Cross Sections and Differential
Spectra for Reactions of 2-20 MeV
Neutrons on natFe

M. Blann
T. T. Komoto

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CROSS SECTIONS AND DIFFERENTIAL SPECTRA FOR REACTIONS
OF 2-20 MeV NEUTRONS ON ^{nat}Fe

M. Blann and I. T. Komoto
E-Division, Physics Department
Lawrence Livermore National Laboratory UCID--21309
P. O. Box 808 DE88 006248
Livermore, California 94550

This report summarizes product yields, secondary n,p and α spectra, and γ -ray spectra calculated for incident neutrons of 2-20 MeV on ^{nat}Fe targets.

Results are all from the code ALICE, using the version ALISO which does weighting of results for targets which are a mix of isotopes. Where natural isotopic targets are involved, yields and n,p, α spectra will be reported weighted over isotopic yields. Gamma-ray spectra, however, will be reported for the most abundant isotope.

In Section I, we present product yields versus incident neutron energy. In Section II, we present n,p, α spectra versus incident neutron energy, and in Section III, we present calculated γ -ray spectra.

SECTION 1

Yields from $^{nat}\text{Fe}(n,x)$ Reactions
for 2-20 MeV Incident Neutrons

sotopically weighted results for incident energy 2.00 mev(lab)

omic number	26	26	26	26	26	26	26	26	26	26
iss number	58	57	56	55	54	53	52	51	50	49
xsect s(j)	1.959e+03	1.969e+03	0.	0.	0.	0.	0.	0.	0.	0.
omic number	25	25	25	25	25	25	25	25	25	25
iss number	57	56	55	54	53	52	51	50	49	48
xsect s(j)	1.891e-01	0.	0.	0.	0.	0.	0.	0.	0.	0.
omic number	24	24	24	24	24	24	24	24	24	24
iss number	56	55	54	53	52	51	50	49	48	47
xsect s(j)	0.	0.	2.955e-04	0.	0.	0.	0.	0.	0.	0.

sotopically weighted results for incident energy 3.00 mev(lab)

omic number	26	26	26	26	26	26	26	26	26	26
iss number	58	57	56	55	54	53	52	51	50	49
xsect s(j)	1.691e+03	1.714e+03	0.	0.	0.	0.	0.	0.	0.	0.
omic number	25	25	25	25	25	25	25	25	25	25
iss number	57	56	55	54	53	52	51	50	49	48
xsect s(j)	2.782e+00	0.	0.	0.	0.	0.	0.	0.	0.	0.
omic number	24	24	24	24	24	24	24	24	24	24
iss number	56	55	54	53	52	51	50	49	48	47
xsect s(j)	0.	0.	3.732e-03	0.	0.	0.	0.	0.	0.	0.

sotopically weighted results for incident energy 4.00 mev(lab)

omic number	26	26	26	26	26	26	26	26	26	26
iss number	58	57	56	55	54	53	52	51	50	49
xsect s(j)	1.619e+03	1.645e+03	0.	0.	0.	0.	0.	0.	0.	0.
omic number	25	25	25	25	25	25	25	25	25	25
iss number	57	56	55	54	53	52	51	50	49	48
xsect s(j)	9.507e+00	0.	0.	0.	0.	0.	0.	0.	0.	0.
omic number	24	24	24	24	24	24	24	24	24	24
iss number	56	55	54	53	52	51	50	49	48	47
xsect s(j)	0.	0.	3.870e-02	0.	0.	0.	0.	0.	0.	0.

isotopically weighted results for incident energy				5.00 mev(lab)							
Atomic number	26	26	26	26	26	26	26	26	26	26	26
mass number	58	57	56	55	54	53	52	51	50	49	48
er xsect S(j)	1.594e+03	1.632e+03	0.	0.	0.	0.	0.	0.	0.	0.	0.
Atomic number	25	25	25	25	25	25	25	25	25	25	25
mass number	57	56	55	54	53	52	51	50	49	48	47
er xsect S(j)	1.766e+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Atomic number	24	24	24	24	24	24	24	24	24	24	24
mass number	56	55	54	53	52	51	50	49	48	47	46
er xsect S(j)	0.	0.	1.836e-01	0.	0.	0.	0.	0.	0.	0.	0.

isotopically weighted results for incident energy				6.00 mev(lab)							
Atomic number	26	26	26	26	26	26	26	26	26	26	26
mass number	58	57	56	55	54	53	52	51	50	49	48
er xsect S(j)	1.551e+03	1.601e+03	0.	0.	0.	0.	0.	0.	0.	0.	0.
Atomic number	25	25	25	25	25	25	25	25	25	25	25
mass number	57	56	55	54	53	52	51	50	49	48	47
er xsect S(j)	2.712e+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Atomic number	24	24	24	24	24	24	24	24	24	24	24
mass number	56	55	54	53	52	51	50	49	48	47	46
er xsect S(j)	0.	0.	8.875e-01	0.	0.	0.	0.	0.	0.	0.	0.

isotopically weighted results for incident energy				7.00 mev(lab)							
Atomic number	26	26	26	26	26	26	26	26	26	26	26
mass number	58	57	56	55	54	53	52	51	50	49	48
er xsect S(j)	1.493e+03	1.539e+03	0.	0.	0.	0.	0.	0.	0.	0.	0.
Atomic number	25	25	25	25	25	25	25	25	25	25	25
mass number	57	56	55	54	53	52	51	50	49	48	47
er xsect S(j)	4.172e+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Atomic number	24	24	24	24	24	24	24	24	24	24	24
mass number	56	55	54	53	52	51	50	49	48	47	46
er xsect S(j)	0.	0.	3.674e+00	0.	0.	0.	0.	0.	0.	0.	0.

isotopically weighted results for incident energy				8.00 mev(lab)							
Atomic number	26	26	26	26	26	26	26	26	26	26	26
mass number	58	57	56	55	54	53	52	51	50	49	48
er xsect S(j)	1.421e+03	1.468e+03	0.	0.	0.	0.	0.	0.	0.	0.	0.
Atomic number	25	25	25	25	25	25	25	25	25	25	25
mass number	57	56	55	54	53	52	51	50	49	48	47
er xsect S(j)	5.716e+01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Atomic number	24	24	24	24	24	24	24	24	24	24	24
mass number	56	55	54	53	52	51	50	49	48	47	46
er xsect S(j)	0.	0.	8.886e+00	0.	0.	0.	0.	0.	0.	0.	0.

isotopically weighted results for incident energy 9.00 mev(lab)

omic number	26	26	26	26	26	26	26	26	26	26
ss number	58	57	56	55	54	53	52	51	50	49
xsect s(j)	1.351e+03	1.391e+03	7.307e+00	0.	0.	0.	0.	0.	0.	0.
omic number	25	25	25	25	25	25	25	25	25	25
ss number	57	56	55	54	53	52	51	50	49	48
xsect s(j)	7.507e+01	0.	0.	0.	0.	0.	0.	0.	0.	0.
omic number	24	24	24	24	24	24	24	24	24	24
ss number	56	55	54	53	52	51	50	49	48	47
xsect s(j)	0.	0.	1.536e+01	0.	0.	0.	0.	0.	0.	0.

isotopically weighted results for incident energy 10.00 mev(lab)

omic number	26	26	26	26	26	26	26	26	26	26
ss number	58	57	56	55	54	53	52	51	50	49
xsect s(j)	1.290e+03	1.336e+03	1.561e+01	0.	0.	0.	0.	0.	0.	0.
omic number	25	25	25	25	25	25	25	25	25	25
ss number	57	56	55	54	53	52	51	50	49	48
xsect s(j)	8.211e+01	0.	0.	0.	0.	0.	0.	0.	0.	0.
omic number	24	24	24	24	24	24	24	24	24	24
ss number	56	55	54	53	52	51	50	49	48	47
xsect s(j)	0.	0.	1.950e+01	0.	0.	0.	0.	0.	0.	0.

isotopically weighted results for incident energy 11.00 mev(lab)

omic number	26	26	26	26	26	26	26	26	26	26
ss number	58	57	56	55	54	53	52	51	50	49
xsect s(j)	1.245e+03	1.293e+03	2.082e+01	0.	0.	0.	0.	0.	0.	0.
omic number	25	25	25	25	25	25	25	25	25	25
ss number	57	56	55	54	53	52	51	50	49	48
xsect s(j)	9.164e+01	4.143e+00	0.	0.	0.	0.	0.	0.	0.	0.
omic number	24	24	24	24	24	24	24	24	24	24
ss number	56	55	54	53	52	51	50	49	48	47
xsect s(j)	6.502e-03	0.	2.132e+01	0.	0.	0.	0.	0.	0.	0.

