

Meteor spectra 2019

Overview

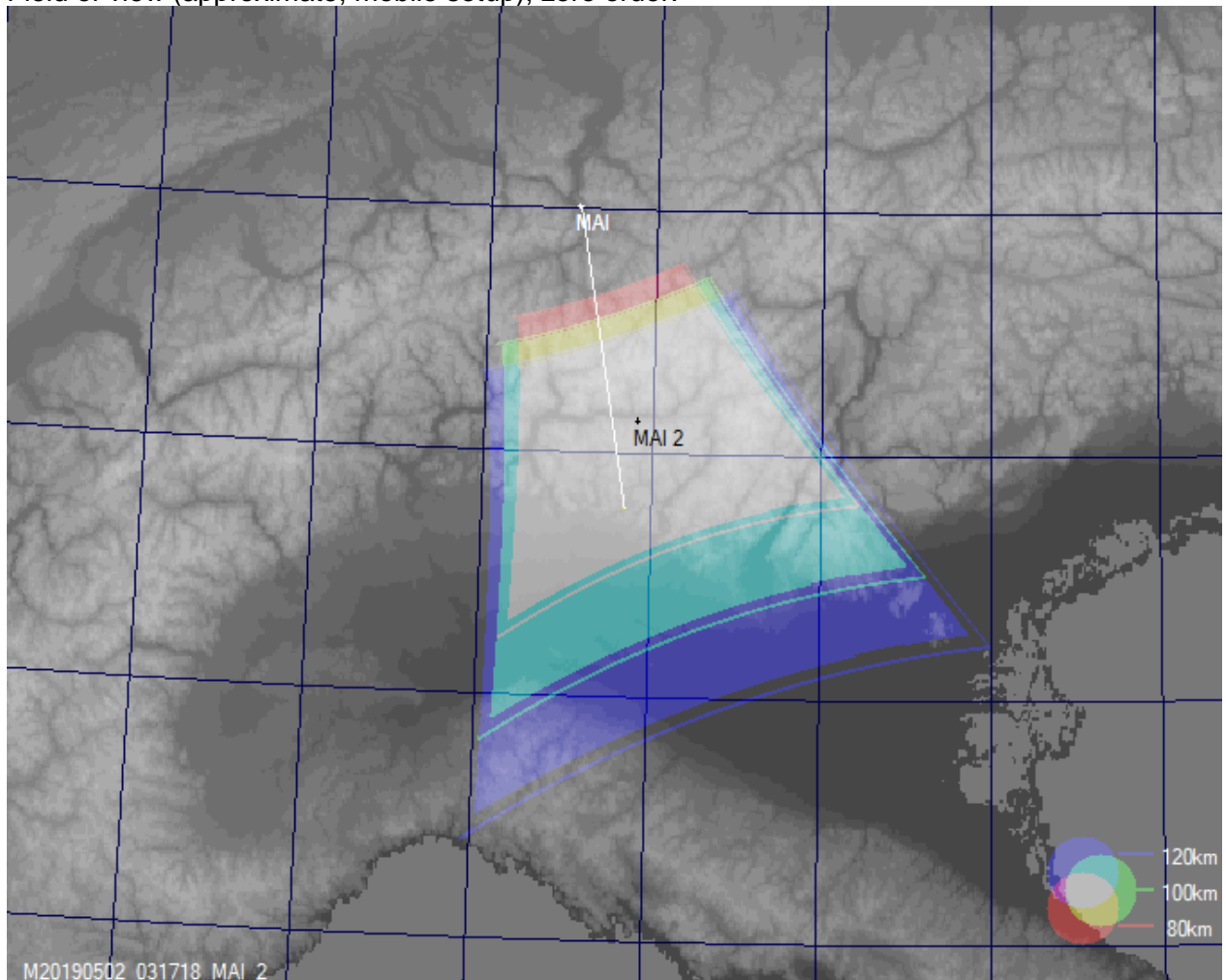
This is a collection of meteor spectra obtained at Maienfeld (MAI_2), with a Watec 902H2 ultimate

20.3.2019

MAI_2 lens changed Fujinon YV → Tamron VG412 ASIR

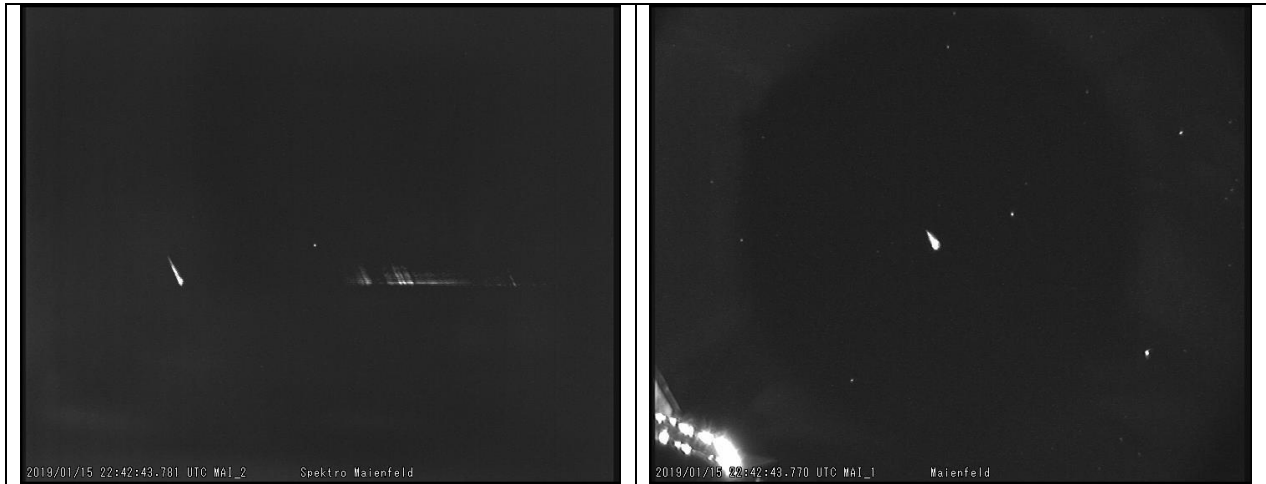
MAI_1 lens changed Tamron 13VG308 ASIR → Tamron VG412 ASIR

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



Spectra analyzed with Python m_pype62.py

M20190115_224243_MAI_2, spo, -3.2m



Fujinon YV F/0.95 f: 7 mm

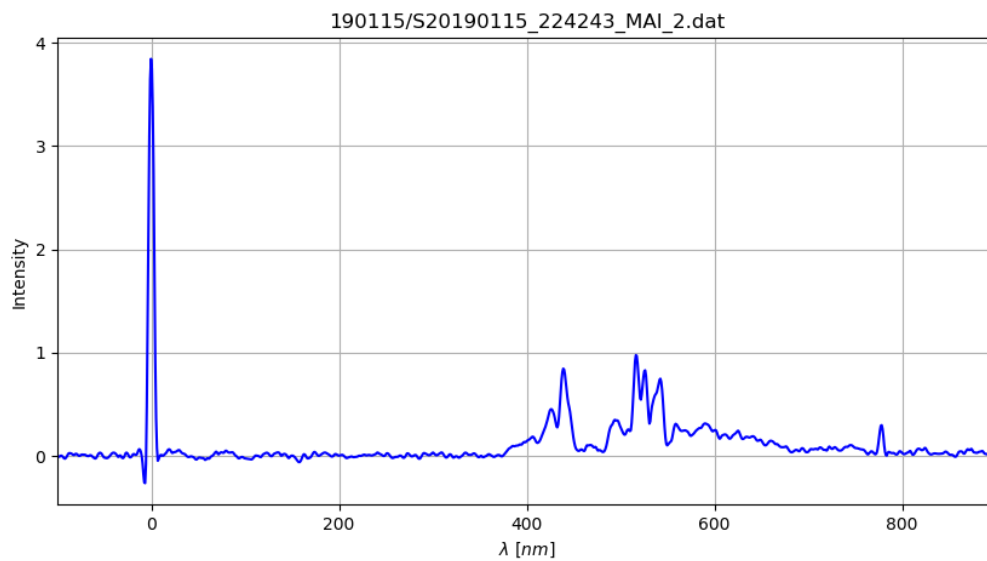
polynom for fit lambda c: [1.971 -354.486] x00 =340

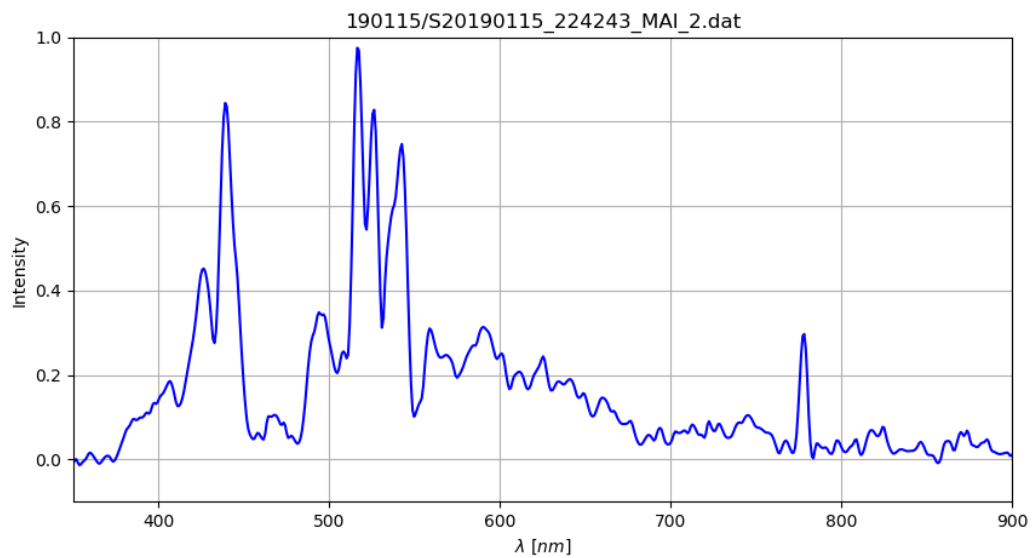
pixel	lambda	fit	error
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179.81,	0.00,	-0.00,	-0.0000
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574.14,	777.40,	777.40,	-0.0000
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rms_x = 0.0000 spectrum 190115/r_add28cal.dat saved



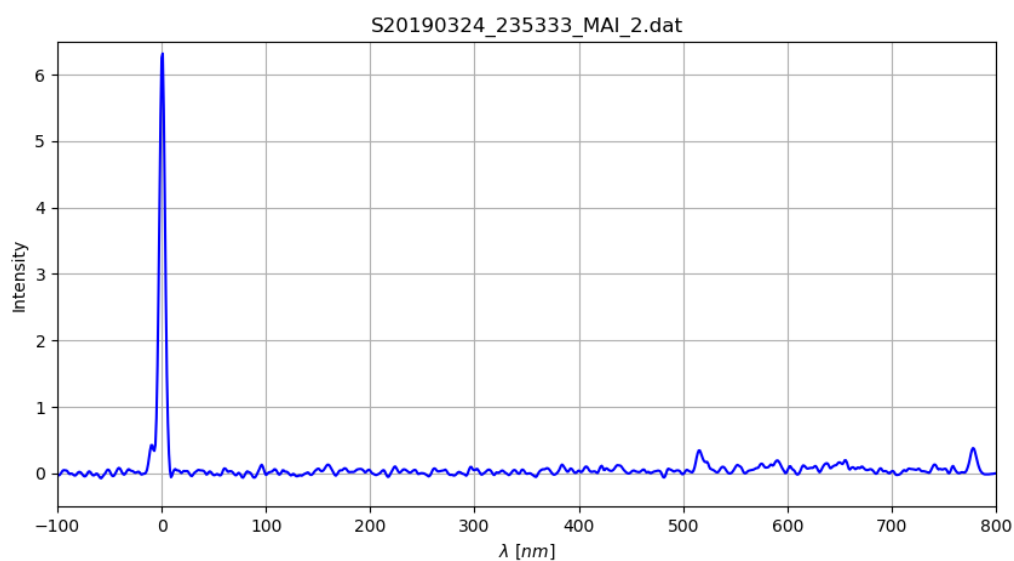


Practically no Na I. Ca lines around 400nm defocused, not useful!

