**GAMMA-RAY PRODUCTION DUE TO
NEUTRON INTERACTIONS WITH COPPER
FOR INCIDENT NEUTRON ENERGIES
BETWEEN 1.0 AND 20 MeV:
TABULATED DIFFERENTIAL CROSS SECTIONS**

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NEUTRON PHYSICS DIVISION

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MASTER

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GAMMA-RAY PRODUCTION DUE TO NEUTRON INTERACTIONS WITH COPPER
FOR INCIDENT NEUTRON ENERGIES BETWEEN 1.0 AND 20 MeV:
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ABSTRACT

Numerical values of differential cross sections for gamma rays produced by neutron reactions with copper have been obtained for neutron energies between 1.0 and 20 MeV for $\theta = 125$ deg. The $d^2\sigma/d\omega dE$ values were obtained using a NaI^Y spectrometer. These data consist of neutron and gamma-ray production group cross-section values of $d^2\sigma/d\omega dE$ for $0.7 > E_\gamma \leq 10.5$ MeV, with gamma-ray intervals ranging from 20 keV for $E_\gamma \leq 1$ MeV to 160 keV for $E_\gamma \sim 9$ MeV. Neutron energy intervals varied from 0.5 MeV for $E_n = 1$ to 5 MeV to 3 MeV for $E_n = 14$ to 20 MeV.

INTRODUCTION

As part of a continuing program for determining numerical values of gamma-ray production cross sections for neutron-induced reactions, we have measured the absolute differential cross sections for gamma rays produced by neutron interactions with copper. The data are presented in this report in tabular and graphical forms.

The sample consisted of 1 piece of copper metal, approximately 12 in. by 12 in. by 0.25 in., giving a sample of 0.054 atoms/barn thickness. Neutrons produced by the Oak Ridge Electron Linear Accelerator impinged on this sample, and the resulting gamma radiation was detected by a 5 in. by 5 in. NaI spectrometer. The data were binned into 17 neutron energy groups and then unfolded. Details of the experimental procedure and data reduction are given elsewhere.¹

The following 17 graphs show the unfolded gamma-ray spectra obtained with the NaI spectrometer for the 17 neutron-energy bins.

The computer output tables which follow the graphs give the data obtained with the NaI spectrometer at the ORELA Shield Test Station. The first set of tables contains data in coarse gamma-ray energy groups of 250 or 500 keV. The errors indicated in these tables represent half the area of the confidence interval given by the unfolding code FERD and are over-estimates since FERD output points were combined. The second set of tables give values of $d^2\sigma/dE d\omega$ for 123 mesh points of the response matrix used in FERD. The differential cross-section values given are the middle values of the confidence interval. These errors do not include an absolute error of about 10% estimated for the neutron flux measurements, effective area of the beam and absolute efficiency of the detector. The relative errors for cross sections corresponding to adjacent neutron energy groups should be less than 5%. The neutron energy groups were selected so as to have enough counts in each pulse-height spectrum for the unfolding code FERD. The neutron group widths are 0.5 MeV from 1 to 5 MeV, 1 MeV from 5 to 10 MeV, 2 MeV from 10 to 14 MeV, and 3 MeV from 14 to 20 MeV.

ACKNOWLEDGEMENTS

We express our appreciation to H. A. Todd and his group for excellent accelerator operation.

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ORNL-DWG 72-13964

ORNL-DWG 72-13966

NEUTRON GAMMA RAY PRODUCTION CROSS SECTIONS FROM COPPER. TABULATED VALUES ARE DIFFERENTIAL CROSS SECTIONS AT 125 DEGREES, IN MB/SR, FOR THE GAMMA-RAY ENERGY INTERVALS, IN KEV, SHOWN IN THE LEFTMOST COLUMN. THE ERRORS INDICATED ARE IN THE SAME UNITS AND DO NOT INCLUDE AN ESTIMATED 10 PERCENT ERROR DUE TO THE ABSOLUTE FLUX MEASUREMENT. THE RELATIVE ERRORS FOR ADJACENT COLUMNS SHOULD BE LESS THAN 5 PERCENT. THE COLUMN HEADINGS ARE, IN MEV, THE LOWER LIMIT OF THE NEUTRON ENERGY INTERVAL FOR THAT COLUMN. THE UPPER LIMIT FOR THE LAST NEUTRON ENERGY INTERVAL IS 6.050 MEV

	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
750-1000	14.50 0.32	21.60 0.67	23.80 1.04	36.70 1.58	41.60 2.03	47.00 2.55	50.80 3.00	53.40 3.36	54.60 3.43
1000-1250	4.71 0.15	10.70 0.47	13.90 0.82	27.50 1.27	33.10 1.77	36.70 2.21	40.80 2.69	43.00 2.99	46.70 2.99
1250-1500	1.07 0.06	12.00 0.31	20.90 0.58	27.70 0.92	33.90 1.26	38.00 1.65	42.60 1.92	46.00 2.28	49.50 2.21
1500-1750	0.13 0.04	2.24 0.11	7.86 0.28	10.50 0.48	12.00 0.73	13.30 0.95	15.40 1.20	17.80 1.42	20.40 1.46
1750-2000	0.09 0.04	0.37 0.05	3.15 0.15	5.84 0.34	9.21 0.56	12.60 0.80	15.40 1.03	16.70 1.19	18.30 1.26
2000-2500	0.15 0.06	0.24 0.06	1.65 0.13	6.63 0.36	10.10 0.67	13.90 0.97	17.00 1.27	19.30 1.55	22.00 1.56
2500-3000	0.14 0.05	0.09 0.06	0.22 0.03	1.60 0.15	6.51 0.38	8.16 0.66	11.40 0.87	14.60 1.12	18.10 1.16
3000-3500	0.16 0.05	0.11 0.05	0.10 0.07	0.24 0.09	1.00 0.16	3.54 0.35	6.29 0.57	9.08 0.81	12.40 0.94
3500-4000	0.11 0.04	0.12 0.05	0.10 0.07	0.09 0.09	0.15 0.11	1.05 0.18	3.18 0.35	5.04 0.56	8.21 0.60
4000-4500	0.10 0.04	0.04 0.05	0.06 0.06	-0.01 0.02	0.13 0.10	0.11 0.12	0.95 0.18	3.24 0.36	5.55 0.45
4500-5000	0.10 0.04	0.08 0.05	0.05 0.06	0.12 0.07	0.01 0.01	0.09 0.09	0.07 0.12	0.51 0.17	2.91 0.49
5000-5500	0.06 0.04	0.05 0.04	0.08 0.05	0.07 0.07	0.08 0.05	0.01 0.02	0.07 0.10	0.12 0.02	1.02 0.17
5500-6000	0.09 0.04	0.08 0.04	0.03 0.05	0.04 0.02	-0.01 0.01	0.05 0.07	0.06 0.08	0.06 0.01	0.29 0.11
6000-6500	0.04 0.03	0.04 0.02	0.06 0.04	0.02 0.00	0.03 0.04	0.01 0.01	0.03 0.04	0.09 0.07	0.05 0.03
6500-7000	0.08 0.03	0.03 0.02	0.03 0.02	0.09 0.04	0.08 0.04	0.05 0.03	0.02 0.00	-0.00 0.01	0.08 0.06
7000-7500	0.07 0.02	0.06 0.02	0.06 0.03	-0.03 0.02	-0.00 0.01	0.02 0.02	0.10 0.05	0.03 0.00	0.00 0.02
7500-8000	0.07 0.02	0.03 0.02	0.01 0.01	0.08 0.03	0.06 0.03	0.05 0.03	0.04 0.04	0.04 0.02	0.02 0.02
8000-8500	0.03 0.01	0.04 0.02	0.04 0.02	0.01 0.02	0.02 0.02	0.02 0.01	0.02 0.02	0.01 0.02	0.04 0.02
8500-9000	0.03 0.01	0.02 0.01	0.01 0.01	0.01 0.01	0.02 0.02	0.01 0.02	0.01 0.01	0.01 0.01	0.00 0.00
9000-9500	0.02 0.00	0.02 0.01	0.01 0.01	0.01 0.01	0.01 0.01	0.01 0.02	0.01 0.02	0.01 0.01	0.01 0.01
9500-9999	0.00 0.00	0.01 0.00	0.01 0.00	0.02 0.01	0.02 0.01	0.02 0.01	0.02 0.01	0.02 0.01	0.02 0.01

NEUTRON GAMMA RAY PRODUCTION CROSS SECTIONS FROM COPPER. TABULATED VALUES ARE DIFFERENTIAL CROSS SECTIONS AT 125 DEGREES, IN MB/SR, FOR THE GAMMA-RAY ENERGY INTERVALS, IN KEV, SHOWN IN THE LEFTMOST COLUMN. THE ERRORS INDICATED ARE IN THE SAME UNITS AND DO NOT INCLUDE AN ESTIMATED 10 PERCENT ERROR DUE TO THE ABSOLUTE FLUX MEASUREMENT. THE RELATIVE ERRORS FOR ADJACENT COLUMNS SHOULD BE LESS THAN 5 PERCENT. THE COLUMN HEADINGS ARE, IN MEV, THE LOWER LIMIT OF THE NEUTRON ENERGY INTERVAL FOR THAT COLUMN. THE UPPER LIMIT FOR THE LAST NEUTRON ENERGY INTERVAL IS 20.000 MEV

	6.05	7.00	8.00	9.00	10.00	12.00	14.00	17.00
750-1000	55.90 3.80	53.50 4.16	51.40 4.61	50.00 5.11	47.30 5.10	36.70 5.74	30.90 6.03	35.40 8.66
1000-1250	47.40 3.41	51.20 3.76	53.20 4.30	53.40 4.76	59.30 4.90	55.50 5.36	49.30 5.92	51.30 8.19
1250-1500	51.50 2.58	50.70 2.93	52.20 3.16	53.20 3.68	49.80 3.64	40.80 3.81	30.10 3.93	36.10 5.80
1500-1750	20.70 1.77	23.60 1.96	22.70 2.36	24.10 2.63	24.10 2.68	17.50 2.72	14.90 2.59	16.60 4.36
1750-2000	20.00 1.48	22.20 1.63	21.90 1.95	21.10 2.24	19.30 2.34	14.50 2.44	11.80 2.41	14.50 3.80
2000-2500	26.20 1.98	27.00 2.38	29.70 2.69	28.60 3.26	26.40 3.25	21.60 3.45	14.50 3.27	17.00 5.31
2500-3000	21.30 1.53	23.20 1.83	23.10 2.29	23.60 2.69	21.50 2.65	14.90 2.89	9.05 2.70	11.90 4.07
3000-3500	15.50 1.19	19.10 1.46	19.80 1.88	19.80 2.30	19.20 2.31	13.20 2.53	8.79 2.28	8.94 3.43
3500-4000	11.40 0.90	12.60 1.17	15.40 1.55	17.40 1.92	15.00 1.92	9.94 2.25	5.51 1.97	6.16 2.66
4000-4500	8.34 0.71	10.50 0.96	11.50 1.31	11.60 1.72	12.10 1.68	9.31 2.05	4.95 1.73	4.24 2.23
4500-5000	4.47 0.55	6.27 0.78	8.54 1.08	9.87 1.49	9.60 1.49	5.84 1.87	4.09 1.54	2.92 1.98
5000-5500	3.11 0.37	5.13 0.57	5.85 0.87	6.60 1.18	7.91 1.29	6.09 1.56	2.45 1.32	2.33 0.91
5500-6000	1.64 0.25	3.06 0.44	5.00 0.71	5.46 0.97	6.21 1.10	4.84 1.35	3.02 1.16	1.41 0.95
6000-6500	0.71 0.16	2.10 0.31	3.43 0.56	5.32 0.81	5.29 0.91	3.48 1.17	1.86 1.03	0.91 1.12
6500-7000	0.15 0.10	1.13 0.20	1.88 0.43	2.93 0.65	3.81 0.77	3.40 1.02	1.52 0.89	1.35 0.94
7000-7500	0.06 0.06	0.46 0.12	1.56 0.23	2.15 0.47	2.44 0.59	2.03 0.78	0.98 0.74	0.84 0.69
7500-8000	0.07 0.05	0.09 0.07	0.62 0.18	1.05 0.34	2.16 0.47	1.61 0.61	1.03 0.59	0.28 0.41
8000-8500	0.00 0.01	0.04 0.05	0.20 0.13	0.57 0.23	0.79 0.35	0.65 0.45	0.23 0.40	0.11 0.21
8500-9000	0.02 0.02	0.03 0.03	0.06 0.06	0.29 0.13	0.72 0.23	0.53 0.29	0.22 0.22	0.18 0.15
9000-9500	0.00 0.01	0.01 0.02	0.03 0.04	0.13 0.06	0.20 0.14	0.19 0.18	0.20 0.14	0.08 0.11
9500-9999	0.03 0.01	0.03 0.01	0.04 0.02	0.05 0.03	0.26 0.06	0.22 0.09	0.14 0.06	0.07 0.07

