ESRF	**Experiment title:** X-Ray Microtomography of Biological Tissues using Phase and Absorption Contrast	**Experiment number:** LS 577
Beamline: ID11	**Date of experiment:** from: 21. Apr. 1997 to: 28. Apr. 1997	**Date of report:** 25. Feb. 1998
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Names and affiliations of applicants (* indicates experimentalists):

U. Bonse*, F. Beckmann*, Th. Biermann*, M. Bartscher*

University of Dortmund, Department of Physics, D-44221 Dortmund, Germany

WWW: http://e1.physik.uni-dortmund.de

Report:

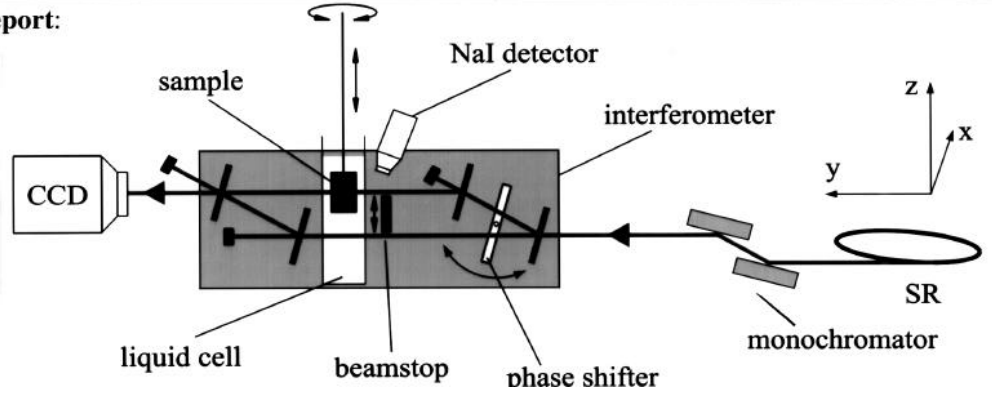

Figure 1: Experimental setup for Phase-Contrast Microtomography (PμCT)

The new method of microtomography using Phase Contrast (PμCT) recently became a valuable tool for the investigation of biological samples consisting mainly of light elements [4][5]. In comparison with microtomography using Absorption Contrast (μCT) [3] by measuring the attenuation of X-rays, PμCT is based on the phase shift introduced by the sample.

Using a skew-symmetric Laue-interferometer in the experimental setup shown in fig. 1 a single phase projection is obtained by measuring interference patterns at superimposed overall phase shift with and without the sample [6]. The tomographic reconstruction based on a set of phase projections of the specimen under different angles determines the 3D volume data set of the sample representing the phase-density $\phi(x,y,z)$ which is direct proportional to the electron density $\sigma(x,y,z)$:

$$\phi(x,y,z) \propto \sigma(x,y,z)\, E^{-1} \qquad \sigma(x,y,z) = \text{electron density} \qquad E = \text{photon energy}$$

PμCT measurements: Rat Trigeminal Nerve

In cooperation with Prof. M. F. Rajewsky Institute of Cell Biology (Cancer Research), University of Essen Medical School, rat trigeminal nerves were investigated to determine the 3D-formation of chemical induced tumors [1][2].

In fig. 2 the 3D-dataset of a tomographical scan is visualized. The trigeminal nerv is embedded in wax which is presented translucent. Fig. 3 shows reconstructed slices investigated at different photon energies (12 and 24 keV). This proves the feasibility of the method of PμCT to investigate samples at high energies and therefore determining the 3D structure of weak and strong absorbing elements at the same time.

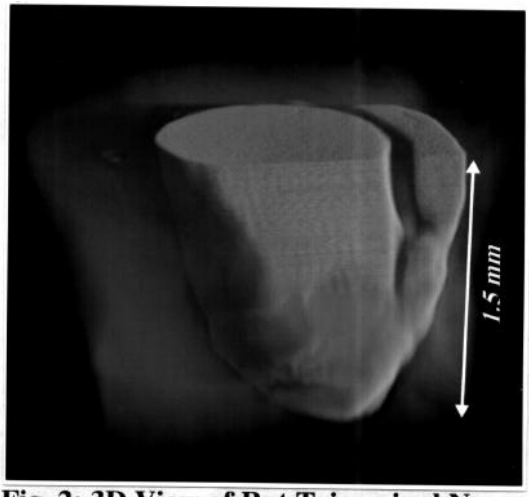

Fig. 2: 3D View of Rat Trigeminal Nerv

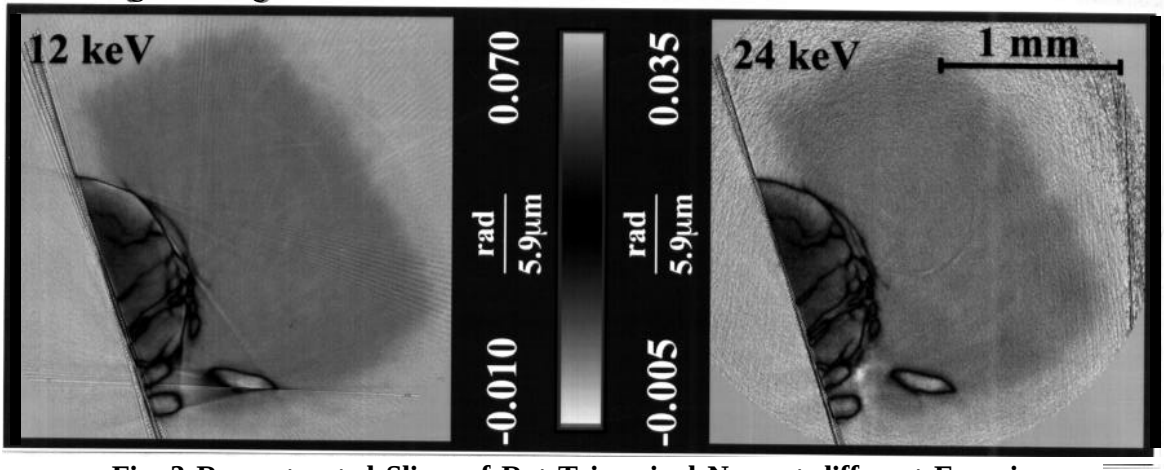

Fig. 3 Reconstructed Slices of Rat Trigeminal Nerv at different Energies

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