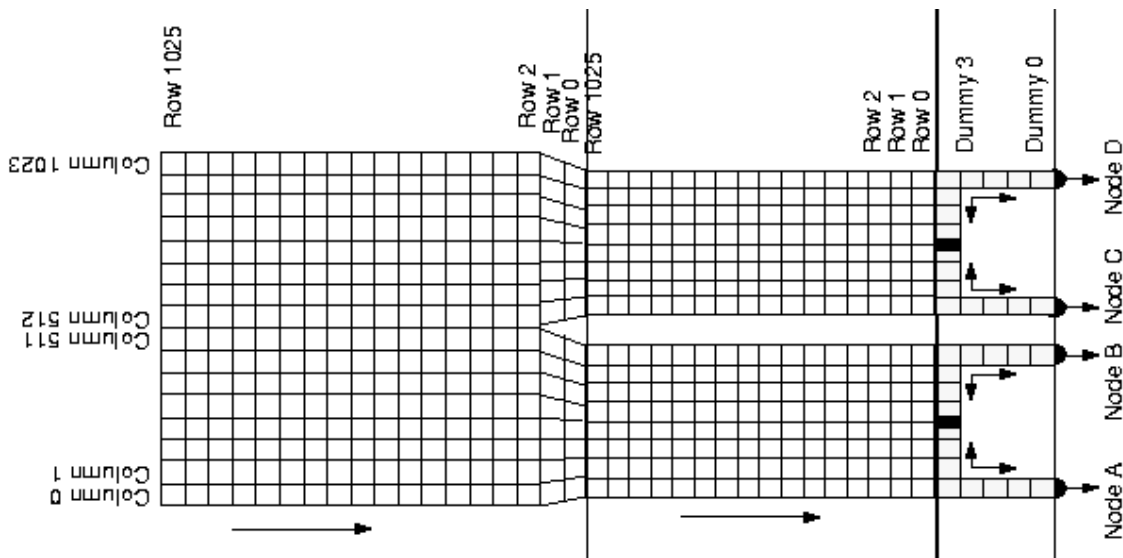
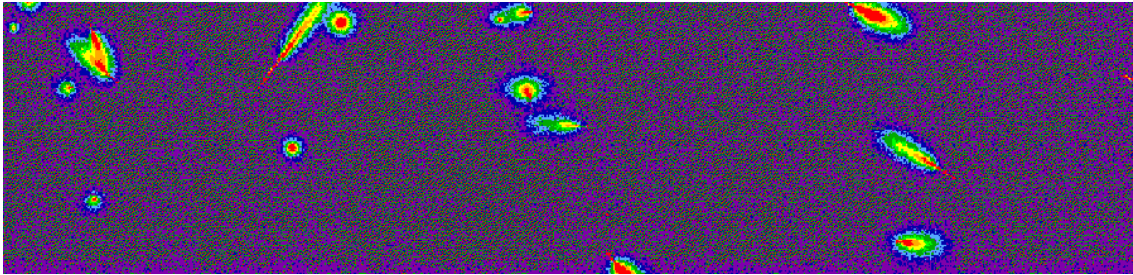


ACIS *FI* Cosmic Ray Induced Dead Area



Yousaf Butt & Brad Spitzbart, DOSS

Calibration Workshop, October

2003

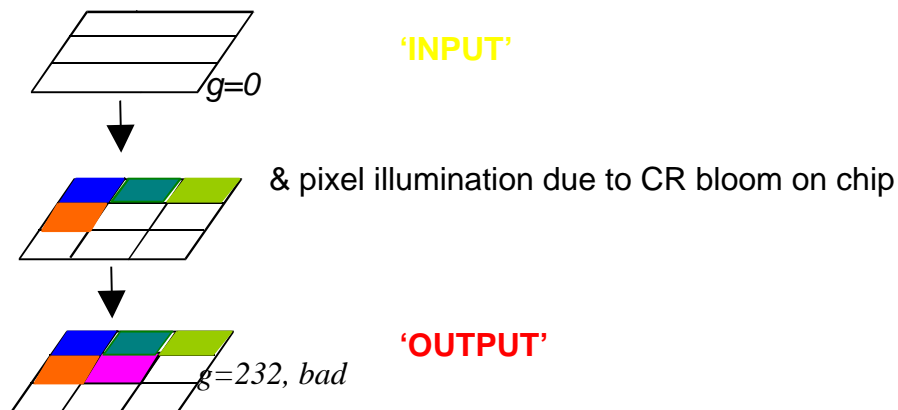
OUTLINE

Valid celestial X-ray events landing in **or on borders** of CR 'blooms' are either undetected or assigned bad (eg. $g=255$) and rejected on board or on ground.

