* Spektren zeigen, aber muss nicht so viel in Detail gehen.
  + Es geht darum, grundlegende Sachen zu zeigen.
  + Vorheizen diskutieren
* Unsicherheit für Auflösung
  + Von T des Plasmas, Dopplerverbreiterung
  + statistischer Fehler
  + Für Kante, width of edge
    - Ist oberer Wert für Auflösung, weil scharfe Kante angenommen
* Anderer Begriff für Auflösung, weil hier haben wir die Quellgröße als Einfluss
  + Können versuchen, die Quellgröße mit knife edge zu bestimmen, dann den Einfluss davon rausfalten.
* Laser energie durch photonenenergie bei einer bekannten Linie (vermutlich He alpha von Al) gibt konversionseffizienz. Das wirkt als sanity check statt Bremsstrahlung von gold zu nehmen. Philipp schickt ein Paper dafür.
* Verhältnis Lyman und He alpha
* Sanity check mit konversionseffizienz eher bei X-ray emission von Plasma
* Das mit knife edge bei Resolution
  + Bei einleitugn für resolution sagen, haben gesehen dass Quellgröße eine Rolle spielt, also zuerst quellgröße bestimmen
* Fokus der Arbeit
  + Auf Spektrometer, deshalb Plasma sachen eher kurz
  + Kann Ausblick geben über die Spektrometer und Backlighter
    - In Discussion section simply give the results and what we noticed
    - Discuss my opinion on the spectrometers
      * Philipp suggests unbent KAP double channel. Is suitable as bending seems to make much more problems than literature suggests.

**Need from Philipp:**

* ~~Conversion efficiency results interpretation~~
  + ~~Ask paul if Größenordnung is reasonable~~
* ~~Specs for KAP~~
* ~~Help with source size determination~~
  + ~~vertical line out of approx. linear edge in KAP Bild. Then fit err function to it 🡪 get sigma 🡪 get gaus of source, then change to micron~~
* ~~Look at FSSR relative reflectivity together~~
* Source size, Doppler broadening, and spectrometer resolution entfalten?
* ~~Help with making picture of experimental setup in Inventor~~
* ~~Still shorten mechanical design of spectrometers? At the moment it’s already rather short.~~
* ~~I think the efficiency argument doesn’t hold up. Same angle area covers smaller area on crystal. Higher collection efficiency of spherically curved crystal should be from collecting rays from different source points to same point on detector in spectral direction~~
  + ~~It could be that these effects largely balance themselves out in most cases. Higher intensity compared to flat crystal should come from imaging in vertical direction most of all.~~
  + ~~Arguably von hamos should have better intensity than FSSR, at the cost of worse resolution and smaller E-range, especially for a small source size~~
  + ~~SNR better for FSSR due to spectral focusing~~

**New questions:**

* Take a look at source size together. Surprisingly the phase plate didn’t seem to have much effect on it
* Help with FLYCHK for Doppler broadening determination
* PHELIX data again, was deleted previously for some reason
* Why is source broadening for single crystal only take into account two directions? Does the out of plane of chip direction really play a role?

**FSSR**

* Events 1 to 8 unusable. 9 has potential but KAP bad. 10 possible, but has same problem as 9 in that lower order peaks being suppressed. 12 to 14 have slit, so very difficult to extract anything meaningful. 15 not possible due to no clear common peak (problems with KAP background). 36 is way too weak.
* 37 possible, 41 is a candidate with good aligning. I think the main problem is higher order stuff, can try line at 1606.3
* For now just show Al shot (event 16)
* Only usable Al shot with FSSR is 16. Generally lower energy part of FSSR looks bad
  + CE from this shot 🡪 1 16 FSSR 1598.4 0.04452811034450615
    - This is for normal handling of FSSR image
    - for summing we get
      * Event Spec E of line [eV] CE [-]

0 16 FSSR 1598.2415511383454 0.0021321981260396293

1 16 KAP 1598.402 0.024423841808532194

* + Ratio can try from rare earth shots
    - Dy possible, Sm possible for high E,
    - R\_int ratio results for event 16, He alpha

Experimental R\_int ratio (FSSR/KAP): 0.05

Theoretical R\_int ratio (FSSR/KAP): 0.67

* for higher E line
* Experimental R\_int ratio (FSSR/KAP): 0.018

Theoretical R\_int ratio (FSSR/KAP): 0.67

* Maybe an issue with taking a constant background for one spectrometer, but not for other?
* Could fit the data and try to get ratio like that. The max of the peak looks promising, maybe integrating over the peak is playing a role, since the resolution is so different?

**DUCC**

* Resolution
  + Shots 23, 24, 31, 32 usable for edge (transmission). Check >32
    - 23 and 24 not usable for absorption
  + Only shot 19 usable for peak
  + Can try the absorption edge as well later, may give better agreement between different backlighters

**Emission Spectra**

* Just show the ones of DUCC first, and maybe of the SUCC later
* Sm
  + Use the multiple energy one, since shows change dependent on energy and form of spectra
  + 29 and 31, since 30 not much different than 31
* Gd
  + Use 24 and 35 bc shows the most obvious changes
* Dy
  + Use 20 and 33. Oddly, 21 is higher than 20
* Tb
  + Just 28 since 22 seems to be absent
* Au
  + Only 25 exists
* Al
  + Use 19 and show both ADP and KAP, since need Ly-alpha line
  + Spectrum cut off below 1500eV to make prettier
* Teflon
  + Use 64 and 72 of KAP, as no good ones available for DUCC

**Absorption**

* DUCC
  + Best to use event 31 and 32, since no preheating
  + Worked like a charm
* FSSR
  + Use event 74 and 75 for the TEFLON. Try 38 and 42, since cold sample
  + 74 not viable, probably bc of many crystal features
  + 41 is calibration of 42. Does not give a pretty spectrum, but it has many problems due to different spectrometers and many crystal features
* Demonstrative example:
  + Use event 72 with 59 calibration. Shows the oscillations excellenly.

