X-ray Analysis of Gigahertz Peaked Galaxies

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introduction

- **What is a GPS?**
- **My project**
- **Procedure of data reduction.**
  - Spectral modeling
  - Deriving parameters from weak sources
  - Timing analysis
- **Results this far**

What is GPS galaxies?

- **Radio defined**
  - Gigahertz Peaked Spectrum (GPS)
  - Turnover frequency between 0.4 and 6 GHz
  - Radio spectral index above the peak steeper than -0.5

- **Active galaxies**
  - AGN
  - Strong and small jets (radio)

- **Initial phase of giant jets**

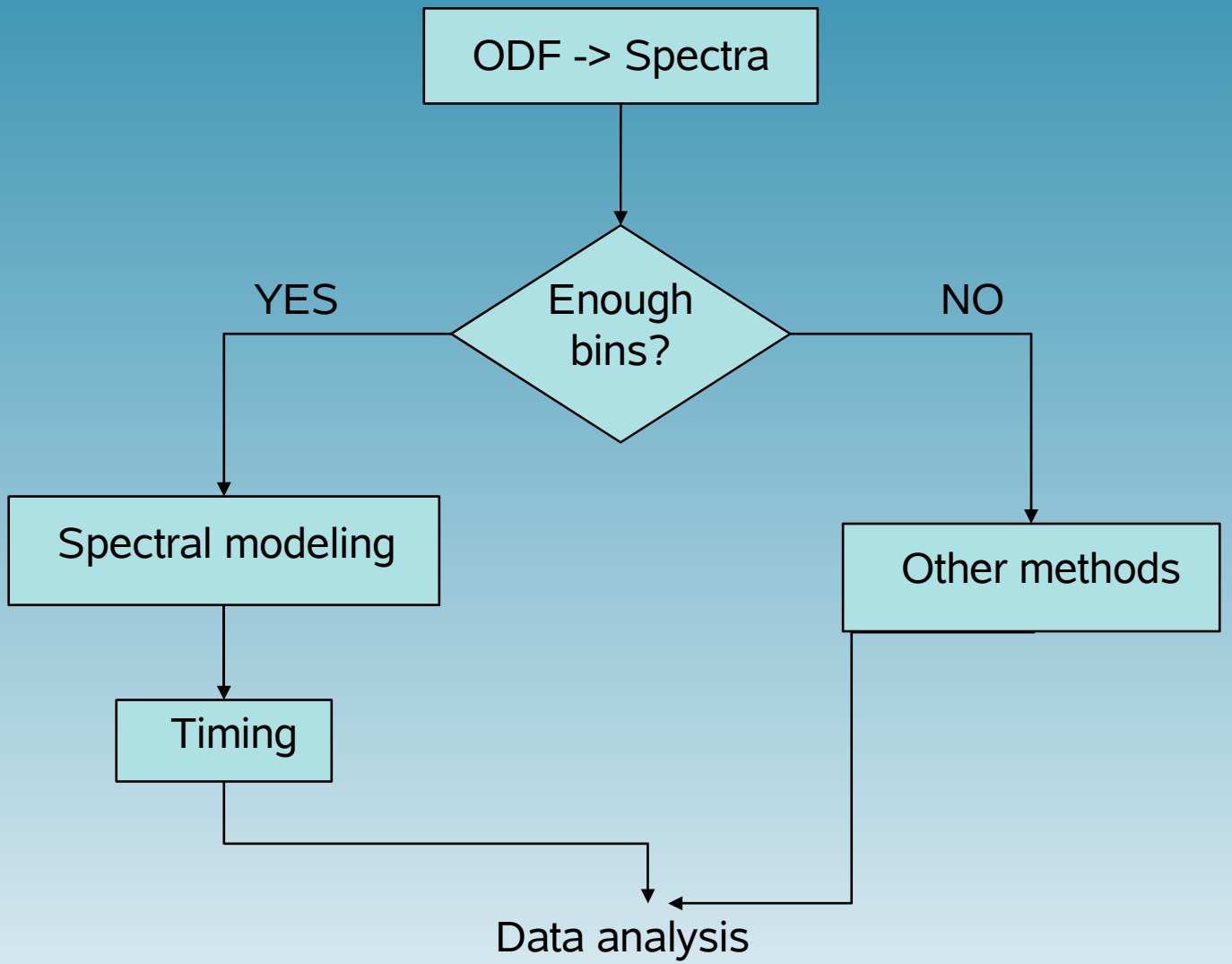
My project

- **Purpose**
  - Analyze 9 observations from different GPS to investigate some of the physical properties in the X-ray band.
  - Finish the analyzes for a complete sample of 16 GPS.
  - Completion of a work published by Guainazzi el al. (2006) & Snellen et al. (2006)
  - **Final goal:** Scientific paper describing the x-rays properties of the whole sample.

