



ICSBEP benchmarking of random Pu-239 data libraries (WP3)

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NRG

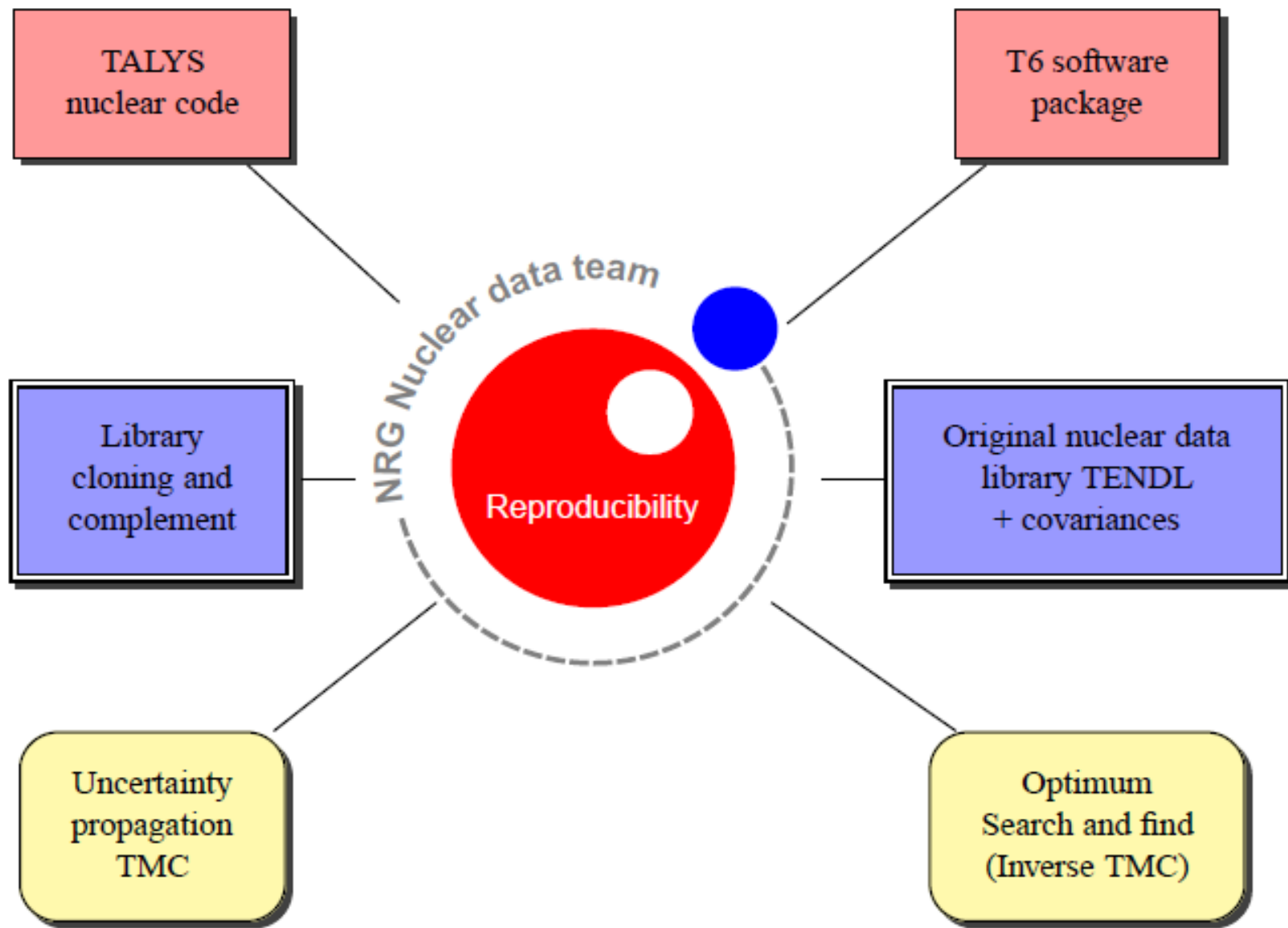
ANDES annual meeting

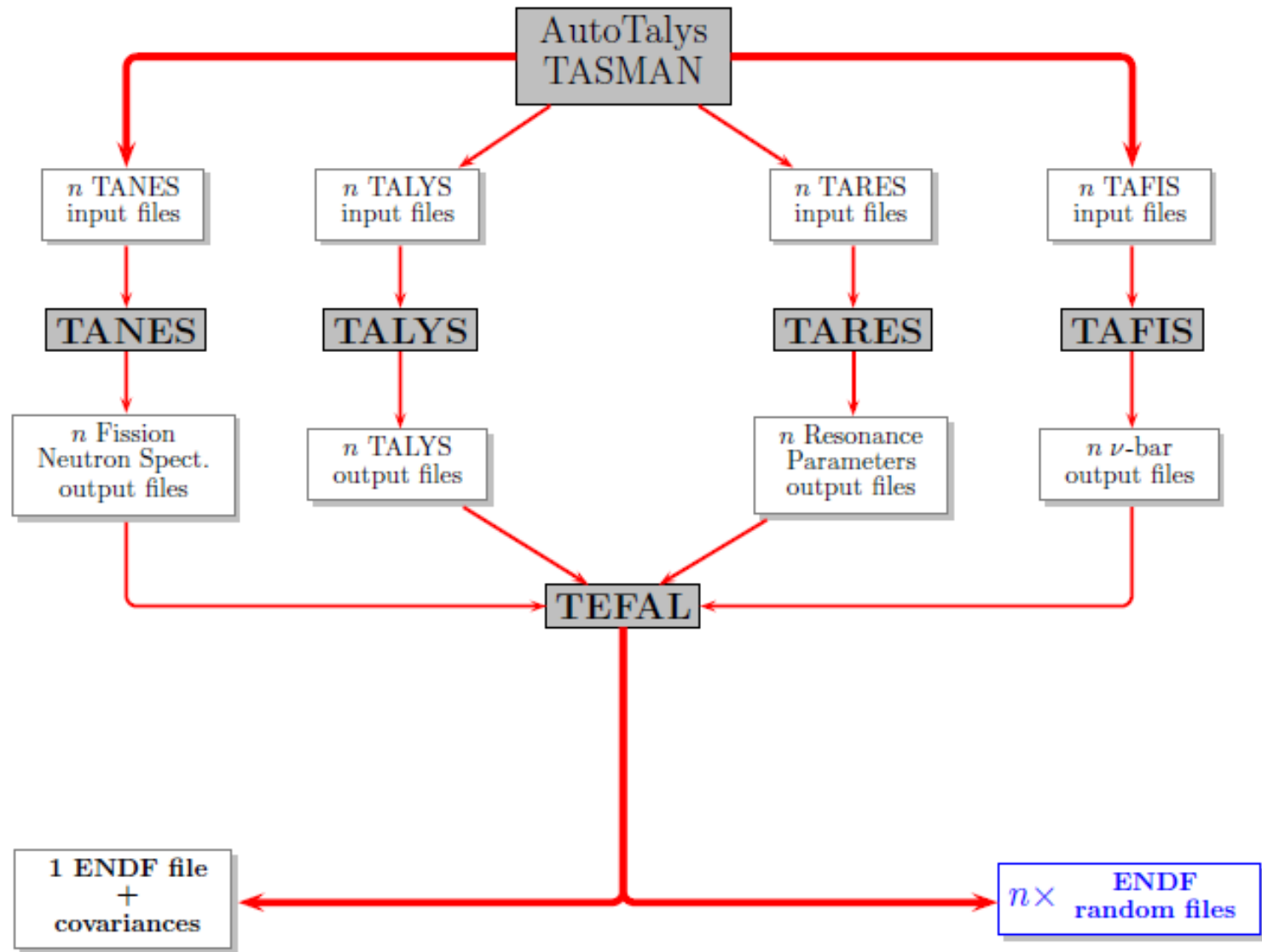
April 23-24, 2012

