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The ESS superconducting RF cavity and cryomodule cryogenic processes

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The European Spallation Source (ESS) is one of Europe's largest research infrastructures, to bring new insights to the grand challenges of science and innovation in fields as diverse as material and life sciences, energy, environmental technology, cultural heritage, solid-state and fundamental physics by the end of the decade. The collaborative project is funded by a collaboration of 17 European countries and is under design and construction in Lund, Sweden. A 5 MW, long pulse proton accelerator is used to reach this goal. The pulsed length is 2.86 ms and the repetition frequency is 14 Hz (4 % duty cycle). The choice of SRF technology is a key element in the development of the ESS linear accelerator (linac). The superconducting linac is composed of one section of spoke cavity cryomodules (352.21 MHz) and two sections of elliptical cavity cryomodules (704.42 MHz). These cryomodules contain niobium SRF cavities operating at 2 K, using the accelerator cryoplant and the cryogenic distribution system. This paper presents the superconducting RF cavity and cryomodule cryogenic processes, which are developed for the technology demonstrators and to be ultimately integrated for the ESS tunnel operation.

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