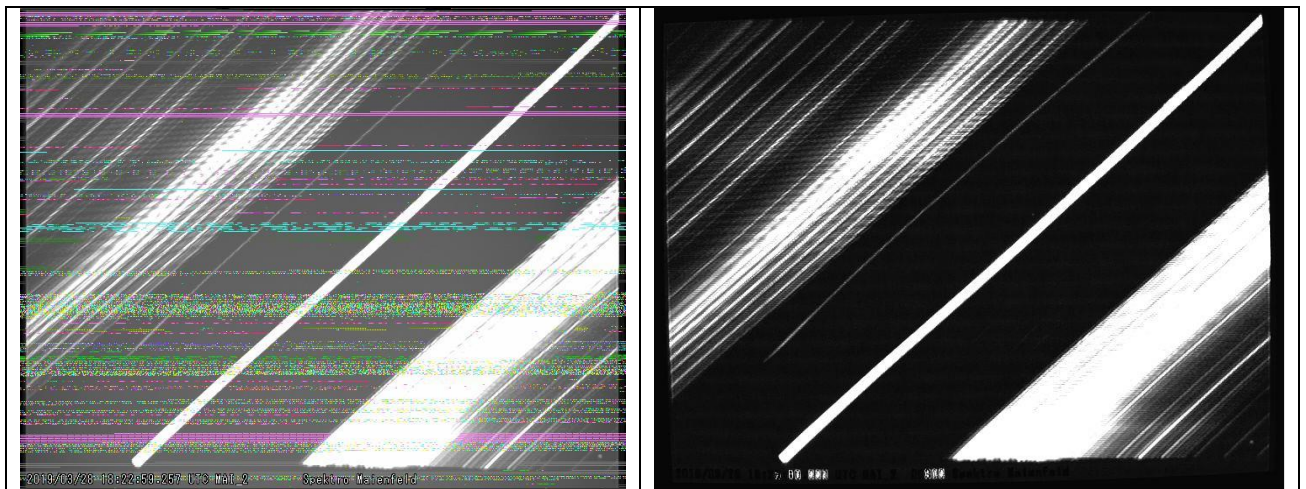
M20190324_235333_MAI_2, spo, -3.4m



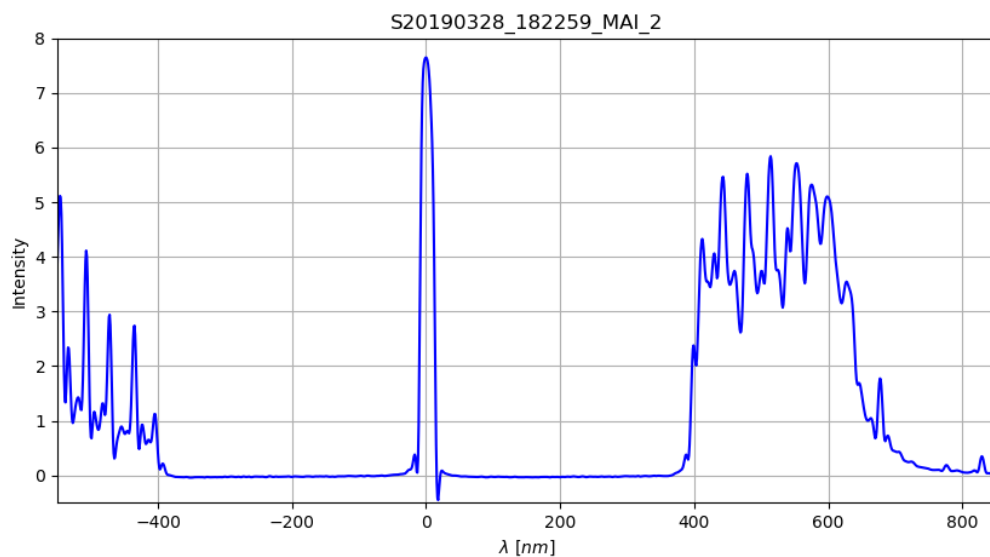
***-> polynom degree: 1
polynom for fit lambda c: [2.027 -627.61]
pixel lambda fit error
309.94, 0.00, 0.53, 0.5347
564.24, 517.50, 515.92, -1.5844
693.78, 777.40, 778.45, 1.0497
rms_x = 1.1399
spectrum out/r_add12cal.dat saved



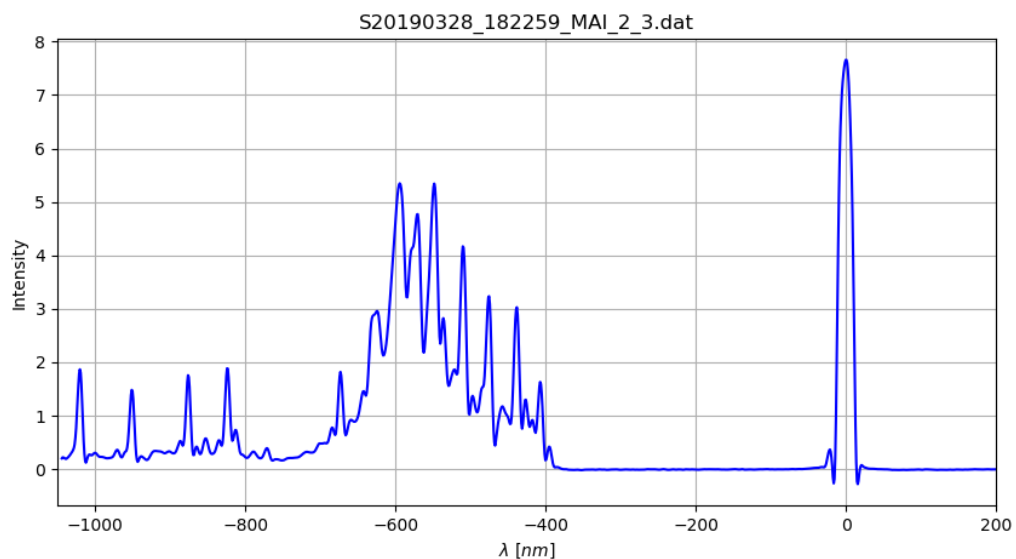
M20190328_182259_MAI_2, airplane, -5.4m



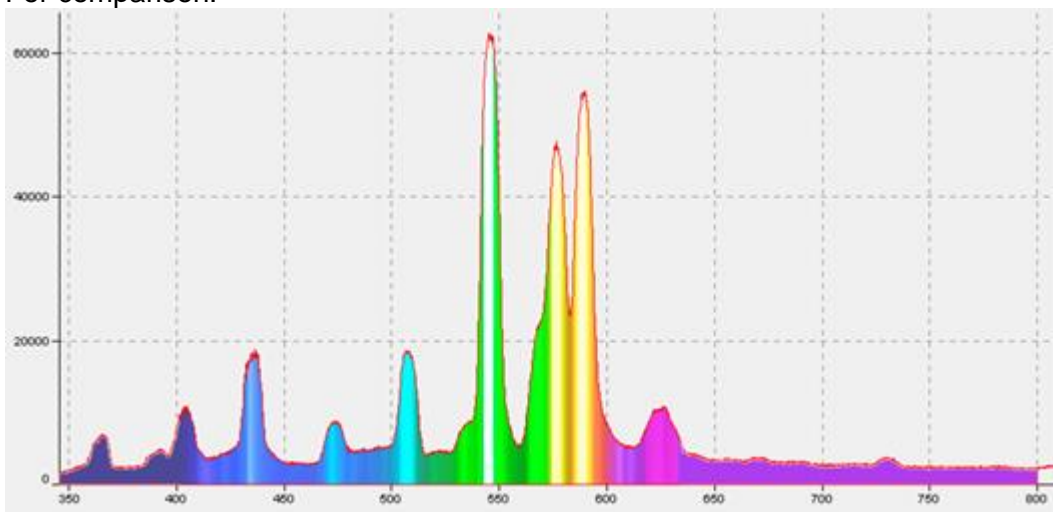
First frame with large noise
r2_add100:



r3_add60:

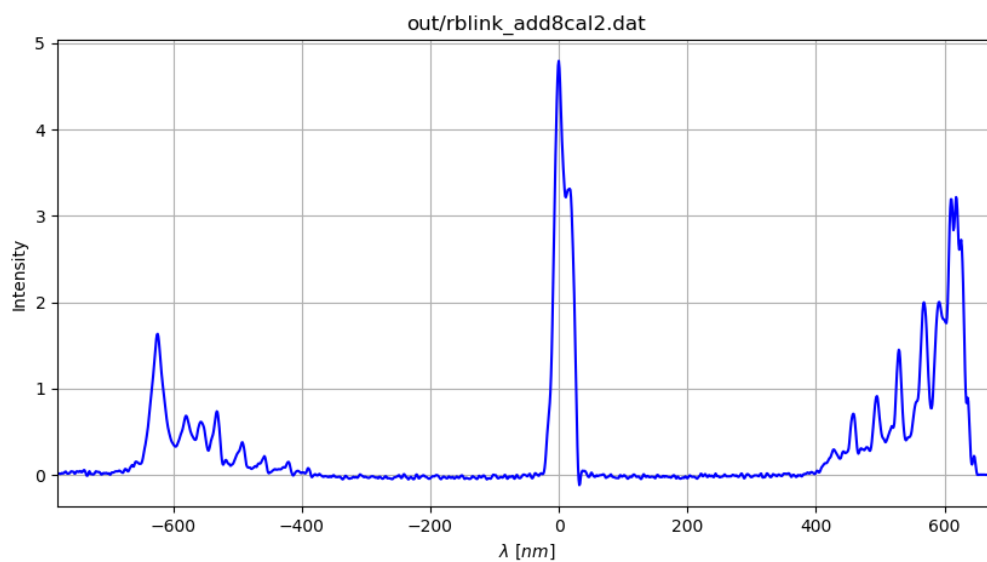


For details see ..\..\Python\190328\m_pipe190329.log
 For comparison:

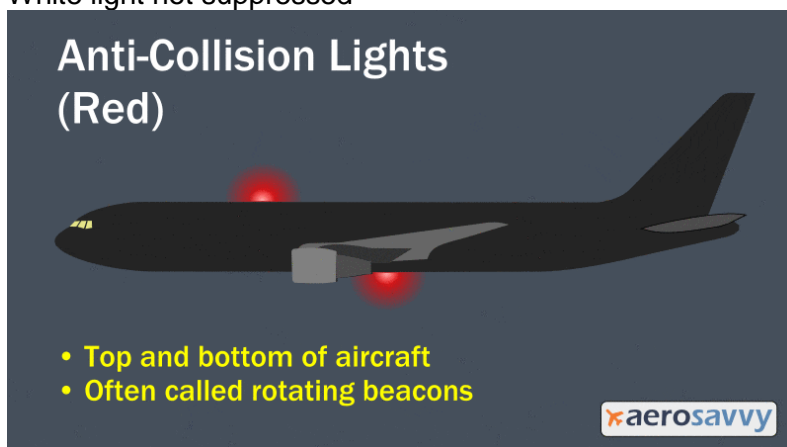


From: http://www.wikiwand.com/en/Metal-halide_lamp

Red blinking light, ..\..\Python\190328\m_pipe190331.log



White light not suppressed



See also mail Di. 02.04.2019 22:15

M20190603_014924_MAI_2, spo, -4.4m



***-> polynom degree: 1

polynom for fit lambda c: [2.029 -229.723]

pixel	lambda	fit	error
113.49,	0.00,	0.50,	0.4976
367.98,	517.50,	516.74,	-0.7558
403.11,	589.00,	588.01,	-0.9927
497.09,	777.40,	778.65,	1.2508

rms_x = 0.9177

spectrum 190603/r_add16cal.dat saved

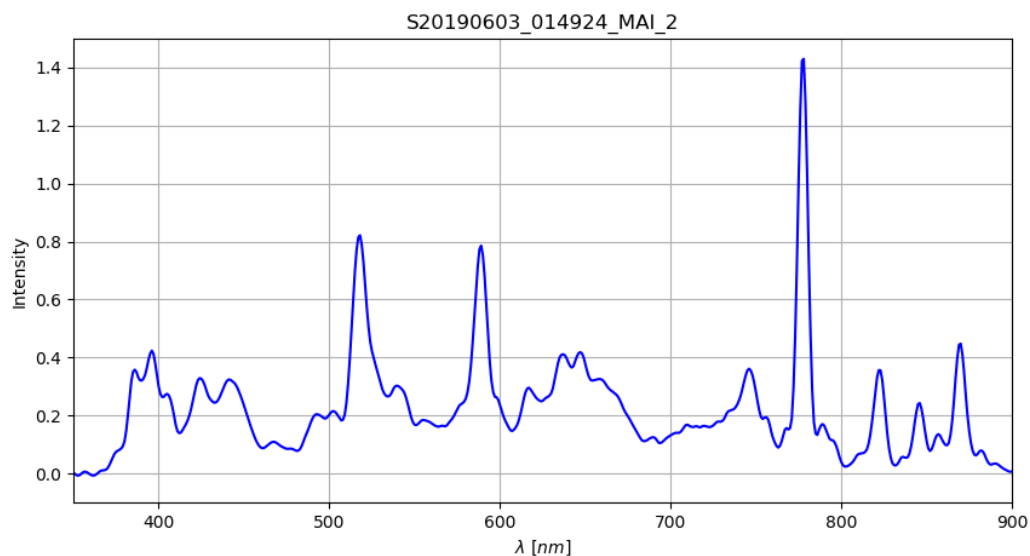
polynom for fit lambda c: [-6.086e-05 2.064e+00 -2.335e+02]

