Appendices

The following appendices to Chapter 2 provide tables containing detailed information on the source terms for the Hiroshima and Nagasaki bombs. The tables in each of these appendices are read from left to right starting with the first row, then from left to right starting in the second row, and so forth.

Appendix A gives information on the neutron energy groups boundaries used in the source term calculations. The first entry in row one gives the lower energy boundary for the first energy group and the second entry in row one gives the upper energy boundary for the first energy group. Thus, the neutron energy groups boundaries for the first energy group (or the bottom energy group) of the neutron source terms for both the Hiroshima and Nagasaki bombs are 0 to 1×10^{-11} MeV. The energy boundaries of the second energy group for the neutron source terms for both bombs are 1×10^{-11} to 5×10^{-10} MeV, and so forth. The total number of neutron energy groups in the neutron source terms for both bombs is one less than 201 entries in Appendix A or 200 groups. Appendix B and Appendix C are read in the same way as Appendix A. There are 43 gamma-ray groups in the source terms for both bombs (44 entries in Appendix B minus 1) and 40 angular bins in the gamma-ray and neutron source terms for the Hiroshima bomb (41 entries in Appendix C minus 1). It was not necessary to use angular bins to specify the source leakage from the Nagasaki bomb since it was essentially a spherical device, whereas the Hiroshima bomb was a cylindrical device having more neutron and gamma-leakage through the sides than through the tail or the nose. The angular bins for the Hiroshima bomb are specified starting at the tail of the bomb (cosine = -1) and ending at the nose of the bomb (cosine = 1).

Appendix D gives information on the number of neutrons in each energy group in moles/kt and the relative error in the calculated value for each group by so-called segments. Segment 1 in Appendix D is the angular bin for cosine = -1 (180°) to cosine = -0.995884 (174.8°). The calculated neutron leakage in this first angular bin for neutron leakage through the tail of the Hiroshima bomb is 0 moles/kt and the relative error in the calculated value is 0 (see first two values in the first row of Appendix D). The 400 entries in segment 1 of Appendix D give the number of neutrons in moles/kt and the relative error for each of the 200 neutron groups. There are a total of 41 segments in Appendix D: the first 40 segments give the neutron leakage and relative error in each of the 200 energy groups starting at the tail (cosine = -1) and ending at the nose (cosine = 1), and the last segment (segment 41) gives the neutron leakage and relative error of each energy group for the angle-integrated, energy-dependent spectrum of the leakage neutrons for the Hiroshima bomb. Appendix E gives the equivalent information for the 43 energy groups and 40 angular bins used in the source term calculations for gamma rays from the Hiroshima bomb.

Appendix F and Appendix G give the number of neutrons and gamma rays in moles/kt and the relative error of the calculated values for each of the 200 energy groups for neutrons and the 43 energy groups for gamma rays that were also used to characterize the source terms for the Nagasaki bomb. As noted previously, it was not necessary to use angular bins to characterize the neutron and gamma-ray leakage from the Nagasaki bomb because it was essentially a spherical device.

Appendix A. Neutron energy group boundaries [MeV]