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

E-V-MIN=		1.00 MEV	EN-MAX=	1.50 MEV	THETA=125. DEG				
E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	DATA-ERR B/SR/MEV
6.500E-01	1.06E-01	3.3E-03	2.150E 00	2.75E-04	1.3E-04	5.230E 00	4.82E-05	7.6E-05	
7.100E-01	7.07E-02	1.5E-03	2.210E 00	2.66E-04	1.3E-04	5.330E 00	1.05E-04	7.7E-05	
7.300E-01	5.07E-02	1.0E-03	2.270E 00	2.17E-04	1.2E-04	5.430E 00	1.04E-04	7.4E-05	
7.500E-01	4.85E-02	1.1E-03	2.330E 00	2.38E-04	1.1E-04	5.530E 00	2.04E-04	7.5E-05	
7.700E-01	4.22E-02	1.0E-03	2.390E 00	3.69E-04	1.1E-04	5.630E 00	2.13E-04	7.3E-05	
7.900E-01	2.95E-02	7.0E-03	2.450E 00	3.39E-04	1.1E-04	5.730E 00	2.09E-04	7.0E-05	
8.100E-01	1.80E-02	1.1E-03	2.510E 00	2.18E-04	1.1E-04	5.830E 00	1.67E-04	7.1E-05	
8.300E-01	1.02E-02	1.1E-03	2.570E 00	1.96E-04	1.1E-04	5.930E 00	1.15E-04	6.8E-05	
8.500E-01	7.47E-03	1.2E-03	2.630E 00	2.09E-04	1.1E-04	6.030E 00	7.05E-05	7.0E-05	
8.700E-01	1.72E-02	1.4E-03	2.690E 00	2.56E-04	1.0E-04	6.130E 00	3.43E-05	6.5E-05	
8.900E-01	4.73E-02	1.5E-03	2.750E 00	3.40E-04	1.0E-04	6.230E 00	3.29E-05	6.4E-05	
9.100E-01	9.07E-02	1.6E-03	2.810E 00	3.27E-04	9.9E-05	6.330E 00	9.51E-05	6.4E-05	
9.300E-01	1.26E-01	1.6E-03	2.870E 00	2.69E-04	1.0E-04	6.440E 00	1.74E-04	6.0E-05	
9.500E-01	1.32E-01	1.6E-03	2.930E 00	2.87E-04	9.6E-05	6.560E 00	1.94E-04	5.8E-05	
9.700E-01	1.09E-01	1.3E-03	2.990E 00	3.56E-04	9.4E-05	6.680E 00	1.67E-04	5.4E-05	
1.000E 00	5.60E-02	1.4E-03	3.050E 00	3.96E-04	9.3E-05	6.800E 00	1.38E-04	5.2E-05	
1.040E 00	2.27E-02	8.1E-04	3.110E 00	3.81E-04	9.3E-05	6.920E 00	1.16E-04	5.0E-05	
1.080E 00	2.81E-02	8.4E-04	3.190E 00	3.52E-04	9.4E-05	7.040E 00	1.24E-04	4.6E-05	
1.120E 00	2.43E-02	5.9E-04	3.260E 00	3.27E-04	1.0E-04	7.160E 00	1.41E-04	4.2E-05	
1.160E 00	1.10E-02	4.2E-04	3.340E 00	2.54E-04	9.3E-05	7.280E 00	1.36E-04	3.9E-05	
1.200E 00	3.66E-03	3.3E-04	3.420E 00	2.58E-04	9.3E-05	7.400E 00	1.37E-04	3.7E-05	
1.240E 00	3.87E-03	3.6E-04	3.500E 00	3.32E-04	8.8E-05	7.520E 00	1.51E-04	3.6E-05	
1.280E 00	6.96E-03	3.5E-04	3.580E 00	3.49E-04	8.6E-05	7.640E 00	1.54E-04	3.4E-05	
1.320E 00	7.79E-03	3.0E-04	3.660E 00	3.07E-04	9.2E-05	7.760E 00	1.37E-04	3.1E-05	
1.360E 00	5.49E-03	2.5E-04	3.740E 00	2.11E-04	9.1E-05	7.890E 00	1.13E-04	3.0E-05	
1.400E 00	2.84E-03	2.1E-04	3.820E 00	1.26E-04	9.4E-05	8.030E 00	8.00E-05	2.8E-05	
1.440E 00	1.51E-03	2.0E-04	3.900E 00	1.25E-04	9.1E-05	8.170E 00	5.03E-05	2.5E-05	
1.480E 00	1.03E-03	1.8E-04	3.980E 00	1.33E-04	8.7E-05	8.310E 00	4.26E-05	2.2E-05	
1.520E 00	6.86E-04	1.8E-04	4.060E 00	1.11E-04	8.6E-05	8.450E 00	5.13E-05	2.1E-05	
1.560E 00	4.67E-04	1.7E-04	4.140E 00	1.58E-04	8.8E-05	8.590E 00	6.46E-05	1.8E-05	
1.600E 00	5.46E-04	1.6E-04	4.220E 00	2.27E-04	8.5E-05	8.730E 00	7.55E-05	1.6E-05	
1.640E 00	6.56E-04	1.5E-04	4.300E 00	2.26E-04	8.8E-05	8.870E 00	7.39E-05	1.3E-05	
1.680E 00	5.39E-04	1.5E-04	4.380E 00	2.44E-04	8.7E-05	9.010E 00	6.02E-05	1.1E-05	
1.720E 00	3.05E-04	1.6E-04	4.460E 00	2.96E-04	8.2E-05	9.150E 00	4.48E-05	8.2E-06	
1.760E 00	2.32E-04	1.6E-04	4.540E 00	2.75E-04	8.3E-05	9.300E 00	3.00E-05	5.6E-06	
1.800E 00	4.13E-04	1.5E-04	4.630E 00	1.91E-04	8.7E-05	9.460E 00	1.58E-05	3.4E-06	
1.850E 00	5.96E-04	1.4E-04	4.730E 00	1.49E-04	8.5E-05	9.620E 00	6.42E-06	2.3E-06	
1.910E 00	3.61E-04	1.4E-04	4.830E 00	1.79E-04	8.4E-05	9.780E 00	2.11E-06	1.4E-06	
1.970E 00	2.22E-04	1.4E-04	4.930E 00	2.13E-04	8.2E-05	9.940E 00	6.32E-07	7.5E-07	
2.030E 00	3.50E-04	1.4E-04	5.030E 00	1.78E-04	7.9E-05	1.010E 01	2.59E-07	5.7E-07	
2.090E 00	3.46E-04	1.3E-04	5.130E 00	8.33E-05	8.1E-05	1.026E 01	1.28E-07	4.1E-07	

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 1.50 MEV EN-MAX= 2.00 MEV THETA=125. DEG

F-GAMMA MEV	DATA R/SR/MEV	DATA-ERR R/SR/MEV	F-GAMMA MEV	DATA R/SR/MEV	DATA-ERR R/SR/MEV	F-GAMMA MEV	DATA R/SR/MEV	DATA-ERR R/SR/MEV
6.000E-01	1.06E-01	5.9E-03	2.150E 00	6.04E-04	1.4E-04	5.230E 00	1.18E-04	8.3E-05
7.103E-01	7.43E-02	2.7E-03	2.210E 00	3.88E-04	1.4E-04	5.330E 00	8.46E-05	8.5E-05
7.300E-01	6.42E-02	2.0E-03	2.270E 00	3.57E-04	1.3E-04	5.430E 00	4.92E-05	8.1E-05
7.500E-01	6.42E-02	2.1E-03	2.330E 00	5.64E-04	1.2E-04	5.530E 00	6.76E-05	8.6E-05
7.700E-01	5.04E-02	2.1E-03	2.390E 00	5.83E-04	1.2E-04	5.630E 00	1.12E-04	8.4E-05
7.900E-01	3.19E-02	2.1E-03	2.450E 00	2.92E-04	1.3E-04	5.730E 00	1.55E-04	8.3E-05
8.100E-01	2.06E-02	2.2E-03	2.510E 00	8.78E-05	1.3E-04	5.830E 00	1.96E-04	8.2E-05
8.300E-01	1.47E-02	2.2E-03	2.570E 00	1.02E-04	1.2E-04	5.930E 00	2.04E-04	7.8E-05
8.500E-01	1.56E-02	2.6E-03	2.630E 00	1.94E-04	1.2E-04	6.030E 00	1.78E-04	7.9E-05
8.700E-01	2.78E-02	2.8E-03	2.690E 00	2.86E-04	1.1E-04	6.130E 00	1.35E-04	7.5E-05
8.900E-01	9.08E-02	3.1E-03	2.750E 00	2.92E-04	1.1E-04	6.230E 00	8.81E-05	7.4E-05
9.100E-01	1.57E-01	3.1E-03	2.810E 00	1.86E-04	1.1E-04	6.330E 00	4.15E-05	7.3E-05
9.300E-01	1.98E-01	3.3E-03	2.870E 00	9.83E-05	1.1E-04	6.440E 00	-3.15E-06	6.9E-05
9.500E-01	1.92E-01	3.2E-03	2.930E 00	1.34E-04	1.1E-04	6.560E 00	-6.87E-06	6.7E-05
9.700E-01	1.47E-01	2.8E-03	2.990E 00	2.34E-04	1.1E-04	6.680E 00	2.89E-05	6.3E-05
1.000E 00	7.35E-02	3.3E-03	3.050E 00	2.96E-04	1.0E-04	6.800E 00	7.87E-05	6.1E-05
1.040E 00	4.88E-02	2.2E-03	3.110E 00	2.53E-04	1.0E-04	6.920E 00	1.32E-04	5.7E-05
1.080E 00	7.28E-02	2.4E-03	3.180E 00	1.25E-04	9.8E-05	7.040E 00	1.67E-04	5.2E-05
1.120E 00	5.82E-02	1.8E-03	3.260E 00	1.72E-04	1.0E-04	7.160E 00	1.55E-04	5.1E-05
1.160E 00	2.16E-02	1.4E-03	3.340E 00	3.10E-04	9.9E-05	7.280E 00	1.05E-04	4.7E-05
1.200E 00	1.14E-02	1.3E-03	3.420E 00	2.47E-04	1.0E-04	7.400E 00	6.20E-05	4.5E-05
1.240E 00	2.81E-02	1.4E-03	3.500E 00	1.41E-04	1.0E-04	7.520E 00	4.02E-05	4.3E-05
1.280E 00	5.50E-02	1.5E-03	3.580E 00	2.20E-04	9.8E-05	7.640E 00	3.15E-05	4.1E-05
1.320E 00	6.68E-02	1.4E-03	3.660E 00	3.53E-04	9.6E-05	7.760E 00	4.75E-05	3.9E-05
1.360E 00	6.19E-02	1.3E-03	3.740E 00	3.20E-04	9.5E-05	7.890E 00	9.04E-05	3.7E-05
1.400E 00	5.26E-02	1.2E-03	3.820E 00	1.92E-04	1.0E-04	8.030E 00	1.18E-04	3.4E-05
1.440E 00	4.41E-02	1.1E-03	3.900E 00	1.52E-04	1.0E-04	8.170E 00	9.62E-05	3.1E-05
1.480E 00	3.69E-02	8.9E-04	3.980E 00	1.73E-04	1.1E-04	8.310E 00	5.78E-05	2.9E-05
1.520E 00	2.96E-02	7.3E-04	4.060E 00	1.27E-04	1.0E-04	8.450E 00	3.37E-05	2.7E-05
1.560E 00	2.13E-02	6.9E-04	4.140E 00	5.79E-05	9.9E-05	8.590E 00	2.52E-05	2.5E-05
1.600E 00	1.32E-02	4.3E-04	4.220E 00	6.90E-05	9.7E-05	8.730E 00	3.70E-05	2.3E-05
1.640E 00	7.57E-03	3.5E-04	4.300E 00	9.01E-05	9.6E-05	8.870E 00	4.33E-05	2.0E-05
1.690E 00	4.82E-03	2.8E-04	4.380E 00	6.79E-05	9.9E-05	9.010E 00	4.48E-05	1.8E-05
1.720E 00	3.41E-03	2.5E-04	4.460E 00	9.19E-05	9.9E-05	9.150E 00	4.52E-05	1.6E-05
1.760E 00	2.61E-03	2.3E-04	4.540E 00	1.89E-04	9.4E-05	9.300E 00	4.42E-05	1.3E-05
1.800E 00	2.13E-03	2.1E-04	4.630E 00	2.39E-04	9.1E-05	9.460E 00	3.82E-05	8.8E-06
1.850E 00	1.58E-03	2.0E-04	4.730E 00	1.73E-04	9.3E-05	9.620E 00	2.86E-05	7.3E-06
1.910E 00	1.15E-03	1.6E-04	4.830E 00	1.10E-04	9.1E-05	9.780E 00	1.73E-05	5.2E-06
1.970E 00	7.72E-04	1.5E-04	4.930E 00	1.42E-04	8.8E-05	9.940E 00	7.59E-06	2.7E-06
2.030E 00	5.11E-04	1.4E-04	5.030E 00	1.25E-04	8.8E-05	1.010E 01	2.55E-06	1.4E-06
2.090E 00	6.29E-04	1.4E-04	5.130E 00	1.17E-04	8.4E-05	1.026E 01	6.81E-07	8.2E-07

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 2.00 MEV EN-MAX= 2.30 MEV THETA=125. DEG

F-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	F-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	F-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	1.33E-01	8.5E-03	2.150E 00	3.53E-03	2.6E-04	5.230E 00	2.21E-04	1.1E-04
7.100E-01	9.29E-02	4.3E-03	2.210E 00	1.81E-03	2.3E-04	5.330E 00	1.24E-04	1.0E-04
7.300E-01	7.57E-02	3.3E-03	2.270E 00	1.53E-03	2.1E-04	5.430E 00	2.51E-05	1.0E-04
7.500E-01	7.48E-02	3.4E-03	2.330E 00	1.28E-03	2.1E-04	5.530E 00	3.21E-06	1.1E-04
7.700E-01	6.44E-02	3.3E-03	2.390E 00	8.70E-04	1.7E-04	5.630E 00	2.20E-05	1.1E-04
7.900E-01	4.74E-02	3.1E-03	2.450E 00	5.13E-04	1.7E-04	5.730E 00	2.94E-05	1.0E-04
8.100E-01	3.43E-02	3.3E-03	2.510E 00	4.53E-04	1.6E-04	5.830E 00	5.10E-05	1.0E-04
8.300E-01	2.88E-02	3.5E-03	2.570E 00	5.68E-04	1.7E-04	5.930E 00	1.13E-04	9.9E-05
8.500E-01	3.36E-02	4.0E-03	2.630E 00	5.68E-04	1.5E-04	6.030E 00	1.79E-04	9.8E-05
8.700E-01	5.82E-02	4.2E-03	2.690E 00	5.01E-04	1.5E-04	6.130E 00	1.91E-04	9.3E-05
8.900E-01	1.14E-01	4.8E-03	2.750E 00	4.69E-04	1.5E-04	6.230E 00	1.51E-04	8.8E-05
9.100E-01	1.91E-01	4.9E-03	2.810E 00	4.36E-04	1.6E-04	6.330E 00	7.76E-05	8.8E-05
9.300E-01	2.48E-01	5.0E-03	2.870E 00	3.58E-04	1.5E-04	6.430E 00	1.03E-06	9.0E-05
9.500E-01	2.50E-01	5.2E-03	2.930E 00	2.75E-04	1.6E-04	6.530E 00	-3.04E-05	8.1E-05
9.700E-01	2.01E-01	4.6E-03	2.990E 00	1.93E-04	1.5E-04	6.630E 00	1.81E-05	7.6E-05
1.000E 00	1.06E-01	5.3E-03	3.050E 00	1.44E-04	1.4E-04	6.800E 00	8.26E-05	7.3E-05
1.040E 00	6.90E-02	3.6E-03	3.110E 00	1.92E-04	1.4E-04	6.920E 00	1.24E-04	7.0E-05
1.080E 00	1.03E-01	4.0E-03	3.180E 00	2.65E-04	1.4E-04	7.040E 00	1.54E-04	6.6E-05
1.120E 00	9.22E-02	3.5E-03	3.260E 00	1.95E-04	1.4E-04	7.160E 00	1.76E-04	6.6E-05
1.160E 00	4.05E-02	2.6E-03	3.340E 00	1.41E-04	1.4E-04	7.280E 00	1.45E-04	6.2E-05
1.200E 00	1.62E-02	2.3E-03	3.420E 00	2.18E-04	1.3E-04	7.400E 00	7.09E-05	5.7E-05
1.240E 00	3.73E-02	2.4E-03	3.500E 00	3.03E-04	1.2E-04	7.520E 00	1.19E-05	5.6E-05
1.280E 00	8.32E-02	2.6E-03	3.580E 00	3.03E-04	1.3E-04	7.640E 00	-7.93E-06	5.7E-05
1.320E 00	1.02E-01	2.5E-03	3.660E 00	2.26E-04	1.2E-04	7.760E 00	3.26E-06	5.4E-05
1.360E 00	9.70E-02	2.5E-03	3.740E 00	1.51E-04	1.4E-04	7.890E 00	4.07E-05	5.0E-05
1.400E 00	8.68E-02	2.3E-03	3.820E 00	1.42E-04	1.4E-04	8.030E 00	8.74E-05	4.9E-05
1.440E 00	7.45E-02	2.1E-03	3.900E 00	1.79E-04	1.3E-04	8.170E 00	1.05E-04	4.6E-05
1.480E 00	6.86E-02	1.9E-03	3.980E 00	1.77E-04	1.3E-04	8.310E 00	8.87E-05	4.2E-05
1.520E 00	6.13E-02	1.6E-03	4.060E 00	1.47E-04	1.3E-04	8.450E 00	6.82E-05	3.9E-05
1.560E 00	4.54E-02	1.5E-03	4.140E 00	1.37E-04	1.2E-04	8.590E 00	5.23E-05	3.5E-05
1.600E 00	3.03E-02	1.2E-03	4.220E 00	1.56E-04	1.3E-04	8.730E 00	2.62E-05	3.1E-05
1.640E 00	2.19E-02	9.2E-04	4.300E 00	1.56E-04	1.3E-04	8.870E 00	1.74E-06	2.8E-05
1.680E 00	1.82E-02	7.7E-04	4.380E 00	8.91E-05	1.2E-04	9.010E 00	-3.79E-06	2.5E-05
1.720E 00	1.55E-02	7.5E-04	4.460E 00	1.76E-05	1.2E-04	9.150E 00	1.28E-05	2.3E-05
1.760E 00	1.43E-02	7.0E-04	4.540E 00	3.24E-05	1.1E-04	9.300E 00	3.49E-05	2.0E-05
1.800E 00	1.54E-02	7.4E-04	4.630E 00	5.55E-05	1.1E-04	9.460E 00	4.60E-05	1.5E-05
1.850E 00	1.50E-02	6.2E-04	4.730E 00	3.26E-05	1.2E-04	9.620E 00	4.16E-05	1.1E-05
1.910E 00	1.03E-02	5.3E-04	4.830E 00	9.98E-05	1.1E-04	9.780E 00	2.82E-05	8.5E-06
1.970E 00	1.01E-02	4.8E-04	4.930E 00	2.30E-04	1.1E-04	9.940E 00	1.40E-05	5.0E-06
2.030E 00	1.06E-02	4.6E-04	5.030E 00	2.62E-04	1.1E-04	1.010E 01	5.43E-06	2.7E-06
2.090E 00	7.39E-03	3.6E-04	5.130E 00	2.47E-04	1.1E-04	1.026E 01	1.70E-06	1.5E-06

