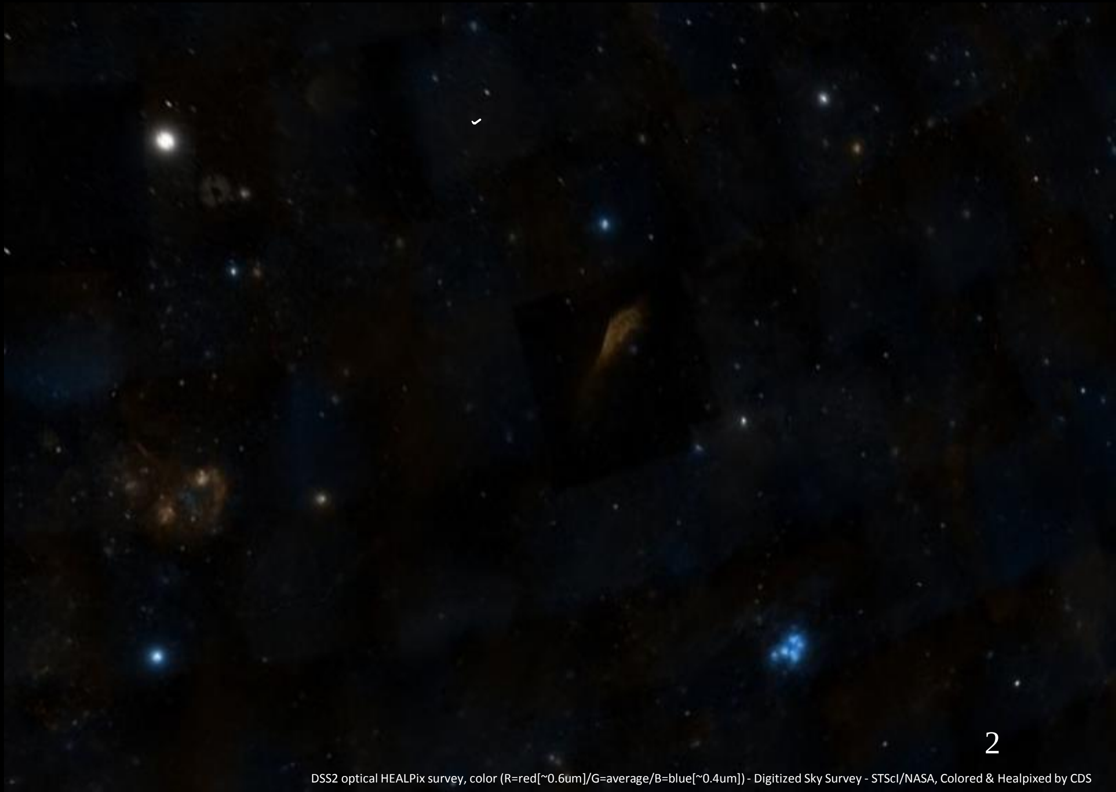
Centrum Astronomiczne im. Mikołaja Kopernika Polskiej Akademii Nauk

Epsilon Persei and Epsilon Centauri observed by BRITE constellation

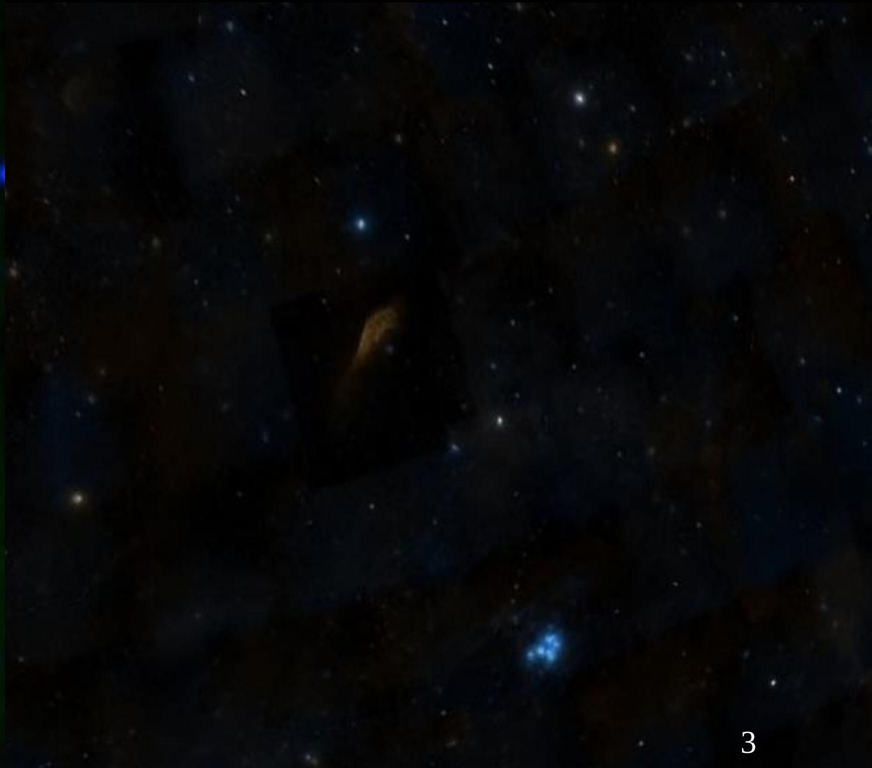
Elżbieta Zocłońska

Stara Lesna 2018-05-16

DSS2 optical HEALPix survey, color (R=red[~0.6um]/G=average/B=blue[~0.4um]) - Digitized Sky Survey - STScI/NASA, Colored & Healpixed by CDS



Źródło: J.A. Toala [2017] XMM-Newton,WISE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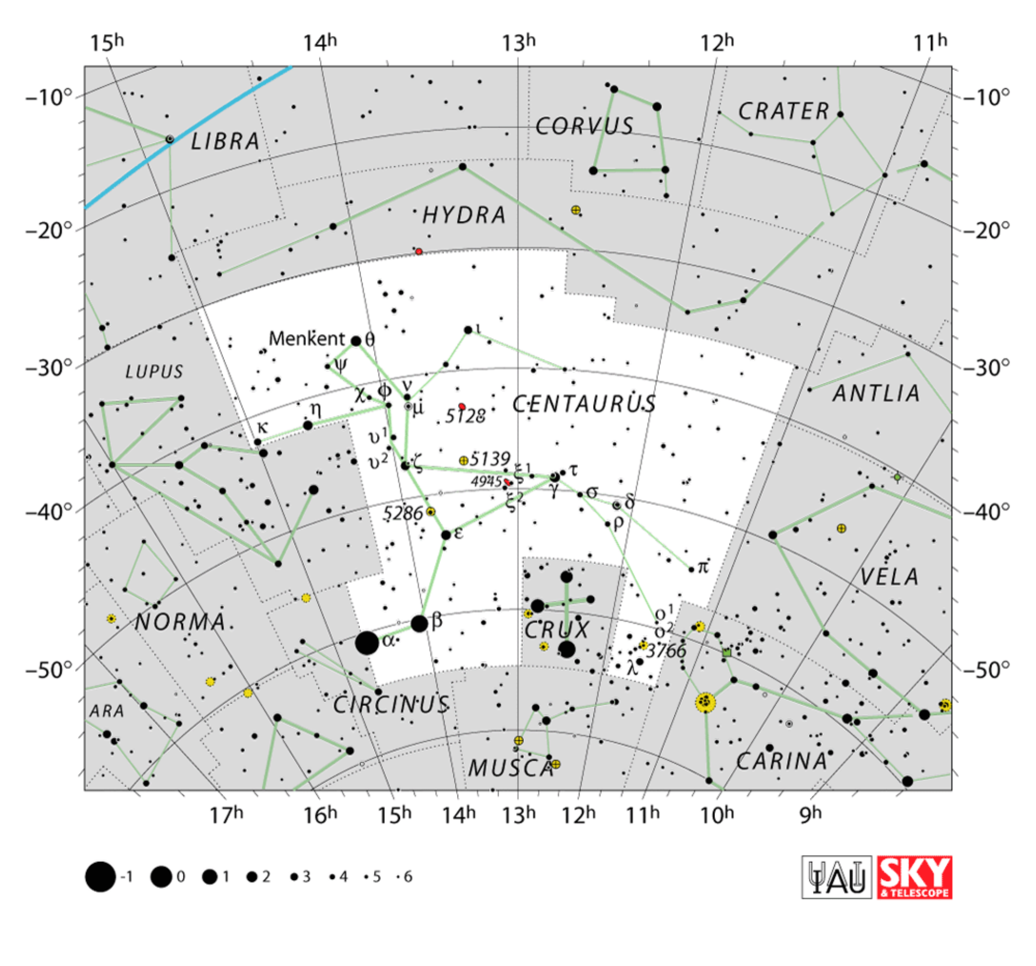
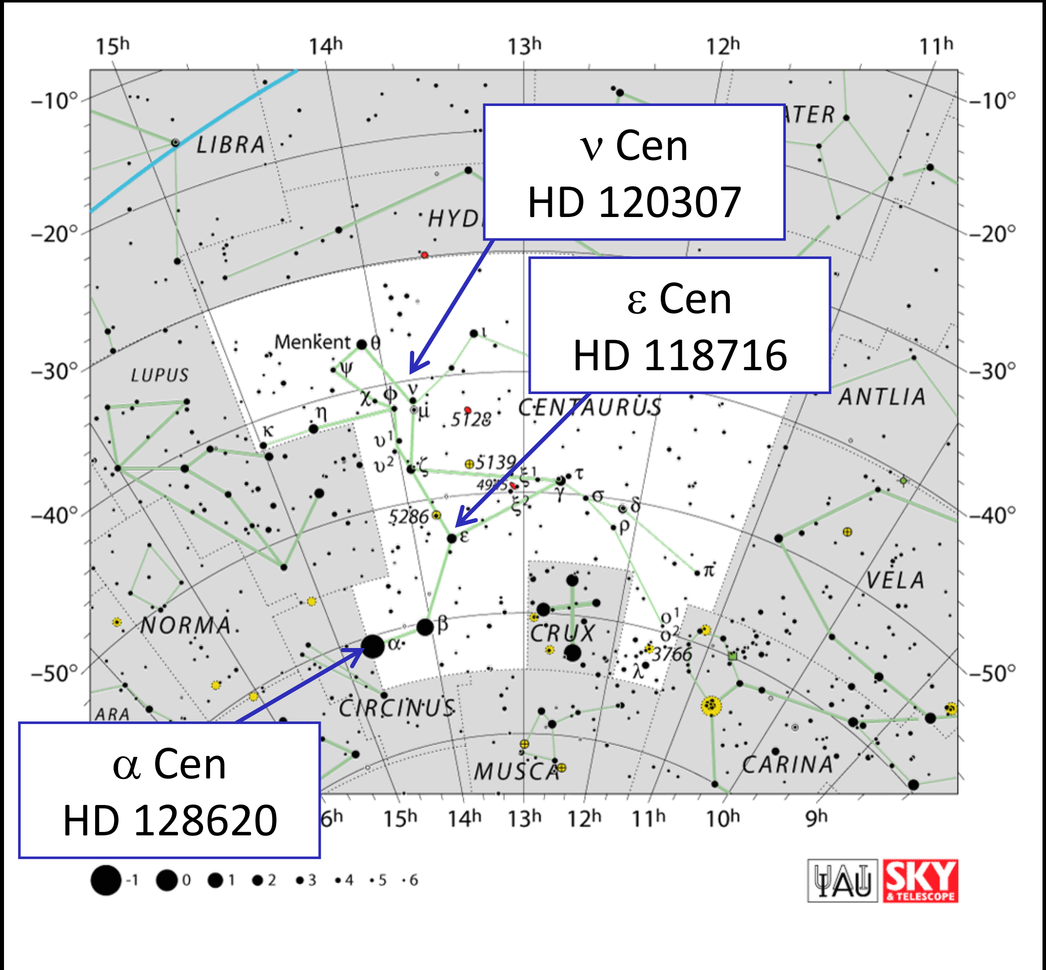


15h
14h
13h
12h
11h
−10°
−20°
−30°
−40°
−50°
LIBRA
CORVUS
CRATER
HYDRA
Menkent
CENTAURUS
ANTLIA
LUPUS
5128
5139
4945
5286
VELA
NORMA
CRUX
3766
CIRCINUS
ARA
MUSCA
CARINA
17h
16h
15h
14h
13h
12h
11h
10h
9h
-1
0
1
2
3
4
5
6
IAU
SKY & TELESCOPE



ν Cen
HD 120307
ε Cen
HD 118716
α Cen
HD 128620
15h
14h
13h
12h
11h
−10°
−20°
−30°
−40°
−50°
LIBRA
HYD
ATER
CENTAURUS
ANTLIA
LUPUS
VELA
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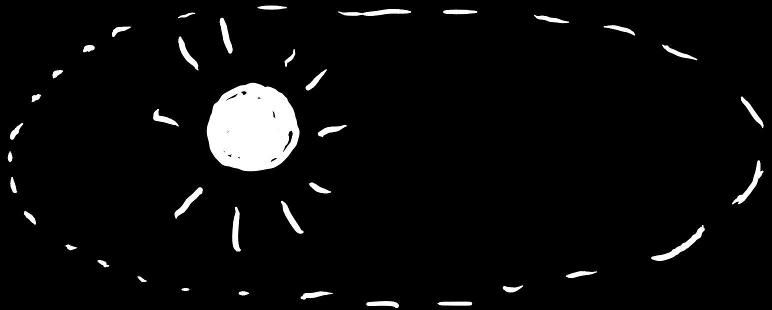
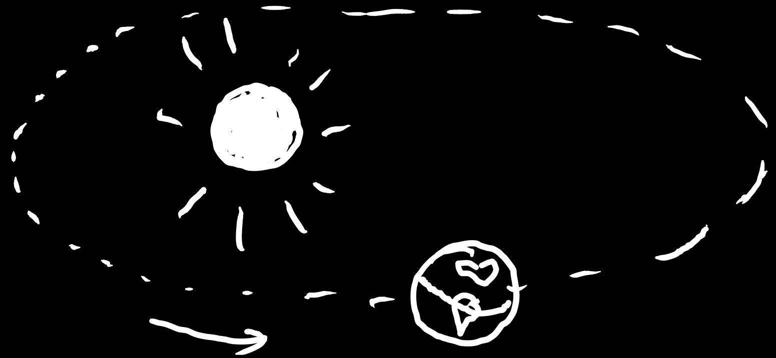
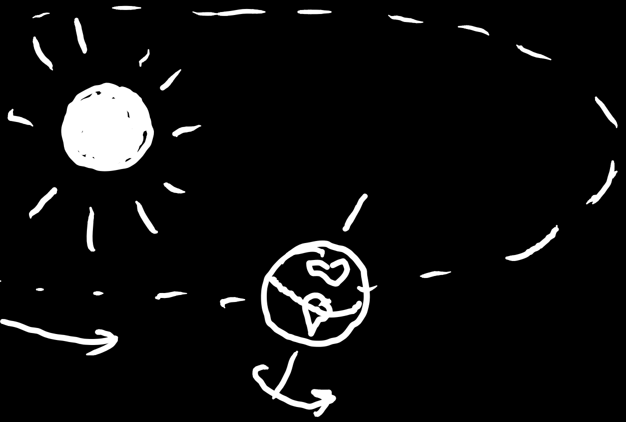
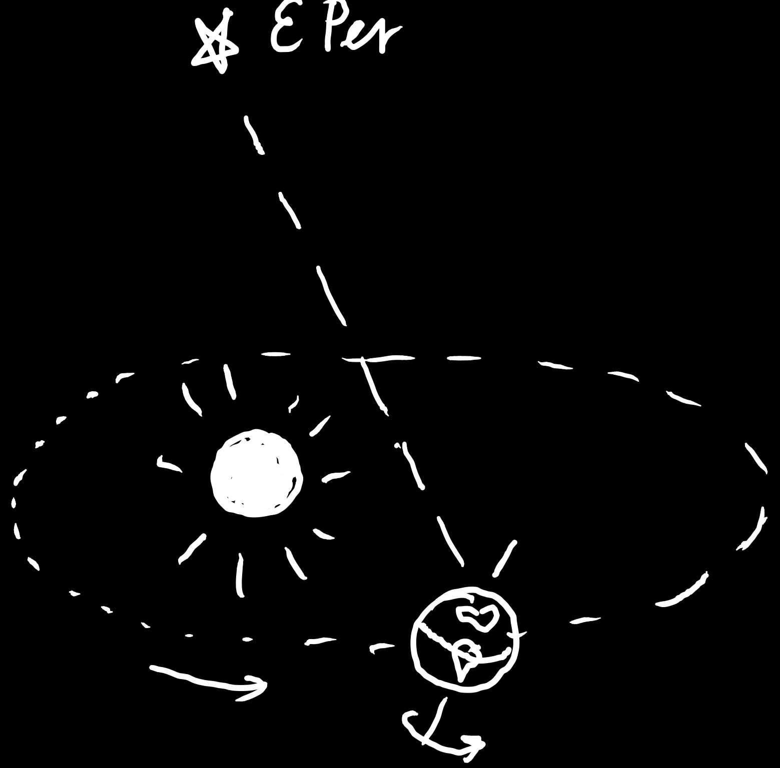
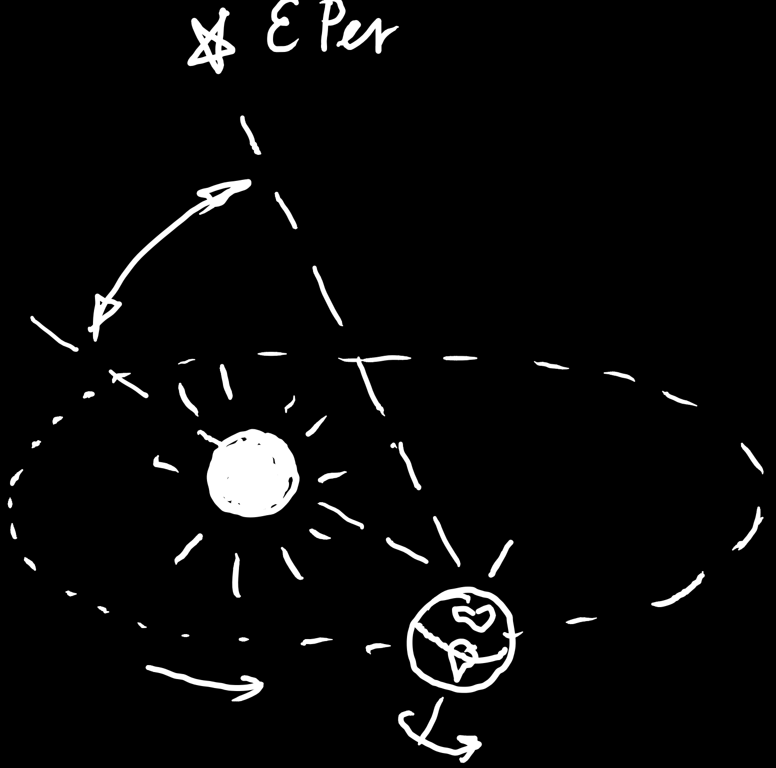
SKY & TELESCOPE

