



Contribution ID: 78

Type: **Poster**

Research on static detection of ICF targets based on muonic X-ray encoded imaging

Saturday 20 April 2024 18:25 (5 minutes)

Abstract: Muonic X-ray Emission (MIXE) was discovered by Chinese physicist Zhang Wenyu as early as 1947, and it can conduct non-destructive elemental analysis inside samples. Research has shown that MIXE can retain the high efficiency of direct imaging while benefiting from the low noise of pinhole imaging through encoding holes. The related technology significantly improves the counting rate while maintaining imaging quality. The ball encoding technology effectively solves the imaging blurring caused by the tilting of the encoding system, and successfully images micrometer sized X-ray sources. This project will combine MIXE and X-ray coding imaging techniques, including ball coding and zone plates, to study the method of non-destructive deep structure imaging of ICF targets and obtaining sub element distribution. This method aims to develop a new method for ICF target detection, which is particularly important for inertial confinement fusion. At the same time, this method can be used to detect and analyze materials that are difficult to penetrate or sensitive, and is expected to solve the problem of element resolution and imaging that traditional technologies cannot overcome. It will provide new methods for the future development of multiple fields such as particle physics, material science, and X-ray optics.

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Session Classification: Poster (For two days)