

**Twenty-Eighth Meeting of the
NEA Working Party on International Nuclear Data Evaluation
Co-operation
May 15 – 19, 2017 • Paris, France**

Meeting Summary

SG42

**Thermal Scattering Kernel $S(\alpha, \beta)$:
Measurement, Evaluation and Application**

Ayman Hawari, Gilles Noguere

Summary

- **The SG 42 meeting was held May 16-18**
- **Around 15 participants were present discussing**
 - Data evaluations
 - Measurements
 - Theory-measurements connections
 - Benchmarks
 - Data Formats
 - Covariance data
- **The main contributors**
 - North Caroline State University (Ayman I. Hawari)
 - Naval Nuclear Laboratory (Jesse Homes)
 - Atomic Center of Bariloche (Florencia Cantargi, Jose Ignacio Marquez Damian)
 - Rensselaer Polytechnic Institute (Emily Liu, Yaron Danon)
 - Nuclear Energy Agency (Oscar Cabellos)
 - NAUSICAA collaboration (Vaibhav Jaiswal, Juan Pablo Scotta, Claude Mounier, Gilles Noguere)
 - University of New South Wales – ANSTO (Lance Maul)

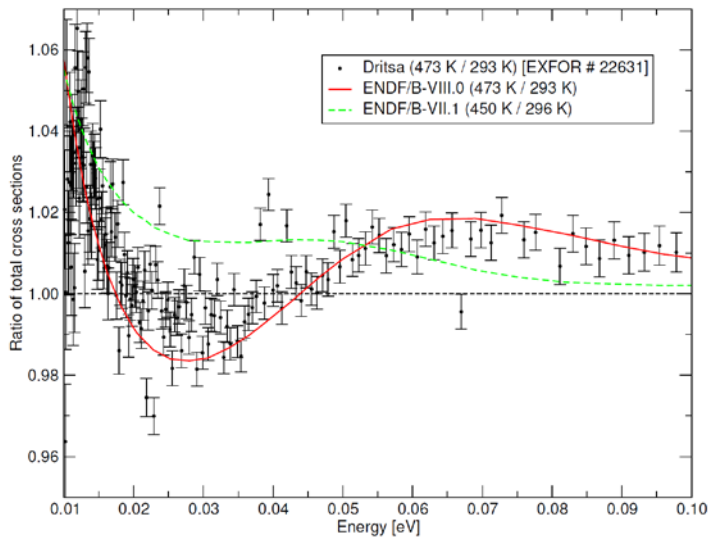
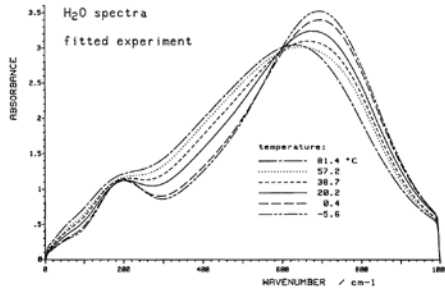
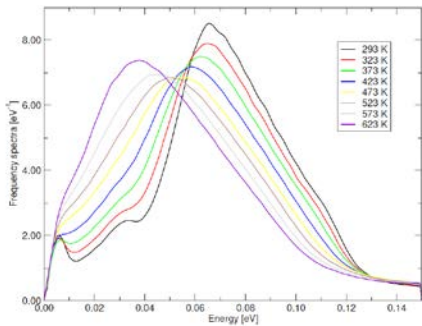
Data Evaluations

