IEC-53

Present Status of Photonuclear Data Evaluation Work in JNDC

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In 1988, a photonuclear data working group has been organized under an activity in Japanese Nuclear Data Committee(JNDC) and then evaluation works started.

We intend to evaluate all of the natural isotopes, several transuranic nuclei(TRU) and some fission products(FP). Unfortunately, our group does not have large man-powers, so we determined to divide the period of file construction into three periods. In the first period, the following nuclides will have been evaluated by April in 1993: C, N, O, Na, Mg, Al, Ca, Ti, Cr, Fe, Co, Ni, Cu, Zr, Mo, Ta, W, Pb, Bi and U. Untill now we have almost finished evaluation of absorption cross sections and photoneutron cross sections for the above nuclides. And now we are performing theoretical calculations of various types of cross sections. In the second period, the following nuclides will be evaluated by 1996: H, D, Be, Si, Cl, Ar, K, Sr, Sn, Cs, Pt, Au, Th, Pu and Np. In the third period, the remaining nuclides will be evaluated by 2000: We are planning to complete the primary version of the photonuclear data file within 2 or 3 years.

We have determined to construct the photonuclear data file using ENDF-6 format. The photonuclear data are evaluated from the threshold energy to 140 MeV(corresponding to the pion threshold). The following data types will be stored: absorption cross sections(photonuclear cross sections), photoneutron cross sections($\sigma[(\gamma, n)+(\gamma, pn)+(\gamma, 2n)+\cdots]$), photoneutron yield cross sections($\sigma[(\gamma, n)+(\gamma, pn)+2(\gamma, 2n)+\cdots]$), single neutron emission cross sections($\sigma[(\gamma, n)+(\gamma, pn)]$), double neutron emission cross sections($\sigma[(\gamma, 2n)+(\gamma, x2n)]$), photo-p, d, t, ^{3}He, α yield cross sections, neutron energy spectra, proton energy spectra, neutron angular distributions, proton angular distributions, neutron DDX, proton DDX, and isotope production cross sections.

Finally, we attach, as an example, the evaluated cross sections for ^{65}Cu in figures and table.

Table 12 Evaluated values for ^{65}Cu(γ, n)^{65}Cu production cross section.

E (MeV)	σ (mb)	E (MeV)	σ (mb)	E (MeV)	σ (mb)
0.000E+00	0.00000E+00	2.000E+01	1.63719E+01	4.000E+01	1.14086E-01
5.000E-01	0.00000E+00	2.050E+01	1.15543E+01	4.250E+01	1.04049E-01
1.000E+00	0.00000E+00	2.100E+01	7.97185E+00	4.500E+01	8.68555E-02
1.500E+00	0.00000E+00	2.150E+01	5.54935E+00	4.750E+01	8.59638E-02
2.000E+00	0.00000E+00	2.200E+01	4.01204E+00	5.000E+01	6.73942E-02
2.500E+00	0.00000E+00	2.250E+01	3.06978E+00	5.250E+01	6.42382E-02
3.000E+00	0.00000E+00	2.300E+01	2.38261E+00	5.500E+01	5.12618E-02
3.500E+00	0.00000E+00	2.350E+01	1.95043E+00	5.750E+01	5.28272E-02
4.000E+00	0.00000E+00	2.400E+01	1.62775E+00	6.000E+01	4.92624E-02
4.500E+00	0.00000E+00	2.450E+01	1.39998E+00	6.250E+01	4.70759E-02
5.000E+00	0.00000E+00	2.500E+01	1.19789E+00	6.500E+01	4.33792E-02
5.500E+00	0.00000E+00	2.550E+01	1.10102E+00	6.750E+01	3.94672E-02
6.000E+00	0.00000E+00	2.600E+01	9.71983E-01	7.000E+01	3.39424E-02
6.500E+00	0.00000E+00	2.650E+01	9.03378E-01	7.250E+01	3.48079E-02
7.000E+00	0.00000E+00	2.700E+01	8.16254E-01	7.500E+01	3.10087E-02
7.500E+00	0.00000E+00	2.750E+01	7.86743E-01	7.750E+01	3.41355E-02
8.000E+00	0.00000E+00	2.800E+01	7.31411E-01	8.000E+01	2.83138E-02
8.500E+00	0.00000E+00	2.850E+01	6.86263E-01	8.250E+01	2.29657E-02
9.000E+00	0.00000E+00	2.900E+01	6.45592E-01	8.500E+01	2.33037E-02
9.500E+00	0.00000E+00	2.950E+01	6.02228E-01	8.750E+01	2.04014E-02
1.000E+01	8.00000E-01	3.000E+01	5.84000E-01	9.000E+01	2.39404E-02
1.050E+01	6.00000E+00	3.050E+01	5.66749E-01	9.250E+01	1.90424E-02
1.100E+01	1.00000E+01	3.100E+01	5.39013E-01	9.500E+01	1.54775E-02
1.150E+01	1.50000E+01	3.150E+01	5.07841E-01	9.750E+01	1.78042E-02
1.200E+01	1.80000E+01	3.200E+01	5.01320E-01	1.000E+02	1.44664E-02
1.250E+01	2.25000E+01	3.250E+01	4.77765E-01	1.025E+02	1.73556E-02
1.300E+01	2.75000E+01	3.300E+01	4.59390E-01	1.050E+02	1.41147E-02
1.350E+01	3.40000E+01	3.350E+01	4.44540E-01	1.075E+02	1.26561E-02
1.400E+01	4.00000E+01	3.400E+01	4.30718E-01	1.100E+02	1.14383E-02
1.450E+01	5.00000E+01	3.450E+01	3.97705E-01	1.125E+02	1.21536E-02
1.500E+01	5.91250E+01	3.500E+01	3.90877E-01	1.150E+02	1.03617E-02
1.550E+01	6.64950E+01	3.550E+01	3.98691E-01	1.175E+02	9.84868E-03
1.600E+01	7.20920E+01	3.600E+01	3.82159E-01	1.200E+02	1.02377E-02
1.650E+01	7.49440E+01	3.650E+01	3.74348E-01	1.225E+02	1.08961E-02
1.700E+01	7.46440E+01	3.700E+01	3.77736E-01	1.250E+02	8.68357E-03
1.750E+01	7.15180E+01	3.750E+01	3.67078E-01	1.275E+02	9.81442E-03
1.800E+01	6.54583E+01	3.800E+01	3.45761E-01	1.300E+02	9.25567E-03
1.850E+01	5.10343E+01	3.850E+01	3.48428E-01	1.325E+02	8.54419E-03
1.900E+01	3.63196E+01	3.900E+01	3.25785E-01	1.350E+02	6.55494E-03
1.950E+01	2.46567E+01	3.950E+01	3.15182E-01	1.375E+02	7.82196E-03
				1.400E+02	6.25575E-03

