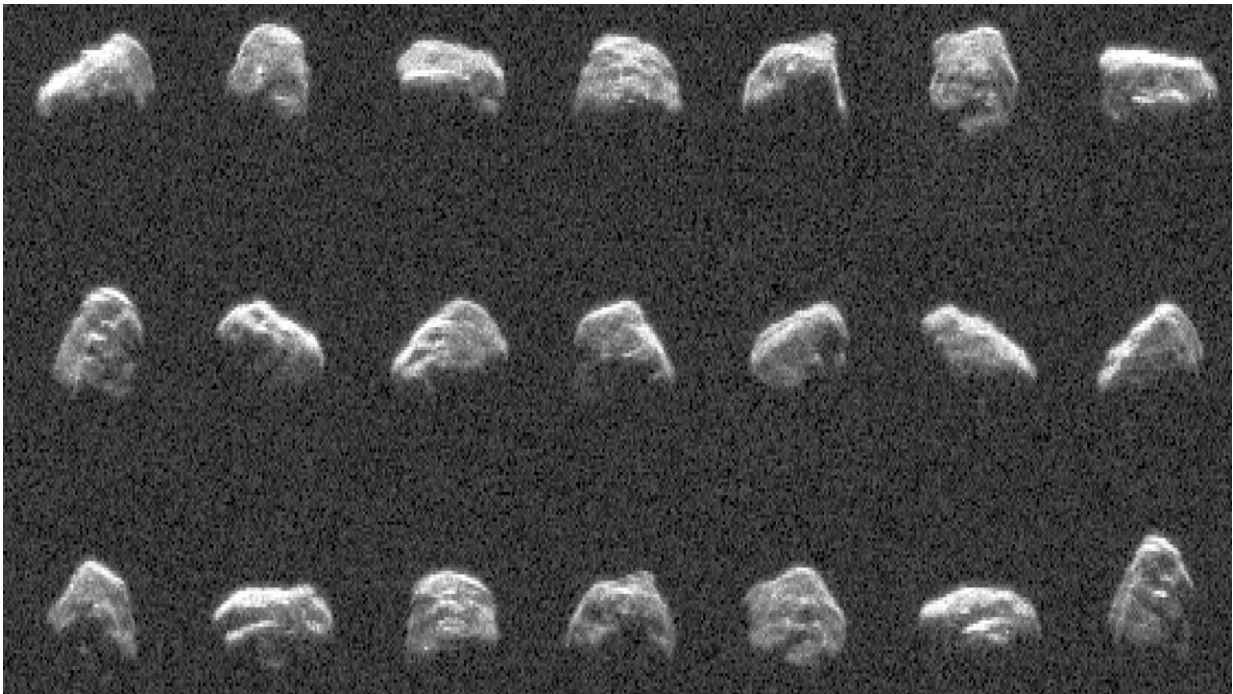


NASA's planetary radar tracks two large asteroid close approaches

July 3 2024



The Goldstone Solar System Radar, part of NASA's Deep Space Network, made these observations of the recently discovered 500-foot-wide (150-meter-wide) asteroid 2024 MK, which made its closest approach—within about 184,000 miles (295,000 kilometers) of Earth—on June 29. Credit: NASA/JPL-Caltech

The Deep Space Network's Goldstone planetary radar had a busy few days observing asteroids 2024 MK and 2011 UL21 as they safely passed Earth.

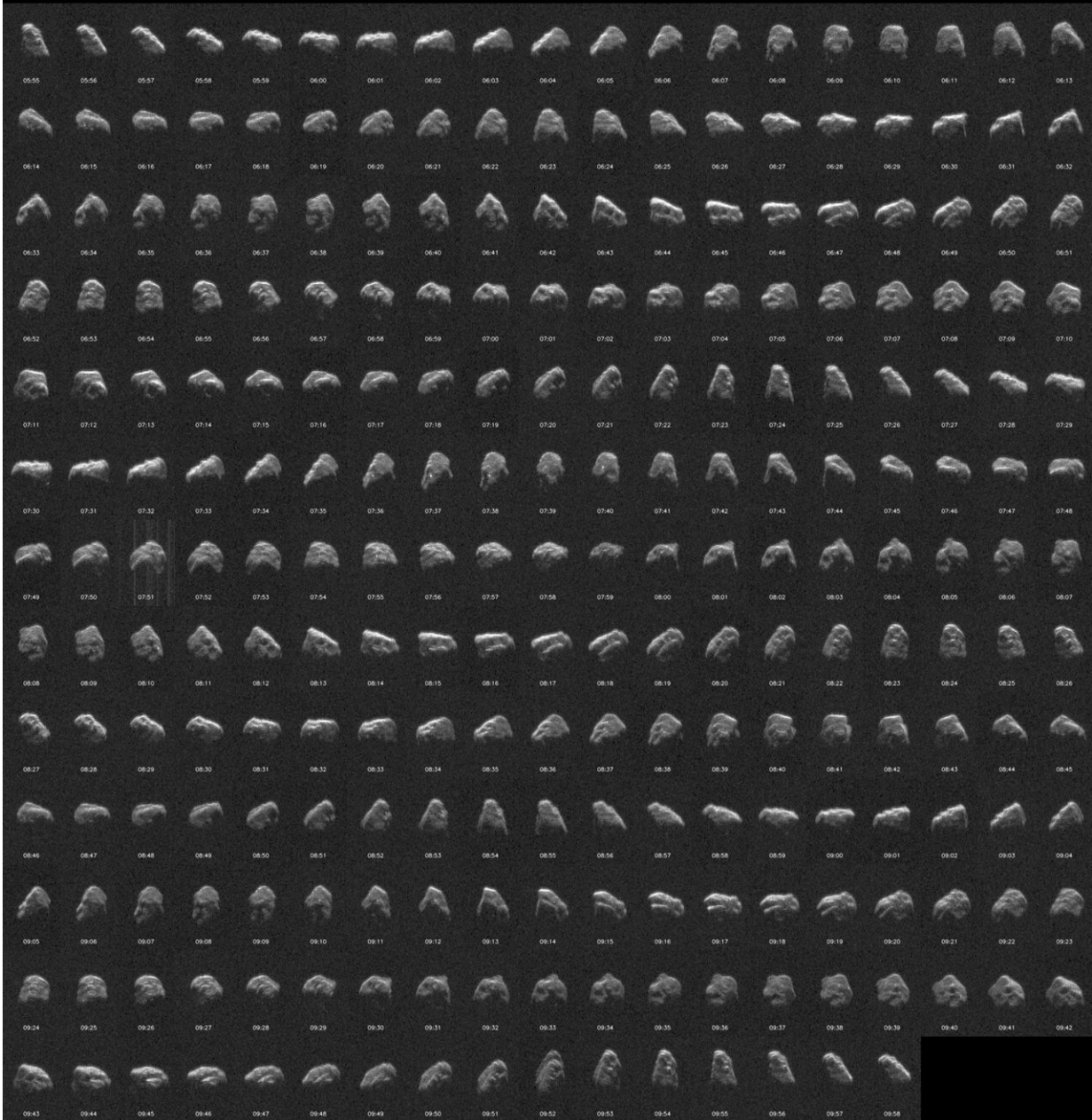
Scientists at NASA's Jet Propulsion Laboratory in Southern California recently tracked two asteroids as they flew by our planet. One turned out to have a little moon orbiting it, while the other had been discovered only 13 days before its [closest approach](#) to Earth. There was no risk of either near-Earth object impacting our planet, but the [radar observations](#) taken during these two close approaches will provide valuable practice for planetary defense, as well as information about their sizes, orbits, rotation, surface details, and clues as to their composition and formation.

