THE OPTICS LABORATORY AT ALBA

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The laboratory of optics of ALBA, the synchrotron radiation facility currently being installed near Barcelona, is being equipped with the optical instruments required to perform the acceptance tests of the optics for the beamlines. The main instruments are a 4 inch Fizeau interferometer, with variable spatial coherence, and a long trace profilometer (LTP). However, given the late delivery and long commissioning time foreseen for the LTP, many of the mirrors for the phase 1 beamlines will be characterized using the Fizeau interferometer. For that, 2 flats and 5 different convex reference mirrors have been purchased. This allows us to characterize 76 out of the 80 optical surfaces of the beamlines in Phase one with the interferometer.

The Fizeau interferometer is being commissioned in a temporary laboratory, in the facilities that ALBA has in the university. The laboratory is under overpressure, and the air conditioning provides temperature stable within ±0.4ºC in 24h. The limiting factor for the temperature stability is the poor isolation of the laboratory.

The interferometer measures the mirror profile with a repeatability 0.4nm RMS point to point. In well isolated environment it is limited by the noise of the CCD. The measure of the radius of curvature of mirrors provided by the interferometer is stable within a 0.47% during 8 hours of continuous measurements and is correlated to temperature variations.

In order to improve the accuracy of the Fizeau, which is limited by the errors of the reference surface, we have implemented the lateral shearing technique to the measurements provided by the interferometer [1][2]. It consists on measuring the sample mirror at two different positions, and then reconstructing the mirror surface from the differences of the two acquisitions. In this case the error of the references can be completely removed, and then the accuracy of the measurement is mainly limited by the uncertainty in the motion of the mirror between measurements: positioning errors, and parasitic angles during the translation. We propose algorithms that allow estimating these errors and reconstructing the mirror profile with accuracies in the order of the one nanometer.

References

[1] C. Elster, I. Weingartner, *J. Opt. Soc. Am A*, **16** (1999) 2281
[2] C. Elster, I. Weingartner, *Appl. Opt*, **38** (1999) 5024

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