

WPEC Subgroup 47 (SG47) on Use of Shielding Integral Benchmark Archive and Database for ND Validation

Justification for a Subgroup

- Integral benchmark experiments have proven to be valuable for validation of nuclear cross-sections. In recent years, the evaluations have been predominantly validated against criticality benchmarks. However, k_{eff} is a very global parameter, dependent on many “free” parameters.
- **Including shielding benchmarks in the validation process is expected to provide a complementary view and would allow broader evaluation of the performance of the nuclear data.** This would ultimately contribute to a production of general-purpose cross-section evaluations.

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Multiple challenges and objectives to be considered, including:

- To **provide feedback on the existing database** and contribute in this way to the quality review: verification of the completeness and the consistency of the experimental information (on the geometry, material composition, the procedure to derive data-unfolding, etc.), in particular concerning the evaluation of experimental sources of uncertainty.
- **Provide recommendations on the SINBAD evaluations** based on the experience, needs and expectations of the nuclear data community;
- To participate in **establishing the priority list of relevant benchmarks** according to the needs of ND community, in particular among new and recent benchmarks; promote including the selected benchmarks in SINBAD; contribute sensitivity profiles.
- To participate, in coordination with EGRTS WPRS, in establishing the **review group and organisation of pilot exercise of SINBAD evaluations**. **FNG (Cu and others), LLNL spheres, Rez Iron spheres, ASPIS IRON88, JANUS, TIARA (Fe, concrete), FNS, OKTAVIAN** benchmark evaluations are good candidates for pilot exercises.,

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Relevance to other NEA ND activities:

SG would work in close coordination with other NEA activities such as EGRTS, WPEC SG45, SG46, CIELO and JEFF project, where this work could be used to guide the evaluations. Feedback from these groups on the specific needs and the use of SINBAD data is expected. SINBAD evaluation work could be coordinated with the interest of SG46 on “Efficient and Effective Use of Integral Experiments for Nuclear Data Validation”.

Past experience in integral benchmark evaluations from the ICSBEP, IRPhE and SINBAD projects will be valuable.

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16 presentations on the following topics:

Analyses of shielding benchmarks (SINBAD, ICSBEP, others)

- Jun Zou reported good general C/E agreement for altogether 19 SINBAD benchmarks using SuperMC (series of OKTAVIAN, FNS, FNG, IPPE, Kant experiments); efficient acceleration using global weight window
- Gleb Lomakov used Russian computational tools to analyse 15 benchmarks (ASPIS, EURACOS, JASPER, OKTAVIAN)
- Yi-Kang Lee presented TRIPOLI analyses
- Luka Fiorito discussed the results for 3 accelerator benchmarks < 100 MeV
- Oscar Cabellos: summary results of the analysis of large number of OKTAVIAN, FNS, LLNL benchmarks
- Stanislav Simakov (ORNL broomstick O, IPPE, KFK, NIST, FNS-O, LLNL Ta, LRC Ohio La Sphere)
- Ivo Kodeli: FNG-Cu, ASPIS-Fe88. TIARA
- Alex Valantine: FNG HCLL & HCPB using SERPENT

SuperMC, ROZ/KASKAD/KATRIN, MCNP and TRIPOLI, SERPENT code inputs shall be provided,

Several inputs already available from NEA GITLAB (FNS-Cu, ASPIS Fe88, OKTAVIAN, FNS, etc.)

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Several comments & suggestions in the presentations by Valantine, Lomakov, Cabellos, Simakov, Tatiana);

Tatiana Ivanova presented future plans and evaluation process in cooperation with ICSBEP/IRPhE and explained the distribution policy allowing contributing organization access to the data.

Proposals for new SINBAD benchmark evaluations:

CIAE Neutron leakage spectra from iron slab with D-T neutrons (Haicheng), Rez Fe spheres (Jansky), LLNL pulsed spheres (Persher), neutron transmission Si & Nb (Lomakov), Mn bath (Y-K. Lee), ASPIS NESDIP 4 & 6, JANUS (Murphy), Alex Valantine (fusion JET), Simakov (Fe KFK gamma, Fe NIST 2000, LRC Ohio Fe Sphere), ongoing measurements: water activation, FNG WCLL (Valantine);

Financing will be needed.

From the evaluators side Luiz Leal presented strategy used for evaluating structural materials such as Fe.

News in SINBAD

- New SINBAD benchmark evaluations prepared in 2018 in the scope of the Fusion for Energy (F4E): FNG-Cu available from NEA GITLAB;
 - New features included in recent SINBAD evaluations:
 - Acceleration of MCNP calculations using ADVANTG
 - CAD geometry: easy conversion to different transport codes: prepared for FNG-Cu, ASPIS-Fe88 (Kodeli), IPPE spheres, FNS duct, ISIS (S. Lilley); storage format to be decided
 - Sensitivity profiles: already prepared for FNG-Cu and ASPIS Iron-88 benchmark evaluations (Kodeli), LLNL (Cabellos);
 - Quality review: 51 of 102 SINBAD benchmarks have quality review, needs to be finished;
 - Computational model(s)
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