

Highlight

FIRST SCIENCE RESULTS OF THE GRAVITY INTERFEROMETER

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GRAVITY is a recently deployed instrument, which coherently combines the light of the European Southern Observatory (ESO) Very Large Telescope Interferometer. The instrument exploits the tremendous 130 m resolving power and 200 m² collective area of the VLTI. GRAVITY uses a novel design of fiber-fed integrated optics beam combination, high resolution spectroscopy, phase-tracking, laser metrology and dual-beam operation. GRAVITY opens the techniques of phase-referenced imaging and narrow-angle astrometry to optical interferometry.

We present some key science results, which have been obtained during the first year of operation. This includes milli-arcsec scale imaging of the Galactic Center supermassive black hole and its fast orbiting star S2; few μ as differential spectro-astrometry of the high mass X-ray binary BP Cru and the active galactic nucleus of PDS 456; high accuracy visibility observations and imaging of the resolved stars ξ Tel and 24 Cap.

GRAVITY has shifted the limits of optical interferometry in terms of sensitivity and accuracy by orders of magnitude. During the commissioning we demonstrated real-time phase stabilisation on stars as faint as $m_K \approx 10$ mag, phase-referenced interferometry of objects as faint as $m_K \approx 18$ mag, visibility accuracies better than 0.25% and a spectro-astrometric precision of better than ten micro-arcseconds (μ as). The experimental dual-beam astrometry mode shows residuals as low as 50 μ as when following objects over several months. The demonstrated performance represents a game-changer in optical interferometry, which leads to exciting new science prospects.