Coherence on F-CRG BM beamlines. Is it possible?

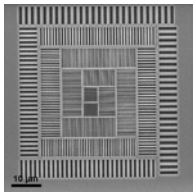
G. Chahine[1], N. Blanc[2], J.C. DaSilva[3], S. Arnaud[2], F. Livet[1], G. Beutier[1], J.L. Hazemann[2], N. Boudet[2]

[1]SIMaP, Grenoble INP, CNRS, Université Grenoble Alpes, 38000 Grenoble, France, [2] Institut Néel, CNRS, Université Grenoble Alpes, 38000 Grenoble, France, [3]ID16A, European Synchrotron Radiation Facility, 38043 Grenoble Cedex, France – **email: gilbert.chahine@esrf.fr**

Coherent X-rays are becoming powerful tools for imaging complex, heterogeneous structures with spatial resolution below focused synchrotron beam sizes. Many beamlines are designed and optimized for exploiting the coherence of X-rays and are mainly based on insertion devices as photon source. The combination of the source size together with long source-sample distance increases the coherence length and defines the size of fully coherent beams. Due to flux limitations, bending magnet beamlines are often considered inefficient for coherent imaging. Nevertheless, the latest developments in single X-ray photon counting detectors will enable bending magnet beamlines to exploit the coherence of the X-ray photons. A test measurement performed at the French CRG D2AM (BM02) beamline showed the possibility of detecting well-resolved coherent fringes from a structured tungsten pattern in transmission geometry.

In addition, the ESRF EBS upgrade will offer 15 times smaller sources with the new SBM (short bending magnet) which will replace some of the existing BM. This reduction in source size will further increase the coherence length and thus increase the flux in a fully coherent beam.

(a)



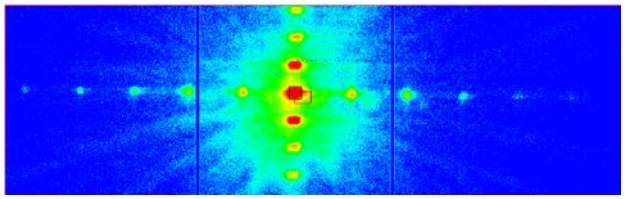


Figure 1: (a) SEM image of multiscale tungsten structures. (b) Diffraction pattern from the tungsten structures.

With the combination of high detection sensitivity and increase of coherence length, the F-CRG D2AM and FAME beamlines will offer to their community the possibility of performing coherent imaging and thus extend their capabilities in characterizing complex compounds and devices.