

SuperEMFL and Latest Developments at LNCMI: Towards 30 to 40 T High Field All SC User Magnets

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Abstract—The European Magnetic Field Laboratory (EMFL) gathers several infrastructures providing access to static resistive magnets (up to 38 T), pulsed non-destructive (up to 100 T) and semi-destructive (up to 200 T) magnets for all qualified European researchers. The SuperEMFL project is a design study aiming at adding an entirely new dimension to the EMFL through the development of novel SC magnets, using high temperature superconductor (HTS) coated conductors. This is meant to be achieved by combining high temperature superconductor (HTS) insert magnets, a still emerging technology that can work in field above 25 T, with low temperature superconductor (LTS) outsert magnets, a more developed and commercial technology but limited in field below 25 T. The project has two design magnetic field targets, 32+T and 40+T. The first design target proposed to combined a single stack of HTS pancakes in combination with a 19 T / 150 mm LTS magnet; the second can be reached with a similar arrangement at the sake of a narrower central space or by a design with two nested HTS coils combined with a 15 T/ 250 mm LTS magnet to maximise the central space for experiment and reduce mechanical constrains. The particular choice of the project is to use no insulation but a metallic tape co-wound with the bare HTS tape. This so-called Metal as Insulation (MI) technology enables a self-protection feature of the HTS coil by allowing the electrical bypass of defects as well as better mechanical performances in a very compact winding. The results of this project (HTS CC selection, insert design, HTS/LTS coupling model) are being used to implement such a magnet at LNCMI.

***Keywords (Index Terms)*— High Field magnet, HTS coil, coated conductors**

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