



PRIMA Astrometric Operations and Software: Ambitions, Conditions, and Routes to Realization

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In this paper we will present the strategy behind the PRIMA astrometric data reduction package, and discuss how this can be translated to a TPF data reduction package. PRIMA is the phase-referenced imaging and micro-arcsecond astrometry facility of the ESO Very Large Telescope Interferometer. Over the past years, ESO has been very active and successful in acquiring and starting the development phase for many of the subsystems required to operate PRIMA in astrometric mode. This will lead to full operations of PRIMA in astrometric mode in 2006 which should then allow 10 micro-arcsecond astrometry. With only 2 years to go from 2004, now is the time to start the design and development of the PRIMA astrometric observing and calibration strategy and the related software. A consortium (Netherlands, Switzerland, and Germany) has formed, which plans to work on three aspects of the PRIMA Operations and Software: 1) PRIMA Astrometry Error Budget, Operations and Calibration Strategy: To quantify all expected systematic error sources, to identify techniques to minimize the impact of these sources (i.e., hardware, software, calibration), and to develop a calibration and observing strategy which will minimize the impact of these errors; 2) PRIMA Astrometry Observing Preparation Tools: Two tools will be required to prepare astrometric observations: one that allows identifying those dates and times of observations which yield the most stringent constraints on astrometric parameters (such as orbital elements of a planetary companion), and one that calculates the exposure times; 3) PRIMA Astrometry Reduction Library: A library of routines will be developed that allows determination of the optimal calibration solution from a large set of data, and applies this solution within the ESO pipeline to an individual observation to obtain calibrated PRIMA astrometry data. The data reduction library will provide the functionality required for identifying and removing systematic trends in the data. This Library is the most ambitious part of these efforts, as the goal is to make an overall calibration of PRIMA astrometric data. This anticipates three phases of data reduction: Level 1) Pipeline solution: data reduction on a single observation block; Level 2) Baseline solution: data reduction on a single night of data; Level 3) Global solution: data reduction on many years of data. In this paper we present the ambitions of the PRIMA astrometric Operations and Software and discuss the design and development path leading to its implementation (including a software technology roadmap). An example of a challenging science case in the context of this presentation will be discussed. In addition, this paper discusses how the strategy behind these efforts could be translated to the TPF case by taking into account the different observing methods, the space requirements (among others on the data volume), and the overall interest of a large astronomy community in the scientific productivity of this mission.