ACIS FI Cosmic Ray Induced Dead Area





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OUTLINE

Vaild 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

DATASET



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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	3-in-a-col	1.92 %	0.12	counting col direction
			%	

GRADE-DEPENDENT EFFECTIVE DEAD-AREA

& pixel illumination due to CR bloom on chip

'OUTPUT'

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	Inactive	mean dead	σ	Grade Branching
Grade	Border PHAs	area		Ratio
0	0	3.68%	0.21%	48%
0	— 6	5.73%	0.36%	48%
θ	— 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**

Implementation Issues

-assumed flt grade distribution or derivied per obsid?

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

-border pixel distributions: derived or assumed?

-more raw mode/cuckoo runs?