

Meteor spectra 2020

Overview

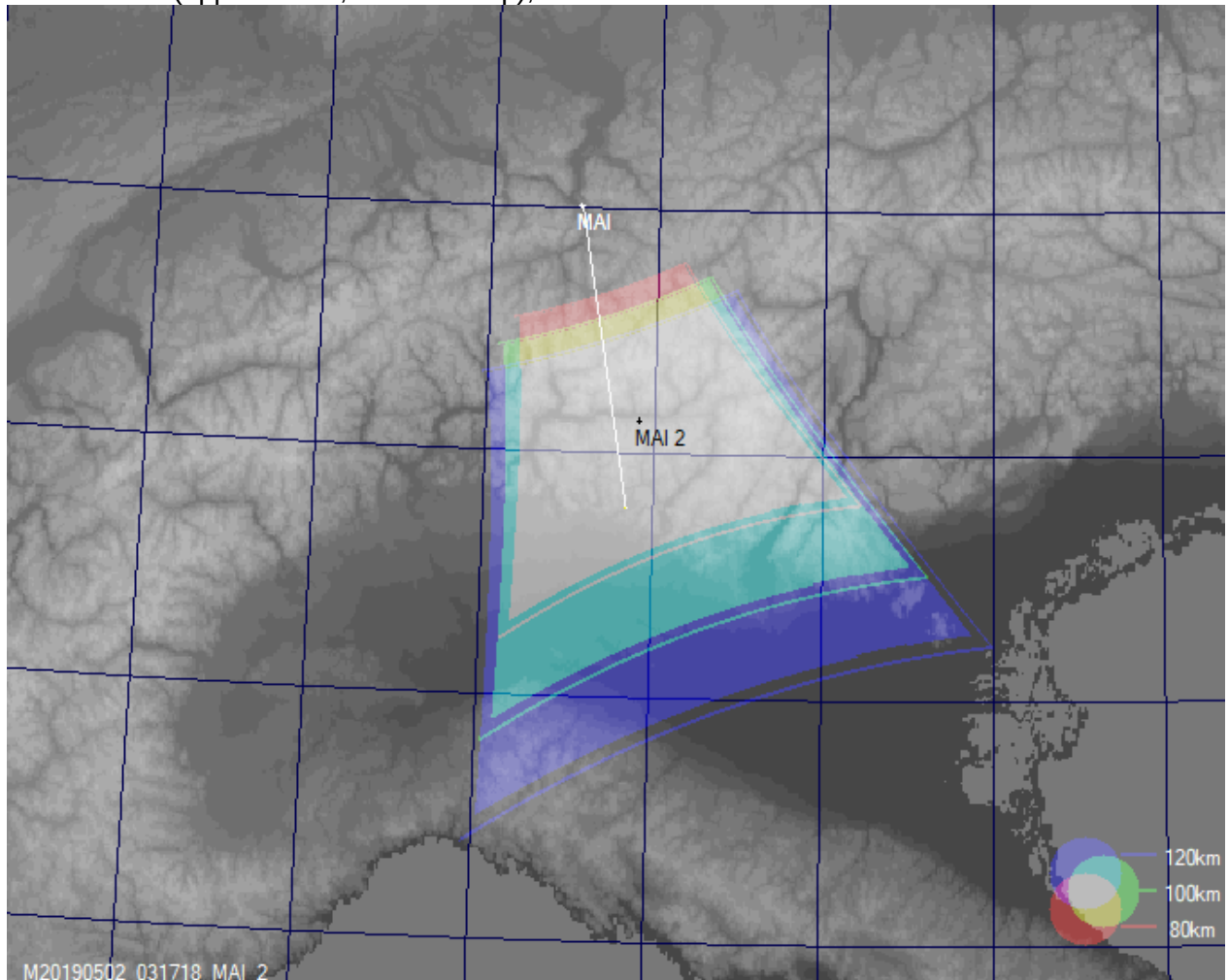
This is a collection of meteor spectra obtained at Maienfeld (MAI_2), with a Watec 902H2 ultimate

20.3.2019

MAI_2 lens Tamron VG412 ASIR at $f \cong 7\text{mm}$, grating Thorlabs, 300l/mm

MAI_1 lens Tamron VG412 ASIR at $f \cong 4\text{mm}$

Field of view (approximate, mobile setup), zero order:



Spectra analyzed with Python M_SPEC.py

M20200103_050238_MAI_2, COM, -1.4m



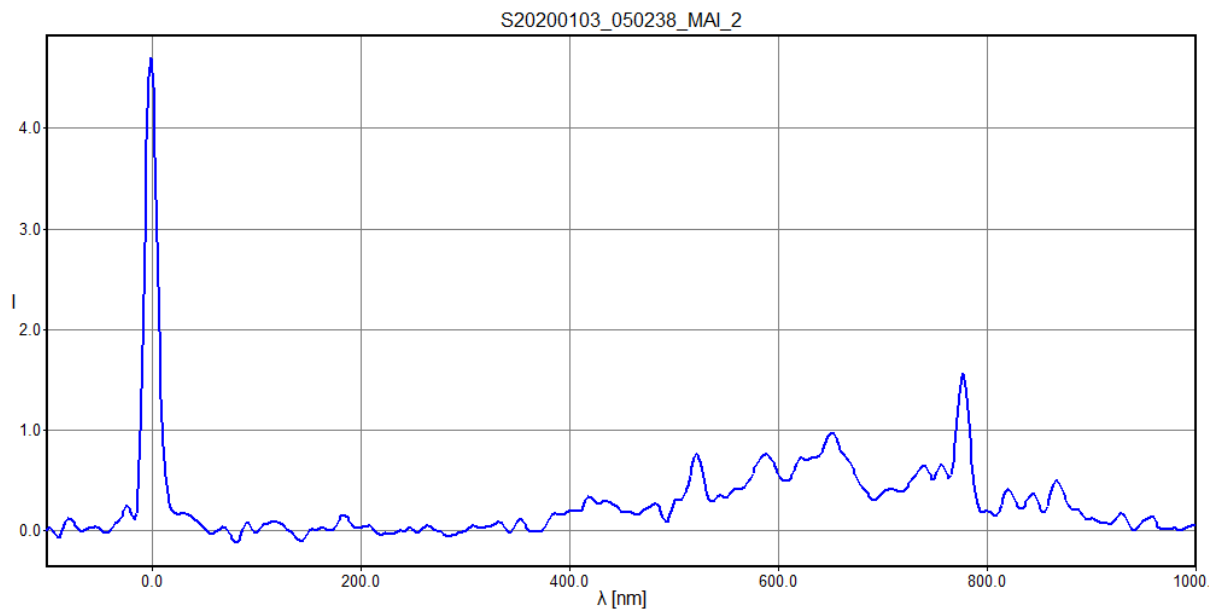
polynom for fit lambda c: [4.045 -1104.814]

pixel	lambda	fit	error
272.91,	0.00,	-0.82,	-0.8161
401.99,	517.50,	521.35,	3.8489
418.26,	589.00,	587.17,	-1.8344
464.99,	777.40,	776.20,	-1.1984

rms_x = 2.2517

spectrum C:\Daten\Python\200103\r_add5cal.dat saved

PyCharm m_spec200511.log



M20200107_011237_MAI_2, spo, -1.8m



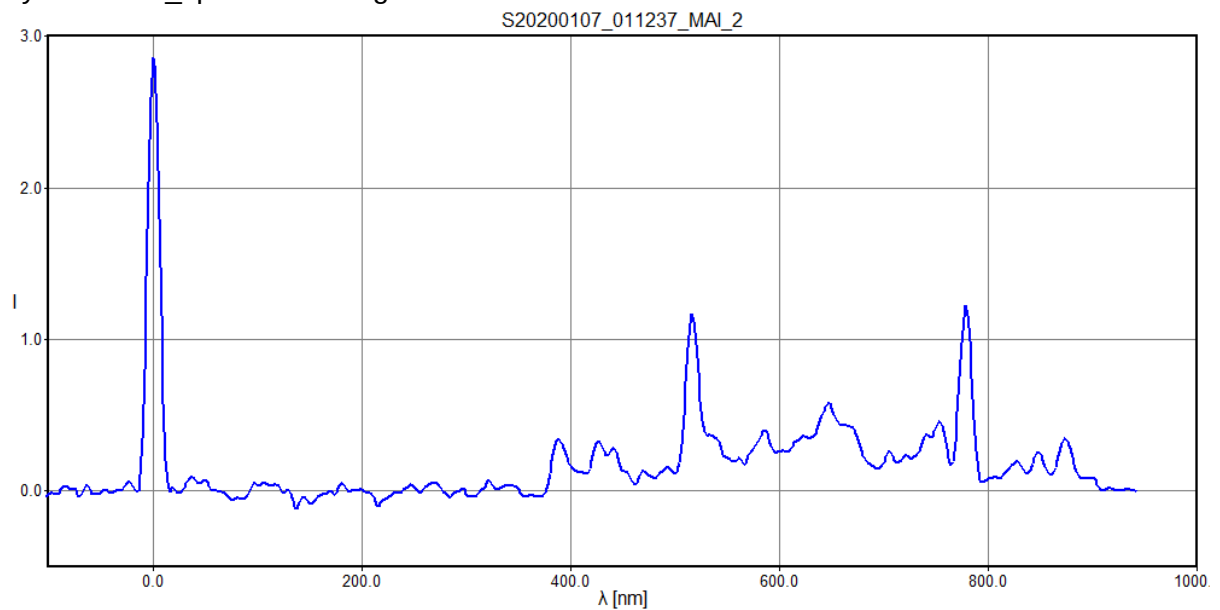
polynom for fit lambda c: [4.082 -1989.207]

pixel	lambda	fit	error
487.39,	0.00,	0.30,	0.3049
613.87,	517.50,	516.59,	-0.9072
677.91,	777.40,	778.00,	0.6023

rms_x = 0.6529

spectrum C:\Daten\Python\200107\r_add9cal.dat saved

PyCharm m_spec200512.log



M20200107_234703_MAI_2, spo, -5.3m



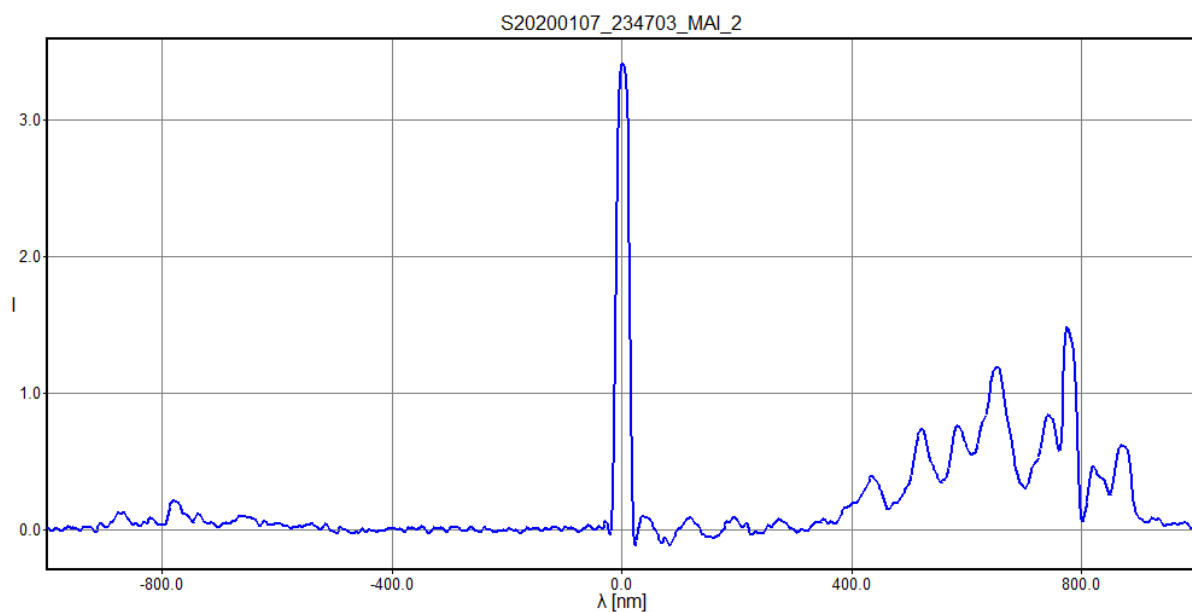
With bobdoubler

polynom for fit lambda c: [4.07 -1464.093]

pixel	lambda	fit	error
168.63,	-777.40,	-777.77,	-0.3662
359.76,	0.00,	0.14,	0.1355
487.81,	517.50,	521.30,	3.8007
503.79,	589.00,	586.34,	-2.6605
550.51,	777.40,	776.49,	-0.9095

rms_x = 2.1215

spectrum C:\Daten\Python\200107\r_add36cal.dat saved PyCharm m_spec200512.log



M20200111_195136_MAI_2, spo, -2.6m



bobdoubler

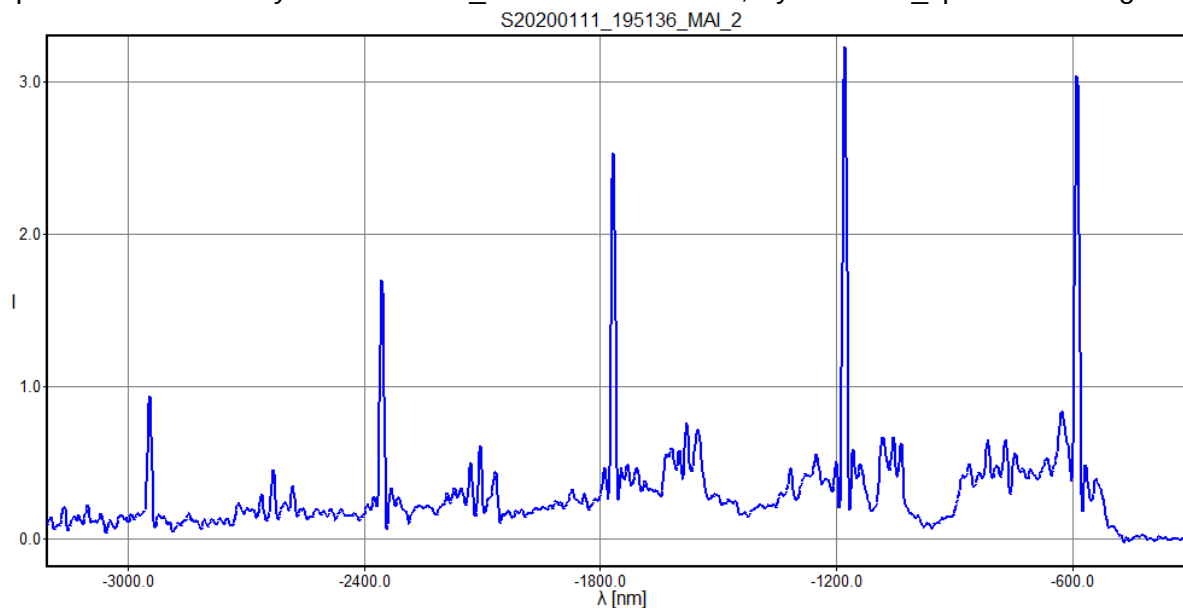
Pixel	lambda	fit	error
644.97	-589.00	-588.58	0.42
500.66	-1178.00	-1178.80	-0.80
356.18	-1767.00	-1767.12	-0.12
211.15	-2356.00	-2355.06	0.94
64.86	-2945.00	-2945.45	-0.45

polynom degree: 2

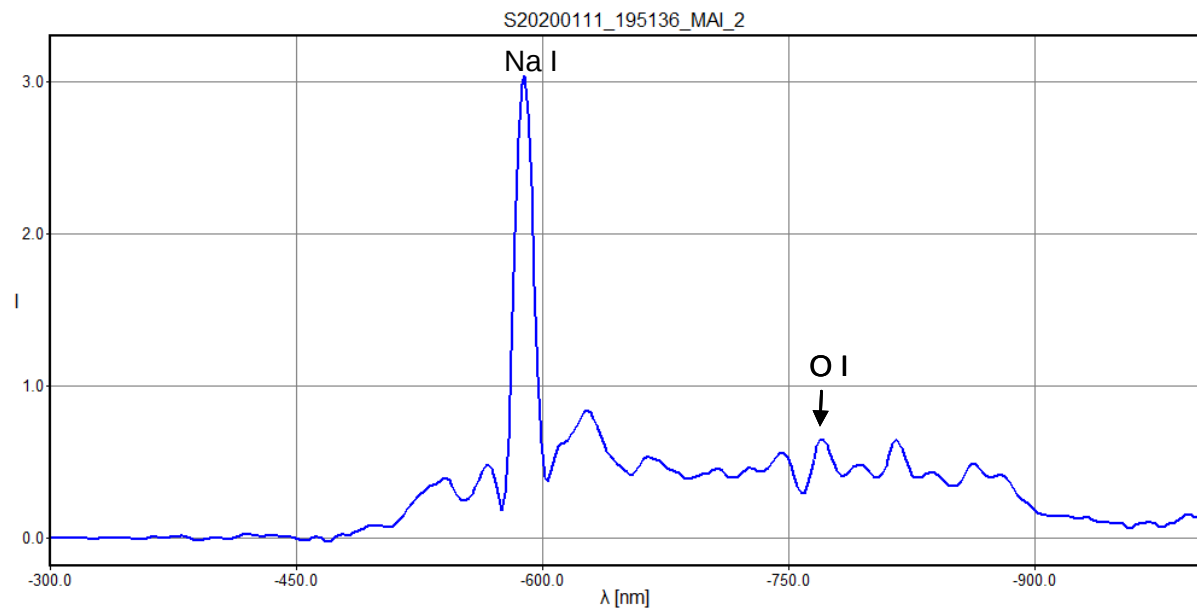
polynom for fit lambda c: [6.2276e-05 4.0186e+00 -3.2064e+03]

rms_x = 0.6201

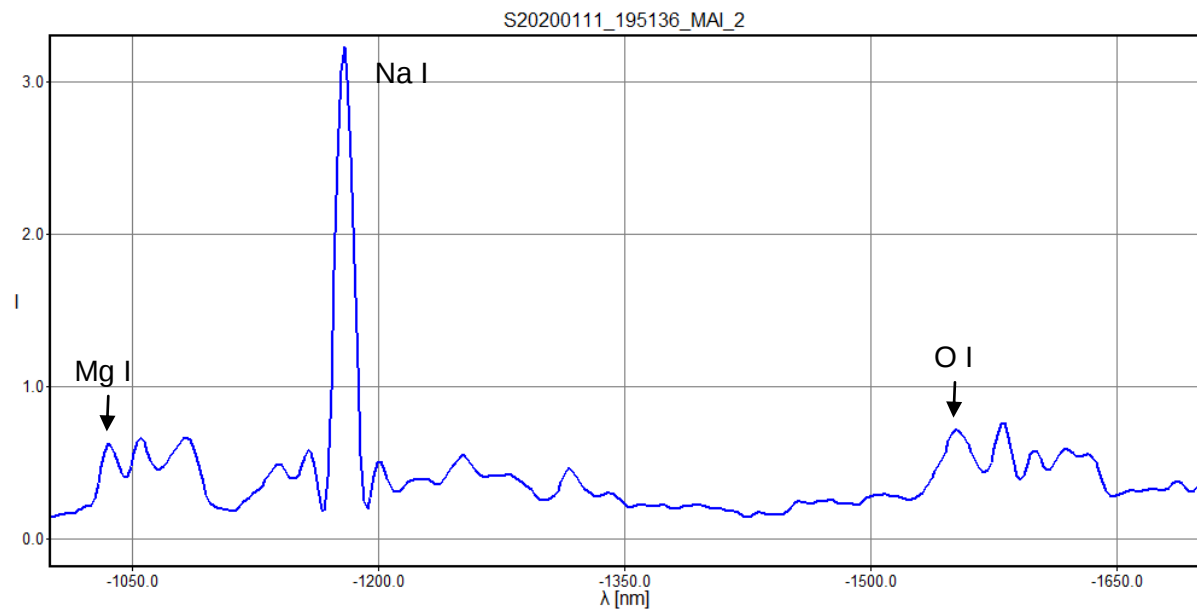
spectrum C:\Daten\Python\200111\r_add56cal.dat saved, PyCharm m_spec200513.log



Full spectrum



-1st order



-2nd order

M20200115_034602_MAI_2, spo, -1.7m



Pixel	lambda	fit	error
236.84	0.00	-0.04	-0.04
381.96	589.00	589.15	0.15
428.30	777.40	777.29	-0.11

