

Foreword

The main motivation in organizing the international colloquium entitled *Improving the performances of current optical interferometers & future designs* at the Haute-Provence Observatory (France) on 23-27 September 2013, comes from the obvious fact that the performances of present day interferometers are still very limited: their sensitivity does not go beyond the magnitude $V=12$, and their imaging capability could yet be improved by increasing the number of telescopes/sub-apertures. Many interesting astrophysical objects remain out of reach. Moreover, in the context of the ELTs, it is not certain how future interferometry projects will be financed. However, interferometry remains the only way to observe compact astrophysical objects with a very high angular resolution ($<$ milliarcsecond). High angular resolution should still improve, for quite some time, our knowledge on the detailed content of the Universe, for example by imaging and characterizing proto-planetary disks, exo-planets, the central engines of AGN, etc.

The main goal of this international colloquium was to discuss the following key points for future interferometers:

- ★ new optical designs,
- ★ techniques to improve the accuracy of the measurements (visibility, closure-phases, etc.),
- ★ progress on delay-line performances,
- ★ solutions without delay-lines,
- ★ technologies that could allow larger apertures at lower cost (ex: lightweight replica mirrors),
- ★ optimized beam combiners (integrated optics, temporal hypertelescope, pupil densifier, etc.),
- ★ fringe tracking systems,
- ★ laser telemetry applied to interferometry,
- ★ heterodyne interferometry,
- ★ discussion on how to improve the performances of the heterodyne detection using new technologies (laser comb, time propagation technologies, etc.),
- ★ progress in image reconstruction techniques (strategy about the ideal UV coverage depending on the observed astrophysical objects, etc.),
- ★ progress in the field of nulling interferometry,
- ★ important science cases that could benefit from progress in interferometry (report of observations at the limit of the performances of the present systems).

The main topics covered during this colloquium were organized in nine sessions as follows:

- ★ Session 1. Science and Technology context
- ★ Session 2. Current Interferometers and future development for these facilities
- ★ Session 3. Poster Session
- ★ Session 4. Optimized beam combiners for present and future interferometers

- ★ Session 5. Discussion on the future of interferometry
- ★ Session 6. Unique science and technologies that will allow to design future interferometers with extremely high performances
- ★ Session 7. Metrology and astrometry with extremely high accuracy
- ★ Session 8. Problems related to the sensitivity of interferometers and quality of the observables in interferometry
- ★ Session 9. Progress in data reduction and image reconstruction techniques

The members of the Scientific Organizing Committee included: Hervé Le Coroller (OHP/Pytheas, France, Chair), Fabien Malbet (IPAG, France, Co-Chair), Jean-Philippe Berger (ESO, Chili), Olivier Chesneau (Lagrange, Observatoire de la Côte d’Azur, France), Michel Lintz (ARTEMIS, Observatoire de la Côte d’Azur, France), Bertrand Mennesson (JPL, California, USA), John Monnier (University of Michigan, USA), Guillaume Montagnier (OHP, France), Claire Moutou (LAM, France), Jörg-Uwe Pott (Max-Planck Institut, Heidelberg, Germany), Jean Surdej (Université de Liège, Belgium), and Gerard Van Belle (Lowell Observatory, USA). The Local Organizing Committee was composed of members from the Haute-Provence Observatory: Luc Arnold, Thierry Botti, Nathalie Bressand, Nathalie Desmons, Mélody Didier, Anne-Marie Galliano, Andrée Laloge, Hervé Le Coroller (Chair), Guillaume Montagnier and Jean-Paul Payan.

A large number of astronomers and engineers (around 50) from all over the world (13 countries) took active part in this meeting. Nearly 50 oral presentations have been delivered, followed by very lively discussions which eventually emerged with the proposition to organize the “Planet Formation Interferometer/Imager” (PFI) project. Stimulating general conclusions were also given by Jörg-Uwe Pott. All these presentations are accessible in the form of pdf and video files via the link:

<http://interferometer.osupytheas.fr/index.php?page=OHP2013>.

The present proceedings reflect most of the highlights of the colloquium. It is our pleasure to thank the members of the SOC, of the LOC and colleagues from the Haute-Provence Observatory in general for having participated to the very good organization of this colloquium. We also thank the CNRS for their financial help and the European Interferometry Initiative (OPTICON) for partially supporting the attendance of several members of the working group “Future of Interferometry in Europe”.

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