pixel	lambda	fit	error
113.49,	0.00,	-0.01,	-0.0119
367.98,	517.50,	517.79,	0.2906
403.11,	589.00,	588.65,	-0.3508
497.09,	777.40,	777.47,	0.0721

rms_x = 0.2307

spectrum 190603/r_add16cal.dat

saved



M20190624_003315_MAI_2, spo, -1.9m



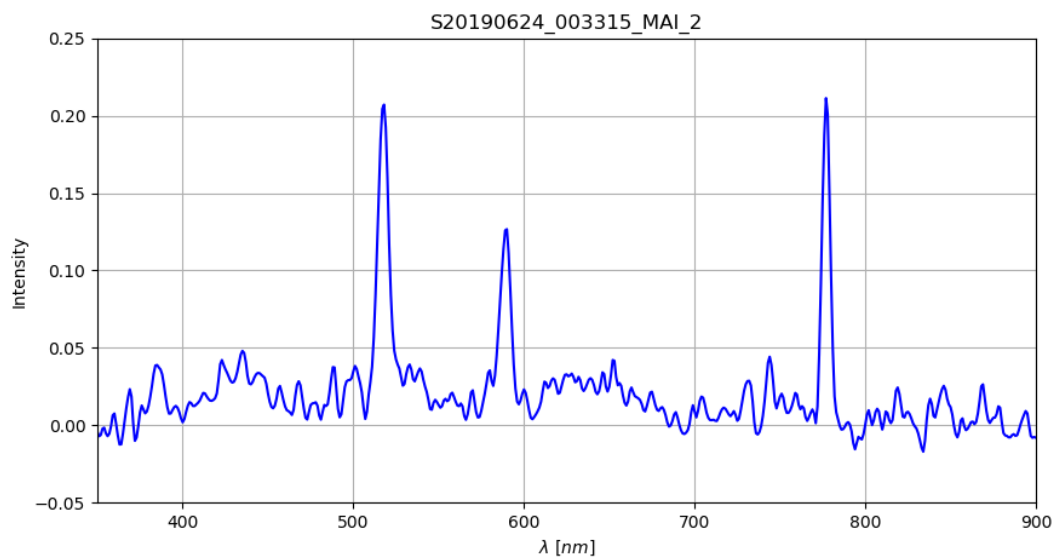
***-> polynom degree: 1

polynom for fit lambda c: [2.02 -458.314]

pixel	lambda	fit	error
226.90,	0.00,	-0.05,	-0.0465
483.12,	517.50,	517.44,	-0.0621
518.69,	589.00,	589.28,	0.2782
611.75,	777.40,	777.23,	-0.1696

rms_x = 0.1675

spectrum 190624/r_add48cal.dat saved



M20190727_003833_MAI_2, spo, -1.9m



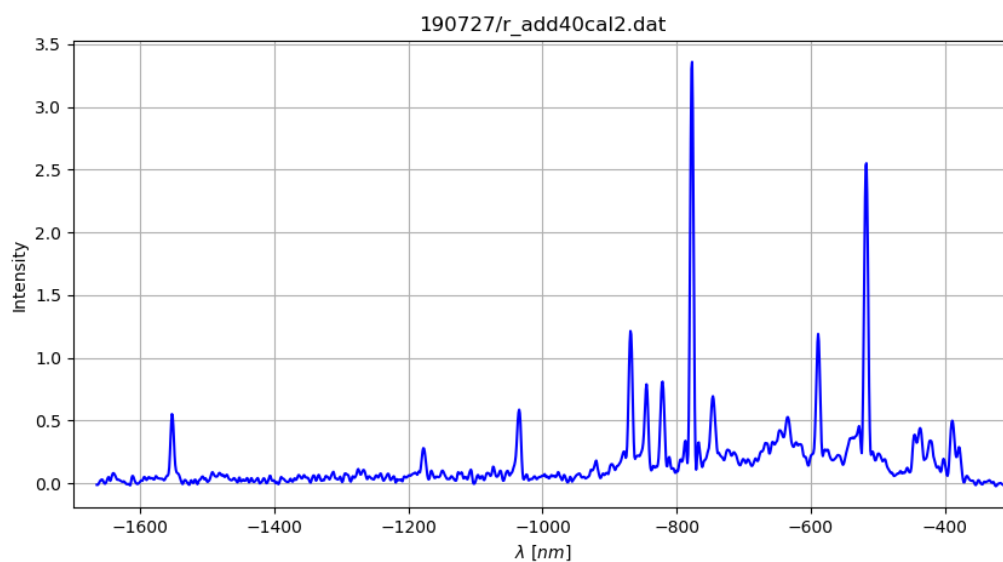
***-> polynom degree: 2

polynom for fit lambda c: [3.576e-05 2.000e+00 -1.667e+03]

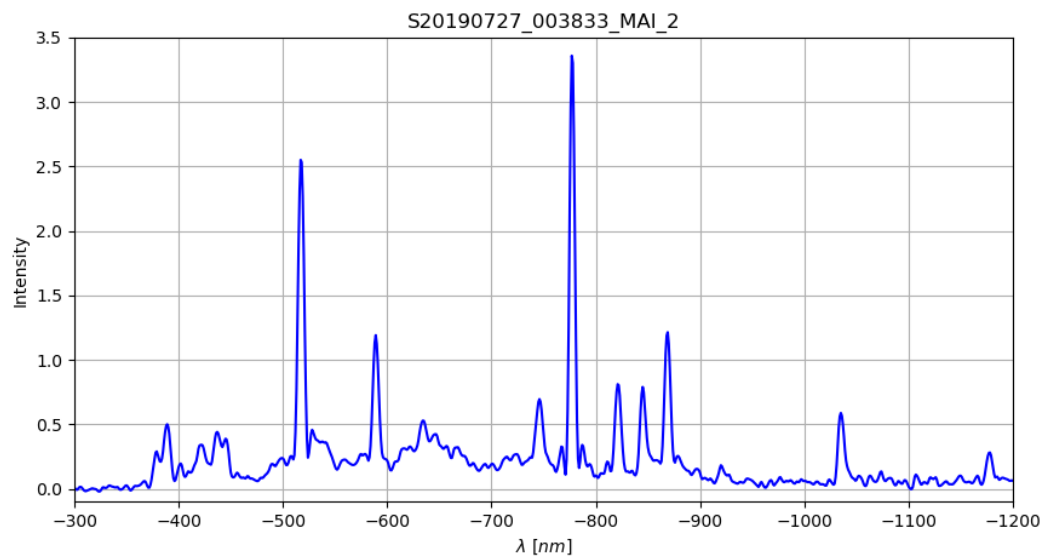
pixel	lambda	fit	error
568.94,	-517.50,	-517.41,	0.0882
533.86,	-589.00,	-588.96,	0.0389
441.18,	-777.40,	-777.57,	-0.1682
313.99,	-1035.00,	-1035.40,	-0.4044
243.68,	-1178.00,	-1177.44,	0.5617
57.11,	-1552.50,	-1552.62,	-0.1162

rms_x = 0.2972

spectrum 190727/r_add40cal.dat saved



Full spectrum



Negative first and second order

M20190804_022600_OHP_1, PER, -3.8m



Result of calibration

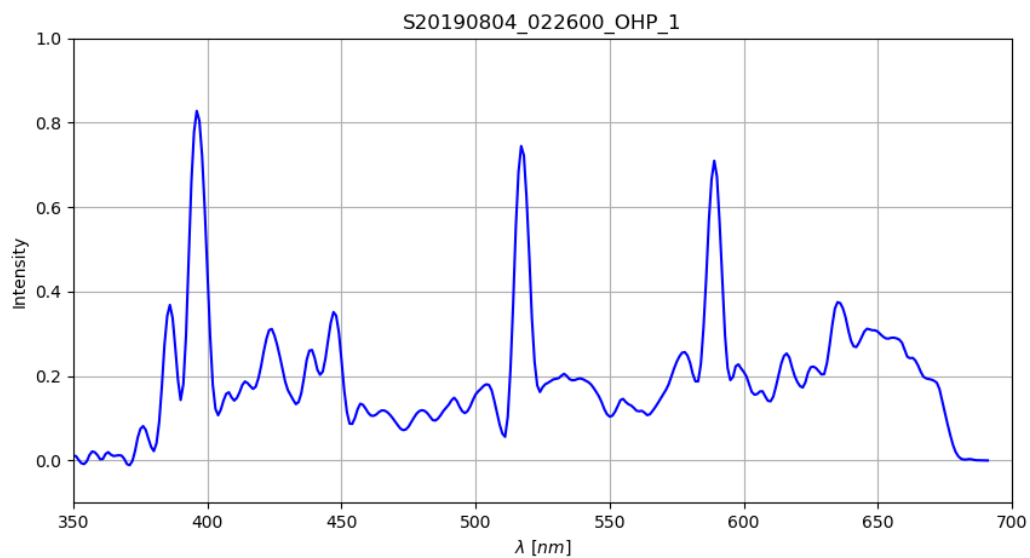
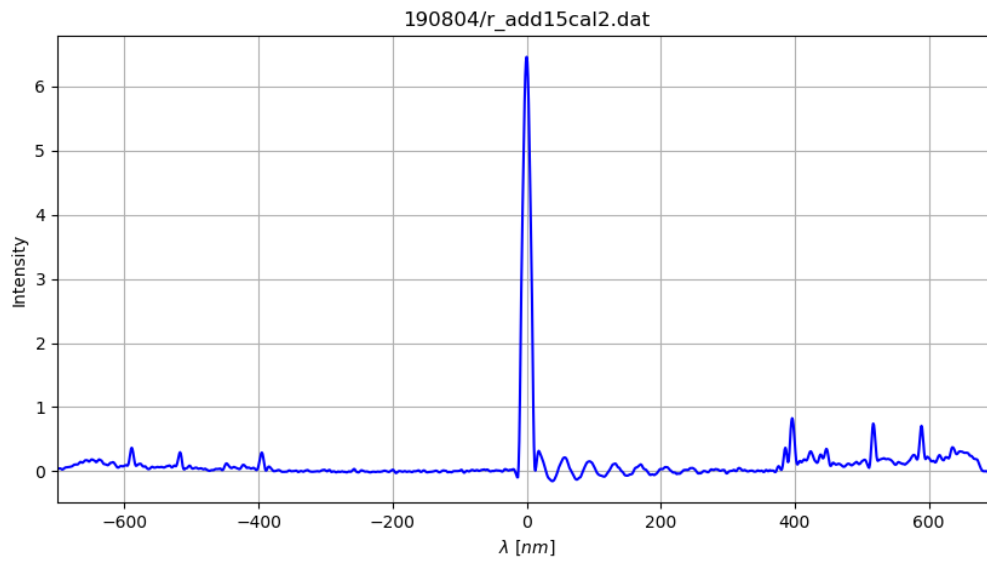
(2nd order fit, because grating was moved since last calibration, transport to OHP)

polynom for fit lambda c: [-1.280e-04 2.111e+00 -7.580e+02]

