

# Development of wet nitrogen doping to enhance Q performance of $\beta=0.53$ half-wave resonators

*Tuesday 27 August 2024 16:00 (2 hours)*

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 0.5MV/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

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