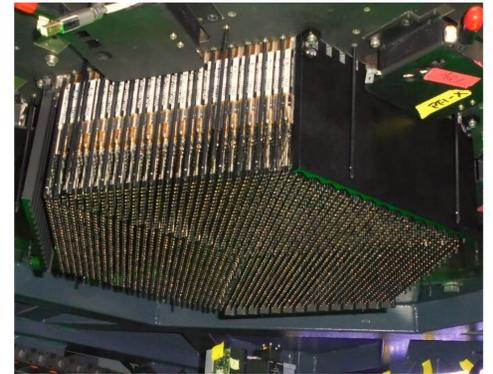


Introduction

The ASIAA has had a long-term collaboration with the National Astronomical Observatory of Japan (NAOJ) on developing next generation of OIR instruments, focusing on the wide-angle observation capabilities of the Subaru telescope.

We have completed wide-field camera, **Hyper Suprime Cam (HSC)** in 2013. Currently, we are conducting the commissioning for the **Prime Focus Spectrograph (PFS)**, a multi-fiber spectrograph, with science operation expected in early 2024. ASIAA also joined the development of the next-generation infrared facility, **ULTIMATE**, to expand the Subaru telescope's infrared observation capabilities. These instruments are expected to bring about breakthroughs in the study of large-scale structures and cosmology.



The PFS is ready on prime focus of Subaru Telescope (left) and array of micro-motors and optical fiber on PFS focal plane (right).



The HSC installation on prime focus of Subaru Telescope (left) and an image of cluster from HSC survey (right)

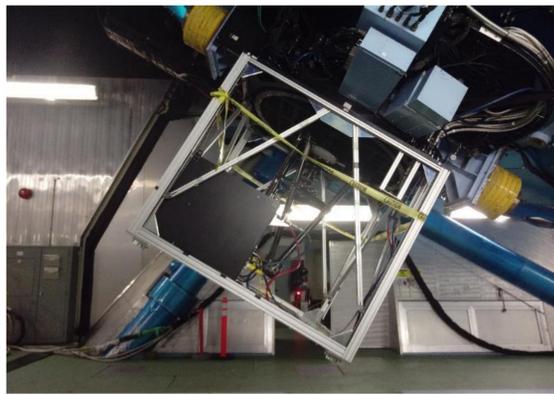
Science

Scientists have utilized HSC data for "weak gravitational lensing surveys" to study the distribution of dark matter in Universe with weak gravitational lensing. After the completion of PFS, there will be 360 nights of survey observations to further measure the redshift (as the distance indicator) of distant galaxies. Coupled with the images obtained by HSC, PFS will significantly impact the study of dark energy in the universe.

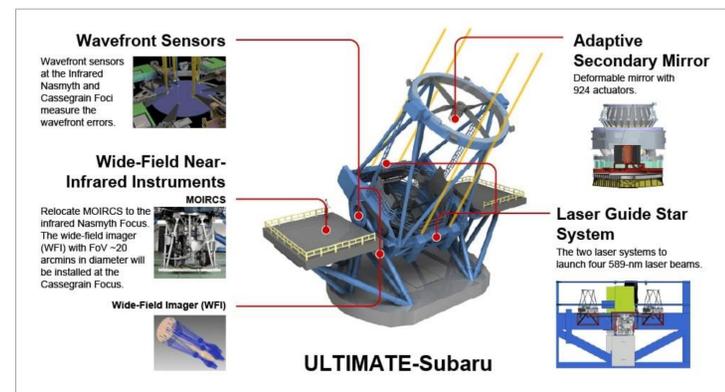
Through this project, Taiwanese astronomers collaborate with astronomers around the world. This collaboration is of significant importance in joining the advanced astronomical research in Taiwan and increasing its visibility in the field of astronomy.



Distribution of dark matter using HSC image



Metrology Camera System at Cassegrain Focus.



Conceptual design of ULTIMATE-Subaru

Technical Development

Developing both astronomical research and instrument technology is the long-term strategy of our institute. By joining the instrument development teams, we provide crucial subsystems to gain the opportunity to participate in significant survey projects. Through the instrument development process, we establish independent key technologies.

In HSC, we developed the filter exchange system and participated in the testing of CCDs and wide-angle corrector lenses. We successfully completed a precise and reliable filter exchange system while also acquiring the technology for high-sensitivity CCDs, enabling Taiwanese manufacturers to participate in the production of precision optical systems. In PFS, we were in charge of the development of the fiber positioning system (FPS) and the system integration of the prime focus instrument as well as the metrology camera system. The FPS accurately measures the positions of over two thousand optical fibers within five seconds (with an error of less than 3 μm). The development process of PFS has allowed us to acquire design and integration testing capabilities for large mechanical and optical systems, as well as the technology for precision positioning measurements.

Through participation in ULTIMATE, we can further enhance our capabilities in the design and testing of infrared-related technologies. These skills will become a stepping stone for participating in the development of next-generation telescope instruments. Even if Taiwan cannot provide substantial funding for the construction of super-large telescopes, we can still contribute by providing crucial technology, enabling our astronomers to have the opportunity to participate in the most important astronomical research with the use of state-of-the-art observational equipment.