Novel X-ray System

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Technology description

Conventional medical X-ray images are adequate for distinguishing between regions with significantly different density such as that between bone and surrounding tissue. The contrast however, is not sufficient to distinguish regions of similar density, such as tumours within healthy tissue etc. STFC’ s patented X-ray technology that simultaneously obtains absorption and refraction images overcomes the limitations of normal X-ray systems.

DESCRIPTION

In a conventional X-ray imaging system an object is illuminated with X-rays which pass through the object with a degree of absorption dependent upon the density with respect to X-rays of the material of the object. Thus, a conventional X-ray image of a bone fracture for instance is effectively a shadow cast by the relatively dense bone within less dense surrounding tissue. However, when the difference in densities is very small, then the contrast is insufficient to infer any useful information. More recently, X-ray imaging techniques have been improved still further by the development of diffraction enhanced X-ray imaging. Separate refraction and absorption images provide different useful information, making it necessary to take two independent images of the object. This increases the time taken to scan the object, and increases the X-ray dose to which the object is subjected. In addition, for the data from the two images to be accurately combined there must be no movement or change in the object between the two image exposures, so that corresponding regions of each image cart be accurately correlated. STFC’ s novel X-ray system uses a Bragg crystal analyser for receiving the X-ray beam transmitted through the body. The crystal diffracts part of this beam to a detector assembly comprising two X-ray detectors. The first detector is a monochromating semiconductor detector which detects a first portion of the first diffracted X-ray beam to generate first image data, and which diffracts a second portion of the first diffracted beam to the second detector which generates second image data. An image processing means are provided for combining the first and second image data to derive a refraction image and an absorption image of the object. Both the Bragg crystal analyser and the monochromating detector are within a particular angular range. This allows the Bragg crystal to separate out the scattered portion of the transmitted beam from the rest, while the ‘monodet’ separates out diffracted and absorbed aspects of the incident beam.

This arrangement separates STFC’ s system from others by providing the ability to obtain both absorption and diffraction in one x-ray scan.

Application area

Medical X-ray Systems
Non-Destructive Testing of mechanical structures

Institution

The Science and Technology Facilities Council

Inventors

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