A time jump analysis on EPIC-pn with some side results

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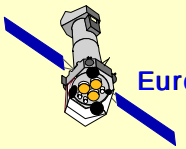
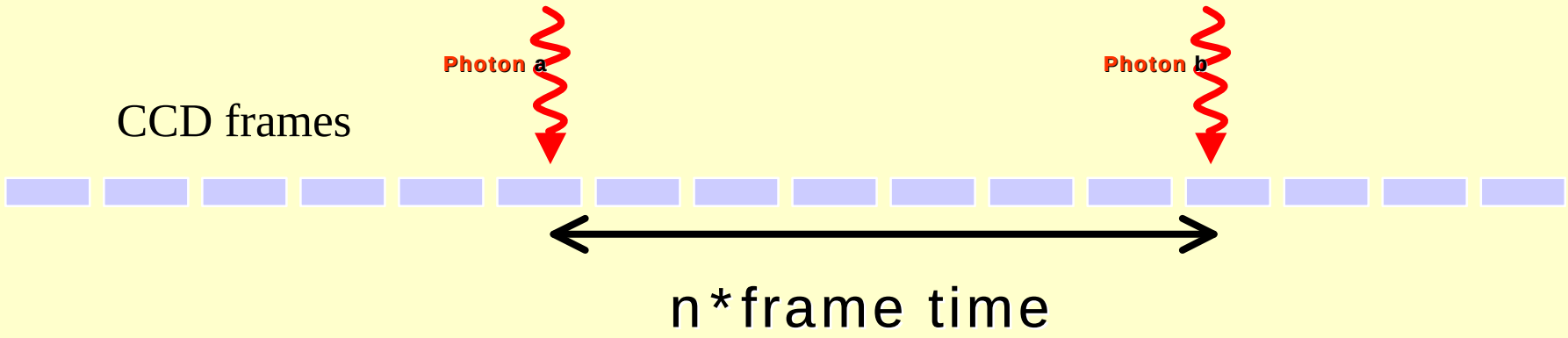
menu

- Do we still have time jumps?
- How can we measure those?
- Can a time jump detection be implemented in a sort of routine check (Qcheck)?
- Are there time issues that we still do not understand ?



What is a time jump

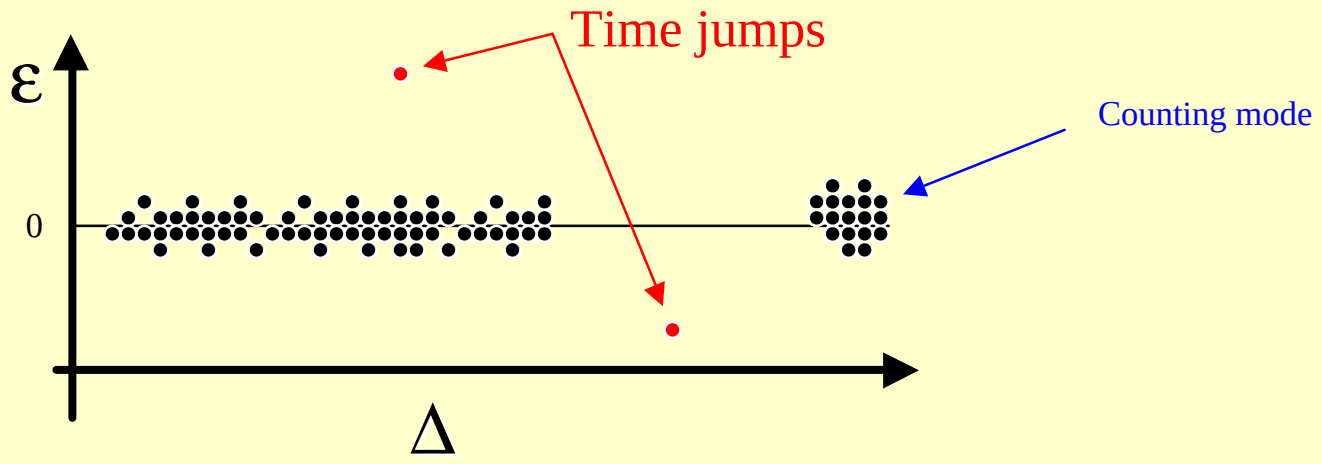


If the time difference between the two arrival times of photon a and photon b is not a multiple of the frame time

