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Applications of monolithic CMOS pixel sensor to medical physics

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In recent years, significant advancements in CMOS silicon pixel detectors have led to their widespread adoption across various fields of physics, driving substantial progress in particle detection technologies. A notable example is the ALTAI chip, a CMOS Monolithic Active Pixel Sensor developed as part of the ALICE (A Large Ion Collider Experiment) ITS sensor studies.

The ALTAI chip offers excellent spatial resolution, high charged-particle detection efficiency, minimal noise and fake-hit rate, and reduced sensitivity to photons, making it well-suited for applications in medical physics.

In this contribution, we present recent developments in two ongoing applications within this field. Specifically, we will discuss the concept of a Compton chamber, where multiple stacks of ALTAI chips serve as scatterer elements to form a sufficiently large sensitive volume, enabling real-time monitoring of proton and ion beams in hadron therapy. Additionally, we will explore the prospects for developing an intraoperative probe incorporating an ALTAI chip as a sensitive element, equipped with real-time imaging capabilities for use in radioguided surgery with beta-emitting radiotracers.

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