

【Grant-in-Aid for Scientific Research (S)】

Science and Engineering (Mathematical and Physical Sciences)



Title of Project : Study of Large-scale Cosmic Plasmas by Wide-field X-ray Spectroscopy Observations

Takaya Ohashi

(Tokyo Metropolitan University, Graduate School of Science and Engineering, Professor)

Research Project Number : 26220703 Researcher Number : 70183027

Research Area : Mathematics and Physical Sciences, Astronomy

Keyword : Astronomy of X-ray and γ -ray

【Purpose and Background of the Research】

In the local universe, the ordinary matter (baryons) remains undetected and called as dark baryons. They are likely to trace large-scale structures as intergalactic medium with temperatures around 10^6 K, but their observational properties remain unclear yet. An almost only method to detect emission from dark baryons is to observe redshifted emission lines with high energy resolution. This research aims to develop a small satellite DIOS (Diffuse Intergalactic Oxygen Surveyor: Fig. 1) to be launched in 2020. The observational instrument consists of TES microcalorimeter array, cryogen free cooling system and 4 reflection X-ray telescope, and the grasp (solid angle times area) below 2 keV is as large as that of a large future X-ray observatory. The high resolution spectroscopy from DIOS will also clarify gas motions from earth's neighborhood to clusters of galaxies.

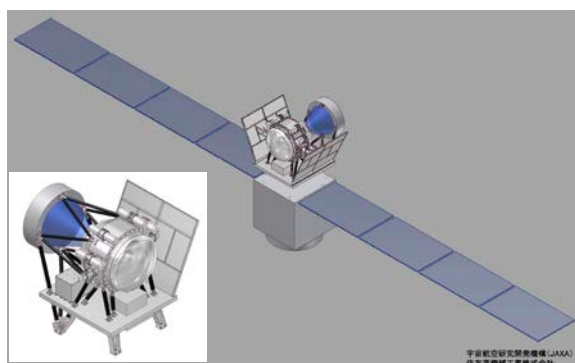


Fig. 1: Schematic view of DIOS, aiming for a launch in 2020. Solar paddle length is about 10 m, and spacecraft weight is about 700 kg.

【Research Methods】

Aiming at the launch of DIOS in 2020, this research will combine expertise of Tokyo Metropolitan University, Nagoya University and ISAS/JAXA, as well as groups in the US and in Europe who have successful collaboration record. We hope to finish the flight model production in the research term.

The first year is performance verification, 2nd year for detailed design after the mission selection, and in the 3rd to 5th year payload production will be carried out. The satellite test will be after this

research term, but flight model of observing instruments will be produced with this budget.

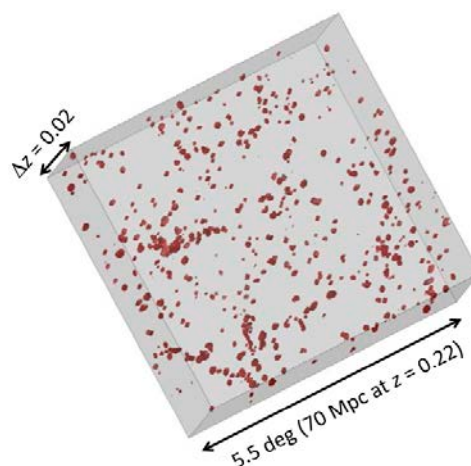


Fig. 2: Simulation of DIOS observation of dark baryons. Survey for 2 years will show large-scale filaments.

【Expected Research Achievements and Scientific Significance】

DIOS will reveal large-scale filaments of dark baryons as shown in Fig. 2, which gives a simulation result based on simultaneous detection of OVII and OVIII lines above 5 sigma.

【Publications Relevant to the Project】

- T. Ohashi et al. "Status of the Diffuse Intergalactic Oxygen Surveyor (DIOS)", SPIE, **8443**, article id. 844319 (2012)
- T. Ohashi et al. "X-ray study of cluster edge and beyond", *Astronomische Nachrichten*, **334**, 325 (2013)

【Term of Project】 FY2014-2018

【Budget Allocation】 158,500 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www-x.phys.se.tmu.ac.jp/home/wp/>