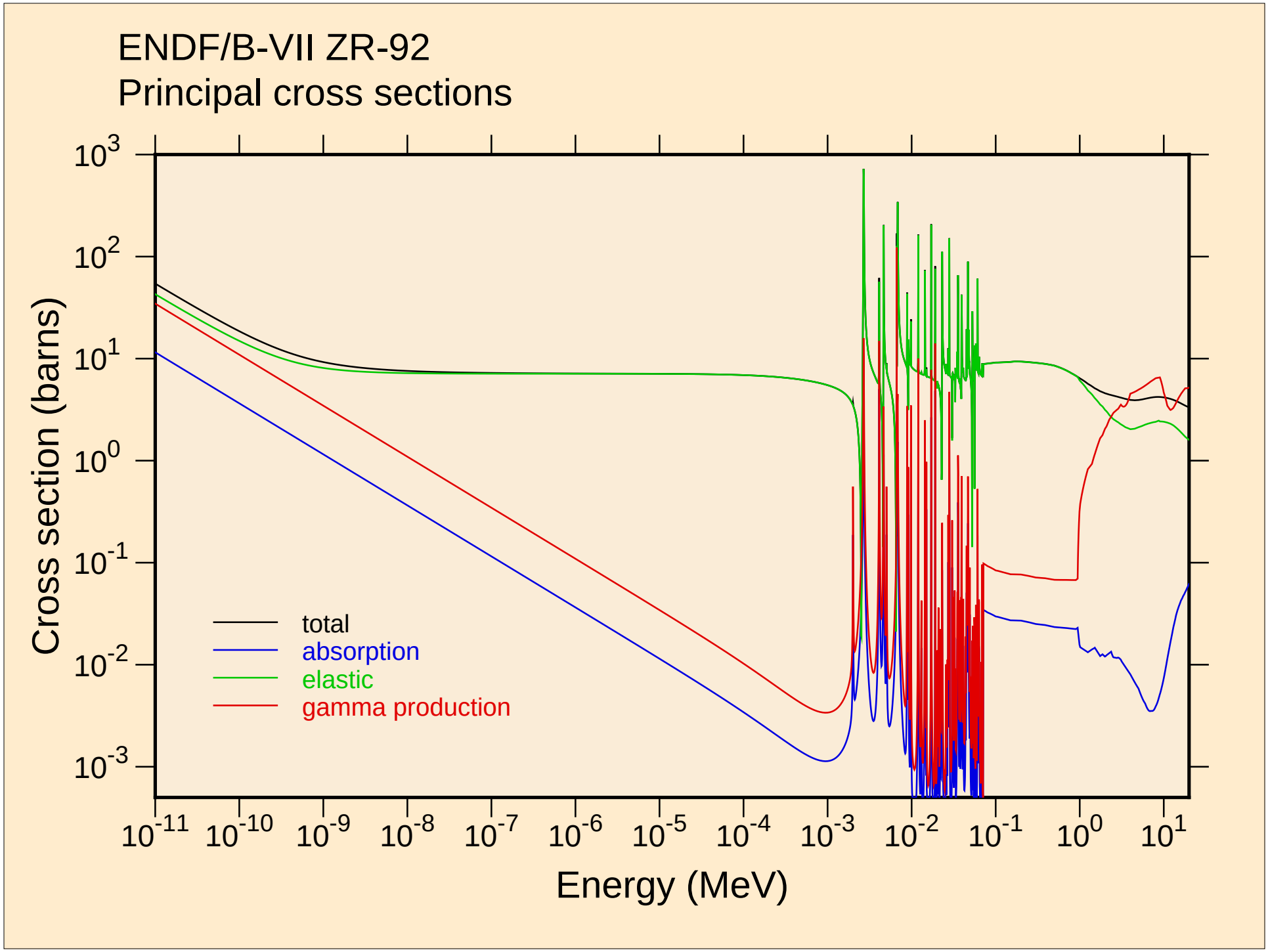
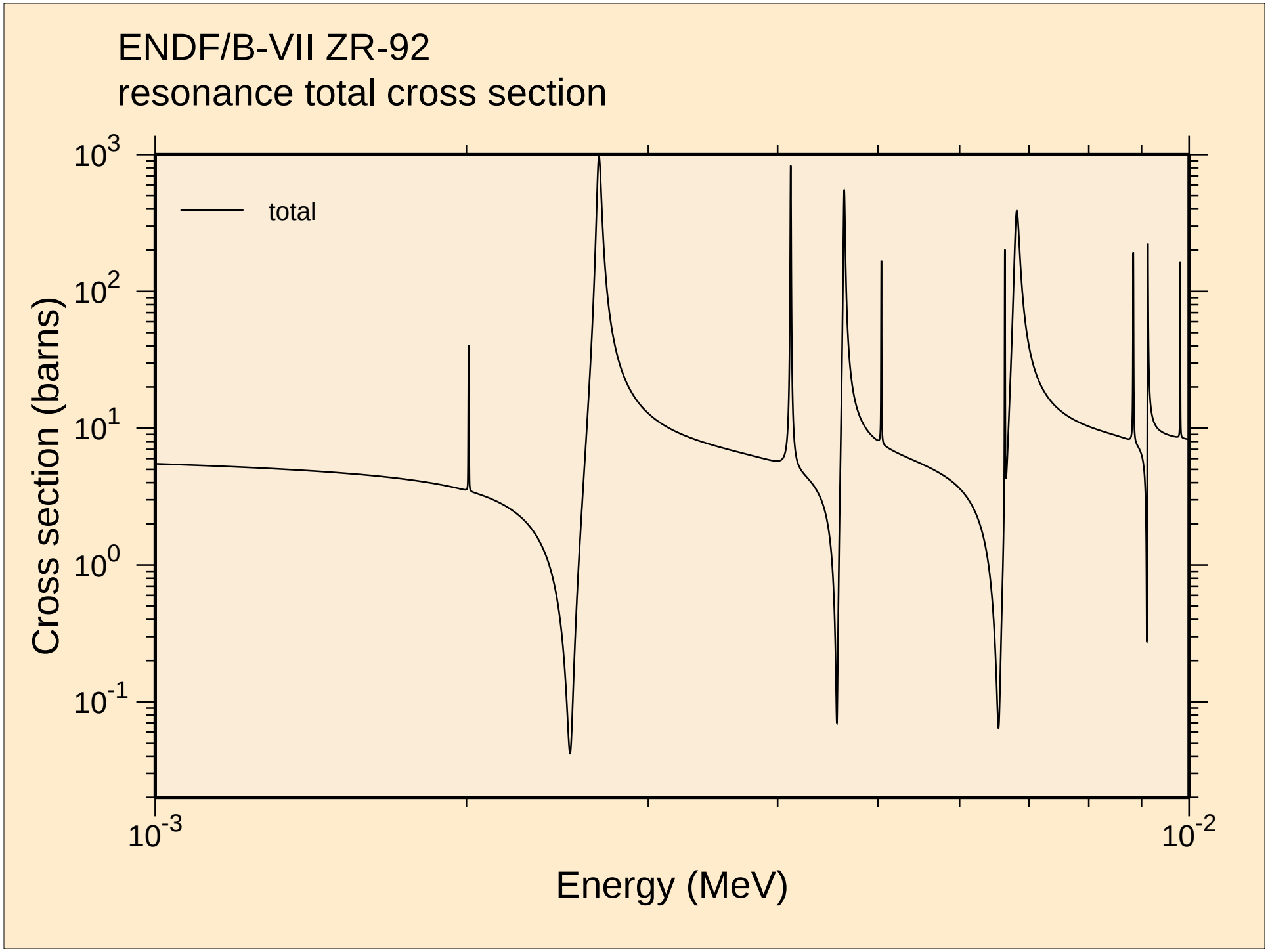
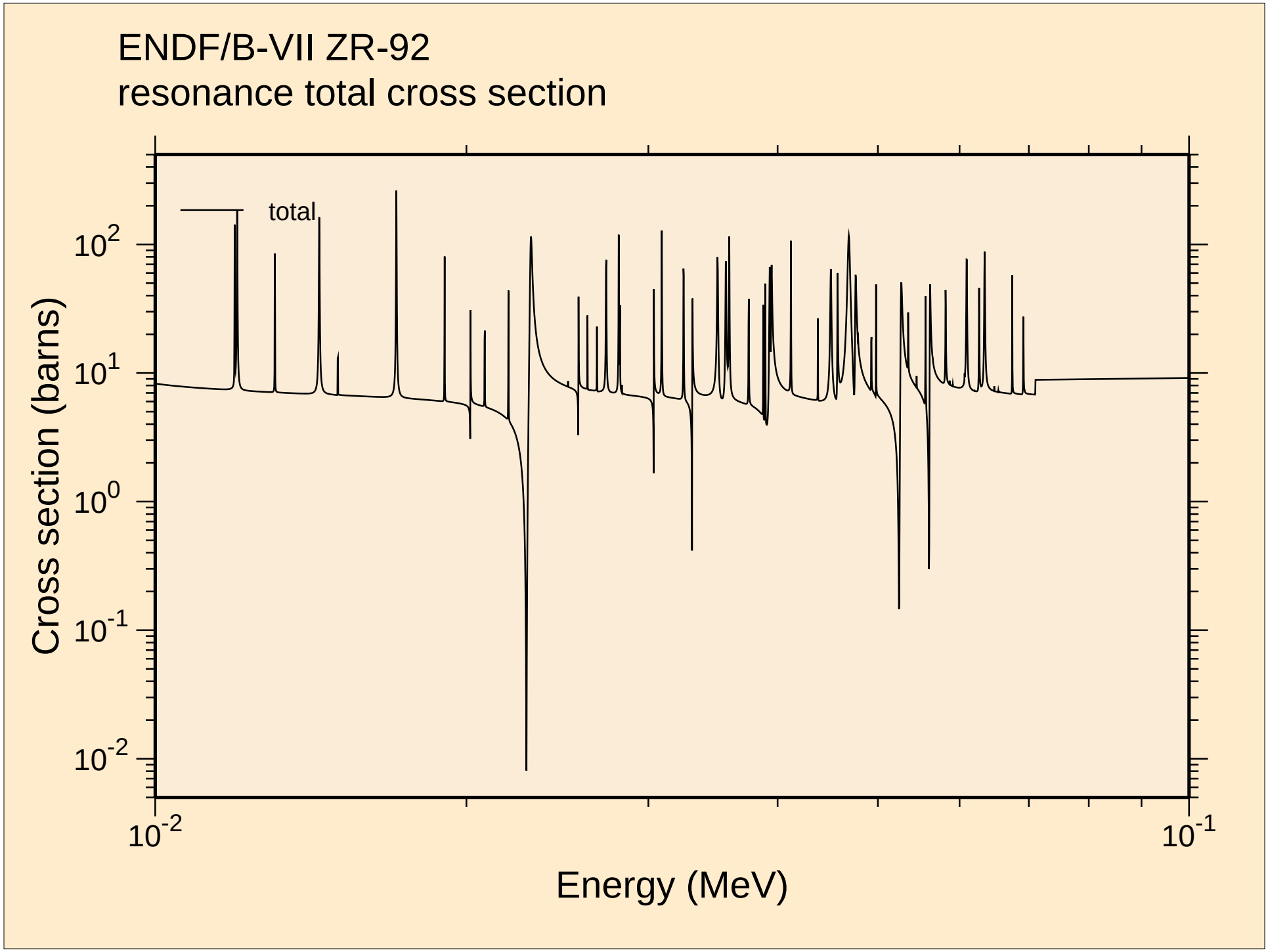
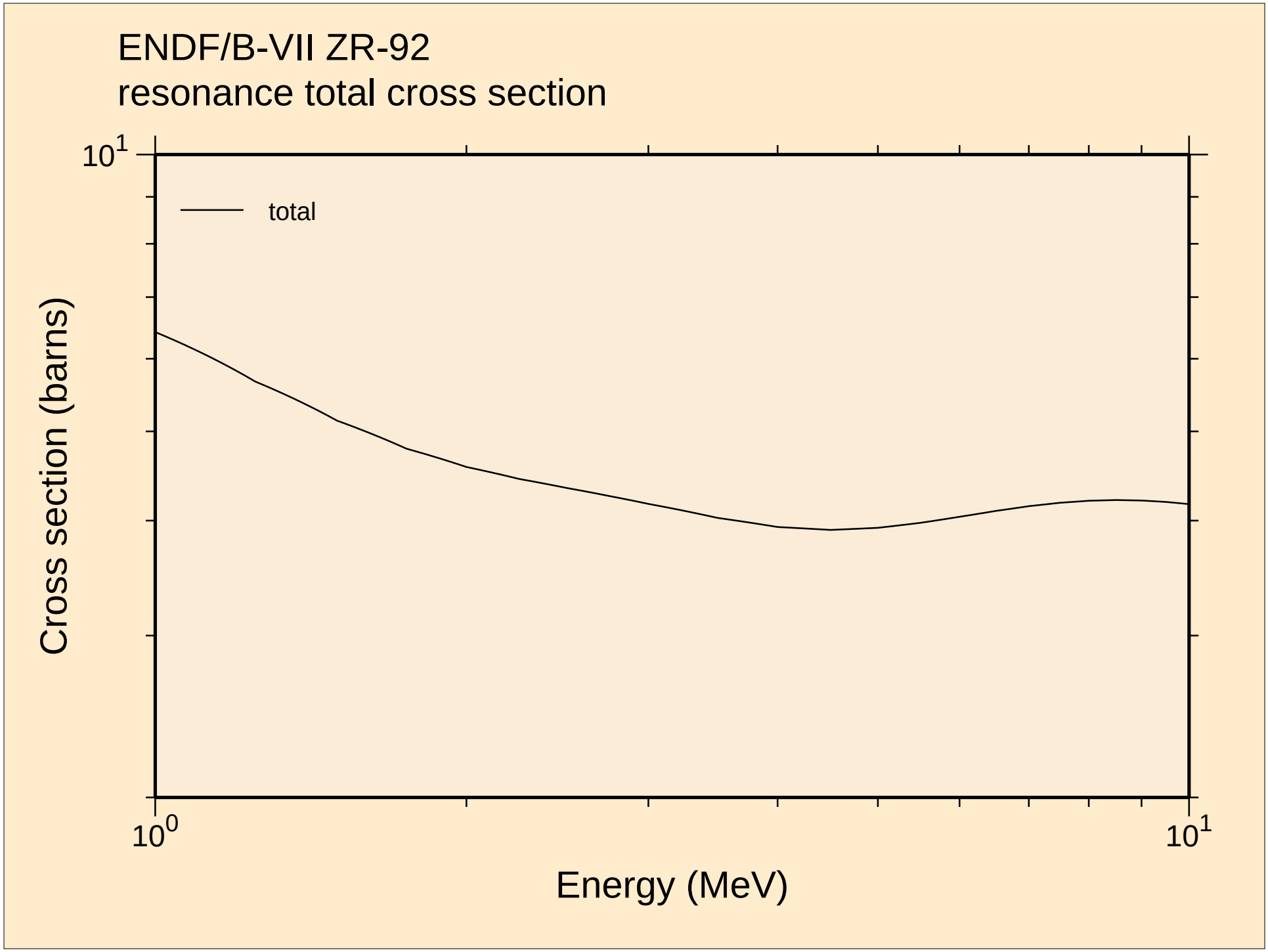
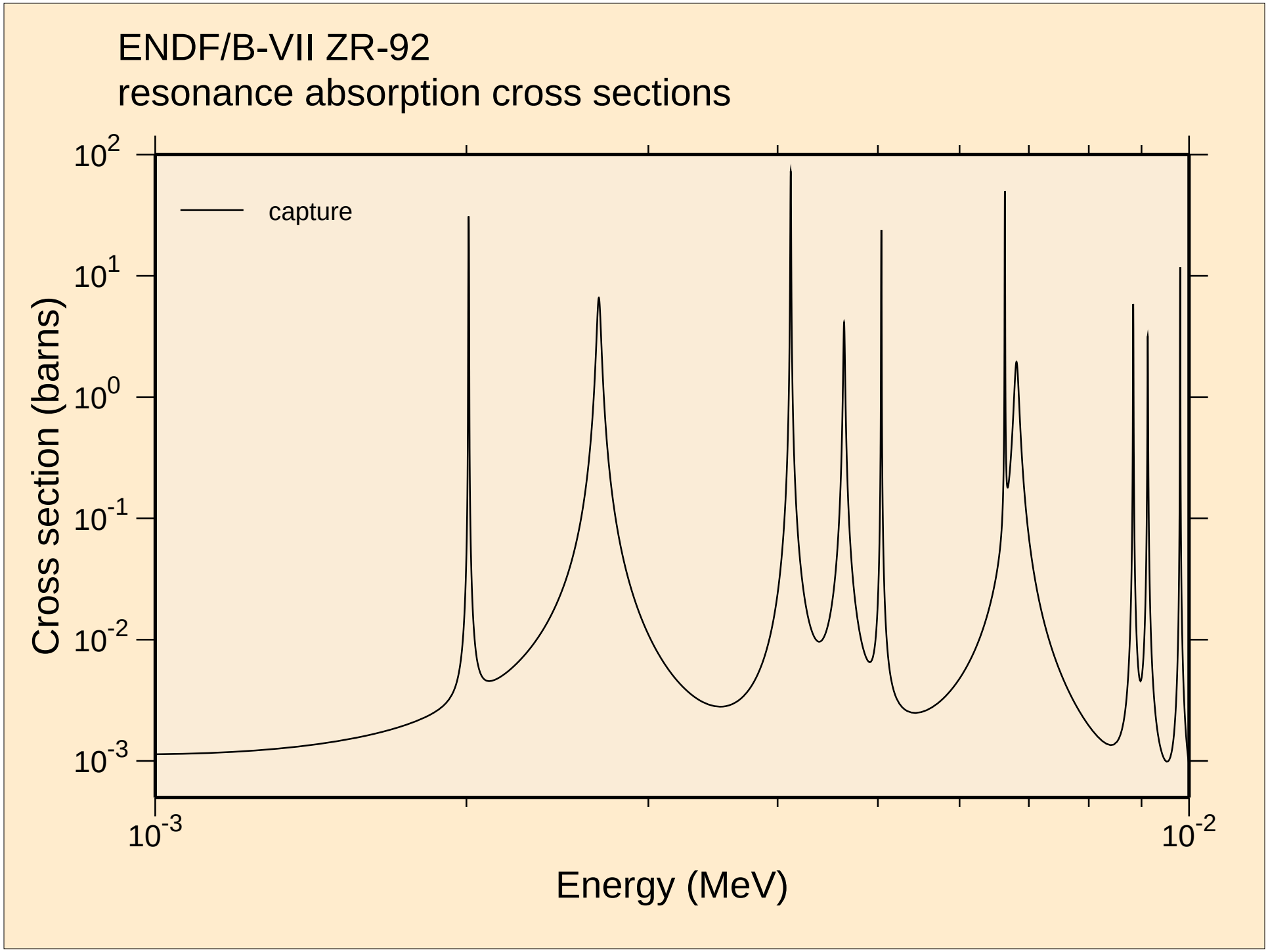

ENDF/B-VII ZR-92
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-11} 10^{-10} 10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1}

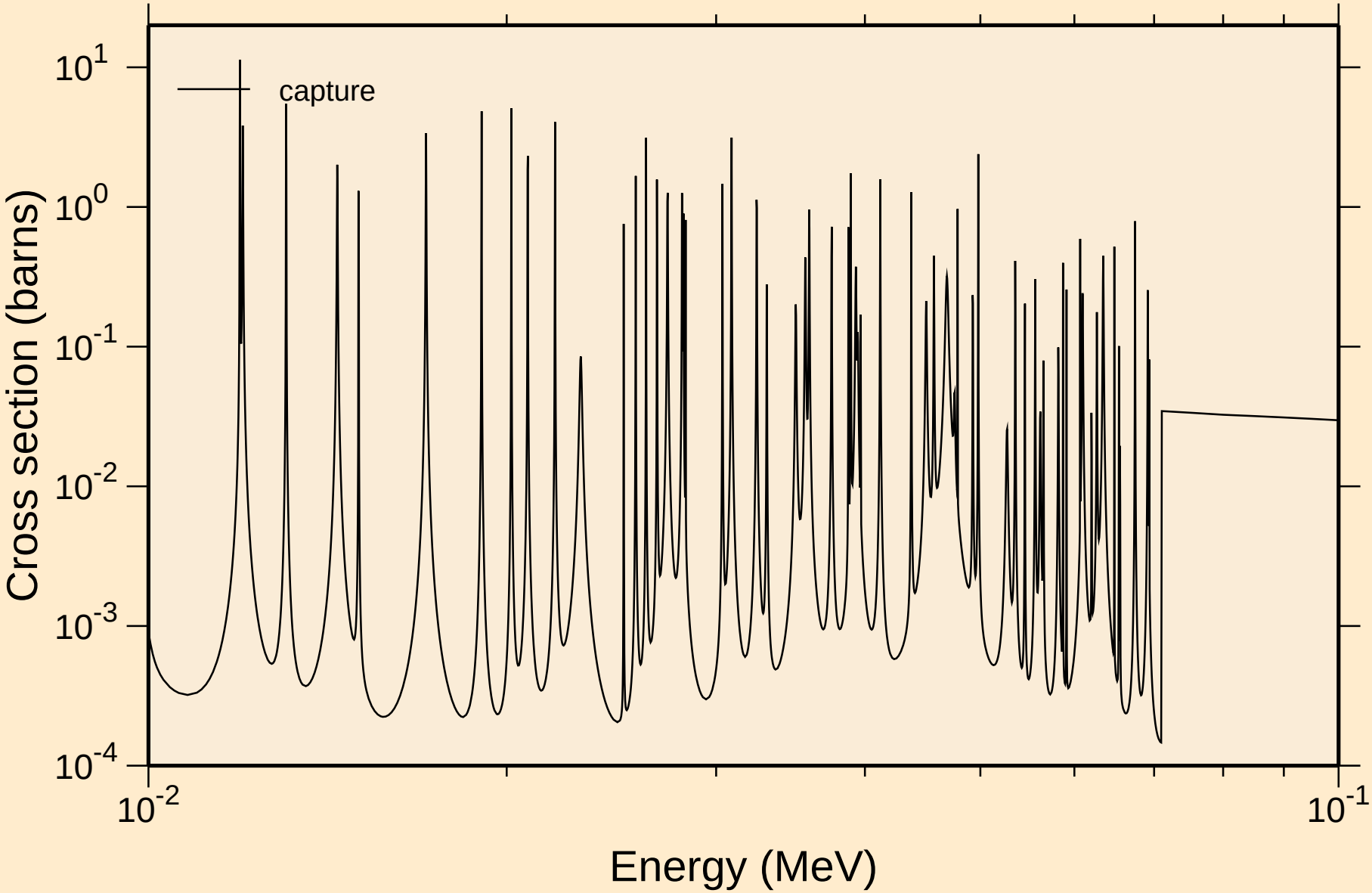

ENDF/B-VII ZR-92
resonance total cross section
total
Cross section (barns)
Energy (MeV)
10^3
10^2
10^1
10^0
10^-1
10^-3
10^-2


ENDF/B-VII ZR-92
resonance total cross section
total
Cross section (barns)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-2}
10^{-1}
Energy (MeV)

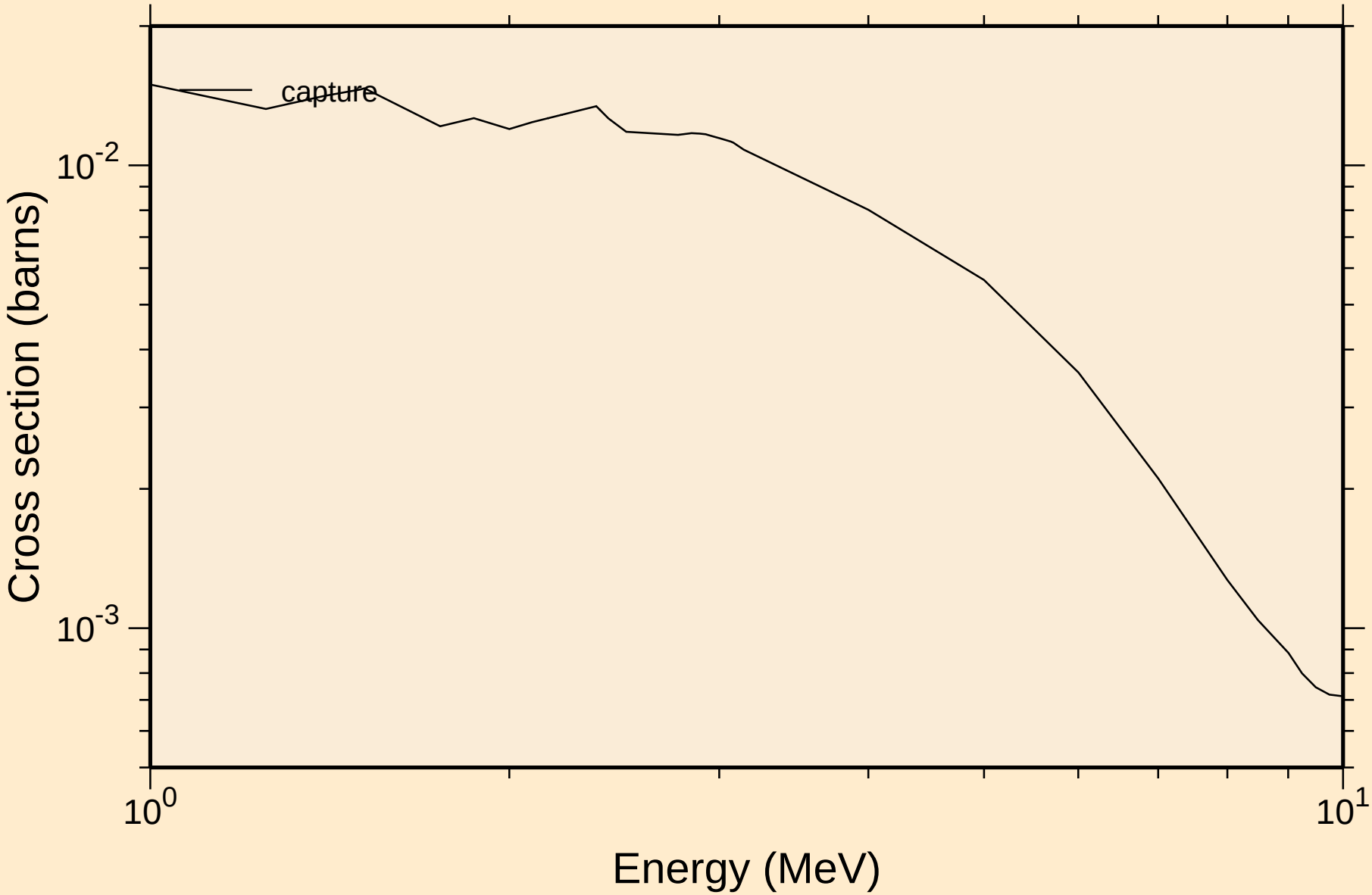

ENDF/B-VII ZR-92
resonance total cross section
total
Cross section (barns)
Energy (MeV)
10^1
10^0
10^1

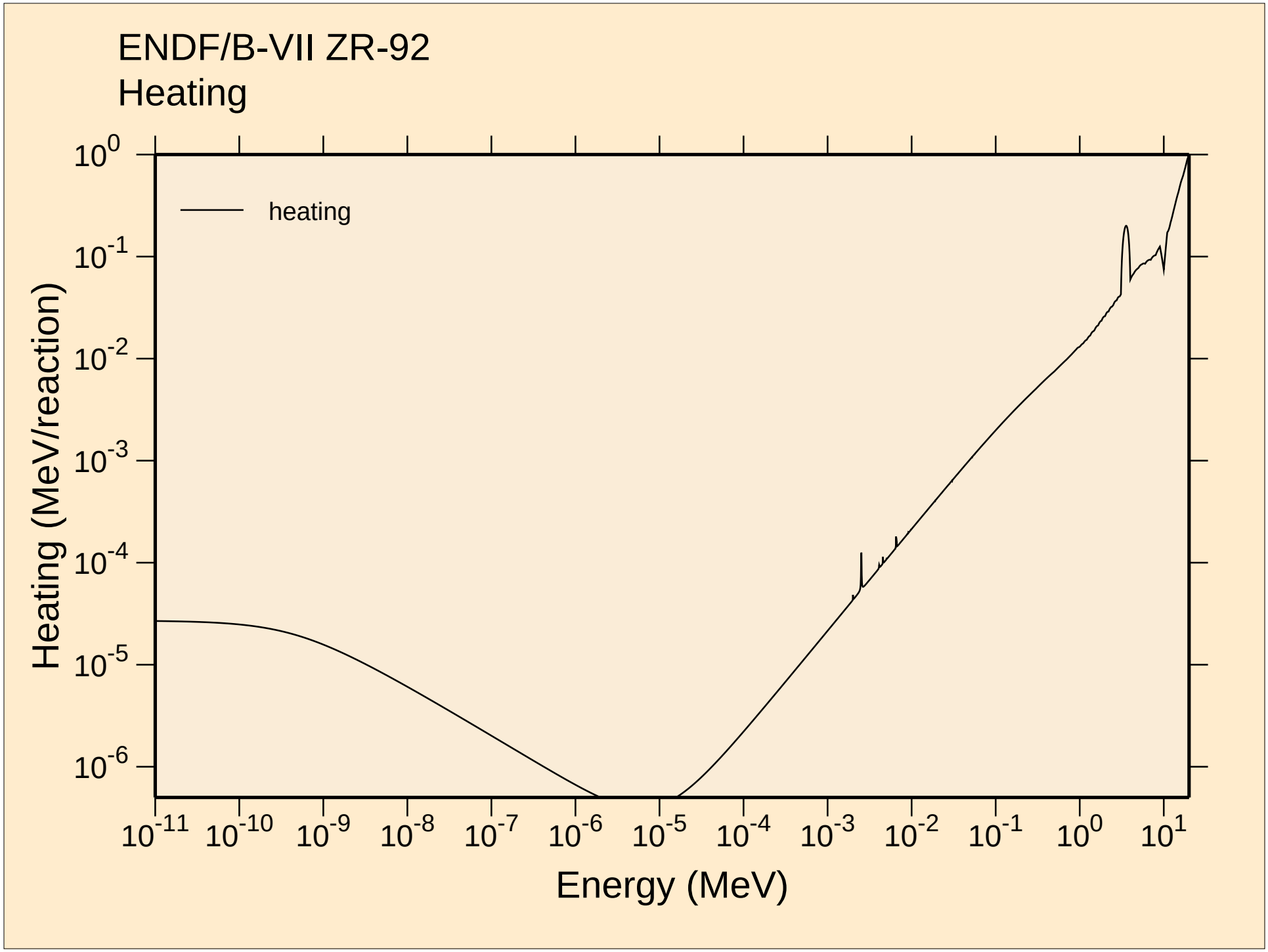

ENDF/B-VII ZR-92
resonance absorption cross sections
capture
Cross section (barns)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-3}
10^{-2}
Energy (MeV)