isotopically weighted results for incident energy 12.00 mev(lab)

omic number	26	26	26	26	26	26	26	26	26	26
ss number	58	57	56	55	54	53	52	51	50	49
xsect s(j)	1.207e+03	1.173e+03	8.994e+01	0.	0.	0.	0.	0.	0.	0.
omic number	25	25	25	25	25	25	25	25	25	25
ss number	57	56	55	54	53	52	51	50	49	48
xsect s(j)	1.042e+02	1.842e+01	0.	0.	0.	0.	0.	0.	0.	0.
omic number	24	24	24	24	24	24	24	24	24	24
ss number	56	55	54	53	52	51	50	49	48	47
xsect s(j)	2.010e-02	0.	2.483e+01	1.174e-05	0.	0.	0.	0.	0.	0.

isotopically weighted results for incident energy 14.00 mev(lab)

Atomic number	26	26	26	26	26	26	26	26	26
mass number	58	57	56	55	54	53	52	51	50
er xsect s(j)	1.124e+03	4.642e+02	5.400e+02	0.	0.	0.	0.	0.	0.
Atomic number	25	25	25	25	25	25	25	25	25
mass number	57	56	55	54	53	52	51	50	49
er xsect s(j)	1.248e+02	5.035e+01	0.	0.	0.	0.	0.	0.	0.
Atomic number	24	24	24	24	24	24	24	24	24
mass number	56	55	54	53	52	51	50	49	48
er xsect s(j)	1.360e-01	0.	3.377e+01	2.478e-01	0.	0.	0.	0.	0.

isotopically weighted results for incident energy 16.00 mev(lab)

Atomic number	26	26	26	26	26	26	26	26	26
mass number	58	57	56	55	54	53	52	51	50
er xsect s(j)	1.048e+03	4.447e+02	6.869e+02	0.	0.	0.	0.	0.	0.
Atomic number	25	25	25	25	25	25	25	25	25
mass number	57	56	55	54	53	52	51	50	49
er xsect s(j)	1.065e+02	1.048e+02	0.	0.	0.	0.	0.	0.	0.
Atomic number	24	24	24	24	24	24	24	24	24
mass number	56	55	54	53	52	51	50	49	48
er xsect s(j)	5.655e-01	0.	3.845e+01	7.253e+00	0.	0.	0.	0.	0.

isotopically weighted results for incident energy 18.00 mev(lab)

Atomic number	26	26	26	26	26	26	26	26	26
mass number	58	57	56	55	54	53	52	51	50
er xsect s(j)	9.559e+02	2.740e+02	7.685e+02	0.	0.	0.	0.	0.	0.
Atomic number	25	25	25	25	25	25	25	25	25
mass number	57	56	55	54	53	52	51	50	49
er xsect s(j)	8.052e+01	1.610e+02	0.	0.	0.	0.	0.	0.	0.
Atomic number	24	24	24	24	24	24	24	24	24
mass number	56	55	54	53	52	51	50	49	48
er xsect s(j)	1.609e+00	0.	2.380e+01	5.068e+01	0.	0.	0.	0.	0.

isotopically weighted results for incident energy 20.00 mev(lab)

Atomic number	26	26	26	26	26	26	26	26	26
mass number	58	57	56	55	54	53	52	51	50
er xsect s(j)	8.687e+02	1.931e+02	7.680e+02	0.	0.	0.	0.	0.	0.
Atomic number	25	25	25	25	25	25	25	25	25
mass number	57	56	55	54	53	52	51	50	49
er xsect s(j)	7.124e+01	1.967e+02	0.	0.	0.	0.	0.	0.	0.
Atomic number	24	24	24	24	24	24	24	24	24
mass number	56	55	54	53	52	51	50	49	48
er xsect s(j)	2.464e+00	1.971e-03	1.275e+01	5.782e+01	0.	0.	0.	0.	0.

SECTION 2

Particle Spectra from $^{nat}\text{Fe}(n,x)$ Reactions
for 2-20 MeV Incident Neutrons

isotopically weighted results for incident energy 2.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		6.8482e+02	0.	0.	0.
0.750		1.0942e+03	0.	0.	0.
1.250		1.1652e+03	0.	0.	0.
1.750		9.9443e+02	3.7816e-01	0.	0.
4.250		0.	0.	5.1067e-04	0.

isotopically weighted results for incident energy 3.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		4.4114e+02	0.	0.	0.
0.750		7.0547e+02	0.	0.	0.
1.250		7.5210e+02	0.	0.	0.
1.750		6.4348e+02	2.4158e-01	0.	0.
2.250		5.0384e+02	1.3445e+00	0.	0.
2.750		8.230e+02	3.9777e+00	0.	0.
4.250		0.	0.	3.0174e-04	0.
4.750		0.	0.	1.5467e-03	0.
5.250		0.	0.	5.6156e-03	0.

isotopically weighted results for incident energy 4.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		3.6711e+02	0.	0.	0.
0.750		5.8747e+02	0.	0.	0.
1.250		6.2693e+02	0.	0.	0.
1.750		6.223e+02	1.8086e-01	0.	0.
2.250		4.2177e+02	9.9301e-01	0.	0.
2.750		3.2182e+02	2.9427e+00	0.	0.
3.250		2.4363e+02	5.8910e+00	0.	0.
3.750		8.363e+02	9.0067e+00	0.	0.
4.250		0.	0.	2.2195e-02	0.
4.750		0.	0.	9.2837e-03	0.
5.250		0.	0.	4.6512e-03	0.
5.750		0.	0.	1.2870e-02	0.
6.250		0.	0.	2.8406e-02	0.

isotopically weighted results for incident energy 5.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	Protons	alphas	deuterons
0.250		3.3712e+02	0.	0.	0.
0.750		5.3991e+02	0.	0.	0.
1.250		5.7663e+02	0.	0.	0.
1.750		4.9490e+02	5.0595e-01	0.	0.
2.250		3.8953e+02	8.2053e-01	0.	0.
2.750		2.9862e+02	2.4344e+00	0.	0.
3.250		2.2794e+02	4.7974e+00	0.	0.
3.750		1.7351e+02	7.1456e+00	0.	0.
4.250		1.3070e+02	9.2599e+00	8.8385e-02	0.
4.750		9.5705e+01	1.0150e+01	9.6030e-02	0.
5.250		0.	0.	2.8685e-02	0.
5.750		0.	0.	8.3685e-02	0.
6.250		0.	0.	2.5569e-02	0.
6.750		0.	0.	4.6111e-02	0.
7.250		0.	0.	6.8777e-02	0.

isotopically weighted results for incident energy 6.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		3.1537e+02	0.	0.	0.
0.750		5.0582e+02	0.	0.	0.
1.250		5.4090e+02	0.	0.	0.
1.750		4.6500e+02	4.5717e-01	0.	0.
2.250		3.6659e+02	2.5171e+00	0.	0.
2.750		2.8206e+02	7.5360e+00	0.	0.
3.250		2.1e58e+02	4.1919e+00	0.	0.
3.750		1.6635e+02	6.4246e+00	0.	0.
4.250		1.2712e+02	7.9671e+00	1.6735e-02	0.
4.750		9.6037e+01	8.7486e+00	8.7392e-02	0.
5.250		7.1359e+01	8.6676e+00	3.2353e-01	0.
5.750		4.8327e+01	7.9324e+00	9.1364e-01	0.
6.250	0.	0.	0.	1.6565e-01	0.
6.750	0.	0.	0.	4.2034e-02	0.
7.250	0.	0.	0.	6.2695e-02	0.
7.750	0.	0.	0.	7.8521e-02	0.
8.250	0.	0.	0.	8.4878e-02	0.

