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**APT Medical Isotope Production Study:
¹⁸F and ¹³¹I Production**

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Abstract

The APT target/blanket assembly provides a radiation environment of neutrons and protons of all energies below that of the incident proton beam. The parasitic application of this environment in the production of radioisotopes of medical and industrial applications has been proposed and candidate radioisotopes listed. In the present work we have simulated the neutron and proton flux spectra at two possible blanket irradiation sites, selected two candidate medical radioisotopes for study, modeled cross sections for target materials leading to their production, and calculated their production rates during APT operation using the fluxes and cross sections obtained. This study illustrates a procedure for isotope production calculations and compares results of cross-section modeling codes available for use in APT simulations.

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APT Medical Isotope Production Study: ^{18}F and ^{131}I Production

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A. Introduction

In a recent study published by the Medical University of South Carolina,¹ the production of medical radioisotopes at the proposed Accelerator Production of Tritium Facility is discussed. A number of radioisotopes of present or predicted applications in medical procedures for diagnosis and treatment are listed. Many of these are candidates for possible production in the intense and energetic neutron and proton fluxes present throughout the APT target/blanket assembly.

We have selected two candidate isotopes — ^{18}F and ^{131}I — to estimate the efficacy of such isotope production and to illustrate the data and techniques available for simulations of medical isotope production with high-energy protons and neutrons at APT.

A computer model of the target/blanket assembly, developed for a study of 100 milliamps of 1.7-GeV protons on the target with a 16 cm \times 160 cm beam area, is shown in fig. 1. The production rate of a radioisotope can be obtained from the integral of the flux and cross section leading to the direct production of the radioisotope as a reaction product. Additional production is realized from other radionuclides decaying to the desired radionuclide. The description of production, then, requires the evaluation of the neutron and proton fluxes at the irradiation position and the associated cross sections leading to the productions of the relevant radionuclides. Ideally, cross sections would be produced for all nuclides in the neighborhood of the desired product(s) and incorporated into a data library for a transmutation code — a task far beyond the scope of the project at present.

B. APT Modeling and Flux Tallies

Irradiation fixtures in the forward blanket and aft blanket areas have been added to the model. These fixtures are composed of three adjacent vertical irradiation tubes located at each of the two regions of the blanket, as shown in fig. 1 as small black circles. An aqueous solution containing the target nuclides or elements could be circulated through the tubes in a batch or continuous-extraction process. Target materials could also be inserted as rabbit samples.

New calculations of the revised target/blanket, modified to include these irradiation fixtures filled with water, were made with the LAHET^{2,3} and MCNP⁴ codes. The neutron and proton fluxes were tallied on the inside tube surface of the central tube for each location. The flux spectra obtained in the forward blanket region are shown in figs. 2 and 3. Flux spectra obtained in the aft blanket region are shown in figs. 4 and 5.

These fluxes are particular to the locations described and do not account for flux perturbations due to absorption in the tube solutes. The fluxes are assumed broadly representative of the irradiation regions. The tallied flux values are given in Appendix A.

C. Cross-Section Modeling

Cross section data extending to the 1.7-GeV maximum neutron and proton energy are not well known. For neutron reaction data, we have begun with the ECNAF neutron reaction data library⁵ for neutrons below 20 MeV — as improved for select target with the modeling of Herman⁶ using the EMPIRE-II Hauser-Feshbach reaction modeling code.^{7,8} Recently calculated neutron and proton data from Chadwick,⁹ obtained using the newly-modified HMS-ALICE code,^{10,11} were used to extend the neutron data to 150 MeV. Proton data below 150 MeV were taken entirely from Chadwick's results.

Neutron and proton reaction data for the targets leading to the two selected medical radioisotopes at energies above 150 MeV were calculated with available codes. For the products leading to ^{131}I ,

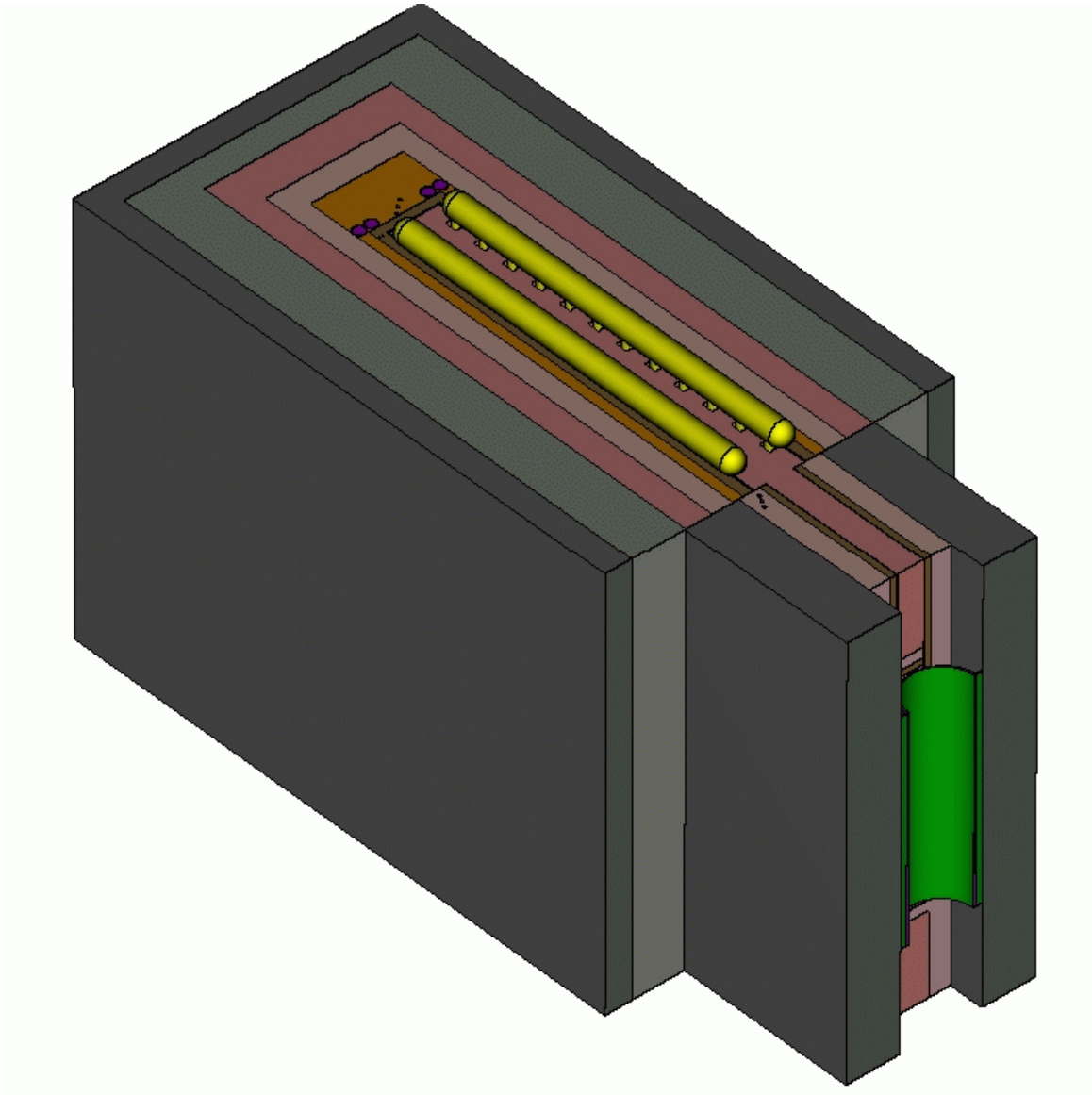


Figure 1: APT Target/Blanket.

calculations were made with the LAHET code operating in the cross-section mode. The reactions leading to the lighter ^{18}F were calculated with the more-advanced but time-consuming cascade excitation model CEM95 code.^{12–14} Additional CEM95 calculations were made for neutrons and protons on ^{133}Cs , $^{137,138}\text{Ba}$, and $^{138,139}\text{La}$ to provide data for comparisons with LAHET results.

The data produced in these voluminous and time-consuming calculations are tabulated in Appendix B.

D. Cross-Section Benchmarking

For many of the target nuclei we considered, experimental information on proton-induced activation cross sections is scanty and there are no data at all for neutron activation cross sections at intermediate energies. There also has been very little previous modeling of these reactions, except for the cases of protons on Al and Mg. Therefore, to investigate the reliability of our cross-section modeling, we have tried to collect all of the available experimental data on isotope production from the relevant targets and compare them to results from the models we have employed — the newly modified HMS-ALICE code, the CEM95 code, and the LAHET code system. To our knowledge, this is the first comparison of results from these three codes for activation cross sections.

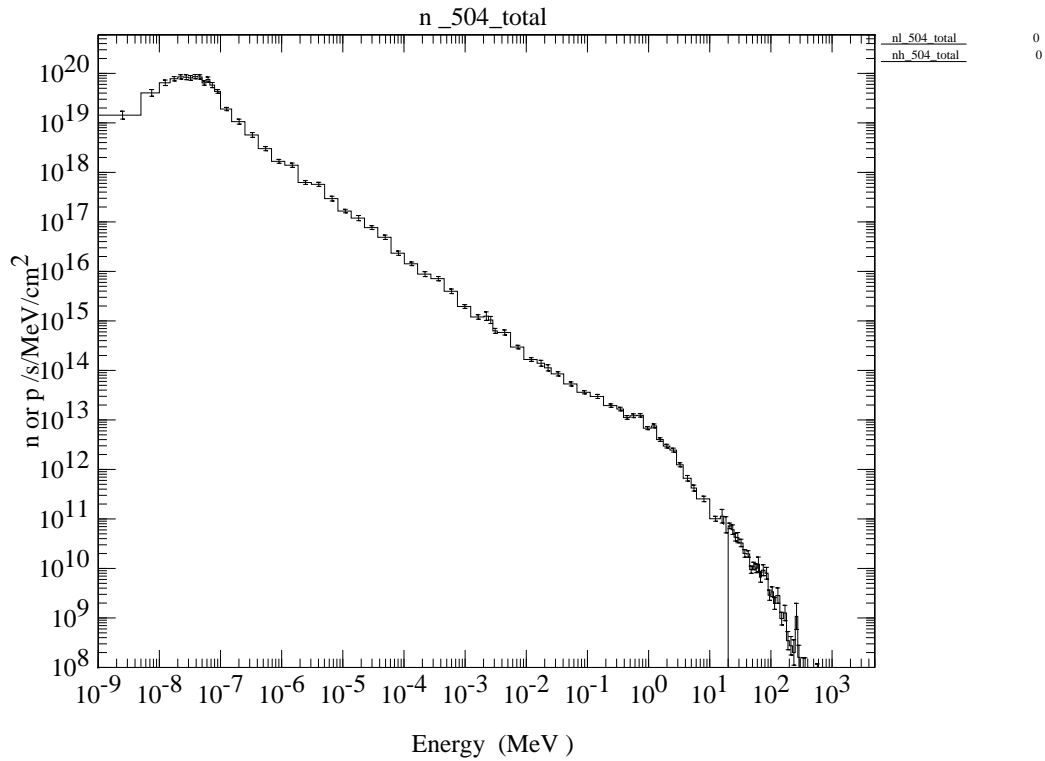


Figure 2: Forward Blanket Central Tube Neutron Flux Spectrum

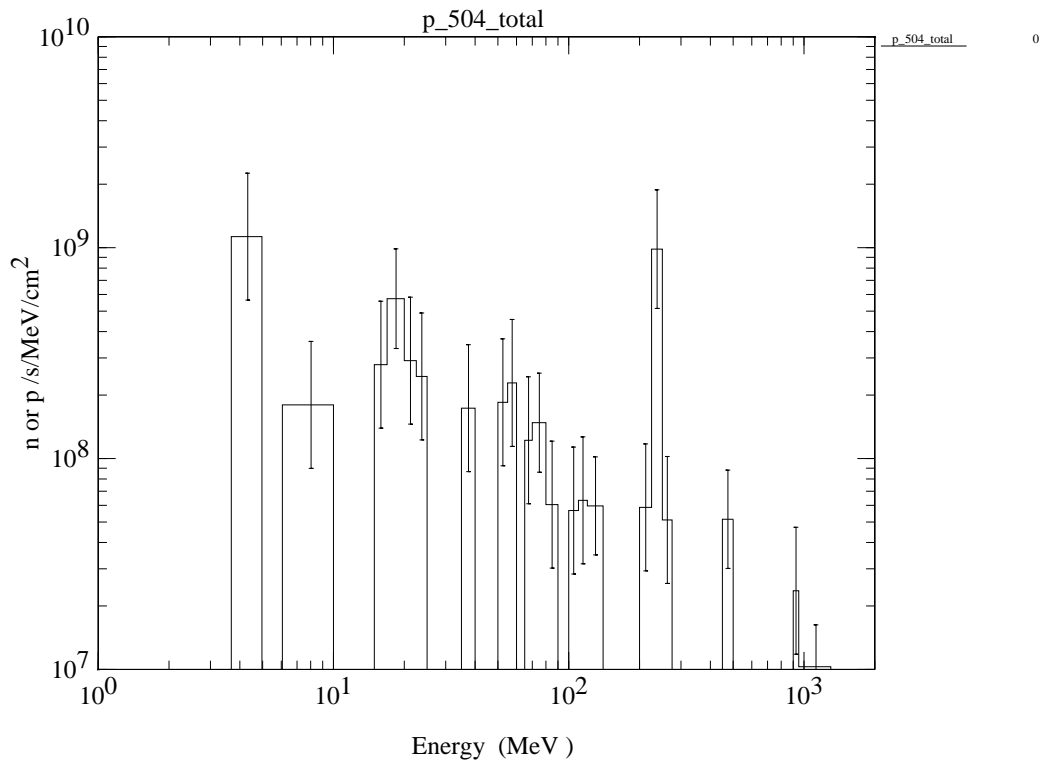


Figure 3: Forward Blanket Central Tube Proton Flux Spectrum

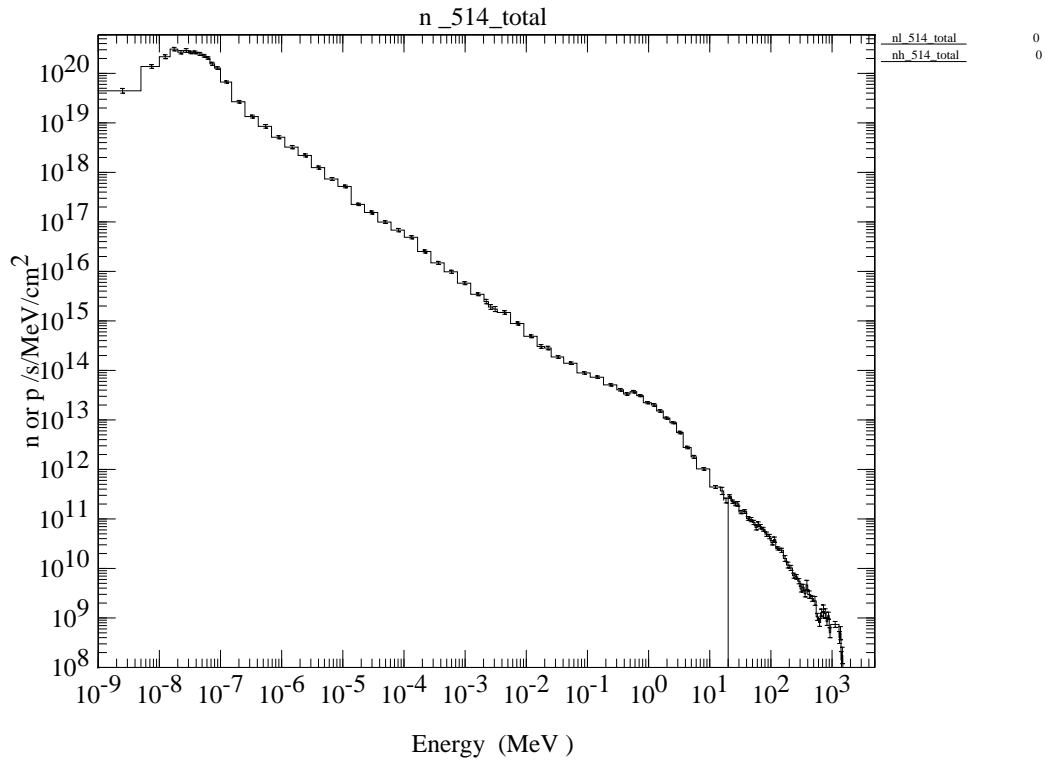


Figure 4: Aft Blanket Central Tube Neutron Flux Spectrum

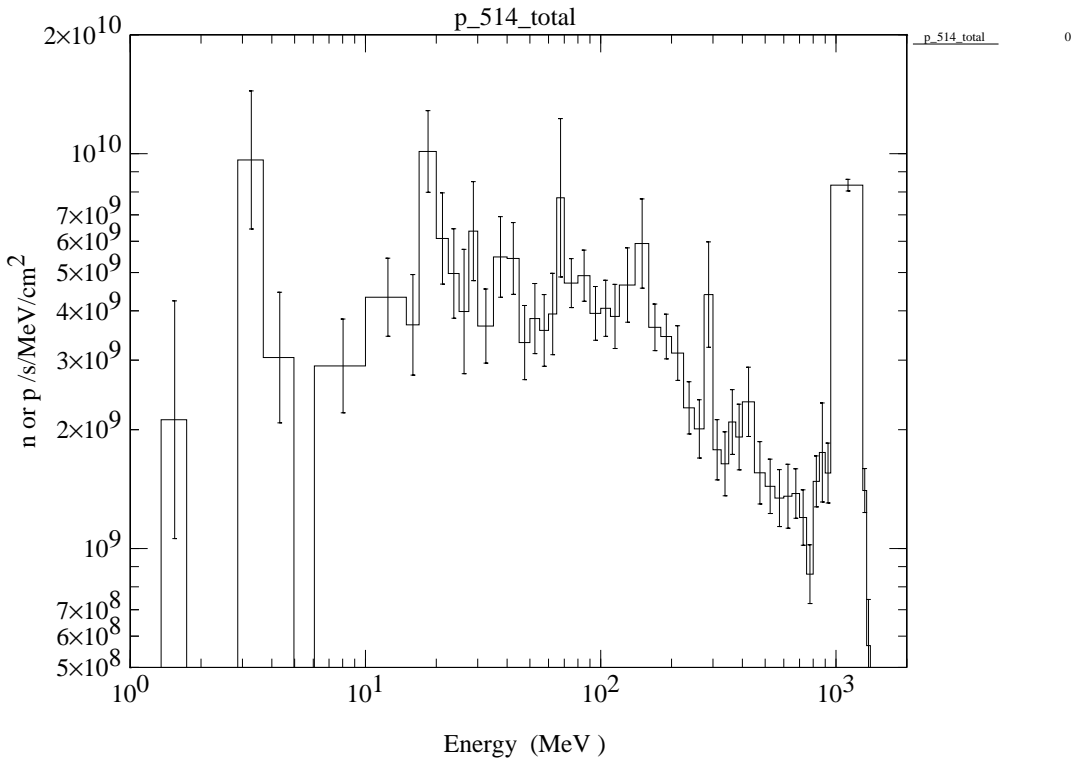


Figure 5: Aft Blanket Central Tube Proton Flux Spectrum

From this comparison we see that, for the majority of nuclides the results agree quite well with each other and with the data. We can therefore conclude that the activation cross sections calculated and used here in radioisotope production estimations are reasonably reliable. At the same time, for several target and residual nuclides, we observe significant differences between results from the three models. This indicates that further improvement of these models must occur before we can have confidence in the predictive power of these models for production of arbitrary isotopes.

We present in Appendix C twenty-three figures with comparisons of results from the three models with measured data for about 100 reactions calculated. References to experimental data, though not given in the figures, may be found in the comprehensive comparisons given in Ref. 13.

E. Isotope Production Results

We have considered proton and neutron interactions on the stable, naturally-occurring isotopes of elements in the neighborhood of the targets investigated. In each case, we have used the following procedure:

1. construct a continuous-energy representation of each cross section from available data;
2. form a flux-weighted average cross section for each particle flux at each irradiation position;
3. compute the one-hour irradiation end-product P production rate per gram of target for each target nuclide/reaction-product p radionuclide combination;
4. form the one-hour irradiation production rate per gram of target nuclide or element.

The flux-weighted cross section σ_{tp} for each target t and reaction product p was obtained as

$$\sigma_{tp} = \frac{\int_0^\infty \phi(E) \sigma_{tp}(E) dE}{\int_0^\infty \phi(E) dE} = \frac{\sigma_{tp} \phi}{\phi} \quad (1)$$

The cross section σ_{tP} leading to end-product P is taken as the sum of all cross sections for the direct production of P and products p decaying to P. The cross section σ_{ZP} for element Z leading to end-product P is obtained as the natural-abundance-weighted sum of the cross sections σ_{tP} of the various naturally-occurring target nuclides of the element.

The production rate R_{tP} (Ci/g-hr) for each target t — end-product P combination is obtained as

$$R_{tP} = N_t \sigma_{tP} \phi (1 - e^{-\lambda_P T}), \quad (2)$$

where λ_P is the decay constant (s^{-1}) of the end-product P and $T=3600s$, corresponding to the one-hour irradiation. N_t is the atom density (atoms/g) of target material defined by

$$N_t = \frac{N_o}{A_t}, \quad (3)$$

where N_o is Avogadro's Number (6.022×10^{23} atoms/mole) and A_t is the atomic weight (g/mole) of the target. A_t is taken as the integer mass number for isotopic targets and as the atomic weight for the elements, as given in Ref. 15.

Table 1 summarizes the radionuclide production rates calculated in Appendix D.

F. Conclusions and Future Plans

These results illustrate a technique for the simulations of production of medical radioisotopes in a high-energy neutron and proton environment. Beginning with the existing Monte-Carlo APT geometry, for which neutron and proton flux spectra were obtained at candidate irradiation locations, the CPU-intensive task of cross-section modeling required about one month using three modern workstations. Data manipulations, calculations, and documentation efforts required an additional month. The development of scripts, procedures and data-manipulation software in this work will

contribute to more efficient resolution of medium-energy isotope production studies in the future. The recent development of the ECNAF neutron transmutation cross section data library for neutrons below 20 MeV and recent HMS-ALICE results for neutron- and proton-induced reactions below 150 MeV were timely and invaluable to the study.

The reaction cross sections produced in this study, describing the production of many nuclides beyond the mass 18 and 131 nuclides considered here, have also served as a testbed for examination of the agreement, or lack thereof, between results from the various codes used in the cross-section modeling.

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Table 1

Summary of Production of ^{18}F and ^{131}I in APT

Target Nuclide =====	Product Nuclide =====	Forward Blanket			Aft Blanket		
		Protons Ci/g-hr =====	Neutrons Ci/g-hr =====	Total Ci/g-hr =====	Protons Ci/g-hr =====	Neutrons Ci/g-hr =====	Total Ci/g-hr =====
80 18	9F 18	1.27E-04	0.	1.27E-04	4.40E-03	0.	4.40E-03
80 nat	9F 18	2.85E-07	0.	2.85E-07	9.89E-06	0.	9.89E-06
9F nat	9F 18	5.80E-04	3.38E-02	3.44E-02	6.14E-02	1.91E-01	2.53E-01
10Ne 20	9F 18	4.11E-04	5.72E-03	6.13E-03	4.21E-02	6.47E-02	1.07E-01
10Ne 21	9F 18	2.56E-04	1.50E-03	1.75E-03	2.38E-02	2.36E-02	4.74E-02
10Ne 22	9F 18	1.76E-04	6.12E-04	7.88E-04	1.60E-02	1.17E-02	2.78E-02
10Nenat	9F 18	3.87E-04	5.19E-03	5.58E-03	3.94E-02	5.93E-02	9.87E-02
11Nanat	9F 18	1.88E-04	4.90E-03	5.09E-03	1.90E-02	4.34E-02	6.23E-02
12Mg 24	9F 18	1.51E-04	1.86E-03	2.02E-03	1.71E-02	2.35E-02	4.06E-02
12Mg 25	9F 18	1.00E-04	7.70E-04	8.70E-04	1.30E-02	1.24E-02	2.55E-02
12Mg 26	9F 18	6.95E-05	3.25E-04	3.94E-04	9.76E-03	7.04E-03	1.68E-02
12Mgnat	9F 18	1.36E-04	1.57E-03	1.71E-03	1.58E-02	2.05E-02	3.63E-02
13Alnat	9F 18	6.57E-05	4.23E-04	4.89E-04	1.03E-02	7.40E-03	1.77E-02
54Xe132	53I 131	5.83E-07	3.97E-05	4.03E-05	9.87E-05	3.17E-04	4.15E-04
54Xe134	53I 131	7.64E-07	5.22E-05	5.30E-05	8.67E-05	5.08E-04	5.95E-04
54Xe136	53I 131	4.42E-07	1.33E-05	1.37E-05	4.48E-05	1.62E-04	2.06E-04
54Xenat	53I 131	2.79E-07	2.80E-04	2.80E-04	4.00E-05	1.19E-03	1.23E-03
55Cs133	53I 131	2.16E-08	7.10E-07	7.31E-07	5.14E-06	9.11E-06	1.43E-05
56Ba134	53I 131	7.76E-10	2.35E-08	2.43E-08	3.54E-07	5.50E-07	9.04E-07
56Ba135	53I 131	2.32E-09	4.89E-08	5.12E-08	6.76E-07	1.13E-06	1.81E-06
56Ba136	53I 131	5.72E-09	8.59E-08	9.16E-08	1.47E-06	2.04E-06	3.51E-06
56Ba137	53I 131	9.38E-09	1.31E-07	1.40E-07	2.13E-06	3.13E-06	5.26E-06
56Ba138	53I 131	1.31E-08	1.66E-07	1.79E-07	3.04E-06	4.08E-06	7.12E-06
56Banat	53I 131	1.11E-08	1.44E-07	1.56E-07	2.59E-06	3.54E-06	6.13E-06
57La138	53I 131	9.22E-10	1.10E-08	1.19E-08	3.16E-07	3.22E-07	6.37E-07
57La139	53I 131	2.37E-09	1.83E-08	2.07E-08	5.83E-07	5.74E-07	1.16E-06
57Lanat	53I 131	2.37E-09	1.83E-08	2.07E-08	5.83E-07	5.74E-07	1.16E-06

Appendix A

Neutron and Proton Fluxes

Neutron and Proton fluxes were calculated in companion LAHET and MCNP transport calculations for the geometry shown in fig. 1 of the main text. The tallied fluxes are tabulated in Table A1.

Table A1

Neutron and Proton Fluxes Tallied by LAHET and MCNP
on the Inside Surfaces of the Central Irradiation Tubes in the
Forward & Aft Blankets for the total height of the APT Target/Blanket
(Fluxes are group fluxes: cm/cm**3 in group)

Upper Egv	Forward Blanket		Aft Blanket		Forward Blanket		Aft Blanket	
	NeutronFlux	Unct	NeutronFlux	Unct	Proton Flux	Unct	Proton Flux	Unct
5.0000E-09	7.14909E+10	0.2030	2.21771E+11	0.1168	0.	0.	0.	0.
1.0000E-08	2.01701E+11	0.1689	6.88401E+11	0.0904	0.	0.	0.	0.
1.5000E-08	3.22680E+11	0.1367	1.08508E+12	0.0955	0.	0.	0.	0.
2.0000E-08	3.89458E+11	0.1073	1.54581E+12	0.0830	0.	0.	0.	0.
2.5000E-08	4.25122E+11	0.1063	1.33789E+12	0.0817	0.	0.	0.	0.
3.0000E-08	4.18375E+11	0.1227	1.45189E+12	0.0912	0.	0.	0.	0.
3.5000E-08	4.04498E+11	0.1159	1.32582E+12	0.0621	0.	0.	0.	0.
4.2000E-08	6.01323E+11	0.1047	1.85469E+12	0.0650	0.	0.	0.	0.
5.0000E-08	6.77317E+11	0.1055	1.97664E+12	0.0735	0.	0.	0.	0.
5.8000E-08	5.11627E+11	0.1059	1.81271E+12	0.0665	0.	0.	0.	0.
6.7000E-08	6.75224E+11	0.1256	1.83914E+12	0.0622	0.	0.	0.	0.
8.0000E-08	7.54950E+11	0.1273	2.02701E+12	0.0741	0.	0.	0.	0.
1.0000E-07	8.65308E+11	0.0894	2.54994E+12	0.0639	0.	0.	0.	0.
1.5200E-07	9.90398E+11	0.0787	3.46927E+12	0.0521	0.	0.	0.	0.
2.5100E-07	1.04880E+12	0.1238	2.64468E+12	0.0620	0.	0.	0.	0.
4.1400E-07	9.30015E+11	0.1170	2.18668E+12	0.0682	0.	0.	0.	0.
6.8300E-07	8.11461E+11	0.1005	2.28871E+12	0.0879	0.	0.	0.	0.
1.1250E-06	7.38907E+11	0.0947	2.26650E+12	0.0734	0.	0.	0.	0.
1.8550E-06	1.01887E+12	0.1039	2.36463E+12	0.0794	0.	0.	0.	0.
3.0590E-06	7.51904E+11	0.0930	2.64842E+12	0.0726	0.	0.	0.	0.
5.0430E-06	1.13790E+12	0.1000	2.47699E+12	0.0749	0.	0.	0.	0.
8.3150E-06	9.66326E+11	0.1169	2.40633E+12	0.0709	0.	0.	0.	0.
1.3710E-05	8.92259E+11	0.0858	2.80524E+12	0.0653	0.	0.	0.	0.
2.2600E-05	1.06134E+12	0.1277	2.00679E+12	0.0572	0.	0.	0.	0.
3.7270E-05	1.12485E+12	0.0932	2.27065E+12	0.0726	0.	0.	0.	0.
6.1440E-05	1.18257E+12	0.1079	2.39718E+12	0.0634	0.	0.	0.	0.
1.0130E-04	9.30066E+11	0.1053	2.72002E+12	0.0808	0.	0.	0.	0.
1.6700E-04	9.35713E+11	0.0871	3.21010E+12	0.0740	0.	0.	0.	0.
2.7540E-04	9.55495E+11	0.1217	2.73657E+12	0.0727	0.	0.	0.	0.
4.5400E-04	1.27606E+12	0.1054	2.65561E+12	0.0708	0.	0.	0.	0.
7.4850E-04	1.16842E+12	0.1124	2.89179E+12	0.0744	0.	0.	0.	0.
1.2340E-03	9.47565E+11	0.0924	2.80736E+12	0.0706	0.	0.	0.	0.
2.0350E-03	9.61971E+11	0.1094	2.76155E+12	0.0678	0.	0.	0.	0.

Table A1 (Continued)

Upper Egy	Forward Blanket		Aft Blanket		Forward Blanket		Aft Blanket	
	NeutronFlux	Unct	NeutronFlux	Unct	Proton Flux	Unct	Proton Flux	Unct
2.4040E-03	4.60567E+11	0.2189	9.06631E+11	0.1078	0.	0.	0.	0.
2.8400E-03	4.55308E+11	0.1795	8.32461E+11	0.1172	0.	0.	0.	0.
3.3550E-03	3.23899E+11	0.1225	8.93915E+11	0.1241	0.	0.	0.	0.
5.5310E-03	1.27159E+12	0.1248	3.21892E+12	0.0843	0.	0.	0.	0.
9.1190E-03	1.06270E+12	0.0868	3.17920E+12	0.0741	0.	0.	0.	0.
1.5030E-02	9.81824E+11	0.0902	2.88794E+12	0.0671	0.	0.	0.	0.
1.9890E-02	6.78407E+11	0.1459	1.48296E+12	0.0892	0.	0.	0.	0.
2.5540E-02	6.37381E+11	0.1567	1.59928E+12	0.0846	0.	0.	0.	0.
4.0870E-02	1.30559E+12	0.1028	2.86689E+12	0.0628	0.	0.	0.	0.
6.7380E-02	1.41342E+12	0.0999	3.69745E+12	0.0603	0.	0.	0.	0.
1.1110E-01	1.58068E+12	0.0768	3.89361E+12	0.0582	0.	0.	0.	0.
1.8320E-01	2.14910E+12	0.1001	5.25146E+12	0.0585	0.	0.	0.	0.
3.0200E-01	2.31335E+12	0.0833	6.06472E+12	0.0537	0.	0.	0.	0.
3.8870E-01	1.43760E+12	0.0880	3.52350E+12	0.0621	0.	0.	0.	0.
4.9790E-01	1.22715E+12	0.0897	3.64998E+12	0.0580	0.	0.	0.	0.
6.3928E-01	1.71715E+12	0.0909	5.25565E+12	0.0593	0.	0.	0.	0.
8.2085E-01	2.25086E+12	0.0856	5.61341E+12	0.0487	0.	0.	0.	0.
1.1080E+00	1.95685E+12	0.0735	6.39981E+12	0.0522	0.	0.	0.	0.
1.3534E+00	1.85703E+12	0.0966	4.93107E+12	0.0633	0.	0.	0.	0.
1.7377E+00	1.54064E+12	0.0870	5.83471E+12	0.0594	0.	0.	8.14540E+08	1.0000
2.2313E+00	1.46066E+12	0.0902	5.35390E+12	0.0509	0.	0.	0.	0.
2.8651E+00	1.55612E+12	0.0961	5.55704E+12	0.0484	0.	0.	0.	0.
3.6788E+00	1.00957E+12	0.0991	4.52239E+12	0.0611	0.	0.	7.84473E+09	0.4959
4.9658E+00	8.53919E+11	0.1384	3.57266E+12	0.0584	1.45217E+09	1.0000	3.92042E+09	0.4635
6.0650E+00	4.62544E+11	0.1500	1.96716E+12	0.0713	0.	0.	0.	0.
1.0000E+01	9.99254E+11	0.1365	4.03596E+12	0.0613	7.07028E+08	1.0000	1.14140E+10	0.3145
1.4918E+01	4.96131E+11	0.1230	2.17176E+12	0.0718	0.	0.	2.12942E+10	0.2557
1.6905E+01	2.25568E+11	0.3730	7.30585E+11	0.1824	5.53928E+08	1.0000	7.32393E+09	0.3407
2.0000E+01	2.35696E+11	0.4572	7.27350E+11	0.1156	1.77341E+09	0.7231	3.13535E+10	0.2688
2.2500E+01	1.81053E+11	0.1386	7.09827E+11	0.0824	7.28243E+08	1.0000	1.52482E+10	0.3048
2.5000E+01	1.51697E+11	0.2489	5.56401E+11	0.0817	6.12844E+08	1.0000	1.24302E+10	0.2980
2.7500E+01	1.06858E+11	0.1939	5.02052E+11	0.0869	0.	0.	9.95879E+09	0.4370
3.0000E+01	1.04779E+11	0.2694	5.03464E+11	0.1133	0.	0.	1.59148E+10	0.3348
3.5000E+01	1.63585E+11	0.1898	6.88623E+11	0.0791	0.	0.	1.83006E+10	0.2413
4.0000E+01	1.00584E+11	0.1941	7.04104E+11	0.0866	8.66651E+08	1.0000	2.73828E+10	0.2649
4.5000E+01	9.80270E+10	0.1628	5.12154E+11	0.0909	0.	0.	2.71428E+10	0.2328
5.0000E+01	4.72778E+10	0.1842	4.84553E+11	0.1031	0.	0.	1.66203E+10	0.2414
5.5000E+01	5.60647E+10	0.1900	4.24635E+11	0.1043	9.24019E+08	1.0000	1.91172E+10	0.2268
6.0000E+01	5.03237E+10	0.2273	3.37560E+11	0.1243	1.14202E+09	1.0000	1.78418E+10	0.2325
6.5000E+01	6.07761E+10	0.3968	3.90142E+11	0.1162	0.	0.	1.96348E+10	0.2678
7.0000E+01	3.33638E+10	0.2663	3.48604E+11	0.1077	6.10352E+08	1.0000	3.86641E+10	0.5868
8.0000E+01	9.21102E+10	0.2912	6.19231E+11	0.0924	1.47960E+09	0.7174	4.70190E+10	0.1535
9.0000E+01	8.00197E+10	0.3147	4.91417E+11	0.1056	6.04765E+08	1.0000	4.90997E+10	0.1608
1.0000E+02	2.88158E+10	0.2683	4.40752E+11	0.1063	0.	0.	3.94060E+10	0.1697
1.1000E+02	3.38150E+10	0.2574	3.30917E+11	0.1078	5.66930E+08	1.0000	4.05923E+10	0.1779
1.2000E+02	1.96331E+10	0.3159	3.81335E+11	0.1288	6.33566E+08	1.0000	3.87143E+10	0.2057
1.4000E+02	5.65906E+10	0.4303	5.06779E+11	0.0744	1.19249E+09	0.7080	9.29810E+10	0.2421
1.6000E+02	1.94032E+10	0.3444	4.64759E+11	0.1016	0.	0.	1.18441E+11	0.2973
1.8000E+02	2.51831E+10	0.4315	3.17806E+11	0.1439	0.	0.	7.26593E+10	0.1456

Table A1 (Continued)

Upper Egy	Forward Blanket		Aft Blanket		Forward Blanket		Aft Blanket	
	NeutronFlux	Unct	NeutronFlux	Unct	Proton Flux	Unct	Proton Flux	Unct
2.0000E+02	6.95563E+09	0.5264	2.34350E+11	0.1467	0.	0.	6.88670E+10	0.1393
2.2500E+02	6.85927E+09	0.5382	2.55959E+11	0.1263	1.46684E+09	1.0000	7.81620E+10	0.1727
2.5000E+02	5.01263E+09	0.8064	1.78522E+11	0.1246	2.46107E+10	0.9109	5.67943E+10	0.1646
2.7500E+02	2.69095E+10	0.8364	1.68181E+11	0.1147	1.27882E+09	1.0000	5.02378E+10	0.1853
3.0000E+02	4.00447E+09	0.7543	1.38086E+11	0.1273	0.	0.	1.09931E+11	0.3599
3.2500E+02	0.	0.	9.59098E+10	0.1474	0.	0.	4.44773E+10	0.1921
3.5000E+02	1.96795E+09	1.0000	1.03950E+11	0.1500	0.	0.	4.09815E+10	0.2051
3.7500E+02	1.95649E+09	1.0000	7.69673E+10	0.1562	0.	0.	5.22940E+10	0.2079
4.0000E+02	0.	0.	1.15902E+11	0.2410	0.	0.	4.79073E+10	0.2110
4.5000E+02	1.25448E+09	1.0000	1.47903E+11	0.1867	0.	0.	1.17635E+11	0.2239
5.0000E+02	0.	0.	1.22630E+11	0.1304	2.57703E+09	0.7106	7.77709E+10	0.1994
5.5000E+02	1.30690E+09	1.0000	1.10636E+11	0.2290	0.	0.	7.18734E+10	0.1718
6.0000E+02	2.94395E+09	1.0000	5.25255E+10	0.1775	0.	0.	6.71146E+10	0.1806
6.5000E+02	1.45550E+09	1.0000	4.07135E+10	0.2045	0.	0.	6.78417E+10	0.2049
7.0000E+02	1.95215E+09	1.0000	6.39706E+10	0.1794	0.	0.	6.89164E+10	0.1552
7.5000E+02	2.13692E+09	0.7662	6.75210E+10	0.3540	0.	0.	5.99188E+10	0.1754
8.0000E+02	0.	0.	6.18697E+10	0.2359	0.	0.	4.30652E+10	0.1869
8.5000E+02	2.34244E+09	0.7077	4.21958E+10	0.1939	0.	0.	7.39745E+10	0.1602
9.0000E+02	9.83650E+08	1.0000	5.56361E+10	0.1755	0.	0.	8.75589E+10	0.3348
9.5000E+02	0.	0.	2.51744E+10	0.2610	1.18053E+09	1.0000	7.76679E+10	0.1909
1.3000E+03	1.11773E+09	1.0000	2.58787E+11	0.1481	3.60490E+09	0.5796	2.91329E+12	0.0346
1.3500E+03	0.	0.	2.01386E+10	0.3205	0.	0.	7.01324E+10	0.1368
1.4000E+03	0.	0.	2.46322E+10	0.3561	0.	0.	2.83918E+10	0.3089
1.4500E+03	0.	0.	7.15498E+09	0.4621	0.	0.	1.26964E+10	0.3832
1.5000E+03	0.	0.	8.73637E+09	0.4649	0.	0.	1.12602E+09	1.0000
1.6000E+03	0.	0.	1.12257E+09	1.0000	0.	0.	0.	0.
1.7000E+03	0.	0.	1.11858E+09	1.0000	0.	0.	1.12810E+09	1.0000
1.8000E+03	0.	0.	0.	0.	0.	0.	0.	0.
1.9000E+03	0.	0.	0.	0.	0.	0.	0.	0.
2.0000E+03	0.	0.	0.	0.	0.	0.	0.	0.
Total	6.16496E+13		1.84549E+14		4.85668E+10		5.21089E+12	

Appendix B

Neutron and Proton Cross Sections

Reaction cross sections were obtained from the following sources:

1. ECNAF evaluated data⁵ with some updated evaluations by Herman⁶ obtained with the EMPIRE-II code;^{7,8}
2. Calculations by M. B. Chadwick⁹ with the recently modified HMS-ALICE code;^{10,11}
3. Calculations by S. G. Mashnik with the CEM95 code;¹²⁻¹⁴ and,
4. Calculations by K. A. Van Riper with the LAHET 2.83 code.^{2,3}

The tabulated cross-section data available were reduced to include only the cross-section values leading to mass 18 and mass 131 products pertinent to these calculations. These were further thinned to eliminate discrepant data, providing data sets of more-or-less reasonable continuity defining the cross-section functions used in the calculations.

