## Neutron and Photon Multigroup Data Libraries for MCNP

Currently, only one coupled neutron-photon multigroup library is supported by XTM, MGXSNP.[1] MGXSNP is comprised of 30-group neutron and 12-group photon data primarily based on ENDF/B-V for 95 nuclides. The MCNP compatible multigroup data library was produced from the original Sn multigroup libraries MENDF5 and MENDF5G using the code CRSRD in April 1987.[2,3] The original neutron data library, MENDF5, was produced using the "TD-Division Weight Function", also called "CLAW" by the processing code NJOY.[4-6] This weight function is a combination of a Maxwellian thermal + 1/E + fission + fusion peak at 14.0 MeV. The data library contains no upscatter groups or self-shielding, and is most applicable for fast systems. All cross-sections are for room temperature, 300K. P0 through P4 scattering matrices from the original library were processed by CRSRD into angular distributions for MCNP using the Carter-Forest equi-probable bin treatment. When available both total and prompt nubar data are provided. The edit reactions available for each ZAID are fully described in reference 1.

Table G.3 describes the MGXSNP data library. The ZAIDs used for this library correspond to the source evaluation in the same manner as the ZAID for the continuous-energy and discrete data; as an example the same source evaluation for natural iron was used to produce 26000.55c, 26000.55d and 26000.55m. For coupled neutron-photon problems, specifying a particular isotope on a material card will invoke the neutron set for that isotope and the corresponding photon set for that element. For example, an entry of "1003" on a material card will cause MCNP to use ZAID=1003.50m for neutron data and 1000.01g for photon data.

**Table G.3**
**MGXSNP: A Coupled Neutron-Photon Multigroup Data Library**

| ZAID | Neutron AWR | Length | ZAID | Photon AWR | Length |
|---|---|---|---|---|---|
| 1001.50m | 0.999172 | 3249 | 1000.01g | 0.999317 | 583 |
| 1002.55m | 1.996810 | 3542 | | | |
| 1003.50m | 2.990154 | 1927 | | | |
| 2003.50m | 2.990134 | 1843 | 2000.01g | 3.968217 | 583 |
| 2004.50m | 3.968238 | 1629 | | | |
| 3006.50m | 5.963479 | 3566 | 3000.01g | 6.881312 | 583 |
| 3007.55m | 6.955768 | 3555 | | | |
| 4007.35m | 6.949815 | 1598 | 4000.01g | 8.934763 | 557 |
| 4009.50m | 8.934807 | 3014 | | | |
| 5010.50m | 9.926970 | 3557 | 5000.01g | 10.717168 | 583 |
| 5011.56m | 10.914679 | 2795 | | | |
| 6000.50m | 11.896972 | 2933 [1] | 6000.01g | 11.907955 | 583 |

| | | | | | |
|---|---|---|---|---|---|
| 6012.50m | 11.896972 | 2933 [1] | | | |
| 7014.50m | 13.882849 | 3501 | 7000.01g | 13.886438 | 583 |
| 7015.55m | 14.871314 | 2743 | | | |
| 8016.50m | 15.857588 | 3346 | 8000.01g | 15.861942 | 583 |
| 9019.50m | 18.835289 | 3261 | 9000.01g | 18.835197 | 583 |
| 11023.50m | 22.792388 | 2982 | 11000.01g | 22.792275 | 583 |
| 12000.50m | 24.096375 | 3802 | 12000.01g | 24.096261 | 583 |
| 13027.50m | 26.749887 | 3853 | 13000.01g | 26.749756 | 583 |
| 14000.50m | 27.844378 | 3266 | 14000.01g | 27.844241 | 583 |
| 15031.50m | 30.707833 | 2123 | 15000.01g | 30.707682 | 583 |
| 16032.50m | 31.697571 | 2185 | 16000.01g | 31.788823 | 583 |
| 17000.50m | 35.148355 | 2737 | 17000.01g | 35.148180 | 583 |
| 18000.35m | 39.605021 | 2022 | 18000.01g | 39.604489 | 557 |
| 19000.50m | 38.762616 | 2833 | 19000.01g | 38.762423 | 583 |
| 20000.50m | 39.734053 | 3450 | 20000.01g | 39.733857 | 583 |
| 22000.50m | 47.455981 | 3015 | 22000.01g | 47.455747 | 583 |
| 23000.50m | 50.504104 | 2775 | 23000.01g | 50.503856 | 583 |
| 24000.50m | 51.549511 | 3924 | 24000.01g | 51.549253 | 583 |
| 25055.50m | 54.466367 | 2890 | 25000.01g | 54.466099 | 583 |
| 26000.55m | 55.366734 | 4304 | 26000.01g | 55.366466 | 583 |
| 27059.50m | 58.427218 | 2889 | 27000.01g | 58.426930 | 583 |
| 28000.50m | 58.182926 | 3373 | 28000.01g | 58.182641 | 583 |
| 29000.50m | 62.999465 | 2803 | 29000.01g | 62.999157 | 583 |
| 31000.50m | 69.124611 | 2084 | 31000.01g | 69.124270 | 583 |
| 33075.35m | 74.278340 | 2022 | 33000.01g | 74.277979 | 557 |
| 36078.50m | 77.251400 | 2108 | 36000.01g | 83.080137 | 583 |
| 36080.50m | 79.230241 | 2257 | | | |
| 36082.50m | 81.210203 | 2312 | | | |
| 36083.50m | 82.202262 | 2141 | | | |
| 36084.50m | 83.191072 | 2460 | | | |
| 36086.50m | 85.173016 | 2413 | | | |
| 40000.50m | 90.440039 | 2466 | 40000.01g | 90.439594 | 583 |
| 41093.50m | 92.108717 | 2746 | 41000.01g | 92.108263 | 583 |
| 42000.50m | 95.107162 | 1991 | 42000.01g | 95.106691 | 583 |
| 45103.50m | 102.021993 | 2147 | 45000.01g | 102.021490 | 583 |
| 45117.90m | 115.544386 | 2709 | | | |
| 46119.90m | 117.525231 | 2629 | 46000.01g | 105.513949 | 557 |
| 47000.55m | 106.941883 | 2693 | 47000.01g | 106.941685 | 583 |
| 47107.50m | 105.987245 | 2107 | | | |
| 47109.50m | 107.969736 | 1924 | | | |
| 48000.50m | 111.442911 | 1841 | 48000.01g | 111.442363 | 583 |
| 50120.35m | 115.995479 | 1929 | 50000.01g | 117.667336 | 557 |
| 50998.99m | 228.025301 | 1382 | | | |
| 50999.99m | 228.025301 | 1413 | | | |
| 54000.35m | 130.171713 | 1929 | 54000.01g | 130.165202 | 557 |
| 56138.50m | 136.721230 | 2115 | 56000.01g | 136.146809 | 583 |

