By creating a large opening angle and the use of short wavelength, a lateral resolution better than 250 nm can be achieved without using any optical elements. To provide a stable and drift free scattering geometry, the new scattering chamber HORST was constructed. This setup can be used for holographic imaging and diffraction microscopy at synchrotron sources and free electron lasers. By tuning the x-ray energy to core resonances, element specific contrast can be obtained. Applications in the field of life sciences and biofouling will be discussed and results obtained at synchrotrons and the free electron laser FLASH will be shown.

FA3-MS01-O4

Highly Sensitive Quantitative Biological Imaging by Scanning X-ray Diffraction Microscopy. Klaus Giewekemeyer[a], Sebastian Kalbfleisch[a], André Beerlink[a], Cameron Kewish[b], Pierre Thibault[b], Franz Pfeiffer[c], Tim Salditt[a]. *[a]Institute for X-ray Physics, Georg-August-University, Goettingen, Germany. [b]Paul-Scherrer-Institute, Villigen PSI, Switzerland. [c]Department of Physics (E17), Technical University of Munich, Munich, Germany.*
E-mail: k.giewek@phys.uni-goettingen.de

Ptychographic diffractive imaging has proved itself a very powerful tool in coherent X-ray imaging as it enables observations with an unlimited field of view and is characterized by fast convergence and a low degree of ambiguity in the reconstruction [1]. Recently it was shown that a pre-knowledge of the complex illuminating wavefield in the sample plane is not necessary any more, but can self-consistently be recovered together with the object transmission function from the same dataset [2]. In this contribution we will report on one of the first applications of this new technique to unstained biological specimens, namely freeze-dried cells of the procaryotic bacterium *Deinococcus radiodurans*, which have been imaged at the cSAXS beamline of the Swiss Light Source using a pinhole (diameter 1.4 microns) as the beam defining optical element at a photon energy of 6.2 keV. We will show how quantitive phase information with very high sensitivity can be extracted from a single dataset taken within 20 minutes at an incident photon flux on the sample of ca. 2e5 photons per second, enabling us to image internal structural features of the cells.

[1] Rodenburg, J.M., Hurst, A.C., Cullis, A.G., Dobson, B.R., Bunk, O., David, C., Jefimovs, K., and Johnson, I. *Physical Review Letters,* **2007**, 98, 034801. [2] Thibault, P., Dierolf, M., Menzel, A., Bunk O., David, C., and Pfeiffer, F. *Science*, **2008**, 321, 379.

Keywords: coherent x-ray imaging; phase determination methods; biological structure