

Intensity Interferometry with Cherenkov Telescope Arrays: Prospects for submilliarcsecond optical imaging

Dainis Dravins

Lund Observatory, Box 43, SE-22100 Lund, Sweden (dainis@astro.lu.se)

Abstract. Intensity interferometry measures the second-order coherence of light. Very rapid (nanosecond) fluctuations are correlated between separate telescopes, without any optical connection. This makes the method insensitive to atmospheric turbulence and optical imperfections, permitting observations over long baselines, and at short wavelengths. The required large telescopes are becoming available as those primarily erected to study gamma rays: the planned Cherenkov Telescope Array (<https://www.cta-observatory.org/>) envisions many tens of telescopes distributed over a few square km. Digital signal handling enables very many baselines to be simultaneously synthesized between many pairs of telescopes, while stars may be tracked across the sky with electronic time delays, synthesizing an optical interferometer in software. Simulations indicate limiting magnitudes around $m(v)=8$, reaching a resolution of 30 microarcseconds in the violet. Since intensity interferometry provides only the modulus (not phase) of any spatial frequency component of the source image, image reconstruction requires phase retrieval techniques. As shown in simulations, full two-dimensional images can be retrieved, provided there is an extensive coverage of the (u,v) -plane, such as will be available once the number of telescopes reaches numbers on the order of ten.

The material presented at the conference has recently been published and the author proposes to the reader the references below.

References

- D. Dravins, S. LeBohec, H. Jensen, P. D. Nuñez: Stellar Intensity Interferometry: Prospects for sub-milliarcsecond optical imaging *New Astronomy Reviews* 56, 143-167 (2012);
<http://dx.doi.org/10.1016/j.newar.2012.06.001>,
preprint <http://arxiv.org/abs/1207.0808>
- D. Dravins, S. LeBohec, H. Jensen, P. D. Nuñez, for the CTA Consortium: Optical Intensity Interferometry with the Cherenkov Telescope Array *Astroparticle Physics* 43, 331-347 (2013);
<http://dx.doi.org/10.1016/j.astropartphys.2012.04.017>,
preprint <http://arxiv.org/abs/1204.3624>