The resulting data file is listed below in Table B1. Two records are given on each line; the file begins at the left of the first line and continues to the end of the table, continuing at the right of the first record to the last line of the table. Each record identifies the incident particle (0=neutron, 1=proton), the Z and A of the target, Z and A of the reaction product, incident-particle energy (MeV), cross-section value (mb), statistical uncertainty (where meaningful) and data source index as identified above.

Table B1

Neutron and Proton Cross Sections

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
=	==	===	==	===	=====	=====	=====	===	=	==	===	==	===	=====	=====	=====	===
0	9	19	9	18	1.098E+01	0.000E+00	0.0000	1	0	57	138	53	131	1.300E+03	2.607E-01	0.2085	4
0	9	19	9	18	1.100E+01	6.364E-02	0.0000	1	0	57	138	53	131	1.700E+03	2.493E-01	0.2132	4
0	9	19	9	18	1.110E+01	1.546E-01	0.0000	1	0	57	138	54	131	1.500E+02	1.506E+00	0.1118	4
0	9	19	9	18	1.120E+01	3.767E-01	0.0000	1	0	57	138	54	131	2.000E+02	1.723E+00	0.0811	4
0	9	19	9	18	1.130E+01	7.300E-01	0.0000	1	0	57	138	54	131	3.000E+02	2.006E+00	0.0751	4
0	9	19	9	18	1.140E+01	1.083E+00	0.0000	1	0	57	138	54	131	5.000E+02	2.403E+00	0.0686	4
0	9	19	9	18	1.150E+01	1.548E+00	0.0000	1	0	57	138	54	131	7.500E+02	1.779E+00	0.0798	4
0	9	19	9	18	1.160E+01	2.122E+00	0.0000	1	0	57	138	54	131	1.000E+03	1.530E+00	0.0860	4
0	9	19	9	18	1.170E+01	2.828E+00	0.0000	1	0	57	138	54	131	1.300E+03	1.575E+00	0.0848	4
0	9	19	9	18	1.180E+01	3.662E+00	0.0000	1	0	57	138	54	131	1.700E+03	1.371E+00	0.0909	4
0	9	19	9	18	1.190E+01	4.582E+00	0.0000	1	0	57	138	55	131	1.500E+02	1.558E+01	0.0269	4
0	9	19	9	18	1.200E+01	5.588E+00	0.0000	1	0	57	138	55	131	1.500E+02	1.551E+01	0.0347	4
0	9	19	9	18	1.210E+01	6.693E+00	0.0000	1	0	57	138	55	131	2.000E+02	1.558E+01	0.0269	4
0	9	19	9	18	1.220E+01	7.898E+00	0.0000	1	0	57	138	55	131	3.000E+02	1.651E+01	0.0261	4
0	9	19	9	18	1.230E+01	9.133E+00	0.0000	1	0	57	138	55	131	5.000E+02	1.431E+01	0.0280	4
0	9	19	9	18	1.240E+01	1.040E+01	0.0000	1	0	57	138	55	131	7.500E+02	1.121E+01	0.0317	4
0	9	19	9	18	1.250E+01	1.167E+01	0.0000	1	0	57	138	55	131	1.000E+03	9.022E+00	0.0354	4

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	9	19	9	18	1.260E+01	1.332E+01	0.0000	1	0	57	138	55	131	1.300E+03	8.070E+00	0.0374	4
0	9	19	9	18	1.270E+01	1.536E+01	0.0000	1	0	57	138	55	131	1.700E+03	6.086E+00	0.0431	4
0	9	19	9	18	1.280E+01	1.741E+01	0.0000	1	0	57	138	56	131	1.500E+02	5.300E+01	0.0145	4
0	9	19	9	18	1.290E+01	1.945E+01	0.0000	1	0	57	138	56	131	1.500E+02	5.184E+01	0.0188	4
0	9	19	9	18	1.300E+01	2.136E+01	0.0000	1	0	57	138	56	131	2.000E+02	4.653E+01	0.0154	4
0	9	19	9	18	1.310E+01	2.314E+01	0.0000	1	0	57	138	56	131	3.000E+02	3.882E+01	0.0169	4
0	9	19	9	18	1.320E+01	2.492E+01	0.0000	1	0	57	138	56	131	5.000E+02	2.771E+01	0.0201	4
0	9	19	9	18	1.330E+01	2.670E+01	0.0000	1	0	57	138	56	131	7.500E+02	1.979E+01	0.0238	4
0	9	19	9	18	1.340E+01	2.847E+01	0.0000	1	0	57	138	56	131	1.000E+03	1.646E+01	0.0261	4
0	9	19	9	18	1.350E+01	3.022E+01	0.0000	1	0	57	138	56	131	1.300E+03	1.220E+01	0.0304	4
0	9	19	9	18	1.360E+01	3.197E+01	0.0000	1	0	57	138	56	131	1.700E+03	1.164E+01	0.0311	4
0	9	19	9	18	1.370E+01	3.372E+01	0.0000	1	0	57	138	57	131	1.500E+02	4.228E+01	0.0162	4
0	9	19	9	18	1.380E+01	3.562E+01	0.0000	1	0	57	138	57	131	1.500E+02	4.247E+01	0.0209	4
0	9	19	9	18	1.390E+01	3.767E+01	0.0000	1	0	57	138	57	131	2.000E+02	3.247E+01	0.0185	4
0	9	19	9	18	1.400E+01	3.972E+01	0.0000	1	0	57	138	57	131	3.000E+02	2.611E+01	0.0207	4
0	9	19	9	18	1.410E+01	4.123E+01	0.0000	1	0	57	138	57	131	5.000E+02	1.752E+01	0.0253	4
0	9	19	9	18	1.420E+01	4.219E+01	0.0000	1	0	57	138	57	131	7.500E+02	1.238E+01	0.0302	4
0	9	19	9	18	1.430E+01	4.357E+01	0.0000	1	0	57	138	57	131	1.000E+03	1.104E+01	0.0320	4
0	9	19	9	18	1.440E+01	4.538E+01	0.0000	1	0	57	138	57	131	1.300E+03	9.702E+00	0.0341	4
0	9	19	9	18	1.450E+01	4.665E+01	0.0000	1	0	57	138	57	131	1.700E+03	8.795E+00	0.0358	4
0	9	19	9	18	1.460E+01	4.739E+01	0.0000	1	0	57	138	58	131	3.000E+02	2.153E-01	0.2294	4
0	9	19	9	18	1.470E+01	4.850E+01	0.0000	1	0	57	138	58	131	5.000E+02	3.740E-01	0.1741	4
0	9	19	9	18	1.480E+01	4.998E+01	0.0000	1	0	57	138	58	131	7.500E+02	6.120E-01	0.1361	4
0	9	19	9	18	1.490E+01	5.133E+01	0.0000	1	0	57	138	58	131	1.000E+03	4.760E-01	0.1543	4
0	9	19	9	18	1.500E+01	5.254E+01	0.0000	1	0	57	138	58	131	1.300E+03	6.007E-01	0.1373	4
0	9	19	9	18	1.510E+01	5.376E+01	0.0000	1	0	57	138	58	131	1.700E+03	6.914E-01	0.1280	4
0	9	19	9	18	1.520E+01	5.497E+01	0.0000	1	0	57	139	50	131	7.500E+01	0.000E+00	0.0000	2
0	9	19	9	18	1.530E+01	5.619E+01	0.0000	1	0	57	139	50	131	8.000E+01	1.038E-26	0.0000	2
0	9	19	9	18	1.540E+01	5.740E+01	0.0000	1	0	57	139	50	131	8.500E+01	4.699E-22	0.0000	2
0	9	19	9	18	1.550E+01	5.854E+01	0.0000	1	0	57	139	50	131	9.000E+01	3.463E-19	0.0000	2
0	9	19	9	18	1.560E+01	5.959E+01	0.0000	1	0	57	139	50	131	9.500E+01	9.149E-17	0.0000	2
0	9	19	9	18	1.570E+01	6.065E+01	0.0000	1	0	57	139	50	131	1.000E+02	3.848E-16	0.0000	2
0	9	19	9	18	1.580E+01	6.170E+01	0.0000	1	0	57	139	50	131	1.100E+02	9.055E-15	0.0000	2
0	9	19	9	18	1.590E+01	6.275E+01	0.0000	1	0	57	139	50	131	1.200E+02	1.258E-13	0.0000	2
0	9	19	9	18	1.600E+01	6.381E+01	0.0000	1	0	57	139	50	131	1.300E+02	1.703E-13	0.0000	2
0	9	19	9	18	1.610E+01	6.486E+01	0.0000	1	0	57	139	50	131	1.400E+02	4.349E-12	0.0000	2
0	9	19	9	18	1.620E+01	6.592E+01	0.0000	1	0	57	139	50	131	1.500E+02	3.769E-13	0.0000	2
0	9	19	9	18	1.630E+01	6.697E+01	0.0000	1	0	57	139	51	131	6.500E+01	0.000E+00	0.0000	2
0	9	19	9	18	1.640E+01	6.802E+01	0.0000	1	0	57	139	51	131	7.000E+01	5.476E-21	0.0000	2
0	9	19	9	18	1.650E+01	6.897E+01	0.0000	1	0	57	139	51	131	7.500E+01	2.207E-15	0.0000	2
0	9	19	9	18	1.660E+01	6.982E+01	0.0000	1	0	57	139	51	131	8.000E+01	1.084E-13	0.0000	2
0	9	19	9	18	1.670E+01	7.068E+01	0.0000	1	0	57	139	51	131	8.500E+01	6.444E-12	0.0000	2
0	9	19	9	18	1.680E+01	7.153E+01	0.0000	1	0	57	139	51	131	9.000E+01	7.514E-11	0.0000	2
0	9	19	9	18	1.690E+01	7.238E+01	0.0000	1	0	57	139	51	131	9.500E+01	5.773E-10	0.0000	2
0	9	19	9	18	1.700E+01	7.322E+01	0.0000	1	0	57	139	51	131	1.000E+02	2.345E-09	0.0000	2
0	9	19	9	18	1.710E+01	7.407E+01	0.0000	1	0	57	139	51	131	1.100E+02	1.171E-08	0.0000	2
0	9	19	9	18	1.720E+01	7.493E+01	0.0000	1	0	57	139	51	131	1.200E+02	2.113E-08	0.0000	2
0	9	19	9	18	1.730E+01	7.578E+01	0.0000	1	0	57	139	51	131	1.300E+02	5.020E-08	0.0000	2
0	9	19	9	18	1.740E+01	7.662E+01	0.0000	1	0	57	139	51	131	1.400E+02	3.065E-07	0.0000	2
0	9	19	9	18	1.750E+01	7.735E+01	0.0000	1	0	57	139	51	131	1.500E+02	5.759E-08	0.0000	2
0	9	19	9	18	1.760E+01	7.794E+01	0.0000	1	0	57	139	52	131	3.000E+01	0.000E+00	0.0000	2
0	9	19	9	18	1.770E+01	7.854E+01	0.0000	1	0	57	139	52	131	3.500E+01	9.450E-16	0.0000	2
0	9	19	9	18	1.780E+01	7.913E+01	0.0000	1	0	57	139	52	131	4.000E+01	1.890E-10	0.0000	2
0	9	19	9	18	1.790E+01	7.972E+01	0.0000	1	0	57	139	52	131	4.500E+01	1.920E-08	0.0000	2
0	9	19	9	18	1.800E+01	8.032E+01	0.0000	1	0	57	139	52	131	5.000E+01	1.619E-07	0.0000	2
0	9	19	9	18	1.810E+01	8.091E+01	0.0000	1	0	57	139	52	131	5.500E+01	3.242E-07	0.0000	2
0	9	19	9	18	1.820E+01	8.150E+01	0.0000	1	0	57	139	52	131	6.000E+01	3.314E-07	0.0000	2
0	9	19	9	18	1.830E+01	8.210E+01	0.0000	1	0	57	139	52	131	6.500E+01	3.291E-07	0.0000	2
0	9	19	9	18	1.840E+01	8.269E+01	0.0000	1	0	57	139	52	131	7.000E+01	3.003E-07	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	9	19	9	18	1.850E+01	8.299E+01	0.0000	1	0	57	139	52	131	7.500E+01	2.663E-07	0.0000	2
0	9	19	9	18	1.860E+01	8.298E+01	0.0000	1	0	57	139	52	131	8.000E+01	4.890E-07	0.0000	2
0	9	19	9	18	1.870E+01	8.297E+01	0.0000	1	0	57	139	52	131	8.500E+01	1.906E-06	0.0000	2
0	9	19	9	18	1.880E+01	8.297E+01	0.0000	1	0	57	139	52	131	9.000E+01	9.144E-06	0.0000	2
0	9	19	9	18	1.890E+01	8.296E+01	0.0000	1	0	57	139	52	131	9.500E+01	1.857E-05	0.0000	2
0	9	19	9	18	1.900E+01	8.296E+01	0.0000	1	0	57	139	52	131	1.000E+02	2.197E-05	0.0000	2
0	9	19	9	18	1.910E+01	8.295E+01	0.0000	1	0	57	139	52	131	1.100E+02	3.368E-05	0.0000	2
0	9	19	9	18	1.920E+01	8.294E+01	0.0000	1	0	57	139	52	131	1.200E+02	6.769E-05	0.0000	2
0	9	19	9	18	1.930E+01	8.294E+01	0.0000	1	0	57	139	52	131	1.300E+02	5.970E-05	0.0000	2
0	9	19	9	18	1.940E+01	8.293E+01	0.0000	1	0	57	139	52	131	1.400E+02	1.177E-04	0.0000	2
0	9	19	9	18	1.950E+01	8.279E+01	0.0000	1	0	57	139	52	131	1.500E+02	9.691E-05	0.0000	2
0	9	19	9	18	1.960E+01	8.251E+01	0.0000	1	0	57	139	52	131	3.000E+02	1.137E-02	1.0000	4
0	9	19	9	18	1.970E+01	8.223E+01	0.0000	1	0	57	139	52	131	1.000E+03	1.137E-02	1.0000	4
0	9	19	9	18	1.980E+01	8.194E+01	0.0000	1	0	57	139	52	131	1.300E+03	1.137E-02	1.0000	4
0	9	19	9	18	1.990E+01	8.166E+01	0.0000	1	0	57	139	53	131	2.800E+01	0.000E+00	0.0000	2
0	9	19	9	18	2.000E+01	8.011E+01	0.0000	2	0	57	139	53	131	3.000E+01	3.000E-07	0.0000	2
0	9	19	9	18	2.200E+01	8.706E+01	0.0000	2	0	57	139	53	131	3.500E+01	6.885E-05	0.0000	2
0	9	19	9	18	2.400E+01	8.227E+01	0.0000	2	0	57	139	53	131	4.000E+01	4.295E-04	0.0000	2
0	9	19	9	18	2.600E+01	7.784E+01	0.0000	2	0	57	139	53	131	4.500E+01	9.813E-04	0.0000	2
0	9	19	9	18	2.800E+01	6.876E+01	0.0000	2	0	57	139	53	131	5.000E+01	7.202E-04	0.0000	2
0	9	19	9	18	3.000E+01	6.461E+01	0.0000	2	0	57	139	53	131	5.500E+01	2.201E-04	0.0000	2
0	9	19	9	18	3.500E+01	5.094E+01	0.0000	2	0	57	139	53	131	6.000E+01	6.766E-05	0.0000	2
0	9	19	9	18	4.000E+01	4.236E+01	0.0000	2	0	57	139	53	131	6.500E+01	5.070E-05	0.0000	2
0	9	19	9	18	4.500E+01	3.786E+01	0.0000	2	0	57	139	53	131	7.000E+01	2.148E-04	0.0000	2
0	9	19	9	18	5.000E+01	3.643E+01	0.0000	2	0	57	139	53	131	7.500E+01	1.365E-03	0.0000	2
0	9	19	9	18	5.500E+01	3.394E+01	0.0000	2	0	57	139	53	131	8.000E+01	3.655E-03	0.0000	2
0	9	19	9	18	6.000E+01	3.147E+01	0.0000	2	0	57	139	53	131	8.500E+01	6.454E-03	0.0000	2
0	9	19	9	18	6.500E+01	3.054E+01	0.0000	2	0	57	139	53	131	9.000E+01	1.034E-02	0.0000	2
0	9	19	9	18	7.000E+01	3.040E+01	0.0000	2	0	57	139	53	131	9.500E+01	1.196E-02	0.0000	2
0	9	19	9	18	7.500E+01	2.916E+01	0.0000	2	0	57	139	53	131	1.000E+02	1.522E-02	0.0000	2
0	9	19	9	18	8.000E+01	2.784E+01	0.0000	2	0	57	139	53	131	1.100E+02	1.580E-02	0.0000	2
0	9	19	9	18	8.500E+01	2.697E+01	0.0000	2	0	57	139	53	131	1.200E+02	1.832E-02	0.0000	2
0	9	19	9	18	9.000E+01	2.800E+01	0.0000	2	0	57	139	53	131	1.300E+02	2.074E-02	0.0000	2
0	9	19	9	18	9.500E+01	2.716E+01	0.0000	2	0	57	139	53	131	1.400E+02	3.149E-02	0.0000	2
0	9	19	9	18	1.000E+02	2.638E+01	0.0000	2	0	57	139	53	131	1.500E+02	4.229E-02	0.0000	2
0	9	19	9	18	1.100E+02	2.681E+01	0.0000	2	0	57	139	53	131	1.500E+02	1.706E-01	0.2582	4
0	9	19	9	18	1.200E+02	2.639E+01	0.0000	2	0	57	139	53	131	2.000E+02	3.071E-01	0.1924	4
0	9	19	9	18	1.300E+02	2.666E+01	0.0000	2	0	57	139	53	131	3.000E+02	5.914E-01	0.1387	4
0	9	19	9	18	1.400E+02	2.680E+01	0.0000	2	0	57	139	53	131	5.000E+02	5.459E-01	0.1443	4
0	9	19	9	18	1.500E+02	2.745E+01	0.0000	2	0	57	139	53	131	7.500E+02	4.777E-01	0.1543	4
0	9	19	9	18	1.500E+02	5.270E+01	3.9400	3	0	57	139	53	131	1.000E+03	4.549E-01	0.1581	4
0	9	19	9	18	2.000E+02	4.970E+01	3.7400	3	0	57	139	53	131	1.300E+03	5.459E-01	0.1443	4
0	9	19	9	18	2.500E+02	4.850E+01	3.6600	3	0	57	139	53	131	1.700E+03	4.208E-01	0.1644	4
0	9	19	9	18	3.000E+02	4.930E+01	3.7000	3	1	8	18	9	18	2.000E+00	0.000E+00	0.0000	2
0	9	19	9	18	5.000E+02	4.680E+01	3.8200	3	1	8	18	9	18	3.000E+00	2.902E+01	0.0000	2
0	9	19	9	18	7.500E+02	4.410E+01	3.9400	3	1	8	18	9	18	4.000E+00	3.820E+00	0.0000	2
0	9	19	9	18	1.000E+03	4.360E+01	3.9700	3	1	8	18	9	18	5.000E+00	1.217E+01	0.0000	2
0	9	19	9	18	1.300E+03	4.140E+01	3.8800	3	1	8	18	9	18	6.000E+00	2.838E+01	0.0000	2
0	9	19	9	18	1.700E+03	4.010E+01	3.8400	3	1	8	18	9	18	7.000E+00	5.056E+01	0.0000	2
0	10	20	9	18	1.554E+01	0.000E+00	0.0000	1	1	8	18	9	18	8.000E+00	7.741E+01	0.0000	2
0	10	20	9	18	1.700E+01	3.116E-02	0.0000	1	1	8	18	9	18	9.000E+00	1.057E+02	0.0000	2
0	10	20	9	18	1.800E+01	4.304E-01	0.0000	1	1	8	18	9	18	1.000E+01	1.180E+02	0.0000	2
0	10	20	9	18	1.900E+01	1.581E+00	0.0000	1	1	8	18	9	18	1.100E+01	1.155E+02	0.0000	2
0	10	20	9	18	2.000E+01	2.593E+00	0.0000	1	1	8	18	9	18	1.200E+01	1.077E+02	0.0000	2
0	10	20	9	18	3.000E+01	1.238E+00	0.0000	2	1	8	18	9	18	1.300E+01	1.077E+02	0.0000	2
0	10	20	9	18	3.500E+01	9.039E+00	0.0000	2	1	8	18	9	18	1.400E+01	9.515E+01	0.0000	2
0	10	20	9	18	4.000E+01	1.957E+01	0.0000	2	1	8	18	9	18	1.500E+01	8.141E+01	0.0000	2
0	10	20	9	18	4.500E+01	2.413E+01	0.0000	2	1	8	18	9	18	1.600E+01	7.022E+01	0.0000	2
0	10	20	9	18	5.000E+01	2.437E+01	0.0000	2	1	8	18	9	18	1.700E+01	6.787E+01	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	10	20	9	18	5.500E+01	2.439E+01	0.0000	2	1	8	18	9	18	1.800E+01	5.876E+01	0.0000	2
0	10	20	9	18	6.000E+01	2.272E+01	0.0000	2	1	8	18	9	18	1.900E+01	4.956E+01	0.0000	2
0	10	20	9	18	6.500E+01	2.248E+01	0.0000	2	1	8	18	9	18	2.000E+01	4.752E+01	0.0000	2
0	10	20	9	18	7.000E+01	2.136E+01	0.0000	2	1	8	18	9	18	2.200E+01	3.929E+01	0.0000	2
0	10	20	9	18	7.500E+01	2.056E+01	0.0000	2	1	8	18	9	18	2.400E+01	3.446E+01	0.0000	2
0	10	20	9	18	8.000E+01	2.081E+01	0.0000	2	1	8	18	9	18	2.600E+01	2.702E+01	0.0000	2
0	10	20	9	18	8.500E+01	2.089E+01	0.0000	2	1	8	18	9	18	2.800E+01	2.539E+01	0.0000	2
0	10	20	9	18	9.000E+01	2.039E+01	0.0000	2	1	8	18	9	18	3.000E+01	2.070E+01	0.0000	2
0	10	20	9	18	9.500E+01	1.979E+01	0.0000	2	1	8	18	9	18	3.500E+01	1.552E+01	0.0000	2
0	10	20	9	18	1.000E+02	1.929E+01	0.0000	2	1	8	18	9	18	4.000E+01	1.379E+01	0.0000	2
0	10	20	9	18	1.100E+02	2.006E+01	0.0000	2	1	8	18	9	18	4.500E+01	1.089E+01	0.0000	2
0	10	20	9	18	1.200E+02	2.000E+01	0.0000	2	1	8	18	9	18	5.000E+01	8.743E+00	0.0000	2
0	10	20	9	18	1.300E+02	1.926E+01	0.0000	2	1	8	18	9	18	5.500E+01	8.110E+00	0.0000	2
0	10	20	9	18	1.400E+02	1.941E+01	0.0000	2	1	8	18	9	18	6.000E+01	6.846E+00	0.0000	2
0	10	20	9	18	1.500E+02	1.955E+01	0.0000	2	1	8	18	9	18	6.500E+01	5.925E+00	0.0000	2
0	10	20	9	18	1.500E+02	3.920E+01	3.4700	3	1	8	18	9	18	7.000E+01	5.672E+00	0.0000	2
0	10	20	9	18	2.000E+02	3.680E+01	3.3000	3	1	8	18	9	18	7.500E+01	5.126E+00	0.0000	2
0	10	20	9	18	2.500E+02	3.540E+01	3.2100	3	1	8	18	9	18	8.000E+01	4.387E+00	0.0000	2
0	10	20	9	18	3.000E+02	3.520E+01	3.2000	3	1	8	18	9	18	8.500E+01	4.319E+00	0.0000	2
0	10	20	9	18	5.000E+02	3.280E+01	3.2500	3	1	8	18	9	18	9.000E+01	4.076E+00	0.0000	2
0	10	20	9	18	7.500E+02	2.830E+01	3.2200	3	1	8	18	9	18	9.500E+01	3.493E+00	0.0000	2
0	10	20	9	18	1.000E+03	2.700E+01	3.1900	3	1	8	18	9	18	1.000E+02	3.573E+00	0.0000	2
0	10	20	9	18	1.300E+03	2.540E+01	3.1100	3	1	8	18	9	18	1.100E+02	2.759E+00	0.0000	2
0	10	20	9	18	1.700E+03	2.410E+01	3.0400	3	1	8	18	9	18	1.200E+02	2.672E+00	0.0000	2
0	10	20	10	18	3.000E+01	0.000E+00	0.0000	2	1	8	18	9	18	1.300E+02	2.340E+00	0.0000	2
0	10	20	10	18	3.500E+01	8.143E-03	0.0000	2	1	8	18	9	18	1.400E+02	2.186E+00	0.0000	2
0	10	20	10	18	4.000E+01	7.273E-02	0.0000	2	1	8	18	9	18	1.500E+02	2.022E+00	0.0000	2
0	10	20	10	18	4.500E+01	1.469E-01	0.0000	2	1	8	18	9	18	1.500E+02	7.050E+00	1.4400	3
0	10	20	10	18	5.000E+01	1.943E-01	0.0000	2	1	8	18	9	18	2.000E+02	5.460E+00	1.2300	3
0	10	20	10	18	5.500E+01	2.128E-01	0.0000	2	1	8	18	9	18	2.500E+02	4.620E+00	1.1200	3
0	10	20	10	18	6.000E+01	2.220E-01	0.0000	2	1	8	18	9	18	3.000E+02	3.830E+00	1.0200	3
0	10	20	10	18	6.500E+01	1.937E-01	0.0000	2	1	8	18	9	18	3.500E+02	3.420E+00	0.9680	3
0	10	20	10	18	7.000E+01	2.631E-01	0.0000	2	1	8	18	9	18	5.000E+02	2.050E+00	0.7820	3
0	10	20	10	18	7.500E+01	2.328E-01	0.0000	2	1	8	18	9	18	7.500E+02	1.150E+00	0.6230	3
0	10	20	10	18	8.000E+01	2.116E-01	0.0000	2	1	8	18	9	18	1.000E+03	2.990E-01	0.3220	3
0	10	20	10	18	8.500E+01	1.849E-01	0.0000	2	1	8	18	9	18	1.300E+03	1.020E-01	0.1900	3
0	10	20	10	18	9.000E+01	2.480E-01	0.0000	2	1	8	18	9	18	1.700E+03	1.250E-01	0.2110	3
0	10	20	10	18	9.500E+01	2.674E-01	0.0000	2	1	9	19	9	18	1.100E+01	0.000E+00	0.0000	2
0	10	20	10	18	1.000E+02	2.439E-01	0.0000	2	1	9	19	9	18	1.200E+01	1.421E-02	0.0000	2
0	10	20	10	18	1.100E+02	2.722E-01	0.0000	2	1	9	19	9	18	1.300E+01	5.638E-01	0.0000	2
0	10	20	10	18	1.200E+02	2.849E-01	0.0000	2	1	9	19	9	18	1.400E+01	1.997E+00	0.0000	2
0	10	20	10	18	1.300E+02	3.026E-01	0.0000	2	1	9	19	9	18	1.500E+01	6.223E+00	0.0000	2
0	10	20	10	18	1.400E+02	2.667E-01	0.0000	2	1	9	19	9	18	1.600E+01	1.489E+01	0.0000	2
0	10	20	10	18	1.500E+02	2.712E-01	0.0000	2	1	9	19	9	18	1.700E+01	2.432E+01	0.0000	2
0	10	20	10	18	1.500E+02	3.370E+00	1.0200	3	1	9	19	9	18	1.800E+01	3.197E+01	0.0000	2
0	10	20	10	18	2.000E+02	3.290E+00	0.9860	3	1	9	19	9	18	1.900E+01	4.389E+01	0.0000	2
0	10	20	10	18	2.500E+02	3.410E+00	0.9960	3	1	9	19	9	18	2.000E+01	5.682E+01	0.0000	2
0	10	20	10	18	3.000E+02	3.660E+00	1.0300	3	1	9	19	9	18	2.200E+01	7.546E+01	0.0000	2
0	10	20	10	18	5.000E+02	3.880E+00	1.1200	3	1	9	19	9	18	2.400E+01	8.710E+01	0.0000	2
0	10	20	10	18	7.500E+02	4.430E+00	1.2700	3	1	9	19	9	18	2.600E+01	9.255E+01	0.0000	2
0	10	20	10	18	1.000E+03	4.220E+00	1.2600	3	1	9	19	9	18	2.800E+01	8.956E+01	0.0000	2
0	10	20	10	18	1.300E+03	4.090E+00	1.2500	3	1	9	19	9	18	3.000E+01	8.690E+01	0.0000	2
0	10	20	10	18	1.700E+03	3.880E+00	1.2200	3	1	9	19	9	18	3.500E+01	7.520E+01	0.0000	2
0	10	21	9	18	3.000E+01	0.000E+00	0.0000	2	1	9	19	9	18	4.000E+01	6.405E+01	0.0000	2
0	10	21	9	18	3.500E+01	8.881E-03	0.0000	2	1	9	19	9	18	4.500E+01	5.724E+01	0.0000	2
0	10	21	9	18	4.000E+01	3.148E-01	0.0000	2	1	9	19	9	18	5.000E+01	5.503E+01	0.0000	2
0	10	21	9	18	4.500E+01	2.051E+00	0.0000	2	1	9	19	9	18	5.500E+01	5.240E+01	0.0000	2
0	10	21	9	18	5.000E+01	4.604E+00	0.0000	2	1	9	19	9	18	6.000E+01	4.765E+01	0.0000	2
0	10	21	9	18	5.500E+01	6.449E+00	0.0000	2	1	9	19	9	18	6.500E+01	4.620E+01	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	10	21	9	18	6.000E+01	7.584E+00	0.0000	2	1	9	19	9	18	7.000E+01	4.603E+01	0.0000	2
0	10	21	9	18	6.500E+01	7.965E+00	0.0000	2	1	9	19	9	18	7.500E+01	4.462E+01	0.0000	2
0	10	21	9	18	7.000E+01	7.785E+00	0.0000	2	1	9	19	9	18	8.000E+01	4.208E+01	0.0000	2
0	10	21	9	18	7.500E+01	7.250E+00	0.0000	2	1	9	19	9	18	8.500E+01	4.169E+01	0.0000	2
0	10	21	9	18	8.000E+01	7.047E+00	0.0000	2	1	9	19	9	18	9.000E+01	4.143E+01	0.0000	2
0	10	21	9	18	8.500E+01	6.954E+00	0.0000	2	1	9	19	9	18	9.500E+01	4.134E+01	0.0000	2
0	10	21	9	18	9.000E+01	6.902E+00	0.0000	2	1	9	19	9	18	1.000E+02	4.001E+01	0.0000	2
0	10	21	9	18	9.500E+01	6.448E+00	0.0000	2	1	9	19	9	18	1.100E+02	3.988E+01	0.0000	2
0	10	21	9	18	1.000E+02	6.339E+00	0.0000	2	1	9	19	9	18	1.200E+02	3.775E+01	0.0000	2
0	10	21	9	18	1.100E+02	5.929E+00	0.0000	2	1	9	19	9	18	1.300E+02	3.899E+01	0.0000	2
0	10	21	9	18	1.200E+02	6.211E+00	0.0000	2	1	9	19	9	18	1.400E+02	3.738E+01	0.0000	2
0	10	21	9	18	1.300E+02	5.775E+00	0.0000	2	1	9	19	9	18	1.500E+02	3.905E+01	0.0000	2
0	10	21	9	18	1.400E+02	5.635E+00	0.0000	2	1	9	19	9	18	1.500E+02	5.120E+01	3.9200	3
0	10	21	9	18	1.500E+02	5.551E+00	0.0000	2	1	9	19	9	18	2.000E+02	4.660E+01	3.6500	3
0	10	21	9	18	1.500E+02	2.430E+01	2.7700	3	1	9	19	9	18	2.500E+02	4.520E+01	3.5600	3
0	10	21	9	18	2.000E+02	2.240E+01	2.6000	3	1	9	19	9	18	3.000E+02	4.470E+01	3.5400	3
0	10	21	9	18	2.500E+02	2.110E+01	2.5100	3	1	9	19	9	18	5.000E+02	4.550E+01	3.7600	3
0	10	21	9	18	3.000E+02	2.110E+01	2.5100	3	1	9	19	9	18	7.500E+02	4.510E+01	3.9800	3
0	10	21	9	18	5.000E+02	2.010E+01	2.5900	3	1	9	19	9	18	1.000E+03	4.210E+01	3.9100	3
0	10	21	9	18	7.500E+02	1.840E+01	2.6300	3	1	9	19	9	18	1.300E+03	4.140E+01	3.8900	3
0	10	21	9	18	1.000E+03	1.740E+01	2.6000	3	1	9	19	9	18	1.700E+03	4.100E+01	3.9000	3
0	10	21	9	18	1.300E+03	1.640E+01	2.5200	3	1	9	19	10	18	1.600E+01	0.000E+00	0.0000	2
0	10	21	9	18	1.700E+03	1.540E+01	2.4600	3	1	9	19	10	18	1.700E+01	1.068E+00	0.0000	2
0	10	21	10	18	3.500E+01	0.000E+00	0.0000	2	1	9	19	10	18	1.800E+01	2.088E-03	0.0000	2
0	10	21	10	18	4.000E+01	2.946E-05	0.0000	2	1	9	19	10	18	1.900E+01	1.266E-02	0.0000	2
0	10	21	10	18	4.500E+01	1.126E-03	0.0000	2	1	9	19	10	18	2.000E+01	5.425E-02	0.0000	2
0	10	21	10	18	5.000E+01	5.617E-03	0.0000	2	1	9	19	10	18	2.200E+01	1.701E-01	0.0000	2
0	10	21	10	18	5.500E+01	1.251E-02	0.0000	2	1	9	19	10	18	2.400E+01	3.974E-01	0.0000	2
0	10	21	10	18	6.000E+01	2.039E-02	0.0000	2	1	9	19	10	18	2.600E+01	5.842E-01	0.0000	2
0	10	21	10	18	6.500E+01	2.215E-02	0.0000	2	1	9	19	10	18	2.800E+01	6.928E-01	0.0000	2
0	10	21	10	18	7.000E+01	2.180E-02	0.0000	2	1	9	19	10	18	3.000E+01	7.478E-01	0.0000	2
0	10	21	10	18	7.500E+01	2.169E-02	0.0000	2	1	9	19	10	18	3.500E+01	6.696E-01	0.0000	2
0	10	21	10	18	8.000E+01	2.281E-02	0.0000	2	1	9	19	10	18	4.000E+01	5.848E-01	0.0000	2
0	10	21	10	18	8.500E+01	2.138E-02	0.0000	2	1	9	19	10	18	4.500E+01	5.381E-01	0.0000	2
0	10	21	10	18	9.000E+01	1.986E-02	0.0000	2	1	9	19	10	18	5.000E+01	4.858E-01	0.0000	2
0	10	21	10	18	9.500E+01	2.124E-02	0.0000	2	1	9	19	10	18	5.500E+01	4.640E-01	0.0000	2
0	10	21	10	18	1.000E+02	2.312E-02	0.0000	2	1	9	19	10	18	6.000E+01	4.636E-01	0.0000	2
0	10	21	10	18	1.100E+02	1.719E-02	0.0000	2	1	9	19	10	18	6.500E+01	3.970E-01	0.0000	2
0	10	21	10	18	1.200E+02	1.937E-02	0.0000	2	1	9	19	10	18	7.000E+01	3.788E-01	0.0000	2
0	10	21	10	18	1.300E+02	1.832E-02	0.0000	2	1	9	19	10	18	7.500E+01	4.662E-01	0.0000	2
0	10	21	10	18	1.400E+02	2.168E-02	0.0000	2	1	9	19	10	18	8.000E+01	4.015E-01	0.0000	2
0	10	21	10	18	1.500E+02	1.754E-02	0.0000	2	1	9	19	10	18	8.500E+01	3.644E-01	0.0000	2
0	10	21	10	18	1.500E+02	1.860E-01	0.2420	3	1	9	19	10	18	9.000E+01	3.378E-01	0.0000	2
0	10	21	10	18	2.000E+02	2.360E-01	0.2680	3	1	9	19	10	18	9.500E+01	3.861E-01	0.0000	2
0	10	21	10	18	2.500E+02	2.260E-01	0.2590	3	1	9	19	10	18	1.000E+02	3.679E-01	0.0000	2
0	10	21	10	18	3.000E+02	3.540E-01	0.3250	3	1	9	19	10	18	1.100E+02	3.872E-01	0.0000	2
0	10	21	10	18	5.000E+02	4.400E-01	0.3830	3	1	9	19	10	18	1.200E+02	3.920E-01	0.0000	2
0	10	21	10	18	7.500E+02	5.200E-01	0.4430	3	1	9	19	10	18	1.300E+02	3.400E-01	0.0000	2
0	10	21	10	18	1.000E+03	4.960E-01	0.4380	3	1	9	19	10	18	1.400E+02	3.413E-01	0.0000	2
0	10	21	10	18	1.300E+03	4.440E-01	0.4160	3	1	9	19	10	18	1.500E+02	4.230E-01	0.0000	2
0	10	21	10	18	1.700E+03	5.270E-01	0.4550	3	1	9	19	10	18	1.500E+02	8.940E-01	0.5180	3
0	10	22	1	18	1.000E+02	2.450E+01	2.9400	3	1	9	19	10	18	2.000E+02	7.230E-01	0.4550	3
0	10	22	1	18	1.500E+02	2.180E+01	2.6600	3	1	9	19	10	18	2.500E+02	7.110E-01	0.4460	3
0	10	22	1	18	2.000E+02	2.030E+01	2.5200	3	1	9	19	10	18	3.000E+02	6.010E-01	0.4110	3
0	10	22	1	18	2.500E+02	1.970E+01	2.4600	3	1	9	19	10	18	5.000E+02	4.410E-01	0.3700	3
0	10	22	1	18	3.000E+02	1.980E+01	2.4700	3	1	9	19	10	18	7.500E+02	3.730E-01	0.3620	3
0	10	22	1	18	5.000E+02	1.980E+01	2.6100	3	1	9	19	10	18	1.000E+03	1.990E-01	0.2690	3
0	10	22	1	18	7.500E+02	1.910E+01	2.7200	3	1	9	19	10	18	1.300E+03	1.100E-01	0.2000	3
0	10	22	1	18	1.000E+03	1.770E+01	2.6500	3	1	9	19	10	18	1.700E+03	1.410E-01	0.2280	3

