

Thorium-Argon Atlas for High Resolution Spectrograph on Xinglong 2.16m Telescope

Version 1.0

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National Astronomical Observatories of China

July, 2011

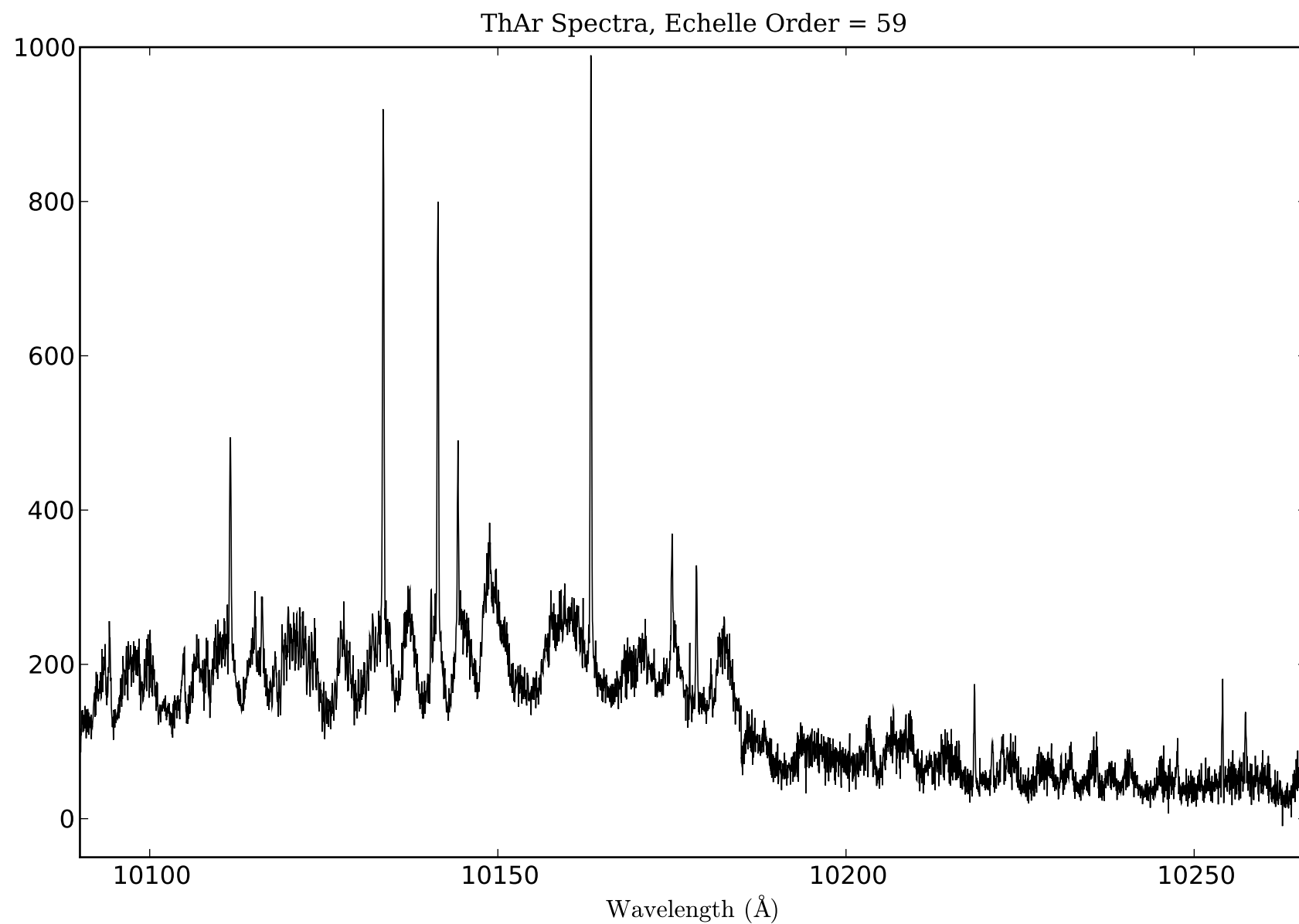
Introduction

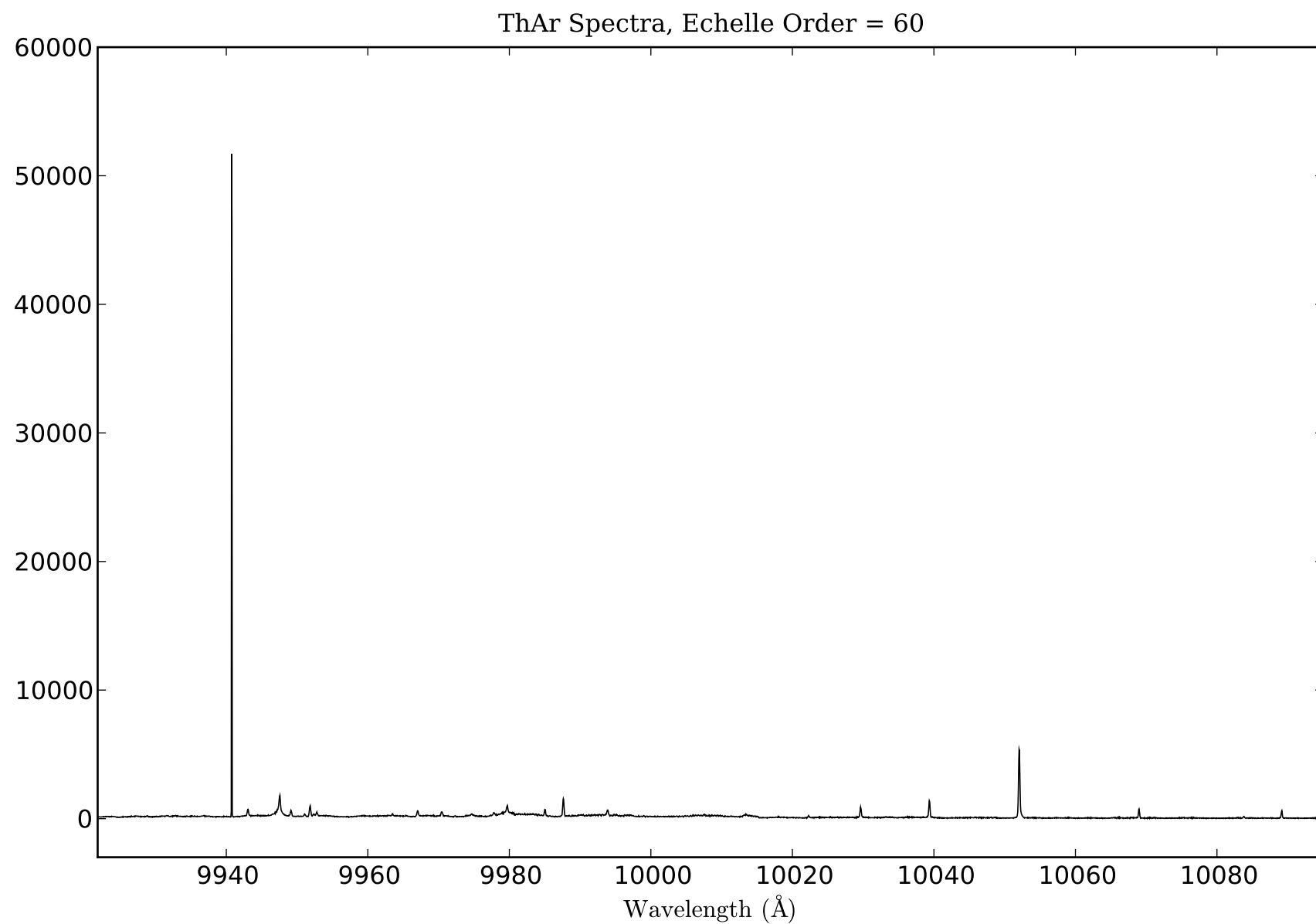
This thorium argon spectra was taken on June 13, 2011 (Frame No. 26), with the EEV 203-82 CCD (4k x 4k) installed on the High Resolution Spectrograph (HRS) of Xinglong 2.16m telescope. The Th-Ar lamp was attached on the interface of Cassegrain focus. The slit width was set to 0.19 mm, corresponding to a resolving power ($R = \lambda/\Delta\lambda$) of $\sim 45,000$ around $5500 \text{ \AA}$. The exposure time was 80 seconds. After bias subtraction and flat fielding, 90 orders were extracted with the `echelle` package in IRAF¹ v2.12.2, covering the wavelength region of $4030 \text{ \AA} - 10250 \text{ \AA}$ (echell order 148 – 59). The echelle orders and the respective wavelength ranges are listed in Table 1. More than 500 emission lines were identified with IRAF `ecidentify` task. A complete list of Th-Ar lines can be found in the IRAF `noaolib$linelists` directory as the `thar.dat` file.

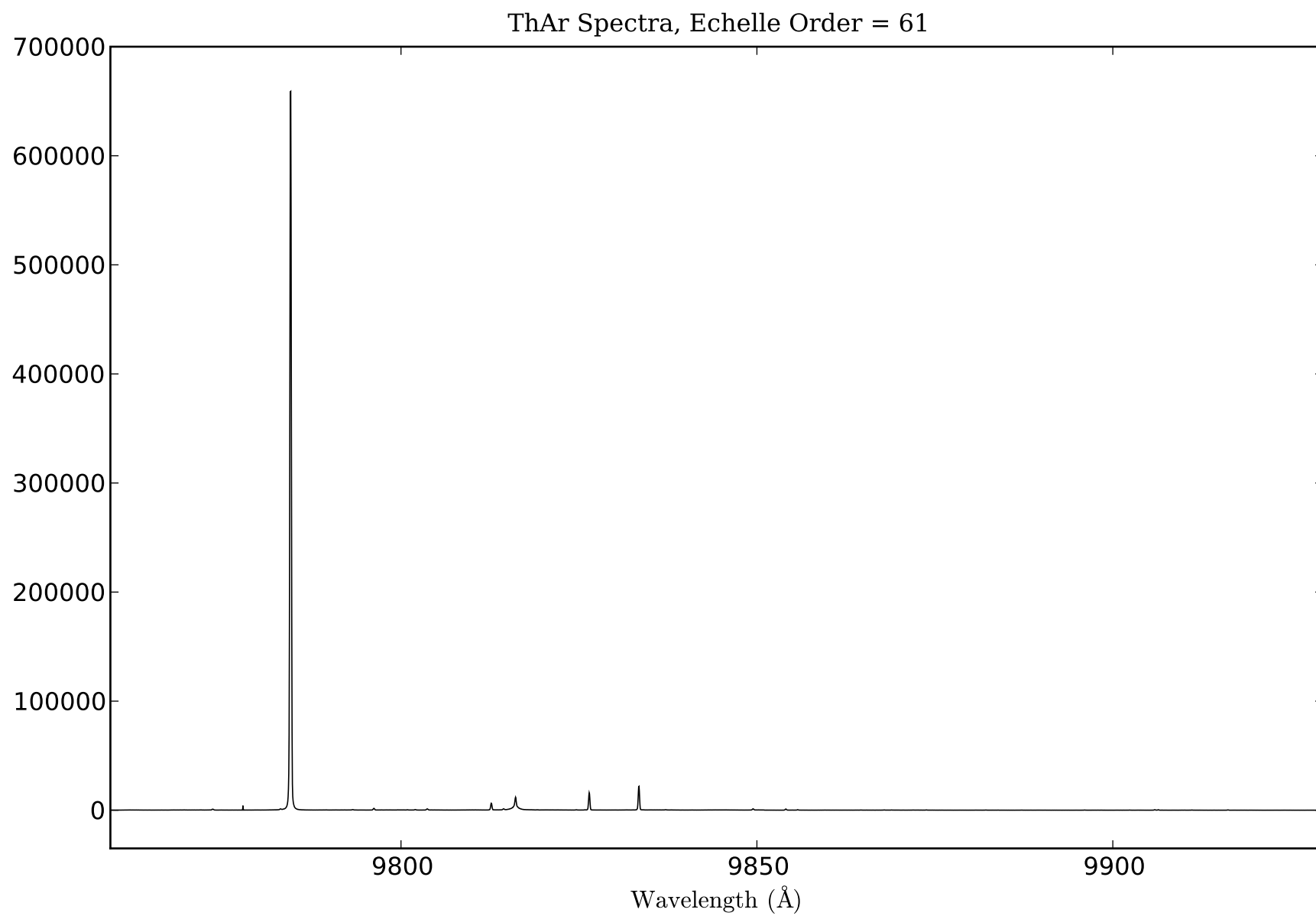
¹IRAF is distributed by the National Optical Astronomy Observatory, which is operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

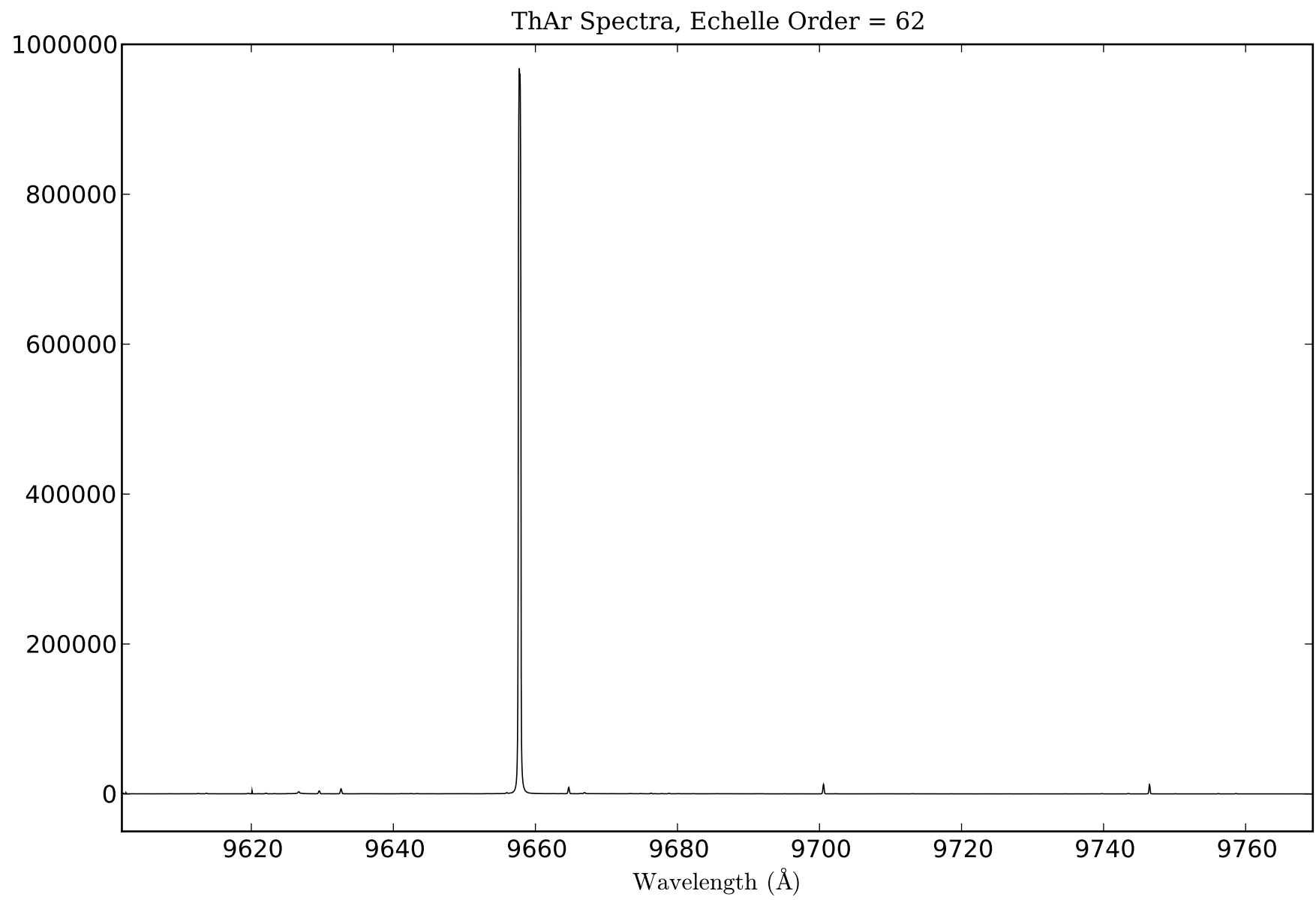
Table 1: List of echelle orders of HRS and the respective wavelength ranges.

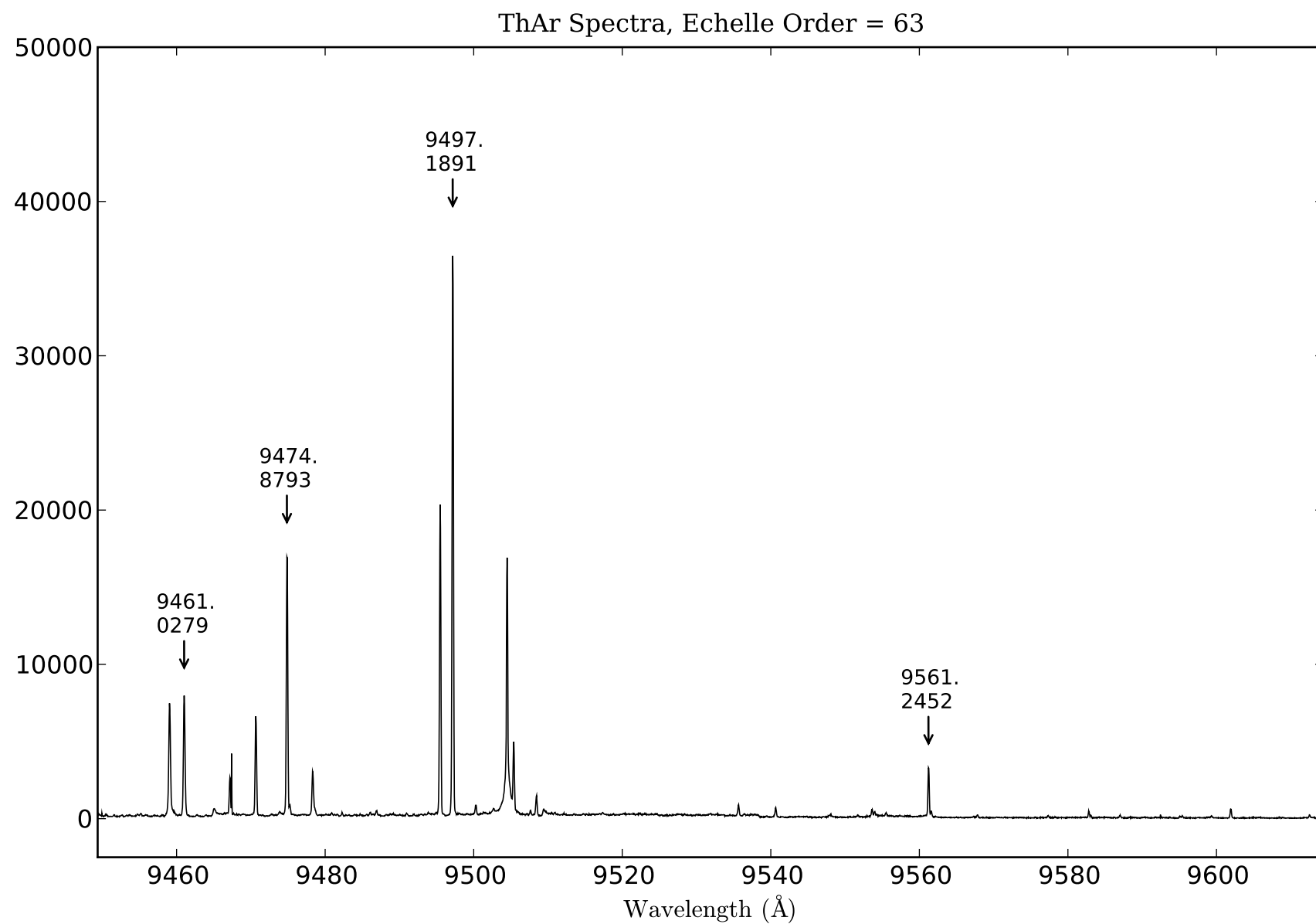
Order	Wavelength (Å)	Order	Wavelength (Å)
148	4023 - 4094	103	5780 - 5881
147	4050 - 4122	102	5837 - 5939
146	4078 - 4150	101	5894 - 5998
145	4106 - 4178	100	5953 - 6058
144	4135 - 4207	99	6014 - 6119
143	4164 - 4237	98	6075 - 6181
142	4193 - 4267	97	6137 - 6245
141	4223 - 4297	96	6201 - 6310
140	4253 - 4328	95	6267 - 6376
139	4283 - 4359	94	6333 - 6444
138	4315 - 4390	93	6401 - 6514
137	4346 - 4422	92	6471 - 6584
136	4378 - 4455	91	6542 - 6657
135	4410 - 4488	90	6615 - 6731
134	4443 - 4521	89	6689 - 6806
133	4477 - 4555	88	6765 - 6883
132	4511 - 4590	87	6843 - 6963
131	4545 - 4625	86	6922 - 7044
130	4580 - 4660	85	7004 - 7126
129	4615 - 4696	84	7087 - 7211
128	4651 - 4733	83	7173 - 7298
127	4688 - 4770	82	7260 - 7387
126	4725 - 4808	81	7350 - 7478
125	4763 - 4847	80	7441 - 7572
124	4801 - 4886	79	7536 - 7668
123	4840 - 4925	78	7632 - 7766
122	4880 - 4966	77	7731 - 7867
121	4920 - 5007	76	7833 - 7970
120	4961 - 5048	75	7938 - 8076
119	5003 - 5091	74	8045 - 8185
118	5045 - 5134	73	8155 - 8298
117	5089 - 5178	72	8268 - 8413
116	5132 - 5222	71	8385 - 8531
115	5177 - 5268	70	8504 - 8653
114	5222 - 5314	69	8628 - 8779
113	5269 - 5361	68	8755 - 8908
112	5316 - 5409	67	8885 - 9041
111	5364 - 5458	66	9020 - 9177
110	5412 - 5507	65	9159 - 9319
109	5462 - 5558	64	9302 - 9464
108	5512 - 5609	63	9449 - 9614
107	5564 - 5662	62	9602 - 9769
106	5616 - 5715	61	9759 - 9930
105	5670 - 5769	60	9922 - 10095
104	5724 - 5825	59	10090 - 10266

