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# Biomedical applications of fast phase-contrast X-ray imaging system - *in vivo* observations of blood flow in rat liver and tumor implanted in nude mouse-

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## Introduction

Phase-contrast X-ray imaging using interferometry is a powerful method for observation of samples mainly composed of light elements such as biological soft tissues and organic materials. Since the sensitivity of this method is about 1000 times higher than that of the conventional absorption method, it enables us to perform detailed observation of those samples without any supplemental measures. We have been developing an imaging system fitted with a two-crystal X-ray interferometer [1], and have been using it for various biomedical imaging [2]. For wider application of this method, we developed a fast phase-contrast X-ray imaging system that combines our system and a fast X-ray camera [3], and applied it for *in vivo* observations.

## *In vivo* observations

*In vivo* observations of blood flow in the liver of a living rat and a tumor implanted in the back of a nude mouse were performed as trial experiments. Figure 1 shows the sequence images of blood flow obtained by injecting saline solution as a contrast agent. The frame rate was 5 fps, the field of view was 20 mm, and the X-ray energy was 17.8 keV. These figures clearly show that the saline solution flowed from the portal vein to other veins.

Figure 2 shows a three-dimensional image of the implanted tumor. The diameter of the tumor was 7 mm and the height was 5 mm. The total measurement time was 7 min, and the 35-keV X-ray was used. Due to the short measurement time, the artifact and blurring caused by the movement of the sample was decreased, and detailed tissues can be observed.

After optimizing the measurement conditions, we plan to apply this method to evaluate the effects of drugs on the tumor.

## References

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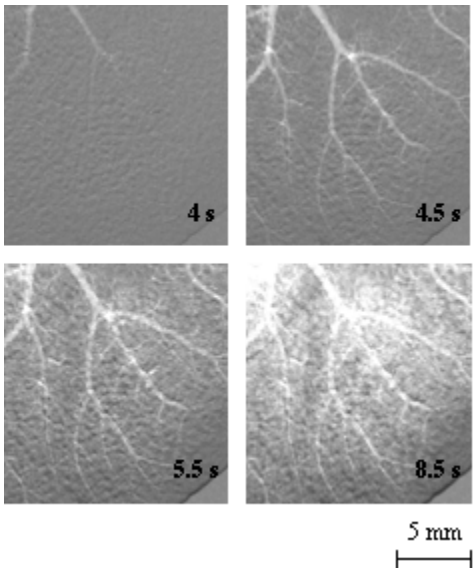


**Fig. 1** Sequence images of blood flow in rat liver. Saline solution was used as contrast agent.

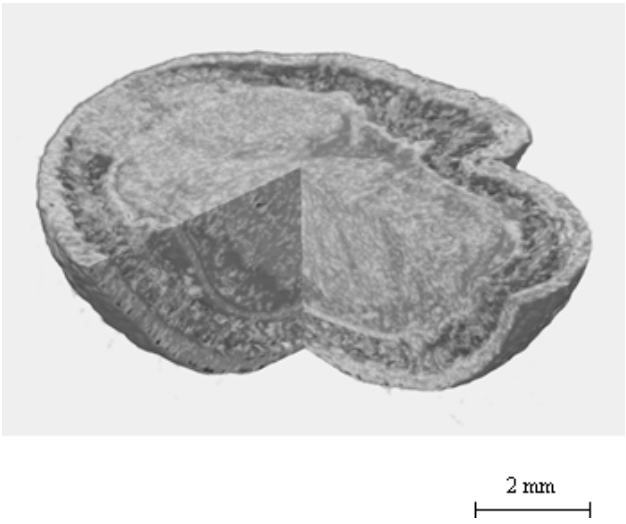


**Fig. 2** Three dimensional image of implanted tumor. The total measurement time was 7 min.