LA-UR-17-24018

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Title: Modular Neutron Multiplicity Module

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Intended for: proposal

Issued: 2017-05-16

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Modular Neutron Multiplicity Module

INTERNATIONAL NUCLEAR SAFEGUARDS

LANL's neutron shift register coincidence and multiplicity firmware on a standard COTS data acquisition card

Background/State of the Art

- The accepted IAEA unattended neutron multiplicity instrument, the AMSR, is obsolete.
- The JSR-12 is antiquated and nearing its end of manufacturable life.
- The JSR-15 is an attended use only instrument without data storage or Ethernet communications.
- The UMSR is a stand-alone instrument

Innovation

- Implement the accepted and proven LANL shift register firmware on a custom board compliant with standard a COTS data acquisition system.
- The modular approach allows the use of one processor board for many different safeguards data acquisition applications.
- Provides a modular design on a proven commercial crate/controller backplane.

Approach, Metrics and Outcomes

MAIN GOAL

- Produce an inexpensive, high performance, neutron shift register coincidence and multiplicity data acquisition board based on the LANL proven firmware and incorporated into a COTS crate/controller architecture.

HOW IT WORKS

- Existing proven LANL shift register firmware would be incorporated into a module that would plug into a COTS crate and controller combination.
- The type of crate and controller could be dependent on the type selected by the IAEA or could default to a recommended crate such as the National Instruments PXI crate/controller.
- This custom module would have tremendous benefits over the use of the generic FPGA PXI module in that a second GPIO module would be unnecessary.
- The custom module will eliminate timing issues that could result from the use of an auxiliary GPIO module.

Impact

- Safeguards relevance
 - Existing safeguards instruments are becoming obsolete and a modular approach to replacing them is being considered.
 - Neutron multiplicity shift registers are one of the functions needed to replace the aging technology
- Long-Term R&D STR-375
 - Need #5: Deploy equipment
- IAEA STR-382 Objective
 - SGTS-11: UMS
- Start of FY TRL = 6
- End of FY TRL (Planned) = 7

Goals/Action Plan

Current FY

- Install the LANL shift register firmware into a modular circuit board based on an IAEA preferred modular crate.

Future FY

- Demonstrate the final product either on site at LANL or at a facility preferred by the IAEA.

Team

LANL NEN-1 Electronics team

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