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	10	22	6	18	1.500E+02	3.250E-03	0.0325	3	1	10	20	9	18	2.400E+01	0.000E+00	0.0000	2
0	10	22	6	18	2.500E+02	3.070E-03	0.0307	3	1	10	20	9	18	2.600E+01	1.398E-02	0.0000	2
0	10	22	6	18	3.000E+02	9.270E-03	0.0535	3	1	10	20	9	18	2.800E+01	1.154E-01	0.0000	2
0	10	22	6	18	5.000E+02	1.030E-02	0.0597	3	1	10	20	9	18	3.000E+01	6.795E-01	0.0000	2
0	10	22	6	18	1.000E+03	1.980E-02	0.0887	3	1	10	20	9	18	3.500E+01	8.620E+00	0.0000	2
0	10	22	6	18	1.300E+03	1.600E-02	0.0802	3	1	10	20	9	18	4.000E+01	2.457E+01	0.0000	2
0	10	22	6	18	1.700E+03	2.020E-02	0.0903	3	1	10	20	9	18	4.500E+01	3.428E+01	0.0000	2
0	10	22	7	18	1.000E+02	4.910E-01	0.4170	3	1	10	20	9	18	5.000E+01	3.579E+01	0.0000	2
0	10	22	7	18	1.500E+02	5.370E-01	0.4180	3	1	10	20	9	18	5.500E+01	3.649E+01	0.0000	2
0	10	22	7	18	2.000E+02	5.200E-01	0.4040	3	1	10	20	9	18	6.000E+01	3.403E+01	0.0000	2
0	10	22	7	18	2.500E+02	5.800E-01	0.4220	3	1	10	20	9	18	6.500E+01	3.263E+01	0.0000	2
0	10	22	7	18	3.000E+02	5.780E-01	0.4220	3	1	10	20	9	18	7.000E+01	3.133E+01	0.0000	2
0	10	22	7	18	5.000E+02	7.750E-01	0.5170	3	1	10	20	9	18	7.500E+01	2.961E+01	0.0000	2
0	10	22	7	18	7.500E+02	9.710E-01	0.6140	3	1	10	20	9	18	8.000E+01	2.940E+01	0.0000	2
0	10	22	7	18	1.000E+03	9.800E-01	0.6240	3	1	10	20	9	18	8.500E+01	2.934E+01	0.0000	2
0	10	22	7	18	1.300E+03	1.050E+00	0.6490	3	1	10	20	9	18	9.000E+01	2.815E+01	0.0000	2
0	10	22	7	18	1.700E+03	8.480E-01	0.5850	3	1	10	20	9	18	9.500E+01	2.756E+01	0.0000	2
0	10	22	8	18	1.000E+02	8.730E+00	1.7600	3	1	10	20	9	18	1.000E+02	2.711E+01	0.0000	2
0	10	22	8	18	1.500E+02	7.080E+00	1.5200	3	1	10	20	9	18	1.100E+02	2.740E+01	0.0000	2
0	10	22	8	18	2.000E+02	6.420E+00	1.4200	3	1	10	20	9	18	1.200E+02	2.699E+01	0.0000	2
0	10	22	8	18	2.500E+02	6.110E+00	1.3700	3	1	10	20	9	18	1.300E+02	2.587E+01	0.0000	2
0	10	22	8	18	3.000E+02	5.950E+00	1.3600	3	1	10	20	9	18	1.400E+02	2.645E+01	0.0000	2
0	10	22	8	18	5.000E+02	6.500E+00	1.5000	3	1	10	20	9	18	1.500E+02	2.621E+01	0.0000	2
0	10	22	8	18	7.500E+02	6.190E+00	1.5500	3	1	10	20	9	18	1.500E+02	4.170E+01	3.5900	3
0	10	22	8	18	1.000E+03	5.810E+00	1.5200	3	1	10	20	9	18	2.000E+02	3.870E+01	3.3800	3
0	10	22	8	18	1.300E+03	5.210E+00	1.4400	3	1	10	20	9	18	2.500E+02	3.710E+01	3.2800	3
0	10	22	8	18	1.700E+03	5.140E+00	1.4400	3	1	10	20	9	18	3.000E+02	3.660E+01	3.2600	3
0	10	22	9	18	4.000E+01	0.000E+00	0.0000	2	1	10	20	9	18	5.000E+02	3.360E+01	3.3000	3
0	10	22	9	18	4.500E+01	6.109E-04	0.0000	2	1	10	20	9	18	7.500E+02	2.940E+01	3.2900	3
0	10	22	9	18	5.000E+01	1.059E-02	0.0000	2	1	10	20	9	18	1.000E+03	2.640E+01	3.1500	3
0	10	22	9	18	5.500E+01	1.475E-01	0.0000	2	1	10	20	9	18	1.300E+03	2.590E+01	3.1300	3
0	10	22	9	18	6.000E+01	7.270E-01	0.0000	2	1	10	20	9	18	1.700E+03	2.360E+01	3.0100	3
0	10	22	9	18	6.500E+01	1.576E+00	0.0000	2	1	10	20	10	18	3.000E+01	0.000E+00	0.0000	2
0	10	22	9	18	7.000E+01	2.505E+00	0.0000	2	1	10	20	10	18	3.500E+01	4.118E-02	0.0000	2
0	10	22	9	18	7.500E+01	3.138E+00	0.0000	2	1	10	20	10	18	4.000E+01	3.775E-01	0.0000	2
0	10	22	9	18	8.000E+01	3.461E+00	0.0000	2	1	10	20	10	18	4.500E+01	8.637E-01	0.0000	2
0	10	22	9	18	8.500E+01	3.742E+00	0.0000	2	1	10	20	10	18	5.000E+01	1.175E+00	0.0000	2
0	10	22	9	18	9.000E+01	3.735E+00	0.0000	2	1	10	20	10	18	5.500E+01	1.305E+00	0.0000	2
0	10	22	9	18	9.500E+01	3.673E+00	0.0000	2	1	10	20	10	18	6.000E+01	1.411E+00	0.0000	2
0	10	22	9	18	1.000E+02	3.505E+00	0.0000	2	1	10	20	10	18	6.500E+01	1.405E+00	0.0000	2
0	10	22	9	18	1.100E+02	3.437E+00	0.0000	2	1	10	20	10	18	7.000E+01	1.488E+00	0.0000	2
0	10	22	9	18	1.200E+02	3.351E+00	0.0000	2	1	10	20	10	18	7.500E+01	1.384E+00	0.0000	2
0	10	22	9	18	1.300E+02	3.215E+00	0.0000	2	1	10	20	10	18	8.000E+01	1.490E+00	0.0000	2
0	10	22	9	18	1.400E+02	3.280E+00	0.0000	2	1	10	20	10	18	8.500E+01	1.543E+00	0.0000	2
0	10	22	9	18	1.500E+02	3.256E+00	0.0000	2	1	10	20	10	18	9.000E+01	1.626E+00	0.0000	2
0	10	22	9	18	1.500E+02	1.420E+01	2.1500	3	1	10	20	10	18	9.500E+01	1.483E+00	0.0000	2
0	10	22	9	18	2.000E+02	1.330E+01	2.0500	3	1	10	20	10	18	1.000E+02	1.413E+00	0.0000	2
0	10	22	9	18	2.500E+02	1.300E+01	2.0000	3	1	10	20	10	18	1.100E+02	1.497E+00	0.0000	2
0	10	22	9	18	3.000E+02	1.330E+01	2.0200	3	1	10	20	10	18	1.200E+02	1.577E+00	0.0000	2
0	10	22	9	18	5.000E+02	1.250E+01	2.0700	3	1	10	20	10	18	1.300E+02	1.396E+00	0.0000	2
0	10	22	9	18	7.500E+02	1.190E+01	2.1500	3	1	10	20	10	18	1.400E+02	1.533E+00	0.0000	2
0	10	22	9	18	1.000E+03	1.090E+01	2.0800	3	1	10	20	10	18	1.500E+02	1.657E+00	0.0000	2
0	10	22	9	18	1.300E+03	1.030E+01	2.0300	3	1	10	20	10	18	1.500E+02	3.400E+00	1.0200	3
0	10	22	9	18	1.700E+03	9.810E+00	1.9900	3	1	10	20	10	18	2.000E+02	3.240E+00	0.9780	3
0	10	22	10	18	4.500E+01	0.000E+00	0.0000	2	1	10	20	10	18	2.500E+02	3.260E+00	0.9730	3
0	10	22	10	18	5.000E+01	3.749E-06	0.0000	2	1	10	20	10	18	3.000E+02	3.400E+00	0.9940	3
0	10	22	10	18	5.500E+01	4.097E-05	0.0000	2	1	10	20	10	18	5.000E+02	3.820E+00	1.1100	3
0	10	22	10	18	6.000E+01	4.446E-04	0.0000	2	1	10	20	10	18	7.500E+02	4.000E+00	1.2100	3
0	10	22	10	18	6.500E+01	1.316E-03	0.0000	2	1	10	20	10	18	1.000E+03	4.010E+00	1.2300	3

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	10	22	10	18	7.000E+01	3.246E-03	0.0000	2	1	10	20	10	18	1.300E+03	4.080E+00	1.2400	3
0	10	22	10	18	7.500E+01	4.748E-03	0.0000	2	1	10	20	10	18	1.700E+03	4.010E+00	1.2400	3
0	10	22	10	18	8.000E+01	6.429E-03	0.0000	2	1	10	20	11	18	5.000E+01	0.000E+00	0.0000	2
0	10	22	10	18	8.500E+01	7.253E-03	0.0000	2	1	10	20	11	18	5.500E+01	2.047E-06	0.0000	2
0	10	22	10	18	9.000E+01	7.349E-03	0.0000	2	1	10	20	11	18	6.000E+01	3.991E-05	0.0000	2
0	10	22	10	18	9.500E+01	6.750E-03	0.0000	2	1	10	20	11	18	6.500E+01	9.169E-05	0.0000	2
0	10	22	10	18	1.000E+02	7.007E-03	0.0000	2	1	10	20	11	18	7.000E+01	1.444E-04	0.0000	2
0	10	22	10	18	1.100E+02	6.304E-03	0.0000	2	1	10	20	11	18	7.500E+01	2.042E-04	0.0000	2
0	10	22	10	18	1.200E+02	6.041E-03	0.0000	2	1	10	20	11	18	8.000E+01	2.091E-04	0.0000	2
0	10	22	10	18	1.300E+02	5.783E-03	0.0000	2	1	10	20	11	18	8.500E+01	2.064E-04	0.0000	2
0	10	22	10	18	1.400E+02	5.783E-03	0.0000	2	1	10	20	11	18	9.000E+01	2.044E-04	0.0000	2
0	10	22	10	18	1.500E+02	9.042E-03	0.0000	2	1	10	20	11	18	9.500E+01	2.450E-04	0.0000	2
0	10	22	10	18	1.500E+02	9.760E-03	0.0563	3	1	10	20	11	18	1.000E+02	2.112E-04	0.0000	2
0	10	22	10	18	2.000E+02	2.190E-02	0.0829	3	1	10	20	11	18	1.100E+02	2.312E-04	0.0000	2
0	10	22	10	18	2.500E+02	1.840E-02	0.0751	3	1	10	20	11	18	1.200E+02	2.117E-04	0.0000	2
0	10	22	10	18	3.000E+02	6.180E-03	0.0437	3	1	10	20	11	18	1.300E+02	3.625E-03	0.0000	2
0	10	22	10	18	5.000E+02	4.820E-02	0.1290	3	1	10	20	11	18	1.400E+02	3.592E-03	0.0000	2
0	10	22	10	18	7.500E+02	5.830E-02	0.1500	3	1	10	20	11	18	1.500E+02	2.132E-04	0.0000	2
0	10	22	10	18	1.000E+03	4.760E-02	0.1370	3	1	10	20	11	18	1.500E+02	6.160E-03	0.0436	3
0	10	22	10	18	1.300E+03	7.210E-02	0.1700	3	1	10	20	11	18	2.000E+02	8.850E-03	0.0511	3
0	10	22	10	18	1.700E+03	6.060E-02	0.1560	3	1	10	20	11	18	2.500E+02	1.450E-02	0.0649	3
0	11	23	9	18	2.200E+01	0.000E+00	0.0000	2	1	10	20	11	18	3.000E+02	1.160E-02	0.0582	3
0	11	23	9	18	2.400E+01	1.737E-05	0.0000	2	1	10	20	11	18	5.000E+02	1.290E-02	0.0646	3
0	11	23	9	18	2.600E+01	1.086E-01	0.0000	2	1	10	20	11	18	7.500E+02	1.470E-02	0.0736	3
0	11	23	9	18	2.800E+01	1.621E+00	0.0000	2	1	10	20	11	18	1.000E+03	7.530E-03	0.0532	3
0	11	23	9	18	3.000E+01	6.348E+00	0.0000	2	1	10	20	11	18	1.300E+03	1.510E-02	0.0757	3
0	11	23	9	18	3.500E+01	2.481E+01	0.0000	2	1	10	21	9	18	3.000E+00	0.000E+00	0.0000	2
0	11	23	9	18	4.000E+01	3.509E+01	0.0000	2	1	10	21	9	18	4.000E+00	4.728E-02	0.0000	2
0	11	23	9	18	4.500E+01	3.318E+01	0.0000	2	1	10	21	9	18	5.000E+00	4.268E+00	0.0000	2
0	11	23	9	18	5.000E+01	2.866E+01	0.0000	2	1	10	21	9	18	6.000E+00	2.497E+01	0.0000	2
0	11	23	9	18	5.500E+01	2.383E+01	0.0000	2	1	10	21	9	18	7.000E+00	5.534E+01	0.0000	2
0	11	23	9	18	6.000E+01	2.100E+01	0.0000	2	1	10	21	9	18	8.000E+00	8.477E+01	0.0000	2
0	11	23	9	18	6.500E+01	1.860E+01	0.0000	2	1	10	21	9	18	9.000E+00	1.117E+02	0.0000	2
0	11	23	9	18	7.000E+01	1.723E+01	0.0000	2	1	10	21	9	18	1.000E+01	1.379E+02	0.0000	2
0	11	23	9	18	7.500E+01	1.670E+01	0.0000	2	1	10	21	9	18	1.100E+01	1.497E+02	0.0000	2
0	11	23	9	18	8.000E+01	1.605E+01	0.0000	2	1	10	21	9	18	1.200E+01	1.531E+02	0.0000	2
0	11	23	9	18	8.500E+01	1.563E+01	0.0000	2	1	10	21	9	18	1.300E+01	1.484E+02	0.0000	2
0	11	23	9	18	9.000E+01	1.556E+01	0.0000	2	1	10	21	9	18	1.400E+01	1.272E+02	0.0000	2
0	11	23	9	18	9.500E+01	1.521E+01	0.0000	2	1	10	21	9	18	1.500E+01	1.015E+02	0.0000	2
0	11	23	9	18	1.000E+02	1.549E+01	0.0000	2	1	10	21	9	18	1.600E+01	7.912E+01	0.0000	2
0	11	23	9	18	1.100E+02	1.519E+01	0.0000	2	1	10	21	9	18	1.700E+01	6.904E+01	0.0000	2
0	11	23	9	18	1.200E+02	1.518E+01	0.0000	2	1	10	21	9	18	1.800E+01	5.209E+01	0.0000	2
0	11	23	9	18	1.300E+02	1.515E+01	0.0000	2	1	10	21	9	18	1.900E+01	3.831E+01	0.0000	2
0	11	23	9	18	1.400E+02	1.511E+01	0.0000	2	1	10	21	9	18	2.000E+01	2.841E+01	0.0000	2
0	11	23	9	18	1.500E+02	1.479E+01	0.0000	2	1	10	21	9	18	2.200E+01	1.807E+01	0.0000	2
0	11	23	9	18	1.500E+02	1.800E+01	2.4600	3	1	10	21	9	18	2.400E+01	9.643E+00	0.0000	2
0	11	23	9	18	2.000E+02	1.680E+01	2.3400	3	1	10	21	9	18	2.600E+01	6.008E+00	0.0000	2
0	11	23	9	18	2.500E+02	1.650E+01	2.3000	3	1	10	21	9	18	2.800E+01	3.116E+00	0.0000	2
0	11	23	9	18	3.000E+02	1.580E+01	2.2500	3	1	10	21	9	18	3.000E+01	1.916E+00	0.0000	2
0	11	23	9	18	5.000E+02	1.540E+01	2.3300	3	1	10	21	9	18	3.500E+01	4.648E-01	0.0000	2
0	11	23	9	18	7.500E+02	1.480E+01	2.4400	3	1	10	21	9	18	4.000E+01	3.347E-01	0.0000	2
0	11	23	9	18	1.000E+03	1.400E+01	2.4100	3	1	10	21	9	18	4.500E+01	1.670E+00	0.0000	2
0	11	23	9	18	1.300E+03	1.310E+01	2.3300	3	1	10	21	9	18	5.000E+01	4.301E+00	0.0000	2
0	11	23	9	18	1.700E+03	1.200E+01	2.2400	3	1	10	21	9	18	5.500E+01	6.862E+00	0.0000	2
0	11	23	10	18	5.500E+01	0.000E+00	0.0000	2	1	10	21	9	18	6.000E+01	8.913E+00	0.0000	2
0	11	23	10	18	6.000E+01	9.617E-10	0.0000	2	1	10	21	9	18	6.500E+01	9.905E+00	0.0000	2
0	11	23	10	18	6.500E+01	4.883E-06	0.0000	2	1	10	21	9	18	7.000E+01	1.019E+01	0.0000	2
0	11	23	10	18	7.000E+01	2.327E-04	0.0000	2	1	10	21	9	18	7.500E+01	9.965E+00	0.0000	2
0	11	23	10	18	7.500E+01	5.791E-04	0.0000	2	1	10	21	9	18	8.000E+01	9.983E+00	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	11	23	10	18	8.000E+01	1.804E-03	0.0000	2	1	10	21	9	18	8.500E+01	9.262E+00	0.0000	2
0	11	23	10	18	8.500E+01	3.551E-03	0.0000	2	1	10	21	9	18	9.000E+01	9.190E+00	0.0000	2
0	11	23	10	18	9.000E+01	6.021E-03	0.0000	2	1	10	21	9	18	9.500E+01	8.925E+00	0.0000	2
0	11	23	10	18	9.500E+01	7.683E-03	0.0000	2	1	10	21	9	18	1.000E+02	8.869E+00	0.0000	2
0	11	23	10	18	1.000E+02	9.148E-03	0.0000	2	1	10	21	9	18	1.100E+02	8.993E+00	0.0000	2
0	11	23	10	18	1.100E+02	1.056E-02	0.0000	2	1	10	21	9	18	1.200E+02	8.883E+00	0.0000	2
0	11	23	10	18	1.200E+02	1.126E-02	0.0000	2	1	10	21	9	18	1.300E+02	8.380E+00	0.0000	2
0	11	23	10	18	1.300E+02	1.234E-02	0.0000	2	1	10	21	9	18	1.400E+02	8.627E+00	0.0000	2
0	11	23	10	18	1.400E+02	1.158E-02	0.0000	2	1	10	21	9	18	1.500E+02	8.413E+00	0.0000	2
0	11	23	10	18	1.500E+02	1.183E-02	0.0000	2	1	10	21	9	18	1.500E+02	2.600E+01	2.9000	3
0	11	23	10	18	1.500E+02	2.690E-02	0.0953	3	1	10	21	9	18	2.000E+02	2.360E+01	2.7000	3
0	11	23	10	18	2.000E+02	1.630E-02	0.0728	3	1	10	21	9	18	2.500E+02	2.220E+01	2.5900	3
0	11	23	10	18	2.500E+02	2.240E-02	0.0847	3	1	10	21	9	18	3.000E+02	2.210E+01	2.5800	3
0	11	23	10	18	3.000E+02	6.710E-02	0.1470	3	1	10	21	9	18	5.000E+02	2.060E+01	2.6200	3
0	11	23	10	18	5.000E+02	7.430E-02	0.1620	3	1	10	21	9	18	7.500E+02	1.900E+01	2.6900	3
0	11	23	10	18	7.500E+02	1.130E-01	0.2130	3	1	10	21	9	18	1.000E+03	1.790E+01	2.6400	3
0	11	23	10	18	1.000E+03	7.430E-02	0.1750	3	1	10	21	9	18	1.300E+03	1.670E+01	2.5600	3
0	11	23	10	18	1.300E+03	1.290E-01	0.2320	3	1	10	21	9	18	1.700E+03	1.570E+01	2.4900	3
0	11	23	10	18	1.700E+03	1.010E-01	0.2060	3	1	10	21	10	18	3.500E+01	0.000E+00	0.0000	2
0	11	23	11	18	7.500E+01	0.000E+00	0.0000	2	1	10	21	10	18	4.000E+01	1.815E-04	0.0000	2
0	11	23	11	18	8.000E+01	4.135E-16	0.0000	2	1	10	21	10	18	4.500E+01	6.267E-03	0.0000	2
0	11	23	11	18	8.500E+01	6.793E-11	0.0000	2	1	10	21	10	18	5.000E+01	3.491E-02	0.0000	2
0	11	23	11	18	9.000E+01	2.854E-08	0.0000	2	1	10	21	10	18	5.500E+01	8.223E-02	0.0000	2
0	11	23	11	18	9.500E+01	3.699E-08	0.0000	2	1	10	21	10	18	6.000E+01	1.554E-01	0.0000	2
0	11	23	11	18	1.000E+02	2.867E-07	0.0000	2	1	10	21	10	18	6.500E+01	1.591E-01	0.0000	2
0	11	23	11	18	1.100E+02	7.591E-07	0.0000	2	1	10	21	10	18	7.000E+01	1.778E-01	0.0000	2
0	11	23	11	18	1.200E+02	1.373E-06	0.0000	2	1	10	21	10	18	7.500E+01	1.874E-01	0.0000	2
0	11	23	11	18	1.300E+02	1.933E-06	0.0000	2	1	10	21	10	18	8.000E+01	1.944E-01	0.0000	2
0	11	23	11	18	1.400E+02	2.902E-06	0.0000	2	1	10	21	10	18	8.500E+01	2.128E-01	0.0000	2
0	11	23	11	18	1.500E+02	2.897E-06	0.0000	2	1	10	21	10	18	9.000E+01	2.118E-01	0.0000	2
0	11	23	11	18	1.700E+03	8.390E-03	0.0593	3	1	10	21	10	18	9.500E+01	2.080E-01	0.0000	2
0	12	24	9	18	3.500E+01	0.000E+00	0.0000	2	1	10	21	10	18	1.000E+02	1.979E-01	0.0000	2
0	12	24	9	18	4.000E+01	7.160E-03	0.0000	2	1	10	21	10	18	1.100E+02	1.956E-01	0.0000	2
0	12	24	9	18	4.500E+01	5.568E-01	0.0000	2	1	10	21	10	18	1.200E+02	2.070E-01	0.0000	2
0	12	24	9	18	5.000E+01	3.879E+00	0.0000	2	1	10	21	10	18	1.300E+02	1.902E-01	0.0000	2
0	12	24	9	18	5.500E+01	9.867E+00	0.0000	2	1	10	21	10	18	1.400E+02	2.254E-01	0.0000	2
0	12	24	9	18	6.000E+01	1.443E+01	0.0000	2	1	10	21	10	18	1.500E+02	1.934E-01	0.0000	2
0	12	24	9	18	6.500E+01	1.646E+01	0.0000	2	1	10	21	10	18	1.500E+02	2.920E-01	0.3080	3
0	12	24	9	18	7.000E+01	1.648E+01	0.0000	2	1	10	21	10	18	2.000E+02	3.420E-01	0.3250	3
0	12	24	9	18	7.500E+01	1.558E+01	0.0000	2	1	10	21	10	18	2.500E+02	3.400E-01	0.3200	3
0	12	24	9	18	8.000E+01	1.473E+01	0.0000	2	1	10	21	10	18	3.000E+02	3.440E-01	0.3220	3
0	12	24	9	18	8.500E+01	1.365E+01	0.0000	2	1	10	21	10	18	5.000E+02	4.600E-01	0.3920	3
0	12	24	9	18	9.000E+01	1.313E+01	0.0000	2	1	10	21	10	18	7.500E+02	5.240E-01	0.4460	3
0	12	24	9	18	9.500E+01	1.262E+01	0.0000	2	1	10	21	10	18	1.000E+03	5.820E-01	0.4750	3
0	12	24	9	18	1.000E+02	1.241E+01	0.0000	2	1	10	21	10	18	1.300E+03	4.780E-01	0.4330	3
0	12	24	9	18	1.100E+02	1.189E+01	0.0000	2	1	10	21	10	18	1.700E+03	5.100E-01	0.4490	3
0	12	24	9	18	1.200E+02	1.154E+01	0.0000	2	1	10	21	11	18	5.500E+01	0.000E+00	0.0000	2
0	12	24	9	18	1.300E+02	1.149E+01	0.0000	2	1	10	21	11	18	6.000E+01	1.173E-11	0.0000	2
0	12	24	9	18	1.400E+02	1.113E+01	0.0000	2	1	10	21	11	18	6.500E+01	3.106E-07	0.0000	2
0	12	24	9	18	1.500E+02	1.075E+01	0.0000	2	1	10	21	11	18	7.000E+01	4.850E-06	0.0000	2
0	12	24	9	18	1.500E+02	1.810E+01	2.5200	3	1	10	21	11	18	7.500E+01	1.366E-05	0.0000	2
0	12	24	9	18	2.000E+02	1.730E+01	2.4100	3	1	10	21	11	18	8.000E+01	2.302E-05	0.0000	2
0	12	24	9	18	2.500E+02	1.640E+01	2.3300	3	1	10	21	11	18	8.500E+01	3.312E-05	0.0000	2
0	12	24	9	18	3.000E+02	1.640E+01	2.3300	3	1	10	21	11	18	9.000E+01	3.927E-05	0.0000	2
0	12	24	9	18	5.000E+02	1.690E+01	2.4900	3	1	10	21	11	18	9.500E+01	4.742E-05	0.0000	2
0	12	24	9	18	7.500E+02	1.650E+01	2.6100	3	1	10	21	11	18	1.000E+02	4.493E-05	0.0000	2
0	12	24	9	18	1.000E+03	1.500E+01	2.5200	3	1	10	21	11	18	1.100E+02	4.998E-05	0.0000	2
0	12	24	9	18	1.300E+03	1.430E+01	2.4800	3	1	10	21	11	18	1.200E+02	5.872E-05	0.0000	2
0	12	24	9	18	1.700E+03	1.320E+01	2.3800	3	1	10	21	11	18	1.300E+02	6.601E-05	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	12	24	10	18	4.000E+01	0.000E+00	0.0000	2	1	10	21	11	18	1.400E+02	5.799E-05	0.0000	2
0	12	24	10	18	4.500E+01	6.071E-05	0.0000	2	1	10	21	11	18	1.500E+02	5.884E-05	0.0000	2
0	12	24	10	18	5.000E+01	1.572E-03	0.0000	2	1	10	21	11	18	2.500E+02	3.010E-03	0.0301	3
0	12	24	10	18	5.500E+01	1.073E-02	0.0000	2	1	10	21	11	18	3.000E+02	3.020E-03	0.0302	3
0	12	24	10	18	6.000E+01	2.967E-02	0.0000	2	1	10	22	9	18	1.400E+01	0.000E+00	0.0000	2
0	12	24	10	18	6.500E+01	4.375E-02	0.0000	2	1	10	22	9	18	1.500E+01	1.058E-02	0.0000	2
0	12	24	10	18	7.000E+01	5.210E-02	0.0000	2	1	10	22	9	18	1.600E+01	4.971E-01	0.0000	2
0	12	24	10	18	7.500E+01	5.534E-02	0.0000	2	1	10	22	9	18	1.700E+01	4.437E+00	0.0000	2
0	12	24	10	18	8.000E+01	5.570E-02	0.0000	2	1	10	22	9	18	1.800E+01	1.646E+01	0.0000	2
0	12	24	10	18	8.500E+01	5.407E-02	0.0000	2	1	10	22	9	18	1.900E+01	2.719E+01	0.0000	2
0	12	24	10	18	9.000E+01	5.605E-02	0.0000	2	1	10	22	9	18	2.000E+01	4.214E+01	0.0000	2
0	12	24	10	18	9.500E+01	5.297E-02	0.0000	2	1	10	22	9	18	2.200E+01	7.042E+01	0.0000	2
0	12	24	10	18	1.000E+02	5.400E-02	0.0000	2	1	10	22	9	18	2.400E+01	8.944E+01	0.0000	2
0	12	24	10	18	1.100E+02	5.769E-02	0.0000	2	1	10	22	9	18	2.600E+01	9.543E+01	0.0000	2
0	12	24	10	18	1.200E+02	5.920E-02	0.0000	2	1	10	22	9	18	2.800E+01	9.277E+01	0.0000	2
0	12	24	10	18	1.300E+02	6.534E-02	0.0000	2	1	10	22	9	18	3.000E+01	8.051E+01	0.0000	2
0	12	24	10	18	1.400E+02	6.442E-02	0.0000	2	1	10	22	9	18	3.500E+01	4.913E+01	0.0000	2
0	12	24	10	18	1.500E+02	6.721E-02	0.0000	2	1	10	22	9	18	4.000E+01	3.018E+01	0.0000	2
0	12	24	10	18	1.500E+02	6.320E-02	0.1490	3	1	10	22	9	18	4.500E+01	2.129E+01	0.0000	2
0	12	24	10	18	2.000E+02	8.440E-02	0.1690	3	1	10	22	9	18	5.000E+01	1.666E+01	0.0000	2
0	12	24	10	18	2.500E+02	1.090E-01	0.1900	3	1	10	22	9	18	5.500E+01	1.457E+01	0.0000	2
0	12	24	10	18	3.000E+02	8.980E-02	0.1730	3	1	10	22	9	18	6.000E+01	1.267E+01	0.0000	2
0	12	24	10	18	5.000E+02	1.990E-01	0.2700	3	1	10	22	9	18	6.500E+01	1.201E+01	0.0000	2
0	12	24	10	18	7.500E+02	2.070E-01	0.2920	3	1	10	22	9	18	7.000E+01	1.132E+01	0.0000	2
0	12	24	10	18	1.000E+03	1.950E-01	0.2870	3	1	10	22	9	18	7.500E+01	1.136E+01	0.0000	2
0	12	24	10	18	1.300E+03	2.100E-01	0.3000	3	1	10	22	9	18	8.000E+01	1.135E+01	0.0000	2
0	12	24	10	18	1.700E+03	1.680E-01	0.2700	3	1	10	22	9	18	8.500E+01	1.100E+01	0.0000	2
0	12	24	11	18	9.000E+01	0.000E+00	0.0000	2	1	10	22	9	18	9.000E+01	1.042E+01	0.0000	2
0	12	24	11	18	9.500E+01	3.151E-15	0.0000	2	1	10	22	9	18	9.500E+01	9.892E+00	0.0000	2
0	12	24	11	18	1.000E+02	4.051E-09	0.0000	2	1	10	22	9	18	1.000E+02	9.393E+00	0.0000	2
0	12	24	11	18	1.100E+02	1.952E-08	0.0000	2	1	10	22	9	18	1.100E+02	8.887E+00	0.0000	2
0	12	24	11	18	1.200E+02	3.386E-07	0.0000	2	1	10	22	9	18	1.200E+02	8.574E+00	0.0000	2
0	12	24	11	18	1.300E+02	2.337E-06	0.0000	2	1	10	22	9	18	1.300E+02	8.184E+00	0.0000	2
0	12	24	11	18	1.400E+02	2.178E-06	0.0000	2	1	10	22	9	18	1.400E+02	7.785E+00	0.0000	2
0	12	24	11	18	1.500E+02	3.447E-06	0.0000	2	1	10	22	9	18	1.500E+02	7.366E+00	0.0000	2
0	12	24	11	18	1.000E+03	4.230E-03	0.0423	3	1	10	22	9	18	1.500E+02	1.720E+01	2.4100	3
0	12	24	11	18	1.300E+03	4.280E-03	0.0428	3	1	10	22	9	18	2.000E+02	1.550E+01	2.2300	3
0	12	24	12	18	1.100E+02	0.000E+00	0.0000	2	1	10	22	9	18	2.500E+02	1.480E+01	2.1500	3
0	12	24	12	18	1.200E+02	2.407E-15	0.0000	2	1	10	22	9	18	3.000E+02	1.420E+01	2.1100	3
0	12	24	12	18	1.300E+02	6.046E-12	0.0000	2	1	10	22	9	18	5.000E+02	1.380E+01	2.1800	3
0	12	24	12	18	1.400E+02	1.769E-10	0.0000	2	1	10	22	9	18	7.500E+02	1.300E+01	2.2600	3
0	12	24	12	18	1.500E+02	4.648E-10	0.0000	2	1	10	22	9	18	1.000E+03	1.160E+01	2.1500	3
0	12	25	9	18	4.000E+01	0.000E+00	0.0000	2	1	10	22	9	18	1.300E+03	1.110E+01	2.1200	3
0	12	25	9	18	4.500E+01	1.008E-12	0.0000	2	1	10	22	9	18	1.700E+03	9.780E+00	2.0000	3
0	12	25	9	18	5.000E+01	1.505E-03	0.0000	2	1	10	22	10	18	4.500E+01	0.000E+00	0.0000	2
0	12	25	9	18	5.500E+01	1.019E-01	0.0000	2	1	10	22	10	18	5.000E+01	1.675E+09	0.0000	2
0	12	25	9	18	6.000E+01	8.281E-01	0.0000	2	1	10	22	10	18	5.500E+01	1.063E-04	0.0000	2
0	12	25	9	18	6.500E+01	2.582E+00	0.0000	2	1	10	22	10	18	6.000E+01	1.081E-03	0.0000	2
0	12	25	9	18	7.000E+01	4.798E+00	0.0000	2	1	10	22	10	18	6.500E+01	3.971E-03	0.0000	2
0	12	25	9	18	7.500E+01	6.501E+00	0.0000	2	1	10	22	10	18	7.000E+01	1.096E-02	0.0000	2
0	12	25	9	18	8.000E+01	7.589E+00	0.0000	2	1	10	22	10	18	7.500E+01	1.704E-02	0.0000	2
0	12	25	9	18	8.500E+01	7.712E+00	0.0000	2	1	10	22	10	18	8.000E+01	2.505E-02	0.0000	2
0	12	25	9	18	9.000E+01	7.713E+00	0.0000	2	1	10	22	10	18	8.500E+01	2.780E-02	0.0000	2
0	12	25	9	18	9.500E+01	7.414E+00	0.0000	2	1	10	22	10	18	9.000E+01	3.122E-02	0.0000	2
0	12	25	9	18	1.000E+02	7.220E+00	0.0000	2	1	10	22	10	18	9.500E+01	3.214E-02	0.0000	2
0	12	25	9	18	1.100E+02	6.867E+00	0.0000	2	1	10	22	10	18	1.000E+02	3.274E-02	0.0000	2
0	12	25	9	18	1.200E+02	6.703E+00	0.0000	2	1	10	22	10	18	1.100E+02	3.311E-02	0.0000	2
0	12	25	9	18	1.300E+02	6.804E+00	0.0000	2	1	10	22	10	18	1.200E+02	3.494E-02	0.0000	2
0	12	25	9	18	1.400E+02	6.572E+00	0.0000	2	1	10	22	10	18	1.300E+02	3.022E-02	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	12	25	9	18	1.500E+02	6.336E+00	0.0000	2	1	10	22	10	18	1.400E+02	3.257E-02	0.0000	2
0	12	25	9	18	1.500E+02	1.180E+01	2.0600	3	1	10	22	10	18	1.500E+02	3.550E-02	0.0000	2
0	12	25	9	18	2.000E+02	1.230E+01	2.0600	3	1	10	22	10	18	1.500E+02	4.410E-02	0.1220	3
0	12	25	9	18	2.500E+02	1.180E+01	2.0000	3	1	10	22	10	18	2.000E+02	2.240E-02	0.0848	3
0	12	25	9	18	3.000E+02	1.220E+01	2.0300	3	1	10	22	10	18	2.500E+02	4.400E-02	0.1180	3
0	12	25	9	18	5.000E+02	1.320E+01	2.2400	3	1	10	22	10	18	3.000E+02	5.020E-02	0.1250	3
0	12	25	9	18	7.500E+02	1.330E+01	2.3700	3	1	10	22	10	18	5.000E+02	4.150E-02	0.1200	3
0	12	25	9	18	1.000E+03	1.280E+01	2.3600	3	1	10	22	10	18	7.500E+02	7.800E-02	0.1740	3
0	12	25	9	18	1.300E+03	1.150E+01	2.2500	3	1	10	22	10	18	1.000E+03	8.740E-02	0.1860	3
0	12	25	9	18	1.700E+03	1.060E+01	2.1700	3	1	10	22	10	18	1.300E+03	8.450E-02	0.1840	3
0	12	25	10	18	4.500E+01	0.000E+00	0.0000	2	1	10	22	10	18	1.700E+03	4.890E-02	0.1410	3
0	12	25	10	18	5.000E+01	1.947E-10	0.0000	2	1	10	22	11	18	6.500E+01	0.000E+00	0.0000	2
0	12	25	10	18	5.500E+01	5.488E-06	0.0000	2	1	10	22	11	18	7.000E+01	2.168E-17	0.0000	2
0	12	25	10	18	6.000E+01	1.251E-04	0.0000	2	1	10	22	11	18	7.500E+01	4.461E-09	0.0000	2
0	12	25	10	18	6.500E+01	1.081E-03	0.0000	2	1	10	22	11	18	8.000E+01	6.539E-08	0.0000	2
0	12	25	10	18	7.000E+01	3.863E-03	0.0000	2	1	10	22	11	18	8.500E+01	4.578E-07	0.0000	2
0	12	25	10	18	7.500E+01	7.171E-03	0.0000	2	1	10	22	11	18	9.000E+01	1.303E-06	0.0000	2
0	12	25	10	18	8.000E+01	1.024E-02	0.0000	2	1	10	22	11	18	9.500E+01	1.981E-06	0.0000	2
0	12	25	10	18	8.500E+01	1.180E-02	0.0000	2	1	10	22	11	18	1.000E+02	4.624E-06	0.0000	2
0	12	25	10	18	9.000E+01	1.274E-02	0.0000	2	1	10	22	11	18	1.100E+02	5.119E-06	0.0000	2
0	12	25	10	18	9.500E+01	1.215E-02	0.0000	2	1	10	22	11	18	1.200E+02	6.557E-06	0.0000	2
0	12	25	10	18	1.000E+02	1.283E-02	0.0000	2	1	10	22	11	18	1.300E+02	8.025E-06	0.0000	2
0	12	25	10	18	1.100E+02	1.158E-02	0.0000	2	1	10	22	11	18	1.400E+02	8.192E-06	0.0000	2
0	12	25	10	18	1.200E+02	1.226E-02	0.0000	2	1	10	22	11	18	1.500E+02	1.040E-05	0.0000	2
0	12	25	10	18	1.300E+02	1.305E-02	0.0000	2	1	10	22	11	18	1.000E+03	3.970E-03	0.0397	3
0	12	25	10	18	1.400E+02	1.388E-02	0.0000	2	1	11	23	9	18	2.400E+01	0.000E+00	0.0000	2
0	12	25	10	18	1.500E+02	1.474E-02	0.0000	2	1	11	23	9	18	2.600E+01	1.121E-04	0.0000	2
0	12	25	10	18	1.500E+02	3.580E-03	0.0358	3	1	11	23	9	18	2.800E+01	9.364E-02	0.0000	2
0	12	25	10	18	2.000E+02	1.720E-02	0.0771	3	1	11	23	9	18	3.000E+01	1.467E+00	0.0000	2
0	12	25	10	18	2.500E+02	3.740E-02	0.1130	3	1	11	23	9	18	3.500E+01	2.022E+01	0.0000	2
0	12	25	10	18	3.000E+02	2.370E-02	0.0897	3	1	11	23	9	18	4.000E+01	4.526E+01	0.0000	2
0	12	25	10	18	5.000E+02	3.790E-02	0.1200	3	1	11	23	9	18	4.500E+01	5.428E+01	0.0000	2
0	12	25	10	18	7.500E+02	3.390E-02	0.1200	3	1	11	23	9	18	5.000E+01	5.099E+01	0.0000	2
0	12	25	10	18	1.000E+03	5.660E-02	0.1570	3	1	11	23	9	18	5.500E+01	4.394E+01	0.0000	2
0	12	25	10	18	1.300E+03	6.140E-02	0.1640	3	1	11	23	9	18	6.000E+01	3.820E+01	0.0000	2
0	12	25	10	18	1.700E+03	6.220E-02	0.1660	3	1	11	23	9	18	6.500E+01	3.314E+01	0.0000	2
0	12	25	11	18	9.500E+01	0.000E+00	0.0000	2	1	11	23	9	18	7.000E+01	3.020E+01	0.0000	2
0	12	25	11	18	1.000E+02	1.362E-24	0.0000	2	1	11	23	9	18	7.500E+01	2.802E+01	0.0000	2
0	12	25	11	18	1.100E+02	1.859E-12	0.0000	2	1	11	23	9	18	8.000E+01	2.662E+01	0.0000	2
0	12	25	11	18	1.200E+02	2.571E-09	0.0000	2	1	11	23	9	18	8.500E+01	2.507E+01	0.0000	2
0	12	25	11	18	1.300E+02	3.355E-08	0.0000	2	1	11	23	9	18	9.000E+01	2.478E+01	0.0000	2
0	12	25	11	18	1.400E+02	1.341E-07	0.0000	2	1	11	23	9	18	9.500E+01	2.445E+01	0.0000	2
0	12	25	11	18	1.500E+02	3.043E-07	0.0000	2	1	11	23	9	18	1.000E+02	2.417E+01	0.0000	2
0	12	25	12	18	1.100E+02	0.000E+00	0.0000	2	1	11	23	9	18	1.100E+02	2.358E+01	0.0000	2
0	12	25	12	18	1.200E+02	4.389E-29	0.0000	2	1	11	23	9	18	1.200E+02	2.309E+01	0.0000	2
0	12	25	12	18	1.300E+02	6.844E-17	0.0000	2	1	11	23	9	18	1.300E+02	2.267E+01	0.0000	2
0	12	25	12	18	1.400E+02	2.480E-13	0.0000	2	1	11	23	9	18	1.400E+02	2.211E+01	0.0000	2
0	12	25	12	18	1.500E+02	5.340E-12	0.0000	2	1	11	23	9	18	1.500E+02	2.127E+01	0.0000	2
0	12	26	9	18	5.500E+01	0.000E+00	0.0000	2	1	11	23	9	18	1.500E+02	1.990E+01	2.6200	3
0	12	26	9	18	6.000E+01	3.387E-04	0.0000	2	1	11	23	9	18	2.000E+02	1.830E+01	2.4500	3
0	12	26	9	18	6.500E+01	2.031E-03	0.0000	2	1	11	23	9	18	2.500E+02	1.690E+01	2.3400	3
0	12	26	9	18	7.000E+01	4.922E-02	0.0000	2	1	11	23	9	18	3.000E+02	1.650E+01	2.3100	3
0	12	26	9	18	7.500E+01	3.386E-01	0.0000	2	1	11	23	9	18	5.000E+02	1.680E+01	2.4500	3
0	12	26	9	18	8.000E+01	9.806E-01	0.0000	2	1	11	23	9	18	7.500E+02	1.570E+01	2.5200	3
0	12	26	9	18	8.500E+01	1.895E+00	0.0000	2	1	11	23	9	18	1.000E+03	1.500E+01	2.4900	3
0	12	26	9	18	9.000E+01	2.852E+00	0.0000	2	1	11	23	9	18	1.300E+03	1.350E+01	2.3800	3
0	12	26	9	18	9.500E+01	3.647E+00	0.0000	2	1	11	23	9	18	1.700E+03	1.220E+01	2.2700	3
0	12	26	9	18	1.000E+02	3.957E+00	0.0000	2	1	11	23	10	18	2.800E+01	0.000E+00	0.0000	2
0	12	26	9	18	1.100E+02	4.263E+00	0.0000	2	1	11	23	10	18	3.000E+01	2.891E-08	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	12	26	9	18	1.200E+02	4.194E+00	0.0000	2	1	11	23	10	18	3.500E+01	3.980E-03	0.0000	2
0	12	26	9	18	1.300E+02	4.225E+00	0.0000	2	1	11	23	10	18	4.000E+01	6.779E-02	0.0000	2
0	12	26	9	18	1.400E+02	4.211E+00	0.0000	2	1	11	23	10	18	4.500E+01	1.837E-01	0.0000	2
0	12	26	9	18	1.500E+02	4.172E+00	0.0000	2	1	11	23	10	18	5.000E+01	2.270E-01	0.0000	2
0	12	26	9	18	1.500E+02	6.640E+00	1.5600	3	1	11	23	10	18	5.500E+01	2.260E-01	0.0000	2
0	12	26	9	18	2.000E+02	8.010E+00	1.6800	3	1	11	23	10	18	6.000E+01	1.994E-01	0.0000	2
0	12	26	9	18	2.500E+02	8.160E+00	1.6900	3	1	11	23	10	18	6.500E+01	1.857E-01	0.0000	2
0	12	26	9	18	3.000E+02	8.320E+00	1.7100	3	1	11	23	10	18	7.000E+01	1.777E-01	0.0000	2
0	12	26	9	18	5.000E+02	1.040E+01	2.0100	3	1	11	23	10	18	7.500E+01	1.592E-01	0.0000	2
0	12	26	9	18	7.500E+02	1.130E+01	2.2200	3	1	11	23	10	18	8.000E+01	1.467E-01	0.0000	2
0	12	26	9	18	1.000E+03	1.040E+01	2.1500	3	1	11	23	10	18	8.500E+01	1.484E-01	0.0000	2
0	12	26	9	18	1.300E+03	1.020E+01	2.1300	3	1	11	23	10	18	9.000E+01	1.428E-01	0.0000	2
0	12	26	9	18	1.700E+03	8.560E+00	1.9700	3	1	11	23	10	18	9.500E+01	1.403E-01	0.0000	2
0	12	26	10	18	6.000E+01	0.000E+00	0.0000	2	1	11	23	10	18	1.000E+02	1.580E-01	0.0000	2
0	12	26	10	18	6.500E+01	1.198E-09	0.0000	2	1	11	23	10	18	1.000E+02	7.180E-02	0.1650	3
0	12	26	10	18	7.000E+01	1.635E-06	0.0000	2	1	11	23	10	18	1.100E+02	1.697E-01	0.0000	2
0	12	26	10	18	7.500E+01	6.517E-05	0.0000	2	1	11	23	10	18	1.200E+02	1.674E-01	0.0000	2
0	12	26	10	18	8.000E+01	3.545E-04	0.0000	2	1	11	23	10	18	1.300E+02	1.714E-01	0.0000	2
0	12	26	10	18	8.500E+01	1.057E-03	0.0000	2	1	11	23	10	18	1.400E+02	1.588E-01	0.0000	2
0	12	26	10	18	9.000E+01	2.202E-03	0.0000	2	1	11	23	10	18	1.500E+02	1.637E-01	0.0000	2
0	12	26	10	18	9.500E+01	3.206E-03	0.0000	2	1	11	23	10	18	1.500E+02	7.910E-02	0.1650	3
0	12	26	10	18	1.000E+02	3.921E-03	0.0000	2	1	11	23	10	18	2.000E+02	1.050E-01	0.1860	3
0	12	26	10	18	1.100E+02	4.914E-03	0.0000	2	1	11	23	10	18	2.500E+02	1.160E-01	0.1940	3
0	12	26	10	18	1.200E+02	4.447E-03	0.0000	2	1	11	23	10	18	3.000E+02	8.370E-02	0.1640	3
0	12	26	10	18	1.300E+02	4.525E-03	0.0000	2	1	11	23	10	18	5.000E+02	1.710E-01	0.2470	3
0	12	26	10	18	1.400E+02	4.732E-03	0.0000	2	1	11	23	10	18	7.500E+02	1.490E-01	0.2440	3
0	12	26	10	18	1.500E+02	5.587E-03	0.0000	2	1	11	23	10	18	1.000E+03	1.450E-01	0.2450	3
0	12	26	10	18	3.000E+02	7.000E-03	0.0495	3	1	11	23	10	18	1.300E+03	1.800E-01	0.2740	3
0	12	26	10	18	5.000E+02	7.750E-03	0.0548	3	1	11	23	10	18	1.700E+03	1.140E-01	0.2190	3
0	12	26	10	18	1.300E+03	4.470E-03	0.0447	3	1	11	23	11	18	8.000E+01	0.000E+00	0.0000	2
0	12	26	10	18	1.700E+03	1.810E-02	0.0904	3	1	11	23	11	18	8.500E+01	1.807E-11	0.0000	2
0	12	26	11	18	1.100E+02	0.000E+00	0.0000	2	1	11	23	11	18	9.000E+01	9.992E-09	0.0000	2
0	12	26	11	18	1.200E+02	2.760E-12	0.0000	2	1	11	23	11	18	9.500E+01	8.045E-08	0.0000	2
0	12	26	11	18	1.300E+02	7.599E-11	0.0000	2	1	11	23	11	18	1.000E+02	6.243E-07	0.0000	2
0	12	26	11	18	1.400E+02	2.056E-09	0.0000	2	1	11	23	11	18	1.100E+02	4.733E-06	0.0000	2
0	12	26	11	18	1.500E+02	3.255E-08	0.0000	2	1	11	23	11	18	1.200E+02	8.982E-06	0.0000	2
0	12	26	12	18	1.300E+02	0.000E+00	0.0000	2	1	11	23	11	18	1.300E+02	1.054E-05	0.0000	2
0	12	26	12	18	1.400E+02	9.470E-19	0.0000	2	1	11	23	11	18	1.400E+02	1.560E-05	0.0000	2
0	12	26	12	18	1.500E+02	3.072E-13	0.0000	2	1	11	23	11	18	1.500E+02	1.989E-05	0.0000	2
0	13	27	9	18	3.500E+01	0.000E+00	0.0000	2	1	11	23	11	18	1.000E+03	1.240E-02	0.0717	3
0	13	27	9	18	4.000E+01	1.826E-04	0.0000	2	1	11	23	12	18	9.500E+01	0.000E+00	0.0000	2
0	13	27	9	18	4.500E+01	1.093E-01	0.0000	2	1	11	23	12	18	1.000E+02	1.623E-23	0.0000	2
0	13	27	9	18	5.000E+01	9.738E-01	0.0000	2	1	11	23	12	18	1.100E+02	1.076E-12	0.0000	2
0	13	27	9	18	5.500E+01	2.343E+00	0.0000	2	1	11	23	12	18	1.200E+02	1.590E-10	0.0000	2
0	13	27	9	18	6.000E+01	3.385E+00	0.0000	2	1	11	23	12	18	1.300E+02	7.979E-10	0.0000	2
0	13	27	9	18	6.500E+01	3.444E+00	0.0000	2	1	11	23	12	18	1.400E+02	3.735E-09	0.0000	2
0	13	27	9	18	7.000E+01	3.065E+00	0.0000	2	1	11	23	12	18	1.500E+02	5.663E-09	0.0000	2
0	13	27	9	18	7.500E+01	2.558E+00	0.0000	2	1	12	24	1	18	1.000E+02	1.880E+01	2.6900	3
0	13	27	9	18	8.000E+01	2.181E+00	0.0000	2	1	12	24	1	18	1.500E+02	1.970E+01	2.6300	3
0	13	27	9	18	8.500E+01	2.044E+00	0.0000	2	1	12	24	1	18	2.000E+02	1.880E+01	2.5200	3
0	13	27	9	18	9.000E+01	1.964E+00	0.0000	2	1	12	24	1	18	2.500E+02	1.790E+01	2.4400	3
0	13	27	9	18	9.500E+01	2.026E+00	0.0000	2	1	12	24	1	18	3.000E+02	1.760E+01	2.4300	3
0	13	27	9	18	1.000E+02	2.223E+00	0.0000	2	1	12	24	1	18	5.000E+02	1.880E+01	2.6300	3
0	13	27	9	18	1.100E+02	2.896E+00	0.0000	2	1	12	24	1	18	7.500E+02	1.880E+01	2.7900	3
0	13	27	9	18	1.200E+02	3.301E+00	0.0000	2	1	12	24	1	18	1.000E+03	1.740E+01	2.7200	3
0	13	27	9	18	1.300E+02	3.499E+00	0.0000	2	1	12	24	1	18	1.300E+03	1.540E+01	2.5700	3
0	13	27	9	18	1.400E+02	3.661E+00	0.0000	2	1	12	24	7	18	1.000E+02	3.850E-03	0.0385	3
0	13	27	9	18	1.500E+02	3.652E+00	0.0000	2	1	12	24	7	18	1.500E+02	1.050E-02	0.0606	3
0	13	27	9	18	1.500E+02	5.370E+00	1.4200	3	1	12	24	7	18	2.000E+02	1.690E-02	0.0754	3

