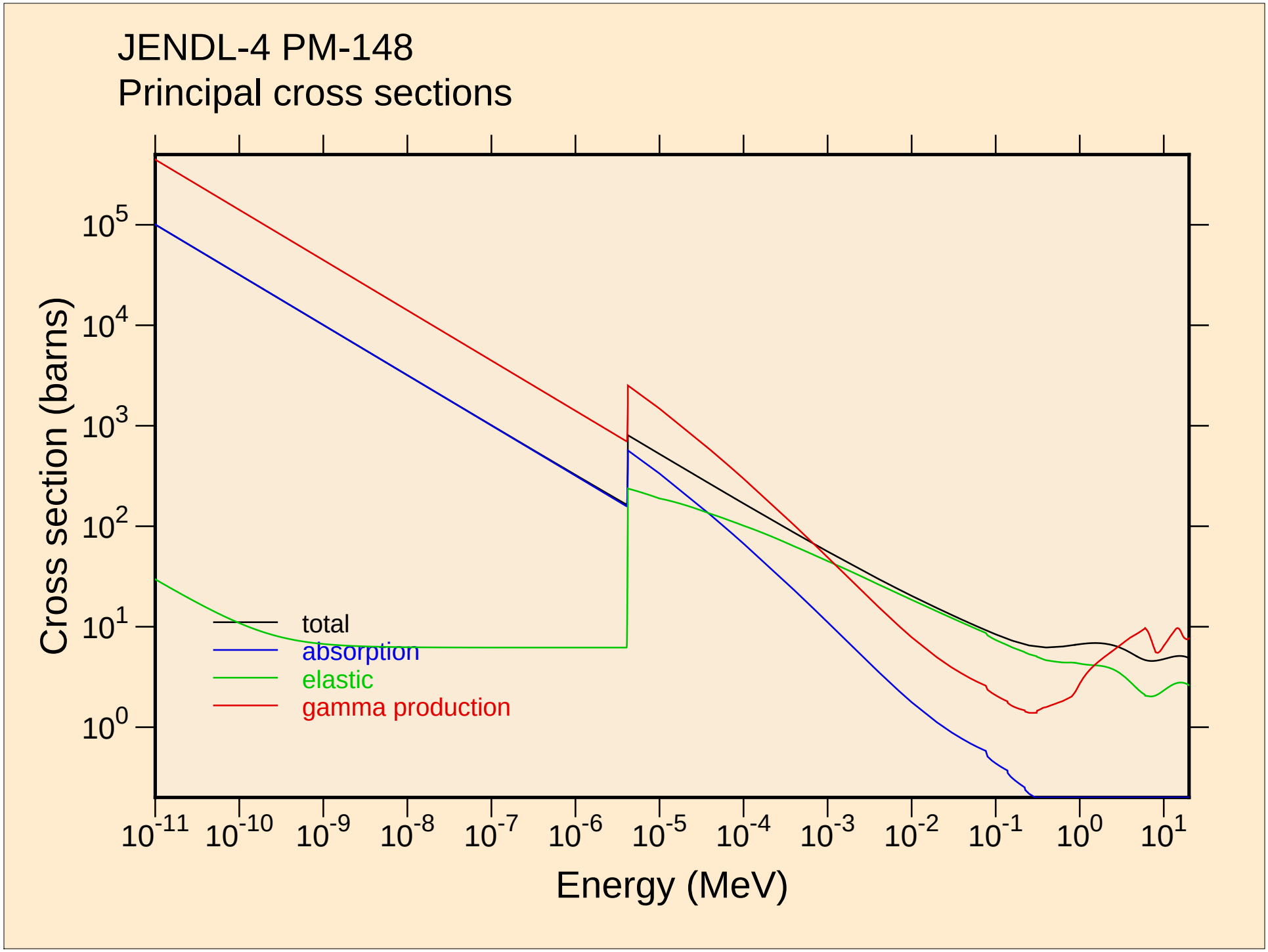
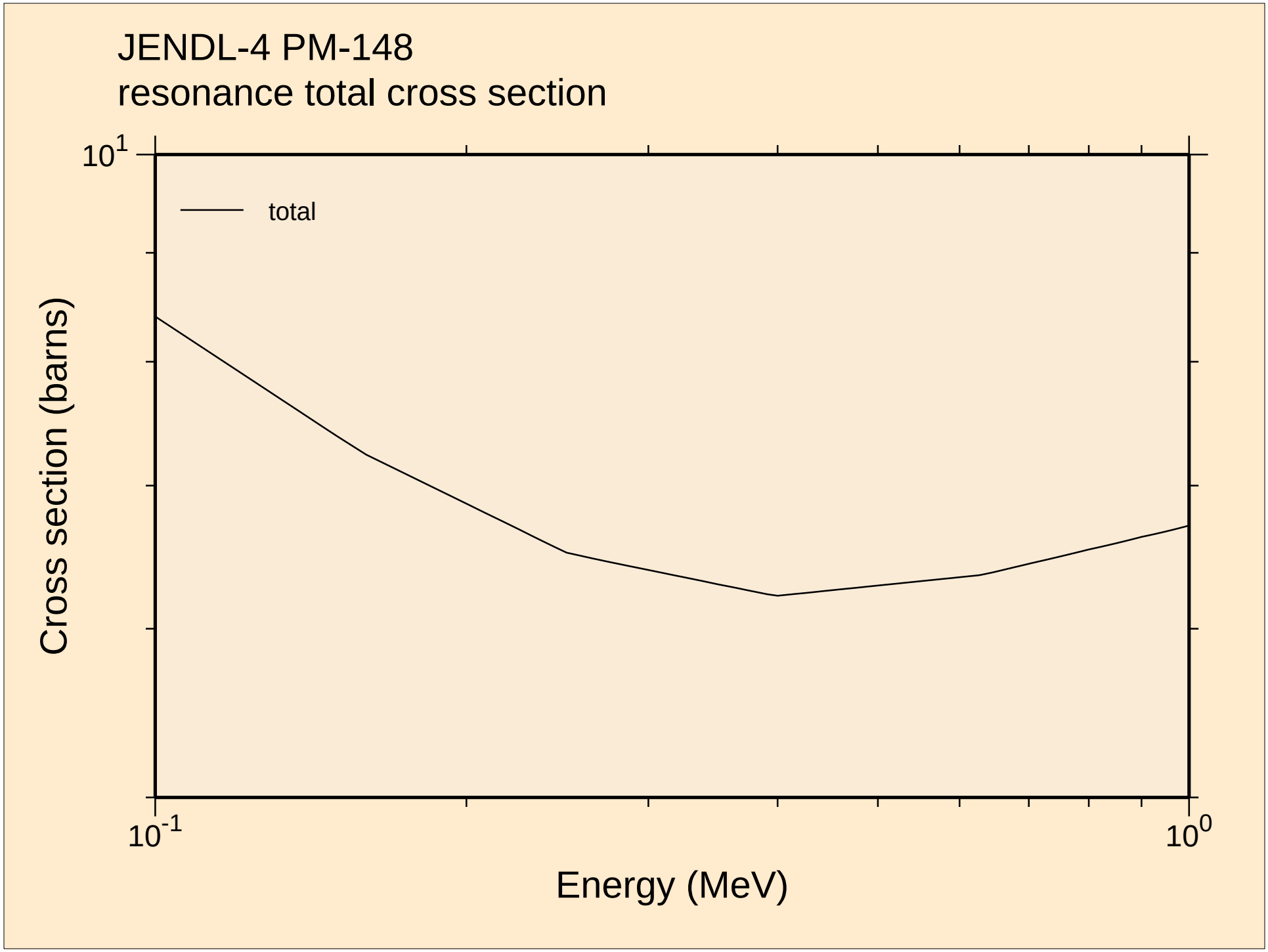
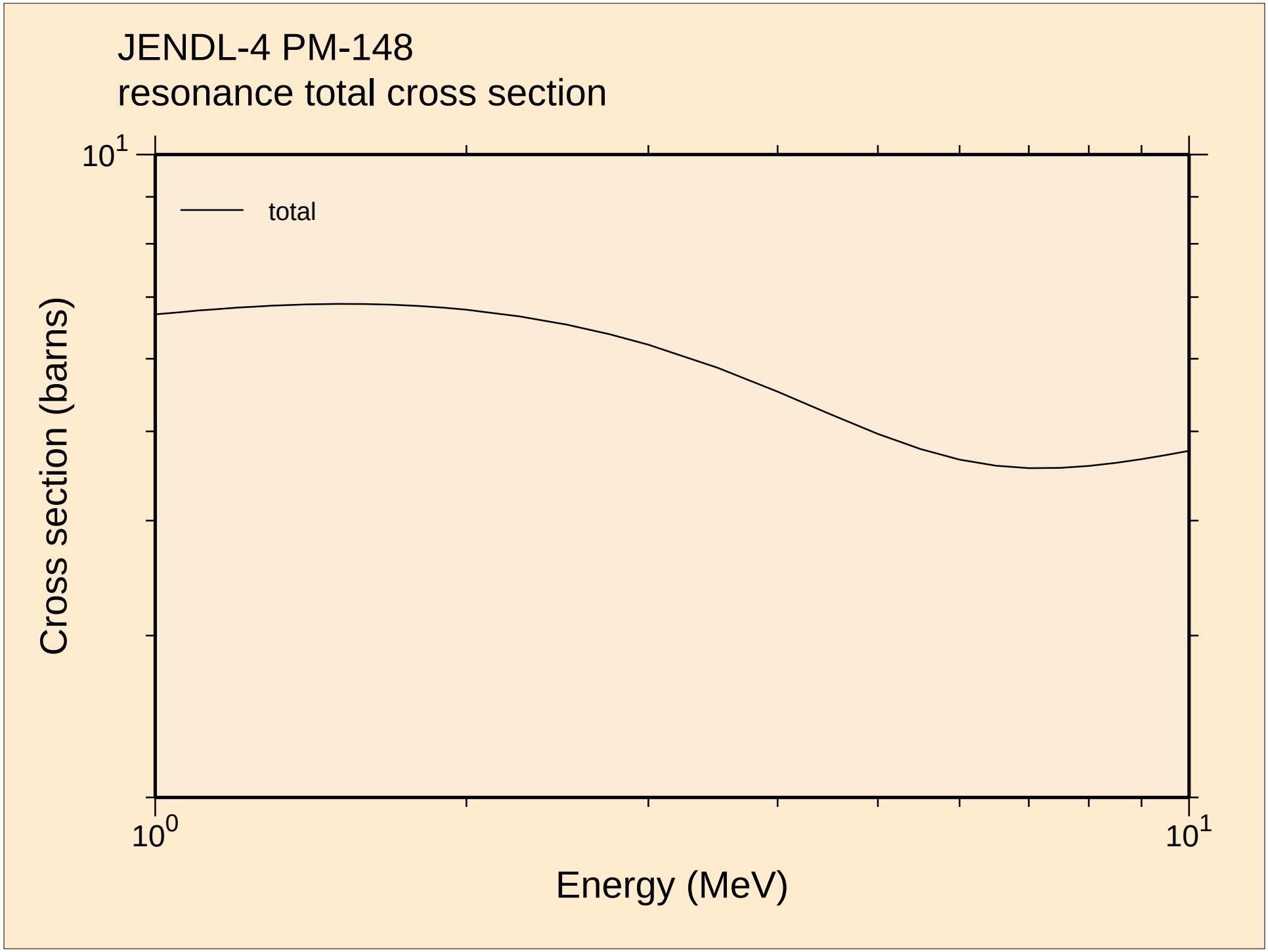
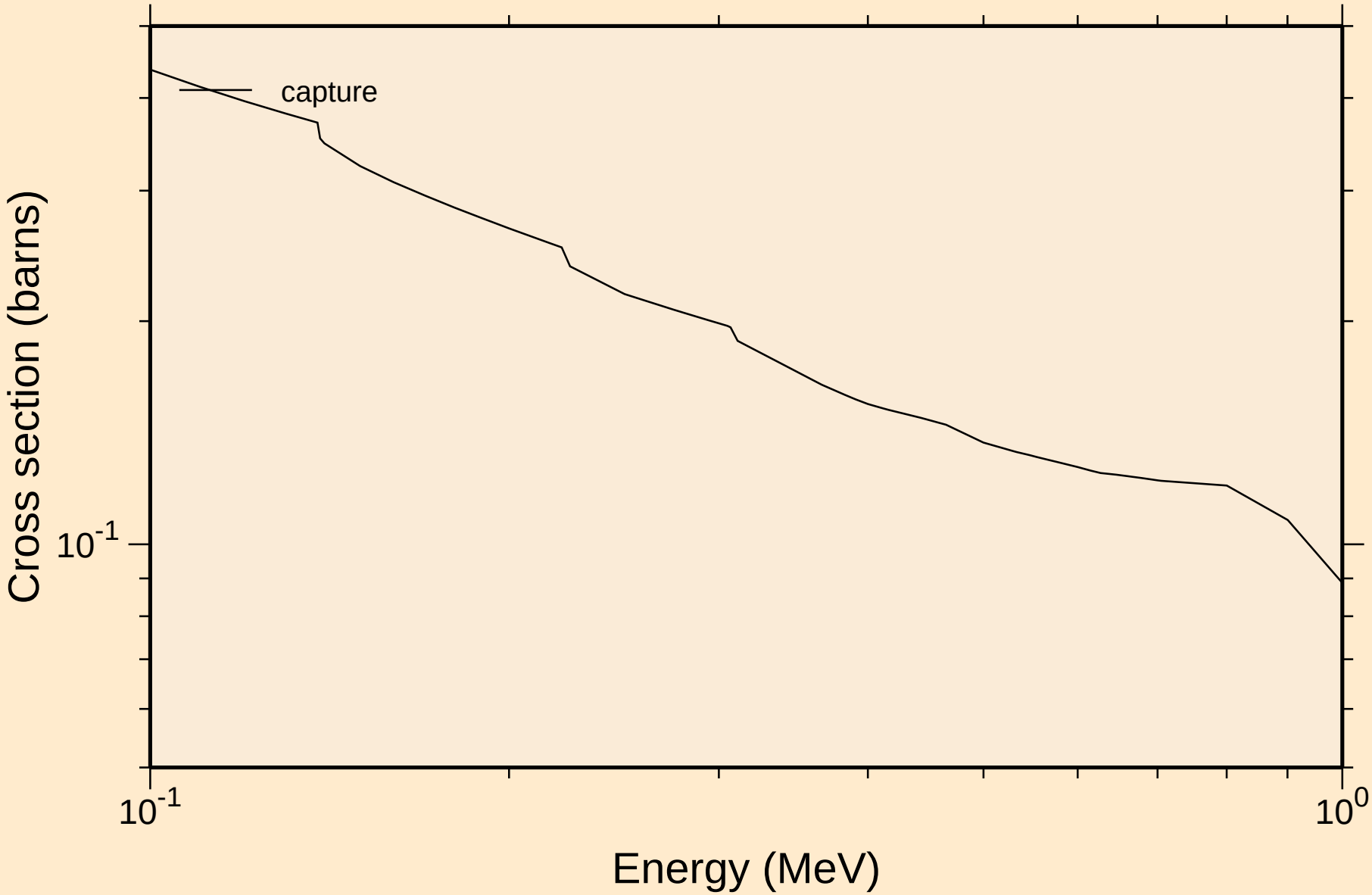
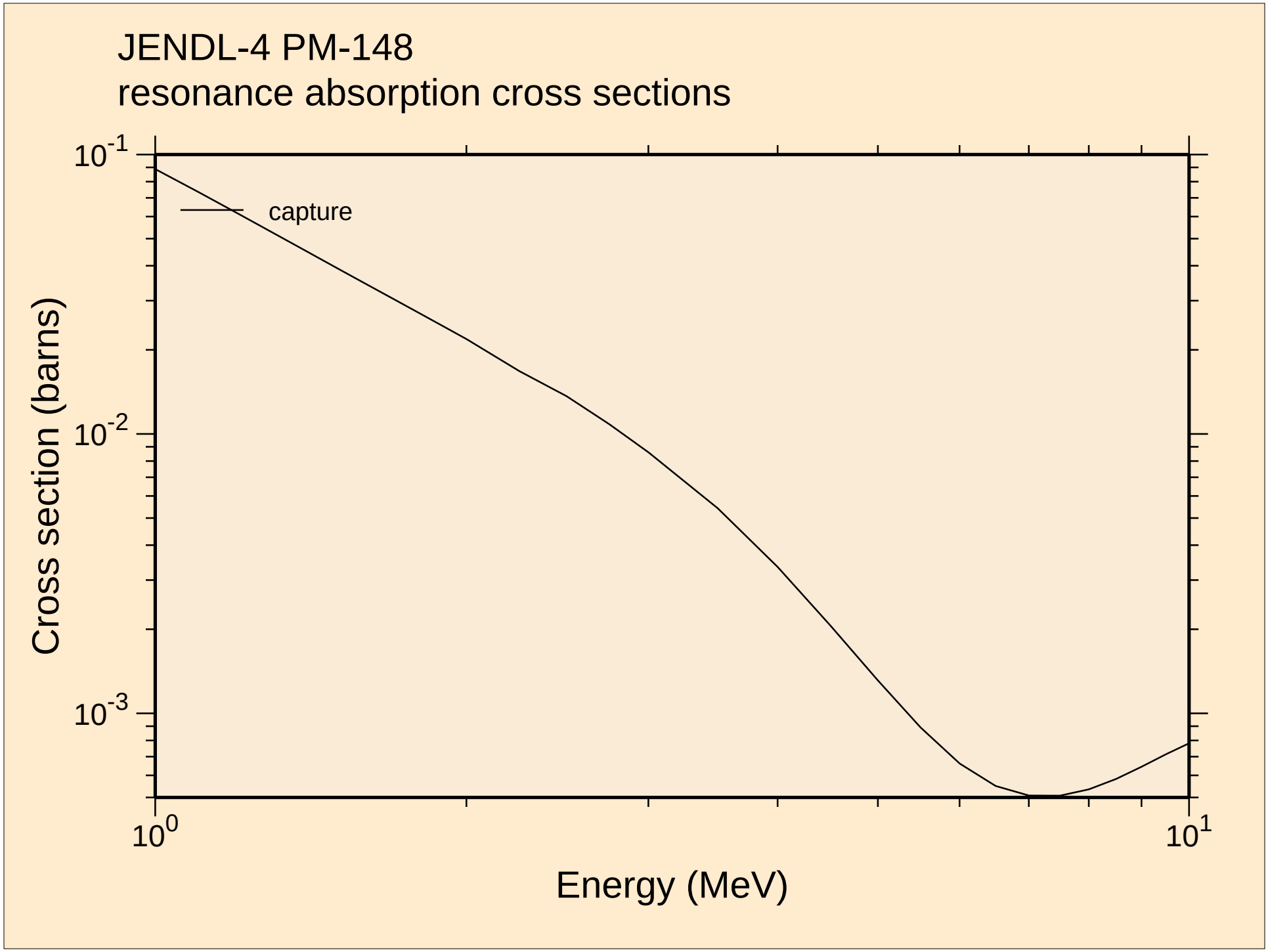

JENDL-4 PM-148
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production

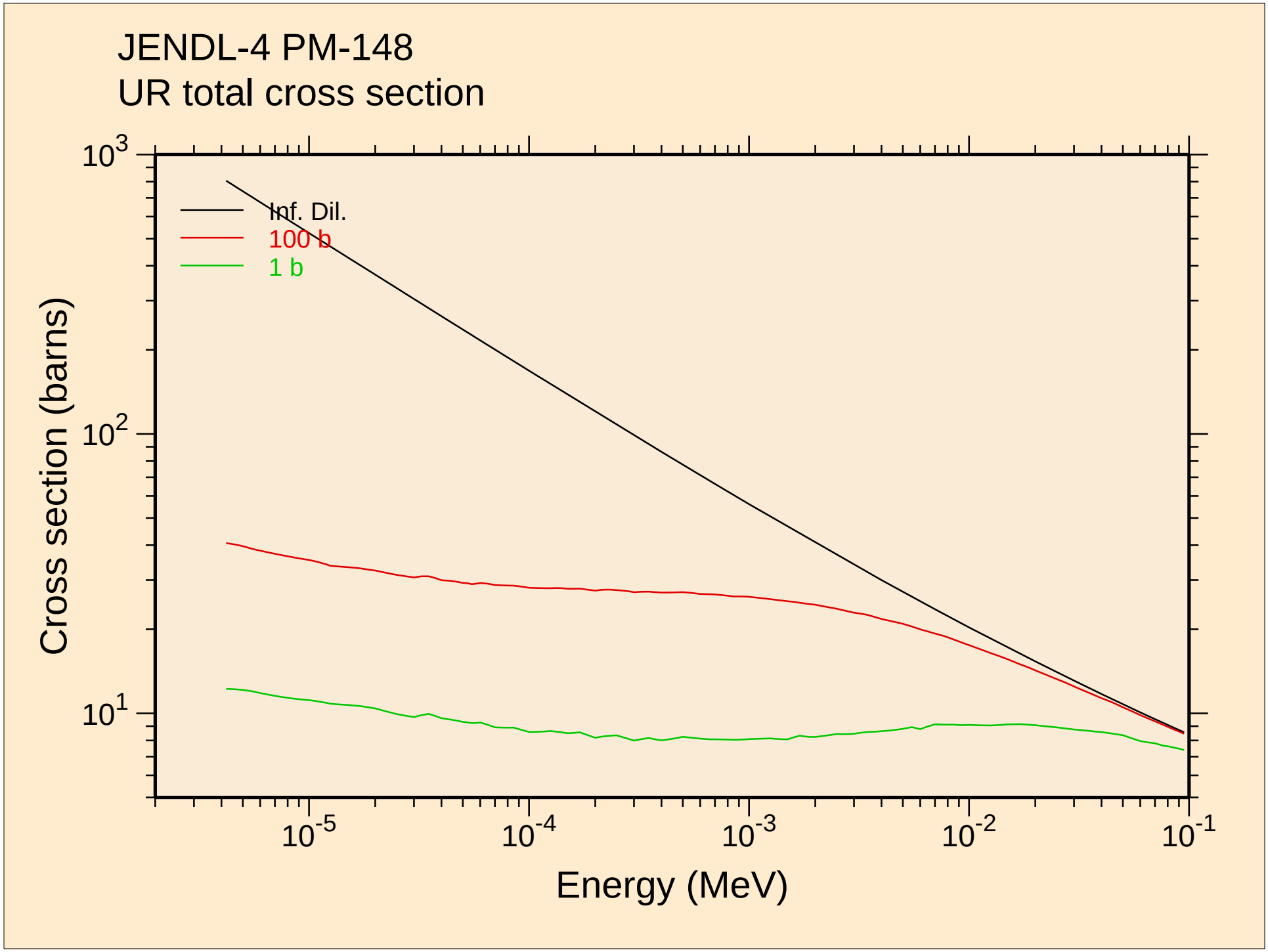

JENDL-4 PM-148
resonance total cross section
total
Cross section (barns)
Energy (MeV)
10^{1}
10^{-1}
10^{0}

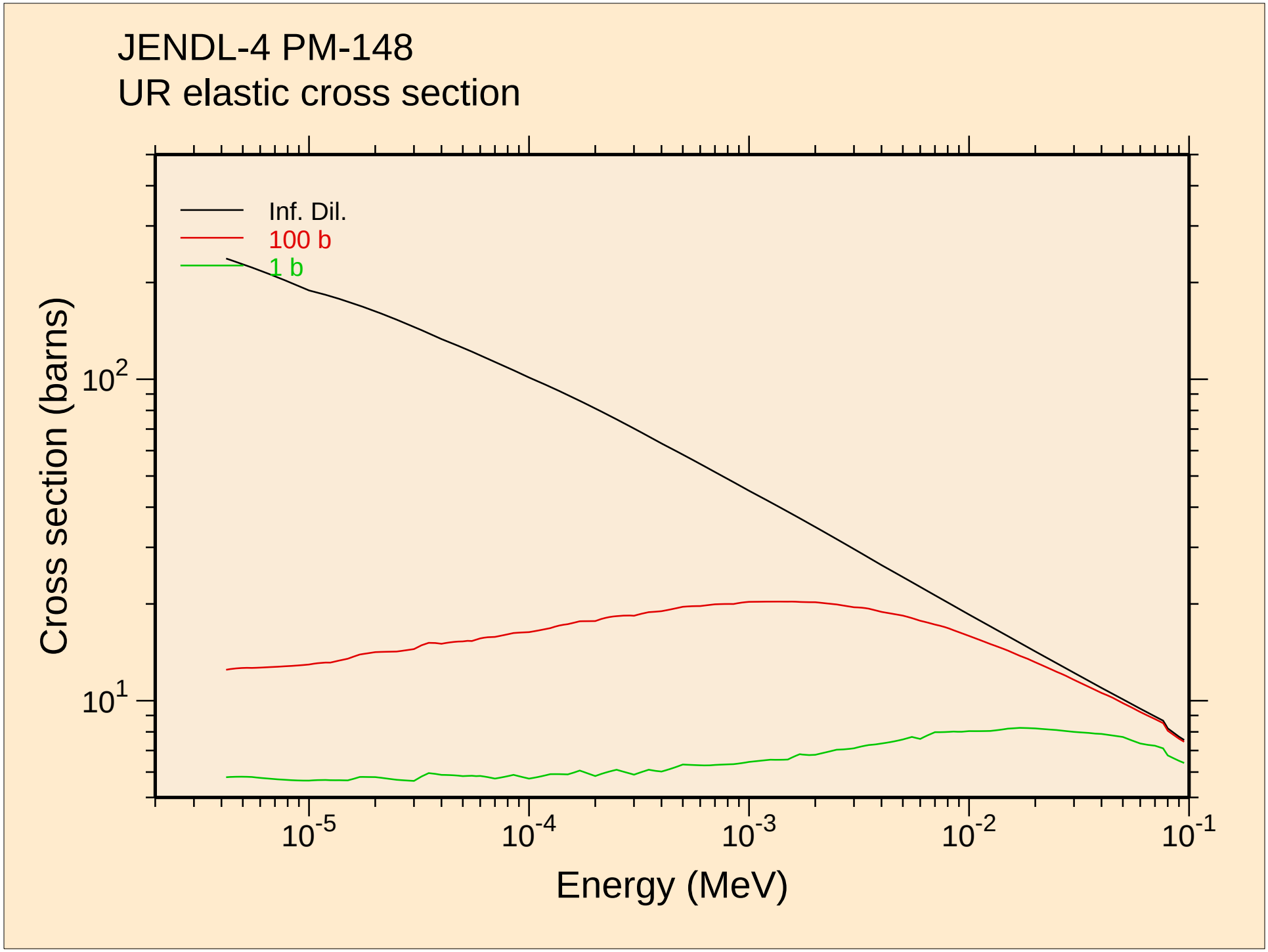

JENDL-4 PM-148
resonance total cross section
total
Cross section (barns)
Energy (MeV)
10^1
10^0
10^1

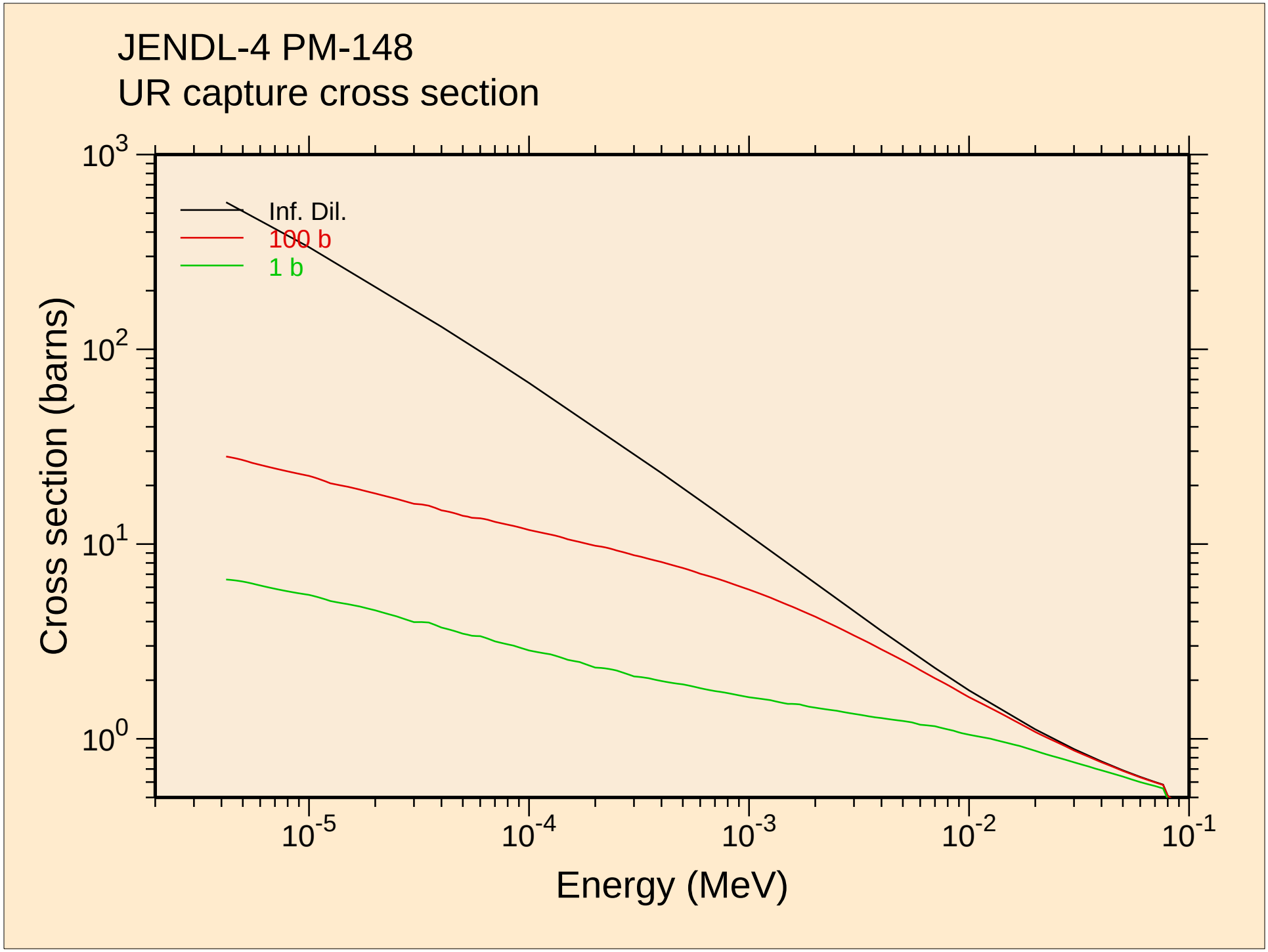
JENDL-4 PM-148
resonance absorption cross sections

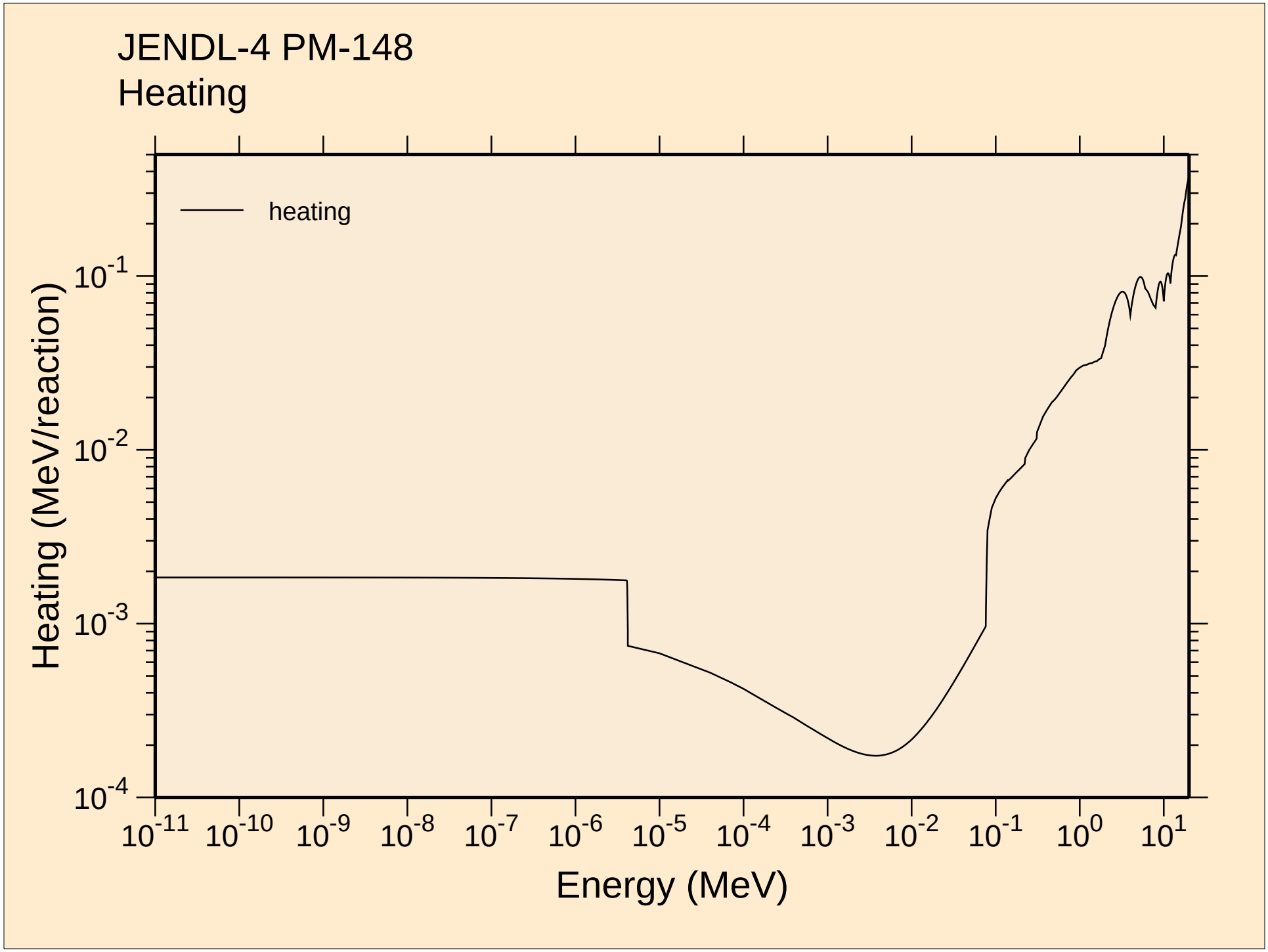


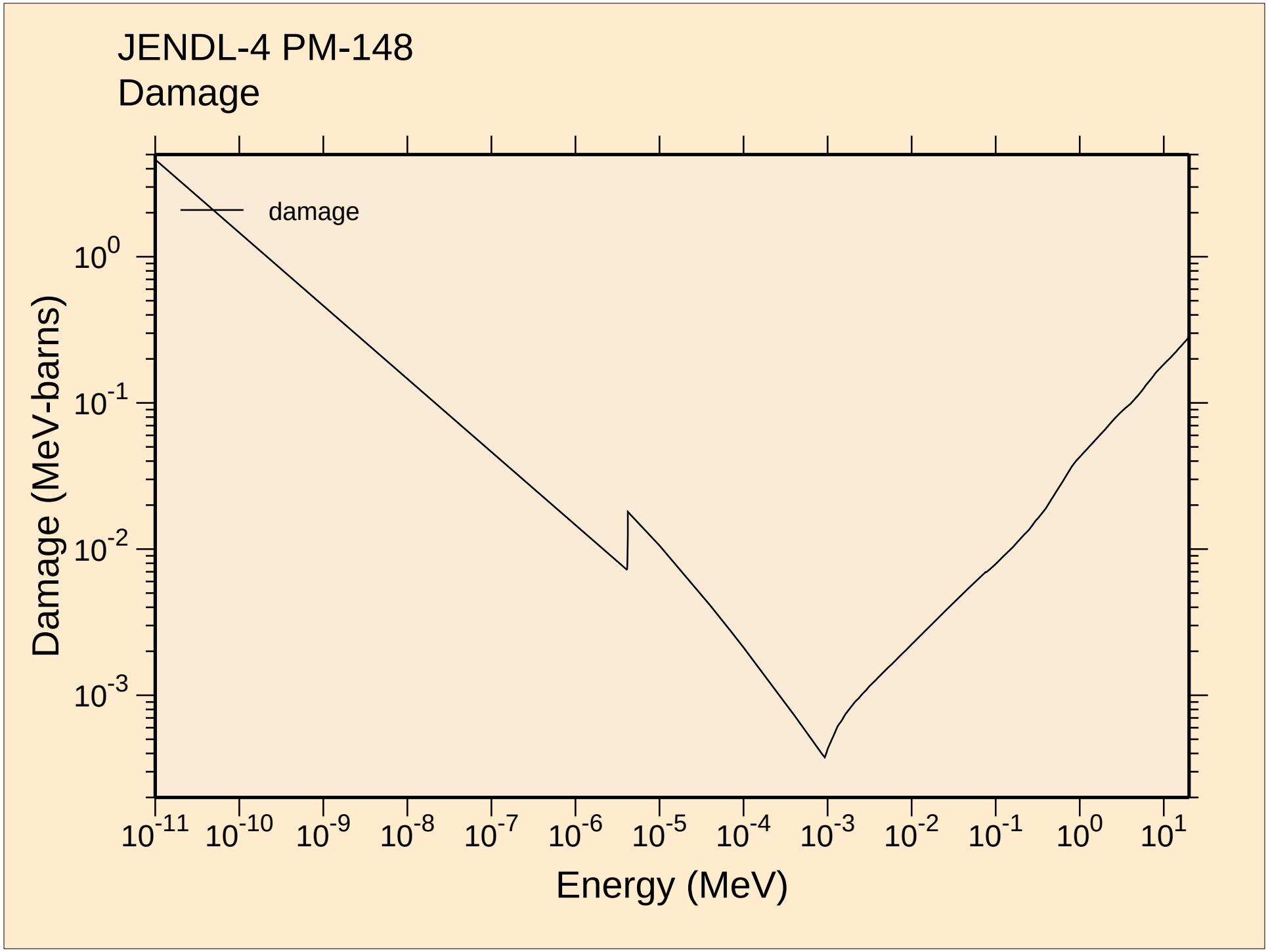

JENDL-4 PM-148
resonance absorption cross sections
capture
Cross section (barns)
10-1
10-2
10-3
100
101
Energy (MeV)

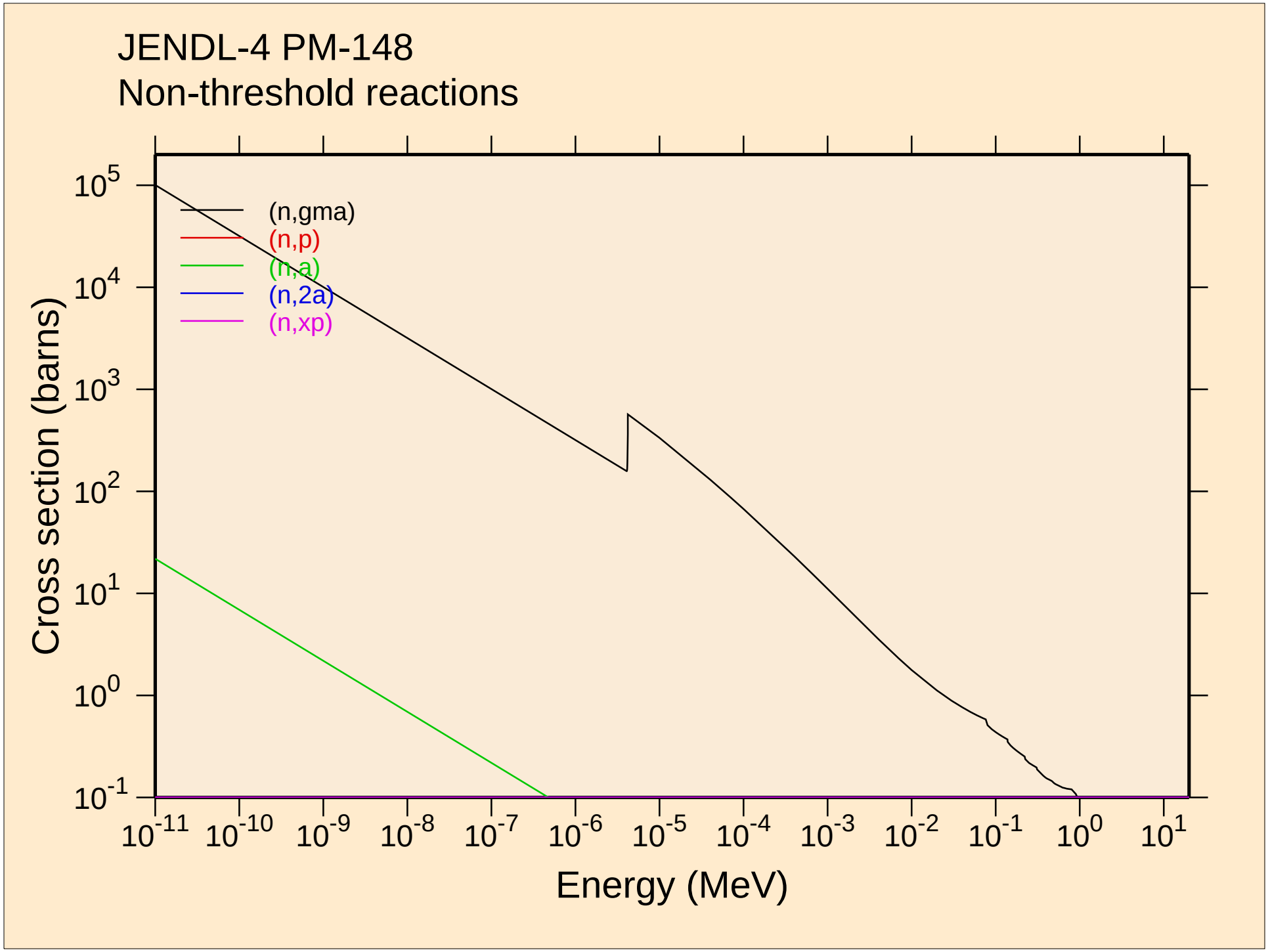

JENDL-4 PM-148
UR total cross section
Inf. Dil.
100 b
1 b
Cross section (barns)
Energy (MeV)
10^3
10^2
10^1
10^-5
10^-4
10^-3
10^-2
10^-1

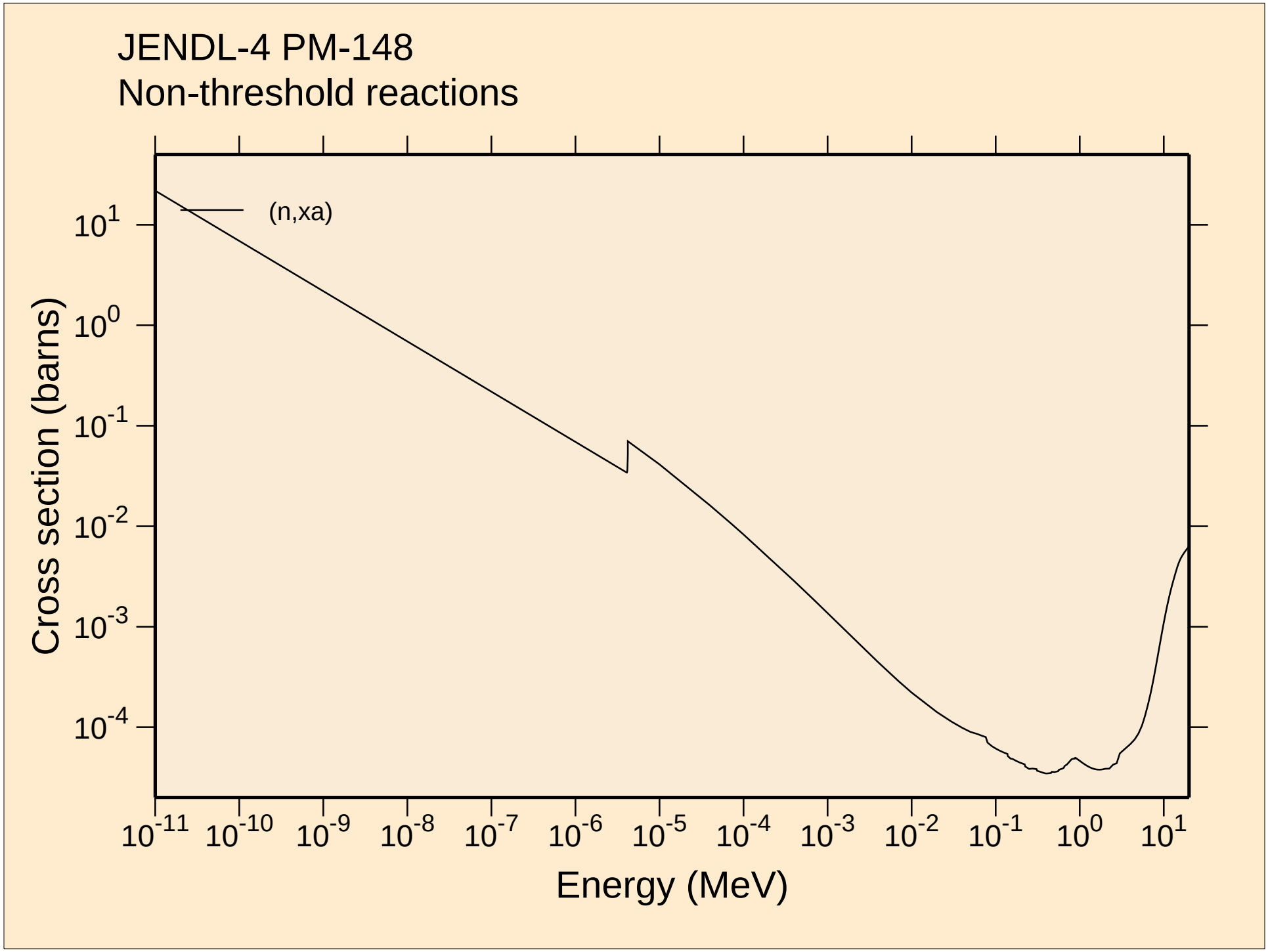

JENDL-4 PM-148
UR elastic cross section
Inf. Dil.
100 b
1 b
Cross section (barns)
10^2
10^1
10^-5
10^-4
10^-3
10^-2
10^-1
Energy (MeV)

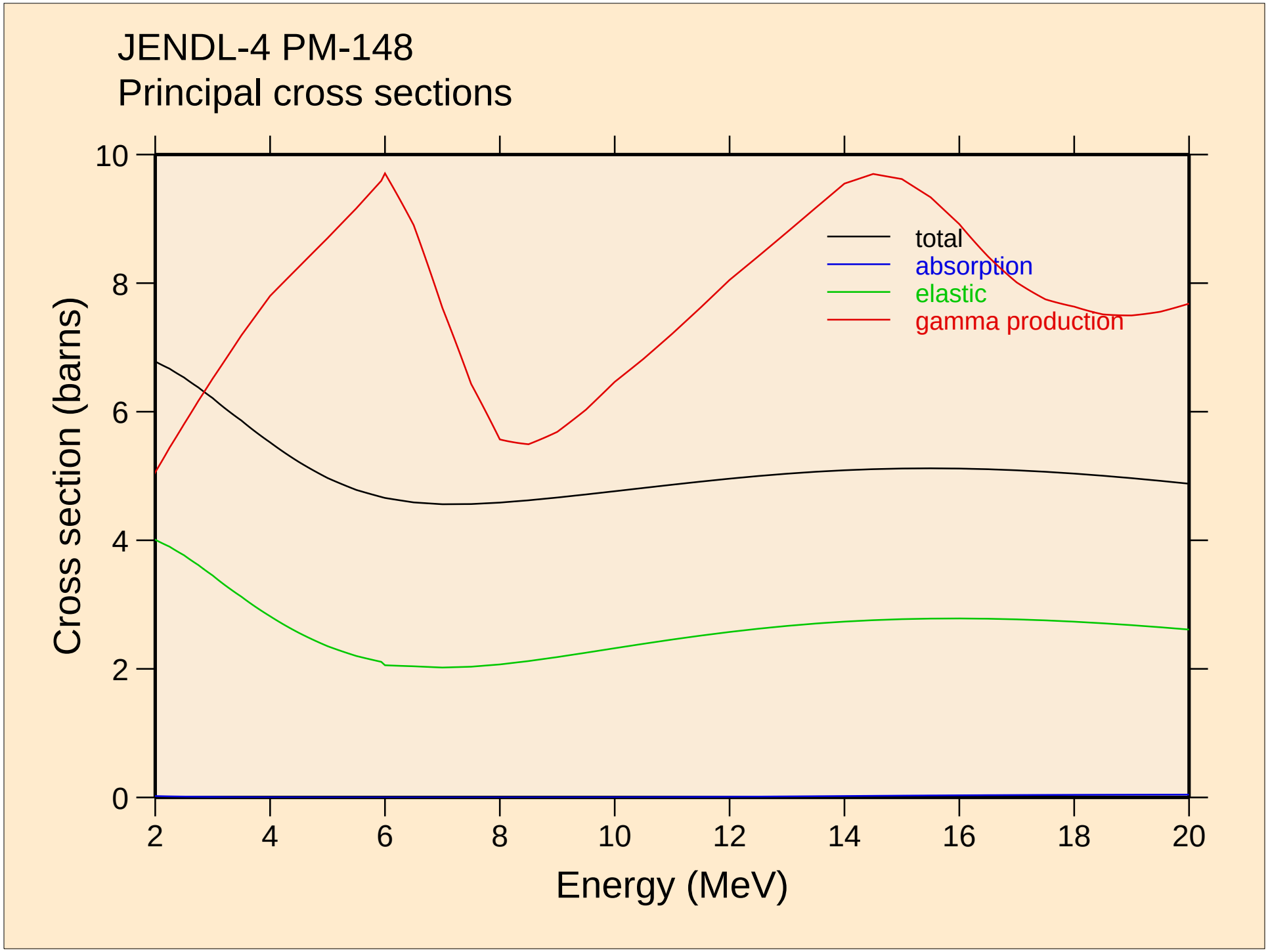

JENDL-4 PM-148
UR capture cross section
Inf. Dil.
100 b
1 b
Cross section (barns)
Energy (MeV)
10^3
10^2
10^1
10^0
10^-5
10^-4
10^-3
10^-2
10^-1

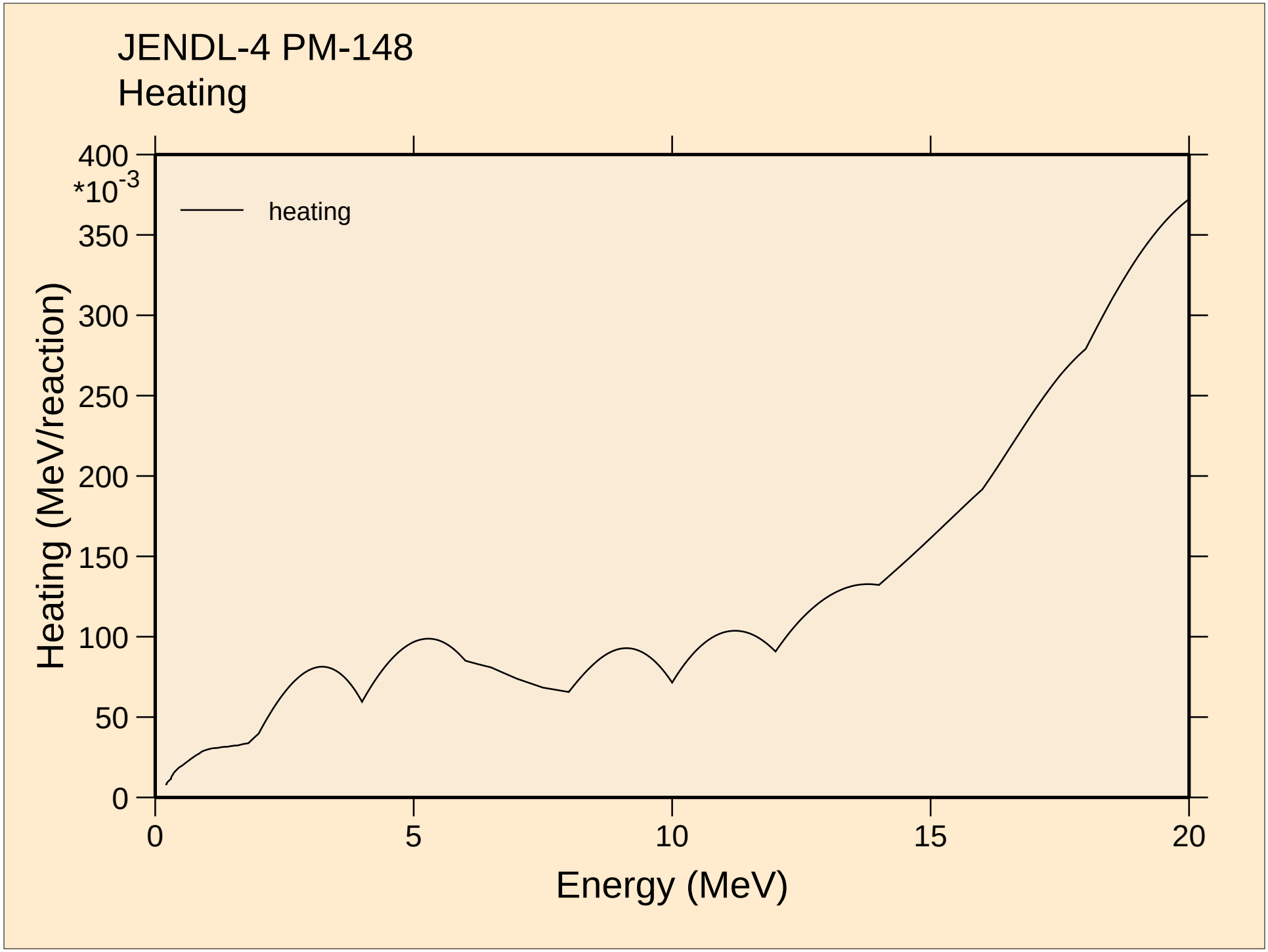

JENDL-4 PM-148
Heating
heating
Heating (MeV/reaction)
Energy (MeV)
10^-1
10^-2
10^-3
10^-4
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

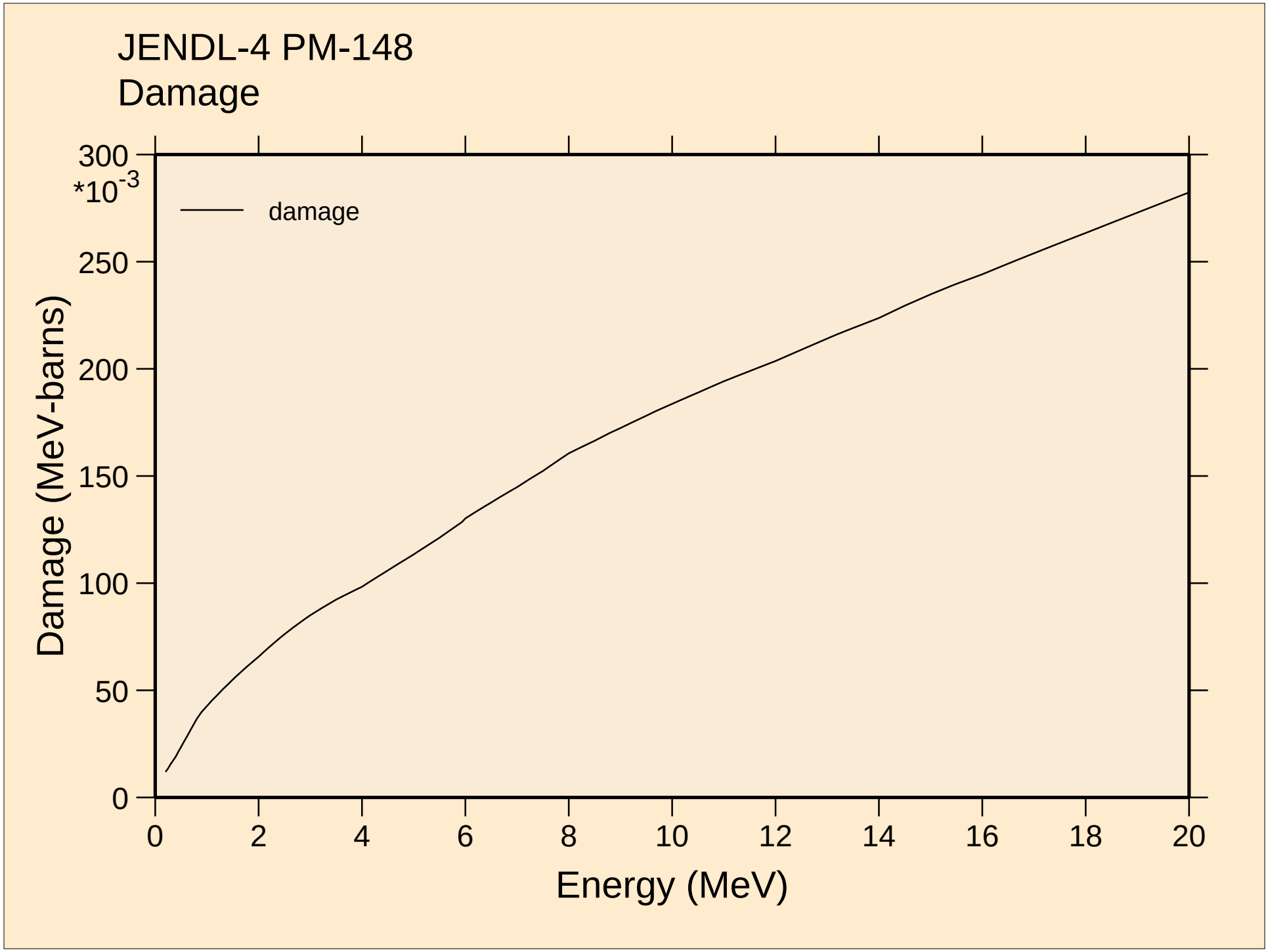

JENDL-4 PM-148
Damage
damage
Damage (MeV-barns)
Energy (MeV)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-11} 10^{-10} 10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1}

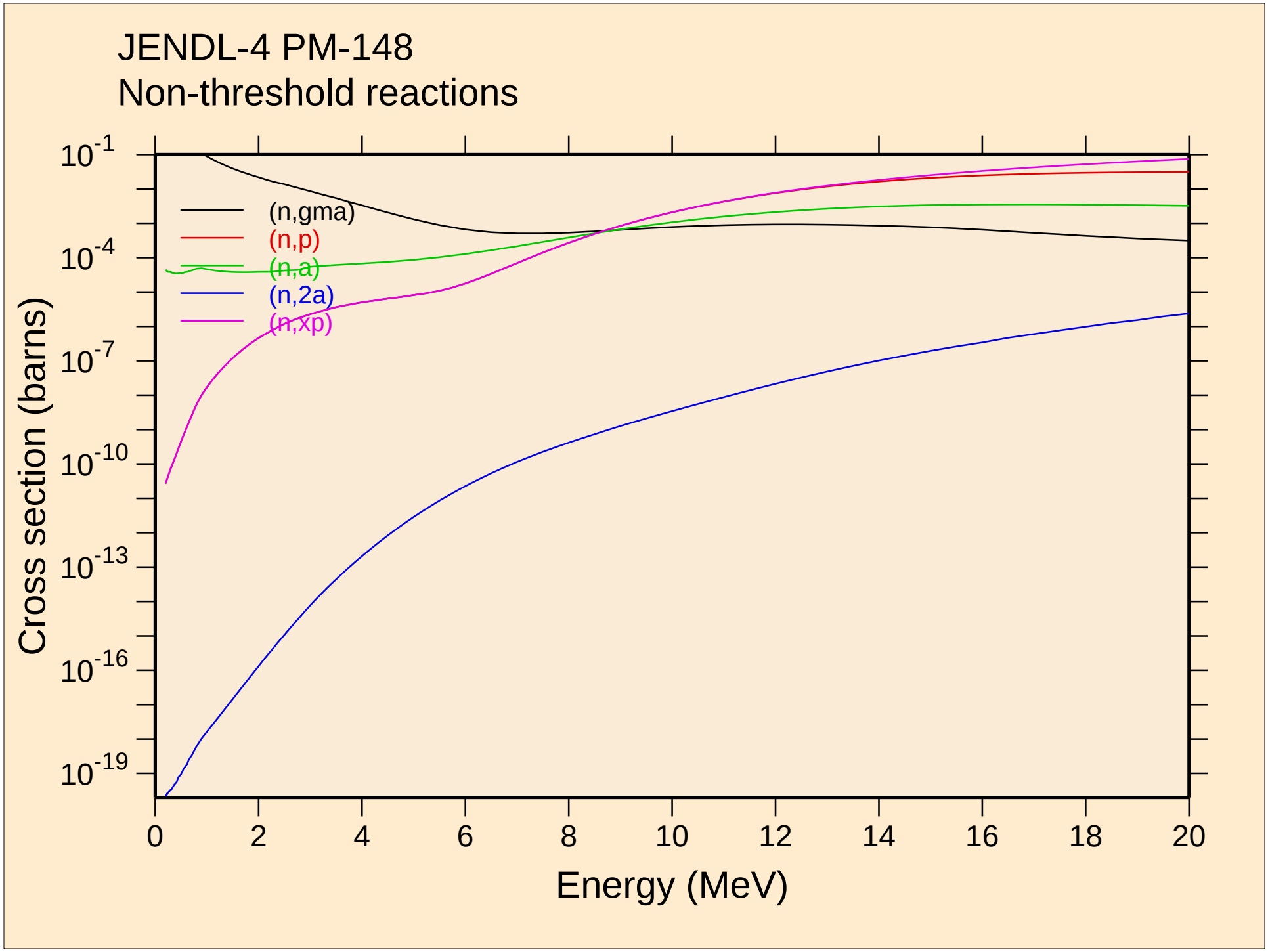

JENDL-4 PM-148
Non-threshold reactions
(n,gma)
(n,p)
(n,a)
(n,2a)
(n,xp)
Cross section (barns)
Energy (MeV)
10^5
10^4
10^3
10^2
10^1
10^0
10^-1
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

