Telescopio Nazionale Galileo Instrumentation

Spettrografo ad Alta Risoluzione Galileo (SARG)

Thorium - Argon Atlas

Yellow Cross Disperser (blue CCD)

Spectral Range: λ (4534 – 6174)Å

DOCUMENT SARG – D036 V

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38700 Santa Cruz de la Palma

FORWARD

The Th-Ar atlas in the region ranging between the wavelengths 4534 Å and 6174 Å as imaged on the SARG blue CCD with the yellow grism (cross disperser 3) is presented.

The spectra were made exploiting the R= 164,000 slit and a 1×1 CCD binning. The trimming section of the blue CCD was:

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[2197:4293;1:3550]
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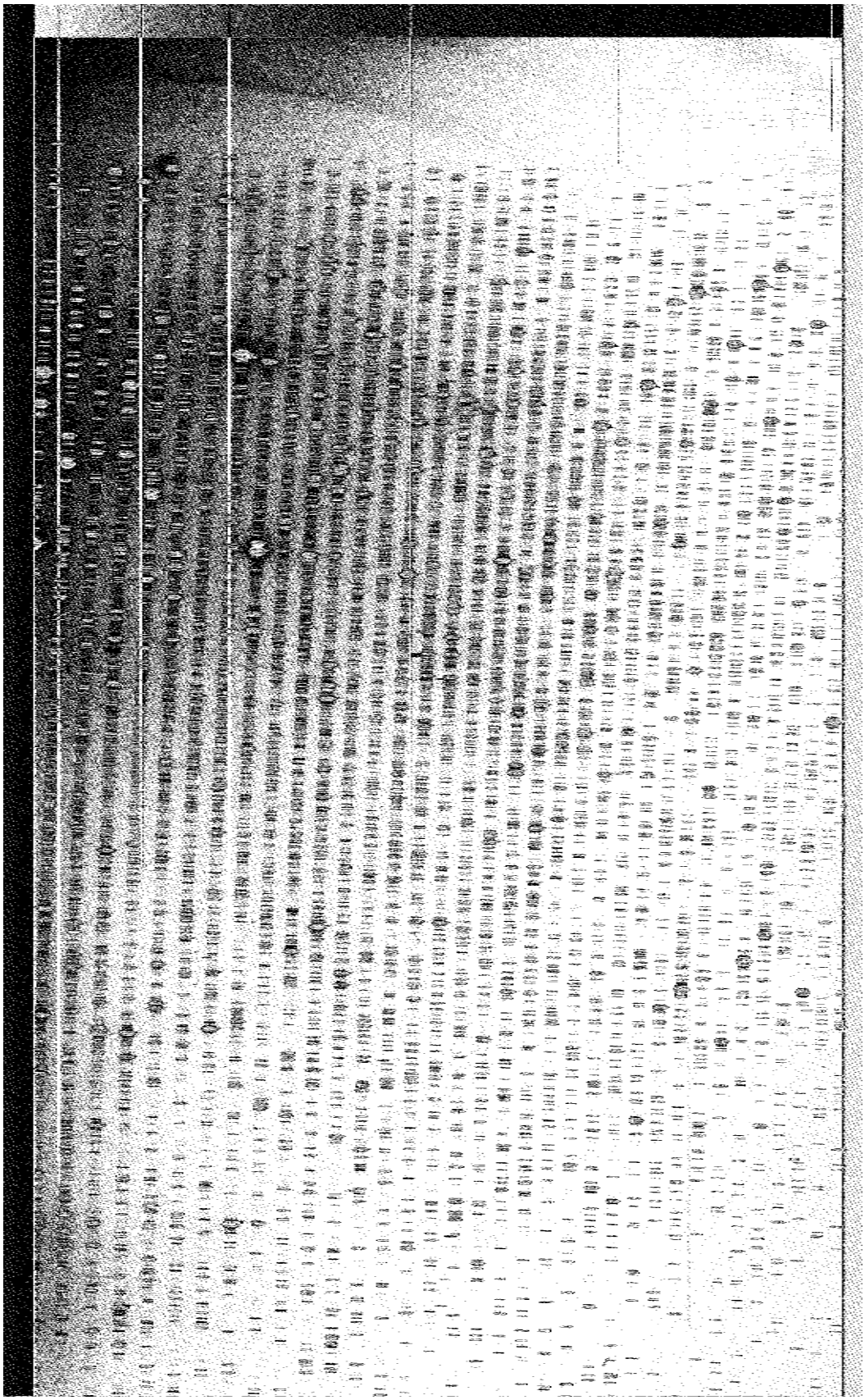
A set of information about the spectral formats is also given:

- a 2-D image of the blue CCD in 1×1 binning format (2200×4200 pixels) with the order position on to the CCD clearly indicated (the picture is enlarged in the X direction for clarity)
- a plot showing the change with the spectral order number of the separation between the order (together with the central wavelengths)
- a table listing: the aperture number (first column), the spectral order (second column), the central wavelength, corresponding to pixel 2048, the initial and ending wavelength, all in Å (third, fourth and fifth columns), the free spectral range (in Å), the average Δλ/pix, the spectral order separation at the centre of the order in pixels (the scale on detector is 0.16 arcsec/pixel). In the last column the number of the page where one can find the corresponding 1-D spectrum plot with the identification of some line.
- A plot showing the residuals of the wavelength solution


100
101
102
103
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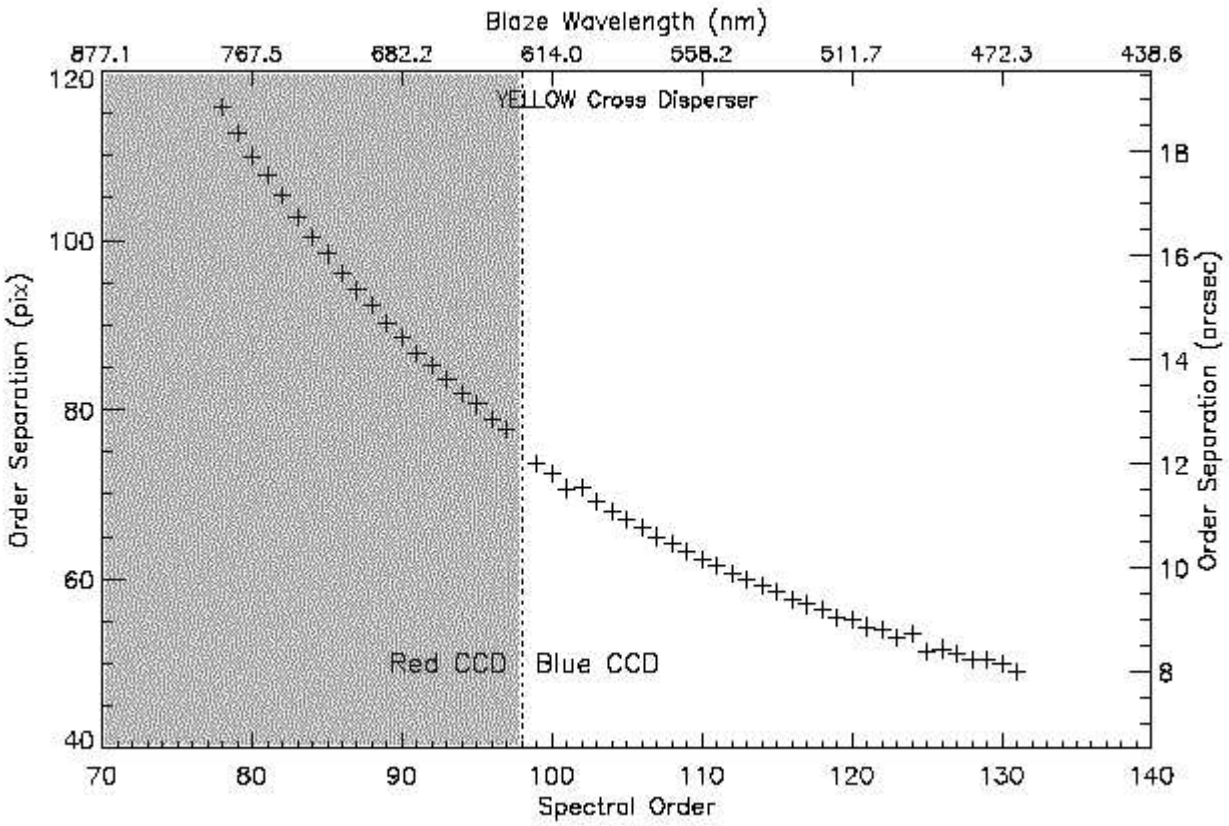
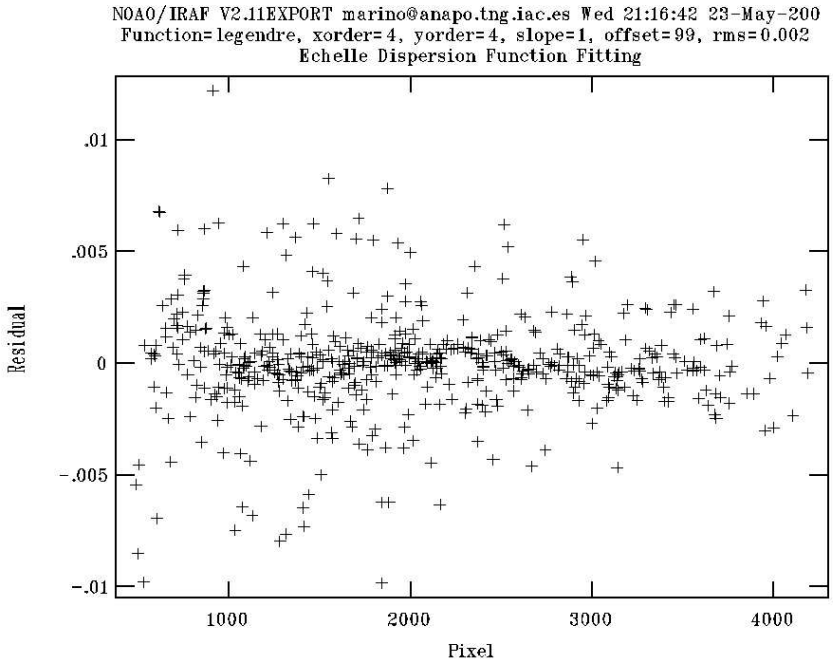
129
130
131
132
133
134

Ap.	**Order**	**λ_C**	**λ_1**	**λ_2**	**FSR**	**$\Delta\lambda$**	**Sep**	**Page**
	#		*(Å)*	*(Å)*	*(Å)*	*(Å/px)*	*(pix)*	
1	100	6140.0	6079.001	6173.656	61.4	0.022547	72.54	**8**
2	101	6079.3	6018.684	6112.455	60.2	0.022337	70.67	**9**
3	102	6019.7	5959.552	6052.455	59.0	0.022130	70.89	**10**
4	103	5961.2	5901.571	5993.621	57.9	0.021927	69.19	**11**
5	104	5903.9	5844.707	5935.919	56.8	0.021727	67.98	**12**
6	105	5847.7	5788.929	5879.317	55.7	0.021531	66.99	**13**
7	106	5792.5	5734.205	5823.784	54.6	0.021338	66.01	**14**
8	107	5738.4	5680.507	5769.290	53.6	0.021149	64.98	**15**
9	108	5685.2	5627.804	5715.806	52.6	0.020963	64.27	**16**
10	109	5633.1	5576.071	5663.303	51.7	0.020780	63.17	**17**
11	110	5581.9	5525.280	5611.757	50.7	0.020599	62.37	**18**
12	111	5531.6	5475.406	5561.139	49.8	0.020422	61.51	**19**
13	112	5482.2	5426.425	5511.426	48.9	0.020248	60.68	**20**
14	113	5433.7	5378.312	5462.594	48.1	0.020077	59.90	**21**
15	114	5386.0	5331.045	5414.619	47.2	0.019908	59.20	**22**
16	115	5339.2	5284.601	5367.479	46.4	0.019742	58.46	**23**
17	116	5293.1	5238.960	5321.152	45.6	0.019579	57.55	**24**
18	117	5247.9	5194.100	5275.618	44.9	0.019418	56.98	**25**
19	118	5203.4	5150.002	5230.856	44.1	0.019260	56.42	**26**
20	119	5159.7	5106.646	5186.846	43.4	0.019104	55.46	**27**
21	120	5116.7	5064.014	5143.571	42.6	0.018951	55.15	**28**
22	121	5074.4	5022.088	5101.012	41.9	0.018800	54.36	**29**
23	122	5032.8	4980.850	5059.150	41.3	0.018652	54.03	**30**
24	123	4991.9	4940.283	5017.970	40.6	0.018506	53.16	**31**
25	124	4951.7	4900.372	4977.454	39.9	0.018362	53.49	**32**
26	125	4912.0	4861.100	4937.587	39.3	0.018220	51.43	**33**
27	126	4873.1	4822.453	4898.354	38.7	0.018080	51.75	**34**
28	127	4834.7	4784.415	4859.738	38.1	0.017943	51.15	**35**
29	128	4796.9	4746.972	4821.726	37.5	0.017807	50.51	**36**
30	129	4759.7	4710.11	4784.304	36.9	0.017674	50.43	**37**
31	130	4723.1	4673.815	4747.457	36.3	0.017542	49.94	**38**
32	131	4687.1	4638.076	4711.174	35.8	0.017413	49.02	**39**
33	132	4651.6	4602.878	4675.440	35.2	0.017285	48.49	**40**
34	133	4616.6	4568.210	4640.244	34.7	0.017159	47.96	**41**
35	134	4582.1	4534.060	4605.574	34.2	0.017035	/	**42**


