= MOA @-@ 2009 @-@ BLG @-@ 387L =

MOA @-@ 2009 @-@ BLG @-@ 387L is a red dwarf in the Sagittarius constellation that is host to the planet MOA @-@ 2009 @-@ BLG @-@ 387Lb . The star is estimated to be nearly 20 @,@ 000 light years away and approximately one fifth the mass of the Sun , although large confidence intervals exist , reflecting the uncertainties in both the mass and distance . The star drew the attention of astronomers when it became the lens of gravitational microlensing event MOA @-@ 2009 @-@ BLG @-@ 387L , in which it eclipsed a background star and created distorted caustics , an envelope of reflected or refracted light rays . Analysis of the caustic events and of follow @-@ up observational data led to the planet 's discovery , which was reported in February 2011 .

= = Observational history = =

On July 24 , 2009 , the Microlensing Observations in Astrophysics collaboration (MOA) detected the star MOA @-@ 2009 @-@ BLG @-@ 387L eclipsing a background star in a microlensing event that was named MOA @-@ 2009 @-@ BLG @-@ 387 . In a process called gravitational microlensing , the star MOA @-@ 2009 @-@ BLG @-@ 387L became a lens that created two distorted caustic images . In the case of the microlensing event MOA @-@ 2009 @-@ BLG @-@ 387 , these caustics produced a series of small " resonating " diffractions ; such resonant @-@ caustic events are valued because they tend to yield more information about an orbiting planet .

The first caustic event was detected by the South African Astronomical Observatory (SAAO) on July 24 , 2009 . An alert was issued , which attracted many to cover the caustic event ; as such , the end of the first caustic event was well @-@ documented . The microlensing event 's second caustic event was seven days later , an unusually long middle period for planetary microlensing events . An alert brought three different telescopes at SAAO and telescopes at ten different observatories to focus on the event .

Follow @-@ up observations on the star MOA @-@ 2009 @-@ BLG @-@ 387L using the NACO imager at the Very Large Telescope array successfully distinguished the star 's mass . The collected data from VLT and from observations during the microlensing event was run through a series of models and analyzed . An orbiting planetary body larger than Jupiter (or of a similar size , given uncertainties) was discovered . The discovery of the planet was reported on February 21 , 2011 in the journal Astronomy and Astrophysics .

= = Characteristics = =

MOA @-@ 2009 @-@ BLG @-@ 387L is an M @-@ type red dwarf in the Sagittarius constellation . It is estimated to be 5700 parsecs (18 @,@ 591 light years) away , although uncertainty has led the discovering team to place the confidence intervals at ± 2200 parsecs (7 @,@ 176 light years) ; in other words , although the distance of MOA @-@ 2009 @-@ BLG @-@ 387L from Earth is best placed at 5700 parsecs , astronomers can only be 90 % certain that it is somewhere between 3 @,@ 500 and 7 @,@ 900 parsecs away . Likewise , although MOA @-@ 2009 @-@ BLG @-@ 387L 's mass has been estimated at 0 @.@ 19 times that of the Sun , the confidence intervals remain large (+ 0 @.@ 3
? 0 @.@ 12) , as uncertainty in the mass of the planet places its true mass between 0 @.@ 07 and 0 @.@ 49 times the mass of the Sun . This covers the entirety of the range of masses known in red dwarfs .

The ratio between planet MOA @-@ 2009 @-@ BLG @-@ 387Lb 's mass to that of its host star has been found with accuracy . However , because the host star 's characteristics are not as well @-@ constrained , the planet 's characteristics are not well @-@ constrained either . The inability to constrain many of MOA @-@ 2009 @-@ BLG @-@ 387L 's characteristics is a consequence of the fact that the star acted as the lens in the microlensing event , which compromised the ability to collect most of the star 's stellar parameters .

= = Planetary system = =

MOA @-@ 2009 @-@ BLG @-@ 387Lb is the only known exoplanet in the orbit of host star MOA @-@ 2009 @-@ BLG @-@ 387L . The planet is estimated to be 2 @.@ 6 times the mass of Jupiter . However , because knowledge of the exact parameters of the planet are tied to the host star 's parameters , and the host star 's parameters are not well @-@ constrained , uncertainty places MOA @-@ 2009 @-@ BLG @-@ 387Lb 's mass between 1 @.@ 0 and 6 @.@ 7 times that of Jupiter . The planet is estimated to orbit its host star every 1970 days at a distance of 1 @.@ 8 AU , some 1 @.@ 8 times the mean distance between Earth and the Sun . Uncertainty broadens the mean distance to between 1 @.@ 1 and 2 @.@ 7 AU .