Thermal Scattering Law Evaluations and Progress at NCSU

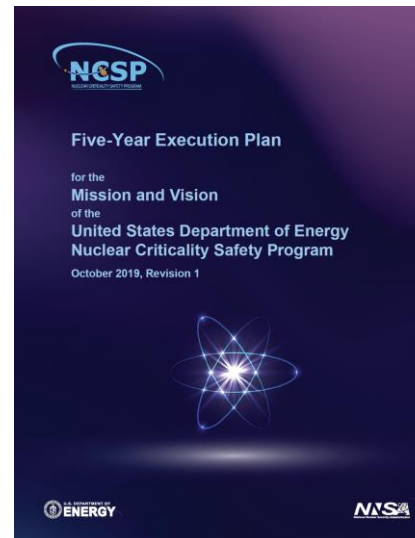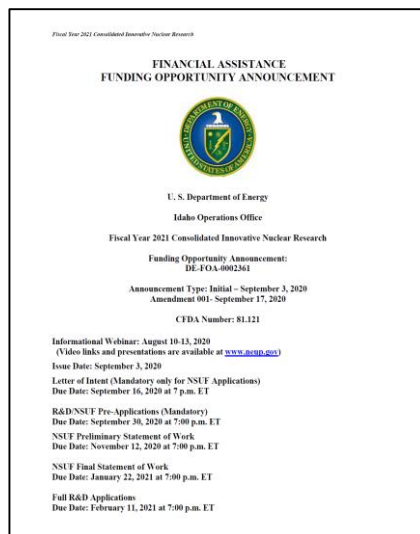## A. I. Hawari, N. C. Fleming. C. A. Manring, B. Laramee, J. Crozier, T. Ahmed

Nuclear Reactor Program

Department of Nuclear Engineering

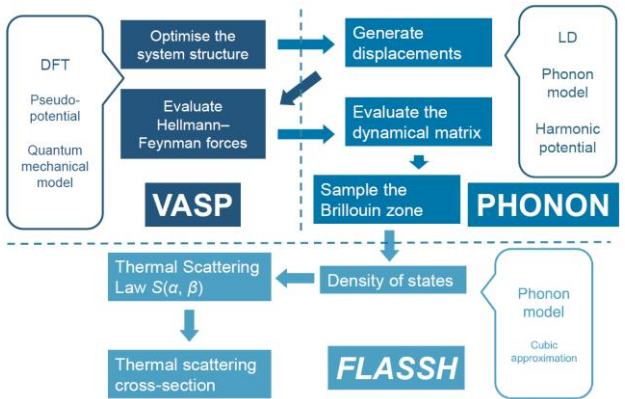**North Carolina State University**

Raleigh, North Carolina, USA

Acknowledgment
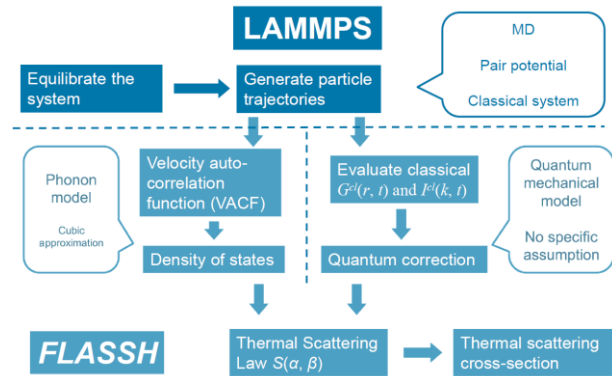
☐ DOE NE through the Nuclear Energy University Program (NEUP)

☐ NNSA Nuclear Criticality Safety Program (NCSP)
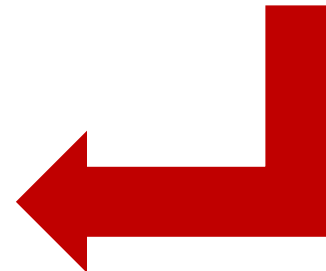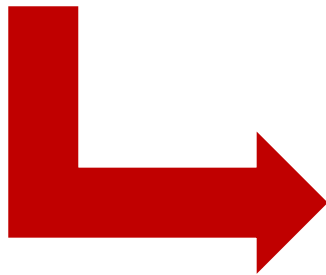- ■ in collaboration with LLNL

☐ Naval Nuclear Propulsion Program (NNPP)

