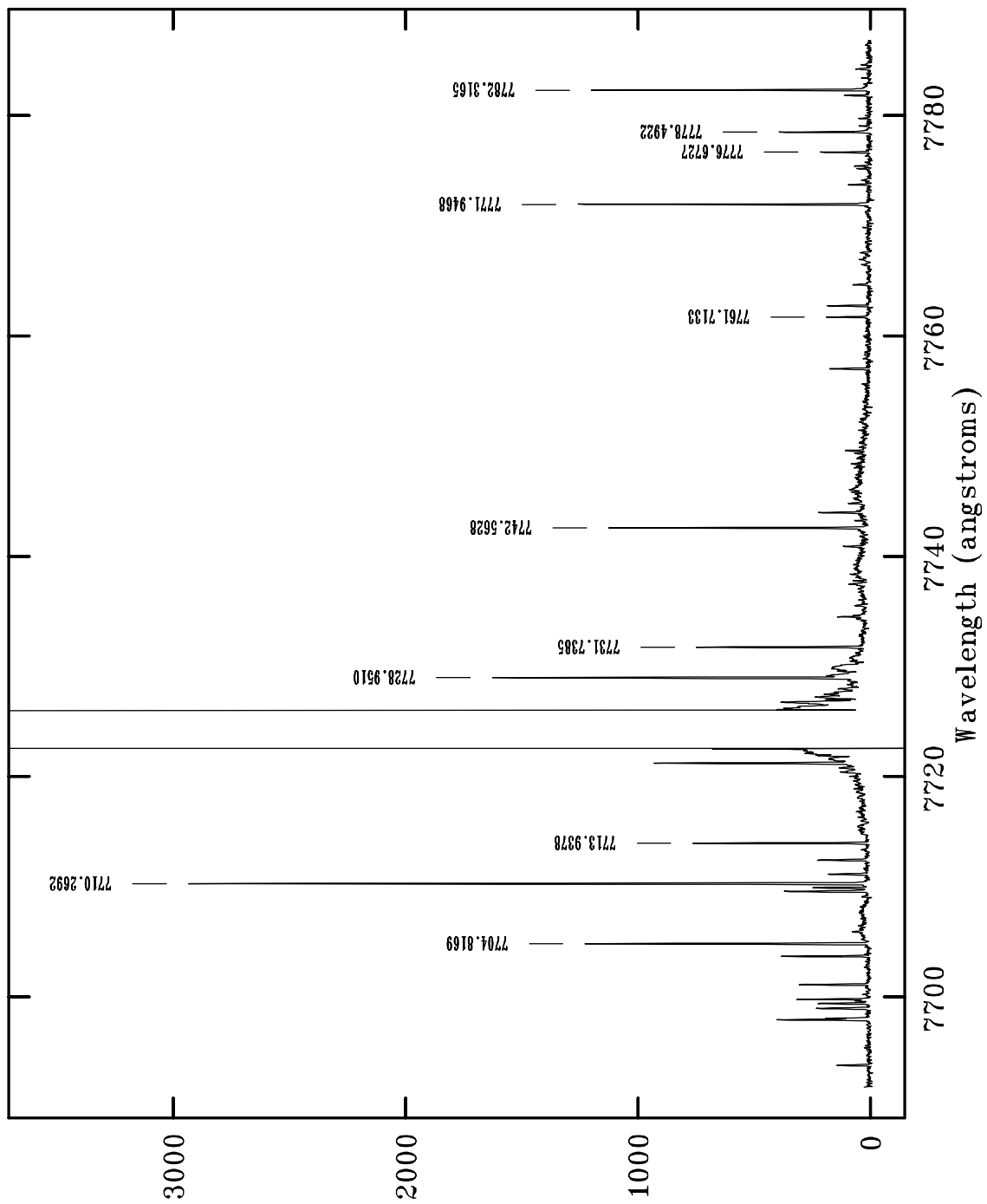


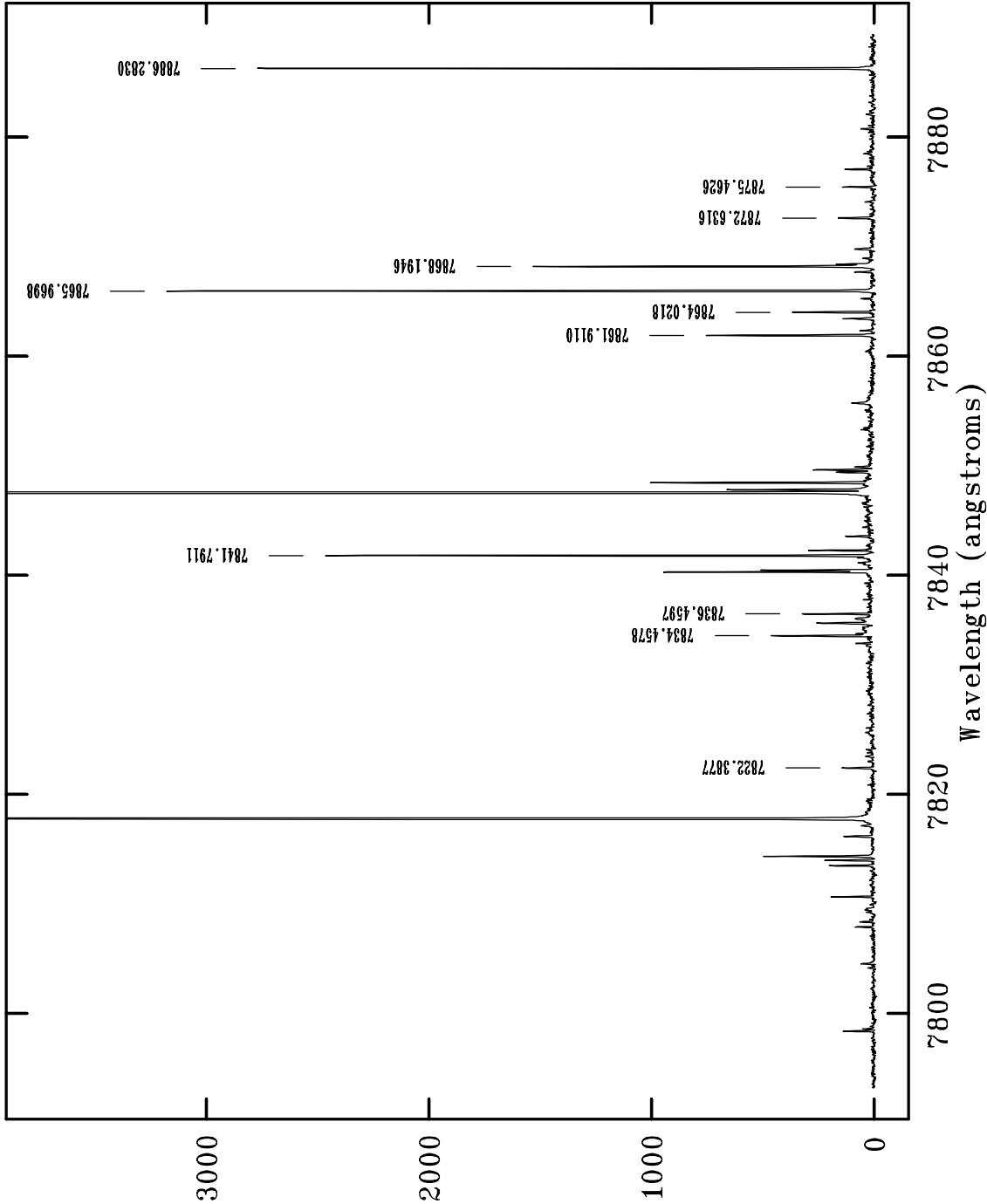
NOAO/IRAF V2.11.3EXPORT honda@hds Fri 22:04:42 08-Sep-2000
Aperture 7, Image line 7, Order 79
ecidentify 063: UNKNOWN



