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**POLARIZED PROTON INDUCED BREAKUP OF  $^{12}\text{C}$  AT 16 MeV**

March 1992

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(Received January 31, 1992)

Double differential cross sections and analyzing powers were measured of protons and  $\alpha$  particles emitted from the bombardment of  $^{12}\text{C}$  with 16 MeV polarized protons. The measured energy spectra of protons and  $\alpha$  particles were analyzed on the basis of the reaction model in which three or four-body simultaneous breakup process is taken into account. The calculated proton and  $\alpha$  particle spectra show good agreement with the continuous spectra observed in the low outgoing energy range.

**Keywords:**  $^{12}\text{C}(\text{p},\text{p}')3\alpha$  Reaction, Polarized Proton Experiment, Simultaneous Breakup Process, Phase Space Model

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\* The University of Tokushima

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16MeVにおける炭素-12の偏極陽子による崩壊反応

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(1992年1月31日受理)

16MeV偏極陽子による<sup>12</sup>Cの崩壊反応から放出される陽子及び $\alpha$ 粒子の二重微分断面積と偏極分解能を測定した。測定された陽子及び $\alpha$ 粒子のエネルギースペクトルを3体あるいは4体への同時崩壊過程を考慮した理論に基づいて解析した。その結果、測定された低エネルギー領域の連続スペクトルは理論計算によって良く説明できた。

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本報告書は、日本原子力研究所が平成2年度に徳島大学に委託して行った研究の成果である。

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## 1. Introduction

In interaction of fast neutrons with carbon, the contribution of the  $^{12}\text{C}(\text{n},\text{n}')3\alpha$  reaction to nonelastic cross sections becomes dominant at neutron energies above 10 MeV. A more detailed study of the four-body breakup reaction, therefore, is important for several applications such as estimation of radiation damage and neutron shielding design in fusion energy development and evaluation of kerma factors needed for high energy neutron radiotherapy. Double differential cross sections (DDXs) for the reaction are required in more accurate calculations of neutron transport and kerma factors as well as in an understanding of the reaction mechanism. Several measurements of the  $^{12}\text{C}(\text{n},\text{n}')3\alpha$  cross section have been made in the high incident energy range between 14 and 60 MeV [1,2,3]. However, there are only a few direct measurements of DDXs of both emitted neutrons and  $\alpha$  particles in the same incident energy range[4,5].

So far, some of the authors have studied neutron-induced reactions for lithium isotopes [6] and several medium heavy nuclei [7] through experimental investigations of proton-induced reactions, which may be similar to neutron-induced reactions in their reaction mechanism. In the present work, this approach is also applied to investigation of the  $^{12}\text{C}(\text{n},\text{n}')3\alpha$  reaction. DDXs and analyzing powers were measured of protons and  $\alpha$  particles emitted from the bombardment of  $^{12}\text{C}$  with 14 and 16 MeV polarized protons. The measured spectra of proton and  $\alpha$  particle were analyzed on the basis of the reaction model in which simultaneous breakup process was taken into account. The aim of the present work is to establish a reliable model to evaluate the  $^{12}\text{C}(\text{n},\text{n}')3\alpha$  or  $^{12}\text{C}(\text{p},\text{p}')3\alpha$  breakup cross section.

## 2. Experimental procedure and data processing

The experiment was performed using a 16 MeV polarized proton beam from the tandem Van de Graaff accelerator at Kyushu University. Before this experiment, double differential proton emission cross sections for the  $^{12}\text{C}(\text{p},\text{p}')$  reaction had been measured with a 16 MeV unpolarized proton beam as a preliminary experiment. These experimental procedures are almost the same as those reported elsewhere [6,7]. A  $\Delta E-E$  counter

telescope consisting of three silicon surface barrier detectors ( $E_1$ : 20 $\mu\text{m}$ ,  $E_2$ : 75 $\mu\text{m}$ ,  $E_3$ : 2000 $\mu\text{m}$ ) was employed to detect protons and  $\alpha$  particles emitted with as low energy as possible ( $E_p > 1$  MeV and  $E_\alpha > 1.5$  MeV). A target was a self-supporting foil of natural carbon: its thickness was 0.116 mg/cm<sup>2</sup> for the polarized beam experiment and 0.524 mg/cm<sup>2</sup> for the unpolarized beam one. Beam polarization was monitored using a polarimeter consisting of <sup>4</sup>He gas target and two  $\Delta E$ -E silicon detectors [8] at the downstream of a scattering chamber.

In order to detect low energy  $\alpha$  particles that cannot be measured with the  $\Delta E$ -E counter telescope system, the signals from  $E_1$  detector were separately measured in case of no signal from  $E_2$  or  $E_3$  detector. Since the 20  $\mu\text{m}$  thick  $E_1$  detector stops protons with lower energy than 1.1 MeV, the events having upper than this energy should be due to  $\alpha$  particles stopped within the detector (it can stop  $\alpha$  particles up to about 4.3 MeV). At the forward angle, however, the  $\alpha$  particle spectrum was contaminated by the nucleus <sup>12</sup>C recoiled by the elastic and inelastic scattering; the contaminated part was excluded for analysis of the  $\alpha$  particle spectra.

### 3. Experimental results

Differential cross sections and analyzing powers for elastic scattering at 16 MeV are shown together with the other experimental data [9] and those calculated using the optical potential parameter by Nodvik et al.[10] in Fig.1. The present experimental data are consistent with the other experimental data as can be seen in Fig.1. Numerical data of the differential cross sections and analyzing powers are given in Appendix 1.

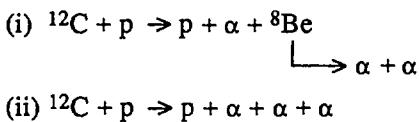
Figure 2 shows measured double differential proton and  $\alpha$  particle emission cross sections for 16 MeV. In Fig.2(b), the experimental data for unpolarized (histograms) and polarized beams (solid circles) are compared and the consistency between both the data is confirmed. The observed proton spectra exhibit a distinct continuum underlying the peak structure corresponding to excited states of <sup>12</sup>C. Two peaks observed in Fig.2(d)-(f) correspond to the transition to the <sup>9</sup>B(g.s.) and <sup>9</sup>B(2.36MeV) via the <sup>12</sup>C(p, $\alpha$ )<sup>9</sup>B reaction. Under those peaks, there is a continuous component that is due to three  $\alpha$  breakup processes of our interest. Numerical data of the double differential cross sections for protons and  $\alpha$  particles are given in Appendices 2 and 3, respectively.

Experimental analyzing powers of emitted protons and  $\alpha$  particles at 16 MeV are shown in Fig.3. There is a tendency that the analyzing power of  $\alpha$  particles at low energies becomes small and approaches to zero.

#### **4. Theoretical analysis and discussion**

Here the following analysis will be restricted to only the energy spectra of proton and  $\alpha$  particle and the analyzing power will not be mentioned.

Multiparticle breakup processes of  $^{12}\text{C}$  induced by proton or neutron are mainly classified into the sequential breakup process via some intermediate states and the simultaneous breakup process [3]. Here we consider the following simultaneous breakup processes in analyzing the observed continuous spectra:



The processes (i) and (ii) are referred to as three-body simultaneous breakup (3BSB) process and four-body simultaneous breakup (4BSB) process, respectively. In the 3BSB process, the sequential decay of  ${}^8\text{Be}$  into two  $\alpha$  particles occurs and finally three  $\alpha$  particles are generated as the reaction products.

The energy spectra of particles emitted in the simultaneous breakup process can be calculated by using the phase space distribution  $\rho_f(E_1)$  derived on the basis of the reaction kinematics [11] as follows:

$$\frac{d^2\sigma}{dE_1 d\Omega_1} = \frac{2\pi}{h^2} \frac{m_p}{k_p} |M|^2 \rho_f(E_1) \quad (1)$$

where  $m_p$  and  $k_p$  are the mass and the wave number of incident proton, respectively.  $|M|^2$  is the square of the transition matrix element. For simplicity, we assume that  $|M|^2$  is an adjustable parameter independent of the angle and outgoing energy. Namely, the shape of energy spectrum is provided by the phase space distribution and the absolute value is

determined by normalization to the experimental value under the assumption that there is no other competing processes. In the present analysis, this adjustable parameter is determined so as to reproduce reasonably the continuum component of the proton spectra for 16 MeV. The same value is used as the normalization parameter in the calculation of the  $\alpha$  particle spectra.

The calculated 4BSB spectra for protons and  $\alpha$  particles are shown by solid lines in Fig.2. Since three  $\alpha$  particles emitted in the breakup process cannot be distinguished each other in the measurement using the present detector system, the right hand side of eq.(1) is multiplied by a factor of three and the obtained  $\alpha$  particle spectra are compared with the experimental data. The calculated proton and  $\alpha$  particle spectra show good agreement with the experimental ones in shape and magnitude as shown in Fig.2. Therefore, the 4BSB process seems to be responsible for emissions of protons and  $\alpha$  particles with low outgoing energies. However, there is somewhat overestimation in the region around the threshold energy of three  $\alpha$  breakup in both those proton and  $\alpha$  particle spectra. Furthermore, we have applied the similar 4BSB calculations to the  $^{12}\text{C}(\text{p},\text{p}')3\alpha$  reaction at 14 MeV. The result is shown in Fig.4. In the calculation, the square of the matrix element  $|\mathcal{M}|^2$  is multiplied by a factor of 1.9 to reproduce the experimental spectra. This indicates that there is the incident energy dependence of  $|\mathcal{M}|^2$ . Antolkovic' et al. [12] have also reported the strong incident energy dependence of  $|\mathcal{M}|^2$  (4BSB) in their analysis of the  $^{12}\text{C}(\text{n},\text{n}')3\alpha$  reaction at 16-27 MeV.

According to the analysis by Antolkovic' et al.[12], the sequential decay process involving the  $\text{n} + \alpha + ^8\text{Be}_{\text{g.s.}}$ (or  $^8\text{Be}_{2.9}$ ) system is the dominant reaction mechanism and the contribution of the 4BSB process is appreciably smaller than that of the 3BSB process. To estimate the contribution of 3BSB in the  $^{12}\text{C}(\text{p},\text{p}')3\alpha$  reaction, therefore, only the proton spectra for 16 MeV were calculated using the reaction model in which the  $\alpha$ - $\alpha$  final state interaction is taken into account in the sequential decay from the  $^8\text{Be}$  ground state and the 2.9 MeV state. The absolute values for each component are normalized so as to reproduce the experimental spectra. As shown in Fig.5, the difference between the calculated 3BSB and 4BSB spectra appears obviously near the threshold energy (5-6 MeV), while both the spectra have similar shape in the low outgoing energy region. From the fitting of spectra near the threshold energy, the transition to  $^8\text{Be}$  ground state (dotted line) in 3BSB is found to be much smaller than that to the 2.9 MeV excited state (dot-dashed line). Further calculation of 3BSB spectra for  $\alpha$

emissions will be necessary to identify which process is dominant in the continuum underlying the peak structure, 3BSB or 4BSB process.

## 5. Summary

The double differential proton and  $\alpha$  particle emission cross sections were measured for the  $^{12}\text{C}(\vec{p},\vec{p}')3\alpha$  reaction at 16 MeV. For the three or four-body simultaneous breakup process, the measured energy spectra of protons and  $\alpha$  particles were analyzed in terms of the phase space model with the transition matrix element independent of the angle and outgoing energy. The calculated 4BSB spectra of both protons and  $\alpha$  particles reproduced well the continuum observed in low outgoing energy region. Although the calculation on the basis of 3BSB process can also provide good fitting to the proton spectra, especially near the breakup threshold energy, the same analysis will be needed for the  $\alpha$  particle spectra. Further analysis of the experimental data including the analyzing power will be required to enhance understanding of the  $p + ^{12}\text{C}$  breakup reaction mechanism.

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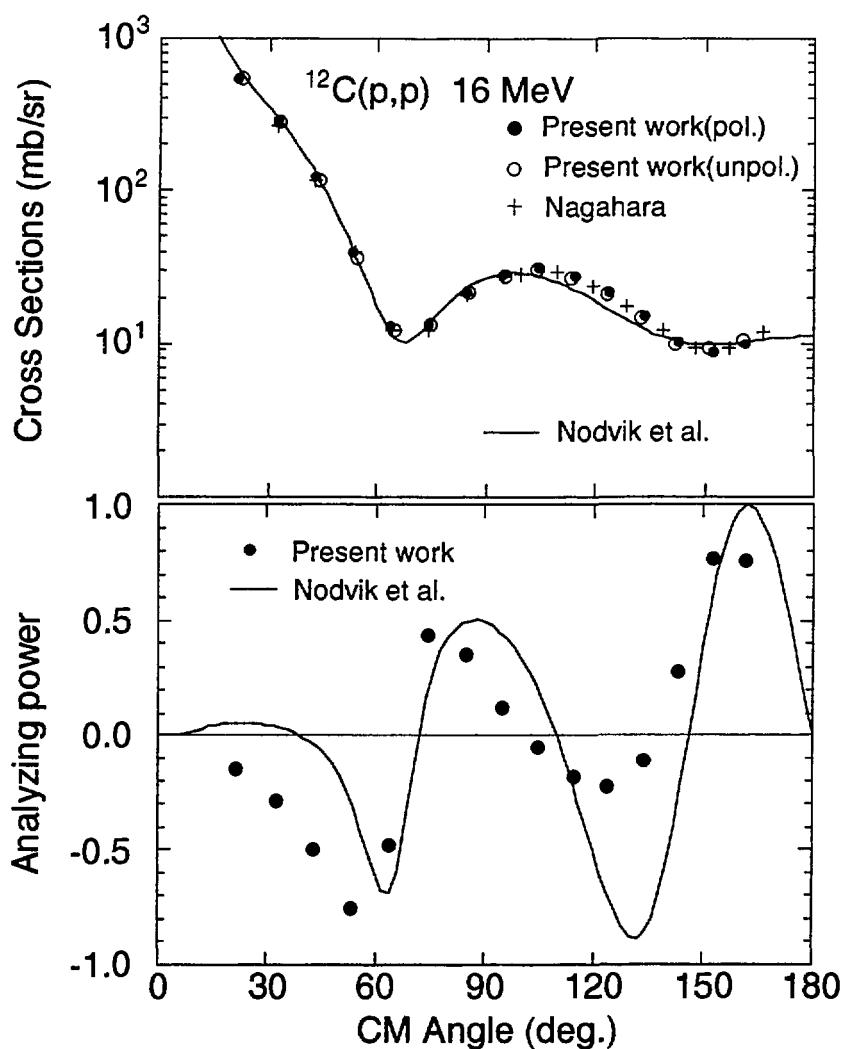
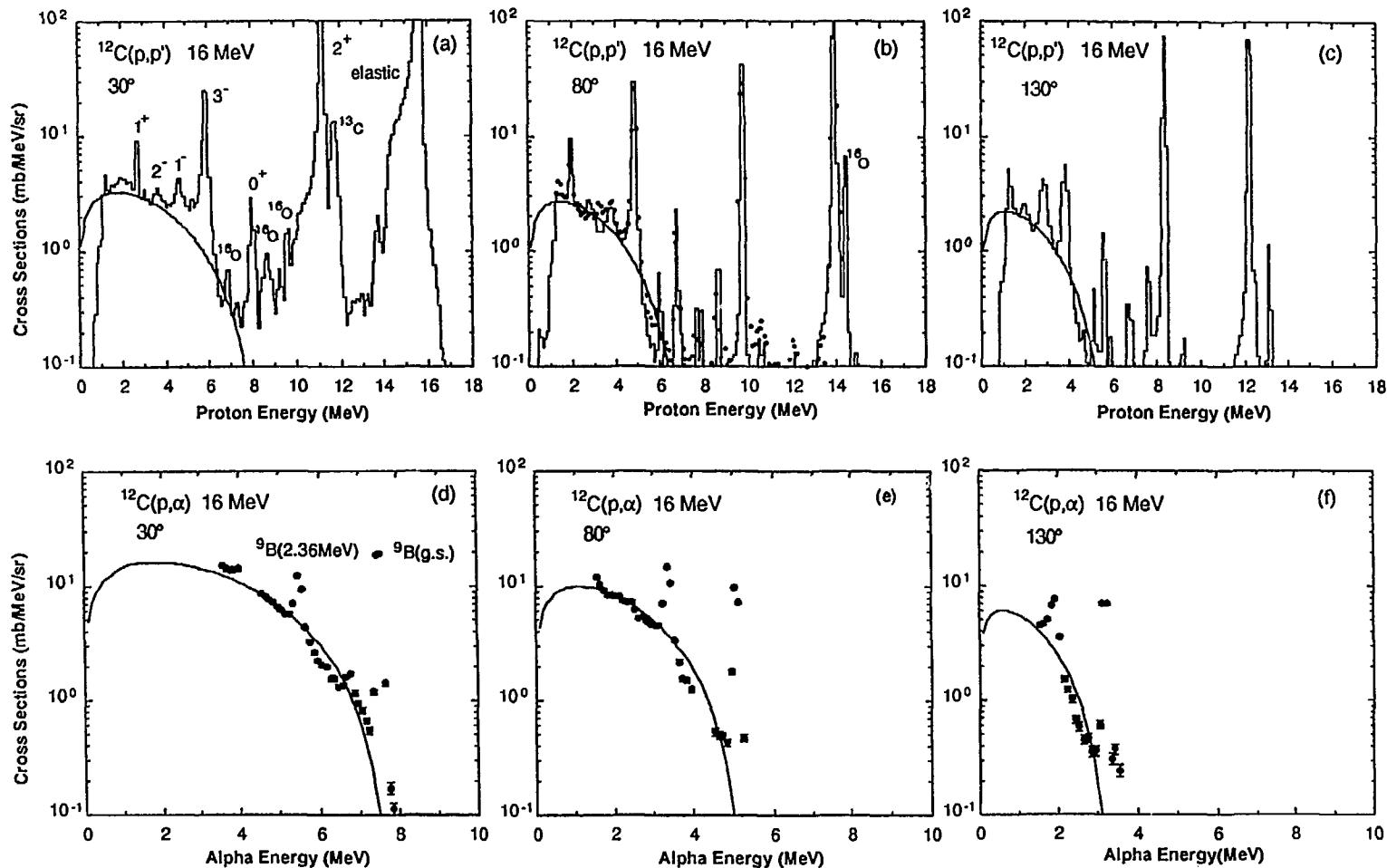


Fig. 1 Differential cross sections and analyzing powers of  $^{12}\text{C}(\text{p},\text{p})$  scattering at 16 MeV. Solid lines are for calculations with the optical potential parameter by Nodvik et al.(ref.[10]).



**Fig. 2** Double differential proton and  $\alpha$  particle emission cross sections of the  $^{12}\text{C}(\text{p},\text{p}')3\alpha$  reaction at 16 MeV. The measured angles are  $30^\circ$ ,  $80^\circ$ , and  $130^\circ$ . Histograms and solid circles are the experimental data and solid lines show the calculated spectra for the four-body simultaneous breakup (4BSB) process (see text).

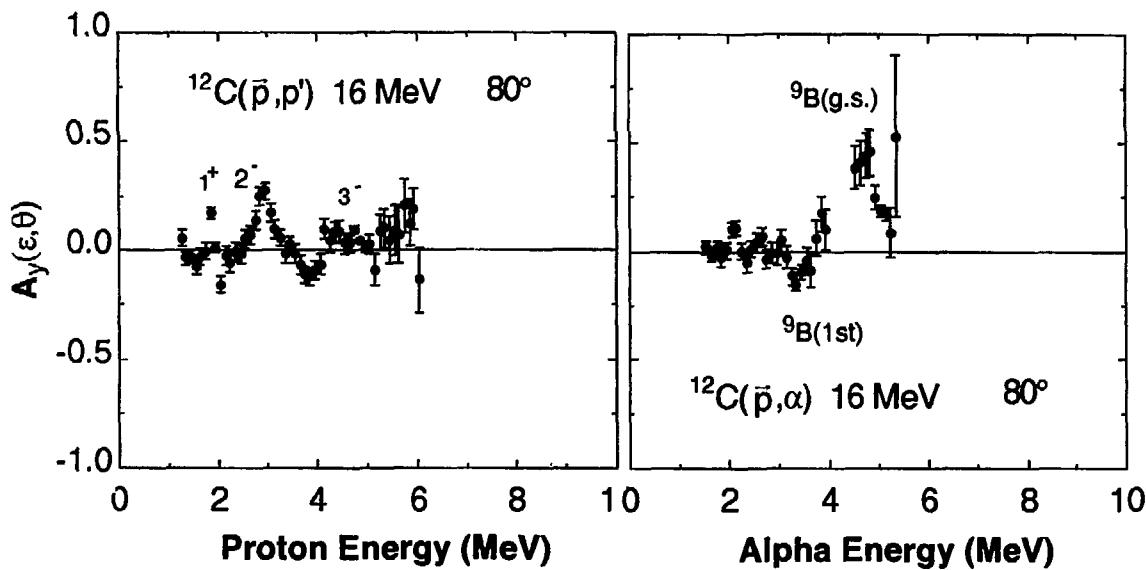


Fig. 3 Experimental analyzing powers of protons and  $\alpha$  particles emitted at  $80^\circ$  for the  $\vec{p} + {}^{12}\text{C}$  reaction at 16 MeV.

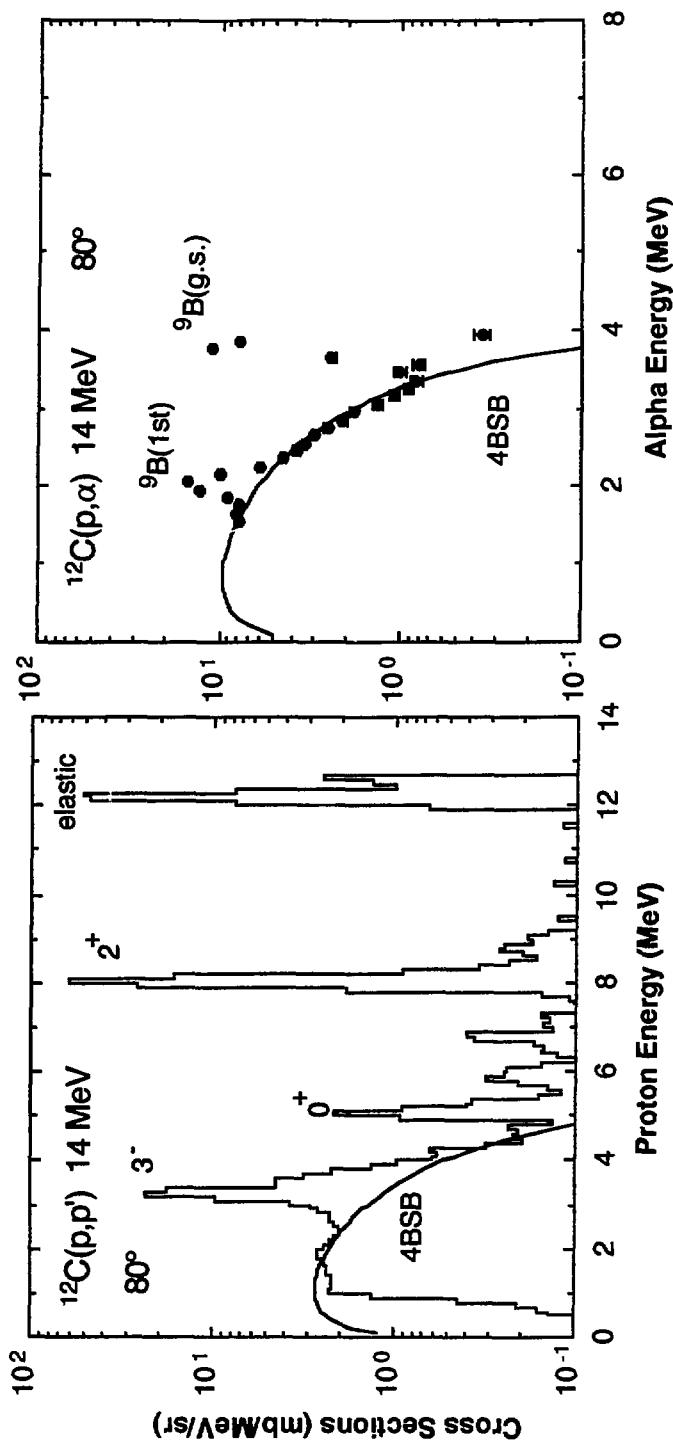


Fig. 4 Double differential proton and  $\alpha$  particle emission cross sections for the  $^{12}\text{C}(\vec{\text{p}}, \text{p}')^{3\alpha}$  reaction at 14 MeV. Solid lines show the calculated 4BSB components.

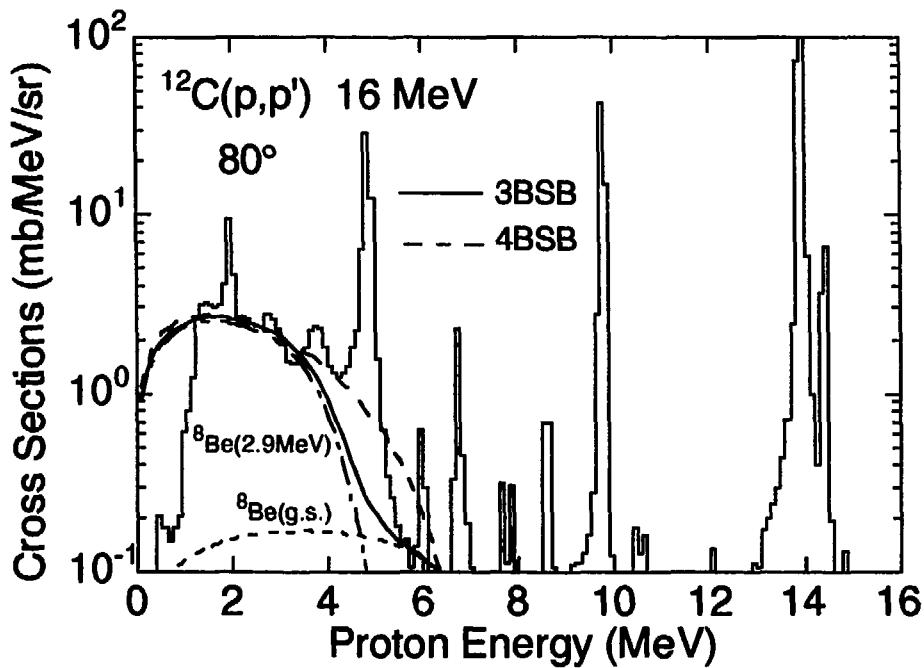


Fig. 5 Double differential proton emission cross sections of the  $^{12}\text{C}(\text{p},\text{p}')$  reaction at 16 MeV. Solid and dashed lines show the calculated 3BSB and 4BSB components, respectively.