TSL Methodology

DFT/LD approach

MD approach

Contributed TSL Evaluations

| Material	Motivation	Theory	Validation
FLiBe (beyllium)	DOE NE Advanced nuclear reactors No TSL data in ENDF/B-VIII.0	MD *FLASSH*	Ongoing against IRPhEP benchmark
FLiBe (flourine)			
FLiBe (lithium)			
Liquid hydrogen fluoride (hydrogen)	NCSP applications No TSL data in ENDF/B-VIII.0	MD *FLASSH*	Ongoing total cross section
Heavy oil (hydrogen)	NCSP/NR applications No TSL data in ENDF/B-VIII.0	MD *FLASSH*	Ongoing total cross section
Sapphire (Al in Al2O3)	Neutron science / Research Reactors No TSL data in ENDF/B-VIII.0 (cryogenic temperatures)	DFT/LD *FLASSH*	Total cross section
Sapphire (O in Al2O3)			
Polyethylene (hydrogen)	NCSP applications Extended ENDF/B-VIII.0 to cryogenic temperature	MD *FLASSH*	Total cross section & benchmarks

New to NNDC
Molten Salt FLiBe Data – DOE NE
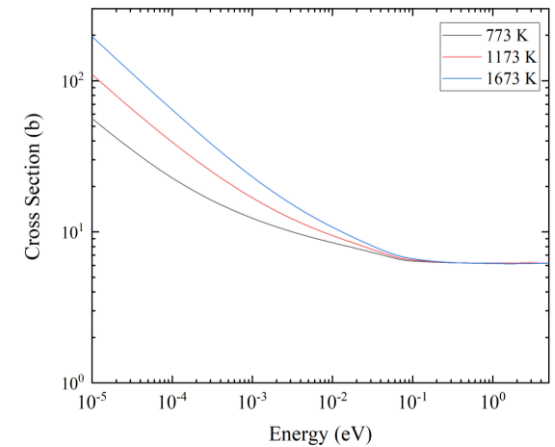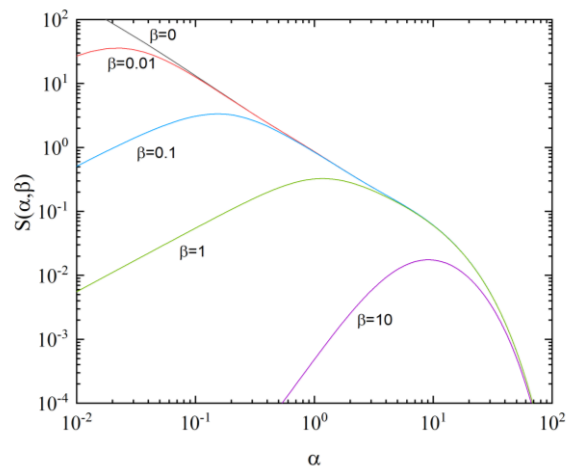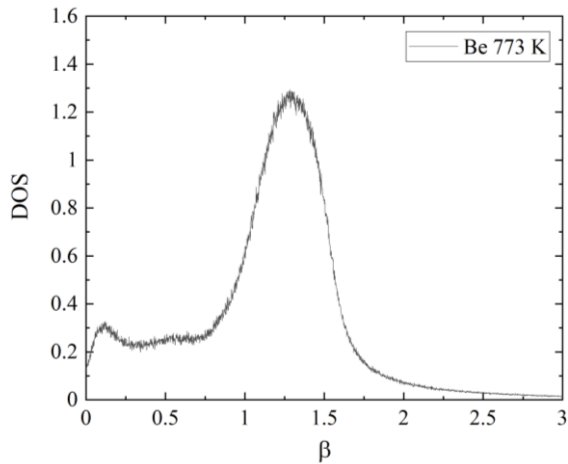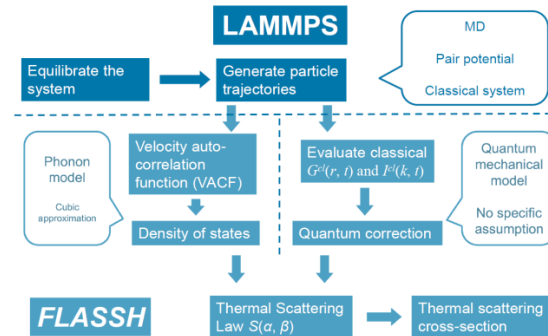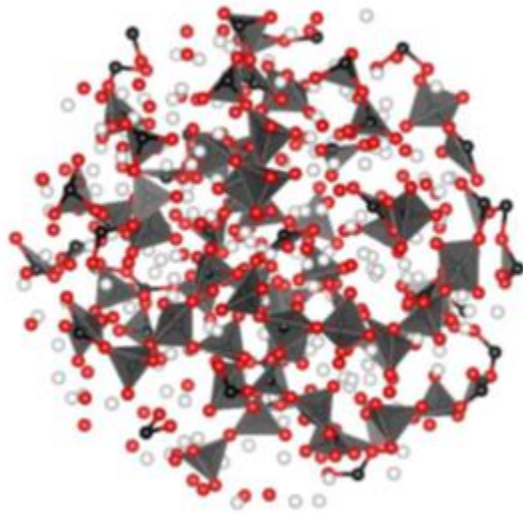
