Exploring Innovative Pathway For SRF Cavity Fabrication

O. Hryhorenko[1†], C.Z. Antoine[2], T. Dohmae[3], R. Valizadeh[4], David Longuevergne[5]

[1†]Thomas Jefferson National Accelerator Facility (JLAB), Newport News, VA, USA

[2]Université Paris-Saclay, CEA-IRFU, Gif-sur-Yvette, France

[3]High Energy Accelerator Research Organization (KEK), Tsukuba, Japan

[4]Science and Technology Facilities Council (STFC/DL/ASTeC), Daresbury, Warrington, UK

[5]Université Paris-Saclay, CNRS/IN2P3, IJCLab, Orsay, France

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Abstract

This article shows a study on an alternative pathway for the fabrication of a complete 1.3 GHz SRF cavity, aiming at improving production reliability, reducing the use of chemical polishing (EP or BCP) which is a costly and safety-critical step, and preserving surface quality after forming. Unlike the conventional pathway, the fabrication process is performed after polishing. This point is crucial as the used polishing technology could be applied only to flat geometries. The performed investigation demonstrates that damages during the fabrication process are considered minor, localized, and limited to the near-surface. Moreover, these studies confirm that the damaged layer (100-200 µm) is mainly caused by the rolling process, and not by the subsequent fabrication steps. A laser confocal microscope and SEM-EBSD technique were used to compare samples before and after forming. The preliminary results are discussed and presented in this paper.

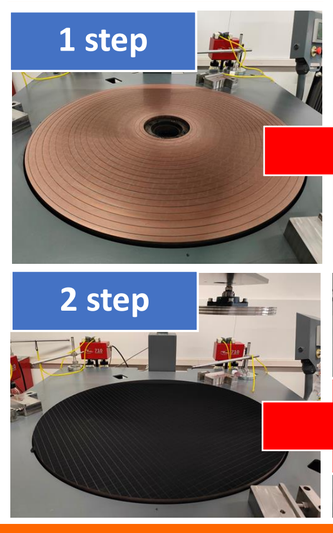
Goals

- Improve production yield
- Remove damaged layer (100-200 µm) before fabrication
- Improve roughness and flatness of substrate for thin-films
- Reduce or completely eliminate hazards involved

