## International Conference on Ion Sources (ICIS2021)



Contribution ID: 179

Type: Parallel Session (Contributed Oral) talk

## New Commissioning Results of the MIST-1 Multicusp Ion Source

Monday, 20 September 2021 06:00 (20 minutes)

For the sterile neutrino experiment IsoDAR (Isotope Decay-At-Rest), we have developed a compact particle accelerator system delivering a 10 mA, continuous wave (cw) proton beam at 60 MeV to a neutrino production target. The accelerator comprises a compact isochronous cyclotron, an RFQ embedded in the cyclotron yoke, and an ion source. To reduce space charge effects during injection and acceleration, we are accelerating  $H<sub>2</sub><sup>+</sup> instead of protons. To produce the needed cw <math>H<sub>2</sub><sup>+</sup> beam current of 10 mA (nominal) at the required purity and quality, we have built a new filament driven, multicusp ion source (MIST-1). Here we report commissioning results for long-time running at reduced power, demonstrating the feasibility of the design. Highlights include an <math>H<sub>2</sub><sup>+</sup> beam current density of 12 mA/cm<sup>2</sup>, > 80 % <math>H<sub>2</sub><sup>+</sup> fraction, and emittances of 0.05 <math>\pi$ -mm-mrad (RMS, normalized) after extraction. We also present high fidelity simulations that are in good qualitative and quantitative agreement with emittance measurements in our test beam line.

## E-mail for contact person

winklehn@mit.edu

## **Funding Information**

**Primary authors:** Dr WINKLEHNER, Daniel (Massachusetts Institute of Technology); CONRAD, Janet (MIT); SMOLSKY, Joseph (Massachusetts Institute of Technology); WAITES, Loyd (Massachusetts Institute of Technology); WEIGEL, Philip (Massachusetts Institute of Technology)

Presenter: Dr WINKLEHNER, Daniel (Massachusetts Institute of Technology)

Track Classification: Production of high intensity ion beams