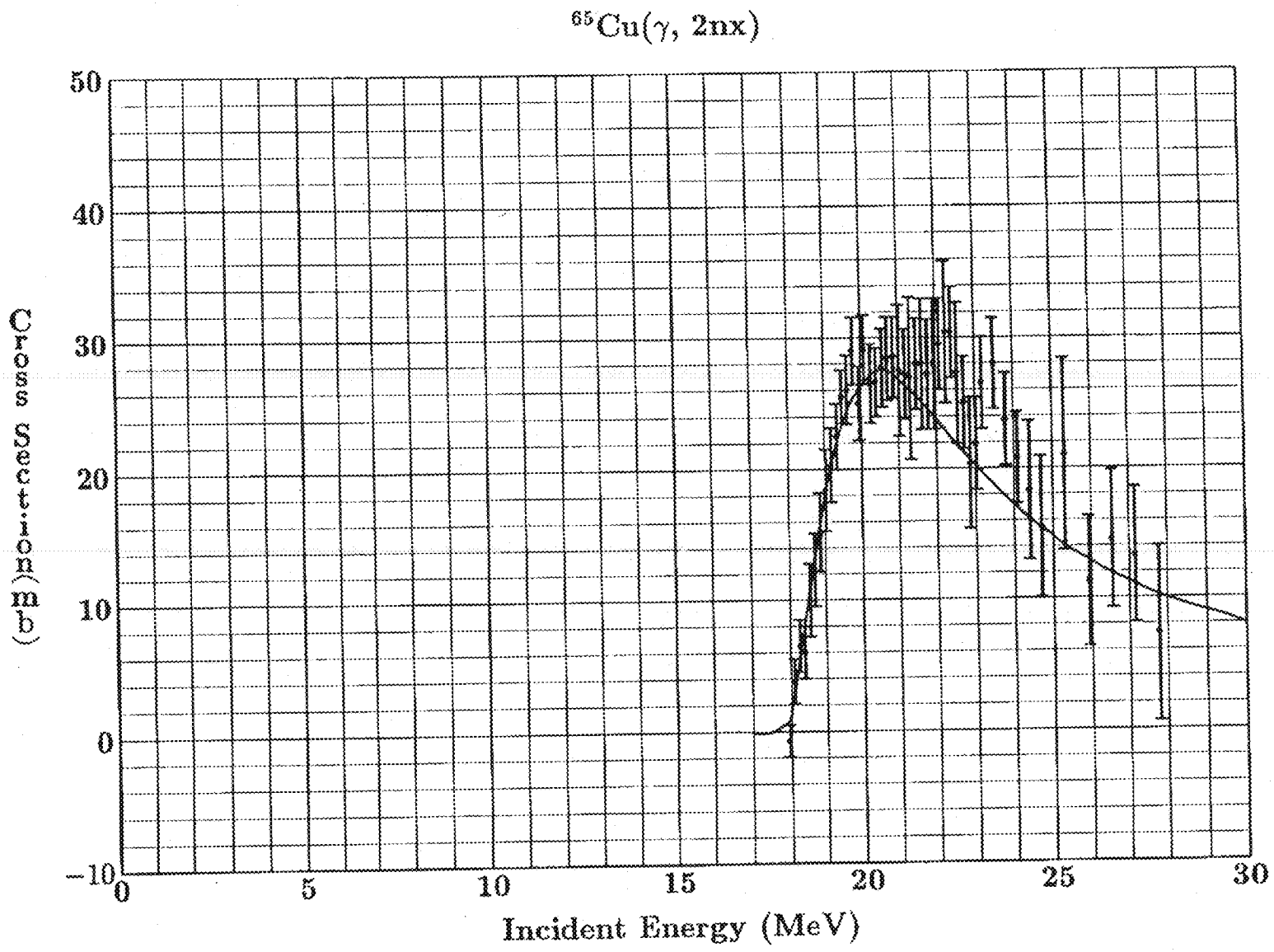

Fig. 28 Comparison between measured(solid circles with error bars) and evaluated(solid line) cross sections for the ^{65}Cu(γ, 2nx) reaction.