- **The sample**
  - 16 GPS galaxies.
  - Redshift $z < 1$.
  - Flux density at 5 GHz above 1 Jy
  - Turnover frequency between 0.4 and 6 GHz
  - Radio spectral index above the peak steeper than -0.5

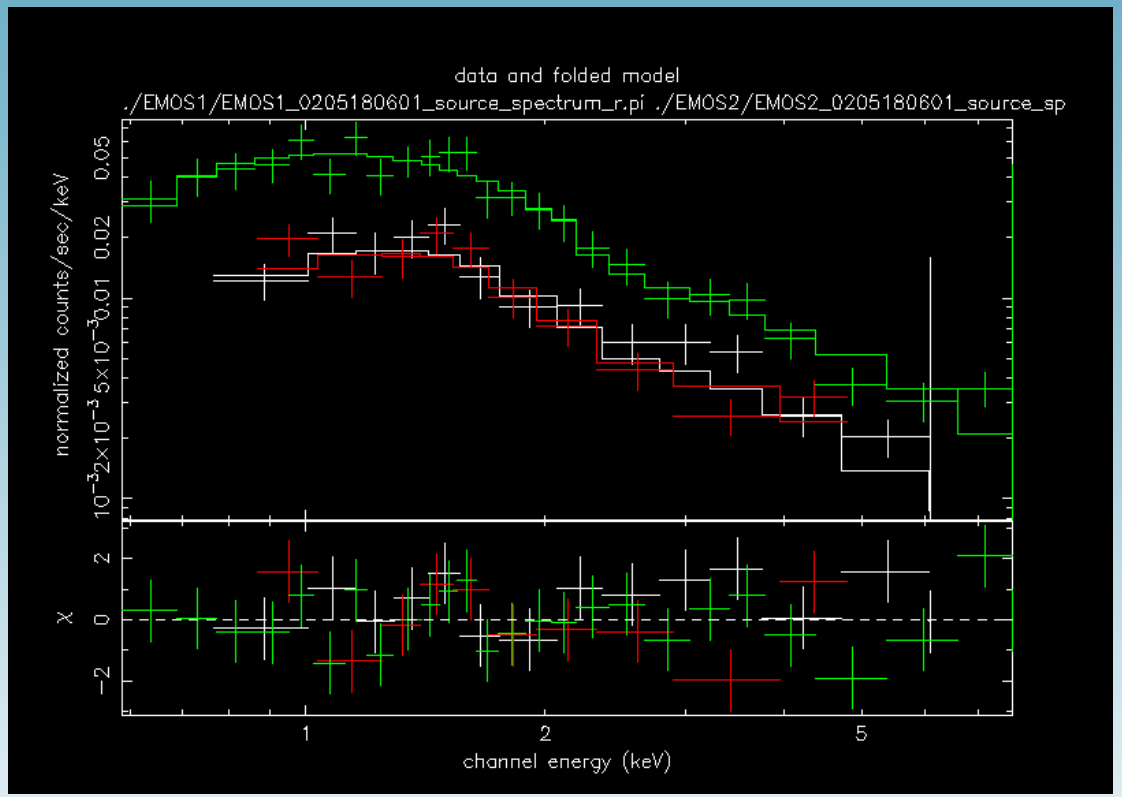
- **Limitations and possible problems**
  - Used energy range 0.2-10.0 keV
  - Weak sources in x-ray

