## JEZEBEL Pu239 Corrective Factors

The specifications of this experiment are provided on the "International Handbook of Evaluated Criticality Safety Benchmark Experiments" under the name "PU-MET-FAST-001" in the Plutonium Systems chapter.
JEZEBEL Pu239 is a 17,020 gram sphere of plutonium alloy with a density of 15.61 $g/cm^3$ and has a radius of 6.3849 cm.
The homogeneous compositions are given in Table I (taken from the benchmark DVD).

For the deterministic spherical model the following meshing has been used with equidistant points in the same region:

| Axis | | | |
|---|---|---|---|
| R | Point | 1 | 33 |
| | Dimens. | 0.0 | 6.3849 |

The following $S_4$ angular data have been used. Just a reminder that directions with zero weight are used only for improving convergence on the curvilinear derivative term and should not affect the final result if not used, as it is the case of some $S_n$ codes (e. g. ONETRAN, ONEDANT).

| Direc. | Weight | μ |
|---|---|---|
| 1 | 0.0000000E+00 | -0.9367418E+00 |
| 2 | 0.1666667E+00 | -0.8688903E+00 |
| 3 | 0.3333333E+00 | -0.3500212E+00 |
| 4 | 0.3333333E+00 | 0.3500212E+00 |
| 5 | 0.1666667E+00 | 0.8688903E+00 |

Corrective factors have been calculated with the ENDF/B-VII cross section data. In table II we provide the corrective factors for the homogenous R model for the deterministic $S_4P_1$ 33 group calculations. Corrective factors are calculated as the ratio between the values obtained by the detailed Monte Carlo calculation and those obtained by the corresponding approximated calculation.

**Table I**. Homogeneous compositions.

| Nuclide | Atom Density, atoms/barn-cm |
|---|---|
| Ga | $1.3752 \times 10^{-3}$ |
| $^{239}$Pu | $3.7047 \times 10^{-2}$ |
| $^{240}$Pu | $1.7512 \times 10^{-3}$ |
| $^{241}$Pu | $1.1674 \times 10^{-4}$ |

**Table II**. Corrective factors for R homogeneous **deterministic** calculations.

| Parameters | MC Detailed | $S_4$ R. | **Corr. Fact.** | Experiment |
|---|---|---|---|---|
| $K_{eff}$ | 0.99986 ±9pcm | 1.00538 | **0.99451** ±100pcm | 1.00000 ±200pcm |
| F28/F25 | 0.2084 ±0.0009 | 0.2032 | **1.0256** ±1% | 0.2133 ±1.1% |
| F37/F25 | 0.9707 ±0.0013 | 0.9620 | **1.0090** ±1% | 0.9835 ±1.4% |
| F49/F25 | 1.4248 ±0.0018 | 1.4220 | **1.0020** ±1% | 1.4609 ±0.9% |