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C4Or1B-03: Two new Helium Refrigerators for the LHC accelerator upgrade (HL-LHC) at CERN; from Concept to Tender

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The High Luminosity LHC (HL-LHC) project is aiming to upgrade the Large Hadron Collider (LHC) at CERN by increasing its peak luminosity by a factor of five with respect to its nominal value. This upgrade will include the replacement of the final focusing superconducting magnets and additional superconducting radiofrequency crab cavities in the long straight sections of the interaction points 1 and 5 of LHC.

The cryogenic heat loads in points 1 and 5 of the LHC accelerator will significantly increase, mainly because of the higher luminosity. Therefore, two new refrigerators will be required in points 1 and 5, with each an equivalent capacity of 14kW@4.5K, including 3.25kW@1.9K.

This paper presents the functional requirements and conceptual design, the key choices and specific challenges including the civil engineering constraints and the major technical requirements detailed in the Technical Specification documents for the supply from the European industry of two new helium Refrigerators for HL-LHC. A procurement contract based on this specification, was placed in 2022.

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