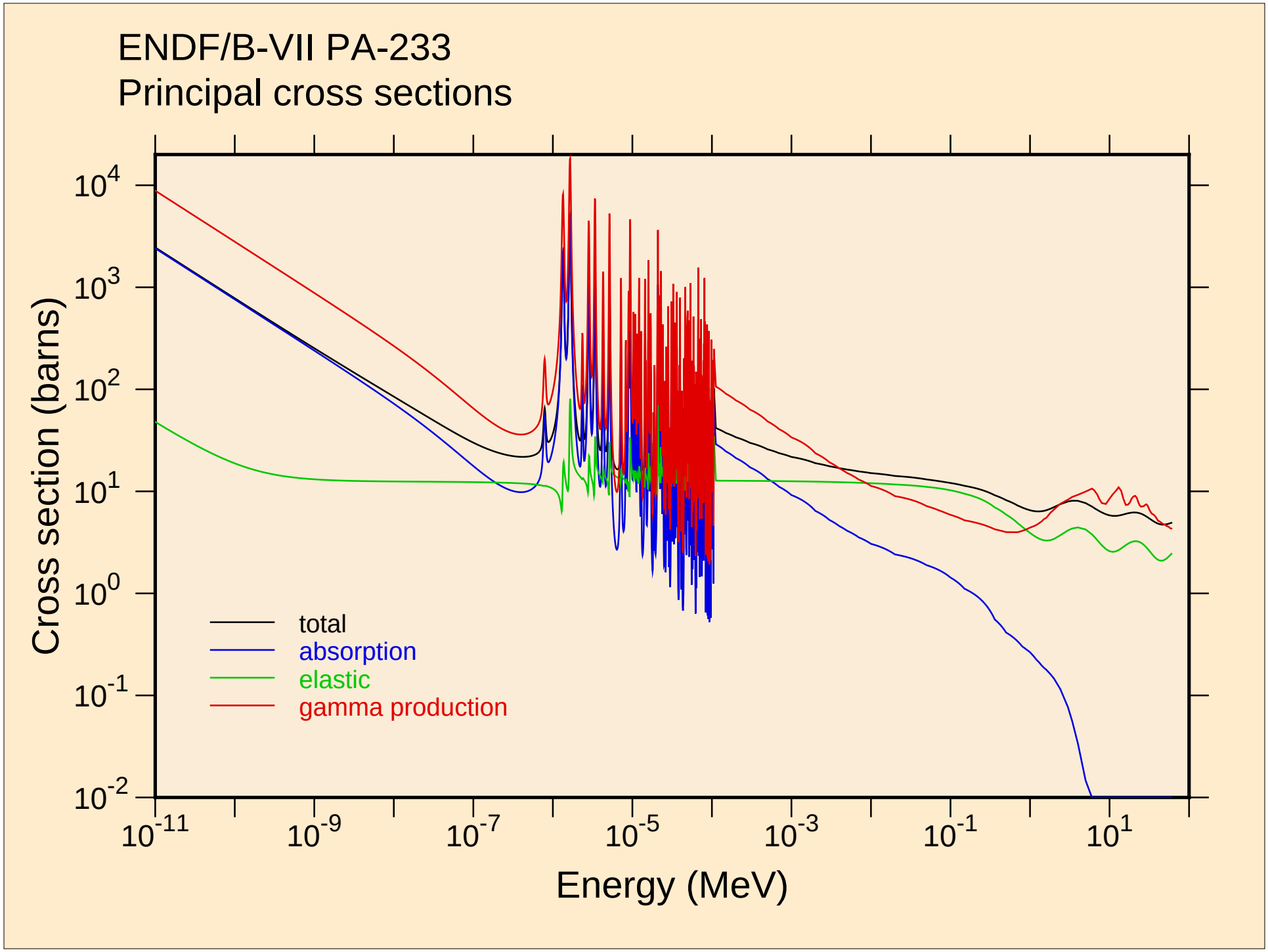
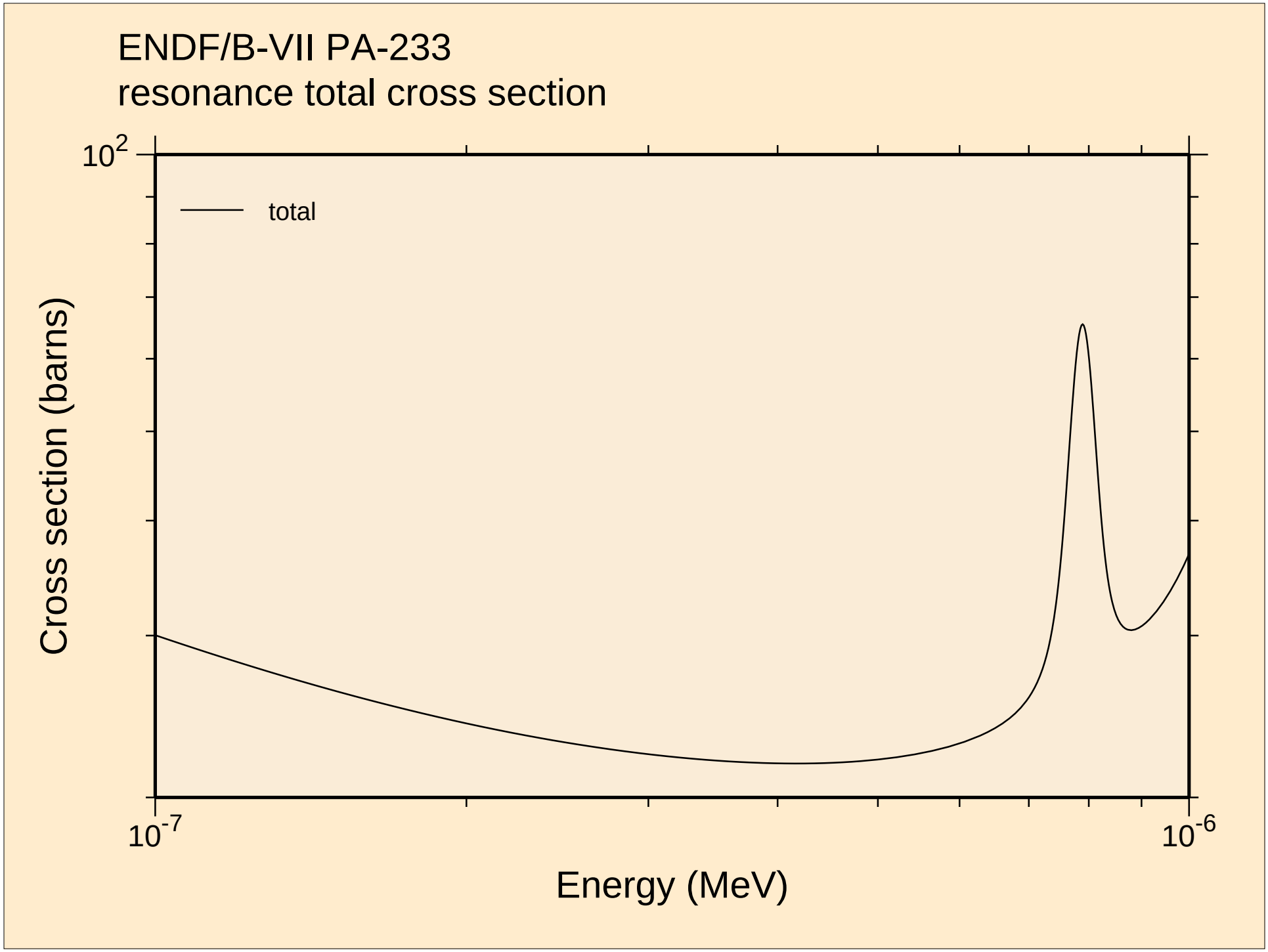
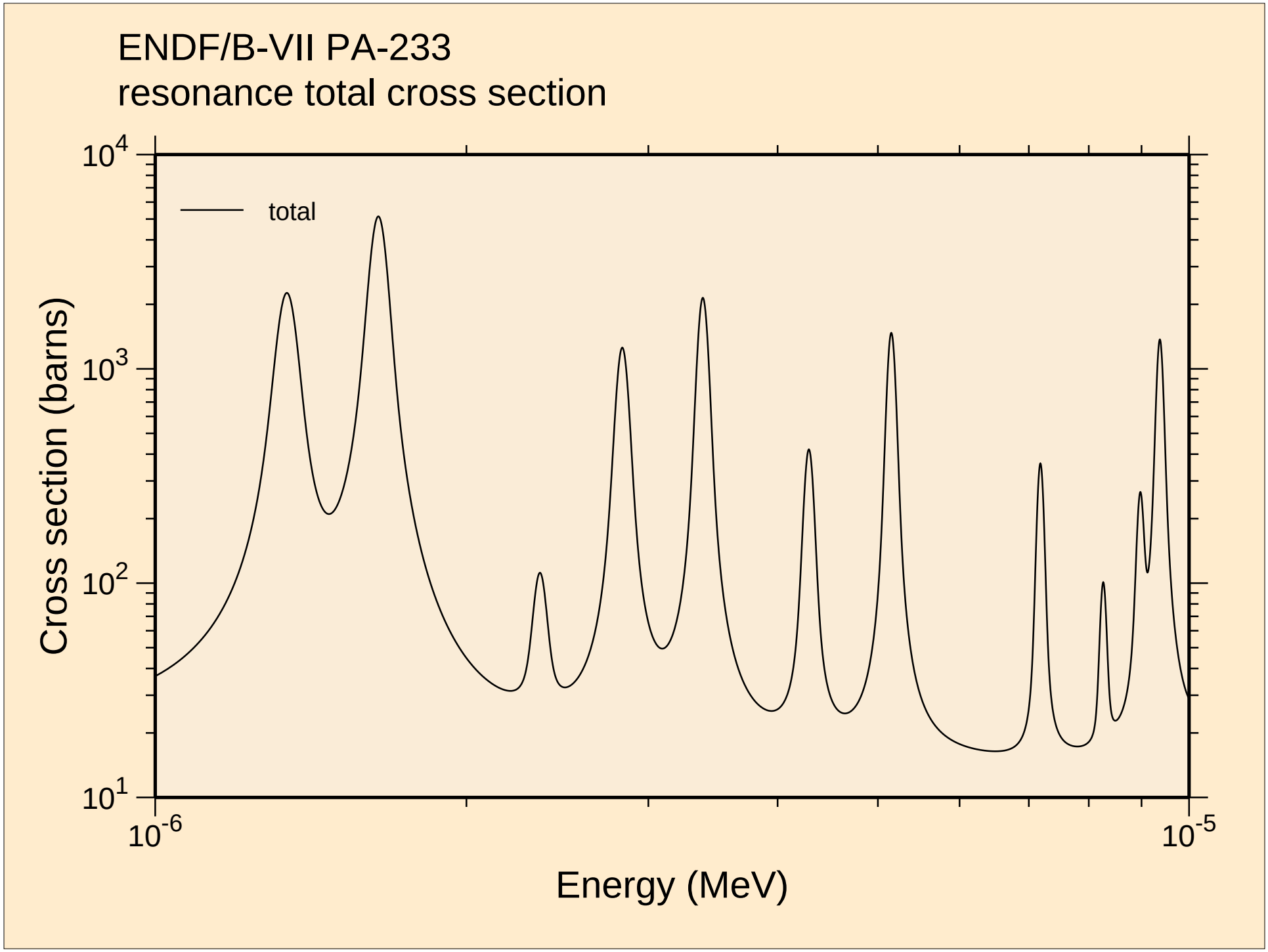
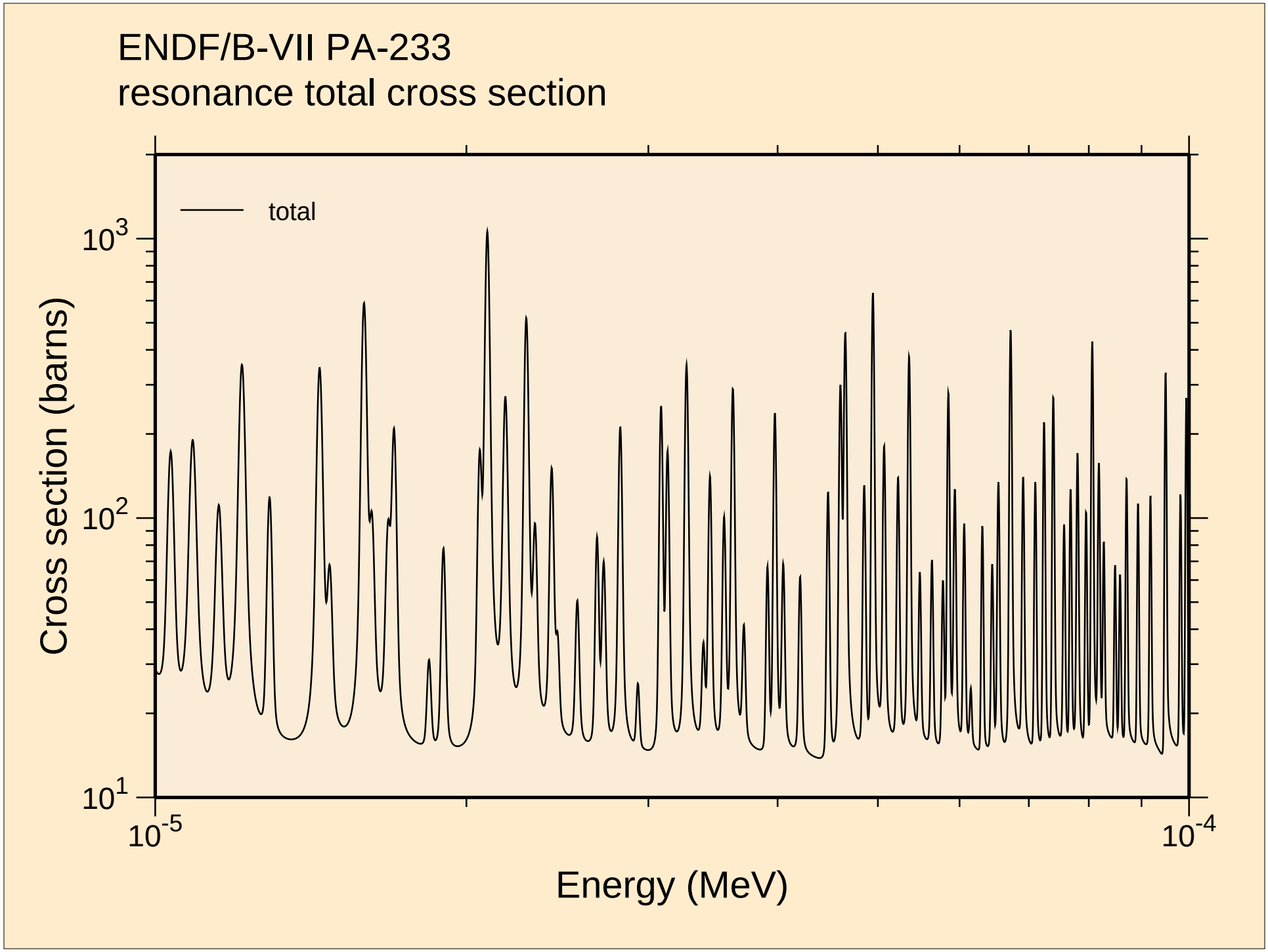
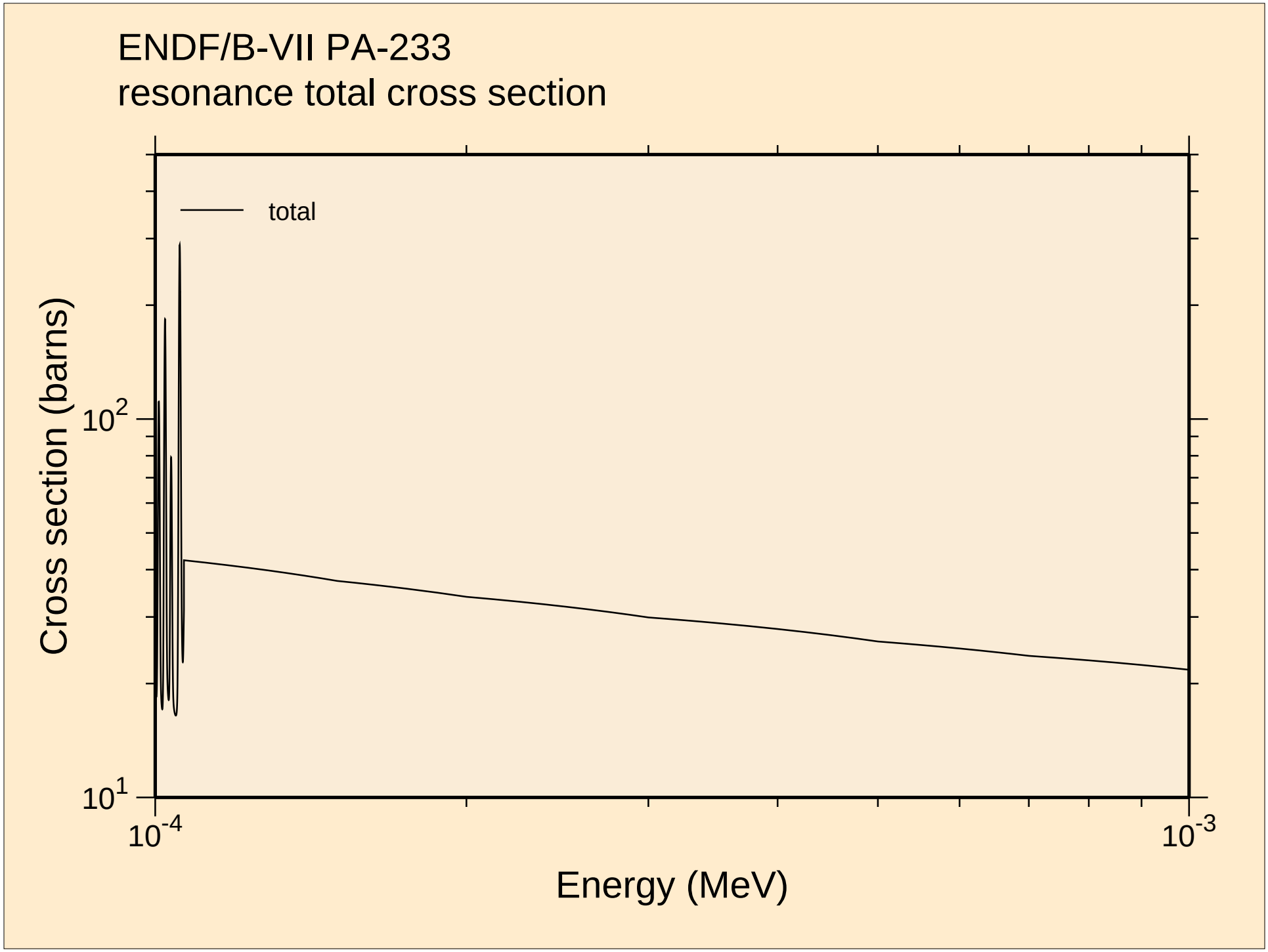
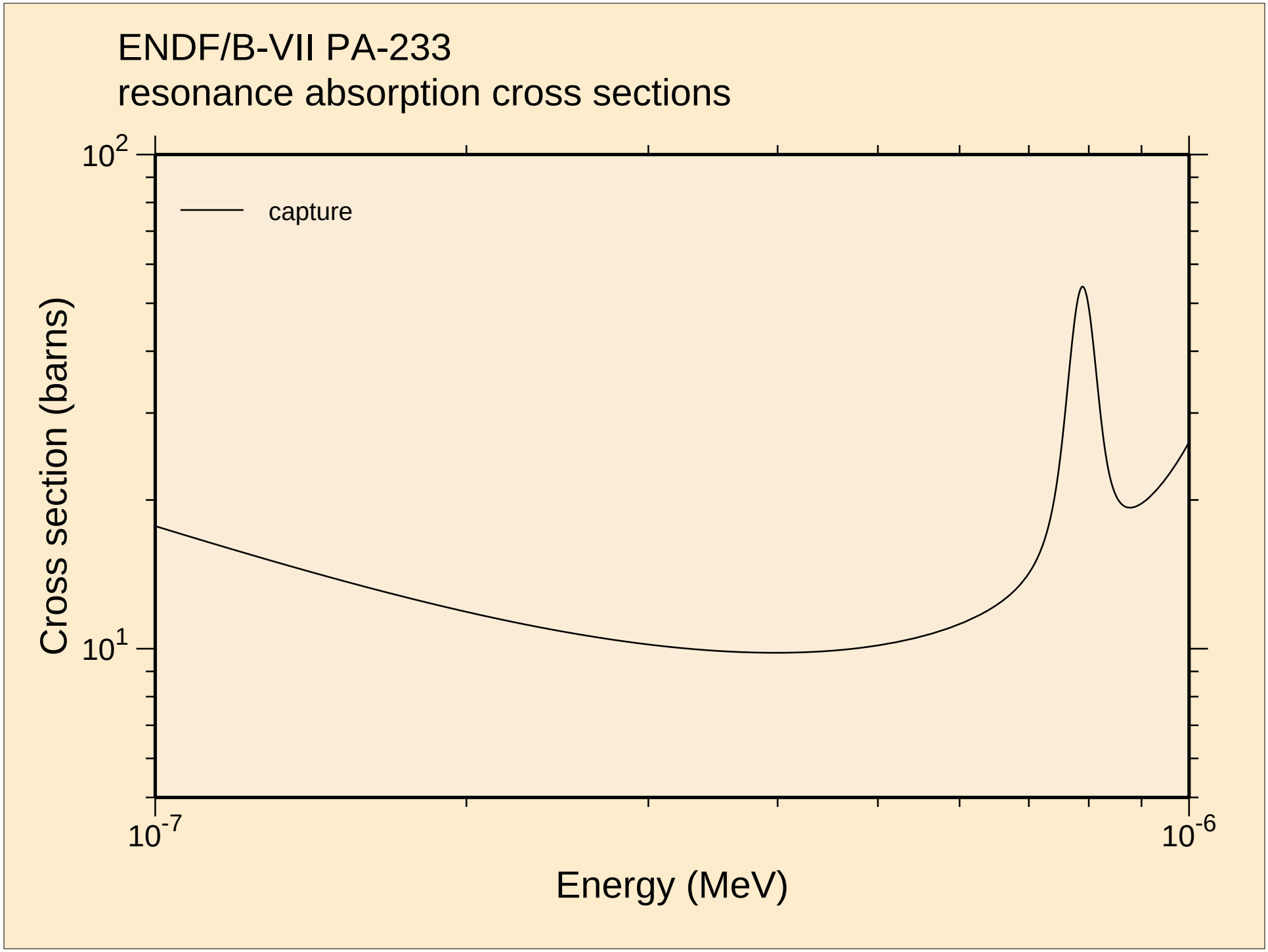

ENDF/B-VII PA-233
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-11}
10^{-9}
10^{-7}
10^{-5}
10^{-3}
10^{-1}
10^{1}


ENDF/B-VII PA-233
resonance total cross section
total
Cross section (barns)
Energy (MeV)
10^2
10^{-7}
10^{-6}

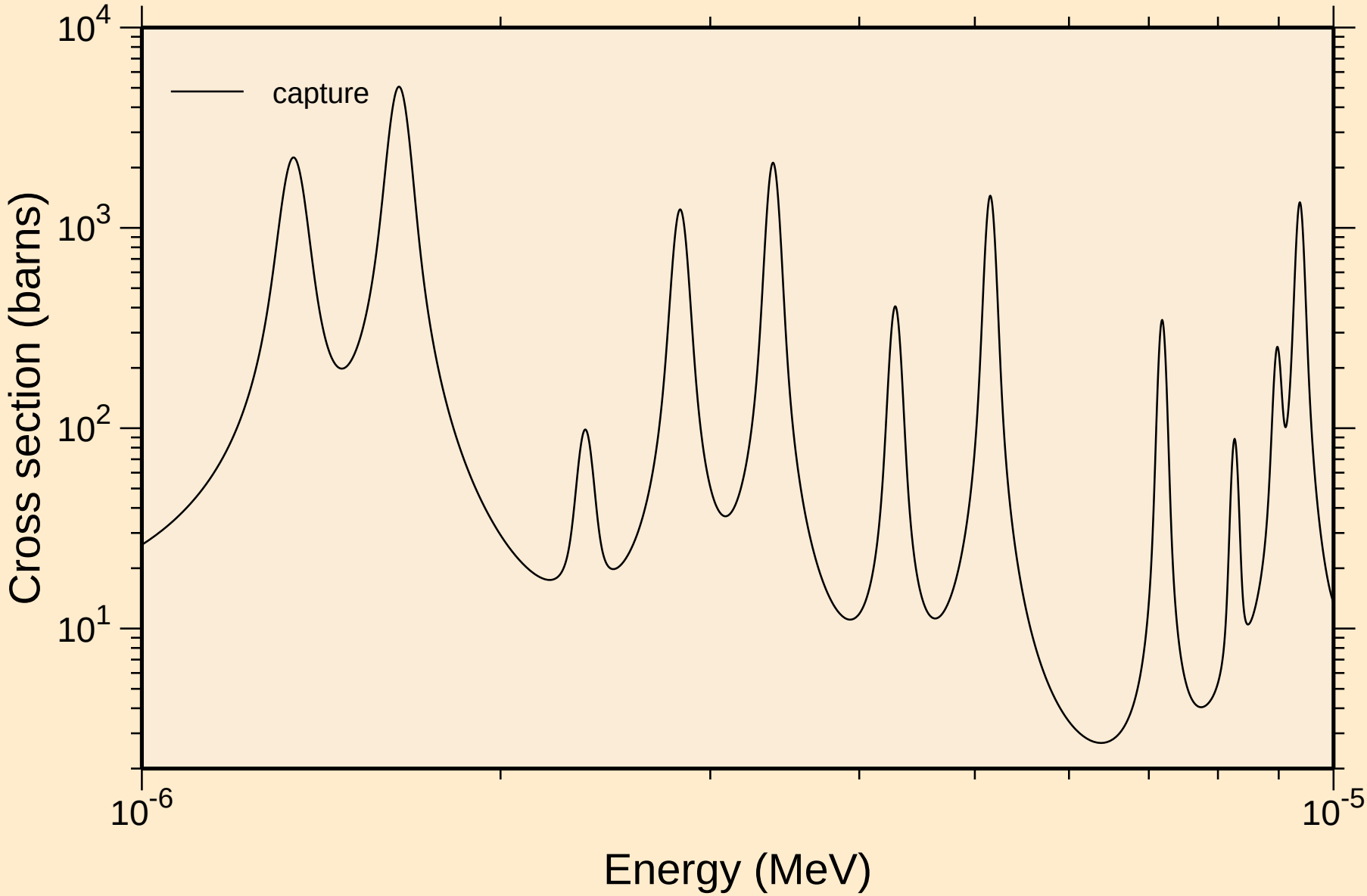

ENDF/B-VII PA-233
resonance total cross section
total
Cross section (barns)
Energy (MeV)
10^4
10^3
10^2
10^1
10^{-6}
10^{-5}


ENDF/B-VII PA-233
resonance total cross section
total
Cross section (barns)
10^3
10^2
10^1
10^{-5}
10^{-4}
Energy (MeV)

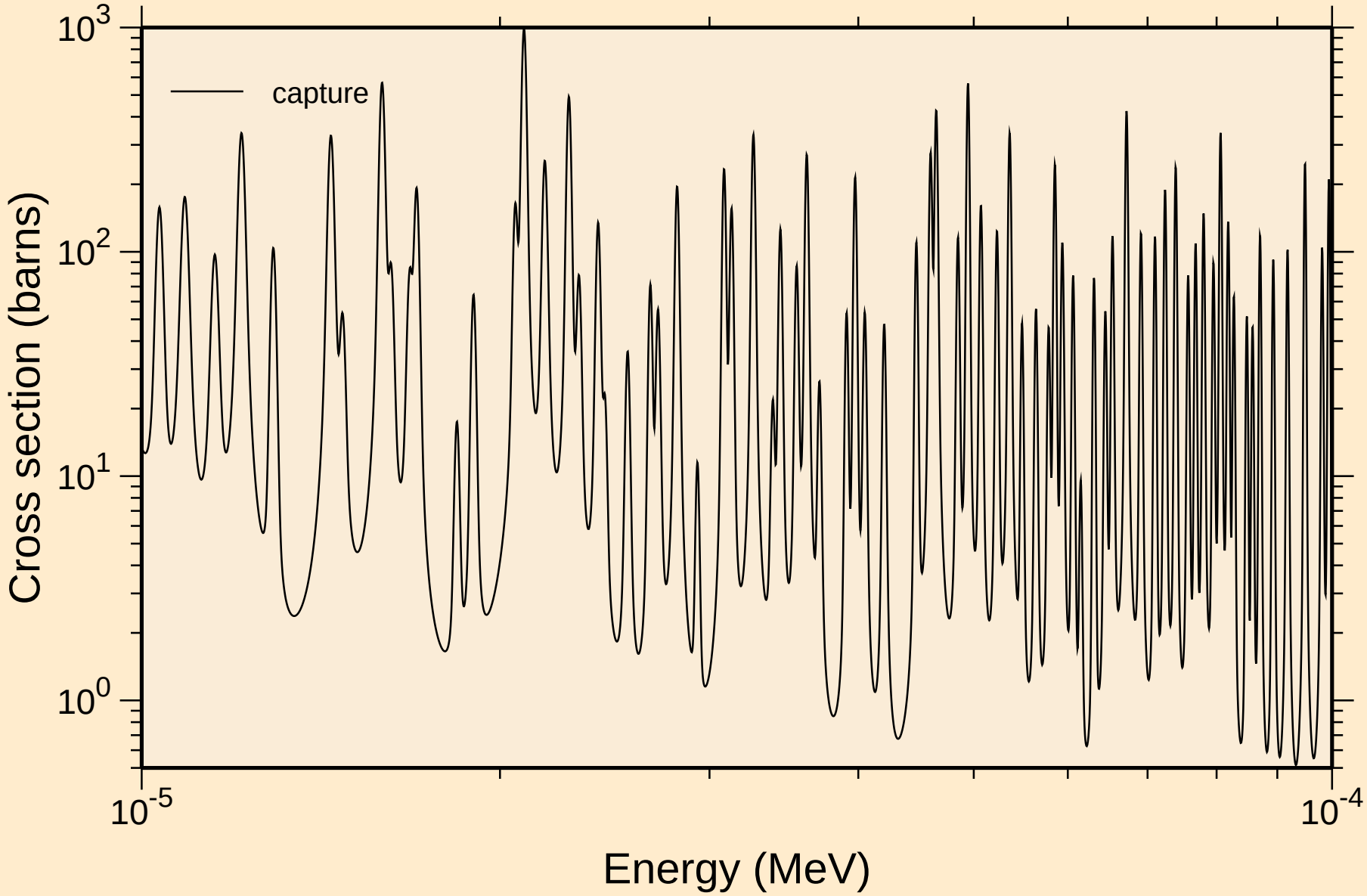

ENDF/B-VII PA-233
resonance total cross section
total
Cross section (barns)
10^2
10^1
10^{-4}
10^{-3}
Energy (MeV)

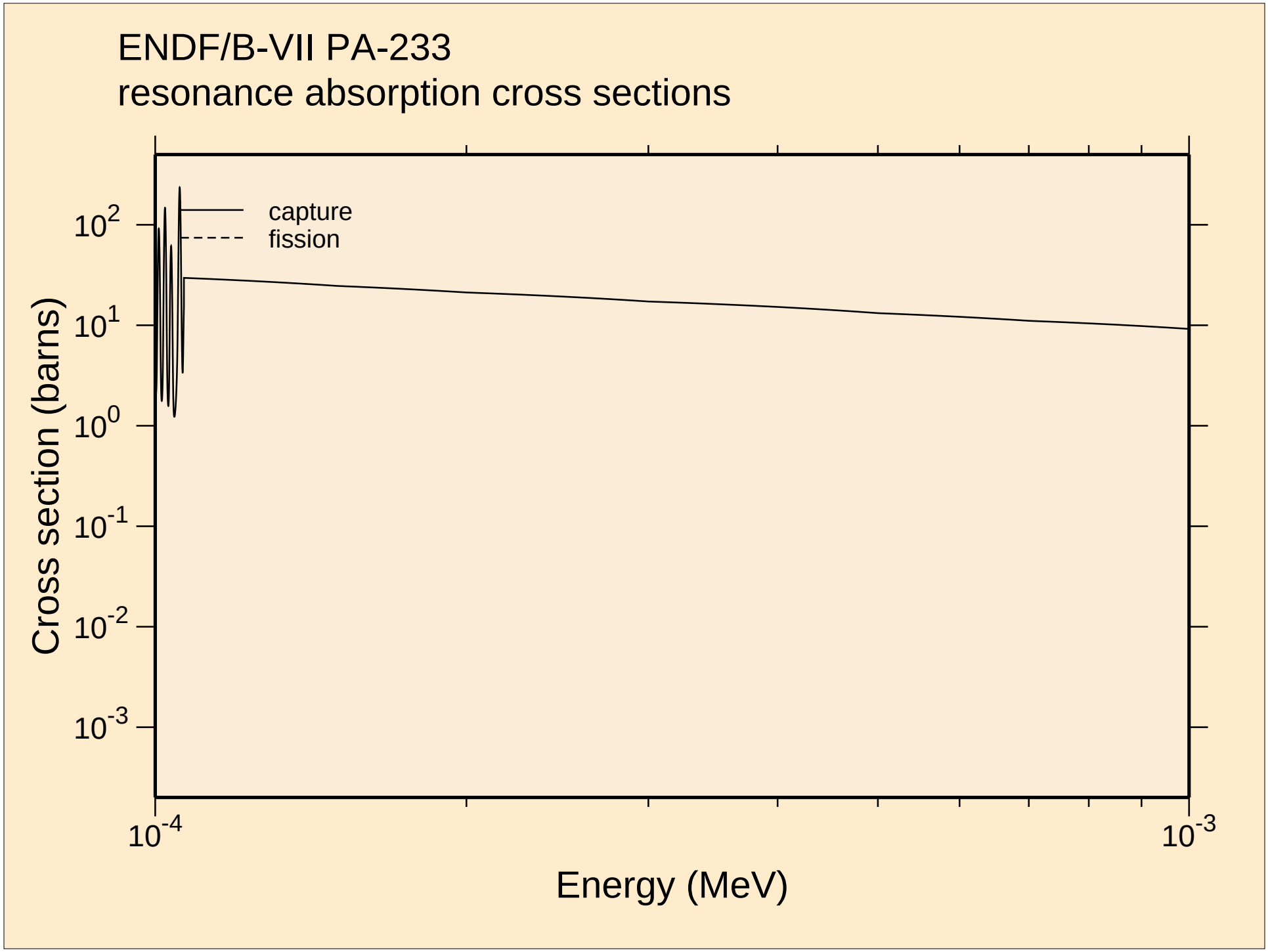

ENDF/B-VII PA-233
resonance absorption cross sections
capture
Cross section (barns)
10^2
10^1
10^{-7}
10^{-6}
Energy (MeV)

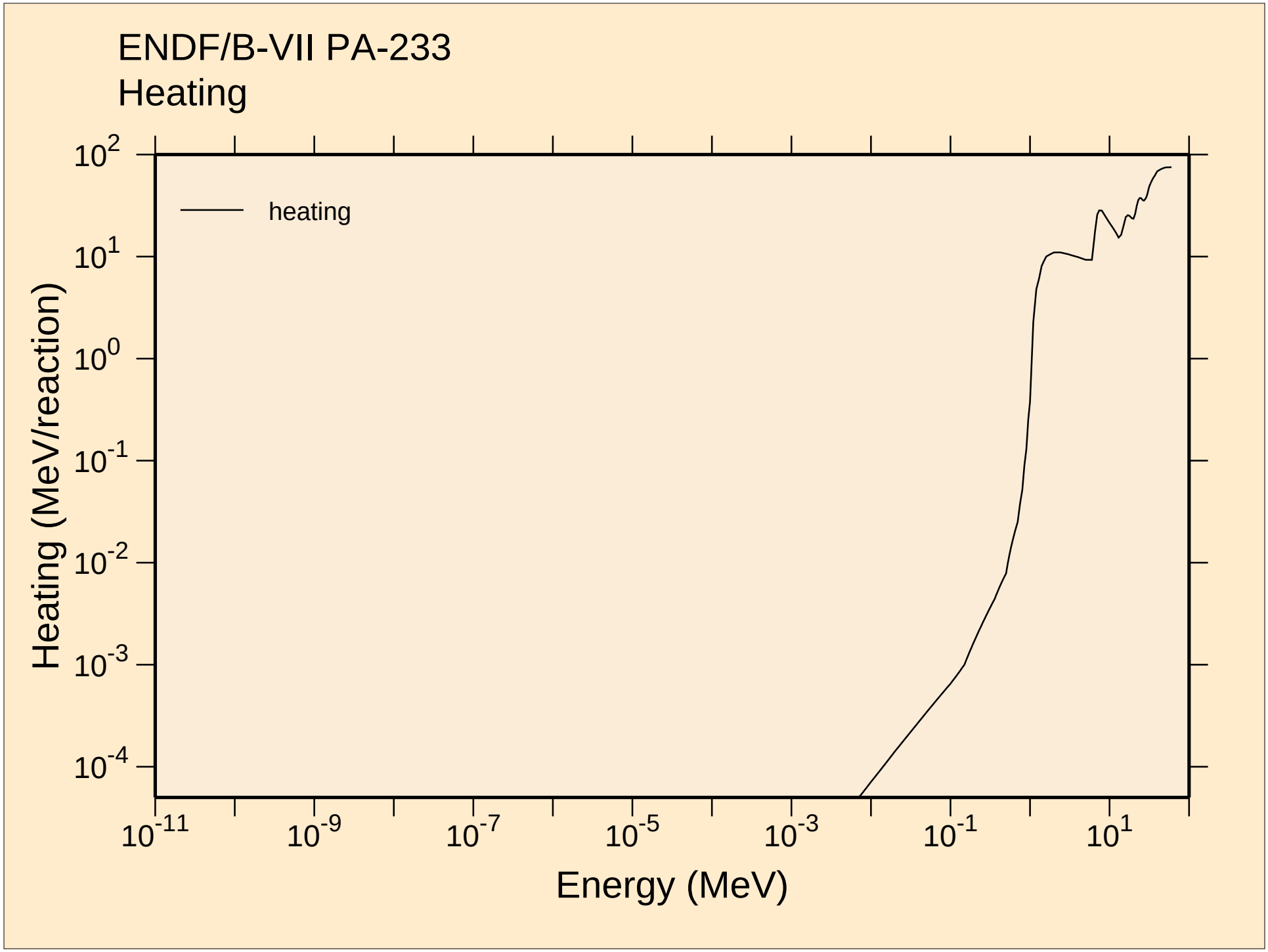
ENDF/B-VII PA-233
resonance absorption cross sections

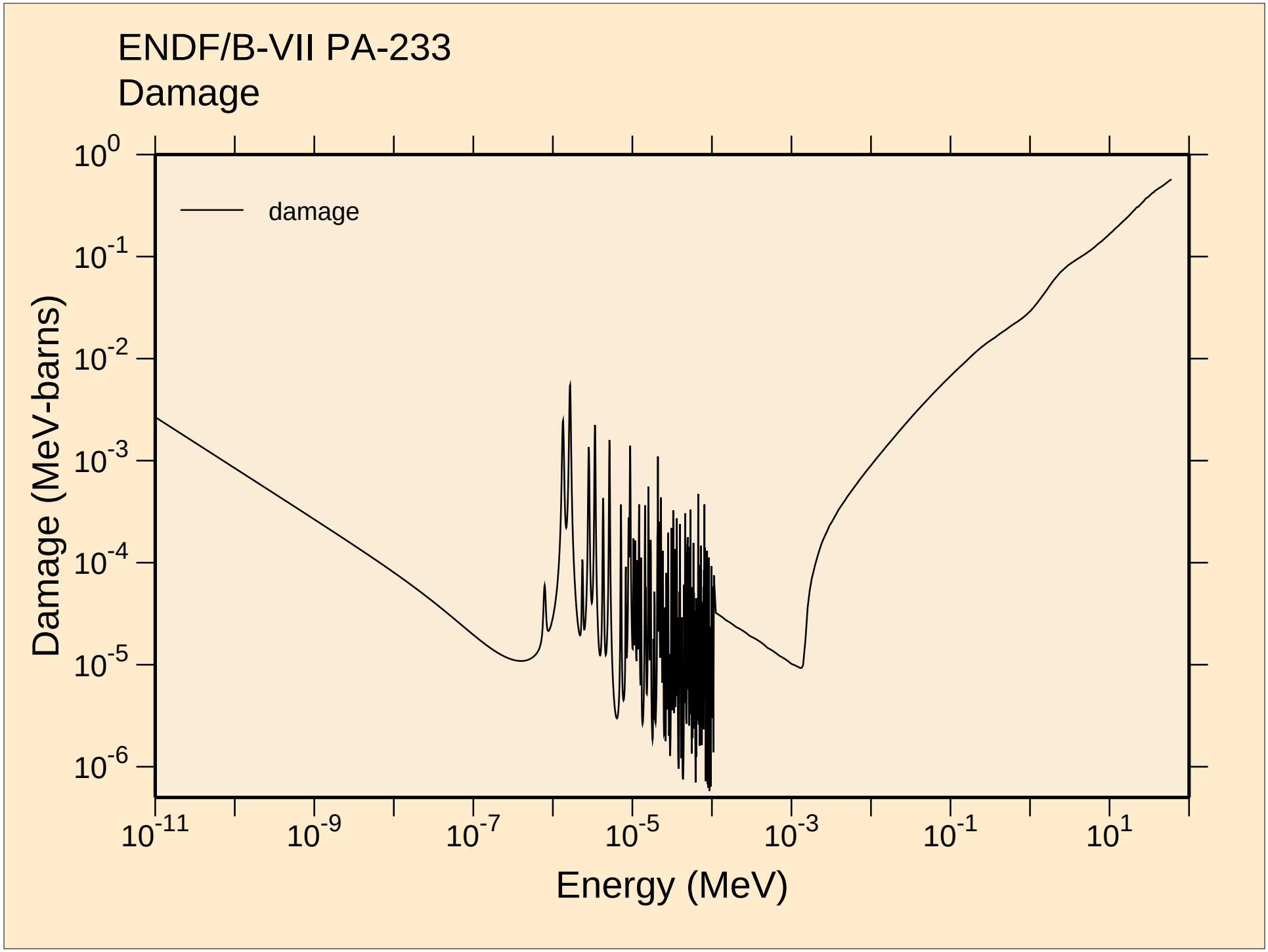


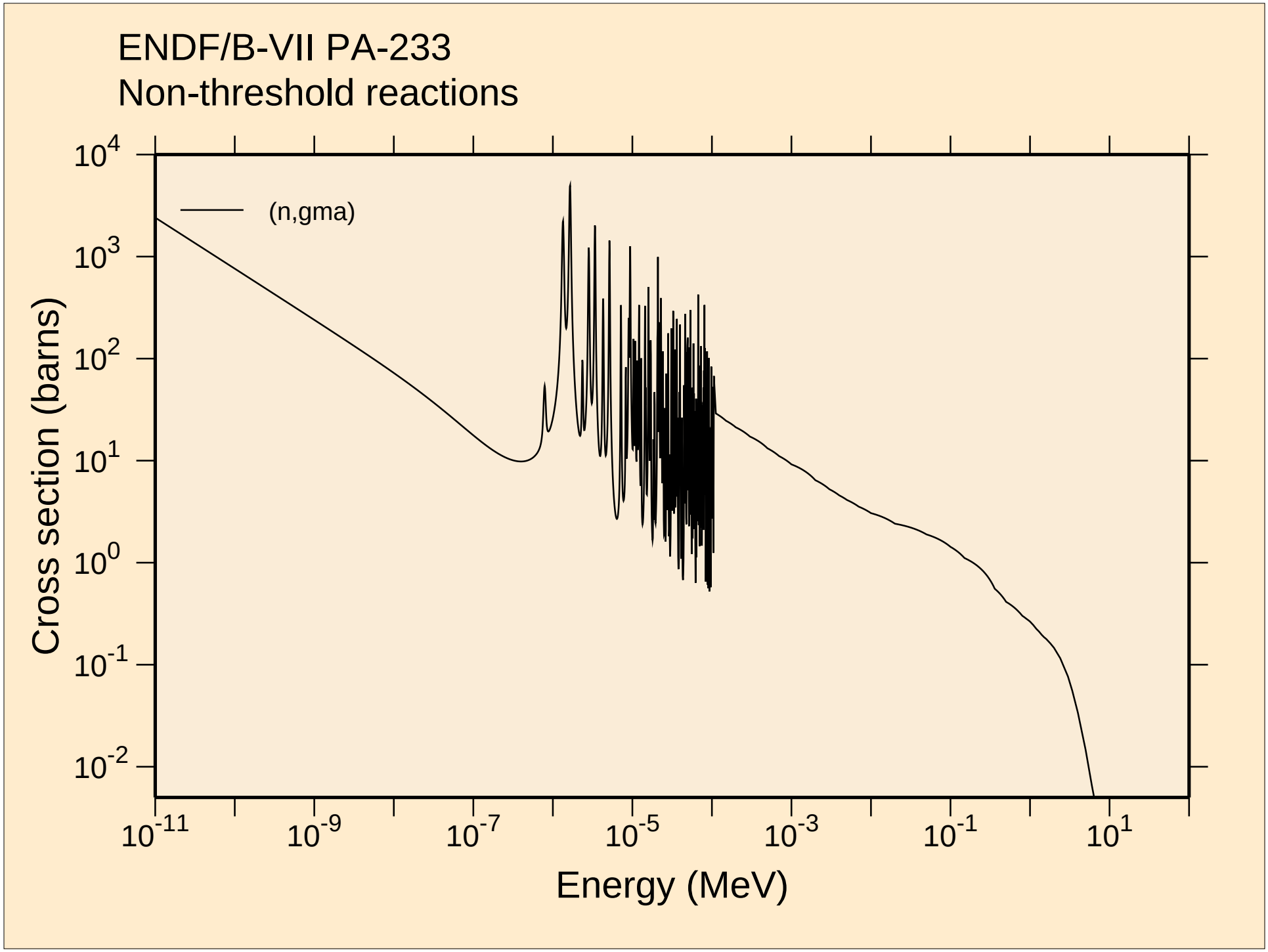
ENDF/B-VII PA-233
resonance absorption cross sections

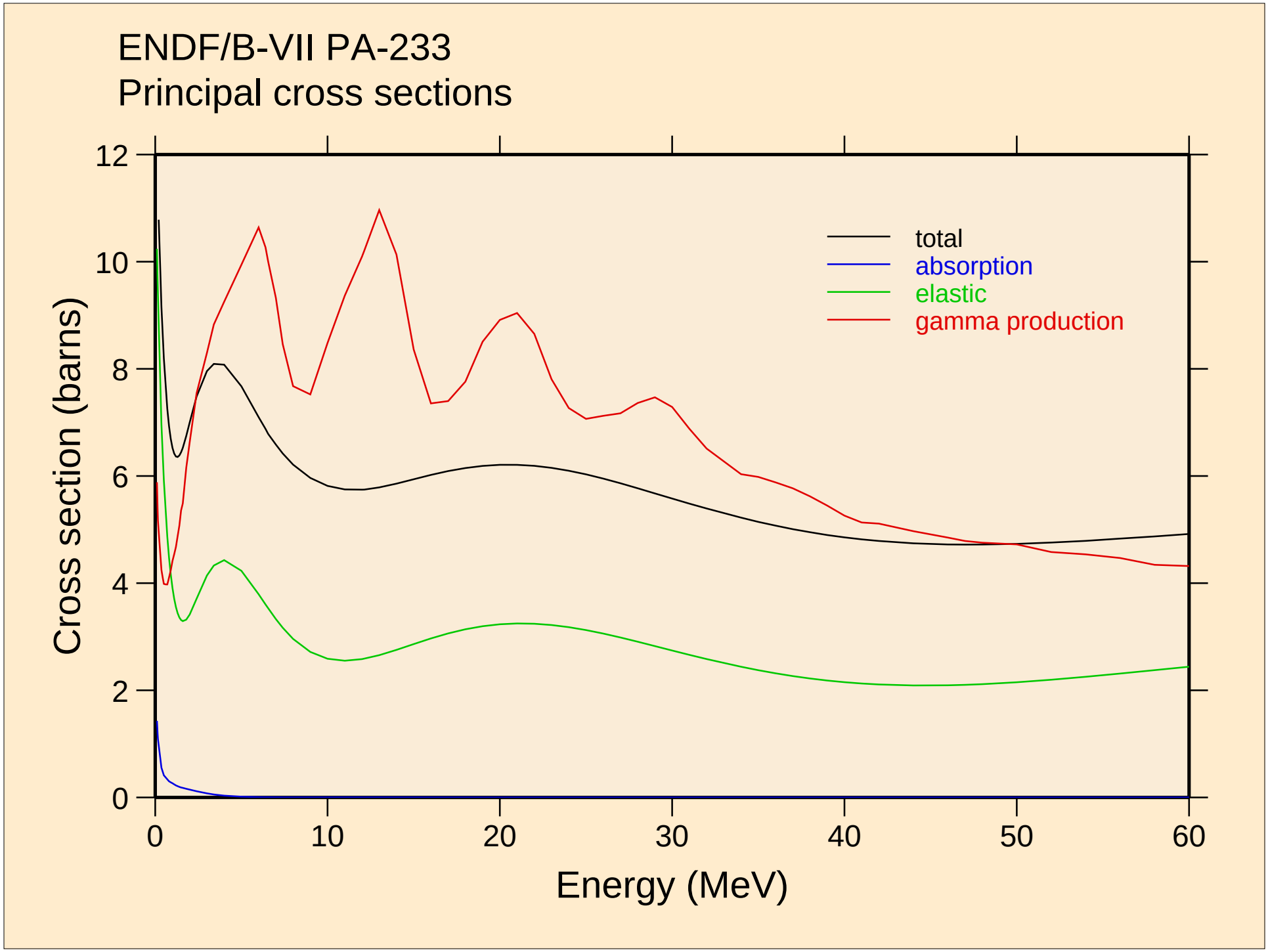


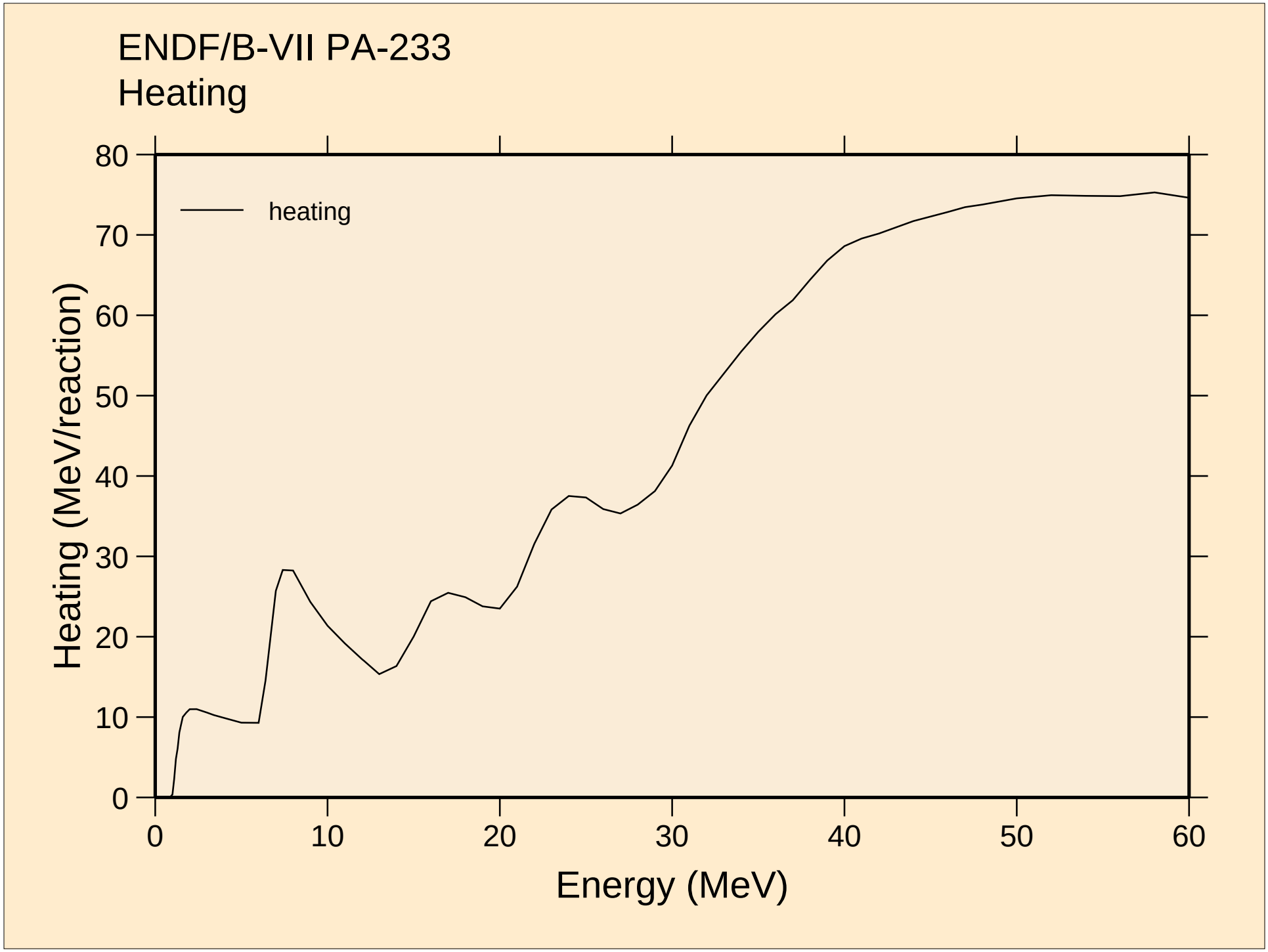

ENDF/B-VII PA-233
resonance absorption cross sections
capture
fission
Cross section (barns)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-3}
Energy (MeV)