Blaze Wavelength (nm)
877.1
767.5
682.2
614.0
558.2
511.7
472.3
438.6
YELLOW Cross Disperser
Red CCD
Blue CCD
Order Separation (pix)
Order Separation (arcsec)
Spectral Order
120
100
80
60
40
18
16
14
12
10
8
70
80
90
100
110
120
130
140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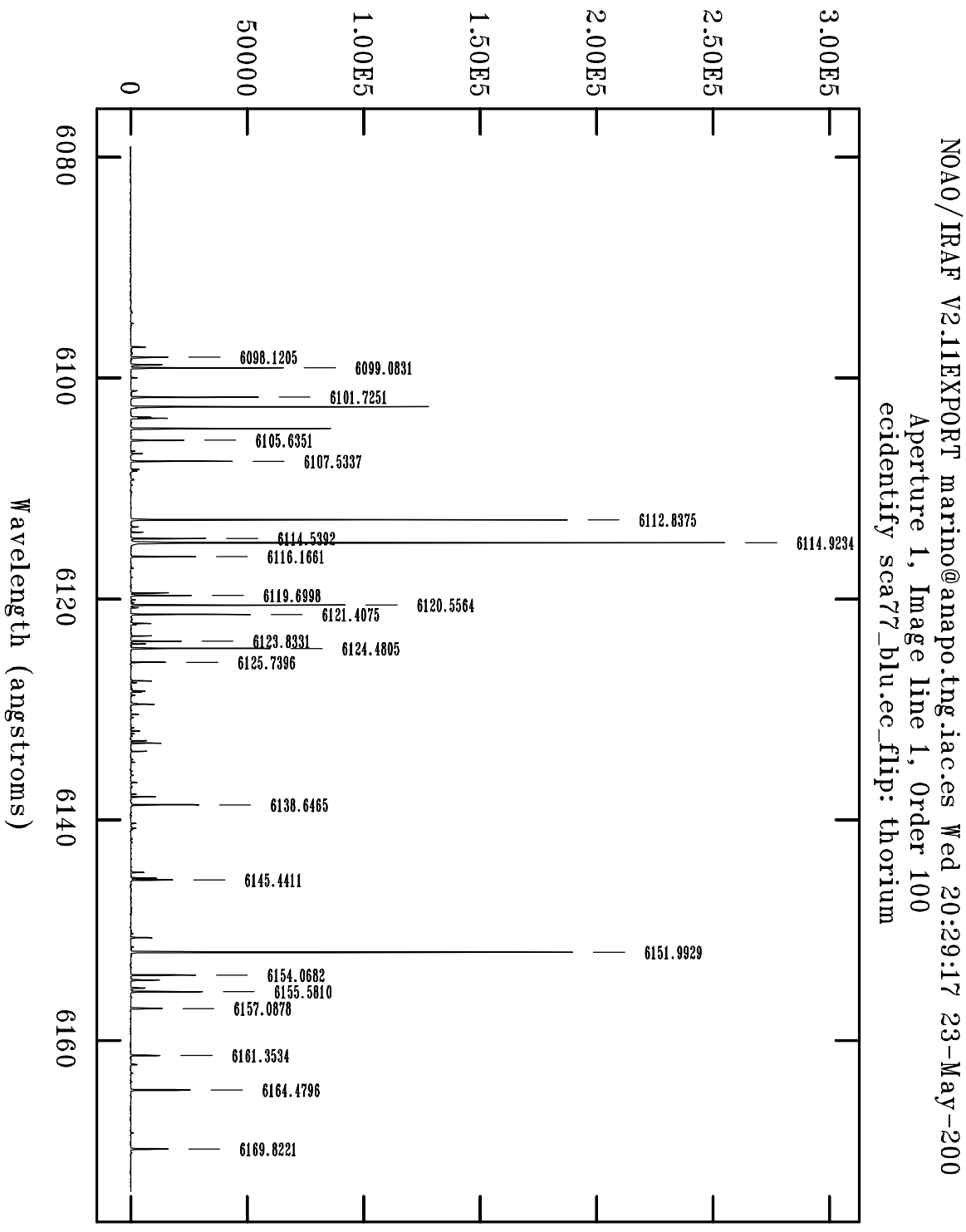
.005
0
-.005
-.01
1000
2000
3000
4000
Pixel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1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
6080
6100
6120
6140
6160
Wavelength (angstroms)
6098.1205
6099.0831
6101.7251
6105.6351
6107.5337
6112.8375
6114.5392
6114.9234
6116.1661
6119.6998
6120.5564
6121.4075
6123.8331
6124.4805
6125.7396
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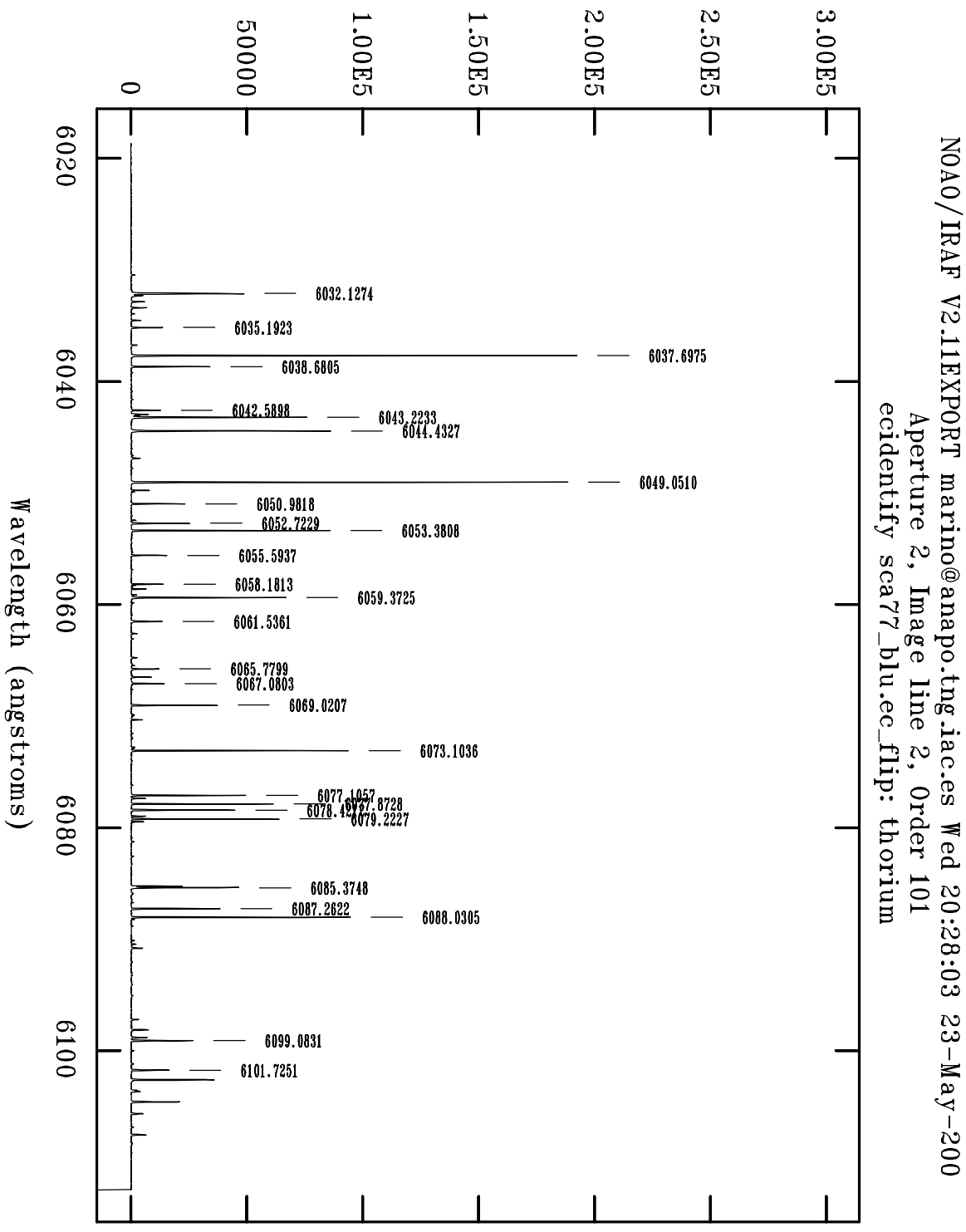
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1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
6020
6040
6060
6080
6100
Wavelength (angstroms)
6032.1274
6035.1923
6037.6975
6038.6805
6042.5898
6043.2233
6044.4327
6049.0510
6050.9818
6052.7229
6053.3808
6055.5937
6058.1813
6059.3725
6061.5361
6065.7799
6067.0803
6069.0207
6073.1036
6077.1057
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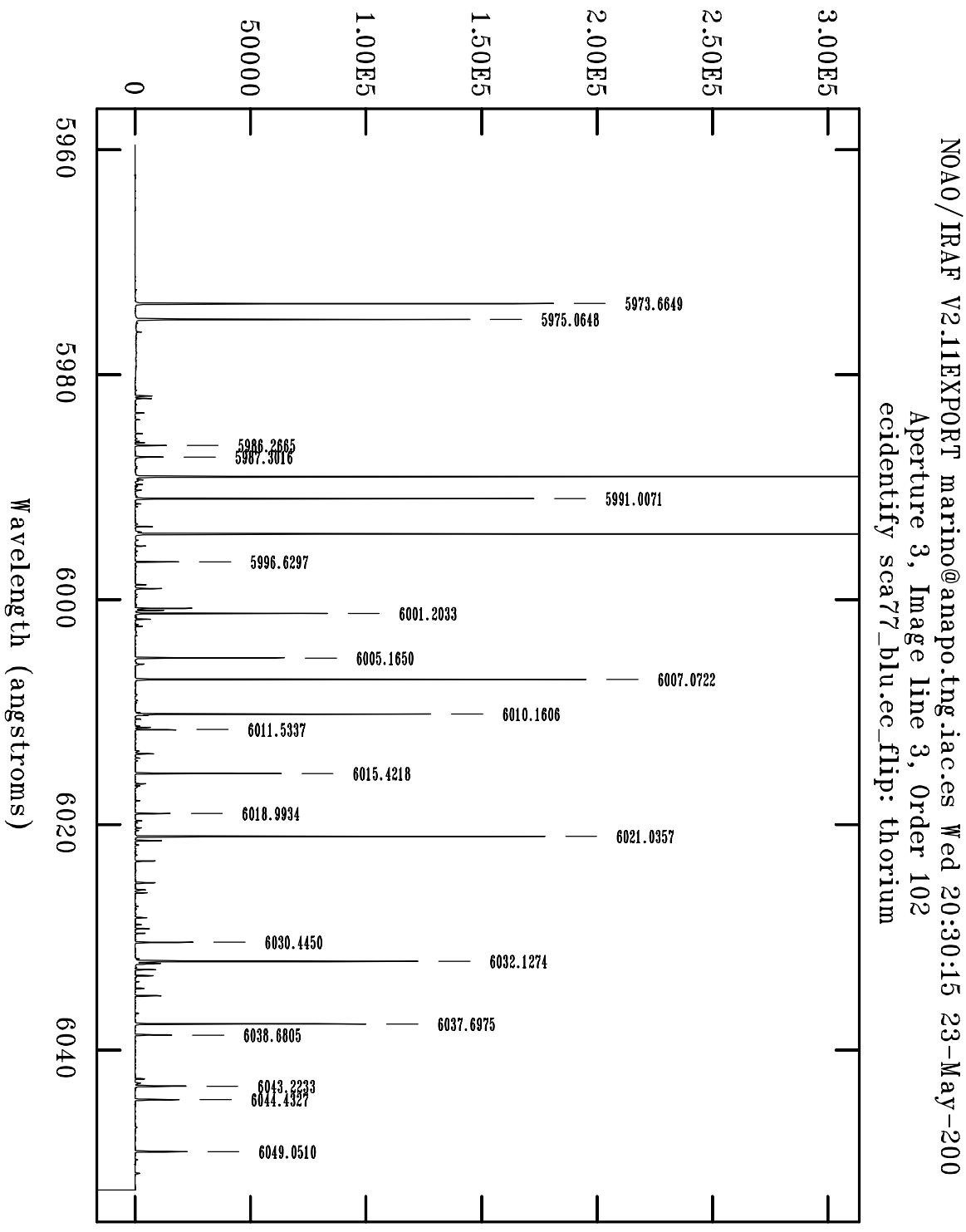
6085.3748
6087.2622
6088.0305
6099.0831
6101.7251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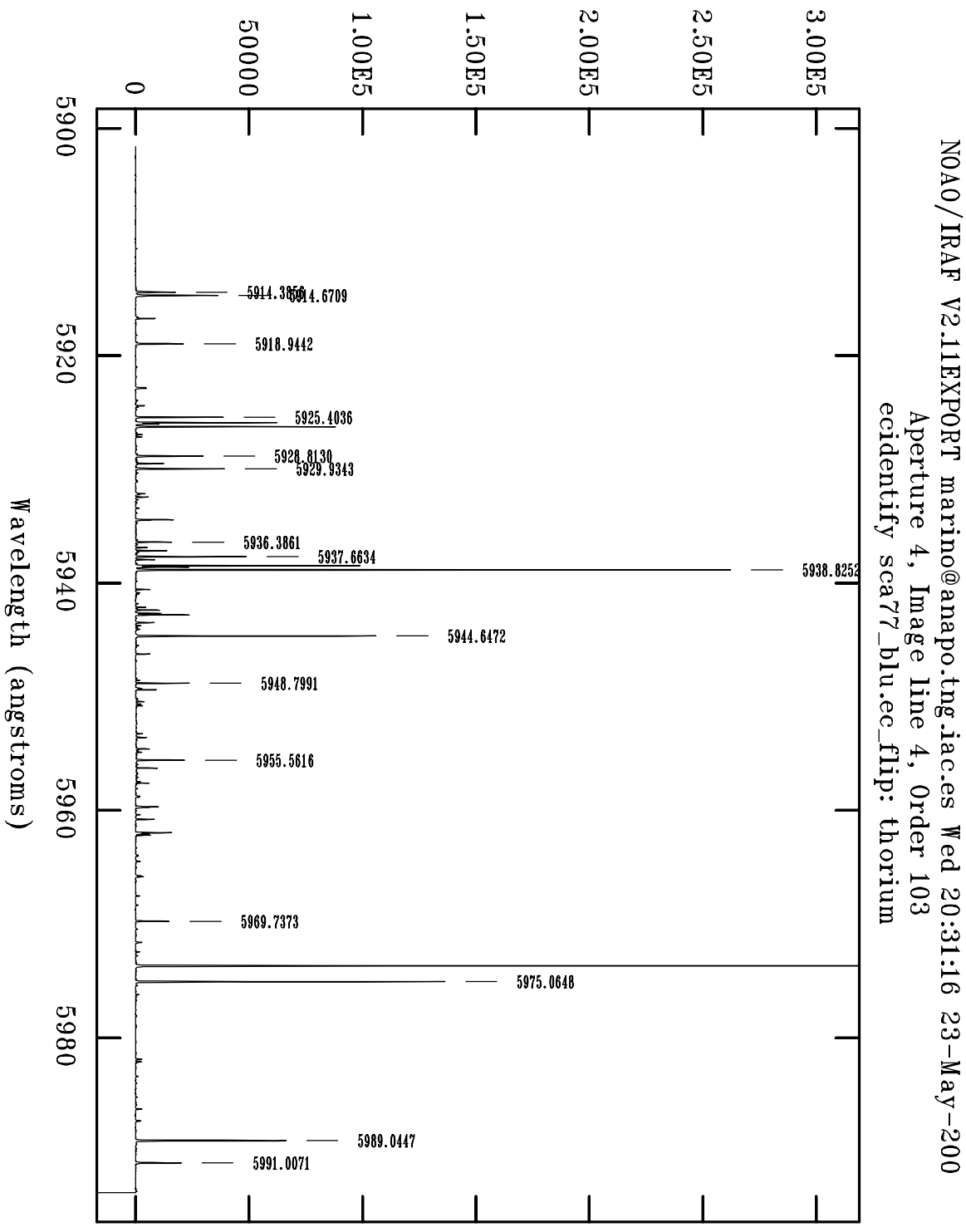
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5960
5980
6000
6020
6040
Wavelength (angstroms)
5973.6649
5975.0648
5986.2665
5987.3016
5991.0071
5996.6297
6001.2033
6005.1650
6007.0722
6010.1606
6011.5337
6015.4218
6018.9934
6021.0357
6030.4450
6032.1274
6037.6975
6038.6805
6043.2233
6044.4327
6049.0510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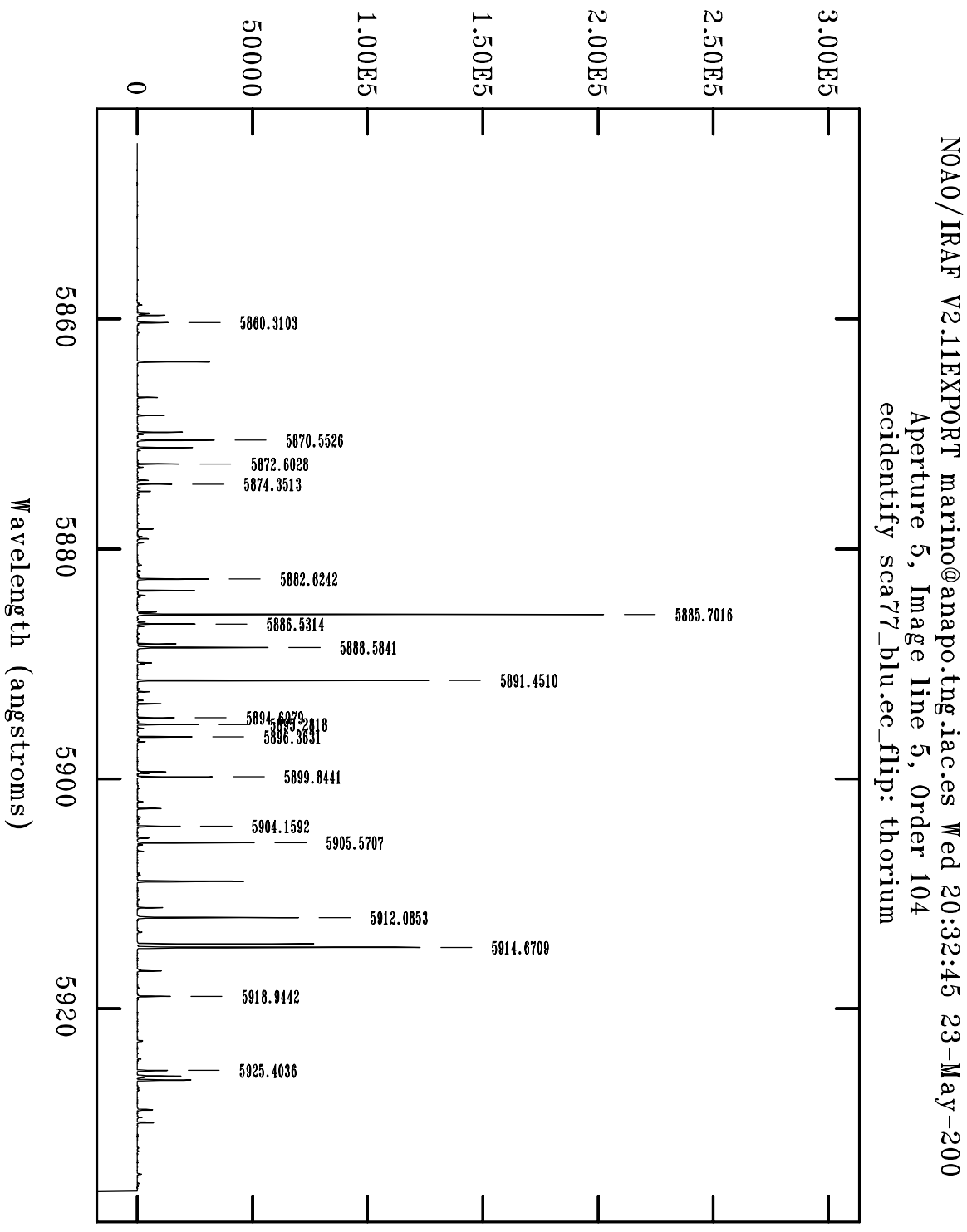
1.50E5
2.00E5
2.50E5
3.00E5
5900
5920
5940
5960
5980
Wavelength (angstroms)
5914.6709
5918.9442
5925.4036
5928.8130
5929.9343
5936.3861
5937.6634
5938.8252
5944.6472
5948.7991
5955.5616
5969.7373
5975.0648
5989.0447
