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Status of the JEFF File Project

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1. Recent Developments

JEFF-3.2 GP file assembly

JEFF-3.2T1

- March 2011
- JEFF-3.1.1 basis + 22 rev. + 139 new + 95 from TENDL-2011

JEFF-3.2T2

- January 2013
- 73 from JEFF-3.2T1 + 89 from JEFF-3.1.2 (January 2012)
  + 42 JEFF Beta + 36 from ENDF/B-VII.1 + 150 from TENDL-2012

2013 WPEC mtg

JEFF-3.2T3

- October 2013
- JEFF-3.2T2 + 10 rev. + γ prod data + Cu-63, Cu-65 from JEFF-3.1.2

JEFF-3.2T4 = JEFF-3.2

- Official release on March 5, 2014
- JEFF-3.2T3 + new Cu-63, Cu-65, Mn-55
- 472 nuclides or elements
- ACE formatted files and JANIS update

1. Recent Developments

- **Recall main changes in JEFF-3.2T2 with respect to JEFF-3.1.x**

  - U-235, U-238 in RRR+URR and at high energies
  - U-236, U-237 at high energies
  - Pu-239, Pu-240 in RRR+URR and at high energies
  - Am-241 in RRR+URR and at high energies
  - Cm isotopes
  - Th-232, Pa-231, Pa-233
  - H-2
  - Na-23
  - Cr, Zn isotopes
  - Cu-63, Cu-65
  - Mn-55
  - Cd isotopes, Ag-109, Ag-107, In-113, In-115
  - Gd-155, Gd-157 + Gd-152, Gd-154 from ENDF/B-VII.0
  - Hf, W isotopes
  - Ta, Re, Os, Pt, Tl isotopes
  - Au-197
  - Pb and Bi isotopes

  - Adopted from ENDF/B-VII.1: H-1, H-3, He-3, Li-6, B-10, B-11, N-14, N-15, Si-29, Si-30, Cl-37, Nb-93, Ag-110m, Ag-111, Cd-115m, Sn-113, I-130, Xe-123, Dy-164, Ho-165, Ir-191, Hg isotopes, Pa-232, U-232, U-233, U-234, U-239, U-240, U-241, Cf-253

1. Recent Developments

Changes in JEFF-3.2 with respect to JEFF-3.2T2

- Cu-63, 65: updated evaluations
- Mn-55: updated evaluation
- Na-23: 175-group covariance data, re-evaluation of RRR and other updates
- Fe-56: added gamma production spectra and merged different contributions
- Ag-109: file with more complete added gamma production
- In-115: file with more complete added gamma production
- Gd-155, -157: corrections
- Hf-174, -177, -178, -179, -180: added gamma production spectra
- W-182, -183, -184, -186: updated evaluations
- Au-197: updated evaluation
- Pu-239: updated covariance data in the resonance region
- Am-241: corrections and update

1. Recent Developments

- **JEFF-3.2 GP**
  - http://www.oecd-nea.org/dbforms/data/eva/evatapes/jeff_32/
  - Outcome of a progressive, incremental approach
    - Guiding principles for introducing changes
    - Contributions from many individuals & organizations
    - Integrate new measurements + progress in model developments and evaluation methods: TALYS, CONRAD
    - Coherent fission modelling (uranium isotopes) → towards more consistent evaluated files
    - Feedback from JEFF-3.1 + benchmarking + users, some “hidden work”
    - Lessons learned
    - NEA DB support

1. Recent Developments

- **JEFF-3.2 GP**

  - First results from criticality benchmarking
    - JEFF-3.1.1 good performance for UO2-fuelled LWR systems preserved
    - Performance for MOX-fuelled LWR systems improved (Am-241)
    - Performance for fast systems improved, as intended

  - Things yet to be improved
    - Known deficiencies, e.g., U-238 fission
    - Error compensations
    - Lack of covariance information