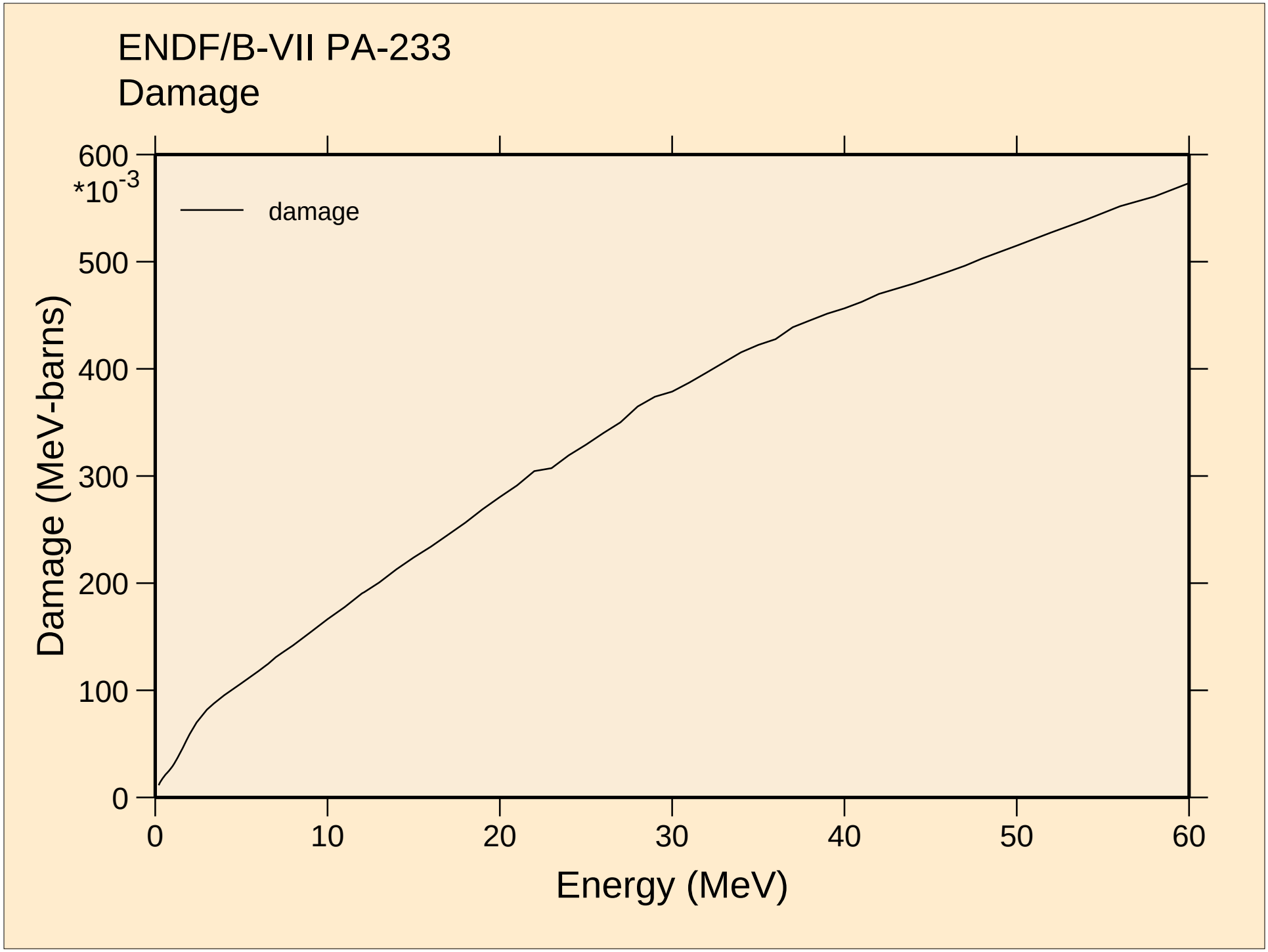

ENDF/B-VII PA-233
Heating
heating
Heating (MeV/reaction)
Energy (MeV)
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-11
10^-9
10^-7
10^-5
10^-3
10^-1
10^1

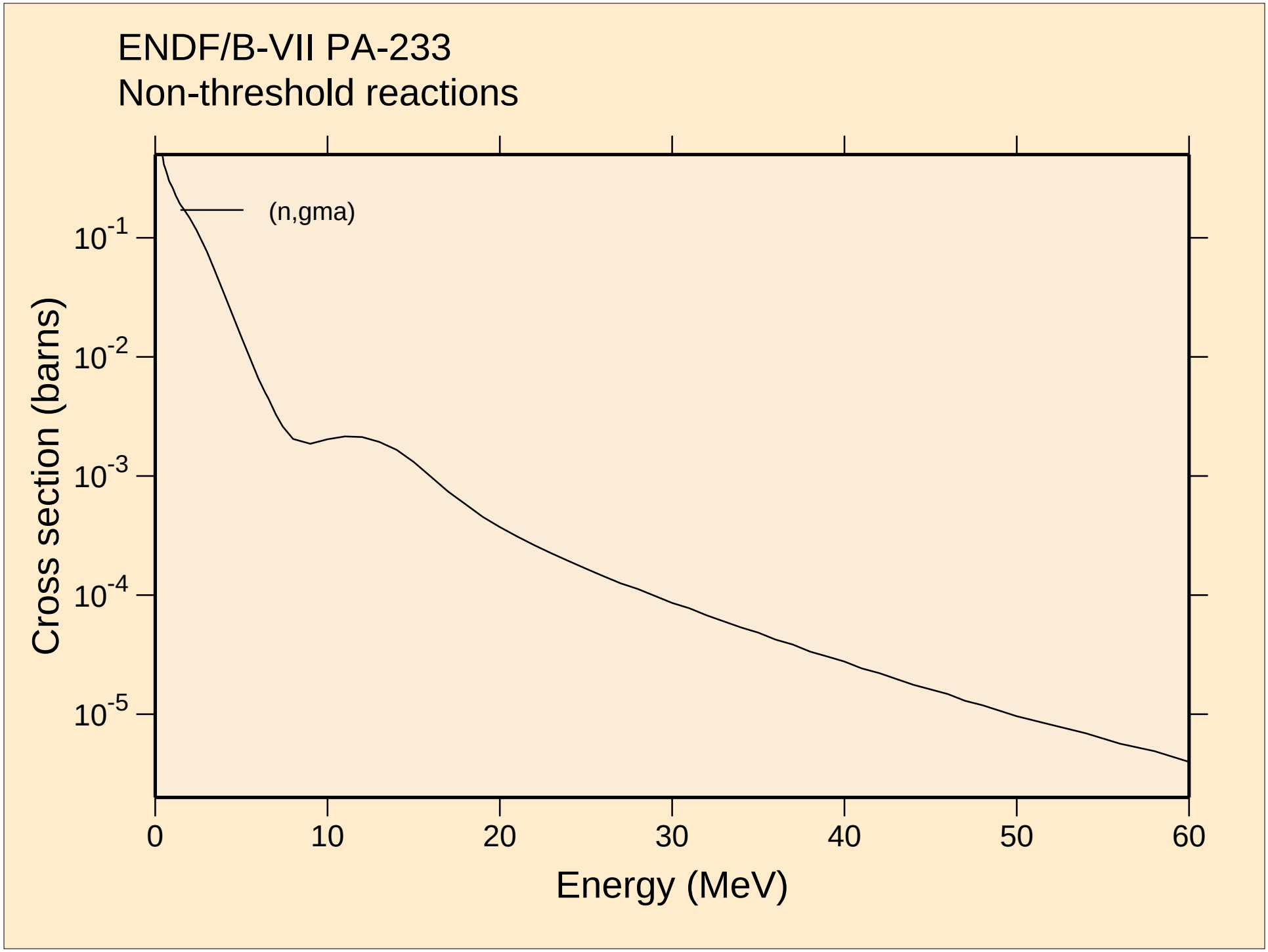

ENDF/B-VII PA-233
Damage
damage
Damage (MeV-barns)
Energy (MeV)
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
10^-6
10^-11
10^-9
10^-7
10^-5
10^-3
10^-1
10^1

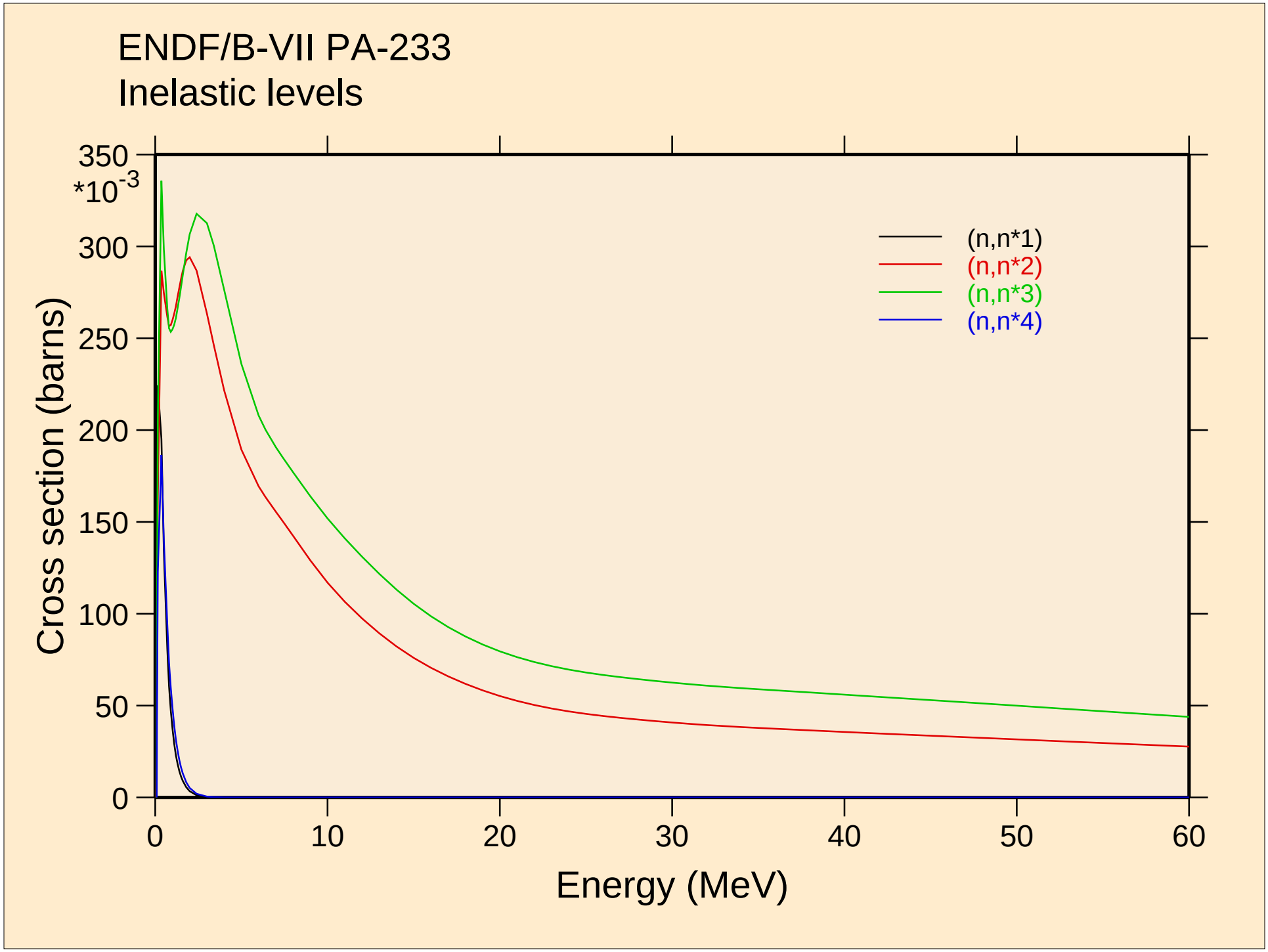

ENDF/B-VII PA-233
Non-threshold reactions
(n,gma)
Cross section (barns)
Energy (MeV)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-11
10^-9
10^-7
10^-5
10^-3
10^-1
10^1

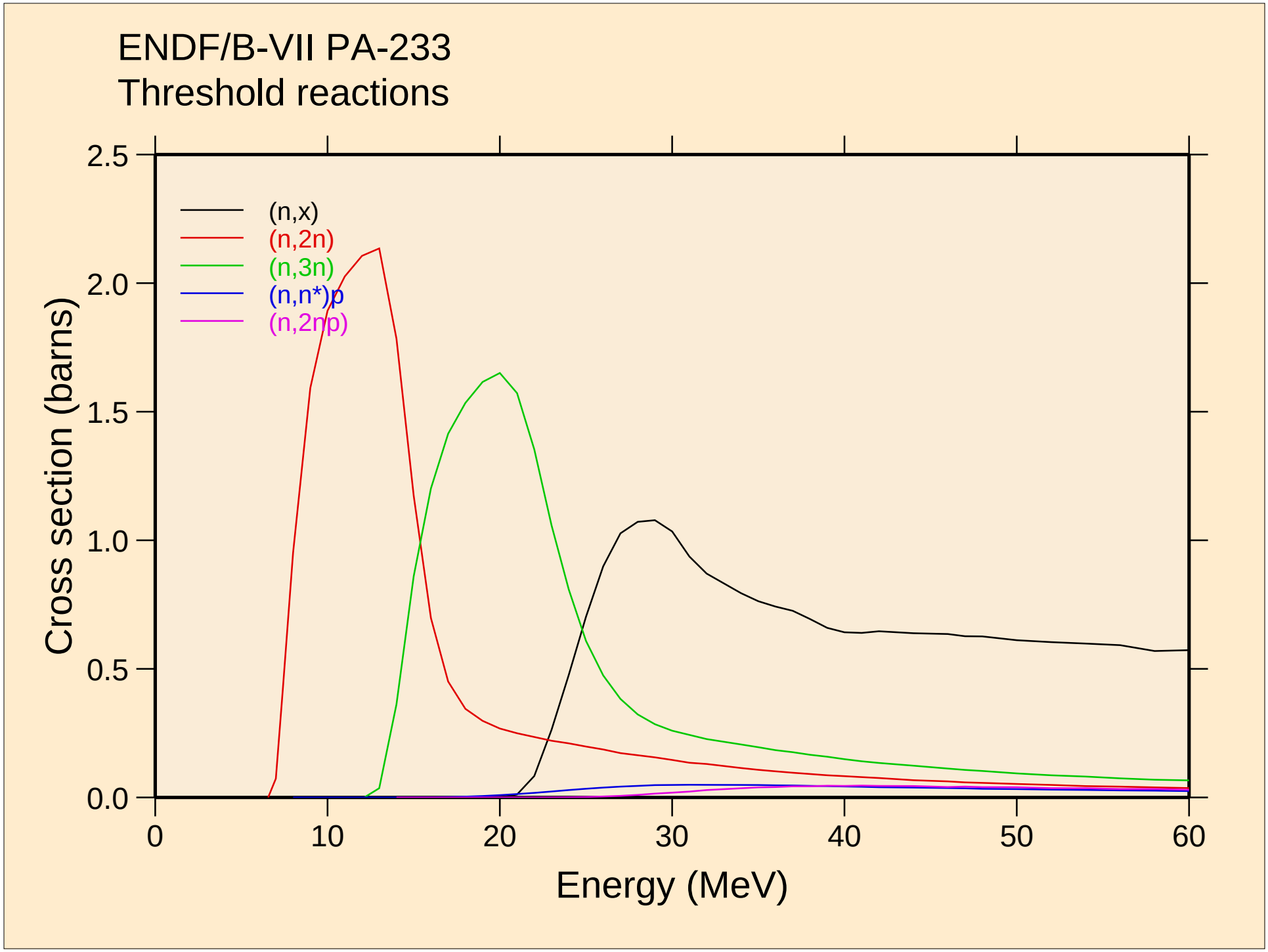

ENDF/B-VII PA-233
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
0
2
4
6
8
10
12
0
10
20
30
40
50
60

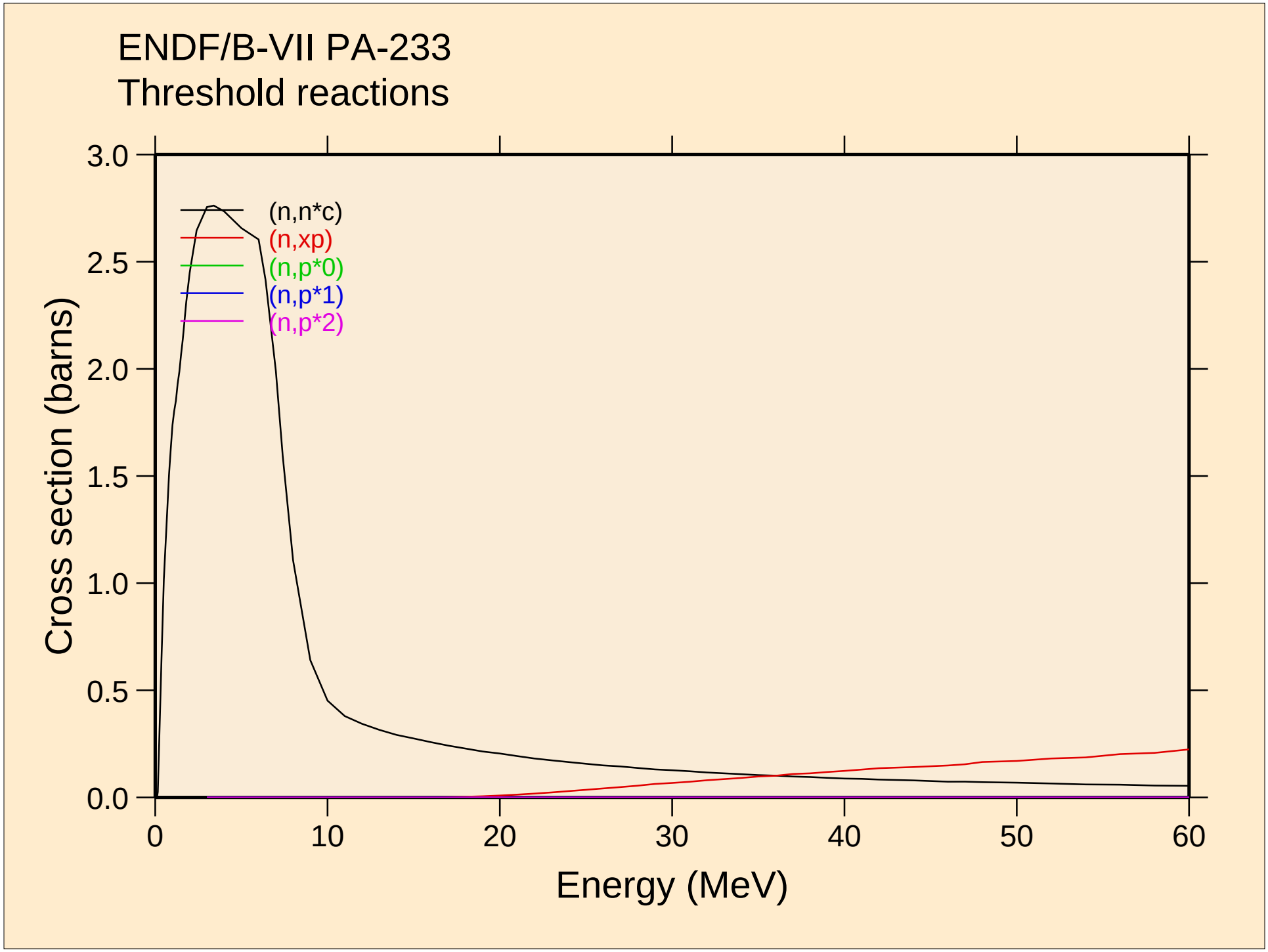

ENDF/B-VII PA-233
Heating
heating
Heating (MeV/reaction)
Energy (MeV)
0
10
20
30
40
50
60
70
80
0
10
20
30
40
50
60

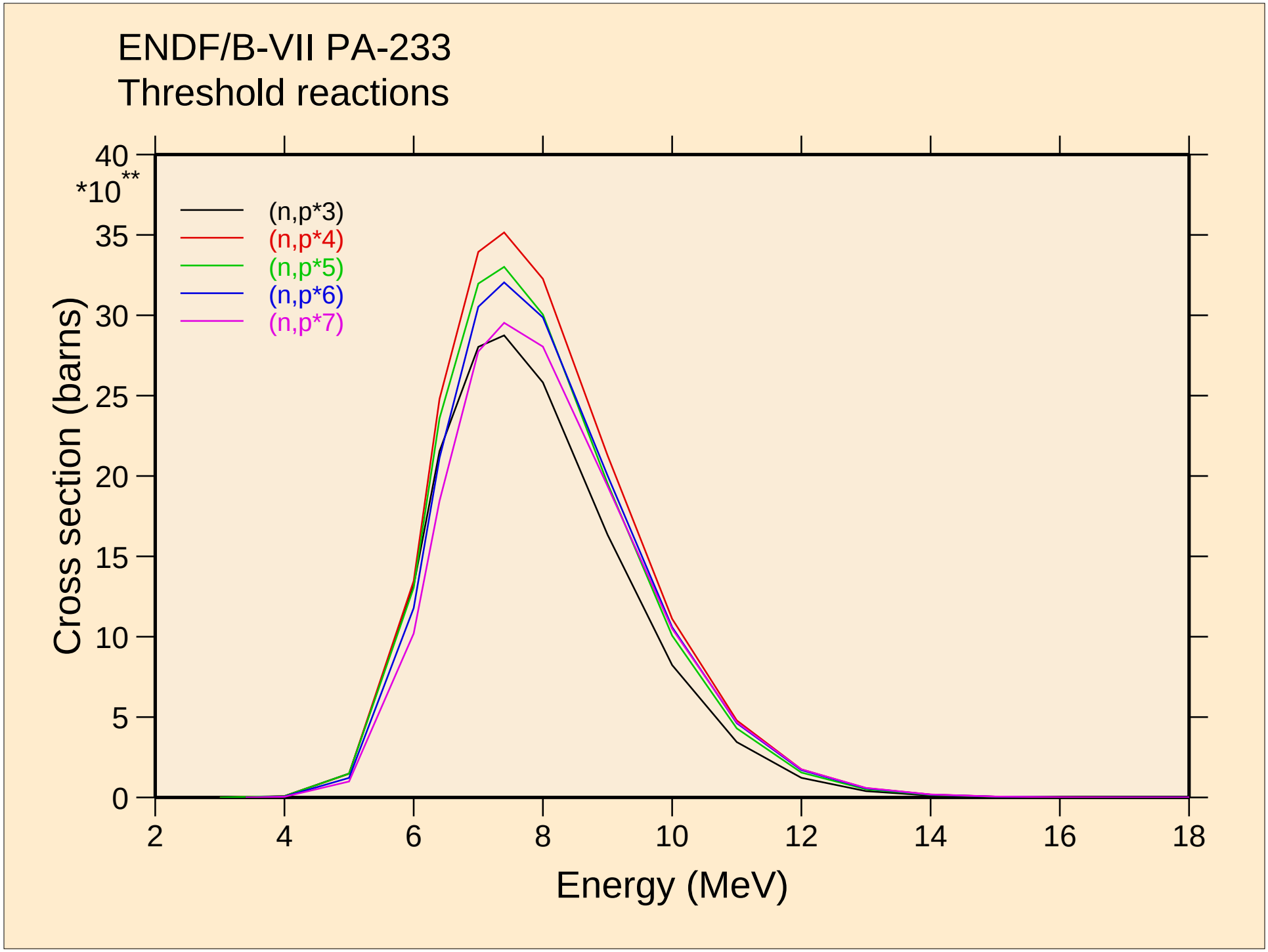

ENDF/B-VII PA-233
Damage
damage
*10-3
600
500
400
300
200
100
0
Damage (MeV-barns)
0
10
20
30
40
50
60
Energy (MeV)

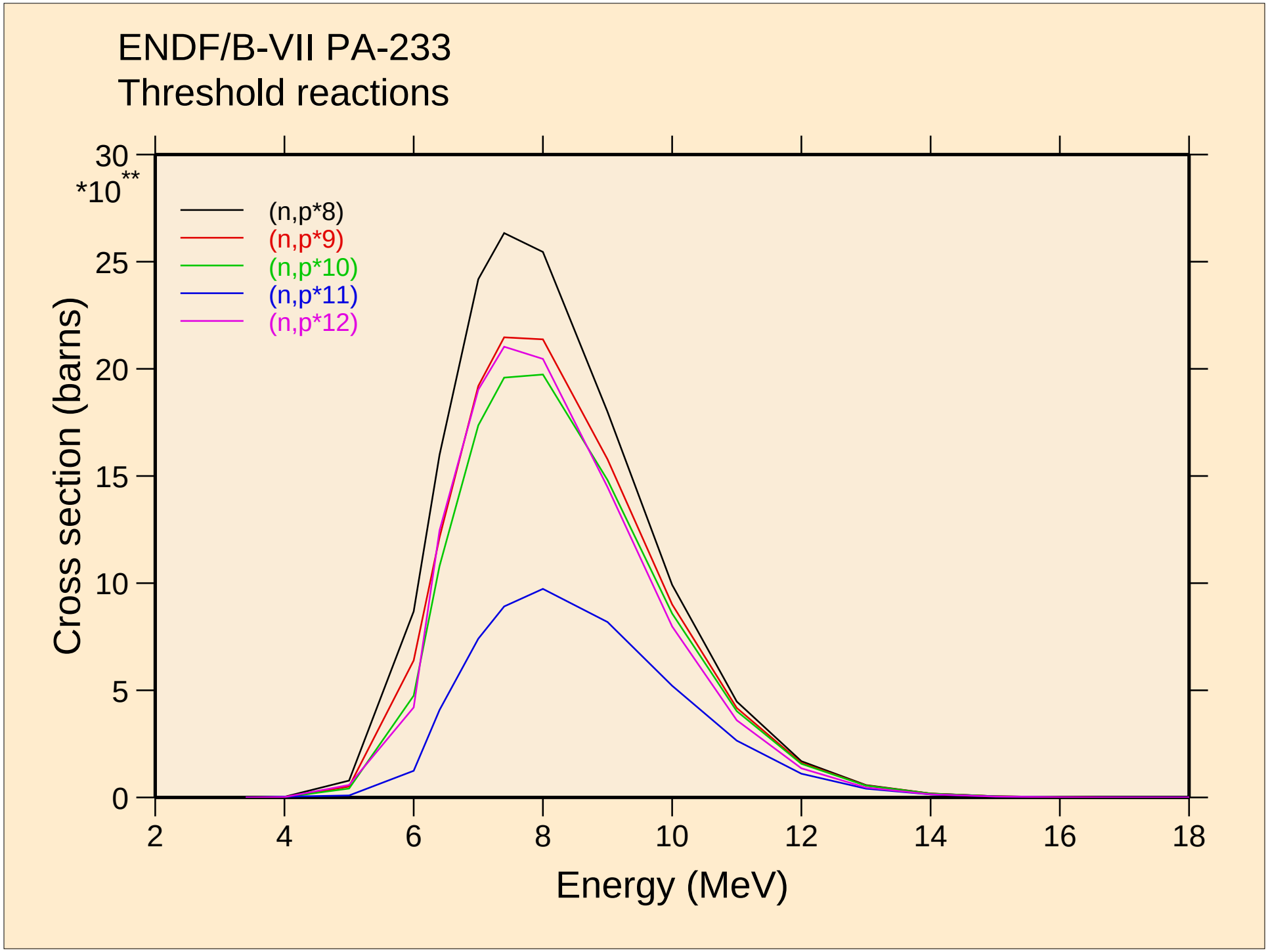

ENDF/B-VII PA-233
Non-threshold reactions
(n,gma)
Cross section (barns)
10-1
10-2
10-3
10-4
10-5
0
10
20
30
40
50
60
Energy (MeV)

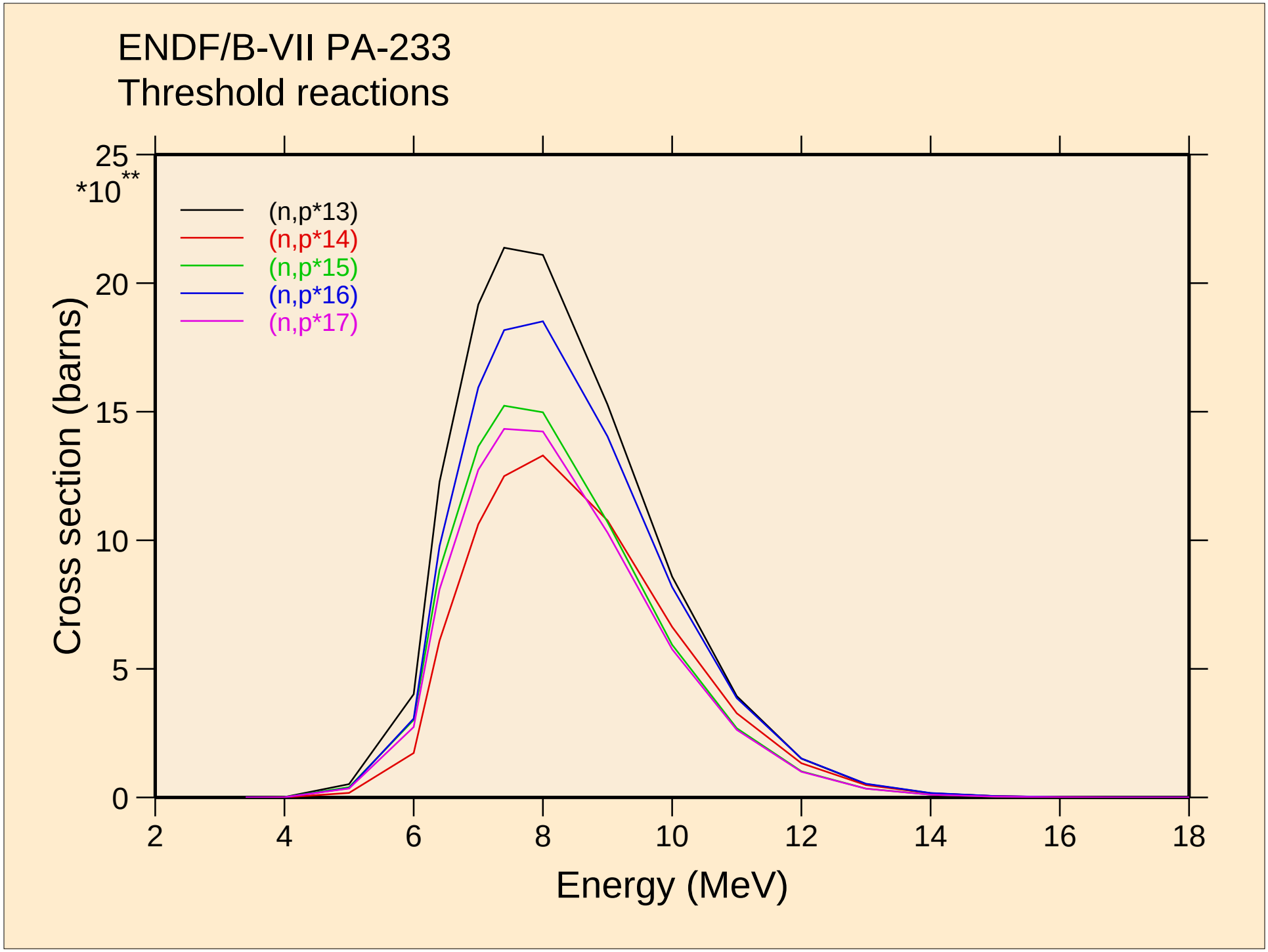

ENDF/B-VII PA-233
Inelastic levels
Cross section (barns)
*10^-3
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
Energy (MeV)
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)

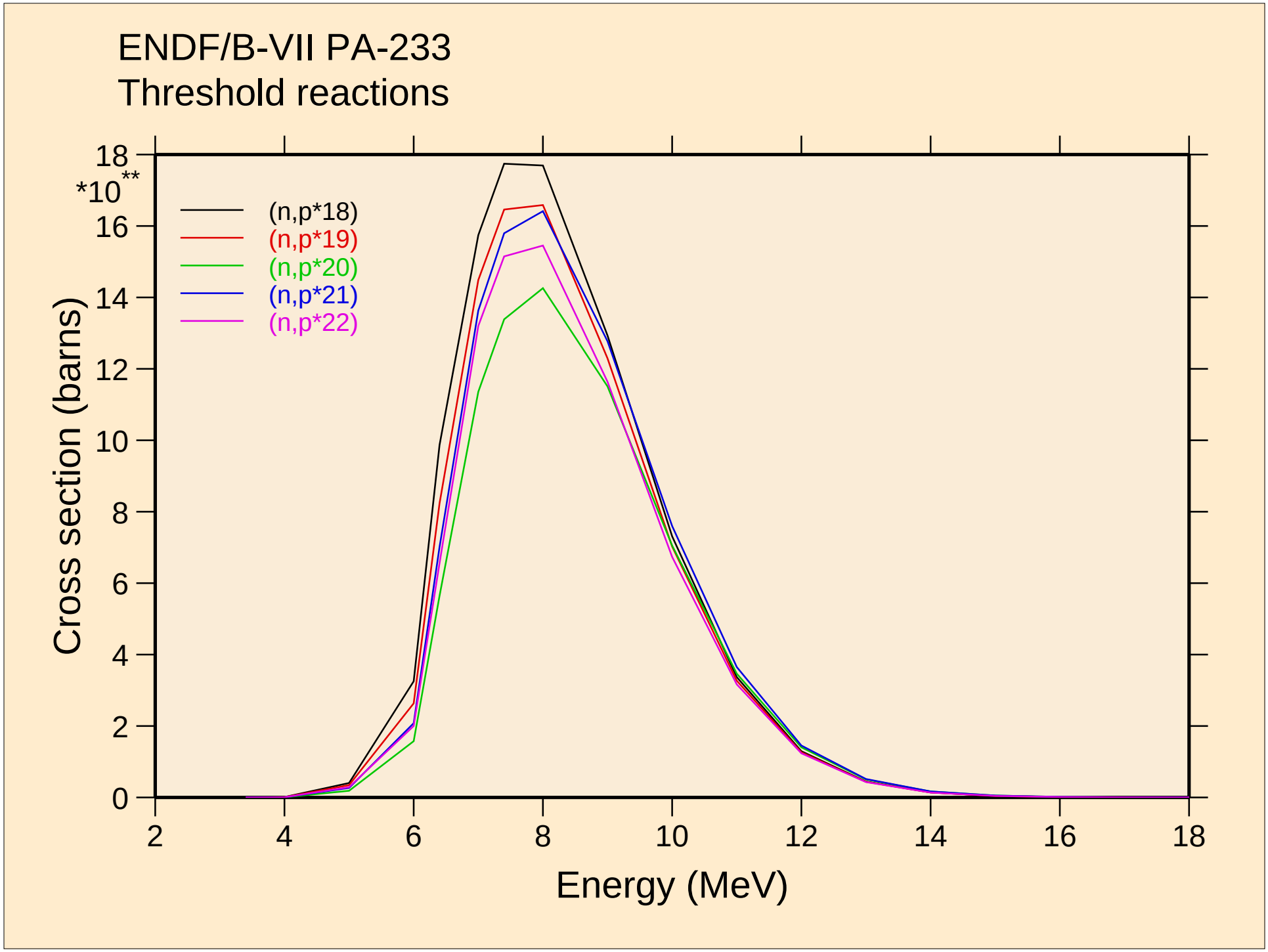

ENDF/B-VII PA-233
Threshold reactions
(n,x)
(n,2n)
(n,3n)
(n,n*)p
(n,2np)
Cross section (barns)
Energy (MeV)
0.0
0.5
1.0
1.5
2.0
2.5
0
10
20
30
40
50
60

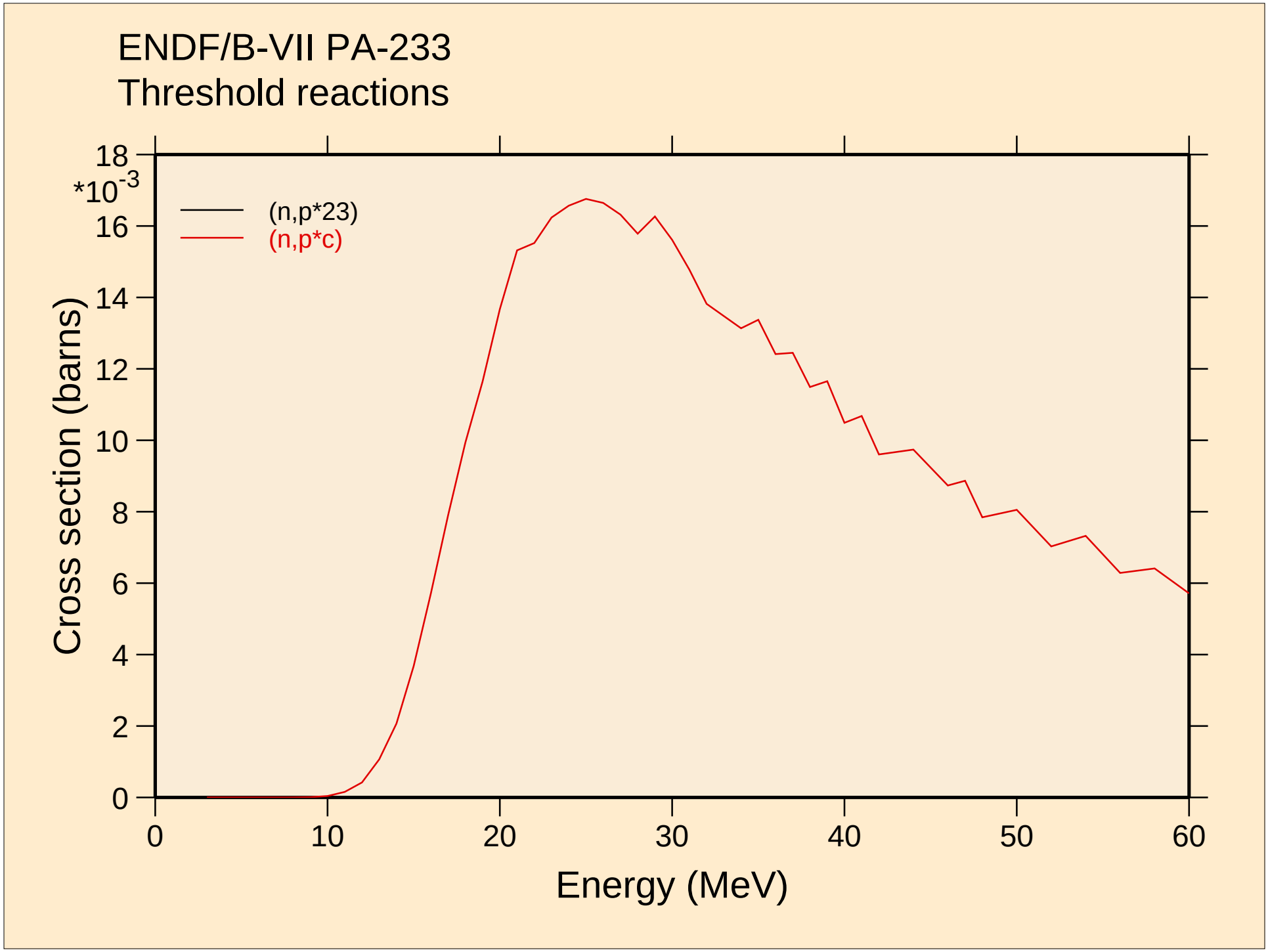

ENDF/B-VII PA-233
Threshold reactions
(n,n*c)
(n,xp)
(n,p*0)
(n,p*1)
(n,p*2)
Cross section (barns)
Energy (MeV)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
10
20
30
40
50
60


ENDF/B-VII PA-233
Threshold reactions
*10**
(n,p*3)
(n,p*4)
(n,p*5)
(n,p*6)
(n,p*7)
Cross section (barns)
Energy (MeV)
0
5
10
15
20
25
30
35
40
2
4
6
8
10
12
14
16
18

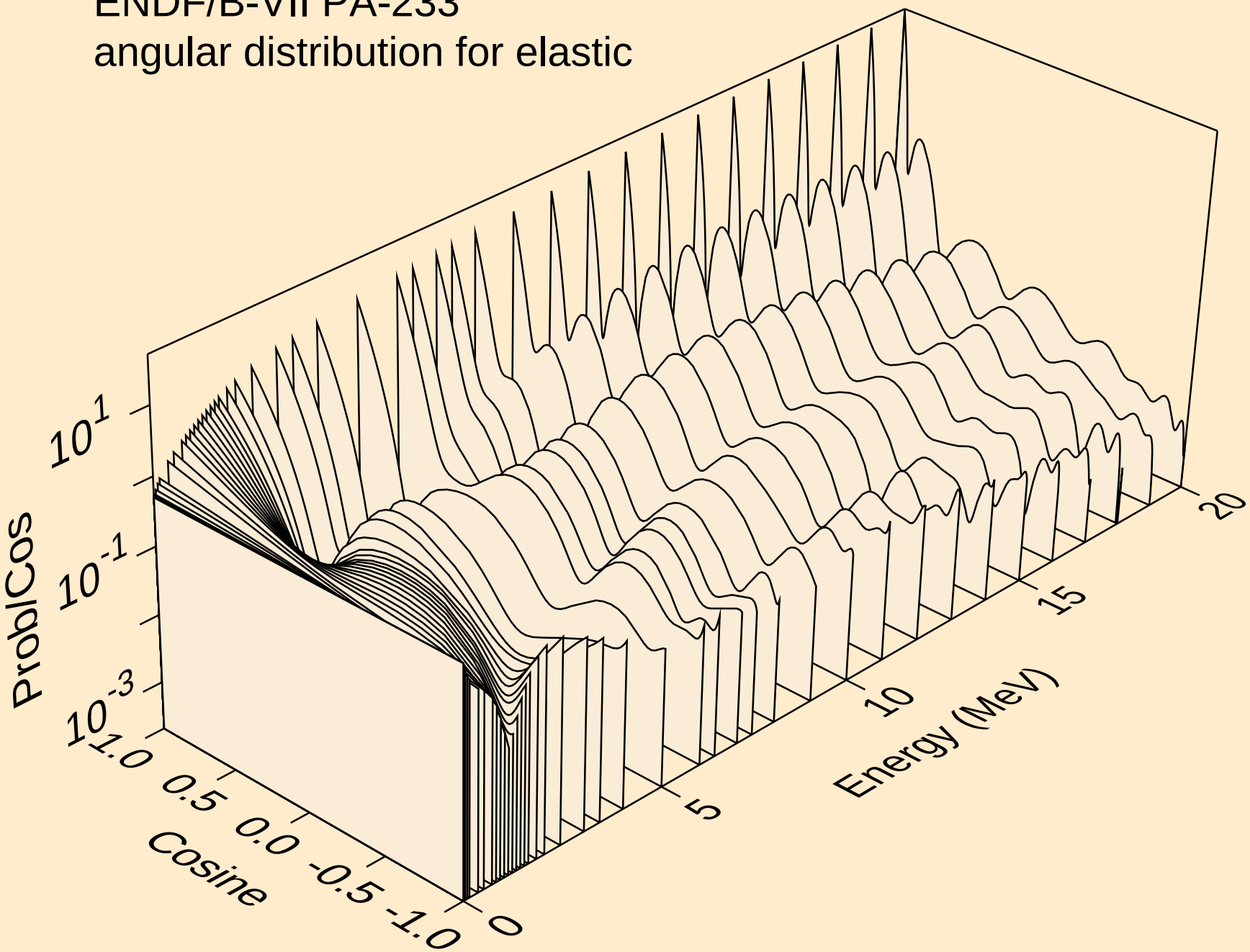

ENDF/B-VII PA-233
Threshold reactions
*10**
(n,p*8)
(n,p*9)
(n,p*10)
(n,p*11)
(n,p*12)
Cross section (barns)
Energy (MeV)
0
5
10
15
20
25
30
2
4
6
8
10
12
14
16
18

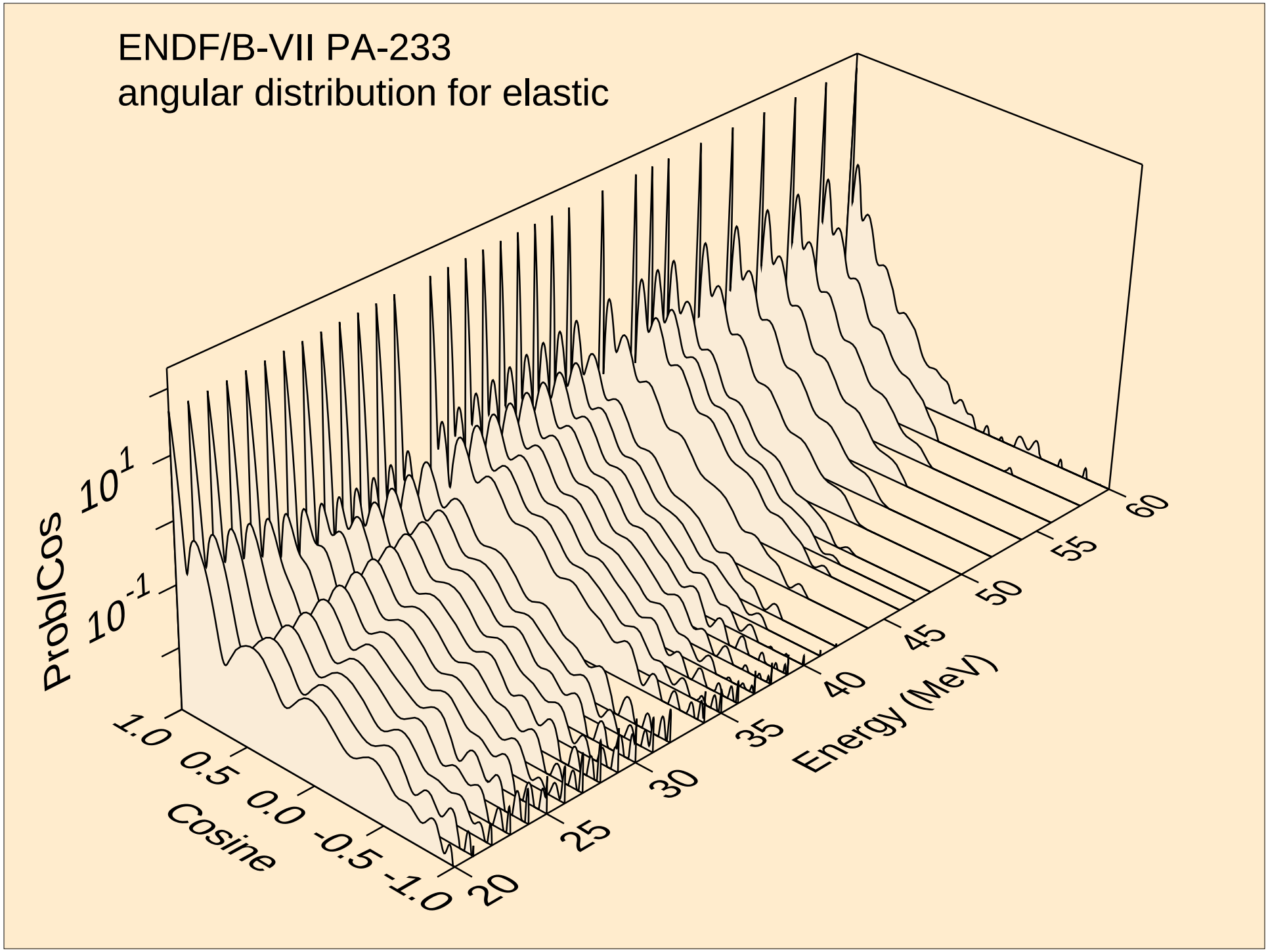

ENDF/B-VII PA-233
Threshold reactions
*10**
(n,p*13)
(n,p*14)
(n,p*15)
(n,p*16)
(n,p*17)
Cross section (barns)
Energy (MeV)
0
5
10
15
20
25
2
4
6
8
10
12
14
16
18