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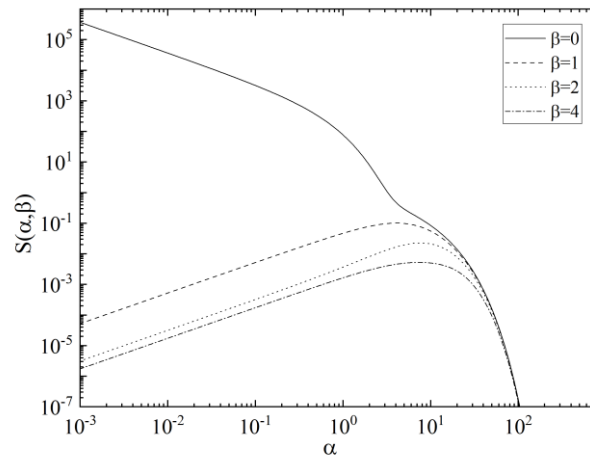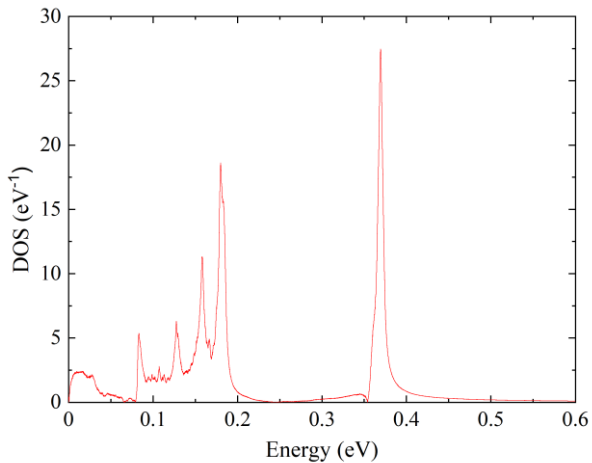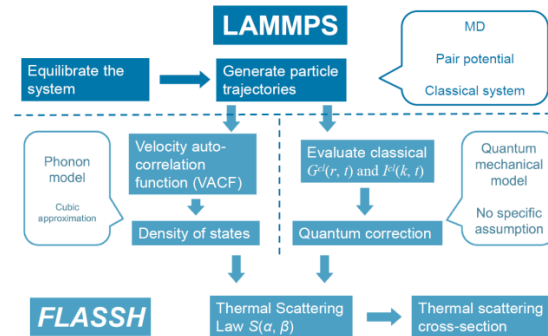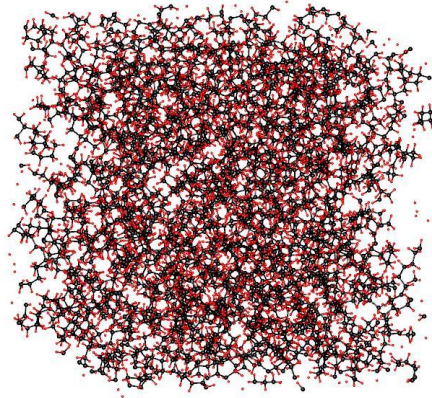# Hydrofluoric Acid Data - NCSP
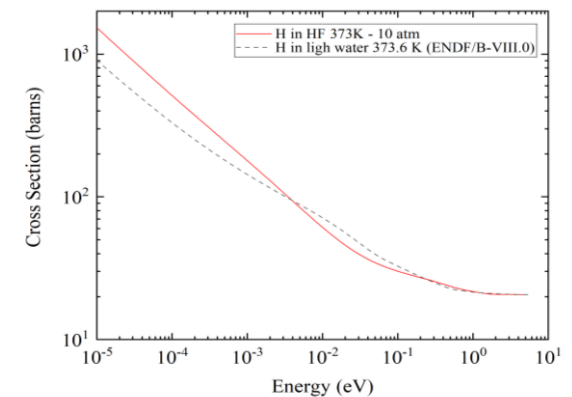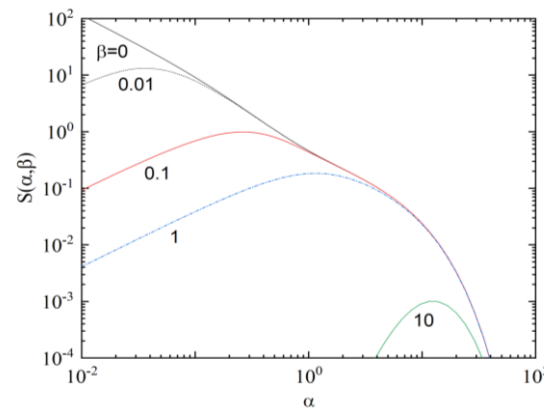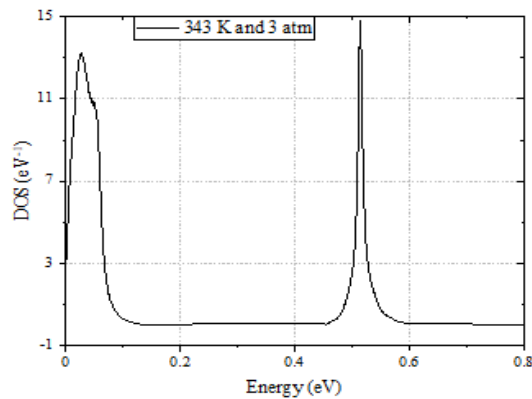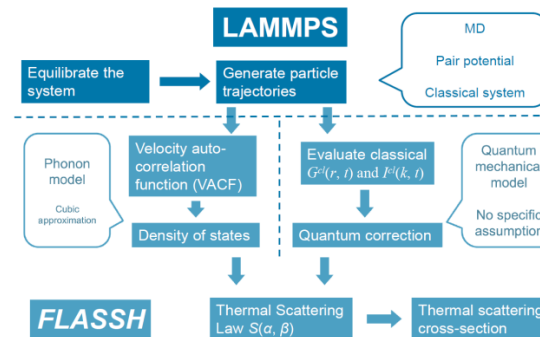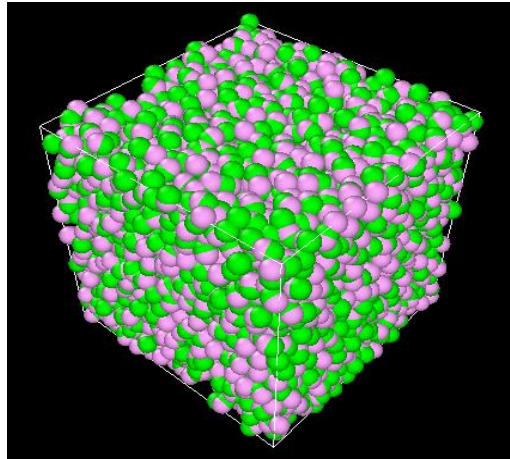
