



W1-signal from the KL11 imaging spectroscopy: comparison to KT3

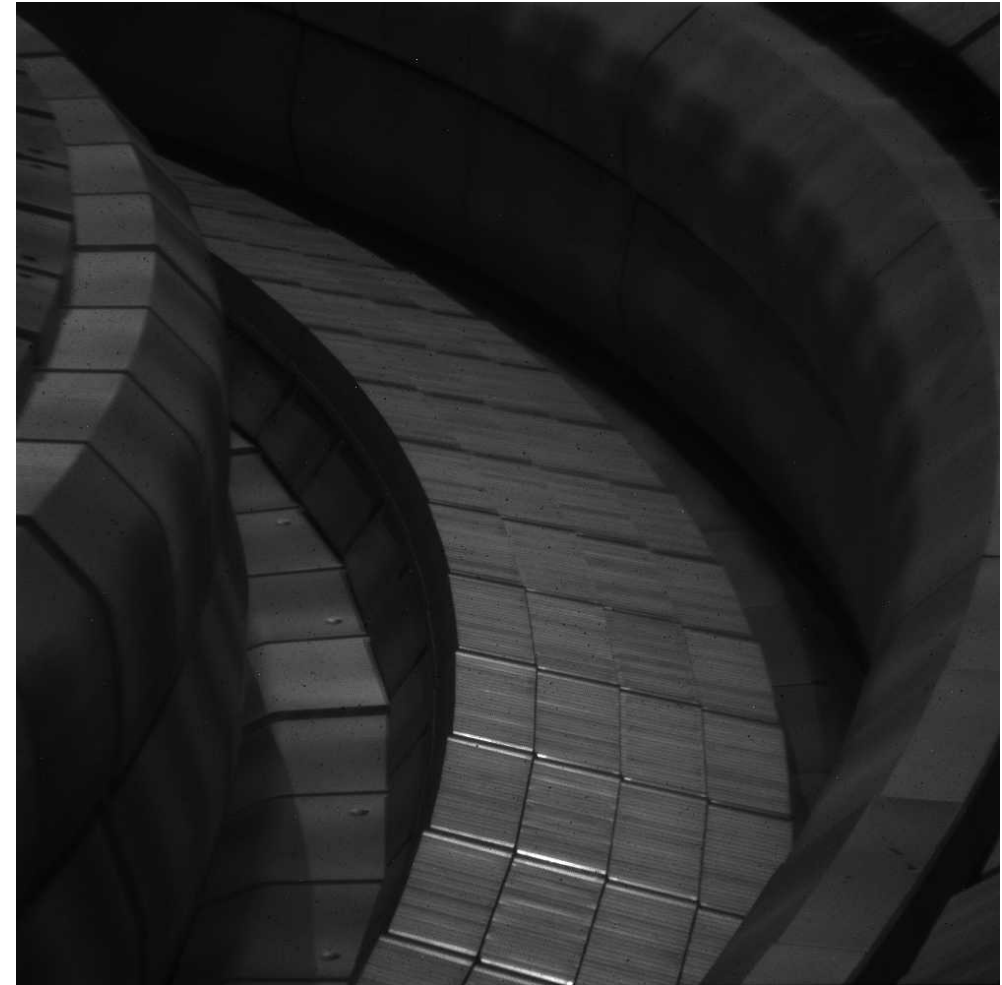
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JET Task Force E1/E2 meeting, 2014-10-07

- **Overview of KL11 and KT3 diagnostics**
- **How can the signals be compared?**
- **Data processing**
- **Results**



- 4 Pike cameras from AVT*: E1DC-E1DF (cam 1 - cam 4)
- Same view: Light distributed by beamsplitters**
- Wavelength filters to select spectral lines of interest



* Allied Vision Technologies

** See A. Huber: Rev. Sci. Instrum. 83(10), 2012: 10D511

Shots	80876 – 81417	81418 – 82419	Since 82420
E1DC	503.5 (1.5)	None	None
E1DD	522.5 (1.0)	522.5 (1.0)	None
E1DE	400.8 (1.0) 505.3 (1.5)	400.8 (1.0) 505.3 (1.5)	400.96 (0.97)
E1DF	400.8 (1.5)	400.8 (1.5)	400.8 (1.5)

Central wavelength (FWHM)

Unit: nm

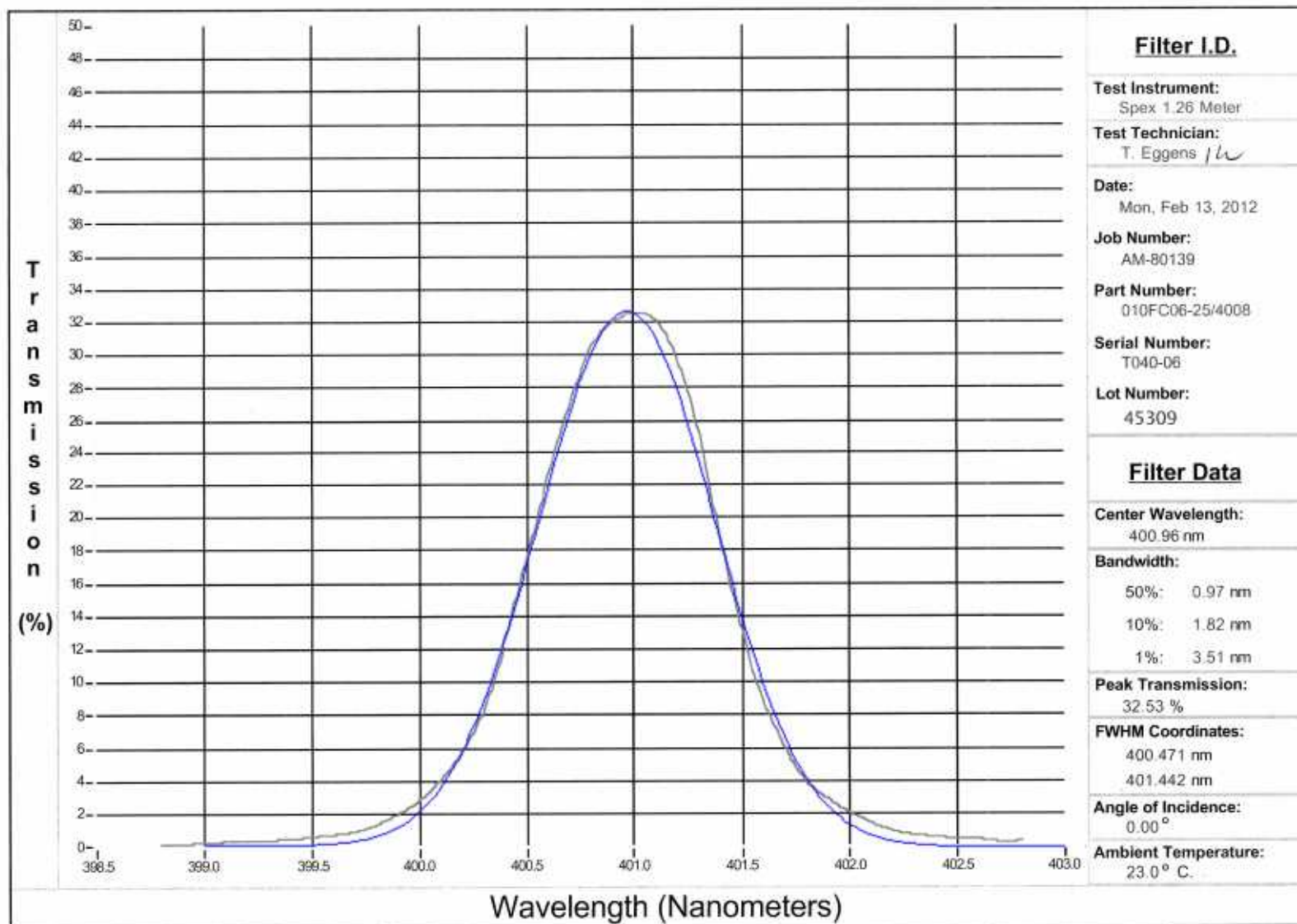
Corresponding neutral tungsten spectral lines