NEA Data Bank, Issy-les-Moulineaux

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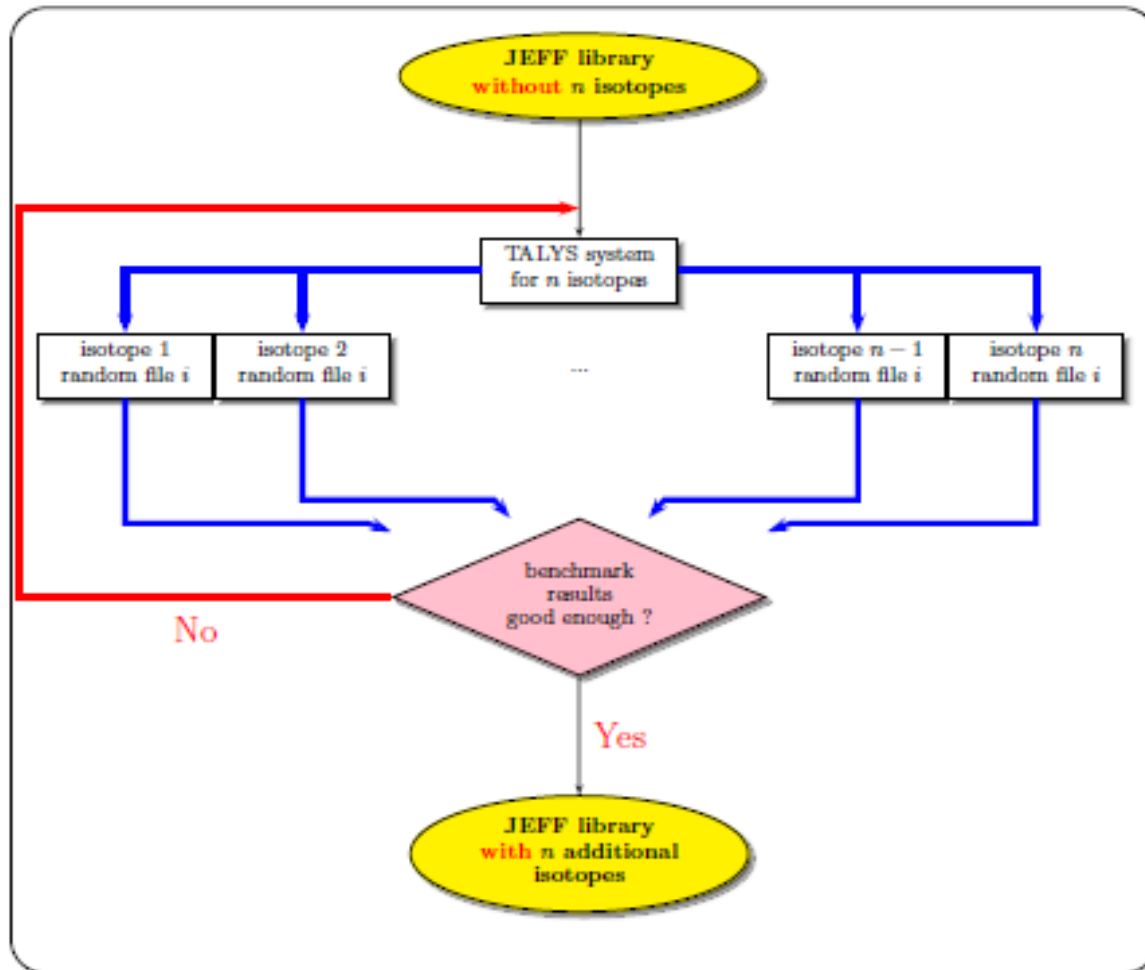
Random optimization

- ① Use the "TALYS system" to create a single ^{239}Pu evaluation close or equal to ENDF/B-VII.0 or JEFF-3.1.1
- ② Randomize all model parameters (resonances, nubar, fission neutron spectrum, TALYS parameters) to create $n > 500$ random ^{239}Pu evaluations
- ③ Benchmark the n files with the same set of criticality benchmarks
- ④ Select the best random file

