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An Angular Diameter Measurement of Merak via Stellar Intensity Interferometry with VERITAS

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The age of the Ursa Major moving group has been assessed from the ages of its members, including nuclear member Merak (β UMa), an A1-type subgiant, by comparing effective temperature and luminosity constraints to model stellar evolution tracks. Previous interferometric limb-darkened angular diameter measurements of β UMa in the near-infrared (CHARA Array, 1.149 ± 0.014 mas) and mid-infrared (Keck Nuller, 1.08 ± 0.07 mas), together with the measured parallax and bolometric flux, have constrained the effective temperature. To obtain the first measured angular diameter at visual wavelengths and to independently constrain the limb-darkened angular diameter, we used the VERITAS imaging air Cherenkov telescope array to perform stellar intensity interferometry (SII) observations of β UMa. We extract squared visibilities from ns-scale time correlations. We fit the resulting squared visibilities to find a limb-darkened angular diameter of 1.07 ± 0.03 (stat) ± 0.05 (sys) mas, using synthetic visibilities from a stellar atmosphere model that provides a good match to the spectrum of β UMa in the optical wave band. The VERITAS-SII limb-darkened angular diameter yields an effective temperature of $9800 \pm 200 \pm 200$ K and, using MESA Isochrones and Stellar Tracks (MIST), an age for β UMa of $390 \pm 20 \pm 29$ Myr.

In addition to the specifics of this measurement, I will discuss the principle and operation of the VERITAS stellar intensity interferometer. Hanbury Brown, whom I met in Catania more than 25 years ago, would have loved to see the field as it is being revived today.

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