

AQuaKET (Automated Quantitative Knife-Edge Test) - Overview

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As the quality of large optics are required to be more accurate, even to the diffraction limit, more accurate testing methods are needed. For example, large telescope optics consist of aspheric concave and convex mirrors with significant aspheric departures. Testing these optics using classical methods usually requires the use of a null lens or mirror. However, the null corrector itself can be wrong and thus lead to incorrect test results. One example is the primary mirror of Hubble Space Telescope. In order to avoid such a mistake, at least two independent test methods should be applied. A new test method - automated quantitative knife-edge test (AQuaKET) - has been developed by revolutionizing one of the oldest testing method, the Foucault test. One of the advantages of the Foucault test is that it does not need any additional optical components which can introduce errors, whereas a disadvantage is that it does not give a quantitative result. Whilst maintaining the merits of the Foucault test, AQuaKET embodies novel ideas for acquiring quantitative results. The paper presents the overall view of AQuaKET with test results of three mirrors which validate the reliability of the method for testing optics with high accuracy, including aspheric mirrors. The overall methodology developed is compared with other approaches currently available.