Gaetan Dalla Vedova OHP - September 2013

A first step toward polychromatic imaging with a nulling interferometer

Introduction

The goal of my Ph.D is a full analysis of the methodology and potential performance of polychromatic model fitting and image reconstruction with a real nulling or standard spectro-interferometer, under astrophysical constraints.

Early in 2013, we started a measurement campaign for characterizing the extinction map in the nuller field for different wavelengths with the nulling interferometer PERSEE (PEGASE Experiment for Research and Stabilization of Extreme Extinction), simulating an off-axis source.

The measured spectrum, from 1.65 to 2.45 µm, is splitted in 9 channels.

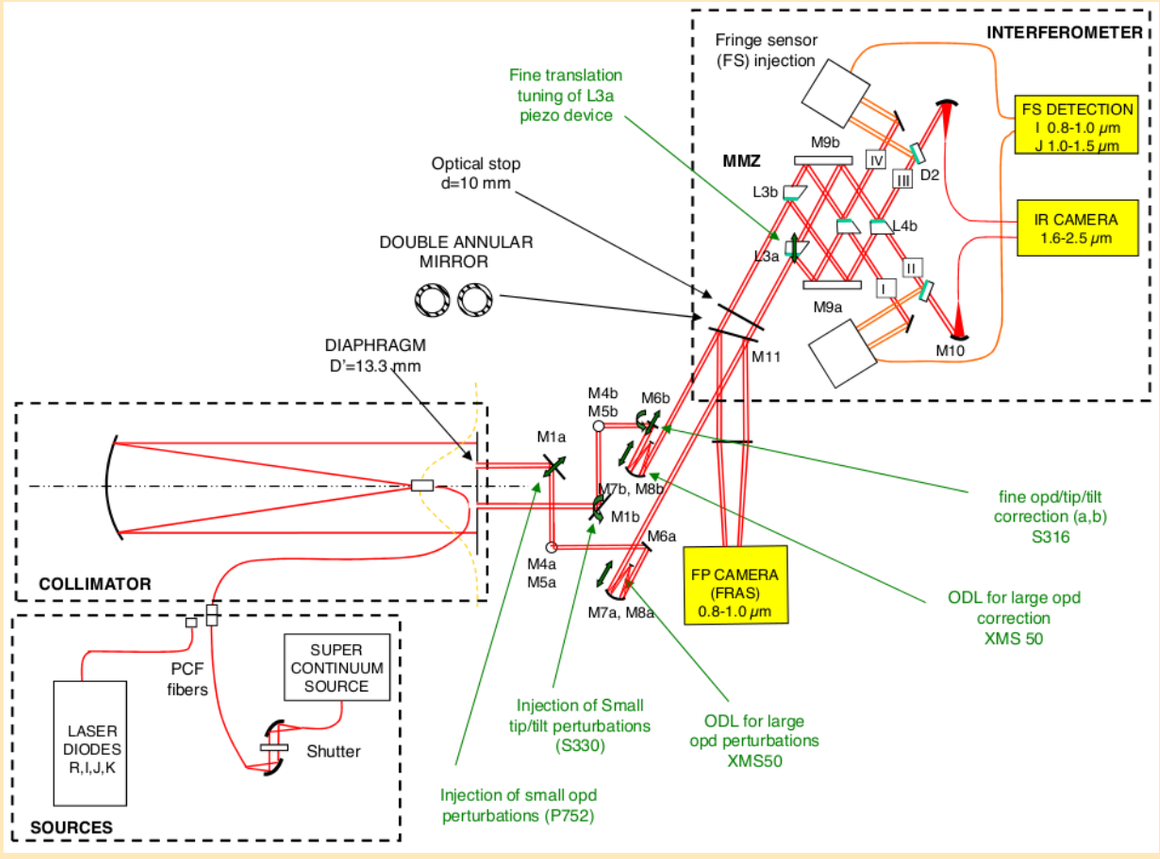

Fig. 1. Optical Design of the PERSEE bench as designed by TAS in June 2008. PERSEE has been defined by a consortium including CNES, IAS, LESIA, OCA, ONERA and TAS.

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Preliminary results

Although the data processing is still in progress, we present preliminary results for the test with an internal Tip-Tilt from -36 to 36 as.

Fig. 5 shows the extinction map for the 9th channel (1.65 µm). The arms of the interferometer are parallel to the axis of abscissas.

In Fig. 6 we present the relationship between extinction and wavelengths. Each row, relative to different channels, shows the mean value, on the y-axis, of the extinction map.