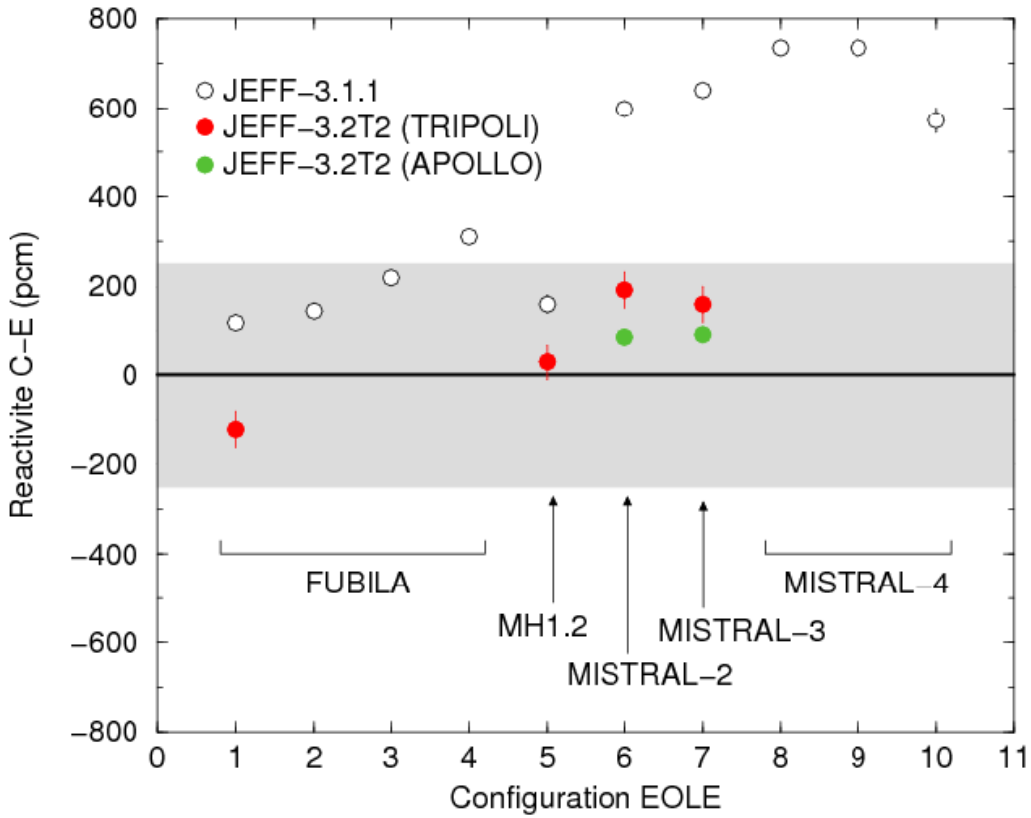
- **JEFF-3.2 SP files and related activities**

  - DD&FY
    - Recent initiative to update the JEFF-3 DD file (JEF/DOC-1567)
    - Good momentum related to FY activities: meetings well attended, new FY evaluations available, GEF code

