

Milky Way is 13.000 Million Years Old

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Observations by an international team of astronomers with the UVES spectrometer on ESO's Very Large [Telescope](#) at the Paranal Observatory (Chile) have thrown new light on the earliest epoch of the Milky Way [galaxy](#). The first-ever measurement of the Beryllium content in two stars in a globular cluster (NGC 6397) - pushing current astronomical technology towards the limit - has made it possible to study the early phase between the formation of the first generation of stars in the Milky Way and that of this stellar cluster. This time interval was found to amount to 200 - 300 million years.

The age of the stars in NGC 6397, as determined by means of stellar

evolution models, is $13,400 \pm 800$ million years. Adding the two time intervals gives the age of the Milky Way, $13,600 \pm 800$ million years.

The currently best estimate of the age of the Universe, as deduced, e.g., from measurements of the Cosmic Microwave Background, is 13,700 million years. The new observations thus indicate that the first generation of stars in the Milky Way galaxy formed soon after the end of the ~200 million-year long "Dark Ages" that succeeded the Big Bang.

A proper understanding of the formation and evolution of the Milky Way system is crucial for our knowledge of the Universe. Nevertheless, the related observations are among the most difficult ones, even with the most powerful telescopes available, as they involve a detailed study of old, remote and mostly faint celestial objects.

Using the high-performance UVES spectrometer on the 8.2-m Kuyen telescope of ESO's Very Large Telescope at the Paranal Observatory (Chile) which is particularly sensitive to ultraviolet light, a team of ESO and Italian astronomers succeeded in obtaining the first reliable measurements of the Beryllium content in two TO-stars (denoted "A0228" and "A2111") in the globular cluster NGC 6397 (PR Photo 23b/04). Located at a distance of about 7,200 light-years in the direction of a rich stellar field in the southern constellation Ara, it is one of the two nearest stellar clusters of this type; the other is Messier 4.

The observations were done during several nights in the course of 2003. Totalling more than 10 hours of exposure on each of the 16th-magnitude stars, they pushed the VLT and UVES towards the technical limit. Reflecting on the technological progress, the leader of the team, ESO-astronomer Luca Pasquini, is elated: "Just a few years ago, any observation like this would have been impossible and just remained an astronomer's dream!"

According to the best current spallation theories, the measured amount of Beryllium must have accumulated in the course of 200 - 300 million years. Italian astronomer Daniele Galli, another member of the team, does the calculation: "So now we know that the age of the Milky Way is this much more than the age of that globular cluster - our galaxy must therefore be $13,600 \pm 800$ million years old. This is the first time we have obtained an independent determination of this fundamental value!".

Within the given uncertainties, this number also fits very well with the current estimate of the age of the Universe, 13,700 million years, that is the time elapsed since the Big Bang. It thus appears that the first generation of stars in the Milky Way galaxy was formed at about the time the "Dark Ages" ended, now believed to be some 200 million years after the Big Bang.

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