

Detectors and Background WG

15th IACHEC, April 2023

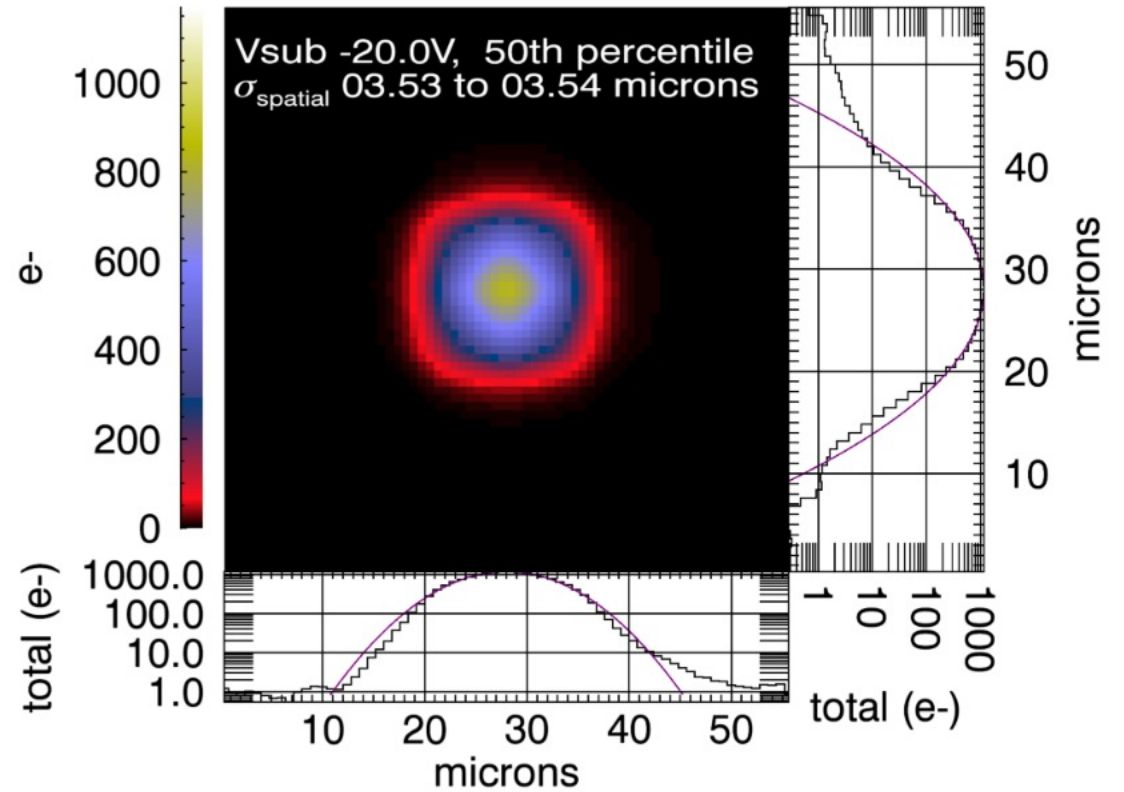