1. Recent Developments

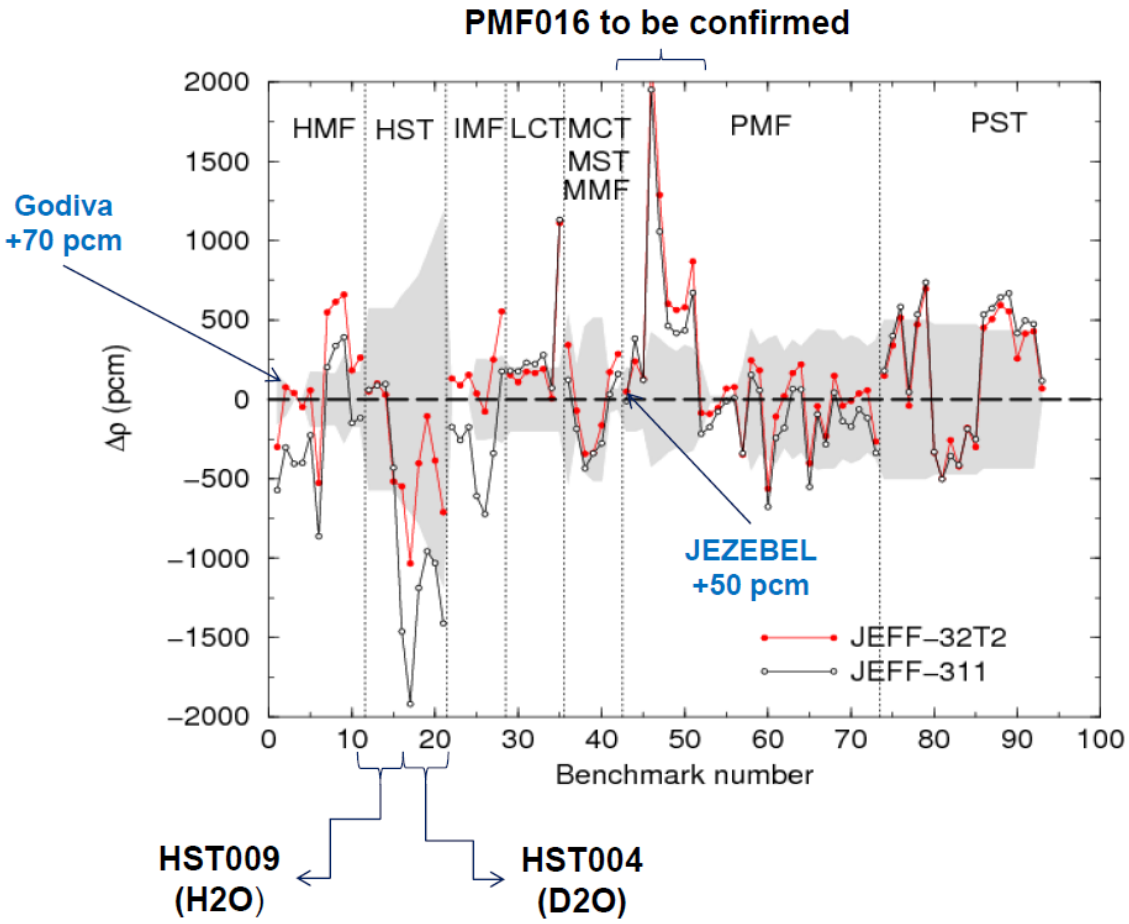
- **JEFF-3.2 GP processing, testing, and initial benchmarking**
  - JEF/DOC-1516 (Cabellos): considerable amount of work
  - Illustration for MOX systems (impact of new Am-241)

    from JEF/DOC-1505 (CEA)



1. Recent Developments

- **JEFF-3.2 GP processing, testing, and initial benchmarking**
  - ICSBEP benchmarks (JEF/DOC-1505)



1. Recent Developments

- **JEFF-3.2 GP processing, testing, and initial benchmarking**

  - From JEF/DOC-1583

When compared with JEFF-3.1.1, JEFF-3.2T3 has global effects on criticality configurations that can be summed up as follows:

- *~ +300 pcm for Uranium in INTER or FAST spectrum*
- *~ no effect for Uranium in THERM spectrum*
- *~ no effect for Plutonium in FAST spectrum*
- *~ -500 to -700 pcm for MOX in SFR spectrum*
- *~ no effect for Plutonium in THERM spectrum*

Significant trends generally go in the direction of improving the agreement between calculations and experiments.

