Spread Function (PSF) produced by scatterings and diffraction effects within the optical system and beyond (baffle). To assess the various factors affecting the PSF in this design, we use PhoSim, the Photon simulator, which is a fast photon Monte Carlo code designed to include all these effects, and also atmospheric effects (for ground-based telescopes) and phenomena occurring inside of the sensor. PhoSim provides very realistic simulations results and is suitable for simulations of very weak signals.

Before the application to the MESSIER optics system, PhoSim had not been validated for confocal off-axis reflective optics (LAF-TMS). As a verification study for the LAF-TMS design, we apply Phosim sequentially.

First, we use a single parabolic mirror system and compare the PSF results of the central field with the results from Zemax, CODE V, and the theoretical Airy pattern. We then test a confocal off-axis Cassegrain system and check PhoSim through cross-validation with CODE V.

At the same time, we describe the shapes of the freeform mirrors with XY and Zernike polynomials. Finally, we will analyze the LAF-TMS design for the MESSIER optical system.

[포 AT-04] Standard Calibration for Broadband and Narrowband Filters of KHAO 0.4 m Telescope

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Maemi Dual Field Telescope System (MDFTS) is a dual telescope system located at Kyung Hee University. The system consists of 0.4 m telescope and 0.1 m telescope for wide-field observation. The 0.4 m telescope provides photometric observation which covers a field of view of 21'×16'. It has been used for various purposes with Johnson-Cousins UBVRI broadband filter system, e.g., SomangNet and Intensive Monitoring Survey of Nearby Galaxies. In this poster, we present the standard calibration result for our broadband filter system. Also, we suggest a new usage of the KHAO 0.4m telescope which is narrowband photometry by demonstrating the standard calibration of H-alpha filter. For flux calibration, not only R filter but also V filter is used for compensating the central wavelength discrepancy between R filter and H-alpha filter.

[포 AT-05] Characterization of the performance of the next-generation controller for the BOES CCD

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We present the characterization of the performance of the next-generation controller (SDSU Gen III) for BOAO Echelle Spectrograph CCD (BOES CCD) at the Bohyunsan Optical Astronomy Observatory. The current controller (SDSU Gen II) of the BOES CCD will be upgraded to SDSU Gen III to provide a more stabilized operation. To assess the performance of the new controller (e.g., conversion gain, full well capacity, S/N), we obtain various types of calibration images (e.g., bias, flat, science images of standard stars). Based on those datasets, we find that the overall performance of the new controller is somewhat comparable to that of the old controller if the slow mode is adopted for the readout. This may demonstrate that the new controller can be successfully substituted for the old controller without a substantial loss of performance. However, further analysis with a large dataset obtained in various observational conditions is necessary to confirm our results.

[포 AT-06] Development Plan for the First GMT ASM Reference Body

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GMT secondary mirror system consists of 7 segmented adaptive mirrors. Each segment consists of a thin shell mirror, actuators and a reference body. The thin shell has a few millimeters of thickness so that it can be easily bent by push and pull force of actuators to compensate the wavefront disturbance of light due to air turbulence. The one end of actuator is supported by the reference body and the other end is adapted to this thin shell. One of critical role of the reference body is to provide the reference surface for the thin shell actuators. Therefore, the reference body is one of key components to succeed in development of GMT ASM. Recently,

Korea Research Institute of Standards and Science (KRISS) and University of Arizona (UA) has signed a contract that they will cooperate to develop the first set of off-axis reference body for GMT ASM. This project started August 2021 and will be finished in Dec. 2022.

The reference body has total 675 holes to accommodate actuators and 144 pockets for lightweighting. The rear surface has a curved rib shape with radius of curvature of 4387 mm with offset of 128.32mm. Since this reference body is placed just above the thin shell so that the front surface shape needs to be close to that of thin shell. The front surface has a concave off-axis asphere, of which radius of curvature is 4165.99 mm and off-axis distance is about 1088 mm. The material is Zerodur CTE class 1 (CTE=0.05 ppm/oC) from SCHOTT. All the actuator holes and pockets are machined normal to the front surface. It is a very complex challenging optical elements that involves sophisticated machining process as well as accurate metrology. After finishing the fabrication of reference body in KRISS, it will be shipped to UA for final touches and finally sent to Adoptica in Italy, in early 2023. This paper presets the development plan for the GMT ASM Reference Body and relevant fabrication and metrology plans.

[포 AT-07] Space Telescope Pre-study of KASI for the Next Decades (2030년대 우주망원경 운영을 대비한 한국천문연구원의 우주망원경 사전 연구)

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한국천문연구원은 천문우주분야의 과학임무 탑재체 개발을 주도적으로 수행해오고 있다. 과학기술위성1호 주탑재체 원자외선영상분광기 FIMS 개발, 과학기술위성3호 주탑재체 다목적적외선영상시스템 MIRIS 개발, 차세대소형위성1호 주탑재체 근적외선영상분광기 NISS 개발을 수행하였고, 현재는 NASA와 국제협력으로 SPHEREx 우주망원경을 개발하고 있다.

이러한 개발 과정을 거치면서 주경 20cm 이하의 소형 탑재체 과학임무 한계와 더불어 연구 현장에서 더 큰 우주망원경의 수요가 제기되었고, 현재의 국가우주개발 중장기계획에도 2030년대 한국형 우주망원경을 포함하게 되었다. 이러한 일정에 발맞추어 한국천문연구원은 2030년대 한국형 우주망원경 독자 운영을 대비하기 위해서 2020년 1월부터 주요 사업으로 한국형 우주망원경 개발을 위한 기획연구를 시작하였다. 이 기획연구는 2021년 말까지 2년 동안 수행하고 있으며, 이 기획연구를 통해서 학계의 과학임무 요구사항을 종합 수렴하였고, 관련 컨설팅 업체와 협업하여 사전 기획연구 활동들을 수행하였으며, 향후 우주망원경 개발에 대한 전략을 제안하고 보고서를 마무리하는 단계에 와 있다. 이 발표에서는 이러한 기획연구의 세부 활동을 공유하고 보고하고자 한다.

[포 AT-08] Development Plan of Package-type Instruments for Next-Generation Space Weather Observation Network

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Starting with the observation of sunspots in 1987, Korea Astronomy and Space Science Institute (KASI) has developed and installed various ground-based instruments for space weather research in Korea. Recently, SNIPE and CODEX are also being developed as space-based instruments. Expansion of the observation area and simultaneous observation have become important in the study of space weather. We have started Next-Generation Space Weather Observation Network Project this year. In order to establish a solar observation network, we planned to develop the Next Solar Telescope (NxST) which is a solar imaging spectrograph, and to install three NxST in the northern hemisphere. And we also planned to develop the Thermosphere-Ionosphere-Mesosphere Observation System (TIMOS), Global Navigation Satellite System (GNSS), and Geomagnetic packages, and install them in about ten sites over the world, for the purpose of establishing a global observation network for the near-earth space weather. We can take simultaneously observed space weather data in the global area, and are expecting it will play an important role in the international community for space weather research. We also have a strategy to secure observational technologies necessary for big space missions in the future, through this project.

태양/태양계

[포 SS-01] Measurement of Radiative Loss from the Multi-layer Spectral Inversion of