



Contribution ID: 2717 Contribution code: THPA048

Type: **Poster Presentation**

Challenges for personnel safety systems during commissioning of ESS normal conducting linac

Thursday, 11 May 2023 16:30 (2 hours)

The normal conducting part of the European Spallation Source (ESS) linear accelerator (Linac) entered the phase of staged beam commissioning in 2021. To allow carrying out commissioning activities and operating the normal conducting Linac (NCL), safe conditions for personnel must be assured, for which the Personnel Safety Systems (PSS) at ESS play a substantial role. The Personnel Safety System 1 (PSS1) is the PSS for NCL, and its purpose is to restrict access to NCL area and to ensure that personnel are protected from being harmed by exposure to ionizing radiation in the NCL, generated by the proton beam and high power radio frequency (RF) systems. It is being realized in three phases, which follows commissioning plan of the NCL: beam up to and including radio-frequency quadrupole (RFQ), beam up to and including drift tube Linac (DTL) 1, and beam up to and including drift tube Linac (DTL) 4. PSS1 is a first PSS where Personnel Access Station (PAS) and Material Access Station (MAS) have been used to access the area, and interfaces with the RF systems realized to allow RF systems testing. It faced many challenges during the first two phases, and preparation for the third one, which will be described in this paper.

Funding Agency

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Session Classification: Thursday Poster Session

Track Classification: MC6: Beam Instrumentation, Controls, Feedback and Operational Aspects:
MC6.T18: Radiation Monitoring and Safety