Data reduction

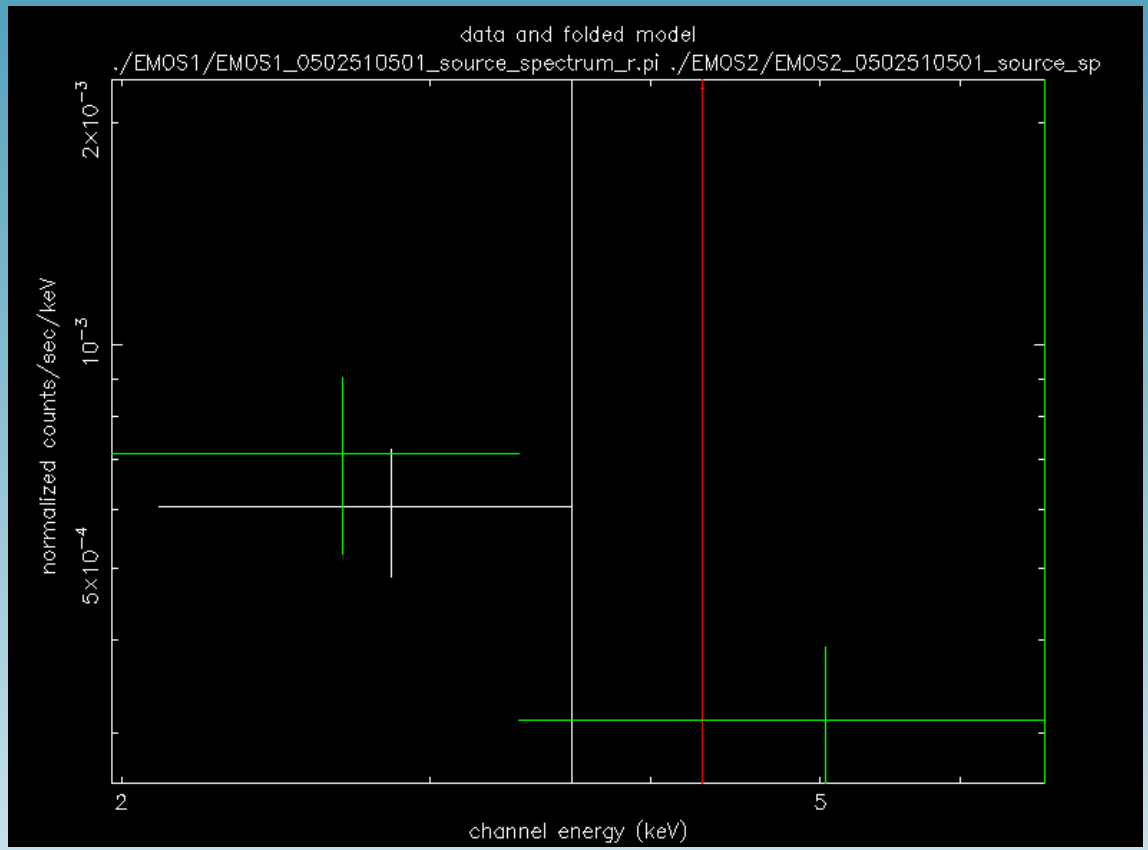


Spectral modeling

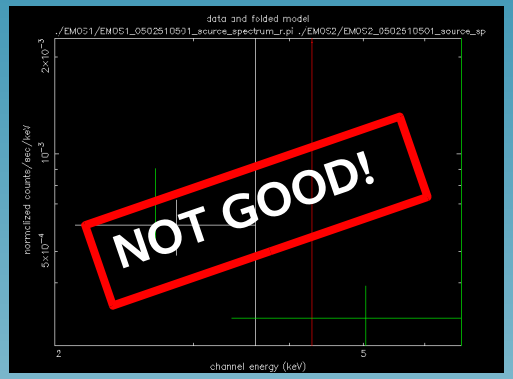
- **Wanted parameters**
  - –Column density, n_H
  - –Photon index, Γ
  - –Flux and Luminosity
- **Model components**
  - –Photon powerlaw
  - –Photo-electric absorption in our Galaxy
  - –Photo-electric absorption in the GPS
  - –Gaussian line profile