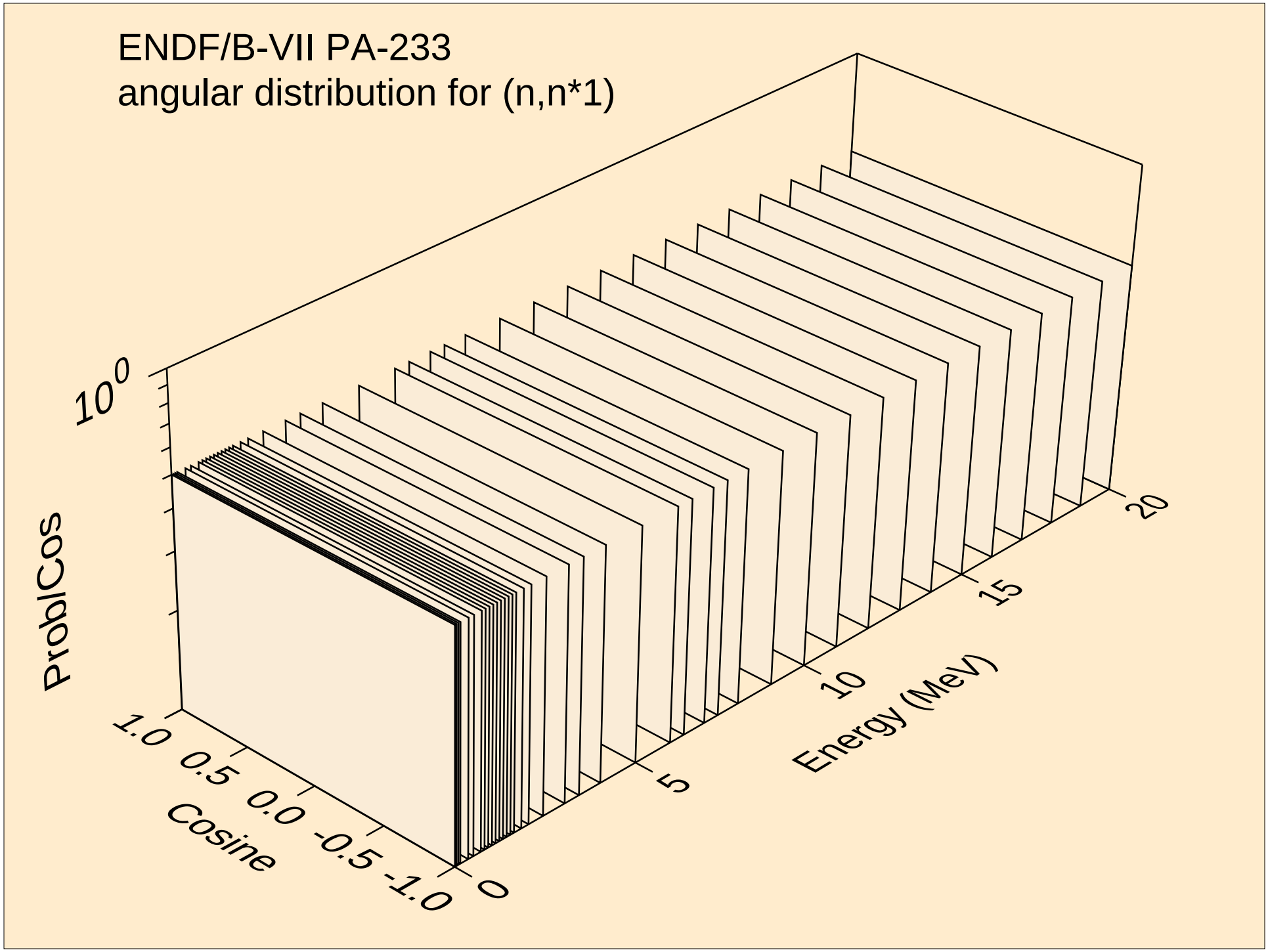

ENDF/B-VII PA-233
Threshold reactions
*10**
(n,p*18)
(n,p*19)
(n,p*20)
(n,p*21)
(n,p*22)
Cross section (barns)
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
2
4
6
8
10
12
14
16
18

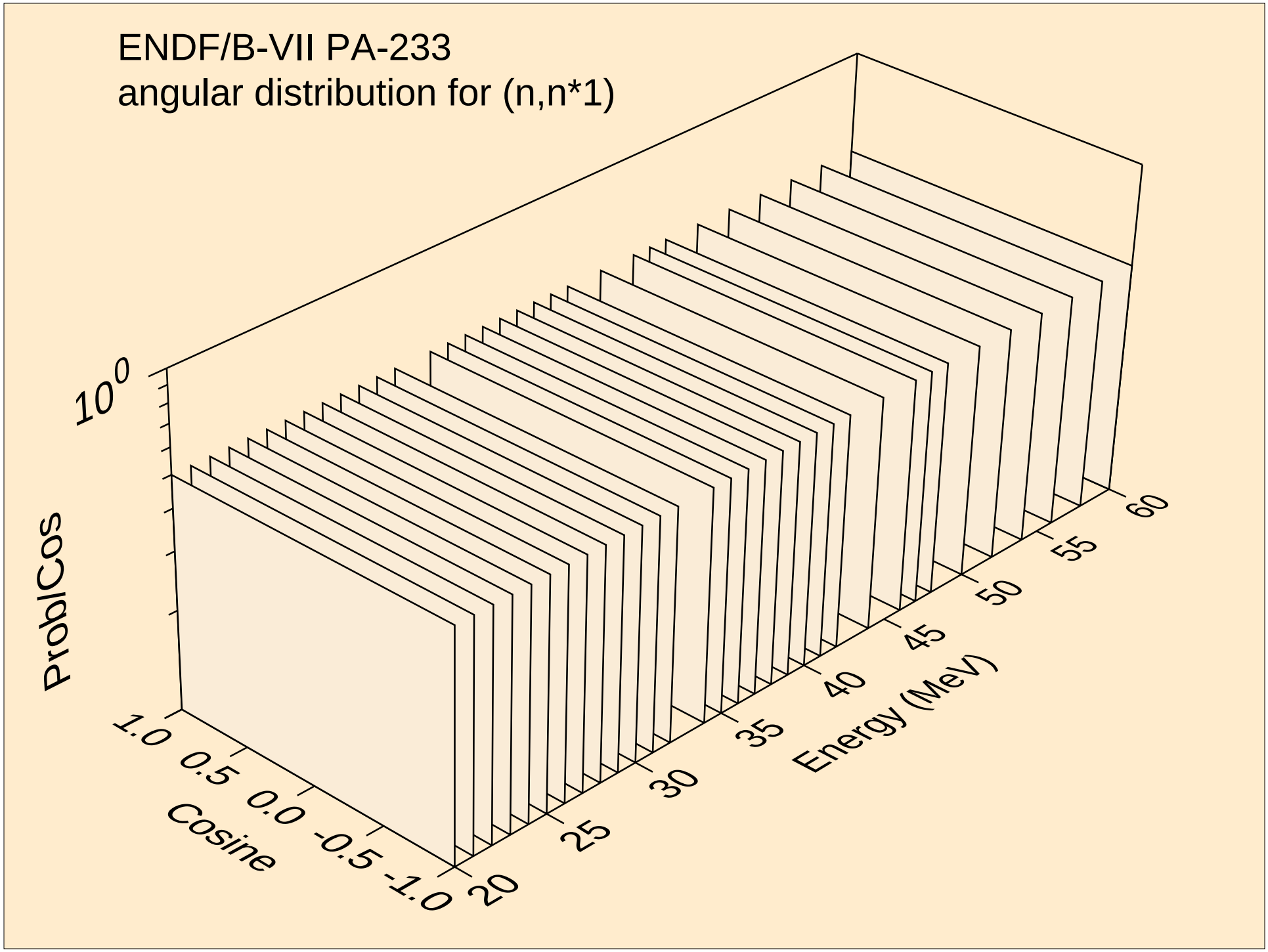

ENDF/B-VII PA-233
Threshold reactions
*10-3
(n,p*23)
(n,p*c)
Cross section (barns)
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
0
10
20
30
40
50
60

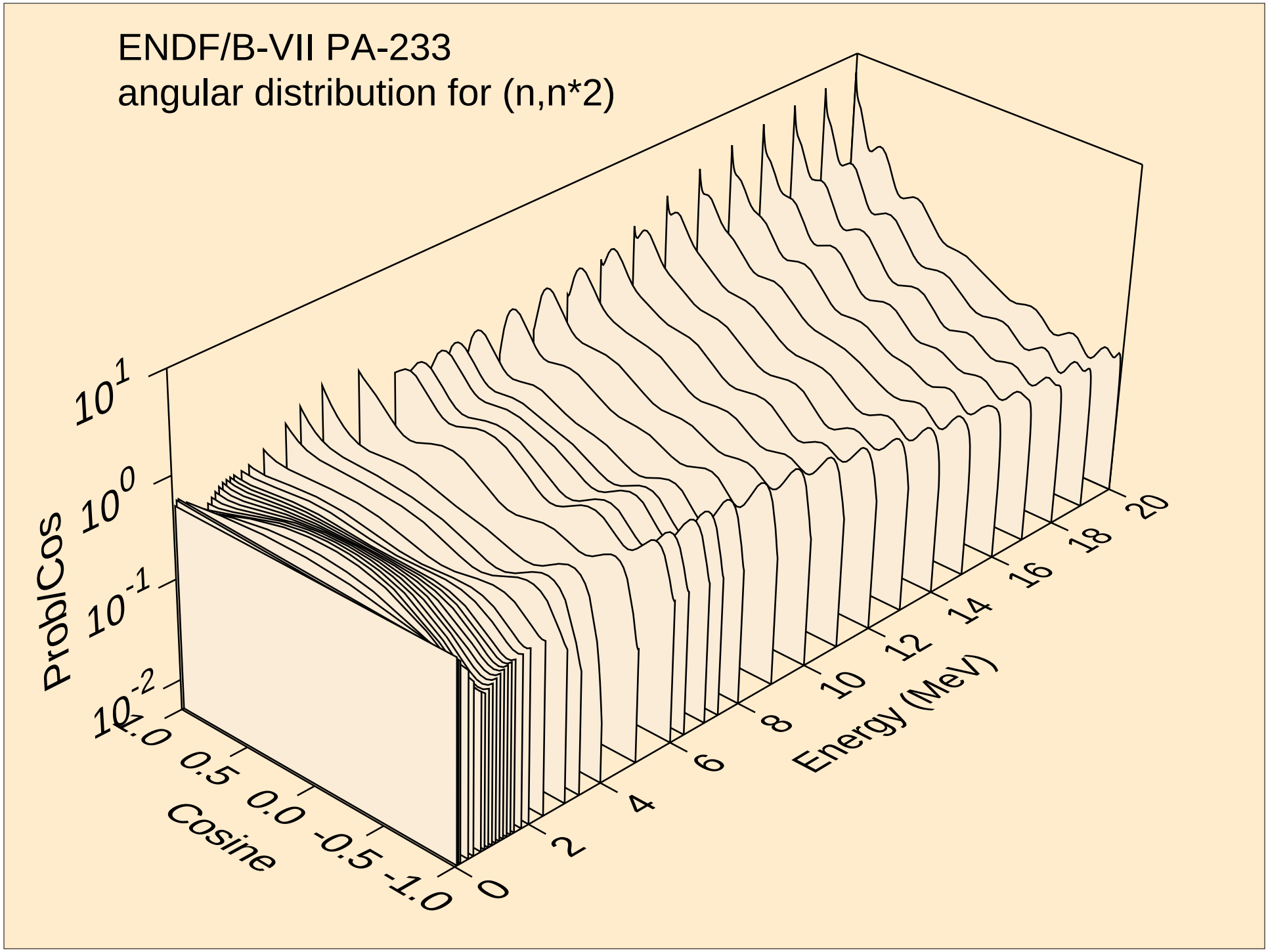
ENDF/B-VII PA-233
angular distribution for elastic

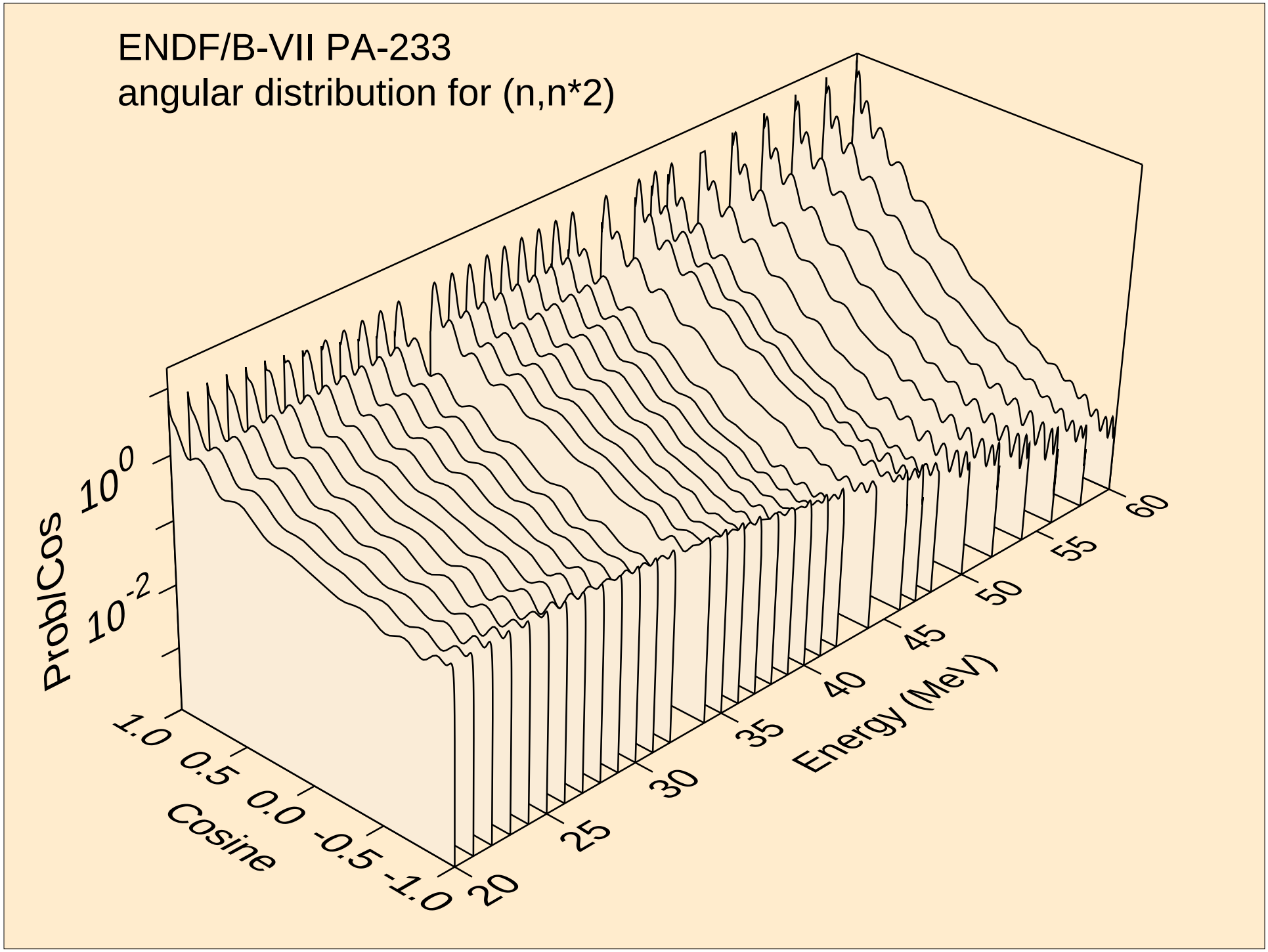


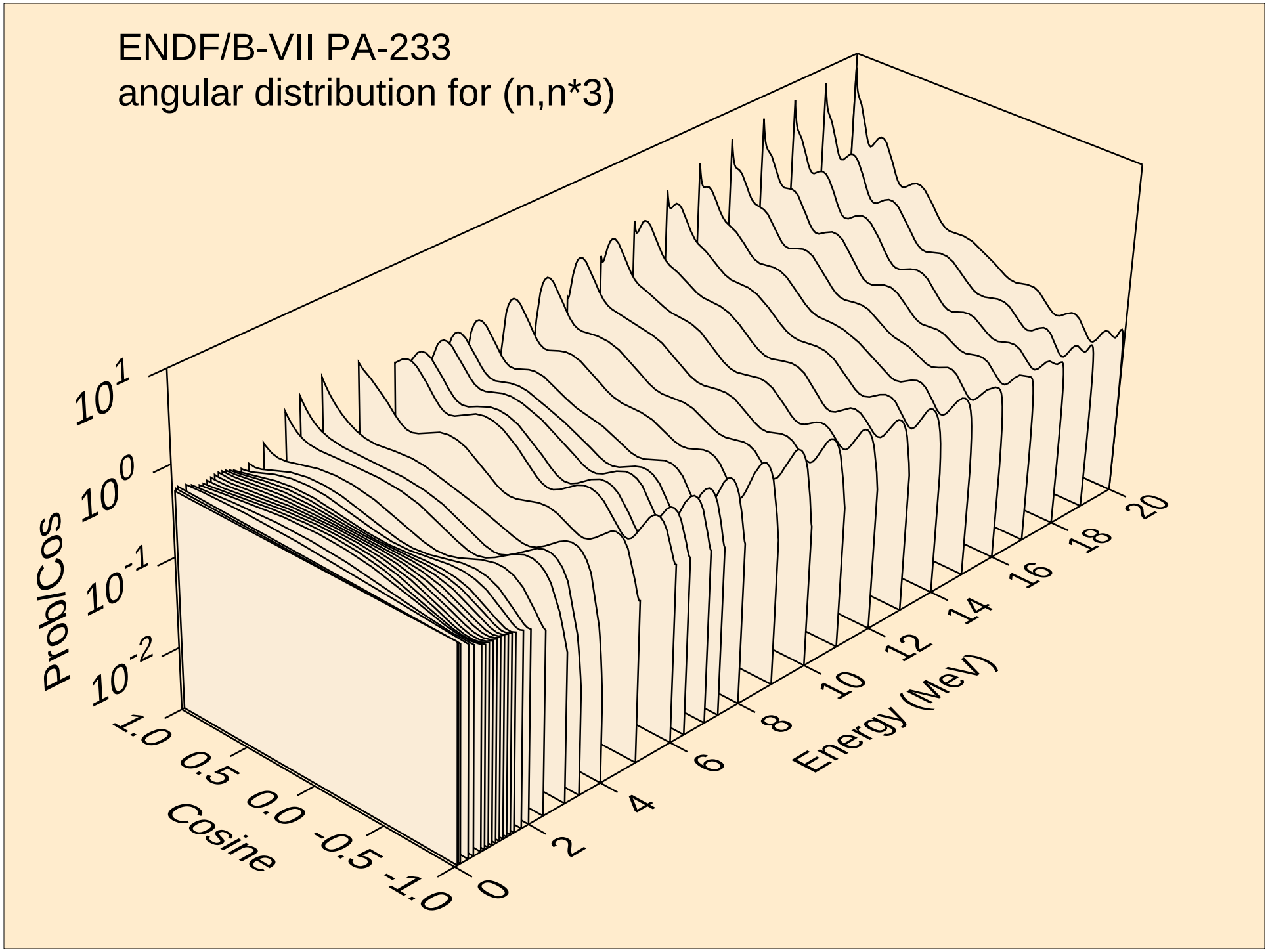

ENDF/B-VII PA-233
angular distribution for elastic
ProbCos
10^{1}
10^{-1}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
20
25
30
35
40
45
50
55
60

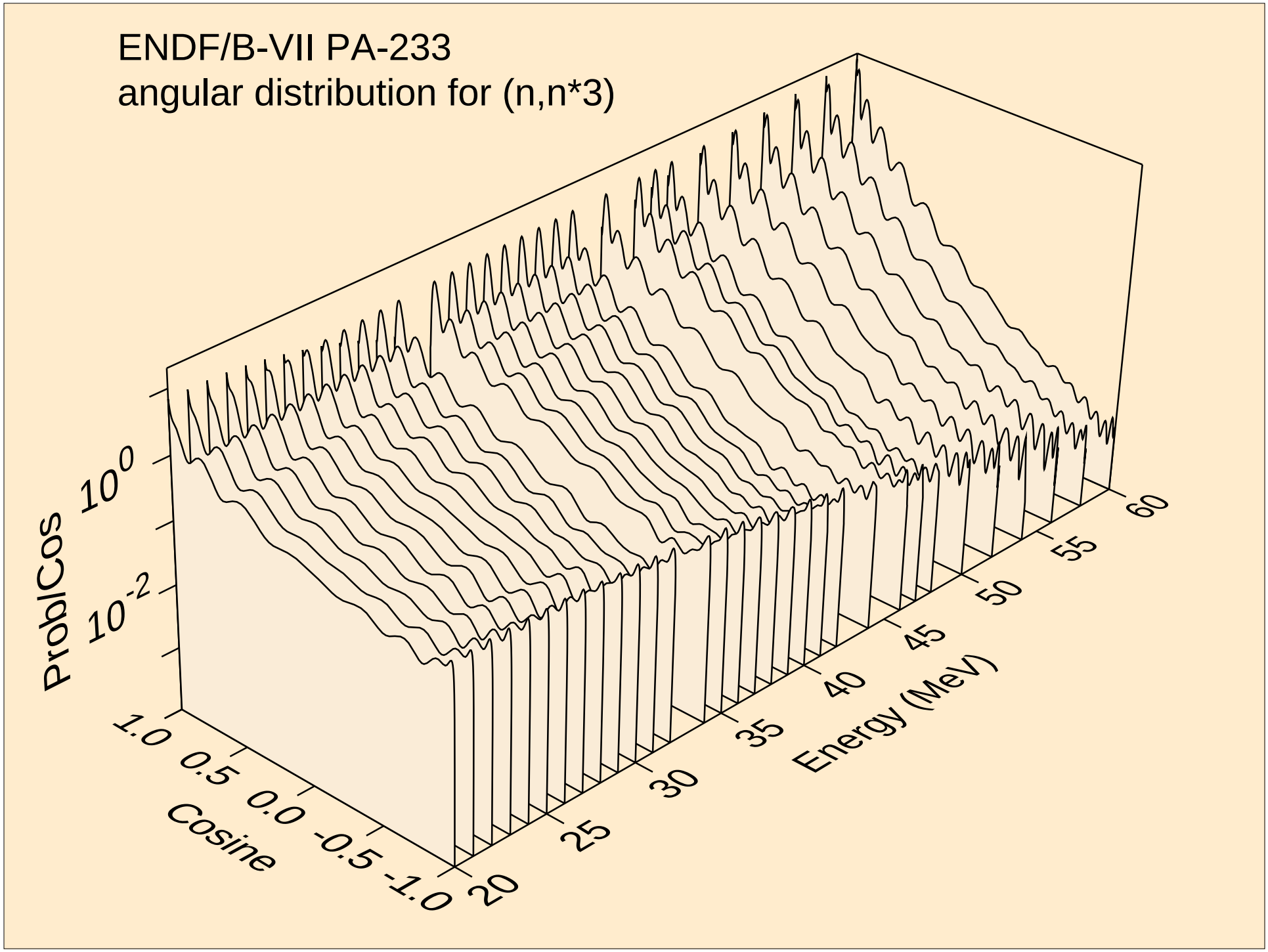

ENDF/B-VII PA-233
angular distribution for (n,n*1)
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

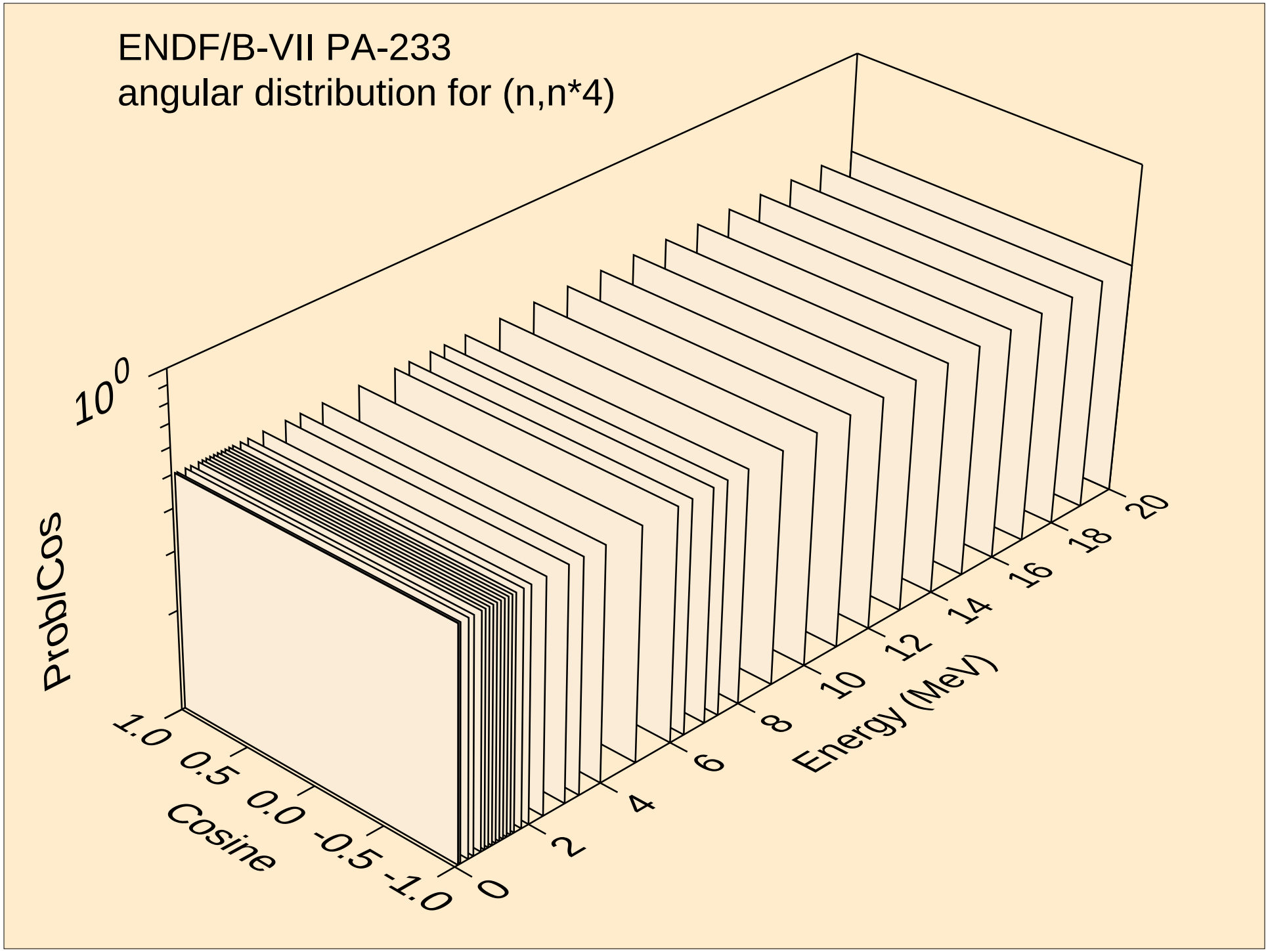

ENDF/B-VII PA-233
angular distribution for (n,n*1)
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

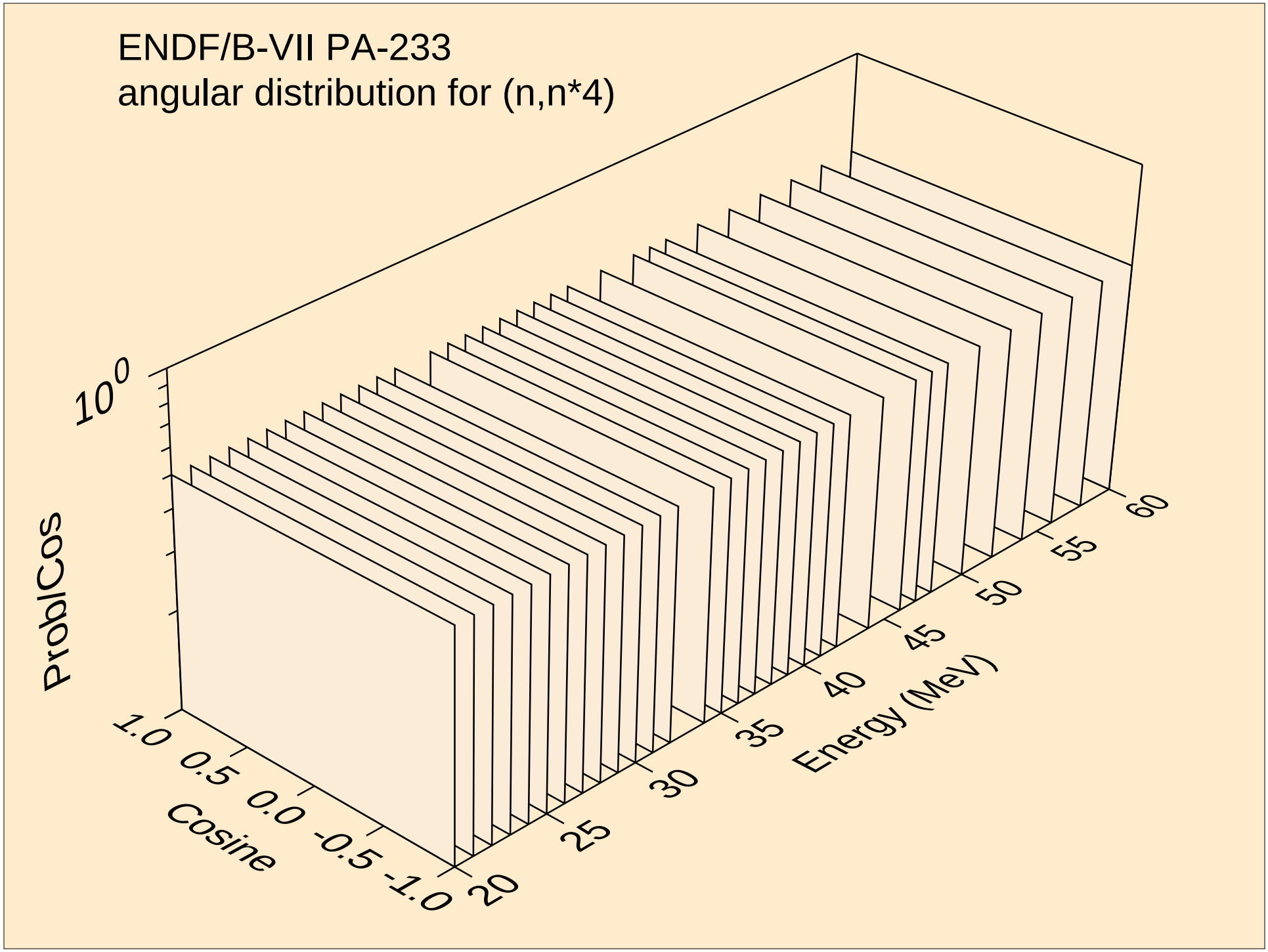

ENDF/B-VII PA-233
angular distribution for (n,n*2)
ProbCos
10^{1}
10^{0}
10^{-1}
10^{-2}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

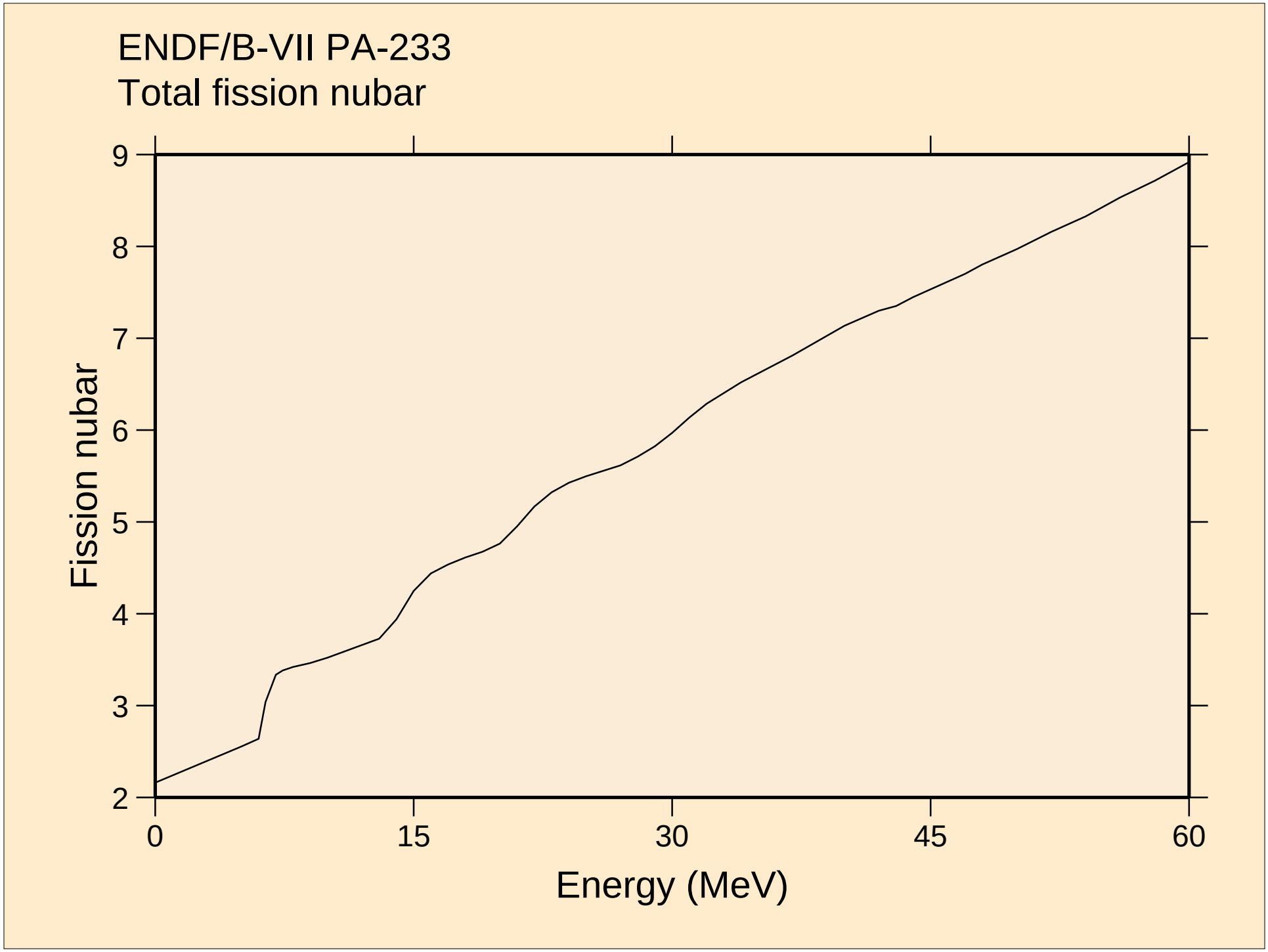

ENDF/B-VII PA-233
angular distribution for (n,n*2)
ProbCos
10^0
10^{-2}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
20
25
30
35
40
45
50
55
60

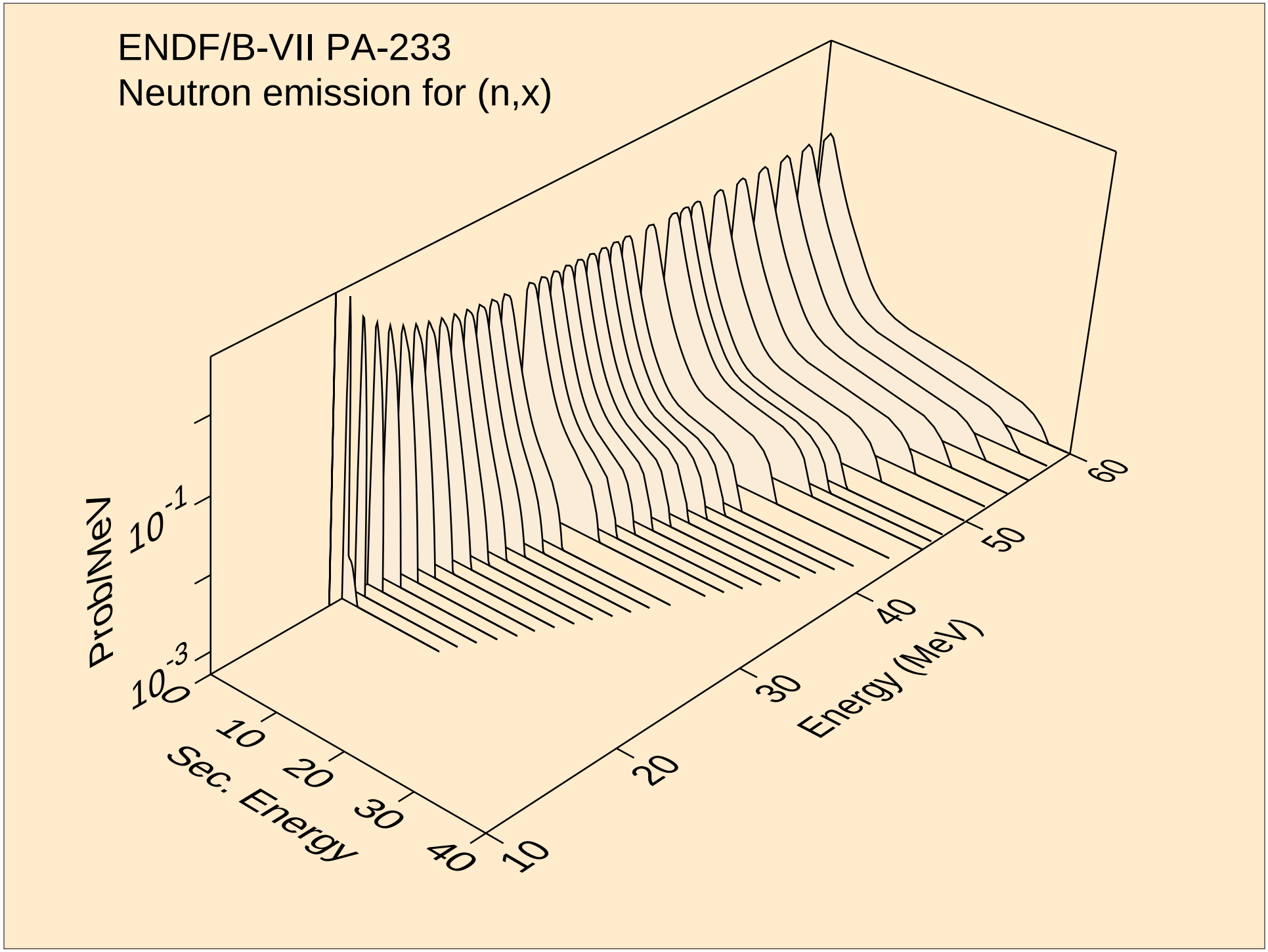

ENDF/B-VII PA-233
angular distribution for (n,n*3)
ProbCos
10^{1}
10^{0}
10^{-1}
10^{-2}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20


ENDF/B-VII PA-233
angular distribution for (n,n*3)
ProbCos
10^0
10^{-2}
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

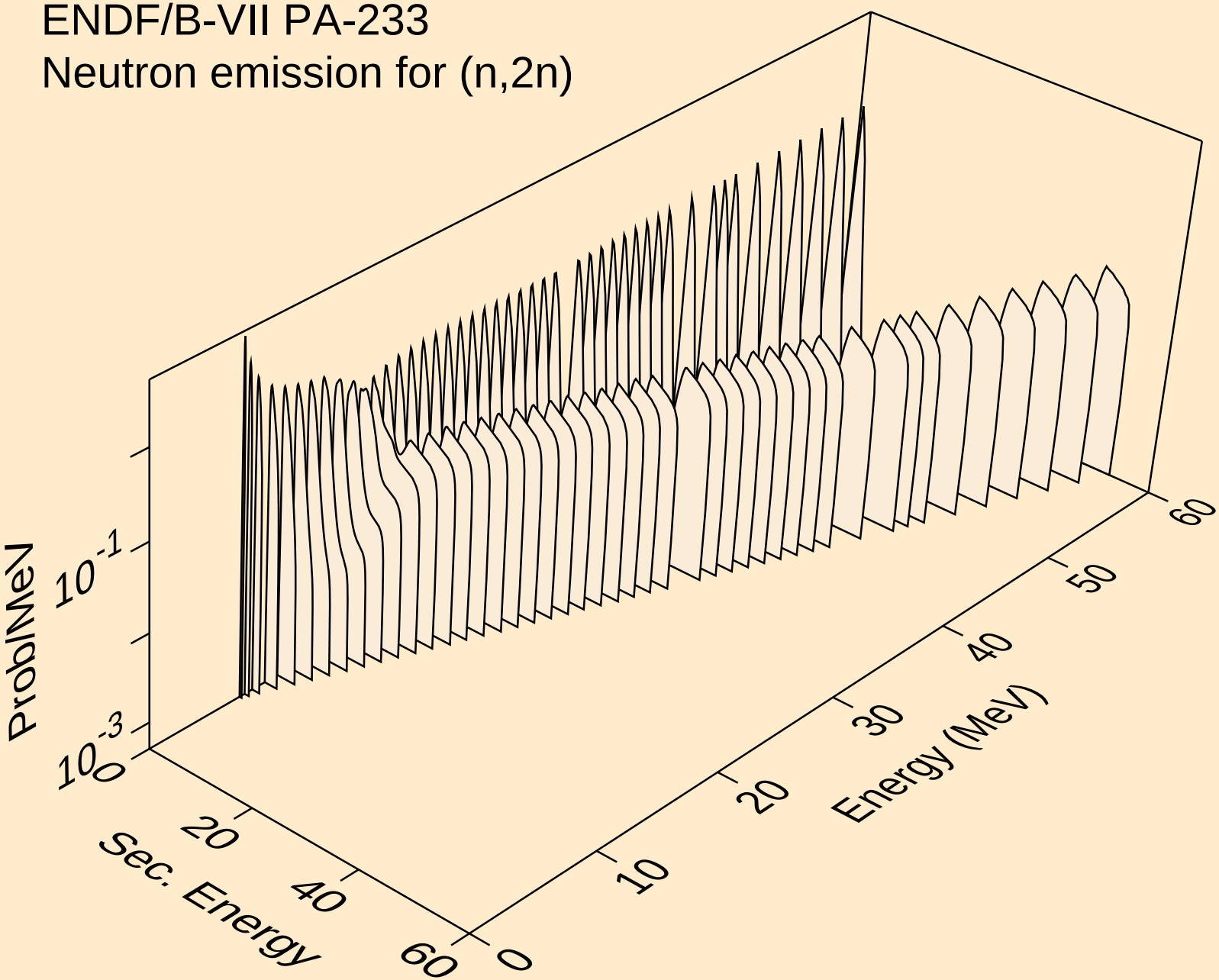

ENDF/B-VII PA-233
angular distribution for (n,n*4)
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


ENDF/B-VII PA-233
angular distribution for (n,n*4)
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

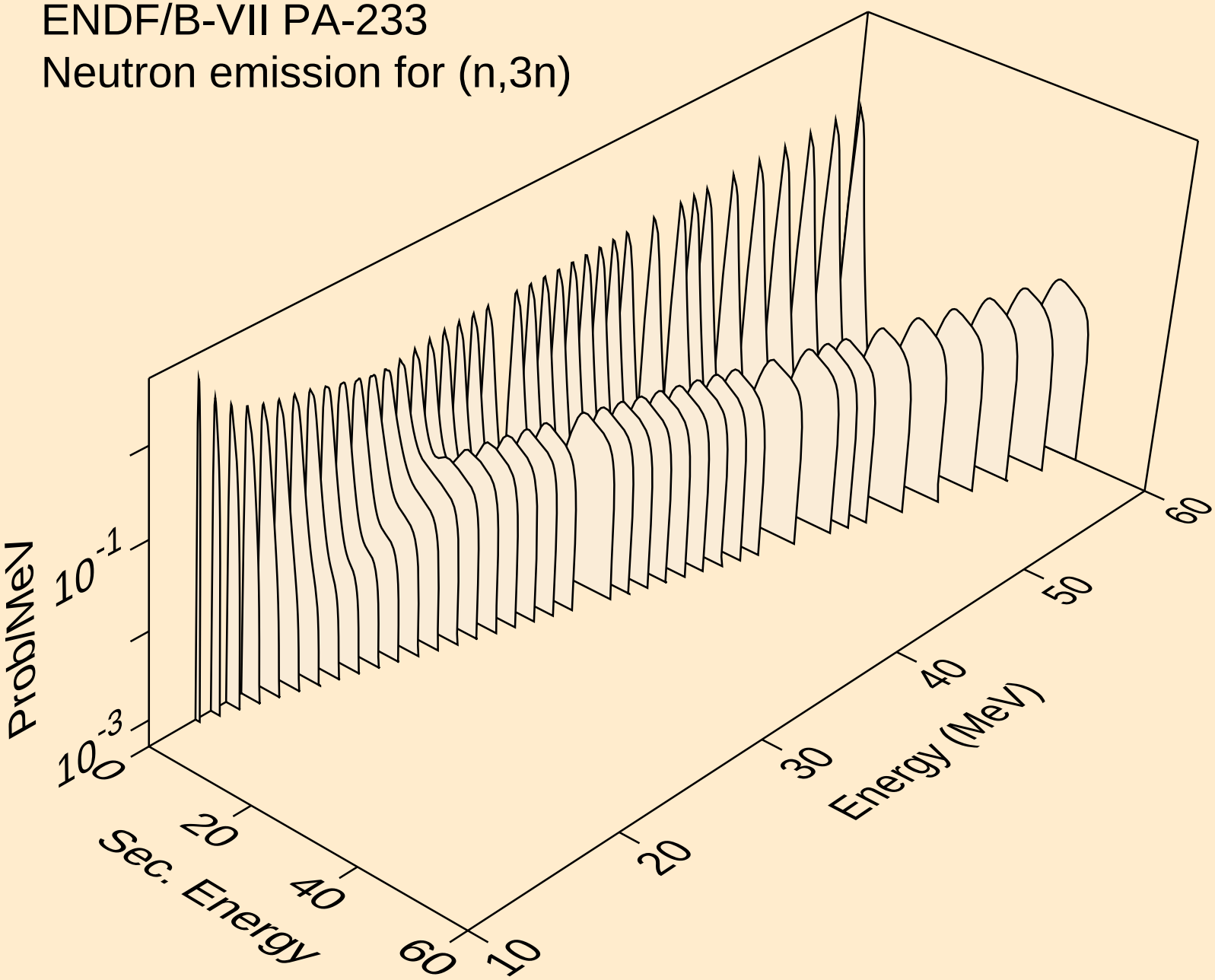

ENDF/B-VII PA-233
Total fission nubar
Fission nubar
9
8
7
6
5
4
3
2
0
15
30
45
60
Energy (MeV)


ENDF/B-VII PA-233
Neutron emission for (n,x)
Prob/MeV
10^{-1}
10^{-3}
0
10
20
30
40
Sec. Energy
10
20
30
40
50
60
Energy (MeV)

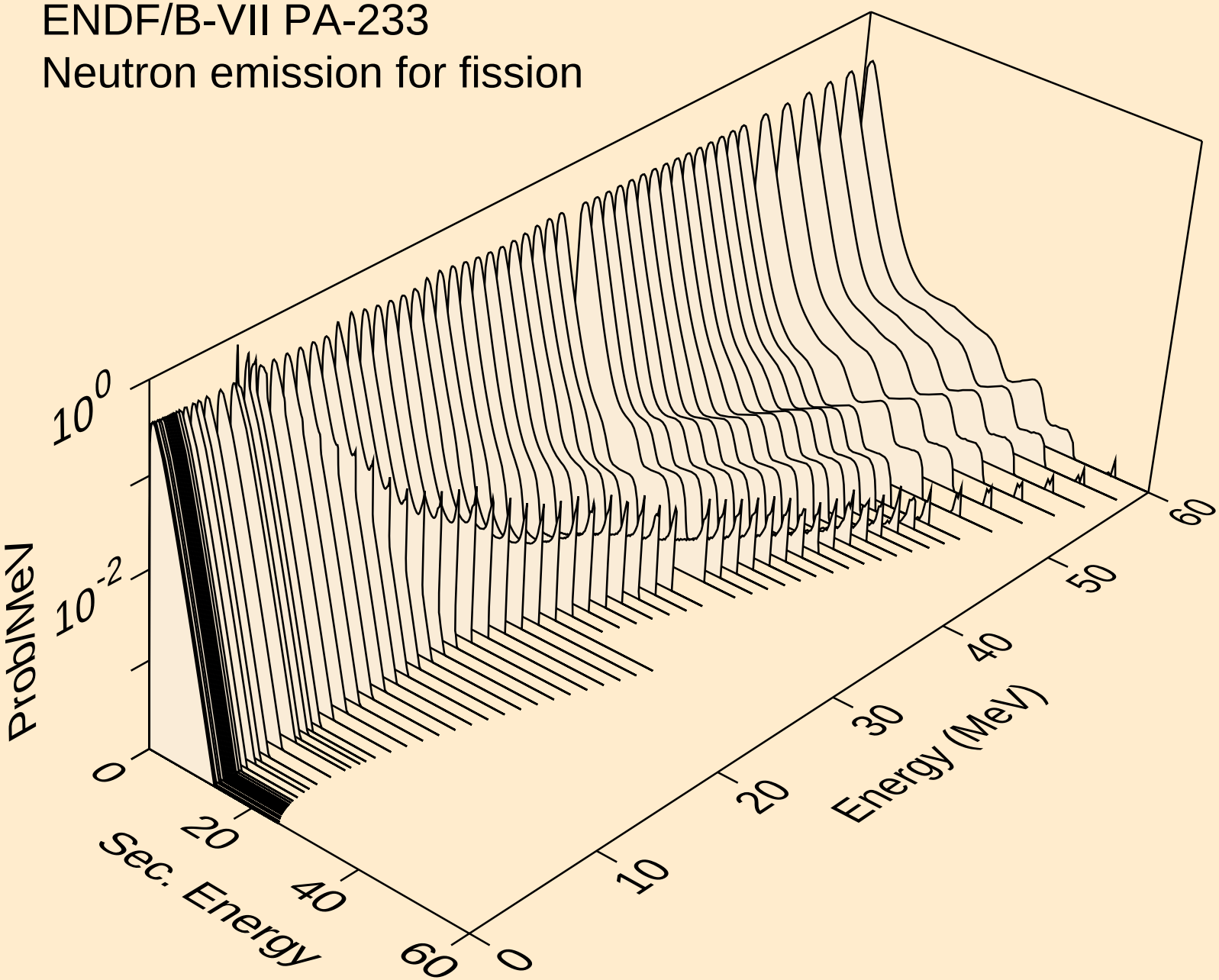
ENDF/B-VII PA-233
Neutron emission for (n,2n)