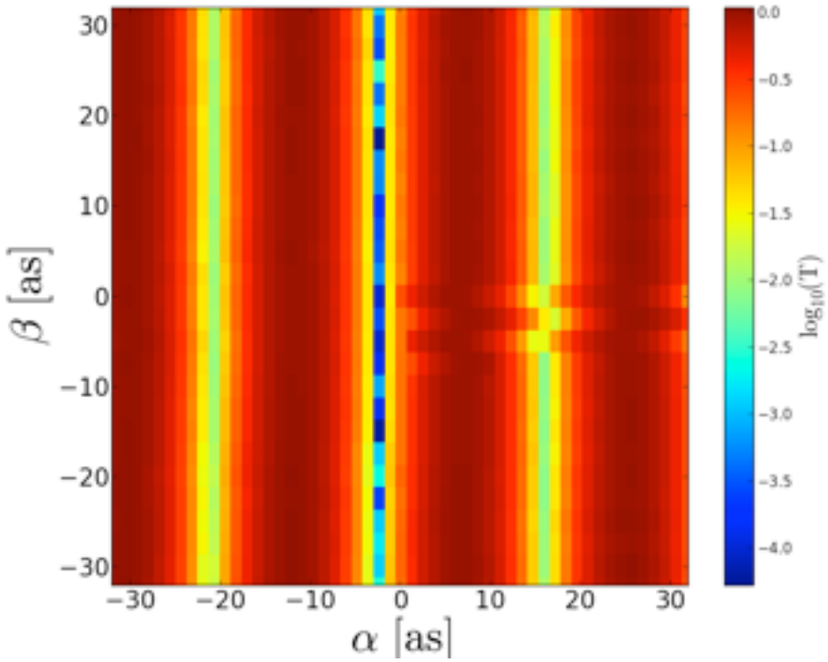

Fig. 5. Extinction Map of the 9th channel from the test with internal Tip-Tilt from -36 to 36 as.

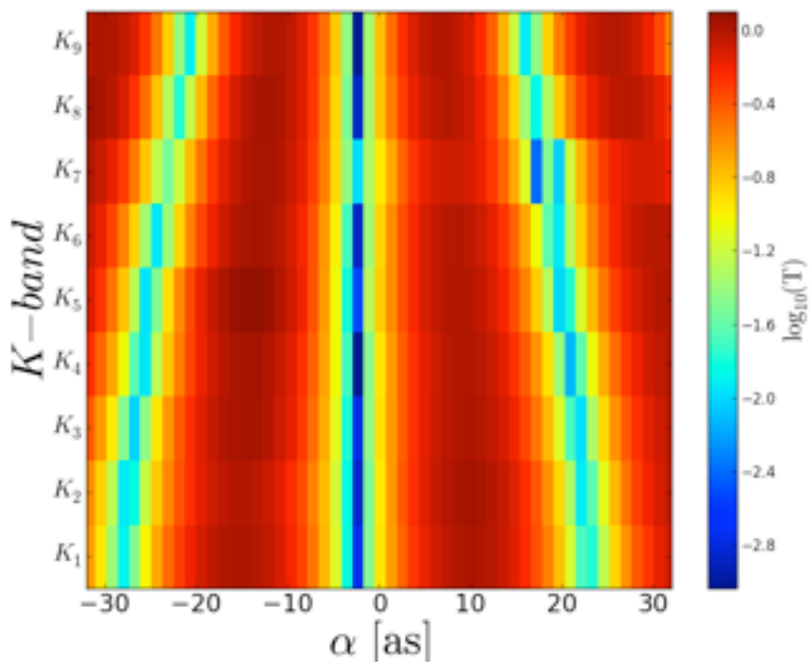

Fig. 6. relationship between extinction and wavelengths.

Conclusions and Perspectives

If the extinction map is perfectly known, the performances of the model fitting or image reconstruction will be set only by fundamental noises.

This is the starting point for a detailed characterization of the nulling performances, especially for image reconstruction with an hyper spectral approach and model fitting of very high-dynamic range scenes such as a star plus an exoplanet, or a star plus a debris disc with gaps.

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Thank you for your attention

G. Dalla Vedova[1], J.-L. Menut[1], F. Millour[1], R. Petrov[1], T. Buey[2], F. Cassaing[4], W. C. Danchi[5], S. Jacquinod[2], J.-M. Le Duigou[3], E. Lhome[6], B. Lopez[1], J. Lozi[7], A. Marcotto[1], J. Montri[4] J. Parisot[2], L. Pham[8], J.-M. Reess[2], A. Sevin[2]

[1] Laboratoire LAGRANGE, Université de Nice-Sophia Antipolis, Observatoire de la Côte d'Azur 06108 Nice, France
[2] LESIA, Observatoire de Paris, 5 Place Jules Janssen, 92195 Meudon, France
[3] Centre National d'Etude Spatiale, 18 Avenue Edouard Belin 31401 Toulouse Cedex 9, France
[4] ONERA, The French Aerospace Lab, F-92322 Châtillon, France
[5] NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA
[6] Isaac Newton Group of Telescopes, Apartado de correos 321 E-38700 Santa Cruz de la Palma, Canary Islands, Spain
[7] The University of Arizona, 1077 N Highland, Tucson Arizona 85721, USA
[8] Adaptive Optics Lab - University of Victoria, 3800 Finnerty Road, Victoria, BC, V8P5C2, Canada