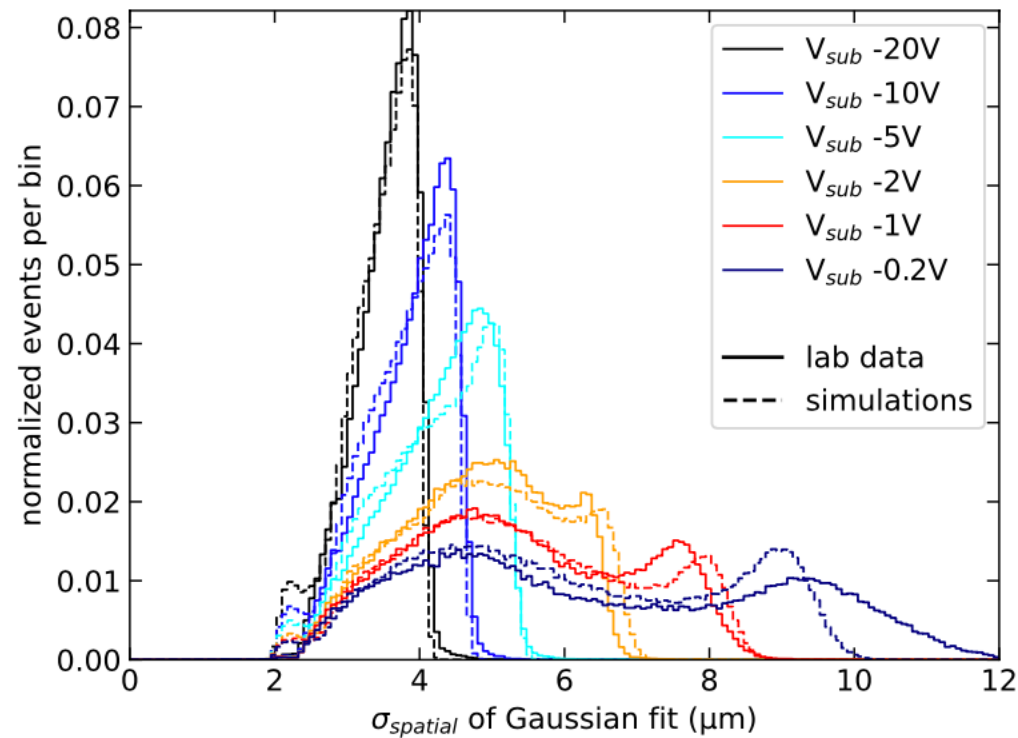
Four talks and short discussion

