

# Recent developments in Diffraction Enhanced Imaging

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Although Diffraction Enhanced X-ray Imaging (DEI) was pioneered 25 years ago, only in the last decade several research groups (most of them belonging to synchrotron radiation community) have deeply investigated this phase sensitive x-ray imaging technique.

DEI is based on the utilization of an analyzer crystal, placed between the sample and the imaging detector. The rocking curve of the analyzer system acts as an angular band-pass filter, whose width is comparable with the tiny deviations suffered by X-ray photons traversing the sample (typically in the order of 1-100  $\mu$ rad). Therefore, an intensity modulation is recorded on the detector. In particular, refraction and ultra-small angle scattering are exploited and provide extra contrast in addition to X-ray absorption.

More precisely, the name DEI is used to indicate an algorithm capable to produce separate images of refraction effects and of absorption effects (including extinction, i.e. the rejection of ultra-small angle scattering). Despite the spectacular images produced by DEI, the method has significant imperfections. In particular, as highlighted in recent studies, the DEI algorithm gives too coarse a treatment of ultra-small angle scattering. Several researches have investigated this issue, suggesting possible alternatives. In this presentation, the limits of the original approach will be discussed and an overview of the new generation methods will be presented.