isotopically weighted results for incident energy 7.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		2.9523e+02	0.	0.	0.
0.750		4.7381e+02	0.	0.	0.
1.250		5.0704e+02	0.	0.	0.
1.750		4.3610e+02	4.1924e-01	0.	0.
2.250		3.4410e+02	2.3067e+00	0.	0.
2.750		2.6524e+02	6.7200e+00	0.	0.
3.250		2.0425e+02	1.3171e+01	0.	0.
3.750		1.5761e+02	1.9614e+01	0.	0.
4.250		1.2134e+02	7.2324e+00	1.5297e-02	0.
4.750		9.2752e+01	7.9446e+00	7.9876e-02	0.
5.250		7.0232e+01	7.7310e+00	2.9566e-01	0.
5.750		5.1304e+01	7.0866e+00	8.3483e-01	0.
6.250		3.5887e+01	6.1269e+00	1.8825e+00	0.
6.750		2.3393e+01	5.0614e+00	3.4744e+00	0.
7.250	0.	0.	0.	4.6738e-01	0.
7.750	0.	0.	0.	7.8244e-02	0.
8.250	0.	0.	0.	8.4578e-02	0.
8.750	0.	0.	0.	8.1664e-02	0.
9.250	0.	0.	0.	7.2664e-02	0.

isotopically weighted results for incident energy 8.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		2.7491e+02	0.	0.	0.
0.750		4.4250e+02	0.	0.	0.
1.250		4.7385e+02	0.	0.	0.
1.750		4.0807e+02	3.8235e-01	0.	0.
2.250		3.2262e+02	3.1680e+00	0.	0.
2.750		2.4935e+02	6.1555e+00	0.	0.
3.250		1.9272e+02	1.2099e+01	0.	0.
3.750		1.4946e+02	1.8076e+01	0.	0.
4.250		1.1588e+02	2.2206e+01	1.3854e-02	0.
4.750		8.9486e+01	2.3785e+01	7.2328e-02	0.
5.250		6.8762e+01	6.8707e+00	2.6768e-01	0.
5.750		5.2672e+01	6.3124e+00	7.5567e-01	0.
6.250		3.9020e+01	5.3595e+00	1.7037e+00	0.
6.750		2.8026e+01	4.4631e+00	3.4437e+00	0.
7.250		1.9170e+01	3.6204e+00	4.8057e+00	0.
7.750		1.0276e+01	2.8929e+00	6.1746e+00	0.
8.250		0.	0.	5.8098e-01	0.
8.750		0.	0.	7.5338e-02	0.
9.250		0.	0.	6.7215e-02	0.
9.750		0.	0.	5.6430e-02	0.
10.250		0.	0.	4.5441e-02	0.

isotopically weighted results for incident energy 9.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		2.6673e+02	0.	0.	0.
0.750		4.1476e+02	0.	0.	0.
1.250		4.4273e+02	0.	0.	0.
1.750		3.8266e+02	3.8130e-01	0.	0.
2.250		3.0310e+02	2.1039e+00	0.	0.
2.750		2.3486e+02	6.1481e+00	0.	0.
3.250		1.8213e+02	1.2102e+01	0.	0.
3.750		1.4188e+02	1.8115e+01	0.	0.
4.250		1.1066e+02	2.2303e+01	1.3637e-02	0.
4.750		8.6137e+01	2.3953e+01	7.1189e-02	0.
5.250		6.6914e+01	2.3379e+01	2.6343e-01	0.
5.750		5.2024e+01	2.1337e+01	7.4367e-01	0.
6.250		4.0447e+01	5.3606e+00	1.6765e+00	0.
6.750		3.0617e+01	4.4766e+00	3.0932e+00	0.
7.250		2.2823e+01	3.5481e+00	4.7281e+00	0.
7.750		1.6516e+01	2.8466e+00	6.0742e+00	0.
8.250		1.1253e+01	2.2721e+00	6.7336e+00	0.
8.750		4.7721e+00	1.8159e+00	6.6415e+00	0.
9.250		0.	0.	6.4252e-01	0.
9.750		0.	0.	5.1771e-02	0.
10.250		0.	0.	4.1689e-02	0.
10.750		0.	0.	3.2558e-02	0.

isotopically weighted results for incident energy 10.00 mev(lab)

ke	ds/d ϵ (mb/mev)=	neutrons	protons	alphas	deuterons
0.250		2.4502e+02	0.	0.	0.
0.750		4.0201e+02	0.	0.	0.
1.250		4.2618e+02	0.	0.	0.
1.750		3.6655e+02	3.4191e-01	0.	0.
2.250		2.9139e+02	1.8903e+00	0.	0.
2.750		2.2611e+02	5.5375e+00	0.	0.
3.250		2.7246e+02	1.0944e+01	0.	0.
3.750		1.5780e+02	1.6430e+01	0.	0.
4.250		1.0800e+02	2.0329e+01	1.2721e-02	0.
4.750		8.4600e+01	1.966e+01	6.6406e-02	0.
5.250		4.264e+01	2.1897e+01	2.4573e-01	0.
5.750		5.2073e+01	1.9889e+01	6.9360e-01	0.
6.250		4.1259e+01	1.7549e+01	1.5635e+00	0.
6.750		3.2278e+01	1.4935e+01	2.8845e+00	0.
7.250		2.5376e+01	3.4907e+00	4.4087e+00	0.
7.750		1.9744e+01	2.8192e+00	5.6633e+00	0.
8.250		1.5152e+01	2.1779e+00	6.2774e+00	0.
8.750		1.1303e+01	1.7530e+00	6.2097e+00	0.
9.250		7.5003e+00	1.4217e+00	5.6551e+00	0.
9.750		2.5163e+00	1.1581e+00	4.8556e+00	0.
10.250		0.	0.	3.8419e-01	0.
10.750		0.	0.	3.4965e-02	0.
11.250		0.	0.	2.6684e-02	0.
11.750		0.	0.	2.0005e-02	0.

isotopically weighted results for incident energy 11.00 mev(lab)

ke	ds/d ϵ (mb/mev)=	neutrons	protons	alphas	deuterons
0.250		1.9529e+02	0.	0.	0.
0.750		3.4275e+02	0.	0.	0.
1.250		4.0929e+02	0.	0.	0.
1.750		3.7522e+02	8.5485e+00	0.	0.
2.250		2.9716e+02	1.8520e+00	0.	0.
2.750		2.3091e+02	5.420e+00	0.	0.
3.250		1.8016e+02	1.0936e+01	0.	0.
3.750		1.4140e+02	1.6421e+01	0.	0.
4.250		1.1099e+02	2.0309e+01	1.1775e-02	0.
4.750		8.7128e+01	2.1948e+01	6.1529e-02	0.
5.250		6.8445e+01	2.1596e+01	2.2767e-01	0.
5.750		5.4001e+01	1.9916e+01	6.4260e-01	0.
6.250		4.3012e+01	1.7617e+01	1.4485e+00	0.
6.750		3.4819e+01	1.5168e+01	2.6722e+00	0.
7.250		2.7403e+01	1.2771e+01	4.0837e+00	0.
7.750		2.2220e+01	1.0688e+01	5.2459e+00	0.
8.250		1.7946e+01	2.2166e+00	5.8145e+00	0.
8.750		1.4465e+01	1.8006e+00	7.516e+00	0.
9.250		1.1541e+01	1.3866e+00	8.257e+00	0.
9.750		8.1433e+00	1.1469e+00	4.4971e+00	0.
10.250		4.9251e+00	9.4111e-01	3.7014e+00	0.
10.750		1.2434e+00	7.7156e-01	2.9536e+00	0.
11.250		0.	0.	2.4427e-01	0.
11.750		0.	0.	2.3081e-02	0.
12.250		0.	0.	1.7061e-02	0.
12.750		0.	0.	1.2469e-02	0.

isotopically weighted results for incident energy 12.00 mev(lab)

ka	ds/do(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		2.9752e+02	0.	0.	0.
0.750		2.9252e+02	0.	0.	0.
1.250		3.5208e+02	0.	0.	0.
1.750		3.4180e+02	1.7214e+01	0.	0.
2.250		3.0438e+02	1.4611e+01	0.	0.
2.750		2.5174e+02	1.0995e+01	0.	0.
3.250		1.9595e+02	1.1388e+01	0.	0.
3.750		1.5360e+02	1.7444e+01	0.	0.
4.250		1.2091e+02	2.1561e+01	1.2321e-02	0.
4.750		9.5154e+01	2.3285e+01	6.5560e-02	0.
5.250		7.4743e+01	2.2903e+01	2.4313e-01	0.
5.750		5.8984e+01	2.1122e+01	6.8681e-01	0.
6.250		4.7016e+01	1.8636e+01	1.5416e+00	0.
6.750		3.7981e+01	1.6175e+01	2.8538e+00	0.
7.250		3.0745e+01	1.3741e+01	4.3597e+00	0.
7.750		2.5202e+01	1.1660e+01	5.5975e+00	0.
8.250		2.0906e+01	9.9446e+00	6.2013e+00	0.
8.750		1.7505e+01	8.5461e+00	6.1312e+00	0.
9.250		1.4748e+01	1.4967e+00	5.5808e+00	0.
9.750		1.2438e+01	1.2490e+00	4.7895e+00	0.
10.250		9.7705e+00	9.6048e-01	3.9400e+00	0.
10.750		6.9194e+00	8.0397e-01	3.1425e+00	0.
11.250		4.1373e+00	6.7712e-01	2.4488e+00	0.
11.750		7.4823e-01	5.7248e-01	1.8744e+00	0.
12.250		0.	0.	1.4605e-01	0.
12.750		0.	0.	1.4993e-02	0.
13.250		0.	0.	1.0856e-02	0.
13.750		0.	0.	7.8002e-03	0.

