



# epfast

January 27, 2025

## Abstract

Applies a rate-dependent CTI correction to PN fast mode events.

## 1 Instruments/Modes

Instrument	Mode
EPIC PN	TIMING,BURST

## 2 Use

pipeline processing	no
interactive analysis	yes

## 3 Usage and Examples

Here is a typical example of running **epfast** on an event file:

```
epfast evfile=NGC4151filtered.ds tbinwidth=100
```

## 4 Description

### 4.1 Introduction

The **epfast** task is designed to correct for a CTI effect which has been seen in EPIC-pn fast mode (timing, burst mode) data. Firstly, it finds the count rate of electrons which have been recorded at a given time in a given column of the CCD. It then applies a formula to this rate to calculate a correction value for the CTI.

$$E_{out} = E_{in} / (a_0 * rate^{a_1} + a_2) \quad (1)$$



where  $E_{in}$  is the initial PI value of the event,  $E_{out}$  is the final PI value and  $rate$  is the number of electrons per second observed in a particular column at a given time. The coefficients,  $a_0$ ,  $a_1$  and  $a_2$  have been calibrated using in-orbit data and are different for Timing and Burst mode. The number of electrons is derived from the total PI charge deposited on the column at that time.

## 5 Parameters

This section documents the parameters recognized by this task (if any).

Parameter	Mand	Type	Default	Constraints
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<b>evfile</b>	yes	string		Name of existing event file
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a specifier which must point to a table of events in a data set.

<b>timebinwidth</b>	no	real	10.0	Time bin width
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the width of time bins to use when calculating the correction factors. It is in units of seconds.

<b>pimin</b>	no	int	100	Minimum PI channel to use
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the minimum PI channel to use from the data when calculating the count rate. This may be changed to avoid low-energy noise.

<b>pimax</b>	no	int	12000	Maximum PI channel to use
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the maximum PI channel to use from the data when calculating the count rate. This may be changed to avoid high-energy noise.

<b>withrandomisation</b>	no	boolean	true	Whether to use randomisation
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Because of the quantised nature of the PI channels it is possible when multiplying by a constant to get an output PI channel which is not filled by any of the input channels. To avoid this the PI channels are internally set to be  $\pm 0.5$  of their initial value before applying the constant. Set *withrandomisation* to false to avoid this behaviour.

## 6 Errors

This section documents warnings and errors generated by this task (if any). Note that warnings and errors can also be generated in the SAS infrastructure libraries, in which case they would not be documented here. Refer to the index of all errors and warnings available in the HTML version of the SAS documentation.



**ThisIsNotEPN** (*error*)

No EPIC-pn data set given

**ThisIsNotFAST** (*error*)

The observaiton mode is neither FAST\_TIMING nor FAST\_BURST

**OTFCLOSED** (*error*)

The event file has made use of an offset map taken with the CLOSED filter and hence can not be processed.

**RDCTIcorrected** (*error*)

Dataset has already been corrected for rate-dependent CTI.

**RDPHAcorrected** (*error*)

Dataset has already been corrected for rate-dependent PHA.

## 7 Input Files

1. a data set with a table containing events to be processed.

## 8 Output Files

1. the input data set with modified PI channel column and the RDCTI keyword set true.

## 9 Algorithm

## 10 Future developments

## References