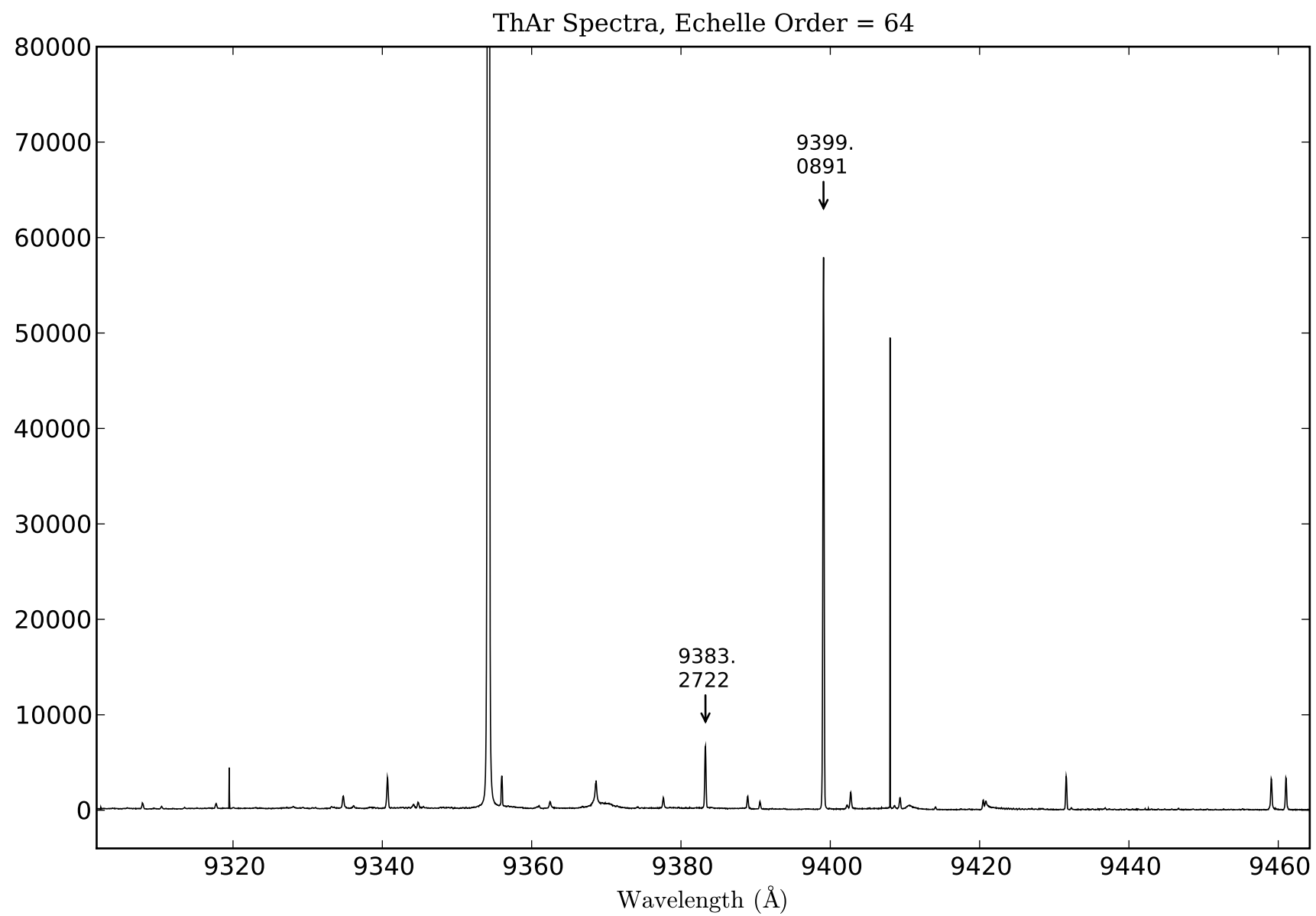


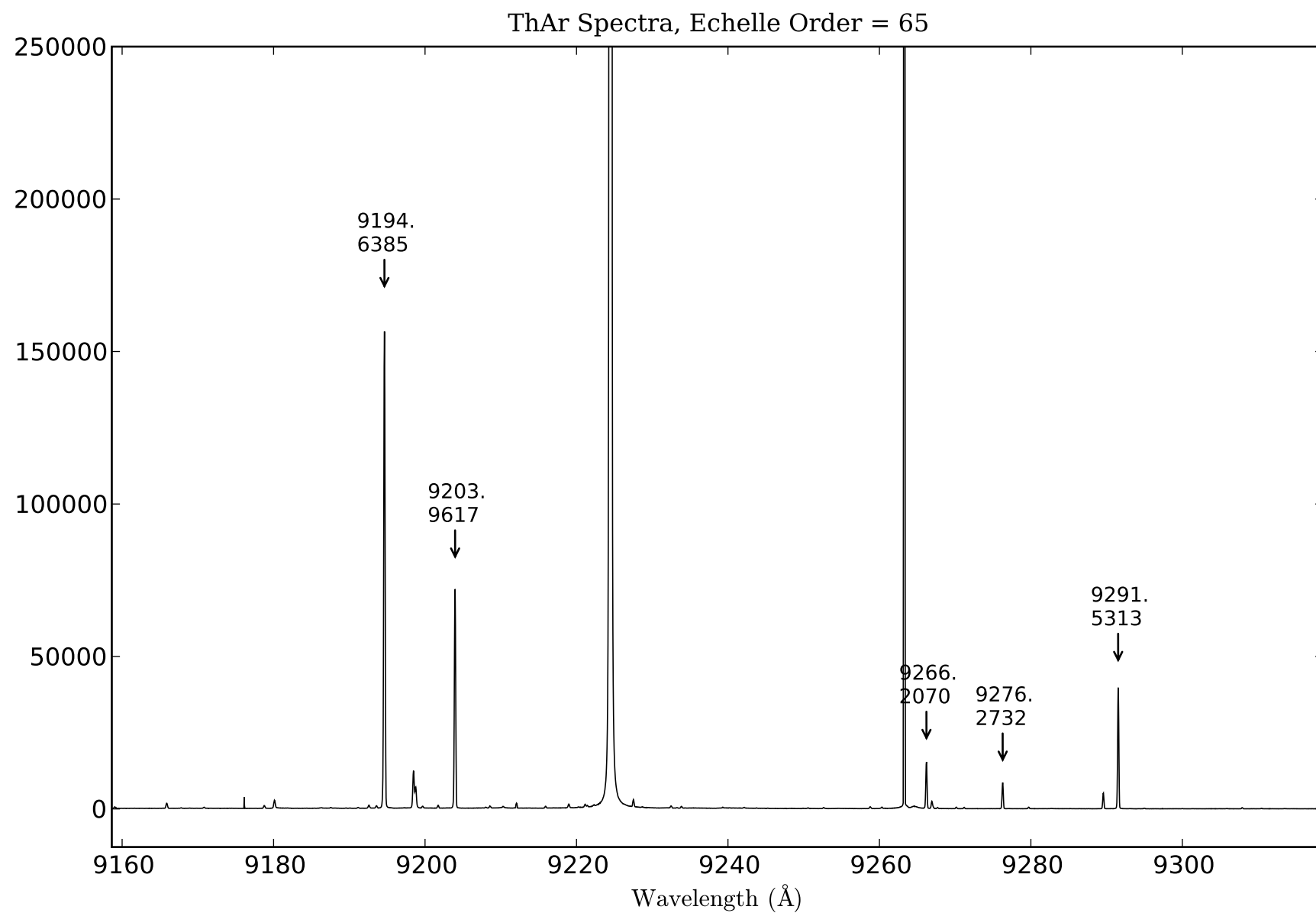


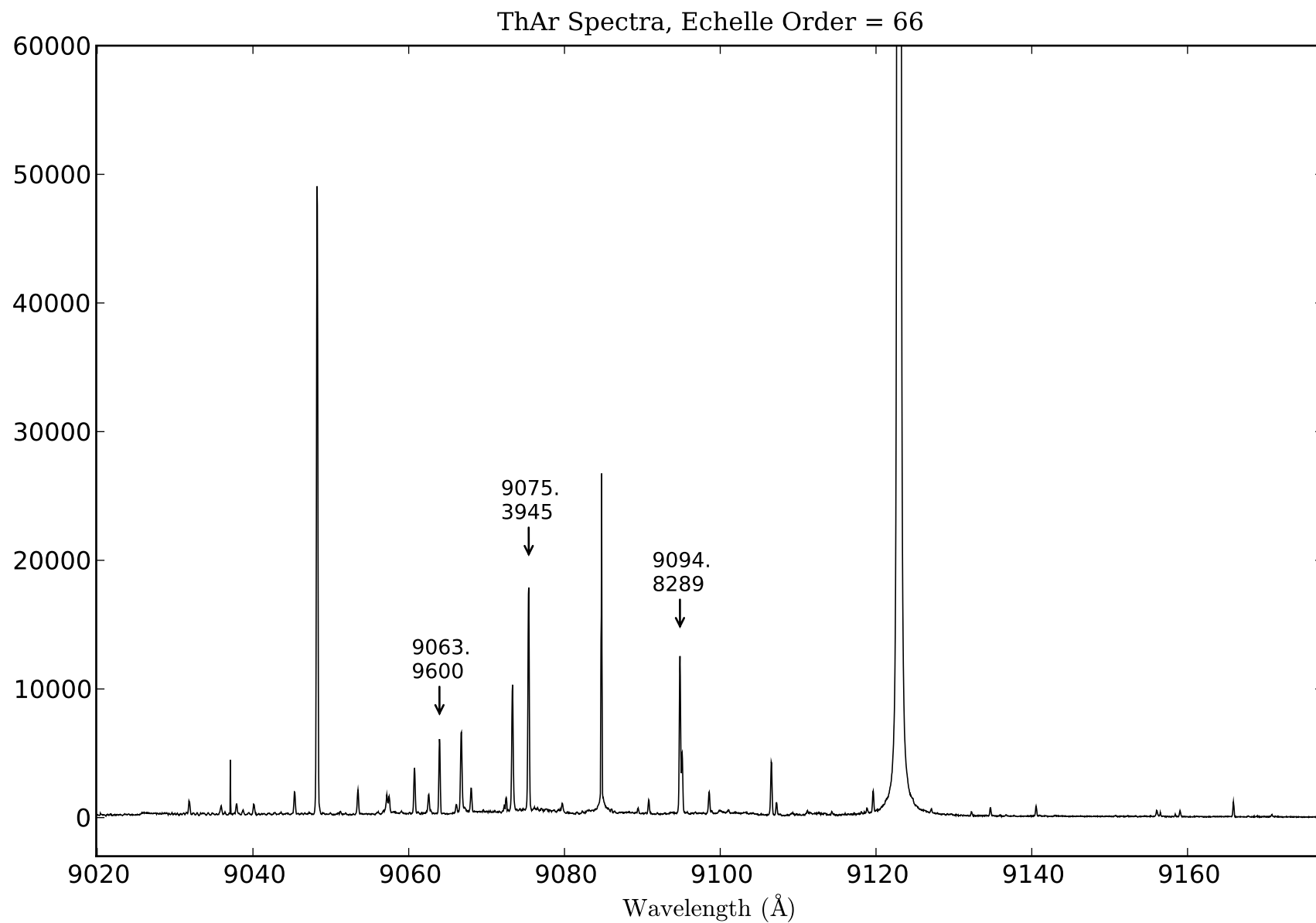




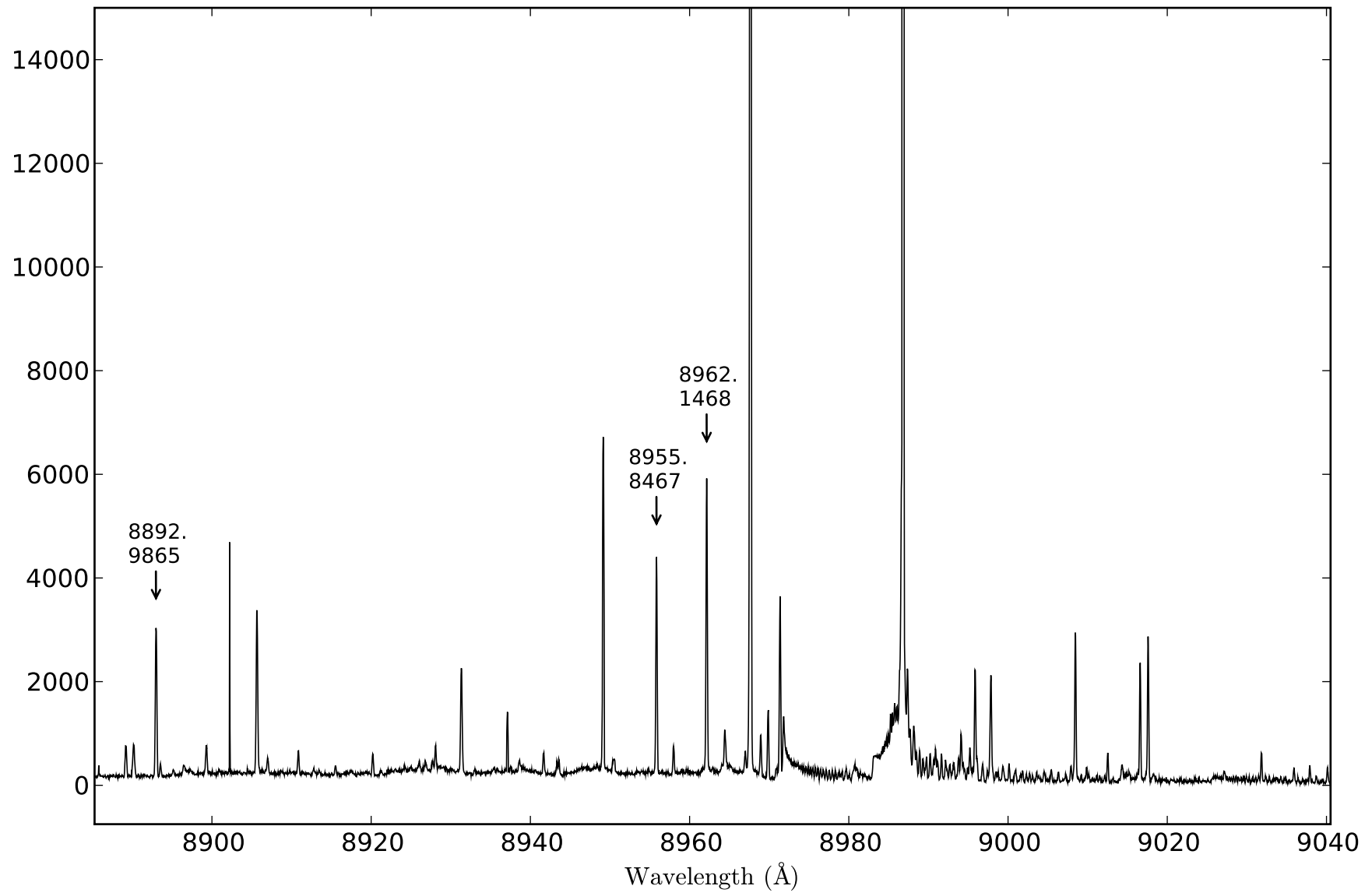


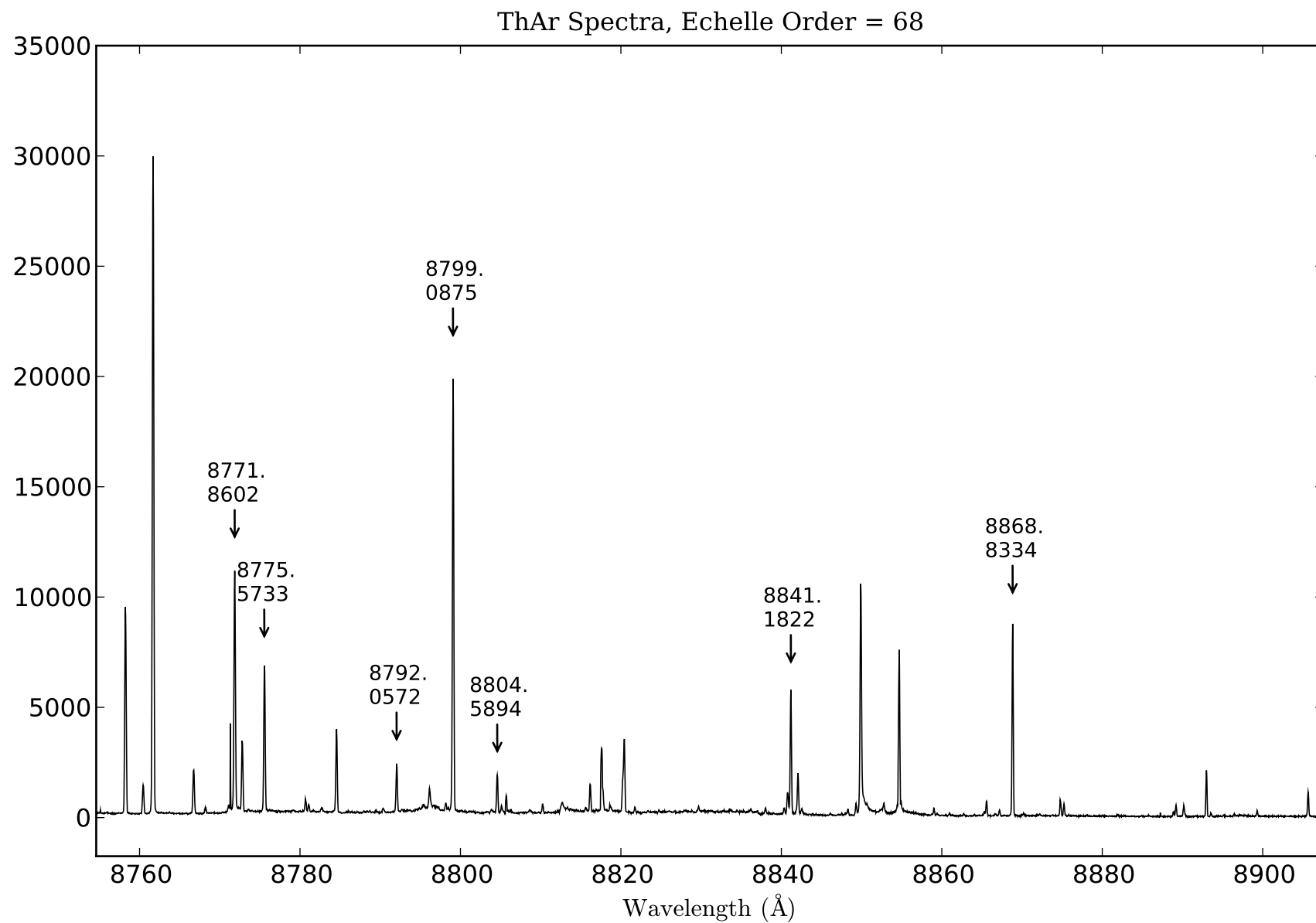


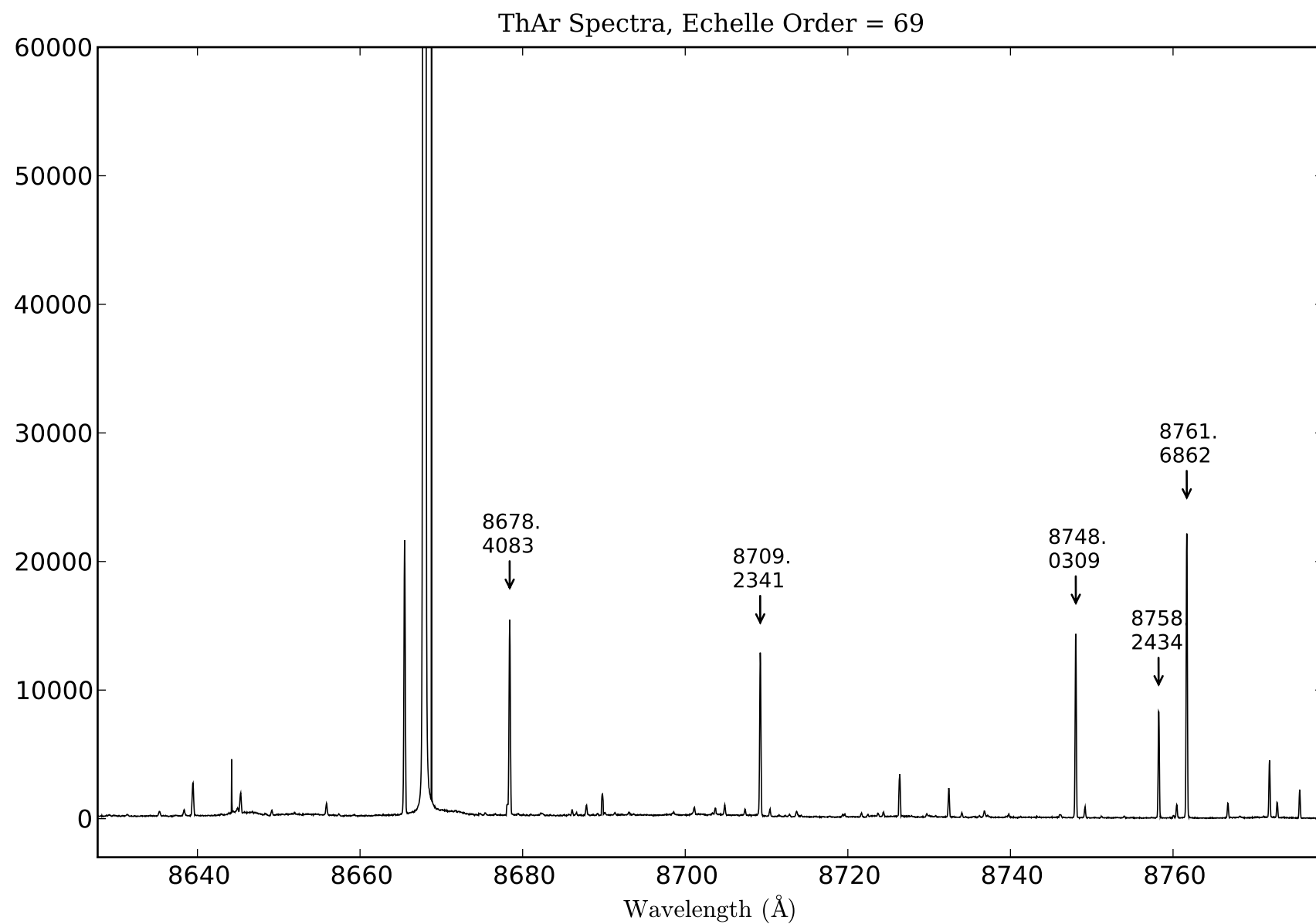


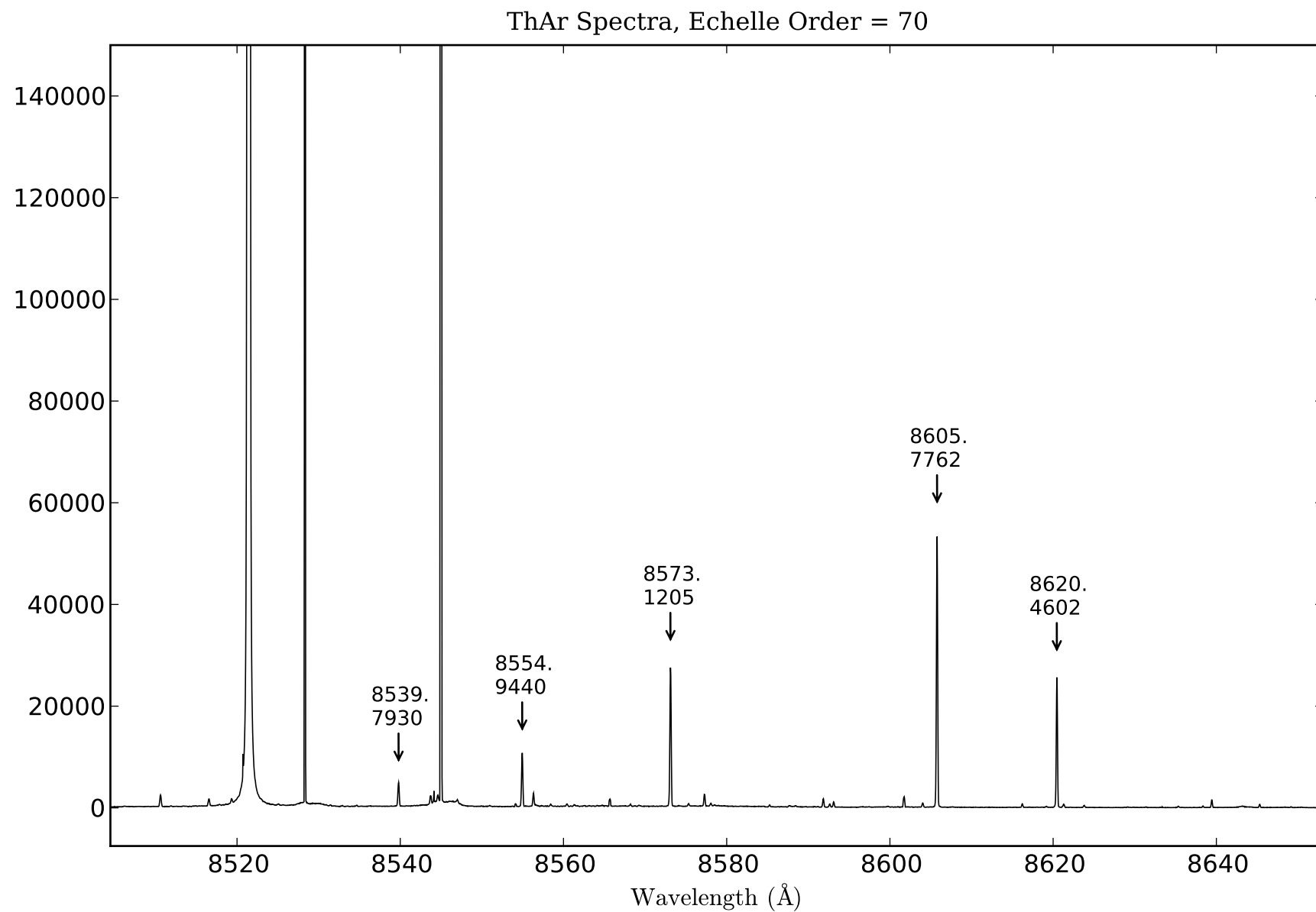


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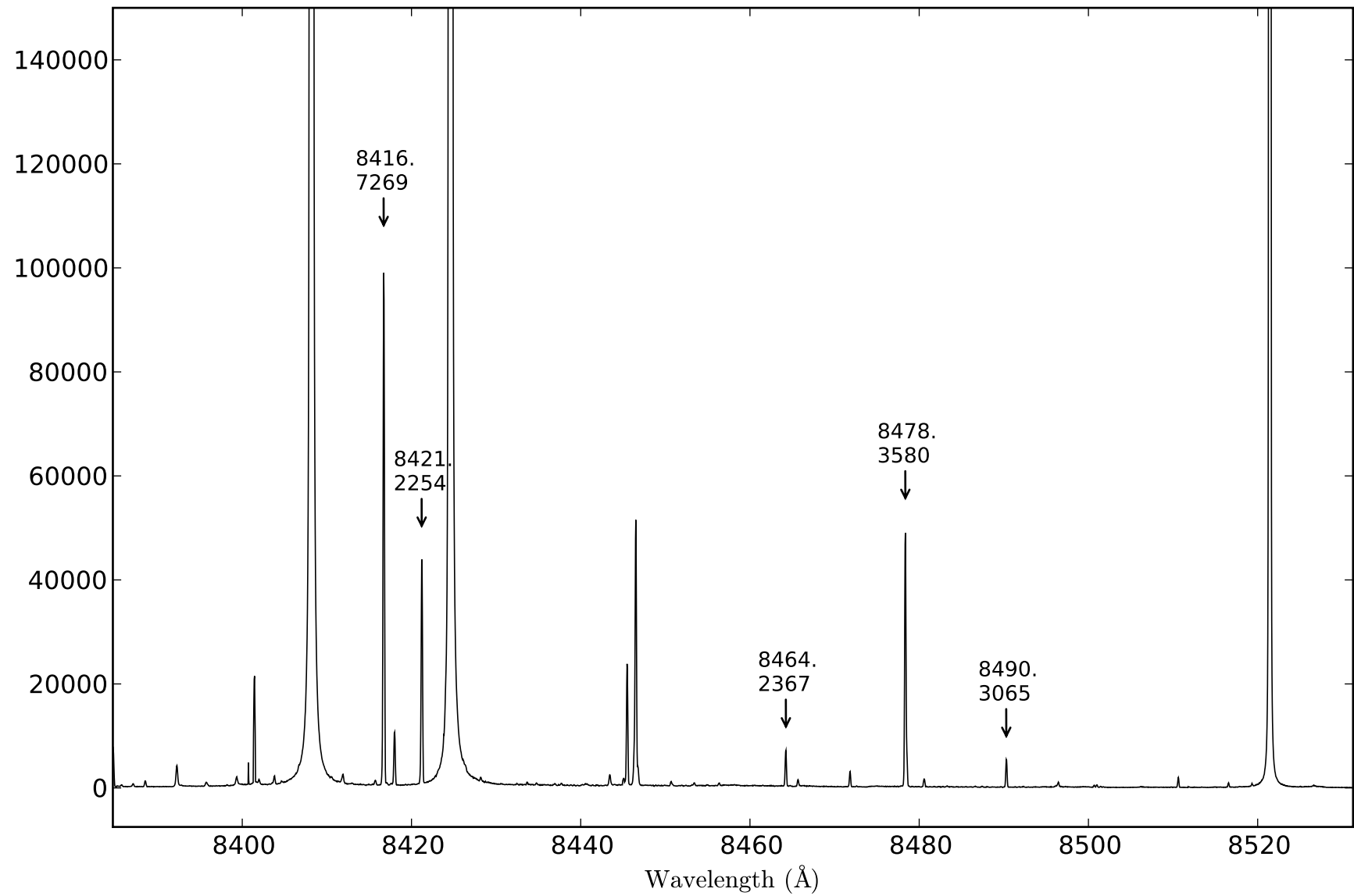


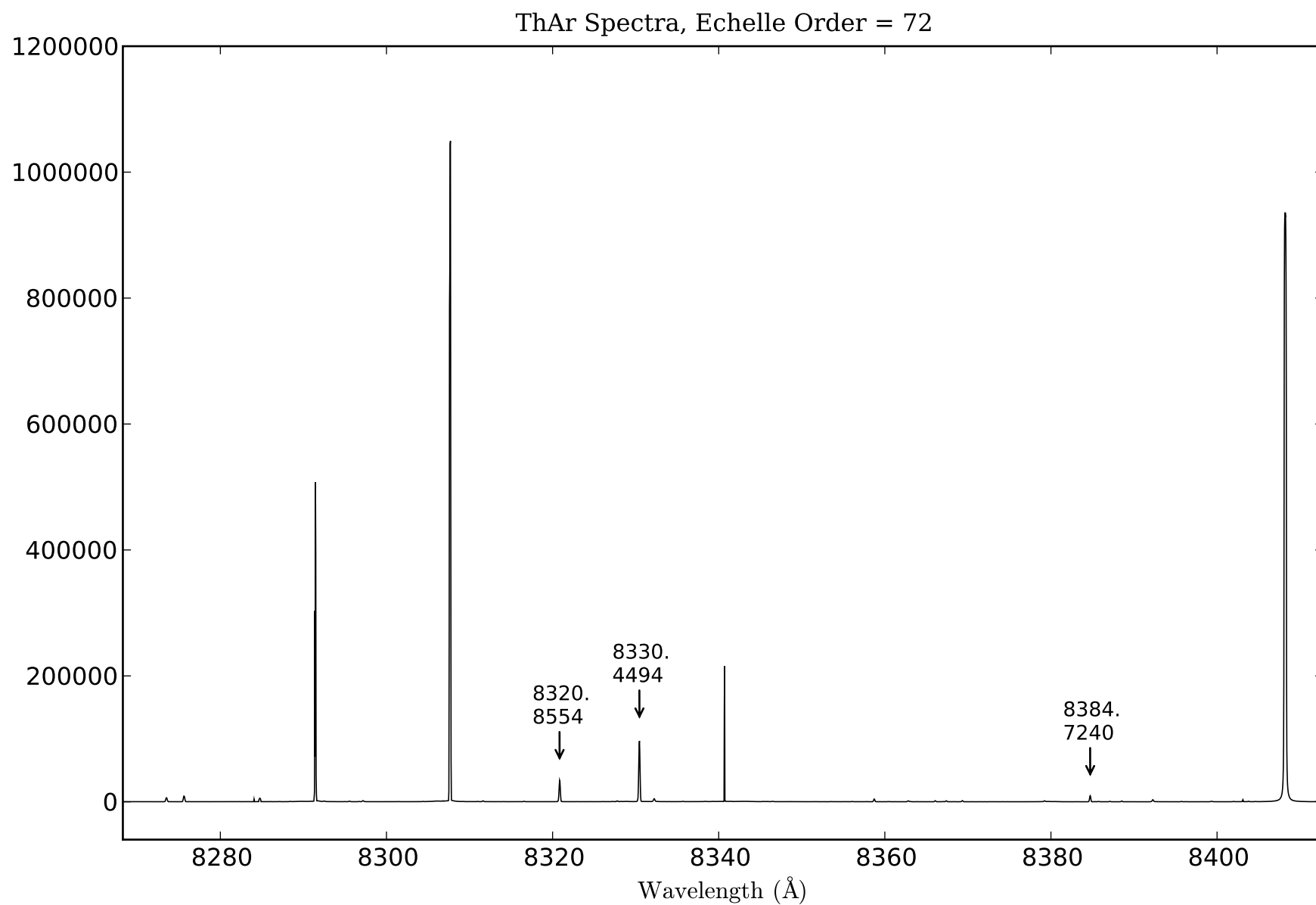


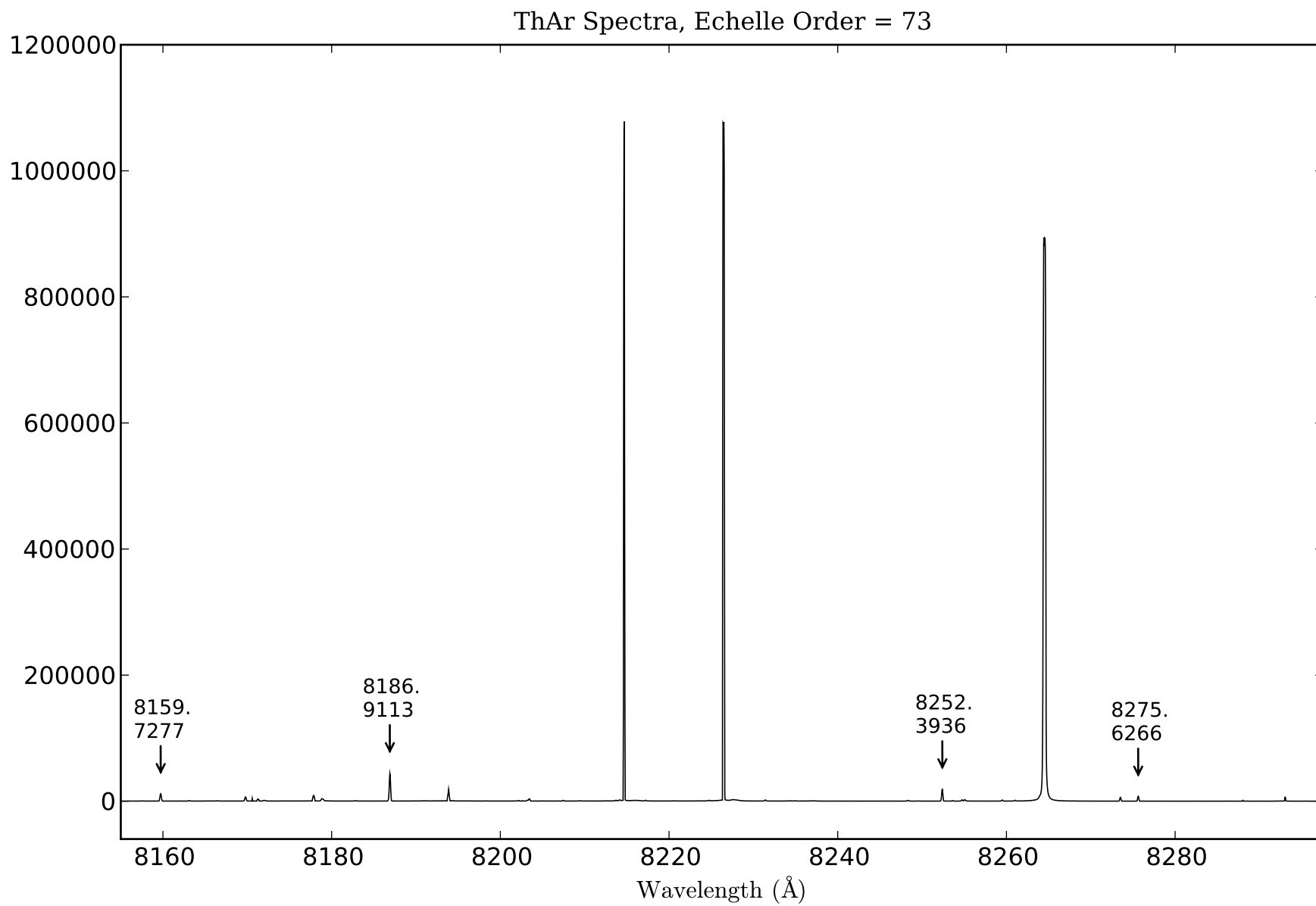


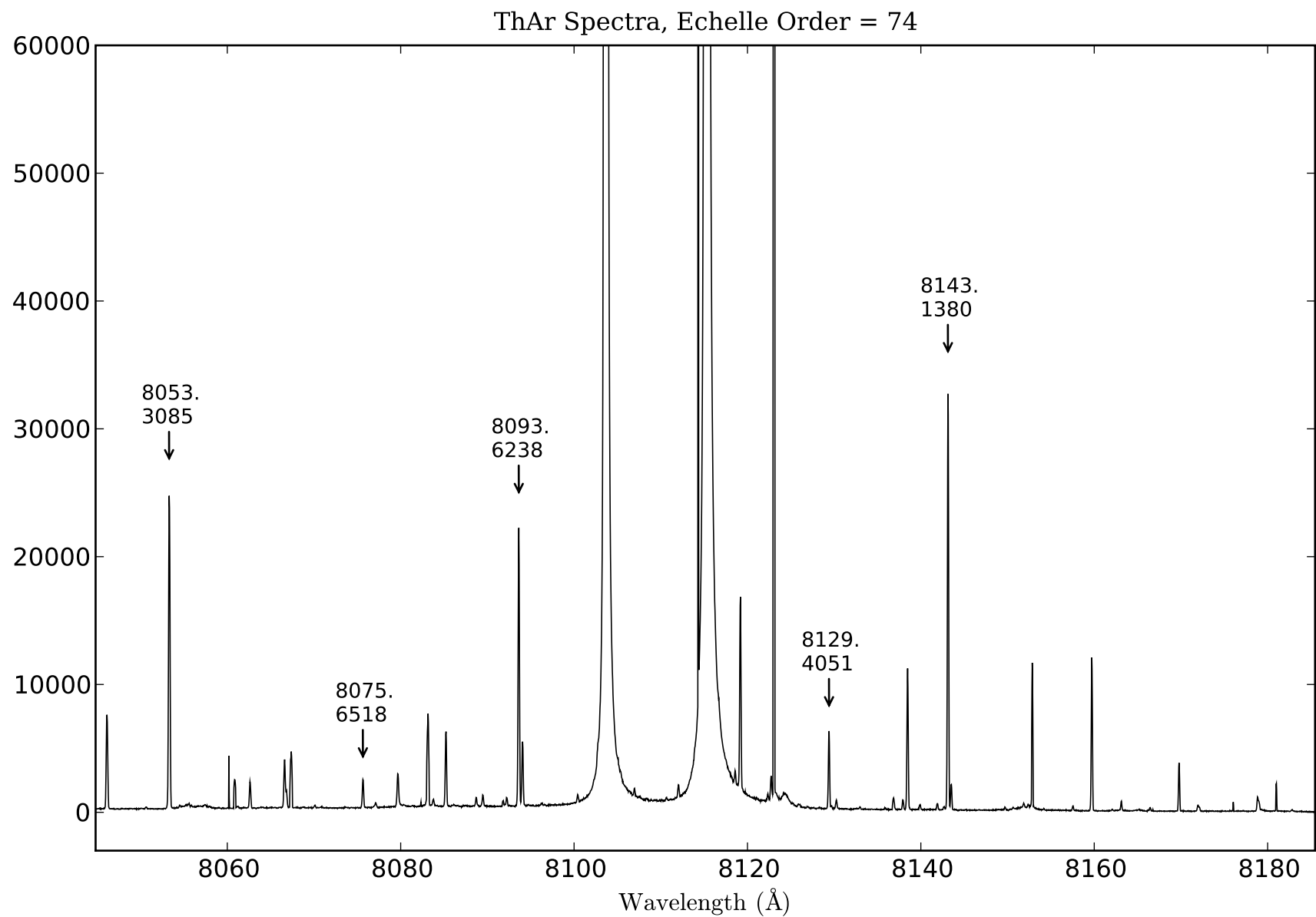


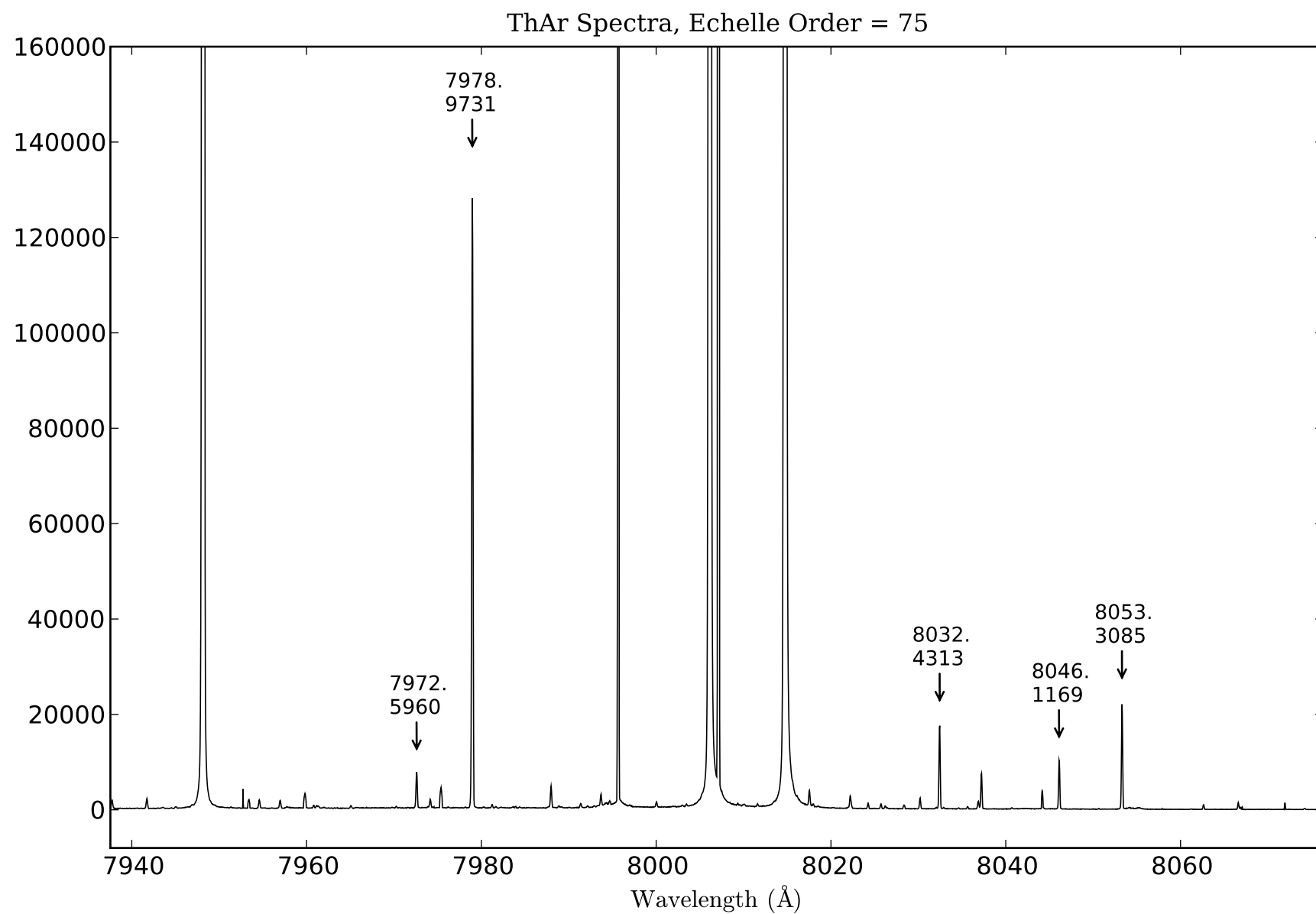
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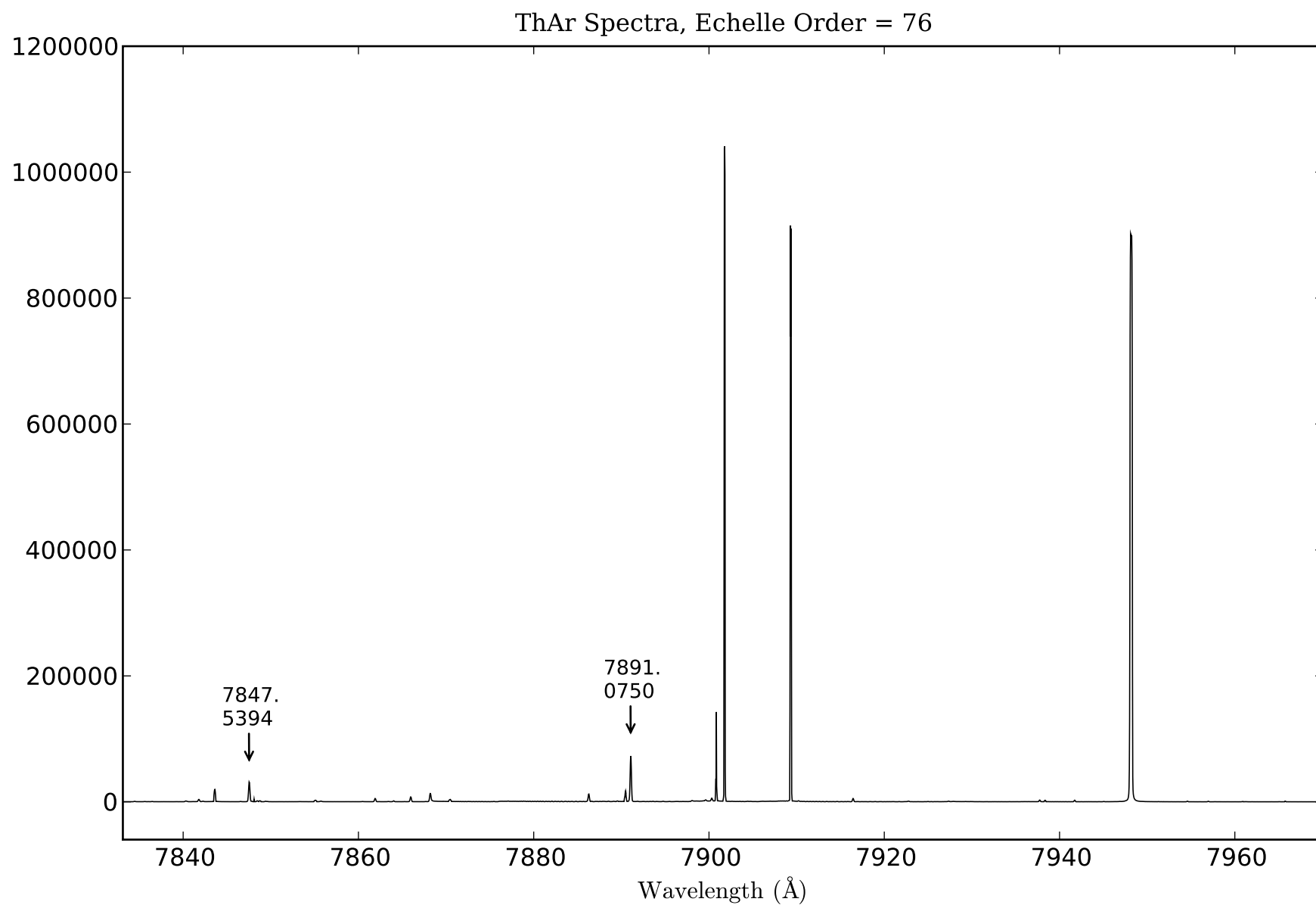


