## **The first diluted telescope ever built in the world** Le coroller H.<sup>a</sup>, Dejonghe J.<sup>a</sup>, Regal X.<sup>a</sup>, Sottile R.<sup>a</sup>, Guillaume C.<sup>a</sup>, Meunier J.P.<sup>a</sup>, Clausse J.M.<sup>b</sup>, Blazit A.<sup>b</sup>, Berio P.<sup>b</sup>, Deram P.<sup>a</sup>, Ricci D.<sup>c</sup>, Le Vansuu A.<sup>a</sup>

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## Talk corresponding to this poster on wednesday, Session 15

Studies are currently underway to propose a generation of post-VLTI interferometers (refs. 1, 2, 3). Such interferometers (refs. 1, 2, 3). Such interferometers (refs. 1, 2, 3). lensing, AGN, Hot Jupiters, etc. The imaging capabilities and sensitivities of the future interferometers (VLTI, Keck, CHARA). To reach these goals, they will have to provide a good coverage of the uv plane (large number of mirrors), a simple optical train in order to many reflexions on the mirrors. In the future, they will have to be equipped with adaptive optics (adapted to diluted pupils) and they should accommodate various focal instruments, such as spectrographs or coronagraphs. A diluted telescope (Paper I, II) could meet all these criteria. It consists of an optical interferometer configured like a diluted version of the Arecibo radio telescope: above the diluted primary mirror made of fixed cospherical segments, a helium balloon (or cables suspended between two mountains or/and Pylones), carries a gondola containing the focal optics. The focal gondola is constrained by cables to move along the half radius focal sphere. It is used for the alignment of the primary segments with one micron accuracy. We have built at the Haute-Provence observatory (France) a prototype called Carlina, made of three 25 cm mirrors separated by a maximum baseline of 10.5 m. The three mirrors in place are already coherenced and first light is scheduled for June-July 2012.





![](_page_0_Picture_11.jpeg)

The primary mirrors (E) have been aligned with 1 µm accuracy using a supercontinum laser source placed on the metrology gondola (A) at the curvature center of the diluted primary mirror (Paper II). All the optics are aligned from a metrology table (D).

We have shown with this prototype that it is possible to track fringes in speckle mode using a gondola attached under cables. We propose the idea of a 50-100 m aperture scientific demonstrator named the Large Diluted Telescope (Paper II). Note that an integrated model of the carlina telescope has been done by Enmarka et al. 2011 (ref. 4). In the future, It should be possible to equip a diluted telescope of a tip-tilt and adaptive optics (ref. 5). A LDT working with tens of mirrors could complement ELTs, and long baseline interferometers. It will be very sensitive with a larger field of view (ref. 6) than conventional interferometers and will be able to record complex images (angular resolution ~ 1 milliarcsecond) of faint objects.

The aperture masking community is getting wider, and the number of observations using NACO and SAM (Sparse Aperture Masking) has significantly increased (ref. 7). This mode will probably be interesting with the ELTs for observations that will require high dynamic, and angular resolution. From this point of view, the OHP prototype is also a preliminary study in order to propose a new generation of Post-ELT telescopes (aperture > 50 - 100 m). A diluted telescope with a 50-100 m aperture, working with hundreds of mirrors could also complement ELTs and very long baseline interferometers. More detailed studies are necessary to determine precisely the properties of potential sites (seeing, geometry, snow and rock avalanches protections, etc.).

1. Le Coroller, H. Dejonghe, J. et al. 2012, A&A, 539, 59 (Paper I) 2. Le Coroller, H., Dejonghe, J., Arpesella, C., Vernet, D. & Labeyrie, A. 2004, A&A, 426, 721 (Paper II) 3. Perrin, G. et al. 2000, SPIE, 4006, 708 4. Enmarka, A. et al. 2011, SPIE, 8336, J1 5. Le Coroller et al. 2012, SPIE, accepted 6. Lardiere, O. et al. 2007 MNRAS, 375, 977 7. Lacour, S. et al. 2011, The Messenger, 146, 18

![](_page_0_Picture_16.jpeg)

![](_page_0_Picture_17.jpeg)