Dense and narrow rings discovered around the Centaur object (10199) Chariklo

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A stellar occultation observed on June 3, 2013 revealed the unexpected presence of two dense rings around (10199) Chariklo [1], the largest Centaur object known to date with a radius of 124 ± 9 km [2]. The two rings have respective orbital radii, widths, and normal optical depths of $a_1 = 391$ km, $W_1 = 7$ km, $\tau_1 = 0.4$ and $a_2 = 405$ km, $W_2 = 3$ km, $\tau_2 = 0.06$ [1]. They are separated by a gap of about 9 km with an optical depth less than 0.004 (1-sigma limit). The presence of those rings has been confirmed during another stellar occultation observed from ESO/NTT La Silla, ESO/VLT Paranal and San Pedro de Atacama on February 16, 2014. More results on the azimuthal variations of the rings and mass estimations of their putative shepherding satellites will be presented.

This is the first ring system ever observed that does not pertain to a giant planet. The existence of such a system raises several questions as to the origin and evolution of rings around such a small object. This discovery also suggests that rings may be a more frequent feature than previously thought, in particular, around small bodies. Possible models for the ring formation will be proposed. They can be classified into collisional scenarios that disrupted an impactor or a pre-existing satellite, tidal disruption of an inward-migrating satellite, or material produced by a cometary activity of the central body.

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References: [1] Braga-Ribas et al. (2014), Nature 26 March 2014, doi:10.1038/nature13155; [2] Fornasier, S. et al. (2013), Astron. Astrophys. 555, A15.