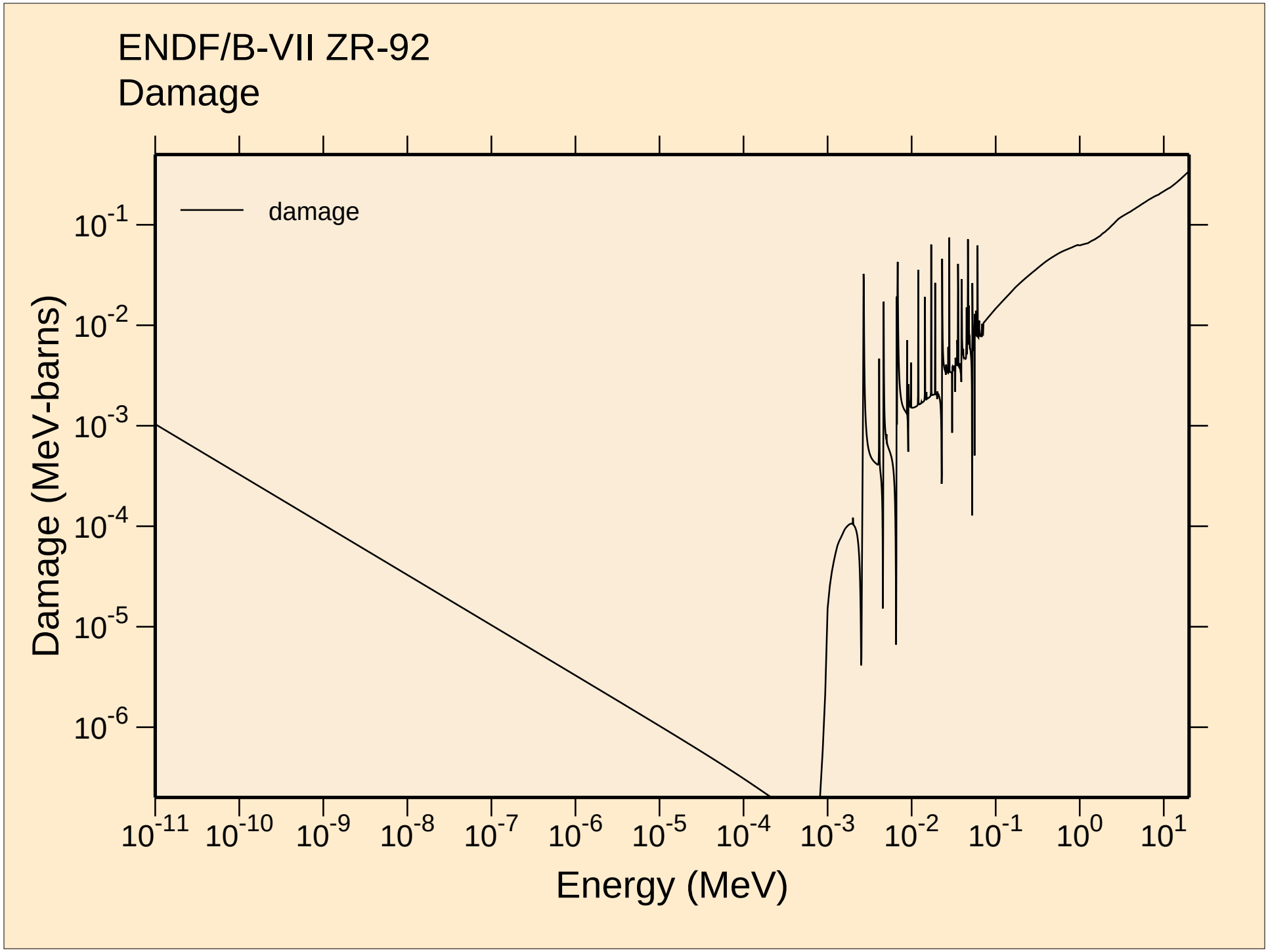
ENDF/B-VII ZR-92
resonance absorption cross sections

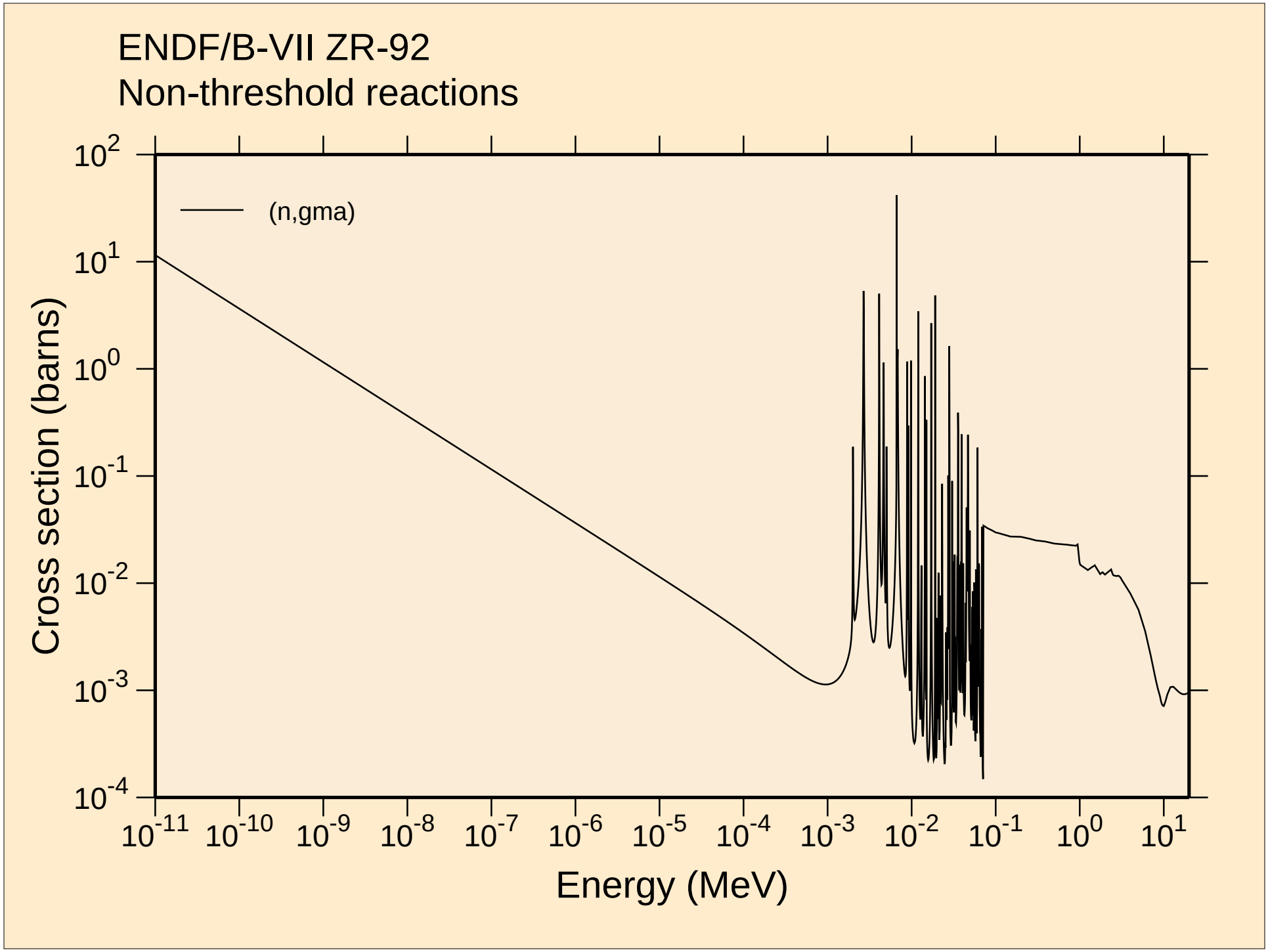


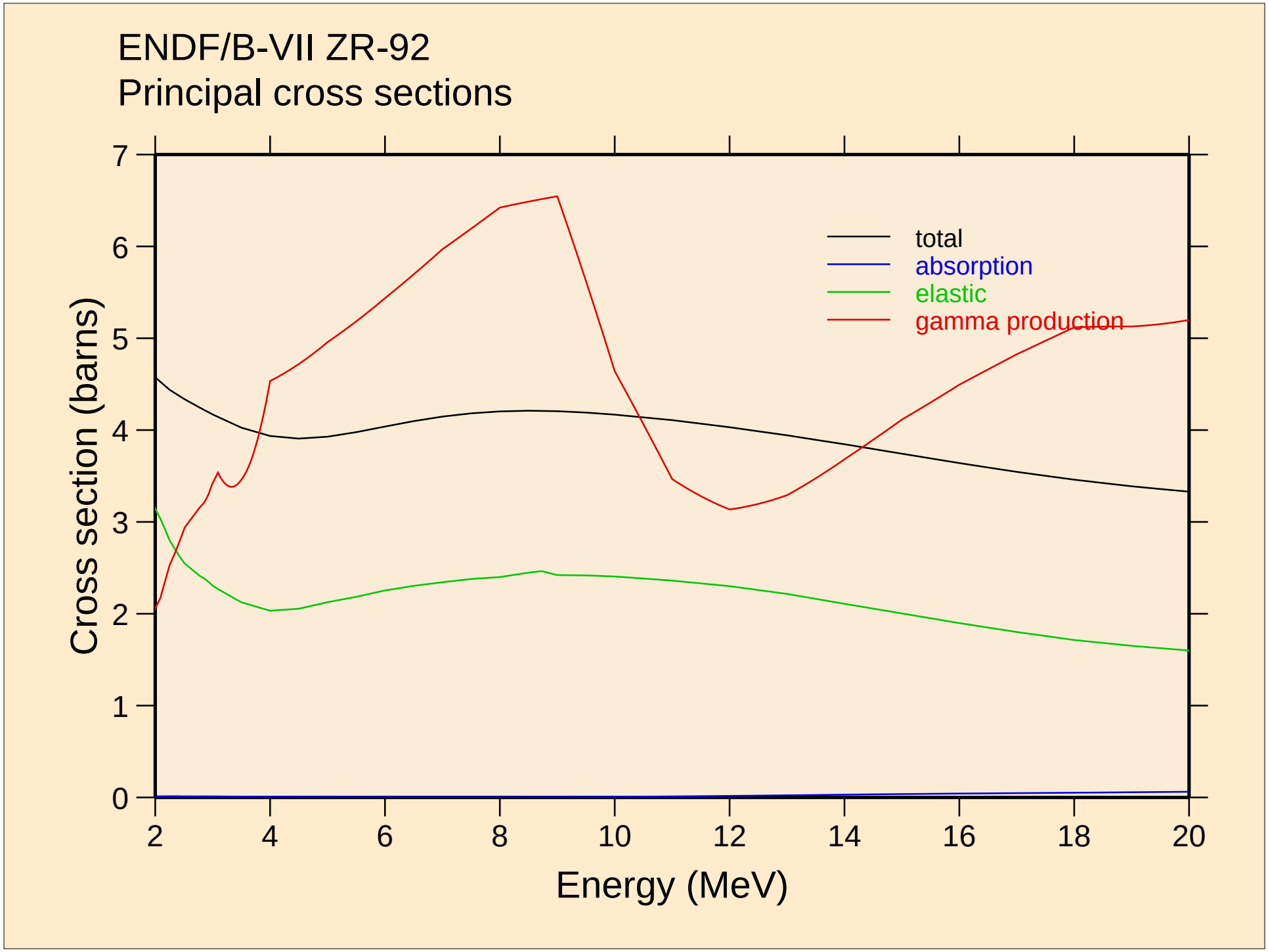
ENDF/B-VII ZR-92
resonance absorption cross sections

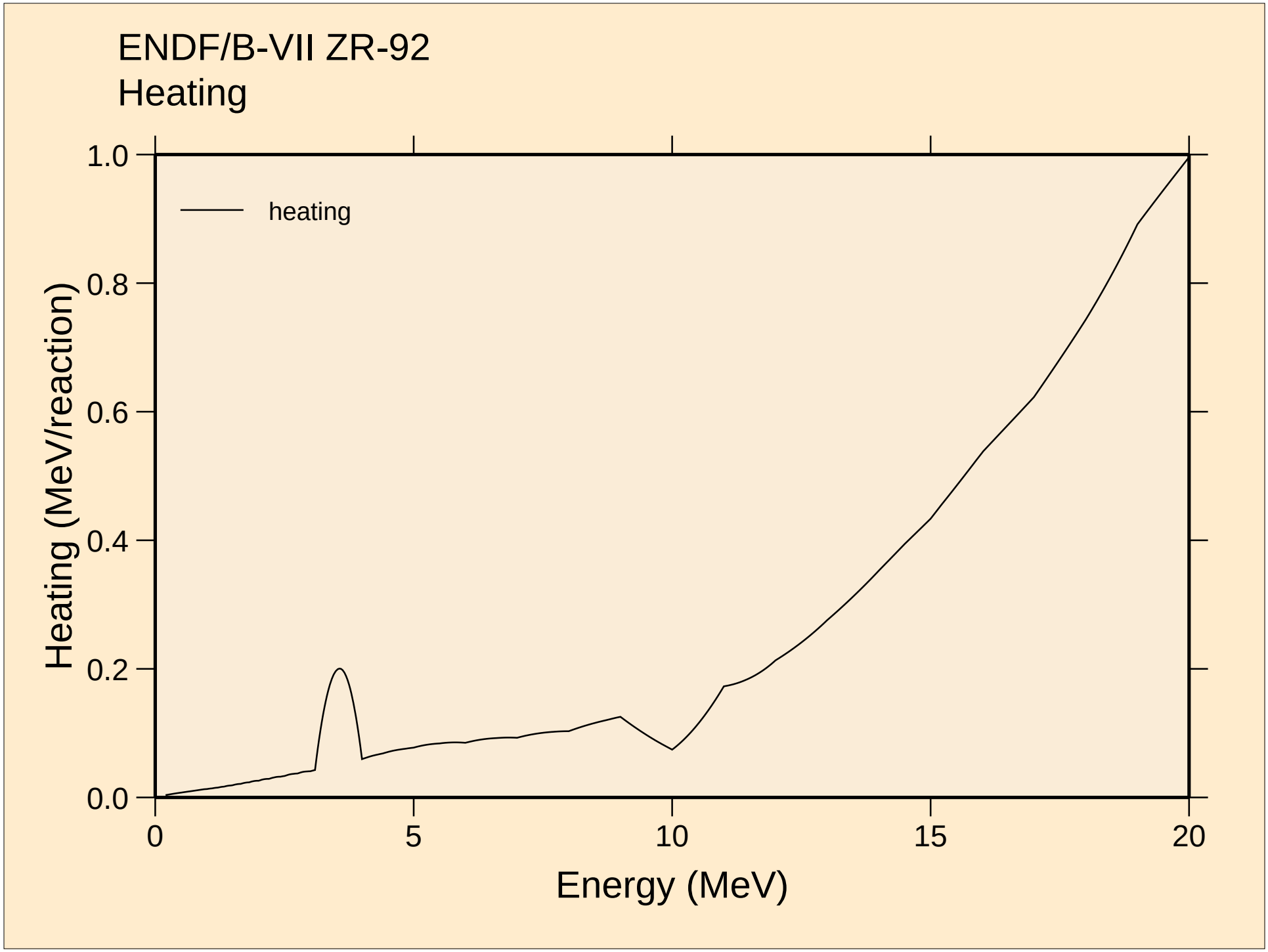


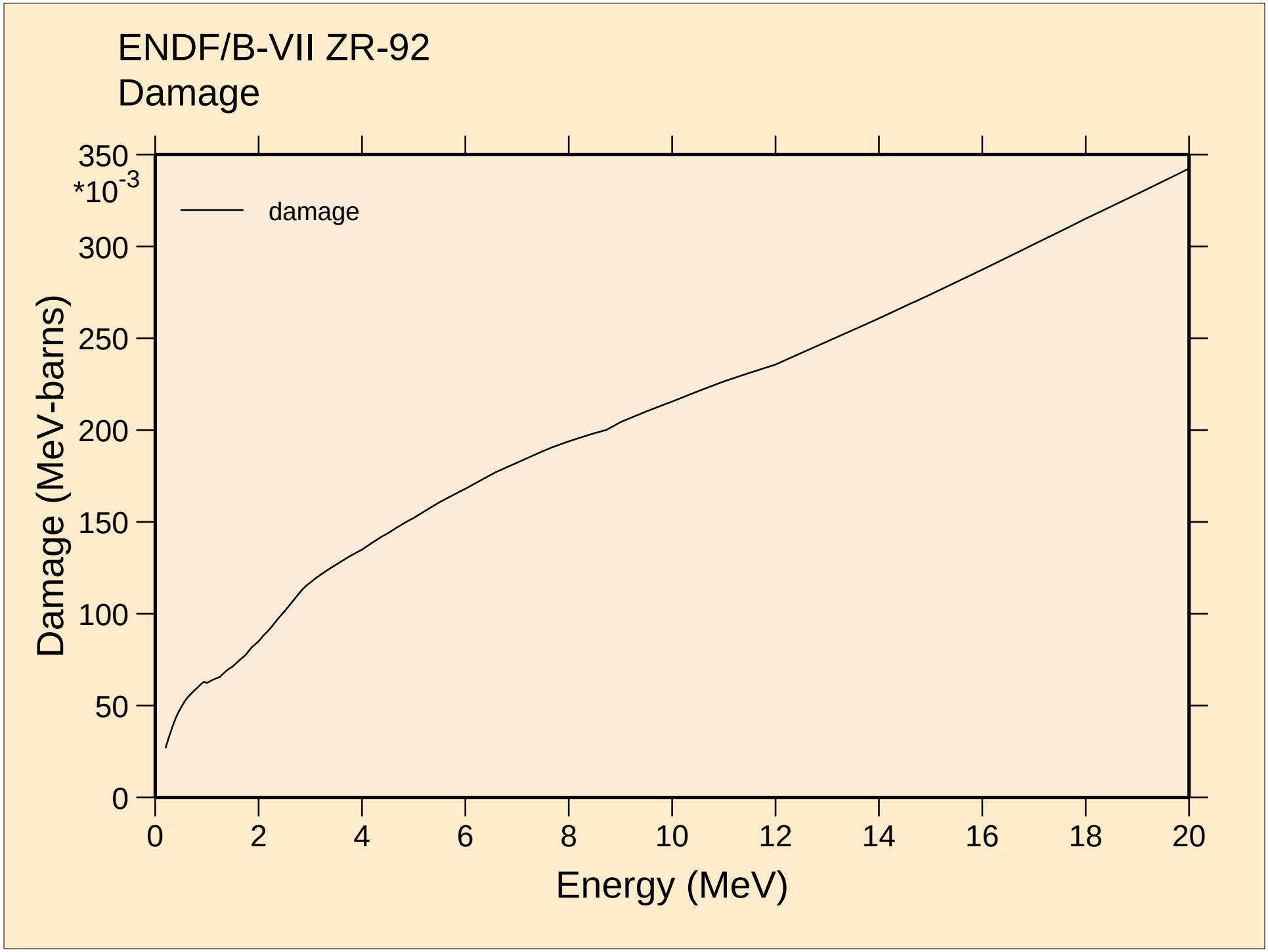

ENDF/B-VII ZR-92
Heating
heating
Heating (MeV/reaction)
Energy (MeV)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-11} 10^{-10} 10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1}

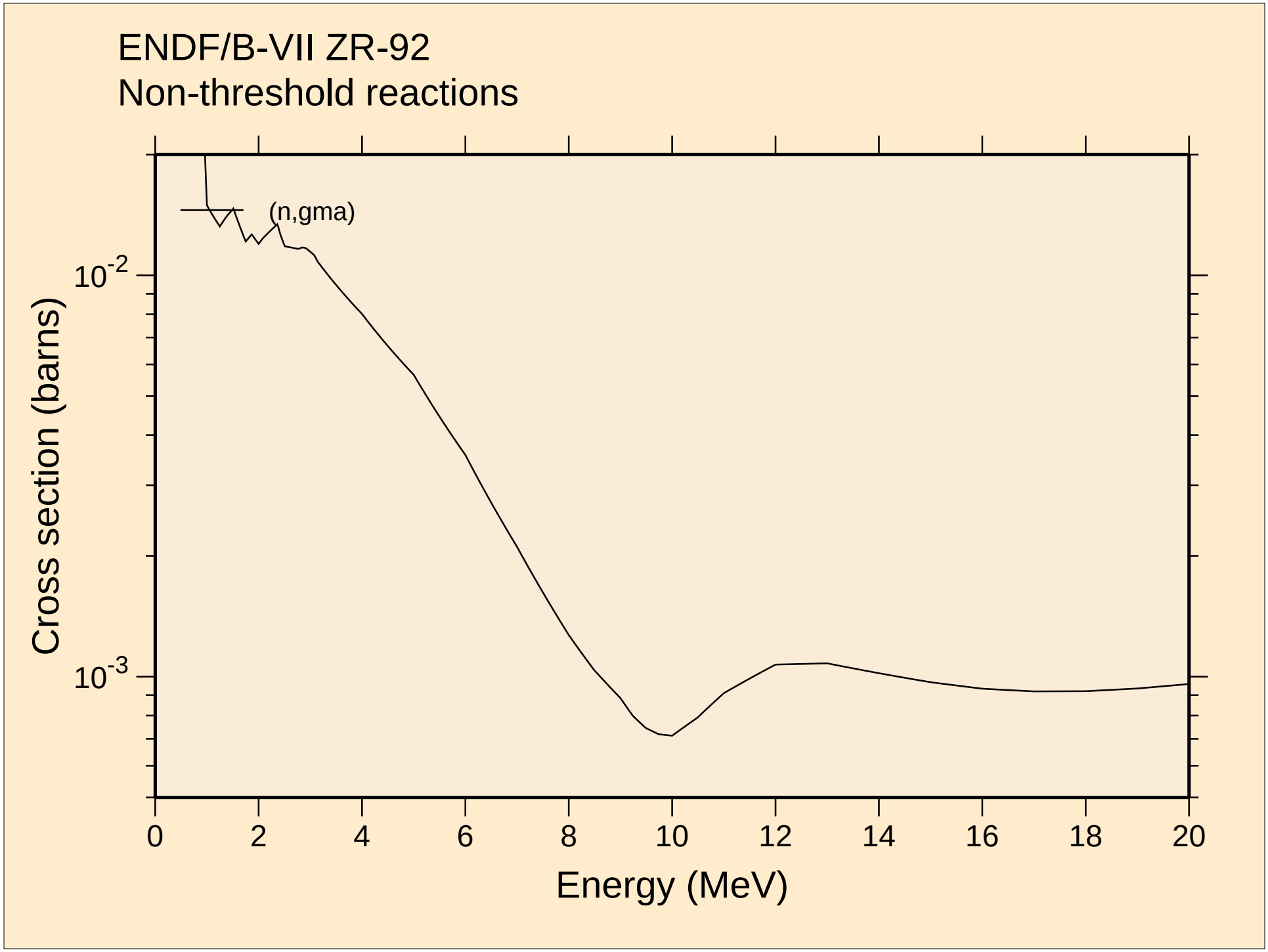

ENDF/B-VII ZR-92
Damage
damage
Damage (MeV-barns)
Energy (MeV)
10^-1
10^-2
10^-3
10^-4
10^-5
10^-6
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

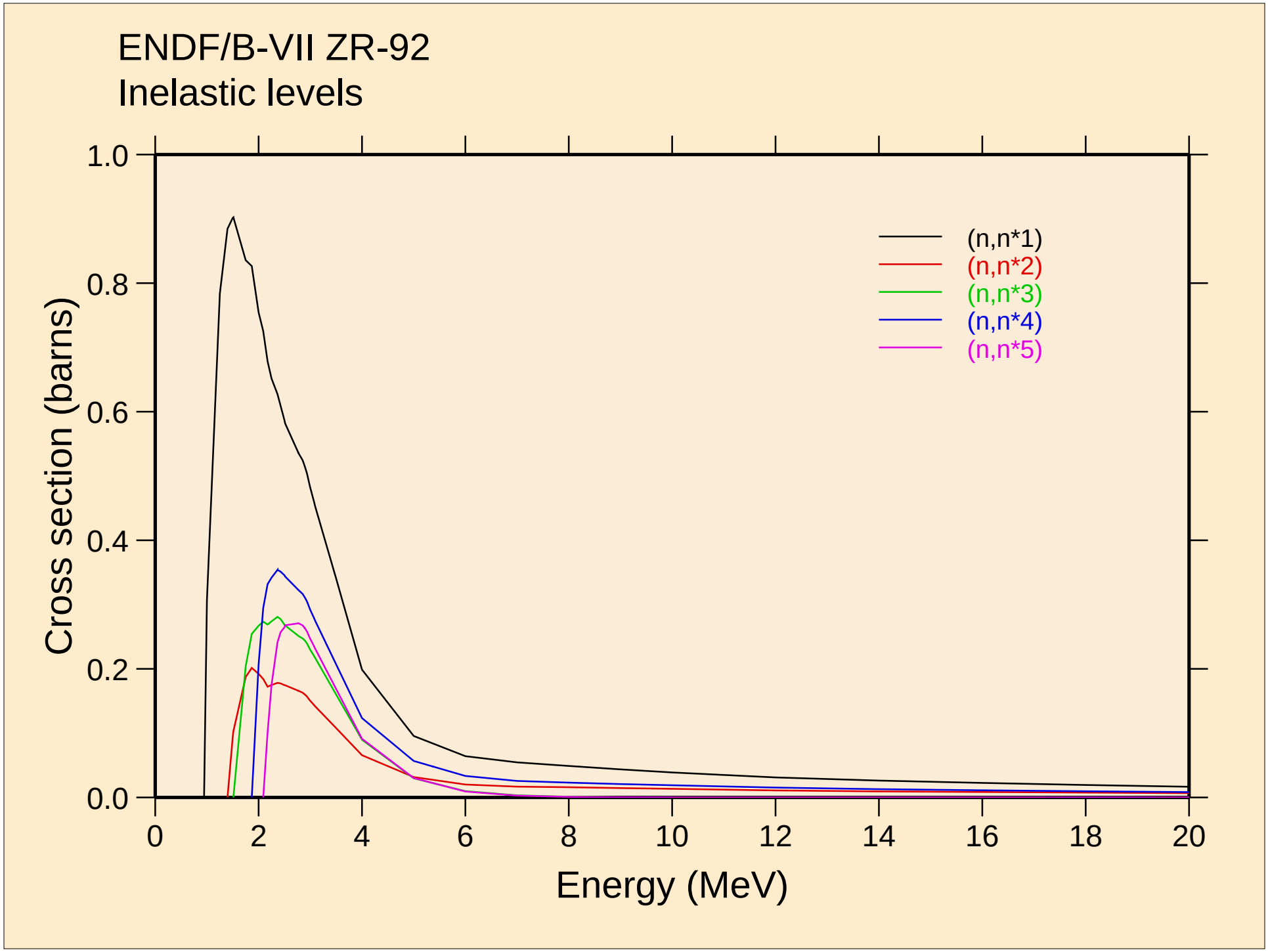

ENDF/B-VII ZR-92
Non-threshold reactions
(n,gma)
Cross section (barns)
Energy (MeV)
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

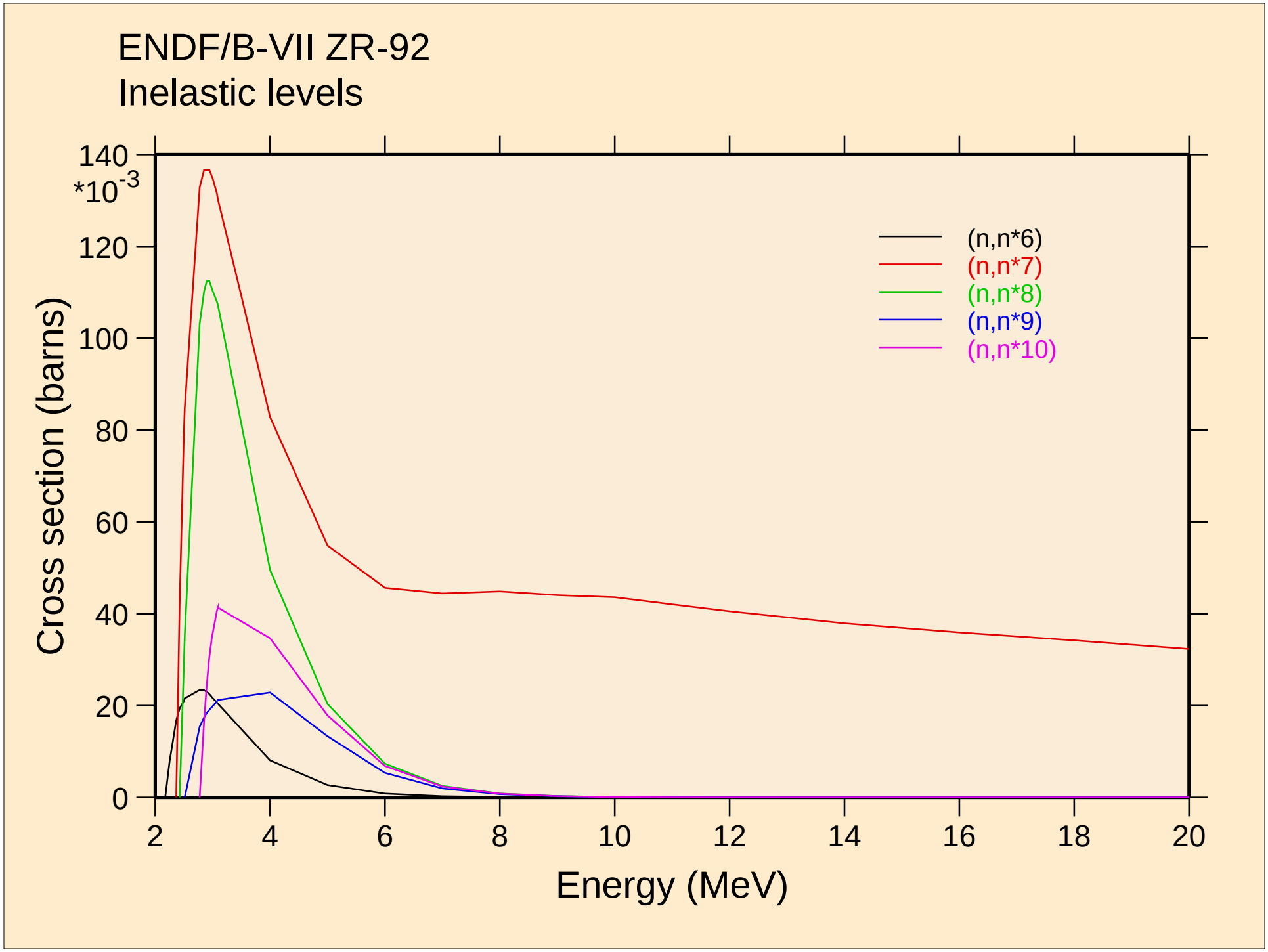

ENDF/B-VII ZR-92
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
0
1
2
3
4
5
6
7
2
4
6
8
10
12
14
16
18
20