Effect much more (factor ~ 10) important for FIs than Bis

Conventions: 'Instrumental' dead-area vs. 'effective grade-dependent' dead-area

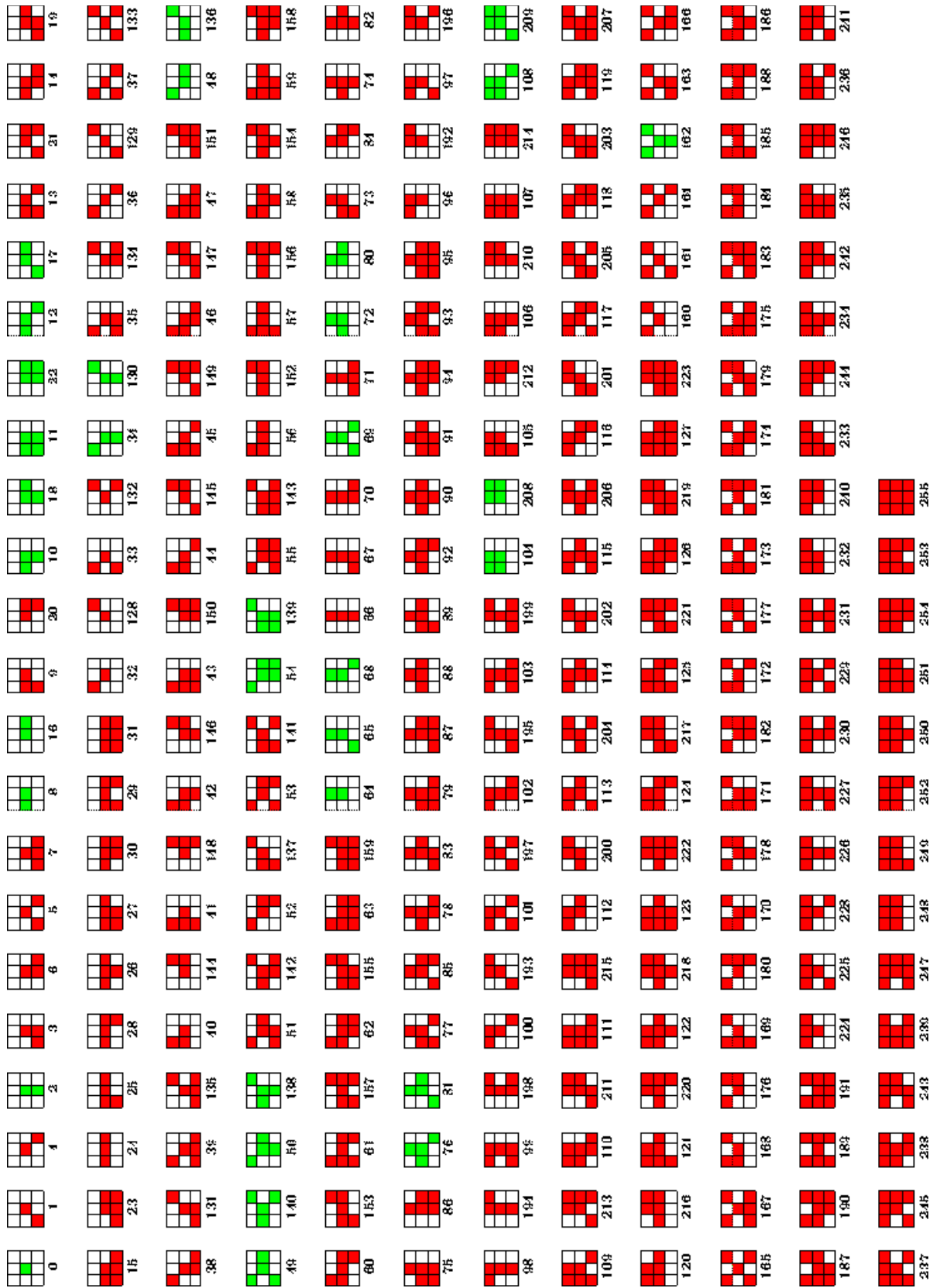
Effect depends on the **flight grade** of incoming event



