Effective Area of the HRMA near the Ir M-V edge at 2.1 keV

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Effects of Pileup

Mk 421 LETGS (10/02) with new edges

- $N_h$: $2.115061 \times 10^{20}$
- $A_1$: 2.0493584
- $\Gamma_1$: 1.9017482
- $A_2$: 0.53020634
- $\Gamma_2$: 1.8563525

- $\tau_{C-K}$: 2.0767686
- $\tau_{N-K}$: -0.016886855
- $\tau_{O-K}$: 0.033560230
- $\tau_{F-K}$: 0.0073570022

Energy (keV) vs. Flux (ph/cm$^2$/s/keV)
Pileup in Grating Spectra

- Pileup appears at Ir-M edge due to peak in effective area
- Rate (Rf) \( \sim 0.01 \) count/frame/column incur \( \sim 8\% \) loss
  - highly nonlinear effect — Rf = 0.1 gives x2.1 correction
- For Mk 421, Nf = 1.3e5, Rf = 0.05; jump = 19%
HETGS and LETGS Data

- Both in MEG and HEG
- Energy is 2.08 keV, same as Ir M-V edge
- Effect ~ 5-10%
Thin Overlayer on HRMA Changes Edge

- HRMA modeling with 10-15 Å of CH₂ enhances area above Ir M-V edge
- Enhancement reduced for shells 4 & 6 — reduced effect in HEG observed
- Thickness of layer is consistent with some pre-launch expectations
Summary

- Grating spectra indicate a $\sim 10\%$ correction is needed at the Ir-M edge
- HETGS and LETGS data agree on
  - location of the edge: 2.08 keV
  - the magnitude and shape of a deviation

- Current model is a 15-20 Å contamination layer (not related to ACIS contamination)
  - Layer gives the right magnitude at the Ir-M edge
  - Layer thickness is “reasonable”
  - Model predicts edge depth depends on shell, as observed by MEG and HEG
Planned Tasks

- Determine an ad hoc correction to HRMA model
- Combine more HETGS observations to get a better jump estimate, then fit for layer thickness
- Reevaluate contribution by pileup: estimated to be <3%
- Search for time dependence in HETGS data