Development of public release system of science mission data from KPLO and future space explorations

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We present the optical design of Linear Astigmatism Free - Three Mirror System (LAF-TMS) D200 for UVO-Multiband Polarizing Imager System (UVOMPIS). LAF-TMS D200 is the off-axis wide-field telescope with EPD = 200 mm, F/2, and Field of View (FoV) = 2’ × 4’. Its optical mirrors are optimized to freeform surfaces for high-quality optical performance over a wide FoV. The proposed mirror holder consists of four aluminum optomechanical modules that have applied for LAF-TMS D150 which is a prototype of the LAF-TMS system. It can accurately mount mirrors and also can sustain from vibration environments. As a feasibility study, quasi-static, modal, harmonic, and random vibration analyses have been performed to LAF-TMS D150 optomechanical structure under the qualification level of the Soyuz-2/Fregat launch system. We evaluate the vibration analysis results in terms of von Mises stress and Margin of Safety.

Deep Learning Study of the 21cm Differential Brightness Temperature During the Epoch of Reionization

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We propose a deep learning analysis technique with a convolutional neural network (CNN) to predict the evolutionary track of the Epoch of Reionization (EoR) from the 21-cm differential brightness temperature tomography images. We use 21cmFAST, a fast semi-numerical cosmological 21-cm signal simulator, to produce mock 21-cm maps between z = 6 ~ 13. We then apply two observational effects, such as instrumental noise and limit of (spatial and depth) resolution somewhat suitable for realistic choices of the Square Kilometre Array (SKA), into the 21-cm maps. We design our deep learning model with CNN to predict the sliced-averaged neutral hydrogen fraction from the given 21-cm map. The estimated neutral fraction from our CNN model has great agreement with the true value even after coarsely smoothing with broad beam size and frequency bandwidth and heavily covered by noise with narrow beam size and frequency bandwidth. Our results show that the deep learning analyzing method has the potential to reconstruct the EoR history efficiently from the 21-cm tomography surveys in future.

Optical Design for UVOMPIS and Design Concept of the Mirror Holder

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