The behemoth has a thick belt

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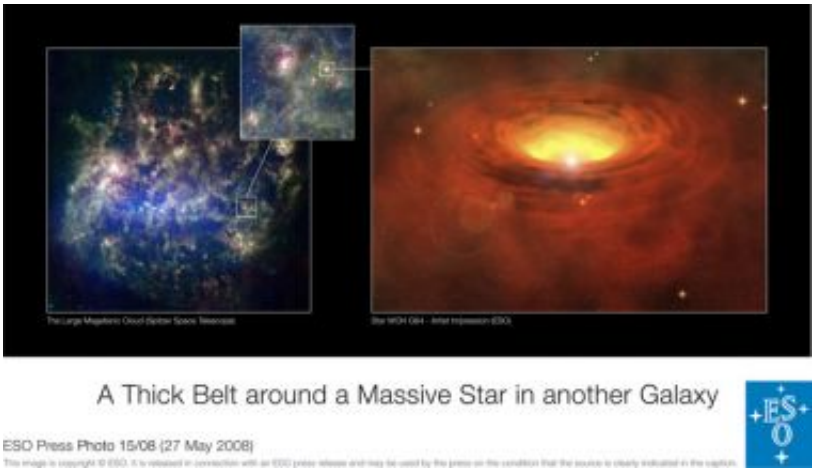

The position of the supergiant star WOH G64 in the Large Magellanic Cloud, one of the Milky Way's neighbouring galaxies, is shown in this Spitzer image (left). On the right, an artist's impression is provided of the thick, massive torus of matter surrounding the star as inferred from observations made with ESO's Very Large Telescope Interferometer. This is the first time that MIDI resolves an individual star in a neighbouring galaxy. Credit: ESO

Talk about a diet! By resolving, for the first time, features of an individual star in a neighbouring galaxy, ESO's VLT has allowed astronomers to determine that it weighs almost half of what was previously thought, thereby solving the mystery of its existence. The behemoth star is found to be surrounded by a massive and thick torus of gas and dust, and is most likely experiencing unstable, violent mass loss.

WOH G64 is a red supergiant star almost 2 000 times as large as our Sun

and is located 163 000 light-years away in the Large Magellanic Cloud, one of the Milky Way's satellite galaxies.

"Previous estimates gave an initial mass of 40 times the mass of the Sun to WOH G64. But this was a real problem as it was way too cold, compared to what theoretical models predict for such a massive star. Its existence couldn't be explained," says Keiichi Ohnaka, who led the work on this object.

New observations, made with ESO's Very Large Telescope Interferometer, conclude that the gas and dust around the star is arranged in a thick ring, rather than a spherical shell, and the star is thus less hidden than had been assumed. This implies that the object is in fact half as luminous as previously thought, and thus, less massive. The astronomers infer that the star started its life with a mass of 25 solar masses. For such a star, the observed temperature is closer to what one would expect.

"Still, the characteristics of the star mean that it may be experiencing a very unstable phase accompanied by heavy mass loss," says co-author Markus Wittkowski from ESO. "We estimate that the belt of gas and dust that surrounds it contains between 3 and 9 solar masses, which means that the star has already lost between one tenth and a third of its initial mass."

To reach this conclusion, the team of astronomers used the MIDI instrument to combine the light collected by three pairs of 8.2-m Unit Telescopes of the VLT. This is the first time that MIDI has been used to study an individual star outside our Galaxy.

The observations allowed the astronomers to clearly resolve the star. Comparisons with models led them to conclude that the star is surrounded by a gigantic, thick torus, expanding from about 15 stellar

radii (or 120 times the distance between the Earth and the Sun - 120 AU!) to more than 250 stellar radii (or 30 000 AU!).

"Everything is huge about this system. The star itself is so big that it would fill almost all the space between the Sun and the orbit of Saturn," says Ohnaka. "And the torus that surrounds it is perhaps a light-year across! Still, because it is so far away, only the power of interferometry with the VLT could give us a glimpse on this object. "

Source: ESO