**Appendices:**

- Appendix 1 Differential cross sections and analyzing powers of the  $^{12}\text{C}(\text{p},\text{p}_0)$  and  $(\text{p},\text{p}')$  scattering at 16 MeV. Numerical data and figures.
- Appendix 2 Double differential cross sections of the  $^{12}\text{C}(\text{p},\text{p}'\chi)$  reaction at 16 MeV. Numerical data and figures.
- Appendix 3 Double differential cross sections of the  $^{12}\text{C}(\text{p},\alpha\chi)$  reaction at 16 MeV. Numerical data and figures.

**Appendix 1 Differential cross sections and analyzing powers  
of the  $^{12}\text{C}(\text{p},\text{p}_0)$  and  $(\text{p},\text{p}')$  scattering at 16 MeV.**

**1.  $^{12}\text{C}$  ground ( $0^+$ )**

Angle(CM)	dσ/dΩ(mb/sr)	error(mb/sr)	Ay	error
21.65	5.552e+2	7.49e-1	-1.458e-1	2.48e-3
32.41	2.911e+2	5.61e-1	-2.911e-1	3.49e-3
43.10	1.255e+2	2.41e-1	-4.958e-1	3.48e-3
53.69	4.044e+1	1.09e-1	-7.614e-1	4.85e-3
64.17	1.301e+1	4.76e-2	-5.074e-1	7.01e-3
74.53	1.344e+1	4.91e-2	4.354e-1	4.96e-3
84.74	2.180e+1	6.28e-2	3.517e-1	3.99e-3
94.82	2.862e+1	6.35e-2	1.250e-1	3.90e-3
104.74	3.127e+1	7.00e-2	-5.250e-2	3.53e-3
114.53	2.825e+1	7.17e-2	-1.824e-1	3.84e-3
124.17	2.188e+1	5.94e-2	-2.223e-1	4.05e-3
133.69	1.515e+1	4.82e-2	-1.121e-1	5.08e-3
143.10	1.048e+1	4.11e-2	2.838e-1	8.12e-3
152.41	8.988e+0	4.12e-2	7.687e-1	9.25e-3
161.65	1.013e+1	4.26e-2	7.599e-1	7.47e-3

**2.  $^{12}\text{C}$  1st (4.439 MeV  $2^+$ )**

Angle(CM)	dσ/dΩ(mb/sr)	error(mb/sr)	Ay	error
21.97	4.146e+1	1.62e-1	-8.310e-2	7.19e-3
32.88	3.408e+1	1.32e-1	-1.337e-1	6.93e-3
43.70	2.635e+1	8.13e-2	-2.470e-1	5.33e-3
54.41	1.885e+1	6.07e-2	-3.473e-1	5.37e-3
64.99	1.304e+1	4.67e-2	-4.358e-1	6.83e-3
75.42	8.678e+0	3.70e-2	-3.525e-1	7.13e-3
85.68	6.186e+0	3.16e-2	-1.009e-1	8.15e-3
95.76	5.493e+0	2.80e-2	2.076e-1	8.76e-3
105.68	6.373e+0	3.15e-2	3.234e-1	8.33e-3
115.42	7.853e+0	3.71e-2	2.594e-1	7.88e-3
124.99	9.679e+0	3.87e-2	2.398e-1	6.65e-3
134.41	1.167e+1	4.25e-2	1.978e-1	6.18e-3
143.70	1.336e+1	4.68e-2	1.761e-1	7.16e-3
152.88	1.450e+1	4.94e-2	1.697e-1	6.42e-3
161.97	1.569e+1	5.14e-2	1.382e-1	5.44e-3

3.  $^{12}\text{C}$  3rd ( 9.641 MeV 3 $^{-}$  )

Angle(CM)	dσ/dΩ(mb/sr)	error(mb/sr)	Ay	error
22.80	5.841e+0	7.09e-2	9.910e-2	2.19e-2
34.09	5.905e+0	6.08e-2	1.569e-1	1.75e-2
45.26	5.366e+0	3.94e-2	2.072e-1	1.16e-2
56.27	5.261e+0	3.38e-2	2.252e-1	9.80e-3
67.09	5.242e+0	3.07e-2	1.533e-1	1.03e-2
77.70	5.281e+0	3.06e-2	9.390e-2	8.94e-3
88.07	4.946e+0	3.05e-2	3.990e-2	9.50e-3
98.20	4.386e+0	2.68e-2	-3.460e-2	1.11e-2
108.07	3.866e+0	2.73e-2	-5.790e-2	1.12e-2
117.70	3.010e+0	2.65e-2	-1.033e-1	1.39e-2
127.09	2.357e+0	2.30e-2	-1.180e-1	1.52e-2
136.27	1.982e+0	2.04e-2	-1.029e-1	1.69e-2
145.26	1.575e+0	1.92e-2	-6.160e-2	2.44e-2
154.09	1.114e+0	1.94e-2	-9.940e-2	3.22e-2
162.80	9.219e-1	2.21e-2	5.610e-2	5.42e-2

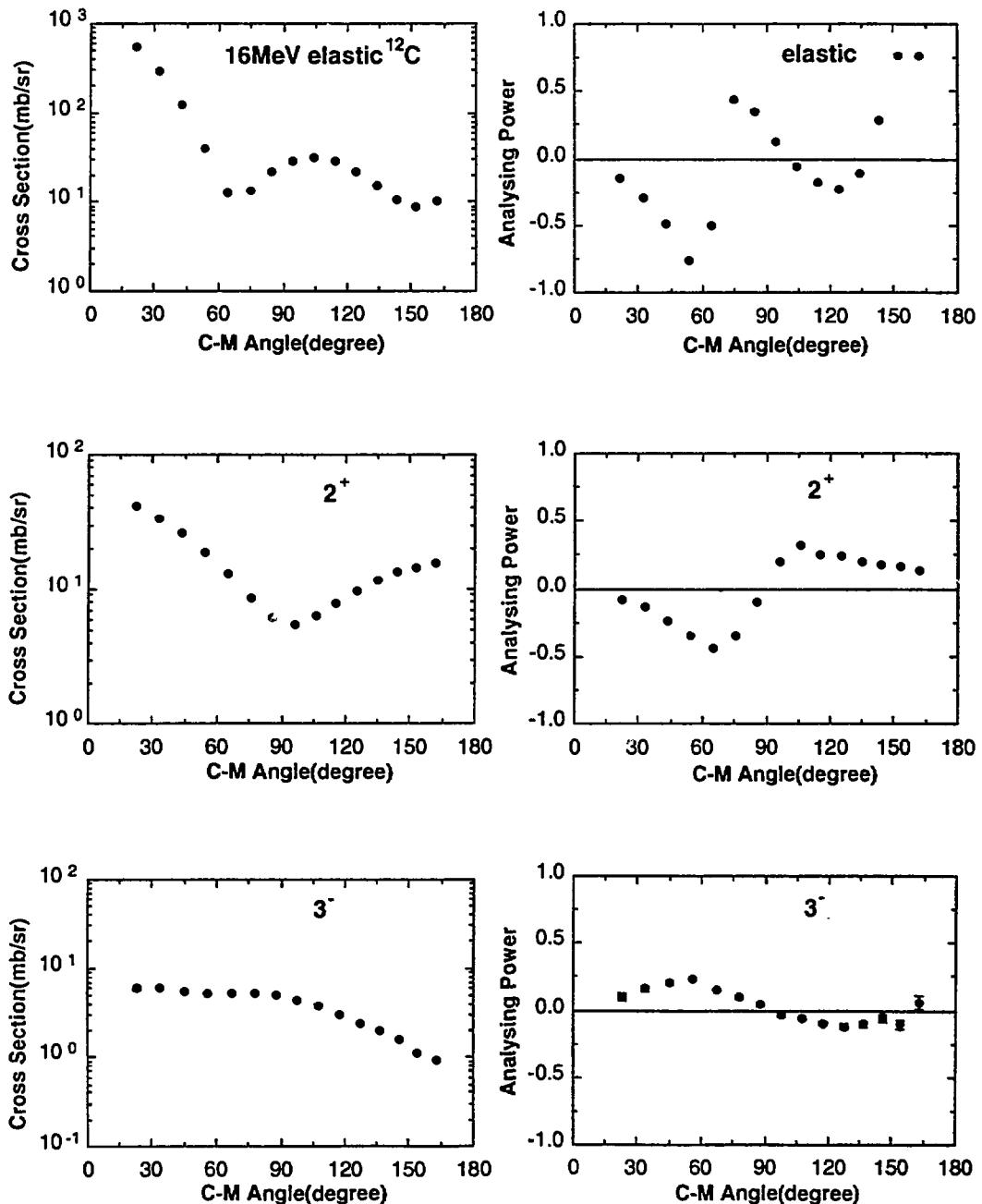


Fig. A-1. Differential cross sections and analyzing powers of the  $^{12}\text{C}(p, p_0)$  and  $(p, p')$  scattering at 16 MeV.

Appendix 2 Double differential cross sections of the  $^{12}\text{C}(\text{p},\text{p}'\text{x})$  reaction at 16 MeV.

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

I-1

$E_{\text{p}'}$ (MeV)		20 deg.	30 deg.	40 deg.	
1.0	--	1.1	5.305E+01 ( 1.939E-01)	1.306E+00 ( 1.776E-01)	1.975E+00 ( 1.055E-01)
1.1	--	1.2	2.266E+00 ( 2.287E-01)	3.176E+00 ( 2.171E-01)	3.179E+00 ( 1.268E-01)
1.2	--	1.3	4.933E+00 ( 2.740E-01)	4.661E+00 ( 2.437E-01)	3.970E+00 ( 1.389E-01)
1.3	--	1.4	4.552E+00 ( 2.665E-01)	3.456E+00 ( 2.207E-01)	4.215E+00 ( 1.424E-01)
1.4	--	1.5	3.361E+00 ( 2.446E-01)	3.286E+00 ( 2.164E-01)	4.390E+00 ( 1.447E-01)
1.5	--	1.6	3.509E+00 ( 2.458E-01)	3.726E+00 ( 2.240E-01)	4.659E+00 ( 1.483E-01)
1.6	--	1.7	3.526E+00 ( 2.448E-01)	3.674E+00 ( 2.221E-01)	4.725E+00 ( 1.490E-01)
1.7	--	1.8	3.713E+00 ( 2.469E-01)	3.939E+00 ( 2.263E-01)	4.940E+00 ( 1.518E-01)
1.8	--	1.9	3.708E+00 ( 2.456E-01)	4.167E+00 ( 2.298E-01)	4.642E+00 ( 1.475E-01)
1.9	--	2.0	3.931E+00 ( 2.484E-01)	4.351E+00 ( 2.325E-01)	4.919E+00 ( 1.512E-01)
2.0	--	2.1	4.279E+00 ( 2.535E-01)	4.214E+00 ( 2.292E-01)	4.759E+00 ( 1.489E-01)
2.1	--	2.2	4.654E+00 ( 2.589E-01)	4.226E+00 ( 2.288E-01)	4.416E+00 ( 1.439E-01)
2.2	--	2.3	4.337E+00 ( 2.525E-01)	3.837E+00 ( 2.208E-01)	4.176E+00 ( 1.402E-01)
2.3	--	2.4	4.581E+00 ( 2.559E-01)	4.044E+00 ( 2.241E-01)	4.292E+00 ( 1.418E-01)
2.4	--	2.5	4.189E+00 ( 2.482E-01)	4.022E+00 ( 2.230E-01)	4.770E+00 ( 1.484E-01)
2.5	--	2.6	4.056E+00 ( 2.449E-01)	3.484E+00 ( 2.119E-01)	9.286E+00 ( 2.018E-01)
2.6	--	2.7	4.163E+00 ( 2.458E-01)	6.354E+00 ( 2.627E-01)	6.579E+00 ( 1.716E-01)
2.7	--	2.8	5.664E+00 ( 2.703E-01)	9.141E+00 ( 3.040E-01)	3.344E+00 ( 1.265E-01)
2.8	--	2.9	8.826E+00 ( 3.168E-01)	2.991E+00 ( 1.994E-01)	3.219E+00 ( 1.242E-01)
2.9	--	3.0	3.193E+00 ( 2.244E-01)	2.908E+00 ( 1.969E-01)	3.306E+00 ( 1.255E-01)
3.0	--	3.1	3.702E+00 ( 2.331E-01)	3.497E+00 ( 2.086E-01)	3.640E+00 ( 1.308E-01)
3.1	--	3.2	3.315E+00 ( 2.247E-01)	2.784E+00 ( 1.928E-01)	3.172E+00 ( 1.230E-01)
3.2	--	3.3	3.219E+00 ( 2.219E-01)	2.914E+00 ( 1.949E-01)	3.077E+00 ( 1.212E-01)
3.3	--	3.4	2.861E+00 ( 2.137E-01)	2.585E+00 ( 1.869E-01)	3.105E+00 ( 1.215E-01)
3.4	--	3.5	3.189E+00 ( 2.195E-01)	2.958E+00 ( 1.946E-01)	3.513E+00 ( 1.282E-01)
3.5	--	3.6	2.789E+00 ( 2.104E-01)	3.135E+00 ( 1.979E-01)	3.431E+00 ( 1.267E-01)
3.6	--	3.7	3.534E+00 ( 2.247E-01)	3.563E+00 ( 2.063E-01)	2.890E+00 ( 1.174E-01)
3.7	--	3.8	3.905E+00 ( 2.311E-01)	3.032E+00 ( 1.945E-01)	2.556E+00 ( 1.112E-01)
3.8	--	3.9	3.666E+00 ( 2.258E-01)	2.791E+00 ( 1.887E-01)	2.476E+00 ( 1.095E-01)
3.9	--	4.0	3.154E+00 ( 2.154E-01)	2.706E+00 ( 1.866E-01)	2.478E+00 ( 1.095E-01)
4.0	--	4.1	3.109E+00 ( 2.144E-01)	2.420E+00 ( 1.799E-01)	2.405E+00 ( 1.082E-01)
4.1	--	4.2	2.915E+00 ( 2.103E-01)	2.592E+00 ( 1.839E-01)	2.528E+00 ( 1.105E-01)
4.2	--	4.3	2.656E+00 ( 2.053E-01)	2.497E+00 ( 1.492E-01)	2.432E+00 ( 1.087E-01)
4.3	--	4.4	3.029E+00 ( 2.131E-01)	2.630E+00 ( 1.520E-01)	3.231E+00 ( 1.230E-01)
4.4	--	4.5	3.370E+00 ( 2.200E-01)	3.168E+00 ( 1.628E-01)	3.301E+00 ( 1.242E-01)
4.5	--	4.6	3.473E+00 ( 2.221E-01)	3.887E+00 ( 1.761E-01)	3.290E+00 ( 1.240E-01)
4.6	--	4.7	4.468E+00 ( 2.409E-01)	4.239E+00 ( 1.823E-01)	2.846E+00 ( 1.164E-01)
4.7	--	4.8	4.648E+00 ( 2.442E-01)	3.245E+00 ( 1.642E-01)	2.518E+00 ( 1.104E-01)
4.8	--	4.9	4.304E+00 ( 2.379E-01)	2.957E+00 ( 1.586E-01)	2.291E+00 ( 1.060E-01)
4.9	--	5.0	3.320E+00 ( 2.190E-01)	2.531E+00 ( 1.499E-01)	2.297E+00 ( 1.062E-01)
5.0	--	5.1	3.284E+00 ( 2.183E-01)	2.476E+00 ( 1.488E-01)	2.226E+00 ( 1.048E-01)
5.1	--	5.2	2.873E+00 ( 2.098E-01)	2.263E+00 ( 1.442E-01)	2.466E+00 ( 1.094E-01)
5.2	--	5.3	2.584E+00 ( 2.037E-01)	2.776E+00 ( 1.550E-01)	2.499E+00 ( 1.100E-01)
5.3	--	5.4	2.796E+00 ( 2.082E-01)	2.459E+00 ( 1.484E-01)	2.904E+00 ( 1.174E-01)
5.4	--	5.5	3.257E+00 ( 2.177E-01)	2.637E+00 ( 1.521E-01)	3.633E+00 ( 1.296E-01)
5.5	--	5.6	3.169E+00 ( 2.159E-01)	3.185E+00 ( 1.631E-01)	6.261E+00 ( 1.664E-01)
5.6	--	5.7	3.244E+00 ( 2.174E-01)	4.677E+00 ( 1.897E-01)	1.961E+01 ( 2.882E-01)
5.7	--	5.8	4.290E+00 ( 2.377E-01)	9.139E+00 ( 2.532E-01)	2.950E+01 ( 3.522E-01)
5.8	--	5.9	6.314E+00 ( 2.725E-01)	2.514E+01 ( 4.062E-01)	7.701E+00 ( 1.835E-01)
5.9	--	6.0	1.908E+01 ( 4.318E-01)	2.397E+01 ( 3.970E-01)	1.660E+00 ( 9.288E-02)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $\text{E}_\text{p} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

I-2

$\text{E}_\text{p}'$ (MeV)		20 deg.	30 deg.	40 deg.	
6.0	--	6.1	$3.564\text{E+01}$ ( 5.762E-01)	$4.412\text{E+00}$ ( 1.853E-01)	$1.119\text{E+00}$ ( 7.989E-02)
6.1	--	6.2	$1.001\text{E+01}$ ( 3.267E-01)	$1.523\text{E+00}$ ( 1.270E-01)	$7.261\text{E-01}$ ( 6.893E-02)
6.2	--	6.3	$2.235\text{E+00}$ ( 1.960E-01)	$9.449\text{E-01}$ ( 1.117E-01)	$6.317\text{E-01}$ ( 6.603E-02)
6.3	--	6.4	$1.447\text{E+00}$ ( 1.775E-01)	$6.922\text{E-01}$ ( 1.043E-01)	$4.702\text{E-01}$ ( 6.075E-02)
6.4	--	6.5	$1.038\text{E+00}$ ( 1.670E-01)	$4.145\text{E-01}$ ( 9.555E-02)	$5.010\text{E-01}$ ( 6.179E-02)
6.5	--	6.6	$7.758\text{E-01}$ ( 1.600E-01)	$3.381\text{E-01}$ ( 9.300E-02)	$5.719\text{E-01}$ ( 6.413E-02)
6.6	--	6.7	$4.955\text{E-01}$ ( 1.521E-01)	$3.728\text{E-01}$ ( 9.416E-02)	$6.449\text{E-01}$ ( 6.645E-02)
6.7	--	6.8	$5.440\text{E-01}$ ( 1.535E-01)	$5.728\text{E-01}$ ( 1.006E-01)	$4.531\text{E-01}$ ( 6.016E-02)
6.8	--	6.9	$7.153\text{E-01}$ ( 1.583E-01)	$6.720\text{E-01}$ ( 1.037E-01)	$2.380\text{E-01}$ ( 5.223E-02)
6.9	--	7.0	$8.686\text{E-01}$ ( 1.625E-01)	$3.955\text{E-01}$ ( 9.492E-02)	$3.872\text{E-01}$ ( 5.785E-02)
7.0	--	7.1	$5.348\text{E-01}$ ( 1.532E-01)	$2.816\text{E-01}$ ( 9.106E-02)	$2.758\text{E-01}$ ( 5.371E-02)
7.1	--	7.2	$2.941\text{E-01}$ ( 1.461E-01)	$3.204\text{E-01}$ ( 9.239E-02)	$3.001\text{E-01}$ ( 5.464E-02)
7.2	--	7.3	$3.665\text{E-01}$ ( 1.483E-01)	$3.507\text{E-01}$ ( 9.342E-02)	$3.479\text{E-01}$ ( 5.642E-02)
7.3	--	7.4	$3.563\text{E-01}$ ( 1.480E-01)	$2.689\text{E-01}$ ( 9.062E-02)	$3.145\text{E-01}$ ( 5.518E-02)
7.4	--	7.5	$4.197\text{E-01}$ ( 1.499E-01)	$2.192\text{E-01}$ ( 8.887E-02)	$3.113\text{B-01}$ ( 5.506E-02)
7.5	--	7.6	$1.417\text{E-01}$ ( 1.415E-01)	$3.284\text{E-01}$ ( 9.267E-02)	$3.909\text{E-01}$ ( 5.798E-02)
7.6	--	7.7	$5.742\text{E-01}$ ( 1.543E-01)	$3.623\text{E-01}$ ( 9.381E-02)	$8.364\text{E-01}$ ( 7.218E-02)
7.7	--	7.8	$5.808\text{E-01}$ ( 1.545E-01)	$4.297\text{E-01}$ ( 9.605E-02)	$2.494\text{E+00}$ ( 1.099E-01)
7.8	--	7.9	$4.546\text{E-01}$ ( 1.509E-01)	$1.139\text{E+00}$ ( 1.170E-01)	$1.347\text{B+00}$ ( 8.559E-02)
7.9	--	8.0	$8.018\text{E-01}$ ( 1.607E-01)	$2.915\text{E+00}$ ( 1.578E-01)	$7.601\text{E-01}$ ( 6.995E-02)
8.0	--	8.1	$2.869\text{E+00}$ ( 2.097E-01)	$1.518\text{E+00}$ ( 1.268E-01)	$3.746\text{E-01}$ ( 5.740E-02)
8.1	--	8.2	$3.884\text{E+00}$ ( 2.300E-01)	$6.929\text{E-01}$ ( 1.043E-01)	$4.408\text{E-01}$ ( 5.974E-02)
8.2	--	8.3	$1.520\text{E+00}$ ( 1.792E-01)	$2.185\text{E-01}$ ( 8.885E-02)	$6.280\text{E-01}$ ( 6.592E-02)
8.3	--	8.4	$7.250\text{E-01}$ ( 1.586E-01)	$4.473\text{E-01}$ ( 9.663E-02)	$6.798\text{E-01}$ ( 6.753E-02)
8.4	--	8.5	$4.102\text{E-01}$ ( 1.496E-01)	$5.803\text{E-01}$ ( 1.009E-01)	$8.549\text{E-01}$ ( 7.271E-02)
8.5	--	8.6	$4.625\text{E-01}$ ( 1.511E-01)	$8.348\text{E-01}$ ( 1.085E-01)	$7.400\text{E-01}$ ( 6.935E-02)
8.6	--	8.7	$1.577\text{E+00}$ ( 1.806E-01)	$9.533\text{E-01}$ ( 1.119E-01)	$9.210\text{E-01}$ ( 7.457E-02)
8.7	--	8.8	$1.619\text{E+00}$ ( 1.817E-01)	$6.788\text{E-01}$ ( 1.039E-01)	$1.249\text{E+00}$ ( 8.320E-02)
8.8	--	8.9	$1.177\text{E+00}$ ( 1.706E-01)	$5.686\text{E-01}$ ( 1.005E-01)	$3.853\text{E+00}$ ( 1.331E-01)
8.9	--	9.0	$1.018\text{E+00}$ ( 1.665E-01)	$3.772\text{E-01}$ ( 9.432E-02)	$9.251\text{E+00}$ ( 2.003E-01)
9.0	--	9.1	$4.507\text{E-01}$ ( 1.508E-01)	$2.936\text{E-01}$ ( 9.148E-02)	$1.151\text{E+01}$ ( 2.225E-01)
9.1	--	9.2	$1.406\text{E-01}$ ( 1.415E-01)	$4.652\text{E-01}$ ( 9.722E-02)	$1.058\text{E+01}$ ( 2.136E-01)
9.2	--	9.3	$2.142\text{E-01}$ ( 1.437E-01)	$6.946\text{E-01}$ ( 1.044E-01)	$5.533\text{E+00}$ ( 1.571E-01)
9.3	--	9.4	$6.397\text{E-01}$ ( 1.562E-01)	$4.869\text{E-01}$ ( 9.792E-02)	$1.632\text{B+00}$ ( 9.225E-02)
9.4	--	9.5	$9.289\text{E-01}$ ( 1.641E-01)	$3.781\text{E-01}$ ( 9.435E-02)	$1.896\text{E+00}$ ( 9.801E-02)
9.5	--	9.6	$6.718\text{E-01}$ ( 1.571E-01)	$1.442\text{E+00}$ ( 1.249E-01)	$9.015\text{E-01}$ ( 7.402E-02)
9.6	--	9.7	$1.375\text{E+00}$ ( 1.757E-01)	$1.543\text{E+00}$ ( 1.275E-01)	$6.764\text{E-01}$ ( 6.742E-02)
9.7	--	9.8	$2.520\text{E+00}$ ( 2.023E-01)	$7.495\text{E-01}$ ( 1.060E-01)	$9.442\text{E-01}$ ( 7.521E-02)
9.8	--	9.9	$4.645\text{E-01}$ ( 1.512E-01)	$1.154\text{E+00}$ ( 1.174E-01)	$9.540\text{E-01}$ ( 7.548E-02)
9.9	--	10.0	$7.312\text{E-01}$ ( 1.588E-01)	$1.257\text{E+00}$ ( 1.202E-01)	$1.317\text{E+00}$ ( 8.487E-02)
10.0	--	10.1	$1.392\text{E+00}$ ( 1.761E-01)	$1.491\text{E+00}$ ( 1.262E-01)	$1.293\text{E+00}$ ( 8.429E-02)
10.1	--	10.2	$1.436\text{E+00}$ ( 1.772E-01)	$2.110\text{E+00}$ ( 1.408E-01)	$1.533\text{E+00}$ ( 9.000E-02)
10.2	--	10.3	$1.694\text{E+00}$ ( 1.835E-01)	$2.212\text{E+00}$ ( 1.431E-01)	$1.596\text{E+00}$ ( 9.142E-02)
10.3	--	10.4	$2.351\text{E+00}$ ( 1.986E-01)	$2.548\text{E+00}$ ( 1.503E-01)	$1.954\text{E+00}$ ( 9.923E-02)
10.4	--	10.5	$2.105\text{E+00}$ ( 1.931E-01)	$2.781\text{E+00}$ ( 1.551E-01)	$2.358\text{E+00}$ ( 1.073E-01)
10.5	--	10.6	$2.538\text{E+00}$ ( 2.027E-01)	$3.185\text{E+00}$ ( 1.631E-01)	$3.050\text{E+00}$ ( 1.200E-01)
10.6	--	10.7	$2.638\text{E+00}$ ( 2.049E-01)	$3.520\text{E+00}$ ( 1.695E-01)	$3.922\text{E+00}$ ( 1.342E-01)
10.7	--	10.8	$3.274\text{E+00}$ ( 2.181E-01)	$4.572\text{E+00}$ ( 1.880E-01)	$6.294\text{E+00}$ ( 1.669E-01)
10.8	--	10.9	$3.326\text{E+00}$ ( 2.192E-01)	$6.131\text{E+00}$ ( 2.125E-01)	$2.706\text{E+01}$ ( 3.376E-01)
10.9	--	11.0	$4.507\text{E+00}$ ( 2.417E-01)	$1.082\text{E+01}$ ( 2.733E-01)	$1.418\text{E+02}$ ( 7.679E-01)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

