

Radio signals from space probes - how long do they take?

Radio signals from space probes can take a long time to reach Earth. Find out the time taken for a signal to reach Earth from the ISS, the Moon, Mars at closest and furthest distances, Jupiter, Saturn, Uranus, Neptune and the spacecraft Voyager 1.

NASA's Jet Propulsion Laboratory Mission Control in Southern California communicates with spacecraft using radio signals. You can take a virtual tour here:

<https://www.jpl.nasa.gov/news/explore-nasas-jet-propulsion-laboratory-with-the-new-virtual-tour>.

The radio signals travel at the speed of light which, while very fast, is still finite. It means there will be a delay between the sending and receiving of a signal.



About One Hour



Kit List

- Calculator
- Internet access for research



Instructions

1. Make a spreadsheet of the Moon and planets with columns for the distance in km and the time taken for a radio signal to reach Earth. Go to this website for the distances between the planets.
<https://theplanets.org/distances-between-planets/>
2. Use the Excel formula to calculate the time taken, using the speed of light as 300,000 km/s.

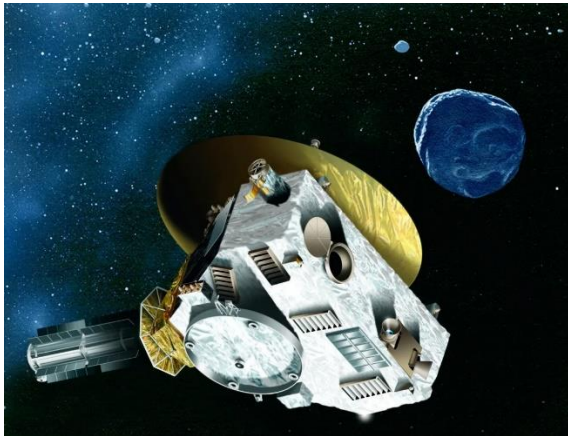


3. Design a poster showing your results, with images of the planets.

Next Steps

The values for the distances to the planets are average values. When NASA communicates with the spacecraft Curiosity, Mars can be close or far away, depending on its position compared to Earth. Calculate the shortest and longest times for the delay in communicating with Curiosity. What problems does this delay cause for the Mars Exploration team?

Voyager 1 is a spacecraft that has left the Solar System. How long do signals take to reach Earth?
<https://voyager.jpl.nasa.gov/>



The nearest star is about 4.2 light years away. If we were to communicate with a planet orbiting it, radio signals would take 4.2 years to reach it. How far away is the star in km?

Astronomers have received radio signals that have travelled enormous distances, called fast radio bursts. Find out what astronomers think is causing them (<https://ras.ac.uk/news-and-press/news/never-seen-fast-radio-burst-sheds-new-light-deep-space-signals>).