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

IN-MIN=		2.50 MEV	EN-MAX=	3.00 MEV	THETA=125. DEG				
E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	
6.900E-01	1.83E-01	1.2E-02	2.150E 00	1.17E-02	7.0E-04	5.230E 00	1.57E-04	1.3E-04	
7.100E-01	1.26E-01	6.2E-03	2.210E 00	7.55E-03	6.3E-04	5.330E 00	1.63E-04	1.4E-04	
7.300E-01	9.82E-02	5.0E-03	2.270E 00	9.97E-03	6.5E-04	5.430E 00	1.31E-04	1.3E-04	
7.500E-01	1.03E-01	5.0E-03	2.330E 00	1.10E-02	6.6E-04	5.530E 00	5.24E-06	1.1E-04	
7.700E-01	9.77E-02	5.0E-03	2.390E 00	1.04E-02	6.1E-04	5.630E 00	-5.88E-05	1.1E-04	
7.900E-01	7.63E-02	4.8E-02	2.450E 00	1.10E-02	5.7E-04	5.730E 00	2.43E-05	1.0E-04	
8.100E-01	5.56E-02	5.1E-03	2.510E 00	1.00E-02	5.3E-04	5.830E 00	1.71E-04	1.0E-04	
8.300E-01	4.56E-02	5.3E-03	2.570E 00	6.55E-03	4.0E-04	5.930E 00	2.44E-04	9.4E-05	
8.500E-01	4.75E-02	6.0E-03	2.630E 00	4.09E-03	3.3E-04	6.030E 00	2.01E-04	9.8E-05	
8.700E-01	6.73E-02	6.4E-02	2.690E 00	2.93E-03	2.9E-04	6.130E 00	1.11E-04	9.3E-05	
8.900E-01	1.14E-01	7.2E-03	2.750E 00	2.13E-03	2.7E-04	6.230E 00	1.42E-05	9.4E-05	
9.100E-01	1.98E-01	7.4E-03	2.810E 00	1.76E-03	2.6E-04	6.330E 00	-6.74E-05	9.2E-05	
9.300E-01	2.67E-01	7.3E-03	2.870E 00	1.46E-03	2.3E-04	6.430E 00	-4.84E-05	1.0E-04	
9.500E-01	3.10E-01	7.9E-03	2.930E 00	9.39E-04	2.1E-04	6.530E 00	6.81E-05	8.9E-05	
9.700E-01	2.91E-01	7.0E-03	2.990E 00	5.36E-04	1.9E-04	6.630E 00	2.16E-04	8.6E-05	
1.000E 00	1.87E-01	7.9E-03	3.050E 00	4.60E-04	2.0E-04	6.800E 00	2.72E-04	8.3E-05	
1.040E 00	1.01E-01	5.7E-02	3.110E 00	4.89E-04	2.0E-04	6.920E 00	1.57E-04	8.0E-05	
1.080E 00	1.47E-01	5.7E-03	3.180E 00	4.56E-04	2.0E-04	7.040E 00	4.76E-05	7.5E-05	
1.120E 00	1.67E-01	5.4E-03	3.260E 00	4.61E-04	1.5E-04	7.160E 00	-5.42E-05	7.4E-05	
1.160E 00	1.03E-01	4.3E-03	3.340E 00	5.16E-04	1.8E-04	7.280E 00	-1.36E-04	7.0E-05	
1.200E 00	4.80E-02	3.8E-03	3.420E 00	4.87E-04	1.7E-04	7.400E 00	-5.50E-05	6.6E-05	
1.240E 00	4.82E-02	3.7E-03	3.500E 00	3.83E-04	1.8E-04	7.520E 00	-5.28E-05	6.5E-05	
1.280E 00	9.55E-02	4.2E-03	3.580E 00	2.68E-04	1.9E-04	7.640E 00	2.04E-04	6.4E-05	
1.320E 00	1.33E-01	4.1E-03	3.660E 00	2.01E-04	1.8E-04	7.760E 00	2.19E-04	5.9E-05	
1.360E 00	1.35E-01	3.9E-03	3.740E 00	1.58E-04	1.6E-04	7.880E 00	1.42E-04	5.4E-05	
1.400E 00	1.22E-01	3.6E-03	3.820E 00	1.59E-04	1.7E-04	8.030E 00	4.92E-05	5.0E-05	
1.440E 00	1.04E-01	3.5E-03	3.900E 00	1.53E-04	1.6E-04	8.170E 00	1.58E-05	4.5E-05	
1.480E 00	9.03E-02	2.9E-03	3.980E 00	3.06E-05	1.5E-04	8.310E 00	2.49E-05	4.1E-05	
1.520E 00	7.87E-02	2.6E-03	4.060E 00	-1.29E-04	1.5E-04	8.450E 00	3.25E-05	3.5E-05	
1.560E 00	6.08E-02	2.5E-03	4.140E 00	-2.16E-04	1.4E-04	8.590E 00	2.89E-05	3.1E-05	
1.600E 00	4.20E-02	1.8E-03	4.220E 00	-1.77E-04	1.4E-04	8.730E 00	2.64E-05	2.7E-05	
1.640E 00	2.94E-02	1.7E-03	4.300E 00	-1.47E-05	1.5E-04	8.870E 00	1.63E-05	2.9E-05	
1.680E 00	2.38E-02	1.6E-03	4.380E 00	1.35E-04	1.3E-04	9.010E 00	6.66E-06	2.6E-05	
1.720E 00	2.10E-02	1.5E-03	4.460E 00	2.16E-04	1.3E-04	9.150E 00	6.93E-06	2.3E-05	
1.760E 00	2.18E-02	1.5E-03	4.540E 00	2.65E-04	1.3E-04	9.300E 00	3.25E-05	2.2E-05	
1.800E 00	2.65E-02	1.6E-02	4.630E 00	3.60E-04	1.2E-04	9.460E 00	5.61E-05	1.9E-05	
1.850E 00	2.83E-02	1.4E-02	4.730E 00	3.73E-04	1.3E-04	9.620E 00	5.25E-05	1.4E-05	
1.910E 00	2.10E-02	1.2E-03	4.830E 00	1.95E-04	1.4E-04	9.780E 00	3.21E-05	1.1E-05	
1.970E 00	1.58E-02	1.1E-03	4.930E 00	6.32E-05	1.5E-04	9.940E 00	1.38E-05	8.0E-06	
2.030E 00	2.46E-02	1.1E-03	5.030E 00	1.11E-04	1.4E-04	1.010E 01	5.00E-06	4.8E-06	
2.090E 00	2.10E-02	9.6E-04	5.130E 00	1.64E-04	1.3E-04	1.026E 01	1.82E-06	2.7E-06	

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 3.00 MEV EN-MAX= 3.50 MEV THETA=125. DEG

E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	2.06E-01	1.6E-02	2.150E 00	1.86E-02	1.4E-03	5.230E 00	2.26E-04	1.4E-04
7.100E-01	1.36E-01	8.4E-03	2.210E 00	1.24E-02	1.2E-03	5.330E 00	2.81E-04	1.4E-04
7.200E-01	1.02E-01	6.9E-03	2.270E 00	1.37E-02	1.3E-03	5.430E 00	2.65E-04	1.5E-04
7.500E-01	1.08E-01	6.9E-03	2.330E 00	1.70E-02	1.3E-03	5.530E 00	2.17E-04	1.5E-04
7.700E-01	1.06E-01	6.7E-03	2.390E 00	1.68E-02	1.2E-03	5.630E 00	1.19E-04	1.5E-04
7.900E-01	8.61E-02	6.4E-03	2.450E 00	1.90E-02	1.1E-03	5.730E 00	-4.84E-05	1.2E-04
8.100E-01	6.18E-02	6.9E-03	2.510E 00	1.91E-02	1.1E-03	5.830E 00	-1.76E-04	1.1E-04
8.200E-01	5.35E-02	7.0E-03	2.570E 00	1.41E-02	8.6E-04	5.930E 00	-1.89E-04	1.2E-04
8.500E-01	6.06E-02	7.8E-03	2.630E 00	9.90E-03	7.6E-04	6.030E 00	-9.81E-05	1.3E-04
8.700E-01	8.01E-02	8.2E-03	2.690E 00	1.01E-02	7.7E-04	6.130E 00	2.50E-05	1.2E-04
8.900E-01	1.24E-01	8.8E-03	2.750E 00	1.37E-02	7.7E-04	6.230E 00	1.11E-04	1.1E-04
9.100E-01	2.04E-01	9.2E-03	2.810E 00	1.60E-02	8.0E-04	6.330E 00	1.36E-04	9.1E-05
9.300E-01	2.97E-01	9.1E-03	2.870E 00	1.47E-02	7.5E-04	6.440E 00	1.13E-04	8.8E-05
9.500E-01	3.54E-01	9.7E-03	2.930E 00	1.16E-02	6.1E-04	6.560E 00	1.35E-04	1.1E-04
9.700E-01	3.37E-01	8.9E-03	2.990E 00	8.49E-03	5.2E-04	6.680E 00	1.92E-04	9.6E-05
1.000E 00	2.18E-01	1.1E-02	3.050E 00	5.60E-03	4.3E-04	6.800E 00	2.13E-04	8.9E-05
1.040E 00	1.19E-01	7.5E-03	3.110E 00	3.16E-03	3.7E-04	6.920E 00	1.11E-04	8.3E-05
1.080E 00	1.66E-01	8.3E-03	3.180E 00	1.53E-03	3.1E-04	7.040E 00	-3.43E-05	7.8E-05
1.120E 00	1.96E-01	7.6E-03	3.260E 00	9.67E-04	2.8E-04	7.160E 00	-8.64E-05	7.8E-05
1.160E 00	1.32E-01	6.0E-03	3.340E 00	6.86E-04	2.4E-04	7.280E 00	-2.22E-05	7.8E-05
1.200E 00	6.73E-02	5.3E-03	3.420E 00	5.36E-04	2.6E-04	7.400E 00	8.59E-05	7.6E-05
1.240E 00	6.38E-02	5.4E-03	3.500E 00	5.14E-04	2.5E-04	7.520E 00	1.77E-04	7.1E-05
1.280E 00	1.19E-01	5.6E-03	3.580E 00	4.56E-04	2.2E-04	7.640E 00	1.93E-04	6.8E-05
1.320E 00	1.69E-01	5.4E-03	3.660E 00	4.20E-04	2.3E-04	7.760E 00	1.25E-04	7.2E-05
1.360E 00	1.65E-01	5.2E-03	3.740E 00	4.06E-04	2.3E-04	7.890E 00	2.73E-05	6.9E-05
1.400E 00	1.44E-01	5.2E-03	3.820E 00	2.52E-04	2.2E-04	8.030E 00	-2.30E-05	5.4E-05
1.440E 00	1.26E-01	4.7E-03	3.900E 00	7.72E-05	2.2E-04	8.170E 00	6.51E-06	5.2E-05
1.480E 00	1.03E-01	4.2E-03	3.980E 00	1.40E-04	2.1E-04	8.310E 00	5.22E-05	5.2E-05
1.520E 00	8.36E-02	3.8E-03	4.060E 00	2.94E-04	1.9E-04	8.450E 00	7.57E-05	4.6E-05
1.560E 00	6.55E-02	3.6E-03	4.140E 00	2.84E-04	2.1E-04	8.590E 00	7.60E-05	4.0E-05
1.600E 00	4.76E-02	2.8E-03	4.220E 00	2.25E-04	2.1E-04	8.730E 00	5.29E-05	3.9E-05
1.640E 00	3.73E-02	2.5E-03	4.300E 00	2.50E-04	2.1E-04	8.870E 00	1.70E-05	3.1E-05
1.680E 00	3.12E-02	2.4E-03	4.380E 00	2.82E-04	1.9E-04	9.010E 00	-1.32E-06	2.5E-05
1.720E 00	2.59E-02	2.5E-03	4.460E 00	2.40E-04	1.8E-04	9.150E 00	2.16E-06	2.4E-05
1.760E 00	2.76E-02	2.5E-03	4.540E 00	1.78E-04	1.9E-04	9.300E 00	1.90E-05	2.1E-05
1.800E 00	3.86E-02	2.6E-03	4.630E 00	1.07E-04	1.9E-04	9.460E 00	3.64E-05	1.6E-05
1.850E 00	4.63E-02	2.2E-03	4.730E 00	9.66E-06	1.9E-04	9.620E 00	4.32E-05	1.3E-05
1.910E 00	3.57E-02	2.1E-03	4.830E 00	-4.08E-05	1.7E-04	9.780E 00	3.92E-05	1.1E-05
1.970E 00	3.31E-02	2.0E-03	4.930E 00	-8.04E-05	1.7E-04	9.940E 00	2.57E-05	9.1E-06
2.030E 00	3.56E-02	1.8E-03	5.030E 00	-5.44E-05	1.7E-04	1.010E 01	1.22E-05	5.9E-06
2.090E 00	2.88E-02	1.6E-03	5.130E 00	7.28E-05	1.6E-04	1.026E 01	4.07E-06	4.0E-06