I-3

$E_{\text{p}'}$ (MeV)	20 deg.	30 deg.	40 deg.
11.0 -- 11.1	6.061E+00 ( 2.685E-01)	2.903E+01 ( 4.353E-01)	9.894E+01 ( 6.419E-01)
11.1 -- 11.2	8.937E+00 ( 3.120E-01)	1.346E+02 ( 9.248E-01)	3.897E+00 ( 1.338E-01)
11.2 -- 11.3	3.453E+01 ( 5.677E-01)	1.755E+02 ( 1.055E+00)	8.594E-01 ( 7.284E-02)
11.3 -- 11.4	2.356E+02 ( 1.445E+00)	1.551E+01 ( 3.229E-01)	5.347E-01 ( 6.292E-02)
11.4 -- 11.5	1.762E+02 ( 1.252E+00)	2.350E+00 ( 1.461E-01)	4.754E-01 ( 6.094E-02)
11.5 -- 11.6	4.109E+00 ( 2.343E-01)	6.199E+00 ( 2.136E-01)	5.498E-01 ( 6.342E-02)
11.6 -- 11.7	3.085E-01 ( 1.467E-01)	1.301E+01 ( 2.976E-01)	5.353E-01 ( 6.294E-02)
11.7 -- 11.8	1.605E-01 ( 1.422E-01)	1.333E+01 ( 3.009E-01)	6.062E-01 ( 6.524E-02)
11.8 -- 11.9	3.233E-01 ( 1.471E-01)	9.257E+00 ( 2.547E-01)	3.523E-01 ( 5.660E-02)
11.9 -- 12.0	5.449E-01 ( 1.536E-01)	3.025E+00 ( 1.600E-01)	1.783E-01 ( 4.982E-02)
12.0 -- 12.1	4.993E-01 ( 1.523E-01)	7.370E-01 ( 1.057E-01)	.031E-01 ( 5.084E-02)
12.1 -- 12.2	1.096E+00 ( 1.686E-01)	4.060E-01 ( 9.532E-02)	1.784E-01 ( 4.982E-02)
12.2 -- 12.3	6.109E-01 ( 1.555E-01)	2.263E-01 ( 8.918E-02)	2.283E-01 ( 5.186E-02)
12.3 -- 12.4	5.329E-01 ( 1.533E-01)	2.866E-01 ( 9.129E-02)	2.871E-01 ( 5.416E-02)
12.4 -- 12.5	3.545E-01 ( 1.481E-01)	2.964E-01 ( 9.163E-02)	2.246E-01 ( 5.171E-02)
12.5 -- 12.6	4.340E-01 ( 1.504E-01)	3.652E-01 ( 9.397E-02)	1.769E-01 ( 4.976E-02)
12.6 -- 12.7	4.687E-01 ( 1.515E-01)	3.605E-01 ( 9.381E-02)	1.936E-01 ( 5.045E-02)
12.7 -- 12.8	6.296E-01 ( 1.561E-01)	3.860E-01 ( 9.467E-02)	1.696E-01 ( 4.946E-02)
12.8 -- 12.9	5.578E-01 ( 1.540E-01)	3.650E-01 ( 9.397E-02)	1.640E-01 ( 4.922E-02)
12.9 -- 13.0	9.380E-01 ( 1.645E-01)	4.207E-01 ( 9.582E-02)	1.849E-01 ( 5.010E-02)
13.0 -- 13.1	5.314E-01 ( 1.533E-01)	2.792E-01 ( 9.105E-02)	2.128E-01 ( 5.124E-02)
13.1 -- 13.2	5.853E-01 ( 1.548E-01)	3.754E-01 ( 9.433E-02)	2.243E-01 ( 5.170E-02)
13.2 -- 13.3	8.753E-01 ( 1.629E-01)	4.306E-01 ( 9.616E-02)	2.314E-01 ( 5.199E-02)
13.3 -- 13.4	5.478E-01 ( 1.538E-01)	3.388E-01 ( 9.310E-02)	4.120E-01 ( 5.875E-02)
13.4 -- 13.5	8.764E-01 ( 1.629E-01)	5.201E-01 ( 9.905E-02)	7.472E-01 ( 6.959E-02)
13.5 -- 13.6	9.148E-01 ( 1.639E-01)	8.135E-01 ( 1.080E-01)	6.595E-01 ( 6.692E-02)
13.6 -- 13.7	1.421E+00 ( 1.770E-01)	1.489E+00 ( 1.262E-01)	2.712E-01 ( 5.356E-02)
13.7 -- 13.8	3.070E+00 ( 2.141E-01)	2.044E+00 ( 1.394E-01)	3.035E-01 ( 5.479E-02)
13.8 -- 13.9	1.536E+01 ( 3.922E-01)	1.202E+00 ( 1.188E-01)	4.330E-01 ( 5.949E-02)
13.9 -- 14.0	2.442E+01 ( 4.832E-01)	9.810E-01 ( 1.128E-01)	1.287E+00 ( 8.416E-02)
14.0 -- 14.1	1.576E+01 ( 3.967E-01)	1.582E+00 ( 1.285E-01)	2.785E+00 ( 1.153E-01)
14.1 -- 14.2	3.298E+00 ( 2.187E-01)	3.414E+00 ( 1.675E-01)	2.845E+00 ( 1.164E-01)
14.2 -- 14.3	1.285E+00 ( 1.736E-01)	6.875E+00 ( 2.233E-01)	3.423E+00 ( 1.263E-01)
14.3 -- 14.4	3.653E+00 ( 2.257E-01)	9.110E+00 ( 2.529E-01)	4.628E+00 ( 1.447E-01)
14.4 -- 14.5	1.195E+01 ( 3.520E-01)	1.036E+01 ( 2.680E-01)	5.204E+00 ( 1.527E-01)
14.5 -- 14.6	1.467E+01 ( 3.844E-01)	1.295E+01 ( 2.970E-01)	6.496E+00 ( 1.694E-01)
14.6 -- 14.7	1.541E+01 ( 3.928E-01)	1.371E+01 ( 3.049E-01)	6.742E+00 ( 1.723E-01)
14.7 -- 14.8	2.084E+01 ( 4.494E-01)	1.532E+01 ( 3.212E-01)	8.134E+00 ( 1.884E-01)
14.8 -- 14.9	2.038E+01 ( 4.449E-01)	1.846E+01 ( 3.506E-01)	1.011E+01 ( 2.090E-01)
14.9 -- 15.0	2.485E+01 ( 4.871E-01)	2.092E+01 ( 3.720E-01)	1.311E+01 ( 2.369E-01)
15.0 -- 15.1	2.725E+01 ( 5.083E-01)	2.559E+01 ( 4.097E-01)	1.813E+01 ( 2.774E-01)
15.1 -- 15.2	3.297E+01 ( 5.555E-01)	3.154E+01 ( 4.532E-01)	3.707E+01 ( 3.943E-01)
15.2 -- 15.3	3.694E+01 ( 5.862E-01)	4.429E+01 ( 5.346E-01)	2.373E+02 ( 9.928E-01)
15.3 -- 15.4	4.593E+01 ( 6.500E-01)	7.712E+01 ( 7.019E-01)	7.196E+02 ( 1.728E+00)
15.4 -- 15.5	6.143E+01 ( 7.475E-01)	2.217E+02 ( 1.185E+00)	2.134E+02 ( 9.416E-01)
15.5 -- 15.6	9.224E+01 ( 9.108E-01)	1.032E+03 ( 2.552E+00)	1.163E+01 ( 2.235E-01)
15.6 -- 15.7	2.554E+02 ( 1.505E+00)	1.425E+03 ( 2.999E+00)	3.015E+00 ( 1.194E-01)
15.7 -- 15.8	2.173E+03 ( 4.373E+00)	1.498E+02 ( 9.751E-01)	1.806E+00 ( 9.610E-02)
15.8 -- 15.9	3.220E+03 ( 5.321E+00)	8.402E+00 ( 2.440E-01)	1.299E+00 ( 8.444E-02)
15.9 -- 16.0	2.325E+02 ( 1.436E+00)	3.447E+00 ( 1.682E-01)	9.170E-01 ( 7.449E-02)

<<  $^{12}\text{C}(\text{p},\text{xp})$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

I-4

$E_{\text{p}'}$ (MeV)	20 deg.	30 deg.	40 deg.
16.0 -- 16.1	6.327E+00 ( 2.730E-01)	1.513E+00 ( 1.268E-01)	6.298E-01 ( 6.601E-02)
16.1 -- 16.2	1.805E+00 ( 1.864E-01)	1.048E+00 ( 1.147E-01)	4.605E-01 ( 6.046E-02)
16.2 -- 16.3	6.594E-01 ( 1.572E-01)	7.453E-01 ( 1.061E-01)	3.621E-01 ( 5.699E-02)
16.3 -- 16.4	4.420E-01 ( 1.510E-01)	4.829E-01 ( 9.795E-02)	3.459E-01 ( 5.640E-02)
16.4 -- 16.5	1.576E-01 ( 1.425E-01)	3.355E-01 ( 9.309E-02)	2.084E-01 ( 5.110E-02)
16.5 -- 16.6	0.000E+00 ( 0.000E+00)	1.443E-01 ( 8.637E-02)	1.485E-01 ( 4.860E-02)
16.6 -- 16.7	0.000E+00 ( 0.000E+00)	1.134E-01 ( 8.524E-02)	9.419E-02 ( 4.623E-02)
16.7 -- 16.8	0.000E+00 ( 0.000E+00)	0.000E+00 ( 0.000E+00)	5.891E-02 ( 4.462E-02)
16.8 -- 16.9	0.000E+00 ( 0.000E+00)	2.200E-02 ( 8.180E-02)	3.968E-02 ( 4.372E-02)
16.9 -- 17.0	0.000E+00 ( 0.000E+00)	0.000E+00 ( 0.000E+00)	5.804E-03 ( 4.209E-02)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

II-1

$E_{\text{p}}' \text{ (MeV)}$		50 deg.	60 deg.	70 deg.
1.0 --	1.1	1.480E+00( 5.340E-02)	9.318E-01( 4.099E-02)	7.765E-01( 3.776E-02)
1.1 --	1.2	1.912E+00( 5.975E-02)	1.462E+00( 5.068E-02)	1.186E+00( 4.594E-02)
1.2 --	1.3	3.003E+00( 7.345E-02)	2.757E+00( 6.885E-02)	2.777E+00( 6.914E-02)
1.3 --	1.4	3.350E+00( 7.727E-02)	3.277E+00( 7.491E-02)	3.358E+00( 7.586E-02)
1.4 --	1.5	3.536E+00( 7.923E-02)	3.484E+00( 7.718E-02)	4.005E+00( 8.269E-02)
1.5 --	1.6	3.776E+00( 8.169E-02)	3.779E+00( 8.032E-02)	5.082E+00( 9.297E-02)
1.6 --	1.7	3.755E+00( 8.143E-02)	3.756E+00( 8.006E-02)	7.130E+00( 1.099E-01)
1.7 --	1.8	3.971E+00( 8.359E-02)	3.689E+00( 7.935E-02)	8.748E+00( 1.216E-01)
1.8 --	1.9	3.918E+00( 8.302E-02)	3.481E+00( 7.710E-02)	6.949E+00( 1.085E-01)
1.9 --	2.0	3.589E+00( 7.959E-02)	3.234E+00( 7.435E-02)	4.292E+00( 8.550E-02)
2.0 --	2.1	3.404E+00( 7.758E-02)	3.112E+00( 7.295E-02)	5.510E+00( 9.671E-02)
2.1 --	2.2	3.490E+00( 7.846E-02)	3.349E+00( 7.562E-02)	1.015E+01( 1.309E-01)
2.2 --	2.3	3.336E+00( 7.677E-02)	7.688E+00( 1.140E-01)	3.435E+00( 7.659E-02)
2.3 --	2.4	4.398E+00( 8.758E-02)	8.002E+00( 1.163E-01)	2.696E+00( 6.799E-02)
2.4 --	2.5	9.671E+00( 1.285E-01)	2.988E+00( 7.146E-02)	2.515E+00( 6.571E-02)
2.5 --	2.6	4.039E+00( 8.400E-02)	2.816E+00( 6.939E-02)	2.718E+00( 6.823E-02)
2.6 --	2.7	2.759E+00( 7.002E-02)	2.802E+00( 6.921E-02)	2.637E+00( 6.722E-02)
2.7 --	2.8	2.837E+00( 7.091E-02)	2.771E+00( 6.882E-02)	2.428E+00( 6.454E-02)
2.8 --	2.9	2.770E+00( 7.008E-02)	2.633E+00( 6.711E-02)	2.471E+00( 6.508E-02)
2.9 --	3.0	2.838E+00( 7.085E-02)	2.650E+00( 6.731E-02)	2.805E+00( 6.924E-02)
3.0 --	3.1	2.867E+00( 7.116E-02)	3.019E+00( 7.176E-02)	2.894E+00( 7.031E-02)
3.1 --	3.2	2.737E+00( 6.958E-02)	2.842E+00( 6.964E-02)	2.271E+00( 6.241E-02)
3.2 --	3.3	2.750E+00( 6.970E-02)	2.853E+00( 6.977E-02)	1.794E+00( 5.561E-02)
3.3 --	3.4	2.903E+00( 7.149E-02)	2.356E+00( 6.349E-02)	1.796E+00( 5.563E-02)
3.4 --	3.5	2.749E+00( 6.962E-02)	2.300E+00( 6.274E-02)	1.640E+00( 5.321E-02)
3.5 --	3.6	2.246E+00( 6.325E-02)	3.229E+00( 7.412E-02)	1.542E+00( 5.164E-02)
3.6 --	3.7	2.092E+00( 6.113E-02)	5.317E+00( 9.486E-02)	1.897E+00( 5.710E-02)
3.7 --	3.8	1.996E+00( 5.977E-02)	8.464E+00( 1.195E-01)	1.854E+00( 5.645E-02)
3.8 --	3.9	1.946E+00( 5.900E-02)	9.371E+00( 1.257E-01)	2.022E+00( 5.889E-02)
3.9 --	4.0	1.820E+00( 5.718E-02)	7.075E+00( 1.093E-01)	2.226E+00( 6.172E-02)
4.0 --	4.1	1.880E+00( 5.805E-02)	4.246E+00( 8.484E-02)	2.162E+00( 6.084E-02)
4.1 --	4.2	2.146E+00( 6.179E-02)	2.411E+00( 6.416E-02)	1.771E+00( 5.518E-02)
4.2 --	4.3	2.574E+00( 6.735E-02)	2.108E+00( 6.006E-02)	1.582E+00( 5.223E-02)
4.3 --	4.4	2.607E+00( 6.776E-02)	1.698E+00( 5.404E-02)	1.365E+00( 4.861E-02)
4.4 --	4.5	2.075E+00( 6.081E-02)	1.640E+00( 5.313E-02)	1.315E+00( 4.775E-02)
4.5 --	4.6	1.833E+00( 5.738E-02)	1.442E+00( 4.989E-02)	1.390E+00( 4.905E-02)
4.6 --	4.7	1.820E+00( 5.718E-02)	1.413E+00( 4.940E-02)	1.508E+00( 5.104E-02)
4.7 --	4.8	1.852E+00( 5.765E-02)	1.523E+00( 5.124E-02)	1.783E+00( 5.537E-02)
4.8 --	4.9	1.748E+00( 5.611E-02)	1.675E+00( 5.368E-02)	2.117E+00( 6.021E-02)
4.9 --	5.0	1.887E+00( 5.816E-02)	1.807E+00( 5.569E-02)	3.764E+00( 7.995E-02)
5.0 --	5.1	2.157E+00( 6.193E-02)	2.234E+00( 6.180E-02)	2.017E+01( 1.842E-01)
5.1 --	5.2	2.239E+00( 6.304E-02)	3.159E+00( 7.329E-02)	2.921E+01( 2.216E-01)
5.2 --	5.3	2.804E+00( 7.015E-02)	1.066E+01( 1.341E-01)	3.710E+00( 7.938E-02)
5.3 --	5.4	4.823E+00( 9.117E-02)	3.608E+01( 2.463E-01)	9.488E-01( 4.081E-02)
5.4 --	5.5	1.456E+01( 1.570E-01)	1.022E+01( 1.313E-01)	4.906E-01( 2.993E-02)
5.5 --	5.6	3.035E+01( 2.262E-01)	1.485E+00( 5.061E-02)	3.562E-01( 2.589E-02)
5.6 --	5.7	1.024E+01( 1.319E-01)	6.758E-01( 3.469E-02)	2.817E-01( 2.335E-02)
5.7 --	5.8	1.665E+00( 5.486E-02)	4.467E-01( 2.861E-02)	2.330E-01( 2.152E-02)
5.8 --	5.9	9.947E-01( 4.341E-02)	3.508E-01( 2.564E-02)	1.981E-01( 2.012E-02)
5.9 --	6.0	9.465E-01( 4.247E-02)	2.394E-01( 2.169E-02)	1.719E-01( 1.899E-02)

<< <sup>12</sup>C(p,xp') E<sub>p</sub> = 16 MeV >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

II-2

E <sub>p'</sub> (MeV)		50 deg.	60 deg.	70 deg.	
6.0	--	6.1	1.038E+00( 4.424E-02)	2.454E-01( 2.192E-02)	1.462E-01( 1.782E-02)
6.1	--	6.2	2.620E+00( 6.792E-02)	2.443E-01( 2.188E-02)	5.051E-01( 3.034E-02)
6.2	--	6.3	6.587E+00( 1.062E-01)	2.222E-01( 2.101E-02)	2.865E-01( 2.352E-02)
6.3	--	6.4	9.709E+00( 1.285E-01)	5.790E-01( 3.226E-02)	9.152E-02( 1.503E-02)
6.4	--	6.5	9.121E+00( 1.246E-01)	2.822E-01( 2.329E-02)	9.019E-02( 1.495E-02)
6.5	--	6.6	5.864E+00( 1.003E-01)	1.221E-01( 1.654E-02)	7.748E-02( 1.422E-02)
6.6	--	6.7	1.430E+00( 5.114E-02)	1.122E-01( 1.603E-02)	7.495E-02( 1.407E-02)
6.7	--	6.8	2.710E-01( 2.587E-02)	9.714E-02( 1.522E-02)	3.610E-02( 1.152E-02)
6.8	--	6.9	1.997E-01( 2.344E-02)	1.005E-01( 1.540E-02)	8.519E-02( 1.467E-02)
6.9	--	7.0	1.803E-01( 2.274E-02)	6.895E-02( 1.357E-02)	6.641E-01( 3.446E-02)
7.0	--	7.1	1.593E-01( 2.195E-02)	8.036E-02( 1.426E-02)	2.937E+00( 7.073E-02)
7.1	--	7.2	1.337E-01( 2.094E-02)	1.249E-01( 1.668E-02)	4.516E-01( 2.882E-02)
7.2	--	7.3	1.343E-01( 2.097E-02)	1.506E+00( 5.096E-02)	3.527E-01( 2.577E-02)
7.3	--	7.4	1.897E-01( 2.308E-02)	2.488E+00( 6.516E-02)	1.031E-01( 1.566E-02)
7.4	--	7.5	8.652E-01( 4.083E-02)	2.881E-01( 2.350E-02)	3.922E-02( 1.175E-02)
7.5	--	7.6	2.260E+00( 6.331E-02)	4.274E-01( 2.804E-02)	6.576E-02( 1.351E-02)
7.6	--	7.7	6.576E-01( 3.631E-02)	1.223E-01( 1.655E-02)	2.433E-02( 1.063E-02)
7.7	--	7.8	3.486E-01( 2.827E-02)	8.269E-02( 1.440E-02)	4.908E-02( 1.243E-02)
7.8	--	7.9	1.997E-01( 2.344E-02)	5.907E-02( 1.295E-02)	3.580E-01( 2.595E-02)
7.9	--	8.0	1.752E-01( 2.255E-02)	6.075E-02( 1.306E-02)	2.225E-01( 2.111E-02)
8.0	--	8.1	1.499E-01( 2.158E-02)	2.524E-01( 2.219E-02)	2.144E-01( 2.079E-02)
8.1	--	8.2	1.562E-01( 2.183E-02)	3.758E-01( 2.645E-02)	1.408E-01( 1.757E-02)
8.2	--	8.3	4.504E-01( 3.115E-02)	1.924E-01( 1.979E-02)	6.009E-02( 1.316E-02)
8.3	--	8.4	3.230E-01( 2.750E-02)	1.998E-01( 2.010E-02)	5.570E-02( 1.287E-02)
8.4	--	8.5	2.835E-01( 2.627E-02)	6.755E-02( 1.349E-02)	3.438E-02( 1.140E-02)
8.5	--	8.6	2.226E-01( 2.425E-02)	1.119E-01( 1.601E-02)	5.195E-02( 1.263E-02)
8.6	--	8.7	1.051E-01( 1.976E-02)	7.722E-02( 1.408E-02)	4.110E-02( 1.188E-02)
8.7	--	8.8	1.331E-01( 2.092E-02)	5.727E-02( 1.283E-02)	2.799E-01( 2.328E-02)
8.8	--	8.9	2.006E-01( 2.347E-02)	7.693E-02( 1.406E-02)	1.433E+00( 4.979E-02)
8.9	--	9.0	1.254E-01( 2.061E-02)	1.902E-01( 1.969E-02)	2.005E-01( 2.022E-02)
9.0	--	9.1	1.213E-01( 2.044E-02)	1.499E+00( 5.084E-02)	4.958E-02( 1.247E-02)
9.1	--	9.2	4.936E-01( 3.229E-02)	6.216E-01( 3.335E-02)	7.943E-02( 1.434E-02)
9.2	--	9.3	1.621E+00( 5.418E-02)	1.208E-01( 1.647E-02)	7.607E-02( 1.414E-02)
9.3	--	9.4	6.885E-01( 3.702E-02)	9.029E-02( 1.484E-02)	1.126E-01( 1.616E-02)
9.4	--	9.5	3.869E-01( 2.939E-02)	1.226E-01( 1.657E-02)	9.128E-02( 1.501E-02)
9.5	--	9.6	4.144E-01( 3.017E-02)	1.002E-01( 1.539E-02)	1.130E-01( 1.618E-02)
9.6	--	9.7	4.920E-01( 3.225E-02)	1.590E-01( 1.831E-02)	1.776E-01( 1.925E-02)
9.7	--	9.8	5.309E-01( 3.325E-02)	1.713E-01( 1.887E-02)	2.193E-01( 2.099E-02)
9.8	--	9.9	6.882E-01( 3.701E-02)	2.196E-01( 2.091E-02)	3.419E-01( 2.542E-02)
9.9	--	10.0	8.417E-01( 4.034E-02)	3.104E-01( 2.428E-02)	1.108E+00( 4.396E-02)
10.0	--	10.1	9.771E-01( 4.307E-02)	3.833E-01( 2.668E-02)	3.233E+01( 2.331E-01)
10.1	--	10.2	1.138E+00( 4.610E-02)	6.866E-01( 3.495E-02)	5.100E+01( 2.928E-01)
10.2	--	10.3	1.517E+00( 5.255E-02)	1.291E+00( 4.729E-02)	1.171E+00( 4.514E-02)
10.3	--	10.4	2.144E+00( 6.175E-02)	2.273E+01( 1.955E-01)	1.256E-01( 1.682E-02)
10.4	--	10.5	3.242E+00( 7.521E-02)	1.002E+02( 4.102E-01)	6.281E-02( 1.333E-02)
10.5	--	10.6	8.922E+00( 1.233E-01)	8.402E+00( 1.191E-01)	3.570E-02( 1.149E-02)
10.6	--	10.7	6.953E+01( 3.420E-01)	2.407E-01( 2.174E-02)	4.602E-02( 1.222E-02)
10.7	--	10.8	1.009E+02( 4.120E-01)	1.683E-01( 1.874E-02)	1.537E-01( 1.817E-02)
10.8	--	10.9	8.212E+00( 1.183E-01)	1.258E-01( 1.673E-02)	1.368E-01( 1.738E-02)
10.9	--	11.0	6.589E-01( 3.634E-02)	8.288E-02( 1.441E-02)	2.461E-01( 2.203E-02)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