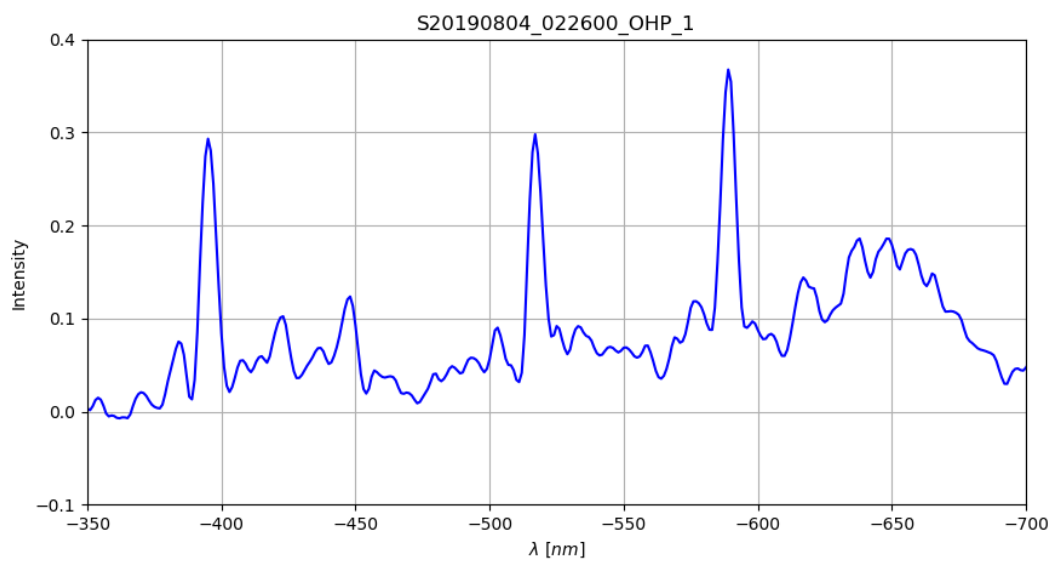
pixel	lambda	fit	error
80.31,	-589.00,	-589.23,	-0.2285
114.82,	-517.50,	-517.23,	0.2696
367.16,	0.00,	-0.04,	-0.0378
627.98,	517.50,	517.41,	-0.0936
664.82,	589.00,	589.09,	0.0904

rms_x = 0.1693

spectrum 190804/r_add15cal.dat saved



First order spectrum, not corrected for instrument response



Negative first order (wrong side of zero order)

You may assign the lines of the spectrum with help of the following list of meteor spectral lines. Note that the resolution of the spectrum is not high enough to resolve all the lines, but you may identify Mg, Ca, Fe, Na lines

373 nm Fe I
383 nm Mg I
395 nm Ca II
425 nm Ca I, Cr I, Fe I
438 nm Fe I
448 nm Mg II
517.5 nm Mg I
522 – 545 nm Fe I
589 nm Na I
616 nm O I, Ca I
635 nm Si II
649 nm Fe I
656 nm H-alpha

M20190816_205405_MAI_2, PER, -4.7m



Calibration:

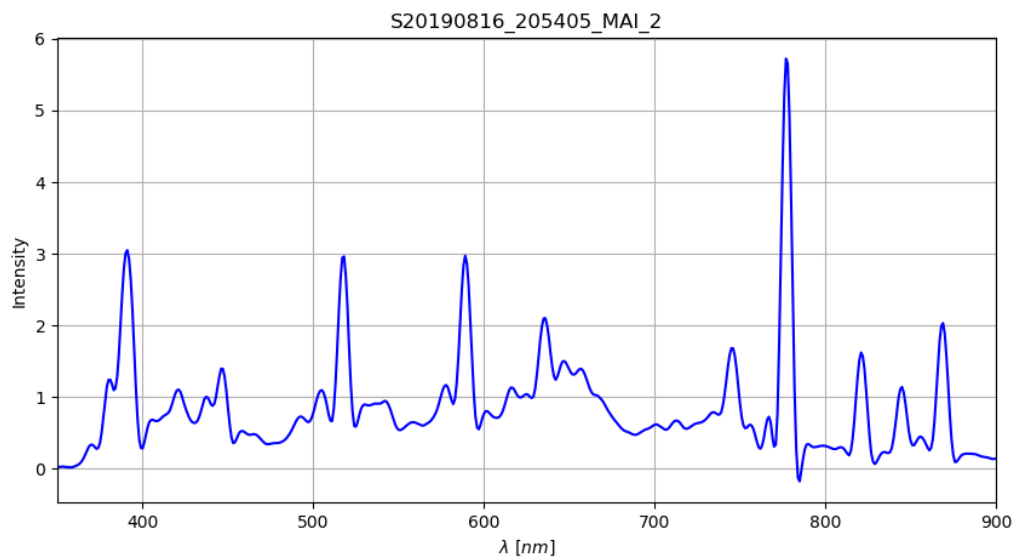
***-> polynom degree: 1

polynom for fit lambda c: [2.034 240.961]

pixel	lambda	fit	error
135.96,	517.50,	517.53,	0.0253
171.08,	589.00,	588.97,	-0.0350
263.72,	777.40,	777.41,	0.0096

rms_x = 0.0255

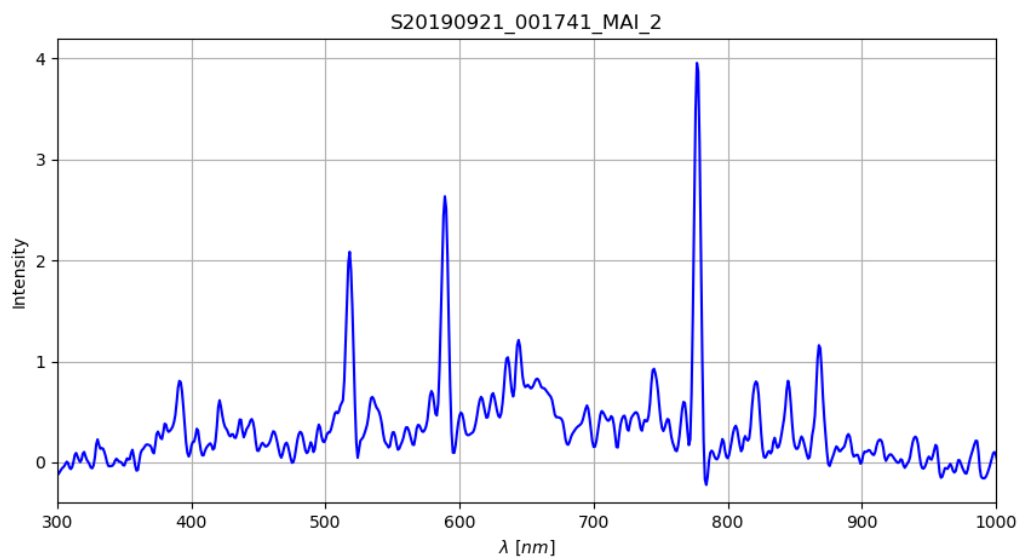
spectrum 190816/r_add31cal.dat saved



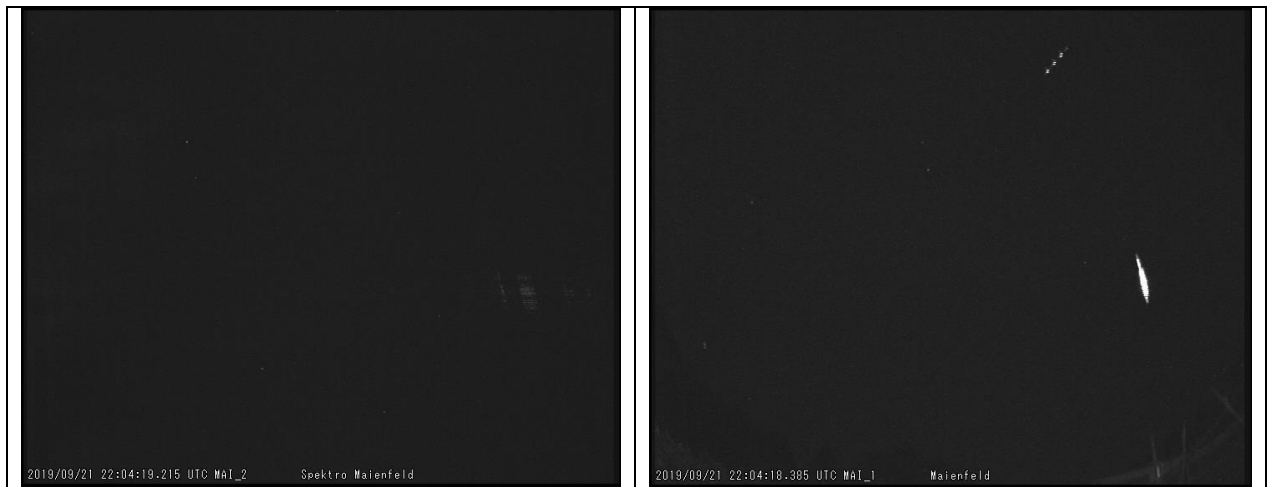
M20190921_001741_MAI_2, spo, -3.2m



***-> polynom degree: 1
polynom for fit lambda c: [2.02 226.633]
pixel lambda fit error
144.07, 517.50, 517.69, 0.1886
179.24, 589.00, 588.74, -0.2596
272.66, 777.40, 777.47, 0.0710
rms_x = 0.1898
spectrum 190921/r_add4cal.dat saved

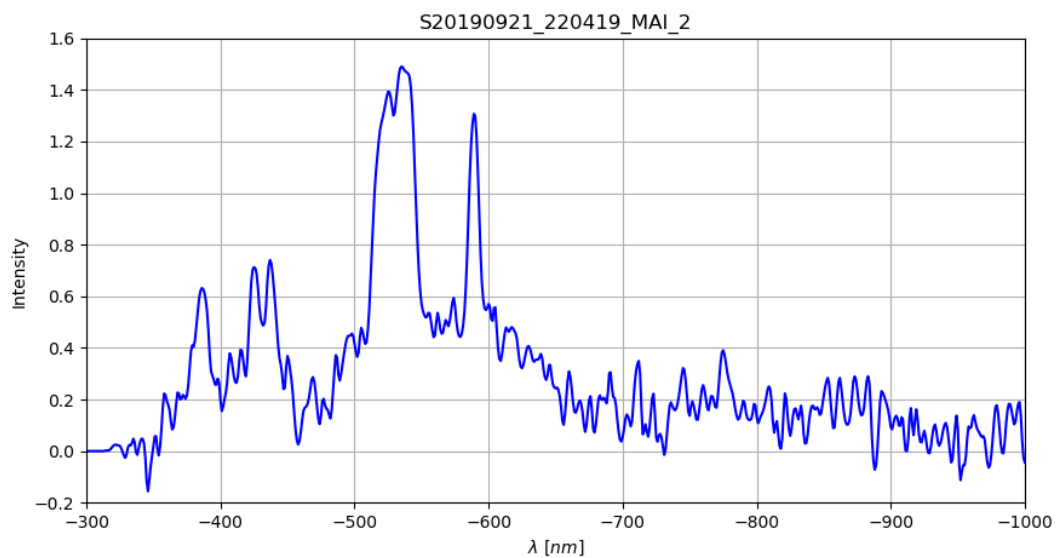


M20190921_220419_MAI_2, spo, -4.5m



***-> polynom degree: 0
***-> select value for disp0: 2.04
polynom for fit lambda c: [2.04, -1765.5088]
pixel lambda fit error
576.72, -589.00, -589.00, 0.0000
602.45, -517.50, -536.51, -19.0108 wrong line, Fe
607.95, -517.50, -525.29, -7.7908 wrong line
(rms_x = 11.8618)
spectrum 190921/rr_add4cal.dat saved

negative first order, calibration doubtful



S20190921_220419_MAI_2a.png

M20190929_004417_MAI_2, spo, -4.3m



polynom for fit lambda c: [2.023 -110.076]

