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Some Benchmark Calculations of ENDF/B-VII b1

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Benchmarks

SOURCE: International Handbook of Evaluated Criticality Safety Benchmark Experiments, 2005

- 1. Bare, Highly Enriched Uranium Sphere (GODIVA), HEU-MET-FAST-001**
- 2. Reflected Uranyl-Fluoride Solutions in Heavy Water, HEU-SOL-THERM-004**
- 3. Unreflected 174-liter Spheres of Enriched Uranium Nitrate Solutions, HEU-SOL-THERM-013**
- 4. Unreflected Large-Diameter Cylinders of Enriched Uranium Nitrate Solutions, HEU-SOL-THERM-042**

1. Bare, Highly Enriched Uranium Sphere (GODIVA),

HEU-MET-FAST-001

	MCNP ENDF-V LANL	MCNP 5 ENDF-VI(66c) NNDC BNL	MCNP 4C3 ENDF/B-VIIb1 NRG Petten	MCNP 5 ENDF/B-VIIb1 NNDC BNL	MCNP 5 ENDF/B-VIIb1 LANL (Mosteller)
CASE 1 (k_{eff})	0.9968 (90)	0.99827 (61)	0.99980 (19)	1.00004 (33)	0.9994 (30)

Uncertainty between brackets – units **pcm**

2. Reflected Uranyl-Fluoride Solutions in Heavy Water

HEU-SOL-THERM-004

	MCNP ENDF-VI (60c) LANL	MCNP 5 ENDF-VI (66c) NNDC BNL	MCNP 4C3 ENDF/B-VIIb1 NRG Petten	MCNP 5 ENDF/B-VIIb1 NNDC BNL
CASE 1 (k_{eff})	1.0089 (80)	0.98512 (50)	0.98500 (84)	0.98375 (56)
CASE 2 (k_{eff})	1.0043 (100)	0.97981 (58)	0.97938 (93)	0.98054 (59)
CASE 3 (k_{eff})	1.0082 (110)	0.98457 (102)	0.98580 (106)	0.98626 (111)
CASE 4 (k_{eff})	1.0079 (110)	0.98294 (52)	0.98808 (102)	0.99052 (55)
CASE 5 (k_{eff})	1.0035 (110)	0.97392 (58)	0.98857 (93)	0.98833 (57)
CASE 6 (k_{eff})	0.9998 (120)	0.95376 (115)	0.98473 (123)	0.98411 (59)

Uncertainty between brackets – units **pcm**

3. Unreflected 174-liter Spheres of Enriched Uranium Nitrate

HEU-SOL-THERM-013

	MCNP 4a ENDF-V GIT/WSR	MCNP 5 ENDF-VI (66c) NNDC BNL	MCNP 4C3 ENDF/B-VIIb1 NRG Petten	MCNP 5 ENDF/B-VIIb1 NNDC BNL
CASE 1 (k_{eff})	1.0001 (40)	0.99934 (39)	0.99789 (58)	0.99876 (38)
CASE 2 (k_{eff})	0.9991 (40)	0.99799 (41)	0.99731 (56)	0.99765 (40)
CASE 3 (k_{eff})	0.9960 (40)	0.99613 (47)	0.99330 (71)	0.99310 (45)
CASE 4 (k_{eff})	0.9971 (40)	0.99682 (51)	0.99638 (71)	0.99469 (45)