II-3

$E_{\text{p}}^*$ (MeV)	50 deg.	60 deg.	70 deg.
11.0 -- 11.1	3.904E-01( 2.949E-02)	2.095E-01( 2.050E-02)	4.013E-02( 1.181E-02)
11.1 -- 11.2	2.962E-01( 2.667E-02)	1.788E-01( 1.920E-02)	6.695E-02( 1.359E-02)
11.2 -- 11.3	2.857E-01( 2.634E-02)	3.408E-01( 2.531E-02)	1.821E-02( 1.014E-02)
11.3 -- 11.4	4.249E-01( 3.046E-02)	8.218E-02( 1.437E-02)	1.921E-02( 1.022E-02)
11.4 -- 11.5	3.391E-01( 2.799E-02)	3.357E-02( 1.117E-02)	8.852E-03( 9.330E-03)
11.5 -- 11.6	3.449E-01( 2.817E-02)	7.792E-02( 1.412E-02)	3.264E-02( 1.127E-02)
11.6 -- 11.7	1.226E-01( 2.050E-02)	5.819E-02( 1.289E-02)	1.725E-02( 1.006E-02)
11.7 -- 11.8	1.096E-01( 1.995E-02)	4.336E-02( 1.189E-02)	9.065E-03( 9.349E-03)
11.8 -- 11.9	7.129E-02( 1.827E-02)	7.568E-02( 1.398E-02)	7.652E-03( 9.221E-03)
11.9 -- 12.0	1.092E-01( 1.994E-02)	8.513E-03( 9.100E-03)	2.578E-02( 1.075E-02)
12.0 -- 12.1	1.146E-01( 2.017E-02)	3.034E-02( 1.093E-02)	3.823E-03( 8.866E-03)
12.1 -- 12.2	9.189E-02( 1.920E-02)	1.161E-02( 9.381E-03)	1.229E-02( 9.634E-03)
12.2 -- 12.3	3.937E-02( 1.674E-02)	1.006E-02( 9.242E-03)	1.552E-02( 9.911E-03)
12.3 -- 12.4	4.248E-02( 1.690E-02)	0.000E+00( 0.000E+00)	6.770E-02( 1.363E-02)
12.4 -- 12.5	4.098E-02( 1.682E-02)	1.479E-02( 9.662E-03)	6.944E-02( 1.374E-02)
12.5 -- 12.6	4.098E-02( 1.682E-02)	1.690E-02( 9.843E-03)	1.595E-02( 9.948E-03)
12.6 -- 12.7	3.744E-02( 1.665E-02)	2.529E-02( 1.053E-02)	5.636E-03( 9.036E-03)
12.7 -- 12.8	1.602E-02( 1.553E-02)	5.313E-02( 1.256E-02)	1.061E-02( 9.487E-03)
12.8 -- 12.9	5.035E-02( 1.728E-02)	8.255E-02( 1.439E-02)	1.565E-02( 9.923E-03)
12.9 -- 13.0	5.961E-02( 1.773E-02)	3.038E-02( 1.093E-02)	7.429E-03( 9.201E-03)
13.0 -- 13.1	1.306E-01( 2.082E-02)	3.342E-03( 8.610E-03)	1.565E-02( 9.923E-03)
13.1 -- 13.2	2.105E-01( 2.383E-02)	8.488E-03( 9.098E-03)	5.909E-02( 1.309E-02)
13.2 -- 13.3	1.371E-01( 2.108E-02)	3.335E-02( 1.116E-02)	4.415E-02( 1.210E-02)
13.3 -- 13.4	6.626E-02( 1.804E-02)	1.693E-02( 9.847E-03)	7.112E-02( 1.384E-02)
13.4 -- 13.5	5.052E-02( 1.729E-02)	2.496E-02( 1.051E-02)	8.267E-02( 1.453E-02)
13.5 -- 13.6	1.043E-01( 1.973E-02)	4.878E-02( 1.226E-02)	1.418E-01( 1.762E-02)
13.6 -- 13.7	2.546E-01( 2.533E-02)	4.517E-02( 1.202E-02)	1.464E-01( 1.793E-02)
13.7 -- 13.8	5.732E-01( 3.430E-02)	8.532E-02( 1.455E-02)	1.512E-01( 1.806E-02)
13.8 -- 13.9	5.999E-01( 3.495E-02)	1.126E-01( 1.605E-02)	1.920E-01( 1.986E-02)
13.9 -- 14.0	7.735E-01( 3.890E-02)	1.392E-01( 1.739E-02)	3.188E-01( 2.465E-02)
14.0 -- 14.1	1.004E+00( 4.359E-02)	1.509E-01( 1.794E-02)	5.165E-01( 3.065E-02)
14.1 -- 14.2	1.214E+00( 4.746E-02)	1.793E-01( 1.922E-02)	1.763E+00( 5.506E-02)
14.2 -- 14.3	1.494E+00( 5.217E-02)	2.833E-01( 2.333E-02)	4.975E+01( 2.891E-01)
14.3 -- 14.4	1.676E+00( 5.503E-02)	3.689E-01( 2.623E-02)	8.019E+01( 3.670E-01)
14.4 -- 14.5	2.085E+00( 6.095E-02)	7.474E-01( 3.638E-02)	3.962E+00( 8.201E-02)
14.5 -- 14.6	2.840E+00( 7.059E-02)	2.876E+00( 6.998E-02)	7.085E-01( 3.552E-02)
14.6 -- 14.7	3.898E+00( 8.221E-02)	6.216E+01( 3.232E-01)	3.547E+00( 7.764E-02)
14.7 -- 14.8	5.736E+00( 9.922E-02)	6.082E+01( 3.197E-01)	7.550E+00( 1.129E-01)
14.8 -- 14.9	1.461E+01( 1.573E-01)	2.246E+00( 6.197E-02)	2.752E-01( 2.311E-02)
14.9 -- 15.0	1.098E+02( 4.297E-01)	2.669E+00( 6.745E-02)	2.598E-02( 1.076E-02)
15.0 -- 15.1	2.234E+02( 6.126E-01)	4.582E+00( 8.810E-02)	1.539E-01( 1.818E-02)
15.1 -- 15.2	2.989E+01( 2.245E-01)	2.068E-01( 2.039E-02)	2.032E-01( 2.033E-02)
15.2 -- 15.3	3.062E+00( 7.317E-02)	1.518E-01( 1.798E-02)	1.328E-01( 1.718E-02)
15.3 -- 15.4	1.293E+00( 4.884E-02)	2.355E-01( 2.154E-02)	1.129E-01( 1.618E-02)
15.4 -- 15.5	5.669E-01( 3.415E-02)	2.418E-01( 2.178E-02)	1.758E-01( 1.917E-02)
15.5 -- 15.6	4.917E-01( 3.225E-02)	4.337E-01( 2.823E-02)	5.859E-03( 9.057E-03)
15.6 -- 15.7	6.796E-01( 3.681E-02)	1.326E-01( 1.706E-02)	3.894E-03( 8.873E-03)
15.7 -- 15.8	3.716E-01( 2.895E-02)	1.857E-02( 9.986E-03)	6.571E-04( 8.561E-03)
15.8 -- 15.9	1.890E-01( 2.306E-02)	6.757E-03( 8.937E-03)	0.000E+00( 0.000E+00)
15.9 -- 16.0	1.331E-01( 2.092E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

II-4

$E_{\text{p}'}$ (MeV)	50 deg.	60 deg.	70 deg.
16.0 -- 16.1	6.968E-02( 1.820E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
16.1 -- 16.2	5.264E-02( 1.740E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
16.2 -- 16.3	2.242E-02( 1.587E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
16.3 -- 16.4	1.742E-02( 1.561E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
16.4 -- 16.5	1.560E-02( 1.551E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
16.5 -- 16.6	2.917E-02( 1.623E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
16.6 -- 16.7	1.729E-02( 1.560E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
16.7 -- 16.8	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
16.8 -- 16.9	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
16.9 -- 17.0	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

III-1

$E_{\text{p}'}$ (MeV)		80 deg.	90 deg.	100 deg.
1.0 --	1.1	7.986E-01( 3.918E-02)	8.651E-01( 4.122E-02)	8.423E-01( 4.090E-02)
1.1 --	1.2	1.233E+00( 4.754E-02)	1.435E+00( 5.149E-02)	1.356E+00( 5.030E-02)
1.2 --	1.3	2.673E+00( 6.837E-02)	2.661E+00( 6.860E-02)	2.509E+00( 6.679E-02)
1.3 --	1.4	3.151E+00( 7.398E-02)	2.888E+00( 7.129E-02)	2.700E+00( 6.912E-02)
1.4 --	1.5	3.239E+00( 7.496E-02)	2.800E+00( 7.022E-02)	2.728E+00( 6.942E-02)
1.5 --	1.6	3.140E+00( 7.382E-02)	2.848E+00( 7.075E-02)	3.911E+00( 8.247E-02)
1.6 --	1.7	2.989E+00( 7.205E-02)	3.276E+00( 7.563E-02)	7.224E+00( 1.112E-01)
1.7 --	1.8	3.107E+00( 7.340E-02)	7.179E+00( 1.108E-01)	4.645E+00( 8.958E-02)
1.8 --	1.9	4.052E+00( 8.349E-02)	6.294E+00( 1.039E-01)	2.623E+00( 6.802E-02)
1.9 --	2.0	9.622E+00( 1.277E-01)	2.797E+00( 7.002E-02)	2.457E+00( 6.590E-02)
2.0 --	2.1	4.599E+00( 8.878E-02)	2.497E+00( 6.631E-02)	2.452E+00( 6.580E-02)
2.1 --	2.2	2.660E+00( 6.800E-02)	2.420E+00( 6.529E-02)	2.440E+00( 6.562E-02)
2.2 --	2.3	2.674E+00( 6.815E-02)	2.354E+00( 6.441E-02)	2.456E+00( 6.580E-02)
2.3 --	2.4	2.597E+00( 6.718E-02)	2.443E+00( 6.553E-02)	2.516E+00( 6.653E-02)
2.4 --	2.5	2.482E+00( 6.570E-02)	2.391E+00( 6.484E-02)	2.871E+00( 7.084E-02)
2.5 --	2.6	2.404E+00( 6.468E-02)	2.520E+00( 6.647E-02)	2.611E+00( 6.766E-02)
2.6 --	2.7	2.343E+00( 6.385E-02)	2.603E+00( 6.747E-02)	2.001E+00( 5.959E-02)
2.7 --	2.8	2.782E+00( 6.937E-02)	2.304E+00( 6.362E-02)	1.544E+00( 5.272E-02)
2.8 --	2.9	2.611E+00( 6.726E-02)	1.680E+00( 5.474E-02)	1.367E+00( 4.980E-02)
2.9 --	3.0	2.322E+00( 6.352E-02)	1.462E+00( 5.125E-02)	1.388E+00( 5.010E-02)
3.0 --	3.1	1.859E+00( 5.705E-02)	1.577E+00( 5.308E-02)	1.741E+00( 5.568E-02)
3.1 --	3.2	1.501E+00( 5.150E-02)	1.404E+00( 5.023E-02)	1.919E+00( 5.828E-02)
3.2 --	3.3	1.467E+00( 5.091E-02)	1.607E+00( 5.350E-02)	2.441E+00( 6.535E-02)
3.3 --	3.4	1.483E+00( 5.115E-02)	1.954E+00( 5.866E-02)	3.036E+00( 7.256E-02)
3.4 --	3.5	1.702E+00( 5.461E-02)	2.341E+00( 6.394E-02)	2.829E+00( 7.011E-02)
3.5 --	3.6	1.834E+00( 5.657E-02)	2.789E+00( 6.955E-02)	2.181E+00( 6.183E-02)
3.6 --	3.7	2.225E+00( 6.210E-02)	2.613E+00( 6.736E-02)	1.680E+00( 5.458E-02)
3.7 --	3.8	2.362E+00( 6.390E-02)	2.031E+00( 5.966E-02)	1.410E+00( 5.023E-02)
3.8 --	3.9	2.335E+00( 6.353E-02)	1.517E+00( 5.190E-02)	1.396E+00( 4.996E-02)
3.9 --	4.0	1.791E+00( 5.586E-02)	1.386E+00( 4.971E-02)	1.366E+00( 4.944E-02)
4.0 --	4.1	1.435E+00( 5.023E-02)	1.249E+00( 4.735E-02)	1.583E+00( 5.300E-02)
4.1 --	4.2	1.283E+00( 4.763E-02)	1.332E+00( 4.880E-02)	2.163E+00( 6.151E-02)
4.2 --	4.3	1.219E+00( 4.648E-02)	1.433E+00( 5.051E-02)	7.457E+00( 1.126E-01)
4.3 --	4.4	1.290E+00( 4.774E-02)	1.829E+00( 5.671E-02)	1.601E+01( 1.644E-01)
4.4 --	4.5	1.437E+00( 5.027E-02)	3.051E+00( 7.258E-02)	7.653E+00( 1.140E-01)
4.5 --	4.6	1.798E+00( 5.597E-02)	1.322E+01( 1.494E-01)	3.708E+00( 7.985E-02)
4.6 --	4.7	2.259E+00( 6.251E-02)	2.256E+01( 1.950E-01)	7.418E-01( 3.737E-02)
4.7 --	4.8	6.358E+00( 1.039E-01)	3.849E+00( 8.129E-02)	3.759E-01( 2.797E-02)
4.8 --	4.9	2.923E+01( 2.218E-01)	9.331E-01( 4.137E-02)	2.655E-01( 2.443E-02)
4.9 --	5.0	1.245E+01( 1.450E-01)	4.850E-01( 3.097E-02)	2.023E-01( 2.216E-02)
5.0 --	5.1	1.538E+00( 5.194E-02)	3.162E-01( 2.599E-02)	1.610E-01( 2.054E-02)
5.1 --	5.2	6.365E-01( 3.439E-02)	2.618E-01( 2.417E-02)	1.219E-01( 1.887E-02)
5.2 --	5.3	3.428E-01( 2.627E-02)	1.493E-01( 1.989E-02)	1.275E-01( 1.912E-02)
5.3 --	5.4	2.624E-01( 2.356E-02)	1.268E-01( 1.891E-02)	9.352E-02( 1.757E-02)
5.4 --	5.5	1.843E-01( 2.058E-02)	1.363E-01( 1.933E-02)	1.050E-01( 1.811E-02)
5.5 --	5.6	1.451E-01( 1.892E-02)	1.087E-01( 1.809E-02)	5.012E-01( 3.151E-02)
5.6 --	5.7	1.547E-01( 1.934E-02)	1.437E-01( 1.965E-02)	3.348E-01( 2.672E-02)
5.7 --	5.8	1.080E-01( 1.720E-02)	5.977E-01( 3.389E-02)	4.702E-02( 1.519E-02)
5.8 --	5.9	1.396E-01( 1.867E-02)	2.387E-01( 2.336E-02)	5.180E-02( 1.545E-02)
5.9 --	6.0	6.403E-01( 3.449E-02)	9.897E-02( 1.763E-02)	7.561E-02( 1.669E-02)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

III-2

$E_{\text{p}'}$ (MeV)		80 deg.	90 deg.	100 deg.	
6.0	--	6.1	2.973E-01( 2.477E-02)	6.433E-02( 1.590E-02)	1.392E-01( 1.963E-02)
6.1	--	6.2	6.282E-02( 1.482E-02)	3.193E-02( 1.408E-02)	5.029E-01( 3.156E-02)
6.2	--	6.3	4.254E-02( 1.363E-02)	6.538E-02( 1.595E-02)	6.249E-01( 3.465E-02)
6.3	--	6.4	6.220E-02( 1.479E-02)	2.246E-01( 2.284E-02)	7.953E-02( 1.689E-02)
6.4	--	6.5	5.393E-02( 1.431E-02)	1.319E+00( 4.857E-02)	1.205E-01( 1.881E-02)
6.5	--	6.6	2.850E-02( 1.273E-02)	4.332E-01( 2.953E-02)	1.167E-01( 1.864E-02)
6.6	--	6.7	3.363E-01( 2.606E-02)	1.009E-01( 1.772E-02)	6.523E-02( 1.616E-02)
6.7	--	6.8	2.296E+00( 6.300E-02)	1.591E-01( 2.029E-02)	4.699E-02( 1.518E-02)
6.8	--	6.9	4.484E-01( 2.945E-02)	2.180E-02( 1.347E-02)	5.156E-02( 1.543E-02)
6.9	--	7.0	1.897E-01( 2.080E-02)	3.458E-02( 1.424E-02)	3.668E-02( 1.460E-02)
7.0	--	7.1	1.073E-01( 1.716E-02)	5.730E-02( 1.552E-02)	9.308E-02( 1.755E-02)
7.1	--	7.2	2.191E-02( 1.229E-02)	2.913E-02( 1.392E-02)	1.438E-01( 1.983E-02)
7.2	--	7.3	1.251E-02( 1.163E-02)	5.990E-02( 1.566E-02)	1.441E-01( 1.984E-02)
7.3	--	7.4	5.303E-02( 1.426E-02)	1.235E-01( 1.876E-02)	1.670E-01( 2.079E-02)
7.4	--	7.5	3.535E-02( 1.318E-02)	2.212E-01( 2.272E-02)	1.806E-01( 2.133E-02)
7.5	--	7.6	8.978E-02( 1.628E-02)	1.433E-01( 1.963E-02)	2.010E-02( 1.362E-02)
7.6	--	7.7	3.162E-01( 2.540E-02)	2.220E-01( 2.275E-02)	1.181E-02( 1.310E-02)
7.7	--	7.8	1.142E-01( 1.749E-02)	4.946E-02( 1.509E-02)	2.741E-02( 1.406E-02)
7.8	--	7.9	3.075E-01( 2.511E-02)	2.519E-02( 1.368E-02)	1.852E-02( 1.352E-02)
7.9	--	8.0	7.694E-02( 1.560E-02)	3.096E-02( 1.403E-02)	7.402E-02( 1.661E-02)
8.0	--	8.1	2.570E-02( 1.255E-02)	3.254E-02( 1.412E-02)	3.006E-01( 2.562E-02)
8.1	--	8.2	4.710E-02( 1.391E-02)	1.827E-02( 1.325E-02)	7.140E-01( 3.675E-02)
8.2	--	8.3	4.019E-02( 1.348E-02)	1.634E-01( 2.047E-02)	2.428E-01( 2.365E-02)
8.3	--	8.4	3.230E-02( 1.298E-02)	7.726E-01( 3.797E-02)	1.448E-01( 1.987E-02)
8.4	--	8.5	6.270E-02( 1.482E-02)	2.649E-01( 2.428E-02)	1.733E-01( 2.104E-02)
8.5	--	8.6	6.968E-01( 3.584E-02)	8.386E-02( 1.690E-02)	1.926E-01( 2.180E-02)
8.6	--	8.7	6.969E-01( 3.584E-02)	6.756E-02( 1.607E-02)	2.242E-01( 2.298E-02)
8.7	--	8.8	1.053E-01( 1.706E-02)	1.241E-01( 1.879E-02)	2.866E-01( 2.516E-02)
8.8	--	8.9	5.451E-02( 1.435E-02)	1.485E-01( 1.985E-02)	5.216E-01( 3.205E-02)
8.9	--	9.0	4.049E-02( 1.350E-02)	1.777E-01( 2.105E-02)	1.177E+00( 4.613E-02)
9.0	--	9.1	7.211E-02( 1.534E-02)	2.123E-01( 2.239E-02)	1.727E+01( 1.707E-01)
9.1	--	9.2	1.086E-01( 1.722E-02)	3.269E-01( 2.634E-02)	3.539E+01( 2.441E-01)
9.2	--	9.3	1.130E-01( 1.744E-02)	6.850E-01( 3.599E-02)	2.561E+00( 6.672E-02)
9.3	--	9.4	1.273E-01( 1.811E-02)	1.170E+01( 1.407E-01)	8.664E-02( 1.724E-02)
9.4	--	9.5	1.631E-01( 1.970E-02)	3.695E+01( 2.494E-01)	8.095E-02( 1.696E-02)
9.5	--	9.6	2.826E-01( 2.426E-02)	2.884E+00( 7.061E-02)	2.367E-02( 1.384E-02)
9.6	--	9.7	2.747E+00( 6.875E-02)	9.173E-02( 1.729E-02)	2.559E-02( 1.395E-02)
9.7	--	9.8	4.229E+01( 2.667E-01)	4.179E-02( 1.466E-02)	1.391E-01( 1.963E-02)
9.8	--	9.9	1.509E+01( 1.595E-01)	1.881E-02( 1.328E-02)	1.690E-01( 2.087E-02)
9.9	--	10.0	1.254E-01( 1.802E-02)	6.444E-03( 1.247E-02)	1.478E-01( 1.999E-02)
10.0	--	10.1	4.269E-02( 1.364E-02)	6.772E-02( 1.608E-02)	9.553E-02( 1.767E-02)
10.1	--	10.2	1.867E-02( 1.207E-02)	1.929E-01( 2.165E-02)	3.622E-02( 1.458E-02)
10.2	--	10.3	3.042E-02( 1.286E-02)	1.656E-01( 2.056E-02)	1.011E-02( 1.299E-02)
10.3	--	10.4	3.505E-02( 1.316E-02)	1.057E-01( 1.795E-02)	1.432E-02( 1.326E-02)
10.4	--	10.5	1.768E-01( 2.028E-02)	1.653E-02( 1.314E-02)	1.498E-02( 1.330E-02)
10.5	--	10.6	1.262E-01( 1.806E-02)	1.853E-02( 1.326E-02)	3.480E-02( 1.450E-02)
10.6	--	10.7	1.625E-01( 1.968E-02)	1.685E-02( 1.316E-02)	4.818E-03( 1.264E-02)
10.7	--	10.8	5.287E-02( 1.425E-02)	1.341E-02( 1.293E-02)	2.473E-02( 1.390E-02)
10.8	--	10.9	1.843E-02( 1.205E-02)	2.149E-02( 1.345E-02)	3.320E-02( 1.440E-02)
10.9	--	11.0	1.714E-02( 1.196E-02)	1.860E-02( 1.327E-02)	9.772E-03( 1.297E-02)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

III-3

$E_{\text{p}'}$ (MeV)	80 deg.	90 deg.	100 deg.
11.0 -- 11.1	2.034E-02( 1.218E-02)	0.000E+00( 0.000E+00)	2.451E-02( 1.389E-02)
11.1 -- 11.2	3.859E-02( 1.338E-02)	9.823E-03( 1.270E-02)	7.933E-02( 1.688E-02)
11.2 -- 11.3	1.392E-02( 1.173E-02)	6.615E-03( 1.249E-02)	1.306E-01( 1.926E-02)
11.3 -- 11.4	1.699E-02( 1.195E-02)	1.655E-02( 1.314E-02)	5.955E-02( 1.586E-02)
11.4 -- 11.5	1.859E-02( 1.206E-02)	2.501E-02( 1.367E-02)	9.837E-03( 1.297E-02)
11.5 -- 11.6	8.802E-03( 1.136E-02)	7.804E-02( 1.661E-02)	1.559E-02( 1.336E-02)
11.6 -- 11.7	1.342E-02( 1.170E-02)	1.408E-01( 1.952E-02)	2.173E-02( 1.372E-02)
11.7 -- 11.8	3.691E-03( 1.098E-02)	2.934E-02( 1.393E-02)	4.334E-02( 1.498E-02)
11.8 -- 11.9	1.349E-02( 1.170E-02)	8.499E-03( 1.261E-02)	4.274E-02( 1.495E-02)
11.9 -- 12.0	7.328E-02( 1.541E-02)	4.870E-03( 1.237E-02)	1.398E-01( 1.966E-02)
12.0 -- 12.1	1.362E-01( 1.852E-02)	1.501E-02( 1.304E-02)	3.446E-01( 2.702E-02)
12.1 -- 12.2	4.961E-02( 1.406E-02)	2.851E-02( 1.388E-02)	3.669E-01( 2.771E-02)
12.2 -- 12.3	0.000E+00( 0.000E+00)	3.465E-02( 1.425E-02)	4.807E-01( 3.096E-02)
12.3 -- 12.4	1.201E-02( 1.160E-02)	1.816E-01( 2.121E-02)	5.931E-01( 3.387E-02)
12.4 -- 12.5	0.000E+00( 0.000E+00)	2.337E-01( 2.318E-02)	6.857E-01( 3.610E-02)
12.5 -- 12.6	6.849E-03( 1.122E-02)	3.058E-01( 2.566E-02)	7.871E-01( 3.838E-02)
12.6 -- 12.7	2.166E-02( 1.228E-02)	3.295E-01( 2.642E-02)	9.774E-01( 4.234E-02)
12.7 -- 12.8	9.069E-02( 1.633E-02)	3.876E-01( 2.821E-02)	1.151E+00( 4.566E-02)
12.8 -- 12.9	9.579E-02( 1.659E-02)	4.675E-01( 3.049E-02)	1.913E+00( 5.799E-02)
12.9 -- 13.0	1.125E-01( 1.741E-02)	6.373E-01( 3.485E-02)	4.076E+00( 8.364E-02)
13.0 -- 13.1	1.076E-01( 1.718E-02)	8.021E-01( 3.862E-02)	5.197E+01( 2.956E-01)
13.1 -- 13.2	1.708E-01( 2.003E-02)	1.060E+00( 4.387E-02)	1.936E+02( 5.703E-01)
13.2 -- 13.3	2.016E-01( 2.128E-02)	1.699E+00( 5.474E-02)	2.896E+01( 2.209E-01)
13.3 -- 13.4	2.385E-01( 2.269E-02)	5.086E+00( 9.319E-02)	1.823E+00( 5.667E-02)
13.4 -- 13.5	2.938E-01( 2.465E-02)	9.369E+01( 3.969E-01)	4.928E-01( 3.129E-02)
13.5 -- 13.6	4.353E-01( 2.907E-02)	1.624E+02( 5.223E-01)	3.291E-01( 2.654E-02)
13.6 -- 13.7	7.203E-01( 3.638E-02)	7.450E+00( 1.125E-01)	1.643E-01( 2.068E-02)
13.7 -- 13.8	2.441E+00( 6.490E-02)	1.445E+00( 5.071E-02)	1.356E+00( 4.929E-02)
13.8 -- 13.9	7.428E+01( 3.533E-01)	4.822E-01( 3.089E-02)	2.062E+00( 6.011E-02)
13.9 -- 14.0	1.333E+02( 4.732E-01)	3.016E-01( 2.552E-02)	1.008E-01( 1.791E-02)
14.0 -- 14.1	5.879E+00( 9.993E-02)	3.075E+00( 7.286E-02)	0.000E+00( 0.000E+00)
14.1 -- 14.2	9.969E-01( 4.229E-02)	3.633E+00( 7.902E-02)	0.000E+00( 0.000E+00)
14.2 -- 14.3	3.977E-01( 2.796E-02)	1.356E-01( 1.930E-02)	0.000E+00( 0.000E+00)
14.3 -- 14.4	3.567E+00( 7.812E-02)	1.506E-02( 1.304E-02)	0.000E+00( 0.000E+00)
14.4 -- 14.5	6.672E+00( 1.064E-01)	8.254E-03( 1.260E-02)	3.811E-02( 1.469E-02)
14.5 -- 14.6	1.968E-01( 2.109E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
14.6 -- 14.7	1.887E-02( 1.208E-02)	4.175E-02( 1.466E-02)	0.000E+00( 0.000E+00)
14.7 -- 14.8	1.181E-04( 1.070E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
14.8 -- 14.9	1.306E-01( 1.827E-02)	9.856E-03( 1.270E-02)	0.000E+00( 0.000E+00)
14.9 -- 15.0	5.781E-02( 1.454E-02)	0.000E+00( 0.000E+00)	1.290E-02( 1.317E-02)
15.0 -- 15.1	3.213E-02( 1.297E-02)	0.000E+00( 0.000E+00)	2.656E-02( 1.401E-02)
15.1 -- 15.2	8.627E-03( 1.135E-02)	9.868E-03( 1.270E-02)	0.000E+00( 0.000E+00)
15.2 -- 15.3	1.678E-02( 1.194E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.3 -- 15.4	2.212E-03( 1.086E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.4 -- 15.5	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.5 -- 15.6	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.6 -- 15.7	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.7 -- 15.8	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.8 -- 15.9	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.9 -- 16.0	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