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|---|---|---|---|---|---|
| 63000.35m | 150.654333 | 1933 | 63000.01g | 150.657141 | 557 |
| 63151.55m | 149.623005 | 2976 | | | |
| 63153.55m | 151.608005 | 2691 | | | |
| 64000.35m | 155.898915 | 1929 | 64000.01g | 155.900158 | 557 |
| 67165.55m | 163.512997 | 2526 | 67000.01g | 163.513493 | 583 |
| 73181.50m | 179.394458 | 2787 | 73000.01g | 179.393456 | 583 |
| 74000.55m | 182.270446 | 4360 | 74000.01g | 182.269548 | 583 |
| 74182.55m | 180.386082 | 3687 | | | |
| 74183.55m | 181.379499 | 3628 | | | |
| 74184.55m | 182.371615 | 3664 | | | |
| 74186.55m | 184.357838 | 3672 | | | |
| 75185.50m | 183.365036 | 1968 | 75000.01g | 184.607108 | 583 |
| 75187.50m | 185.350629 | 2061 | | | |
| 78000.35m | 193.415026 | 1929 | 78000.01g | 193.404225 | 557 |
| 79197.56m | 195.274027 | 3490 | 79000.01g | 195.274513 | 583 |
| 82000.50m | 205.437162 | 3384 | 82000.01g | 205.436151 | 583 |
| 83209.50m | 207.186158 | 2524 | 83000.01g | 207.185136 | 583 |
| 90232.50m | 230.045857 | 2896 | 90000.01g | 230.044724 | 583 |
| 91233.50m | 231.039442 | 1970 | 91000.01g | 229.051160 | 479 |
| 92233.50m | 231.038833 | 1988 | 92000.01g | 235.984125 | 583 |
| 92234.50m | 232.031554 | 2150 | | | |
| 92235.50m | 233.025921 | 3164 | | | |
| 92236.50m | 234.018959 | 2166 | | | |
| 92237.50m | 235.013509 | 2174 | | | |
| 92238.50m | 236.006966 | 3553 | | | |
| 92239.35m | 236.997601 | 2147 | | | |
| 93237.55m | 235.012957 | 2812 | 93000.01g | 235.011799 | 479 |
| 94238.50m | 236.005745 | 2442 | 94000.01g | 241.967559 | 583 [2] |
| 94239.55m | 236.999740 | 3038 | | | |
| 94240.50m | 237.992791 | 3044 | | | |
| 94241.50m | 238.987218 | 2856 | | | |
| 94242.50m | 239.980508 | 2956 | | | |
| 95241.50m | 238.987196 | 2535 | | | |
| 95242.50m | 239.981303 | 2284 | | | |
| 95243.50m | 240.974535 | 2480 | | | |
| 96242.50m | 239.980599 | 1970 | | | |
| 96244.50m | 241.967311 | 1950 | | | |

[1] The neutron transport data for ZAID's 6012.50m and 6000.50m are the same.

[2] Photon transport data are not provided for Z>94.

REFERENCES

[1] R. C. Little, “Neutron and Photon Multigroup Data Tables for MCNP3B,” LANL internal memorandum X-6:RCL-87-225 (1987).

[2] R. C. Little and R. E. Seamon, “New MENDF5 and MENDF5G,” LANL internal memoradum X-6:RCL-86-412 (1986).

[3] J. C. Wagner et al., “MCNP: Multigroup/Adjoint Capabilities,” LANL report LA-12704 (1994).

[4] R. E. Seamon, “Weight Functions for the Isotopes on Permfile THIRTY2,” LANL Internal memorandum, TD-6 (July 23, 1976).

[5] R. E. Seamon,“Plots of the TD Weight Function,” LANL internal memorandum, X-6:RES-91-80 (1980).

[6] R. E. MacFarlane and D. W. Muir, “The NJOY Nuclear Data Processing System,” LANL report LA-12740 (1994).