ENDF/B-VII ZR-90
Principal cross sections

Energy (MeV)

Cross section (barns)

- total
- absorption
- elastic
- gamma production
ENDF/B-VII ZR-90
resonance total cross section

Cross section (barns)

Energy (MeV)
ENDF/B-VII ZR-90
resonance absorption cross sections
ENDF/B-VII ZR-90
resonance absorption cross sections

![Graph showing the resonance absorption cross sections for ENDF/B-VII ZR-90. The x-axis represents Energy (MeV) ranging from $10^{-2}$ to $10^{-1}$, and the y-axis represents Cross section (barns) ranging from $10^{-4}$ to $10^{1}$. The graph features multiple resonances with sharp peaks and valleys, indicative of typical resonance behavior in nuclear reactions. The term "capture" is indicated by a line on the graph.](image-url)
ENDF/B-VII ZR-90
UR total cross section

Energy (MeV)

Cross section (barns)

- Inf. Dil.
- 100 b
ENDF/B-VII ZR-90
UR elastic cross section

Energy (MeV)

Cross section (barns)

Inf. Dil.

100 b
ENDF/B-VII ZR-90
Non-threshold reactions
ENDF/B-VII ZR-90
Principal cross sections

![Graph showing cross sections as functions of energy](image-url)
ENDF/B-VII ZR-90
Non-threshold reactions

Cross section (barns)

Energy (MeV)

10^{-2}
10^{-3}
10^{-4}
ENDF/B-VII ZR-90
Inelastic levels

Energy (MeV)

Cross section (barns)

- (n,n*1)
- (n,n*2)
- (n,n*3)
- (n,n*4)
- (n,n*5)
ENDF/B-VII ZR-90
Inelastic levels

Cross section (barns)

Energy (MeV)
ENDF/B-VII ZR-90
Threshold reactions

Cross section (barns) vs Energy (MeV)

- (n,2n)
- (n,n*)a
- (n,n*)p
- (n,n*c)
- (n,p)
ENDF/B-VII ZR-90
Threshold reactions

Cross section (barns) vs. Energy (MeV) graph.

The graph shows the threshold reactions for ENDF/B-VII ZR-90.

(n,a) reaction.
ENDF/B-VII ZR-90
Threshold reactions

Cross section (barns)

Energy (MeV)

- (n,xp)
- (n,xa)
- (n,p*0)
- (n,p*1)
- (n,p*2)
Threshold reactions

ENDF/B-VII ZR-90

Energy (MeV) vs. Cross section (barns)

- (n,p*13)
- (n,p*14)
- (n,p*15)
- (n,p*16)
- (n,p*c)

Energy (MeV) range: 4 to 20
Cross section range: 0 to 60 $\times 10^{-3}$ barns
ENDF/B-VII ZR-90
Threshold reactions

Energy (MeV)

Cross section (barns)

*(n,a*0)
*(n,a*1)
*(n,a*2)
*(n,a*3)
*(n,a*4)
ENDF/B-VII ZR-90
Threshold reactions

Energy (MeV)

Cross section (barns)

(n,a^5)
(n,a^6)
(n,a^7)
(n,a^8)
(n,a^9)
ENDF/B-VII ZR-90
Threshold reactions

Energy (MeV) vs Cross section (barns)

- (n,a*25)
- (n,a*26)
- (n,a*27)
- (n,a*28)
- (n,a*29)
ENDF/B-VII ZR-90
Threshold reactions

Energy (MeV)

Cross section (barns)

- (n,a*30)
- (n,a*31)
- (n,a*32)
- (n,a*33)
- (n,a*34)
ENDF/B-VII ZR-90
Threshold reactions

![Graph showing cross-sections for different reactions vs energy (MeV)]
ENDF/B-VII ZR-90
angular distribution for elastic
angular distribution for (n,n*1)
ENDF/B-VII ZR-90
angular distribution for (n,n*2)
ENDF/B-VII ZR-90
angular distribution for (n,n*4)
ENDF/B-VII ZR-90
angular distribution for (n,n*5)
ENDF/B-VII ZR-90
angular distribution for (n,n*6)
ENDF/B-VII ZR-90
angular distribution for (n,n*8)
ENDF/B-VII ZR-90
angular distribution for (n,n*9)
ENDF/B-VII ZR-90
angular distribution for (n,n*10)
ENDF/B-VII ZR-90
Neutron emission for (n,2n)
ENDF/B-VII ZR-90
Neutron emission for (n,n*)a

Energy (MeV)

Sec. Energy

Prob./MeV

Energy (MeV)
ENDF/B-VII ZR-90
Neutron emission for (n,n*)p
ENDF/B-VII ZR-90
Neutron emission for (n,n*c)
ENDF/B-VII ZR-90
Photon emission for (n,2n)
ENDF/B-VII ZR-90
Photon emission for \((n,n^*)a\)
Photon emission for (n,n'c)