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	13	27	9	18	2.000E+02	6.820E+00	1.5700	3	1	12	24	7	18	2.500E+02	6.630E-03	0.0469	3
0	13	27	9	18	2.500E+02	7.880E+00	1.6800	3	1	12	24	7	18	3.000E+02	2.340E-02	0.0883	3
0	13	27	9	18	3.000E+02	8.210E+00	1.7200	3	1	12	24	7	18	5.000E+02	2.580E-02	0.0974	3
0	13	27	9	18	5.000E+02	1.070E+01	2.0600	3	1	12	24	7	18	7.500E+02	3.310E-02	0.1170	3
0	13	27	9	18	7.500E+02	1.230E+01	2.3500	3	1	12	24	7	18	1.000E+03	3.820E-02	0.1270	3
0	13	27	9	18	1.000E+03	1.200E+01	2.3500	3	1	12	24	7	18	1.300E+03	3.440E-02	0.1210	3
0	13	27	9	18	1.300E+03	1.090E+01	2.2400	3	1	12	24	7	18	1.700E+03	4.350E-02	0.1370	3
0	13	27	9	18	1.700E+03	9.840E+00	2.1500	3	1	12	24	8	18	1.000E+02	2.310E-01	0.2980	3
0	13	27	10	18	7.000E+01	0.000E+00	0.0000	2	1	12	24	8	18	1.500E+02	5.070E-01	0.4210	3
0	13	27	10	18	7.500E+01	2.659E-10	0.0000	2	1	12	24	8	18	2.000E+02	6.610E-01	0.4720	3
0	13	27	10	18	8.000E+01	6.152E-07	0.0000	2	1	12	24	8	18	2.500E+02	7.760E-01	0.5070	3
0	13	27	10	18	8.500E+01	1.146E-05	0.0000	2	1	12	24	8	18	3.000E+02	7.410E-01	0.4970	3
0	13	27	10	18	9.000E+01	3.407E-04	0.0000	2	1	12	24	8	18	5.000E+02	1.050E+00	0.6220	3
0	13	27	10	18	9.500E+01	3.723E-04	0.0000	2	1	12	24	8	18	7.500E+02	1.040E+00	0.6570	3
0	13	27	10	18	1.000E+02	8.481E-04	0.0000	2	1	12	24	8	18	1.000E+03	1.230E+00	0.7210	3
0	13	27	10	18	1.100E+02	2.536E-03	0.0000	2	1	12	24	8	18	1.300E+03	9.920E-01	0.6530	3
0	13	27	10	18	1.200E+02	4.549E-03	0.0000	2	1	12	24	8	18	1.700E+03	9.390E-01	0.6390	3
0	13	27	10	18	1.300E+02	5.192E-03	0.0000	2	1	12	24	9	18	3.500E+01	0.000E+00	0.0000	2
0	13	27	10	18	1.400E+02	5.829E-03	0.0000	2	1	12	24	9	18	4.000E+01	7.753E-03	0.0000	2
0	13	27	10	18	1.500E+02	6.103E-03	0.0000	2	1	12	24	9	18	4.500E+01	2.399E-01	0.0000	2
0	13	27	10	18	2.000E+02	3.630E-03	0.0363	3	1	12	24	9	18	5.000E+01	2.684E+00	0.0000	2
0	13	27	10	18	3.000E+02	1.080E-02	0.0625	3	1	12	24	9	18	5.500E+01	9.563E+00	0.0000	2
0	13	27	10	18	5.000E+02	4.360E-02	0.1310	3	1	12	24	9	18	6.000E+01	1.599E+01	0.0000	2
0	13	27	10	18	7.500E+02	1.790E-02	0.0897	3	1	12	24	9	18	6.500E+01	2.018E+01	0.0000	2
0	13	27	10	18	1.000E+03	2.290E-02	0.1020	3	1	12	24	9	18	7.000E+01	2.102E+01	0.0000	2
0	13	27	10	18	1.300E+03	3.230E-02	0.1220	3	1	12	24	9	18	7.500E+01	2.035E+01	0.0000	2
0	13	27	10	18	1.700E+03	1.880E-02	0.0938	3	1	12	24	9	18	8.000E+01	1.909E+01	0.0000	2
0	13	27	11	18	9.000E+01	0.000E+00	0.0000	2	1	12	24	9	18	8.500E+01	1.784E+01	0.0000	2
0	13	27	11	18	9.500E+01	1.836E-15	0.0000	2	1	12	24	9	18	9.000E+01	1.685E+01	0.0000	2
0	13	27	11	18	1.000E+02	2.984E-12	0.0000	2	1	12	24	9	18	9.500E+01	1.604E+01	0.0000	2
0	13	27	11	18	1.100E+02	3.704E-09	0.0000	2	1	12	24	9	18	1.000E+02	1.566E+01	0.0000	2
0	13	27	11	18	1.200E+02	3.995E-08	0.0000	2	1	12	24	9	18	1.000E+02	1.840E+01	2.6600	3
0	13	27	11	18	1.300E+02	1.705E-07	0.0000	2	1	12	24	9	18	1.100E+02	1.476E+01	0.0000	2
0	13	27	11	18	1.400E+02	2.744E-07	0.0000	2	1	12	24	9	18	1.200E+02	1.437E+01	0.0000	2
0	13	27	11	18	1.500E+02	4.517E-07	0.0000	2	1	12	24	9	18	1.300E+02	1.410E+01	0.0000	2
0	13	27	12	18	1.300E+02	0.000E+00	0.0000	2	1	12	24	9	18	1.400E+02	1.363E+01	0.0000	2
0	13	27	12	18	1.400E+02	1.327E-36	0.0000	2	1	12	24	9	18	1.500E+02	1.342E+01	0.0000	2
0	13	27	12	18	1.500E+02	2.049E-20	0.0000	2	1	12	24	9	18	1.500E+02	1.900E+01	2.5800	3
0	54	131	53	131	6.660E+00	0.000E+00	0.0000	1	1	12	24	9	18	2.000E+02	1.790E+01	2.4600	3
0	54	131	53	131	7.000E+00	4.130E+02	0.0000	1	1	12	24	9	18	2.500E+02	1.700E+01	2.3700	3
0	54	131	53	131	7.000E+00	3.576E-01	0.0000	2	1	12	24	9	18	3.000E+02	1.660E+01	2.3500	3
0	54	131	53	131	7.500E+00	8.250E+02	0.0000	1	1	12	24	9	18	5.000E+02	1.740E+01	2.5300	3
0	54	131	53	131	8.000E+00	1.290E+03	0.0000	1	1	12	24	9	18	7.500E+02	1.730E+01	2.6800	3
0	54	131	53	131	8.500E+00	1.580E+03	0.0000	1	1	12	24	9	18	1.000E+03	1.580E+01	2.5900	3
0	54	131	53	131	9.000E+00	1.750E+03	0.0000	1	1	12	24	9	18	1.300E+03	1.410E+01	2.4600	3
0	54	131	53	131	9.500E+00	1.840E+03	0.0000	1	1	12	24	9	18	1.700E+03	1.320E+01	2.4000	3
0	54	131	53	131	1.000E+01	1.890E+03	0.0000	1	1	12	24	10	18	4.000E+01	0.000E+00	0.0000	2
0	54	131	53	131	1.100E+01	1.940E+03	0.0000	1	1	12	24	10	18	4.500E+01	1.315E-06	0.0000	2
0	54	131	53	131	1.200E+01	1.950E+03	0.0000	1	1	12	24	10	18	5.000E+01	1.695E-03	0.0000	2
0	54	131	53	131	1.300E+01	1.950E+03	0.0000	1	1	12	24	10	18	5.500E+01	2.620E-02	0.0000	2
0	54	131	53	131	1.400E+01	1.950E+03	0.0000	1	1	12	24	10	18	6.000E+01	8.898E-02	0.0000	2
0	54	131	53	131	1.500E+01	1.950E+03	0.0000	1	1	12	24	10	18	6.500E+01	1.594E-01	0.0000	2
0	54	131	53	131	1.600E+01	1.960E+03	0.0000	1	1	12	24	10	18	7.000E+01	2.082E-01	0.0000	2
0	54	131	53	131	1.700E+01	1.870E+03	0.0000	1	1	12	24	10	18	7.500E+01	2.614E-01	0.0000	2
0	54	131	53	131	1.800E+01	1.470E+03	0.0000	1	1	12	24	10	18	8.000E+01	2.683E-01	0.0000	2
0	54	131	53	131	1.900E+01	9.660E+02	0.0000	1	1	12	24	10	18	8.500E+01	2.790E-01	0.0000	2
0	54	131	53	131	2.000E+01	5.650E+02	0.0000	1	1	12	24	10	18	9.000E+01	2.824E-01	0.0000	2
0	54	131	53	131	2.000E+01	3.190E+01	0.0000	2	1	12	24	10	18	9.500E+01	2.928E-01	0.0000	2
0	54	131	53	131	2.200E+01	3.198E+01	0.0000	2	1	12	24	10	18	1.000E+02	2.911E-01	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	54	131	53	131	2.400E+01	2.876E+01	0.0000	2	1	12	24	10	18	1.000E+02	2.120E-01	0.2850	3
0	54	131	53	131	2.600E+01	2.696E+01	0.0000	2	1	12	24	10	18	1.100E+02	3.080E-01	0.0000	2
0	54	131	53	131	2.800E+01	2.609E+01	0.0000	2	1	12	24	10	18	1.200E+02	3.110E-01	0.0000	2
0	54	131	53	131	3.000E+01	2.390E+01	0.0000	2	1	12	24	10	18	1.300E+02	3.211E-01	0.0000	2
0	54	131	53	131	3.500E+01	2.111E+01	0.0000	2	1	12	24	10	18	1.400E+02	3.325E-01	0.0000	2
0	54	131	53	131	4.000E+01	1.887E+01	0.0000	2	1	12	24	10	18	1.500E+02	3.420E-01	0.0000	2
0	54	131	53	131	4.500E+01	1.608E+01	0.0000	2	1	12	24	10	18	1.500E+02	1.820E-01	0.2520	3
0	54	131	53	131	5.000E+01	1.319E+01	0.0000	2	1	12	24	10	18	2.000E+02	1.720E-01	0.2410	3
0	54	131	53	131	5.500E+01	1.268E+01	0.0000	2	1	12	24	10	18	2.500E+02	1.860E-01	0.2480	3
0	54	131	53	131	6.000E+01	1.043E+01	0.0000	2	1	12	24	10	18	3.000E+02	2.500E-01	0.2890	3
0	54	131	53	131	6.500E+01	1.088E+01	0.0000	2	1	12	24	10	18	5.000E+02	2.870E-01	0.3250	3
0	54	131	53	131	7.000E+01	9.125E+00	0.0000	2	1	12	24	10	18	7.500E+02	3.390E-01	0.3750	3
0	54	131	53	131	7.500E+01	8.634E+00	0.0000	2	1	12	24	10	18	1.000E+03	2.930E-01	0.3520	3
0	54	131	53	131	8.000E+01	7.565E+00	0.0000	2	1	12	24	10	18	1.300E+03	2.580E-01	0.3330	3
0	54	131	53	131	8.500E+01	7.470E+00	0.0000	2	1	12	24	10	18	1.700E+03	3.170E-01	0.3710	3
0	54	131	53	131	9.000E+01	6.808E+00	0.0000	2	1	12	24	11	18	6.000E+01	0.000E+00	0.0000	2
0	54	131	53	131	9.500E+01	6.652E+00	0.0000	2	1	12	24	11	18	6.500E+01	1.177E-12	0.0000	2
0	54	131	53	131	1.000E+02	5.929E+00	0.0000	2	1	12	24	11	18	7.000E+01	4.783E-08	0.0000	2
0	54	131	53	131	1.100E+02	5.251E+00	0.0000	2	1	12	24	11	18	7.500E+01	4.873E-06	0.0000	2
0	54	131	53	131	1.200E+02	4.581E+00	0.0000	2	1	12	24	11	18	8.000E+01	1.039E-05	0.0000	2
0	54	131	53	131	1.300E+02	4.294E+00	0.0000	2	1	12	24	11	18	8.500E+01	1.327E-05	0.0000	2
0	54	131	53	131	1.400E+02	4.212E+00	0.0000	2	1	12	24	11	18	9.000E+01	2.451E-05	0.0000	2
0	54	131	53	131	1.500E+02	3.238E+00	0.0000	2	1	12	24	11	18	9.500E+01	3.195E-05	0.0000	2
0	54	131	53	131	1.500E+02	9.888E+00	0.0334	4	1	12	24	11	18	1.000E+02	4.286E-05	0.0000	2
0	54	131	53	131	2.000E+02	7.621E+00	0.0380	4	1	12	24	11	18	1.100E+02	3.971E-05	0.0000	2
0	54	131	53	131	3.000E+02	4.778E+00	0.0481	4	1	12	24	11	18	1.200E+02	5.721E-05	0.0000	2
0	54	131	53	131	5.000E+02	2.500E+00	0.0665	4	1	12	24	11	18	1.300E+02	6.616E-05	0.0000	2
0	54	131	53	131	7.500E+02	1.792E+00	0.0785	4	1	12	24	11	18	1.400E+02	6.493E-05	0.0000	2
0	54	131	53	131	1.000E+03	1.825E+00	0.0778	4	1	12	24	11	18	1.500E+02	8.439E-05	0.0000	2
0	54	131	53	131	1.300E+03	1.526E+00	0.0851	4	1	12	24	11	18	7.500E+02	4.140E-03	0.0414	3
0	54	131	53	131	1.700E+03	1.272E+00	0.0932	4	1	12	24	11	18	1.000E+03	4.240E-03	0.0424	3
0	54	132	52	131	1.065E+01	0.000E+00	0.0000	1	1	12	24	11	18	1.300E+03	8.590E-03	0.0607	3
0	54	132	52	131	1.085E+01	7.839E-06	0.0000	1	1	12	24	12	18	1.100E+02	0.000E+00	0.0000	2
0	54	132	52	131	1.450E+01	3.723E-04	0.0000	1	1	12	24	12	18	1.200E+02	2.386E-16	0.0000	2
0	54	132	52	131	1.500E+01	6.177E-04	0.0000	1	1	12	24	12	18	1.300E+02	2.774E-12	0.0000	2
0	54	132	52	131	1.550E+01	1.002E-03	0.0000	1	1	12	24	12	18	1.400E+02	7.443E-11	0.0000	2
0	54	132	52	131	1.600E+01	1.587E-03	0.0000	1	1	12	24	12	18	1.500E+02	7.588E-10	0.0000	2
0	54	132	52	131	1.650E+01	2.452E-03	0.0000	1	1	12	24	13	18	1.400E+02	0.000E+00	0.0000	2
0	54	132	52	131	1.700E+01	3.699E-03	0.0000	1	1	12	24	13	18	1.500E+02	1.953E-23	0.0000	2
0	54	132	52	131	1.750E+01	5.463E-03	0.0000	1	1	12	25	9	18	1.600E+01	0.000E+00	0.0000	2
0	54	132	52	131	1.800E+01	7.917E-03	0.0000	1	1	12	25	9	18	1.700E+01	8.397E-07	0.0000	2
0	54	132	52	131	1.850E+01	1.130E-02	0.0000	1	1	12	25	9	18	1.800E+01	2.295E-03	0.0000	2
0	54	132	52	131	1.900E+01	1.589E-02	0.0000	1	1	12	25	9	18	1.900E+01	5.845E-02	0.0000	2
0	54	132	52	131	1.950E+01	2.210E-02	0.0000	1	1	12	25	9	18	2.000E+01	3.007E-01	0.0000	2
0	54	132	52	131	2.000E+01	3.039E-02	0.0000	1	1	12	25	9	18	2.200E+01	2.908E+00	0.0000	2
0	54	132	52	131	3.000E+01	1.882E-02	0.0000	2	1	12	25	9	18	2.400E+01	7.607E+00	0.0000	2
0	54	132	52	131	3.500E+01	7.160E-02	0.0000	2	1	12	25	9	18	2.600E+01	1.183E+01	0.0000	2
0	54	132	52	131	4.000E+01	6.993E-02	0.0000	2	1	12	25	9	18	2.800E+01	1.521E+01	0.0000	2
0	54	132	52	131	4.500E+01	8.425E-02	0.0000	2	1	12	25	9	18	3.000E+01	1.427E+01	0.0000	2
0	54	132	52	131	5.000E+01	1.462E-01	0.0000	2	1	12	25	9	18	3.500E+01	8.091E+00	0.0000	2
0	54	132	52	131	5.500E+01	1.113E-01	0.0000	2	1	12	25	9	18	4.000E+01	3.274E+00	0.0000	2
0	54	132	52	131	6.000E+01	1.856E-01	0.0000	2	1	12	25	9	18	4.500E+01	1.164E+00	0.0000	2
0	54	132	52	131	6.500E+01	2.124E-01	0.0000	2	1	12	25	9	18	5.000E+01	3.833E-01	0.0000	2
0	54	132	52	131	7.000E+01	1.346E-01	0.0000	2	1	12	25	9	18	5.500E+01	1.622E-01	0.0000	2
0	54	132	52	131	7.500E+01	1.177E-01	0.0000	2	1	12	25	9	18	6.000E+01	5.264E-01	0.0000	2
0	54	132	52	131	8.000E+01	2.600E-01	0.0000	2	1	12	25	9	18	6.500E+01	1.972E+00	0.0000	2
0	54	132	52	131	8.500E+01	2.844E-01	0.0000	2	1	12	25	9	18	7.000E+01	4.373E+00	0.0000	2
0	54	132	52	131	9.000E+01	1.972E-01	0.0000	2	1	12	25	9	18	7.500E+01	6.934E+00	0.0000	2
0	54	132	52	131	9.500E+01	7.028E-02	0.0000	2	1	12	25	9	18	8.000E+01	8.743E+00	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	54	132	52	131	1.000E+02	2.343E-01	0.0000	2	1	12	25	9	18	8.500E+01	9.253E+00	0.0000	2
0	54	132	52	131	1.100E+02	3.919E-01	0.0000	2	1	12	25	9	18	9.000E+01	9.432E+00	0.0000	2
0	54	132	52	131	1.200E+02	2.136E-01	0.0000	2	1	12	25	9	18	9.500E+01	9.433E+00	0.0000	2
0	54	132	52	131	1.300E+02	3.426E-01	0.0000	2	1	12	25	9	18	1.000E+02	9.303E+00	0.0000	2
0	54	132	52	131	1.400E+02	2.480E-01	0.0000	2	1	12	25	9	18	1.000E+02	1.020E+01	2.0200	3
0	54	132	52	131	1.500E+02	2.590E-01	0.0000	2	1	12	25	9	18	1.100E+02	9.030E+00	0.0000	2
0	54	132	52	131	1.500E+02	2.187E+00	0.0712	4	1	12	25	9	18	1.200E+02	8.995E+00	0.0000	2
0	54	132	52	131	2.000E+02	1.432E+00	0.0880	4	1	12	25	9	18	1.300E+02	9.197E+00	0.0000	2
0	54	132	52	131	3.000E+02	9.324E-01	0.1091	4	1	12	25	9	18	1.400E+02	9.052E+00	0.0000	2
0	54	132	52	131	5.000E+02	5.550E-01	0.1414	4	1	12	25	9	18	1.500E+02	9.074E+00	0.0000	2
0	54	132	52	131	7.500E+02	5.439E-01	0.1428	4	1	12	25	9	18	1.500E+02	1.280E+01	2.1600	3
0	54	132	52	131	1.000E+03	3.996E-01	0.1667	4	1	12	25	9	18	2.000E+02	1.260E+01	2.1000	3
0	54	132	52	131	1.300E+03	1.110E-01	0.3162	4	1	12	25	9	18	2.500E+02	1.230E+01	2.0500	3
0	54	132	52	131	1.700E+03	8.880E-02	0.3535	4	1	12	25	9	18	3.000E+02	1.220E+01	2.0400	3
0	54	132	53	131	6.950E+00	0.000E+00	0.0000	1	1	12	25	9	18	5.000E+02	1.360E+01	2.2700	3
0	54	132	53	131	1.100E+01	1.750E-03	0.0000	1	1	12	25	9	18	7.500E+02	1.460E+01	2.4900	3
0	54	132	53	131	1.200E+01	4.650E-02	0.0000	1	1	12	25	9	18	1.000E+03	1.370E+01	2.4400	3
0	54	132	53	131	1.300E+01	1.050E-01	0.0000	1	1	12	25	9	18	1.300E+03	1.190E+01	2.2800	3
0	54	132	53	131	1.400E+01	2.030E-01	0.0000	1	1	12	25	9	18	1.700E+03	1.080E+01	2.1900	3
0	54	132	53	131	1.500E+01	3.900E-01	0.0000	1	1	12	25	10	18	4.500E+01	0.000E+00	0.0000	2
0	54	132	53	131	1.600E+01	7.420E-01	0.0000	1	1	12	25	10	18	5.000E+01	5.152E-13	0.0000	2
0	54	132	53	131	1.700E+01	1.390E+00	0.0000	1	1	12	25	10	18	5.500E+01	9.909E-07	0.0000	2
0	54	132	53	131	1.800E+01	2.530E+00	0.0000	1	1	12	25	10	18	6.000E+01	4.795E-04	0.0000	2
0	54	132	53	131	1.900E+01	4.390E+00	0.0000	1	1	12	25	10	18	6.500E+01	3.640E-03	0.0000	2
0	54	132	53	131	2.000E+01	7.060E+00	0.0000	1	1	12	25	10	18	7.000E+01	1.189E-02	0.0000	2
0	54	132	53	131	2.000E+01	1.488E+01	0.0000	2	1	12	25	10	18	7.500E+01	2.700E-02	0.0000	2
0	54	132	53	131	2.200E+01	2.710E+01	0.0000	2	1	12	25	10	18	8.000E+01	3.986E-02	0.0000	2
0	54	132	53	131	2.400E+01	3.849E+01	0.0000	2	1	12	25	10	18	8.500E+01	4.992E-02	0.0000	2
0	54	132	53	131	2.600E+01	5.173E+01	0.0000	2	1	12	25	10	18	9.000E+01	5.683E-02	0.0000	2
0	54	132	53	131	2.800E+01	6.330E+01	0.0000	2	1	12	25	10	18	9.500E+01	6.107E-02	0.0000	2
0	54	132	53	131	3.000E+01	6.671E+01	0.0000	2	1	12	25	10	18	1.000E+02	6.515E-02	0.0000	2
0	54	132	53	131	3.500E+01	7.323E+01	0.0000	2	1	12	25	10	18	1.000E+02	1.600E-02	0.0800	3
0	54	132	53	131	4.000E+01	7.062E+01	0.0000	2	1	12	25	10	18	1.100E+02	6.837E-02	0.0000	2
0	54	132	53	131	4.500E+01	6.801E+01	0.0000	2	1	12	25	10	18	1.200E+02	7.491E-02	0.0000	2
0	54	132	53	131	5.000E+01	6.769E+01	0.0000	2	1	12	25	10	18	1.300E+02	7.774E-02	0.0000	2
0	54	132	53	131	5.500E+01	6.647E+01	0.0000	2	1	12	25	10	18	1.400E+02	8.087E-02	0.0000	2
0	54	132	53	131	6.000E+01	6.304E+01	0.0000	2	1	12	25	10	18	1.500E+02	8.238E-02	0.0000	2
0	54	132	53	131	6.500E+01	6.094E+01	0.0000	2	1	12	25	10	18	1.500E+02	2.910E-02	0.1030	3
0	54	132	53	131	7.000E+01	6.027E+01	0.0000	2	1	12	25	10	18	2.000E+02	1.390E-02	0.0697	3
0	54	132	53	131	7.500E+01	5.864E+01	0.0000	2	1	12	25	10	18	2.500E+02	5.150E-02	0.1330	3
0	54	132	53	131	8.000E+01	5.597E+01	0.0000	2	1	12	25	10	18	3.000E+02	4.110E-02	0.1190	3
0	54	132	53	131	8.500E+01	5.702E+01	0.0000	2	1	12	25	10	18	5.000E+02	5.290E-02	0.1410	3
0	54	132	53	131	9.000E+01	5.536E+01	0.0000	2	1	12	25	10	18	7.500E+02	7.200E-02	0.1750	3
0	54	132	53	131	9.500E+01	5.588E+01	0.0000	2	1	12	25	10	18	1.000E+03	4.800E-02	0.1450	3
0	54	132	53	131	1.000E+02	5.349E+01	0.0000	2	1	12	25	10	18	1.300E+03	8.770E-02	0.1960	3
0	54	132	53	131	1.100E+02	5.457E+01	0.0000	2	1	12	25	10	18	1.700E+03	5.330E-02	0.1540	3
0	54	132	53	131	1.200E+02	5.291E+01	0.0000	2	1	12	25	11	18	7.000E+01	0.000E+00	0.0000	2
0	54	132	53	131	1.300E+02	5.237E+01	0.0000	2	1	12	25	11	18	7.500E+01	3.764E-11	0.0000	2
0	54	132	53	131	1.400E+02	5.077E+01	0.0000	2	1	12	25	11	18	8.000E+01	9.998E-09	0.0000	2
0	54	132	53	131	1.500E+02	4.896E+01	0.0000	2	1	12	25	11	18	8.500E+01	1.413E-07	0.0000	2
0	54	132	53	131	1.500E+02	7.386E+01	0.0121	4	1	12	25	11	18	9.000E+01	9.092E-07	0.0000	2
0	54	132	53	131	2.000E+02	6.809E+01	0.0126	4	1	12	25	11	18	9.500E+01	1.942E-06	0.0000	2
0	54	132	53	131	3.000E+02	6.344E+01	0.0130	4	1	12	25	11	18	1.000E+02	3.399E-06	0.0000	2
0	54	132	53	131	5.000E+02	5.260E+01	0.0144	4	1	12	25	11	18	1.100E+02	8.535E-06	0.0000	2
0	54	132	53	131	7.500E+02	4.841E+01	0.0150	4	1	12	25	11	18	1.200E+02	1.089E-05	0.0000	2
0	54	132	53	131	1.000E+03	4.730E+01	0.0152	4	1	12	25	11	18	1.300E+02	1.240E-05	0.0000	2
0	54	132	53	131	1.300E+03	4.378E+01	0.0158	4	1	12	25	11	18	1.400E+02	1.314E-05	0.0000	2
0	54	132	53	131	1.700E+03	4.242E+01	0.0160	4	1	12	25	11	18	1.500E+02	1.316E-05	0.0000	2
0	54	132	54	131	1.500E+02	8.106E+01	0.0115	4	1	12	25	11	18	7.500E+02	4.240E-03	0.0424	3

