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# X-ray phase-contrast imaging

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## Abstract

X-ray imaging is a standard tool for the non-destructive inspection of the internal structure of samples. It finds application in a vast diversity of fields: medicine, biology, many engineering disciplines, palaeontology and earth sciences are just few examples. The fundamental principle underpinning the image formation have remained the same for over a century: the X-rays traversing the sample are subjected to different amount of absorption in different parts of the sample. By means of phase-sensitive techniques it is possible to generate contrast also in relation to the phase shifts imparted by the sample and to extend the capabilities of X-ray imaging to those details that lack enough absorption contrast to be visualised in conventional radiography. A general overview of X-ray phase contrast imaging techniques is presented in this review, along with more recent advances in this fast evolving field and some examples of applications.

*Keywords:* X-ray; phase-contrast; imaging

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## 1. Introduction

2 The use of X-rays for imaging the internal structure of samples quickly spread  
3 around the world soon after the first X-ray radiograph was taken by Wilhelm  
4 Conrad Röntgen towards the end of 1895 [1]. Great improvements have con-  
5 stantly been made throughout the last century both with regard to the X-ray  
6 generators and to the image receptors, including transformative advances such

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