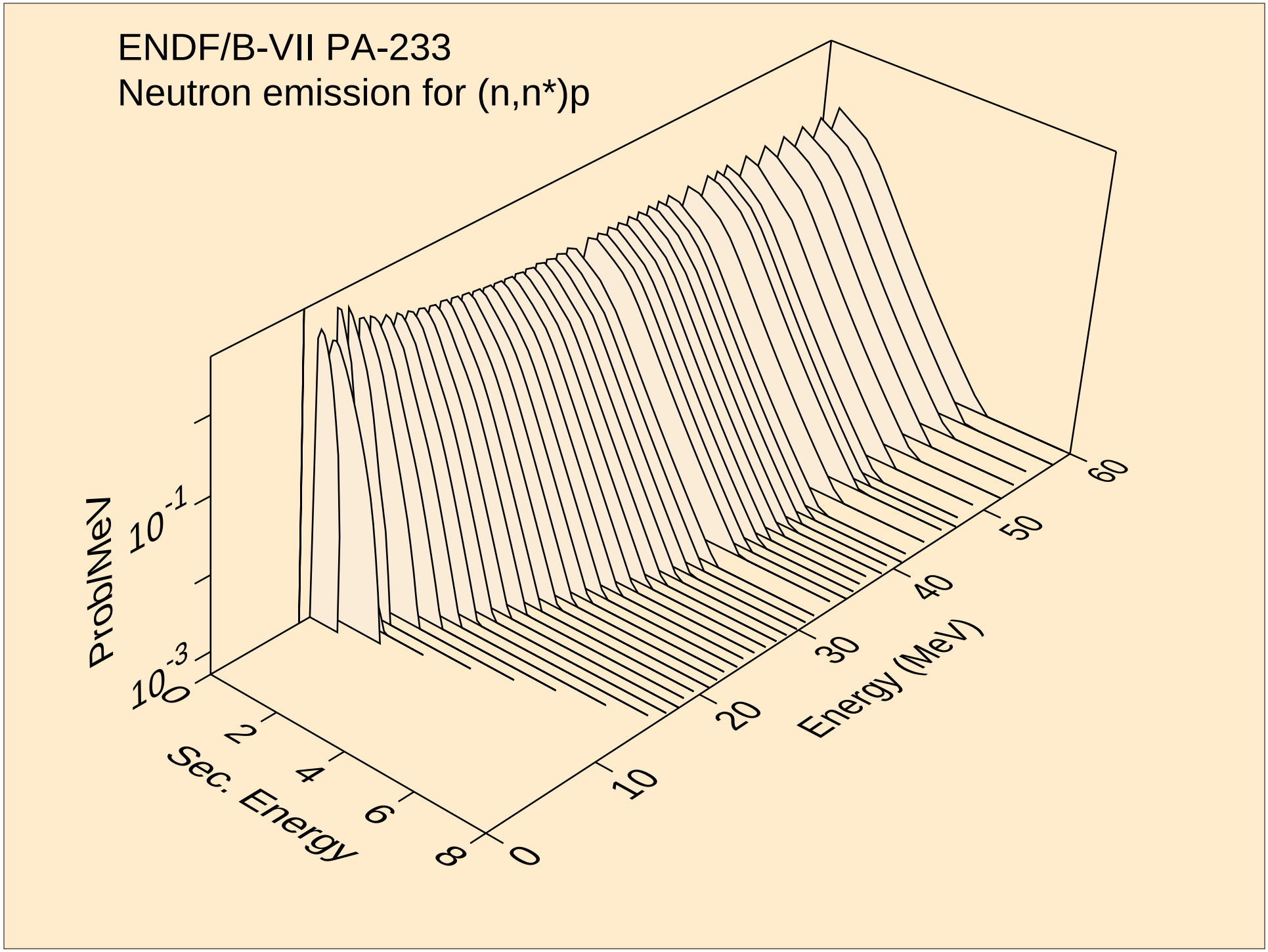


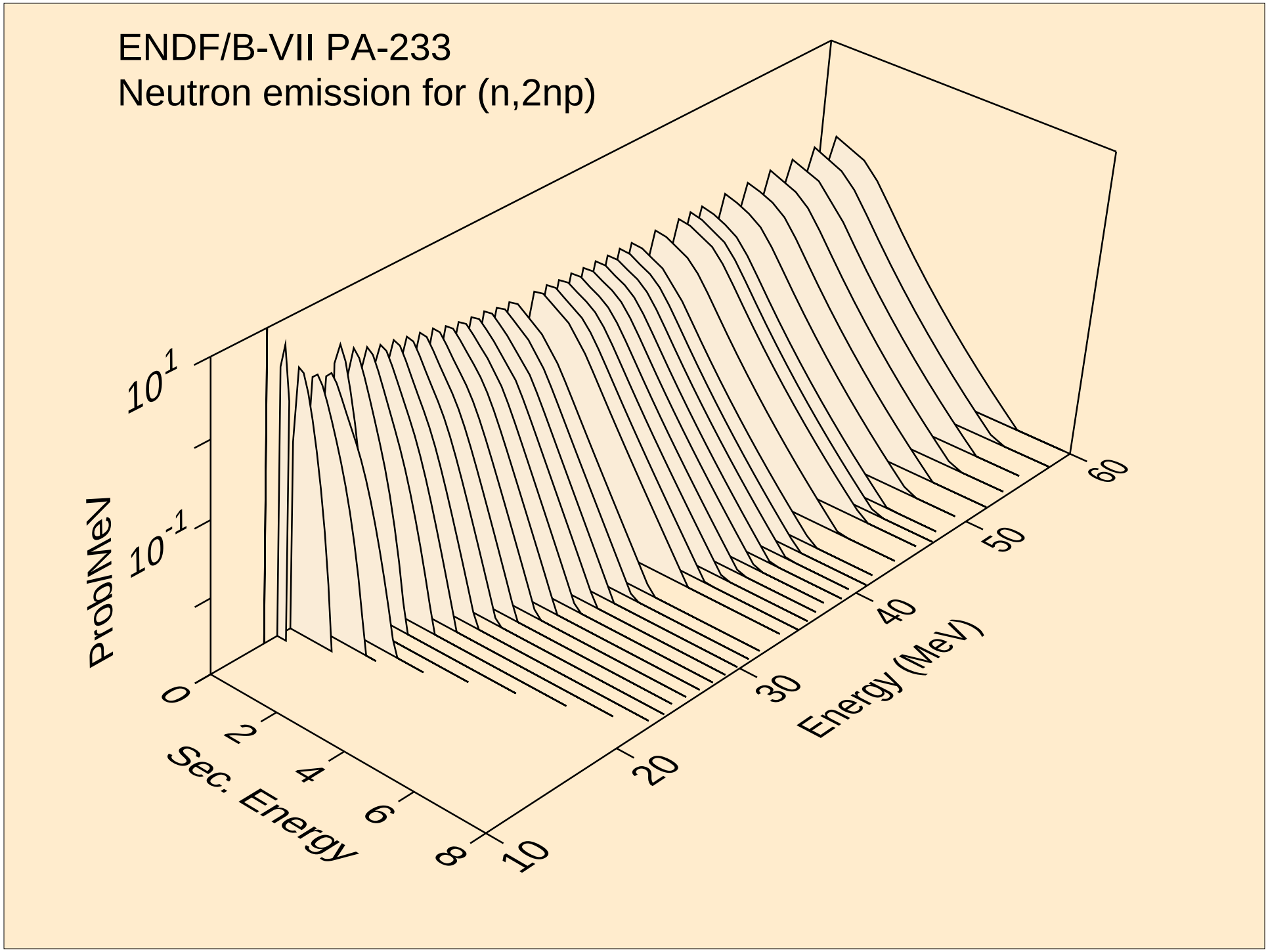
ENDF/B-VII PA-233
Neutron emission for (n,3n)



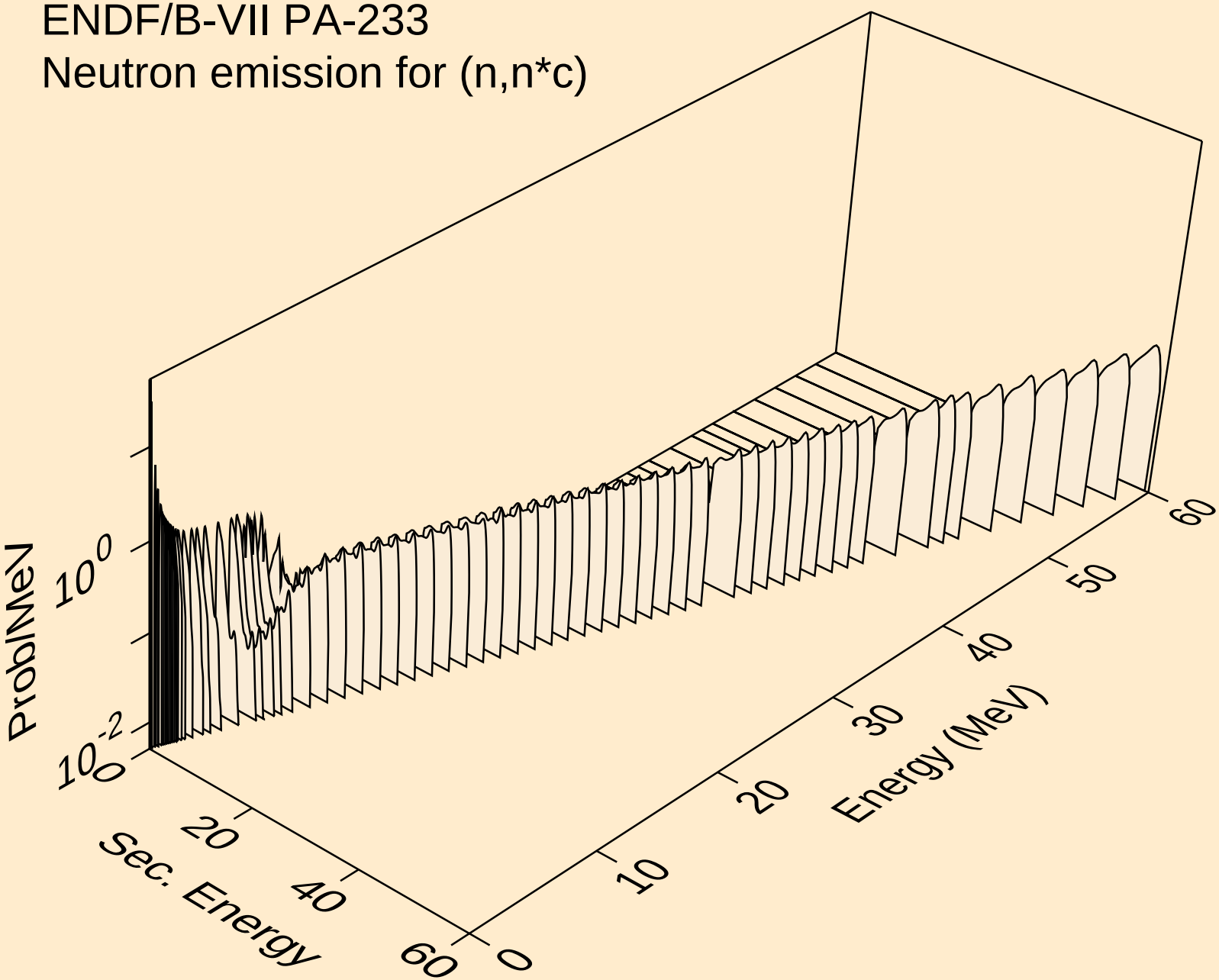
ENDF/B-VII PA-233
Neutron emission for fission

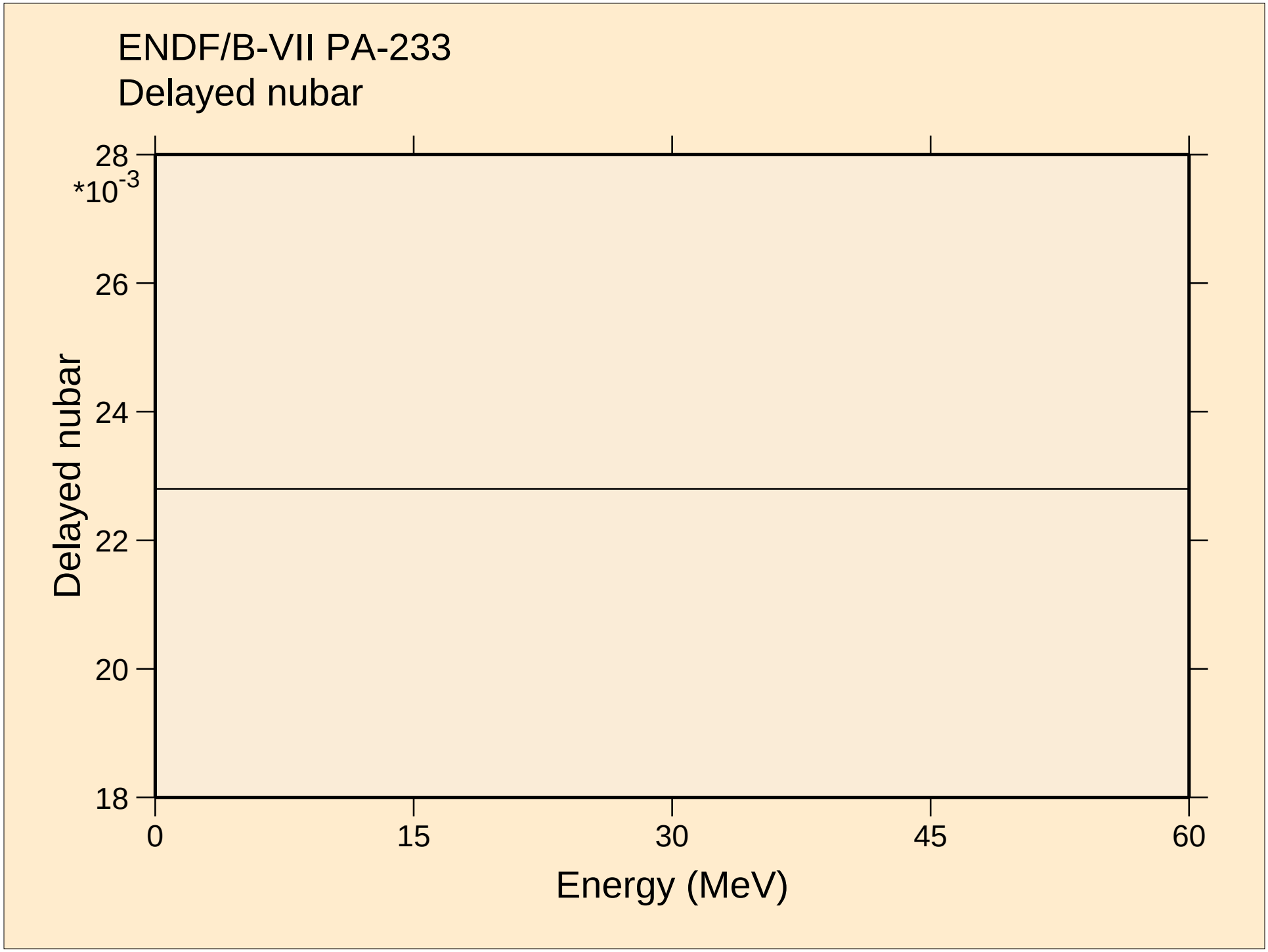


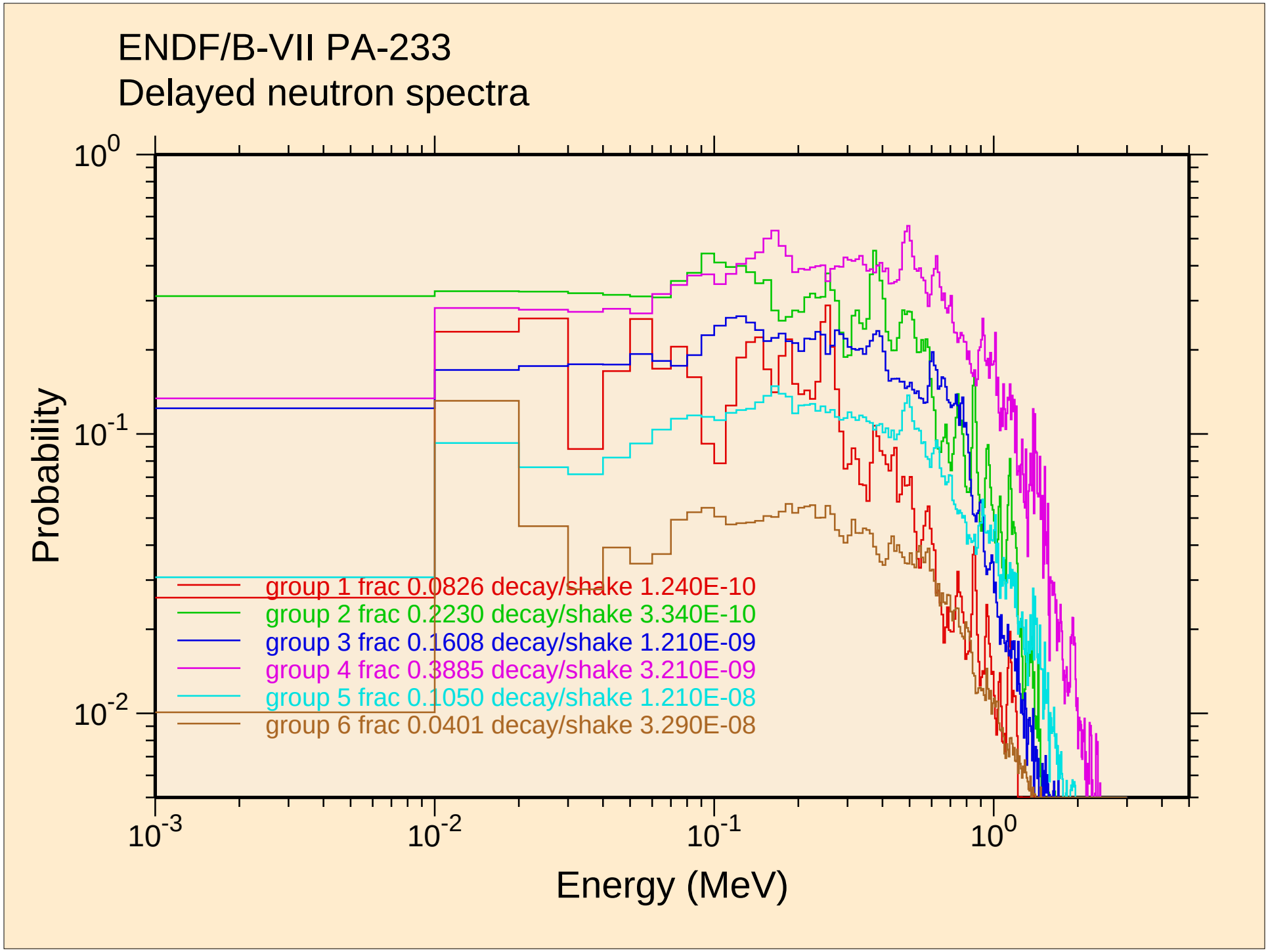

ENDF/B-VII PA-233
Neutron emission for (n,n*)p
Prob/MeV
10^{-1}
10^{-3}
0
2
4
6
8
Sec. Energy
0
10
20
30
40
50
60
Energy (MeV)


ENDF/B-VII PA-233
Neutron emission for (n,2np)
Prob/MeV
10^{1}
10^{-1}
0
2
4
6
8
10
Sec. Energy
20
30
40
50
60
Energy (MeV)

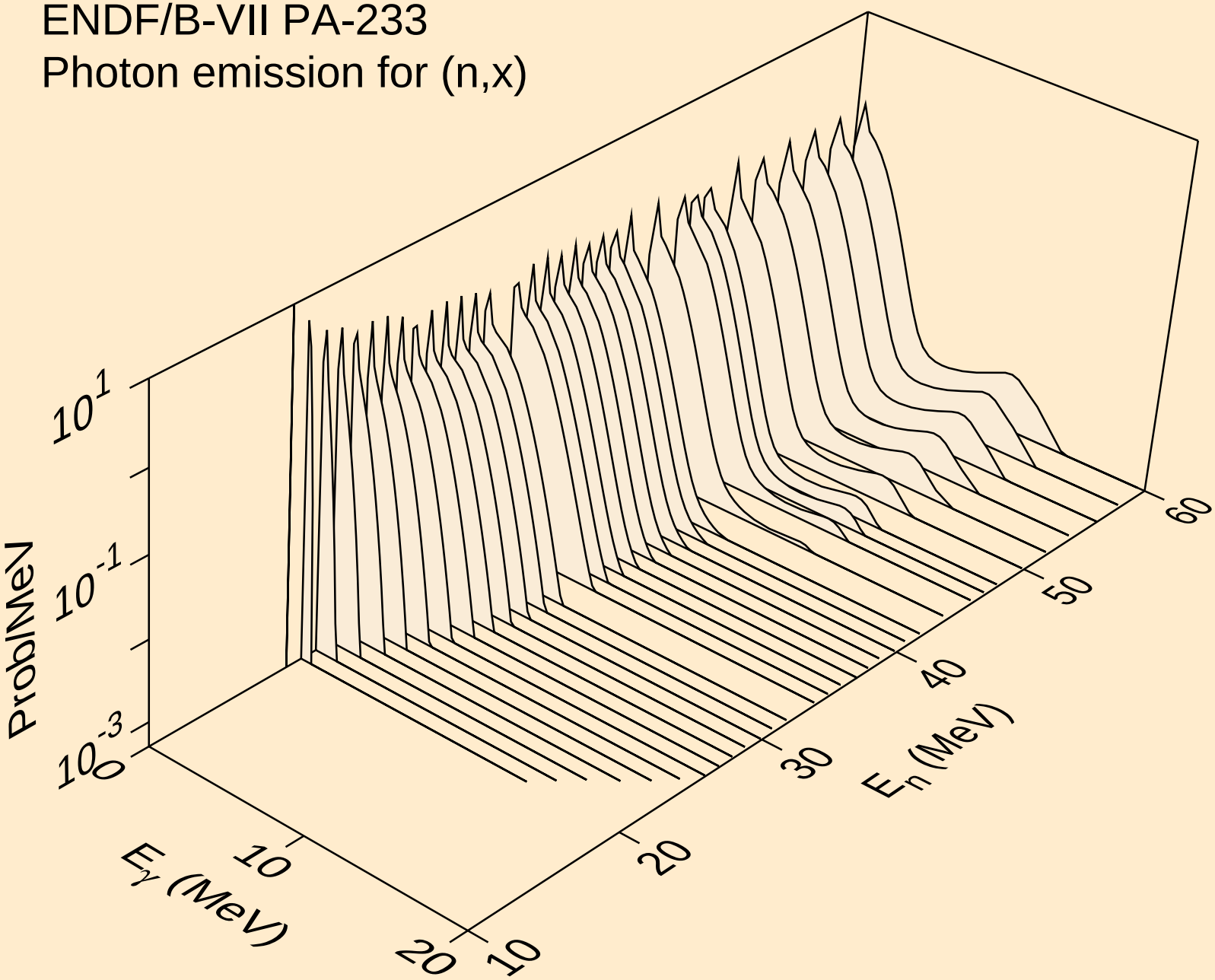
ENDF/B-VII PA-233
Neutron emission for (n,n*c)



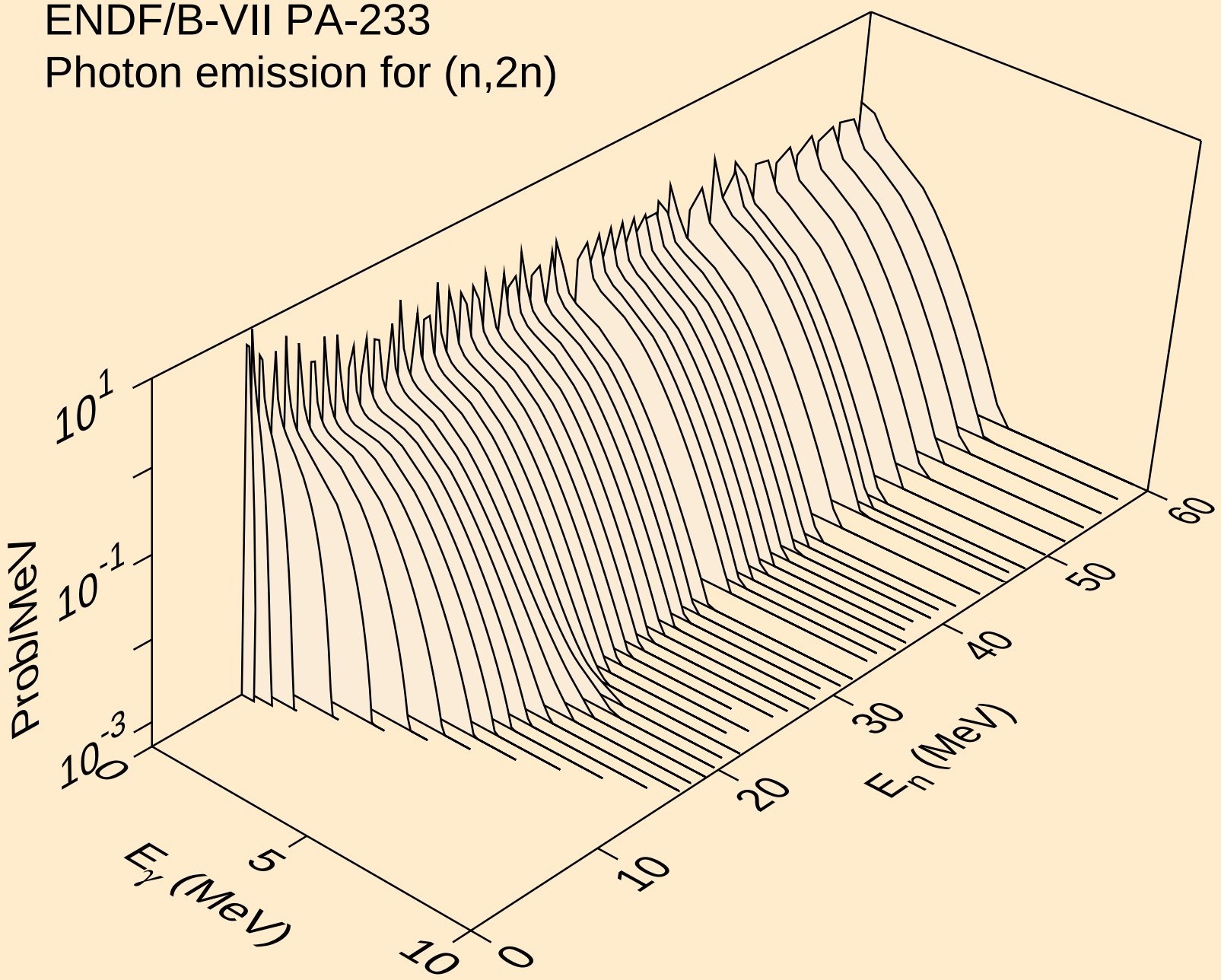

ENDF/B-VII PA-233
Delayed nubar
28
*10-3
26
24
22
20
18
Delayed nubar
0
15
30
45
60
Energy (MeV)


ENDF/B-VII PA-233
Delayed neutron spectra
Probability
Energy (MeV)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-2}
10^{-1}
10^{0}
group 1 frac 0.0826 decay/shake 1.240E-10
group 2 frac 0.2230 decay/shake 3.340E-10
group 3 frac 0.1608 decay/shake 1.210E-09
group 4 frac 0.3885 decay/shake 3.210E-09
group 5 frac 0.1050 decay/shake 1.210E-08
group 6 frac 0.0401 decay/shake 3.290E-08

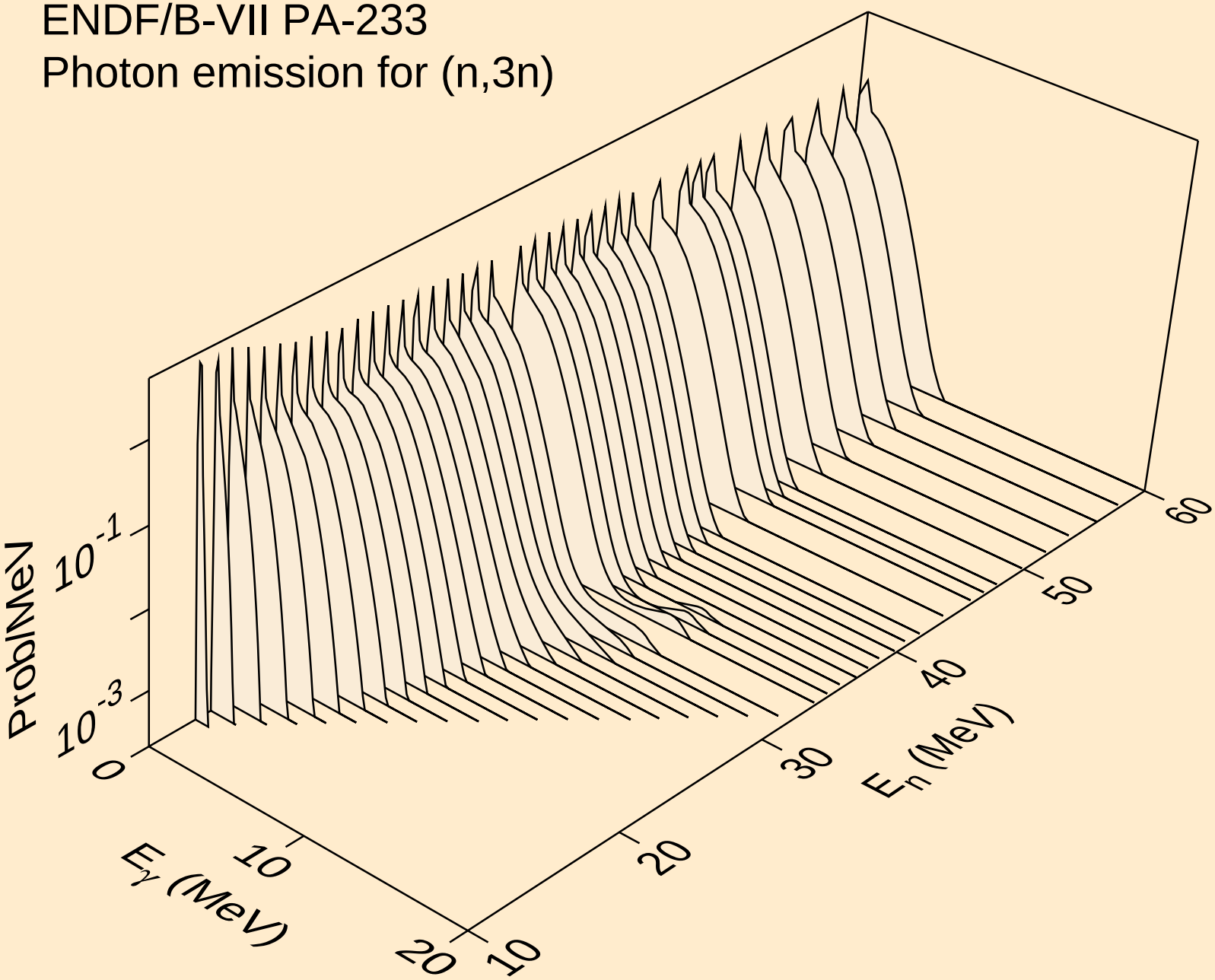
ENDF/B-VII PA-233
Photon emission for (n,x)



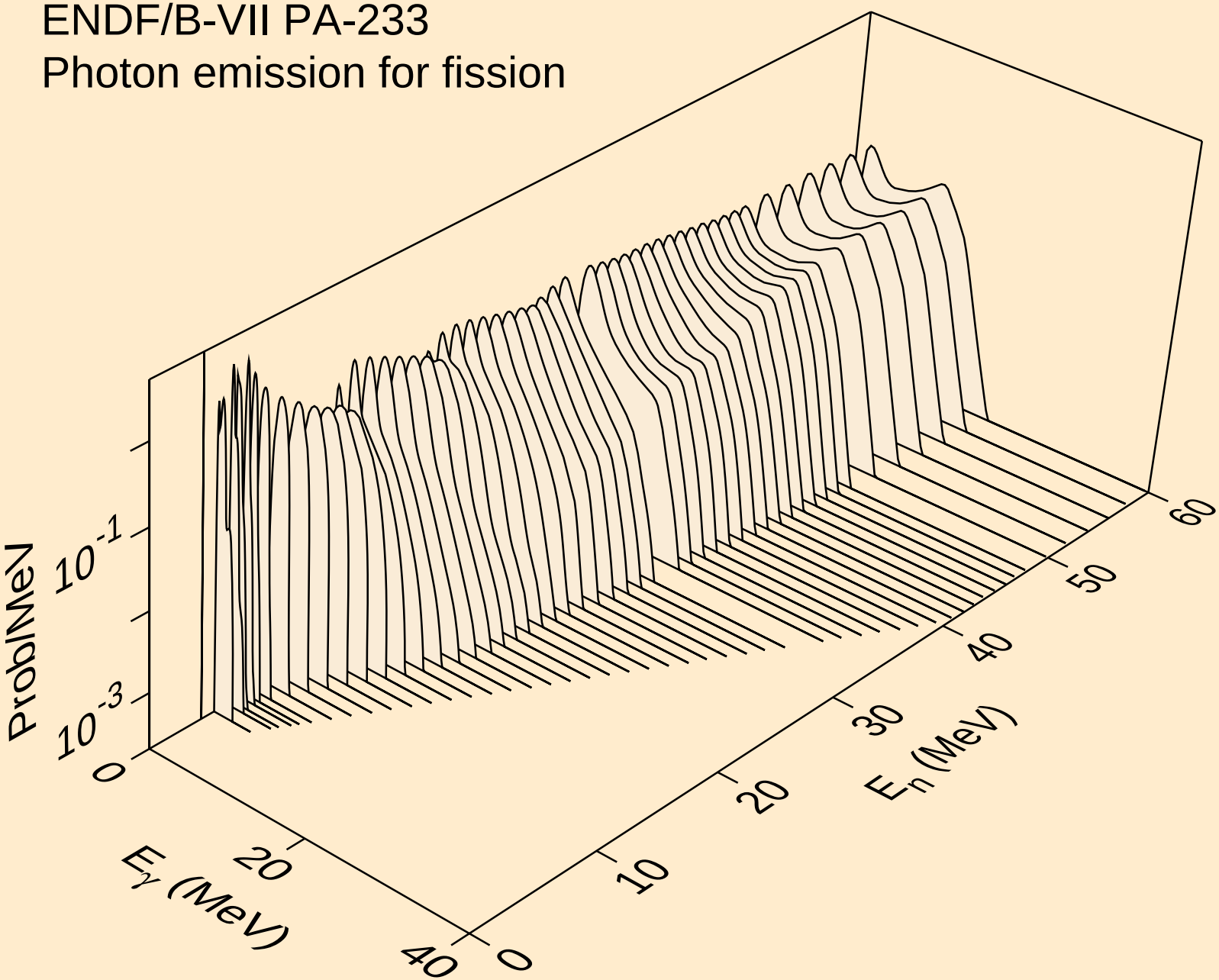
ENDF/B-VII PA-233
Photon emission for (n,2n)



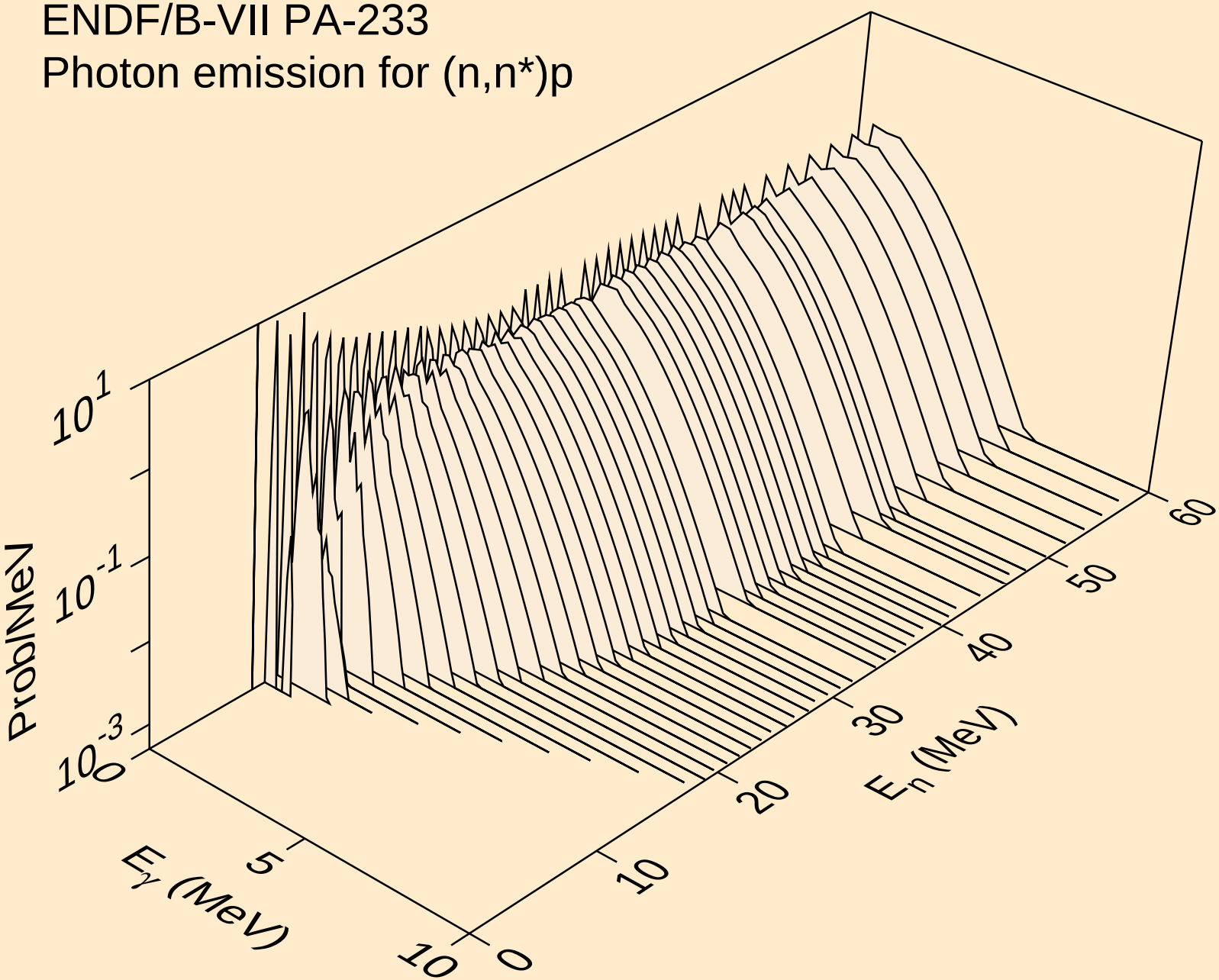
ENDF/B-VII PA-233
Photon emission for (n,3n)



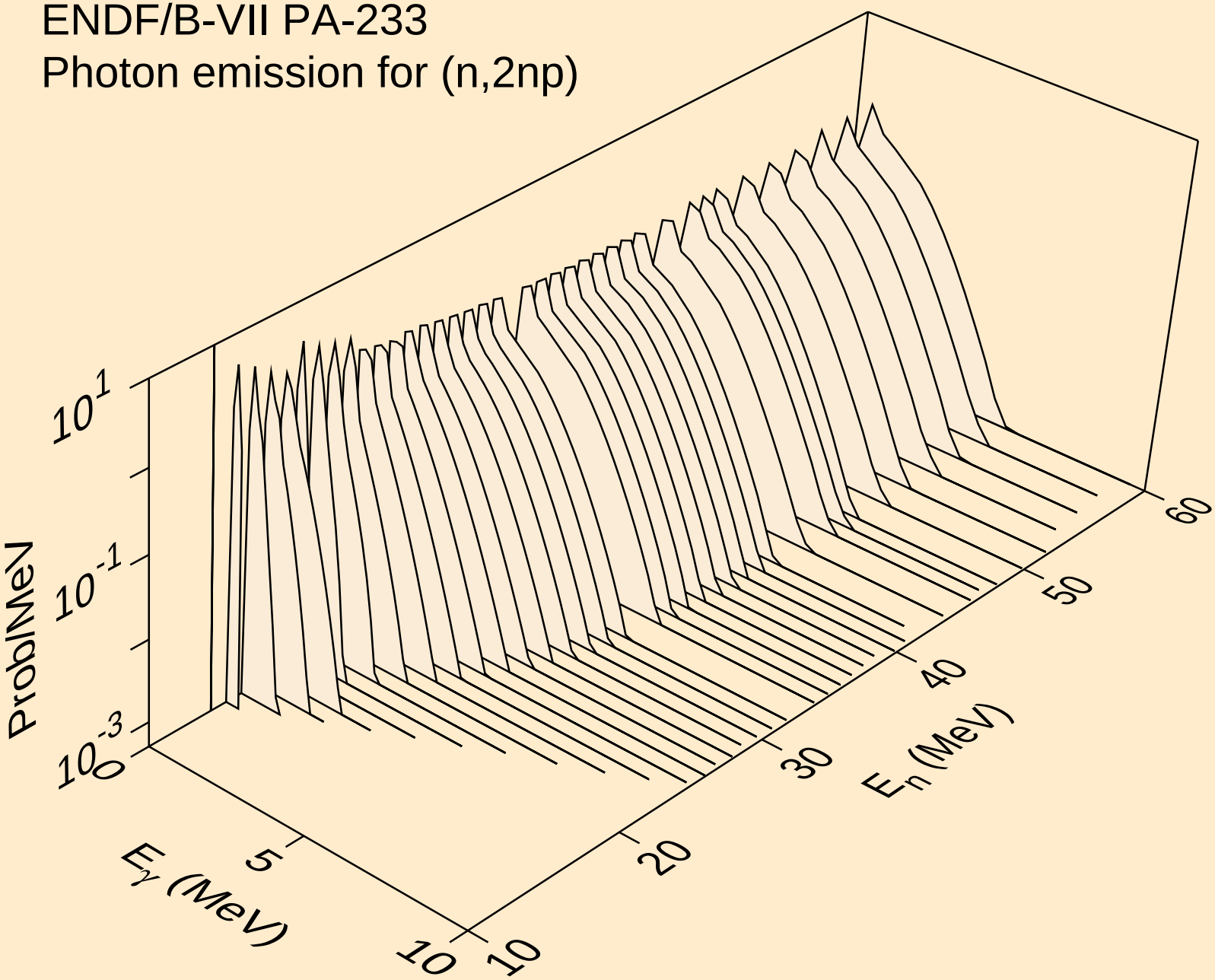
ENDF/B-VII PA-233
Photon emission for fission



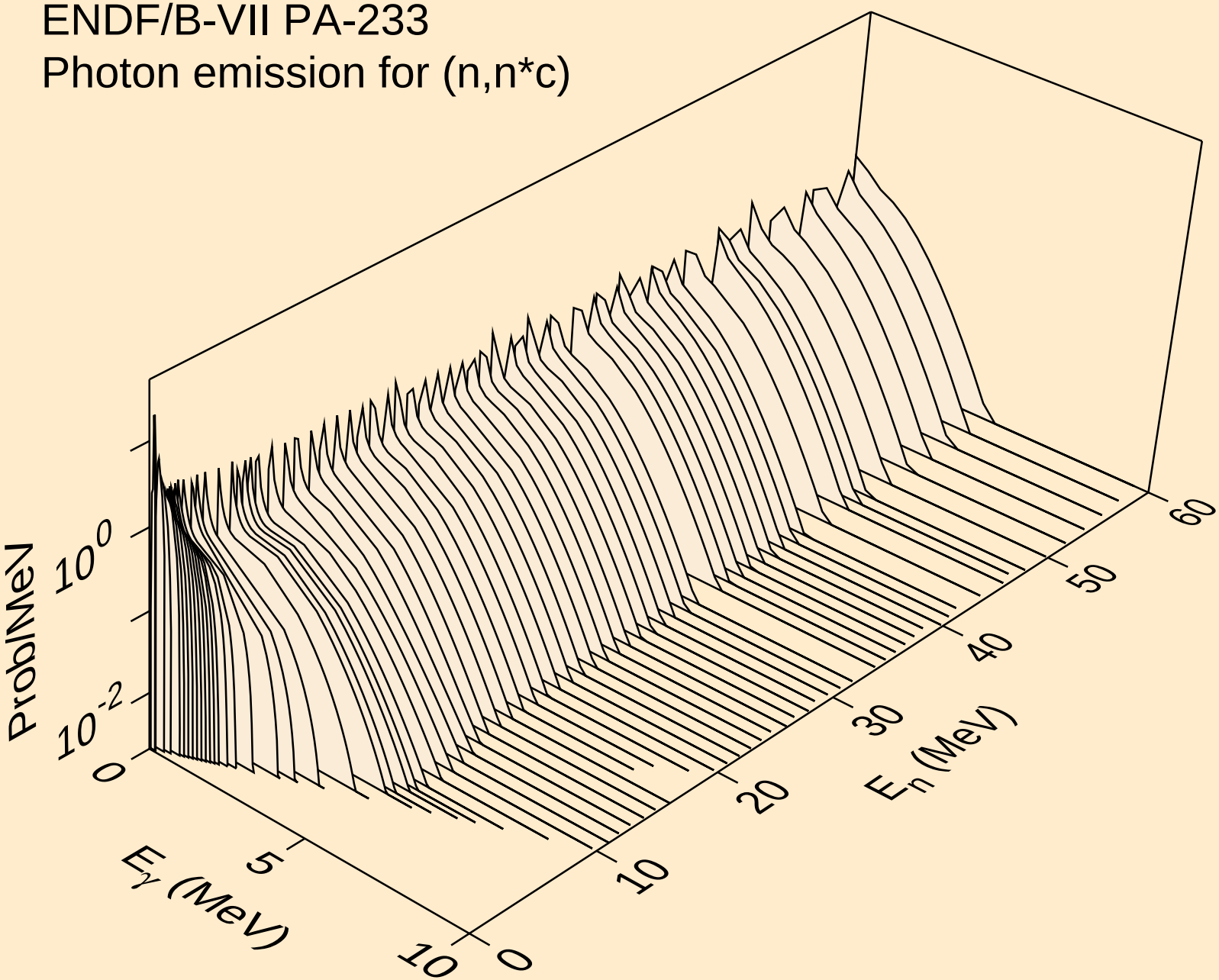
ENDF/B-VII PA-233
Photon emission for (n,n*)p



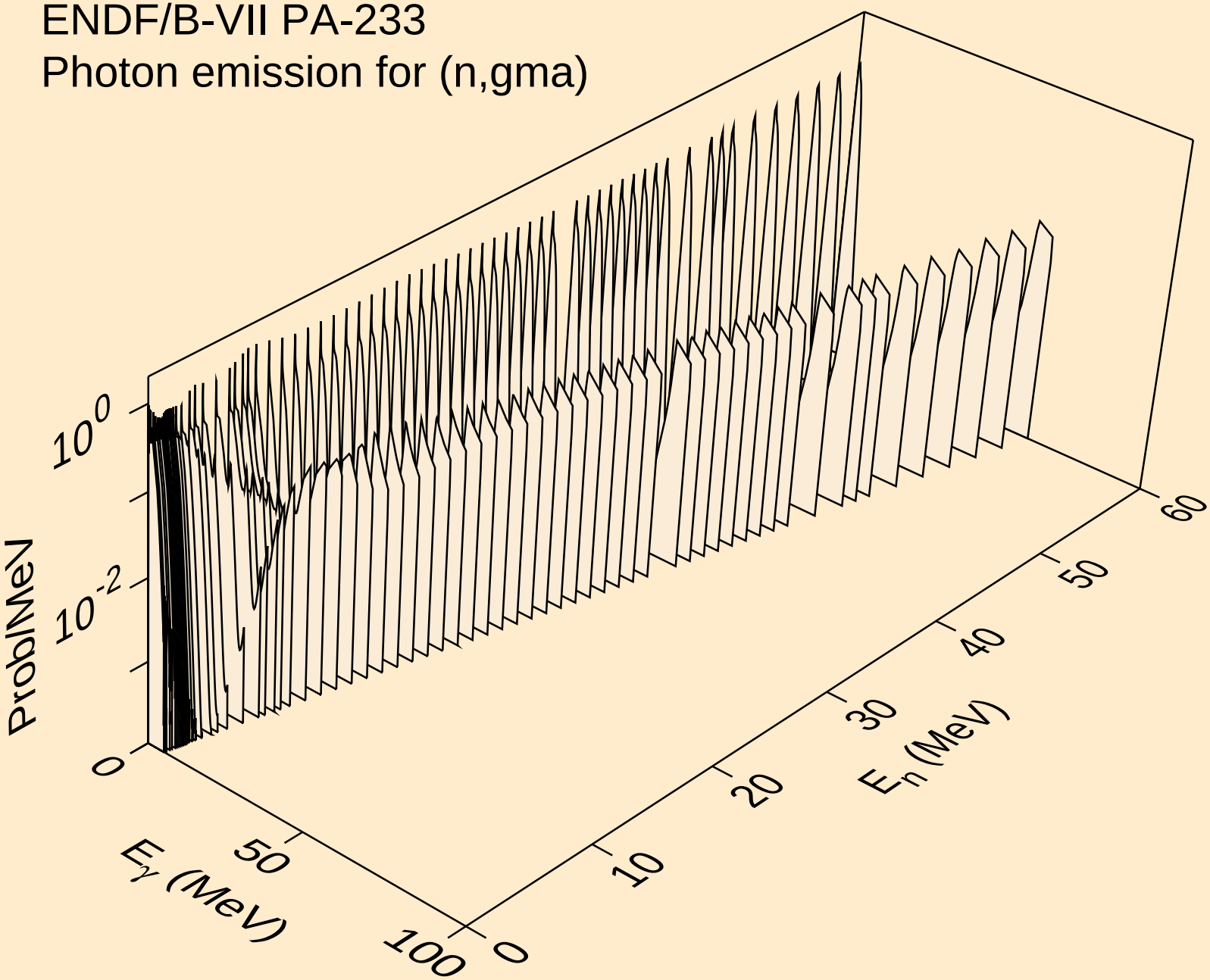
ENDF/B-VII PA-233
Photon emission for (n,2np)



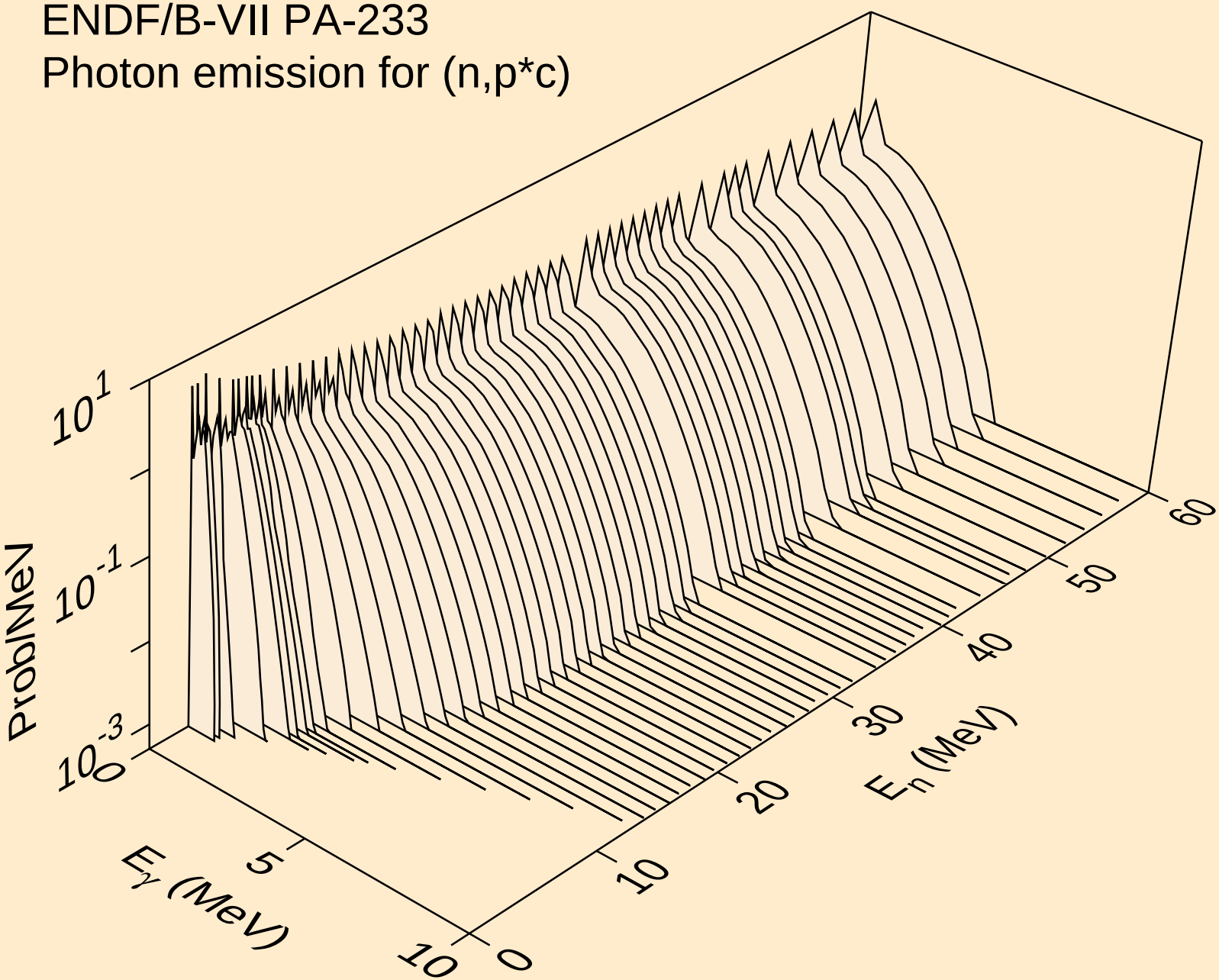
ENDF/B-VII PA-233
Photon emission for (n,n*c)

