

## PPVI 1. Looking for exo-earths around M dwarfs

A. Quirrenbach<sup>3</sup>, P. J. Amado<sup>2</sup>, J. A. Caballero<sup>10</sup>, W. Seifert<sup>3</sup>, M. Azzaro<sup>11</sup>, D. Galadí<sup>11</sup>, M. L. García-Vargas, H. Mandel<sup>3</sup>, R. Mundt<sup>1</sup>, A. Reiners<sup>5</sup>, I. Ribas<sup>4</sup>, A. Pérez-Calpena, M. A. Sánchez-Carrasco<sup>2</sup> and the CARMENES Consortium<sup>1,2,3,4,5,6,7,8,9,10,11</sup>

<sup>1</sup>Max-Planck-Institut für Astronomie • <sup>2</sup>Instituto de Astrofísica de Andalucía • <sup>3</sup>Landessternwarte Königstuhl • <sup>4</sup>Institut de Ciències de l'Espai • <sup>5</sup>Institut für Astrophysik Göttingen • <sup>6</sup>Instituto de Astrofísica de Canarias • <sup>7</sup>Thüringer Landessternwarte Tautenburg • <sup>8</sup>Universidad Complutense de Madrid • <sup>9</sup>Hamburger Sternwarte • <sup>10</sup>Centro de Astrobiología • <sup>11</sup>Centro Astronómico Hispano-Alemán – Calar Alto Observatory

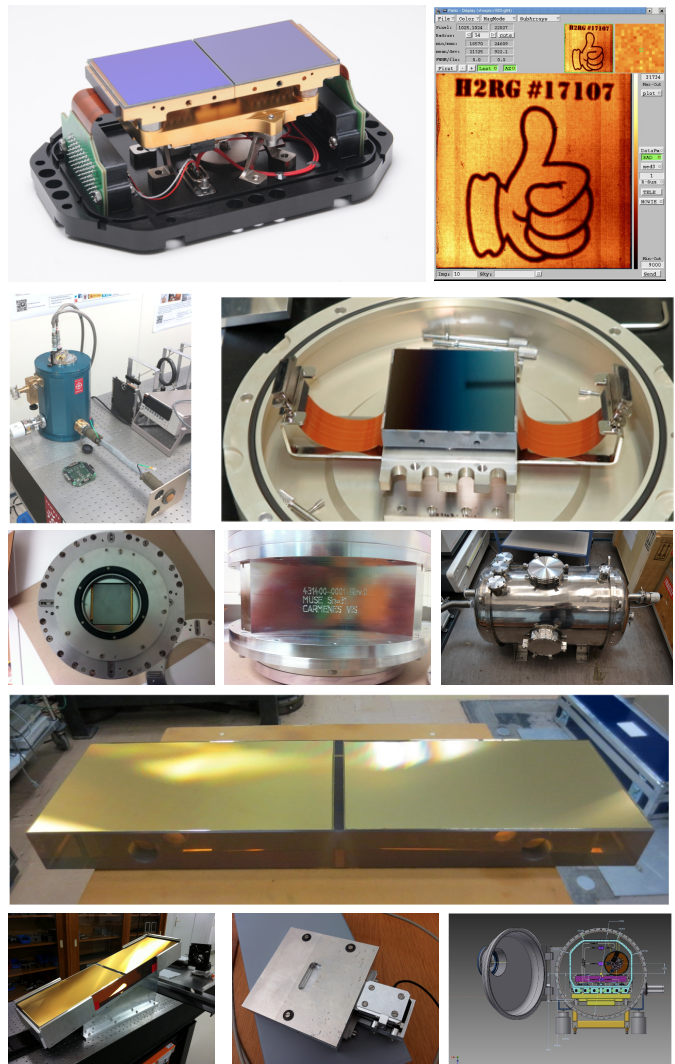
**CARMENES (Calar Alto high-Resolution search for M dwarfs with Exo-earths with Near-infrared and optical Echelle Spectrographs)** is a next-generation instrument being built for the 3.5 m telescope at the Calar Alto Observatory by a consortium of eleven Spanish and German institutions. CARMENES will conduct a five-year exoplanet survey targeting ~300 M dwarfs.

The CARMENES instrument consists of two separate échelle spectrographs covering the wavelength range from 0.55 to 1.7  $\mu\text{m}$  at a spectral resolution of  $R = 82,000$ , fed by fibers from the Cassegrain focus of the telescope. For late-M spectral types, the wavelength range around 1.0  $\mu\text{m}$  (Y band) is the most important wavelength region for radial-velocity work. Therefore, the efficiency of CARMENES will be optimized in this range. It is thus natural to adopt an instrument concept with two spectrographs, one equipped with a CCD for the range 0.55-1.05  $\mu\text{m}$ , and one with HgCdTe detectors for the range from 0.9-1.7  $\mu\text{m}$ .

Each spectrograph will be coupled to the 3.5 m telescope with its own optical fiber. The front end at the telescope Cassegrain focus will contain a dichroic beam splitter and an atmospheric dispersion corrector, to feed the light into the fibers leading to the spectrographs. Guiding is performed with a separate camera. Additional fibers are available for simultaneous injection of light from emission line lamps and two Fabry-Pérot wavemeters for radial-velocity calibration.

The spectrographs are mounted on benches inside vacuum tanks located in the coudé laboratory of the 3.5 m dome. Each vacuum tank is equipped with a temperature stabilization system capable of keeping the temperature constant to within  $\pm 0.01\text{K}$  over 24 h. The visible-light (VIS) spectrograph will be operated at near room temperature, the near-infrared (NIR) spectrograph will be cooled to 140 K.

First light of the VIS channel is planned for January 2015; the NIR channel will arrive early afterwards. At least 600 useable nights have been allocated at the Calar Alto 3.5 m telescope for the CARMENES survey in the time frame from 2015 to 2018.



From top to bottom: NIR detector science-grade 2x1 Hawaii 2RG sensor array mosaic and first image of NIR eng-grade detector; VIS detector eng-grade e2v CCD231-84 with ARC controller, cryo cables and test cryostat; VIS cryostat detector head and cooling unit heat exchanger; NIR échelle grating mosaic; VIS échelle grating mosaic, front-end shutter prototype and final drawings of the two identical vacuum tanks (being built).

