Contribution ID: **18** Contribution code: **WEPD073** Type: **Poster Presentation**

Using computer vision for online calibration of beam instruments at CERN

Wednesday, 24 September 2025 16:30 (1h 30m)

Accurate calibration of beam instrumentation is critical for the optimal operation of particle accelerators. This work presents a case study of a beam imaging system at CERN's Antiproton Decelerator (AD) target, composed of a light-emitting screen interacting with the beam and an observation camera. During operational use, the system required frequent online recalibrations to address temperature-induced image drifts. To resolve this issue, a fully automated procedure was developed that periodically acquired images and applied multiple computer vision techniques. These techniques included custom curve-fitting methods applied to preprocessed regions of interest and SIFT-based (Scale-Invariant Feature Transform) feature detection to track and correct positional shifts. By automatically performing recalibrations at regular intervals, the approach has significantly enhanced consistency and reliability, enabling continuous and precise beam monitoring in varying environmental conditions. This stabilization technique has subsequently contributed to the optimization of antiproton production at the AD facility. The paper first introduces the challenges associated with calibrating the beam imaging instrumentation of the AD target. It then presents the chosen image analysis techniques, followed by a discussion of the results and measurement errors of the tested methods. Finally, an outlook on potential future improvements is provided.

Funding Agency

Footnotes

Author: MARTÍNEZ SAMBLAS, Javier (European Organization for Nuclear Research)

Co-authors: GONZALEZ-BERGES, Manuel (European Organization for Nuclear Research); Mr BURGER, Stephane (European Organization for Nuclear Research)

Presenter: MARTÍNEZ SAMBLAS, Javier (European Organization for Nuclear Research)

Session Classification: WEPD Posters

Track Classification: MC13: Artificial Intelligence & Machine Learning