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Low temperature technologies for accelerators and detectors at CERN

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The European Strategy for Particle Physics (ESPP) has set new objectives for the future options of accelerators in view of Precision Physics or Frontier's Discovery machines. All these accelerators imply large scales of technological breakthroughs which performances may be reconsidered in view of the strategic weight of the sustainability and environmental objectives.
Operating accelerator's systems at higher temperatures for superconducting radiofrequency cavities and for superconducting magnets is one of the highest priorities, giving more visibility and weight to intermediate cryogenic temperatures in the 4.5-50 K domain. As such, the high-Luminosity LHC upgrade was pioneer as technology demonstrator, confirming that the cryogenic aspects shall be part of the overall design of the systems (sc magnets or sc RF cavities), excluding the idea of being a third-party engineering system.
The engineering challenges such as thermo-mechanics, operating temperature range, heat loads extractions, energy efficiency, reliability and Safety and finally integrated M&O (from construction to operation and maintenance) optimisation opens tremendous perspectives to the Cryogenic Engineering in the domains of particle accelerators, keeping their central role in the accelerator and component's design and offering to the experts, domains of developments in the engineering, systems'design, M&O at a level which ensure intellectual and scientific competitivity with other industrial applications of Cryogenics, including those of the environmental sustainability.
Thus, without any doubt, Cryogenic domains will remain a central technology of any future accelerator design provided it manages to go through the engineering and sustainability challenges this technology is facing.

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