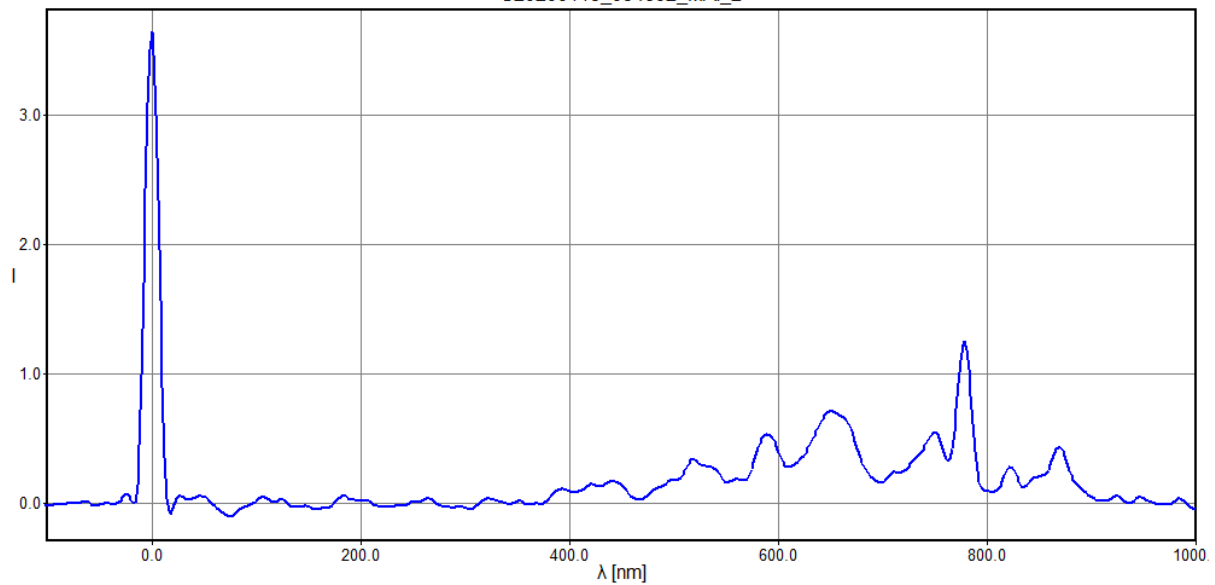
polynom degree: 1

polynom for fit lambda c: [4.06 -961.601]

rms_x = 0.1094

spectrum C:\Daten\Python\200115\r_add26cal.dat saved, PyCharm m_spec200512.log

S20200115_034602_MAI_2



M20200120_202205_MAI_2, spo, -2.3m



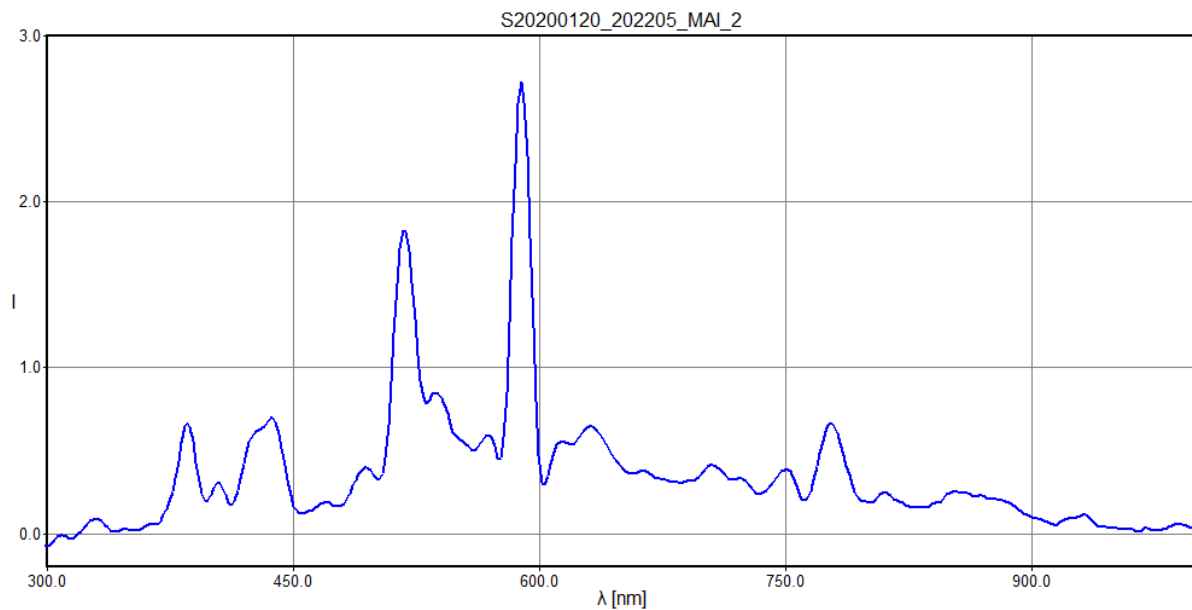
Pixel	lambda	fit	error
293.96	0.00	-0.02	-0.02
421.94	517.50	517.98	0.48
439.12	589.00	588.42	-0.58
484.98	777.40	777.52	0.12

polynom degree: 2

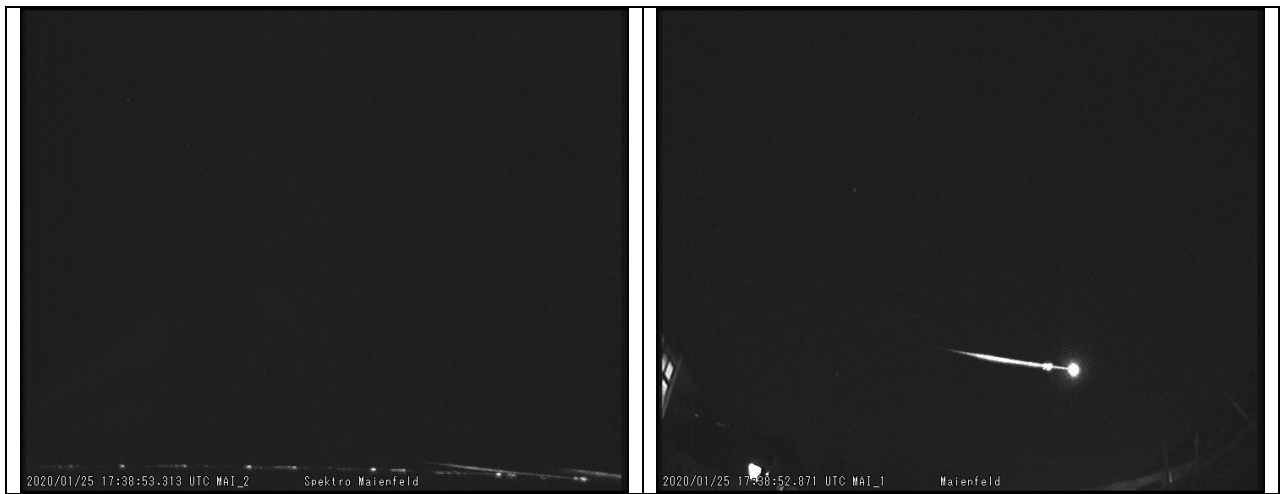
polynom for fit lambda c: [3.6455e-04 3.7865e+00 -1.1446e+03]

rms_x = 0.3797

spectrum C:\Daten\Python\200120\r_add28cal.dat saved, PyCharm m_spec200512.log



M20200125_173853_MAI_2, XUM, -7.3m



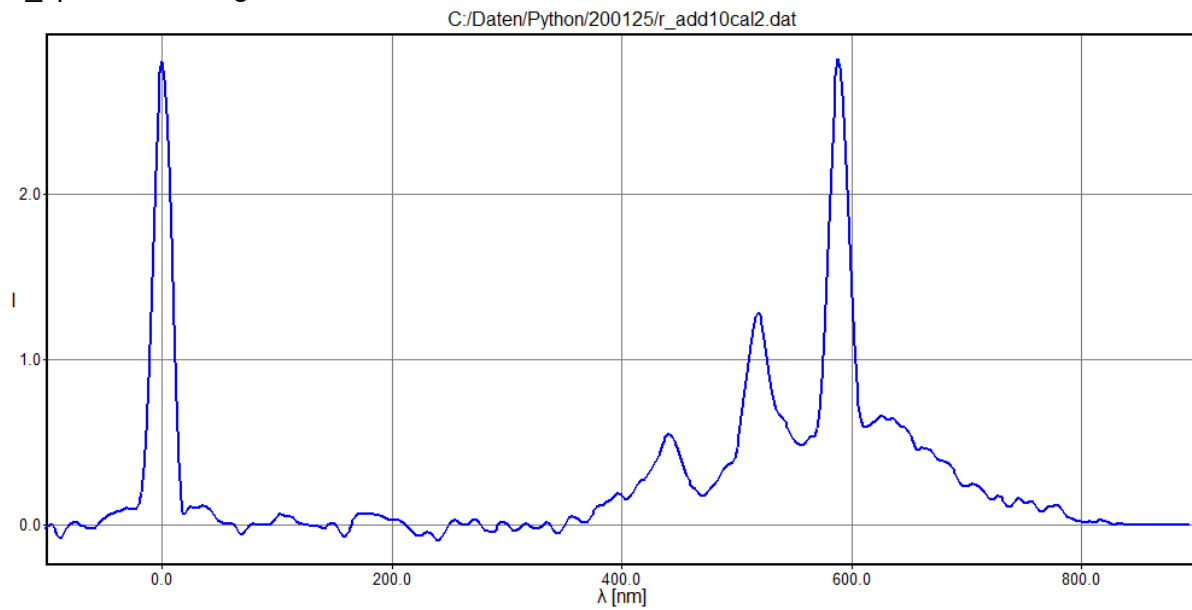
polynom for fit lambda c: [4.085 -2039.759]

pixel	lambda	fit	error
499.34,	0.00,	-0.09,	-0.0865
626.23,	517.50,	518.23,	0.7258
643.40,	589.00,	588.36,	-0.6393

rms_x = 0.5606

spectrum C:\Daten\Python\200125\r_add10cal.dat saved

m_spec200512.log



M20200207_054020_MAI_2, COM, -3.1m



bobdoubler

Pixel	lambda	fit	error
221.18	0.00	-0.07	-0.07
351.78	517.50	519.55	2.05
368.19	589.00	586.53	-2.47
414.58	777.40	777.89	0.49

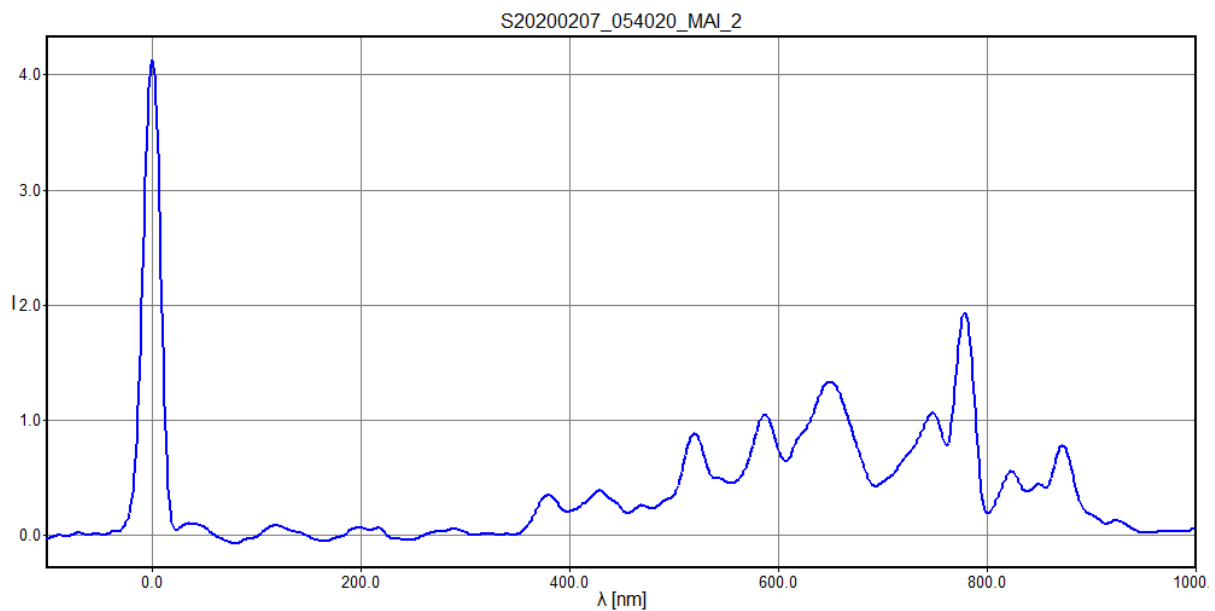
polynom degree: 2

polynom for fit lambda c: [6.9724e-04 3.5793e+00 -8.2585e+02]

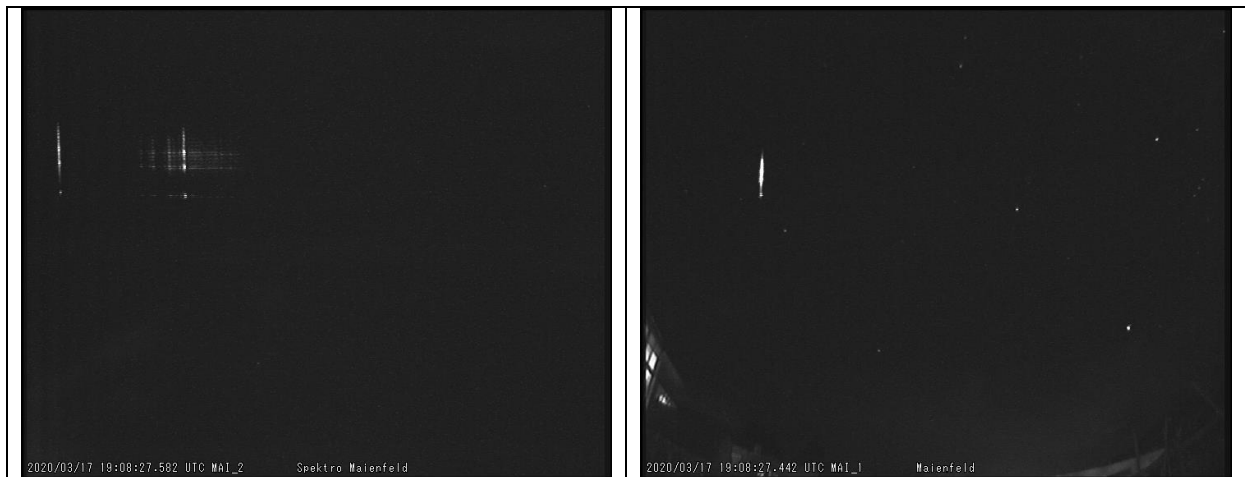
rms_x = 1.6260

spectrum C:\Daten\Python\200207\r_add20cal.dat saved,

PyCharm m_spec200513.log



M20200317_190827_MAI_2, spo, -2.7m



Pixel	lambda	fit	error
48.22	0.00	-0.07	-0.07
178.31	517.50	518.09	0.59
195.98	589.00	588.48	-0.52

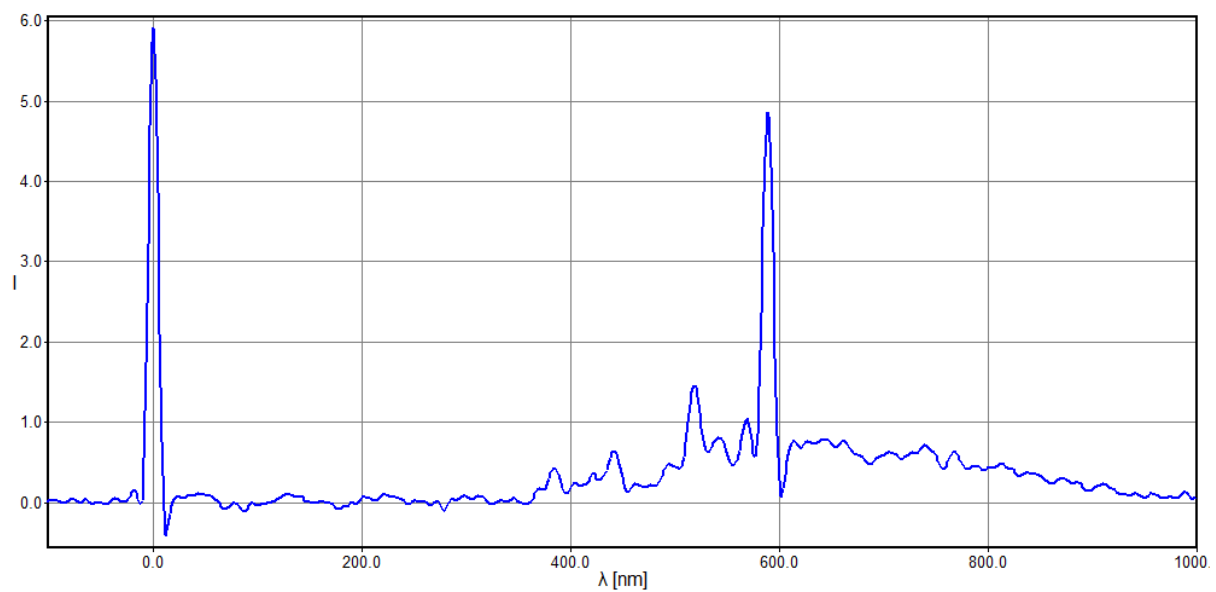
polynom degree: 1

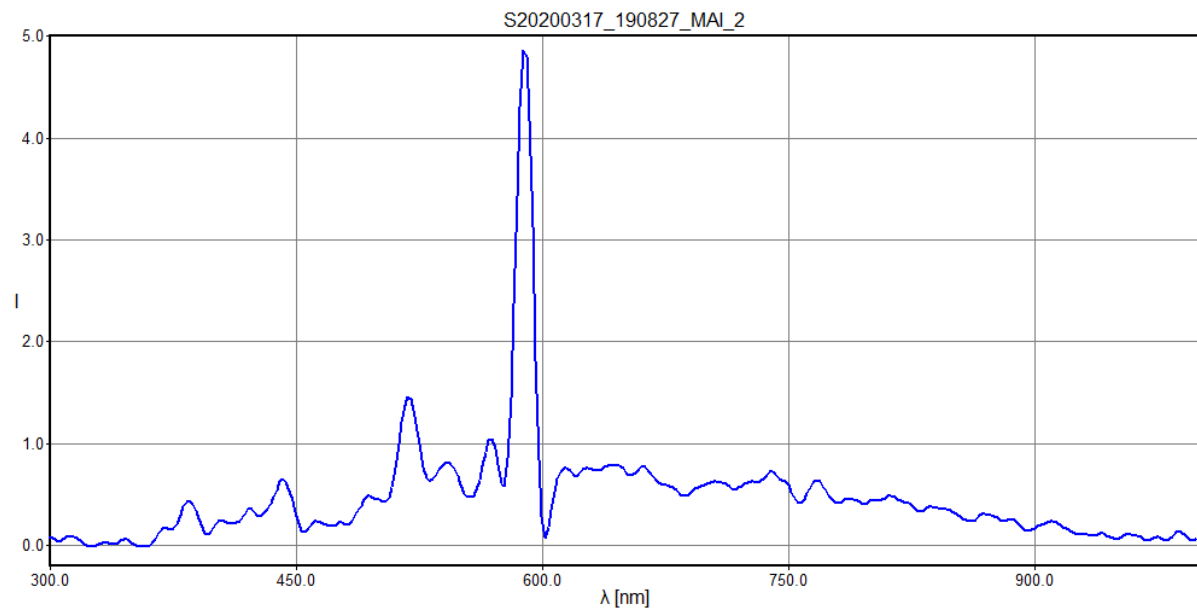
polynom for fit lambda c: [3.9831 -192.1377]

rms_x = 0.4592

spectrum C:\Daten\Python\200317\r_add23cal.dat saved

m_spec200513.log



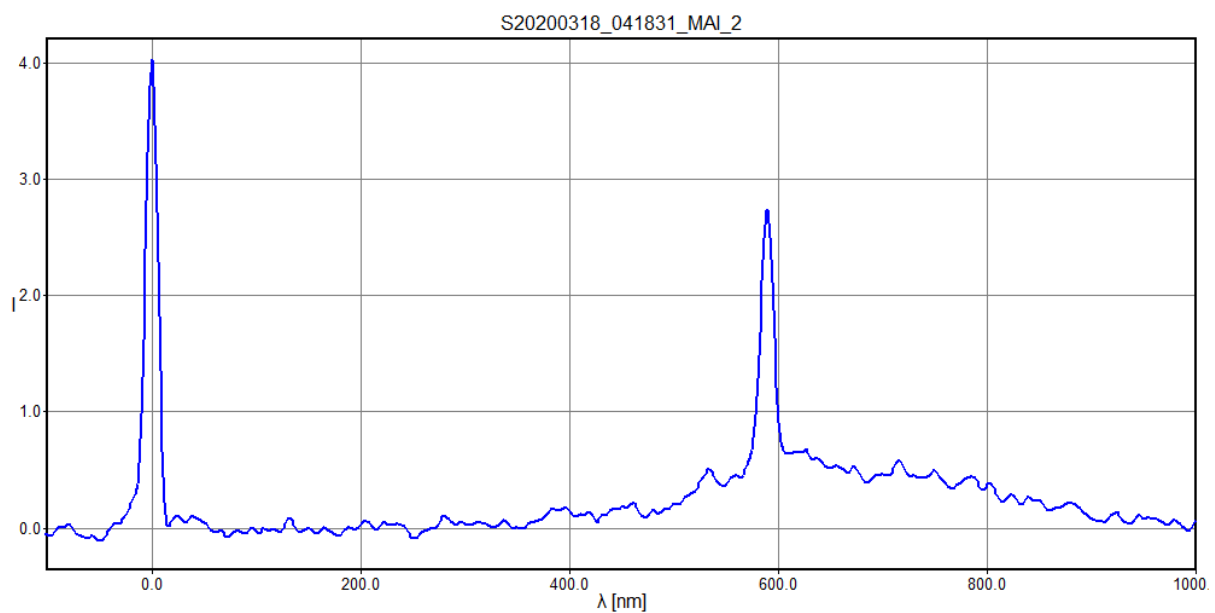


M20200318_041831_MAI_2, spo, -2.4m



Pixel	lambda	fit	error
304.80	0.00	0.00	0.00
448.90	589.00	589.00	0.00

polynom degree: 1
polynom for fit lambda c: [4.0874 -1245.8515]
rms_x = 0.0000
spectrum C:\Daten\Python\200318\r_add22cal.dat saved
PyCharm m_spec200513.log



M20200319_001041_MAI_2, spo, -1.9m



Pixel	lambda	fit	error
115.86	0.00	-0.03	-0.03
246.08	517.50	518.20	0.70
263.37	589.00	588.15	-0.85
309.87	777.40	777.58	0.18

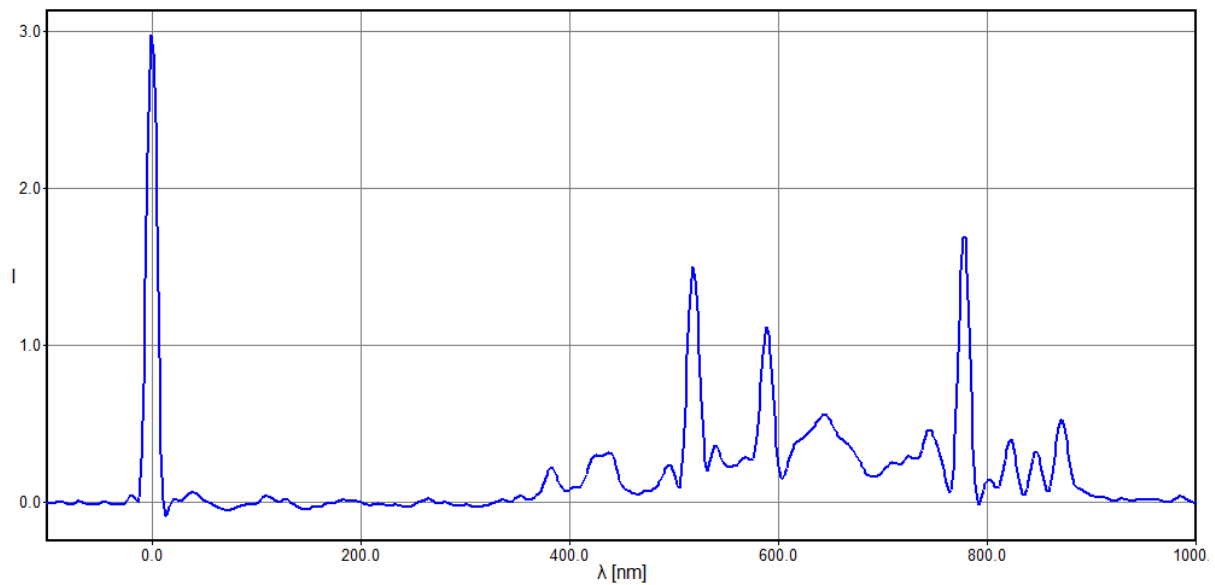
polynom degree: 2

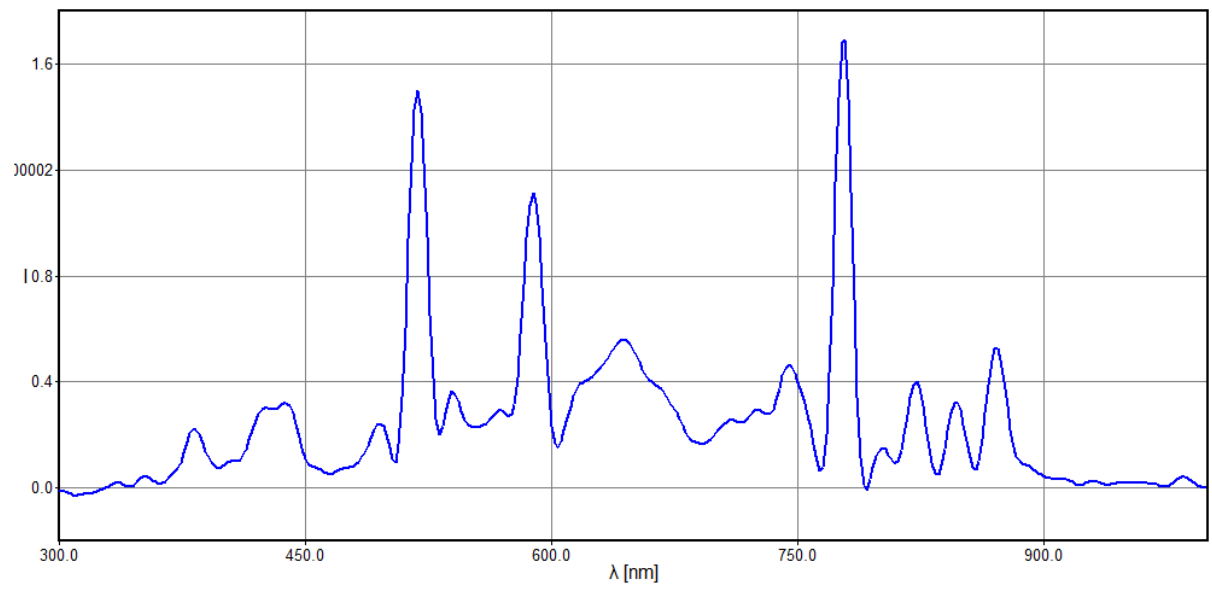
polynom for fit lambda c: [4.4517e-04 3.8185e+00 -4.4842e+02]

rms_x = 0.5598

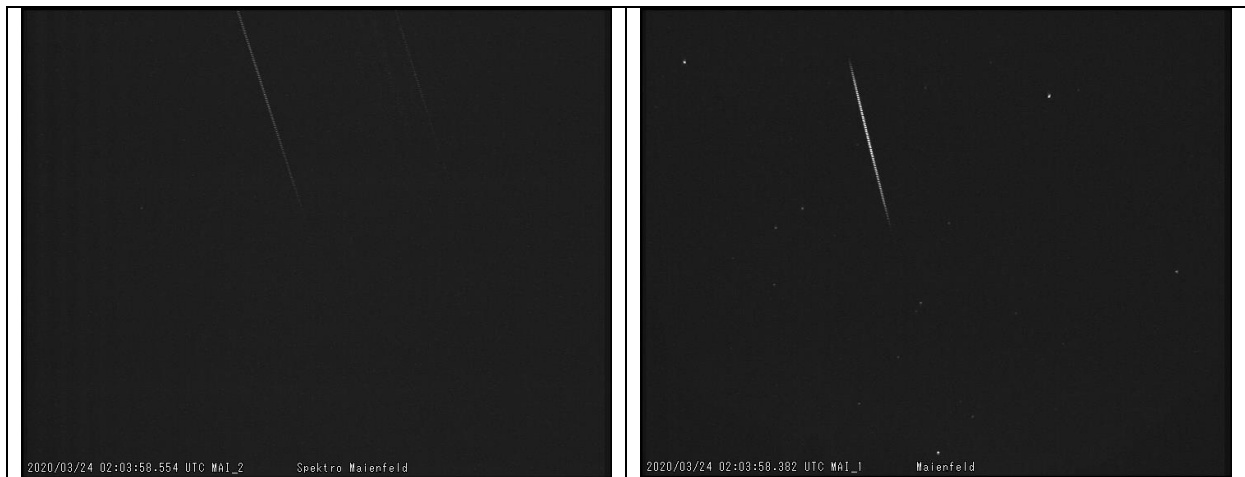
spectrum C:\Daten\Python\200319\r_add45cal.dat saved