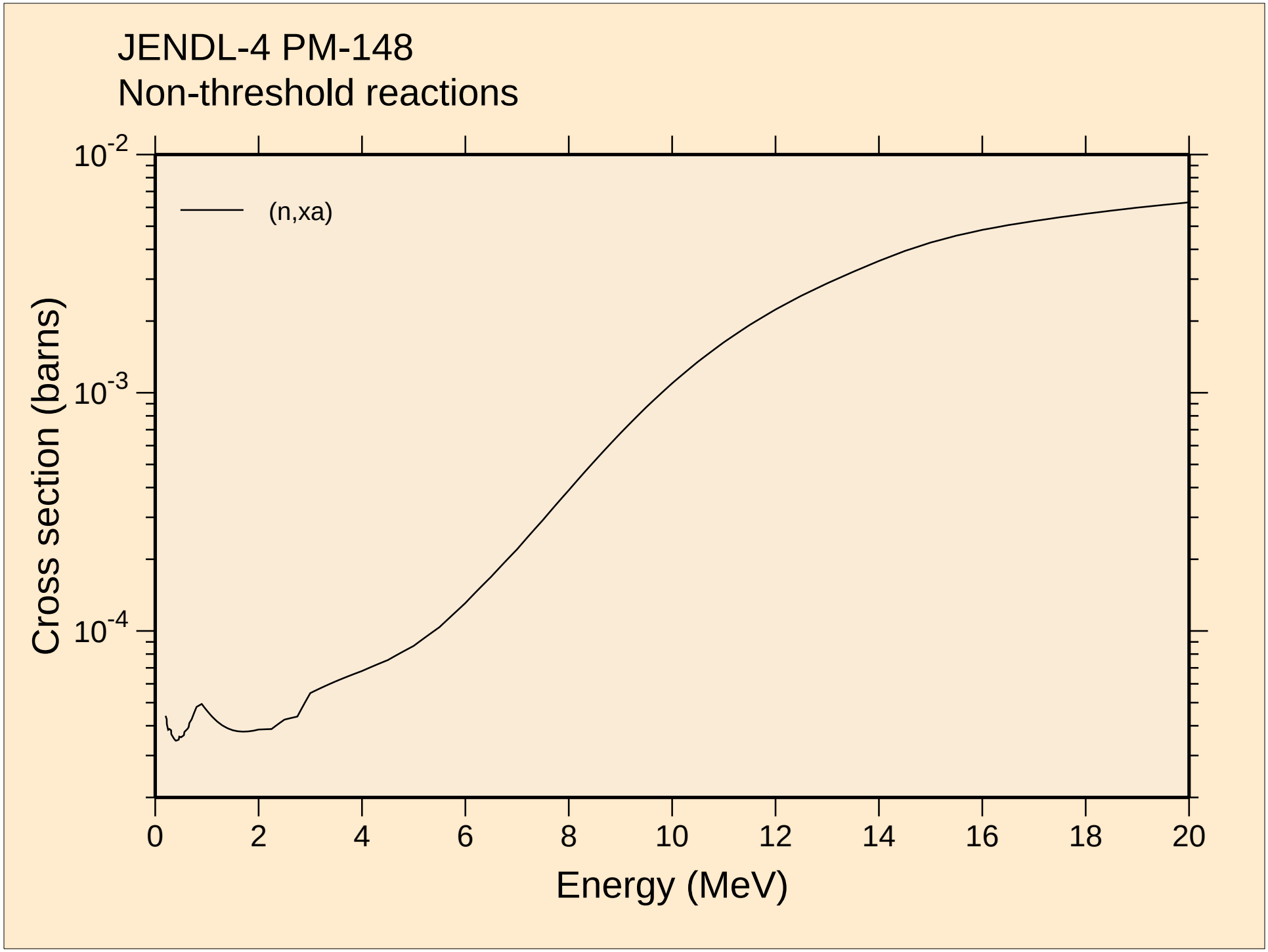

JENDL-4 PM-148
Non-threshold reactions
(n,xa)
Cross section (barns)
Energy (MeV)
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

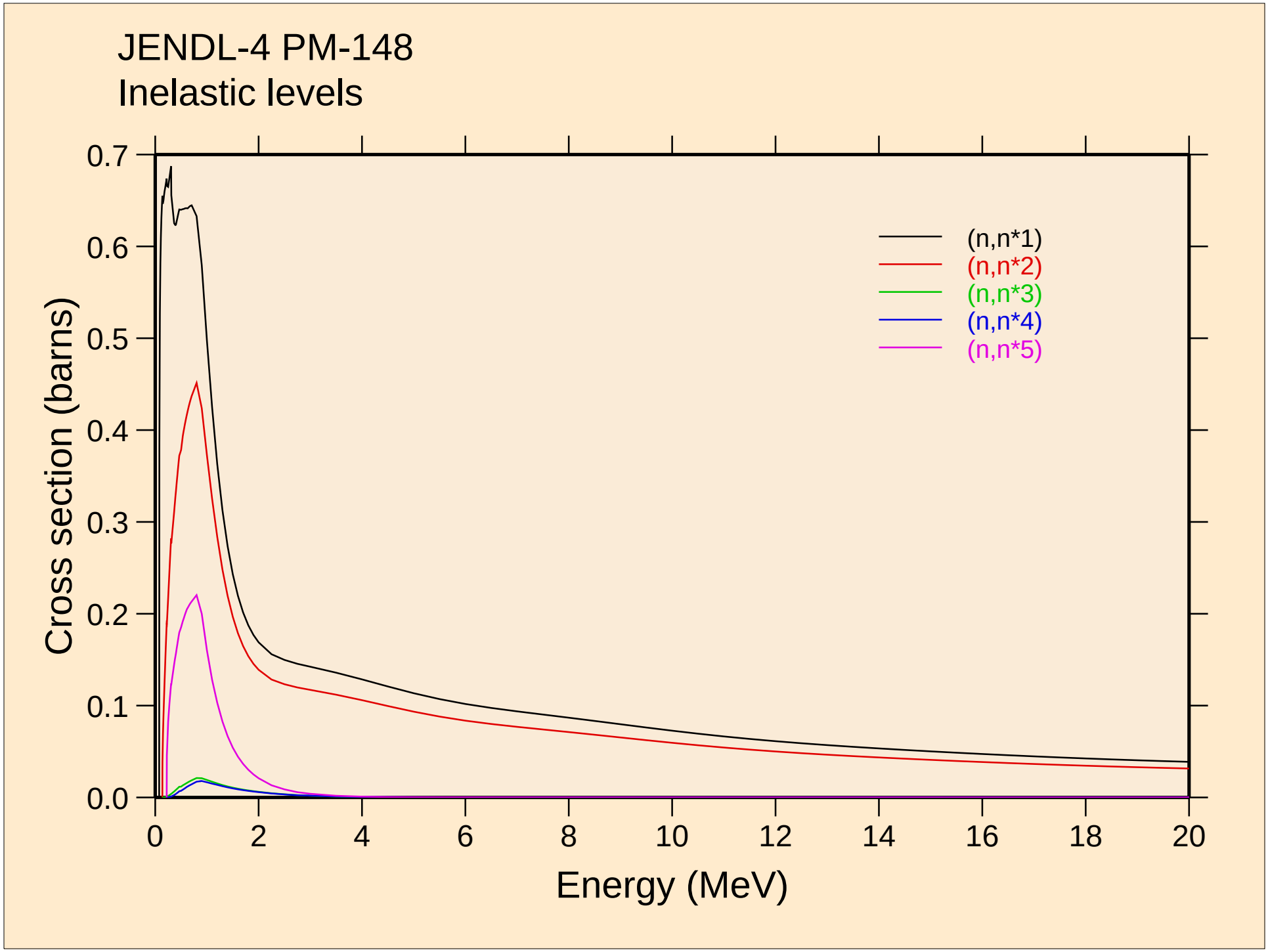

JENDL-4 PM-148
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
0
2
4
6
8
10
2
4
6
8
10
12
14
16
18
20

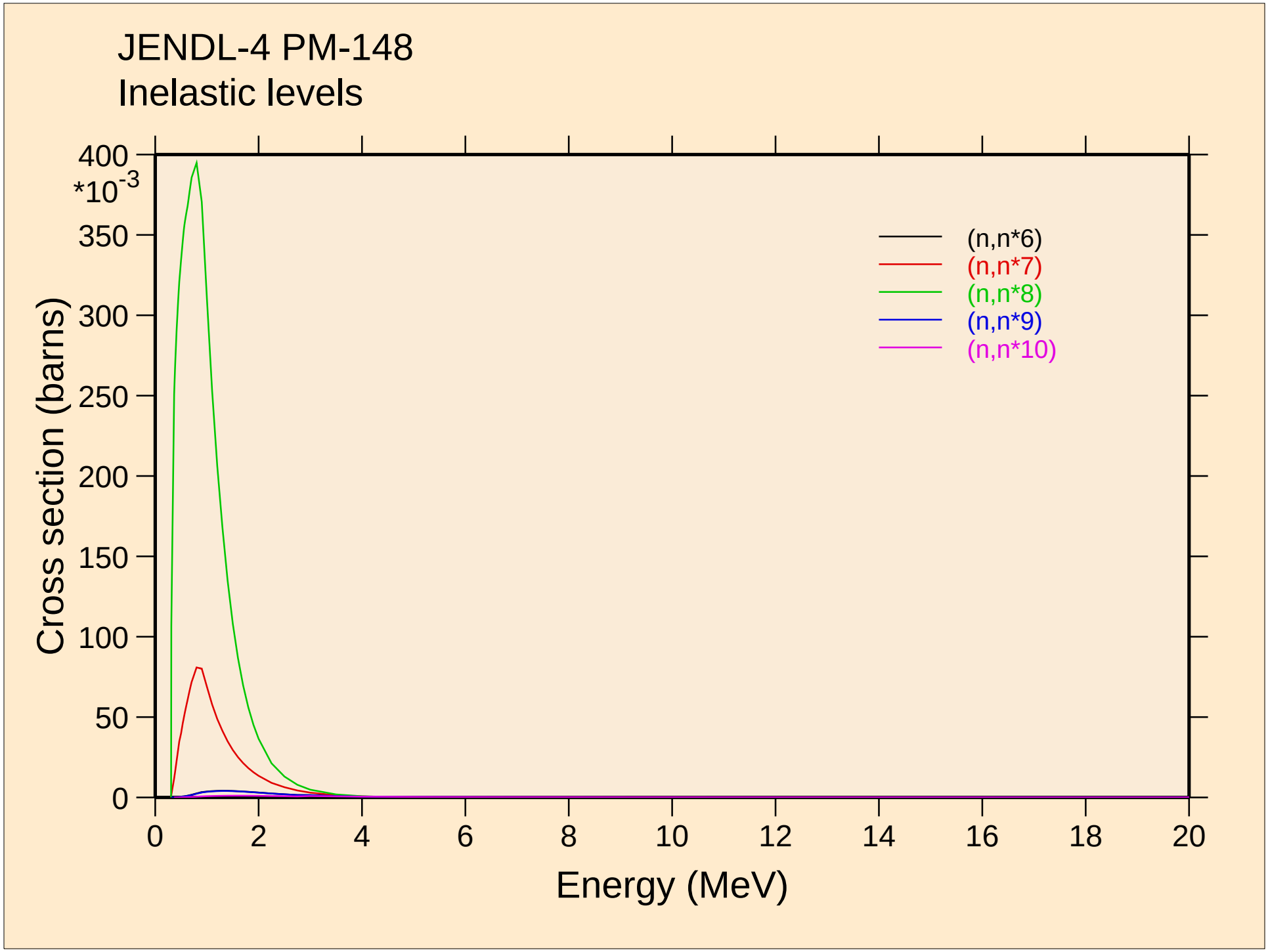

JENDL-4 PM-148
Heating
heating
Heating (MeV/reaction)
*10-3
400
350
300
250
200
150
100
50
0
0
5
10
15
20
Energy (MeV)

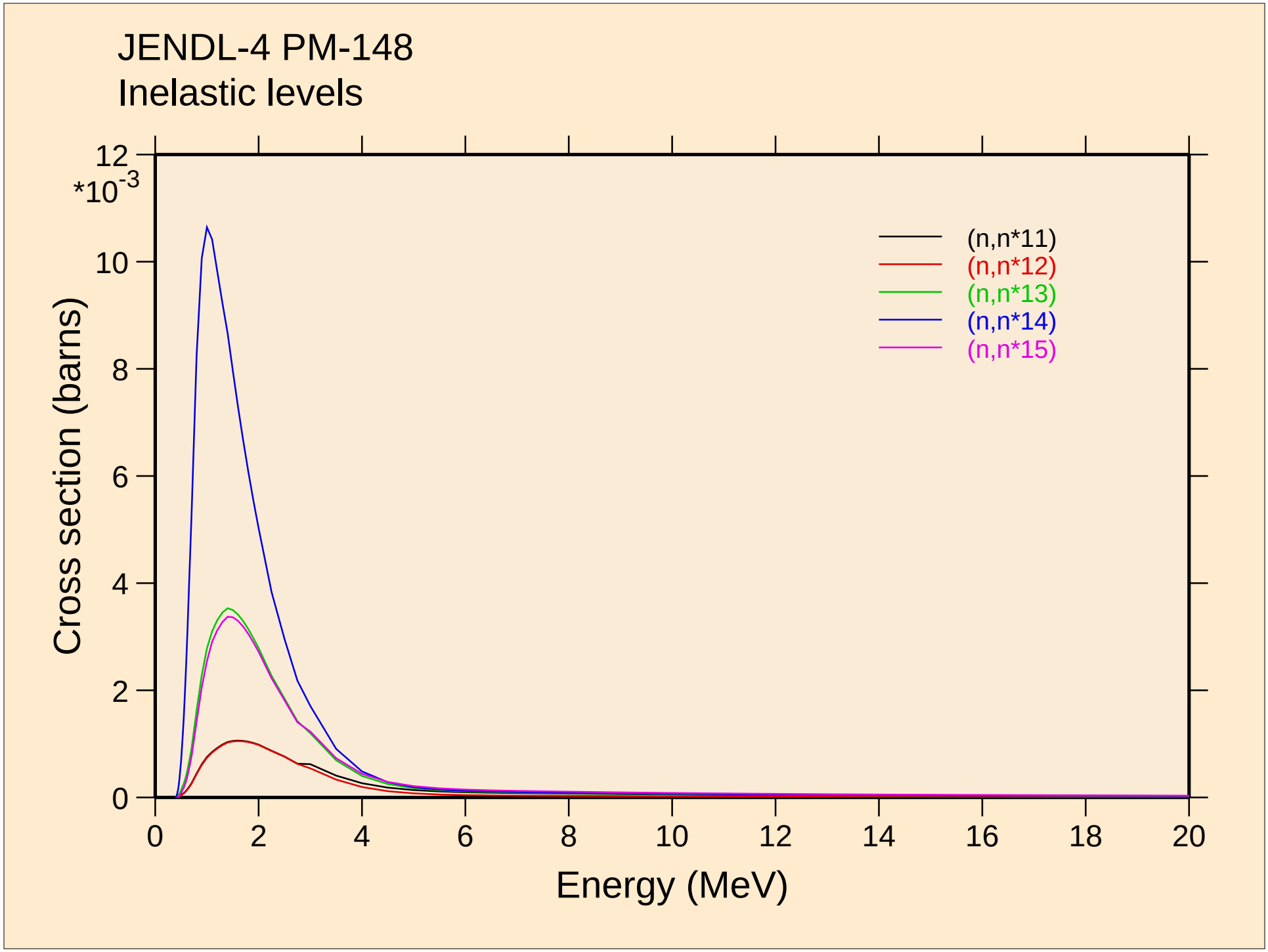

JENDL-4 PM-148
Damage
damage
Damage (MeV-barns)
*10-3
300
250
200
150
100
50
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

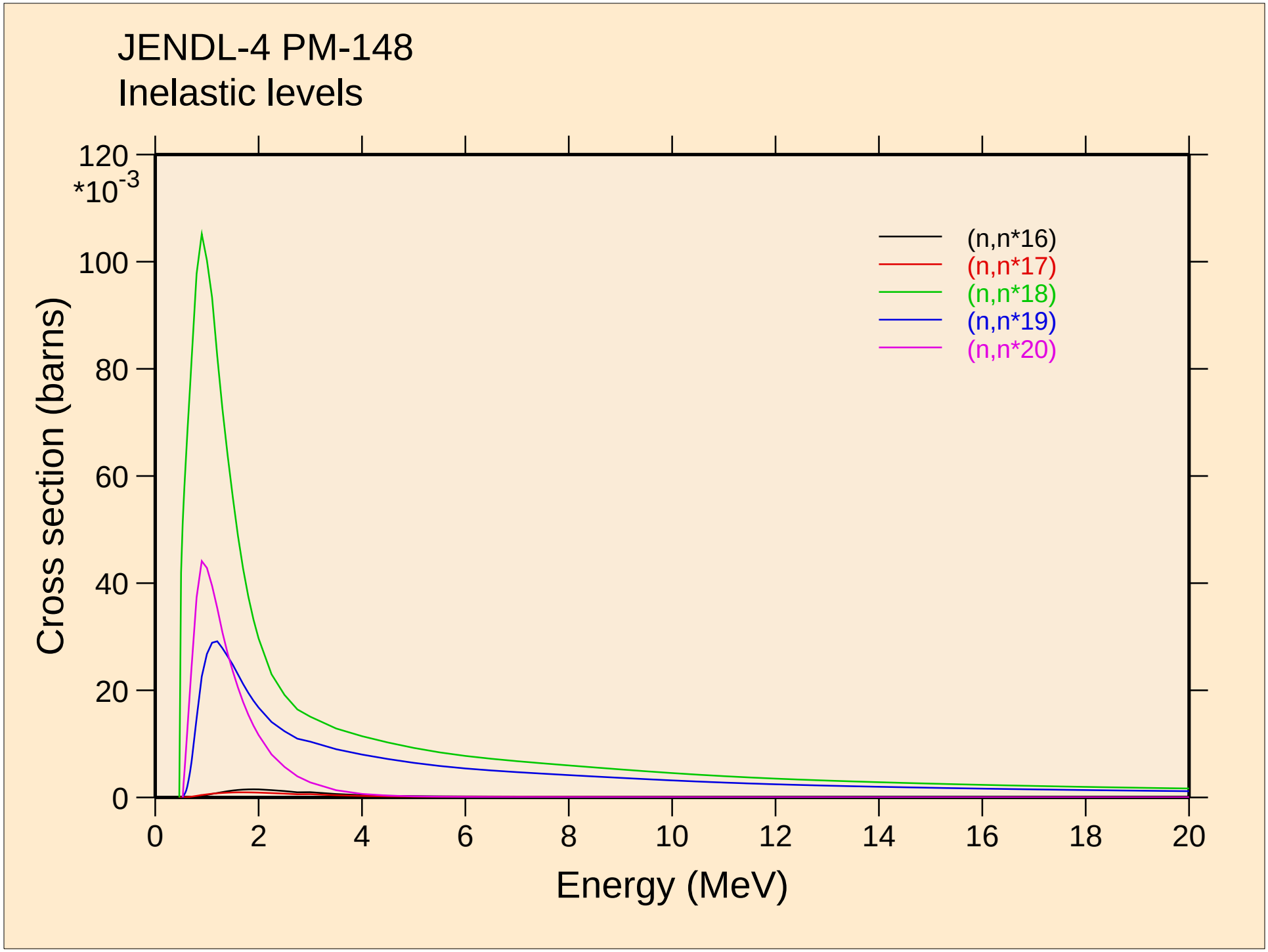

JENDL-4 PM-148
Non-threshold reactions
(n,gma)
(n,p)
(n,a)
(n,2a)
(n,xp)
Cross section (barns)
Energy (MeV)
10-1
10-4
10-7
10-10
10-13
10-16
10-19
0
2
4
6
8
10
12
14
16
18
20

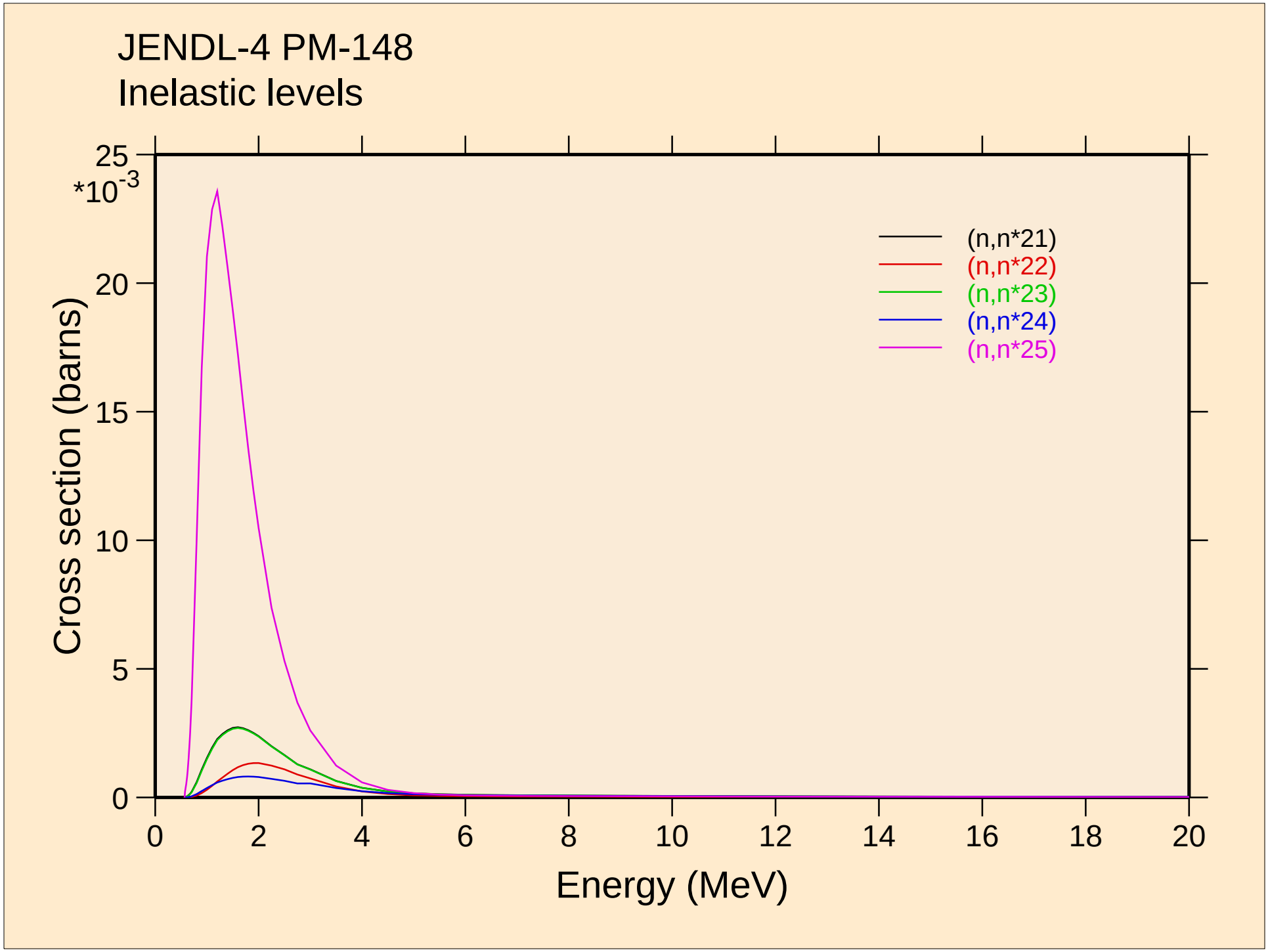

JENDL-4 PM-148
Non-threshold reactions
(n,xa)
Cross section (barns)
10-2
10-3
10-4
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

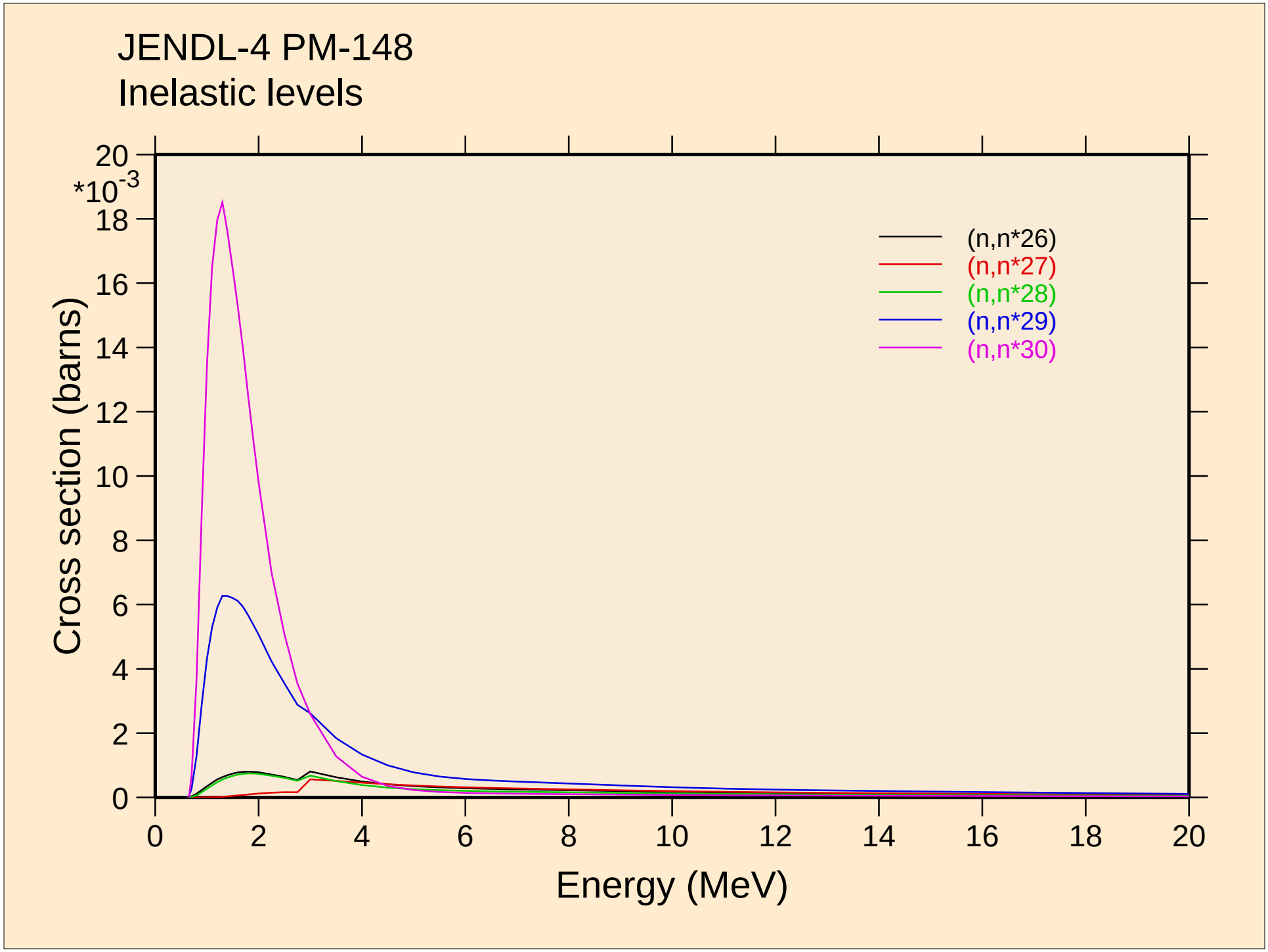

JENDL-4 PM-148
Inelastic levels
Cross section (barns)
Energy (MeV)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0
2
4
6
8
10
12
14
16
18
20
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)
(n,n*5)

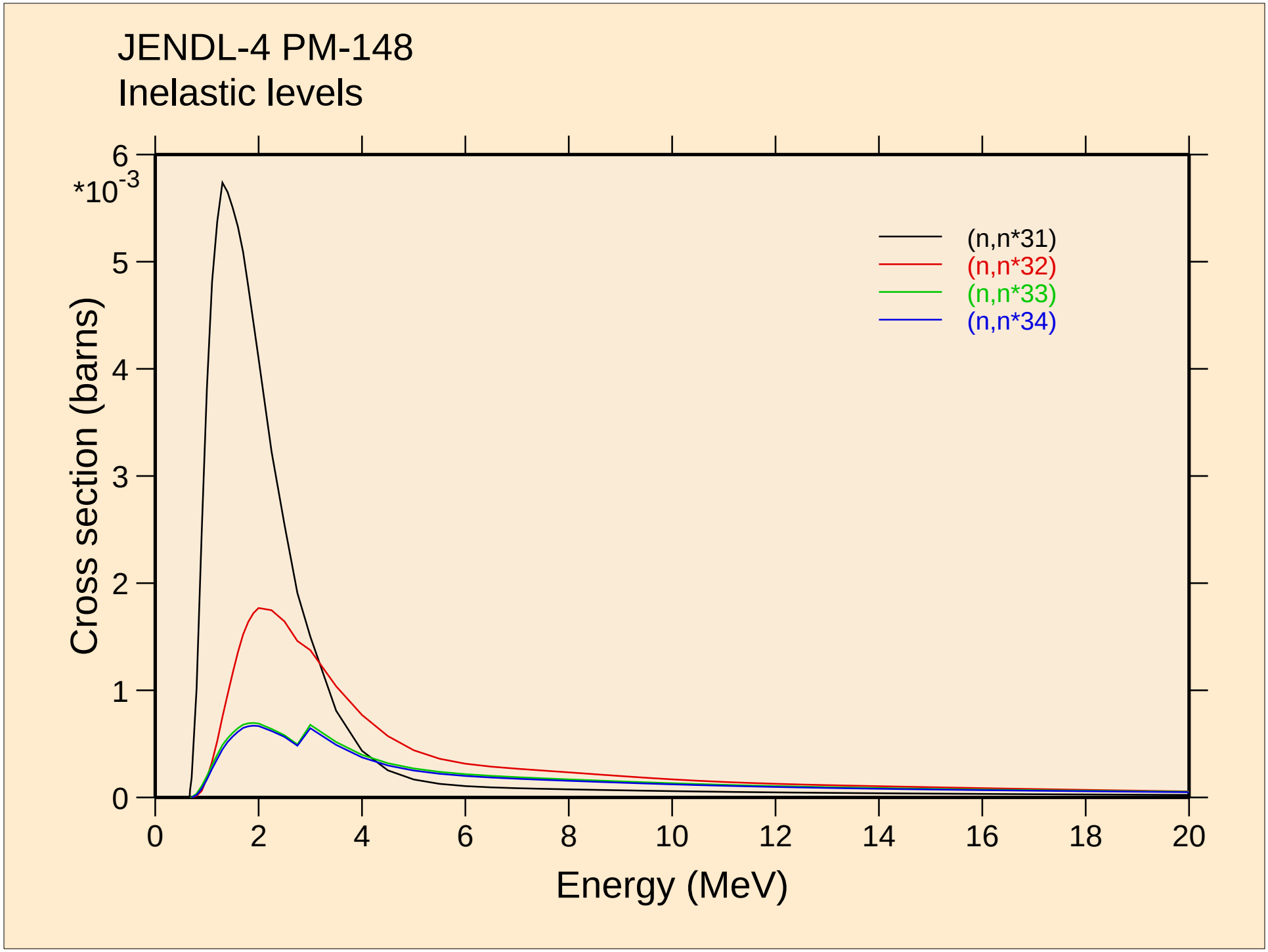

JENDL-4 PM-148
Inelastic levels
Cross section (barns)
*10^-3
400
350
300
250
200
150
100
50
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*6)
(n,n*7)
(n,n*8)
(n,n*9)
(n,n*10)

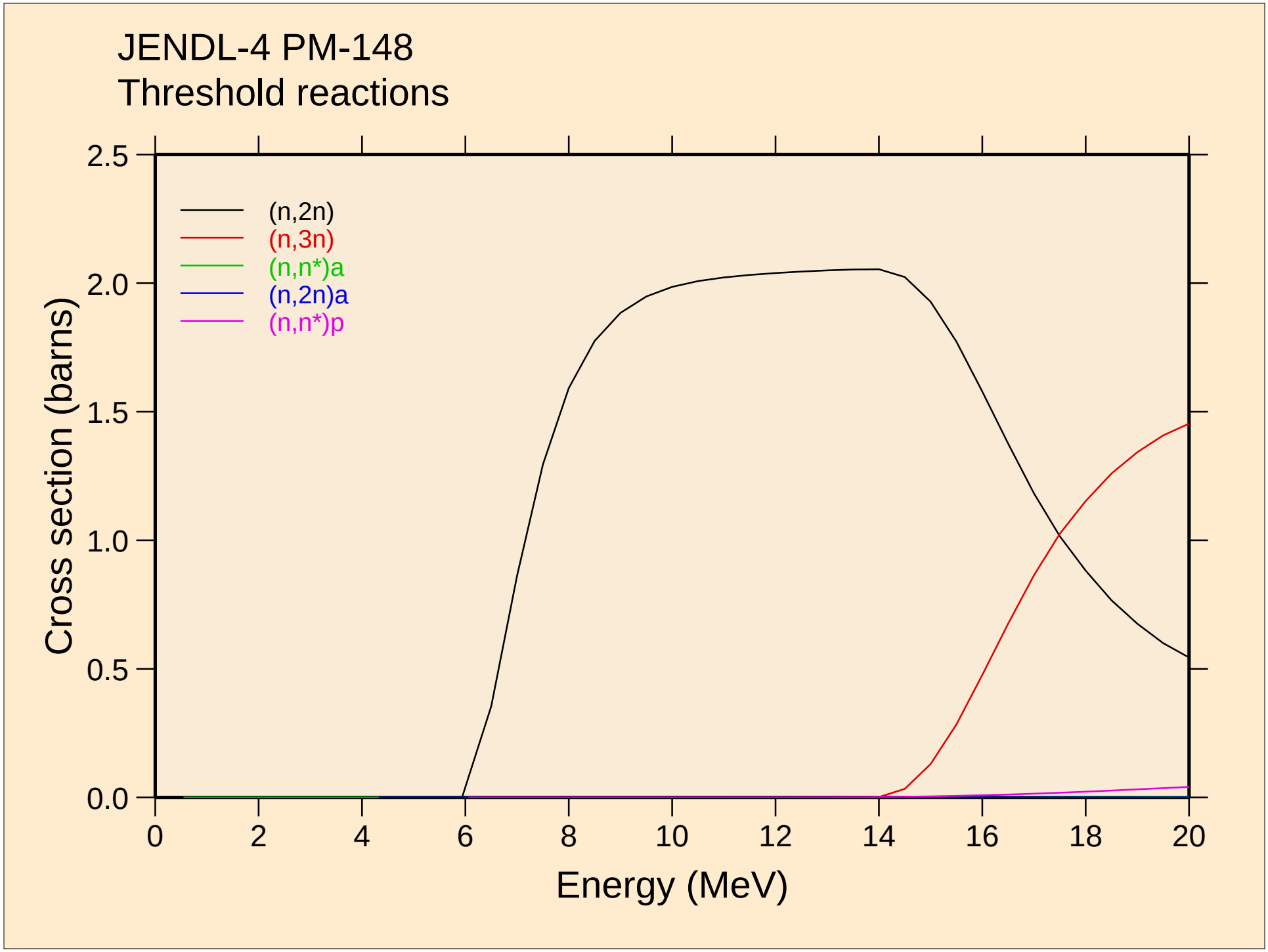

JENDL-4 PM-148
Inelastic levels
*10-3
12
10
8
6
4
2
0
Cross section (barns)
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*11)
(n,n*12)
(n,n*13)
(n,n*14)
(n,n*15)

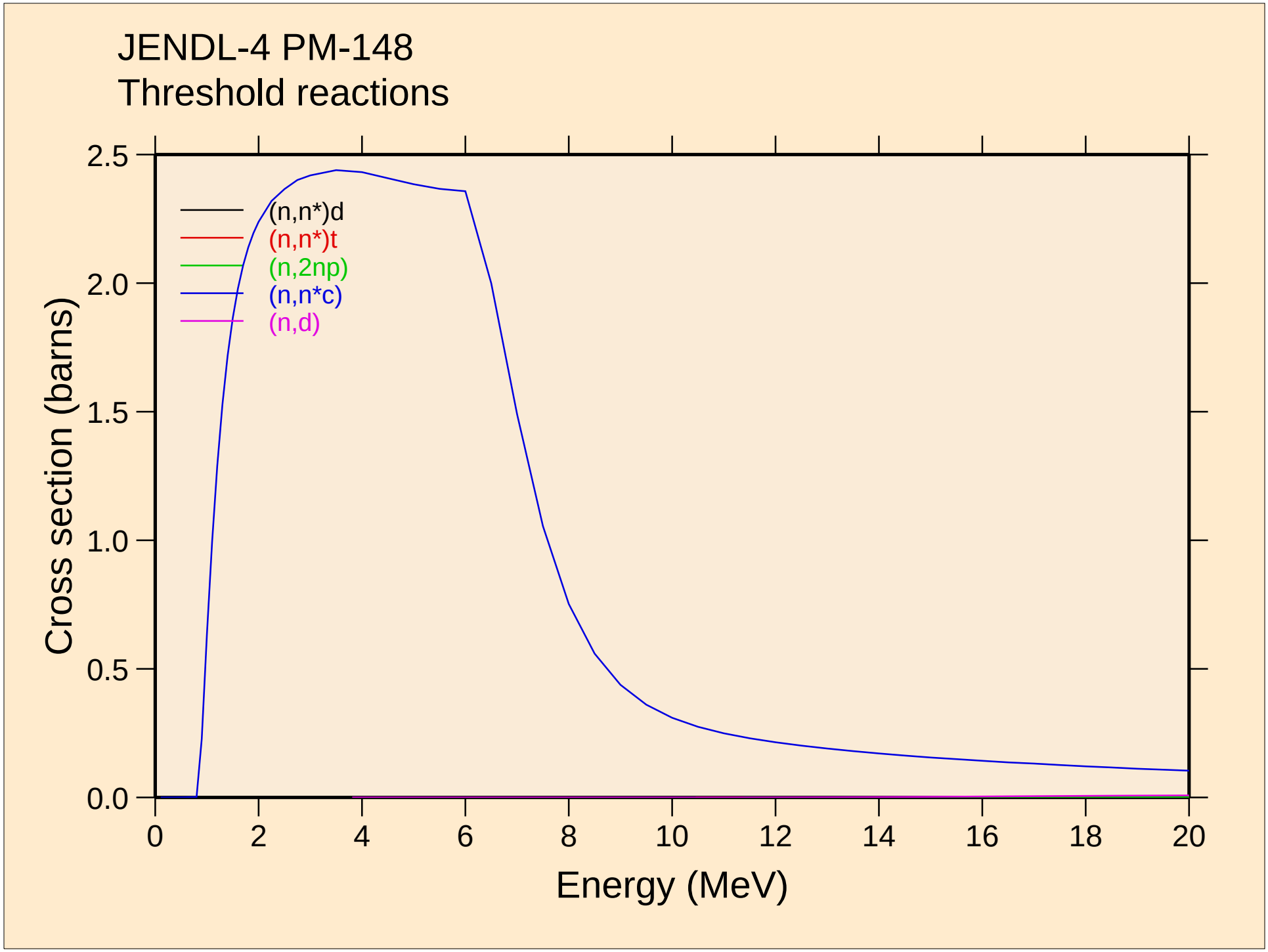

JENDL-4 PM-148
Inelastic levels
Cross section (barns)
*10^-3
120
100
80
60
40
20
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*16)
(n,n*17)
(n,n*18)
(n,n*19)
(n,n*20)

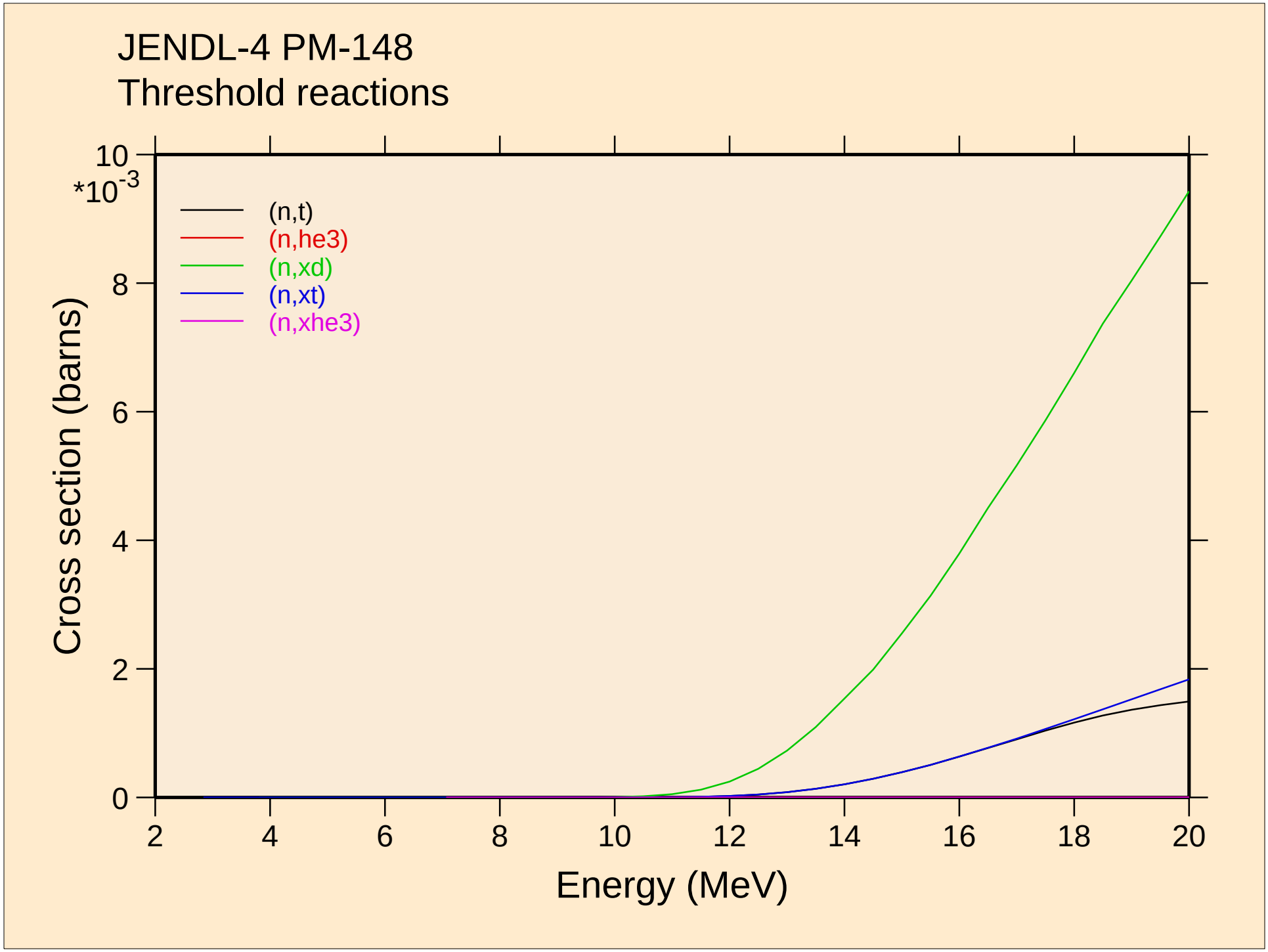

JENDL-4 PM-148
Inelastic levels
*10-3
25
20
15
10
5
0
Cross section (barns)
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*21)
(n,n*22)
(n,n*23)
(n,n*24)
(n,n*25)

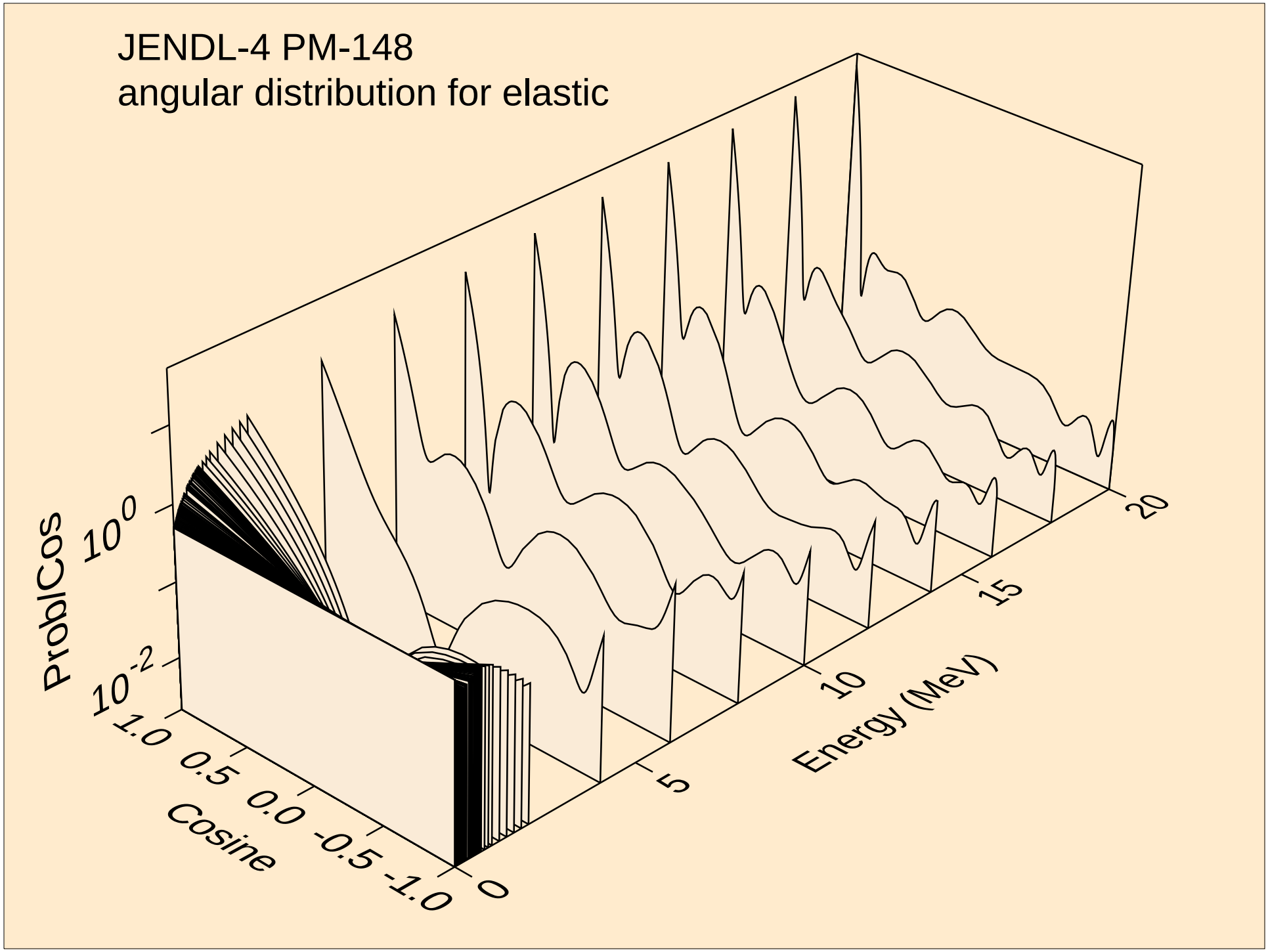

JENDL-4 PM-148
Inelastic levels
Cross section (barns)
*10-3
20
18
16
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*26)
(n,n*27)
(n,n*28)
(n,n*29)
(n,n*30)

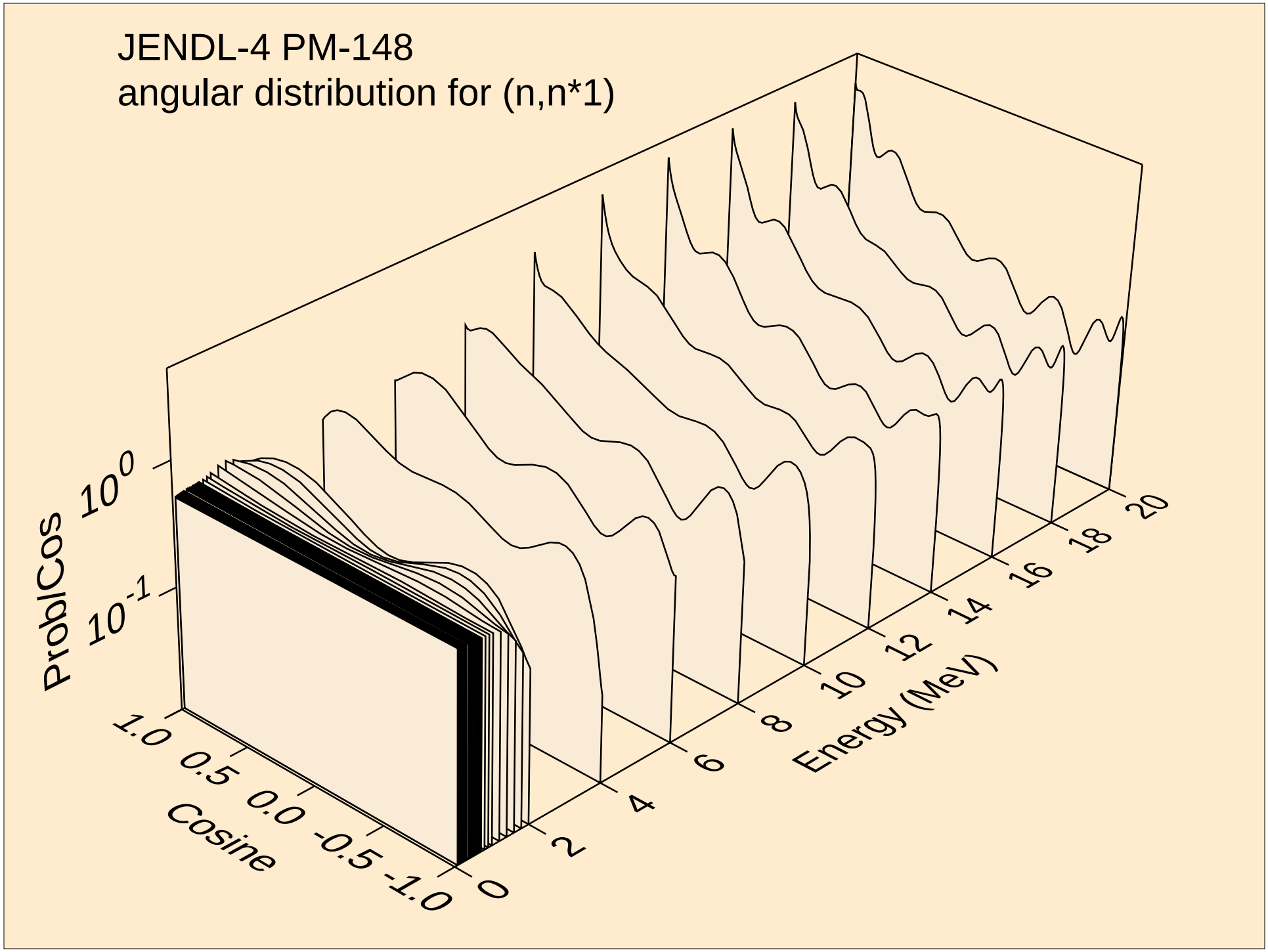

JENDL-4 PM-148
Inelastic levels
*10-3
Cross section (barns)
Energy (MeV)
(n,n*31)
(n,n*32)
(n,n*33)
(n,n*34)
0
1
2
3
4
5
6
0
2
4
6
8
10
12
14
16
18
20

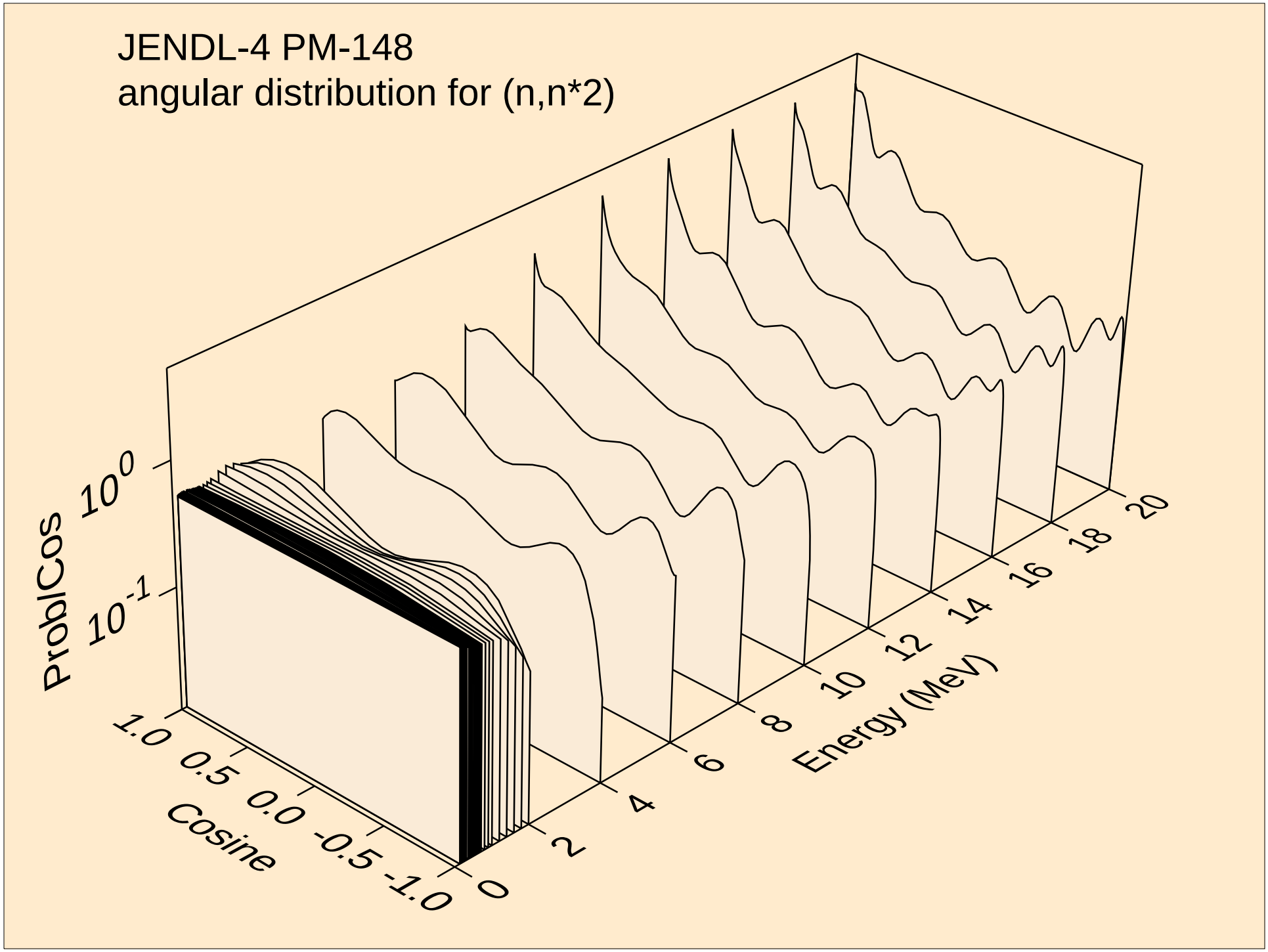

JENDL-4 PM-148
Threshold reactions
(n,2n)
(n,3n)
(n,n*)a
(n,2n)a
(n,n*)p
Cross section (barns)
Energy (MeV)
0.0
0.5
1.0
1.5
2.0
2.5
0
2
4
6
8
10
12
14
16
18
20

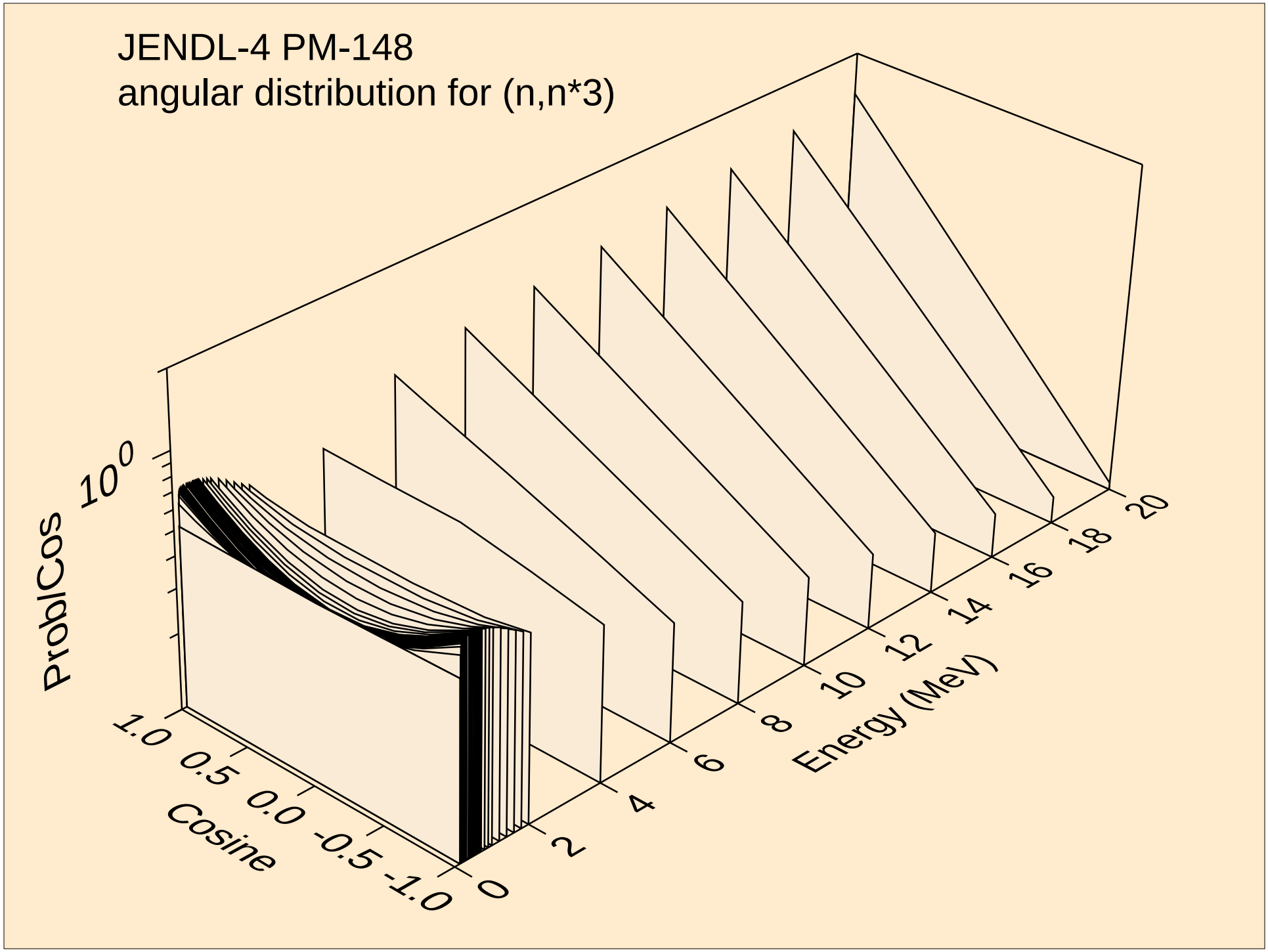

JENDL-4 PM-148
Threshold reactions
(n,n*)d
(n,n*)t
(n,2np)
(n,n*c)
(n,d)
Cross section (barns)
Energy (MeV)
0.0
0.5
1.0
1.5
2.0
2.5
0
2
4
6
8
10
12
14
16
18
20

