

Suzaku observations of cyclotron resonances in binary X-ray pulsars

Y. Terada (1), T. Mihara (1), F. Nagase (2), T. Dotani (2), T. Enoto (3), S. Kitamoto (4), T. Kohmura (5), M. Kokubun (3), T. Kotani (6), K. Makishima (1,3), S. Naik (2), M. Nakajima (1), S. Sugita (7), K. Sudoh (4), M. Suzuki (1), H. Takahashi (3), D. Yonetoku (8), A. Yoshida (7)

(1) RIKEN, Japan, (2) ISAS/JAXA, Japan, (3) Univ. of Tokyo, Japan, (4) Rikkyo Univ., Japan, (5) Tokyo Urban Tech, Japan, (6) Tokyo Tech, Japan, (7) Aoyama Gakuin Univ., Japan, (8) Kanazawa Univ., Japan (terada@riken.jp, phone +81+48-462-4874)

Since the typical magnetic field strengths of neutron stars reach 10^{12} Gauss, the cyclotron resonance by a transition between Landau levels appears in the X-ray band. Systematic measurements of cyclotron absorption features in bright persistent sources have been carried out extensively with Ginga, RXTE, BeppoSAX, and INTEGRAL. Now, the cyclotron resonance phenomena can be studied with a higher sensitivity over a wider hard X-ray band than before, thanks to the Hard X-ray Detector onboard the fifth Japanese X-ray satellite, Suzaku, launched in July 2005. Suzaku observed Her X-1 mainly for calibration purposes, and successfully confirmed its well-known cyclotron absorption. Furthermore, the transient pulsar A0535+26 was observed with Suzaku on 14 September 2005, in the decay phase of its minor outburst (ATEL 595). The cyclotron resonance of A0535+26 was successfully detected in absorption at about 45 keV (ATEL 613), even the object was as dim as 30 mCrab. When compared with previous measurements of the same feature achieved at much brighter phases (e.g., ATEL 601,605), the Suzaku results give a new constraint to luminosity-related changes in the resonance energy which are observed in other binary pulsars (Nakajima et.al 2006; astro-ph/0601491).