PyCharm m_spec200513.log





M20200324_020358_MAI_2, spo, -2.1m



Pixel	lambda	fit	error
337.90	0.00	0.00	0.00
465.24	517.50	517.43	-0.07
482.78	589.00	589.08	0.08
528.77	777.40	777.38	-0.02

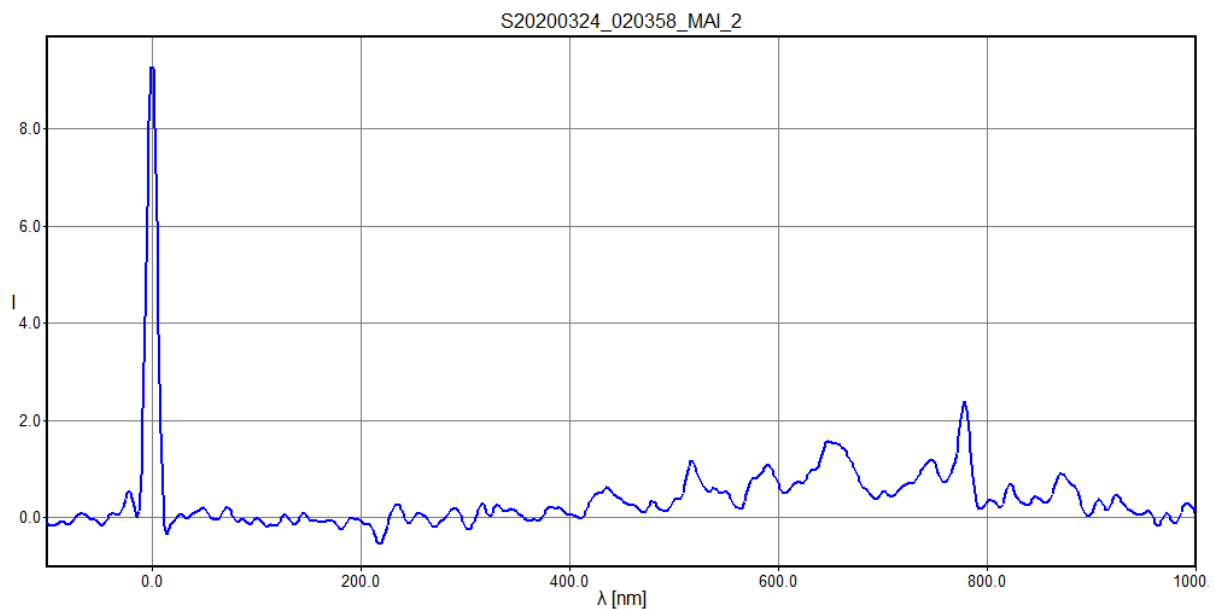
polynom degree: 2

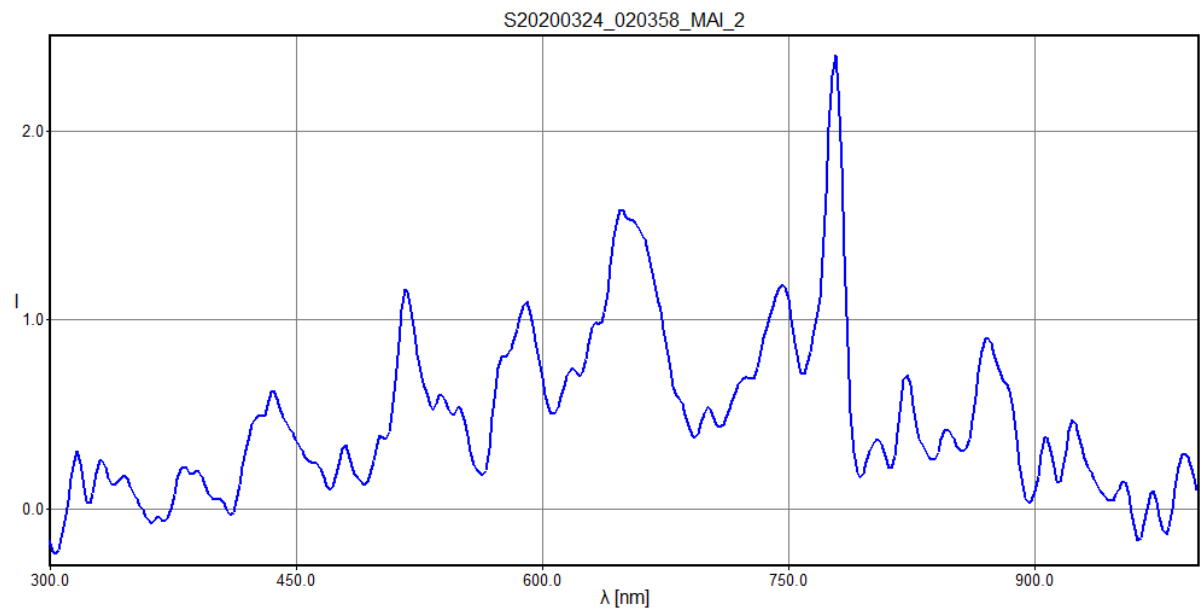
polynom for fit lambda c: [1.4881e-04 3.9439e+00 -1.3496e+03]

rms_x = 0.0539

spectrum C:\Daten\Python\200324\r_add12cal.dat saved

PyCharm m_spec200513.log





M20200327_021111_MAI_2, spo, -1.9m



Pixel	lambda	fit	error
465.28	0.00	0.00	0.00
592.36	517.50	517.49	-0.01
656.19	777.40	777.41	0.01

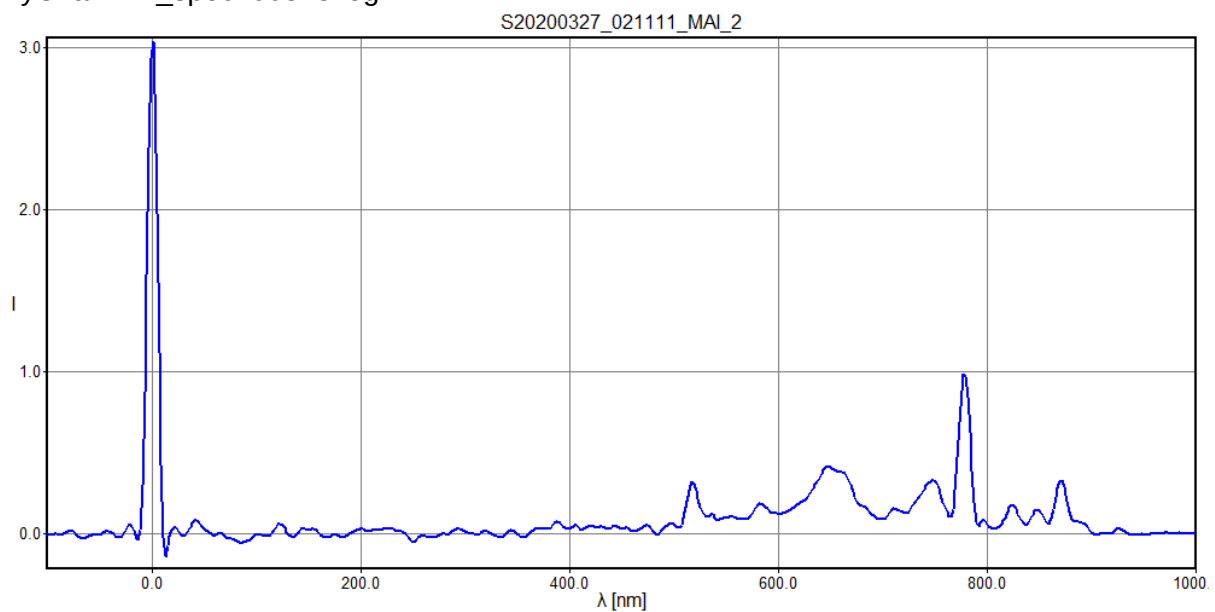
polynom degree: 1

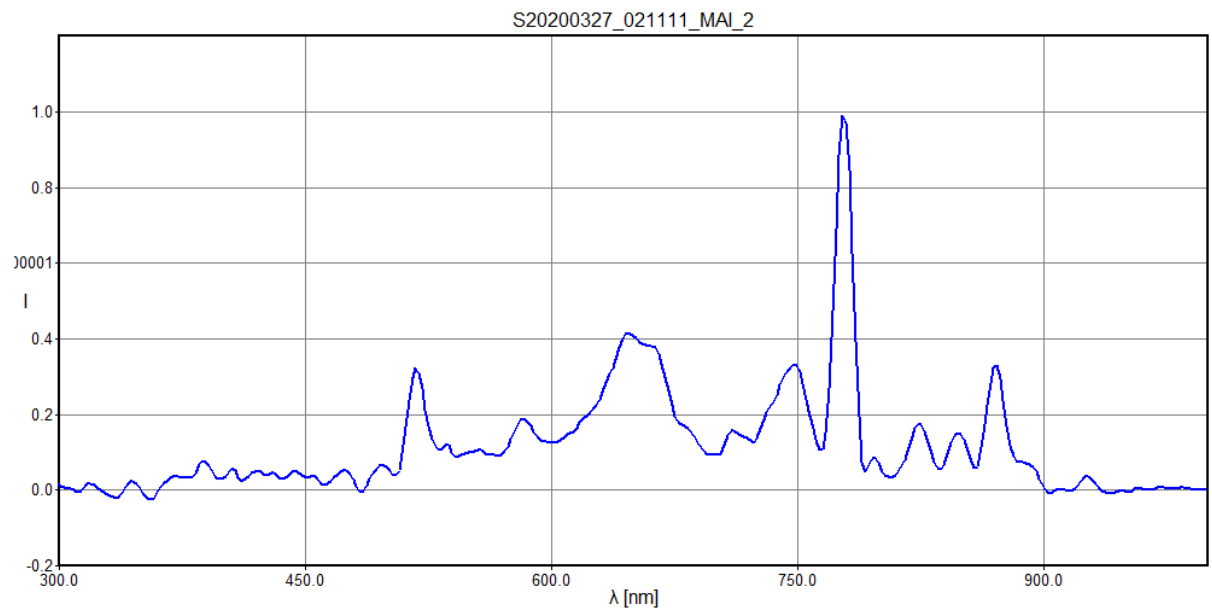
polynom for fit lambda c: [4.0721 -1894.6617]

rms_x = 0.0095

spectrum C:\Daten\Python\200327\r_add12cal.dat saved

PyCharm m_spec200513.log





M20200412_011545_MAI_2, spo, -0.6m



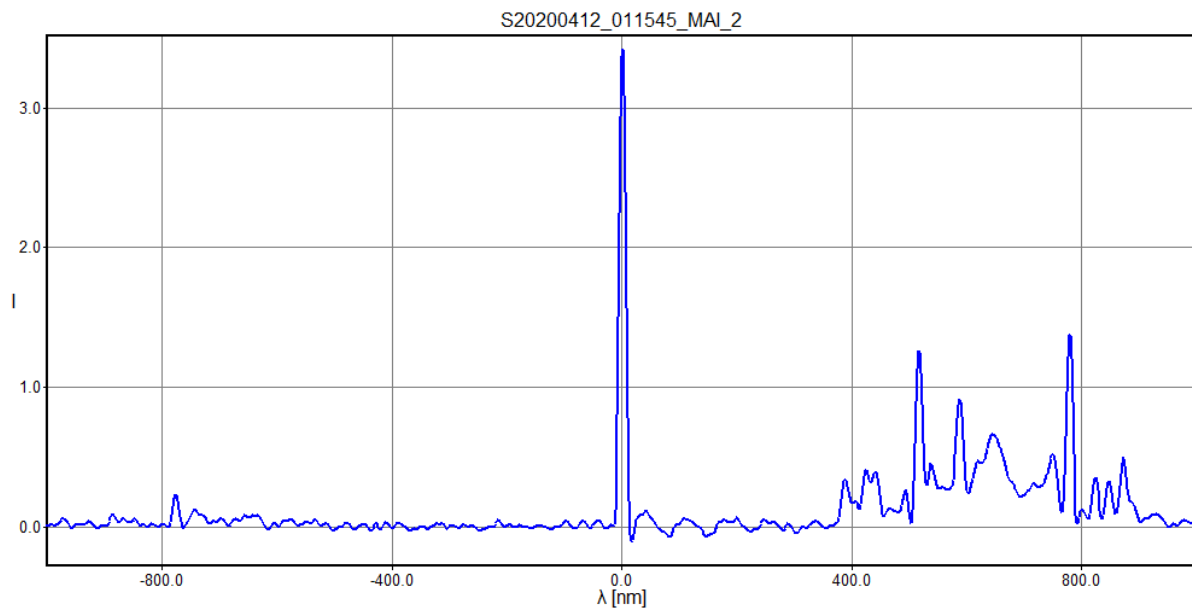
polynom for fit lambda c: [5.881e-05 4.016e+00 -1.697e+03]

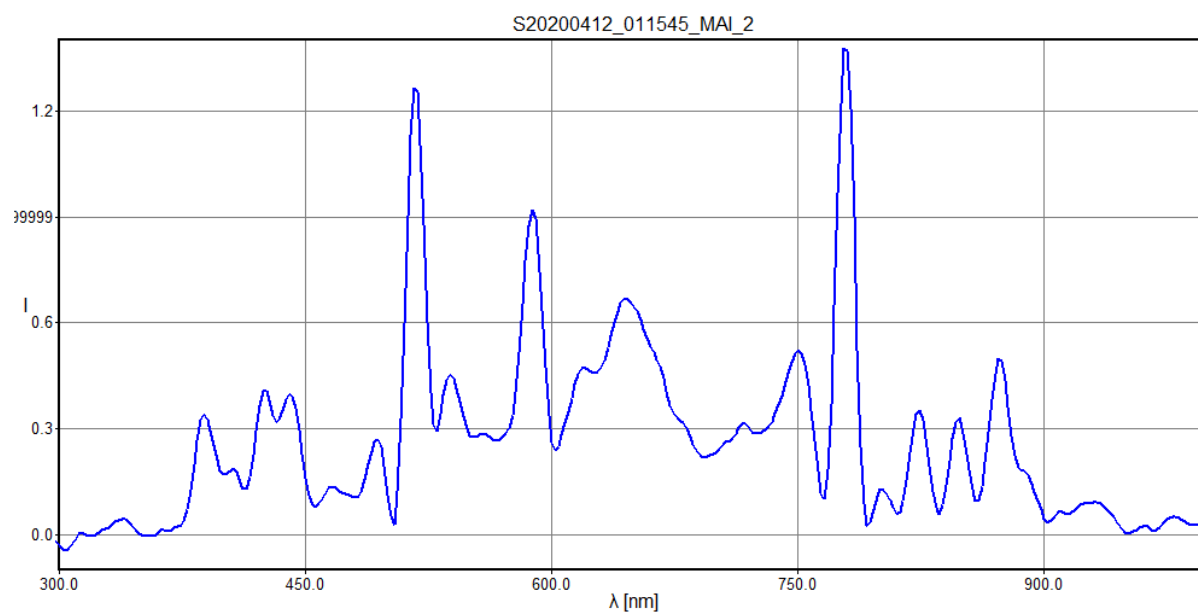
pixel	lambda	fit	error
228.25,	-777.40,	-777.58,	-0.1763
420.26,	0.00,	0.84,	0.8425
564.29,	589.00,	587.59,	-1.4058
611.04,	777.40,	778.57,	1.1696
547.01,	517.50,	517.07,	-0.4301

rms_x = 0.9241

spectrum C:\Daten\Python\200412\r_add14cal.dat saved

Pyzo m_spec200412.log





M20200413_032407_MAI_2, spo, -3.5m



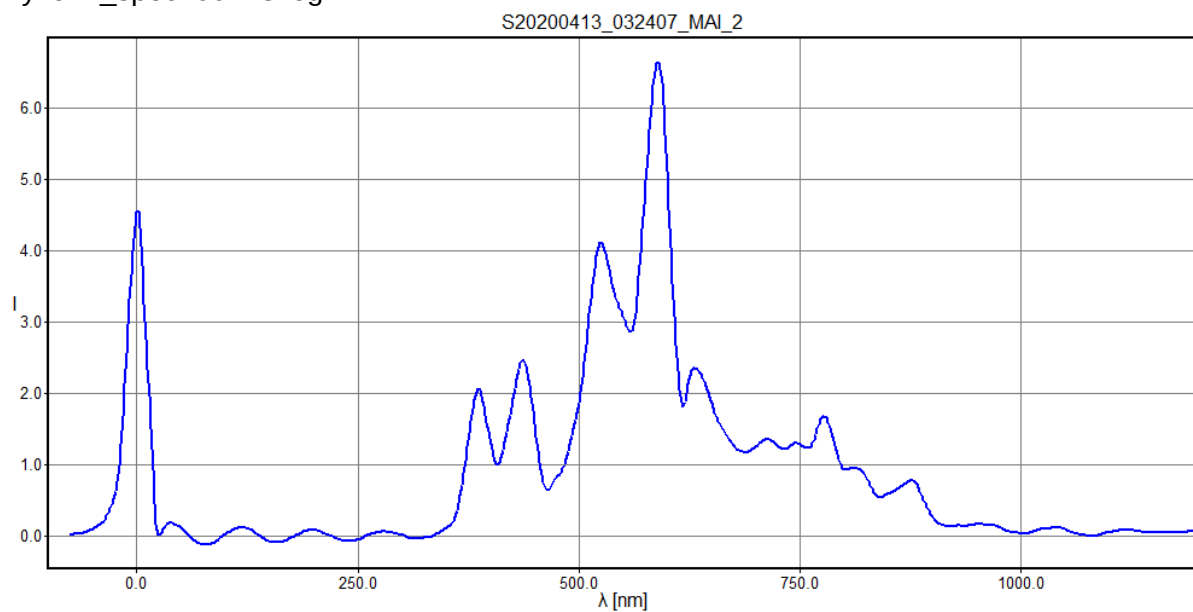
polynom for fit lambda c: [4.038 -77.442]

pixel	lambda	fit	error
19.18,	0.00,	-0.00,	-0.0008
165.06,	589.00,	589.00,	0.0033
211.72,	777.40,	777.40,	-0.0025

rms_x = 0.0025

spectrum C:\Daten\Python\200413\r_add35cal.dat saved

Pyzo m_spec200413.log



M20200414_233635_MAI_2, spo, -1.4m



Pixel	lambda	fit	error
329.99	0.00	-0.08	-0.08
457.70	517.50	518.15	0.65
475.02	589.00	588.43	-0.57

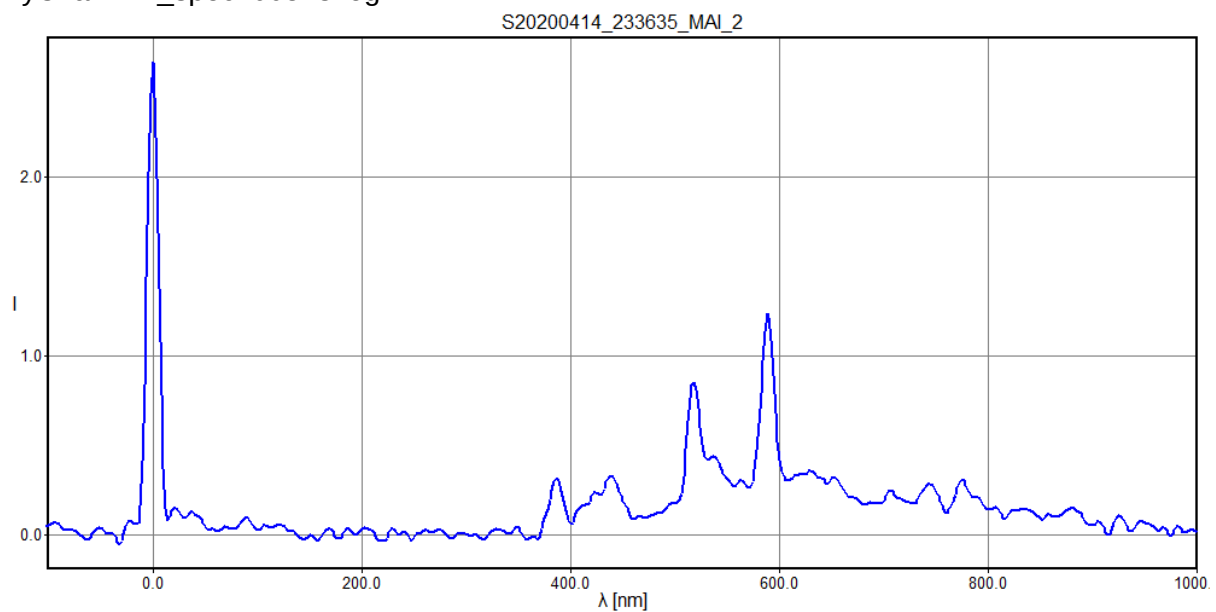
polynom degree: 1

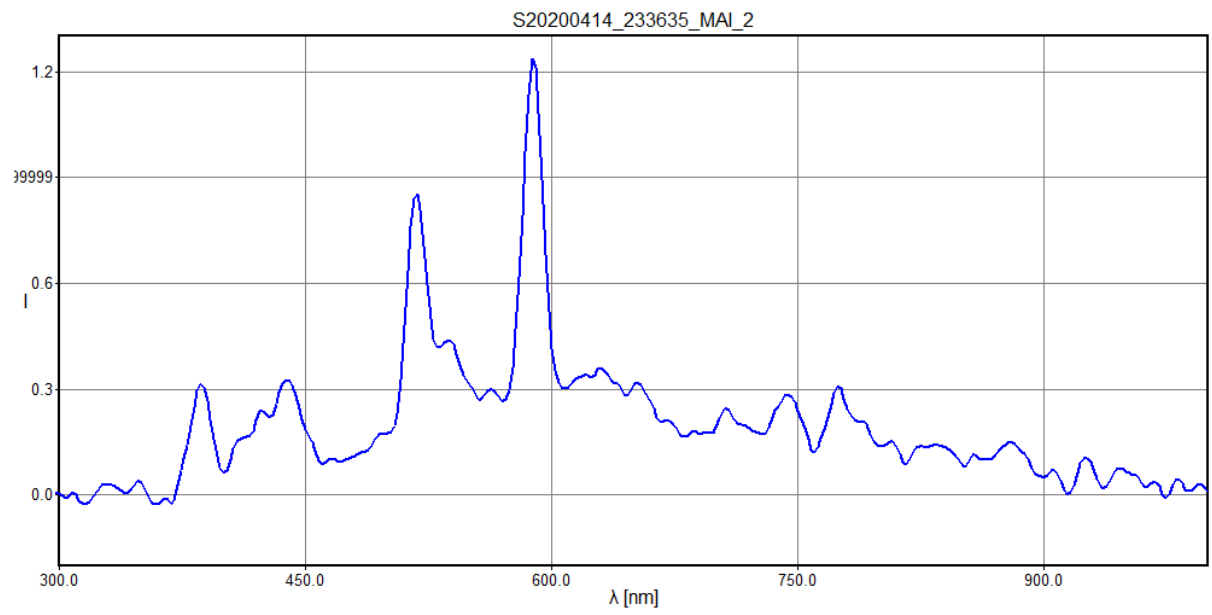
polynom for fit lambda c: [4.0578 -1339.1202]

rms_x = 0.5004

spectrum C:\Daten\Python\200414\r_add20cal.dat saved

PyCharm m_spec200513.log





M20200416_010738_MAI_1, LYR, -2.6m



Pixel	lambda	fit	error
144.22	517.50	517.32	-0.18
161.94	589.00	589.25	0.25
208.27	777.40	777.33	-0.07