Passing Earth on June 27 at a distance of 4.1 million miles (6.6 million kilometers), or about 17 times the distance between the moon and Earth, the asteroid 2011 UL21 was discovered in 2011 by the Catalina Sky Survey, in Tucson, Arizona. But this is the first time it has come close enough to Earth to be imaged by radar. While the nearly mile-wide (1.5-kilometer-wide) object is classified as being potentially hazardous, calculations of its future orbits show that it won't pose a threat to our planet for the foreseeable future.

Using the Deep Space Network's 230-foot-wide (70-meter) Goldstone Solar System Radar, called Deep Space Station 14 (DSS-14), near Barstow, California, JPL scientists transmitted [radio waves](#) to the asteroid and received the reflected signals by the same antenna. In addition to determining the asteroid is roughly spherical, they discovered that it's a [binary system](#): A smaller asteroid, or moonlet, orbits it from a distance of about 1.9 miles (3 kilometers).

"It is thought that about two-thirds of asteroids of this size are binary systems, and their discovery is particularly important because we can use measurements of their relative positions to estimate their mutual orbits, masses, and densities, which provide key information about how they may have formed," said Lance Benner, principal scientist at JPL who helped lead the observations.

Goldstone Radar Images of Asteroid 2024 MK 2024 Jun 30, 05:55:18-09:59:18 UT, 3.75 m x 0.5 Hz



Because close approaches by asteroids the size of 2024 MK are relatively rare, JPL's planetary radar team gathered as much information about the near-Earth object as possible. This mosaic shows the spinning asteroid in one-minute increments about 16 hours after its closest approach with Earth. Credit:

NASA/JPL-Caltech



These seven radar observations by the Deep Space Network's Goldstone Solar System Radar shows the mile-wide asteroid 2011 UL21 during its June 27 close approach with Earth from about 4 million miles away. The asteroid and its small moon (a bright dot at the bottom of the image) are circled in white. Credit: NASA/JPL-Caltech



This sunset photo shows NASA's Deep Space Station 14 (DSS-14), the 230-foot-wide (70-meter) antenna at the Goldstone Deep Space Communications Complex near Barstow, California. NASA/JPL-Caltech

Second close approach

Two days later, on June 29, the same team observed the asteroid 2024 MK pass our planet from a distance of only 184,000 miles (295,000 kilometers), or slightly more than three-quarters of the distance between the moon and Earth. About 500 feet (150 meters) wide, this asteroid appears to be elongated and angular, with prominent flat and rounded regions.

For these observations, the scientists also used DSS-14 to transmit radio waves to the object, but they used Goldstone's 114-foot (34-meter) DSS-13 antenna to receive the signal that bounced off the asteroid and came back to Earth. The result of this "bistatic" radar observation is a detailed image of the asteroid's surface, revealing concavities, ridges, and boulders about 30 feet (10 meters) wide.

Close approaches of near-Earth objects the size of 2024 MK are relatively rare, occurring about every couple of decades, on average, so the JPL team sought to gather as much data about the object as possible.

"This was an extraordinary opportunity to investigate the [physical properties](#) and obtain detailed images of a near-Earth asteroid," said Benner.

The asteroid 2024 MK was first reported on June 16 by the Asteroid Terrestrial-impact Last Alert System (ATLAS) at Sutherland Observing Station in South Africa. Its orbit was changed by Earth's gravity as it passed by, reducing its 3.3-year orbital period around the sun by about 24 days. Although it is classified as a potentially hazardous asteroid, calculations of its future motion show that it does not pose a threat to our planet for the foreseeable future.

Provided by Jet Propulsion Laboratory

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