



Chandra Science Highlight

Supernova 1987A: The Remnant of an Exploded Star in the Large Magellanic Cloud Galaxy

Chandra X-ray Observatory ACIS spectra



Scale: The ring is 1.4 light years in diameter and subtends an angle of 1.6 arc seconds.

The Chandra X-ray image (left) reveals a ring of multimillion-degree gas produced by the collision of an outward-moving supernova shock wave with a ring of cool circumstellar gas. The optical image (right) from the Hubble Space Telescope shows a ring of bright spots that are also caused by the

shock wave hitting the cool gas.

(Credit: X-ray: NASA/MSFC/CXC/U.Colo./S.Zhekov et al./

Optical: NASA/STScI/CfA/P.Challis).

- X-ray spectra obtained with Chandra show that the velocity of the shock wave is much less than the velocity inferred from the radial expansion rate of the X-ray image.
- The low measured velocities indicate that the X-rays and the optical bright spots are produced by a shock wave that has encountered relatively dense fingers of gas protruding from the circumstellar ring.
- The fingers of dense gas were likely produced long ago by the interaction of the high-speed wind with the dense circumstellar cloud.
- As the supernova shock wave plows deeper into the cool cloud the ring should become larger and much brighter in both optical and X-ray light.

Reference: S.A. Zhekov, et al. *Astrophysical Journal Letters*, 628, L127 (2005).