Discovery and Characterization of Binary Asteroids with Adaptive Optics

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Since 2001 we have been using adaptive optics instruments on Palomar, Keck, and the Very Large Telescope (VLT) to conduct sub-arcsecond observations of a large sample of main belt asteroids.

With 13 nights at Palomar, 9 nights at Keck, and 3 nights at VLT, we performed 725 observing sequences (an average of 29 objects per night) with very consistent observing parameters. Of all asteroids numbered between 1 and 1000, 382 have been observed at least once. About 10% of observations were performed in appulse.

We discovered asteroid satellites to 22 Kalliope (M/X), 87 Sylvia (P/X), 379 Huenna (B/C), and 702 Alauda (C/B), with types from Tholen/SMASS taxonomies listed in parentheses [1]. The orbits have been fully characterized and we provided the first density measurements to asteroids of taxonomic types M, P, and B [2, 3, 4].

The mass of 22 Kalliope and its 181 ± 4.6 km IRAS diameter yield a density of 2.4 ± 0.4 g cm^{-3} [2]. The mass of 87 Sylvia and its 261 ± 13.3 km IRAS diameter yield a density of 1.6 ± 0.3 g cm^{-3} [3]. The mass of 702 Alauda and its 194.7 ± 3.2 km IRAS diameter yield a density of 1.6 ± 0.2 gcm^{-3} [4]. The first two masses have been subsequently confirmed.

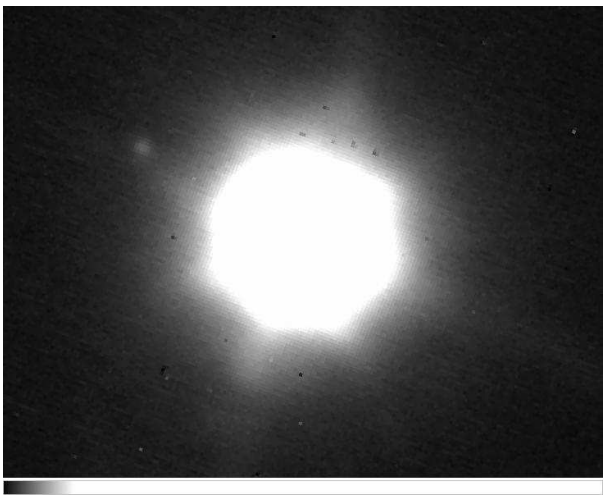

Figure 1: VLT H-band image of (702) Alauda observed on 2007 Jul 27 (Rojo and Margot, CBET 1016, 2007). The companion is clearly visible at a distance of 0.75" from the primary.

We identified the 2003 and 2007 mutual event seasons in the Kalliope/Linus system that have led to lightcurve observations and to improved estimates of the binary component sizes [5, 6].

The homogeneous nature of our survey allows us to characterize the frequency of binaries in a well-characterized space of primary-to-secondary angular separation and magnitude difference.

We will present the latest results of the survey and describe important similarities and differences between main belt binaries and those observed in other populations [7, 8].

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