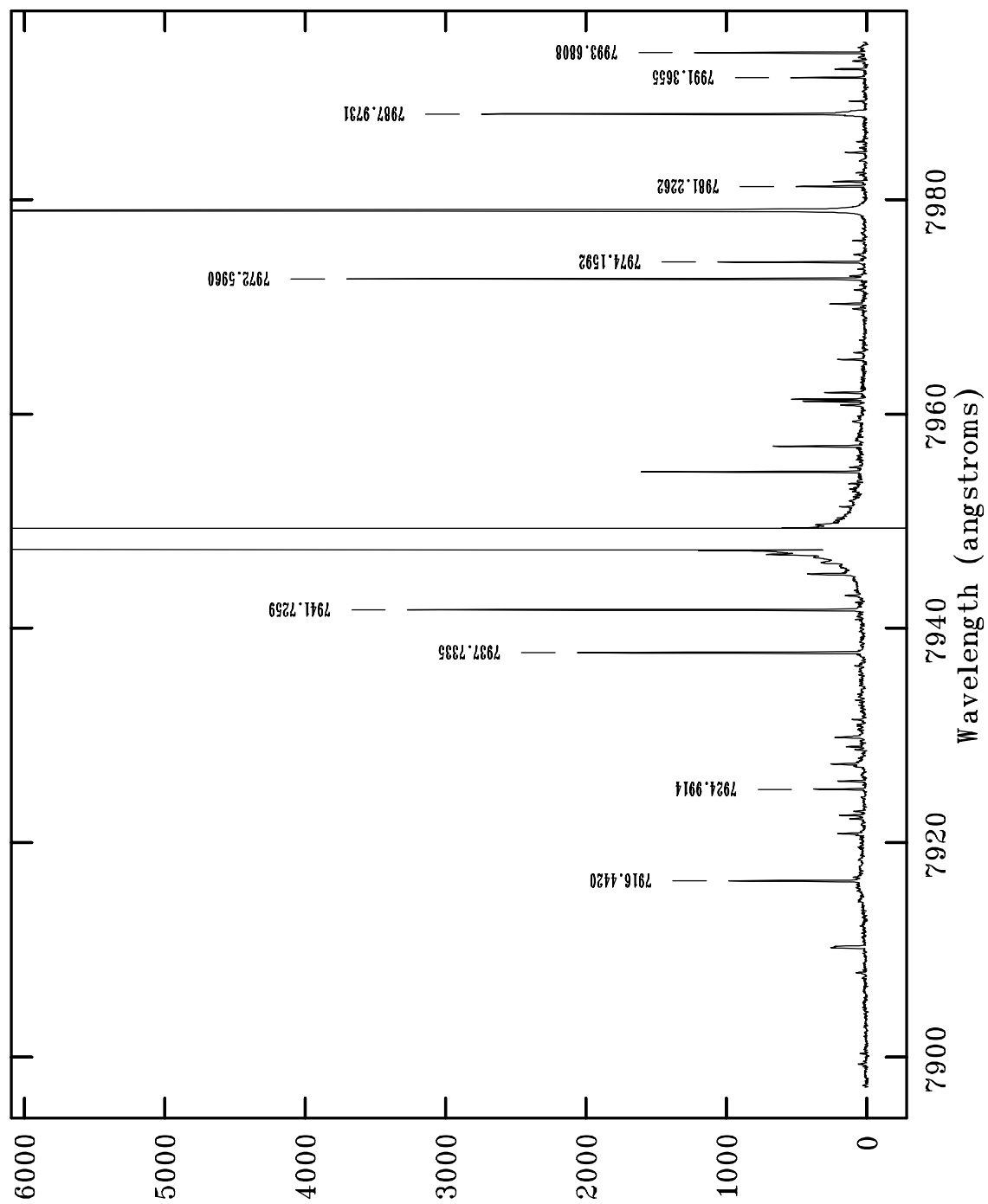


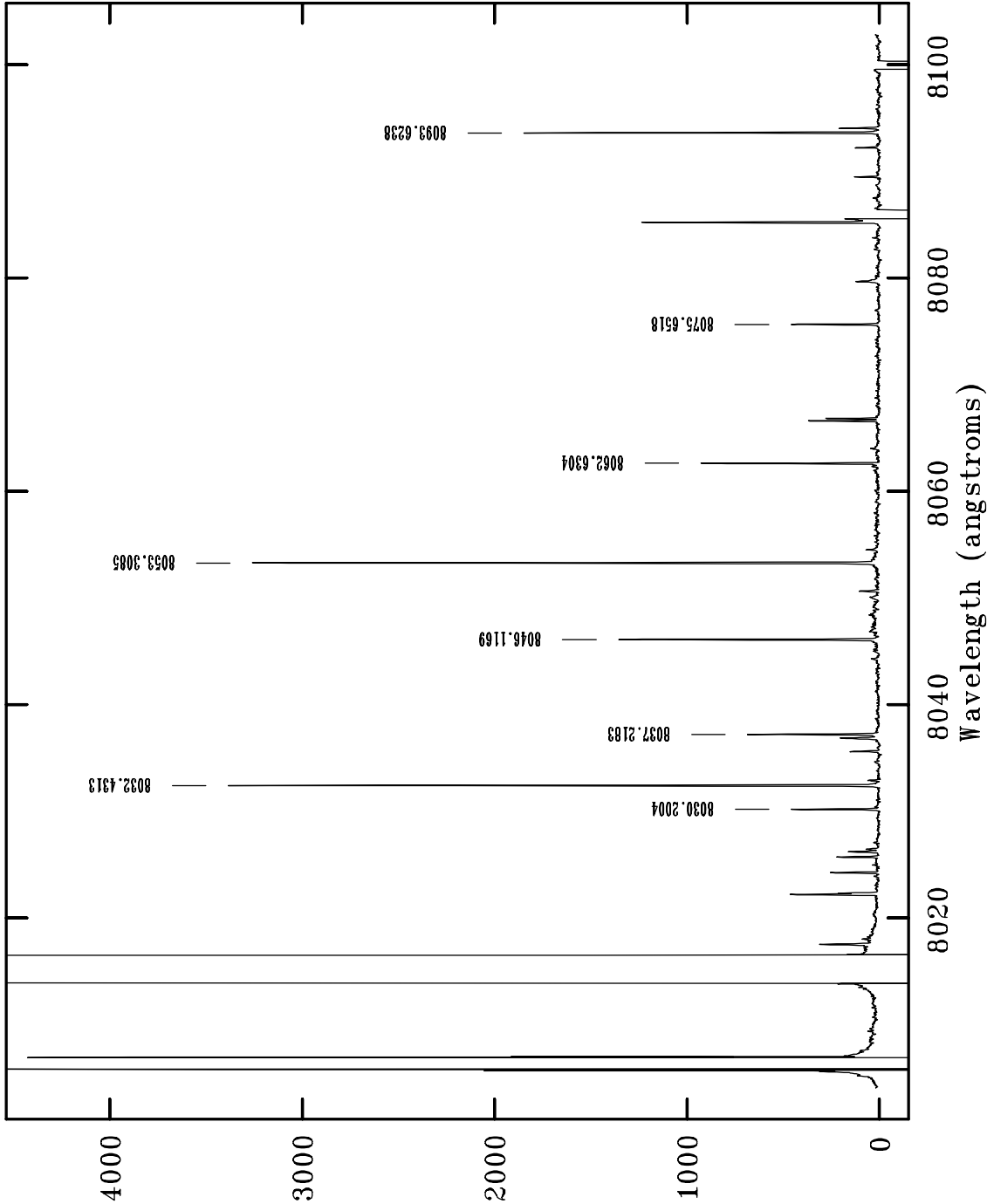
NOAO/IRAF V2.11.3EXPORT honda@hds Fri 21:58:51 08-Sep-2000
Aperture 5, Image line 5, Order 77
identify 063: UNKNOWN