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 3.50 MEV EN-MAX= 4.00 MEV THETA=125. DEG

F-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	2.13E-01	1.8E-02	2.150E 00	2.55E-02	1.9E-03	5.230E 00	-1.38E-04	1.5E-04
7.100E-01	1.50E-01	9.9E-03	2.210E 00	2.08E-02	1.9E-03	5.330E 00	-2.59E-05	1.5E-04
7.300E-01	1.16E-01	8.2E-03	2.270E 00	2.33E-02	1.9E-03	5.430E 00	1.14E-04	1.5E-04
7.500E-01	1.13E-01	8.4E-03	2.330E 00	2.43E-02	1.9E-03	5.530E 00	1.02E-04	1.4E-04
7.700E-01	9.87E-02	8.1E-03	2.390E 00	2.33E-02	1.8E-03	5.630E 00	2.60E-05	1.4E-04
7.900E-01	7.87E-02	7.8E-03	2.450E 00	2.44E-02	1.7E-03	5.730E 00	8.87E-06	1.4E-04
8.100E-01	6.70E-02	8.3E-03	2.510E 00	2.34E-02	1.6E-03	5.830E 00	1.09E-04	1.4E-04
8.300E-01	7.14E-02	8.9E-03	2.570E 00	1.77E-02	1.4E-03	5.930E 00	2.22E-04	1.4E-04
8.500E-01	9.08E-02	9.9E-03	2.630E 00	1.25E-02	1.4E-03	6.030E 00	2.47E-04	1.4E-04
8.700E-01	1.27E-01	1.0E-02	2.690E 00	1.25E-02	1.4E-03	6.130E 00	1.74E-04	1.3E-04
8.900E-01	1.86E-01	1.1E-02	2.750E 00	1.61E-02	1.3E-03	6.230E 00	4.03E-05	1.2E-04
9.100E-01	2.69E-01	1.2E-02	2.810E 00	2.01E-02	1.3E-03	6.330E 00	-8.88E-05	1.2E-04
9.300E-01	3.48E-01	1.2E-02	2.870E 00	1.95E-02	1.3E-03	6.430E 00	-1.68E-04	1.2E-04
9.500E-01	3.78E-01	1.2E-02	2.930E 00	1.48E-02	1.1E-03	6.530E 00	-1.05E-04	1.0E-04
9.700E-01	3.34E-01	1.1E-02	2.990E 00	1.13E-02	1.0E-03	6.630E 00	4.95E-05	9.9E-05
1.000E 00	2.04E-01	1.3E-02	3.050E 00	9.35E-03	9.0E-04	6.800E 00	1.91E-04	9.6E-05
1.040E 00	1.33E-01	9.7E-03	3.110E 00	7.67E-03	8.1E-04	6.920E 00	2.20E-04	8.8E-05
1.080E 00	1.97E-01	1.0E-02	3.180E 00	4.22E-03	6.8E-04	7.040E 00	1.57E-04	7.2E-05
1.120E 00	2.12E-01	9.0E-03	3.260E 00	5.83E-03	6.6E-04	7.160E 00	4.84E-05	6.8E-05
1.160E 00	1.33E-01	7.7E-03	3.340E 00	7.53E-03	6.6E-04	7.280E 00	-1.37E-05	6.8E-05
1.200E 00	7.99E-02	7.1E-03	3.420E 00	9.52E-03	6.1E-04	7.400E 00	6.82E-07	6.4E-05
1.240E 00	9.29E-02	6.9E-03	3.500E 00	7.60E-03	5.6E-04	7.520E 00	6.02E-05	5.8E-05
1.280E 00	1.51E-01	7.6E-03	3.580E 00	4.52E-03	4.6E-04	7.640E 00	1.06E-04	5.2E-05
1.320E 00	1.99E-01	7.0E-03	3.660E 00	2.41E-03	3.7E-04	7.760E 00	1.21E-04	5.0E-05
1.360E 00	1.90E-01	7.0E-03	3.740E 00	1.20E-03	3.4E-04	7.890E 00	1.27E-04	4.6E-05
1.400E 00	1.48E-01	6.5E-03	3.820E 00	6.37E-04	3.0E-04	8.030E 00	1.07E-04	5.0E-05
1.440E 00	1.24E-01	6.2E-03	3.900E 00	4.75E-04	2.7E-04	8.170E 00	7.04E-05	4.7E-05
1.480E 00	1.11E-01	5.4E-03	3.980E 00	3.98E-04	2.7E-04	8.310E 00	1.72E-05	4.3E-05
1.520E 00	8.91E-02	4.5E-03	4.060E 00	3.74E-04	2.6E-04	8.450E 00	-2.88E-07	4.4E-05
1.560E 00	6.63E-02	4.4E-03	4.140E 00	3.69E-04	2.6E-04	8.590E 00	7.10E-06	4.0E-05
1.600E 00	5.03E-02	3.6E-03	4.220E 00	2.78E-04	2.6E-04	8.730E 00	2.45E-05	3.5E-05
1.640E 00	4.04E-02	3.5E-03	4.300E 00	1.10E-04	2.1E-04	8.870E 00	2.47E-05	3.5E-05
1.680E 00	3.88E-02	3.3E-03	4.380E 00	3.81E-05	2.0E-04	9.010E 00	1.06E-05	3.5E-05
1.720E 00	3.78E-02	3.4E-03	4.460E 00	5.88E-05	2.0E-04	9.150E 00	6.12E-06	3.1E-05
1.760E 00	3.81E-02	3.6E-03	4.540E 00	1.08E-04	2.0E-04	9.300E 00	1.62E-05	2.9E-05
1.800E 00	5.08E-02	3.7E-03	4.630E 00	1.35E-04	1.9E-04	9.460E 00	3.62E-05	2.8E-05
1.850E 00	6.48E-02	3.2E-03	4.730E 00	1.38E-04	1.9E-04	9.620E 00	4.57E-05	2.3E-05
1.910E 00	5.08E-02	3.0E-03	4.830E 00	2.09E-04	1.8E-04	9.780E 00	4.02E-05	1.9E-05
1.970E 00	4.30E-02	2.9E-03	4.930E 00	3.04E-04	1.7E-04	9.940E 00	2.74E-05	1.5E-05
2.030E 00	4.50E-02	2.5E-03	5.030E 00	2.31E-04	1.7E-04	1.010E 01	1.50E-05	9.7E-06
2.090E 00	3.73E-02	2.2E-03	5.130E 00	-1.76E-05	1.4E-04	1.026E 01	6.75E-06	6.0E-06

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

E-N-MIN=		4.00 MEV	E-N-MAX=	4.50 MEV	THETA=125. DEG	
E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV
6.900E-01	2.28E-01	2.1E-02	2.150E 00	3.15E-02	2.4E-03	5.230E 00
7.100E-01	1.53E-01	1.2E-02	2.210E 00	2.65E-02	2.4E-03	5.330E 00
7.300E-01	1.17E-01	9.9E-03	2.270E 00	2.95E-02	2.5E-03	5.430E 00
7.500E-01	1.16E-01	9.9E-03	2.330E 00	3.26E-02	2.5E-03	5.530E 00
7.700E-01	1.05E-01	9.8E-03	2.390E 00	3.27E-02	2.2E-03	5.630E 00
7.900E-01	8.62E-02	9.2E-03	2.450E 00	3.09E-02	2.4E-03	5.730E 00
8.100E-01	7.29E-02	9.9E-03	2.510E 00	2.70E-02	2.0E-03	5.830E 00
8.300E-01	7.39E-02	1.1E-02	2.570E 00	2.20E-02	1.9E-03	5.930E 00
8.500E-01	9.09E-02	1.2E-02	2.630E 00	2.04E-02	1.7E-03	6.030E 00
8.700E-01	1.31E-01	1.2E-02	2.690E 00	2.06E-02	1.7E-03	6.130E 00
8.900E-01	2.07E-01	1.3E-02	2.750E 00	2.30E-02	1.7E-03	6.230E 00
9.100E-01	3.06E-01	1.4E-02	2.810E 00	2.70E-02	1.8E-03	6.330E 00
9.300E-01	3.85E-01	1.4E-02	2.870E 00	2.63E-02	1.8E-03	6.440E 00
9.500E-01	4.03E-01	1.4E-02	2.930E 00	2.10E-02	1.5E-03	6.560E 00
9.700E-01	3.53E-01	1.3E-02	2.990E 00	1.74E-02	1.5E-03	6.680E 00
1.000E 00	2.27E-01	1.4E-02	3.050E 00	1.51E-02	1.3E-03	6.800E 00
1.040E 00	1.49E-01	1.2E-02	3.110E 00	1.15E-02	1.2E-03	6.920E 00
1.080E 00	2.13E-01	1.3E-02	3.180E 00	9.30E-03	1.2E-03	7.040E 00
1.120E 00	2.18E-01	1.1E-02	3.260E 00	1.09E-02	1.1E-03	7.160E 00
1.160E 00	1.43E-01	9.3E-03	3.340E 00	1.28E-02	1.1E-03	7.280E 00
1.200E 00	1.04E-01	8.6E-03	3.420E 00	1.45E-02	1.1E-03	7.400E 00
1.240E 00	1.09E-01	8.6E-03	3.500E 00	1.34E-02	1.1E-03	7.520E 00
1.280E 00	1.73E-01	9.2E-03	3.580E 00	9.00E-03	8.2E-04	7.640E 00
1.320E 00	2.23E-01	8.1E-03	3.660E 00	5.85E-03	7.4E-04	7.760E 00
1.360E 00	1.98E-01	7.7E-03	3.740E 00	5.41E-03	6.6E-04	7.890E 00
1.400E 00	1.67E-01	7.5E-03	3.820E 00	5.18E-03	6.6E-04	8.030E 00
1.440E 00	1.49E-01	7.1E-03	3.900E 00	4.61E-03	5.6E-04	8.170E 00
1.480E 00	1.22E-01	6.3E-03	3.980E 00	4.62E-03	5.3E-04	8.310E 00
1.520E 00	9.63E-02	5.8E-03	4.060E 00	4.36E-03	4.8E-04	8.450E 00
1.560E 00	7.58E-02	5.3E-03	4.140E 00	2.98E-03	4.2E-04	8.590E 00
1.600E 00	5.77E-02	4.6E-03	4.220E 00	1.52E-03	3.6E-04	8.730E 00
1.640E 00	4.78E-02	4.5E-03	4.300E 00	8.84E-04	3.3E-04	8.870E 00
1.680E 00	4.60E-02	4.3E-03	4.380E 00	6.24E-04	2.9E-04	9.010E 00
1.720E 00	4.62E-02	4.4E-03	4.460E 00	2.90E-04	2.4E-04	9.150E 00
1.760E 00	5.29E-02	4.4E-03	4.540E 00	6.58E-05	2.3E-04	9.300E 00
1.800E 00	6.58E-02	4.6E-03	4.630E 00	7.72E-05	2.4E-04	9.460E 00
1.850E 00	6.99E-02	4.3E-03	4.730E 00	2.23E-04	2.5E-04	9.620E 00
1.910E 00	6.10E-02	4.0E-03	4.830E 00	2.25E-04	2.4E-04	9.780E 00
1.970E 00	5.67E-02	3.4E-03	4.930E 00	8.72E-05	2.3E-04	9.940E 00
2.030E 00	4.98E-02	3.2E-03	5.030E 00	6.73E-05	2.1E-04	1.010E 01
2.090E 00	4.08E-02	2.9E-03	5.130E 00	1.69E-04	2.0E-04	1.026E 01

DATA B/SR/MEV	DATA-ERR B/SR/MEV
2.32E-04	2.1E-04
1.22E-04	1.9E-04
7.35E-05	1.6E-04
1.27E-04	1.6E-04
1.82E-04	1.6E-04
1.56E-04	1.6E-04
7.47E-05	1.5E-04
3.94E-05	1.3E-04
8.49E-05	1.4E-04
1.47E-04	1.4E-04
1.21E-04	1.2E-04
1.93E-05	1.2E-04
-8.80E-05	1.2E-04
-1.04E-04	1.1E-04
-1.55E-05	1.1E-04
9.58E-05	1.1E-04
1.71E-04	1.1E-04
1.90E-04	1.0E-04
1.57E-04	9.4E-05
2.14E-04	1.0E-04
1.80E-04	9.8E-05
1.16E-04	7.6E-05
6.70E-05	7.6E-05
5.88E-05	8.1E-05
6.61E-05	7.1E-05
6.07E-05	5.6E-05
4.63E-05	5.4E-05
2.95E-05	5.7E-05
4.17E-06	5.3E-05
-1.40E-06	4.4E-05
1.25E-05	4.0E-05
2.62E-05	3.9E-05
2.80E-05	3.5E-05
1.79E-05	3.3E-05
1.75E-05	3.1E-05
3.54E-05	2.7E-05
5.08E-05	2.5E-05
4.45E-05	2.1E-05
2.86E-05	1.6E-05
1.37E-05	1.1E-05
6.45E-06	7.3E-06

COOPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN=		4.50 MEV	EN-MAX=	5.00 MEV	THETA=125. DEG	
E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV
6.900E-01	2.38E-01	2.4E-02	2.130E 00	3.91E-02	2.2E-03	5.230E 00
7.100E-01	1.50E-01	1.3E-02	2.210E 00	3.27E-02	3.1E-03	5.330E 00
7.300E-01	1.17E-01	1.1E-02	2.270E 00	3.43E-02	3.0E-03	5.430E 00
7.500E-01	1.30E-01	1.1E-02	2.330E 00	3.63E-02	3.2E-03	5.530E 00
7.700E-01	1.25E-01	1.0E-02	2.390E 00	3.46E-02	2.6E-03	5.630E 00
7.900E-01	8.99E-02	1.1E-02	2.450E 00	3.18E-02	2.6E-03	5.730E 00
8.100E-01	6.48E-02	1.2E-02	2.510E 00	3.03E-02	2.6E-03	5.830E 00
8.300E-01	7.04E-02	1.2E-02	2.570E 00	2.82E-02	2.2E-03	5.930E 00
8.500E-01	9.80E-02	1.3E-02	2.630E 00	2.68E-02	2.2E-03	6.030E 00
8.700E-01	1.41E-01	1.4E-02	2.690E 00	2.74E-02	2.2E-03	6.130E 00
8.900E-01	2.08E-01	1.5E-02	2.750E 00	2.90E-02	2.2E-03	6.230E 00
9.100E-01	2.01E-01	1.6E-02	2.810E 00	2.13E-02	2.4E-03	6.330E 00
9.300E-01	2.92E-01	1.6E-02	2.870E 00	3.24E-02	2.2E-03	6.440E 00
9.500E-01	4.30E-01	1.6E-02	2.930E 00	2.01E-02	2.0E-03	6.560E 00
9.700E-01	3.89E-01	1.4E-02	2.990E 00	2.56E-02	2.0E-03	6.680E 00
1.000E 00	2.54E-01	1.6E-02	3.050E 00	2.14E-02	1.8E-03	6.800E 00
1.040E 00	1.63E-01	1.3E-02	3.110E 00	1.87E-02	1.7E-03	6.920E 00
1.080E 00	2.19E-01	1.3E-02	3.130E 00	1.65E-02	1.7E-03	7.040E 00
1.120E 00	2.40E-01	1.2E-02	3.260E 00	1.88E-02	1.6E-03	7.160E 00
1.160E 00	1.54E-01	1.1E-02	3.340E 00	1.86E-02	1.6E-03	7.280E 00
1.200E 00	9.99E-02	1.0E-02	3.420E 00	1.75E-02	1.5E-03	7.400E 00
1.240E 00	1.07E-01	9.4E-03	3.500E 00	1.54E-02	1.4E-03	7.520E 00
1.280E 00	1.91E-01	1.1E-02	3.580E 00	1.25E-02	1.2E-03	7.640E 00
1.320E 00	2.44E-01	9.3E-03	3.660E 00	9.75E-03	1.1E-03	7.760E 00
1.360E 00	2.06E-01	9.7E-03	3.740E 00	8.19E-03	1.1E-03	7.890E 00
1.400E 00	1.74E-01	8.9E-03	3.820E 00	8.39E-03	1.1E-03	8.030E 00
1.440E 00	1.61E-01	8.4E-03	3.900E 00	9.36E-03	1.1E-03	8.170E 00
1.480E 00	1.39E-01	7.9E-03	3.980E 00	9.82E-03	9.4E-04	8.310E 00
1.520E 00	1.11E-01	7.0E-03	4.060E 00	9.12E-03	9.4E-04	8.450E 00
1.560E 00	8.93E-02	6.4E-03	4.140E 00	7.83E-03	8.6E-04	8.590E 00
1.600E 00	6.84E-02	5.2E-03	4.220E 00	6.99E-03	7.3E-04	8.730E 00
1.640E 00	5.37E-02	5.2E-03	4.300E 00	6.16E-03	6.4E-04	8.870E 00
1.680E 00	5.30E-02	5.1E-03	4.380E 00	4.82E-03	5.8E-04	9.010E 00
1.720E 00	5.44E-02	5.1E-03	4.460E 00	3.43E-03	5.4E-04	9.150E 00
1.760E 00	5.47E-02	5.2E-03	4.540E 00	2.54E-03	4.6E-04	9.300E 00
1.800E 00	6.39E-02	5.6E-03	4.630E 00	1.66E-03	3.7E-04	9.460E 00
1.850E 00	7.74E-02	4.5E-03	4.720E 00	6.73E-04	3.3E-04	9.620E 00
1.910E 00	7.00E-02	4.4E-03	4.820E 00	2.84E-04	3.1E-04	9.780E 00
1.970E 00	6.26E-02	4.0E-03	4.920E 00	3.58E-04	2.9E-04	9.940E 00
2.030E 00	5.57E-02	3.8E-03	5.020E 00	7.81E-04	2.5E-04	1.010E 01
2.090E 00	4.71E-02	3.4E-03	5.120E 00	8.01E-04	2.3E-04	1.026E 01

DATA-ERR
B/SR/MEVDATA
B/SR/MEVE-GAMMA
MEVDATA-ERR
B/SR/MEVDATA
B/SR/MEVE-GAMMA
MEVDATA-ERR
B/SR/MEVDATA
B/SR/MEVE-GAMMA
MEV

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 5.00 MEV EN-MAX= 6.05 MEV THETA=125. DEG

E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	2.44E-01	2.4E-02	2.150E 00	4.56E-02	3.2E-03	5.230E 00	2.08E-03	3.3E-04
7.100E-01	1.65E-01	1.3E-02	2.210E 00	3.90E-02	3.0E-03	5.330E 00	1.53E-03	2.9E-04
7.300E-01	1.21E-01	1.1E-02	2.270E 00	4.09E-02	3.0E-03	5.430E 00	9.54E-04	2.9E-04
7.500E-01	1.18E-01	1.1E-02	2.330E 00	4.29E-02	3.1E-03	5.530E 00	6.24E-04	2.8E-04
7.700E-01	1.05E-01	1.1E-02	2.390E 00	4.22E-02	2.7E-03	5.630E 00	6.58E-04	2.5E-04
7.900E-01	8.72E-02	1.1E-02	2.450E 00	4.27E-02	2.7E-03	5.730E 00	7.29E-04	2.2E-04
8.100E-01	8.32E-02	1.1E-02	2.510E 00	4.06E-02	2.7E-03	5.830E 00	5.97E-04	2.0E-04
8.300E-01	9.31E-02	1.2E-02	2.570E 00	3.55E-02	2.6E-03	5.930E 00	3.46E-04	2.1E-04
8.500E-01	1.07E-01	1.4E-02	2.630E 00	3.63E-02	2.5E-03	6.030E 00	1.27E-04	2.0E-04
8.700E-01	1.36E-01	1.4E-02	2.690E 00	3.69E-02	2.3E-03	6.130E 00	7.04E-04	1.8E-04
8.900E-01	2.00E-01	1.5E-02	2.750E 00	3.58E-02	2.2E-03	6.230E 00	9.18E-07	1.6E-04
9.100E-01	2.00E-01	1.6E-02	2.810E 00	3.80E-02	2.3E-03	6.330E 00	1.10E-04	1.5E-04
9.300E-01	2.96E-01	1.6E-02	2.870E 00	3.82E-02	2.2E-03	6.430E 00	2.52E-04	1.4E-04
9.500E-01	4.40E-01	1.6E-02	2.930E 00	3.46E-02	2.0E-03	6.530E 00	2.92E-04	1.3E-04
9.700E-01	4.05E-01	1.5E-02	2.990E 00	3.03E-02	1.9E-03	6.630E 00	2.21E-04	1.1E-04
1.000E 00	2.74E-01	1.6E-02	3.050E 00	2.64E-02	1.9E-03	6.800E 00	1.26E-04	1.0E-04
1.040E 00	1.73E-01	1.3E-02	3.110E 00	2.29E-02	1.8E-03	6.920E 00	4.93E-05	1.0E-04
1.080E 00	2.31E-01	1.3E-02	3.180E 00	2.28E-02	1.7E-03	7.040E 00	4.59E-06	6.7E-05
1.120E 00	2.58E-01	1.3E-02	3.260E 00	2.62E-02	1.6E-03	7.160E 00	2.48E-06	7.7E-05
1.160E 00	1.76E-01	1.0E-02	3.340E 00	2.68E-02	1.6E-03	7.280E 00	1.04E-05	6.7E-05
1.200E 00	1.11E-01	9.7E-03	3.420E 00	2.44E-02	1.5E-03	7.400E 00	-1.15E-05	5.6E-05
1.240E 00	1.30E-01	9.3E-03	3.500E 00	2.14E-02	1.4E-03	7.520E 00	-3.35E-04	5.6E-05
1.280E 00	2.07E-01	4.8E-03	3.580E 00	1.95E-02	1.3E-03	7.640E 00	1.80E-05	5.6E-05
1.320E 00	2.55E-01	9.2E-03	3.660E 00	1.66E-02	1.3E-03	7.760E 00	5.50E-05	5.5E-05
1.360E 00	2.31E-01	8.8E-03	3.740E 00	1.47E-02	1.2E-03	7.890E 00	8.14E-05	5.4E-05
1.400E 00	1.91E-01	9.1E-03	3.820E 00	1.45E-02	1.1E-03	8.030E 00	8.70E-05	4.8E-05
1.440E 00	1.67E-01	8.3E-03	3.900E 00	1.52E-02	1.1E-03	8.170E 00	9.25E-05	4.3E-05
1.480E 00	1.47E-01	7.8E-03	3.980E 00	1.57E-02	1.1E-03	8.310E 00	8.25E-05	4.3E-05
1.520E 00	1.26E-01	6.7E-03	4.060E 00	1.39E-02	1.0E-03	8.450E 00	5.89E-05	3.9E-05
1.560E 00	1.01E-01	6.7E-03	4.140E 00	1.15E-02	9.4E-04	8.590E 00	3.20E-05	3.6E-05
1.600E 00	7.81E-02	5.7E-03	4.220E 00	1.12E-02	8.9E-04	8.730E 00	5.74E-06	3.3E-05
1.640E 00	6.49E-02	5.6E-03	4.300E 00	1.13E-02	8.8E-04	8.870E 00	-1.11E-05	2.9E-05
1.680E 00	5.01E-02	5.2E-03	4.380E 00	9.84E-03	8.3E-04	9.010E 00	-9.58E-06	2.6E-05
1.720E 00	6.13E-02	5.1E-03	4.460E 00	7.91E-02	7.6E-04	9.150E 00	5.31E-06	2.3E-05
1.760E 00	6.80E-02	5.3E-03	4.540E 00	6.85E-03	7.2E-04	9.300E 00	2.22E-05	2.2E-05
1.800E 00	7.90E-02	5.9E-03	4.630E 00	6.18E-03	6.6E-04	9.460E 00	2.55E-05	2.0E-05
1.850E 00	9.53E-02	5.3E-03	4.730E 00	6.14E-03	5.8E-04	9.620E 00	3.54E-05	1.5E-05
1.910E 00	7.20E-02	4.8E-03	4.830E 00	5.64E-03	5.3E-04	9.780E 00	3.53E-05	1.3E-05
1.970E 00	6.13E-02	4.1E-03	4.930E 00	4.60E-03	4.9E-04	9.940E 00	2.59E-05	1.1E-05
2.030E 00	5.89E-02	3.9E-03	5.030E 00	3.55E-03	4.3E-04	1.010E 01	1.34E-05	7.4E-06
2.090E 00	5.51E-02	3.5E-03	5.130E 00	2.71E-03	3.6E-04	1.026E 01	4.81E-06	4.8E-06

FN-MIN	6.05 MEV	FN-MAX	7.90 MEV	THETA=125. DEG	
F-GAMMA MEV	DATA R/SR/MEV	DATA-ERR R/SR/MEV	F-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	2.60E-01	2.7E-02	2.150E 00	5.21E-02	4.2E-03
7.100E-01	1.73E-01	1.5E-02	2.210E 00	4.33E-02	4.1E-03
7.300E-01	1.23E-01	1.3F-02	2.270E 00	4.77E-02	3.9E-03
7.500E-01	1.21E-01	1.3E-02	2.330E 00	5.18E-02	3.8E-03
7.700E-01	1.16E-01	1.2E-02	2.390E 00	5.01E-02	3.7E-03
7.900E-01	1.02E-01	1.2E-02	2.450E 00	4.58E-02	3.5E-03
8.100E-01	9.33E-02	1.3E-02	2.510E 00	4.45E-02	3.4E-03
8.300E-01	9.64E-02	1.4E-02	2.570E 00	4.64E-02	3.2E-03
8.500E-01	1.07E-01	1.5E-02	2.630E 00	4.40E-02	3.2E-03
8.700E-01	1.33E-01	1.6F-02	2.690E 00	4.26E-02	3.2E-03
8.900E-01	1.92E-01	1.7E-02	2.750E 00	4.21E-02	3.0E-03
9.100E-01	2.88E-01	1.7E-02	2.810E 00	4.04E-02	3.1E-03
9.300E-01	3.90E-01	1.7E-02	2.870E 00	4.04E-02	3.0E-03
9.500E-01	4.48E-01	1.8E-02	2.930E 00	4.14E-02	2.8E-03
9.700E-01	4.24E-01	1.7E-02	2.990E 00	4.05E-02	2.6E-03
1.000E 00	2.95E-01	1.8E-02	3.050E 00	3.55E-02	2.5E-03
1.040E 00	1.81E-01	1.5E-02	3.110E 00	3.05E-02	2.5E-03
1.080E 00	2.25E-01	1.5E-02	3.180E 00	3.17E-02	2.5E-03
1.120E 00	2.47E-01	1.4E-02	3.260E 00	3.27E-02	2.3E-03
1.160E 00	1.80E-01	1.3E-02	3.340E 00	2.94E-02	2.4E-03
1.200E 00	1.20E-01	1.1E-02	3.420E 00	2.76E-02	2.3E-03
1.240E 00	1.28E-01	1.0E-02	3.500E 00	2.50E-02	2.1E-03
1.280E 00	2.07E-01	1.1E-02	3.580E 00	2.54E-02	1.9E-03
1.320E 00	2.69E-01	1.1E-02	3.660E 00	2.45E-02	1.8E-03
1.360E 00	2.18E-01	1.1E-02	3.740E 00	2.19E-02	1.9E-03
1.400E 00	1.91E-01	1.1E-02	3.820E 00	2.06E-02	1.7E-03
1.440E 00	1.80E-01	9.4E-03	3.900E 00	2.08E-02	1.7E-03
1.480E 00	1.60E-01	9.0E-03	3.980E 00	2.20E-02	1.6E-03
1.520E 00	1.24E-01	8.3E-03	4.060E 00	2.17E-02	1.5E-03
1.560E 00	9.58E-02	8.2E-03	4.140E 00	1.93E-02	1.5E-03
1.600E 00	8.16E-02	6.6E-03	4.220E 00	1.68E-02	1.4E-03
1.640E 00	7.32E-02	6.5E-03	4.300E 00	1.52E-02	1.5E-03
1.680E 00	6.56E-02	6.2E-03	4.380E 00	1.39E-02	1.4E-03
1.720E 00	6.06E-02	6.4E-03	4.460E 00	1.18E-02	1.3E-03
1.760E 00	6.38E-02	6.5E-03	4.540E 00	4.98E-03	1.3E-03
1.800E 00	7.71E-02	6.8E-03	4.620E 00	9.57E-03	1.2E-03
1.850E 00	9.35E-02	6.2E-03	4.700E 00	9.08E-03	1.1E-03
1.900E 00	8.60E-02	5.7E-03	4.800E 00	8.22E-03	1.1E-03
1.950E 00	7.16E-02	4.8E-03	4.930E 00	8.16E-03	9.2E-04
2.000E 00	6.70E-02	4.6E-03	5.030E 00	7.86E-03	8.6E-04
2.050E 00	6.18E-02	4.2E-03	5.130E 00	6.97E-03	8.3E-04

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 7.00 MEV EN-MAX= 8.00 MEV THETA=125. DEG