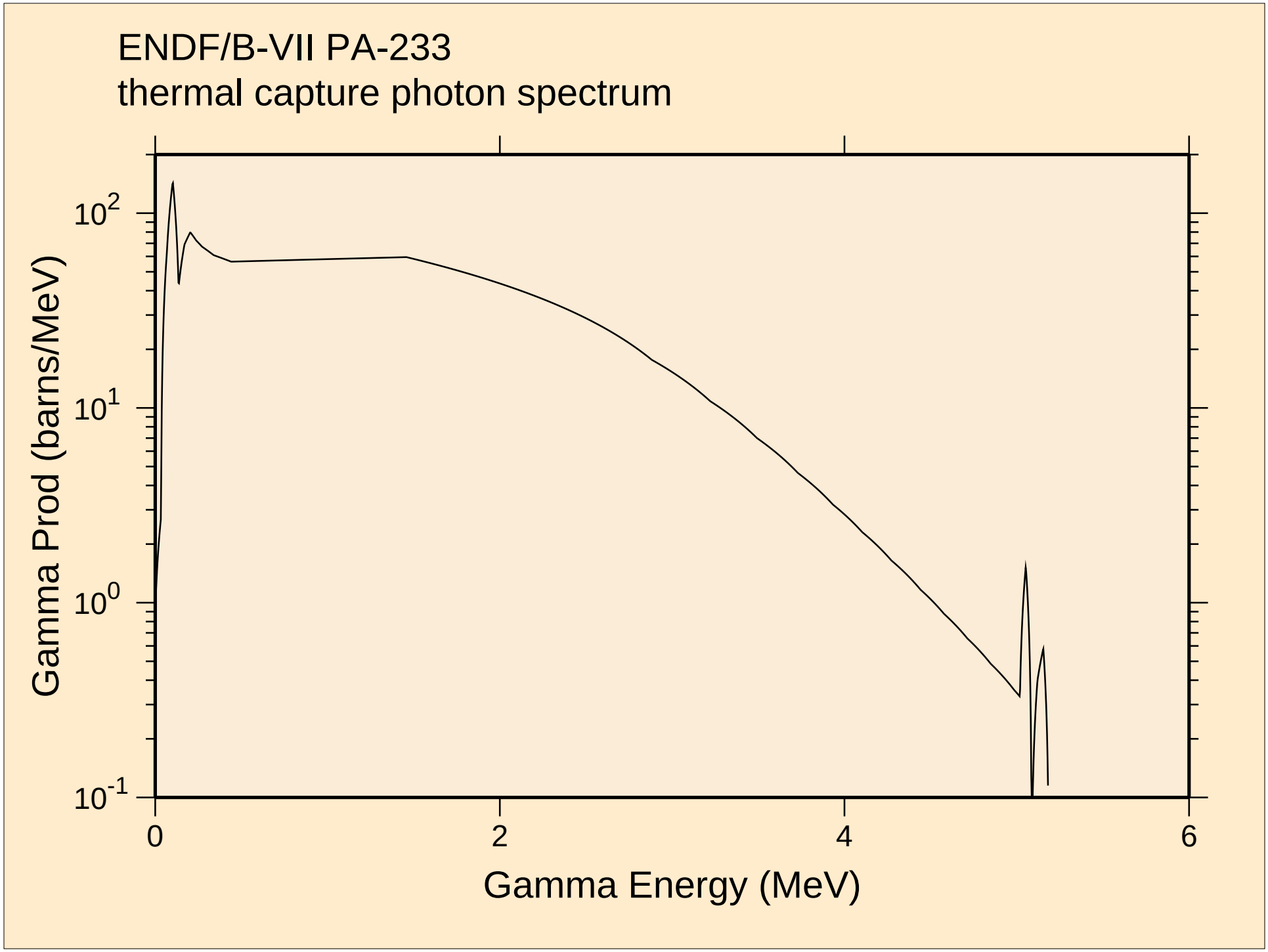


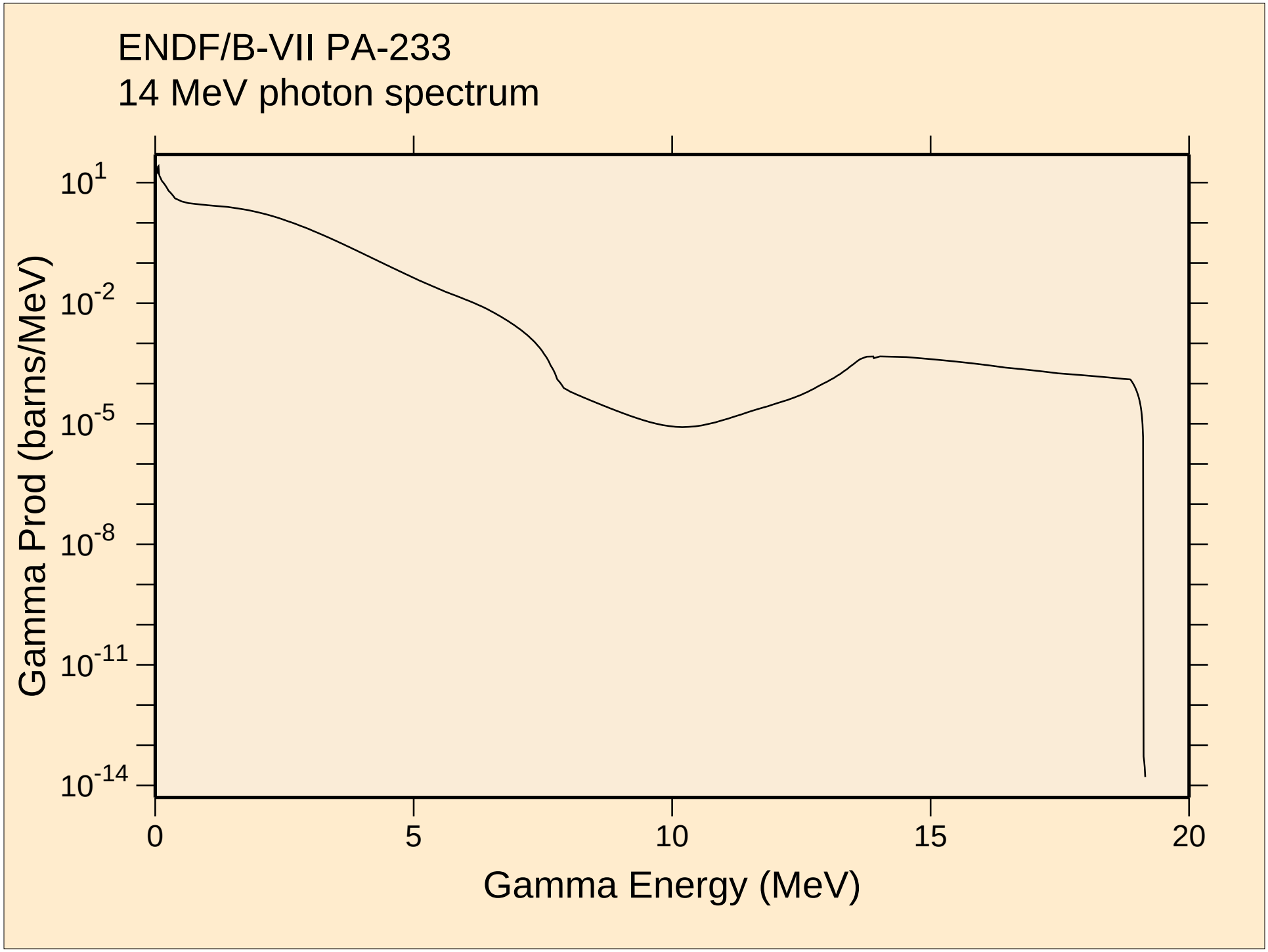
ENDF/B-VII PA-233
Photon emission for (n,gma)

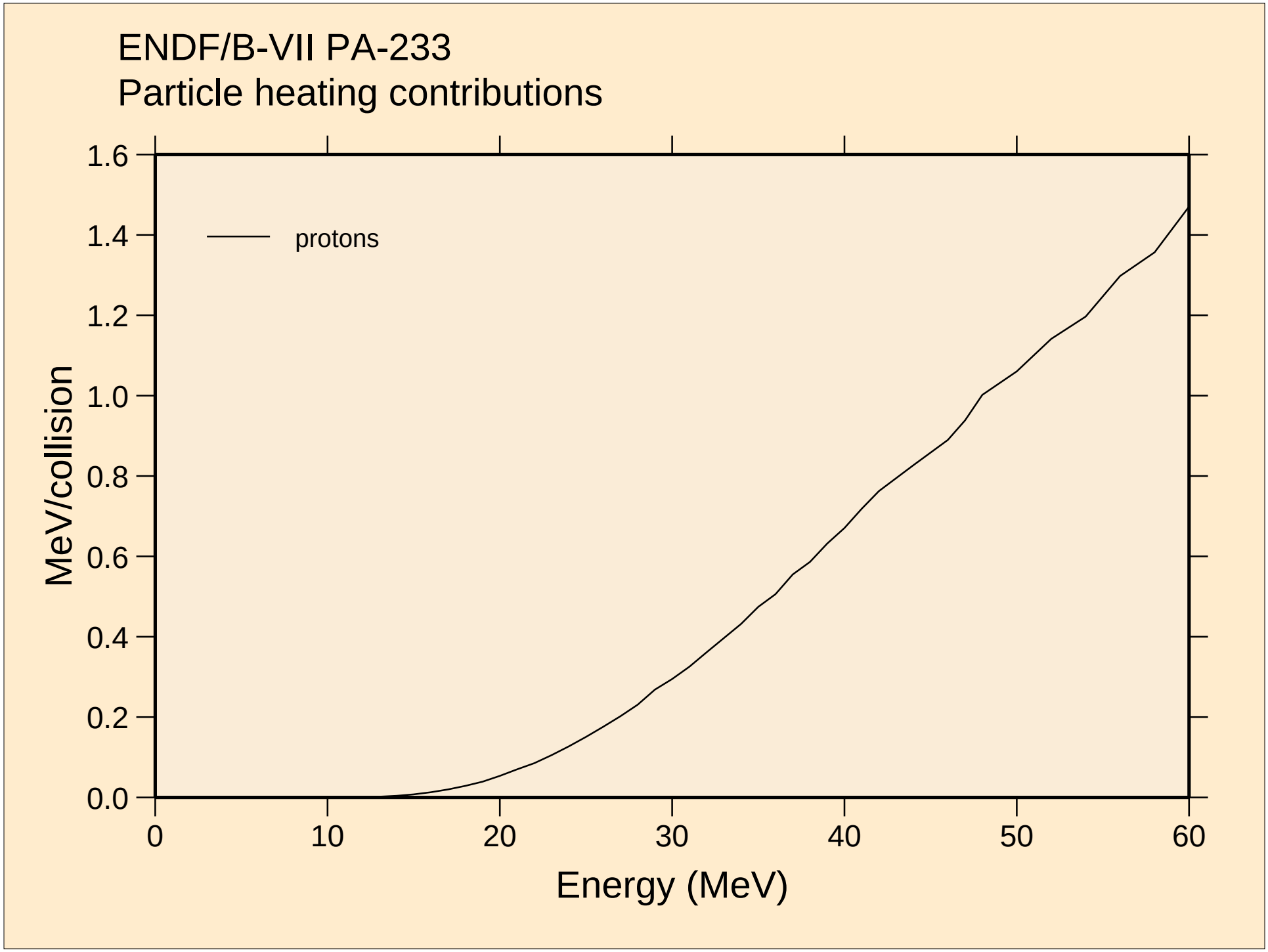


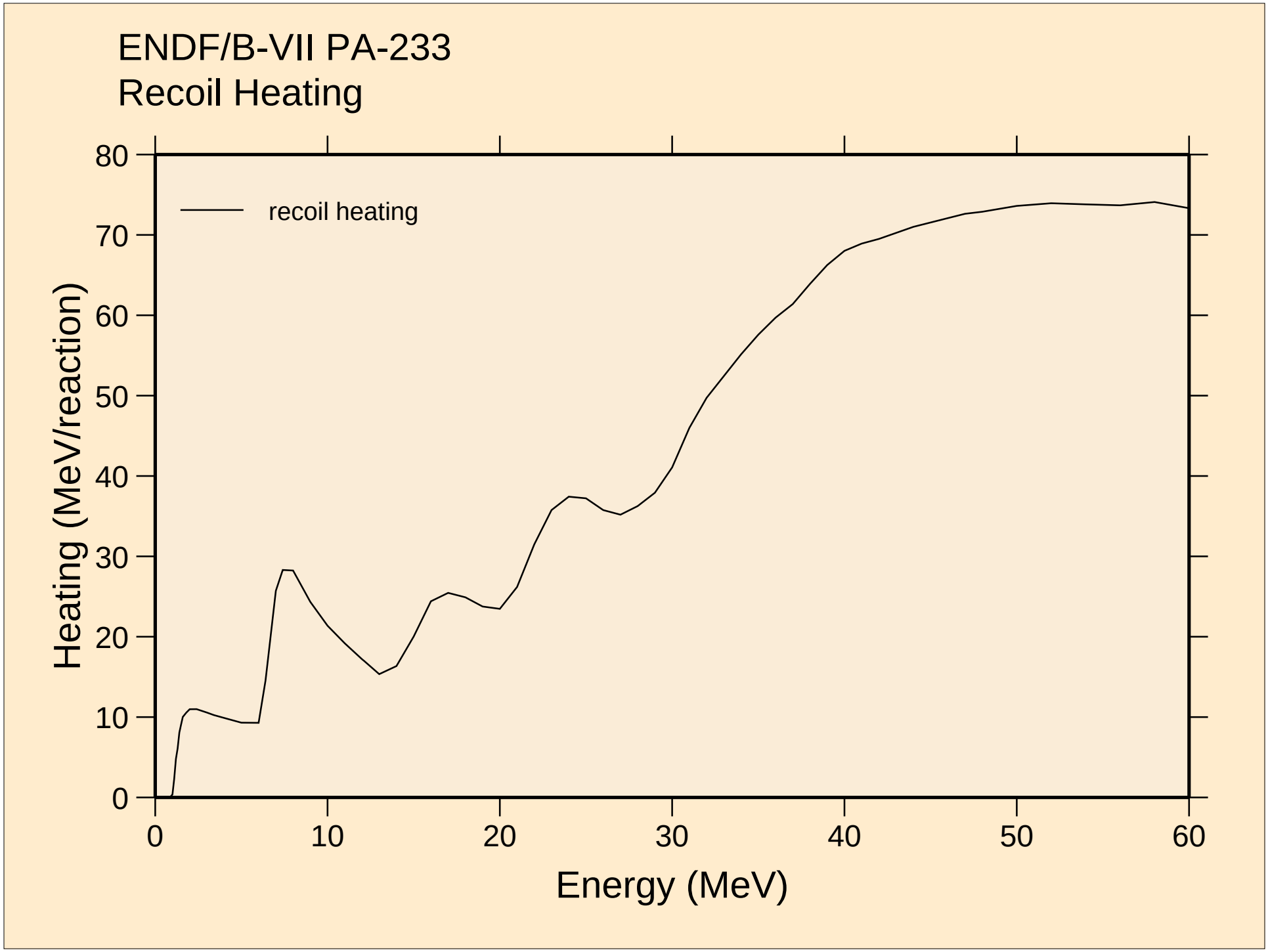
ENDF/B-VII PA-233
Photon emission for (n,p*c)

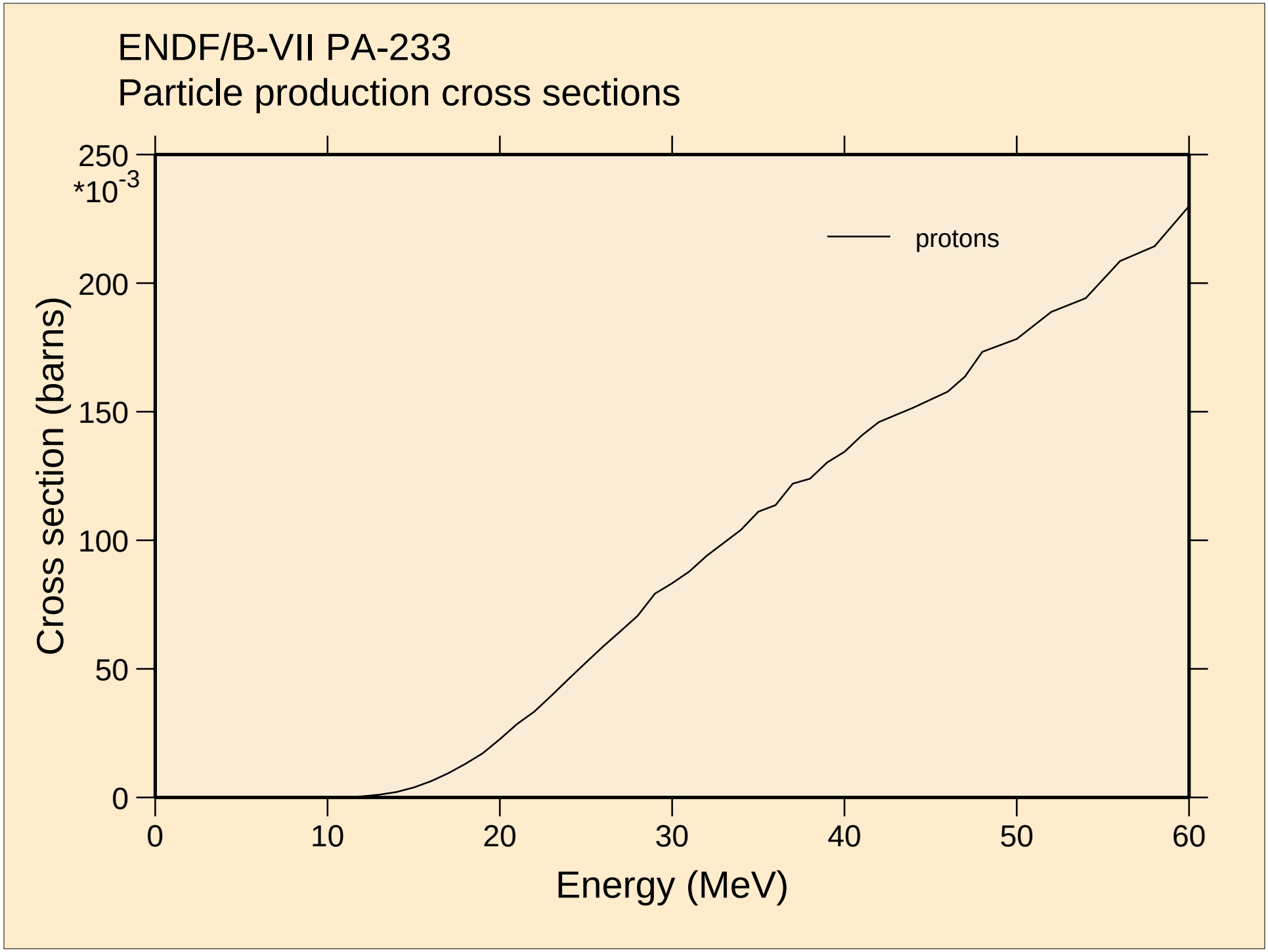


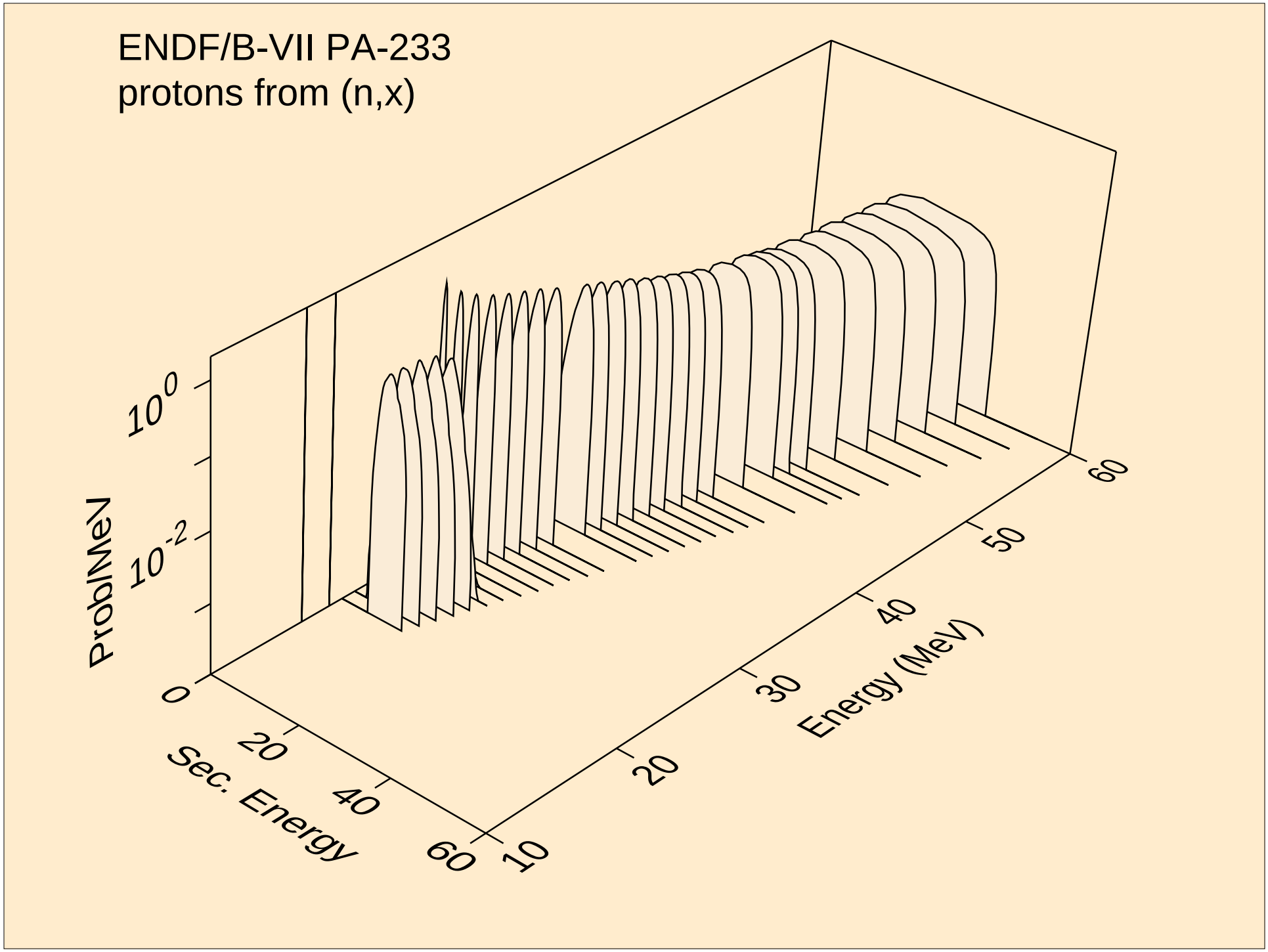

ENDF/B-VII PA-233
thermal capture photon spectrum
Gamma Prod (barns/MeV)
10^{2}
10^{1}
10^{0}
10^{-1}
0
2
4
6
Gamma Energy (MeV)

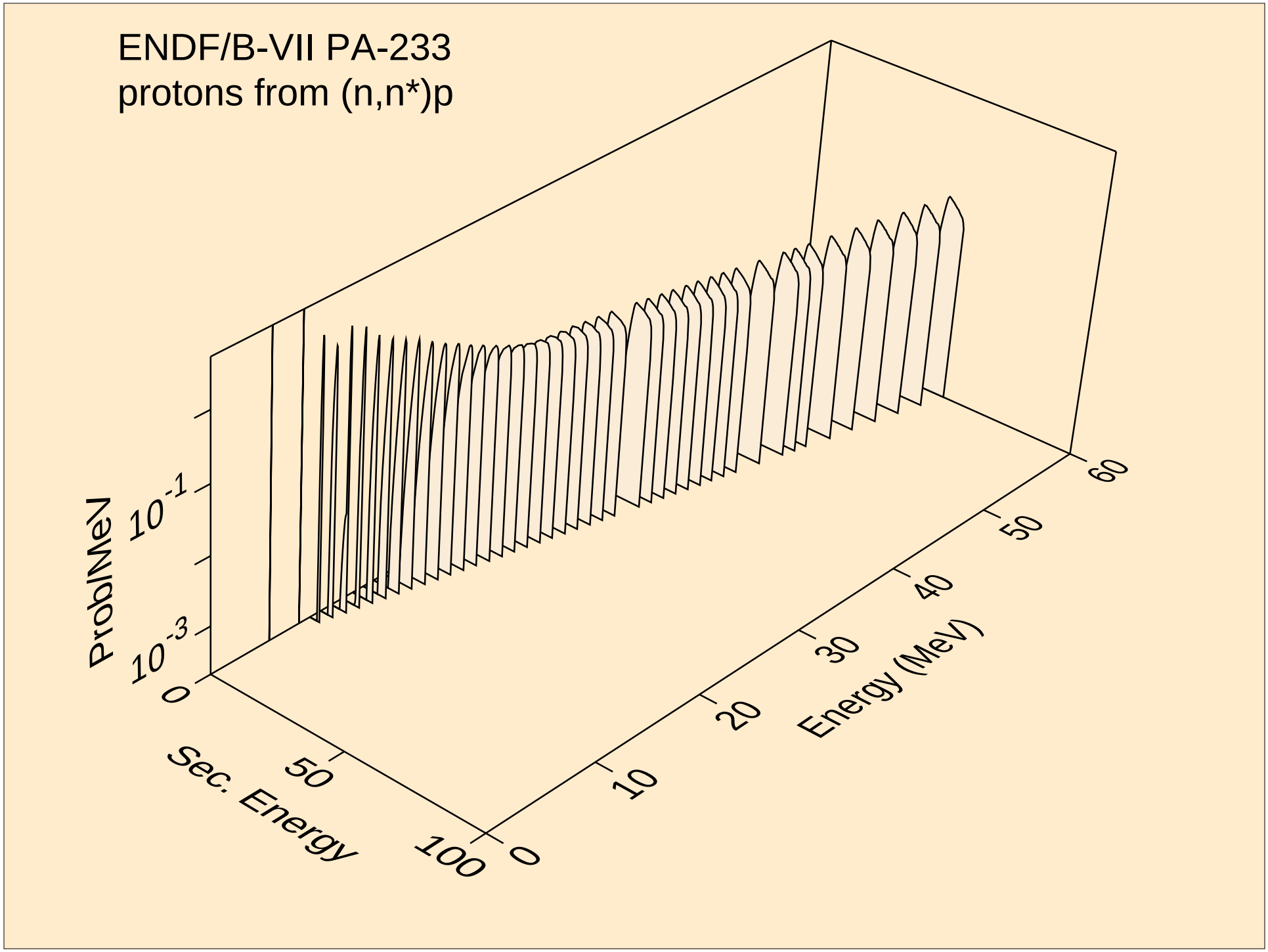

ENDF/B-VII PA-233
14 MeV photon spectrum
Gamma Prod (barns/MeV)
10^1
10^-2
10^-5
10^-8
10^-11
10^-14
0
5
10
15
20
Gamma Energy (MeV)

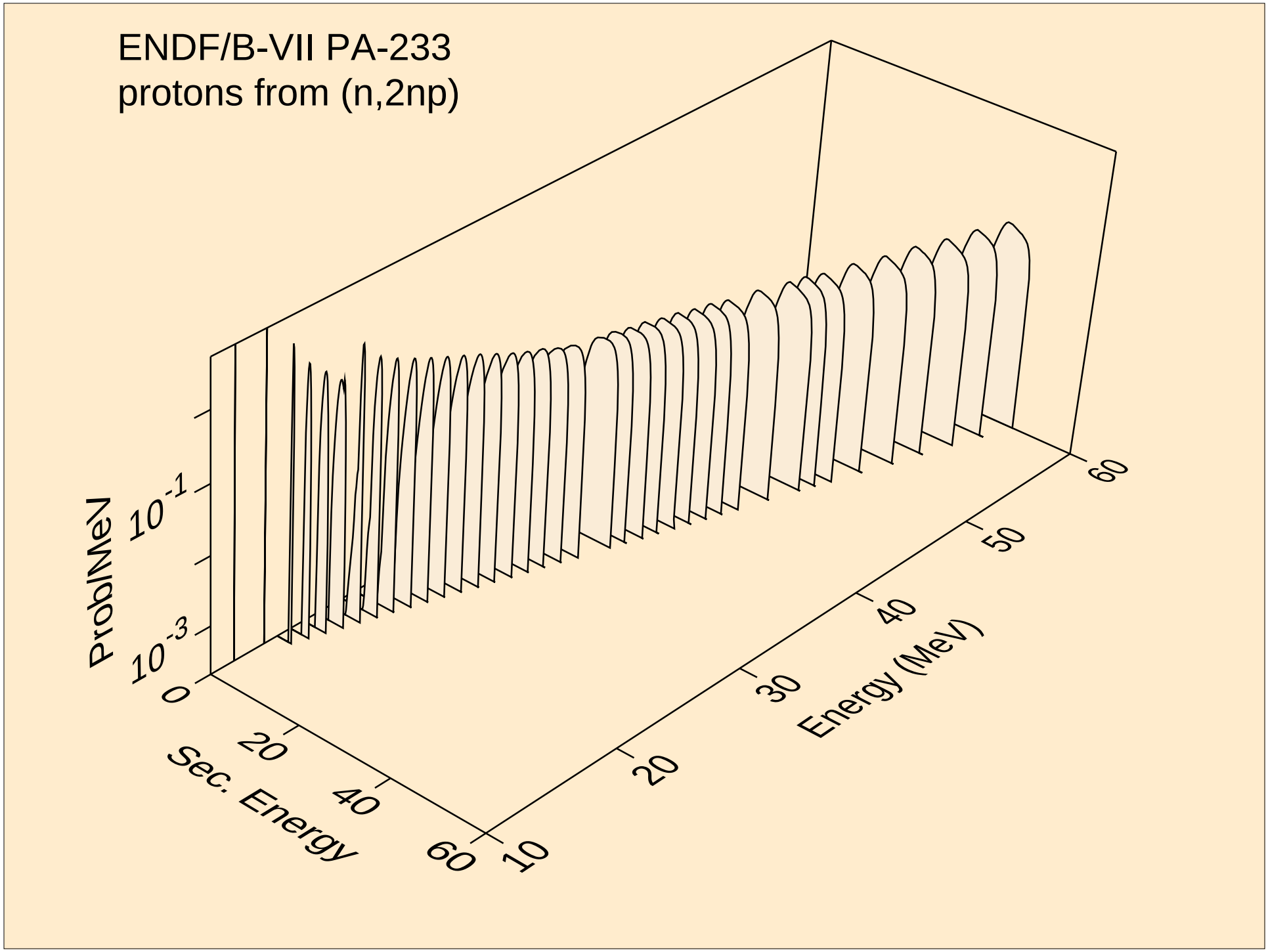

ENDF/B-VII PA-233
Particle heating contributions
protons
MeV/collision
Energy (MeV)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
0
10
20
30
40
50
60

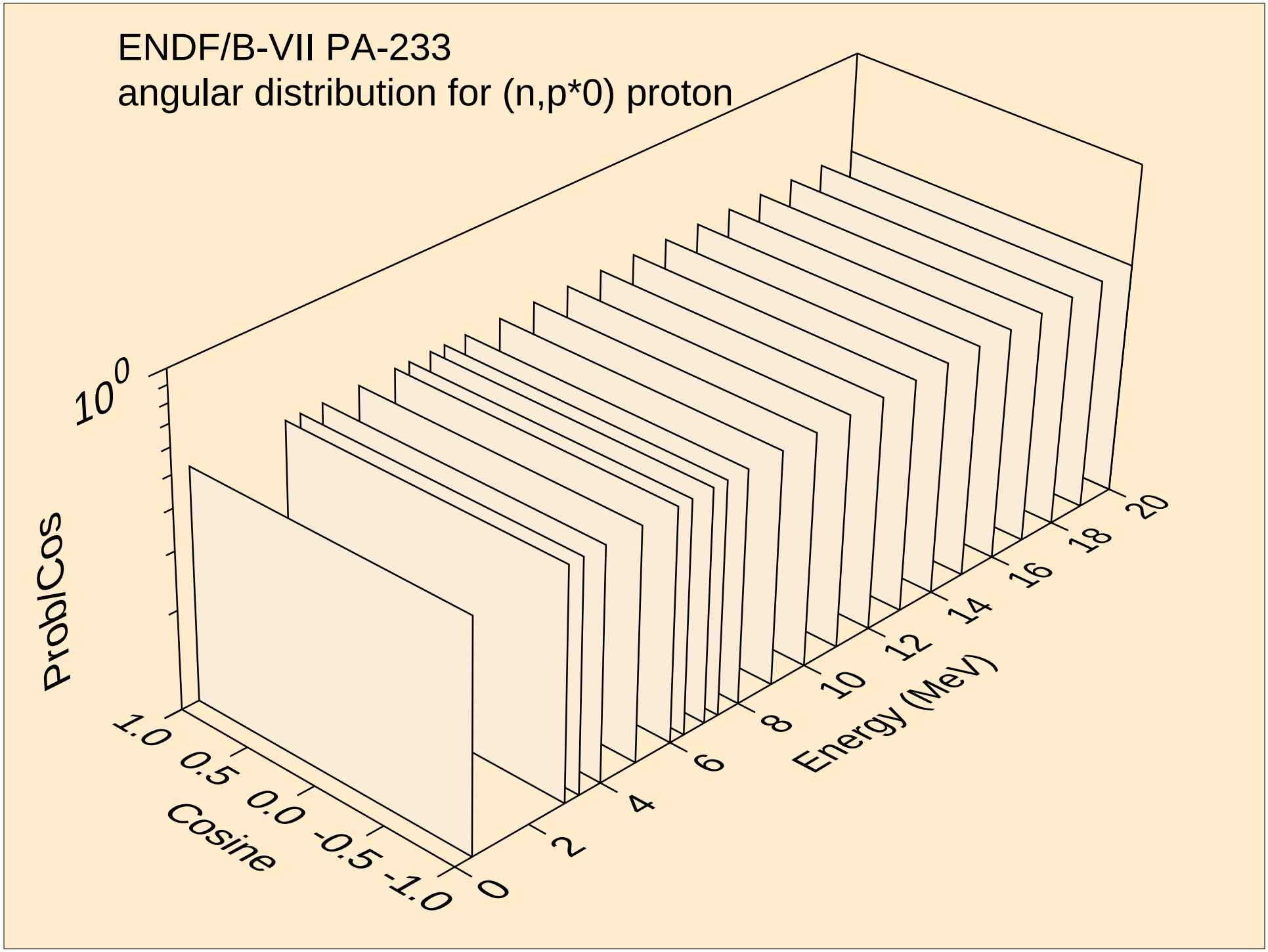

ENDF/B-VII PA-233
Recoil Heating
recoil heating
Heating (MeV/reaction)
Energy (MeV)
0
10
20
30
40
50
60
70
80
0
10
20
30
40
50
60

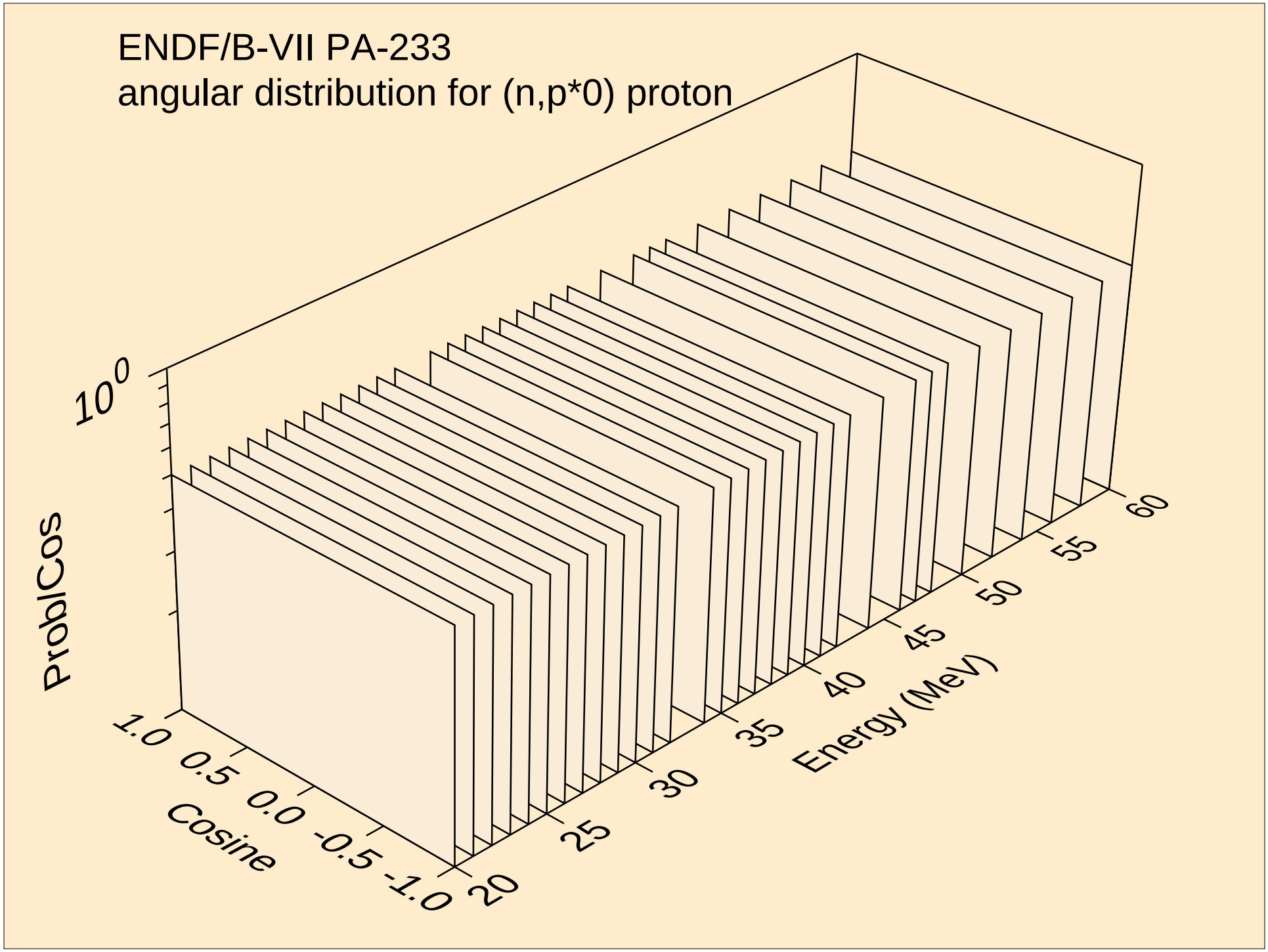

ENDF/B-VII PA-233
Particle production cross sections
250
*10-3
200
150
100
50
0
Cross section (barns)
protons
0
10
20
30
40
50
60
Energy (MeV)

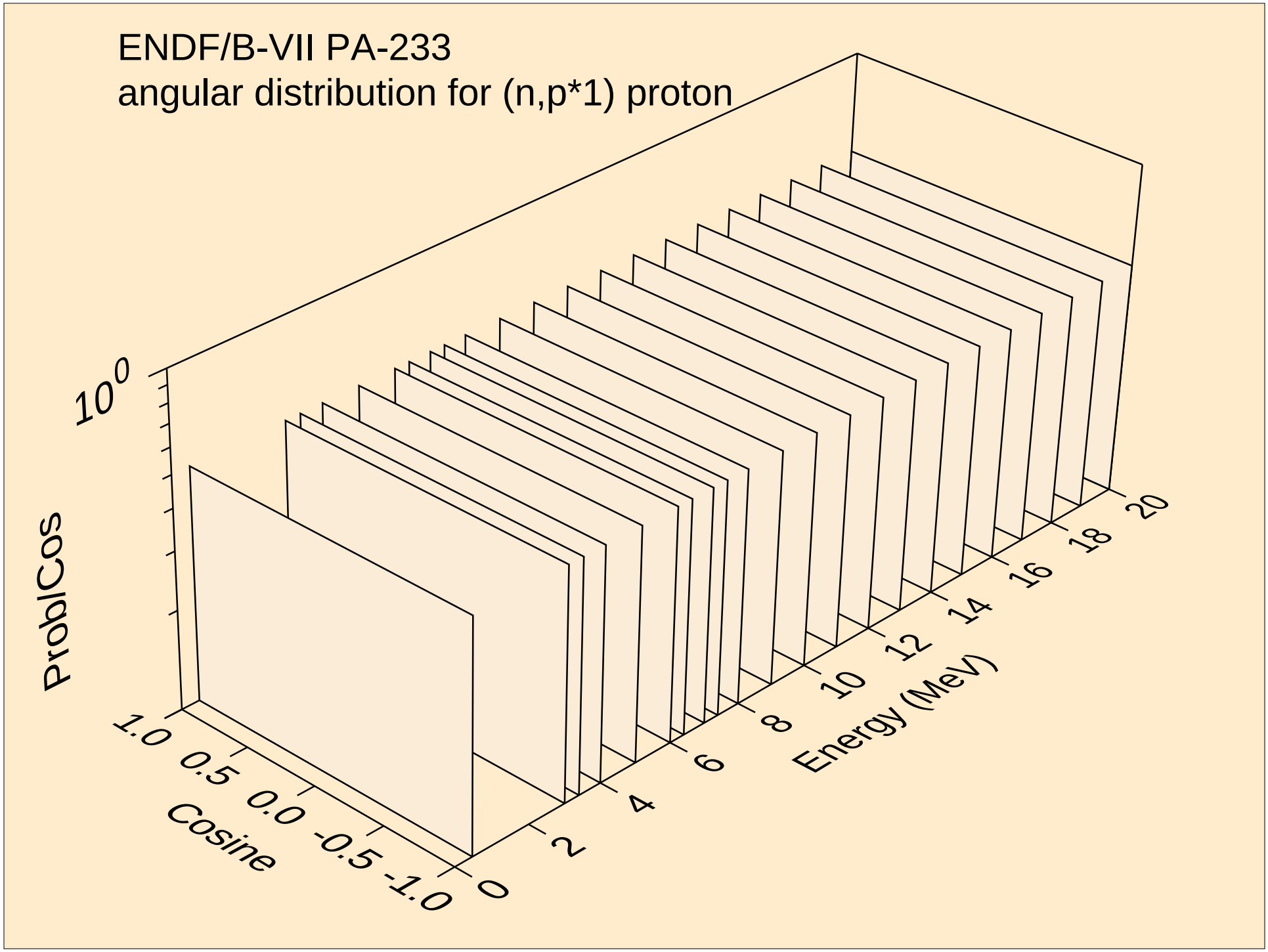

ENDF/B-VII PA-233
protons from (n,x)
Prob/MeV
10^0
10^{-2}
0
20
40
60
Sec. Energy
10
20
30
40
50
60
Energy (MeV)

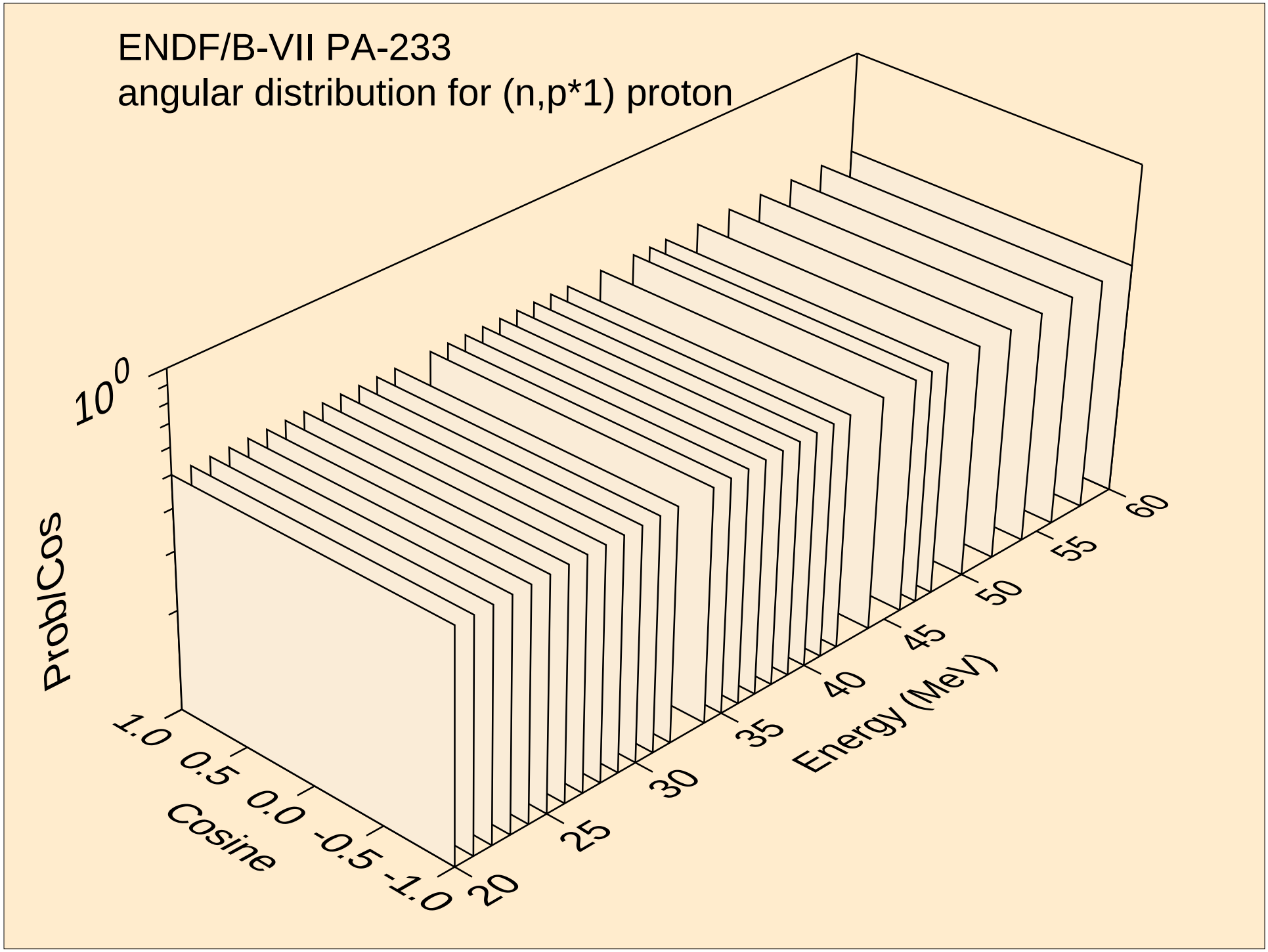

ENDF/B-VII PA-233
protons from (n,n*)p
Prob/MeV
10^-1
10^-3
0
Sec. Energy
50
100
0
10
20
30
40
50
60
Energy (MeV)

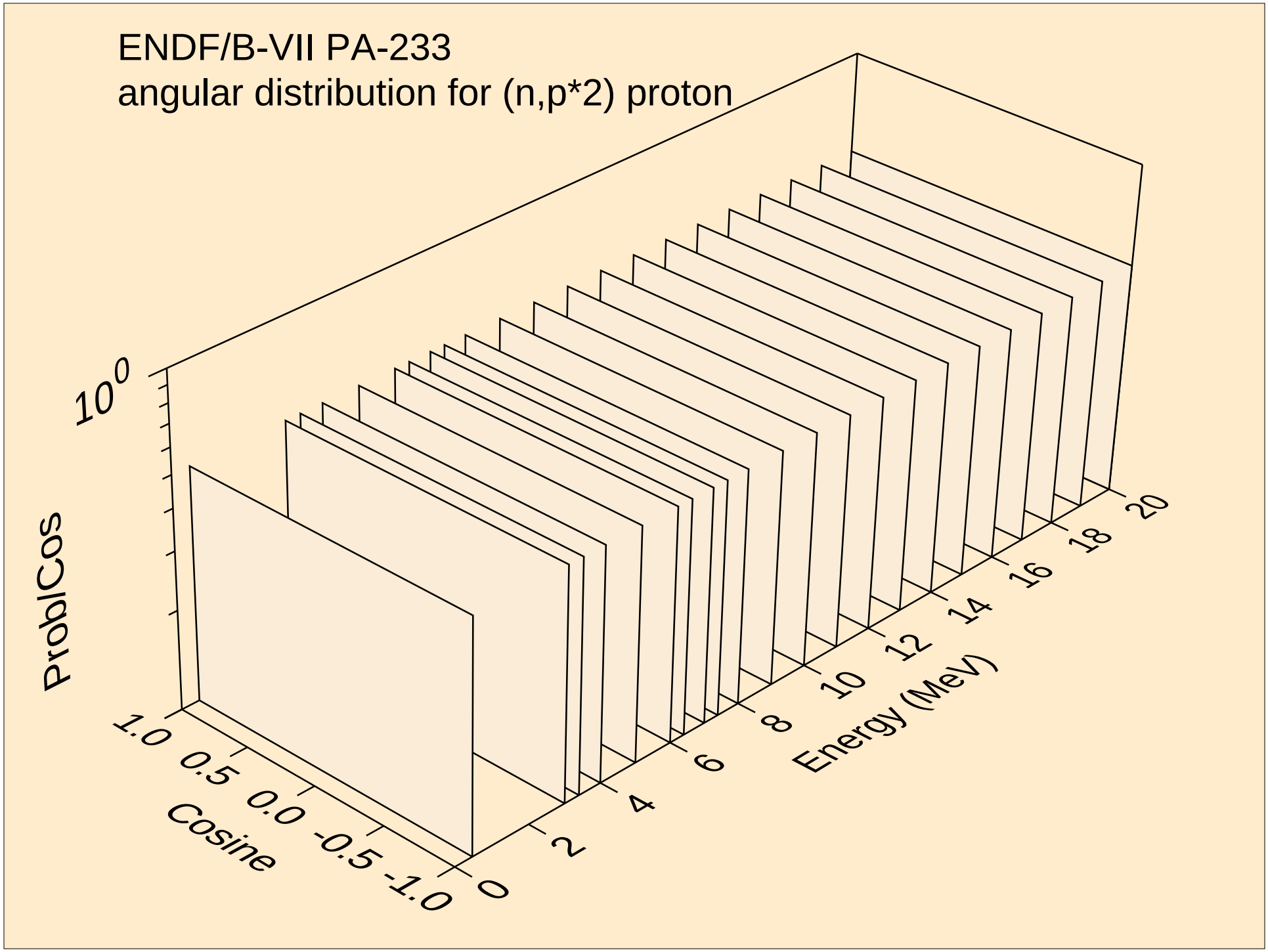

ENDF/B-VII PA-233
protons from (n,2np)
Prob/MeV
10^-1
10^-3
0
20
40
60
Sec. Energy
10
20
30
40
50
60
Energy (MeV)