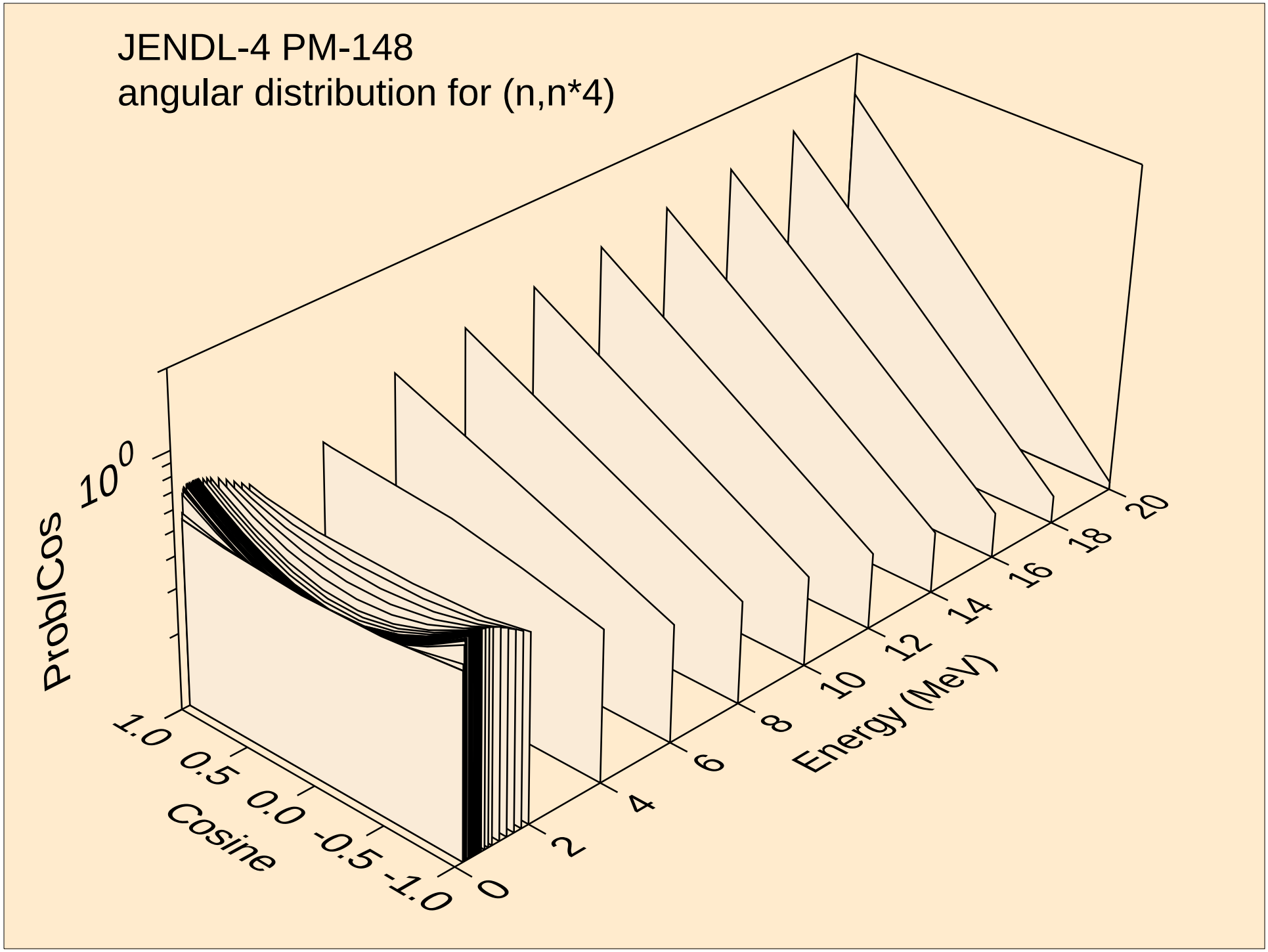

JENDL-4 PM-148
Threshold reactions
*10^-3
10
8
6
4
2
0
Cross section (barns)
(n,t)
(n,he3)
(n,xd)
(n,xt)
(n,xhe3)
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

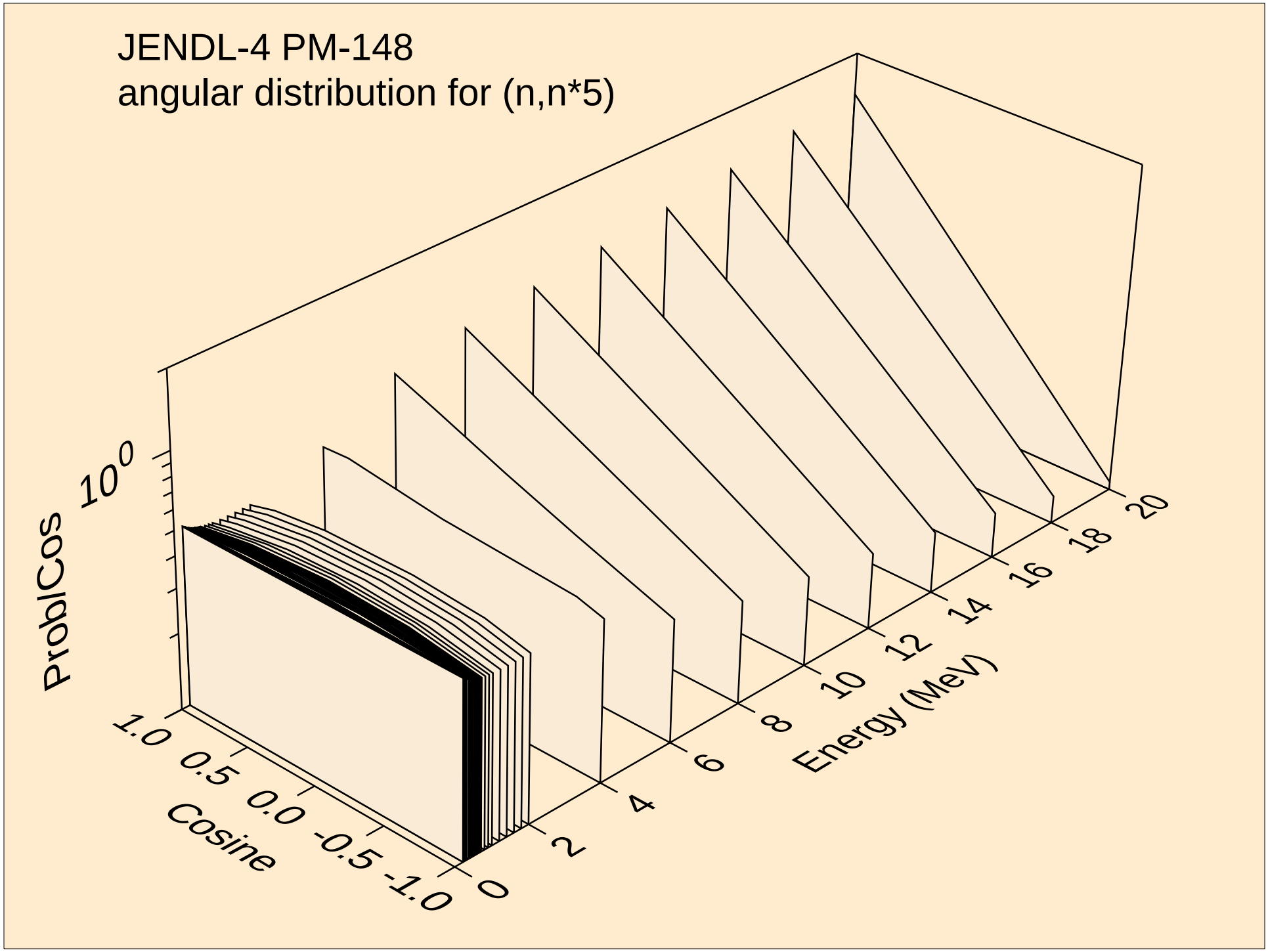

JENDL-4 PM-148
angular distribution for elastic
ProblCos
10^0
10^{-2}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

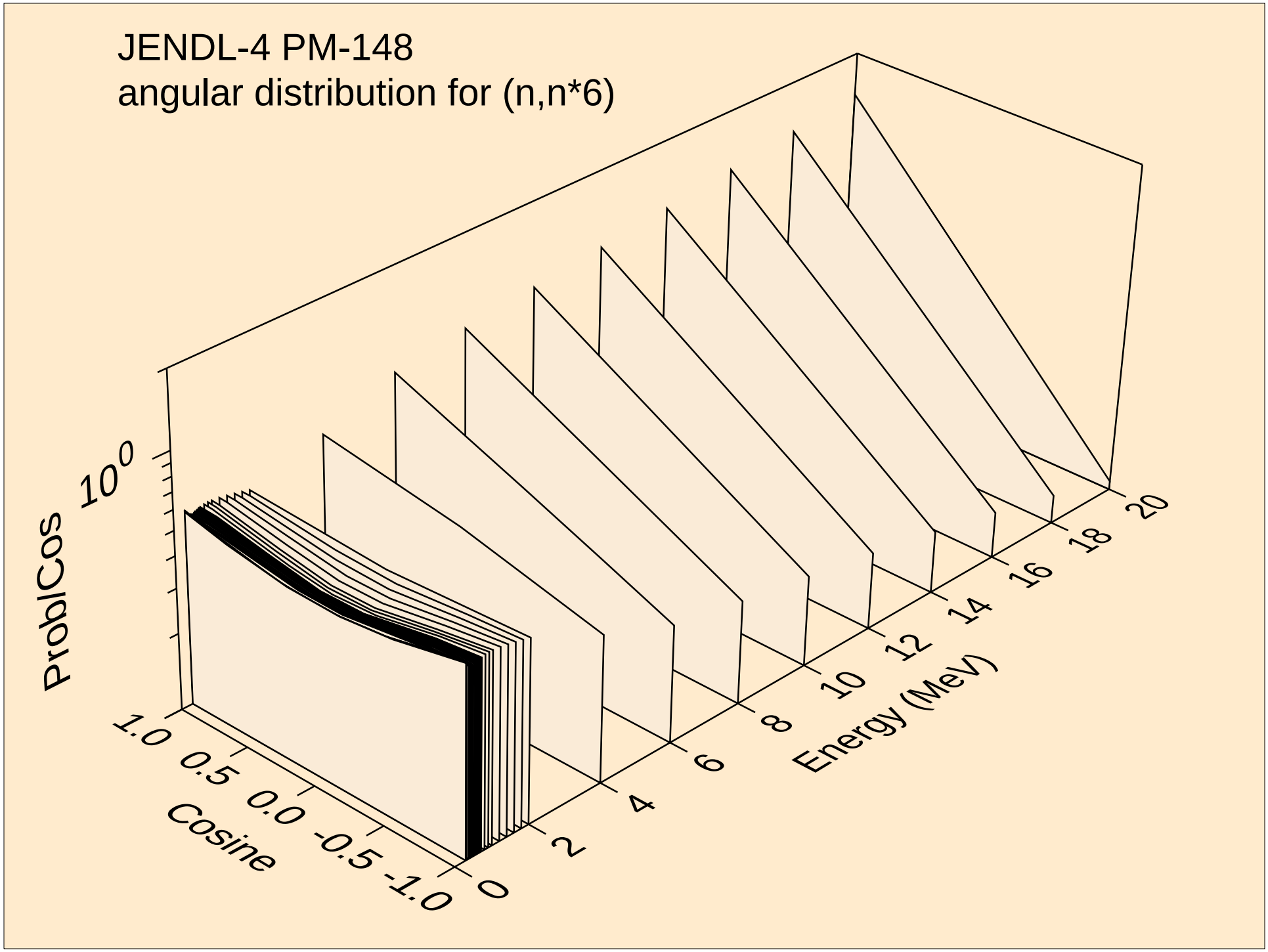

JENDL-4 PM-148
angular distribution for (n,n*1)
ProbCos
10^0
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

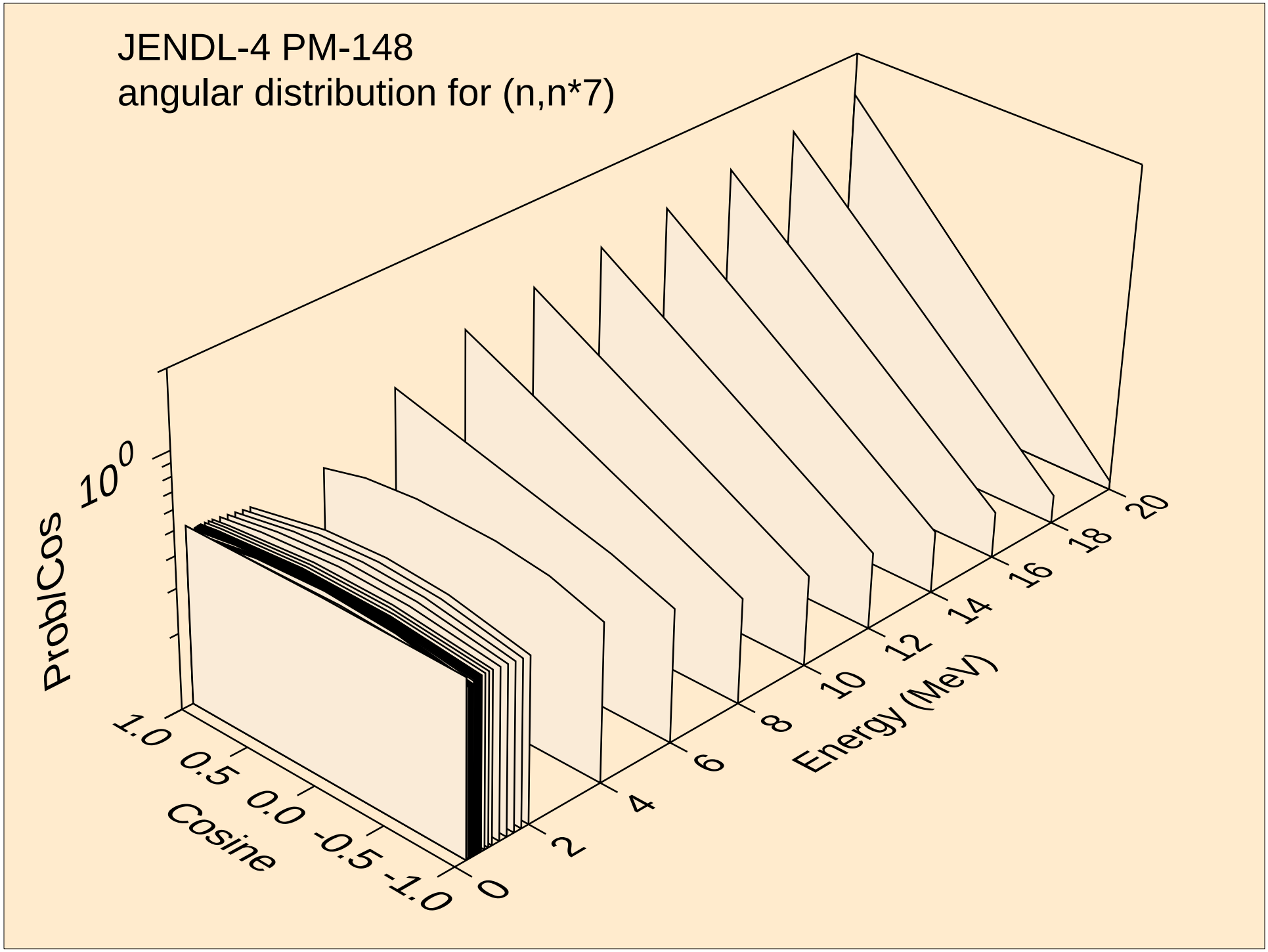

JENDL-4 PM-148
angular distribution for (n,n*2)
ProblCos
10^0
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

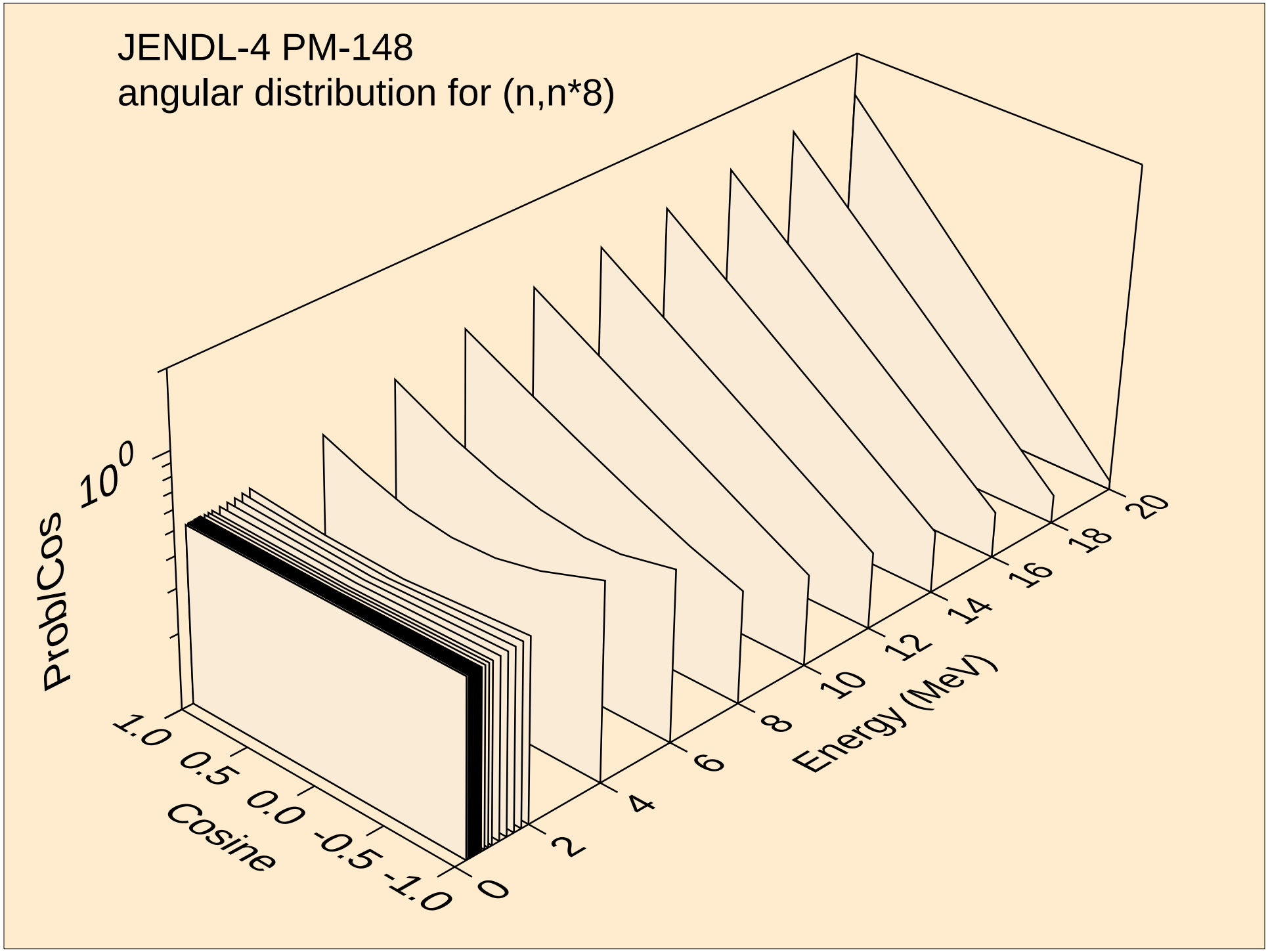

JENDL-4 PM-148
angular distribution for (n,n*3)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

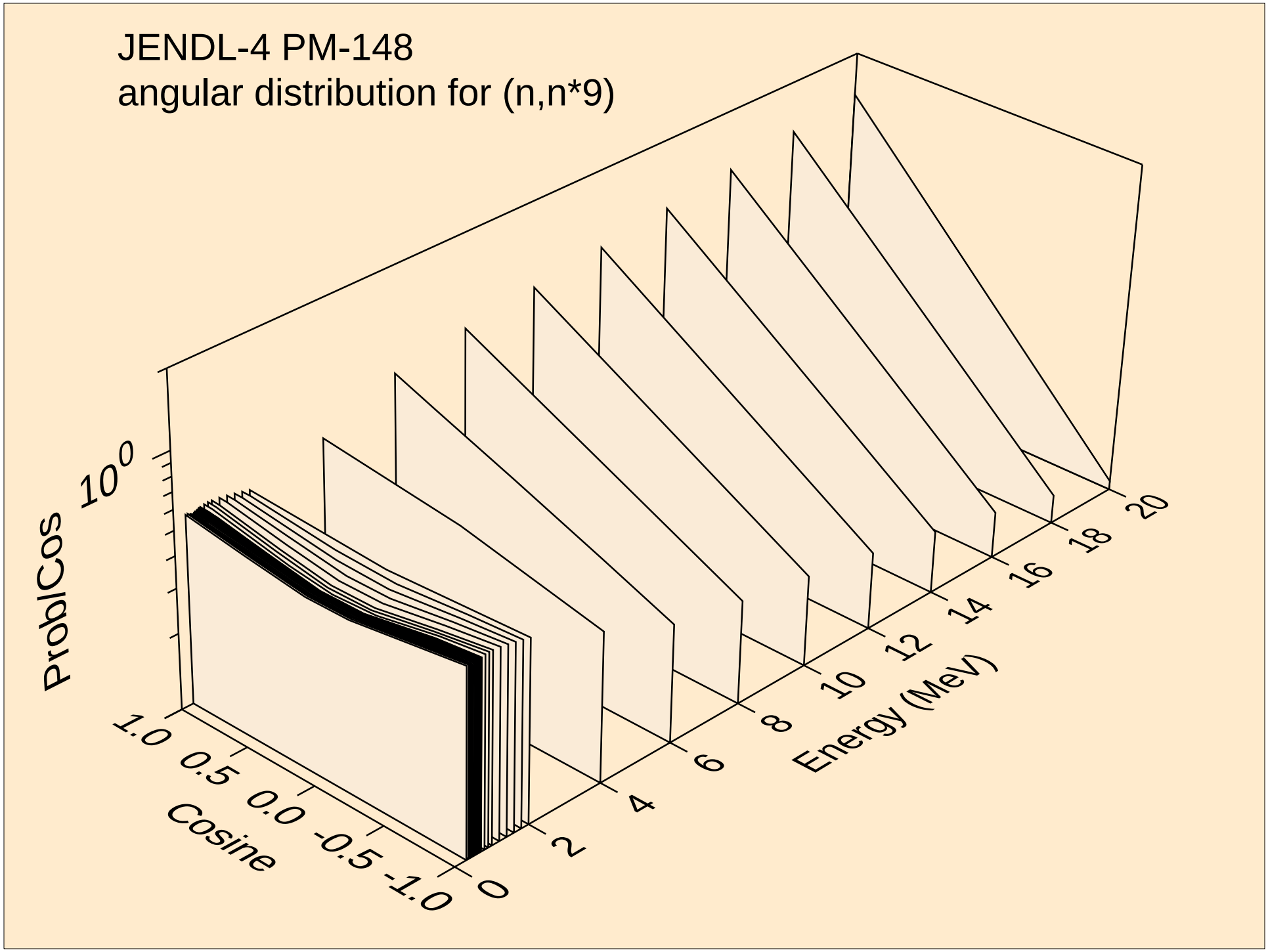

JENDL-4 PM-148
angular distribution for (n,n*4)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

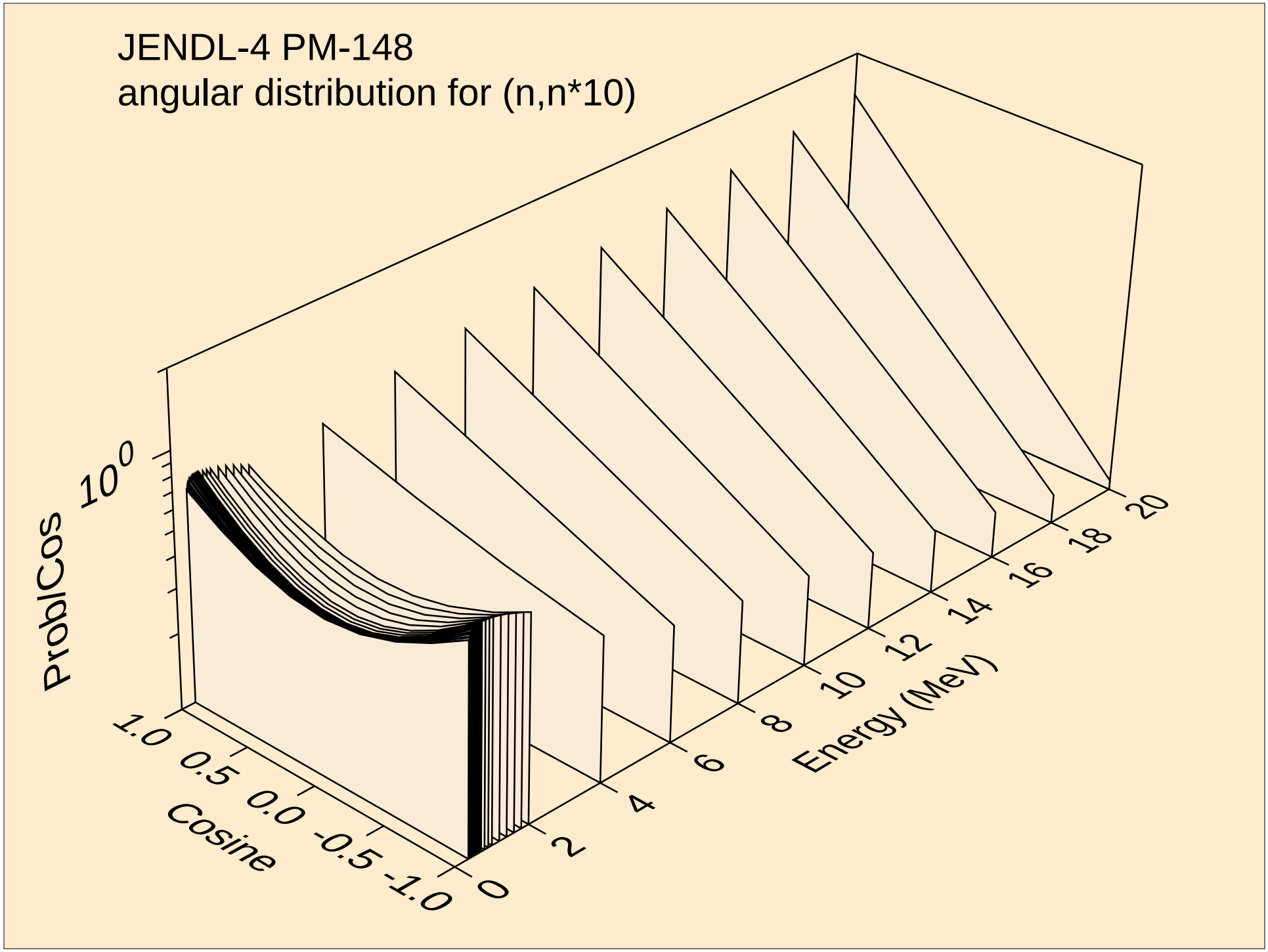

JENDL-4 PM-148
angular distribution for (n,n*5)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

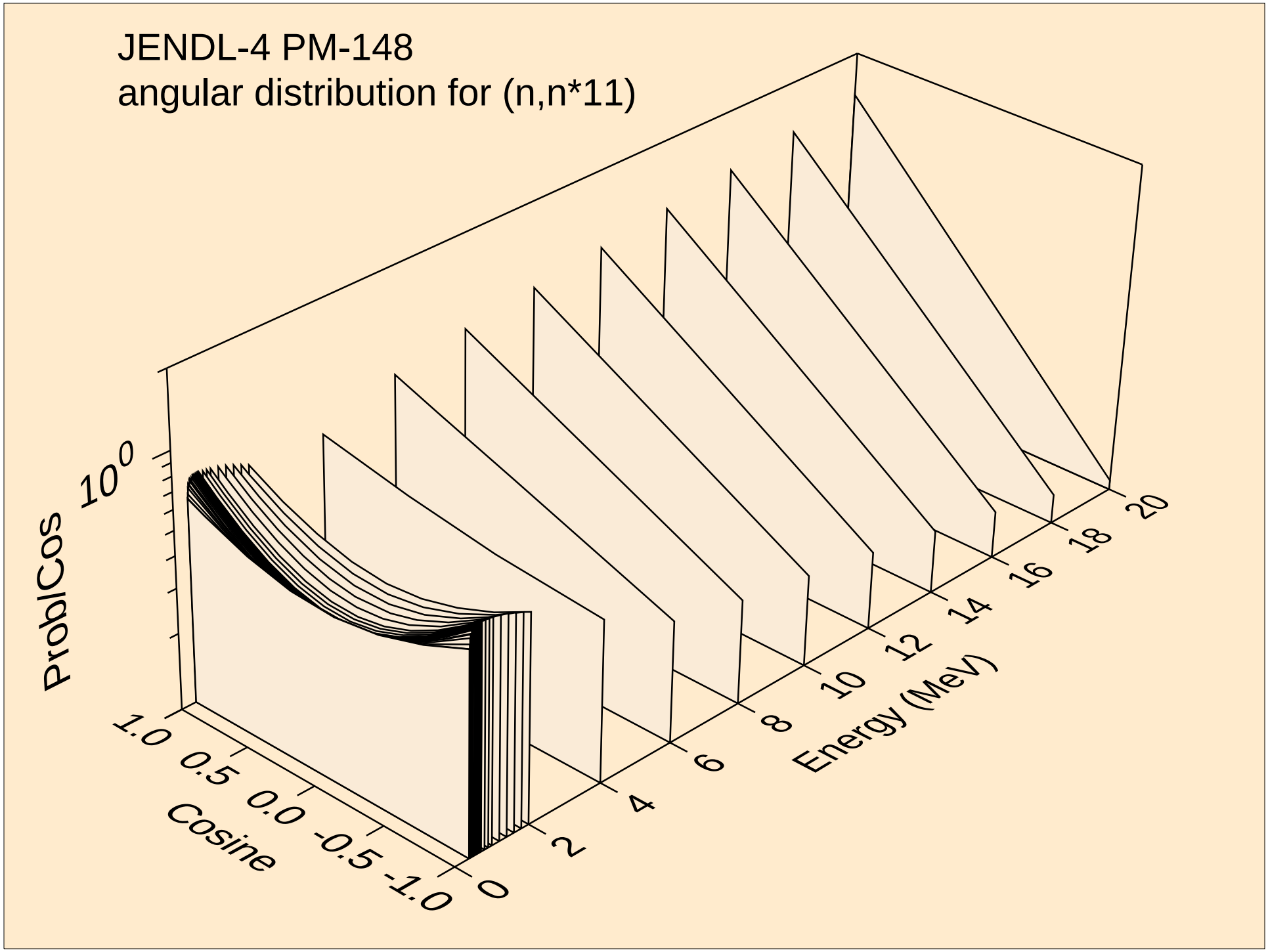

JENDL-4 PM-148
angular distribution for (n,n*6)
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

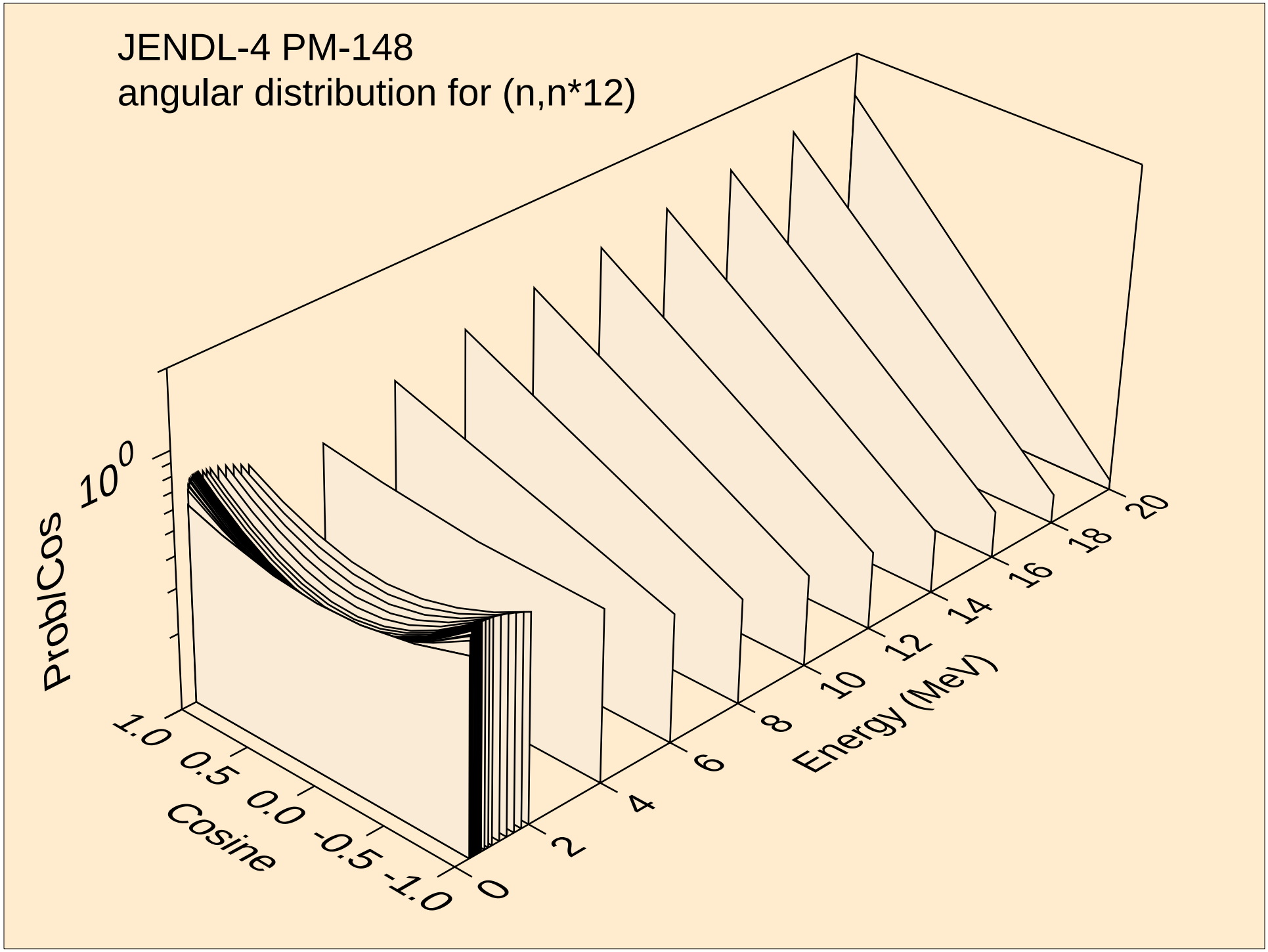

JENDL-4 PM-148
angular distribution for (n,n*7)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

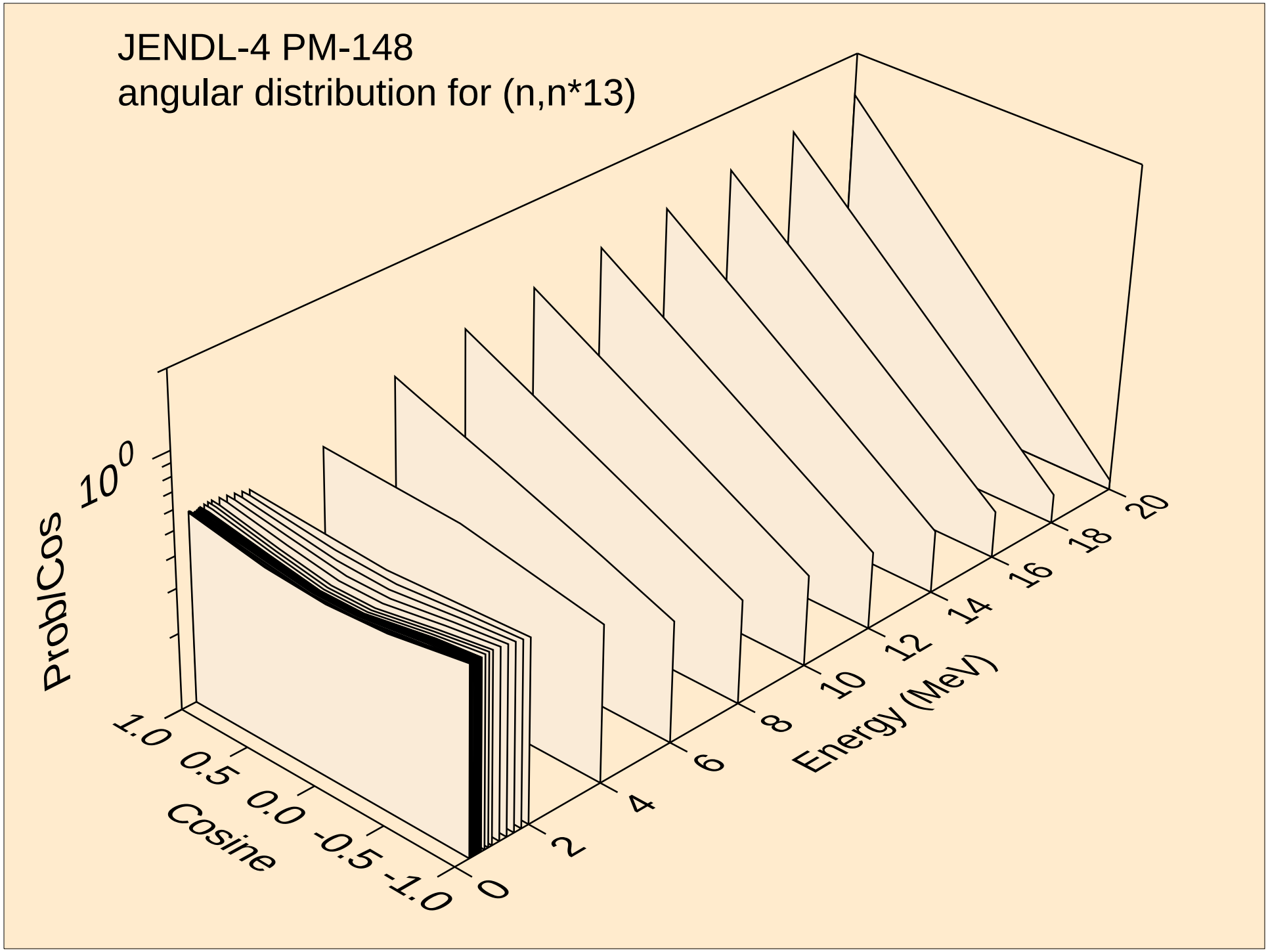

JENDL-4 PM-148
angular distribution for (n,n*8)
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

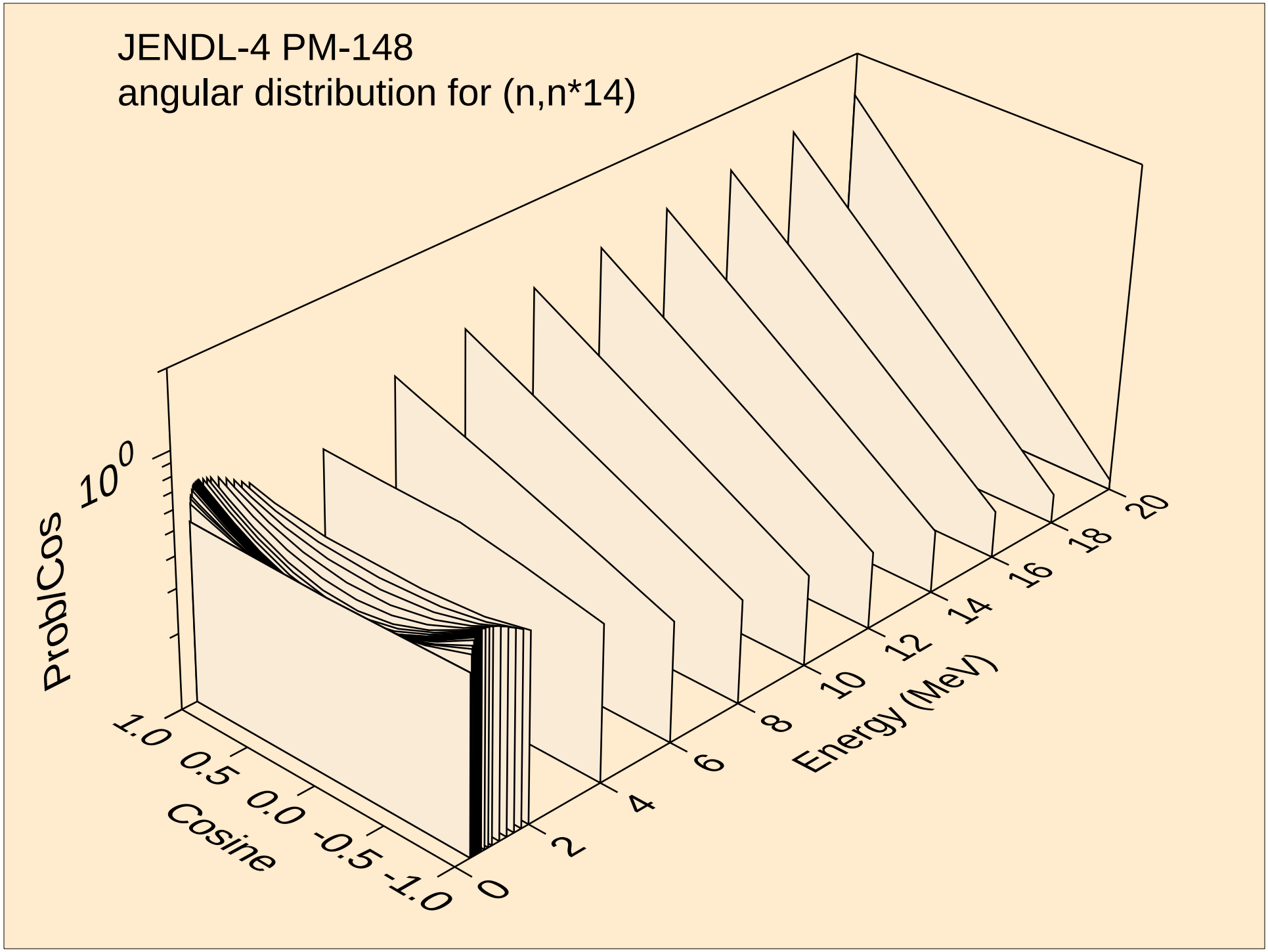

JENDL-4 PM-148
angular distribution for (n,n*9)
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

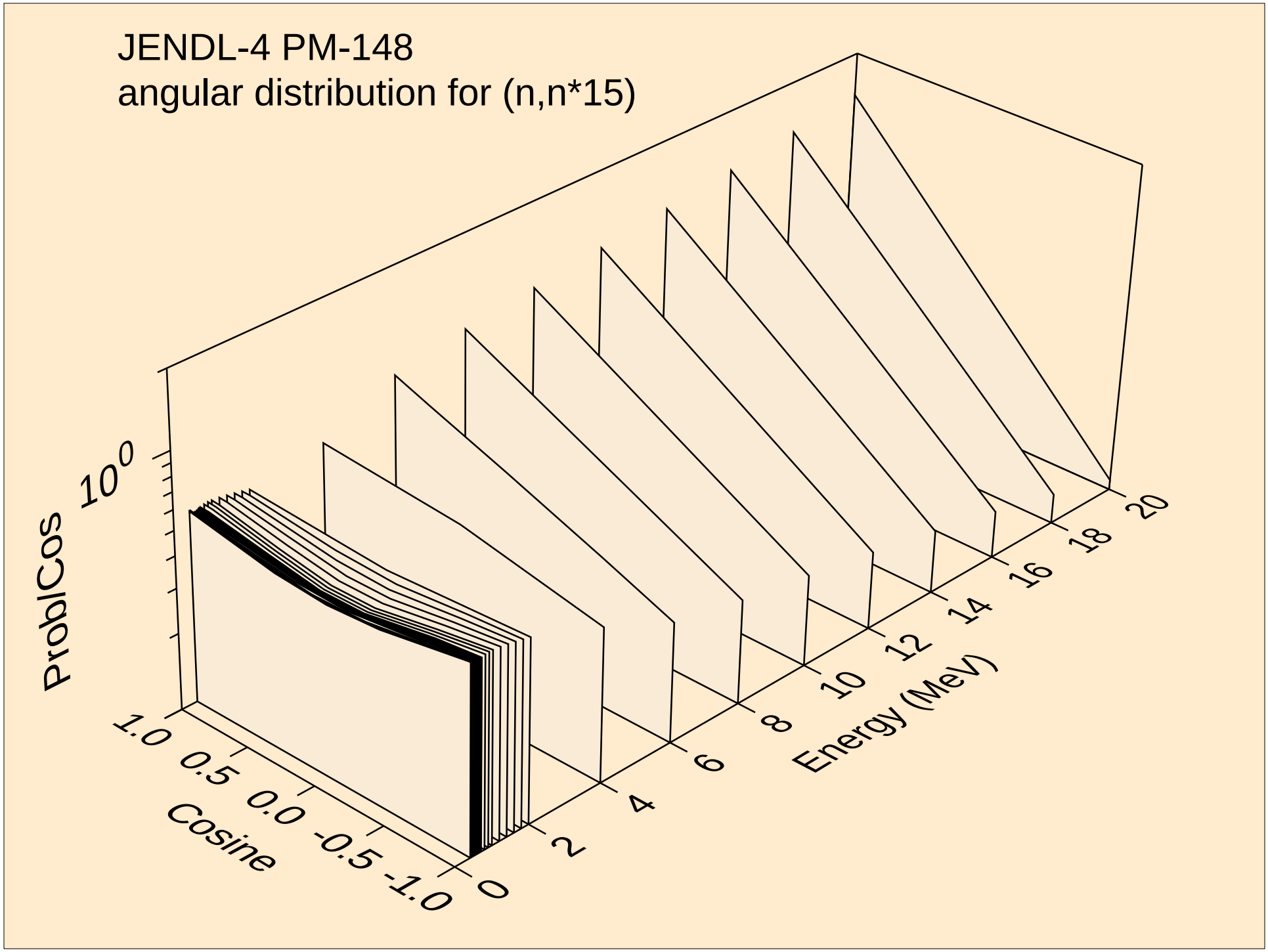

JENDL-4 PM-148
angular distribution for (n,n*10)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

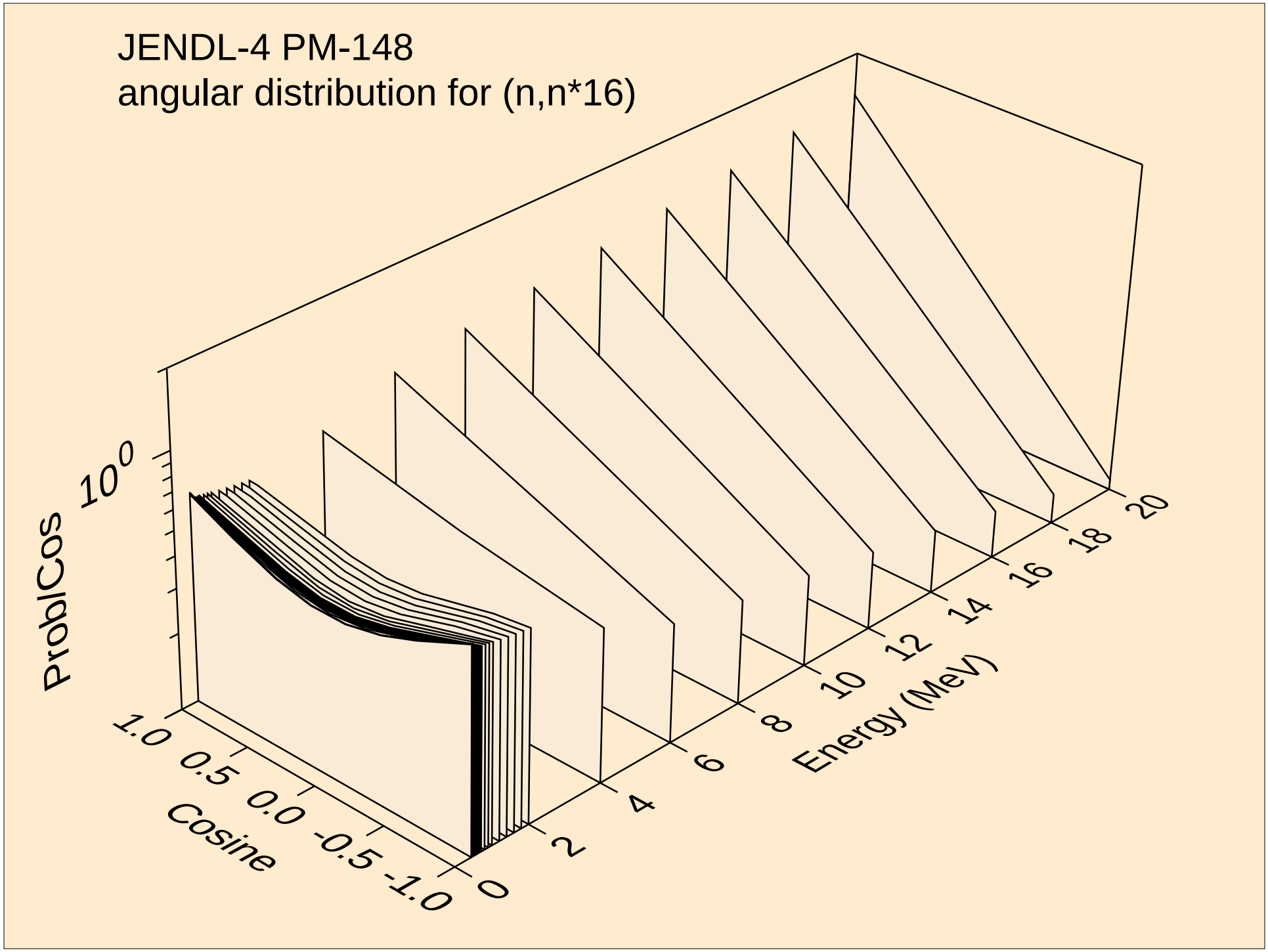

JENDL-4 PM-148
angular distribution for (n,n*11)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

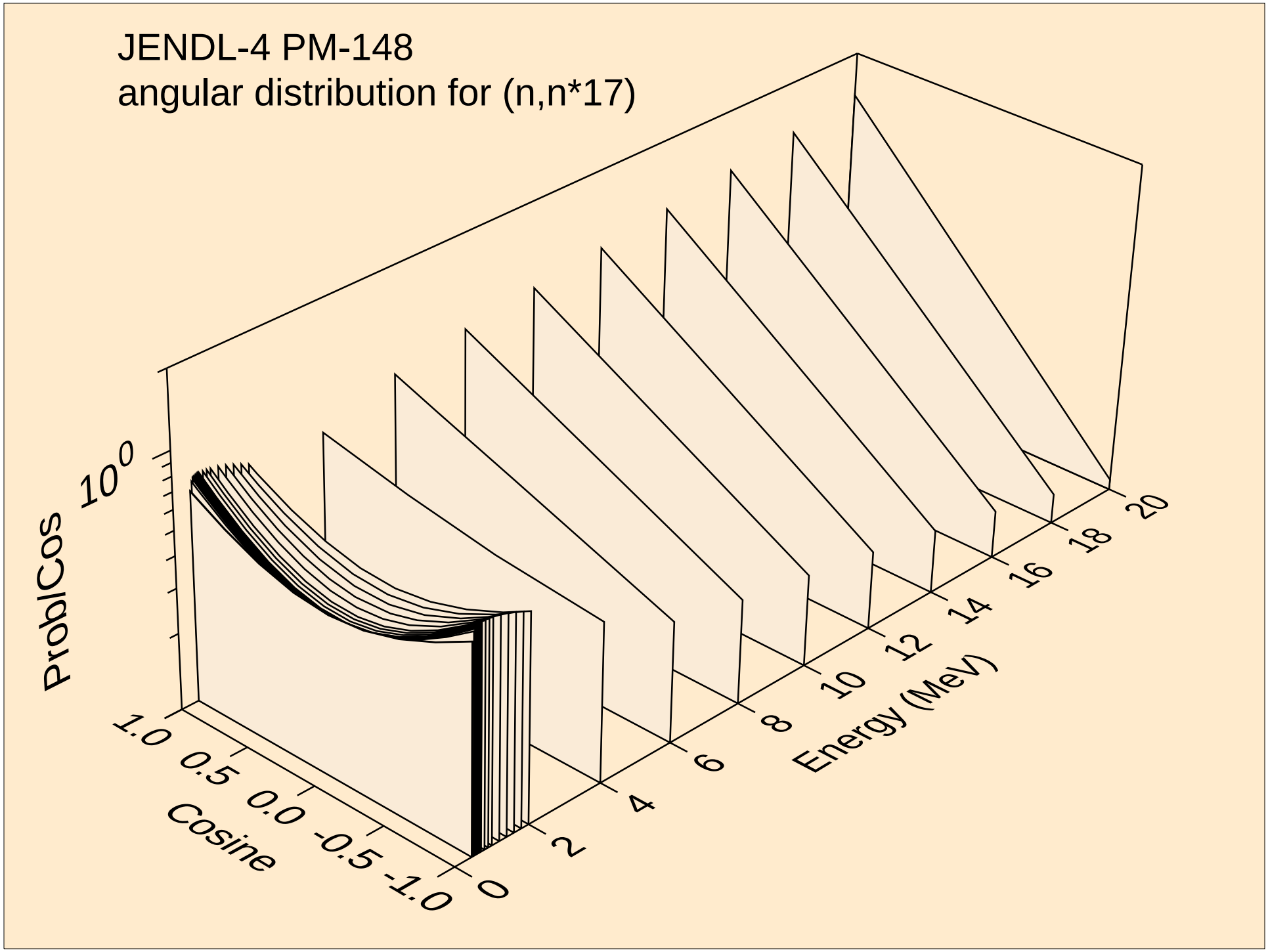

JENDL-4 PM-148
angular distribution for (n,n*12)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

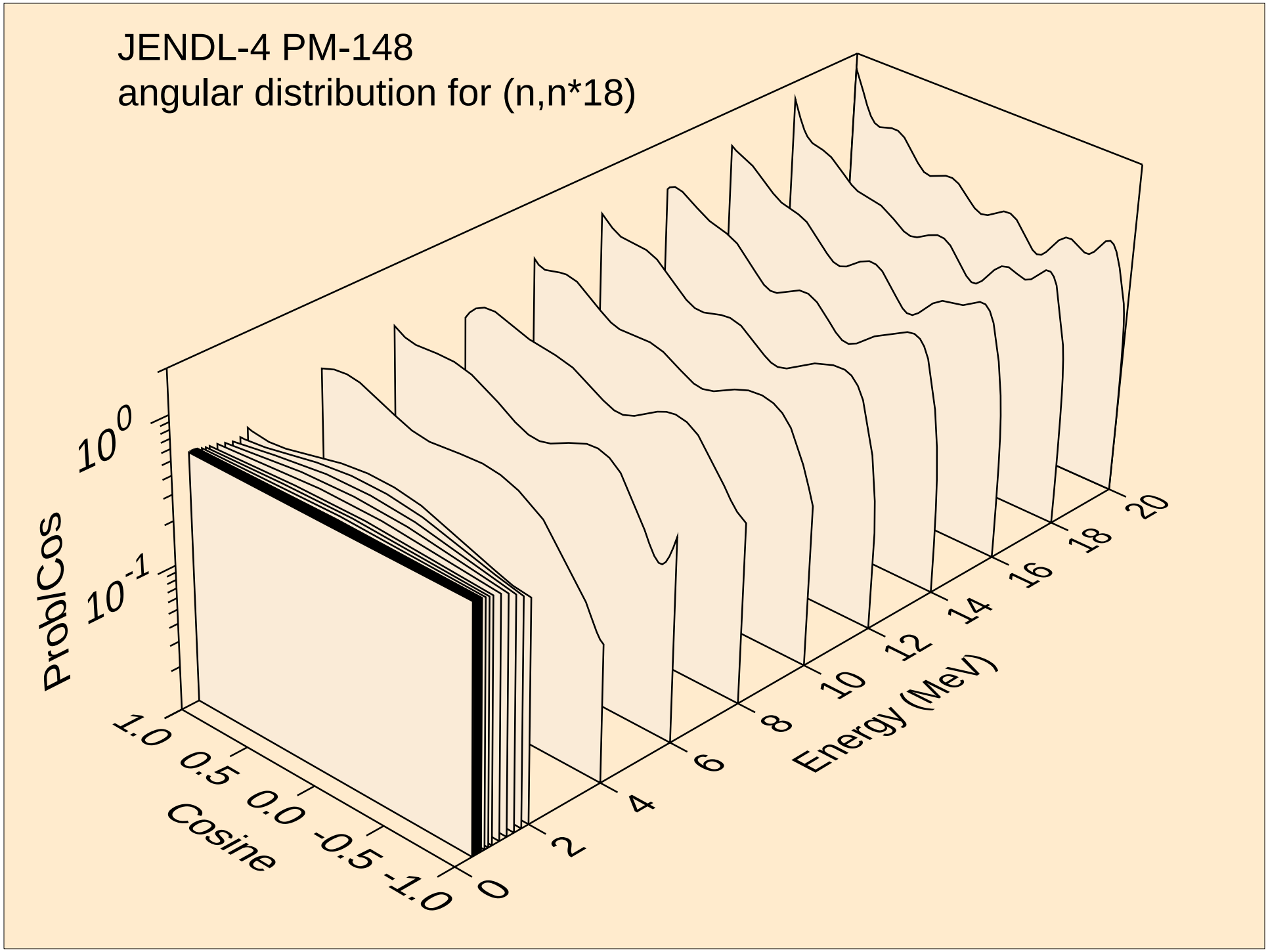

JENDL-4 PM-148
angular distribution for (n,n*13)
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

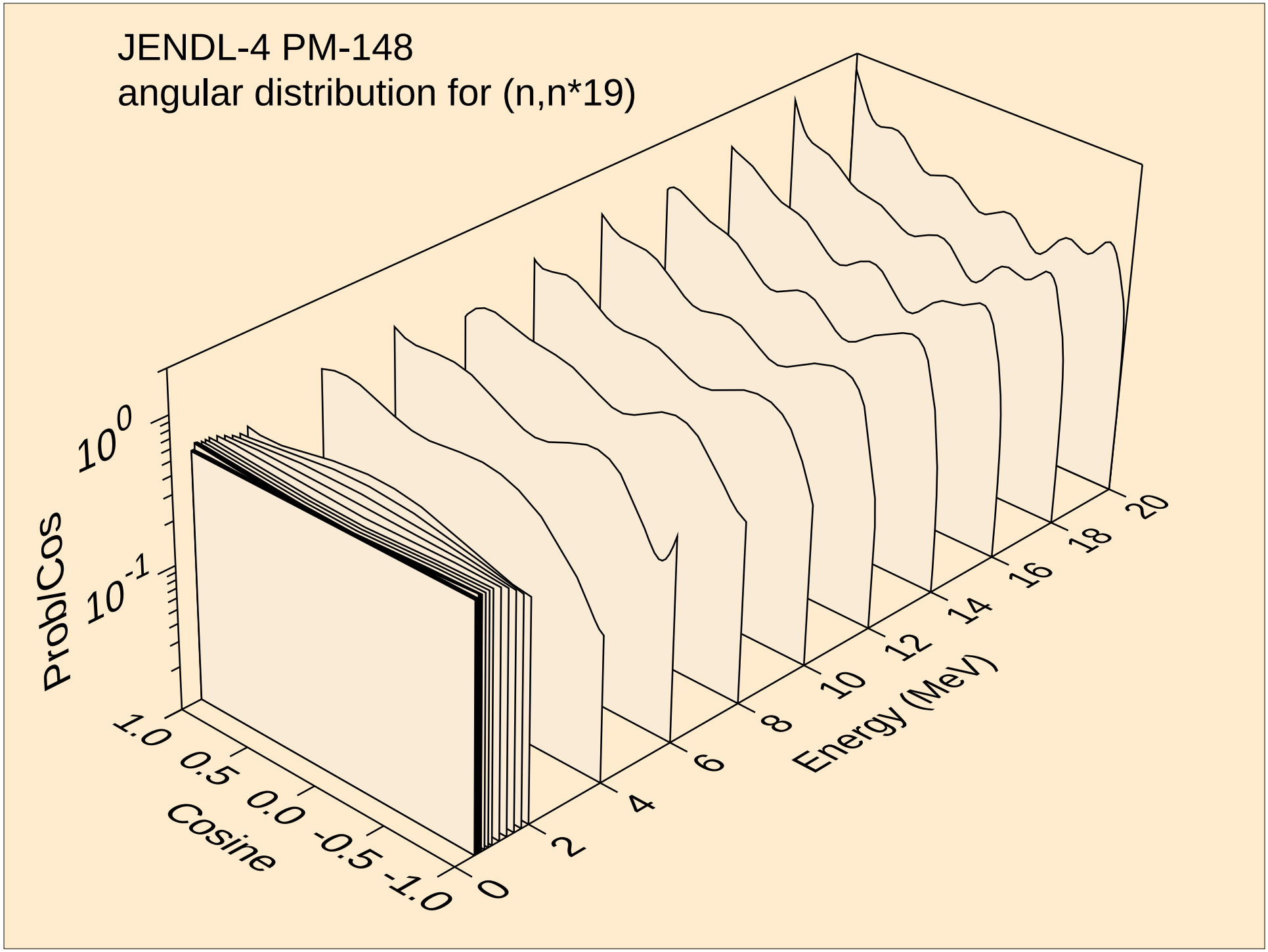

JENDL-4 PM-148
angular distribution for (n,n*14)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

