X-ray afterglow observations of Gamma-Ray Bursts with Chandra and ASCA (Iron line diagnosis in X-ray afterglows)

T. Murakami, D. Yonetoku (*Institute of Space and Astronautical Science (ISAS), 3-1-1, Yoshinodai, Sagamihara, Kanagawa 229-8510 Japan, murakami@astro.isas.ac.jp*),
A. Yoshida (*Department of Physics, Aoyama Gakuin University, 6-16-1, Chitosedai, Setagaya, Tokyo, 157-8572 Japan*),

Abstract

A gamma-ray burst of 28 August 1997 was localized by the All-Sky Monitor onboard the RXTE satellite and its coordinates were promptly disseminated. An ASCA followup started 1.17 days after the burst as a Target of Opportunity Observation and detected an X-ray afterglow. The data displayed in spectra a *hump* around ~ 5 keV. This *hump* structure is likely a recombination edge of iron in the vicinity of the source, taking account of the redshift $z = 0.9578$ found for the likely host galaxy of the associated radio flare by Keck. However, it is very curious that there was no iron Kα line detected. Radiative Recombination edge and Continuum model can interpret the spectrum from highly ionized plasma in a non equilibrium ionization state.

Iron spectral features are thought to be the best tracer of a progenitor of GRBs. The detections of spectral features such as an iron line and/or a Radiative Recombination edge and Continuum (RRC) were reported in four X-ray afterglows of GRBs. However their properties were different each other burst by burst. For example, Chandra observation of GRB 991216 detected both the strong H-like iron line together with its RRC feature. On the contrary, ASCA reports only a detection of the strong RRC in GRB 970828. Since it is difficult to produce the strong RRC, we have to consider some special condition for the line and/or the RRC forming region. In this poster, we point out a possibility of a *"non-equilibrium ionization state"* for the line and the RRC forming region and also we discuss probable mechanisms to produce the RRC feature.
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