pixel	lambda	fit	error
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310.54,	517.50,	518.04,	0.5424
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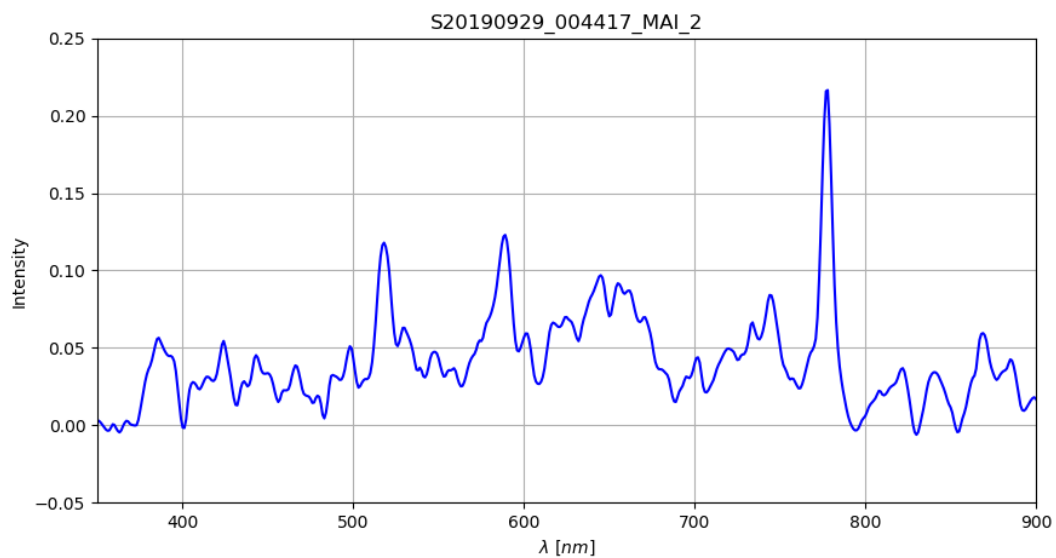
54.41,	0.00,	-0.02,	-0.0229
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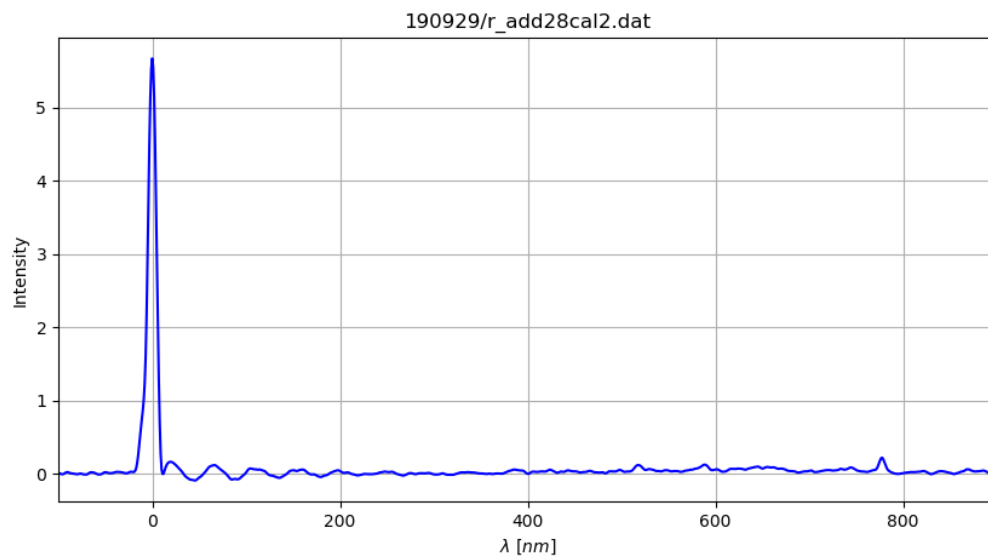
345.30,	589.00,	588.35,	-0.6497
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438.83,	777.40,	777.53,	0.1302
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rms_x = 0.4283

spectrum 190929/r_add28cal.dat saved



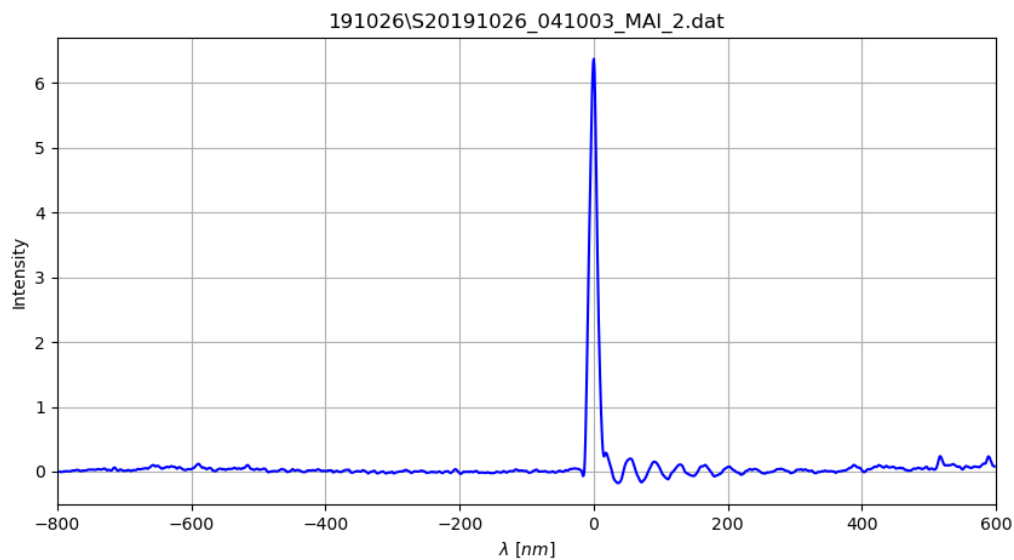


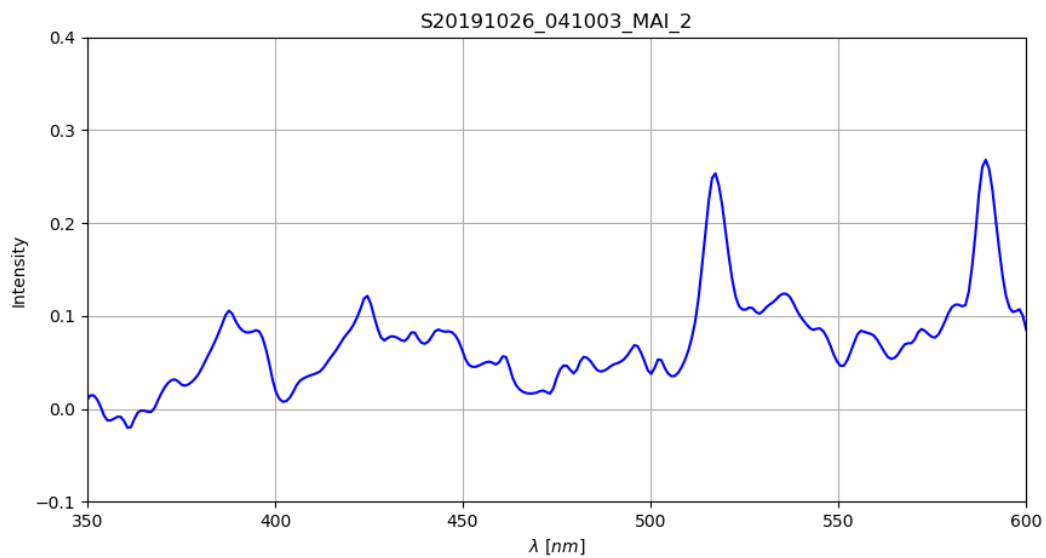
Grating efficiency very bad

M20191026_041003_MAI_2, ORI, -3.3m



***-> polynom degree: [1] set 0 for single line calibration: 2
c Peak =: [4.375e-05 1.989e+00 -8.500e+02]
rms_x = 0.5297
pixel lambda fit error
[[130.48 -589. -589.716 -0.716]
[166.98 -517.5 -516.645 0.855]
[423.34 0. -0.141 -0.141]
[677.32 517.5 517.237 -0.263]
[712.46 589. 589.265 0.265]]
***-> plot spectrum, path and filename [191026/ra_add12cal2].dat

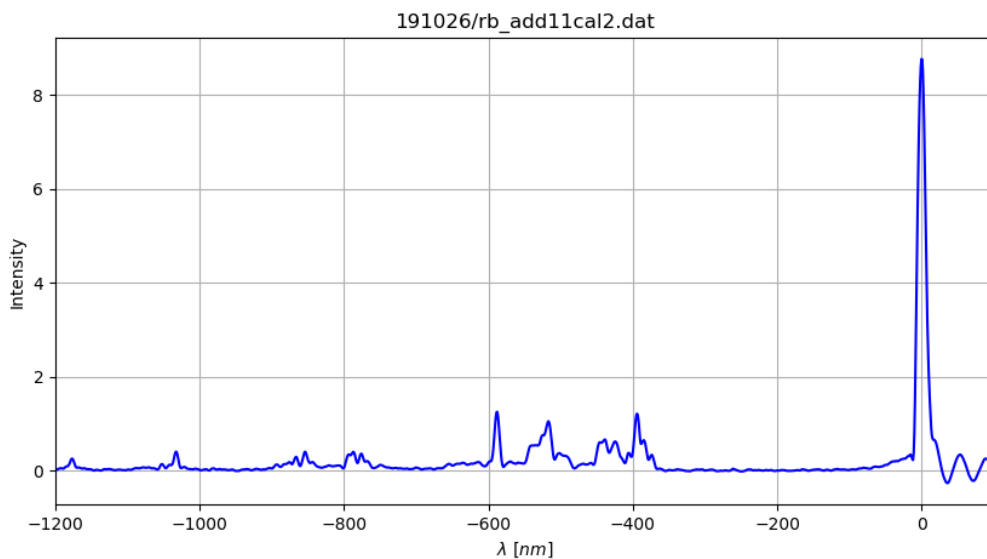


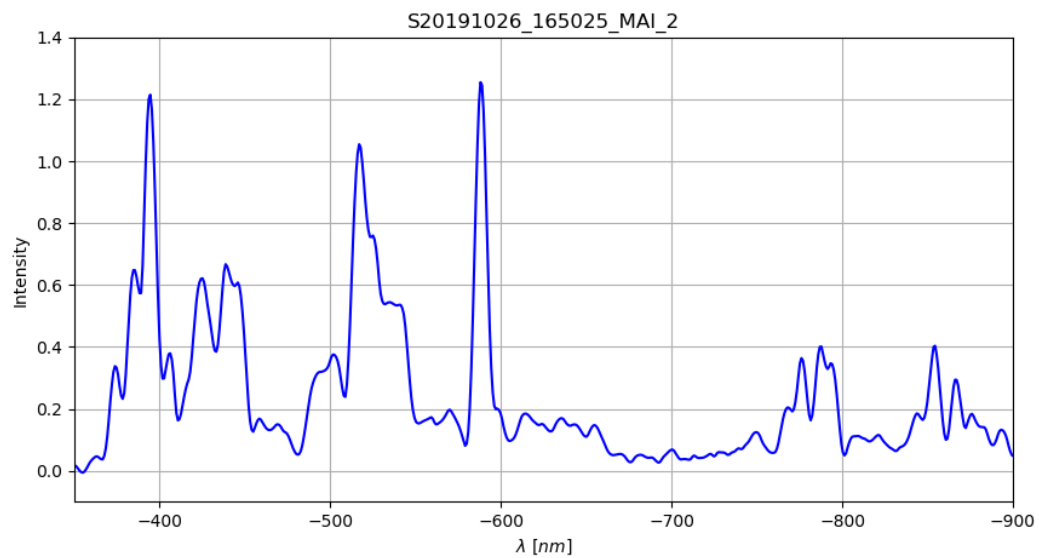


M20191026_165025_MAI_2, spo, -5.3m



```
***-> polynom degree: [1] set 0 for single line calibration: 2
c Peak =: [ 3.920e-05 1.992e+00 -1.300e+03]
rms_x = 1.0073
pixel lambda fit error
[[ 644.32 0. -0.168 -0.168]
 [ 389.82 -517.5 -517.484 0.016]
 [ 354.81 -589. -588.25 0.75 ]
 [ 133.8 -1031. -1032.766 -1.766]
 [ 61.76 -1178. -1176.832 1.168]]
***-> plot spectrum, path and filename [191026/rb_add11cal2].dat
```





M20191114_002743_MAI_2, NTA, -2.0m

New grating mounted 191111, 300 L/mm, 50x50mm, Thorlabs



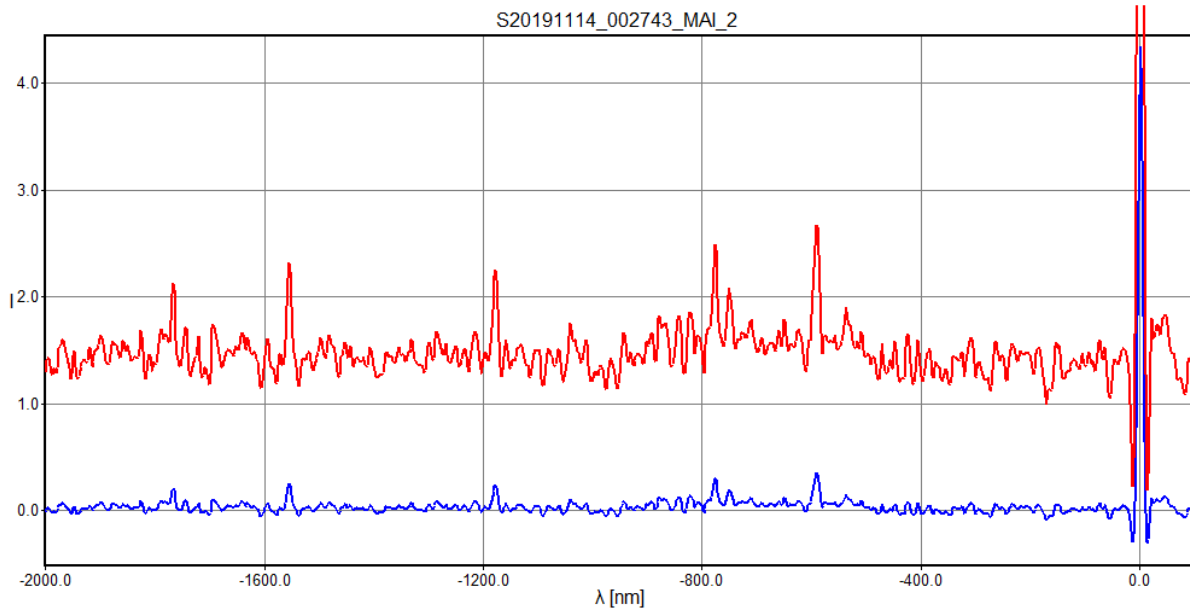
***-> polynom degree: 1

polynom for fit lambda c: [2.031 -1297.875]

