

Refraction imaging with parallel X-ray beam for medical use

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The highly parallel X-ray beam for the third-generation synchrotron radiation source such as Spring-8 enables us to observe refraction of X-rays which is in the range of micro-radians. Fig. 1 shows principle of refraction of X-ray. X-ray is slightly refracted at the margin of two materials. Fig. 2 shows phase-contrast image of nude mouse. Phase-contrast imaging of nude mouse was performed to avoid refraction from furs. The image was recorded with a long specimen-to-detector distance (6.5m: far-field image.) Fig. 3 shows X-ray image of mouse hand. The high contrast bright lines were observed that runs parallel to the periphery of bones and skin. Fig. 4 shows image of nude mouse. Bright lines were observed respiratory duct, alveoli and bubbles in this image. This is the edge-enhance effect between air and tissue margin. The most promising application is visualization of the lung, as demonstrated in Fig. 4. Application to a human body has not been performed yet. In conclusion, this phase-contrast imaging to be a potential new technique for diagnosis of the lung disease.

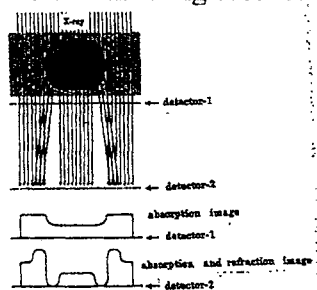


Fig. 1 Schema of X-ray refraction

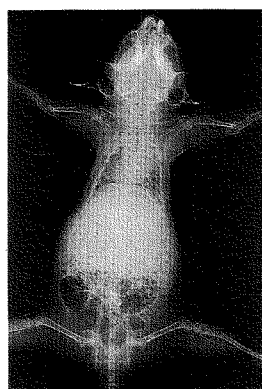


Fig. 2 X-ray image of nude mouse

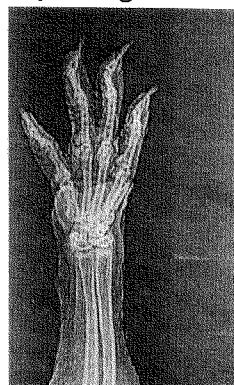


Fig. 3 Image of mouse hand

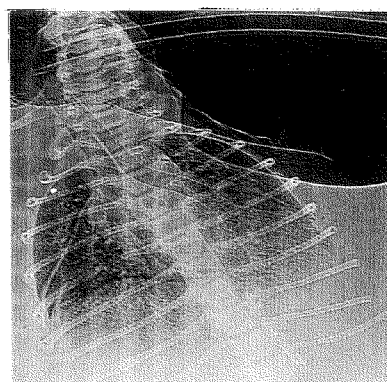


Fig. 4 Image of mouse lung