

Discovery of intense radio emission from a tiny binary star calls for a review of stellar models

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UNA ESTRELLA DOBLE-DOBLE CON INTENSA EMISIÓN EN RADIO

Desde 2007, una red de antenas parabólicas distribuidas por Australia y Sudáfrica observan el sistema estelar conocido con el nombre de AB Doradus. Las estrellas normalmente emiten luz que podemos ver a simple vista o con telescopios, pero algunas de ellas también emiten ondas de radio, similares a las ondas de TV, teléfonos móviles o microondas.



¿Dónde se encuentra?

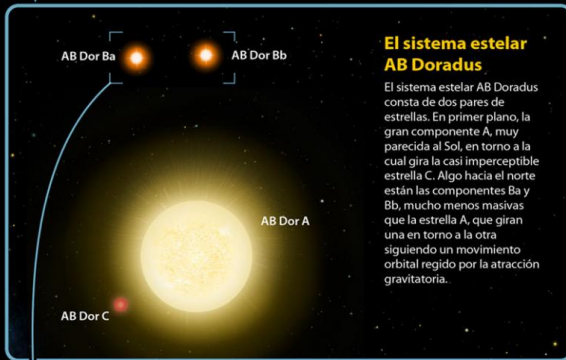
El sistema AB Doradus se encuentra en la constelación del Dorado, en el hemisferio sur. La forma de esta constelación recuerda, quizá de forma vaga, a este tipo de pez.

Red de antenas

Hasta 10 antenas entre Australia y Sudáfrica observan el cielo de manera coordinada constituyendo el equivalente a un único radiotelescopio de miles de kilómetros de extensión. Esta técnica, denominada interferometría de muy larga base, permite ver detalles finísimos en los objetos celestes.

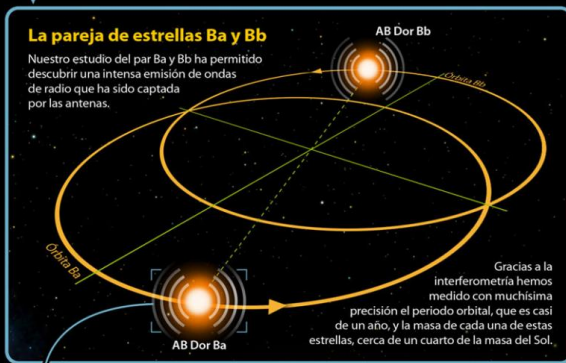


Antenas



El sistema estelar AB Doradus

El sistema estelar AB Doradus consta de dos pares de estrellas. En primer plano, la gran componente A, muy parecida al Sol, en torno a la cual gira la casi imperceptible estrella C. Algo hacia el norte están las componentes Ba y Bb, mucho menos masivas que la estrella A, que giran una en torno a la otra siguiendo un movimiento orbital regido por la atracción gravitatoria.



La pareja de estrellas Ba y Bb

Nuestro estudio del par Ba y Bb ha permitido descubrir una intensa emisión de ondas de radio que ha sido captada por las antenas.

Gracias a la interferometría hemos medido con muchísima precisión el periodo orbital, que es casi de un año, y la masa de cada una de estas estrellas, cerca de un cuarto de la masa del Sol.



Dos estrellas en una

Es difícil medir la masa de estrellas tan poco masivas y tan jóvenes. Nuestro estudio muestra que los modelos de evolución estelar actuales no predicen por qué las estrellas Ba y Bb tienen precisamente esa masa. Quizá necesitemos saber algo más del interior de estas estrellas.

La intensa emisión en radio es un misterio: si tienen sólo un quinto de la masa del Sol, ¿por qué tienen tanta emisión en ondas de radio? La gran velocidad de rotación de cada una de las estrellas nos hace sospechar que tanto Ba como Bb son, a su vez, el resultado de dos estrellas en contacto en altísima rotación que se fundieron en un único objeto. Por ello, hoy en día Ba y Bb aún giran sobre sí mismas con gran velocidad produciendo ondas de radio.

A study led by researchers in the Group of Radio Astronomy of the University of Valencia has determined the mass of a tiny binary star thanks to its intense radio emissions –rare in such small stars– which compels scientists to review stellar evolution models. The findings of this study have just been published in the latest issue of the journal *Astronomy & Astrophysics*.

Specifically, this small [binary star](#) is known as AB Doradus B and is located in the AB Doradus star system, consisting of two pairs of stars. Stars normally emit light that can be seen with the naked eye or through telescopes, but some also emit radio waves, similar to those from televisions, mobile phones or microwave ovens.

These emissions have made it possible to calculate the [mass](#) of the star, which is usually complex, but "when the star is accompanied by another, its orbital motion gives us an accurate way to determine it, as Kepler's laws establish," says the director of the Astronomical Observatory, José Carlos Guirado, co-author of the study. "The mass of these stars cannot be reproduced by the current models of stellar evolution, so we require a major overhaul of these theories," adds the scientist in the Department of Astronomy and Astrophysics.

Two stars in one

Since 2007, researchers at the University of Valencia have been observing the AB Doradus star system through the Australian network of radio antennas known as Long Baseline Array (LBA). The LBA consists

of a total of 10 antennas located between Australia and South Africa which observe the southern sky in a coordinated manner and are the equivalent to a single radio telescope spanning thousands of kilometres. This technique, which combines the observations from several antennas, is called very-long-baseline interferometry and allows [scientists](#) to see very fine details in celestial objects, so much so that if you could take a newspaper to the moon you would be able to read the headlines from the Earth.

The study of the pair Ba and Bb has revealed that these stars, as pointed out by researcher Rebecca Azulay, co-author of the work, "have an intense radio emission that has been captured by the Australian interferometer antennas. But the stars shine at visible wavelengths and not so much at [radio wavelengths](#); then, where do such emissions come from?" asks the scientist.

"The high speed of rotation of each of the stars makes us suspect that both Ba and Bb are, in turn, the result of two [stars](#) in contact at very high rotation rates which merged into a single object. That is why, still today, Ba and Bb revolve on themselves at great speed and produce intense [radio waves](#) in the same way that a bicycle dynamo generates light when the wheels turn," says Azulay.

In the Large Magellanic Cloud

The AB Doradus [star system](#) lies in the constellation of Dorado, a circumpolar constellation visible only from the southern hemisphere and whose form recalls, perhaps vaguely, this type of fish. It is well known because it contains most of the Large Magellanic Cloud, the third closest galaxy to the Milky Way and one of the most attractive extragalactic objects to see with the naked eye.

More information: 'Dynamical masses of the low-mass stellar binary

AB Doradus B.' [DOI: 10.1051/0004-6361/201525704](https://doi.org/10.1051/0004-6361/201525704) *Arxiv:*
arxiv.org/abs/1504.02766

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