Contributions to ENDF/B-VIII

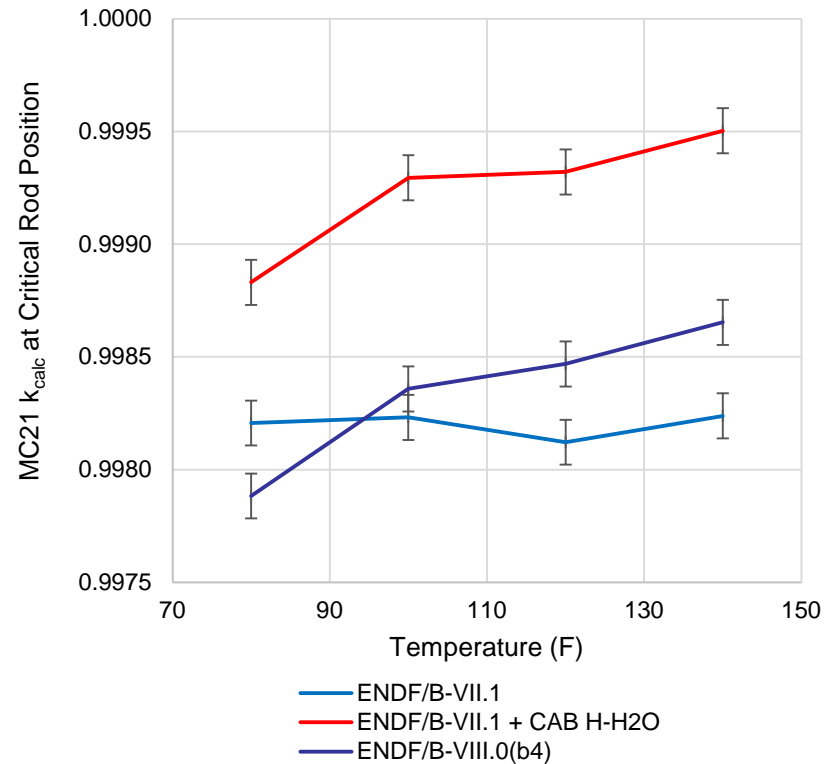
Material	Method	Evaluator
Ice (light water)	DFT / NJOY	NNL
Yttrium hydride (YH ₂)	DFT / NJOY	NNL
Light water	MD / NJOY	CAB
Heavy water	MD / NJOY	CAB
Lucite (C ₅ H ₈ O ₂) _n	MD / NJOY	NCSU
Polyethylene (CH ₂) _n	MD / NJOY	NCSU
Beryllium (Be metal)	DFT / NJOY	NCSU
Beryllium oxide (BeO)	DFT / NJOY	NCSU
Silicon carbide (SiC)	DFT / NJOY	NCSU
Silicon dioxide (SiO ₂)	DFT / NJOY	NCSU
Graphite (crystalline)	DFT / NJOY	NCSU
Graphite (nuclear)	MD / NJOY	NCSU
Uranium mononitride (UN)	DFT / NJOY	NCSU
Uranium dioxide (UO ₂)	DFT / NJOY	NCSU

Data Evaluations

Light Water



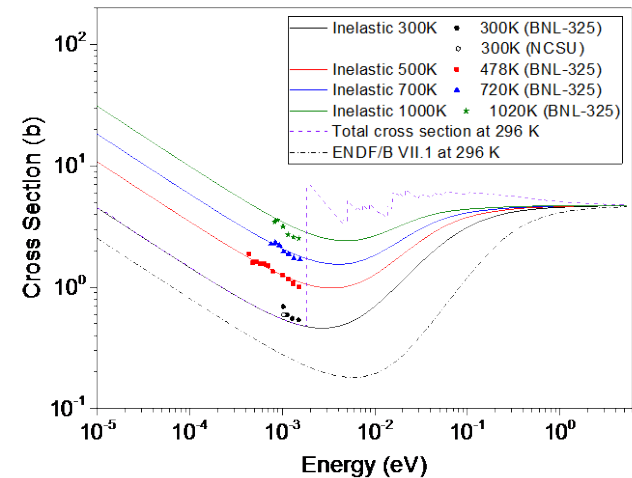
Sensitivity of Neptune Configuration C to ENDF/B-VIII.0(β 4) H-H₂O thermal scattering evaluation