E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	2.58E-01	2.9E-02	2.150E 00	5.55E-02	4.4E-03	5.230E 00	1.19E-02	1.2E-03
7.100E-01	1.65E-01	1.7E-02	2.210E 00	4.45E-02	4.7E-03	5.330E 00	5.55E-03	1.1E-03
7.300E-01	1.23E-01	1.4E-02	2.270E 00	4.47E-02	4.9E-03	5.430E 00	7.58E-03	1.0E-03
7.500E-01	1.34E-01	1.4E-02	2.330E 00	4.97E-02	4.8E-03	5.530E 00	6.47E-03	1.0E-03
7.700E-01	1.32E-01	1.4E-02	2.390E 00	5.26E-02	4.3E-03	5.630E 00	6.41E-03	9.6E-04
7.900E-01	1.03E-01	1.3E-02	2.450E 00	5.42E-02	3.9E-03	5.730E 00	6.50E-03	8.6E-04
8.100E-01	7.72E-02	1.4E-02	2.510E 00	5.23E-02	4.0E-03	5.830E 00	6.1CE-03	8.4E-04
8.300E-01	7.27E-02	1.5E-02	2.570E 00	4.76E-02	3.8E-03	5.930E 00	5.45E-03	7.7E-04
8.500E-01	7.76E-02	1.6E-02	2.630E 00	4.49E-02	3.8E-03	6.030E 00	4.85E-03	7.2E-04
8.700E-01	1.19E-01	1.7E-02	2.690E 00	4.57E-02	3.7E-03	6.130E 00	4.46E-03	6.9E-04
8.900E-01	1.71E-01	1.8E-02	2.750E 00	4.47E-02	3.8E-03	6.230E 00	4.13E-03	6.3E-04
9.100E-01	2.53E-01	1.9E-02	2.810E 00	4.42E-02	3.8E-03	6.330E 00	3.85E-03	6.0E-04
9.300E-01	3.55E-01	1.9E-02	2.870E 00	4.81E-02	3.6E-03	6.430E 00	3.94E-03	5.3E-04
9.500E-01	4.33E-01	2.0E-02	2.930E 00	4.83E-02	3.3E-03	6.530E 00	3.62E-03	4.7E-04
9.700E-01	4.35E-01	1.8E-02	2.990E 00	4.25E-02	3.3E-03	6.630E 00	2.41E-03	4.4E-04
1.000E 00	3.25E-01	2.0E-02	3.050E 00	4.04E-02	3.2E-03	6.800E 00	1.65E-03	3.9E-04
1.040E 00	2.08E-01	1.6E-02	3.110E 00	4.11E-02	3.7E-03	6.920E 00	1.53E-03	3.4E-04
1.080E 00	2.15E-01	1.7E-02	3.180E 00	3.60E-02	3.2E-03	7.040E 00	1.33E-03	2.9E-04
1.120E 00	2.68E-01	1.5E-02	3.260E 00	3.46E-02	2.9E-03	7.160E 00	1.07E-03	2.5E-04
1.160E 00	2.19E-01	1.4E-02	3.340E 00	3.02E-02	2.7E-03	7.280E 00	8.62E-04	2.3E-04
1.200E 00	1.31E-01	1.3E-02	3.420E 00	3.91E-02	2.6E-03	7.400E 00	6.20E-04	2.0E-04
1.240E 00	1.33E-01	1.2E-02	3.500E 00	3.28E-02	2.6E-03	7.520E 00	4.17E-04	1.7E-04
1.280E 00	1.88E-01	1.3E-02	3.580E 00	2.95E-02	2.7E-03	7.640E 00	2.83E-04	1.6E-04
1.320E 00	2.55E-01	1.2E-02	3.660E 00	2.78E-02	2.3E-03	7.760E 00	1.61E-04	1.5E-04
1.360E 00	2.55E-01	1.2E-02	3.740E 00	2.50E-02	2.3E-03	7.890E 00	5.62E-05	1.3E-04
1.400E 00	2.00E-01	1.1E-02	3.820E 00	2.25E-02	2.2E-03	8.030E 00	3.54E-05	1.1E-04
1.440E 00	1.71E-01	1.1E-02	3.900E 00	2.09E-02	2.2E-03	8.170E 00	8.46E-05	9.9E-05
1.480E 00	1.62E-01	1.1E-02	3.980E 00	2.14E-02	2.2E-03	8.310E 00	1.00E-04	9.0E-05
1.520E 00	1.37E-01	9.3E-03	4.060E 00	2.25E-02	2.1E-03	8.450E 00	7.13E-05	8.7E-05
1.560E 00	1.11E-01	9.3E-03	4.140E 00	2.25E-02	2.0E-03	8.590E 00	5.63E-05	7.4E-05
1.600E 00	1.01E-01	7.0E-03	4.220E 00	2.12E-02	2.0E-03	8.730E 00	6.43E-05	6.5E-05
1.640E 00	8.71E-02	7.0E-03	4.300E 00	2.04E-02	1.9E-03	8.870E 00	6.48E-05	6.2E-05
1.680E 00	6.99E-02	7.2E-03	4.380E 00	2.02E-02	1.8E-03	9.010E 00	3.84E-05	5.5E-05
1.720E 00	6.70E-02	7.1E-03	4.460E 00	1.86E-02	1.8E-03	9.150E 00	9.33E-06	5.1E-05
1.760E 00	7.77E-02	6.9E-03	4.540E 00	1.65E-02	1.8E-03	9.300E 00	6.16E-06	4.7E-05
1.800E 00	9.28E-02	7.3E-03	4.630E 00	1.37E-02	1.7E-03	9.400E 00	3.22E-05	4.2E-05
1.850E 00	1.04E-01	6.5E-03	4.730E 00	1.11E-02	1.6E-03	9.620E 00	6.40E-05	3.2E-05
1.910E 00	9.06E-02	6.5E-03	4.830E 00	1.14E-02	1.5E-03	9.740E 00	6.90E-05	2.7E-05
1.970E 00	7.57E-02	5.6E-03	4.930E 00	1.07E-02	1.3E-03	9.940E 00	4.41E-05	2.3E-05
2.030E 00	7.02E-02	5.4E-03	5.030E 00	1.07E-02	1.3E-03	1.010E 01	2.49E-05	1.4E-05
2.090E 00	6.15E-02	5.5E-03	5.130E 00	1.23E-02	1.2E-03	1.026E 01	9.80E-06	8.5E-06

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN=		8.00 MEV	EN-MAX=		9.00 MEV	THETA=125. DEG		
F-GAMMA MEV	DATA R/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	CATA R/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA R/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	2.64E-01	3.2E-02	2.150E 00	6.54E-02	5.7E-03	5.230E 00	9.51E-03	1.7E-03
7.100E-01	1.75E-01	1.8E-02	2.210E 00	5.47E-02	5.1E-03	5.330E 00	1.01E-02	1.7E-03
7.300E-01	1.21E-01	1.5E-02	2.270E 00	5.61E-02	5.2E-03	5.430E 00	1.20E-02	1.6E-03
7.500E-01	1.15E-01	1.6E-02	2.330E 00	5.70E-02	5.3E-03	5.530E 00	1.09E-02	1.5E-03
7.700E-01	1.15E-01	1.5E-02	2.390E 00	5.05E-02	4.9E-03	5.630E 00	5.60E-03	1.5E-03
7.900E-01	1.04E-01	1.5E-02	2.450E 00	5.12E-02	5.0E-03	5.730E 00	5.03E-02	1.4E-03
8.100E-01	8.46E-02	1.6E-02	2.510E 00	5.10E-02	4.8E-03	5.830E 00	1.08E-02	1.4E-03
8.300E-01	7.25E-02	1.6E-02	2.570E 00	4.71E-02	5.2E-03	5.930E 00	5.16E-03	1.3E-03
8.500E-01	7.93E-02	1.8E-02	2.630E 00	4.51E-02	4.8E-03	6.030E 00	7.40E-03	1.3E-03
8.700E-01	1.06E-01	1.9E-02	2.690E 00	4.35E-02	4.8E-03	6.130E 00	7.27E-03	1.2E-03
8.900E-01	1.54E-01	1.9E-02	2.750E 00	4.32E-02	4.5E-03	6.230E 00	7.56E-03	1.1E-03
9.100E-01	2.30E-01	2.1E-02	2.810E 00	4.83E-02	4.6E-03	6.330E 00	6.85E-03	1.0E-03
9.300E-01	3.24E-01	2.0E-02	2.870E 00	5.10E-02	4.3E-03	6.440E 00	5.65E-03	1.0E-03
9.500E-01	4.05E-01	2.3E-02	2.930E 00	4.55E-02	4.0E-03	6.560E 00	4.53E-03	9.7E-04
9.700E-01	4.34E-01	2.0E-02	2.990E 00	4.13E-02	4.1E-03	6.680E 00	3.45E-03	8.8E-04
1.000E 00	3.72E-01	2.2E-02	3.050E 00	4.26E-02	4.2E-03	6.800E 00	3.20E-03	8.1E-04
1.040E 00	2.20E-01	1.9E-02	3.110E 00	4.16E-02	4.1E-03	6.920E 00	3.80E-03	7.9E-04
1.080E 00	2.07E-01	1.9E-02	3.180E 00	3.78E-02	4.0E-03	7.040E 00	4.44E-03	6.6E-04
1.120E 00	2.70E-01	1.8E-02	3.260E 00	3.84E-02	3.6E-03	7.160E 00	4.28E-03	6.0E-04
1.160E 00	2.26E-01	1.6E-02	3.340E 00	3.99E-02	3.6E-03	7.280E 00	3.05E-03	5.5E-04
1.200E 00	1.44E-01	1.5E-02	3.420E 00	3.91E-02	3.4E-03	7.400E 00	1.63E-03	5.2E-04
1.240E 00	1.26E-01	1.4E-02	3.500E 00	3.64E-02	3.3E-03	7.520E 00	9.87E-04	4.3E-04
1.280E 00	1.81E-01	1.4E-02	3.580E 00	3.37E-02	3.4E-03	7.640E 00	1.10E-03	3.9E-04
1.320E 00	2.52E-01	1.3E-02	3.660E 00	2.99E-02	3.1E-03	7.760E 00	1.40E-03	3.5E-04
1.360E 00	2.66E-01	1.3E-02	3.740E 00	2.89E-02	3.1E-03	7.890E 00	1.39E-03	3.2E-04
1.400E 00	2.23E-01	1.3E-02	3.820E 00	3.03E-02	3.0E-03	8.030E 00	9.20E-04	2.5E-04
1.440E 00	1.86E-01	1.2E-02	3.900E 00	3.00E-02	2.9E-03	8.170E 00	4.38E-04	2.2E-04
1.480E 00	1.67E-01	1.1E-02	3.980E 00	2.85E-02	2.9E-03	8.310E 00	2.30E-04	1.9E-04
1.520E 00	1.33E-01	1.1E-02	4.060E 00	2.56E-02	2.7E-03	8.450E 00	1.66E-04	1.5E-04
1.560E 00	1.05E-01	1.0E-02	4.140E 00	2.27E-02	2.7E-03	8.590E 00	1.36E-04	1.3E-04
1.600E 00	9.75E-02	8.8E-03	4.220E 00	2.24E-02	2.6E-03	8.730E 00	1.25E-04	1.2E-04
1.640E 00	8.67E-02	9.0E-03	4.300E 00	2.26E-02	2.6E-03	8.870E 00	1.19E-04	1.1E-04
1.680E 00	7.77E-02	8.8E-03	4.380E 00	2.24E-02	2.6E-03	9.010E 00	9.30E-05	9.3E-05
1.720E 00	5.97E-02	8.9E-03	4.460E 00	2.10E-02	2.4E-03	9.150E 00	4.47E-05	8.6E-05
1.760E 00	6.59E-02	8.4E-03	4.540E 00	1.94E-02	2.4E-03	9.300E 00	3.44E-05	8.1E-05
1.800E 00	8.78E-02	9.0E-03	4.630E 00	1.92E-02	2.3E-03	9.460E 00	6.72E-05	4.4E-05
1.850E 00	1.06E-01	7.8E-03	4.730E 00	1.74E-02	2.1E-03	9.620E 00	1.01E-04	5.0E-05
1.910E 00	9.25E-02	7.5E-03	4.830E 00	1.52E-02	2.0E-03	9.780E 00	9.53E-05	4.2E-05
1.970E 00	7.40E-02	6.8E-03	4.930E 00	1.50E-02	2.0E-03	9.940E 00	6.12E-05	3.1E-05
2.030E 00	7.12E-02	6.3E-03	5.030E 00	1.48E-02	1.9E-03	1.010E 01	2.56E-05	1.9E-05
2.090E 00	7.20E-02	5.8E-03	5.130E 00	1.26E-02	1.9E-03	1.026E 01	1.18E-05	1.2E-05