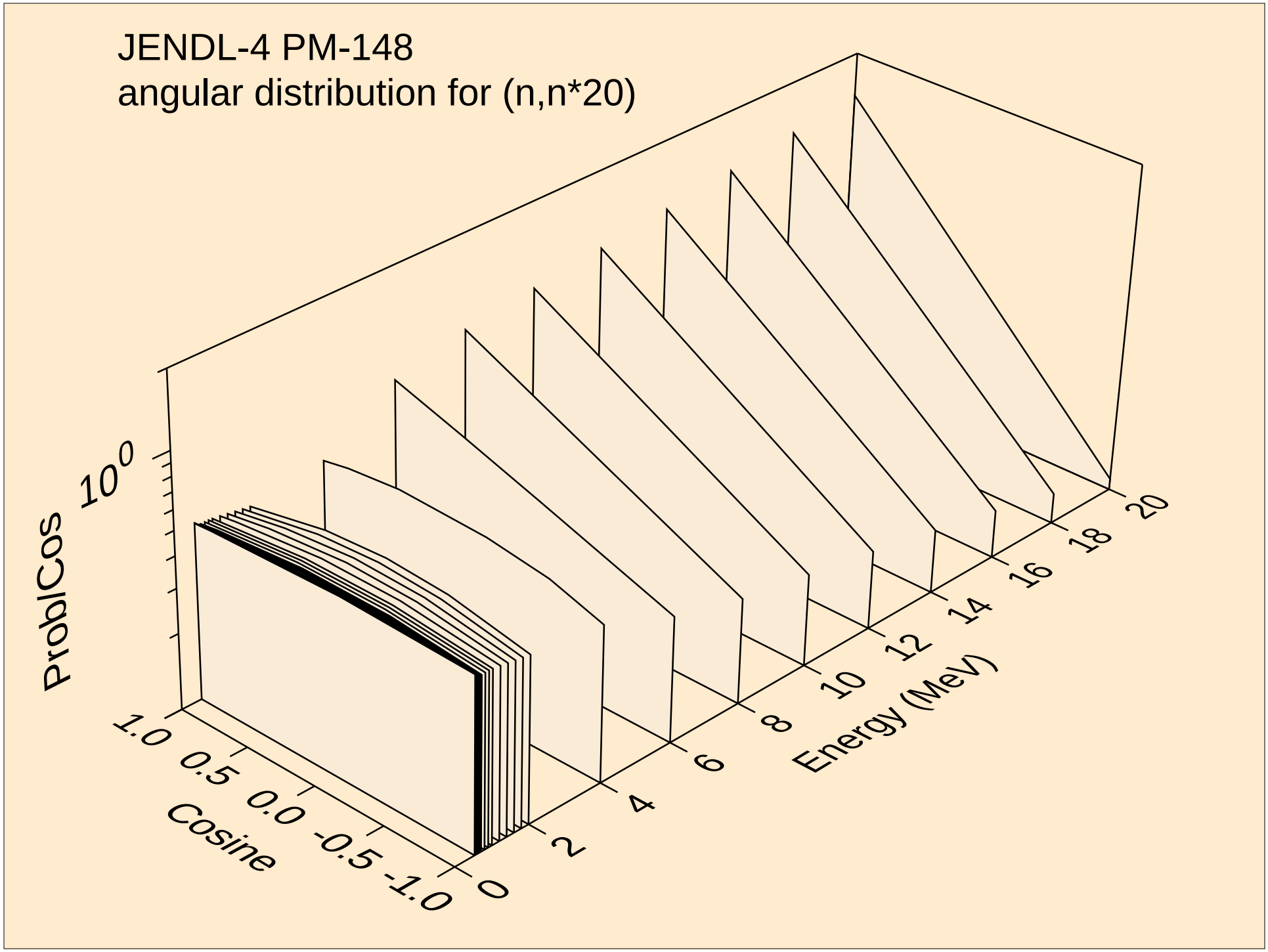

JENDL-4 PM-148
angular distribution for (n,n*15)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

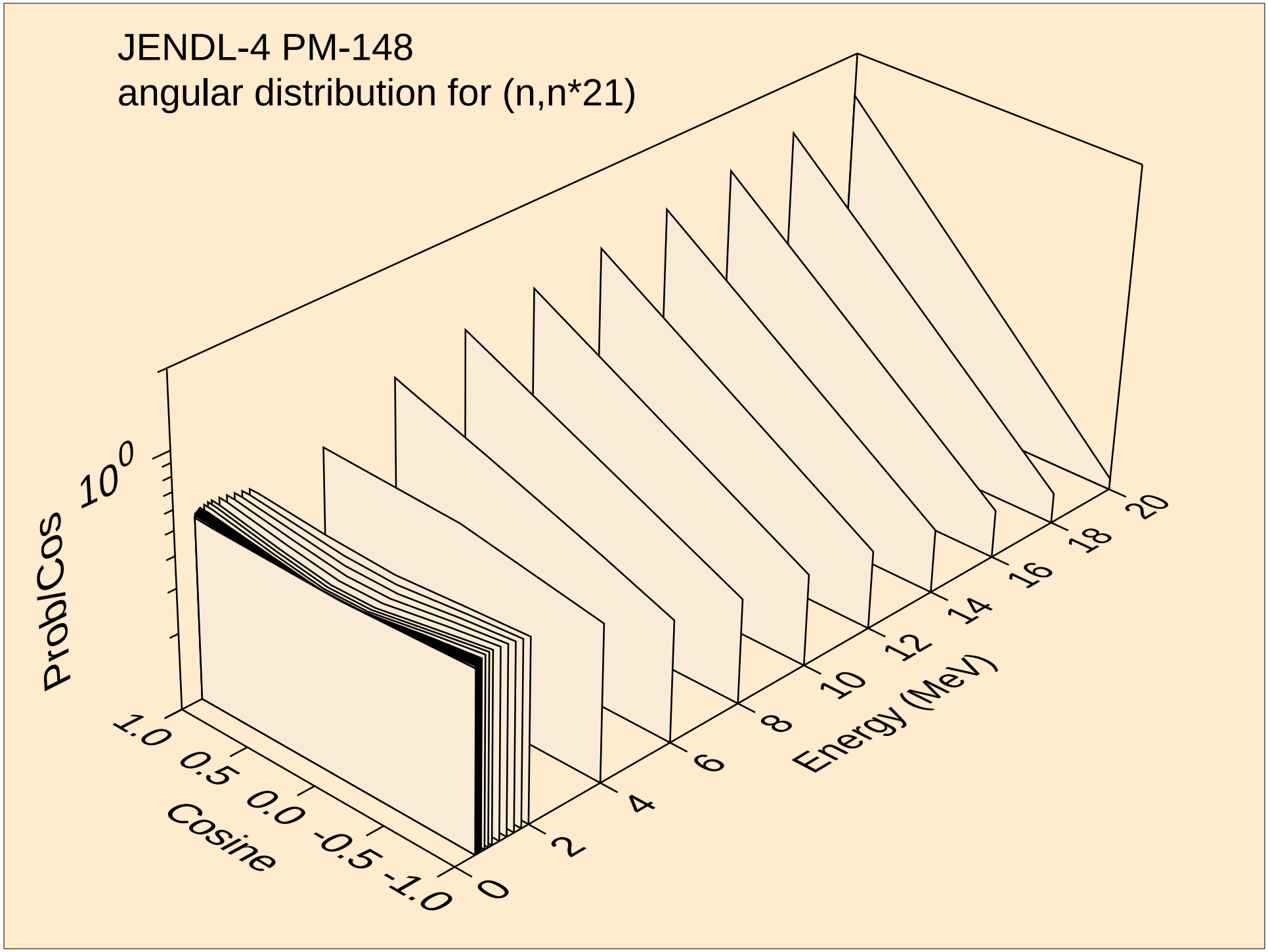

JENDL-4 PM-148
angular distribution for (n,n*16)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

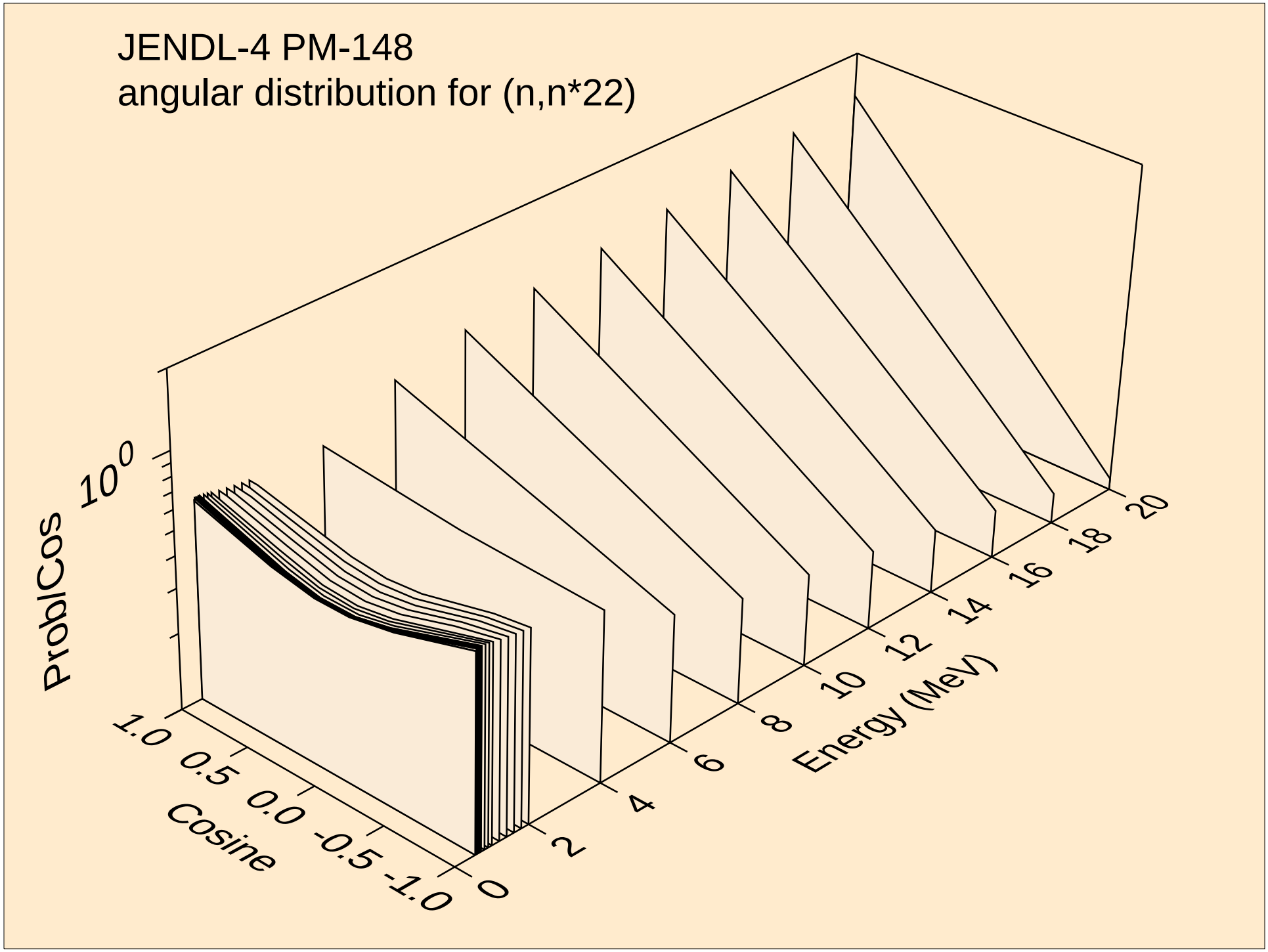

JENDL-4 PM-148
angular distribution for (n,n*17)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

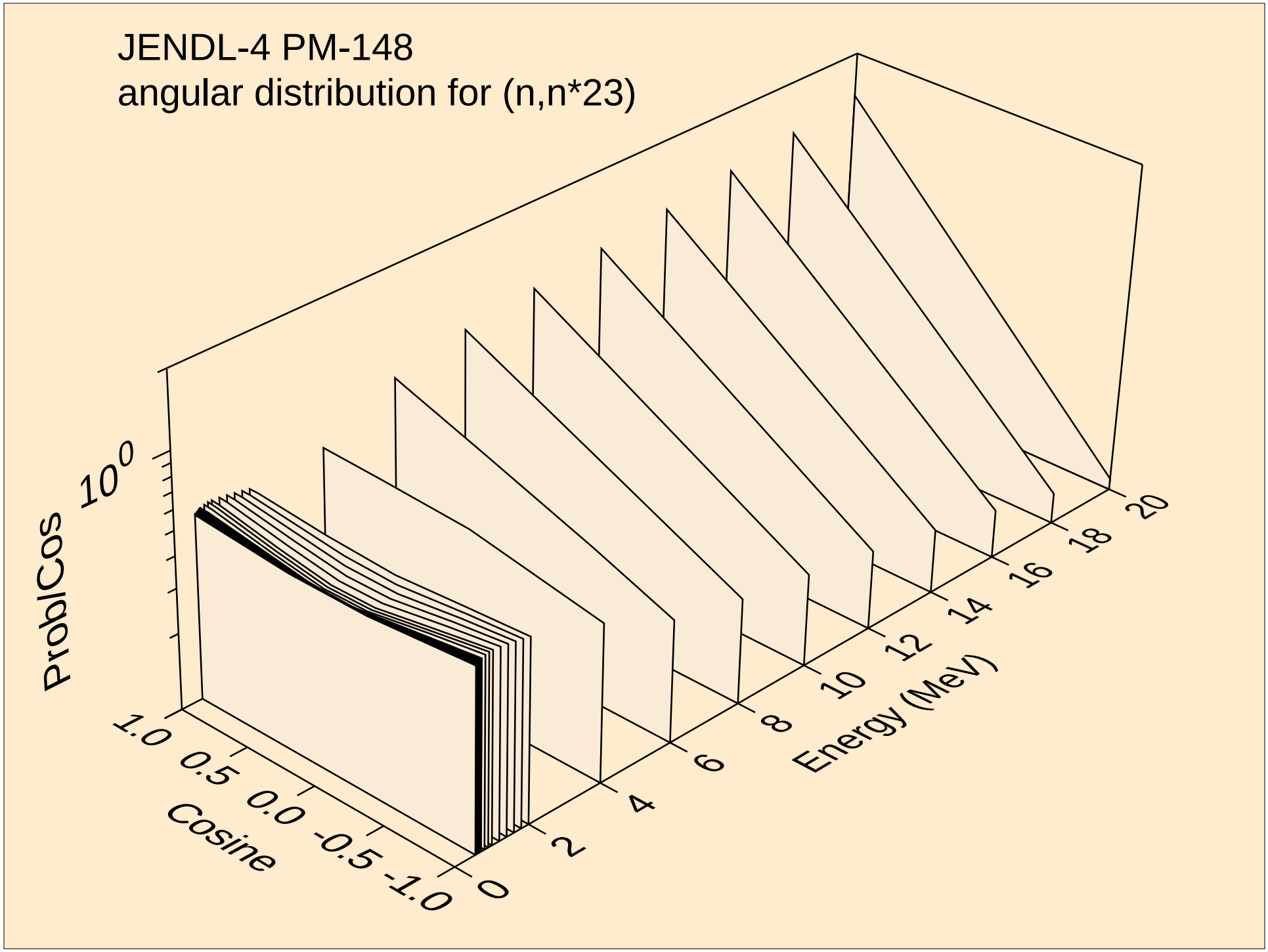

JENDL-4 PM-148
angular distribution for (n,n*18)
ProbCos
10^0
10^{-1}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

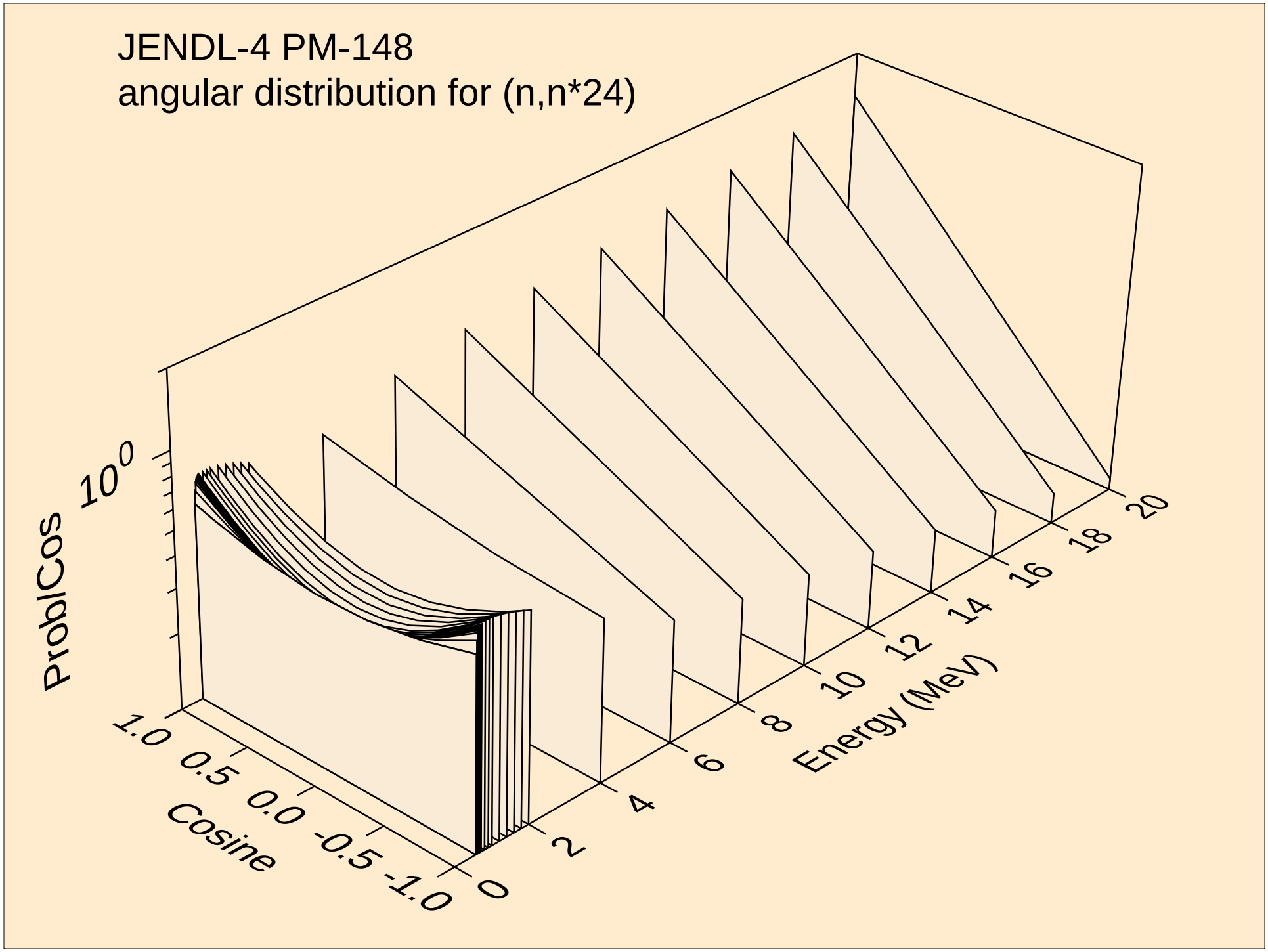

JENDL-4 PM-148
angular distribution for (n,n*19)
ProbCos
10^0
10^{-1}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

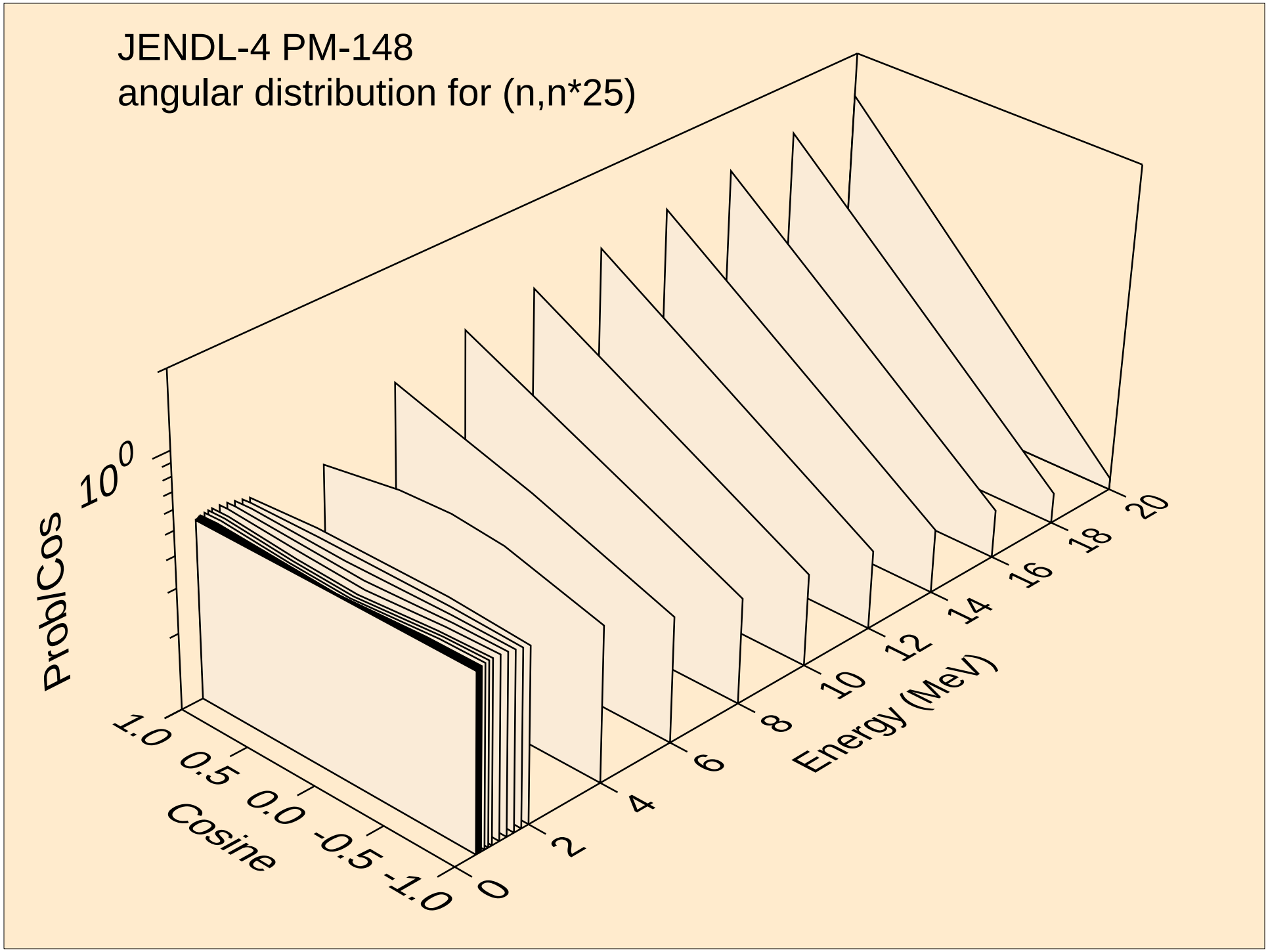

JENDL-4 PM-148
angular distribution for (n,n*20)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

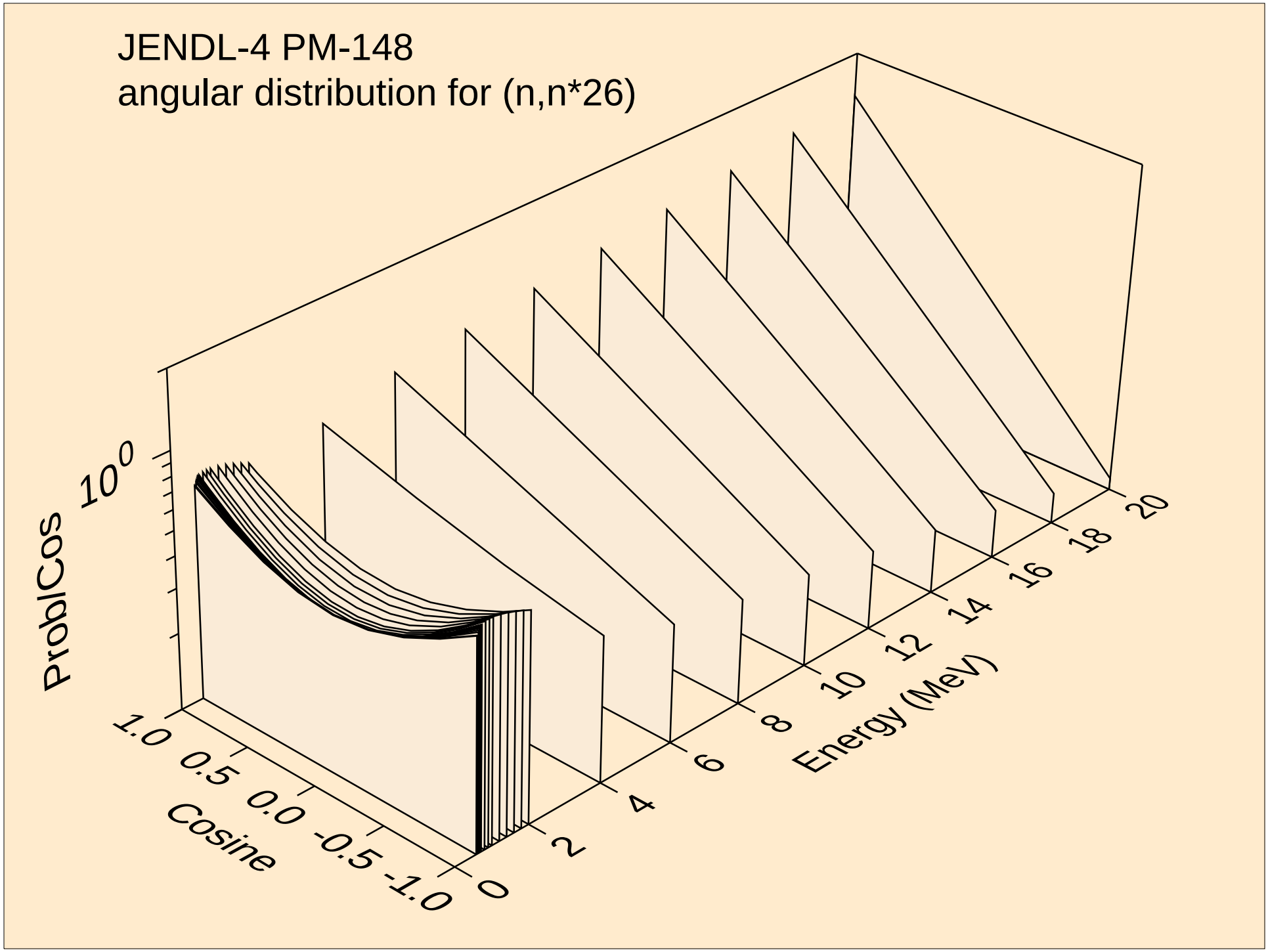

JENDL-4 PM-148
angular distribution for (n,n*21)
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

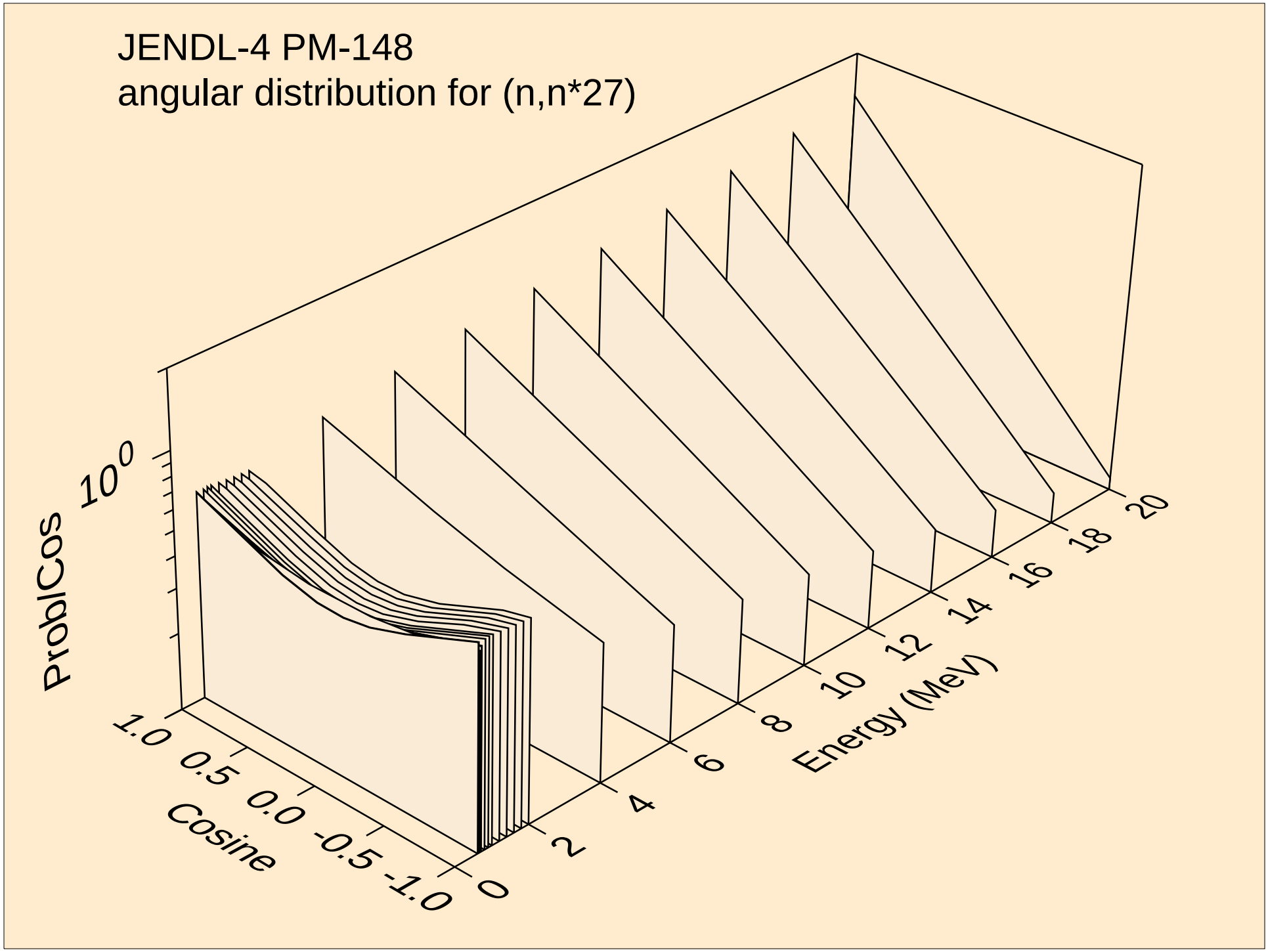

JENDL-4 PM-148
angular distribution for (n,n*22)
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

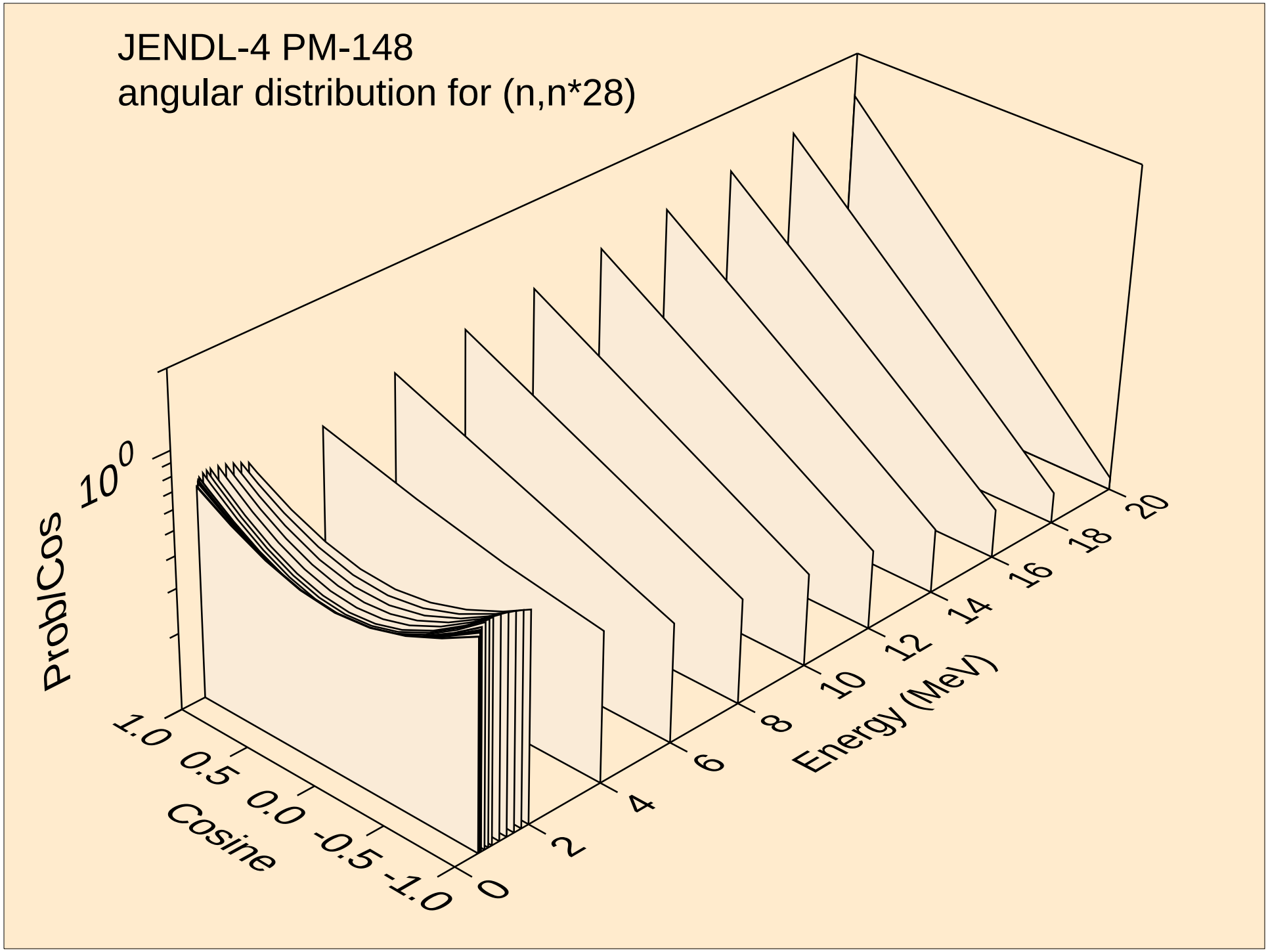

JENDL-4 PM-148
angular distribution for (n,n*23)
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

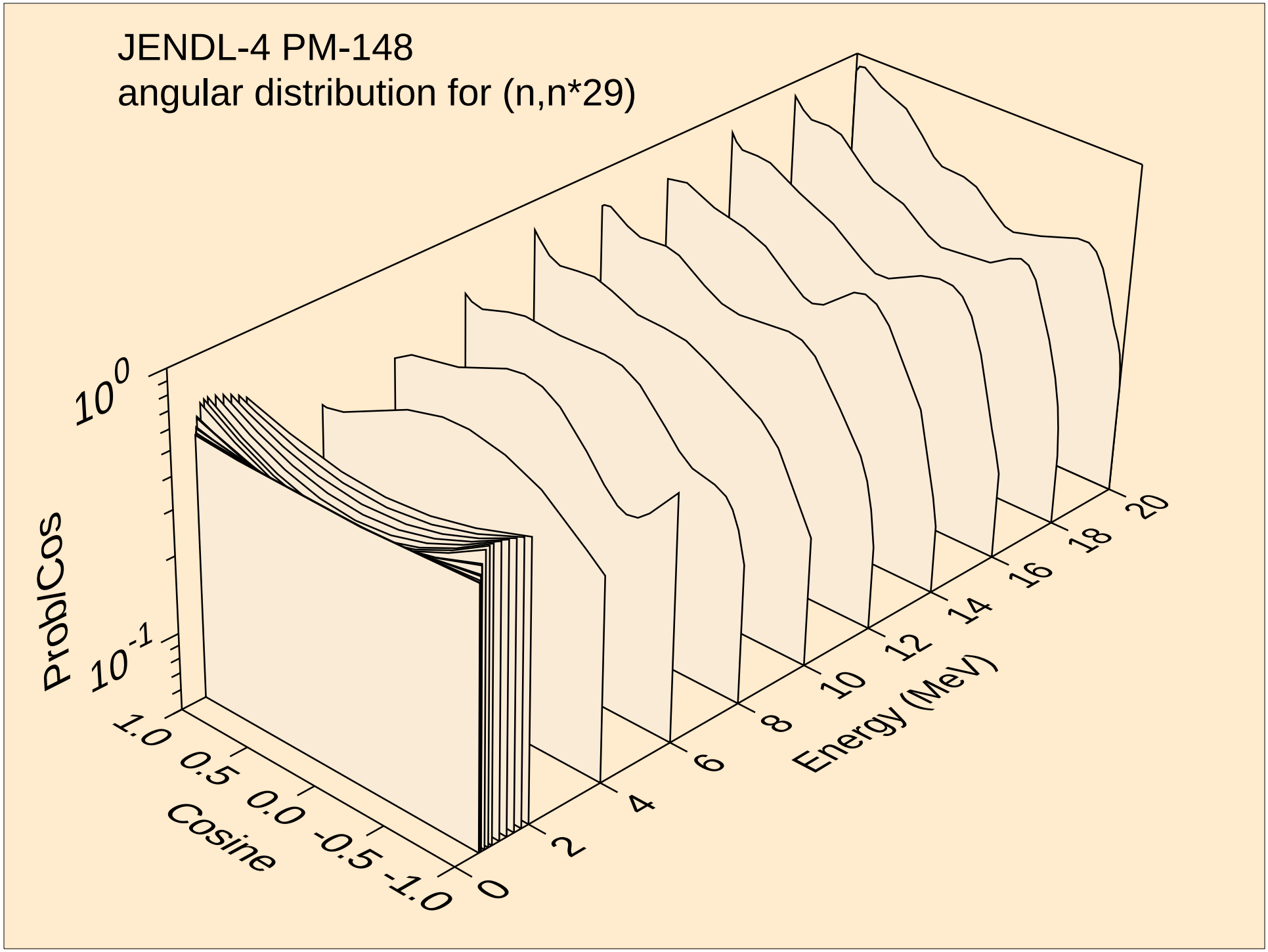

JENDL-4 PM-148
angular distribution for (n,n*24)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

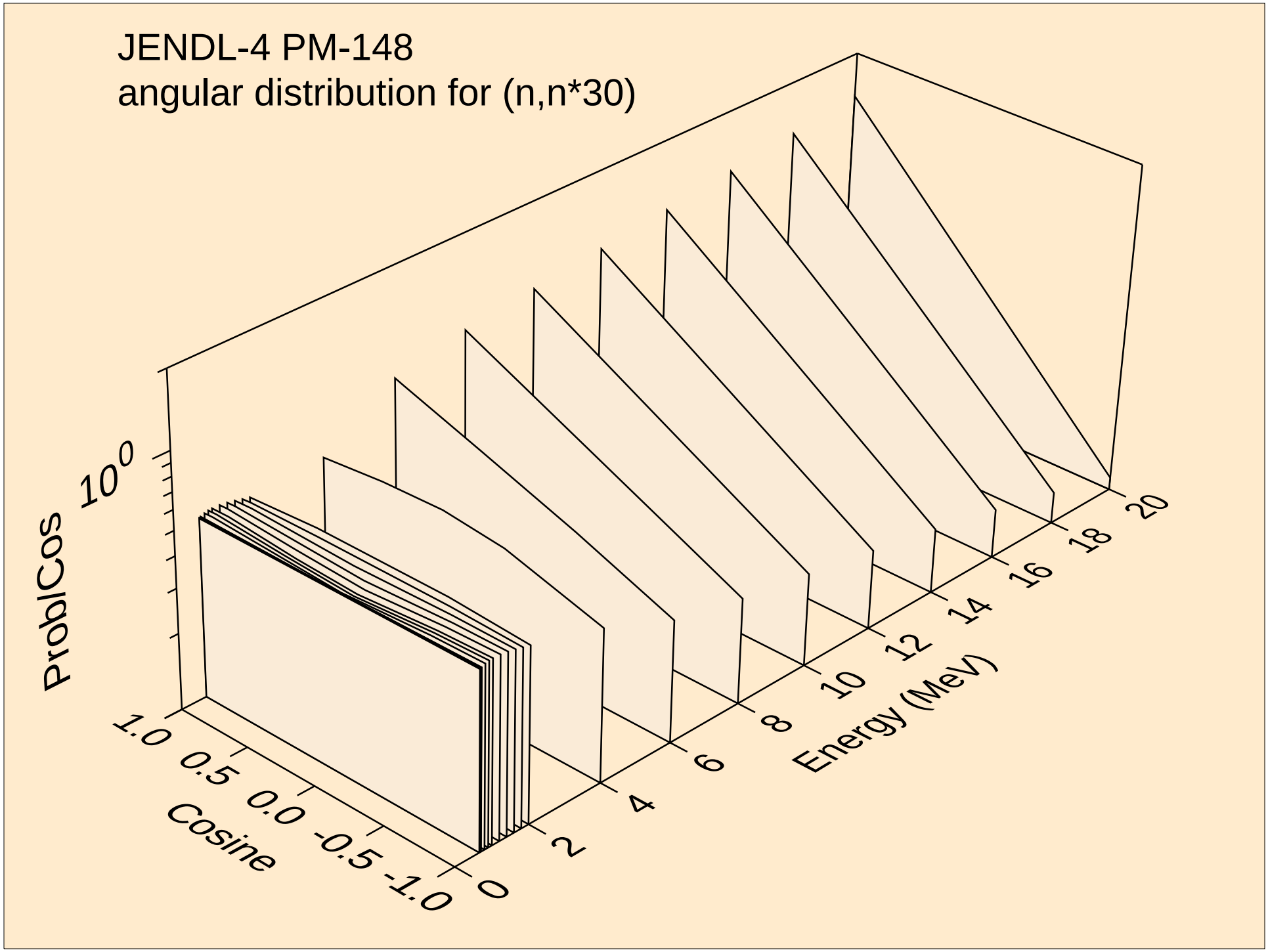

JENDL-4 PM-148
angular distribution for (n,n*25)
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

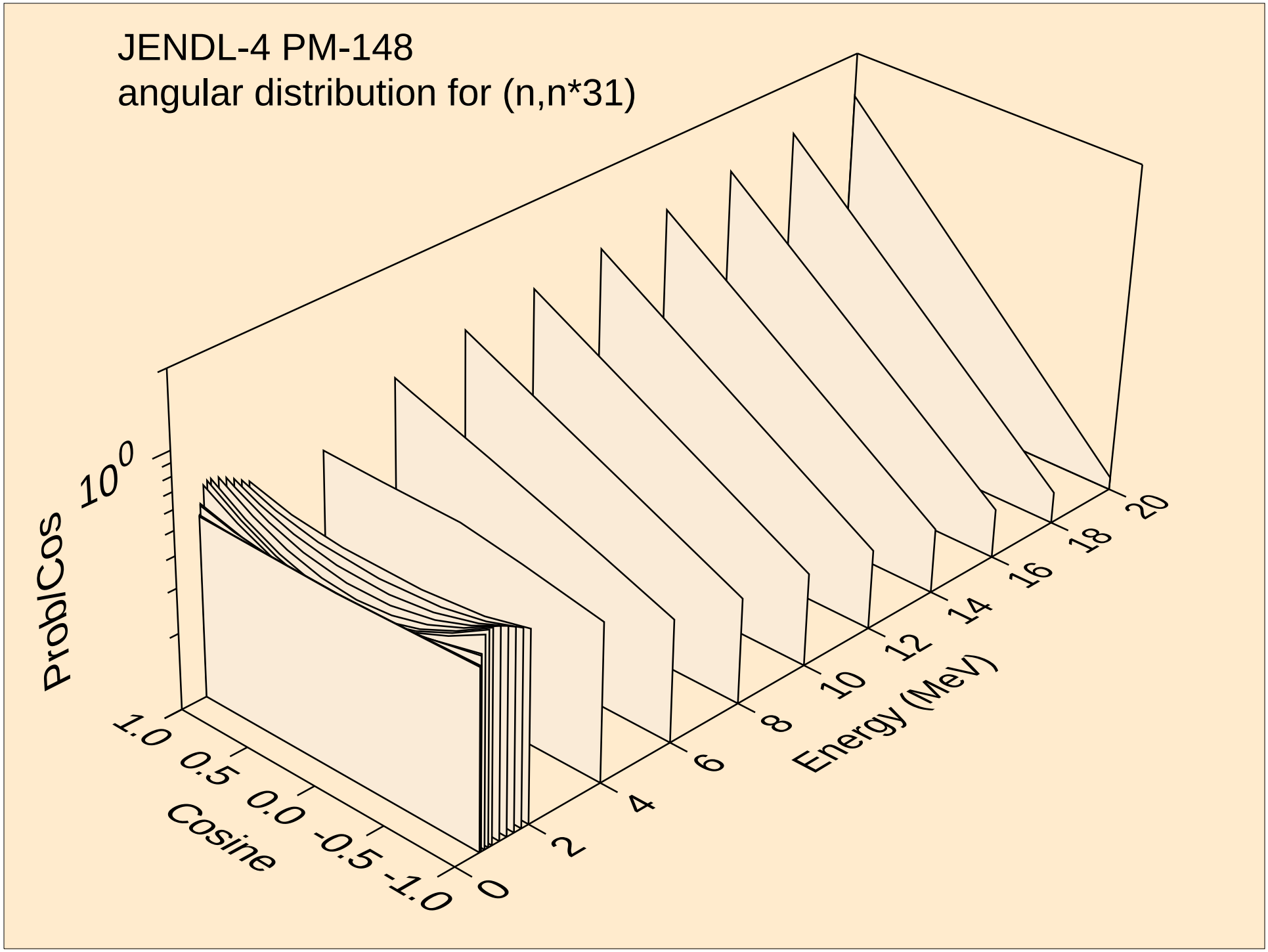

JENDL-4 PM-148
angular distribution for (n,n*26)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

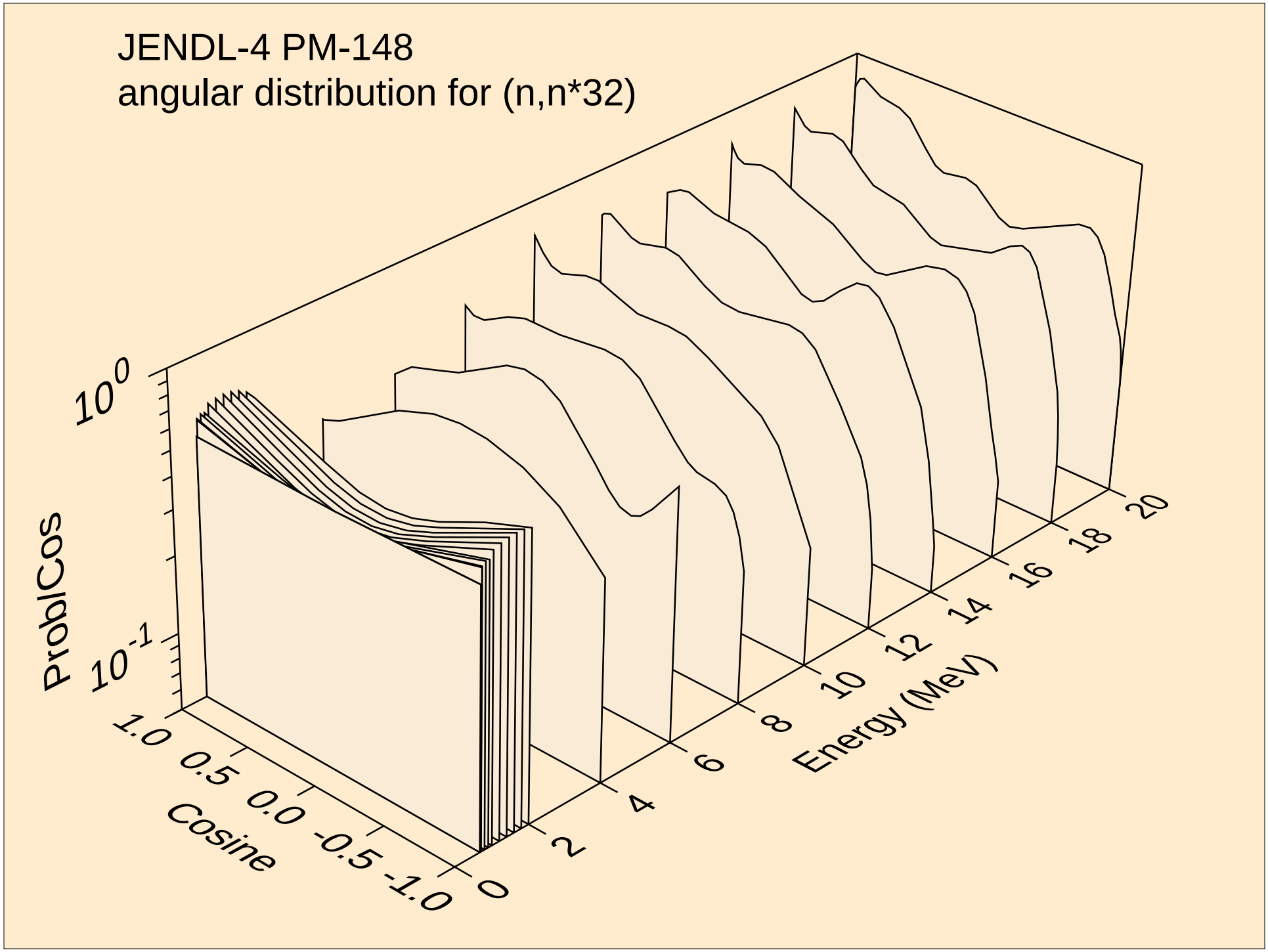

JENDL-4 PM-148
angular distribution for (n,n*27)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

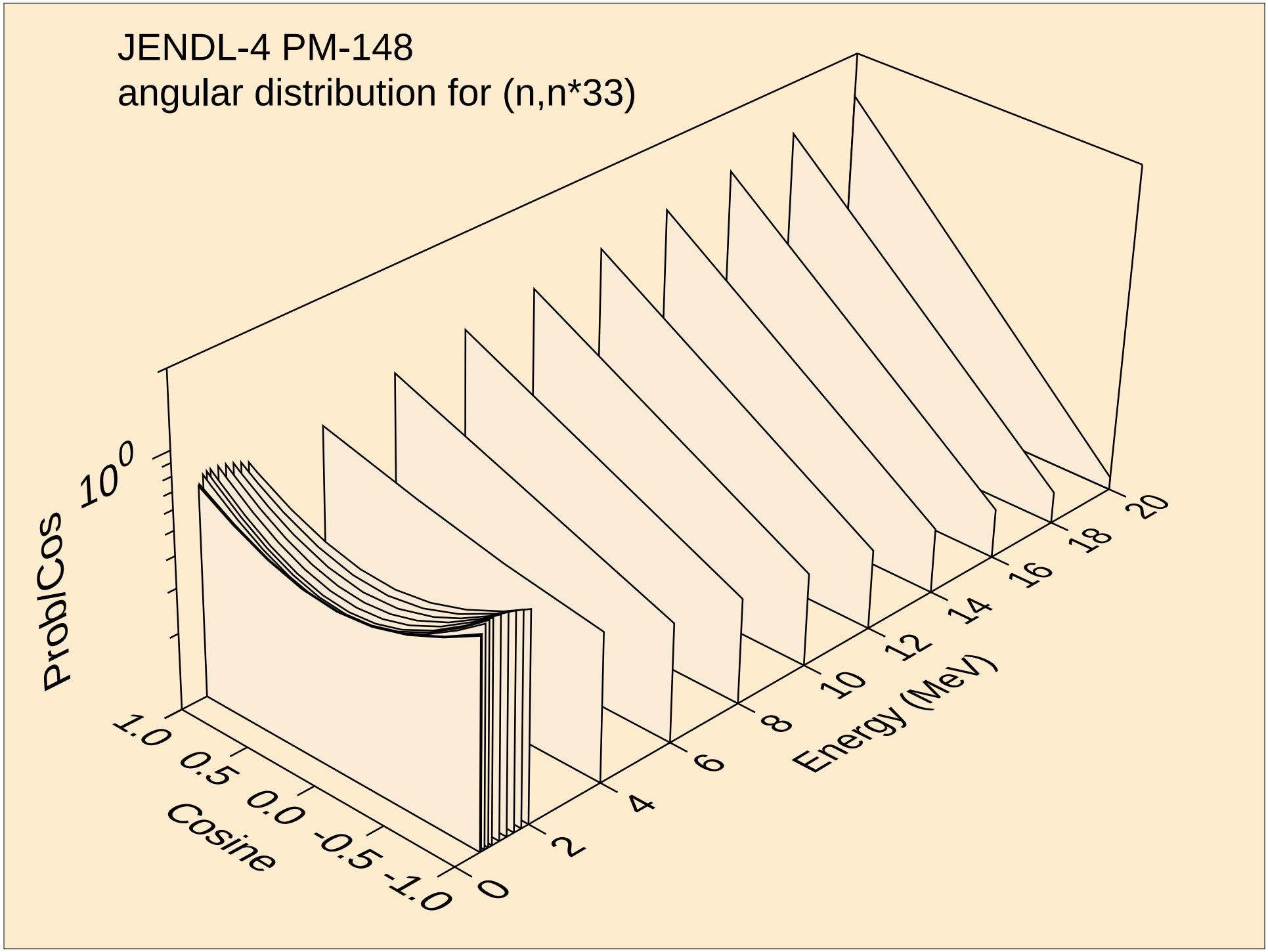

JENDL-4 PM-148
angular distribution for (n,n*28)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

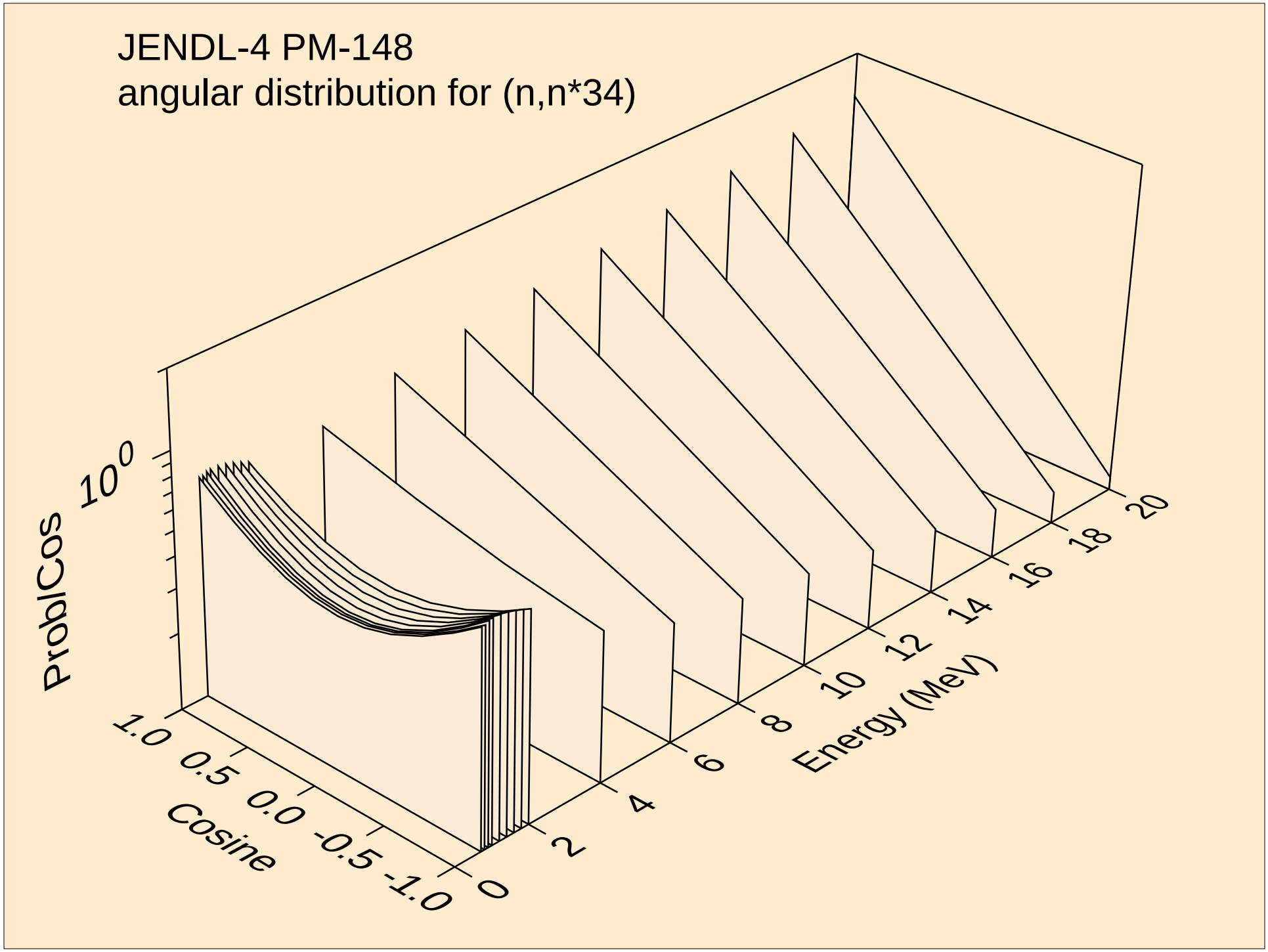

JENDL-4 PM-148
angular distribution for (n,n*29)
ProbCos
10^0
10^{-1}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