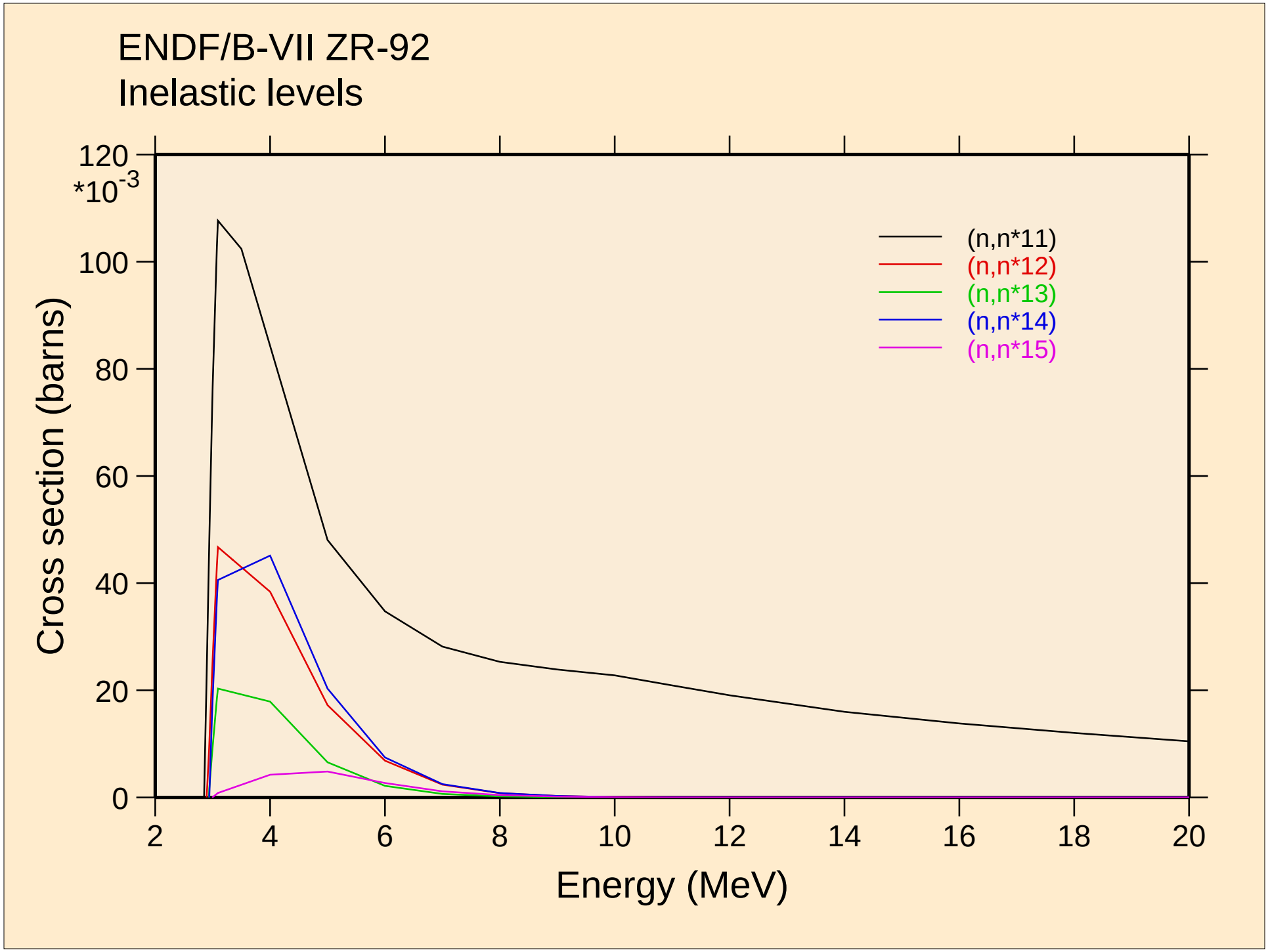

ENDF/B-VII ZR-92
Heating
heating
Heating (MeV/reaction)
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20
Energy (MeV)

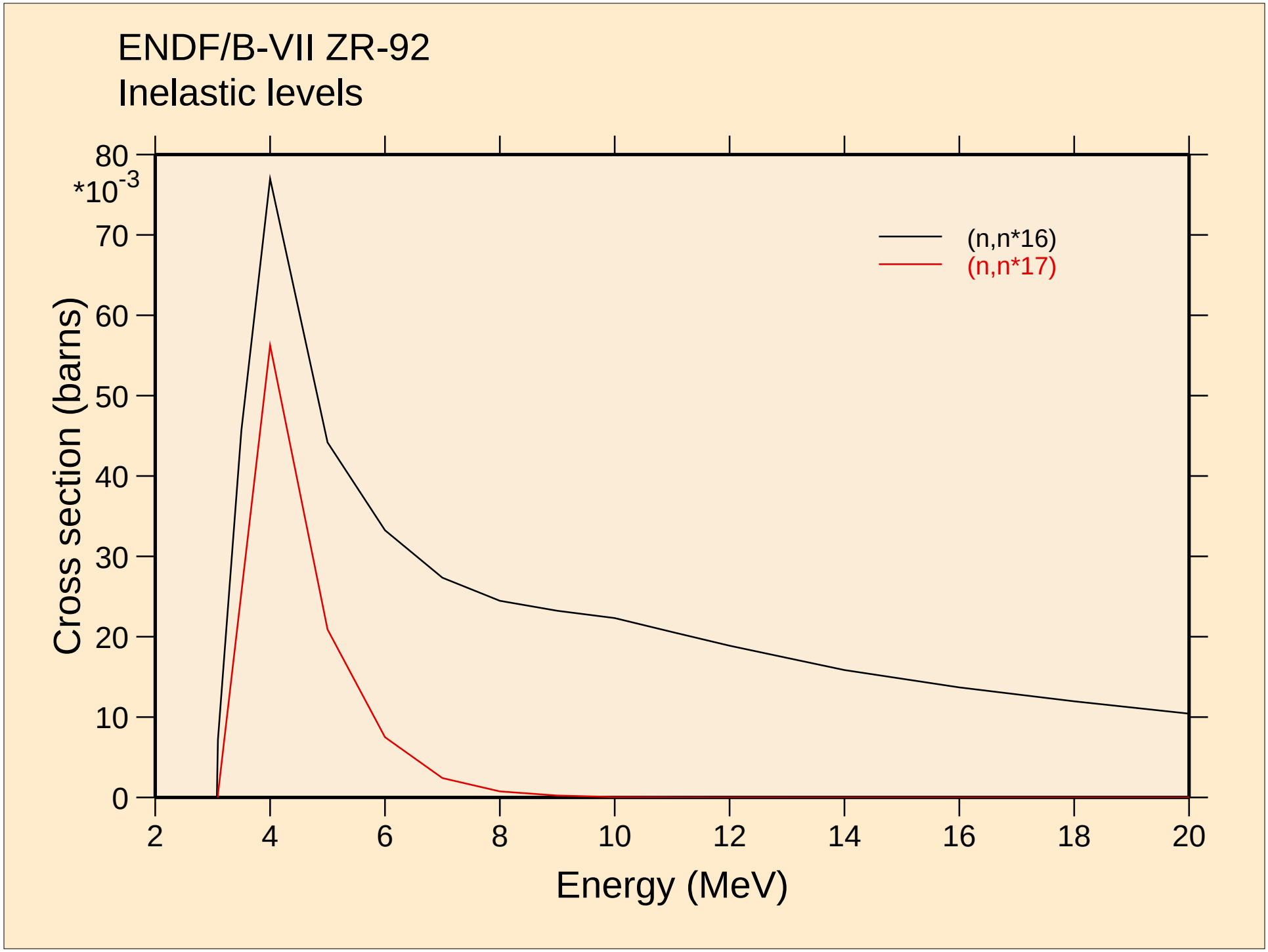

ENDF/B-VII ZR-92
Damage
damage
*10-3
350
300
250
200
150
100
50
0
Damage (MeV-barns)
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

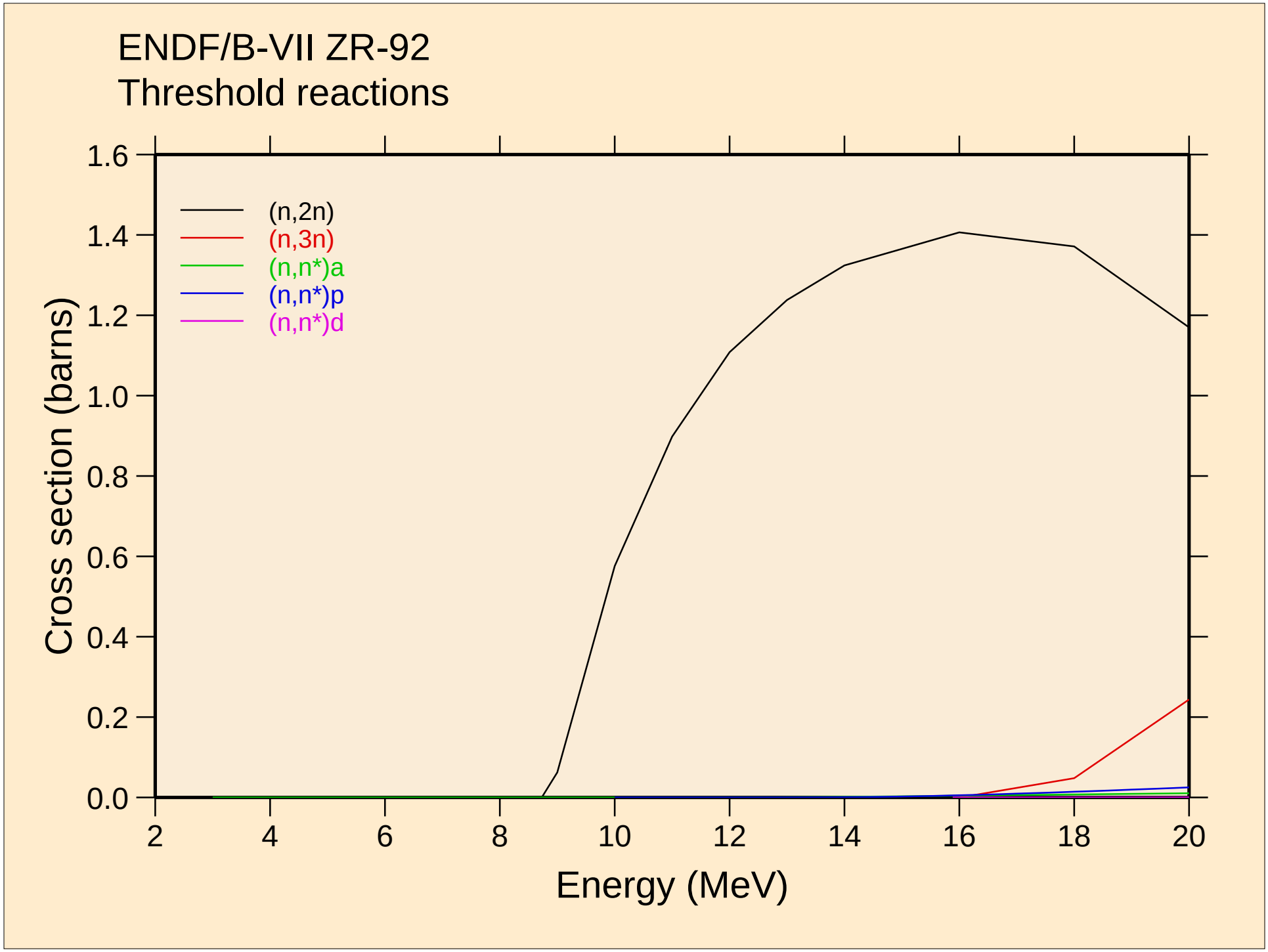

ENDF/B-VII ZR-92
Non-threshold reactions
(n,gma)
Cross section (barns)
10-2
10-3
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

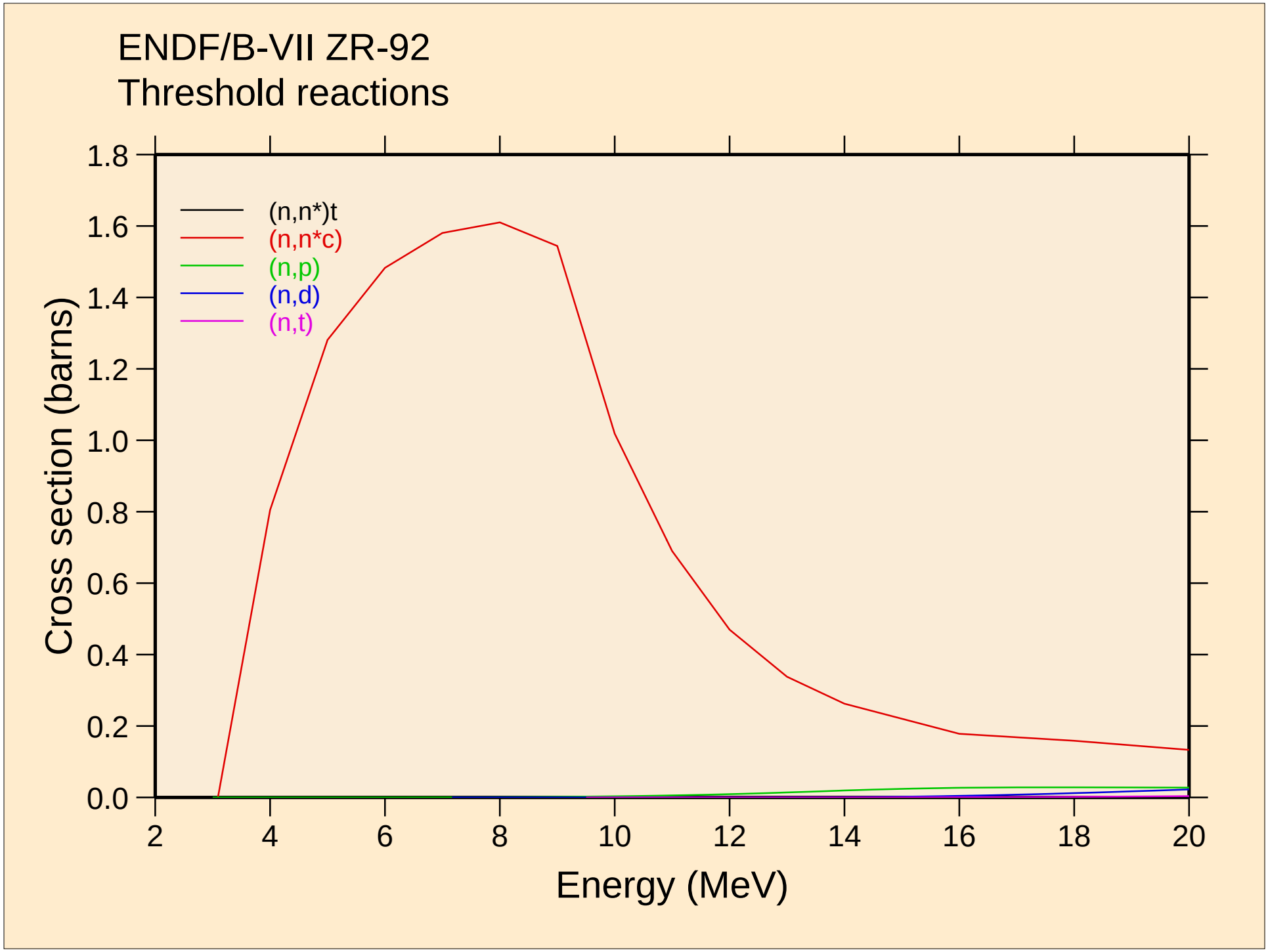

ENDF/B-VII ZR-92
Inelastic levels
Cross section (barns)
Energy (MeV)
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)
(n,n*5)
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
16
18
20

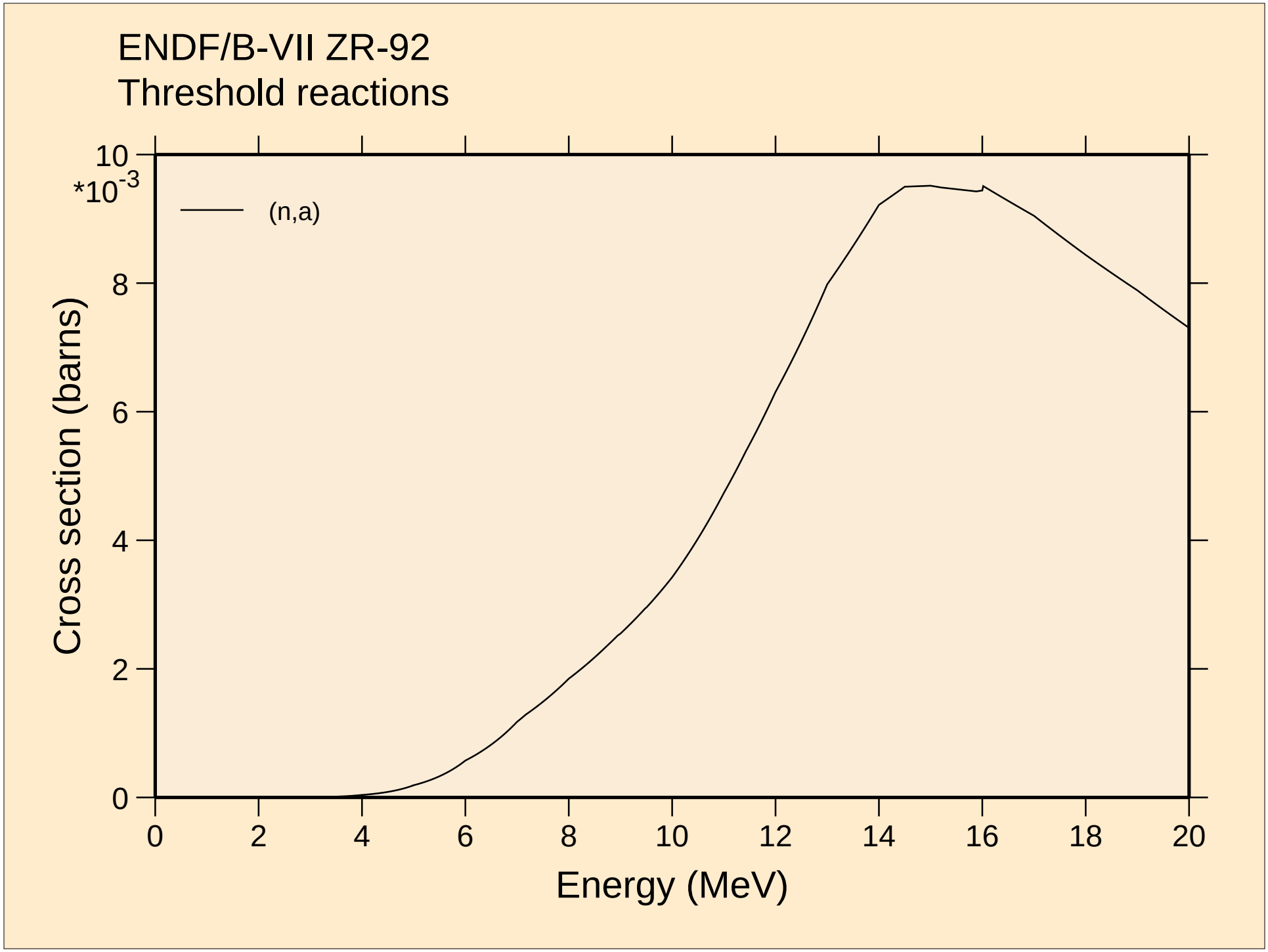

ENDF/B-VII ZR-92
Inelastic levels
Cross section (barns)
*10^-3
140
120
100
80
60
40
20
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*6)
(n,n*7)
(n,n*8)
(n,n*9)
(n,n*10)

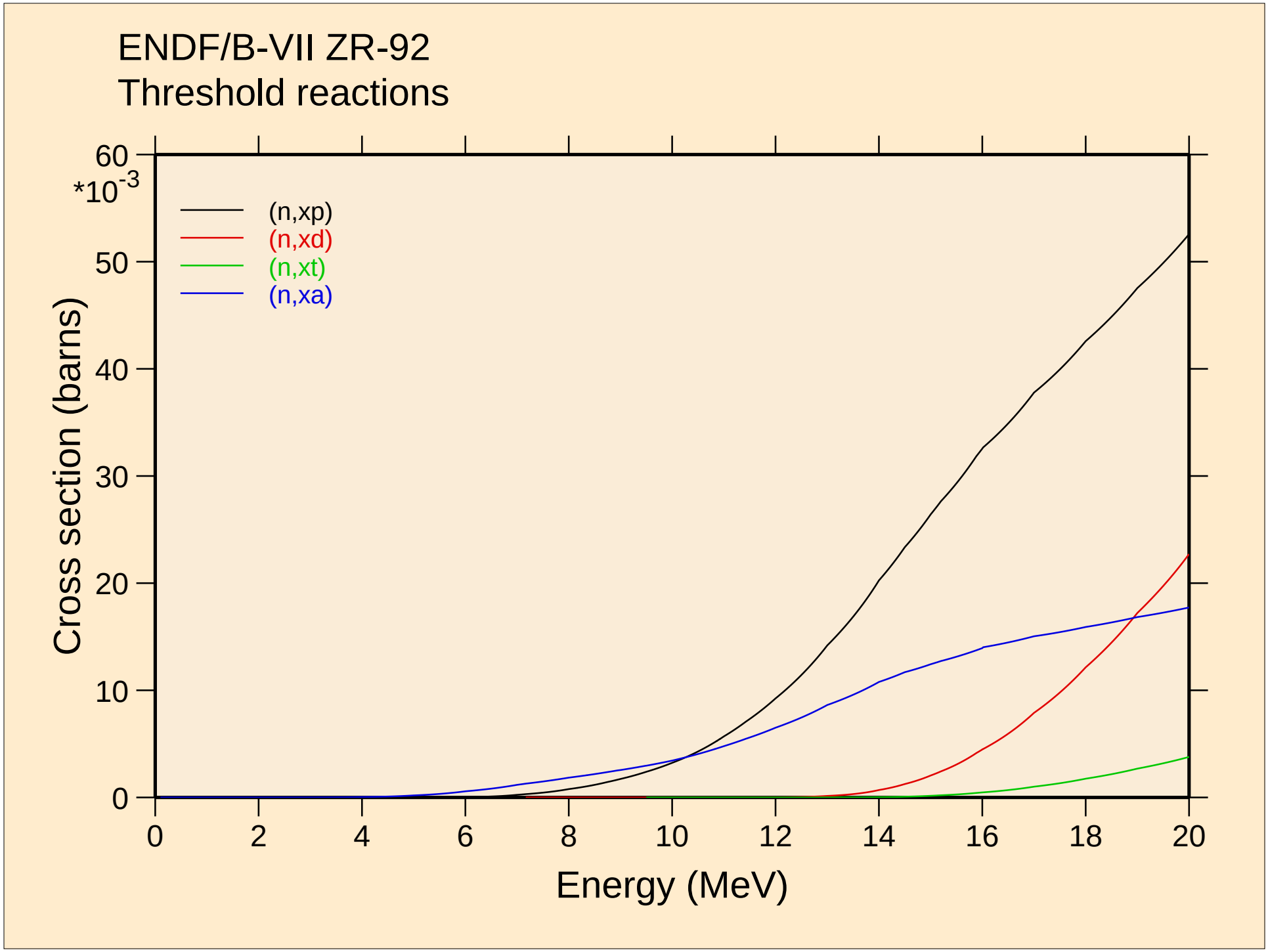

ENDF/B-VII ZR-92
Inelastic levels
120
*10-3
100
80
60
40
20
0
Cross section (barns)
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*11)
(n,n*12)
(n,n*13)
(n,n*14)
(n,n*15)


ENDF/B-VII ZR-92
Inelastic levels
*10-3
80
70
60
50
40
30
20
10
0
Cross section (barns)
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*16)
(n,n*17)

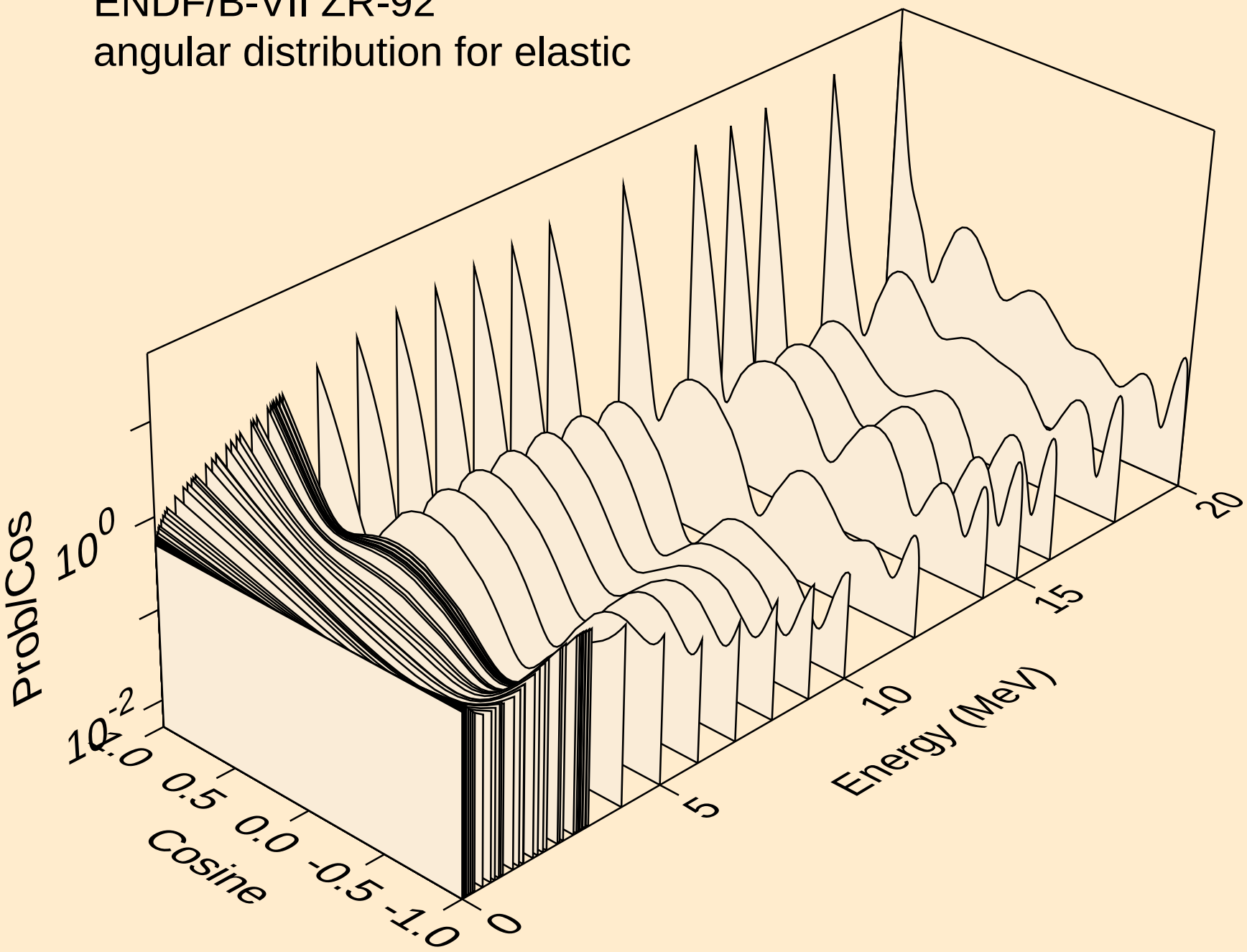

ENDF/B-VII ZR-92
Threshold reactions
(n,2n)
(n,3n)
(n,n*)a
(n,n*)p
(n,n*)d
Cross section (barns)
Energy (MeV)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
2
4
6
8
10
12
14
16
18
20

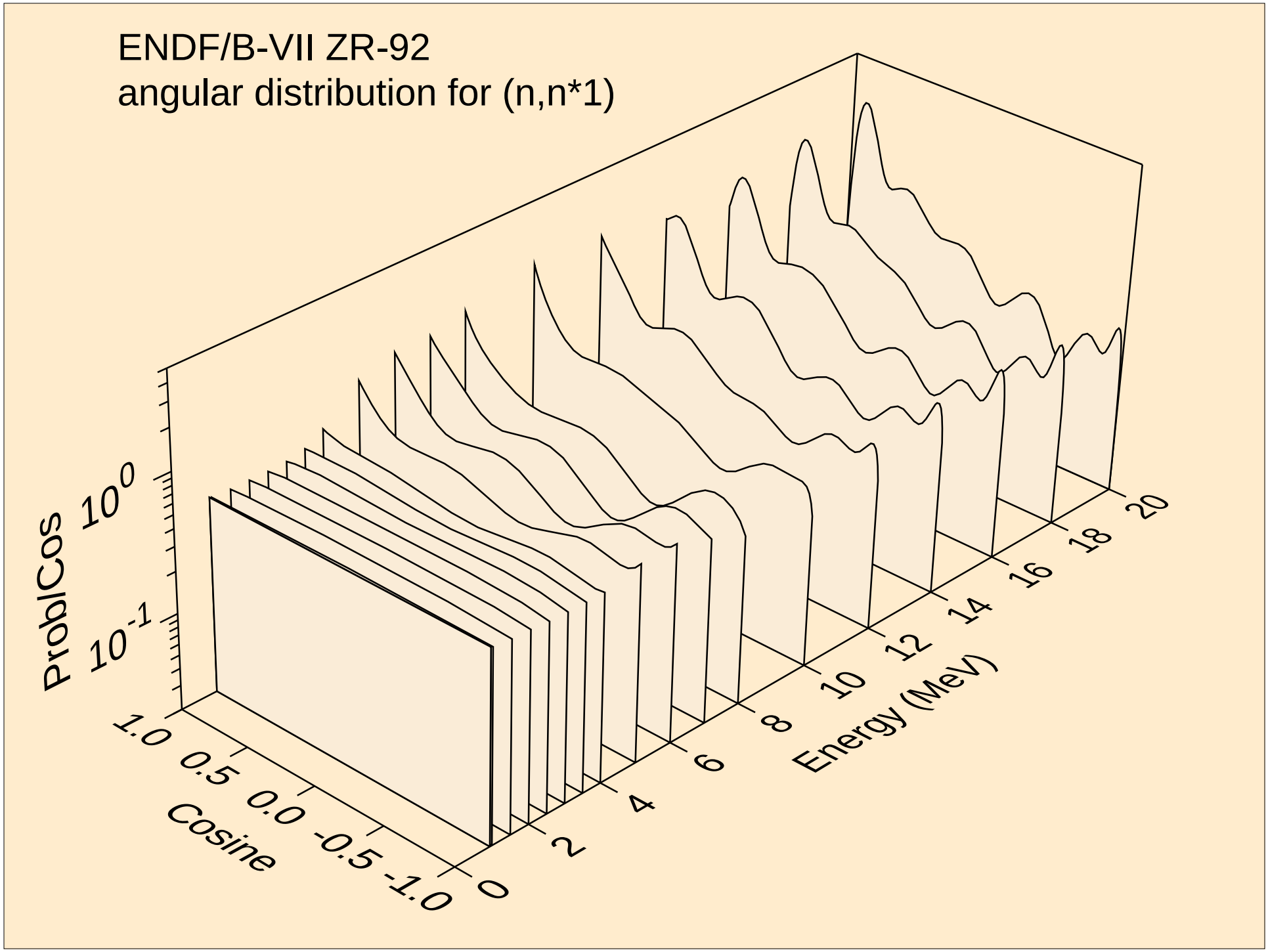

ENDF/B-VII ZR-92
Threshold reactions
(n,n*)t
(n,n*c)
(n,p)
(n,d)
(n,t)
Cross section (barns)
Energy (MeV)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2
4
6
8
10
12
14
16
18
20

