

# Timing of the ALS booster injection and extraction

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## Abstract

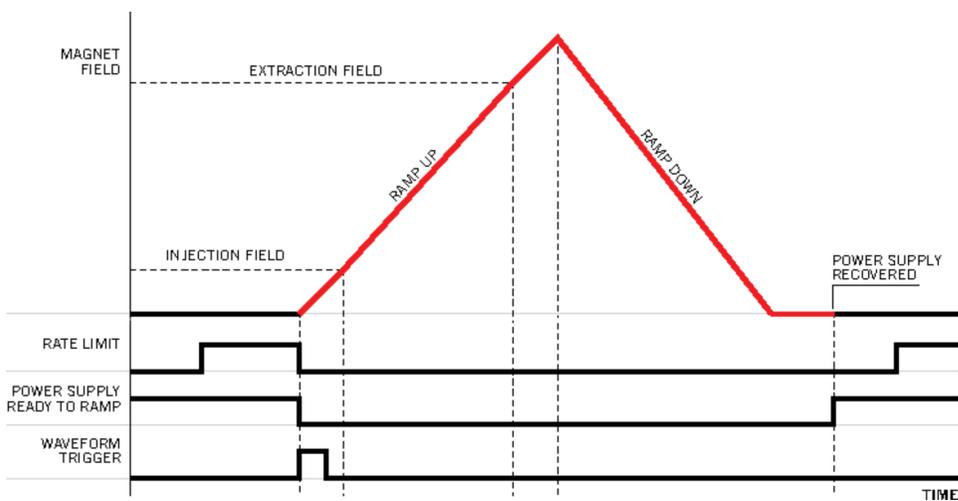
The Advanced Light Source (ALS) timing system upgrade introduces a complete replacement of both the hardware and the technology used to drive the timing of the accelerator. The implementation of a new strategy for the booster injection and extraction mechanisms is conceptually similar to the one in place today, but fundamentally different due to the replacement of the technology. Here we describe some of the building blocks of this new implementation as well as an example of how the system can be configured to provide timing for injection and extraction of the ALS booster.

## Overview

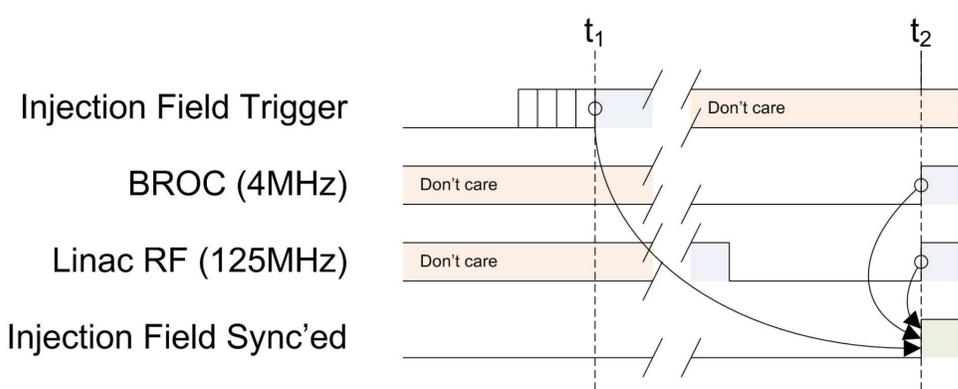
The ALS timing system is currently being replaced as part of the ALS control system upgrade. The current timing system was implemented around 20 years ago based on booster field measurements and the generation of analog triggers to drive the different components of the machine. The timing system upgrade currently undergoing will benefit from 20 years of improvements in the electronics and optics fields.

The injection and extraction mechanisms are of particular interest in the process of upgrading the timing system due to the change in the technology. We have been evaluating different options and the new architecture really favors a purely time-based system, where instead of having the booster bending magnet drive the start of the injection and extraction sequences, these processes will be entirely predicted and driven having a time base from the centralized Event Generator.