isotopically weighted results for incident energy 14.00 mev(lab)

ke	ds/de(mb/mev)*	neutrons	protons	alphas	deuterons
0.250		5.6854e+02	0.	0.	0.
0.750		5.5934e+02	0.	0.	0.
1.250		4.6704e+02	0.	0.	0.
1.750		3.5261e+02	1.7704e+01	0.	0.
2.250		2.7153e+02	1.7212e+01	0.	0.
2.750		2.2428e+02	2.1024e+01	0.	0.
3.250		1.9680e+02	2.2940e+01	0.	0.
3.750		1.7259e+02	2.4111e+01	0.	0.
4.250		1.5058e+02	2.6819e+01	2.5004e-02	0.
4.750		1.2462e+02	2.8637e+01	9.6234e-02	0.
5.250		9.7359e+01	2.8550e+01	3.0788e-01	0.
5.750		7.6331e+01	2.6520e+01	8.2526e-01	0.
6.250		6.0388e+01	2.5296e+01	1.9559e+00	0.
6.750		4.8381e+01	2.0011e+01	3.6809e+00	0.
7.250		3.9126e+01	1.6987e+01	5.6361e+00	0.
7.750		3.2205e+01	1.4452e+01	7.2407e+00	0.
8.250		2.7033e+01	1.2429e+01	8.0156e+00	0.
8.750		2.3133e+01	1.0850e+01	7.9190e+00	0.
9.250		2.0154e+01	9.6244e+00	7.2026e+00	0.
9.750		1.7834e+01	8.6632e+00	6.1765e+00	0.
10.250		1.5980e+01	7.8902e+00	5.0774e+00	0.
10.750		1.4451e+01	7.2389e+00	4.0465e+00	0.
11.250		1.2810e+01	9.0976e-01	3.1508e+00	0.
11.750		1.0502e+01	7.8866e-01	2.4098e+00	0.
12.250		8.2292e+00	6.1071e-01	1.8171e+00	0.
12.750		5.9349e+00	5.4481e-01	1.3547e+00	0.
13.250		3.4191e+00	4.8933e-01	1.0006e+00	0.
13.750		3.5130e-01	4.4135e-01	7.3345e-01	0.
14.250		0.	0.	5.3746e-02	0.
14.750		0.	0.	6.5507e-03	0.
15.250		0.	0.	4.6271e-03	0.
15.750		0.	0.	3.2546e-03	0.

isotopically weighted results for incident energy 16.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		5.1160e+02	0.	0.	0.
0.750		5.7345e+02	0.	0.	0.
1.250		5.2440e+02	0.	0.	0.
1.750		4.1647e+02	7.2787e+00	0.	0.
2.250		3.1715e+02	1.1831e+01	0.	0.
2.750		2.4407e+02	1.8909e+01	0.	0.
3.250		1.9417e+02	2.652e+01	0.	0.
3.750		1.6130e+02	3.1946e+01	0.	0.
4.250		1.3907e+02	3.3754e+01	2.4972e-02	0.
4.750		1.2205e+02	3.3106e+01	1.1152e-01	0.
5.250		1.0582e+02	3.2202e+01	5.774e-01	0.
5.750		9.0897e+01	3.1102e+01	1.0137e+00	0.
6.250		7.7589e+01	2.9175e+01	2.2374e+00	0.
6.750		6.2819e+01	2.5579e+01	4.1749e+00	0.
7.250		5.0042e+01	2.1764e+01	6.7154e+00	0.
7.750		4.0560e+01	1.8421e+01	9.4808e+00	0.
8.250		3.3587e+01	1.5578e+01	1.1909e+01	0.
8.750		2.8401e+01	1.3395e+01	1.2017e+01	0.
9.250		2.4545e+01	1.1739e+01	1.095e+01	0.
9.750		2.1272e+01	1.0485e+01	9.3559e+00	0.
10.250		1.9502e+01	9.5291e+00	7.7198e+00	0.
10.750		1.7833e+01	8.7843e+00	6.1491e+00	0.
11.250		1.6518e+01	8.1947e+00	4.7852e+00	0.
11.750		1.5452e+01	7.7151e+00	3.6578e+00	0.
12.250		1.4303e+01	7.1970e+00	2.7566e+00	0.
12.750		1.2927e+01	6.3659e+00	2.0538e+00	0.
13.250		1.0773e+01	7.0026e-01	1.5160e+00	0.
13.750		8.9955e+00	6.3347e-01	1.1105e+00	0.
14.250		7.1070e+00	5.0474e-01	8.0818e-01	0.
14.750		4.8785e+00	4.7046e-01	5.8490e-01	0.
15.250		2.5965e+00	4.4061e-01	4.2129e-01	0.
15.750		0.	2.8788e-01	5.0221e-01	0.
16.250		0.	0.	2.0621e-02	0.
16.750		0.	0.	2.4564e-03	0.
17.250		0.	0.	1.7106e-03	0.
17.750		0.	0.	1.1882e-03	0.

isotopically weighted results for incident energy 18.00 mev(lab)

ke	ds/dε(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		4.3536e+02	0.	0.	0.
0.750		5.4665e+02	0.	0.	0.
1.250		5.3594e+02	0.	0.	0.
1.750		4.4506e+02	4.4468e+00	0.	0.
2.250		3.4824e+02	8.4437e+00	0.	0.
2.750		2.7381e+02	1.5881e+01	0.	0.
3.250		2.1941e+02	2.5434e+01	0.	0.
3.750		1.7952e+02	3.5998e+01	0.	0.
4.250		1.4855e+02	5.9079e+01	2.1677e-02	0.
4.750		1.2405e+02	4.0195e+01	1.0408e-01	0.
5.250		1.0428e+02	3.8601e+01	3.7200e-01	0.
5.750		8.8482e+01	3.5243e+01	1.0441e+00	0.
6.250		7.5842e+01	3.1276e+01	2.3862e+00	0.
6.750		6.5409e+01	2.7560e+01	4.5520e+00	0.
7.250		5.6509e+01	2.4429e+01	7.2227e+00	0.
7.750		4.8479e+01	2.1832e+01	9.7843e+00	0.
8.250		4.1916e+01	1.9533e+01	1.1567e+01	0.
8.750		3.5228e+01	1.6920e+01	1.2379e+01	0.
9.250		2.9673e+01	1.4611e+01	1.2375e+01	0.
9.750		2.5617e+01	1.2798e+01	1.1874e+01	0.
10.250		2.2634e+01	1.1340e+01	1.1001e+01	0.
10.750		2.0398e+01	1.0237e+01	8.7870e+00	0.
11.250		1.8715e+01	9.3548e+00	6.8584e+00	0.
11.750		1.7428e+01	8.7464e+00	5.2452e+00	0.
12.250		1.6423e+01	8.2382e+00	3.9518e+00	0.
12.750		1.5613e+01	7.8266e+00	2.9436e+00	0.
13.250		1.4599e+01	7.3291e+00	2.1723e+00	0.
13.750		1.3273e+01	6.6852e+00	1.5908e+00	0.
14.250		1.1971e+01	6.0559e+00	1.1574e+00	0.
14.750		1.0659e+01	5.4341e+00	8.3737e-01	0.
15.250		9.3250e+00	5.9521e-01	6.0297e-01	0.
15.750		7.8659e+00	5.4809e-01	4.3240e-01	0.
16.250		6.0094e+00	4.4824e-01	3.0897e-01	0.
16.750		4.1198e+00	4.0959e-01	2.2906e-01	0.
17.250		2.1462e+00	3.6395e-01	1.5629e-01	0.
17.750		0.	3.2280e-01	1.1073e-01	0.
18.250		0.	0.	8.1462e-03	0.
18.750		0.	0.	1.0137e-03	0.
19.250		0.	0.	6.9956e-04	0.
19.750		0.	0.	4.8188e-04	0.