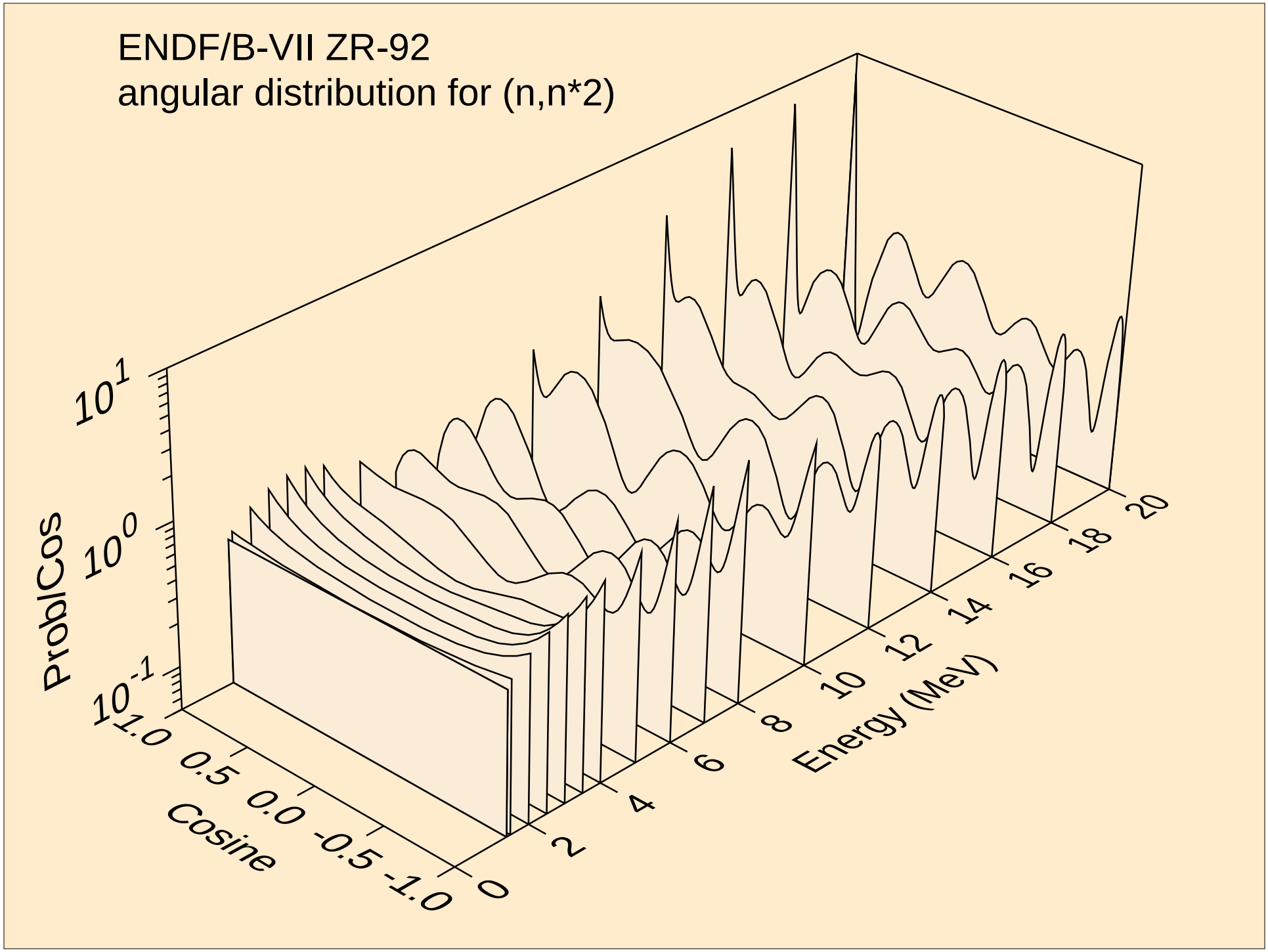

ENDF/B-VII ZR-92
Threshold reactions
(n,a)
Cross section (barns)
*10-3
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

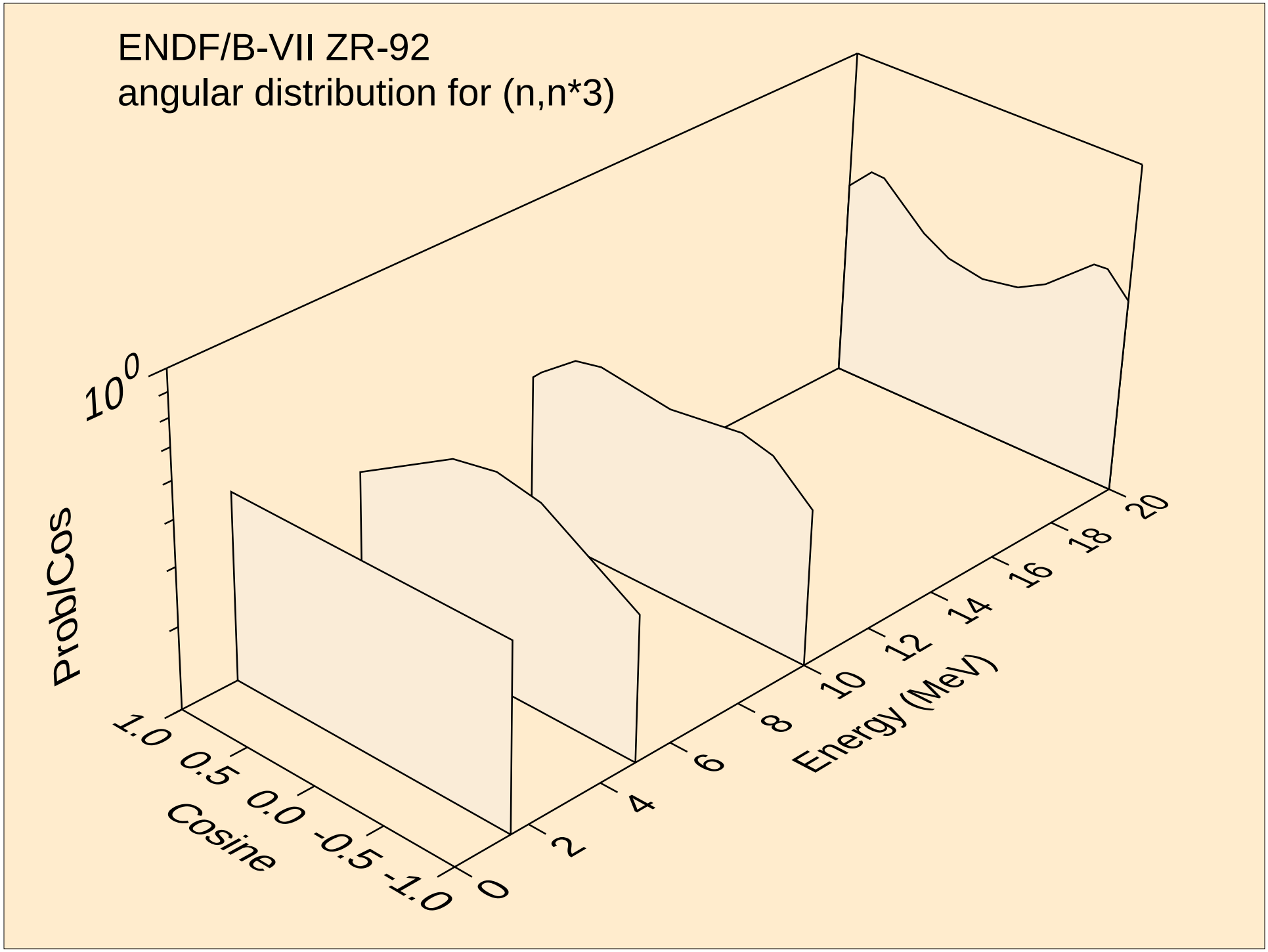

ENDF/B-VII ZR-92
Threshold reactions
*10-3
60
50
40
30
20
10
0
Cross section (barns)
(n,xp)
(n,xd)
(n,xt)
(n,xa)
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

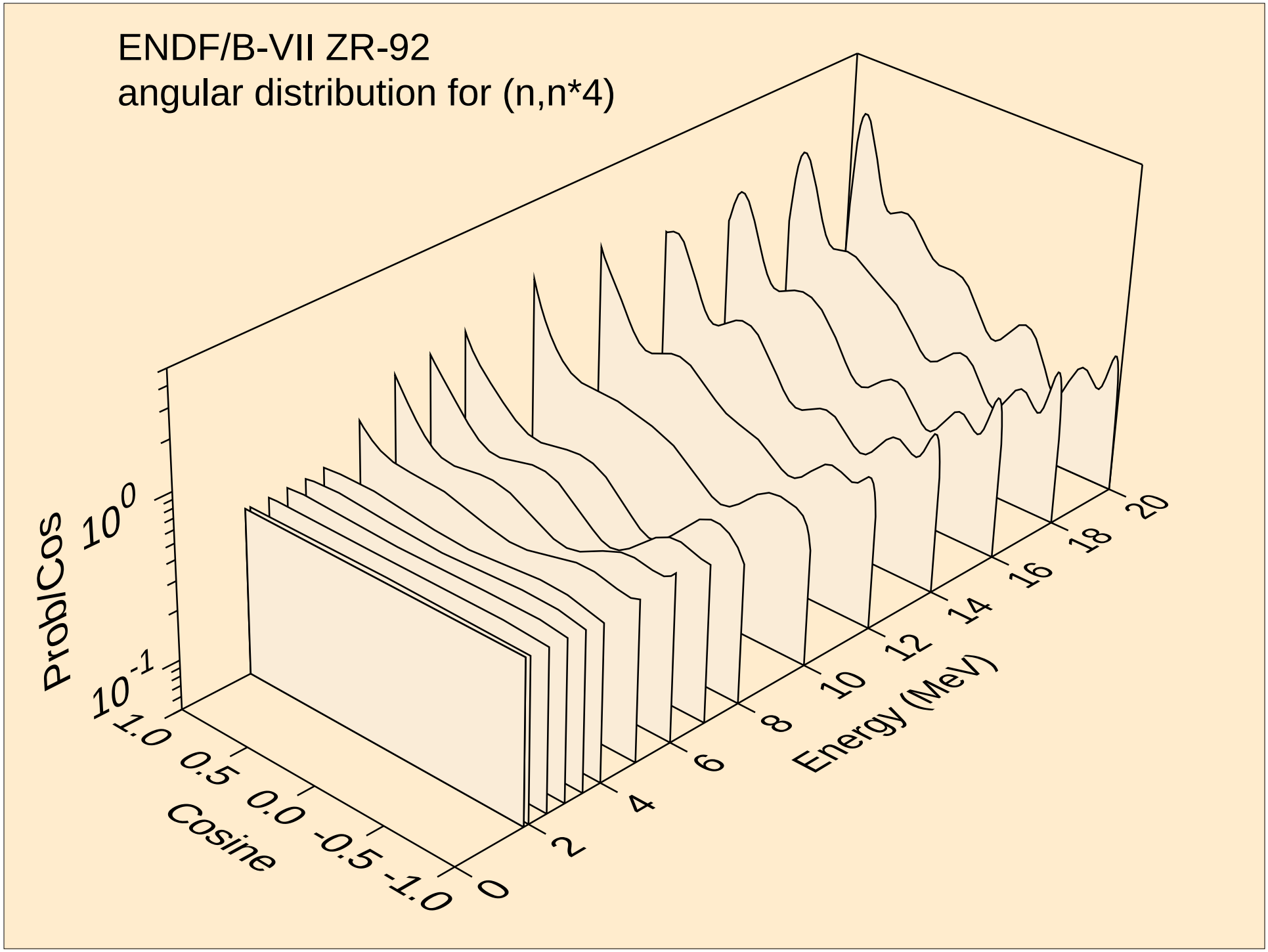
ENDF/B-VII ZR-92
angular distribution for elastic

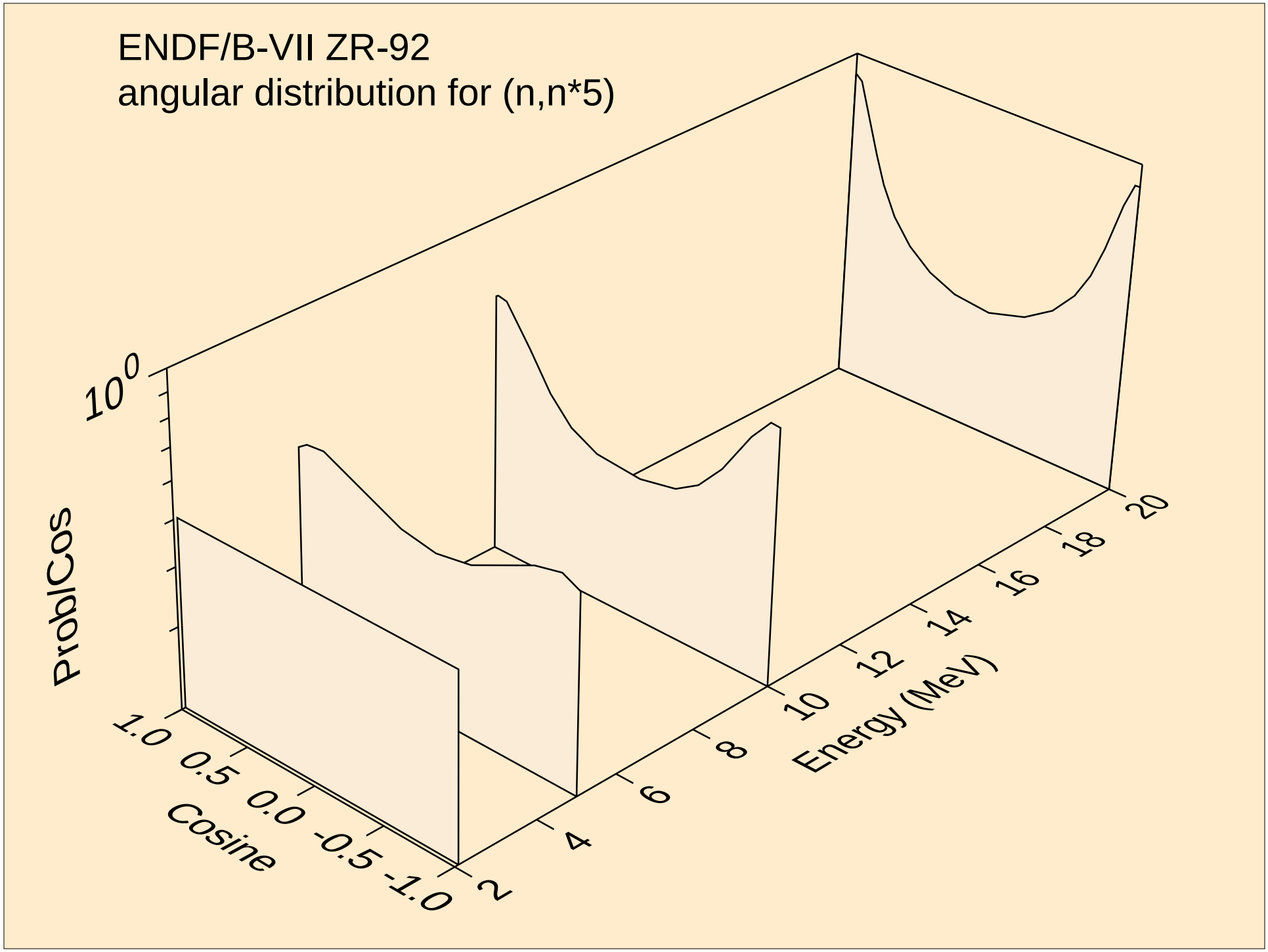


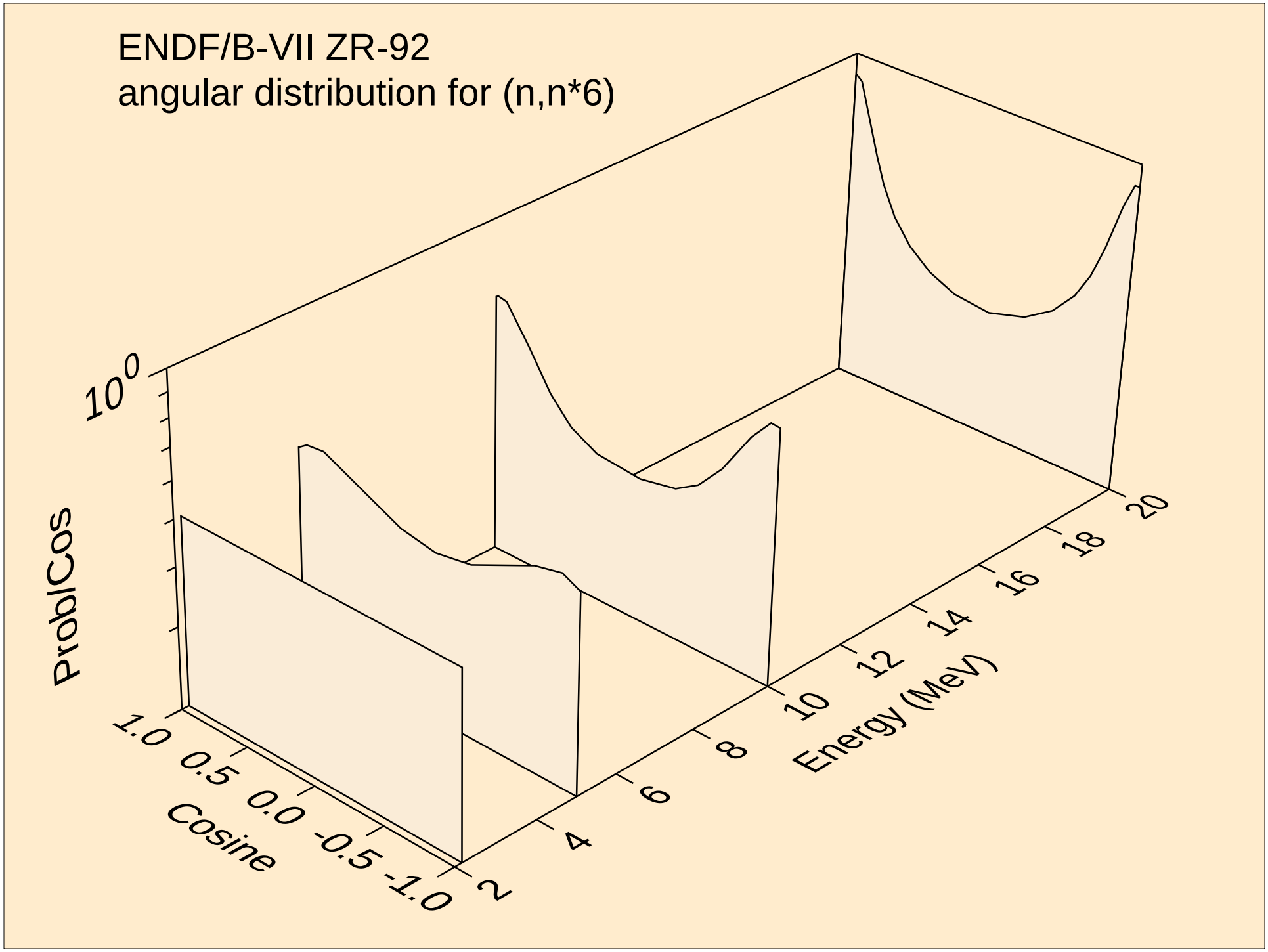

ENDF/B-VII ZR-92
angular distribution for (n,n*1)
Prob/Cos
10^0
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

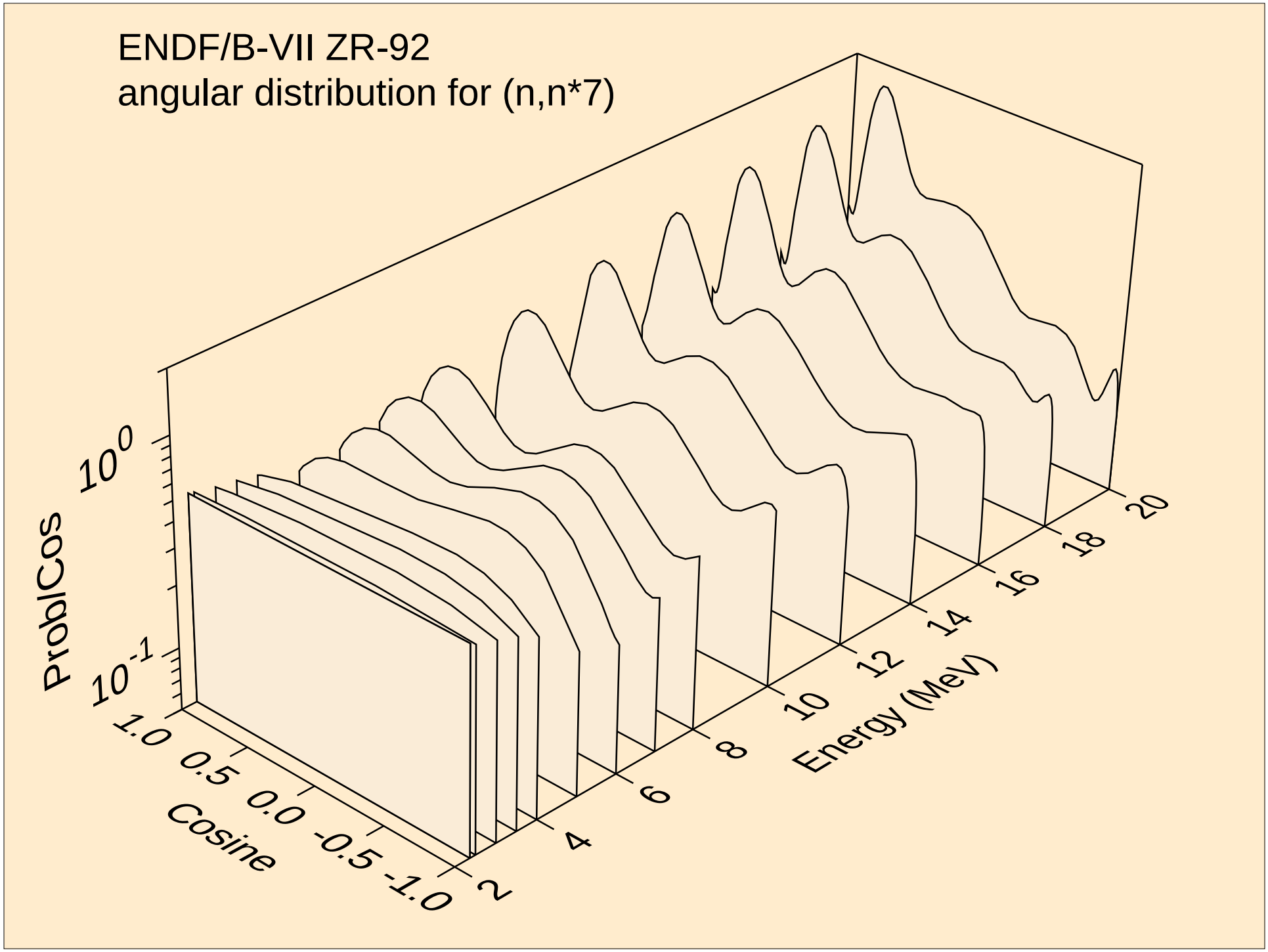

ENDF/B-VII ZR-92
angular distribution for (n,n*2)
ProbCos
10^{1}
10^{0}
10^{-1}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

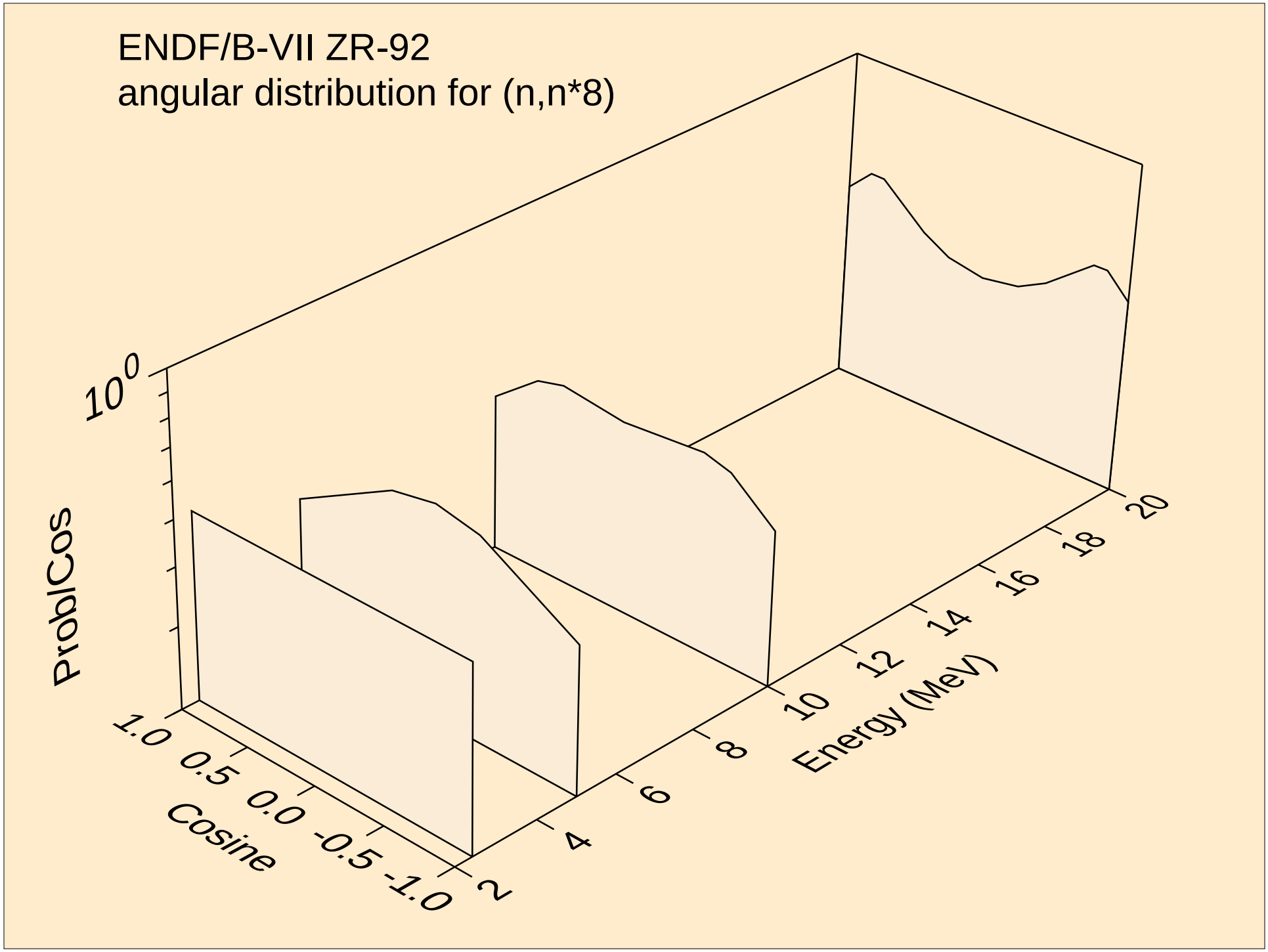

ENDF/B-VII ZR-92
angular distribution for (n,n*3)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

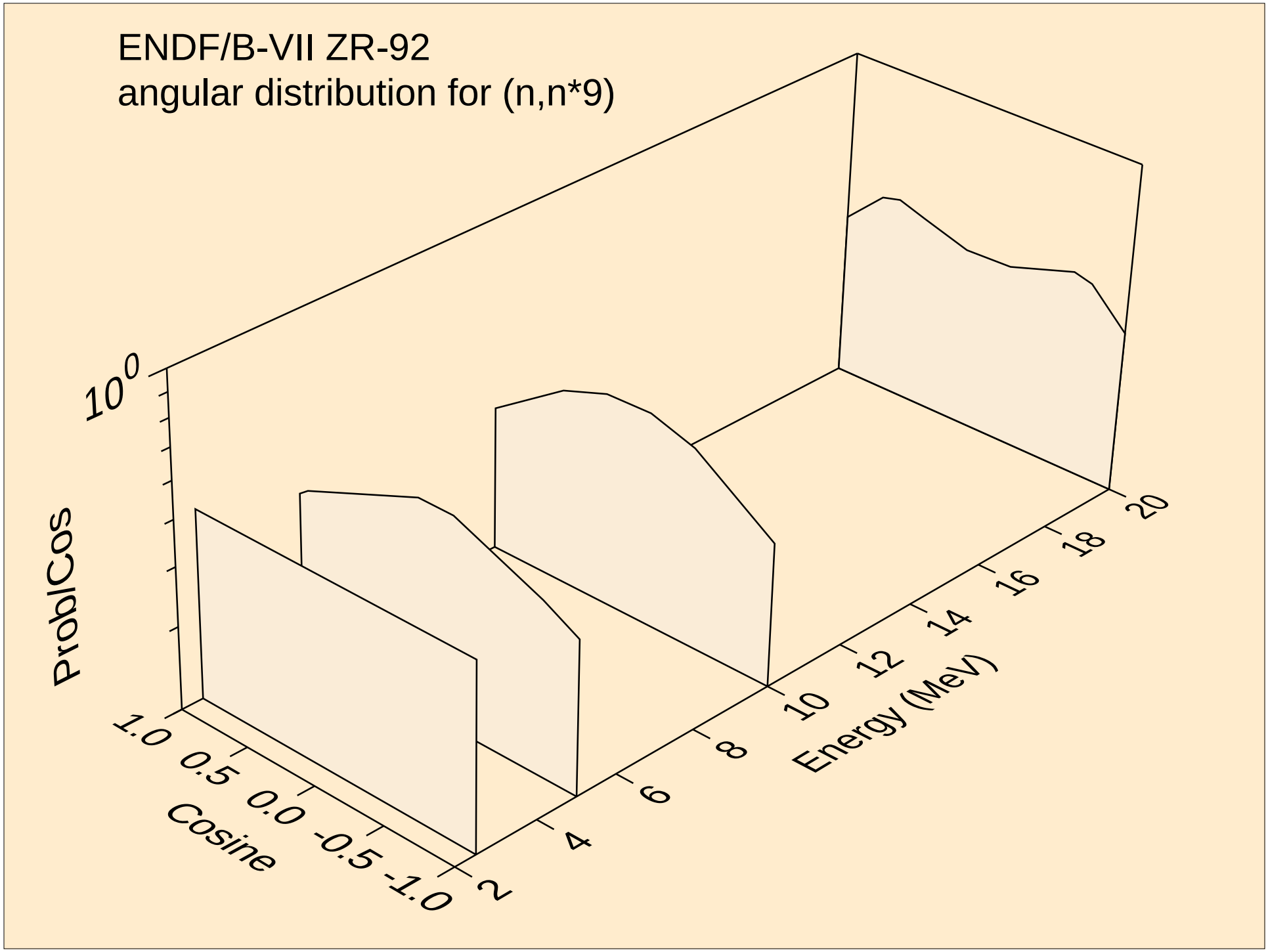

ENDF/B-VII ZR-92
angular distribution for (n,n*4)
ProblCos
10^0
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

