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Measuring uniformity and gas density of gas sheet profile monitor for use with heavy-ion accelerators

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We report updates on design work* and ongoing development of a fluorescence-based molecular gas curtain which will be used to observe the 2D transverse profile of multi-charge state heavy ion beams at the Facility for Rare Isotope Beams (FRIB). The device will produce an ultra-thin, rarefied nitrogen gas sheet and requires that the gas curtain be uniform and thin to prevent distortion of the collected signal in operation. To determine the characteristics of the generated curtain, we evaluate the design using a combination of bench-testing with a Bayard-Alpert gauge and molecular dynamics simulations using MolFlow+. This paper details the design and bench testing of the sheet generator, gas removal system, and interaction chamber of the device, as well as expected photon generation from these parameters.

Footnotes

- A. Lokey and S.M. Lidia, "Status of Gas Sheet Monitor for Profile Measurements at FRIB", in Proc. 12th Int. Beam Instrum. Conf. (IBIC'23), Saskatoon, Canada, Sep. 2023, pp. 415-417. doi:10.18429/JACoW-IBIC2023-WEP027

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