

Principal Researcher	Hideyo Kunieda			Number of Reserchers	4	
Research Institution • Department • Title	Professor, High energy astrophysics division, Institute of Space and Astronautical Science			Location of Institution	Sagamihara	
Title of Project	Search for Hard X-ray objects with balloon borne supermirror hard X-ray telescopes					
Abstract of Research Project	<p>In X-ray astronomy, high energy phenomena have been investigated mainly by observing emission of thermal components. However, new evidences are being found for the existence of power law spectra from non-thermal components. We are going to explore non-thermal phenomena with hard X-ray telescopes with multilayers to cover up to 60 keV.</p> <p>The first supermirror hard X-ray telescope was launched in a balloon experiment under the collaboration with the groups at NASA Goddard Space Flight Center. In the first experiment in July 2001, the hard X-ray image of Cyg X-1 in 20-40 keV band was successfully observed for the first time in the world.</p> <p>The first part of our program is the continuation of the balloon campaign with the NASA groups with improved telescopes. The second half is our own balloon experiment in India. The balloon system will be newly designed for our particular observations.</p> <p>Our major goal is to establish the astronomy in the hard X-ray band by performing several balloon observations of galaxy clusters and active galaxies.</p> <p>In addition to our science, the hard X-ray optics developed in our program can be applied for the research of biology and medical fields, since it can manipulate hard X-rays used in medical systems.</p>					
References	<p>"Supermirror hard X-ray telescopes", K. Yamashita, P. J. Serlemitsos, J. Tueller, H. Kunieda et al., Appl.Opt.Vol. 37, No. 34, 8067-8073 (1998).</p> <p>"X-ray telescope onboard AstroE: I. Optical design and fabrication of thin foil mirrors", H. Kunieda, M. Ishida, T. Endow, et al., Appl. Opt. Vol. 40, 553-564 (2001)</p>					
Term of Project	Fiscal years 2003-2007 . (5years)					
Budget Allocation (in thousand of yen)	FY2003	FY2004	FY2005	FY2006	FY2007	TOTAL
	26,100	12,900	12,900	12,900	9,400	74,200
Homepage Address	Under construction					