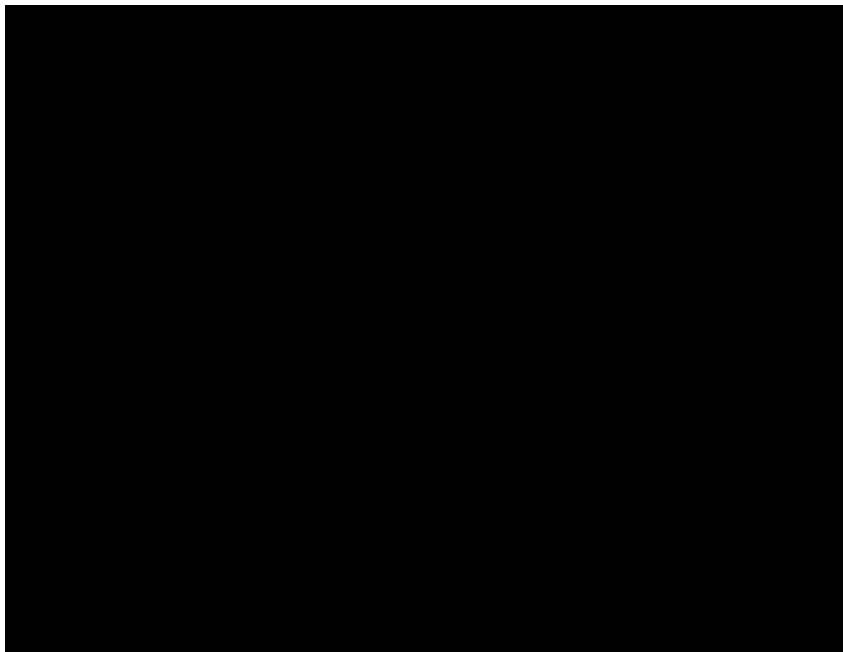
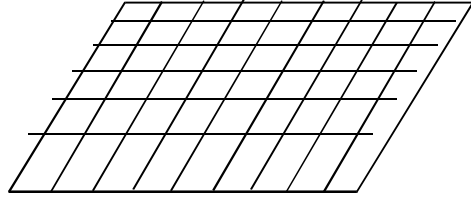
Effect also depends on exact PHAs **even below split thres.** in the nominally **inactive border** pixels as these low PHAs can conspire with charge present on the chip – **even if that too is below split thres.** – to make a bad output grade