Plus many related talks in plenary sessions

Bev LaMarr – Depletion studies of high thickness to pixel size ratio silicon devices

- Results from two JATIS papers, LaMarr+ 2022, Miller+ 2022, both lab results and simulations
- Future high spatial resolution missions, like Lynx, require “tall small”, high aspect ratio pixels, charge sharing between pixels very important
- Measure charge distribution as a function of depth and field strength/device depletion

Bev LaMarr – Depletion studies of high thickness to pixel size ratio silicon devices

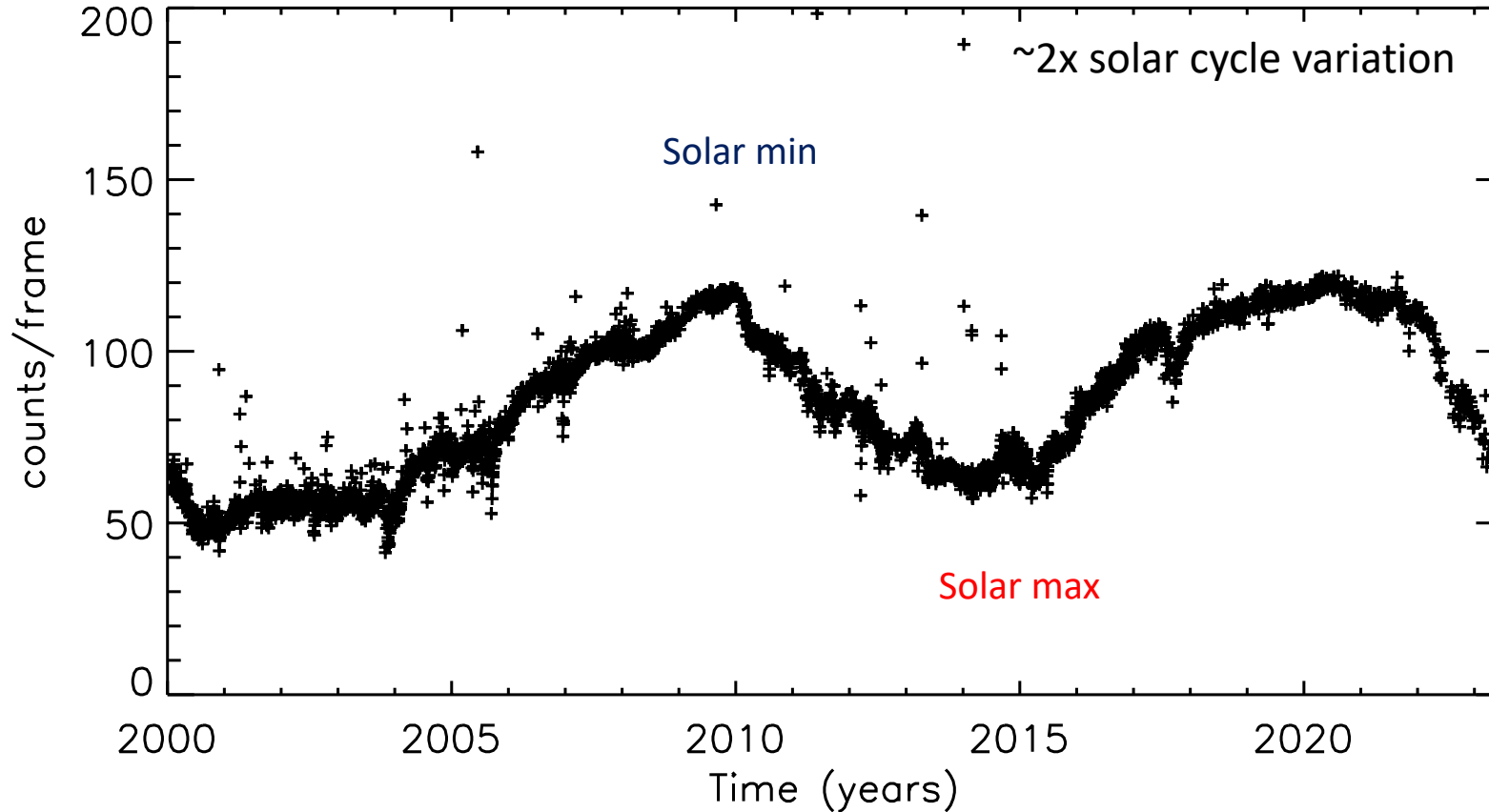


Ivan Valtchanov - XMM EPIC-pn: spatial CTI correction using Cu K α and Mn K α

- Spatial residuals derived using the fluorescent Cu K α line at 8 keV
- Spatial residuals derived using the cal source Mn K α line at 6 keV
 - Both incorporated in **EPN_SPATIALCTI_0001.CCF**
 - (Both with **caveats**)
- XMM-SAS task epspatialcti modified to use the new CCF with option **SD20mode=yes** (set as default)
 - One can choose either to apply the Cu K α or Mn K α with **element=CU** or **element=MN**
- Inconclusive analysis of the energy scale compression in 6 to 9 keV
 - ➔ not implemented.
- Release note:
<https://xmmweb.esac.esa.int/docs/documents/CAL-SRN-0391-1-3.pdf>

