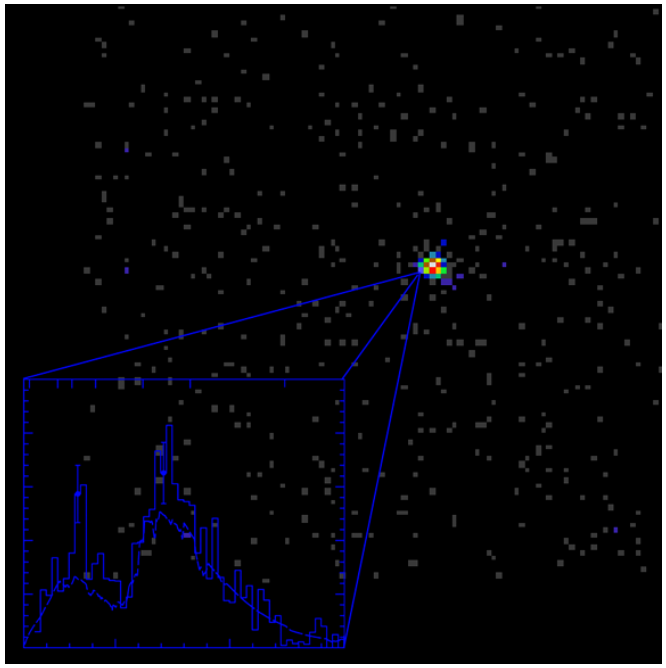
Chandra Science Highlights

GRB991216: A Gamma-Ray Burst that Exploded Roughly 8 Billion Years Ago



NASA's Chandra X-ray Observatory was used to measure the spectrum of the X-ray afterglow of a gamma-ray burst 37 hours after the burst, for a time of 3.4 hours. The proposed identification of lines in the spectrum with emission from highly ionized iron ions enabled astronomers to estimate the redshift, mass, and motion of the material. The results imply that ~0.01 solar masses of iron was ejected before the burst at a speed of about 0.1 the speed of light.

Credit: NASA/CNR/L. Piro et al.

Chandra X-ray Observatory HETG/ACIS spectrum/image.

Scale: 1 arcmin on a side.

- Spectral features identified with H-like iron and an iron recombination edge at a redshift z=1.00 +/- 0.02.
- From the line strength and the detection of the line 1.5 days after the burst, the mass of iron in the emitting region is estimated to be ~0.01 solar masses.
- The line width implies kinematic broadening with a velocity v~0.1 c
- The deduced size of the emitting region implies that the material was ejected a few months before the GRB, favoring a hypernova model for GRB.

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