Post mortem analysis of IEX monochromator
IEX overview

Energy range: 250 - 2500 eV
Variable Line Spacing Plane Grating Monochromator

ARPES focus
M4A (vertical focusing)
M3A (horizontal focusing)
M4R (vertical focusing)
Exit Slits
M3R (horizontal focusing/deflecting)
Clean-up slits
VLS-PGM (horizontal deflecting/energy filtering)
M1
M0
EM-VPU
Variable Line Spacing Plane Grating Monochromator

VLS law - line density $k$:

$$k(w) = k_0(1 + 2b_2w + 3b_3w^2 + \cdots)$$

$\Rightarrow$ monochromatic beam focused at fixed exit slit

$$\lambda = d(\sin \alpha - \sin \beta)$$
Variable Line Spacing Plane Grating Monochromator

VLS law - line density $k$:

$$k(w) = k_0(1 + 2b_2w + 3b_3w^2 + \cdots)$$

xFFFF monochromatic beam focused at fixed exit slit

$$\lambda = d(sin\alpha - sin\beta)$$
Beamline calibration

Fermi Edge

Au Exit slits

Electron Analyzer resolution & absolute energy of the beamline

\[ |E_b| = h\nu - \phi - E_{kin} \]
Slits calibration

- Slit = (2 x 4.5)

- Electron Analyzer

- Clean up slits

- Exit slits
Energy Resolution?

![Graph showing size vs energy with horizontal and vertical lines.

Graph on the right showing Au-4f transition with 0.5 eV width.

Diagram below showing electron paths through Au with the Electron Analyzer.
Energy Resolution?

\[ \lambda = d (\sin \alpha - \sin \beta) \]

Diagram showing the relationship between exit slits, clean-up slits, and the energy resolution \( \lambda \). The formula \( \lambda = d (\sin \alpha - \sin \beta) \) is shown, where \( d \) is the distance between the slits, and \( \alpha \) and \( \beta \) are the angles of incidence.

Heat bump, slope error is mentioned in the context of the energy resolution calculations.

Graph showing Au-4f transitions with a peak at 0.5 eV and a width of 4.5 eV.
Troubleshooting

Use clean-up slits as movable aperture to map the grating
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Troubleshooting

\[ k(w) = k_0 (1 + 2b_2 w + 3b_3 w^2 + \cdots) \]

\( \Rightarrow \) VLS law?
Troubleshooting

axios Substrate distortion?

Fixed Exit Slits

Clean-up Slits
Troubleshooting

⇒ Substrate distortion?

Fixed Exit Slits
Troubleshooting

.isUserSubstrateDistortion?
May Shutdown 2016

- Mirror
- Dummies
- MEG
- HEG
Metrology measurements

➡️ Wyko 6000 Interferometer

Unruled Substrate:
- Dashed line: Original Holder
- Solid line: Free Standing

![Graph showing height deformation in nm for different conditions.](image)
Grating holder modification

Unruled Substrate:
- Original Holder
- Free Standing

VLS grating:
- Original Holder
- Modified Holder

Graph showing height deformation vs. grating length for both Unruled Substrate and VLS grating with Original Holder and Modified Holder.
Like the phoenix our mono will rise...

\[ \frac{\Delta E}{E} = 200 \]

\[ \frac{\Delta E}{E} = 2000 - 5000 \]