Effect backgd CR rate dependent

Effect frame-time dependent



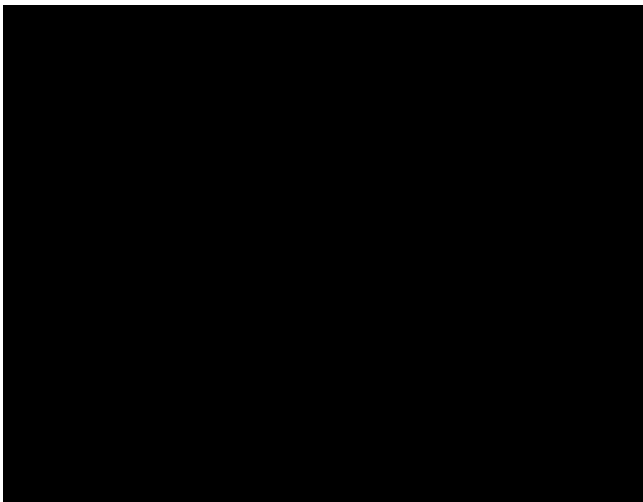
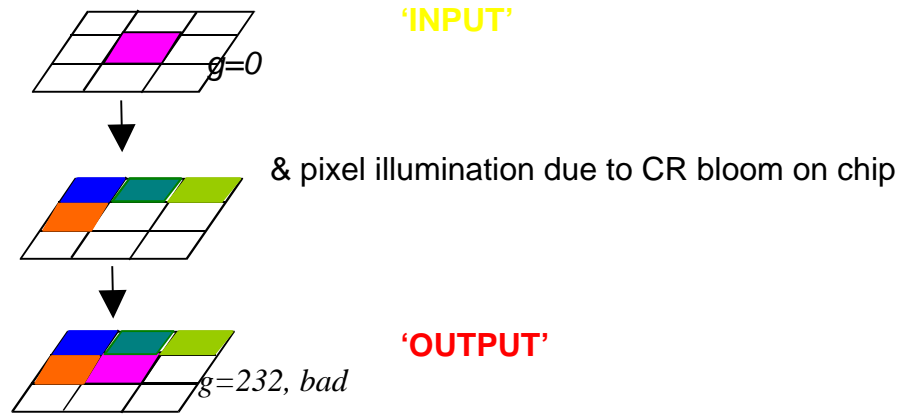
INSTRUMENTAL DEAD-AREA



PHA thresh.	cnt. thresh.	mean dead area	σ	Notes
13 ADU	3-in-a-row	2.45 %	0.15 %	
13 ADU	3-in-a-row	2.49 %	0.14 %	non-squeegy only
20 ADU	3-in-a-row	1.87 %	0.12 %	
20 ADU	3-in-a-row	1.91 %	0.11 %	non-squeegy only
13 ADU	3-in-a-col	2.51 %	0.15 %	counting col direction

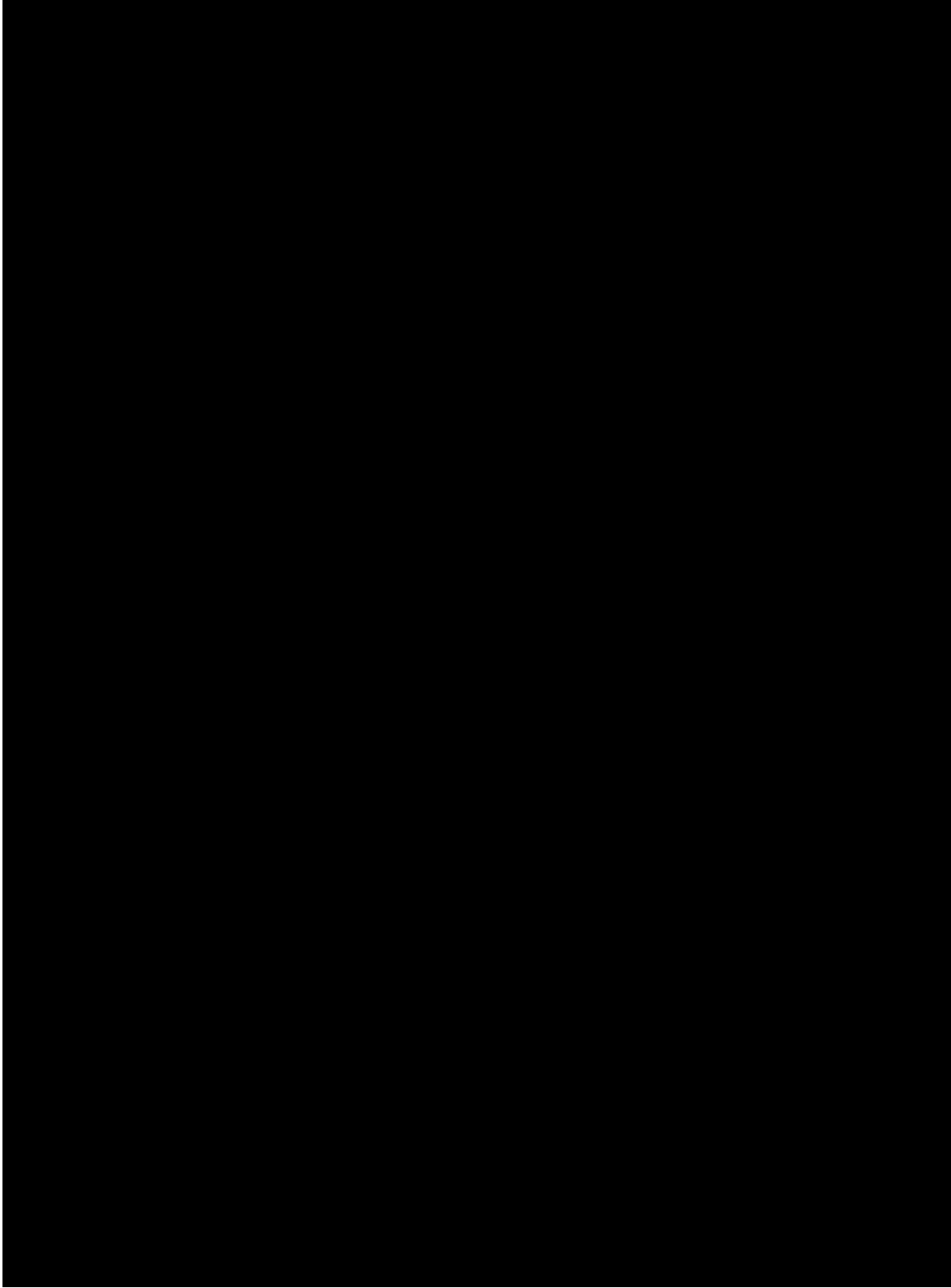
20 ADU	<i>3-in-a-col</i>	1.92 %	0.12 %	counting col direction
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GRADE-DEPENDENT EFFECTIVE DEAD-AREA



