

## Answer on Question #69685, Physics / Astronomy | Astrophysics

Is it possible for a tidally locked planet to have a moon?

**Answer:**

There is no reason that a tidally locked planet cannot have a natural satellite. In this case, the moon would orbit around the planet normally.

For any moons to exist in a stable orbit, it has to be really, really close to the planet, since the star is so close (and thus its gravity so much more competitive than the planet's). If the moon were really close to the planet, its orbit would drop into the planet or if it were large enough, it would be tidally disrupted.

The region in which a planet is gravitationally dominant is called «Hill Sphere». It's an area of space around the planet where, if I dropped a marble, it would fall toward the planet instead of the star. It is calculated as follows:

$$a \sqrt{\frac{m}{3M}}$$

Where  $r$  is the radius of the Hill Sphere,  $a$  is the semi-major axis,  $e$  is the eccentricity,  $m$  is the mass of the secondary, and  $M$  is the mass of the primary.

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