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Publication Date

2005-12-22

Global high-accuracy inter-comparison of slope measuring instruments

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The upcoming generation of high accuracy synchrotron radiation (SR) optics will be characterized by slope errors in the range of some $0.05\mu\text{rad}$ rms at a sampling interval of about 1 mm. To certify and improve the measurement capabilities of metrology tools to inspect to these stringent specifications, an essential step is a worldwide inter-comparison of these measurements based on a set of transfer standards. It is the aim of these cross measurements to verify the “absolute” correctness and comparability of the measurement results obtained by the cooperating partners when measuring the topography of specific references using their latest metrology tools and methods.

Organized by members of the SR-optics community, new national and international cross measurement comparisons of typical synchrotron radiation mirrors have been realized during the last few years: A round robin test initialized by the European COST-program (BESSY, Elettra, ESRF, SLS and Soleil) during the years 2004-2005 and a similar cooperation realized by the APS, ESRF and Spring-8 have been proceeded. The first results of both projects have been presented at the “Optics & Photonics” conference in San Diego in August 2005 [1, 2]. These work build upon earlier work [3].

The participants of both groups and the representatives of other SR-laboratories agreed to start a global cooperation bringing together the two round robin projects and open these activities to other partners from the SR- community, optical manufacturers and other interested parties.

This initiative is intended to initiate an extensive comparison of various measurement principles and tools and will help to push the frontiers in metrology, and hence production, to a precision well below the current state of the art limit of $0.5\mu\text{rad}$ rms for slope errors.

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- [2] L. Assoufid, A. Rommeveaux, H. Ohashi, K. Yamauchi, H. Miamura, J. Qian, O. Hignette, A.M. Khounsary, T. Ishikawa, C. Morawe, A.T. Macrander, S. Goto, “The APS/ESRF/Spring-8 metrology round-robin campaign”, SPIE Conference on Optics and Photonics, SPIE Proceedings 5921-21, San Diego August 2005
- [3] S.C. Irick, “Long trace profiler survey results”, SPIE Conference on Optical Manufacturing and Testing III, SPIE Proceedings 3782, pp. 275-82, Denver, July 1999

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