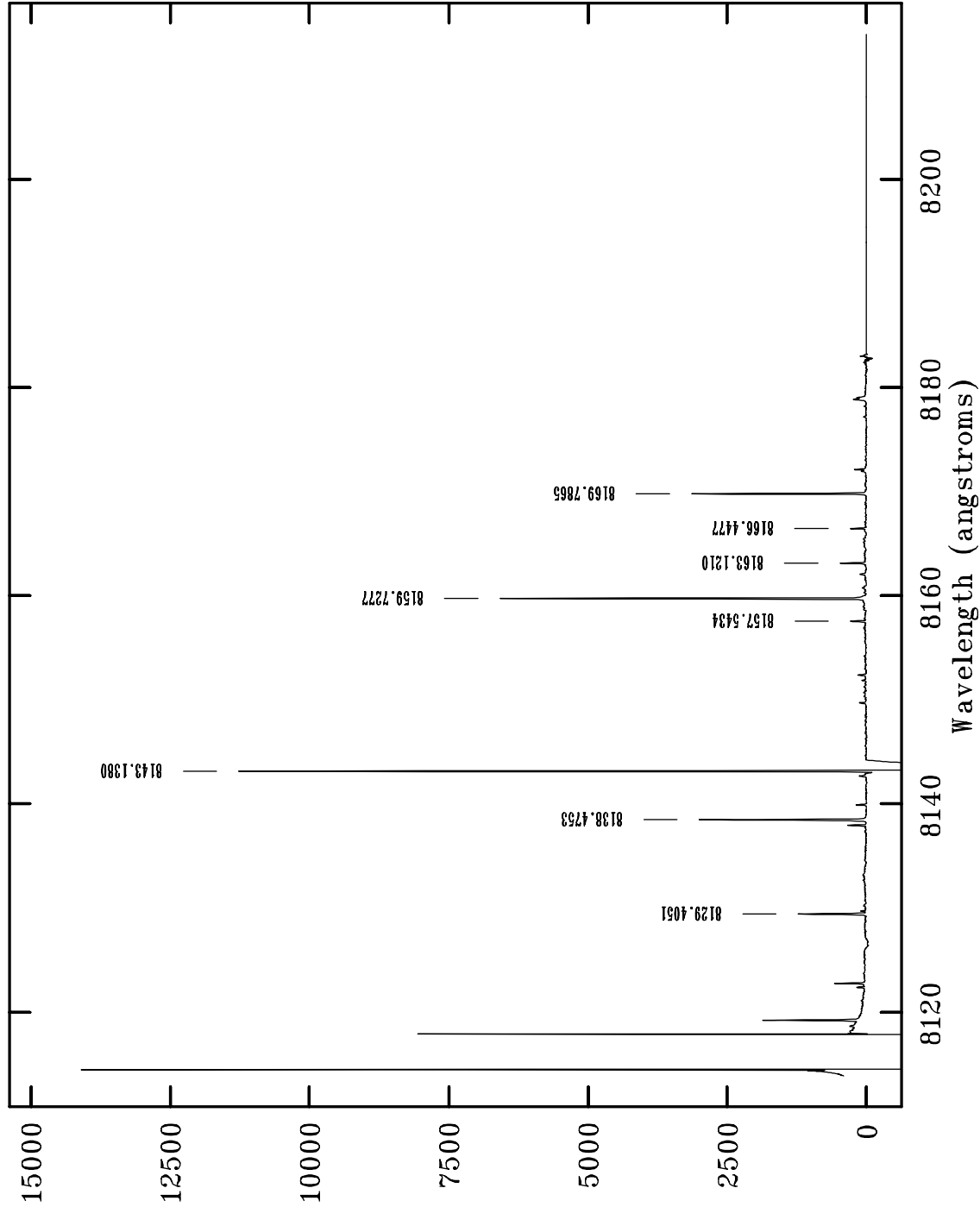


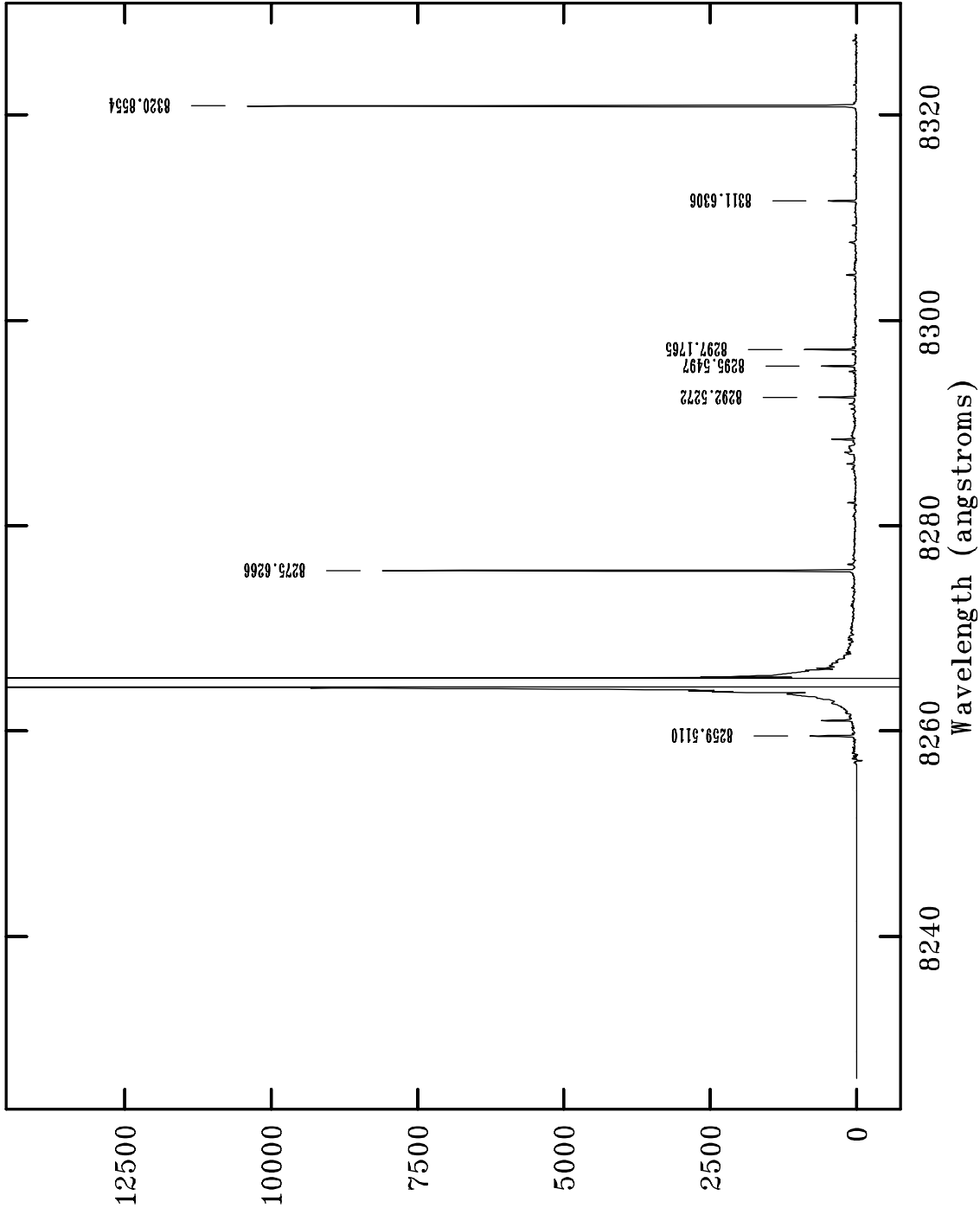
NOAO/IRAF V2.11.3EXPORT honda@hds Fri 15:00:03 08-Sep-2000
Aperture 3, Image line 3, Order 75
ecidentify 063: UNKNOWN