isotopically weighted results for incident energy 20.00 mev(lab)

ke	ds/de(mb/mev)=	neutrons	protons	alphas	deuterons
0.250		3.5812e+02	0.	0.	0.
0.750		4.9490e+02	0.	0.	0.
1.250		5.0785e+02	0.	0.	0.
1.750		4.3537e+02	2.9060e+00	0.	0.
2.250		3.5010e+02	4.3212e+00	0.	0.
2.750		2.7964e+02	1.3407e+01	0.	0.
3.250		2.2642e+02	2.3112e+01	0.	0.
3.750		1.8627e+02	3.3082e+01	0.	0.
4.250		1.5497e+02	3.9878e+01	1.8342e-02	0.
4.750		1.2972e+02	4.2703e+01	9.2917e-02	0.
5.250		1.0895e+02	4.2319e+01	3.4882e-01	0.
5.750		9.1774e+01	3.9590e+01	1.0016e+00	0.
6.250		7.7602e+01	3.5649e+01	2.3505e+00	0.
6.750		6.5976e+01	3.1381e+01	4.5690e+00	0.
7.250		5.6517e+01	2.7348e+01	7.4359e+00	0.
7.750		4.8857e+01	2.3821e+01	1.0269e+01	0.
8.250		4.2597e+01	2.0879e+01	1.2344e+01	0.
8.750		3.7427e+01	1.8529e+01	1.3341e+01	0.
9.250		3.3106e+01	1.6663e+01	1.3360e+01	0.
9.750		2.9536e+01	1.5151e+01	1.2682e+01	0.
10.250		2.6600e+01	1.3853e+01	1.1599e+01	0.
10.750		2.3564e+01	1.2419e+01	1.0345e+01	0.
11.250		2.1216e+01	1.1158e+01	9.0318e+00	0.
11.750		1.9473e+01	1.0157e+01	7.7948e+00	0.
12.250		1.8160e+01	9.3660e+00	6.6239e+00	0.
12.750		1.7142e+01	8.7583e+00	4.9461e+00	0.
13.250		1.6340e+01	8.2822e+00	3.6599e+00	0.
13.750		1.5691e+01	7.8966e+00	2.6809e+00	0.
14.250		1.4705e+01	7.3428e+00	1.9495e+00	0.
14.750		1.3695e+01	6.8735e+00	1.4097e+00	0.
15.250		1.2707e+01	6.3931e+00	1.0145e+00	0.
15.750		1.1719e+01	5.9331e+00	7.2709e-01	0.
16.250		1.0733e+01	5.4867e+00	5.1922e-01	0.
16.750		9.7463e+00	5.7063e-01	3.6958e-01	0.
17.250		8.5146e+00	4.3153e-01	2.8552e-01	0.
17.750		6.9290e+00	4.8129e-01	1.8557e-01	0.
18.250		5.3234e+00	3.7946e-01	1.3119e-01	0.
18.750		3.6851e+00	5.028e-01	9.2487e-02	0.
19.250		1.7847e+00	3.2150e-01	6.5081e-02	0.
19.750	0.			4.5716e-02	0.
20.250	0.	0.	0.	3.1889e-03	0.
20.750	0.	0.	0.	4.1068e-04	0.
21.250	0.	0.	0.	2.8161e-04	0.
21.750	0.	0.	0.	1.4286e-04	0.

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SECTION 3

γ -ray Spectra Following $^{56}\text{Fe}(n, \gamma)$ Reactions

laboratory bombardment energy = 2.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1966.6
 excitation energy of compound nucleus = 9.6mev j= 0
 reaction cross section 1966.6

e gamma (mev)	cross section (mb/mev)	(mb/sr.meV)
5.000e-01	2.047e+03	1.625e+02
1.000e+00	1.105e+03	8.769e+01
1.500e+00	3.862e+02	3.065e+01
2.000e+00	4.796e+00	3.806e-01
2.500e+00	9.563e+00	7.589e-01
3.000e+00	1.561e+01	1.239e+00
3.500e+00	2.209e+01	1.753e+00
4.000e+00	2.791e+01	2.215e+00
4.500e+00	3.203e+01	2.542e+00
5.000e+00	3.567e+01	2.672e+00
5.500e+00	3.245e+01	2.576e+00
6.000e+00	2.855e+01	2.266e+00
6.500e+00	2.264e+01	1.797e+00
7.000e+00	1.581e+01	1.254e+00
7.500e+00	9.303e+00	7.384e-01
8.000e+00	4.241e+00	3.366e-01
8.500e+00	1.231e+00	9.766e-02
9.000e+00	1.143e-01	9.069e-03

laboratory bombardment energy = 3.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1715.8
 excitation energy of compound nucleus = 10.6mev j= 0
 reaction cross section 1715.8

gamma	cross section	
(mev)	(mb/mev)	(mb/sr.mev)
5.000e-01	1.782e+03	1.414e+02
1.000e+00	1.200e+03	9.522e+01
1.500e+00	8.059e+02	6.396e+01
2.000e+00	4.419e+02	3.508e+01
2.500e+00	1.558e+02	1.236e+01
3.000e+00	9.820e+00	7.793e-01
3.500e+00	1.449e+01	1.150e+00
4.000e+00	1.924e+01	1.527e+00
4.500e+00	2.340e+01	1.857e+00
5.000e+00	2.637e+01	2.093e+00
5.500e+00	2.768e+01	2.197e+00
6.000e+00	2.709e+01	2.150e+00
6.500e+00	2.464e+01	1.955e+00
7.000e+00	2.065e+01	1.639e+00
7.500e+00	1.572e+01	1.248e+00
8.000e+00	1.060e+01	8.412e-01
8.500e+00	6.043e+00	4.795e-01
9.000e+00	2.670e+00	2.119e-01
9.500e+00	7.453e-01	5.915e-02
1.000e+01	6.337e-02	5.029e-03

laboratory bombardment energy = 4.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1654.9
 excitation energy of compound nucleus = 11.6mev j= 0
 reaction cross section 1654.9

e gamma (mev)	cross section (mb/mev)	(mb/Sr.meV)
5.000e-01	1.712e+03	1.359e+02
1.000e+00	1.171e+03	9.294e+01
1.500e+00	8.075e+02	7.044e+01
2.000e+00	6.653e+02	5.280e+01
2.500e+00	4.490e+02	3.563e+01
3.000e+00	2.418e+02	1.919e+01
3.500e+00	8.202e+01	6.509e+00
4.000e+00	5.133e-01	4.074e-02
4.500e+00	6.516e-01	5.171e-02
5.000e+00	7.717e-01	6.125e-02
5.500e+00	8.589e-01	6.817e-02
6.000e+00	9.017e-01	7.157e-02
6.500e+00	8.936e-01	7.092e-02
7.000e+00	8.341e-01	6.620e-02
7.500e+00	7.294e-01	5.789e-02
8.000e+00	5.916e-01	4.695e-02
8.500e+00	4.380e-01	3.476e-02
9.000e+00	2.882e-01	2.287e-02
9.500e+00	1.609e-01	1.277e-02
1.000e+01	6.984e-02	5.543e-03
1.050e+01	1.951e-02	1.549e-03
1.100e+01	2.472e-03	1.962e-04

laboratory bombardment energy = 5.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1650.7
 excitation energy of compound nucleus = 12.6mev j= 0
 reaction cross section 1650.7