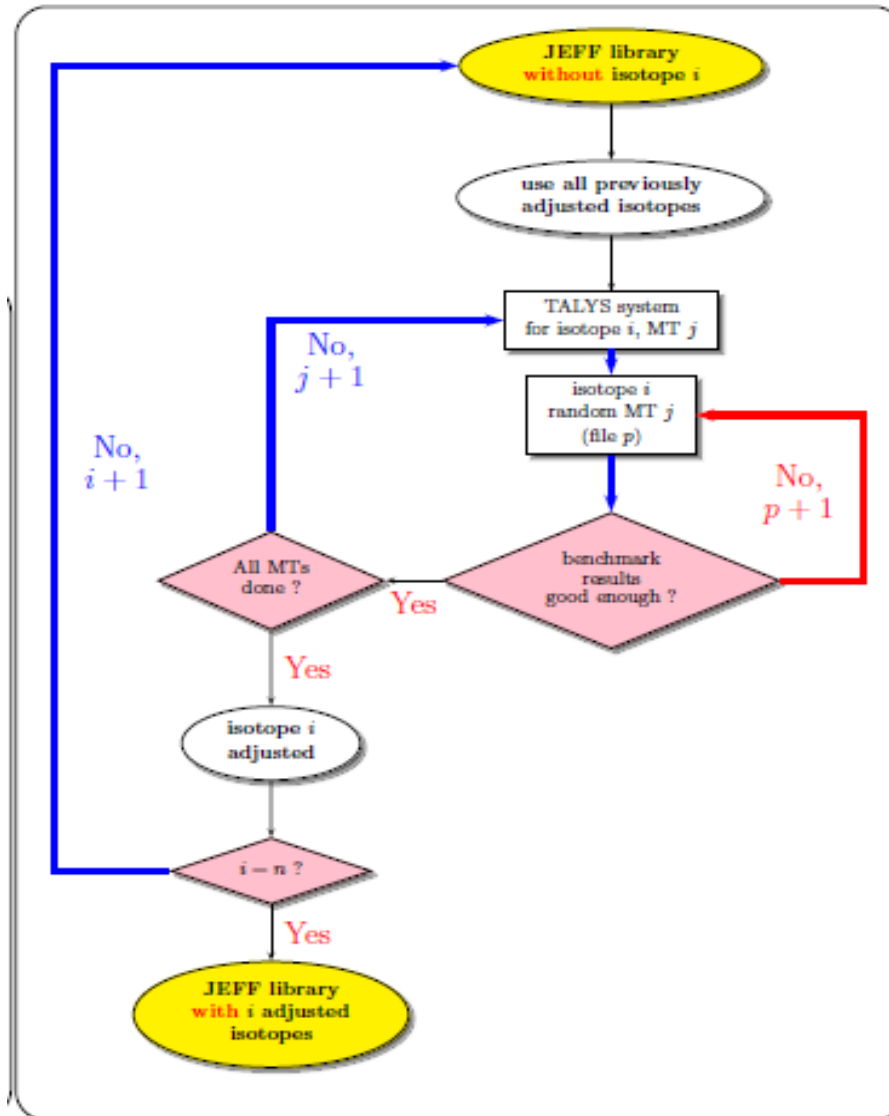
TABLE I: List of 124 k_{eff} plutonium benchmarks selected for the random search.