ACIS Background Variability

ACIS High Energy Reject Rate



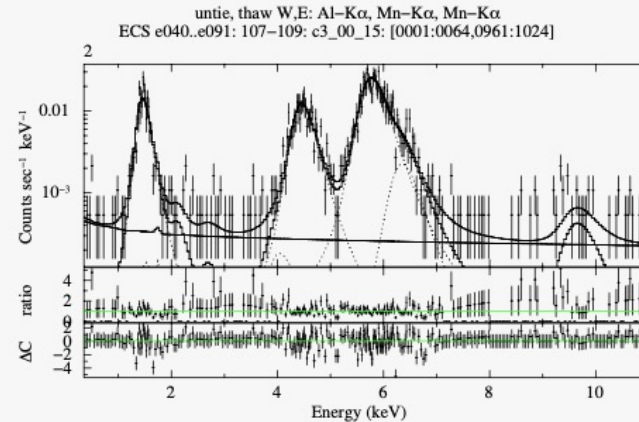
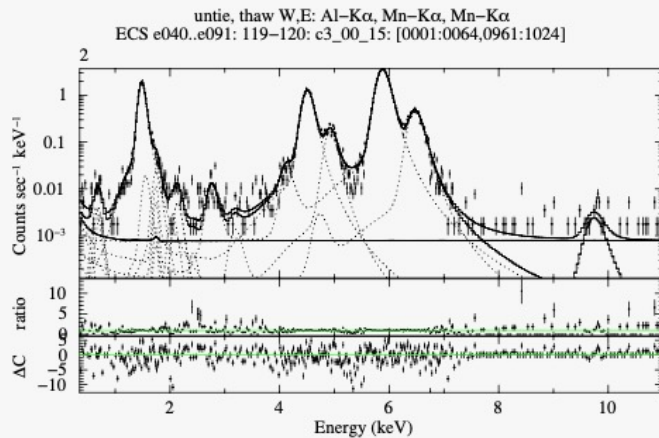
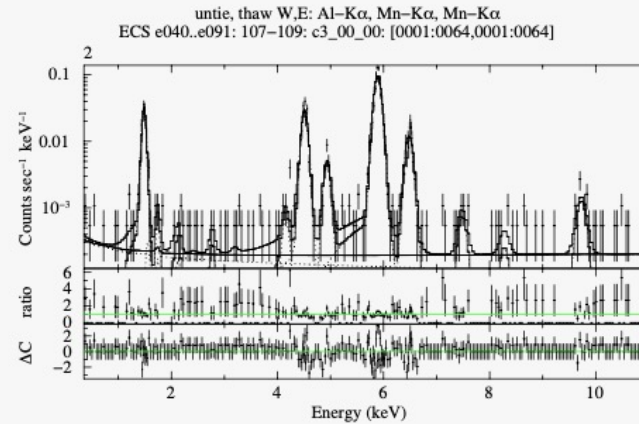
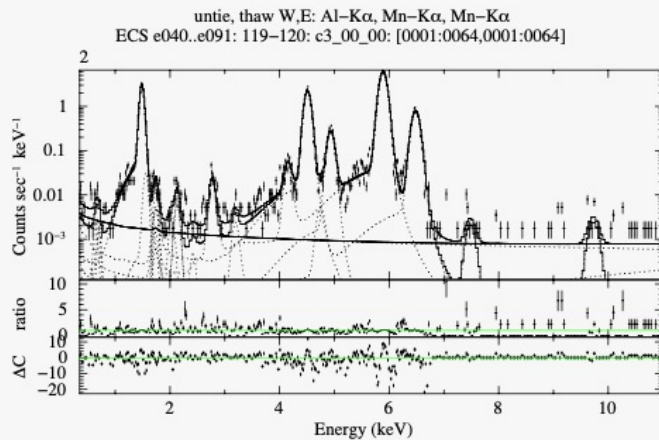
- Variable on many timescales
- Well correlated with AMS GCR protons
- Future plans
 - Include all ACIS data
 - More timescales
- Unlike LEO, bkg cannot be accurately predicted