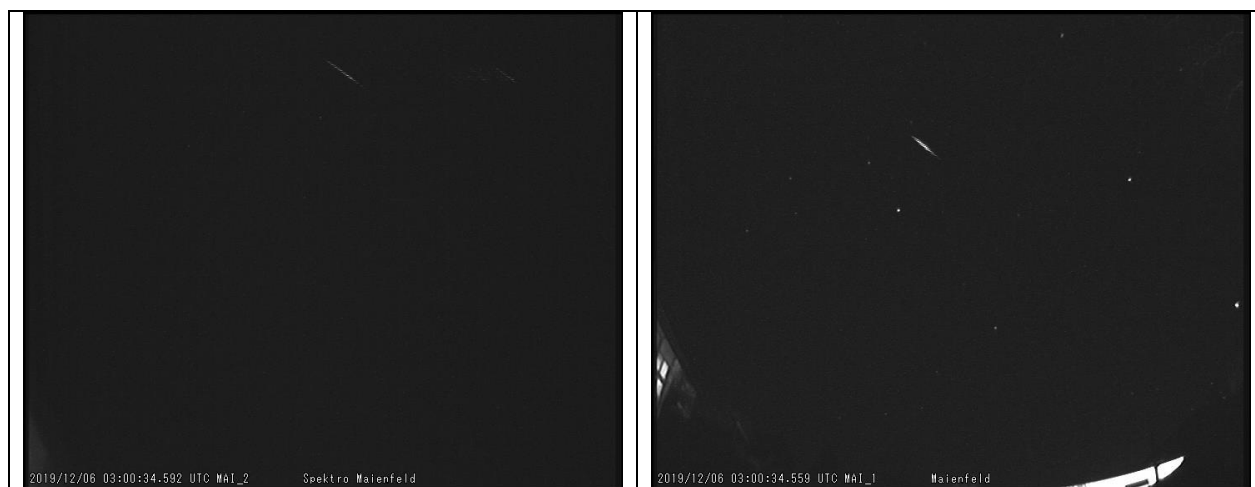
pixel	lambda	fit	error
639.00,	0.00,	-0.04,	-0.0392
349.10,	-589.00,	-588.84,	0.1615
256.20,	-777.40,	-777.52,	-0.1223

rms_x = 0.1192

spectrum 191114/ra_add14cal.dat saved



M20191206_030034_MAI_2, psU, -1.7m

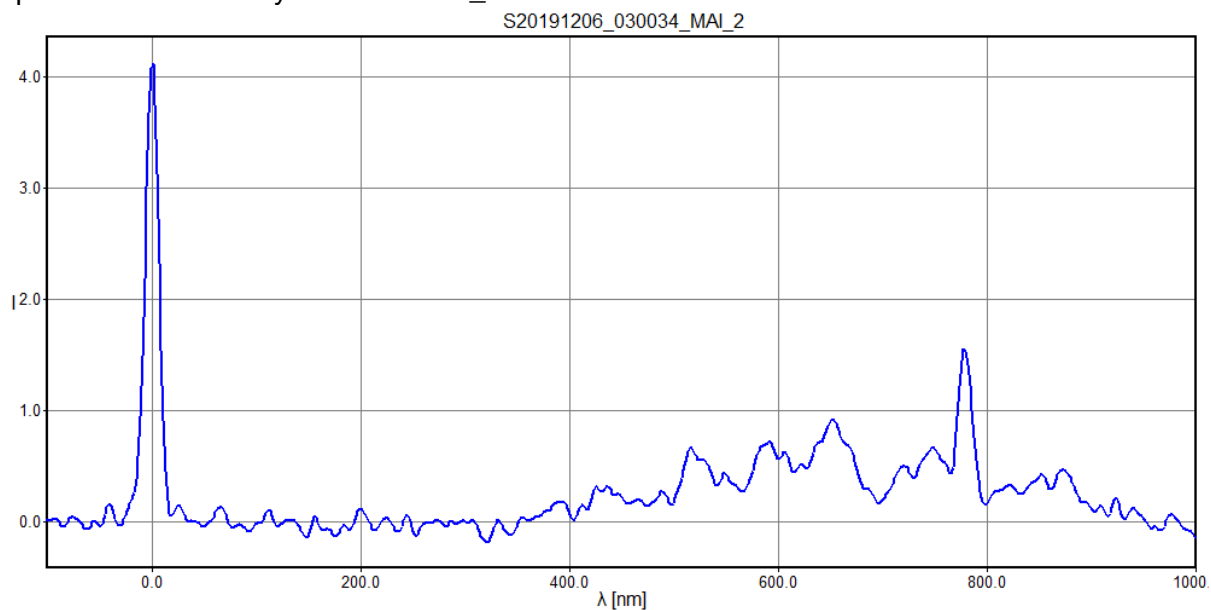


polynom for fit lambda c: [4.082 -1468.83]

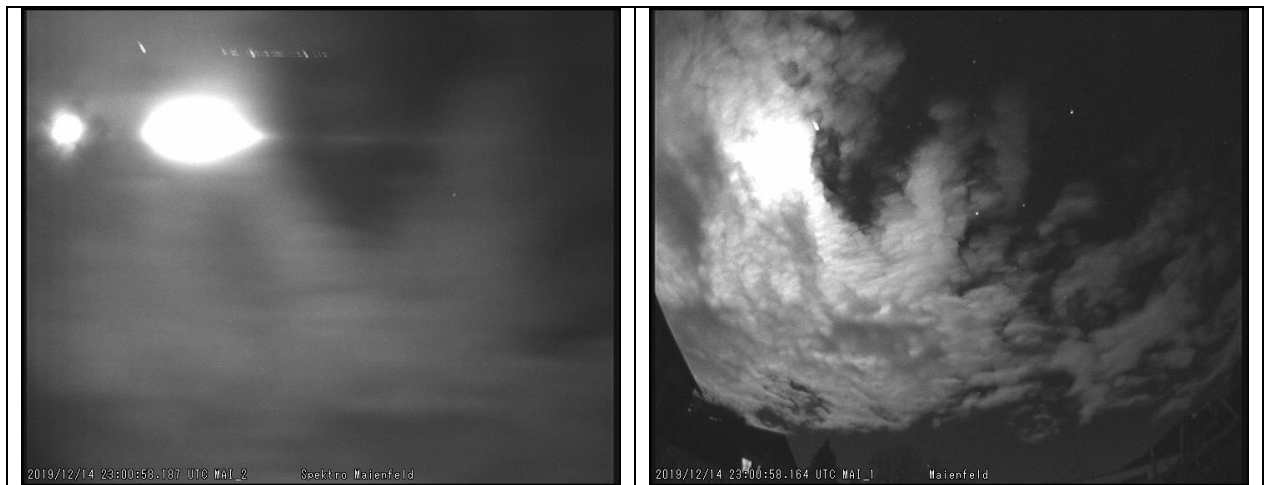
pixel	lambda	fit	error
359.91,	0.00,	0.24,	0.2436
486.47,	517.50,	516.83,	-0.6662
504.13,	589.00,	588.92,	-0.0819
550.43,	777.40,	777.90,	0.5046

rms_x = 0.4372

spectrum C:\Daten\Python\191206\r_add8cal.dat saved



M20191214_230058_MAI_2, GEM ; -1.6m



***-> polynom degree: [1] set 0 for single line calibration:

c Peak =: [4.034 -574.223]

rms_x = 1.5369

pixel lambda fit error

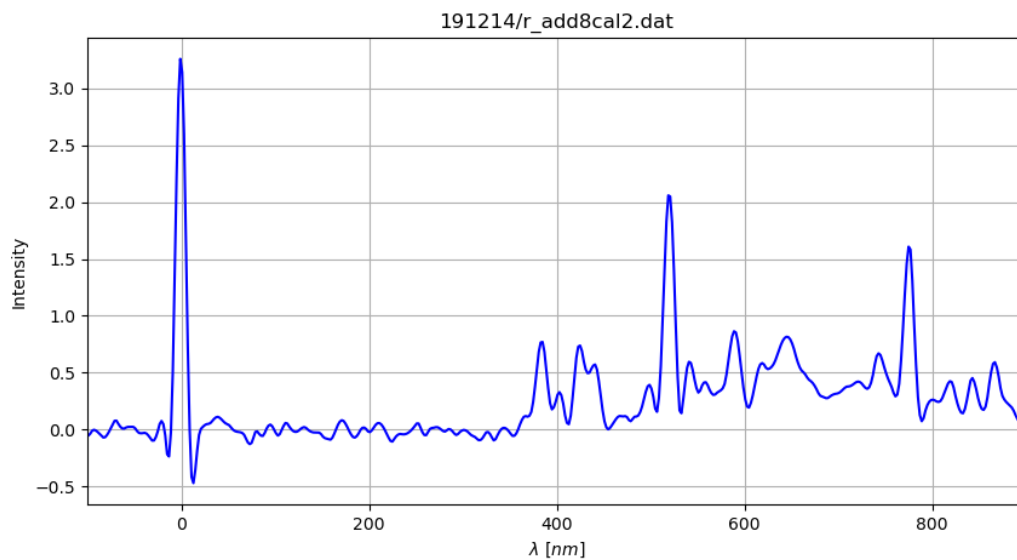
[[142.14 0. -0.859 -0.859]

[271.18 517.5 519.663 2.163]

[288.52 589. 589.609 0.609]

[334.6 777.4 775.487 -

1.913]]



M20191214_231941_MAI_2, GEM, -1.5m



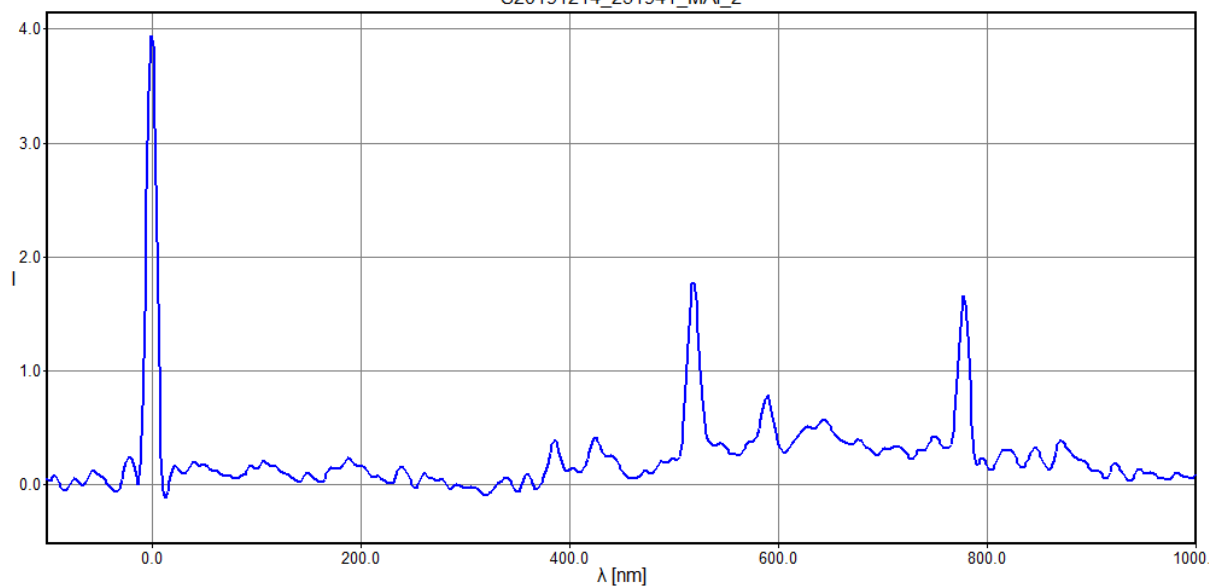
polynom for fit lambda c: [4.067 -1276.349]

pixel	lambda	fit	error
313.81,	0.00,	-0.23,	-0.2259
441.28,	517.50,	518.14,	0.6368
458.72,	589.00,	589.06,	0.0573
504.92,	777.40,	776.93,	-0.4682

