# Fast Data Testing and Temperature Effects for ENDF/-VII Beta 1

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*CSEWG 2005*
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- Reports MCNP5 calculations for various fast critical assemblies drawn from both CSEWG and ICSBEP compendiums.
- Reports initial calculations of the effect of temperature using the new cross sections and thermal scattering data.

# Our Old Favorites

| Assembly | R8 C/E | Beta1 C/E | Notes |
|---|---|---|---|
| Godiva 1.0000(10) | .99665(19) | 1.00009(15) | Bare HEU |
| HMF001 1.0000(10) | .99664(19) | .99989(15) | (Godiva) |
| Jezebel 1.0000(20) | .99722(18) | 1.00018(14) | Bare Pu |
| PMF001 1.0000(20) | .99750(19) | 1.00010(15) | (Jezebel) |
| Jezebel-23 1.0000(10) | .99255(18) | .99951(14) | Bare U-233 |
| Flattop-25 1.0000(10) | 1.00193(19) | 1.00284(21) | HEU/U refl. |
| HMF028 1.0000(30) | 1.00147(21) | 1.00358(20) | (Flattop-25) |
| Flattop-Pu 1.0000(14) | 1.00203(22) | 1.00196(22) | PU/U refl. |
| PMF006 1.0000(30) | 1.00269(18) | 1.00196((22) | (Flattop-Pu) |
| Flattop-23 1.0000(14) | 1.00239(230 | 1.00131(22) | U-233/U refl. |
| UMF006 1.0000(14) | 1.00055(21) | .99989(17) | (Flattop-23) |

# Larger Assemblies

| Assembly | R8 C/E | Beta1 C/E | Notes |
|---|---|---|---|
| Bigten 0.9960(3) | 1.01355(17) | 1.00227(16) | HEU/U 10% |
| IMF007h 0.9948(13) | 1.01251(16) | 1.00059(16) | Bigten homog. |
| IMF007s 1.0045(07) | 1.01167(24) | 1.00068(16) | Bigten simpl. |
| ZPR66A 0.9939(23) | .99921(26) | .99828(15) | U LMFBR |
| MCF001 0.9866(23) | 1.00605(33) | 1.00102(17) | Pu LMFBR |
| HMF055 0.9955(28) | | 1.00382(37) | ZPR3-23 HEU/Al/U |

# More Fast Cases

| Assembly | R8 C/E | Beta1 C/E | Notes |
|---|---|---|---|
| HMF004 0.9985 | .99625(25) | 1.00045(19) | HEU/H2O |
| PMF011 1.0000(10) | .99715(23) | .99926(19) | Pu/H2O |
| HMF011 0.9989(15) | | 1.00013(26) | HEU/poly |
| PMF024 1.0000(20) | | 1.00180(23) | Pu98%/poly |
| PMF023 1.0000(24) | | 1.00037(16) | Pu99%/graphite |

# Even More Fast Cases

| Assembly | R8 C/E | Beta1 C/E | Notes |
|---|---|---|---|
| HMF008 .9989(16) | | .99650(37) | Bare HEU |
| HMF014 .9989(17) | | .99915(35) | HEU/U refl. |
| PMF022 1.0000(21) | | 0.99894(22) | Pu98% bare |
| PMF029 1.0000(20) | | .99727(18) | Pu88% bare |
| PMF020 0.9993(17) | | .99955(21) | Pu/U refl |
| PMF025 1.0000(20) | | .99951(30) | Pu98/steel 1.55 |
| PMF026 1.0000(20) | | 1.00260(23) | Pu98/steel 11.5 |

# Temperature Effects

- While doing a set of simple k-inf cases, Harish Huria (Westinghouse) noticed that although the cold reactivity increased with preVII as expected, the hot reactivity did not increase, it even decreased.
- We have repeated some of those calculations with the latest beta1 cross sections and thermal data, seeing similar results.
- We've also tried to substitution runs to try to find the source of the effect..Attack #2: Reflector Bias

# K-inf Calculations

| Condition | Huria R3 | Huria R8 | Huria preVII | LANL beta1 |
|---|---|---|---|---|
| CZP | 1.25529(28) | 1.25351(26) | 1.25674(29) | 1.25676(29) |
| HZP | 1.24200(28) | 1.23829(27) | 1.23921(29) | 1.24143(29) |
| HFP | 1.23170(29) | 1.23170(29) | 1.22896(29) | 1.23138(28) |

Change back to R8 U-238:

CZP 1.25375(28) delta=-.00301

HZP 1.23848(31) delta=-.00295

# Kritz2:19 MOX Assembly

| Condition | ENDF66 | beta1 |
|---|---|---|
| Cold | 0.9967(03) | 1.00191(30) |
| Hot 500K | | 1.00006(45) |
| 509.1K | 0.9940(03) | .99938 |
| Hot 600K | | 1.00750(45) |
| Doppler | -.0027 | -.00253 |

# Kritz2:13 U Assembly

| Condition | ENDF66 | beta1 |
|---|---|---|
| Cold | 0.9949(03) | .99951(34) |
| Hot 500K | | .99805(30) |
| 516.2K | 0.9917(03) | .99730 |
| Hot 600K | | .99342(31) |
| Doppler | -.0032 | -.00221 |