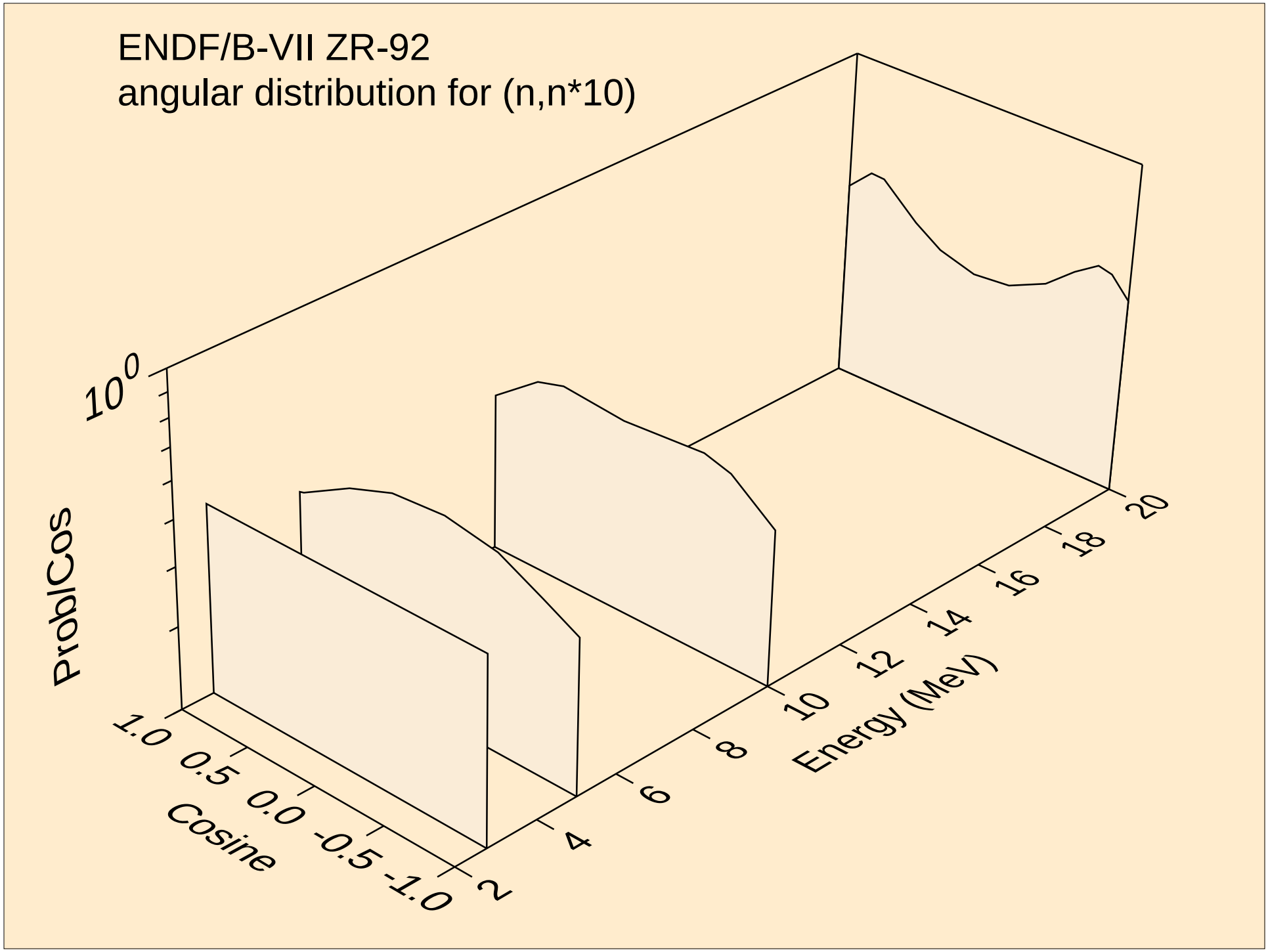

ENDF/B-VII ZR-92
angular distribution for (n,n*5)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

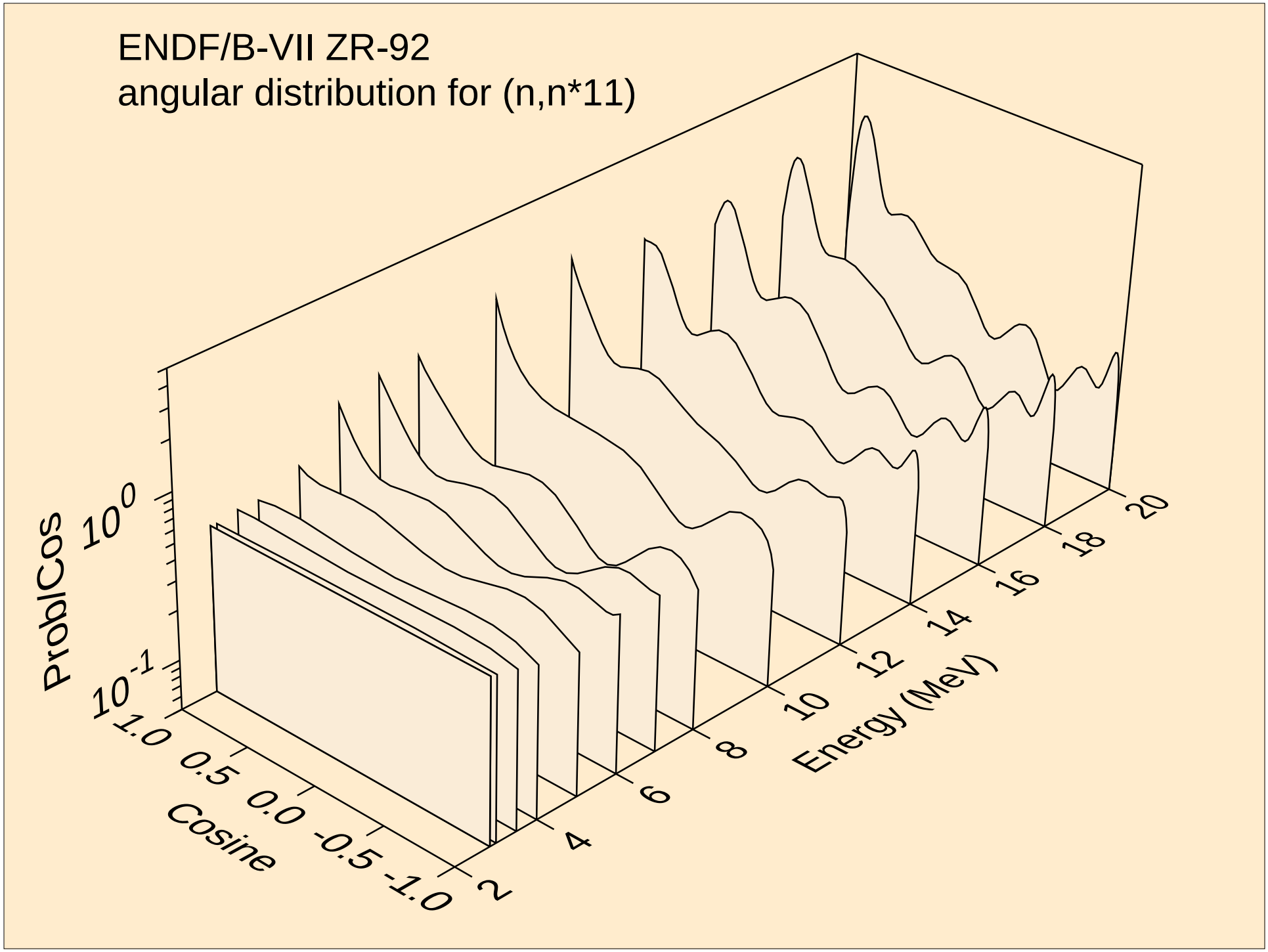

ENDF/B-VII ZR-92
angular distribution for (n,n*6)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

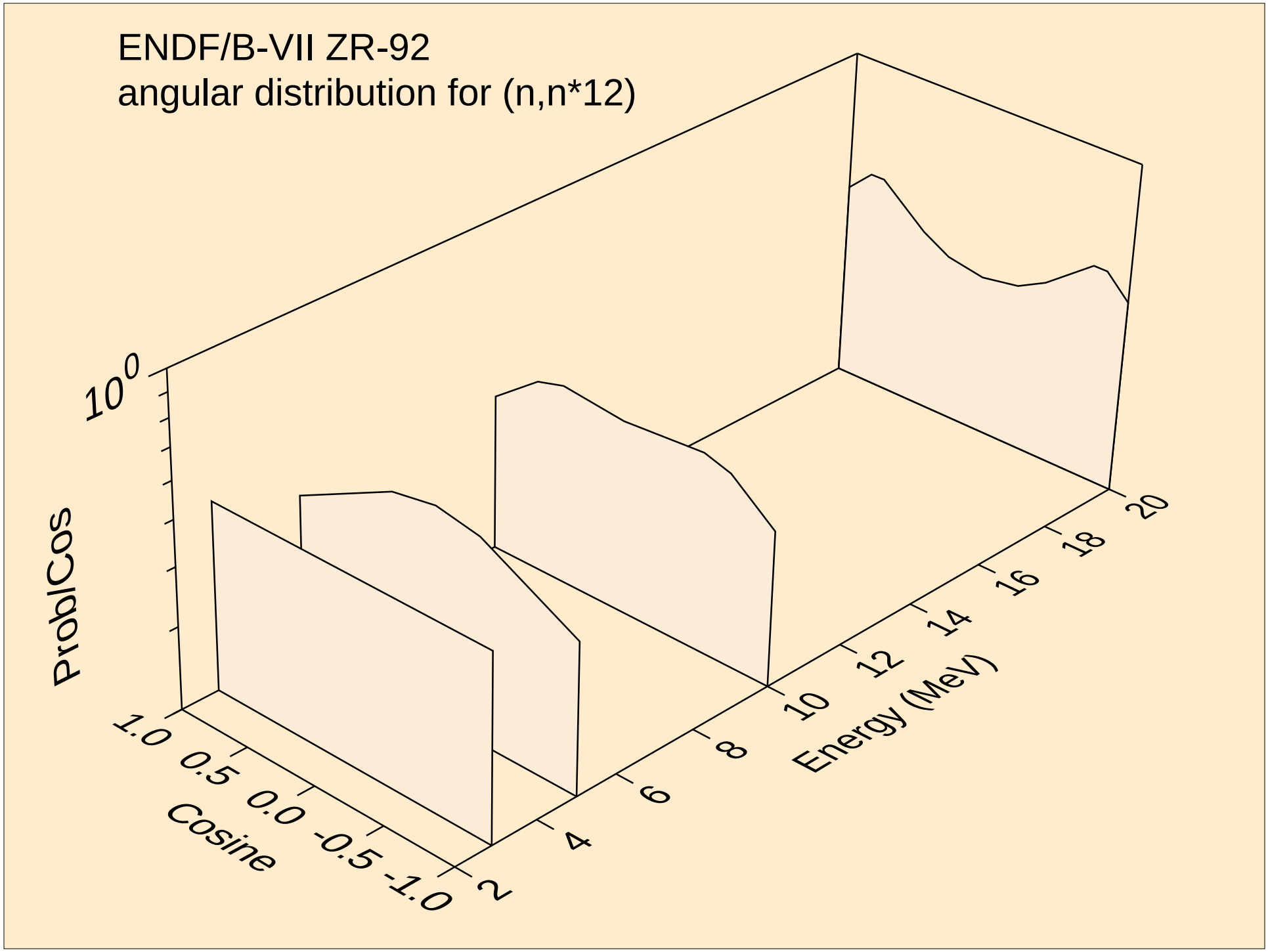

ENDF/B-VII ZR-92
angular distribution for (n,n*7)
ProbCos
10^0
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

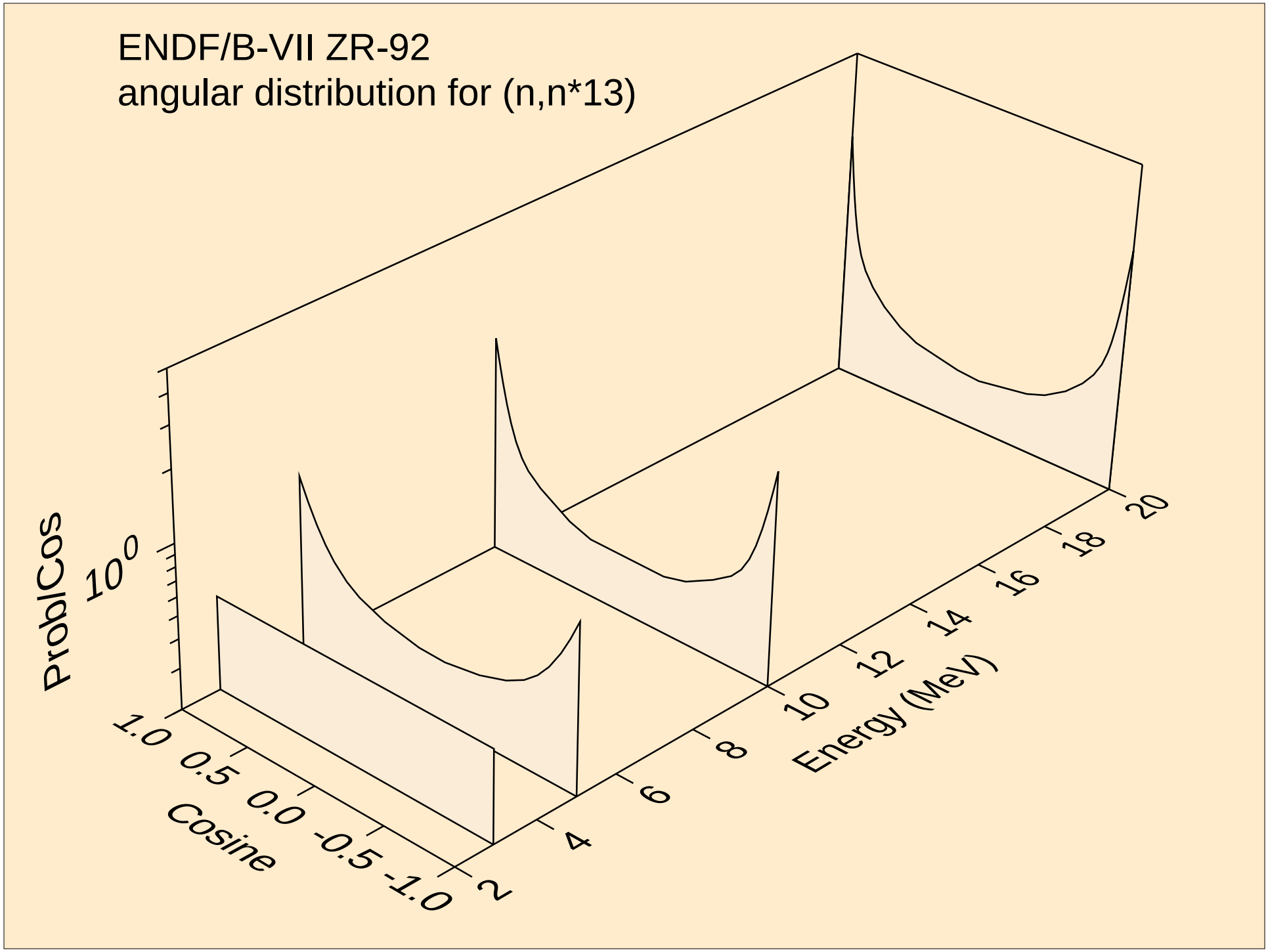

ENDF/B-VII ZR-92
angular distribution for (n,n*8)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

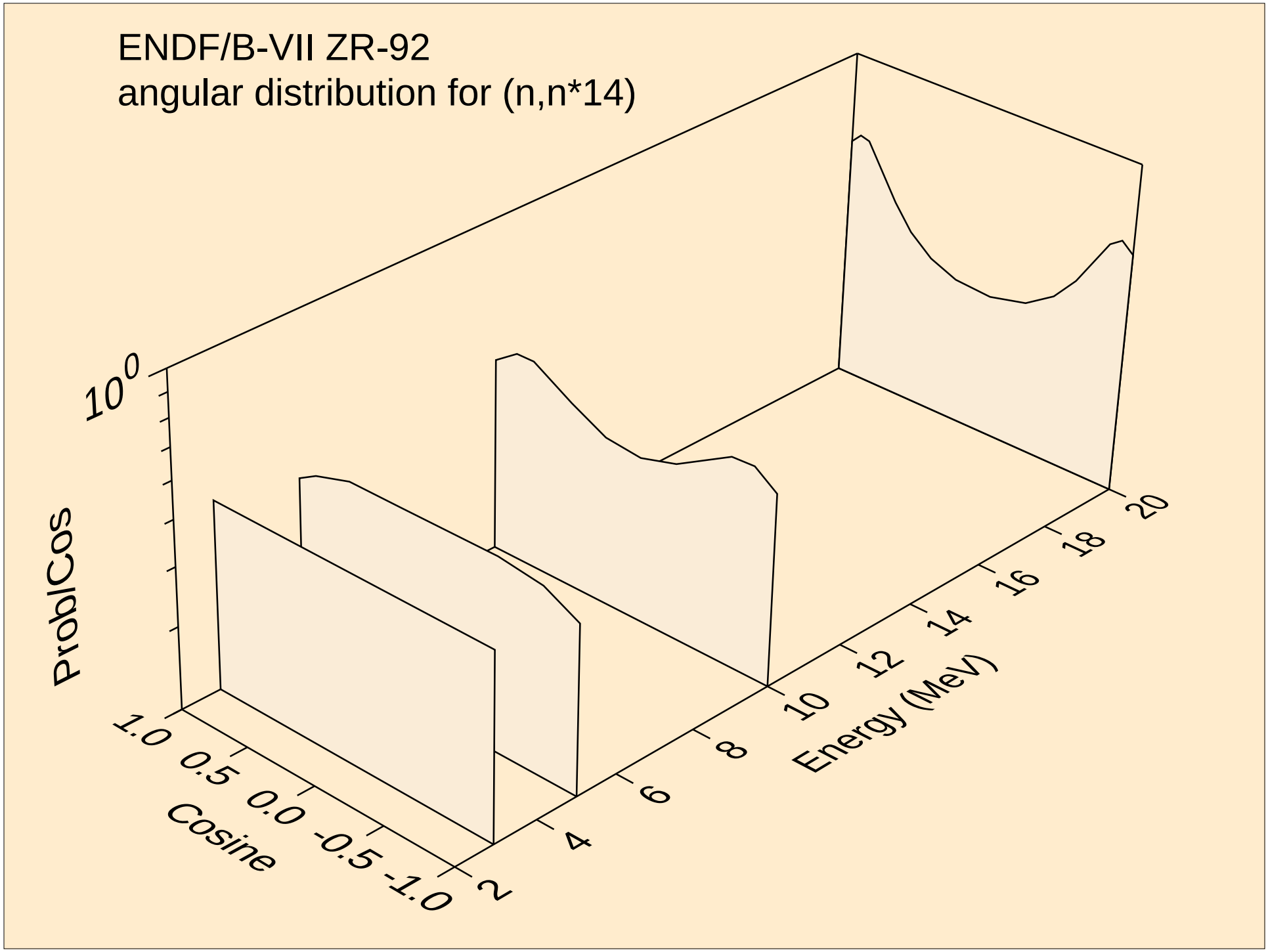

ENDF/B-VII ZR-92
angular distribution for (n,n*9)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

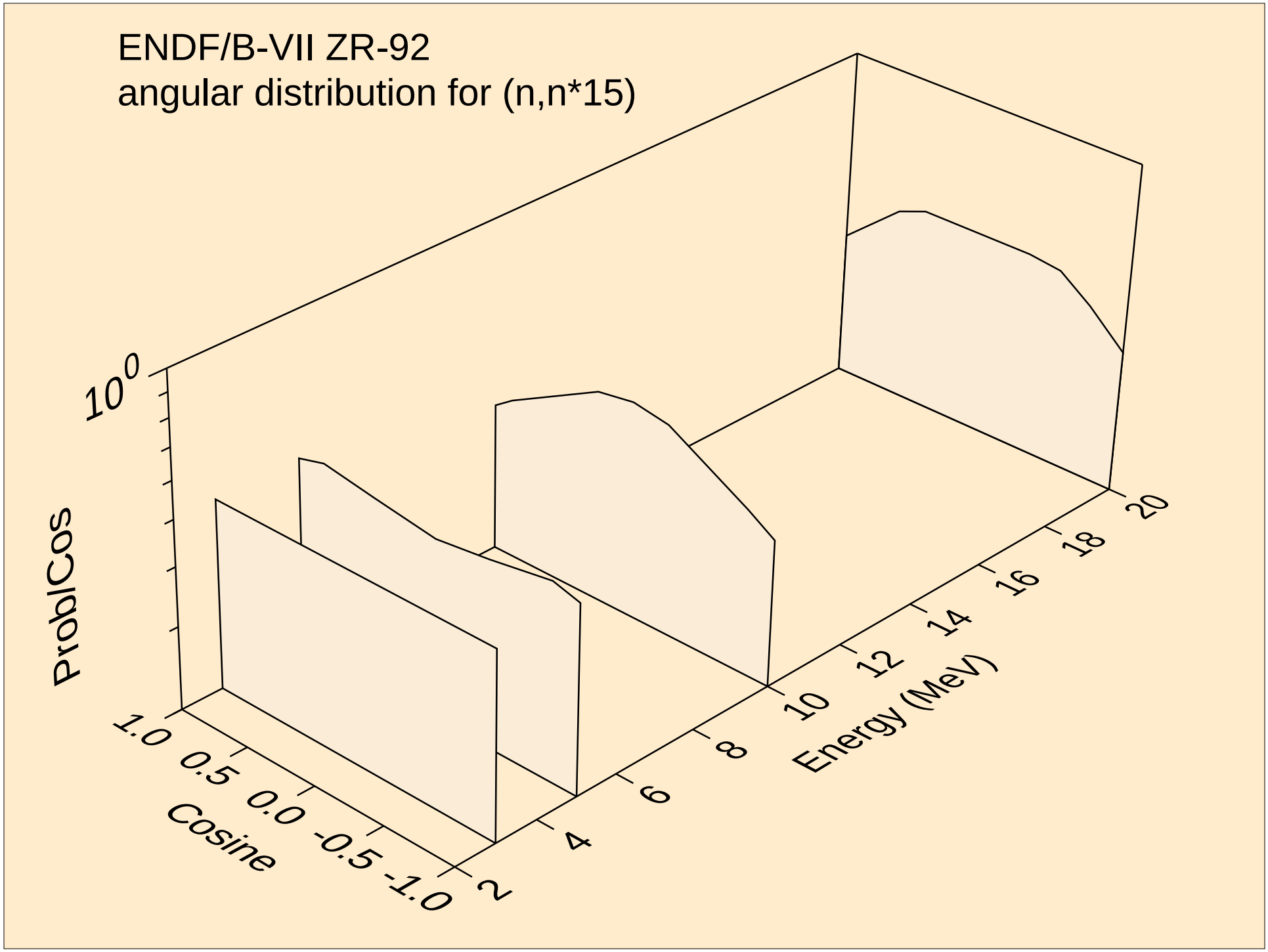

ENDF/B-VII ZR-92
angular distribution for (n,n*10)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

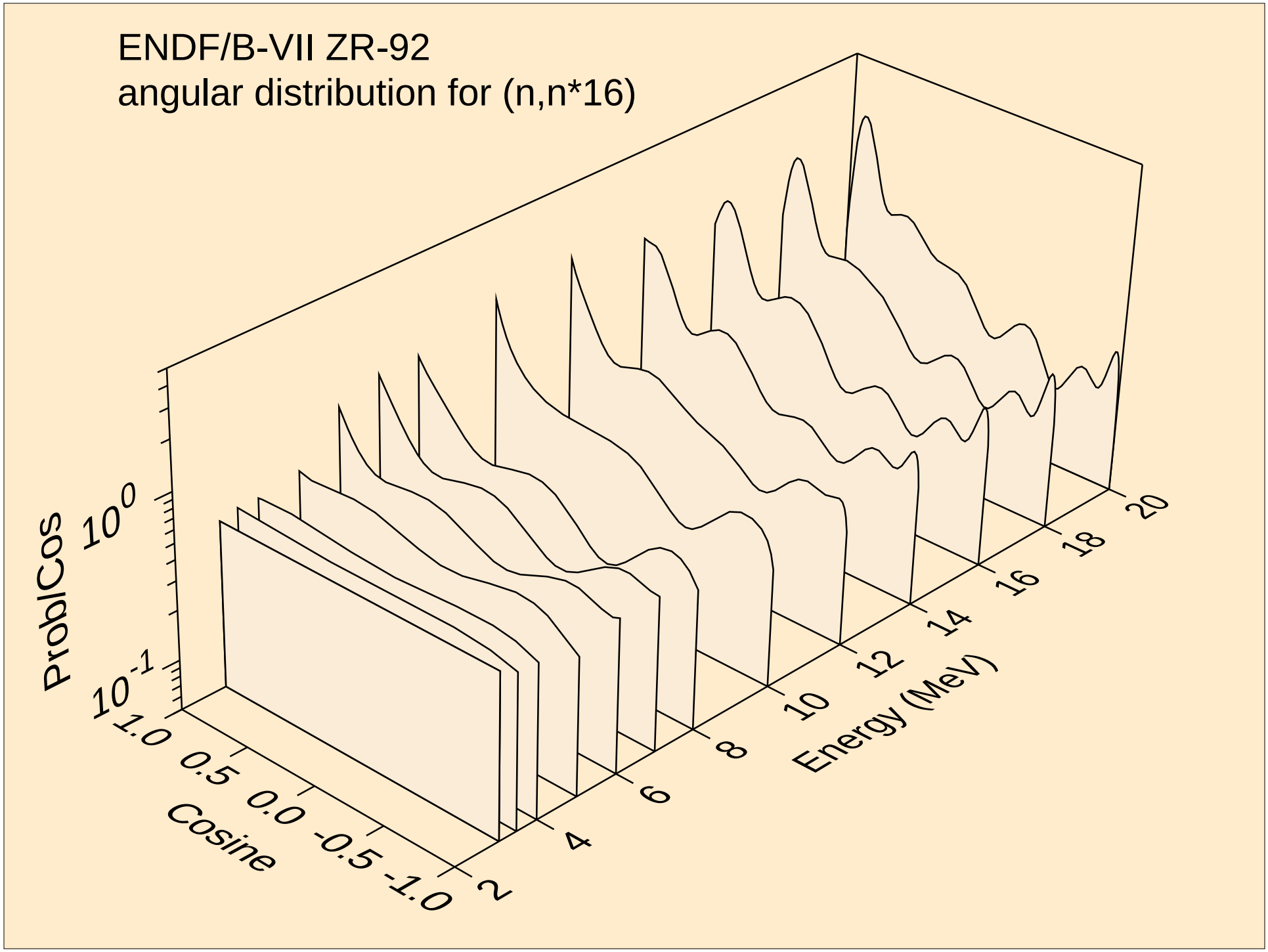

ENDF/B-VII ZR-92
angular distribution for (n,n*11)
Prob/Cos
10^0
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

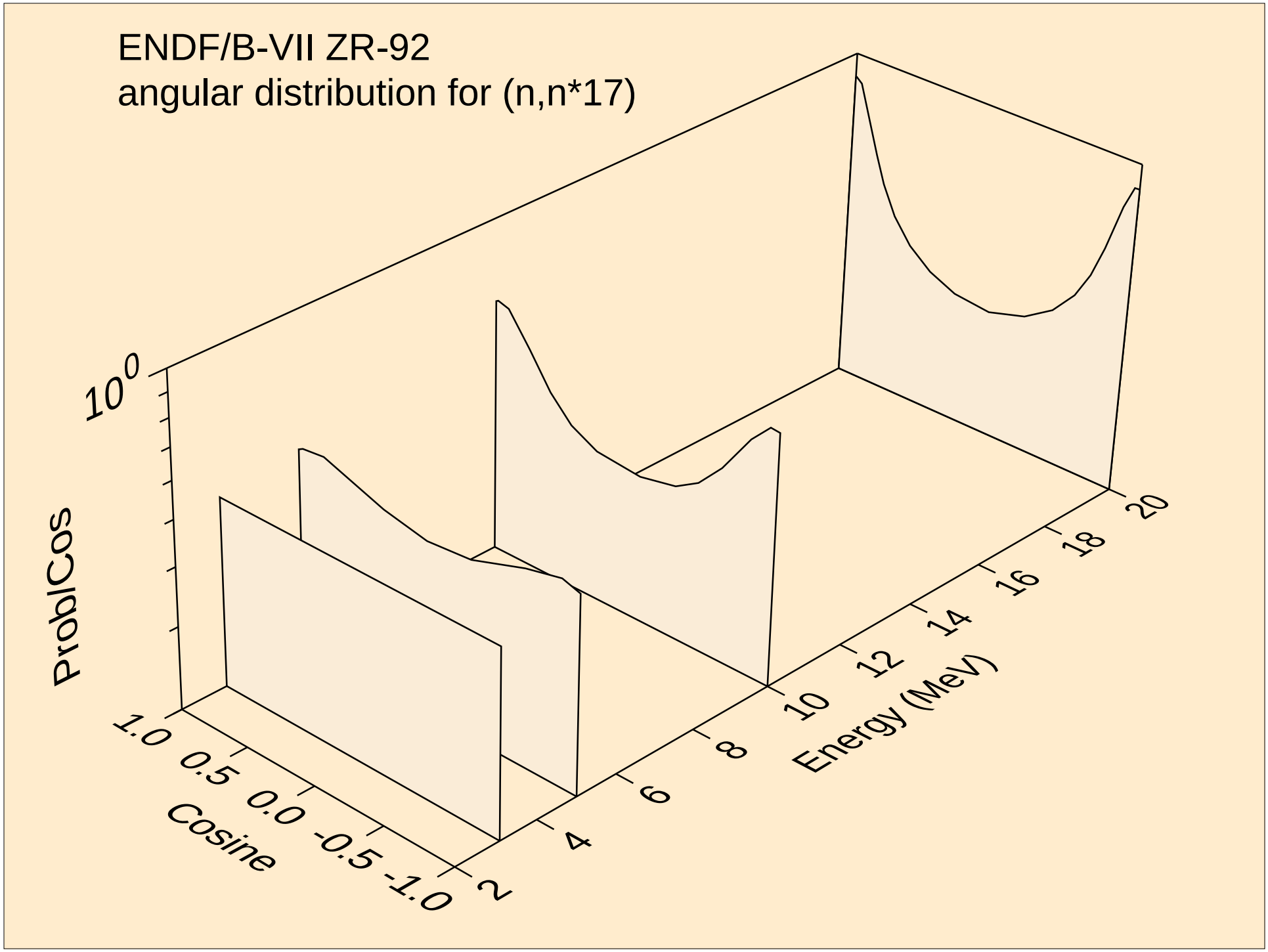

ENDF/B-VII ZR-92
angular distribution for (n,n*12)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