5991.0071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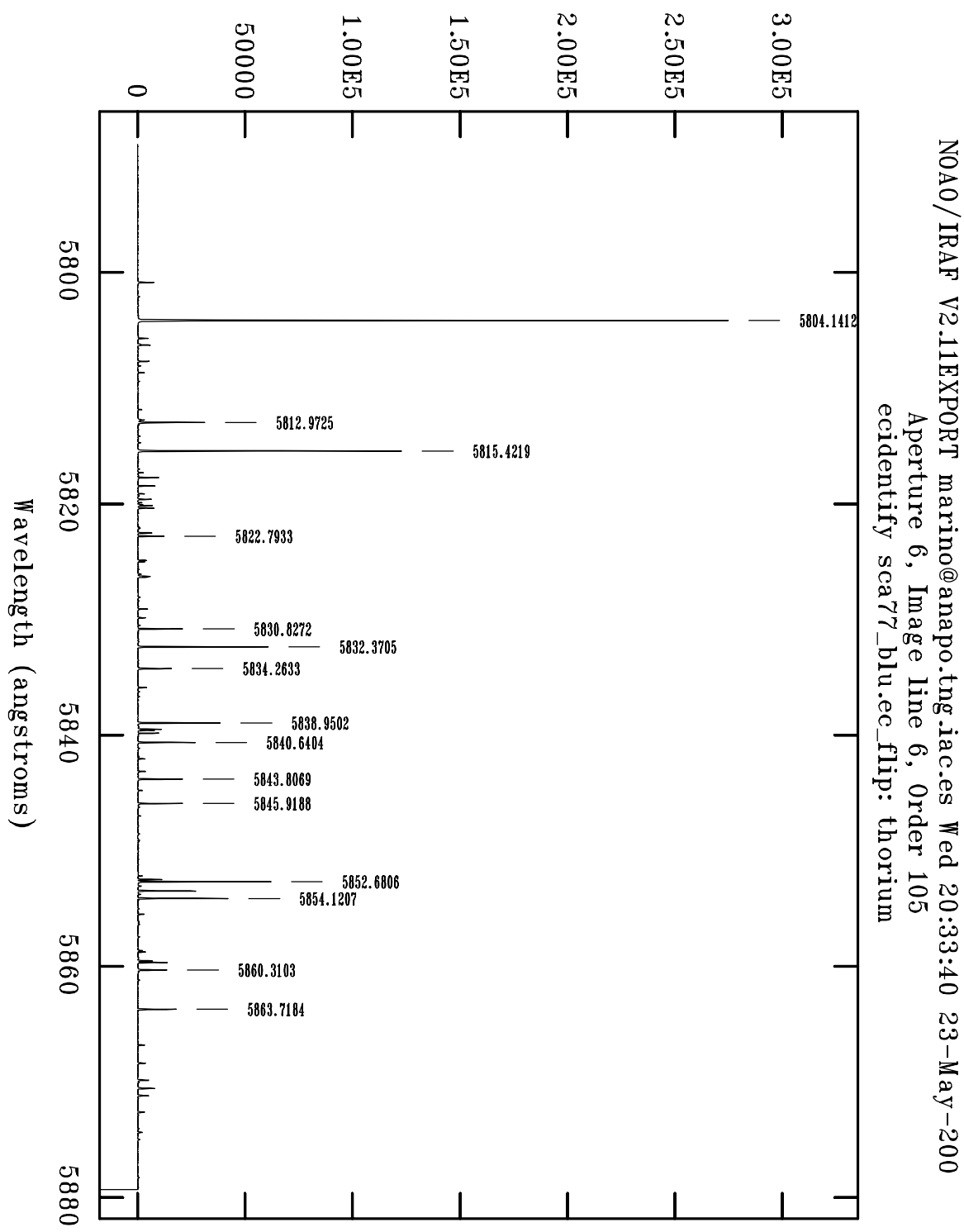
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5860
5880
5900
5920
Wavelength (angstroms)
5860.3103
5870.5526
5872.6028
5874.3513
5882.6242
5885.7016
5886.5314
5888.5841
5891.4510
5896.3631
5899.8441
5904.1592
5905.5707
5912.0853
5914.6709
5918.9442
5925.4036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50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5800
5820
5840
5860
5880
Wavelength (angstroms)
5804.1412
5812.9725
5815.4219
5822.7933
5830.8272
5832.3705
5834.2633
5838.9502
5840.6404
5843.8069
5845.9188
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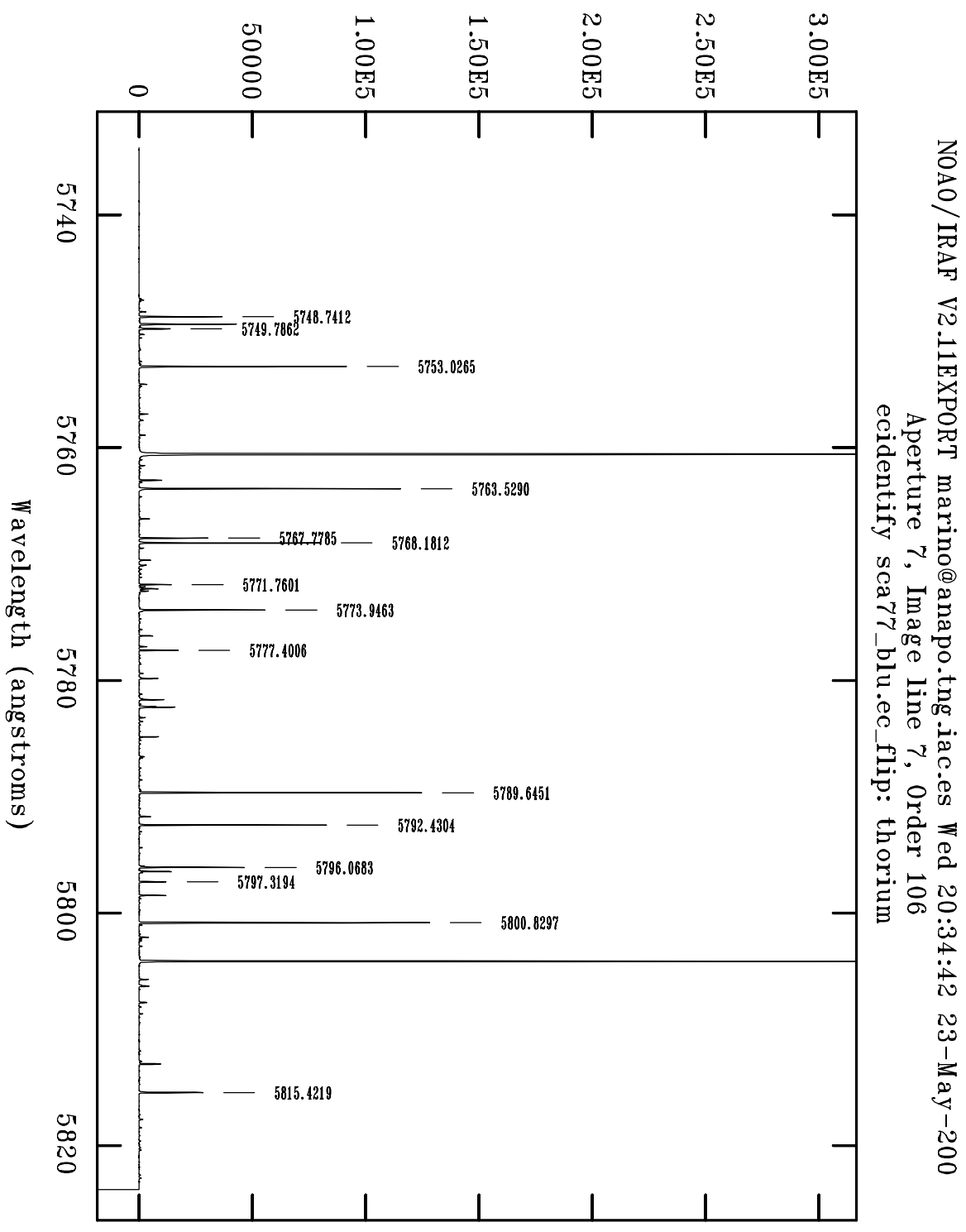
5854.1207
5860.3103
5863.7184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50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5740
5760
5780
5800
5820
Wavelength (angstroms)
5748.7412
5749.7862
5753.0265
5763.5290
5767.7785
5768.1812
5771.7601
5773.9463
5777.4006
5789.6451
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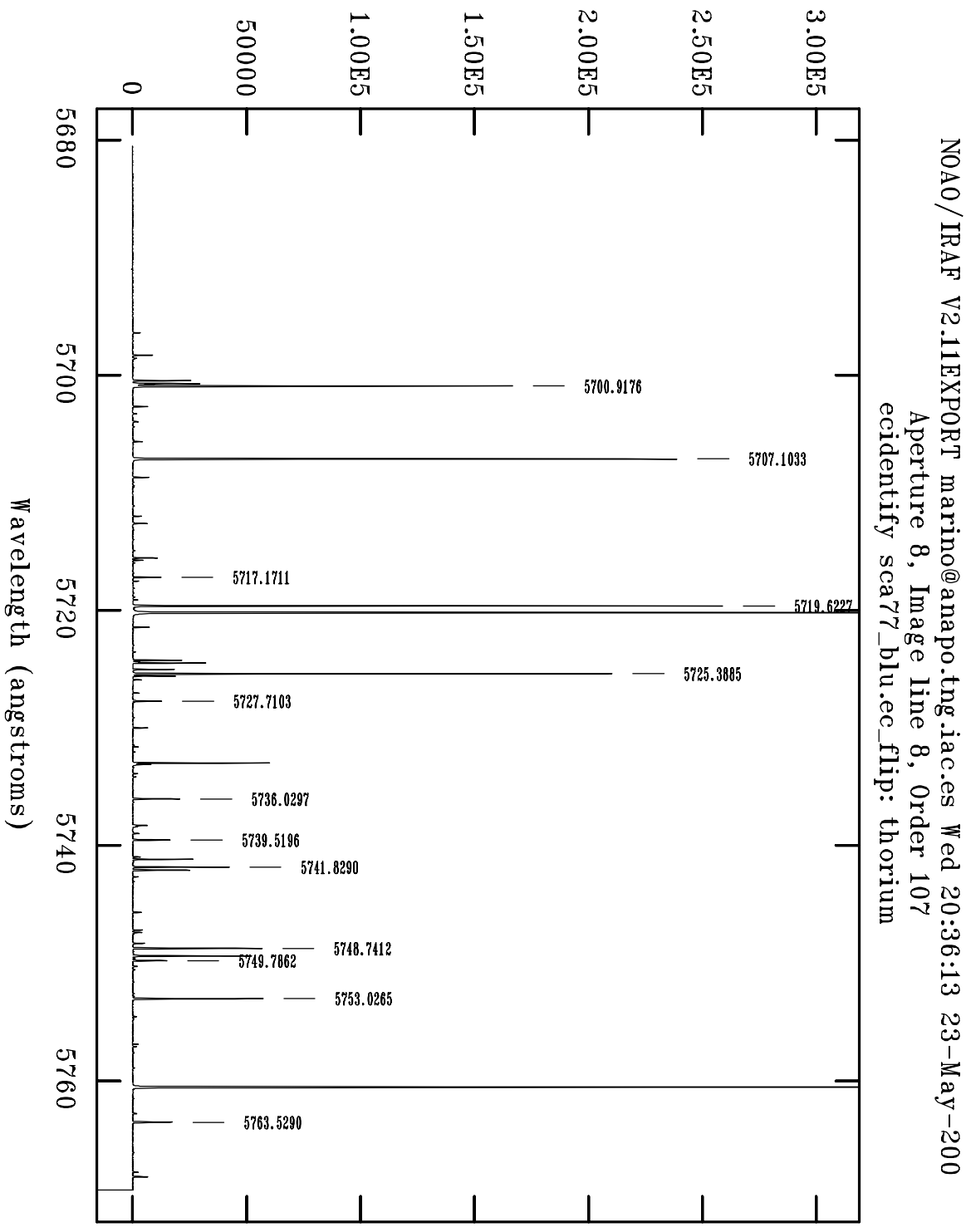
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1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5680
5700
5720
5740
5760
Wavelength (angstroms)
5700.9176
5707.1033
5717.1711
5719.6227
5725.3885
5727.7103
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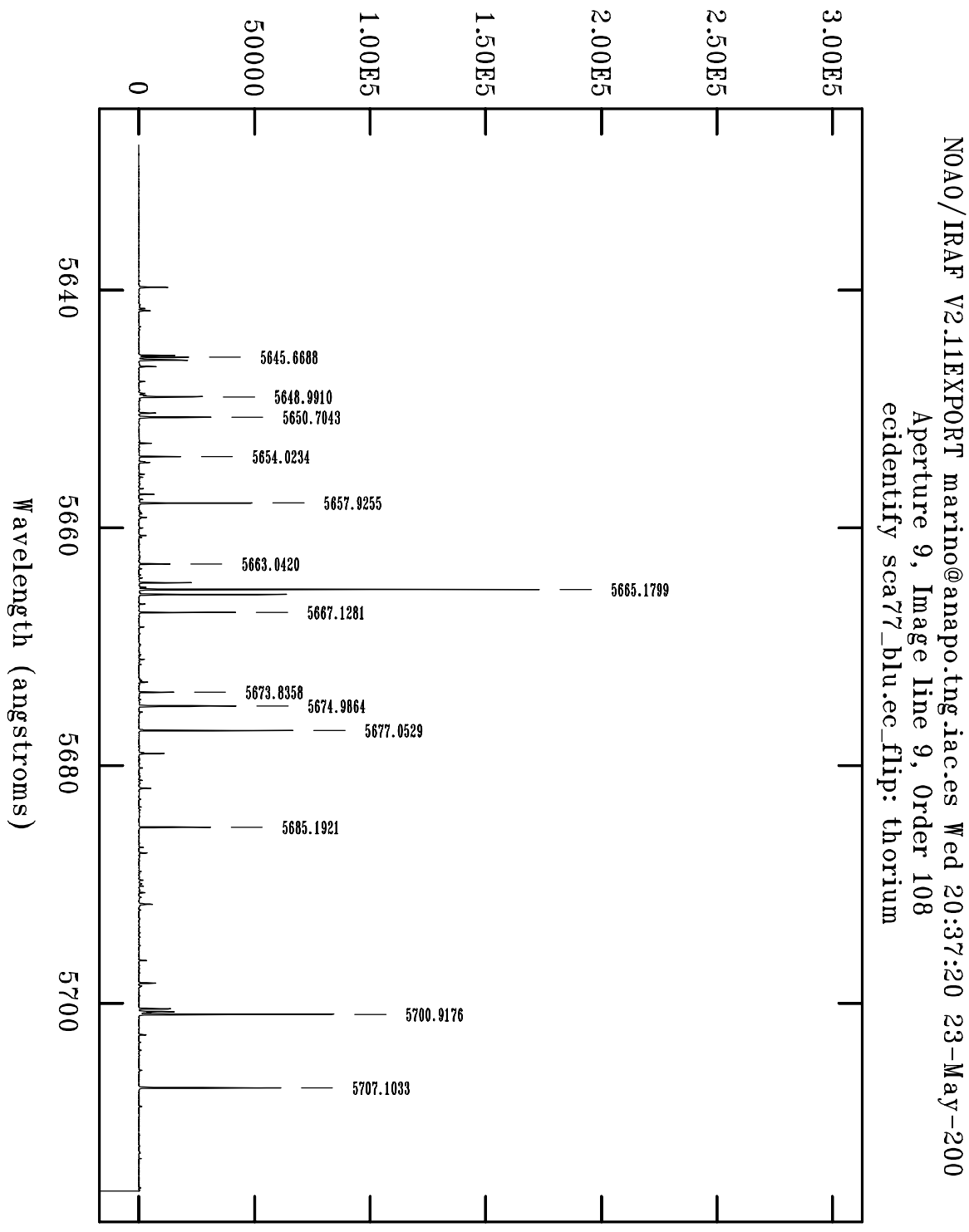
5763.5290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0
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1.50E5
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2.50E5
3.00E5
5640
5660
5680
5700
Wavelength (angstroms)
5645.6688
5648.9910
5650.7043
5654.0234
5657.9255
5663.0420
5665.1799
5667.1281
5673.8358
5674.9864
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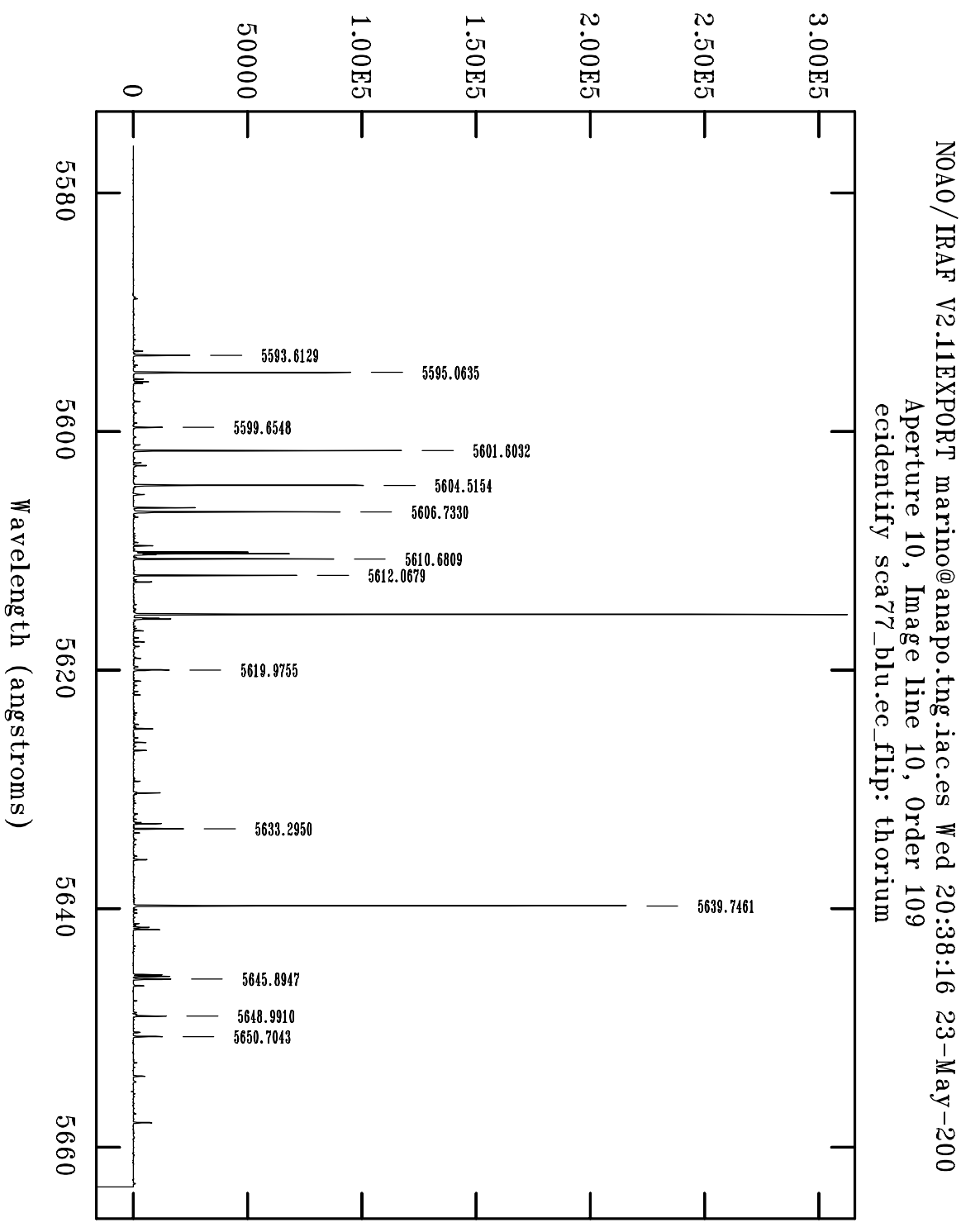
5707.1033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2.50E5
3.00E5
5580
5600
5620
5640
5660
Wavelength (angstroms)
5593.6129
5595.0635
5599.6548
5601.6032
5604.5154