1. Recent Developments

- **Meetings**
  - November 2013: “Nuclear Data Week”
    - Joint JEFF + NEEDS workshop on ND measurements (~90 regist.)
    - Fusion WG
    - Covariance WG
    - DD&FY, Eval.&Benchmarking WGs
    - Joint session
  - April 2014: 2.5-day meeting
    - Fusion WG
    - Covariance WG
    - DD&FY, Eval.&Benchmarking WGs
    - Joint session
- **JEF/DOCs**
  - Access to JEF/DOCs working documents

2. On-going Activities and Near-term Plans

- **JEFF-3.2 GP file**
  - More benchmarking expected
- **JEFF-3.2 SP files**
  - DD file update
    - Will include 900 ENSDF updates, 85 IAEA actinide DD, 80 IRDFF DD, 50 UKPADD, 30 new DDEP evaluations, TAGS results from Tain & Algora
    - NUBASE 2012 update probably not included
    - Target date: ~June 2014, with very little testing
  - FY file update
    - Same methodology as before (R. Mills)
    - Target date: Fall 2014
- **Documentation**
  - Journal article on JEFF-3.2

2. On-going Activities and Near-term Plans

- **JEFF Mandate**
  - June 2013: one-year extension of previous mandate
  - New work plan and three-year mandate under preparation, to be presented to NSC at the June 2014 meeting
  - Contents
    - Completion of on-going JEFF-3.2 work
    - Main part is preparation of JEFF-4
- **Meetings**
  - November 24-28, 2014: ND week
  - April 2015: Joint workshop with FP7/CHANDA project

3. Long-term Plans

- **JEFF Project**
  - 30+ years of volunteered contributions + NEA/DB support
  - Guiding principles
    - Meet the users' needs
    - Use the best physics
    - Continuously improve
  - Driven by nuclear application needs, fission and fusion
    Major emphasis on electro-nuclear applications
  - Broader collaboration in recent years, with new participants
  - Called "Project", but not a formal NEA (separated funded) project.
    Actually relies on in-kind volunteered contributions.
    EC support of some activities, important

3. Long-term Plans

- **Long-term vision and objectives for JEFF-4 (First version in ~2020)**

  - Aim for a qualitative leap forward, while sticking to the basic principles of needs-driven evolutions and preservation of past performance

  - Double challenge:
    - Create the conditions so that future JEFF files can be consistently updated by **progressively removing error compensations** and improving file internal consistency
    - Address the needs of a broader users' community, including innovative applications ⇒ Need to deliver on good-quality, **"credible" covariances**, useable in applied uncertainty assessment studies

  - Can build upon
    - New, high-quality, differential and integral measurements which are coming and will have to be assimilated
    - Progress made in models/codes: TALYS, CONRAD, GEF
    - Also on covariance production capabilities

3. Long-term Plans

Latest JEFF Files

The latest JEFF-3.2 library

- Represents the continuity of earlier JEFF file versions
- Capitalizes on past investments, established organization and practices
- Integrates users' feedback
- Performs relatively well

But…

- Is a hybrid library by construction, assembled by parts over the years
- Is difficult to update consistently in a systematic manner, because of many remaining error compensations
- Lacks covariance data

3. Long-term Plans

- **Desirable improvements → JEFF-4**

  - Better integration of information at NEA DB
    - Automated versioning system
    - Efficient incorporation of user feedback
    - Efficient processing, consistency checks and testing
    - Efficient benchmarking with NEA's integral databases
    - Analysis of discrepancies

  - Updated practices
    - Lessons learned
    - Recommendations from recent WPEC/SGs

  - Resources
    - Stronger commitments from contributing organizations
    - Additional resources needed, especially for detailed analyses and evaluation activities, or else time frame will be unreasonably long

  - Organization that
    - Keeps the connection between ND producers and ND users
    - Keeps the expertise "alive and in the loop"

3. Long-term Plans

- **Beyond JEFF-3.2: A new cycle + multi-year work plan towards JEFF-4**

  - Tentative target dates (actual delivery dates will depend on the available resources)

    1. Mid-term objective (next mandate)
       - **~2017**
       - JEFF-3.3 file including some of the above improvements, as a step towards JEFF-4.0, rather than a JEFF-3.2 update

    2. Long-term objective
       - **~2020**
       - JEFF-4.0 GP and SP files, integrating substantial progress, modern data representation (SG38)…

  - Continued efforts to reach out to a broad community of contributors/organizations, while keeping the activities sufficiently focussed