
Adaptive Optics Telemetry Format

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Abstract

Context: There is a growing volume of AO telemetry data being generated in facility-class ground-based VIS/NIR observatories, which has highlighted the need for a standardized data exchange format to enable performance analysis and AO R&D involving extensive telemetry mining, processing, and curation.

Aims: In this paper, we present the Adaptive Optics Telemetry (AOT) data exchange format, designed to facilitate the sharing of AO telemetry from visible/infrared ground-based observatories. The AOT format is built on the Flexible Image Transport System (FITS) and aims to provide a clear and consistent means of accessing data across multiple systems and configurations, including classical natural and single/multiple laser guide-star AO systems.

Methods: AOT was designed with two main use-cases in mind 1) atmospheric turbulence parameters estimation and 2) Point-spread function reconstruction (PSF-R). To support this format, a Python package that enables data conversion, reading, writing and exploration of AOT files was developed.

Results: The AOT format has a well-defined file structure, including data fields, descriptions, data types, units, and expected data dimensions. A supporting Python package has been made publicly available. To demonstrate the format's versatility, we packaged data from four different 8-meter class telescopes of vastly different configurations.

Keywords: Adaptive Optics Telemetry, Data Exchange Format, Data Standardization, Point Spread Function Reconstruction, Turbulence

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