Abstract:
DOE/NNSA now has created the most versatile Dense Plasma Focus capability in America. In two laboratories that support the varied research performed at the Nevada National Security Site, NSTec has steadily improved the performance, repeatability and reliability of a particular type of machine that produces nuclear fusion: the Dense Plasma Focus. With this growing capability in Nevada, the DOE has achieved world-class DPF performance. The DPF machines are producing intense (up to $10^{13}$ neutrons per burst), short (less than $1/10^{10}$ of a millionth of a second) pulses of both 2.45 and 14 MeV neutrons from nuclear fusion. Remarkably, these machines can fire more than 30 shots a day. They are perhaps the most economical way to produce large bursts of neutrons.
This DPF capability, coupled with the full service laboratories in which they are operated makes the DPFs a powerful scientific research asset. The DPF Labs have been used by LANL, LLNL, SNL, AWE, R&D programs, and universities. During the period of capability building, the Nevada designed and built DPFs have grown from storing less than 100 kilo-joules to having the capacity of storing up to 2 million joules. Yields have increased over 3 decades, shot-to-shot repeatability has greatly improved through engineering design, operational flexibility has significantly increased and because of this, over 6,000 >1 MA DPF shots have been executed.
This talk will focus on the projects that are currently using the DPF laboratories, which include NDSE (Neutron Driven Sub-critical Experiments), NRS (Neutron Resonance Spectroscopy), flash neutron radiography, and nuclear forensics work. This talk will also address some of the current technical issues that prevent DPFs from having $10^{14}$ DT yields, engineering challenges and diagnostic tools that are pertinent to DPF scientific regimes.

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