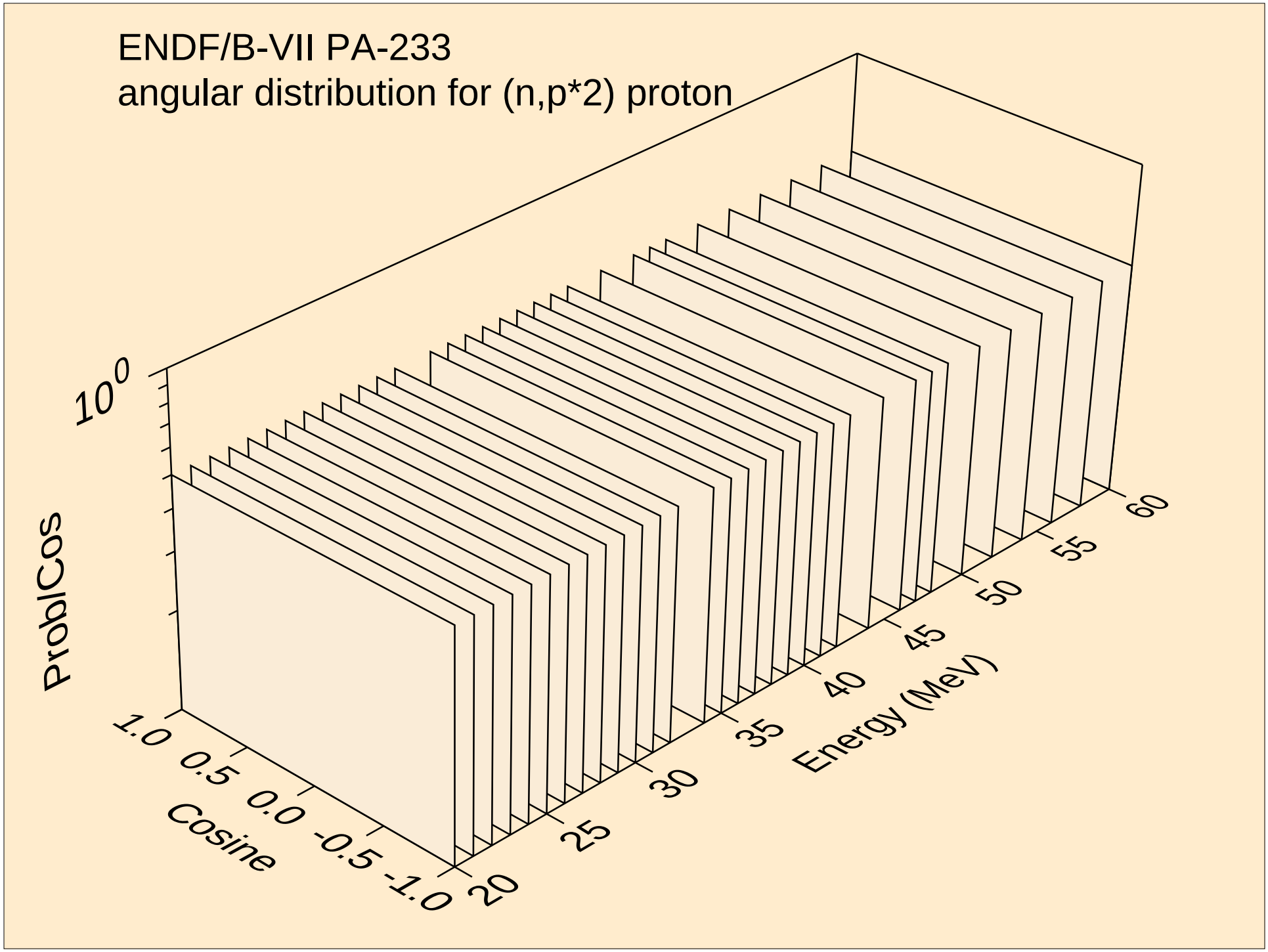

ENDF/B-VII PA-233
angular distribution for (n,p*0) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

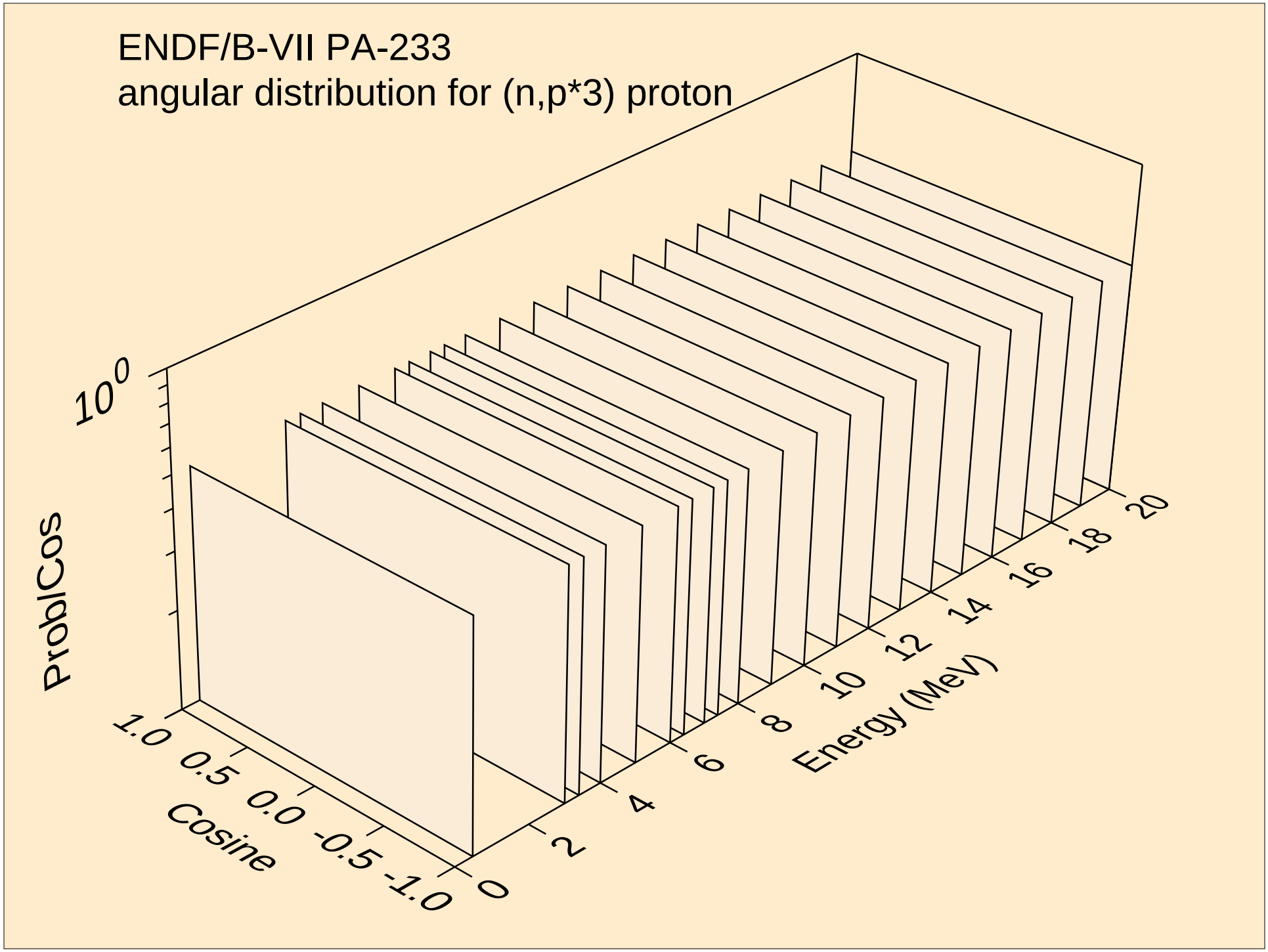

ENDF/B-VII PA-233
angular distribution for (n,p*0) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

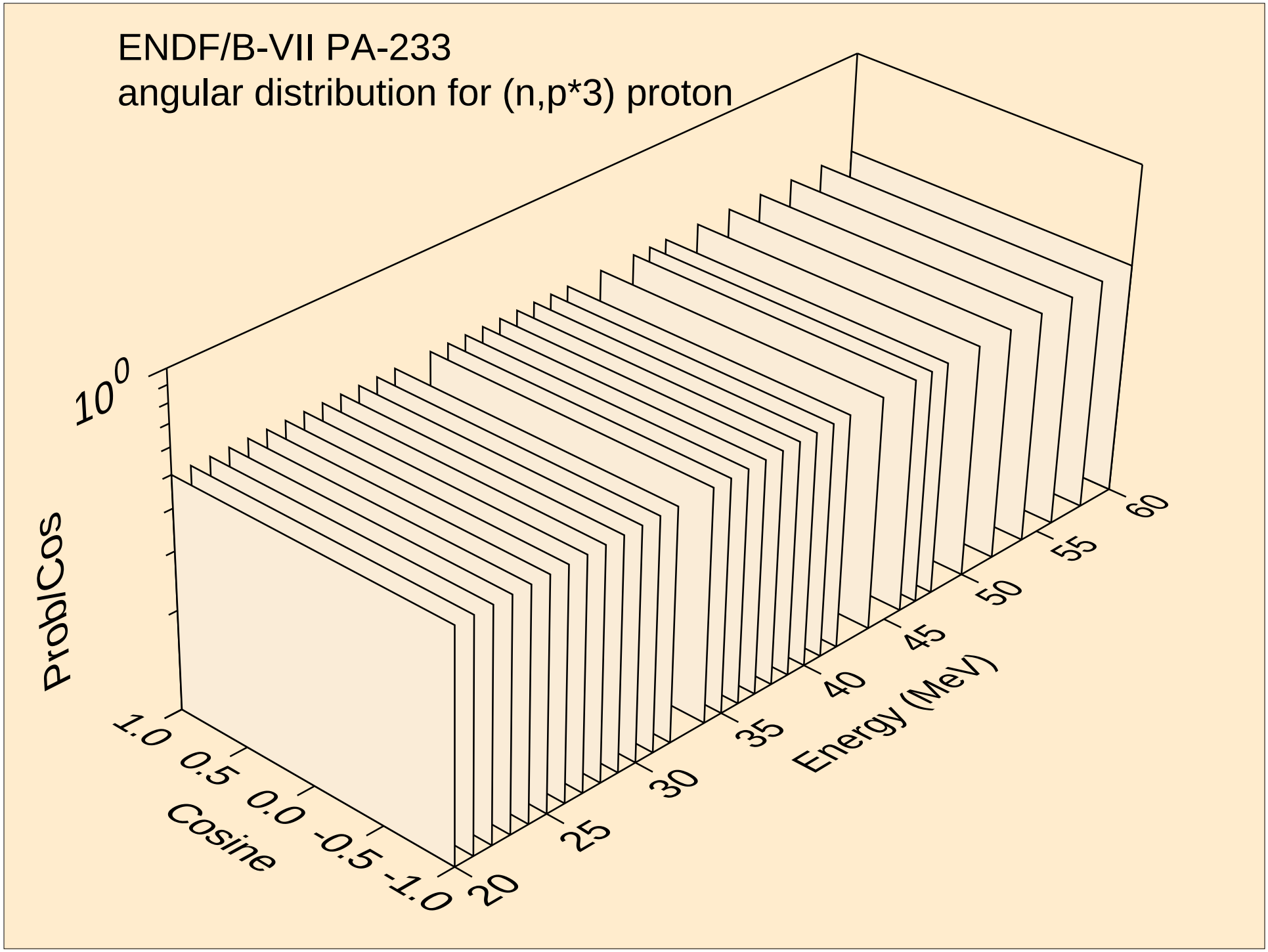

ENDF/B-VII PA-233
angular distribution for (n,p*1) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

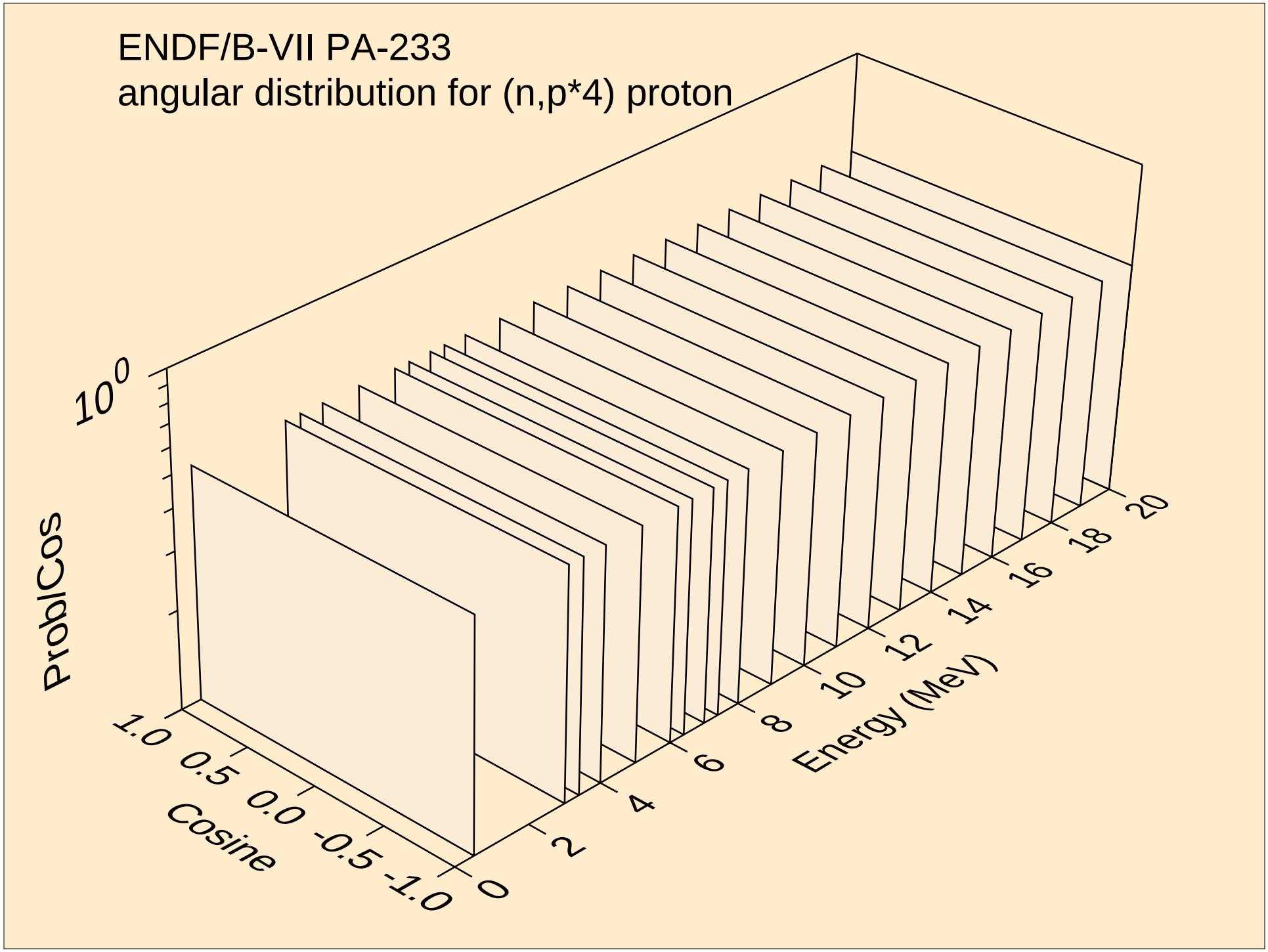

ENDF/B-VII PA-233
angular distribution for (n,p*1) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

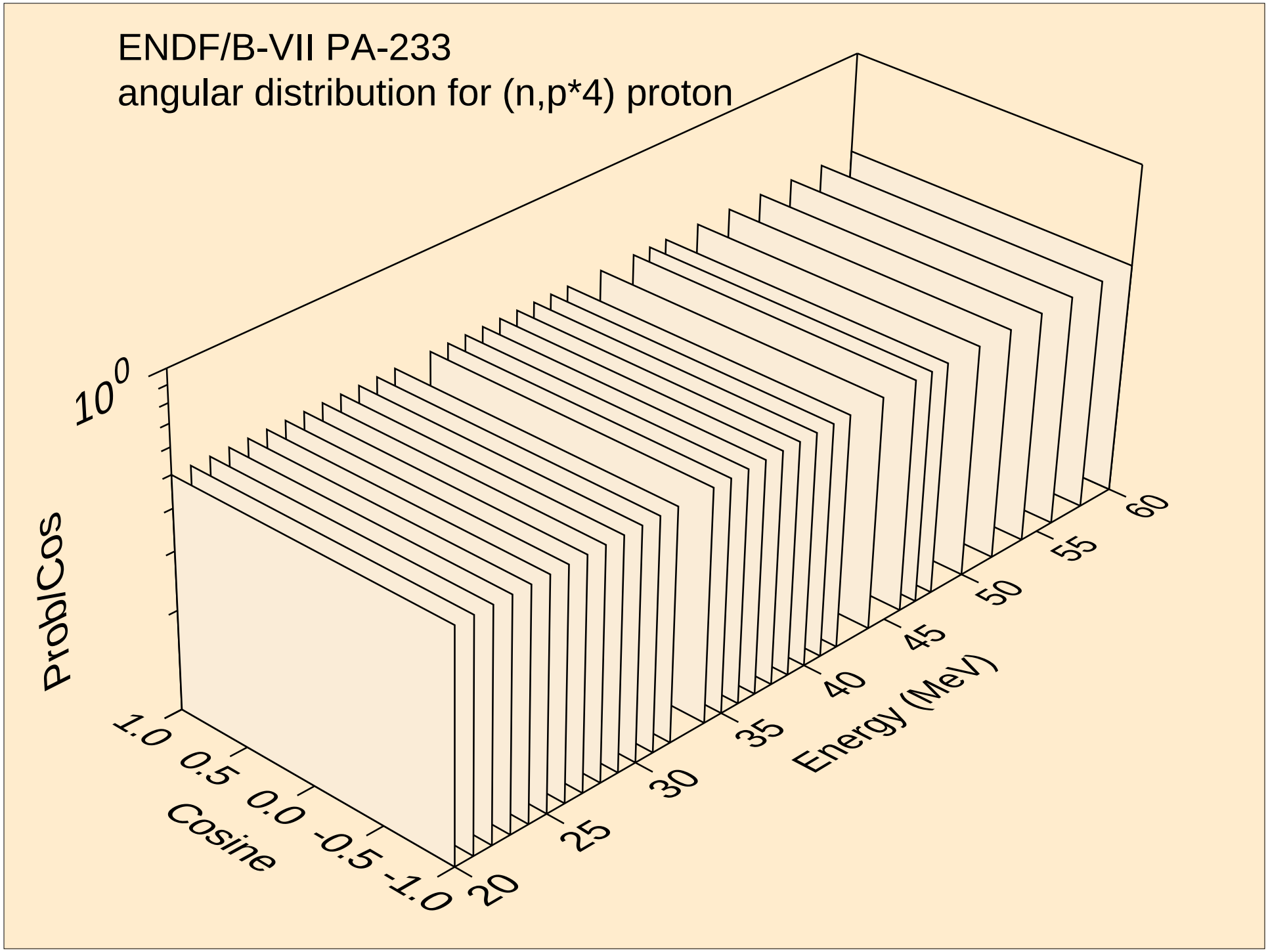

ENDF/B-VII PA-233
angular distribution for (n,p*2) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

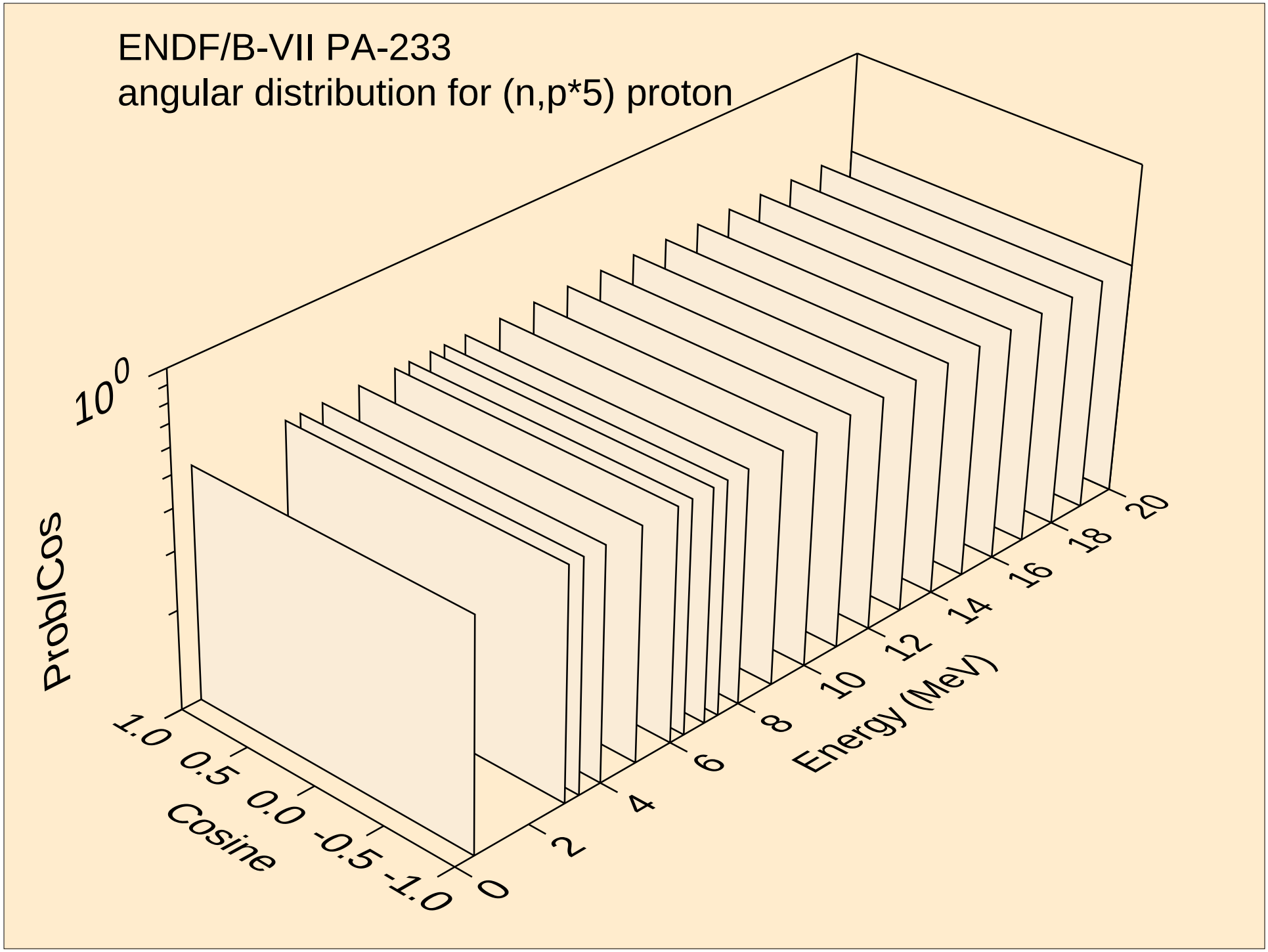

ENDF/B-VII PA-233
angular distribution for (n,p*2) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

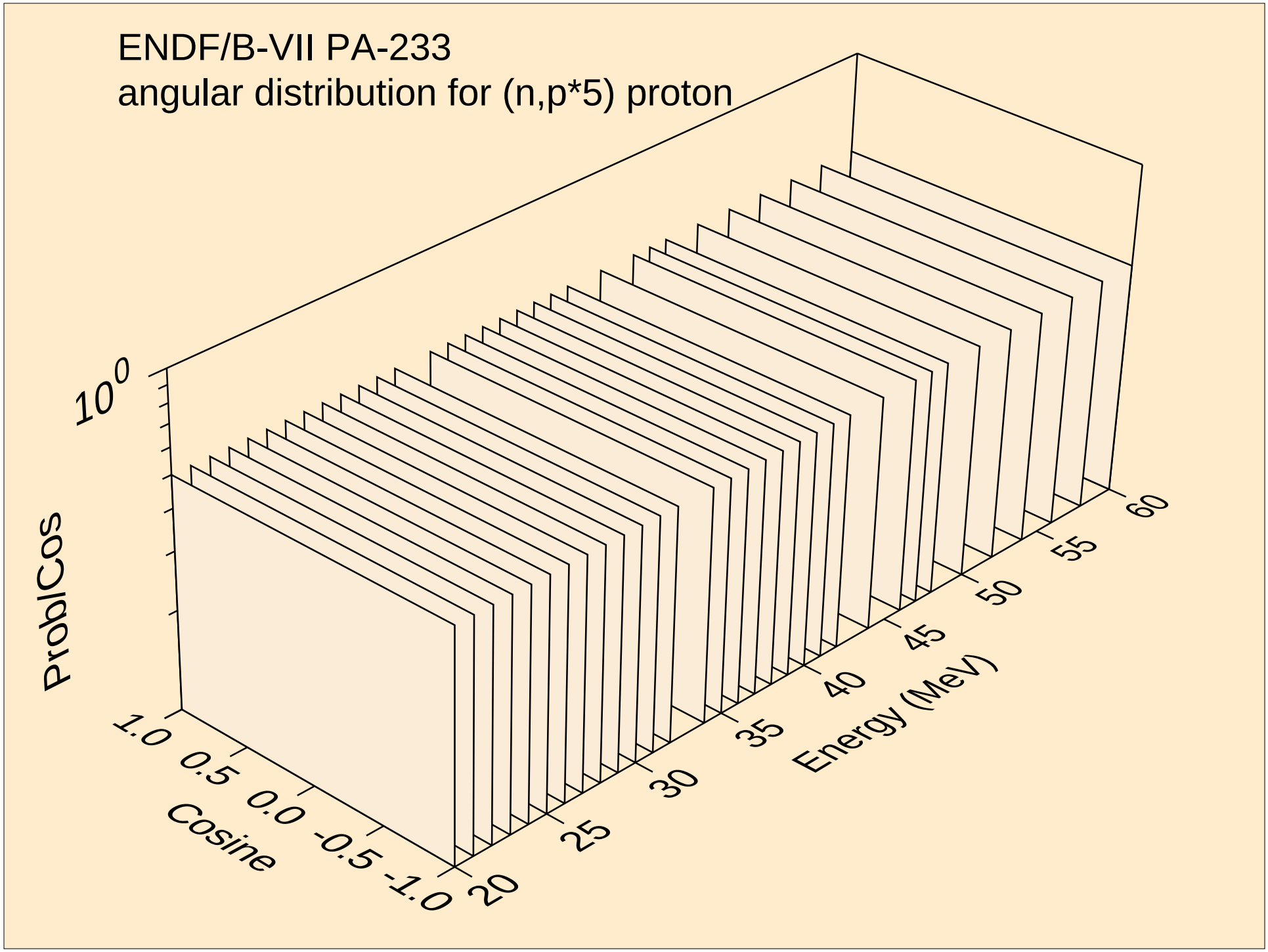

ENDF/B-VII PA-233
angular distribution for (n,p*3) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

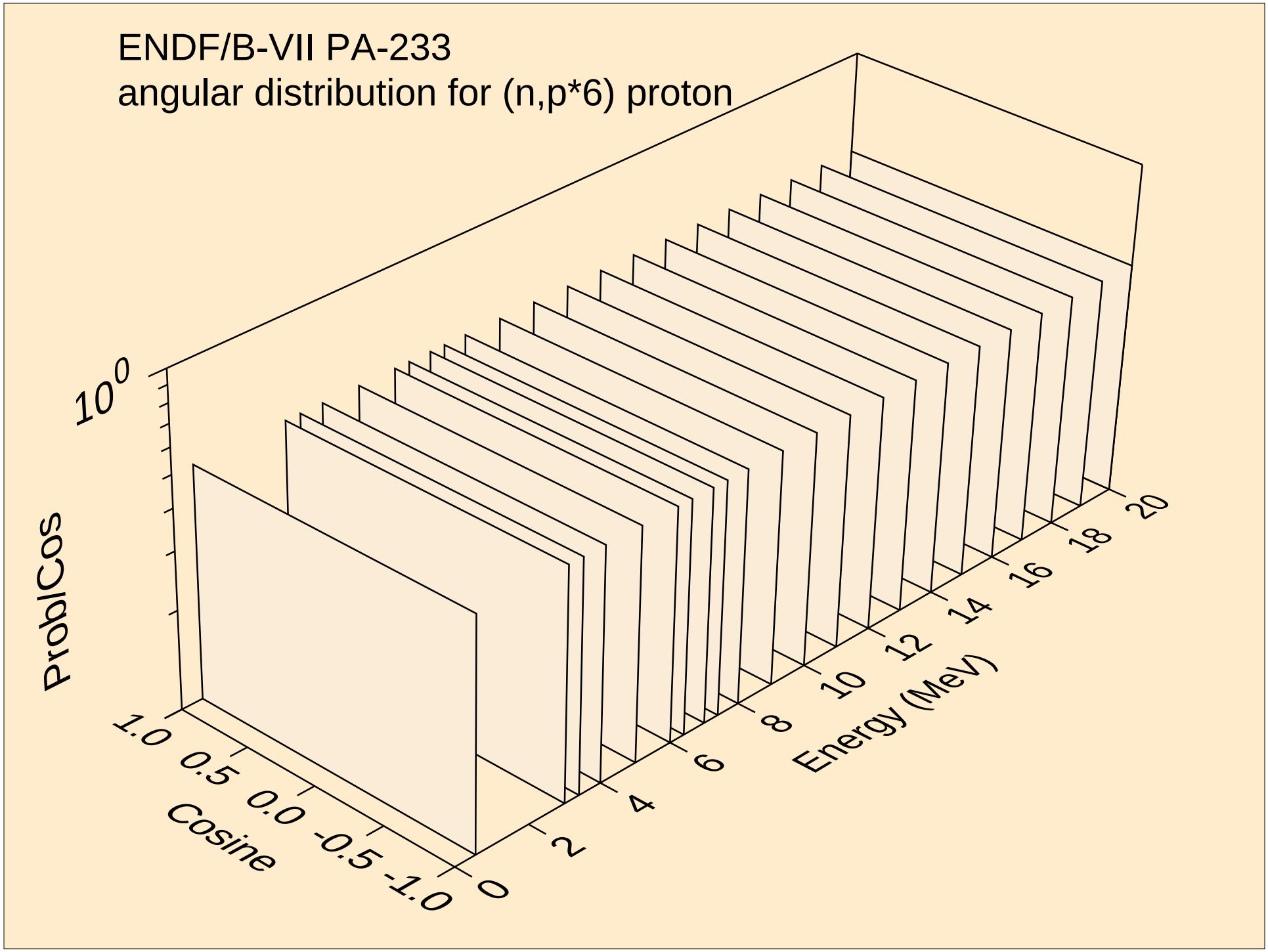

ENDF/B-VII PA-233
angular distribution for (n,p*3) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

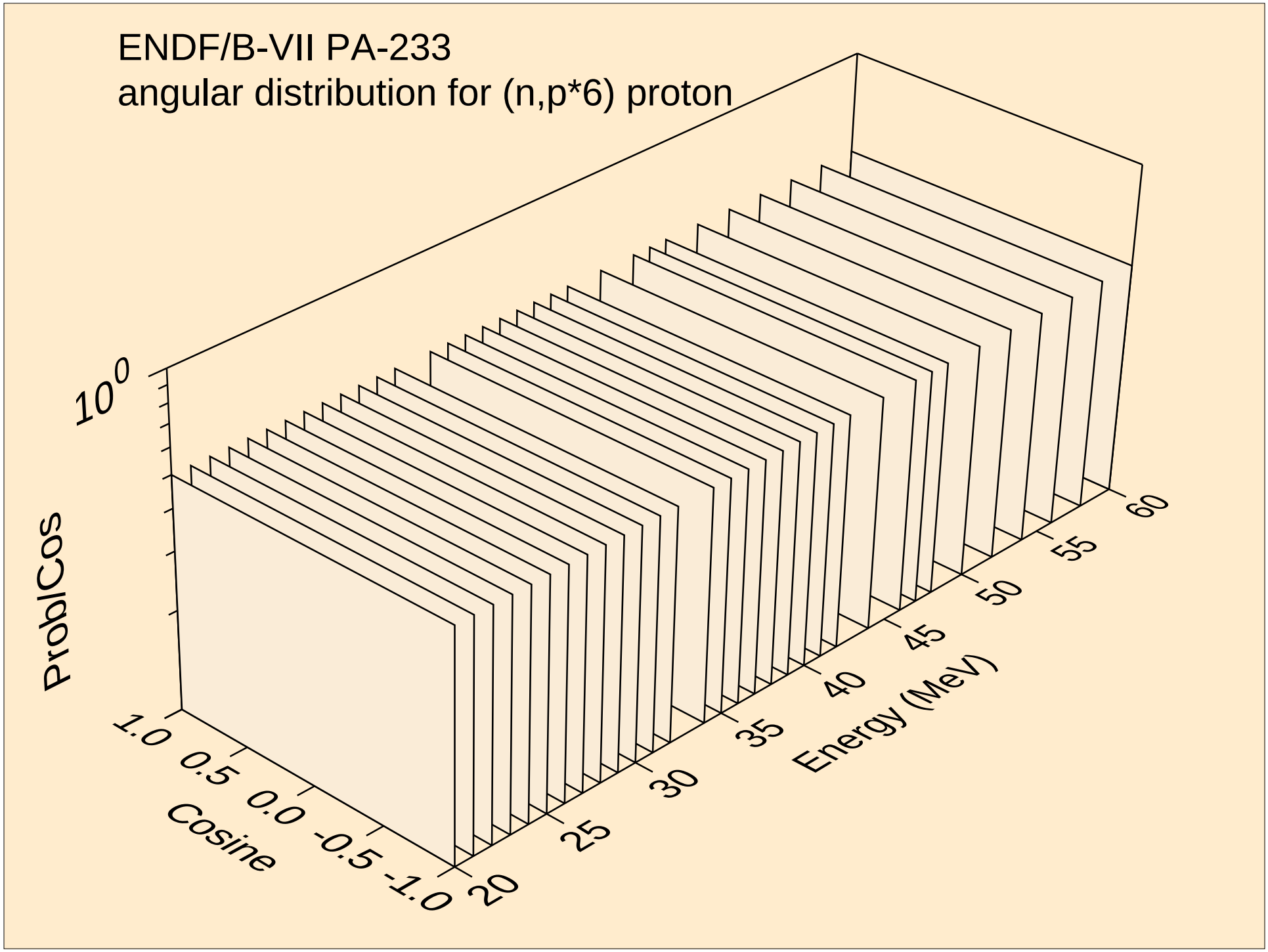

ENDF/B-VII PA-233
angular distribution for (n,p*4) proton
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

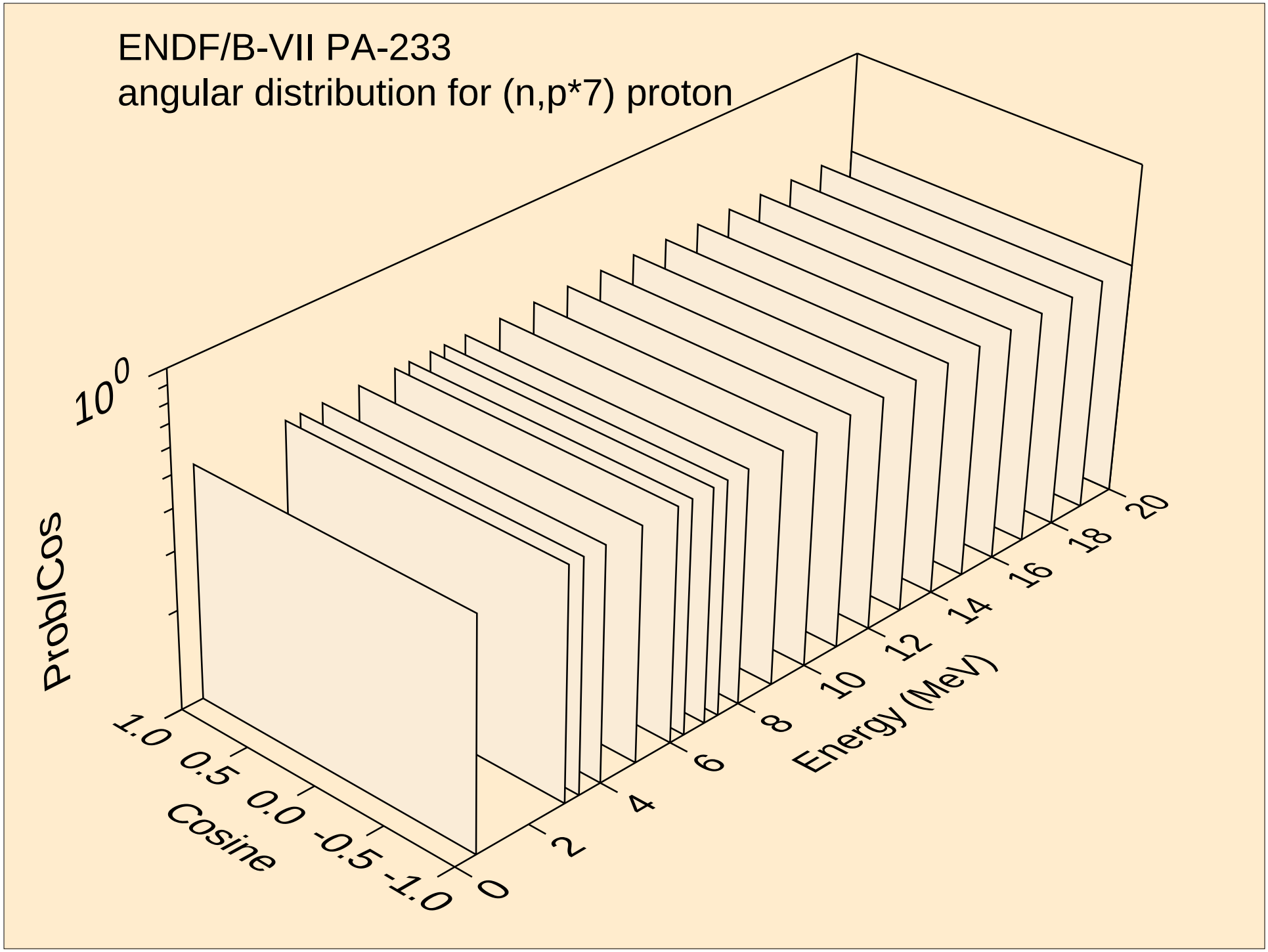

ENDF/B-VII PA-233
angular distribution for (n,p*4) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

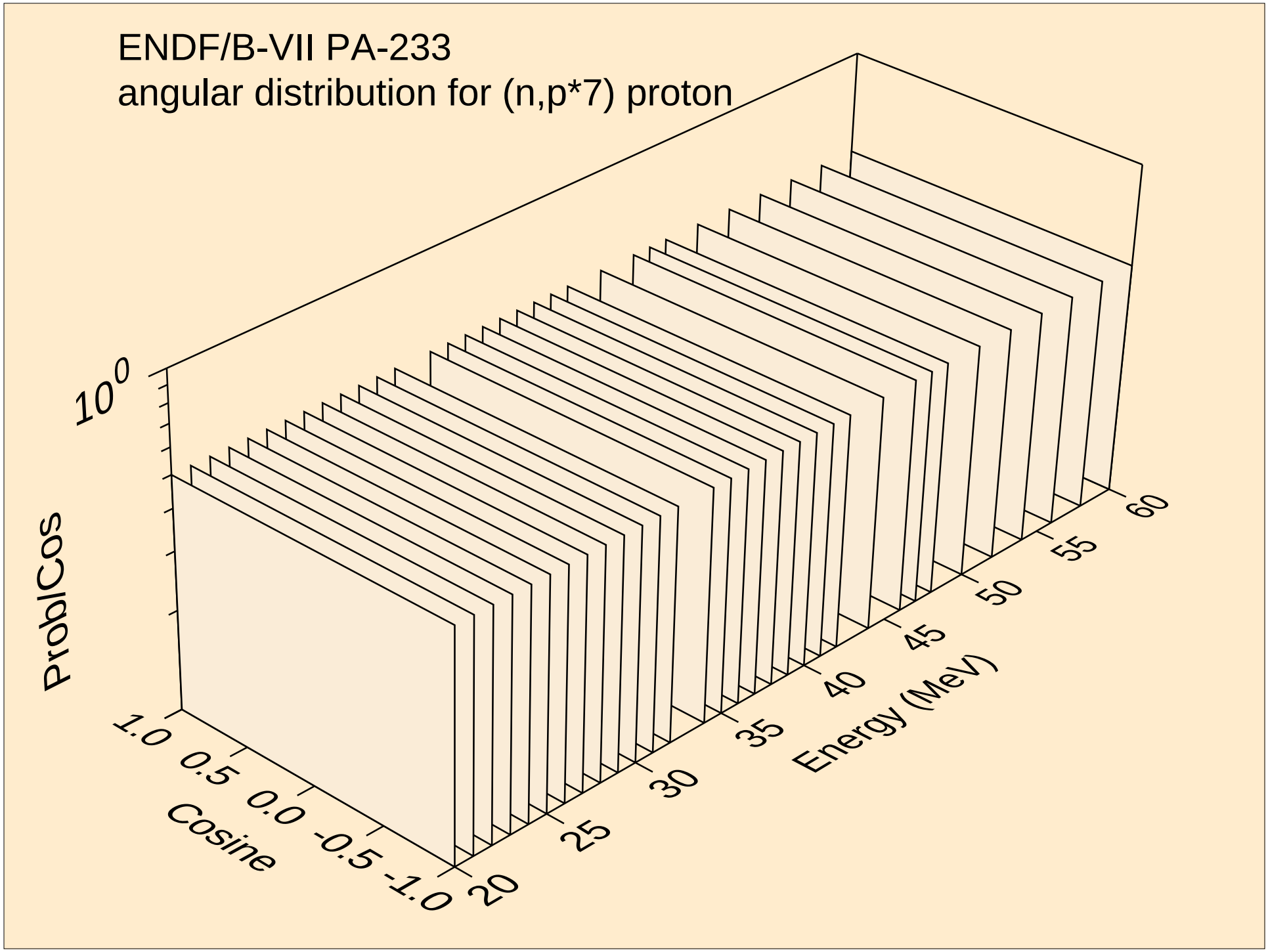

ENDF/B-VII PA-233
angular distribution for (n,p*5) proton
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

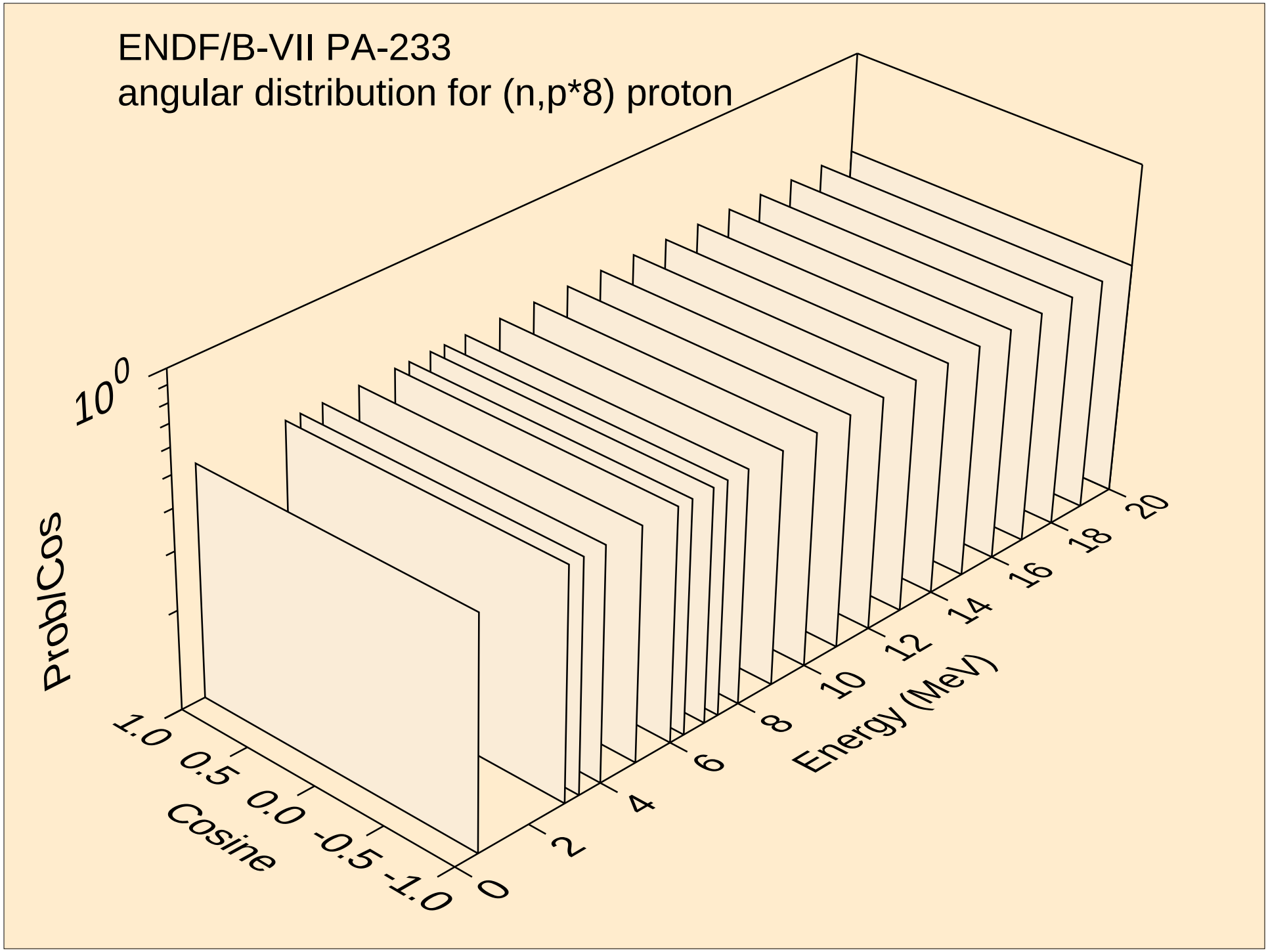

ENDF/B-VII PA-233
angular distribution for (n,p*5) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

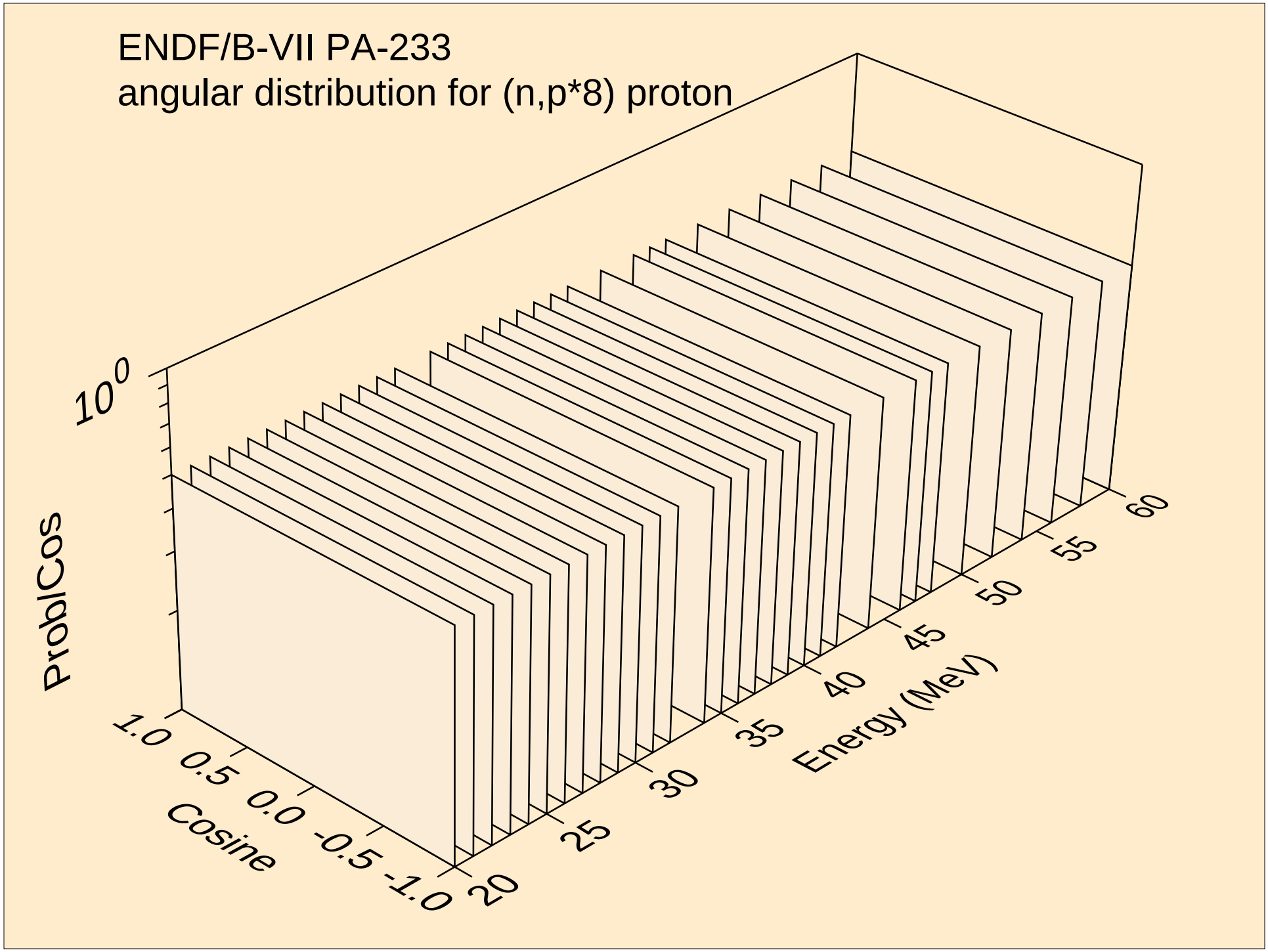

ENDF/B-VII PA-233
angular distribution for (n,p*6) proton
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

