

# Commissioning of CCD231 upgrade for the PMAS Integral Field Spectrograph

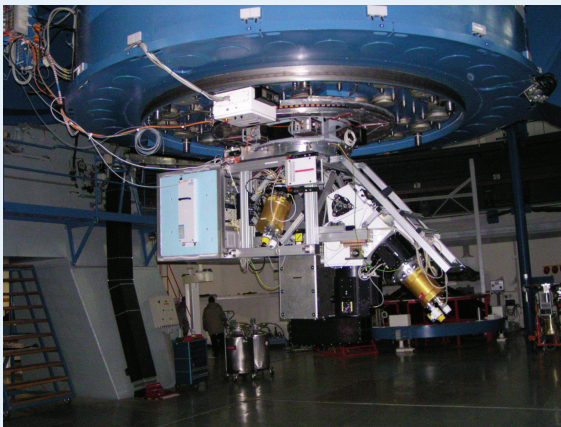
M. M. Roth, T. Fechner, D. Wolter, S.-M. Bauer, J. Paschke, V. Plank, E. Popow, A. Kelz



Astrophysikalisches Institut Potsdam

## The Potsdam Multi-Aperture Spectrophotometer (PMAS)

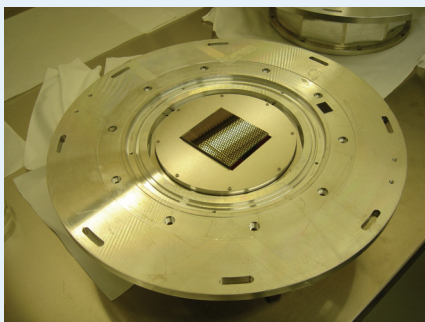
PMAS is a dedicated 3D Spectrophotometer which was developed entirely in-house at Astrophysikalisches Institut Potsdam, Germany. Initially intended to be an experimental travelling instrument, PMAS was soon after completion invited to become a common user instrument at the Calar Alto Observatory 3.5m Telescope, where it has been in operation since 2001. The instrument has found increasing demand over the years to the extent of being the most used instrument at the 3.5m Telescope over more than 6 years. The instrument features two fiber-optical IFUs and offers the largest FoV and highest throughput compared to any other 3D instrument worldwide.



PMAS at the cassegrain focus of the Calar Alto Observatory 3.5m Telescope

## The PMAS Detector System

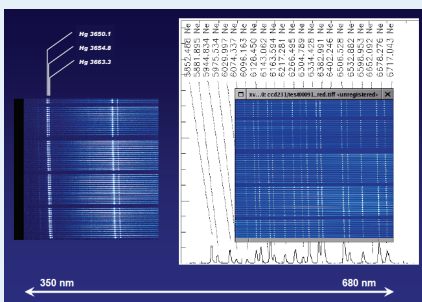
The excellent performance of PMAS relies on a high-throughput apochromatic optical system for the fiber-coupled spectrograph, which was designed to have a 60mm x 60mm focal plane. Up to present, only half of this area could be used with a SITe ST002A CCD detector, which has now been retired and replaced by the new e2v CCD231 (4096 x 4112, 15 $\mu$ m pixels). This CCD is still operated with the ESO-developed ACE controller. The upgrade has resulted in a 2-fold increase of QE at 400nm, a 2-fold improvement of readout noise, and a 2-fold increase of readout speed, thus significantly boosting the overall efficiency of PMAS.



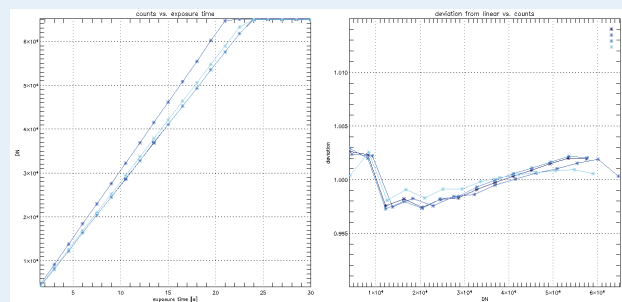
Open detector head with CCD231

## Performance

standard operation: 2x2 binned, 4-quadrant readout  
 read noise: < 3.0 e<sup>-</sup>  
 readout time: 70 s with ACE controller  
 Q.E. 80 - 76 - 70 % at 400-650-800nm  
 uniformity: 3%  
 dark current: 2 e<sup>-</sup>/pixel/hour



The new 4Kx4K CCD enables 3300 Å wavelength coverage with 3 Å resolution. Two zoomed areas (blue/red) from the same exposure are shown.



Nonlinearity measurements. Right: deviation from best linear fit (< 0.3 %)