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

FN-MIN=		9.00 MEV	EN-MAX=		10.00 MEV	THETA=125. DEG		
E-GAMMA MEV	DATA R/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	CATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	2.52E-01	3.4E-02	2.150E 00	5.73E-02	6.4E-03	5.230E 00	1.35E-02	2.4E-03
7.100E-01	1.79E-01	2.0E-02	2.210E 00	5.42E-02	6.2E-03	5.330E 00	1.08E-02	2.3E-03
7.300E-01	1.38E-01	1.6E-02	2.270E 00	5.28E-02	6.3E-03	5.430E 00	1.01E-02	2.2E-03
7.500E-01	1.27E-01	1.7E-02	2.330E 00	5.59E-02	6.4E-03	5.530E 00	1.16E-02	2.1E-03
7.700E-01	1.12E-01	1.7E-02	2.390E 00	5.61E-02	6.2E-03	5.630E 00	1.16E-02	2.0E-03
7.900E-01	9.84E-02	1.7E-02	2.450E 00	5.14E-02	6.4E-03	5.730E 00	1.04E-02	1.9E-03
8.100E-01	9.03E-02	1.7E-02	2.510E 00	5.07E-02	5.7E-03	5.830E 00	1.04E-02	1.9E-03
8.300E-01	9.02E-02	1.8E-02	2.570E 00	5.09E-02	5.5E-03	5.930E 00	1.07E-02	1.9E-03
8.500E-01	9.93E-02	2.0E-02	2.630E 00	4.81E-02	5.4E-03	6.030E 00	1.06E-02	1.7E-03
8.700E-01	1.17E-01	2.0E-02	2.690E 00	4.92E-02	5.3E-03	6.130E 00	1.11E-02	1.7E-03
8.900E-01	1.47E-01	2.2E-02	2.750E 00	4.66E-02	5.3E-03	6.230E 00	1.17E-02	1.6E-03
9.100E-01	2.05E-01	2.4E-02	2.810E 00	4.14E-02	5.3E-03	6.330E 00	1.09E-02	1.5E-03
9.300E-01	2.91E-01	2.2E-02	2.870E 00	4.51E-02	5.5E-03	6.440E 00	9.30E-03	1.5E-03
9.500E-01	3.79E-01	2.4E-02	2.930E 00	4.86E-02	5.2E-03	6.540E 00	7.54E-03	1.4E-03
9.700E-01	4.17E-01	2.2E-02	2.990E 00	4.27E-02	5.1E-03	6.680E 00	6.00E-03	1.4E-03
1.000E 00	3.59E-01	2.5E-02	3.050E 00	3.81E-02	5.0E-03	6.800E 00	4.53E-03	1.3E-03
1.040E 00	2.13E-01	2.2E-02	3.110E 00	3.91E-02	4.9E-03	6.920E 00	5.05E-03	1.2E-03
1.080E 00	1.92E-01	2.0E-02	3.180E 00	4.23E-02	4.9E-03	7.040E 00	5.56E-03	1.1E-03
1.120E 00	2.70E-01	1.9E-02	3.260E 00	4.34E-02	4.4E-03	7.160E 00	4.77E-03	1.0E-03
1.160E 00	2.52E-01	1.8E-02	3.340E 00	3.74E-02	4.4E-03	7.280E 00	4.05E-03	9.3E-04
1.200E 00	1.54E-01	1.6E-02	3.420E 00	3.70E-02	4.4E-03	7.400E 00	3.55E-03	8.3E-04
1.240E 00	1.27E-01	1.6E-02	3.500E 00	4.04E-02	3.9E-03	7.520E 00	2.81E-03	7.8E-04
1.280E 00	1.83E-01	1.5E-02	3.580E 00	3.60E-02	4.0E-03	7.640E 00	2.28E-03	7.6E-04
1.320E 00	2.58E-01	1.5E-02	3.660E 00	3.15E-02	4.1E-03	7.760E 00	2.04E-03	6.9E-04
1.360E 00	2.75E-01	1.5E-02	3.740E 00	3.29E-02	3.9E-03	7.890E 00	1.77E-03	5.8E-04
1.400E 00	2.18E-01	1.5E-02	3.820E 00	3.70E-02	3.7E-03	8.030E 00	1.48E-03	5.7E-04
1.440E 00	1.86E-01	1.4E-02	3.900E 00	3.59E-02	3.6E-03	8.170E 00	1.23E-03	5.2E-04
1.480E 00	1.78E-01	1.3E-02	3.980E 00	3.21E-02	3.7E-03	8.310E 00	9.85E-04	4.1E-04
1.520E 00	1.44E-01	1.3E-02	4.060E 00	3.12E-02	3.5E-03	8.450E 00	9.37E-04	3.6E-04
1.560E 00	1.16E-01	1.2E-02	4.140E 00	2.80E-02	3.5E-03	8.590E 00	9.08E-04	3.1E-04
1.600E 00	1.04E-01	1.0E-02	4.220E 00	2.39E-02	3.6E-03	8.730E 00	6.41E-04	2.7E-04
1.640E 00	9.01E-02	9.7E-03	4.300E 00	2.05E-02	3.4E-03	8.870E 00	3.27E-04	2.1E-04
1.680E 00	7.26E-02	9.0E-03	4.380E 00	1.71E-02	3.3E-03	9.010E 00	2.45E-04	1.9E-04
1.720E 00	6.10E-02	1.0E-02	4.460E 00	1.69E-02	3.2E-03	9.150E 00	3.02E-04	1.5E-04
1.760E 00	6.25E-02	1.0E-02	4.540E 00	1.87E-02	3.2E-03	9.300E 00	2.74E-04	1.1E-04
1.800E 00	7.31E-02	1.1E-02	4.630E 00	1.83E-02	3.2E-03	9.460E 00	1.57E-04	9.5E-05
1.850E 00	9.17E-02	8.8E-03	4.730E 00	1.90E-02	3.0E-03	9.620E 00	1.26E-04	6.9E-05
1.910E 00	9.97E-02	7.9E-03	4.830E 00	2.17E-02	2.8E-03	9.780E 00	8.89E-05	5.2E-05
1.970E 00	7.77E-02	7.8E-03	4.930E 00	2.10E-02	2.7E-03	9.940E 00	5.60E-05	3.1E-05
2.030E 00	7.29E-02	7.2E-03	5.030E 00	1.77E-02	2.6E-03	1.010E 01	3.13E-05	2.2E-05
2.090E 00	6.04E-02	7.1E-03	5.130E 00	1.55E-02	2.5E-03	1.026E 01	1.41E-05	1.7E-05

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 10.00 MEV EN-MAX= 12.00 MEV THETA=125. DEG

E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	2.42E-01	3.4E-02	2.150E 00	5.52E-02	6.7E-03	5.230E 00	1.79E-02	2.5E-03
7.100E-01	1.61E-01	2.1E-02	2.210E 00	5.05E-02	6.1E-03	5.330E 00	1.55E-02	2.5E-03
7.300E-01	1.05E-01	1.9E-02	2.270E 00	5.34E-02	6.1E-03	5.430E 00	1.24E-02	2.4E-03
7.500E-01	9.78E-02	1.9E-02	2.330E 00	5.26E-02	6.3E-03	5.530E 00	1.24E-02	2.4E-03
7.700E-01	1.03E-01	1.9E-02	2.390E 00	4.61E-02	6.2E-03	5.630E 00	1.37E-02	2.2E-03
7.900E-01	9.58E-02	1.7E-02	2.450E 00	4.13E-02	6.3E-03	5.730E 00	1.39E-02	2.2E-03
8.100E-01	7.51E-02	1.8E-02	2.510E 00	4.25E-02	5.8E-03	5.830E 00	1.25E-02	2.2E-03
8.300E-01	6.79E-02	1.9E-02	2.570E 00	4.63E-02	5.6E-03	5.930E 00	1.01E-02	2.1E-03
8.500E-01	9.18E-02	2.0E-02	2.630E 00	4.48E-02	5.5E-03	6.030E 00	9.57E-03	2.0E-03
8.700E-01	1.31E-01	2.1E-02	2.690E 00	3.90E-02	5.5E-03	6.130E 00	1.10E-02	1.9E-03
8.900E-01	1.66E-01	2.1E-02	2.750E 00	3.75E-02	5.3E-03	6.230E 00	1.16E-02	1.9E-03
9.100E-01	2.07E-01	2.3E-02	2.810E 00	4.28E-02	5.4E-03	6.330E 00	1.08E-02	1.8E-03
9.300E-01	2.76E-01	2.3E-02	2.870E 00	4.62E-02	5.1E-03	6.440E 00	9.92E-03	1.7E-03
9.500E-01	3.54E-01	2.3E-02	2.930E 00	4.42E-02	4.8E-03	6.560E 00	9.30E-03	1.7E-03
9.700E-01	3.87E-01	2.1E-02	2.990E 00	4.32E-02	4.8E-03	6.680E 00	8.06E-03	1.6E-03
1.000E 00	3.32E-01	2.3E-02	3.050E 00	4.22E-02	4.9E-03	6.800E 00	7.10E-03	1.5E-03
1.040E 00	2.26E-01	2.1E-02	3.110E 00	4.07E-02	4.9E-03	6.920E 00	6.41E-03	1.4E-03
1.080E 00	1.91E-01	2.0E-02	3.180E 00	4.05E-02	4.8E-03	7.040E 00	5.20E-03	1.3E-03
1.120E 00	2.67E-01	2.1E-02	3.260E 00	3.58E-02	4.5E-03	7.160E 00	4.26E-03	1.2E-03
1.160E 00	3.09E-01	1.9E-02	3.340E 00	3.51E-02	4.5E-03	7.280E 00	4.54E-03	1.1E-03
1.200E 00	2.21E-01	1.8E-02	3.420E 00	3.79E-02	4.4E-03	7.400E 00	5.36E-03	1.1E-03
1.240E 00	1.60E-01	1.6E-02	3.500E 00	3.35E-02	4.1E-03	7.520E 00	5.61E-03	1.0E-03
1.280E 00	1.73E-01	1.6E-02	3.580E 00	3.14E-02	3.9E-03	7.640E 00	5.17E-03	9.9E-04
1.320E 00	2.39E-01	1.5E-02	3.660E 00	3.10E-02	3.9E-03	7.760E 00	4.44E-03	9.3E-04
1.360E 00	2.51E-01	1.5E-02	3.740E 00	3.02E-02	4.0E-03	7.890E 00	3.33E-03	8.6E-04
1.400E 00	2.09E-01	1.5E-02	3.820E 00	2.94E-02	3.8E-03	8.030E 00	2.04E-03	7.9E-04
1.440E 00	1.76E-01	1.3E-02	3.900E 00	2.81E-02	3.7E-03	8.170E 00	1.33E-03	7.3E-04
1.480E 00	1.55E-01	1.3E-02	3.980E 00	2.81E-02	3.5E-03	8.310E 00	1.46E-03	6.7E-04
1.520E 00	1.34E-01	1.2E-02	4.060E 00	2.70E-02	3.5E-03	8.450E 00	1.75E-03	6.1E-04
1.560E 00	1.23E-01	1.1E-02	4.140E 00	2.32E-02	3.4E-03	8.590E 00	1.77E-03	5.0E-04
1.600E 00	1.08E-01	9.8E-03	4.220E 00	2.36E-02	3.4E-03	8.730E 00	1.60E-03	4.5E-04
1.640E 00	8.14E-02	1.1E-02	4.300E 00	2.61E-02	3.3E-03	8.870E 00	1.22E-03	4.3E-04
1.680E 00	6.80E-02	1.1E-02	4.380E 00	2.42E-02	3.3E-03	9.010E 00	6.49E-04	3.6E-04
1.720E 00	6.98E-02	1.0E-02	4.460E 00	2.06E-02	3.2E-03	9.150E 00	2.48E-04	3.1E-04
1.760E 00	6.73E-02	1.0E-02	4.540E 00	1.81E-02	3.3E-03	9.300E 00	3.06E-04	2.7E-04
1.800E 00	7.14E-02	1.1E-02	4.630E 00	1.80E-02	3.0E-03	9.460E 00	6.01E-04	2.2E-04
1.850E 00	8.95E-02	9.2E-03	4.730E 00	2.02E-02	3.0E-03	9.620E 00	7.11E-04	1.6E-04
1.910E 00	8.47E-02	9.0E-03	4.830E 00	2.05E-02	2.9E-03	9.780E 00	5.12E-04	1.1E-04
1.970E 00	6.79E-02	7.8E-03	4.930E 00	1.92E-02	2.3E-03	9.940E 00	2.49E-04	6.8E-05
2.030E 00	6.13E-02	7.8E-03	5.030E 00	1.73E-02	2.9E-03	1.010E 01	8.47E-05	3.2E-05
2.090E 00	6.45E-02	7.0E-03	5.130E 00	1.72E-02	2.7E-03	1.026E 01	2.11E-05	1.6E-05

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 12.00 MEV EN-MAX= 14.00 MEV THETA=125. DEG

E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	1.82E-01	2.8E-02	2.150E 00	4.78E-02	6.6E-03	5.230E 00	1.25E-02	3.1E-03
7.100E-01	1.27E-01	2.6E-02	2.210E 00	4.96E-02	7.1E-03	5.330E 00	1.23E-02	2.9E-03
7.300E-01	1.02E-01	2.0E-02	2.270E 00	4.40E-02	6.4E-03	5.430E 00	1.24E-02	2.9E-03
7.500E-01	9.24E-02	2.1E-02	2.330E 00	3.87E-02	7.3E-03	5.530E 00	1.00E-02	2.8E-03
7.700E-01	7.41E-02	2.1E-02	2.390E 00	3.91E-02	6.5E-03	5.630E 00	8.54E-03	2.8E-03
7.900E-01	6.12E-02	2.0E-02	2.450E 00	3.05E-02	6.4E-03	5.730E 00	9.85E-03	2.6E-03
8.100E-01	5.74E-02	2.0E-02	2.510E 00	2.92E-02	6.0E-03	5.830E 00	9.97E-03	2.7E-03
8.300E-01	6.20E-02	2.0E-02	2.570E 00	3.36E-02	6.0E-03	5.930E 00	9.85E-03	2.6E-03
8.500E-01	7.71E-02	2.1E-02	2.630E 00	2.69E-02	6.1E-03	6.030E 00	1.02E-02	2.4E-03
8.700E-01	9.95E-02	2.3E-02	2.690E 00	2.28E-02	6.0E-03	6.130E 00	8.94E-03	2.3E-03
8.900E-01	1.26E-01	2.4E-02	2.750E 00	2.66E-02	6.0E-03	6.230E 00	6.73E-03	2.3E-03
9.100E-01	1.65E-01	2.7E-02	2.810E 00	3.02E-02	5.7E-03	6.330E 00	5.46E-03	2.3E-03
9.300E-01	2.21E-01	2.7E-02	2.870E 00	3.22E-02	5.6E-03	6.440E 00	4.55E-03	2.3E-03
9.500E-01	2.77E-01	2.7E-02	2.930E 00	3.33E-02	5.4E-03	6.560E 00	4.06E-03	2.2E-03
9.700E-01	2.97E-01	2.4E-02	2.990E 00	3.23E-02	5.3E-03	6.680E 00	6.24E-03	2.1E-03
1.000E 00	2.51E-01	2.5E-02	3.050E 00	2.94E-02	5.3E-03	6.800E 00	8.73E-03	2.0E-03
1.040E 00	1.67E-01	2.2E-02	3.110E 00	2.78E-02	5.4E-03	6.920E 00	8.06E-03	1.9E-03
1.080E 00	1.58E-01	2.3E-02	3.180E 00	2.82E-02	5.1E-03	7.040E 00	6.07E-03	1.8E-03
1.120E 00	2.47E-01	2.2E-02	3.260E 00	2.79E-02	4.9E-03	7.160E 00	4.83E-03	1.7E-03
1.160E 00	3.14E-01	2.1E-02	3.340E 00	2.51E-02	4.8E-03	7.280E 00	3.58E-03	1.5E-03
1.200E 00	2.54E-01	2.0E-02	3.420E 00	2.21E-02	5.0E-03	7.400E 00	2.56E-03	1.4E-03
1.240E 00	1.78E-01	1.8E-02	3.500E 00	2.33E-02	4.7E-03	7.520E 00	2.67E-03	1.4E-03
1.280E 00	1.54E-01	1.8E-02	3.580E 00	2.24E-02	4.7E-03	7.640E 00	3.42E-03	1.3E-03
1.320E 00	1.82E-01	1.6E-02	3.660E 00	1.71E-02	4.7E-03	7.760E 00	3.73E-03	1.2E-03
1.360E 00	1.98E-01	1.5E-02	3.740E 00	1.83E-02	4.6E-03	7.890E 00	3.13E-03	1.1E-03
1.400E 00	1.73E-01	1.5E-02	3.820E 00	2.27E-02	4.3E-03	8.030E 00	1.98E-03	1.0E-03
1.440E 00	1.44E-01	1.4E-02	3.900E 00	1.98E-02	4.2E-03	8.170E 00	1.10E-03	9.6E-04
1.480E 00	1.27E-01	1.3E-02	3.980E 00	1.72E-02	4.3E-03	8.310E 00	1.06E-03	8.8E-04
1.520E 00	1.07E-01	1.3E-02	4.060E 00	2.11E-02	4.3E-03	8.450E 00	1.38E-03	7.5E-04
1.560E 00	8.70E-02	1.2E-02	4.140E 00	2.39E-02	4.1E-03	8.590E 00	1.28E-03	6.3E-04
1.600E 00	7.29E-02	1.0E-02	4.220E 00	1.87E-02	4.1E-03	8.730E 00	1.03E-03	5.9E-04
1.640E 00	6.40E-02	1.1E-02	4.300E 00	1.35E-02	4.3E-03	8.870E 00	9.15E-04	5.4E-04
1.680E 00	5.29E-02	9.6E-03	4.380E 00	1.57E-02	3.8E-03	9.010E 00	7.81E-04	4.4E-04
1.720E 00	4.22E-02	1.0E-02	4.460E 00	1.87E-02	3.9E-03	9.150E 00	4.53E-04	3.4E-04
1.760E 00	4.17E-02	1.0E-02	4.540E 00	1.52E-02	4.1E-03	9.300E 00	1.95E-04	3.8E-04
1.800E 00	5.50E-02	1.1E-02	4.630E 00	9.88E-03	4.1E-03	9.460E 00	3.35E-04	3.2E-04
1.850E 00	7.25E-02	9.5E-03	4.730E 00	1.20E-02	3.6E-03	9.620E 00	5.37E-04	1.9E-04
1.910E 00	6.18E-02	9.1E-03	4.830E 00	1.31E-02	3.5E-03	9.780E 00	5.08E-04	1.7E-04
1.970E 00	5.02E-02	9.5E-03	4.930E 00	9.34E-03	3.6E-03	9.940E 00	2.86E-04	1.2E-04
2.030E 00	5.31E-02	8.0E-03	5.030E 00	1.02E-02	3.4E-03	1.010E 01	1.17E-04	6.1E-05
2.090E 00	4.86E-02	7.1E-03	5.130E 00	1.30E-02	3.3E-03	1.026E 01	3.76E-05	3.3E-05

