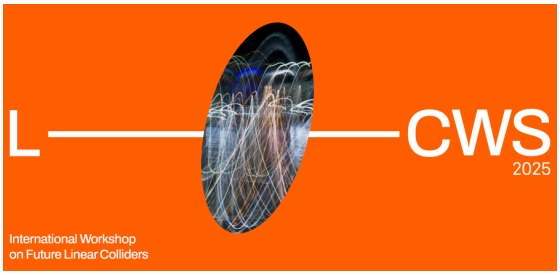

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Modular LLRF Control and Acquisition System for the ion injector being developed at IFIC

Tuesday 21 October 2025 19:40 (1 hour)

This contribution presents the design and preliminary validation of a modular Low-Level Radio Frequency (LLRF) acquisition and control system specifically tailored for the low energy linear ion injector being developed at IFIC, operating around 750 MHz.
The system adopts a MicroTCA (uTCA) platform integrating high-speed Advanced Mezzanine Cards (AMC) for RF signal generation, conditioning, digitization, and interlock management. The architecture is optimized for flexibility and scalability in injector configurations, enabling seamless adaptation to varying beam parameters and operational scenarios.
Key subsystems include FPGA-based I/Q demodulators allowing parallel processing of multiple RF channels, and a real-time embedded software stack based on a Linux distribution. These host control routines for phase/amplitude stabilization, power regulation via PID loops, and failure response mechanisms critical to injector integrity.
The system is supervised through a distributed SCADA layer built with the TANGO Controls framework, providing operator interface, alarm/event handling, and long-term data logging capabilities. This combination of open hardware and software solutions fosters reusability and cost-efficiency in injector test benches and potentially in future linear collider injector modules.

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