= HIP 78530 b =

HIP 78530 b is an object that is either a planet or a brown dwarf in the orbit of the star HIP 78530 . It was observed as early as 2000 , but the object was not confirmed as one in orbit of the star HIP 78530 until a direct imaging project photographed the star in 2008 . The image caught the attention of the project 's science team , so the team followed up on its initial observations . HIP 78530 b orbits a young , hot , bright blue star in the Upper Scorpius association . The planet itself is over twenty @-@ three times more massive than Jupiter , orbiting eighteen times further from its host star than Pluto does from the Sun by the estimates published in its discovery paper . In this predicted orbit , HIP 78530 b completes an orbit every twelve thousand years .

= = Discovery = =

Between 2000 and 2001 , the ADONIS system at the ESO 3 @.@ 6 m Telescope in Chile detected a faint object in the vicinity of HIP 78530 . This object was reported in 2005 and 2007 , although the astronomers investigating the star were not able to tell , based on their observations , if the faint object was an orbiting companion or not . The team did not follow up on this .

The random selection of ninety @-@ one stars in the Upper Scorpius association provided a sample of stars to be observed using the Near Infrared Imager and Spectrometer (NIRI) and Altitude conjugate Adaptive Optics for the Infrared (ALTAIR) adaptive optics system at the Gemini Observatory . Among the ninety stars selected for direct imaging was the star HIP 78530 , which was first imaged by the camera on May 24 , 2008 . This initial image revealed the presence of the same faint object within the vicinity of HIP 78530 .

Follow @-@ up imaging took place on July 2 , 2009 and August 30 , 2010 using the same instruments , as astronomers hoped to reveal this companion object 's proper motion , or the rate that it moves over time . Additional follow @-@ up data was recovered in the spring and summer of 2010 , but large errors in the data 's astrometry led the investigating astronomers to disregard it . The observations over the three years was compiled , with the data used to filter out pixelated portions of the images and improve the images ' quality . The result suggested not only that the faint object in the image was nearby the star HIP 78530 , but that it was a brown dwarf or planet in size . Further study would be needed to prove its true nature .

On July 2 , 2009 , July 3 , 2009 , and August 8 , 2009 , use of the NIFS integral field spectrograph with ALTAIR allowed the astronomers to collect data on the spectrum of the faint object and its star . Analysis of the spectra and the objects ' astrometry (how the star and the faint object change position in the sky) led to the confirmation of the companion HIP 78530 b .

The confirmation of HIP 78530 b was reported on January 24 , 2011 . In imaging the ninety @-@ one stars , HIP 78530 b and 1RXSJ1609 @-@ 2105b were discovered . The discoveries of these two orbiting bodies allowed astronomers to predict that bodies with such low planet / brown dwarf @-@ to @-@ star mass ratios (below 0 @.@ 01) orbiting at a distance of hundreds of AU exists in the orbits of 2 @.@ 2 + 5 @.@ 5

? 1 @.@ 9 % of all stars . However , this number is a lower limit , as astronomers have been unable to detect smaller , low @-@ mass planets that fit this scenario .

= = Host star = =

HIP 78530 is a bright , blue B @-@ type main sequence star in the Upper Scorpius association , a loose star cluster composed of stars with a common origin . The star is estimated to be approximately 2 @.@ 5 times the mass of the Sun . Ages of the Upper Scorpius group have been quoted at 5 million years , however a more recent estimate suggests that the group is somewhat older (approximately 11 million years old) . Its effective temperature is estimated at 10500 K , less than twice the effective temperature of the Sun .

HIP 78530 has an apparent magnitude of 7 @.@ 18 . It is incredibly faint , if visible at all , as seen from the unaided eye of an observer on Earth .

= = Characteristics = =

HIP 78530 b is most likely a brown dwarf , a massive object that is large enough to fuse deuterium (something that planets are too small to do) but not large enough to ignite and become a star . Because HIP 78530 b 's characteristics blend the line between whether or not it is a brown dwarf or a planet , astronomers have tried to determine what HIP 78530 b is by predicting whether it was created in a planet @-@ like or star @-@ like (how brown dwarves are formed) manner .

Its estimated mass is over 23 @.@ 04 times that of Jupiter . Additionally , HIP 78530 b orbits its host star at an estimated average distance of 710 AU , which is 710 times the average distance between the Earth and the Sun assuming the brown dwarf has a circular orbit . The average distance between dwarf planet Pluto and the Sun is 39 @.@ 482 AU , meaning that HIP 78530 b orbits its host star nearly eighteen times further than Pluto orbits the Sun . In accordance with the data , HIP 78530 b would complete an orbit approximately every 12 @,@ 000 years , although the actual orbital motion of HIP 78530 b is most likely smaller than 710 AU , but it has not been directly observed long enough to know definitively .