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## Novel distributed fast controls architecture for the consolidation of CERN's PS kickers

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The control of fast pulsed magnet systems at CERN requires often a common set of fast digital electronics sub-systems to perform tight timing control and fast protection of high-voltage pulse generators. Although the generators architecture is mainly modular, these control systems were until now most of the time centralized: several generators per equipment, but one global and equipment-specific control system.

With the upcoming consolidation of CERN's PS kicker magnets controls, a new distributed architecture is proposed. Instead of one global control crate per functionality (timing, fast protection, acquisition, etc.), this new approach incorporates one control crate per generator, merging several functionalities together. The crate becomes more generic, offering higher flexibility in terms of system size (number of generators or magnets). It also allows to reduce the cabling costs but comes with new challenges in terms of data transmission bandwidth and software latency.

This paper presents the new Distributed Kicker Fast Controls (DKFC) solution based on CERN ATS Distributed I/O Tier (DI/OT) ecosystem\*, including new Open Hardware electronic boards (ADCs, DACs, I/Os, dry contacts, etc.) and gateway structure with high-speed board-to-board data exchange. Advantages and drawbacks of this new architecture and possible future extensions are also discussed.

### Footnotes

- G. Daniluk et al., "Low-cost modular platform for custom electronics in radiation-exposed and radiation-free areas at CERN", ICALEPCS'19, New York, USA, doi:10.18429/JACoW-ICALEPCS2019-TUAPP03

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