0.0000e+00	1.0000e-11	5.0000e-10	2.0000e-09	5.0000e-09	1.0000e-08
1.4500e-08	2.1000e-08	3.0000e-08	4.0000e-08	5.0000e-08	7.0000e-08
1.0000e-07	1.2500e-07	1.5000e-07	1.8400e-07	2.2500e-07	2.7500e-07
3.2500e-07	3.6680e-07	4.1399e-07	5.0000e-07	5.3158e-07	6.2506e-07
6.8256e-07	8.0000e-07	8.7643e-07	1.0000e-06	1.0400e-06	1.0800e-06
1.1253e-06	1.3000e-06	1.4450e-06	1.8554e-06	2.3824e-06	3.0590e-06
3.9279e-06	5.0435e-06	6.4760e-06	8.3153e-06	1.0677e-05	1.3710e-05
1.7604e-05	2.2603e-05	2.9023e-05	3.7266e-05	4.7851e-05	6.1442e-05
7.8893e-05	1.0130e-04	1.3007e-04	1.6702e-04	2.1445e-04	2.7536e-04
3.5357e-04	4.5400e-04	5.8295e-04	7.4852e-04	9.6112e-04	1.2341e-03
1.5846e-03	2.0347e-03	2.2487e-03	2.4852e-03	2.6126e-03	2.7465e-03
3.0354e-03	3.3546e-03	3.7074e-03	4.3074e-03	5.5308e-03	7.1017e-03
9.1188e-03	1.0595e-02	1.1709e-02	1.5034e-02	1.9305e-02	2.1875e-02
2.3579e-02	2.4176e-02	2.4788e-02	2.6058e-02	2.7000e-02	2.8501e-02
3.1828e-02	3.4307e-02	4.0868e-02	4.6309e-02	5.2475e-02	5.6562e-02
6.7379e-02	7.1998e-02	7.9499e-02	8.2503e-02	8.6517e-02	9.8037e-02
1.1109e-01	1.1679e-01	1.2277e-01	1.2907e-01	1.3569e-01	1.4264e-01
1.4996e-01	1.5764e-01	1.6573e-01	1.7422e-01	1.8316e-01	1.9255e-01
2.0242e-01	2.1280e-01	2.2371e-01	2.3518e-01	2.4724e-01	2.7324e-01
2.8725e-01	2.9452e-01	2.9721e-01	2.9849e-01	3.0197e-01	3.3373e-01
3.6883e-01	3.8774e-01	4.0762e-01	4.5049e-01	4.9787e-01	5.2340e-01
5.5023e-01	5.7844e-01	6.0810e-01	6.3928e-01	6.7206e-01	7.0651e-01
7.4274e-01	7.8082e-01	8.2085e-01	8.6294e-01	9.0718e-01	9.6164e-01
1.0026e+00	1.1080e+00	1.1648e+00	1.2246e+00	1.2874e+00	1.3534e+00
1.4227e+00	1.4957e+00	1.5724e+00	1.6530e+00	1.7377e+00	1.8268e+00
1.9205e+00	2.0190e+00	2.1225e+00	2.2313e+00	2.3069e+00	2.3457e+00
2.3653e+00	2.3852e+00	2.4660e+00	2.5924e+00	2.7253e+00	2.8651e+00
3.0119e+00	3.1664e+00	3.3287e+00	3.6788e+00	4.0657e+00	4.4933e+00
4.7237e+00	4.9659e+00	5.2295e+00	5.4881e+00	5.7695e+00	6.0653e+00
6.3763e+00	6.5924e+00	6.7032e+00	7.0469e+00	7.4082e+00	7.7880e+00
8.1873e+00	8.6071e+00	9.0484e+00	9.5123e+00	1.0000e+01	1.0513e+01
1.1052e+01	1.1618e+01	1.2214e+01	1.2523e+01	1.2840e+01	1.3499e+01
1.3840e+01	1.4191e+01	1.4550e+01	1.4918e+01	1.5683e+01	1.6487e+01
1.6905e+01	1.7332e+01	1.9640e+01			

Appendix B. Gamma energy group boundaries [MeV]

0	1.00e-03	1.00e-02	2.00e-02	3.00e-02	4.00e-02
4.50e-02	6.00e-02	7.00e-02	7.50e-02	1.00e-01	1.50e-01
2.00e-01	3.00e-01	4.00e-01	4.50e-01	5.10e-01	5.12e-01
6.00e-01	7.00e-01	8.00e-01	1.00e+00	1.33e+00	1.34e+00
1.50e+00	1.66e+00	2.00e+00	2.50e+00	3.00e+00	3.50e+00
4.00e+00	4.50e+00	5.00e+00	5.50e+00	6.00e+00	6.50e+00
7.00e+00	7.50e+00	8.00e+00	1.00e+01	1.20e+01	1.40e+01
2.00e+01	3.00e+01				

Appendix C. Angular bin boundaries [cosines] (tail to nose)

-1	-0.995884	-0.983572	-0.963163	-0.934827	-0.898772
-0.863572	-0.823534	-0.7789	-0.729924	-0.676392	-0.619779
-0.559772	-0.496671	-0.430984	-0.362686	-0.29254	-0.220868
-0.147982	-0.074108	0	0.074108	0.147982	0.220868
0.29254	0.362686	0.430984	0.496671	0.559772	0.619779
0.676392	0.729924	0.7789	0.823534	0.863572	0.898772
0.934827	0.963163	0.983572	0.995884	1	

Appendix D. Hiroshima neutron source [moles/kt, relative error]