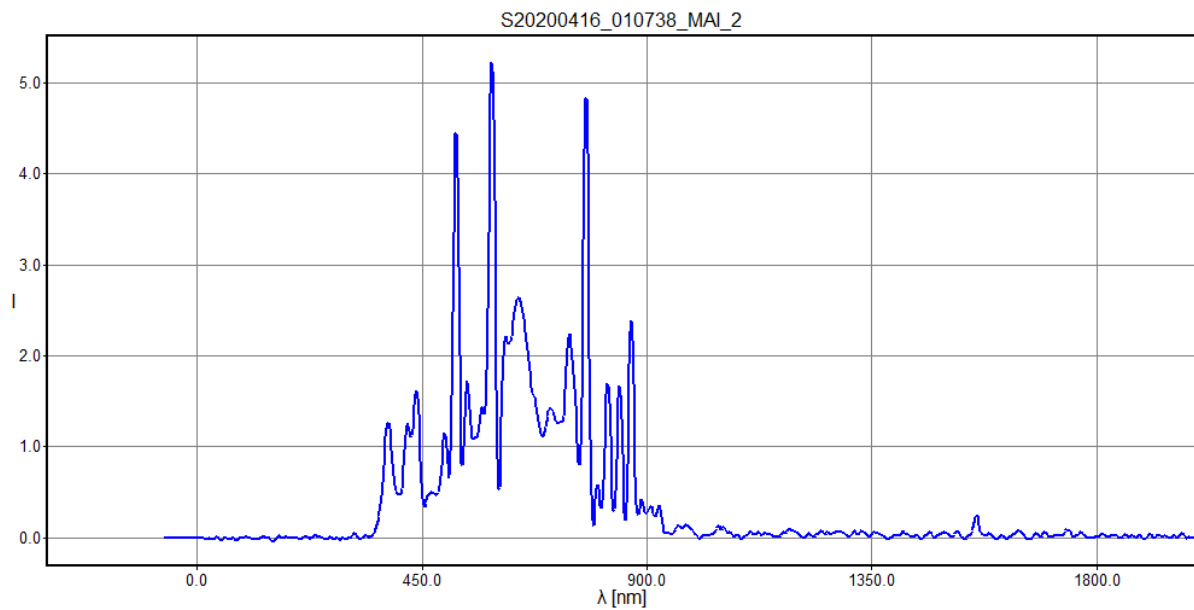
polynom degree: 1

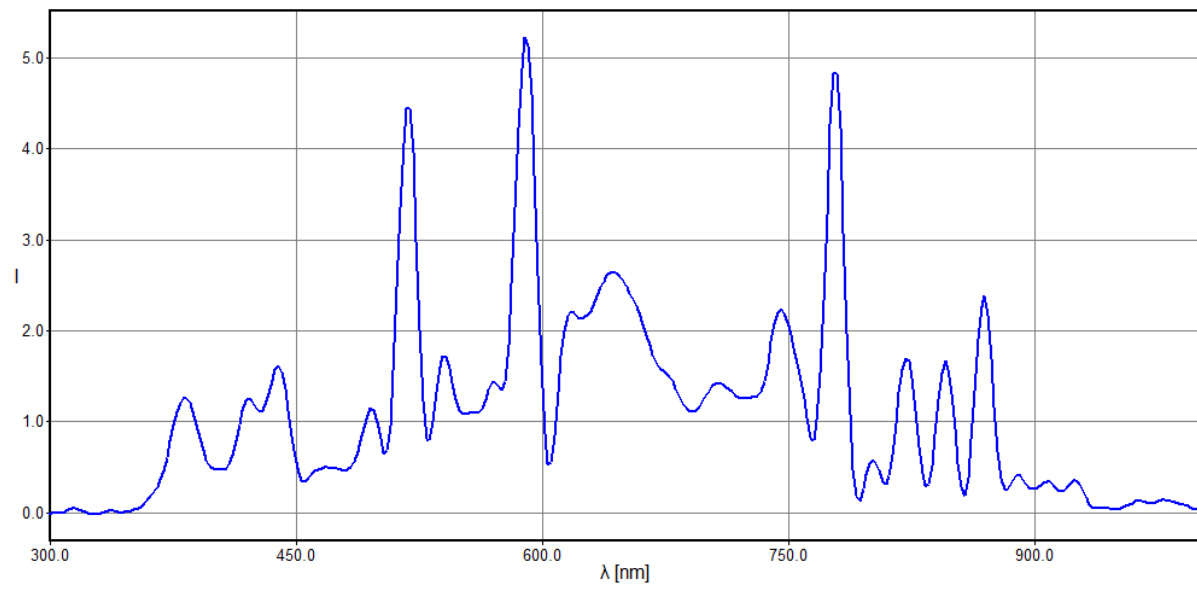
polynom for fit lambda c: [4.0595 -68.1475]

rms_x = 0.1842

spectrum C:\Daten\Python\200416\r_add15cal.dat saved

PyCharm m_spec200513.log



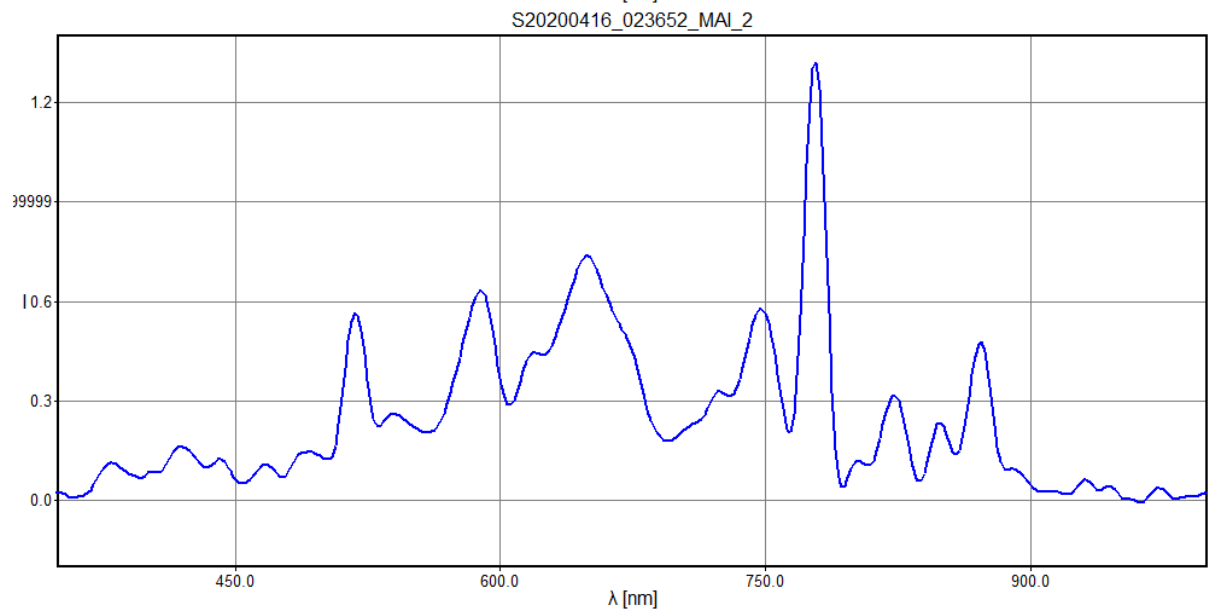
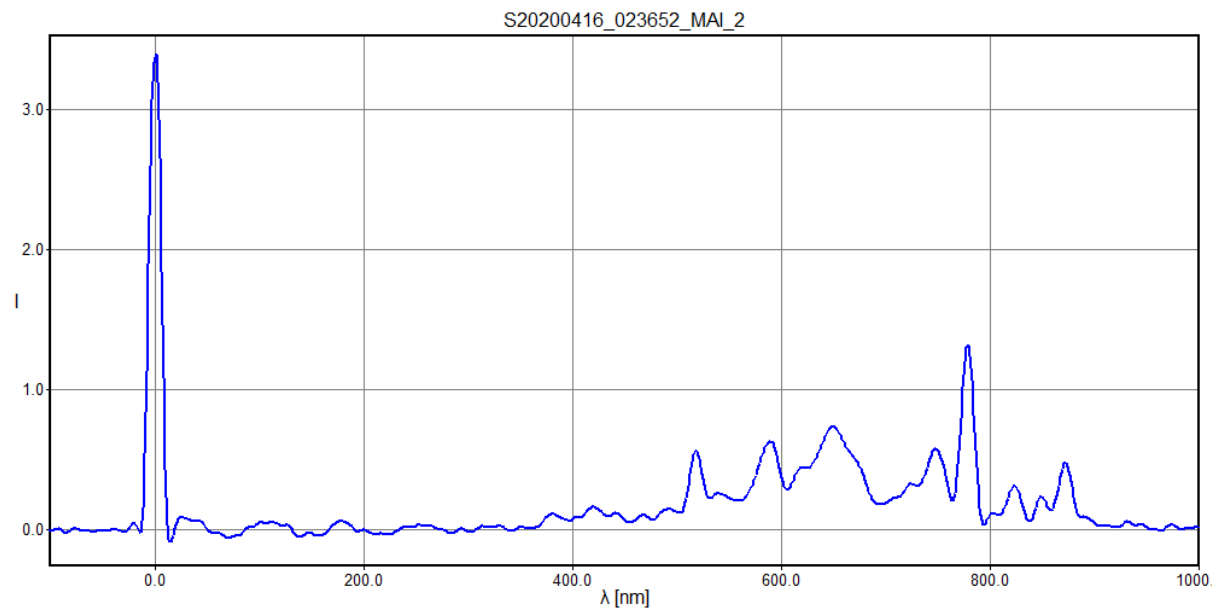


M20200416_023652_MAI_2, -0.1m?

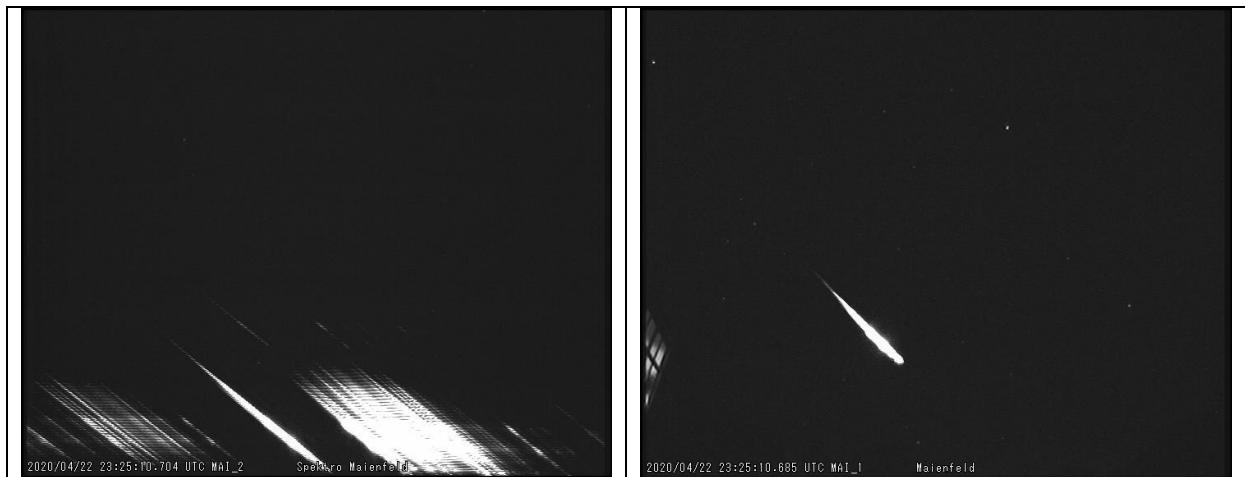


Pixel	lambda	fit	error
138.16	0.00	-0.03	-0.03
267.94	517.50	518.24	0.74
285.09	589.00	588.10	-0.90
331.21	777.40	777.58	0.18

polynom degree: 2
polynom for fit lambda c: [5.4703e-04 3.7713e+00 -5.3151e+02]
rms_x = 0.5879
spectrum C:\Daten\Python\200416\ra_add21cal.dat saved
PyCharm m_spec200513.log



M20200422_232510_MAI_2, LYR, -4.2m



Pixel	lambda	fit	error
192.63	0.00	-0.23	-0.23
320.57	517.50	518.40	0.90
338.02	589.00	589.23	0.23
384.10	777.40	776.38	-1.02
575.37	1554.80	1554.92	0.12

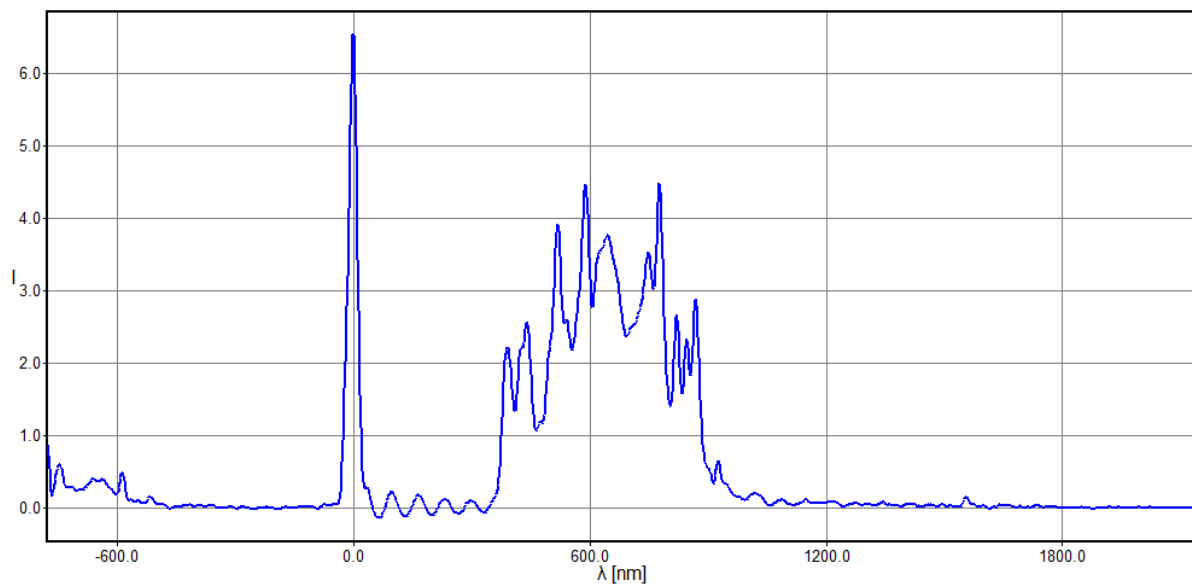
polynom degree: 2

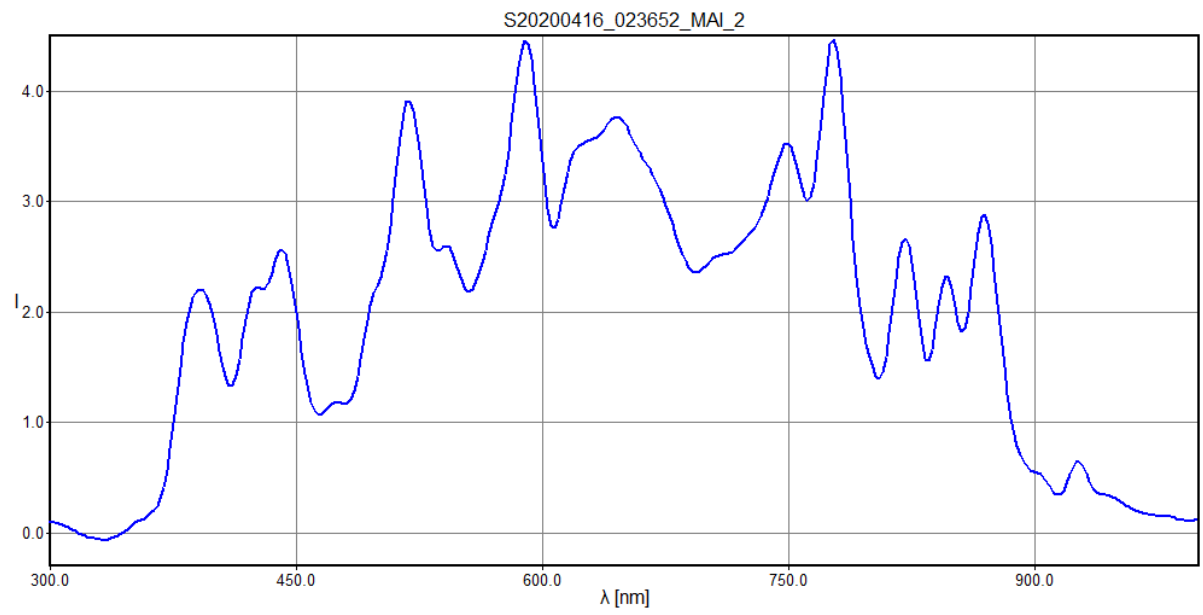
polynom for fit lambda c: [3.7313e-05 4.0346e+00 -7.7879e+02]

rms_x = 0.6262

spectrum C:\Daten\Python\200422\ra_add20cal.dat saved

first 20 frames added, rest saturated, PyCharm m_spec200513.log



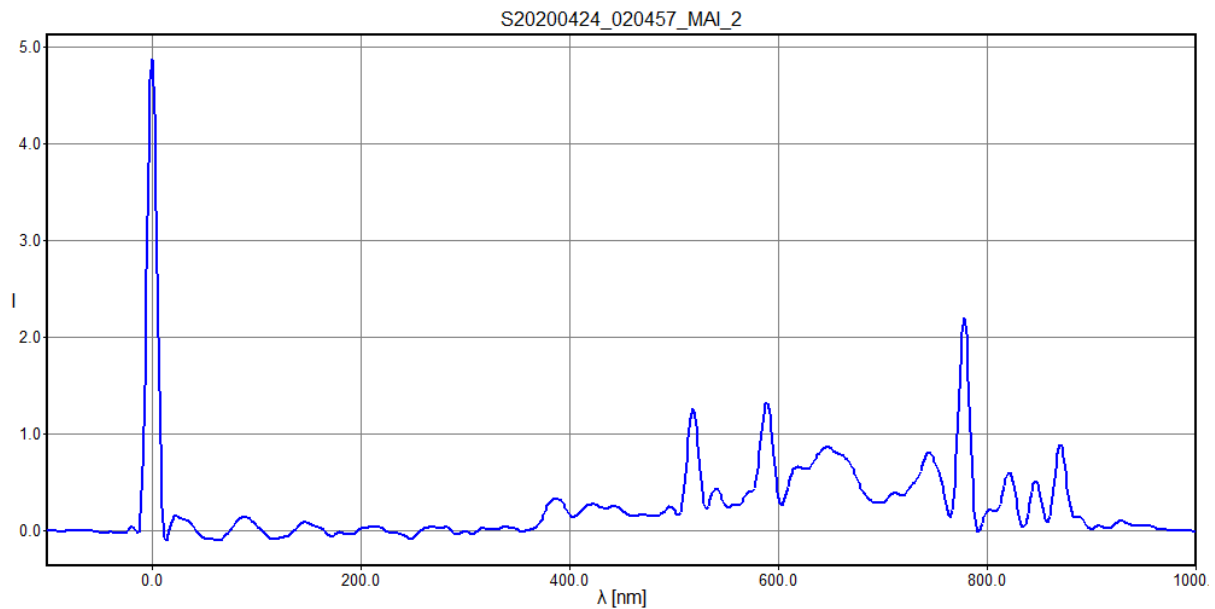


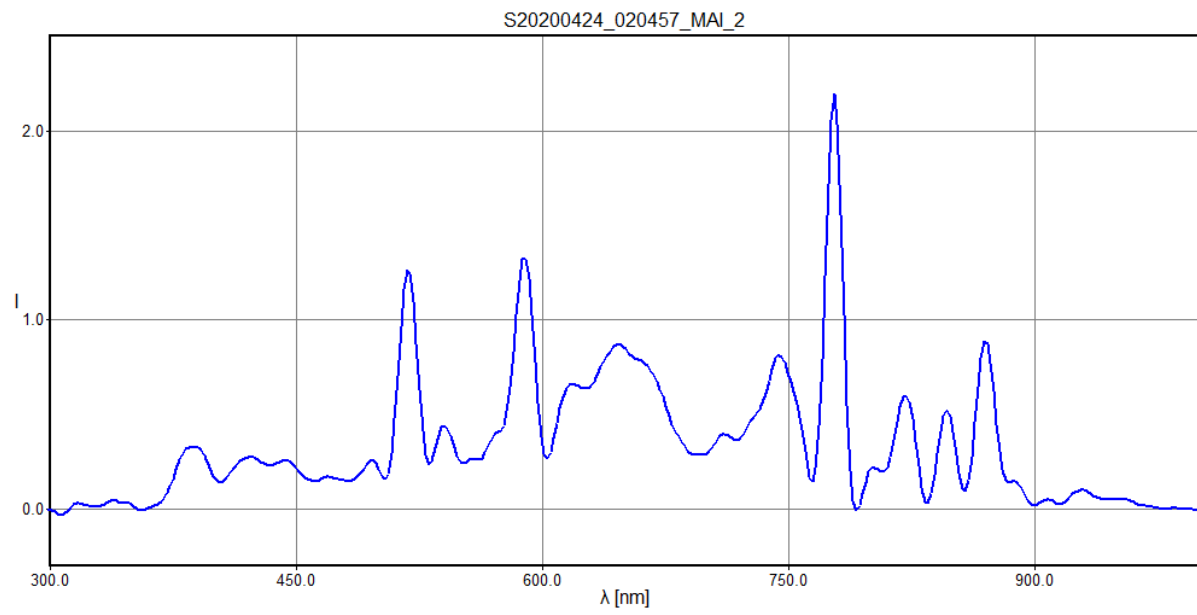
M20200424_020457_MAI_2, LYR, -2.8m



Pixel	lambda	fit	error
42.00	0.00	-0.03	-0.03
172.78	517.50	518.19	0.69
190.12	589.00	588.17	-0.83
236.69	777.40	777.57	0.17

polynom degree: 2
polynom for fit lambda c: [4.9352e-04 3.8565e+00 -1.6287e+02]
rms_x = 0.5478
spectrum C:\Daten\Python\200424\r_add12cal.dat saved
PyCharm m_spec200513.log