5606.7330
5610.6809
5612.0679
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5633.2950
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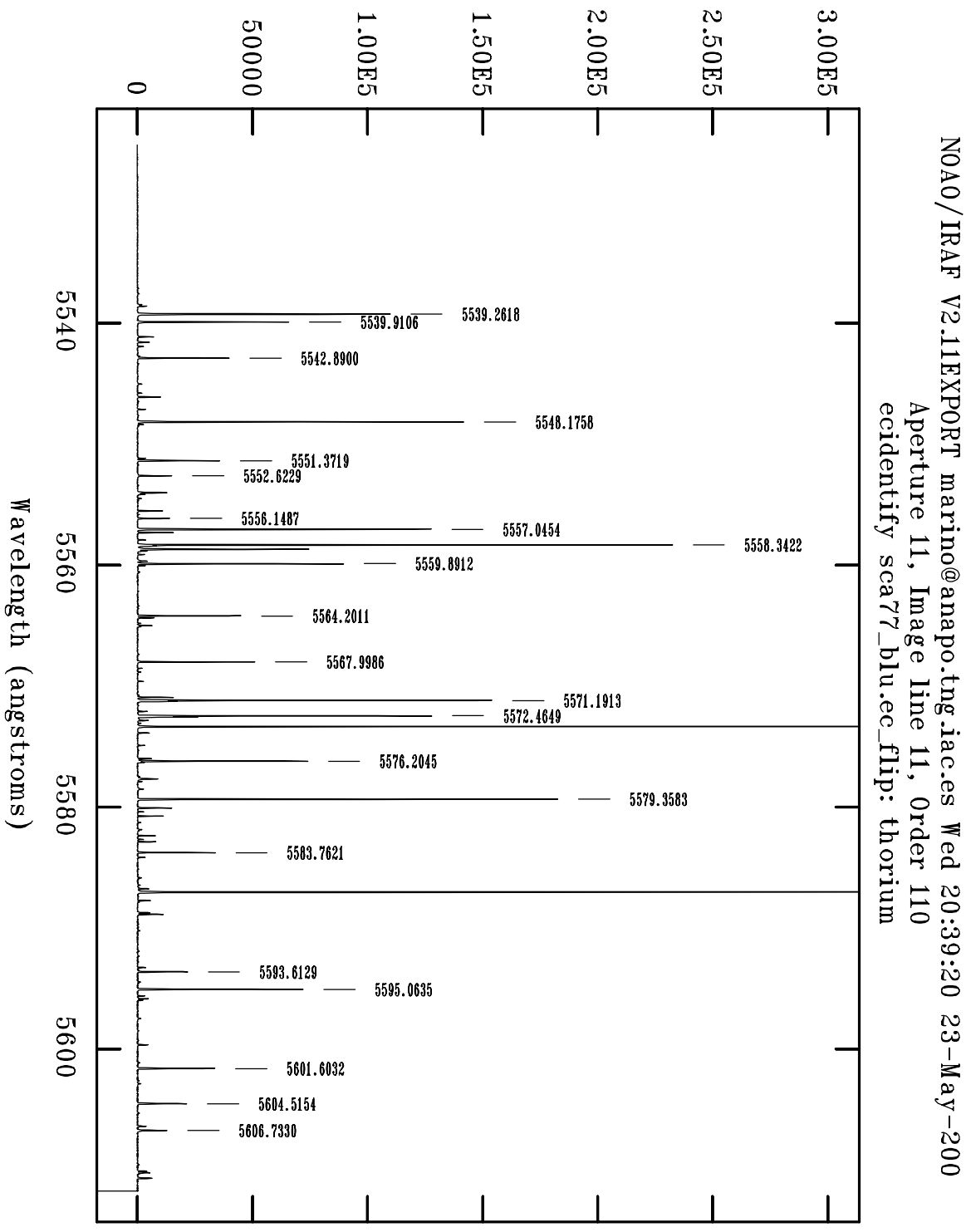
5645.8947
5648.9910
5650.7043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2.00E5
2.50E5
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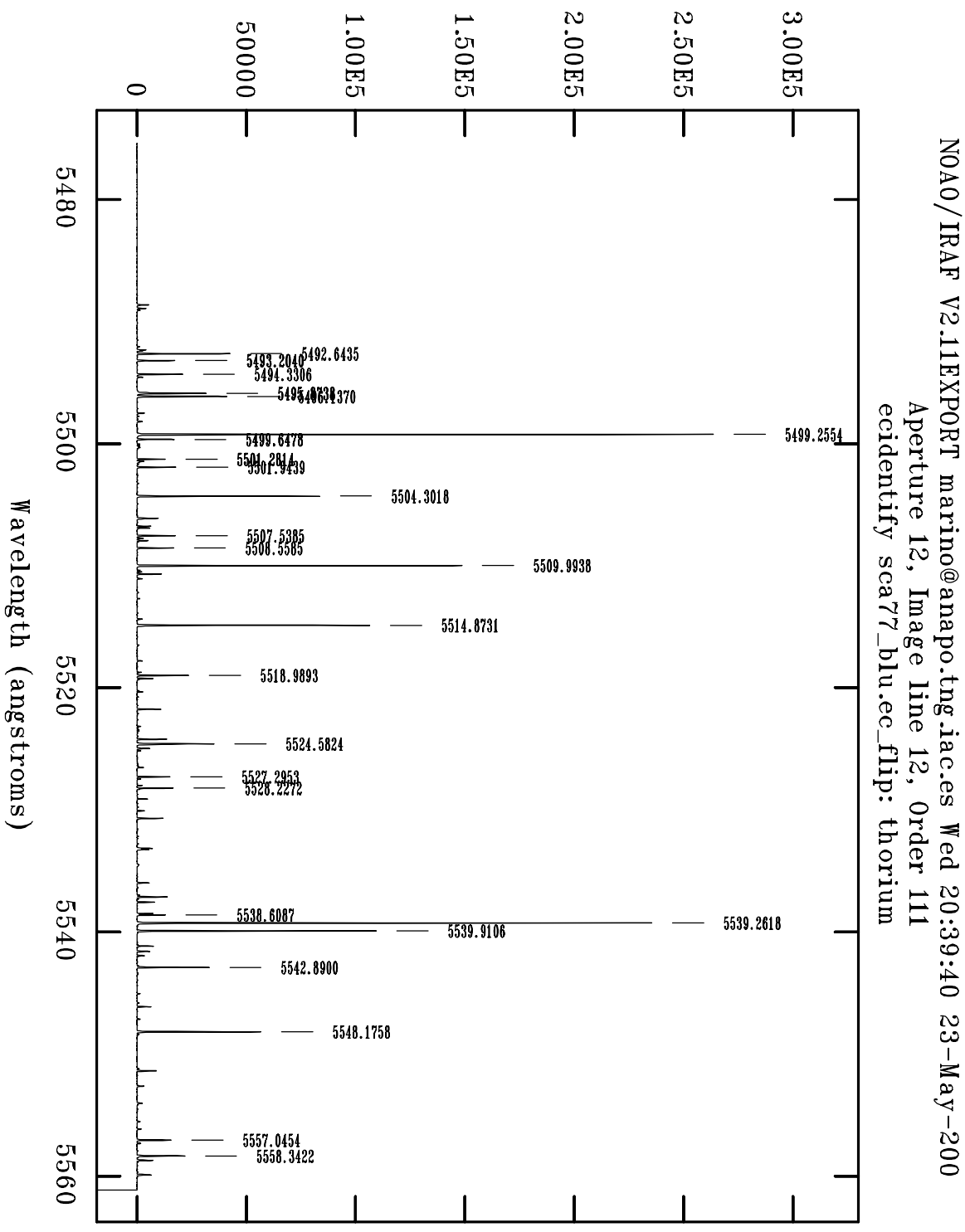
5539.9106
5542.8900
5548.1758
5551.3719
5552.6229
5556.1487
5557.0454
5558.3422
5559.8912
5564.2011
5567.9986
5571.1913
5572.4649
5576.2045
5579.3583
5583.7621
5593.6129
5595.0635
5601.6032
5604.5154
5606.7330
5540
5560
5580
5600
Wavelength (angstroms)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2.50E5
3.00E5
5480
5500
5520
5540
5560
Wavelength (angstroms)
5492.6435
5493.2040
5494.3306
5499.2554
5499.6478
5504.3018
5507.5385
5509.9938
5514.8731
5518.9893
5524.5824
5527.2953
5528.2272
5538.6087
5539.2618
5539.9106
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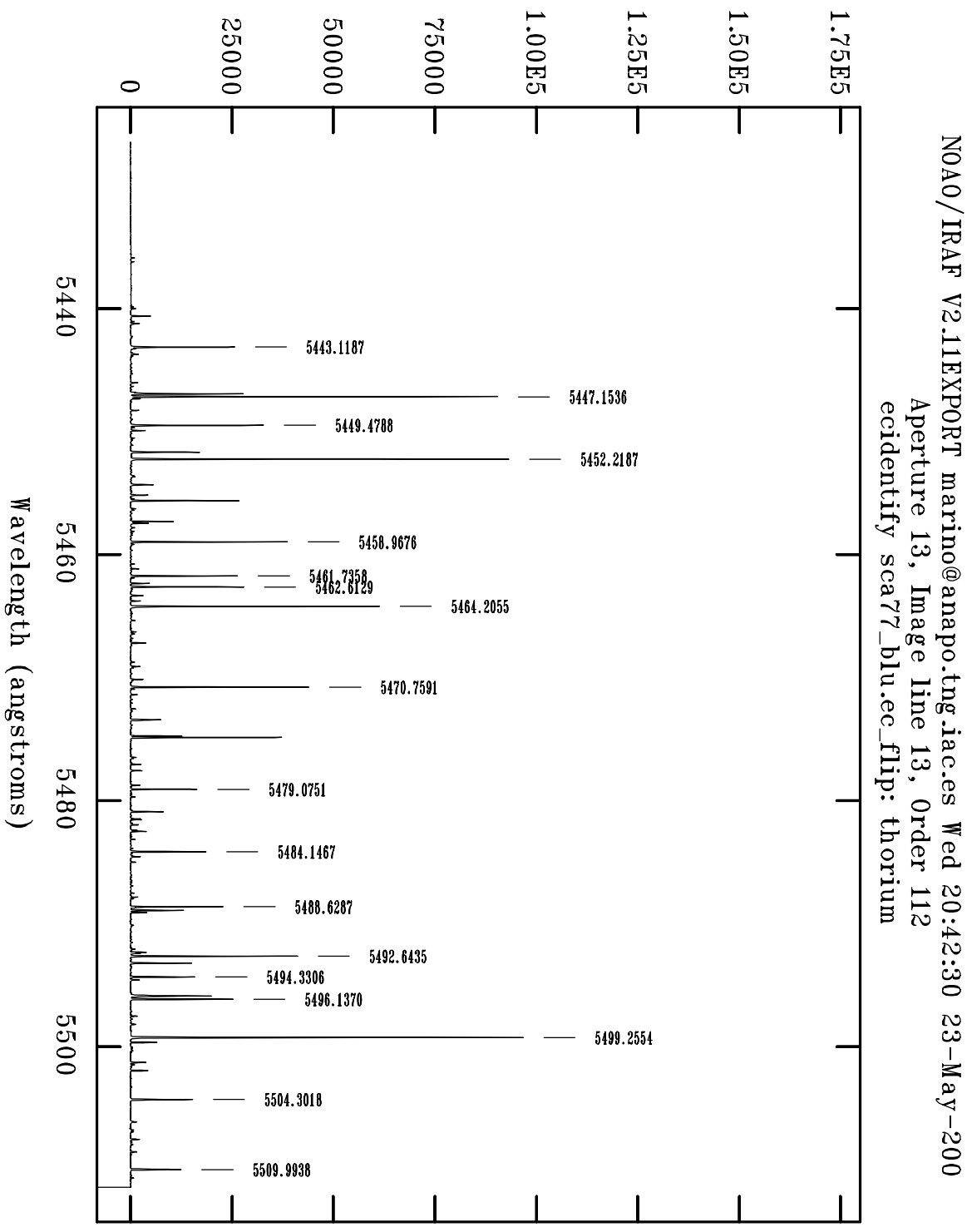
5558.3422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0
25000
50000
75000
1.00E5
1.25E5
1.50E5
1.75E5
5440
5460
5480
5500
Wavelength (angstroms)
5443.1187
5447.1536
5449.4788
5452.2187
5458.9676
5461.7358
5462.6129
5464.2055
5470.7591
5479.0751
5484.1467
5488.6287
5492.6435
5494.3306
5496.1370
5499.2554
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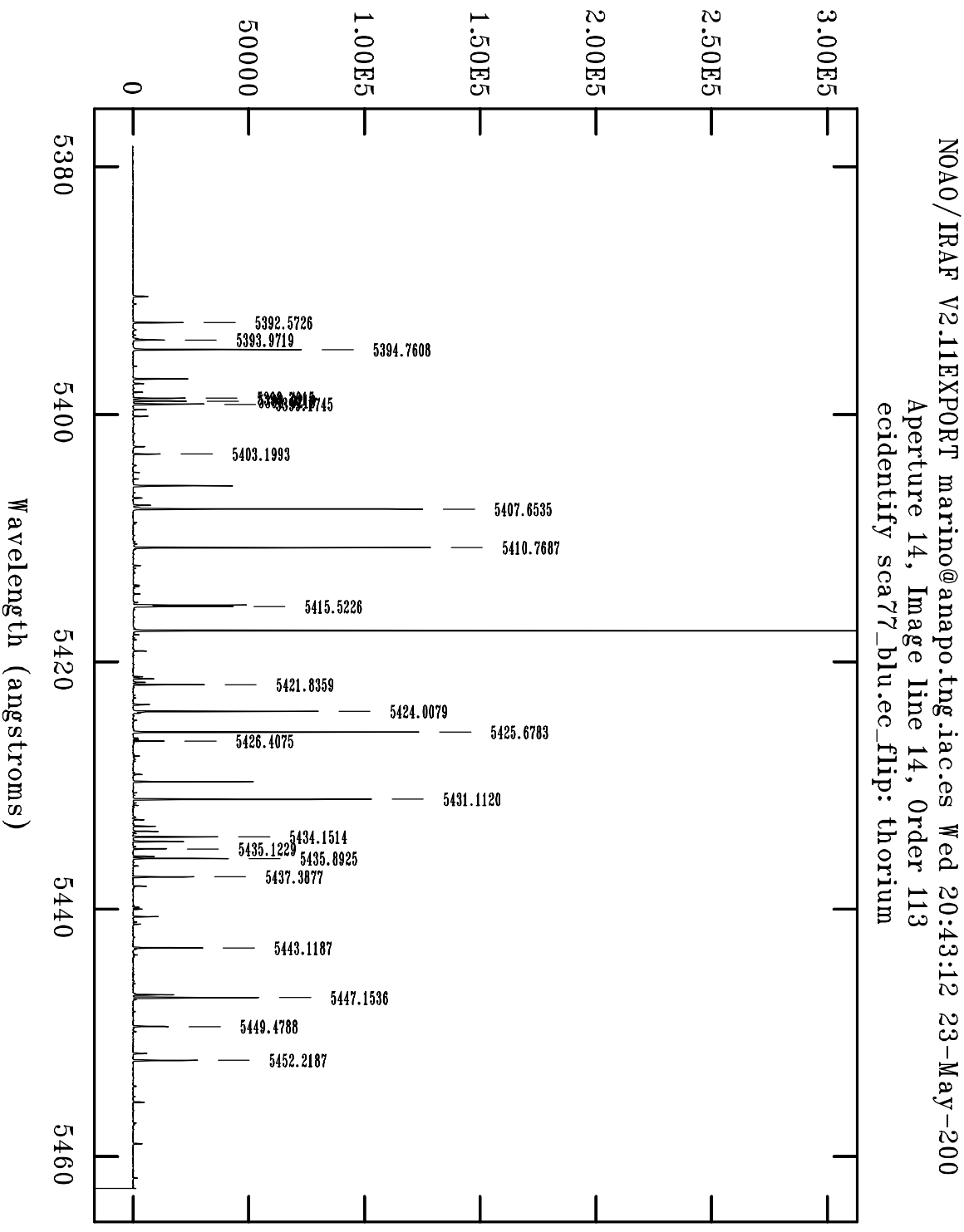
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50000
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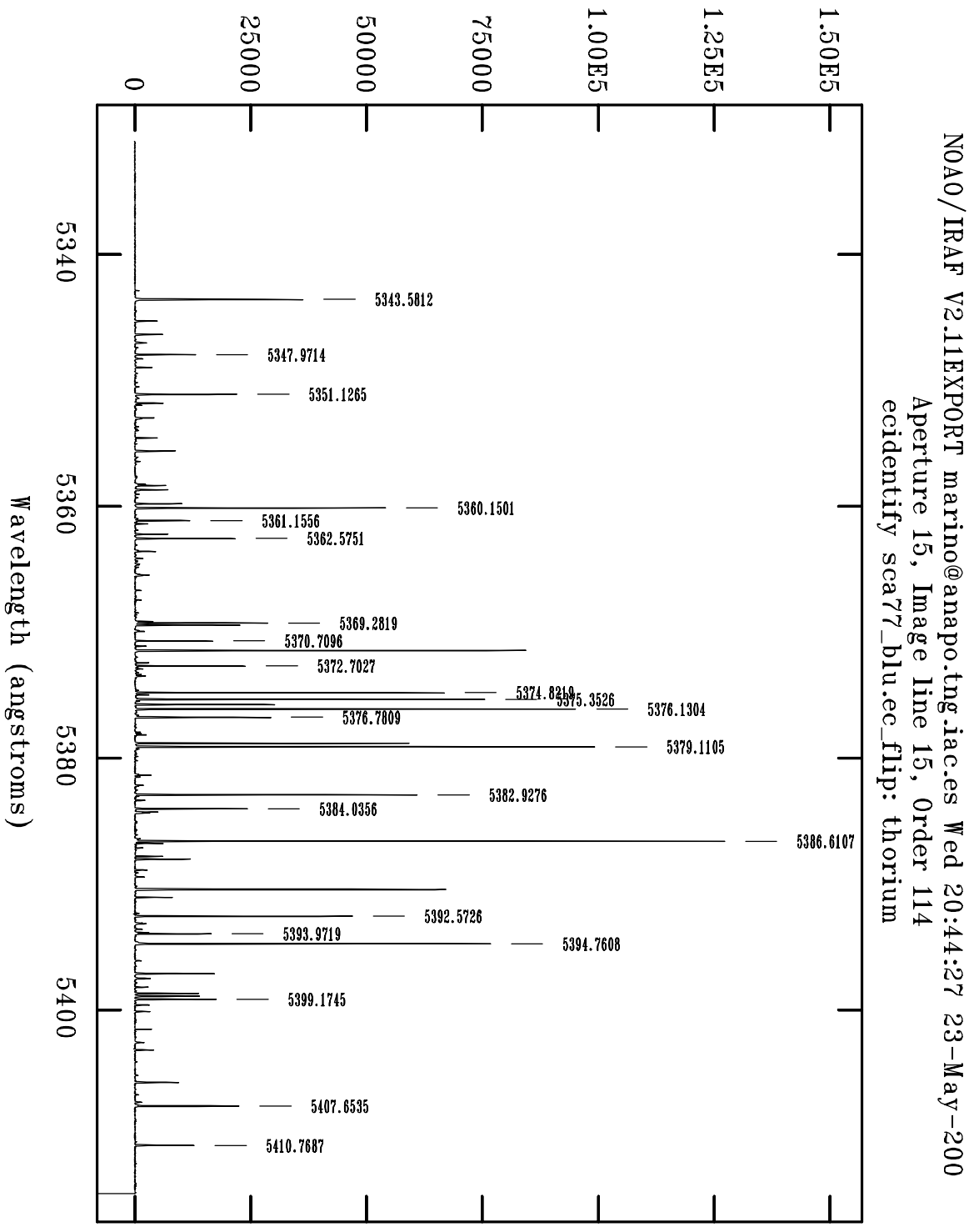
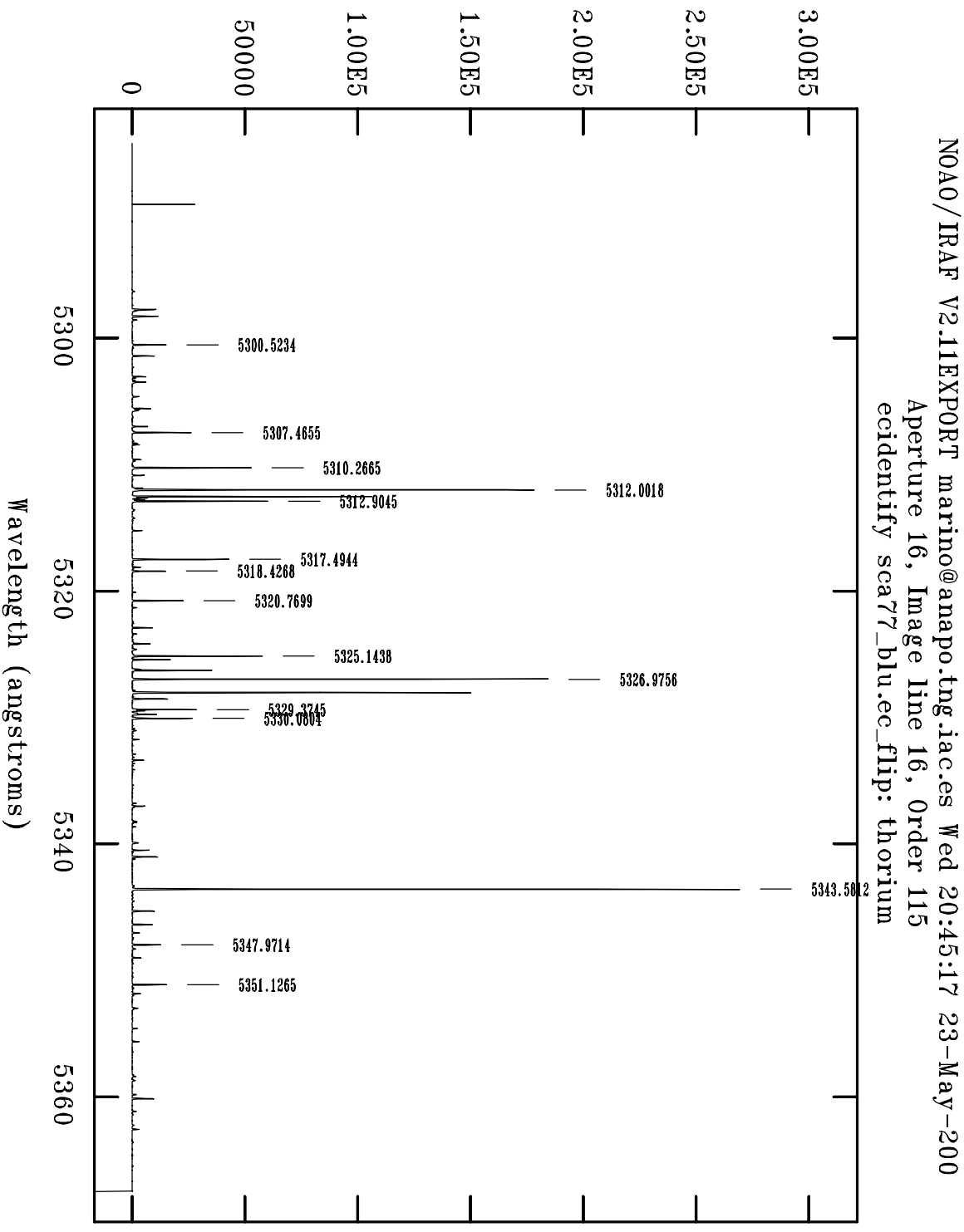
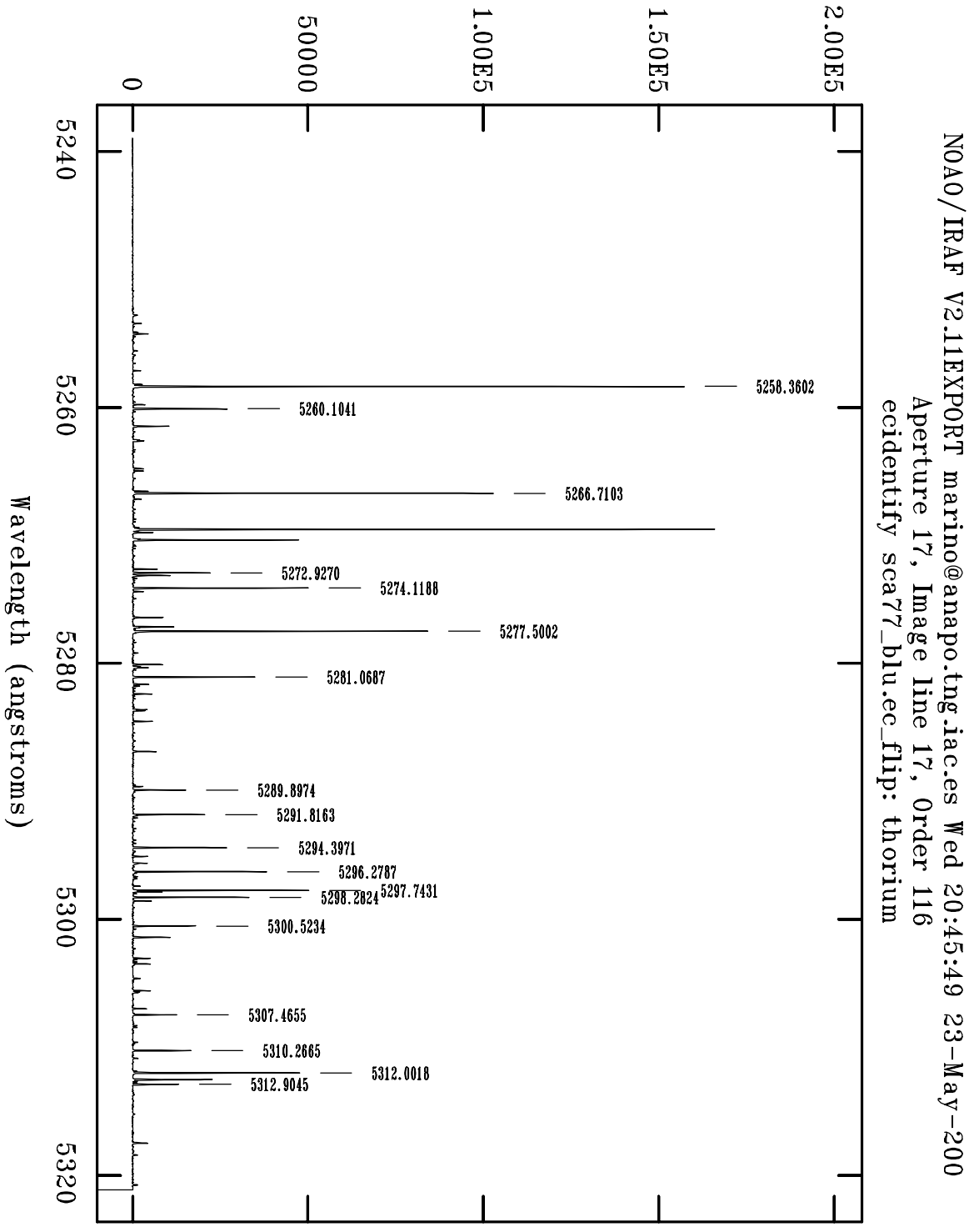
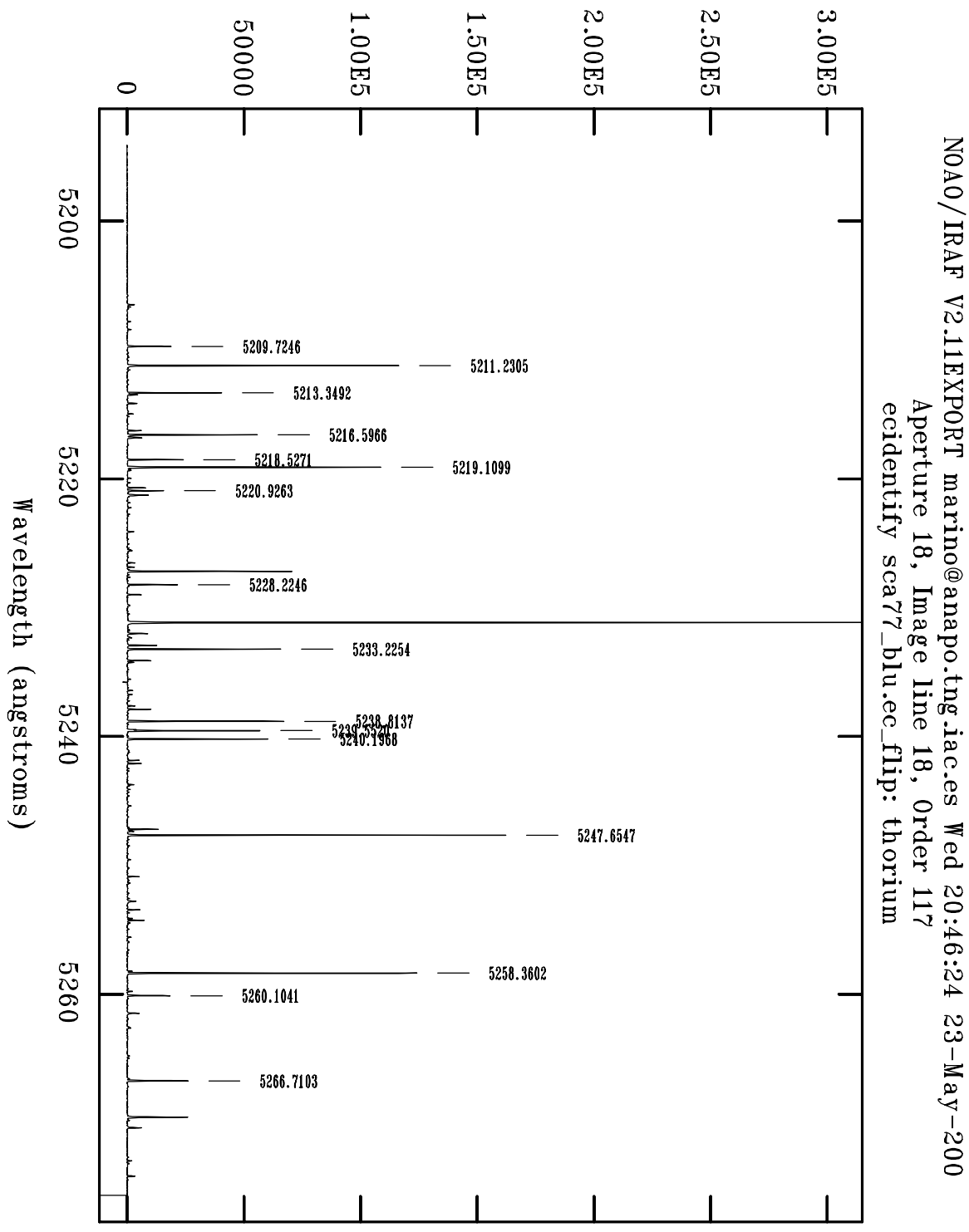
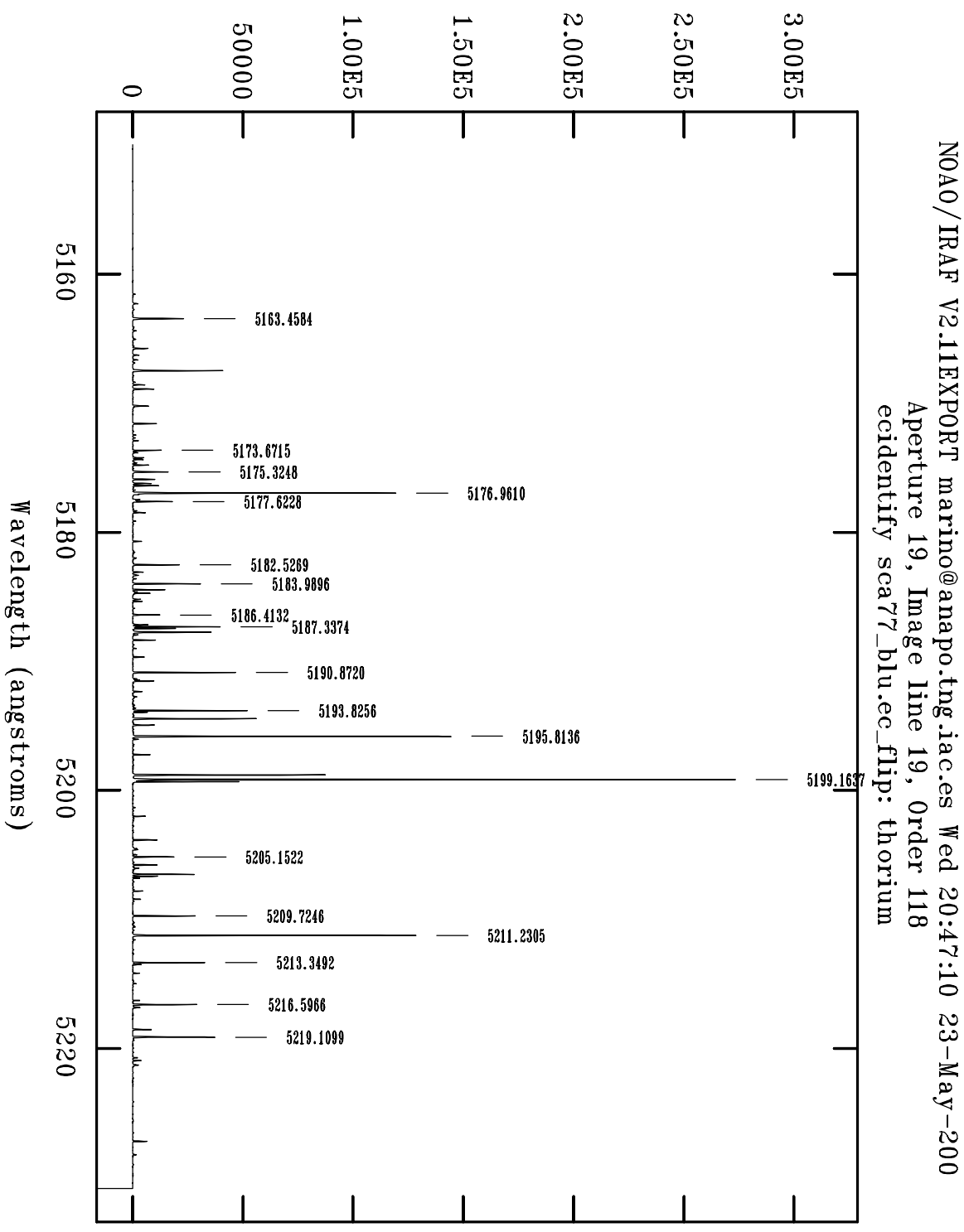
1.50E5
2.00E5
2.50E5
3.00E5
5380
5400
5420
5440
5460
Wavelength (angstroms)
5392.5726
5393.9719
5394.7608
5403.1993
5407.6535
5410.7687
5415.5226
5421.8359
5424.0079
5425.6783
5426.4075
5431.1120
5434.1514
5435.1229
5435.8925
5437.3877
5443.1187
5447.1536
5449.4788
5452.2187

