

LHC-SPS LLRF Upgrade

The view from SLAC

C. H. Rivetta¹
P. Baudrenghien² J. D. Fox¹, T. Mastoridis²

¹Advanced Accelerator Research Department, SLAC
²BE-RF Group - CERN

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1 Introduction

2 SPS RF system

3 Plan

Introduction

Toward the operation of the LHC Complex at high current

- Evidence of limiting the beam current capability in the LHC Complex is defined by SPS injector
- Plans to optimize the operation and LLRF settings in the LHC-RF system are "second priority" and give SPS up grades "first priority".
- A re-direction of our collaboration with CERN BE-RF group in the area of RF systems-longitudinal beam dynamics under the LARP support seems to be a natural path in order to increase the beam current operation and limits in the LHC Complex toward an improvements in Luminosity.
- The SPS RF project bring new options to expands our research in the topic of RF system - long. beam dynamics interaction adding to the previous experience with SLAC- PEP-2 and CERN LHC RF systems
 - Include modeling of traveling wave cavities
 - Operation of two RF systems (200MHz-800MHz)

SPS RF system up-grade: Goal of the Collaboration

Goals

- Develop models of the SPS LLRF-beam interaction, which will help with the choices during the SPS LLRF upgrade design process at CERN
 - This process allowed in the past to consider the interaction of LLRF-RF system and beam dynamics as a unique system.
 - Link LLRF variables to beam dynamics metrics and quantify their impact
 - Impact of imperfections and non-linearities in the system stability and performance. Robustness.
 - Guide choices in the LLRF implementation compatible with the overall specifications and performance of the RF system-beam quality.
- Automated configuration tools for RF system setting-up
 - Remote tool to consistently set the LLRF parameters based on the measured model of the RF system.

SPS RF system up-grade: Challenges

Challenges - Future Impact

- SPS RF system is composed by two 'harmonic systems'
 - Implies coordination of both systems during operation
 - Complex design
 - Configuration tool for both systems.
- Synergy with future projects at SLAC
 - One of the options for the RF system in the proposed future light source PEP-X at SLAC, considered to use two RF systems to compatibilize performance and beam life time.

LARP LLRF system project - Plan

Plan

- Re-direct the collaboration right now - 800MHz system installed end 2012 - Large part of the 200MHz installed and commissioned during 2013-2014 shutdown. 2 additional cavities in 2017.
- Address the studies via simulation, participate in the design of the LLRF and participate in the commissioning of the system. Actively involved in the design and commissioning of the configuration tools.
- Ramp up the collaboration for next FY up to 1FTE
- Option 1
 - SLAC FT - 50-75 %
 - 1 Stanford Univ. Grad.Student
- Option 2
 - SLAC FT - 30-50 %
 - Toohig Fellow (Part-time 50-70 %)
 - 1 Stanford Univ. Grad.Student

Thanks to the audience for your attention!!!, ...Questions?