MIT
Center for Space Research — Chandra X-Ray Center

MEMORANDUM
March 1, 2004

To: Arnold Rots, Archive Lead
From: Bish K. Ishibashi, SDS

Subject: Introducing New Keywords for Non-Pixel-Randomized Event files
Revision: 0.1
URL:
File: /nfs/cxc/h2/bish/CXC SDS/RANDOM/memo_random_0.2.tex

1 Pixel Randomization

1.1 Description

Chandra's bore-sight shifts in Lissajous pattern by default. Through aspect processing, each event is mapped into a proper place and an aspect-corrected image is reconstructed. It is, however, noted earlier that anomalous aliasing / artifacts remain in the aspect reconstructed image. In order to minimize the effect of potentially harmful artifacts, uniform pixel randomization of ± 0.5 pix is applied onto CHIP X and Y prior to calculating SKY X and Y values. A similar spatial pixel randomization is applied in TG coordinate when processed through CIAO tg_resolve_events. In the same sense, another randomization is being added onto ACIS energy (PHA) value. This is to mitigate PI spectral aliasing (PHA ± 0.5 adu).

In Repro *III*, decisions have been made to alter some default options for randomization on SKY X/Y and TG R/D, while keeping the PI randomization as it is. This document describes how we propose to implement additional keywords into Level 1 Event products and higher.

1.2 Data Randomization

Table 1 shows the current schema for data randomization and proposed changes.

Table 1. Data Randomization

Quantity	Present Default	Proposed Default	Comment
SKY X/Y (ACIS)	± 0.5 pix	± 0.5 pix	Need new development of SER scheme.
SKY X/Y (HRC)	± 0.5 pix	0.0 pix	Randomization adds no merit.
TG R/D (ACIS & HRC)	± 0.5 pix	0.0 pix	No viable merit in randomization.
PI energy (ACIS)	± 0.5 adu	± 0.5 adu	Mitigates PI spectral aliasing

Table 2. New Keywords for Randomization

Keyword	Type	Range	Description
XY_RAND	Float	[0.0, 0.5]	Sky X/Y randomization
TG_RAND	Float	[0.0, 0.5]	Grating Coordinate randomization
PI_RAND	Float	[0.0, 0.5]	This may not be necessary now

Table 3. Affected Tools

Toolname	Keywords	Description
acis_process_events	XY_RAND, PI_RAND	controlled via rand_pix_size and rand_pha
tg_resolve_events	TG_RAND	controlled via rand_pix_size
mkgrmf	TG_RAND	query keyword to locate proper CALDB/LSFPARM

1.3 Required Additional Header Keywords

To query through CALDB for either randomized or non-randomized calibration products, we require additional header keywords to be defined and included into appropriate CALDB products (e.g., LSFPARM and gRMF) and processed event files at Level 1 (e.g., for SKY X/Y) or higher. To accommodate this enhancement, we propose to introduce the following three new keywords (Table 2).

2 Affected CIAO Tools

See Table 3.