→ TIME JUMP

How to detect the jump

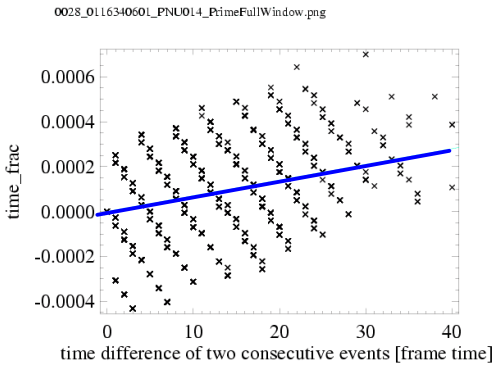
- Take all frame times in array: T
- Δ=(T(i+1)-T(i))/frametime
- ε=difference of Δ to next full frametime
- Plot $\varepsilon(\Delta)$
- If ε >tolerance →time jump

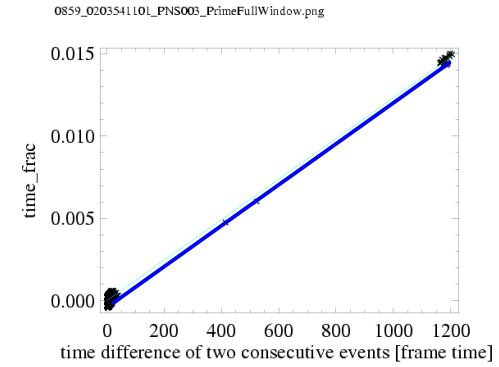


Mega processing

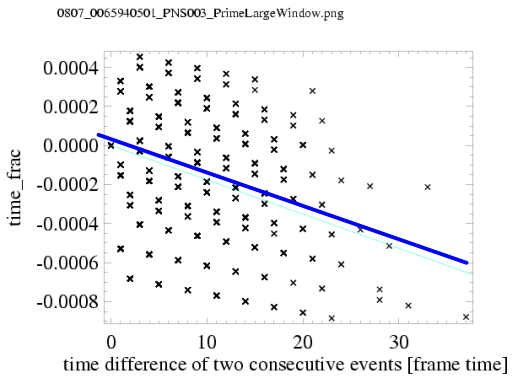
- Past: only known problem cases have been checked at MPE
- Now: processing of all public and non public available archive data at ESAC
- Some characteristic results:

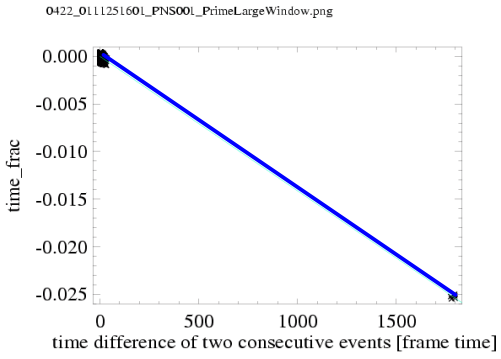
FF



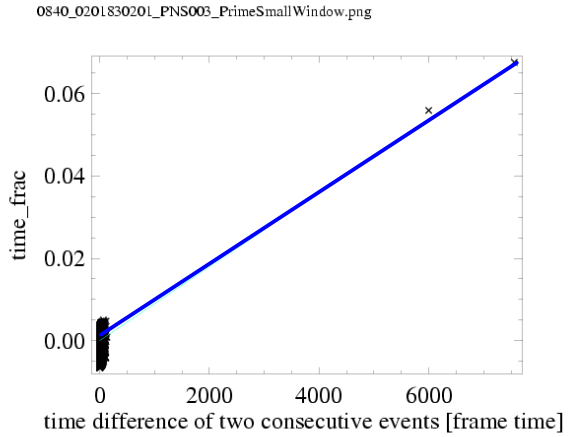


LW

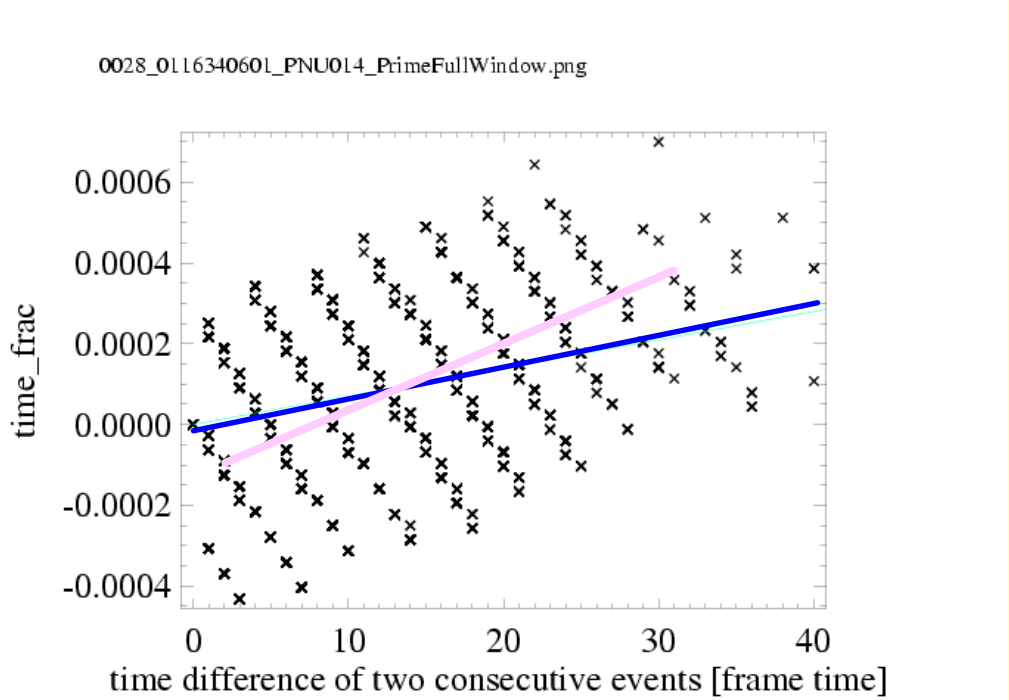




SW

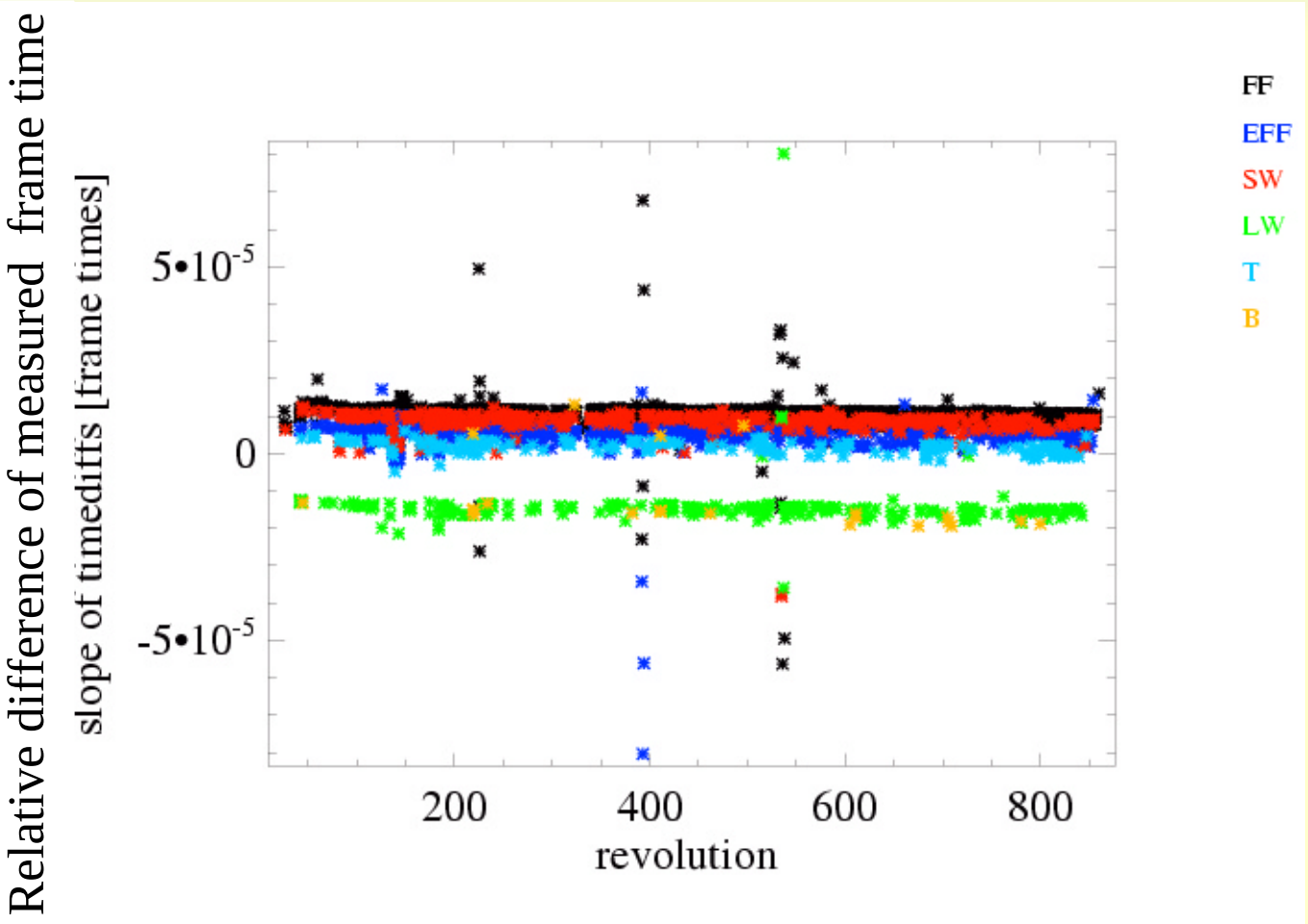


findings



- Slope:
  - Is the clock drifting?
  - Are the frame times correctly used?
- Diagonal patterns: numerical effects