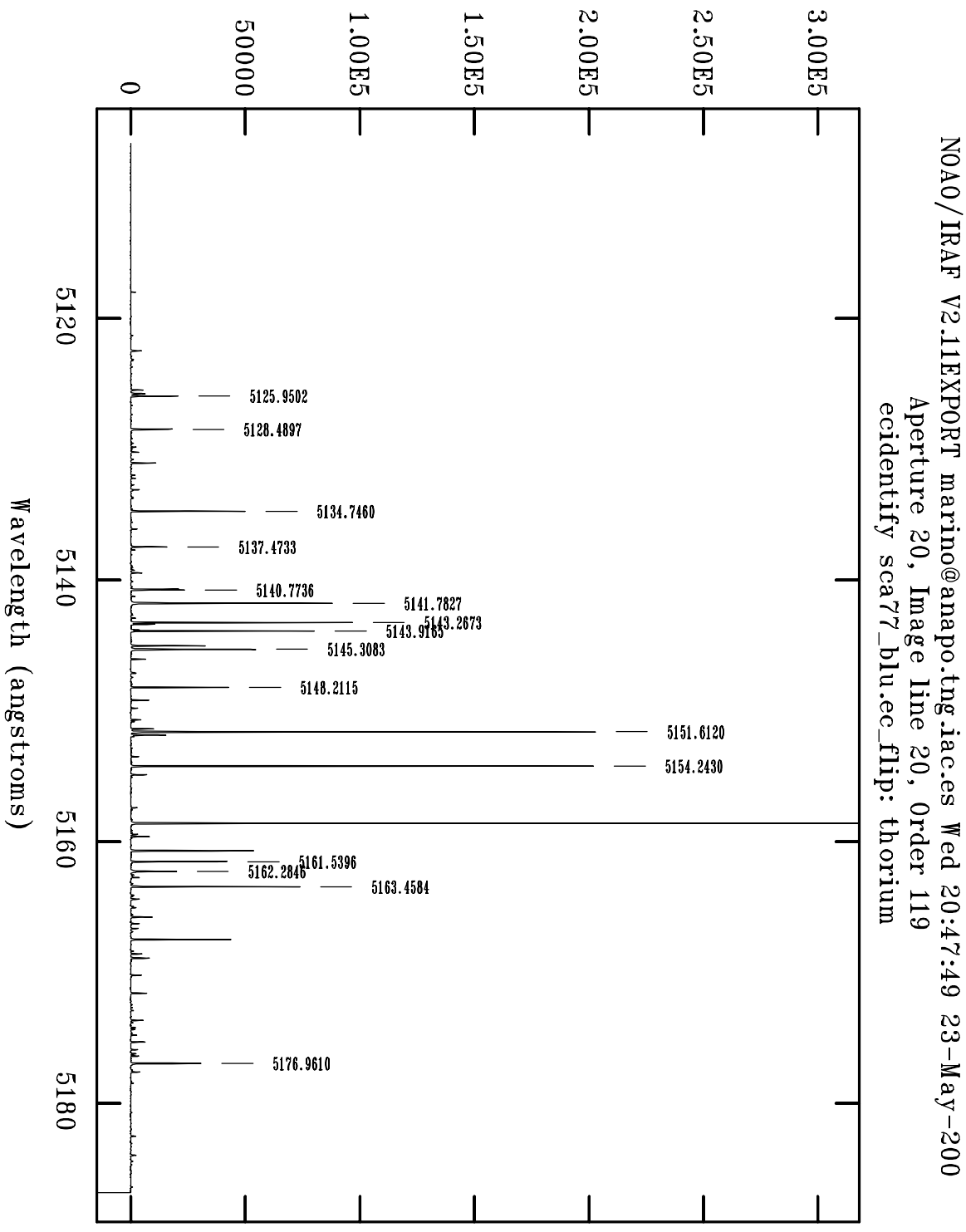

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 20:44:27 23-May-200
Aperture 15, Image line 15, Order 114
ecidentify sca77_blu.ec_flip: thorium
0
25000
50000
75000
1.00E5
1.25E5
1.50E5
5340
5360
5380
5400
Wavelength (angstroms)
5343.5812
5347.9714
5351.1265
5360.1501
5361.1556
5362.5751
5369.2819
5370.7096
5372.7027
5374.8219
5375.3526
5376.1304
5376.7809
5379.1105
5382.9276
5384.0356
5386.6107
5392.5726
5393.9719
5394.7608
5399.1745
5407.6535
5410.7687

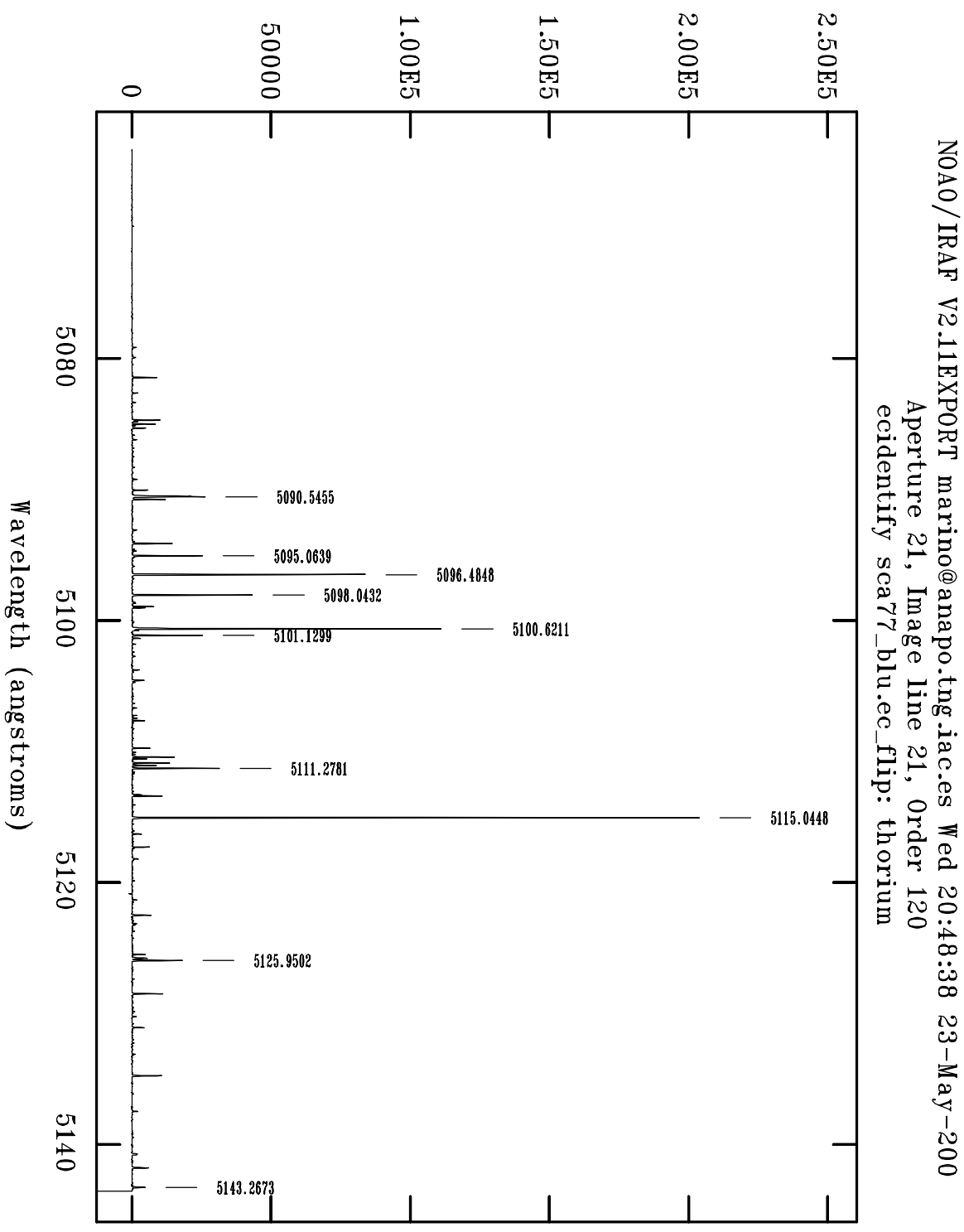

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 20:45:17 23-May-200
Aperture 16, Image line 16, Order 115
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5300
5320
5340
5360
Wavelength (angstroms)
5300.5234
5307.4655
5310.2665
5312.0018
5312.9045
5317.4944
5318.4268
5320.7699
5325.1438
5326.9756
5329.3745
5330.0804
5343.5012
5347.9714
5351.1265