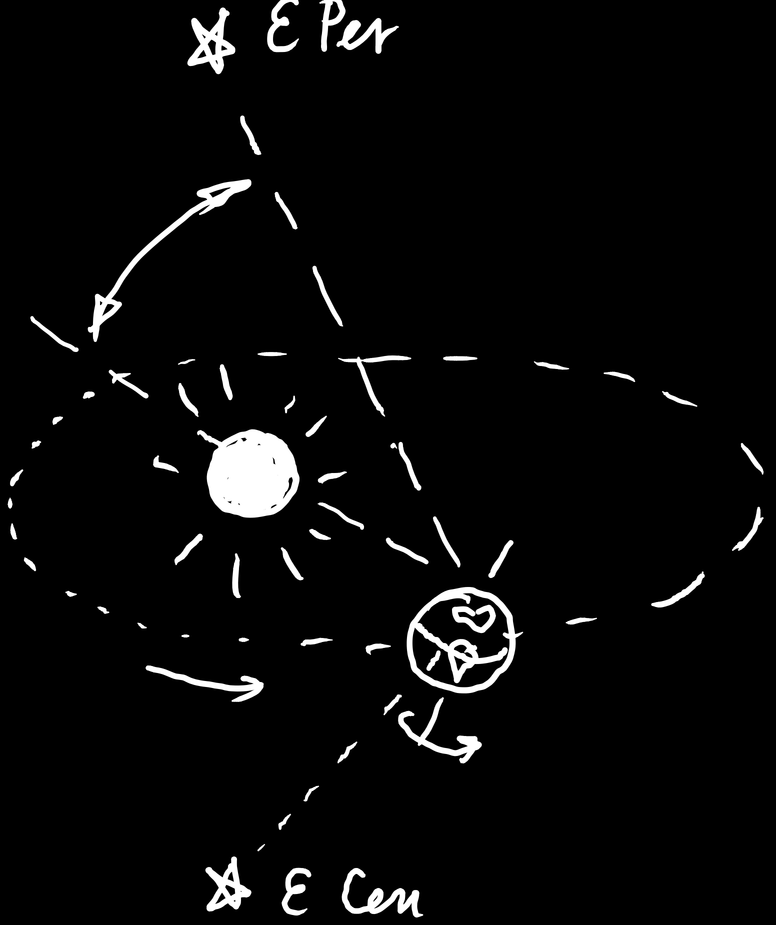


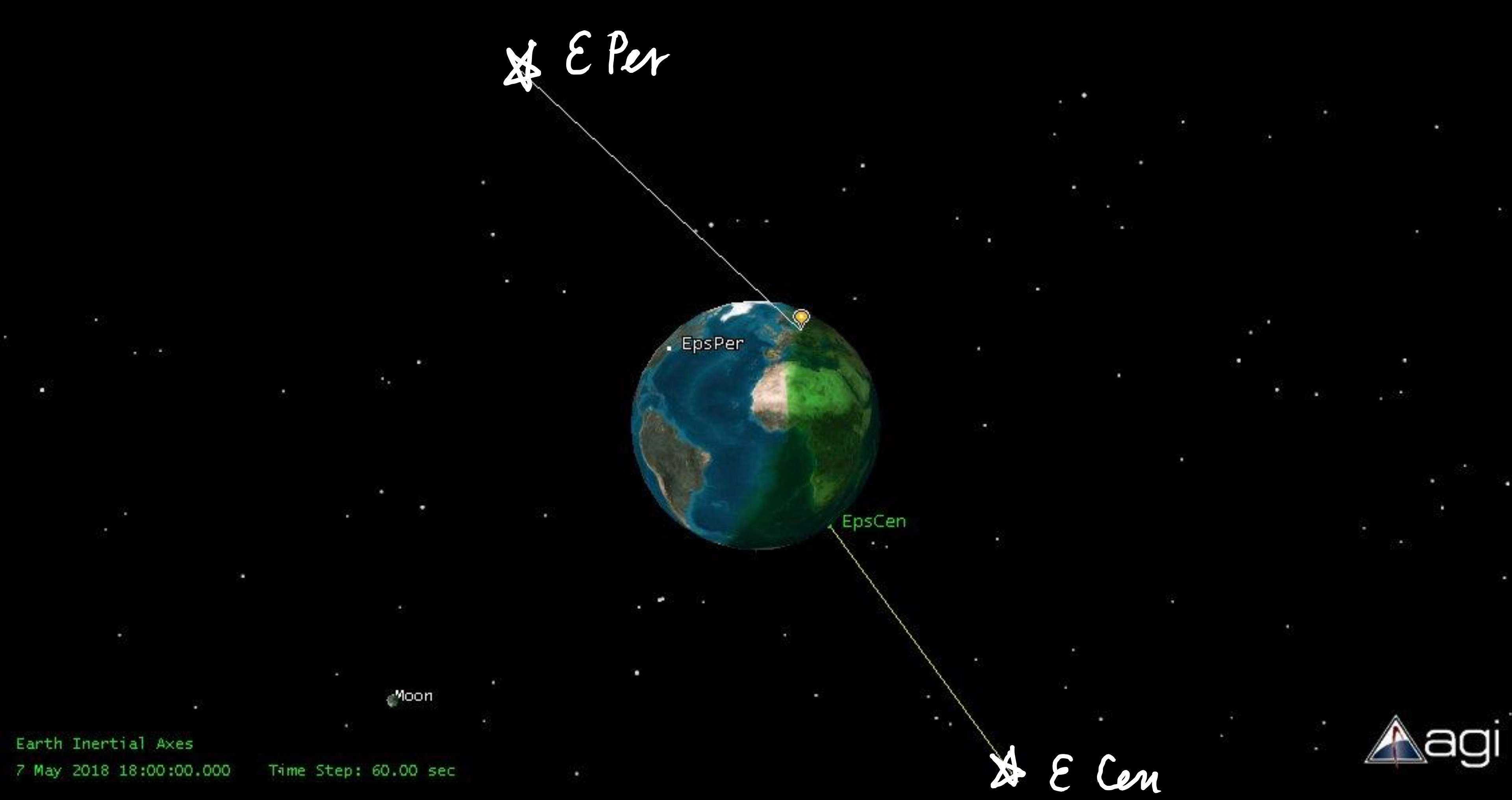




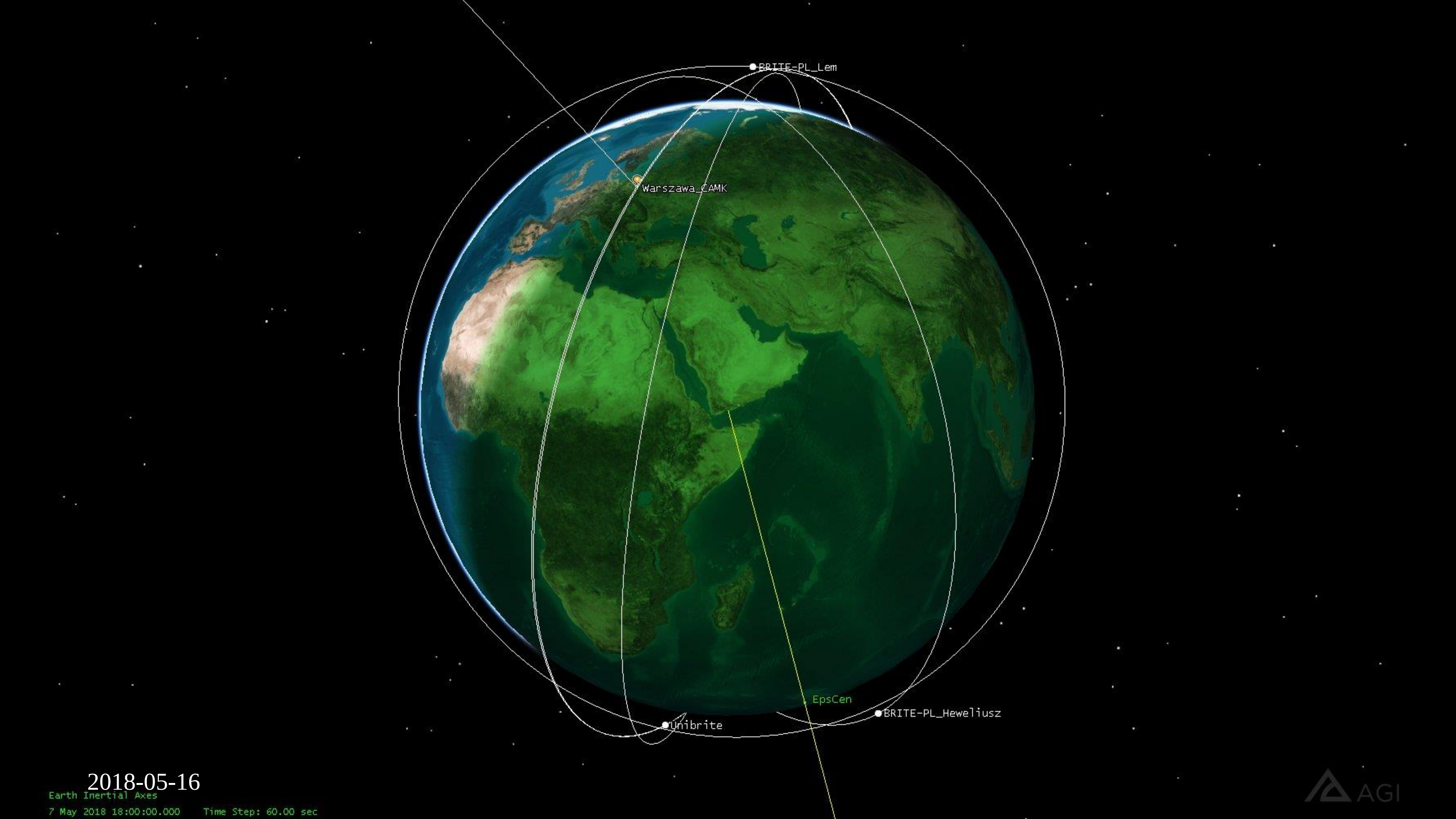

ε Per


ε Per

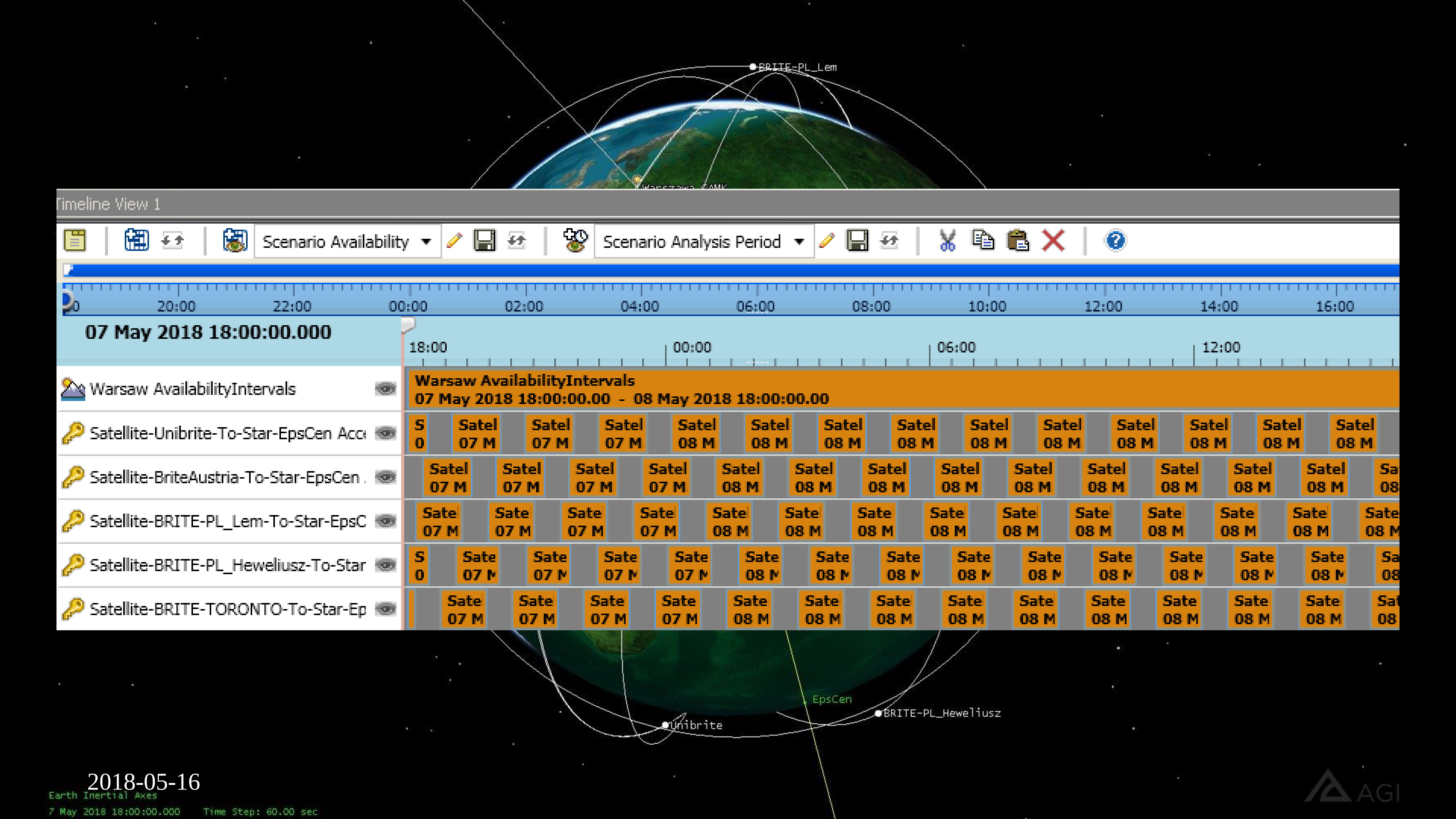

ε Per
ε Cen

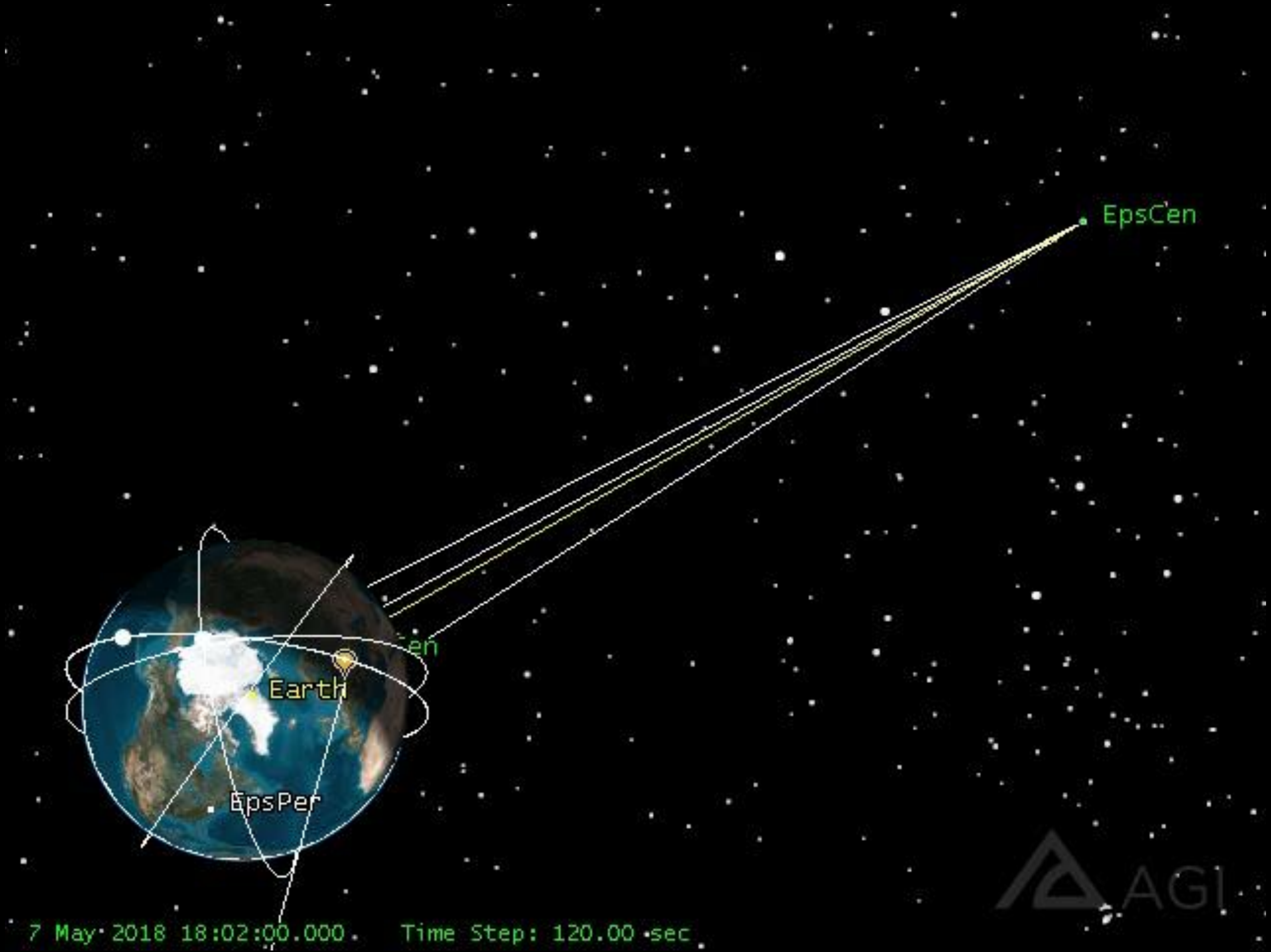

ε Per
EpsPer
EpsCen
Moon
Earth Inertial Axes
7 May 2018 18:00:00.000
Time Step: 60.00 sec
ε Cen
agi

BRITE satellites constellation

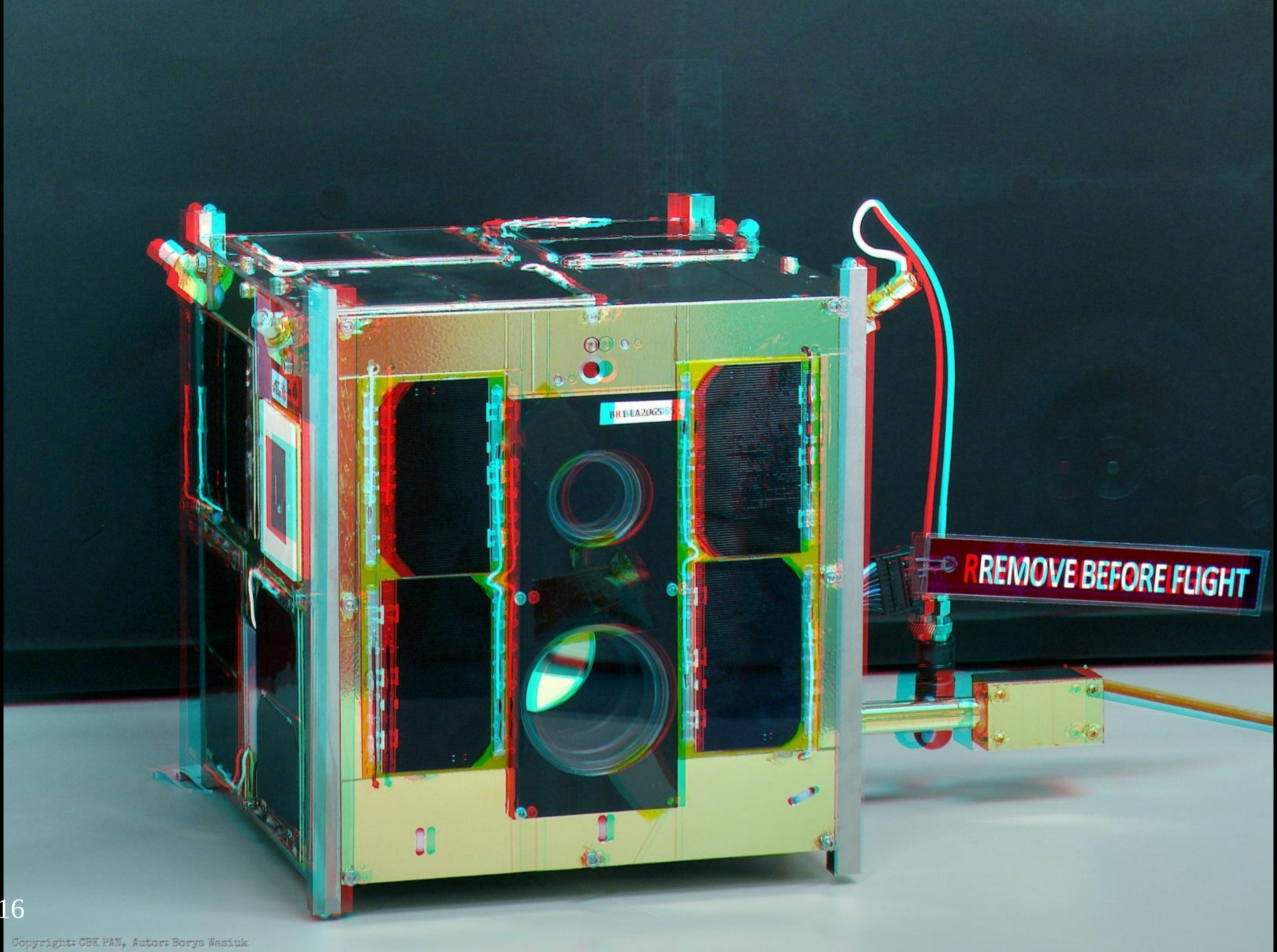

BRITE-PL_Lem
Warszawa_CAMK
EpsCen
BRITE-PL_Heweliusz
Unibrite
Earth Inertial Axes
7 May 2018 18:00:00.000 Time Step: 60.00 sec
AGI

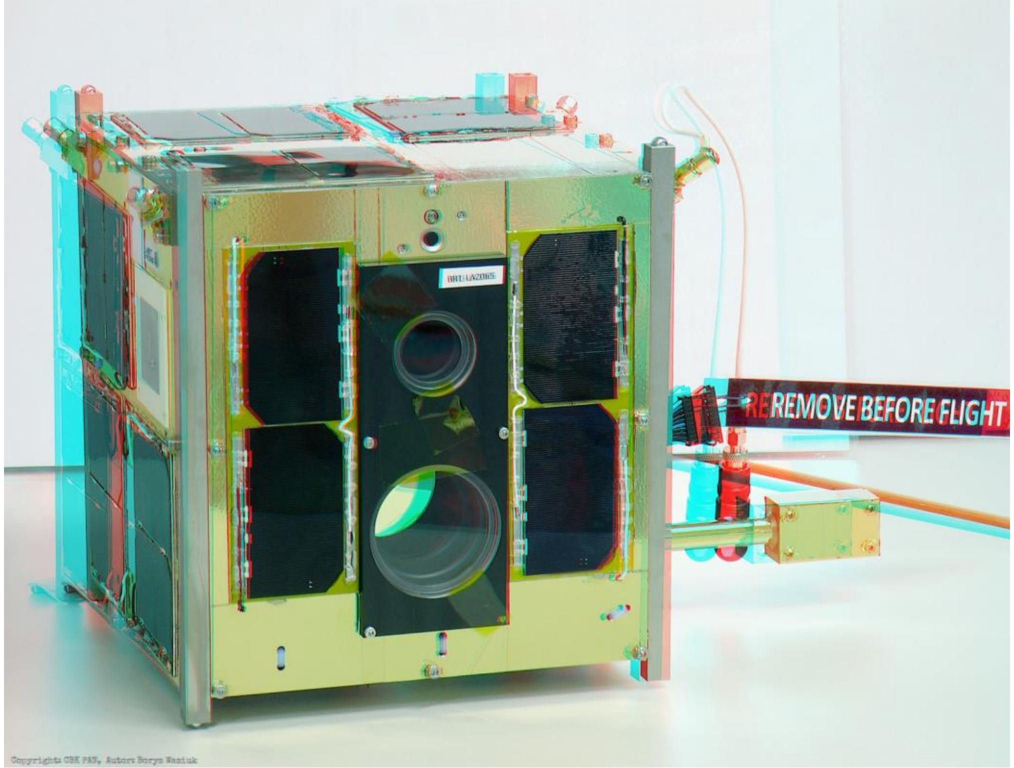
2018-05-16

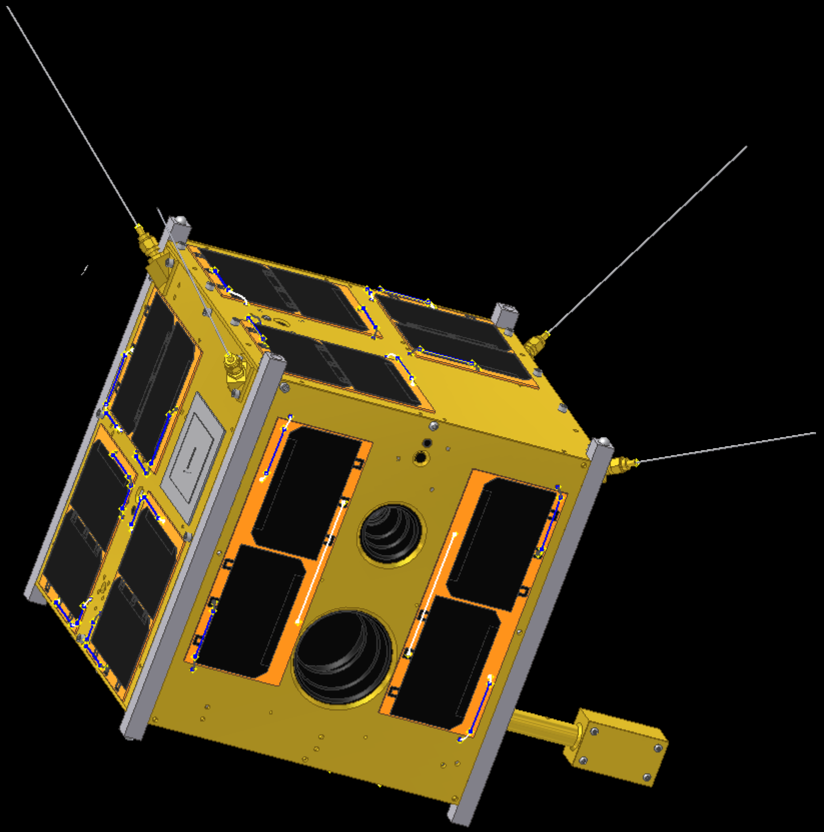

BRITE-PL_Lem
Timeline View 1
Scenario Availability
Scenario Analysis Period
20:00
22:00
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
07 May 2018 18:00:00.000
18:00
00:00
06:00
12:00
Warsaw AvailabilityIntervals
Warsaw AvailabilityIntervals
07 May 2018 18:00:00.00 - 08 May 2018 18:00:00.00
Satellite-Unibrite-To-Star-EpsCen Acc
Satellite-BriteAustria-To-Star-EpsCen
Satellite-BRITE-PL_Lem-To-Star-EpsC
Satellite-BRITE-PL_Heweliusz-To-Star
Satellite-BRITE-TORONTO-To-Star-Ep
EpsCen
BRITE-PL_Heweliusz
Unibrite
2018-05-16
Earth Inertial Axes
7 May 2018 18:00:00.000
Time Step: 60.00 sec


EpsCen
Earth
EpsPer
7 May 2018 18:02:00.000
Time Step: 120.00 sec
AGI

Teleskop

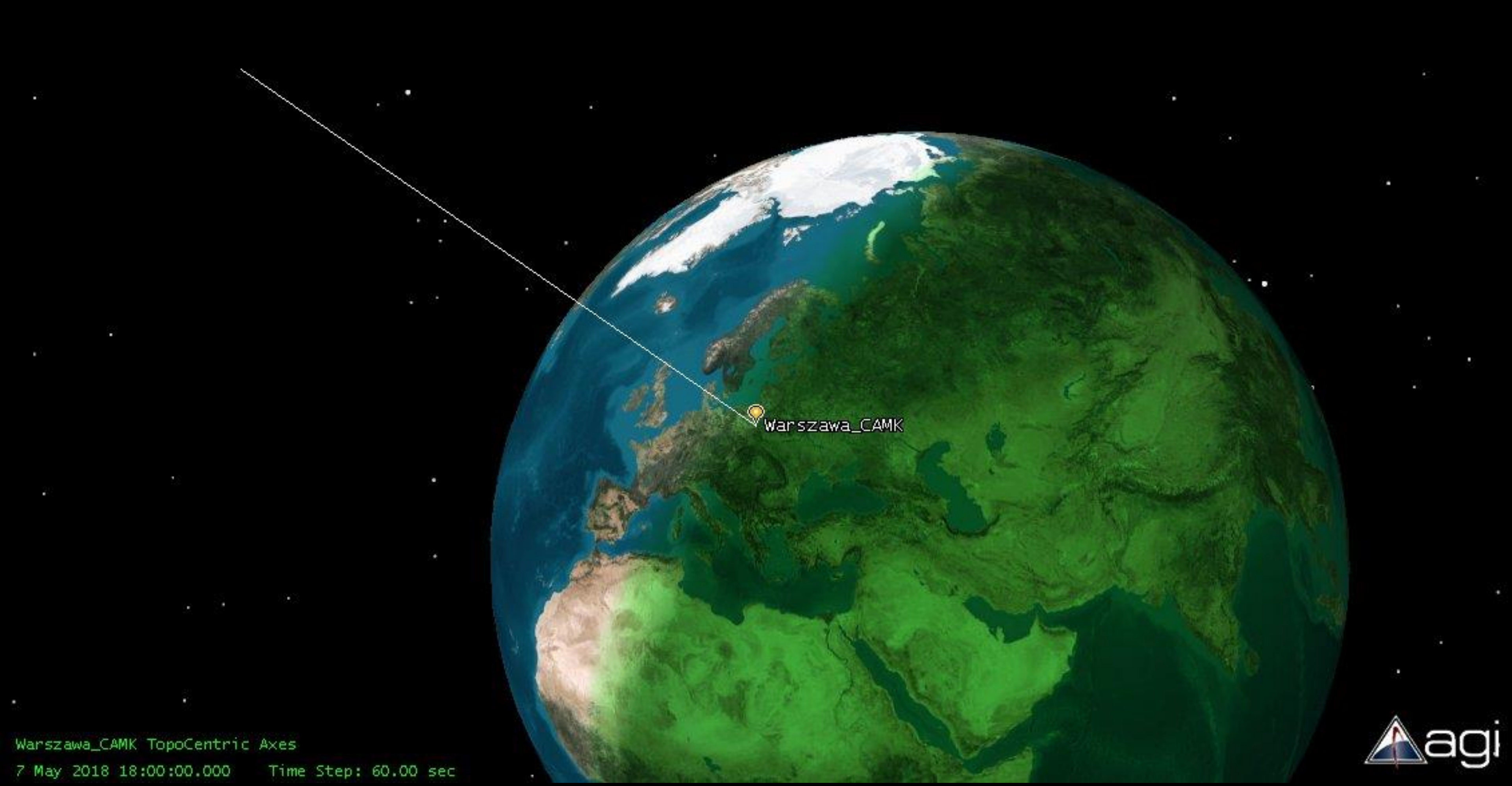

REMOVE BEFORE FLIGHT
Copyright: CBK PAN, Autor: Borys Wasiuk

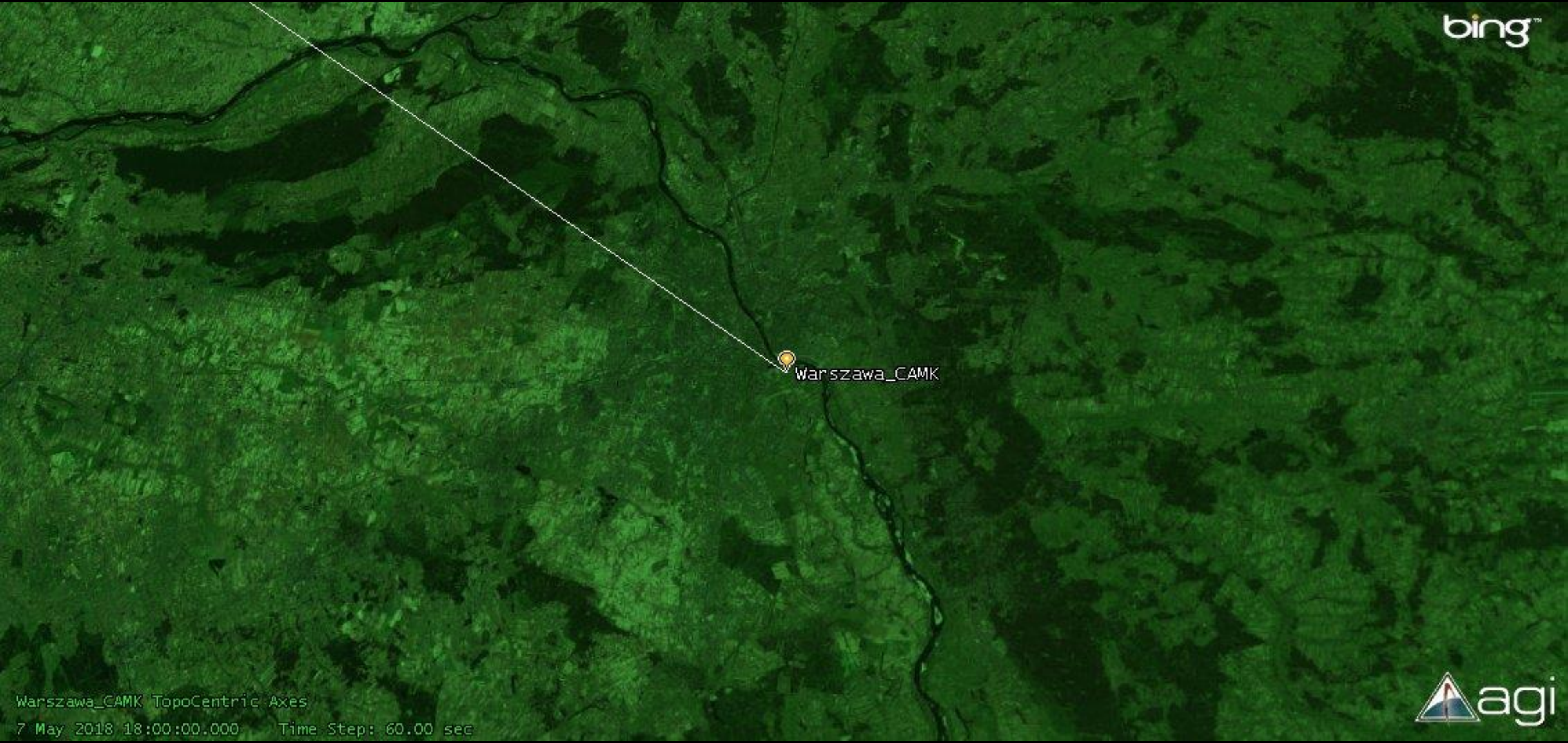

REMOVE BEFORE FLIGHT



Ground station in CAMK

CAMK: BRITE satellites control center


Warszawa_CAMK
Warszawa_CAMK TopoCentric Axes
7 May 2018 18:00:00.000   Time Step: 60.00 sec


Warszawa_CAMK
Warszawa_CAMK TopoCentric Axes
7 May 2018 18:00:00.000 Time Step: 60.00 sec


bing
Warszawa_CAMK
Warszawa_CAMK TopoCentric Axes
7 May 2018 18:00:00.000   Time Step: 60.00 sec
agi

CAMK: BRITE satellites control center

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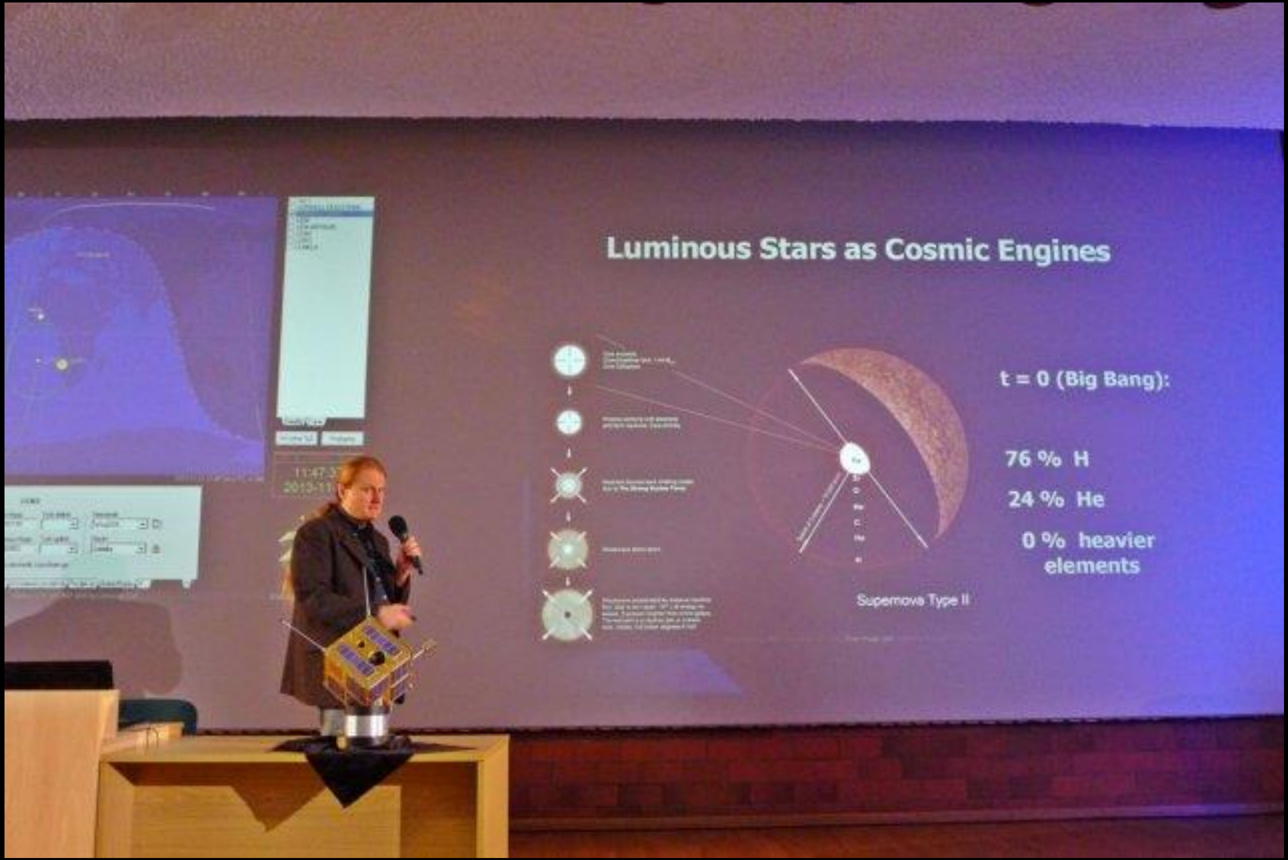
Luminous Stars as Cosmic Engines
t = 0 (Big Bang):
76 % H
24 % He
0 % heavier elements
Supernova Type II


Luminous Stars as Cosmic Engines
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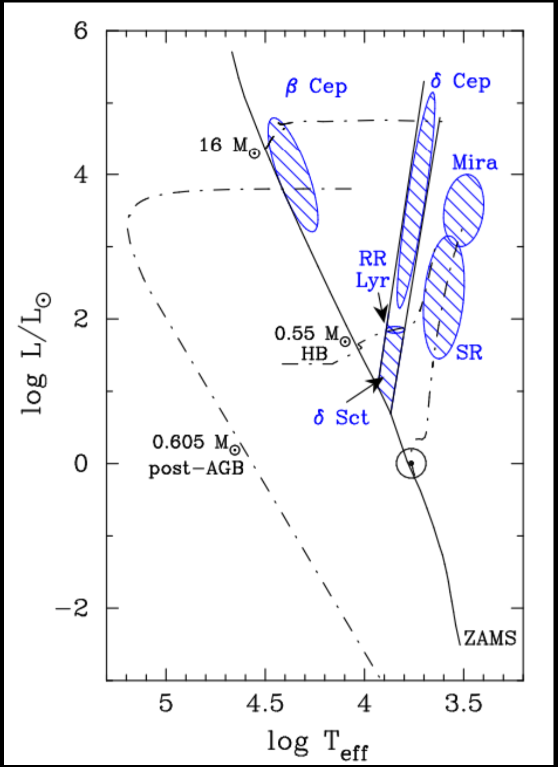
76 % H
24 % He
0 % heavier elements
Supernova Type II

Gwiazdy typu β Cephei

Beta Cephei star

- main sequence stars
- pulsating variable (change size and shape)
- mass from 8 to 18 M⊙
- pulsation period 2 - 8 h
- β Cephei pulsations are triggered in the ionization zone of the iron-group elements.
- very complex pulsation patterns, multiperiodic radial and nonradial oscillators



Source: Handler G. „Asteroseismology” https://doi.org/10.1007/978-94-007-5615-1_4

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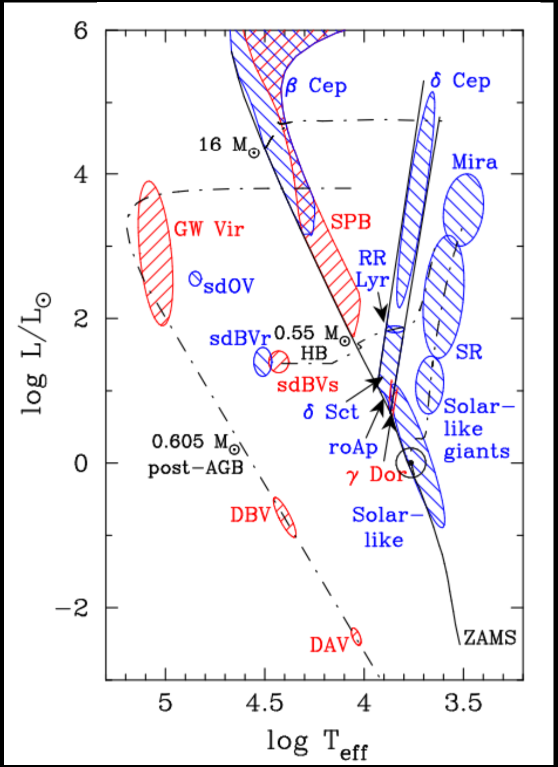

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Asteroseismology

- determination of the interior structure of star by using its oscillations

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  - light
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Asteroseismology

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- stellar oscillations generate motions and temperature variations on the surface
- variations causes:
  - light
  - radial velocity
  - line profile changes.
- pulsating stars can be studied both photometrically and spectroscopically, via time series measurements

Pulsation driving mechanism

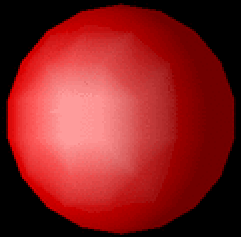
κ-γ mechanism

β Cephei star – pulsation are triggered in the ionization zone of the iron group elements

