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Magnetic and Electromechanical Characterization of a High-Jc RRP wire for the MQXF Cable

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In this work, we summarize the results of an experimental campaign of inductive and transport measurements aimed at the evaluation of the electromechanical performances of a 0.85 mm diameter RRP® wire relevant for the HiLumi LHC project. SEM micrographs have been used to evaluate the sub-element diameter and Cu/non-Cu ratio, whereas the chemical composition across the sub-element sections has been studied via energy dispersive X-rays spectroscopy. The critical current dependence on the magnetic field and uniaxial applied strain (between -0.2% and 0.5%) has been investigated in a temperature range comprised between 4.5 K and 10 K. Furthermore, the strand magnetization up to 12 T has been measured at different temperatures (4.3 K-14 K) to determine the strand's effective filament diameter and to assess the critical current density in the temperature and field range where transport current measurements were not available. The experimental results have been analysed in the framework of a scaling law model, by using two different approaches for the data fitting. These results provide an accurate parameterization of the critical surface in terms of field, temperature and strain, to be used as a general reference for all purposes aimed at realizing a magnet sound design.

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