$P \propto M^V_\gamma$

$E_\gamma (\text{MeV})$

$E_n (\text{MeV})$
ENDF/B-VII ZR-90
Photon emission for (n,gma)
ENDF/B-VII ZR-90
Photon emission for \( (n,a^*c) \)
ENDF/B-VII ZR-90
thermal capture photon spectrum
ENDF/B-VII ZR-90
14 MeV photon spectrum

Gamma Prod (barns/MeV)

Gamma Energy (MeV)
ENDF/B-VII ZR-90
Particle heating contributions

Energy (MeV)

MeV/collision

Energy (MeV)

protons

alphas
ENDF/B-VII ZR-90
Recoil Heating

Heating (MeV/reaction) vs. Energy (MeV)

- Energy (MeV) range: 0 to 20
- Heating (MeV/reaction) range: 0 to 4 \times 10^{-3}

The graph shows the recoil heating as a function of energy.
ENDF/B-VII ZR-90
Particle production cross sections

Cross section (barns)

Energy (MeV)
ENDF/B-VII ZR-90 protons from (n,n*)p
ENDF/B-VII ZR-90
angular distribution for \((n,p^*0)\) proton

![Graph showing the angular distribution for \((n,p^*0)\) proton over a range of energies.](image)
ENDF/B-VII ZR-90 angular distribution for (n,p*) proton

Energy (MeV)

Cosine

Prob/Cos

0.1 1.0 5.0 0.0 -0.5 -1.0

-1.0
ENDF/B-VII ZR-90
angular distribution for (n,p*2) proton
ENDF/B-VII ZR-90
angular distribution for (n,p*3) proton

Energy (MeV)
ENDF/B-VII ZR-90
angular distribution for \((n,p^4)\) proton

Energy (MeV)
ENDF/B-VII ZR-90
angular distribution for (n,p*) proton
ENDF/B-VII ZR-90
angular distribution for (n, p*6) proton
ENDF/B-VII ZR-90
angular distribution for \((n,p^*7)\) proton
ENDF/B-VII ZR-90
angular distribution for (n,p*8) proton
ENDF/B-VII ZR-90
angular distribution for (n,p*9) proton
ENDF/B-VII ZR-90
angular distribution for (n,p*10) proton
ENDF/B-VII ZR-90
angular distribution for (n,p*11) proton
ENDF/B-VII ZR-90
angular distribution for \((n,p^{*12})\) proton
ENDF/B-VII ZR-90
angular distribution for (n,p*13) proton
ENDF/B-VII ZR-90
angular distribution for \((n,p^{*14})\) proton
ENDF/B-VII ZR-90
angular distribution for (n,p*15) proton
ENDF/B-VII ZR-90
angular distribution for \((n,p)\) proton

\[
\begin{array}{cccccc}
\cos \theta & 0.0 & -0.5 & -1.0 & 2 & 4 & 6 & 8 & 10 & 12 & 14 & 16 & 18 & 20 \\
E_{\text{energ}} (\text{MeV}) & 1.0 & 0.5 & 0.0 & -0.5 & -1.0 & 2 & 4 & 6 & 8 & 10 & 12 & 14 & 16 & 18 & 20 \\
\end{array}
\]
ENDF/B-VII ZR-90 alphas from \((n,n^*)a\)
ENDF/B-VII ZR-90
angular distribution for \((n,a^0)\) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*1) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*2) alpha
ENDF/B-VII ZR-90 angular distribution for \((n,a^3)\) alpha

Energy (MeV) vs. Cosine vs. Probability

Energy (MeV) ranges from 0 to 20.
Cosine ranges from -1 to 1.
Probability ranges from 10\(^{-1}\) to 10.0.

ENDF/B-VII ZR-90
angular distribution for (n,a*4) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*5) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*6) alpha
ENDF/B-VII ZR-90
angular distribution for \( (n,a^7) \) alpha
ENDF/B-VII ZR-90 angular distribution for \((n, a^8)\) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*9) alpha
ENDF/B-VII ZR-90 angular distribution for (n,a*10) alpha

Energy (MeV)
ENDF/B-VII ZR-90
angular distribution for (n,a*11) alpha
ENDF/B-VII ZR-90
angular distribution for \((n,a^*12)\) alpha
ENDF/B-VII ZR-90 angular distribution for (n,a*13) alpha
ENDF/B-VII ZR-90 angular distribution for (n,a*14) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*15) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*16) alpha

Energy (MeV)

Cosine

Prob/Cos
ENDF/B-VII ZR-90
angular distribution for (n,a*17) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*18) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*19) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*20) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*22) alpha
Endf/B-VII Zr-90 angular distribution for (n,a*23) alpha

Energy (MeV)

Cosine

Pro/Co
ENDF/B-VII ZR-90
angular distribution for (n,a*24) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*25) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*26) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*27) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*28) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*29) alpha
Angular distribution for (n,α*30) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*32) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a\*33) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*34) alpha
ENDF/B-VII ZR-90 angular distribution for (n,a*35) alpha
ENDF/B-VII ZR-90
angular distribution for \((n,a^*36)\) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a^{37}) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a^{38}) alpha
ENDF/B-VII ZR-90
angular distribution for (n,a*39) alpha
ENDF/B-VII ZR-90
alphas from (n,a*c)