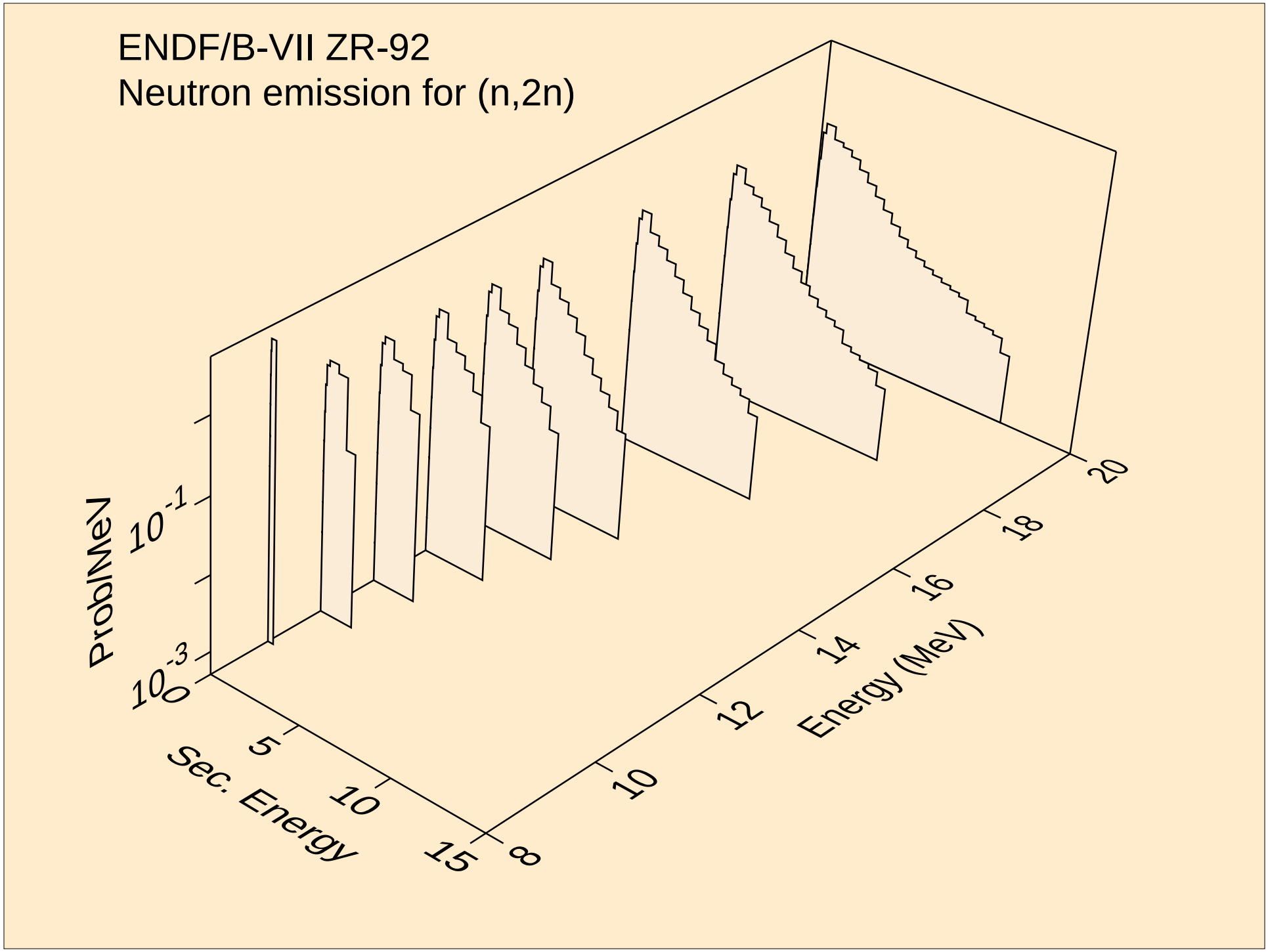

ENDF/B-VII ZR-92
angular distribution for (n,n*13)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

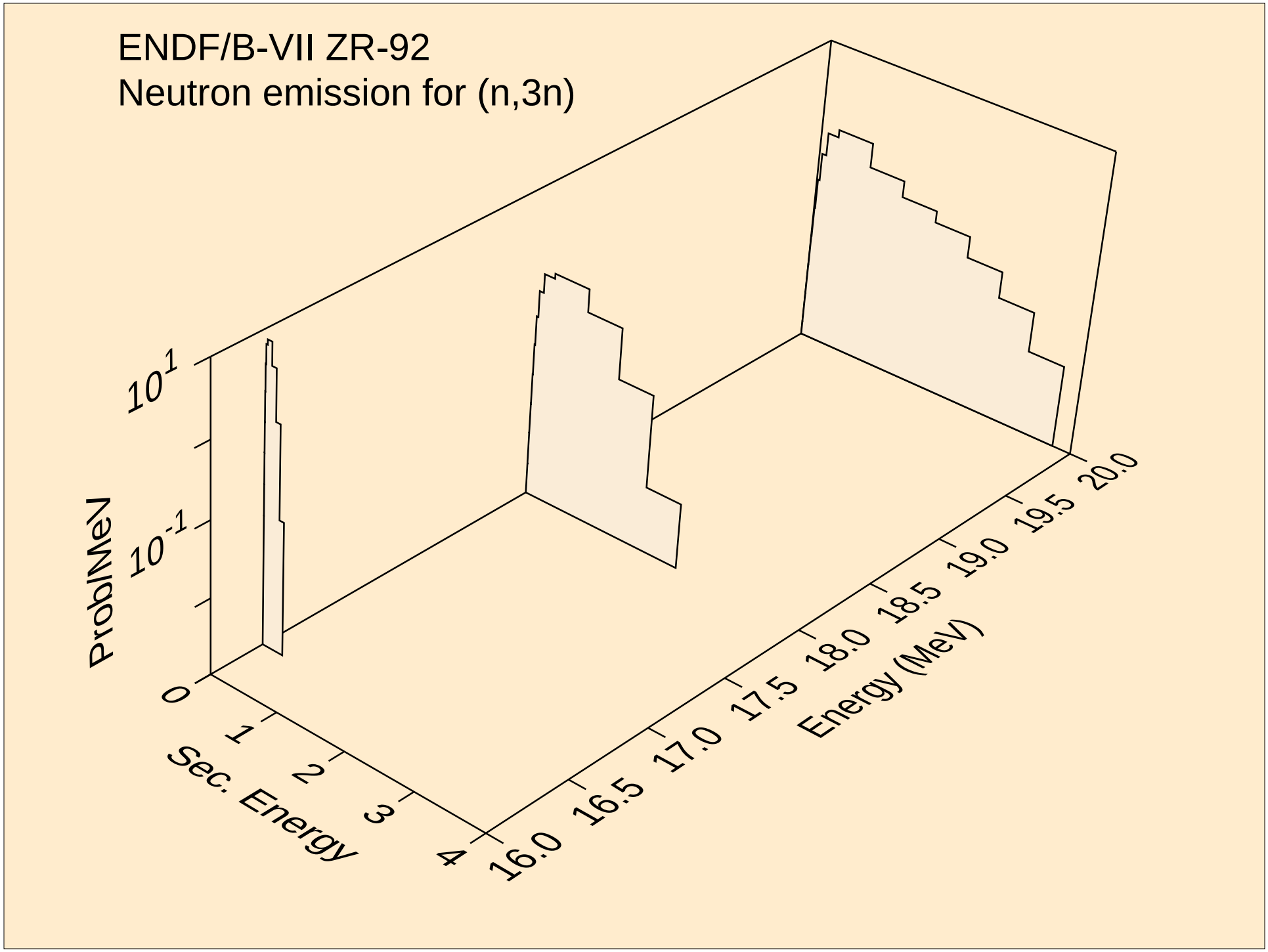

ENDF/B-VII ZR-92
angular distribution for (n,n*14)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

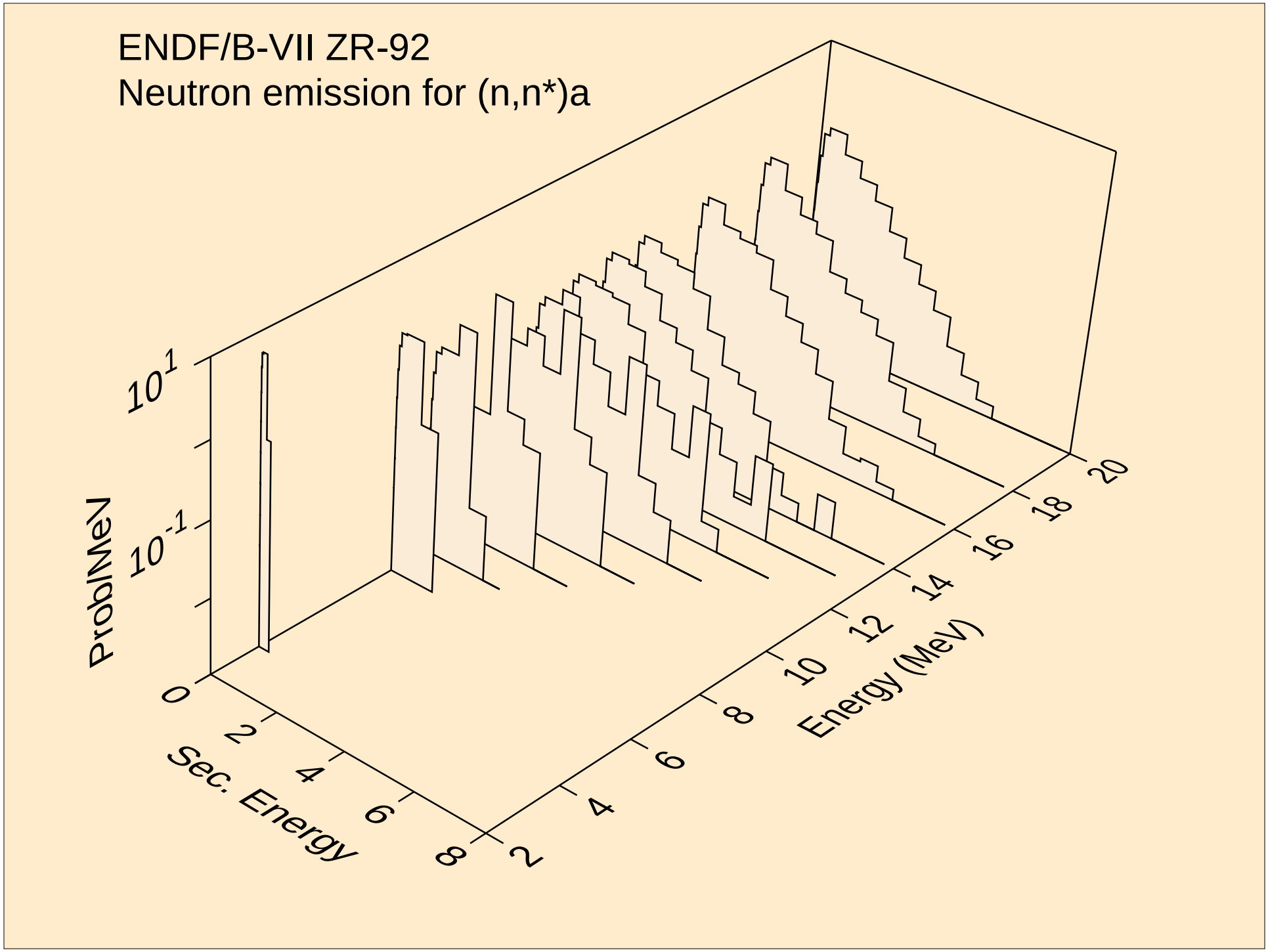

ENDF/B-VII ZR-92
angular distribution for (n,n*15)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

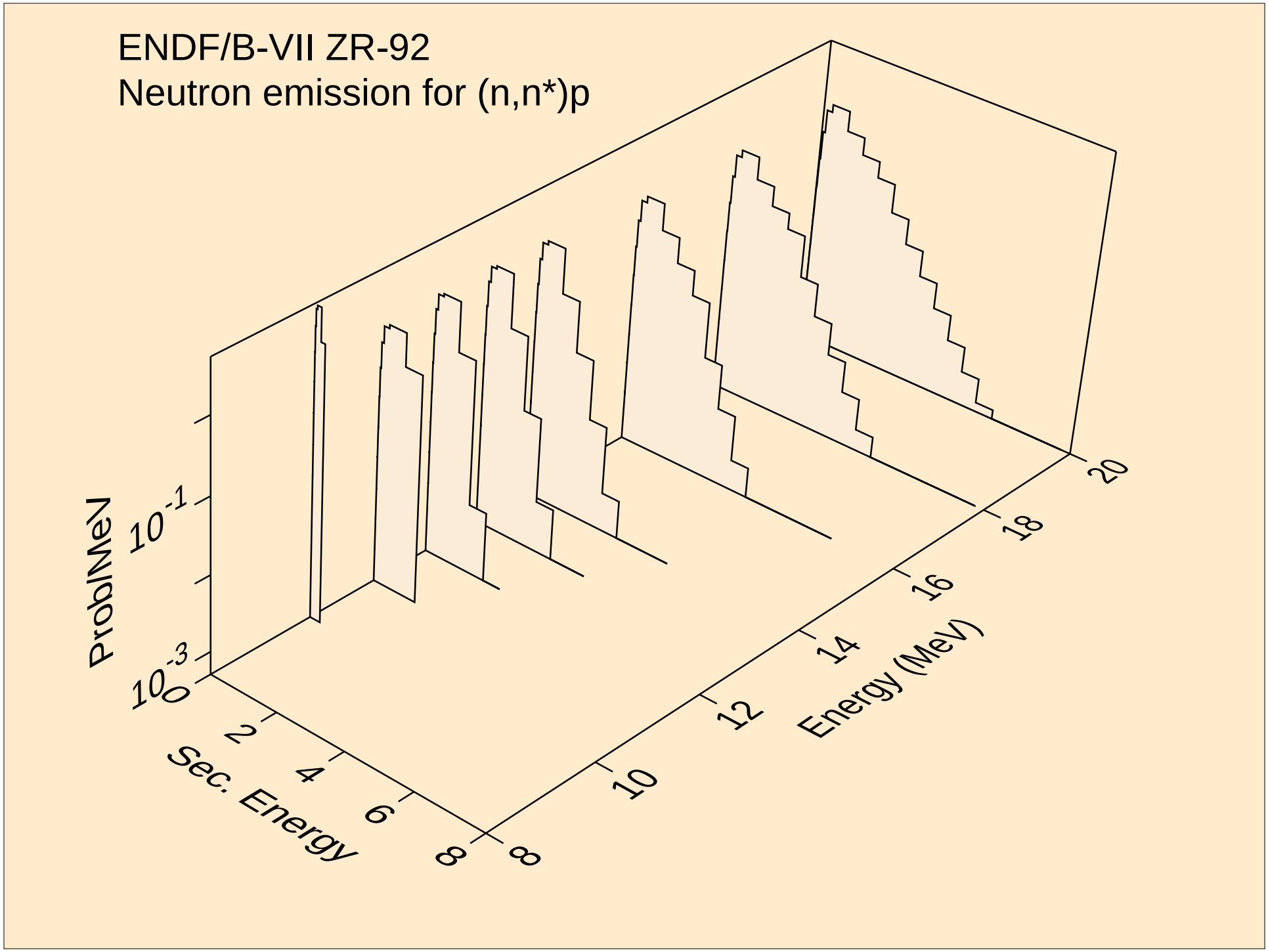

ENDF/B-VII ZR-92
angular distribution for (n,n*16)
Prob/Cos
10^0
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

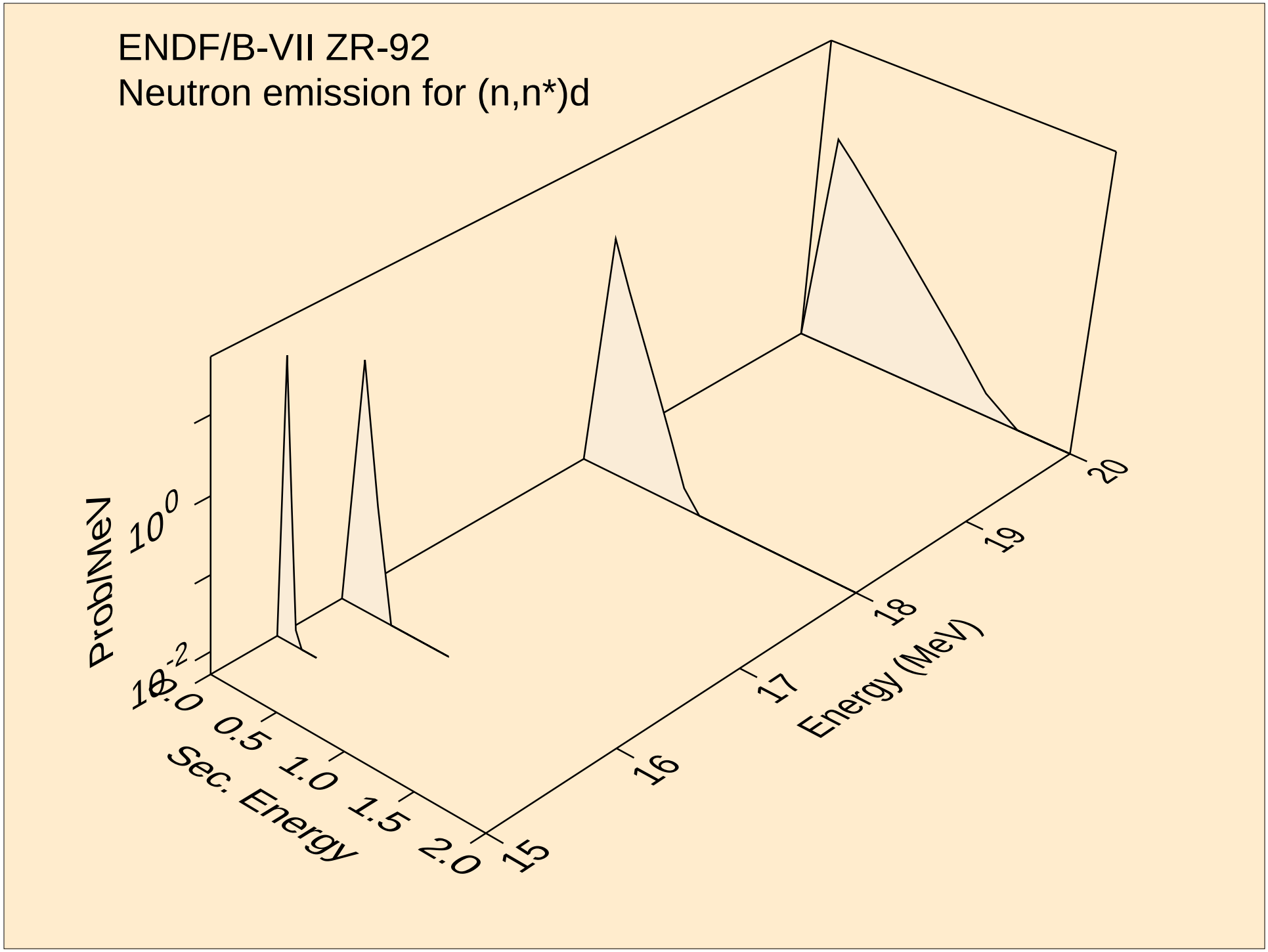

ENDF/B-VII ZR-92
angular distribution for (n,n*17)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


ENDF/B-VII ZR-92
Neutron emission for (n,2n)
Prob/MeV
10^{-1}
10^{-3}
0
5
10
15
Sec. Energy
8
10
12
14
16
18
20
Energy (MeV)

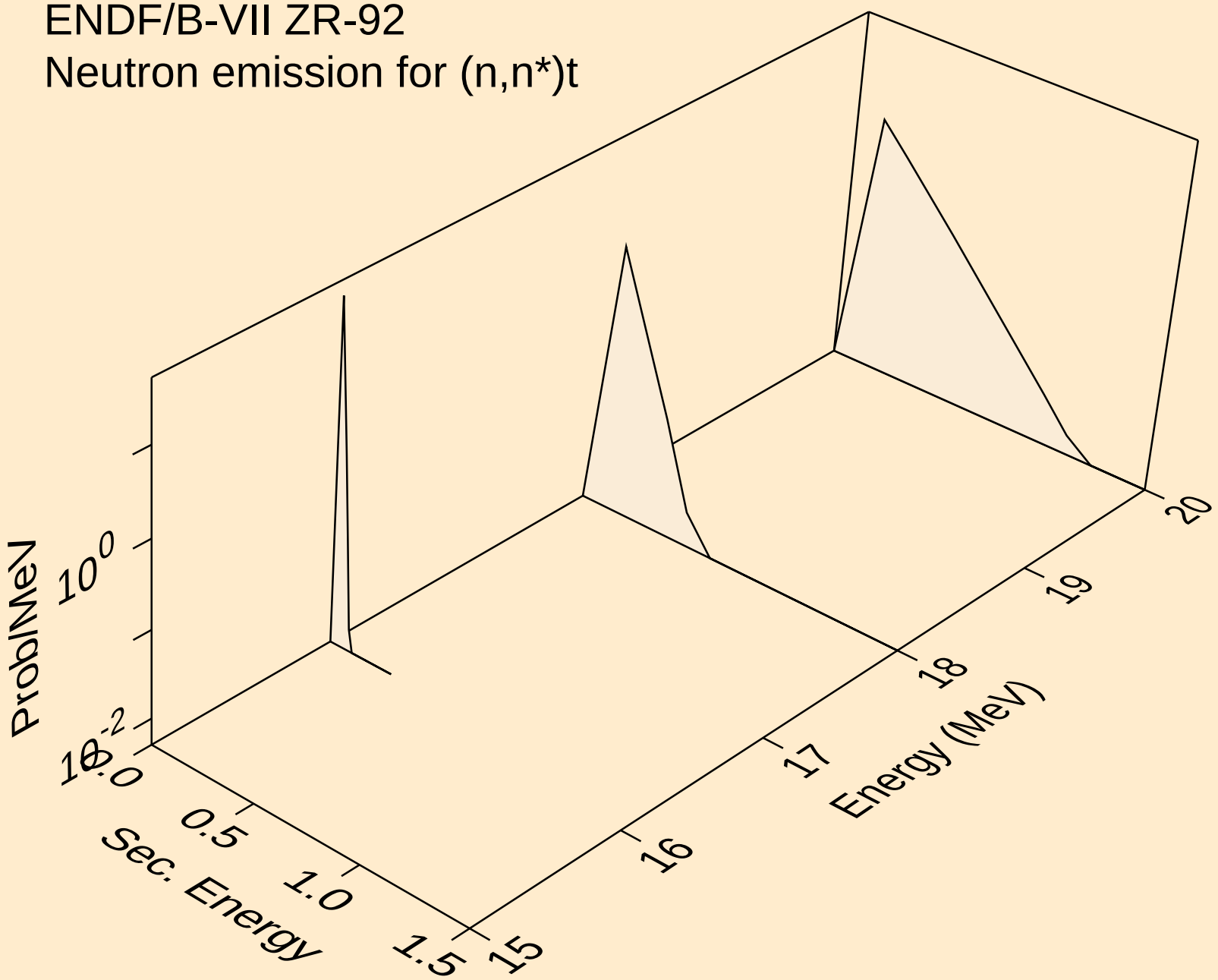

ENDF/B-VII ZR-92
Neutron emission for (n,3n)
Prob/MeV
10^{1}
10^{-1}
0
1
2
3
4
Sec. Energy
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5
20.0
Energy (MeV)

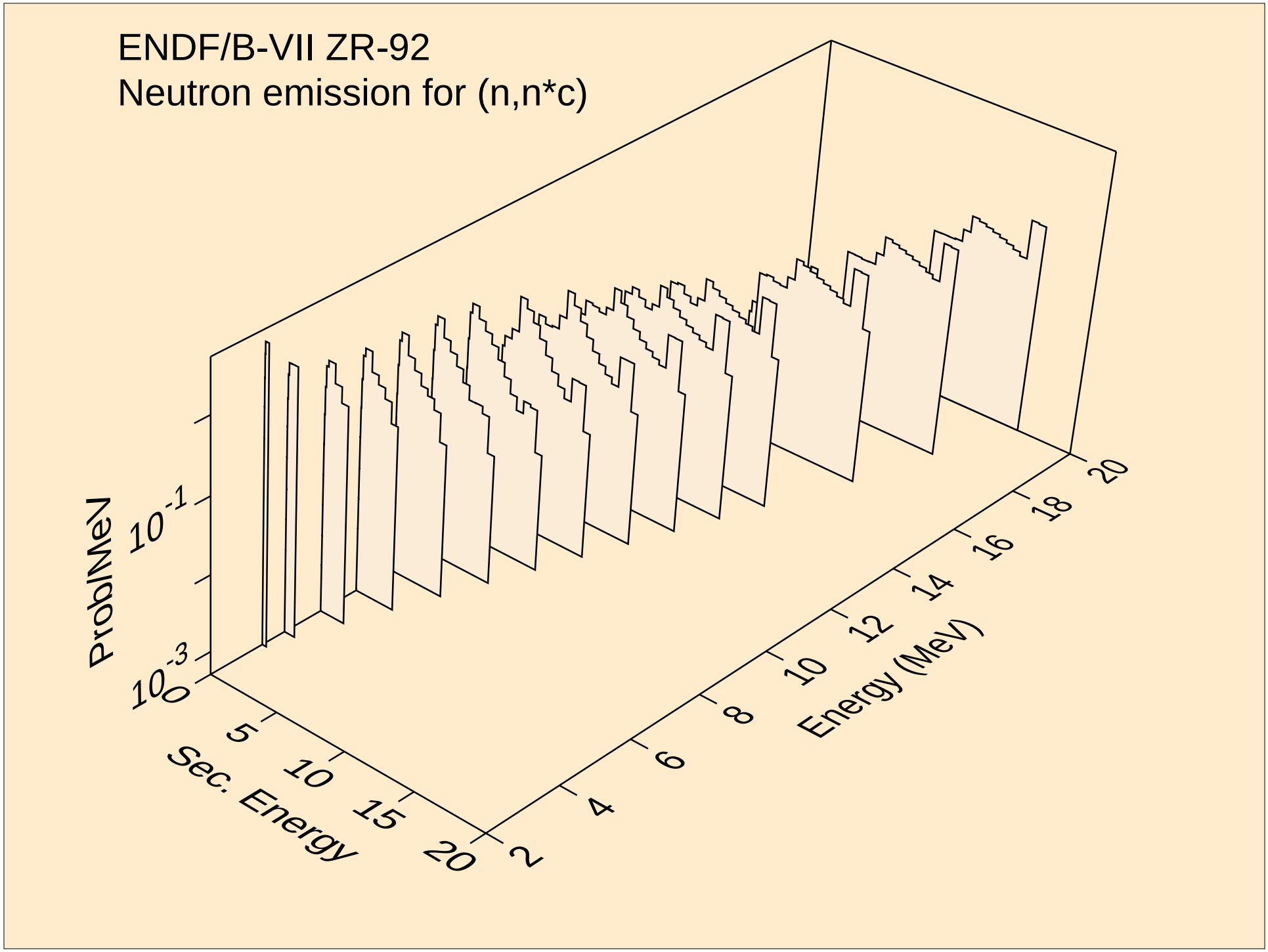

ENDF/B-VII ZR-92
Neutron emission for (n,n*)a
Prob/MeV
10^{1}
10^{-1}
0
Sec. Energy
2
4
6
8
Energy (MeV)
2
4
6
8
10
12
14
16
18
20


ENDF/B-VII ZR-92
Neutron emission for (n,n*)p
Prob/MeV
10^{-1}
10^{-3}
0
2
4
6
8
Sec. Energy
8
10
12
14
16
18
20
Energy (MeV)

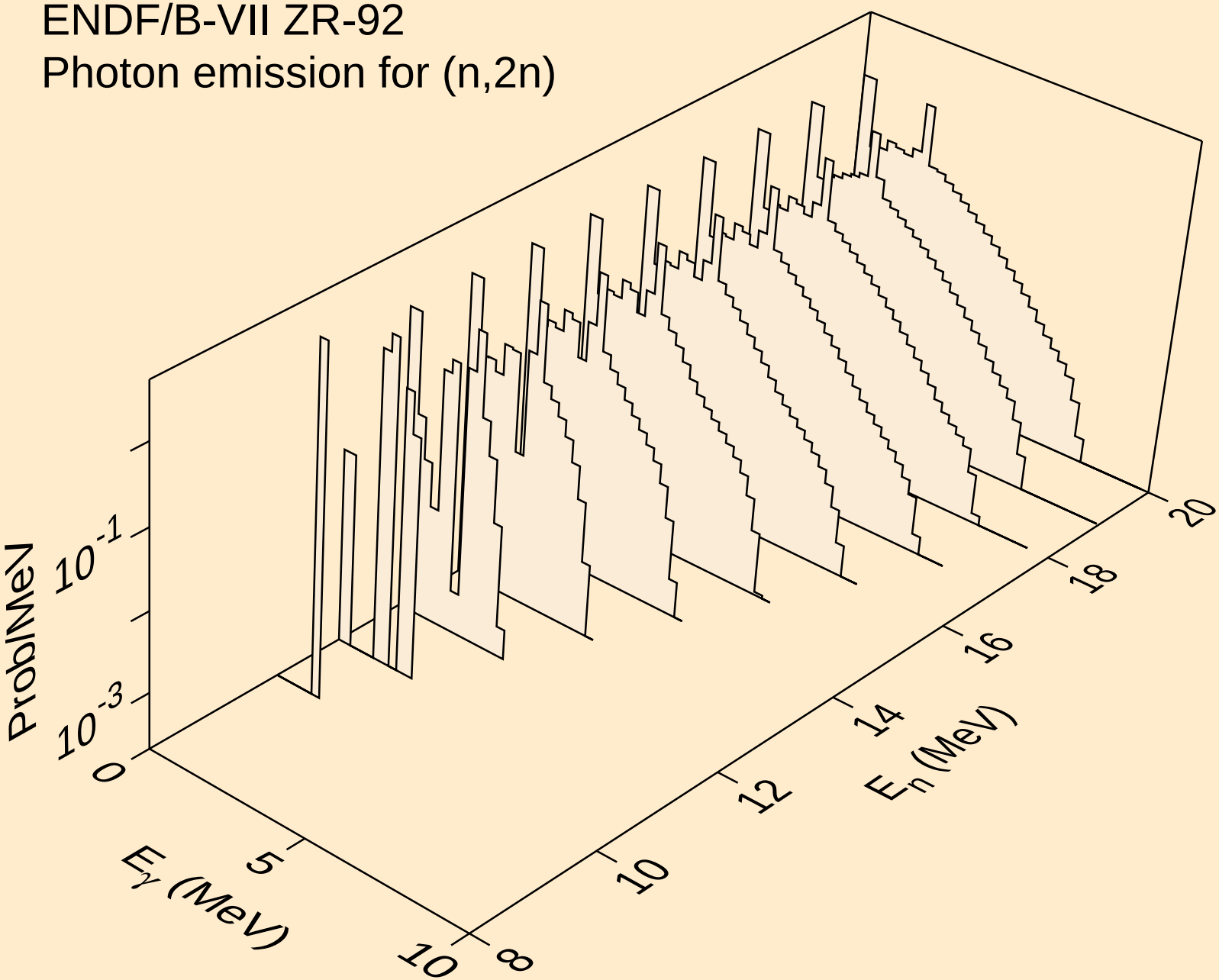

ENDF/B-VII ZR-92
Neutron emission for (n,n*)d
Prob/MeV
10^0
10^{-2}
0.0
0.5
1.0
1.5
2.0
Sec. Energy
15
16
17
18
19
20
Energy (MeV)