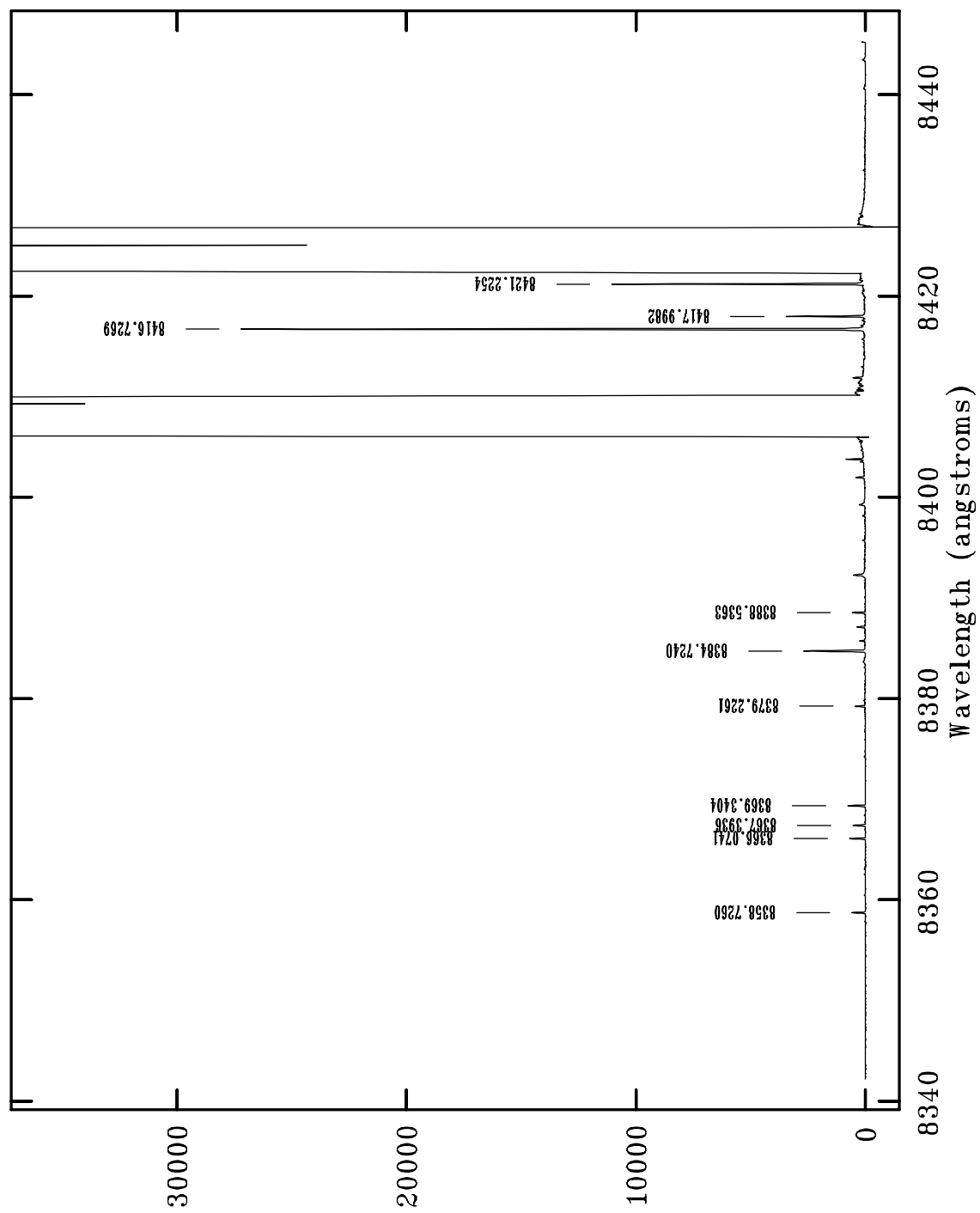


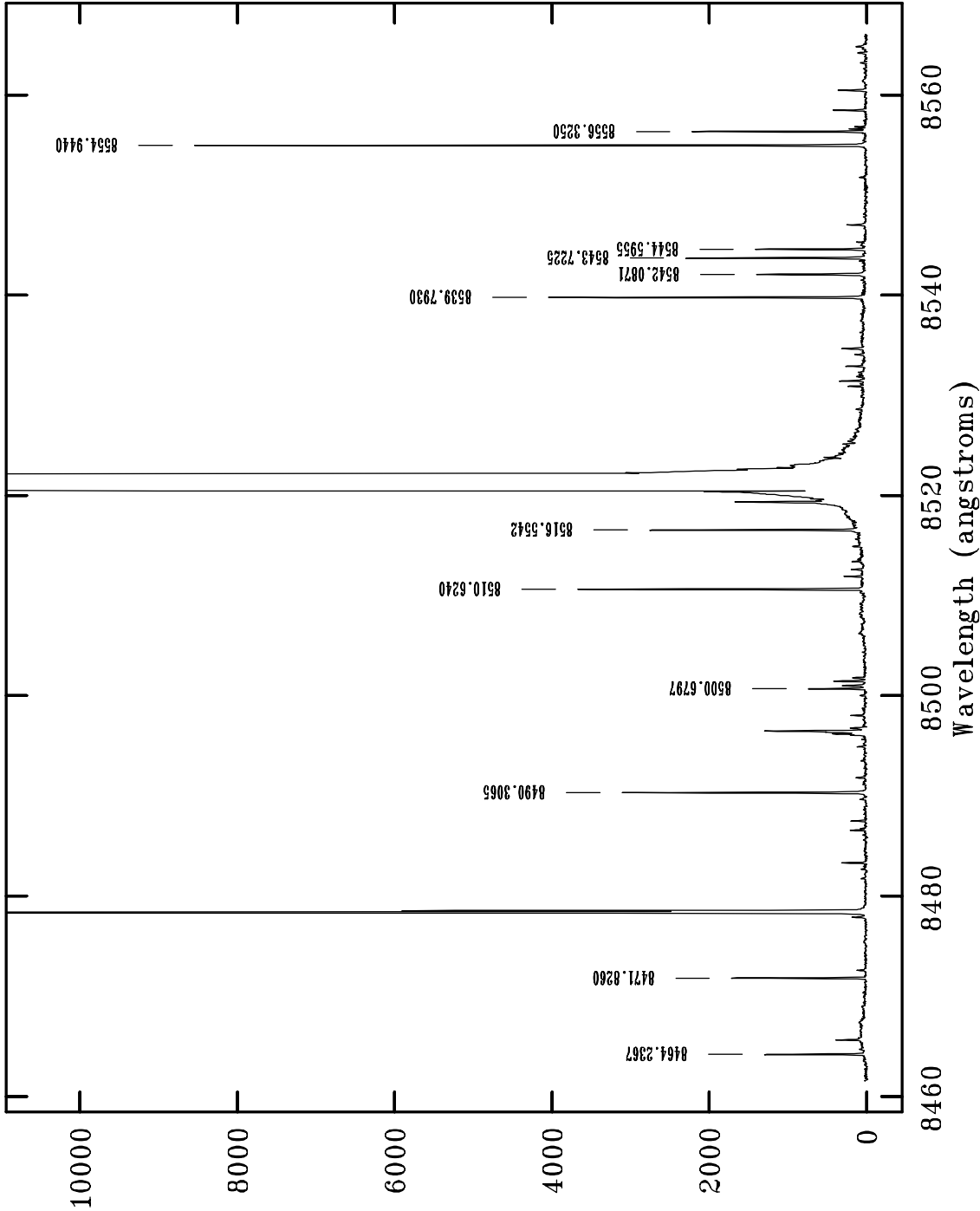
NOAO/IRAF V2.11.3EXPORT honda@hds Fri 14:53:44 08-Sep-2000
Aperture 1, Image line 1, Order 73
ecidentify 063: UNKNOWN