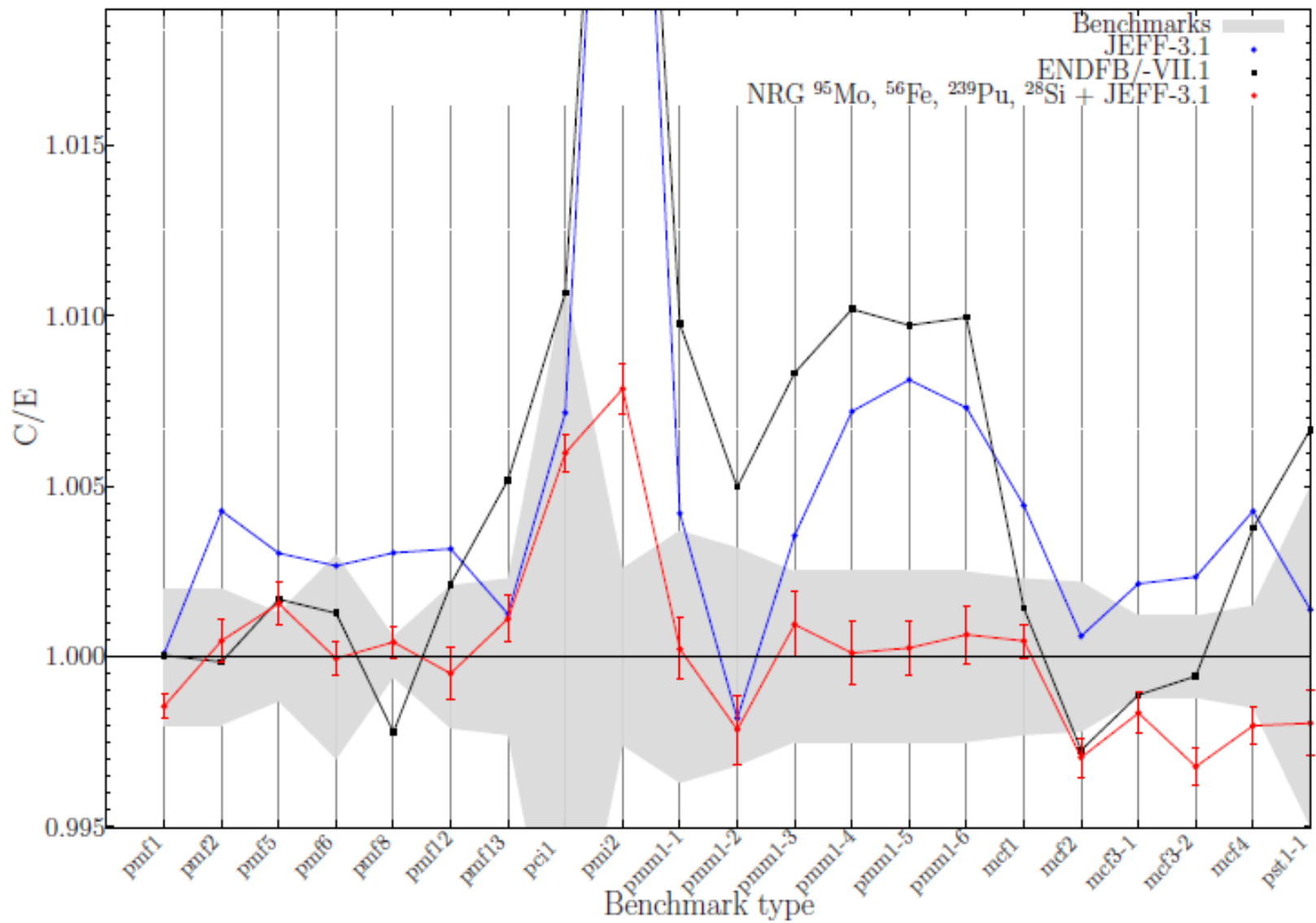
Name	Cases	Name	Cases	Name	Cases	Name	Cases
pmf1	1	pmf2	1	pmf5	1	pmf6	1
pmf8	1	pmf12	1	pmf13	1	mcf1	1
mcf2	1	mcf3	2	mcf4	1	pci1	1
pmi2	1	pst1	6	pst2	6	pst3	8
pst4	13	pst5	9	pst6	3	pst7	9
pst8	29	pst12	22	pmm1	6		