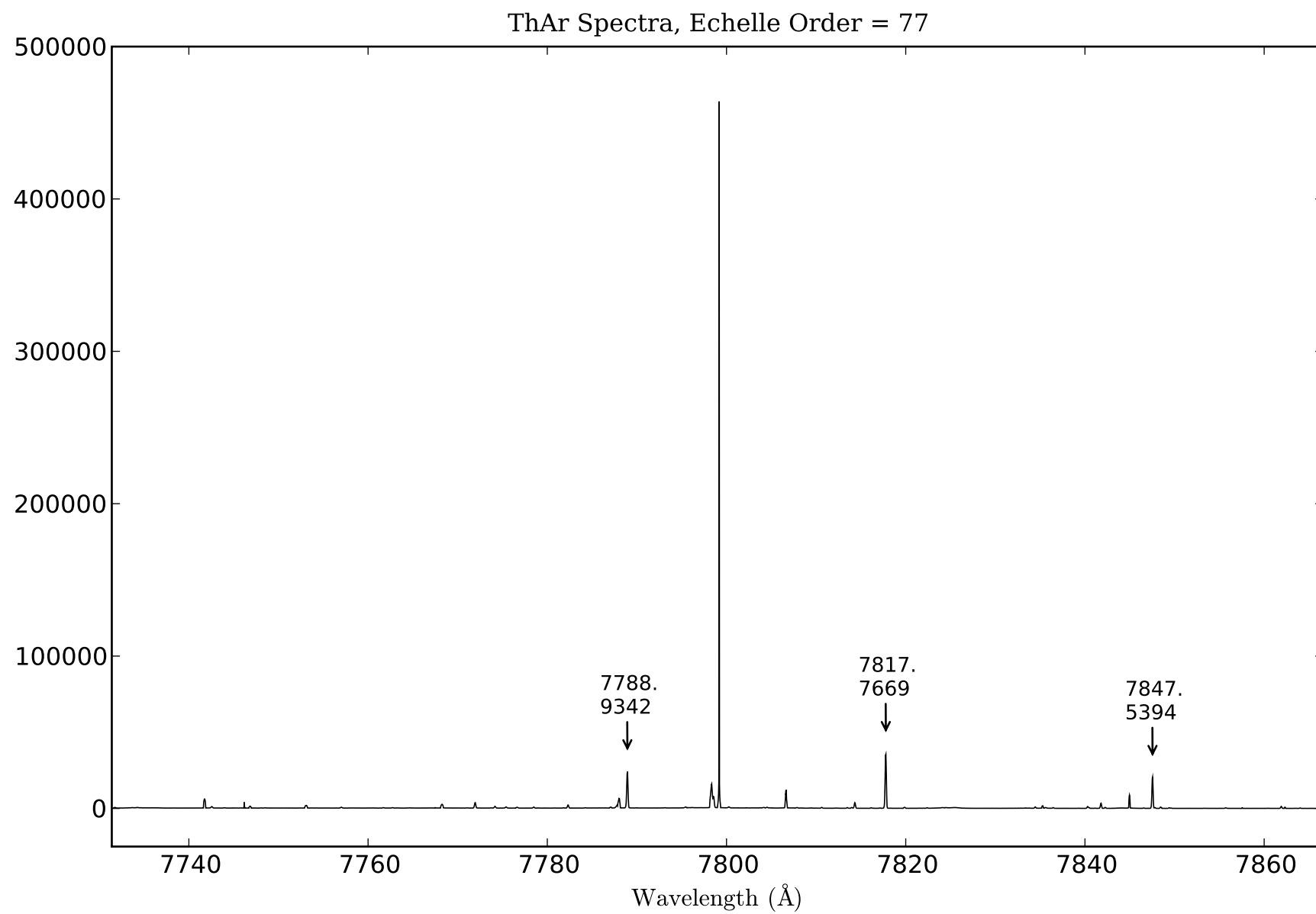


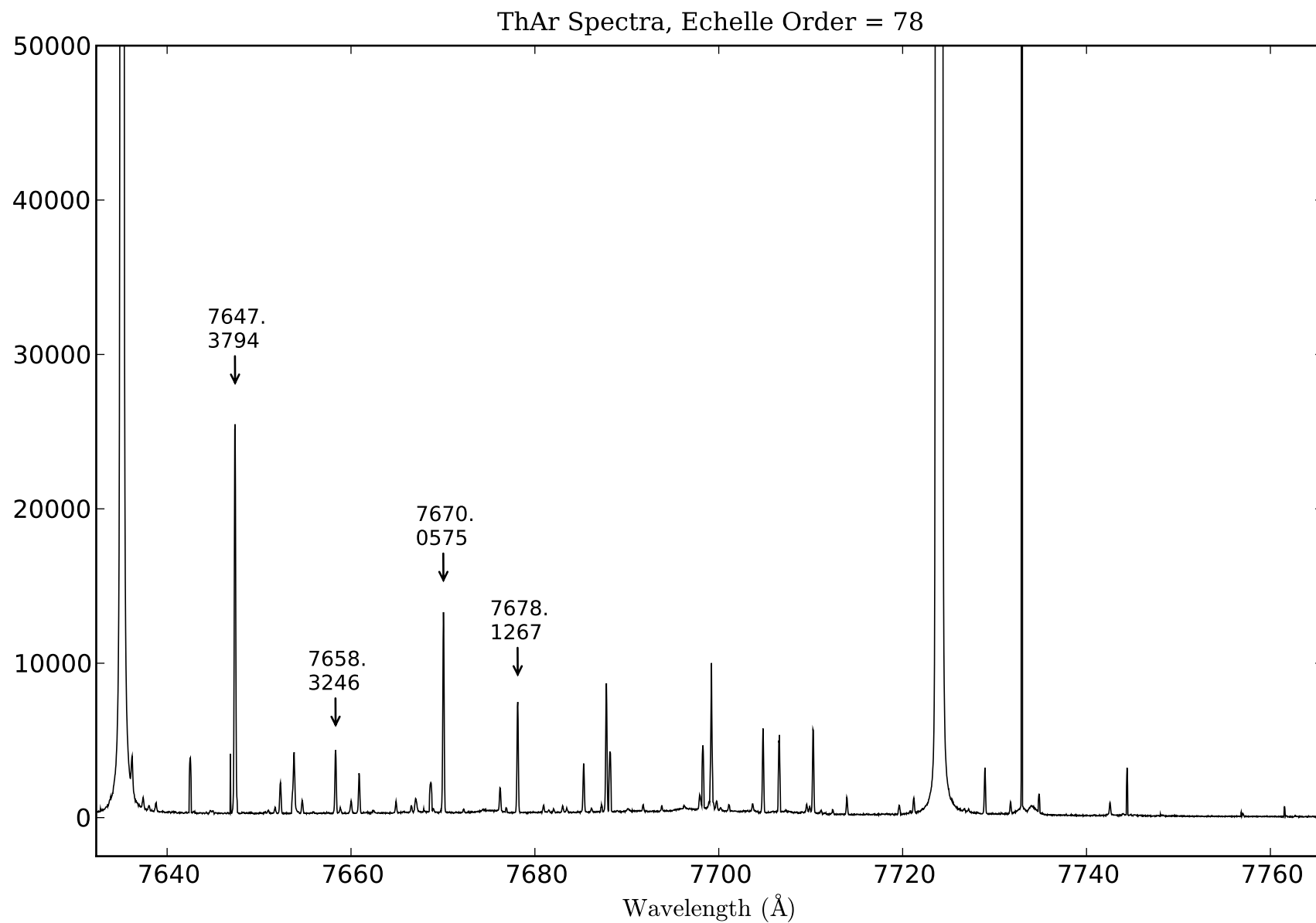


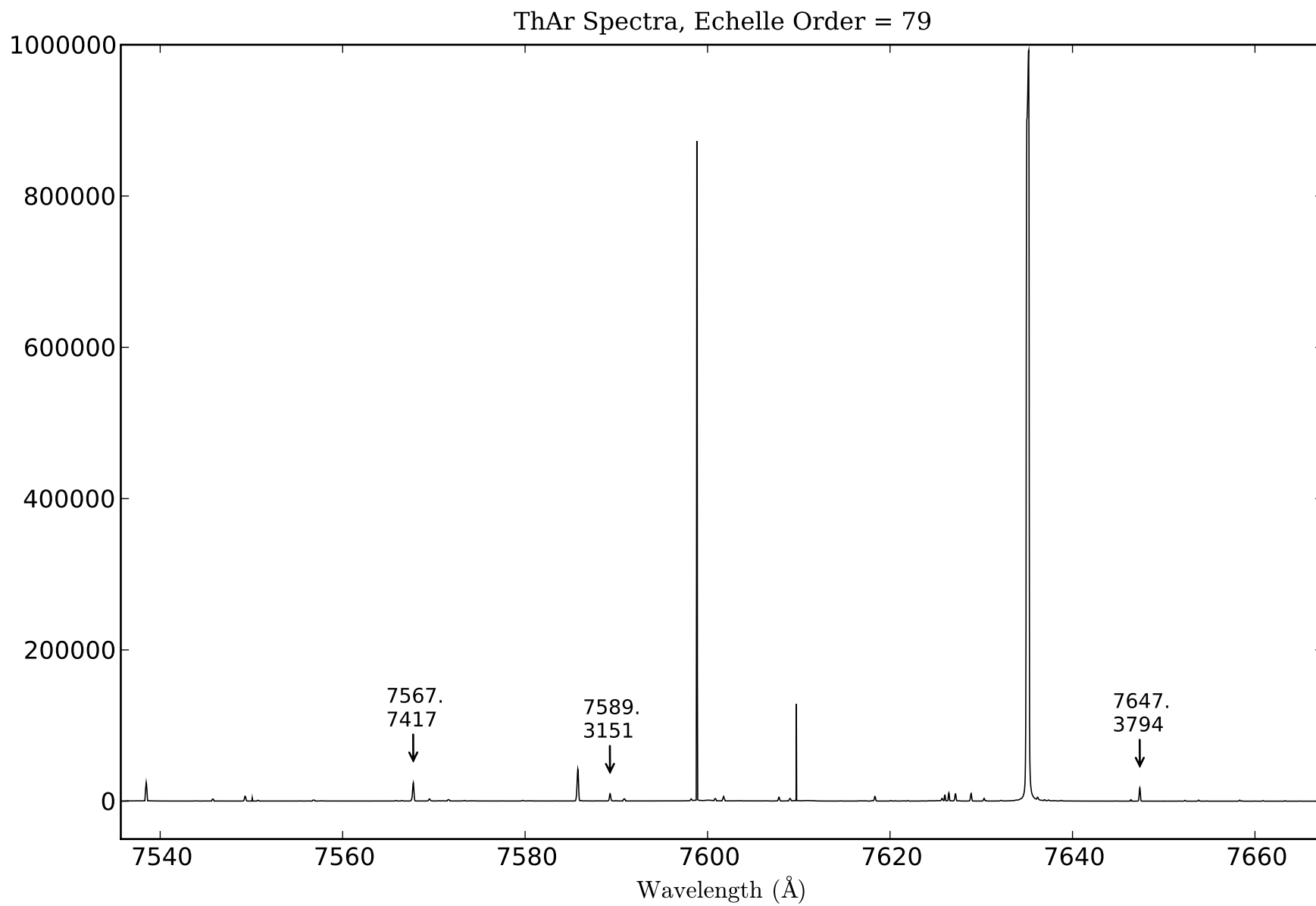


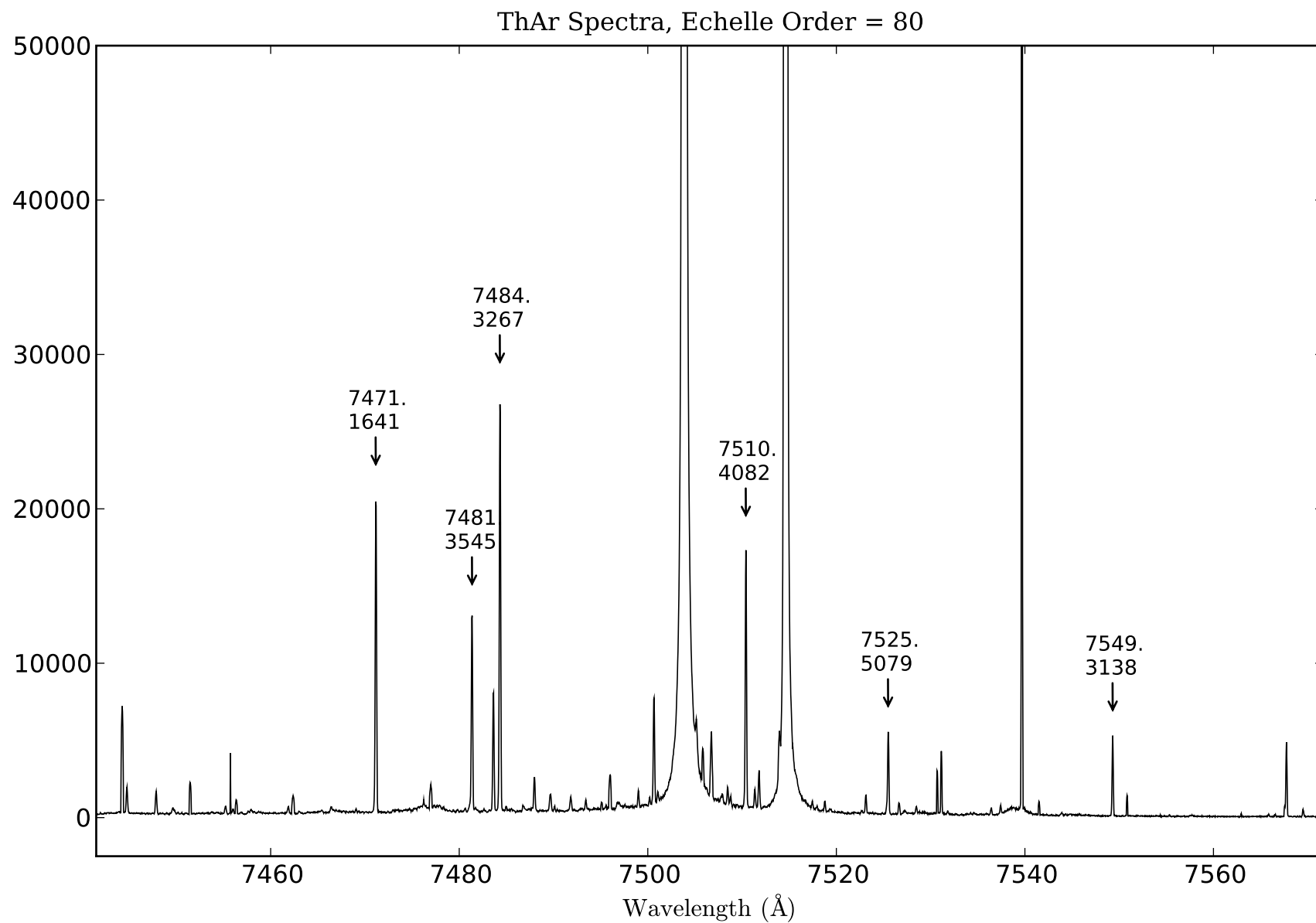


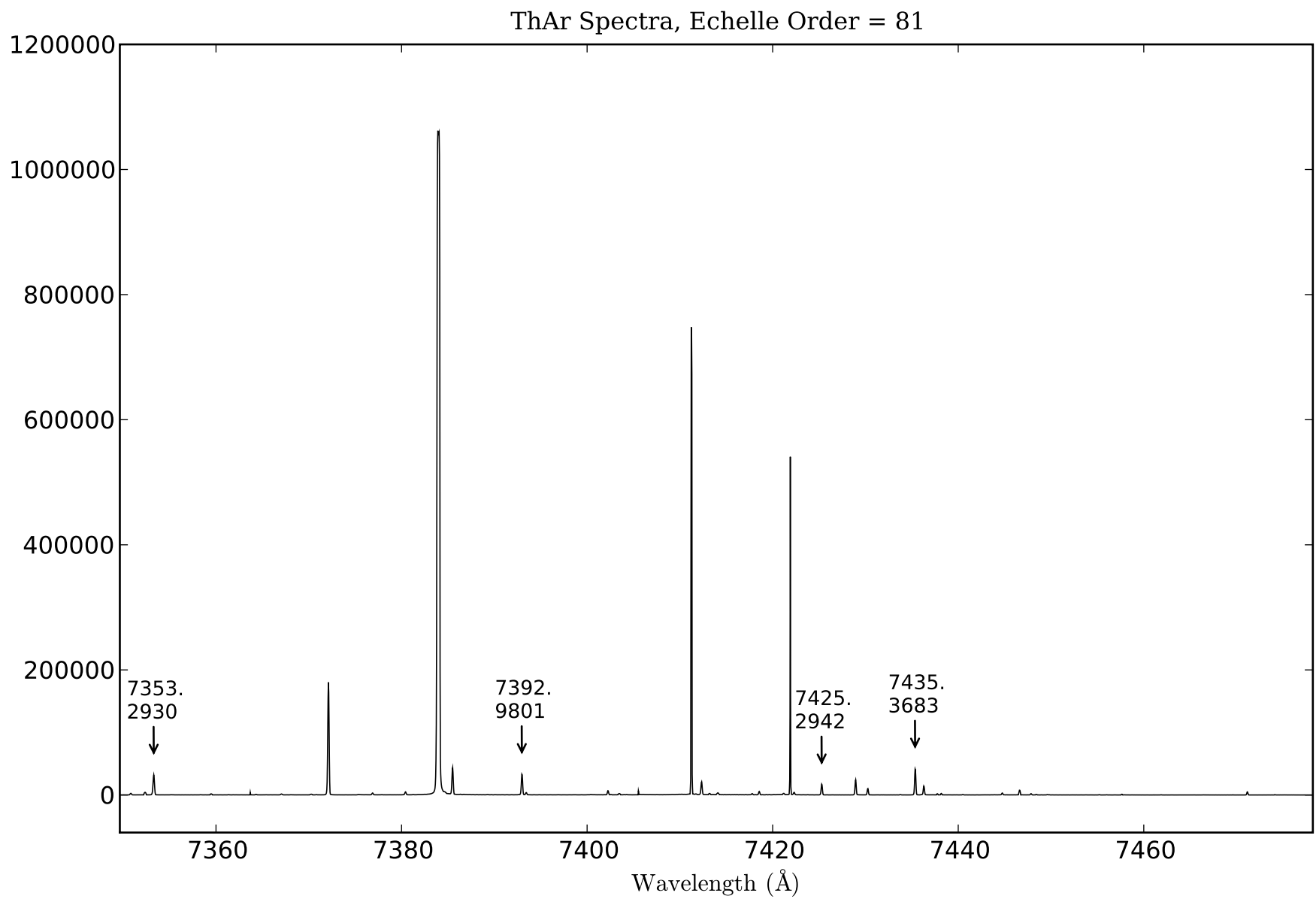


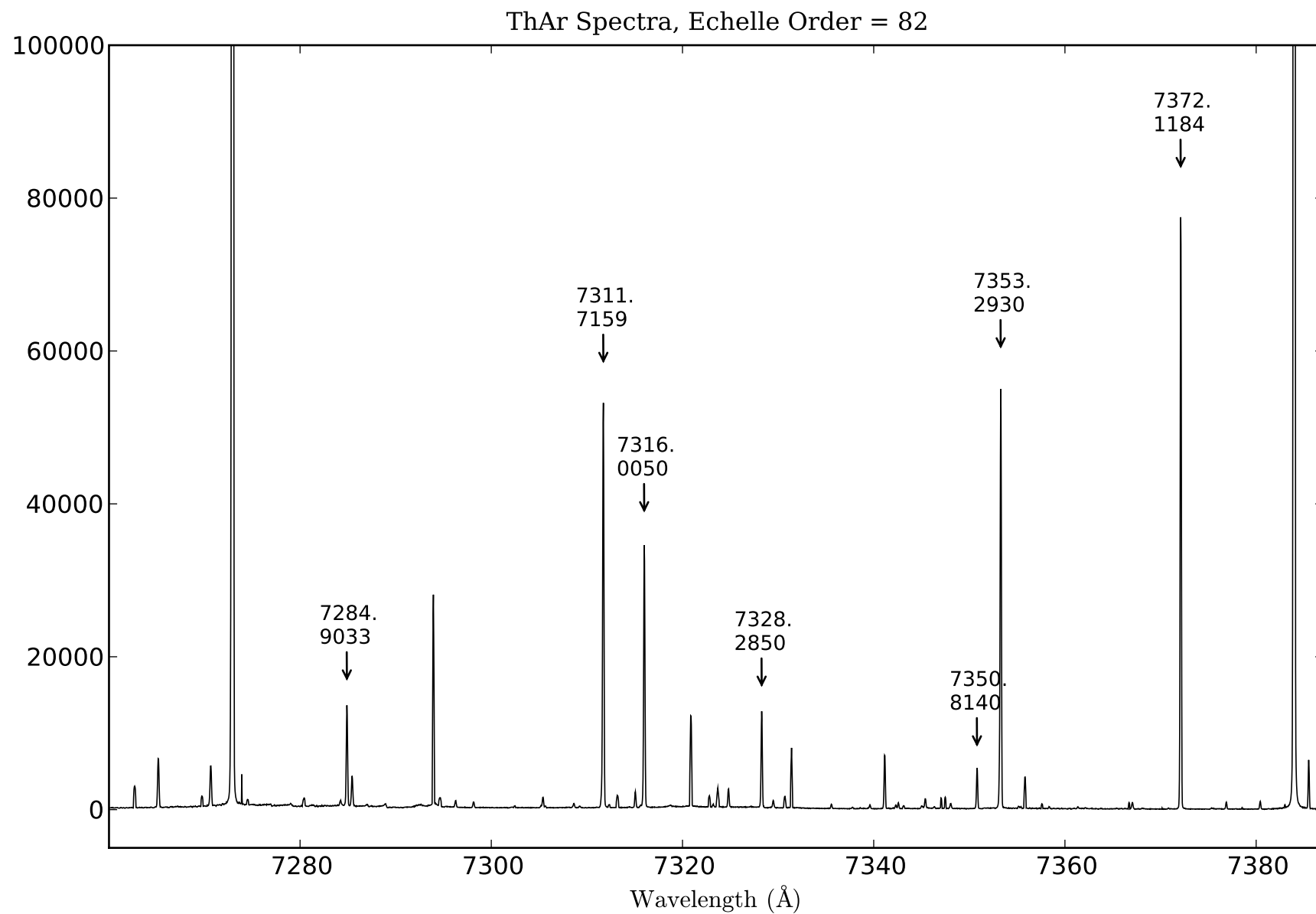


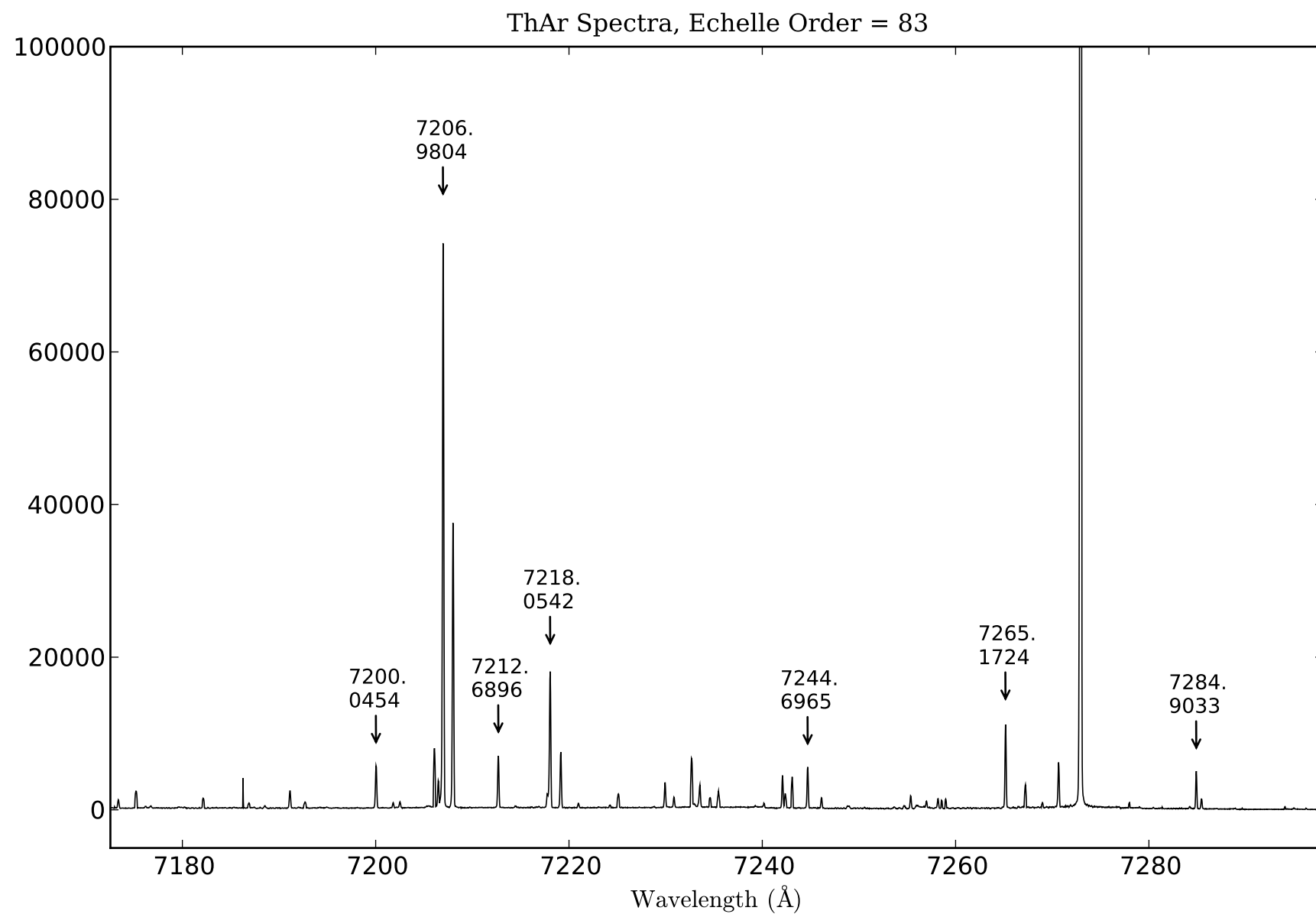


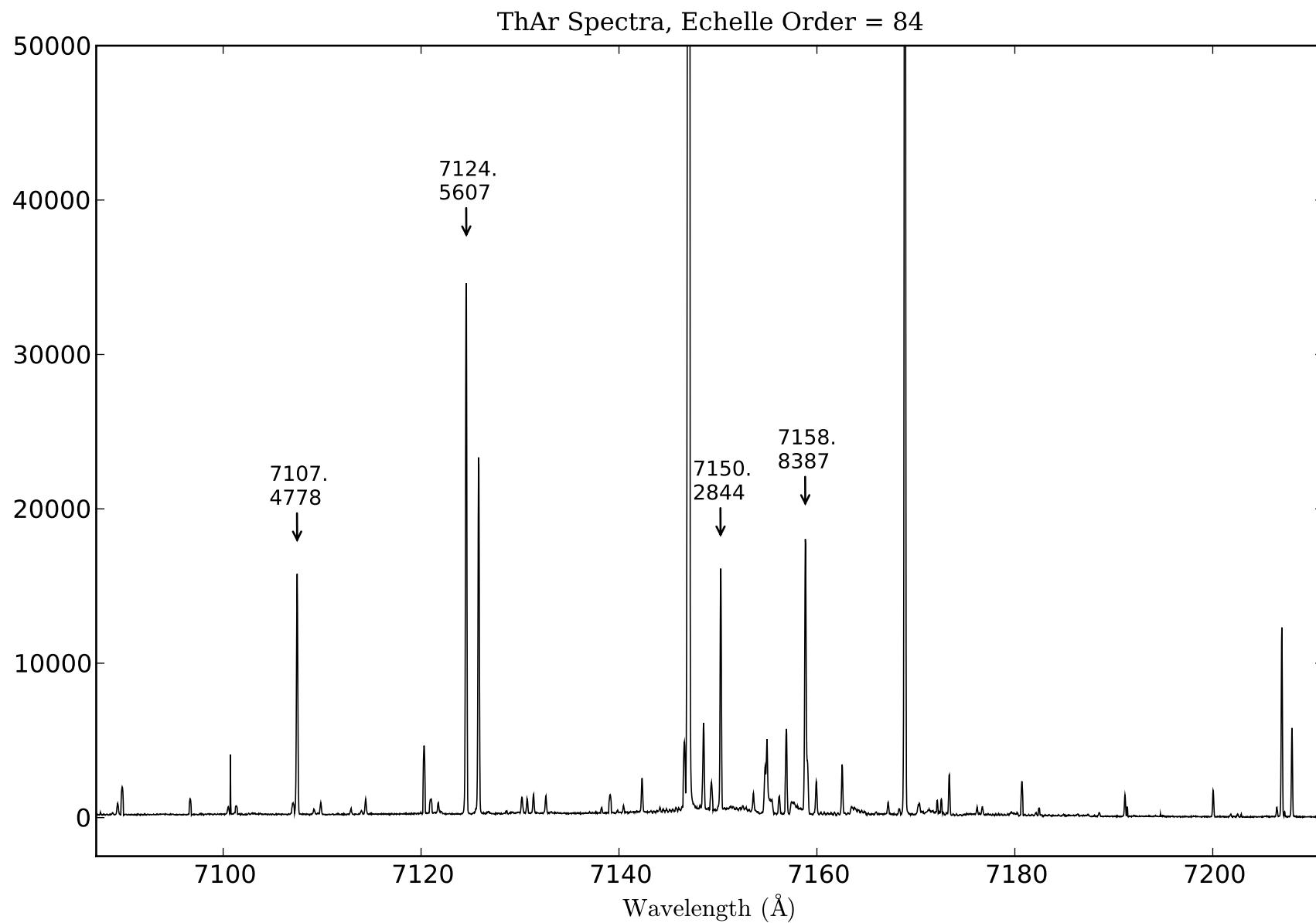


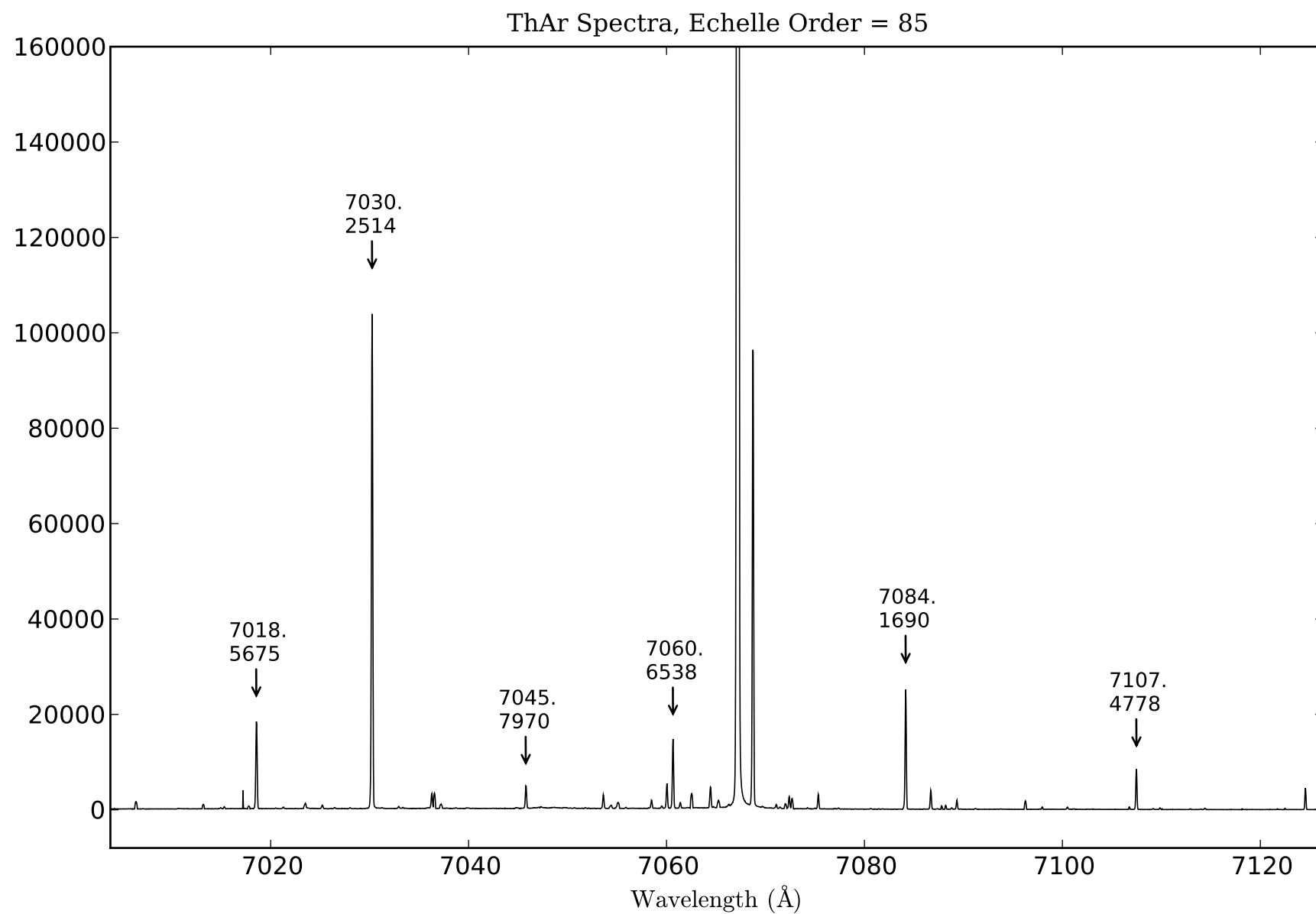


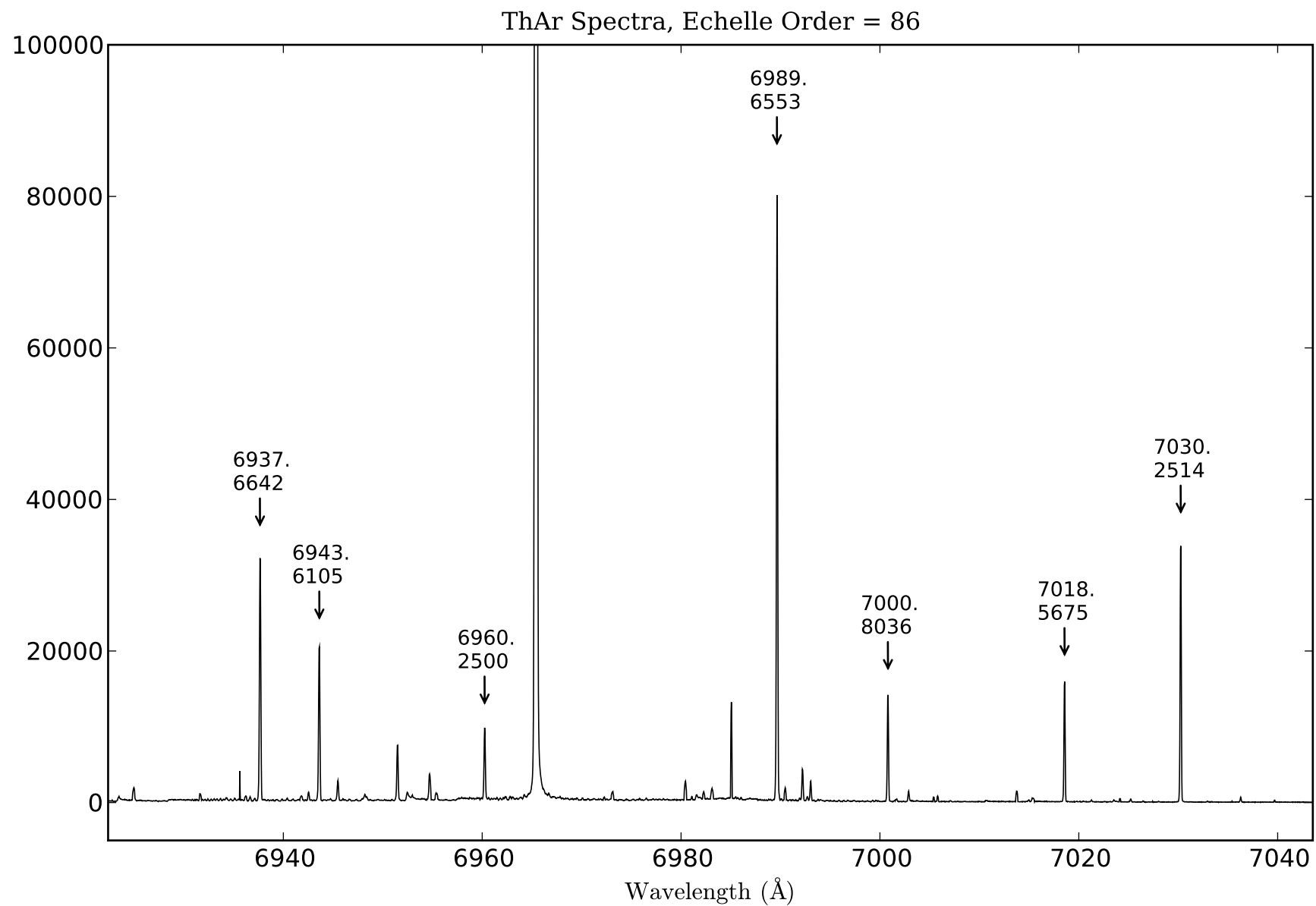




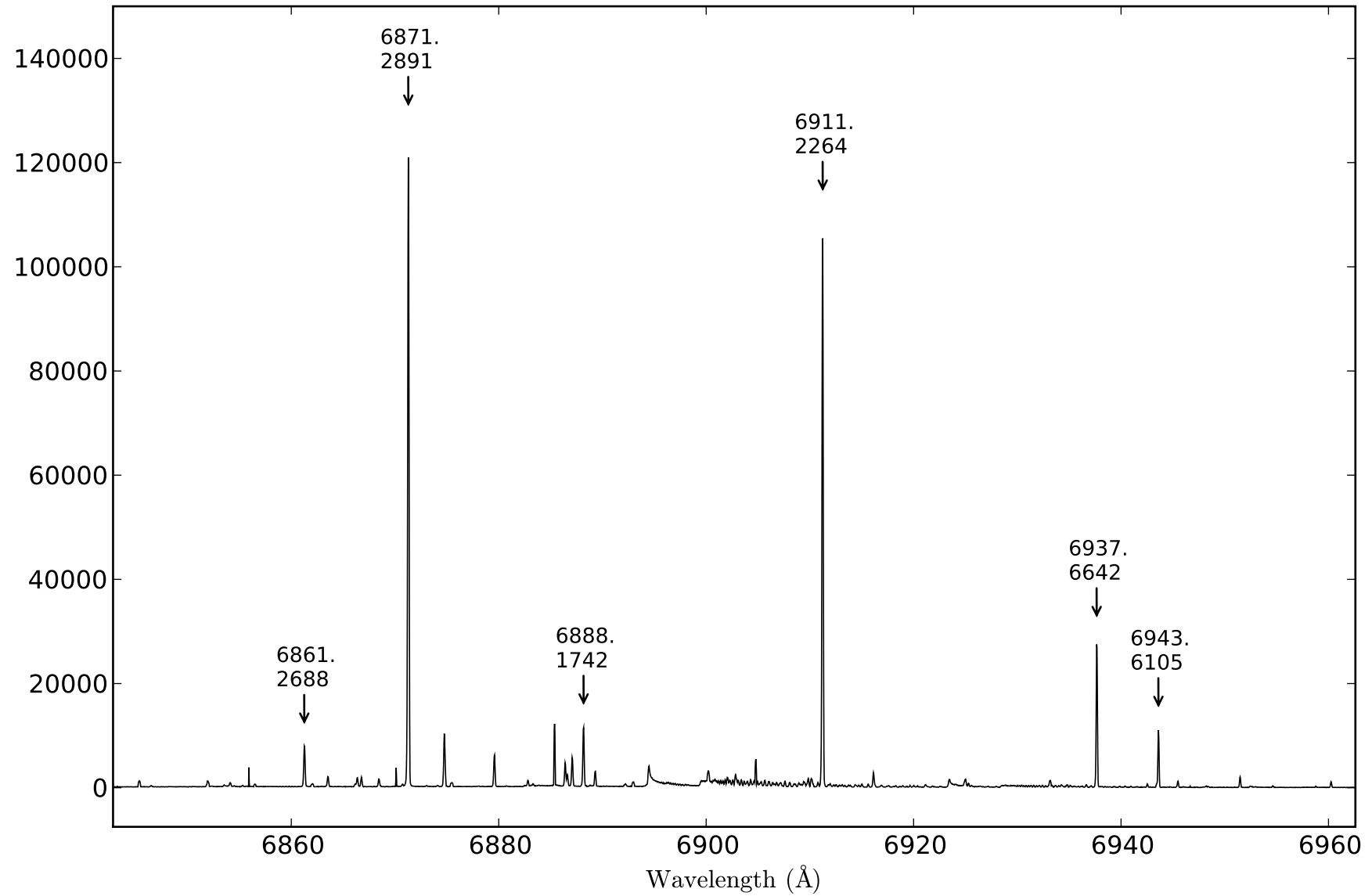


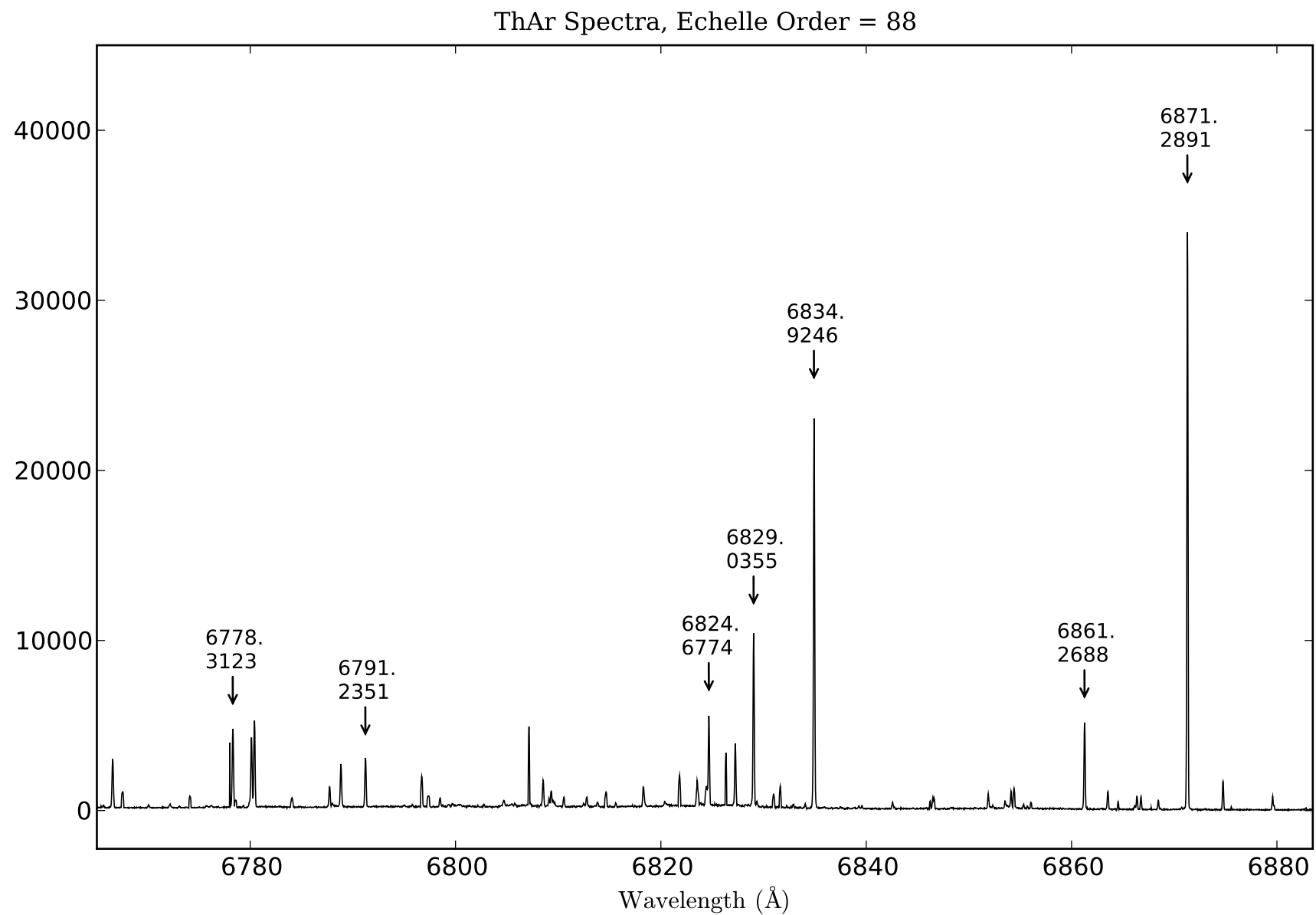


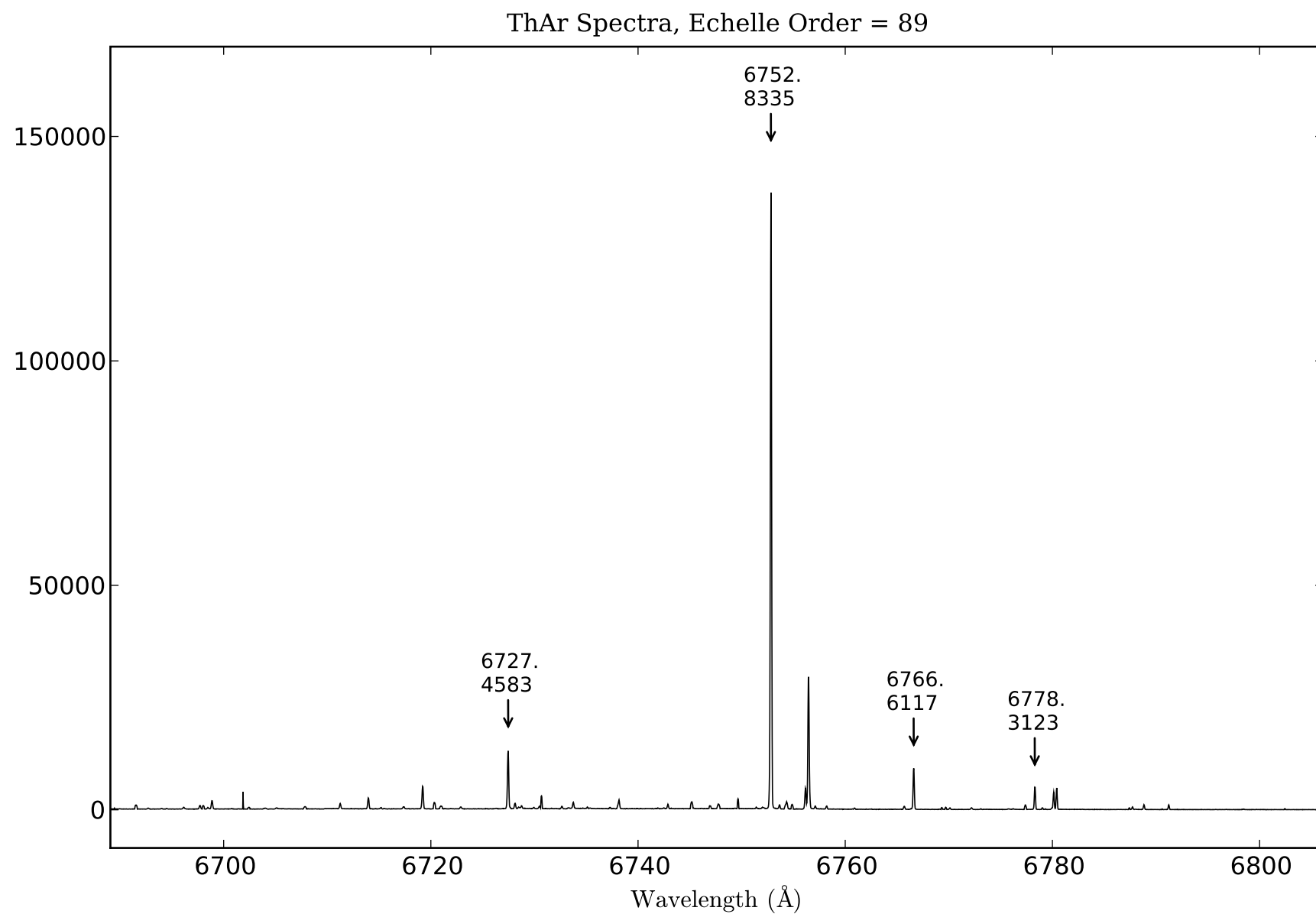


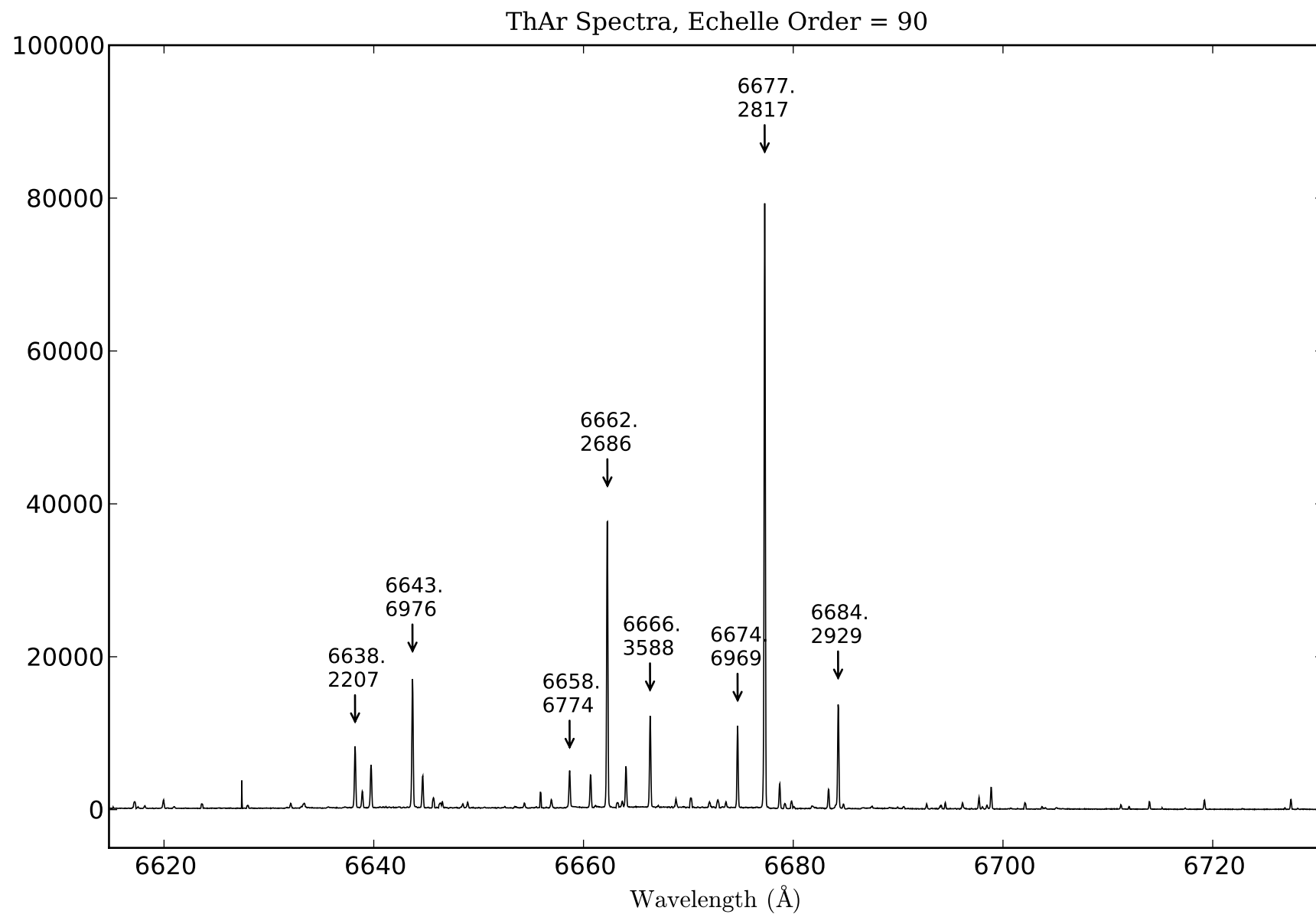


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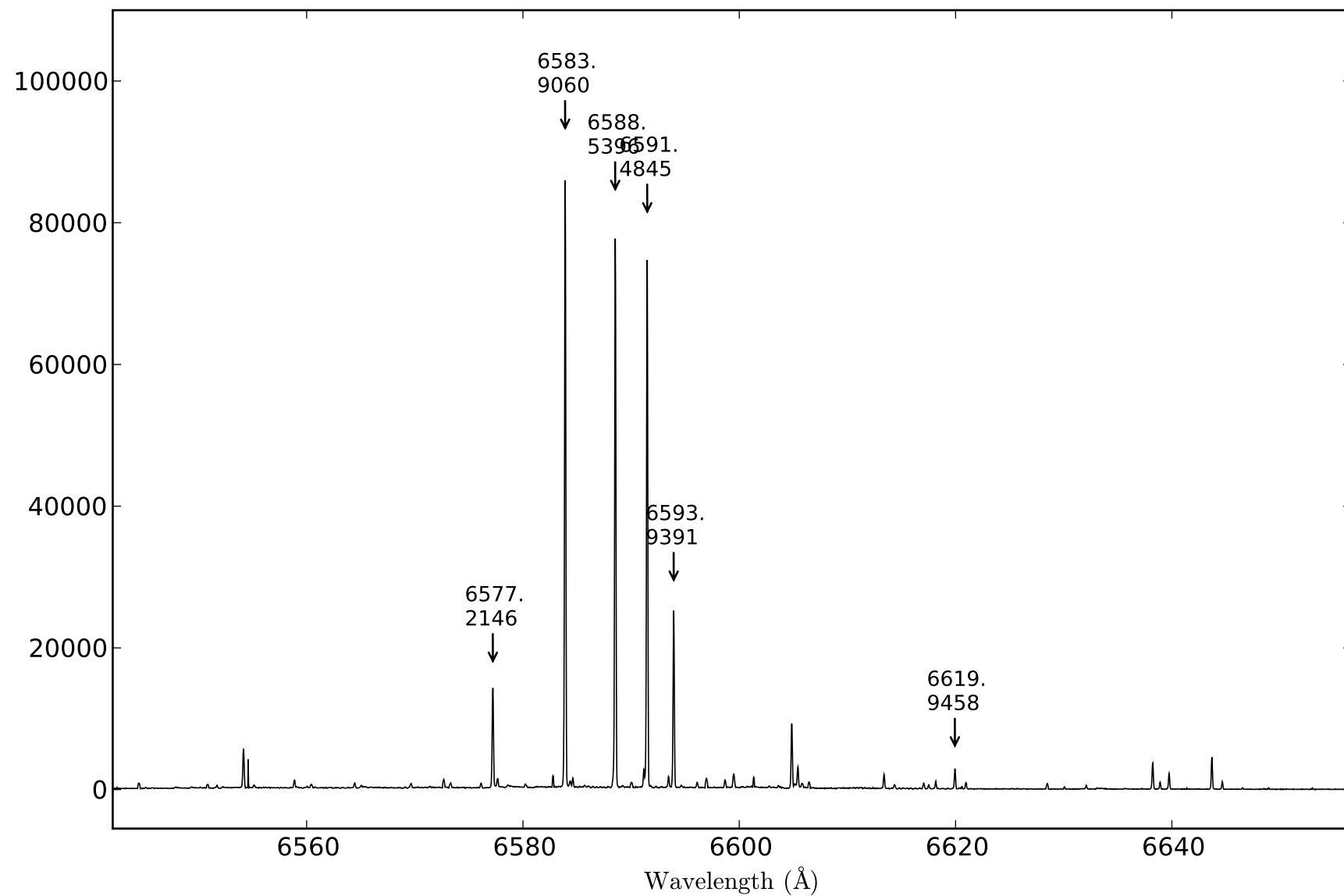


