Field modeling for partially coherent X-ray imaging system

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Introduction

The statistical properties of a synchrotron source is described by the cross-spectral density function as a superposition of mutually uncorrelated, spatially localized modes (Fig. 1). This description is applied to model the propagation of spatially partially coherent light beams in an X-ray imaging system (Fig. 2) with non-ideal grazing-incidence mirrors (Fig. 3).

Fig. 1: Gaussian Shell Model source [1], \( \lambda = 173 \text{ pm} \).

Fig. 2: X-ray gold coated grazing mirrors, \( \theta = 3 \text{ mrad} \).

Fig. 3: Mirror’s figure errors.

Setup

Computation

Table 1: Operators used; *requires smooth wave front.

Results

Fig. 5: a) Focal spot without figure errors, b) cross-section of elementary modes.

Fig. 6: a) Focal spot with figure errors, b) cross-section of elementary modes.