

## Optical Error Analyses on AQuaKET

### - Intensity variation, Diffraction, Speckle, and Parallax

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Automated Quantitative Knife-Edge Test (AQuaKET) method had been developed for testing surface profile of large optics with high accuracy. It is a geometric test method which can be used in parallel with interferometric test method, so that the test results from both the AQuaKET and interferometric tests can be compared and confirmed. In this way, such a disaster as the wrong shaping of the primary mirror of Hubble Space Telescope would not be happened again. Testing large optics with high accuracy is not an easy job to achieve, as it is a nano-technology. There are lots of possible error sources which can occur during the measurements and in the data processing of the AQuaKET. The error sources can be categorized into 5 areas: optics, mechanics, electronics, numerical processes, and system. In this paper, possible error sources in Optics are discussed, which are intensity variation of the light source, diffraction effects, speckle image produced by optical fiber, and parallax effect. Because of large variation in intensity of halogen lamp, the light source was replaced by He-Ne laser which was stable enough for the test. Diffraction occurs at every edge on the way of the light path. Most affected one came from the knife-edge itself, but it was analyzed and solved. Speckle image came out when the laser light went through an optical fiber, which was also dissolved by adding a rotating diffuser. Parallax can be a strong candidate for contributing measurement errors and is usually solved by placing a half-reflecting plate on the optical path. However, the solution could permit other error source to the path. My idea gave better solution to the parallax. In this paper, those possible error sources in the aspect of optics are discussed.