Operation and Calibration Strategy

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Outline:

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- Calibrator Stars

Scope of Operation and Calibration Strategy

- establish procedures for successful operation and calibration of PRIMA, in particular for microarcsecond astrometry

- identify potential operation/calibration problems and develop strategies to work around them

- highest priority now:
  determine whether it is necessary to perform preparatory observations in order to identify suitable calibration stars

- provide lists of calibration stars

Operation Tasks

- daytime calibration of PRIMA subsystems and PRIMA alignment, using an artificial source

- nighttime calibration of PRIMA subsystems and PRIMA alignment:

    - calibration of FSU on real star

    - calibration of PRIMA transfer function on sky

    - alignment of PRIMA on sky

- pointing, presetting and pupil optimization

- baseline calibration

- determine fringe integration time
(based on separation between sources)

Calibration Tasks

- calibration procedures: why, when, how often?

- consistency check:
  Can we predict our measurements for well-known systems?

  - single stars (same in both instrument paths),
    resolved and non-resolved

  - visual binaries with known orbits

  - visual binaries without any orbital motion

Visual Binaries with Known Orbits

- selection criteria:

  - only high precision subset of the *Sixth Catalog of Orbits of Visual Binary Stars*, recommended for calibration

  - separation 2–10″

  - visible from Paranal

- this leaves 13 systems, which might be very well suited for calibration purposes

- most have periods from several hundred to several thousand years, and both components are bright enough for PRIMA

- even if the precision of the orbital elements is not good enough to predict the separations with microarcsecond precision, these systems might be a good starting point

Visual Binaries without Detectable Orbital Motion

- the best calibration sources would in principle be two stars which do not move more than $1~\mu$as or so with respect to each other over a few years

- in the WDS (*Washington Double Star Catalogue*), there are 8 systems which have been measured at different epochs and for which no orbital motion was detectable at all

- with microarcsecond precision, there might still be orbital motion detectable, but again these systems might be good starting points

Possibility of Identifying Other Stable Stars?

Question:

Is it possible to identify other pairs of stars which do not move with respect to each other as measured by PRIMA?

Requirements:

- long period
  (longest ones known are several million years, *Duquennoy & Mayor 1991*)

- long period systems will also have large physical separations, but for PRIMA angular separation cannot be larger than $10''$
  $\rightarrow$ systems will be far away so that angular separation is small

- largest possible distance for a K giant brighter than $K = 12$ mag: roughly 8–10 kpc

  $\rightarrow$ those systems should exist, but how can one identify them???