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Characterisation of HTS insulated coil for high field insert

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High Temperature Superconductors (HTS) are a strong candidate for high field magnets. As their properties are extraordinary especially under high fields and very low temperatures, there are many ongoing projects around the world. The NOUGAT project aims at building a 10 T insert working first inside a 20 T resistive background. Its objectives are not to reach higher field than the already existing resistive magnets but rather to overcome the main issues of using HTS for this kind of applications and pave the way toward full superconductive magnets at lower cost. YBCO was preferred for the NOUGAT insert even if its implementation is still challenging. YBCO tapes display inhomogeneities along their length and this combined with their high thermal stability make them prone to permanent damage when wound. The slow quench propagation also makes the transition hard to detect, so protection remains one of the most challenging issues. Both insulated and metal insulated (MI) coils have been considered for the NOUGAT project. Due to their self-protection behaviour, MI windings have been selected for building the insert but we are still investigating insulated coils for future applications.

We built a fully-instrumented insulated single pancake wound with a 6-mm tape. Voltage taps are set up on each turn to monitor the quench propagation in helium bath under high magnetic field. Results are compared with our quench model, and the MI coils measurements. This study aims at developing our understanding of the windings quench behaviour and testing various quench detection procedures for future large scale insulated applications.

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