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	54	132	54	131	2.000E+02	7.508E+01	0.0120	4	1	12	25	11	18	1.700E+03	8.880E-03	0.0628	3
0	54	132	54	131	3.000E+02	7.042E+01	0.0124	4	1	12	25	12	18	1.100E+02	0.000E+00	0.0000	2
0	54	132	54	131	5.000E+02	6.946E+01	0.0124	4	1	12	25	12	18	1.200E+02	1.268E-28	0.0000	2
0	54	132	54	131	7.500E+02	7.521E+01	0.0119	4	1	12	25	12	18	1.300E+02	6.915E-17	0.0000	2
0	54	132	54	131	1.000E+03	7.585E+01	0.0119	4	1	12	25	12	18	1.400E+02	2.160E-13	0.0000	2
0	54	132	54	131	1.300E+03	7.870E+01	0.0117	4	1	12	25	12	18	1.500E+02	1.944E-11	0.0000	2
0	54	132	54	131	1.700E+03	7.360E+01	0.0121	4	1	12	26	9	18	2.800E+01	0.000E+00	0.0000	2
0	54	132	55	131	2.000E+02	4.440E-02	0.5000	4	1	12	26	9	18	3.000E+01	9.792E-05	0.0000	2
0	54	132	55	131	3.000E+02	2.331E-01	0.2182	4	1	12	26	9	18	3.500E+01	6.470E-01	0.0000	2
0	54	132	55	131	5.000E+02	5.994E-01	0.1361	4	1	12	26	9	18	4.000E+01	4.862E+00	0.0000	2
0	54	132	55	131	7.500E+02	7.992E-01	0.1178	4	1	12	26	9	18	4.500E+01	8.133E+00	0.0000	2
0	54	132	55	131	1.000E+03	8.325E-01	0.1154	4	1	12	26	9	18	5.000E+01	7.828E+00	0.0000	2
0	54	132	55	131	1.300E+03	4.085E+00	0.0521	4	1	12	26	9	18	5.500E+01	5.800E+00	0.0000	2
0	54	132	55	131	1.700E+03	4.917E+00	0.0475	4	1	12	26	9	18	6.000E+01	4.123E+00	0.0000	2
0	54	132	56	131	1.700E+03	2.220E-02	0.7071	4	1	12	26	9	18	6.500E+01	3.031E+00	0.0000	2
0	54	134	50	131	5.000E+01	0.000E+00	0.0000	2	1	12	26	9	18	7.000E+01	2.332E+00	0.0000	2
0	54	134	50	131	5.500E+01	6.173E-16	0.0000	2	1	12	26	9	18	7.500E+01	1.995E+00	0.0000	2
0	54	134	50	131	6.000E+01	1.148E-12	0.0000	2	1	12	26	9	18	8.000E+01	2.152E+00	0.0000	2
0	54	134	50	131	6.500E+01	4.280E-11	0.0000	2	1	12	26	9	18	8.500E+01	2.671E+00	0.0000	2
0	54	134	50	131	7.000E+01	5.876E-10	0.0000	2	1	12	26	9	18	9.000E+01	3.475E+00	0.0000	2
0	54	134	50	131	7.500E+01	3.680E-08	0.0000	2	1	12	26	9	18	9.500E+01	4.467E+00	0.0000	2
0	54	134	50	131	8.000E+01	3.568E-08	0.0000	2	1	12	26	9	18	1.000E+02	5.094E+00	0.0000	2
0	54	134	50	131	8.500E+01	2.068E-09	0.0000	2	1	12	26	9	18	1.000E+02	4.560E+00	1.3700	3
0	54	134	50	131	9.000E+01	8.076E-08	0.0000	2	1	12	26	9	18	1.100E+02	5.722E+00	0.0000	2
0	54	134	50	131	9.500E+01	1.100E-07	0.0000	2	1	12	26	9	18	1.200E+02	5.676E+00	0.0000	2
0	54	134	50	131	1.000E+02	6.796E-08	0.0000	2	1	12	26	9	18	1.300E+02	5.838E+00	0.0000	2
0	54	134	50	131	1.100E+02	1.248E-07	0.0000	2	1	12	26	9	18	1.400E+02	5.967E+00	0.0000	2
0	54	134	50	131	1.200E+02	2.461E-08	0.0000	2	1	12	26	9	18	1.500E+02	5.608E+00	0.0000	2
0	54	134	50	131	1.300E+02	1.588E-07	0.0000	2	1	12	26	9	18	1.500E+02	8.100E+00	1.7500	3
0	54	134	50	131	1.400E+02	5.997E-08	0.0000	2	1	12	26	9	18	2.000E+02	8.630E+00	1.7600	3
0	54	134	50	131	1.500E+02	7.763E-08	0.0000	2	1	12	26	9	18	2.500E+02	8.740E+00	1.7600	3
0	54	134	51	131	4.000E+01	0.000E+00	0.0000	2	1	12	26	9	18	3.000E+02	8.870E+00	1.7800	3
0	54	134	51	131	4.500E+01	3.912E-10	0.0000	2	1	12	26	9	18	5.000E+02	1.100E+01	2.0700	3
0	54	134	51	131	5.000E+01	1.909E-07	0.0000	2	1	12	26	9	18	7.500E+02	1.210E+01	2.2900	3
0	54	134	51	131	5.500E+01	5.782E-06	0.0000	2	1	12	26	9	18	1.000E+03	1.090E+01	2.2100	3
0	54	134	51	131	6.000E+01	6.480E-05	0.0000	2	1	12	26	9	18	1.300E+03	9.900E+00	2.1100	3
0	54	134	51	131	6.500E+01	1.479E-04	0.0000	2	1	12	26	9	18	1.700E+03	9.370E+00	2.0700	3
0	54	134	51	131	7.000E+01	2.868E-04	0.0000	2	1	12	26	10	18	6.000E+01	0.000E+00	0.0000	2
0	54	134	51	131	7.500E+01	1.516E-02	0.0000	2	1	12	26	10	18	6.500E+01	2.727E-10	0.0000	2
0	54	134	51	131	8.000E+01	1.539E-02	0.0000	2	1	12	26	10	18	7.000E+01	1.286E-06	0.0000	2
0	54	134	51	131	8.500E+01	5.556E-04	0.0000	2	1	12	26	10	18	7.500E+01	5.164E-05	0.0000	2
0	54	134	51	131	9.000E+01	1.519E-02	0.0000	2	1	12	26	10	18	8.000E+01	4.516E-04	0.0000	2
0	54	134	51	131	9.500E+01	4.004E-02	0.0000	2	1	12	26	10	18	8.500E+01	1.632E-03	0.0000	2
0	54	134	51	131	1.000E+02	7.632E-04	0.0000	2	1	12	26	10	18	9.000E+01	4.125E-03	0.0000	2
0	54	134	51	131	1.100E+02	2.330E-02	0.0000	2	1	12	26	10	18	9.500E+01	6.787E-03	0.0000	2
0	54	134	51	131	1.200E+02	8.285E-04	0.0000	2	1	12	26	10	18	1.000E+02	1.065E-02	0.0000	2
0	54	134	51	131	1.300E+02	1.418E-02	0.0000	2	1	12	26	10	18	1.100E+02	1.408E-02	0.0000	2
0	54	134	51	131	1.400E+02	3.386E-02	0.0000	2	1	12	26	10	18	1.200E+02	1.447E-02	0.0000	2
0	54	134	51	131	1.500E+02	2.649E-02	0.0000	2	1	12	26	10	18	1.300E+02	1.411E-02	0.0000	2
0	54	134	51	131	1.500E+02	1.900E-01	0.2425	4	1	12	26	10	18	1.400E+02	1.652E-02	0.0000	2
0	54	134	51	131	2.000E+02	2.012E-01	0.2357	4	1	12	26	10	18	1.500E+02	1.854E-02	0.0000	2
0	54	134	51	131	3.000E+02	1.453E-01	0.2773	4	1	12	26	10	18	3.000E+02	3.550E-03	0.0355	3
0	54	134	51	131	5.000E+02	1.006E-01	0.3333	4	1	12	26	10	18	5.000E+02	7.780E-03	0.0550	3
0	54	134	51	131	7.500E+02	6.707E-02	0.4082	4	1	12	26	10	18	7.500E+02	8.700E-03	0.0615	3
0	54	134	51	131	1.000E+03	7.825E-02	0.3780	4	1	12	26	10	18	1.000E+03	2.230E-02	0.0998	3
0	54	134	51	131	1.300E+03	2.571E-01	0.2085	4	1	12	26	10	18	1.300E+03	2.700E-02	0.1100	3
0	54	134	51	131	1.700E+03	1.341E-01	0.2887	4	1	12	26	10	18	1.700E+03	2.280E-02	0.1020	3
0	54	134	52	131	8.000E+00	0.000E+00	0.0000	1	1	12	26	11	18	8.000E+01	0.000E+00	0.0000	2
0	54	134	52	131	8.500E+00	1.240E-02	0.0000	1	1	12	26	11	18	8.500E+01	9.250E-17	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	54	134	52	131	9.000E+00	1.544E-02	0.0000	1	1	12	26	11	18	9.000E+01	3.196E-11	0.0000	2
0	54	134	52	131	9.500E+00	1.880E-02	0.0000	1	1	12	26	11	18	9.500E+01	2.699E-09	0.0000	2
0	54	134	52	131	1.000E+01	2.239E-02	0.0000	1	1	12	26	11	18	1.000E+02	1.886E-08	0.0000	2
0	54	134	52	131	1.100E+01	2.980E-02	0.0000	1	1	12	26	11	18	1.100E+02	2.407E-07	0.0000	2
0	54	134	52	131	1.200E+01	3.750E-02	0.0000	1	1	12	26	11	18	1.200E+02	7.394E-07	0.0000	2
0	54	134	52	131	1.300E+01	4.490E-02	0.0000	1	1	12	26	11	18	1.300E+02	1.297E-06	0.0000	2
0	54	134	52	131	1.400E+01	5.180E-02	0.0000	1	1	12	26	11	18	1.400E+02	1.516E-06	0.0000	2
0	54	134	52	131	1.500E+01	5.750E-02	0.0000	1	1	12	26	11	18	1.500E+02	1.619E-06	0.0000	2
0	54	134	52	131	1.600E+01	6.140E-02	0.0000	1	1	12	26	12	18	1.300E+02	0.000E+00	0.0000	2
0	54	134	52	131	1.700E+01	6.330E-02	0.0000	1	1	12	26	12	18	1.400E+02	4.043E-18	0.0000	2
0	54	134	52	131	1.800E+01	6.350E-02	0.0000	1	1	12	26	12	18	1.500E+02	2.321E-15	0.0000	2
0	54	134	52	131	1.900E+01	6.280E-02	0.0000	1	1	13	27	9	18	3.500E+01	0.000E+00	0.0000	2
0	54	134	52	131	2.000E+01	6.190E-02	0.0000	1	1	13	27	9	18	4.000E+01	9.036E-08	0.0000	2
0	54	134	52	131	2.200E+01	2.341E-03	0.0000	2	1	13	27	9	18	4.500E+01	1.617E-02	0.0000	2
0	54	134	52	131	2.400E+01	6.190E-04	0.0000	2	1	13	27	9	18	5.000E+01	6.607E-01	0.0000	2
0	54	134	52	131	2.600E+01	1.602E-04	0.0000	2	1	13	27	9	18	5.500E+01	3.070E+00	0.0000	2
0	54	134	52	131	2.800E+01	4.173E-05	0.0000	2	1	13	27	9	18	6.000E+01	6.303E+00	0.0000	2
0	54	134	52	131	3.000E+01	1.099E-05	0.0000	2	1	13	27	9	18	6.500E+01	7.970E+00	0.0000	2
0	54	134	52	131	3.500E+01	6.668E-07	0.0000	2	1	13	27	9	18	7.000E+01	7.844E+00	0.0000	2
0	54	134	52	131	4.000E+01	3.865E-04	0.0000	2	1	13	27	9	18	7.500E+01	6.837E+00	0.0000	2
0	54	134	52	131	4.500E+01	9.968E-03	0.0000	2	1	13	27	9	18	8.000E+01	5.769E+00	0.0000	2
0	54	134	52	131	5.000E+01	1.410E-01	0.0000	2	1	13	27	9	18	8.500E+01	5.166E+00	0.0000	2
0	54	134	52	131	5.500E+01	4.058E-01	0.0000	2	1	13	27	9	18	9.000E+01	4.631E+00	0.0000	2
0	54	134	52	131	6.000E+01	7.293E-01	0.0000	2	1	13	27	9	18	9.500E+01	4.166E+00	0.0000	2
0	54	134	52	131	6.500E+01	1.110E+00	0.0000	2	1	13	27	9	18	1.000E+02	4.175E+00	0.0000	2
0	54	134	52	131	7.000E+01	1.518E+00	0.0000	2	1	13	27	9	18	1.100E+02	4.746E+00	0.0000	2
0	54	134	52	131	7.500E+01	1.662E+00	0.0000	2	1	13	27	9	18	1.200E+02	5.234E+00	0.0000	2
0	54	134	52	131	8.000E+01	2.207E+00	0.0000	2	1	13	27	9	18	1.300E+02	5.609E+00	0.0000	2
0	54	134	52	131	8.500E+01	1.902E+00	0.0000	2	1	13	27	9	18	1.400E+02	5.588E+00	0.0000	2
0	54	134	52	131	9.000E+01	2.291E+00	0.0000	2	1	13	27	9	18	1.500E+02	5.564E+00	0.0000	2
0	54	134	52	131	9.500E+01	2.605E+00	0.0000	2	1	13	27	9	18	1.500E+02	5.990E+00	1.5200	3
0	54	134	52	131	1.000E+02	2.485E+00	0.0000	2	1	13	27	9	18	1.600E+02	6.420E+00	2.0200	3
0	54	134	52	131	1.100E+02	2.510E+00	0.0000	2	1	13	27	9	18	1.800E+02	7.100E+00	2.1100	3
0	54	134	52	131	1.200E+02	3.093E+00	0.0000	2	1	13	27	9	18	2.000E+02	7.280E+00	1.6400	3
0	54	134	52	131	1.300E+02	3.076E+00	0.0000	2	1	13	27	9	18	2.000E+02	7.630E+00	2.1600	3
0	54	134	52	131	1.400E+02	3.076E+00	0.0000	2	1	13	27	9	18	2.500E+02	8.210E+00	1.7300	3
0	54	134	52	131	1.500E+02	3.533E+00	0.0000	2	1	13	27	9	18	3.000E+02	8.530E+00	1.7600	3
0	54	134	52	131	1.500E+02	6.215E+00	0.0424	4	1	13	27	9	18	3.000E+02	8.600E+00	1.7600	3
0	54	134	52	131	2.000E+02	5.589E+00	0.0447	4	1	13	27	9	18	4.000E+02	9.830E+00	1.9300	3
0	54	134	52	131	3.000E+02	4.628E+00	0.0491	4	1	13	27	9	18	5.000E+02	1.130E+01	2.1200	3
0	54	134	52	131	5.000E+02	3.767E+00	0.0544	4	1	13	27	9	18	5.000E+02	1.150E+01	2.1500	3
0	54	134	52	131	7.500E+02	3.264E+00	0.0585	4	1	13	27	9	18	6.000E+02	1.270E+01	2.3300	3
0	54	134	52	131	1.000E+03	2.750E+00	0.0637	4	1	13	27	9	18	7.500E+02	1.300E+01	2.4100	3
0	54	134	52	131	1.300E+03	2.157E+00	0.0719	4	1	13	27	9	18	8.000E+02	1.350E+01	2.4700	3
0	54	134	52	131	1.700E+03	2.482E+00	0.0671	4	1	13	27	9	18	1.000E+03	1.240E+01	2.3800	3
0	54	134	53	131	1.854E+01	0.000E+00	0.0000	1	1	13	27	9	18	1.000E+03	1.240E+01	2.3900	3
0	54	134	53	131	1.890E+01	2.630E-07	0.0000	1	1	13	27	9	18	1.200E+03	1.170E+01	2.3200	3
0	54	134	53	131	1.926E+01	2.261E-06	0.0000	1	1	13	27	9	18	1.300E+03	1.120E+01	2.2700	3
0	54	134	53	131	1.962E+01	1.334E-05	0.0000	1	1	13	27	9	18	1.600E+03	1.020E+01	2.1800	3
0	54	134	53	131	2.000E+01	1.006E-04	0.0000	1	1	13	27	9	18	1.700E+03	1.030E+01	2.2000	3
0	54	134	53	131	3.000E+01	3.354E-04	0.0000	2	1	13	27	10	18	4.000E+01	0.000E+00	0.0000	2
0	54	134	53	131	3.500E+01	3.350E+00	0.0000	2	1	13	27	10	18	4.500E+01	1.019E-09	0.0000	2
0	54	134	53	131	4.000E+01	2.603E+01	0.0000	2	1	13	27	10	18	5.000E+01	2.321E-05	0.0000	2
0	54	134	53	131	4.500E+01	5.772E+01	0.0000	2	1	13	27	10	18	5.500E+01	1.160E-03	0.0000	2
0	54	134	53	131	5.000E+01	7.875E+01	0.0000	2	1	13	27	10	18	6.000E+01	6.199E-03	0.0000	2
0	54	134	53	131	5.500E+01	8.905E+01	0.0000	2	1	13	27	10	18	6.500E+01	1.362E-02	0.0000	2
0	54	134	53	131	6.000E+01	9.260E+01	0.0000	2	1	13	27	10	18	7.000E+01	1.801E-02	0.0000	2
0	54	134	53	131	6.500E+01	9.075E+01	0.0000	2	1	13	27	10	18	7.500E+01	1.713E-02	0.0000	2
0	54	134	53	131	7.000E+01	9.044E+01	0.0000	2	1	13	27	10	18	8.000E+01	1.643E-02	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	54	134	53	131	7.500E+01	8.960E+01	0.0000	2	1	13	27	10	18	8.500E+01	1.537E-02	0.0000	2
0	54	134	53	131	8.000E+01	8.697E+01	0.0000	2	1	13	27	10	18	9.000E+01	1.457E-02	0.0000	2
0	54	134	53	131	8.500E+01	8.777E+01	0.0000	2	1	13	27	10	18	9.500E+01	1.356E-02	0.0000	2
0	54	134	53	131	9.000E+01	8.886E+01	0.0000	2	1	13	27	10	18	1.000E+02	1.456E-02	0.0000	2
0	54	134	53	131	9.500E+01	8.520E+01	0.0000	2	1	13	27	10	18	1.100E+02	1.754E-02	0.0000	2
0	54	134	53	131	1.000E+02	8.508E+01	0.0000	2	1	13	27	10	18	1.200E+02	2.232E-02	0.0000	2
0	54	134	53	131	1.100E+02	8.278E+01	0.0000	2	1	13	27	10	18	1.300E+02	2.397E-02	0.0000	2
0	54	134	53	131	1.200E+02	8.152E+01	0.0000	2	1	13	27	10	18	1.400E+02	2.686E-02	0.0000	2
0	54	134	53	131	1.300E+02	8.194E+01	0.0000	2	1	13	27	10	18	1.500E+02	2.886E-02	0.0000	2
0	54	134	53	131	1.400E+02	8.093E+01	0.0000	2	1	13	27	10	18	1.500E+02	3.840E-03	0.0384	3
0	54	134	53	131	1.500E+02	7.920E+01	0.0000	2	1	13	27	10	18	1.800E+02	6.250E-03	0.0625	3
0	54	134	53	131	1.500E+02	5.384E+01	0.0142	4	1	13	27	10	18	2.000E+02	1.840E-02	0.0825	3
0	54	134	53	131	2.000E+02	4.735E+01	0.0152	4	1	13	27	10	18	2.000E+02	1.830E-02	0.1060	3
0	54	134	53	131	3.000E+02	4.030E+01	0.0165	4	1	13	27	10	18	2.500E+02	1.820E-02	0.0812	3
0	54	134	53	131	5.000E+02	2.887E+01	0.0195	4	1	13	27	10	18	3.000E+02	2.550E-02	0.0963	3
0	54	134	53	131	7.500E+02	2.320E+01	0.0218	4	1	13	27	10	18	3.000E+02	1.450E-02	0.0724	3
0	54	134	53	131	1.000E+03	2.263E+01	0.0221	4	1	13	27	10	18	4.000E+02	1.130E-02	0.0655	3
0	54	134	53	131	1.300E+03	1.743E+01	0.0252	4	1	13	27	10	18	5.000E+02	3.190E-02	0.1130	3
0	54	134	53	131	1.700E+03	1.673E+01	0.0257	4	1	13	27	10	18	5.000E+02	3.590E-02	0.1200	3
0	54	136	48	131	9.000E+01	0.000E+00	0.0000	2	1	13	27	10	18	6.000E+02	5.110E-02	0.1480	3
0	54	136	48	131	9.500E+01	1.912E-38	0.0000	2	1	13	27	10	18	7.500E+02	6.730E-02	0.1740	3
0	54	136	48	131	1.000E+02	7.908E-32	0.0000	2	1	13	27	10	18	8.000E+02	4.510E-02	0.1430	3
0	54	136	48	131	1.100E+02	1.379E-24	0.0000	2	1	13	27	10	18	1.000E+03	5.510E-02	0.1590	3
0	54	136	48	131	1.200E+02	5.078E-24	0.0000	2	1	13	27	10	18	1.000E+03	5.970E-02	0.1660	3
0	54	136	48	131	1.300E+02	2.452E-22	0.0000	2	1	13	27	10	18	1.200E+03	7.390E-02	0.1850	3
0	54	136	48	131	1.400E+02	7.845E-21	0.0000	2	1	13	27	10	18	1.300E+03	5.080E-02	0.1530	3
0	54	136	48	131	1.500E+02	3.533E-20	0.0000	2	1	13	27	10	18	1.600E+03	3.730E-02	0.1320	3
0	54	136	49	131	7.500E+01	0.000E+00	0.0000	2	1	13	27	10	18	1.700E+03	1.400E-02	0.0810	3
0	54	136	49	131	8.000E+01	1.729E-25	0.0000	2	1	13	27	11	18	9.000E+01	0.000E+00	0.0000	2
0	54	136	49	131	8.500E+01	8.911E-21	0.0000	2	1	13	27	11	18	9.500E+01	1.731E-18	0.0000	2
0	54	136	49	131	9.000E+01	3.832E-18	0.0000	2	1	13	27	11	18	1.000E+02	3.763E-13	0.0000	2
0	54	136	49	131	9.500E+01	2.224E-16	0.0000	2	1	13	27	11	18	1.100E+02	7.456E-09	0.0000	2
0	54	136	49	131	1.000E+02	7.527E-15	0.0000	2	1	13	27	11	18	1.200E+02	1.605E-07	0.0000	2
0	54	136	49	131	1.100E+02	2.043E-12	0.0000	2	1	13	27	11	18	1.300E+02	7.897E-07	0.0000	2
0	54	136	49	131	1.200E+02	3.966E-12	0.0000	2	1	13	27	11	18	1.400E+02	2.120E-06	0.0000	2
0	54	136	49	131	1.300E+02	5.046E-12	0.0000	2	1	13	27	11	18	1.500E+02	2.755E-06	0.0000	2
0	54	136	49	131	1.400E+02	1.080E-11	0.0000	2	1	13	27	12	18	1.100E+02	0.000E+00	0.0000	2
0	54	136	49	131	1.500E+02	7.929E-12	0.0000	2	1	13	27	12	18	1.200E+02	1.209E-16	0.0000	2
0	54	136	50	131	3.500E+01	0.000E+00	0.0000	2	1	13	27	12	18	1.300E+02	1.055E-12	0.0000	2
0	54	136	50	131	4.000E+01	1.802E-14	0.0000	2	1	13	27	12	18	1.400E+02	3.328E-11	0.0000	2
0	54	136	50	131	4.500E+01	5.683E-11	0.0000	2	1	13	27	12	18	1.500E+02	1.784E-10	0.0000	2
0	54	136	50	131	5.000E+01	2.511E-08	0.0000	2	1	54	132	52	131	5.000E+02	4.440E-02	0.5000	4
0	54	136	50	131	5.500E+01	1.166E-07	0.0000	2	1	54	132	52	131	7.500E+02	3.330E-02	0.5773	4
0	54	136	50	131	6.000E+01	2.675E-07	0.0000	2	1	54	132	52	131	1.000E+03	1.110E-01	0.3162	4
0	54	136	50	131	6.500E+01	5.055E-07	0.0000	2	1	54	132	52	131	1.300E+03	6.660E-02	0.4082	4
0	54	136	50	131	7.000E+01	5.659E-07	0.0000	2	1	54	132	52	131	1.700E+03	5.550E-02	0.4472	4
0	54	136	50	131	7.500E+01	8.267E-07	0.0000	2	1	54	132	53	131	1.800E+01	0.000E+00	0.0000	2
0	54	136	50	131	8.000E+01	1.074E-06	0.0000	2	1	54	132	53	131	1.900E+01	6.488E-08	0.0000	2
0	54	136	50	131	8.500E+01	8.708E-07	0.0000	2	1	54	132	53	131	2.000E+01	1.316E-06	0.0000	2
0	54	136	50	131	9.000E+01	9.800E-07	0.0000	2	1	54	132	53	131	2.200E+01	1.502E-02	0.0000	2
0	54	136	50	131	9.500E+01	1.049E-06	0.0000	2	1	54	132	53	131	2.400E+01	1.575E-02	0.0000	2
0	54	136	50	131	1.000E+02	1.559E-06	0.0000	2	1	54	132	53	131	2.600E+01	9.434E-02	0.0000	2
0	54	136	50	131	1.100E+02	2.408E-06	0.0000	2	1	54	132	53	131	2.800E+01	1.919E-01	0.0000	2
0	54	136	50	131	1.200E+02	2.283E-06	0.0000	2	1	54	132	53	131	3.000E+01	2.465E-01	0.0000	2
0	54	136	50	131	1.300E+02	4.904E-06	0.0000	2	1	54	132	53	131	3.500E+01	1.272E+00	0.0000	2
0	54	136	50	131	1.400E+02	3.950E-06	0.0000	2	1	54	132	53	131	4.000E+01	1.948E+00	0.0000	2
0	54	136	50	131	1.500E+02	1.317E-02	0.0000	2	1	54	132	53	131	4.500E+01	2.655E+00	0.0000	2
0	54	136	50	131	2.000E+02	1.126E-02	1.0000	4	1	54	132	53	131	5.000E+01	4.427E+00	0.0000	2
0	54	136	50	131	3.000E+02	1.126E-02	1.0000	4	1	54	132	53	131	5.500E+01	4.931E+00	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	54	136	52	131	3.000E+02	7.305E+00	0.0392	4	1	54	134	53	131	1.700E+01	1.881E-01	0.0000	2
0	54	136	52	131	5.000E+02	6.416E+00	0.0418	4	1	54	134	53	131	1.800E+01	2.056E-01	0.0000	2
0	54	136	52	131	7.500E+02	4.852E+00	0.0481	4	1	54	134	53	131	1.900E+01	1.898E-01	0.0000	2
0	54	136	52	131	1.000E+03	4.514E+00	0.0499	4	1	54	134	53	131	2.000E+01	1.463E-01	0.0000	2
0	54	136	52	131	1.300E+03	3.647E+00	0.0555	4	1	54	134	53	131	2.200E+01	6.388E-02	0.0000	2
0	54	136	52	131	1.700E+03	3.366E+00	0.0578	4	1	54	134	53	131	2.400E+01	1.986E-02	0.0000	2
0	54	136	53	131	4.000E+01	0.000E+00	0.0000	2	1	54	134	53	131	2.600E+01	5.686E-03	0.0000	2
0	54	136	53	131	4.500E+01	5.895E-06	0.0000	2	1	54	134	53	131	2.800E+01	1.401E-03	0.0000	2
0	54	136	53	131	5.000E+01	1.249E-01	0.0000	2	1	54	134	53	131	3.000E+01	3.877E-04	0.0000	2
0	54	136	53	131	5.500E+01	3.757E+00	0.0000	2	1	54	134	53	131	3.500E+01	2.192E-05	0.0000	2
0	54	136	53	131	6.000E+01	1.710E+01	0.0000	2	1	54	134	53	131	4.000E+01	2.997E-02	0.0000	2
0	54	136	53	131	6.500E+01	3.852E+01	0.0000	2	1	54	134	53	131	4.500E+01	3.156E-01	0.0000	2
0	54	136	53	131	7.000E+01	5.240E+01	0.0000	2	1	54	134	53	131	5.000E+01	9.565E-01	0.0000	2
0	54	136	53	131	7.500E+01	6.004E+01	0.0000	2	1	54	134	53	131	5.500E+01	2.495E+00	0.0000	2
0	54	136	53	131	8.000E+01	6.457E+01	0.0000	2	1	54	134	53	131	6.000E+01	4.473E+00	0.0000	2
0	54	136	53	131	8.500E+01	6.750E+01	0.0000	2	1	54	134	53	131	6.500E+01	6.297E+00	0.0000	2
0	54	136	53	131	9.000E+01	6.762E+01	0.0000	2	1	54	134	53	131	7.000E+01	7.915E+00	0.0000	2
0	54	136	53	131	9.500E+01	6.692E+01	0.0000	2	1	54	134	53	131	7.500E+01	8.613E+00	0.0000	2
0	54	136	53	131	1.000E+02	6.692E+01	0.0000	2	1	54	134	53	131	8.000E+01	1.016E+01	0.0000	2
0	54	136	53	131	1.100E+02	6.530E+01	0.0000	2	1	54	134	53	131	8.500E+01	1.226E+01	0.0000	2
0	54	136	53	131	1.200E+02	6.346E+01	0.0000	2	1	54	134	53	131	9.000E+01	1.244E+01	0.0000	2
0	54	136	53	131	1.300E+02	6.185E+01	0.0000	2	1	54	134	53	131	9.500E+01	1.473E+01	0.0000	2
0	54	136	53	131	1.400E+02	6.147E+01	0.0000	2	1	54	134	53	131	1.000E+02	1.514E+01	0.0000	2
0	54	136	53	131	1.500E+02	5.856E+01	0.0000	2	1	54	134	53	131	1.100E+02	1.643E+01	0.0000	2
0	54	136	53	131	1.500E+02	5.827E+01	0.0137	4	1	54	134	53	131	1.200E+02	1.889E+01	0.0000	2
0	54	136	53	131	2.000E+02	5.007E+01	0.0148	4	1	54	134	53	131	1.300E+02	2.079E+01	0.0000	2
0	54	136	53	131	3.000E+02	4.307E+01	0.0160	4	1	54	134	53	131	1.400E+02	2.164E+01	0.0000	2
0	54	136	53	131	5.000E+02	3.003E+01	0.0192	4	1	54	134	53	131	1.500E+02	2.219E+01	0.0000	2
0	54	136	53	131	7.500E+02	2.321E+01	0.0219	4	1	54	134	53	131	1.500E+02	2.231E+01	0.0223	4
0	54	136	53	131	1.000E+03	2.030E+01	0.0234	4	1	54	134	53	131	2.000E+02	2.299E+01	0.0219	4
0	54	136	53	131	1.300E+03	1.534E+01	0.0270	4	1	54	134	53	131	3.000E+02	2.297E+01	0.0219	4
0	54	136	53	131	1.700E+03	1.435E+01	0.0279	4	1	54	134	53	131	5.000E+02	2.221E+01	0.0223	4
0	55	133	52	131	3.000E+01	0.000E+00	0.0000	2	1	54	134	53	131	7.500E+02	2.022E+01	0.0234	4
0	55	133	52	131	3.500E+01	5.001E-08	0.0000	2	1	54	134	53	131	1.000E+03	1.931E+01	0.0240	4
0	55	133	52	131	4.000E+01	5.663E-07	0.0000	2	1	54	134	53	131	1.300E+03	1.721E+01	0.0254	4
0	55	133	52	131	4.500E+01	7.079E-06	0.0000	2	1	54	134	53	131	1.700E+03	1.625E+01	0.0261	4
0	55	133	52	131	5.000E+01	1.931E-05	0.0000	2	1	54	136	49	131	8.000E+01	0.000E+00	0.0000	2
0	55	133	52	131	5.500E+01	3.334E-05	0.0000	2	1	54	136	49	131	8.500E+01	3.277E-28	0.0000	2
0	55	133	52	131	6.000E+01	5.231E-05	0.0000	2	1	54	136	49	131	9.000E+01	1.181E-23	0.0000	2
0	55	133	52	131	6.500E+01	6.555E-05	0.0000	2	1	54	136	49	131	9.500E+01	1.008E-20	0.0000	2
0	55	133	52	131	7.000E+01	7.545E-05	0.0000	2	1	54	136	49	131	1.000E+02	1.323E-18	0.0000	2
0	55	133	52	131	7.500E+01	6.368E-05	0.0000	2	1	54	136	49	131	1.100E+02	1.471E-15	0.0000	2
0	55	133	52	131	8.000E+01	7.999E-05	0.0000	2	1	54	136	49	131	1.200E+02	1.856E-14	0.0000	2
0	55	133	52	131	8.500E+01	1.433E-02	0.0000	2	1	54	136	49	131	1.300E+02	1.303E-14	0.0000	2
0	55	133	52	131	9.000E+01	8.599E-05	0.0000	2	1	54	136	49	131	1.400E+02	3.635E-14	0.0000	2
0	55	133	52	131	9.500E+01	1.851E-04	0.0000	2	1	54	136	49	131	1.500E+02	4.232E-14	0.0000	2
0	55	133	52	131	1.000E+02	1.679E-04	0.0000	2	1	54	136	50	131	6.500E+01	0.000E+00	0.0000	2
0	55	133	52	131	1.000E+02	6.684E-02	0.4082	4	1	54	136	50	131	7.000E+01	6.066E-24	0.0000	2
0	55	133	52	131	1.100E+02	1.364E-02	0.0000	2	1	54	136	50	131	7.500E+01	4.366E-17	0.0000	2
0	55	133	52	131	1.200E+02	1.031E-04	0.0000	2	1	54	136	50	131	8.000E+01	8.221E-15	0.0000	2
0	55	133	52	131	1.300E+02	6.742E-05	0.0000	2	1	54	136	50	131	8.500E+01	6.991E-13	0.0000	2
0	55	133	52	131	1.400E+02	1.300E-04	0.0000	2	1	54	136	50	131	9.000E+01	1.125E-11	0.0000	2
0	55	133	52	131	1.500E+02	9.357E-05	0.0000	2	1	54	136	50	131	9.500E+01	1.237E-10	0.0000	2
0	55	133	52	131	1.500E+02	2.210E-02	0.1570	3	1	54	136	50	131	1.000E+02	2.483E-10	0.0000	2
0	55	133	52	131	1.500E+02	7.798E-02	0.3780	4	1	54	136	50	131	1.100E+02	2.483E-09	0.0000	2
0	55	133	52	131	2.000E+02	1.090E-02	0.1090	3	1	54	136	50	131	1.200E+02	3.888E-09	0.0000	2
0	55	133	52	131	2.000E+02	5.570E-02	0.4472	4	1	54	136	50	131	1.300E+02	3.713E-07	0.0000	2
0	55	133	52	131	2.500E+02	2.170E-02	0.1540	3	1	54	136	50	131	1.400E+02	9.516E-09	0.0000	2
0	55	133	52	131	3.000E+02	6.684E-02	0.4082	4	1	54	136	50	131	1.500E+02	9.130E-09	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	56	136	51	131	1.500E+02	1.191E-07	0.0000	2	1	56	135	53	131	1.500E+02	1.010E-01	0.3333	4
0	56	136	52	131	3.000E+01	0.000E+00	0.0000	2	1	56	135	53	131	3.000E+02	1.010E-01	0.3333	4
0	56	136	52	131	3.500E+01	7.919E-13	0.0000	2	1	56	135	53	131	5.000E+02	3.029E-01	0.1924	4
0	56	136	52	131	4.000E+01	5.218E-09	0.0000	2	1	56	135	53	131	7.500E+02	4.712E-01	0.1543	4
0	56	136	52	131	4.500E+01	3.915E-07	0.0000	2	1	56	135	53	131	1.000E+03	2.468E-01	0.2132	4
0	56	136	52	131	5.000E+01	3.244E-06	0.0000	2	1	56	135	53	131	1.300E+03	5.160E-01	0.1474	4
0	56	136	52	131	5.500E+01	6.816E-06	0.0000	2	1	56	135	53	131	1.700E+03	4.599E-01	0.1562	4
0	56	136	52	131	6.000E+01	8.897E-06	0.0000	2	1	56	136	51	131	7.000E+01	0.000E+00	0.0000	2
0	56	136	52	131	6.500E+01	1.396E-05	0.0000	2	1	56	136	51	131	7.500E+01	8.908E-25	0.0000	2
0	56	136	52	131	7.000E+01	1.542E-05	0.0000	2	1	56	136	51	131	8.000E+01	8.243E-20	0.0000	2
0	56	136	52	131	7.500E+01	1.955E-05	0.0000	2	1	56	136	51	131	8.500E+01	9.027E-17	0.0000	2
0	56	136	52	131	8.000E+01	1.586E-05	0.0000	2	1	56	136	51	131	9.000E+01	1.124E-14	0.0000	2
0	56	136	52	131	8.500E+01	2.178E-05	0.0000	2	1	56	136	51	131	9.500E+01	1.116E-12	0.0000	2
0	56	136	52	131	9.000E+01	4.409E-05	0.0000	2	1	56	136	51	131	1.000E+02	1.865E-12	0.0000	2
0	56	136	52	131	9.500E+01	7.922E-05	0.0000	2	1	56	136	51	131	1.100E+02	2.524E-11	0.0000	2
0	56	136	52	131	1.000E+02	8.290E-05	0.0000	2	1	56	136	51	131	1.200E+02	8.421E-11	0.0000	2
0	56	136	52	131	1.100E+02	1.230E-04	0.0000	2	1	56	136	51	131	1.300E+02	7.741E-11	0.0000	2
0	56	136	52	131	1.200E+02	1.495E-04	0.0000	2	1	56	136	51	131	1.400E+02	2.064E-10	0.0000	2
0	56	136	52	131	1.300E+02	2.437E-04	0.0000	2	1	56	136	51	131	1.500E+02	1.754E-10	0.0000	2
0	56	136	52	131	1.400E+02	2.612E-04	0.0000	2	1	56	136	52	131	6.000E+01	0.000E+00	0.0000	2
0	56	136	52	131	1.500E+02	2.680E-04	0.0000	2	1	56	136	52	131	6.500E+01	1.222E-24	0.0000	2
0	56	136	52	131	1.500E+02	1.126E-02	1.0000	4	1	56	136	52	131	7.000E+01	2.105E-15	0.0000	2
0	56	136	52	131	2.000E+02	2.251E-02	0.7071	4	1	56	136	52	131	7.500E+01	4.311E-12	0.0000	2
0	56	136	52	131	5.000E+02	3.377E-02	0.5773	4	1	56	136	52	131	8.000E+01	1.833E-10	0.0000	2
0	56	136	52	131	7.500E+02	3.377E-02	0.5773	4	1	56	136	52	131	8.500E+01	3.540E-09	0.0000	2
0	56	136	52	131	1.000E+03	1.126E-02	1.0000	4	1	56	136	52	131	9.000E+01	2.913E-08	0.0000	2
0	56	136	52	131	1.300E+03	1.126E-02	1.0000	4	1	56	136	52	131	9.500E+01	8.786E-08	0.0000	2
0	56	136	52	131	1.700E+03	3.377E-02	0.5773	4	1	56	136	52	131	1.000E+02	1.707E-07	0.0000	2
0	56	136	53	131	2.800E+01	4.304E-08	0.0000	2	1	56	136	52	131	1.100E+02	4.699E-06	0.0000	2
0	56	136	53	131	3.000E+01	1.981E-05	0.0000	2	1	56	136	52	131	1.200E+02	5.209E-07	0.0000	2
0	56	136	53	131	3.500E+01	1.964E-03	0.0000	2	1	56	136	52	131	1.300E+02	4.923E-07	0.0000	2
0	56	136	53	131	4.000E+01	1.319E-02	0.0000	2	1	56	136	52	131	1.400E+02	6.792E-07	0.0000	2
0	56	136	53	131	4.500E+01	3.134E-02	0.0000	2	1	56	136	52	131	1.500E+02	1.056E-06	0.0000	2
0	56	136	53	131	5.000E+01	3.794E-02	0.0000	2	1	56	136	52	131	3.000E+02	1.126E-02	1.0000	4
0	56	136	53	131	5.500E+01	3.859E-02	0.0000	2	1	56	136	52	131	5.000E+02	2.251E-02	0.7071	4
0	56	136	53	131	6.000E+01	3.432E-02	0.0000	2	1	56	136	52	131	7.500E+02	1.126E-02	1.0000	4
0	56	136	53	131	6.500E+01	3.295E-02	0.0000	2	1	56	136	52	131	1.000E+03	1.126E-02	1.0000	4
0	56	136	53	131	7.000E+01	3.217E-02	0.0000	2	1	56	136	52	131	1.300E+03	3.377E-02	0.5773	4
0	56	136	53	131	7.500E+01	3.384E-02	0.0000	2	1	56	136	52	131	1.700E+03	3.377E-02	0.5773	4
0	56	136	53	131	8.000E+01	3.530E-02	0.0000	2	1	56	136	53	131	1.000E+00	0.000E+00	0.0000	2
0	56	136	53	131	8.500E+01	6.659E-02	0.0000	2	1	56	136	53	131	3.000E+01	0.000E+00	0.0000	2
0	56	136	53	131	9.000E+01	8.174E-02	0.0000	2	1	56	136	53	131	3.500E+01	4.972E-10	0.0000	2
0	56	136	53	131	9.500E+01	6.686E-02	0.0000	2	1	56	136	53	131	4.000E+01	7.220E-07	0.0000	2
0	56	136	53	131	1.000E+02	7.572E-02	0.0000	2	1	56	136	53	131	4.500E+01	2.027E-05	0.0000	2
0	56	136	53	131	1.100E+02	2.149E-01	0.0000	2	1	56	136	53	131	5.000E+01	1.129E-04	0.0000	2
0	56	136	53	131	1.200E+02	2.214E-01	0.0000	2	1	56	136	53	131	5.500E+01	3.214E-04	0.0000	2
0	56	136	53	131	1.300E+02	2.243E-01	0.0000	2	1	56	136	53	131	6.000E+01	3.942E-04	0.0000	2
0	56	136	53	131	1.400E+02	2.793E-01	0.0000	2	1	56	136	53	131	6.500E+01	5.004E-04	0.0000	2
0	56	136	53	131	1.500E+02	2.965E-01	0.0000	2	1	56	136	53	131	7.000E+01	6.110E-04	0.0000	2
0	56	136	53	131	1.500E+02	1.430E+00	0.0887	4	1	56	136	53	131	7.500E+01	6.927E-04	0.0000	2
0	56	136	53	131	2.000E+02	1.508E+00	0.0864	4	1	56	136	53	131	8.000E+01	7.967E-04	0.0000	2
0	56	136	53	131	3.000E+02	1.520E+00	0.0860	4	1	56	136	53	131	8.500E+01	1.053E-03	0.0000	2
0	56	136	53	131	5.000E+02	1.238E+00	0.0953	4	1	56	136	53	131	9.000E+01	1.174E-03	0.0000	2
0	56	136	53	131	7.500E+02	1.148E+00	0.0990	4	1	56	136	53	131	9.500E+01	1.560E-03	0.0000	2
0	56	136	53	131	1.000E+03	1.238E+00	0.0953	4	1	56	136	53	131	1.000E+02	1.910E-03	0.0000	2
0	56	136	53	131	1.300E+03	1.081E+00	0.1020	4	1	56	136	53	131	1.100E+02	6.796E-03	0.0000	2
0	56	136	53	131	1.700E+03	9.455E-01	0.1091	4	1	56	136	53	131	1.200E+02	2.880E-03	0.0000	2
0	56	137	49	131	9.000E+01	0.000E+00	0.0000	2	1	56	136	53	131	1.300E+02	3.224E-03	0.0000	2
0	56	137	49	131	9.500E+01	4.616E-39	0.0000	2	1	56	136	53	131	1.400E+02	3.805E-03	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	56	137	49	131	1.000E+02	3.953E-31	0.0000	2	1	56	136	53	131	1.500E+02	4.730E-03	0.0000	2
0	56	137	49	131	1.100E+02	3.613E-23	0.0000	2	1	56	136	53	131	1.500E+02	1.688E-01	0.2582	4
0	56	137	49	131	1.200E+02	3.277E-20	0.0000	2	1	56	136	53	131	2.000E+02	2.589E-01	0.2085	4
0	56	137	49	131	1.300E+02	2.388E-18	0.0000	2	1	56	136	53	131	3.000E+02	2.927E-01	0.1961	4
0	56	137	49	131	1.400E+02	5.425E-17	0.0000	2	1	56	136	53	131	5.000E+02	6.641E-01	0.1302	4
0	56	137	49	131	1.500E+02	6.244E-17	0.0000	2	1	56	136	53	131	7.500E+02	8.780E-01	0.1132	4
0	56	137	50	131	8.000E+01	0.000E+00	0.0000	2	1	56	136	53	131	1.000E+03	7.317E-01	0.1240	4
0	56	137	50	131	8.500E+01	9.873E-25	0.0000	2	1	56	136	53	131	1.300E+03	9.793E-01	0.1072	4
0	56	137	50	131	9.000E+01	2.905E-20	0.0000	2	1	56	136	53	131	1.700E+03	7.429E-01	0.1231	4
0	56	137	50	131	9.500E+01	1.682E-17	0.0000	2	1	56	137	50	131	8.500E+01	0.000E+00	0.0000	2
0	56	137	50	131	1.000E+02	8.528E-16	0.0000	2	1	56	137	50	131	9.000E+01	2.085E-32	0.0000	2
0	56	137	50	131	1.100E+02	1.476E-13	0.0000	2	1	56	137	50	131	9.500E+01	1.633E-26	0.0000	2
0	56	137	50	131	1.200E+02	1.185E-12	0.0000	2	1	56	137	50	131	1.000E+02	7.700E-23	0.0000	2
0	56	137	50	131	1.300E+02	1.090E-11	0.0000	2	1	56	137	50	131	1.100E+02	3.057E-18	0.0000	2
0	56	137	50	131	1.400E+02	2.178E-11	0.0000	2	1	56	137	50	131	1.200E+02	2.074E-16	0.0000	2
0	56	137	50	131	1.500E+02	2.034E-11	0.0000	2	1	56	137	50	131	1.300E+02	1.656E-15	0.0000	2
0	56	137	51	131	4.500E+01	0.000E+00	0.0000	2	1	56	137	50	131	1.400E+02	7.262E-15	0.0000	2
0	56	137	51	131	5.000E+01	3.717E-17	0.0000	2	1	56	137	50	131	1.500E+02	1.152E-14	0.0000	2
0	56	137	51	131	5.500E+01	5.273E-13	0.0000	2	1	56	137	51	131	7.500E+01	0.000E+00	0.0000	2
0	56	137	51	131	6.000E+01	1.028E-10	0.0000	2	1	56	137	51	131	8.000E+01	4.457E-27	0.0000	2
0	56	137	51	131	6.500E+01	2.113E-09	0.0000	2	1	56	137	51	131	8.500E+01	5.753E-20	0.0000	2
0	56	137	51	131	7.000E+01	1.367E-08	0.0000	2	1	56	137	51	131	9.000E+01	8.968E-17	0.0000	2
0	56	137	51	131	7.500E+01	1.968E-07	0.0000	2	1	56	137	51	131	9.500E+01	1.020E-14	0.0000	2
0	56	137	51	131	8.000E+01	9.399E-08	0.0000	2	1	56	137	51	131	1.000E+02	3.734E-12	0.0000	2
0	56	137	51	131	8.500E+01	2.128E-07	0.0000	2	1	56	137	51	131	1.100E+02	4.626E-11	0.0000	2
0	56	137	51	131	9.000E+01	4.307E-07	0.0000	2	1	56	137	51	131	1.200E+02	3.818E-10	0.0000	2
0	56	137	51	131	9.500E+01	1.034E-07	0.0000	2	1	56	137	51	131	1.300E+02	7.340E-10	0.0000	2
0	56	137	51	131	1.000E+02	6.035E-07	0.0000	2	1	56	137	51	131	1.400E+02	1.229E-09	0.0000	2
0	56	137	51	131	1.100E+02	4.392E-07	0.0000	2	1	56	137	51	131	1.500E+02	1.509E-09	0.0000	2
0	56	137	51	131	1.200E+02	4.861E-07	0.0000	2	1	56	137	52	131	4.500E+01	0.000E+00	0.0000	2
0	56	137	51	131	1.300E+02	1.102E-06	0.0000	2	1	56	137	52	131	5.000E+01	1.304E-13	0.0000	2
0	56	137	51	131	1.400E+02	1.355E-06	0.0000	2	1	56	137	52	131	5.500E+01	1.632E-10	0.0000	2
0	56	137	51	131	1.500E+02	1.604E-06	0.0000	2	1	56	137	52	131	6.000E+01	6.569E-09	0.0000	2
0	56	137	51	131	5.000E+02	1.130E-02	1.0000	4	1	56	137	52	131	6.500E+01	3.724E-08	0.0000	2
0	56	137	51	131	1.300E+03	1.130E-02	1.0000	4	1	56	137	52	131	7.000E+01	8.398E-08	0.0000	2
0	56	137	52	131	4.000E+01	0.000E+00	0.0000	2	1	56	137	52	131	7.500E+01	4.338E-07	0.0000	2
0	56	137	52	131	4.500E+01	1.091E-08	0.0000	2	1	56	137	52	131	8.000E+01	3.757E-07	0.0000	2
0	56	137	52	131	5.000E+01	1.766E-06	0.0000	2	1	56	137	52	131	8.500E+01	6.273E-07	0.0000	2
0	56	137	52	131	5.500E+01	2.604E-05	0.0000	2	1	56	137	52	131	9.000E+01	7.059E-07	0.0000	2
0	56	137	52	131	6.000E+01	9.226E-05	0.0000	2	1	56	137	52	131	9.500E+01	1.016E-06	0.0000	2
0	56	137	52	131	6.500E+01	1.746E-04	0.0000	2	1	56	137	52	131	1.000E+02	9.014E-07	0.0000	2
0	56	137	52	131	7.000E+01	2.027E-04	0.0000	2	1	56	137	52	131	1.100E+02	2.527E-06	0.0000	2
0	56	137	52	131	7.500E+01	2.632E-04	0.0000	2	1	56	137	52	131	1.200E+02	4.106E-06	0.0000	2
0	56	137	52	131	8.000E+01	3.060E-04	0.0000	2	1	56	137	52	131	1.300E+02	3.492E-06	0.0000	2
0	56	137	52	131	8.500E+01	3.475E-04	0.0000	2	1	56	137	52	131	1.400E+02	5.902E-06	0.0000	2
0	56	137	52	131	9.000E+01	3.681E-04	0.0000	2	1	56	137	52	131	1.500E+02	5.975E-06	0.0000	2
0	56	137	52	131	9.500E+01	4.330E-04	0.0000	2	1	56	137	52	131	3.000E+02	1.130E-02	1.0000	4
0	56	137	52	131	1.000E+02	4.302E-04	0.0000	2	1	56	137	52	131	5.000E+02	4.518E-02	0.5000	4
0	56	137	52	131	1.100E+02	6.200E-04	0.0000	2	1	56	137	52	131	7.500E+02	1.130E-02	1.0000	4
0	56	137	52	131	1.200E+02	7.111E-04	0.0000	2	1	56	137	52	131	1.000E+03	2.259E-02	0.7071	4
0	56	137	52	131	1.300E+02	7.883E-04	0.0000	2	1	56	137	52	131	1.300E+03	2.259E-02	0.7071	4
0	56	137	52	131	1.400E+02	8.814E-04	0.0000	2	1	56	137	52	131	1.700E+03	6.777E-02	0.4082	4
0	56	137	52	131	1.500E+02	1.113E-03	0.0000	2	1	56	137	53	131	3.500E+01	0.000E+00	0.0000	2
0	56	137	52	131	1.500E+02	4.518E-02	0.5000	4	1	56	137	53	131	4.000E+01	2.381E-12	0.0000	2
0	56	137	52	131	2.000E+02	5.648E-02	0.4472	4	1	56	137	53	131	4.500E+01	4.571E-07	0.0000	2
0	56	137	52	131	3.000E+02	1.130E-01	0.3162	4	1	56	137	53	131	5.000E+01	3.238E-05	0.0000	2
0	56	137	52	131	5.000E+02	3.389E-02	0.5773	4	1	56	137	53	131	5.500E+01	2.612E-04	0.0000	2
0	56	137	52	131	7.500E+02	3.389E-02	0.5773	4	1	56	137	53	131	6.000E+01	9.443E-04	0.0000	2
0	56	137	52	131	1.000E+03	3.389E-02	0.5773	4	1	56	137	53	131	6.500E+01	1.808E-03	0.0000	2

