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HPR and Plasma Processing of a Superconducting 360 MHz CH Cavity

Wednesday, 22 May 2024 16:00 (2 hours)

Goethe University (GU), Gesellschaft für Schwerionenforschung (GSI) and Helmholtz Institut Mainz (HIM) work in collaboration on the Helmholtz Linear Accelerator (HELIAC). A new superconducting (SC) continuous wave (CW) high-intensity heavy ion linear accelerator (Linac) will provide ion beams with a maximum duty factor up to beam energies of 7.3 MeV/u. The acceleration voltage will be provided by SC Crossbar H-mode (CH) cavities, developed by the Institute for Applied Physics (IAP) at GU. Preparation methods were investigated to increase their performance. High-pressure rinsing (HPR) with ultra-pure water was performed at HIM and recovered the maximum electric field of a 360 MHz 19-cell CH cavity from $E_a = 1.6$ MV/m to $E_a = 8.4$ MV/m. This result exceeds the prior highest electric field observed of $E_a = 7$ MV/m by 20%. The effect of helium processing has been subsequently investigated. The cavity has been processed for a total of 2 hours at a cavity pressure of 5×10^{-5} mBar. The performance measurement showed promising results, with an increase in maximum gradient and a change in Q-slope behavior. Further tests of helium processing concerning the reproducibility, longevity, and optimization of the observed effects are scheduled at IAP.

Footnotes

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