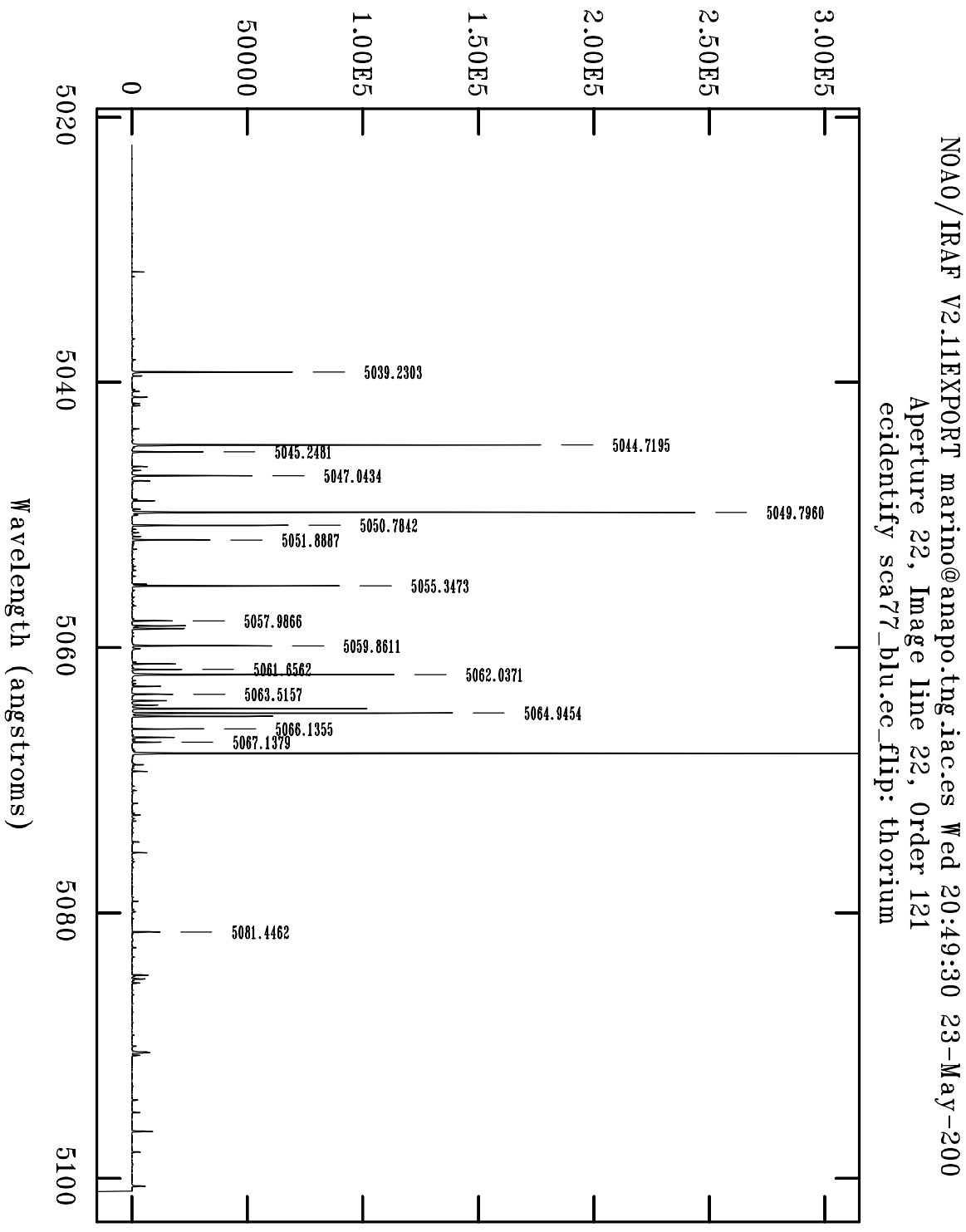

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 20:45:49 23-May-200
Aperture 17, Image line 17, Order 116
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
5240
5260
5280
5300
5320
Wavelength (angstroms)
5258.3602
5260.1041
5266.7103
5272.9270
5274.1188
5277.5002
5281.0687
5289.8974
5291.8163
5294.3971
5296.2787
5297.7431
5298.2824
5300.5234
5307.4655
5310.2665
5312.0018
5312.9045

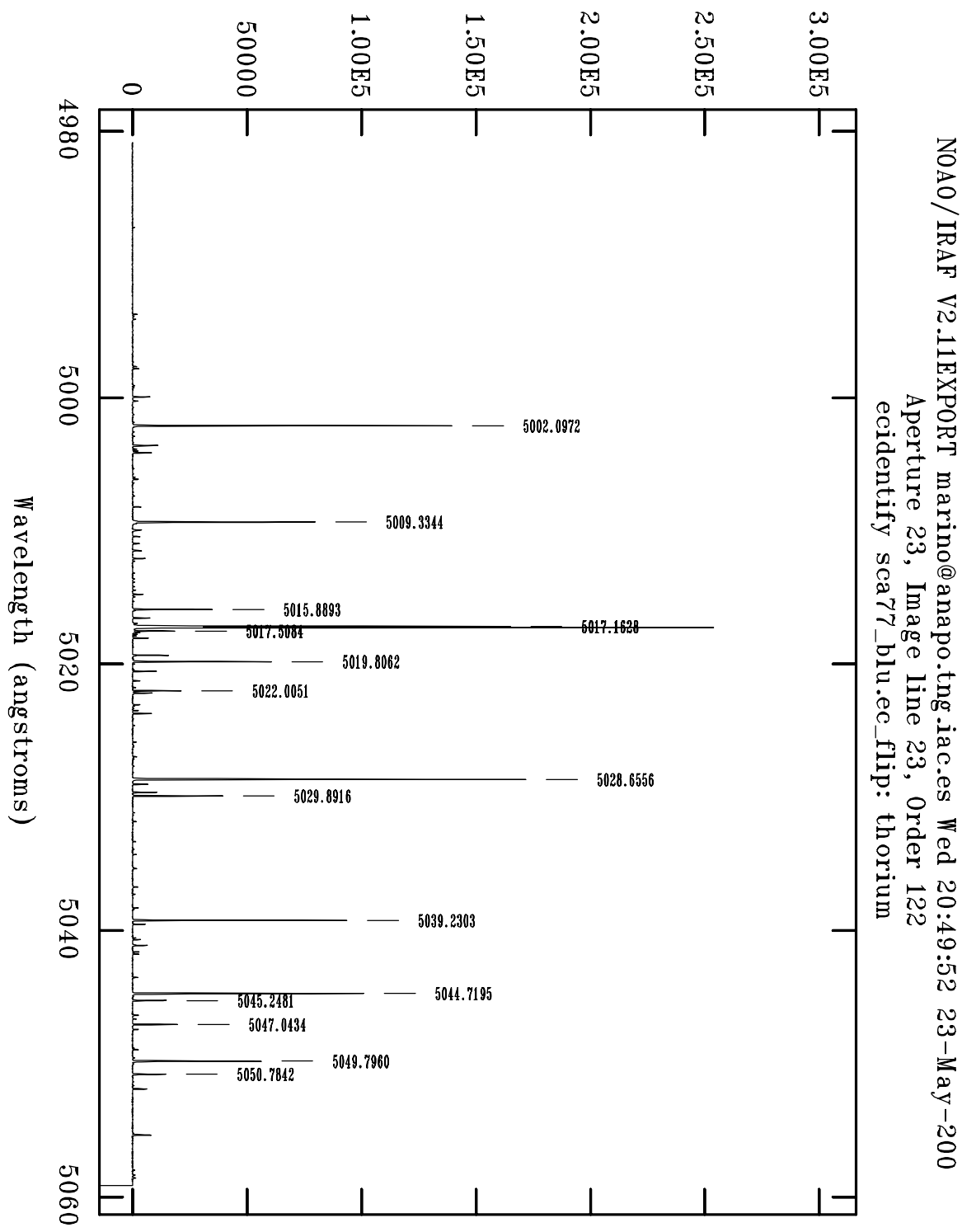

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 20:46:24 23-May-200
Aperture 18, Image line 18, Order 117
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5200
5220
5240
5260
Wavelength (angstroms)
5209.7246
5211.2305
5213.3492
5216.5966
5218.5271
5219.1099
5220.9263
5228.2246
5233.2254
5238.8137
5240.1968
5247.6547
5258.3602
5260.1041
5266.7103

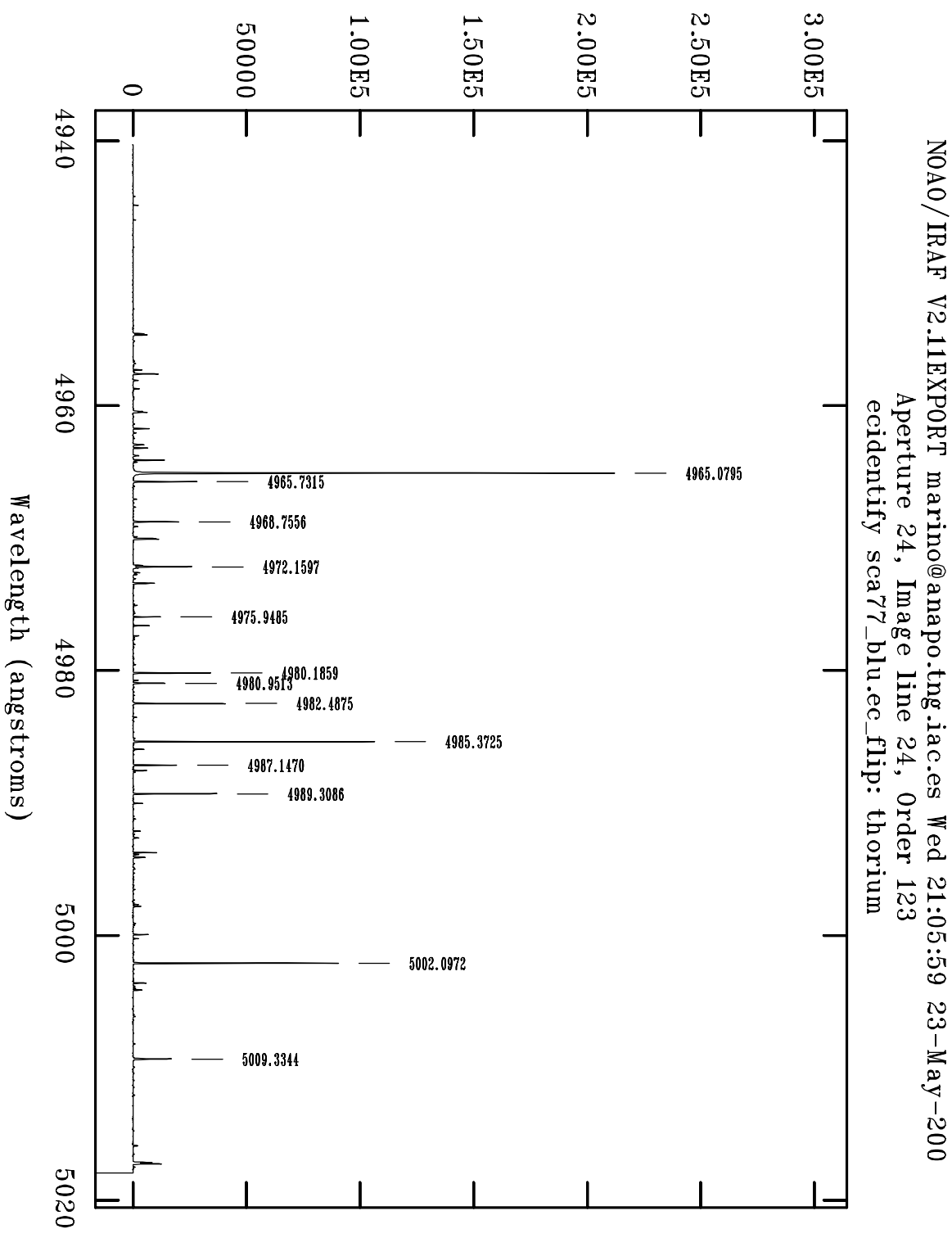

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 20:47:10 23-May-200
Aperture 19, Image line 19, Order 118
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5160
5180
5200
5220
Wavelength (angstroms)
5163.4584
5173.6715
5175.3248
5176.9610
5177.6228
5182.5269
5183.9896
5186.4132
5187.3374
5190.8720
5193.8256
5195.8136
5199.1637
5205.1522
5209.7246
5211.2305
5213.3492
5216.5966
5219.1099

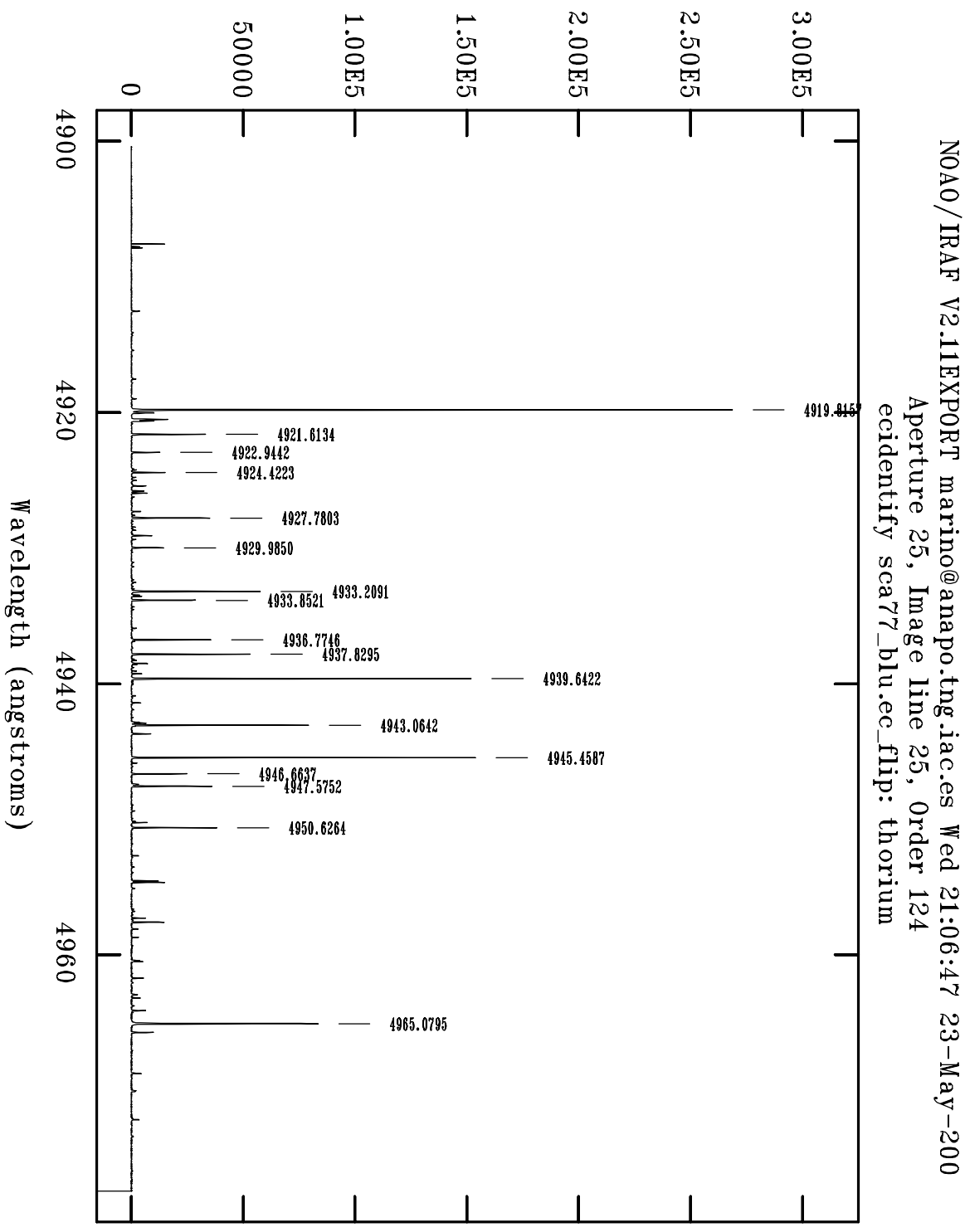

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 20:47:49 23-May-200
Aperture 20, Image line 20, Order 119
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5120
5140
5160
5180
Wavelength (angstroms)
5125.9502
5128.4897
5134.7460
5137.4733
5140.7736
5141.7827
5143.2673
5143.9163
5145.3083
5148.2115
5151.6120
5154.2430
5161.5396
5162.2845
5163.4584
5176.9610

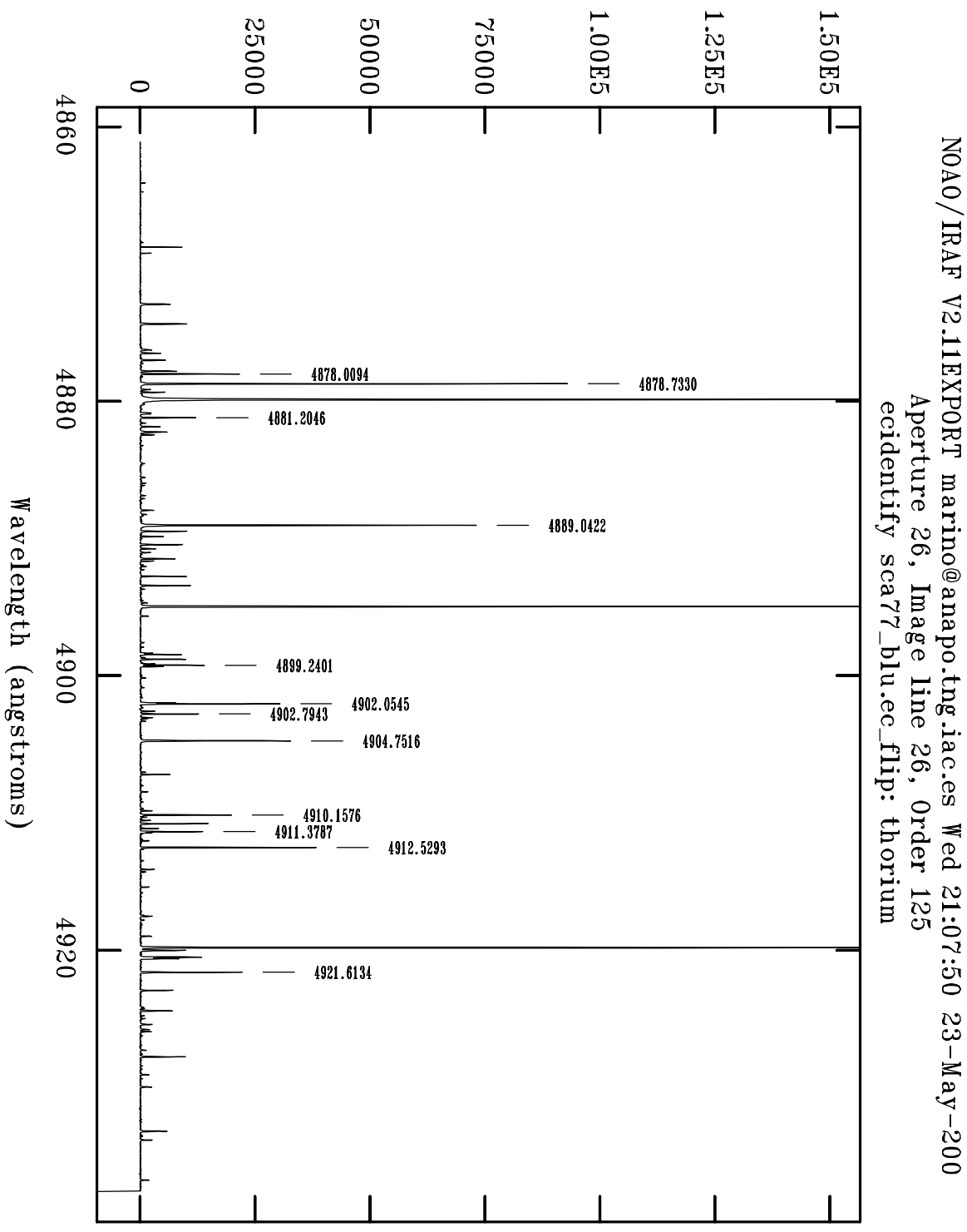

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 20:48:38 23-May-200
Aperture 21, Image line 21, Order 120
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
5080
5100
5120
5140
Wavelength (angstroms)
5090.5455
5095.0639
5096.4848
5098.0432
5100.6211
5101.1299
5111.2781
5115.0448
5125.9502
5143.2673