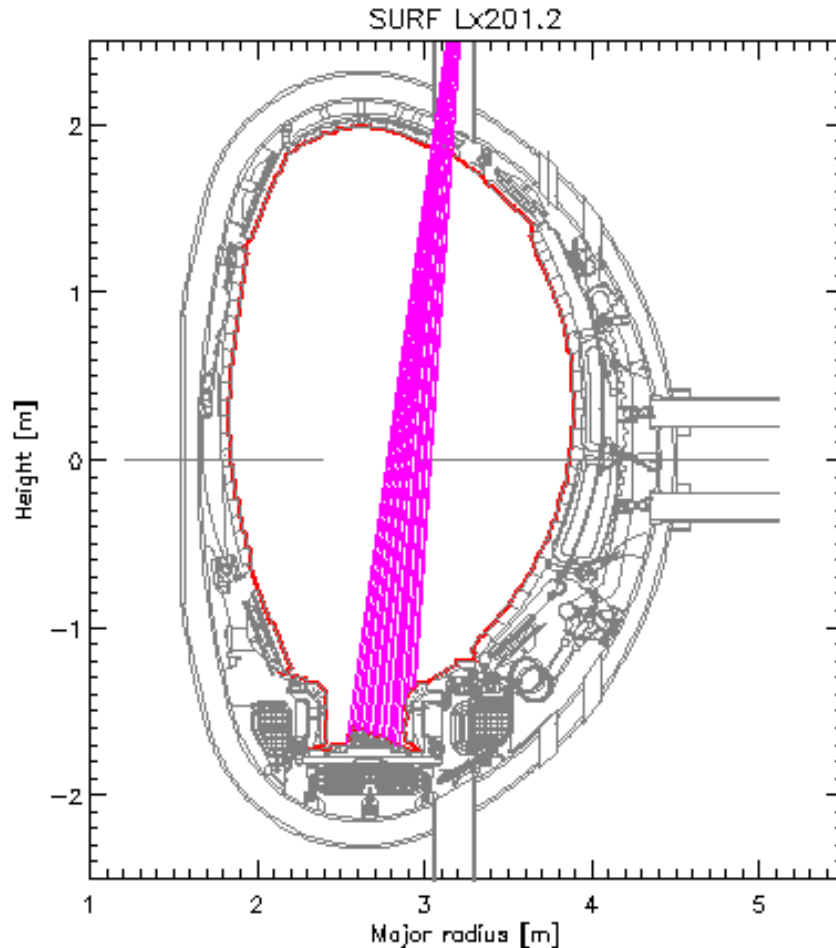
Wavelength	400.88	505.33	522.47
Relative intensity	1000	90	90

**KL11-E1DE
&
KL11-E1DF**

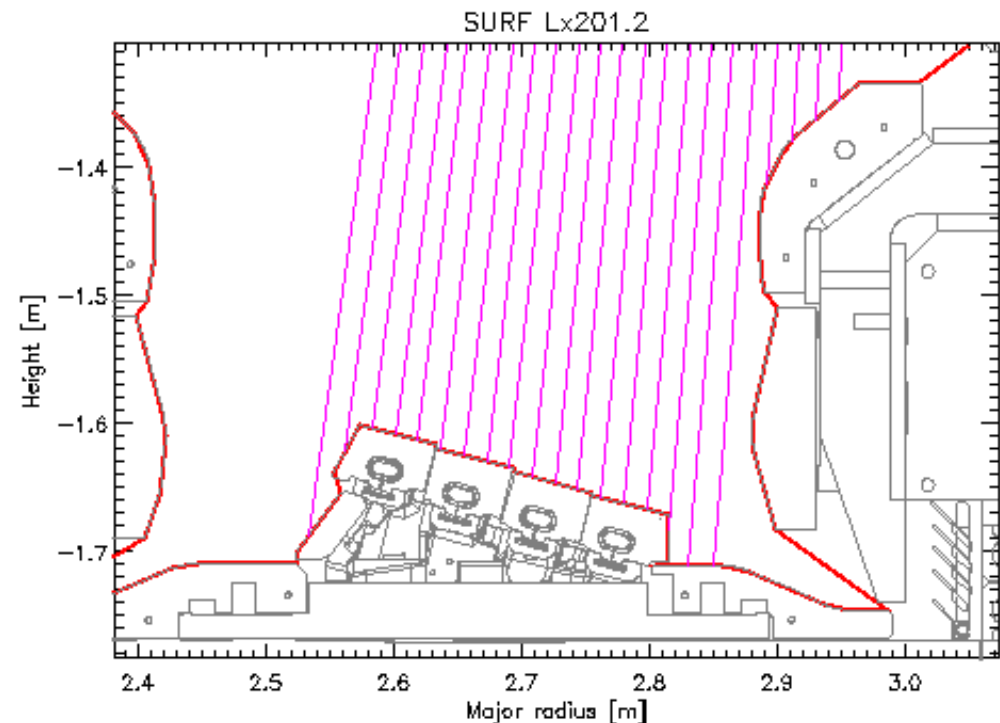
Source: National Institute of Standards and Technology, physics.nist.gov

L.O.T.-Oriel Ltd.