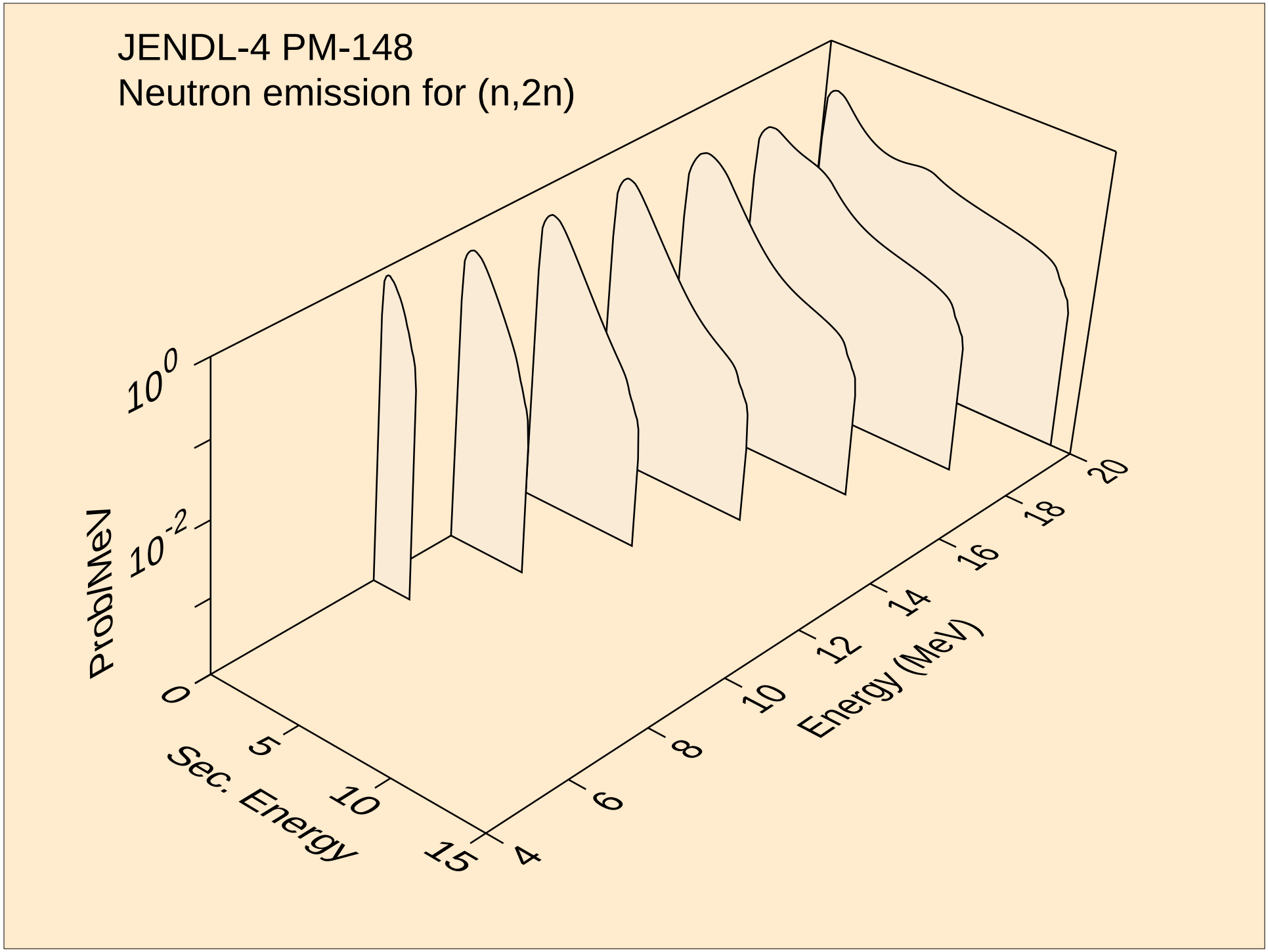

JENDL-4 PM-148
angular distribution for (n,n*30)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

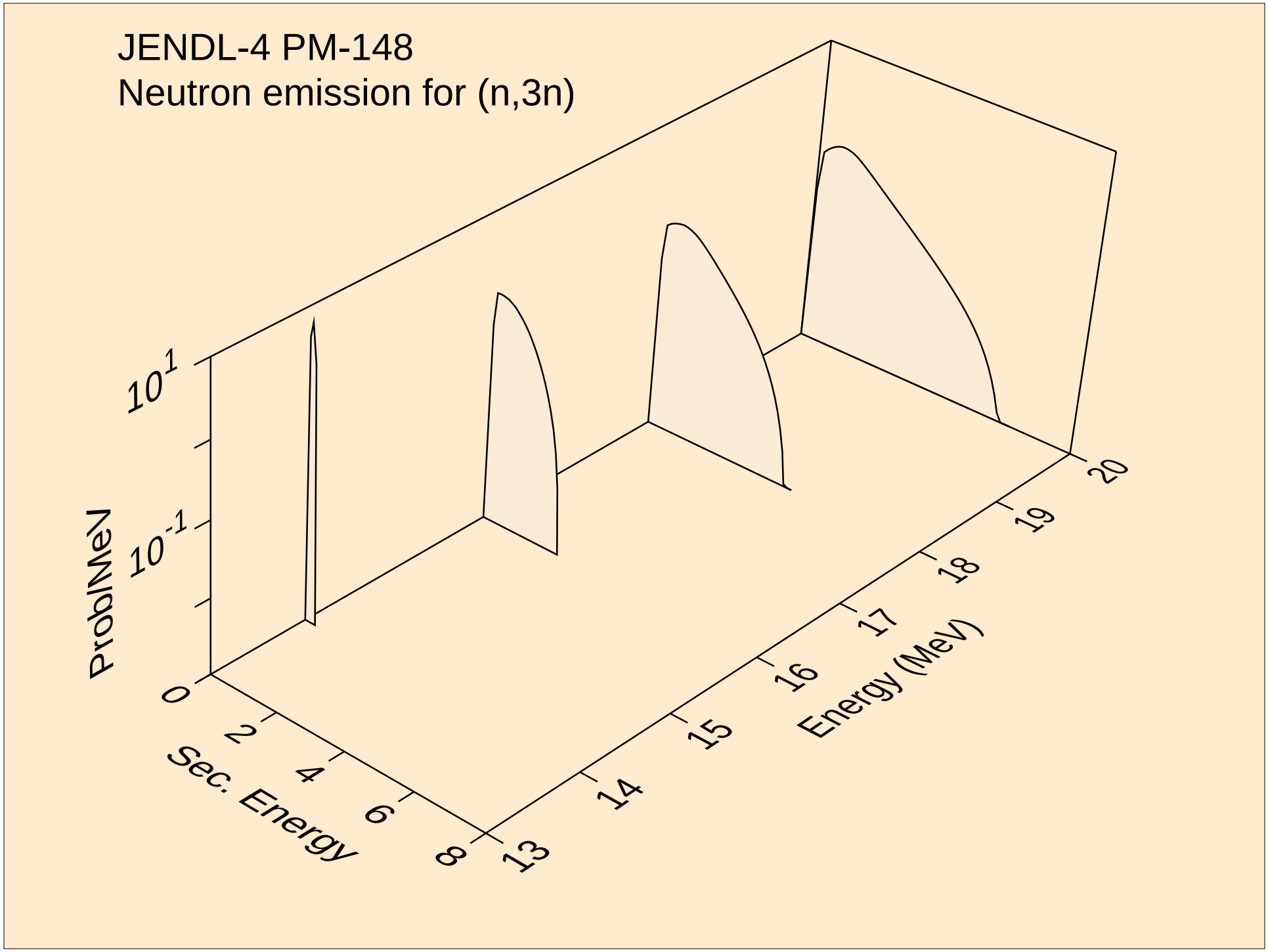

JENDL-4 PM-148
angular distribution for (n,n*31)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20


JENDL-4 PM-148
angular distribution for (n,n*32)
ProblCos
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

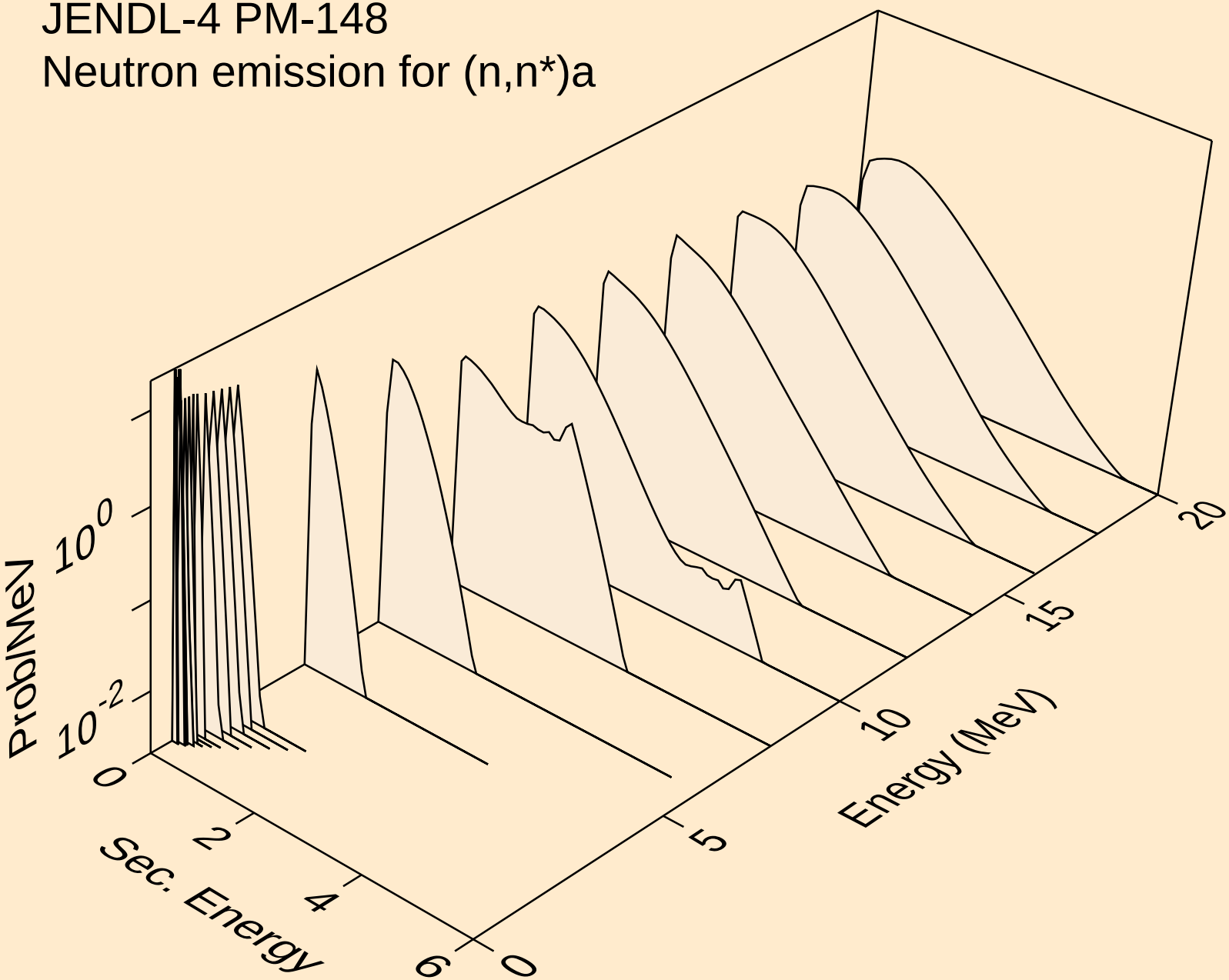

JENDL-4 PM-148
angular distribution for (n,n*33)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

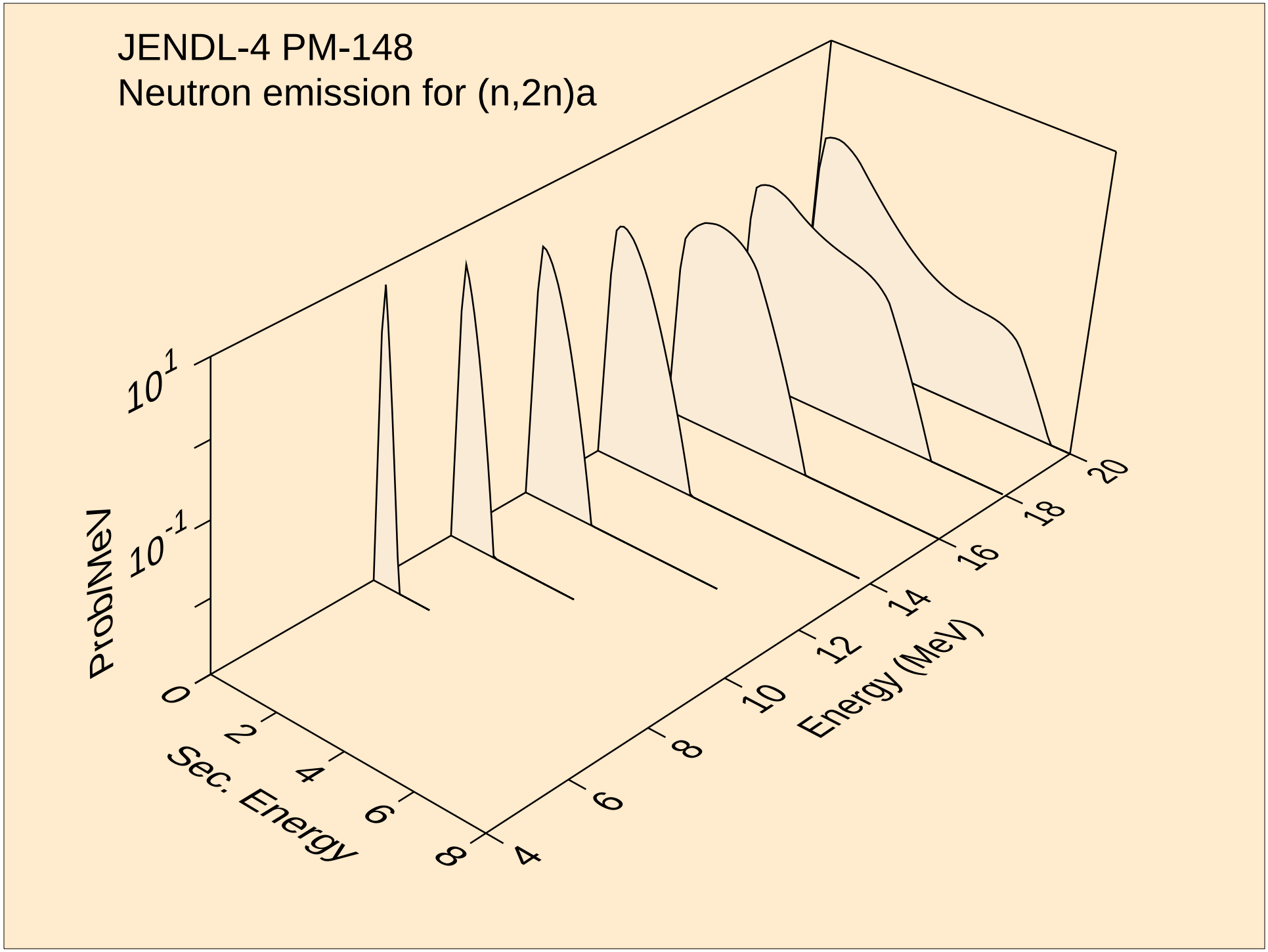

JENDL-4 PM-148
angular distribution for (n,n*34)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

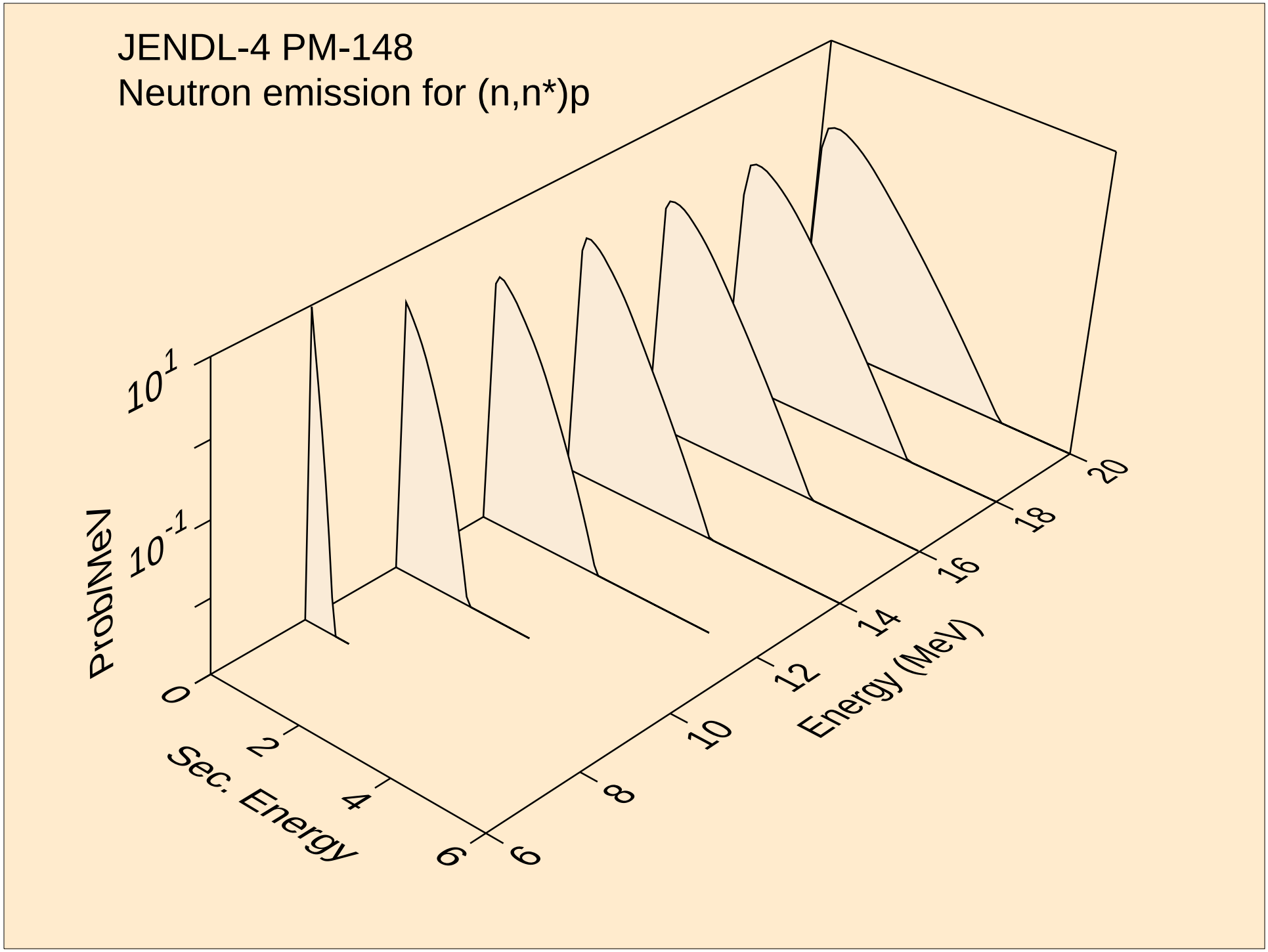

JENDL-4 PM-148
Neutron emission for (n,2n)
Prob/MeV
10^0
10^{-2}
0
5
10
15
Sec. Energy
4
6
8
10
12
14
16
18
20
Energy (MeV)

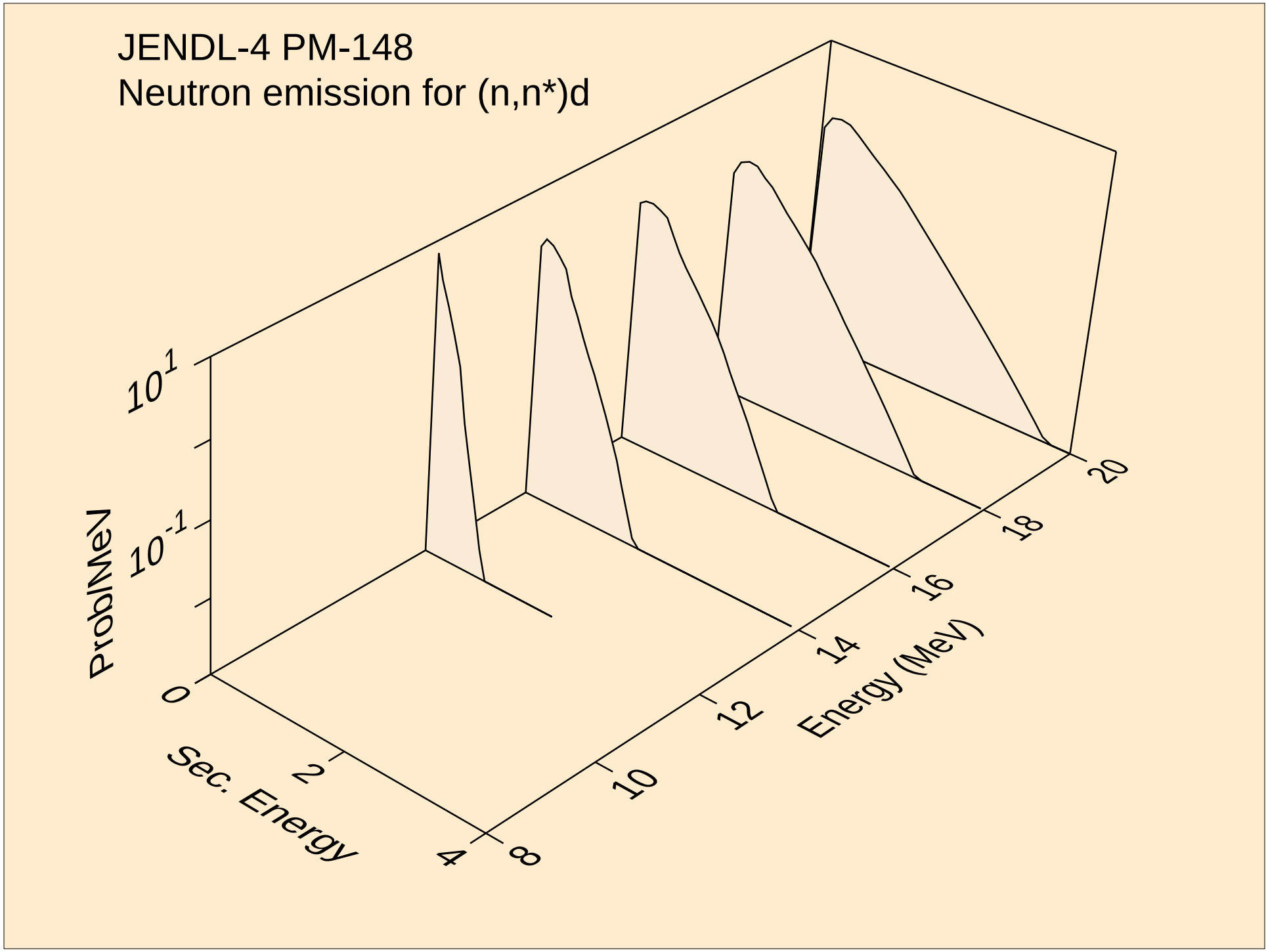

JENDL-4 PM-148
Neutron emission for (n,3n)
Prob/MeV
10^{1}
10^{-1}
0
Sec. Energy
2
4
6
8
Energy (MeV)
13
14
15
16
17
18
19
20

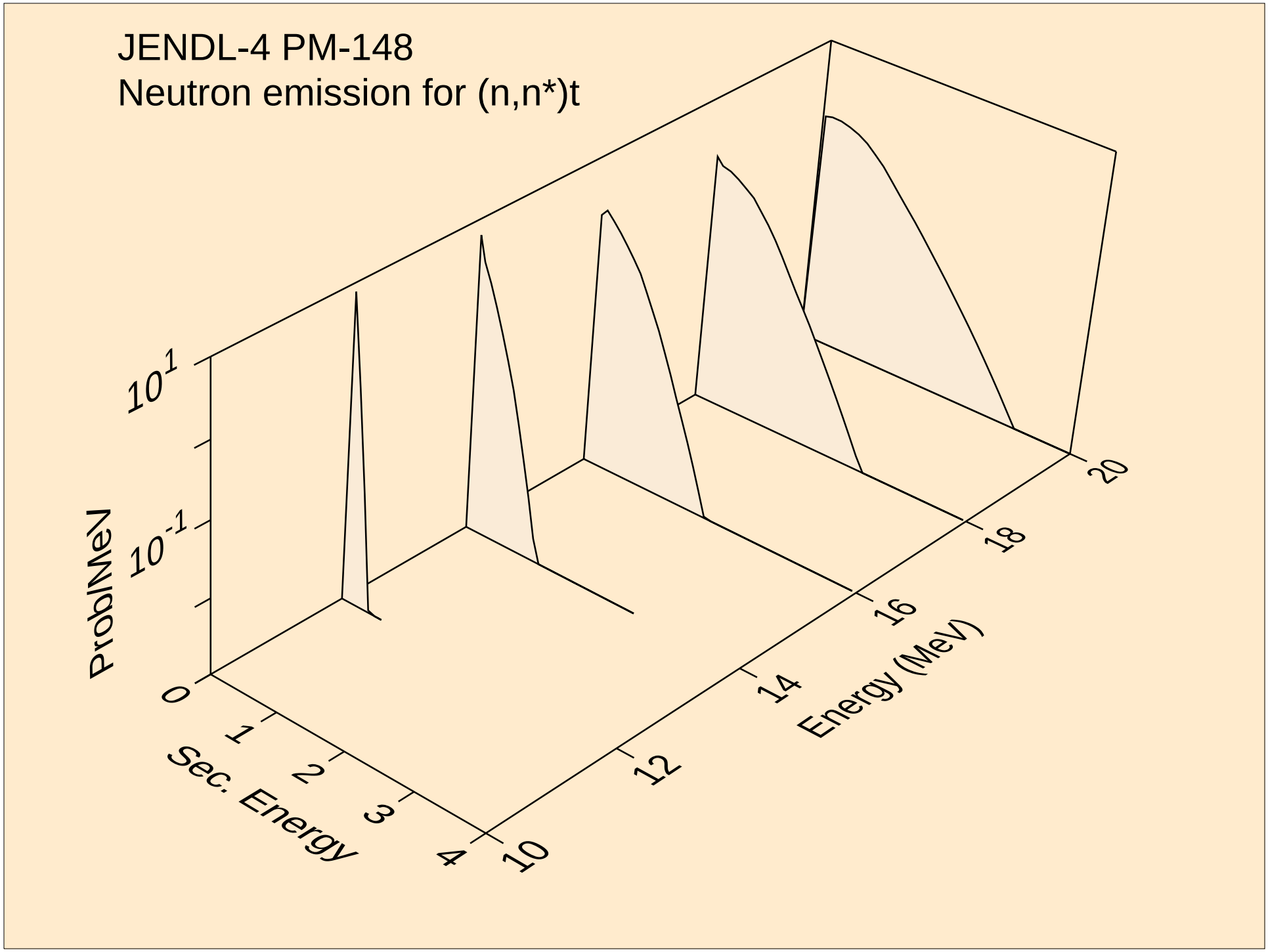
JENDL-4 PM-148
Neutron emission for (n,n*)a



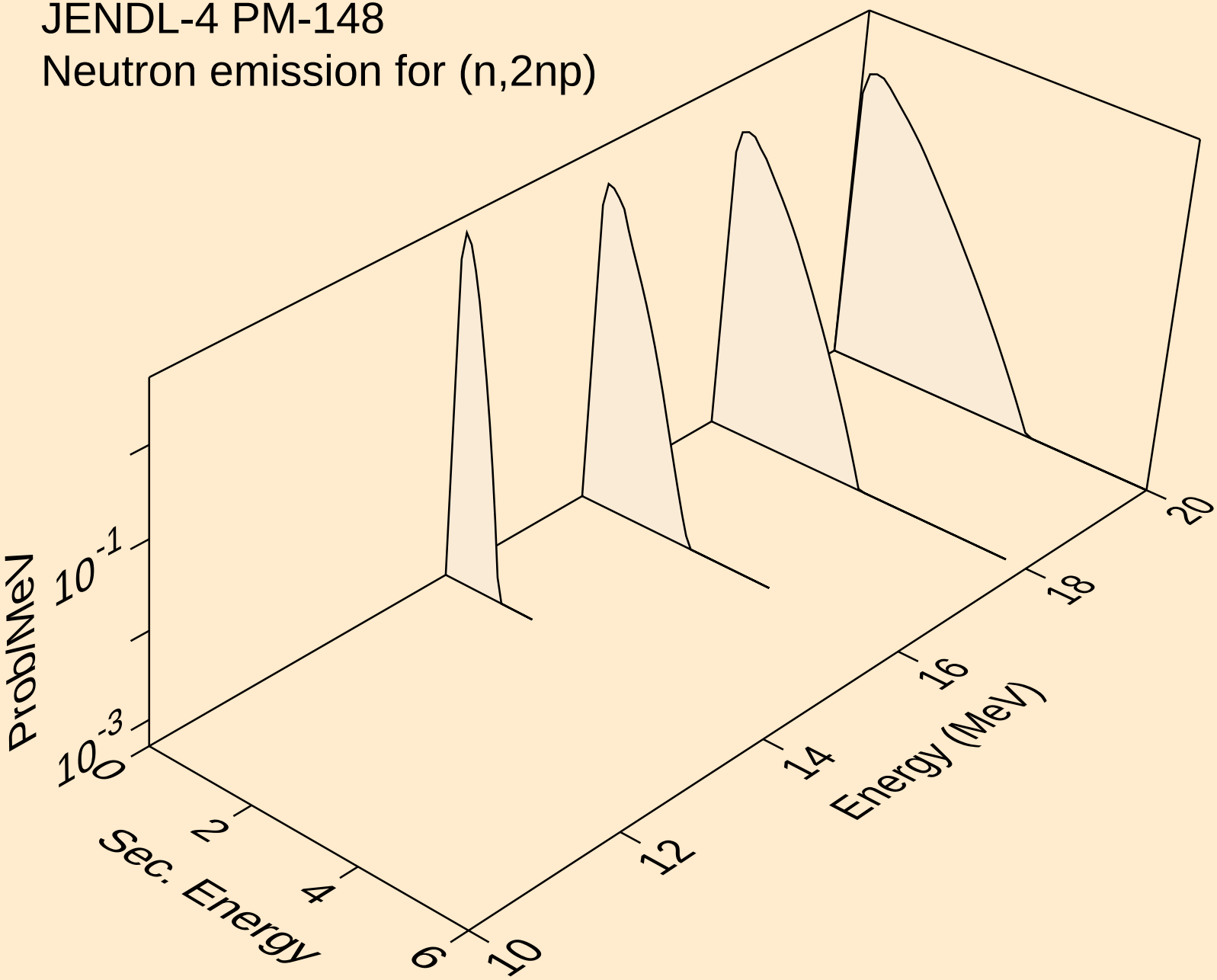

JENDL-4 PM-148
Neutron emission for (n,2n)a
Prob/MeV
10^{1}
10^{-1}
0
Sec. Energy
2
4
6
8
Energy (MeV)
4
6
8
10
12
14
16
18
20

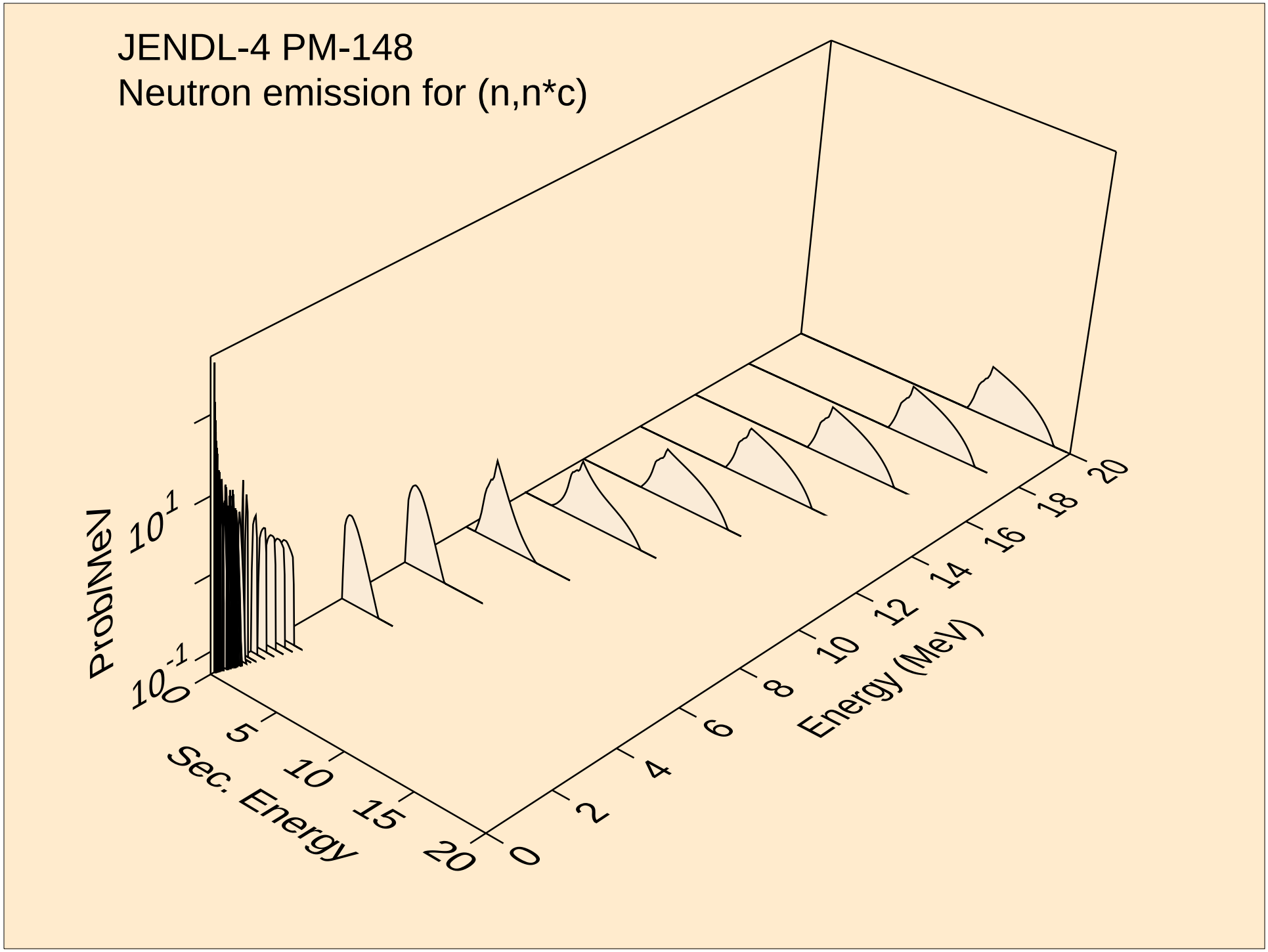

JENDL-4 PM-148
Neutron emission for (n,n*)p
Prob/MeV
10^1
10^-1
0
Sec. Energy
2
4
6
Energy (MeV)
6
8
10
12
14
16
18
20

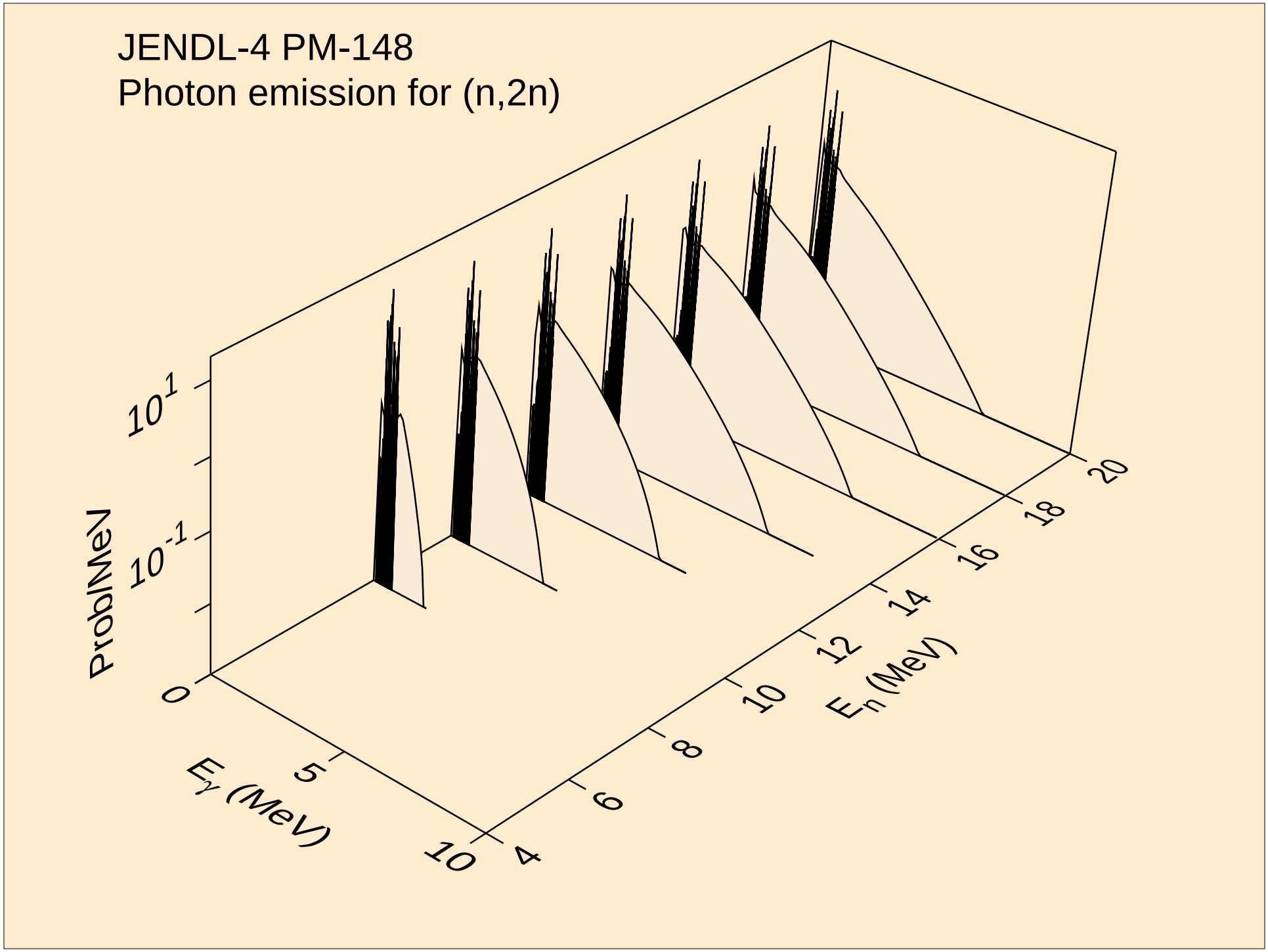

JENDL-4 PM-148
Neutron emission for (n,n*)d
Prob/MeV
10^1
10^-1
0
Sec. Energy
2
4
8
10
12
14
16
18
20
Energy (MeV)


JENDL-4 PM-148
Neutron emission for (n,n*)t
Prob/MeV
10^1
10^-1
0
Sec. Energy
1
2
3
4
Energy (MeV)
10
12
14
16
18
20

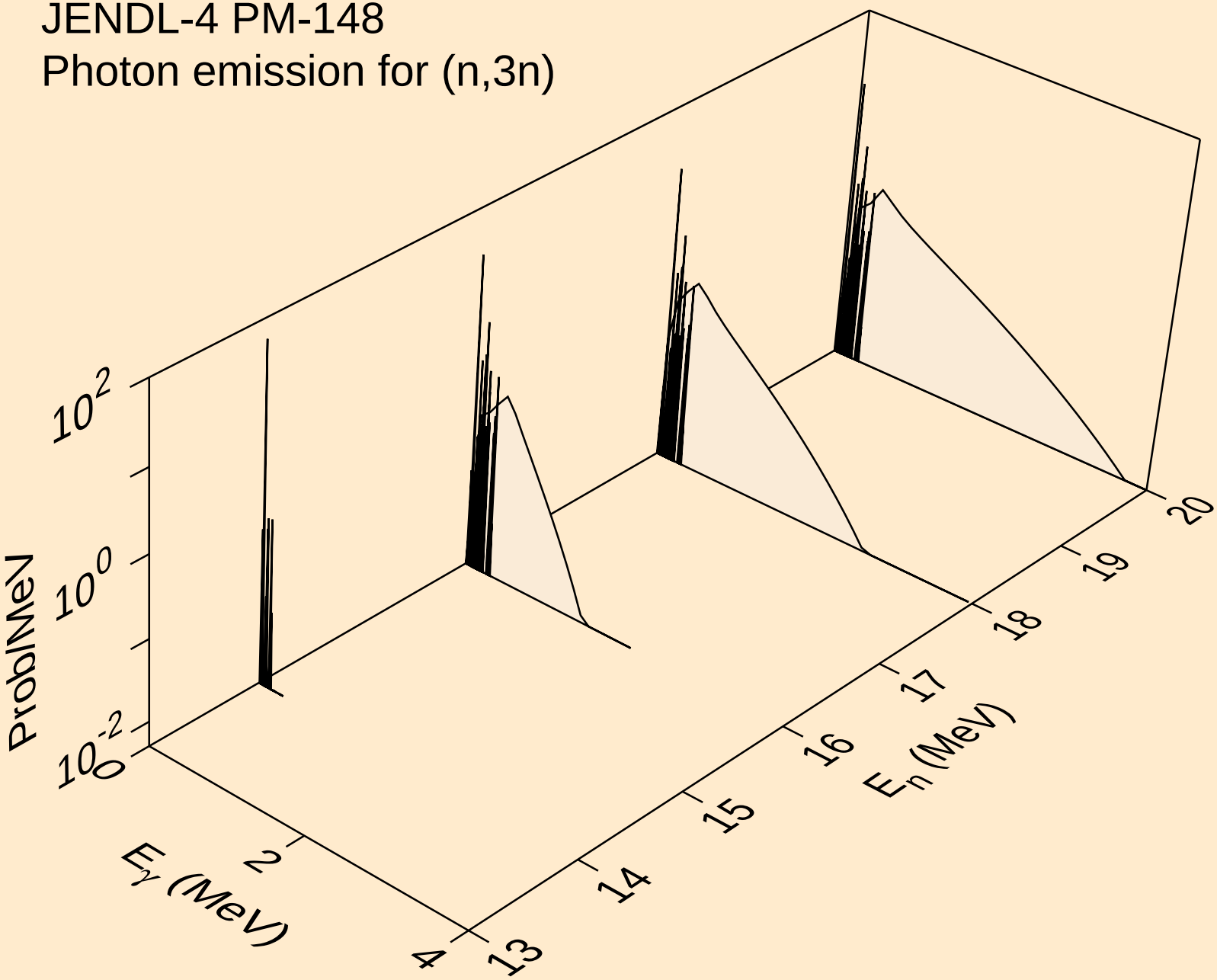
JENDL-4 PM-148
Neutron emission for (n,2np)



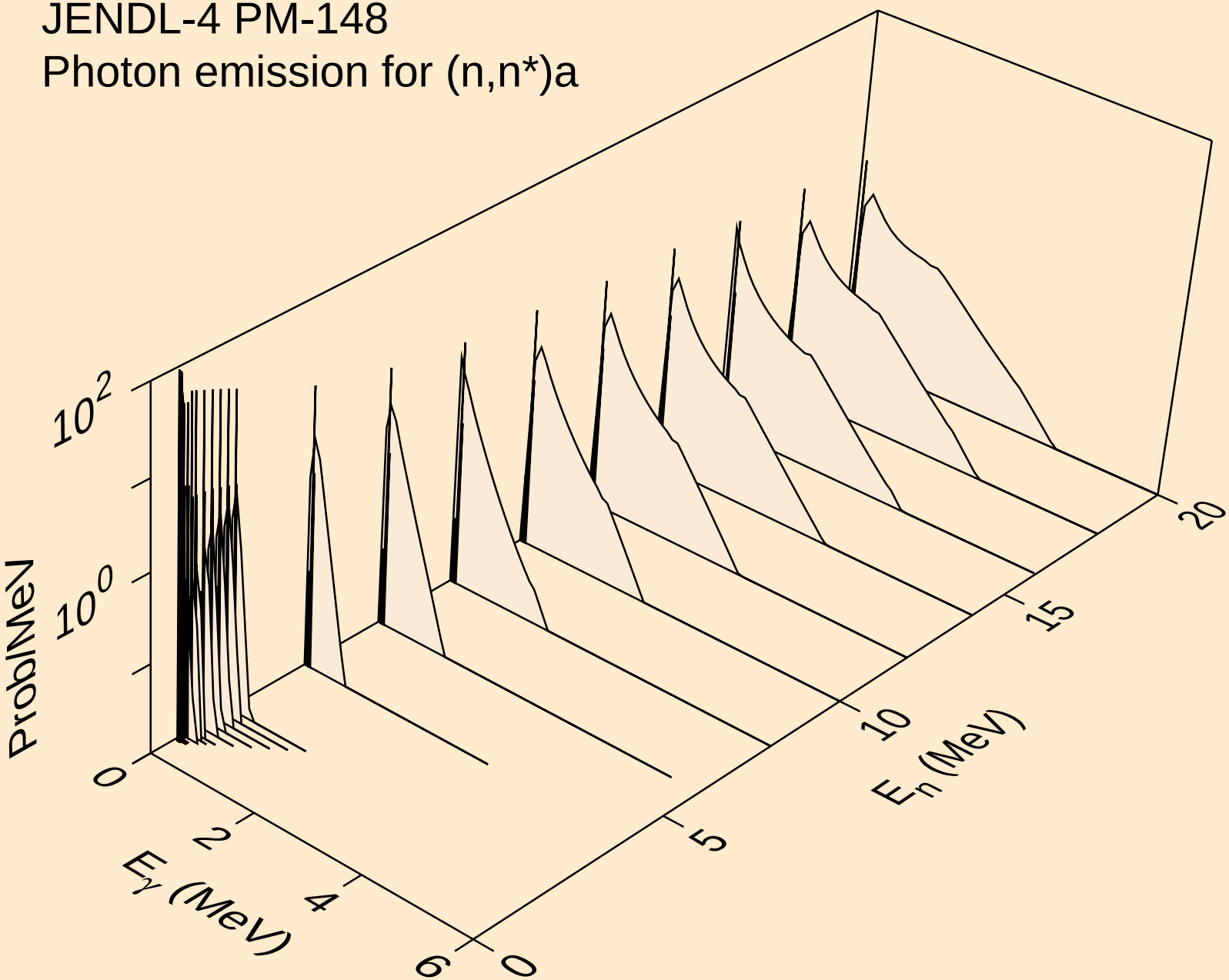

JENDL-4 PM-148
Neutron emission for (n,n*c)
Prob/MeV
10^{1}
10^{-1}
0
5
10
15
20
Sec. Energy
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


JENDL-4 PM-148
Photon emission for (n,2n)
Prob/MeV
10^{1}
10^{-1}
0
5
10
E_γ (MeV)
4
6
8
10
12
14
16
18
20
E_n (MeV)

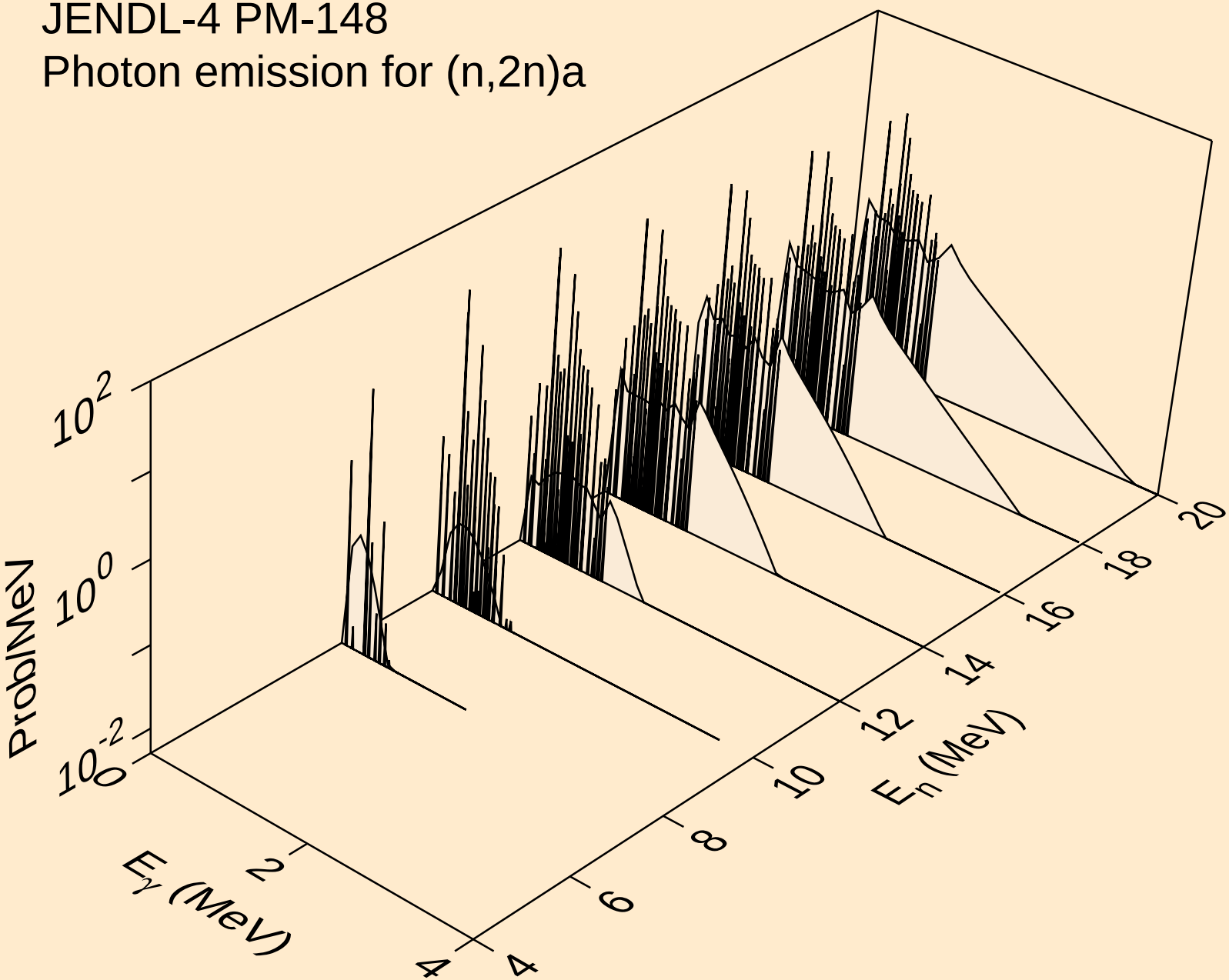
JENDL-4 PM-148
Photon emission for (n,3n)

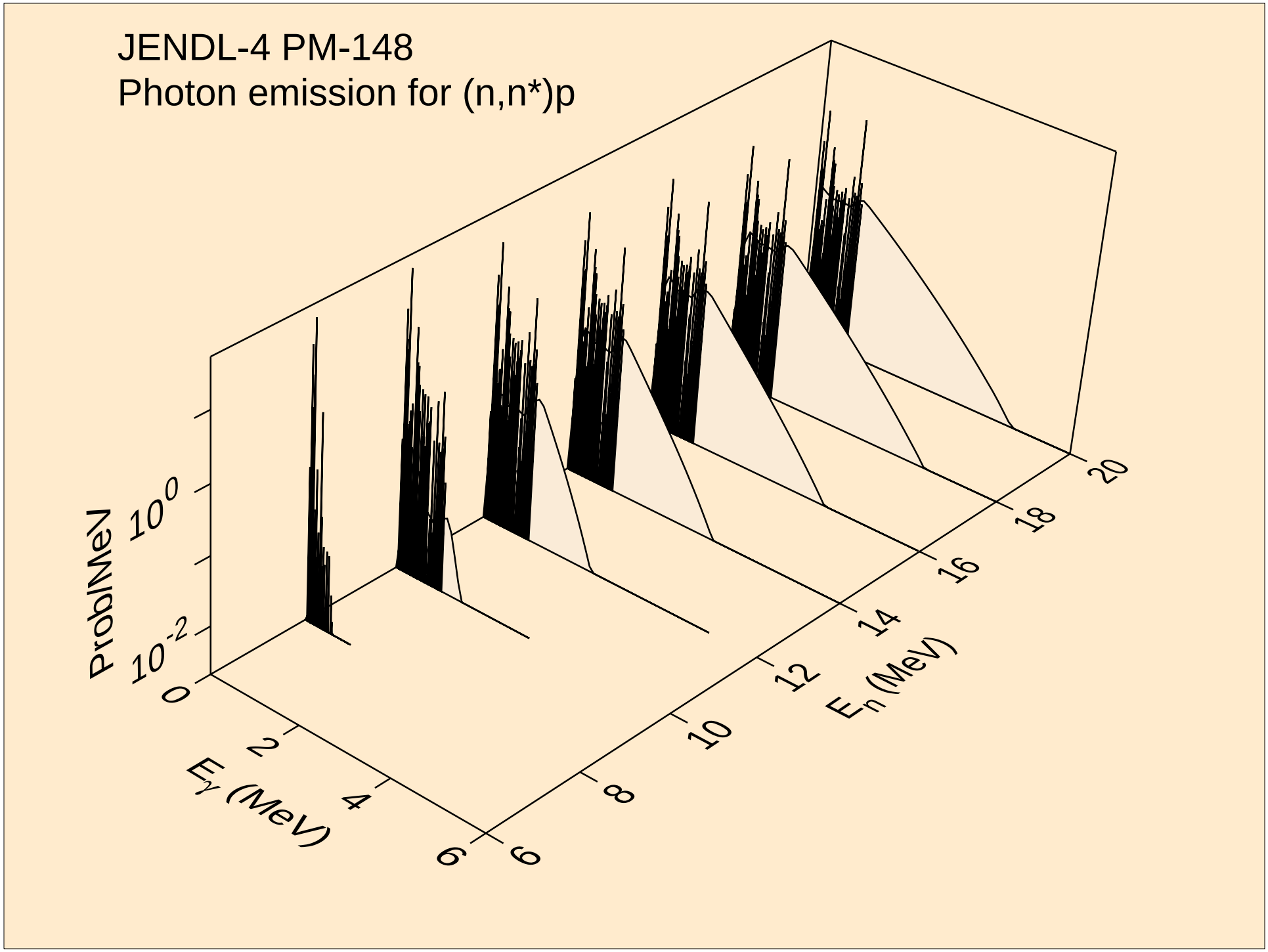


JENDL-4 PM-148
Photon emission for (n,n*)a

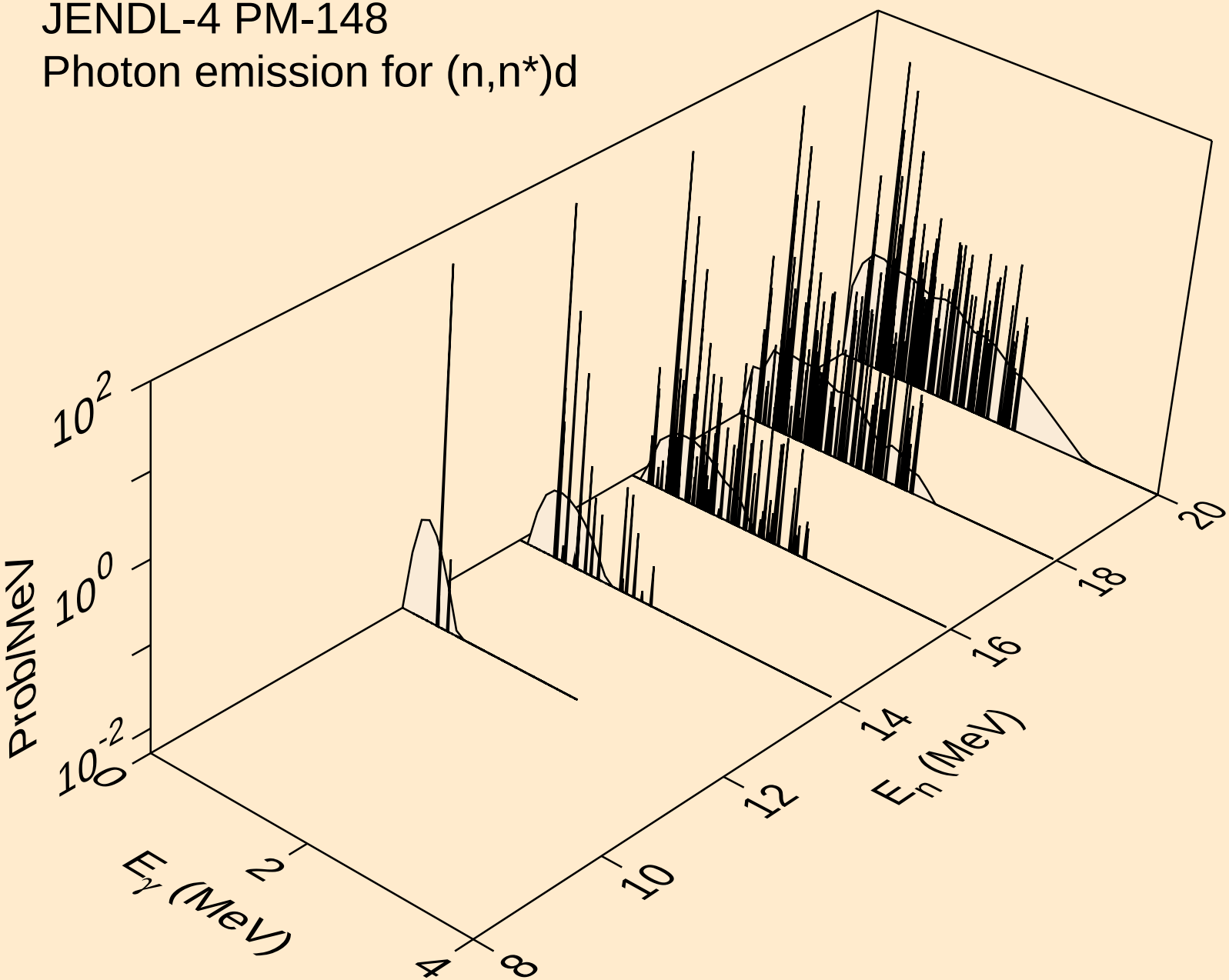


JENDL-4 PM-148
Photon emission for (n,2n)a

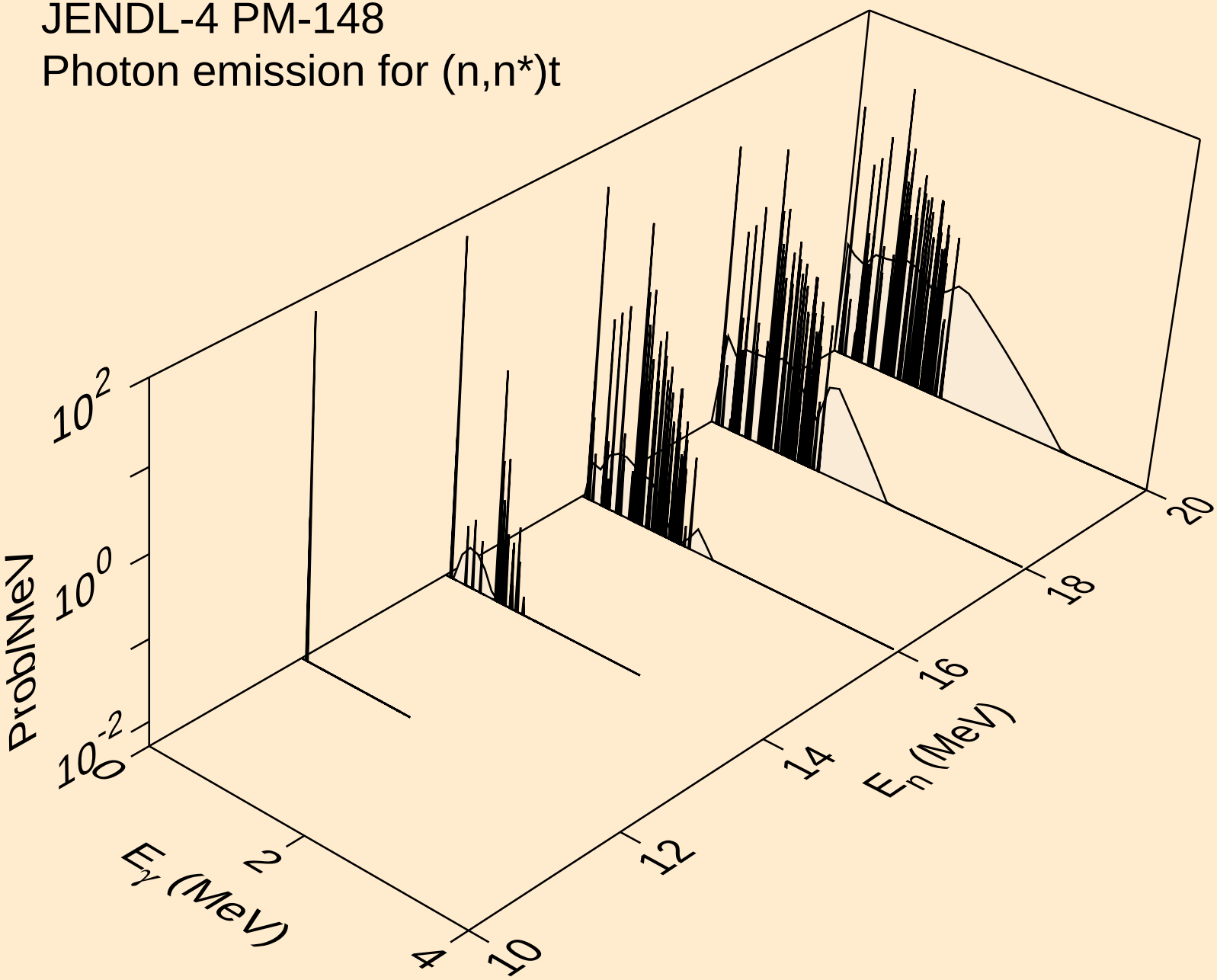



JENDL-4 PM-148
Photon emission for (n,n*)p
Prob/MeV
10^0
10^{-2}
0
2
4
6
E_γ (MeV)
6
8
10
12
14
16
18
20
E_n (MeV)