Grade branching ratios from CTI evt mode data - grades 24, 66, 107, 214, 255 are rejected on board

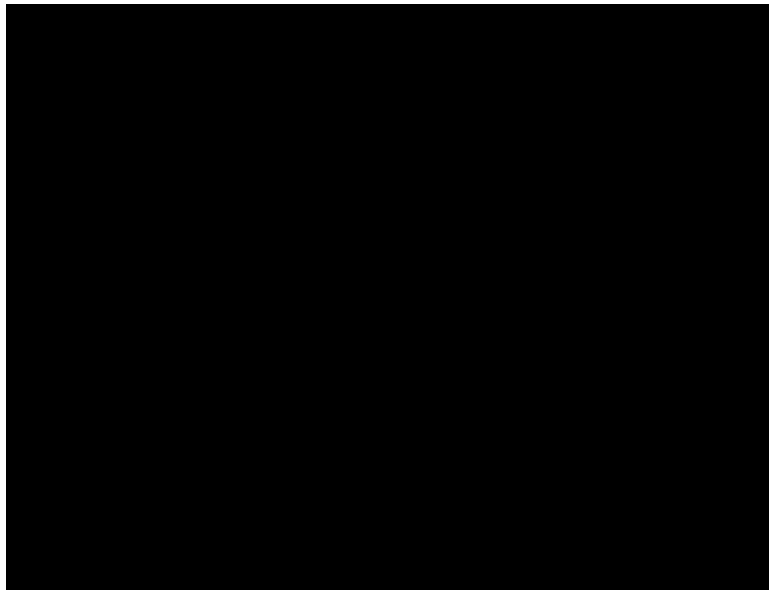
The flight grade distribution of 254,140 events collected from CTI runs Jan 2000-Jan 2001 for the 16 column cuckoo region of I3. ~48% of the events are grade 0. Other popular good grades are 2, 8, 16, 22, 64, 104, 208.