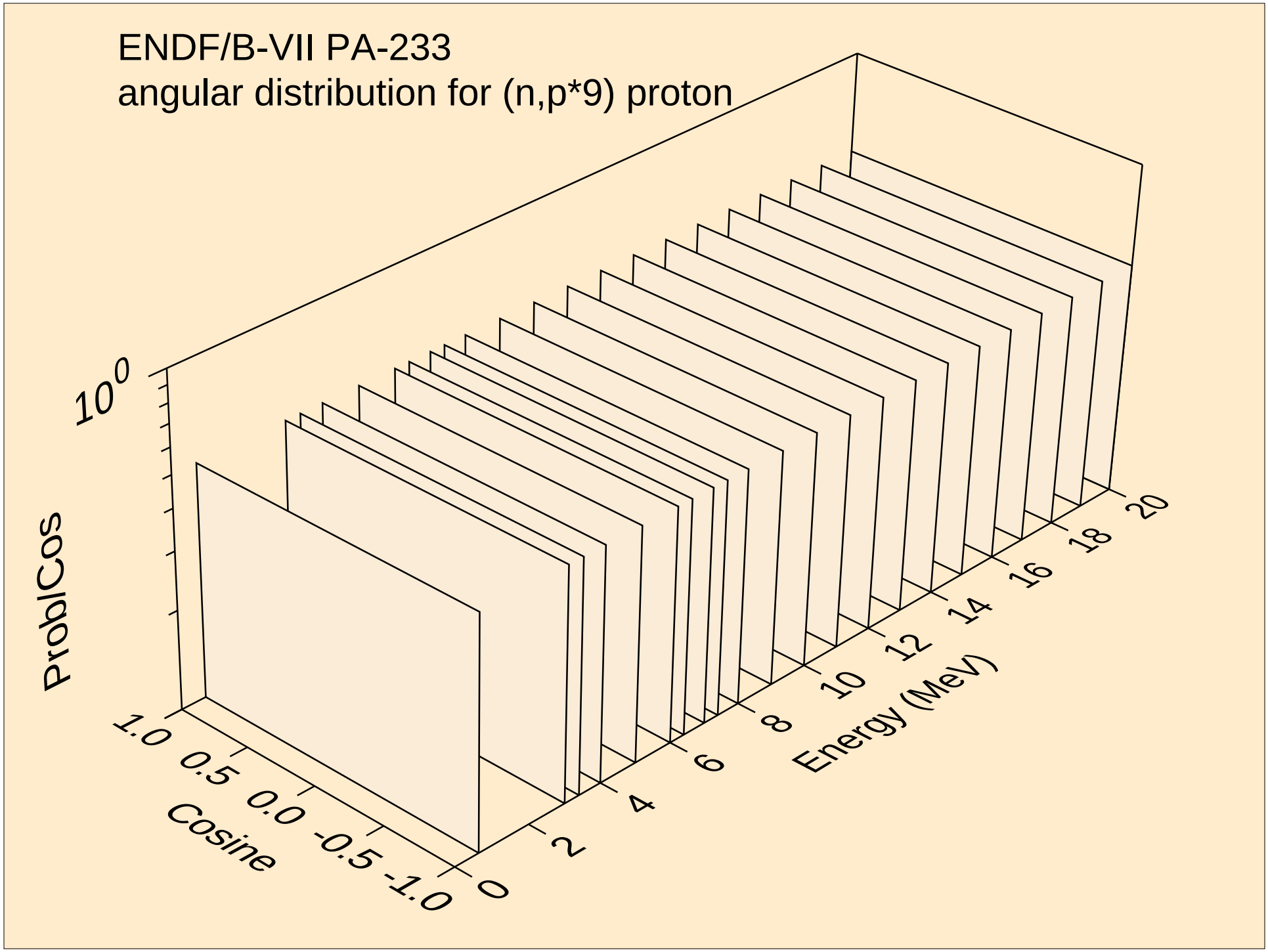

ENDF/B-VII PA-233
angular distribution for (n,p*6) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

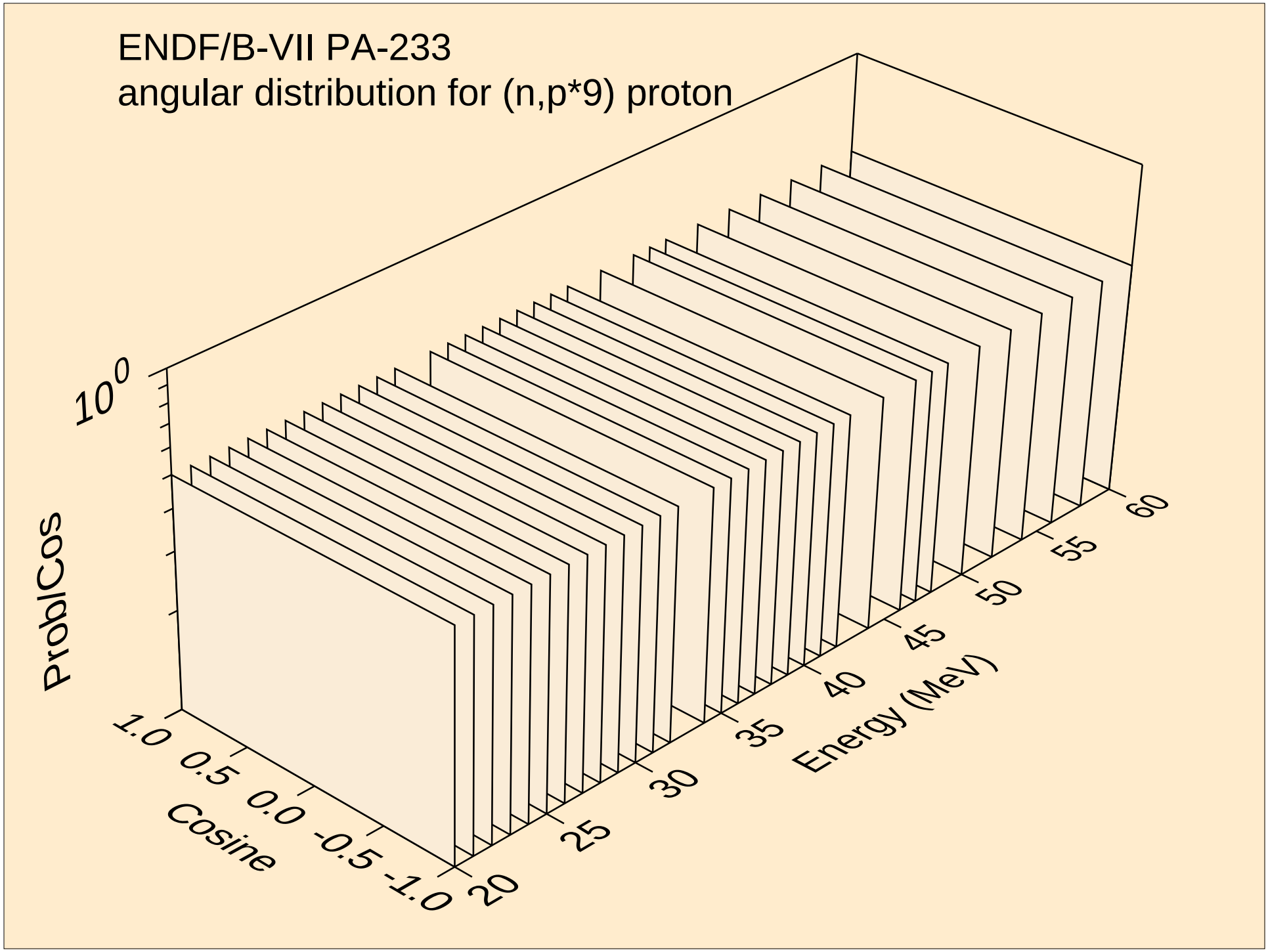

ENDF/B-VII PA-233
angular distribution for (n,p*7) proton
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

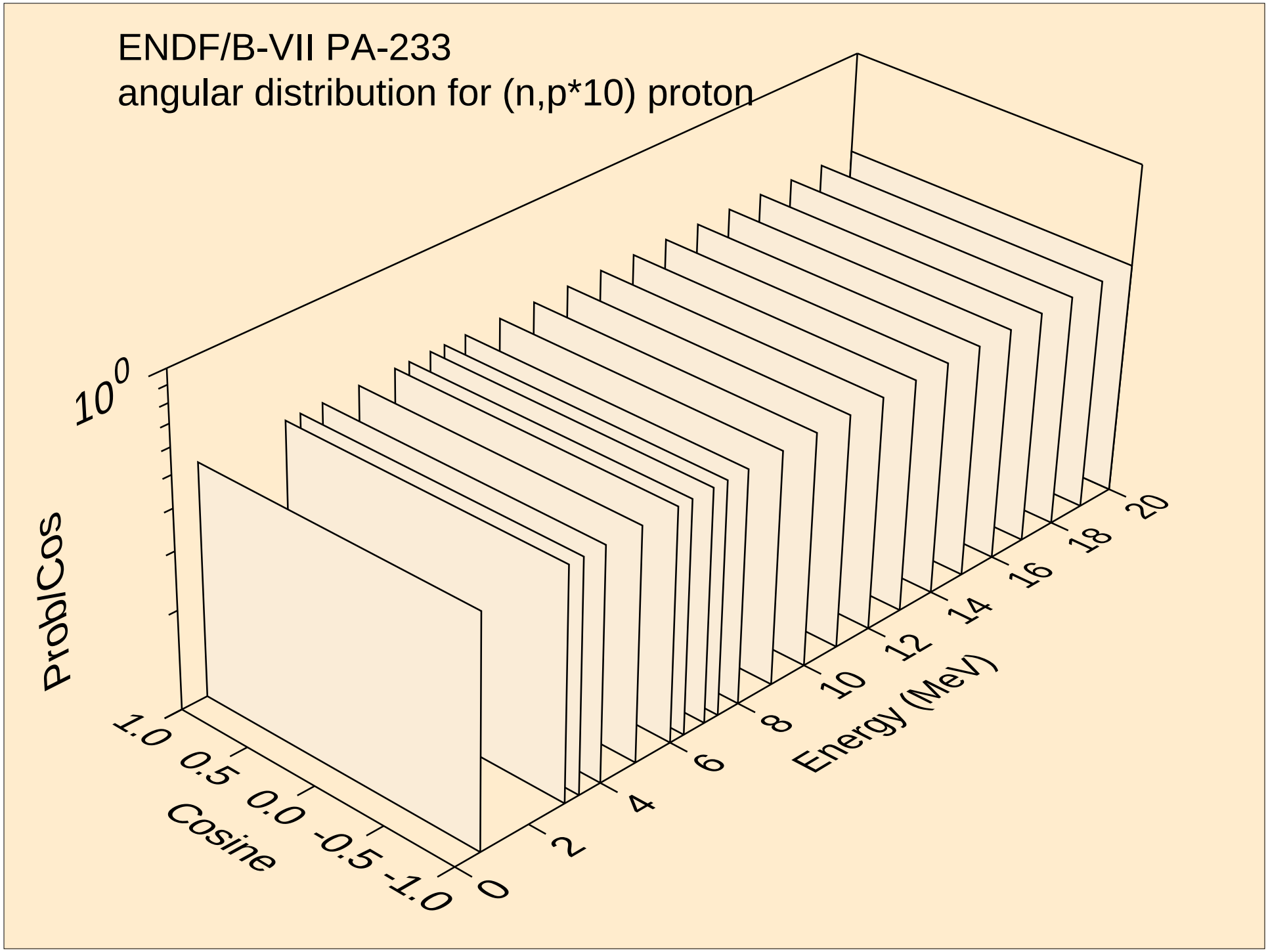

ENDF/B-VII PA-233
angular distribution for (n,p*7) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

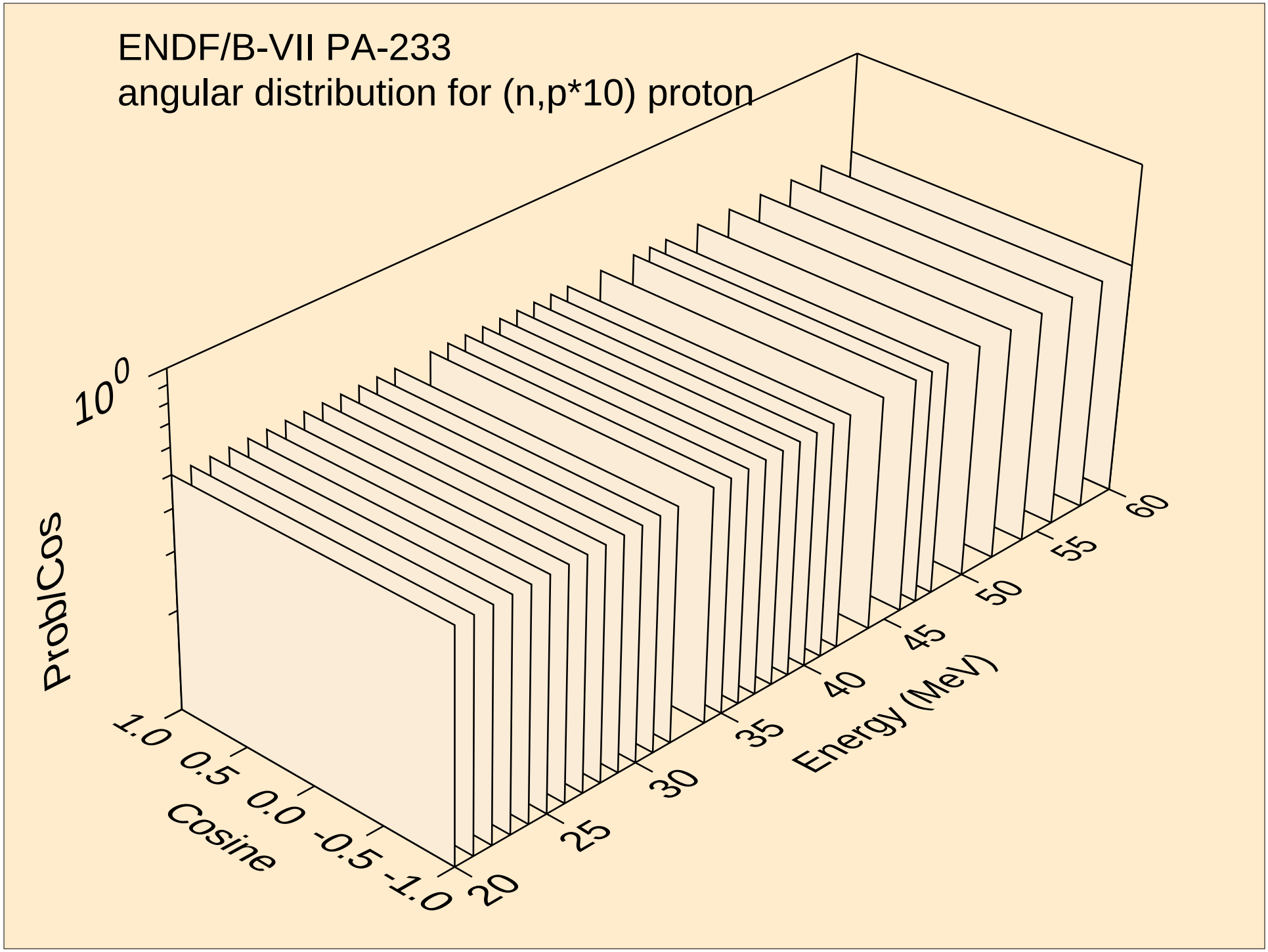

ENDF/B-VII PA-233
angular distribution for (n,p*8) proton
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

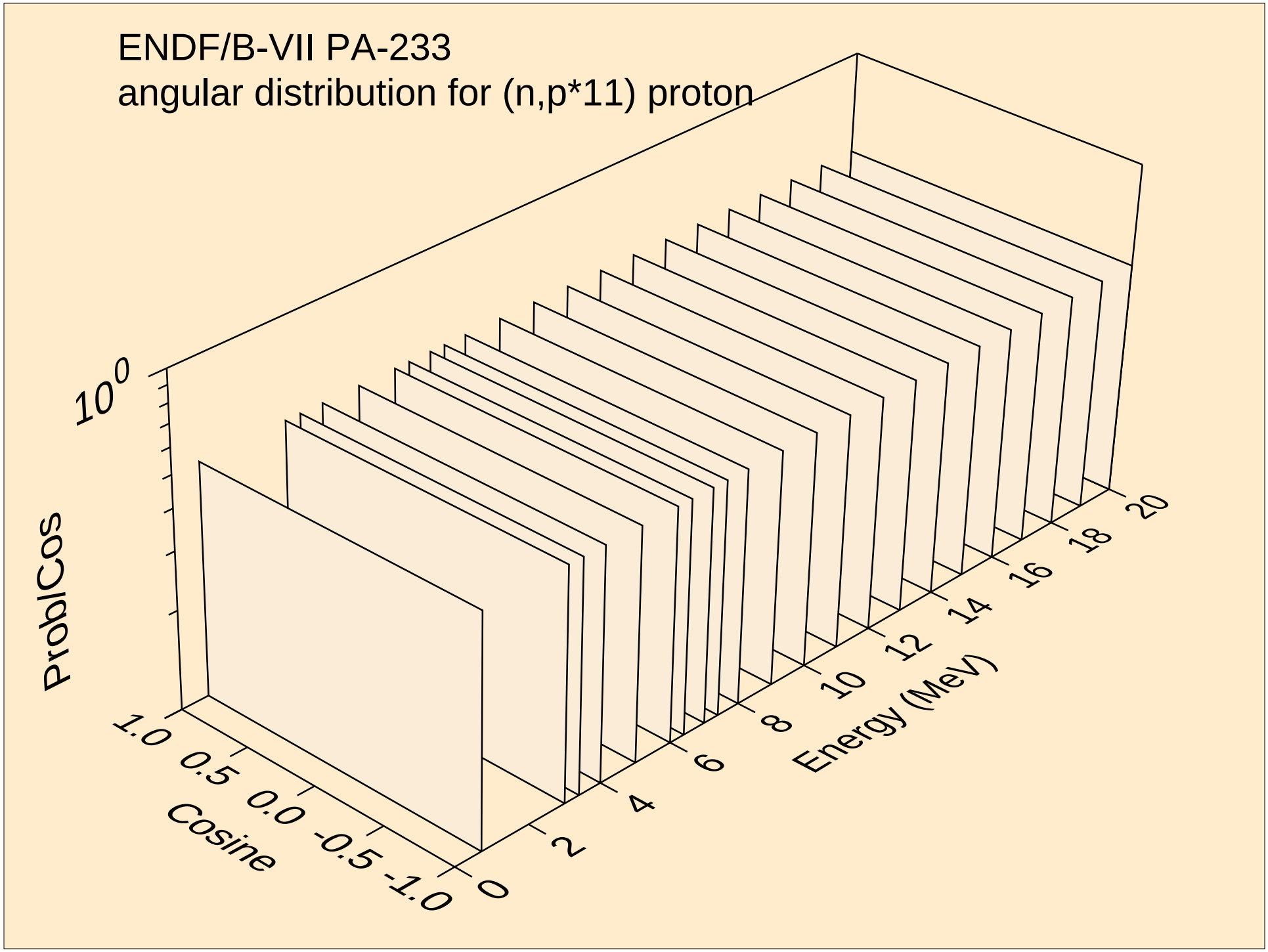

ENDF/B-VII PA-233
angular distribution for (n,p*8) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

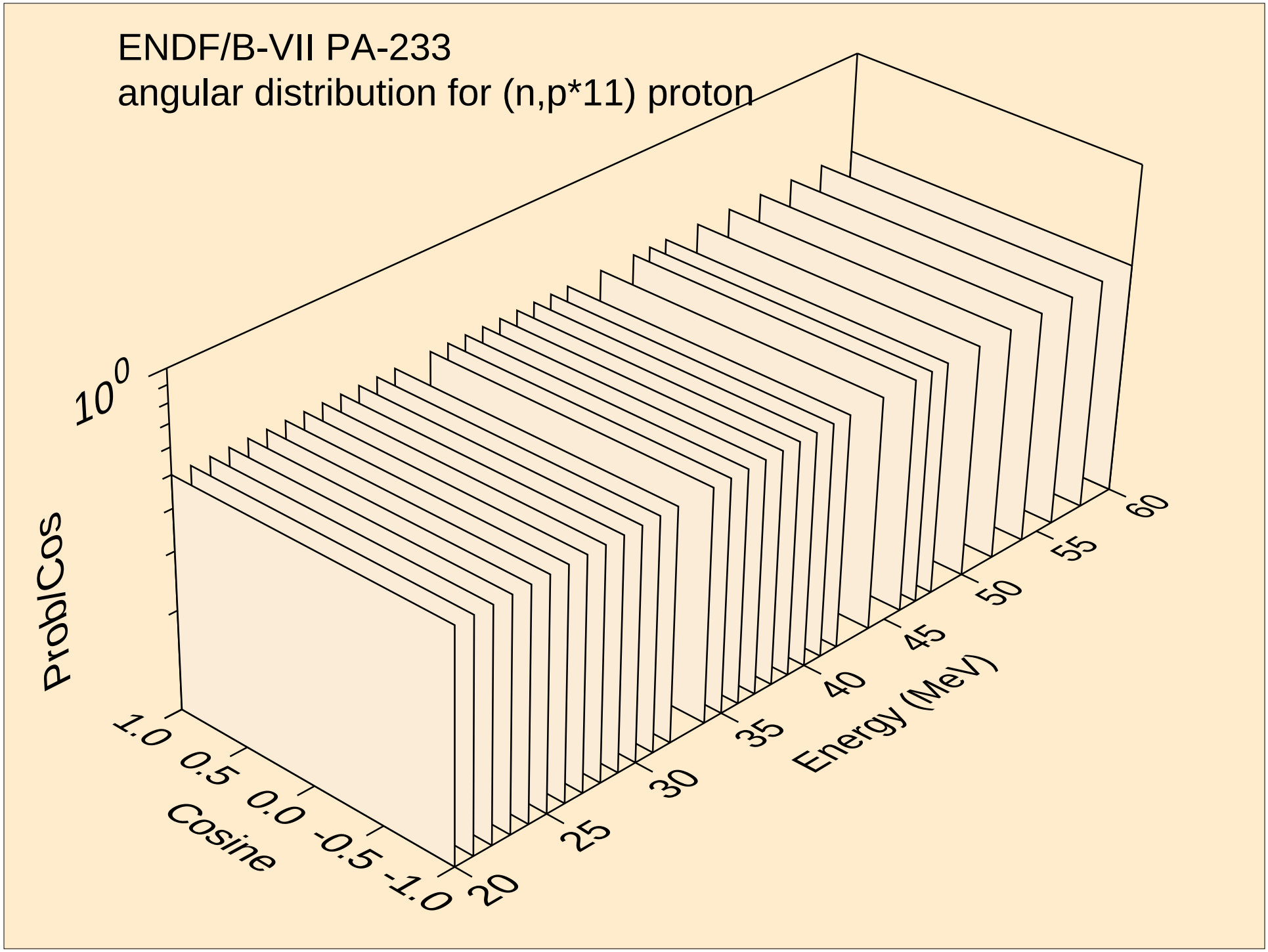

ENDF/B-VII PA-233
angular distribution for (n,p*9) proton
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

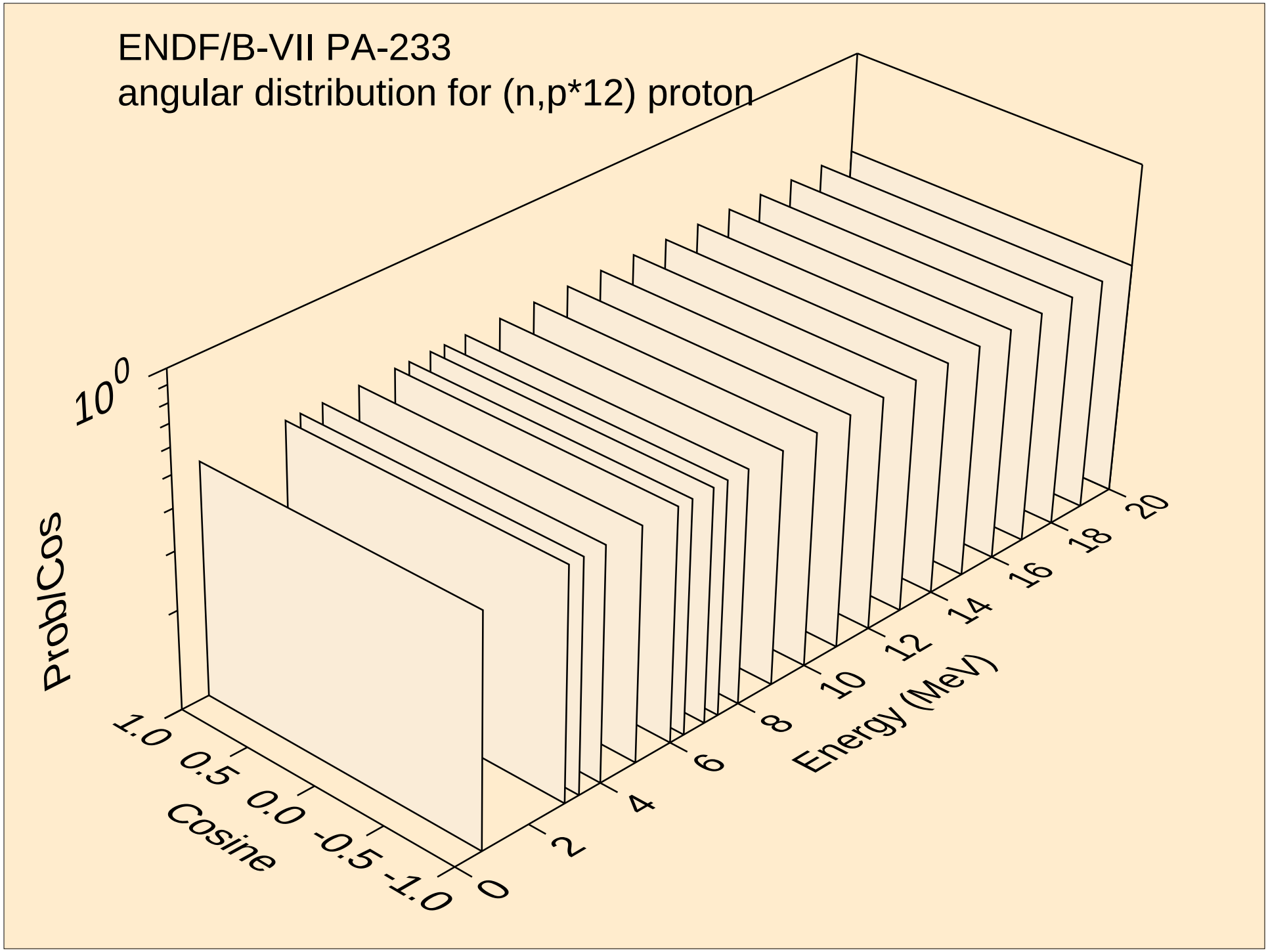

ENDF/B-VII PA-233
angular distribution for (n,p*9) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

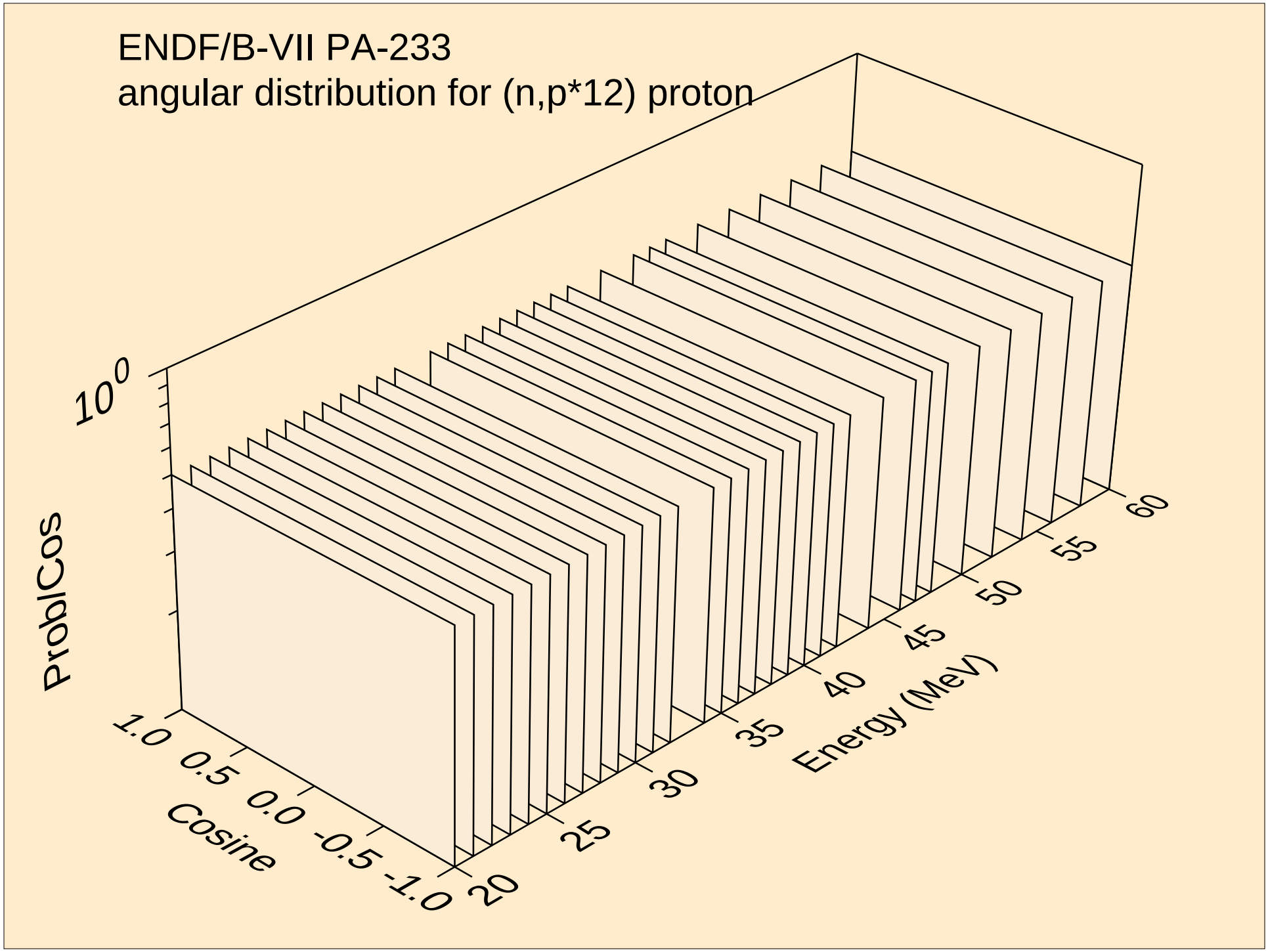

ENDF/B-VII PA-233
angular distribution for (n,p*10) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

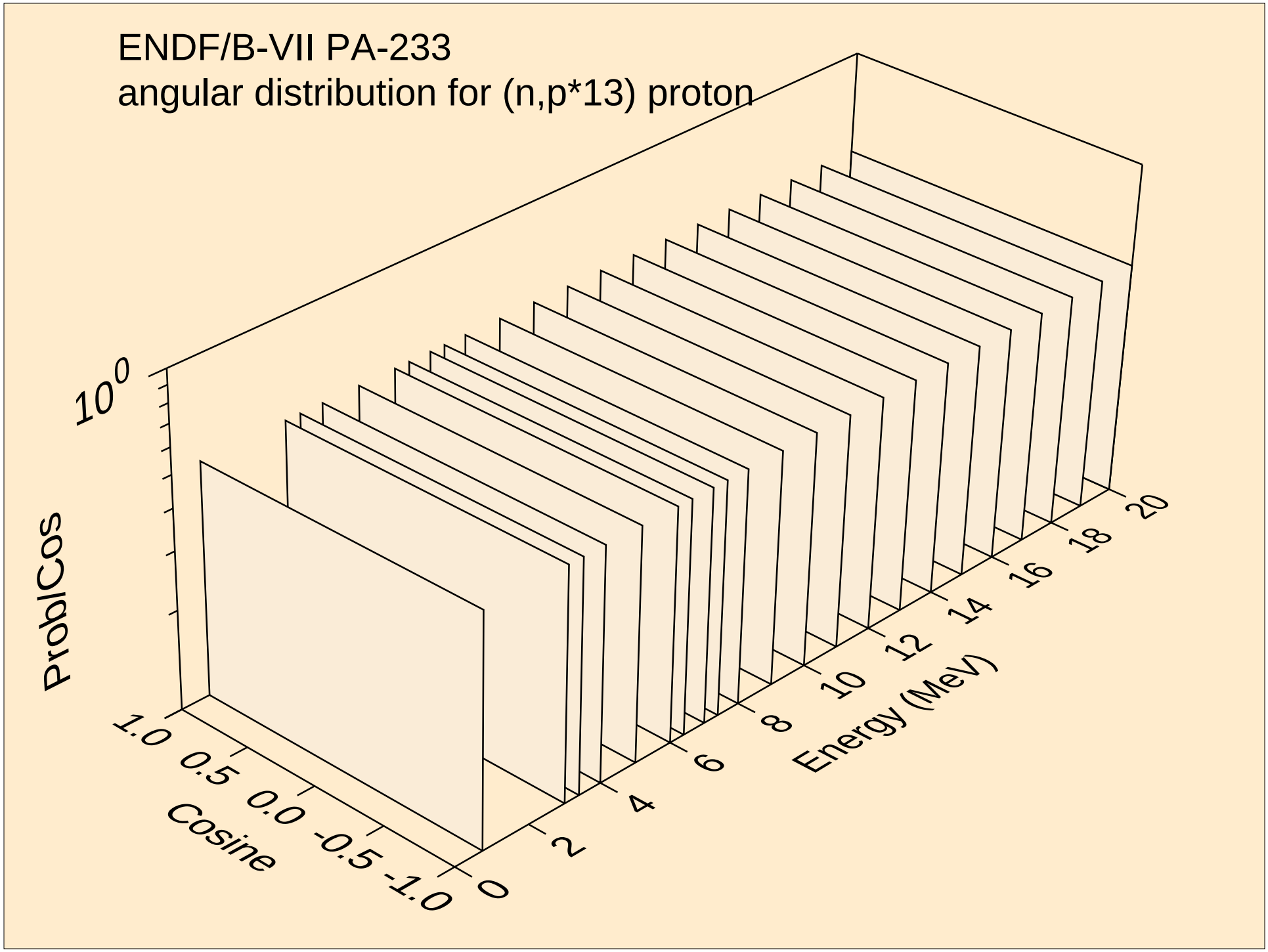

ENDF/B-VII PA-233
angular distribution for (n,p*10) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

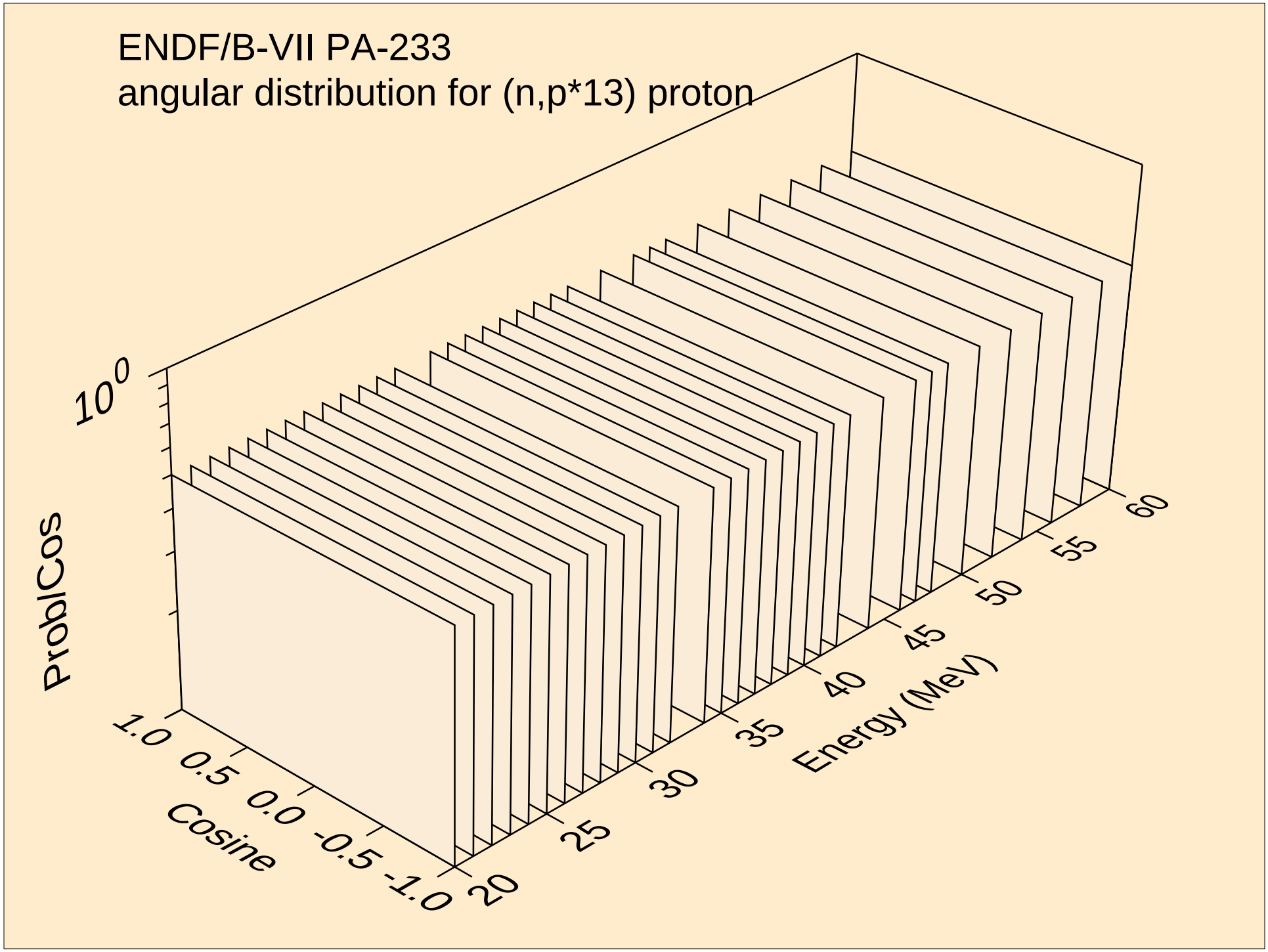

ENDF/B-VII PA-233
angular distribution for (n,p*11) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

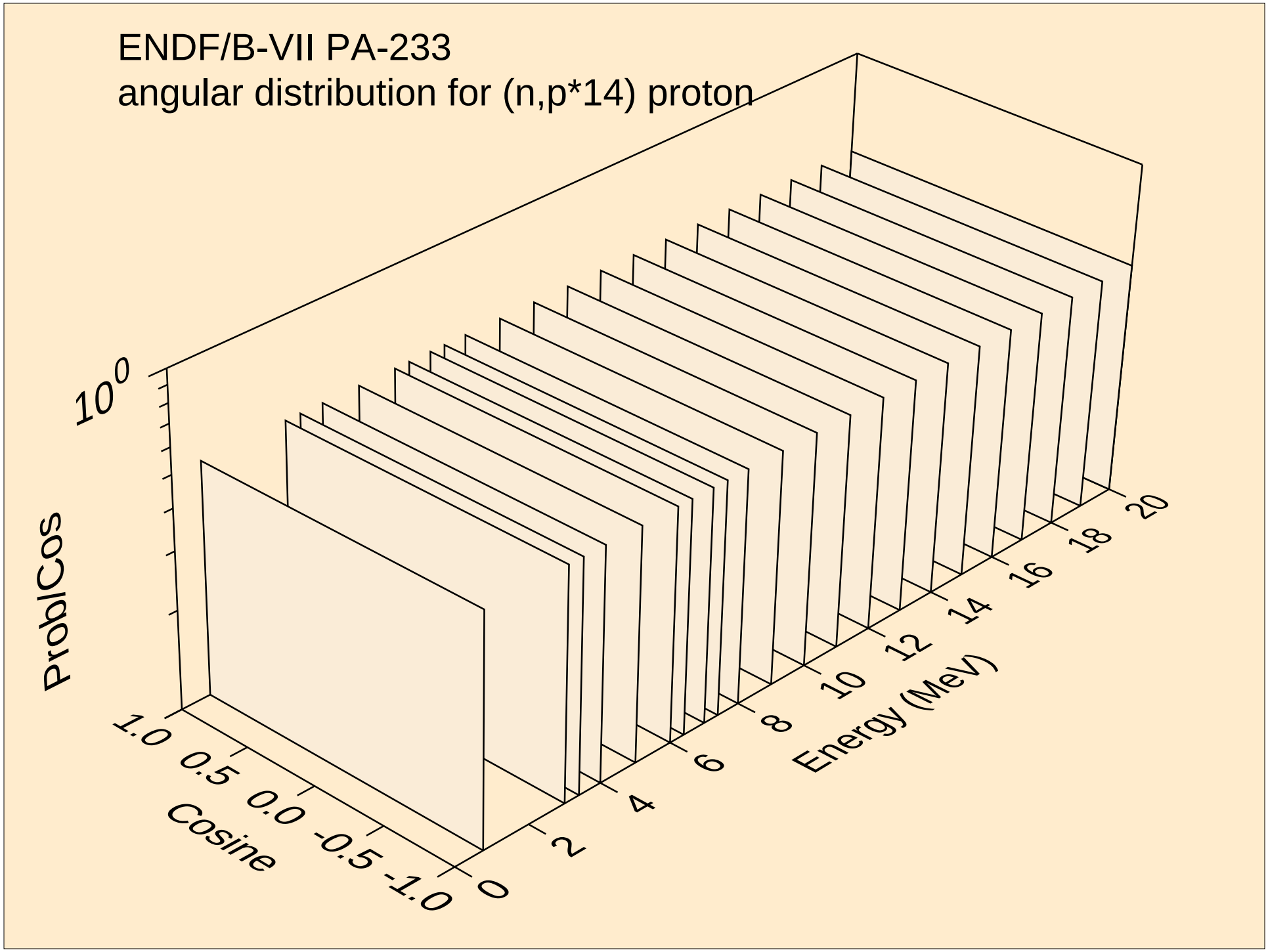

ENDF/B-VII PA-233
angular distribution for (n,p*11) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

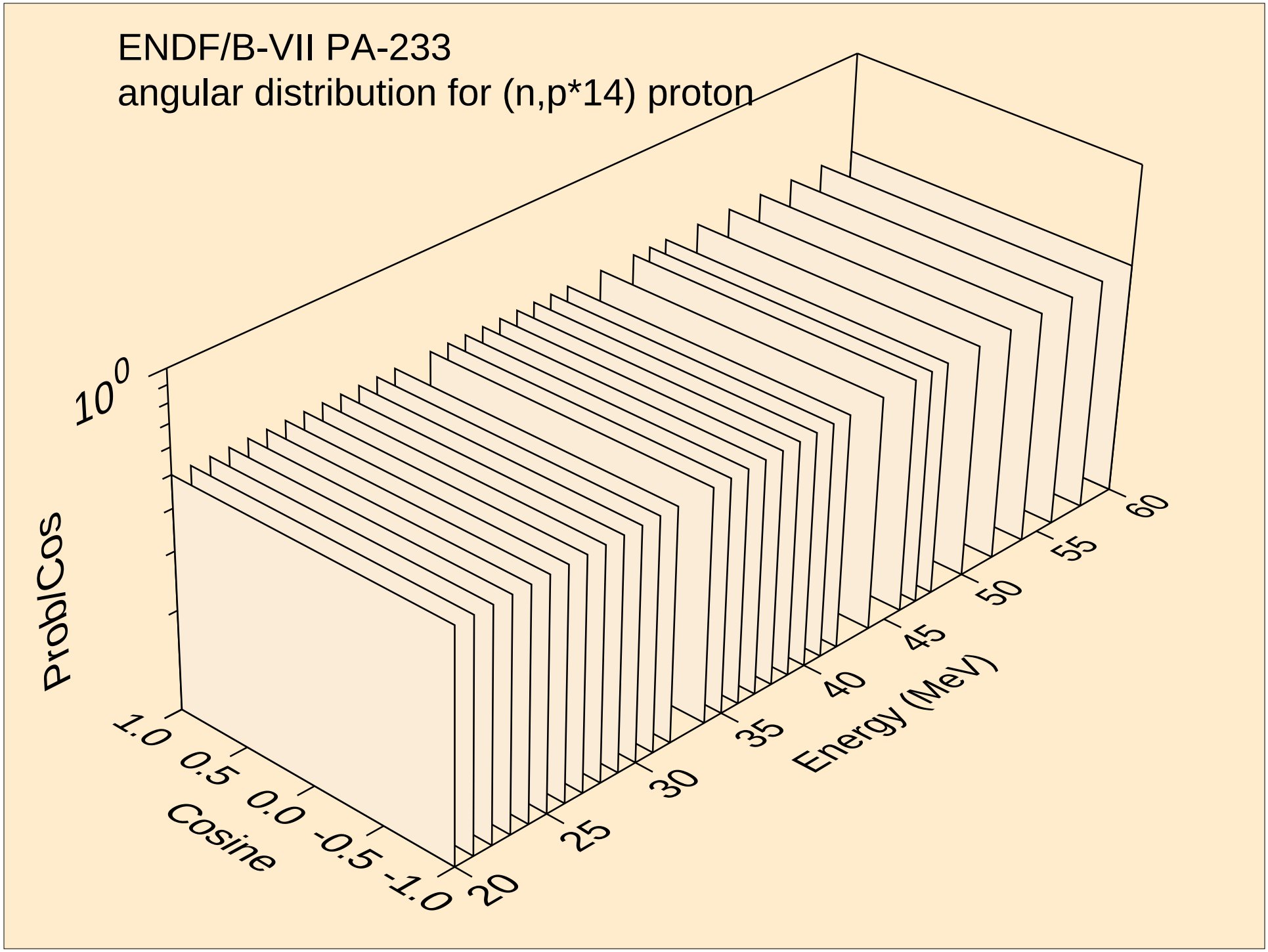

ENDF/B-VII PA-233
angular distribution for (n,p*12) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

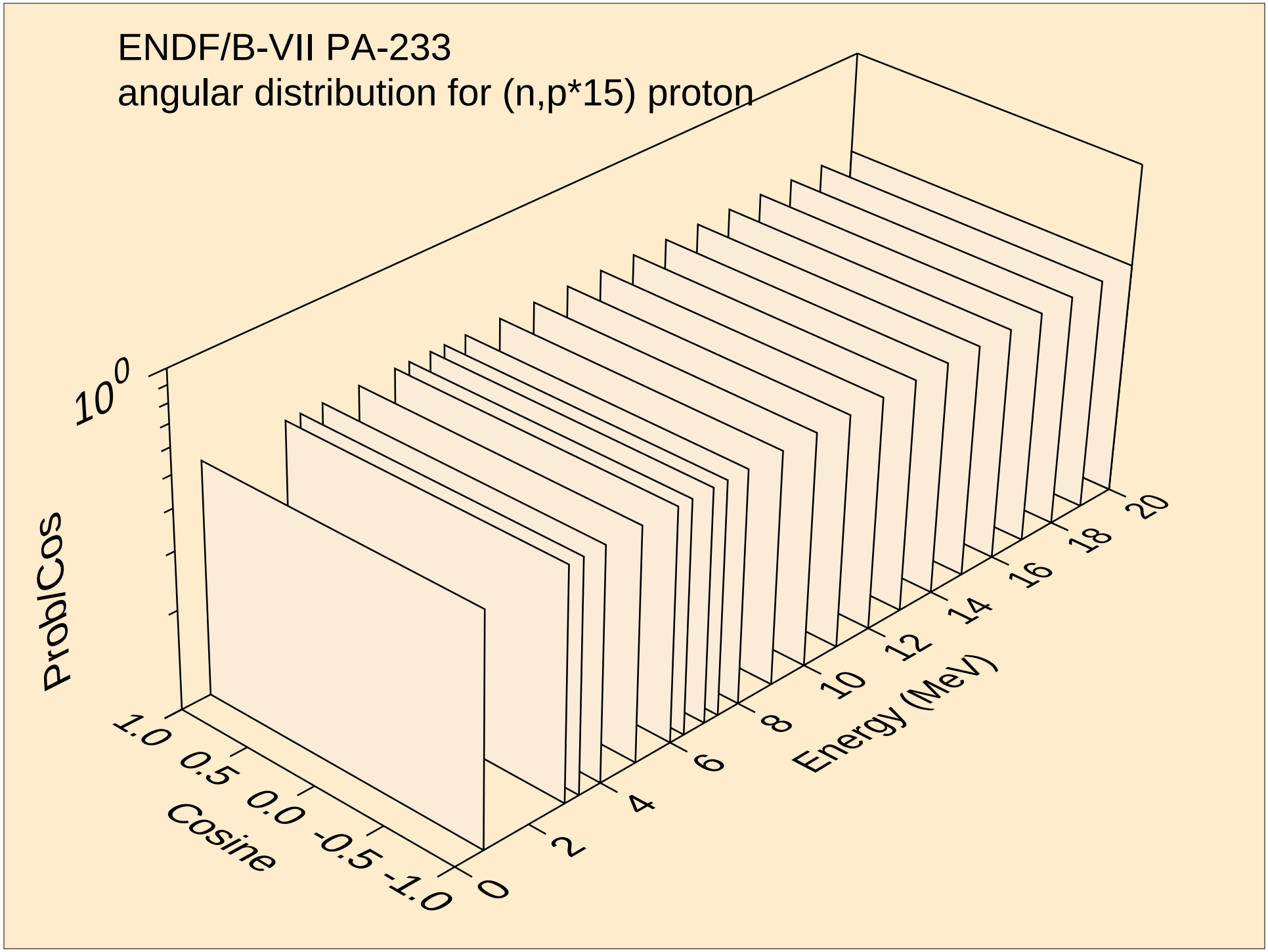

ENDF/B-VII PA-233
angular distribution for (n,p*12) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

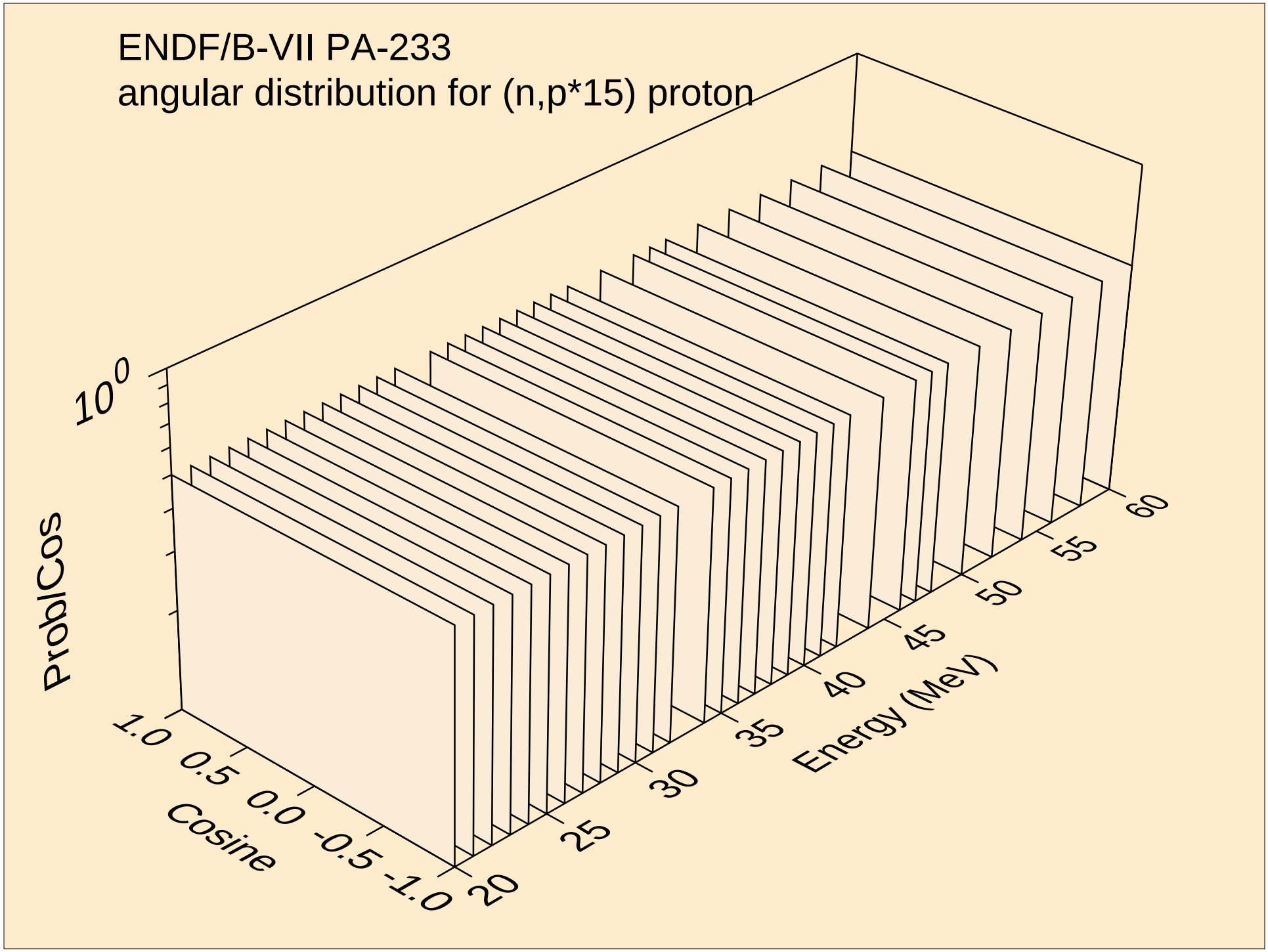

ENDF/B-VII PA-233
angular distribution for (n,p*13) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