Pulsation modes

radial modes

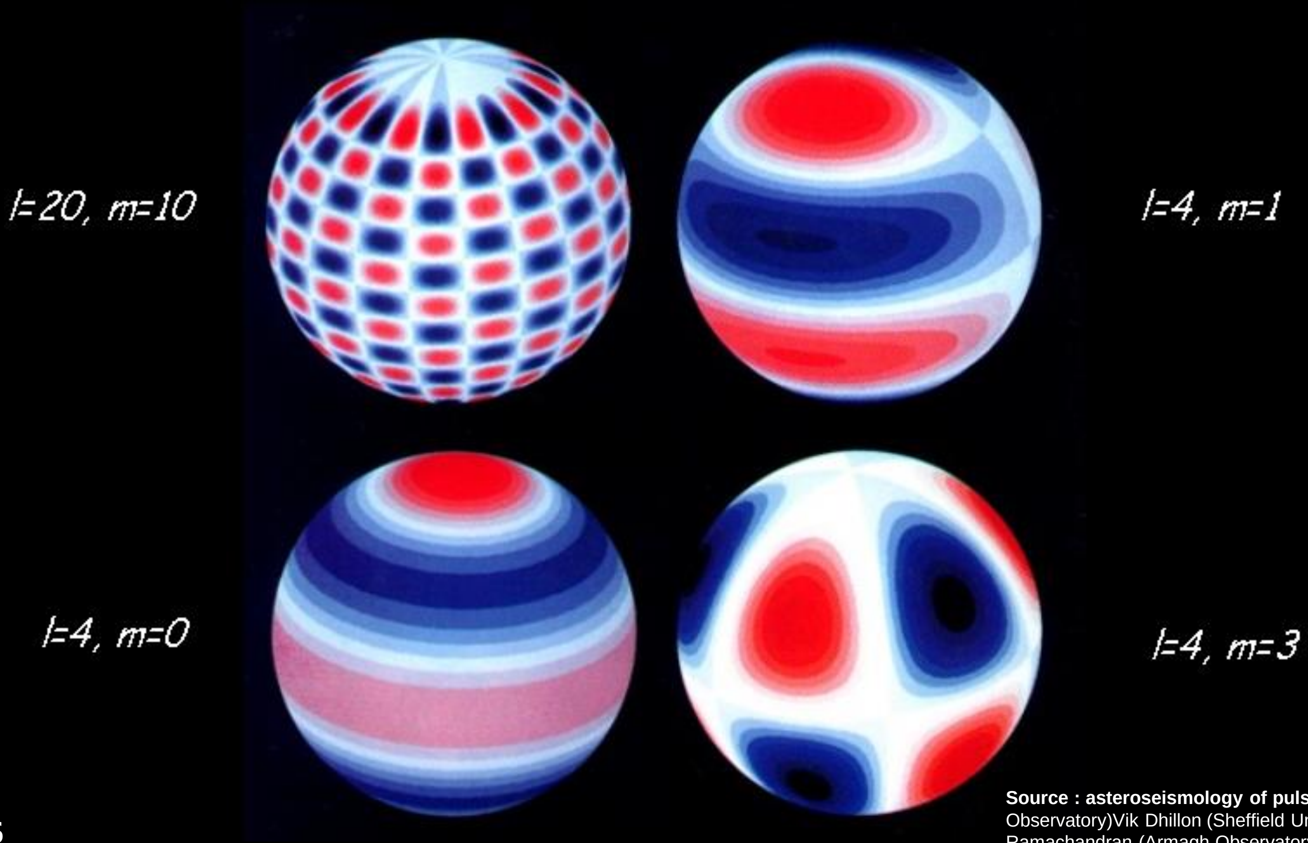
non radial modes



2018-05-16

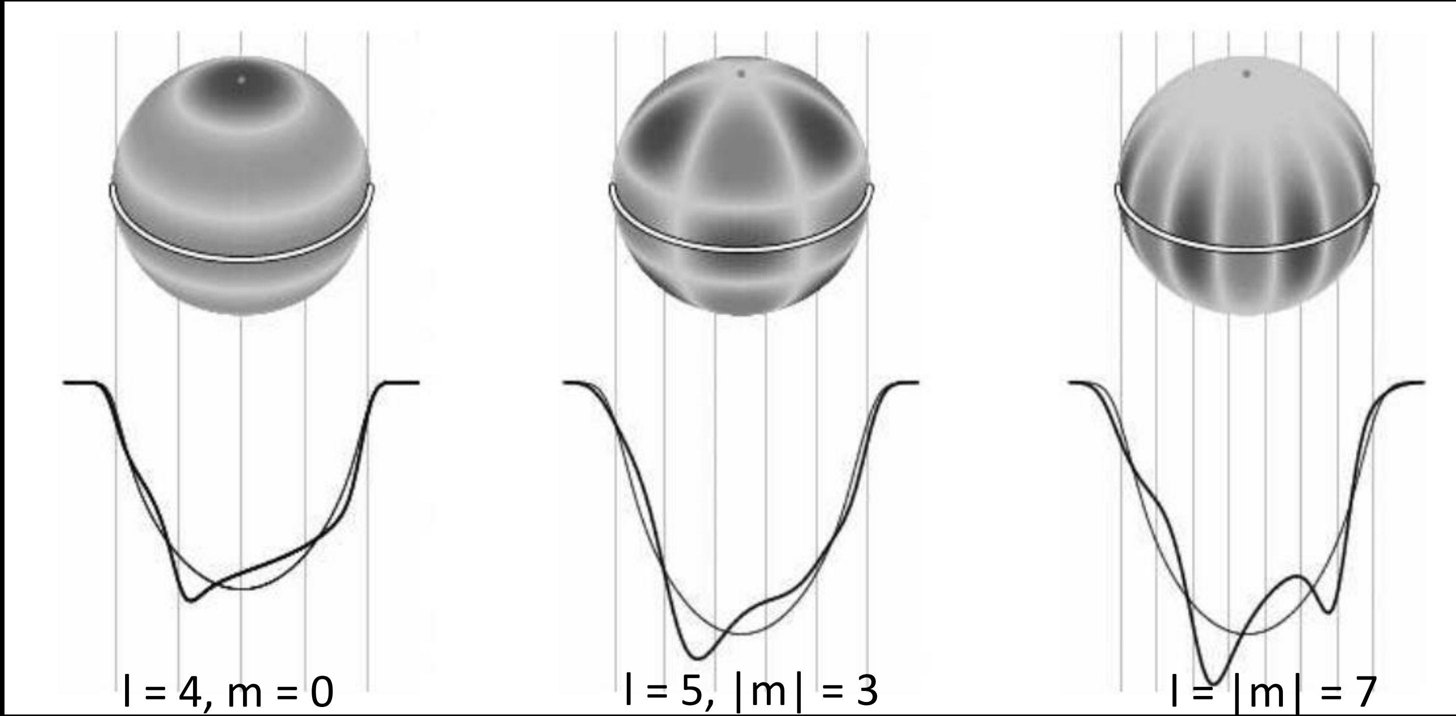
These animations were produced by students Alexandra Chambers and Darran Baker as part of a course on Scientific Computing in the School of Physics at the University of Sydney.

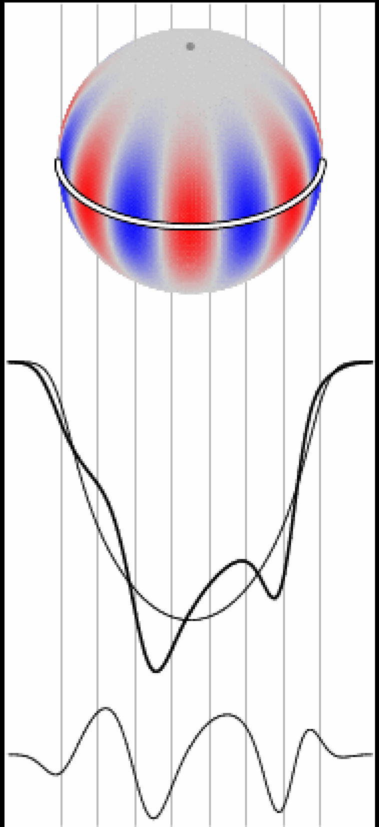
Non radial oscillations



Source : asteroseismology of pulsating sdB stars; Simon Jeffery (Armagh Observatory)Vik Dhillon (Sheffield University) Tom Marsh (Warwick University) Ramachandran (Armagh Observatory) Conny Aerts, Paul Groot (Nijmegen)MNRAS: July 2004

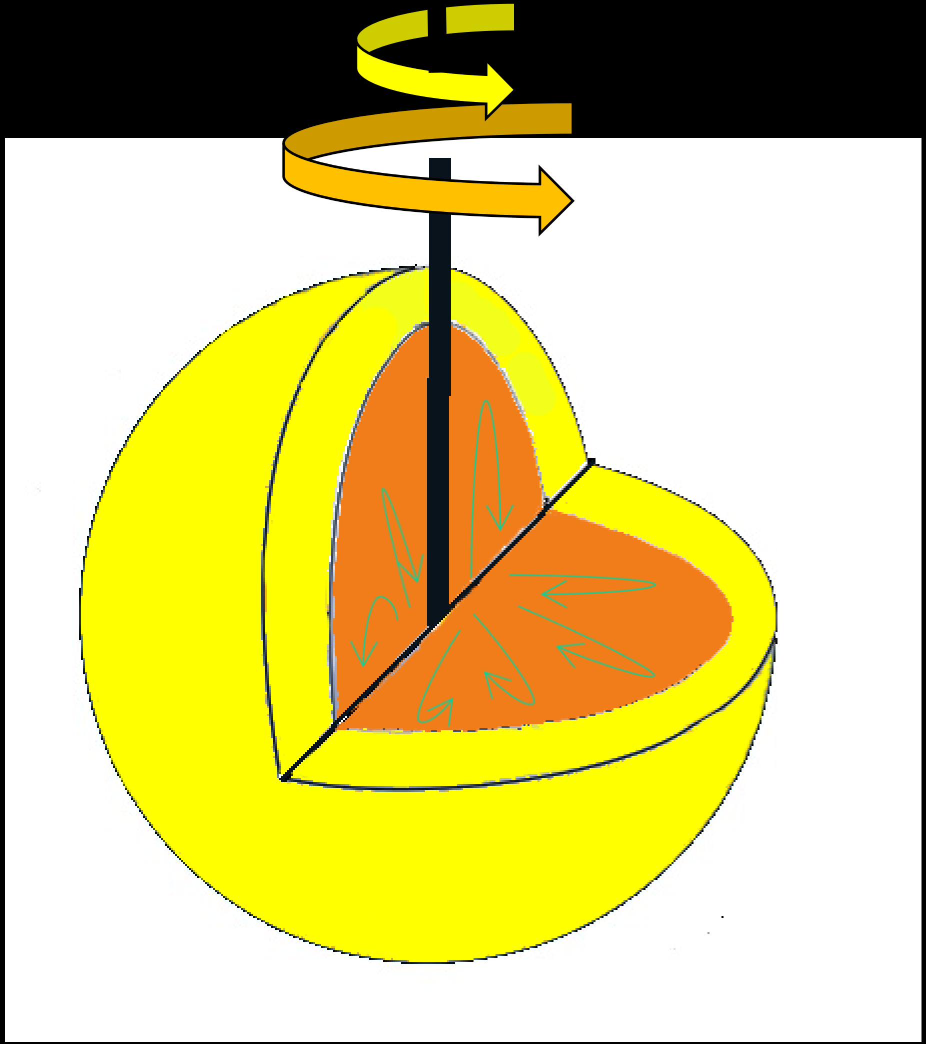
Line profile variations due to stellar pulsation





Source: Handler G. „Asteroseismology" https://doi.org/10.1007/978-94-007-5615-1_4
Adapted from Telting & Schrijvers (1997)

Angular Momentum transport

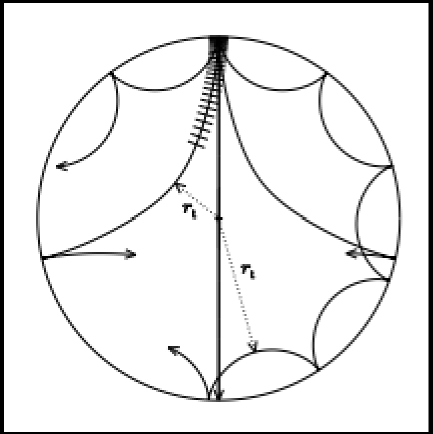


ω envelope

ω core

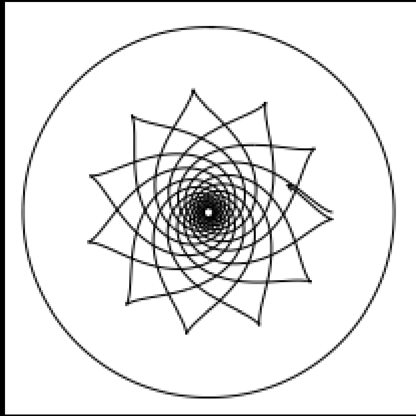
ω – angular velocity

Stellar oscilations



acoustic mode (p modes) caused by pressure changes inside star

gravity mode (g modes) caused by gravity (bouyacy)



Source: „A review on Asteroseismology” Maria Pia Di Mauro **arXiv:1703.07604v2 [astro-ph.SR]**

Epsilon Persei HD24760

Beta Cephei star

Triple system

Main componen ε Per A: spectral type B1.5 III

Second component: spectral type A6, orbital period 14.069 days [Libich et al., 2005]