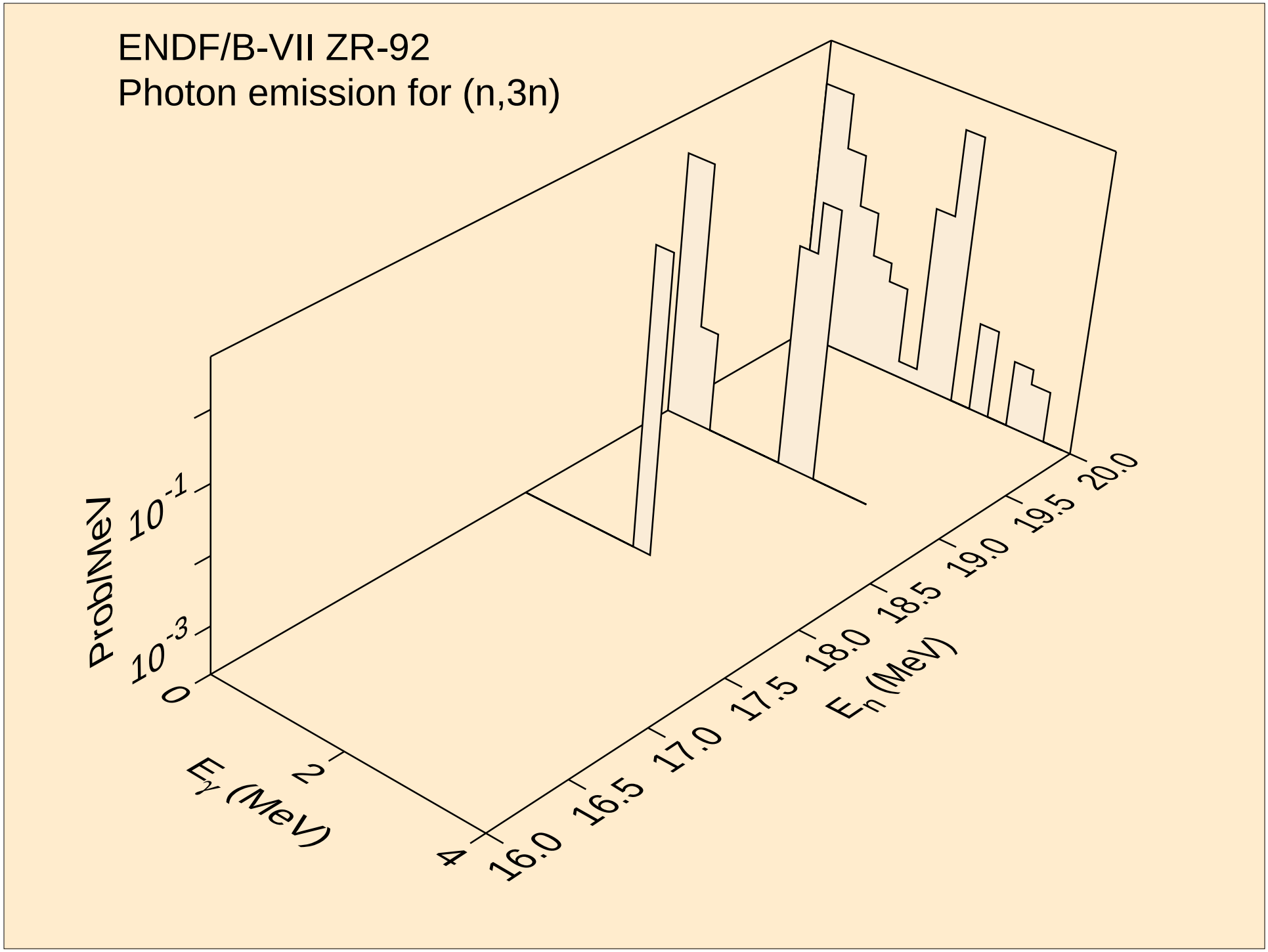
ENDF/B-VII ZR-92
Neutron emission for (n,n*)t

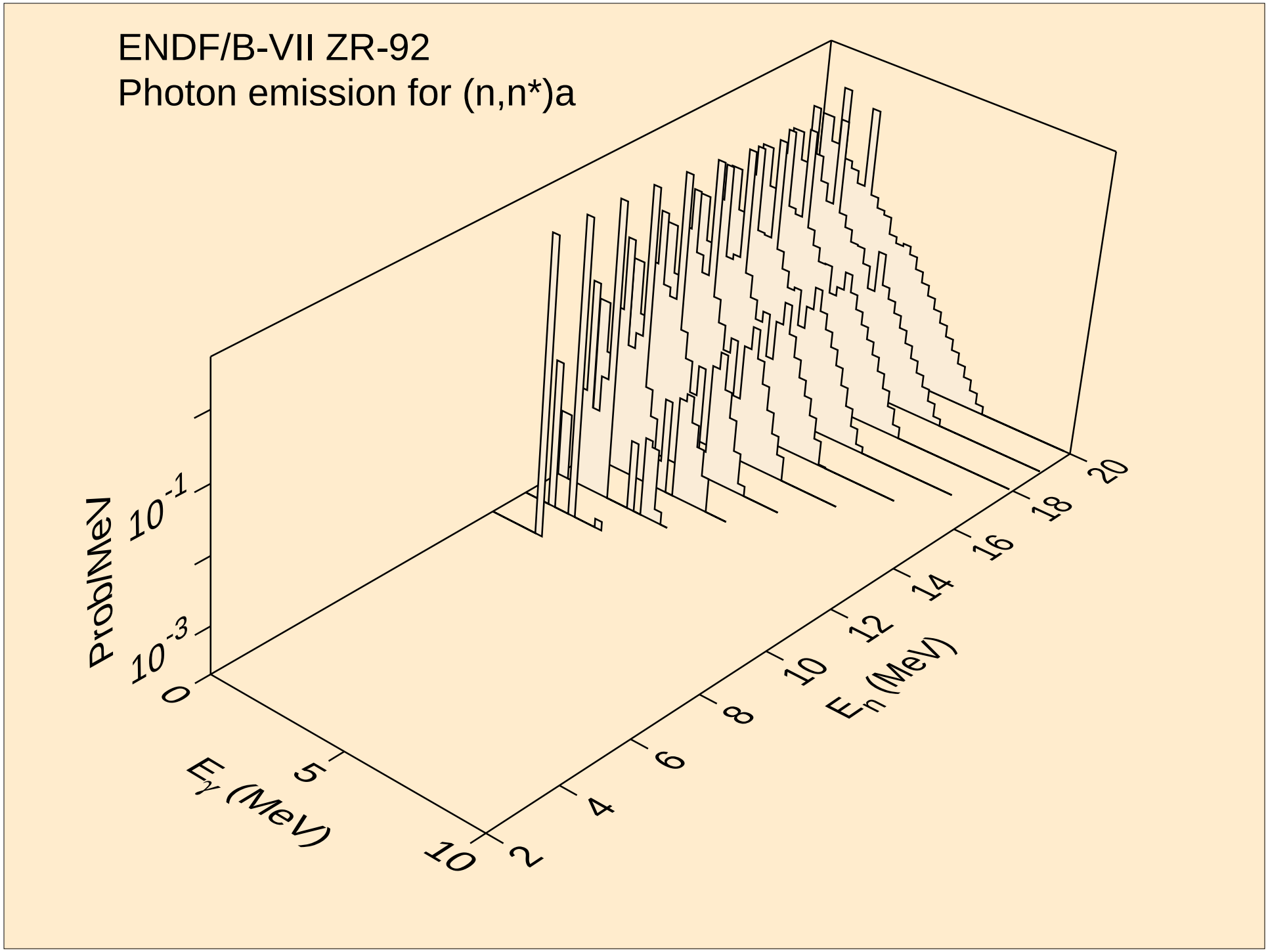


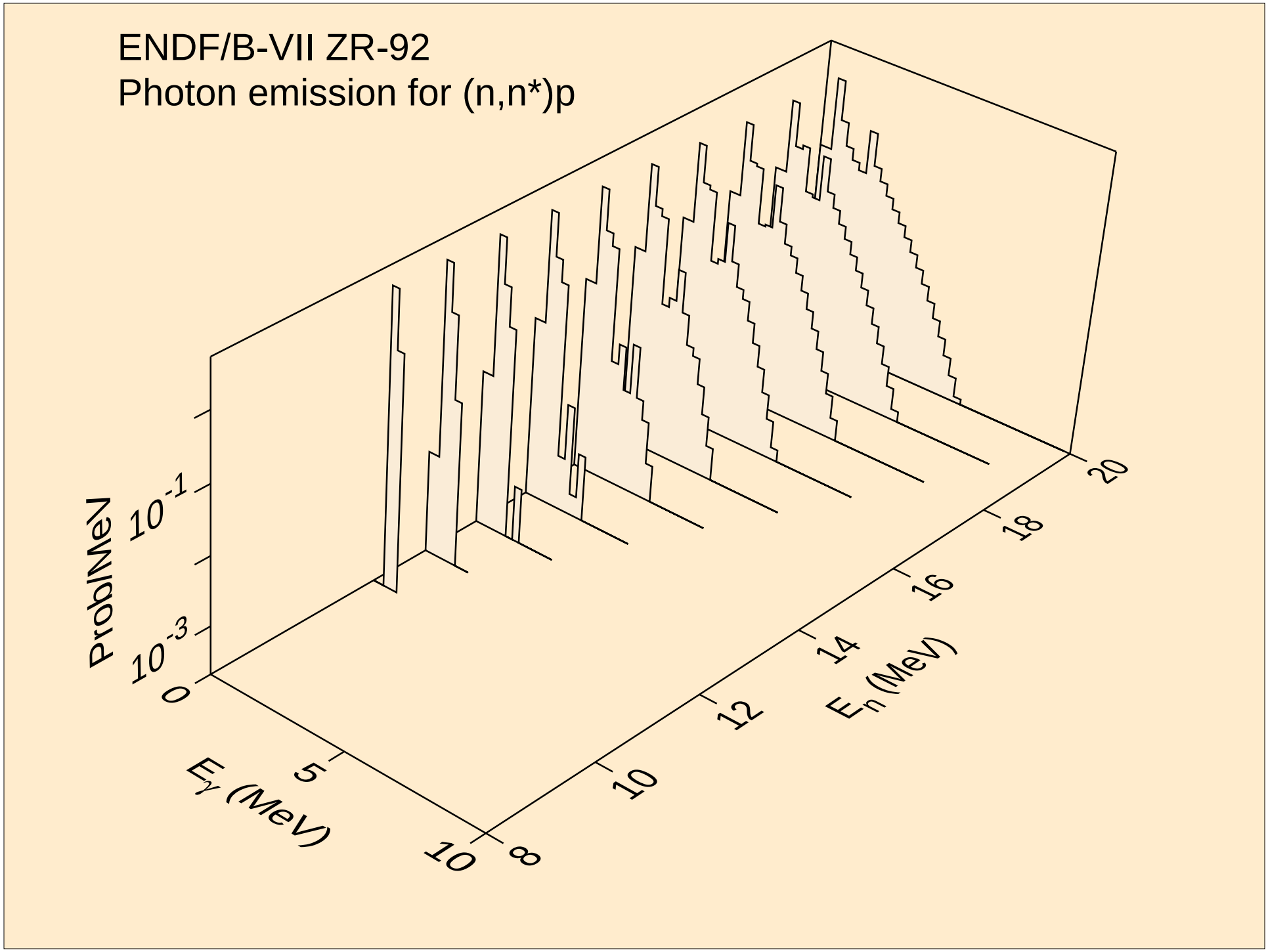

ENDF/B-VII ZR-92
Neutron emission for (n,n*c)
Prob/MeV
10^{-1}
10^{-3}
0
5
10
15
20
Sec. Energy
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

ENDF/B-VII ZR-92
Photon emission for (n,2n)

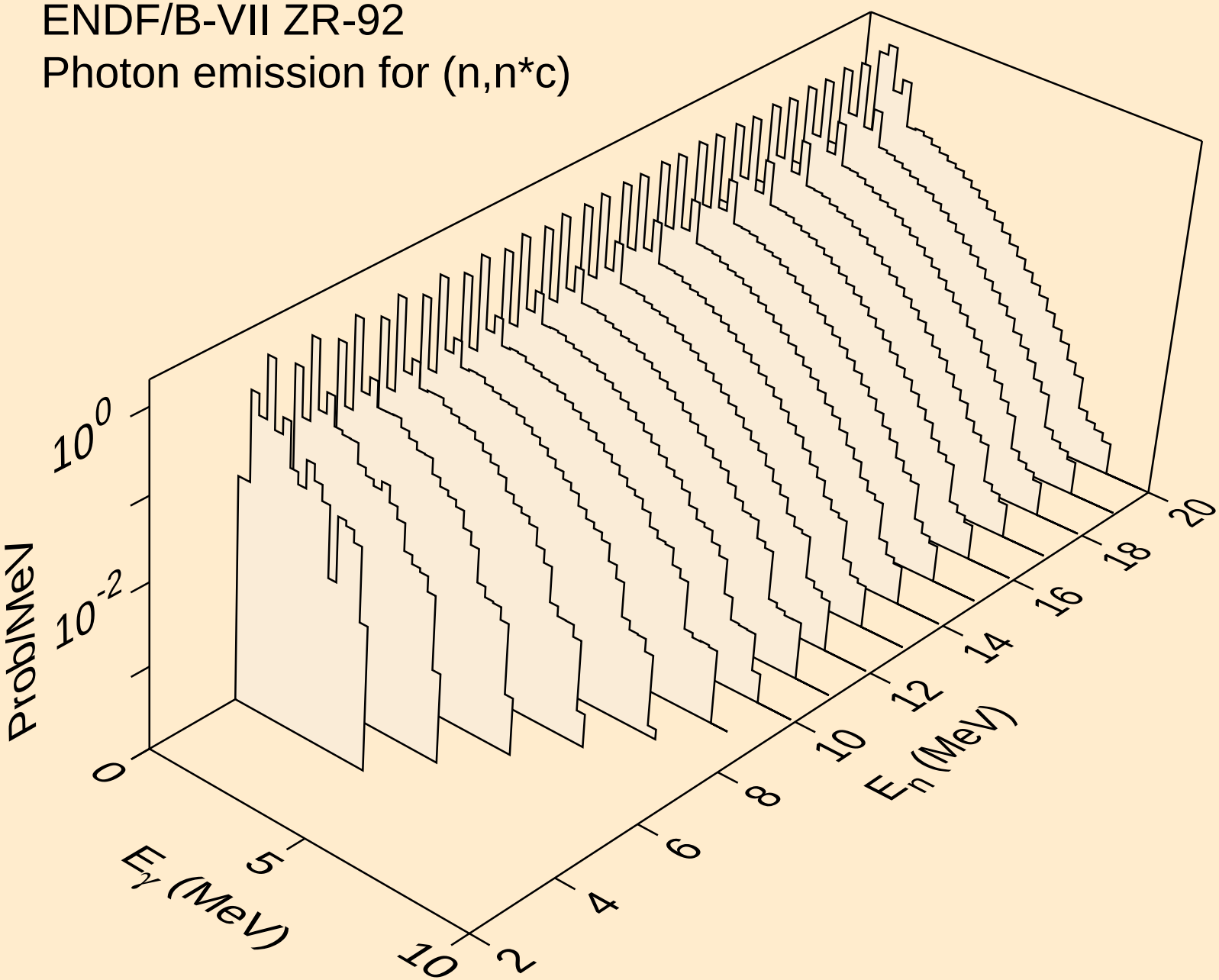


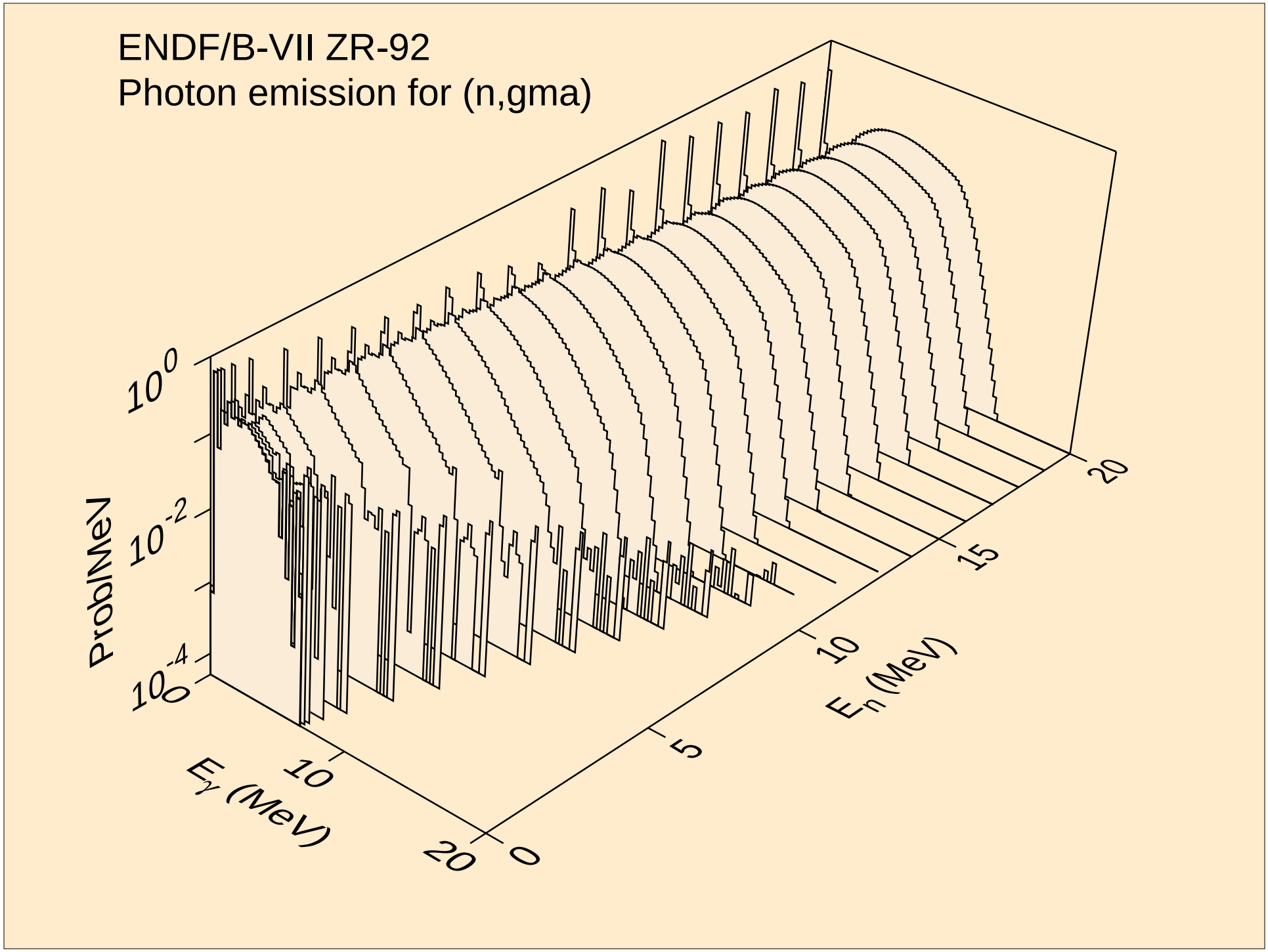

ENDF/B-VII ZR-92
Photon emission for (n,3n)
Prob/MeV
10^{-1}
10^{-3}
0
2
4
E_γ (MeV)
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5
20.0
E_n (MeV)

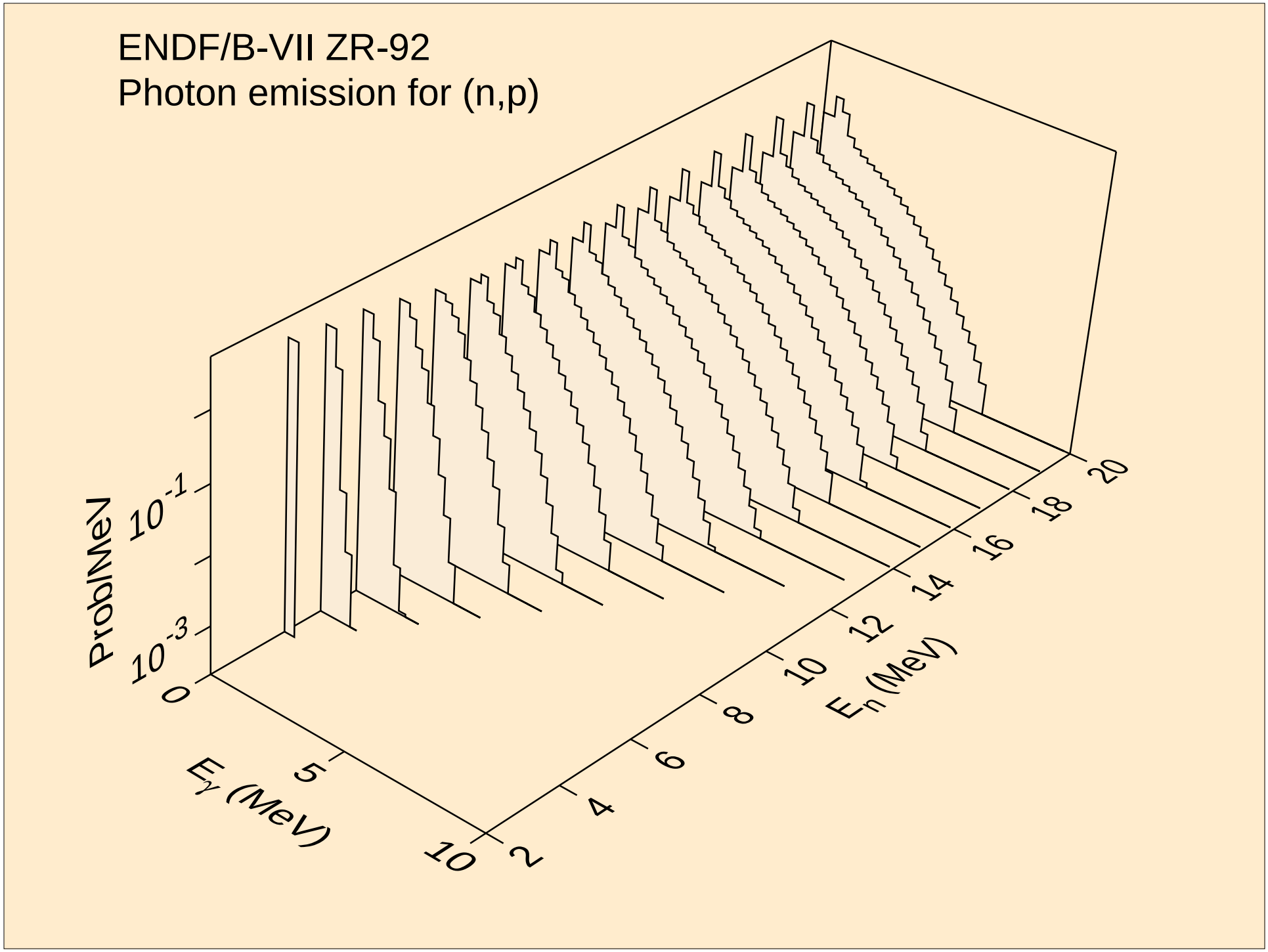

ENDF/B-VII ZR-92
Photon emission for (n,n*)a
Prob/MeV
10^{-1}
10^{-3}
0
5
10
E_γ (MeV)
2
4
6
8
10
12
14
16
18
20
E_n (MeV)


ENDF/B-VII ZR-92
Photon emission for (n,n*)p
Prob/MeV
10^-1
10^-3
0
5
10
E_γ (MeV)
8
10
12
14
16
18
20
E_n (MeV)

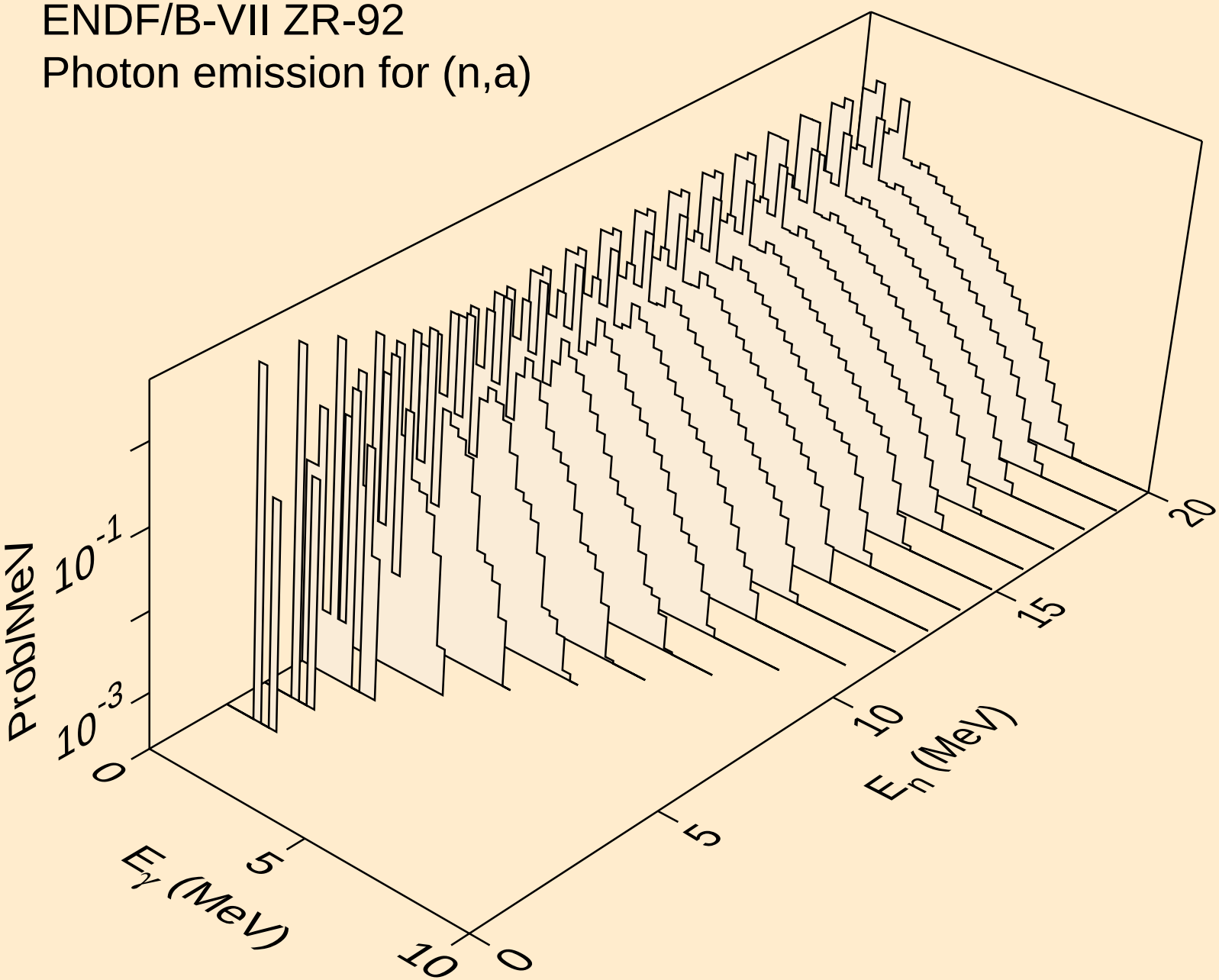
ENDF/B-VII ZR-92
Photon emission for (n,n*c)

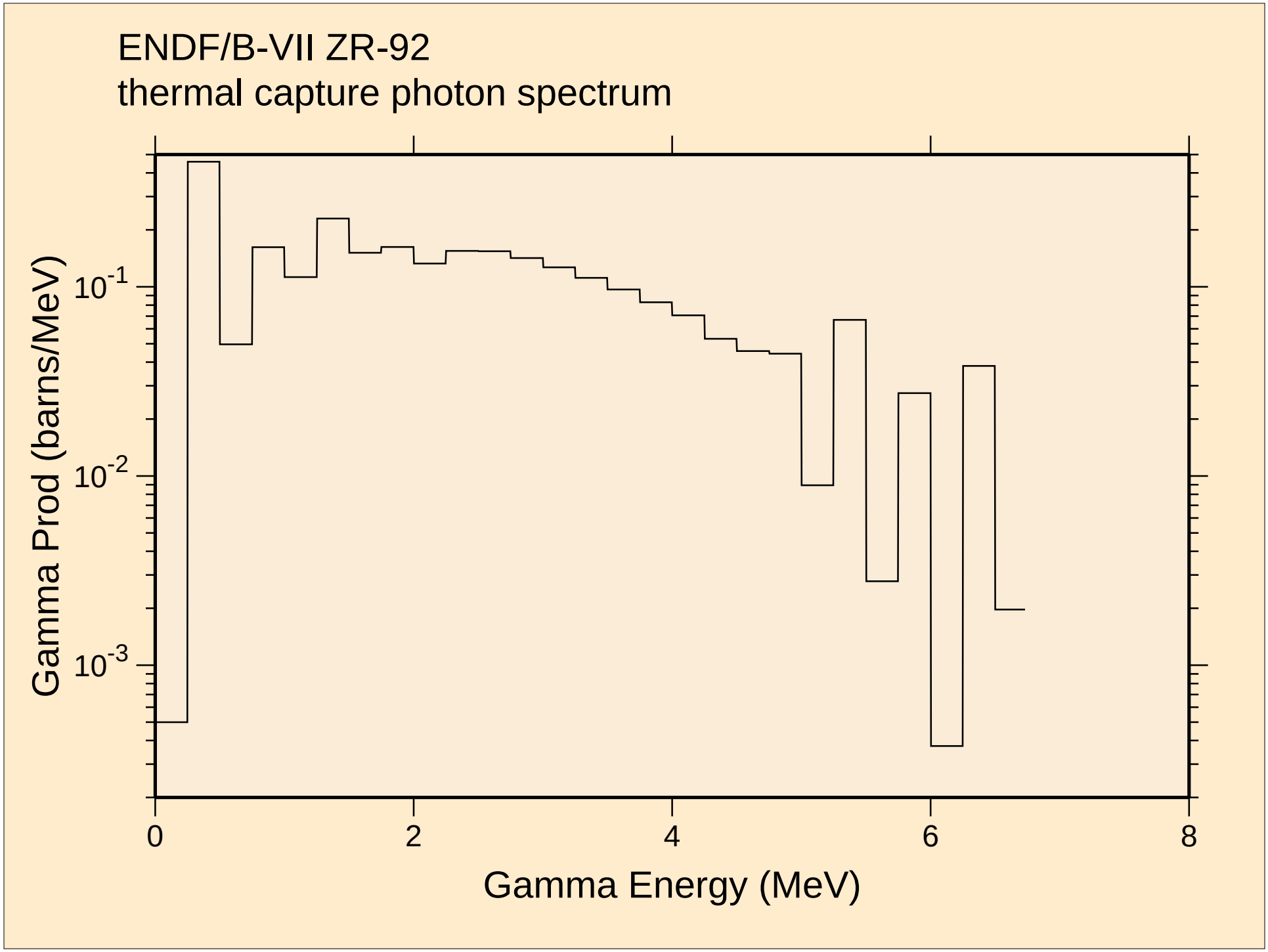


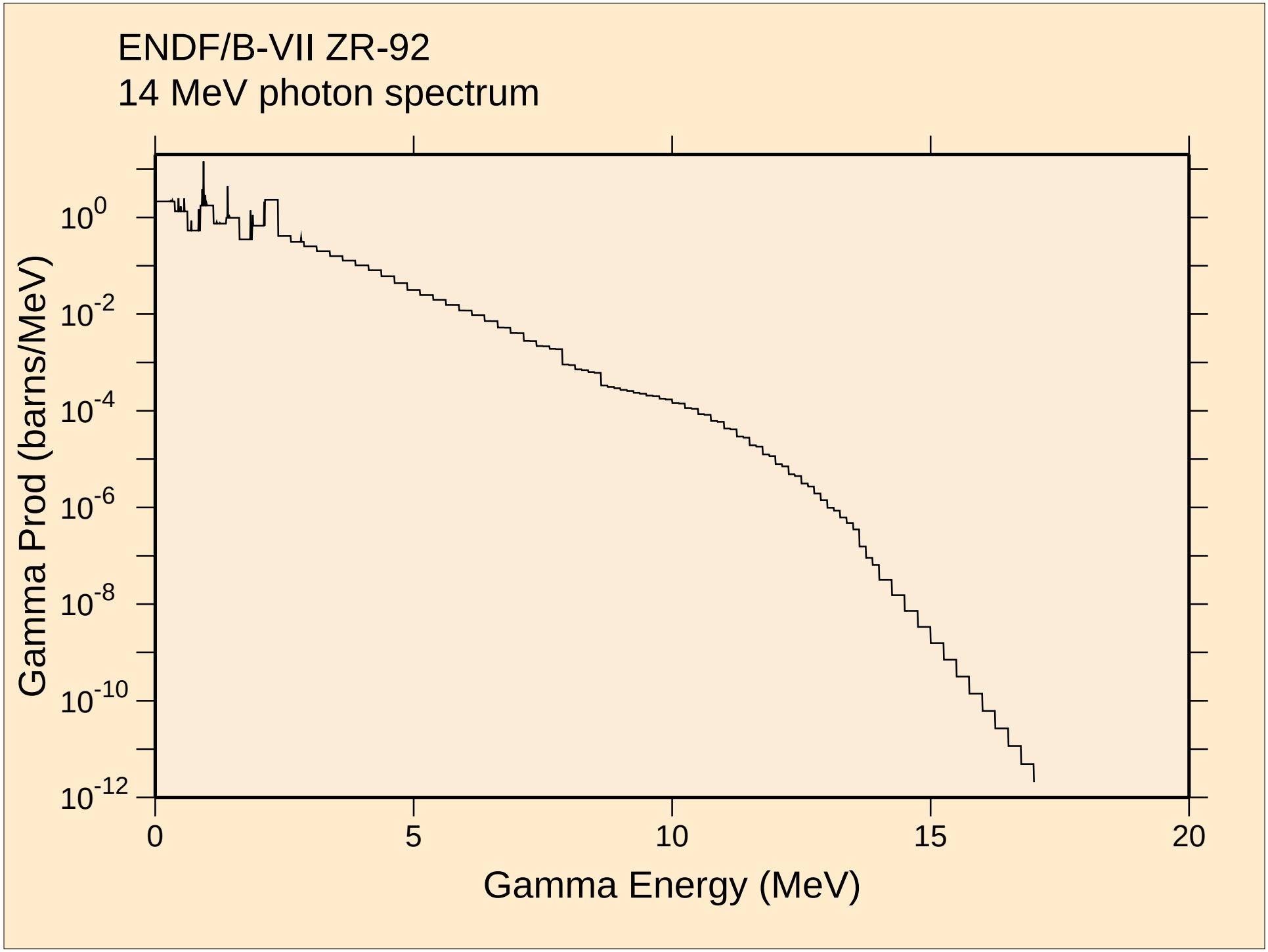

ENDF/B-VII ZR-92
Photon emission for (n,gma)
Prob/MeV
10^0
10^{-2}
10^{-4}
E_γ (MeV)
0
10
20
E_n (MeV)
0
5
10
15
20