M20200522_012931_MAI_2, spo, -2.2m



Bobdoubler

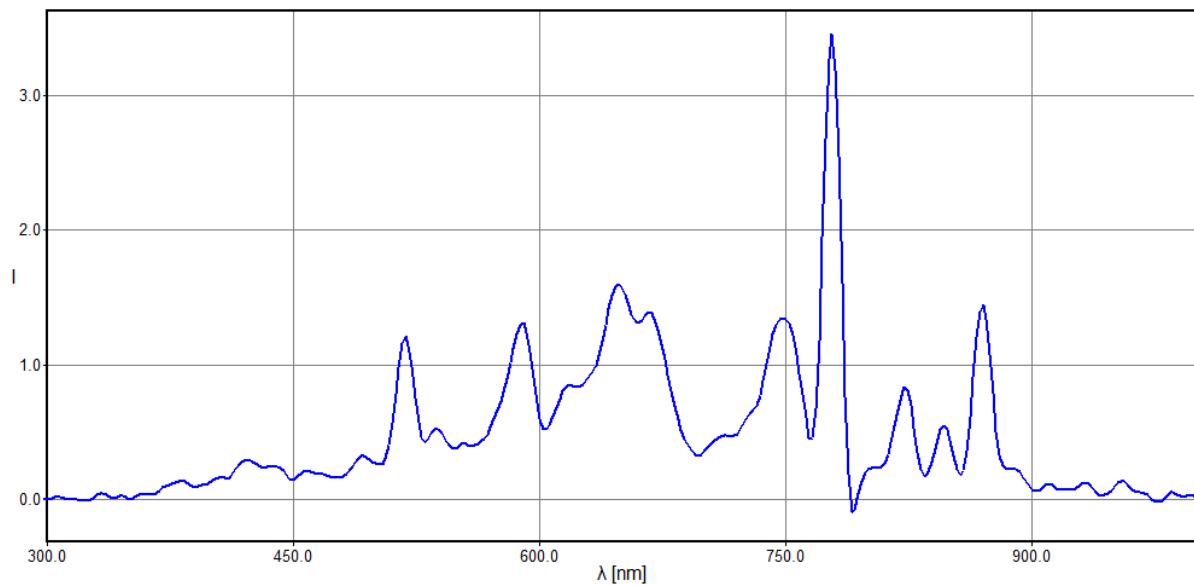
Pixel	lambda	fit	error
76.19	517.50	517.73	0.23
93.63	589.00	588.69	-0.31
140.03	777.40	777.49	0.09

polynom degree: 1

polynom for fit lambda c: [4.0689 207.7171]

rms_x = 0.2279

spectrum C:\Daten\Python\200522\r_add16cal.dat saved



M20200527_224035_MAI_2, spo, -1.9m



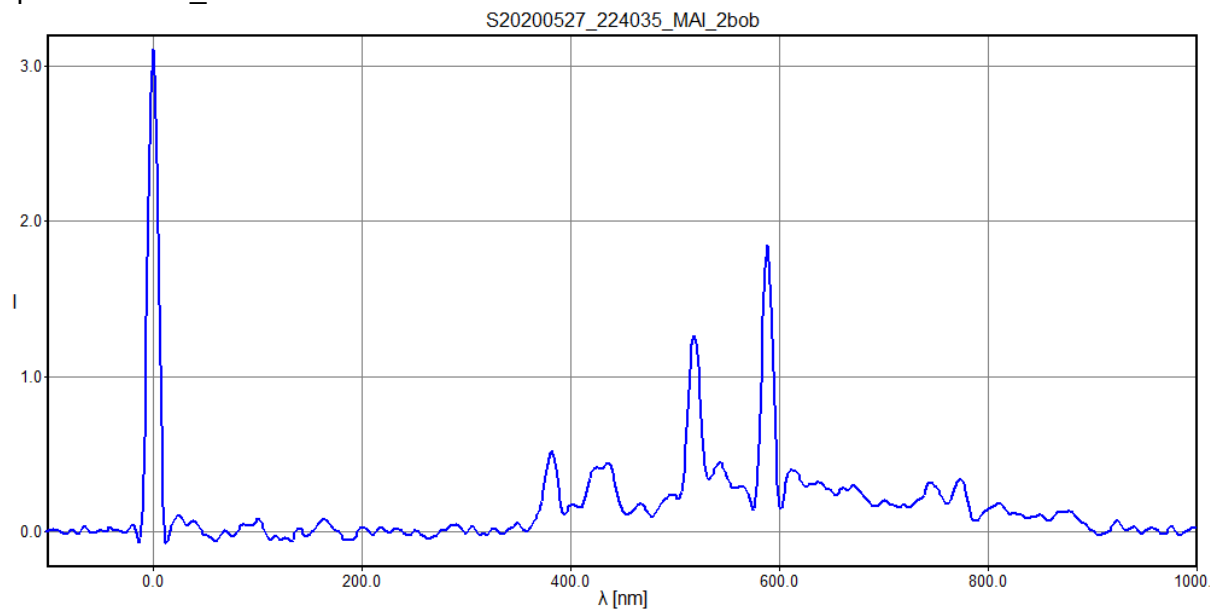
with bob doubler

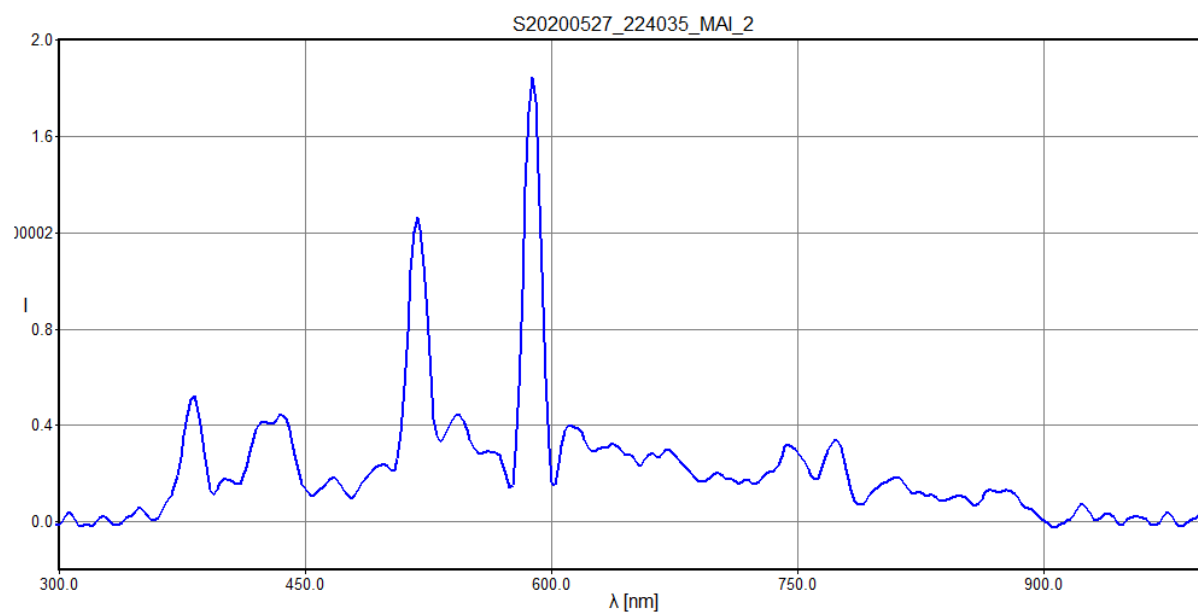
polynom for fit lambda c: [4.0631 -667.2294]

pixel	lambda	fit	error
164.19,	0.00,	-0.11,	-0.1095
291.81,	517.50,	518.42,	0.9230
308.98,	589.00,	588.19,	-0.8136

rms_x = 0.7132

spectrum out\r_add42cal.dat saved





M20200602_004607_MAI_2, spo, -2.0m



Pixel	lambda	fit	error
319.97	0.00	-0.00	-0.00
451.52	517.50	517.50	0.00

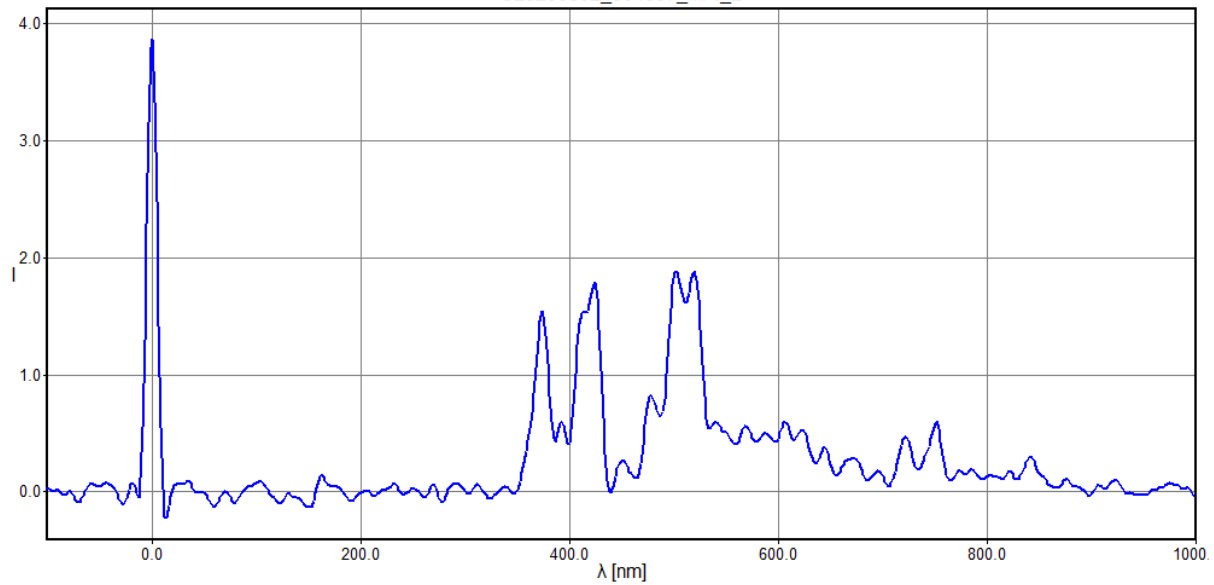
polynom degree: 1

polynom for fit lambda c: [3.9339 -1258.7189]

rms_x = 0.0000

spectrum C:/Daten/Python/200602/r_add11cal.dat saved

S20200602_004607_MAI_2



no Na I line visible! calibration doubtful

M20200624_000237_MAI_2, spo, -2.0m



With bobdoubler

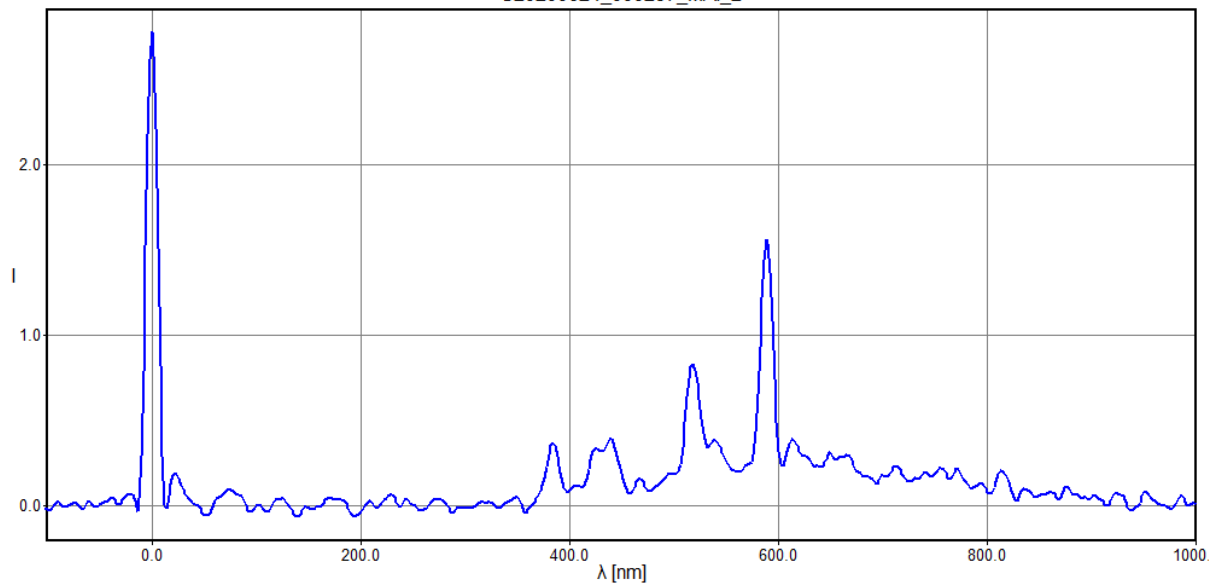
polynom for fit lambda c: [4.0614 -1133.6602]

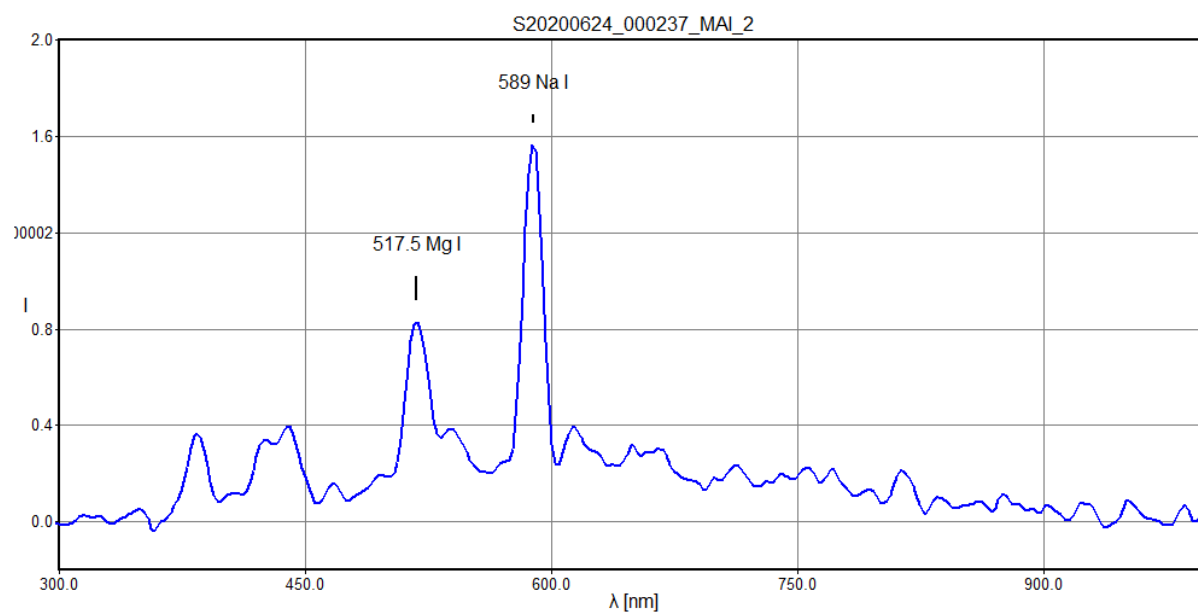
pixel	lambda	fit	error
279.11,	0.00,	-0.08,	-0.0786
406.71,	517.50,	518.16,	0.6580
424.01,	589.00,	588.42,	-0.5795

rms_x = 0.5083

spectrum C:/Daten/Python/200624\r_add38cal.dat saved

S20200624_000237_MAI_2





M20200625_212924_MAI_2, spo, -3.8m



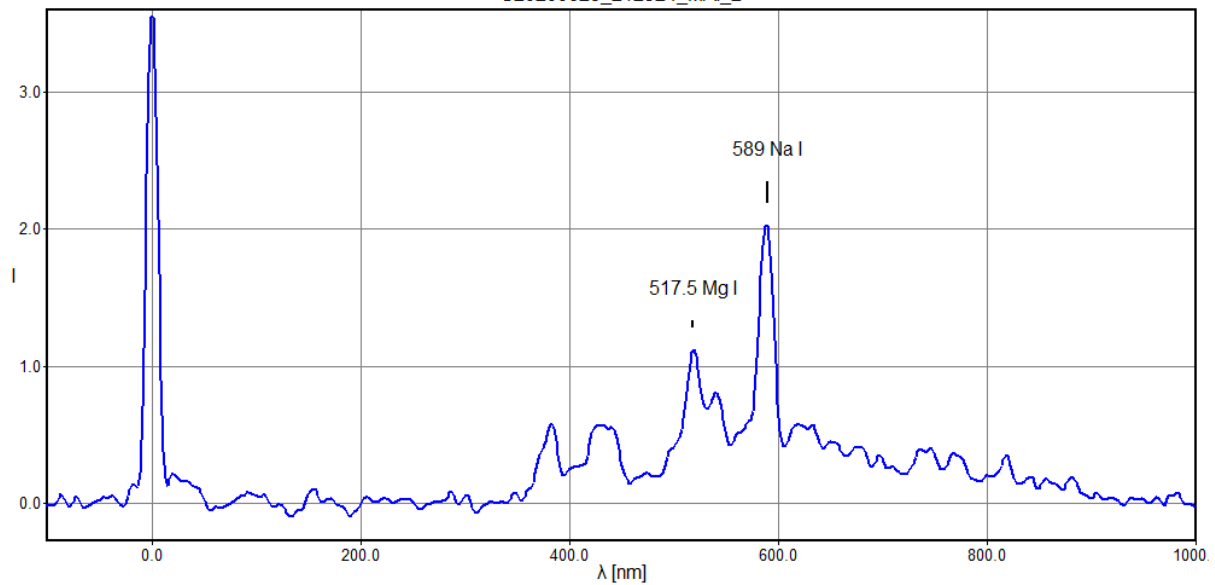
polynom for fit lambda c: [4.0631 -708.8254]

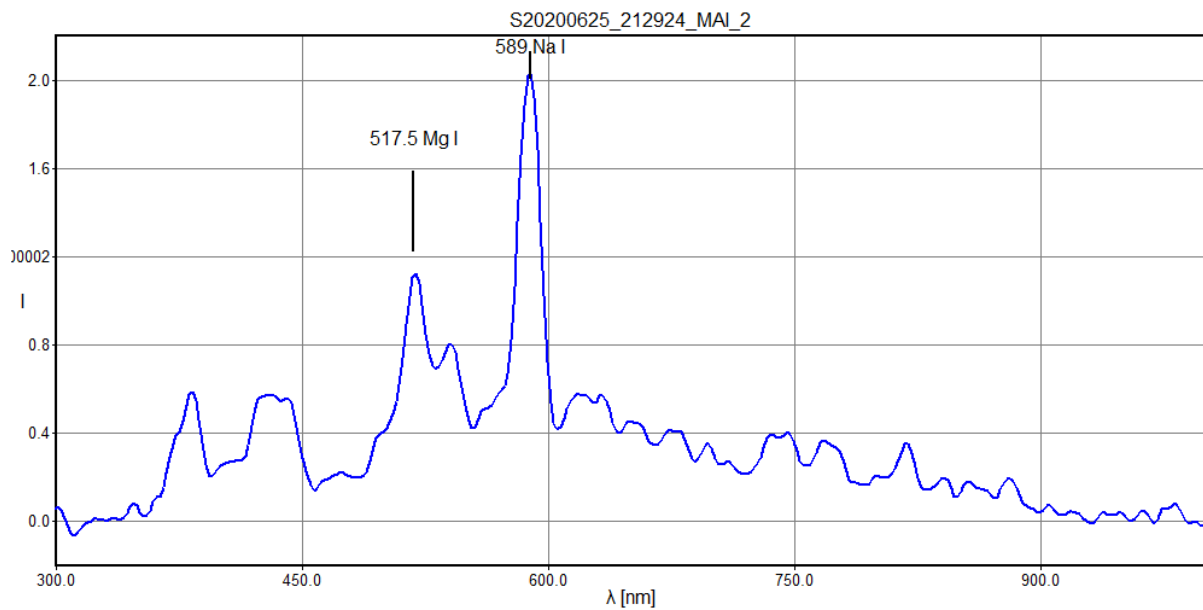
pixel	lambda	fit	error
174.42,	0.00,	-0.15,	-0.1466
302.13,	517.50,	518.75,	1.2467
319.15,	589.00,	587.90,	-1.1001

rms_x = 0.9636

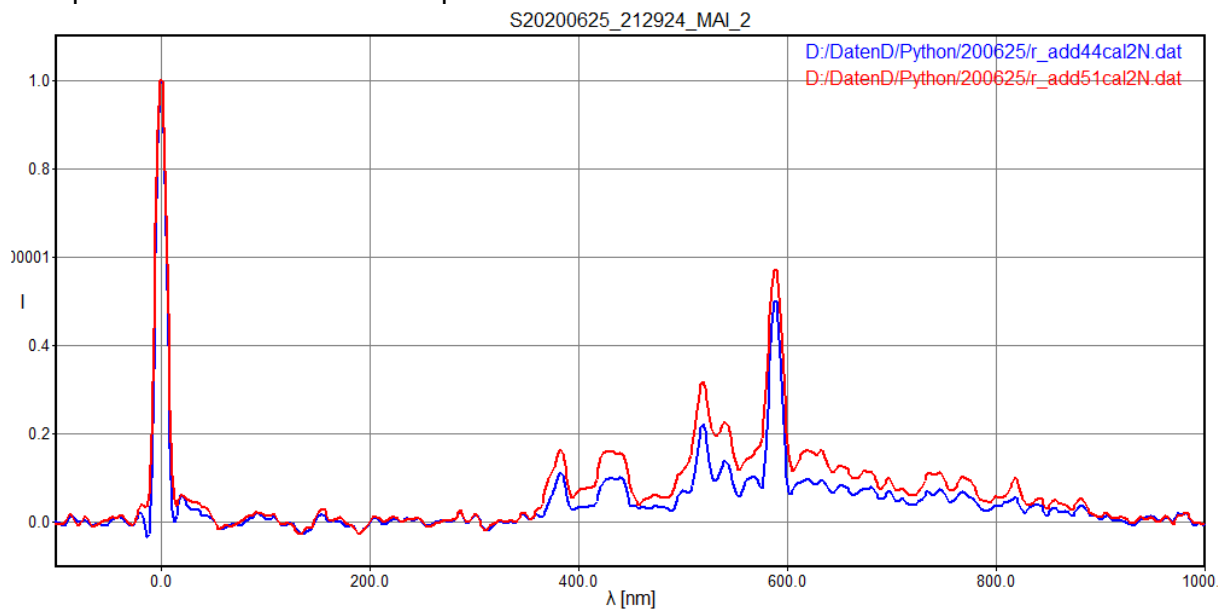
spectrum C:/Daten/Python/200624\r_add51cal.dat saved

S20200625_212924_MAI_2





Comparison with non-saturated spectrum:



Red: spectrum of all meteor spectra added.