**Resolution**

* DUCC
  + For peak use 19, one gauss one voigt
    - Gauss: Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|

1 19 ADP 1.7585 0.0007 0.454 0.0339 None None 0.474 0.1 1.6315 0.0306

* + - Voigt: Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|

1 19 ADP 1.1897 0.0179 0.454 0.0339 0.8671 0.0329 0.474 0.1 0.9922 0.0546

* + For edge use 31 as is Sm and clean for transmission and absorption. Uses constant background to avoid 0 values for transmission. Absorp uses normal background subtraction
    - Transmission: Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|
    - Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|

1 31 ADP 1.2725 0.0038 0.6362 0.0046 None None None None 1.1021 0.0051

* + - Absorp: Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|

1 31 ADP 1.0009 0.0062 0.5694 0.0087 None None None None 0.8232 0.0096

* + Also try edge of Gd 32
    - Transmission: Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|
    - 1 32 ADP 0.8795 0.0073 0.5216 0.0053 None None None None 0.7082 0.0099
    - Absorp: Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|
    - 1 32 ADP 1.0244 0.0085 0.5125 0.0034 None None None None 0.887 0.01
  + Results indicate that spectrum features and other broadening effects are impacting the resolution significantly, but an upper limit of 1 eV can be estimated despite this.
* FSSR
  + Edge use 42 and maybe 74, though 74 is difficult due to weak signal to edge ratio, as this can use the entire length of image (others have pokalon on bottom half, this should be used to show higher order stuff later). Transmission only (not a double channel spectro)
    - Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|

1 74 FSSR 1.7719 0.1053 None None None None None None 1.7719 0.1053

2 42 FSSR 0.7046 0.0268 None None None None None None 0.7046 0.0268

* + Peak use event 16 and 2 (16 is unfocused, 2 is focused at very low energy). 11 is too weak due to heavy polycarbonate filters. Used 0.2 relative error due to poor crystal quality
    - Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|

1 2 FSSR 1.8511 0.0057 None None None None 0.474 0.1 1.7894 0.0271

2 16 FSSR 1.8804 0.0255 None None None None 0.474 0.1 1.8197 0.0371

* KAP
  + Peak: 1 and 2 no background data. 12 bad bc oversaturation and 26 very noisy. 58 is extremely dark. 11, 16, 18, 19, and 26 usable. throw 11 bc fit is not great and source size hard to determine. Throw 26 bc oversaturation of pixels and unknown broadening (unsure of plasma T)
    - Event| Spec| Gauss [eV]| d\_gauss| sigma\_source [eV]| d\_source| Lorentz [eV]| d\_lorentz| Doppler [eV]| d\_doppler| sigma\_spec [eV]| d\_spec|

1 16 KAP 3.0196 0.0161 1.3582 0.0990 None None 0.474 0.2 2.6549 0.0646

2 18 KAP 3.3821 0.0326 1.2174 0.1609 None None 0.474 0.2 3.1196 0.0782

3 19 KAP 3.2522 0.0275 1.7913 0.2242 None None 0.474 0.2 2.6727 0.1580

* + Transmission not possible, no valid shots

**Ratio of R\_int**

* DUCC
  + Event 19 (transmission channel)
    - 0.884+-0.044 (ADP/KAP), lit 0.5 (ADP/KAP)
    - Graph as well showing the limits of 1585 to 1610
  + Event 19 (source channel)
    - 0.773+-0.038
    - same limits
    - to note is that is noticeably different. Most likely background effects, see graph
  + Is not bad for other events (for example event 23) but has the problem of adding more unknowns and having impact of different filters
* FSSR
  + Event 16. Includes 20 percent error of counts. limit is 1583 to 1610
    - Experimental R\_int ratio (FSSR/KAP): 0.068+-0.016
    - Theoretical R\_int ratio (FSSR/KAP): 0.67
    - R\_int from FSSR (event 16) using theoretical efficiency: 2.755+-0.633 vs. R\_lit = 53.6

**Conversion Efficiency**

* DUCC
  + event 19: 1593 to 1607
  + Event Spec E of line [eV] CE [-] d\_CE

0 19 ADP 1598.24 0.044719 0.022377

1 19 ADP 1598.404 0.037482 0.018754

* FSSR
  + use event 16 with data from Artem: 1592 to 1605
  + CE from FSSR (event 16) using theoretical efficiency: 0.04346+-0.00319
  + Normal

Event Spec E of line [eV] CE [-] d\_CE

0 16 FSSR 1598.242 0.00222 0.001122

* SUCC
  + Event 16 and 19: 1592 to 1609
  + Event Spec E of line [eV] CE [-] d\_CE

0 19 KAP 1598.401 0.027375 0.01375

1 16 KAP 1598.402 0.025576 0.012854