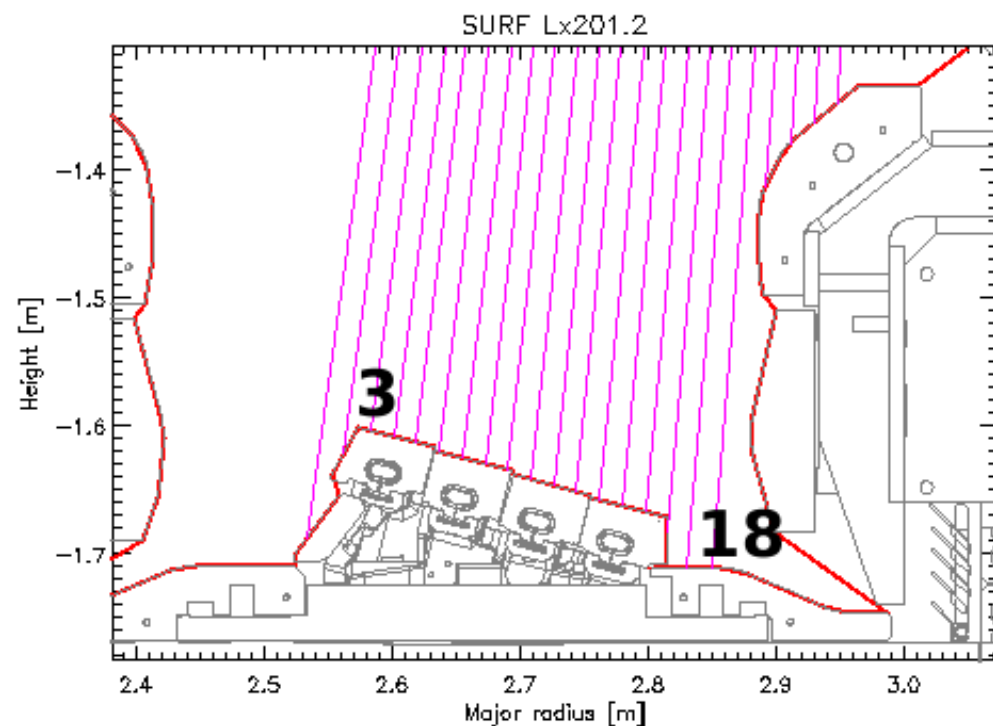
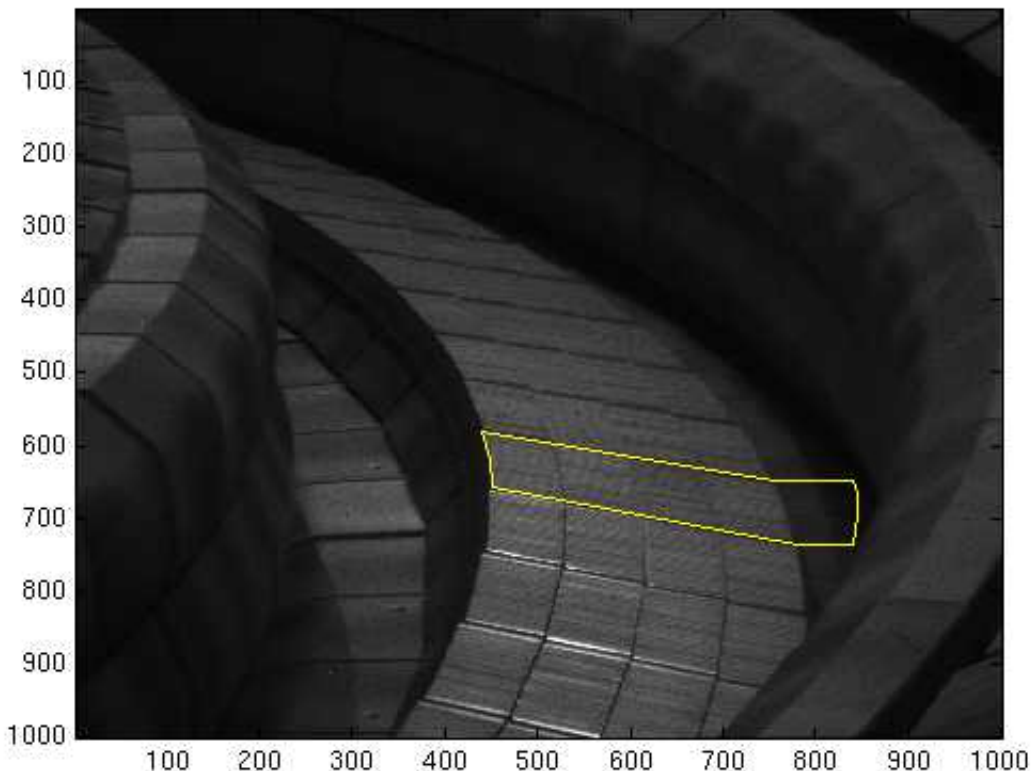
CCD cameras: 22 lines from top of vessel, integrated intensity