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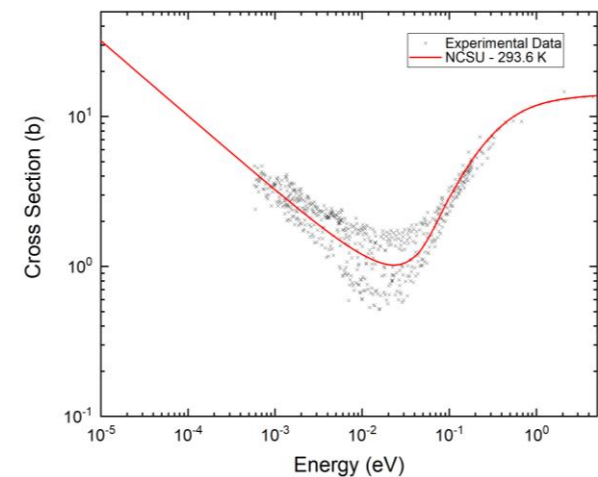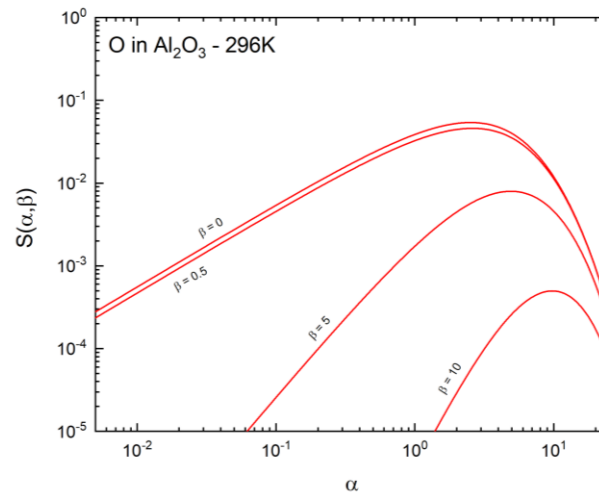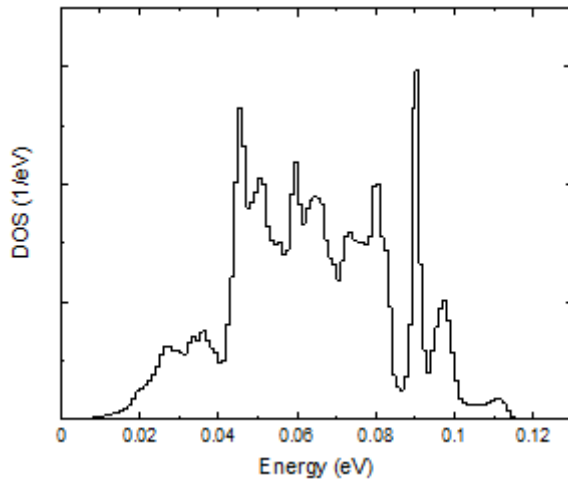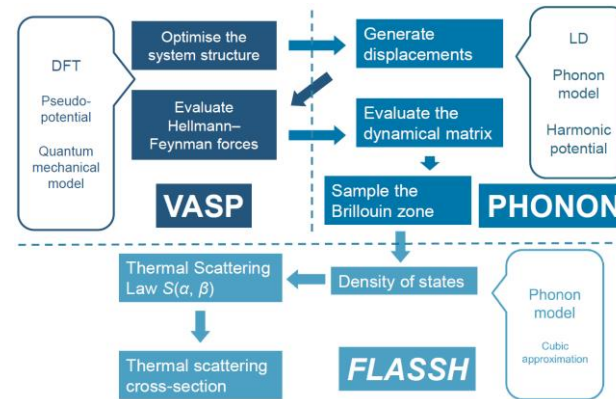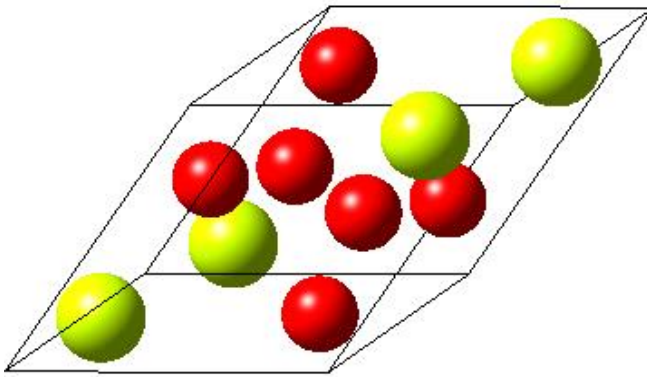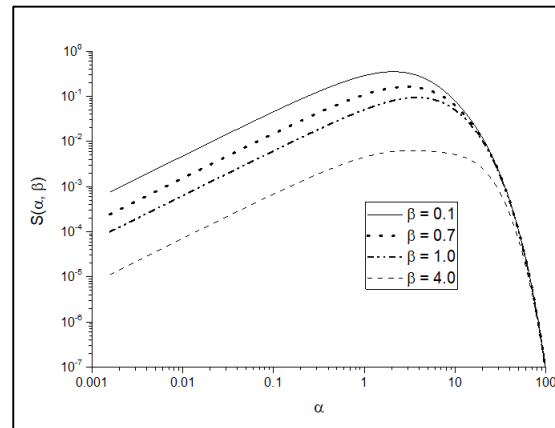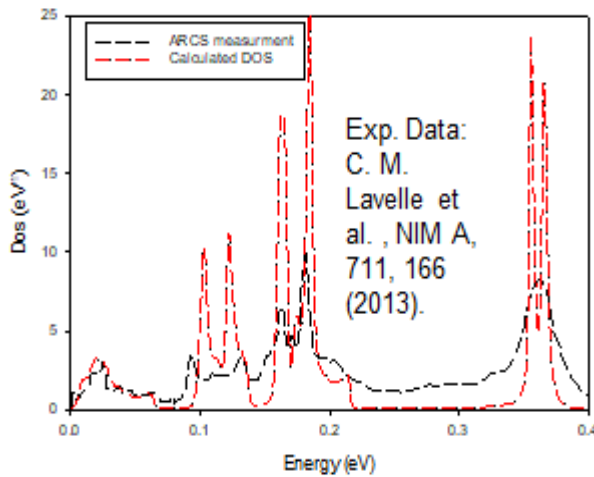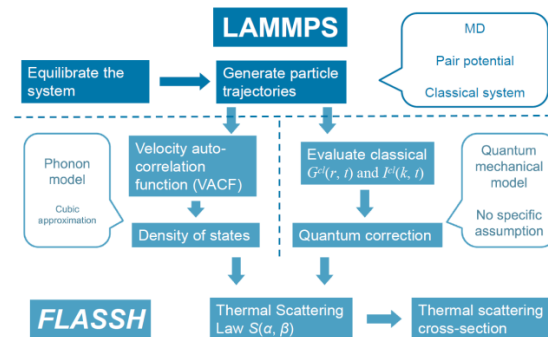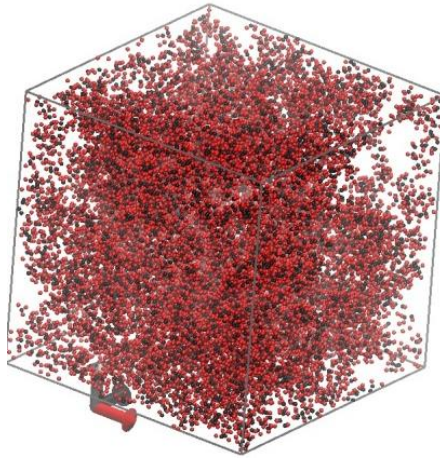## Heavy Paraffinic Oil Data – NCSP/NR
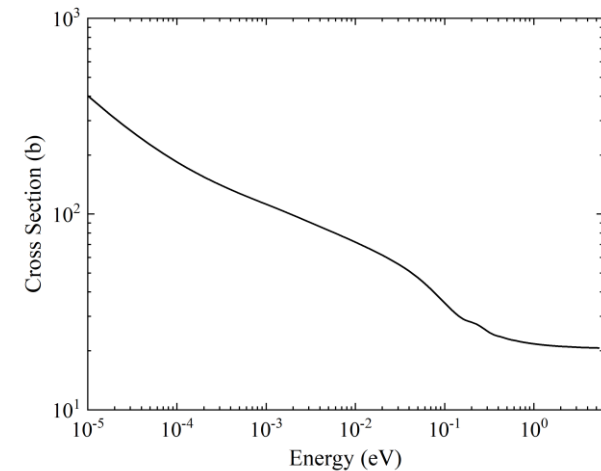
New to NNDC
Single Crystal Sapphire Data - RR