Terry Gaetz – T-dependent ACIS response

- Calibrating RMF as a function of energy, temperature, and position

WIP

Becoming more Important as
intra-observation temperature
variation increases



Spectral features in the Si-K edge region

- For Suzaku, gain calibration needed to add discontinuity at the edge

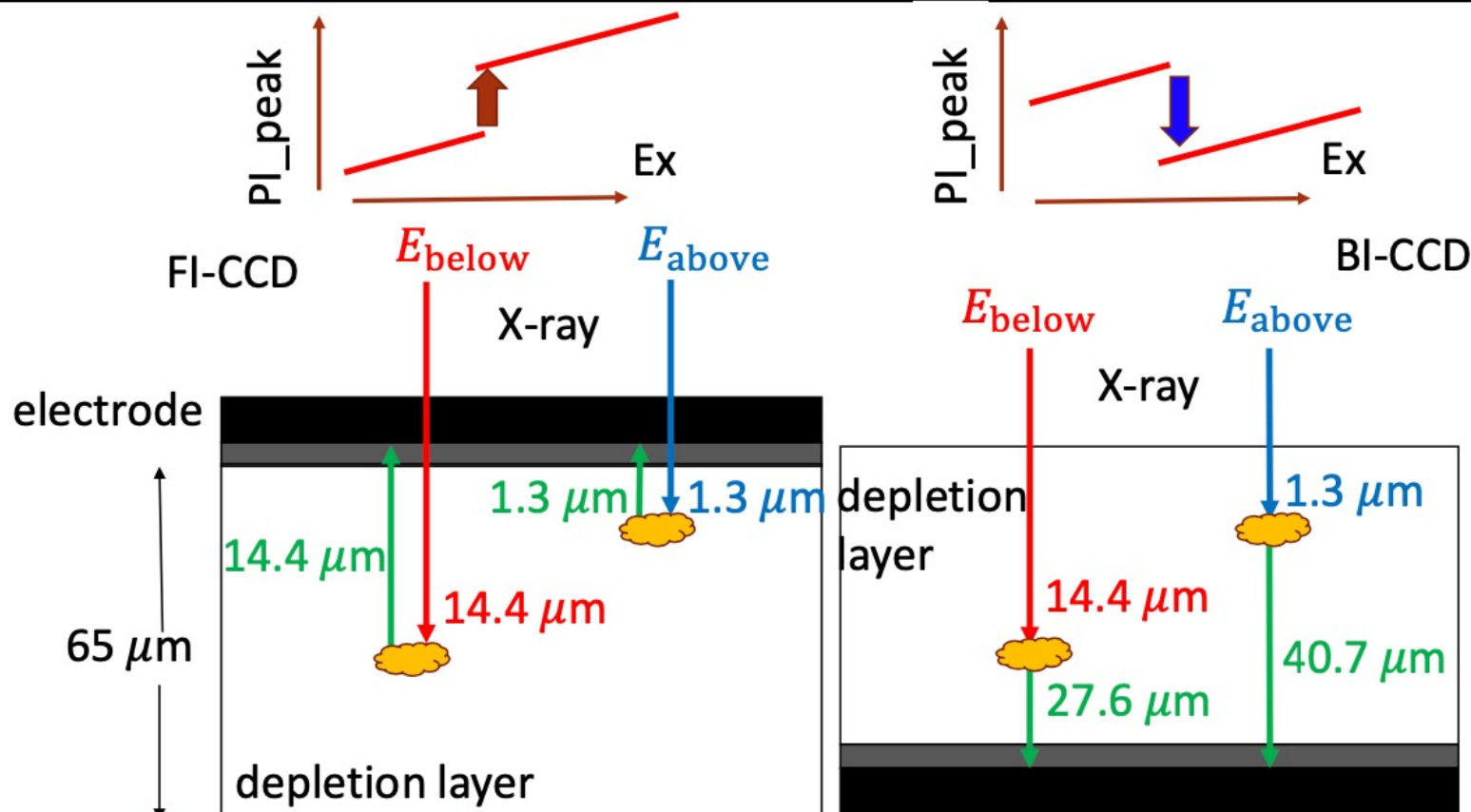


Possible Origin of Jumps

✧ Si-K edge : 1838.9 eV

$E_{\text{below}} : 1.838.5 \text{ eV}$

$E_{\text{above}} : 1.839.1 \text{ eV}$

