
Servo controlled hectometric outdoor fiber links between telescopes: principle and on-sky experimental demonstration at 810nm

Julie Magri¹, Ludovic Grossard*¹, François Reynaud¹, and Marc Fabert¹

¹Photonique Fibre et Sources Cohérentes – Institut XLIM – France

Abstract

In the framework of the ALOHA (Astronomical Light Optical Hybrid Analysis) project, we have developed and tested a fibre-linked interferometer connecting two telescopes of the CHARA Array to the beam combination facility 200 m away.

The path-length difference between the two 240-m long fibers is stabilized using a metrology laser at 1064nm. We developed a two-stage servo control system based on the joint use of an optical fibre modulator and an adjustable fibre delay line. We were able to stabilize the optical path difference within 3 nm RMS over a 3000 s record. Fringes obtained with an internal source at 810 nm showed that the signal-to-noise ratio of the fringe modulation peak is enhanced by a factor better than two when the servo control is on.

during two consecutive nights, we were able to record on-sky fringes on the star Vega at 810 nm using the fibre servo control. We have shown an enhancement of the fringe peak amplitude and SNR when the servo control system was on and 200 s integration time.

References:

Julie, M., Ludovic, G., François, R. et al. Outdoor fibre link between two telescopes and the lab of the CHARA array at 810 nm. Demonstration of the optical path servo control. *Exp Astron* 57, 13 (2024). <https://doi.org/10.1007/s10686-024-09935-x>

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*Speaker