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Tests on Integration of Industrial and Scientific Control Systems for IFMIF-DONES

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As part of the EUROFUSION consortium, S2Innovation has been actively involved in the development and validation of control system solutions for the IFMIF-DONES project, addressing one of the most critical challenges in large-scale scientific facilities: bridging the gap between open-source research frameworks and industrial-grade safety systems.

The presentation will highlight three completed tasks:

1. Hybrid EPICS + WinCC OA integration –development of a prototype Bridge ensuring bidirectional communication with <30 ms latency and >99.5% reliability, demonstrating that hybrid research–industry architectures can meet Machine Protection System (MPS) requirements.

2. PLC–EPICS IOC communication tests –systematic comparison of communication protocols (OPC UA, s7plc, s7nodave) showing that while OPC UA offers interoperability, only direct S7nodave-based communication on modern PLCs consistently meets safety latency requirements.

3. OPC UA pilot implementation –building a testbed replicating CODAC conditions, proving that IPC hardware with integrated S7-1500 dramatically reduces latency to ˜15 ms, while standard S7-1200 PLCs remain unsuitable for critical paths.

Key outcomes: validated guidelines for safe and reliable communication architectures in DONES, reduction of technological risk for future fusion projects (ITER, DEMO), and contribution to international best practices in control system integration.

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