
Recent progress of astronomical piezoelectric deformable mirror technologies at IOE, CAS

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Abstract

Institute of Optics & Electronics (IOE), Chinese Academy of Sciences (CAS) has about 40 years experiences on piezoelectric deformable mirror (DM) technologies research and developing since early 1980s. Several piezoelectric DMs of IOE, CAS have been used in many different application systems.

A brief history of piezoelectric DMs development at IOE and several recently achievements, and the main characters, performance and test results of these DMs will be presented in this paper

1. Wide temperature range deformable mirror. Since 2014, according to the actual testing of piezoelectric actuator characters-temperature relationship and mirror surface error-temperature relationship, an improved structure scheme of wide temperature range DM was proposed. A wide temperature range DM, which could be used in the range of -20°C to 40°C has been fabricated and tested;

2. Piezoelectric deformable secondary mirror. The 73-piezoelectric deformable secondary mirror prototype was docked with 1.8m telescope to obtain its first light. Since 2018, the 1.8m telescope's new piezoelectric deformable secondary mirror with 241 actuators has been developed. The new piezoelectric deformable secondary mirror had been integrated with the telescope in early 2022. In addition, another piezoelectric deformable secondary mirror with 439 actuators for the 1.8m solar telescope (China Large Solar Telescope) has been developed since 2020. It will be integrated with the telescope in mid – 2023;

3. High density deformable mirror. In recent years, high-density deformable mirrors have been widely used in optical communication, retinal imaging, astronomy and other fields. In order to meet the requirements of future extreme large telescopes, a high density deformable mirror prototype with 6400 actuators has been fabricated and tested since 2019.

Keywords: Deformable Mirror, Adaptive Secondary Mirror, Piezoelectric

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