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In-vivo study of lung physiology with sub-second X-ray tomographic microscopy

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The development of high-speed tomographic microscopy instrumentation is of great interest for 3D in-vivo studies. An important application is the study of lung dynamics, in particular, lung inflation/deflation issues during physiological and mechanical ventilation, which is required after a premature birth or during a general anesthetic. At TOMCAT we are currently working on an ultra-fast tomography end-station with sub-second temporal resolution in 3D. The feasibility study [1] shows that high-quality tomograms can be obtained in <1s, allowing for studies of explicit gas-exchange processes during breathing at an acinar and alveolar level. To further understand these processes we aim to establish in-vivo X-ray tomography at the micrometer scale. Using this volumetric data we may then answer open questions in lung development and physiology that can help clinicians in developing new strategies to decrease ventilator-induced lung injuries in newborns and adults. Here we show some of the key components of the project (beamline settings, detectors, endstation upgrade) and how we intend to combine them to achieve our goal.

[1] R. Mokso et al., AIP Conference Proceedings, XRM 2010, 2011

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Poster

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