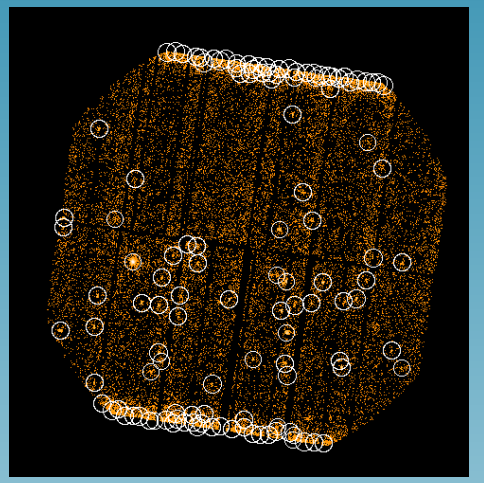
Other methods



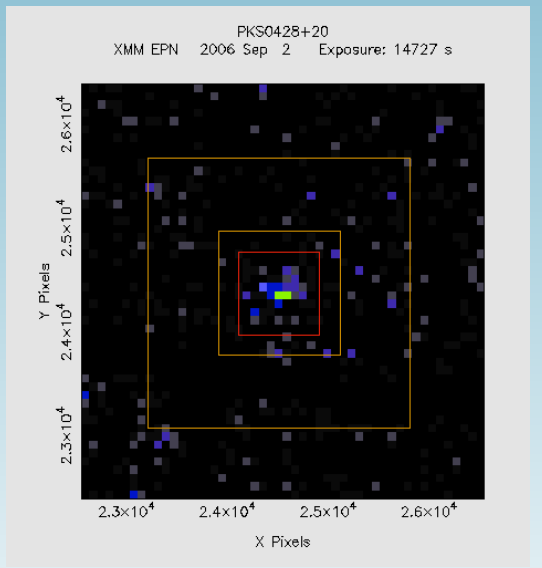
Other methods



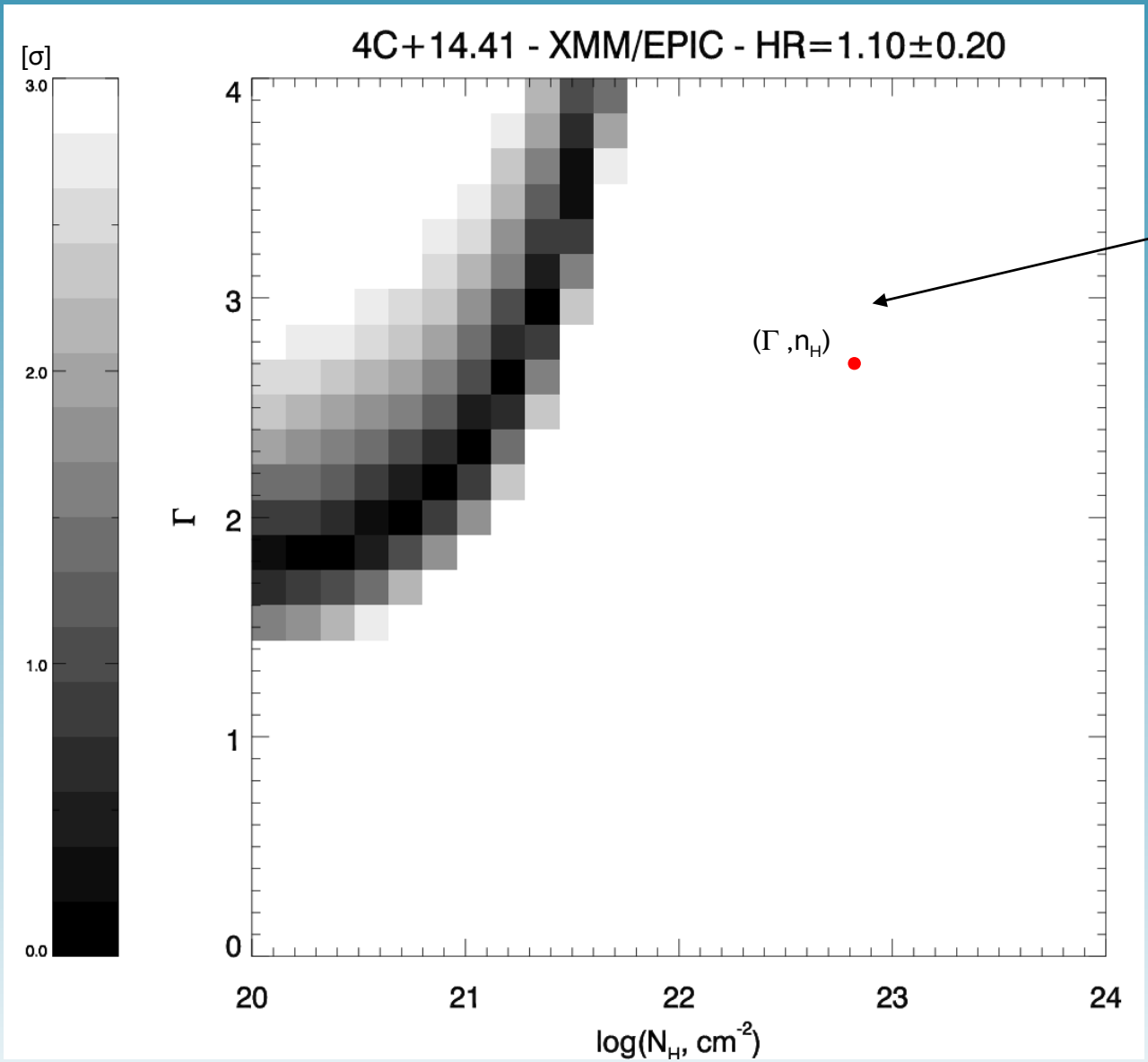
- **Source finding**
  - Use *edetectchain*
  - Counts and errors from *fv*



- **ximage**
  - Counts / upper limits



Deriving parameters from HR



- Chose a point (Γ,n_H)
- Make a spectral model, *S(E)* using the chosen parameters
- Calculate:

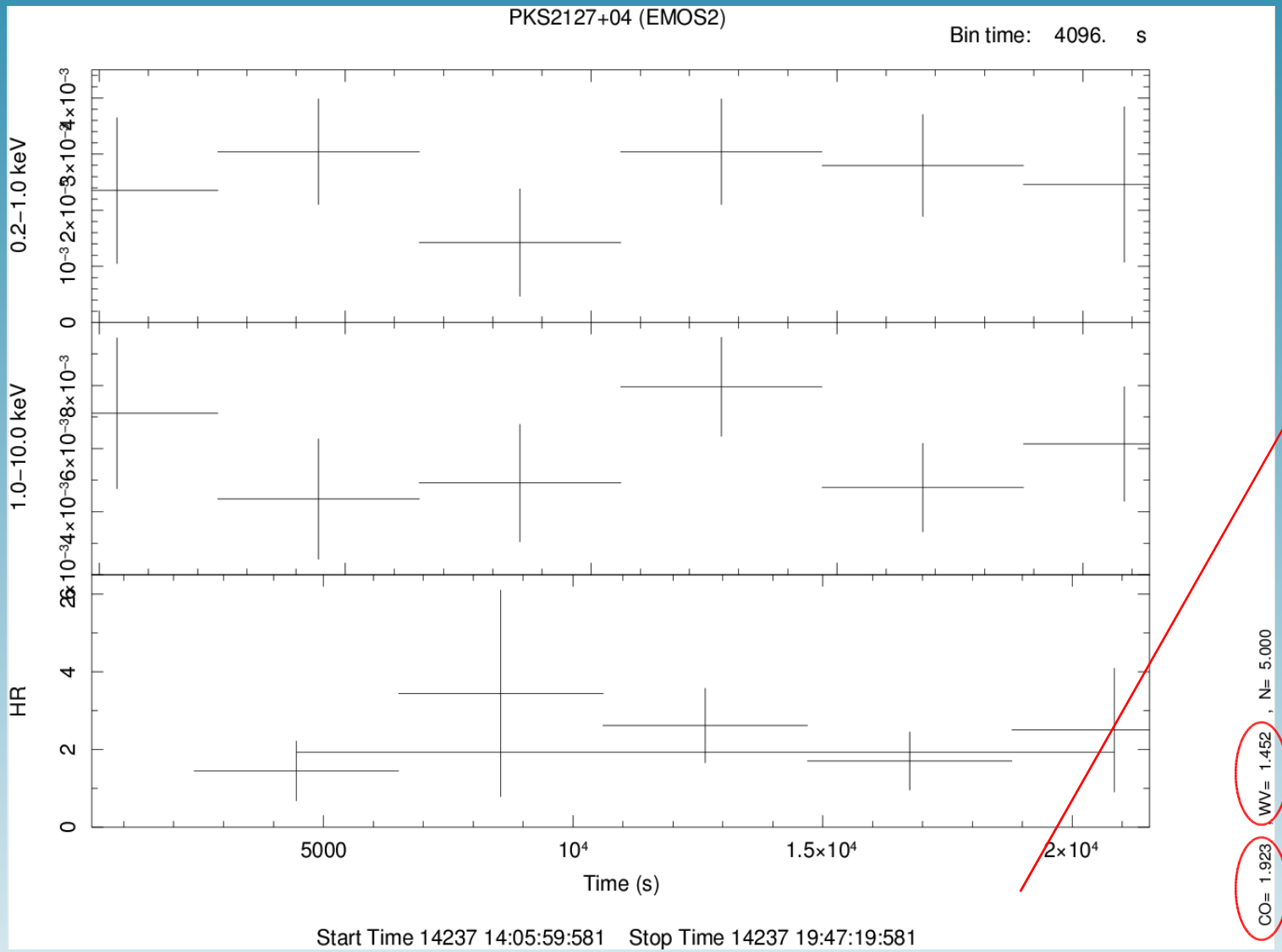
$$HARD_{counts} = \int_{1.0}^{10.0} S(E) * dE$$

$$SOFT_{counts} = \int_{0.2}^{1.0} S(E) * dE$$

$$HR = \frac{HARD_{counts}}{SOFT_{counts}}$$

- Compare with obtained HR

Timing analysis



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Results this far

- **6 sources analyzed**
  - 3 lower limits
  - 1 limit
  - 2 spectra

- **Spectral modeling**
  - No $Fe_{K\alpha}$ emission line detected

- **Timing analysis**
  - No time variations detected in the hardness ratio.