Superconducting Niobium-Tin (Nb_3Sn) wires have become a key technology for the development of next generation accelerator magnets. These conductors can be described by their high critical current density but also by their remarkable strain-dependent behavior. In presence of mechanical loads, the superconducting lattice is distorted resulting usually in a reversible decrease of the critical current. In addition, the performance of the wire is irreversibly degraded when the applied loads exceed a critical threshold. These two aspects are equally critical in view of achieving sound design solutions.

At University of Geneva, a measurement probe with a geometry similar to a Walters spring is used to investigate the critical current of impregnated Nb_3Sn strands under transversal applied forces. This configuration is chosen to simulate the working conditions of a wire in an accelerator magnet. An extensive campaign of measurements has been undertaken to explore the electro-mechanical behaviour of Powder-In-Tube (PIT) and Restacked-Rod-Process (RRP) wires. To approach the conditions experienced in the Rutherford cables of accelerator magnets, the effects of 15 % rolling deformation and of glass fiber sleeving are investigated. The measurements method and the experimental results are presented in detail here.

Furthermore, different research lines are open to study the intrinsic factors of the wire determining the electro-mechanical properties. The presence of voids, the sub-element disposition and the mechanical properties of the strand are currently being studied, with the objective of shedding some light on the mechanisms behind reversible and irreversible critical current degradation.