rms_x = 0.4120

spectrum C:\Daten\Python\191214\r_add9cal.dat saved

S20191214_231941_MAI_2



M20191215_005531_MAI_2, GEM, -3.5m



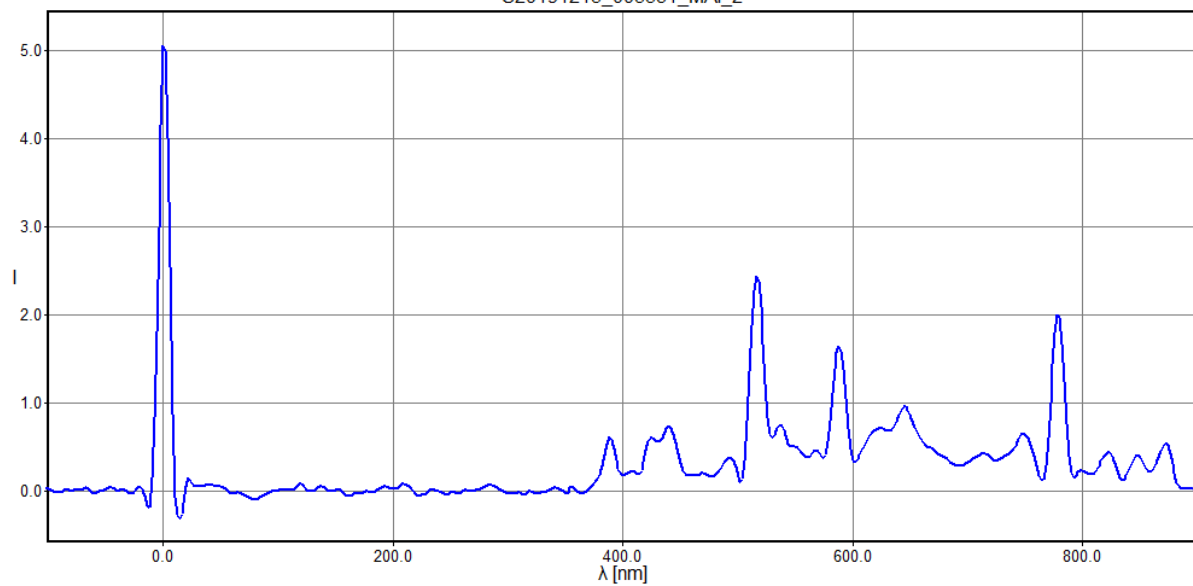
polynom for fit lambda c: [4.075 -1979.872]

pixel	lambda	fit	error
485.93,	0.00,	0.47,	0.4733
612.67,	517.50,	516.99,	-0.5141
630.04,	589.00,	587.78,	-1.2248
676.88,	777.40,	778.67,	1.2656

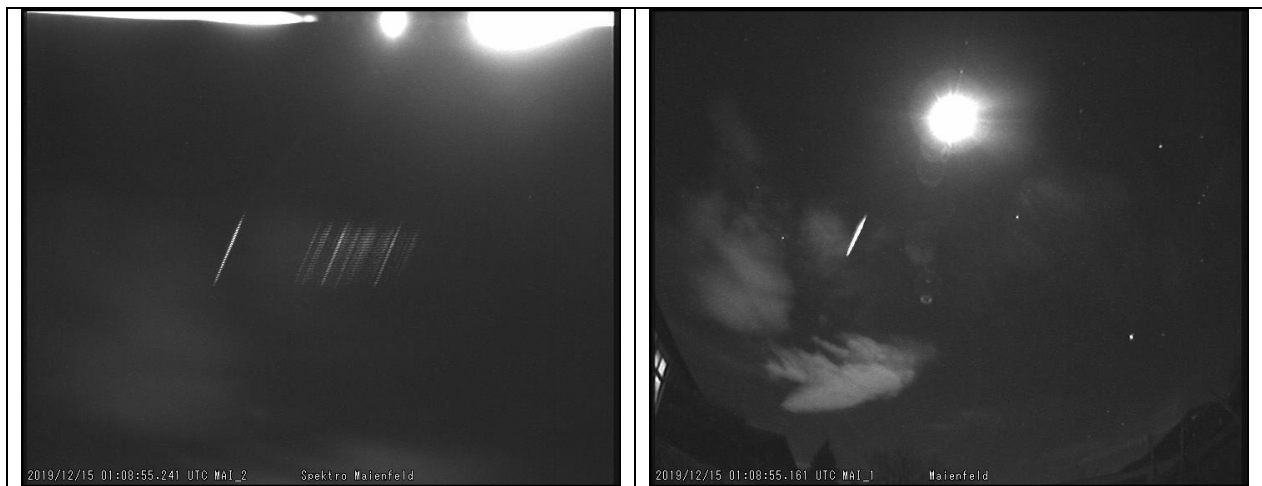
rms_x = 0.9474

spectrum C:\Daten\Python\191215\r_add12cal.dat saved

S20191215_005531_MAI_2



M20191215_010855_MAI_2, GEM, -2.2m



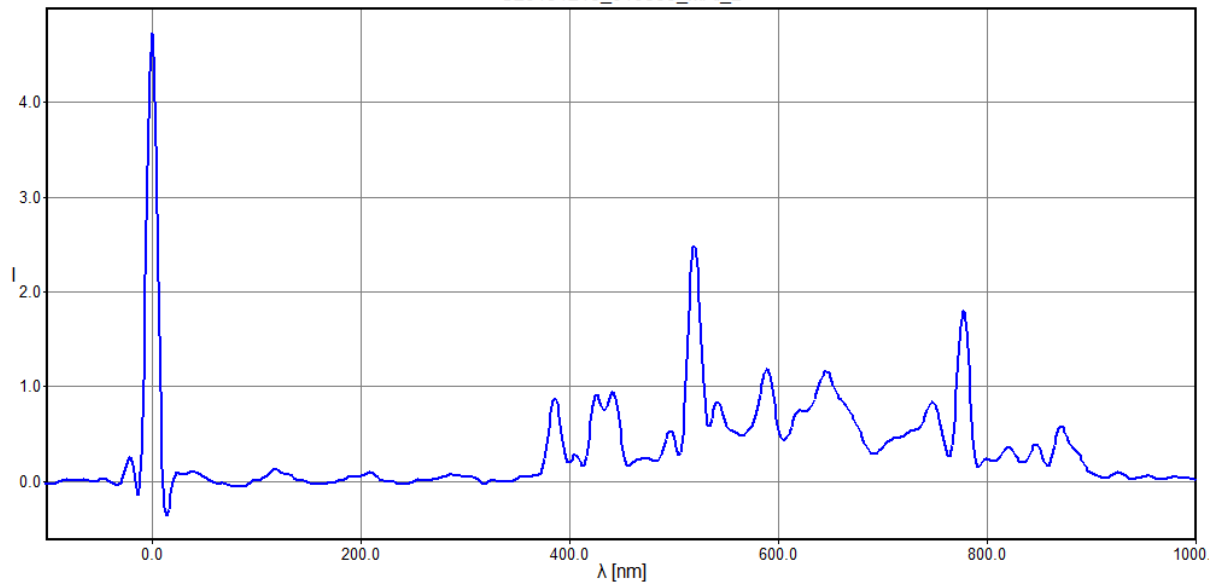
polynom for fit lambda c: [4.06 -1077.177]

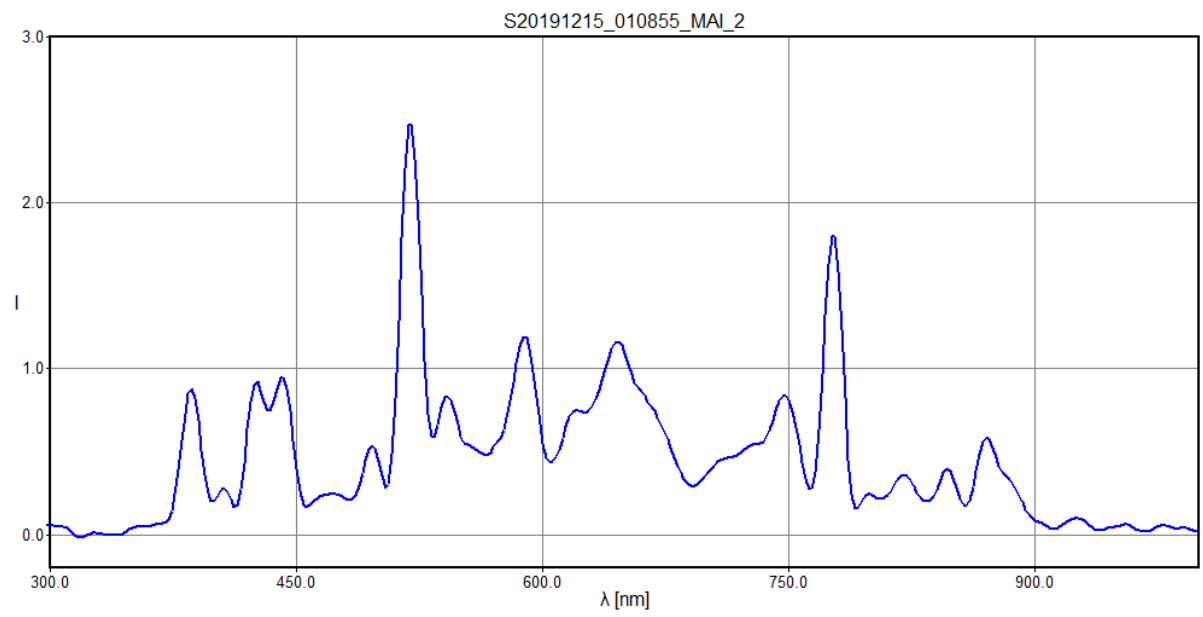
pixel	lambda	fit	error
265.25,	0.00,	-0.34,	-0.3445
393.21,	517.50,	519.13,	1.6330
456.71,	777.40,	776.92,	-0.4768
410.22,	589.00,	588.19,	-0.8117

rms_x = 0.9581

spectrum C:\Daten\Python\191215\r_add16cal.dat saved

S20191215_010855_MAI_2





M20191215_022343_MAI_2, NTA, -2.5m



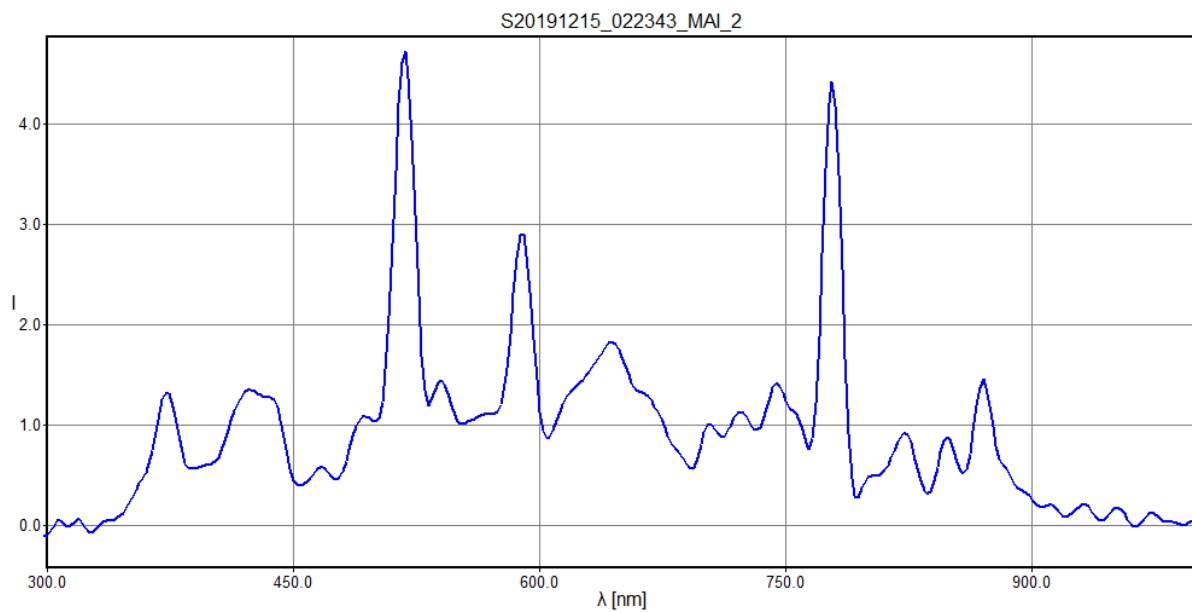
polynom for fit lambda c: [4.08 151.956]

pixel	lambda	fit	error
89.64,	517.50,	517.66,	0.1642
107.07,	589.00,	588.77,	-0.2260
153.32,	777.40,	777.46,	0.0619