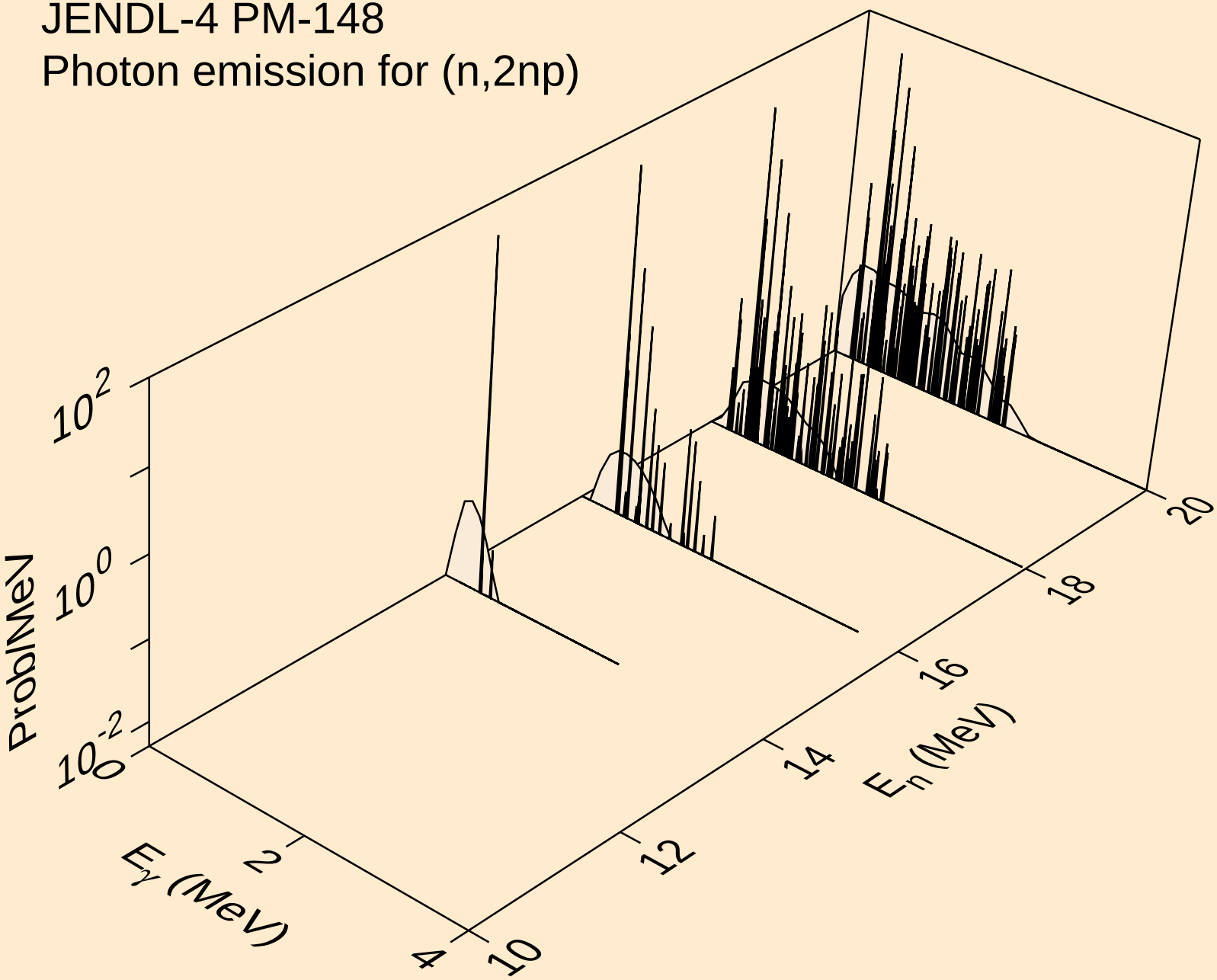
JENDL-4 PM-148
Photon emission for (n,n*)d



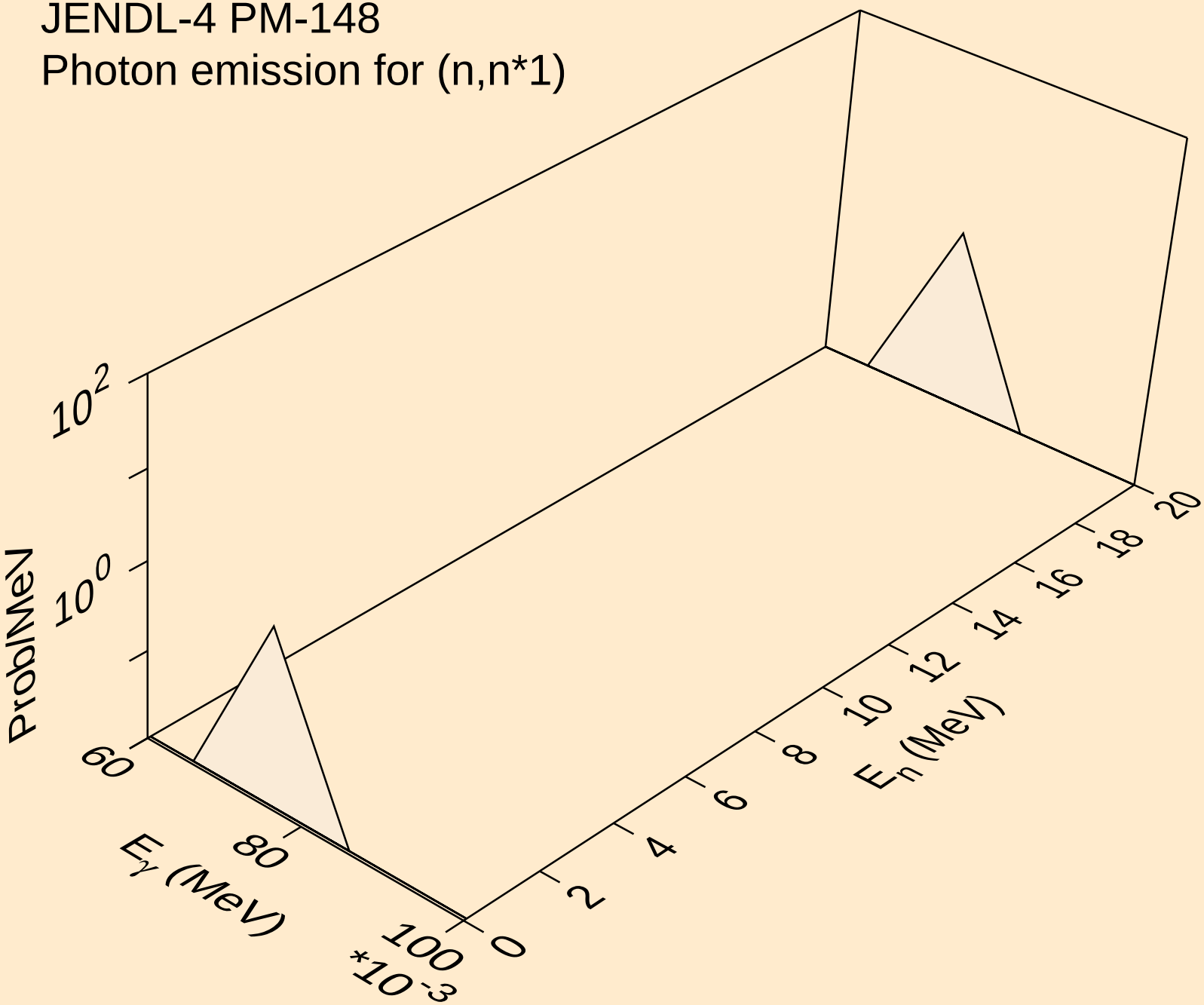
JENDL-4 PM-148
Photon emission for (n,n*)t



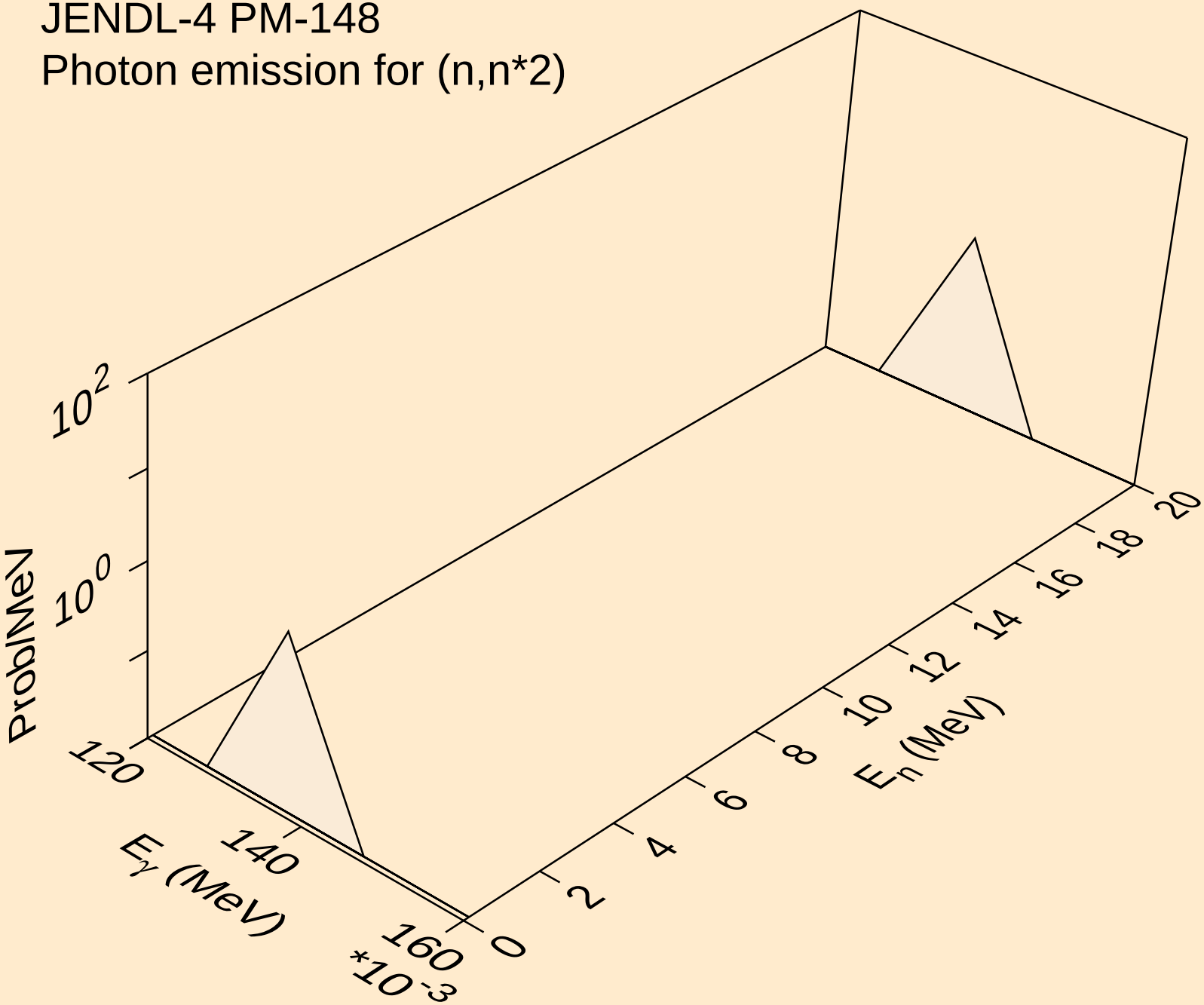
JENDL-4 PM-148
Photon emission for (n,2np)



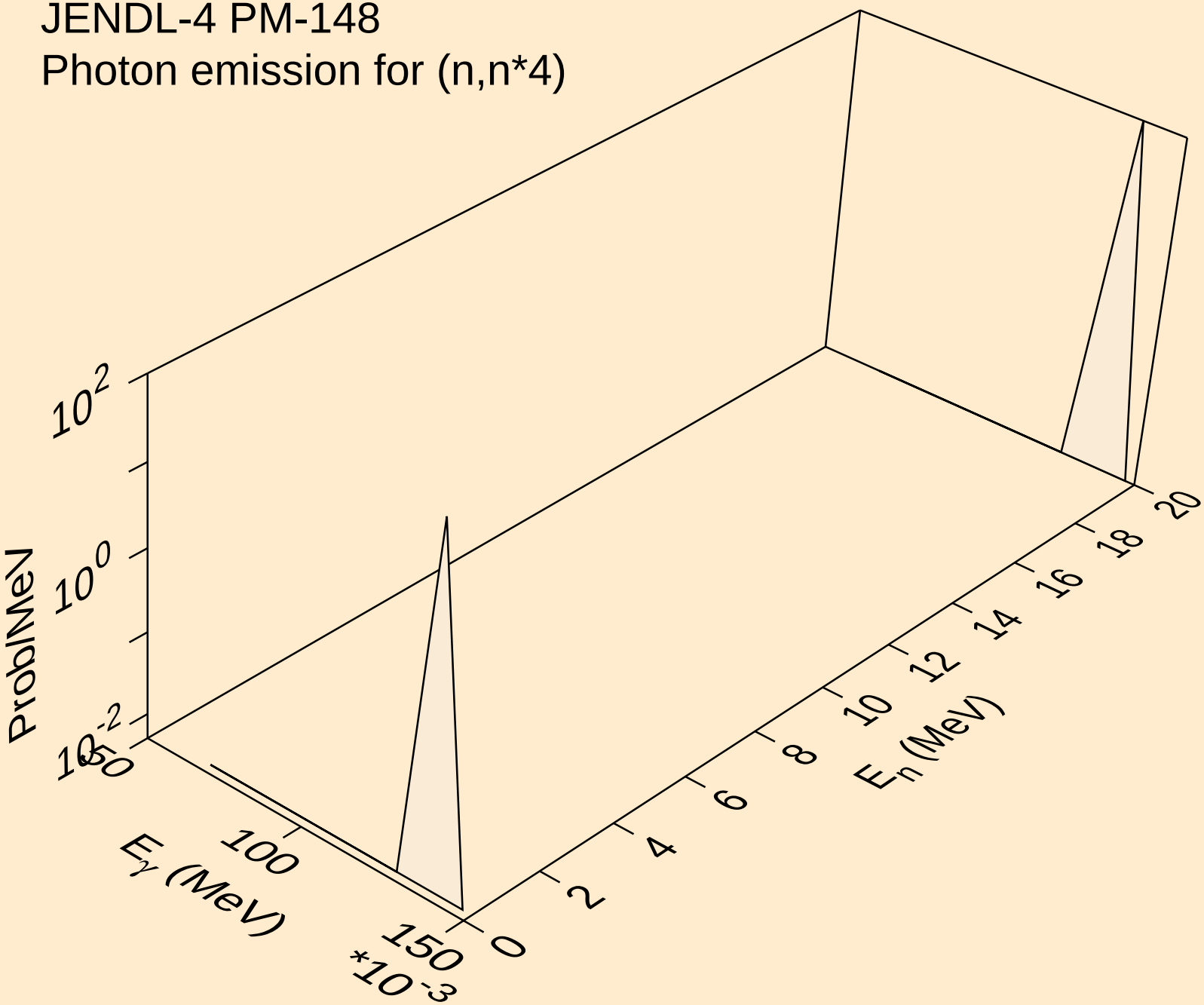
JENDL-4 PM-148
Photon emission for (n,n*1)



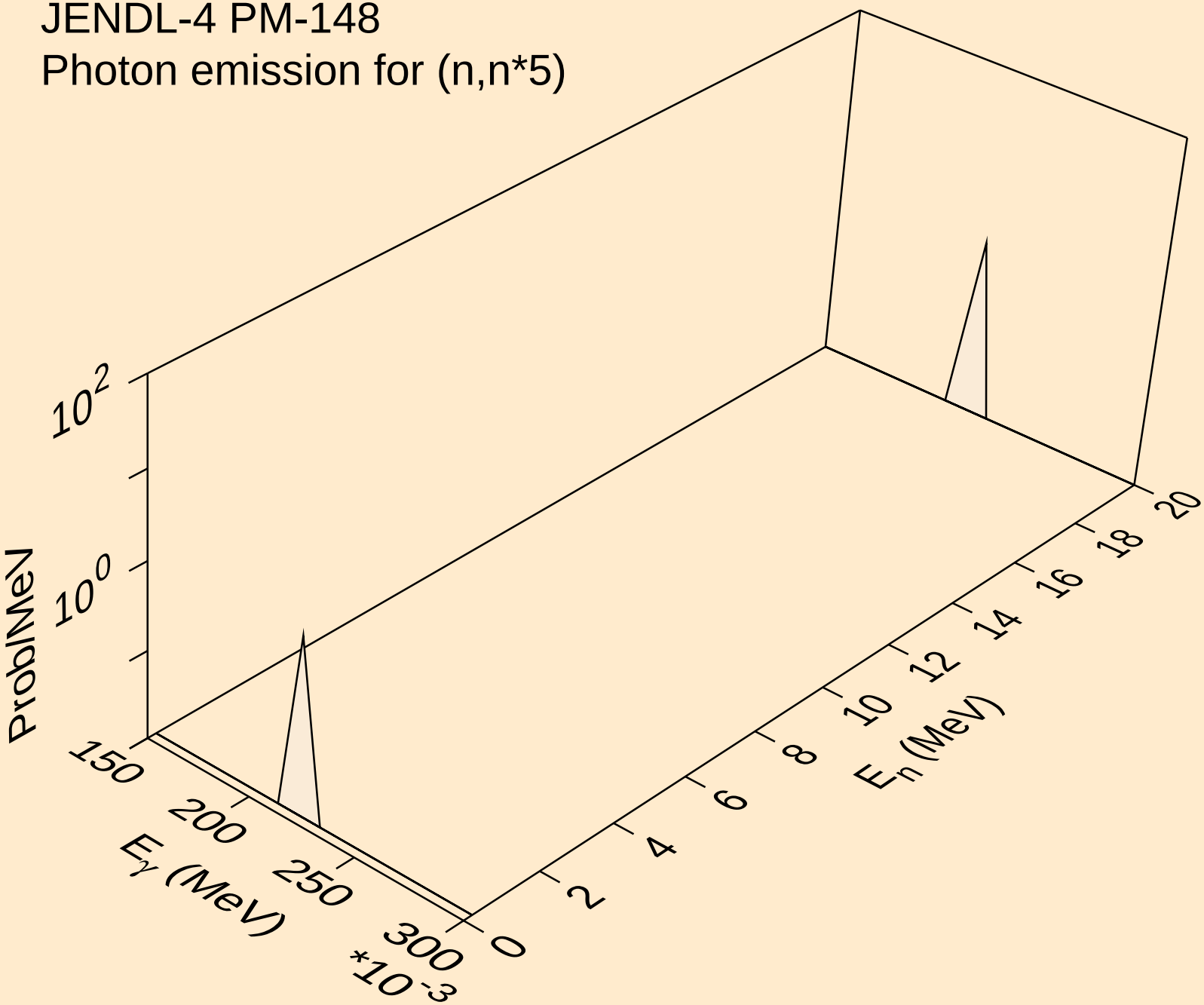
JENDL-4 PM-148
Photon emission for (n,n*2)



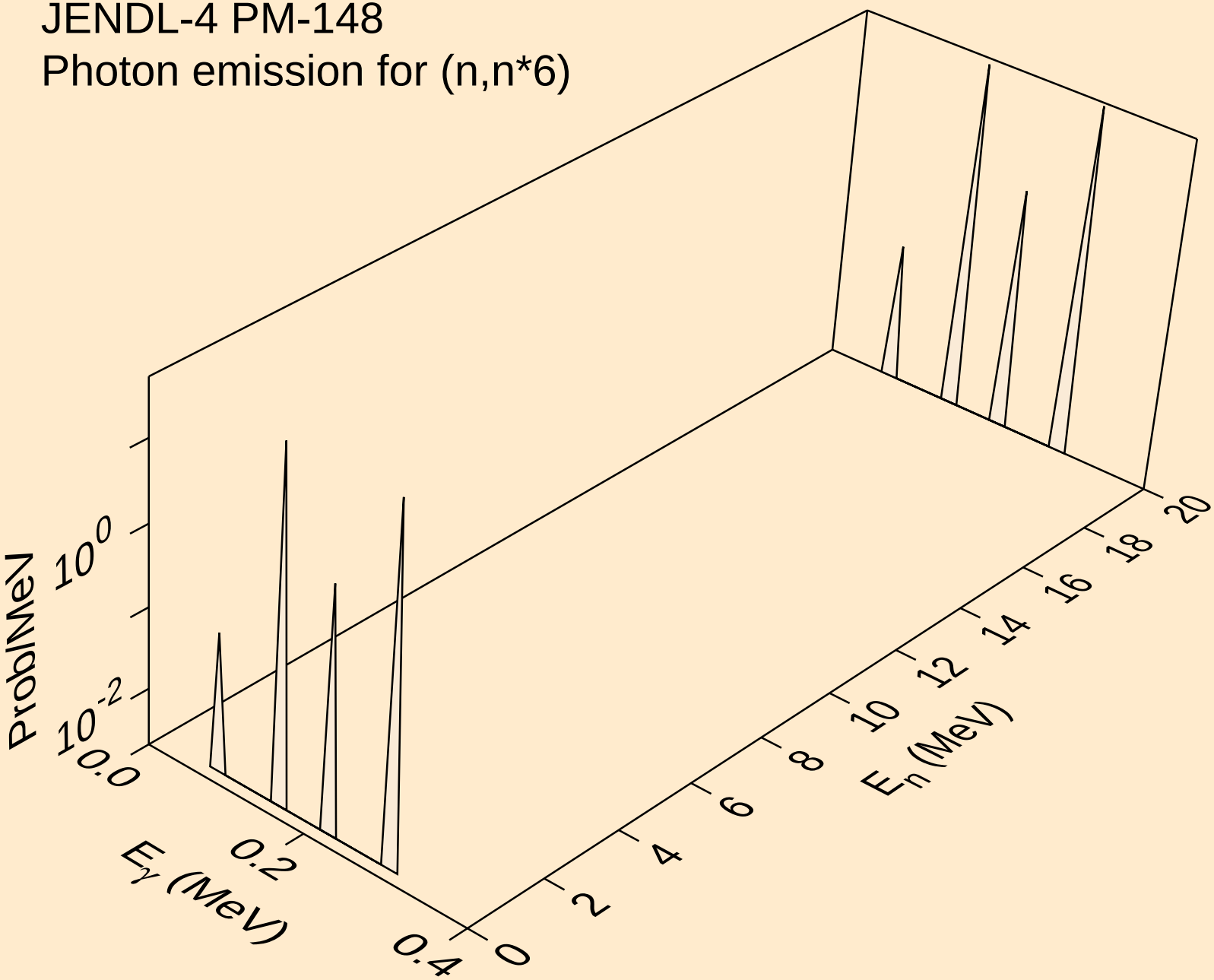
JENDL-4 PM-148
Photon emission for (n,n*4)



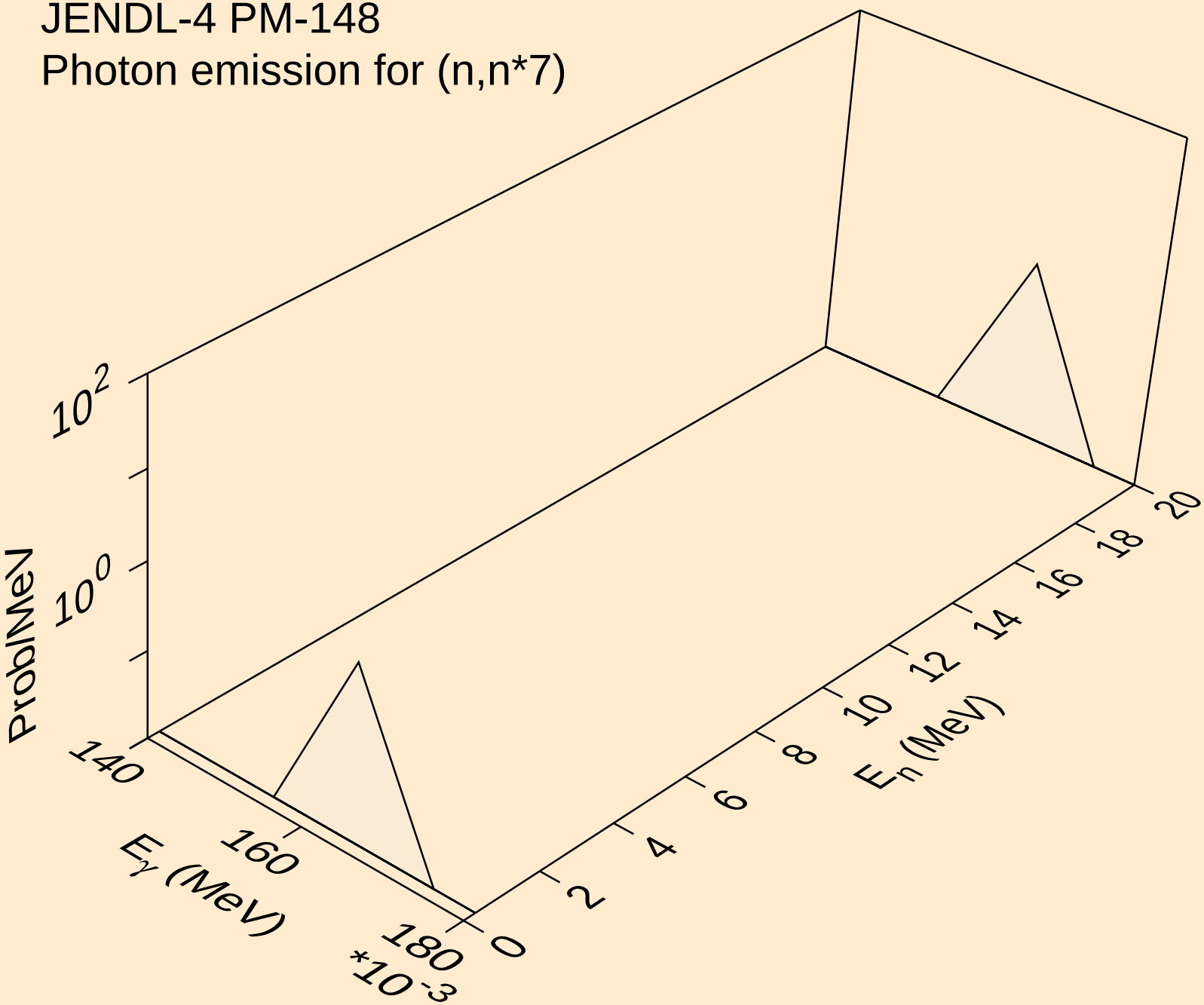
JENDL-4 PM-148
Photon emission for (n,n*5)



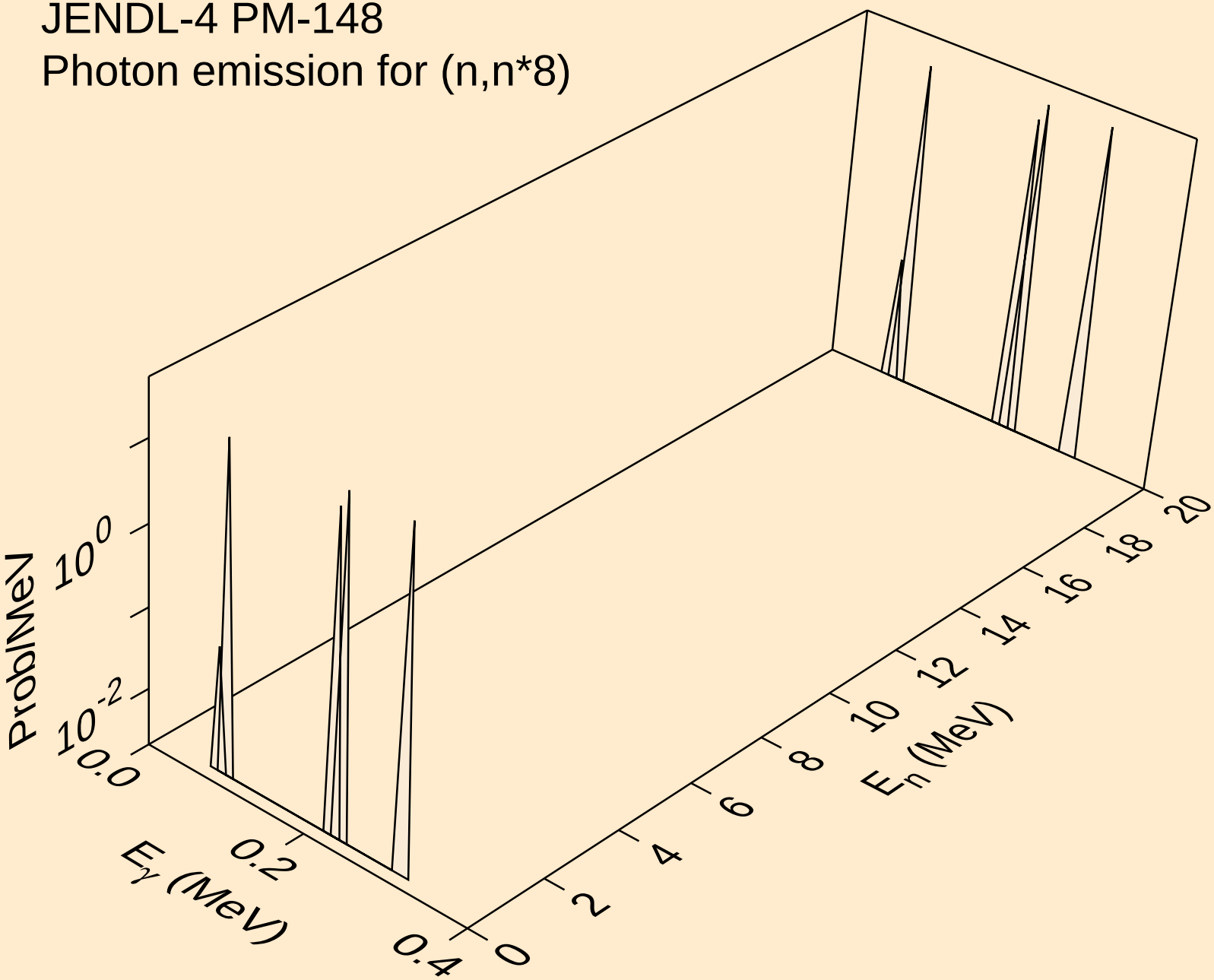
JENDL-4 PM-148
Photon emission for (n,n*6)



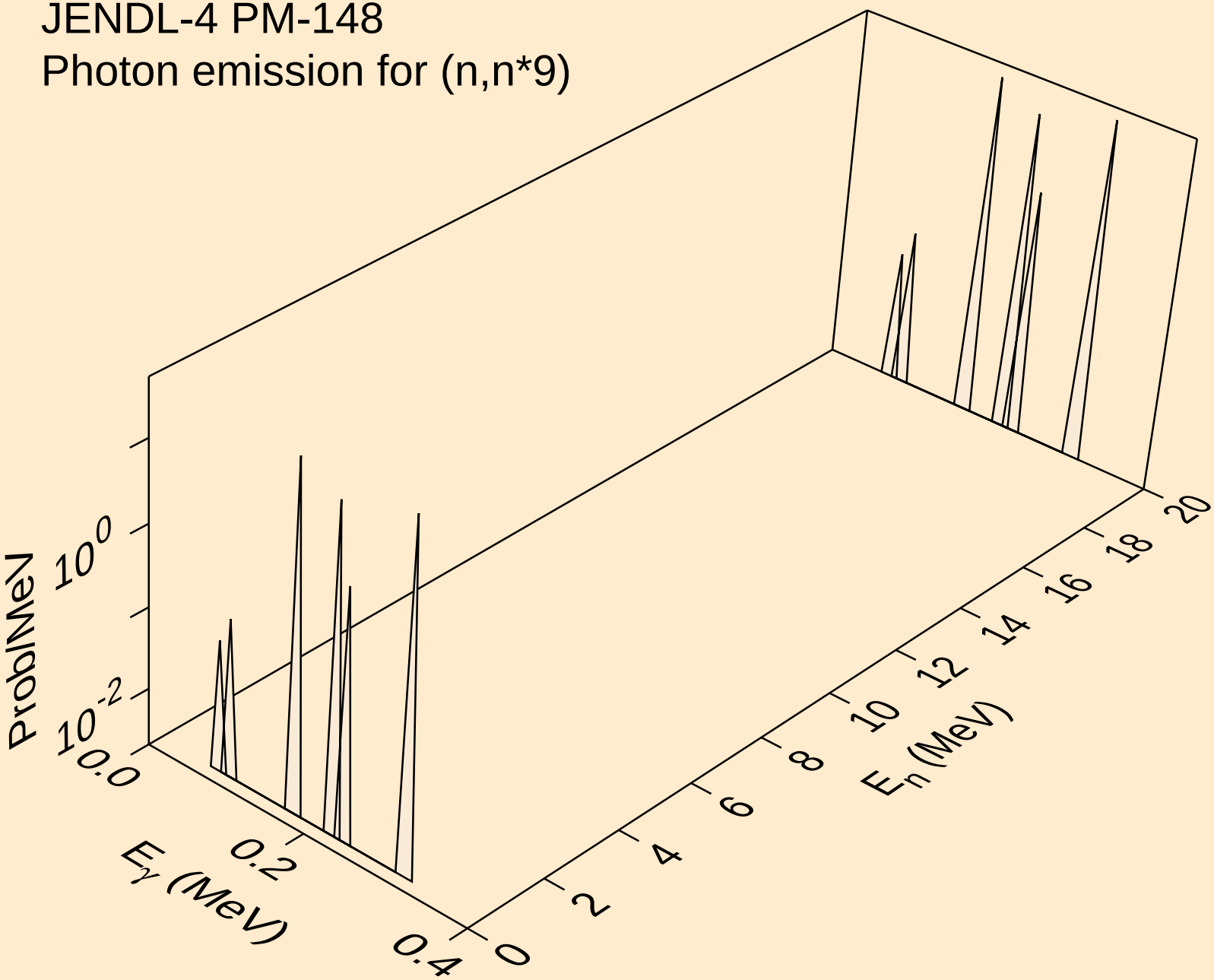
JENDL-4 PM-148
Photon emission for (n,n*7)



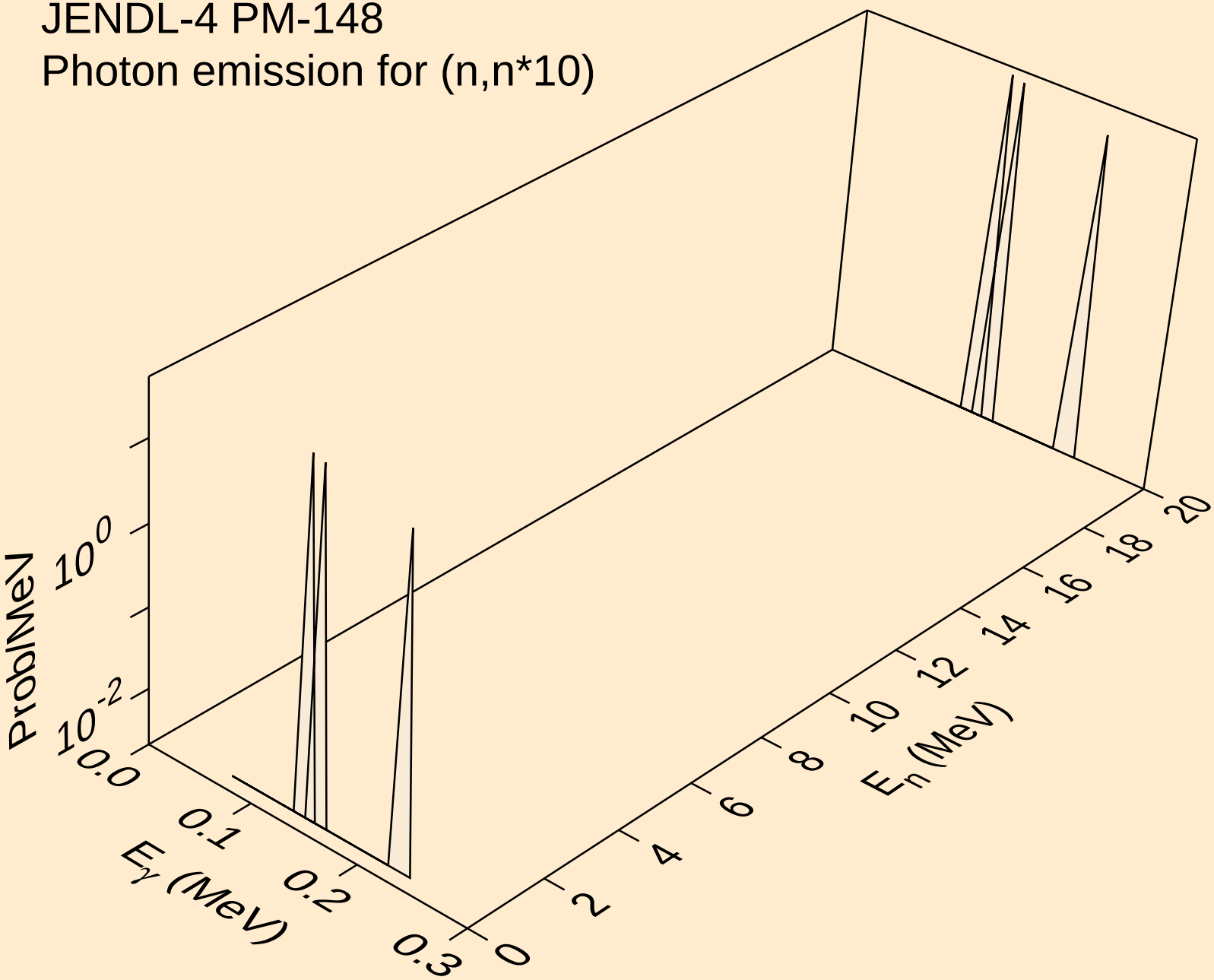
JENDL-4 PM-148
Photon emission for (n,n*8)



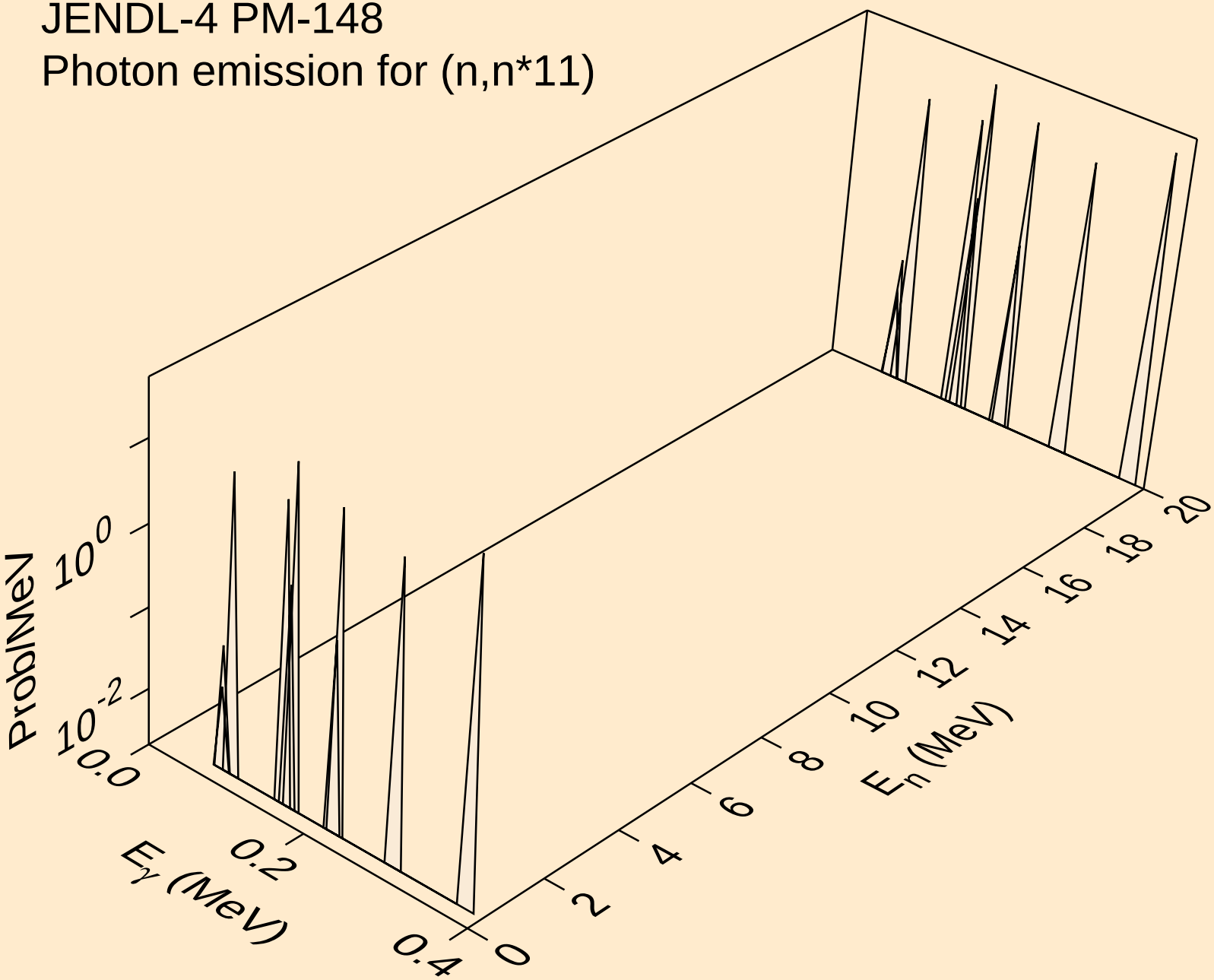
JENDL-4 PM-148
Photon emission for (n,n*9)



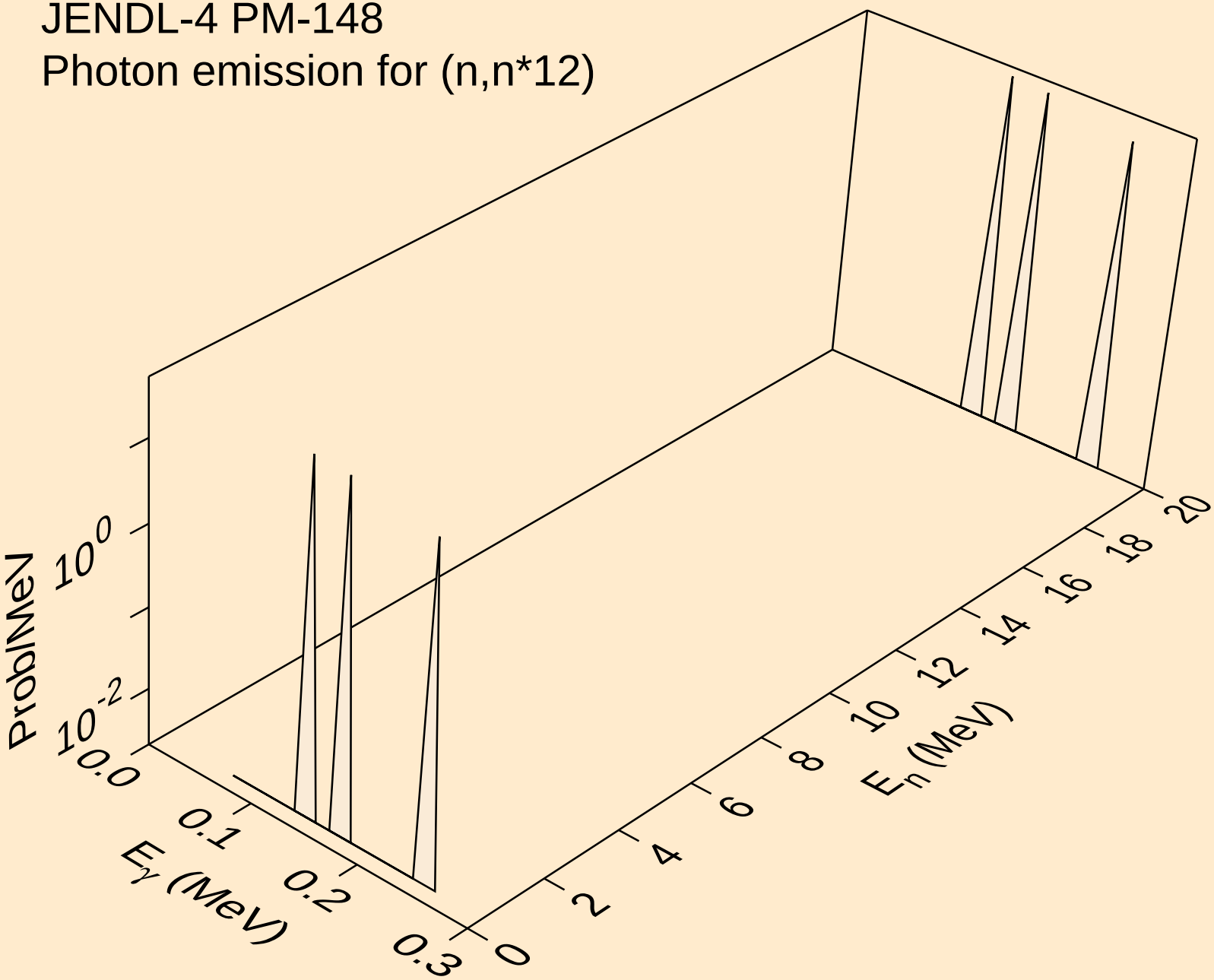
JENDL-4 PM-148
Photon emission for (n,n*10)

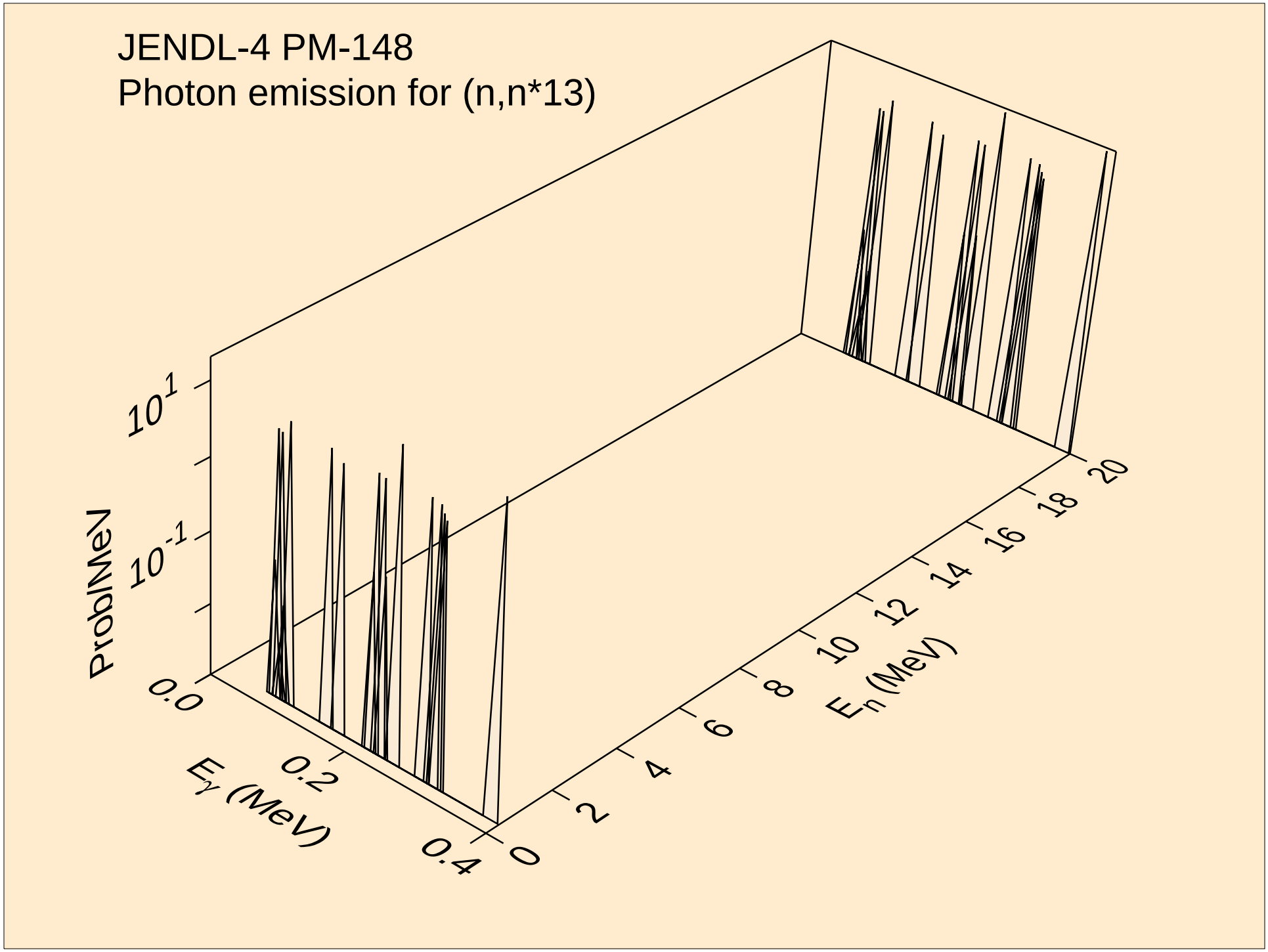


JENDL-4 PM-148
Photon emission for (n,n*11)

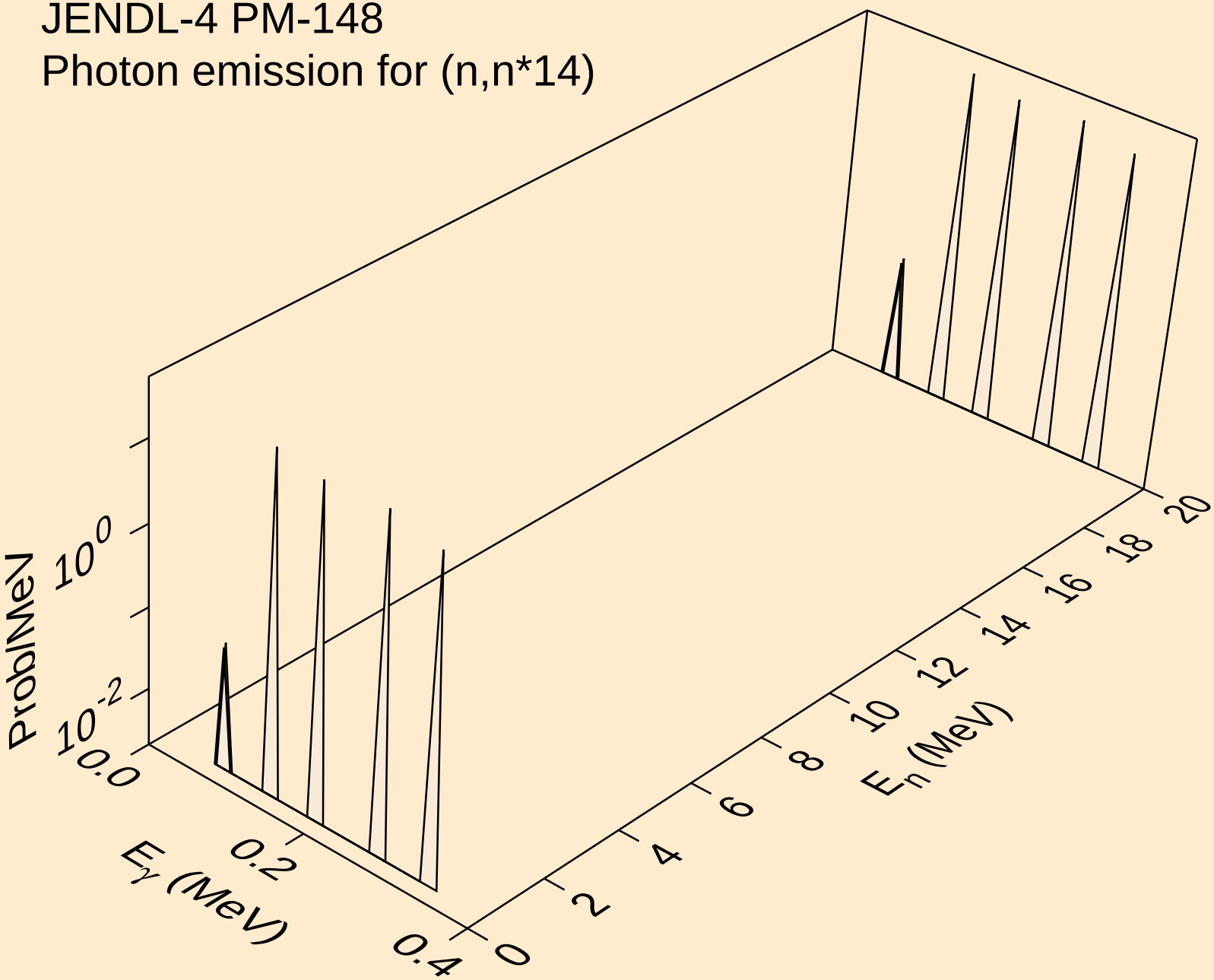


JENDL-4 PM-148
Photon emission for (n,n*12)

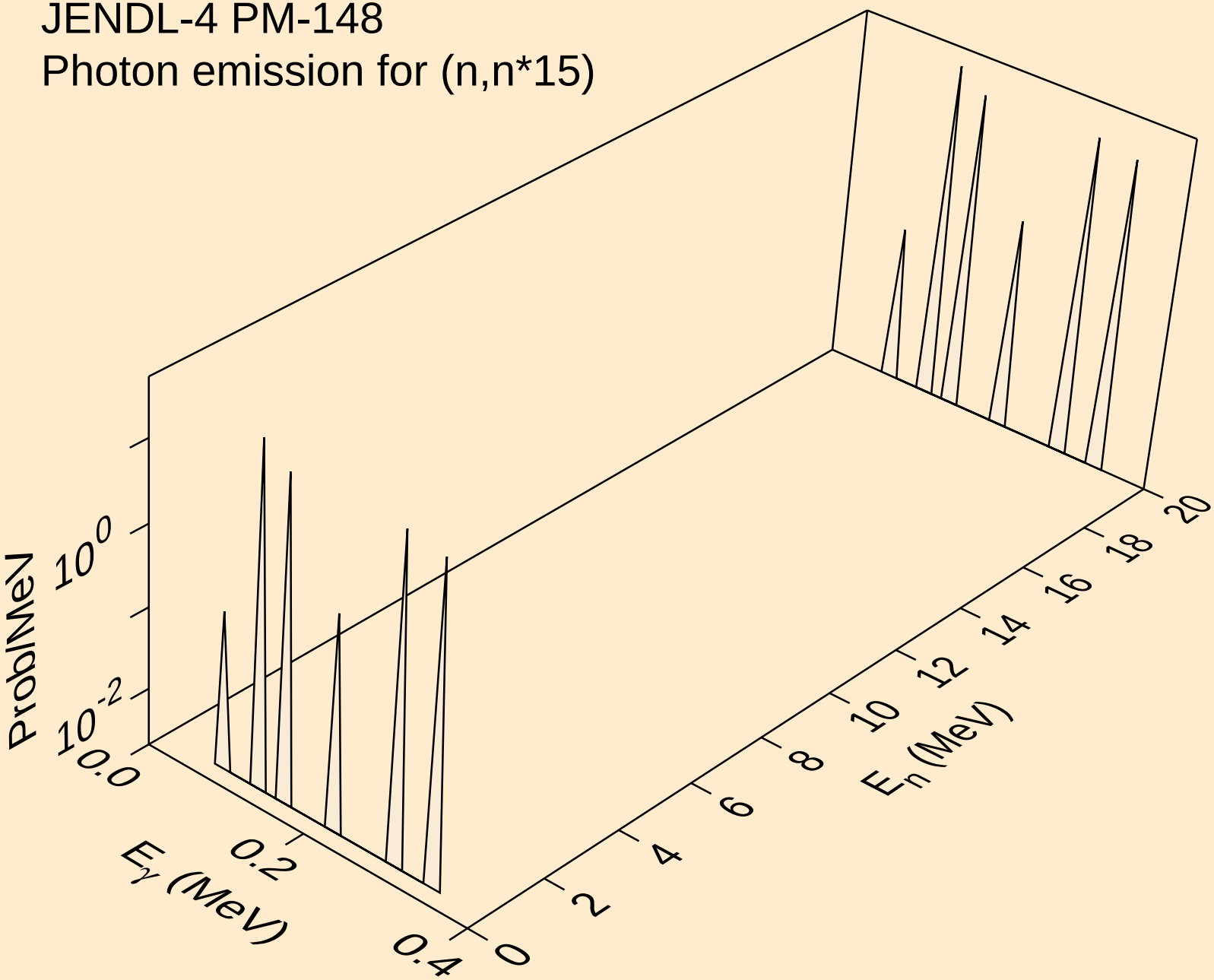


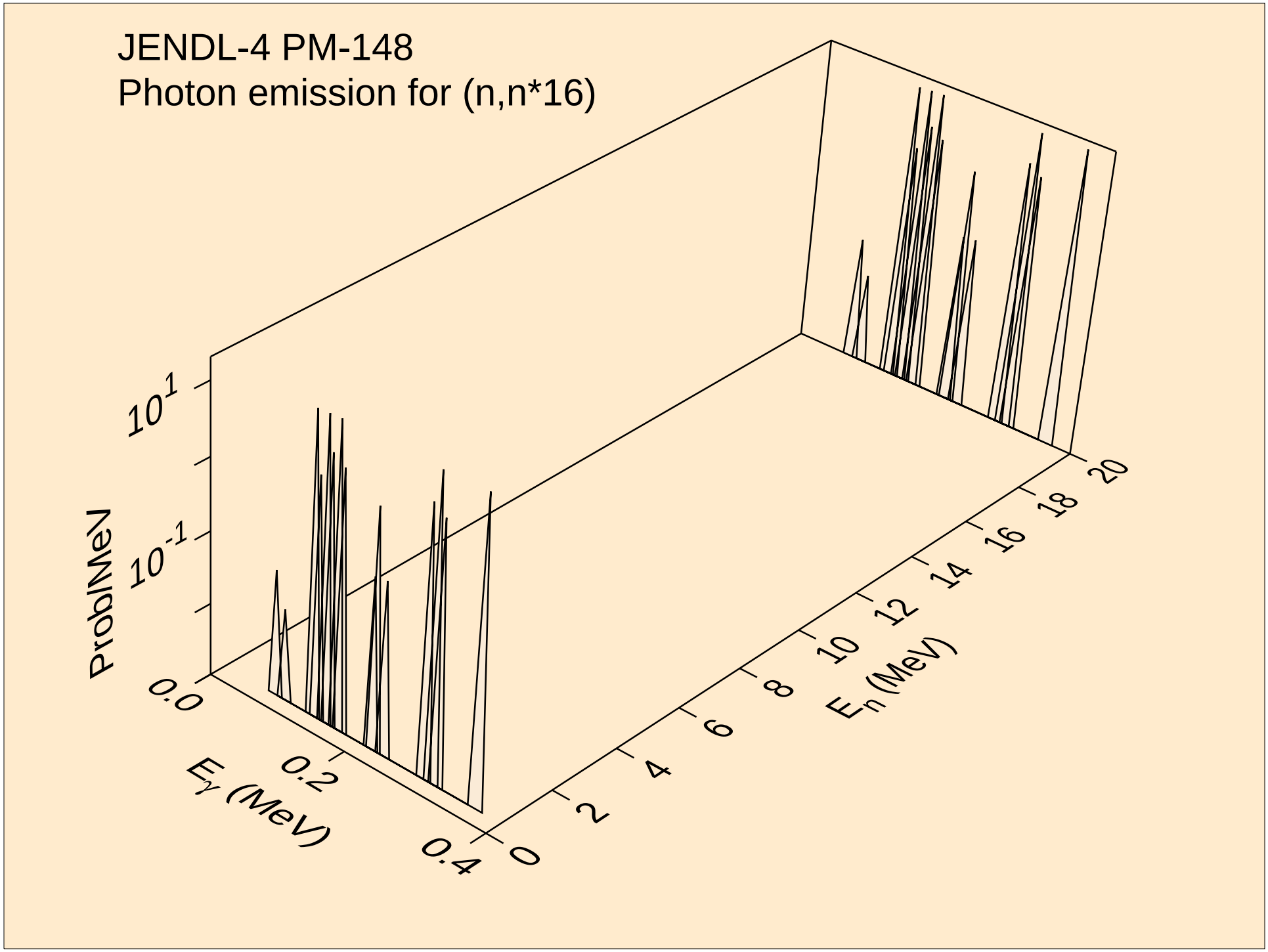

JENDL-4 PM-148
Photon emission for (n,n*13)
Prob/MeV
10^{1}
10^{-1}
0.0
0.2
0.4
E_γ (MeV)
0
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

