A super-fast-rotating asteroid

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Harris (1996) showed a 'spin barrier' at 2.2 hours for asteroids with $D < 1$ km, which indicates large asteroids are gravitationally bound aggregates (i.e., rubble-pile structure). Following that study, Pravec & Harris (2000) revealed that asteroids with diameters larger than a few hundred meters are rubble piles and have spin rates lower than the 'spin barrier', while smaller asteroids may rotate faster than the 'spin barrier' (i.e., super-fast-rotator; see an example study by Hergenrother & Whiteley 2011) and are likely to be monolithic objects. Only one exception to this rule was found, 2001 OE_{84}, which has a diameter of 0.9 km and a rotation period of 29.19 min (Pravec et al. 2002). Subsequently, Holsapple (2007) suggested a size-dependent strength for asteroids and predicted the existence of kilometer-sized super-fast rotators. Although several km-sized super-fast-rotator candidates had been reported (Masiero et al. 2009 and Dermawan et al. 2011), none of them had been confirmed yet. Therefore, to discover more such km-sized super-fast rotators will give us a more clear picture of the interior structure of the asteroids. Here, we report another super-fast rotator discovered during the asteroid rotation survey mission of the intermediate Palomar Transient Factory (iPTF) in Feb. 2014 and confirmed by the follow-up observation of the 200-inch Hale Telescope at the Palomar Observatory.

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References: Dermawan, B., Nakamura, T., & Yoshida, F. 2011, PASJ, 63, 555; Harris, A. W. 1996, Lunar and Planetary Institute Science Conference Abstracts, 27, 493; Holsapple, K. A. 2007, Icarus, 187, 500; Masiero, J., Jedicke, R., Durech, J., et al. 2009, Icarus, 204, 145; Pravec, P., & Harris, A. W. 2000, Icarus, 148, 12; Pravec, P., Kusnirak, P., Sarounova, L., et al. 2002, Asteroids, Comets, and Meteors: ACM 2002, 500, 743.