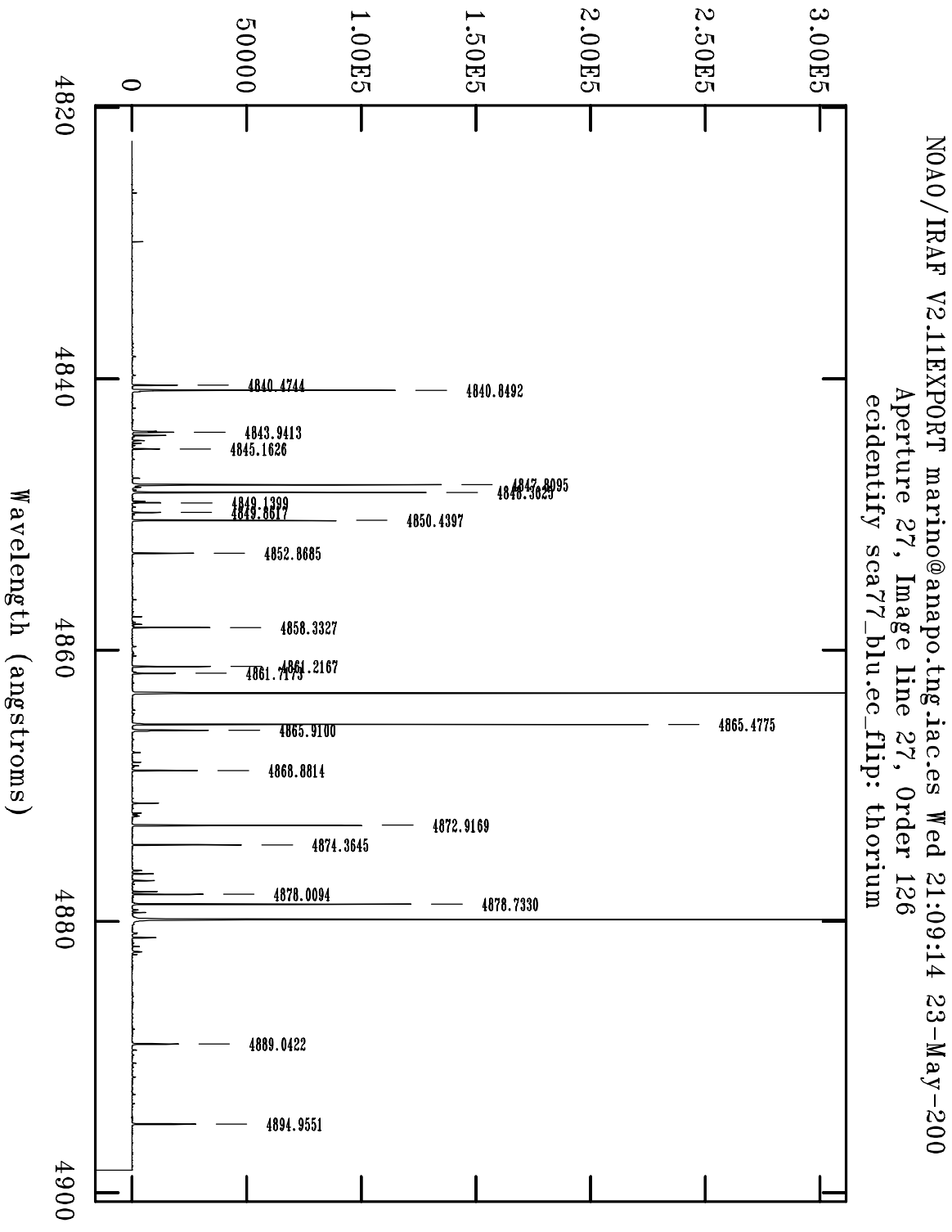

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 20:49:30 23-May-200
Aperture 22, Image line 22, Order 121
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
5020
5040
5060
5080
5100
Wavelength (angstroms)
5039.2303
5044.7195
5045.2481
5047.0434
5049.7960
5050.7842
5051.8887
5055.3473
5057.9866
5059.8611
5061.6562
5062.0371
5063.5157
5064.9454
5066.1355
5067.1379
5081.4462

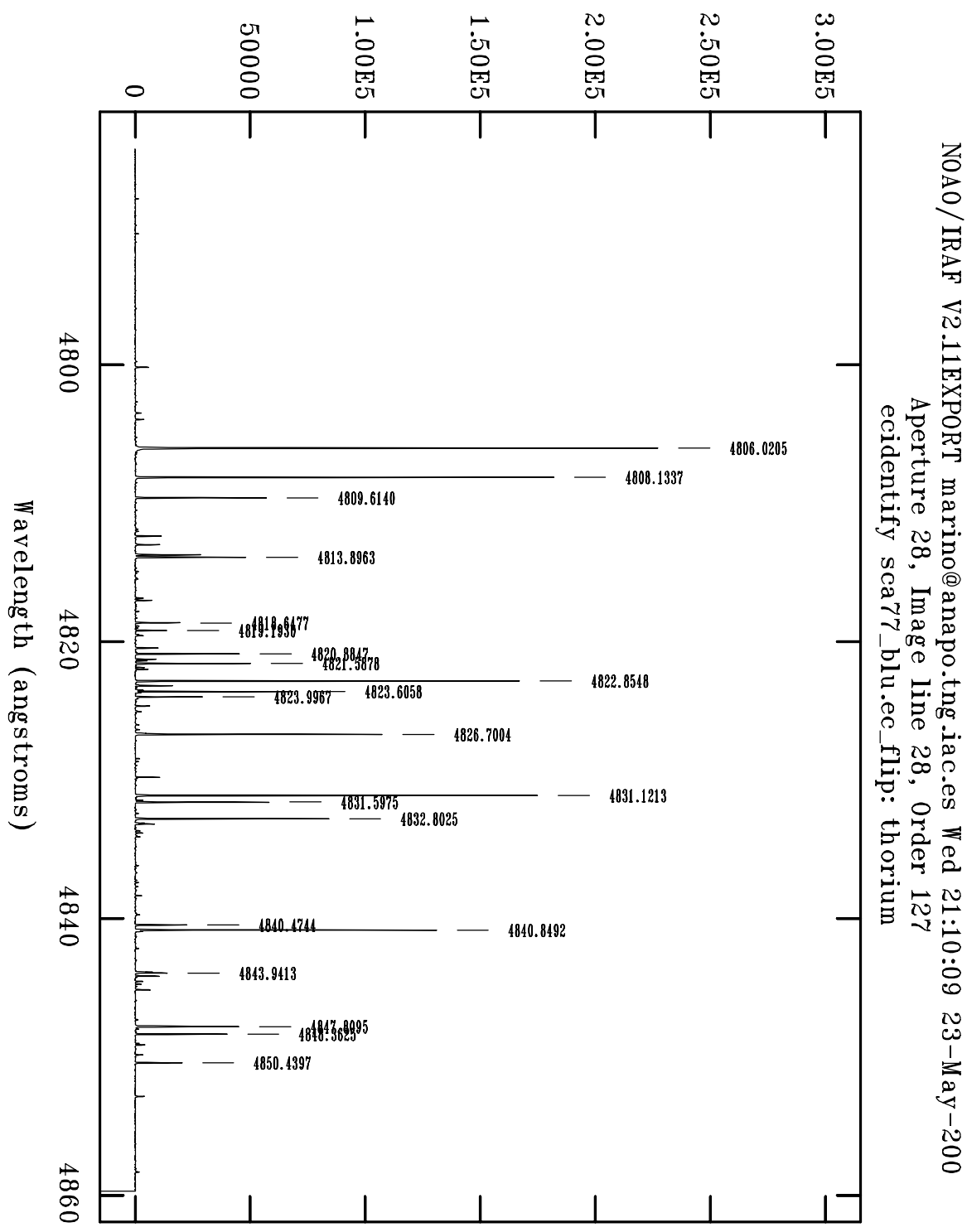

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 20:49:52 23-May-200
Aperture 23, Image line 23, Order 122
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
4980
5000
5020
5040
5060
Wavelength (angstroms)
5002.0972
5009.3344
5015.8893
5017.5084
5017.1628
5019.8062
5022.0051
5028.6556
5029.8916
5039.2303
5044.7195
5045.2481
5047.0434
5049.7960
5050.7842

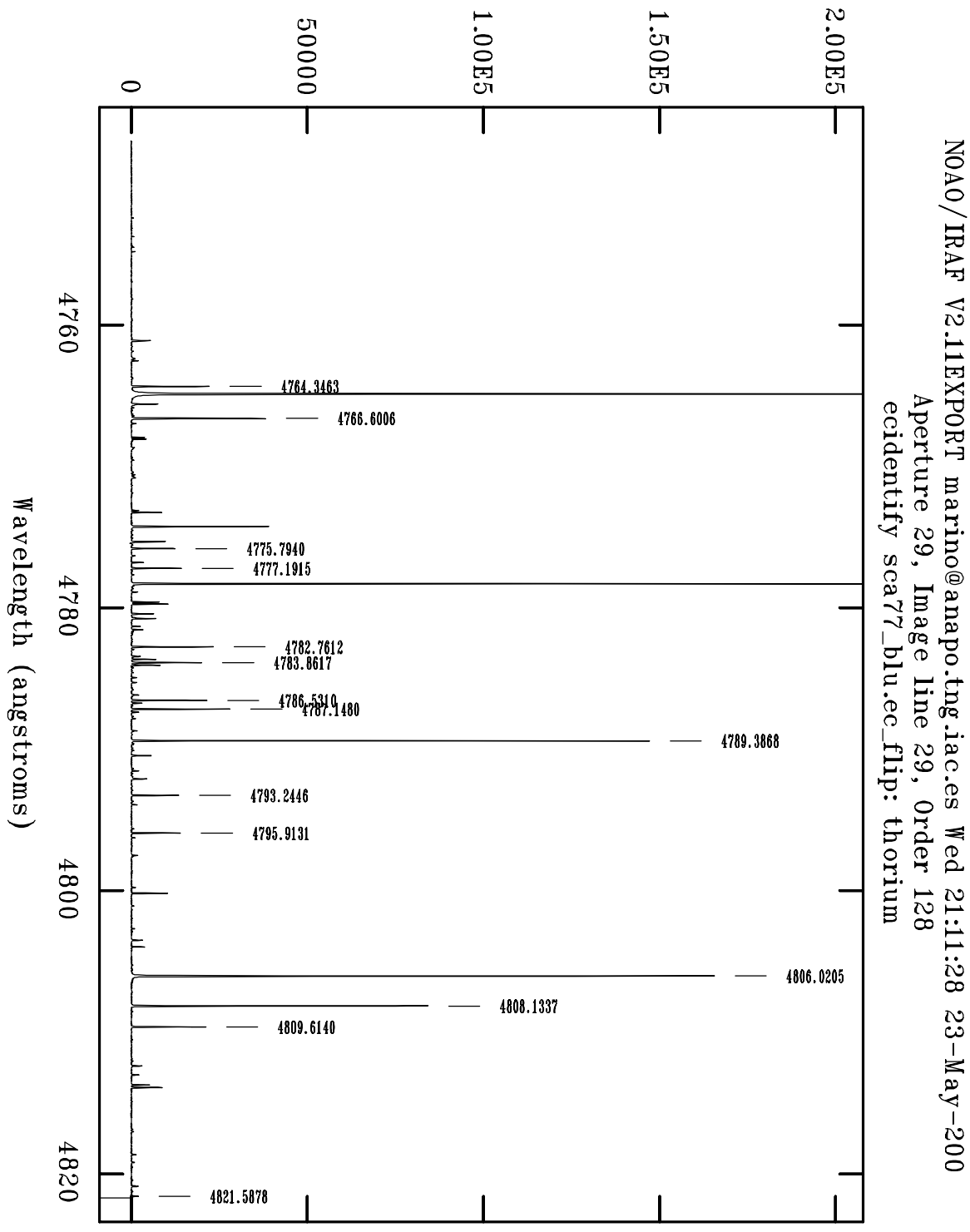

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:05:59 23-May-200
Aperture 24, Image line 24, Order 123
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
4940
4960
4980
5000
5020
Wavelength (angstroms)
4965.0795
4965.7315
4968.7556
4972.1597
4975.9485
4980.1859
4980.9513
4982.4875
4985.3725
4987.1470
4989.3086
5002.0972
5009.3344

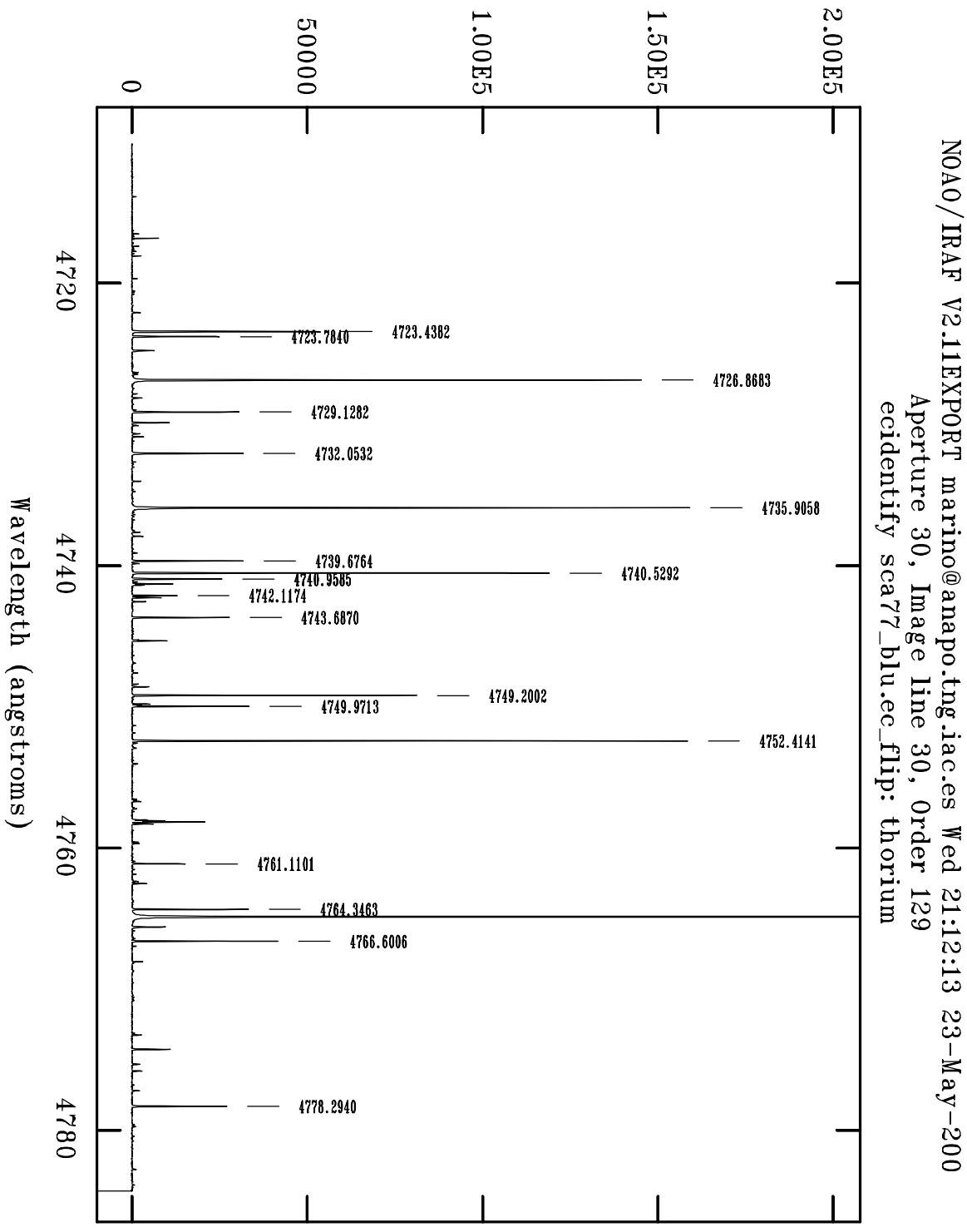

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:06:47 23-May-200
Aperture 25, Image line 25, Order 124
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
4900
4920
4940
4960
Wavelength (angstroms)
4919.8152
4921.6134
4922.9442
4924.4223
4927.7803
4929.9850
4933.2091
4933.8521
4936.7746
4937.8295
4939.6422
4943.0642
4945.4587
4946.6637
4947.5752
4950.6264
4965.0795

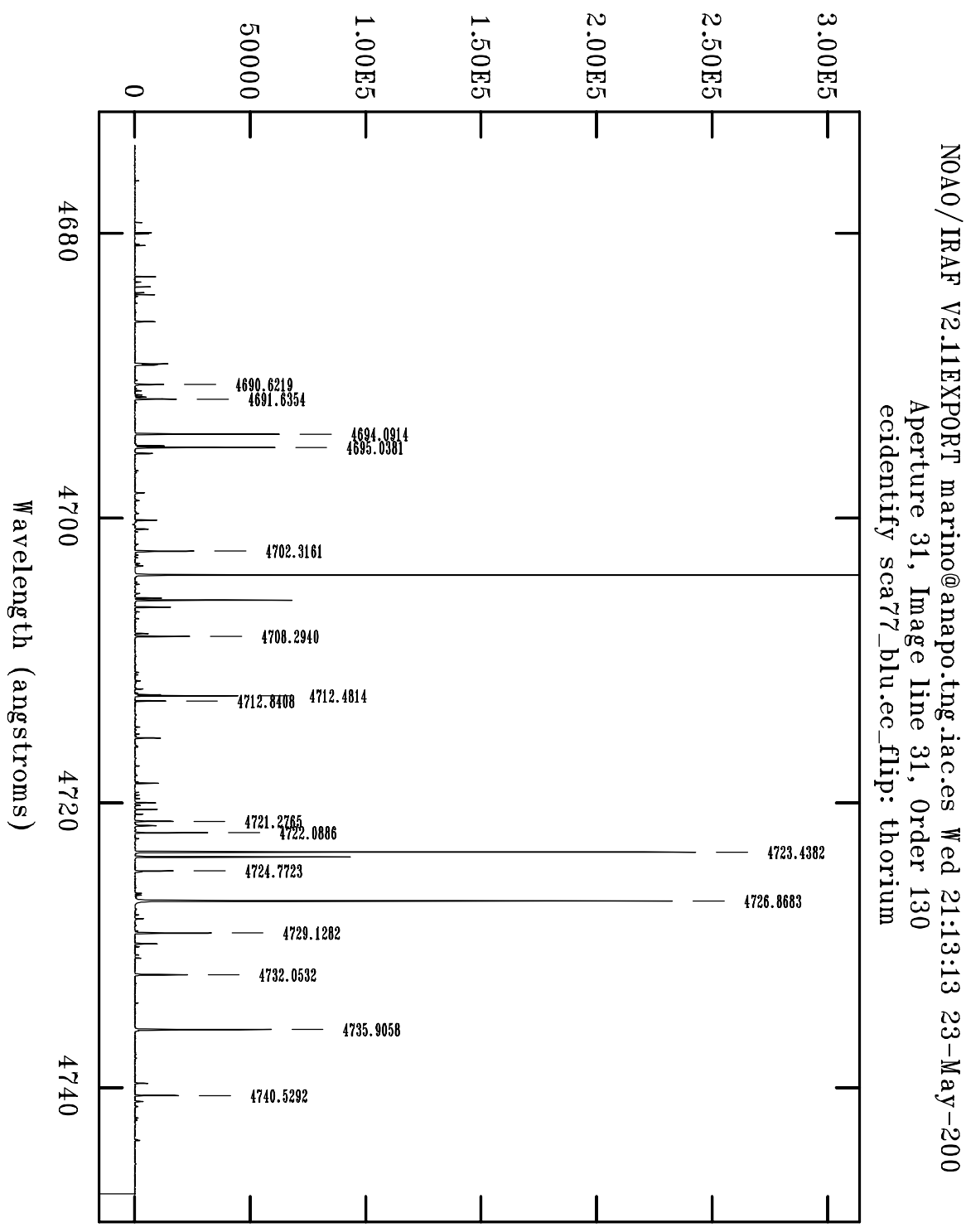

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:07:50 23-May-200
Aperture 26, Image line 26, Order 125
ecidentify sca77_blu.ec_flip: thorium
0
25000
50000
75000
1.00E5
1.25E5
1.50E5
4860
4880
4900
4920
Wavelength (angstroms)
4878.0094
4878.7330
4881.2046
4889.0422
4899.2401
4902.0545
4902.7943
4904.7516
4910.1576
4911.3787
4912.5293
4921.6134

