



Hubble finds double Einstein ring

More than just a novelty, a very rare phenomenon found with the Hubble Space Telescope can offer insight into dark matter, dark energy, the nature of distant galaxies, and even the curvature of the Universe. A double Einstein ring has been found by an international team of astronomers led by Raphael Gavazzi and Tommaso Treu of the University of California, Santa Barbara.

The phenomenon, called gravitational lensing, occurs when a massive galaxy in the foreground bends the light rays from a distant galaxy behind it, in much the same way as a magnifying glass would. When both galaxies are exactly lined up, the light forms a circle, called an “Einstein ring”, around the foreground galaxy. If another more distant galaxy lies precisely on the same sightline, a second, larger ring will appear.

The odds of seeing such a special alignment are so small that Tommaso Treu said that they had “hit the jackpot” with this discovery. “Such stunning cosmic coincidences reveal so much about nature. Dark matter is not hidden to lensing.”

The massive foreground galaxy is almost perfectly aligned in the sky with two background galaxies at different distances. The foreground galaxy is 3 billion light-years away. The inner ring and outer ring are comprised of multiple images of two galaxies at a distance of 6 billion and approximately 11 billion light-years.

The distribution of dark matter in the foreground galaxy that is warping space to create the gravitational lens can be precisely mapped. In addition, the geometry of the two Einstein rings allowed the team to measure the mass of the middle galaxy precisely at a value of 1 billion solar masses. The team reports that this is the first measurement of the mass of a dwarf galaxy at cosmological distances. A sample of 50 suitable double Einstein rings would be sufficient to measure the dark matter content of the Universe and the equation of state of dark energy to a precision of 10 percent.

(Taken from <http://www.sciencedaily.com/releases/2008/01/080110102319.htm>)

EXERCISES

1 True or false?

- A double Einstein ring is quite a common observable phenomenon. T F
- The distribution of dark matter that is warping space and creates gravitational lensing can be precisely mapped. T F
- To observe a double Einstein Ring three galaxies must be almost perfectly aligned. T F
- The measurement of the mass of the dwarf galaxy was the first to be made at cosmological distances. T F

2 Find and correct mistakes.

- A team of Native American astronomers observed the double Einstein Ring.
- Gravitational lensing occurs when a massive galaxy in the foreground bends the light rays from a distant galaxy in front of it.
- This was the first measurement of the mass of a dwarf galaxy at planetary distances.
- Dark matter cannot be observed through gravitational lensing phenomenon.
- The inner ring and outer ring of this double Einstein ring are comprised of a single image of the two galaxies .

3 Match questions and answers.

QUESTIONS		ANSWERS	
A	What is gravitational lensing?	1	Observing two Einstein rings it is possible to measure the mass of the middle galaxy.
B	What can be measured through the geometry of two Einstein rings?	2	A sample of 50 suitable observations would be sufficient to measure the dark matter content of the Universe to a precision of 10 percent.
C	How many double Einstein rings observations are required to measure the dark matter content of the Universe?	3	It is a phenomenon that can be observed when a massive galaxy in the foreground bends the light rays from a galaxy behind it.

A

B

C