Blue: only non-saturated spectra added

Both normalized to zero order peak

M20200721_020740_MAI_2, CAP, -3.8m



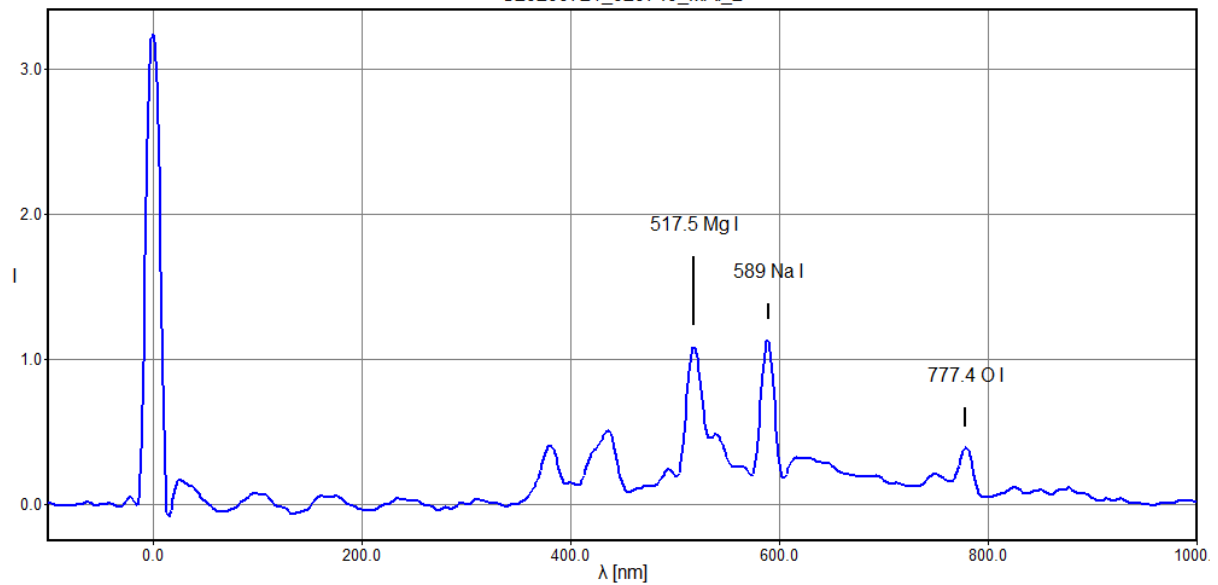
polynom for fit lambda c: [4.4278e-04 3.8046e+00 -8.9080e+02]

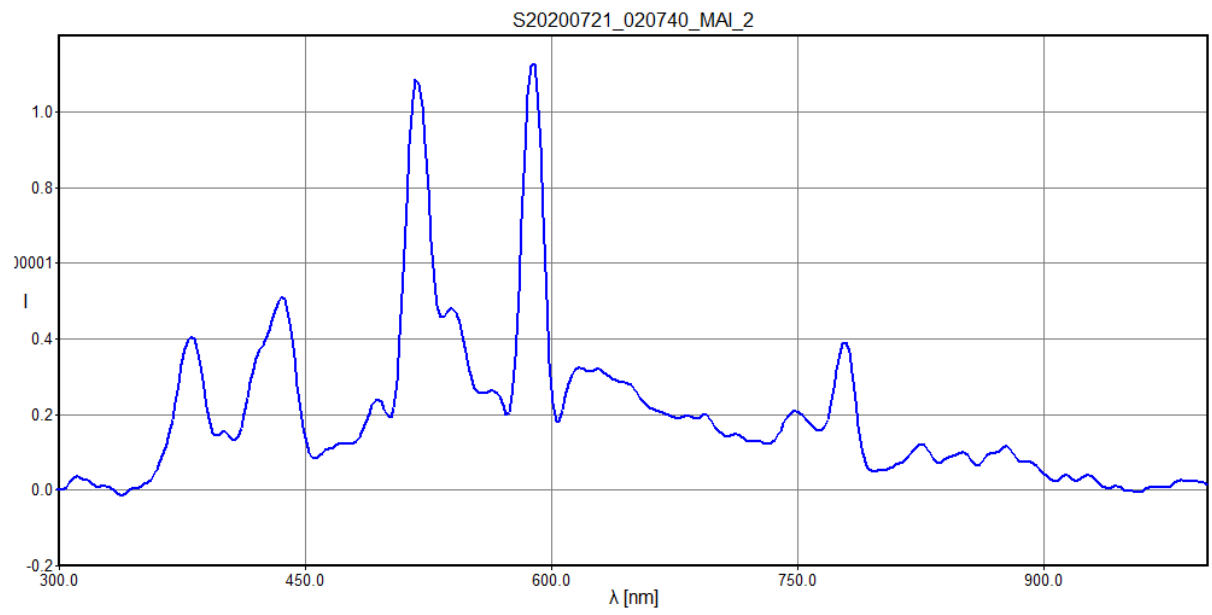
pixel	lambda	fit	error
228.08,	0.00,	-0.02,	-0.0170
355.56,	517.50,	517.94,	0.4378
372.65,	589.00,	588.47,	-0.5311
418.15,	777.40,	777.51,	0.1103

rms_x = 0.3486

spectrum D:/DatenD/Python/200721/r_add67cal.dat saved

S20200721_020740_MAI_2





M20200730_231942_MAI_2, CAP, -2.8

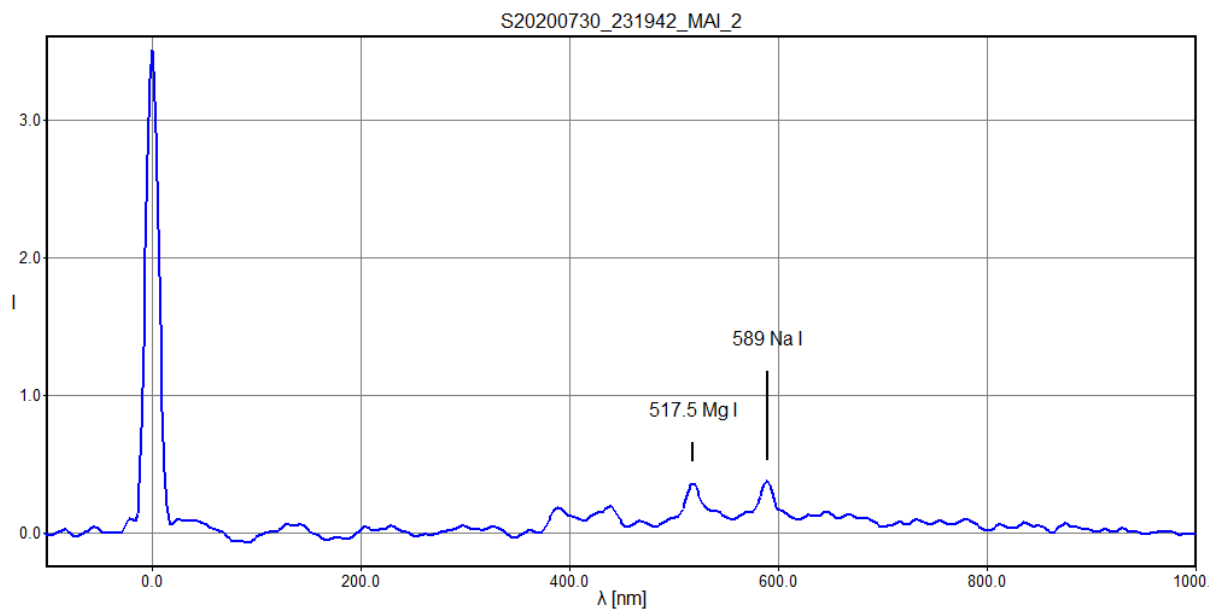


polynom for fit lambda c: [4.0781 -1473.3731]

pixel	lambda	fit	error
361.28,	0.00,	-0.03,	-0.0321
488.25,	517.50,	517.77,	0.2661
505.66,	589.00,	588.77,	-0.2340

rms_x = 0.2054

spectrum D:/DatenD/Python/200730/r_add26cal.dat saved



M20200731_025311_MAI_2, PER, -4.5m



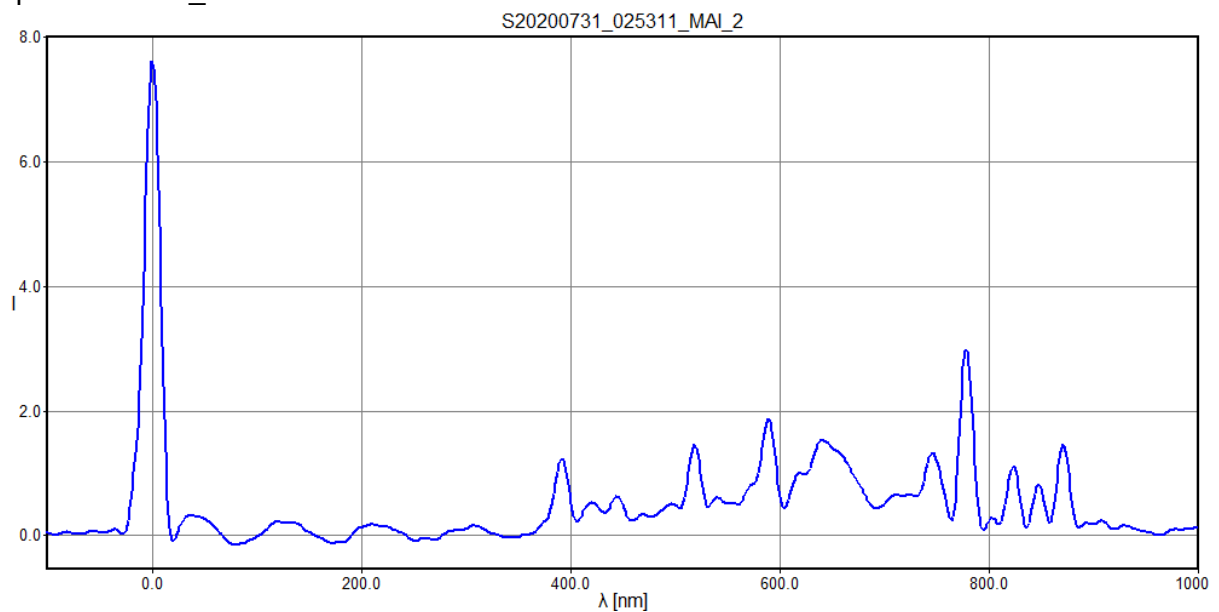
Pixel	lambda	fit	error
150.14	0.00	-0.01	-0.01
277.34	517.50	517.73	0.23
294.63	589.00	588.72	-0.28
340.43	777.40	777.46	0.06

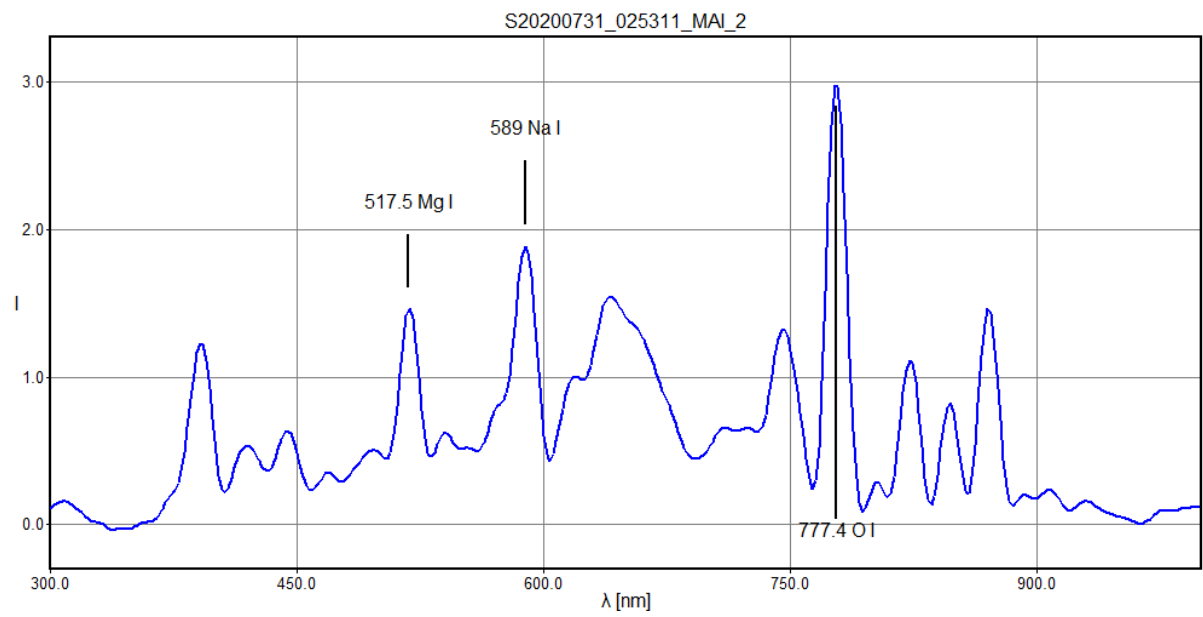
polynom degree: 2

polynom for fit lambda c: [2.4414e-04 3.9659e+00 -6.0096e+02]

rms_x = 0.1852

spectrum out\r_add14cal.dat saved





M20200731_204910_MAI_2, CAP, -5.5m



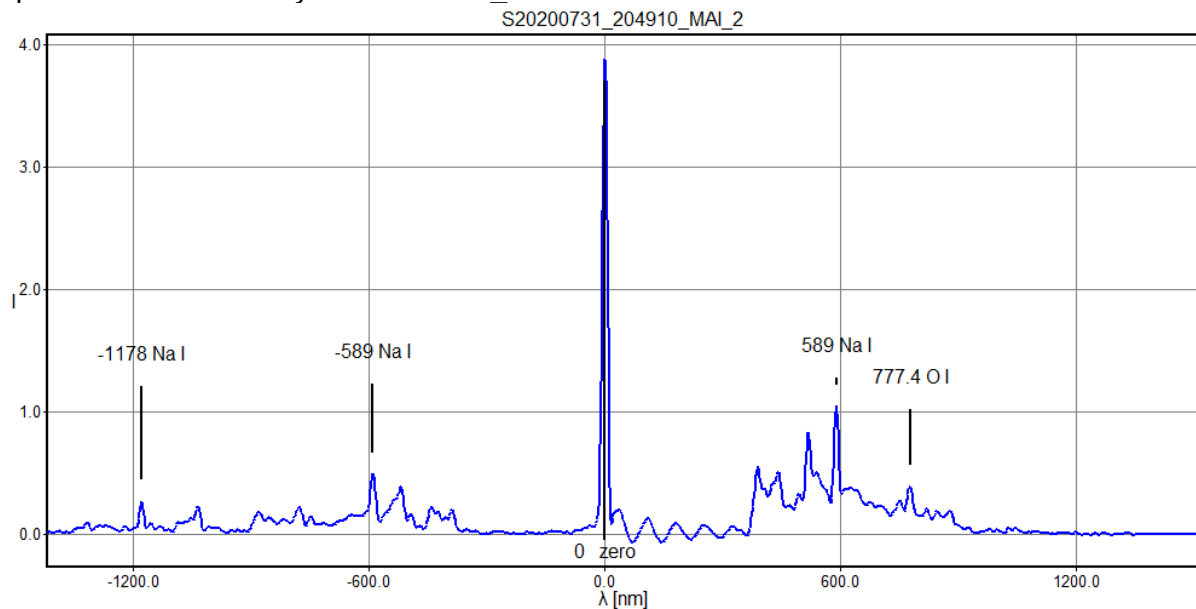
Pixel	lambda	fit	error
59.08	-1178.00	-1177.55	0.45
94.05	-1035.00	-1034.76	0.24
157.04	-777.40	-777.59	-0.19
203.17	-589.00	-589.28	-0.28
220.44	-517.50	-518.79	-1.29
347.79	0.00	0.93	0.93
474.71	517.50	518.72	1.22
491.94	589.00	589.00	-0.00
537.87	777.40	776.32	-1.08

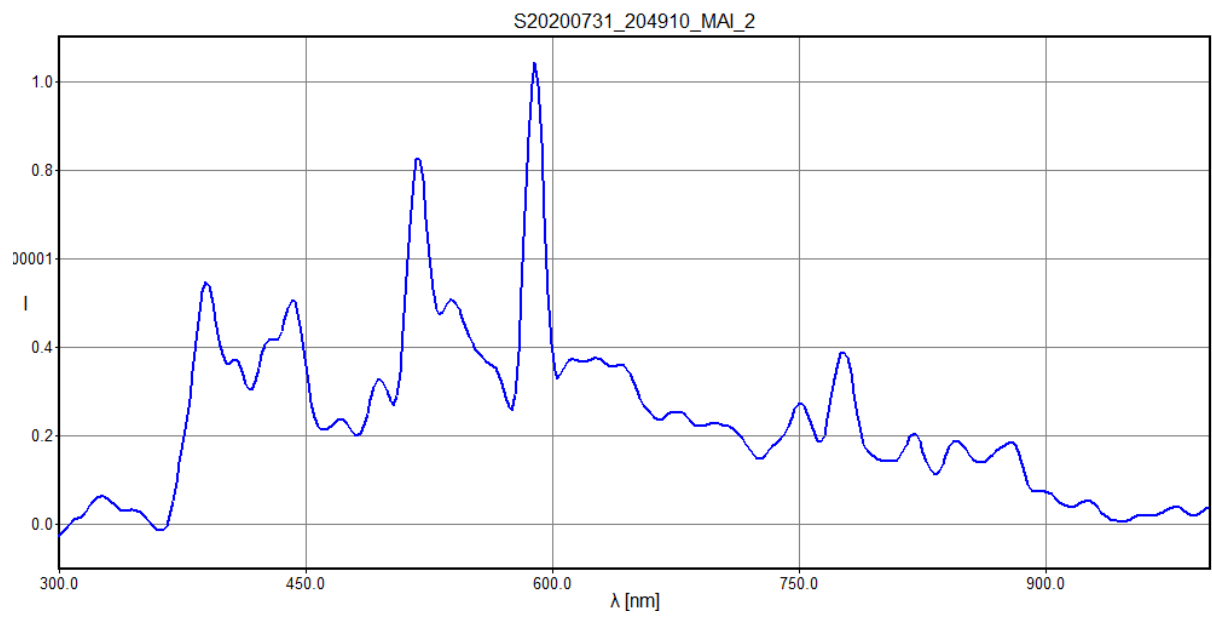
polynom degree: 2

polynom for fit lambda c: [-5.3540e-06 4.0841e+00 -1.4188e+03]

rms_x = 0.7844

spectrum D:\DatenD\Python\200731\r_add39cal.dat saved





M20200801_013444_MAI_2, BPI, -3.1m



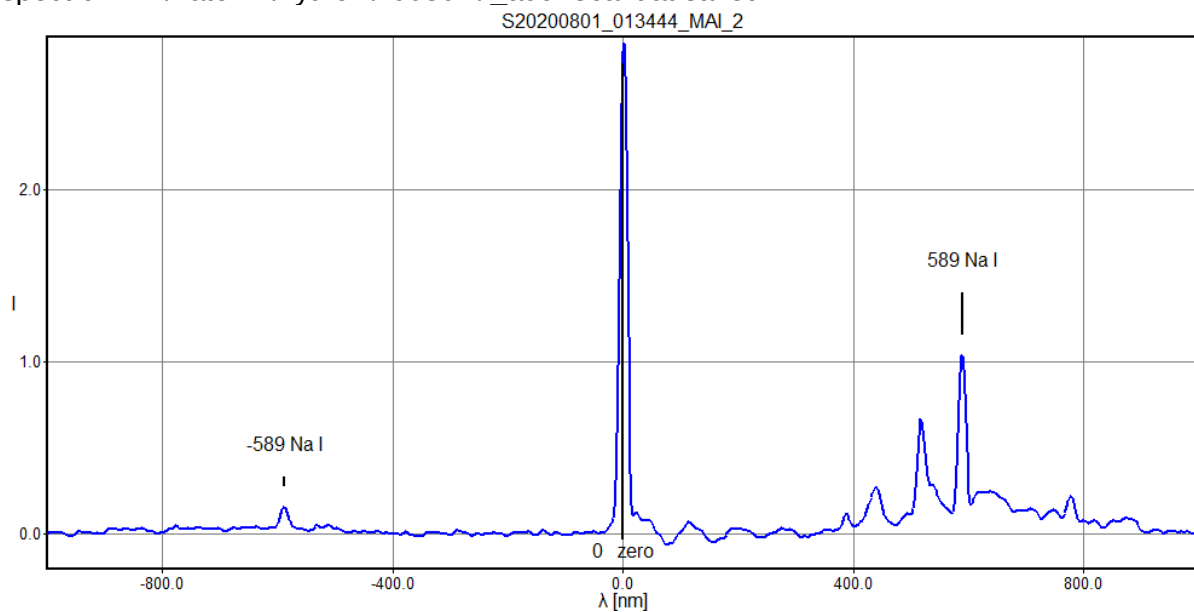
Pixel	lambda	fit	error
205.67	-589.00	-589.05	-0.05
350.42	0.00	0.17	0.17
477.15	517.50	517.93	0.43
494.29	589.00	588.10	-0.90
540.58	777.40	777.75	0.35

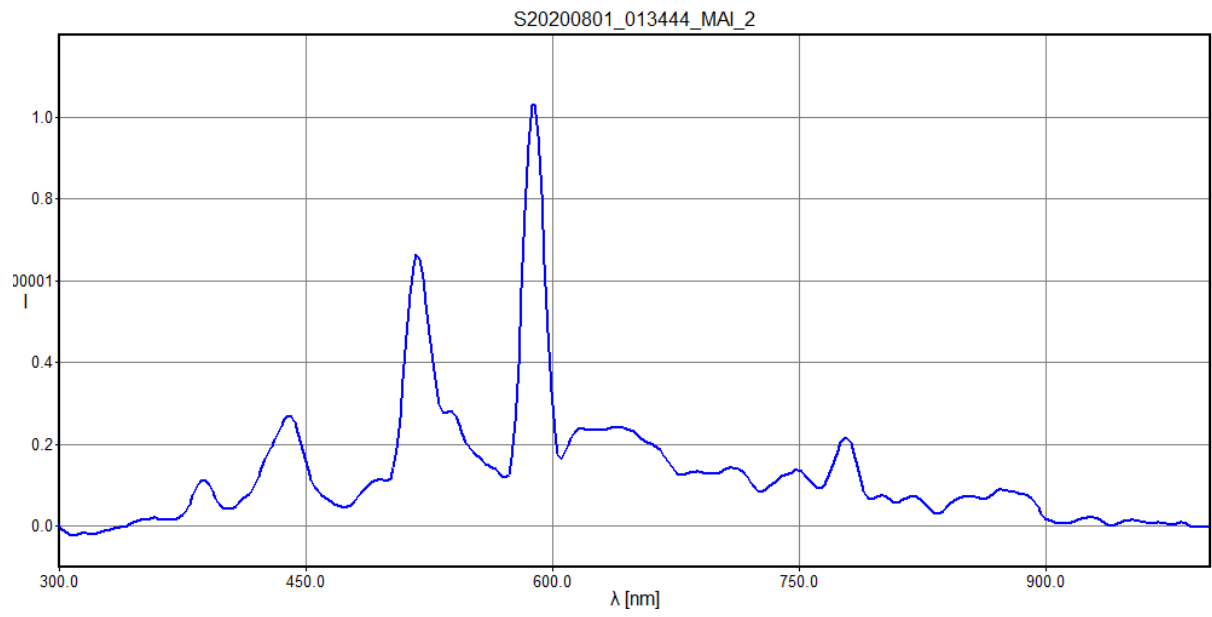
polynom degree: 2

polynom for fit lambda c: [5.5348e-05 4.0398e+00 -1.4223e+03]

rms_x = 0.4808

spectrum D:\DatenD\Python\200801r_add25cal.dat saved





M20200809_024634_MAI_2, PER, -3.1m



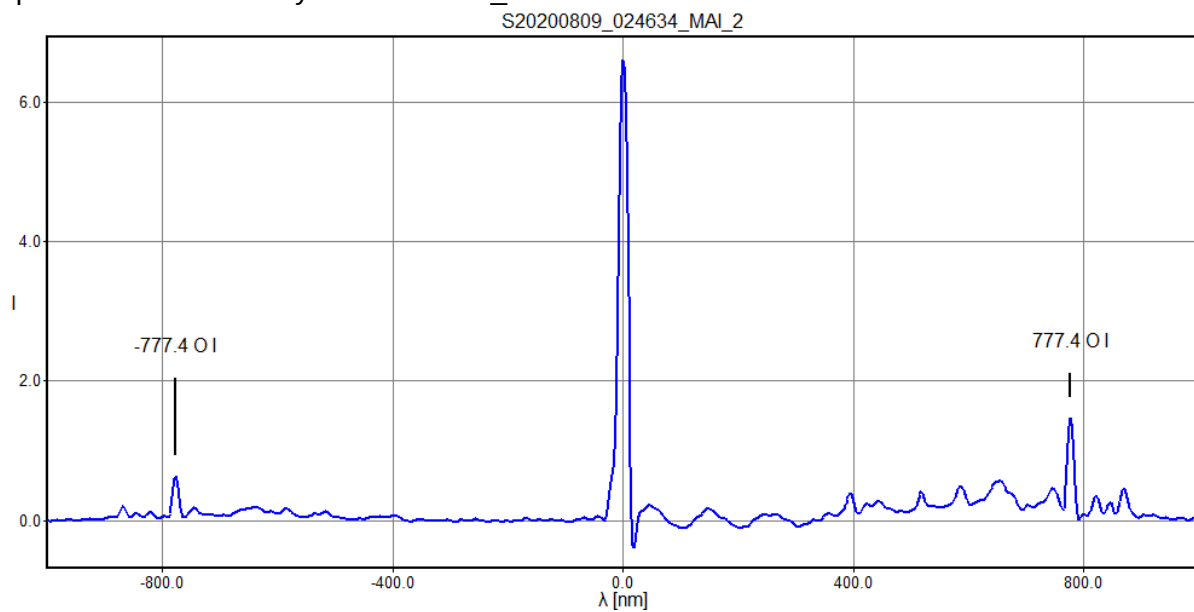
Pixel	lambda	fit	error
58.19	-777.40	-777.36	0.04
248.88	0.00	-0.20	-0.20
376.16	517.50	517.85	0.35
439.93	777.40	777.20	-0.20