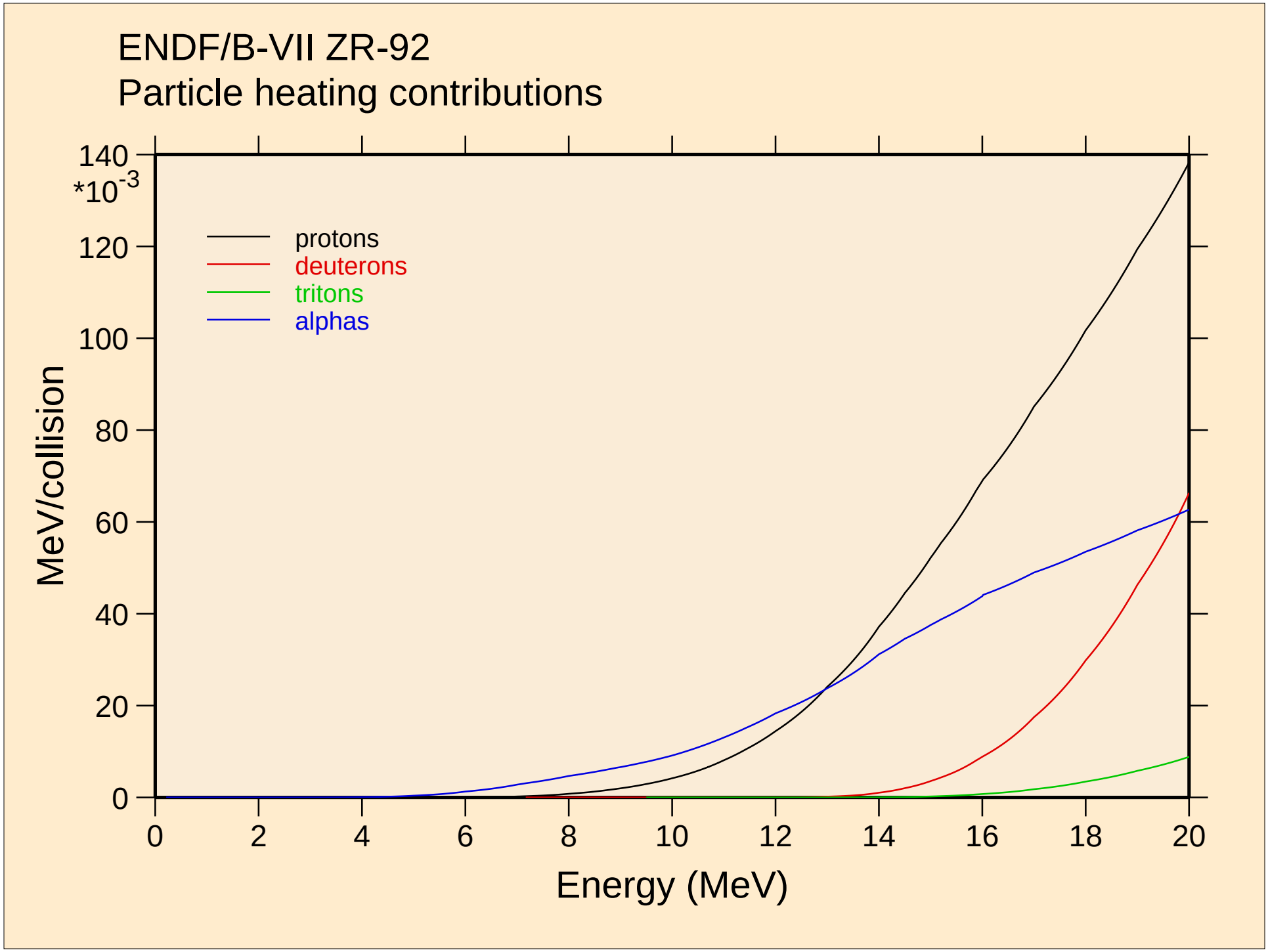

ENDF/B-VII ZR-92
Photon emission for (n,p)
Prob/MeV
10^{-1}
10^{-3}
0
5
10
E_γ (MeV)
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

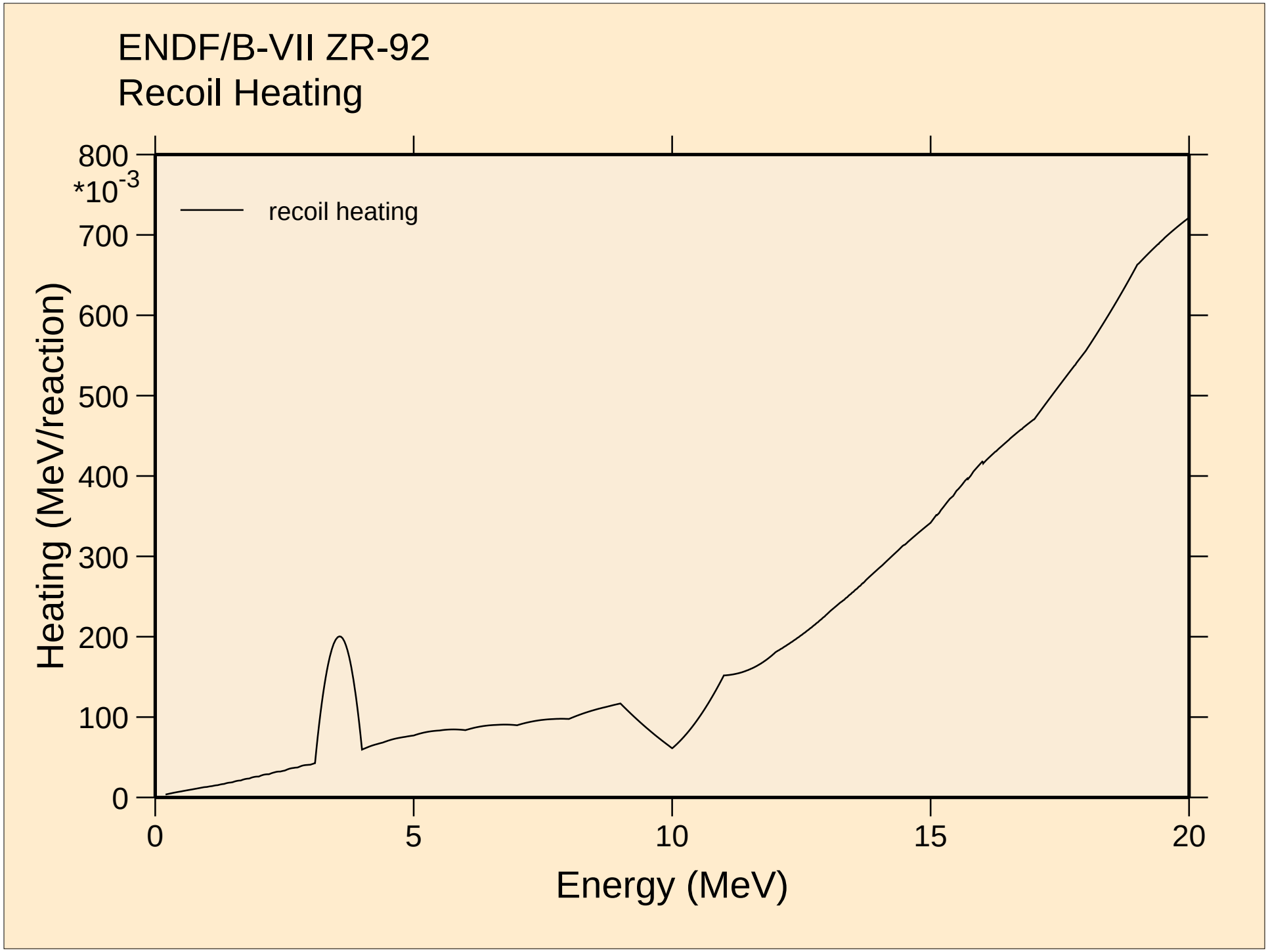
ENDF/B-VII ZR-92
Photon emission for (n,a)

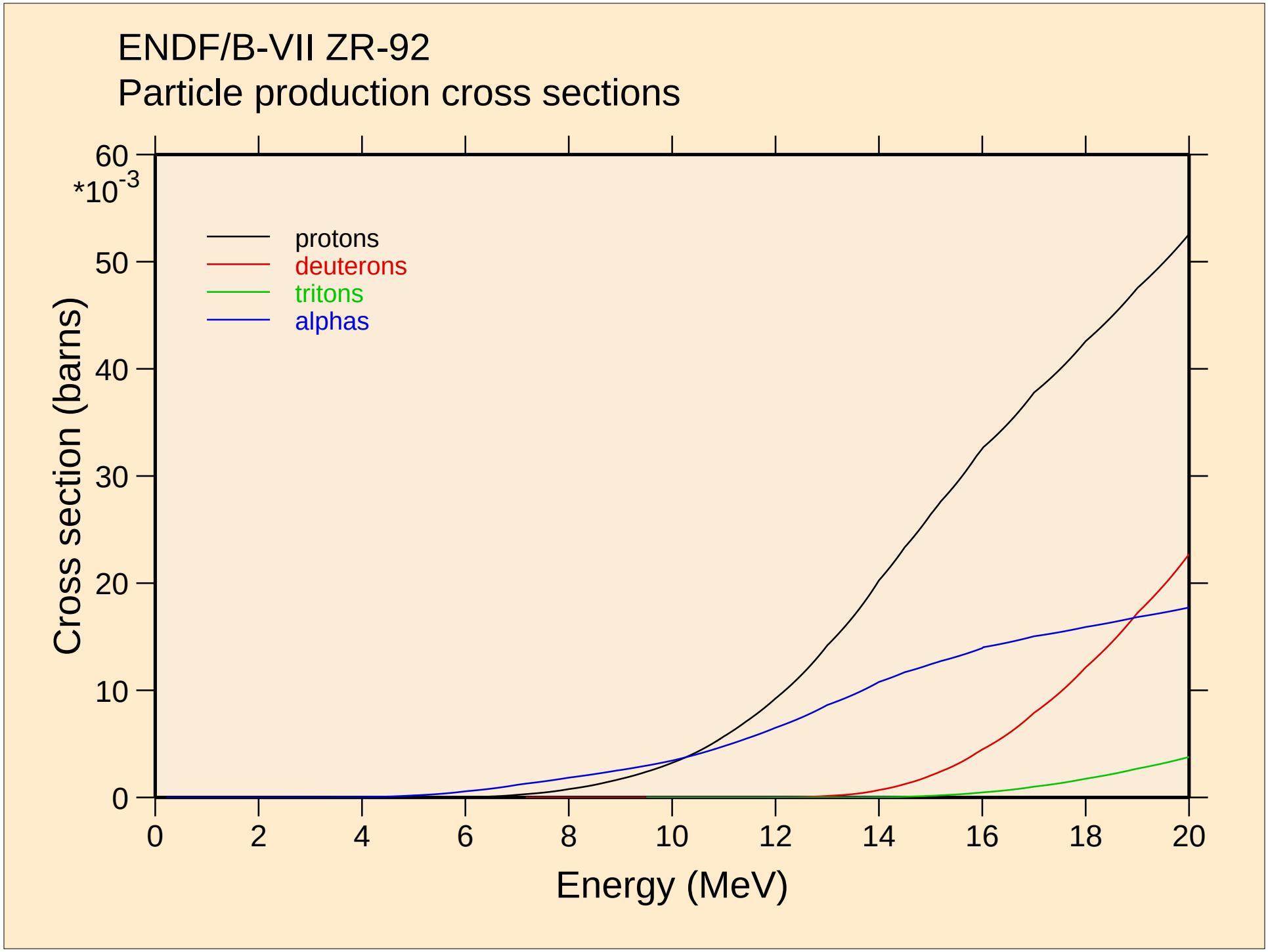


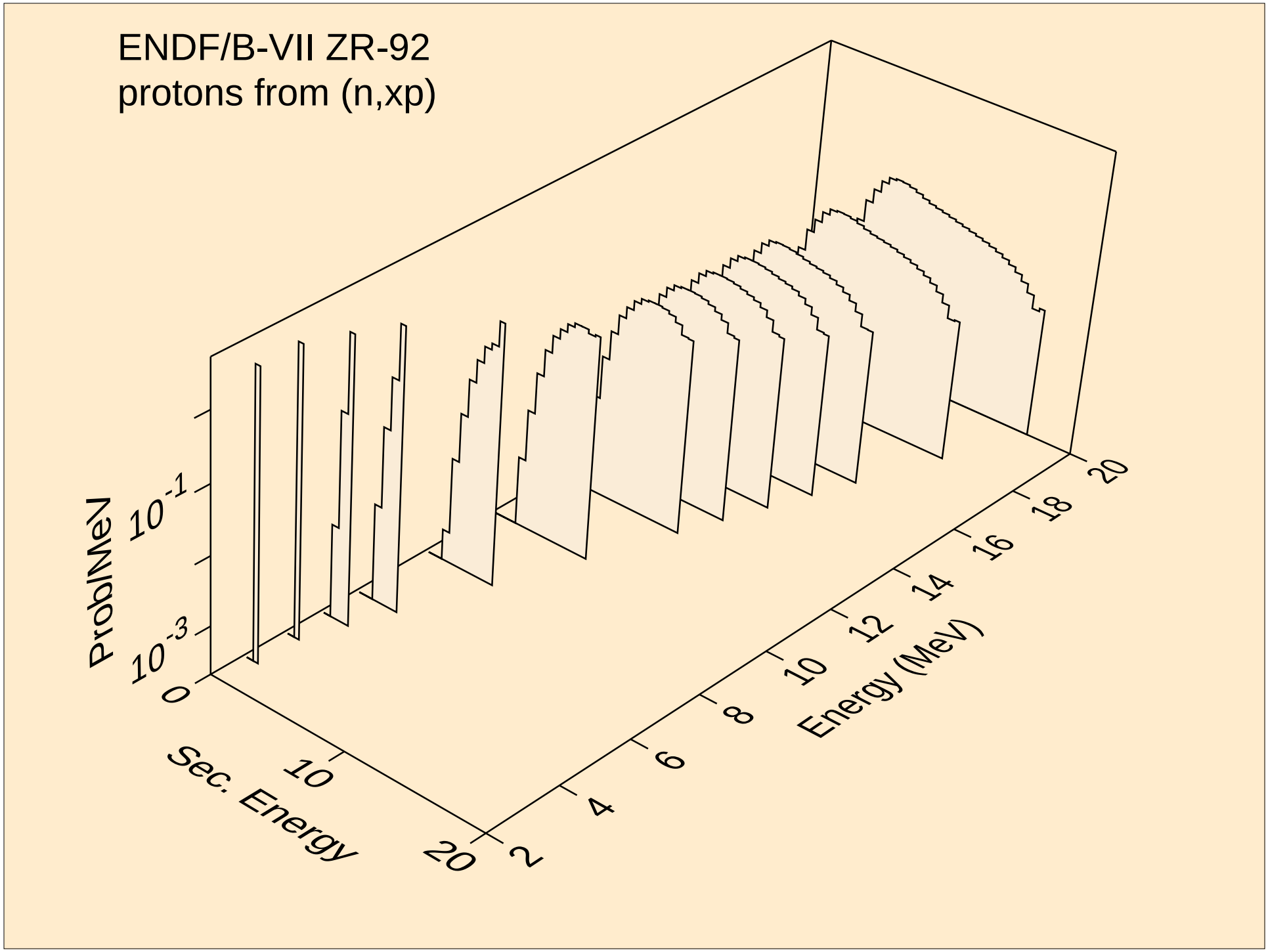

ENDF/B-VII ZR-92
thermal capture photon spectrum
Gamma Prod (barns/MeV)
10-1
10-2
10-3
0
2
4
6
8
Gamma Energy (MeV)

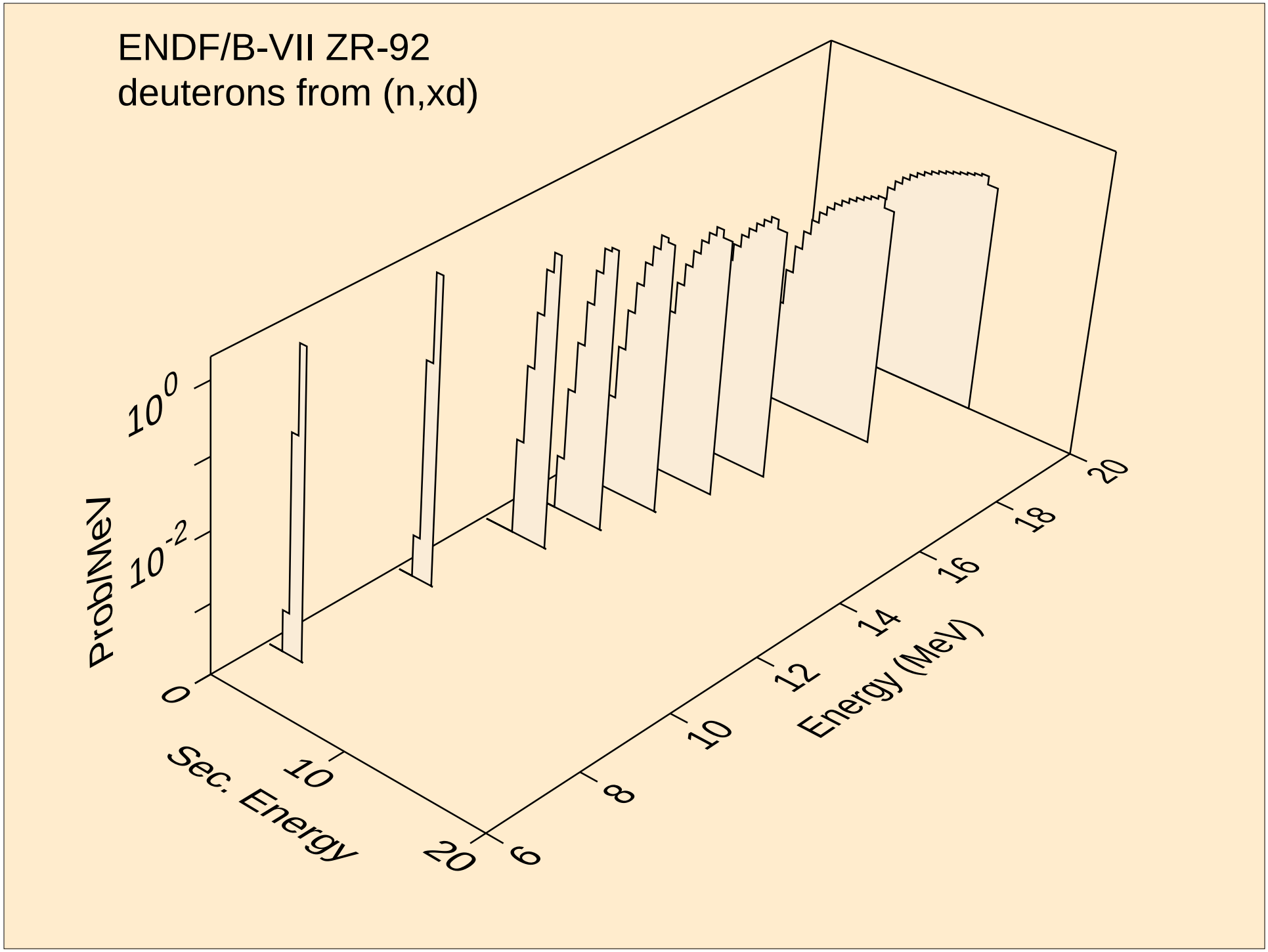

ENDF/B-VII ZR-92
14 MeV photon spectrum
Gamma Prod (barns/MeV)
10^{0}
10^{-2}
10^{-4}
10^{-6}
10^{-8}
10^{-10}
10^{-12}
0
5
10
15
20
Gamma Energy (MeV)

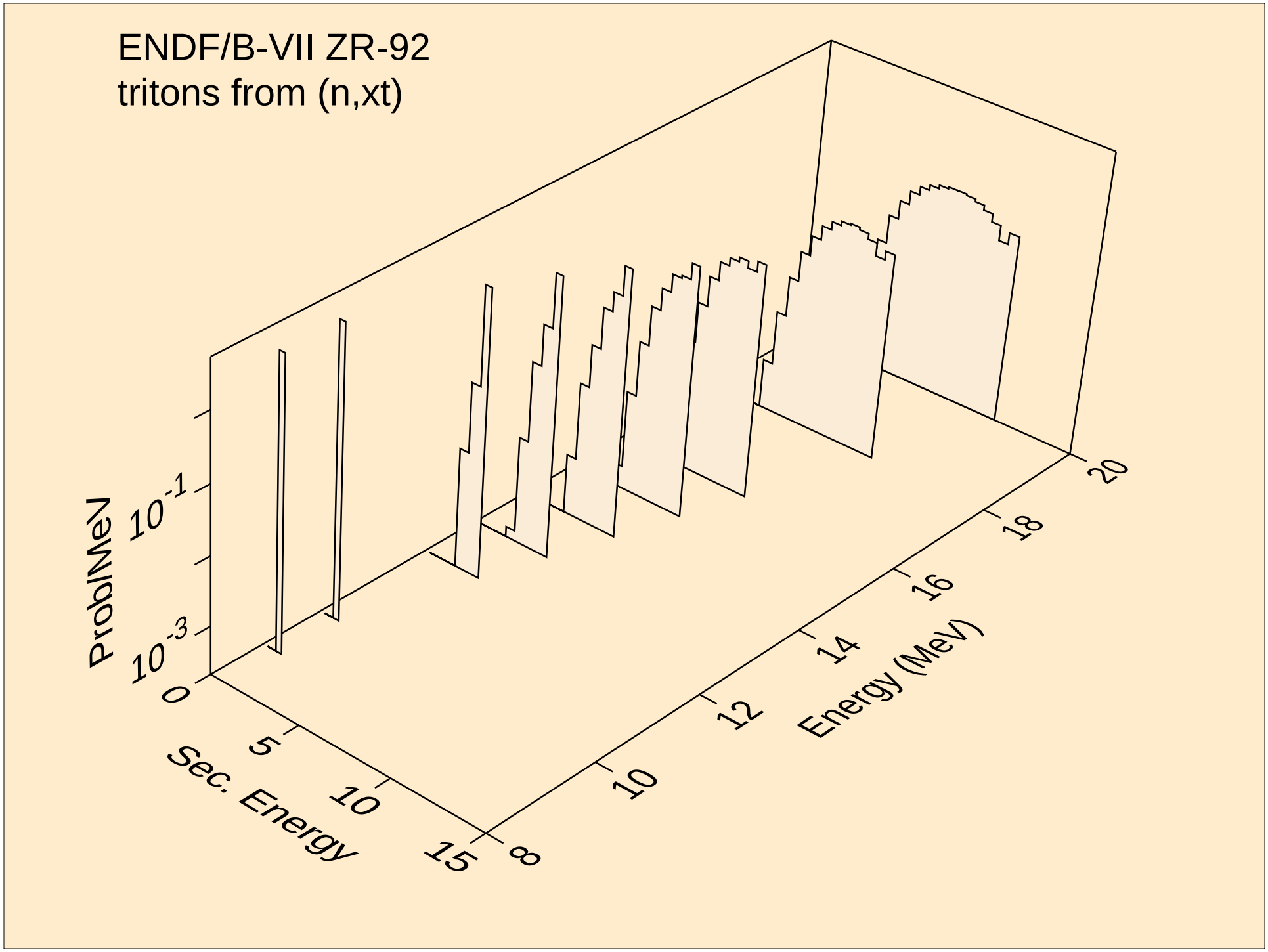

ENDF/B-VII ZR-92
Particle heating contributions
*10^-3
140
120
100
80
60
40
20
0
MeV/collision
protons
deuterons
tritons
alphas
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

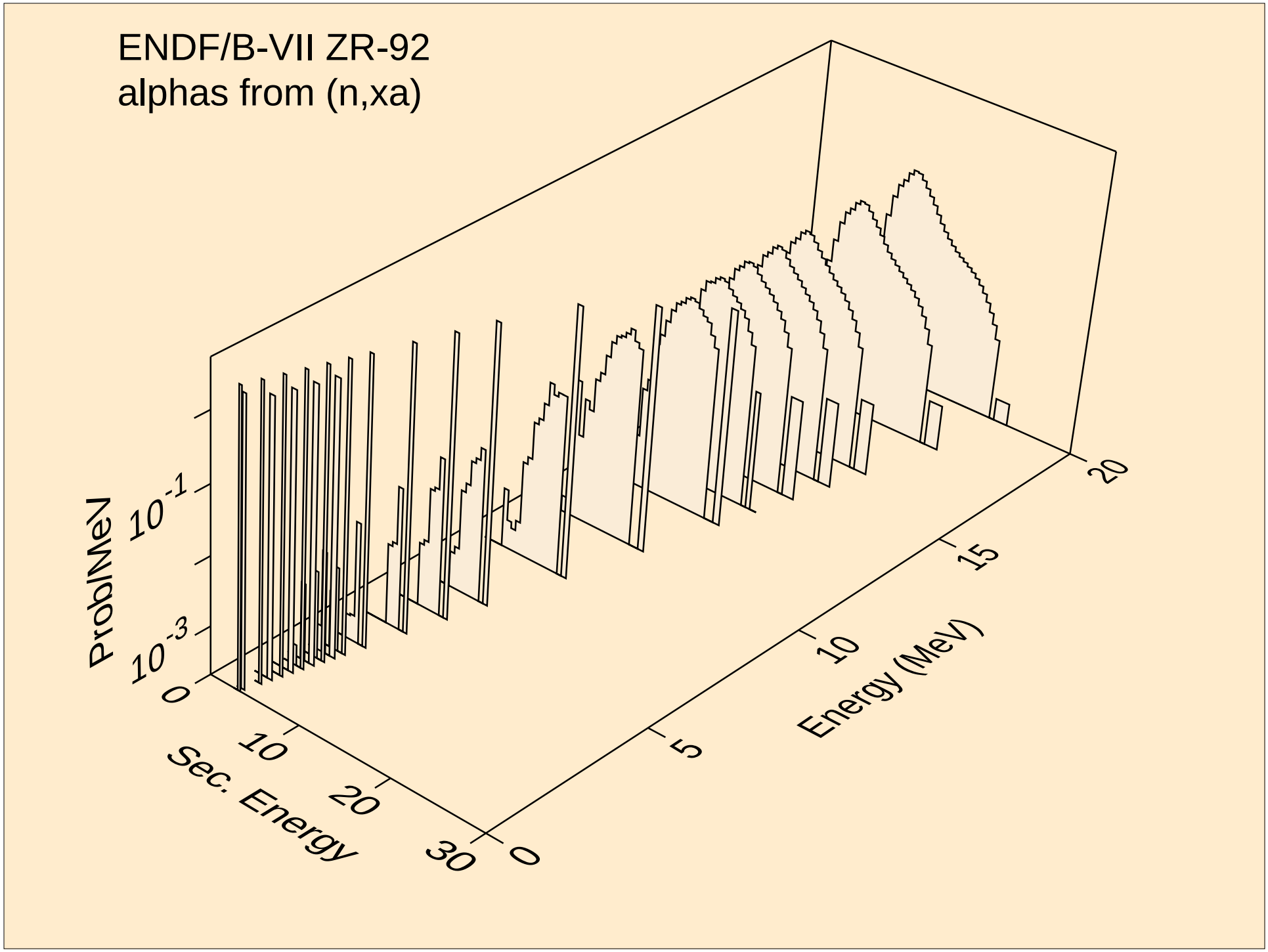

ENDF/B-VII ZR-92
Recoil Heating
recoil heating
Heating (MeV/reaction)
*10^-3
800
700
600
500
400
300
200
100
0
0
5
10
15
20
Energy (MeV)


ENDF/B-VII ZR-92
Particle production cross sections
*10^-3
60
50
40
30
20
10
0
Cross section (barns)
protons
deuterons
tritons
alphas
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


ENDF/B-VII ZR-92
protons from (n,xp)
Prob/MeV
10^-1
10^-3
0
Sec. Energy
10
20
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


ENDF/B-VII ZR-92
deuterons from (n,xd)
Prob/MeV
10^0
10^{-2}
0
10
20
Sec. Energy
6
8
10
12
14
16
18
20
Energy (MeV)


ENDF/B-VII ZR-92
tritons from (n,xt)
Prob/MeV
10^-1
10^-3
0
5
10
15
Sec. Energy
8
10
12
14
16
18
20
Energy (MeV)


ENDF/B-VII ZR-92
alphas from (n,xa)
Prob/MeV
10^-1
10^-3
0
10
20
30
Sec. Energy
0
5
10
15
20
Energy (MeV)