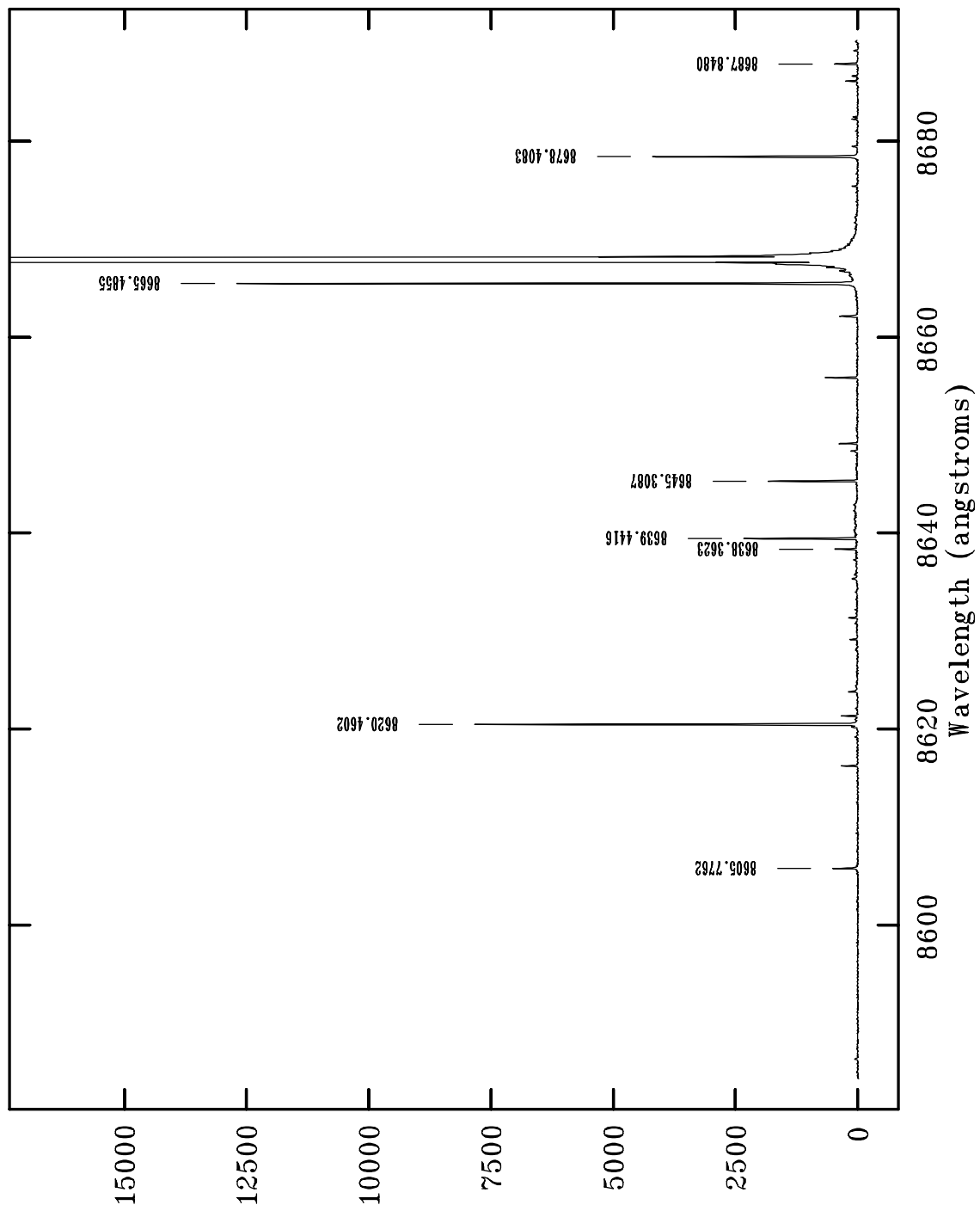


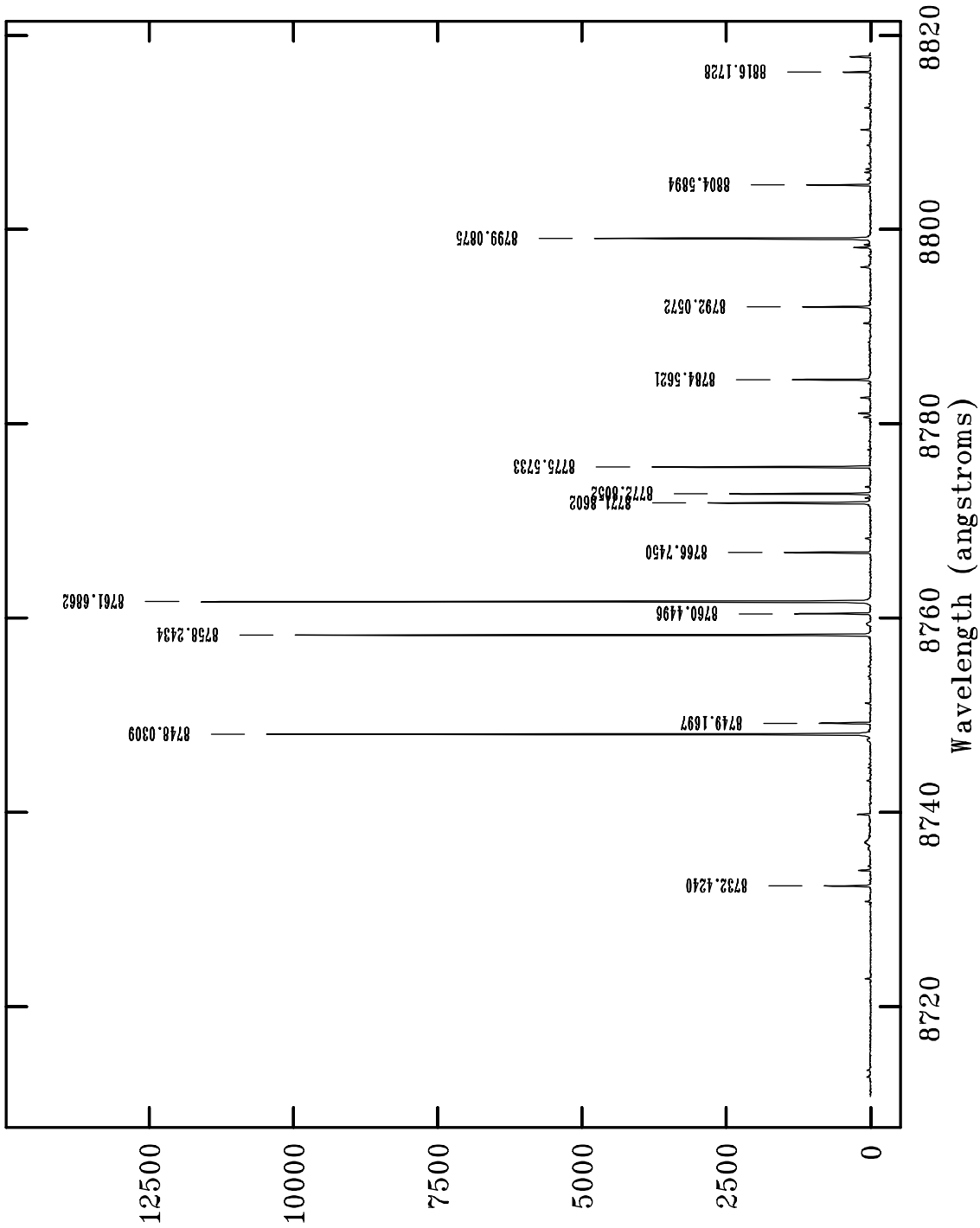
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 15:10:40 30-Nov-2000
 Aperture 10, Image line 10, Order 71
 identify 062: UNKNOWN