Diffraction gratings (different for KT3a, b, c) in Czerny-Turner set up

→ Different wavelengths end up on different pixels of light gathering chip

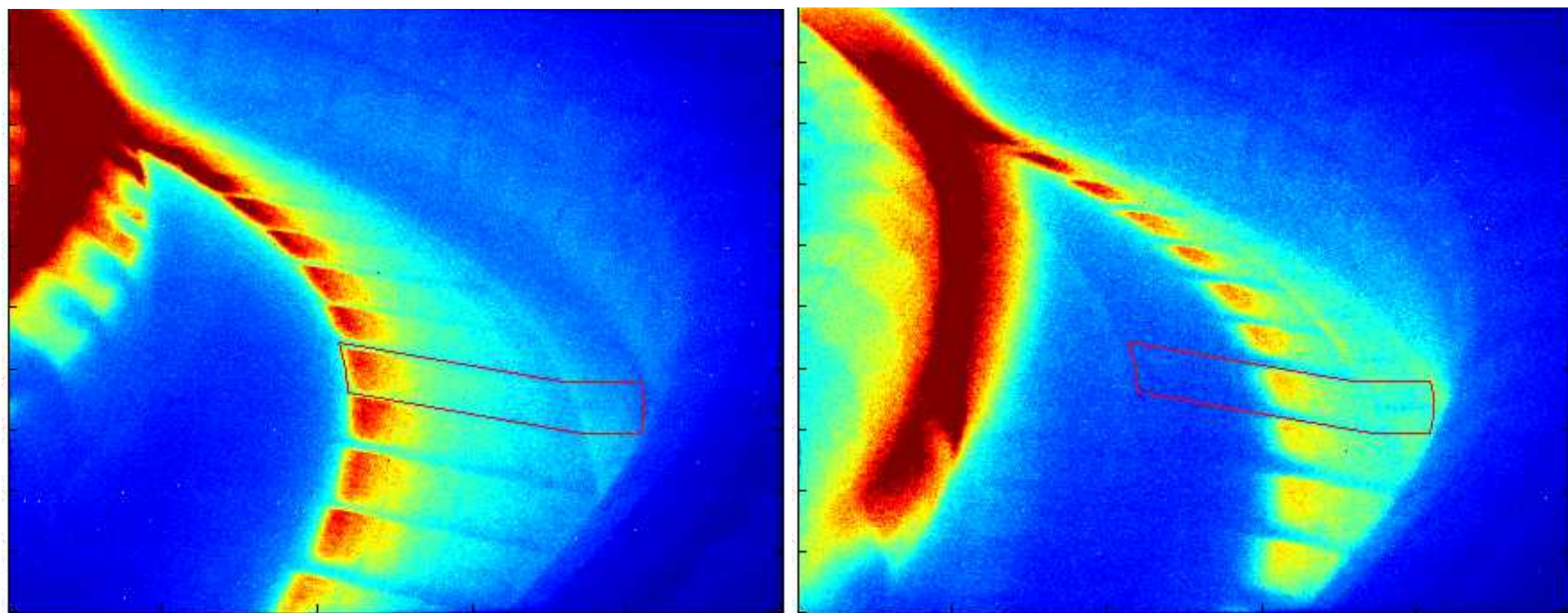
Output: Intensity as function of wavelength, track number and time

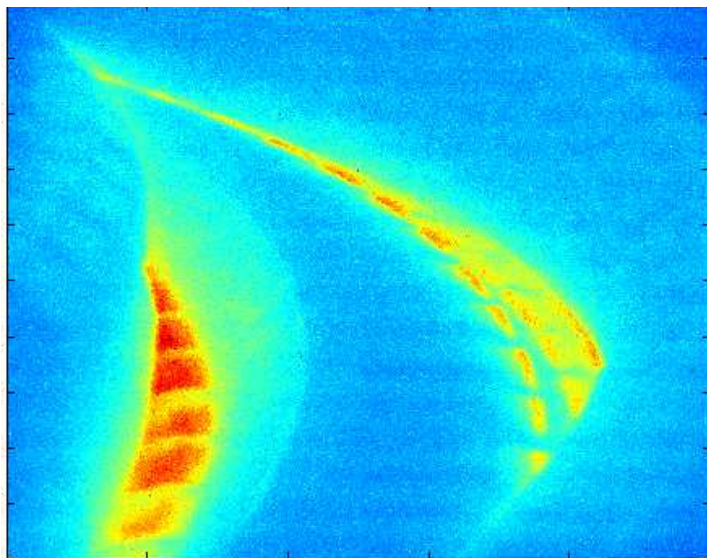


OBS! Different toroidal positions. Toroidal symmetry must be assumed.

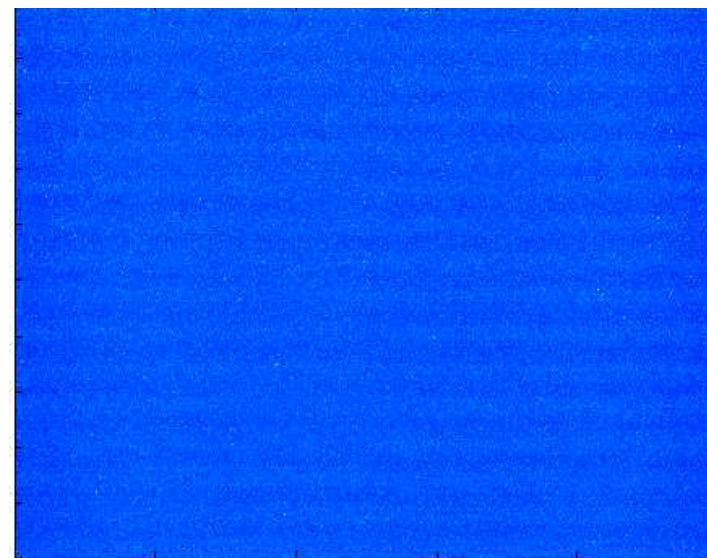
KL11: All wavelength filters distort the image (magnification + shift)

→ Define ROIs individually for each filter by identifying structures!