Update to **NNDC**
Polyethylene Data - NCSP
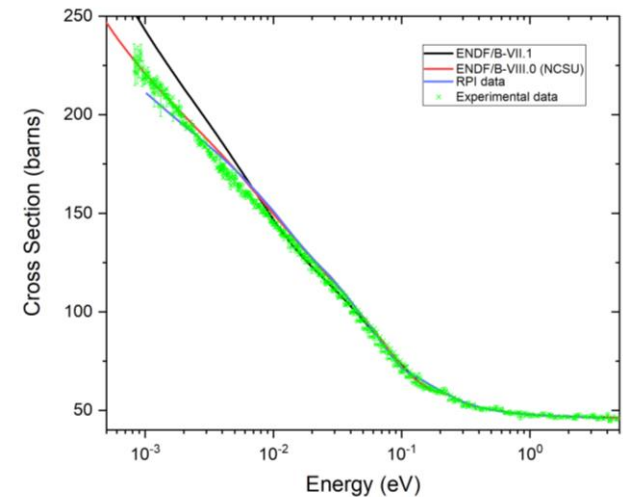
Summary

- ☐ 8 new TSL evaluations have been submitted to NNDC

- ☐ All evaluations are performed using the NCSU *FLASSH* code
  - ■ NJOY/LEAPR input files are provided to allow for independent testing

- ☐ Expect more evaluations to be submitted before end of 2020.