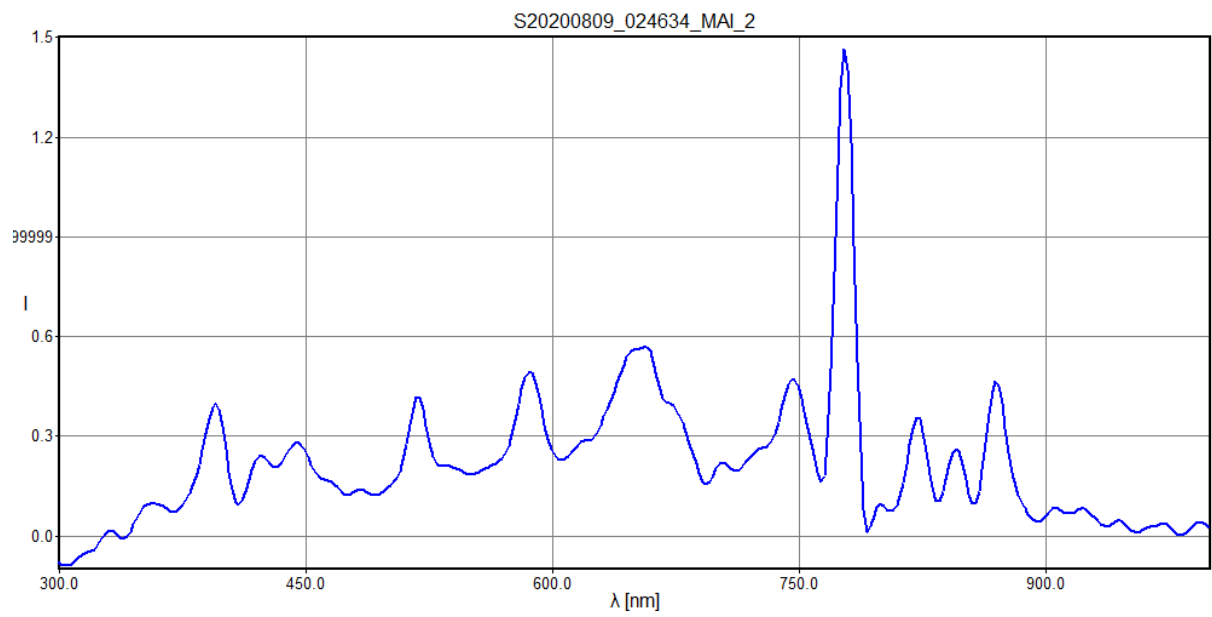
polynom degree: 2

polynom for fit lambda c: [-1.6865e-05 4.0807e+00 -1.0148e+03]

rms_x = 0.2261

spectrum D:\DatenD\Python\200809\r_add29cal.dat saved





M20200809_230019_MAI_2, PER, -3.6m



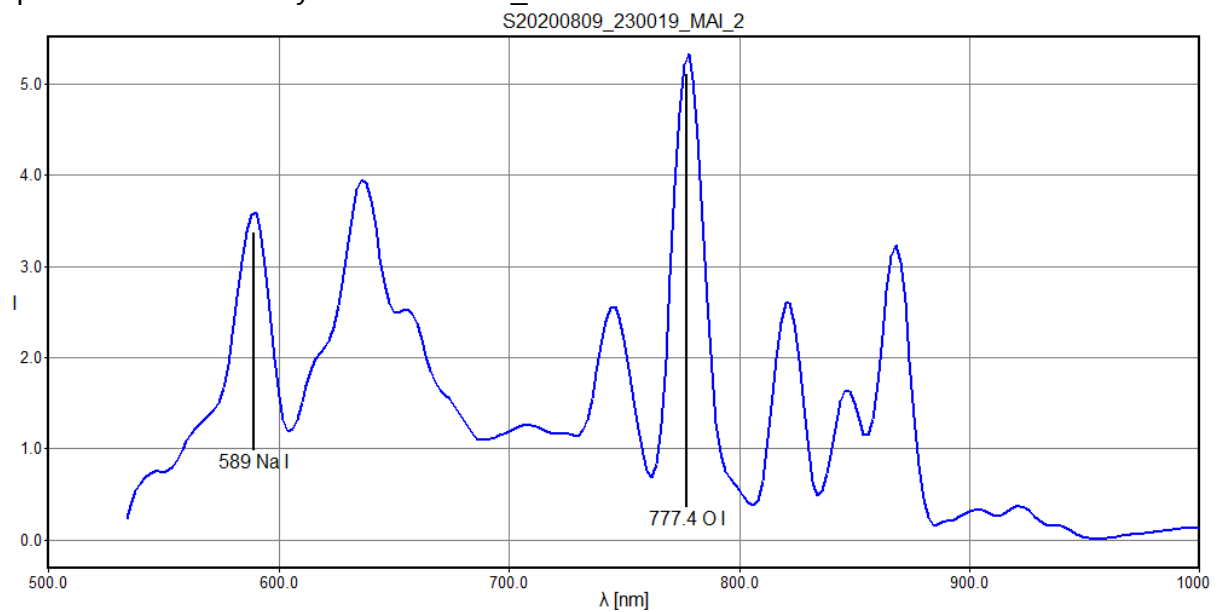
Pixel	lambda	fit	error
13.51	589.00	589.00	-0.00
59.29	777.40	777.40	-0.00

polynom degree: 1

polynom for fit lambda c: [4.1153 533.4018]

rms_x = 0.0000

spectrum D:\DatenD\Python\200809\rrr_add11cal.dat saved



M20200810_030222_MAI_2, spo, -3.8



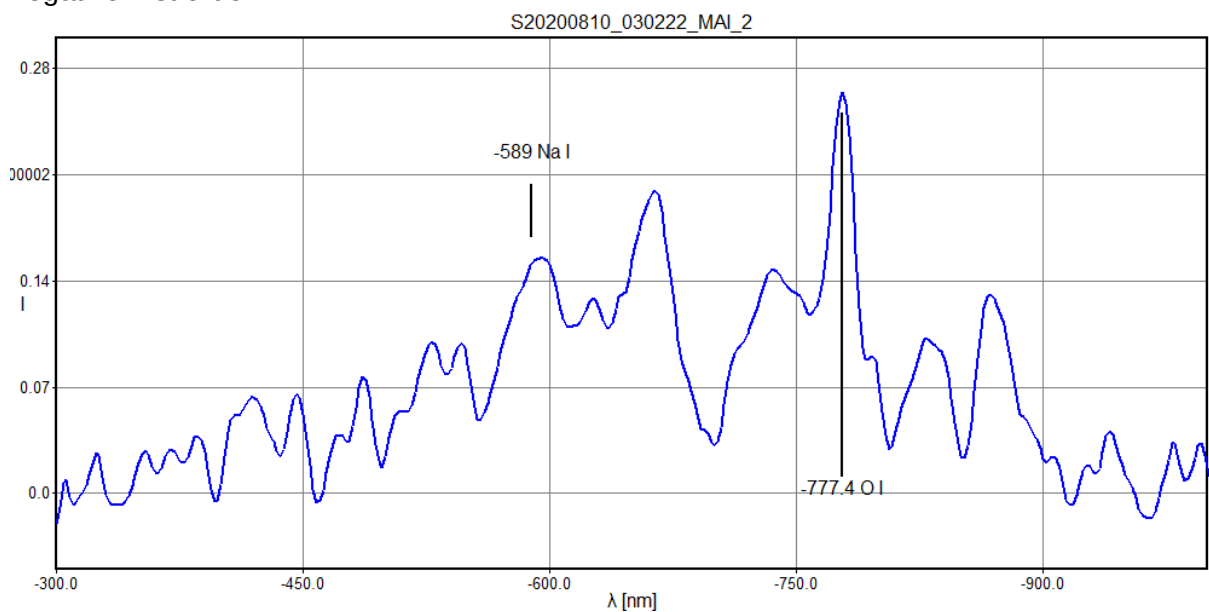
polynom for fit lambda c: [4.1113 -2311.1914]

pixel	lambda	fit	error
373.07,	-777.40,	-777.40,	0.0000
562.16,	0.00,	0.00,	0.0000

rms_x = 0.0000

spectrum D:\DatenD\Python\200810\r_add8cal.dat saved

negative first order:

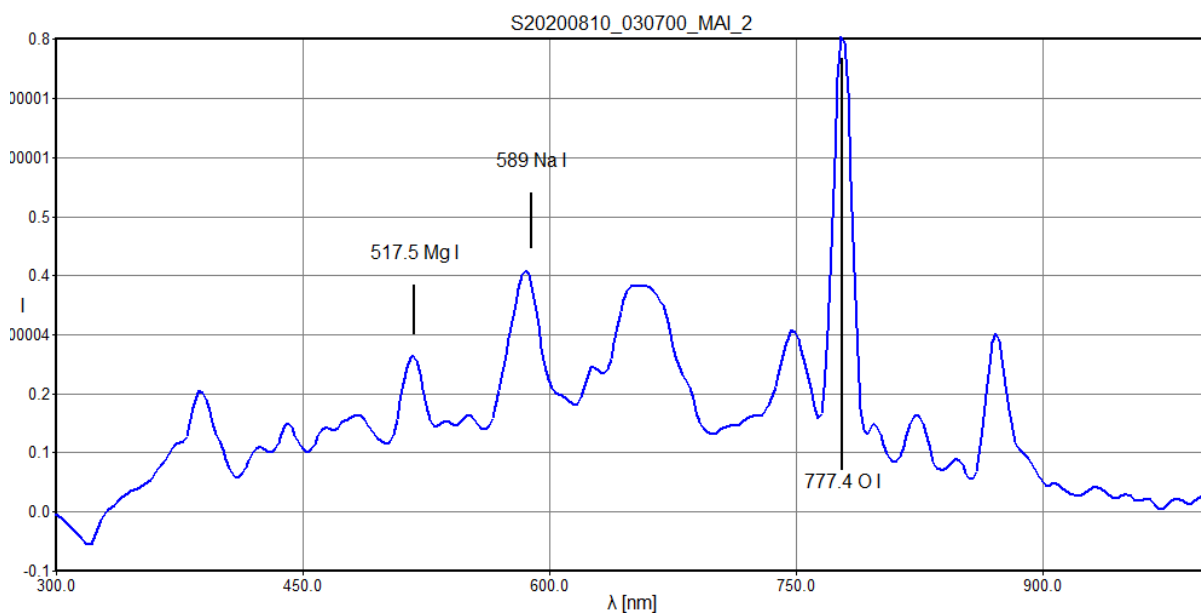


M20200810_030700_MAI_2, PER, -2.9



Pixel	lambda	fit	error
123.15	-777.40	-777.40	0.00
314.00	0.00	0.00	0.00
504.38	777.40	777.40	-0.00

polynom degree: 2
polynom for fit lambda c: [2.6378e-05 4.0618e+00 -1.2780e+03]
rms_x = 0.0000
spectrum D:\DatenD\Python\200810\r_add12cal.dat saved



M20200827_021543_MAI_2, PER, -3.4m

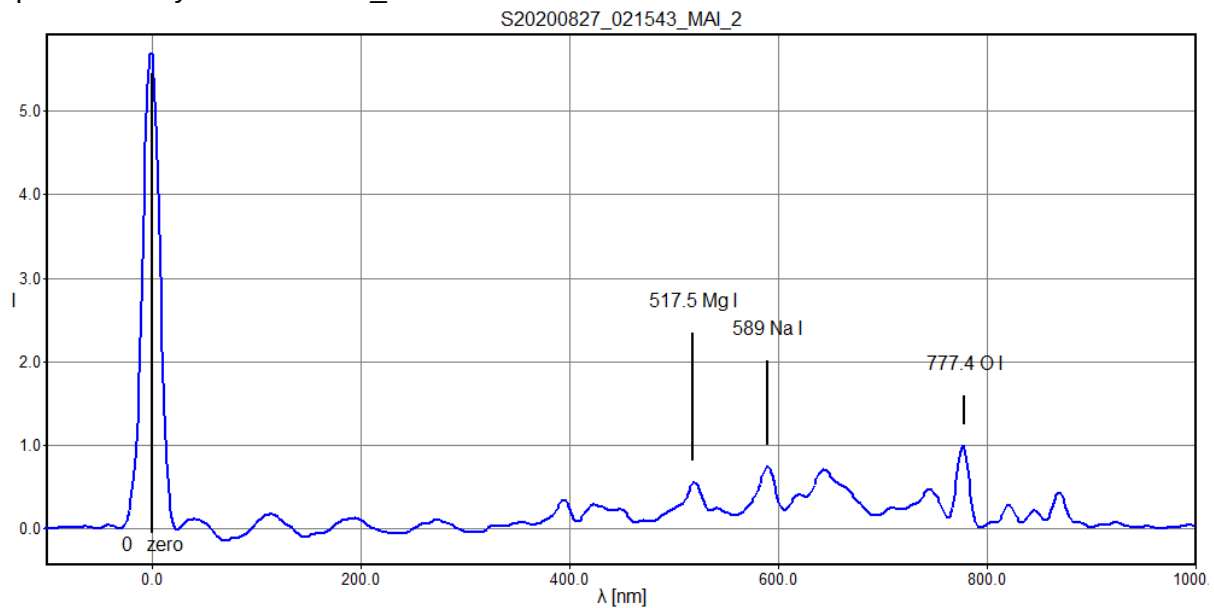


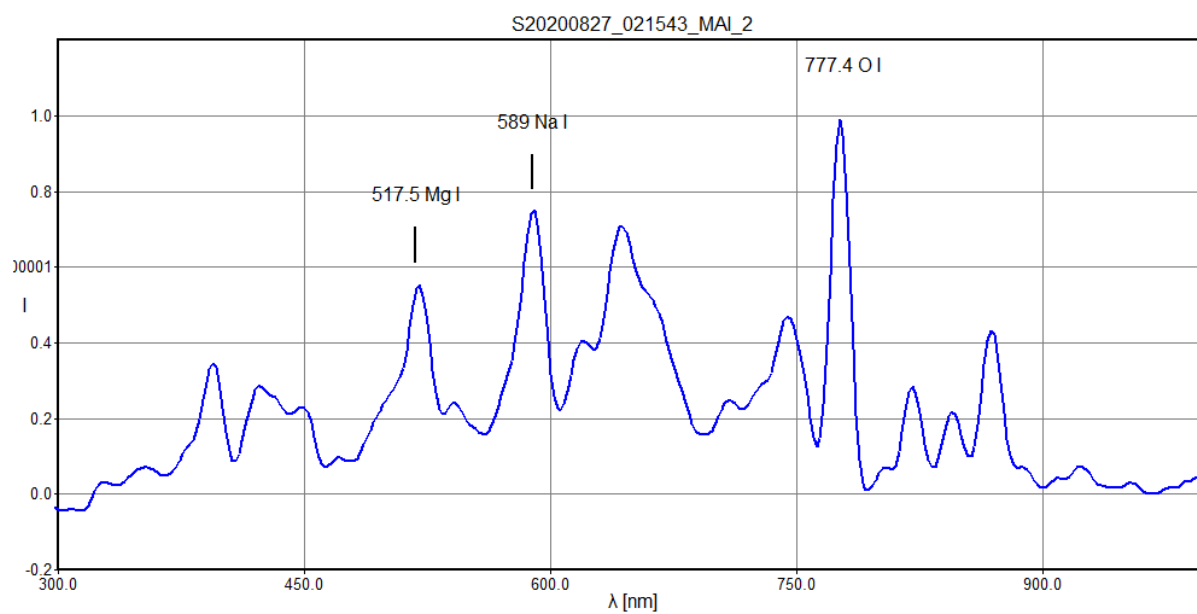
spectrum C:/Daten/Python/m_spec921git/out/r_add13cal.dat saved
polynom for fit lambda c: [2.3358e-04 3.9819e+00 -4.1977e+02]

pixel	lambda	fit	error
104.77,	0.00,	-0.02,	-0.0213
232.35,	517.50,	518.04,	0.5418
249.52,	589.00,	588.34,	-0.6556
295.56,	777.40,	777.54,	0.1351

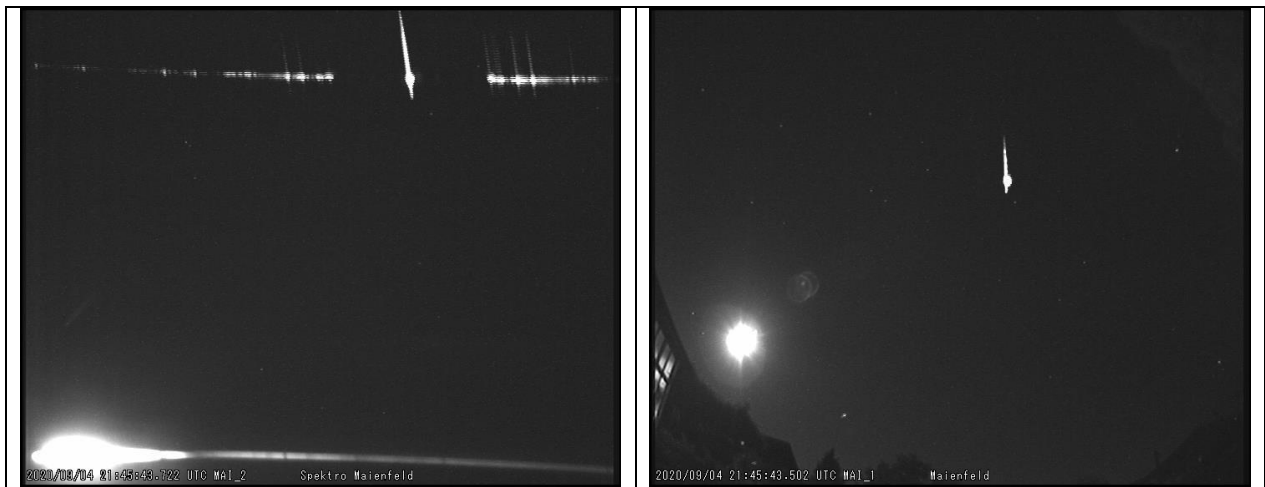
rms_x = 0.4307

spectrum ..\Python\200827\r_add12cal.dat saved





M20200904_214543_MAI_2, KCY, -3.7m



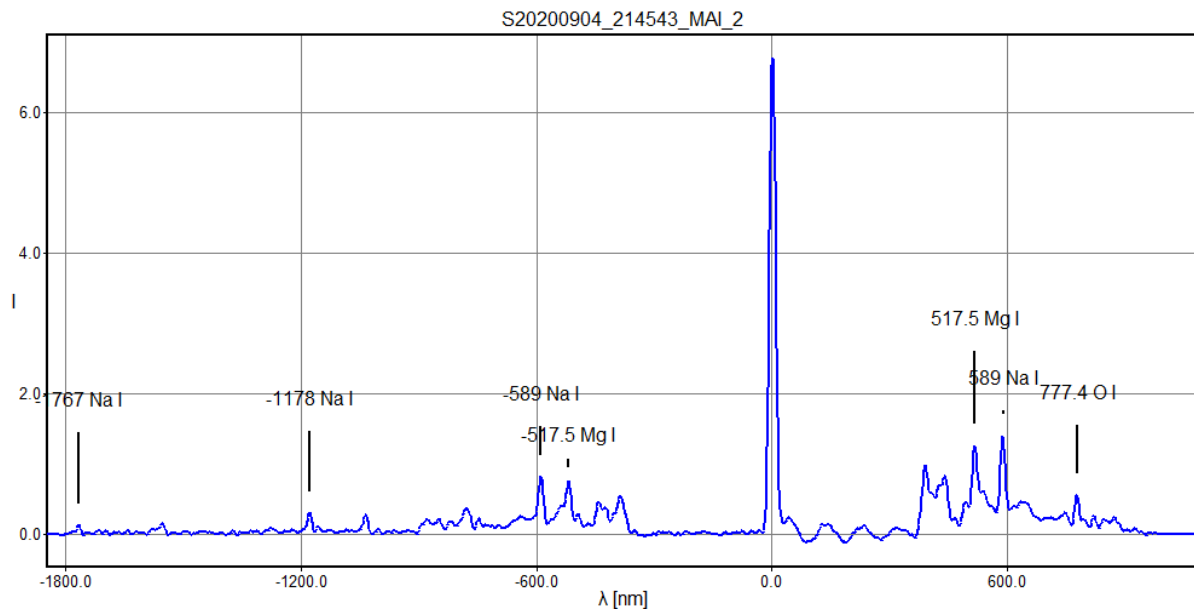
polynom for fit lambda c: [1.5909e-05 4.0729e+00 -1.8475e+03]