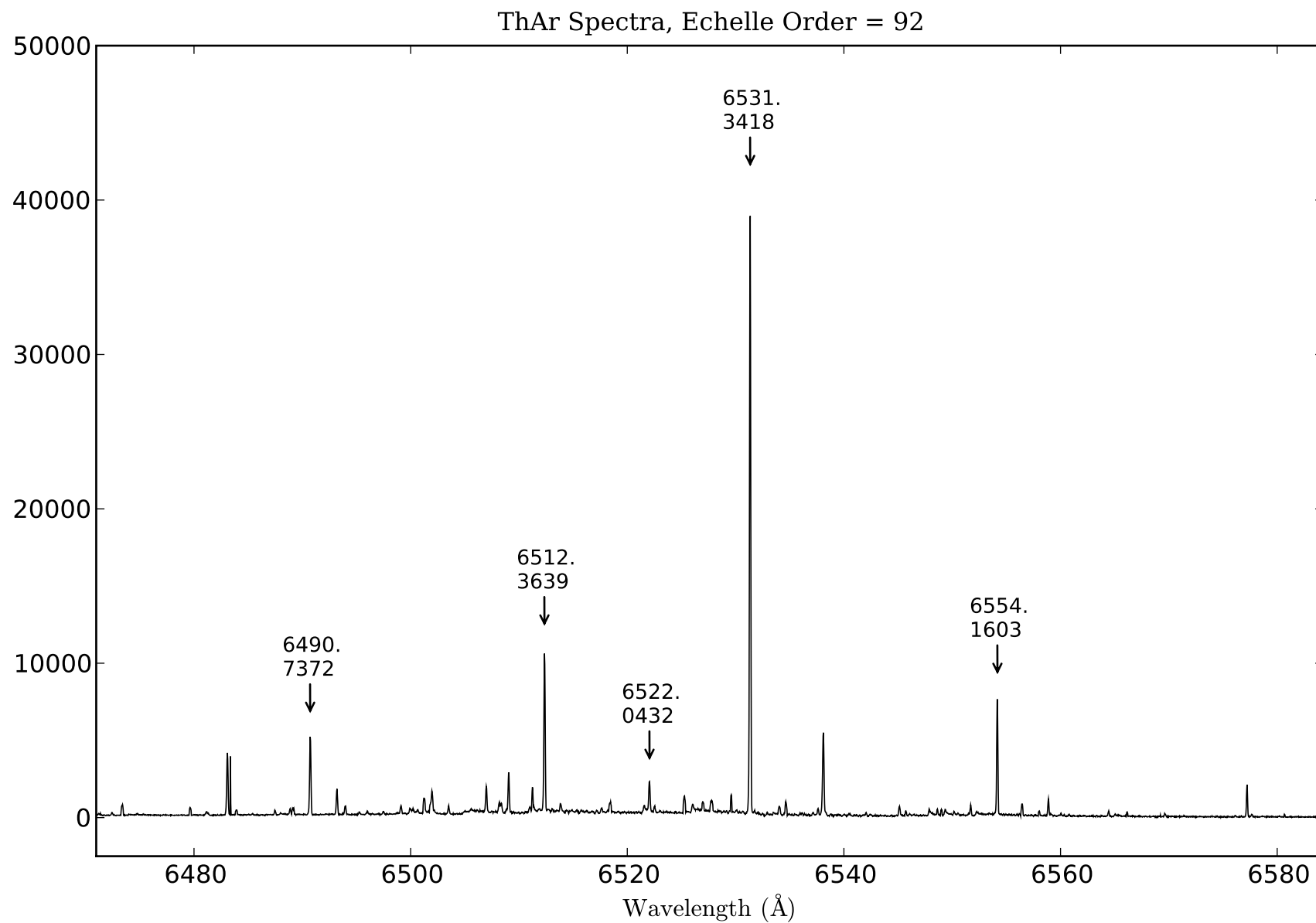


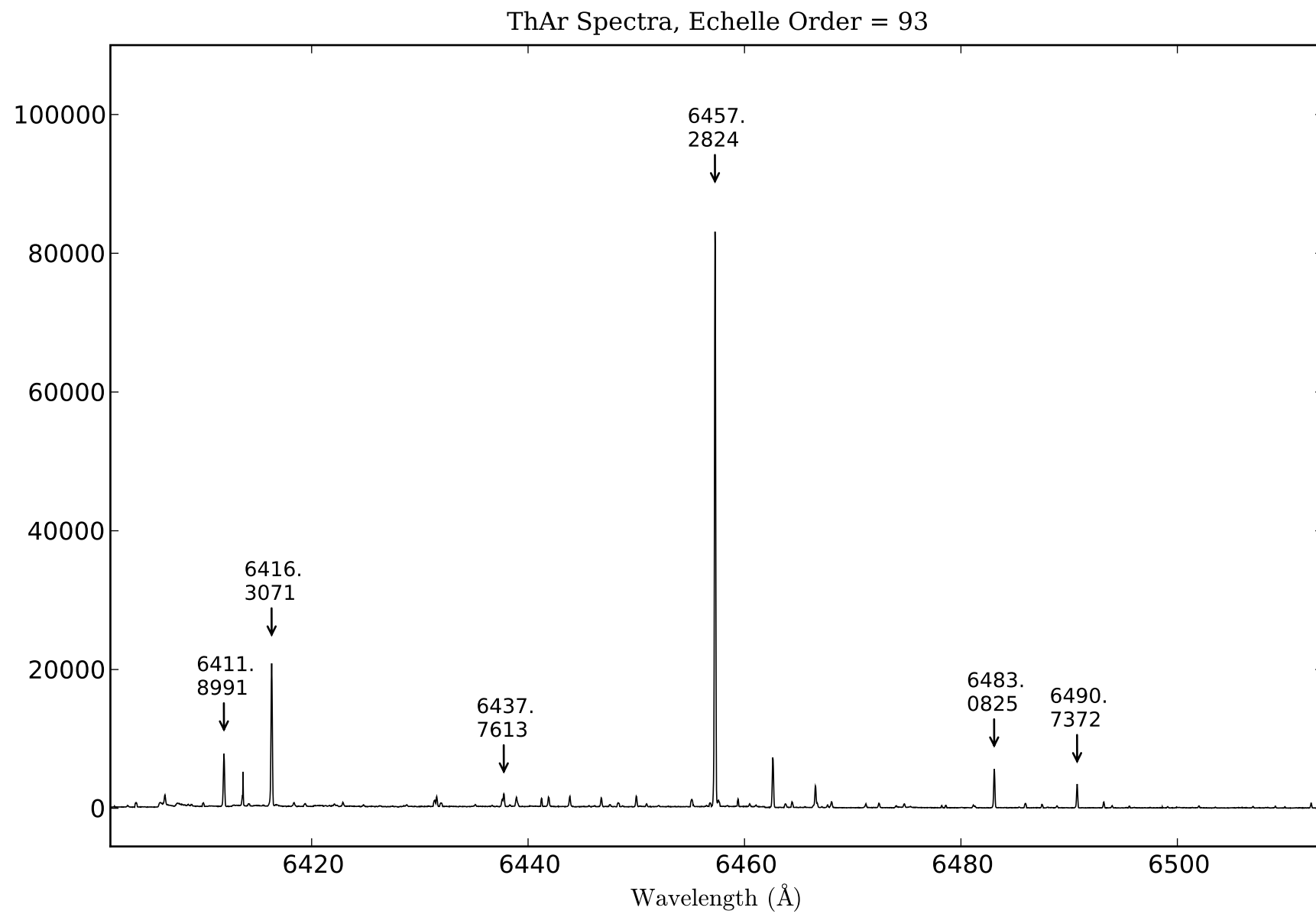


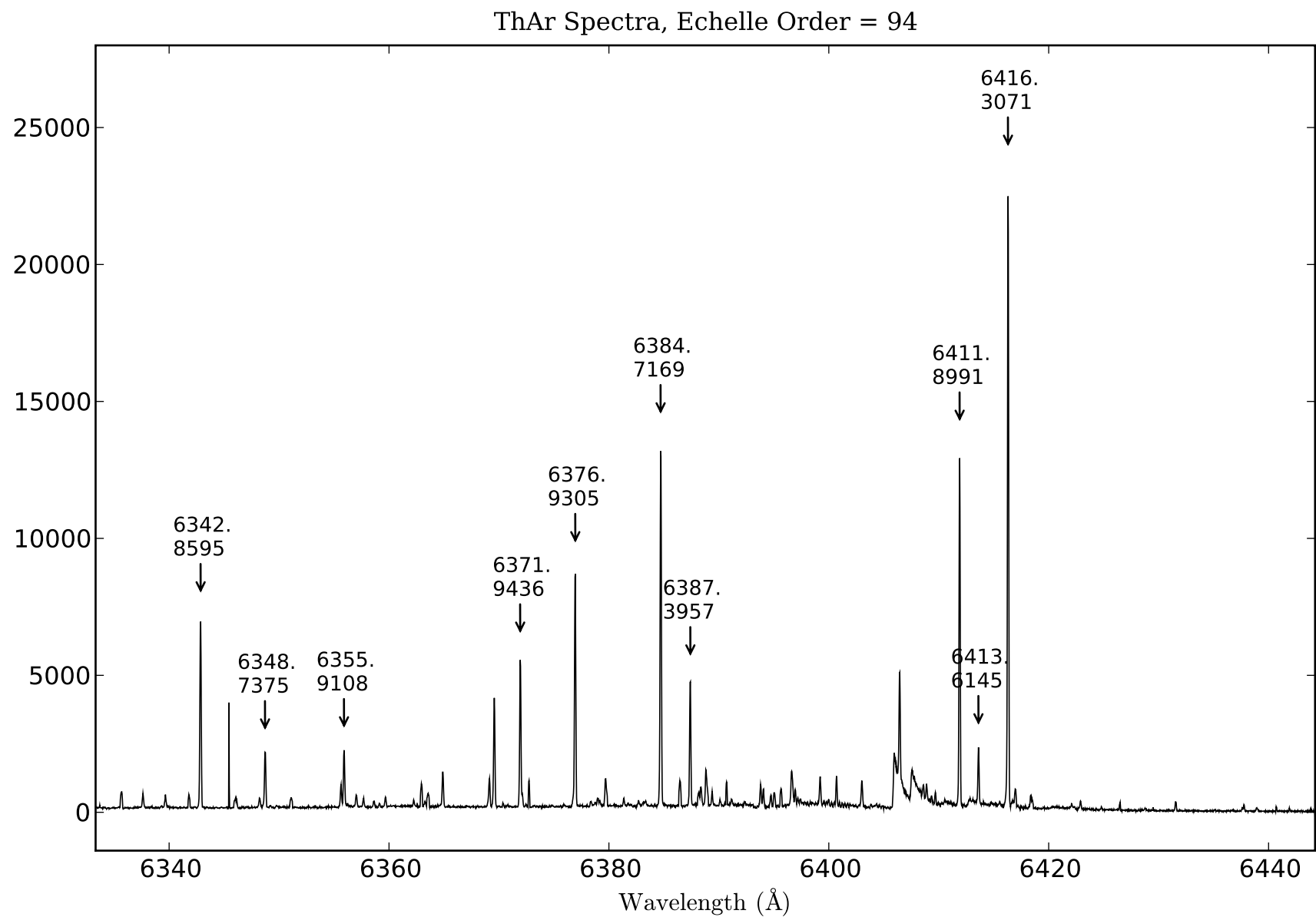


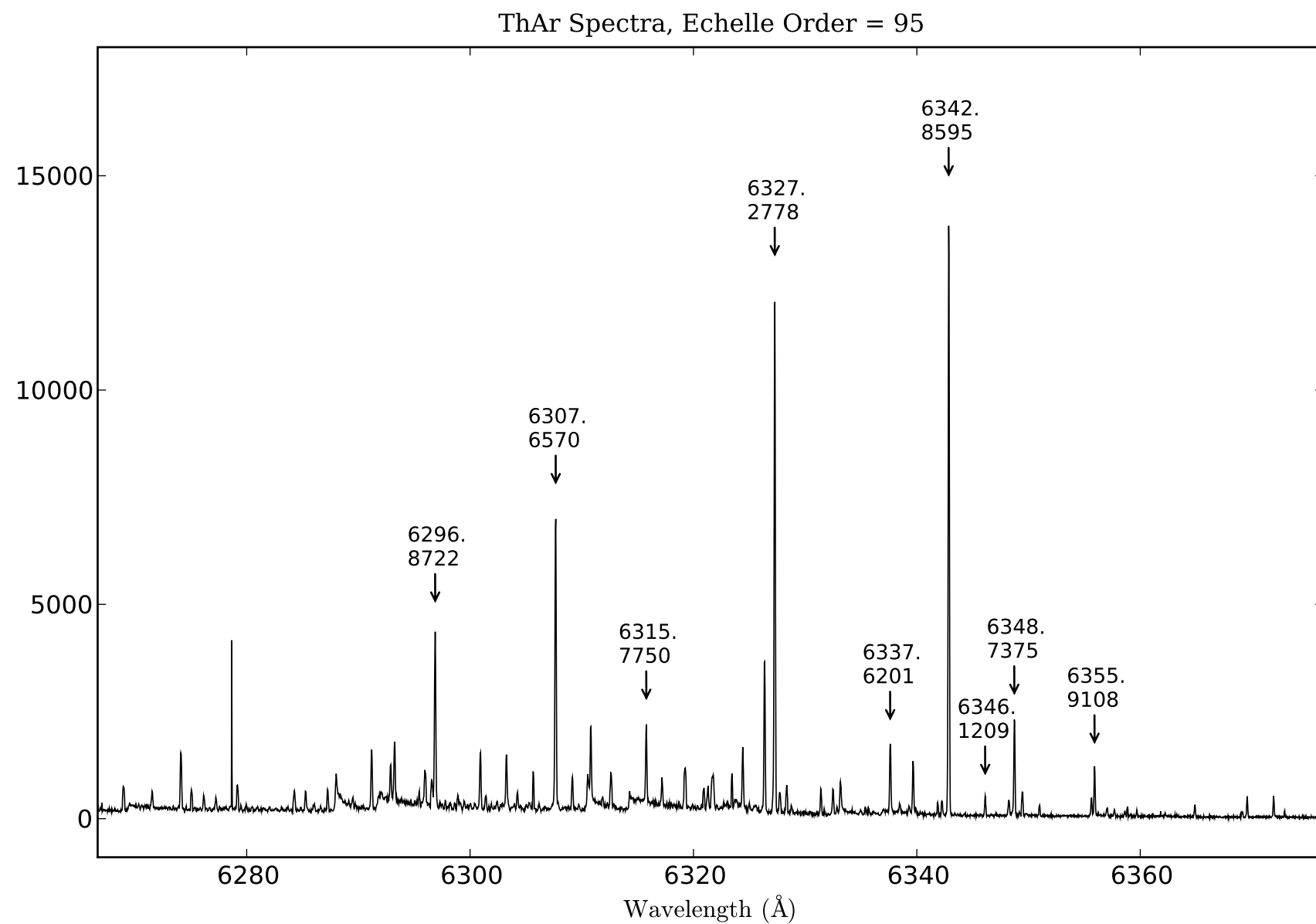
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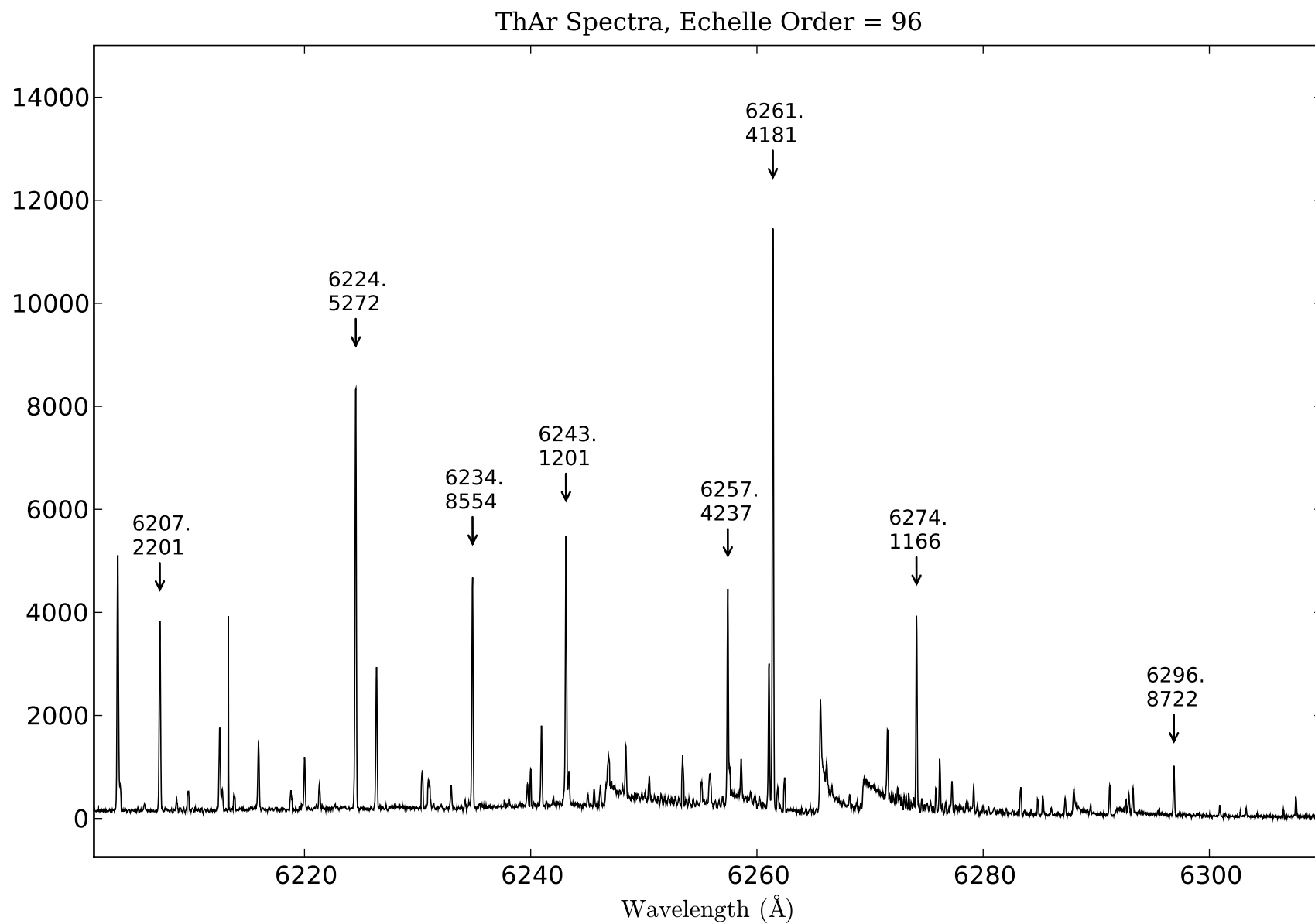


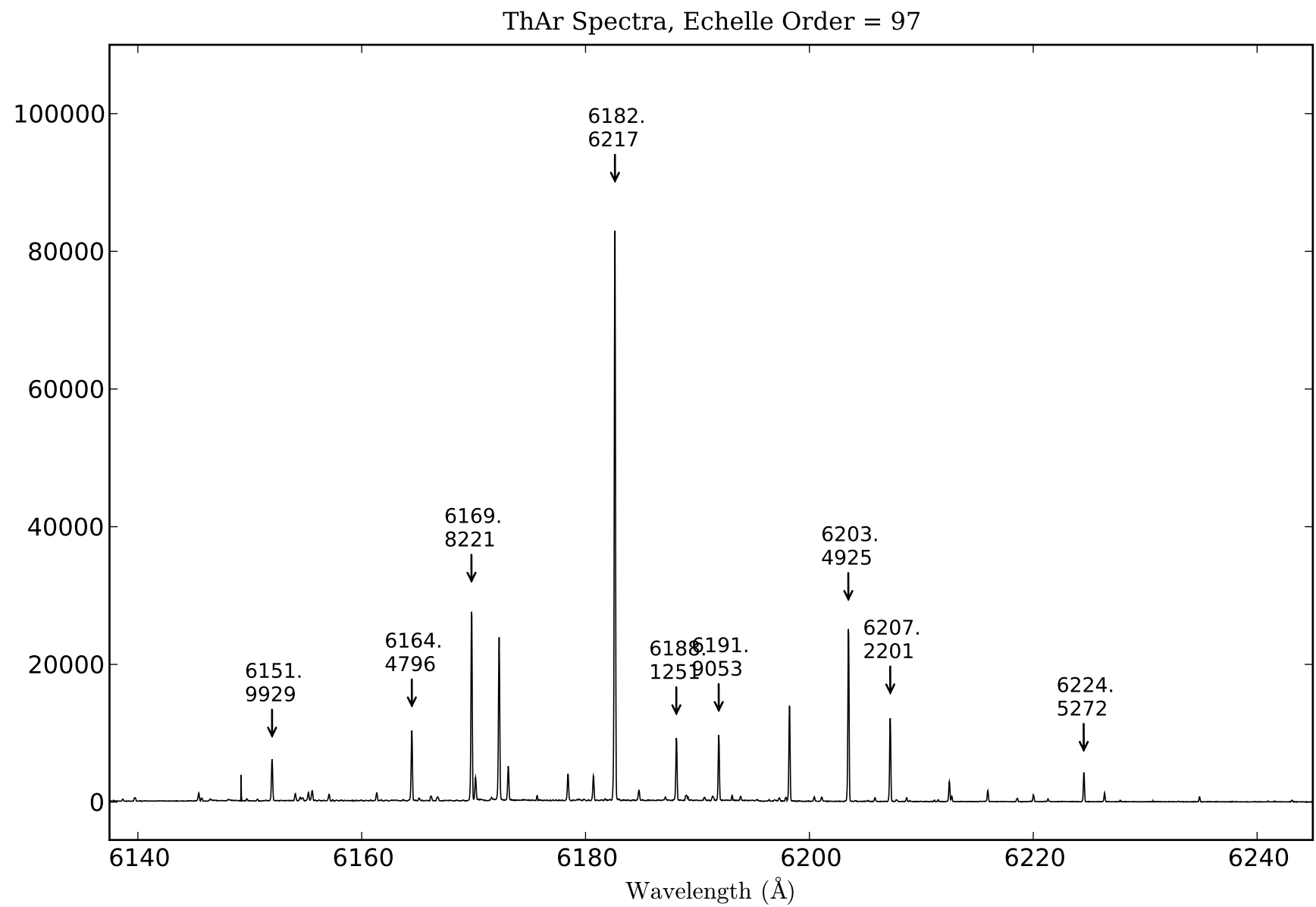


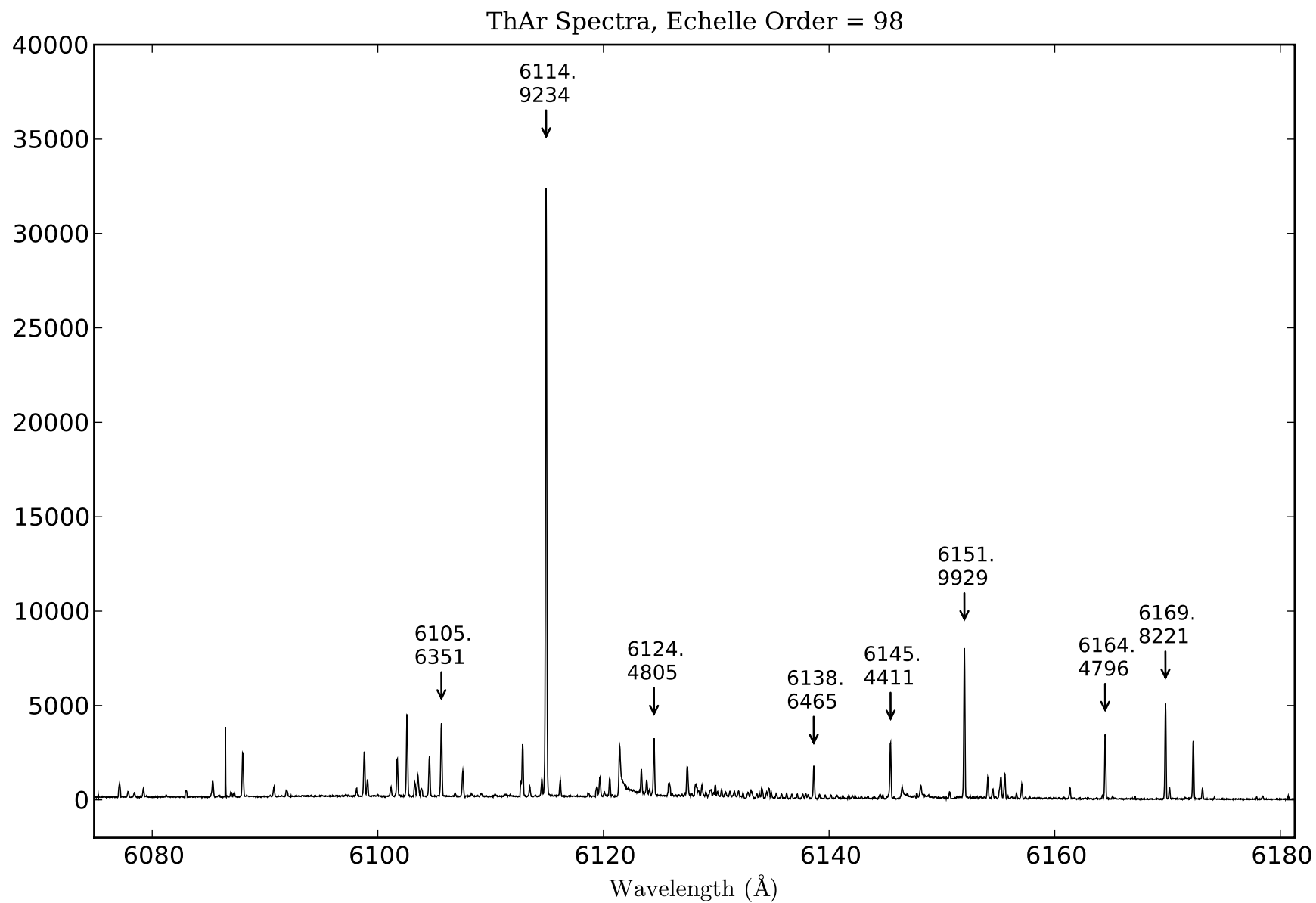




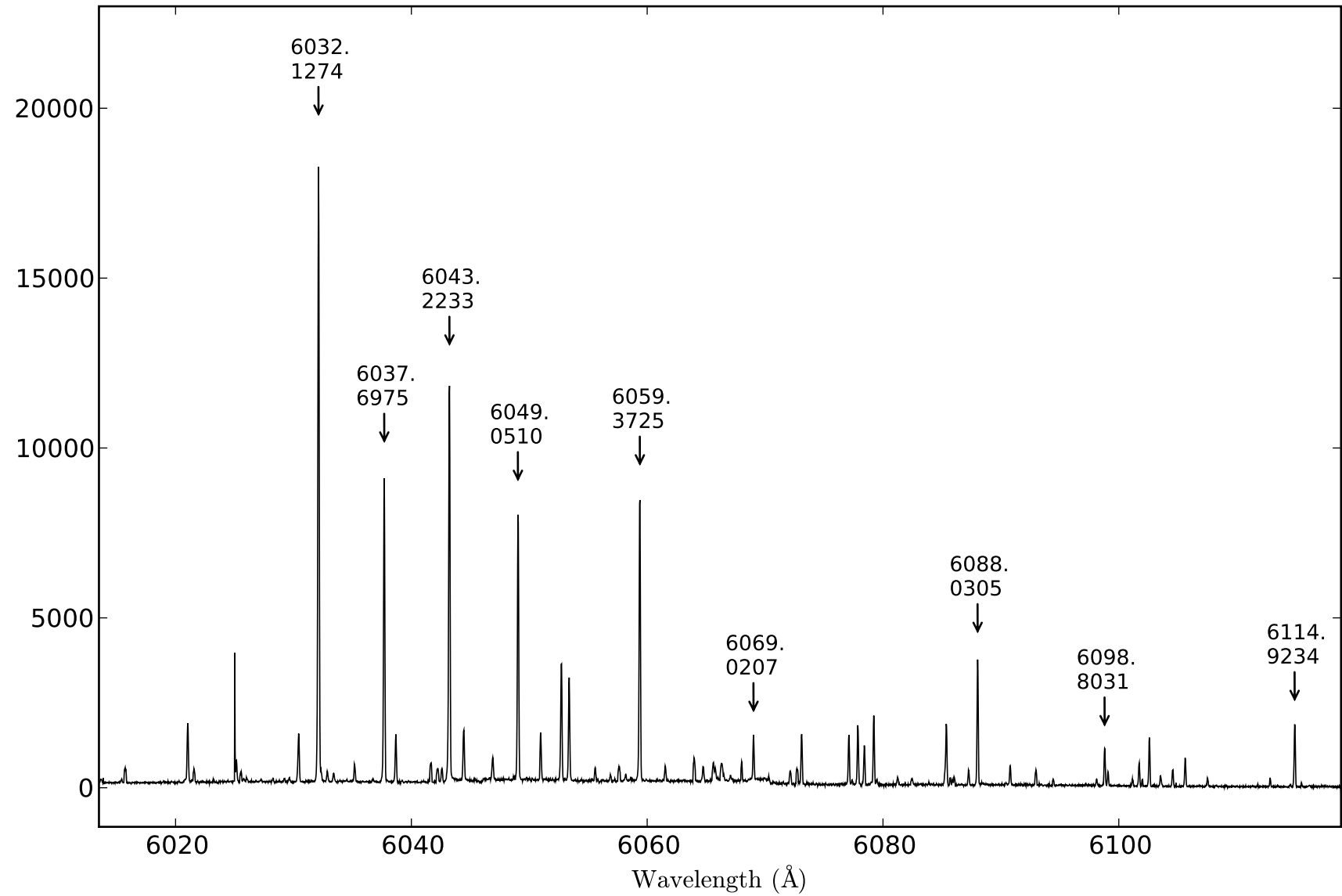


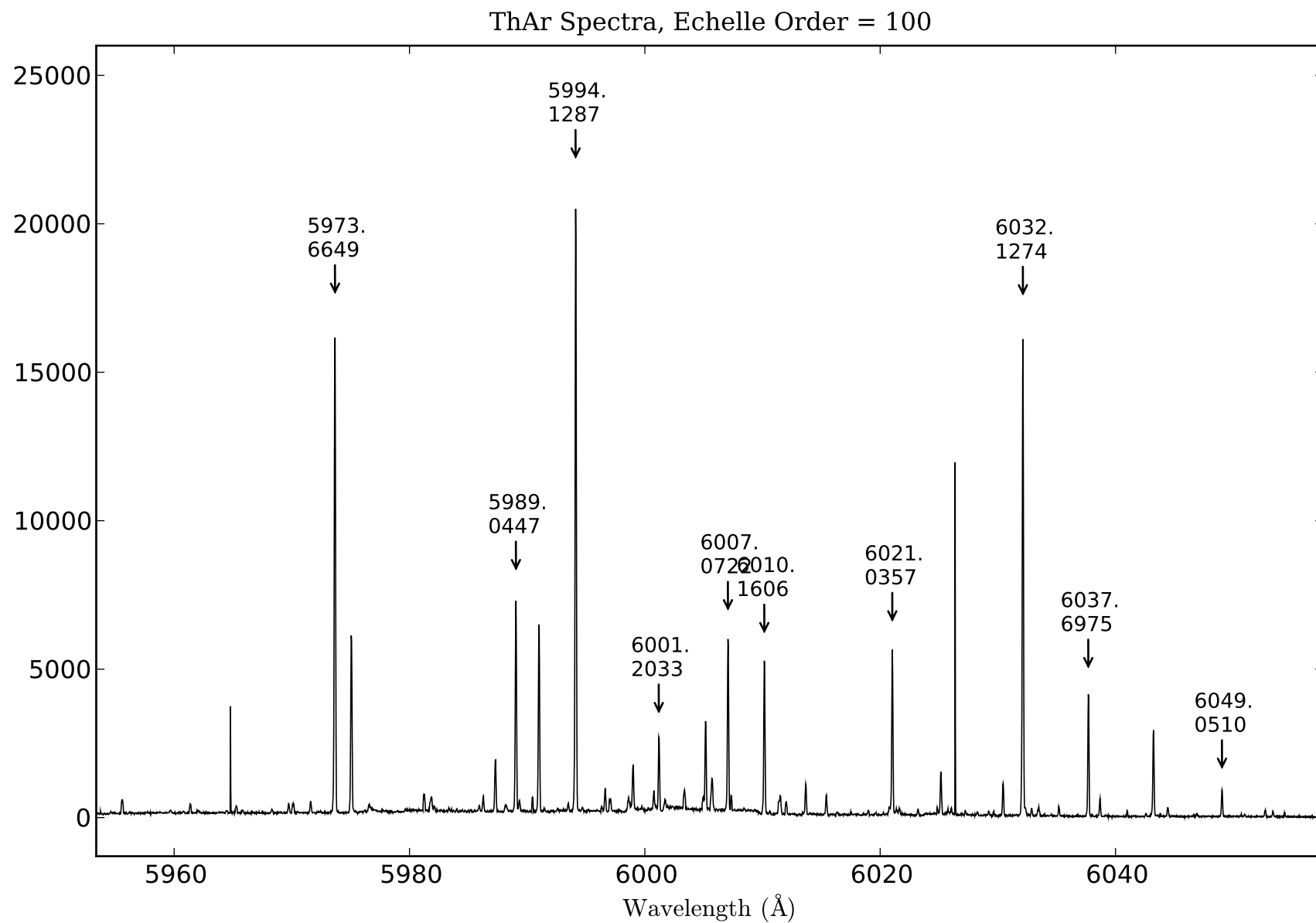




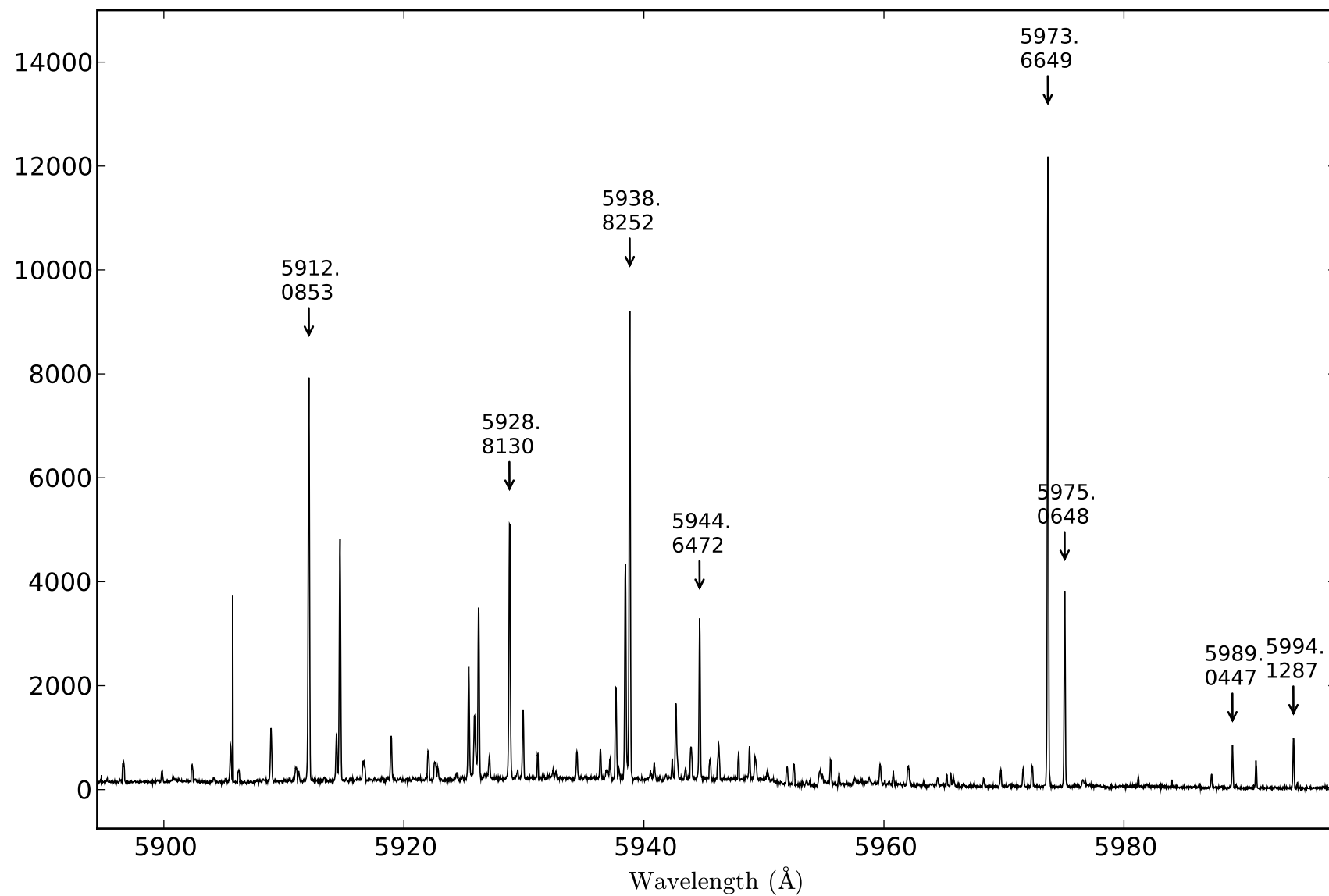


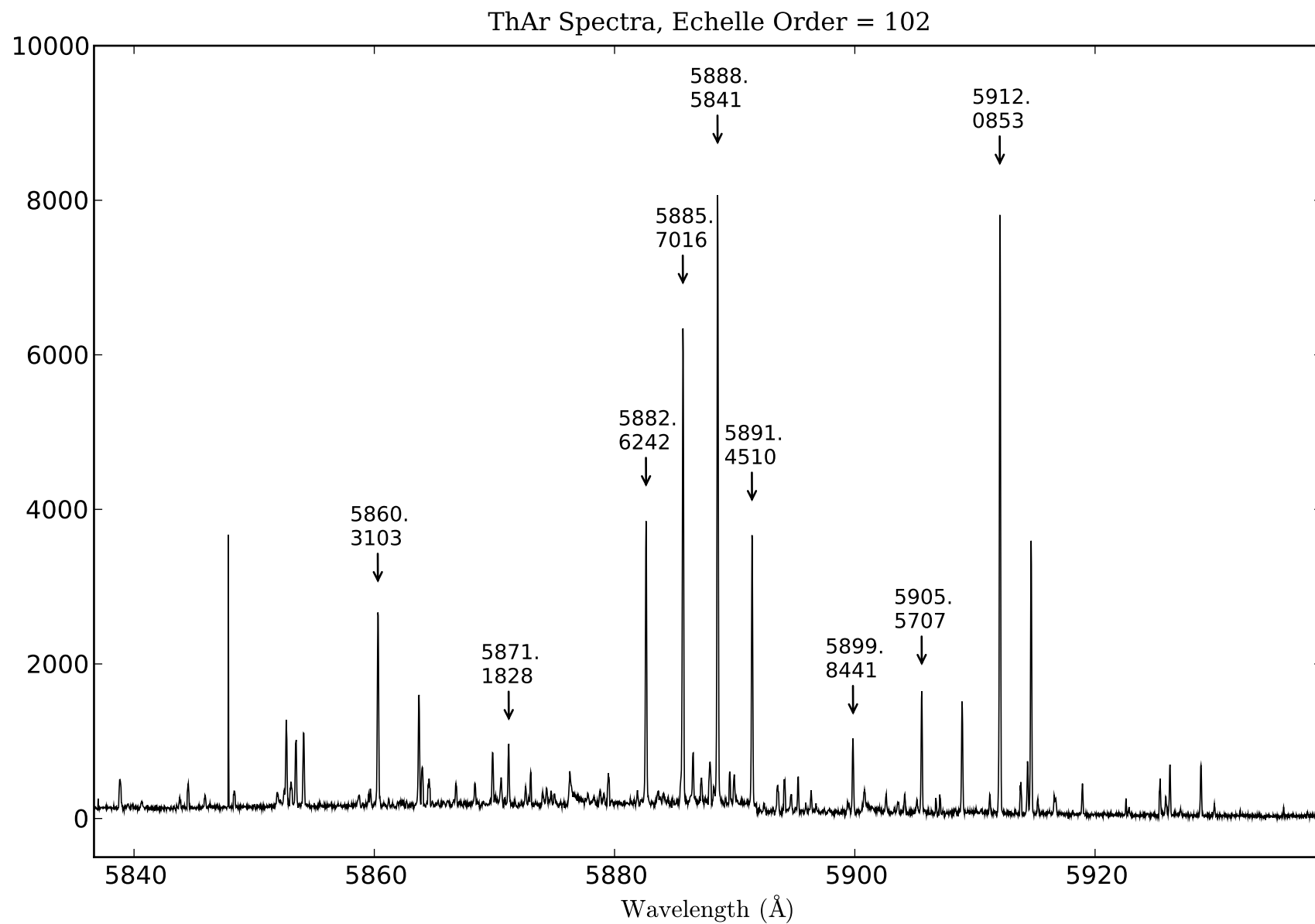
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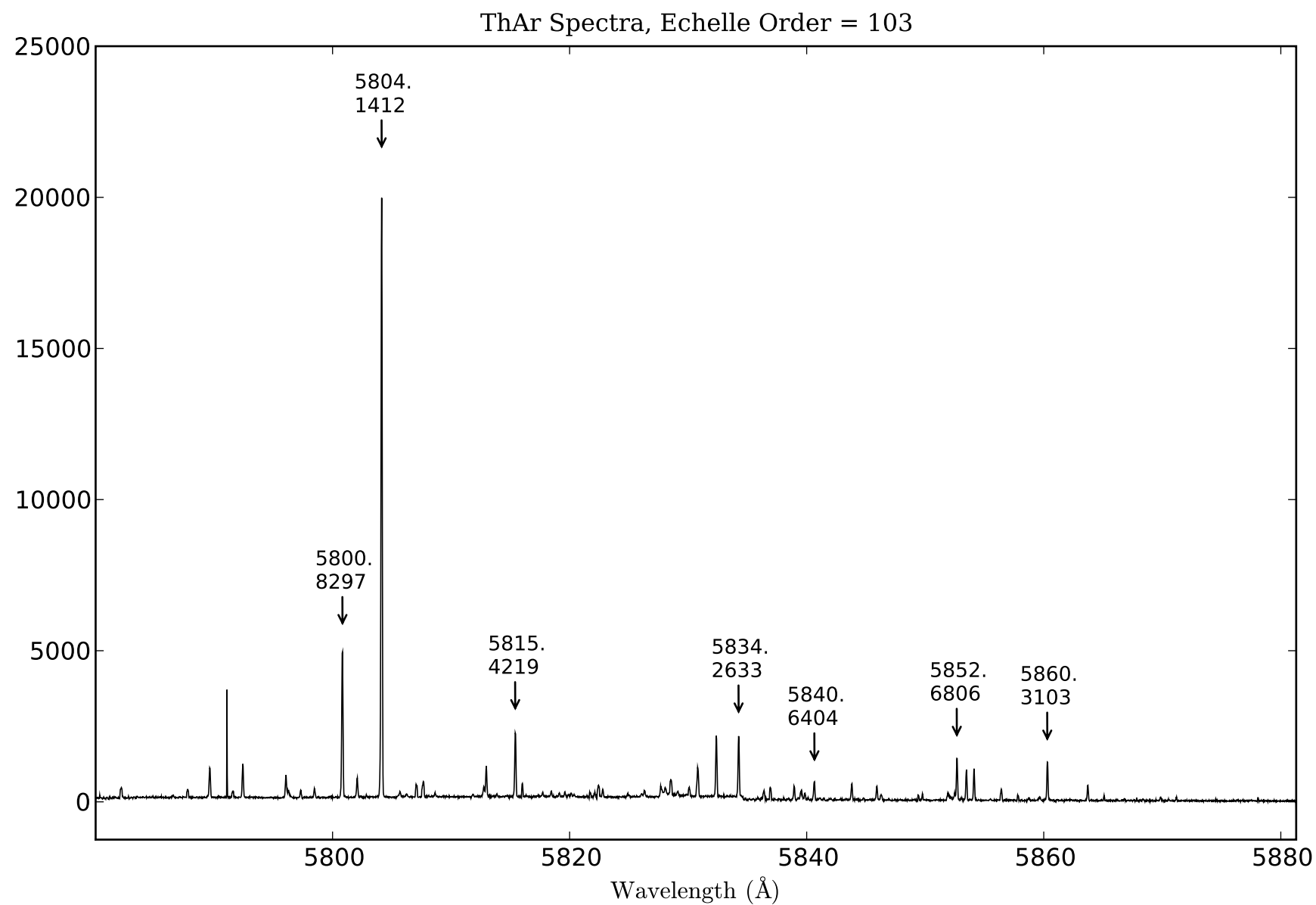


