

= HD 40307 d =

HD 40307 d is an extrasolar planet orbiting the star HD 40307 , located 42 light @-@ years from Earth in the direction of the southern constellation Pictor . The planet was discovered by the radial velocity method , using the HARPS apparatus in June 2008 . It is the most massive of the six proposed planets in the system . The planet is of interest as this star has relatively low metallicity , supporting a hypothesis that different metallicities in protostars determine what kind of planets they will form .

= = Discovery = =

HD 40307 d was discovered through the Doppler spectroscopy method , which functions by measuring the variations in radial velocity in a star produced by the gravitational effect of orbiting exoplanets . The radial velocities were measured by the High Accuracy Radial Velocity Planet Searcher spectrography system ( HARPS ) at the La Silla Observatory in Chile 's Atacama Desert . The other less massive planets orbiting HD 40307 were discovered in the same way : HD 40307 b and HD 40307 c first , and then HD 40307 e , HD 40307 f , and HD 40307 g . The discovery of HD 40307 d and the former two was announced at the astrophysics conference that took place on June 16 ? 18 , 2008 in Nantes , France .

= = Orbit and mass = =

HD 40307 d has a mass of at least 9 @.@ 2 times Earth 's ; assuming that all planets in the system have coplanar orbits , it is the most massive planet known in the system . The planet orbits approximately 0 @.@ 135 astronomical units from its primary star , as compared to Earth 's orbit at approximately one astronomical unit away from the Sun . As a result , one year on HD 40307 d constitutes approximately 20 @.@ 45 Earth days . The eccentricity of the planet 's orbit was found to not differ significantly from zero , meaning that there is insufficient data to distinguish the orbit from an entirely circular one .

The star around which HD 40307 d orbits has an unusually low metallicity compared to that of other planet @-@ bearing stars . This supports a hypothesis concerning the possibility that the metallicity of stars during their births may determine whether a protostar 's accretion disk forms gas giants or terrestrial planets .

= = Characteristics = =

The planet has not been found to transit and , further , it is not likely to . It has also not been imaged . More specific physical characteristics such as radius , composition , and average surface temperature cannot be observed .

A dynamical study of planets b , c , and d showed tidal effects at least on b and c , to the extent that b had to be a sub @-@ Neptune . All the planets from b to at least f must have migrated inward . That study implied that d was a sub @-@ Neptune as well .

As such strong tidal forces often result in the destruction of larger natural satellites in planets orbiting close to a star , it is unlikely that HD 40307 d hosts any satellites .