Abstract
There will be a major extension of the FLASH facility during next three years. The modifications include a new experimental hall to double the number of user stations and an additional variable-gap undulator in a separate tunnel to be able to deliver two largely independent wavelengths to two different user stations simultaneously. The electron beam is switched between the present fixed-gap undulator line of FLASH and the new variable gap undulator FLASH2. The LLRF system will be capable to control RF field stability according to new requirements like RF amplitude and phase change from pulse to pulse and intra-pulse, different beam loading for different beam lines, ability of independent LLRF parameter adjustment and tuning for FLASH and FLASH2.

Bi-level Accelerating Gradient Test - from Pulse to Pulse

- (12/06/2011) Tested the possibility of operating the cavities with two gradient levels (from pulse to pulse) at ACC07 so that they can be run with low and high gradient for FLASH and FLASH2
- 10 Hz rep rate (gradient levels aren't synchronized with beam)

Possible Implementation of LLRF Control Tables for Bi-level Operation

- Controller server creates two reference sets of tables for FLASH and FLASH2 pulses
- Actual tables are superposition of both reference tables

Bi-level Accelerating Gradient Test - Intrapulse

- Tested the possibility of operating the cavities with two gradient levels (intra pulse) at ACC07 so that they can be run with high and low gradient for FLASH and FLASH2
- 10 Hz rep rate (gradient levels aren't synchronized with beam)

Requirements
- RF amplitude and phase change within pulse
- RF amplitude and phase change from pulse to pulse
- Different beam loading for FLASH and FLASH2 (including arbitrary pulse patterns)
- Ability of gradient tuning of ACC05 and ACC07 (for wavelength scans FLASH)
- Ability of phase tuning of Gun, ACC1, ACC39 (for variation in compression FLASH and FLASH2)
- Ability of independent LLRF parameter adjustment for FLASH and FLASH2

High gradient ramp must be set up so that an adjustment to the lower ramp does not affect the high gradient ramp. This is for adjusting all LLRF parameters in FLASH without worrying to disturb the operation in FLASH2.

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FLASH II Project: LLRF Options and Tests

Schematic Layout of the FLASH Facility

The electron gun is on the left, the experimental hall on the right. Behind the last accelerating module, the beam is switched between FLASH I, which is the present undulator line, and FLASH II, which is the upgrade.