Third component: orbital period $\sim$ 25.8 years

Fast rotating star

Multiple pulsation modes

Magnetic field

Epsilon Centaurii HD118716

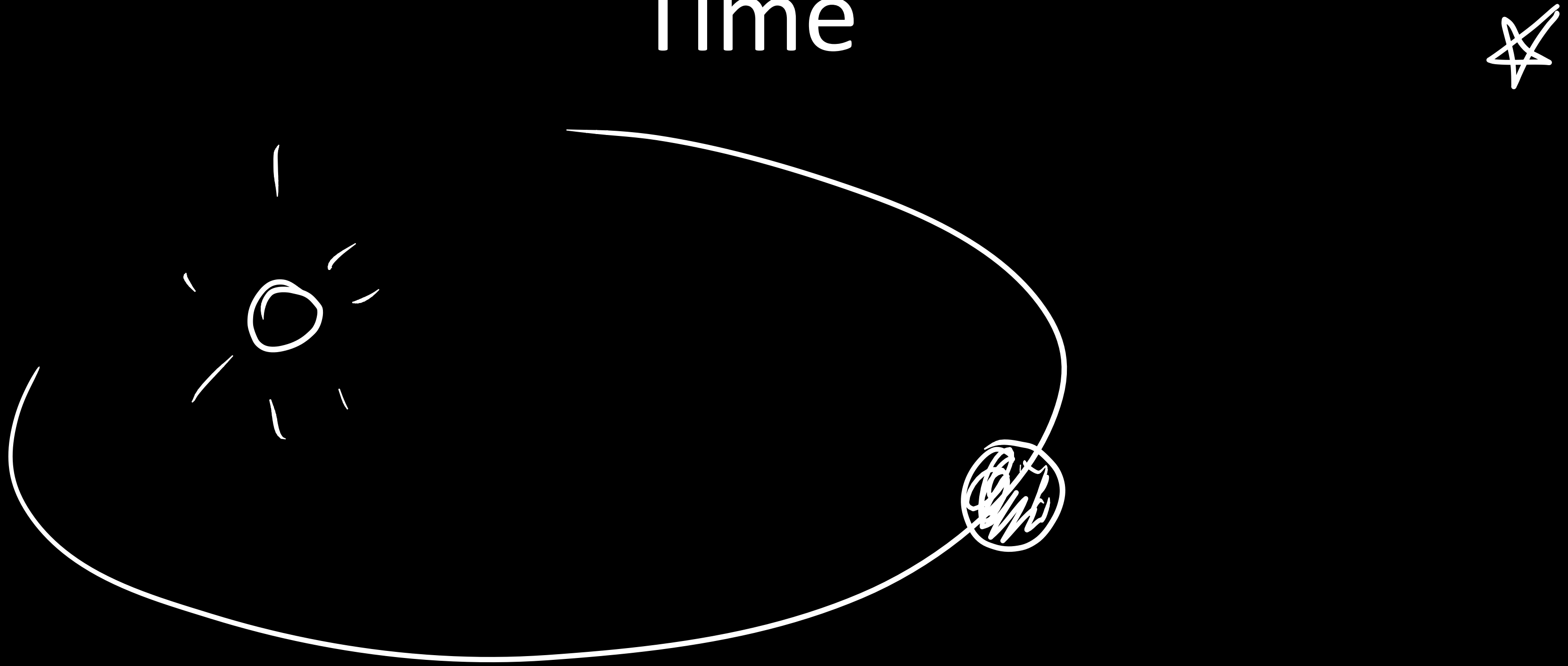
Beta Cephei star

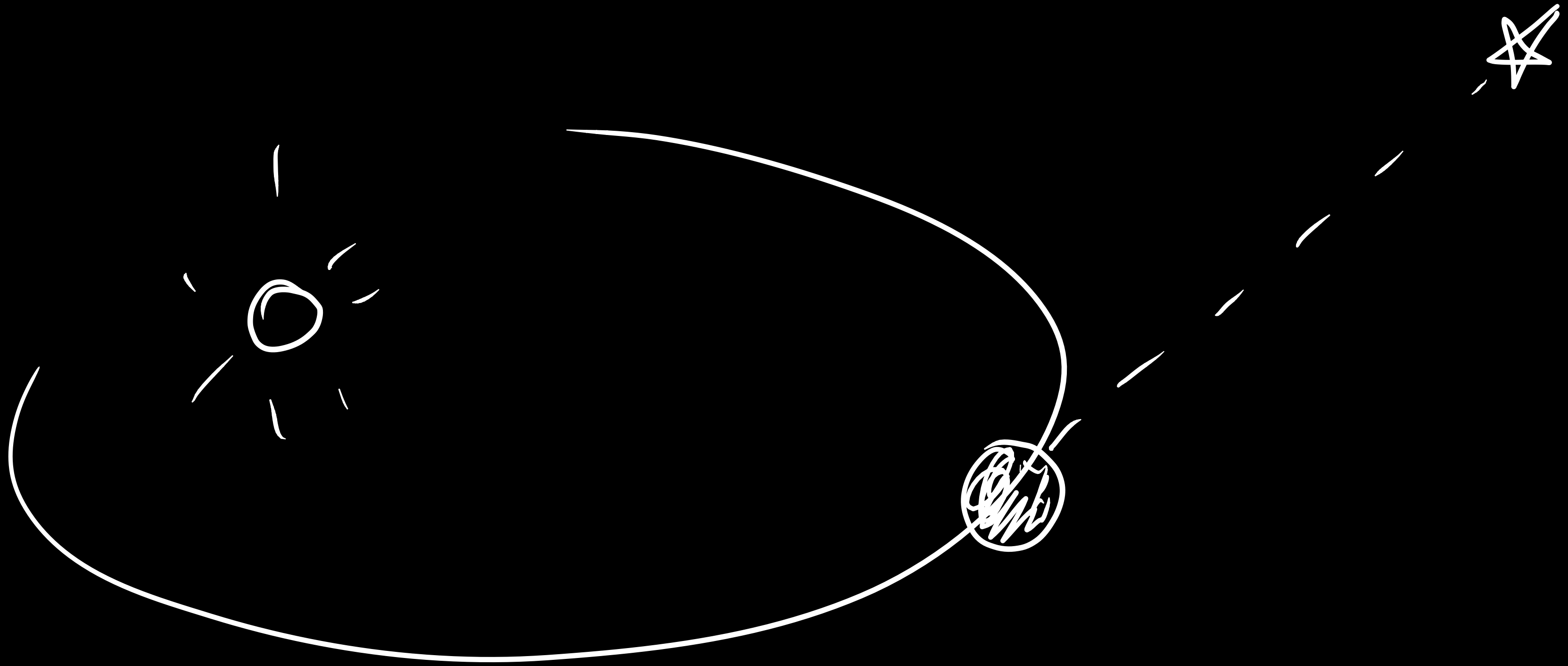
Binary system

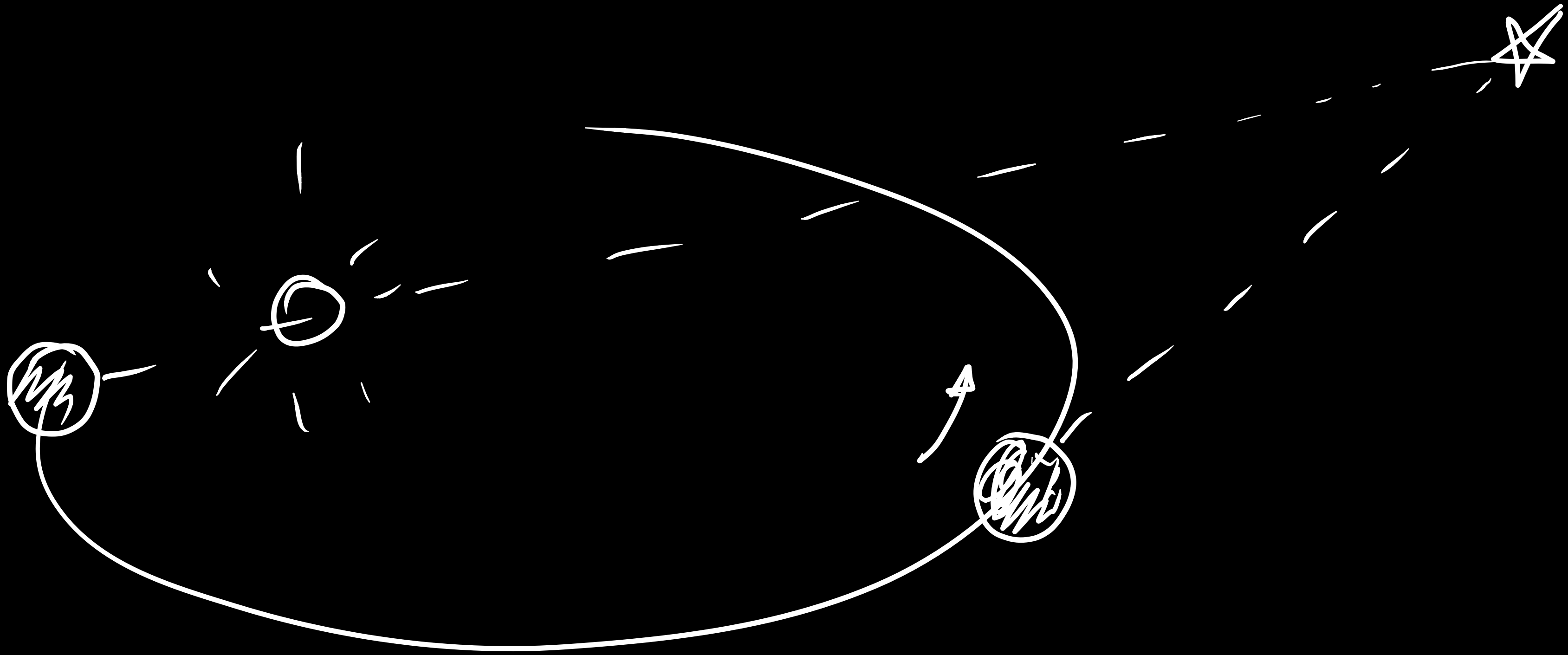
Multiple pulsation modes

Time

Time







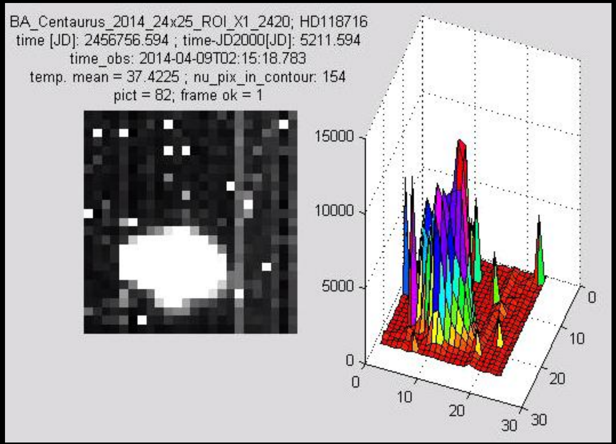
Observational data analysis

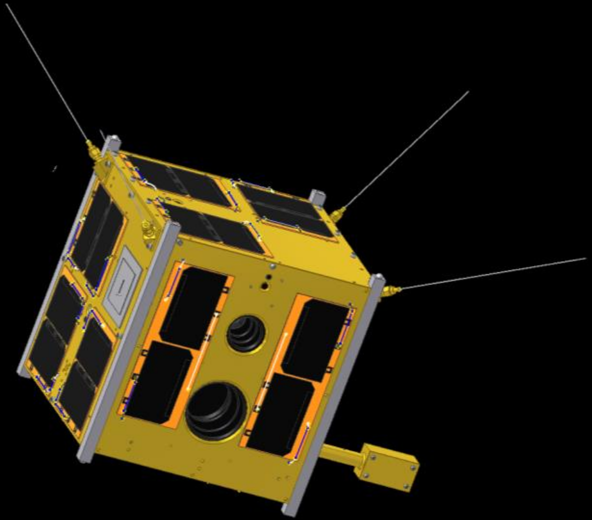
Photometry

obserwacje z satelity

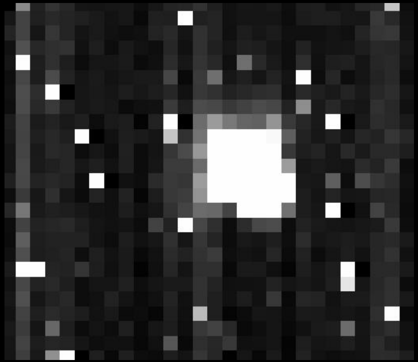
BRITE data analysis

ε Cen

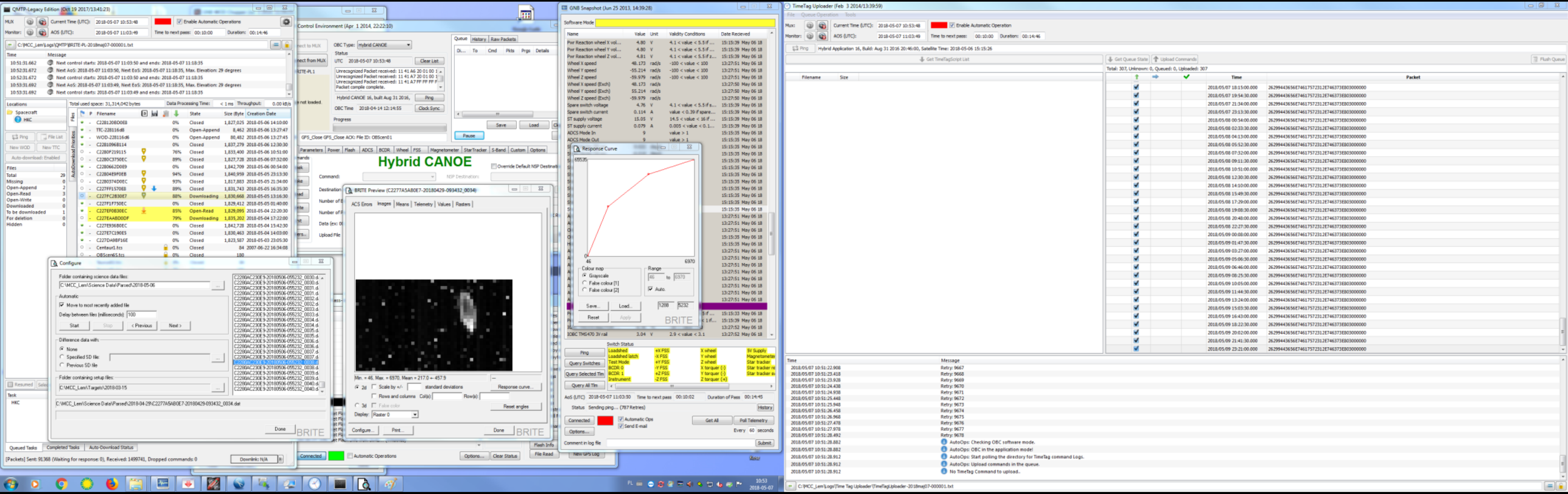




ε Per

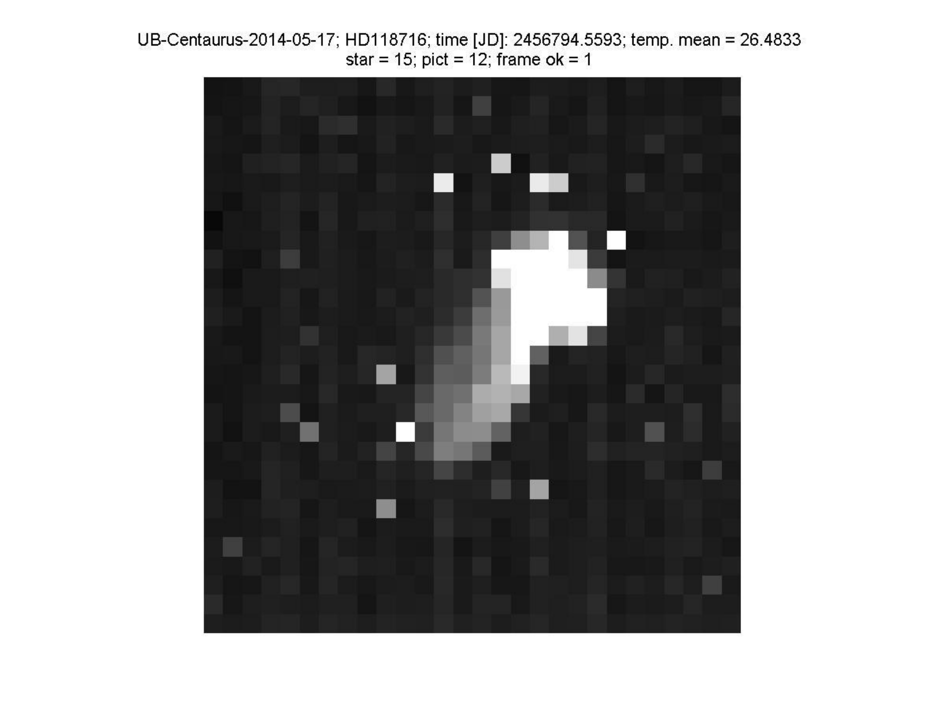


BRITE data analysis

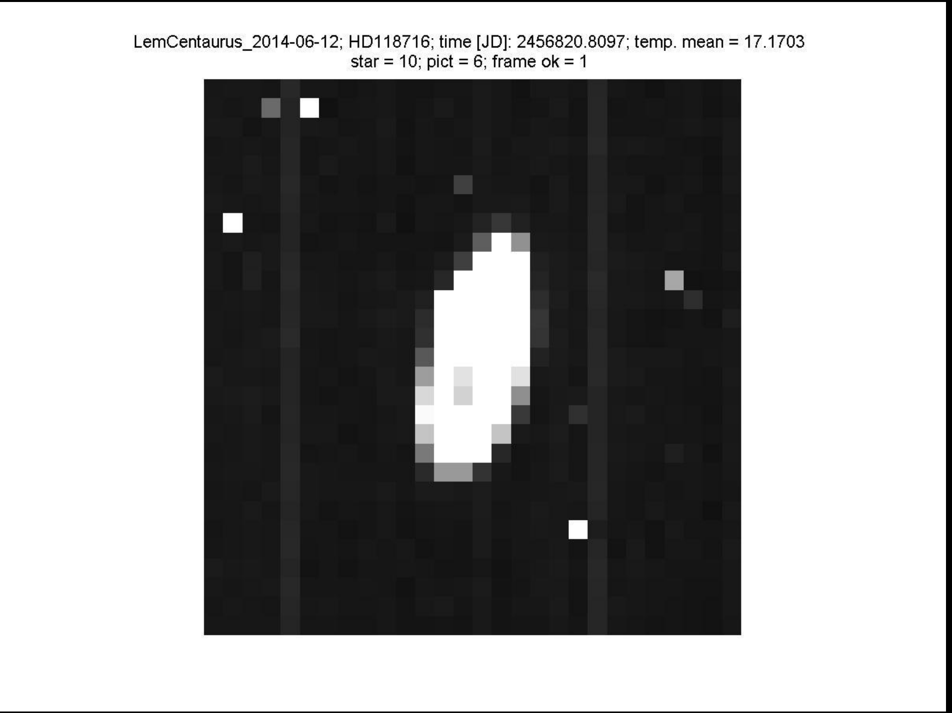


ε Cen
HD118716

UB



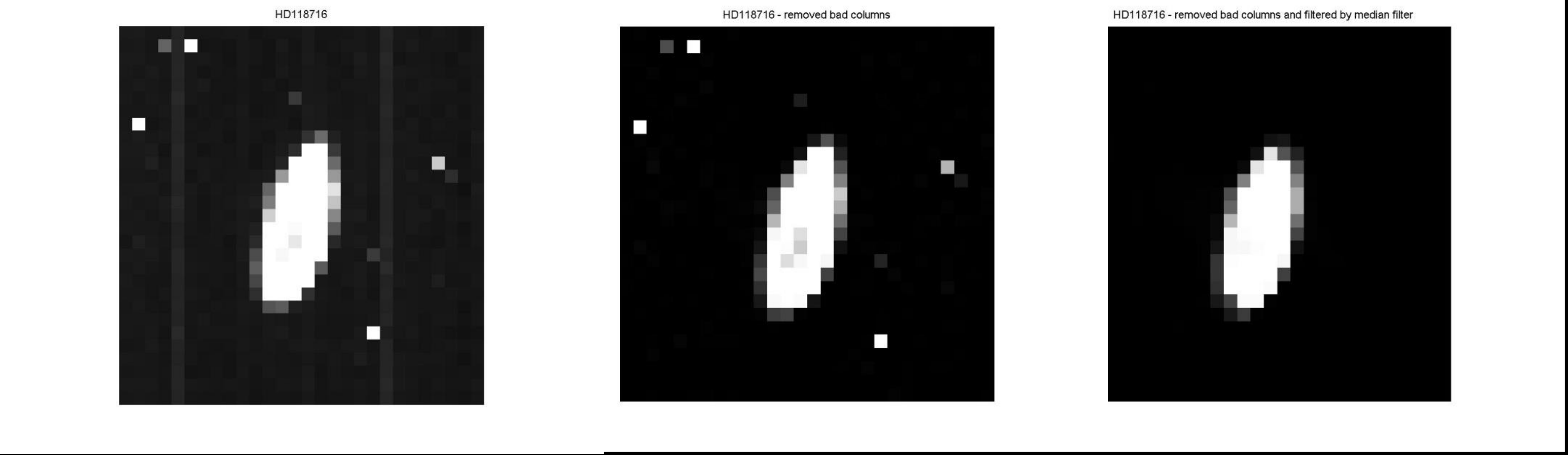
Lem

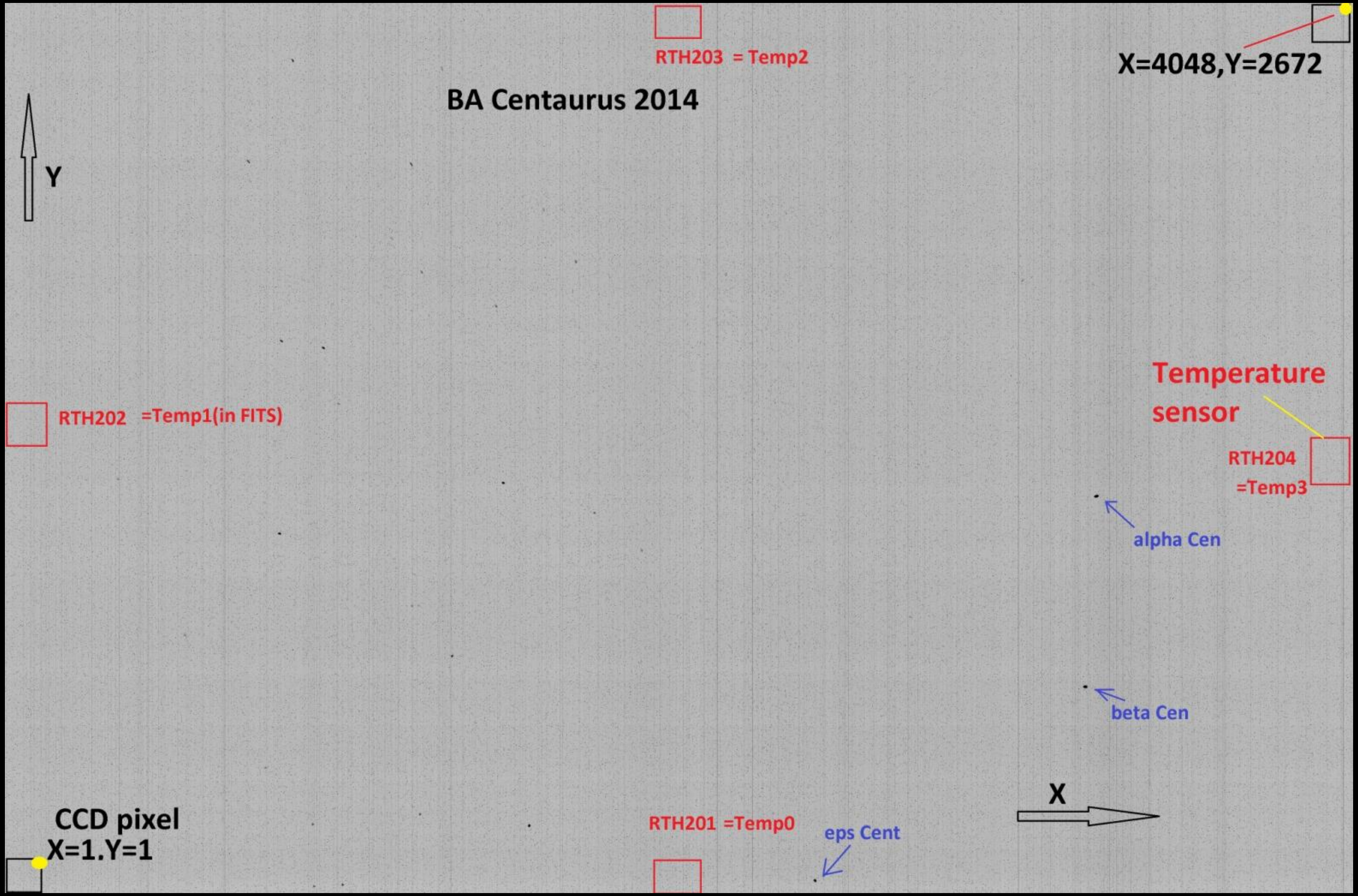


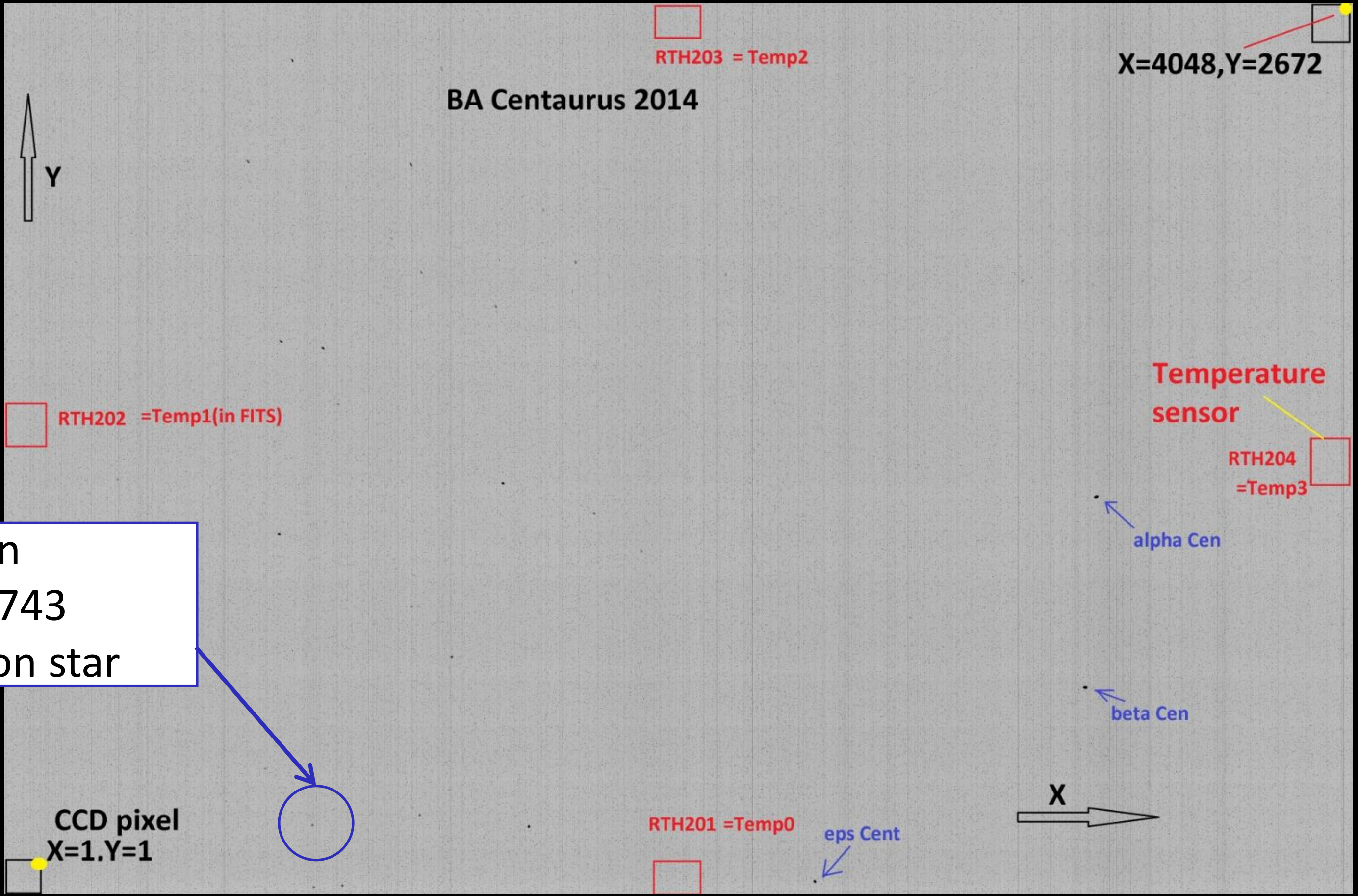
ε Cen
HD118716

after reduction

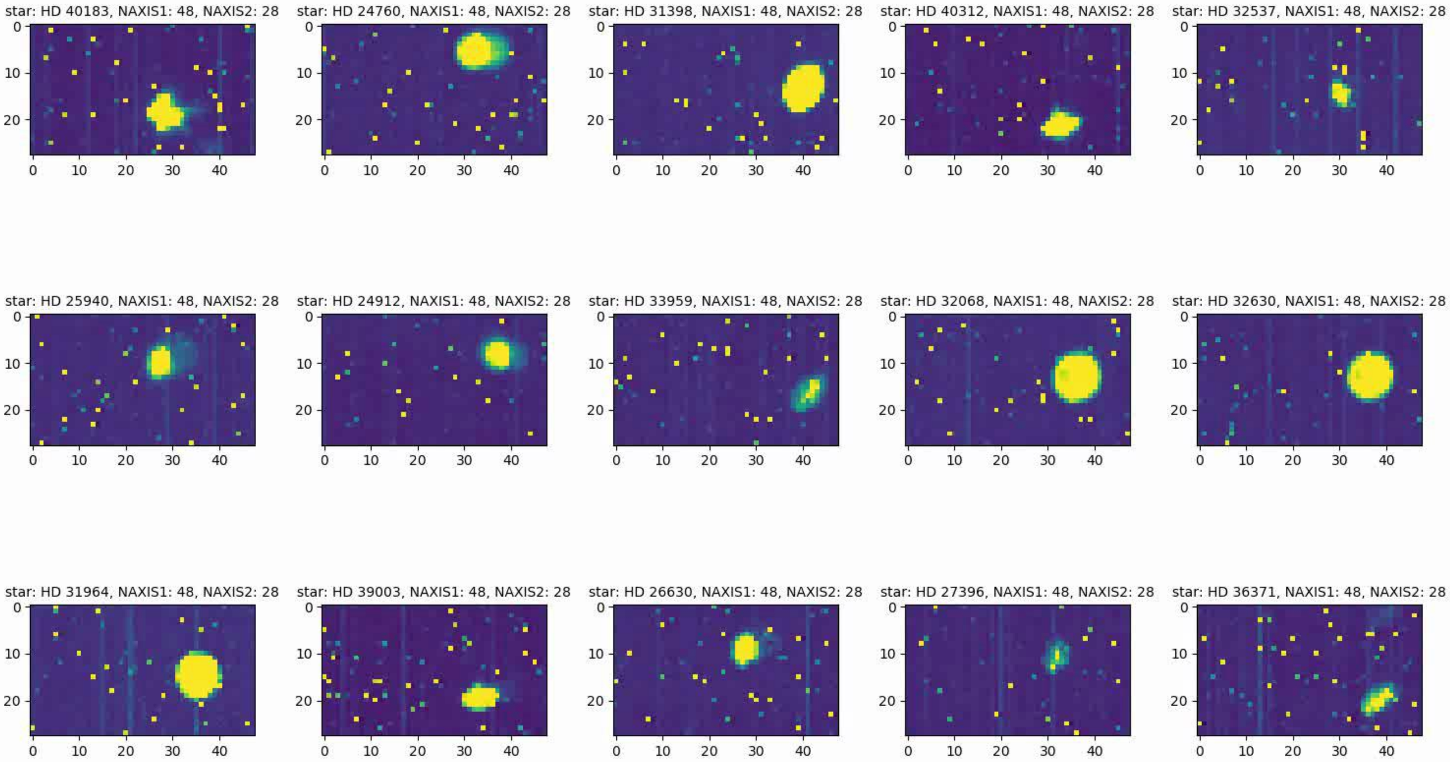
Lem



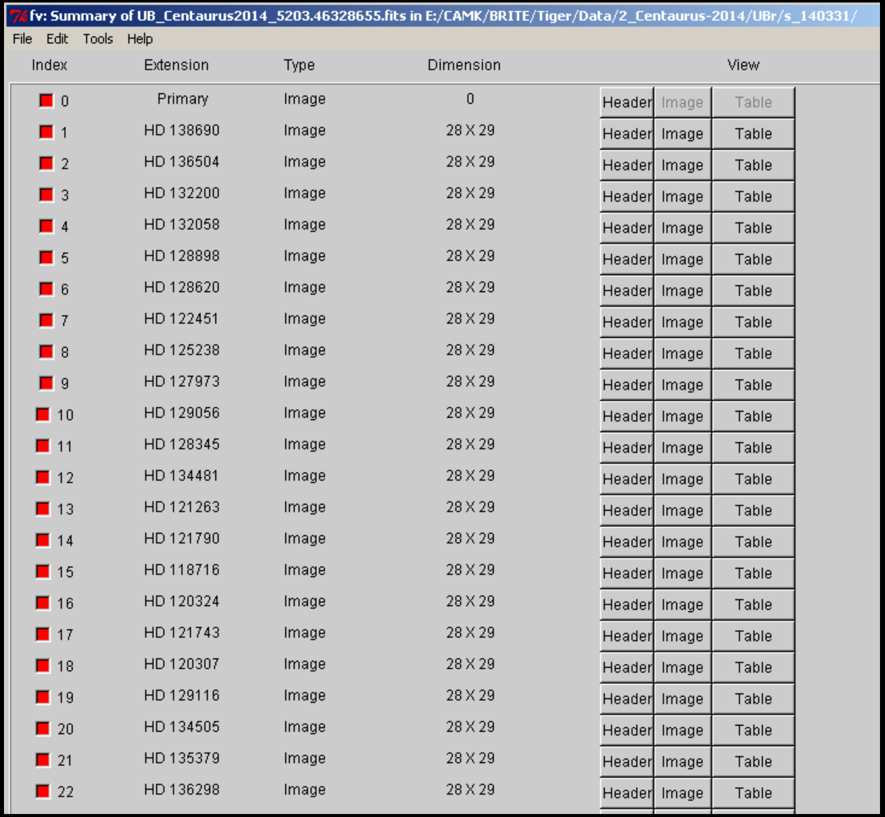

RTH203 = Temp2
X=4048,Y=2672
BA Centaurus 2014
Y
RTH202 =Temp1(in FITS)
Temperature sensor
RTH204
=Temp3
alpha Cen
beta Cen
X
CCD pixel
X=1.Y=1
RTH201 =Temp0
eps Cent



ϕ Cen
HD121743
comparison star


star: HD 40183, NAXIS1: 48, NAXIS2: 28
star: HD 24760, NAXIS1: 48, NAXIS2: 28
star: HD 31398, NAXIS1: 48, NAXIS2: 28
star: HD 40312, NAXIS1: 48, NAXIS2: 28
star: HD 32537, NAXIS1: 48, NAXIS2: 28
star: HD 25940, NAXIS1: 48, NAXIS2: 28
star: HD 24912, NAXIS1: 48, NAXIS2: 28
star: HD 33959, NAXIS1: 48, NAXIS2: 28
star: HD 32068, NAXIS1: 48, NAXIS2: 28
star: HD 32630, NAXIS1: 48, NAXIS2: 28
star: HD 31964, NAXIS1: 48, NAXIS2: 28
star: HD 39003, NAXIS1: 48, NAXIS2: 28
star: HD 26630, NAXIS1: 48, NAXIS2: 28
star: HD 27396, NAXIS1: 48, NAXIS2: 28
star: HD 36371, NAXIS1: 48, NAXIS2: 28

BRITE FITS files



fv: Summary of UB_Centaurus2014_5203.46328655.fits in E:/CAMK/BRITE/Tiger/Data/2_Centaurus-2014/UBr/s_140331/

File Edit Tools Help

Index	Extension	Type	Dimension	View		
0	Primary	Image	0	Header	Image	Table
1	HD 138690	Image	28 X 29	Header	Image	Table
2	HD 136504	Image	28 X 29	Header	Image	Table
3	HD 132200	Image	28 X 29	Header	Image	Table
4	HD 132058	Image	28 X 29	Header	Image	Table
5	HD 128898	Image	28 X 29	Header	Image	Table
6	HD 128620	Image	28 X 29	Header	Image	Table
7	HD 122451	Image	28 X 29	Header	Image	Table
8	HD 125238	Image	28 X 29	Header	Image	Table
9	HD 127973	Image	28 X 29	Header	Image	Table
10	HD 129056	Image	28 X 29	Header	Image	Table
11	HD 128345	Image	28 X 29	Header	Image	Table
12	HD 134481	Image	28 X 29	Header	Image	Table
13	HD 121263	Image	28 X 29	Header	Image	Table
14	HD 121790	Image	28 X 29	Header	Image	Table
15	HD 118716	Image	28 X 29	Header	Image	Table
16	HD 120324	Image	28 X 29	Header	Image	Table
17	HD 121743	Image	28 X 29	Header	Image	Table
18	HD 120307	Image	28 X 29	Header	Image	Table
19	HD 129116	Image	28 X 29	Header	Image	Table
20	HD 134505	Image	28 X 29	Header	Image	Table
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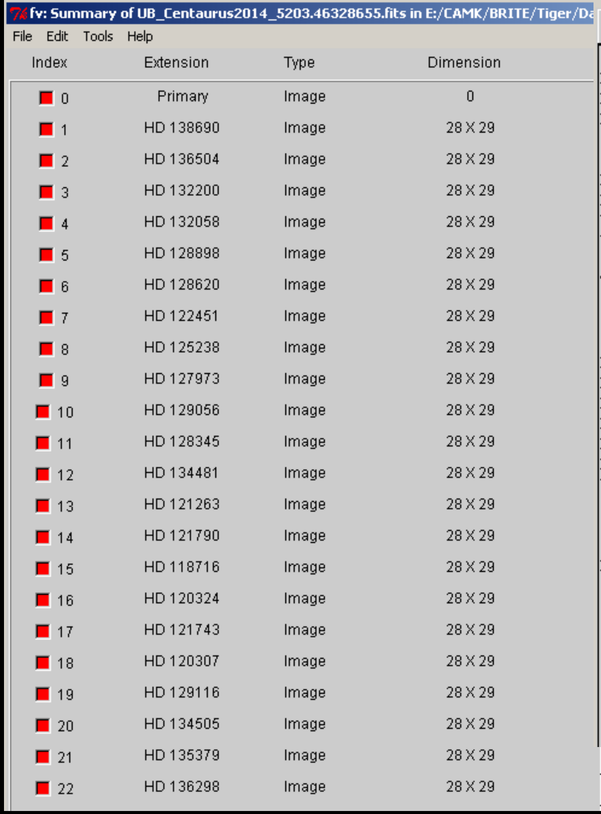
22	HD 136298	Image	28 X 29	Header	Image	Table

BRITE FITS files



Index	Extension	Type	Dimension
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1	HD 138690	Image	28 X 29
2	HD 136504	Image	28 X 29
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7	HD 122451	Image	28 X 29
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9	HD 127973	Image	28 X 29
10	HD 129056	Image	28 X 29
11	HD 128345	Image	28 X 29
12	HD 134481	Image	28 X 29
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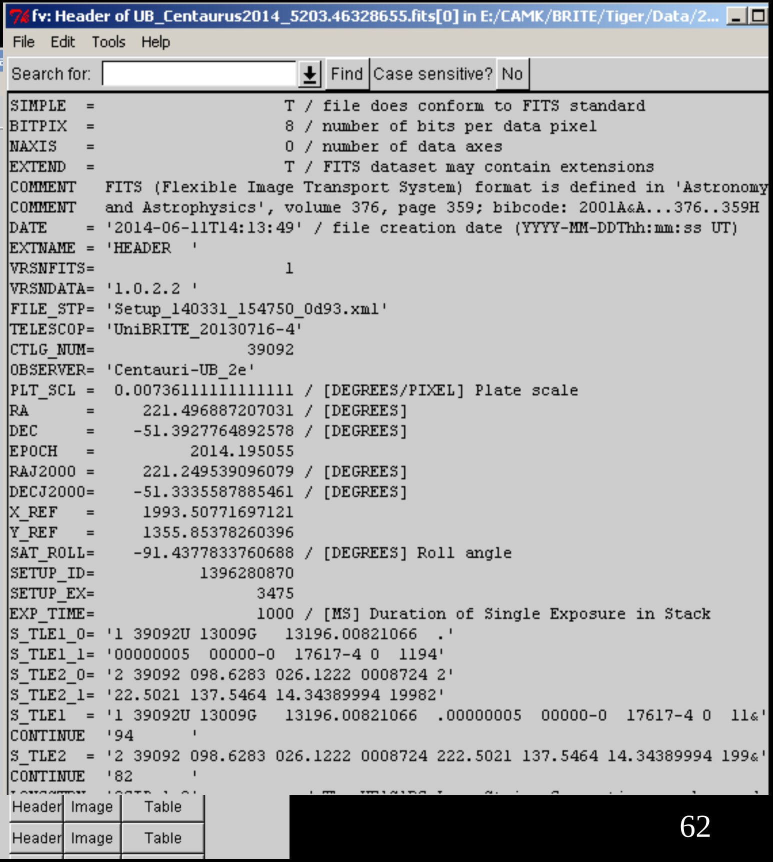
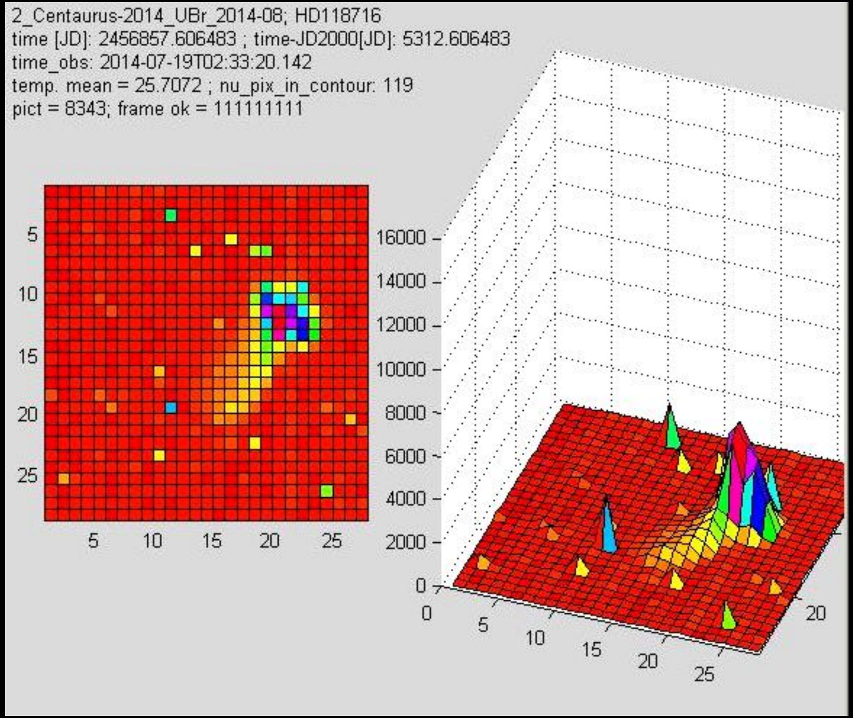
16	HD 120324	Image	28 X 29
17	HD 121743	Image	28 X 29
18	HD 120307	Image	28 X 29
19	HD 129116	Image	28 X 29
20	HD 134505	Image	28 X 29
21	HD 135379	Image	28 X 29
22	HD 136298	Image	28 X 29



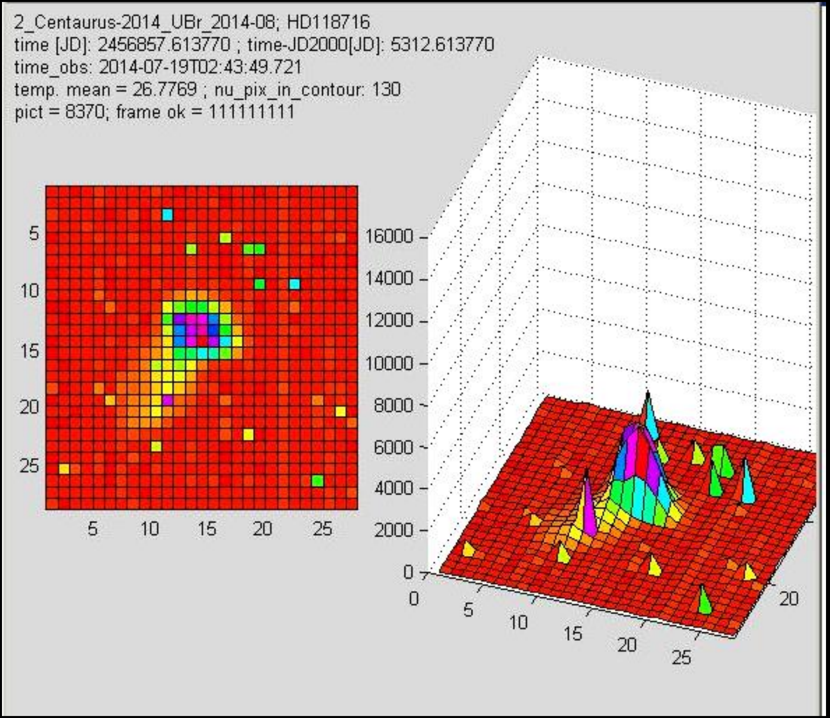

```
SIMPLE  =                    T / file does conform to FITS standard
BITPIX  =                    8 / number of bits per data pixel
NAXIS   =                    0 / number of data axes
EXTEND  =                    T / FITS dataset may contain extensions
COMMENT   FITS (Flexible Image Transport System) format is defined in 'Astronomy
COMMENT   and Astrophysics', volume 376, page 359; bibcode: 2001A&A...376..359H
DATE    = '2014-06-11T14:13:49' / file creation date (YYYY-MM-DDThh:mm:ss UT)
EXTNAME = 'HEADER  '
VRSNFITS=                    1
VRSNDATA= '1.0.2.2 '
FILE_STP= 'Setup_140331_154750_0d93.xml'
TELESCOP= 'UniBRITE_20130716-4'
CTLG_NUM=                39092
OBSERVER= 'Centauri-UB_2e'
PLT_SCL =  0.00736111111111111 / [DEGREES/PIXEL] Plate scale
RA      =     221.496887207031 / [DEGREES]
DEC     =    -51.3927764892578 / [DEGREES]
EPOCH   =          2014.195055
RAJ2000 =     221.249539096079 / [DEGREES]
DECJ2000=    -51.3335587885461 / [DEGREES]
X_REF   =     1993.50771697121
Y_REF   =     1355.85378260396
SAT_ROLL=    -91.4377833760688 / [DEGREES] Roll angle
SETUP_ID=           1396280870
SETUP_EX=                 3475
EXP_TIME=                 1000 / [MS] Duration of Single Exposure in Stack
S_TLE1_0= '1 39092U 13009G   13196.00821066  .'
S_TLE1_1= '00000005  00000-0  17617-4 0  1194'
S_TLE2_0= '2 39092 098.6283 026.1222 0008724 2'
S_TLE2_1= '22.5021 137.5464 14.34389994 19982'
S_TLE1  = '1 39092U 13009G   13196.00821066  .00000005  00000-0  17617-4 0  11&'
CONTINUE  '94      '
S_TLE2  = '2 39092 098.6283 026.1222 0008724 222.5021 137.5464 14.34389994 199&'
CONTINUE  '82      '
```

