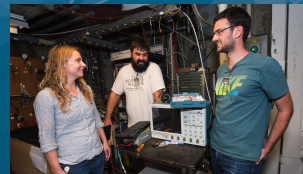
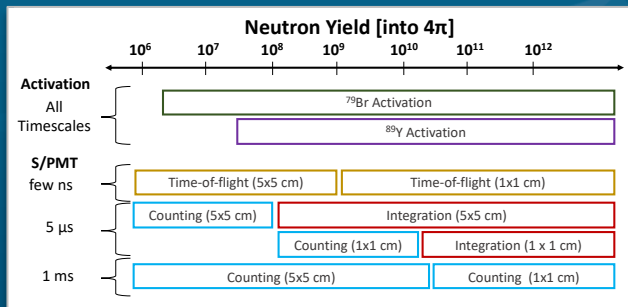
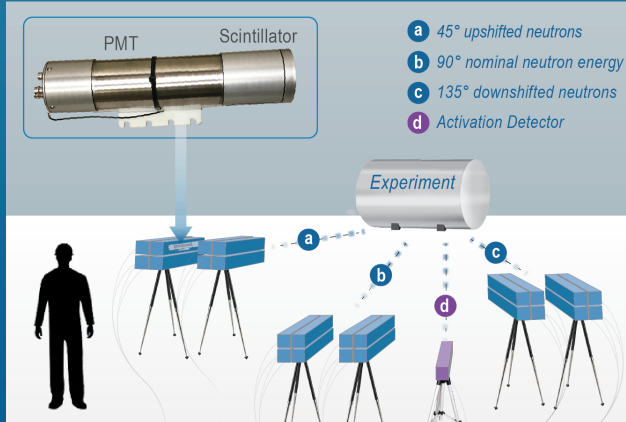


Portable & Adaptable Neutron Diagnostics for ARPA-E (PANDA)

Lawrence Livermore National Laboratory & University of California, Berkeley

Calibrated *neutron yield* measurement & *thermonuclear fusion* verification



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Key Properties

Calibrated neutron yields

Measurement	Measurement of total neutron yield from calibrated LaBr ₃ detectors
Technique	Neutron yield via ⁷⁹ Br and ⁸⁹ Y activation. Automated yields provided in <2 minutes.
Minimum yield	Provide accurate yields at 5e6 total neutrons at 20 cm (fluence = 1e3/cm ²).

Thermonuclear fusion verification

Measurement	Neutron energy resolution to demonstrate thermonuclear fusion and rule out instability generation. Up to 24x independent plastic scintillators coupled to PMTs.
Technique	<p><100-ns neutron pulse: time-of-flight method at different distances and angles allows for recovery of neutron energy</p> <p>>1-μs neutron pulse: neutron pulse-integral histogram used to infer neutron energy spectra</p>
Minimum yield	Measurements possible at neutron yields as low as 1e5 (see left panel).

Small form factor, fast set-up time, and expert simulations

Suitability	Suitable for MCF, ICF, MIF. Any pulse duration, wherever neutrons are produced > 1e5.
Form factor	Under 10-sq-ft footprint.
Set-up time	Diagnostics can be shipped and ready for data collection in ~2 weeks.
Simulation Support	Expert Monte-Carlo simulation (GEANT, MCNP) support to understand neutron environment.