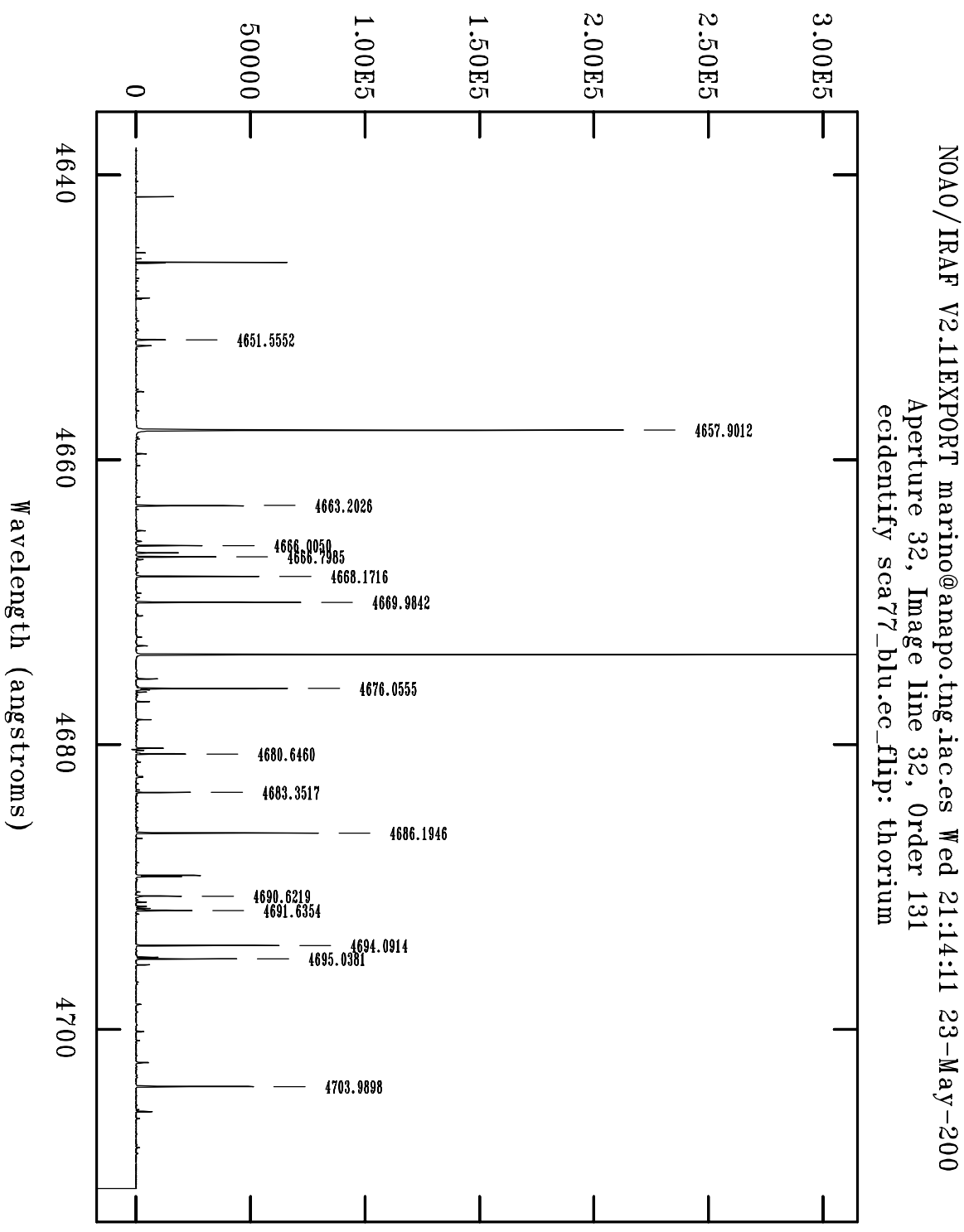

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:09:14 23-May-200
Aperture 27, Image line 27, Order 126
ecidentify sca77_blu.ec_flip: thorium
Wavelength (angstroms)
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
4820
4840
4860
4880
4900
4840.4744
4840.8492
4843.9413
4845.1626
4847.8095
4848.3029
4849.1399
4849.8617
4850.4397
4852.8685
4858.3327
4861.2167
4865.4775
4865.9100
4868.8814
4872.9169
4874.3645
4878.0094
4878.7330
4889.0422
4894.9551

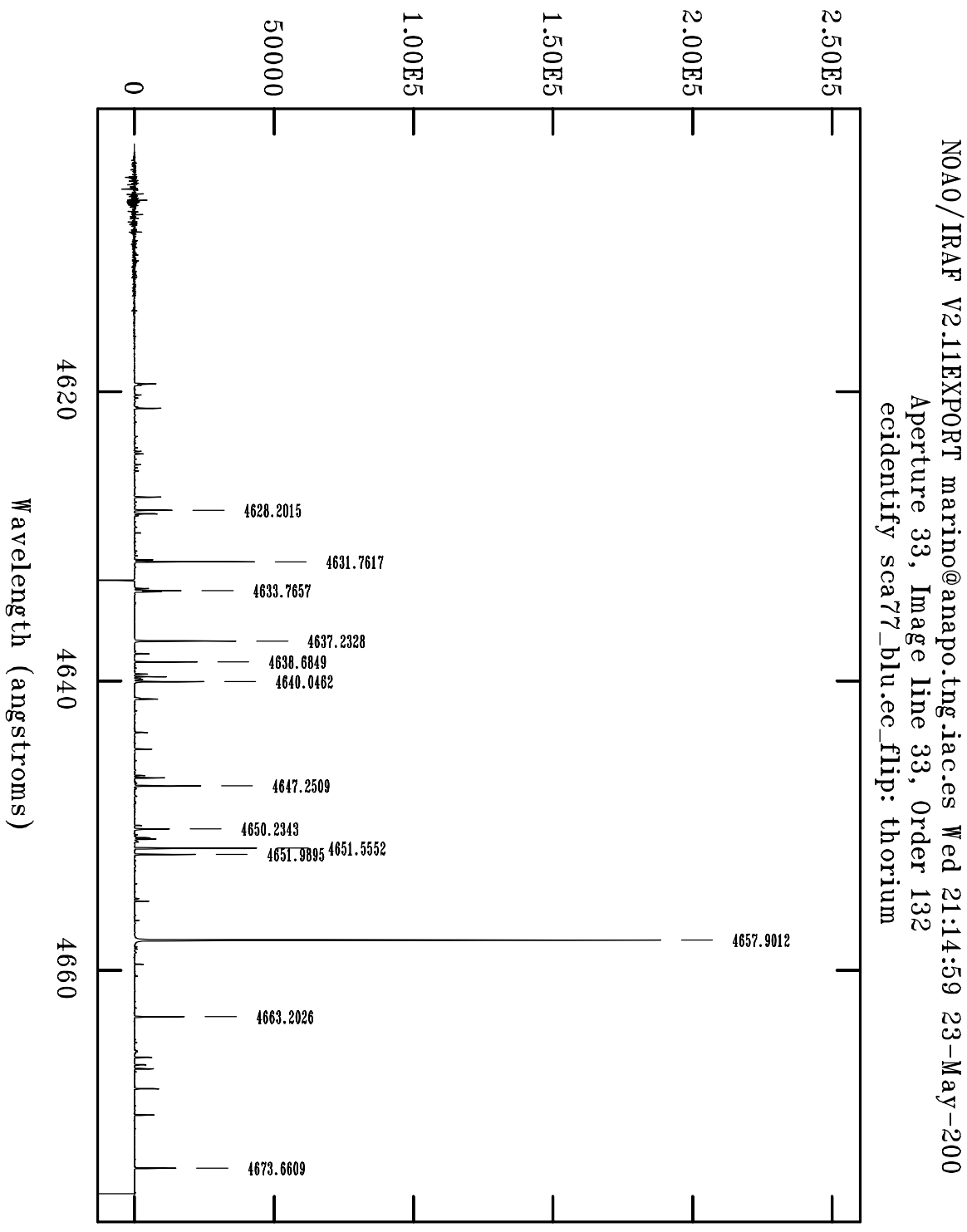

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:10:09 23-May-200
Aperture 28, Image line 28, Order 127
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
4800
4820
4840
4860
Wavelength (angstroms)
4806.0205
4808.1337
4809.6140
4813.8963
4819.6477
4819.7936
4820.8847
4821.3878
4822.8548
4823.6058
4823.9967
4826.7004
4831.1213
4831.5975
4832.8025
4840.4744
4840.8492
4843.9413
4847.8095
4848.3629
4850.4397

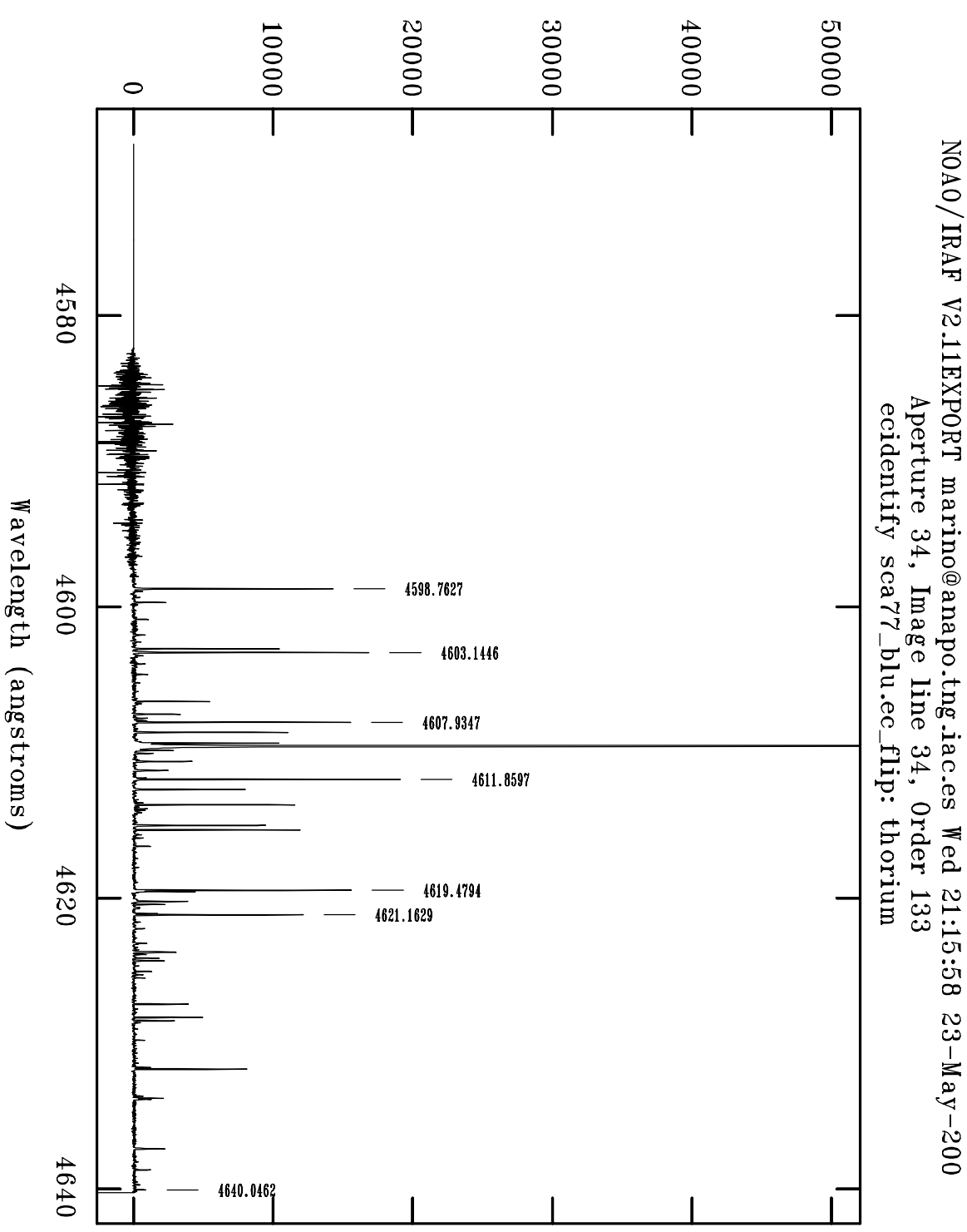

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:11:28 23-May-200
Aperture 29, Image line 29, Order 128
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
4760
4780
4800
4820
Wavelength (angstroms)
4764.3463
4766.6006
4775.7940
4777.1915
4782.7612
4783.8617
4786.5310
4787.1480
4789.3868
4793.2446
4795.9131
4806.0205
4808.1337
4809.6140
4821.5878

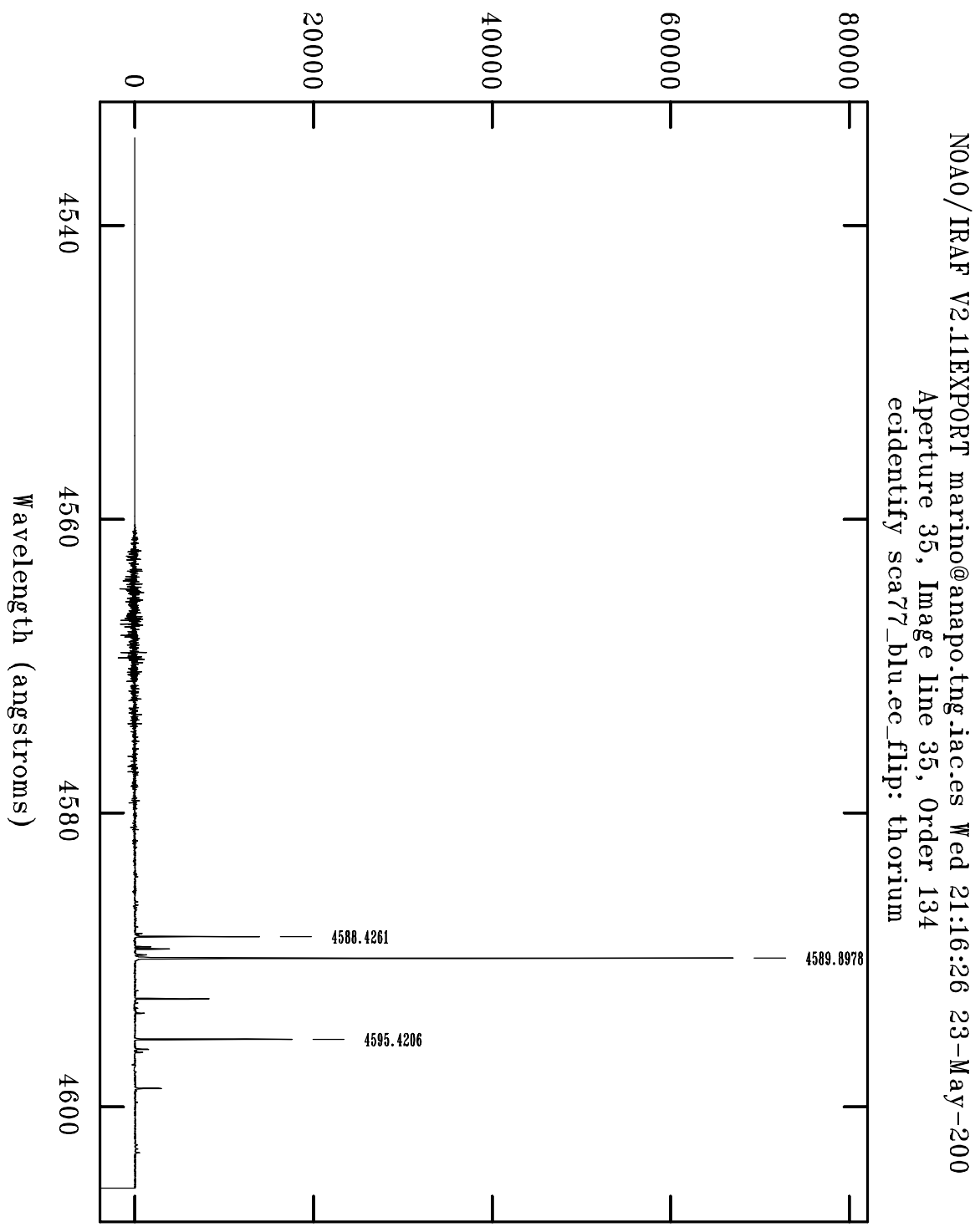

NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:12:13 23-May-200
Aperture 30, Image line 30, Order 129
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
4720
4740
4760
4780
Wavelength (angstroms)
4723.7840
4723.4382
4726.8683
4729.1282
4732.0532
4735.9058
4739.6764
4740.9585
4740.5292
4742.1174
4743.6870
4749.2002
4749.9713
4752.4141
4761.1101
4764.3463
4766.6006
4778.2940


NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:13:13 23-May-200
Aperture 31, Image line 31, Order 130
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
4680
4700
4720
4740
Wavelength (angstroms)
4690.6219
4691.6354
4694.0914
4695.0381
4702.3161
4708.2940
4712.8408
4712.4814
4721.2765
4722.0886
4723.4382
4724.7723
4726.8683
4729.1282
4732.0532
4735.9058
4740.5292


NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:14:11 23-May-200
Aperture 32, Image line 32, Order 131
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
3.00E5
4640
4660
4680
4700
Wavelength (angstroms)
4651.5552
4657.9012
4663.2026
4666.0050
4666.7985
4668.1716
4669.9842
4676.0555
4680.6460
4683.3517
4686.1946
4690.6219
4691.6354
4694.0914
4695.0381
4703.9898


NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:14:59 23-May-200
Aperture 33, Image line 33, Order 132
ecidentify sca77_blu.ec_flip: thorium
0
50000
1.00E5
1.50E5
2.00E5
2.50E5
4620
4640
4660
Wavelength (angstroms)
4628.2015
4631.7617
4633.7657
4637.2328
4638.6849
4640.0462
4647.2509
4650.2343
4651.9895
4651.5552
4657.9012
4663.2026
4673.6609


NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:15:58 23-May-200
Aperture 34, Image line 34, Order 133
ecidentify sca77_blu.ec_flip: thorium
0
10000
20000
30000
40000
50000
4580
4600
4620
4640
Wavelength (angstroms)
4598.7627
4603.1446
4607.9347
4611.8597
4619.4794
4621.1629
4640.0462


NOAO/IRAF V2.11EXPORT marino@anapo.tng.iac.es Wed 21:16:26 23-May-200
Aperture 35, Image line 35, Order 134
ecidentify sca77_blu.ec_flip: thorium
0
20000
40000
60000
80000
4540
4560
4580
4600
Wavelength (angstroms)
4588.4261
4589.8978
4595.4206