capabilities of G-CLEF.

[구 AT-05] Preliminary Design of the G-CLEF Flexure Control Camera

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The GMT-Consortium Large Earth Finder(G-CLEF) is one of the first light instruments at the Giant Magellan Telescope. The international consortium consists of five astronomical institutes including the Center for Astrophysics, the Observatories of Carnegie Institute, the University of Catolica in Chile, the University of Chicago, and Korea Astronomy and Space Science Institute, led by CfA. The extremely precise radial velocity capability is one of the principal instrumental feature of G-CLEF. The RV goal is 10 cm/s capable of detecting an Earth-like planet around a Sun-like host star. This high precision wavelength calibration stability requires a set of significantly tight optomechanical tolerances in the mechanical design of the Flexure Control Camera system. KASI is in charge of the Flexure Control Camera and the Calibration Light System for the G-CLEF spectrograph. In this presentation, we introduce the preliminary design and analysis results of the G-CLEF Flexure Control Camera.

[구 AT-06] Multi-Core Fiber Based Fiber Bragg Gratings for Ground Based Instruments

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Fiber Bragg gratings (FBGs) are the most compact and reliable method of suppressing atmospheric emission lines in the infrared for ground-based telescopes. It has been proved that real FBGs based filters were able to eliminate 63 bright sky lines with minimal interline losses in 2011 (GNOSIS). Inscribing FBGs on multi-core fibers offers advantages. Compared to arrays of individual SMFs, the multi-core fiber Bragg grating (MCFBG) is greatly reduced in size, resistant to damage, simple to fabricate, and easy to taper into a photonics lantern (PRAXIS). Multi-mode fibers should be used and the number of modes has to be large enough to capture a sufficient amount of light from the telescope. However, the fiber Bragg gratings can only be inscribed in the single-mode fiber. A photonic lantern bi-directionally converts multi-mode to single-mode. The number of cores in MCFBGs corresponds to the mode.

For a writing system consisting of a single ultra-violet (UV) laser and phase mask, the standard writing method is insufficient to produce uniform MCFBGs due to the spatial variations of the field at each core within the fiber. Most significant technical challenges are consequences of the side-on illumination of the fiber. Firstly, the fiber cladding acts as a cylindrical lens, narrowing the incident beam as it passes through the air-cladding interface. Consequently, cores receive reduced or zero illumination, while the focusing induces variations in the power at those that are exposed. The second effect is the shadowing of the furthest cores by the cores nearest to the light source. Due to a higher refractive index of cores than the cladding, diffraction occurs at each core-cladding interface as well as cores absorb the light. As a result, any core that is located directly behind another in the beam path is underexposed or exposed to a distorted interference pattern from what phase mask originally generates. Technologies are discussed to overcome the problems and recent experimental results are presented as well as simulation results.

[초 AT-07] Development of state-of-the-art detectors for X-ray astronomy

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We are developing large arrays of X-ray microcalorimeters for applications in X-ray astronomy. X-ray microcalorimeters can detect the energy of X-rays with extremely high resolution. High-resolution Imaging spectroscopy enabled by these arrays will allow us to study the hot and energetic nature of the Universe through the detection of X-rays from astronomical objects such