IV-1

$E_{\text{p}'}$ (MeV)		110 deg.	120 deg.	130 deg.
1.0 --	1.1	7.149E-01( 3.776E-02)	6.404E-01( 3.529E-02)	7.558E-01( 4.152E-02)
1.1 --	1.2	1.218E+00( 4.761E-02)	1.079E+00( 4.449E-02)	2.305E+00( 7.052E-02)
1.2 --	1.3	2.204E+00( 6.259E-02)	2.183E+00( 6.188E-02)	5.205E+00( 1.052E-01)
1.3 --	1.4	2.562E+00( 6.719E-02)	4.335E+00( 8.625E-02)	3.635E+00( 8.809E-02)
1.4 --	1.5	4.339E+00( 8.657E-02)	5.860E+00( 9.999E-02)	2.374E+00( 7.148E-02)
1.5 --	1.6	6.447E+00( 1.050E-01)	2.892E+00( 7.079E-02)	2.291E+00( 7.023E-02)
1.6 --	1.7	3.262E+00( 7.535E-02)	2.356E+00( 6.409E-02)	2.120E+00( 6.761E-02)
1.7 --	1.8	2.506E+00( 6.638E-02)	2.326E+00( 6.367E-02)	2.145E+00( 6.800E-02)
1.8 --	1.9	2.357E+00( 6.443E-02)	2.297E+00( 6.327E-02)	2.323E+00( 7.068E-02)
1.9 --	2.0	2.396E+00( 6.491E-02)	2.356E+00( 6.402E-02)	2.563E+00( 7.413E-02)
2.0 --	2.1	2.368E+00( 6.452E-02)	2.426E+00( 6.492E-02)	2.451E+00( 7.251E-02)
2.1 --	2.2	2.402E+00( 6.493E-02)	2.727E+00( 6.869E-02)	2.032E+00( 6.616E-02)
2.2 --	2.3	2.717E+00( 6.886E-02)	2.457E+00( 6.528E-02)	1.719E+00( 6.098E-02)
2.3 --	2.4	2.706E+00( 6.870E-02)	1.965E+00( 5.858E-02)	1.473E+00( 5.657E-02)
2.4 --	2.5	2.101E+00( 6.083E-02)	1.526E+00( 5.190E-02)	1.555E+00( 5.804E-02)
2.5 --	2.6	1.655E+00( 5.431E-02)	1.427E+00( 5.025E-02)	1.697E+00( 6.056E-02)
2.6 --	2.7	1.389E+00( 4.999E-02)	1.431E+00( 5.028E-02)	2.173E+00( 6.828E-02)
2.7 --	2.8	1.350E+00( 4.930E-02)	1.585E+00( 5.277E-02)	3.268E+00( 8.342E-02)
2.8 --	2.9	1.398E+00( 5.008E-02)	2.084E+00( 6.016E-02)	4.202E+00( 9.443E-02)
2.9 --	3.0	1.827E+00( 5.679E-02)	3.089E+00( 7.284E-02)	3.679E+00( 8.842E-02)
3.0 --	3.1	2.753E+00( 6.912E-02)	4.175E+00( 8.442E-02)	2.245E+00( 6.933E-02)
3.1 --	3.2	3.142E+00( 7.367E-02)	2.821E+00( 6.965E-02)	1.605E+00( 5.884E-02)
3.2 --	3.3	3.094E+00( 7.311E-02)	1.815E+00( 5.621E-02)	1.257E+00( 5.226E-02)
3.3 --	3.4	2.156E+00( 6.138E-02)	1.506E+00( 5.137E-02)	1.035E+00( 4.756E-02)
3.4 --	3.5	1.887E+00( 5.756E-02)	1.329E+00( 4.837E-02)	9.515E-01( 4.567E-02)
3.5 --	3.6	1.329E+00( 4.872E-02)	1.137E+00( 4.490E-02)	1.195E+00( 5.094E-02)
3.6 --	3.7	1.212E+00( 4.662E-02)	1.135E+00( 4.484E-02)	2.493E+00( 7.292E-02)
3.7 --	3.8	1.228E+00( 4.689E-02)	1.375E+00( 4.911E-02)	3.984E+00( 9.189E-02)
3.8 --	3.9	1.295E+00( 4.805E-02)	3.669E+00( 7.913E-02)	5.638E+00( 1.092E-01)
3.9 --	4.0	1.967E+00( 5.861E-02)	6.719E+00( 1.067E-01)	3.273E+00( 8.337E-02)
4.0 --	4.1	6.716E+00( 1.068E-01)	6.600E+00( 1.057E-01)	7.034E-01( 3.948E-02)
4.1 --	4.2	1.008E+01( 1.306E-01)	3.977E+00( 8.233E-02)	5.107E-01( 3.397E-02)
4.2 --	4.3	7.242E+00( 1.109E-01)	7.855E+01( 3.767E-02)	3.213E-01( 2.750E-02)
4.3 --	4.4	3.251E+00( 7.477E-02)	4.589E+01( 2.950E-02)	2.362E-01( 2.404E-02)
4.4 --	4.5	6.578E-01( 3.517E-02)	3.283E+01( 2.552E-02)	1.631E-01( 2.060E-02)
4.5 --	4.6	3.747E-01( 2.759E-02)	1.880E+01( 2.039E-02)	1.704E-01( 2.097E-02)
4.6 --	4.7	2.874E-01( 2.479E-02)	1.657E+01( 1.944E-02)	2.009E-01( 2.247E-02)
4.7 --	4.8	1.853E-01( 2.106E-02)	1.707E+01( 1.967E-02)	1.360E-01( 1.920E-02)
4.8 --	4.9	1.488E-01( 1.955E-02)	1.205E+01( 1.740E-02)	1.064E-01( 1.751E-02)
4.9 --	5.0	1.391E-01( 1.914E-02)	1.240E+01( 1.756E-02)	8.894E-02( 1.643E-02)
5.0 --	5.1	1.129E-01( 1.795E-02)	1.064E+01( 1.670E-02)	1.669E-01( 2.082E-02)
5.1 --	5.2	6.315E-02( 1.545E-02)	1.213E+01( 1.744E-02)	4.644E-01( 3.252E-02)
5.2 --	5.3	1.031E-01( 1.749E-02)	4.287E+01( 2.864E-02)	1.581E-01( 2.037E-02)
5.3 --	5.4	3.237E-01( 2.600E-02)	1.495E+01( 1.874E-02)	1.361E-01( 1.921E-02)
5.4 --	5.5	4.199E-01( 2.894E-02)	1.610E+01( 1.925E-02)	1.352E-01( 1.916E-02)
5.5 --	5.6	7.190E-02( 1.592E-02)	1.564E+01( 1.905E-02)	1.432E+00( 5.557E-02)
5.6 --	5.7	5.305E-02( 1.489E-02)	2.812E+01( 2.393E-02)	8.446E-01( 4.308E-02)
5.7 --	5.8	1.655E-01( 2.026E-02)	1.047E+00( 4.310E-02)	8.072E-02( 1.590E-02)
5.8 --	5.9	1.924E-01( 2.135E-02)	2.269E+01( 2.194E-02)	1.828E-01( 2.161E-02)
5.9 --	6.0	7.379E-01( 3.703E-02)	7.777E-02( 1.520E-02)	9.036E-02( 1.652E-02)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

IV-2

$E_{\text{p}'}$ (MeV)		110 deg.	120 deg.	130 deg.
6.0	-- 6.1	2.142E-01( 2.219E-02)	1.692E-01( 1.961E-02)	3.422E-02( 1.245E-02)
6.1	-- 6.2	9.538E-02( 1.711E-02)	5.638E-02( 1.396E-02)	2.657E-02( 1.179E-02)
6.2	-- 6.3	1.505E-01( 1.963E-02)	4.282E-02( 1.312E-02)	4.000E-02( 1.293E-02)
6.3	-- 6.4	7.625E-02( 1.615E-02)	4.210E-02( 1.308E-02)	5.781E-02( 1.430E-02)
6.4	-- 6.5	3.882E-02( 1.407E-02)	3.503E-02( 1.262E-02)	8.118E-02( 1.593E-02)
6.5	-- 6.6	1.207E-02( 1.237E-02)	4.282E-02( 1.312E-02)	6.228E-02( 1.463E-02)
6.6	-- 6.7	2.503E-02( 1.322E-02)	7.496E-02( 1.504E-02)	3.494E-01( 2.858E-02)
6.7	-- 6.8	5.779E-02( 1.516E-02)	1.403E-01( 1.833E-02)	2.605E-01( 2.510E-02)
6.8	-- 6.9	7.876E-02( 1.628E-02)	3.101E-01( 2.492E-02)	2.489E-01( 2.461E-02)
6.9	-- 7.0	1.669E-01( 2.032E-02)	1.261E-01( 1.766E-02)	9.352E-02( 1.672E-02)
7.0	-- 7.1	2.041E-01( 2.180E-02)	1.529E-01( 1.889E-02)	6.318E-02( 1.469E-02)
7.1	-- 7.2	1.608E-01( 2.007E-02)	4.072E-02( 1.299E-02)	6.198E-02( 1.461E-02)
7.2	-- 7.3	1.221E-01( 1.838E-02)	2.558E-02( 1.197E-02)	5.070E-02( 1.377E-02)
7.3	-- 7.4	2.201E-02( 1.303E-02)	7.205E-02( 1.488E-02)	6.924E-02( 1.512E-02)
7.4	-- 7.5	5.091E-02( 1.477E-02)	7.204E-02( 1.488E-02)	1.375E-01( 1.928E-02)
7.5	-- 7.6	3.285E-02( 1.371E-02)	9.601E-02( 1.617E-02)	7.308E-01( 4.021E-02)
7.6	-- 7.7	6.425E-02( 1.551E-02)	2.960E-01( 2.444E-02)	5.466E-01( 3.508E-02)
7.7	-- 7.8	1.105E-01( 1.784E-02)	7.809E-01( 3.757E-02)	1.869E-01( 2.181E-02)
7.8	-- 7.9	3.267E-01( 2.610E-02)	3.537E-01( 2.635E-02)	1.850E-01( 2.171E-02)
7.9	-- 8.0	6.877E-01( 3.588E-02)	1.994E-01( 2.086E-02)	2.058E-01( 2.270E-02)
8.0	-- 8.1	3.326E-01( 2.629E-02)	2.630E-01( 2.328E-02)	2.715E-01( 2.556E-02)
8.1	-- 8.2	2.133E-01( 2.216E-02)	2.918E-01( 2.429E-02)	6.080E-01( 3.687E-02)
8.2	-- 8.3	2.448E-01( 2.332E-02)	3.562E-01( 2.643E-02)	1.473E+01( 1.761E-01)
8.3	-- 8.4	2.614E-01( 2.391E-02)	7.304E-01( 3.642E-02)	7.427E+01( 3.949E-01)
8.4	-- 8.5	3.395E-01( 2.651E-02)	1.003E+01( 1.301E-01)	8.309E+00( 1.324E-01)
8.5	-- 8.6	5.918E-01( 3.356E-02)	6.116E+01( 3.206E-01)	1.094E-01( 1.769E-02)
8.6	-- 8.7	1.394E+00( 4.973E-02)	1.070E+01( 1.344E-01)	8.275E-02( 1.603E-02)
8.7	-- 8.8	2.273E+01( 1.957E-01)	1.274E-01( 1.773E-02)	9.111E-02( 1.657E-02)
8.8	-- 8.9	4.154E+01( 2.643E-01)	4.115E-02( 1.302E-02)	3.835E-02( 1.280E-02)
8.9	-- 9.0	2.277E+00( 6.289E-02)	4.935E-02( 1.354E-02)	2.855E-02( 1.197E-02)
9.0	-- 9.1	9.849E-02( 1.727E-02)	9.310E-02( 1.602E-02)	9.785E-02( 1.699E-02)
9.1	-- 9.2	7.897E-02( 1.629E-02)	4.218E-02( 1.308E-02)	1.280E-01( 1.876E-02)
9.2	-- 9.3	3.876E-02( 1.407E-02)	8.704E-02( 1.570E-02)	1.738E-01( 2.117E-02)
9.3	-- 9.4	1.078E-01( 1.771E-02)	1.151E-01( 1.714E-02)	1.597E-02( 1.081E-02)
9.4	-- 9.5	1.532E-01( 1.975E-02)	1.823E-01( 2.016E-02)	1.516E-02( 1.073E-02)
9.5	-- 9.6	9.267E-02( 1.698E-02)	2.711E-02( 1.208E-02)	6.787E-03( 9.876E-03)
9.6	-- 9.7	1.262E-01( 1.857E-02)	1.242E-02( 1.101E-02)	9.447E-03( 1.016E-02)
9.7	-- 9.8	1.441E-01( 1.936E-02)	5.970E-03( 1.051E-02)	7.890E-02( 1.578E-02)
9.8	-- 9.9	2.825E-02( 1.342E-02)	1.402E-02( 1.113E-02)	1.419E-02( 1.063E-02)
9.9	-- 10.0	1.869E-02( 1.281E-02)	5.432E-02( 1.384E-02)	8.357E-03( 1.004E-02)
10.0	-- 10.1	2.708E-02( 1.335E-02)	2.780E-02( 1.213E-02)	6.834E-03( 9.881E-03)
10.1	-- 10.2	2.347E-02( 1.312E-02)	1.957E-02( 1.154E-02)	5.015E-03( 9.686E-03)
10.2	-- 10.3	3.916E-02( 1.409E-02)	5.553E-03( 1.047E-02)	3.850E-02( 1.281E-02)
10.3	-- 10.4	3.104E-02( 1.360E-02)	1.301E-02( 1.105E-02)	5.352E-02( 1.399E-02)
10.4	-- 10.5	1.348E-02( 1.247E-02)	6.847E-02( 1.467E-02)	2.716E-02( 1.185E-02)
10.5	-- 10.6	1.187E-02( 1.236E-02)	8.161E-02( 1.541E-02)	9.647E-03( 1.018E-02)
10.6	-- 10.7	1.507E-02( 1.257E-02)	5.377E-02( 1.381E-02)	1.595E-02( 1.081E-02)
10.7	-- 10.8	3.307E-02( 1.372E-02)	1.604E-02( 1.128E-02)	2.719E-02( 1.185E-02)
10.8	-- 10.9	1.471E-01( 1.949E-02)	9.165E-03( 1.076E-02)	1.247E-02( 1.046E-02)
10.9	-- 11.0	1.064E-01( 1.765E-02)	2.603E-02( 1.200E-02)	1.102E-02( 1.032E-02)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

IV-3

$E_{\text{p}}' \text{ (MeV)}$	110 deg.	120 deg.	130 deg.
11.0 -- 11.1	3.918E-02( 1.409E-02)	1.275E-02( 1.103E-02)	1.242E-02( 1.046E-02)
11.1 -- 11.2	1.186E-02( 1.236E-02)	1.588E-02( 1.127E-02)	4.743E-02( 1.352E-02)
11.2 -- 11.3	1.470E-02( 1.255E-02)	2.421E-02( 1.187E-02)	3.822E-02( 1.279E-02)
11.3 -- 11.4	2.625E-02( 1.330E-02)	8.568E-02( 1.563E-02)	4.574E-02( 1.339E-02)
11.4 -- 11.5	3.237E-02( 1.368E-02)	1.364E-01( 1.815E-02)	8.243E-02( 1.601E-02)
11.5 -- 11.6	6.467E-02( 1.554E-02)	1.803E-01( 2.008E-02)	1.257E-01( 1.863E-02)
11.6 -- 11.7	1.836E-01( 2.100E-02)	2.538E-01( 2.295E-02)	1.525E-01( 2.009E-02)
11.7 -- 11.8	3.158E-01( 2.575E-02)	2.759E-01( 2.374E-02)	1.873E-01( 2.183E-02)
11.8 -- 11.9	3.810E-01( 2.779E-02)	3.695E-01( 2.685E-02)	2.615E-01( 2.514E-02)
11.9 -- 12.0	4.449E-01( 2.966E-02)	4.446E-01( 2.910E-02)	4.439E-01( 3.186E-02)
12.0 -- 12.1	5.744E-01( 3.312E-02)	6.650E-01( 3.488E-02)	3.293E+00( 8.363E-02)
12.1 -- 12.2	6.686E-01( 3.543E-02)	8.234E-01( 3.851E-02)	7.061E+01( 3.851E-01)
12.2 -- 12.3	8.293E-01( 3.905E-02)	1.710E+00( 5.451E-02)	5.206E+01( 3.307E-01)
12.3 -- 12.4	9.994E-01( 4.255E-02)	2.378E+01( 2.000E-01)	6.872E-01( 3.906E-02)
12.4 -- 12.5	1.479E+00( 5.115E-02)	1.384E+02( 4.821E-01)	5.456E-01( 3.505E-02)
12.5 -- 12.6	2.556E+00( 6.651E-02)	2.350E+01( 1.989E-01)	1.218E-01( 1.841E-02)
12.6 -- 12.7	1.629E+01( 1.658E-01)	7.201E-01( 3.619E-02)	9.718E-02( 1.695E-02)
12.7 -- 12.8	1.541E+02( 5.088E-01)	5.173E-01( 3.113E-02)	3.347E-02( 1.239E-02)
12.8 -- 12.9	7.128E+01( 3.461E-01)	1.212E-01( 1.743E-02)	1.696E-02( 1.090E-02)
12.9 -- 13.0	1.610E+00( 5.326E-02)	1.162E-01( 1.719E-02)	1.139E-01( 1.796E-02)
13.0 -- 13.1	1.007E+00( 4.271E-02)	2.783E-02( 1.213E-02)	1.126E+00( 4.945E-02)
13.1 -- 13.2	2.522E-01( 2.358E-02)	6.422E-02( 1.443E-02)	3.084E-01( 2.703E-02)
13.2 -- 13.3	2.023E-01( 2.173E-02)	5.582E-01( 3.221E-02)	0.000E+00( 0.000E+00)
13.3 -- 13.4	6.382E-02( 1.549E-02)	1.696E-01( 1.962E-02)	0.000E+00( 0.000E+00)
13.4 -- 13.5	3.653E-01( 2.732E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.5 -- 13.6	8.874E-01( 4.028E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.6 -- 13.7	4.559E-02( 1.447E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.7 -- 13.8	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.8 -- 13.9	3.265E-03( 1.176E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.9 -- 14.0	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	1.979E-02( 1.117E-02)
14.0 -- 14.1	0.000E+00( 0.000E+00)	1.740E-02( 1.138E-02)	0.000E+00( 0.000E+00)
14.1 -- 14.2	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
14.2 -- 14.3	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	2.957E-02( 1.206E-02)
14.3 -- 14.4	0.000E+00( 0.000E+00)	5.752E-03( 1.049E-02)	0.000E+00( 0.000E+00)
14.4 -- 14.5	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
14.5 -- 14.6	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	2.015E-04( 9.152E-03)
14.6 -- 14.7	0.000E+00( 0.000E+00)	1.064E-02( 1.087E-02)	1.177E-02( 1.039E-02)
14.7 -- 14.8	0.000E+00( 0.000E+00)	1.791E-02( 1.142E-02)	5.478E-03( 9.738E-03)
14.8 -- 14.9	2.499E-02( 1.322E-02)	1.756E-02( 1.139E-02)	0.000E+00( 0.000E+00)
14.9 -- 15.0	1.033E-02( 1.225E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.0 -- 15.1	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.1 -- 15.2	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.2 -- 15.3	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.3 -- 15.4	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.4 -- 15.5	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.5 -- 15.6	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.6 -- 15.7	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.7 -- 15.8	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.8 -- 15.9	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
15.9 -- 16.0	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

V-1

$E_{\text{p}}'$ (MeV)	140 deg.	150 deg.	155 deg.
1.0 -- 1.1	1.177E+00 ( 4.528E-02)	1.638E+00 ( 5.307E-02)	1.782E+00 ( 5.532E-02)
1.1 -- 1.2	3.344E+00 ( 7.541E-02)	3.429E+00 ( 7.631E-02)	2.874E+00 ( 6.995E-02)
1.2 -- 1.3	4.190E+00 ( 8.429E-02)	2.801E+00 ( 6.905E-02)	2.567E+00 ( 6.615E-02)
1.3 -- 1.4	2.513E+00 ( 6.549E-02)	2.561E+00 ( 6.606E-02)	2.494E+00 ( 6.521E-02)
1.4 -- 1.5	2.560E+00 ( 6.608E-02)	2.587E+00 ( 6.638E-02)	2.626E+00 ( 6.688E-02)
1.5 -- 1.6	2.289E+00 ( 6.253E-02)	2.594E+00 ( 6.646E-02)	2.425E+00 ( 6.430E-02)
1.6 -- 1.7	2.328E+00 ( 6.304E-02)	2.444E+00 ( 6.452E-02)	2.505E+00 ( 6.532E-02)
1.7 -- 1.8	2.376E+00 ( 6.367E-02)	2.553E+00 ( 6.592E-02)	2.679E+00 ( 6.751E-02)
1.8 -- 1.9	2.520E+00 ( 6.553E-02)	2.599E+00 ( 6.649E-02)	2.577E+00 ( 6.623E-02)
1.9 -- 2.0	2.391E+00 ( 6.385E-02)	2.453E+00 ( 6.461E-02)	2.457E+00 ( 6.468E-02)
2.0 -- 2.1	2.140E+00 ( 6.045E-02)	2.232E+00 ( 6.167E-02)	2.350E+00 ( 6.327E-02)
2.1 -- 2.2	1.873E+00 ( 5.662E-02)	2.298E+00 ( 6.255E-02)	2.547E+00 ( 6.582E-02)
2.2 -- 2.3	1.749E+00 ( 5.473E-02)	2.504E+00 ( 6.525E-02)	2.781E+00 ( 6.874E-02)
2.3 -- 2.4	1.835E+00 ( 5.602E-02)	2.677E+00 ( 6.743E-02)	3.247E+00 ( 7.420E-02)
2.4 -- 2.5	2.177E+00 ( 6.092E-02)	3.133E+00 ( 7.288E-02)	3.767E+00 ( 7.986E-02)
2.5 -- 2.6	2.701E+00 ( 6.776E-02)	4.372E+00 ( 8.597E-02)	5.393E+00 ( 9.543E-02)
2.6 -- 2.7	3.554E+00 ( 7.760E-02)	5.942E+00 ( 1.001E-01)	6.487E+00 ( 1.046E-01)
2.7 -- 2.8	4.717E+00 ( 8.929E-02)	5.362E+00 ( 9.514E-02)	4.794E+00 ( 9.000E-02)
2.8 -- 2.9	4.149E+00 ( 8.378E-02)	3.117E+00 ( 7.268E-02)	2.810E+00 ( 6.905E-02)
2.9 -- 3.0	2.636E+00 ( 6.692E-02)	2.055E+00 ( 5.914E-02)	1.991E+00 ( 5.823E-02)
3.0 -- 3.1	2.074E+00 ( 5.944E-02)	1.901E+00 ( 5.691E-02)	1.644E+00 ( 5.298E-02)
3.1 -- 3.2	1.457E+00 ( 4.997E-02)	1.231E+00 ( 4.596E-02)	1.116E+00 ( 4.382E-02)
3.2 -- 3.3	1.069E+00 ( 4.294E-02)	1.066E+00 ( 4.283E-02)	9.233E-01 ( 3.995E-02)
3.3 -- 3.4	9.647E-01 ( 4.084E-02)	9.908E-01 ( 4.132E-02)	1.120E+00 ( 4.389E-02)
3.4 -- 3.5	1.000E+00 ( 4.155E-02)	1.440E+00 ( 4.961E-02)	1.506E+00 ( 5.072E-02)
3.5 -- 3.6	1.625E+00 ( 5.268E-02)	2.113E+00 ( 5.992E-02)	2.729E+00 ( 6.802E-02)
3.6 -- 3.7	2.564E+00 ( 6.596E-02)	4.173E+00 ( 8.395E-02)	3.214E+00 ( 7.375E-02)
3.7 -- 3.8	4.862E+00 ( 9.060E-02)	1.584E+00 ( 5.197E-02)	7.759E-01 ( 3.667E-02)
3.8 -- 3.9	2.229E+00 ( 6.154E-02)	5.911E-01 ( 3.214E-02)	5.453E-01 ( 3.093E-02)
3.9 -- 4.0	5.517E-01 ( 3.115E-02)	5.032E-01 ( 2.975E-02)	4.295E-01 ( 2.761E-02)
4.0 -- 4.1	4.578E-01 ( 2.851E-02)	4.772E-01 ( 2.901E-02)	4.563E-01 ( 2.841E-02)
4.1 -- 4.2	3.060E-01 ( 2.361E-02)	3.557E-01 ( 2.524E-02)	2.347E-01 ( 2.086E-02)
4.2 -- 4.3	2.981E-01 ( 2.333E-02)	1.669E-01 ( 1.790E-02)	1.818E-01 ( 1.861E-02)
4.3 -- 4.4	2.017E-01 ( 1.956E-02)	1.821E-01 ( 1.860E-02)	1.262E-01 ( 1.591E-02)
4.4 -- 4.5	1.599E-01 ( 1.769E-02)	1.377E-01 ( 1.647E-02)	1.084E-01 ( 1.495E-02)
4.5 -- 4.6	1.609E-01 ( 1.774E-02)	1.030E-01 ( 1.461E-02)	1.168E-01 ( 1.542E-02)
4.6 -- 4.7	1.201E-01 ( 1.569E-02)	1.144E-01 ( 1.526E-02)	1.273E-01 ( 1.598E-02)
4.7 -- 4.8	8.884E-02 ( 1.392E-02)	1.204E-01 ( 1.559E-02)	2.100E-01 ( 1.986E-02)
4.8 -- 4.9	7.094E-02 ( 1.279E-02)	4.136E-01 ( 2.711E-02)	4.596E-01 ( 2.852E-02)
4.9 -- 5.0	3.299E-01 ( 2.446E-02)	2.374E-01 ( 2.096E-02)	1.147E-01 ( 1.530E-02)
5.0 -- 5.1	3.460E-01 ( 2.501E-02)	9.349E-02 ( 1.406E-02)	1.661E-01 ( 1.790E-02)
5.1 -- 5.2	8.067E-02 ( 1.342E-02)	5.026E-01 ( 2.974E-02)	2.353E+00 ( 6.319E-02)
5.2 -- 5.3	1.157E-01 ( 1.545E-02)	3.425E+00 ( 7.610E-02)	2.797E+00 ( 6.883E-02)
5.3 -- 5.4	1.838E+00 ( 5.595E-02)	7.330E-01 ( 3.566E-02)	1.575E-01 ( 1.749E-02)
5.4 -- 5.5	1.357E+00 ( 4.820E-02)	1.159E-01 ( 1.534E-02)	1.604E-01 ( 1.763E-02)
5.5 -- 5.6	1.139E-01 ( 1.535E-02)	2.388E-01 ( 2.102E-02)	1.766E-01 ( 1.839E-02)
5.6 -- 5.7	1.729E-01 ( 1.830E-02)	1.072E-01 ( 1.485E-02)	5.552E-02 ( 1.161E-02)
5.7 -- 5.8	1.252E-01 ( 1.596E-02)	4.389E-02 ( 1.070E-02)	5.334E-02 ( 1.145E-02)
5.8 -- 5.9	3.545E-02 ( 1.020E-02)	4.044E-02 ( 1.042E-02)	3.011E-02 ( 9.599E-03)
5.9 -- 6.0	3.895E-02 ( 1.048E-02)	4.223E-02 ( 1.057E-02)	5.815E-02 ( 1.180E-02)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