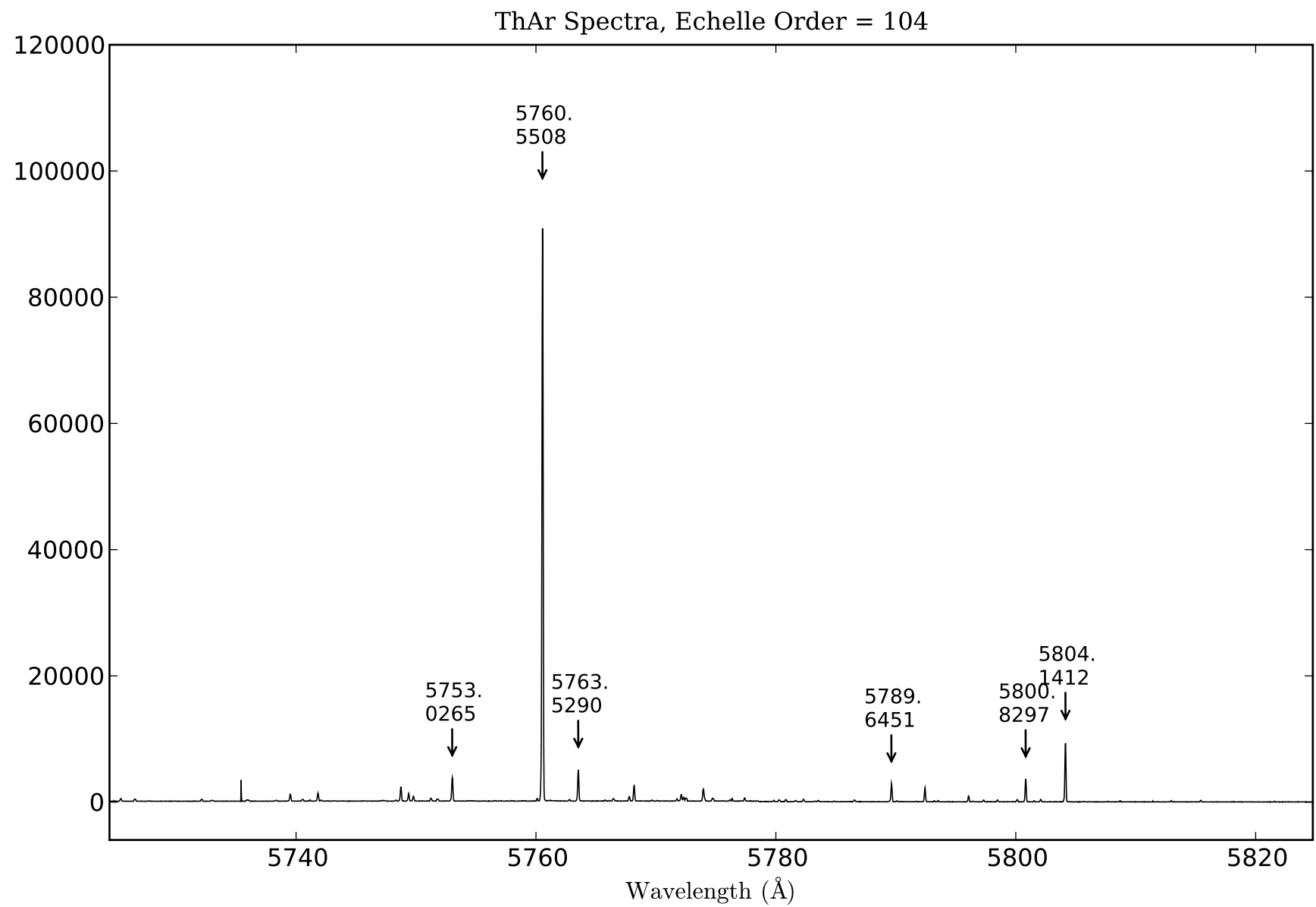


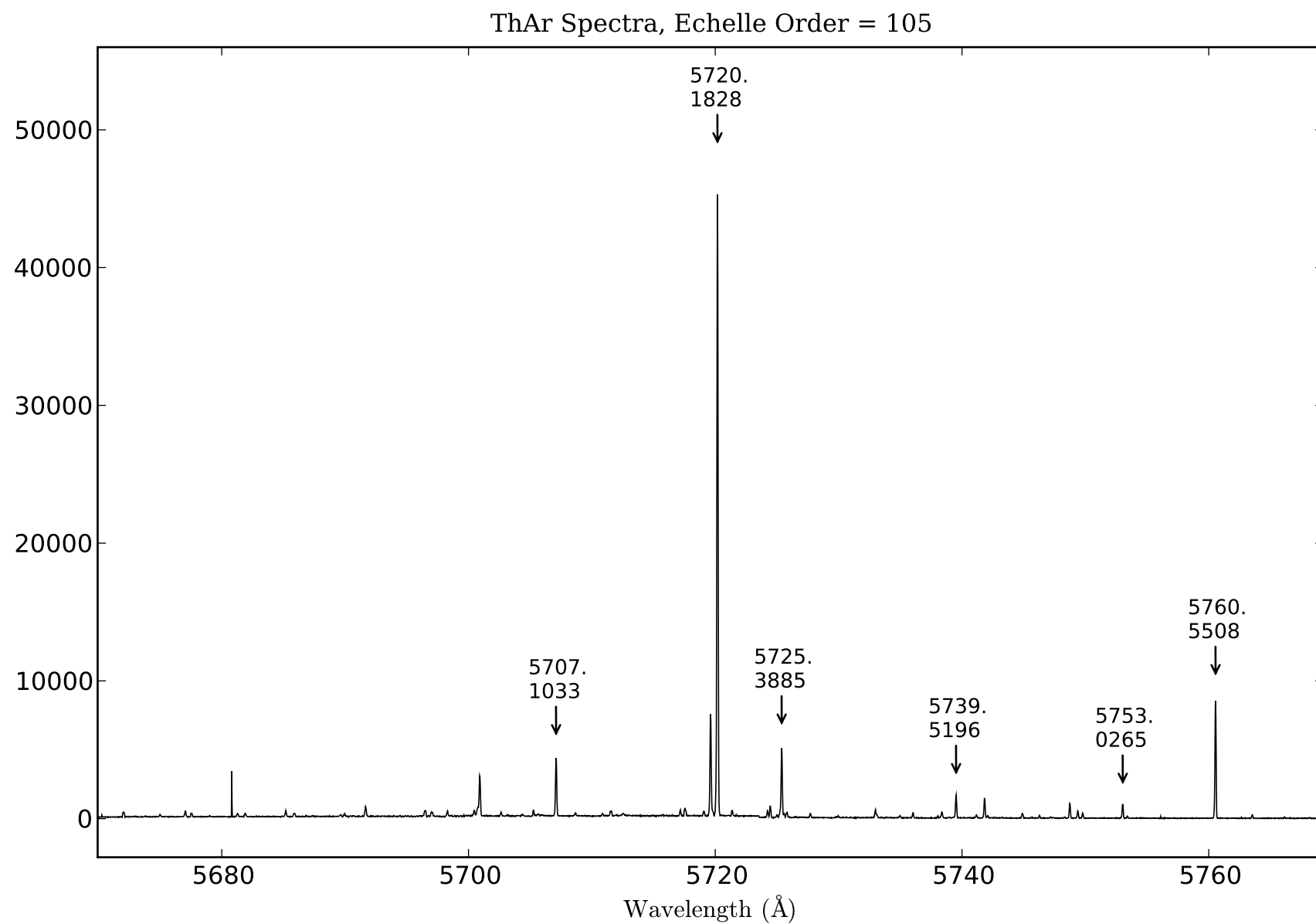
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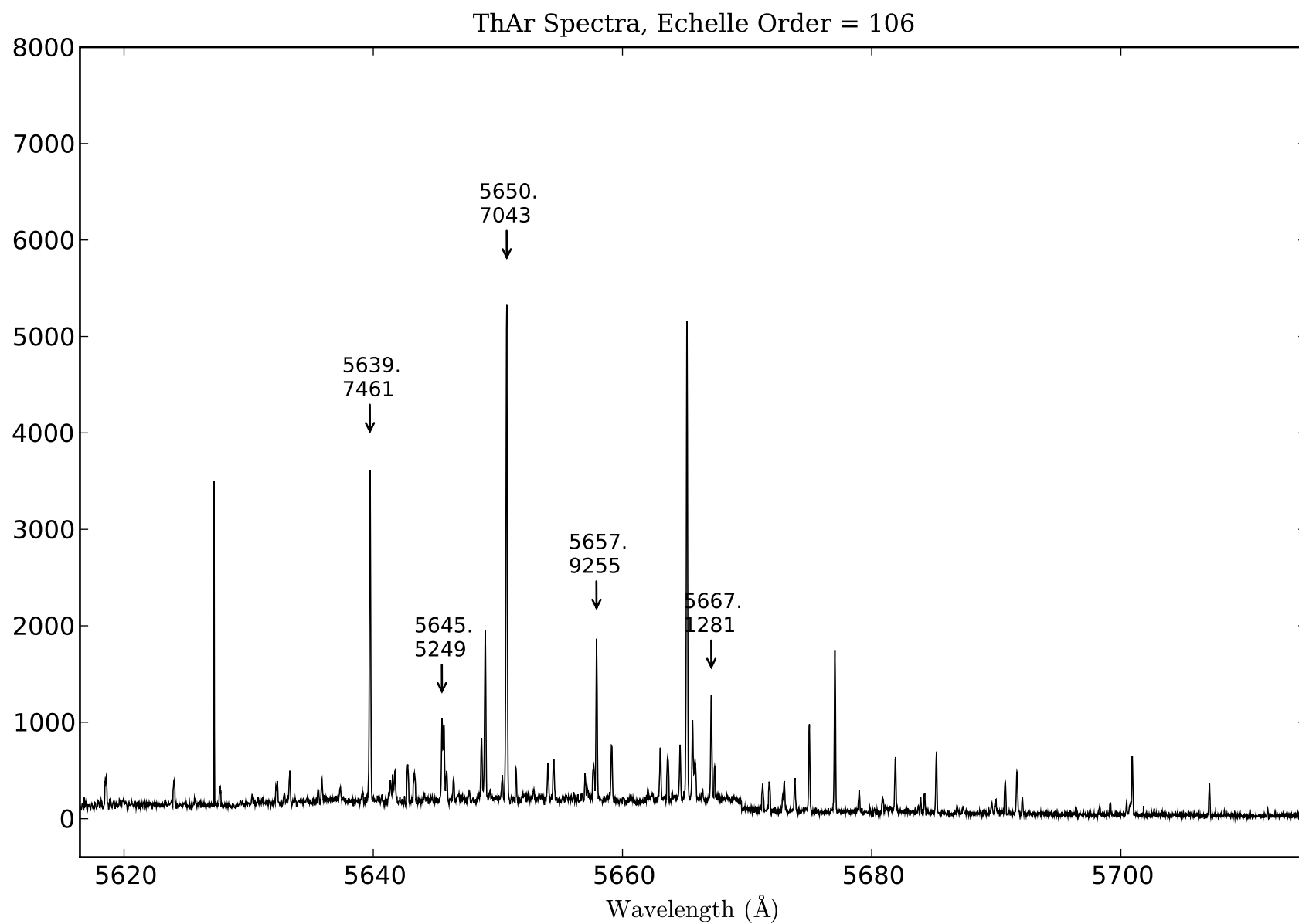




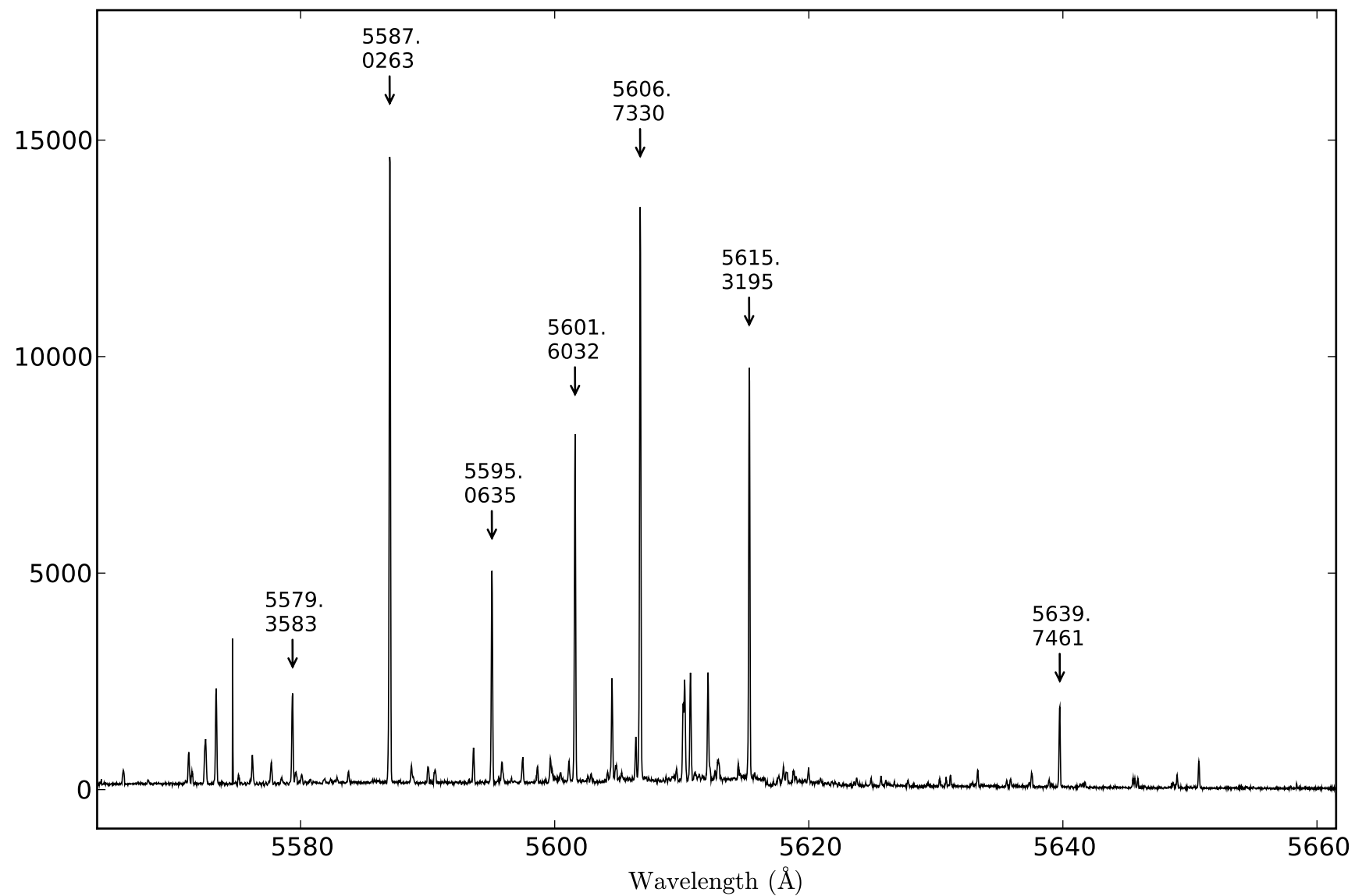


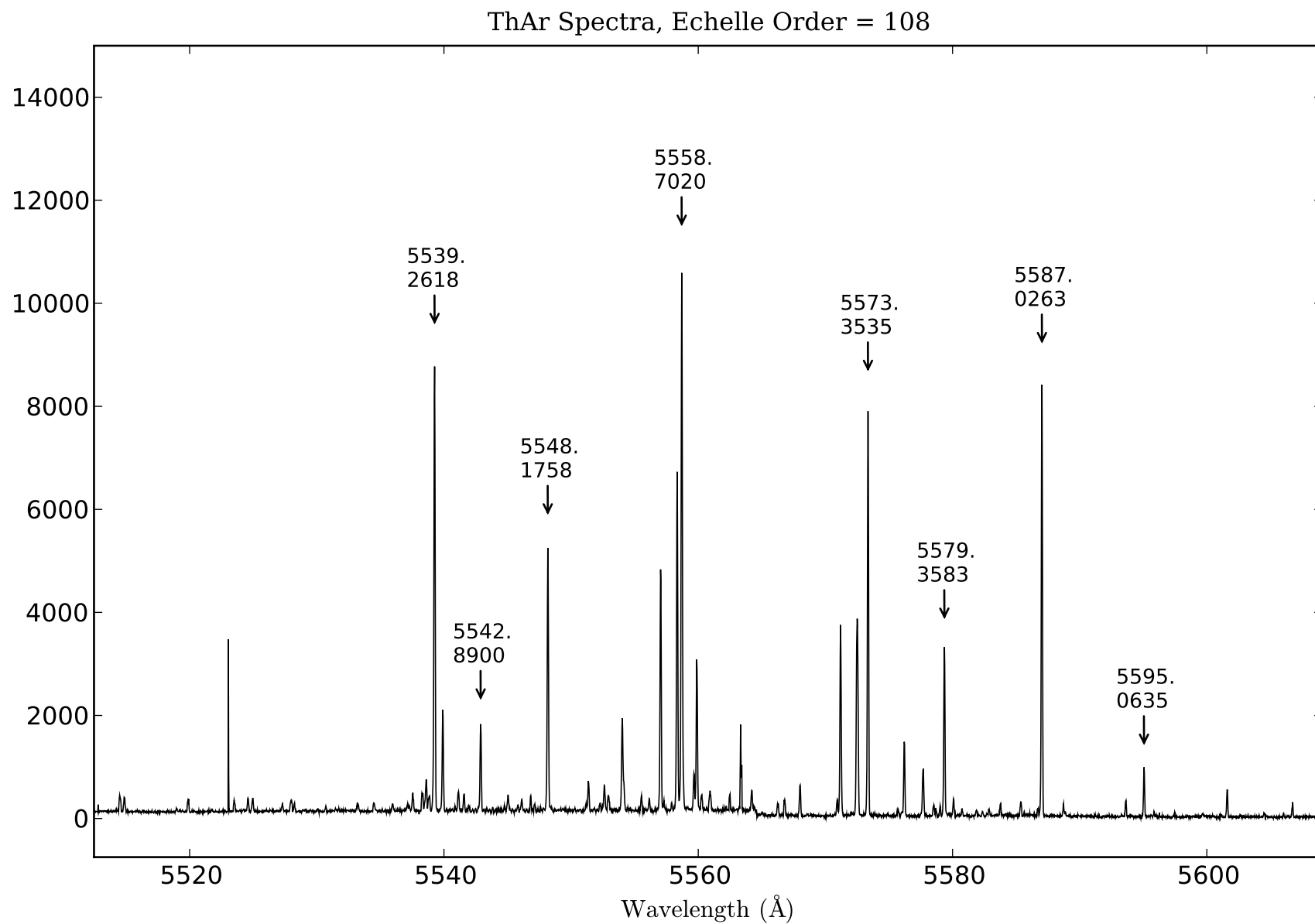


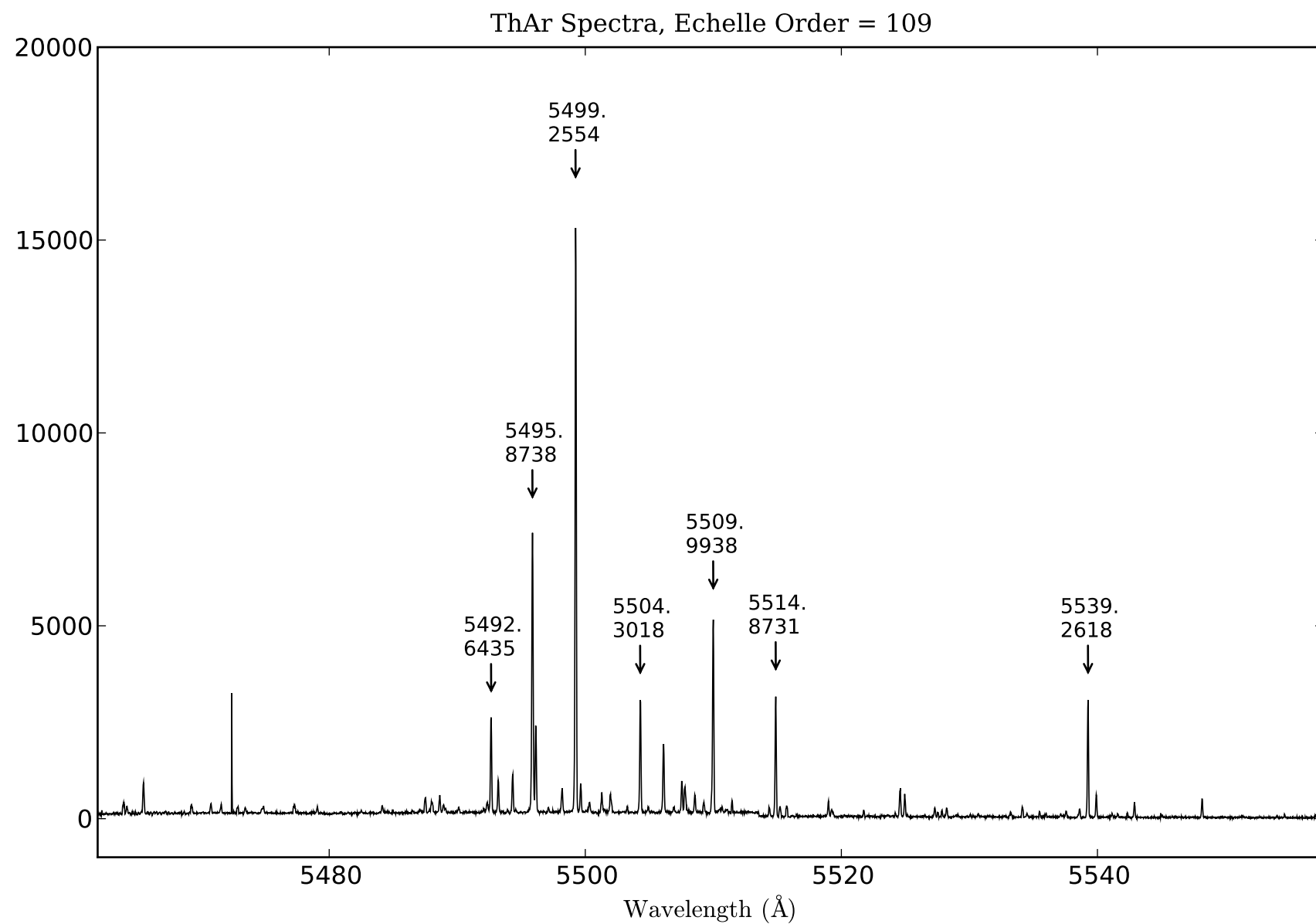


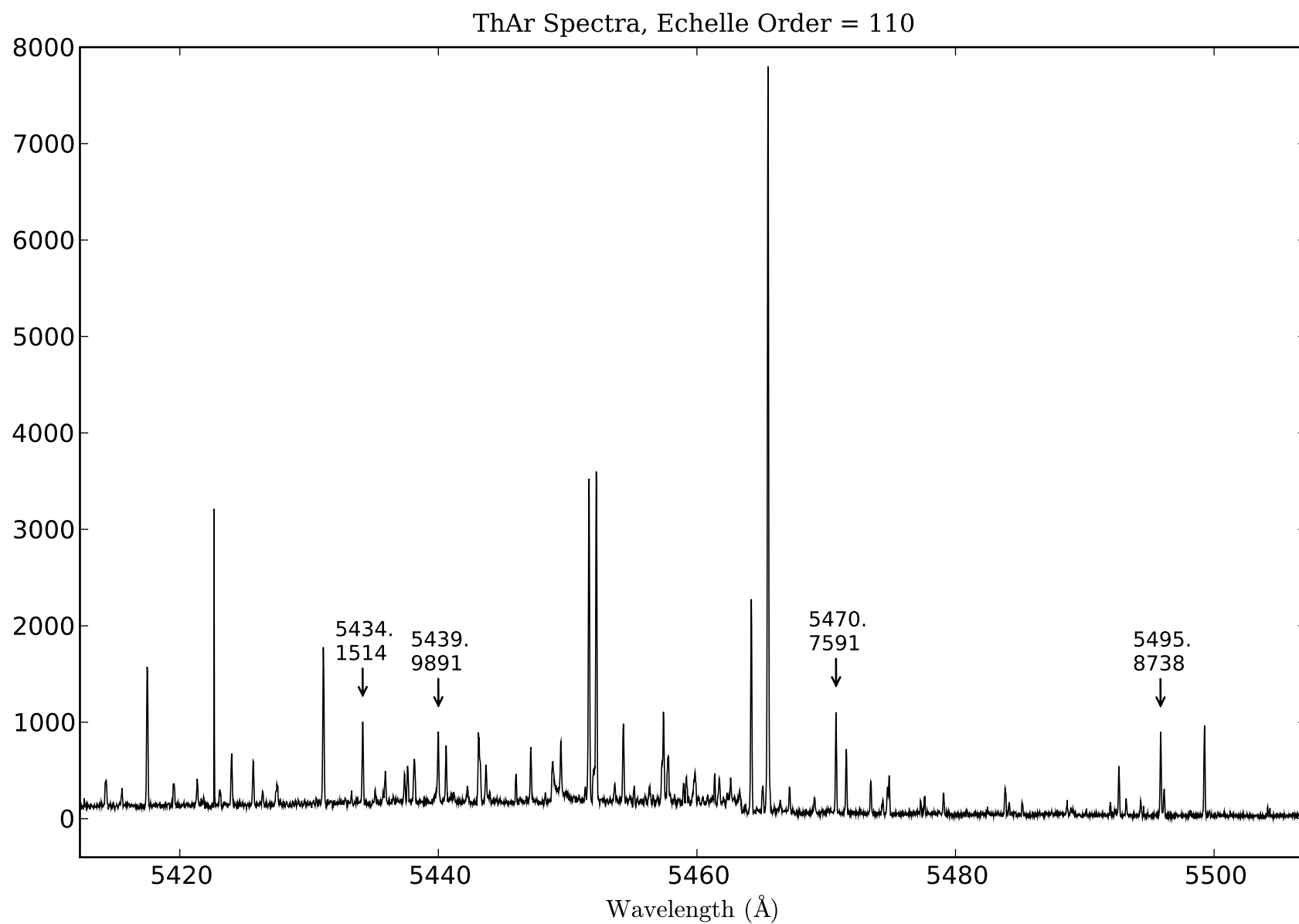


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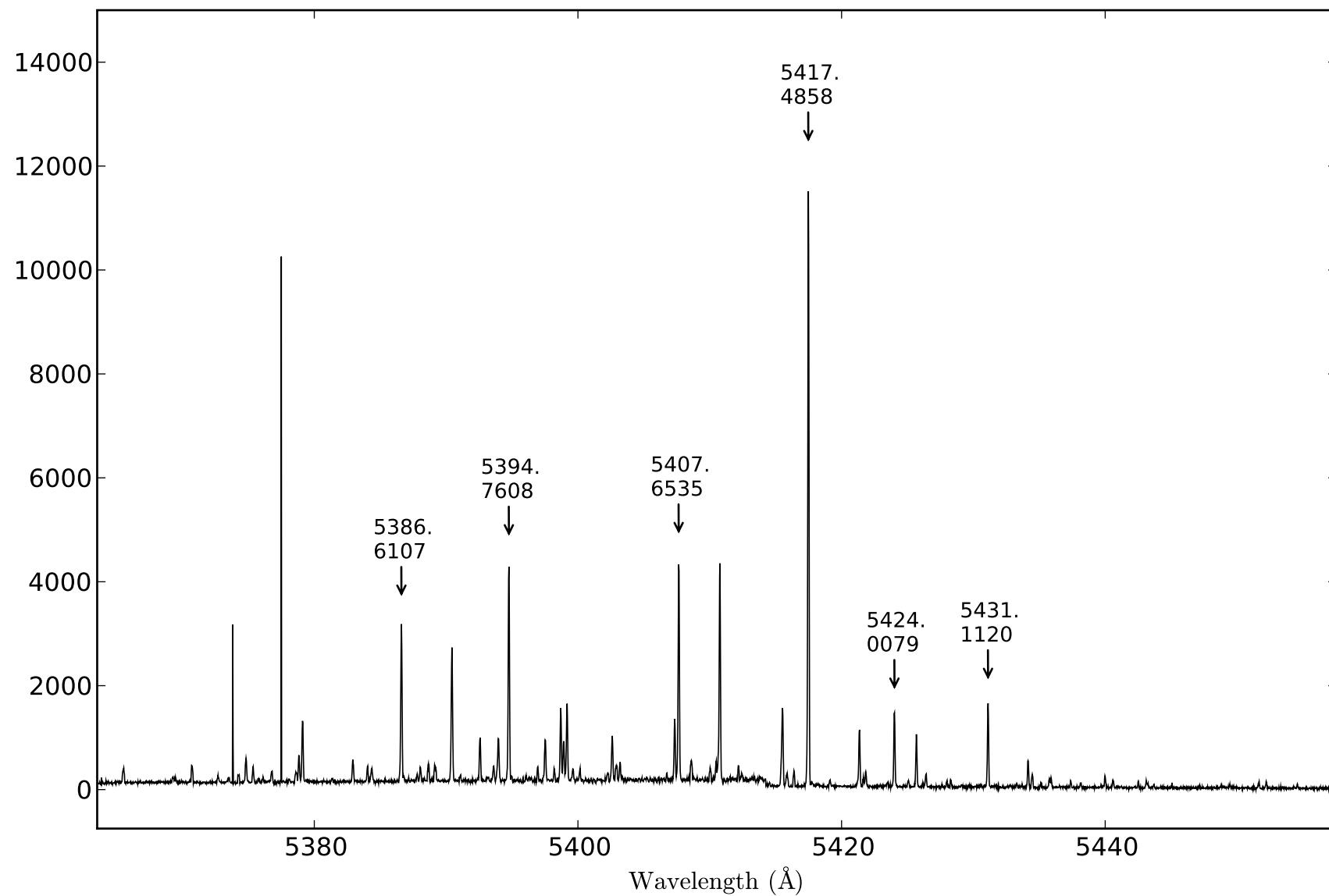


