

【Grant-in-Aid for Specially Promoted Research】
Science and Engineering (Mathematics/Physics)

Title of Project : Cosmic evolution study by using a combination between the high sensitivity X-ray CCD and the super mirror



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Research Area : Science and Engineering, Mathematical and physical sciences, Astronomy

Keyword : X-ray/ γ -ray astronomy

【Purpose and Background of the Research】

Our universe started from the Big Bang about 13.7 billion years ago and is still evolving. We can study its evolution by measuring of the brightness distribution of our universe. There are many Active Galactic Nuclei (AGN) that are believed to have giant black holes. AGN generate Cosmic X-ray background (CXB) that becomes the brightest around 40keV. Due to the technological constraint, X-ray observations with high sensitivity were done only below 10keV (soft X-ray). We need perform high sensitivity observation above 10keV (hard X-ray). With taking into account the CXB spectrum, a new frontier is left at hard X-ray band.

X-ray observation using X-ray focusing telescope is concentrated in the very narrow region in pointing mode. On the contrary, scanning observation for a large sky area is done by using non-focusing telescope. We have to cover various targets in brightness that cannot be done so far. We plan to observe a large sky area using a focusing super mirror covering the energy up to 80keV. We are eager to perform the observation to reveal the evolution of the universe based on our idea.



【Research Methods】

We will continue the scan observation in hard X-ray by using MAXI onboard the ISS that has no focusing telescope. ASTRO-H to be launched in FY2013 will observe hard X-ray using focusing telescope. It will focus on a pointing mode. In this context, we are

planning to have the FFAST mission that consists of two small satellites. One carries a super mirror developed in Nagoya University, covering the X-ray energy up to 80keV. The other carries an SDCCD developed in Osaka University. The figure left bottom shows the FFAST image in orbit.

【Expected Research Achievements and Scientific Significance】

The FFAST mission will perform a scan observation of a large sky region by using a focusing super mirror for the first time. This will help us to reveal the evolution of the universe.

Formation flight projects were proposed in US and in Europe while they are cancelled. We will use the formation flight technology developed in JAXA. It will be the first mission from the engineering point of view.

【Publications Relevant to the Project】

Hiroshi TSUNEMI, Kiyoshi HAYASHIDA, Naohisa ANABUKI, Rui SAKAGUCHI, Hideyo KUNIEDA, Yasushi OGASAKA, Masayuki ITOH, Masanobu OZAKI, Isao KAWANO, and FFAST team, "High Energy X-Ray Sky Observation by the Formation Flight All Sky Telescope", Transaction of JSASS Aerospace Tech Japan, To_4_7-12, 2010

Hiroshi Tsunemi, Shutaro Ueda, Kazuo Shigeyama, Koji Mori, Shoichi Aoyama, Shinichiro Takagi, "Performance of a newly developed SDCCD for X-ray use", Nucl. Instrum. and Meth. 10.1016/j.nima.2010.08.118

【Term of Project】 FY2011-2015

【Budget Allocation】 424,800 Thousand Yen

【Homepage Address and Other Contact Information】

<http://wwwxray.ess.sci.osaka-u.ac.jp/ffast/FFAST/Top.html>

http://wwwxray.ess.sci.osaka-u.ac.jp/OskXrayTlabHP/Tsunemi_Labo.html