

The SwissFEL LLRF system - concept and realization

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PSI prepares the construction of an X-ray free-electron laser facility, SwissFEL, which has received full funding by end of 2012. The baseline design consists of a 5.8 GeV normal conducting linear accelerator operated with a repetition frequency of 100 Hz and two FEL lines providing X-rays with pulse lengths in the fs range and wavelengths down to 0.1 nm. The generation of high-brightness beams with a very compact accelerator layout imposes tough stability requirements on the RF system and hence on the LLRF system. In this contribution the concept of the SwissFEL LLRF system will be introduced. It has to control the accelerating fields of RF standing and traveling wave structures at S-, C- and X-band frequencies and cope with vector sum control of up to four cavities including phase modulation schemes for the operation of barrel open cavity RF pulse compressors. The modular hard- and software structure of a scalable modern digital processing platform based on FPGAs, multicore CPUs running real-time Linux, and FMC standards will be presented. A prototype LLRF system for C-band has been developed and first experiences will be given.

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