

SOI Pixel 検出器による X 線イメージング

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X-ray Imaging with SOI Pixel detector

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<Synopsis>

In KEK Detector Technology Project, we have been developing SOI Pixel detectors (SOIPIX) where both radiation sensors and readout electronics are implemented on a Silicon-On-Insulator (SOI) wafer. The SOI wafer has a thin layer of integrated-circuit electronics and high-purity thick Si substrate, and these are separated by a thin oxide layer. The SOIPIX can achieve high resolution X-ray imaging since it is fabricated with fine semiconductor process only. Furthermore, each pixel has CMOS integrated circuit, so in-pixel data processing such as time resolved measurement, energy discriminated detection etc. can be realized.

Recent results and future prospect of this technology are reported.

KEK の測定器開発室では、放射線センサーと読み出しエレクトロニクスを一体化させた SOI Pixel 検出器 (SOIPIX) の開発を行っている。Silicon-On-Insulator (SOI) ウエハーとは集積回路を搭載する薄い Si 層と高純度の厚い Si 層を、絶縁膜を間に張合わせたものである。SOIPIX は、半導体微細加工技術のみで製造される為、非常に高精細な X 線画像が得られる。また各画素に集積回路が搭載される事から、従来不可能であった時分割測定やエネルギー弁別測定等が実現出来る。

最近の測定結果や、今後の開発見通しについて報告する。

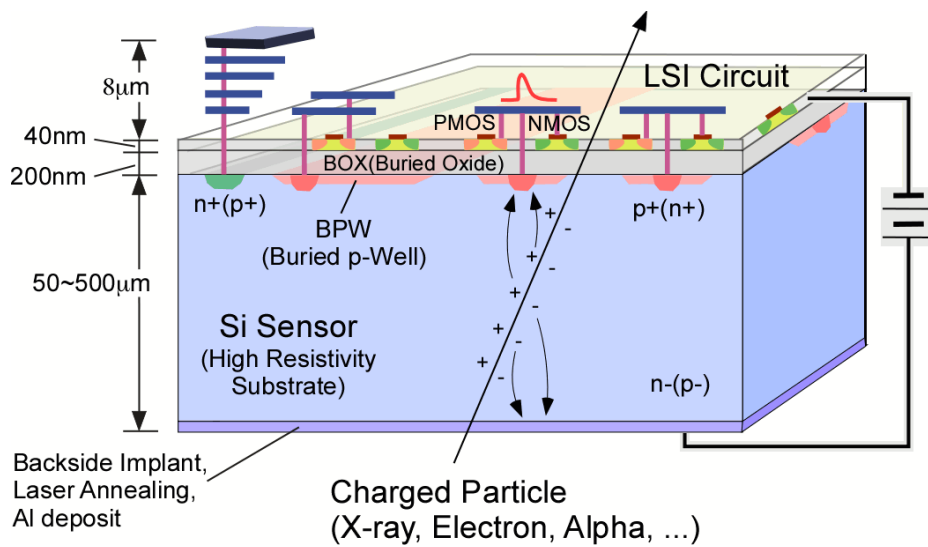


Fig. Cross-section of the SOIPIX detector.

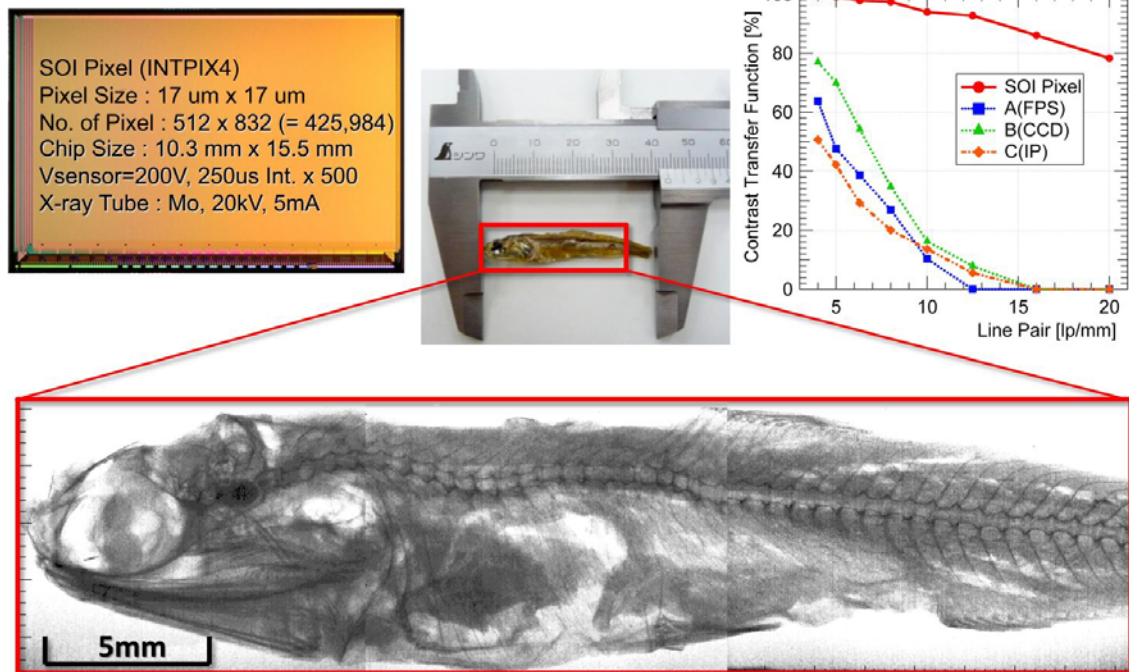


Figure. X-ray image of a dried fish taken by the SOI based sensor, INTPIX4. Photograph of the sensor is shown at the upper left corner with basic parameters. Contrast Transfer Function (CTF) of the sensor, which indicates ability of resolving fine structure, is shown in the upper right graph. The graph also includes CTF of commercial X-ray sensors (A: X-ray flat panel sensor of 50 μm square, B: Fiber-coupling X-ray CCD with effective pixel size of 23 μm square, C: X-ray Imaging plate of \sim 50 μm resolution). SOI sensor shows superb resolution especially for fine object.