NCSP Related Nuclear Data Research at RPI

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RPI Nuclear Data Group

- RPI Faculty
  - Prof. Yaron Danon - LINAC Director
  - New hire …..
- LINAC Technical Staff
  - 3 Engineer
  - 4 Technicians
- Graduate Students in 2023
  - 6 PhD students
  - 1 undergraduate
- NNL @ RPI
  - 6 PhDs

Overview of FY 2023 activity

- **ND1 – Cross section measurements ($360K+ $100K CO, ~ -$82K CO to FY24)**
  - Fe-54 measurements and evaluation (**Sukhjinder Singh**)
  - Evaluation work on Zr isotopes (**Gregory Siemers**)
  - F and Ta neutron scattering (**Gregory Siemers**)
  - Improvement to SAMMY URR capabilities (**Alec Golas**)
  - Completed Lead isotopes evaluation (**Peter Brain**)

	Pre-FY2023	FY2023
Iron (^{54}Fe)	RPI	
	IRSN	
Lead (^{204,206,207,208}Pb)	ORNL	ORNL
	RPI	RPI
	BNL	BNL
	NNL	NNL
	IRSN	IRSN

- **ND3 – LINAC refurbishment ($100K)**
  - Improve NCSP and NR nuclear data measurement capabilities
    - Completed modulator and klystron acceptance test
    - Completed speed of light section acceptance test.
    - Current completion date is shifted to 2029
  - A short update will follow

	Pre-FY2024	FY2024
Fluorine (^{19}F)		
	RPI	RPI
Tantalum (Ta)	RPI	RPI

Materials	Pre-FY2024	FY2024	FY2025	FY2026	FY2027
Zirconium (^{90,91,92,94,96}Zr)		ORNL	ORNL	ORNL	ORNL
		NNL	NNL	NNL	NNL
		RPI	RPI	RPI	RPI
		BNL	BNL		

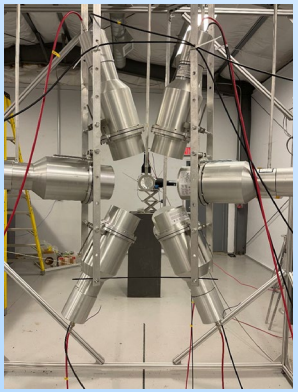
RPI ND-Group Research

Research topic	Student	Degree
Improvements of nuclear data evaluations for lead isotopes in support of next generation lead-cooled fast systems	Peter Brain (graduated)	Ph.D.
Improvement to SAMMY for URR evaluation methods	Alec Golas	PhD.
Fe-54 neutron capture and transmission measurements and resonance parameter evaluation	Sukhjinder Singh	Ph.D.
Neutron die away experiments	Benjamin Wang	Ph.D.
Evaluation of ^{90,91}Zr isotopes and fast neutrons quasi-differential scattering from Ta and F	Gregory Siemers	PhD.
Neutron induced gamma production measurements in the RRR and URR	Katelyn Cook	PhD.
Development of benchmark measurements for capture gamma cascades	Ian Parker	PhD.

NCSP funded | NCSP related

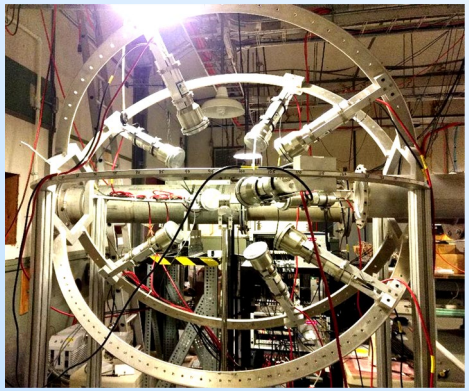
Thermal neutron target

C_6D_6 detector array

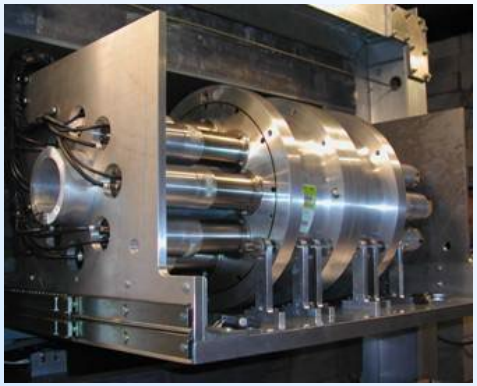


Neutron die away

KeV neutron scattering



Capture detector



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LINAC runs since last review

Use	Time [hours]	Sponsor
Teaching	12	RPI
Thermal cross sections	93	ORNL/NCSP
Preliminary, Carbon, Ta, and Teflon Testing	25	NCSP/NNL
Production In-Beam EJ301 Efficiency Measurements	25	NCSP/NNL
Flight Path Calibration w/ Be Transmission	4	NCSP/NNL
Production Ta Measurement	94	NCSP/NNL
Production Teflon Measurement	165	NCSP/NNL
Total	**418**	

- RF windows conditioning - 130 hours
- Speed of light section SAT - 782 hours
- **A total of 1330 hours**

Workshop on Elastic and Inelastic Neutron Scattering (WINS-2023)

October 10-12, 2023

- Hosted at RPI in NES building and included a tour of the LINAC
- International meeting postponed due to COVID from 2020 to this year.
- About 35 attendees from different laboratories
  - Brookhaven National Laboratory
  - Helmholtz-Zentrum Dresden Rossendoff, Germany
  - IRMM, Belgium
  - Horia Hulubei National Institute Romania, CNRS/IPHC, Strasbourg
  - US Naval Academy
  - Los Alamos National Laboratory
  - Naval Nuclear Laboratory (NNL)
- 21 presentation
  - 7 talks form this group.
- Sponsored by RPI and NNL

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Update on LINAC refurbishment (ND3)

- **Additional details were given in NR/NCSP review in October 2023**
- Completion date shifted to 2029.
- Current LINAC is 2 sections down out of 9, due to dead klystrons
- Cost escalation and slow parts delivery resulted in a longer more expensive phased approach
- Phased upgrades while maintaining capabilities
  1. Install one new modulator to drive two LINAC sections (2024)
  2. Install all modulator to drive existing LINAC (~2027)
  3. Install new accelerator sections (~2029)
- Currently working on
  - Conditioning additional windows.
  - Testing Tapered Phase Velocity (TPV) section
  - Restarting section production
  - Getting ready to connect a new modulator to the current accelerator