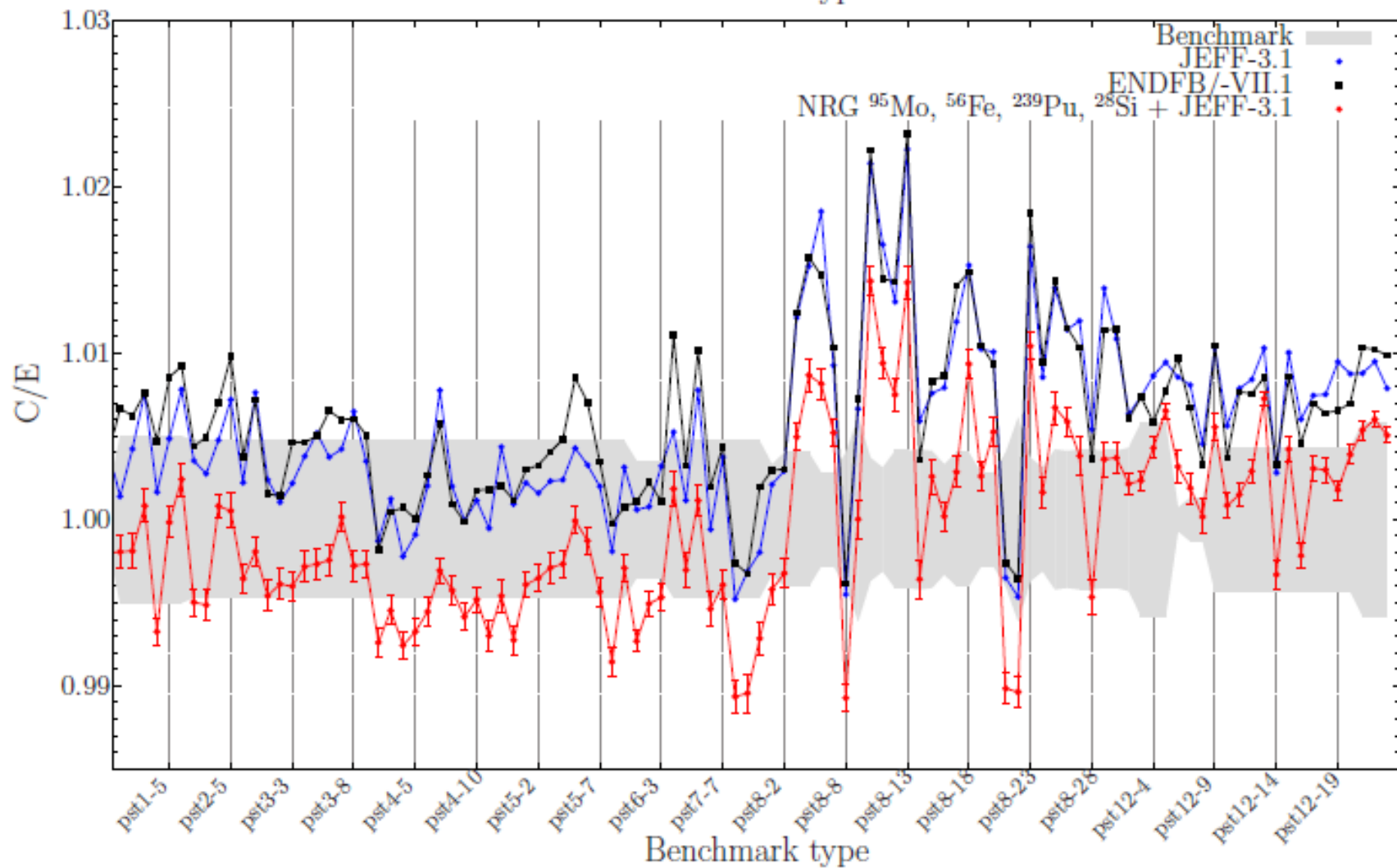
Random search for the best library



Random search for the best library



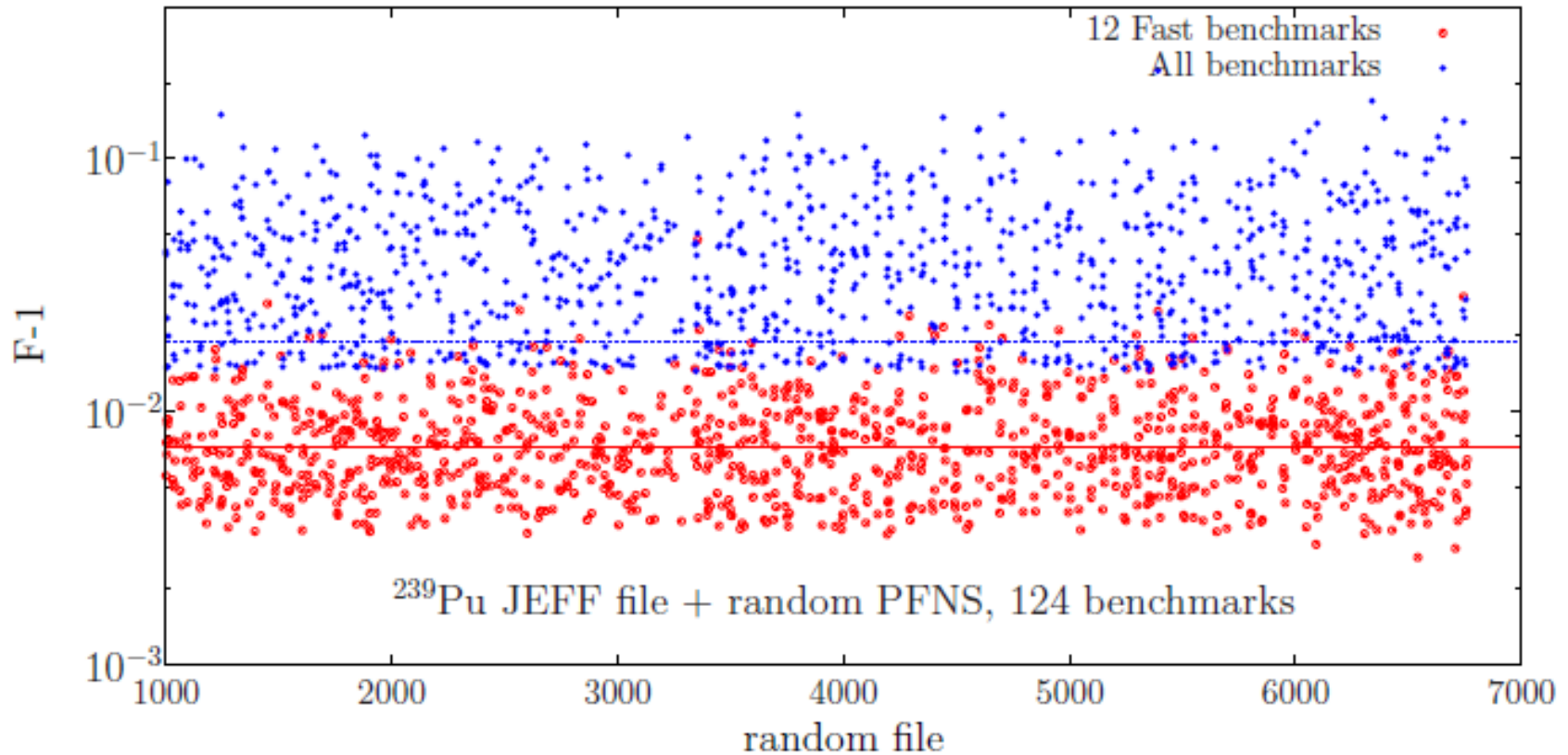




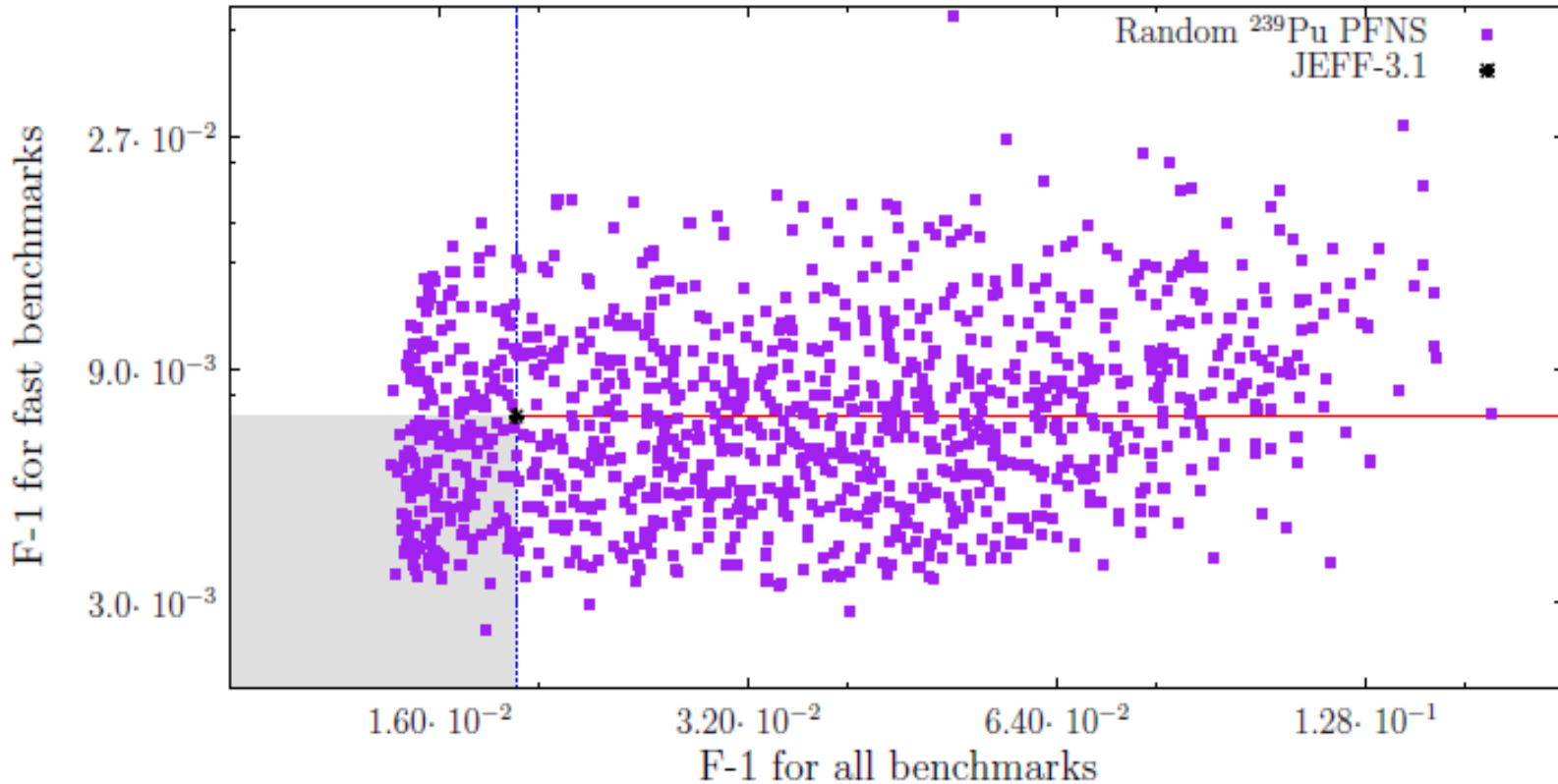
C/E values for the ANDES k-eff benchmarks

	run 1167 ²³⁹ Pu adjusted	²³⁹ Pu, ⁹⁵ Mo, ⁵⁶ Fe, ²⁸ Si adjusted	JEFF-3.1	ENDF/B-VII.0	ENDF/B-VII.1	JENDL-4.0
pmf1	0.99855	0.99855	1.00010	1.00016	0.99987	0.99815
pmf2	1.00047	1.00047	1.00428	1.00019	0.99987	0.99848
pmf5	1.00156	1.00156	1.00304	1.00825	1.00048	1.00201