i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref	i	Zt	At	Zp	Ap	E, MeV	CX, mb	uncrty	ref
0	57	138	53	131	6.500E+01	1.340E-03	0.0000	2	1	57	139	53	131	6.500E+01	1.515E-05	0.0000	2
0	57	138	53	131	7.000E+01	3.379E-03	0.0000	2	1	57	139	53	131	7.000E+01	1.279E-05	0.0000	2
0	57	138	53	131	7.500E+01	5.457E-03	0.0000	2	1	57	139	53	131	7.500E+01	1.341E-05	0.0000	2
0	57	138	53	131	8.000E+01	7.178E-03	0.0000	2	1	57	139	53	131	8.000E+01	2.192E-05	0.0000	2
0	57	138	53	131	8.500E+01	8.495E-03	0.0000	2	1	57	139	53	131	8.500E+01	5.088E-05	0.0000	2
0	57	138	53	131	9.000E+01	8.850E-03	0.0000	2	1	57	139	53	131	9.000E+01	1.289E-04	0.0000	2
0	57	138	53	131	9.500E+01	8.280E-03	0.0000	2	1	57	139	53	131	9.500E+01	1.783E-04	0.0000	2
0	57	138	53	131	1.000E+02	9.898E-03	0.0000	2	1	57	139	53	131	1.000E+02	2.695E-04	0.0000	2
0	57	138	53	131	1.100E+02	1.132E-02	0.0000	2	1	57	139	53	131	1.100E+02	4.323E-04	0.0000	2
0	57	138	53	131	1.200E+02	1.704E-02	0.0000	2	1	57	139	53	131	1.200E+02	5.078E-04	0.0000	2
0	57	138	53	131	1.300E+02	2.800E-02	0.0000	2	1	57	139	53	131	1.300E+02	6.910E-04	0.0000	2
0	57	138	53	131	1.400E+02	1.698E-02	0.0000	2	1	57	139	53	131	1.400E+02	9.531E-04	0.0000	2
0	57	138	53	131	1.500E+02	1.641E-02	0.0000	2	1	57	139	53	131	1.500E+02	1.179E-03	0.0000	2
0	57	138	53	131	1.500E+02	1.360E-01	0.2887	4	1	57	139	53	131	2.000E+02	6.824E-02	0.4082	4
0	57	138	53	131	1.500E+02	1.506E-01	0.3535	4	1	57	139	53	131	3.000E+02	2.275E-01	0.2236	4
0	57	138	53	131	2.000E+02	2.040E-01	0.2357	4	1	57	139	53	131	5.000E+02	1.592E-01	0.2673	4
0	57	138	53	131	3.000E+02	2.040E-01	0.2357	4	1	57	139	53	131	7.500E+02	2.502E-01	0.2132	4
0	57	138	53	131	5.000E+02	2.720E-01	0.2041	4	1	57	139	53	131	1.000E+03	3.298E-01	0.1857	4
0	57	138	53	131	7.500E+02	4.080E-01	0.1667	4	1	57	139	53	131	1.300E+03	3.981E-01	0.1690	4
0	57	138	53	131	1.000E+03	2.607E-01	0.2085	4	1	57	139	53	131	1.700E+03	2.957E-01	0.1961	4

Appendix C

Benchmarking of Proton Cross Sections

Cross-section data were obtained for neutrons and protons on pertinent isotopes of the following elements: ${}^8\text{O}$, ${}^9\text{F}$, ${}^{10}\text{Ne}$, ${}^{11}\text{Na}$, ${}^{12}\text{Mg}$, ${}^{13}\text{Al}$, ${}^{54}\text{Xe}$, ${}^{55}\text{Cs}$, ${}^{56}\text{Ba}$, and ${}^{57}\text{La}$. In addition to data describing mass 18 and mass 131 products, including or leading to ${}^{18}\text{F}$ and ${}^{131}\text{I}$, cross sections leading to products of a wide range of masses were produced for each target isotope. Comparisons of data from available sources and, where available, measured data are made in the figures shown on the subsequent pages of this appendix.

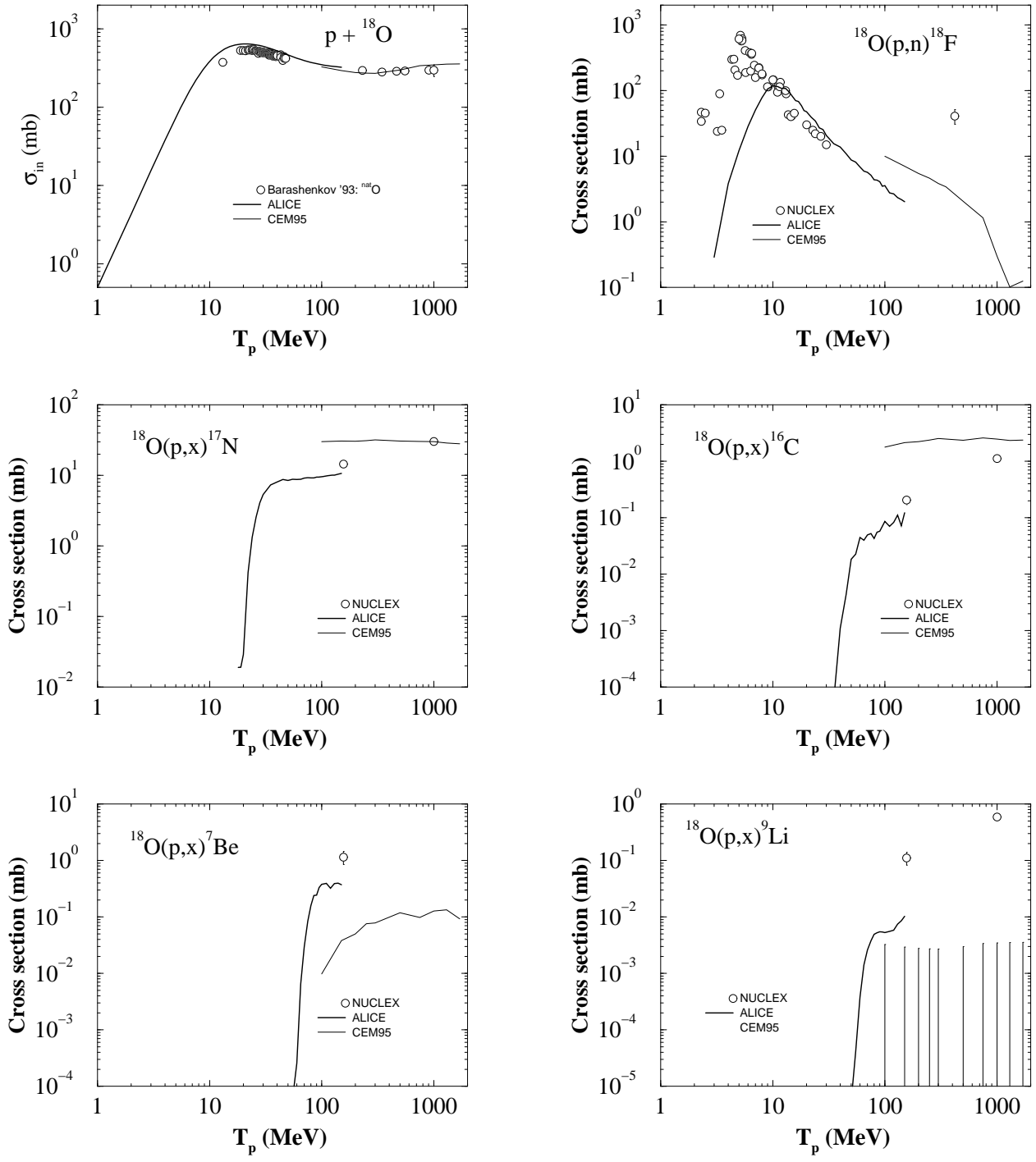


Figure 6: $p + {}^{18}\text{O}$

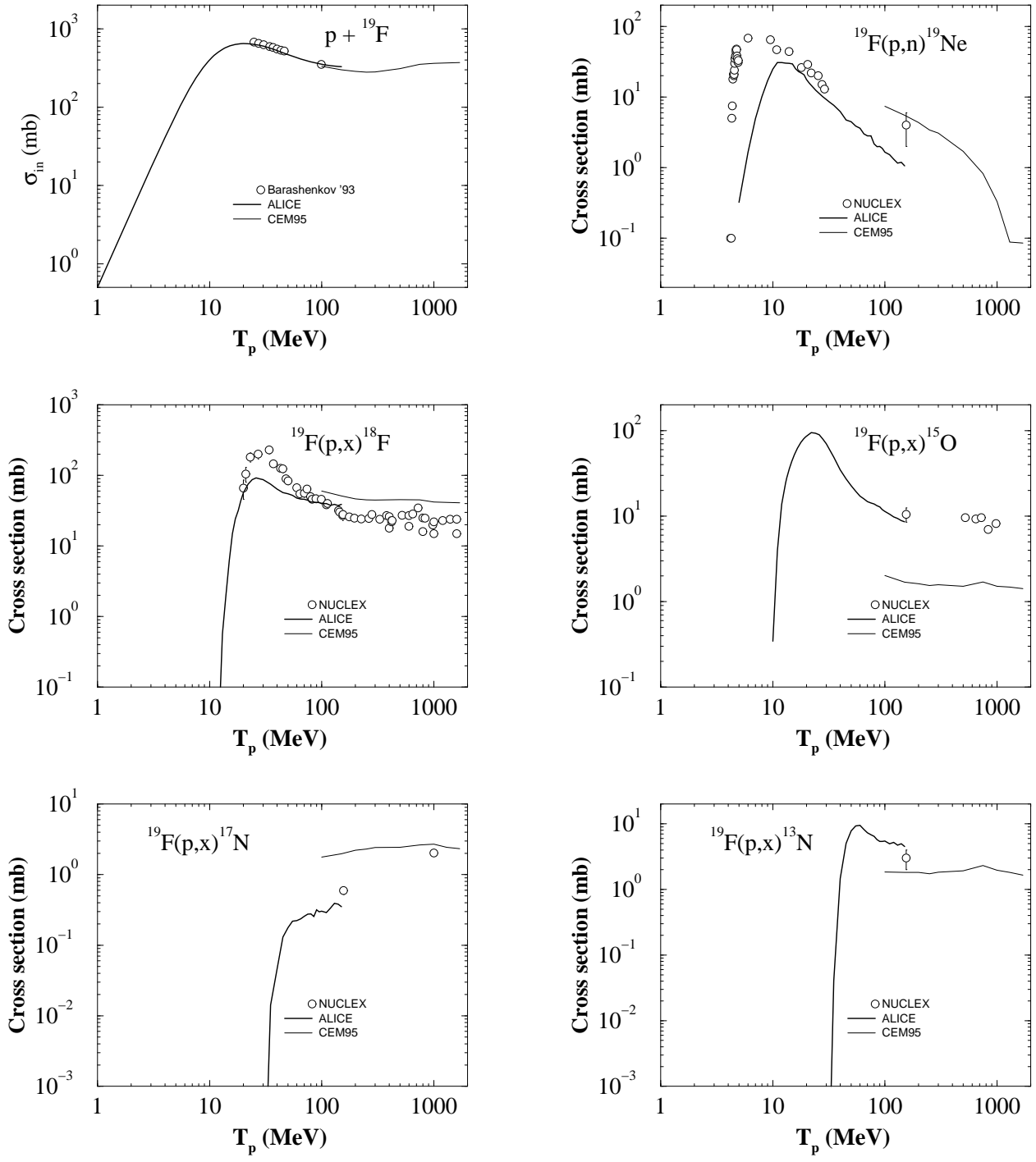


Figure 7: $p + ^{19}\text{F}$, part 1

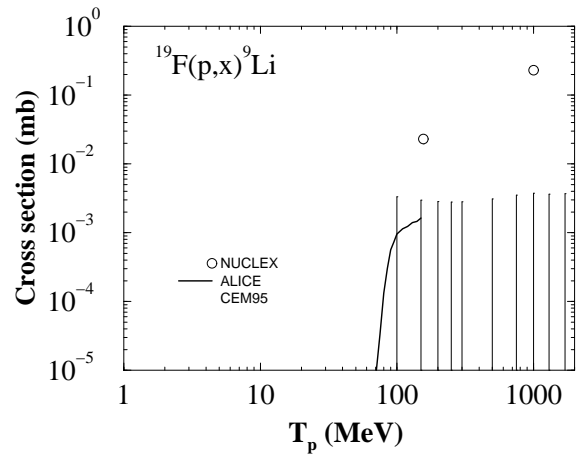
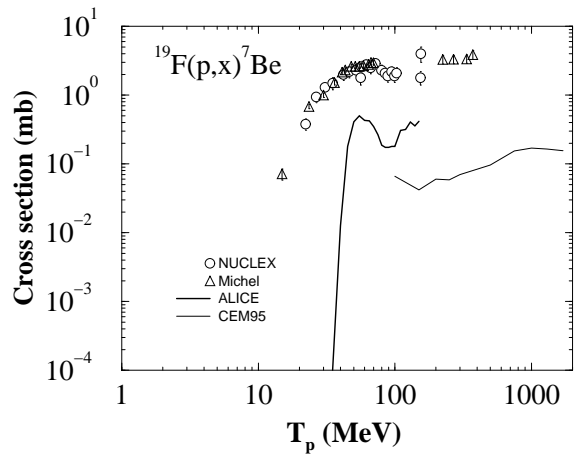
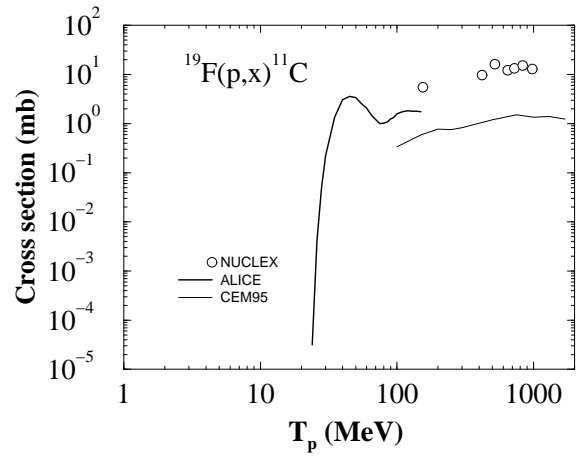
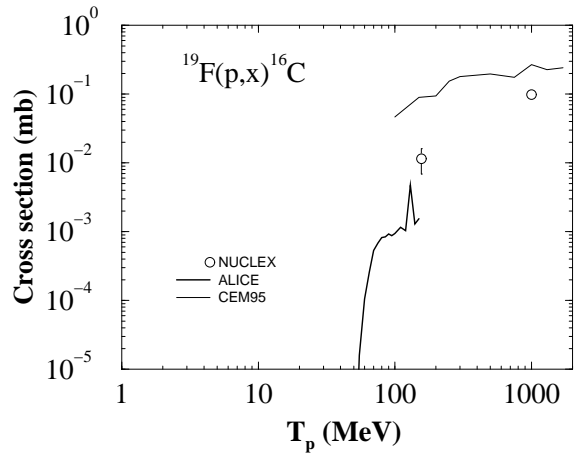


Figure 8: $p + ^{19}\text{F}$, part 2

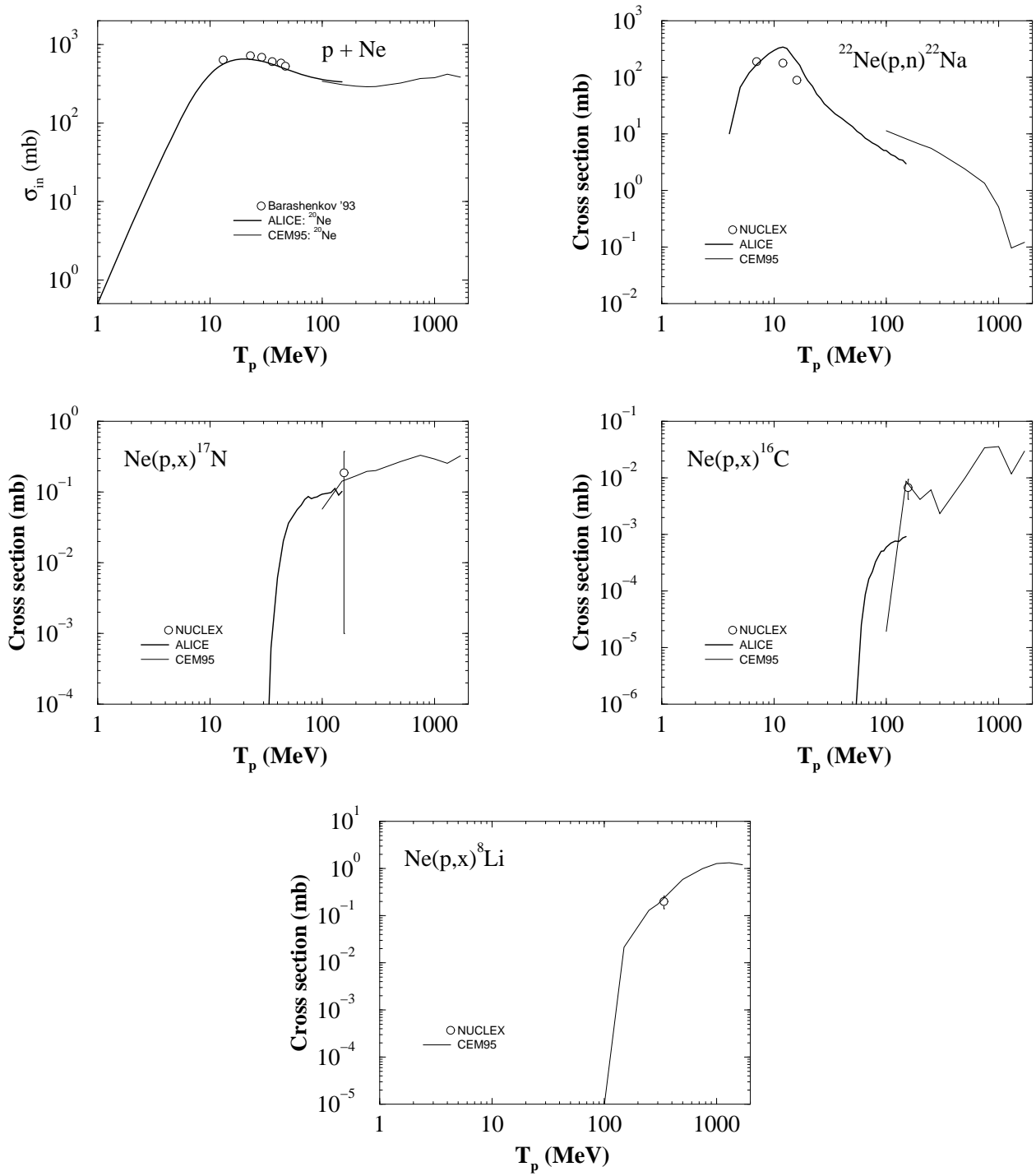


Figure 9: $p + \text{Ne}$

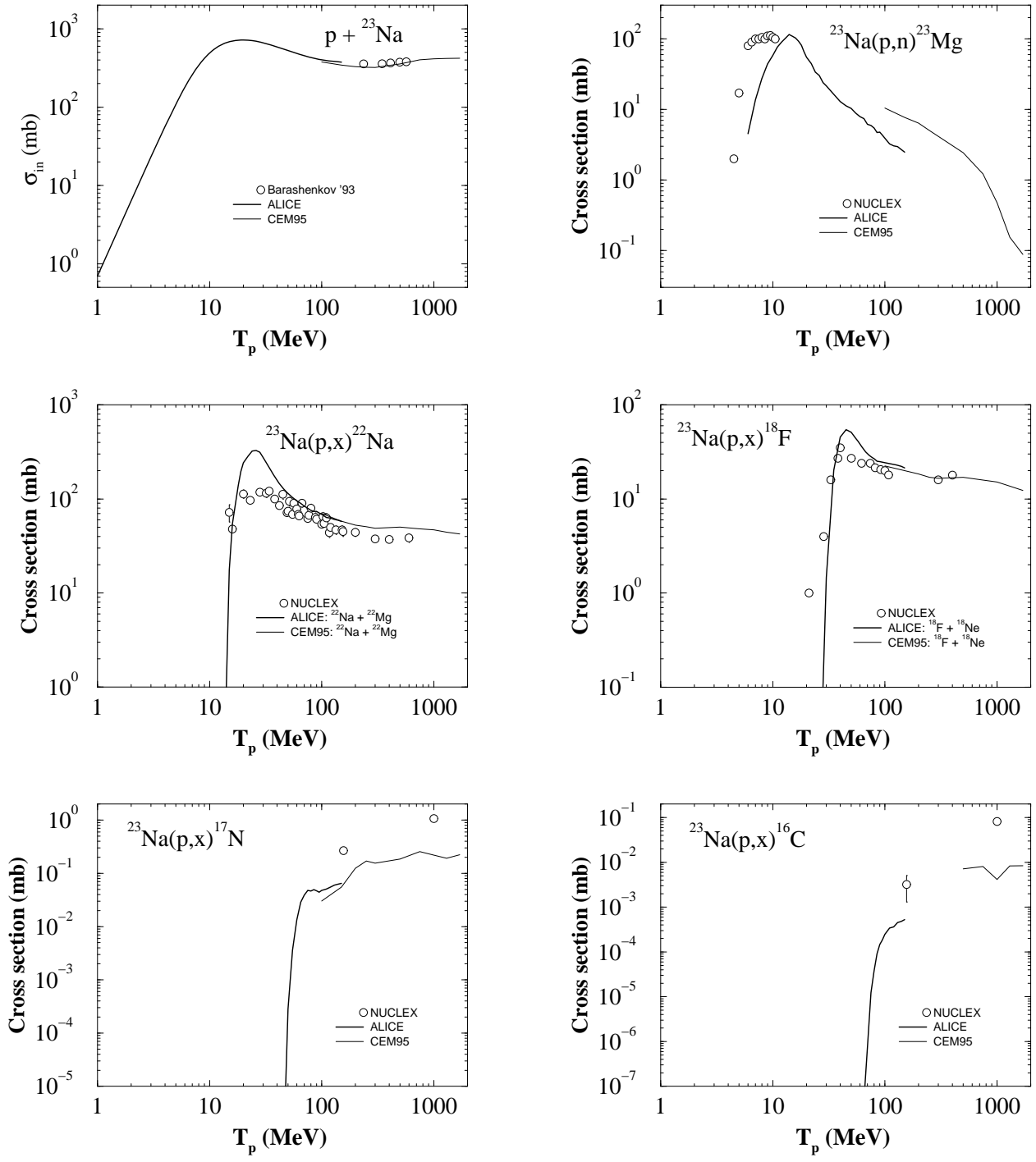


Figure 10: $p + {}^{23}\text{Na}$

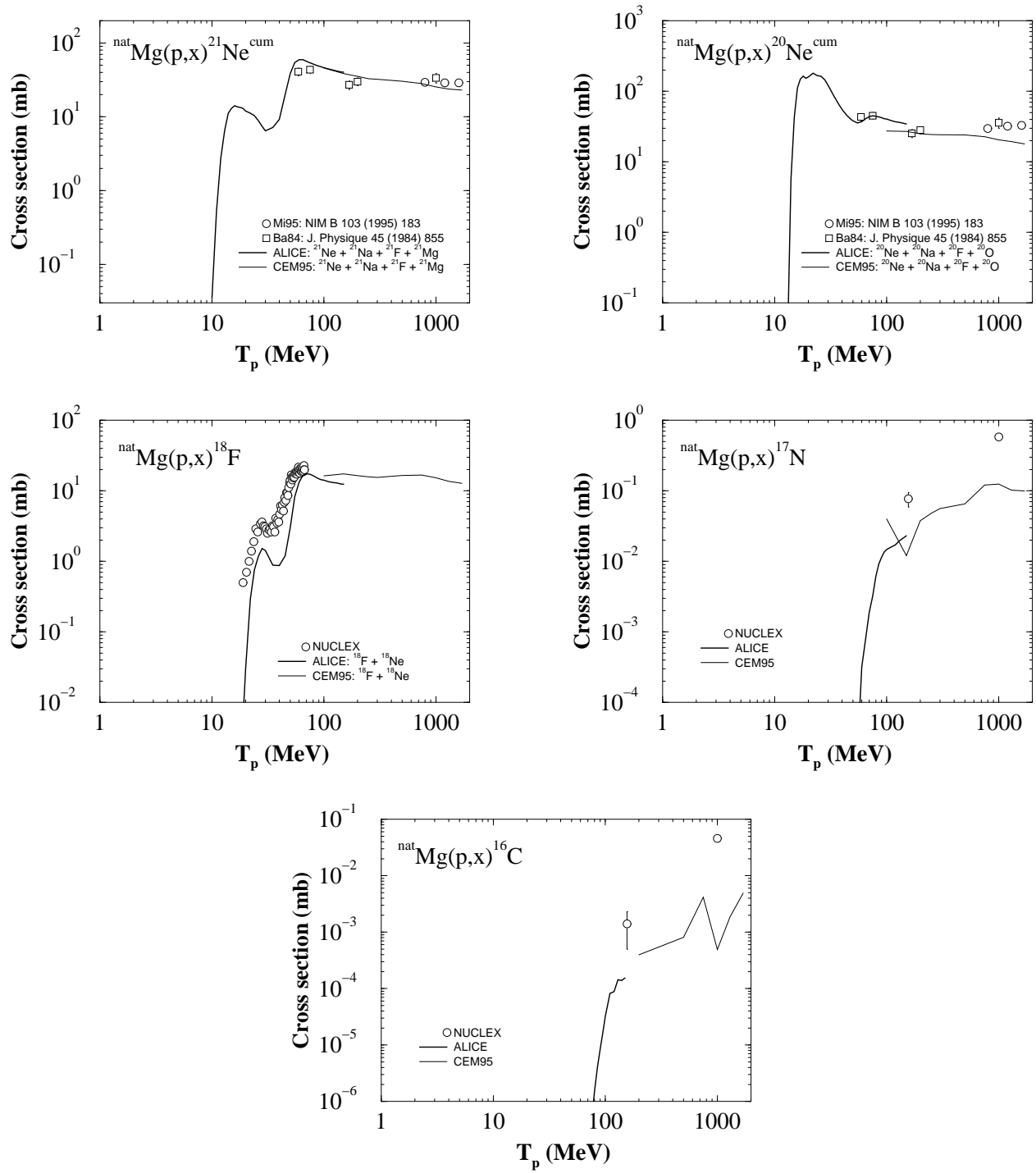


Figure 11: p + Mg, part 1

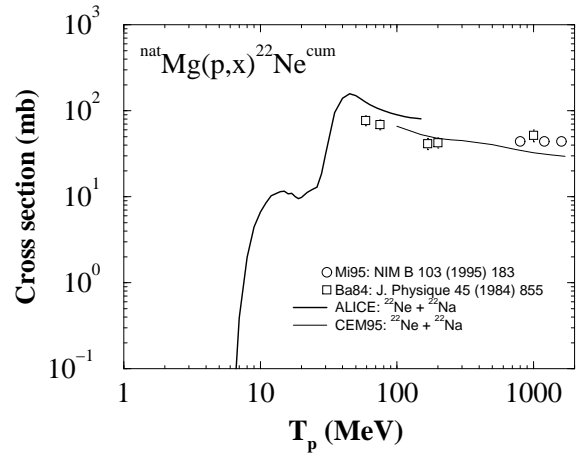
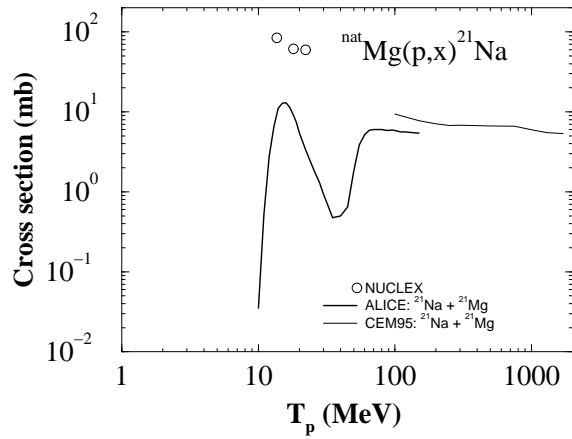
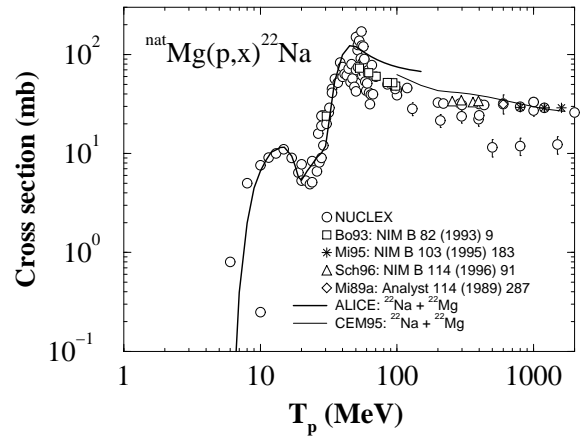
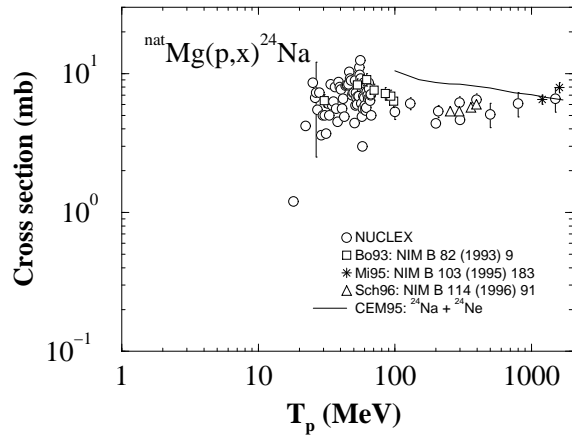
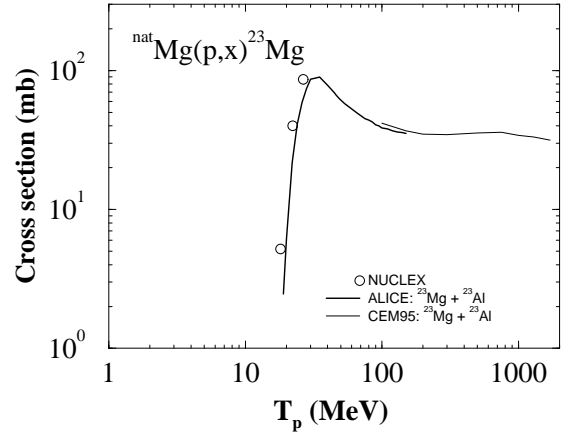
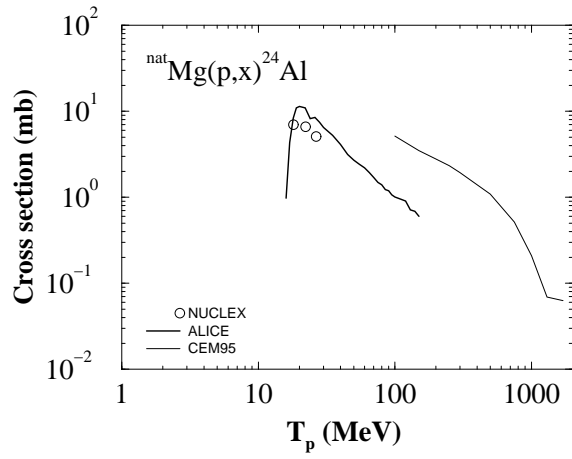