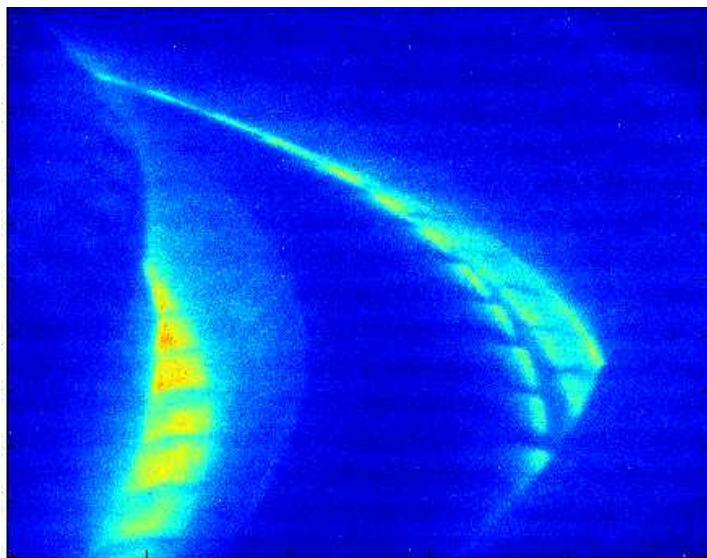




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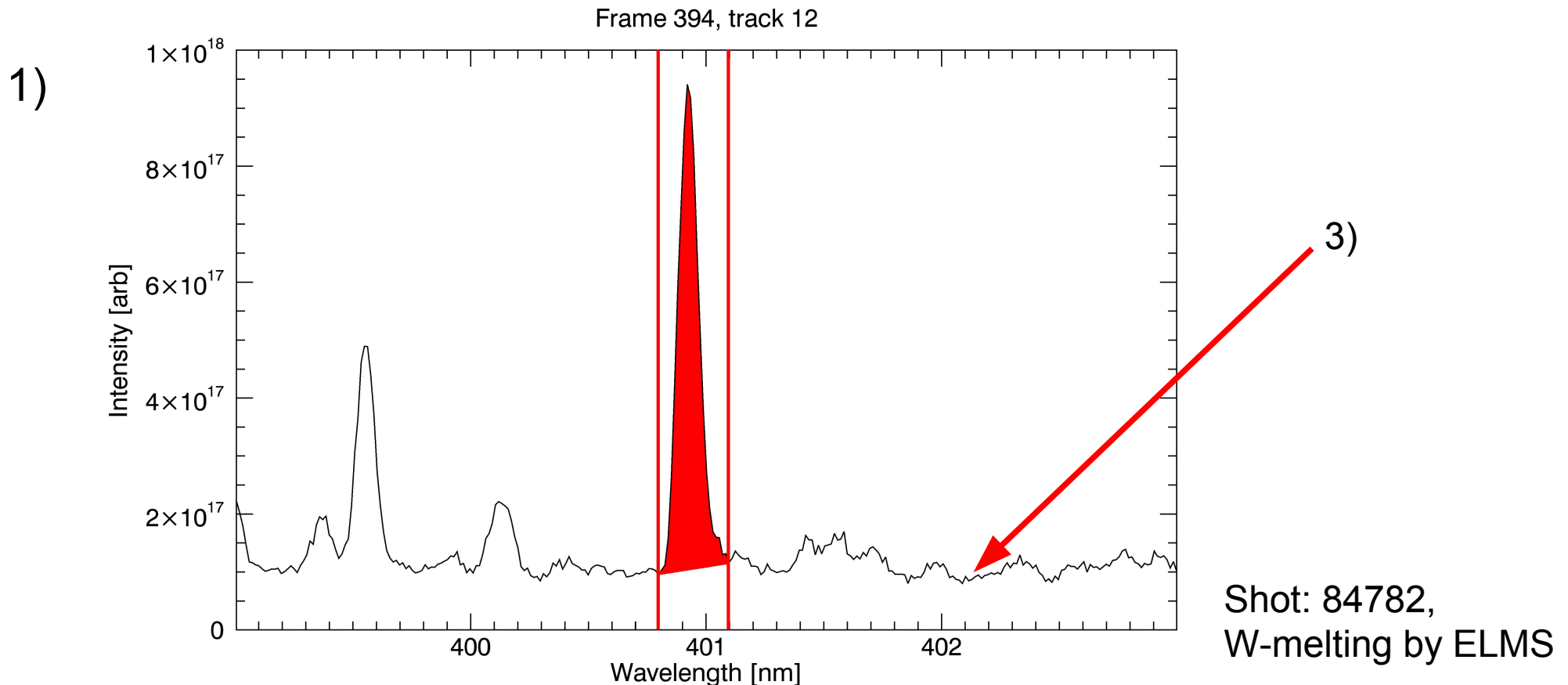
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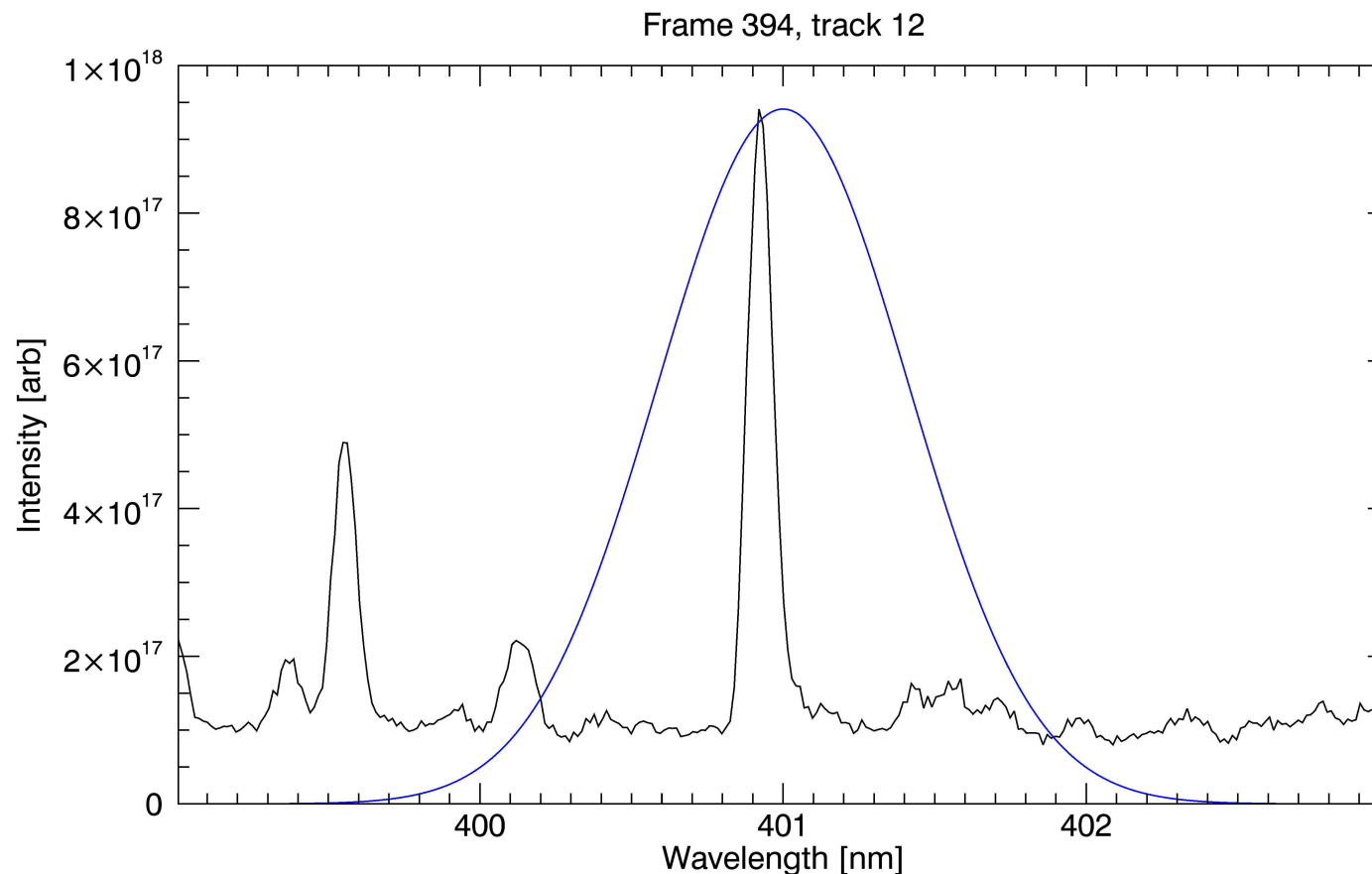
- a) Subtract camera 0-signal
(frame 1)
- b) Integrate over ROI
(sum pixel values)