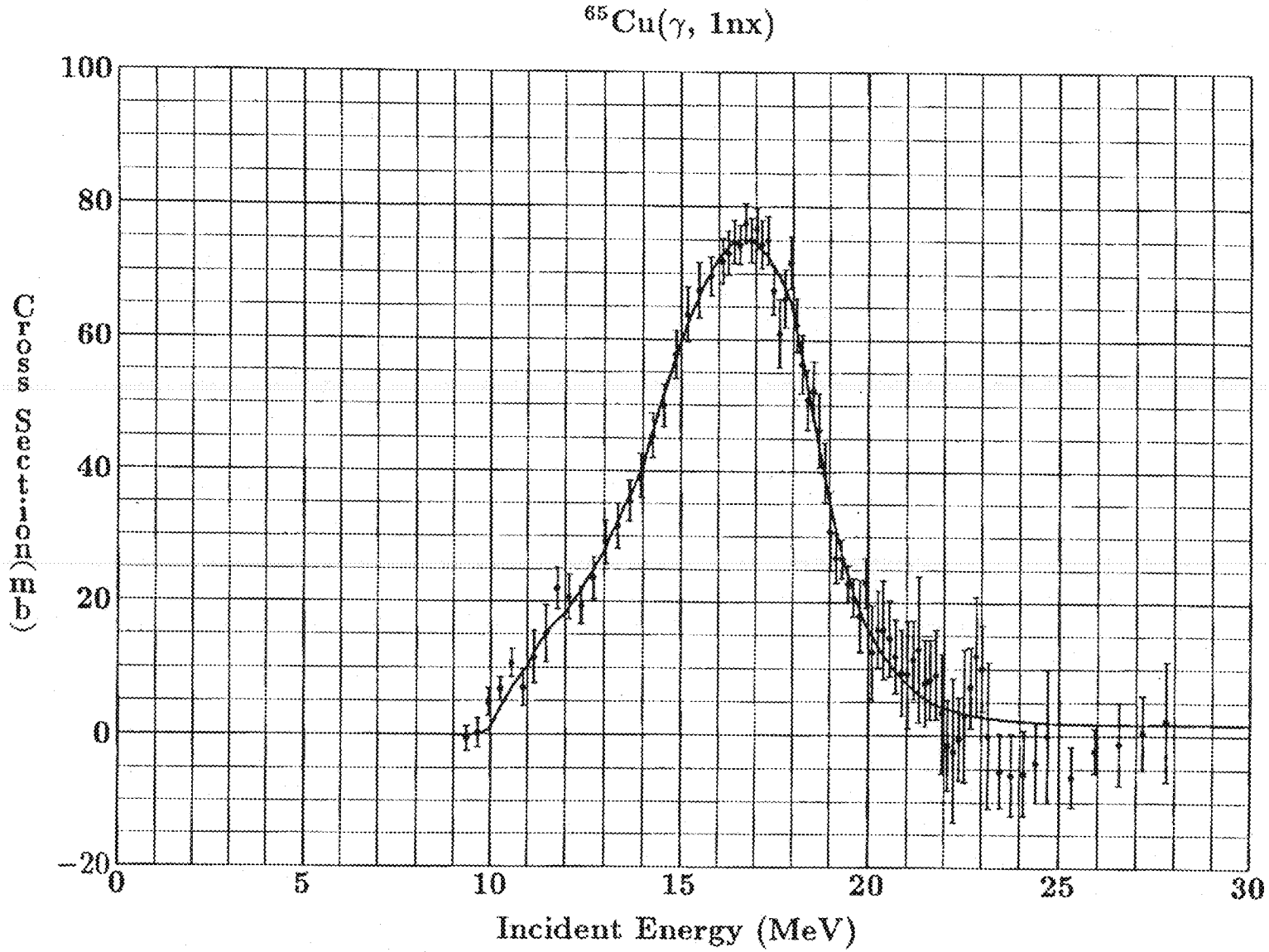

Fig. 27 Comparison between measured(solid circles with error bars) and evaluated(solid line) cross sections for the ^{65}Cu(γ, 1nx) reaction.

