Polarimetry with ISO: Lessons Learned, Enabled Science

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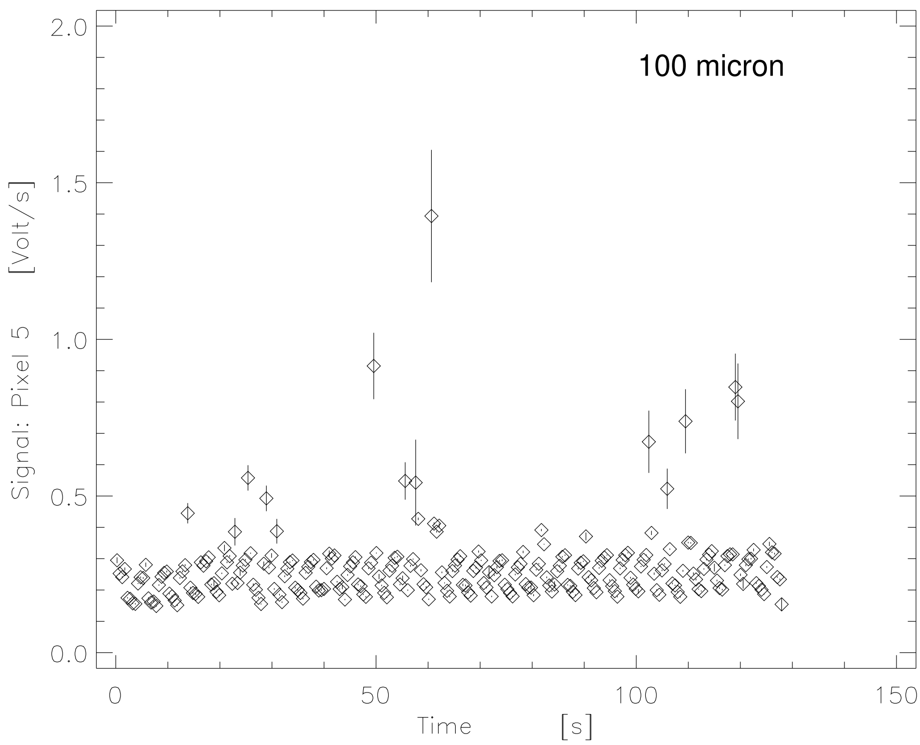
- some historical issues
- search for best observing mode
- .....calibration...
- if we could do it again

Some historical issues

- ISOPHOT and ISOCAM polarisation: "desirable".
- Minimal support from ISO development.
  Preparations and planning were performed by instrument team member and 1 resident SOC astronomer per instrument.
- Operations to be performed using the calibration uplink system (CUS).
  Advantage: full flexibility,
  disadvantage: need instrument specialist.
- Data entry interface software written by instrument team member.
- During operations no formal support, "workload permitted".
- Data processing using Interactive Analysis.
- Present results only achieved due to longer lifetime of ISO.

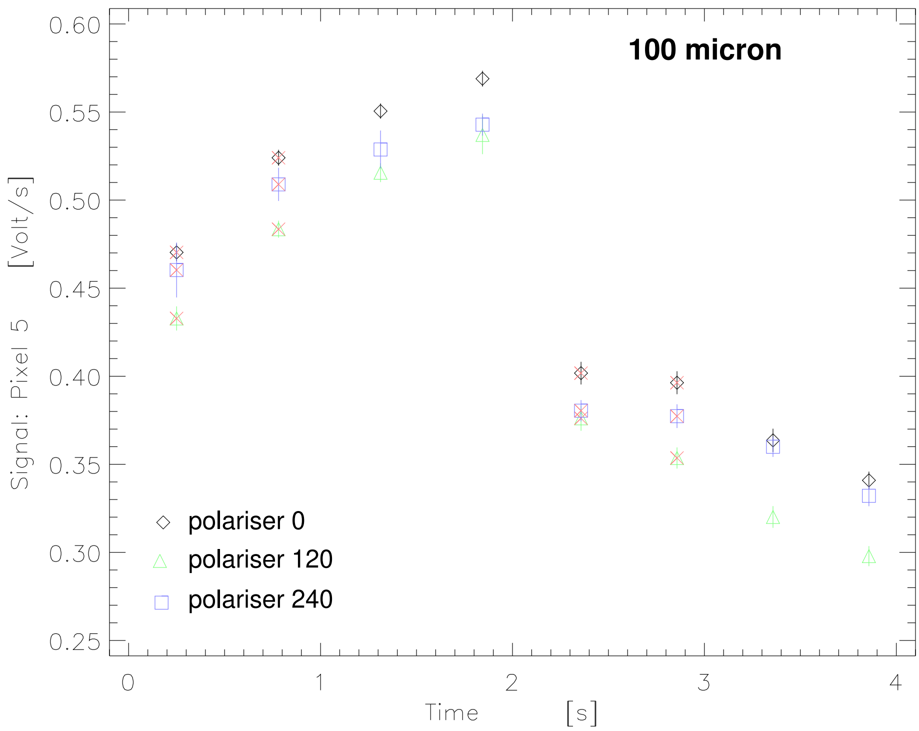
Search for best observing mode (1)

- "unexpected" in-orbit performance of detectors
  1. higher noise for C100 and P3 detectors (Ge:Ga material)
  2. detector transients rendered measurement times less than 32 s unfeasible
  3. transients difficult to model/predict with sufficient accuracy
- need long and stable integrations