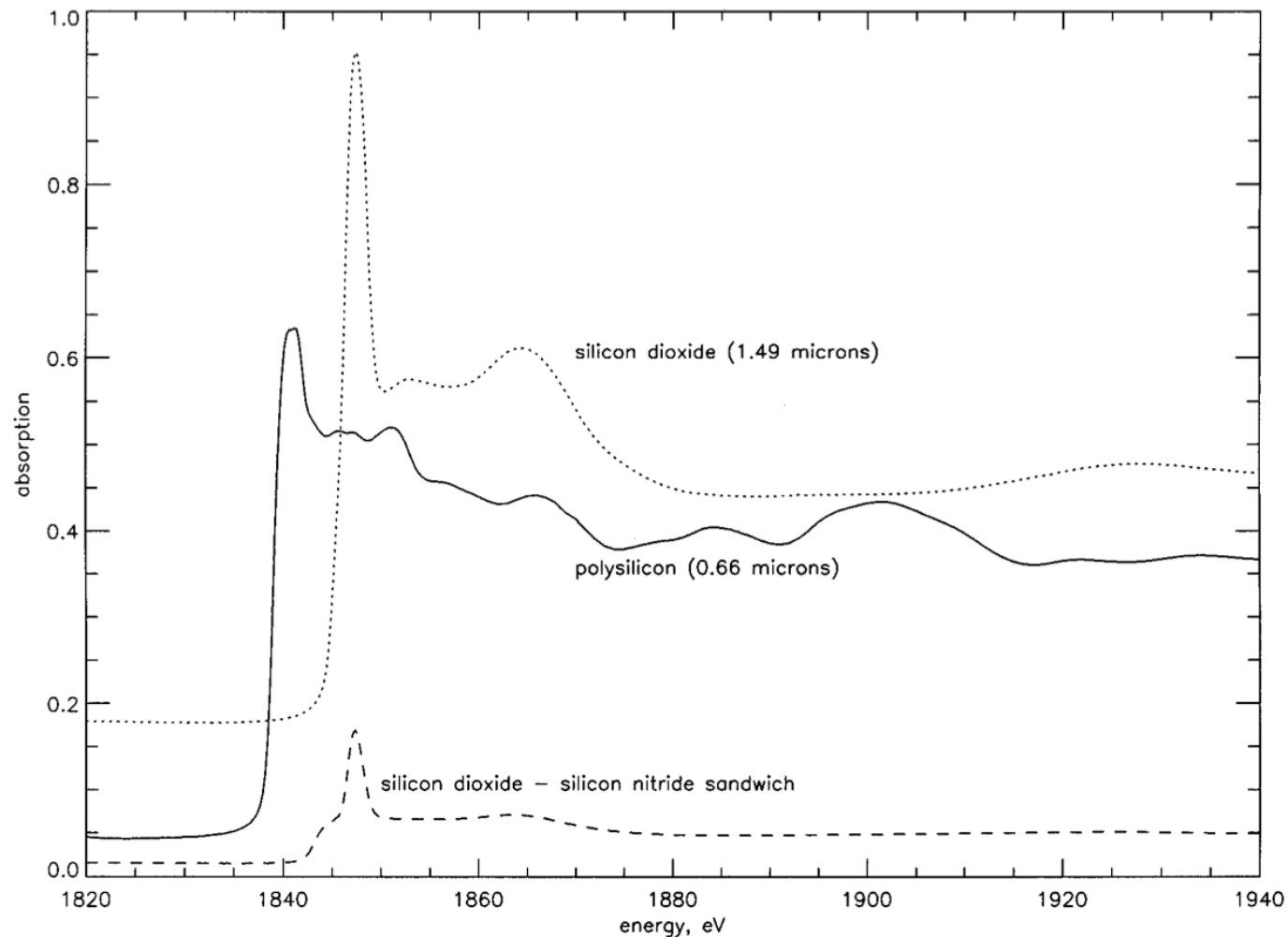


The longer the path length is, the larger the charge loss is. Some amount of charges is lost in the depletion layer?

Hayashida, IACHEC 2019
Okazaki+ 2018, Proc SPIE 10709

Spectral features in the Si-K edge region

- For a thin detector, QE curve may need XAFS at the Si-K edge



Example measurements
From ACIS ground cal
(Prigozhin+ 1998)

Thank you!

Thank you to speakers and participants,
see you next year!