

Question #69905, Physics / Other

While passing between Earth and the Moon, a spacecraft is momentarily located on the line connecting the centers of the two bodies and is at a distance of $d = 130$ km from a radio antenna on the surface of Earth. The distance from the antenna to the moon is denoted by d_m .

1. Recall that the speed of light is 3.0×10^8 m/s. How long, in seconds, does it take for a signal from the spacecraft to arrive at the antenna on Earth?
2. Scientists bounce a laser beam off the Moon and measure the two-way travel time to be 2.42 s. How far away is the Moon in meters?

Solution

Distance from Earth to Moon = 384,400 km

$$d_m = 384,400 - 130 = 384,270 \text{ km}$$

$$1. t_l = \frac{130 \times 10^3}{3 \times 10^8} = 4.3 \times 10^{-4} \text{ s}$$

$$2. d_m = \frac{1}{2} \times 2.42 \times 3 \times 10^8 = 3.63 \times 10^8 \text{ m}$$

Answer provided by <https://www.AssignmentExpert.com>