CalibrationStatus/SystematicErrors

Title: BAT Spectral Systematic Errors

Revision Date:	2006-05-29
Version:	1
Document:	SWIFT-BAT-CALDB-SYSERR-v1

1. Summary

This document describes systematic errors in spectral fitting.

2. Component Files

File Name	Valid Date	Release Date	Version	Description
swbsyserr20030101v002.fits	2003-01-01	2005-07-14	2	Systematic error vector

3. Scope of Document

This document relates to systematic error vectors that should be applied to spectra before fitting.

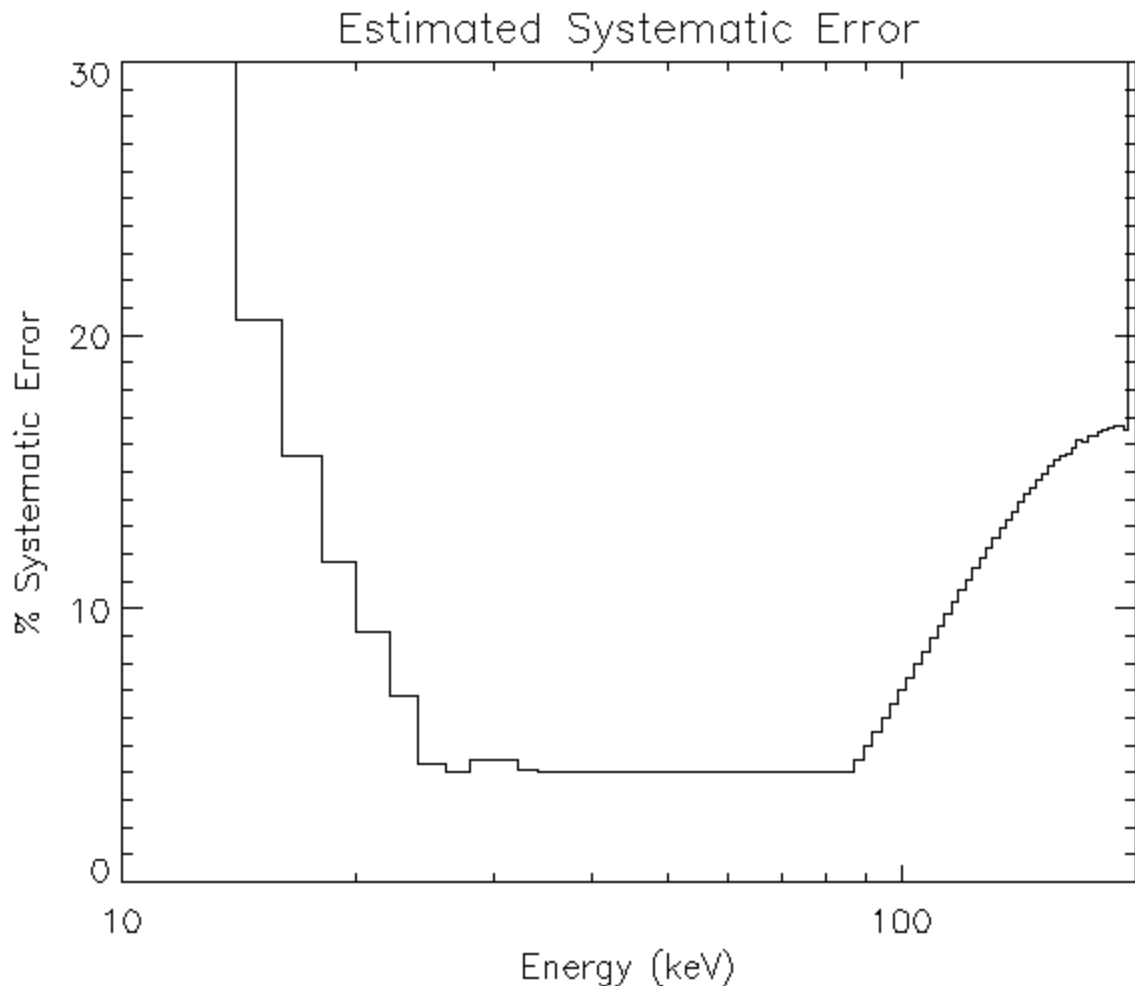## 4. Reason for Update

Initial document.

5. Discussion

Figure 1. Systematic error as a function of energy.

The BAT team has delivered a systematic error vector to be used for all spectral fitting activities. Figure 1 shows this error as a function of energy. The error vector is a FITS file in CALDB containing a fractional systematic error `SYS_ERR`, and instructions are provided for applying this vector in the Science Analysis Issues section.

This systematic vector was constructed by assuming the correction vector was a constant fraction of the matrix corrections applied, with a minimum of 4% for the entire energy range. The error fraction was determined iteratively, in order to make the parameters derived from Crab on-axis and 30 degrees off-axis agree to within 1-2 sigma.

The BAT team has released a task called **batphasyserr** which can apply the systematic error vector to BAT spectra. It works for both type I and type II spectral files, and works for any type of energy binning.

Most commonly, the task will be invoked in the following way:

```
batphasyserr spectrum.pha CALDB
```

where `spectrum.pha` is the spectrum to be modified (it is modified in place). After using this task, `spectrum.pha` should have a new column, **SYS_ERR**, which XSPEC uses during spectral fitting.

6. Caveat Emptor

NOTE: Because the systematic errors are significant, it is likely that for bright sources the **reduced chi-squared value will be less than 1.0.** When this occurs, at least a portion of the spectrum is systematics-dominated instead of statistics-dominated. The formal parameter errors of the XSPEC fit will be appropriately larger than the corresponding statistical errors.

7. Expected Updates

This file may be updated if the response matrix is updated.

8. Version History

8.1. Update 14 Jul 2005

```
 * swbsyserr20030101v002.fits VERSION 2


   A slight improvement to the systematic error vector to be used
with
   spectral fitting.  This file applies to all observations.
```

8.2. Update 27 Mar 2005

```
 * swbsyserr20030101v001.fits


    This is a new file to the BAT CALDB area which contains the
    estimated systematic error due to the BAT response matrix.  It
is
    essentially formatted according to the OGIP standard for
spectral
```

```
    files, but with a single interesting column, SYS_ERR.  This
    contains the fractional systematic error for a standard 80-bin
    spectrum.  The user is meant to append the column to their
    spectrum, as in:

        ftpaste input.pha swbsyserr20030101v001.fits'[col SYS_ERR]'
output.pha

    Once this is done, output.pha is ready for use with XSPEC.
```

last edited 2006-05-30 01:22:36 by CraigMarkwardt