V-2

$E_{\text{p}}' \text{ (MeV)}$	140 deg.	150 deg.	155 deg.
6.0 -- 6.1	4.411E-02( 1.089E-02)	5.854E-02( 1.179E-02)	8.681E-02( 1.369E-02)
6.1 -- 6.2	6.135E-02( 1.215E-02)	7.340E-02( 1.280E-02)	6.910E-02( 1.255E-02)
6.2 -- 6.3	8.965E-02( 1.397E-02)	5.702E-02( 1.168E-02)	8.575E-02( 1.362E-02)
6.3 -- 6.4	6.313E-02( 1.227E-02)	3.012E-01( 2.338E-02)	4.693E-01( 2.880E-02)
6.4 -- 6.5	1.791E-01( 1.858E-02)	4.260E-01( 2.749E-02)	2.225E-01( 2.037E-02)
6.5 -- 6.6	4.085E-01( 2.703E-02)	2.259E-01( 2.049E-02)	2.181E-01( 2.019E-02)
6.6 -- 6.7	1.625E-01( 1.782E-02)	1.165E-01( 1.538E-02)	6.723E-02( 1.243E-02)
6.7 -- 6.8	1.691E-01( 1.813E-02)	5.922E-02( 1.184E-02)	4.561E-02( 1.087E-02)
6.8 -- 6.9	6.316E-02( 1.227E-02)	5.000E-02( 1.117E-02)	5.814E-02( 1.180E-02)
6.9 -- 7.0	4.218E-02( 1.074E-02)	7.432E-02( 1.286E-02)	1.119E-01( 1.515E-02)
7.0 -- 7.1	6.142E-02( 1.215E-02)	1.088E-01( 1.494E-02)	1.293E-01( 1.608E-02)
7.1 -- 7.2	8.083E-02( 1.343E-02)	1.610E-01( 1.764E-02)	4.922E-01( 2.946E-02)
7.2 -- 7.3	1.014E-01( 1.465E-02)	1.025E+00( 4.197E-02)	1.305E+00( 4.725E-02)
7.3 -- 7.4	6.325E-01( 3.326E-02)	7.009E-01( 3.489E-02)	4.280E-01( 2.757E-02)
7.4 -- 7.5	7.562E-01( 3.625E-02)	2.590E-01( 2.181E-02)	2.911E-01( 2.303E-02)
7.5 -- 7.6	2.277E-01( 2.066E-02)	3.142E-01( 2.384E-02)	3.985E-01( 2.666E-02)
7.6 -- 7.7	1.876E-01( 1.896E-02)	3.947E-01( 2.652E-02)	6.168E-01( 3.282E-02)
7.7 -- 7.8	2.392E-01( 2.112E-02)	7.913E-01( 3.700E-02)	3.488E+00( 7.679E-02)
7.8 -- 7.9	3.271E-01( 2.437E-02)	1.367E+01( 1.516E-01)	7.596E+01( 3.572E-01)
7.9 -- 8.0	1.080E+00( 4.310E-02)	9.433E+01( 3.980E-01)	4.573E+01( 2.772E-01)
8.0 -- 8.1	3.425E+01( 2.399E-01)	1.450E+01( 1.562E-01)	5.921E-01( 3.218E-02)
8.1 -- 8.2	6.958E+01( 3.419E-01)	2.102E+01( 1.984E-02)	2.164E-01( 2.012E-02)
8.2 -- 8.3	2.656E+00( 6.711E-02)	1.601E-01( 1.759E-02)	9.605E-02( 1.424E-02)
8.3 -- 8.4	1.109E-01( 1.519E-02)	7.705E-02( 1.304E-02)	8.137E-02( 1.335E-02)
8.4 -- 8.5	8.028E-02( 1.339E-02)	4.206E-02( 1.055E-02)	3.158E-02( 9.727E-03)
8.5 -- 8.6	5.299E-02( 1.155E-02)	4.019E-02( 1.040E-02)	5.980E-02( 1.192E-02)
8.6 -- 8.7	1.844E-02( 8.689E-03)	1.031E-01( 1.462E-02)	1.079E-01( 1.493E-02)
8.7 -- 8.8	5.199E-02( 1.148E-02)	1.247E-01( 1.582E-02)	2.560E-01( 2.171E-02)
8.8 -- 8.9	1.117E-01( 1.523E-02)	2.309E-01( 2.070E-02)	1.022E-01( 1.460E-02)
8.9 -- 9.0	1.407E-01( 1.676E-02)	3.148E-02( 9.673E-03)	9.486E-03( 7.584E-03)
9.0 -- 9.1	1.293E-01( 1.618E-02)	2.016E-02( 8.635E-03)	1.349E-02( 8.015E-03)
9.1 -- 9.2	5.284E-03( 7.308E-03)	1.850E-02( 8.472E-03)	1.320E-02( 7.985E-03)
9.2 -- 9.3	8.642E-03( 7.684E-03)	1.408E-02( 8.022E-03)	9.330E-02( 1.408E-02)
9.3 -- 9.4	8.272E-03( 7.644E-03)	7.213E-02( 1.272E-02)	5.534E-02( 1.160E-02)
9.4 -- 9.5	4.014E-02( 1.058E-02)	1.795E-02( 8.418E-03)	1.855E-02( 8.528E-03)
9.5 -- 9.6	5.267E-02( 1.153E-02)	1.879E-02( 8.501E-03)	7.182E-03( 7.324E-03)
9.6 -- 9.7	1.534E-02( 8.384E-03)	4.713E-03( 6.973E-03)	2.337E-02( 8.991E-03)
9.7 -- 9.8	1.366E-02( 8.215E-03)	3.556E-02( 1.002E-02)	3.949E-02( 1.039E-02)
9.8 -- 9.9	1.826E-02( 8.671E-03)	6.028E-02( 1.191E-02)	2.823E-02( 9.433E-03)
9.9 -- 10.0	2.708E-02( 9.487E-03)	2.575E-02( 9.162E-03)	5.855E-03( 7.171E-03)
10.0 -- 10.1	4.495E-02( 1.095E-02)	1.251E-02( 7.856E-03)	8.757E-03( 7.503E-03)
10.1 -- 10.2	1.296E-02( 8.142E-03)	5.805E-03( 7.104E-03)	3.884E-03( 6.936E-03)
10.2 -- 10.3	3.613E-03( 7.114E-03)	5.397E-03( 7.055E-03)	9.688E-03( 7.606E-03)
10.3 -- 10.4	1.091E-02( 7.928E-03)	2.201E-02( 8.813E-03)	1.052E-02( 7.697E-03)
10.4 -- 10.5	0.000E+00( 0.000E+00)	1.475E-02( 8.092E-03)	5.043E-03( 7.075E-03)
10.5 -- 10.6	0.000E+00( 0.000E+00)	1.313E-02( 7.922E-03)	7.822E-03( 7.397E-03)
10.6 -- 10.7	6.970E-03( 7.499E-03)	8.651E-03( 7.432E-03)	4.139E-02( 1.054E-02)
10.7 -- 10.8	1.029E-02( 7.862E-03)	2.707E-02( 9.283E-03)	3.408E-02( 9.941E-03)
10.8 -- 10.9	1.262E-02( 8.107E-03)	4.272E-02( 1.060E-02)	5.317E-02( 1.144E-02)
10.9 -- 11.0	3.261E-02( 9.965E-03)	3.498E-02( 9.972E-03)	9.481E-02( 1.417E-02)

<<  $^{12}\text{C}(\text{p},\text{xp}')$   $E_{\text{p}} = 16 \text{ MeV}$  >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

V-3

$E_{\text{p}}^*$ (MeV)	140 deg.	150 deg.	155 deg.
11.0 -- 11.1	4.440E-02( 1.091E-02)	9.613E-02( 1.422E-02)	1.175E-01( 1.545E-02)
11.1 -- 11.2	6.637E-02( 1.249E-02)	1.164E-01( 1.536E-02)	1.580E-01( 1.752E-02)
11.2 -- 11.3	9.751E-02( 1.443E-02)	1.371E-01( 1.646E-02)	1.758E-01( 1.835E-02)
11.3 -- 11.4	1.245E-01( 1.593E-02)	1.735E-01( 1.822E-02)	2.242E-01( 2.045E-02)
11.4 -- 11.5	8.995E-02( 1.398E-02)	2.805E-01( 2.262E-02)	5.464E-01( 3.097E-02)
11.5 -- 11.6	1.544E-01( 1.743E-02)	7.875E-01( 3.692E-02)	1.263E+01( 1.458E-01)
11.6 -- 11.7	2.453E-01( 2.136E-02)	2.304E+01( 1.968E-01)	6.030E+01( 3.182E-01)
11.7 -- 11.8	7.386E-01( 3.584E-02)	5.160E+01( 2.944E-01)	5.678E+00( 9.785E-02)
11.8 -- 11.9	2.260E+01( 1.949E-01)	2.105E+00( 5.979E-02)	2.671E-01( 2.214E-02)
11.9 -- 12.0	5.861E+01( 3.138E-01)	3.474E-01( 2.498E-02)	6.021E-01( 3.244E-02)
12.0 -- 12.1	2.782E+00( 6.867E-02)	4.368E-01( 2.782E-02)	8.316E-02( 1.346E-02)
12.1 -- 12.2	3.031E-01( 2.352E-02)	4.427E-02( 1.073E-02)	1.989E-01( 1.938E-02)
12.2 -- 12.3	3.406E-01( 2.483E-02)	1.768E-01( 1.837E-02)	1.142E-01( 1.528E-02)
12.3 -- 12.4	4.227E-02( 1.075E-02)	6.236E-02( 1.206E-02)	3.424E-02( 9.954E-03)
12.4 -- 12.5	1.315E-01( 1.629E-02)	9.367E-03( 7.513E-03)	3.346E-02( 9.888E-03)
12.5 -- 12.6	4.260E-02( 1.077E-02)	1.056E-01( 1.477E-02)	1.064E+00( 4.276E-02)
12.6 -- 12.7	1.702E-02( 8.551E-03)	2.120E+00( 6.001E-02)	2.164E+00( 6.063E-02)
12.7 -- 12.8	3.235E-01( 2.424E-02)	1.154E+00( 4.449E-02)	6.069E-02( 1.198E-02)
12.8 -- 12.9	2.056E+00( 5.913E-02)	9.839E-03( 7.566E-03)	0.000E+00( 0.000E+00)
12.9 -- 13.0	2.929E-01( 2.316E-02)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.0 -- 13.1	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.1 -- 13.2	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	1.286E-02( 7.949E-03)
13.2 -- 13.3	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.3 -- 13.4	1.632E-02( 8.482E-03)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.4 -- 13.5	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.5 -- 13.6	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	1.726E-02( 8.401E-03)
13.6 -- 13.7	0.000E+00( 0.000E+00)	1.951E-02( 8.572E-03)	2.460E-02( 9.105E-03)
13.7 -- 13.8	2.679E-02( 9.462E-03)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.8 -- 13.9	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
13.9 -- 14.0	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	9.516E-03( 7.588E-03)
14.0 -- 14.1	6.492E-03( 7.446E-03)	1.831E-02( 8.453E-03)	0.000E+00( 0.000E+00)
14.1 -- 14.2	8.819E-03( 7.704E-03)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
14.2 -- 14.3	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
14.3 -- 14.4	0.000E+00( 0.000E+00)	7.260E-03( 7.274E-03)	2.155E-02( 8.819E-03)
14.4 -- 14.5	7.987E-04( 6.774E-03)	1.116E-02( 7.712E-03)	9.780E-03( 7.617E-03)
14.5 -- 14.6	1.341E-02( 8.189E-03)	4.464E-03( 6.944E-03)	8.086E-03( 7.428E-03)
14.6 -- 14.7	2.183E-03( 6.944E-03)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
14.7 -- 14.8	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
14.8 -- 14.9	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)
14.9 -- 15.0	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)	0.000E+00( 0.000E+00)

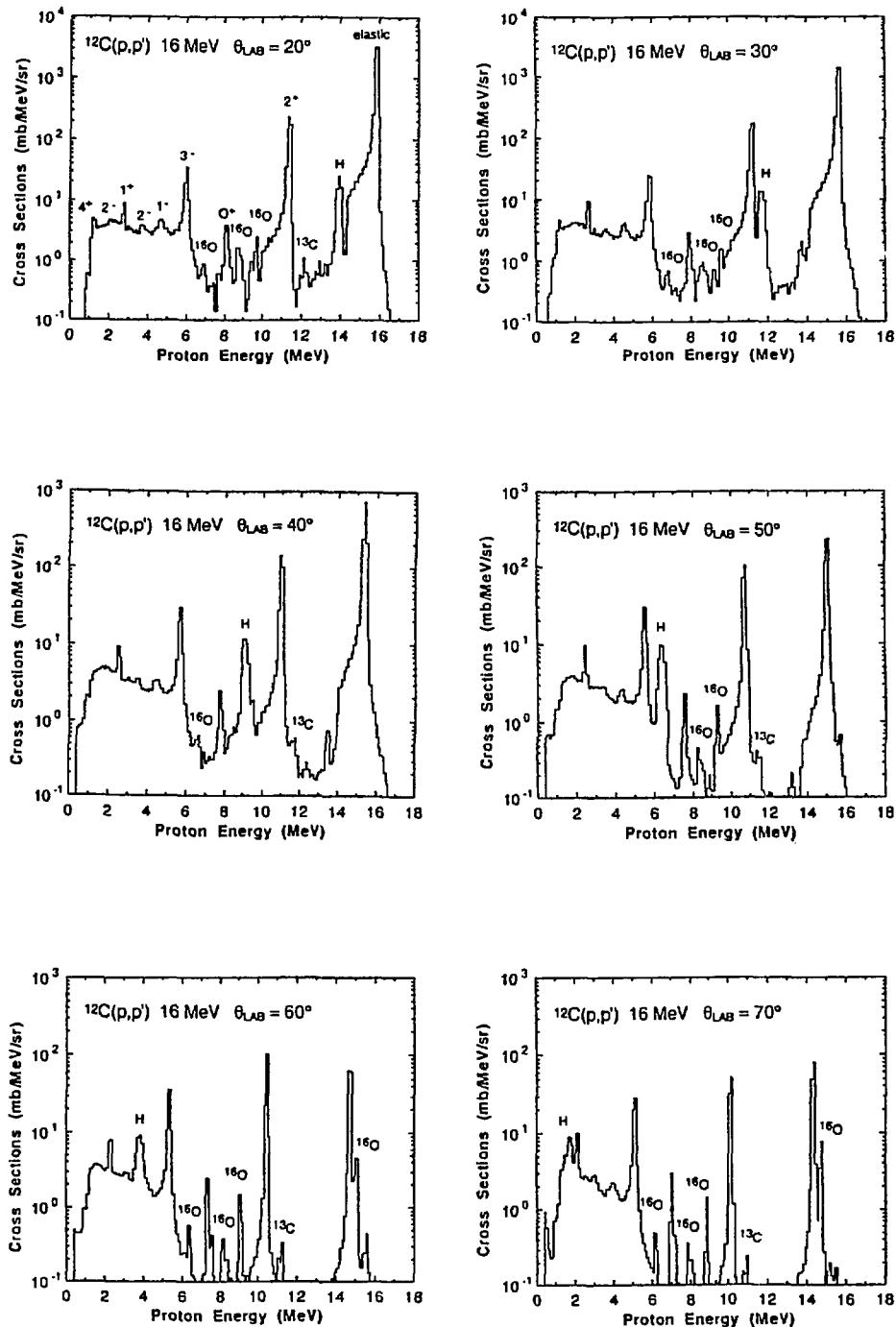


Fig. A-2. Differential cross sections of the  $^{12}\text{C}(\text{p},\text{p}'')$  reaction at 16 MeV.

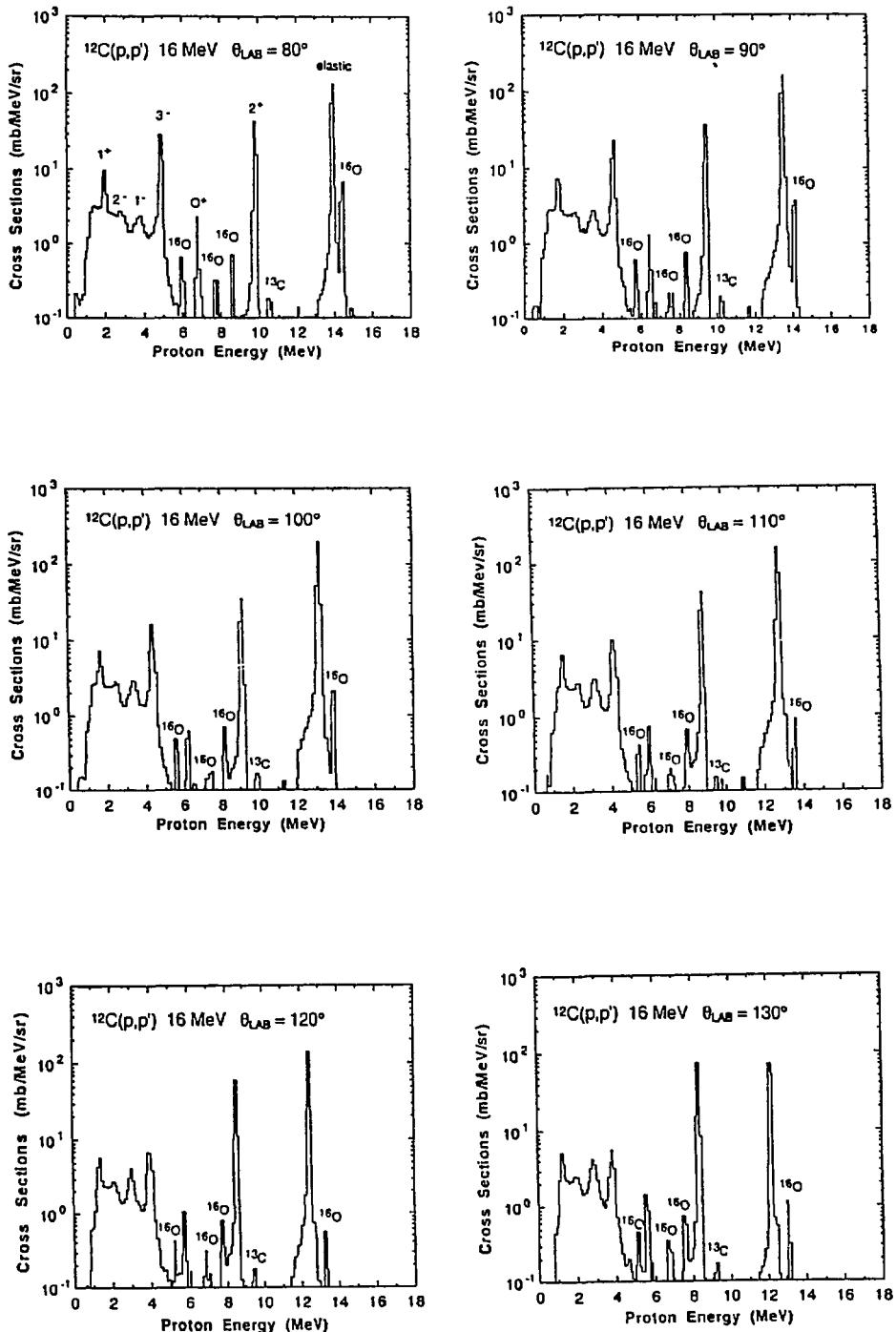


Fig. A-2. Continued.

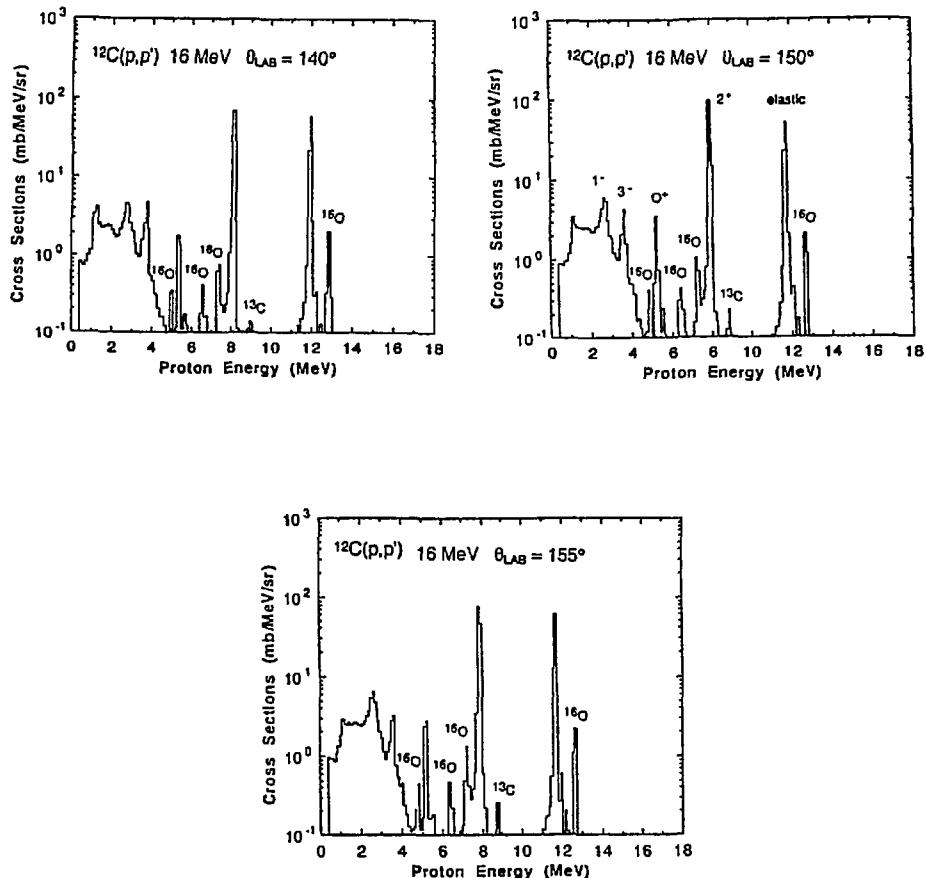


Fig. A-2. Continued.

Appendix 3 Double differential cross sections of the  $^{12}\text{C}(\text{p},\alpha)$  reaction  
at 16 MeV.

\*\*\*\*\* indicate data are not available.