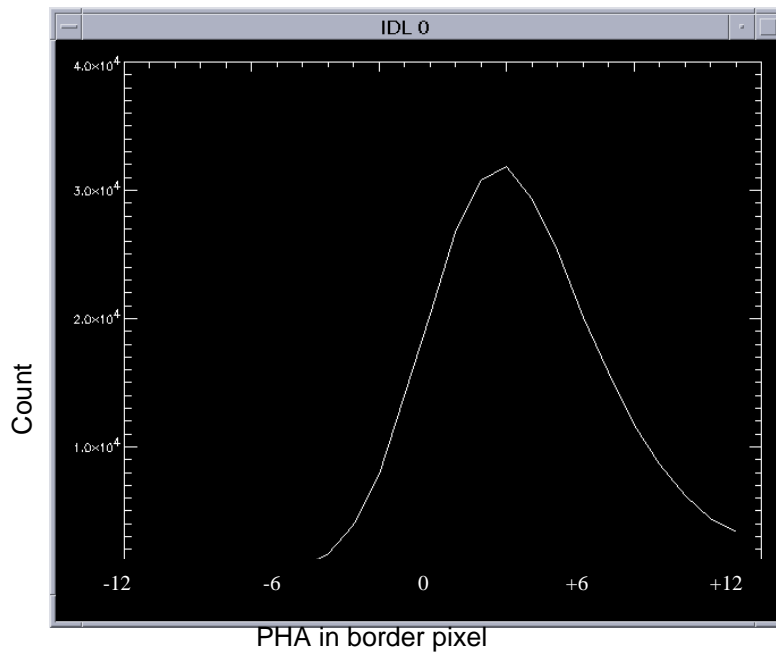
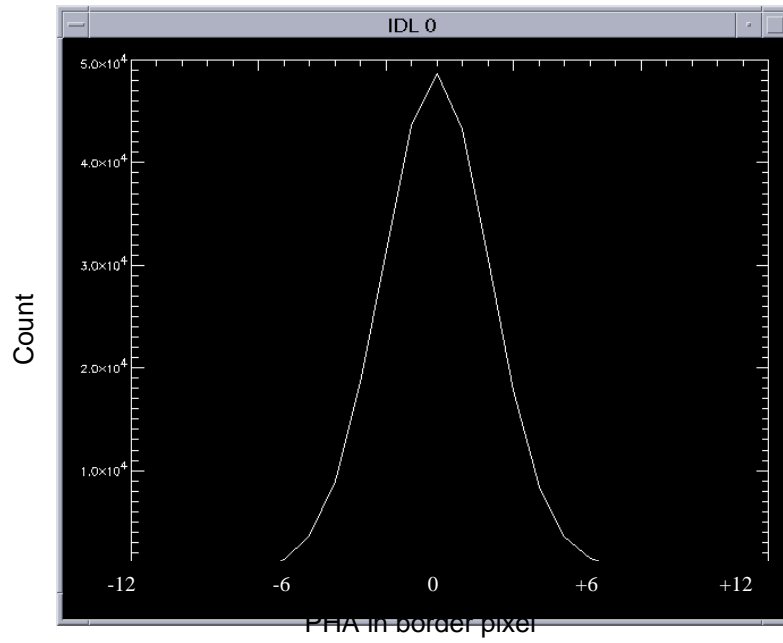
Summary Table

Flight Grade	Inactive Border PHAs	mean dead area	σ	Grade Branching Ratio
0	0	3.68%	0.21%	48%
0	-6	5.73%	0.36%	-48%
0	-12	68%	2.9%	-48%
2	-6	5.53%	0.35%	-8%
8	0	3.57%	0.21%	5%
8	-6	5.54%	0.35%	-5%
16	-6	5.54%	0.35%	-5%
22	-6	5.83%	0.37%	-2%
64	6	5.53%	0.35%	10%
104	-6	5.82%	0.37%	-2%
208	-6	5.83%	0.37%	-2%

The dead area as computed for the various flight grades



Distribution of border pixel PHAs from
80ksec exp of Abell2163 (obs1653) **EVT MODE DATA**



Dead Area Variation w/ Backgd CR Rate

9%	8%	7%
8	8	6
6	8	6



Implementation Issues

-assumed flt grade distribution or derived per obsid?

-how different are point-like vs. diffuse srcs? Pile-up?

-border pixel distributions: derived or assumed?

-more raw mode/cuckoo runs?