Fast, scalable, low-dose phase-based x-ray imaging with conventional sources

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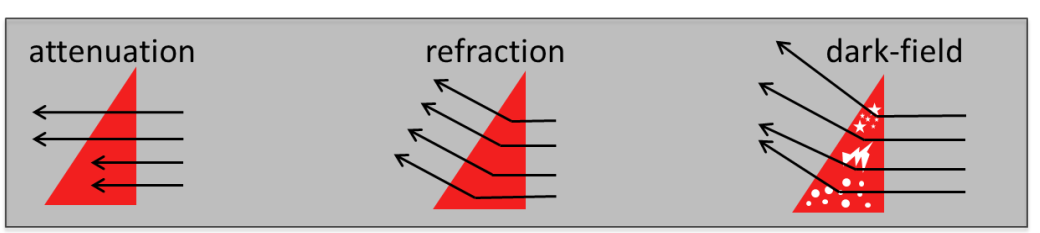
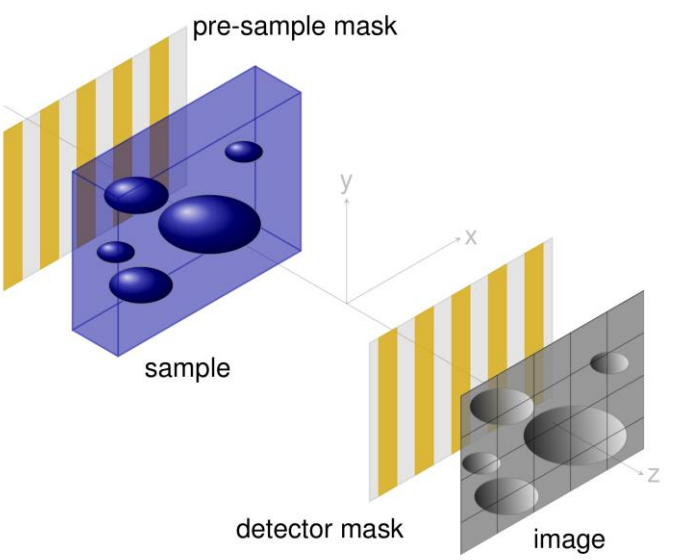
Introduction

X-ray Phase-Contrast Imaging (XPCI) bears a tremendous potential for the **non-invasive visualization of the internal structure of samples. The open challenge** is to translate this into a **widely accessible tool** for the community.

The Idea is to use simple and robust **x-ray masks that do not require any coherence of the radiation illuminating the sample**: one for shaping the beam before the sample, and one for analysing the beam before the detector. Such a system **works with standard X-ray tubes technology at low delivered doses and short exposure times**, and is **easily scalable.**

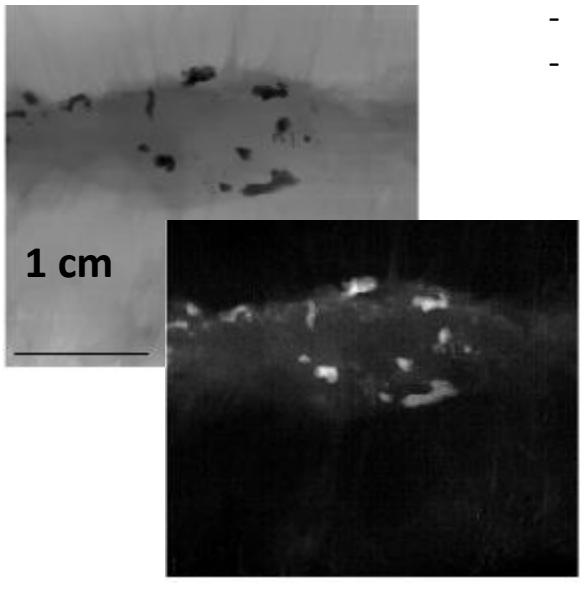




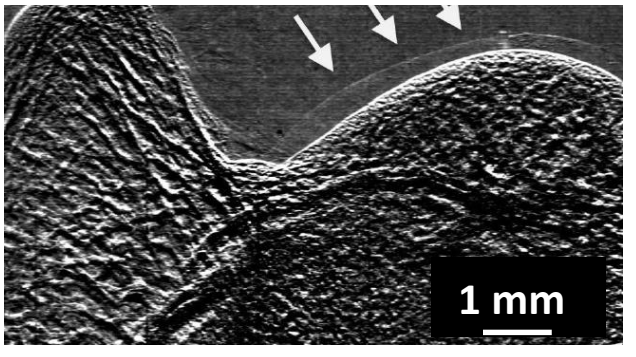
The Potential Impact spans across a diversity of fields such as **security**, **materials science, biology and medicine.**

