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Enhancement of medium-temperature heat-treated SRF cavities for high quality and high gradient with supporting sample investigations

Tuesday 23 September 2025 09:50 (20 minutes)

The heat treatment of SRF cavities at medium temperature (250 ℃ to 350 ℃), also known as "mid-T heat treatment", is one of the R&D activities at DESY towards a high-duty-cycle (HDC) upgrade of the European XFEL. Such treated cavities exhibit an improvement in the quality factor Q0 (3E10 to 5E10) at a moderate accelerating electric field strength Eacc (10 MV/m to 20 MV/m) compared to EuXFEL cavities. In fact, cavities treated in this way do experience quenching at Eacc in the range of 20–30 MV/m, i.e. they cannot be operated at gradients above 30 MV/m. However, in this work, we have found that a heat treatment consisting of a combination of mid-T and low-T not only favorable high Q0-values were measured, but additionally high gradients of up to 40 MV/m could be achieved. This offers great potential for upgrading modern LINACs with new high usable performance. The results of 1.3 GHz TESLA-type single- and nine-cell cavities as well as the influence of the effective oxygen diffusion length l will be presented. Further insights into the surface of Nb are provided by supporting sample analyses.

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Yes

Footnotes

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