FUSION FOR ENERGY

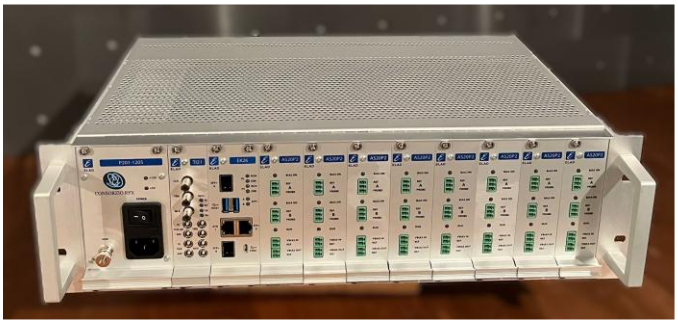
TECHNOLOGY OFFER

Modular high-performance DAQ systems for extreme electromagnetic environments

Through its collaboration with Consorzio RFX and Fusion for Energy (F4E), ELAD has developed specialized data-acquisition (DAQ) architectures designed for the most demanding environments. Built on System-on-Module FPGA+CPU devices, these systems ensure signal integrity where high channel density, robust galvanic isolation, and sub-microsecond synchronization are required, even in the presence of megavolt accelerators and 2000 V disturbance peaks.

The technology

ELAD provides **modular DAQ platforms** that handle **data acquisition** and **real-time digital signal processing** (such as numerical integration of dB/dt signals to eliminate analogue drift). The hardware is supported by a **software suite** for live visualization and dashboard customization, Python-based math channels, and multiple data export options.



Advantages and Potential Applications

- Robust **signal integrity**: Engineered for environments dominated by strong electromagnetic disturbances and arc discharges.
- Total isolation: Each channel features **independent galvanic isolation** (up to 1.5 kV rms AC) to prevent ground loops and protect hardware.
- Hardware **synchronization: Distributed timing** over an LVDS bus or PTP/IEEE 1588 ensures inter-module jitter typically remains below 1 ns.
- High performance: Supports a range of interchangeable front-ends, from standard 16-bit/80 kS/s to high-speed 16-bit/20 MS/s and high-performance 20-bit/1 MS/s sampling.
- Active conditioning: Capability to generate **programmable waveforms** for active biasing (up to ±500 V) while simultaneously measuring voltage and current.

While specifically designed to handle the extreme operational demands of the ITER Neutral Beam Test Facility, **the DAQ platform can be restated across different applications**:

- Industrial plasma processing: Plasma thrusters, electric propulsion, and semiconductor etch/deposition.
- Qualification Testing: EMC qualification and high-voltage transient analysis, vibration monitoring, rotating-machinery diagnostics, and motor/inverter test benches.

Collaboration opportunities

ELAD offers two paths for industrial and scientific partners: the modular platform for flexible, off-the-shelf implementation, or fully custom DAQ systems engineered specifically for unique acquisition challenges. The company provides expertise in hardware design, real-time FPGA firmware, and software integration for complex scientific infrastructures.

Fusion for Energy Technology Transfer Programme

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