medical imaging soft tissue contrast
- delineation of tumour margins
- cartilage layers visualization
- dose reduction in screening

breast tumour with calcifications

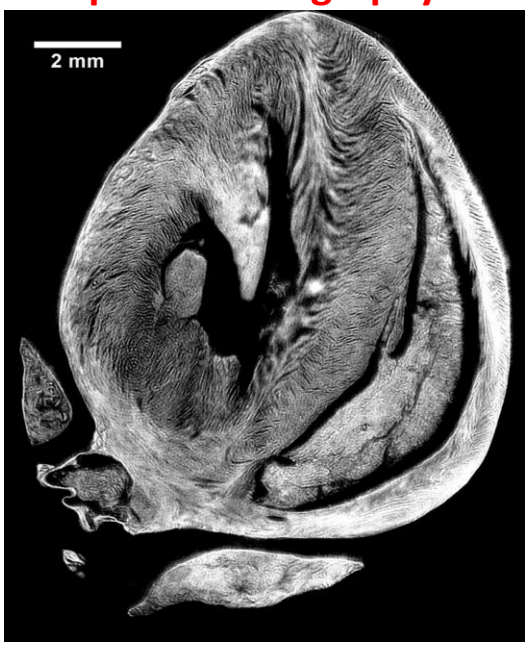


cartilage in water – rabbit tibia

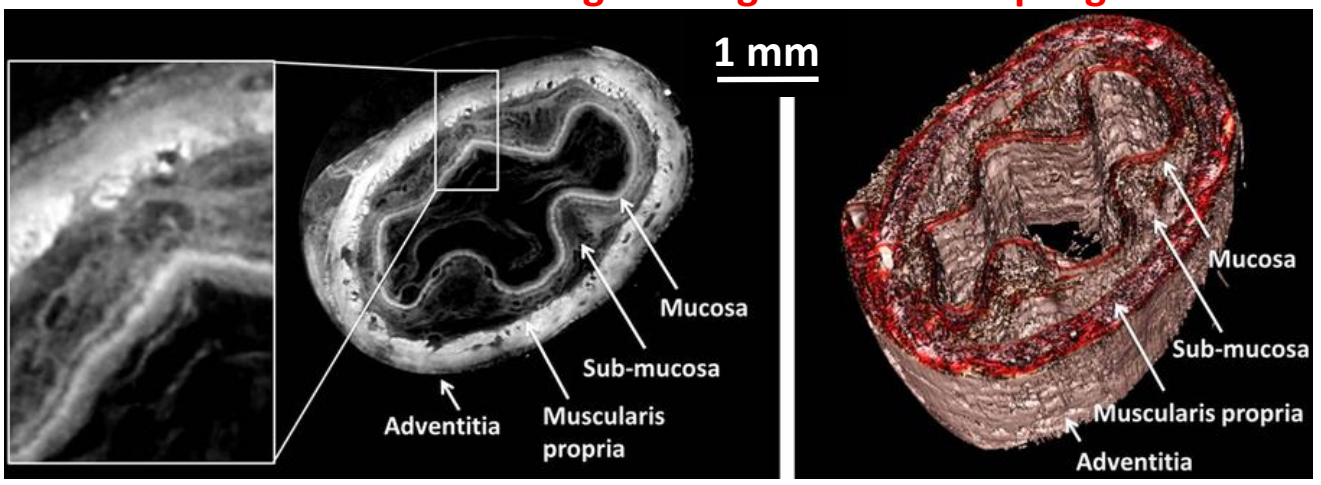


rat heart

computed tomography



acellular matrices for tissue engineering – rabbit oesophagus



THREE DIMENSIONAL IMAGING

non-destructive inspection
- enhanced visualisation for **tissue engineering**
- detection of faint yet structurally important details such as micro-cracks and fibre detachment in composite materials

[1] A. Olivo et a. Med. Phys. 28(8):1610-9, 2001. [2] A. Olivo et al. Appl. Phys. Lett., 91(7):074106, 2007. [3] M. Endrizzi et al. Appl. Phys. Lett., 104(2):024106, 2014. [4] M. Endrizzi et al. JINST 9(11):C11004, 2014. [5] C.K. Hagen et al. Sci. Rep. 5, 18156, 2015.