3C273, C100 chopped, polariser 0

Search for best observing mode (2)

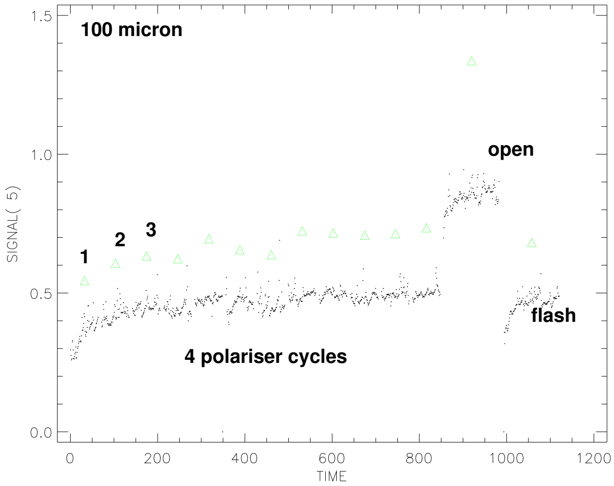


3C273, C100 processed chopped

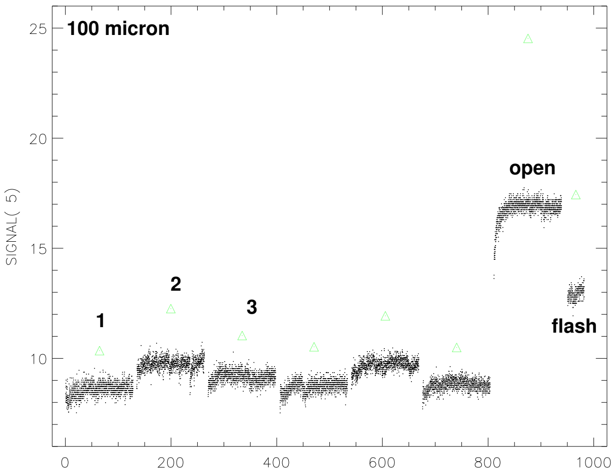
Example of recently processed chopped measurements according latest processing algorithms.

New deglitching techniques and additional calibration could be used to interpret the data. Requires lots of humanpower and a sufficient amount of calibration/test data.

Search for best observing mode (3)



3C279, C100 staring



Centaurus A, C100 staring

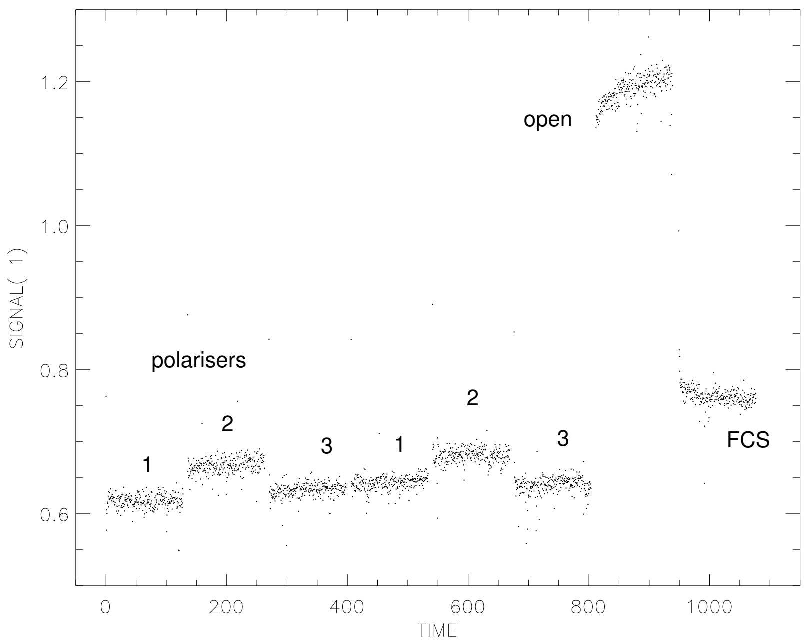
Examples of C100 (Ge:Ga detector) signals for a weak (3C279) and a strong (Centaurus A) source.

Search for best observing mode (4)

Final design of ISOPHOT polarisation mode

- choose best detectors and most suitable filters:
  P2 (Si:B) with 25 micron filter
  C200 (stressed Ge:Ga) with 170 micron filter
- long fixed integration time per polariser cycle
- avoid upsetting the detector: open and FCS measurement at the end
- impose redundancy in observing strategy.

Price: (1) long integration times per pointing and (2) intensive uplink support for fixed time scheduling.



Search for best observing mode (5)

Instrumental features in CAM polarisation:

1. polariser change caused source displacement on the array
2. detector transients; however, transients only affect the absolute photometric accuracy
3. dead column, 2×2 raster maps required.

Final design of ISOCAM polarisation mode for extended sources:

- change polariser *after* completion small raster map
- perform repointing after each polariser change

...Calibration...

One needs to be able to have the:

- firm set of polarised and unpolarised calibrators;
- ability to repeat observations at (ir)regular time intervals;
- ability to derive the instrumental, sky, and source polarisation early during operations;
- a flexible uplink/analysis system to test new observing procedures.

If we could do it again....

Apart from sufficient **expert** human resources, we would:

- like to have ground tests experience available during operations;
- polariser throughputs and efficiencies;
- pool of readily available calibration standards;
- short uplink turn-around times;
- be prepared to change the entire observing strategy.