

CIELO WPEC Subgroup Proposal

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CIELO Pilot Project (Subgroup 40) Completed and Documented in NDS Paper & Forthcoming Report

Principal advances by this international multi-lab collaboration:

- Use of standards (IAEA, NIST, LANL, IPPE, ...)
- Use of much new differential data from CERN, JRC, TUNL, RPI, LANL,
- Resonance evaluations (ORNL, IRSN, CEA)
- Refined R-matrix evaluations for light (LANL, JAEA, LLNL, ...)
- Theory & eval. methods for actinides, fission, & structural (IAEA, BNL, LANL, LLNL, CEA, CNDC/CIAEA, ORNL, JRC, ...)
- Covariances & Validation testing (Sg40, Sg39, IAEA, NEA, LANL, CEA, INL, JAEA, LLNL, BNL, NRC, CIEMAT, JSI, CNL, NRL,) showing many improvements

The new WPEC proposal will continue this CIELO collaboration, with IAEA/INDEN collaboration, with a goal of establishing new methods & tools, solving some open problems, and creating a further-improved CIELO evaluated data library options



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CIELO Collaboration Summary Results: International Evaluations of Neutron Reactions on Uranium, Plutonium, Iron, Oxygen and Hydrogen

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CIELO: Computational methods for integration of integral and differential nuclear data insights & covariance advances, for improved international evaluated cross section databases

Subgroup Monitor: TBD: possibilities include Plompen, Bauge, Cabellos

Subgroup Coordinator: M.B. Chadwick, Co-leader TBD (possibilities include Talou, Herman, others)

Subgroup Participants:

Draft proposal – the data projects will identify appropriate participants from their respective communities.

Build upon the CIELO collaboration community already established

The leaders of CIELO have discussed best mechanisms to continue the progress on CIELO, with leaders from the NEA and the IAEA. The conclusion is that an international collaboration on the continued improvement of the underlying cross sections and covariances will be coordinated by the IAEA (the INDEN project); while integral performance of criticality and transport, data sensitivity studies, and covariance impact on integral criticality assessments, will be coordinated by a NEA WPEC subgroup. This latter effort is the focus of this new WPEC proposal.

Focus Areas

The previous subgroup 40 collaboration identified a variety of gaps and opportunities that need further attention (see NDS paper and Sg40 report):

- **Use of modern computational tools**
- **Machine learning (ML) techniques**
- **Use of fundamental data**
- **Use of integral information**
- **Use of neutron transmission data**
- **Covariances and calibration**
- **Feedback to HPRL**
- **Processes for continuous improvement**

*Please see
proposal for
details*

The value of having a new WPEC subgroup that is separate to the important new work in Subgroups 44, 45, 46, 47 is that this subgroup will **focus on the integration of all these advances to improve the CIELO product**. Thus, as well as exploring CIELO-related issues, and new computational method opportunities including machine learning, it will closely coordinate with Subgroups 44, 45, 46, 47.

Example of CIELO Advances – Oscar Cabellos recent calculations

	ENDF/B-VII.1	ENDF/B-VIII.0	JEFF-3.1.1	JEFF-3.2	JEFF-3.3
PU	4.2 (29)	2.2 (29)	2.9 (29)	3.6 (29)	2.7 (29)
HEU	6.1 (42)	3.4 (42)	5.3 (42)	11.8 (42)	2.8 (42)
IEU	5.0 (12)	1.9 (12)	11.3 (12)	4.9 (12)	2.4 (12)
LEU	0.9 (13)	1.4 (13)	1.4 (13)	0.9 (13)	2.3 (13)
U233	1.7 (18)	2.1 (18)	9.5 (18)	1.2 (18)	1.6 (18)
MIX	0.7 (8)	1.0 (8)	1.2 (8)	0.9 (8)	1.0 (8)
SPEC (C/E)	0.99249 (1)	0.99338 (1)	0.98719 (1)	0.98847 (1)	0.99107 (1)
Total	3.7 (123)	2.0 (123)	6.5 (123)	5.6 (123)	2.2 (123)

CIELO advances contributed to these improvements.

But many questions remain, that will be advanced between the NEA & IAEA in the next phase