X-ray grating interferometer for imaging at a second-generation synchrotron radiation source

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X-ray phase-contrast radiography and tomography enables to increase contrast for weakly absorbing materials. Recently, x-ray grating interferometers were developed which extend the possibility of phase-contrast imaging from highly brilliant radiation sources like third-generation synchrotron even to non-coherent sources. Here, we present a setup of an x-ray grating interferometer designed and installed at low-coherence wiggler source at the GKSS beamline W2 (HARWI II) operated at the second-generation synchrotron storage ring DORIS at the Deutsches Elektronen-Synchrotron (DESY, Hamburg, Germany). The beamline is dedicated to imaging in materials science. Equipped with the grating interferometer, it is the first synchrotron radiation beamline with a three-grating setup combining the advantages of phase-contrast imaging with monochromatic radiation with very high flux and a sufficiently large field of view for centimeter sized objects. Examples of radiography on laser-welded aluminum and magnesium joints are presented to demonstrate the high potential of the new grating-based setup in the field of materials science. In addition, the results of an off-axis phase-contrast tomography of a human urethra with 15 mm in diameter are presented showing internal structures, which cannot be resolved by the conventional tomography in absorption mode.
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