JENDL-4 PM-148
Photon emission for (n,n*14)

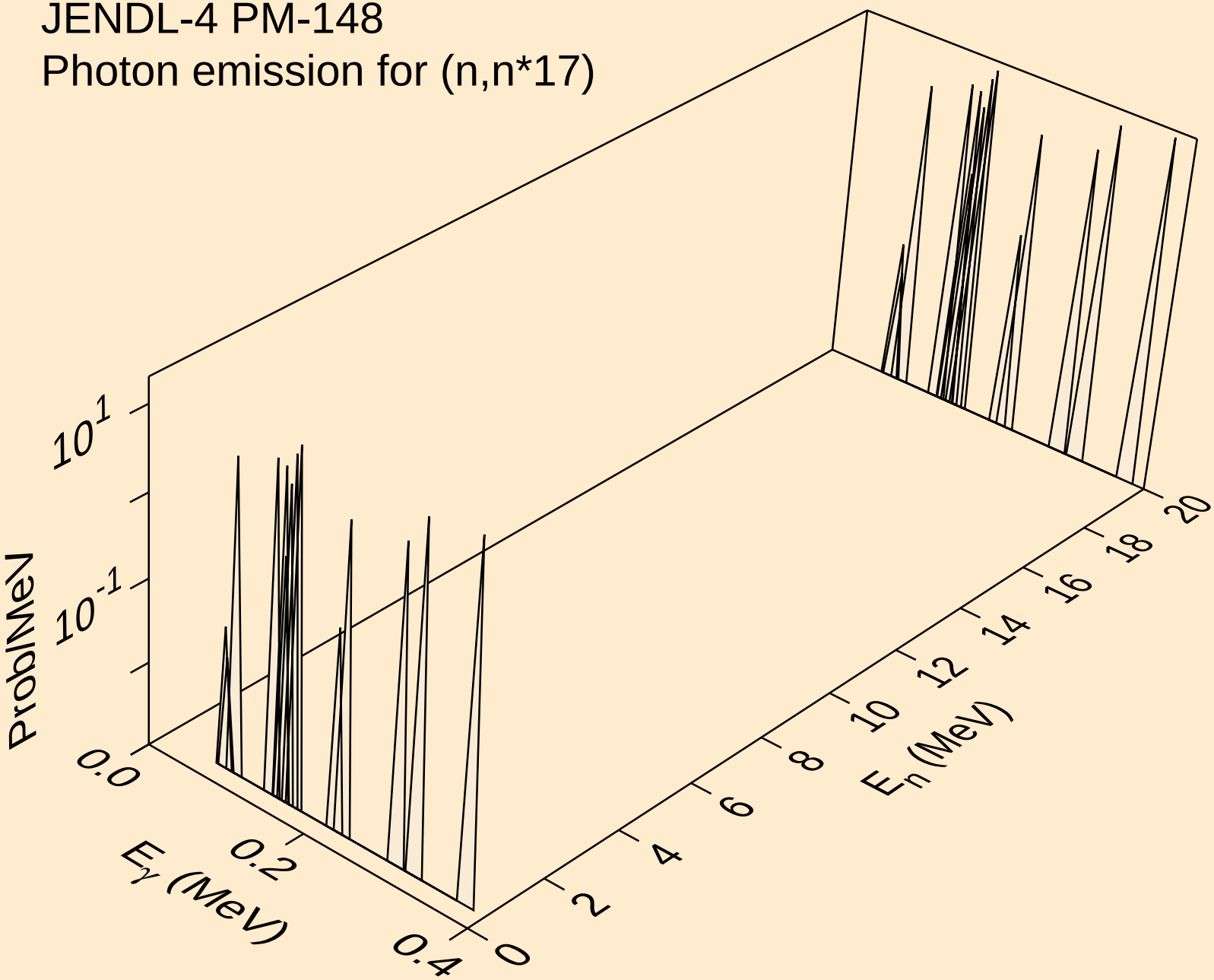


JENDL-4 PM-148
Photon emission for (n,n*15)

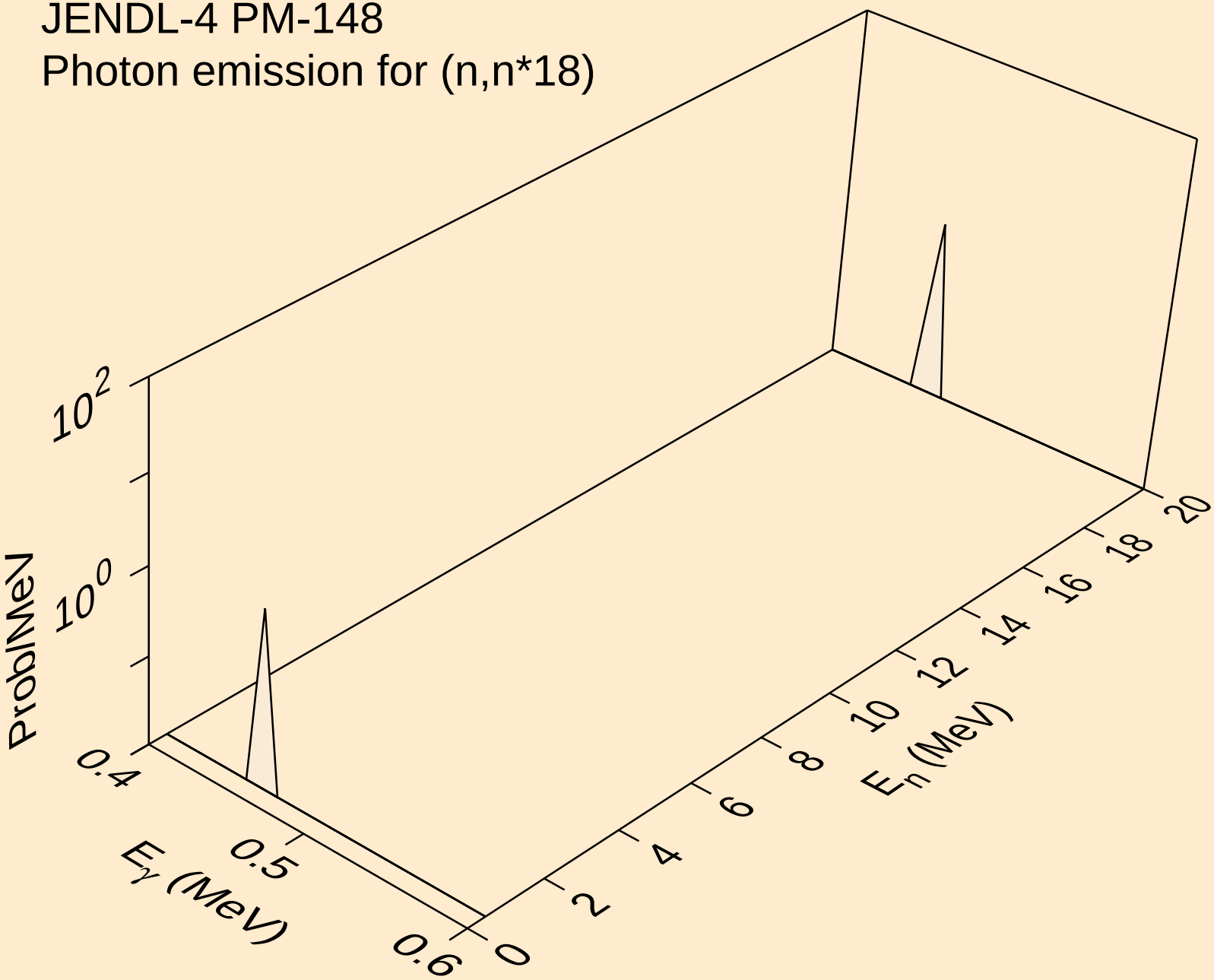



JENDL-4 PM-148
Photon emission for (n,n*16)
Prob/MeV
10^{1}
10^{-1}
0.0
0.2
0.4
E_γ (MeV)
0
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

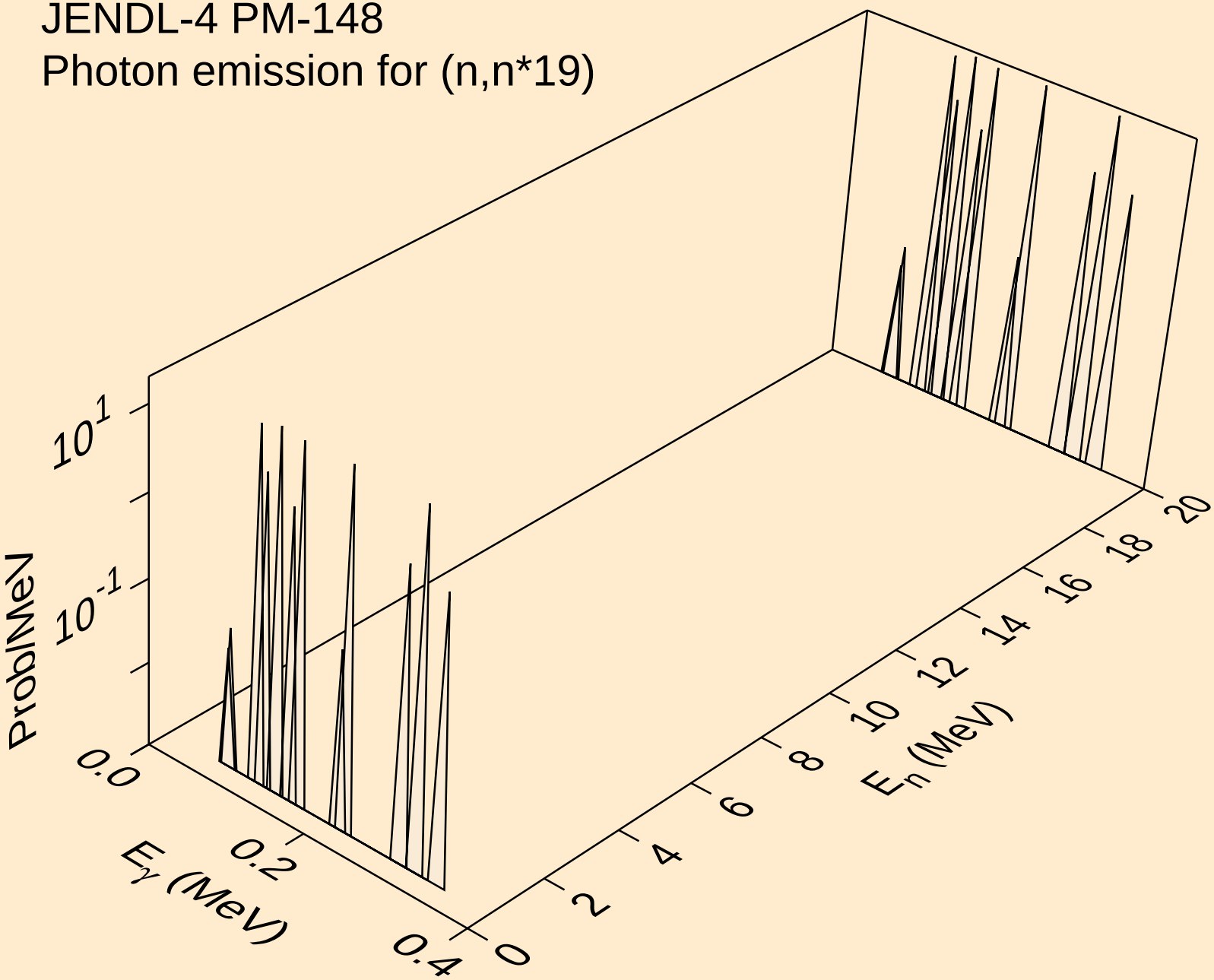
JENDL-4 PM-148
Photon emission for (n,n*17)



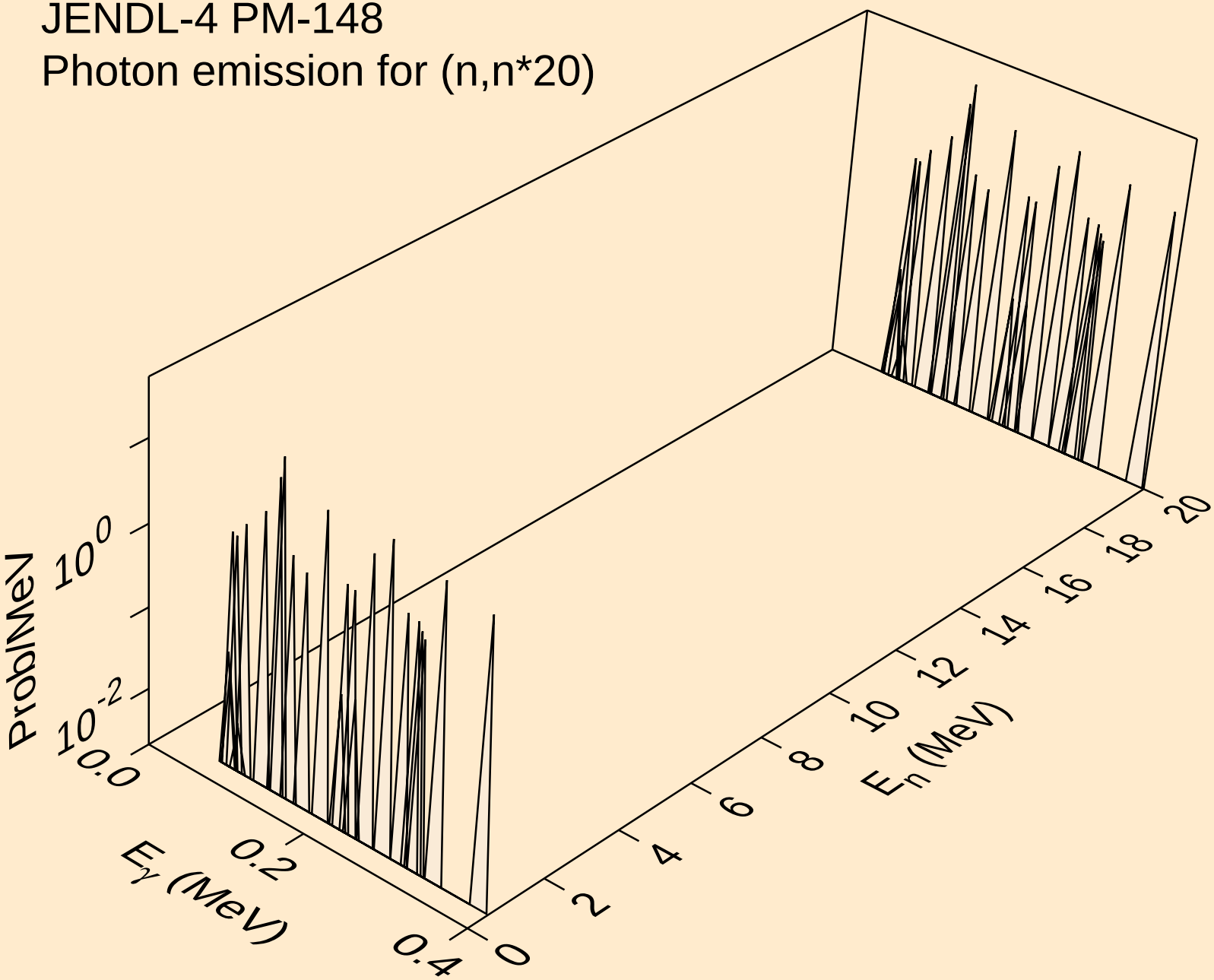
JENDL-4 PM-148
Photon emission for (n,n*18)



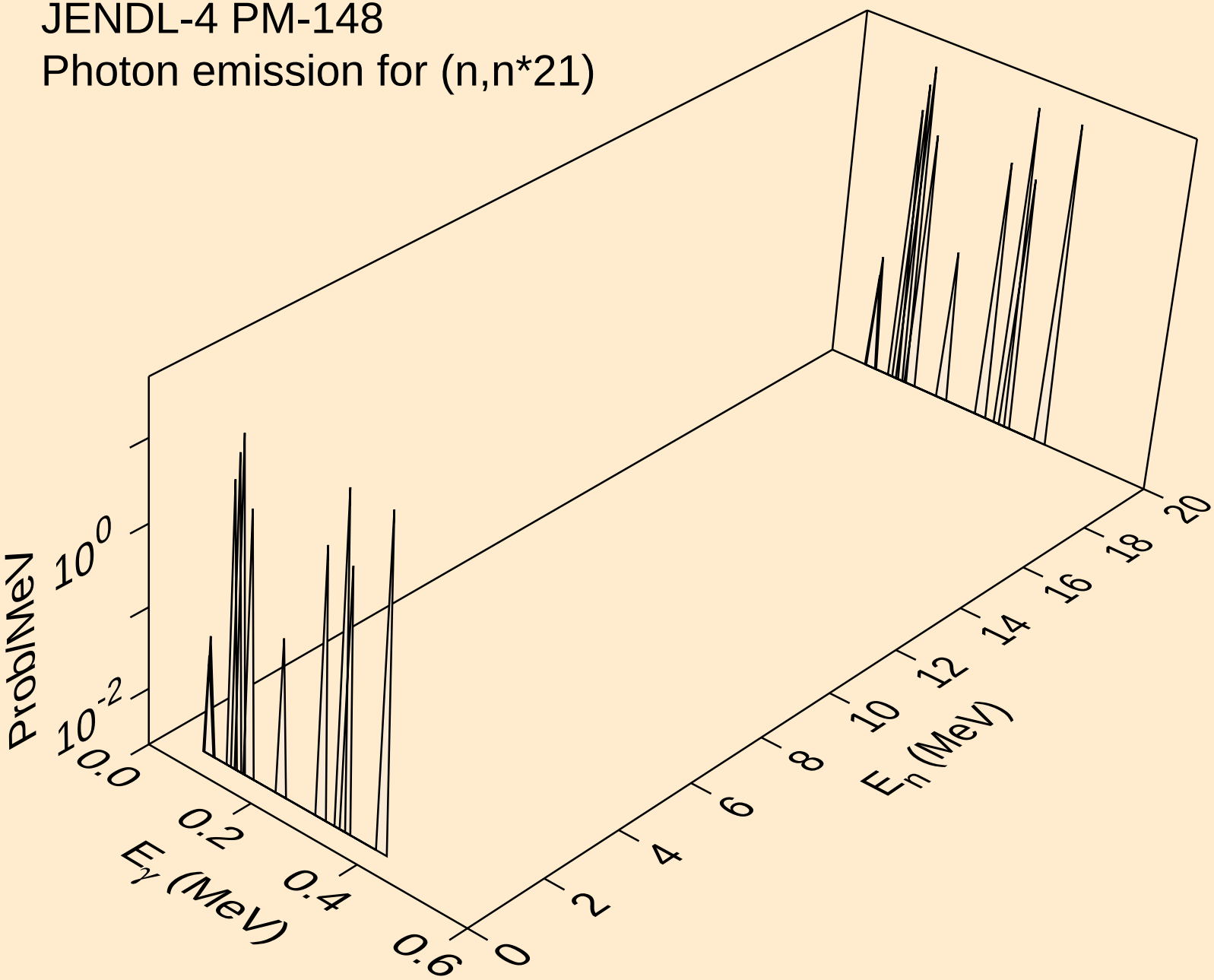
JENDL-4 PM-148
Photon emission for (n,n*19)



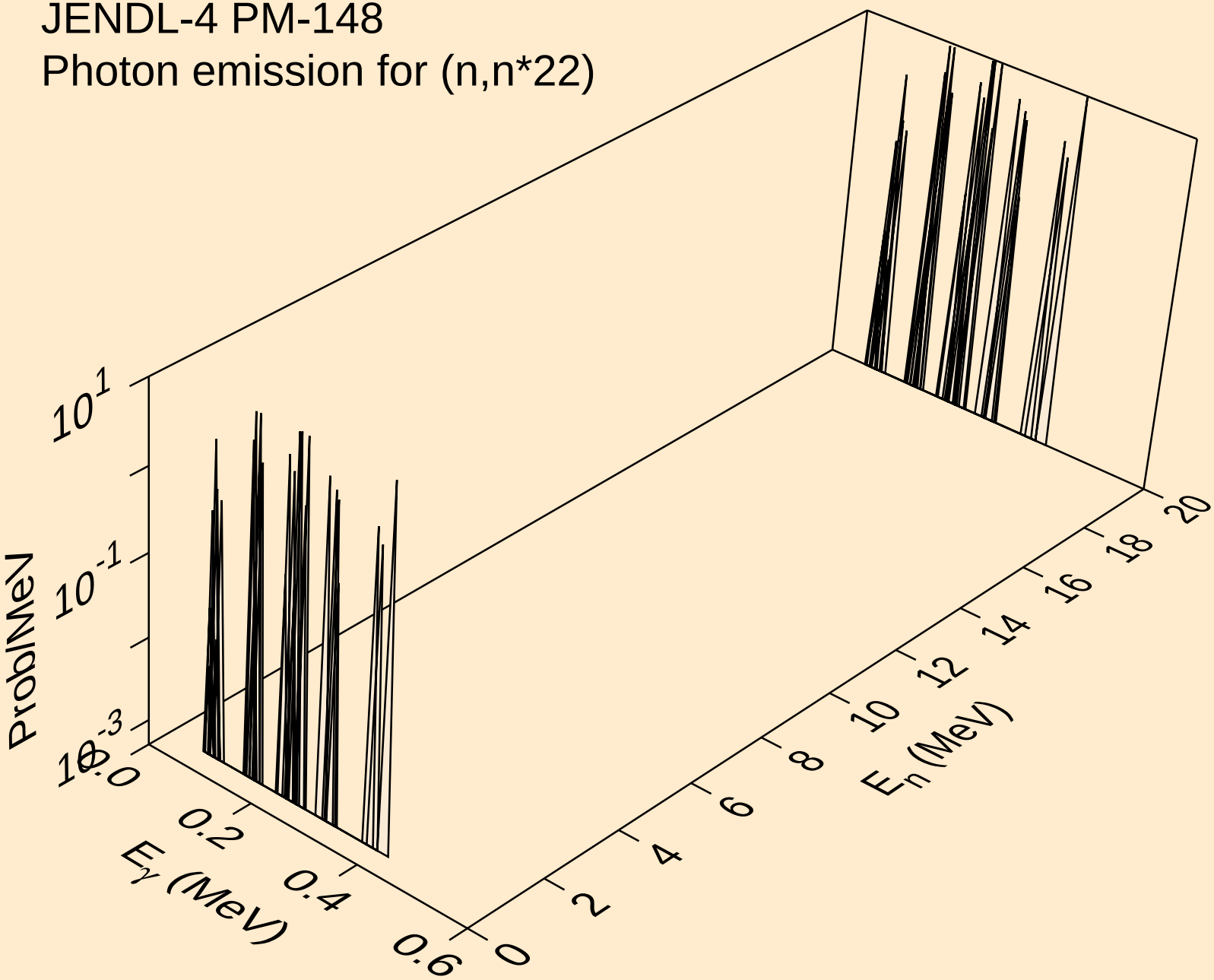
JENDL-4 PM-148
Photon emission for (n,n*20)



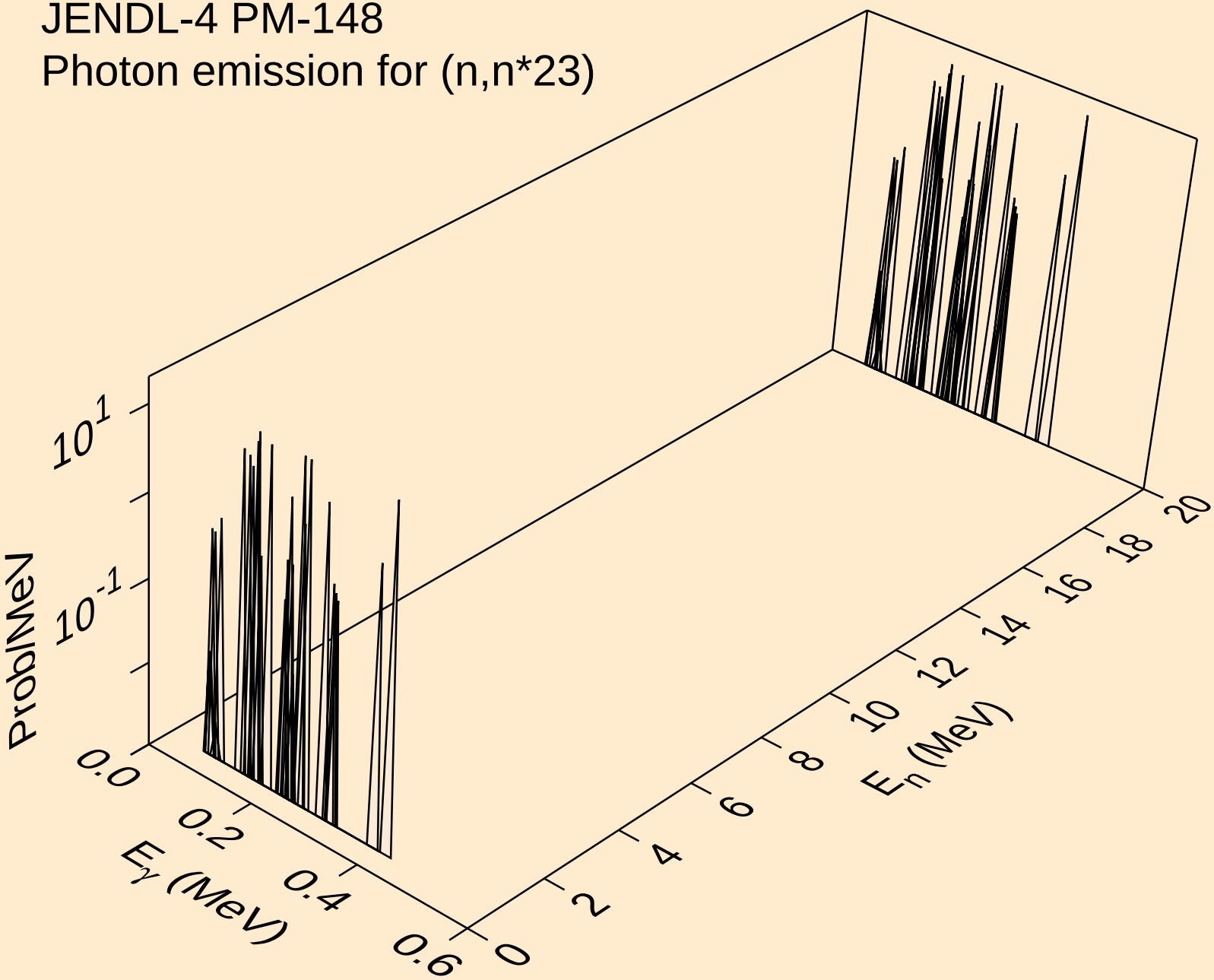
JENDL-4 PM-148
Photon emission for (n,n*21)



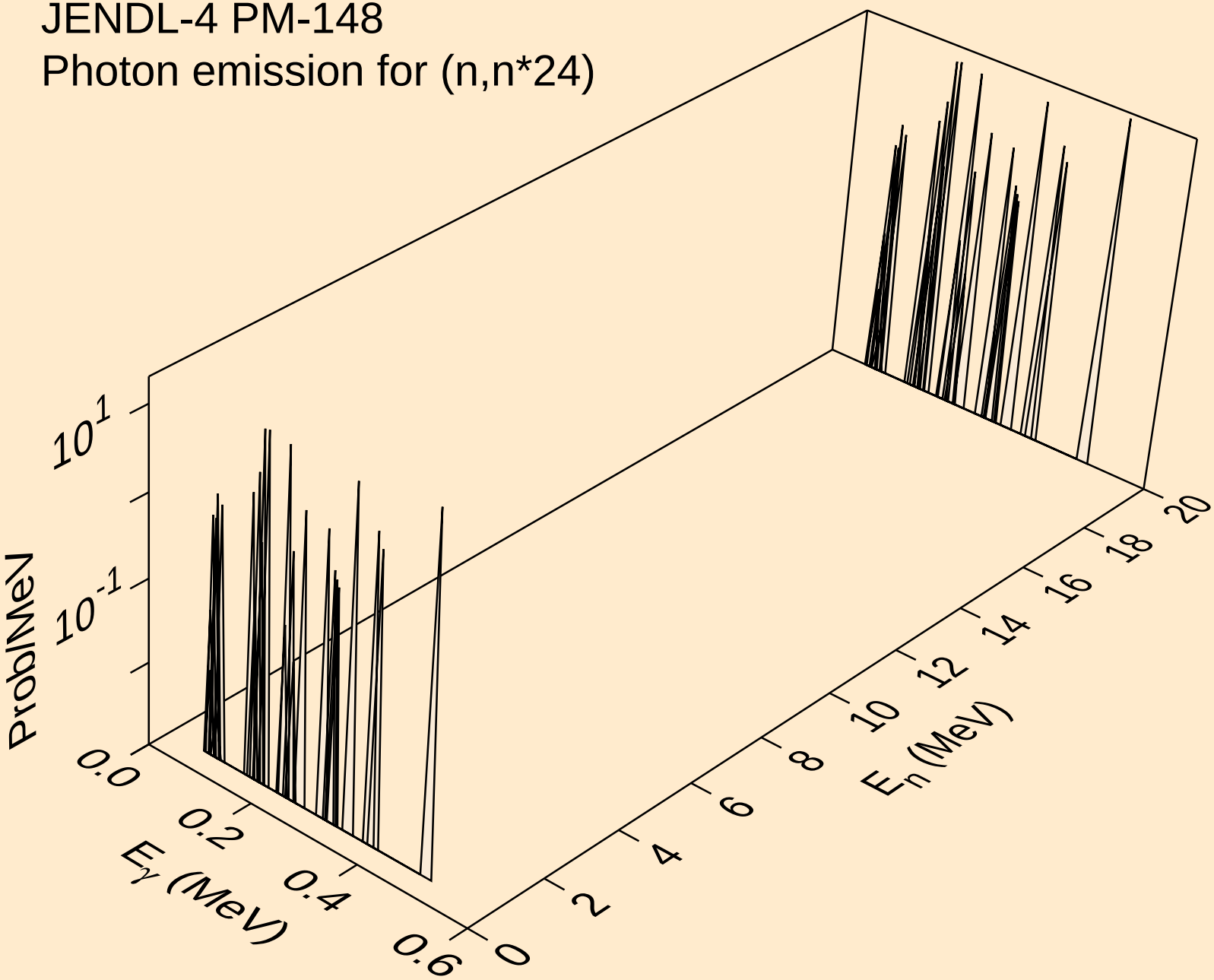
JENDL-4 PM-148
Photon emission for (n,n*22)

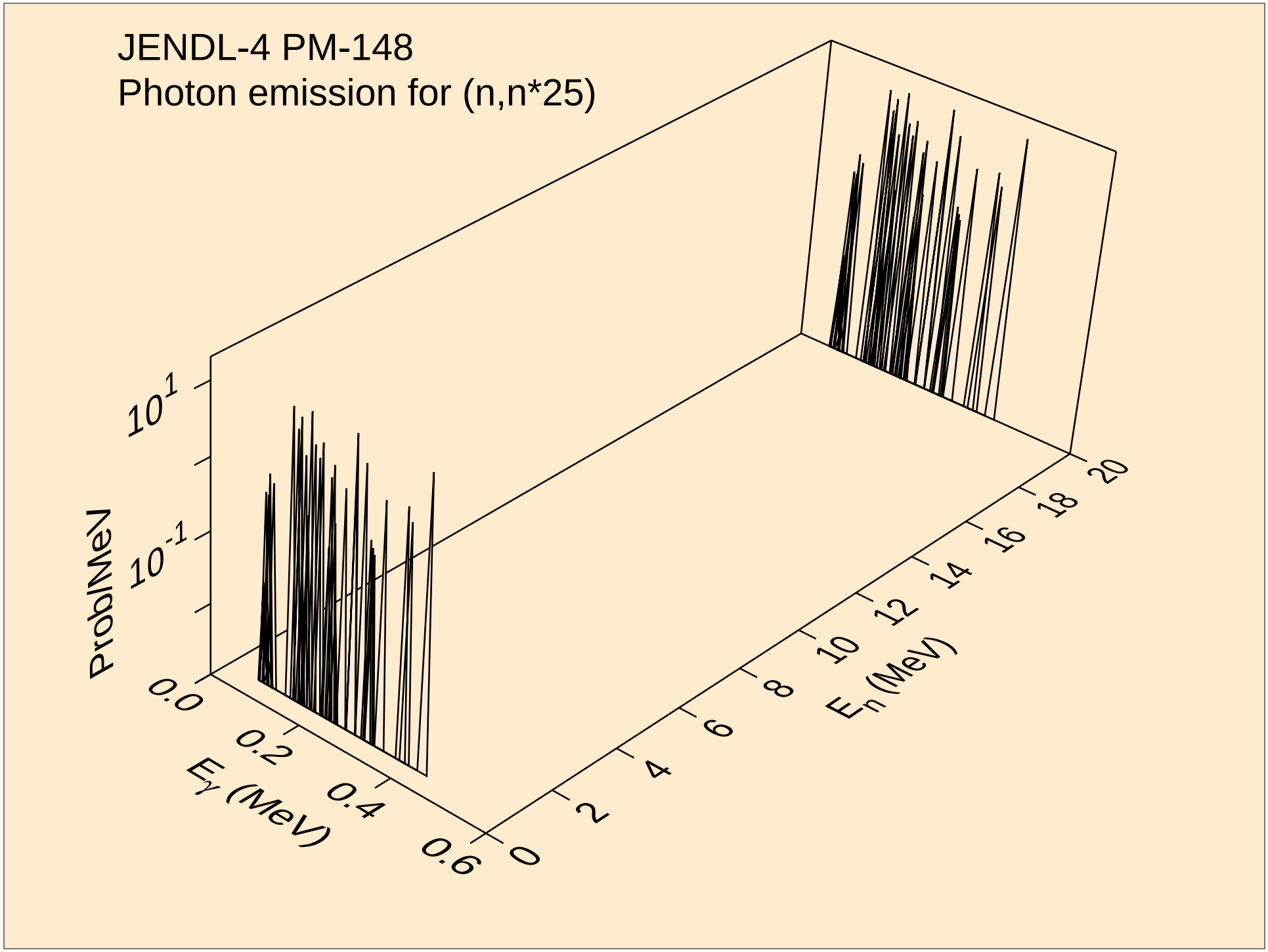


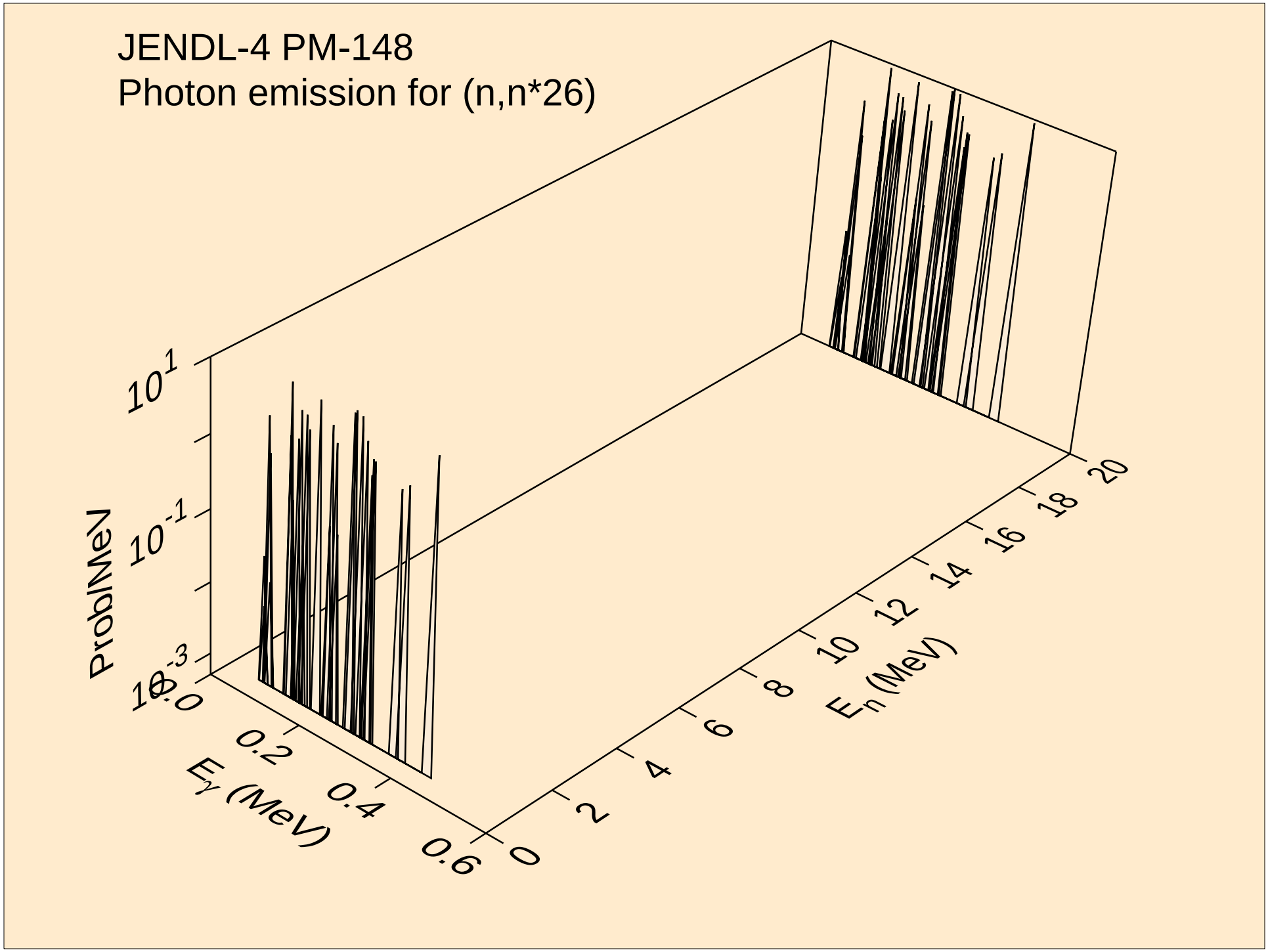
JENDL-4 PM-148
Photon emission for (n,n*23)



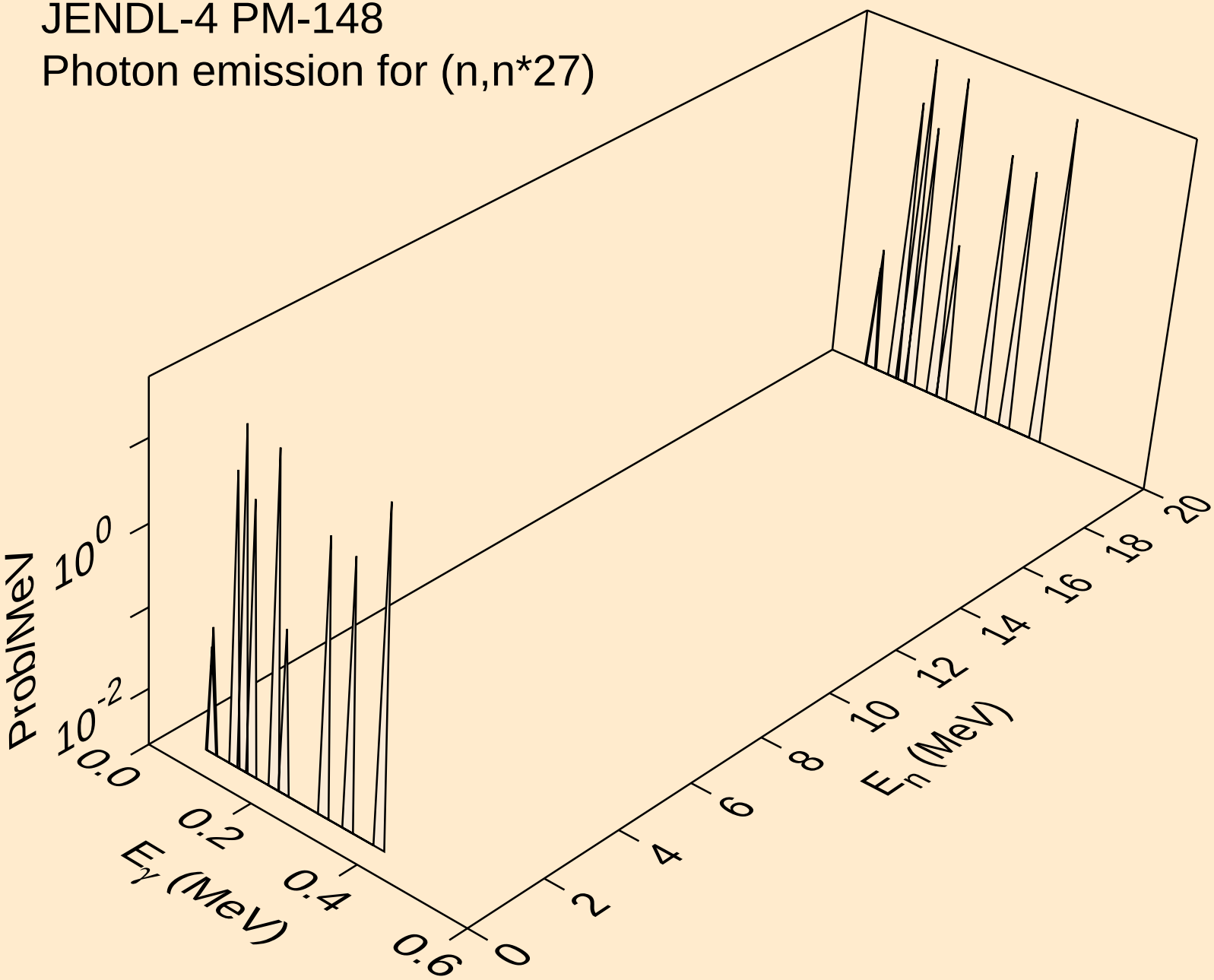
JENDL-4 PM-148
Photon emission for (n,n*24)



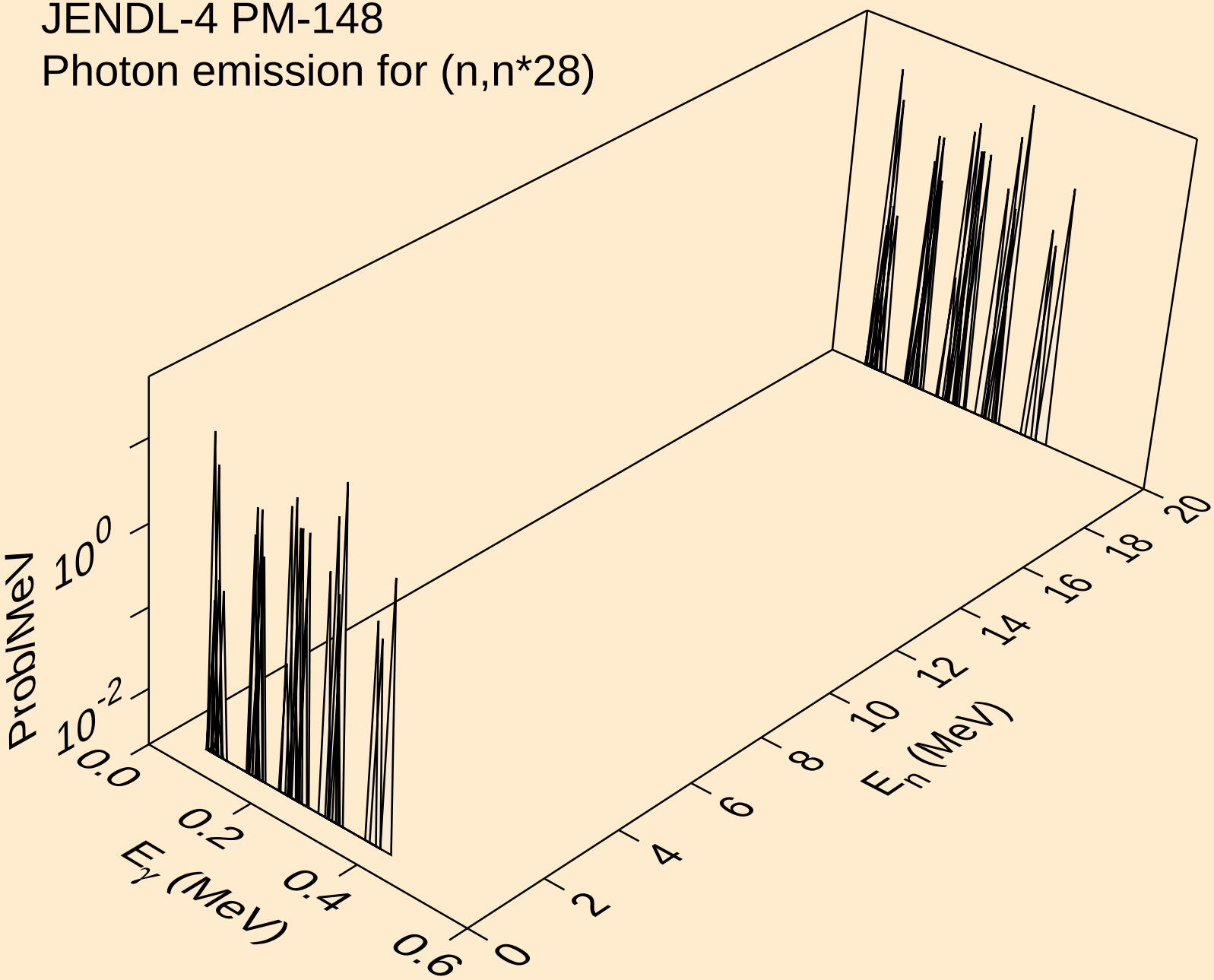

JENDL-4 PM-148
Photon emission for (n,n*25)
Prob/MeV
10^{1}
10^{-1}
0.0
0.2
0.4
0.6
E_γ (MeV)
0
2
4
6
8
10
12
14
16
18
20
E_n (MeV)


JENDL-4 PM-148
Photon emission for (n,n*26)
Prob/MeV
10^{1}
10^{-1}
10^{-3}
0.0
0.2
0.4
0.6
E_γ (MeV)
0
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

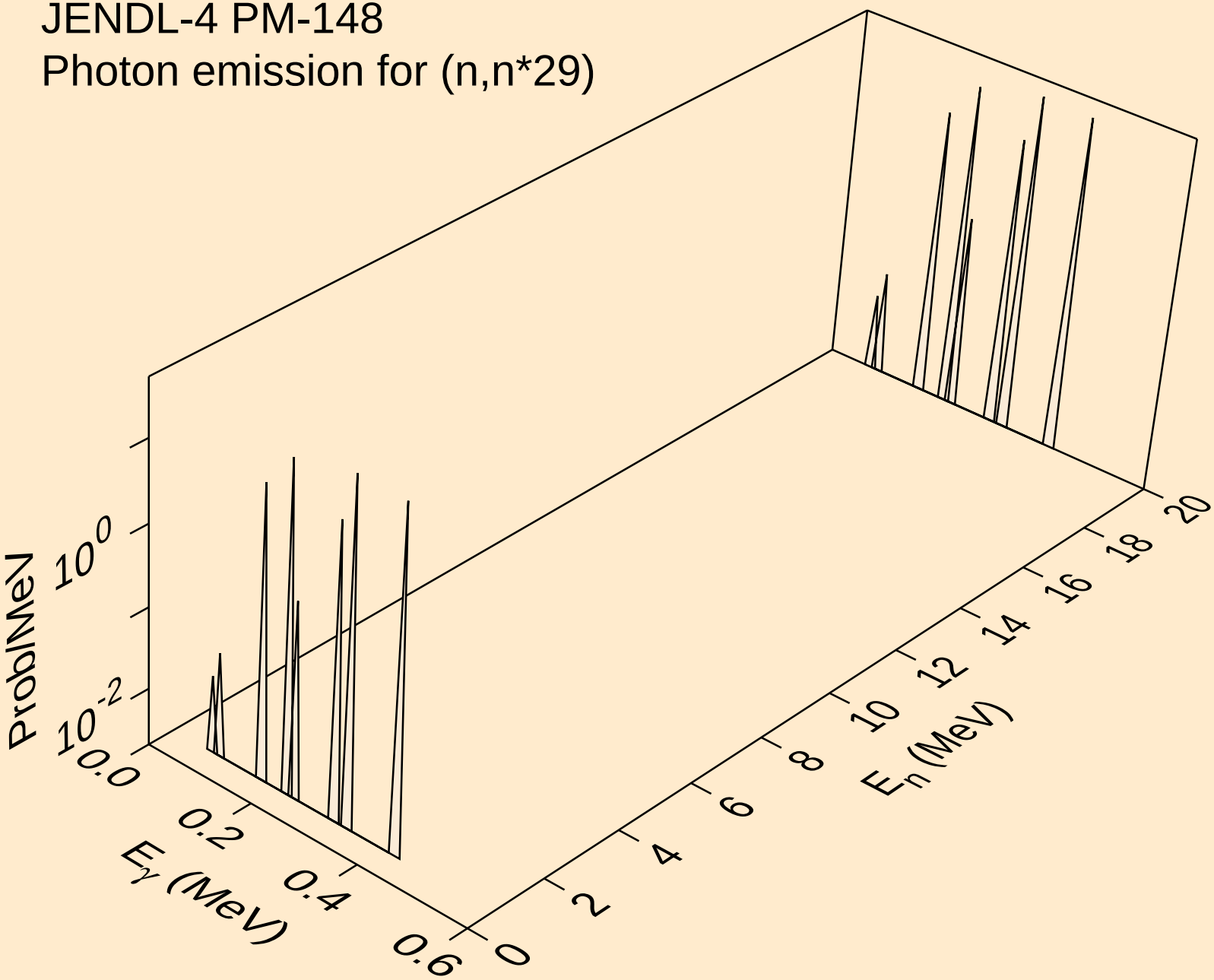
JENDL-4 PM-148
Photon emission for (n,n*27)

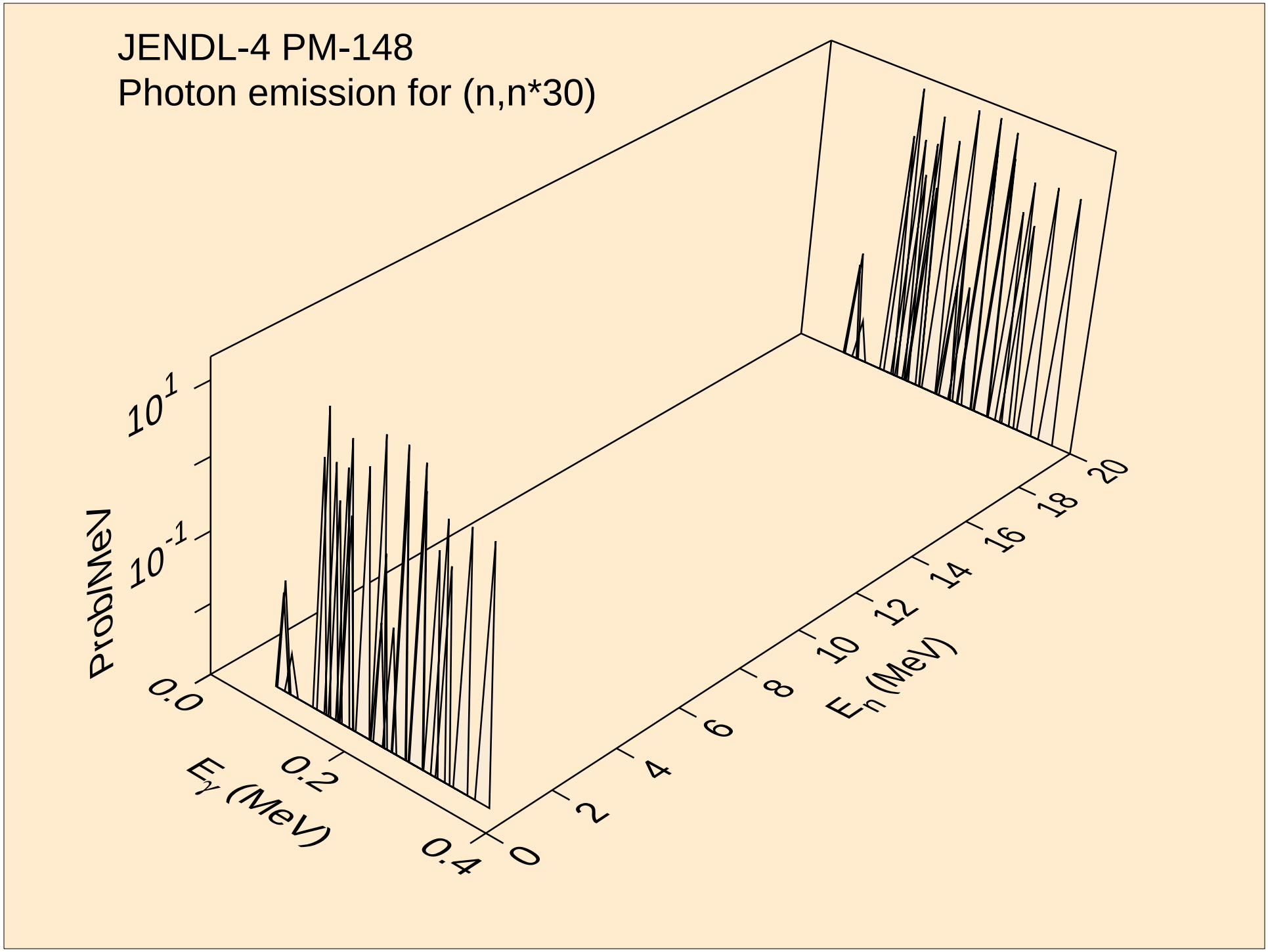


JENDL-4 PM-148
Photon emission for (n,n*28)

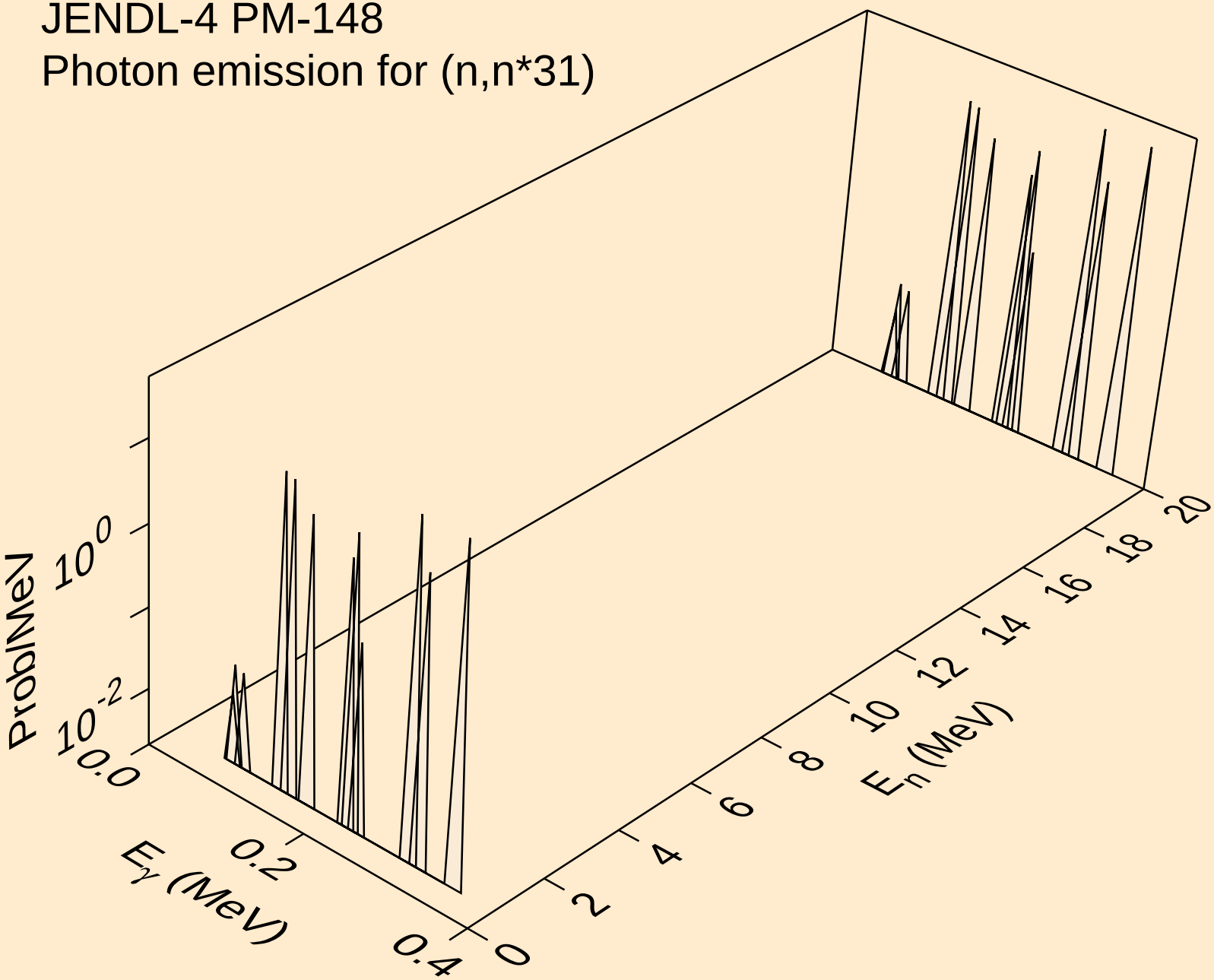


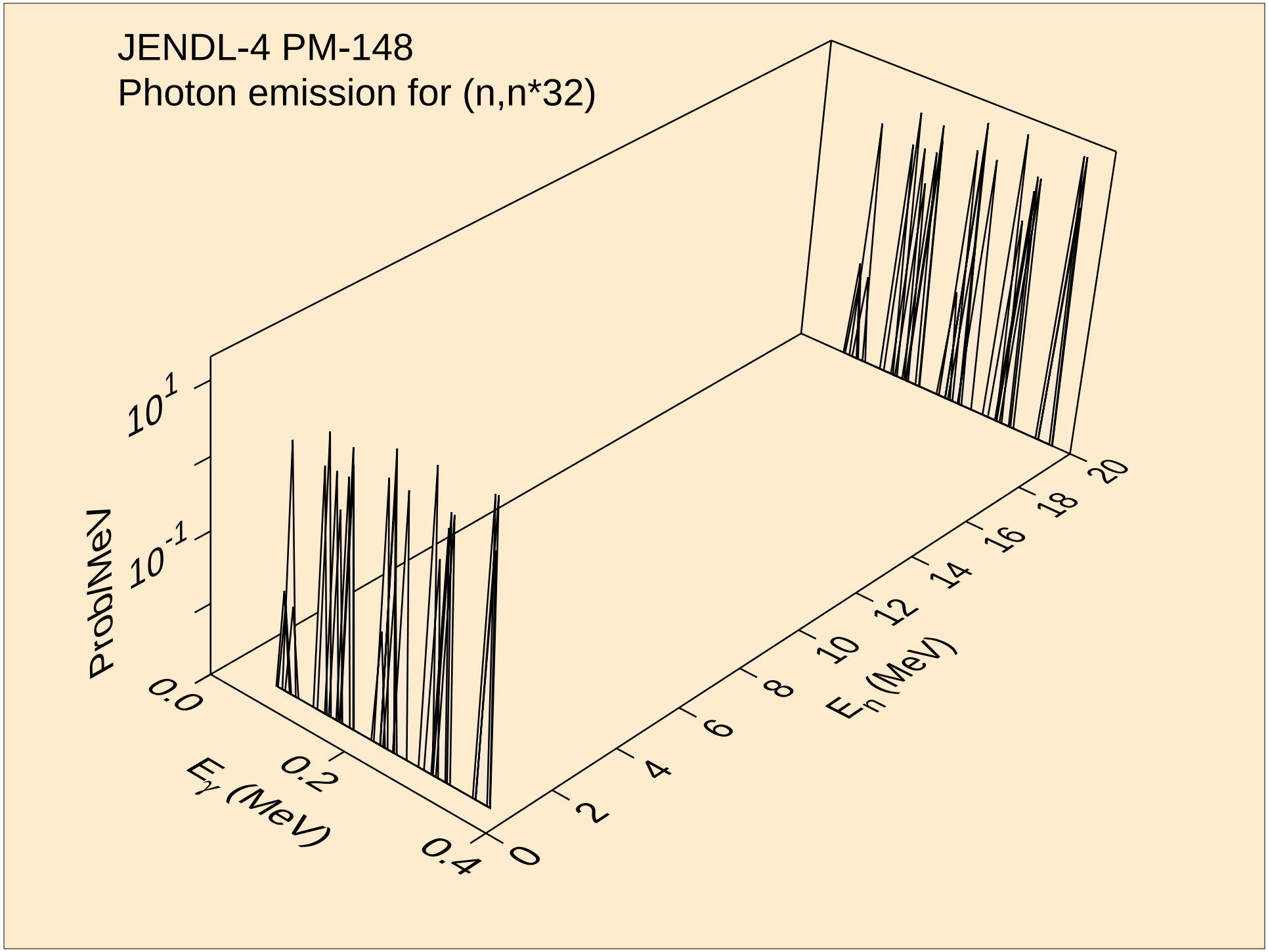
JENDL-4 PM-148
Photon emission for (n,n*29)