MP technology

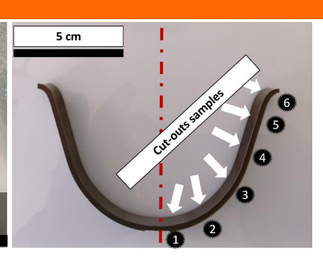
Lapping device

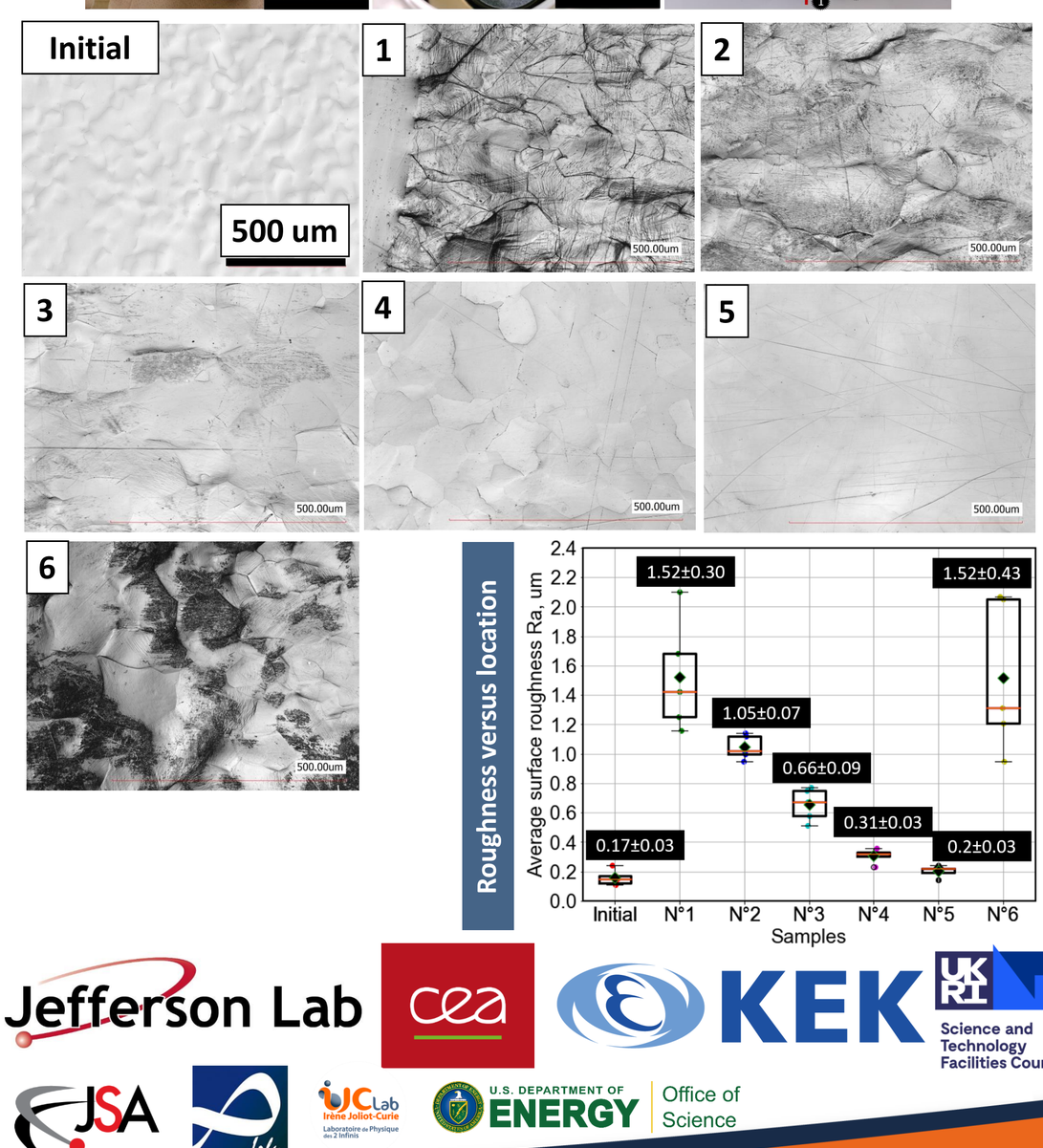
2 steps procedure



Visual inspection

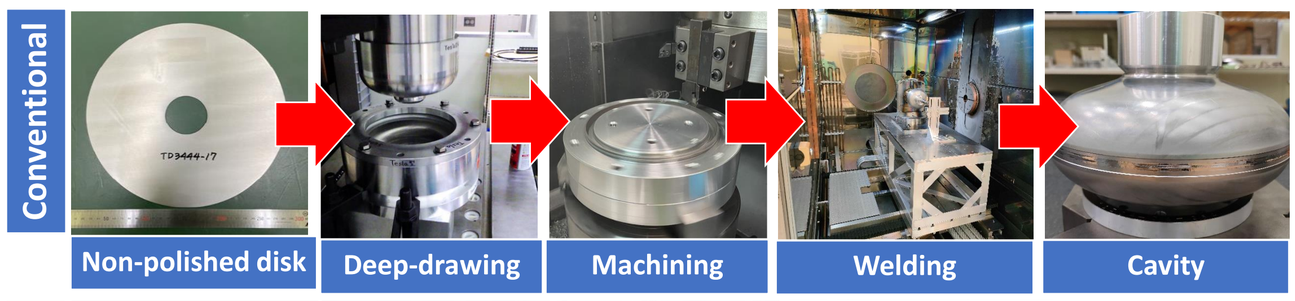
Face characterization





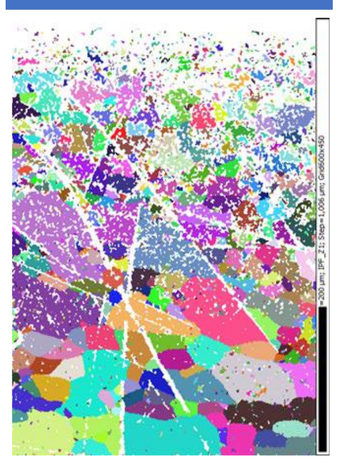
Experimental set-up

SRF Cavity Fabrication Pathway

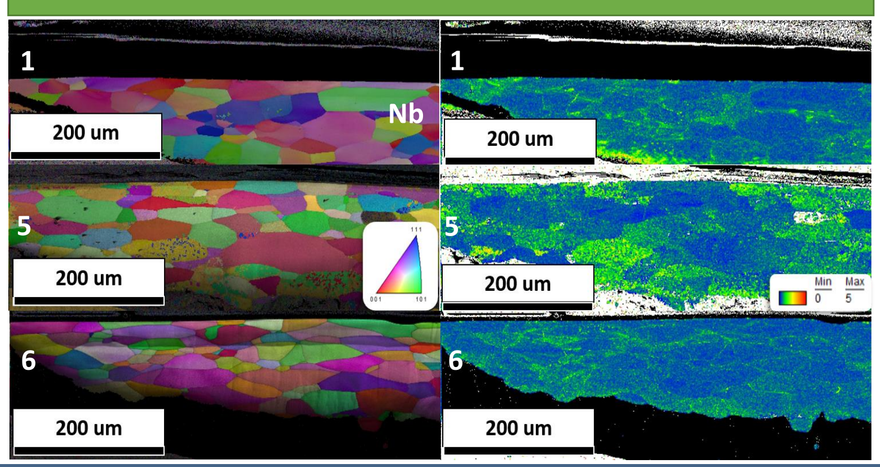


Cross-section evaluation

Conventional



Alternative fabrication



Conclusions & Perspectives

- We fabricated a first one 1.3 GHz cell with a novel approach, applying polishing before fabrication, to study material properties.
- Damages after cavity fabrication are considered to be less than 1 µm and located at revealed new grain GBs.
- Superior level of smoothness and flatness before forming compared to conventional polishing.
- High residual strain at GB might be removed via recrystallization (800 °C, 2h).
- Three additional cavities will be fabricated in the framework of the FJPPL program (one is welded, and 4 half-cells are ready), to study RF performance.

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