ε Cen HD 118716 UniBRITE



FITS

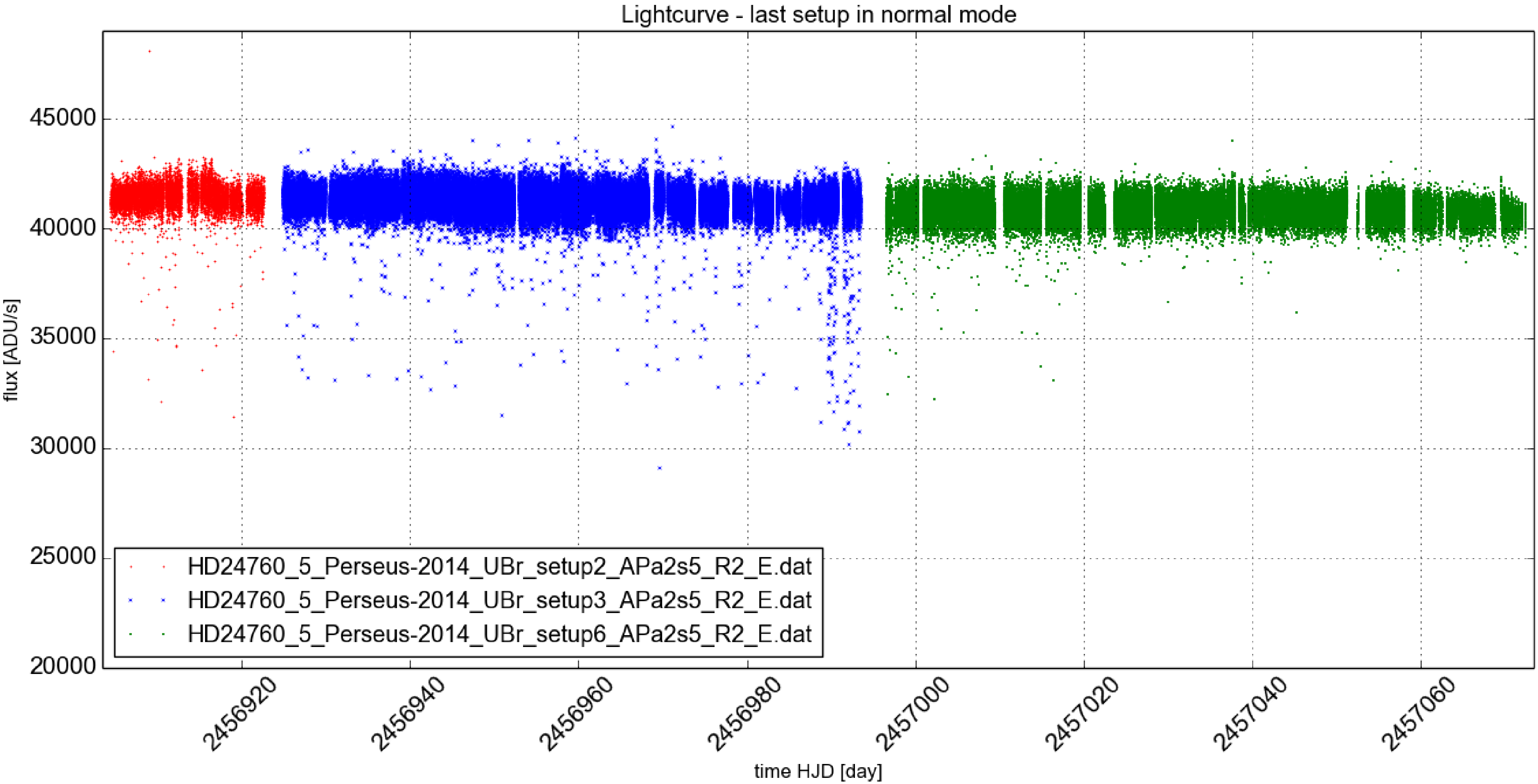
ε Cen HD 118716 UniBRITE

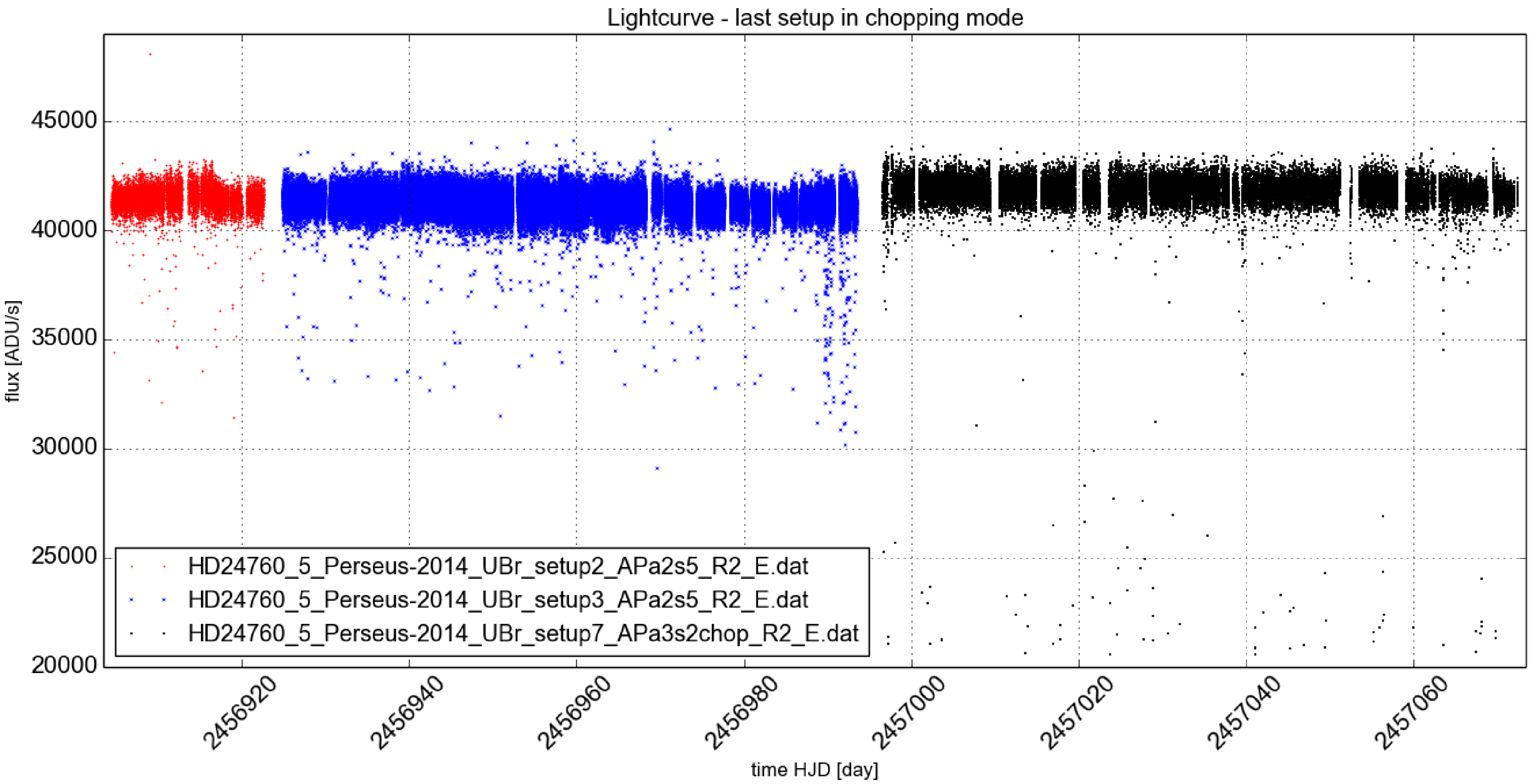


FITS

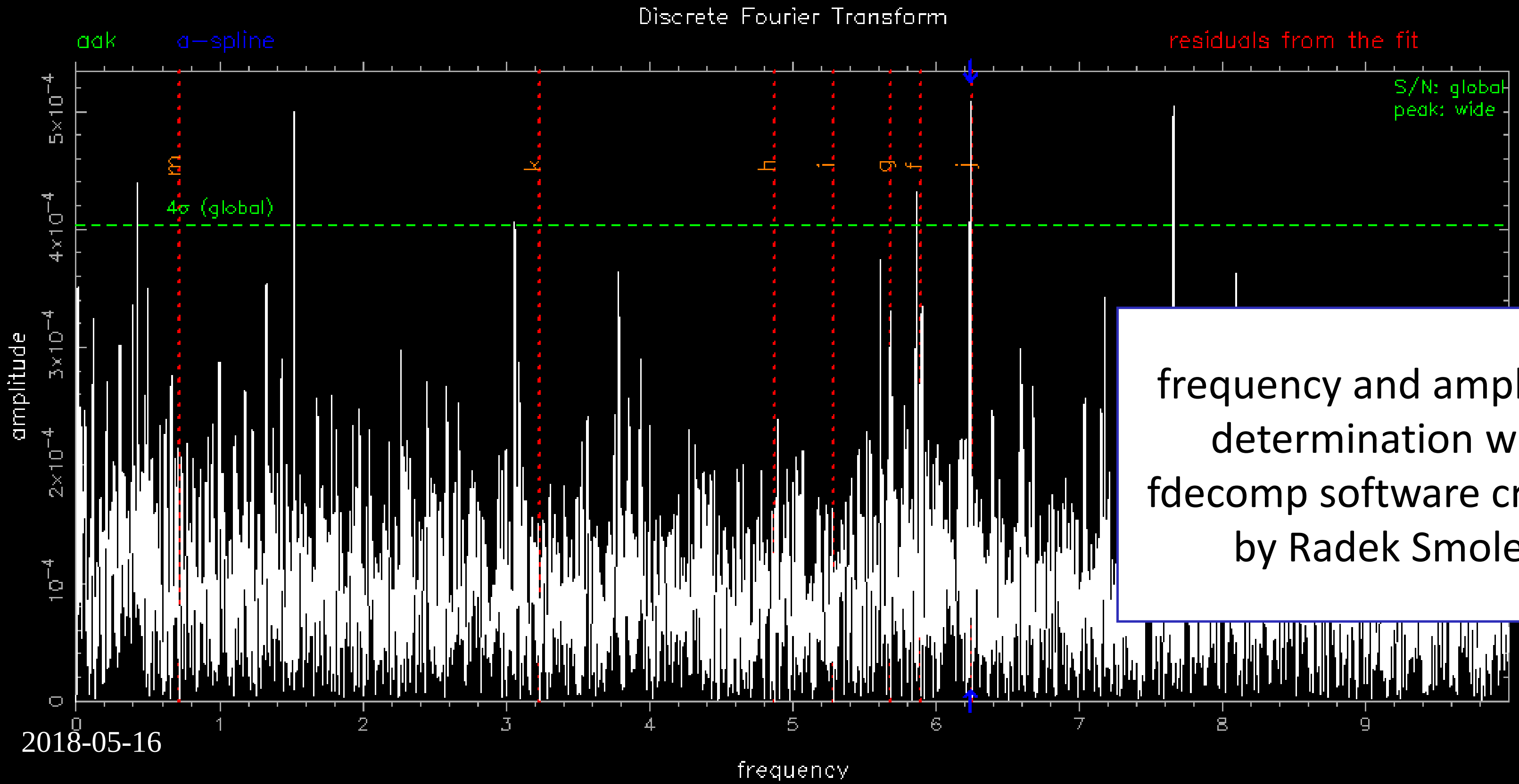
observations in „chopping" mode ε Cen and ε Per

Lightcurve analysis


Lightcurve - last setup in normal mode
flux [ADU/s]
45000
40000
35000
30000
25000
20000
2456920
2456940
2456960
2456980
2457000
2457020
2457040
2457060
time HJD [day]
HD24760_5_Perseus-2014_UBr_setup2_APa2s5_R2_E.dat
HD24760_5_Perseus-2014_UBr_setup3_APa2s5_R2_E.dat
HD24760_5_Perseus-2014_UBr_setup6_APa2s5_R2_E.dat

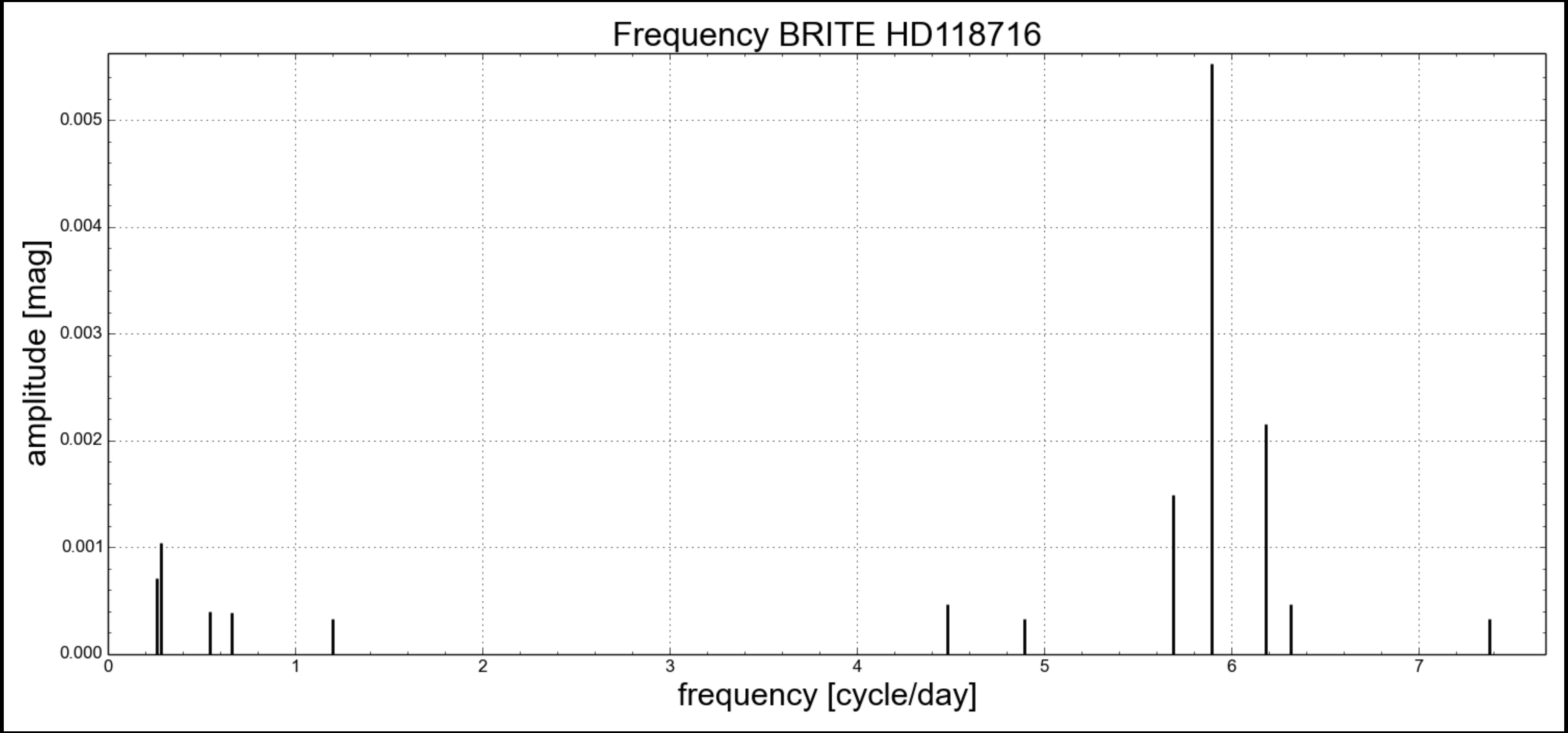

Lightcurve - last setup in chopping mode
flux [ADU/s]
time HJD [day]
45000
40000
35000
30000
25000
20000
2456920
2456940
2456960
2456980
2457000
2457020
2457040
2457060
HD24760_5_Perseus-2014_UBr_setup2_APa2s5_R2_E.dat
HD24760_5_Perseus-2014_UBr_setup3_APa2s5_R2_E.dat
HD24760_5_Perseus-2014_UBr_setup7_APa3s2chop_R2_E.dat

Lightcurve analysis

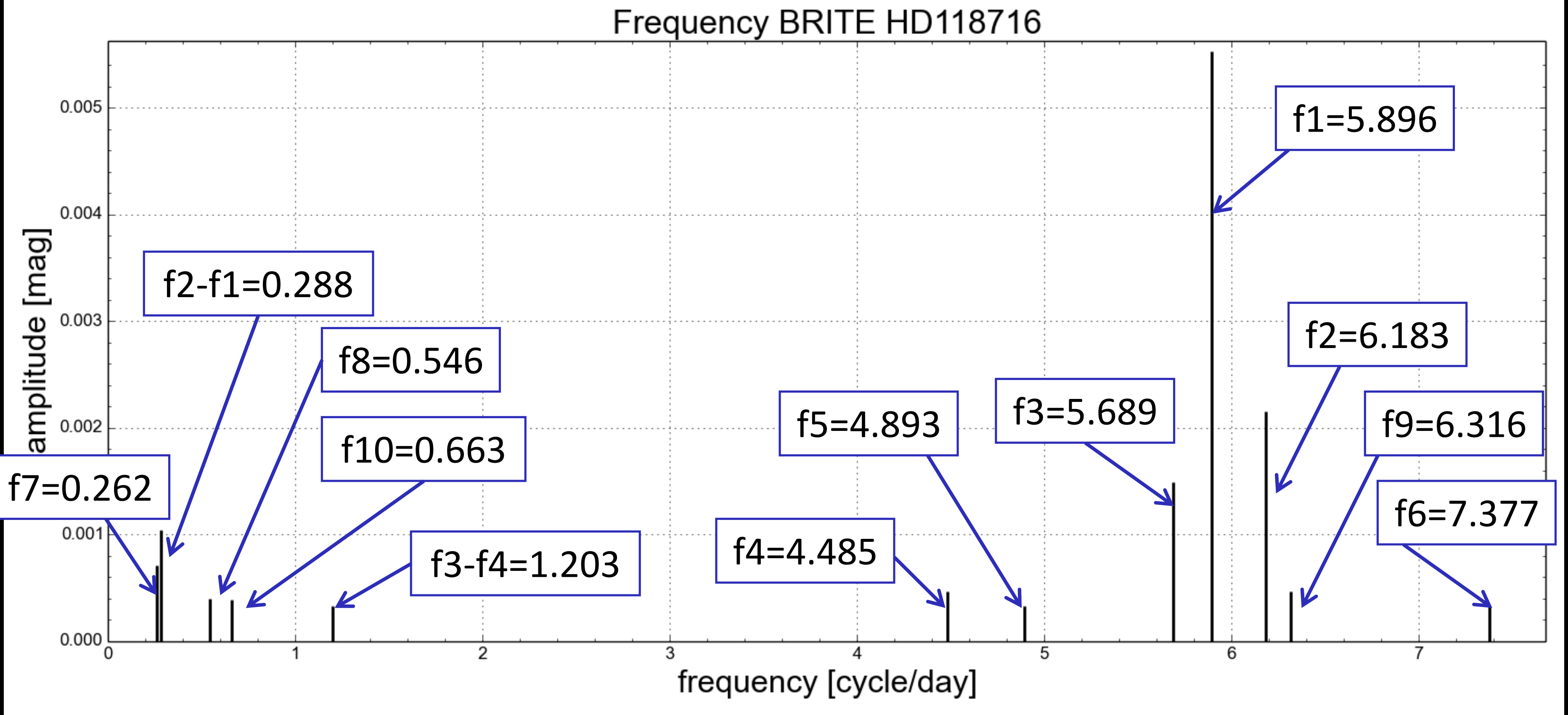


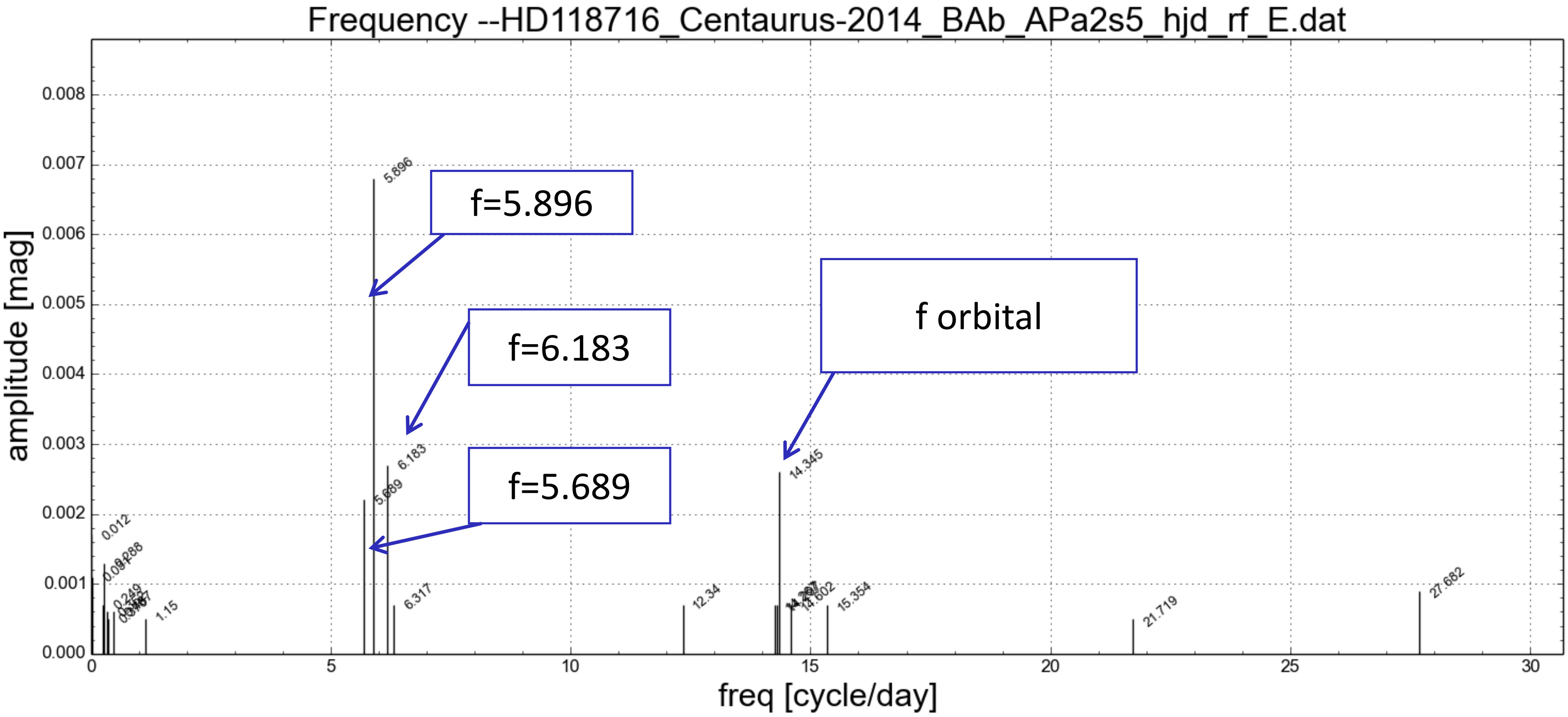
frequency and amplitude determination with fdecomp software created by Radek Smolec

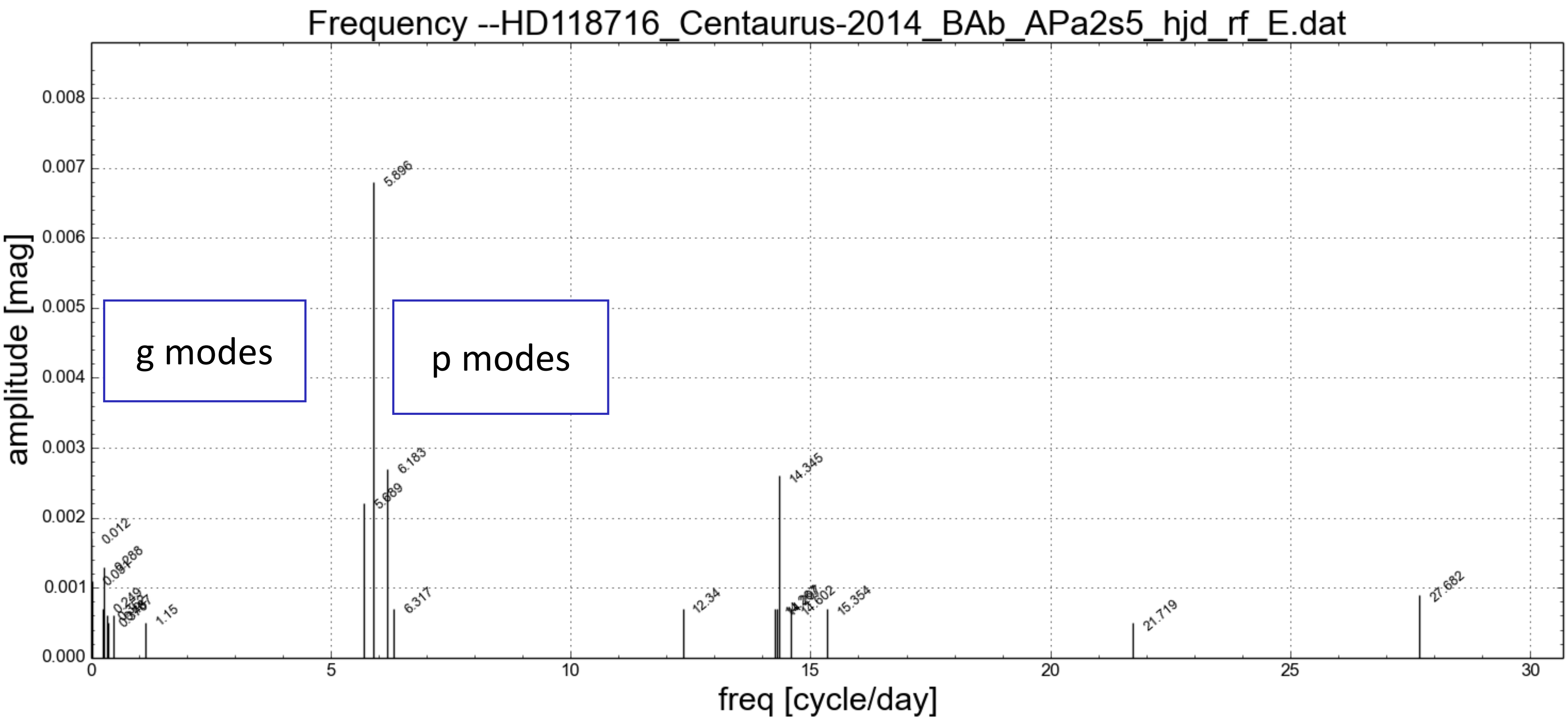
ε Cen frequencies



ε Cen frequencies

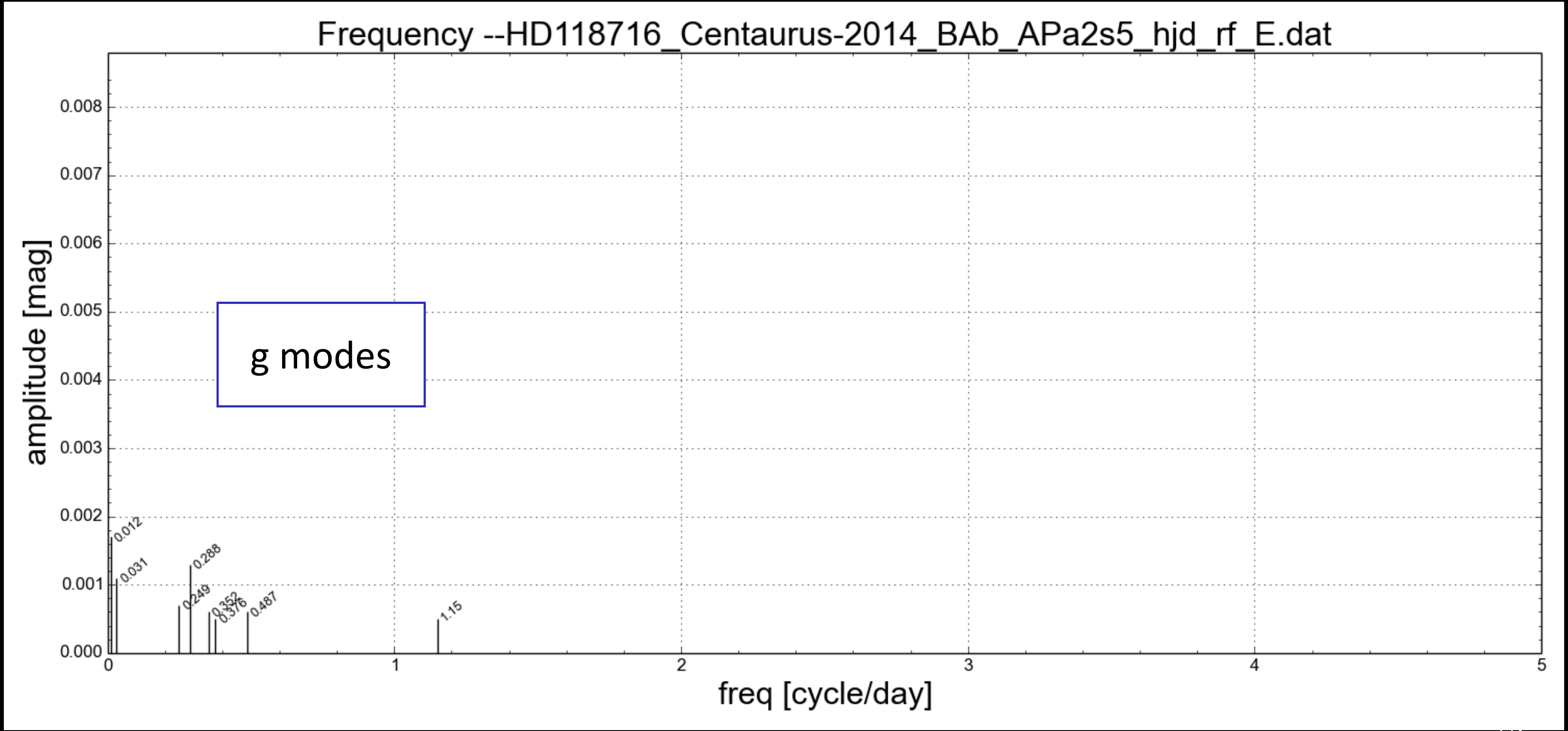



Frequency --HD118716_Centaurus-2014_BAb_APa2s5_hjd_rf_E.dat
amplitude [mag]
freq [cycle/day]
f=5.896
f=6.183
f=5.689
f orbital
5.896
6.183
5.689
14.345
6.317
12.34
14.602
15.354
21.719
27.682
0.012
1.15
0.249



Frequency --HD118716_Centaurus-2014_BAb_APa2s5_hjd_rf_E.dat
amplitude [mag]
freq [cycle/day]
g modes
p modes
5.896
6.183
14.345
6.317
12.34
15.354
21.719
27.682
1.15
0.012

ε Cen



Frequency --HD118716_Centaurus-2014_BAb_APa2s5_hjd_rf_E.dat
amplitude [mag]
freq [cycle/day]
g modes
0.012
0.031
0.288
0.249
0.352
0.376
0.487
1.15
0.000
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
0
1
2
3
4
5

Photometry

BRITE – from space:

