V210a Development of micro-mirror slicer integral field spectroscopy for high-resolution solar observations

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The optical design of the IFU with an image slicer employing only re = ective optics was made for GRIS (GREGOR Infrared Spectrograph) at GREGOR. A diffraction-limited resolution of 1.5-m aperture GREGOR at the wavelength 1.56 μm is 0.26 arcsec and the solar image formed on the slit plane with image scale of 0.13 arcsec per 35 = m. Then as a guideline, we tried to design the IFU in which a slicing mirror is 35 μm wide and a collimator and camera mirror refocus the slicer without changing the image scale. As a result, we come to a stack of 16 narrow slicers of 35 μm wide and 1.176 mm long; each 8 set of slicers is re-focused as two set of pseudo-slits. Each flat mirror slicer is set at a different angle so that the diverging beam from each slicer exits in two columns of collimator mirror array. Each beam is then reflected to a corresponding camera mirror and a following folding mirror. The overall effect is to rearrange the rectangular field of 2.1×4.4 arcsec^2 into two sets of a long thin field made up of all the slices arranged end to end, which forms two entrance slits of the spectrograph. It should be noted that the collimator and camera mirrors are oversized in the direction of diffraction to pick up a main lobe of diffracted beam in the longest observation wavelength of 1.56 μm, reducing amount of the light vignetted by the collimator and camera mirrors. We present the optical design and the performance of manufactured thin metallic mirror slicers.