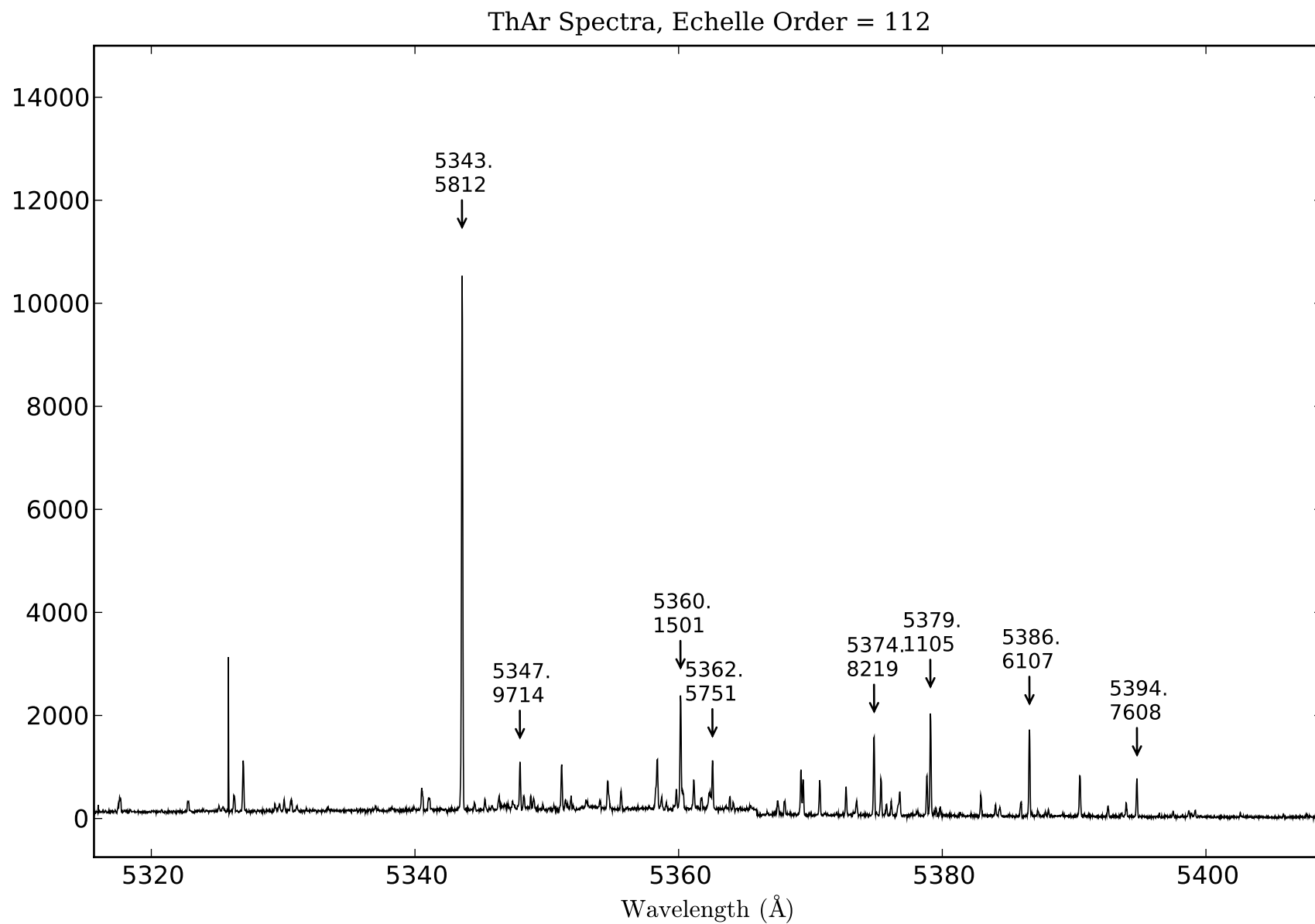


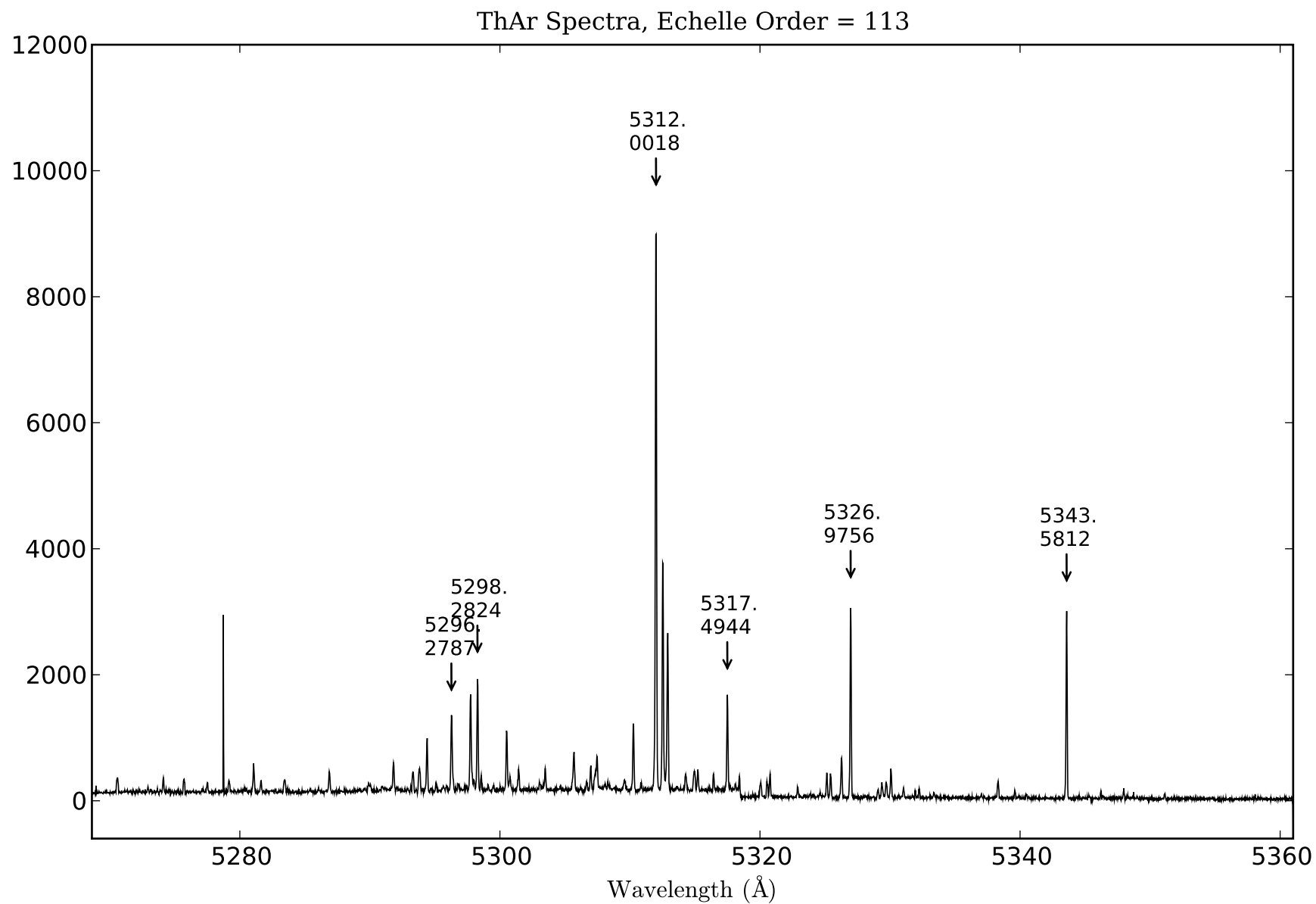


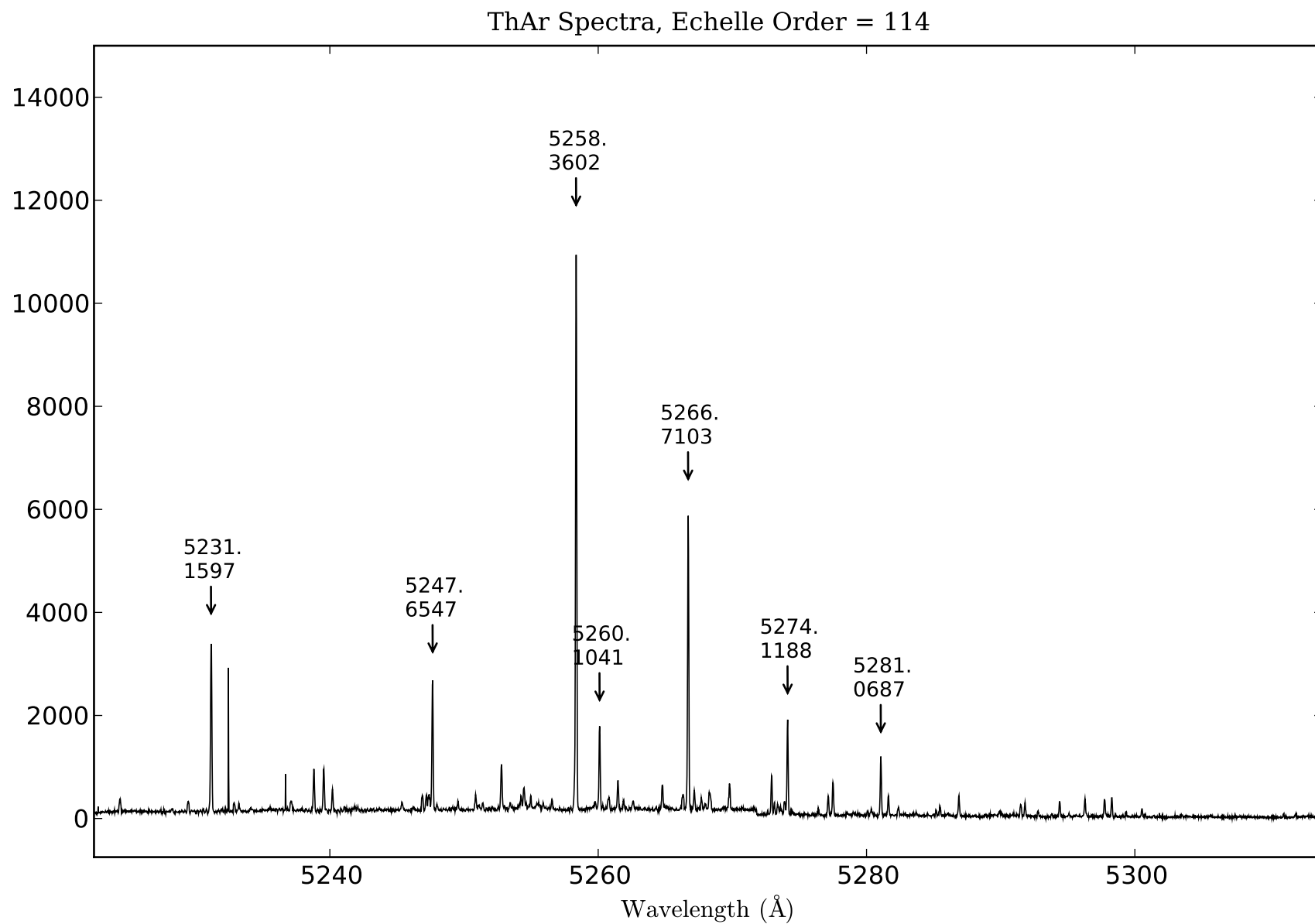


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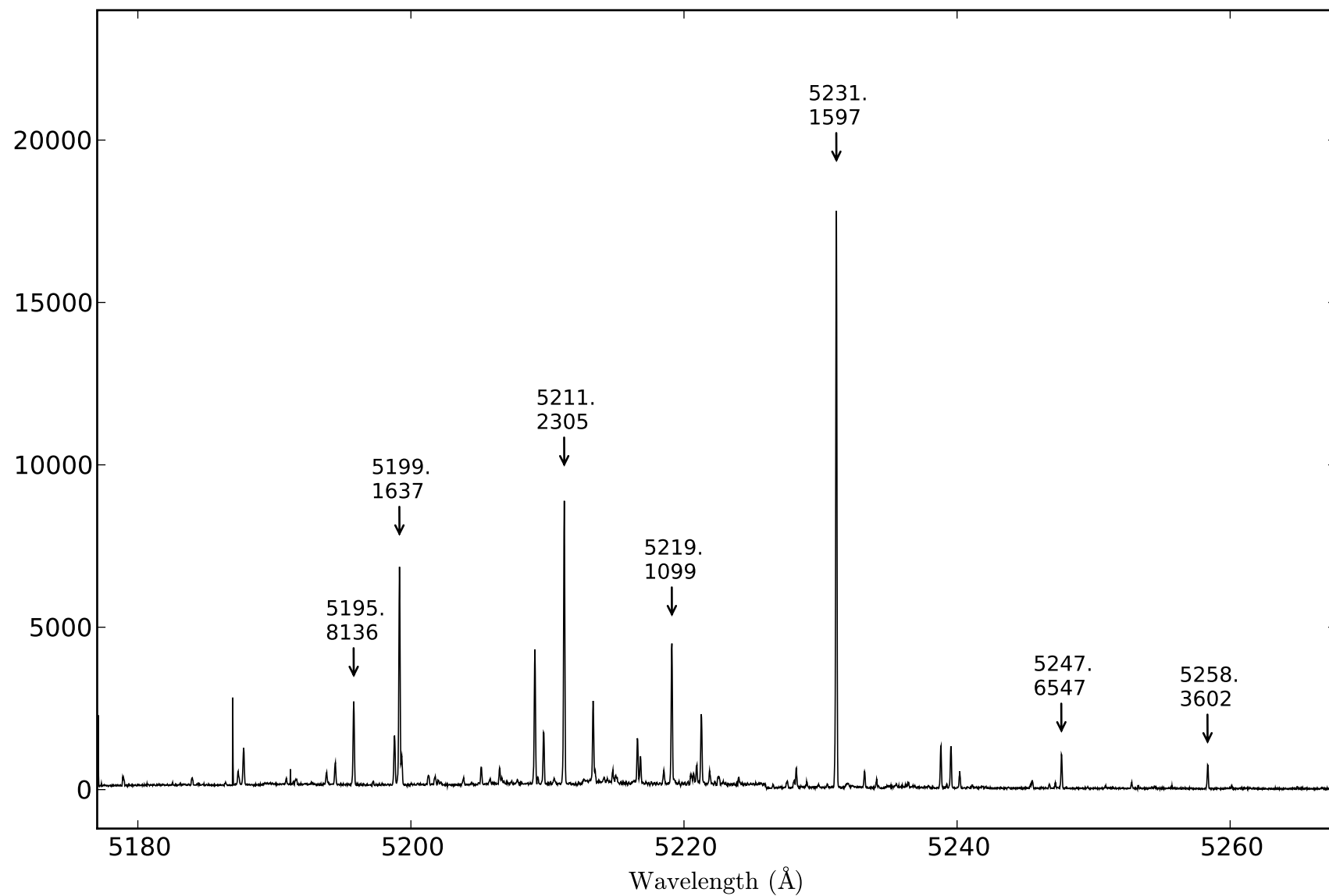


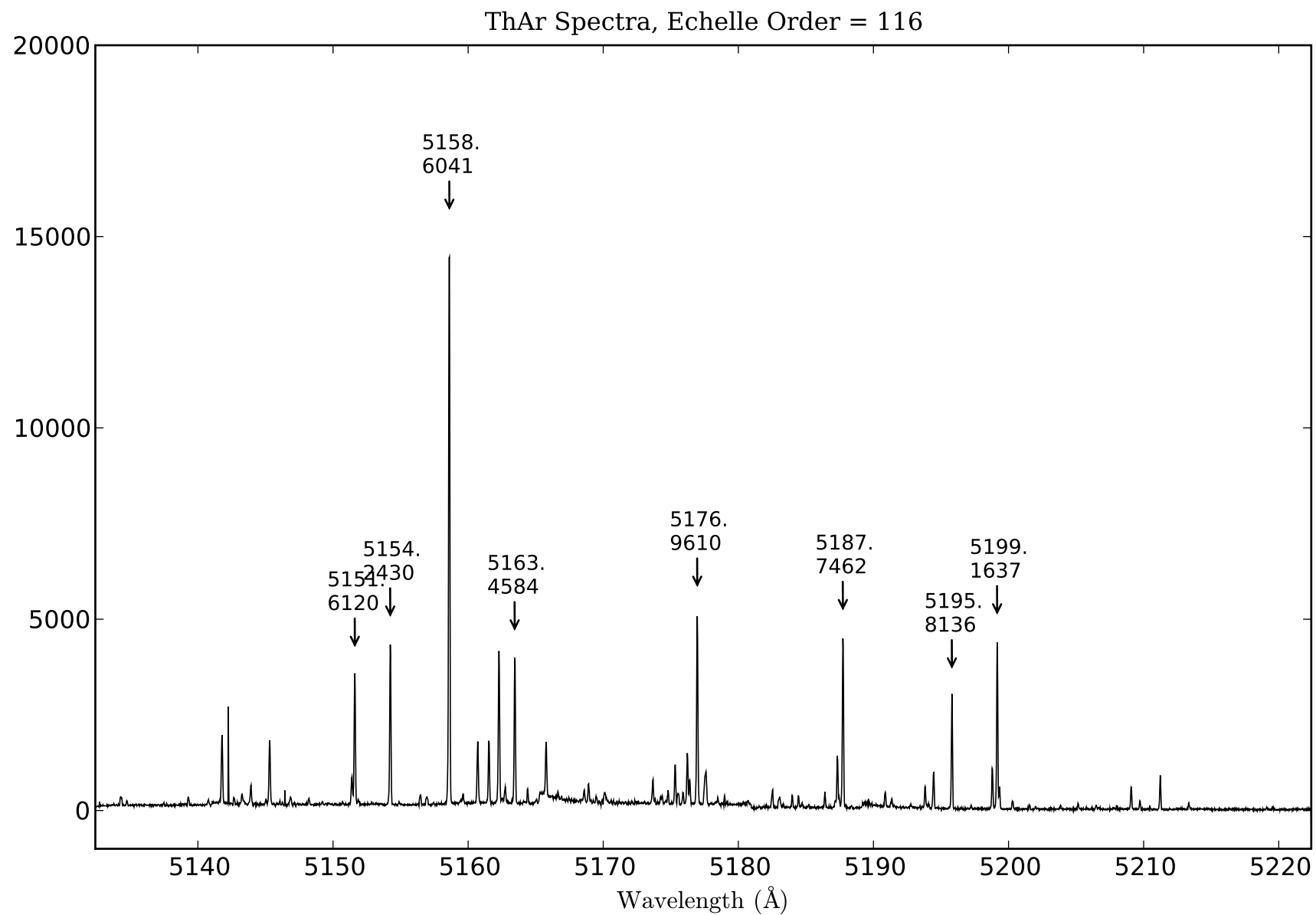


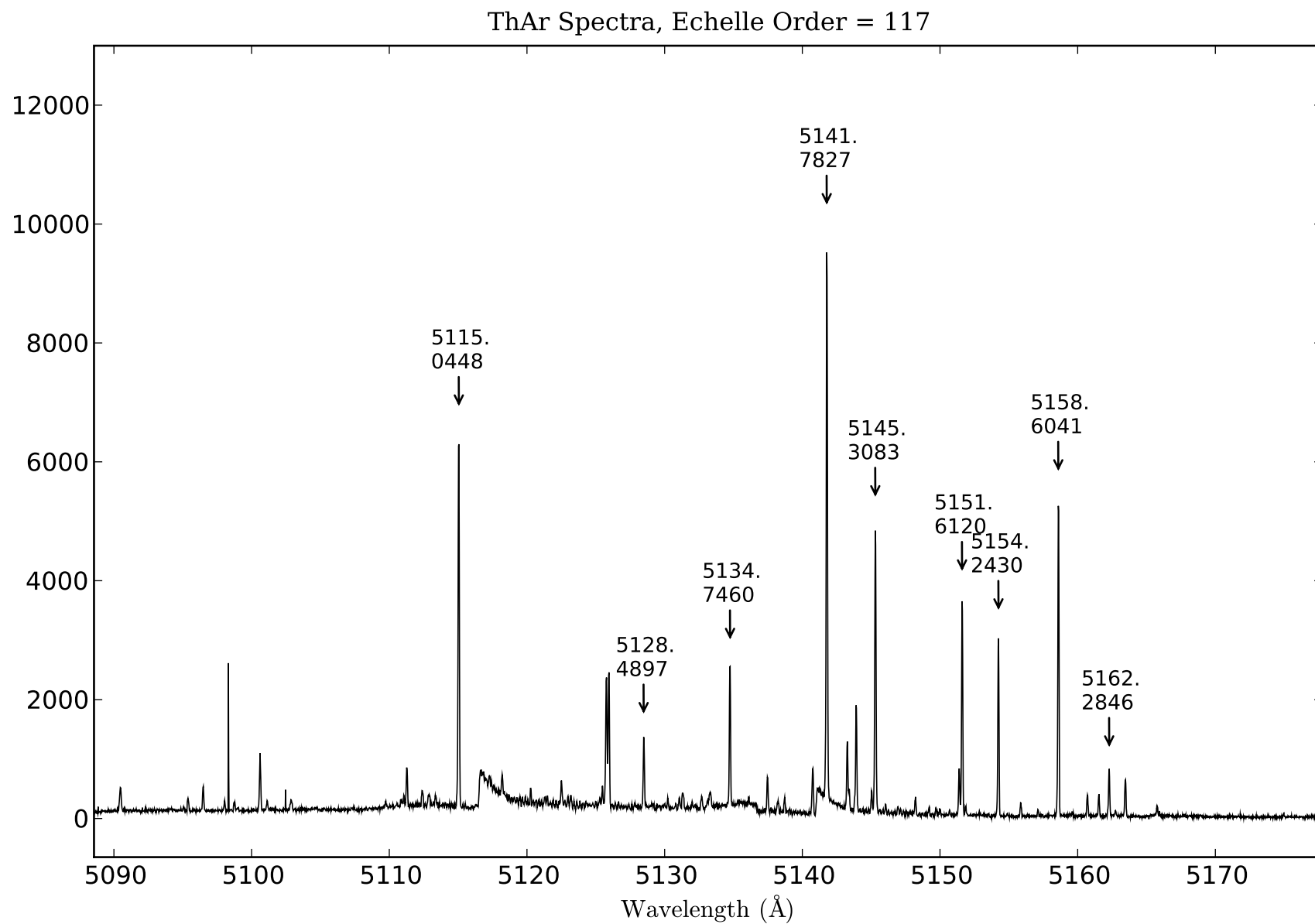


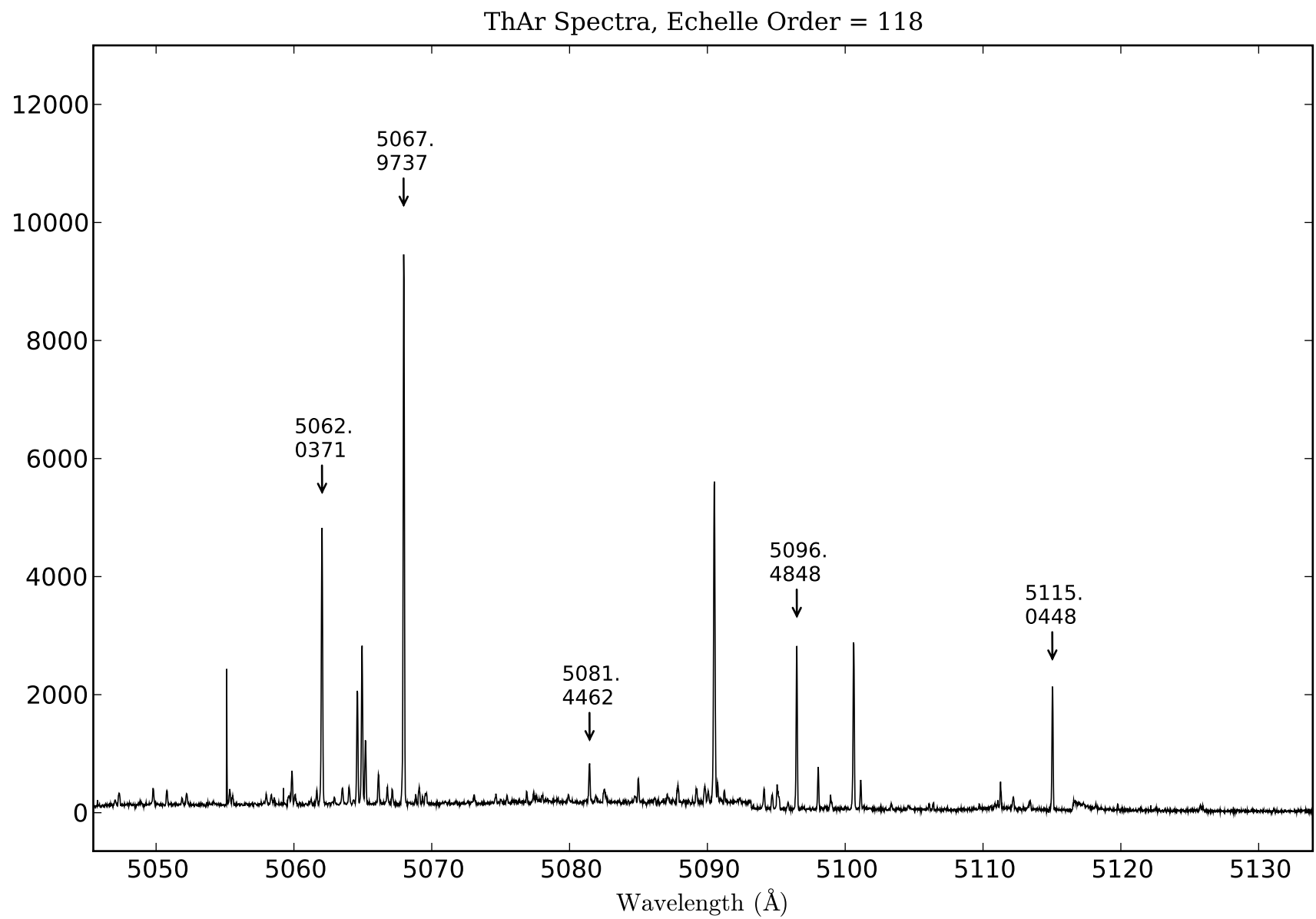


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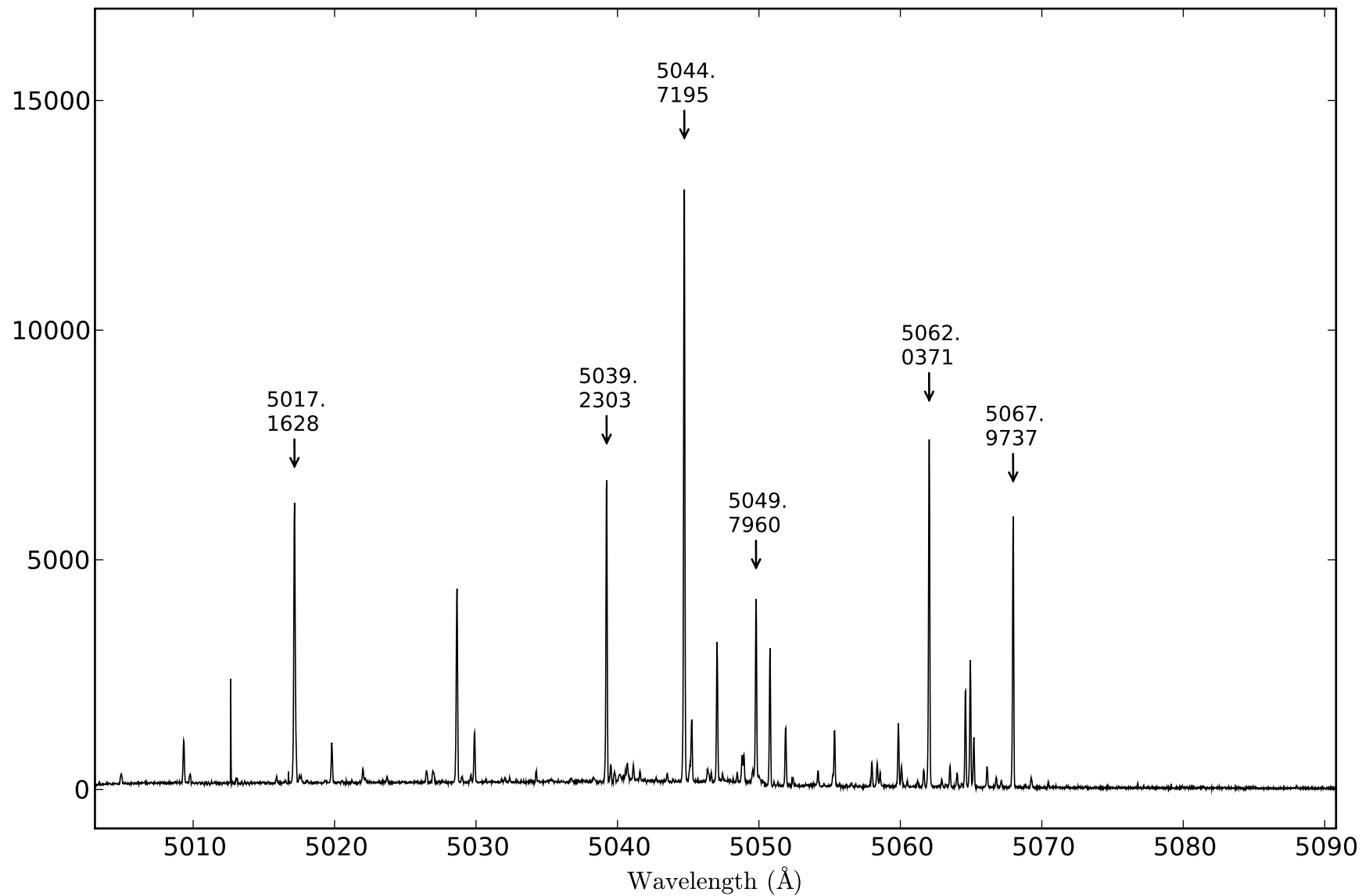


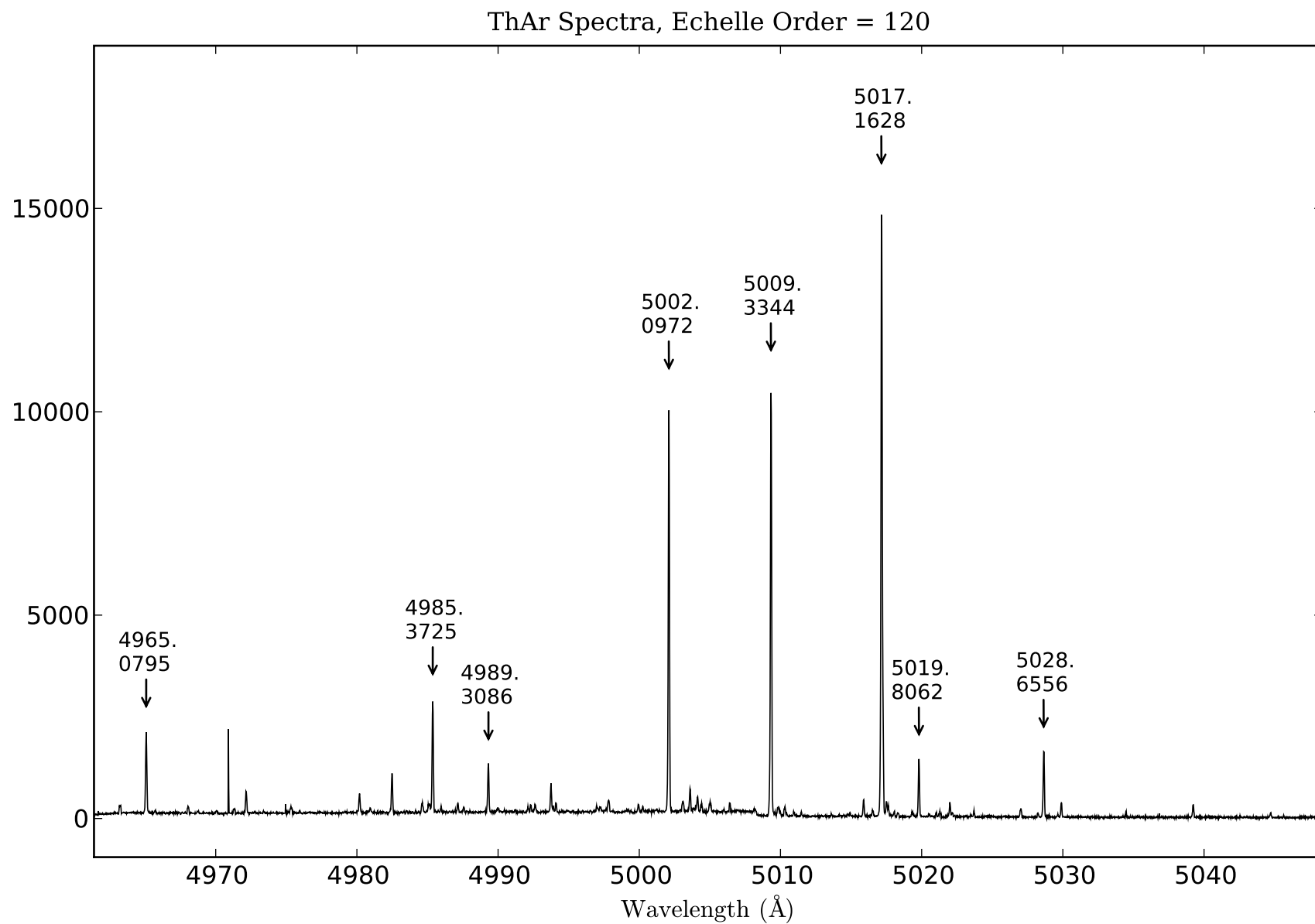


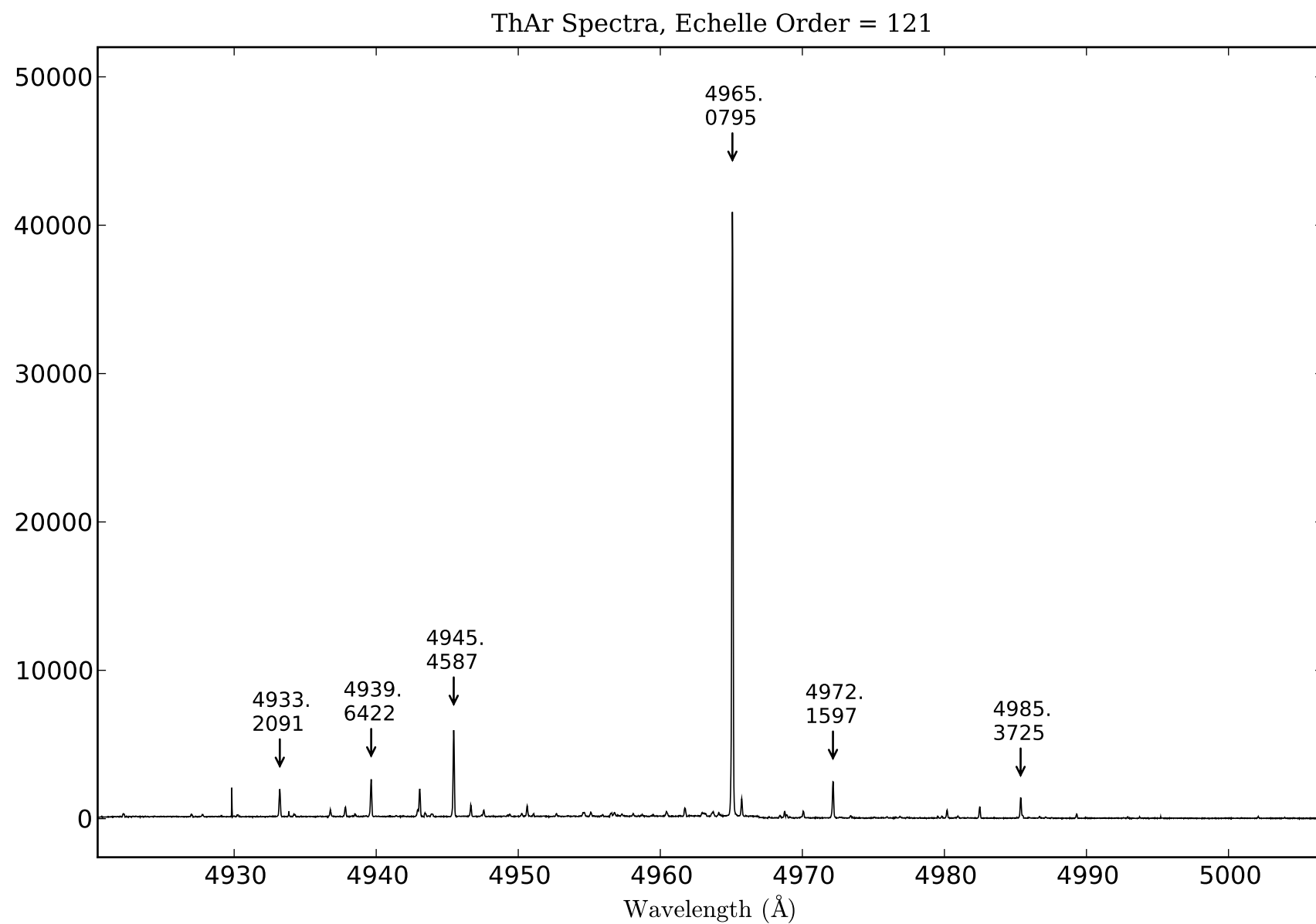


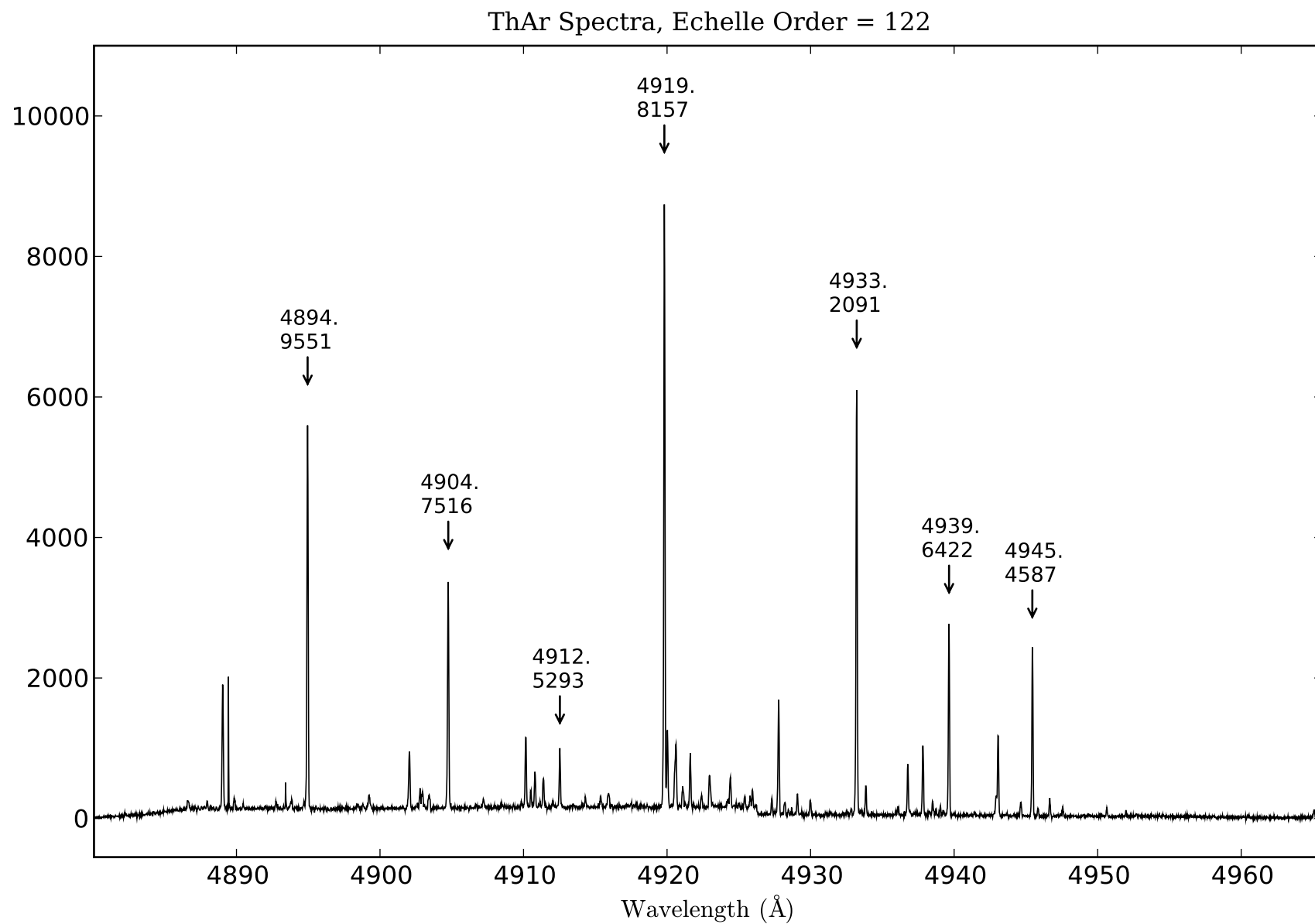


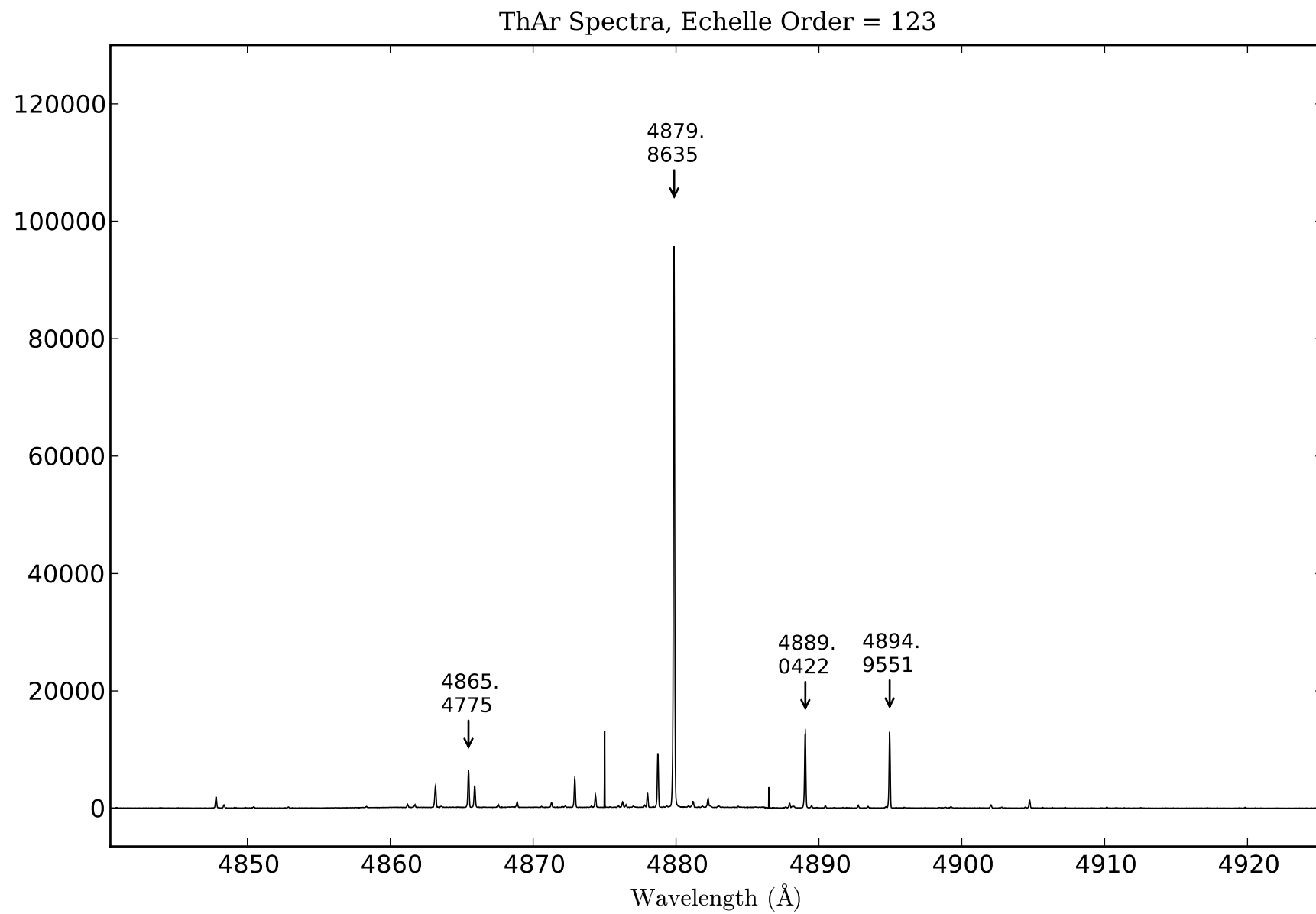
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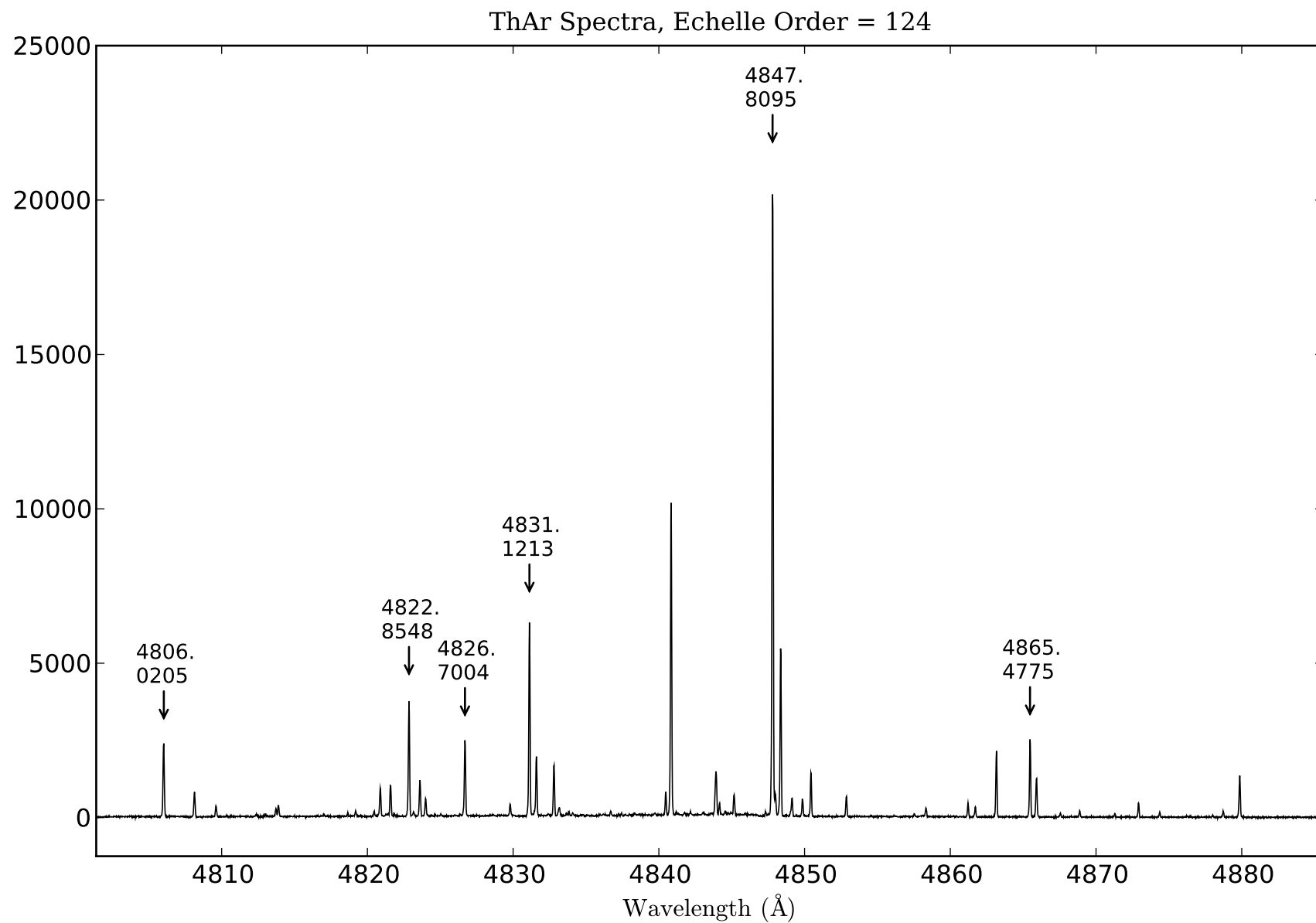