<<  $^{12}\text{C}(\text{p},\alpha)$  Ep = 16 MeV >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

I-1

E <sub>a</sub> (MeV)	20 deg.	30 deg.	40 deg.
1.0 -- 1.1	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.1 -- 1.2	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.2 -- 1.3	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.3 -- 1.4	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.4 -- 1.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.5 -- 1.6	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.6 -- 1.7	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.7 -- 1.8	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.8 -- 1.9	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.9 -- 2.0	***** ( ***** )	***** ( ***** )	***** ( ***** )
2.0 -- 2.1	***** ( ***** )	***** ( ***** )	***** ( ***** )
2.1 -- 2.2	***** ( ***** )	***** ( ***** )	***** ( ***** )
2.2 -- 2.3	***** ( ***** )	***** ( ***** )	***** ( ***** )
2.3 -- 2.4	***** ( ***** )	***** ( ***** )	***** ( ***** )
2.4 -- 2.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
2.5 -- 2.6	***** ( ***** )	***** ( ***** )	***** ( ***** )
2.6 -- 2.7	***** ( ***** )	***** ( ***** )	***** ( ***** )
2.7 -- 2.8	***** ( ***** )	***** ( ***** )	***** ( ***** )
2.8 -- 2.9	***** ( ***** )	***** ( ***** )	1.668E+01 ( 5.509E-01 )
2.9 -- 3.0	***** ( ***** )	***** ( ***** )	1.571E+01 ( 5.346E-01 )
3.0 -- 3.1	***** ( ***** )	***** ( ***** )	1.397E+01 ( 5.055E-01 )
3.1 -- 3.2	***** ( ***** )	***** ( ***** )	1.384E+01 ( 5.028E-01 )
3.2 -- 3.3	***** ( ***** )	***** ( ***** )	1.346E+01 ( 4.963E-01 )
3.3 -- 3.4	***** ( ***** )	***** ( ***** )	1.269E+01 ( 4.814E-01 )
3.4 -- 3.5	***** ( ***** )	***** ( ***** )	1.237E+01 ( 4.749E-01 )
3.5 -- 3.6	***** ( ***** )	1.505E+01 ( 5.207E-01 )	1.278E+01 ( 4.843E-01 )
3.6 -- 3.7	***** ( ***** )	1.407E+01 ( 5.031E-01 )	1.201E+01 ( 4.690E-01 )
3.7 -- 3.8	***** ( ***** )	1.391E+01 ( 4.996E-01 )	1.207E+01 ( 4.699E-01 )
3.8 -- 3.9	***** ( ***** )	1.396E+01 ( 4.999E-01 )	1.047E+01 ( 4.389E-01 )
3.9 -- 4.0	***** ( ***** )	1.412E+01 ( 5.054E-01 )	1.124E+01 ( 4.536E-01 )
4.0 -- 4.1	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.1 -- 4.2	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.2 -- 4.3	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.3 -- 4.4	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.4 -- 4.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.5 -- 4.6	1.144E+01 ( 1.584E-01 )	8.566E+00 ( 1.418E-01 )	6.198E+00 ( 1.198E-01 )
4.6 -- 4.7	1.055E+01 ( 1.521E-01 )	8.151E+00 ( 1.383E-01 )	5.866E+00 ( 1.166E-01 )
4.7 -- 4.8	9.712E+00 ( 1.456E-01 )	7.567E+00 ( 1.331E-01 )	5.394E+00 ( 1.116E-01 )
4.8 -- 4.9	8.297E+00 ( 1.346E-01 )	7.273E+00 ( 1.305E-01 )	5.051E+00 ( 1.084E-01 )
4.9 -- 5.0	6.452E+00 ( 1.187E-01 )	6.691E+00 ( 1.252E-01 )	5.208E+00 ( 1.101E-01 )
5.0 -- 5.1	4.465E+00 ( 9.876E-02 )	6.226E+00 ( 1.205E-01 )	9.182E+00 ( 1.481E-01 )
5.1 -- 5.2	3.363E+00 ( 8.567E-02 )	5.761E+00 ( 1.159E-01 )	1.069E+01 ( 1.607E-01 )
5.2 -- 5.3	3.365E+00 ( 8.569E-02 )	5.685E+00 ( 1.154E-01 )	4.258E+00 ( 1.003E-01 )
5.3 -- 5.4	3.531E+00 ( 8.761E-02 )	6.981E+00 ( 1.284E-01 )	2.288E+00 ( 7.268E-02 )
5.4 -- 5.5	4.428E+00 ( 9.818E-02 )	1.238E+01 ( 1.729E-01 )	2.008E+00 ( 6.803E-02 )
5.5 -- 5.6	5.592E+00 ( 1.106E-01 )	9.342E+00 ( 1.499E-01 )	1.921E+00 ( 6.699E-02 )
5.6 -- 5.7	6.594E+00 ( 1.203E-01 )	4.316E+00 ( 1.007E-01 )	1.866E+00 ( 6.625E-02 )
5.7 -- 5.8	1.101E+01 ( 1.560E-01 )	3.220E+00 ( 8.700E-02 )	1.818E+00 ( 6.574E-02 )
5.8 -- 5.9	1.234E+01 ( 1.656E-01 )	2.611E+00 ( 7.809E-02 )	1.705E+00 ( 6.344E-02 )
5.9 -- 6.0	7.006E+00 ( 1.243E-01 )	2.235E+00 ( 7.288E-02 )	1.492E+00 ( 5.975E-02 )

<<  $^{12}\text{C}(\text{p},\alpha)$  Ep = 16 MeV >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

I-2

E $\alpha$	(MeV)	20 deg.	30 deg.	40 deg.	
6.0	--	6.1	4.730E+00( 1.015E-01)	2.039E+00( 6.982E-02)	1.463E+00( 5.925E-02)
6.1	--	6.2	3.919E+00( 9.236E-02)	1.978E+00( 6.896E-02)	1.442E+00( 5.902E-02)
6.2	--	6.3	3.554E+00( 8.794E-02)	1.546E+00( 6.113E-02)	1.321E+00( 5.655E-02)
6.3	--	6.4	3.077E+00( 8.157E-02)	1.547E+00( 6.182E-02)	1.387E+00( 5.818E-02)
6.4	--	6.5	2.848E+00( 7.858E-02)	1.320E+00( 5.709E-02)	1.687E+00( 6.388E-02)
6.5	--	6.6	2.728E+00( 7.675E-02)	1.359E+00( 5.767E-02)	1.321E+00( 5.685E-02)
6.6	--	6.7	2.175E+00( 6.833E-02)	1.614E+00( 6.296E-02)	8.948E-01( 4.688E-02)
6.7	--	6.8	2.067E+00( 6.663E-02)	1.701E+00( 6.541E-02)	7.068E-01( 4.137E-02)
6.8	--	6.9	2.016E+00( 6.601E-02)	1.158E+00( 5.385E-02)	6.833E-01( 4.107E-02)
6.9	--	7.0	2.258E+00( 7.024E-02)	9.392E-01( 4.830E-02)	9.003E-01( 4.666E-02)
7.0	--	7.1	2.203E+00( 6.952E-02)	8.117E-01( 4.541E-02)	1.335E+01( 1.774E-01)
7.1	--	7.2	1.420E+00( 5.523E-02)	6.588E-01( 4.030E-02)	3.189E+01( 2.745E-01)
7.2	--	7.3	1.265E+00( 5.190E-02)	5.492E-01( 3.661E-02)	4.668E+00( 1.043E-01)
7.3	--	7.4	9.854E-01( 4.578E-02)	1.186E+00( 5.257E-02)	1.386E-01( 1.795E-02)
7.4	--	7.5	8.641E-01( 4.245E-02)	1.886E+01( 2.071E-01)	1.037E-01( 1.486E-02)
7.5	--	7.6	7.214E-01( 3.892E-02)	1.930E+01( 2.093E-01)	3.926E-02( 9.440E-03)
7.6	--	7.7	6.277E-01( 3.660E-02)	1.415E+00( 5.649E-02)	4.441E-02( 1.035E-02)
7.7	--	7.8	2.603E+00( 7.370E-02)	1.708E-01( 1.931E-02)	4.312E-02( 1.018E-02)
7.8	--	7.9	2.781E+01( 2.460E-01)	1.125E-01( 1.597E-02)	2.141E-02( 7.190E-03)
7.9	--	8.0	1.539E+01( 1.813E-01)	5.206E-02( 1.092E-02)	8.610E-03( 4.520E-03)
8.0	--	8.1	9.175E-01( 4.336E-02)	1.706E-02( 6.420E-03)	1.340E-02( 5.270E-03)
8.1	--	8.2	1.387E-01( 1.672E-02)	7.270E-03( 3.730E-03)	1.350E-02( 5.360E-03)
8.2	--	8.3	8.888E-02( 1.358E-02)	3.610E-03( 2.550E-03)	3.640E-03( 2.570E-03)
8.3	--	8.4	6.952E-02( 1.218E-02)	***** ( ***** )	***** ( ***** )
8.4	--	8.5	7.070E-03( 3.880E-03)	***** ( ***** )	***** ( ***** )
8.5	--	8.6	4.220E-03( 3.040E-03)	***** ( ***** )	***** ( ***** )
8.6	--	8.7	1.011E-02( 5.060E-03)	***** ( ***** )	***** ( ***** )
8.7	--	8.8	1.690E-03( 1.690E-03)	***** ( ***** )	***** ( ***** )
8.8	--	8.9	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.9	--	9.0	***** ( ***** )	***** ( ***** )	***** ( ***** )

<<  $^{12}\text{C}(\text{p},\alpha)$  Ep = 16 MeV >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

II-1

E $\alpha$	(MeV)	50 deg.	60 deg.	70 deg.
1.0	-- 1.1	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.1	-- 1.2	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.2	-- 1.3	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.3	-- 1.4	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.4	-- 1.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.5	-- 1.6	***** ( ***** )	2.641E+01( 3.166E-01)	2.059E+01( 2.704E-01)
1.6	-- 1.7	***** ( ***** )	2.543E+01( 3.108E-01)	1.747E+01( 2.494E-01)
1.7	-- 1.8	***** ( ***** )	2.388E+01( 3.015E-01)	1.468E+01( 2.282E-01)
1.8	-- 1.9	***** ( ***** )	2.195E+01( 2.882E-01)	1.143E+01( 2.016E-01)
1.9	-- 2.0	***** ( ***** )	1.962E+01( 2.730E-01)	9.132E+00( 1.801E-01)
2.0	-- 2.1	2.614E+01( 5.350E-01)	1.662E+01( 2.513E-01)	8.493E+00( 1.735E-01)
2.1	-- 2.2	2.291E+01( 5.015E-01)	1.394E+01( 2.303E-01)	7.969E+00( 1.684E-01)
2.2	-- 2.3	2.107E+01( 4.784E-01)	1.177E+01( 2.116E-01)	8.215E+00( 1.707E-01)
2.3	-- 2.4	1.821E+01( 4.459E-01)	1.065E+01( 2.017E-01)	7.728E+00( 1.658E-01)
2.4	-- 2.5	1.699E+01( 4.319E-01)	9.674E+00( 1.918E-01)	7.626E+00( 1.650E-01)
2.5	-- 2.6	1.451E+01( 4.000E-01)	9.413E+00( 1.893E-01)	7.611E+00( 1.644E-01)
2.6	-- 2.7	1.402E+01( 3.932E-01)	9.136E+00( 1.863E-01)	7.081E+00( 1.588E-01)
2.7	-- 2.8	1.370E+01( 3.921E-01)	8.854E+00( 1.831E-01)	6.779E+00( 1.555E-01)
2.8	-- 2.9	1.248E+01( 3.707E-01)	8.843E+00( 1.834E-01)	5.985E+00( 1.459E-01)
2.9	-- 3.0	1.126E+01( 3.519E-01)	9.256E+00( 1.876E-01)	5.769E+00( 1.436E-01)
3.0	-- 3.1	1.087E+01( 3.465E-01)	8.209E+00( 1.775E-01)	5.464E+00( 1.394E-01)
3.1	-- 3.2	1.136E+01( 3.545E-01)	7.250E+00( 1.660E-01)	5.984E+00( 1.465E-01)
3.2	-- 3.3	1.013E+01( 3.344E-01)	6.969E+00( 1.629E-01)	6.115E+00( 1.480E-01)
3.3	-- 3.4	9.357E+00( 3.230E-01)	6.278E+00( 1.550E-01)	5.255E+00( 1.368E-01)
3.4	-- 3.5	9.682E+00( 3.292E-01)	6.053E+00( 1.521E-01)	4.545E+00( 1.275E-01)
3.5	-- 3.6	9.733E+00( 3.308E-01)	5.664E+00( 1.468E-01)	4.485E+00( 1.260E-01)
3.6	-- 3.7	8.806E+00( 3.154E-01)	5.509E+00( 1.455E-01)	5.678E+00( 1.421E-01)
3.7	-- 3.8	7.858E+00( 2.978E-01)	5.174E+00( 1.414E-01)	1.361E+01( 2.208E-01)
3.8	-- 3.9	6.915E+00( 2.775E-01)	4.917E+00( 1.378E-01)	1.513E+01( 2.328E-01)
3.9	-- 4.0	6.465E+00( 2.685E-01)	4.656E+00( 1.345E-01)	4.395E+00( 1.251E-01)
4.0	-- 4.1	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.1	-- 4.2	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.2	-- 4.3	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.3	-- 4.4	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.4	-- 4.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.5	-- 4.6	6.317E+00( 1.080E-01)	1.620E+00( 5.646E-02)	7.166E-01( 3.807E-02)
4.6	-- 4.7	1.340E+01( 1.592E-01)	1.389E+00( 5.296E-02)	5.989E-01( 3.496E-02)
4.7	-- 4.8	1.096E+01( 1.439E-01)	1.062E+00( 4.624E-02)	5.702E-01( 3.434E-02)
4.8	-- 4.9	3.541E+00( 8.107E-02)	9.643E-01( 4.401E-02)	4.781E-01( 3.147E-02)
4.9	-- 5.0	2.083E+00( 6.163E-02)	8.053E-01( 3.997E-02)	3.702E-01( 2.748E-02)
5.0	-- 5.1	1.404E+00( 5.035E-02)	5.846E-01( 3.425E-02)	2.729E-01( 2.382E-02)
5.1	-- 5.2	1.103E+00( 4.470E-02)	4.307E-01( 2.959E-02)	2.175E-01( 2.091E-02)
5.2	-- 5.3	1.017E+00( 4.284E-02)	3.618E-01( 2.694E-02)	2.521E-01( 2.275E-02)
5.3	-- 5.4	9.803E-01( 4.235E-02)	3.824E-01( 2.767E-02)	3.667E-01( 2.759E-02)
5.4	-- 5.5	1.042E+00( 4.352E-02)	3.023E-01( 2.435E-02)	4.331E-01( 2.953E-02)
5.5	-- 5.6	9.746E-01( 4.223E-02)	4.359E-01( 2.944E-02)	8.255E+00( 1.279E-01)
5.6	-- 5.7	9.601E-01( 4.175E-02)	4.924E-01( 3.129E-02)	3.056E+01( 2.456E-01)
5.7	-- 5.8	1.017E+00( 4.315E-02)	7.226E-01( 3.798E-02)	8.068E+00( 1.259E-01)
5.8	-- 5.9	9.568E-01( 4.213E-02)	6.414E-01( 3.583E-02)	2.224E-01( 2.080E-02)
5.9	-- 6.0	8.890E-01( 4.070E-02)	4.282E-01( 2.960E-02)	5.429E-02( 1.029E-02)

<<  $^{12}\text{C}(\text{p},\alpha)$  Ep = 16 MeV >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

II-2

E $\alpha$ (MeV)		50 deg.	60 deg.	70 deg.	
6.0	--	6.1	1.095E+00 ( 4.499E-02)	2.943E+00 ( 7.642E-02)	3.020E-02 ( 7.820E-03)
6.1	--	6.2	1.196E+00 ( 4.671E-02)	3.482E+01 ( 2.634E-01)	2.641E-02 ( 7.350E-03)
6.2	--	6.3	8.228E-01 ( 3.904E-02)	2.598E+01 ( 2.269E-01)	4.704E-02 ( 9.690E-03)
6.3	--	6.4	6.086E-01 ( 3.347E-02)	1.053E+00 ( 4.594E-02)	5.220E-02 ( 1.026E-02)
6.4	--	6.5	5.629E-01 ( 3.227E-02)	5.498E-02 ( 1.054E-02)	2.335E-02 ( 7.040E-03)
6.5	--	6.6	2.049E+00 ( 6.154E-02)	2.755E-02 ( 7.510E-03)	8.250E-03 ( 4.190E-03)
6.6	--	6.7	3.228E+01 ( 2.449E-01)	2.158E-02 ( 6.550E-03)	7.560E-03 ( 3.850E-03)
6.7	--	6.8	2.727E+01 ( 2.251E-01)	4.948E-02 ( 9.800E-03)	6.630E-03 ( 3.420E-03)
6.8	--	6.9	1.089E+00 ( 4.470E-02)	3.916E-02 ( 8.640E-03)	2.026E-02 ( 6.420E-03)
6.9	--	7.0	3.906E-02 ( 8.330E-03)	1.136E-02 ( 4.730E-03)	2.594E-02 ( 7.370E-03)
7.0	--	7.1	5.638E-02 ( 1.009E-02)	5.310E-03 ( 3.120E-03)	3.870E-03 ( 2.760E-03)
7.1	--	7.2	9.457E-02 ( 1.304E-02)	1.441E-02 ( 5.190E-03)	2.061E-02 ( 6.300E-03)
7.2	--	7.3	3.371E-02 ( 7.440E-03)	6.240E-03 ( 3.080E-03)	1.116E-02 ( 4.570E-03)
7.3	--	7.4	2.023E-02 ( 6.030E-03)	3.290E-02 ( 8.070E-03)	8.270E-03 ( 3.920E-03)
7.4	--	7.5	8.760E-03 ( 4.030E-03)	4.170E-02 ( 9.320E-03)	1.059E-02 ( 4.780E-03)
7.5	--	7.6	1.849E-02 ( 5.830E-03)	9.600E-03 ( 4.630E-03)	6.050E-03 ( 3.550E-03)
7.6	--	7.7	7.970E-03 ( 3.720E-03)	2.660E-03 ( 2.010E-03)	3.100E-03 ( 2.530E-03)
7.7	--	7.8	5.100E-03 ( 3.090E-03)	1.631E-02 ( 5.400E-03)	7.490E-03 ( 4.060E-03)
7.8	--	7.9	4.450E-02 ( 9.060E-03)	1.572E-02 ( 5.740E-03)	1.079E-02 ( 4.830E-03)
7.9	--	8.0	6.555E-02 ( 1.106E-02)	4.360E-03 ( 2.580E-03)	4.680E-02 ( 1.003E-02)
8.0	--	8.1	9.630E-03 ( 4.280E-03)	9.840E-03 ( 4.470E-03)	1.839E-02 ( 6.120E-03)
8.1	--	8.2	8.280E-03 ( 3.770E-03)	***** ( ***** )	5.859E-02 ( 1.052E-02)
8.2	--	8.3	1.388E-02 ( 4.990E-03)	***** ( ***** )	7.252E-02 ( 1.186E-02)
8.3	--	8.4	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.4	--	8.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.5	--	8.6	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.6	--	8.7	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.7	--	8.8	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.8	--	8.9	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.9	--	9.0	***** ( ***** )	***** ( ***** )	***** ( ***** )

<<  $^{12}\text{C}(\text{p},\alpha)$  Ep = 16 MeV >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

III-1

E $\alpha$ (MeV)	80 deg.	90 deg.	100 deg.
1.0 -- 1.1	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.1 -- 1.2	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.2 -- 1.3	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.3 -- 1.4	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.4 -- 1.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.5 -- 1.6	1.194E+01 ( 2.158E-01)	9.744E+00 ( 1.889E-01)	9.115E+00 ( 1.880E-01)
1.6 -- 1.7	1.019E+01 ( 1.990E-01)	9.123E+00 ( 1.830E-01)	8.501E+00 ( 1.812E-01)
1.7 -- 1.8	9.249E+00 ( 1.898E-01)	8.868E+00 ( 1.797E-01)	8.471E+00 ( 1.816E-01)
1.8 -- 1.9	8.366E+00 ( 1.801E-01)	8.728E+00 ( 1.788E-01)	7.327E+00 ( 1.692E-01)
1.9 -- 2.0	8.366E+00 ( 1.805E-01)	8.134E+00 ( 1.721E-01)	6.250E+00 ( 1.560E-01)
2.0 -- 2.1	8.152E+00 ( 1.791E-01)	7.980E+00 ( 1.710E-01)	5.110E+00 ( 1.406E-01)
2.1 -- 2.2	8.031E+00 ( 1.779E-01)	6.958E+00 ( 1.595E-01)	4.982E+00 ( 1.391E-01)
2.2 -- 2.3	7.511E+00 ( 1.710E-01)	5.643E+00 ( 1.431E-01)	4.636E+00 ( 1.338E-01)
2.3 -- 2.4	7.302E+00 ( 1.680E-01)	5.264E+00 ( 1.387E-01)	4.384E+00 ( 1.300E-01)
2.4 -- 2.5	7.185E+00 ( 1.673E-01)	4.878E+00 ( 1.333E-01)	4.461E+00 ( 1.316E-01)
2.5 -- 2.6	6.275E+00 ( 1.566E-01)	4.537E+00 ( 1.285E-01)	7.139E+00 ( 1.674E-01)
2.6 -- 2.7	5.226E+00 ( 1.431E-01)	4.591E+00 ( 1.296E-01)	9.391E+00 ( 1.920E-01)
2.7 -- 2.8	5.379E+00 ( 1.444E-01)	4.696E+00 ( 1.307E-01)	5.217E+00 ( 1.435E-01)
2.8 -- 2.9	4.867E+00 ( 1.376E-01)	6.830E+00 ( 1.571E-01)	2.131E+00 ( 9.119E-02)
2.9 -- 3.0	4.595E+00 ( 1.336E-01)	1.143E+01 ( 2.029E-01)	1.773E+00 ( 8.240E-02)
3.0 -- 3.1	4.506E+00 ( 1.328E-01)	8.194E+00 ( 1.717E-01)	1.553E+00 ( 7.681E-02)
3.1 -- 3.2	4.568E+00 ( 1.331E-01)	2.758E+00 ( 1.000E-01)	1.243E+00 ( 6.854E-02)
3.2 -- 3.3	6.990E+00 ( 1.639E-01)	1.739E+00 ( 7.968E-02)	1.228E+00 ( 6.832E-02)
3.3 -- 3.4	1.454E+01 ( 2.360E-01)	1.672E+00 ( 7.818E-02)	1.092E+00 ( 6.426E-02)
3.4 -- 3.5	1.058E+01 ( 2.019E-01)	1.467E+00 ( 7.392E-02)	9.478E-01 ( 6.055E-02)
3.5 -- 3.6	3.323E+00 ( 1.134E-01)	1.337E+00 ( 6.989E-02)	9.252E-01 ( 5.960E-02)
3.6 -- 3.7	2.174E+00 ( 9.151E-02)	1.237E+00 ( 6.820E-02)	7.804E-01 ( 5.460E-02)
3.7 -- 3.8	1.547E+00 ( 7.785E-02)	1.082E+00 ( 6.312E-02)	6.378E-01 ( 4.932E-02)
3.8 -- 3.9	1.503E+00 ( 7.720E-02)	9.803E-01 ( 6.085E-02)	5.304E-01 ( 4.471E-02)
3.9 -- 4.0	1.250E+00 ( 7.012E-02)	9.935E-01 ( 6.116E-02)	5.622E-01 ( 4.600E-02)
4.0 -- 4.1	***** ( ***** )	***** ( ***** )	1.480E+00 ( 7.299E-02)
4.1 -- 4.2	***** ( ***** )	***** ( ***** )	7.528E+00 ( 1.650E-01)
4.2 -- 4.3	***** ( ***** )	***** ( ***** )	4.242E+00 ( 1.234E-01)
4.3 -- 4.4	***** ( ***** )	***** ( ***** )	2.244E-01 ( 2.868E-02)
4.4 -- 4.5	***** ( ***** )	***** ( ***** )	1.489E-02 ( 7.070E-03)
4.5 -- 4.6	5.345E-01 ( 3.641E-02)	1.090E+01 ( 1.690E-01)	***** ( ***** )
4.6 -- 4.7	4.984E-01 ( 3.520E-02)	5.295E+00 ( 1.170E-01)	***** ( ***** )
4.7 -- 4.8	4.899E-01 ( 3.496E-02)	2.265E-01 ( 2.397E-02)	***** ( ***** )
4.8 -- 4.9	4.370E-01 ( 3.305E-02)	3.311E-02 ( 9.300E-03)	***** ( ***** )
4.9 -- 5.0	1.790E+00 ( 6.619E-02)	2.439E-02 ( 7.860E-03)	***** ( ***** )
5.0 -- 5.1	9.729E+00 ( 1.539E-01)	8.340E-03 ( 4.310E-03)	***** ( ***** )
5.1 -- 5.2	7.148E+00 ( 1.318E-01)	1.171E-02 ( 5.250E-03)	***** ( ***** )
5.2 -- 5.3	4.708E+01 ( 3.365E-02)	1.006E-02 ( 4.940E-03)	***** ( ***** )
5.3 -- 5.4	3.459E-02 ( 9.330E-03)	1.390E-02 ( 5.640E-03)	***** ( ***** )
5.4 -- 5.5	2.870E-02 ( 8.580E-03)	3.765E-02 ( 9.120E-03)	***** ( ***** )
5.5 -- 5.6	1.855E-02 ( 6.970E-03)	5.028E-02 ( 1.048E-02)	***** ( ***** )
5.6 -- 5.7	2.431E-02 ( 7.680E-03)	1.375E-02 ( 5.900E-03)	***** ( ***** )
5.7 -- 5.8	1.434E-02 ( 5.880E-03)	1.004E-02 ( 5.010E-03)	***** ( ***** )
5.8 -- 5.9	5.214E-02 ( 1.085E-02)	1.744E-02 ( 6.210E-03)	***** ( ***** )
5.9 -- 6.0	5.574E-02 ( 1.115E-02)	9.200E-03 ( 4.920E-03)	***** ( ***** )

<<  $^{12}\text{C}(\text{p},\alpha)$  Ep = 16 MeV >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

III-2

Ea (MeV)		80 deg.	90 deg.	100 deg.
6.0 --	6.1	2.124E-02( 7.130E-03)	1.121E-02( 5.470E-03)	***** ( ***** )
6.1 --	6.2	5.820E-03( 3.990E-03)	2.273E-02( 7.210E-03)	***** ( ***** )
6.2 --	6.3	9.100E-03( 4.400E-03)	1.288E-02( 5.420E-03)	***** ( ***** )
6.3 --	6.4	2.355E-02( 7.550E-03)	7.570E-03( 4.430E-03)	***** ( ***** )
6.4 --	6.5	1.444E-02( 5.740E-03)	7.680E-03( 3.840E-03)	***** ( ***** )
6.5 --	6.6	5.950E-03( 3.760E-03)	1.514E-02( 6.130E-03)	***** ( ***** )
6.6 --	6.7	1.352E-02( 5.540E-03)	7.570E-03( 4.620E-03)	***** ( ***** )
6.7 --	6.8	1.179E-02( 5.260E-03)	5.650E-03( 3.990E-03)	***** ( ***** )
6.8 --	6.9	1.241E-02( 5.050E-03)	1.439E-02( 5.720E-03)	***** ( ***** )
6.9 --	7.0	1.522E-02( 6.160E-03)	1.171E-02( 5.370E-03)	***** ( ***** )
7.0 --	7.1	5.570E-03( 3.570E-03)	1.903E-02( 7.210E-03)	***** ( ***** )
7.1 --	7.2	8.200E-03( 4.740E-03)	1.318E-02( 5.650E-03)	***** ( ***** )
7.2 --	7.3	8.200E-03( 4.740E-03)	5.254E-02( 1.123E-02)	***** ( ***** )
7.3 --	7.4	1.020E-02( 5.180E-03)	1.155E-01( 1.708E-02)	***** ( ***** )
7.4 --	7.5	1.367E-02( 5.650E-03)	4.574E-02( 1.071E-02)	***** ( ***** )
7.5 --	7.6	1.154E-02( 5.130E-03)	7.570E-03( 4.430E-03)	***** ( ***** )
7.6 --	7.7	2.492E-02( 7.560E-03)	2.820E-03( 2.820E-03)	***** ( ***** )
7.7 --	7.8	5.539E-02( 1.109E-02)	***** ( ***** )	***** ( ***** )
7.8 --	7.9	5.910E-02( 1.215E-02)	2.460E-03( 2.170E-03)	***** ( ***** )
7.9 --	8.0	9.454E-02( 1.526E-02)	8.880E-03( 4.430E-03)	***** ( ***** )
8.0 --	8.1	2.413E-02( 7.380E-03)	1.080E-03( 1.440E-03)	***** ( ***** )
8.1 --	8.2	1.001E-02( 5.230E-03)	5.650E-03( 3.990E-03)	***** ( ***** )
8.2 --	8.3	1.870E-03( 1.870E-03)	4.740E-03( 3.410E-03)	***** ( ***** )
8.3 --	8.4	***** ( ***** )	1.920E-03( 1.920E-03)	***** ( ***** )
8.4 --	8.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.5 --	8.6	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.6 --	8.7	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.7 --	8.8	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.8 --	8.9	***** ( ***** )	***** ( ***** )	***** ( ***** )
8.9 --	9.0	***** ( ***** )	***** ( ***** )	***** ( ***** )

<<  $^{12}\text{C}(\text{p},\alpha)$  Ep = 16 MeV >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

