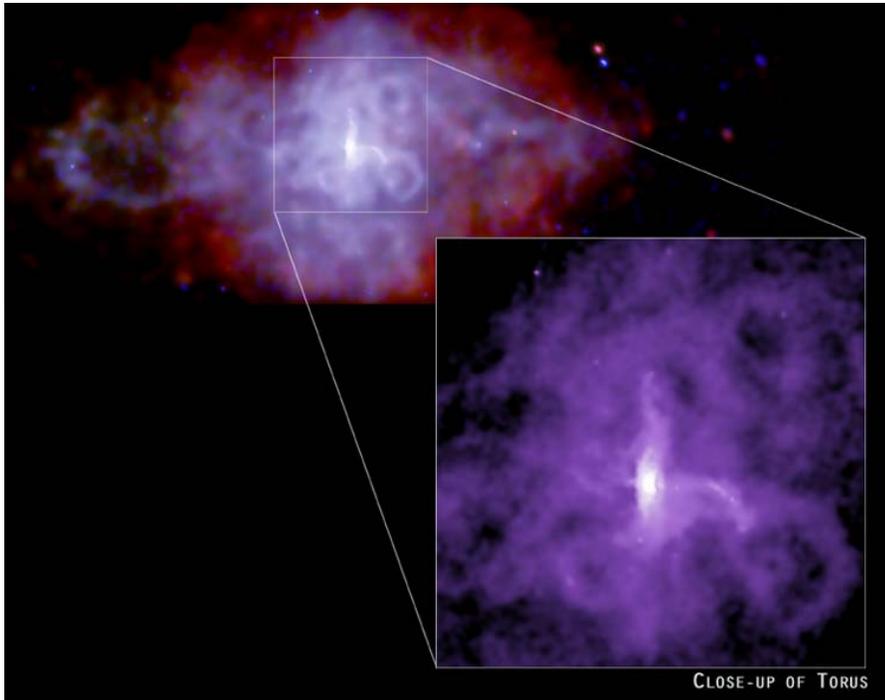




# Chandra Science Highlight

## 3C58: A young supernova remnant with a cool central neutron star

Chandra X-ray Observatory ACIS Image



3C58 is the remnant of a supernova observed in the year 1181 by Chinese and Japanese astronomers. A long look by Chandra shows that the central pulsar is surrounded by a bright torus of X-ray emission. An X-ray jet erupts in both directions from the center of the torus, and extends over a distance of a few light years. Further out, an intricate web of X-ray loops can be seen.

- The pulsar, a rapidly rotating neutron star, has a 16-millisecond period: the present observations provide strong evidence that the surface of the 3c58 pulsar has a temperature  $< 0.9$  MK.
- The low temperature at an observed age of about 820 years points to enhanced cooling of the neutron star, perhaps by an excess of protons or the presence of pion condensates or other exotic forms of nuclear matter.
- The emission from the rings, jets and loops has a nonthermal spectrum consistent with synchrotron radiation from extremely high energy particles in the magnetic field of the nebula.
- The outermost regions of the nebula require a thermal emission component due to a shock wave produced by the expanding supernova ejecta.

*Reference: P. Slane et al. 2004 Astrophys. J. 616, 403*