

Conference: Signposts of Planets
Location: GSFC, Greenbelt, MD
Dates: October 18-20, 2011

Presentation Title: "Discovery and Mass Measurements of a Cold, 10-Earth Mass Planet and Its Host Star"
Poster or Paper: Poster
First Author: Richard K. Barry
FA Affiliation: NASA GSFC
First Co-Author: Y. Muraki
First Co-Author Affiliation: Konan University, Japan
Second Co-Author: C. Han
Second Co-Author Affiliation: Chungbuk National University, Korea
Additional Authors: D.P. Bennett, B.S. Gaudi
Additional Author Affiliations: University of Notre Dame, Ohio State University

Abstract:

We present the discovery and mass measurement of the cold, low-mass planet MOA-2009-BLG-266Lb, made with the gravitational microlensing method. This planet has a mass of $m_p = 10.4 \pm 1.9 M_{\text{Earth}}$ and orbits a star of $M_{\text{star}} = 0.56 \pm 0.09 M_{\text{Sun}}$ at a semi-major axis of $a = 3.2 \pm 0.5 \text{ AU}$, and an orbital period of $7.6 \pm 1.5 \text{ yrs}$. The planet and host star mass measurements are due to the measurement of the microlensing parallax effect.

This measurement was primarily due to the orbital motion of the Earth, but the analysis also demonstrates the capability to measure microlensing parallax with the Deep Impact (or EPOXI) spacecraft in a Heliocentric orbit. The planet mass and orbital distance are similar to predictions for the critical core mass needed to accrete a substantial gaseous envelope, and thus may indicate that this planet is a failed gas giant. This and future microlensing detections will test planet formation theory predictions regarding the prevalence and masses of such planets.