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Design, fabrication and concept for the surface treatment of the SRF cavity prototype for the CLIC damping rings

Monday 22 September 2025 14:30 (3 hours)

The Compact Linear Collider (CLIC) Damping Rings (DRs) must generate ultra-low emittance bunches to achieve high luminosity. This requires many wigglers with high energy loss, compensated by the RF system. The resulting strong beam loading transients pose a major challenge for RF system design. A novel 2 GHz SRF cavity with an ultra-low R/Q below 1 Ω is proposed to minimize these transients. Design and fabrication of a bulk Nb prototype, turned from a single piece and EB welded, are presented. A conceptual study of surface treatment to achieve the highest surface magnetic field—the goal of the prototype cold test—is also described. To enable excellent performance, we plan to apply a 75/120℃ modified low-temp bake with cold electropolishing. This approach consistently delivers high gradients and quality factors in TESLA-shaped 1.3 GHz SRF cavities. Adapting this for the 2 GHz ultra-low R/Q design aims to maximize surface magnetic field while minimizing residual resistance and field emission—critical to meeting CLIC DR RF performance requirements under high beam loading.

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Yes

Footnotes

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