3 KT3b signals for comparison with KL11:

- 1) Baseline subtracted, integrated over selected W1-peak (400.88nm)
- 2) Weighted by filter function, integrated from 399nm to 403nm
- 3) Pure background

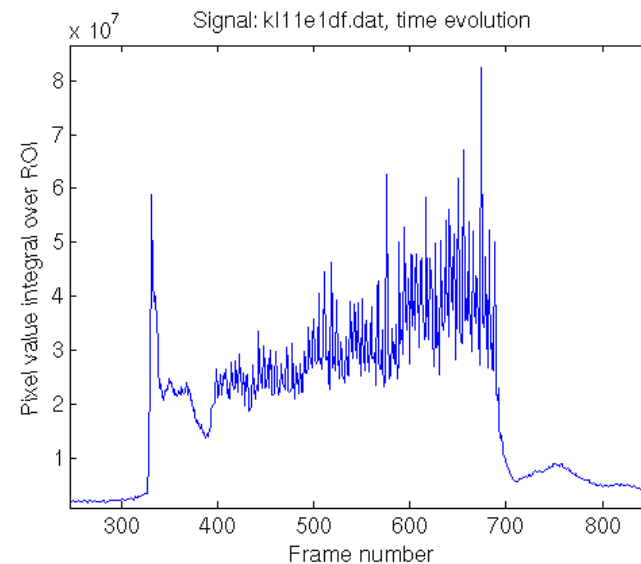
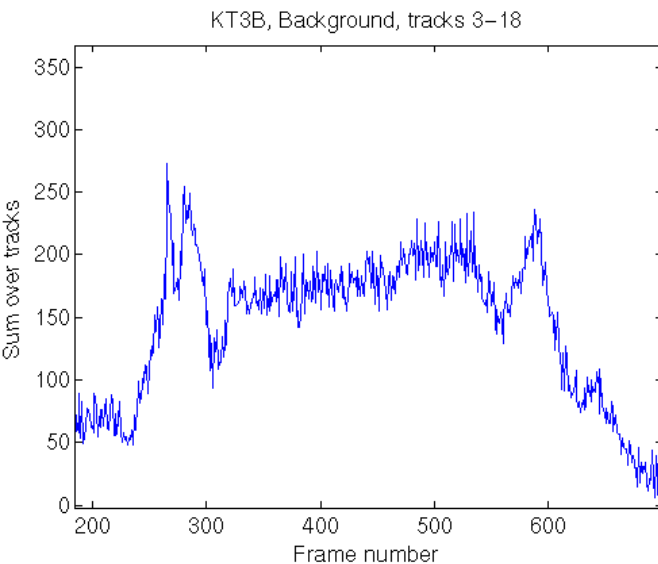
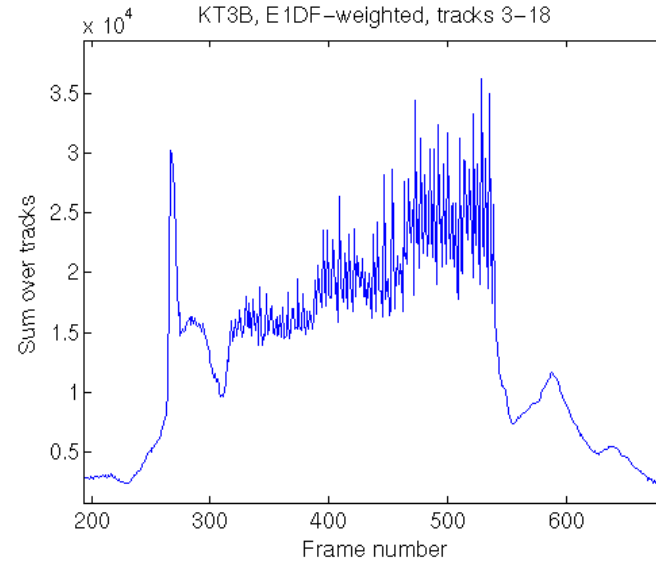
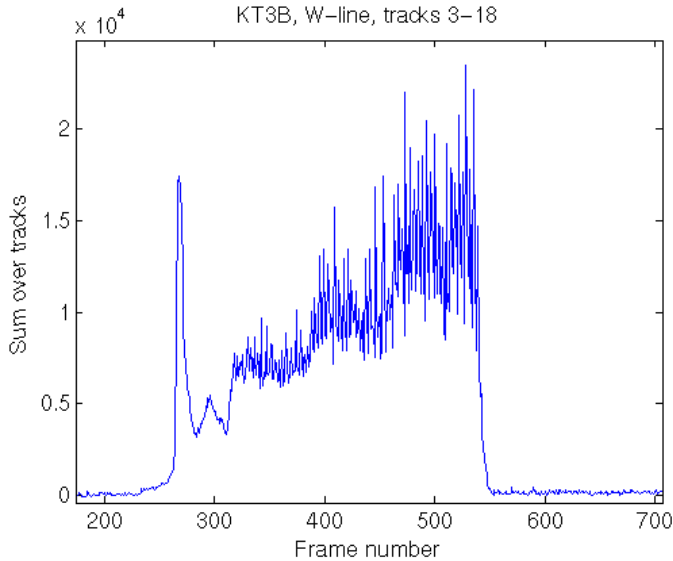


2)



Filter function central wavelength shifted by theoretical minus experimental peak position to compensate for calibration offset!

