

17th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Post Mission Disposal and Space Debris Removal (2) (6)

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GROUND-BASED ADAPTIVE OPTICS FOR TRACKING AND PUSHING SPACE DEBRIS: ON SKY
RESULTS OF THE ADAPTIVE OPTICS SYSTEM**Abstract**

The Advanced Instrumentation and Technology Centre of the Research School of Astronomy and Astrophysics of the Australian National University (ANU) is involved in a cooperative research project funded by the Australian government and managed by the Space Environment Research Centre (SERC). Dealing with space situational awareness, SERC's goal is space debris mitigation by improving space debris detection, data bases and collision prediction as well as ground based collision mitigation. As a partner of SERC, the ANU is building an adaptive optics system. This system is designed to firstly measure the atmospheric distortions using the reflected sunlight off the debris object and the beacon from a laser guide star. Secondly, it is designed to pre-condition a high-power continuous wave laser beam propagating through the atmosphere to perturb the orbit of a space debris object on collision course with another space debris object to prevent such a collision by means of photon pressure. Hence, the final adaptive optics system consists of a laser guide star, the single conjugate adaptive optics system itself and the high-power laser. This paper details the commissioning of the adaptive optics system and presents its performance results during on-sky operation in 2019.