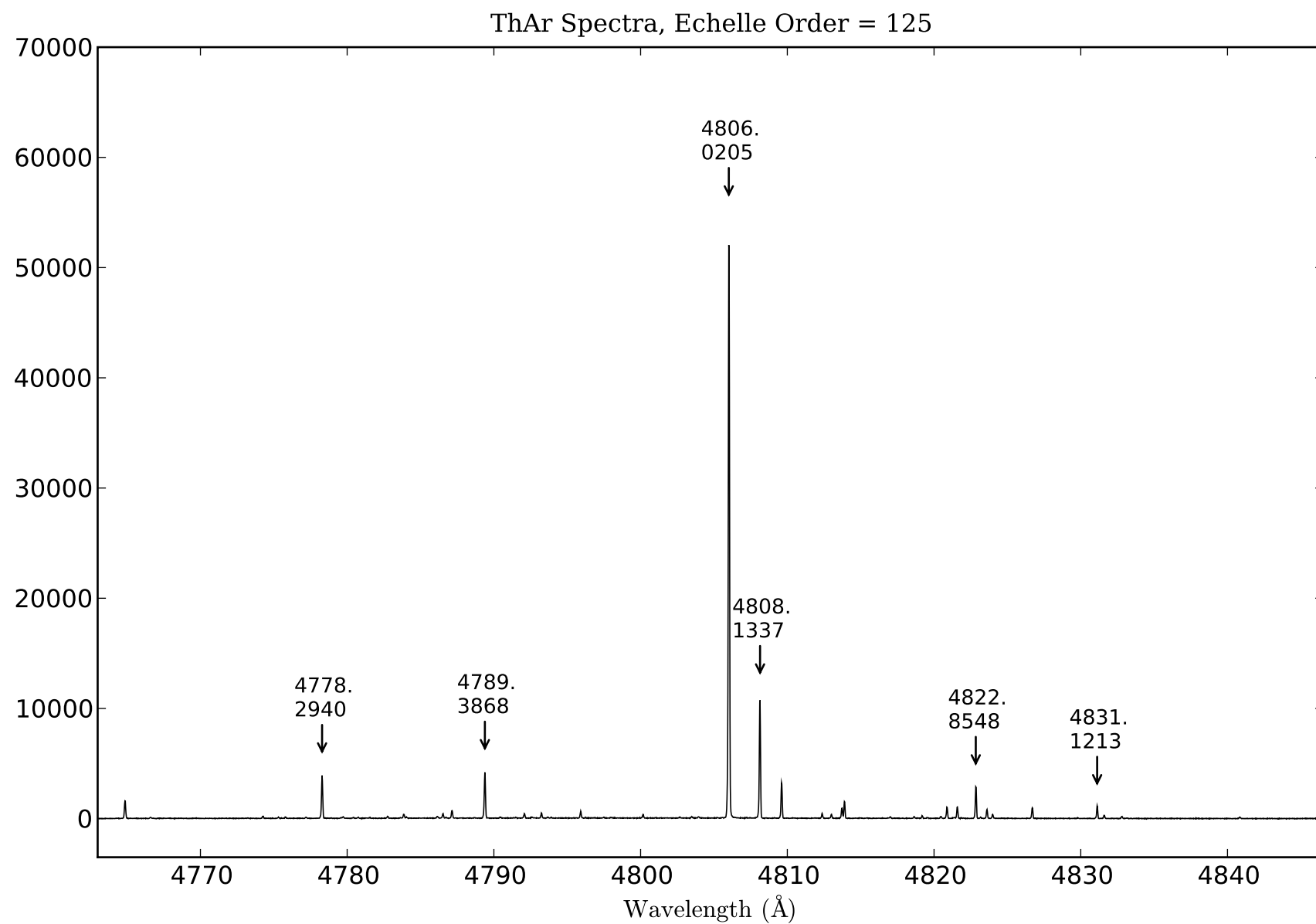


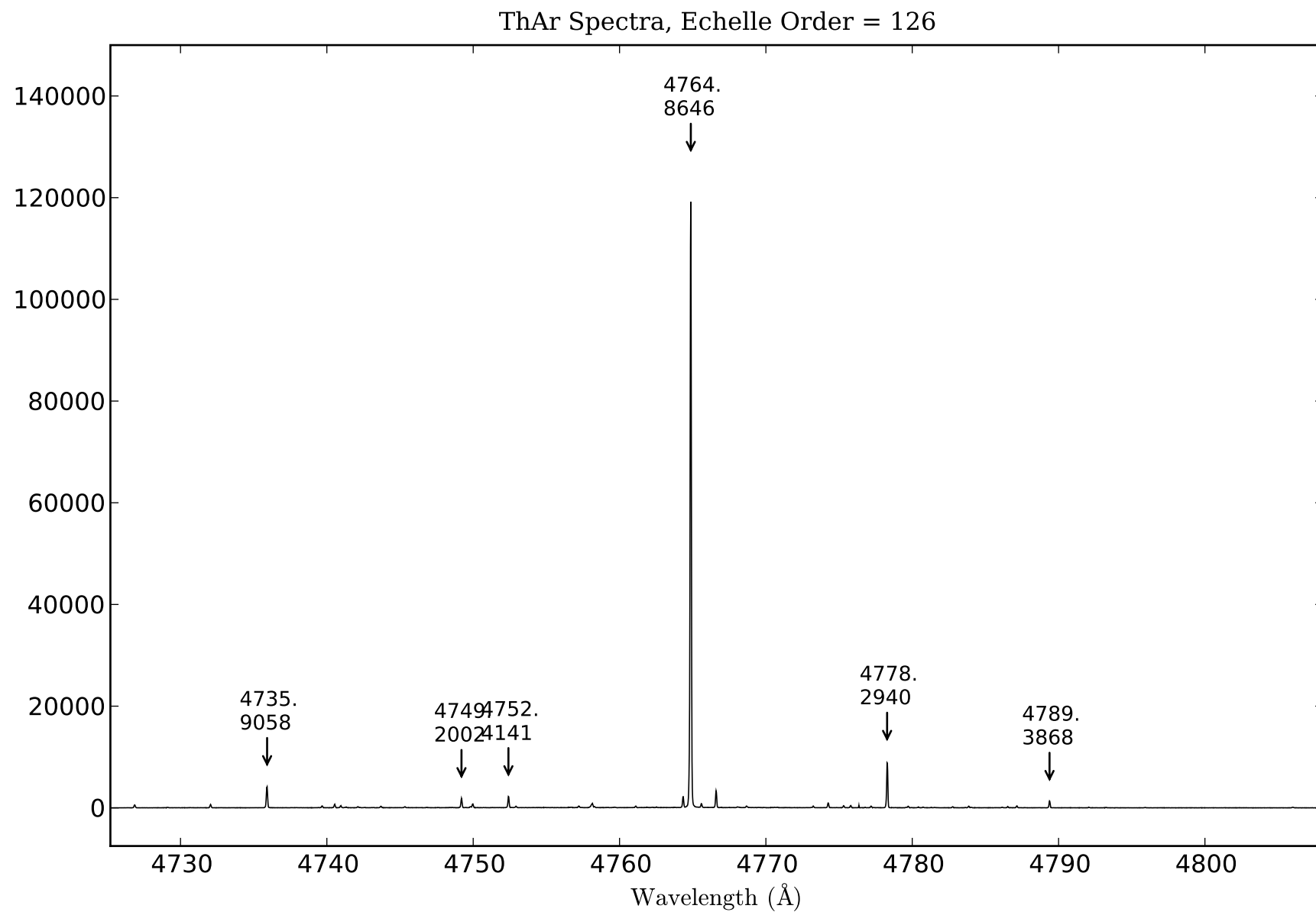


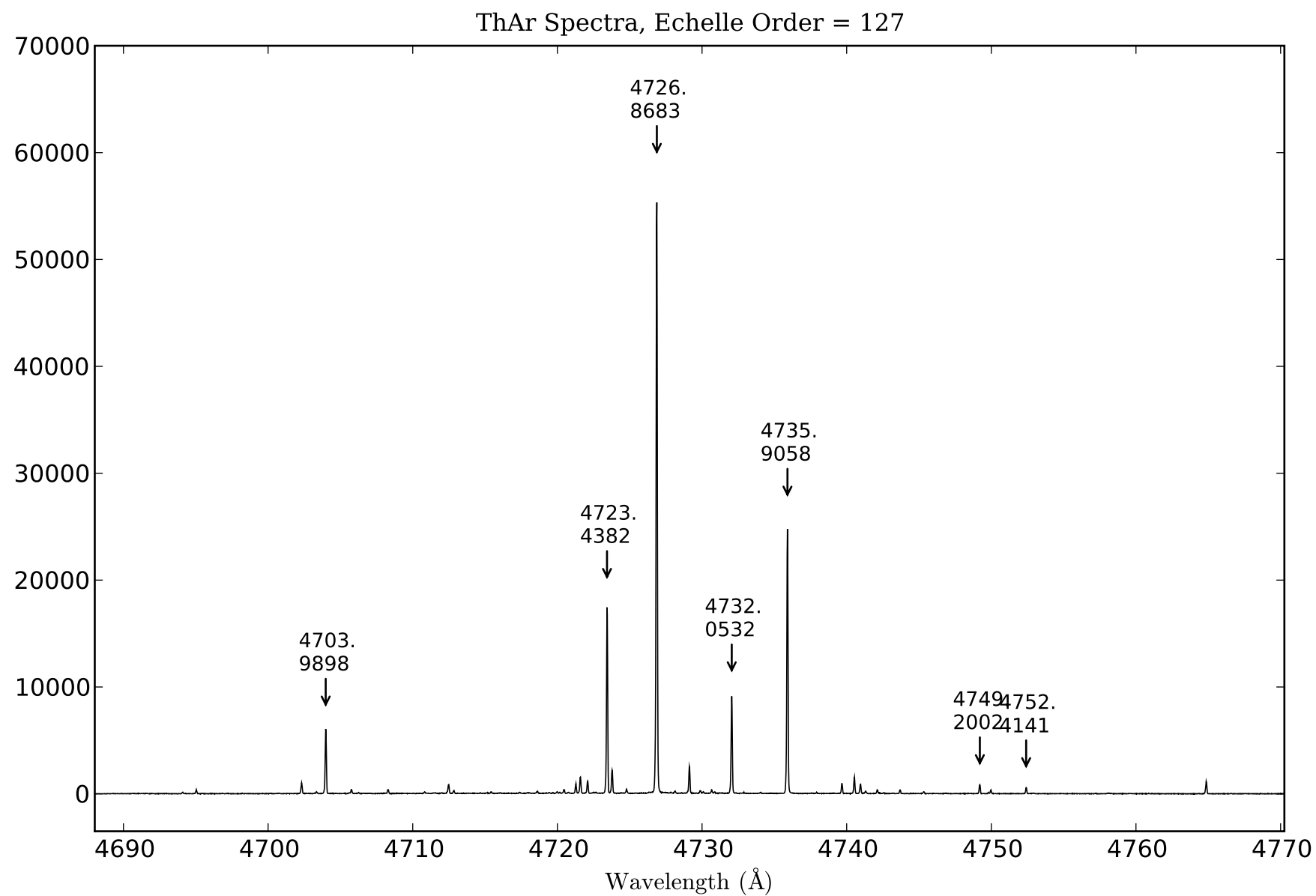


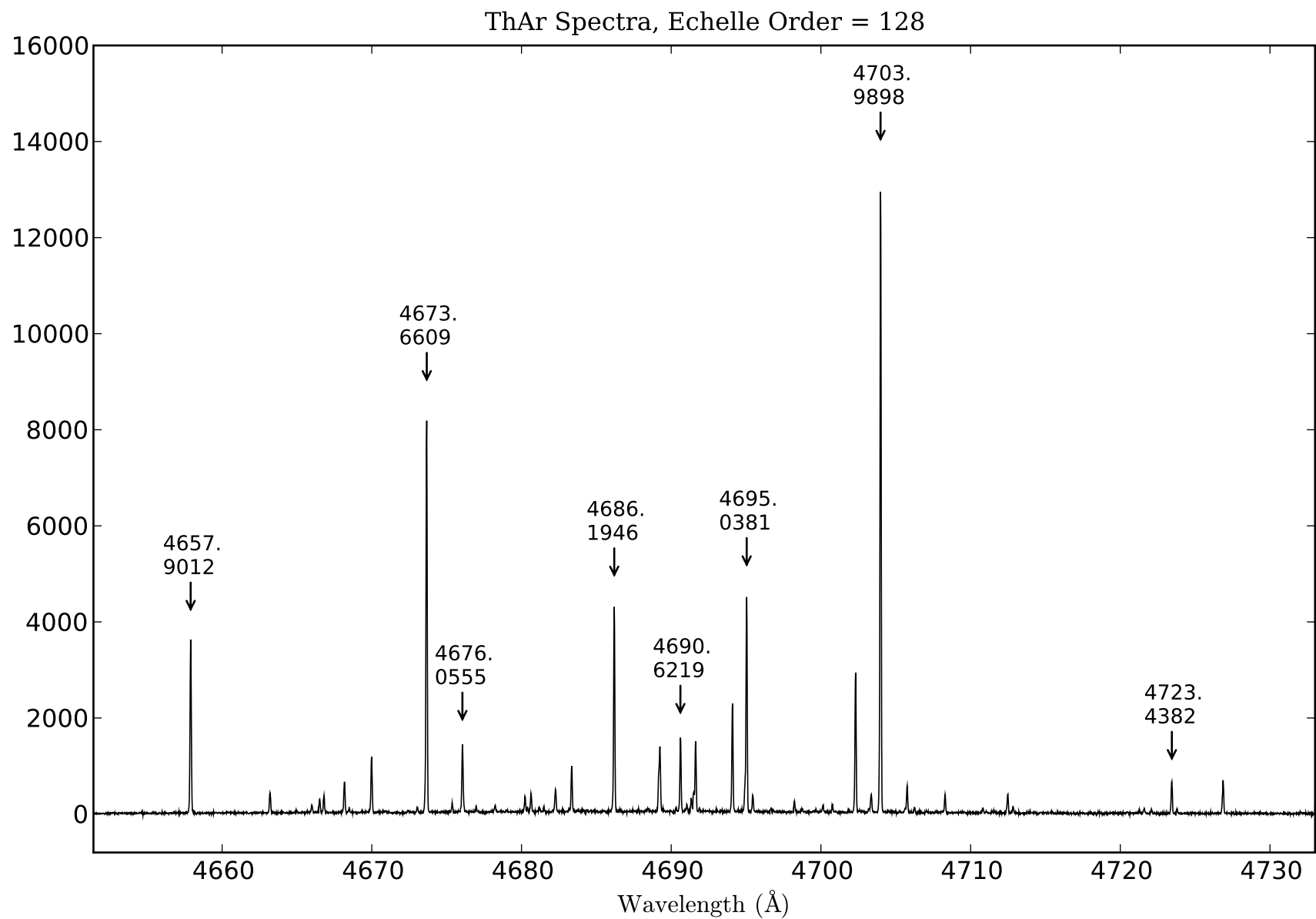


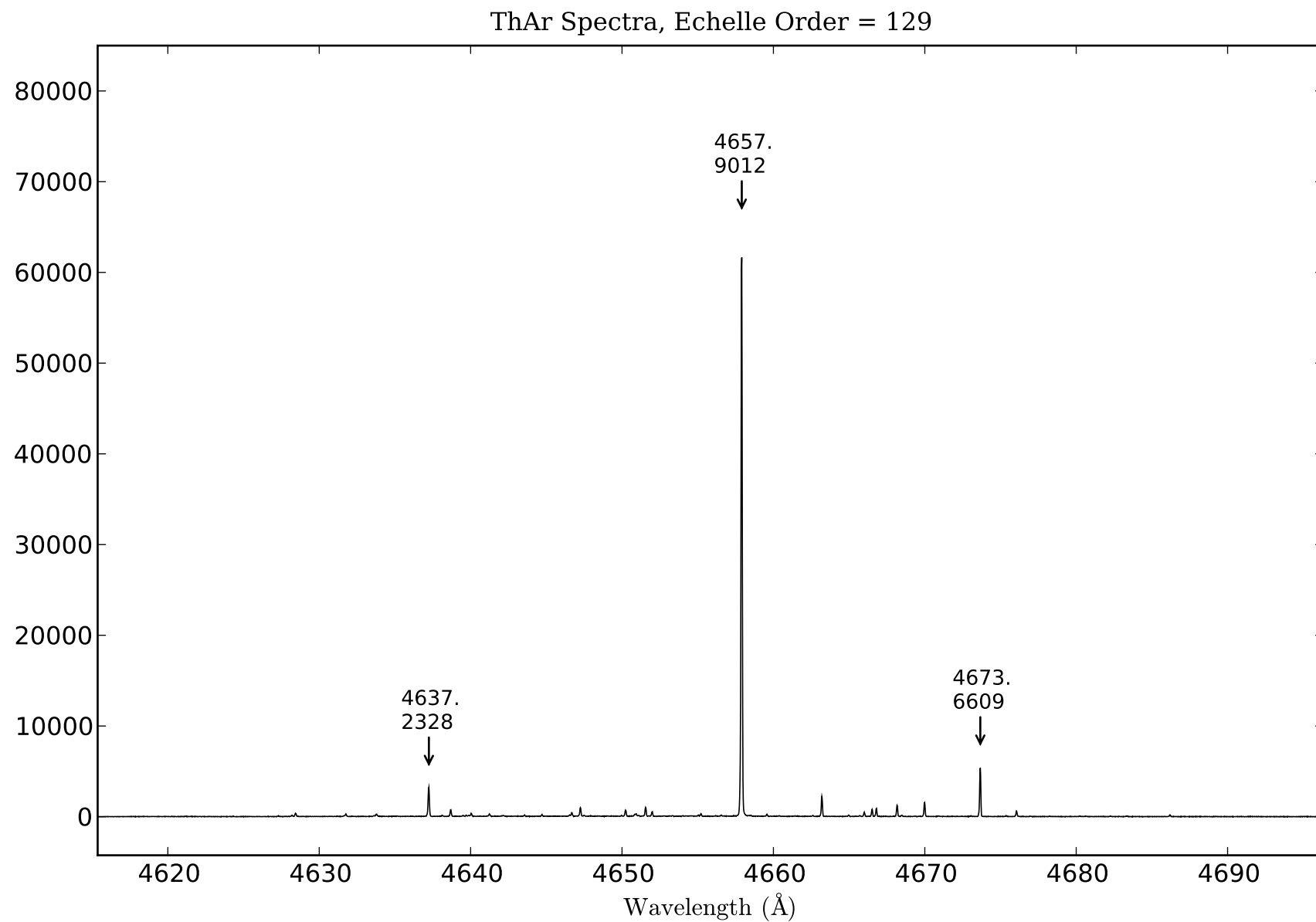


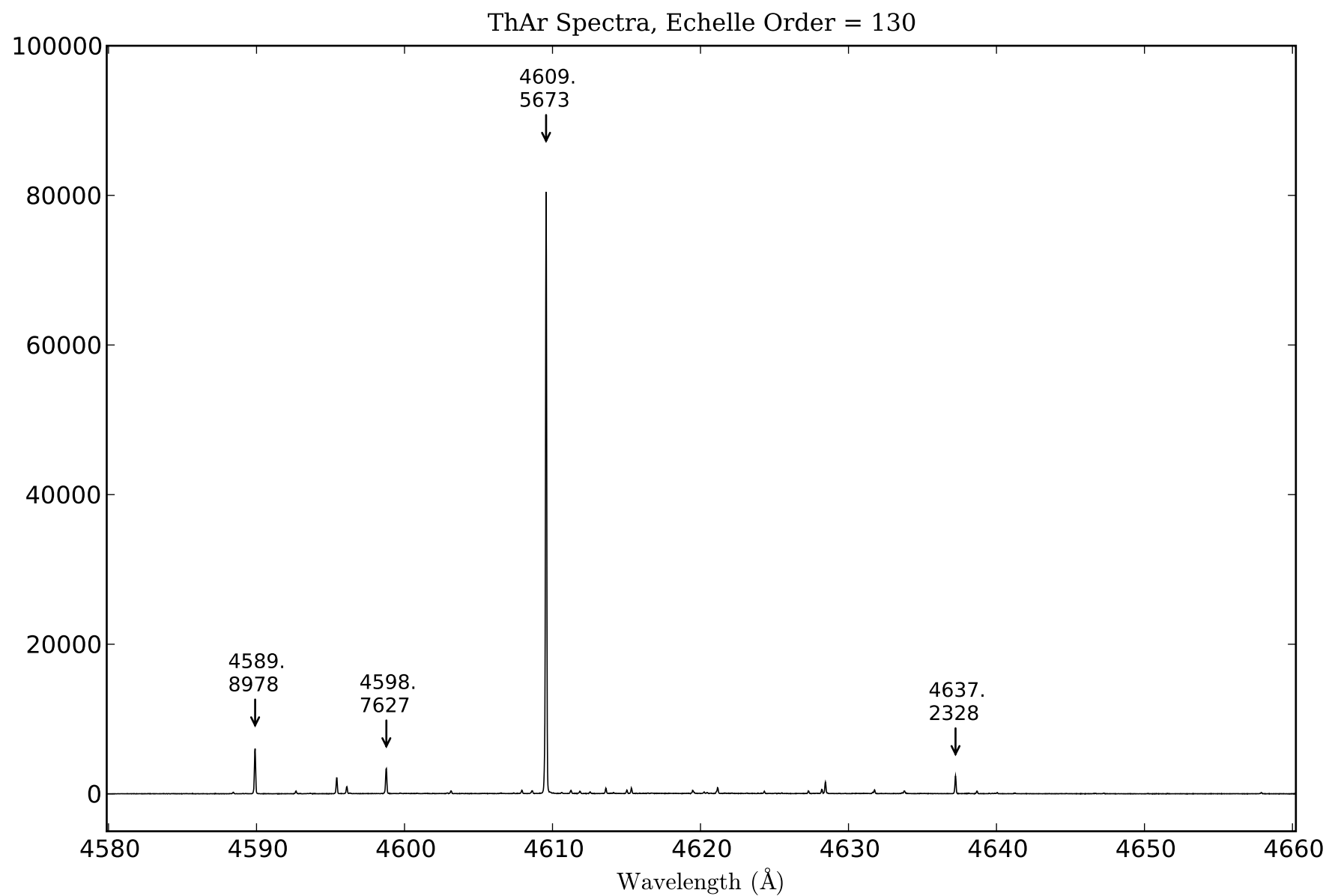


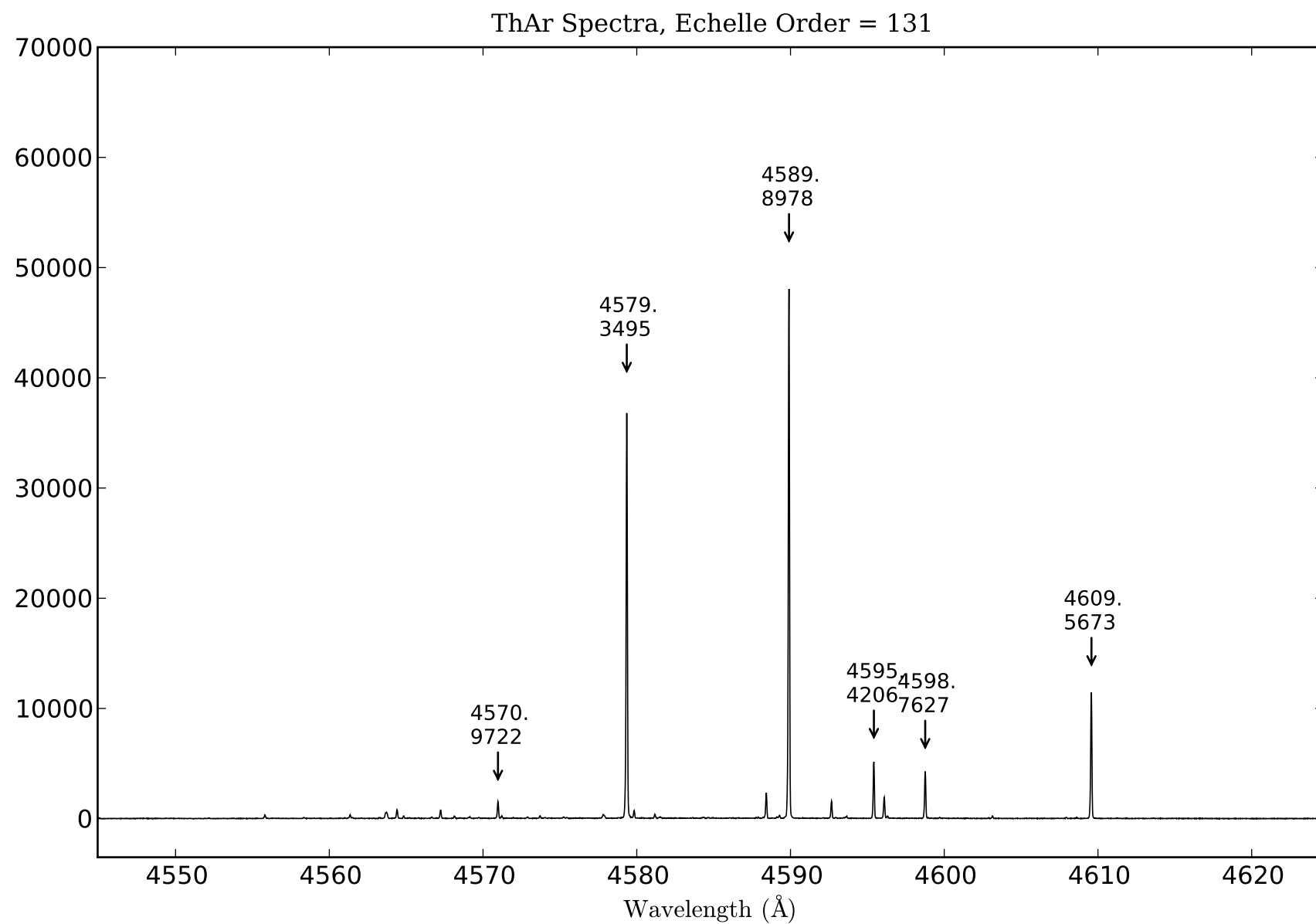


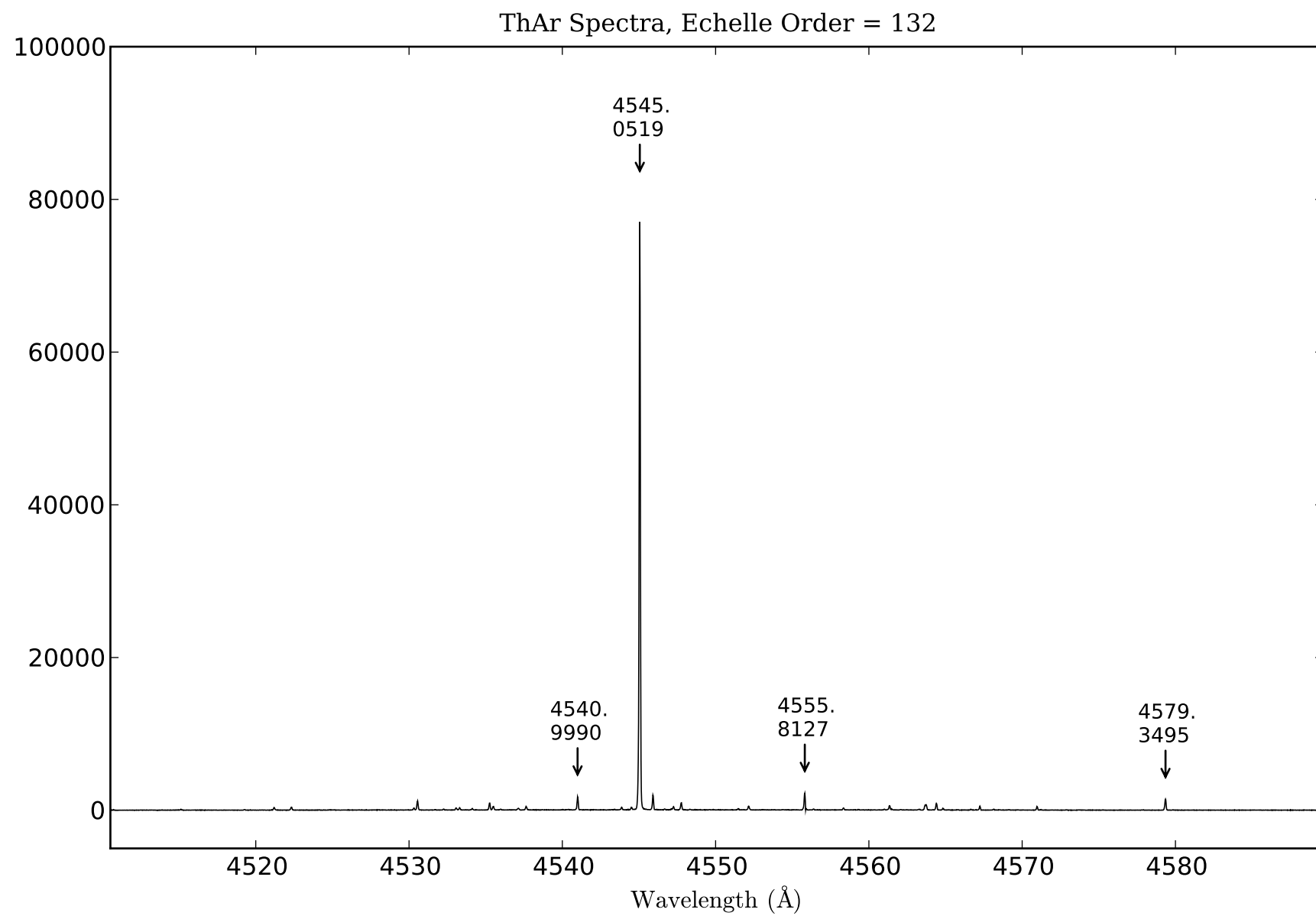


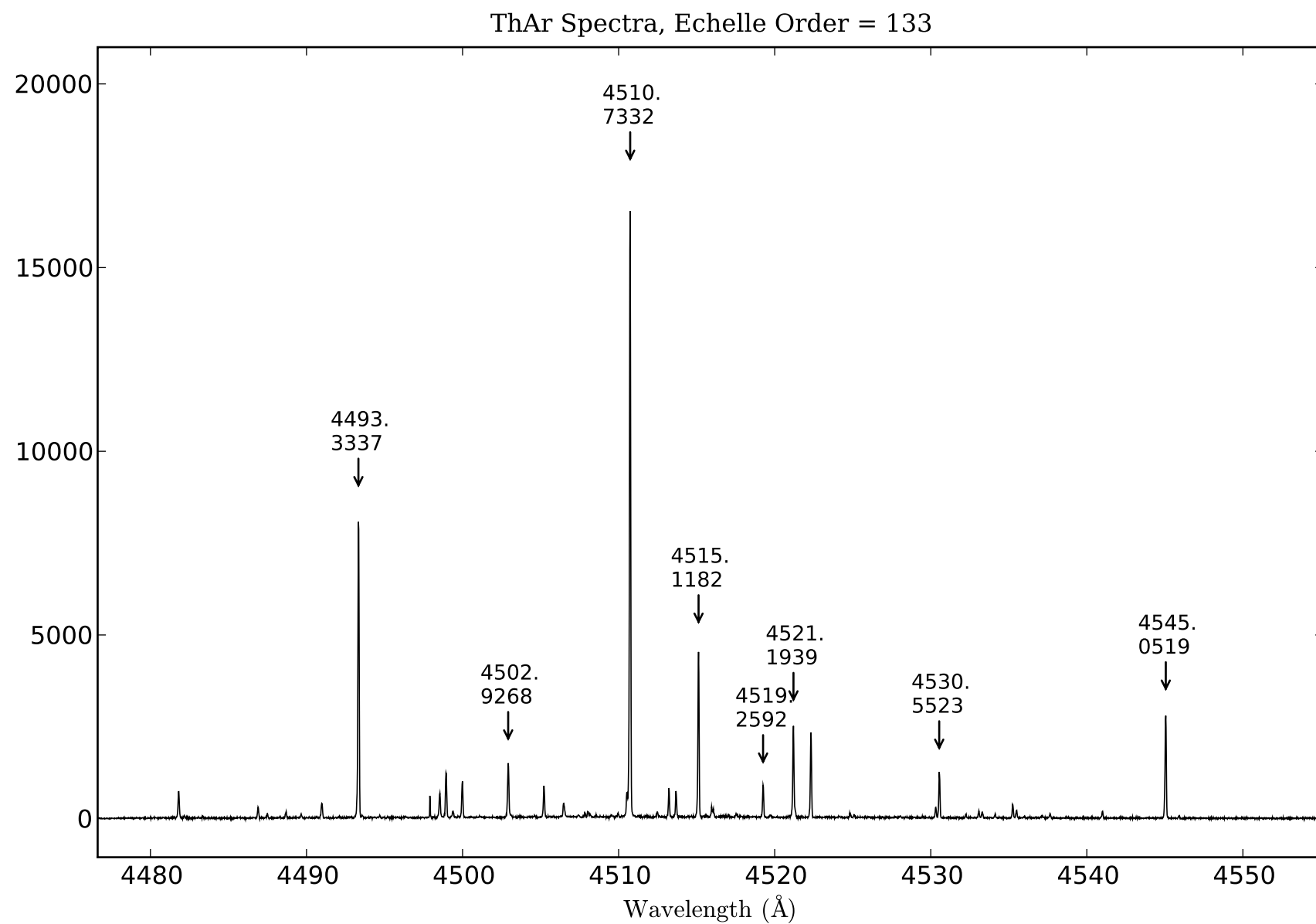


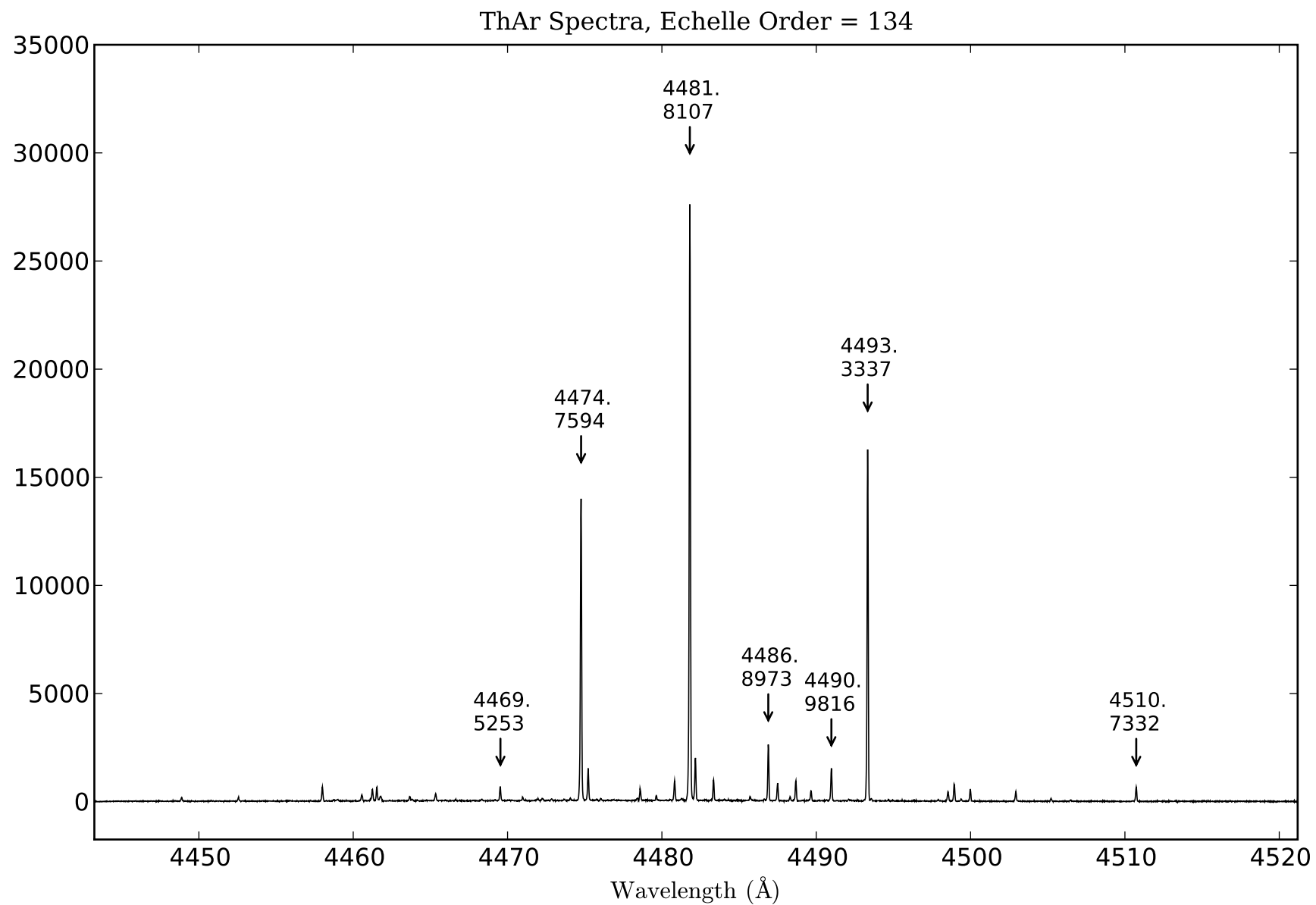


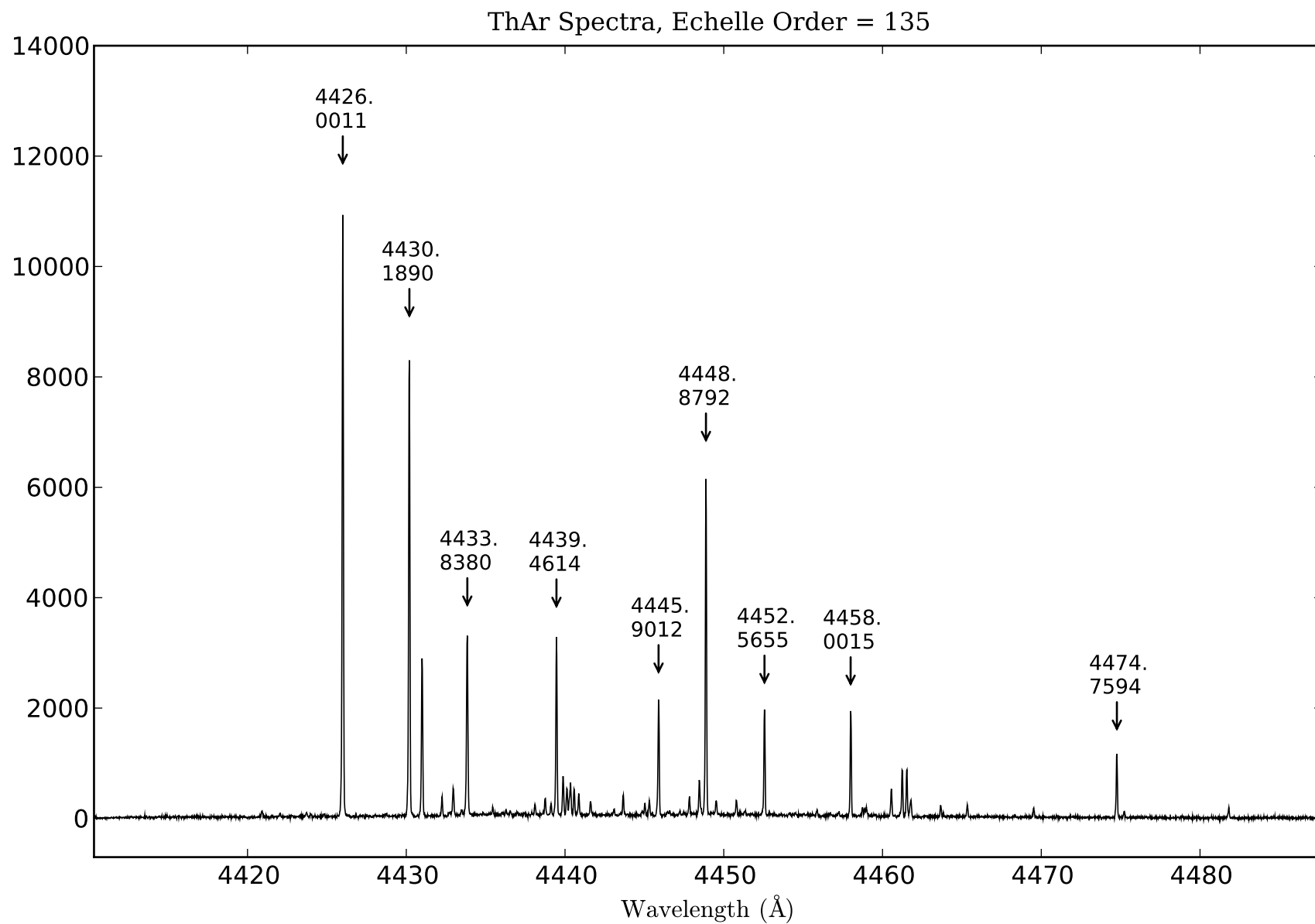


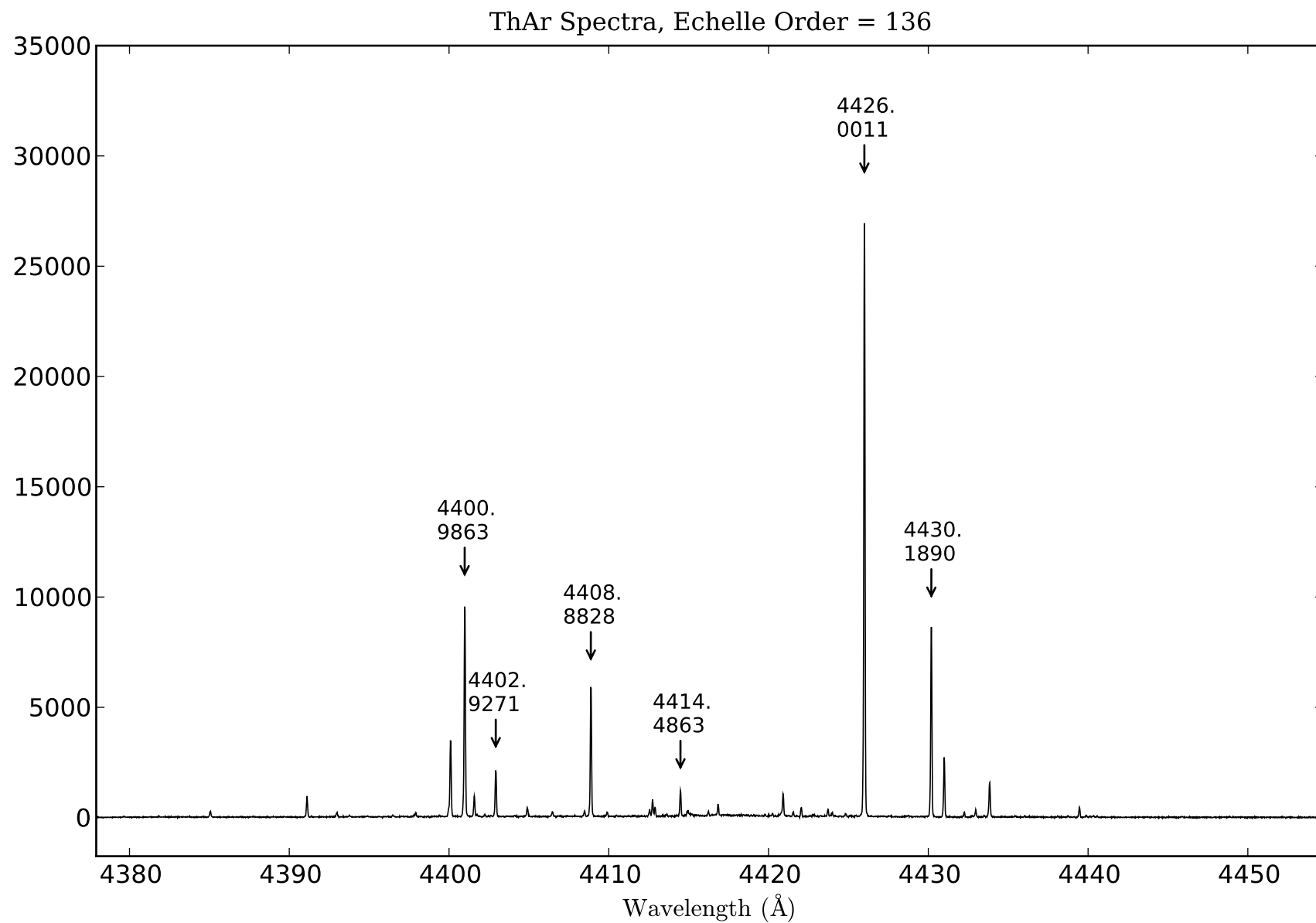