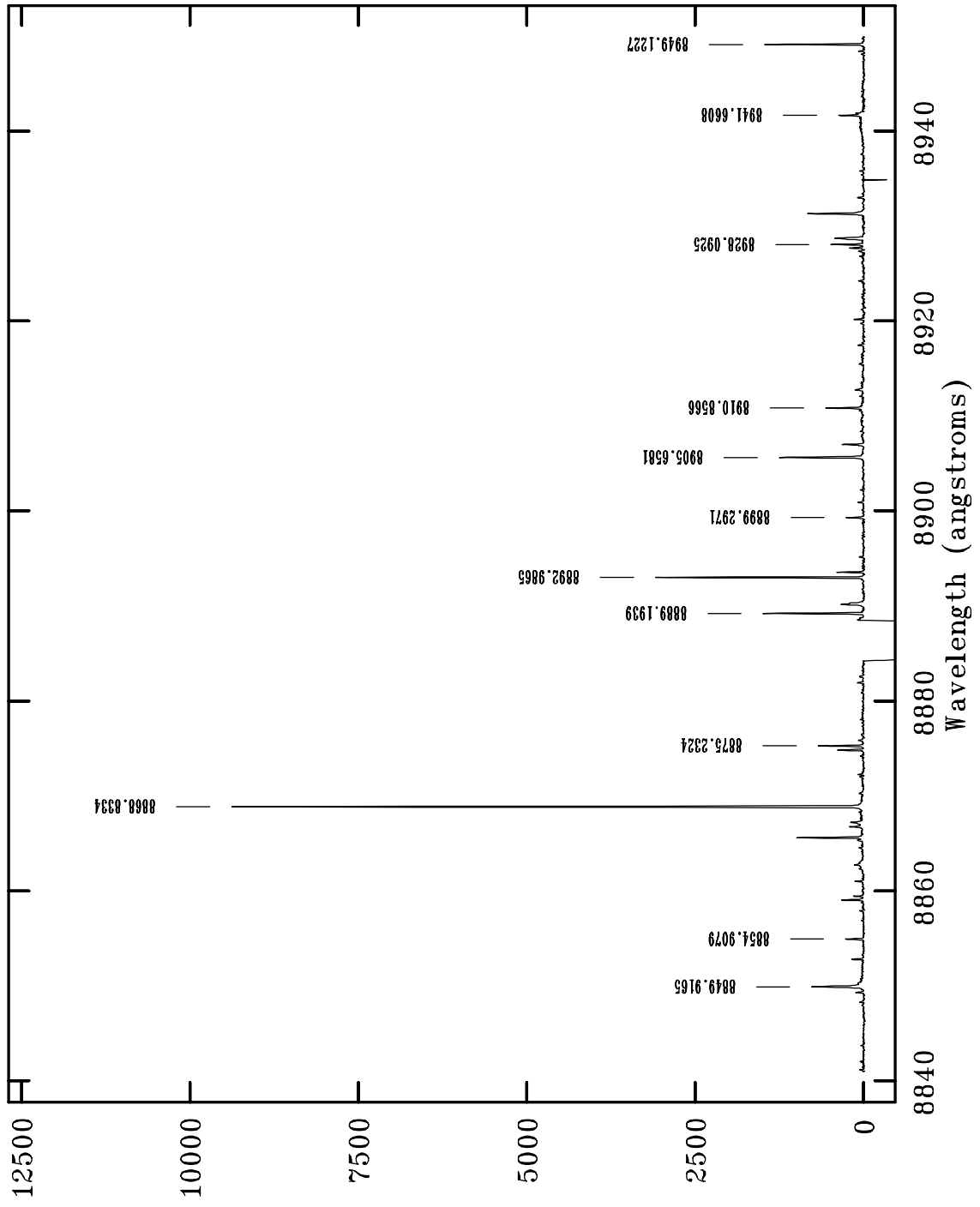


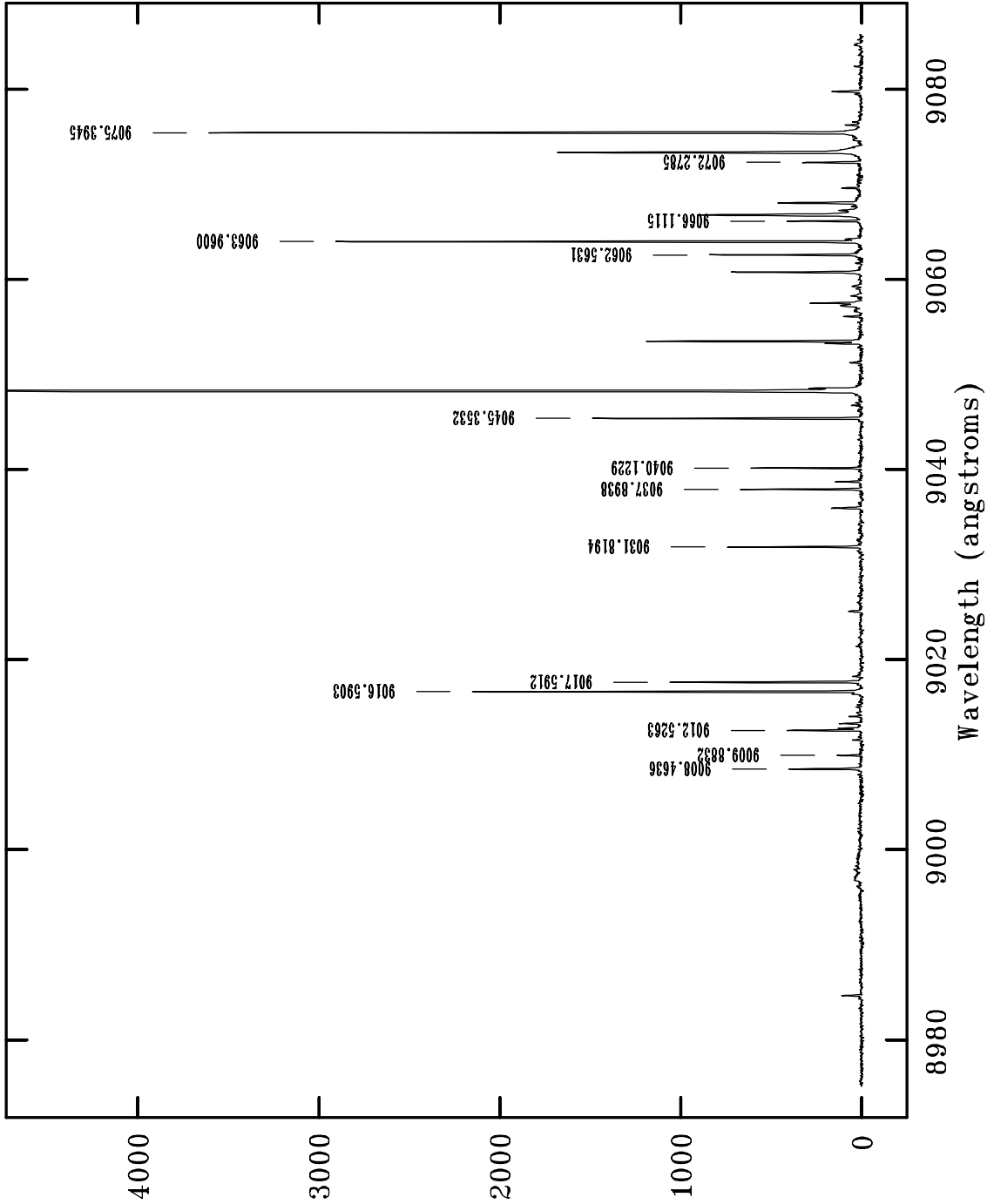
NOAO/IRAF V2.11.3EXPORT honda@hds Thu 15:08:11 30-Nov-2000
Aperture 8, Image line 8, Order 69
identify 062: UNKNOWN