Segment	1:	(Tail)			
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	6.724612e-09	1.000000
1.491946e-08	0.713000	1.197279e-08	0.709100	4.861489e-09	1.000000
3.214455e-08	0.457000	4.234934e-08	0.386900	2.807091e-08	0.452400
3.432612e-08	0.412300	8.037689e-08	0.282100	1.183838e-07	0.233800
2.461762e-07	0.165400	1.792816e-07	0.188900	1.673915e-07	0.205600
2.624087e-07	0.158200	3.534970e-07	0.133100	5.593504e-07	0.112200
4.897676e-07	0.113800	5.466332e-07	0.108800	8.505021e-07	0.088770
9.469667e-07	0.085960	3.451223e-07	0.142600	2.473135e-07	0.166600
1.336858e-07	0.231200	1.668746e-07	0.193200	4.008505e-07	0.140900
3.679719e-07	0.135400	3.563920e-07	0.138000	5.246107e-07	0.115900
9.849116e-07	0.089720	4.406564e-07	0.141500	2.483474e-07	0.180200
3.947504e-07	0.138700	4.006438e-07	0.149500	1.317213e-06	0.083480
2.392489e-06	0.061690	3.175166e-06	0.055240	3.958877e-06	0.049100
2.326319e-06	0.065830	3.612514e-06	0.052500	3.918554e-06	0.050590
1.088717e-08	0.717600	4.789114e-08	0.508700	1.578795e-07	0.261200
2.409032e-07	0.216400	6.111497e-07	0.130900	7.049262e-07	0.127300
7.916721e-07	0.118800	5.457026e-07	0.144300	2.153654e-06	0.073530
1.733883e-06	0.080710	1.120769e-06	0.104400	4.137745e-06	0.052240
3.172065e-07	0.188000	1.024201e-06	0.109000	1.707001e-06	0.083230
1.003832e-06	0.111200	1.838309e-06	0.081910	3.308542e-06	0.060620
1.591202e-06	0.089820	4.684689e-06	0.051690	4.777741e-07	0.162300
6.220059e-07	0.142500	1.611880e-06	0.089870	2.313912e-06	0.073970
2.570324e-06	0.071690	2.015109e-06	0.078460	4.007471e-07	0.183000
5.102392e-07	0.157900	2.915653e-06	0.067530	8.814163e-07	0.121400
1.693560e-06	0.088270	4.323851e-06	0.055410	2.547577e-06	0.072330
6.158024e-07	0.150700	3.351967e-07	0.199400	4.042625e-07	0.186700
1.018928e-06	0.115200	8.764534e-06	0.038940	6.034987e-06	0.047530
3.174132e-06	0.065460	3.868926e-07	0.190800	1.263449e-06	0.105600
2.467966e-06	0.074680	8.776941e-07	0.128300	1.049428e-06	0.116600
1.260348e-06	0.104500	1.897242e-06	0.086320	3.177234e-06	0.067450
2.500017e-06	0.076220	1.668746e-06	0.093410	8.621854e-07	0.129400
3.209286e-07	0.213300	3.622853e-07	0.193500	7.175400e-07	0.141200
5.588334e-07	0.160700	1.234500e-06	0.110500	5.183038e-07	0.171000
7.887771e-07	0.138100	4.489278e-07	0.182500	8.207252e-07	0.136900
2.379048e-07	0.259600	2.971484e-07	0.225900	2.124704e-07	0.269700
1.012414e-07	0.380800	1.917920e-07	0.280400	2.004770e-07	0.279600
2.268419e-07	0.260300	1.673915e-07	0.296500	9.072642e-08	0.392300
1.666678e-07	0.303700	1.261382e-07	0.355500	8.978556e-08	0.409800
2.828803e-08	0.712200	6.713238e-08	0.500000	1.679085e-08	1.000000
1.692526e-08	1.000000	3.510156e-08	0.606000	7.093721e-08	0.457100
7.560018e-08	0.448300	6.192143e-08	0.501700	3.134843e-08	0.709000
7.936365e-08	0.448800	2.354234e-08	0.772100	3.385052e-08	0.707100
3.923724e-08	0.589400	9.236002e-08	0.412400	1.694594e-08	1.000000
4.429311e-08	0.580900	0.000000e+00	0.000000	2.874296e-08	0.716900
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000
0.000000e+00	0.000000	0.000000e+00	0.000000	0.000000e+00	0.000000

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