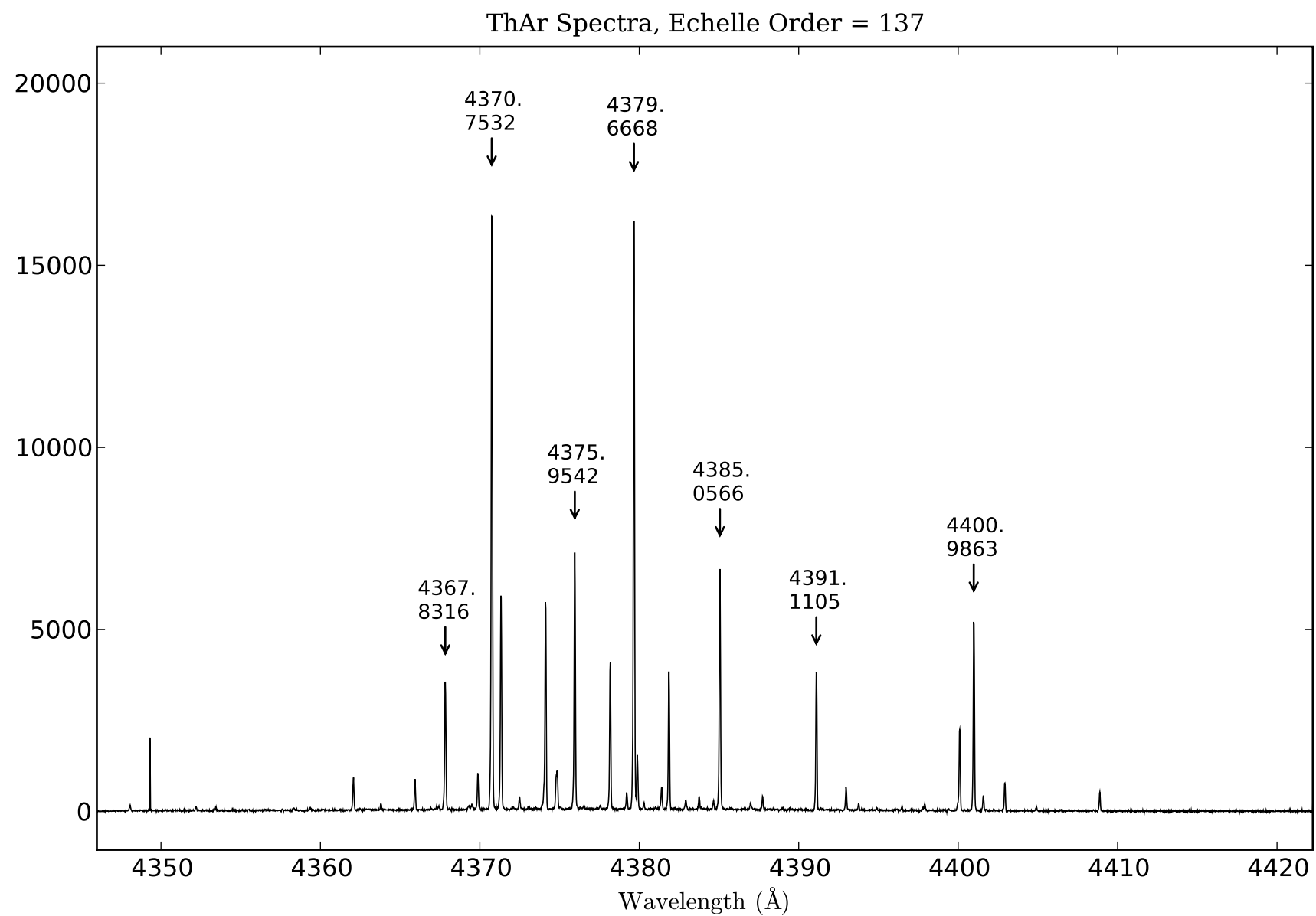


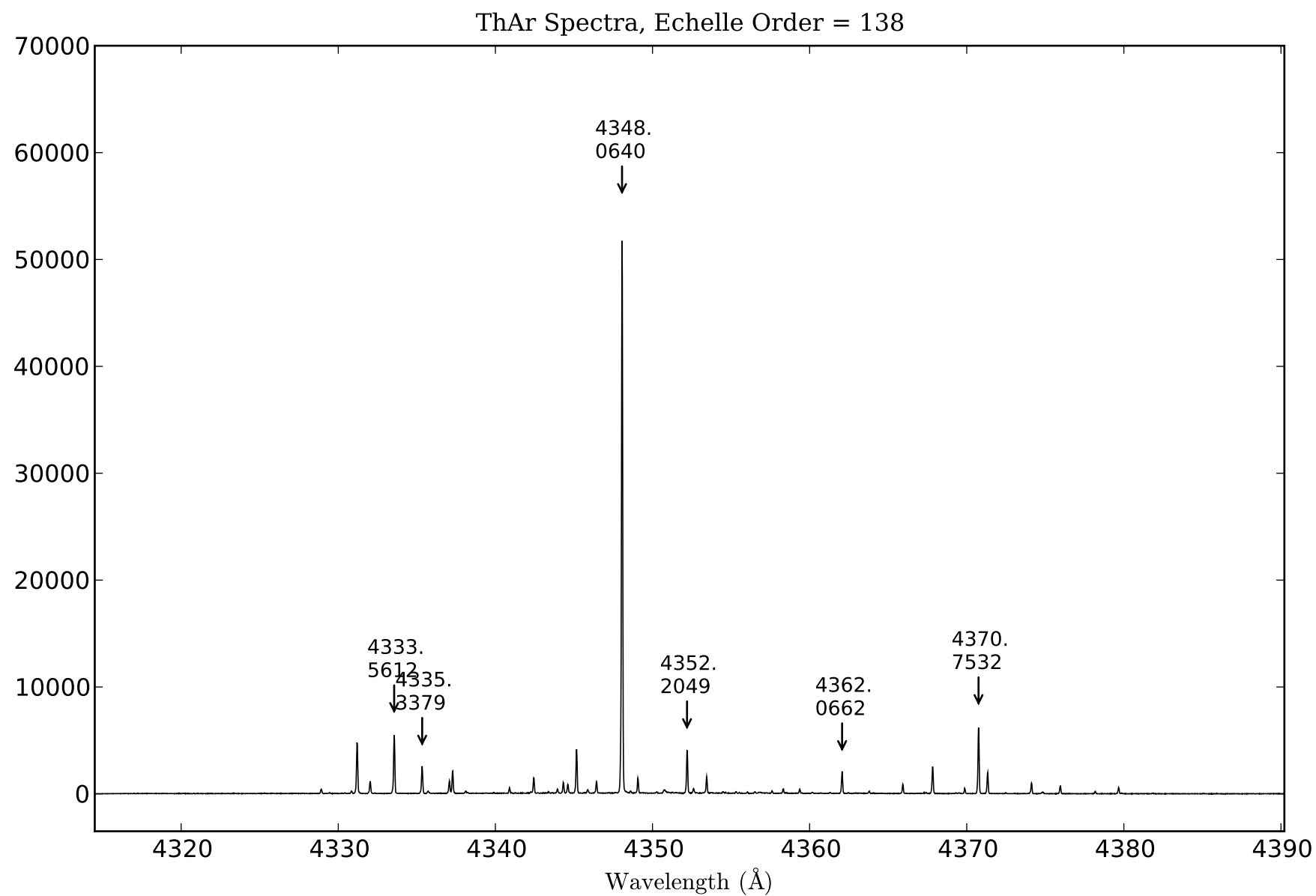


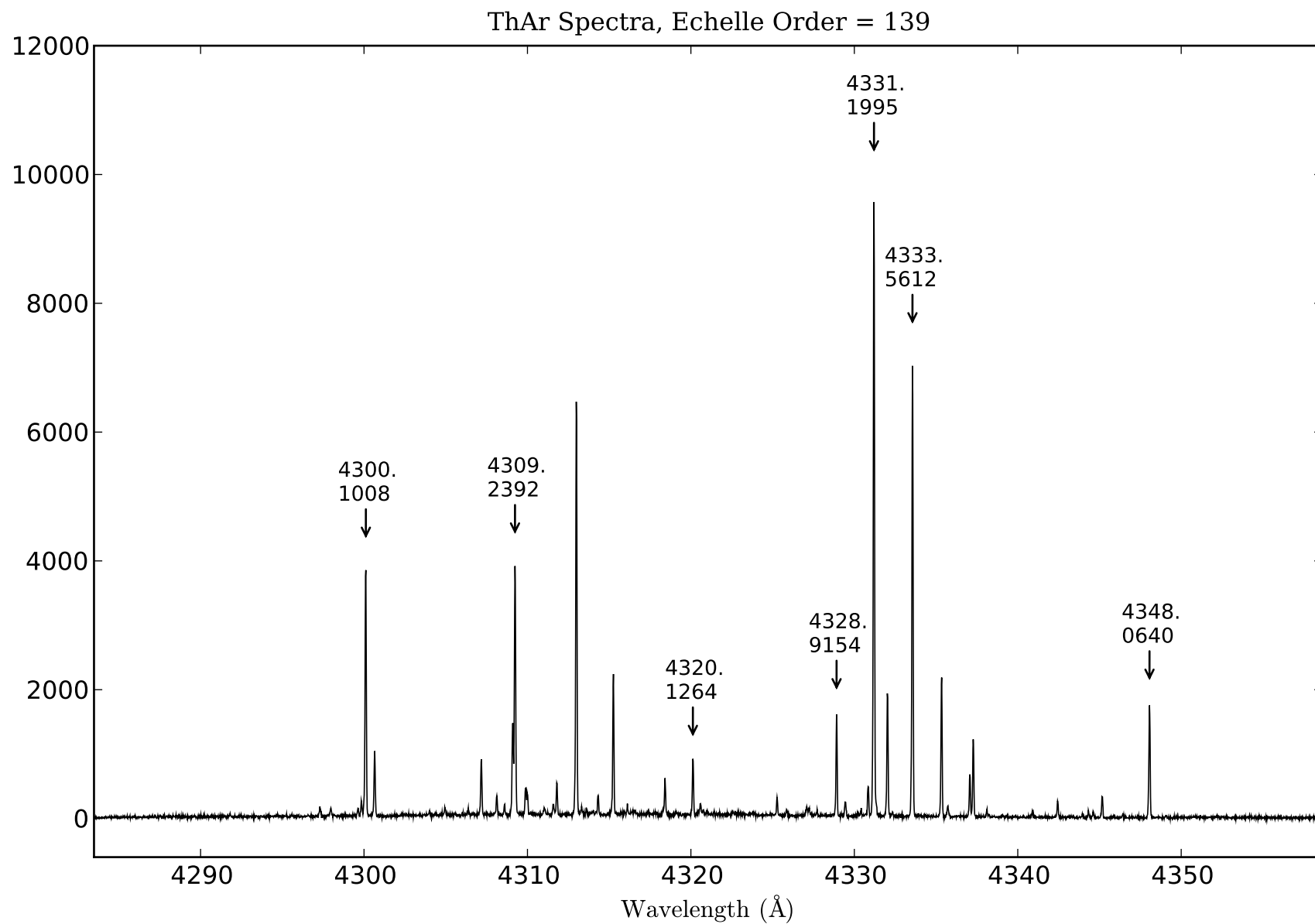


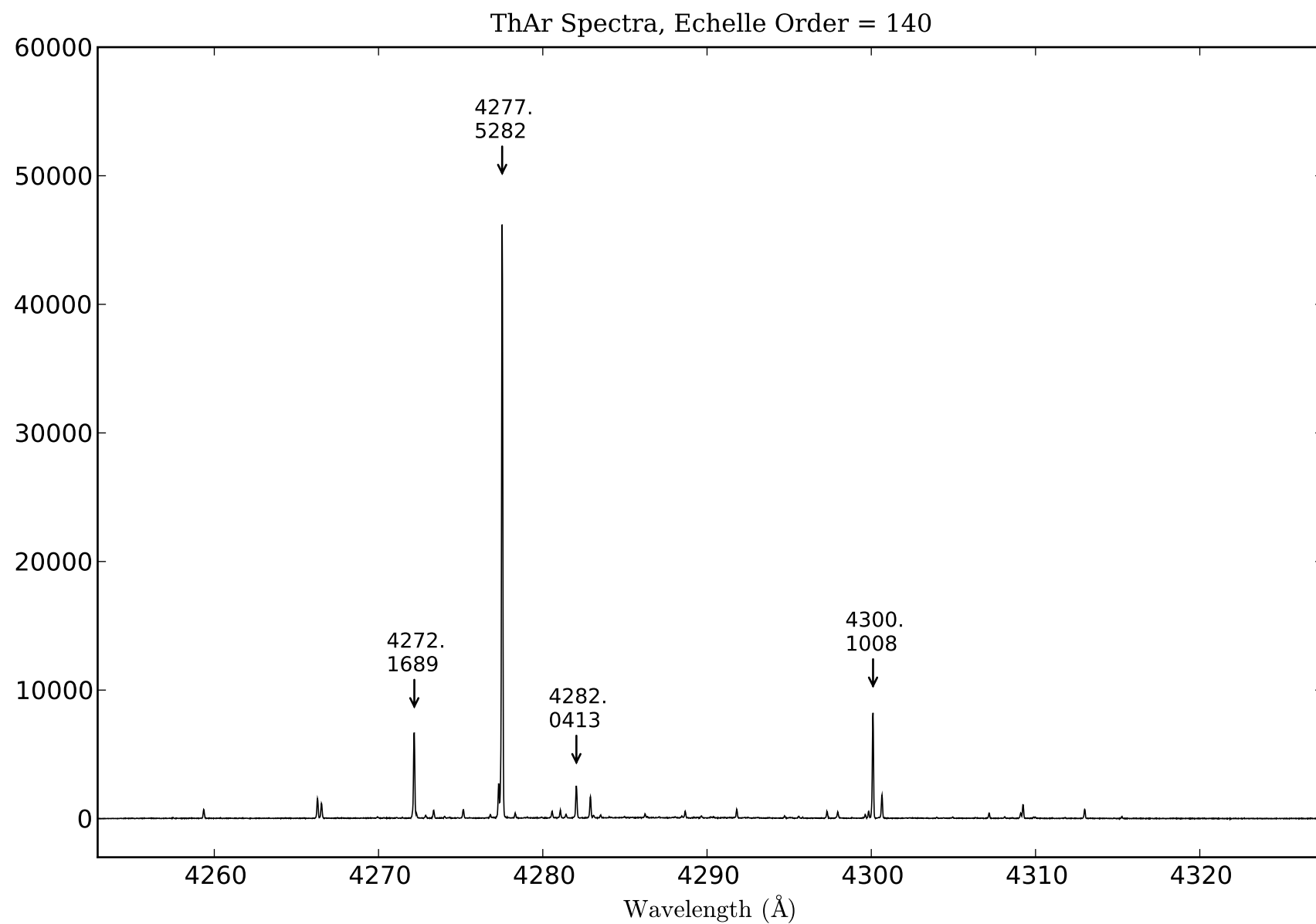




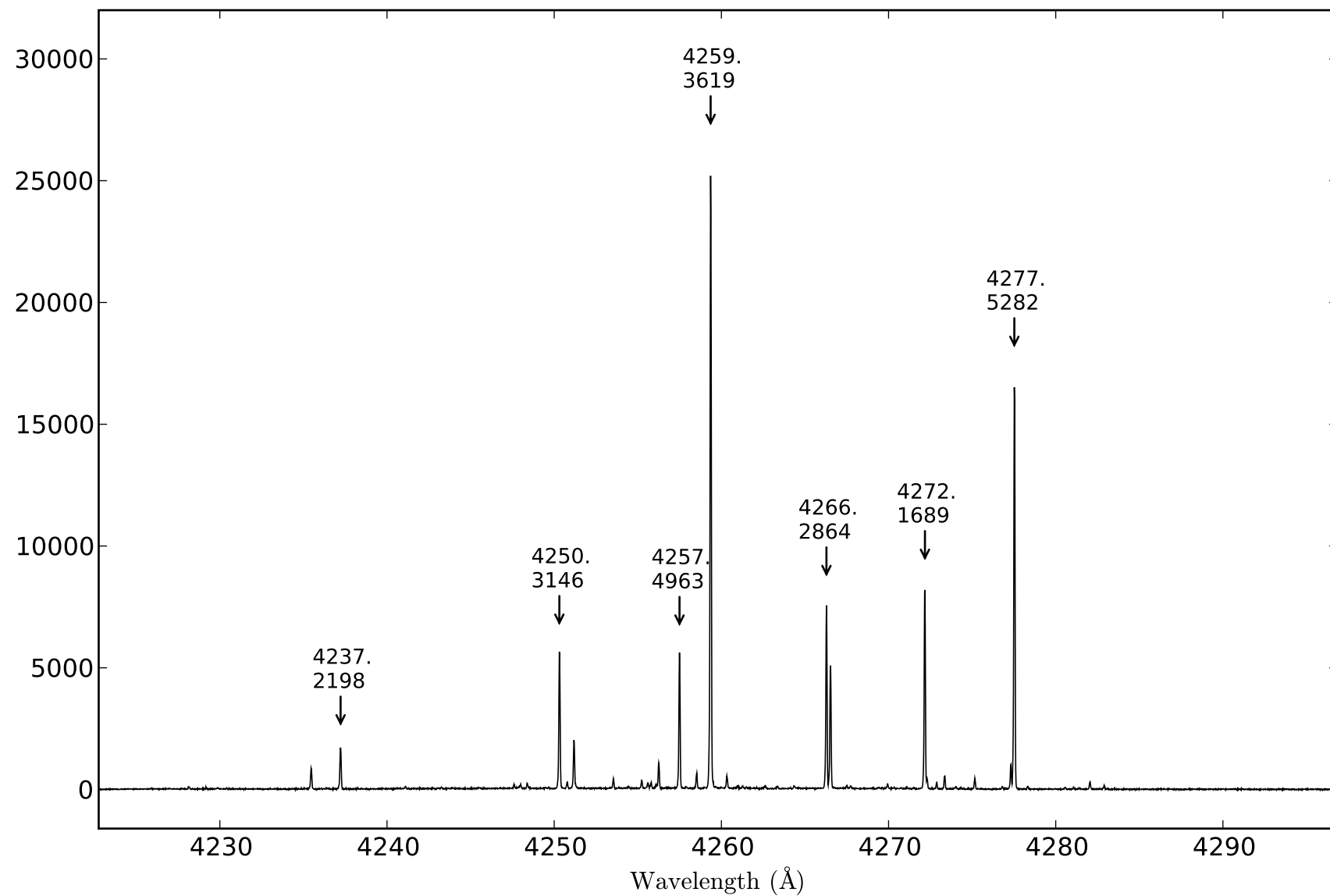


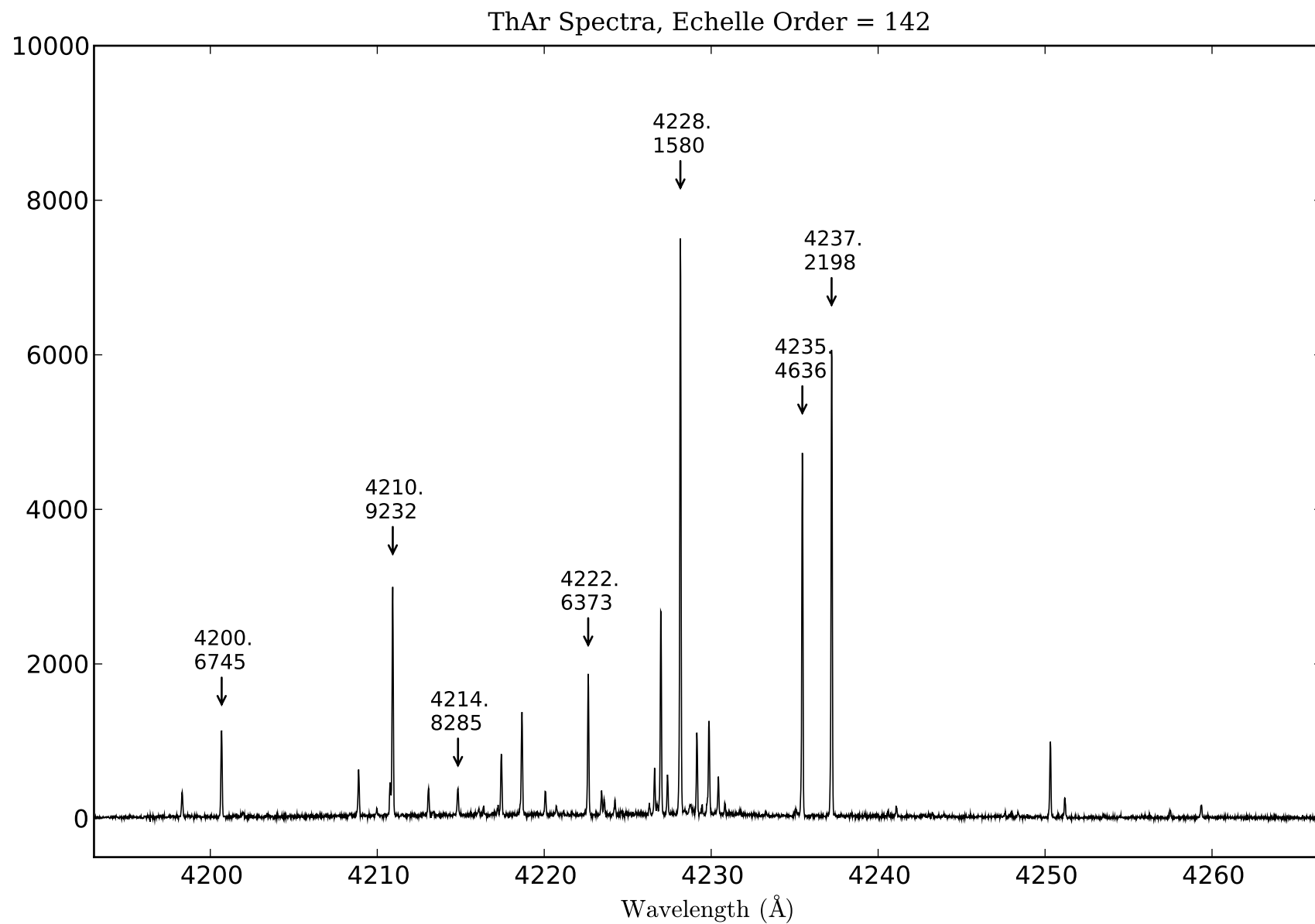


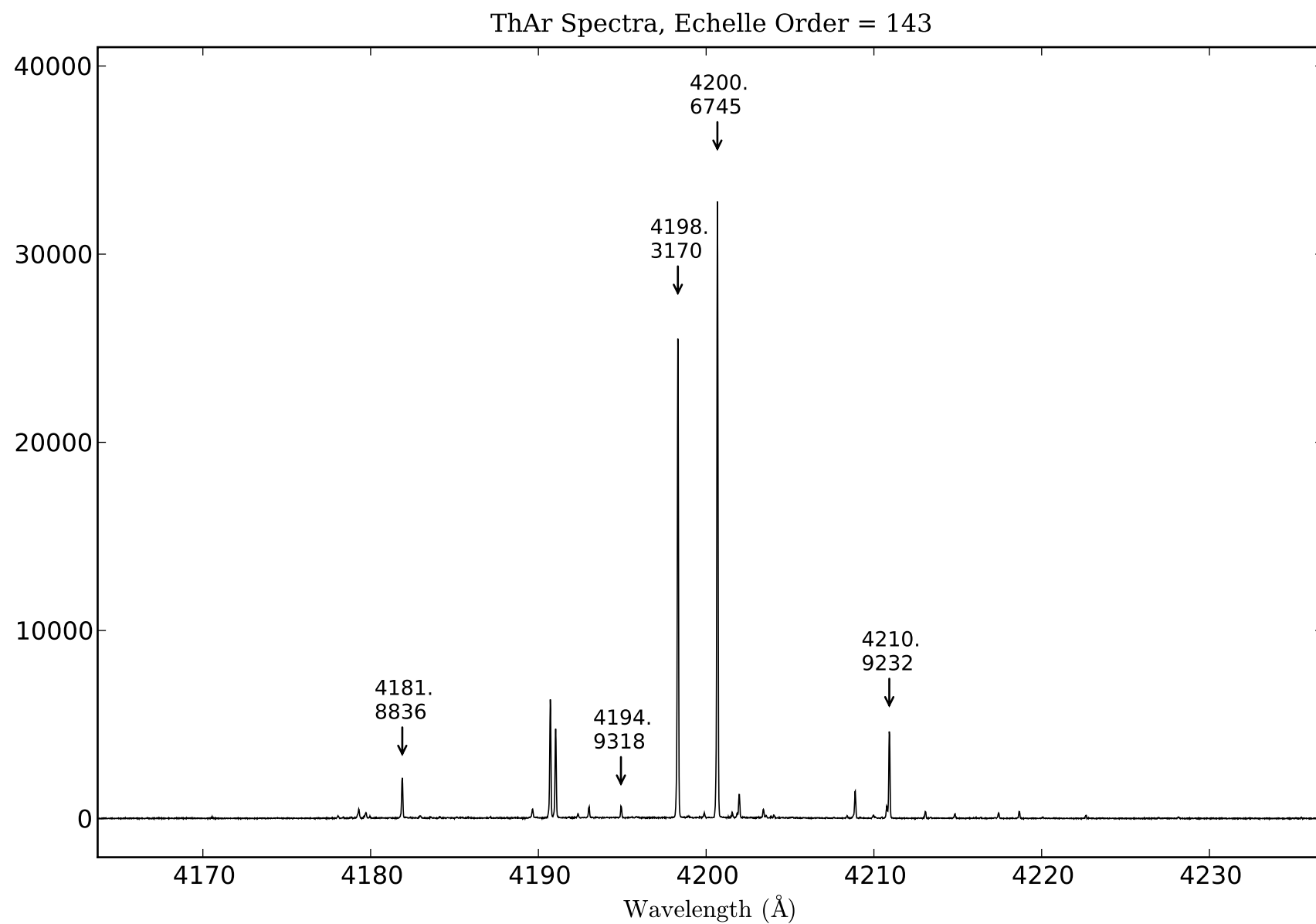


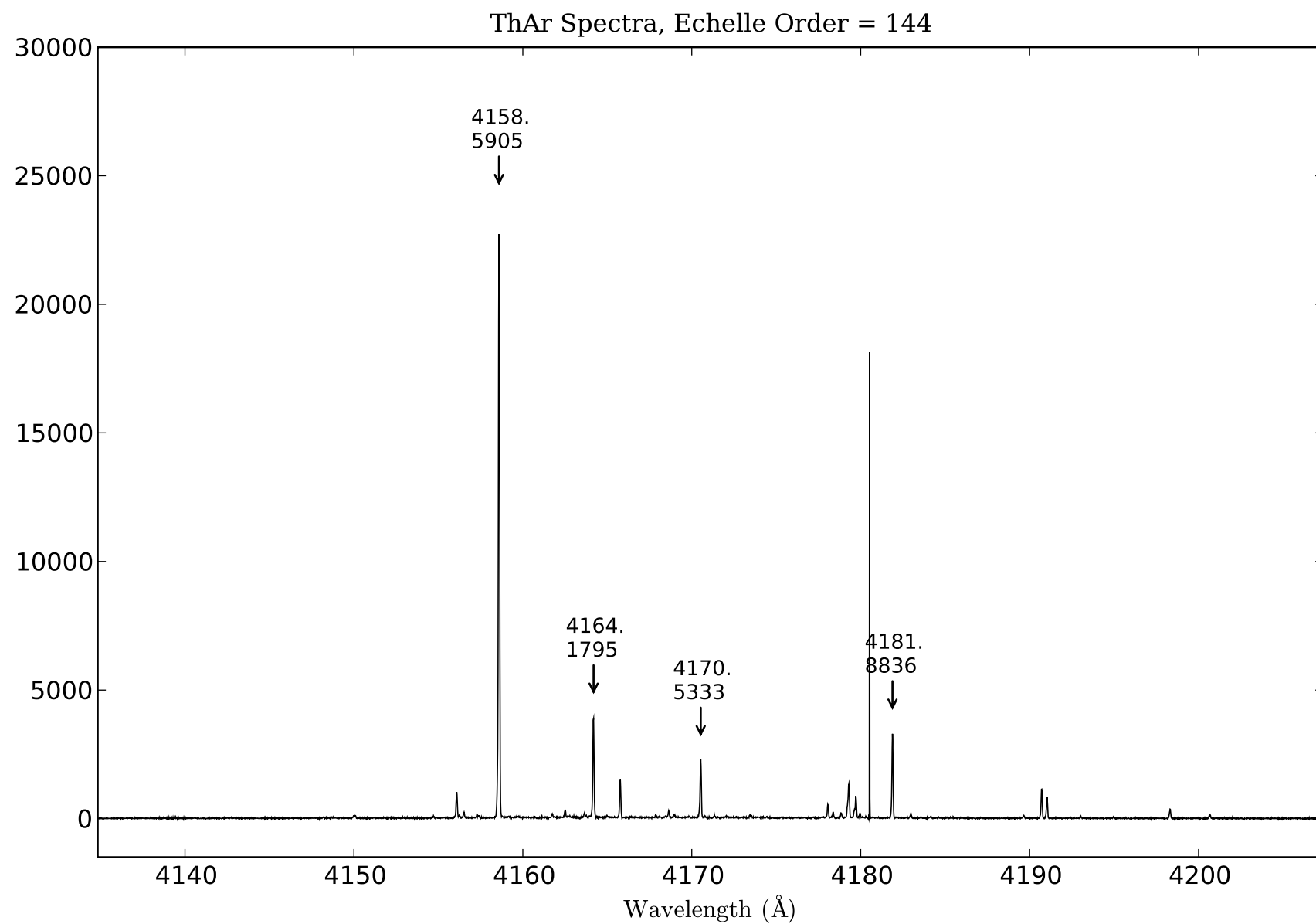


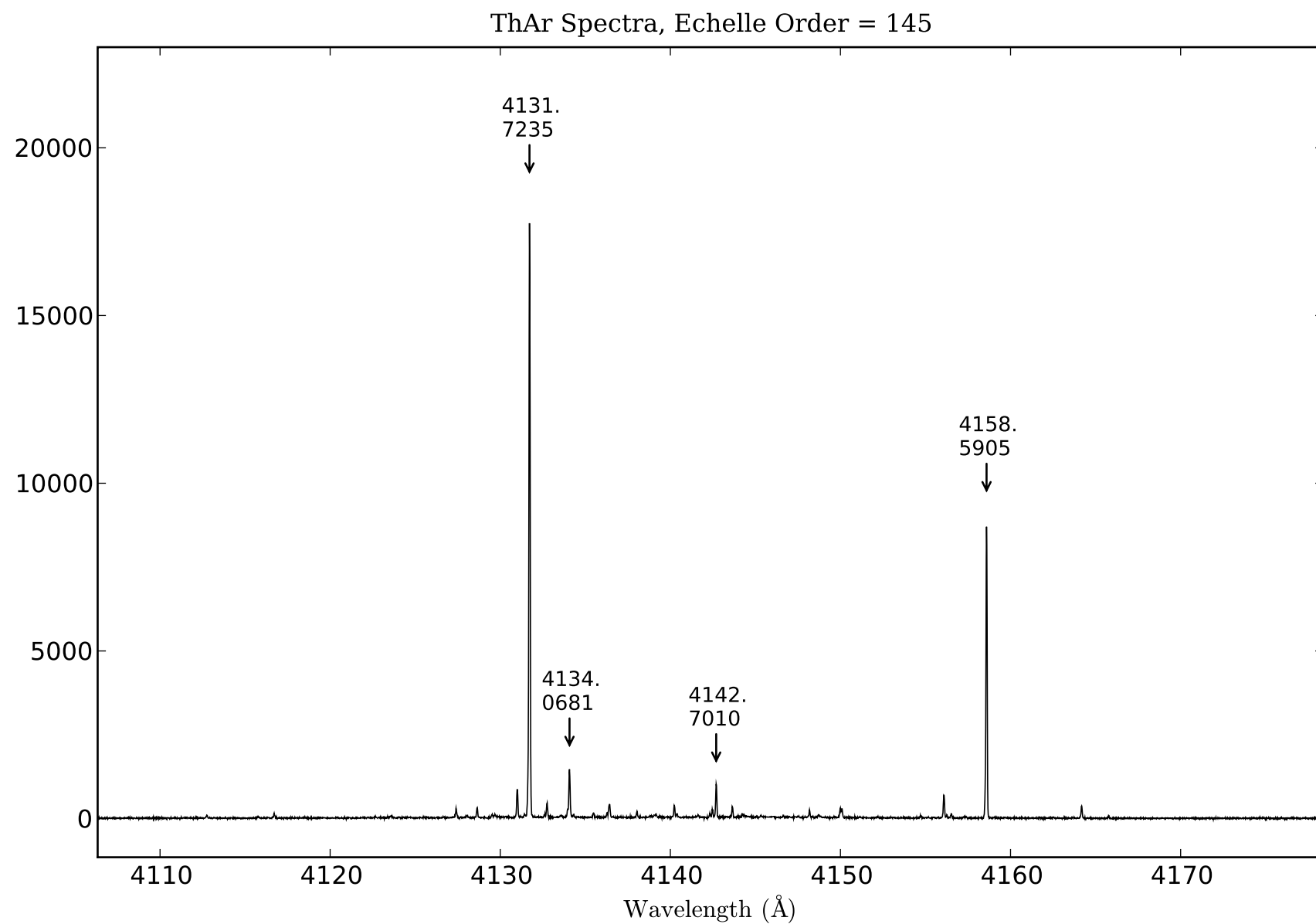
ThAr Spectra, Echelle Order = 141

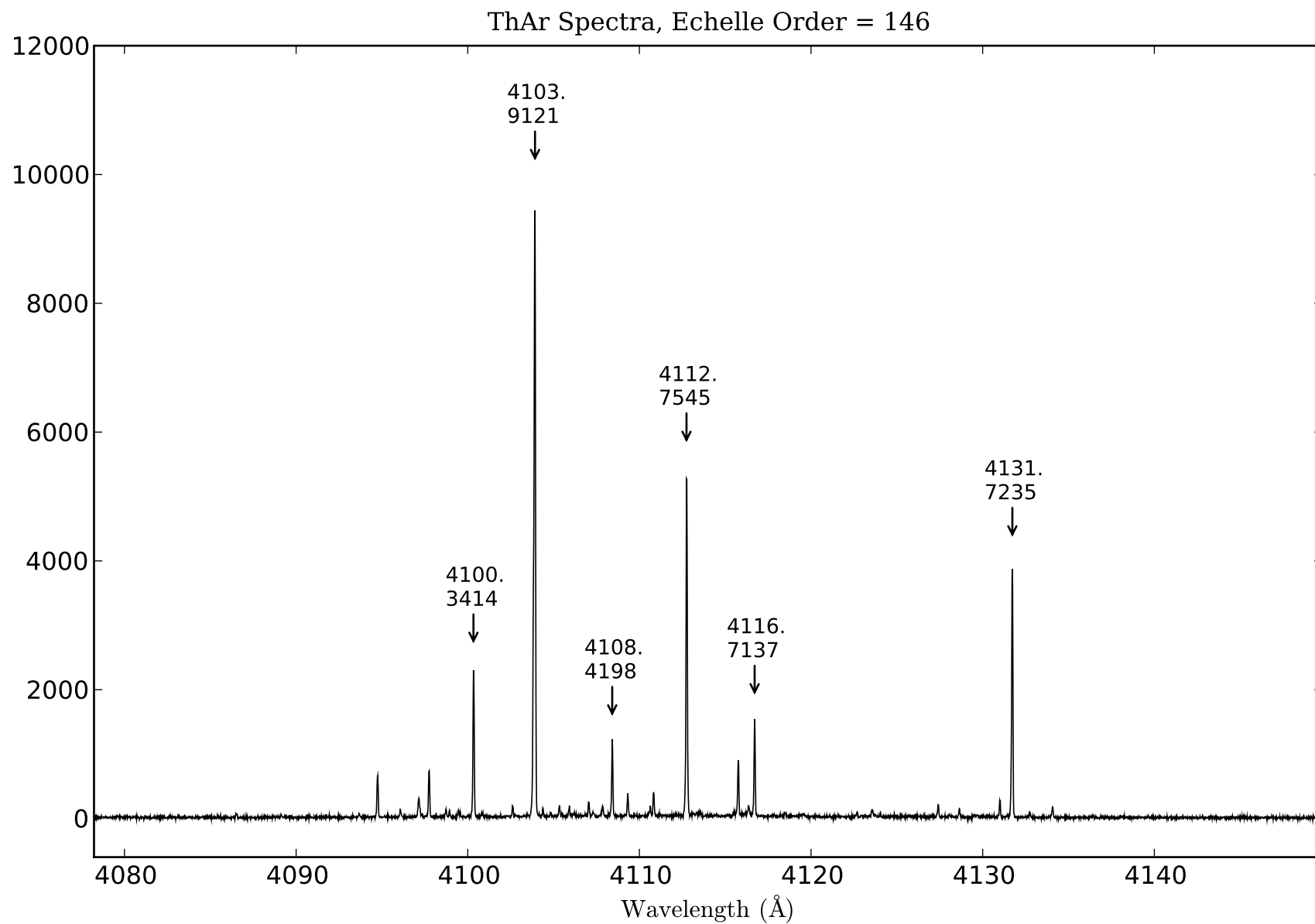












ThAr Spectra, Echelle Order = 147