Figure 12: p + Mg, part 2

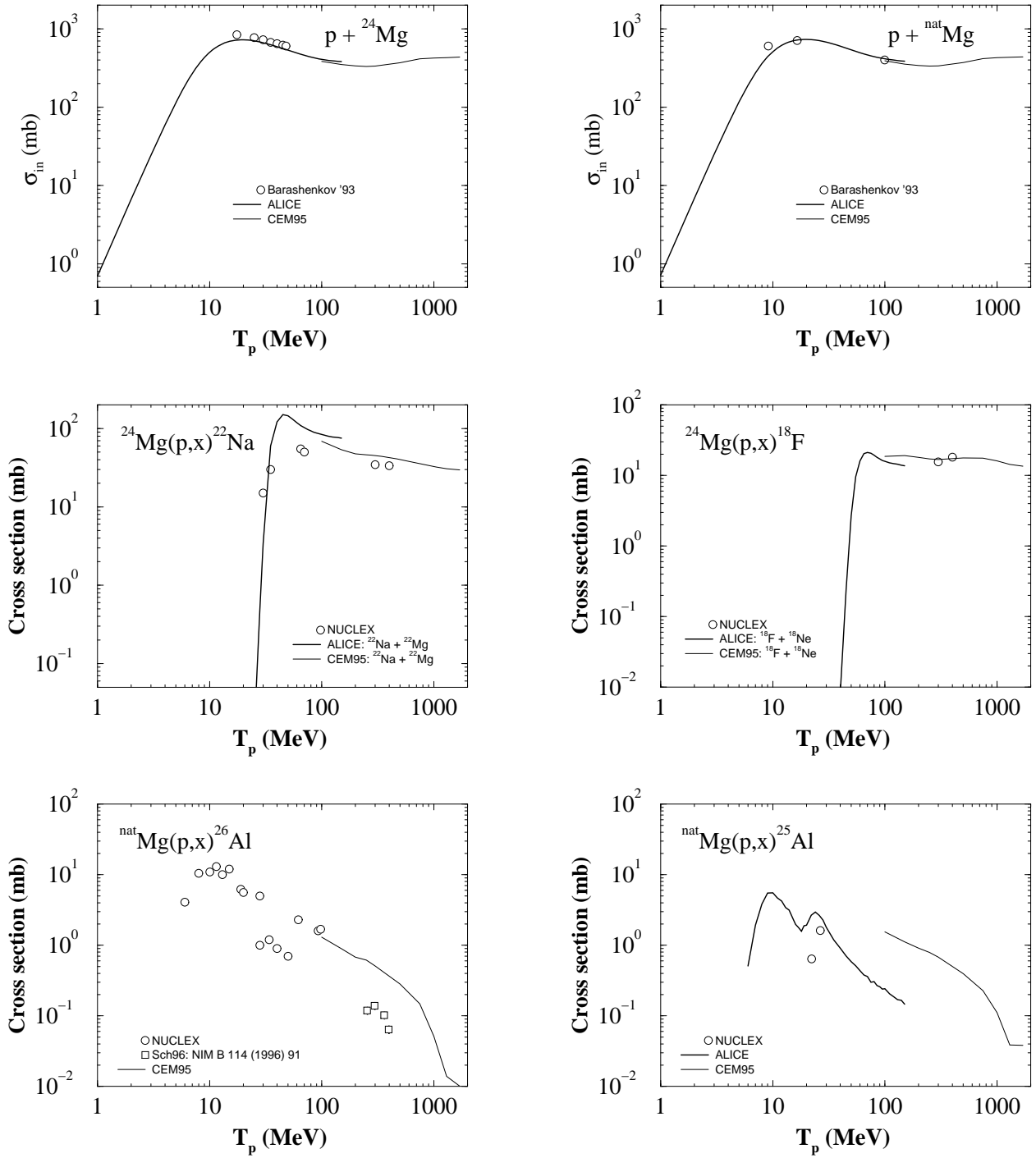


Figure 13: p + Mg, part 3

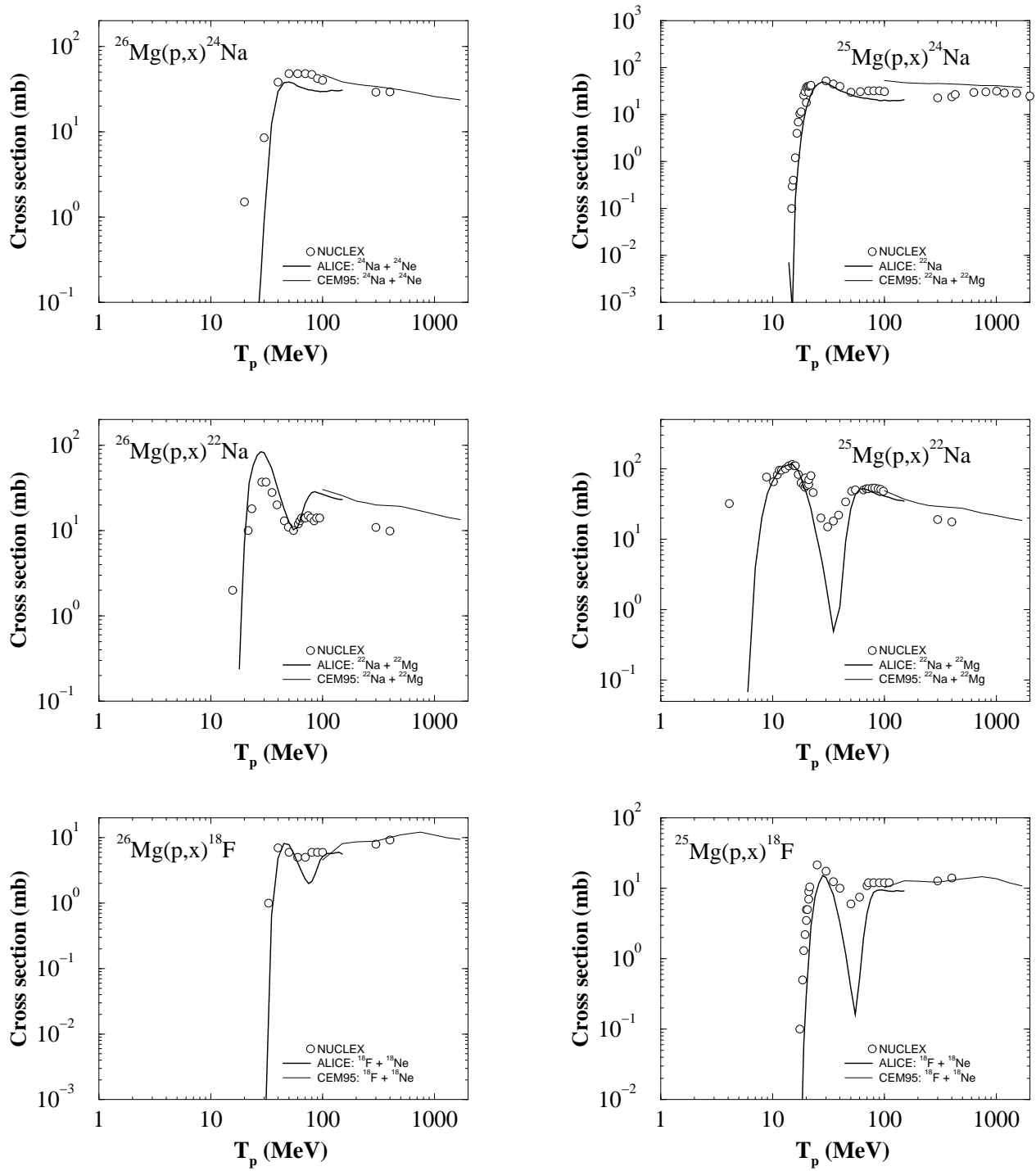


Figure 14: p + Mg, part 4

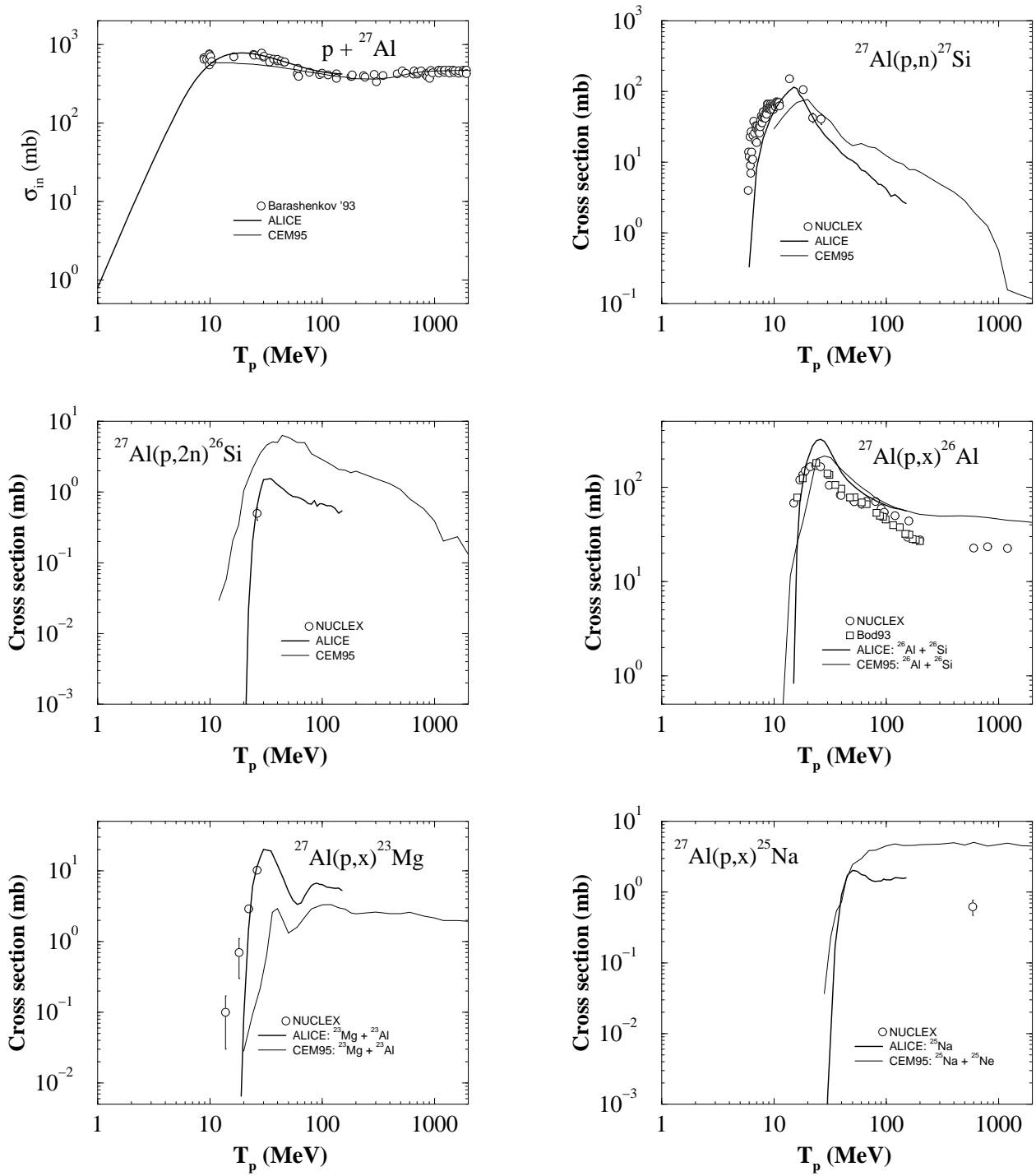


Figure 15: $p + ^{27}\text{Al}$, part 1

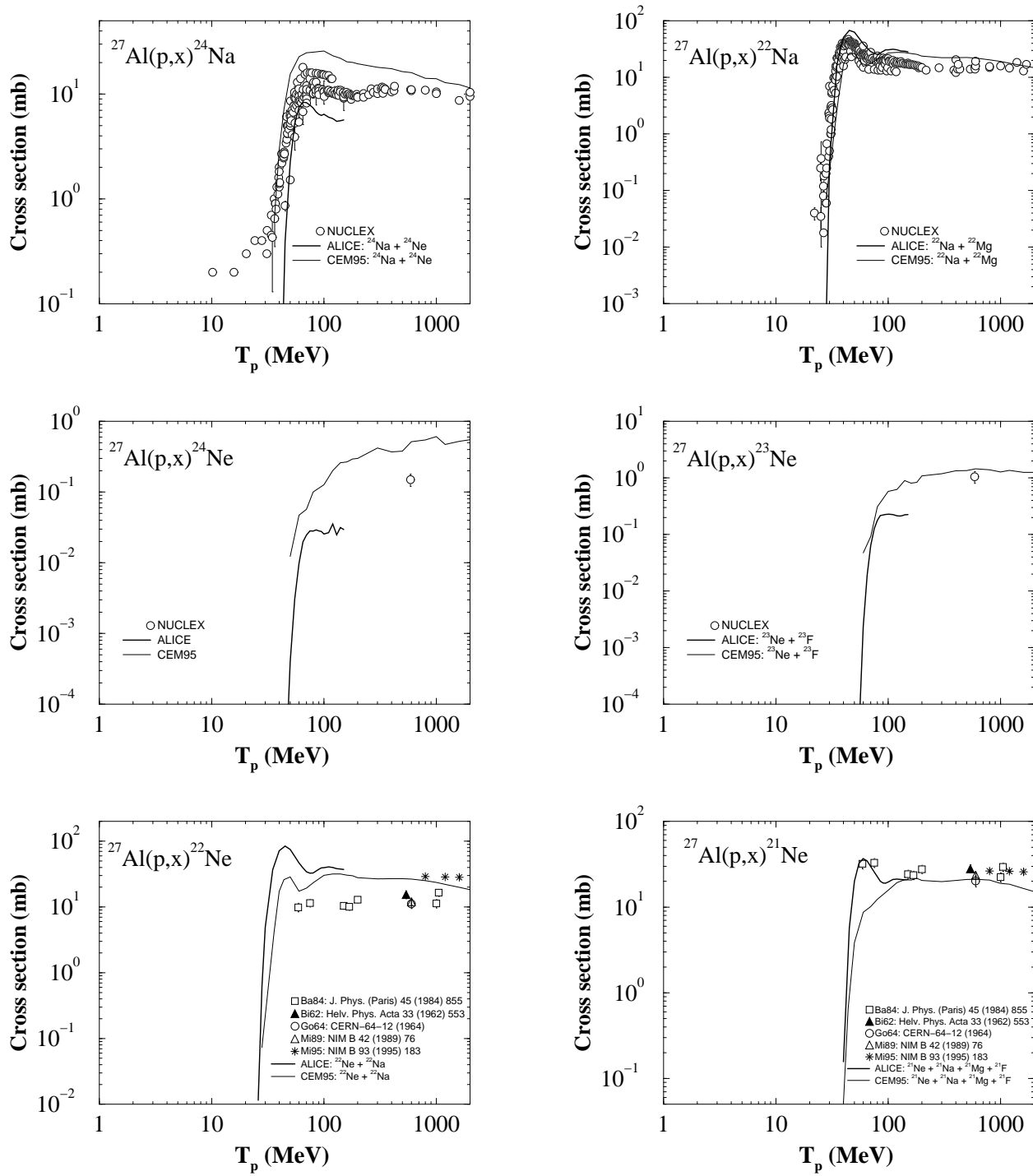


Figure 16: $p + {}^{27}\text{Al}$, part 2

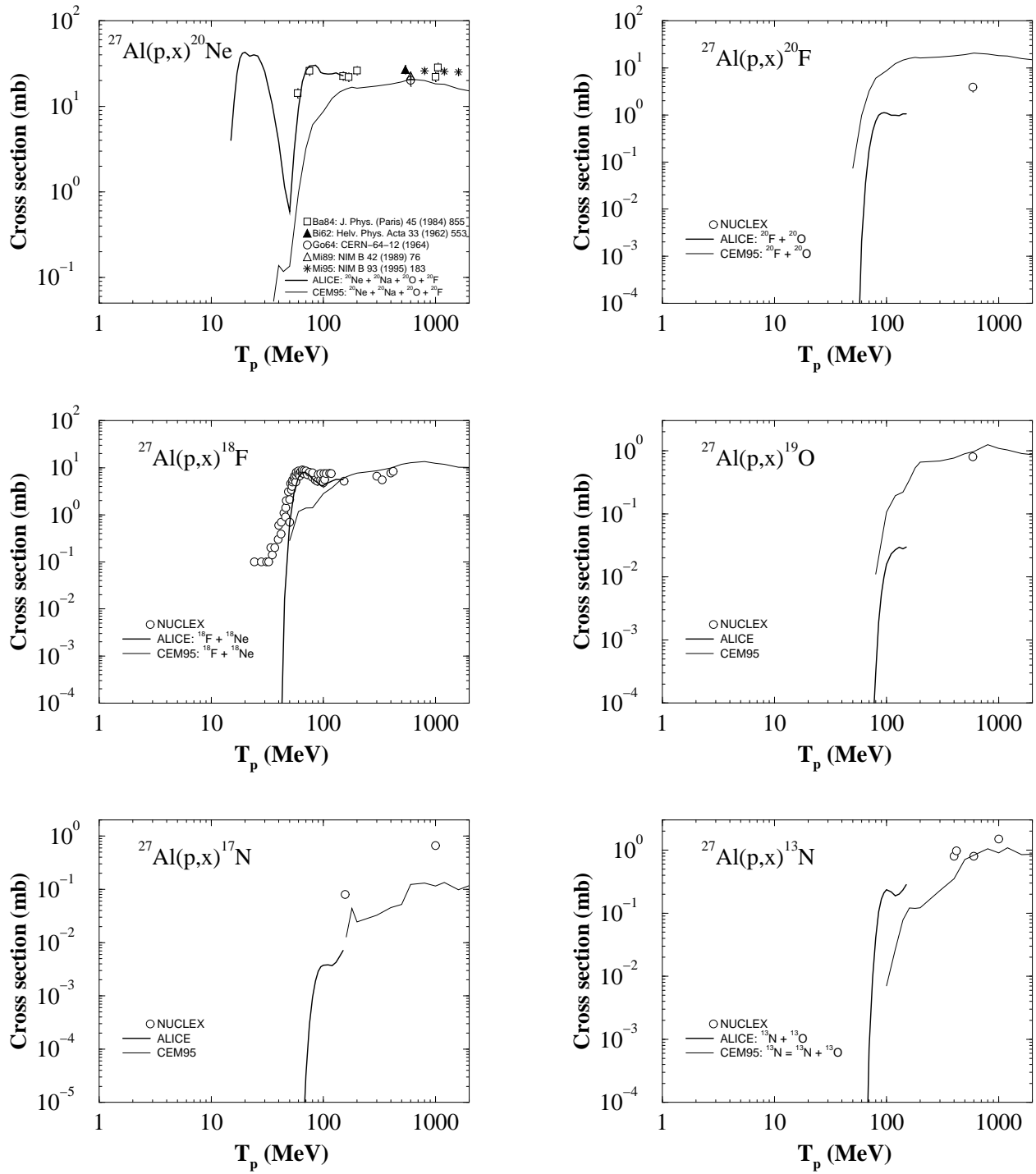


Figure 17: $p + {}^{27}\text{Al}$, part 3

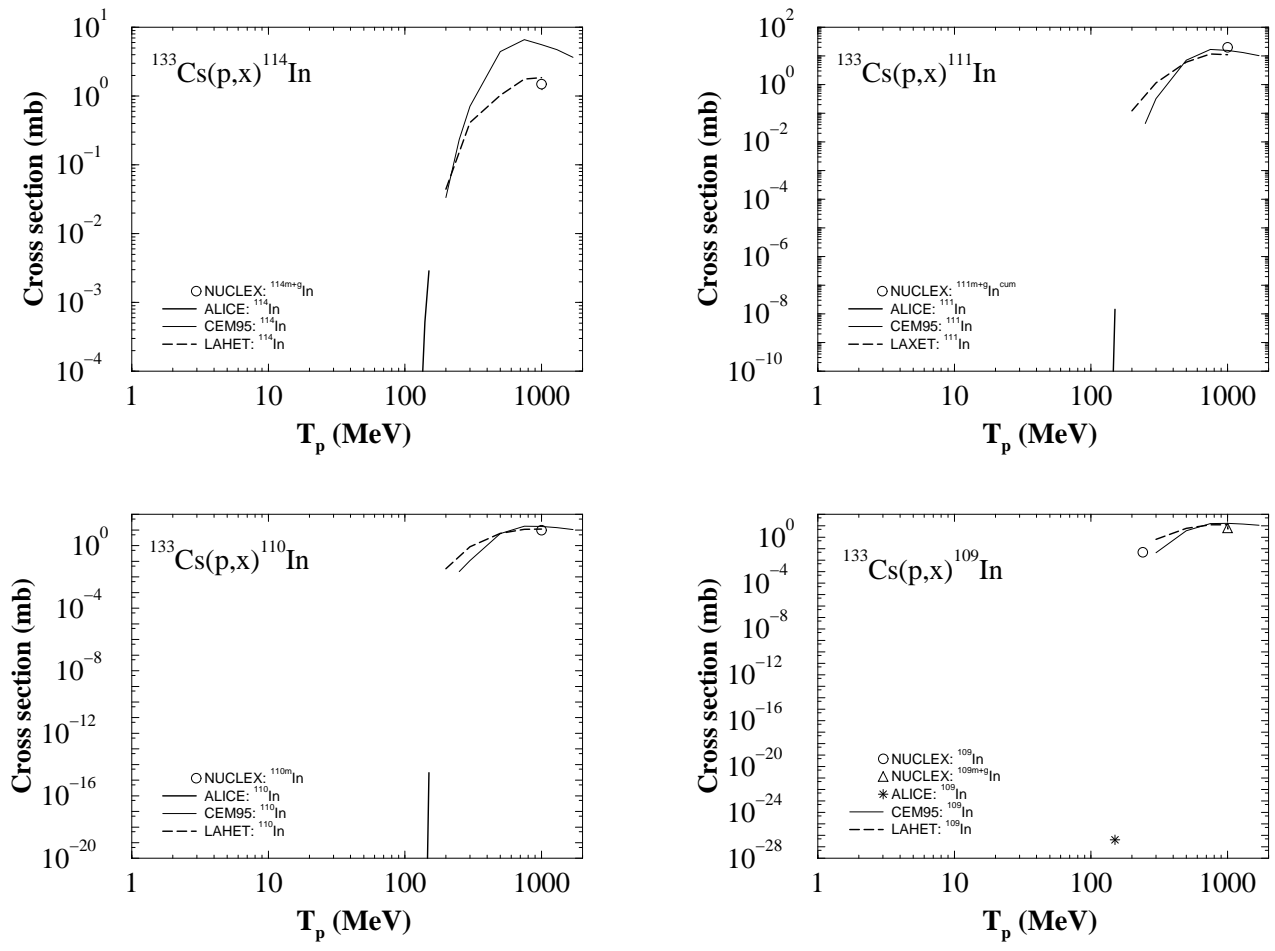


Figure 18: $p + ^{133}\text{Cs}$, part 1

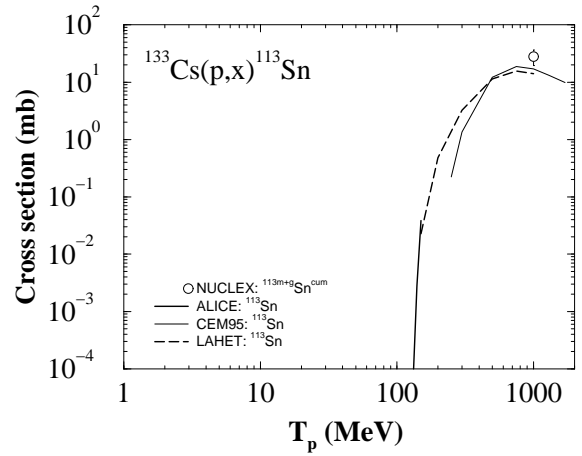
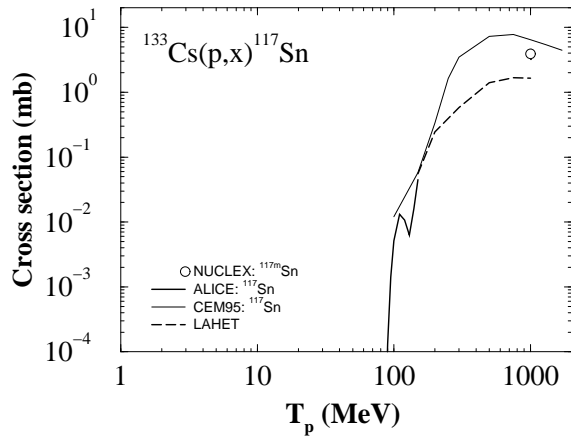
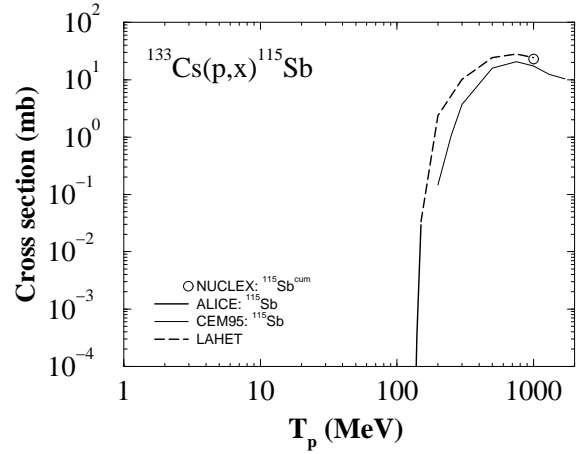
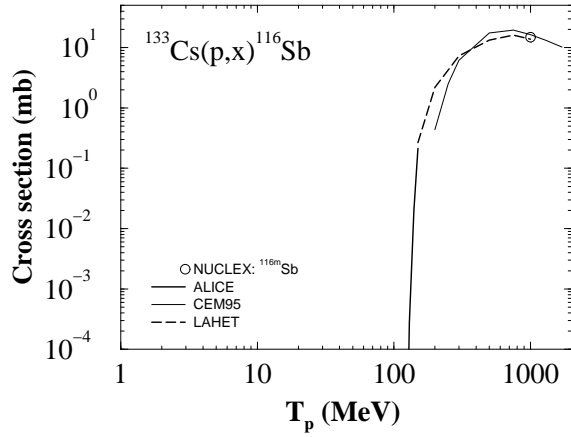
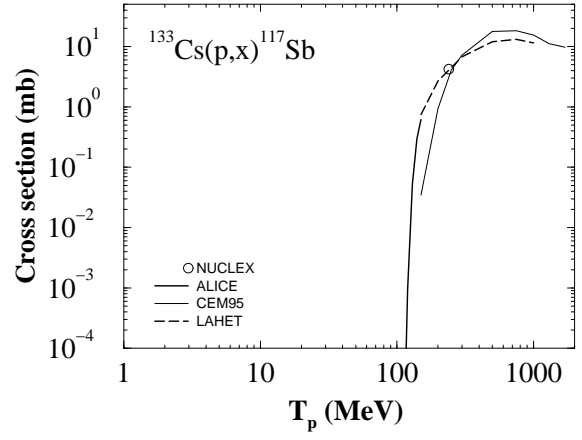
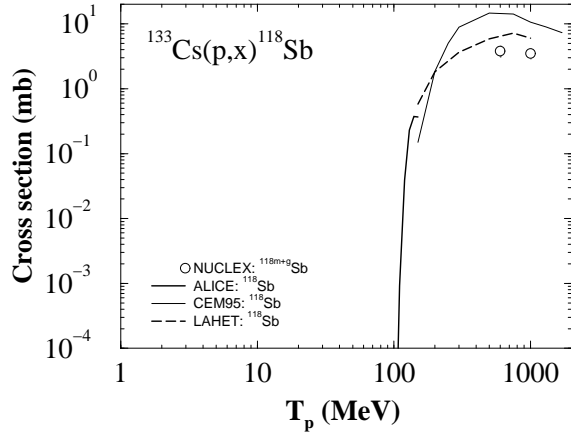