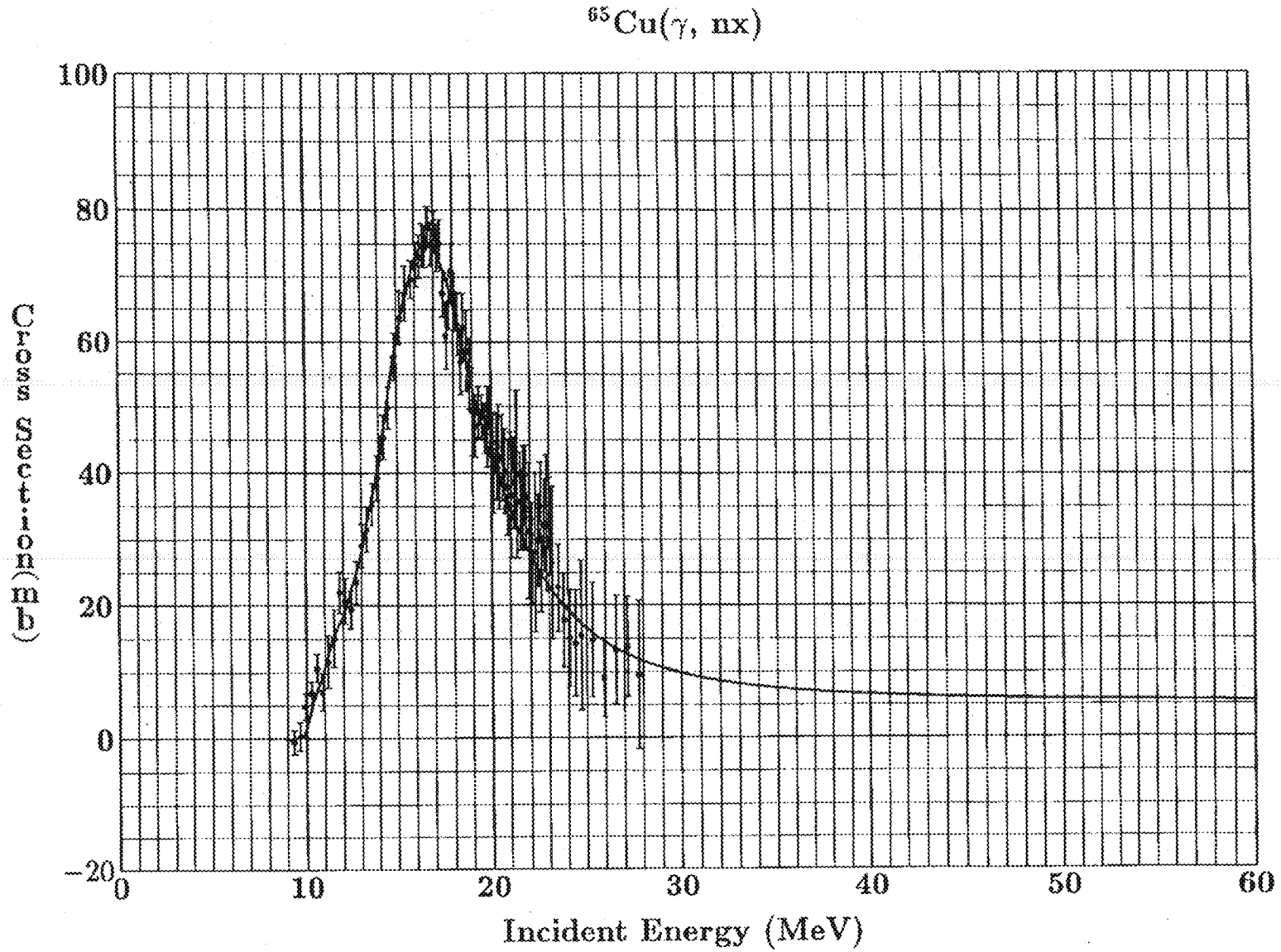

Fig. 12 Comparison between measured(solid circles with error bars) and evaluated(solid line) photoneutron cross sections for ^{65}Cu.