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Derivation of the masses of Pluto and Charon from the New Horizons´s flyby in 2015

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Radio Doppler tracking of spacecraft passing close to a planetary body is a powerful and precise tool for the determination of the body mass. The New Horizon (NH) spacecraft will encounter the Pluto-Charon system on 14 July 2015, providing an opportunity to sense directly the effects of Pluto and Charon on the spacecraft trajectory. The importance of a NH flyby determination in the Pluto/Charon system lies in the opportunity to obtain values of the masses that are independent of astrometry. Close flybys of Pluto and Charon will take place at a distance of 11,095 km and 26,925 km, or about 10 and 45 radii, respectively. Given the masses, plus the radii from other methods, the bulk density is readily found. A simulation of the flyby based on the planned flyby trajectory demonstrates the feasibility, accuracy, and the precision of the inferred system mass, as well as the individual masses of Pluto and Charon. The results show that it is possible to achieve a relative accuracy of 10^{-4}, which is orders of magnitude more accurate than the best values obtained to date. With radii information from imaging and radio occultation during the flyby, the bulk density can be derived to a relative precision of 10^{-3}.