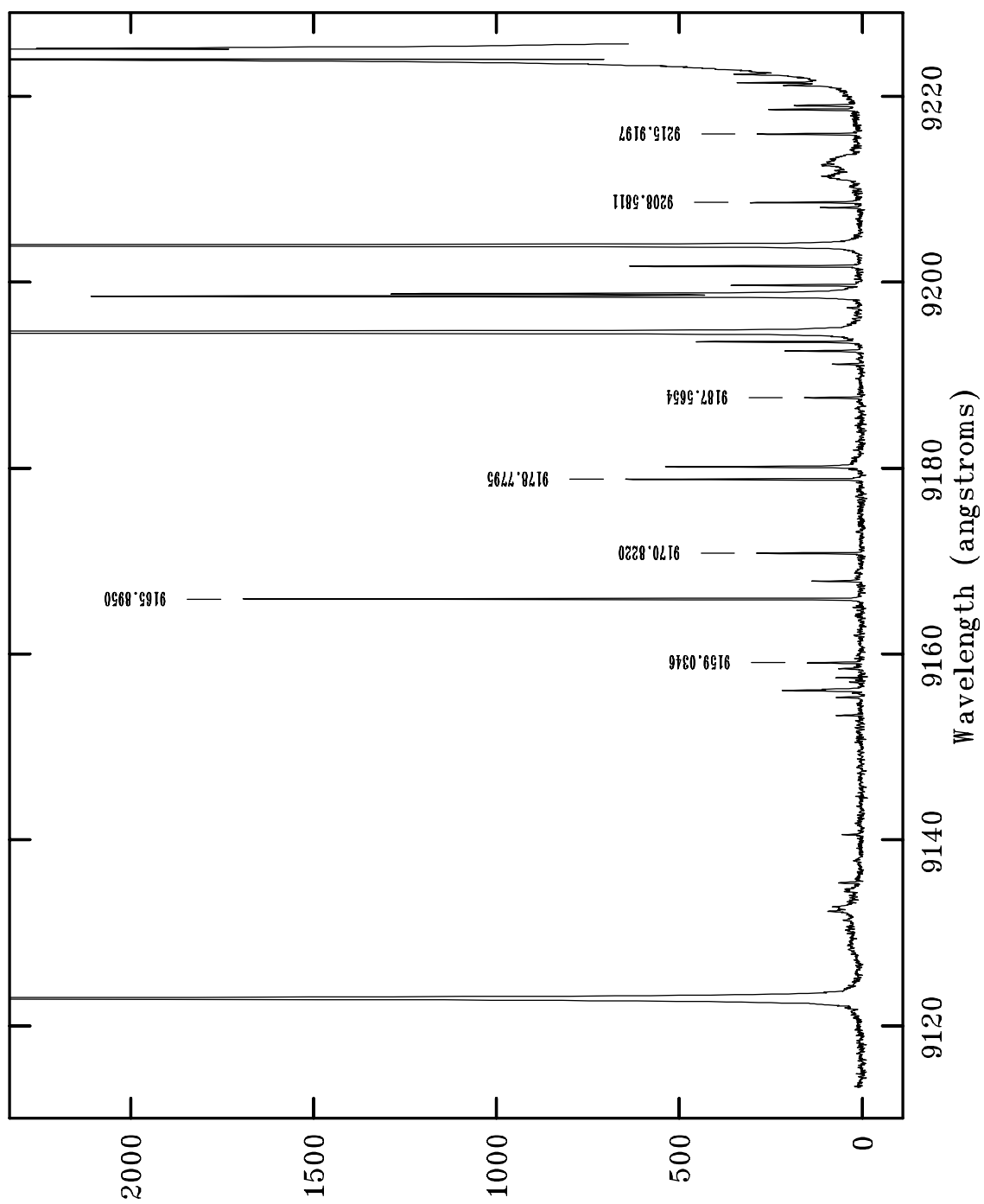


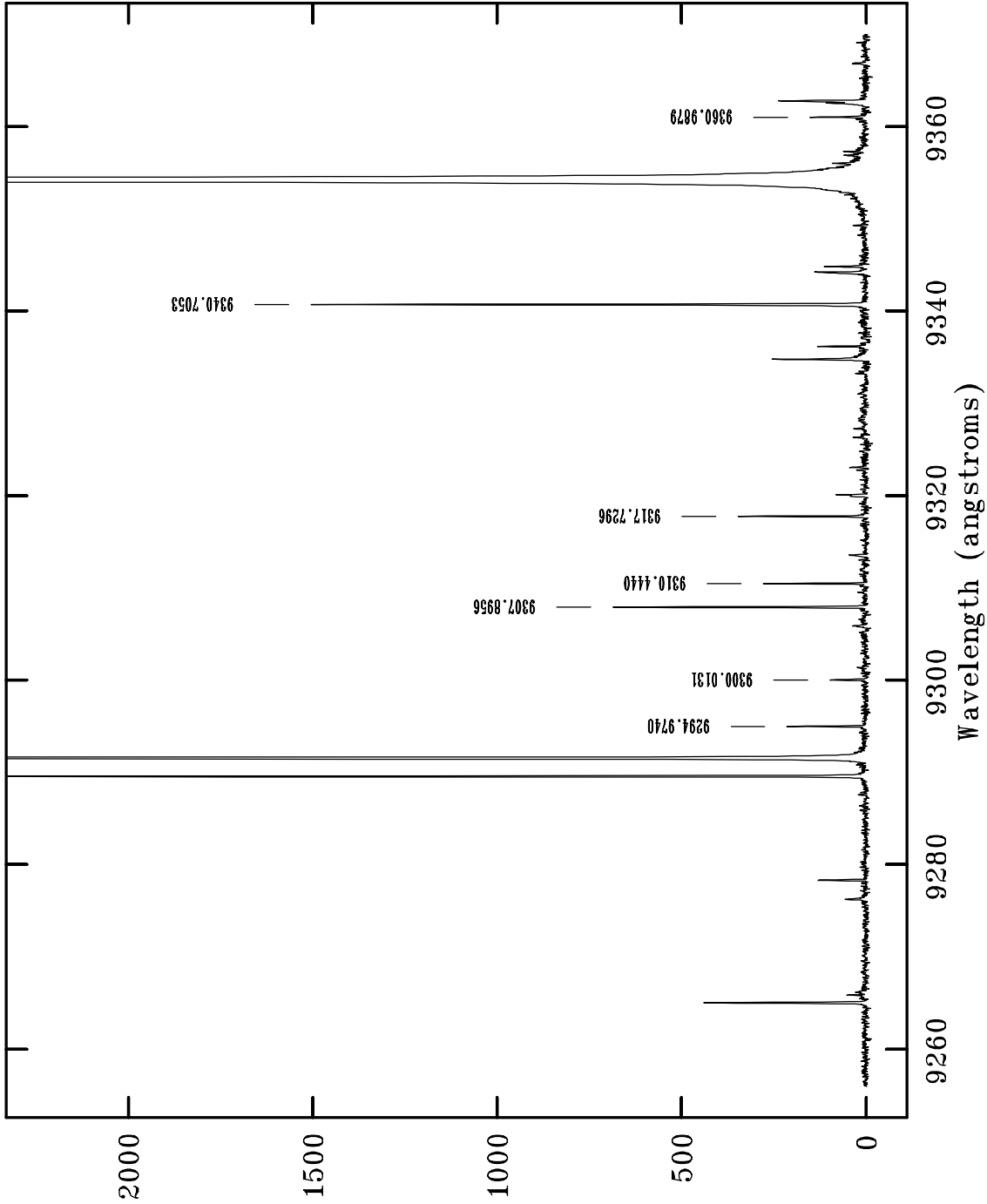
NOAO/IRAF V2.11.3EXPORT honda@hds Fri 13:26:44 08-Sep-2000
Aperture 6, Image line 6, Order 67
ecidentify 062: UNKNOWN





NOAO/IRAF V2.11.3EXPORT honda@hds Thu 15:04:02 30-Nov-2000
Aperture 4, Image line 4, Order 65
identify 062: UNKNOWN





NOAO/IRAF V2.11.3EXPORT honda@hds Thu 17:51:16 07-Sep-2000
Aperture 2, Image line 2, Order 63
ecidentify 062: UNKNOWN