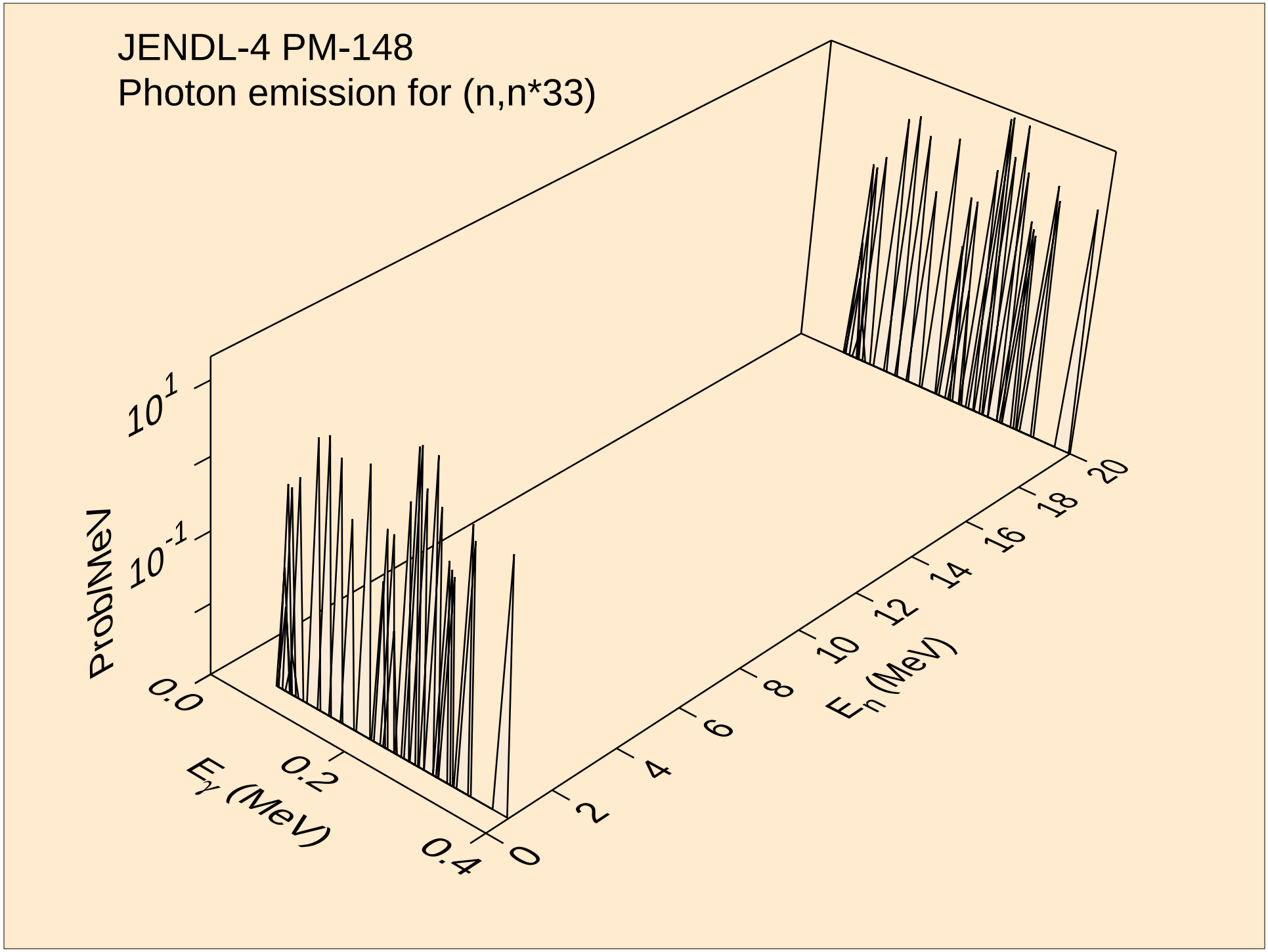



JENDL-4 PM-148
Photon emission for (n,n*30)
Prob/MeV
10^{1}
10^{-1}
0.0
0.2
0.4
E_γ (MeV)
0
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

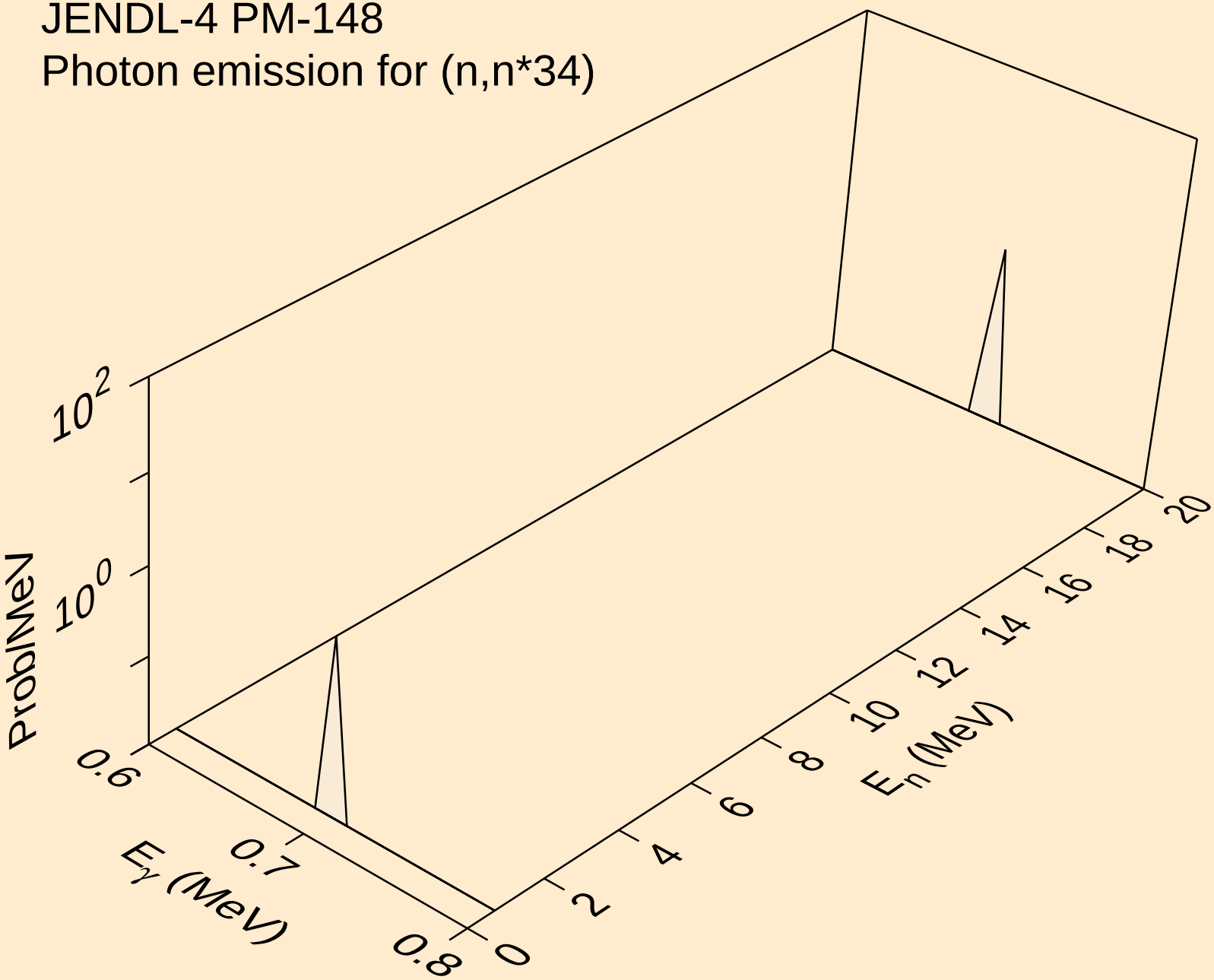
JENDL-4 PM-148
Photon emission for (n,n*31)



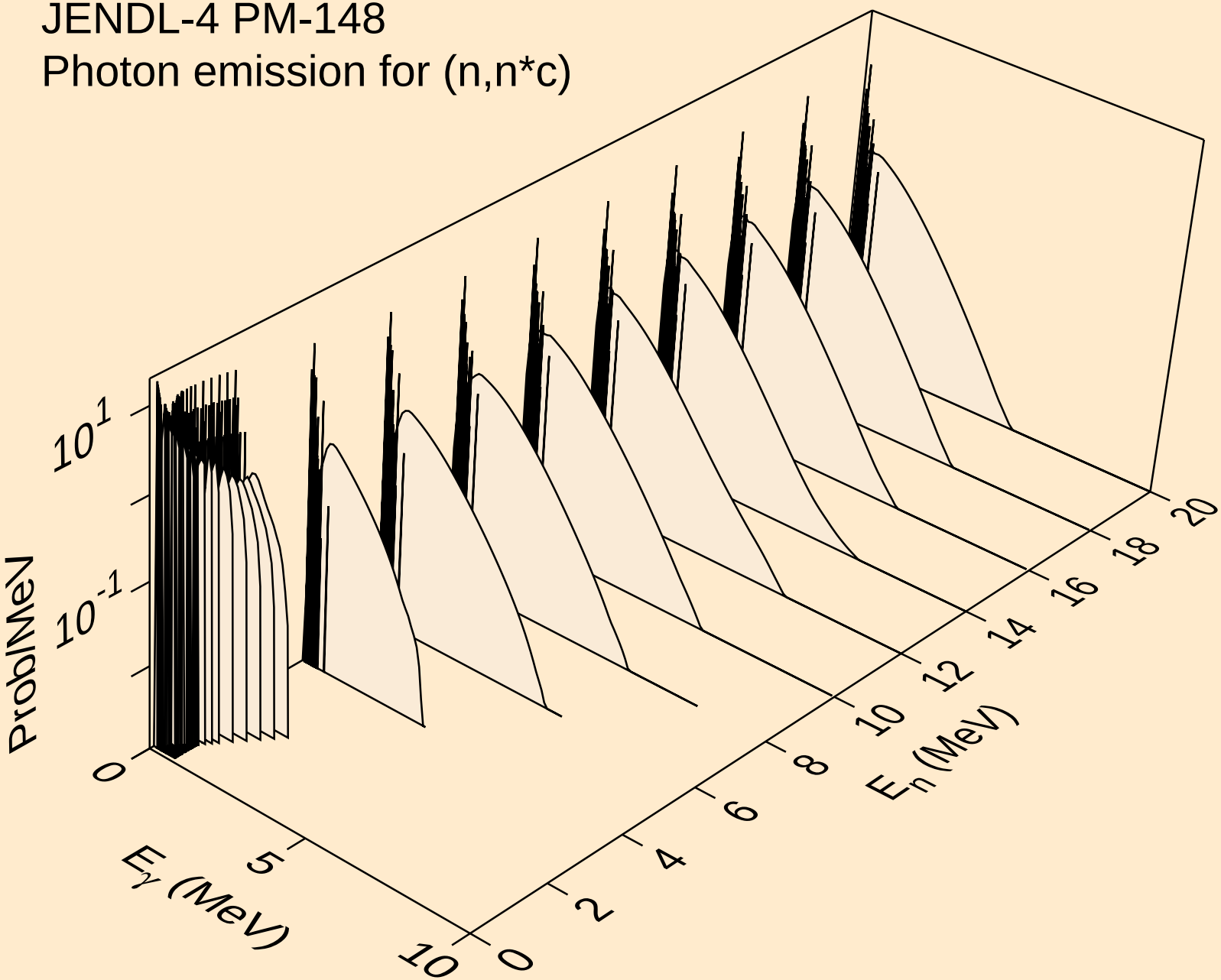

JENDL-4 PM-148
Photon emission for (n,n*32)
Prob/MeV
10^{1}
10^{-1}
0.0
0.2
0.4
E_γ (MeV)
0
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

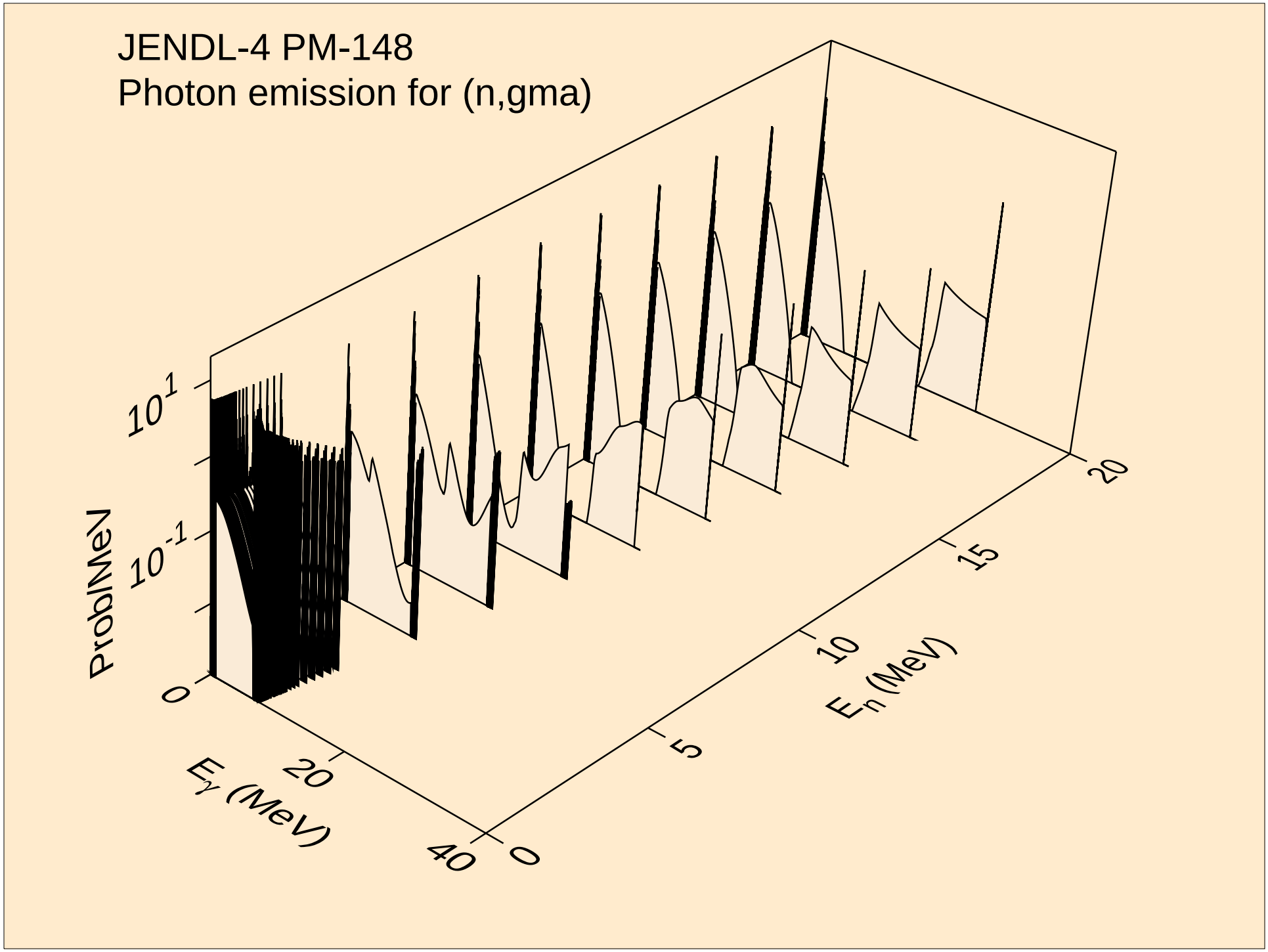

JENDL-4 PM-148
Photon emission for (n,n*33)
Prob/MeV
10^{1}
10^{-1}
0.0
0.2
0.4
E_γ (MeV)
0
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

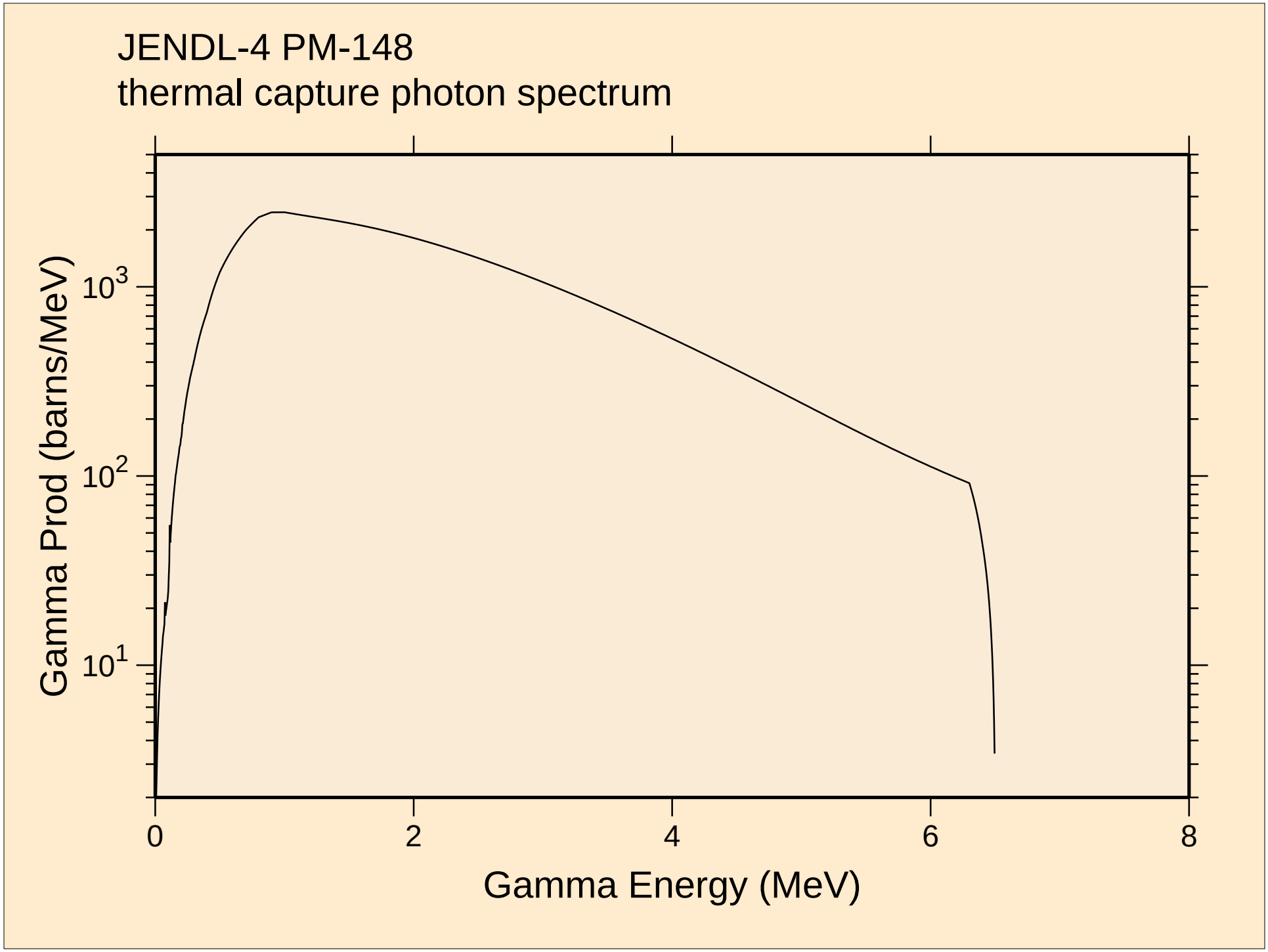
JENDL-4 PM-148
Photon emission for (n,n*34)

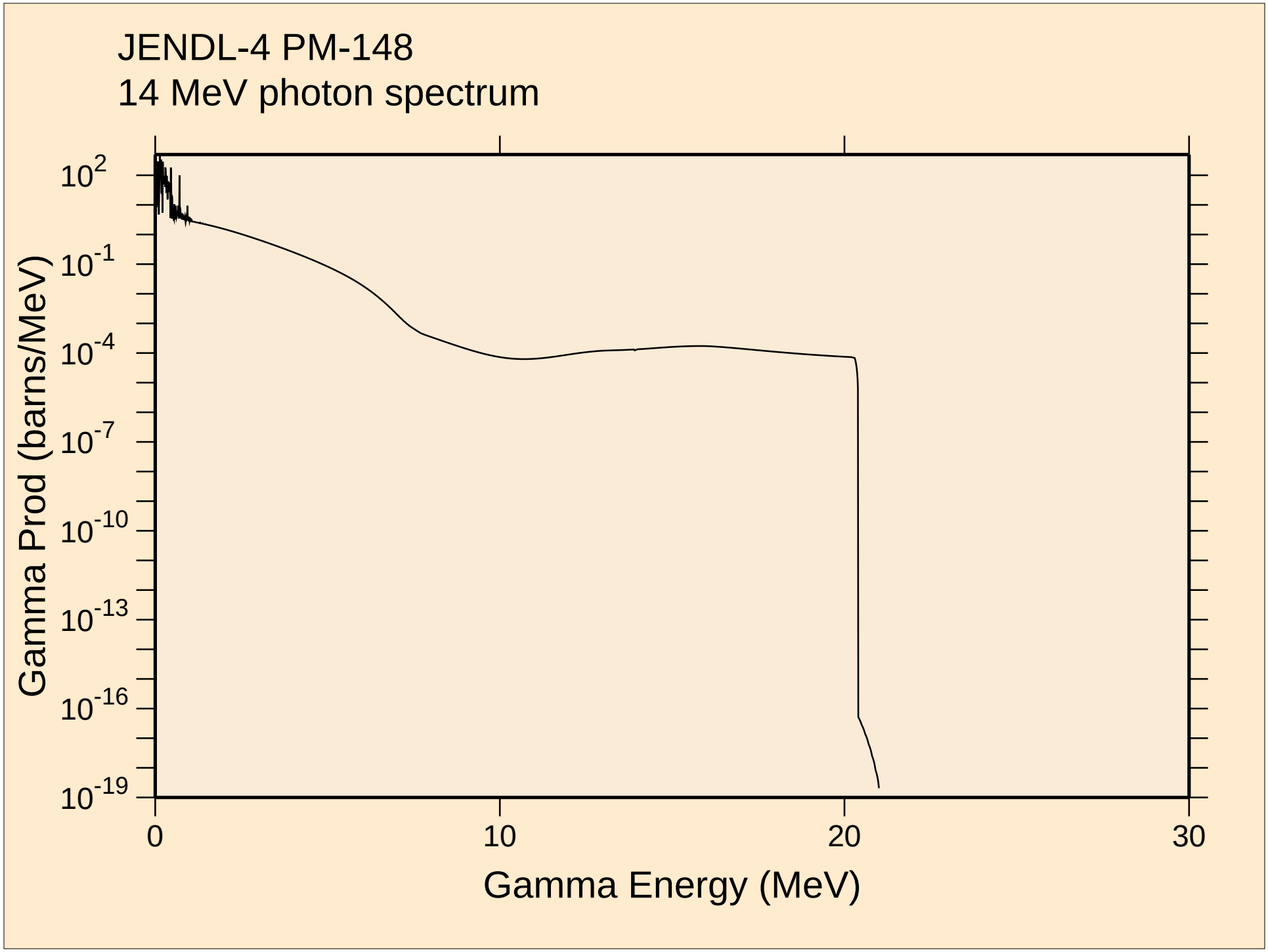


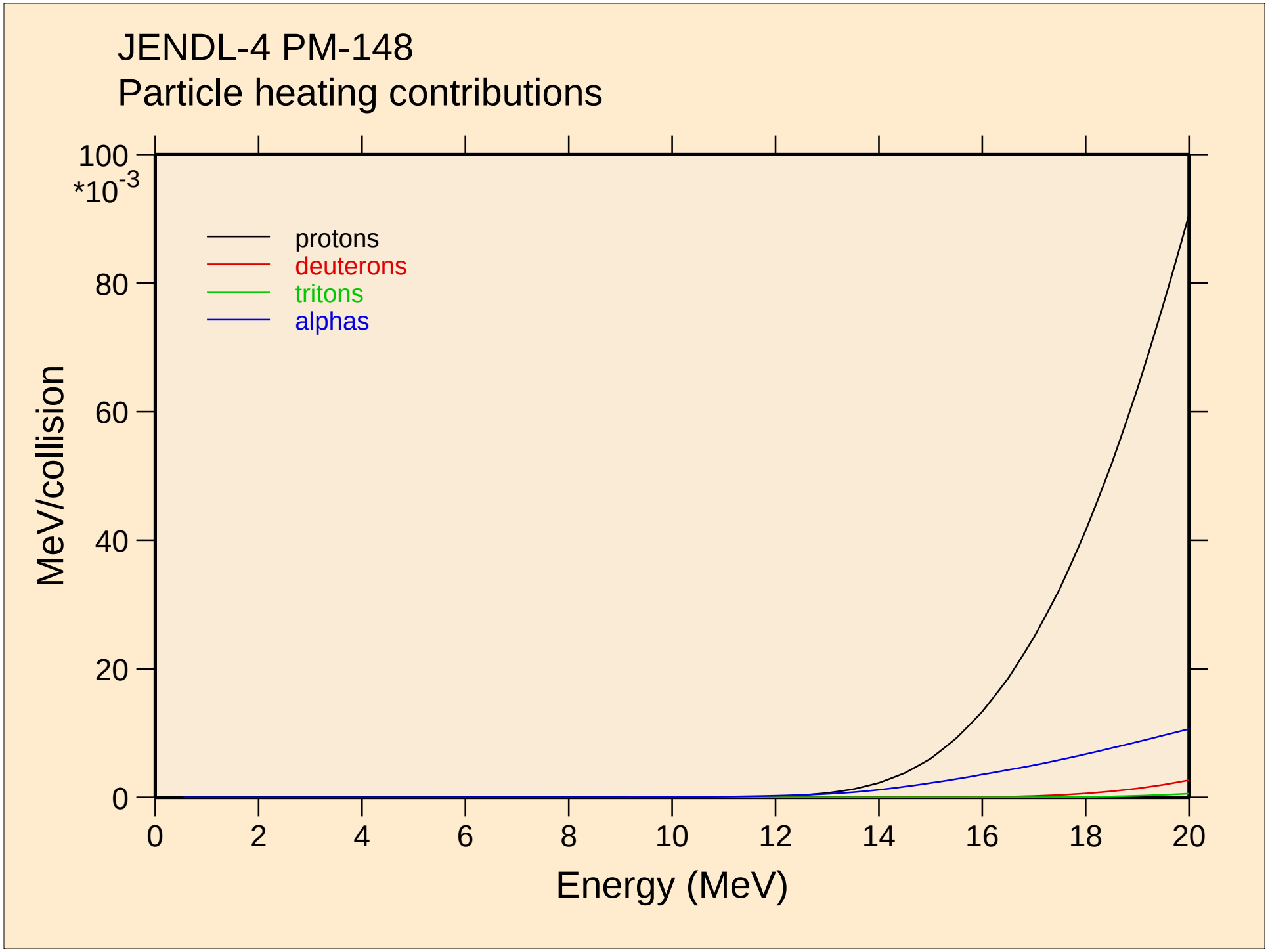
JENDL-4 PM-148
Photon emission for (n,n*c)

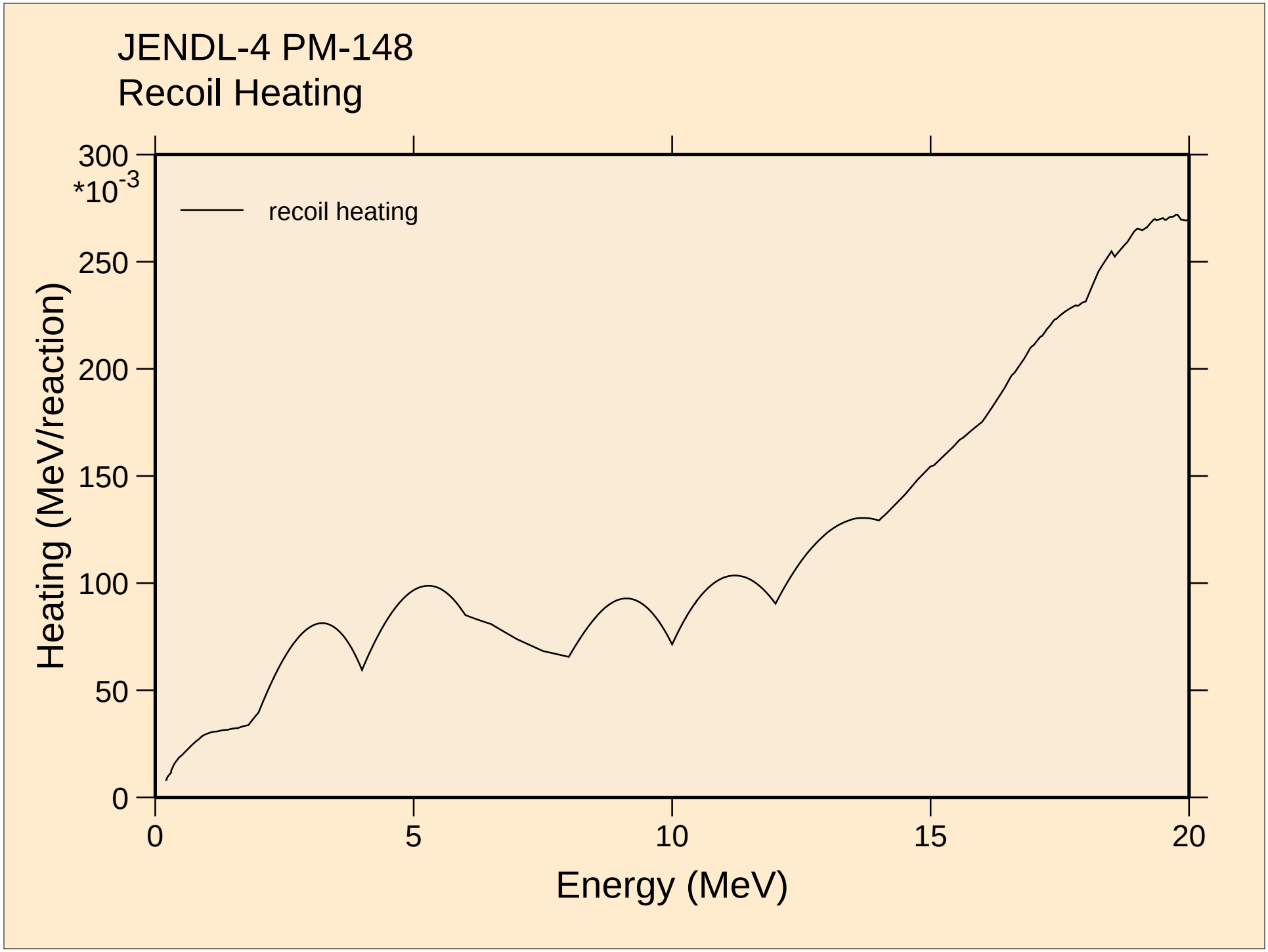


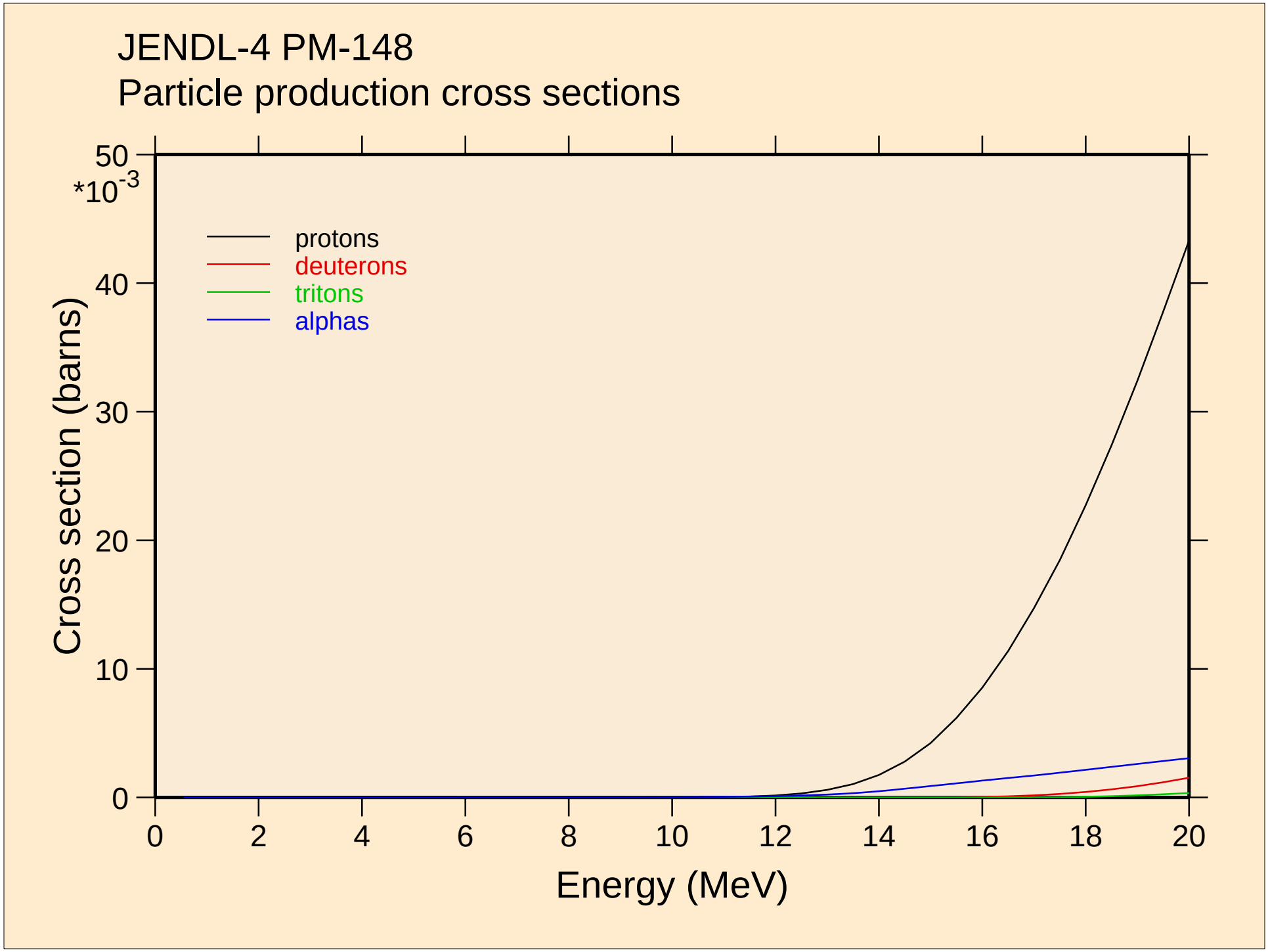

JENDL-4 PM-148
Photon emission for (n,gma)
Prob/MeV
10^{1}
10^{-1}
0
20
40
E_γ (MeV)
0
5
10
15
20
E_n (MeV)

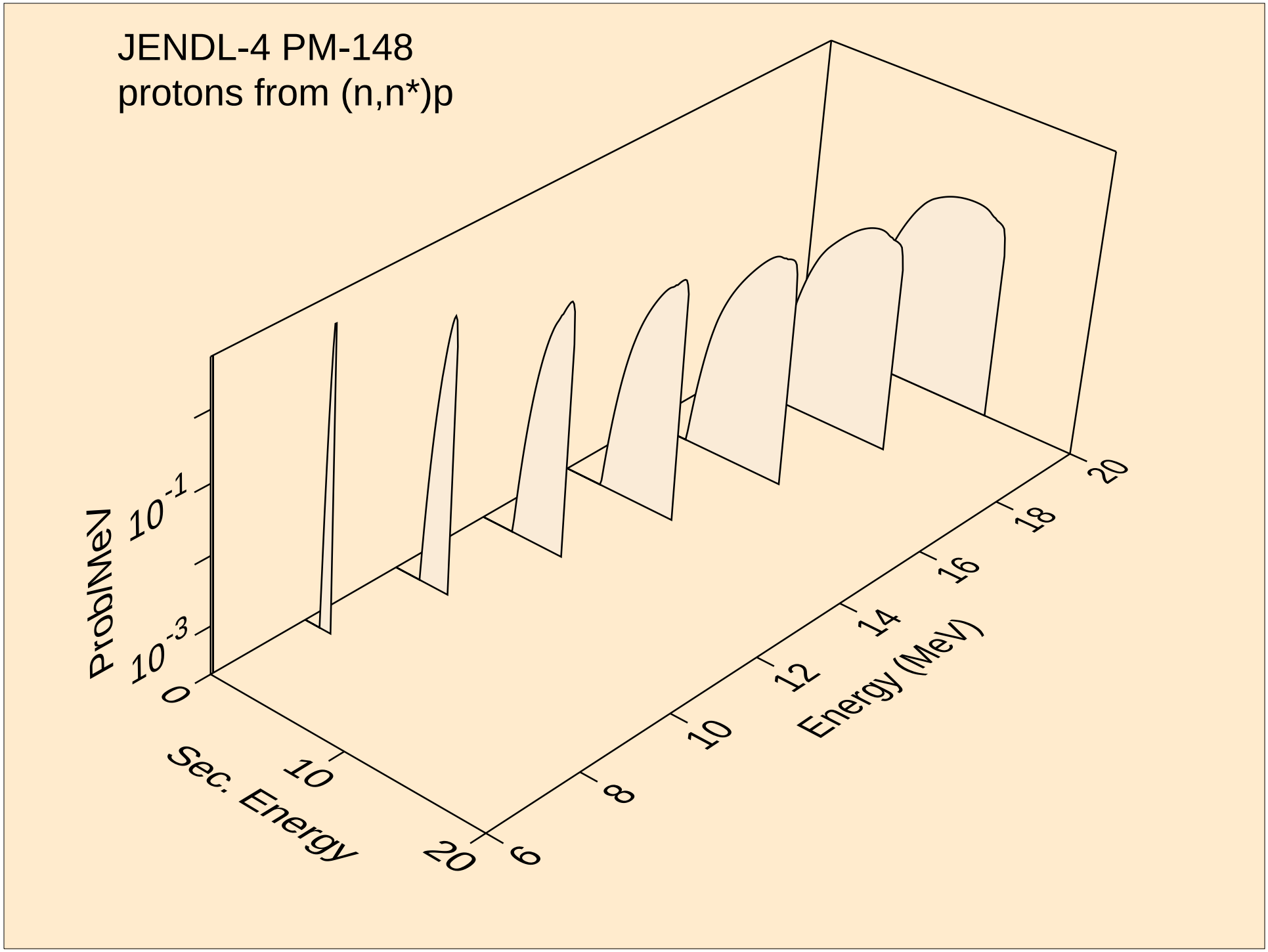

JENDL-4 PM-148
thermal capture photon spectrum
Gamma Prod (barns/MeV)
10^3
10^2
10^1
0
2
4
6
8
Gamma Energy (MeV)

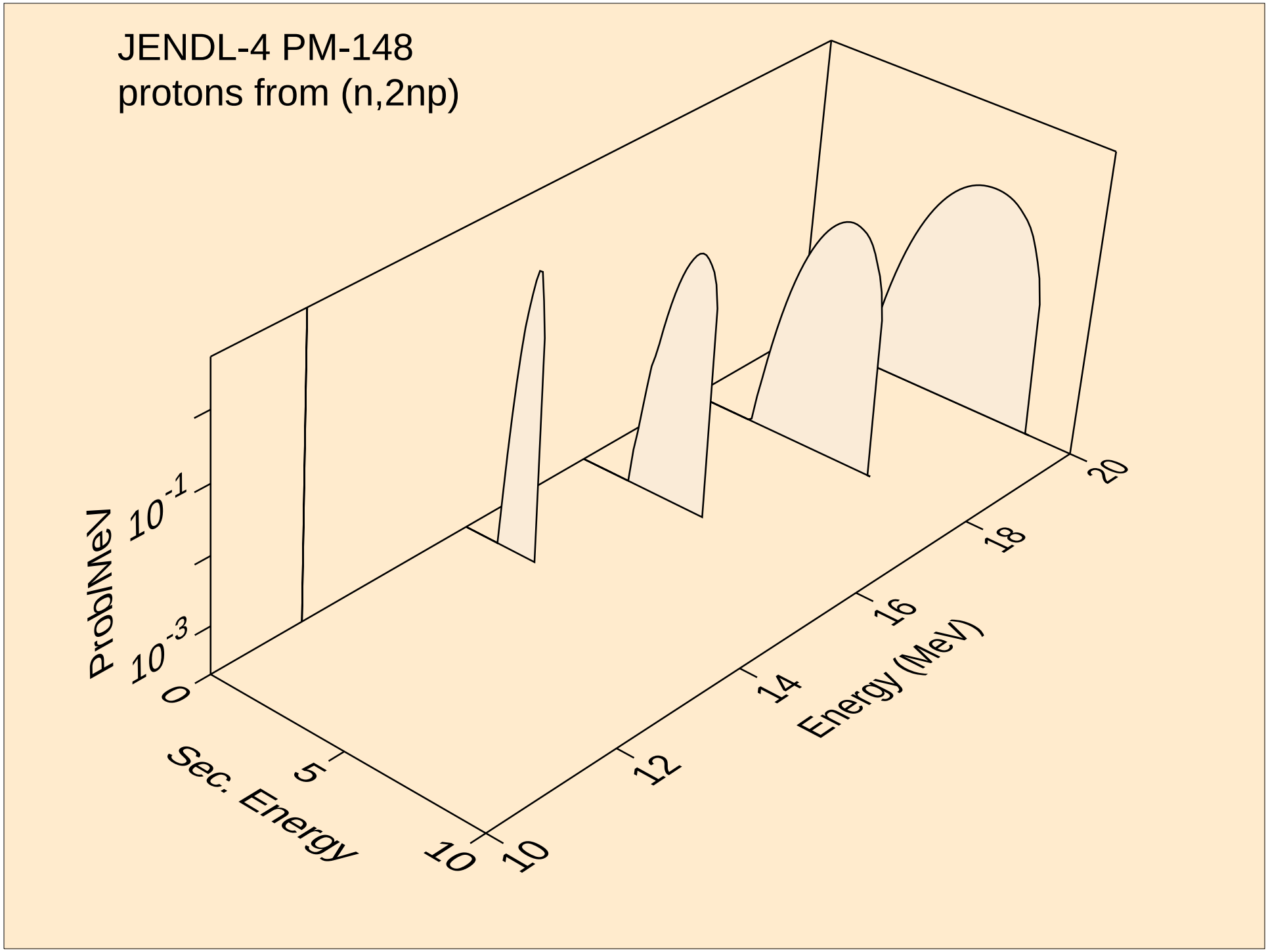

JENDL-4 PM-148
14 MeV photon spectrum
Gamma Prod (barns/MeV)
10^2
10^-1
10^-4
10^-7
10^-10
10^-13
10^-16
10^-19
0
10
20
30
Gamma Energy (MeV)

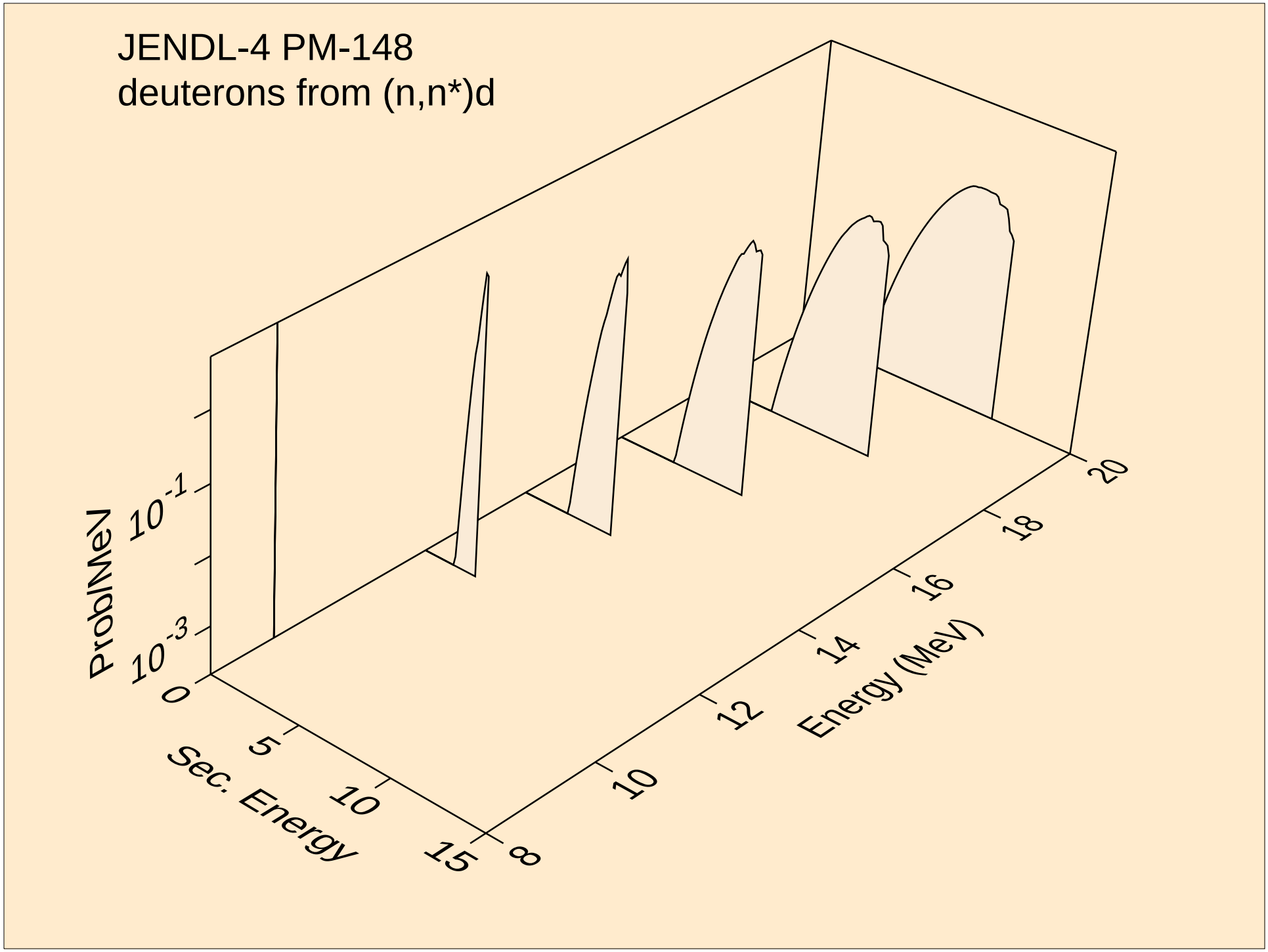

JENDL-4 PM-148
Particle heating contributions
100
*10-3
80
60
40
20
0
MeV/collision
protons
deuterons
tritons
alphas
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

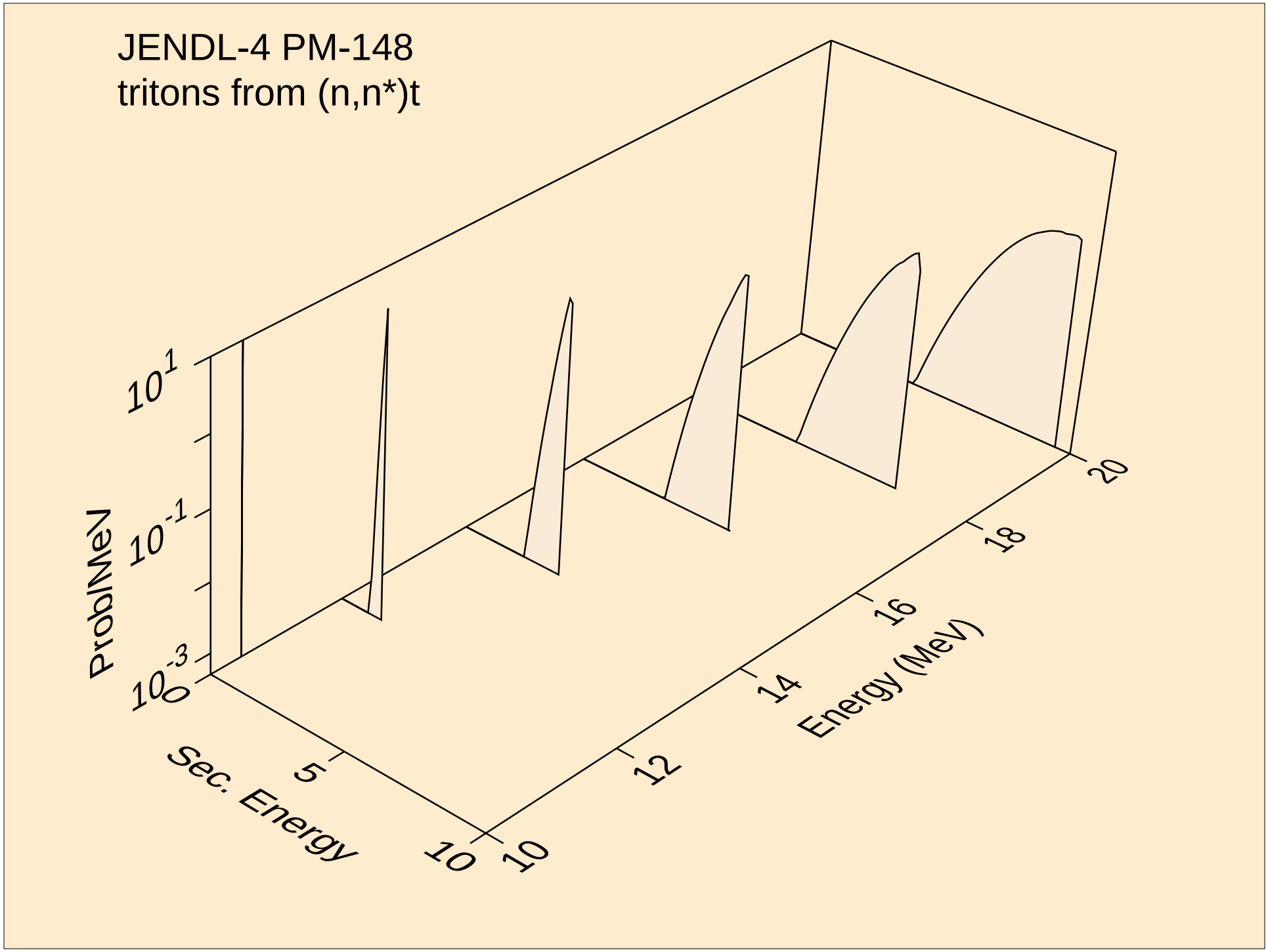

JENDL-4 PM-148
Recoil Heating
recoil heating
Heating (MeV/reaction)
*10^-3
300
250
200
150
100
50
0
0
5
10
15
20
Energy (MeV)

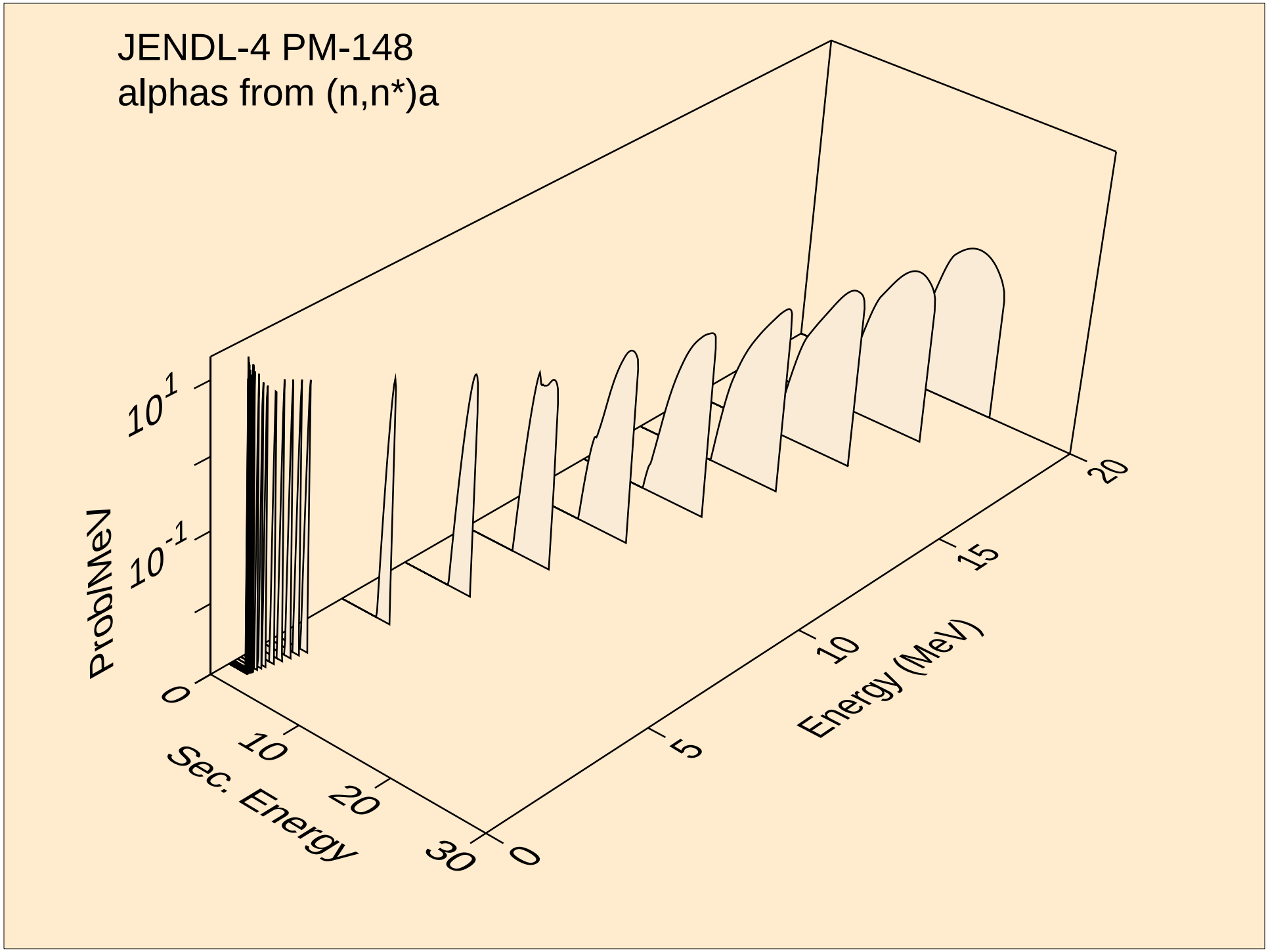

JENDL-4 PM-148
Particle production cross sections
protons
deuterons
tritons
alphas
Cross section (barns)
*10^-3
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

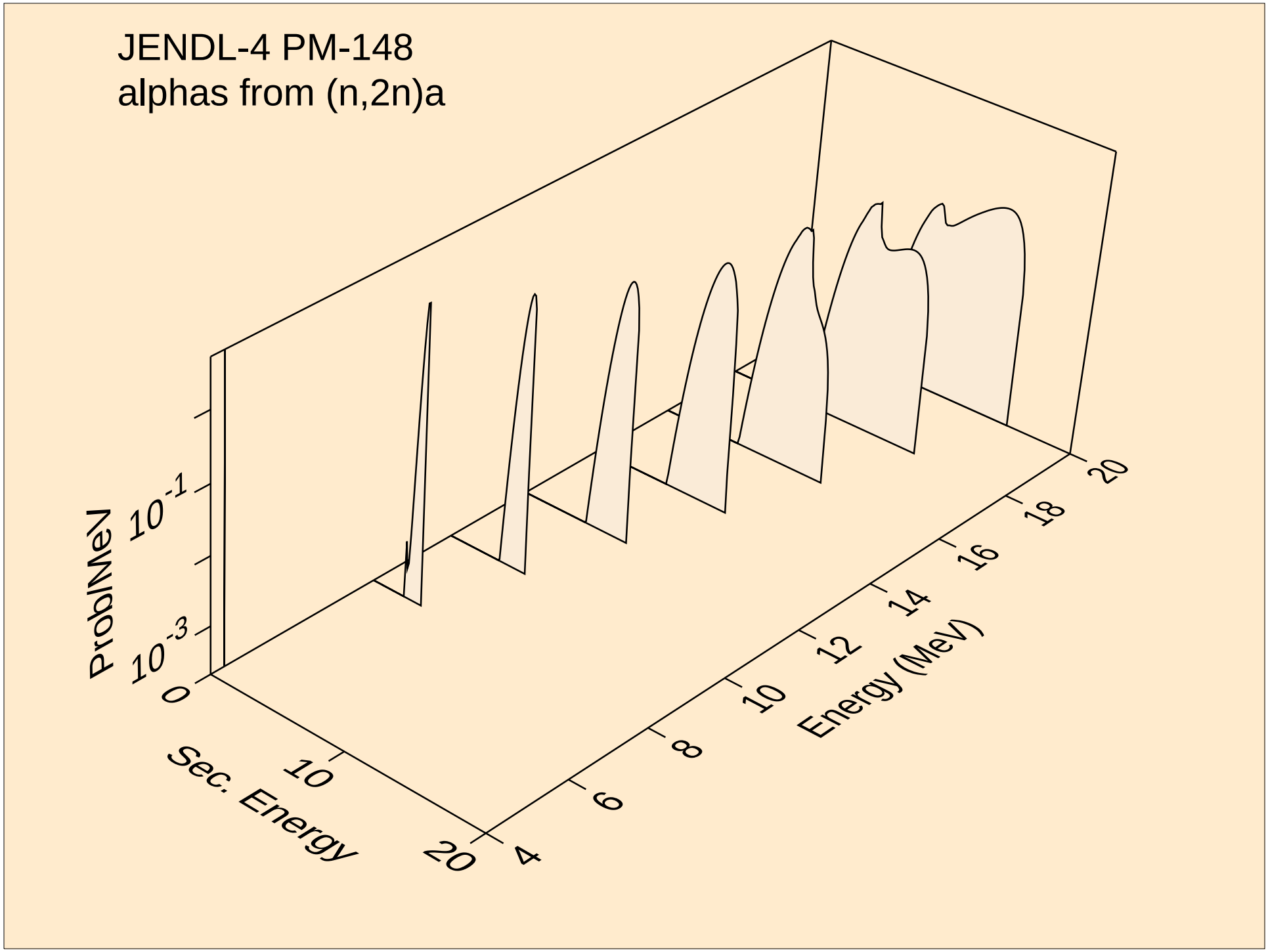

JENDL-4 PM-148
protons from (n,n*)p
Prob/MeV
10^-1
10^-3
0
Sec. Energy
10
20
6
8
10
12
14
16
18
20
Energy (MeV)


JENDL-4 PM-148
protons from (n,2np)
Prob/MeV
10^-1
10^-3
0
Sec. Energy
5
10
10
12
14
16
18
20
Energy (MeV)


JENDL-4 PM-148
deuterons from (n,n*)d
Prob/MeV
10-1
10-3
0
5
10
15
Sec. Energy
8
10
12
14
16
18
20
Energy (MeV)


JENDL-4 PM-148
tritons from (n,n*)t
Prob/MeV
10^1
10^-1
10^-3
Sec. Energy
0
5
10
Energy (MeV)
10
12
14
16
18
20


JENDL-4 PM-148
alphas from (n,n*)a
Prob/MeV
10^{1}
10^{-1}
0
10
20
30
Sec. Energy
0
5
10
15
20
Energy (MeV)


JENDL-4 PM-148
alphas from (n,2n)a
Prob/MeV
10^-1
10^-3
0
Sec. Energy
10
20
4
6
8
10
12
14
16
18
20
Energy (MeV)