- BRITE-Austria
- UNIBRITE
- BRITE Lem
- BRITE Toronto
- BRITE Heweliusz

APT – from ground

Spectroscopy

Spectroscopy

- GATS - Krzysztof Kaminski, Wojciech Dimitrov, Monika Kamińska, Magdalena Polińska (Polinska et al., 2014)
- AAVSO:
    - Austria, Germany - Berthold Stober, Manfred Schwarz, Siegfried Hold, Ulrich Waldschlager
    - China - Dong Li
    - France (La Tourbiere) - Olivier Garde
    - USA (Baltimore)
- Lithuania (Moletai) - Erika Pakstiene, Sarunas Mikolaitis
- Slovakia (Stara Lesna Observatory) - Ernst Paunzen
- USA (McDonald Observatory) - Elżbieta Zocłońska

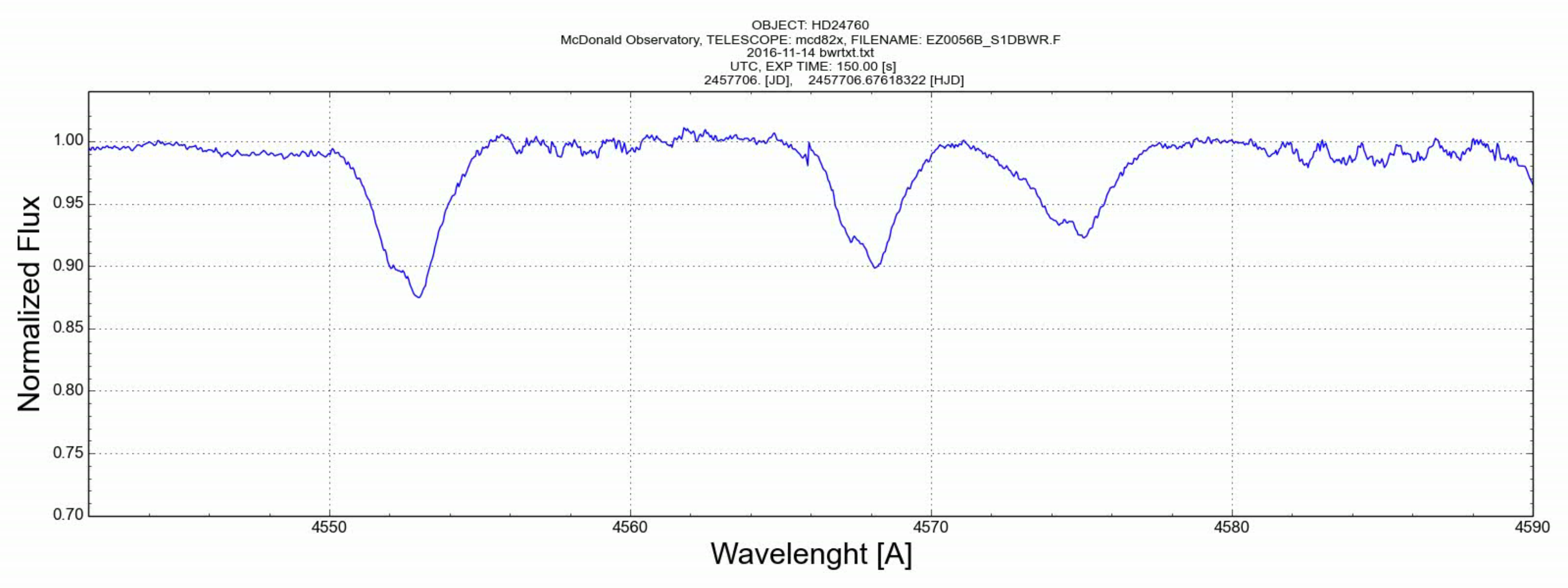
Spectroscopy

Telescope diameter 2,1 m

Echelle type spectroscope

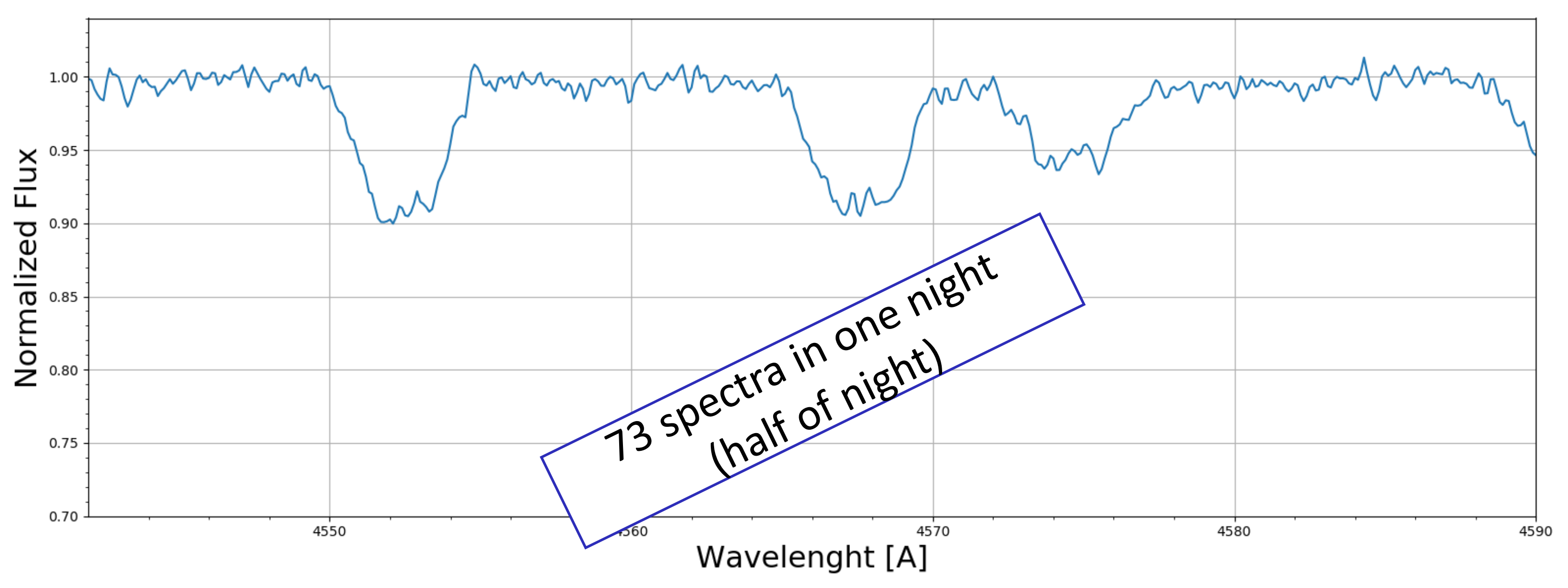
Wavelenght range 4341-4861Å

McDonald spectroscopy – ε Per



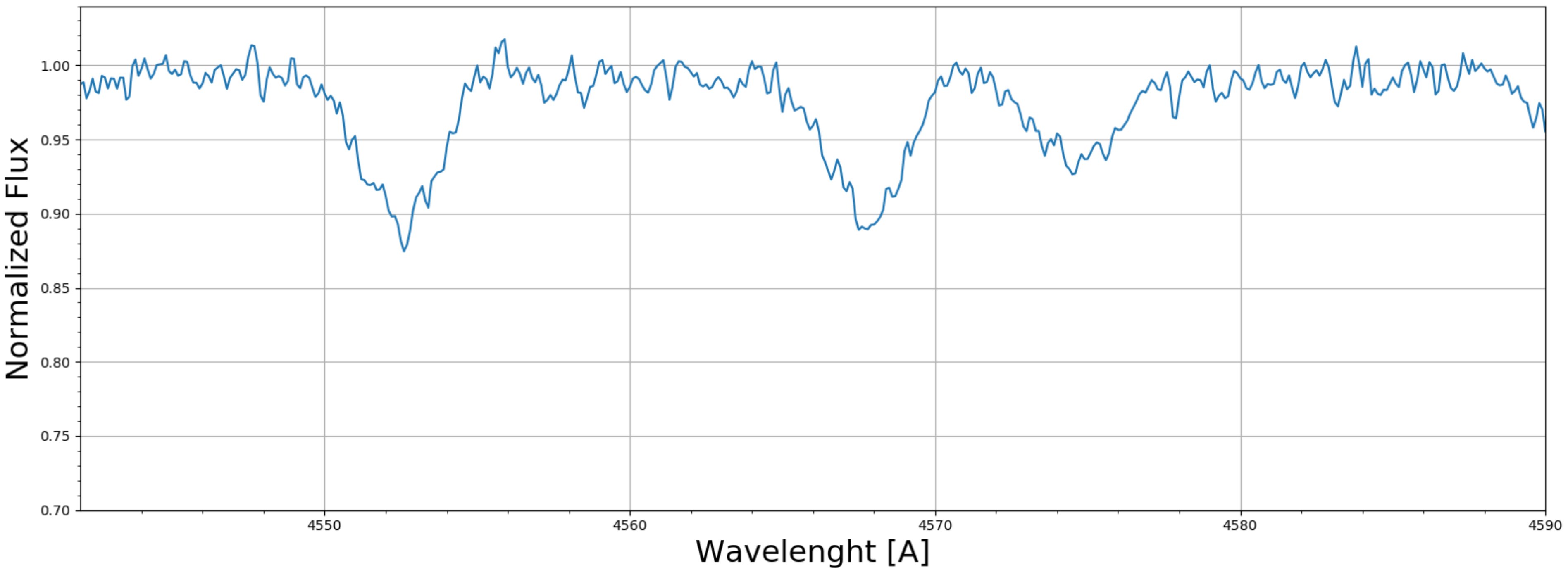
Si III 4553A

Stara Lesna spectroscopy – ε Per



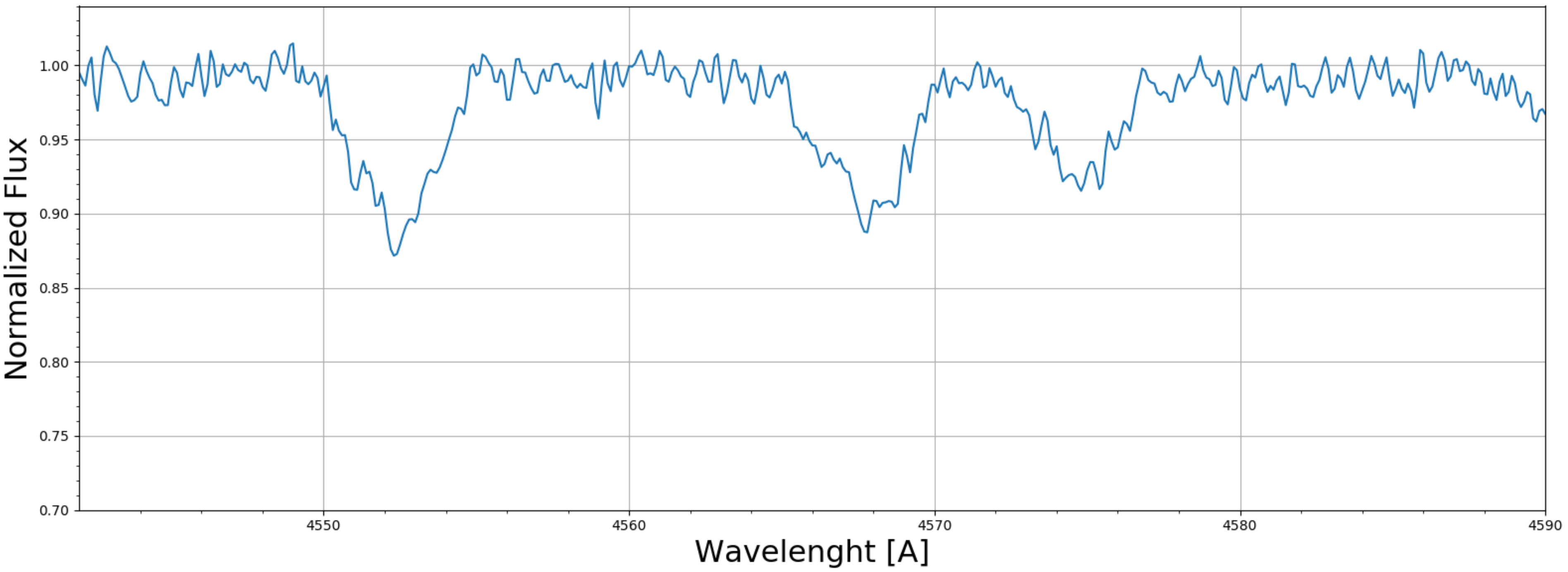
Si III 4553A

Stara Lesna spectroscopy – ε Per



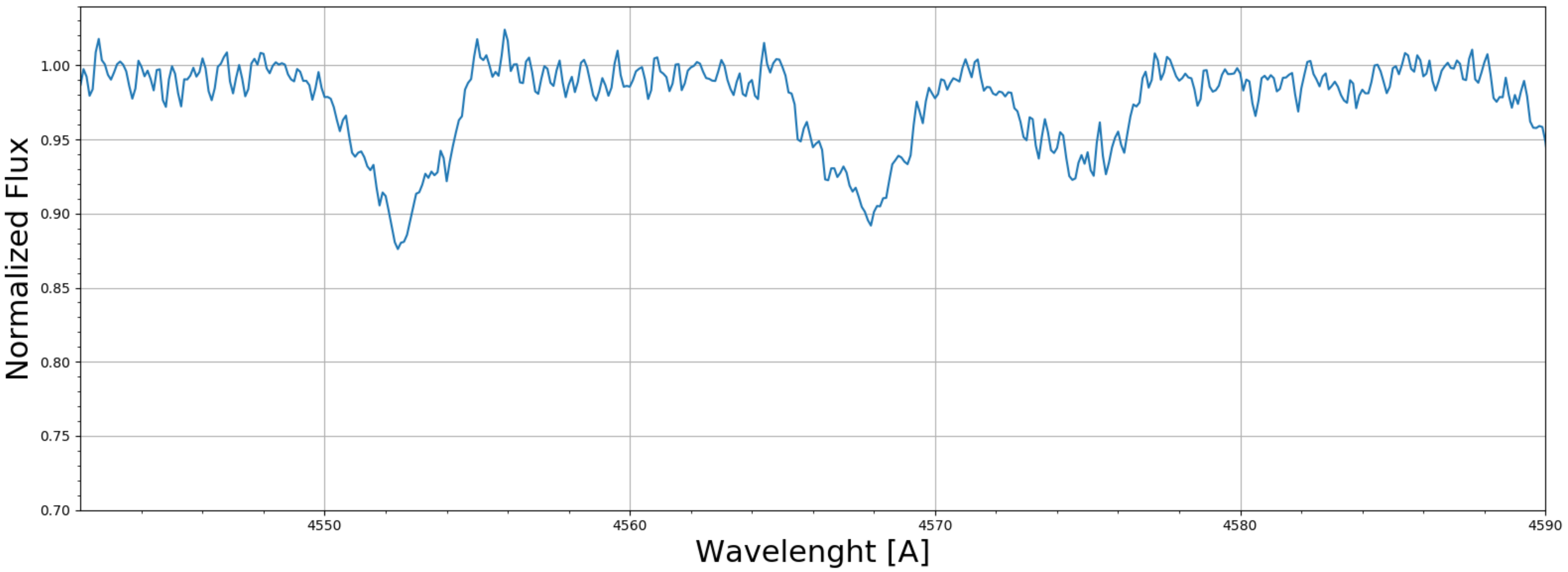
Si III 4553A

Stara Lesna spectroscopy – ε Per



Si III 4553A

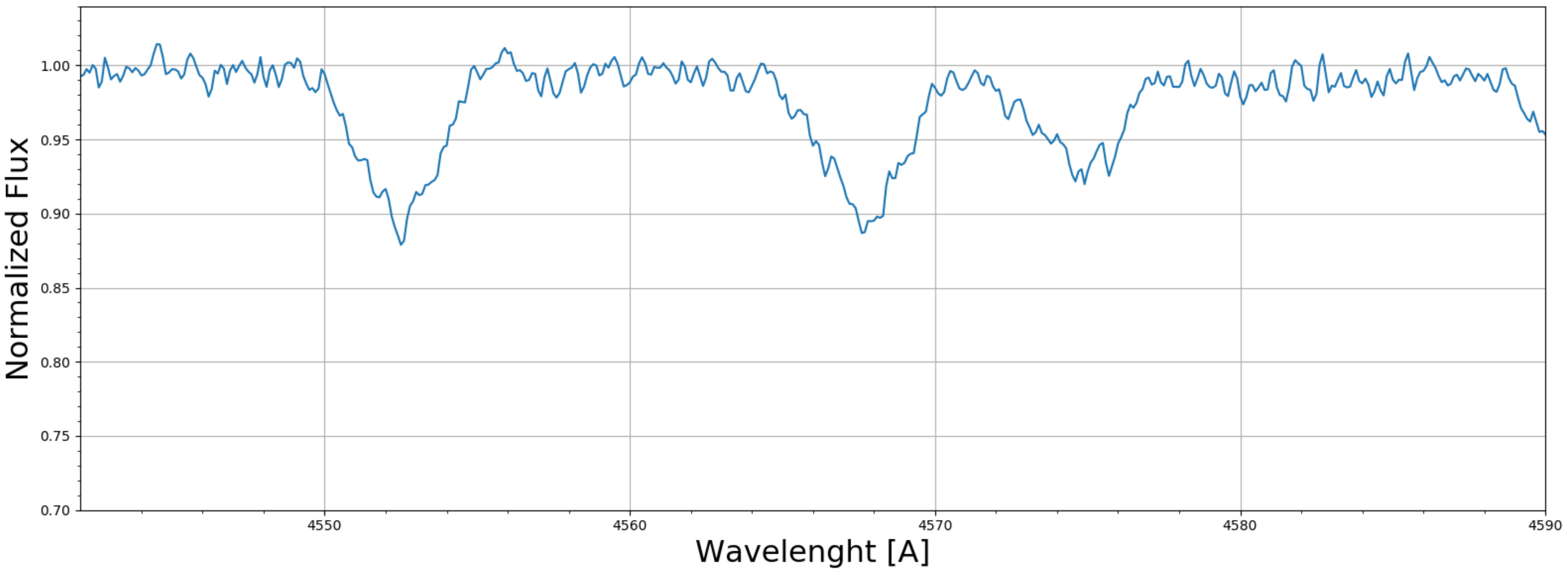
Stara Lesna spectroscopy – ε Per



Si III 4553A

2018-05-16

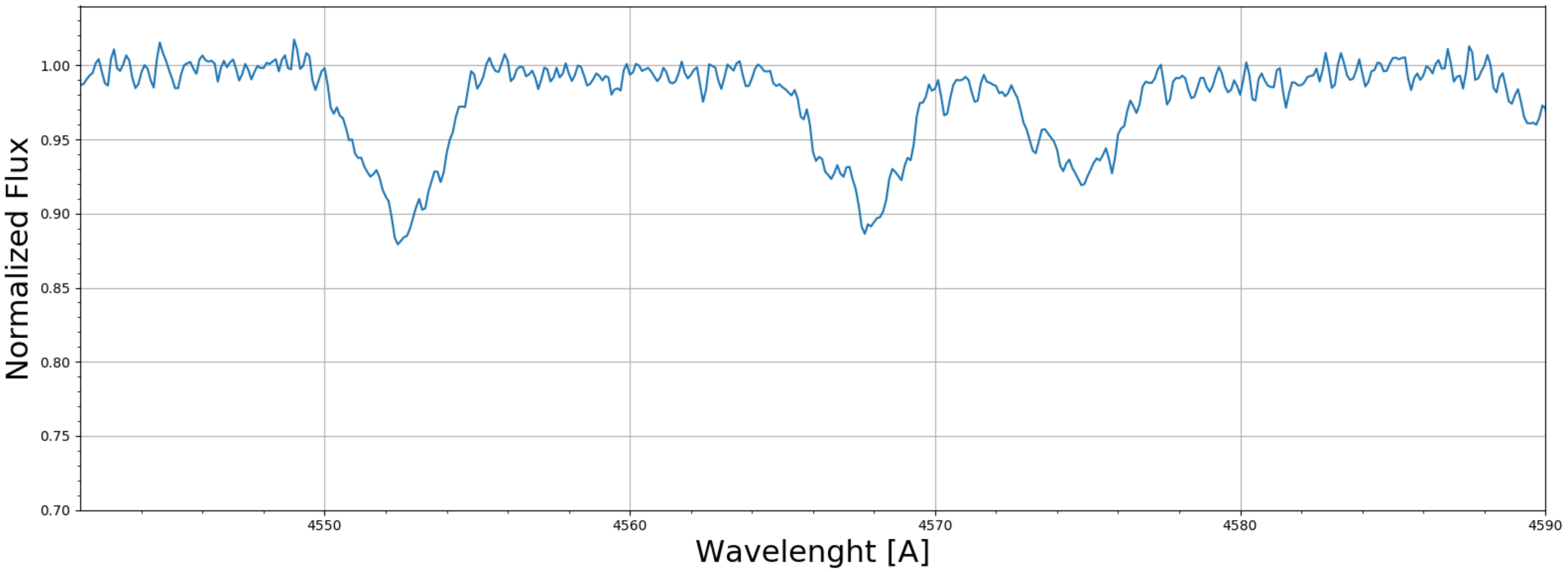
Stara Lesna spectroscopy – ε Per



Si III 4553A

2018-05-16

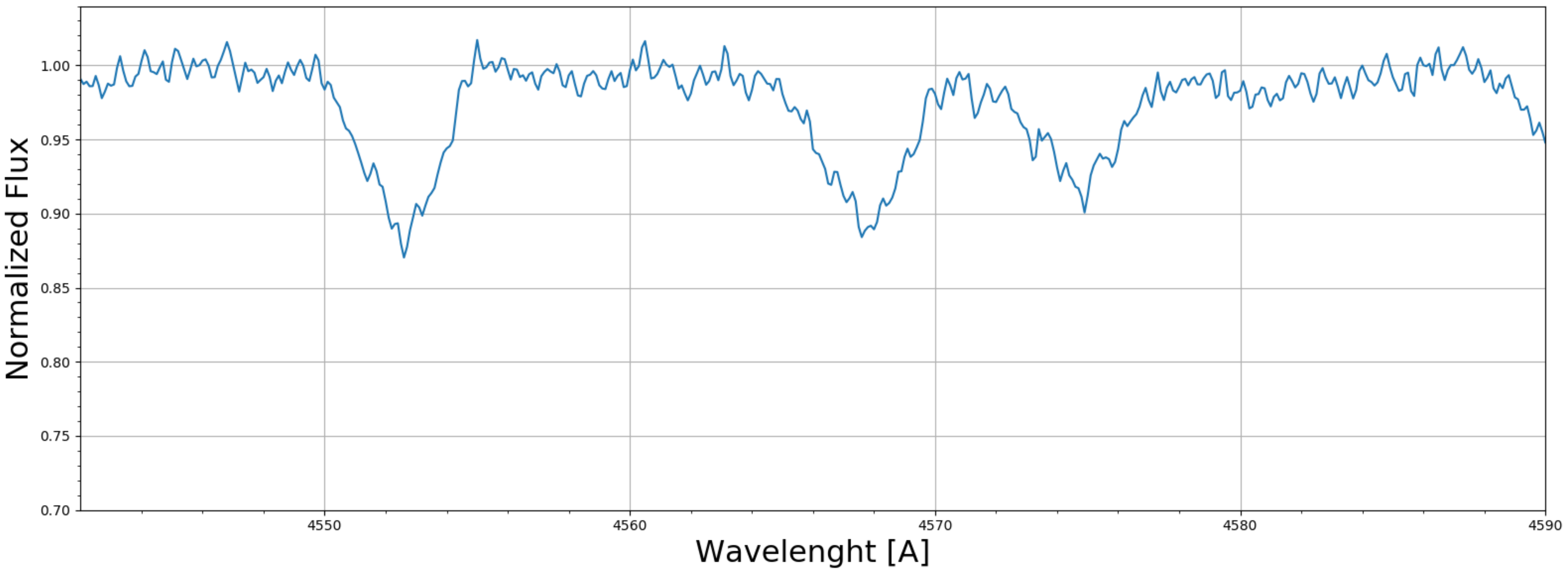
Stara Lesna spectroscopy – ε Per



Si III 4553A

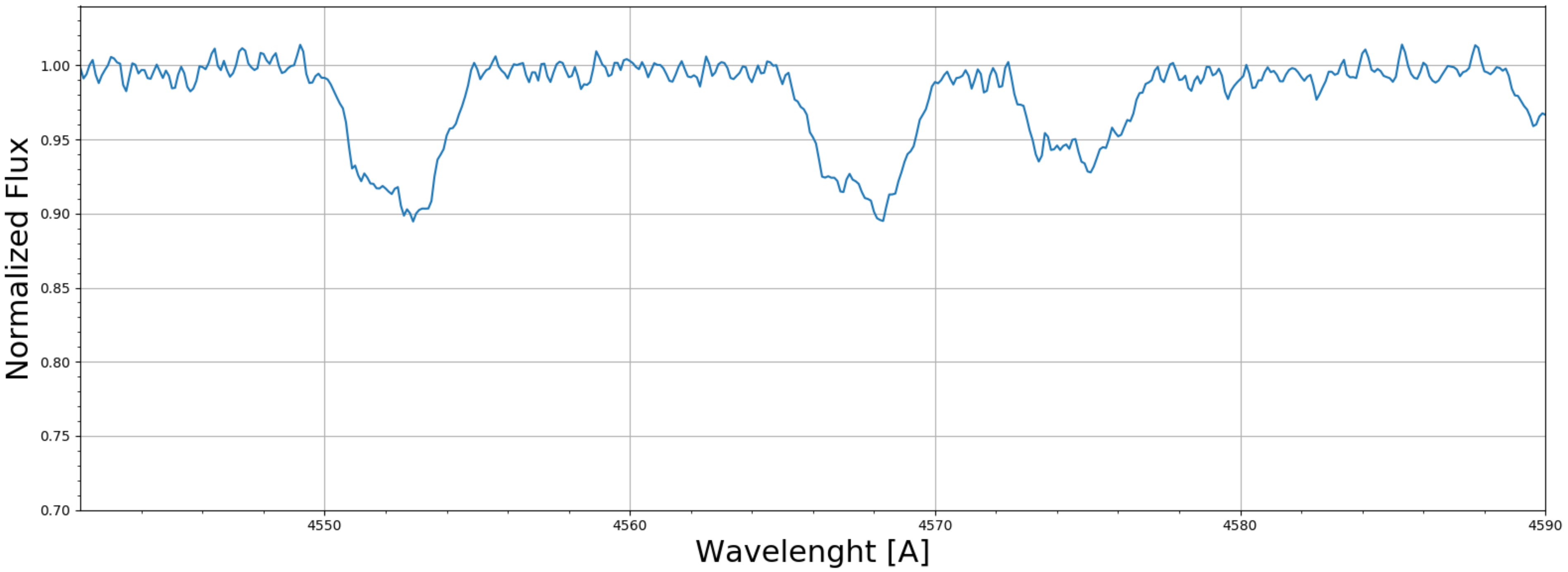
2018-05-16

Stara Lesna spectroscopy – ε Per



Si III 4553A

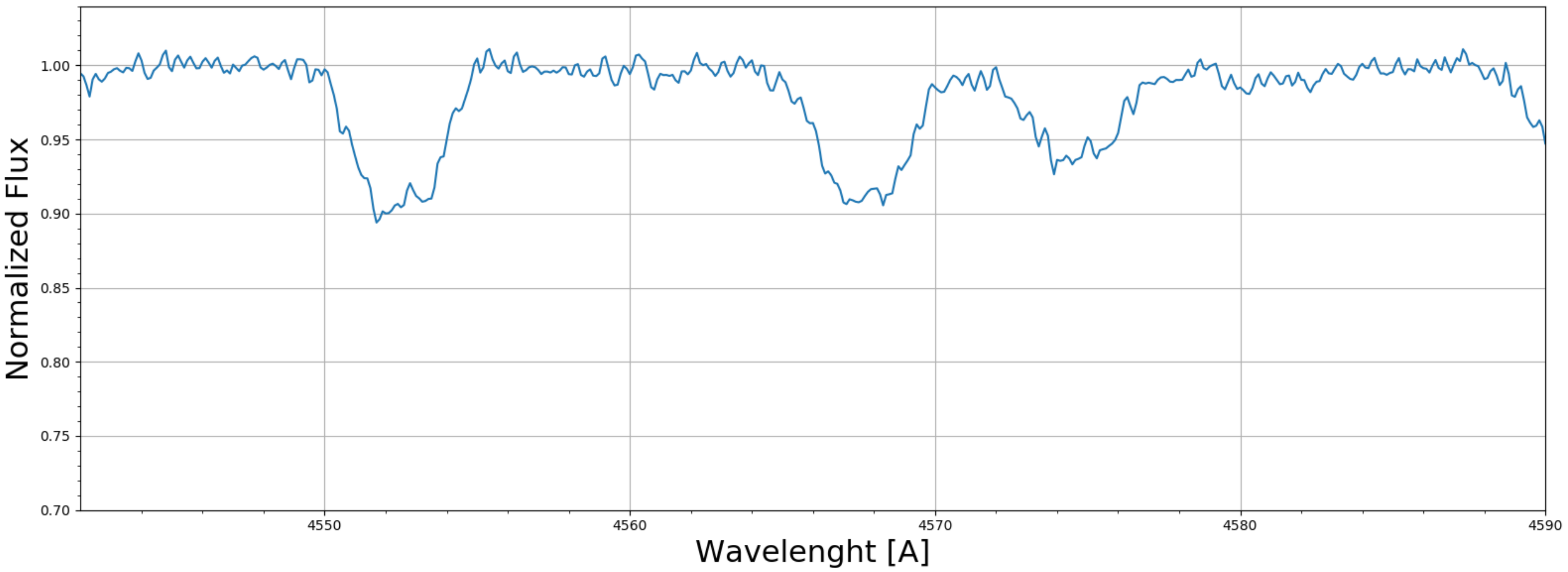
Stara Lesna spectroscopy – ε Per



Si III 4553A

2018-05-16

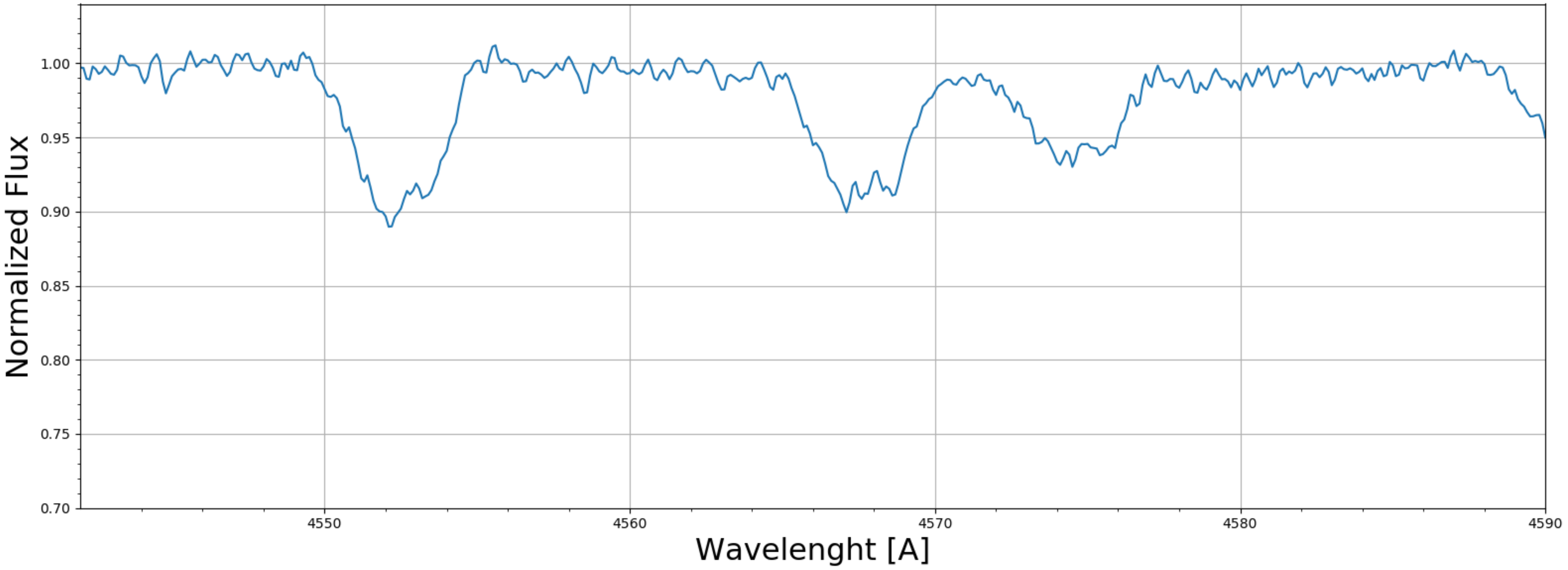
Stara Lesna spectroscopy – ε Per



Si III 4553A

2018-05-16

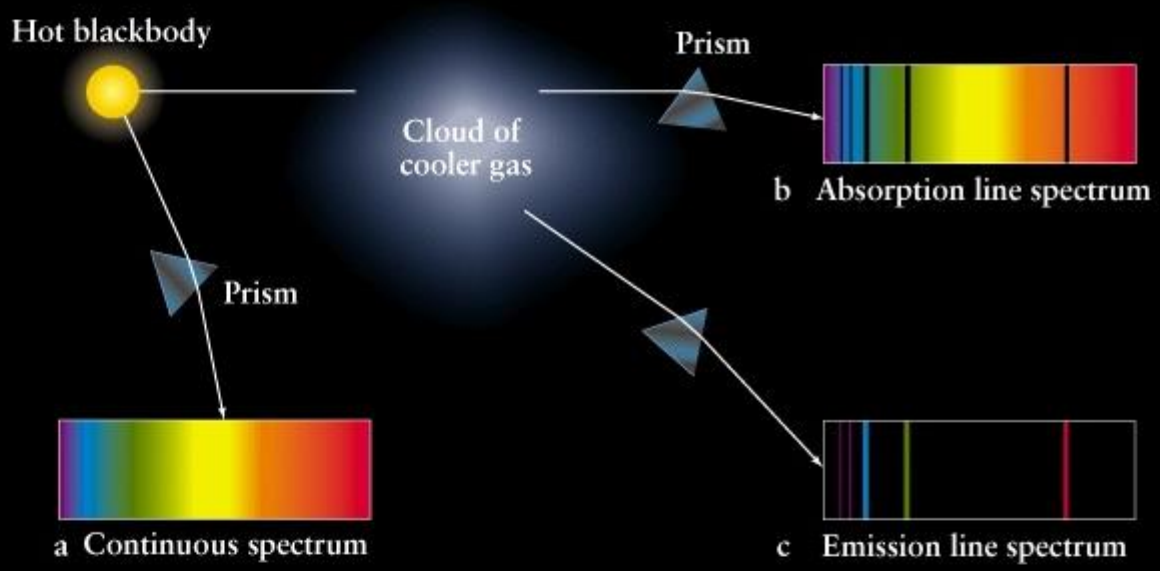
Stara Lesna spectroscopy – ε Per