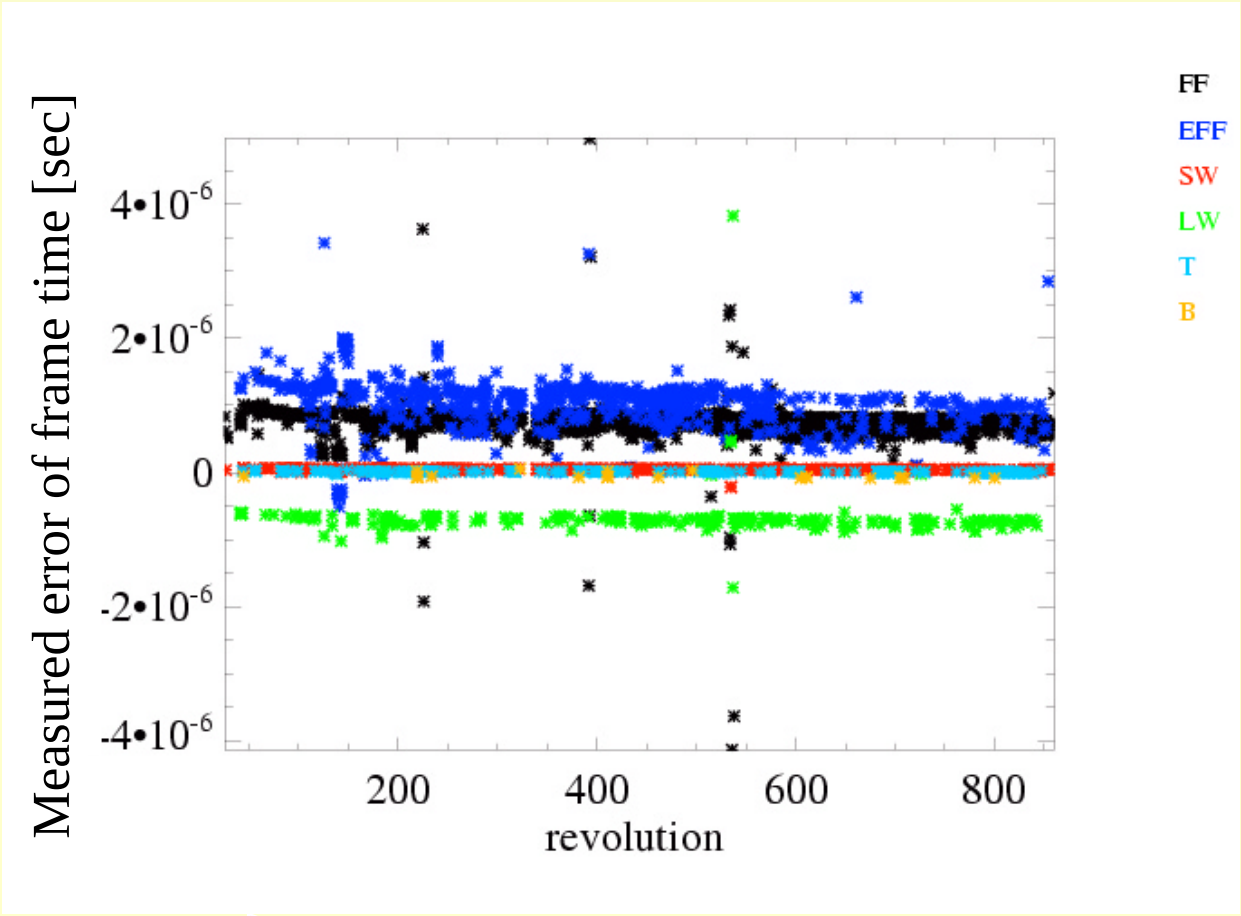
slopes for all ODF



- Different slopes for different modes
- LW similar to Burst –1E-5
- Rest similar around 1E-5
- Errors:
  - FF group: 1E-5 frametimes per frame
- Slight drift in frame times

→ **Oscillator stable, otherwise relative differences should show same shift**

resulting absolute error



- Burst, Timing and Small Window mode do show negligible absolute errors
- FF, eFF and LW show room for improvement

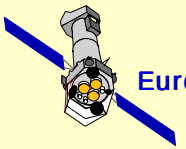
  → frame times are not fully correct
  → can be calibrated using the result of that analysis

→ Not critical for exposure time and timing

→ Analysis can be used to refine frame times with very high accuracy

Numeric effects

- mjf



How to proceed now

- Determine frametimes
- Repeat analysis with correct frametimes and search for time jumps