

The Parkes radio telescope

– Fast Facts

CSIRO Astronomy and Space Science



CSIRO's Parkes telescope is a 64-m diameter parabolic dish used for radio astronomy. It is located about 20 km north of the town of Parkes, NSW, and about 380 km west of Sydney. It is operated by CSIRO Astronomy and Space Science (CASS), a business unit of CSIRO. CASS also operates the Australia Telescope Compact Array near Narrabri, NSW, and the Mopra radio telescope near Coonabarabran, NSW, and is developing the Australian SKA Pathfinder (ASKAP) telescope in Western Australia.

The telescope

The telescope was built in 1961, but only its basic structure has remained unchanged. The surface, control system, focus cabin, receivers, computers and cabling have all been upgraded—some parts many times—to keep the telescope current. The telescope is now ten thousand times more sensitive than when commissioned in 1961.

Did you know?

- NASA copied the telescope's design for the satellite tracking dishes of its Deep Space Network.
- The moving part of the telescope, above the concrete tower, weighs 1000 tonnes—more than two Boeing 747s.
- The telescope can be pointed with an accuracy of better than 11 arcseconds—about the width of a finger seen 150 m away.
- It can detect radio waves from 7 mm to 4 m long.
- The telescope only receives signals from space, never sends them.



> CSIRO's Parkes radio telescope. Photo: David McClenaghan

Using the telescope

The telescope works day and night, and through rain and cloud.

About 85% of all time each year is scheduled for observing. Less than 5% of that is lost because of high winds or equipment problems. Most of the rest of the time each year is used for maintenance and testing.

> Students can control the Parkes telescope over the Internet for education projects. Photo: David Crosling

The moving part of the dish is not fixed to the top of the tower but just sits on it. Because the large surface catches the wind like a sail, the telescope must be 'stowed' (pointed directly up) when the wind exceeds 35 km an hour.

The telescope is used by 300 researchers each year. More than 40% of these users are from overseas.





> Open Days at the Parkes Observatory give the public a chance to view the telescope up close.
Photo: Shaun Amy

Radio astronomy

The radio waves from objects in space are extremely weak by the time they reach Earth. The power received from a strong cosmic radio source by the Parkes telescope is about a hundredth of a millionth of a millionth of a watt (10^{-14} W). If you wanted to heat water with this power it would take about 70 000 years to heat one drop by one degree Celsius.

Galaxies contain stars, gas and dust. The gas—mostly hydrogen—is the raw material from which stars form. It emits radio waves, at a frequency of 1420 MHz. Radio astronomers spend a lot of time studying this gas, learning where it is and how it is moving.

Astronomers don't look through the telescope. Instead, signal processing systems and computers take the radio waves the telescope collects and turns them into pictures (like photographs) of objects in space.

Space tracking

Although not a NASA facility, the Parkes telescope has frequently been contracted to receive signals from NASA spacecraft (and others).

Parkes' first such work was in 1962, when it received signals from the Mariner II space mission. In 1965 it tracked Mariner IV. In 1969 it was a prime receiving station for the Apollo 11 mission. During the 1970s it played a similar role for the Apollo 12, 14, 15 and 17 missions, and was also called in to help during the emergency that occurred during Apollo 13.

In the 1980s, Parkes was used to receive signals from NASA's Voyager II spacecraft and the European Space Agency's Giotto spacecraft. In the 1990s it supported NASA's Galileo mission to Jupiter and the tracking of spacecraft around Mars. In 2005 Parkes was used in an experiment to receive signals from the European Space Agency's Huygens spaceprobe as it plunged into Saturn's moon Titan.

The movie

"The Dish" is an Australian movie, released in 2000, that was loosely based on the Parkes telescope's role in receiving pictures from the Apollo 11 mission, the first manned Moon landing, in July 1969.

The film differed from the real event in several ways. In reality:

- there was no power failure;
- the telescope did not lose track of the spacecraft;
- there were dozens of people at the telescope for the event, not just four;
- there was no animosity between the Australians and the Americans; the relationship was a good one;
- the Prime Minister visited the Honeysuckle Creek tracking station in the ACT rather than Parkes; and
- the first few minutes of the televised broadcast were sourced from the Honeysuckle Creek station.

The film did follow reality in that on the day of the Moonwalk the wind was gusting at 100 km per hour. Normally the telescope would not operate under such conditions, for safety reasons, but the telescope director gave the go-ahead to do it.

Did anyone ever play cricket on the dish? No. And although the film scene was shot on the dish itself, the actors only tossed a tennis ball around.

> The Parkes telescope has discovered the only known system of two pulsars (a special kind of star) orbiting each other. Image: John Rowe Animations

Vital statistics

Diameter of dish
64 m

Collecting area of dish
3,216 m²

Height to top of focus cabin
58 m

Focal length
27.4 m

Weight of dish
300 tonnes

Weight above control tower
1000 tonnes

Maximum tilt
60° from the vertical

Time to maximum tilt
5 minutes

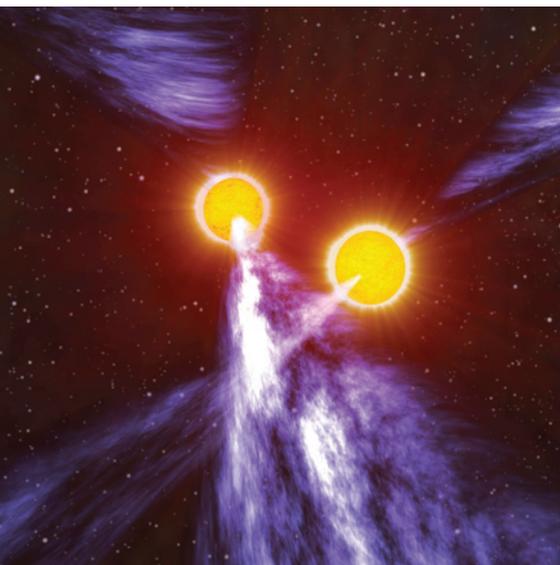
Time for 360° rotation
15 minutes

Surface accuracy
1–2 mm difference from best-fit parabola

Pointing accuracy
11 arcseconds rms in wind (about the width of a finger seen 150 m away)

Maximum operating wind speed
35 km per hour

Motors
4 x 15 hp 480 volt DC
Gear ratios 40,000 : 1



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