e gamma (mev)	cross section	
	(mb/mev)	(mb/sr.mev)
5.000e-01	1.715e+03	1.361e+02
1.000e+00	1.179e+03	9.357e+01
1.500e+00	9.128e+02	7.245e+01
2.000e+00	7.322e+02	5.811e+01
2.500e+00	5.790e+02	4.595e+01
3.000e+00	4.327e+02	3.434e+01
3.500e+00	2.885e+02	2.290e+01
4.000e+00	1.547e+02	1.228e+01
4.500e+00	5.384e+01	4.273e+00
5.000e+00	3.117e+00	2.474e-01
5.500e+00	3.621e+00	2.874e-01
6.000e+00	3.996e+00	3.171e-01
6.500e+00	4.200e+00	3.333e-01
7.000e+00	4.208e+00	3.359e-01
7.500e+00	4.011e+00	3.184e-01
8.000e+00	3.625e+00	2.877e-01
8.500e+00	3.035e+00	2.449e-01
9.000e+00	2.446e+00	1.941e-01
9.500e+00	1.776e+00	1.409e-01
1.000e+01	1.148e+00	9.114e-02
1.050e+01	6.304e-01	5.003e-02
1.100e+01	2.680e-01	2.127e-02
1.150e+01	7.162e-02	5.684e-03
1.200e+01	6.737e-03	5.347e-04

laboratory bombardment energy = 6.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1628.1
 excitation energy of compound nucleus = 13.5mev j= 0
 reaction cross section 1628.1

e gamma (mev)	cross section (mb/mev)	cross section (mb/sr.meV)
5.000e-01	1.697e+03	1.347e+02
1.000e+00	1.176e+03	9.334e+01
1.500e+00	9.224e+02	7.320e+01
2.000e+00	7.555e+02	5.956e+01
2.500e+00	6.221e+02	4.937e+01
3.000e+00	5.045e+02	4.004e+01
3.500e+00	3.956e+02	3.139e+01
4.000e+00	2.919e+02	2.311e+01
4.500e+00	1.916e+02	1.521e+01
5.000e+00	1.014e+02	8.046e+00
5.500e+00	3.426e+01	2.719e+00
6.000e+00	5.562e-01	4.415e-02
6.500e+00	6.104e-01	4.844e-02
7.000e+00	6.429e-01	5.103e-02
7.500e+00	6.504e-01	5.162e-02
8.000e+00	6.313e-01	5.010e-02
8.500e+00	5.862e-01	4.653e-02
9.000e+00	5.185e-01	4.115e-02
9.500e+00	4.336e-01	3.441e-02
1.000e+01	3.389e-01	2.690e-02
1.050e+01	2.434e-01	1.932e-02
1.100e+01	1.562e-01	1.240e-02
1.150e+01	8.565e-02	6.788e-03
1.200e+01	3.709e-02	2.944e-03
1.250e+01	1.139e-02	9.040e-04
1.300e+01	3.591e-03	2.850e-04

laboratory bombardment energy = 1.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1583.4
 excitation energy of compound nucleus = 14.5mev j= 0
 reaction cross section 1583.4

energy (mev)	cross section (mb/mev)	cross section (mb/sr.meV)
5.000e-01	1.652e+03	1.311e+02
1.000e+00	1.153e+03	9.148e+01
1.500e+00	9.138e+02	7.252e+01
2.000e+00	7.995e+02	6.027e+01
2.500e+00	6.377e+02	5.061e+01
3.000e+00	5.322e+02	4.224e+01
3.500e+00	4.379e+02	3.475e+01
4.000e+00	3.523e+02	2.796e+01
4.500e+00	2.737e+02	2.172e+01
5.000e+00	2.003e+02	1.590e+01
5.500e+00	1.317e+02	1.045e+01
6.000e+00	7.076e+01	5.616e+00
6.500e+00	2.581e+01	2.056e+00
7.000e+00	5.527e+00	2.799e-01
7.500e+00	3.725e+00	2.956e-01
8.000e+00	3.602e+00	3.018e-01
8.500e+00	3.747e+00	3.974e-01
9.000e+00	3.560e+00	2.825e-01
9.500e+00	3.249e+00	2.578e-01
1.000e+01	2.633e+00	2.248e-01
1.050e+01	2.342e+00	1.859e-01
1.100e+01	1.815e+00	1.440e-01
1.150e+01	1.294e+00	1.027e-01
1.200e+01	8.245e-01	6.543e-02
1.250e+01	4.470e-01	3.548e-02
1.300e+01	1.877e-01	1.490e-02
1.350e+01	5.002e-02	3.970e-03
1.400e+01	6.858e-03	5.443e-04

laboratory bombardment energy = 8.0mev   target mass = 56.0
 compound nucleus mass = 57.0   compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26   mass num= 57
 total reaction cross section = 1531.7
 excitation energy of compound nucleus = 15.5mev   j= 0
 reaction cross section 1531.7

e gamma (mev)	cross section (mb/mev)	cross section (mb/Sr.mev)
5.000e-01	1.605e+03	1.274e+02
1.000e+00	1.127e+03	8.941e+01
1.500e+00	8.995e+02	7.139e+01
2.000e+00	7.544e+02	5.988e+01
2.500e+00	6.408e+02	5.036e+01
3.000e+00	5.431e+02	4.311e+01
3.500e+00	4.559e+02	3.619e+01
4.000e+00	3.776e+02	2.997e+01
4.500e+00	3.075e+02	2.440e+01
5.000e+00	2.447e+02	1.942e+01
5.500e+00	1.881e+02	1.493e+01
6.000e+00	1.363e+02	1.082e+01
6.500e+00	8.876e+01	7.045e+00
7.000e+00	4.702e+01	3.732e+00
7.500e+00	1.637e+01	1.300e+00
8.000e+00	1.020e+00	8.095e-02
8.500e+00	1.090e+00	8.333e-02
9.000e+00	1.049e+00	8.329e-02
9.500e+00	1.017e+00	8.071e-02
1.000e+01	9.533e-01	7.566e-02
1.050e+01	8.613e-01	6.835e-02
1.100e+01	7.458e-01	5.919e-02
1.150e+01	6.140e-01	4.873e-02
1.200e+01	4.750e-01	3.770e-02
1.250e+01	3.391e-01	2.692e-02
1.300e+01	2.173e-01	1.725e-02
1.350e+01	1.195e-01	9.485e-03
1.400e+01	5.249e-02	4.166e-03
1.450e+01	1.757e-02	1.394e-03
1.500e+01	8.041e-03	6.382e-04

laboratory bombardment energy = 9.0mev   target mass = 56.0
 compound nucleus mass = 57.0   compound nucleus formation q value = 7.6
     compound nucleus atomic number = 26   mass num= 57
     total reaction cross section = 1484.2
 excitation energy of compound nucleus = 16.5mev   j= 0
     reaction cross section 1484.2

e gamma (mev)	cross section (mb/mev)	mb/Sr.meV
5.000e-01	1.562e+03	1.239e-02
1.000e+00	1.105e+03	8.749e-01
1.500e+00	8.901e+02	7.064e+01
2.000e+00	7.523e+02	5.970e+01
2.500e+00	6.437e+02	5.109e+01
3.000e+00	5.502e+02	4.366e+01
3.500e+00	4.672e+02	3.708e+01
4.000e+00	3.929e+02	3.118e+01
4.500e+00	3.267e+02	2.593e+01
5.000e+00	2.679e+02	2.126e+01
5.500e+00	2.162e+02	1.716e+01
6.000e+00	1.707e+02	1.355e+01
6.500e+00	1.304e+02	1.035e+01
7.000e+00	9.403e+01	7.462e+00
7.500e+00	6.097e+01	4.839e+00
8.000e+00	3.216e+01	2.552e+00
8.500e+00	1.011e+01	8.740e-01
9.000e+00	3.777e-01	2.997e-02
9.500e+00	3.824e-01	3.035e-02
1.000e+01	3.773e-01	2.994e-02
1.050e+01	3.621e-01	2.874e-02
1.100e+01	3.573e-01	2.677e-02
1.150e+01	3.037e-01	2.411e-02
1.200e+01	2.630e-01	2.087e-02
1.250e+01	2.172e-01	1.724e-02
1.300e+01	1.593e-01	1.348e-02
1.350e+01	1.226e-01	9.727e-03
1.400e+01	8.063e-02	6.400e-03
1.450e+01	4.005e-02	3.734e-03
1.500e+01	2.451e-02	1.947e-03
1.550e+01	1.399e-02	1.111e-03
1.600e+01	1.359e-02	1.063e-03

laboratory bombardment energy = 10.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1447.6
 excitation energy of compound nucleus = 17.5mev j= 0
 reaction cross section 1447.6

