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SPS/LHC setting-up tools using Python

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Commissioning of the LLRF systems of CERN accelerators consists of a number of time-consuming procedures, involving calibration and fine-tuning of numerous parameters. In the recent years, a system of Python scripts was developed to automate the setting up of the LLRF of the LHC and the SPS. Targeted at RF experts, the scripts provide high-level interface to the underlying physical system, managing I/O communication and performing data analysis and parameter optimisation. Designed with maintainability and portability in mind, the system can be expanded to be used with other accelerators at CERN.

In addition to the scripts, a dedicated IP (Intellectual Property) core was designed to be easily deployed in RF systems. The IP core is an excitation mechanism built into the FPGA firmware to perform measurements of transfer functions (Baseband Network Analyzer, BBNA) and to inject band-limited noise to study Coupled-Bunch Instability (CBI), growth rates and longitudinal diffusion.

The excitation core works in conjunction with the embedded acquisition IP core (acqCore) to record the excitation and the response of a system. The recorded data allow offline computing of the transfer function.

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