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 14.00 MEV E-MAX= 17.00 MEV THETA=125. DEG

E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	2.19E-01	3.8E-02	2.150E 00	3.98E-02	6.3E-03	5.230E 00	6.03E-03	2.5E-03
7.100E-01	2.33E-01	2.9E-02	2.210E 00	2.85E-02	6.6E-03	5.330E 00	5.06E-03	2.6E-03
7.300E-01	7.56E-02	2.5E-02	2.270E 00	2.54E-02	6.5E-03	5.430E 00	3.12E-03	2.6E-03
7.500E-01	7.46E-02	2.3E-02	2.330E 00	2.80E-02	6.1E-03	5.530E 00	3.26E-03	2.4E-03
7.700E-01	8.62E-02	2.1E-02	2.390E 00	2.31E-02	6.0E-03	5.630E 00	4.81E-03	2.4E-03
7.900E-01	8.68E-02	2.1E-02	2.450E 00	2.07E-02	5.7E-03	5.730E 00	5.85E-03	2.3E-03
8.100E-01	7.88E-02	2.0E-02	2.510E 00	2.33E-02	5.7E-03	5.830E 00	7.08E-03	2.2E-03
8.300E-01	7.53E-02	2.2E-02	2.570E 00	1.97E-02	5.8E-03	5.930E 00	8.17E-03	2.3E-03
8.500E-01	8.27E-02	2.4E-02	2.630E 00	1.70E-02	5.9E-03	6.030E 00	7.13E-03	2.2E-03
8.700E-01	9.56E-02	2.5E-02	2.690E 00	2.01E-02	5.5E-03	6.130E 00	4.54E-03	2.1E-03
8.900E-01	1.11E-01	2.5E-02	2.750E 00	2.12E-02	5.4E-03	6.230E 00	2.78E-03	2.1E-03
9.100E-01	1.32E-01	2.7E-02	2.810E 00	1.72E-02	5.5E-03	6.330E 00	2.51E-03	2.0E-03
9.300E-01	1.61E-01	2.6E-02	2.870E 00	1.22E-02	5.3E-03	6.440E 00	2.67E-03	2.0E-03
9.500E-01	1.92E-01	2.9E-02	2.930E 00	1.44E-02	4.8E-03	6.560E 00	2.72E-03	2.0E-03
9.700E-01	2.06E-01	2.6E-02	2.990E 00	2.12E-02	4.6E-03	6.680E 00	2.98E-03	1.7E-03
1.000E 00	1.97E-01	2.6E-02	3.050E 00	2.16E-02	4.6E-03	6.800E 00	3.24E-03	1.7E-03
1.040E 00	1.65E-01	2.3E-02	3.110E 00	1.65E-02	4.9E-03	6.920E 00	3.19E-03	1.7E-03
1.080E 00	1.62E-01	2.5E-02	3.180E 00	1.47E-02	4.5E-03	7.040E 00	2.77E-03	1.6E-03
1.120E 00	2.19E-01	2.5E-02	3.260E 00	1.92E-02	4.7E-03	7.160E 00	1.88E-03	1.5E-03
1.160E 00	2.63E-01	2.3E-02	3.340E 00	1.89E-02	4.5E-03	7.280E 00	1.34E-03	1.4E-03
1.200E 00	2.07E-01	2.3E-02	3.420E 00	1.61E-02	4.3E-03	7.400E 00	1.89E-03	1.5E-03
1.240E 00	1.74E-01	1.9E-02	3.500E 00	1.41E-02	4.0E-03	7.520E 00	2.67E-03	1.3E-03
1.280E 00	1.65E-01	1.6E-02	3.580E 00	1.20E-02	4.0E-03	7.640E 00	2.67E-03	1.2E-03
1.320E 00	1.36E-01	1.7E-02	3.660E 00	1.16E-02	4.3E-03	7.760E 00	2.11E-03	1.2E-03
1.360E 00	1.15E-01	1.7E-02	3.740E 00	1.05E-02	4.1E-03	7.890E 00	1.47E-03	1.1E-03
1.400E 00	1.03E-01	1.7E-02	3.820E 00	8.63E-03	3.9E-03	8.030E 00	8.71E-04	9.7E-04
1.440E 00	9.78E-02	1.4E-02	3.900E 00	9.68E-03	3.6E-03	8.170E 00	3.79E-04	8.5E-04
1.480E 00	9.49E-02	1.3E-02	3.980E 00	1.29E-02	3.6E-03	8.310E 00	2.71E-04	7.8E-04
1.520E 00	7.85E-02	1.2E-02	4.060E 00	1.20E-02	3.6E-03	8.450E 00	5.43E-04	6.3E-04
1.560E 00	5.95E-02	1.1E-02	4.140E 00	7.16E-03	3.5E-03	8.590E 00	7.33E-04	4.9E-04
1.600E 00	5.67E-02	1.0E-02	4.220E 00	6.99E-03	3.6E-03	8.730E 00	5.27E-04	4.3E-04
1.640E 00	5.47E-02	9.5E-03	4.300E 00	1.10E-02	3.4E-03	8.870E 00	1.90E-04	3.8E-04
1.680E 00	5.30E-02	9.0E-03	4.380E 00	1.22E-02	3.3E-03	9.010E 00	6.24E-05	3.4E-04
1.720E 00	5.65E-02	9.9E-03	4.460E 00	9.60E-03	3.3E-03	9.150E 00	2.55E-04	3.1E-04
1.760E 00	5.33E-02	1.0E-02	4.540E 00	8.24E-03	3.3E-03	9.300E 00	5.38E-04	2.5E-04
1.800E 00	4.53E-02	1.2E-02	4.630E 00	1.01E-02	3.2E-03	9.460E 00	6.04E-04	2.1E-04
1.850E 00	4.58E-02	9.7E-03	4.730E 00	1.06E-02	3.1E-03	9.620E 00	4.21E-04	1.7E-04
1.900E 00	5.27E-02	8.8E-03	4.830E 00	7.18E-03	3.0E-03	9.780E 00	2.10E-04	1.1E-04
1.970E 00	4.14E-02	8.7E-03	4.930E 00	5.44E-03	3.0E-03	9.940E 00	8.93E-05	8.0E-05
2.030E 00	3.09E-02	7.6E-03	5.030E 00	5.44E-03	2.8E-03	1.010E 01	4.38E-05	5.8E-05
2.090E 00	3.76E-02	7.5E-03	5.130E 00	5.47E-03	2.8E-03	1.026E 01	2.48E-05	3.9E-05

COPPER GAMMA-RAY PRODUCTION CROSS SECTIONS

EN-MIN= 17.00 MEV		EN-MAX= 20.00 MEV		THETA=125. DEG	
F-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV	F-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
6.900E-01	1.98E-01	6.2E-02	2.150E 00	4.94E-02	1.1E-02
7.100E-01	1.56E-01	4.4E-02	2.210E 00	1.85E-02	1.1E-02
7.300E-01	1.11E-01	3.8E-02	2.270E 00	2.04E-02	1.0E-02
7.500E-01	9.01E-02	3.9E-02	2.330E 00	3.86E-02	9.0E-03
7.700E-01	9.67E-02	3.6E-02	2.390E 00	3.19E-02	9.3E-03
7.900E-01	1.17E-01	3.2E-02	2.450E 00	2.79E-02	9.6E-03
8.100E-01	1.20E-01	3.0E-02	2.510E 00	3.64E-02	8.8E-03
8.300E-01	1.10E-01	3.2E-02	2.570E 00	3.79E-02	8.3E-03
8.500E-01	1.01E-01	3.2E-02	2.630E 00	2.71E-02	7.9E-03
8.700E-01	1.05E-01	3.1E-02	2.690E 00	2.06E-02	7.8E-03
8.900E-01	1.23E-01	3.3E-02	2.750E 00	2.24E-02	7.6E-03
9.100E-01	1.47E-01	3.4E-02	2.810E 00	2.16E-02	7.9E-03
9.300E-01	1.71E-01	3.5E-02	2.870E 00	1.75E-02	8.7E-03
9.500E-01	1.97E-01	4.4E-02	2.930E 00	1.47E-02	3.4E-03
9.700E-01	2.17E-01	4.0E-02	2.990E 00	1.77E-02	8.2E-03
1.000E 00	2.09E-01	3.7E-02	3.050E 00	2.17E-02	6.9E-03
1.040E 00	1.46E-01	3.6E-02	3.110E 00	2.03E-02	6.7E-03
1.080E 00	1.38E-01	3.6E-02	3.180E 00	1.78E-02	7.7E-03
1.120E 00	2.22E-01	3.2E-02	3.260E 00	2.17E-02	6.8E-03
1.160E 00	2.54E-01	3.3E-02	3.340E 00	2.07E-02	6.9E-03
1.200E 00	2.35E-01	3.0E-02	3.420E 00	1.21E-02	6.3E-03
1.240E 00	2.12E-01	2.4E-02	3.500E 00	6.83E-03	5.8E-03
1.280E 00	1.92E-01	2.5E-02	3.580E 00	9.64E-03	5.6E-03
1.320E 00	1.64E-01	2.4E-02	3.660E 00	1.48E-02	5.4E-03
1.360E 00	1.38E-01	2.5E-02	3.740E 00	1.42E-02	5.3E-03
1.400E 00	1.20E-01	2.3E-02	3.820E 00	1.09E-02	5.1E-03
1.440E 00	1.22E-01	2.1E-02	3.900E 00	1.27E-02	5.2E-03
1.480E 00	1.17E-01	2.1E-02	3.980E 00	1.46E-02	5.2E-03
1.520E 00	8.45E-02	1.8E-02	4.060E 00	9.55E-03	4.9E-03
1.560E 00	6.00E-02	1.9E-02	4.140E 00	4.56E-03	4.6E-03
1.600E 00	6.77E-02	1.6E-02	4.220E 00	7.10E-03	4.6E-03
1.640E 00	7.32E-02	1.6E-02	4.300E 00	1.14E-02	4.4E-03
1.680E 00	6.01E-02	1.7E-02	4.380E 00	1.05E-02	4.0E-03
1.720E 00	5.68E-02	1.8E-02	4.460E 00	6.83E-03	4.2E-03
1.760E 00	6.41E-02	1.6E-02	4.540E 00	5.49E-03	4.2E-03
1.800E 00	6.09E-02	1.7E-02	4.630E 00	5.56E-03	4.0E-03
1.850E 00	5.07E-02	1.5E-02	4.730E 00	5.30E-03	4.1E-03
1.910E 00	5.88E-02	1.5E-02	4.830E 00	5.59E-03	3.8E-03
1.970E 00	5.89E-02	1.4E-02	4.930E 00	6.67E-03	3.7E-03
2.030E 00	3.83E-02	1.3E-02	5.030E 00	8.49E-03	3.7E-03
2.090E 00	4.60E-02	1.2E-02	5.130E 00	9.13E-03	3.2E-03

E-GAMMA MEV	DATA B/SR/MEV	DATA-ERR B/SR/MEV
5.230E 00	6.13E-03	3.3E-03
5.330E 00	1.87E-03	3.1E-03
5.430E 00	-7.61E-04	2.9E-03
5.530E 00	-3.51E-04	2.9E-03
5.630E 00	1.75E-03	2.9E-03
5.730E 00	3.78E-03	2.7E-03
5.830E 00	4.5CE-03	2.4E-03
5.930E 00	3.73E-03	2.5E-03
6.030E 00	2.00E-03	2.5E-03
6.130E 00	1.38E-03	2.4E-03
6.230E 00	1.94E-03	2.2E-03
6.330E 00	2.21E-03	2.0E-03
6.440E 00	1.66E-03	2.2E-03
6.560E 00	1.69E-03	2.1E-03
6.680E 00	3.01E-03	1.9E-03
6.800E 00	3.51E-03	1.7E-03
6.920E 00	2.60E-03	1.8E-03
7.040E 00	1.74E-03	1.6E-03
7.160E 00	1.83E-03	1.5E-03
7.280E 00	1.56E-03	1.4E-03
7.400E 00	1.46E-03	1.2E-03
7.520E 00	7.14E-04	1.0E-03
7.640E 00	3.92E-04	9.9E-04
7.760E 00	4.61E-04	8.3E-04
7.890E 00	6.77E-04	6.2E-04
8.030E 00	5.56E-04	4.9E-04
8.170E 00	2.67E-04	4.5E-04
8.310E 00	2.70E-05	3.9E-04
8.450E 00	1.17E-04	3.6E-04
8.590E 00	3.66E-04	3.5E-04
8.730E 00	4.60E-04	3.0E-04
8.870E 00	3.23E-04	2.7E-04
9.010E 00	1.72E-04	2.4E-04
9.150E 00	1.12E-04	2.3E-04
9.300E 00	1.71E-04	1.9E-04
9.460E 00	2.50E-04	1.7E-04
9.620E 00	2.03E-04	1.5E-04
9.780E 00	1.29E-04	1.3E-04
9.940E 00	7.51E-05	1.3E-04
1.010E 01	5.15E-05	1.0E-04
1.026E 01	3.47E-05	7.8E-05