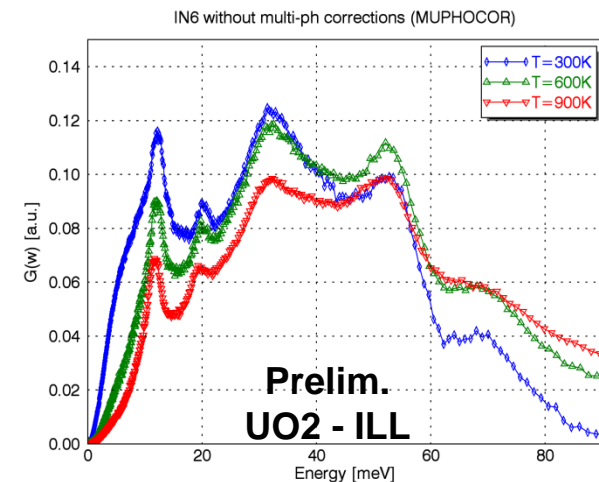
Measurements

- **Measured data was discussed for several materials**

- Light water, polyethylene, uranium dioxide
- Total cross section measurements
- TOF chopper spectrometers at
 - SNS
 - ILL
- DOS measurements
 - VISION instrument at SNS



- **Work remains needed to understand corrections and for data interpretation**



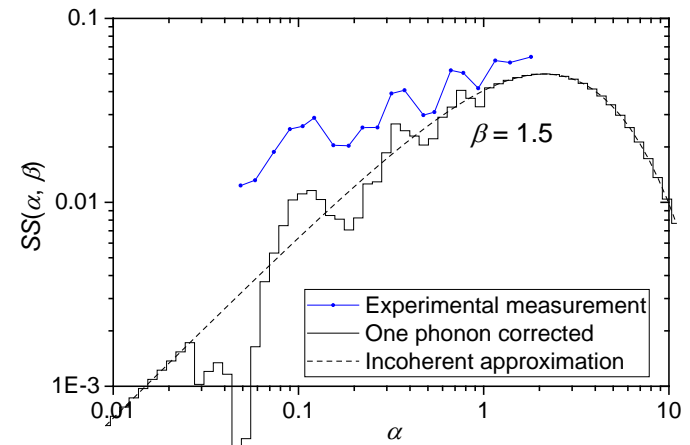
Theory-Measurements Connections

Measurements and computations can be compared meaningfully if :

- **Computational results are corrected for approximations**
 - Quantum Mechanic effects (if TSL is derived from classical simulations)
 - Model assumptions (e.g., NJOY/LEAPR incoherent approximation)
- **Measured data are corrected for experimental effects**

Main Instrument effects :

- Resolution of the spectrometer
- TOF chopper limitations
- Dynamic range
- Detection efficiency
- Sample effects



⇒ Difficult to satisfy these criteria when old data and evaluations are studied

Benchmarks

- **Benchmarks presented for**

- Ice
- Graphite

⇒ Promising results were obtained in both cases

- **Benchmarks selection**

- Pulsed slowing down experiments discussed
- Temperature dependent benchmarks for water remain needed

Covariance Data

- **Possible strategy for generating Covariance data**
 - TSL Covariance data can be produced using standard methods applied for analyzing neutron cross sections above the thermal cut-off
- **Considerations for generating Covariance data**
 - ⇒ Uncertainties due to models used in generating cross sections (e.g., capability of the model to reproduce thermophysical properties) to be taken into account
 - ⇒ Experimental contributions

Data Formats

- **TSL data in GND format in connection with SG-38 activities**
 - GND ready to accept current File 7 data
 - Ability of format to address modern data generation capability was discussed
 - Template files will be created for specific materials
 - A representative TSL covariance data set will be provided

Upcoming Activities

- **New evaluations will continue to be released within the next 12 months**
 - ⇒ Some of them are already available in the “ENDF/B-VIII.β4 Thermal Kernels” web page: <https://ndclx4.bnl.gov/gf/project/endl/frs/>
- **Upcoming experimental activities are planned (or under discussions):**
 - Further work are planed on cryogenic Cold Neutron Source materials
 - Further work on light water
 - Other materials
- **Methods development**
 - Further development of NJOY
 - NCSU code “*FLASSH*” with enhanced capabilities



Final meeting of SG42 in may 2018