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Calibration of LLRF Systems at ESS

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The European Spallation Source ERIC (ESS) is poised to be a high intensity and high energy neutron source for scientific applications. The source behind this high intensity neutron beam is a long pulse linear proton accelerator. In order to meet the stringent requirements on the proton beam, the protons need to be accelerated in stable accelerating gradients in the accelerating cavities. In order to achieve this, the LLRF system controlling the cavity gradients needs to be carefully calibrated. The presence of around 150 such LLRF systems, each with at least seven RF channels, and their corresponding calibration, poses quite a challenge. In this paper we present the automated calibration procedure that has been developed and is utilized at the facility. The process uses python scripts and integrated signal generator, power meter and the distributed control system (EPICS Channel Access) deployed at the facility to automatically generate the calibration tables, which are then deployed in the respective systems. The method utilizes statistical analysis of measurement data, and curve fitting procedures to generate calibration tables with high accuracy.

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Footnotes

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Yes

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