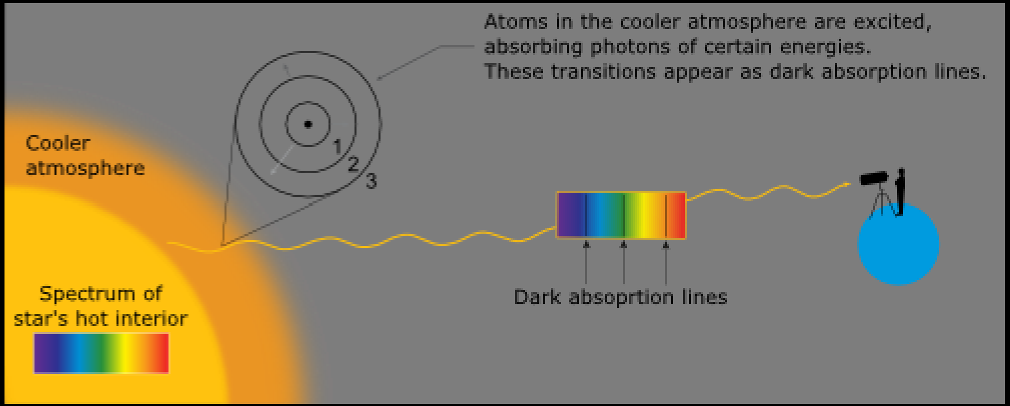
Si III 4553A

2018-05-16

Spectroscopy

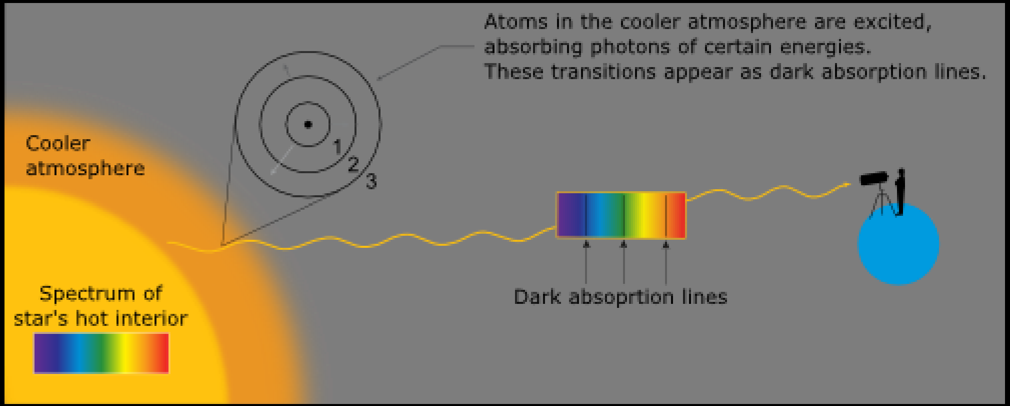


Spectroscopy



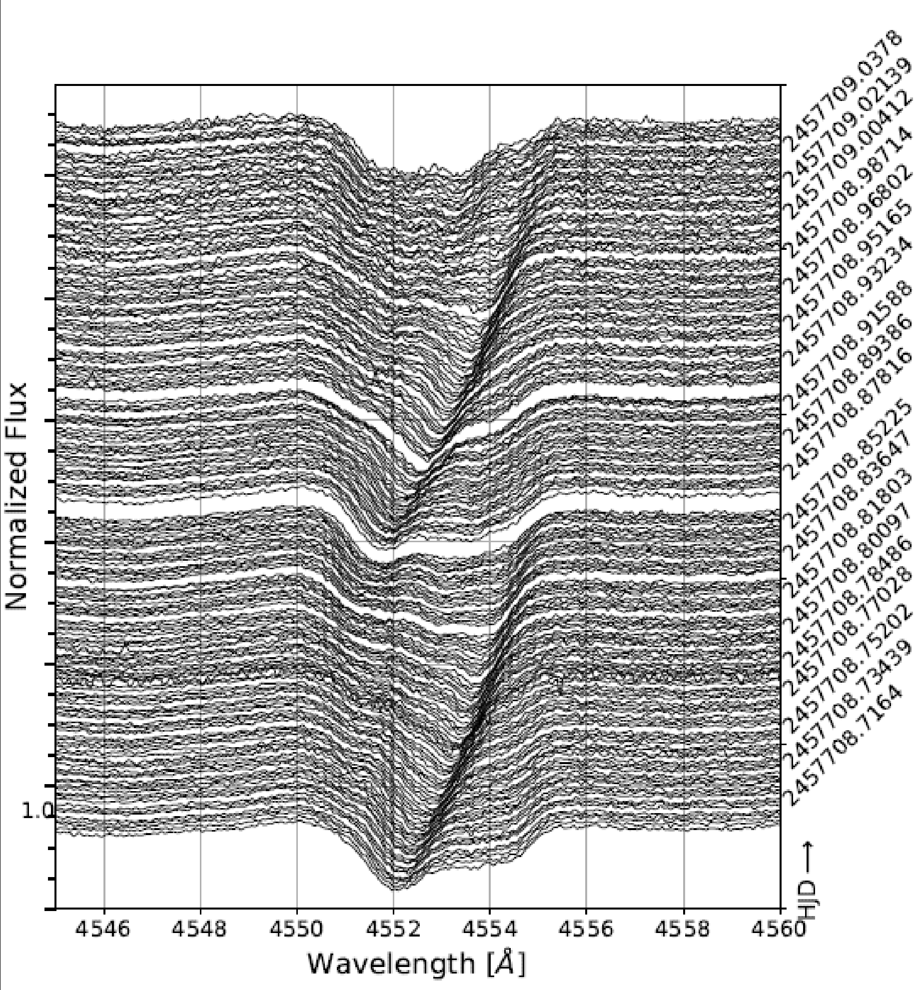
Source: http://astro.unl.edu/naap/hr/hr_background1.html

Spectroscopy



Si III 4553A

Source: http://astro.unl.edu/naap/hr/hr_background1.html



Normalized Flux
1.0
4546
4548
4550
4552
4554
4556
4558
4560
Wavelength [Å]
HJD ⟶
2457709.0378
2457709.02139
2457709.00412
2457708.98714
2457708.96802
2457708.95165
2457708.93234
2457708.91588
2457708.89386
2457708.87816
2457708.85225
2457708.83647
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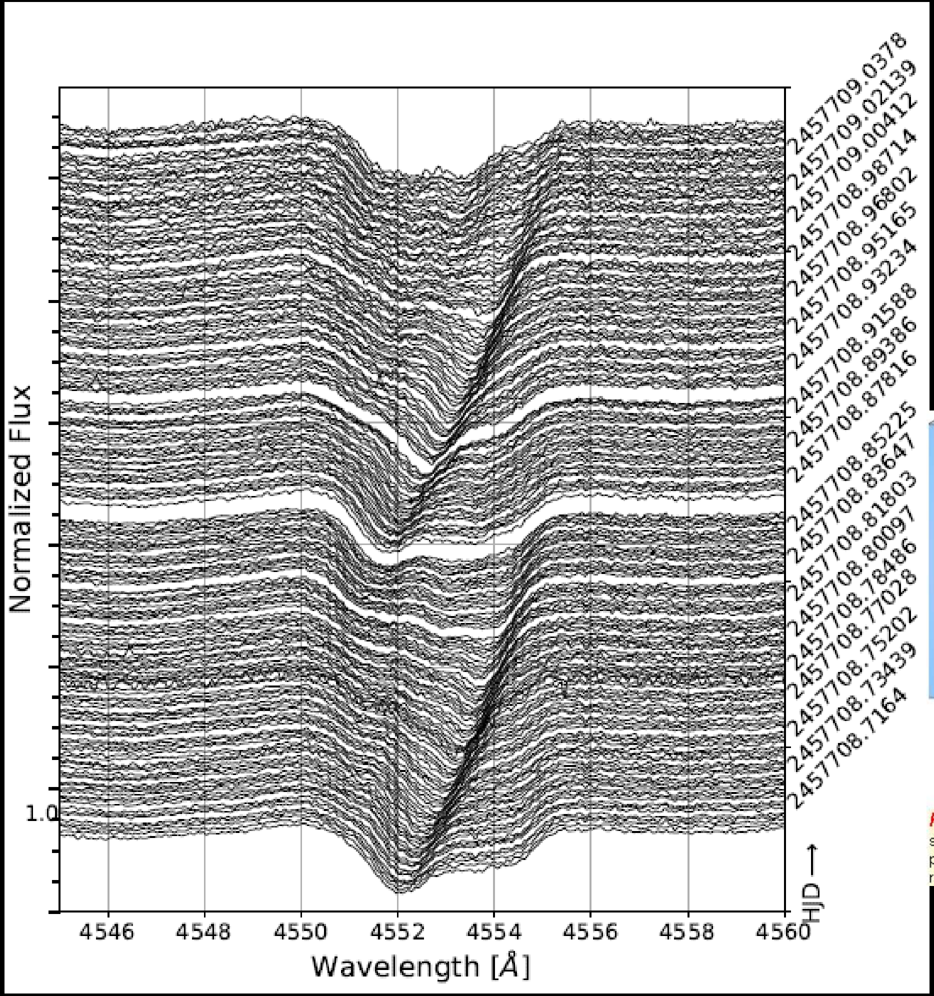
2457708.75202
2457708.73439
2457708.7164



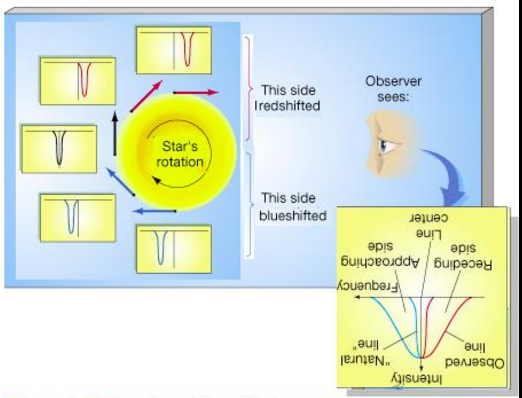
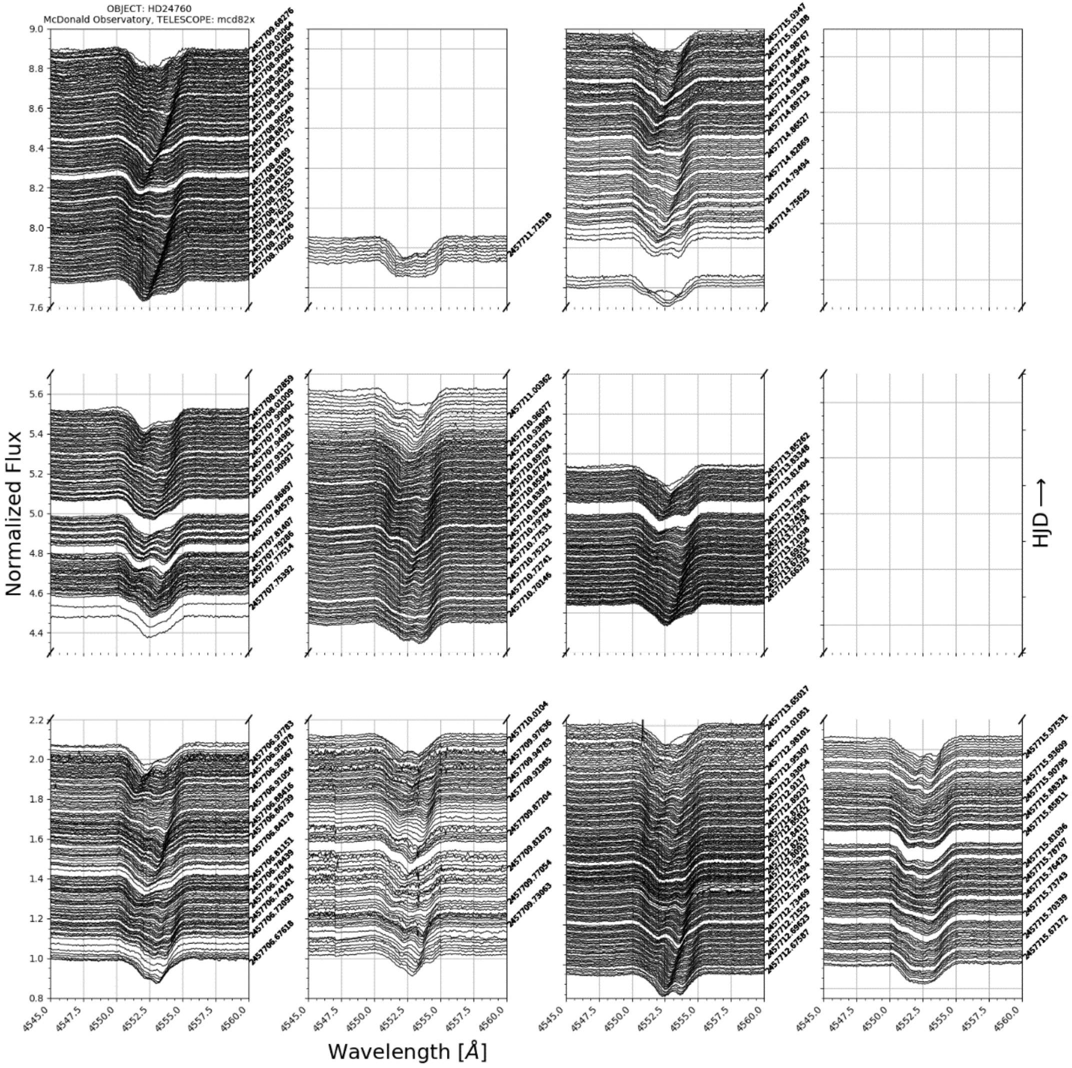
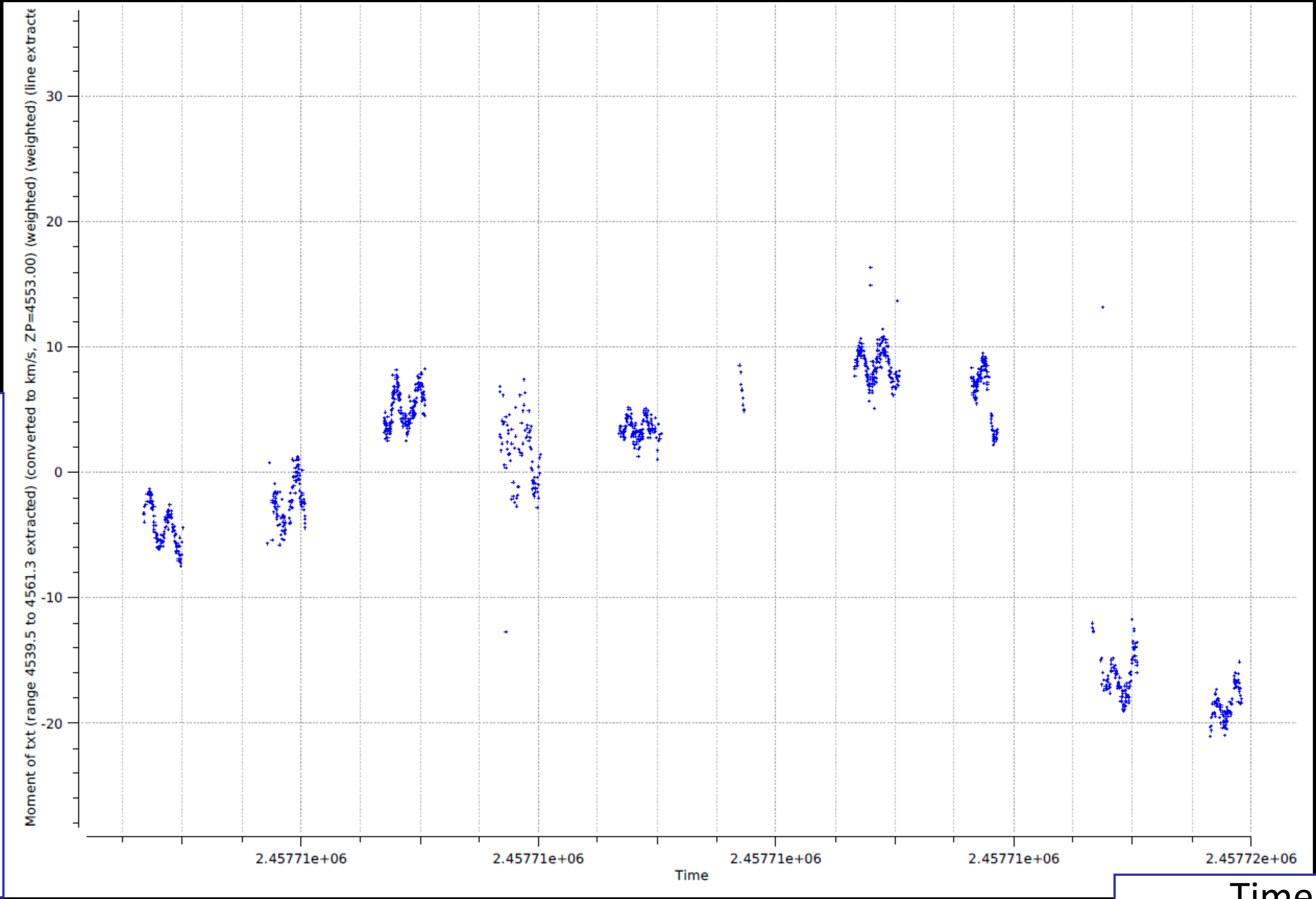


Figure 4.17 **Rotational Broadening** The rotation of a star can cause spectral line broadening. Since most stars are unresolved, light rays from all parts of the star merge to produce broadened lines. The more rapid the rotation, the greater the broadening.


OBJECT: HD24760
McDonald Observatory, TELESCOPE: mcd82x
Normalized Flux
Wavelength [Å]
HJD ⟶



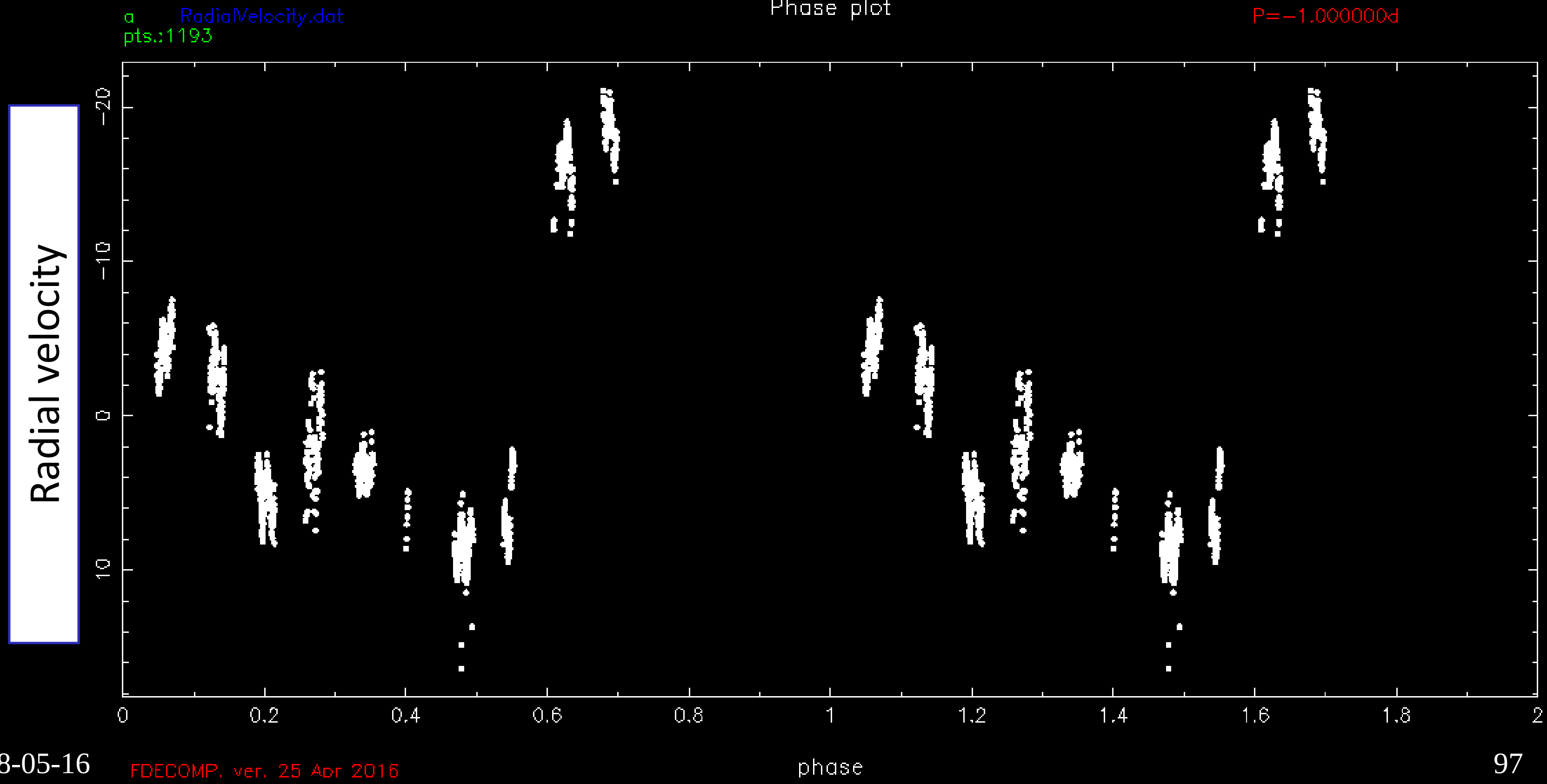
Radia velocity

Time [jd]

Orbital period

Epsilon Persei- triple system with close binary period:
Libich [2005]: P orb= 14.069 dni
de Cat [2000]: P orb= 14.076 dni

Orbital phase



Frequencies [cycle/day]

f=.17413498

h=.16142715

o=.07229716

q=.39614309

s=5.65844705

j=6.23706979

b=2.35783275

c=3.91918773

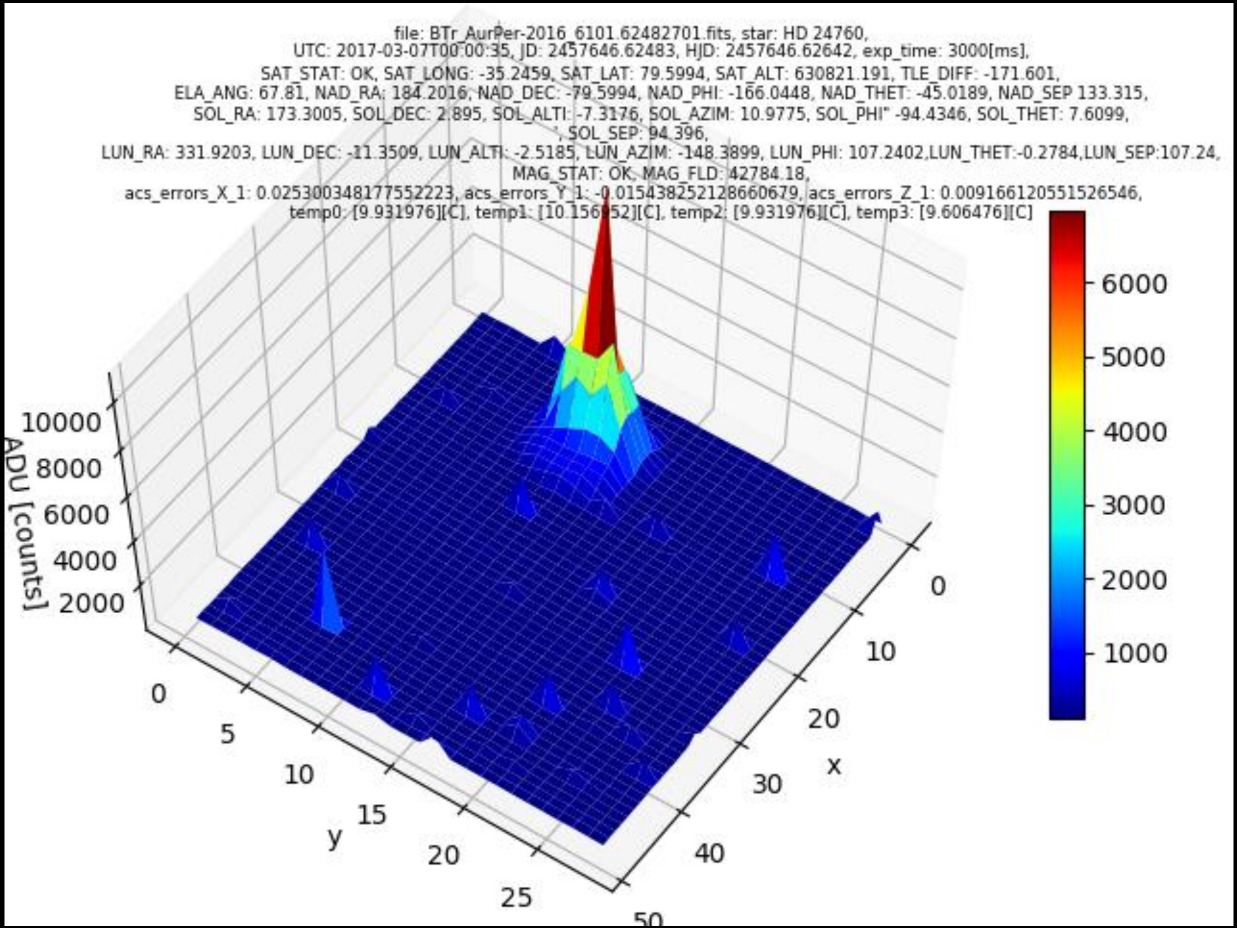
d=6.05413865

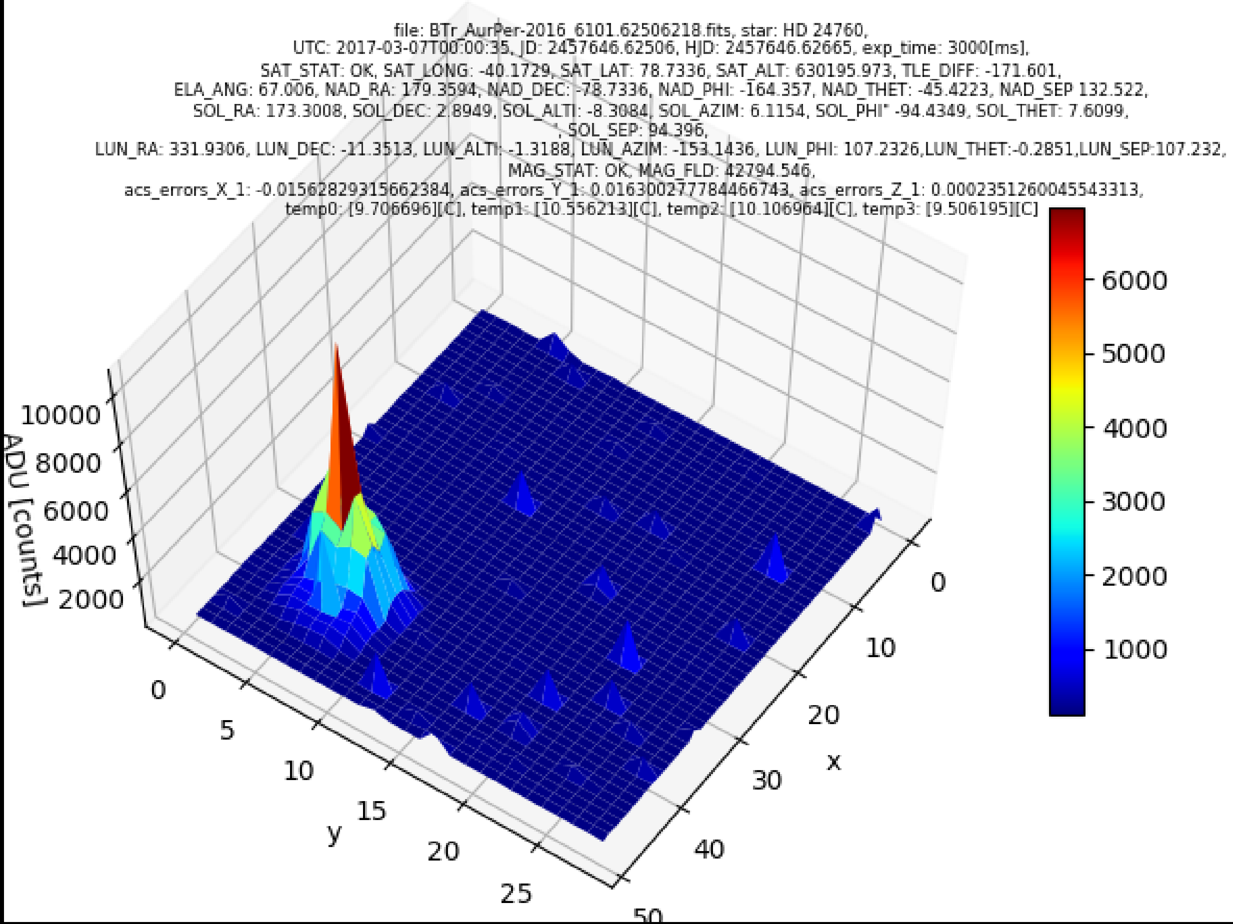
u=2.95661520

- n=2.69353726
- v=7.42876627
- a=2.28748068
- t=3.54325171
- i=7.60181326
- k=5.86961022