# gamma	cross section	
(mev)	(mb/mev)	(mb/sr.meV)
5.000e-01	1.529e+03	1.213e+02
1.000e+00	1.091e+03	8.636e+01
1.500e+00	8.889e+02	7.055e+01
2.000e+00	7.598e+02	6.031e+01
2.500e+00	6.564e+02	5.210e+01
3.000e+00	5.655e+02	4.488e+01
3.500e+00	4.836e+02	3.838e+01
4.000e+00	4.102e+02	3.256e+01
4.500e+00	3.451e+02	2.739e+01
5.000e+00	2.876e+02	2.284e+01
5.500e+00	2.372e+02	1.883e+01
6.000e+00	1.934e+02	1.535e+01
6.500e+00	1.555e+02	1.234e+01
7.000e+00	1.226e+02	9.730e+00
7.500e+00	9.576e+01	7.441e+00
8.000e+00	6.799e+01	5.396e+00
8.500e+00	4.469e+01	3.547e+00
9.000e+00	2.439e+01	1.936e+00
9.500e+00	2.458e+00	7.506e-01
1.000e+01	2.388e+00	1.895e-01
1.050e+01	2.394e+00	1.900e-01
1.100e+01	2.346e+00	1.862e-01
1.150e+01	2.242e+00	1.780e-01
1.200e+01	2.085e+00	1.655e-01
1.250e+01	1.879e+00	1.492e-01
1.300e+01	1.631e+00	1.295e-01
1.350e+01	1.324e+00	1.034e-01
1.400e+01	1.058e+00	8.400e-02
1.450e+01	7.664e-01	6.083e-02
1.500e+01	4.985e-01	3.957e-02
1.550e+01	2.776e-01	2.203e-02
1.600e+01	1.231e-01	9.771e-03
1.650e+01	4.308e-02	3.419e-03
1.700e+01	2.323e-02	1.844e-03

laboratory bombardment energy = 11.0mev   target mass = 56.0
 compound nucleus mass = 57.0   compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26   mass num= 57
 total reaction cross section = 1424.7
 excitation energy of compound nucleus = 18.5mev   j= 0
 reaction cross section 1424.7

e gamma (mev)	cross section (mb/mev)	(mb/cr.mev)
5.000e-01	1.508e+03	1.196e+02
1.000e+00	1.081e+03	8.594e+01
1.500e+00	8.913e+02	7.075e+01
2.000e+00	7.699e+02	6.110e+01
2.500e+00	6.717e+02	5.331e+01
3.000e+00	5.836e+02	4.631e+01
3.500e+00	5.025e+02	3.988e+01
4.000e+00	4.285e+02	3.401e+01
4.500e+00	3.622e+02	2.875e+01
5.000e+00	3.038e+02	2.411e+01
5.500e+00	2.529e+02	2.007e+01
6.000e+00	2.089e+02	1.658e+01
6.500e+00	1.710e+02	1.357e+01
7.000e+00	1.384e+02	1.098e+01
7.500e+00	1.104e+02	8.765e+00
8.000e+00	8.634e+01	6.853e+00
8.500e+00	6.525e+01	5.179e+00
9.000e+00	4.634e+01	3.679e+00
9.500e+00	2.916e+01	2.314e+00
1.000e+01	1.487e+01	1.180e+00
1.050e+01	5.399e+00	4.285e-01
1.100e+01	1.21e+00	8.894e-02
1.150e+01	1.120e+00	8.886e-02
1.200e+01	1.097e+00	8.703e-02
1.250e+01	1.051e+00	8.338e-02
1.300e+01	9.819e-01	7.733e-02
1.350e+01	8.915e-01	7.075e-02
1.400e+01	7.817e-01	6.204e-02
1.450e+01	6.560e-01	5.206e-02
1.500e+01	5.201e-01	4.128e-02
1.550e+01	3.819e-01	3.031e-02
1.600e+01	2.522e-01	2.001e-02
1.650e+01	1.441e-01	1.144e-02
1.700e+01	7.020e-02	5.722e-03
1.750e+01	3.515e-02	2.789e-03
1.800e+01	2.632e-02	2.248e-03

laboratory bombardment energy = 12.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1414.3
 excitation energy of compound nucleus = 19.4mev j= 0
 reaction cross section 1414.3

E gamma (mev)	Cross section (mb/mev) (mb/cr. mev)
5.000e-01	1.410e+03 1.119e+02
1.000e+00	1.016e+03 8.061e+01
1.500e+00	8.407e+02 6.673e+01
2.000e+00	7.307e+02 5.799e+01
2.500e+00	6.413e+02 5.090e+01
3.000e+00	5.604e+02 4.448e+01
3.500e+00	4.850e+02 3.849e+01
4.000e+00	4.152e+02 3.295e+01
4.500e+00	3.518e+02 2.792e+01
5.000e+00	2.954e+02 2.349e+01
5.500e+00	2.463e+02 1.955e+01
6.000e+00	2.041e+02 1.620e+01
6.500e+00	1.681e+02 1.334e+01
7.000e+00	1.374e+02 1.091e+01
7.500e+00	1.113e+02 8.836e+00
8.000e+00	8.908e+01 7.070e+00
8.500e+00	6.999e+01 5.559e+00
9.000e+00	5.342e+01 4.239e+00
9.500e+00	3.868e+01 3.070e+00
1.000e+01	2.576e+01 2.044e+00
1.050e+01	1.483e+01 1.177e+00
1.100e+01	6.067e+00 4.815e-01
1.150e+01	6.023e-01 4.780e-02
1.200e+01	6.130e-01 4.863e-02
1.250e+01	6.141e-01 4.874e-02
1.300e+01	6.046e-01 4.799e-02
1.350e+01	5.840e-01 4.633e-02
1.400e+01	5.517e-01 4.378e-02
1.450e+01	5.074e-01 4.027e-02
1.500e+01	4.512e-01 3.581e-02
1.550e+01	3.840e-01 3.048e-02
1.600e+01	3.080e-01 2.444e-02
1.650e+01	2.277e-01 1.807e-02
1.700e+01	1.511e-01 1.199e-02
1.750e+01	8.902e-02 7.065e-03
1.800e+01	5.004e-02 3.971e-03
1.850e+01	2.326e-02 1.840e-03
1.900e+01	2.840e-02 2.254e-03

laboratory bombardment energy = 14.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1412.1
 excitation energy of compound nucleus = 21.4mev j= 0
 reaction cross section 1412.1

E gamma (mev)	cross section (mb/mev) (mb/sr mev)	
5.000e-01	1.305e+03	1.034e+02
1.000e+00	7.947e+02	6.507e+01
1.500e+00	5.696e+02	4.521e+01
2.000e+00	4.612e+02	3.660e+01
2.500e+00	3.966e+02	3.148e+01
3.000e+00	3.453e+02	2.740e+01
3.500e+00	2.978e+02	2.363e+01
4.000e+00	2.540e+02	2.016e+01
4.500e+00	2.143e+02	1.701e+01
5.000e+00	1.788e+02	1.419e+01
5.500e+00	1.475e+02	1.171e+01
6.000e+00	1.205e+02	9.563e+00
6.500e+00	9.756e+01	7.743e+00
7.000e+00	7.855e+01	6.234e+00
7.500e+00	6.303e+01	5.003e+00
8.000e+00	5.087e+01	4.037e+00
8.500e+00	4.060e+01	3.222e+00
9.000e+00	3.176e+01	2.520e+00
9.500e+00	2.399e+01	1.904e+00
1.000e+01	1.724e+01	1.368e+00
1.050e+01	1.146e+01	9.119e-01
1.100e+01	6.485e+00	5.147e-01
1.150e+01	2.185e+00	1.734e-01
1.200e+01	2.319e+00	1.840e-01
1.250e+01	4.35e+00	1.825e-01
1.300e+01	5.544e+00	1.919e-01
1.350e+01	2.629e+00	2.087e-01
1.400e+01	2.691e+00	2.136e-01
1.450e+01	7.23e+00	2.161e-01
1.500e+01	5.716e+00	2.156e-01
1.550e+01	2.657e+00	2.109e-01
1.600e+01	2.525e+00	2.004e-01
1.650e+01	2.297e+00	1.823e-01
1.700e+01	1.951e+00	1.549e-01
1.750e+01	1.497e+00	1.155e-01
1.800e+01	9.987e-01	7.926e-02
1.850e+01	5.639e-01	4.472e-02
1.900e+01	2.676e-01	1.24e-02
1.950e+01	1.101e-01	8.740e-03
2.000e+01	4.409e-02	3.500e-03
2.050e+01	2.276e-02	1.807e-03