Uncertainty between brackets – units **pcm**

4. Unreflected Large-Diameter Cylinders of Enriched Uranium Nitrate Solutions

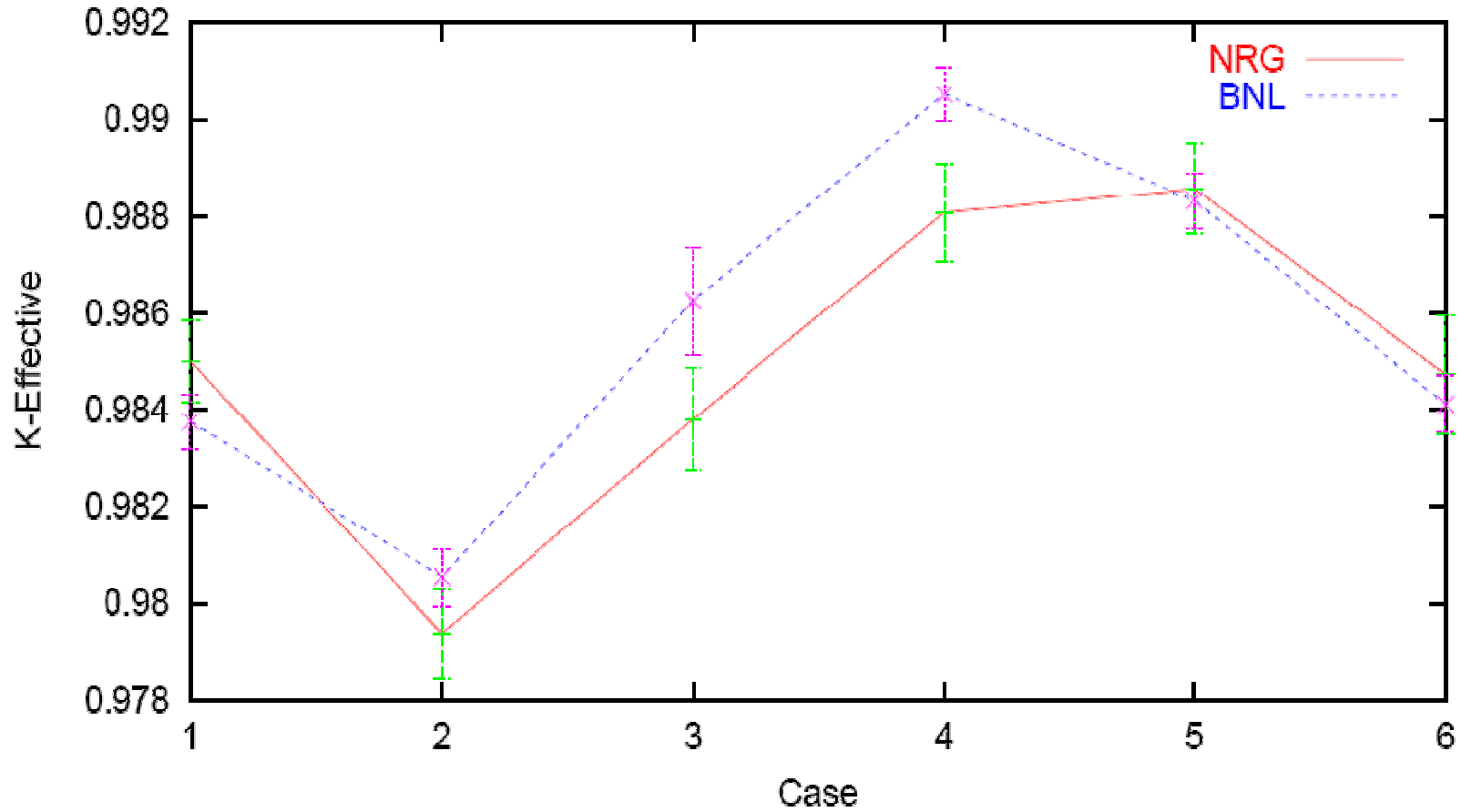
HEU-SOL-THERM-042

	MCNP 4b ENDF-V WSMS LLC	MCNP 5 ENDF-VI (66c) NNDC BNL	MCNP 4C3 ENDF/B-VIIb1 NRG Petten	MCNP 5 ENDF/B-VIIb1 NNDC BNL	MCNP 5 ENDF/B-VIIb1 LANL (normalized)
CASE 1 (k_{eff})	0.9976 (30)	0.99649 (56)	0.99573 (50)	0.99664 (38)	1.00040 (16)
CASE 2 (k_{eff})	0.9979 (30)	0.99811 (53)	0.99580 (47)	0.99674 (26)	0.9980 (16)
CASE 3 (k_{eff})	1.0017 (20)	1.00073 (41)	0.99862 (37)	1.00021 (23)	1.00032 (13)
CASE 4 (k_{eff})	1.0023 (20)	1.00102 (38)	1.00076 (35)	1.00128 (28)	---
CASE 5 (k_{eff})	0.9995 (20)	0.99767 (33)	0.99964 (29)	0.99881 (22)	0.99919 (11)
CASE 6 (k_{eff})	1.0002 (20)	1.00027 (36)	0.99937 (30)	0.99995 (18)	---
CASE 7 (k_{eff})	1.0017 (20)	1.00097 (32)	1.00012 (31)	1.00087 (22)	1.00032 (10)
CASE 8 (k_{eff})	1.0016 (10)	1.00073 (27)	1.00081 (26)	1.00152 (17)	1.00127 (09)

