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Exposure Maps for AXAF

D. Huenemoerder, 1 October 1997

The exposure map team: D. Huenemoerder (lead scientist); J. Davis (lead programmer, science input); N. Adams, J. Flanagan (programmers); A. Dobrzycki (science input, background maps).

Imaging-mode exposure map: is the time-averaged *Response Matrix* vs. sky position.

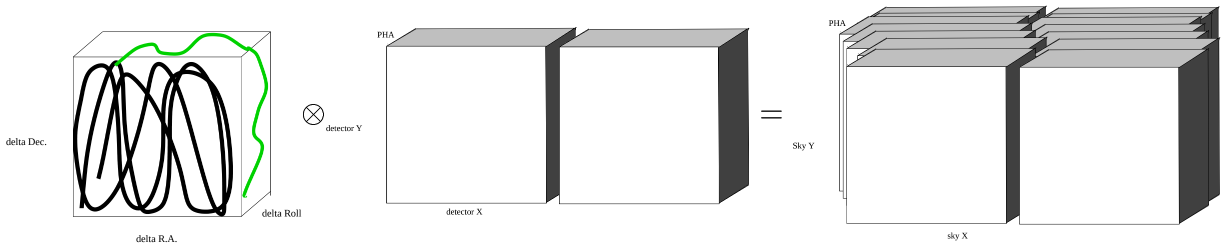
Grating-mode exposure map: is the time-averaged *effective area* vs. wavelength.

Assumptions:

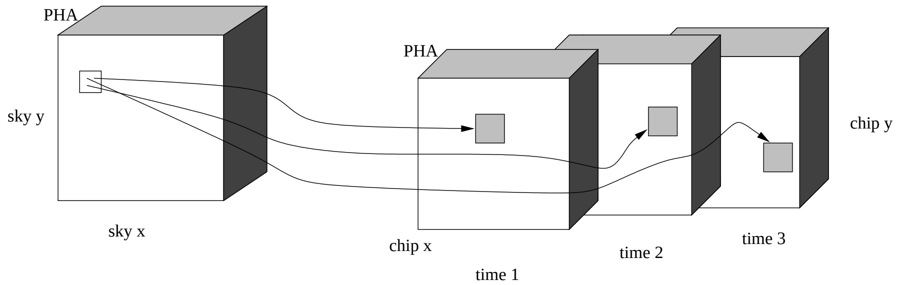
Point source
Delta-function spatial PSF

Two possible methods:

1. Forward convolution: Convolve detector maps by the *Aspect Histogram*



2. Back-projection, time-integrate: integrate over time, projecting sky bins onto the detector.



"Third method:" time-only map, for projecting internal backgrounds onto sky.

Trade-offs:

1. Forward method:
   - + Integrate over time once (for Aspect Histogram)
   - − Image processing issues: sampling, aliasing
   - − Light-curve support unwieldy
2. Reverse method:
   - + Fewer image-processing issues
   - + Light-curves easy
   - − Need to integrate over time for every sky-bin.

AXAF Issues:

1. Many pixels!
   Solution is to use multi-resolution maps:
   low, for entire field (QE is spatially averaged)
   high, for edges, gaps, bad pixels
2. Dither, combined with hetergenous responses (FI, BI)
3. Aspect solution uncertainties (blur aspect histogram)
4. Grating modes: source and order dependent exposure map
5. ACIS modes: continuous clocking; windows
6. Drake Flat
7. PSF issues:
   position dependence (slew)
   energy dependence
   extended sources
   — All may require explicit treatment in the response (i.e., and exposure map isn't good enough).