Mode identification

- frequencies from photometry
- radial velocity from spectroscopy
- mode identification in FAMIAS software using
  - moment method
  - line profile variation


file: BTr_AurPer-2016_6101.62482701.fits, star: HD 24760,
UTC: 2017-03-07T00:00:35, JD: 2457646.62483, HJD: 2457646.62642, exp_time: 3000[ms],
SAT_STAT: OK, SAT_LONG: -35.2459, SAT_LAT: 79.5994, SAT_ALT: 630821.191, TLE_DIFF: -171.601,
ELA_ANG: 67.81, NAD_RA: 184.2016, NAD_DEC: -79.5994, NAD_PHI: -166.0448, NAD_THET: -45.0189, NAD_SEP 133.315,
SOL_RA: 173.3005, SOL_DEC: 2.895, SOL_ALTI: -7.3176, SOL_AZIM: 10.9775, SOL_PHI" -94.4346, SOL_THET: 7.6099,
', SOL_SEP: 94.396,
LUN_RA: 331.9203, LUN_DEC: -11.3509, LUN_ALTI: -2.5185, LUN_AZIM: -148.3899, LUN_PHI: 107.2402,LUN_THET:-0.2784,LUN_SEP:107.24,
MAG_STAT: OK, MAG_FLD: 42784.18,
acs_errors_X_1: 0.025300348177552223, acs_errors_Y_1: -0.015438252128660679, acs_errors_Z_1: 0.009166120551526546,
temp0: [9.931976][C], temp1: [10.156952][C], temp2: [9.931976][C], temp3: [9.606476][C]
ADU [counts]
10000
8000
6000
4000
2000
0
5
10
15
y
20
25
0
10
20
30
x
40
50
6000
5000
4000
3000
2000
1000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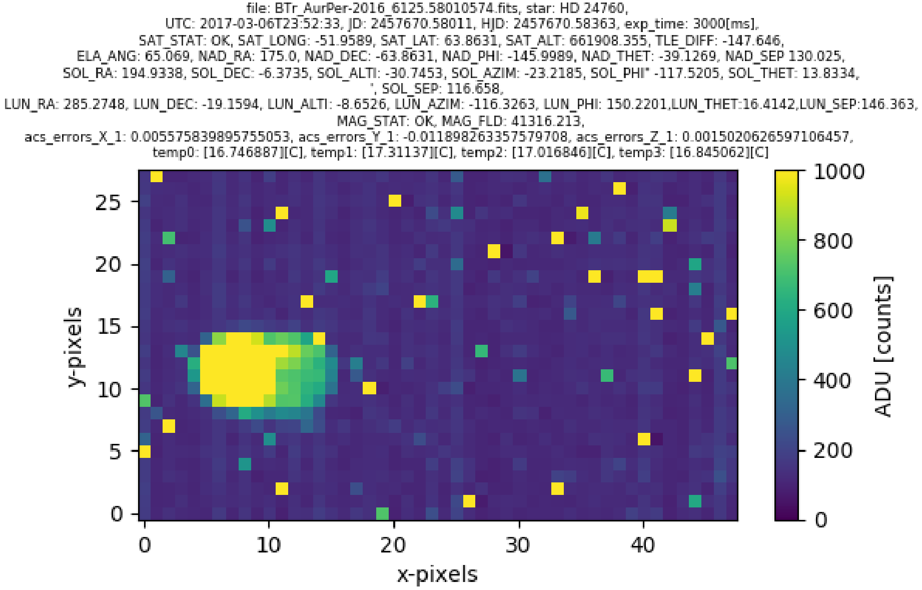
SAT_STAT: OK, SAT_LONG: -40.1729, SAT_LAT: 78.7336, SAT_ALT: 630195.973, TLE_DIFF: -171.601,
ELA_ANG: 67.006, NAD_RA: 179.3594, NAD_DEC: -78.7336, NAD_PHI: -164.357, NAD_THET: -45.4223, NAD_SEP 132.522,
SOL_RA: 173.3008, SOL_DEC: 2.8949, SOL_ALTI: -8.3084, SOL_AZIM: 6.1154, SOL_PHI" -94.4349, SOL_THET: 7.6099,
', SOL_SEP: 94.396,
LUN_RA: 331.9306, LUN_DEC: -11.3513, LUN_ALTI: -1.3188, LUN_AZIM: -153.1436, LUN_PHI: 107.2326,LUN_THET:-0.2851,LUN_SEP:107.232,
MAG_STAT: OK, MAG_FLD: 42794.546,
acs_errors_X_1: -0.01562829315662384, acs_errors_Y_1: 0.016300277784466743, acs_errors_Z_1: 0.00023512600455543313,
temp0: [9.706696][C], temp1: [10.556213][C], temp2: [10.106964][C], temp3: [9.506195][C]
ADU [counts]
10000
8000
6000
4000
2000
0
5
10
15
20
25
y
0
10
20
30
40
50
x
6000
5000
4000
3000
2000
1000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UTC: 2017-03-06T23:52:33, JD: 2457670.58011, HJD: 2457670.58363, exp_time: 3000[ms],
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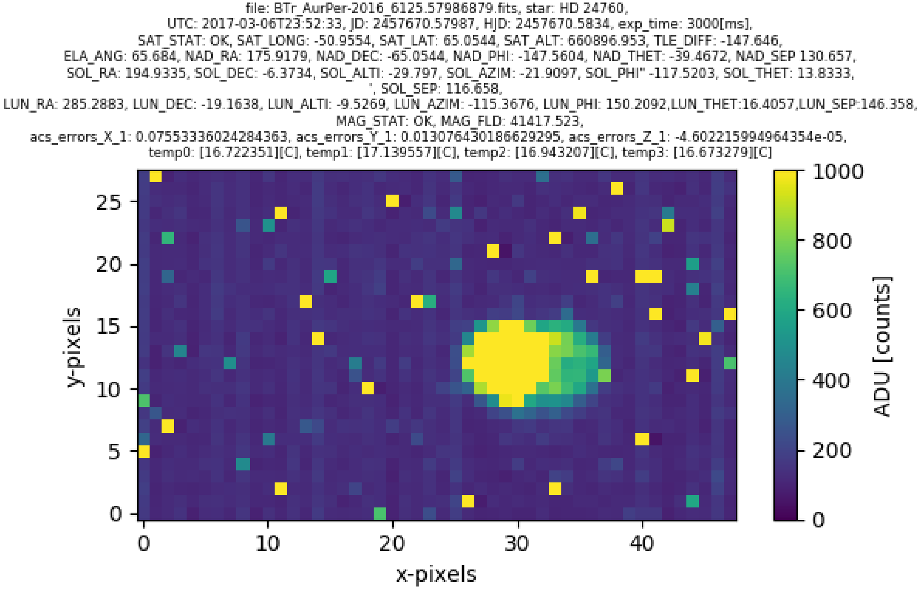
ELA_ANG: 65.069, NAD_RA: 175.0, NAD_DEC: -63.8631, NAD_PHI: -145.9989, NAD_THET: -39.1269, NAD_SEP 130.025,
SOL_RA: 194.9338, SOL_DEC: -6.3735, SOL_ALTI: -30.7453, SOL_AZIM: -23.2185, SOL_PHI" -117.5205, SOL_THET: 13.8334,
', SOL_SEP: 116.658,
LUN_RA: 285.2748, LUN_DEC: -19.1594, LUN_ALTI: -8.6526, LUN_AZIM: -116.3263, LUN_PHI: 150.2201,LUN_THET:16.4142,LUN_SEP:146.363,
MAG_STAT: OK, MAG_FLD: 41316.213,
acs_errors_X_1: 0.005575839895755053, acs_errors_Y_1: -0.011898263357579708, acs_errors_Z_1: 0.0015020626597106457,
temp0: [16.746887][C], temp1: [17.31137][C], temp2: [17.016846][C], temp3: [16.845062][C]
y-pixels
x-pixels
ADU [counts]
0
5
10
15
20
25
30
40
200
400
600
800
1000


file: BTr_AurPer-2016_6125.57986879.fits, star: HD 24760,
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', SOL_SEP: 116.658,
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x-pixels
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10
15
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40
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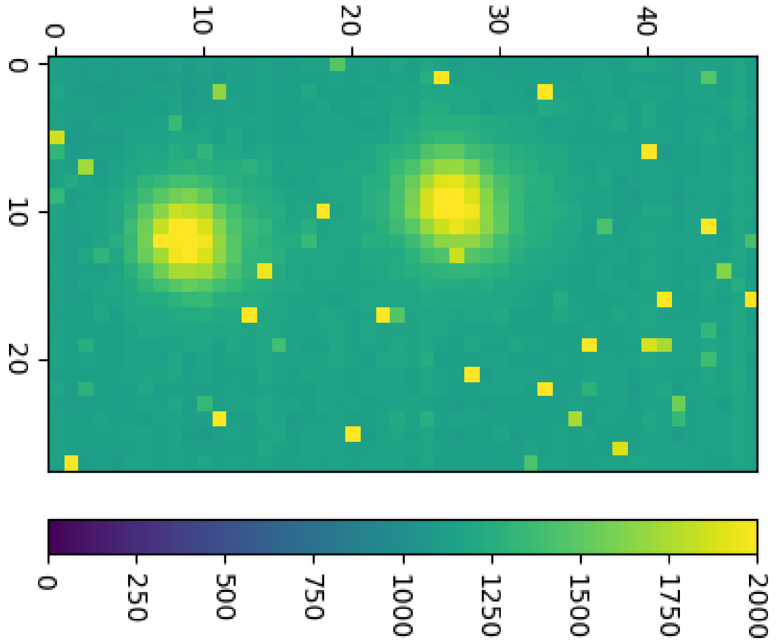
400
600
800
1000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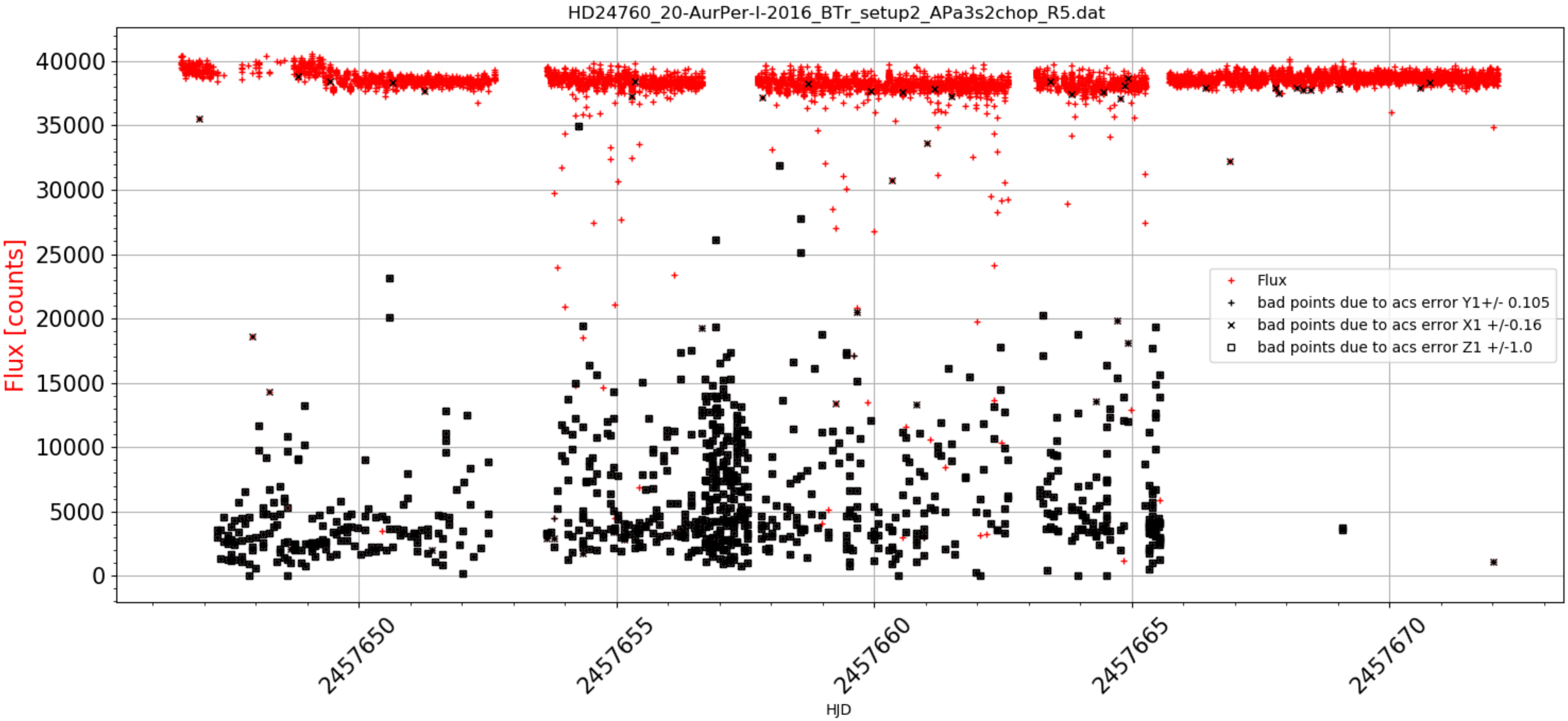
HD24760_20-AurPer-I-2016_BTr_setup2_APa3s2chop_R5.dat
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25000
20000
15000
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2457655
2457660
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Flux
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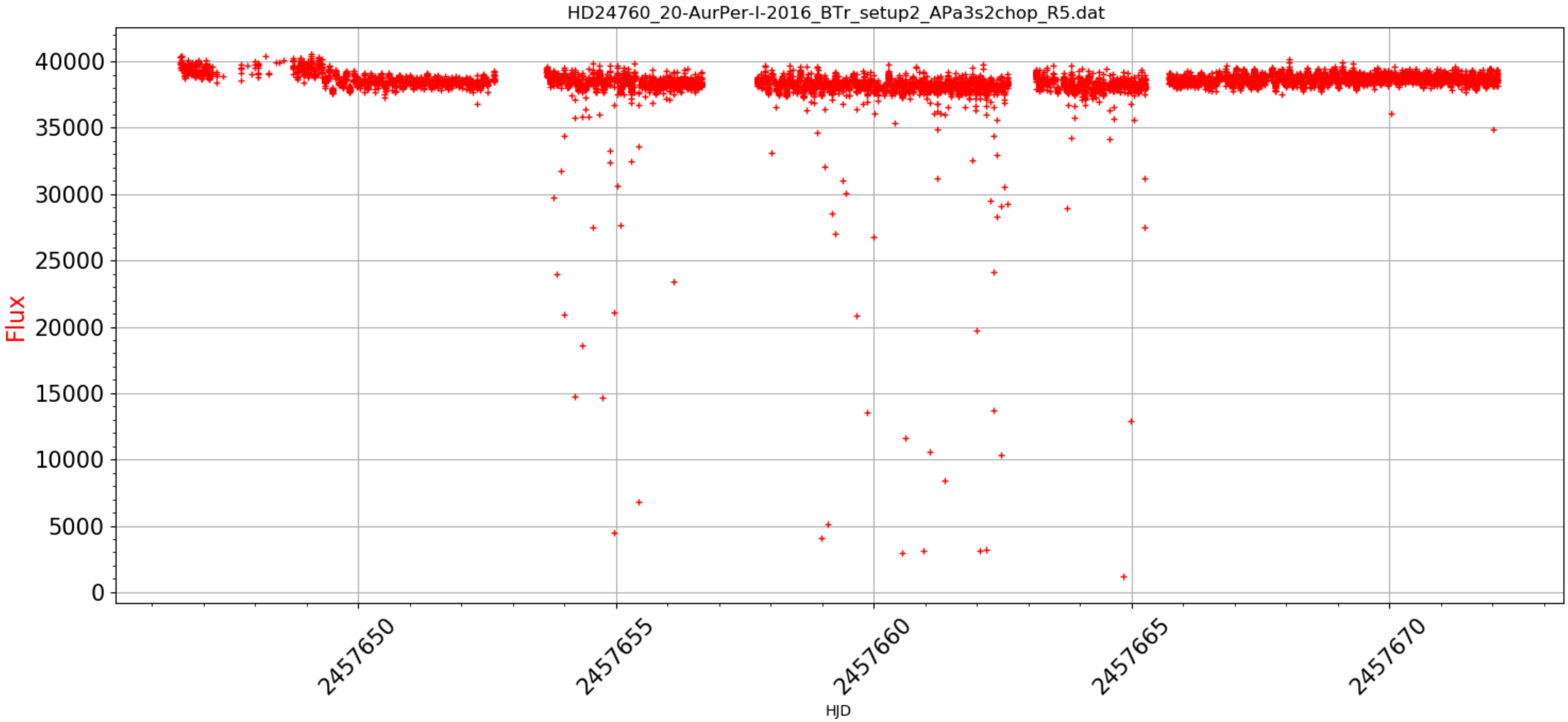
bad points due to acs error X1 +/-0.16
bad points due to acs error Z1 +/-1.0



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30000
25000
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10000
5000
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2457655
2457660
2457665
2457670

FITS and lightcurves from BRITE

http://brite.craq-astro.ca/doku.php

BRITE Photometry Wiki

Register

Recent changes Media Manag

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General Information

Brite Satellites

- UniBRITE (UBr), red
- BRITE Austria (BAb), blue
- BRITE Lem (BLb), blue
- BRITE Heweliusz (BHr), red
- BRITE Toronto (BTr), red

Principal Investigators

Fields

- 01-Ori-I-2013 (released)
- 02-Cen-I-2014 (released)
- 03-Sgr-I-2014 (released)
- 04-Cyg-I-2014 (released)
- 05-Per-I-2014 (released)
- 06-Ori-II-2014 (released)
- 07-VelPup-I-2014 (released)
- 08-VelPic-I-2015 (released)
- 09-Sco-I-2015 (released)
- 10-Cyg-II-2015 (released)
- **11-CasCep-I-2015 (released)**
- 12-CMaPup-I-2015 (released)
- 13-Ori-III-2015 (released)
- 14-VelPup-II-2015 (released)
- 15-CruCar-I-2016 (released)
- 16-Sgr-II-2016 (released)

- Perseus I
  - Observational Details
  - Targets

Perseus I

Field ID: 05-Per-I-2014

Observational Details

```
Coordinates:   RA[hms] = 3:27:00, Dec[°'"] = +37:06:00
Observed:      September 2nd, 2014 - February 18th, 2014
Status:        Released
Satellites:    UBr, BAb
```

Targets

#	HD	Name	V	Sp.Type	Contact PI	TNDP[1)]	Data avail.[2)]
1	16908	35 Ari	4.66	B3 V	Pigulski	616	public
2	17573	41 Ari	3.63	B8 Vn	Pigulski	24914	public
3	17584	16 Per	4.23	F2 III	Zwintz	75839	public
4	17709	17 Per	4.53	K5 III	Kallinger	10164	public
5	18296	21 (LT) Per	5.11	B9pSi	Lüftinger	10232	public

FITS and lightcurves from BRITE

https://brite.camk.edu.pl/pub/index.html

Szukaj

BRITE public data archive

DATA ARCHIVE | BRITE-CONSTELLATION | BRITE WIKI

BRITE

- Public lightcurve archive
- Public fits archive
  - Full Frame Image

BRITE-Constellation
BRITE Wiki
Data release desciption
BRITE_FullFrameImage_Catalogue.xlsx

Data archive

BRITE (BRIght Target Explorer) Constellation is a space astronomy mission to collect high-quality, time-dependent, dual-filter, optical photometry of bright stars with a set of nanosatellites, operated simultaneously by an international team of scientists and engineers. The scientific strength of BRITE Constellation is the ability to monitor at high photometric precision many of the apparently brightest stars in the night sky with sampling comparable to a BRITE nanosatellite orbital period (~100 minutes) for months or even years.

Researchers are requested to include the following acknowledgement in any publication that makes use of data retrieved from this database:
"Based on data collected by the BRITE Constellation satellite mission, designed, built, launched, operated and supported by the Austrian Research Promotion Agency (FFG), the University of Vienna, the Technical University of Graz, the Canadian Space Agency (CSA), the University of Toronto Institute for Aerospace Studies (UTIAS), the Foundation for Polish Science & Technology (FNiTP MNiSW), and National Science Centre (NCN)."

Search for names..

Star	Field_DataRelease	Lightcurve
HD3901	11-CasCep-I-2015_R4	HD3901_11-CasCep-I-2015_R4.zip
HD4614	11-CasCep-I-2015_R4	HD4614_11-CasCep-I-2015_R4.zip

FITS and lightcurves from BRITE

BRITE public data archive

DATA ARCHIVE | BRITE-CONSTELLATION | BRITE WIKI

BRITE

- Public lightcurve archive
  - 01 Orion I
  - 02 Centaurus I
  - 04 Cygnus I
  - 05 Perseus I
    - 05-Per-I-2014_R2
    - 05-Per-I-2014_R2_chop
  - 06 Orion II
  - 07 Vela/Puppis I
  - 08 Vela/Pictoris I
  - 09 Scorpius I
  - 10 Cygnus II
  - 11 Cassiopeia/Cepheus I
  - 21 Cetus/Eridanus I
- Public fits archive

BRITE-Constellation
BRITE Wiki
Data release desciption
BRITE_FullFrameImage_Catalogue.xlsx

Data archive

https://brite.camk.edu.pl/pub/index.html

BRITE (BRIght Target Explorer) Constellation is a space astronomy mission to collect high-quality, time-dependent, dual-filter, optical photometry of bright stars with a set of nanosatellites, operated simultaneously by an international team of scientists and engineers. The scientific strength of BRITE Constellation is the ability to monitor at high photometric precision many of the apparently brightest stars in the night sky with sampling comparable to a BRITE nanosatellite orbital period (~100 minutes) for months or even years.

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Search for names..

Star	Field_DataRelease	Lightcurve
HD3901	11-CasCep-I-2015_R4	HD3901_11-CasCep-I-2015_R4.zip

FITS and lightcurves from BRITE

BRITE public data archive

DATA ARCHIVE | BRITE-CONSTELLATION | BRITE WIKI

BRITE

Public lightcurve archive

BRITE-Constellation
BRITE Wiki
Data release desciption

Data realease description

The release notes for 22-Ori-IV-2016_R5

The Quality Check Team (QCT) release notes: 22-Orion-V-2016_Release_Notes.pdf

The release notes for 21-CetEri-I-2016_R5

The Quality Check Team (QCT) release notes: 21-CetEri-I-2016_Release_Notes.pdf

The release notes for 20-AurPer-I-2016_R5

The Quality Check Team (QCT) release notes: 20-AurPer-I-2016_Release_Notes.pdf

The release notes for 19-Cas-I-2016_R5

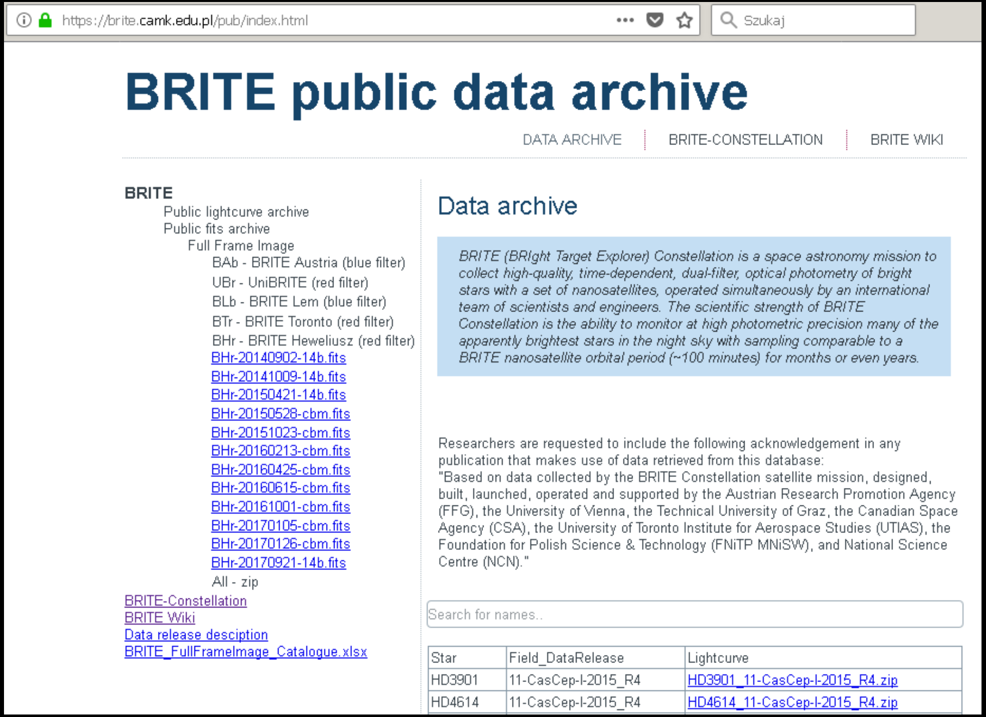
The Quality Check Team (QCT) release notes: 19-Cas-I-2016_Release_Notes.pdf

RELEASE 5 DATA

The latest reduction of Cru/Car field (the Release R5) is now available.
The release 5 columns description is here: DR5-descr.pdf

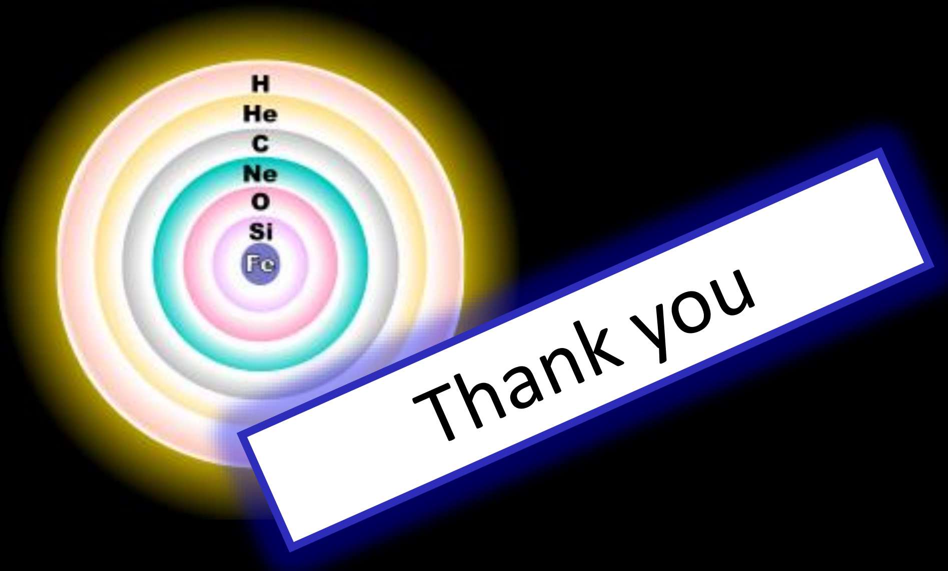
RELEASE 4 DATA

FITS and lightcurves from BRITE



List of BRITE & BRITE-related publications

- http://brite.craq-astro.ca/doku.php?id=brite_science
- Last updated: April 6, 2018 (141 publication)



Type II

Epsilon Persei and Epsilon Centauri as supernowa type II progenitor

Appendix

Chopping = „nodding”

F:\temp\WykladPoniedzialkowy\animacja_epsper\epsper

LASR-Guided Stellar Photometric Variability Subtraction: TheLinear Algorithm For Significance Reduction

https://arxiv.org/pdf/1804.03653.pdf

that stellar variability in high mass stars

the technique of “prewhitening" servesas the traditional method of asteroseismic analysis

high-mass stars often rotate rapidly, inducing an oblateshape and a pole-to-equator luminosity gradient across the stel-lar surface (Barnes 2009; Barnes et al. 2011; Ahlers et al. 2015;Ahlers 2016).

Techniquesfor analyzing non-sinusoidal or non-periodic signals in the lightcurves such as the autocorrelation function (McQuillan et al.2014) and Gaussian proces et al. 2016) producestrong results when applied to such stars.

dis-play more stellar variability than the Sun

high-massstars behave quite differently. At~6250K and hotter, stars invertto become radiative rather than convective at their surface (Winnet al. 2010). These stars have we or nonexistent sunspots, andcommonly rotate rapidly as a mostly-rigid body throughout theirlifetimes. High-mass stars in the classical instability strip pulsatewith radial and nonradial modes at high amplitudes. Therefore,analysis of stellar variability in the light curves of high-massstars comes with a unique set of challenges and must be handleddifferently than variability in low-mass stars.

magnetic fields may have built up throughdynamo processes (similar to that generating the Earth or the sun magneticfields)

All stars are rotating (the rotation period of the sun is about 27 d)

The compactification of the star then impliesfaster rotation

The rotational energy ofa star can be estimated simply as$E_{rot}=I\Omega^2/2 = 2I\pi^2P^{-2}$where$I$is themoment of inertia which, for a homogeneous sphere of mass$M$and radius$R$is$I= 2MR^2/5$.

Źródło: https://arxiv.org/pdf/1804.03451.pdf