W divertor erosion, low density



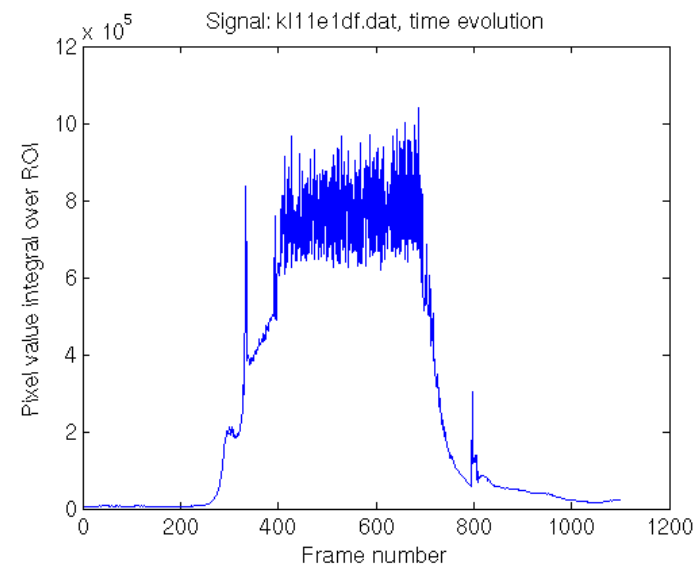
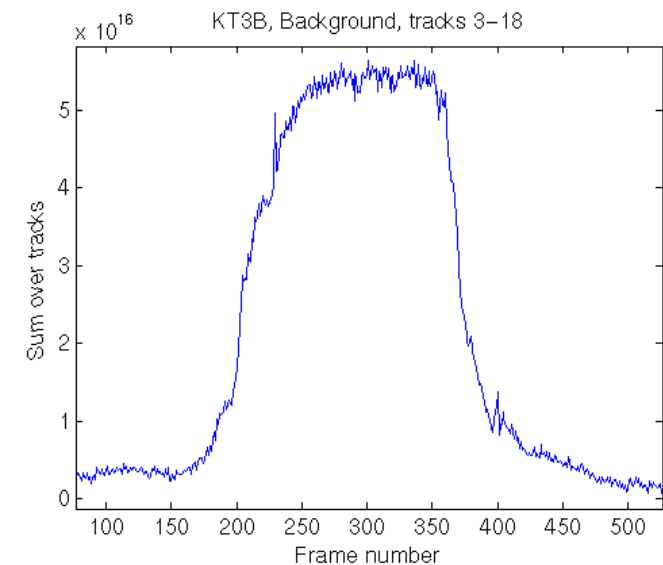
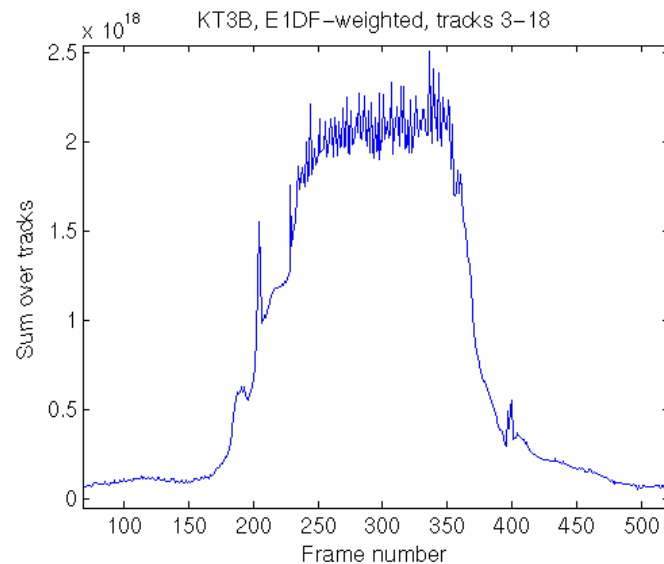
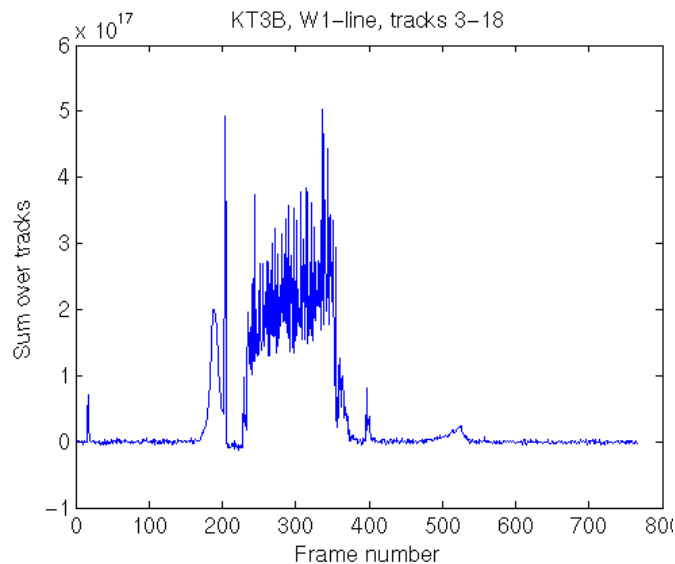
Correlation coefficients