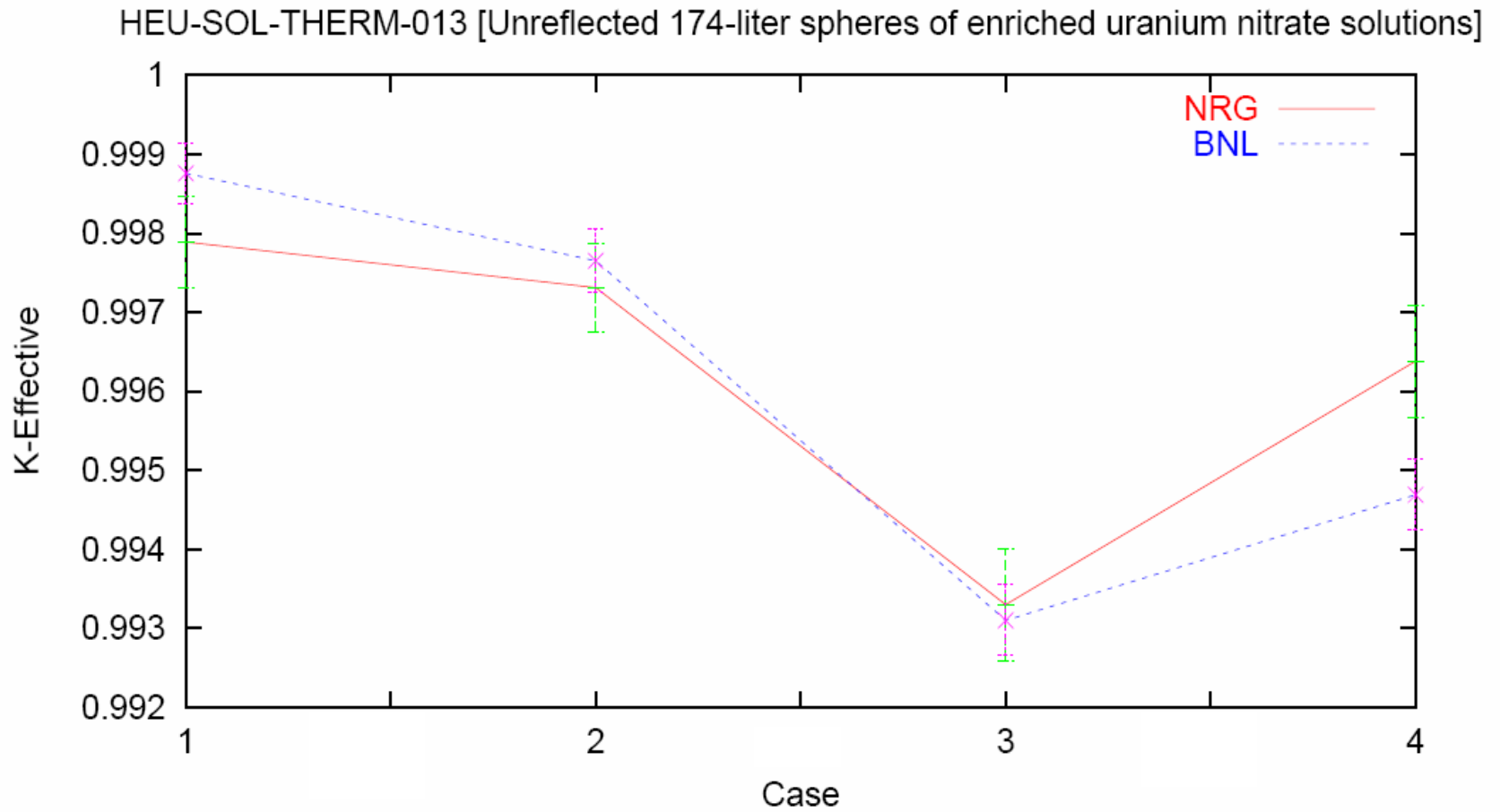
Uncertainty between brackets – units **pcm**

2.

HEU-SOL-THERM-004 [Reflected uranyl-fluoride solutions in heavy water]



3.



4.