laboratory bombardment energy = 16.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 24 mass num= 57
 total reaction cross section = 1394.9
 excitation energy of compound nucleus = 23.4mev j= 0
 reaction cross section 1394.9

gamma (mev)	cross section (mb/mev) (mb/gr.mev)
5.000e-01	1.323e+03 1.050e+02
1.000e+00	8.226e+02 6.529e+01
1.500e+00	5.662e+02 4.494e+01
2.000e+00	4.152e+02 3.295e+01
2.500e+00	3.174e+02 2.519e+01
3.000e+00	2.524e+02 2.005e+01
3.500e+00	2.085e+02 1.654e+01
4.000e+00	1.751e+02 1.389e+01
4.500e+00	1.471e+02 1.167e+01
5.000e+00	1.223e+02 9.704e+00
5.500e+00	1.005e+02 7.976e+00
6.000e+00	8.157e+01 6.473e+00
6.500e+00	6.525e+01 5.17e+00
7.000e+00	5.127e+01 4.069e+00
7.500e+00	3.958e+01 3.141e+00
8.000e+00	3.123e+01 2.478e+00
8.500e+00	2.471e+01 1.941e+00
9.000e+00	1.911e+01 1.516e+00
9.500e+00	1.427e+01 1.132e+00
1.000e+01	1.014e+01 8.048e-01
1.050e+01	6.584e+00 5.225e-01
1.100e+01	3.453e+00 2.744e-01
1.150e+01	7.951e-01 6.110e-02
1.200e+01	8.741e-01 6.937e-02
1.250e+01	9.560e-01 7.587e-02
1.300e+01	1.041e+00 8.260e-02
1.350e+01	1.128e+00 8.954e-02
1.400e+01	1.218e+00 9.668e-02
1.450e+01	1.309e+00 1.039e-01
1.500e+01	1.399e+00 1.110e-01
1.550e+01	1.481e+00 1.175e-01
1.600e+01	1.542e+00 1.224e-01
1.650e+01	1.590e+00 1.259e-01
1.700e+01	1.604e+00 1.26e-01
1.750e+01	1.348e+00 1.070e-01
1.800e+01	1.085e+00 8.614e-02
1.850e+01	7.730e-01 6.135e-02
1.900e+01	4.894e-01 3.844e-02
1.950e+01	2.814e-01 2.233e-02
2.000e+01	1.508e-01 1.197e-02
2.050e+01	7.739e-02 6.142e-03

laboratory bombardment energy = 18.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1349.3
 excitation energy of compound nucleus = 25.3mev j= 0
 reaction cross section 1349.3

e gamma (mev)	cross section (mb/mev) (mb/cr. mev)
5.000e-01	1.314e+03 1.042e+02
1.000e+00	8.434e+02 6.694e+01
1.500e+00	5.968e+02 4.737e+01
2.000e+00	4.401e+02 3.493e+01
2.500e+00	3.281e+02 2.604e+01
3.000e+00	2.445e+02 1.947e+01
3.500e+00	1.810e+02 1.437e+01
4.000e+00	1.342e+02 1.065e+01
4.500e+00	1.003e+02 7.960e+00
5.000e+00	7.645e+01 6.067e+00
5.500e+00	5.978e+01 4.744e+00
6.000e+00	4.755e+01 3.774e+00
6.500e+00	3.776e+01 2.996e+00
7.000e+00	2.943e+01 2.336e+00
7.500e+00	2.241e+01 1.776e+00
8.000e+00	1.757e+01 1.394e+00
8.500e+00	1.408e+01 1.117e+00
9.000e+00	1.117e+01 8.864e-01
9.500e+00	8.735e+00 6.933e-01
1.000e+01	6.716e+00 5.335e-01
1.050e+01	5.019e+00 3.983e-01
1.100e+01	3.558e+00 2.823e-01
1.150e+01	2.370e+00 1.881e-01
1.200e+01	2.672e+00 2.120e-01
1.250e+01	5.002e+00 3.822e-01
1.300e+01	3.365e+00 2.671e-01
1.350e+01	3.766e+00 2.989e-01
1.400e+01	4.211e+00 3.342e-01
1.450e+01	4.702e+00 3.732e-01
1.500e+01	5.240e+00 4.159e-01
1.550e+01	5.811e+00 4.612e-01
1.600e+01	6.376e+00 5.060e-01
1.650e+01	6.844e+00 5.432e-01
1.700e+01	7.056e+00 5.600e-01
1.750e+01	6.804e+00 5.400e-01
1.800e+01	5.967e+00 4.736e-01
1.850e+01	4.684e+00 3.719e-01
1.900e+01	3.318e+00 2.633e-01
1.950e+01	2.165e+00 1.718e-01
2.000e+01	1.332e+00 1.057e-01
2.050e+01	7.839e-01 6.222e-02
2.100e+01	4.442e-01 3.525e-02
2.150e+01	2.422e-01 1.922e-02
2.200e+01	1.267e-01 1.005e-02
2.250e+01	6.360e-02 5.040e-03
2.300e+01	3.121e-02 2.477e-03
2.350e+01	1.597e-02 1.267e-03
2.400e+01	9.645e-03 7.655e-04
2.450e+01	7.418e-03 5.887e-04
2.500e+01	6.664e-03 5.289e-04

laboratory bombardment energy = 20.0mev target mass = 56.0
 compound nucleus mass = 57.0 compound nucleus formation q value = 7.6
 compound nucleus atomic number = 26 mass num= 57
 total reaction cross section = 1305.3
 excitation energy of compound nucleus = 27.3mev j= 0
 reaction cross section 1305.3

e gamma (mev)	cross section (mb/mev) (mb/sr.meV)
5.000e-01	1.309e+03 1.039e+02
1.000e+00	8.689e+02 6.896e+01
1.500e+00	6.387e+02 5.069e+01
2.000e+00	4.895e+02 3.885e+01
2.500e+00	3.770e+02 2.992e+01
3.000e+00	2.889e+02 2.293e+01
3.500e+00	2.190e+02 1.735e+01
4.000e+00	1.634e+02 1.297e+01
4.500e+00	1.201e+02 9.535e+00
5.000e+00	8.641e+01 6.858e+00
5.500e+00	6.109e+01 4.849e+00
6.000e+00	4.236e+01 3.362e+00
6.500e+00	2.903e+01 2.314e+00
7.000e+00	1.993e+01 1.581e+00
7.500e+00	1.381e+01 1.096e+00
8.000e+00	1.035e+01 8.214e-01
8.500e+00	8.100e+00 6.425e-01
9.000e+00	6.266e+00 4.975e-01
9.500e+00	4.759e+00 3.777e-01
1.000e+01	3.531e+00 2.803e-01
1.050e+01	2.519e+00 1.995e-01
1.100e+01	1.663e+00 1.320e-01
1.150e+01	1.006e+00 7.986e-02
1.200e+01	1.156e+00 9.175e-02
1.250e+01	1.326e+00 1.052e-01
1.300e+01	1.519e+00 1.205e-01
1.350e+01	1.740e+00 1.381e-01
1.400e+01	1.995e+00 1.583e-01
1.450e+01	2.290e+00 1.811e-01
1.500e+01	2.629e+00 2.086e-01
1.550e+01	3.011e+00 2.390e-01
1.600e+01	3.424e+00 2.717e-01
1.650e+01	3.852e+00 3.034e-01
1.700e+01	4.285e+00 3.364e-01
1.750e+01	4.165e+00 3.302e-01
1.800e+01	3.857e+00 3.061e-01
1.850e+01	3.221e+00 2.556e-01
1.900e+01	2.445e+00 1.940e-01
1.950e+01	1.728e+00 1.372e-01
2.000e+01	1.166e+00 9.256e-02
2.050e+01	7.649e-01 6.070e-02
2.100e+01	5.921e-01 4.706e-02
2.150e+01	3.118e-01 2.475e-02
2.200e+01	1.946e-01 1.545e-02
2.250e+01	1.196e-01 9.493e-03
2.300e+01	7.252e-02 5.793e-03
2.350e+01	4.314e-02 3.424e-03
2.400e+01	2.565e-02 2.036e-03
2.450e+01	1.558e-02 1.237e-03
2.500e+01	1.809e-02 1.409e-03
2.550e+01	7.297e-03 5.791e-04
2.600e+01	5.980e-03 4.746e-04
2.650e+01	3.799e-03 2.969e-04
2.700e+01	1.055e-03 8.012e-05