W-line: 0.93

Weighted: 0.94

Background: 0.52

W source control



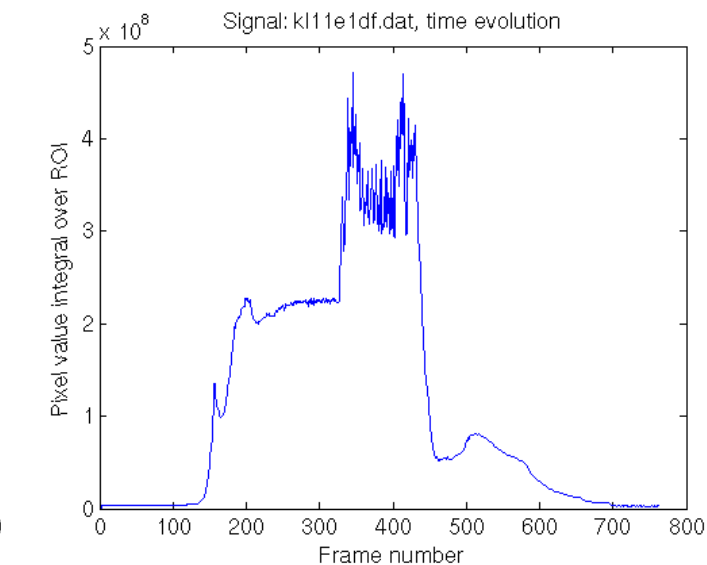
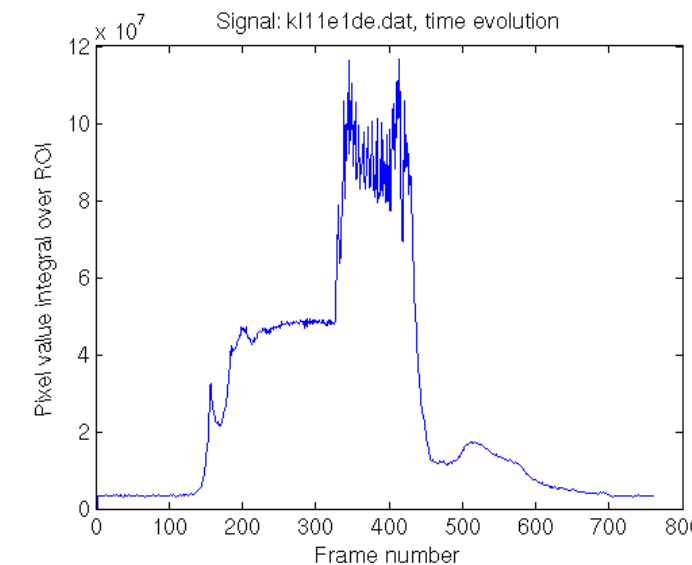
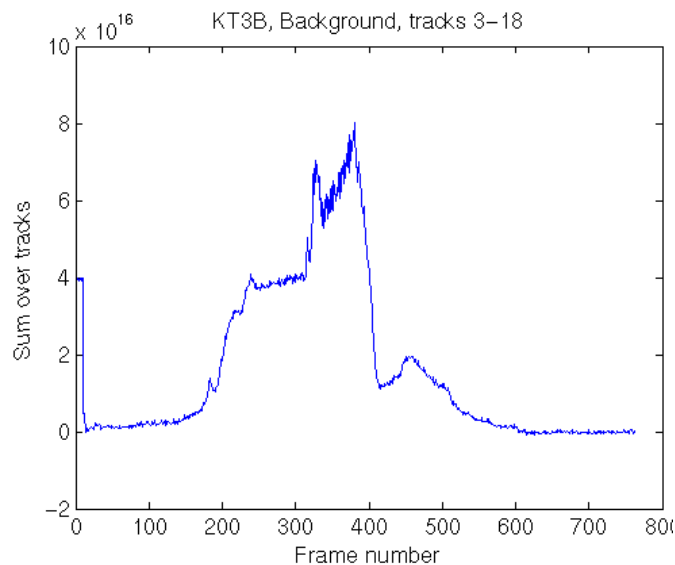
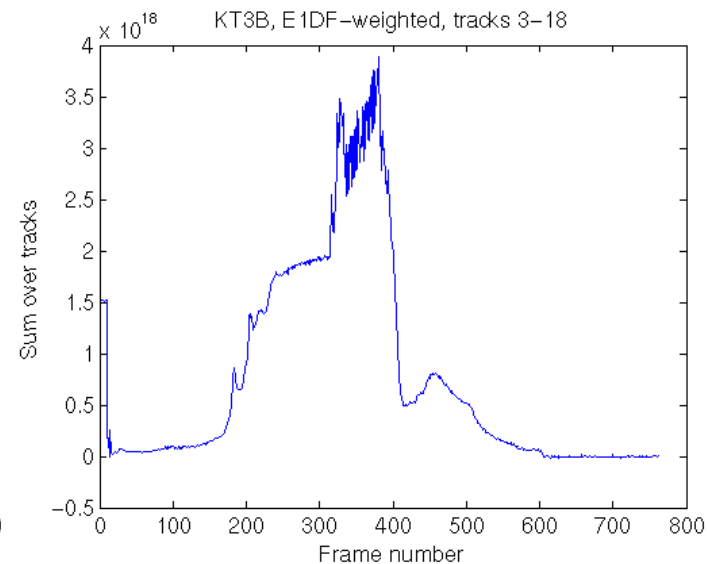
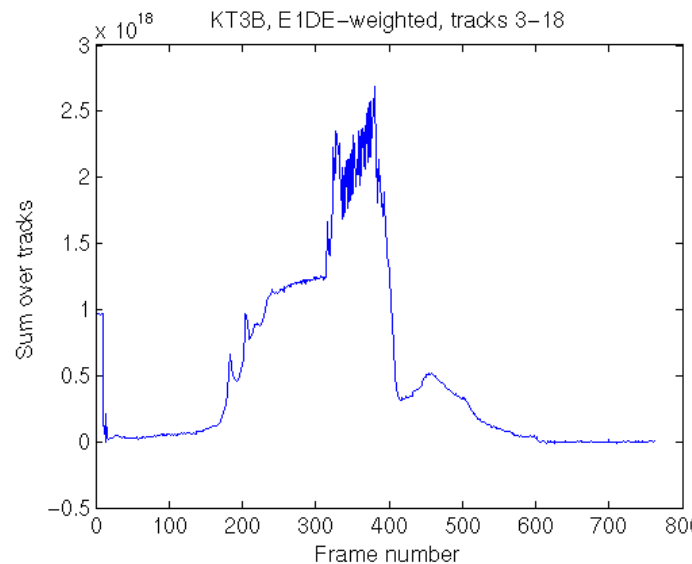
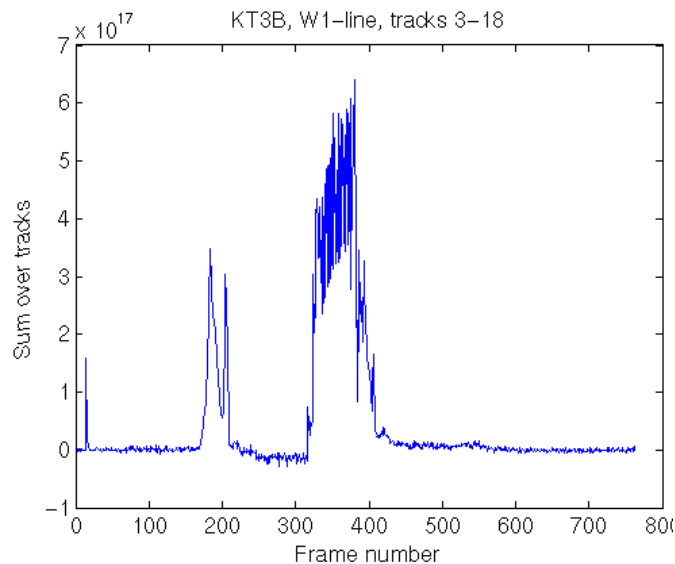
Correlation coefficients

W-line: 0.75

Weighted: 0.97

Background: 0.95

W melting by ELMS



Correlation coefficients

E1DE

W-line: 0.72

Weighted (E1DE): 0.97

Background: 0.97

E1DF

W-line: 0.65

Weighted (E1DF): 0.96

Background: 0.96

- **KL11 pixel value integral correlates well to filter function weighted KT3b data for the W1-line at 400.88nm.**
- **When background is weak, high correlation to background subtracted, integrated W1-peak is seen.**
- **When background is strong, there is a high correlation to that background.**

- **Study additional shots to verify result, possibly for other lines besides W1, 400.88nm**
- **Create several smaller ROI:s and compare to individual KT3 tracks or a few tracks at a time**
- **Attempt a background subtraction for KL11 by comparing the signals with broad and narrow filter**
- **All code (and this presentation) can be found under jac in [/work/pstrom](#)**

Questions per e-mail: pestro@kth.se

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&

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