SUPERCONDUCTING MAGNETS FOR THE EUROPEAN MAGNET FIELD LABORATORY

Designing of series of beyond state-of-the-art, all-superconducting, 32 T + and 40 T + user magnets to be implemented throughout the EMFL facilities.

2.9 M€	**48**	**11**
BUDGET	MONTHS	PARTNERS

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The development of all-superconducting magnets that can partly replace current high-field resistive magnets will result in a significant reduction of the energy consumption of the static field EMFL facilities. This will strongly improve EMFL's financial and ecological sustainability and at the same time boost its scientific performance and impact, while offering new levels of high-field performance to the scientific community.

By using all-superconducting magnets to offer high field values together with very low noise and vibration levels, and the possibility to run very long duration experiments, EMFL facilities will be attractive for scientific communities for whom present such facilities are not viable (NMR, scanning probe, Fourier transform infrared spectroscopies, ultra-low temperature physics, electro-chemistry …).

The SuperEMFL consortium recognises that all-superconducting magnets have to be useful to EMFL users, who are scientists leading widely varying experiments under very high field and who have purpose-specific needs (peak field, available experimental volume, homogeneity, …) depending on their individual research specialisation and their working environment at the given facility.

The SuperEMFL deployment strategy is thus targeted on the suitable match of magnet design to user expectations and to facilities environment, and on reliable estimation of implementation costs.

High temperature superconductors (HTS) enable high field magnet designs that will:

- Reduce drastically the energy required to generate the field – no resistance and no energy dissipation in HTS magnet coils
- Provide more user access to high field by longer magnet up-time
- Allow long duration / low noise experiments
- Enable new experimental possibilities including FTIR magneto-spectroscopy, scanning tunnelling microscopy, single nano-object magneto-spectroscopy, magneto-Raman scattering, solid-state NMR, …
- Engage new communities across physics, chemistry, biology, materials science, and quantum technologies

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