

# Development of wet nitrogen doping to improve the performance of half-wave resonators

*Tuesday 27 August 2024 15:05 (5 minutes)*

FRIB is developing a new N-doping method with a simplified recipe. This recipe is called wet nitrogen doping, by adding nitric acid to the conventional EP acid. Nitrogen doping introduces impurities to the SRF surface, and reduces the BCS resistance by shortening the mean free path, which leads to a higher  $Q_0$ . Conventional nitrogen doping, developed at FNAL and Jlab, requires a high-temperature treatment (900 °C), and an additional light EP to remove the over-contaminated layer. This recipe produces a decreasing  $Q_0$  at extremely low fields but successfully achieves high  $Q_0$  performance up to 25 MV/m. The wet doping method does not require additional high-temperature baking and light EP afterwards, therefore it is superior in terms of processing steps. This method produced a high  $Q_0$  of  $8 \times 10^{10}$  at a low field of 0.5 MV/m without the decreasing trend on FRIB beta=0.53 HWR. In this presentation, we will show the related R&D results generated from the FRIB 0.53 HWRs.

## Footnotes

## Funding Agency

the U.S. Department of Energy, Office of Science, DOE Office of Science User Facility under Award Number RC114424

**Primary author:** Dr WU, Yuting (Facility for Rare Isotope Beams, Michigan State University)

**Co-authors:** GANSHYN, Andrei (Facility for Rare Isotope Beams, Michigan State University); COMPTON, Chris (Facility for Rare Isotope Beams, Michigan State University); METZGAR, Ethan (Facility for Rare Isotope Beams, Michigan State University); SAITO, Kenji (Facility for Rare Isotope Beams); ELLIOTT, Kyle (Facility for Rare Isotope Beams, Michigan State University); POPIELARSKI, Laura (Facility for Rare Isotope Beams, Michigan State University); KIM, Sang-Hoon (Facility for Rare Isotope Beams, Michigan State University); COMBS, Spencer (Facility for Rare Isotope Beams); KONOMI, Taro (Facility for Rare Isotope Beams); XU, Ting (Facility for Rare Isotope Beams); HARTUNG, Walter (Facility for Rare Isotope Beams, Michigan State University); CHANG, Wei (Facility for Rare Isotope Beams, Michigan State University); Dr CHEON, Yoo Lim (Facility for Rare Isotope Beams, Michigan State University)

**Presenter:** Dr WU, Yuting (Facility for Rare Isotope Beams, Michigan State University)

**Session Classification:** Tuesday Oral Posters

**Track Classification:** MC4: Technology: MC4.8 Superconducting RF