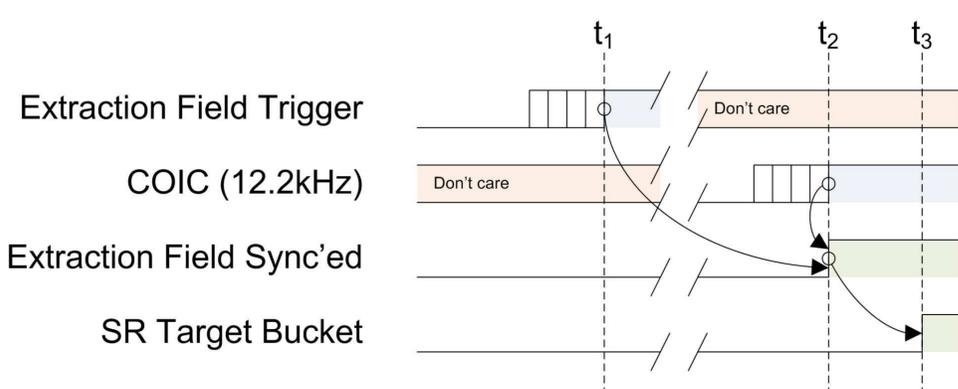
## BOOSTER FIELD CYCLE



## INJECTION

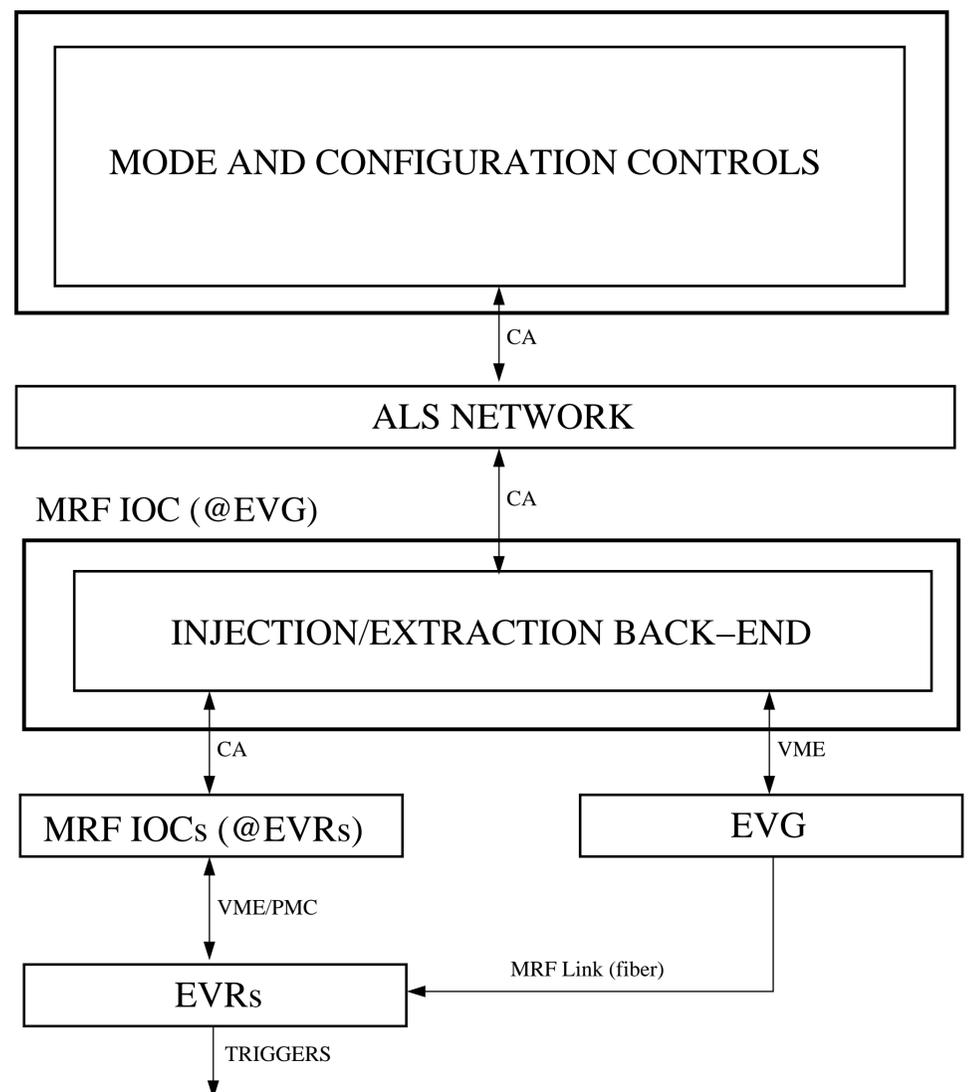


## Extraction



## Implementation

TIMING APPS (Matlab, C#, etc.)



- ▶ Field-based system translated into time-based system with field tracking,
- ▶ Adaptation of legacy injection and extraction mechanisms are challenging,
- ▶ System tested in user operations and no degradation of injection/extraction efficiency found.