pmf6	0.99955	0.99995	1.00267	1.00118	1.00132	0.99900
pmf8	1.00043	1.00043	1.00305	0.99879	0.99832	0.99779
pmf12	1.00083	0.99951	1.00317	1.00207	1.00248	1.00173
pmf13	1.00152	1.00112	1.00126	1.00540	1.00387	1.00444
pci1	1.00598	1.00598	1.00716	1.01111	1.01119	1.01376
pmi2	1.04108	1.00786	1.03893	1.04626	1.04041	1.04769
mcf1	1.00099	1.00047	1.00444	1.00113	1.00014	1.00522
mcf2	0.99875	0.99704	1.00061	0.99894	0.99794	1.00118
mcf3-1	0.99991	0.99835	1.00215	0.99894	0.99929	1.00524
mcf3-2	0.99982	0.99677	1.00234	0.99847	1.00026	1.00457
mcf4	0.99914	0.99798	1.00428	1.00312	1.00223	1.00610
1-F	1.025	1.007	1.025	1.030	1.026	1.031

Optimizing fission neutron spectrum



Optimizing fission neutron spectrum



Conclusions

- Nuclear data evaluation, optimization and benchmarking are now part of one and the same process.
- The effect of optimizing cross sections, channel-by-channel, fission neutron spectrum and nubar have been investigated for a selected set of Pu239 benchmarks. (the “ANDES” set)
- Report is being finalized
- Spin-off: fully optimized set of nuclides for 2013 ([Manhattan project](#))