Figure 19: $p + ^{133}\text{Cs}$, part 2

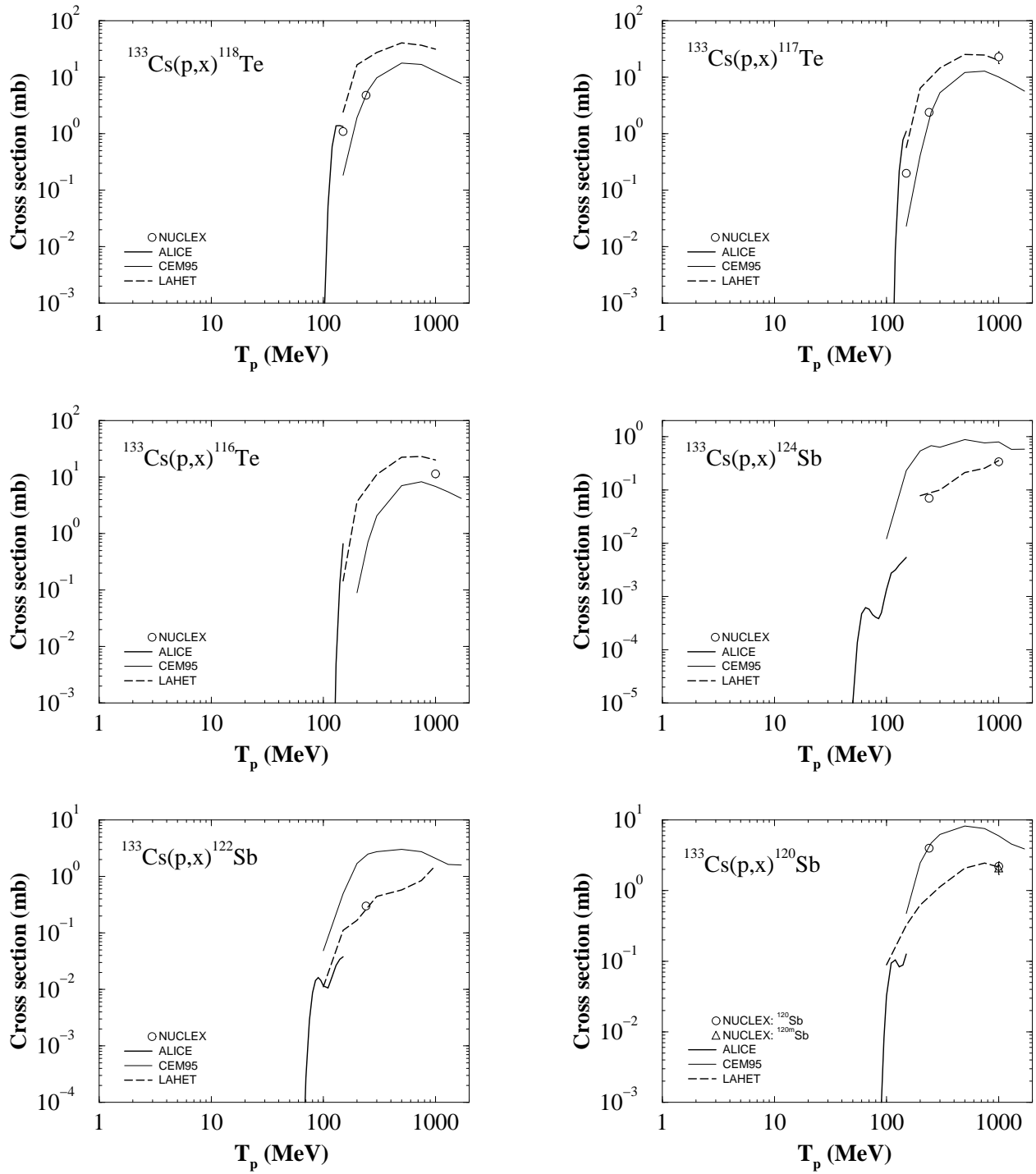


Figure 20: $p + {}^{133}\text{Cs}$, part 3

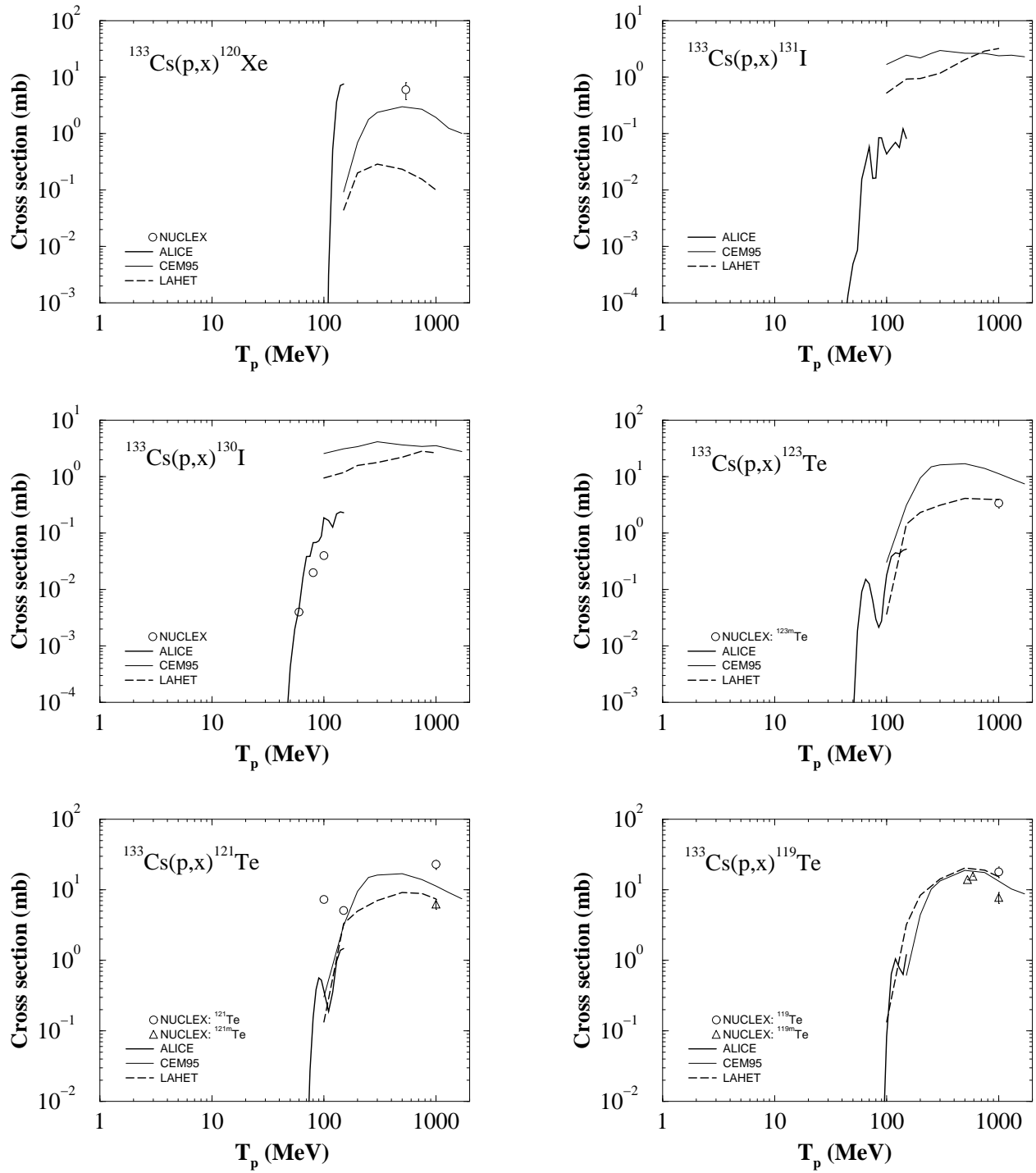


Figure 21: $p + {}^{133}\text{Cs}$, part 4

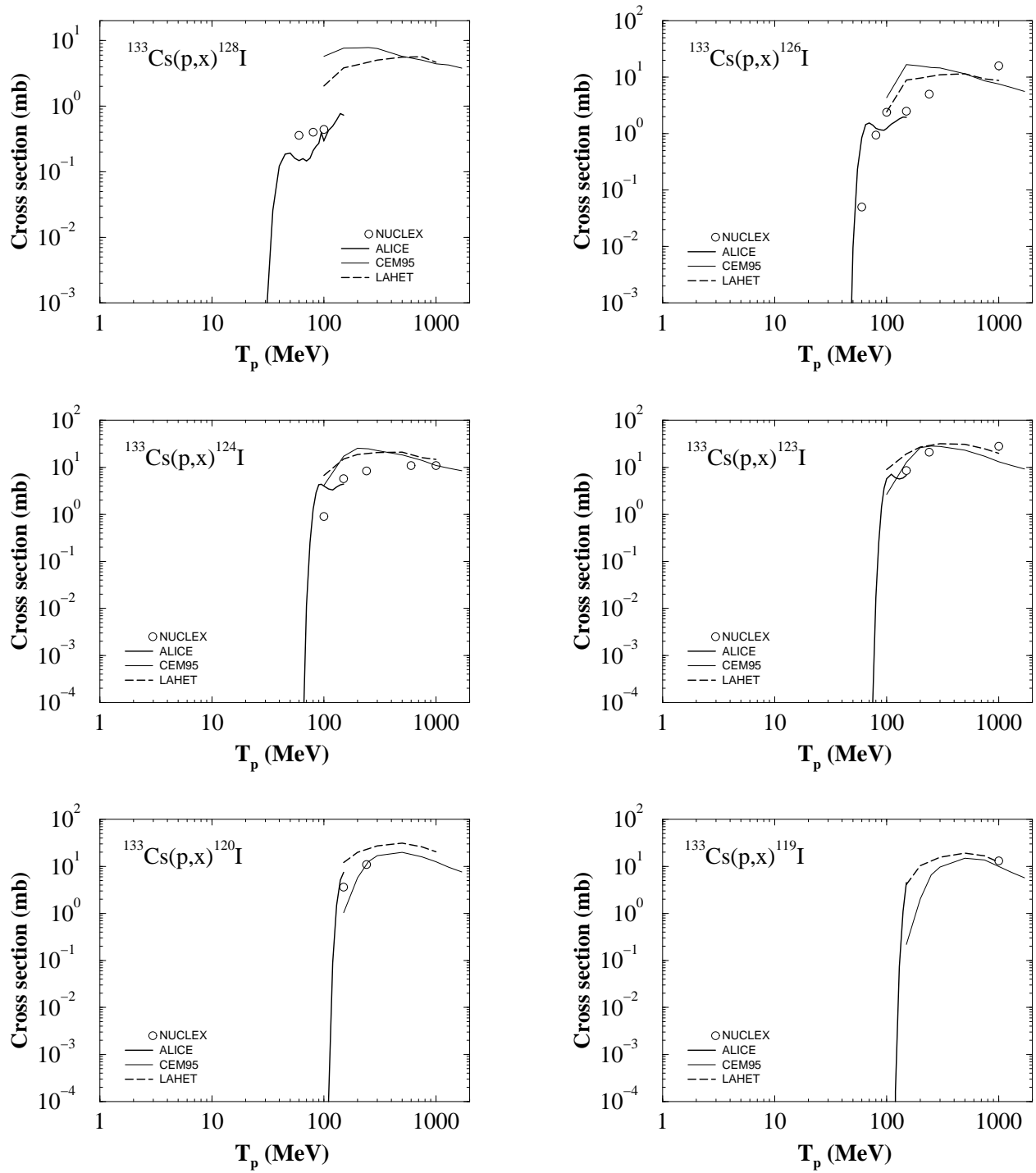


Figure 22: $p + {}^{133}\text{Cs}$, part 5

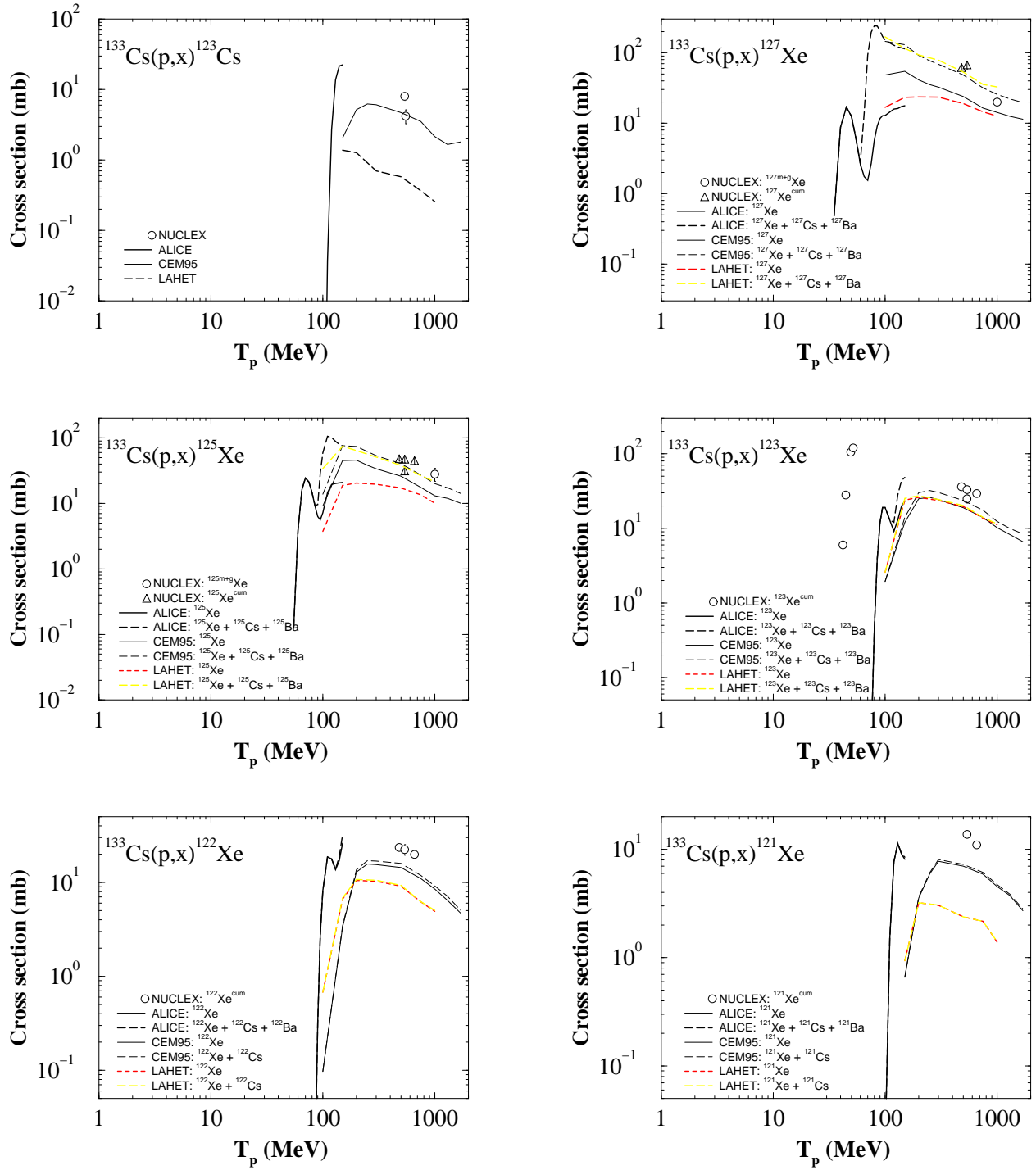


Figure 23: $p + {}^{133}\text{Cs}$, part 6

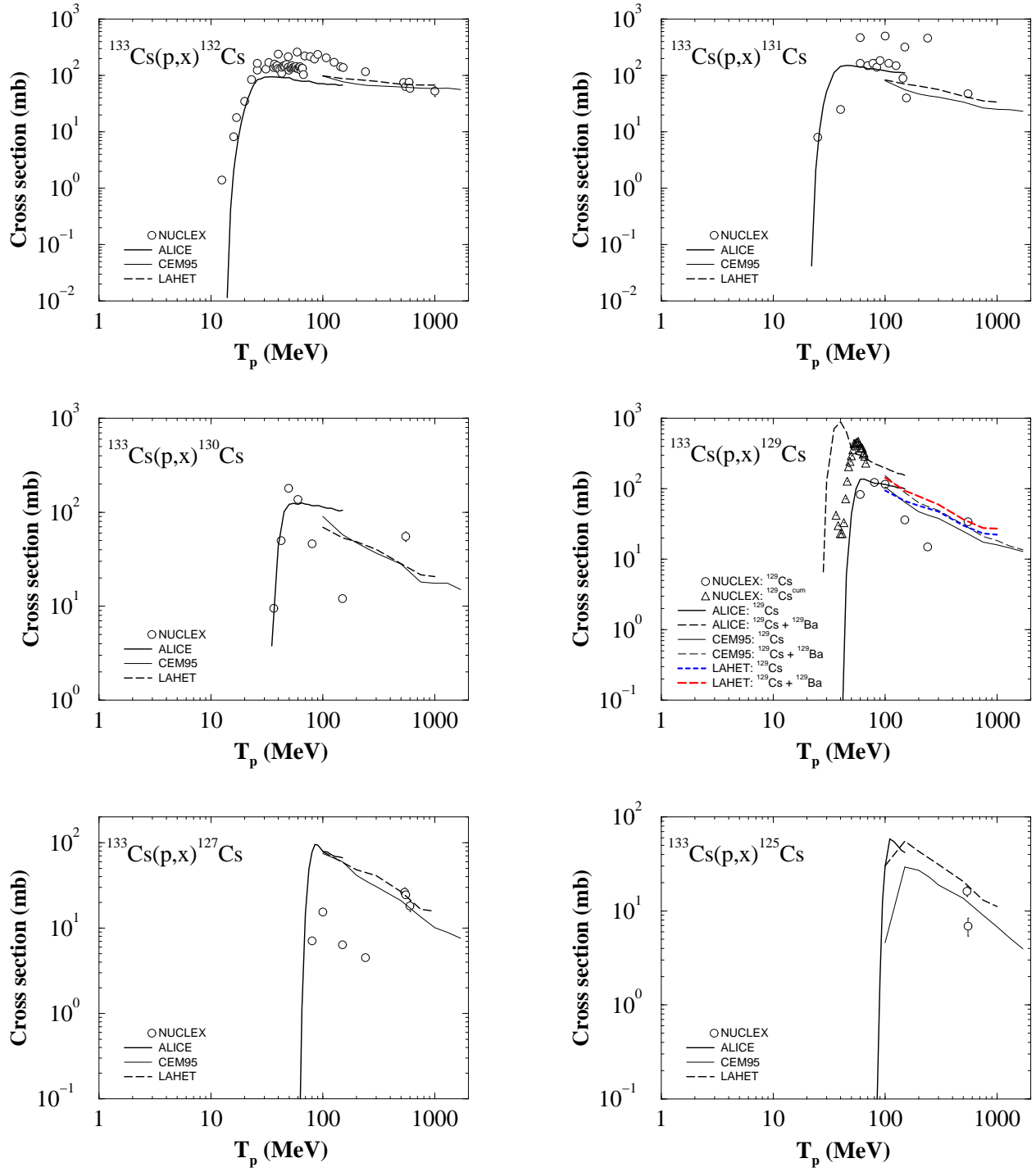


Figure 24: $p + ^{133}\text{Cs}$, part 7

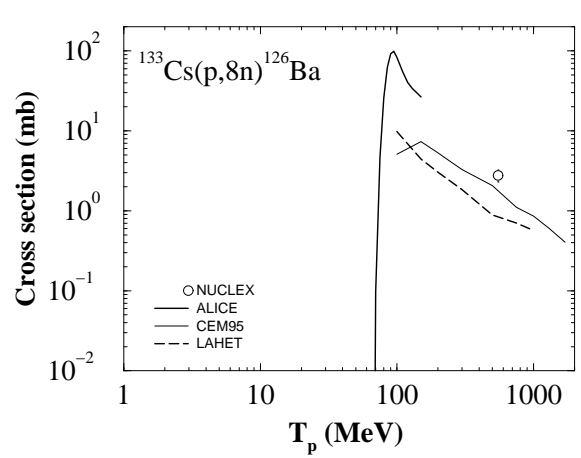
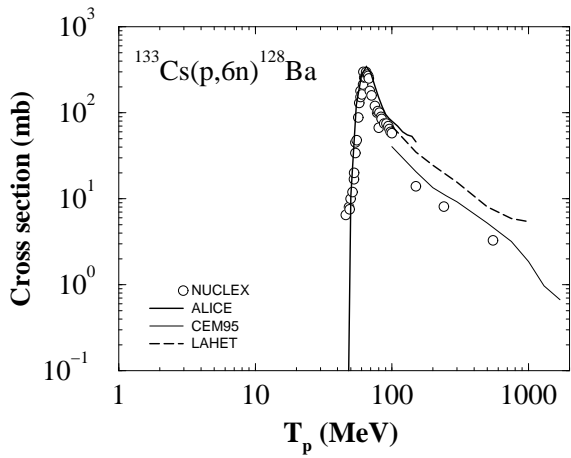
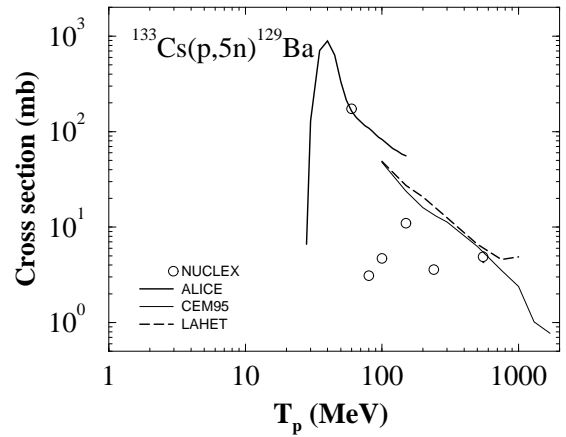
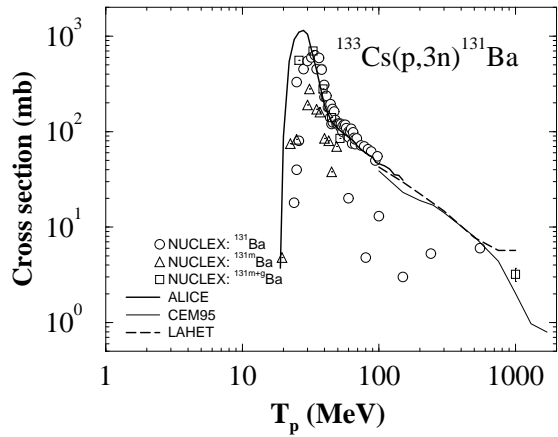
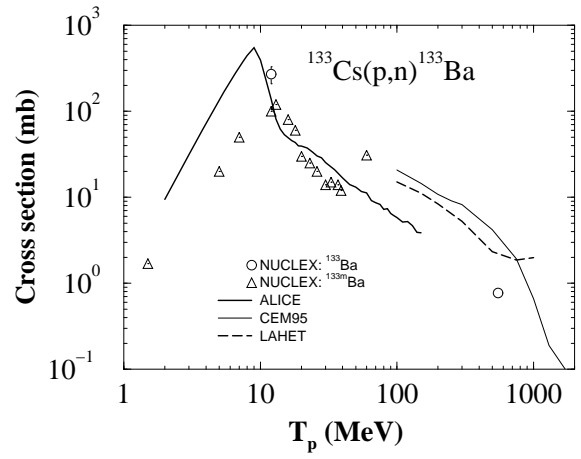
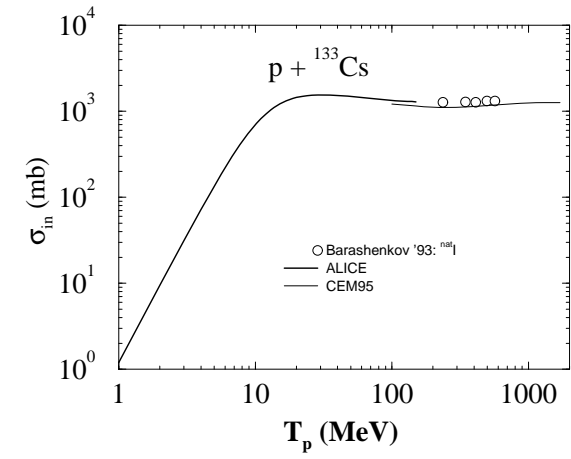


Figure 25: $p + {}^{133}\text{Cs}$, part 8

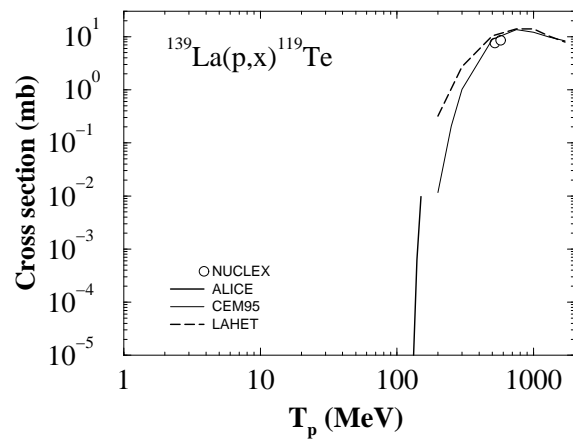
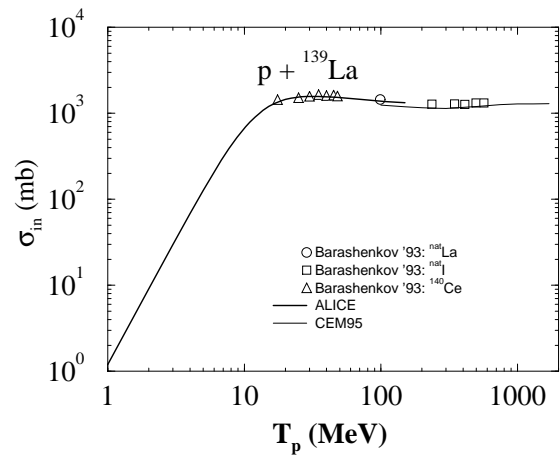


Figure 26: $p + {}^{139}\text{La}$, part 1

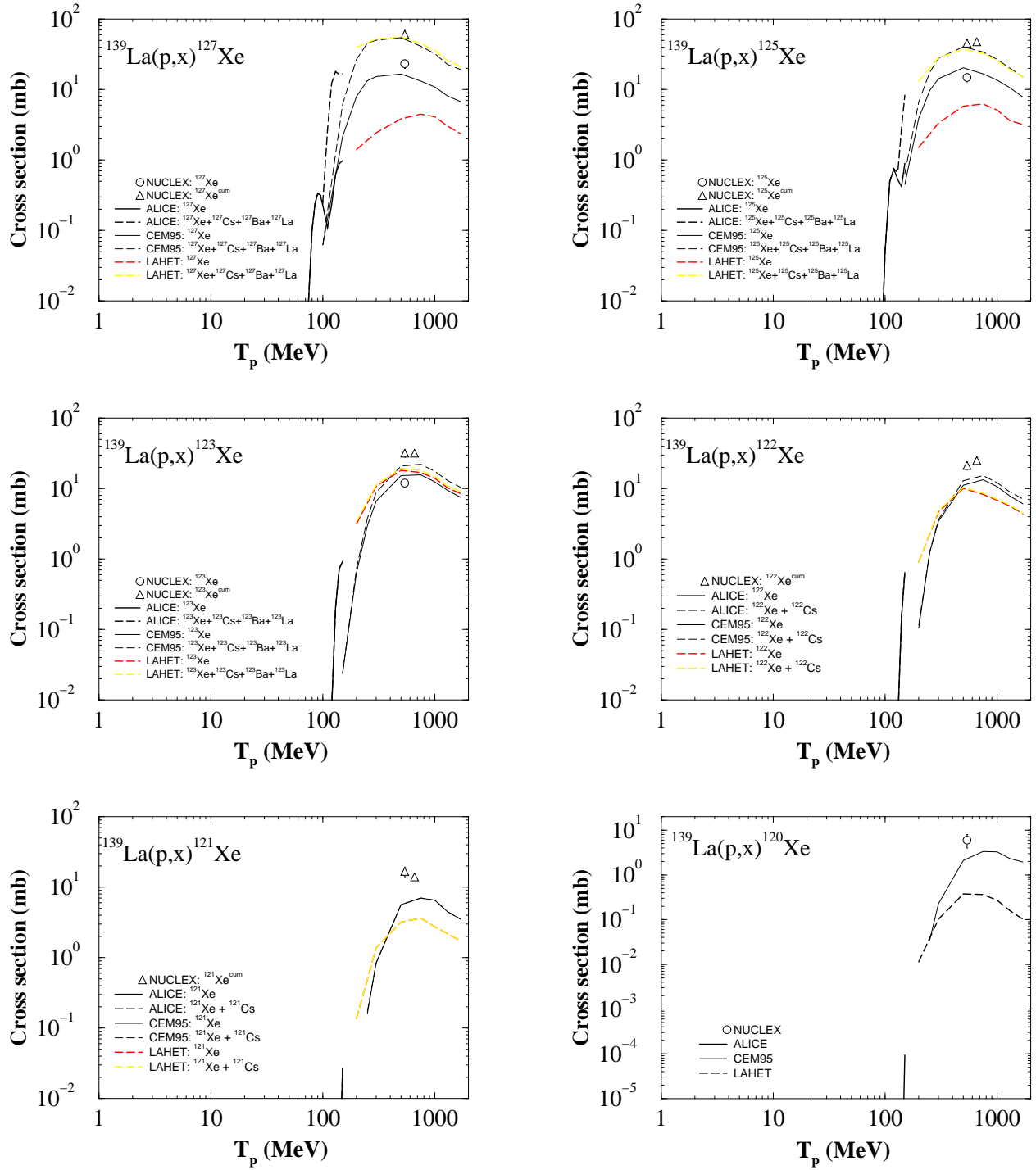


Figure 27: $p + ^{139}\text{La}$, part 2

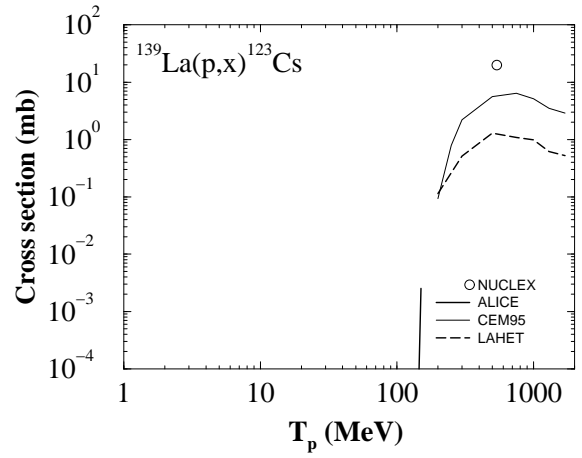
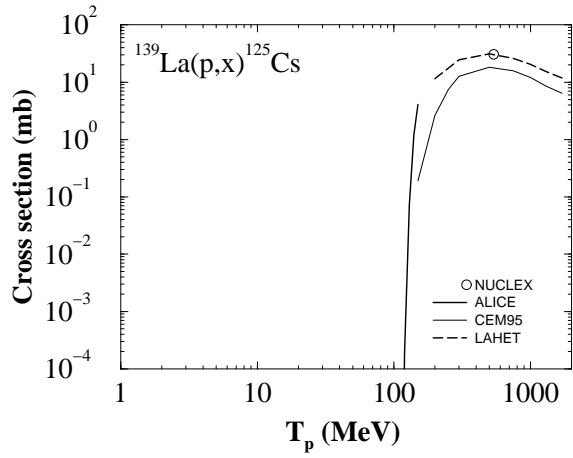
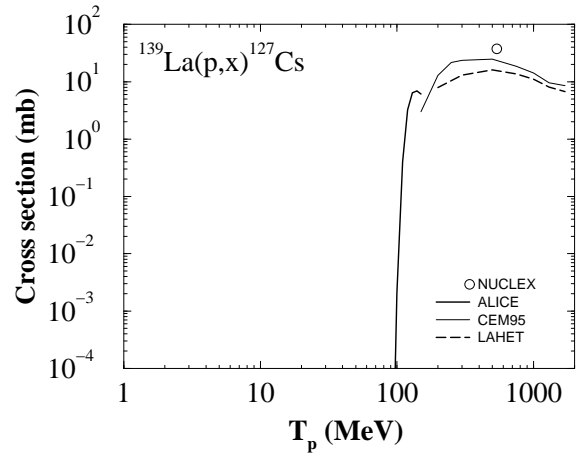
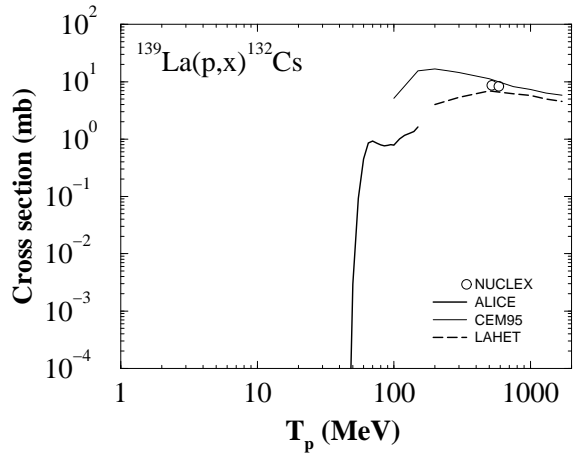
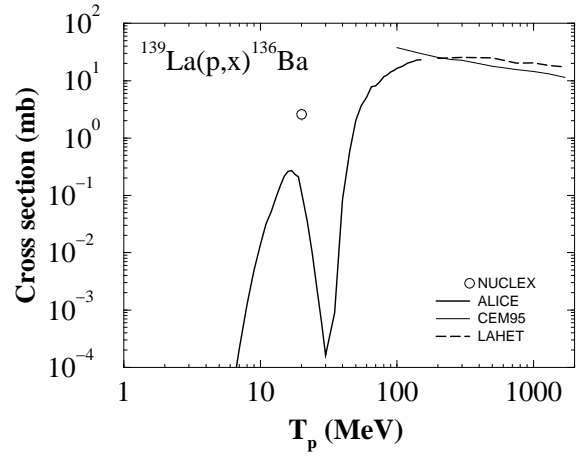
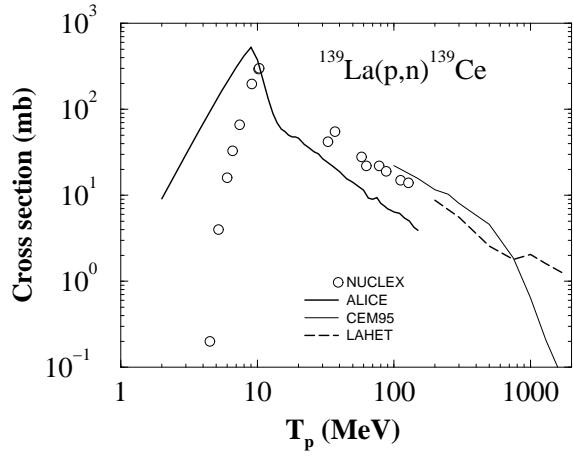


Figure 28: $p + ^{139}\text{La}$, part 3

Appendix D

Summary of Reaction Data, Production of ¹⁸F and ¹³¹I in APT

Target Nuclide/ Element	Natural Abundance	Product Nuclide	Protons, FwdBlknt		Neutrons, FwdBlknt		Forward Blanket Total Productn Ci/g-hr	Protons, AftBlknt		Neutrons, AftBlknt		Aft Blanket Total Productn Ci/g-hr
			Cross Section, mb	Productn Rate, Ci/g-hr	Cross Section, mb	Productn Rate, Ci/g-hr		Cross Section, mb	Productn Rate, Ci/g-hr	Cross Section, mb	Productn Rate, Ci/g-hr	
80 18	0.0020	9F 18	9.16E+00	1.27E-04	0.	0.	1.27E-04	2.96E+00	4.40E-03	0.	0.	4.40E-03
80 nat	1.0000	F 18	1.83E-02	2.85E-07	0.	0.	2.85E-07	5.92E-03	9.89E-06	0.	0.	9.89E-06
9F 19	1.0000	10Ne 18	5.23E-01	6.86E-06	0.	0.	6.86E-06	2.94E-01	4.14E-04	0.	0.	4.14E-04
		9F 18	4.37E+01	5.73E-04	2.03E+00	3.38E-02	3.44E-02	4.33E+01	6.10E-02	3.83E+00	1.91E-01	2.52E-01
9F nat	1.0000	F 18	4.42E+01	5.80E-04	2.03E+00	3.38E-02	3.44E-02	4.36E+01	6.14E-02	3.83E+00	1.91E-01	2.53E-01
10Ne 20	0.9048	11Na 18	9.10E-03	1.13E-07	9.22E-07	1.46E-08	1.28E-07	9.85E-03	1.32E-05	1.35E-06	6.38E-08	1.32E-05
		10Ne 18	2.64E+00	3.30E-05	8.28E-03	1.31E-04	1.64E-04	3.53E+00	4.73E-03	6.72E-02	3.18E-03	7.91E-03
		9F 18	3.04E+01	3.78E-04	3.53E-01	5.59E-03	5.97E-03	2.79E+01	3.74E-02	1.30E+00	6.15E-02	9.89E-02
		net F 18	3.30E+01	4.11E-04	3.61E-01	5.72E-03	6.13E-03	3.15E+01	4.21E-02	1.37E+00	6.47E-02	1.07E-01
10Ne 21	0.0027	11Na 18	1.93E-03	2.30E-08	4.07E-05	6.13E-07	6.36E-07	2.51E-03	3.20E-06	4.38E-05	1.98E-06	5.18E-06
		10Ne 18	2.93E-01	3.48E-06	6.28E-04	9.47E-06	1.29E-05	4.50E-01	5.73E-04	5.99E-03	2.70E-04	8.43E-04
		9F 18	2.13E+01	2.52E-04	9.87E-02	1.49E-03	1.74E-03	1.82E+01	2.32E-02	5.17E-01	2.33E-02	4.66E-02
		net F 18	2.15E+01	2.56E-04	9.94E-02	1.50E-03	1.75E-03	1.87E+01	2.38E-02	5.23E-01	2.36E-02	4.74E-02
10Ne 22	0.0925	11Na 18	6.97E-04	7.90E-09	1.18E-05	1.70E-07	1.78E-07	2.74E-03	3.33E-06	1.67E-05	7.21E-07	4.05E-06
		10Ne 18	3.49E-02	3.95E-07	6.93E-05	9.97E-07	1.39E-06	6.73E-02	8.18E-05	5.87E-04	2.53E-05	1.07E-04
		9F 18	1.55E+01	1.75E-04	4.25E-02	6.11E-04	7.87E-04	1.31E+01	1.60E-02	2.72E-01	1.17E-02	2.77E-02
		net F 18	1.55E+01	1.76E-04	4.26E-02	6.12E-04	7.88E-04	1.32E+01	1.60E-02	2.73E-01	1.17E-02	2.78E-02
10Ne nat	1.0000	F 18	3.14E+01	3.87E-04	3.31E-01	5.19E-03	5.58E-03	2.97E+01	3.94E-02	1.26E+00	5.93E-02	9.87E-02
11Na 23	1.0000	12Hg 18	4.08E-09	4.42E-14	4.85E-07	6.68E-09	6.68E-09	4.99E-09	5.81E-12	8.55E-07	3.52E-08	3.52E-08
		11Na 18	2.17E-03	2.35E-08	1.28E-06	1.76E-08	4.11E-08	8.54E-03	9.94E-06	2.52E-05	1.04E-06	1.10E-05
		10Ne 18	1.14E-01	1.24E-06	9.64E-05	1.33E-06	2.56E-06	1.46E-01	1.70E-04	1.03E-03	4.24E-05	1.12E-04
		9F 18	1.72E+01	1.87E-04	3.56E-01	4.90E-03	5.08E-03	1.61E+01	1.88E-02	1.05E+00	4.33E-02	6.21E-02
11Na nat	1.0000	F 18	1.73E+01	1.88E-04	3.56E-01	4.90E-03	5.09E-03	1.63E+01	1.90E-02	1.05E+00	4.34E-02	6.23E-02
12Hg 24	0.7899	13Al 18	1.40E-23	1.45E-28	1.75E-08	2.31E-10	2.31E-10	1.71E-23	1.90E-26	2.16E-08	8.51E-10	8.51E-10
		12Hg 18	5.43E-10	5.64E-15	8.77E-13	1.16E-14	1.72E-14	6.63E-10	7.39E-13	8.16E-12	3.22E-13	1.06E-12
		11Na 18	1.06E-03	1.10E-08	1.16E-06	1.53E-08	2.63E-08	4.21E-03	4.69E-06	2.17E-05	8.56E-07	5.55E-06
		10Ne 18	1.76E-01	1.83E-06	5.57E-04	7.34E-06	9.17E-06	2.60E-01	2.90E-04	3.28E-03	1.29E-04	4.19E-04
		9F 18	1.44E+01	1.49E-04	1.41E-01	1.86E-03	2.01E-03	1.51E+01	1.68E-02	5.93E-01	2.34E-02	4.02E-02
		net F 18	1.46E+01	1.51E-04	1.41E-01	1.86E-03	2.02E-03	1.54E+01	1.71E-02	5.96E-01	2.35E-02	4.06E-02
12Hg 25	0.1000	13Al 18	6.85E-05	6.83E-10	5.90E-06	7.46E-08	7.53E-08	2.06E-05	2.20E-08	1.37E-05	5.20E-07	5.42E-07
		12Hg 18	1.39E-11	1.39E-16	9.50E-15	1.20E-16	2.59E-16	1.70E-11	1.82E-14	9.13E-14	3.46E-15	2.16E-14
		11Na 18	1.05E-03	1.05E-08	5.94E-10	7.52E-12	1.05E-08	4.20E-03	4.49E-06	5.41E-09	2.05E-10	4.49E-06
		10Ne 18	3.70E-02	3.69E-07	9.74E-05	1.23E-06	1.60E-06	5.65E-02	6.04E-05	6.63E-04	2.51E-05	8.56E-05
		9F 18	1.00E+01	1.00E-04	6.07E-02	7.69E-04	8.69E-04	1.21E+01	1.30E-02	3.27E-01	1.24E-02	2.54E-02
		net F 18	1.01E+01	1.00E-04	6.08E-02	7.70E-04	8.70E-04	1.22E+01	1.30E-02	3.28E-01	1.24E-02	2.55E-02
12Hg 26	0.1101	13Al 18	3.10E-09	2.97E-14	8.01E-16	9.75E-18	2.97E-14	4.30E-10	4.43E-13	1.41E-15	5.14E-17	4.43E-13
		12Hg 18	1.66E-15	1.59E-20	5.42E-16	6.60E-18	6.61E-18	2.03E-15	2.09E-18	5.23E-15	1.91E-16	1.93E-16
		11Na 18	1.19E-06	1.15E-11	5.81E-11	7.07E-13	1.22E-11	1.45E-06	1.49E-09	5.57E-10	2.03E-11	1.51E-09
		10Ne 18	8.87E-03	8.51E-08	2.27E-05	2.76E-07	3.62E-07	1.76E-02	1.81E-05	1.54E-04	5.61E-06	2.37E-05
		9F 18	7.23E+00	6.94E-05	2.67E-02	3.25E-04	3.94E-04	9.47E+00	9.75E-03	1.93E-01	7.03E-03	1.68E-02
		net F 18	7.24E+00	6.95E-05	2.67E-02	3.25E-04	3.94E-04	9.49E+00	9.76E-03	1.93E-01	7.04E-03	1.68E-02
12Hg nat	1.0000	F 18	1.33E+01	1.36E-04	1.21E-01	1.57E-03	1.71E-03	1.44E+01	1.58E-02	5.25E-01	2.05E-02	3.63E-02

Target Nuclide/Element	Natural Abundance	Product Nuclide	Protons, FwdBlknt			Neutrons, FwdBlknt			Forward Blanket Total	Protons, AftBlknt		Neutrons, AftBlknt		Aft Blanket Total
			Cross Section, mb	Productn Rate, Ci/g-hr	Cross Section, mb	Productn Rate, Ci/g-hr	Cross Section, mb	Productn Rate, Ci/g-hr		Cross Section, mb	Productn Rate, Ci/g-hr	Cross Section, mb	Productn Rate, Ci/g-hr	
13Al 27	1.0000	14Si 18	0.	0.	1.40E-07	1.64E-09	1.64E-09	1.22E-07	1.20E-10	3.14E-07	1.10E-08	1.11E-08		
		13Al 18	0.	0.	1.40E-07	1.64E-09	1.64E-09	1.22E-07	1.20E-10	3.14E-07	1.10E-08	1.11E-08		
		12Mg 18	8.42E-03	7.77E-08	3.62E-23	4.24E-25	7.77E-08	3.17E-03	3.14E-06	3.49E-22	1.22E-23	3.14E-06		
		11Na 18	1.99E-06	1.84E-11	9.76E-10	1.14E-11	2.99E-11	2.44E-06	2.41E-09	8.37E-09	2.94E-10	2.71E-09		
		10Ne 18	1.98E-02	1.82E-07	2.50E-05	2.93E-07	4.75E-07	4.70E-02	4.66E-05	2.99E-04	1.05E-05	5.71E-05		
		9F 18	7.09E+00	6.54E-05	3.60E-02	4.22E-04	4.88E-04	1.04E+01	1.03E-02	2.11E-01	7.39E-03	1.77E-02		
13Al nat	1.0000	F 18	7.12E+00	6.57E-05	3.61E-02	4.23E-04	4.89E-04	1.04E+01	1.03E-02	2.11E-01	7.40E-03	1.77E-02		
54Xe131	0.2120	53I 131	7.98E-10	1.73E-17	4.50E+01	1.24E-03	1.24E-03	2.40E-10	5.58E-16	5.94E+01	4.89E-03	4.89E-03		
54Xe132	0.2690	52Te131	8.88E-03	1.91E-10	4.73E-03	1.29E-07	1.29E-07	5.85E-02	1.35E-07	2.39E-02	1.95E-06	2.09E-06		
		53I 131	2.71E+01	5.82E-07	1.45E+00	3.96E-05	4.01E-05	4.27E+01	9.85E-05	3.85E+00	3.15E-04	4.13E-04		
		net I 131	2.71E+01	5.83E-07	1.45E+00	3.97E-05	4.03E-05	4.27E+01	9.87E-05	3.87E+00	3.17E-04	4.15E-04		
54Xe134	0.1040	50Sn131	3.78E-10	8.02E-18	4.34E-10	1.17E-14	1.17E-14	6.23E-11	1.42E-16	2.36E-09	1.90E-13	1.90E-13		
		51Sb131	3.78E-10	8.02E-18	3.49E-04	9.40E-09	9.40E-09	6.23E-11	1.42E-16	2.75E-03	2.21E-07	2.21E-07		
		52Te131	1.01E+00	2.15E-08	2.42E-02	6.50E-07	6.72E-07	1.70E+00	3.87E-06	1.23E-01	9.89E-06	1.38E-05		
		53I 131	1.75E+01	3.71E-07	9.58E-01	2.58E-05	2.61E-05	1.82E+01	4.14E-05	3.09E+00	2.49E-04	2.90E-04		
		53I 131	1.75E+01	3.71E-07	9.58E-01	2.58E-05	2.61E-05	1.82E+01	4.14E-05	3.09E+00	2.49E-04	2.90E-04		
		net I 131	3.61E+01	7.64E-07	1.94E+00	5.22E-05	5.30E-05	3.81E+01	8.67E-05	6.31E+00	5.08E-04	5.95E-04		
54Xe136	0.0890	48Cd131	2.27E-07	4.73E-15	6.49E-23	1.72E-27	4.73E-15	3.41E-08	7.64E-14	6.13E-22	4.86E-26	7.64E-14		
		49In131	3.09E-14	6.45E-22	2.20E-14	5.85E-19	5.85E-19	3.76E-14	8.43E-20	1.67E-13	1.33E-17	1.33E-17		
		50Sn131	3.43E-03	7.17E-11	2.09E-05	5.54E-10	6.26E-10	1.45E-02	3.24E-08	2.07E-04	1.65E-08	4.89E-08		
		51Sb131	9.00E-02	1.88E-09	9.81E-04	2.60E-08	2.79E-08	2.77E-01	6.20E-07	9.15E-03	7.27E-07	1.35E-06		
		52Te131	1.81E+00	3.78E-08	2.83E-02	7.50E-07	7.88E-07	2.92E+00	6.54E-06	1.67E-01	1.32E-05	1.98E-05		
		53I 131	1.93E+01	4.03E-07	4.70E-01	1.25E-05	1.29E-05	1.68E+01	3.76E-05	1.86E+00	1.48E-04	1.85E-04		
		net I 131	2.12E+01	4.42E-07	5.00E-01	1.33E-05	1.37E-05	2.00E+01	4.48E-05	2.04E+00	1.62E-04	2.06E-04		
54Xe nat	1.0000	I 131	1.29E+01	2.79E-07	1.02E+01	2.80E-04	2.80E-04	1.72E+01	4.00E-05	1.45E+01	1.19E-03	1.23E-03		
55Cs133	1.0000	52Te131	1.26E-06	2.69E-14	1.04E-04	2.81E-09	2.81E-09	2.45E-07	5.63E-13	7.48E-04	6.07E-08	6.07E-08		
		53I 131	1.01E+00	2.16E-08	2.61E-02	7.07E-07	7.29E-07	2.24E+00	5.14E-06	1.11E-01	9.05E-06	1.42E-05		
		net I 131	1.01E+00	2.16E-08	2.62E-02	7.10E-07	7.31E-07	2.24E+00	5.14E-06	1.12E-01	9.11E-06	1.43E-05		
56Ba134	0.0242	52Te131	0.	0.	1.32E-08	3.56E-13	3.56E-13	4.18E-15	9.52E-21	9.06E-08	7.30E-12	7.30E-12		
		53I 131	3.66E-02	7.76E-10	8.74E-04	2.35E-08	2.43E-08	1.56E-01	3.54E-07	6.83E-03	5.50E-07	9.04E-07		
		net I 131	3.66E-02	7.76E-10	8.74E-04	2.35E-08	2.43E-08	1.56E-01	3.54E-07	6.83E-03	5.50E-07	9.04E-07		
56Ba135	0.0659	51Sb131	0.	0.	3.78E-11	1.01E-15	1.01E-15	4.08E-17	9.21E-23	2.70E-10	2.16E-14	2.16E-14		
		52Te131	3.91E-03	8.22E-11	3.50E-05	9.35E-10	1.02E-09	1.54E-02	3.48E-08	3.38E-04	2.70E-08	6.19E-08		
		53I 131	1.06E-01	2.24E-09	1.80E-03	4.80E-08	5.02E-08	2.84E-01	6.42E-07	1.38E-02	1.10E-06	1.74E-06		
		net I 131	1.10E-01	2.32E-09	1.83E-03	4.89E-08	5.12E-08	3.00E-01	6.76E-07	1.41E-02	1.13E-06	1.81E-06		
56Ba136	0.0785	50Sn131	2.47E-22	5.16E-30	2.30E-15	6.11E-20	6.11E-20	2.10E-21	4.70E-27	1.88E-14	1.50E-18	1.50E-18		
		51Sb131	1.29E-10	2.69E-18	3.22E-10	8.53E-15	8.53E-15	1.57E-10	3.52E-16	2.47E-09	1.96E-13	1.96E-13		
		52Te131	6.62E-03	1.38E-10	3.75E-05	9.94E-10	1.13E-09	1.58E-02	3.54E-08	3.83E-04	3.04E-08	6.58E-08		
		53I 131	2.67E-01	5.58E-09	3.20E-03	8.49E-08	9.05E-08	6.42E-01	1.44E-06	2.53E-02	2.01E-06	3.45E-06		
		net I 131	2.74E-01	5.72E-09	3.24E-03	8.59E-08	9.16E-08	6.58E-01	1.47E-06	2.57E-02	2.04E-06	3.51E-06		
56Ba137	0.1123	49In131	0.	0.	1.28E-19	3.37E-24	3.37E-24	0.	0.	1.14E-18	8.97E-23	8.97E-23		
		50Sn131	8.30E-15	1.72E-22	4.81E-14	1.27E-18	1.27E-18	1.02E-14	2.26E-20	3.92E-13	3.09E-17	3.10E-17		
		51Sb131	1.10E-09	2.28E-17	5.96E-06	1.57E-10	1.57E-10	1.34E-09	2.98E-15	9.45E-05	7.45E-09	7.45E-09		
		52Te131	8.00E-03	1.66E-10	1.12E-04	2.96E-09	3.12E-09	1.84E-02	4.11E-08	1.07E-03	8.43E-08	1.25E-07		
		53I 131	4.44E-01	9.21E-09	4.86E-03	1.28E-07	1.37E-07	9.38E-01	2.09E-06	3.85E-02	3.04E-06	5.12E-06		
		net I 131	4.52E-01	9.38E-09	4.97E-03	1.31E-07	1.40E-07	9.56E-01	2.13E-06	3.97E-02	3.13E-06	5.26E-06		
56Ba138	0.7170	48Cd131	2.10E-14	4.33E-22	1.12E-12	2.93E-17	2.93E-17	6.32E-15	1.40E-20	1.59E-12	1.24E-16	1.24E-16		
		49In131	2.10E-14	4.33E-22	6.91E-20	1.81E-24	4.35E-22	6.32E-15	1.40E-20	6.65E-19	5.20E-23	1.40E-20		
		50Sn131	9.86E-13	2.03E-20	1.29E-13	3.38E-18	3.40E-18	1.21E-12	2.67E-18	1.02E-12	8.00E-17	8.26E-17		
		51Sb131	1.97E-03	4.06E-11	1.75E-06	4.58E-11	8.64E-11	7.80E-03	1.72E-08	3.42E-05	2.68E-09	1.99E-08		
		52Te131	1.57E-02	3.23E-10	1.20E-04	3.13E-09	3.46E-09	5.62E-02	1.24E-07	1.34E-03	1.05E-07	2.29E-07		
		53I 131	6.19E-01	1.27E-08	6.22E-03	1.63E-07	1.75E-07	1.31E+00	2.90E-06	5.08E-02	3.97E-06	6.87E-06		
		net I 131	6.37E-01	1.31E-08	6.34E-03	1.66E-07	1.79E-07	1.38E+00	3.04E-06	5.22E-02	4.08E-06	7.12E-06		
56Ba nat	1.0000	I 131	5.37E-01	1.11E-08	5.50E-03	1.44E-07	1.56E-07	1.17E+00	2.59E-06	4.50E-02	3.54E-06	6.13E-06		

Target Nuclide/ Element	Natural Abundance	Product Nuclide	Protons, FwdBlknt		Neutrons, FwdBlknt		Forward Blanket	Protons, AftBlknt		Neutrons, AftBlknt		Aft Blanket
			Cross Section, mb	Productn Rate, Ci/g-hr	Cross Section, mb	Productn Rate, Ci/g-hr	Total Productn Ci/g-hr	Cross Section, mb	Productn Rate, Ci/g-hr	Cross Section, mb	Productn Rate, Ci/g-hr	Total Productn Ci/g-hr
57La138	0.0009	49In131	9.58E-11	1.97E-18	1.35E-10	3.53E-15	3.53E-15	1.82E-11	4.01E-17	2.38E-10	1.86E-14	1.86E-14
		50Sn131	9.58E-11	1.97E-18	2.72E-15	7.11E-20	2.04E-18	1.82E-11	4.01E-17	2.61E-14	2.04E-18	4.22E-17
		51Sb131	1.24E-11	2.56E-19	1.16E-10	3.02E-15	3.02E-15	1.52E-11	3.36E-17	7.04E-10	5.51E-14	5.51E-14
		52Te131	1.97E-03	4.06E-11	6.07E-06	1.59E-10	1.99E-10	7.80E-03	1.72E-08	9.52E-05	7.45E-09	2.47E-08
		53I 131	4.28E-02	8.81E-10	4.15E-04	1.08E-08	1.17E-08	1.35E-01	2.98E-07	4.02E-03	3.14E-07	6.13E-07
		net I 131	4.48E-02	9.22E-10	4.21E-04	1.10E-08	1.19E-08	1.43E-01	3.16E-07	4.11E-03	3.22E-07	6.37E-07
57La139	0.9991	48Cd131	1.29E-13	2.63E-21	1.75E-13	4.53E-18	4.53E-18	2.46E-14	5.40E-20	1.82E-13	1.42E-17	1.42E-17
		49In131	1.29E-13	2.63E-21	1.75E-13	4.53E-18	4.53E-18	2.46E-14	5.40E-20	1.82E-13	1.42E-17	1.42E-17
		50Sn131	1.29E-13	2.63E-21	2.12E-15	5.51E-20	5.77E-20	2.46E-14	5.40E-20	1.26E-14	9.79E-19	1.03E-18
		51Sb131	3.47E-10	7.09E-18	2.33E-10	6.04E-15	6.04E-15	4.23E-10	9.28E-16	1.52E-09	1.18E-13	1.19E-13
		52Te131	1.16E-03	2.36E-11	1.03E-05	2.66E-10	2.90E-10	4.87E-03	1.07E-08	1.29E-04	1.00E-08	2.07E-08
		53I 131	1.15E-01	2.34E-09	6.95E-04	1.80E-08	2.04E-08	2.61E-01	5.72E-07	7.26E-03	5.64E-07	1.14E-06
		net I 131	1.16E-01	2.37E-09	7.06E-04	1.83E-08	2.07E-08	2.66E-01	5.83E-07	7.39E-03	5.74E-07	1.16E-06
57La nat	1.0000	I 131	1.16E-01	2.37E-09	7.05E-04	1.83E-08	2.07E-08	2.66E-01	5.83E-07	7.39E-03	5.74E-07	1.16E-06