Contribution ID: **146** Type: **Poster (by default)**

Studying Instabilities in a PIG Ion Source

At iThemba Laboratory for Accelerator Based Sciences (LABS), a Penning Ionization Gauge (PIG) Ion Source is used for proton production. The accelerated proton beam impinges on a target, and after chemical extraction and purification, is used to manufacture a range of radioisotopes. The accelerated proton beam is also used to study various low-cross section nuclear physics processes. Over the years the PIG source have become prone to various instabilities. These instabilities have a profoundly negative impact on the extracted proton beam and therefore on the applications mentioned above. While the root cause of these instabilities remain largely unknown, a concerted effort has been made to gain a better understanding of the source of the aforementioned instabilities. With this presentation we will report on two approaches that will be used to shed more light on the observed instabilities. The first involve implementing novel optical diagnostics to learn more on the plasma processes leading to the observed instabilities. The second approach is to leverage the power of Machine Learning algorithms to characterize the impact of the various ion source parameters on the instabilities. The progress and preliminary results of these investigations will be reported on.

Funding Agency

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Yes

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Track Classification: Fundamental Processes in Ion Sources, Plasma