IV-1

$E_\alpha$ (MeV)	110 deg.	120 deg.	130 deg.
1.0 -- 1.1	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.1 -- 1.2	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.2 -- 1.3	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.3 -- 1.4	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.4 -- 1.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.5 -- 1.6	7.584E+00( 1.716E-01)	5.290E+00( 1.435E-01)	4.559E+00( 1.336E-01)
1.6 -- 1.7	6.730E+00( 1.616E-01)	4.652E+00( 1.343E-01)	4.665E+00( 1.348E-01)
1.7 -- 1.8	5.401E+00( 1.443E-01)	4.579E+00( 1.323E-01)	5.004E+00( 1.401E-01)
1.8 -- 1.9	5.010E+00( 1.394E-01)	4.493E+00( 1.315E-01)	6.726E+00( 1.638E-01)
1.9 -- 2.0	4.834E+00( 1.369E-01)	4.716E+00( 1.354E-01)	7.709E+00( 1.761E-01)
2.0 -- 2.1	4.510E+00( 1.321E-01)	7.212E+00( 1.680E-01)	3.528E+00( 1.187E-01)
2.1 -- 2.2	4.563E+00( 1.329E-01)	7.421E+00( 1.703E-01)	1.521E+00( 7.671E-02)
2.2 -- 2.3	5.718E+00( 1.492E-01)	3.374E+00( 1.484E-01)	1.240E+00( 6.912E-02)
2.3 -- 2.4	8.360E+00( 1.813E-01)	1.597E+00( 7.852E-02)	1.020E+00( 6.339E-02)
2.4 -- 2.5	5.459E+00( 1.461E-01)	1.246E+00( 6.923E-02)	6.776E-01( 5.150E-02)
2.5 -- 2.6	2.112E+00( 9.049E-02)	9.089E-01( 5.934E-02)	5.872E-01( 4.846E-02)
2.6 -- 2.7	1.474E+00( 7.510E-02)	7.904E-01( 5.541E-02)	4.520E-01( 4.232E-02)
2.7 -- 2.8	1.295E+00( 7.086E-02)	6.457E-01( 4.991E-02)	4.697E-01( 4.384E-02)
2.8 -- 2.9	1.058E+00( 6.379E-02)	6.371E-01( 4.989E-02)	3.523E-01( 3.698E-02)
2.9 -- 3.0	8.909E-01( 5.812E-02)	4.533E-01( 4.191E-02)	3.662E-01( 3.739E-02)
3.0 -- 3.1	8.638E-01( 5.801E-02)	4.466E-01( 4.173E-02)	6.128E-01( 4.750E-02)
3.1 -- 3.2	7.208E-01( 5.278E-02)	3.908E-01( 3.906E-02)	6.980E+00( 1.590E-01)
3.2 -- 3.3	7.156E-01( 5.299E-02)	3.171E-01( 3.505E-02)	6.933E+00( 1.584E-01)
3.3 -- 3.4	5.185E-01( 4.475E-02)	1.341E+00( 6.926E-02)	3.108E-01( 3.387E-02)
3.4 -- 3.5	4.571E-01( 4.256E-02)	8.448E+00( 1.737E-01)	3.739E-01( 3.816E-02)
3.5 -- 3.6	3.513E-01( 3.674E-02)	3.706E+00( 1.146E-01)	2.437E-01( 3.039E-02)
3.6 -- 3.7	7.390E-01( 5.121E-02)	2.452E-01( 3.088E-02)	4.472E-02( 1.355E-02)
3.7 -- 3.8	5.832E+00( 1.441E-01)	2.698E-01( 3.220E-02)	2.435E-02( 9.790E-03)
3.8 -- 3.9	5.197E+00( 1.357E-01)	5.400E-02( 1.444E-02)	1.875E-02( 8.670E-03)
3.9 -- 4.0	4.698E-01( 4.159E-02)	2.136E-02( 8.550E-03)	3.817E-02( 1.256E-02)
4.0 -- 4.1	1.477E-01( 2.389E-02)	2.384E-02( 9.820E-03)	2.881E-02( 1.116E-02)
4.1 -- 4.2	4.431E-02( 1.262E-02)	2.690E-02( 1.051E-02)	6.182E-02( 1.559E-02)
4.2 -- 4.3	3.122E-02( 1.090E-02)	5.412E-02( 1.454E-02)	9.378E-02( 1.943E-02)
4.3 -- 4.4	9.160E-03( 5.820E-03)	3.589E-02( 1.197E-02)	3.485E-02( 1.167E-02)
4.4 -- 4.5	4.370E-03( 4.370E-03)	8.910E-03( 5.560E-03)	3.000E-03( 3.000E-03)
4.5 -- 4.6	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.6 -- 4.7	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.7 -- 4.8	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.8 -- 4.9	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.9 -- 5.0	***** ( ***** )	***** ( ***** )	***** ( ***** )

<<  $^{12}\text{C}(\text{p},\alpha)$  Ep = 16 MeV >> \*\*\* DDX (error) in [mb/MeV/sr] \*\*\*

V-1

E $\alpha$ (MeV)	140 deg.	150 deg.	160 deg.
1.0 -- 1.1	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.1 -- 1.2	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.2 -- 1.3	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.3 -- 1.4	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.4 -- 1.5	***** ( ***** )	***** ( ***** )	***** ( ***** )
1.5 -- 1.6	4.599E+00( 1.306E-01)	6.042E+00( 1.504E-01)	8.065E+00( 1.796E-01)
1.6 -- 1.7	5.529E+00( 1.439E-01)	8.582E+00( 1.823E-01)	6.899E+00( 1.665E-01)
1.7 -- 1.8	8.382E+00( 1.791E-01)	5.956E+00( 1.513E-01)	2.592E+00( 1.005E-01)
1.8 -- 1.9	6.177E+00( 1.541E-01)	1.991E+00( 8.612E-02)	1.461E+00( 7.477E-02)
1.9 -- 2.0	2.319E+00( 9.305E-02)	1.260E+00( 6.829E-02)	1.051E+00( 6.376E-02)
2.0 -- 2.1	1.439E+00( 7.297E-02)	9.295E-01( 5.822E-02)	9.118E-01( 5.924E-02)
2.1 -- 2.2	9.666E-01( 5.962E-02)	6.776E-01( 5.004E-02)	5.963E-01( 4.769E-02)
2.2 -- 2.3	7.159E-01( 5.169E-02)	6.604E-01( 4.898E-02)	5.128E-01( 4.389E-02)
2.3 -- 2.4	6.582E-01( 4.969E-02)	5.247E-01( 4.360E-02)	4.828E-01( 4.311E-02)
2.4 -- 2.5	4.984E-01( 4.300E-02)	4.753E-01( 4.230E-02)	3.206E-01( 3.533E-02)
2.5 -- 2.6	3.916E-01( 3.763E-02)	3.495E-01( 3.573E-02)	4.374E-01( 4.069E-02)
2.6 -- 2.7	3.334E-01( 3.484E-02)	4.711E-01( 4.148E-02)	3.626E+00( 1.155E-01)
2.7 -- 2.8	3.214E-01( 3.405E-02)	3.746E+00( 1.145E-01)	4.724E+00( 1.324E-01)
2.8 -- 2.9	8.495E-01( 5.526E-02)	7.372E+00( 1.615E-01)	4.462E-01( 4.052E-02)
2.9 -- 3.0	7.508E+00( 1.629E-01)	9.145E-01( 5.679E-02)	1.130E-01( 2.096E-02)
3.0 -- 3.1	5.745E+00( 1.423E-01)	1.503E-01( 2.412E-02)	2.343E-01( 3.074E-02)
3.1 -- 3.2	1.977E-01( 2.670E-02)	2.593E-01( 3.102E-02)	1.202E-01( 2.147E-02)
3.2 -- 3.3	2.414E-01( 2.973E-02)	1.427E-01( 2.288E-02)	5.270E-02( 1.414E-02)
3.3 -- 3.4	2.502E-01( 3.031E-02)	7.582E-02( 1.719E-02)	5.983E-02( 1.537E-02)
3.4 -- 3.5	3.368E-02( 1.116E-02)	1.689E-02( 7.760E-03)	6.891E-02( 1.650E-02)
3.5 -- 3.6	4.440E-02( 1.282E-02)	3.928E-02( 1.168E-02)	6.396E-02( 1.595E-02)
3.6 -- 3.7	3.099E-02( 1.085E-02)	3.705E-02( 1.182E-02)	5.281E-02( 1.435E-02)
3.7 -- 3.8	3.616E-02( 1.189E-02)	3.752E-02( 1.228E-02)	1.567E-01( 2.494E-02)
3.8 -- 3.9	2.683E-02( 1.041E-02)	1.084E-01( 2.067E-02)	6.072E-02( 1.521E-02)
3.9 -- 4.0	4.740E-02( 1.351E-02)	6.632E-02( 1.639E-02)	7.348E-02( 1.734E-02)
4.0 -- 4.1	8.253B-02( 1.792E-02)	3.107E-02( 9.630E-03)	7.550E-02( 1.748E-02)
4.1 -- 4.2	1.030E-02( 6.350E-03)	6.819E-02( 1.566E-02)	2.626E-02( 1.018E-02)
4.2 -- 4.3	3.473E-02( 1.156E-02)	2.126E-02( 8.910E-03)	1.524E-02( 7.680E-03)
4.3 -- 4.4	2.222E-02( 8.870E-03)	4.100E-04( 1.100E-03)	1.049E-02( 6.160E-03)
4.4 -- 4.5	2.720E-03( 3.370E-03)	2.500E-03( 2.690E-03)	***** ( ***** )
4.5 -- 4.6	***** ( ***** )	1.540E-03( 2.120E-03)	***** ( ***** )
4.6 -- 4.7	***** ( ***** )	1.370E-03( 2.000E-03)	***** ( ***** )
4.7 -- 4.8	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.8 -- 4.9	***** ( ***** )	***** ( ***** )	***** ( ***** )
4.9 -- 5.0	***** ( ***** )	***** ( ***** )	***** ( ***** )

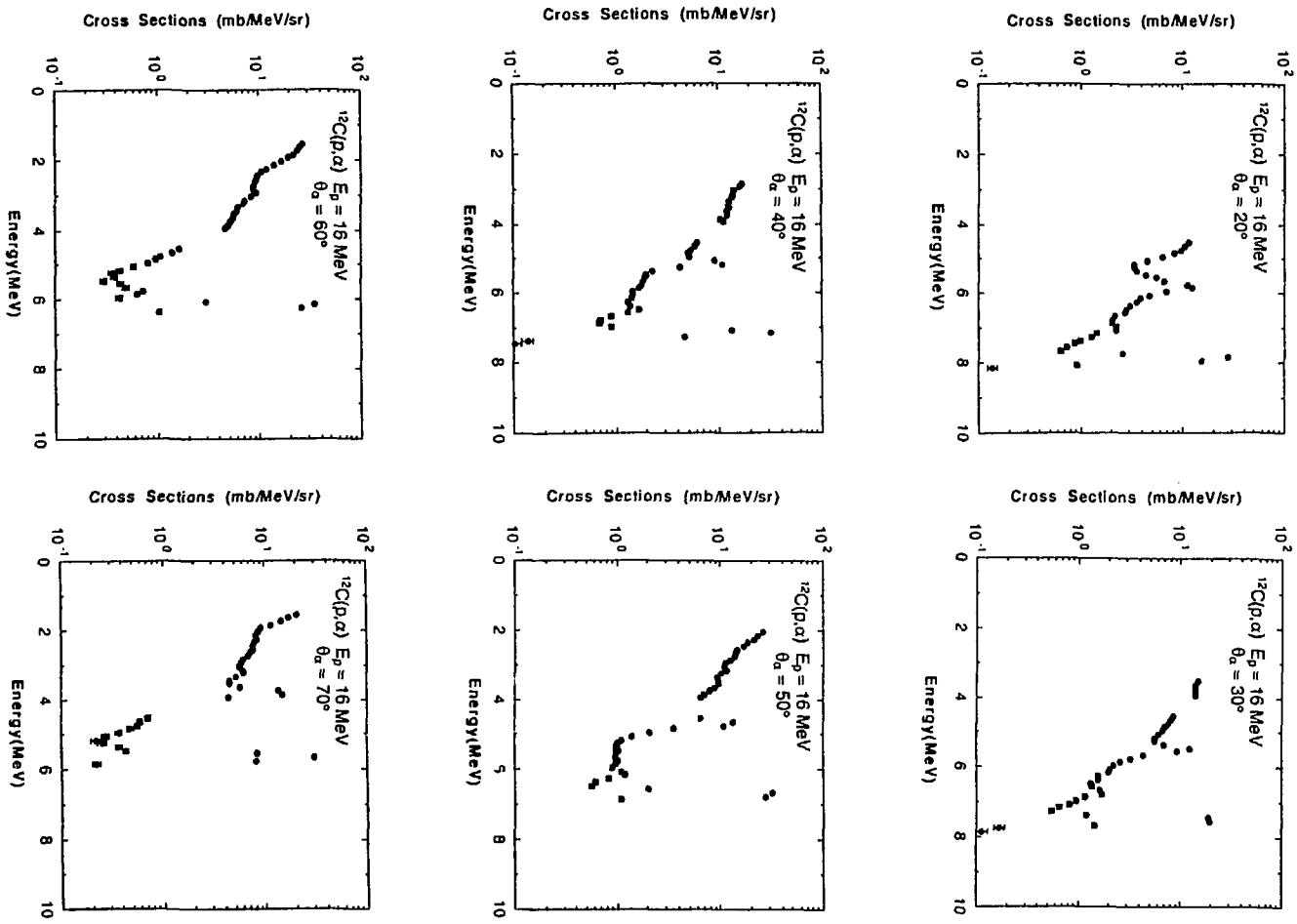


Fig. A-3. Differential cross sections of the  $^{12}\text{C}(\text{p},\alpha)$  reaction at 16 MeV.

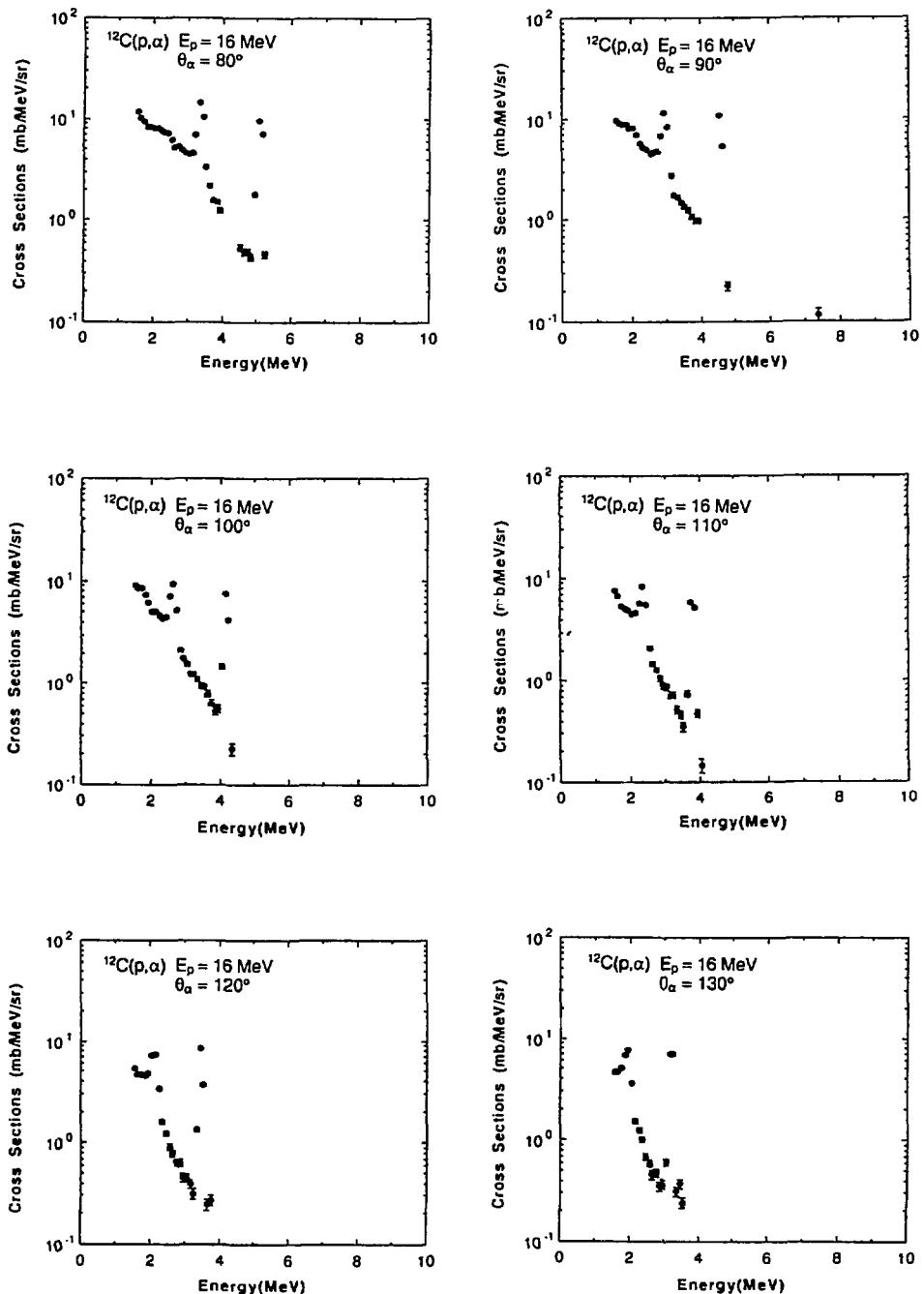


Fig. A-3. Continued.

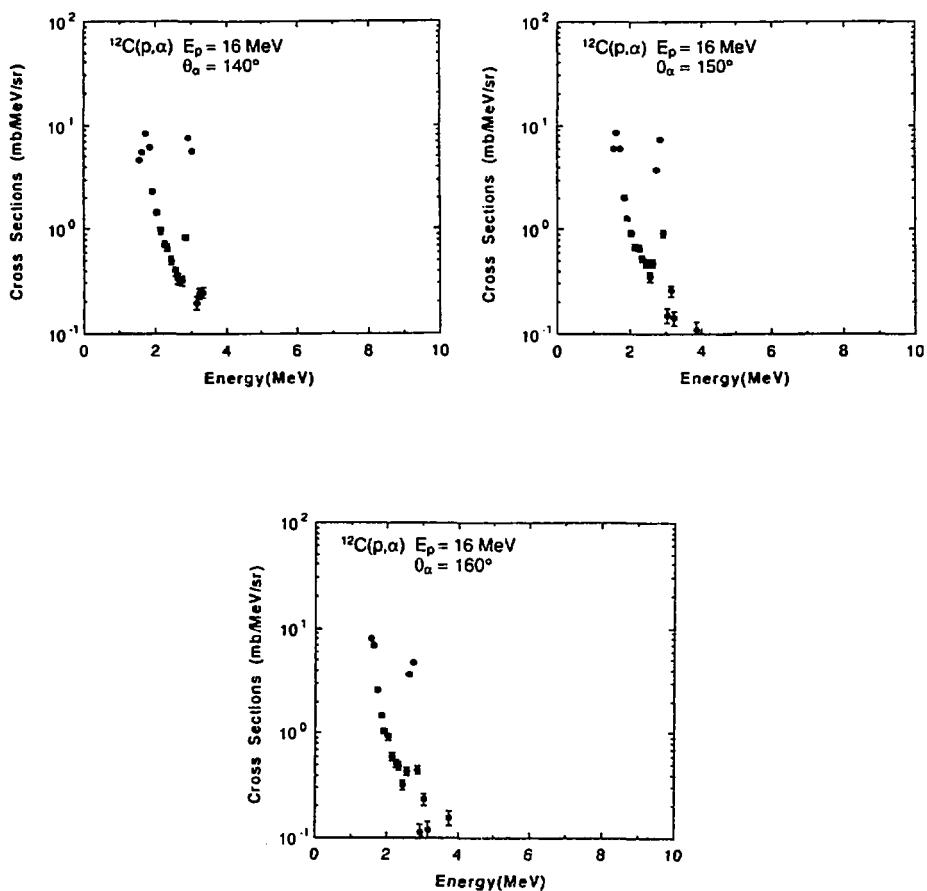


Fig. A-3. Continued.

# 国際単位系(SI)と換算表

表1 SI基本単位および補助単位

量	名称	記号
長さ	メートル	m
質量	キログラム	kg
時間	秒	s
電流	アンペア	A
熱力学温度	ケルビン	K
物質量	モル	mol
光强度	カンデラ	cd
平面角	ラジアン	rad
立体角	ステラジアン	sr

表3 固有の名称をもつSI組立単位

量	名称	記号	他のSI単位による表現
周波数	ヘルツ	Hz	s <sup>-1</sup>
圧力、応力	ニュートン	N	m·kg/s <sup>2</sup>
エネルギー、仕事、熱量	パスカル	Pa	N/m <sup>2</sup>
エネルギー、仕事、熱量	ジュール	J	N·m
工率、放射束	ワット	W	J/s
電気量、電荷	クーロン	C	A·s
電位、電圧、起電力	ボルト	V	W/A
静電容量	ファラード	F	C/V
電気抵抗	オーム	Ω	V/A
コンダクタンス	ジーメンス	S	A/V
磁束密度	ウェーバ	Wb	V·s
磁束密度	テスラ	T	Wb/m <sup>2</sup>
インダクタンス	ヘンリー	H	Wb/A
セルシウス温度	セルシウス度	°C	
光束度	ルーメン	lm	cd·sr
照度	ルクス	lx	lm/m <sup>2</sup>
放射能	ベクレル	Bq	s <sup>-1</sup>
吸収線量	グレイ	Gy	J/kg
線量当量	シーベルト	Sv	J/kg

表2 SIと併用される単位

名称	記号
分、時、日	min, h, d
度、分、秒	°, ', "
リットル	L, L
トン	t
電子ボルト	eV
原子質量単位	u

$$1 \text{ eV} = 1.60218 \times 10^{-19} \text{ J}$$

$$1 \text{ u} = 1.66054 \times 10^{-27} \text{ kg}$$

表5 SI接頭語

倍数	接頭語	記号
$10^{18}$	エクサ	E
$10^{15}$	ペタ	P
$10^{12}$	テラ	T
$10^9$	ギガ	G
$10^6$	メガ	M
$10^3$	キロ	k
$10^2$	ヘクト	h
$10^1$	デ	da
$10^{-1}$	デシ	d
$10^{-2}$	センチ	c
$10^{-3}$	ミリ	m
$10^{-6}$	マイクロ	μ
$10^{-9}$	ナノ	n
$10^{-12}$	ピコ	p
$10^{-15}$	フェムト	f
$10^{-18}$	アト	a

(注)

- 表1～5は「国際単位系」第5版、国際度量衡局1985年刊行による。ただし、1eVおよび1uの値はCODATAの1986年推奨値によった。
- 表4には海里、ノット、アール、ヘクトールも含まれているが日常の単位なのでここでは省略した。
- barは、JISでは流体の圧力を表わす場合に限り表2のカテゴリーに分類されている。
- EC閣僚理事会指令ではbar、barnおよび「血圧の単位」mmHgを表2のカテゴリーに入れている。

表4 SIと共に暫定的に維持される単位

名称	記号
オングストローム	Å
バーン	b
バール	bar
ガル	Gal
キュリ	Ci
レントゲン	R
ラド	rad
レム	rem

$$1 \text{ Å} = 0.1 \text{ nm} = 10^{-10} \text{ m}$$

$$1 \text{ b} = 100 \text{ fm}^2 = 10^{-28} \text{ m}^2$$

$$1 \text{ bar} = 0.1 \text{ MPa} = 10^5 \text{ Pa}$$

$$1 \text{ Gal} = 1 \text{ cm/s}^2 = 10^{-2} \text{ m/s}^2$$

$$1 \text{ Ci} = 3.7 \times 10^{-10} \text{ Bq}$$

$$1 \text{ R} = 2.58 \times 10^{-4} \text{ C/kg}$$

$$1 \text{ rad} = 1 \text{ cGy} = 10^{-2} \text{ Gy}$$

$$1 \text{ rem} = 1 \text{ cSv} = 10^{-2} \text{ Sv}$$

## 換算表

圧	MPa(=10 bar)	kgf/cm <sup>2</sup>	atm	mmHg(Torr)	lbf/in <sup>2</sup> (psi)
力	1	10.1972	9.86923	7.50062 × 10 <sup>3</sup>	145.038
9.80665	1	2.20462	0.967841	735.559	14.2233
4.44822	0.453592	1	0.101325	760	14.6959
1.33322 × 10 <sup>-4</sup>	1.35951 × 10 <sup>-3</sup>	1.31579 × 10 <sup>-3</sup>	1	1.93368 × 10 <sup>-2</sup>	
6.89476 × 10 <sup>-3</sup>	7.03070 × 10 <sup>-2</sup>	6.80460 × 10 <sup>-2</sup>	51.7149	1	

粘度 1 Pa·s(N·s/m<sup>2</sup>) = 10 P(ボアズ)(g/(cm·s))

動粘度 1 m<sup>2</sup>/s = 10<sup>4</sup> St(ストークス)(cm<sup>2</sup>/s)

エネルギー・仕事・熱量	J(=10 <sup>7</sup> erg)	kgf·m	kW·h	cal(計量法)	Btu	ft · lbf	eV	I cal = 4.18605 J(計量法)
1	0.101972	2.77778 × 10 <sup>-7</sup>	0.238889	9.47813 × 10 <sup>-4</sup>	0.737562	6.24150 × 10 <sup>18</sup>	= 4.184 J(熱化学)	
9.80665	1	2.72407 × 10 <sup>-6</sup>	2.34270	9.29487 × 10 <sup>-3</sup>	7.23301	6.12082 × 10 <sup>19</sup>	= 4.1855 J(15 °C)	
3.6 × 10 <sup>6</sup>	3.67098 × 10 <sup>5</sup>	1	8.59999 × 10 <sup>5</sup>	3412.13	2.65522 × 10 <sup>6</sup>	2.24694 × 10 <sup>25</sup>	= 4.1868 J(国際蒸気表)	
4.18605	0.426858	1.16279 × 10 <sup>-6</sup>	1	3.96759 × 10 <sup>-3</sup>	3.08747	2.61272 × 10 <sup>19</sup>	仕事率 1 PS(仮馬力)	
1055.06	107.586	2.93072 × 10 <sup>-4</sup>	252.042	1	778.172	6.58515 × 10 <sup>21</sup>	= 75 kgf·m/s	
1.35582	0.138255	3.76616 × 10 <sup>-7</sup>	0.323890	1.28506 × 10 <sup>-3</sup>	1	8.46233 × 10 <sup>18</sup>	= 735.499 W	
1.60218 × 10 <sup>-19</sup>	1.63377 × 10 <sup>-20</sup>	4.45050 × 10 <sup>-26</sup>	3.82743 × 10 <sup>-20</sup>	1.51857 × 10 <sup>-22</sup>	1.18171 × 10 <sup>-19</sup>	1		

放射能	Bq	Ci
1	2.70270 × 10 <sup>-11</sup>	
3.7 × 10 <sup>10</sup>	1	

吸収線量	Gy	rad
1	100	
0.01	1	

照射線量	C/kg	R
1	3876	
2.58 × 10 <sup>-4</sup>	1	

線量当量	Sv	rem
1	100	
0.01	1	