rms_x = 0.1652

spectrum C:\Daten\Python\191215\r_add7cal.dat

saved



M20191215_060340_MAI_2, COM, -1.9m



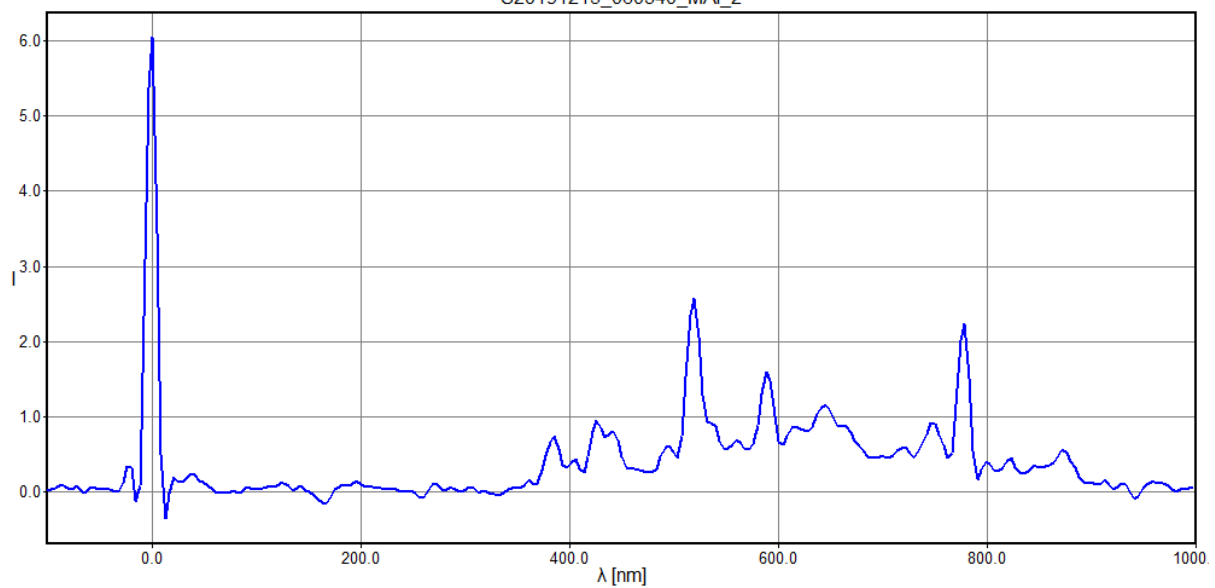
polynomial for fit lambda c: [4.049 -1161.125]

pixel	lambda	fit	error
286.74,	0.00,	-0.21,	-0.2091
414.87,	517.50,	518.55,	1.0469
432.13,	589.00,	588.43,	-0.5731
478.74,	777.40,	777.14,	-0.2646

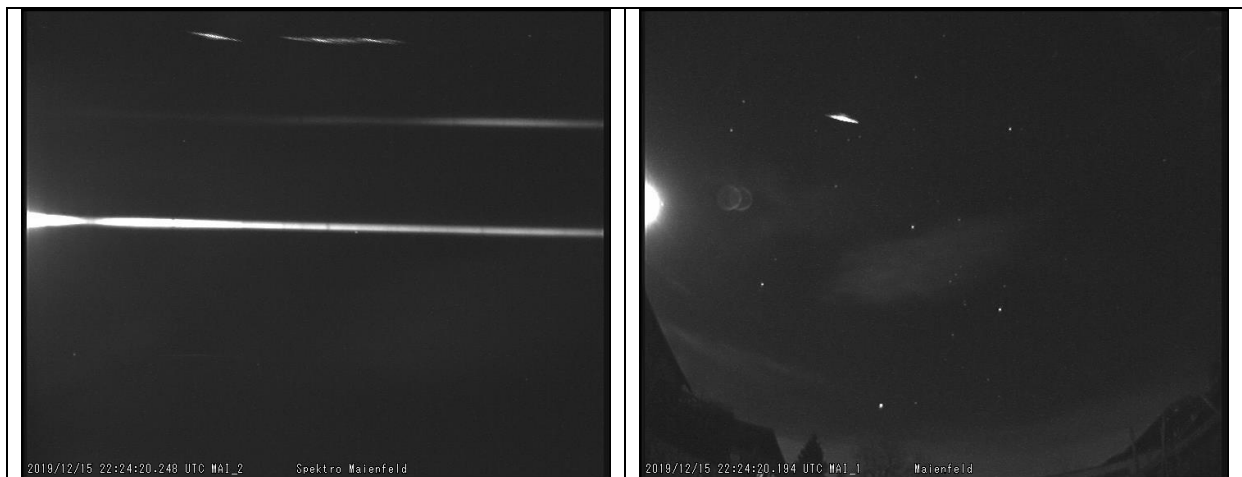
rms_x = 0.6201

spectrum C:\Daten\Python\191215\r_add17cal.dat saved

S20191215_060340_MAI_2



M20191215_222420_MAI_2, GEM, -1.8m



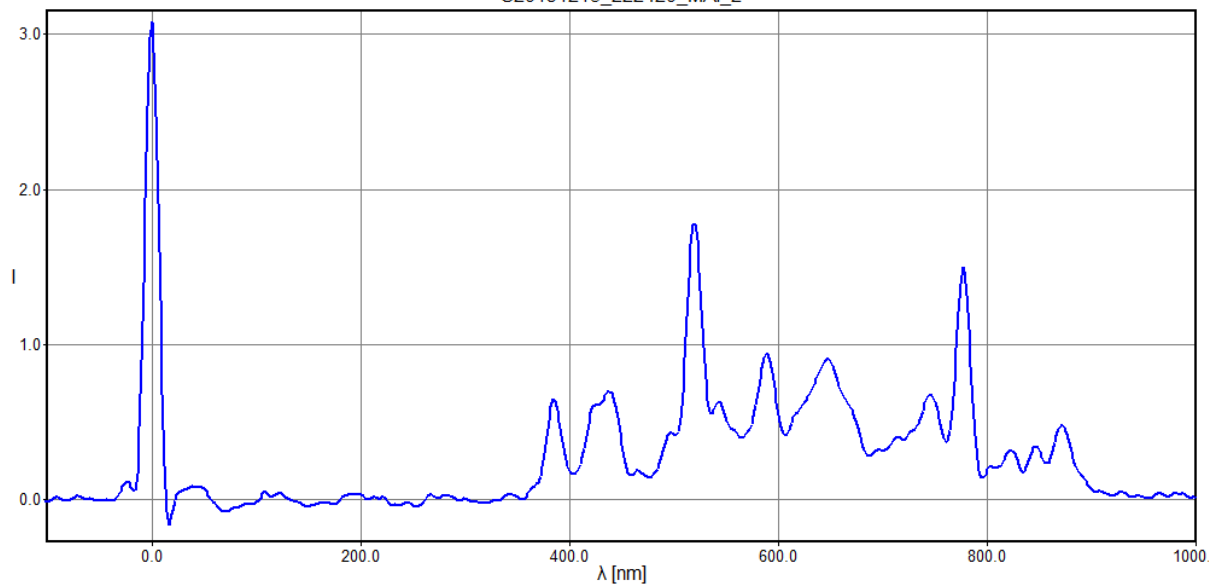
polynom for fit lambda c: [4.058 -821.709]

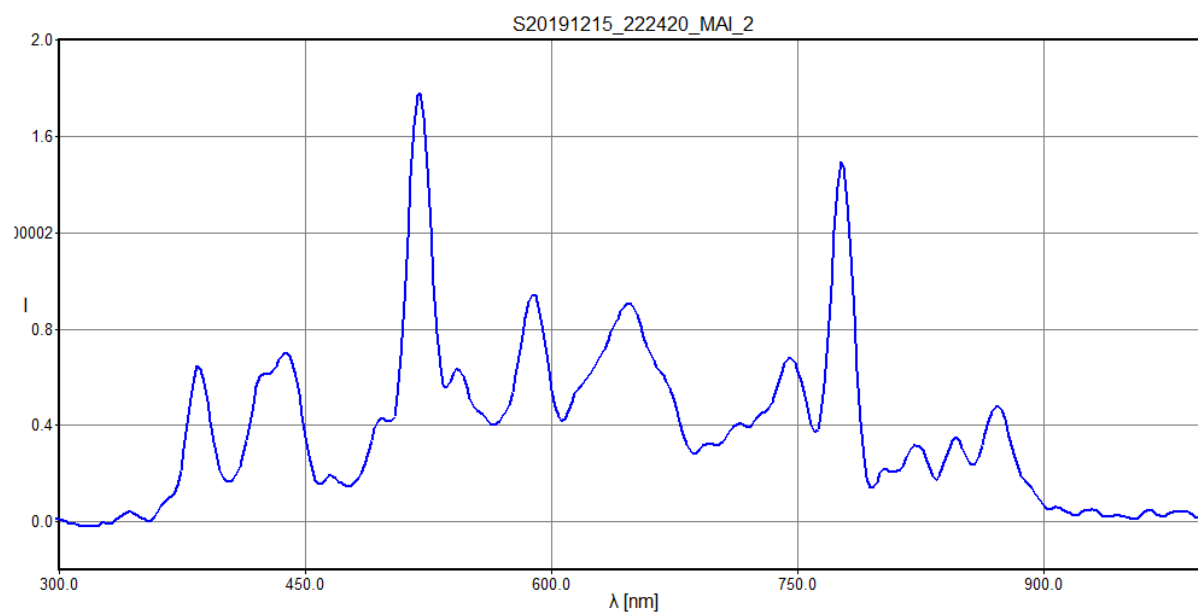
pixel	lambda	fit	error
202.37,	0.00,	-0.41,	-0.4091
330.34,	517.50,	518.95,	1.4454
347.53,	589.00,	588.71,	-0.2906
393.84,	777.40,	776.65,	-0.7457

rms_x = 0.8510

spectrum C:\Daten\Python\191206\r_add19cal.dat saved

S20191215_222420_MAI_2





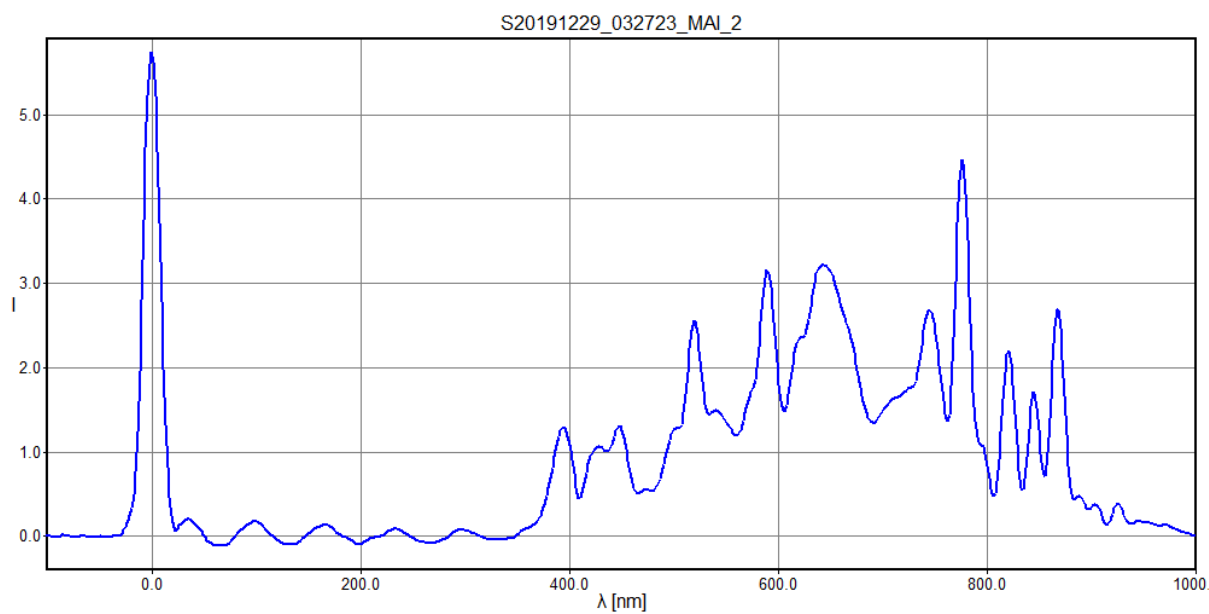
M20191229_032723_MAI_2, COM, -6.0m



polynom for fit lambda c: [1.177e-04 3.955e+00 -2.161e+02]

pixel	lambda	fit	error
54.44,	0.00,	-0.42,	-0.4175
184.94,	517.50,	519.45,	1.9492
202.31,	589.00,	588.95,	-0.0523
248.90,	777.40,	775.71,	-1.6921
441.95,	1554.80,	1555.01,	0.2127

rms_x = 1.1735



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 both 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*	

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