

# RF CONTROLS FOR HIGH- $Q_L$ FOR THE LCLS-II\*

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## Abstract

The SLAC National Accelerator Laboratory is building LCLS-II, a new 4 GeV CW superconducting (SCRF) Linac as a major upgrade of the existing LCLS. The LCLS-II LLRF collaboration is a multi-DOE lab collaboration leveraging expertise on LLRF and controls across the DOE accelerator complex. The necessity of high longitudinal beam stability of LCLS-II imposes tight amplitude and phase stability requirements on the LLRF system (up to 0.01% in amplitude and 0.01° in phase). This is the first time such requirements are expected of superconducting cavities operating in continuous-wave (CW) mode. Initial measurements on the Cryomodule test-stands at partner labs have shown that the early production units are able to meet the extrapolated hardware requirements to achieve such levels of performance. A large effort is currently underway for system integration, EPICS controls, transfer of knowledge from the partner labs to SLAC and the production and testing of 75 racks of LLRF equipment.

## INTRODUCTION

The LCLS-II LLRF project is a multi-lab collaboration leveraging LLRF and controls expertise across the DOE accelerator complex. The end result is the production of 75 racks of LLRF equipment, loaded with FPGA logic to apply real-time feedback and covered with layers of software to interact with the LCLS-II EPICS control system. The hardware design is now frozen and the production is well under way at SLAC. Gateway and software development is still in progress at the partner labs. Several test-stands are currently in use to gain experience on the system in preparation for commissioning of the Linac in late 2019. The Gun and buncher LLRF systems are now ready for commissioning as part of the Early Injector Commissioning (EIC) at SLAC and development will continue over the course of FY18 and FY19.

## HARDWARE PRODUCTION & TESTING

### EPICS CONTROLS

### EARLY INJECTOR COMMISSIONING

### TEST-STANDS AT PARTNER LABS

*CMTF AT FNAL*

*LERF AT JLAB*

*TEST-STAND AT SLAC*

*TEST-STAND AT LBNL*

### TEST RESULTS

### CONCLUSIONS

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