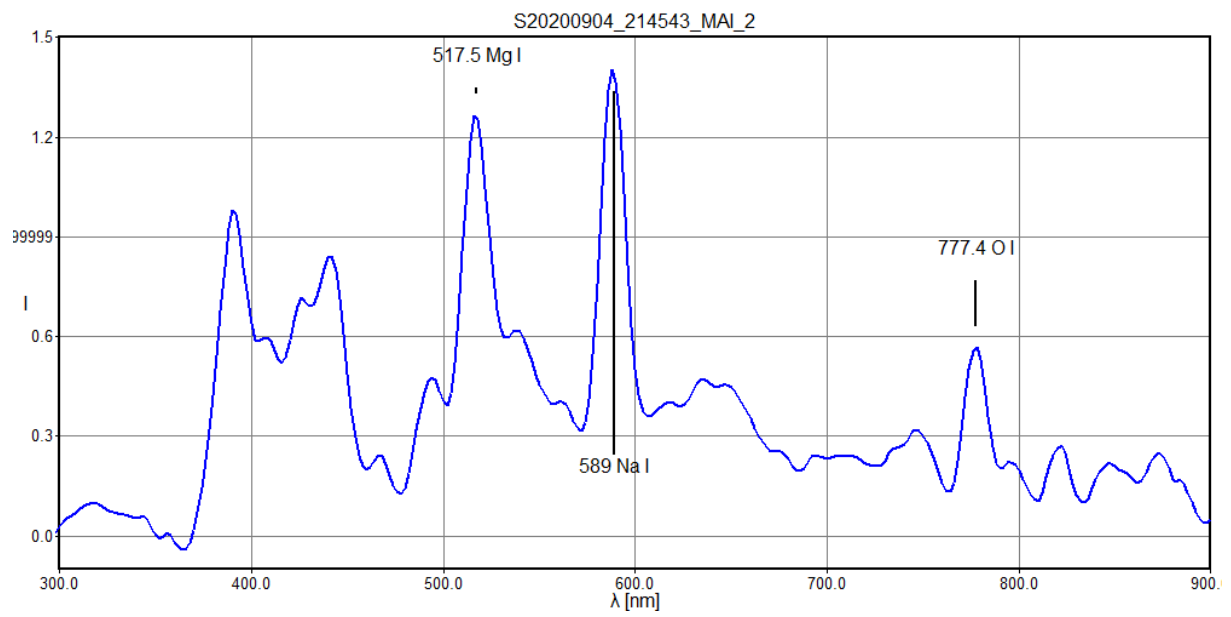
pixel	lambda	fit	error
164.14,	-1178.00,	-1178.54,	-0.5422
19.90,	-1767.00,	-1766.44,	0.5642
199.13,	-1035.00,	-1035.83,	-0.8302
308.83,	-589.00,	-588.15,	0.8505
325.94,	-517.50,	-518.29,	-0.7899
453.19,	0.00,	1.56,	1.5605
579.25,	517.50,	517.06,	-0.4426
596.70,	589.00,	588.46,	-0.5445
642.91,	777.40,	777.57,	0.1742

rms_x = 0.7893

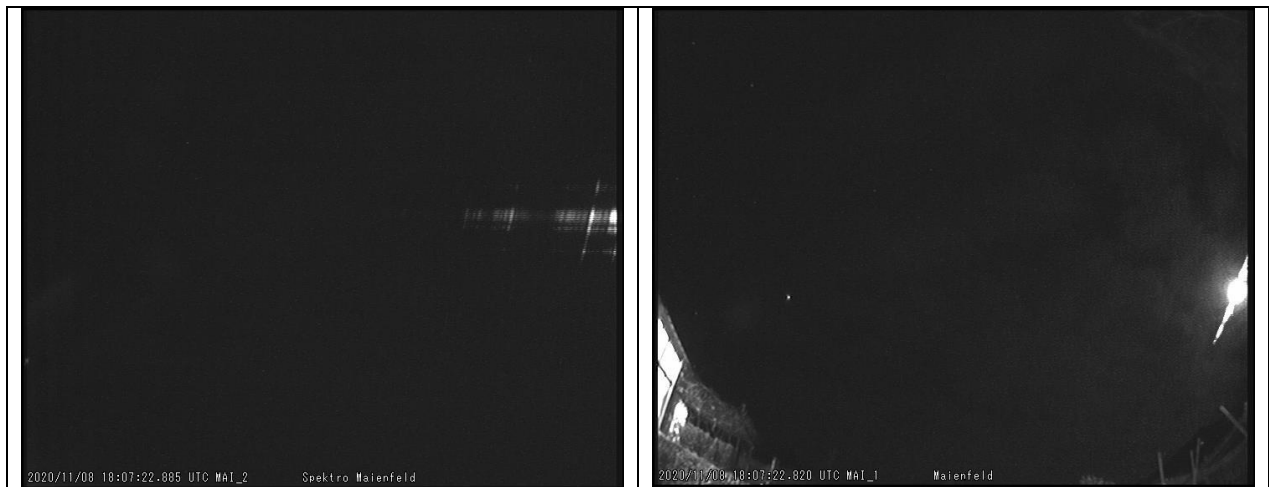
spectrum ..\Python\200904\r_add38cal.dat

saved





M20201108_180722_MAI_2, spo, -4.6m



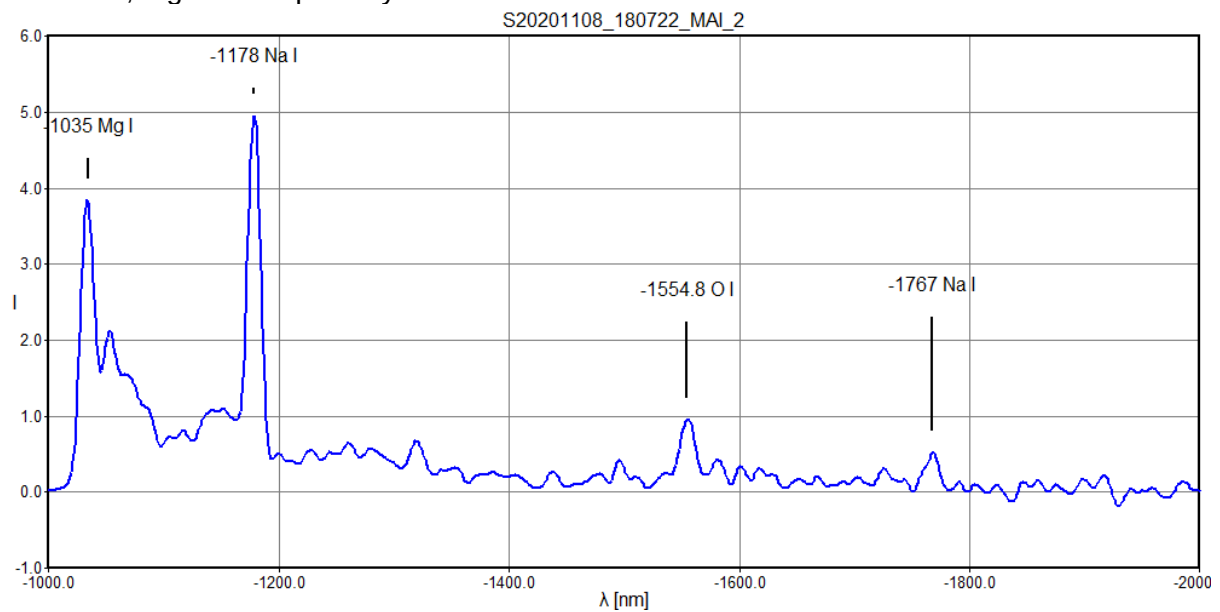
polynom for fit lambda c: [8.0517e-04 3.1416e+00 -3.6388e+03]

pixel	lambda	fit	error
668.70	-1178.00	-1178.00	0.0000
577.80	-1554.80	-1554.80	-0.0000
525.14	-1767.00	-1767.00	-0.0000

rms_x = 0.0000

D:\DatenD\Python\201108\r_add7cal.dat saved

-2nd order, Mg I cut off partially:



M20201121_022830_MAI_2, Leo, -3.2m

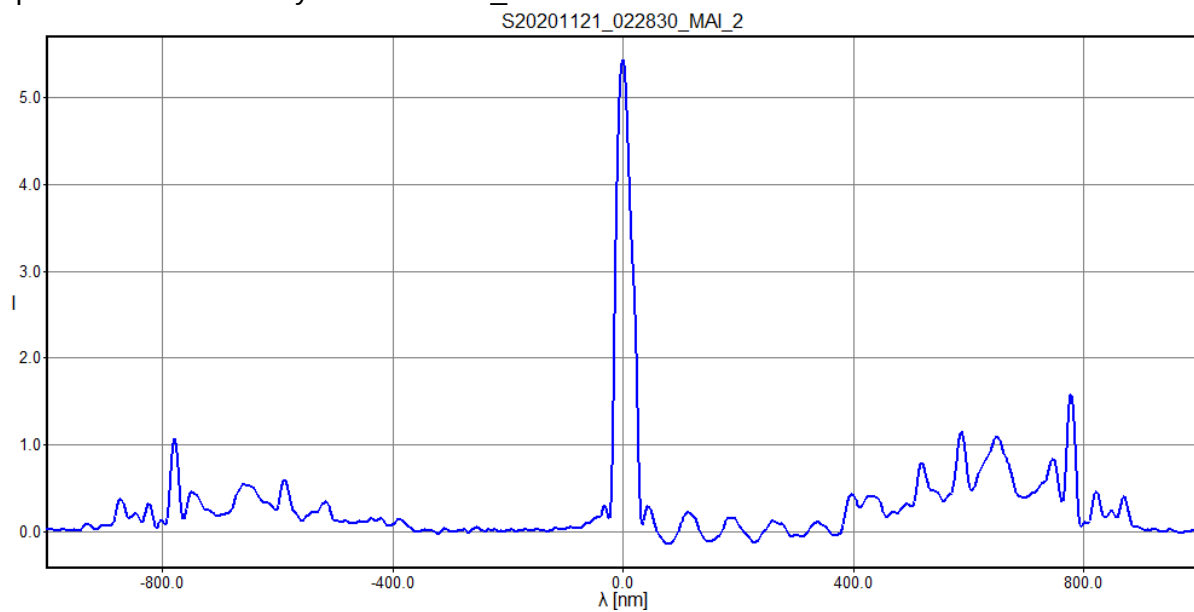


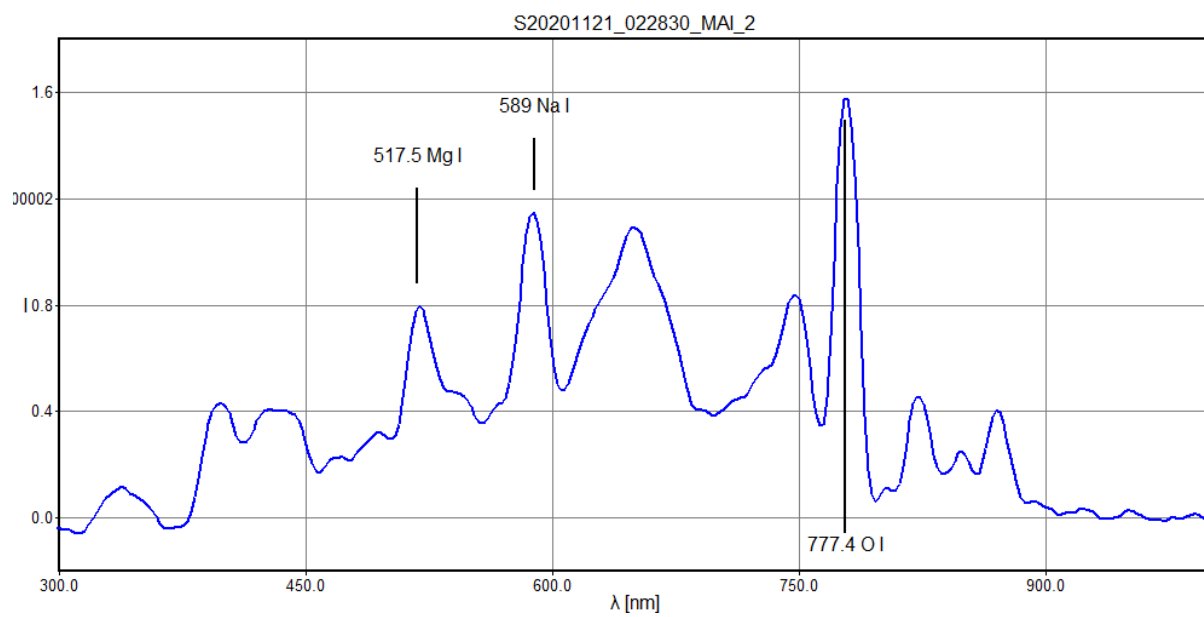
polynom for fit lambda c: [-1.2064e-04 4.2009e+00 -1.6624e+03]

pixel	lambda	fit	error
211.67,	-777.40,	-778.56,	-1.1559
257.79,	-589.00,	-587.42,	1.5797
400.27,	0.00,	-0.18,	-0.1806
544.15,	589.00,	587.86,	-1.1412
591.01,	777.40,	778.30,	0.8980

rms_x = 1.0930

spectrum D:\DatenD\Python\201121\r_add37cal.dat saved





M20201227_032647_MAI_2, Com, -3.7m

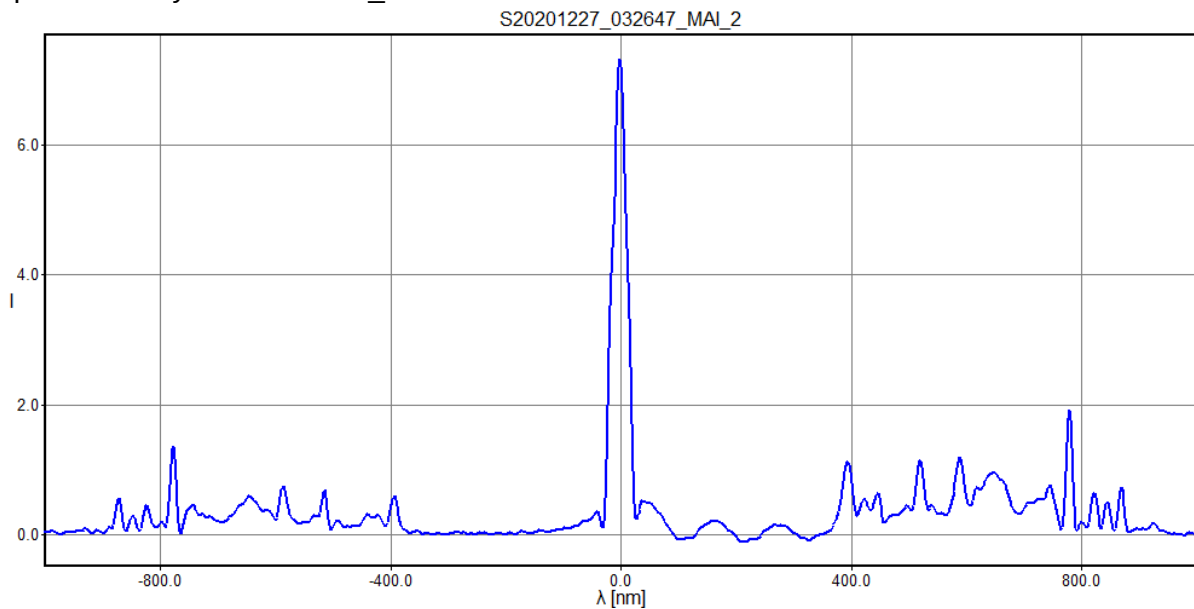


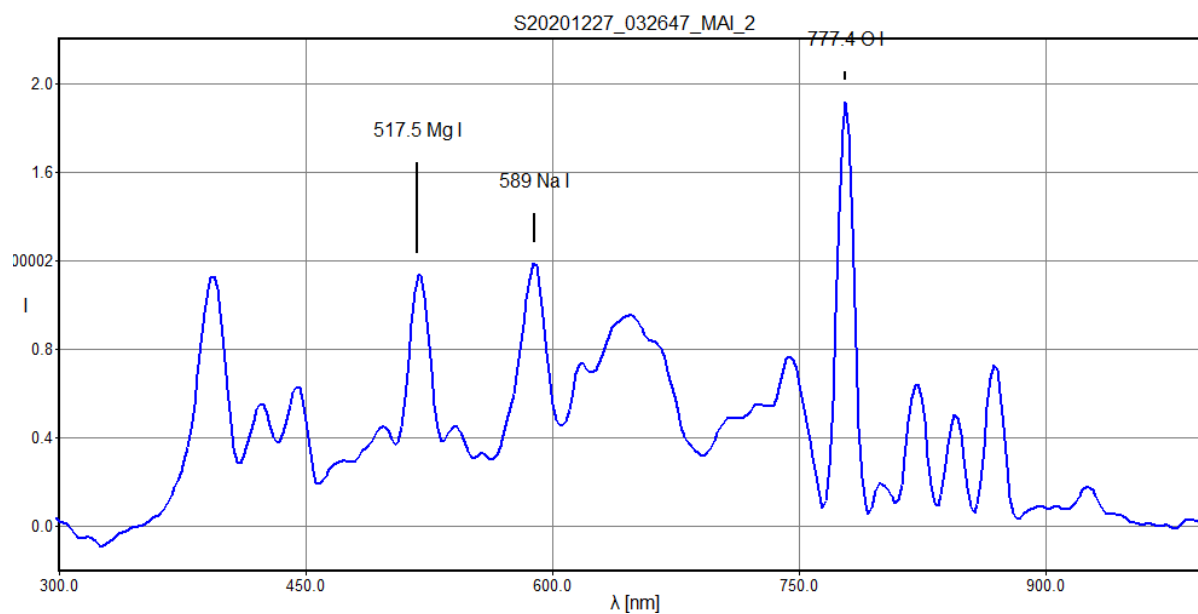
polynom for fit lambda c: [-6.9163e-05 4.1218e+00 -1.1337e+03]

pixel	lambda	fit	error
86.11,	-777.40,	-779.29,	-1.8856
133.01,	-589.00,	-586.68,	2.3182
150.08,	-517.50,	-516.66,	0.8439
275.83,	0.00,	-2.04,	-2.0381
403.70,	517.50,	519.01,	1.5127
420.76,	589.00,	588.36,	-0.6414
467.29,	777.40,	777.29,	-0.1097

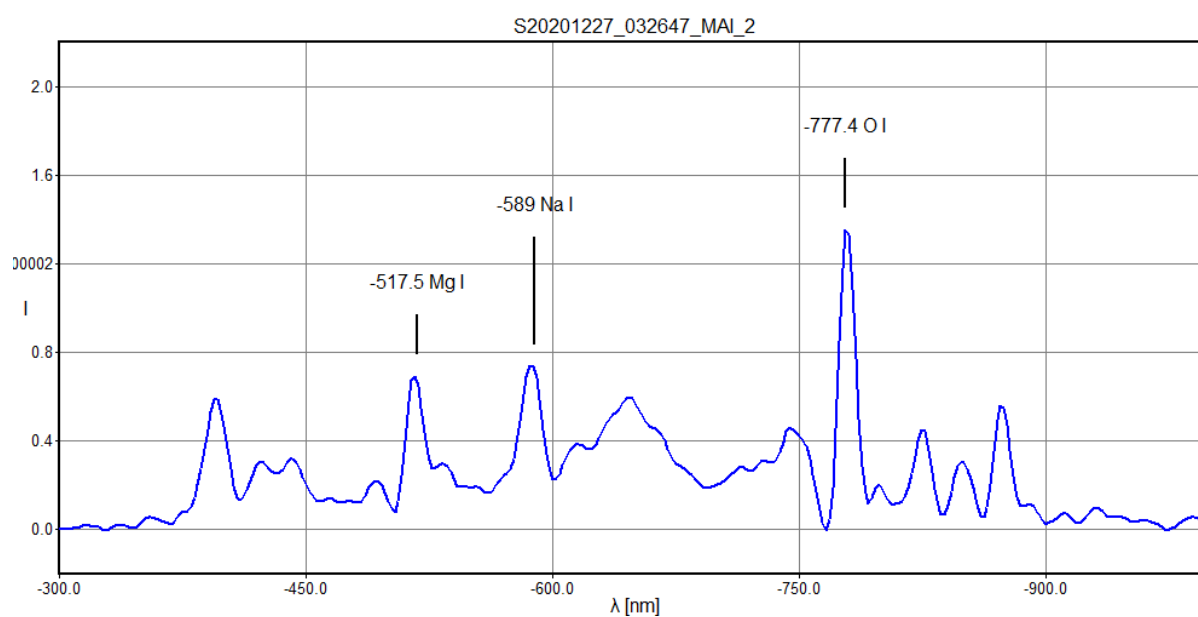
rms_x = 1.5357

spectrum ..\Python\201227\r_add13cal.dat saved





First order



Negative first order

Meteor spectral lines

Table 3-7: List of spectral lines frequently found in meteor spectra and their relative intensities. The identification of the lines (numbers) in our example is also given. Lines marked with an asterisk appear in spectra of fast meteors, such as the Perseids, but much fainter in spectra of slow meteors.

Laboratory data			ident. number	Laboratory data			ident. number
$\lambda_{\text{lab}}, [\text{\AA}]$	atom/ion	intensity		$\lambda_{\text{lab}}, [\text{\AA}]$	atom/ion	intensity	
3719.9	Fe	10	2	4923.9	Fe ⁺	2*	
3734.9	Fe	8		4957.6	Fe	4	
3737.1	Fe	9	3	5012.1	Fe	1	
3745.6	Fe	8		5018.4	Fe ⁺	3*	
3749.5	Fe	8		5110.4	Fe	1	
3820.4	Fe	9		5167.3	Mg	17	
3825.9	Fe	8		5172.7	Mg	25	
3829.4	Mg	10		5183.6	Mg	28	
3832.3	Mg	11		5208.4	Cr	10	
3838.3	Mg	12		5227.2	Fe	5	
3859.9	Fe	11		5269.5	Fe	14	
3886.3	Fe	9		5328.0	Fe	12	
3933.7	Ca ⁺	40*	8	5371.5	Fe	9	
3968.5	Ca ⁺	35*	9	5397.1	Fe	5	
4030.8	Mn	10		5405.8	Fe	6	
4045.8	Fe	10		5429.7	Fe	6	
4063.6	Fe	9		5434.5	Fe	4	
4131.0	Si ⁺	1*		5446.9	Fe	4	
4226.7	Ca	11	12	5455.6	Fe	4	
4254.4	Cr	9		5528.4	Mg	2	
4271.8	Fe	10		5615.7	Fe	1	
4274.8	Cr	8		5890.0	Na	40	
4289.7	Cr	7		5895.9	Na	35	
4307.9	Fe	10		6156.8	O	1*	
4325.8	Fe	10		6162.2	Ca	1	
4383.5	Fe	14	15	6347.1	Si ⁺	6*	
4404.8	Fe	11		6371.4	Si ⁺	3*	
4481.2	Mg ⁺	15*		6495.0	Fe	1	
4920.5	Fe	3		6562.9	H	2*	

From: Spectral lines, (IMO Photographic Handbook 03 Spectra, p 47)

<http://www.imo.net/docs/03spectra.pdf>

Another list from Borovicka, 2005

<https://ui.adsabs.harvard.edu/abs/2005Icar..174...15B/abstract>

Free access from:

<https://sci-hub.st/https://doi.org/10.1016/j.icarus.2004.09.011>

Table 1

List of the most important atomic lines used to fit the spectra in the 4200–8500 Å range, ordered according to line groups

λ (Å)	Atom & multiplet	Typical intensity	λ (Å)	Atom & multiplet	Typical intensity
<i>Low temperature lines</i>			<i>Wake lines^a</i>		
4226	Ca I 2	80	4216	Fe I 3	16
4273	Fe I 42	30	4376	Fe I 2	26
4308	Fe I 42	25	4427	Fe I 2	21
4326	Fe I 42	25	4462	Fe I 2	12
4384	Fe I 41	45	4482	Fe I 2	7
4405	Fe I 41	25	4571	Mg I 1	17
4920	Fe I 318	11	5110	Fe I 1	9
4957	Fe I 318	16	5169	Fe I 1	8
5047	Fe I 114	13	5205	Fe I 1	5
5182	Mg I 2	200	<i>Atmospheric lines</i>		
5269	Fe I 15	23	5330	O I 12	47
5328	Fe I 15	19	5436	O I 11	34
5371	Fe I 15	17	6157	O I 10	150
5404	Fe I 15	15	6455	O I 9	17
5431	Fe I 15	13	6484	N I 21	27
5449	Fe I 15	11	7424	N I 3	60
5528	Mg I 9	22	7442	N I 3	120
5589	Ca I 21	5	7468	N I 3	150
5892	Na I 1	150	7774	O I 1	1400
6163	Ca I 3	4	8186	N I 2	400
6439	Ca I 18	3	8218	N I 2	700
6463	Ca I 18	2	8243	N I 2	280
8194	Na I 4	3	8446	O I 4	800
<i>High temperature line</i>			<i>Train line</i>		
4481	Mg II 4	36	5577	[O I] 3F	31

^a Wake lines are low excitation intercombination lines with a small transition probability. They are so named because they are prominent in meteor wakes, i.e., in the radiation forming a “tail” just behind the meteor head. They may be, nevertheless, present also in meteor heads, in particular when the collisional deexcitation rate is low.

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M20200115_034602_MAI_2, spo, -1.7m	7
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