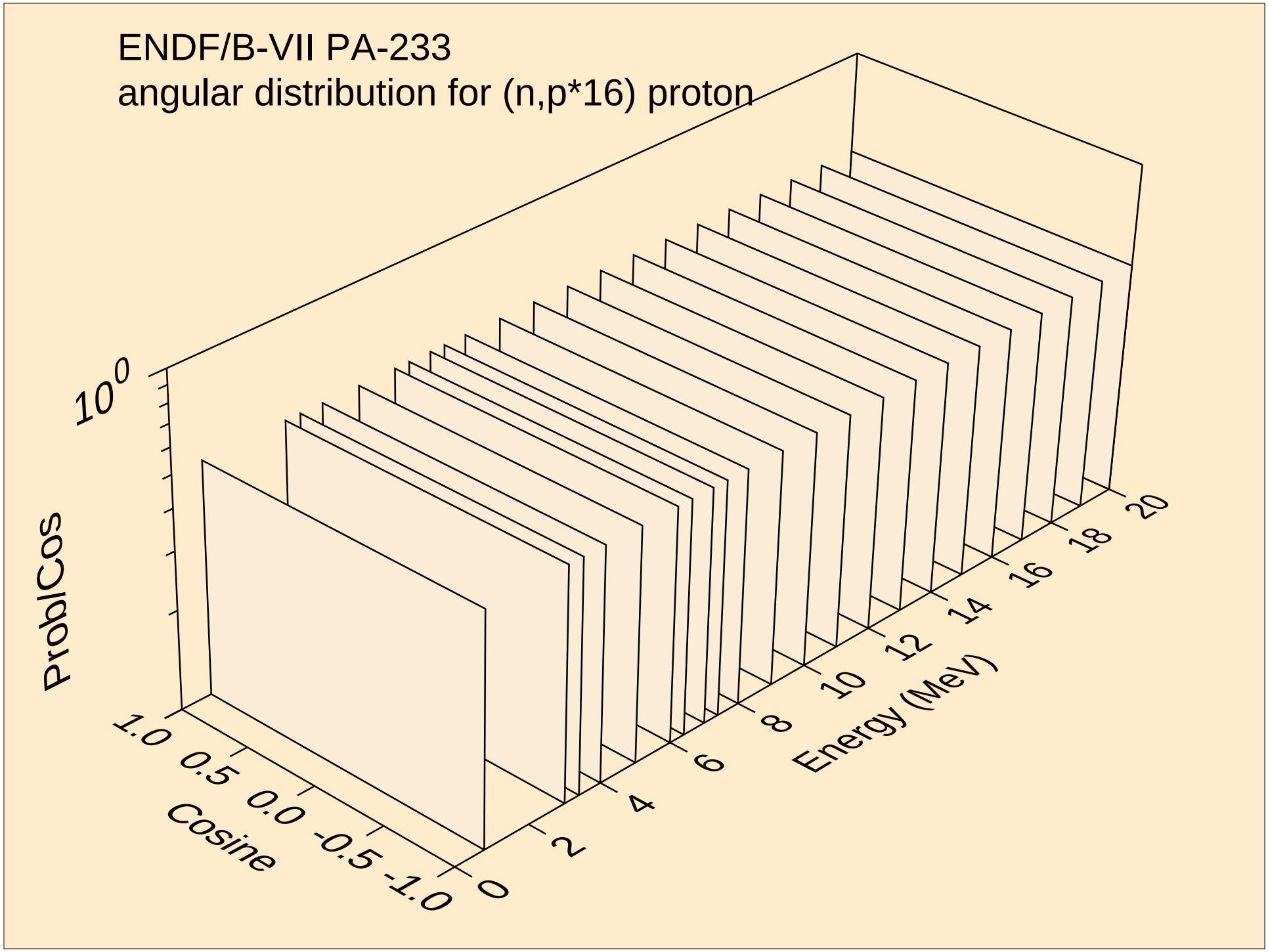

ENDF/B-VII PA-233
angular distribution for (n,p*13) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

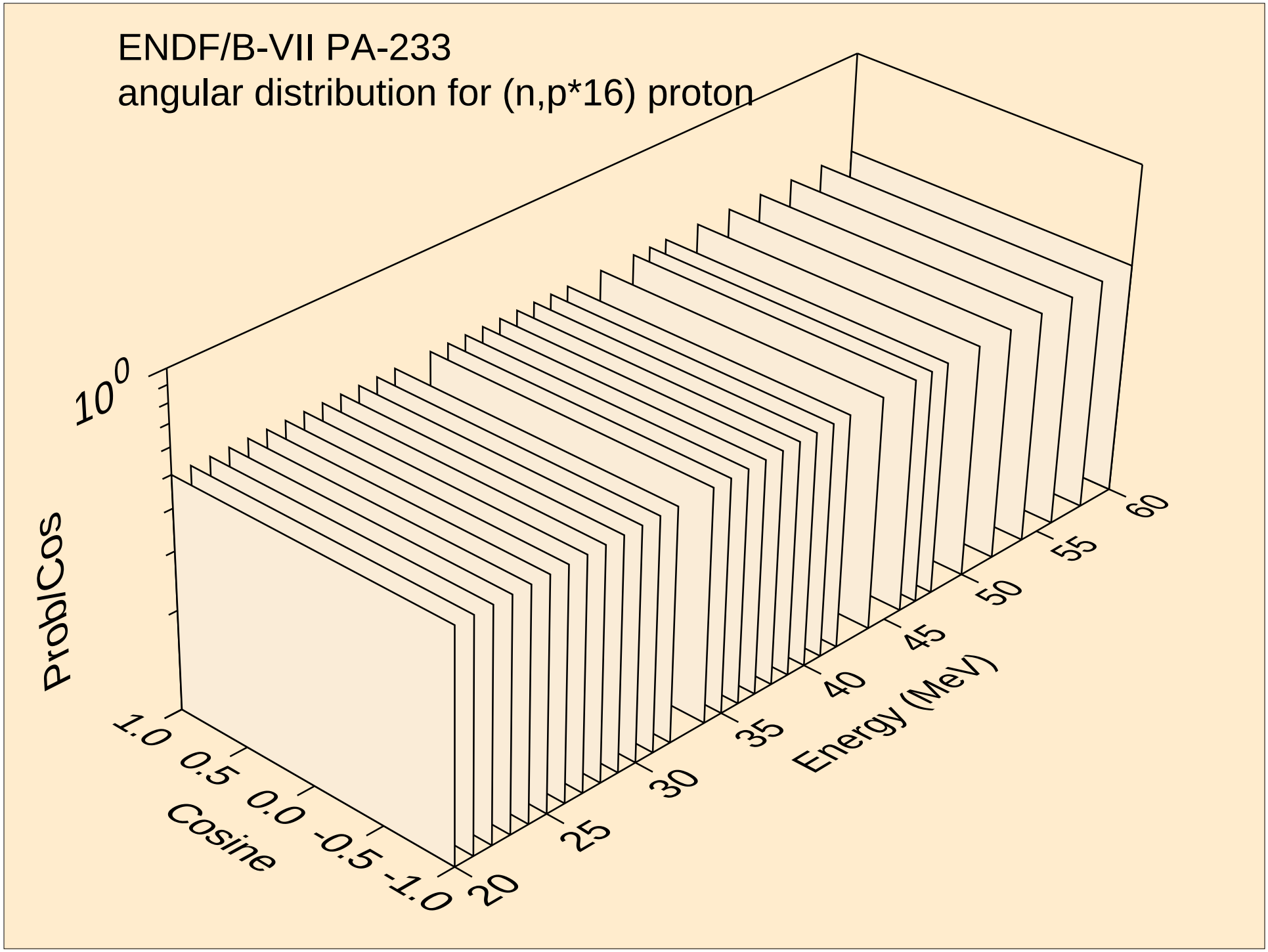

ENDF/B-VII PA-233
angular distribution for (n,p*14) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

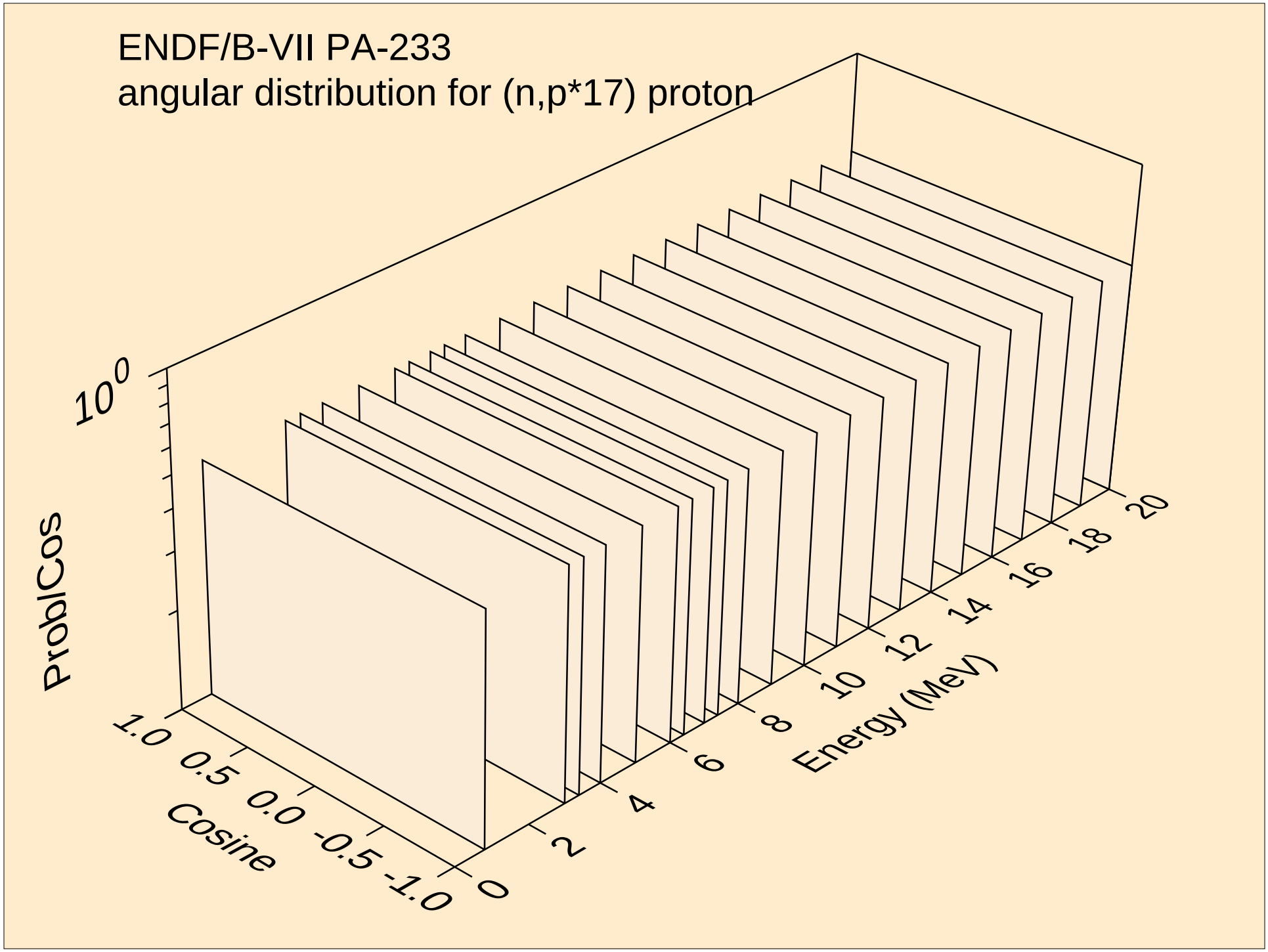

ENDF/B-VII PA-233
angular distribution for (n,p*14) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

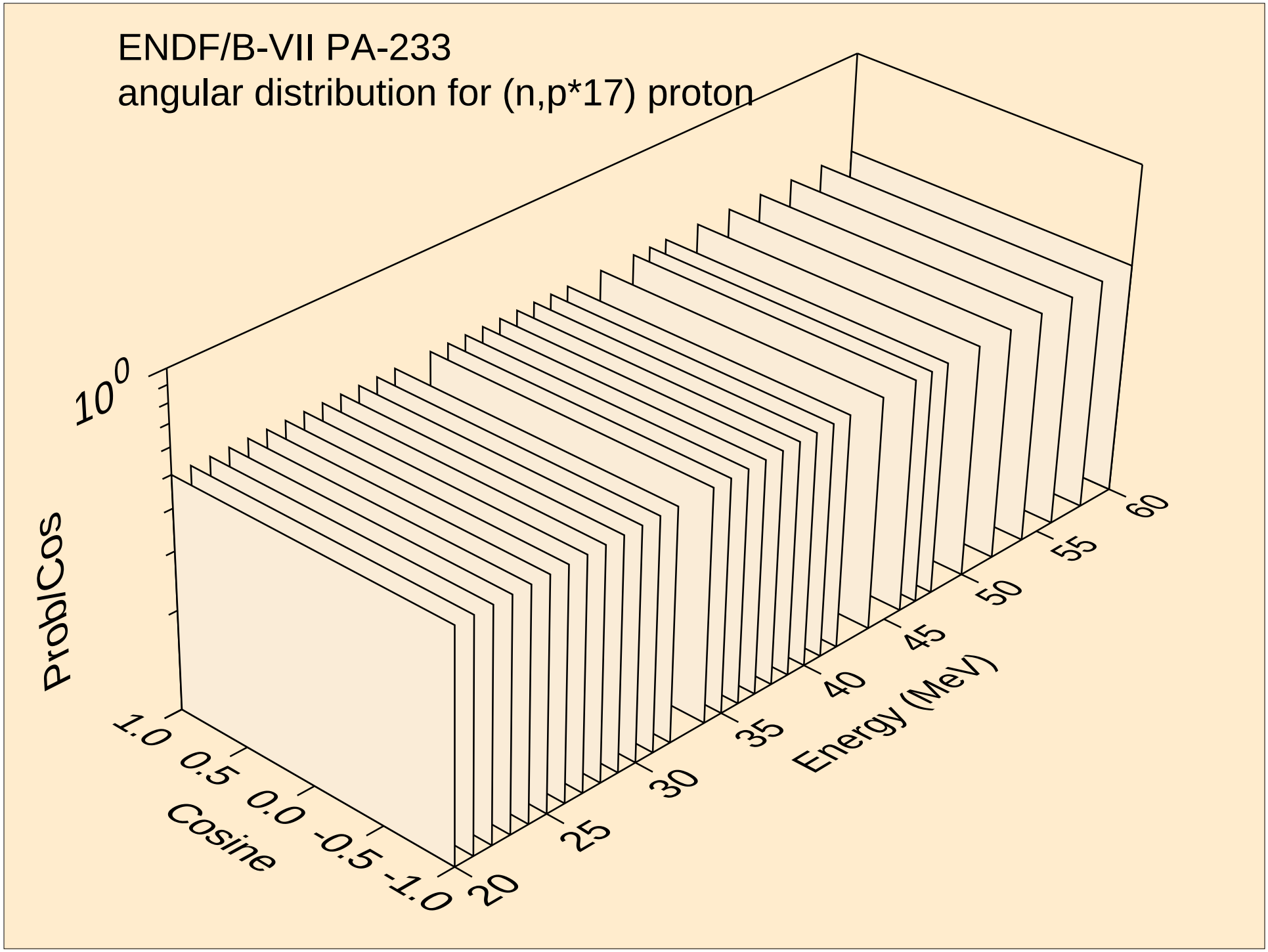

ENDF/B-VII PA-233
angular distribution for (n,p*15) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

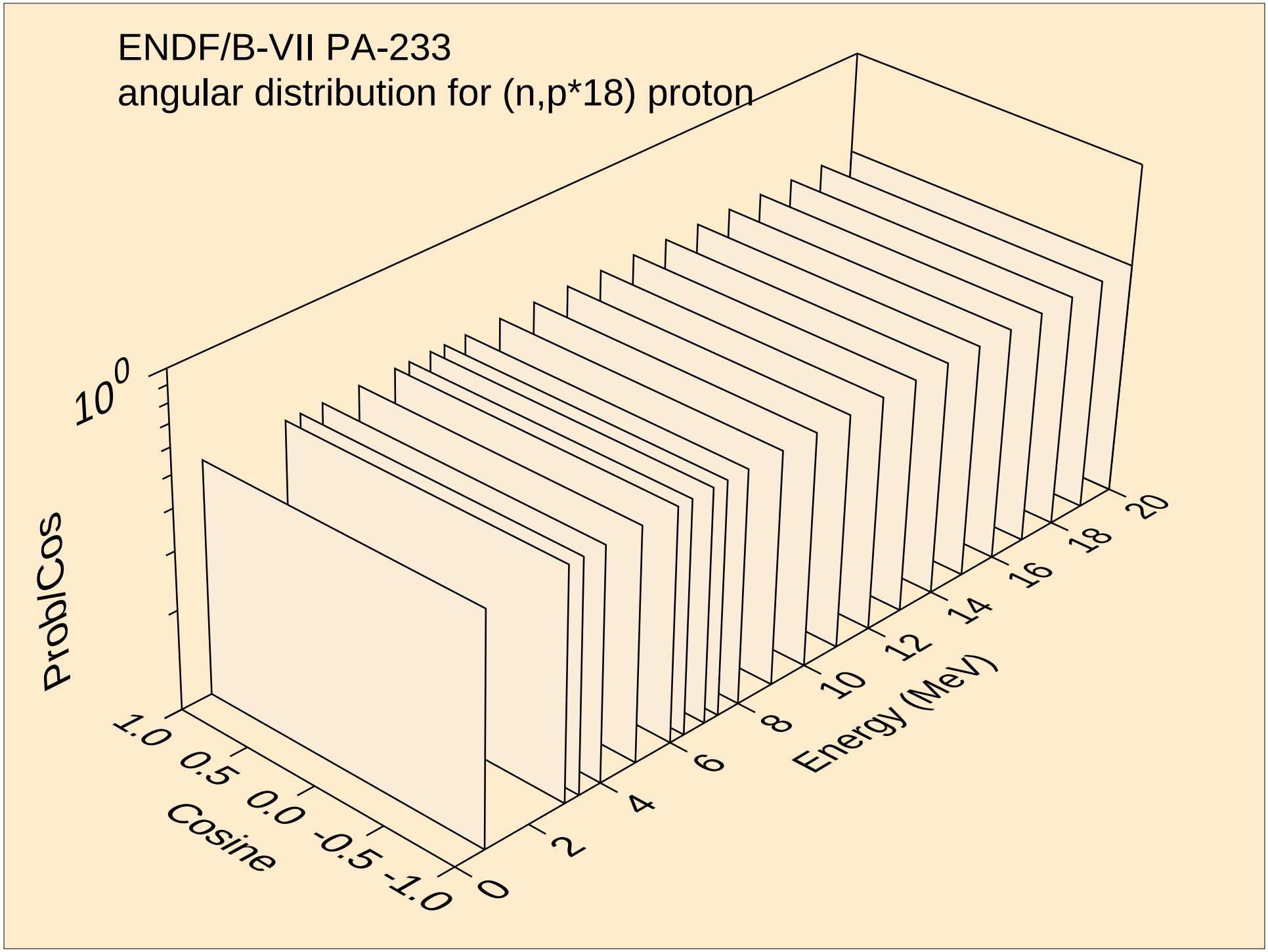

ENDF/B-VII PA-233
angular distribution for (n,p*15) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

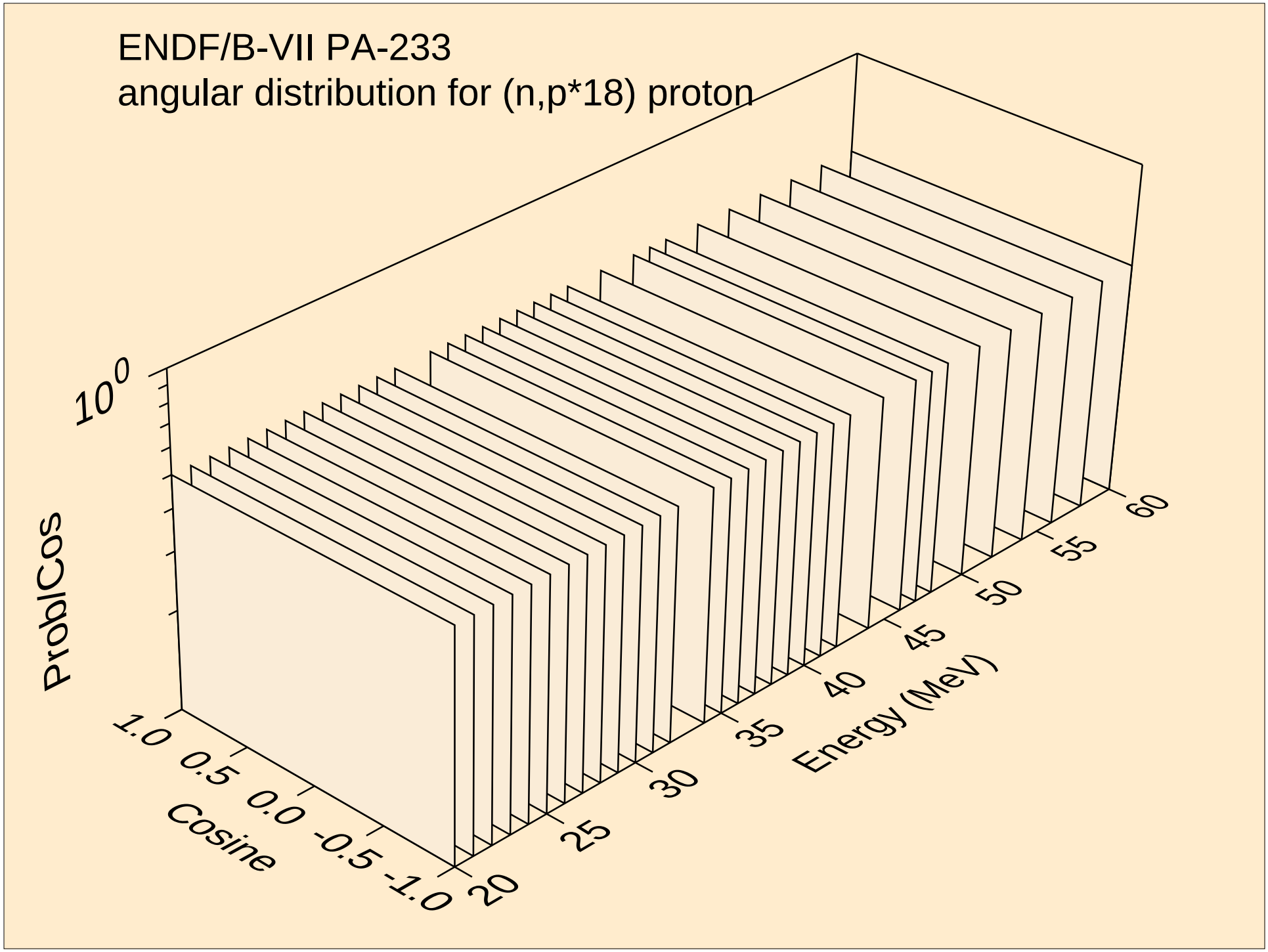

ENDF/B-VII PA-233
angular distribution for (n,p*16) proton
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

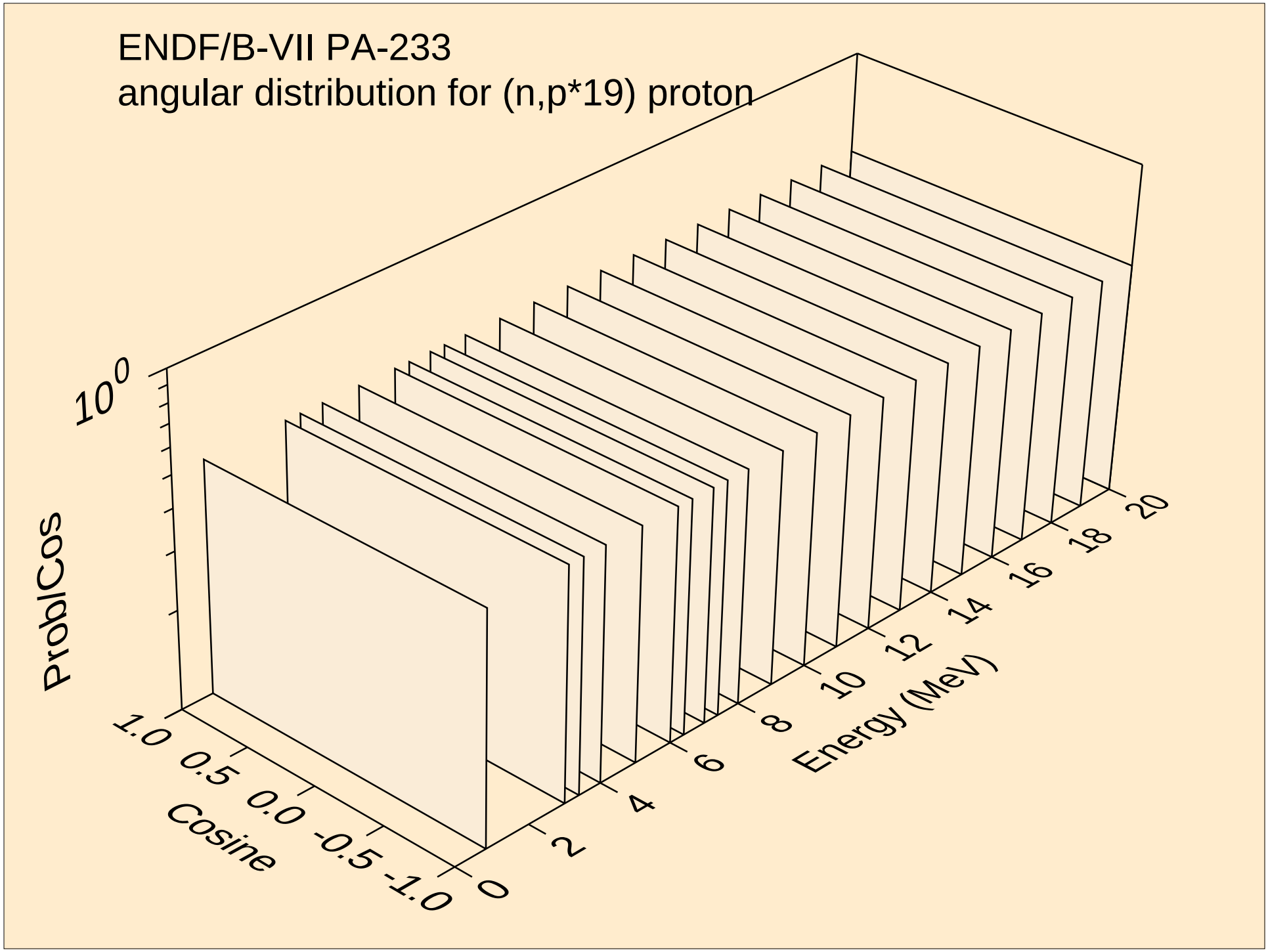

ENDF/B-VII PA-233
angular distribution for (n,p*16) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

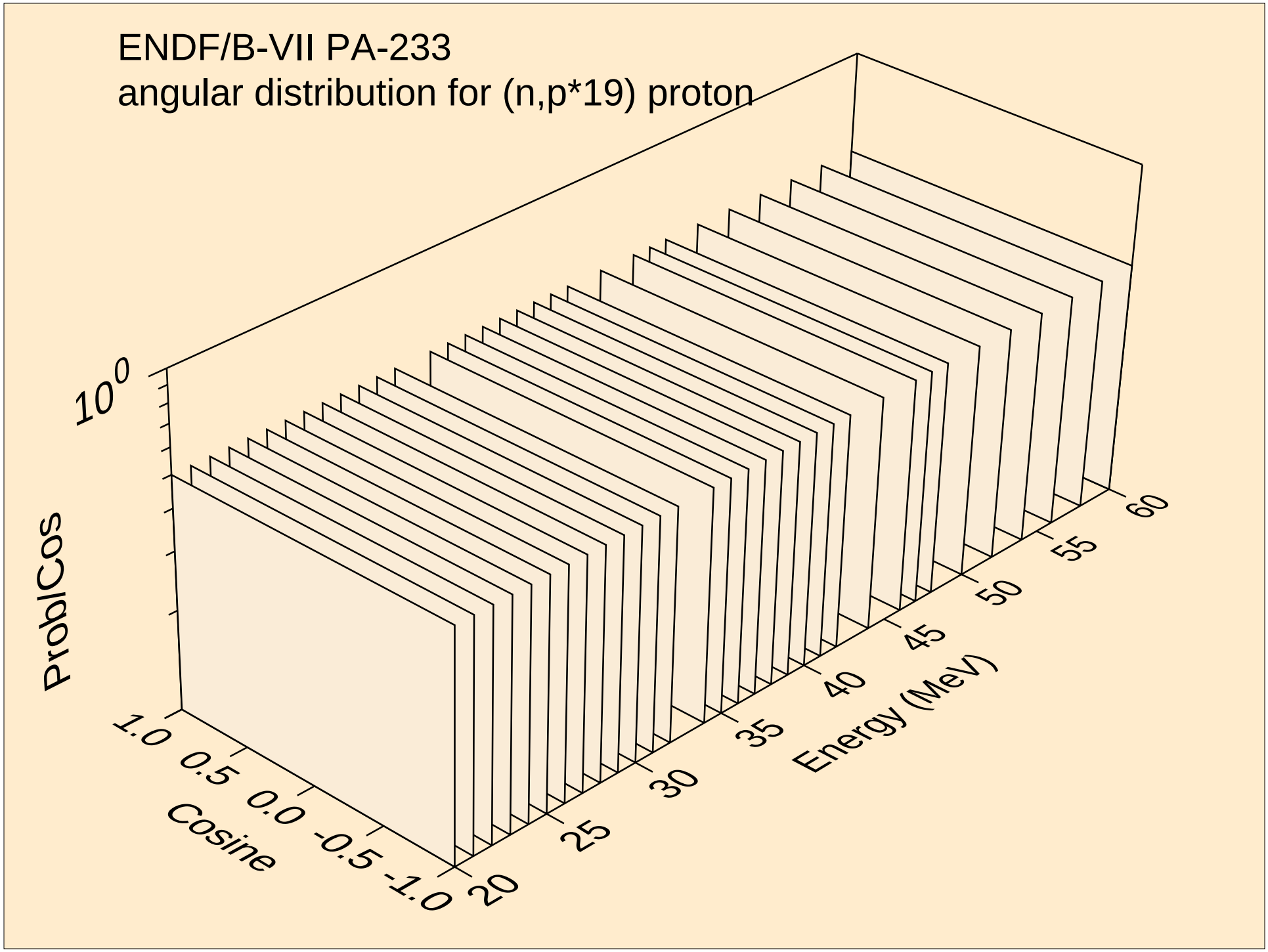

ENDF/B-VII PA-233
angular distribution for (n,p*17) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

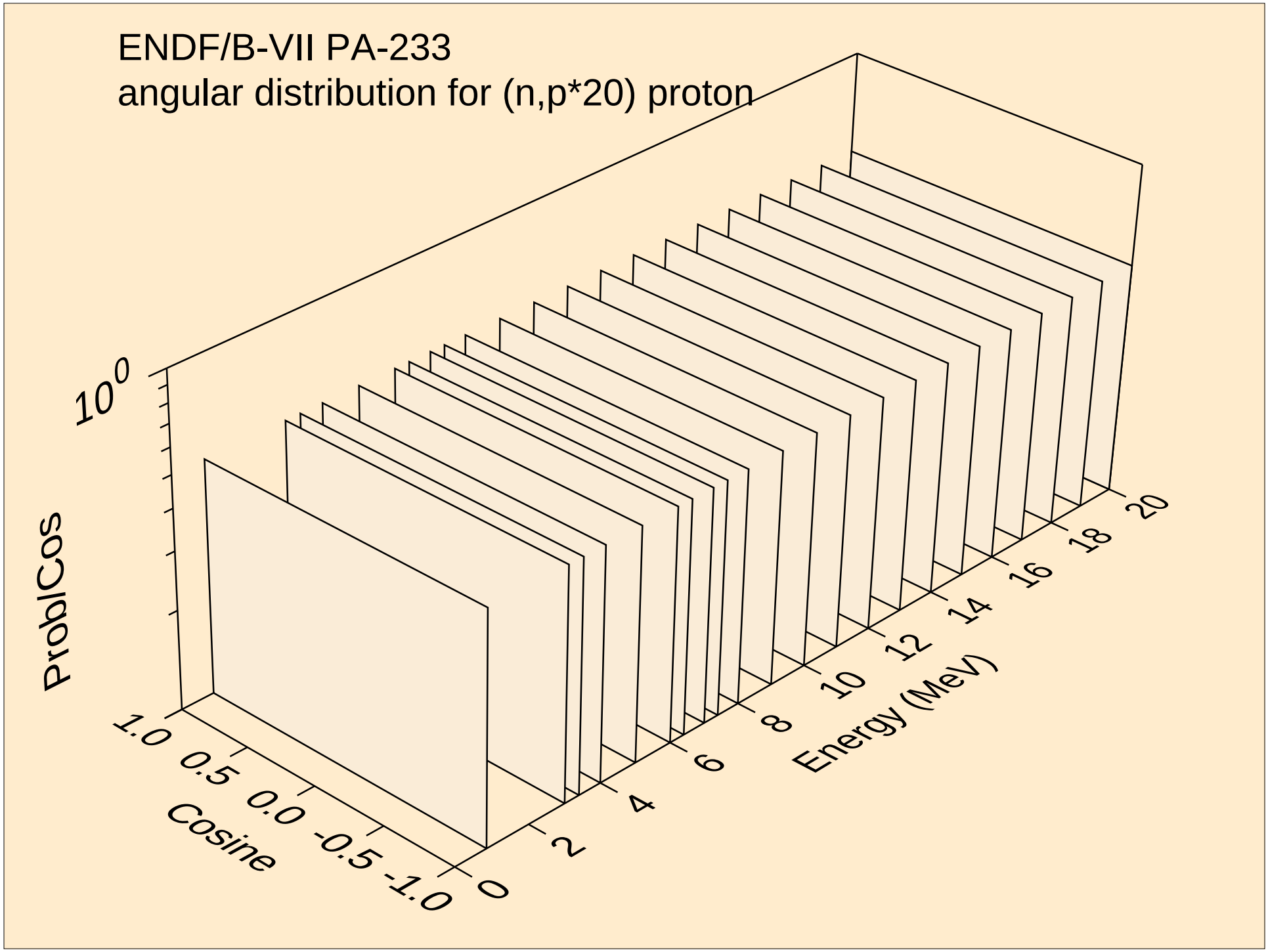

ENDF/B-VII PA-233
angular distribution for (n,p*17) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

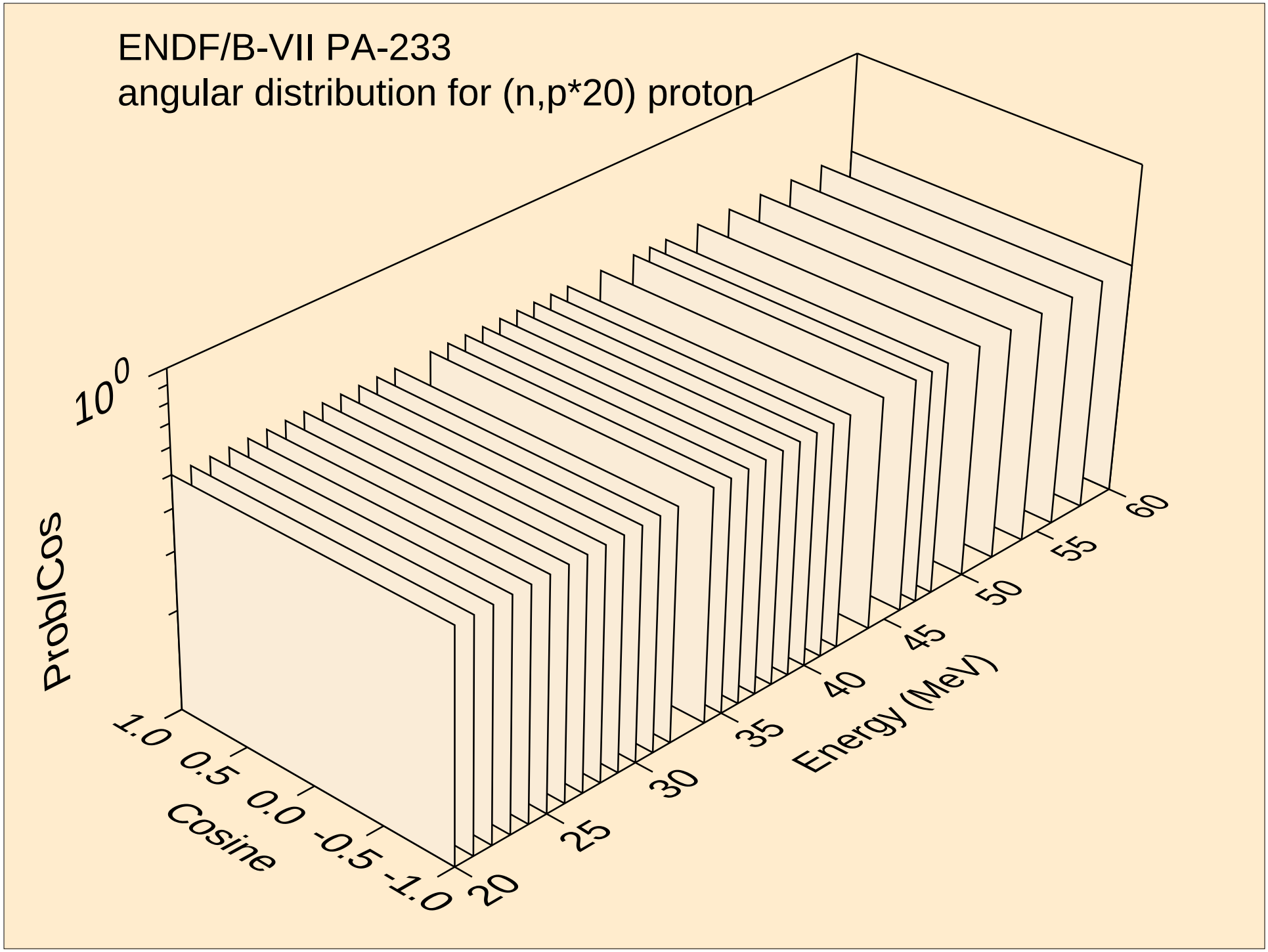

ENDF/B-VII PA-233
angular distribution for (n,p*18) proton
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

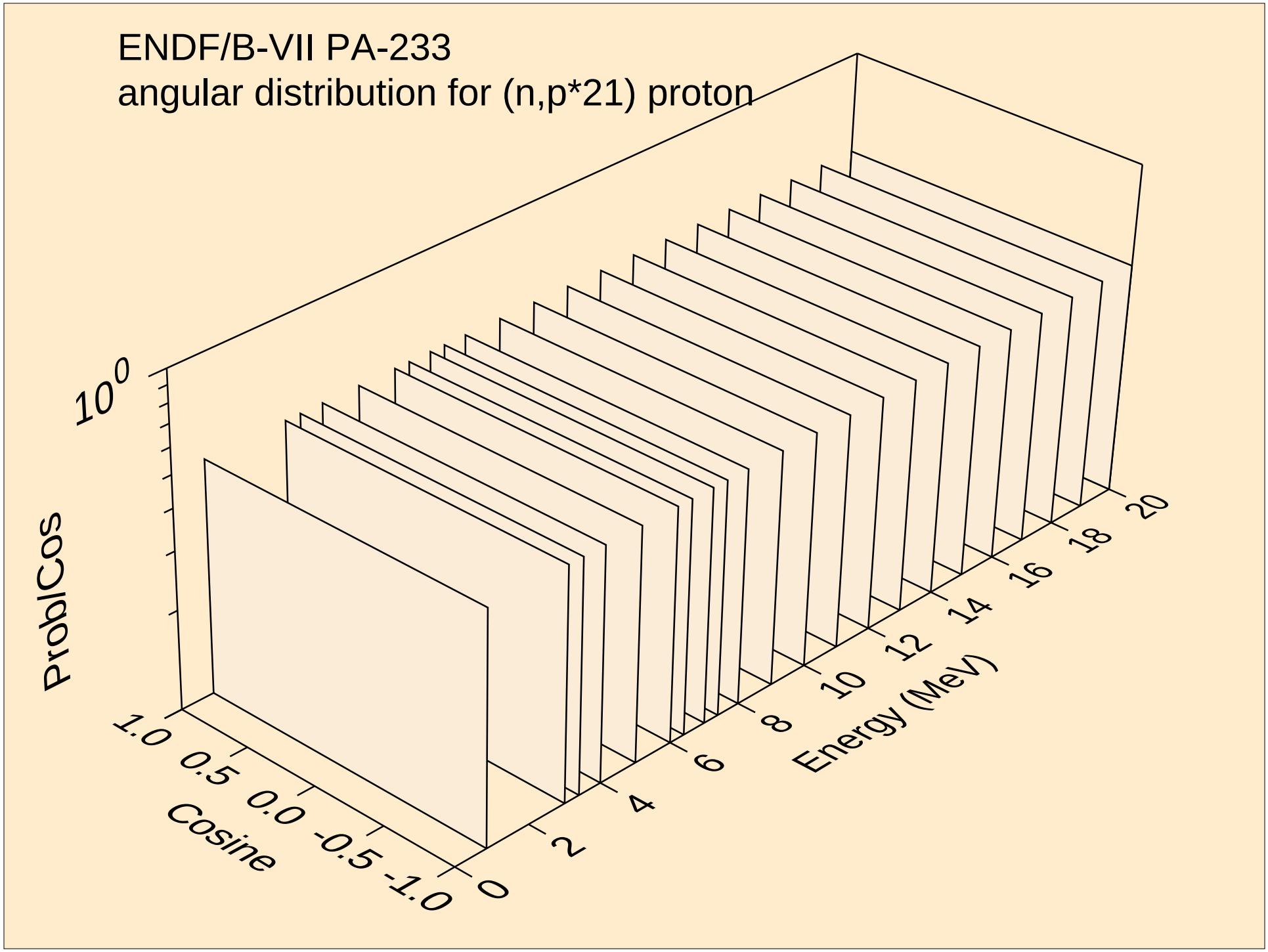

ENDF/B-VII PA-233
angular distribution for (n,p*18) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

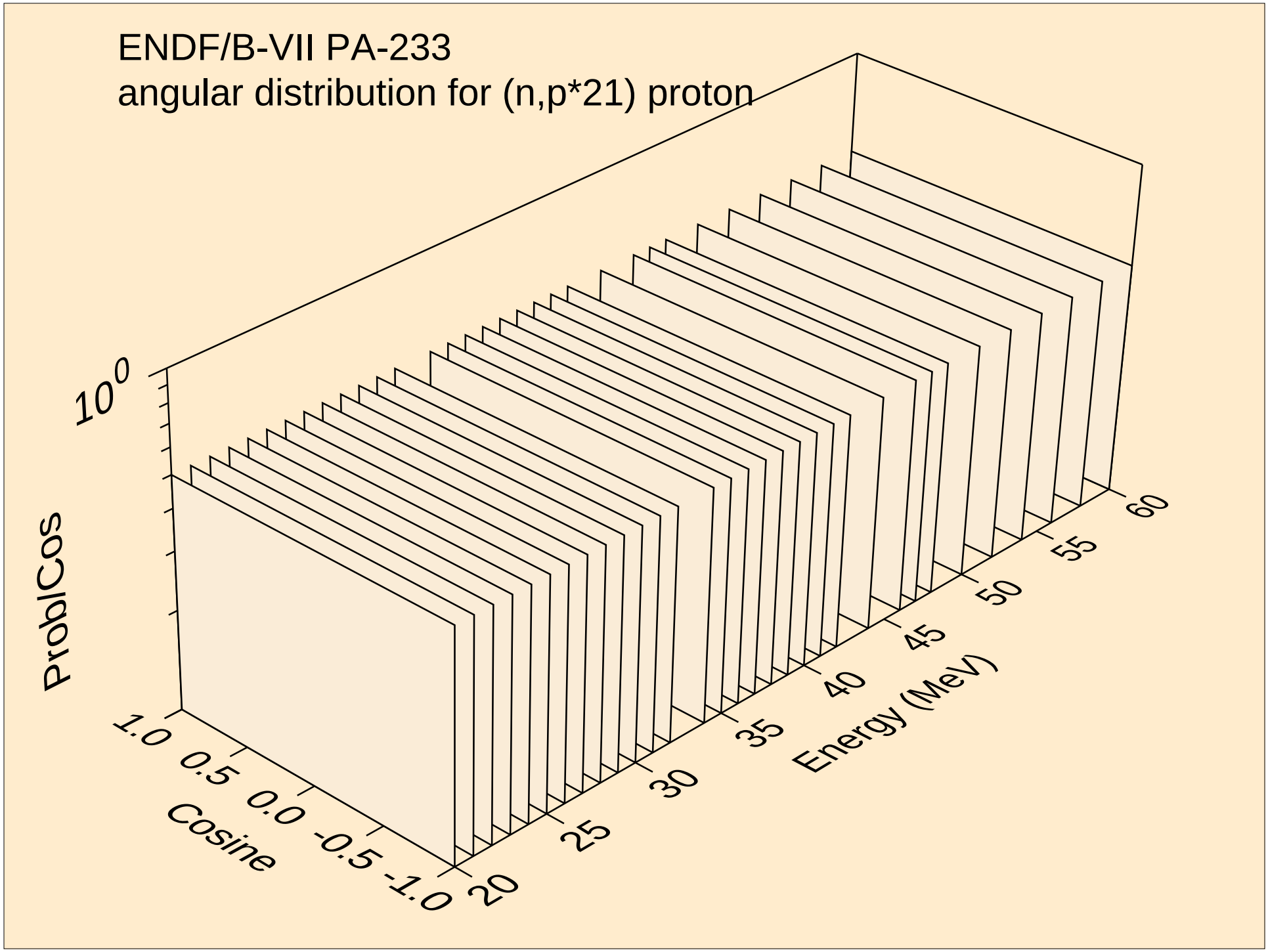

ENDF/B-VII PA-233
angular distribution for (n,p*19) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

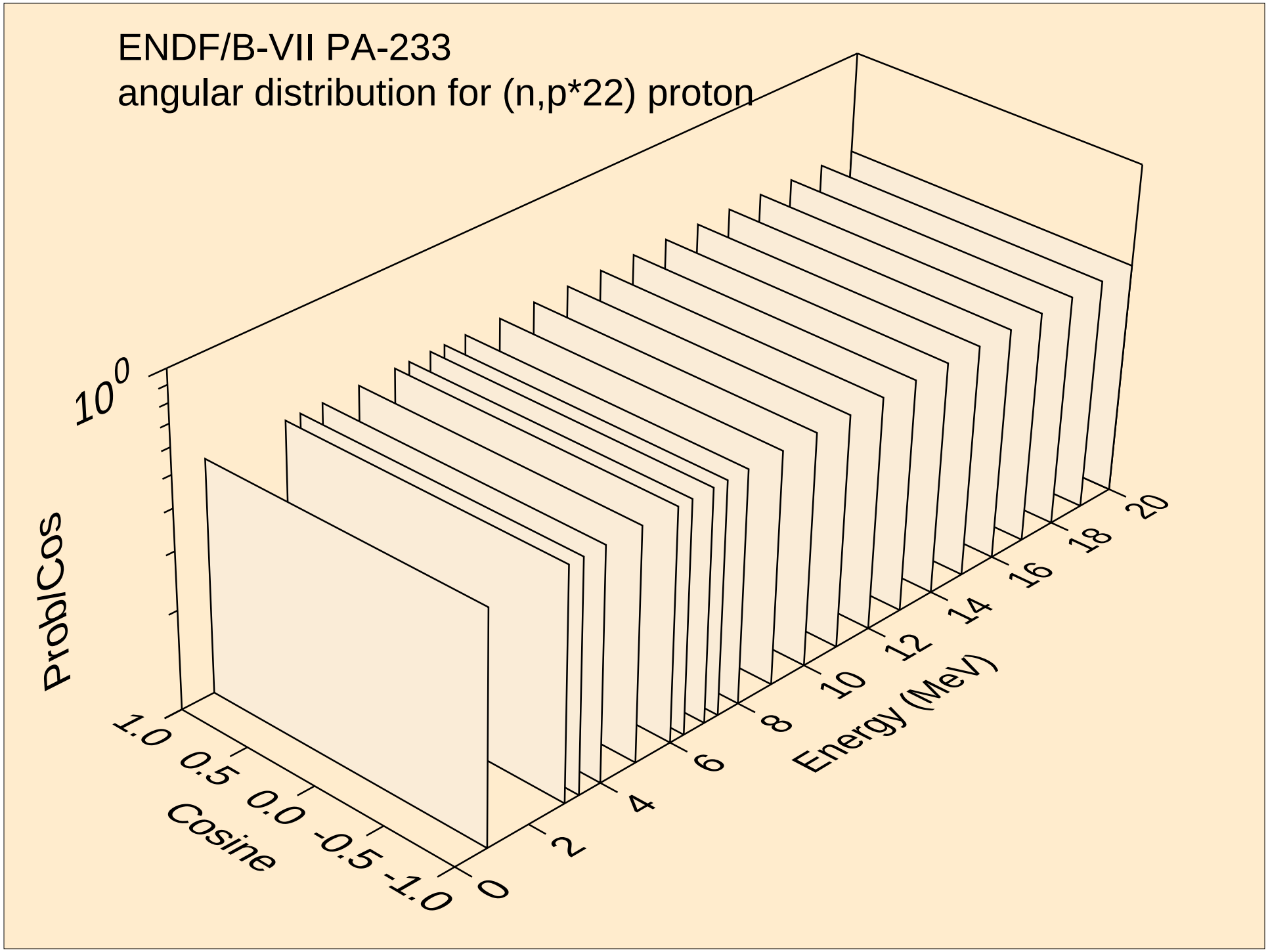

ENDF/B-VII PA-233
angular distribution for (n,p*19) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

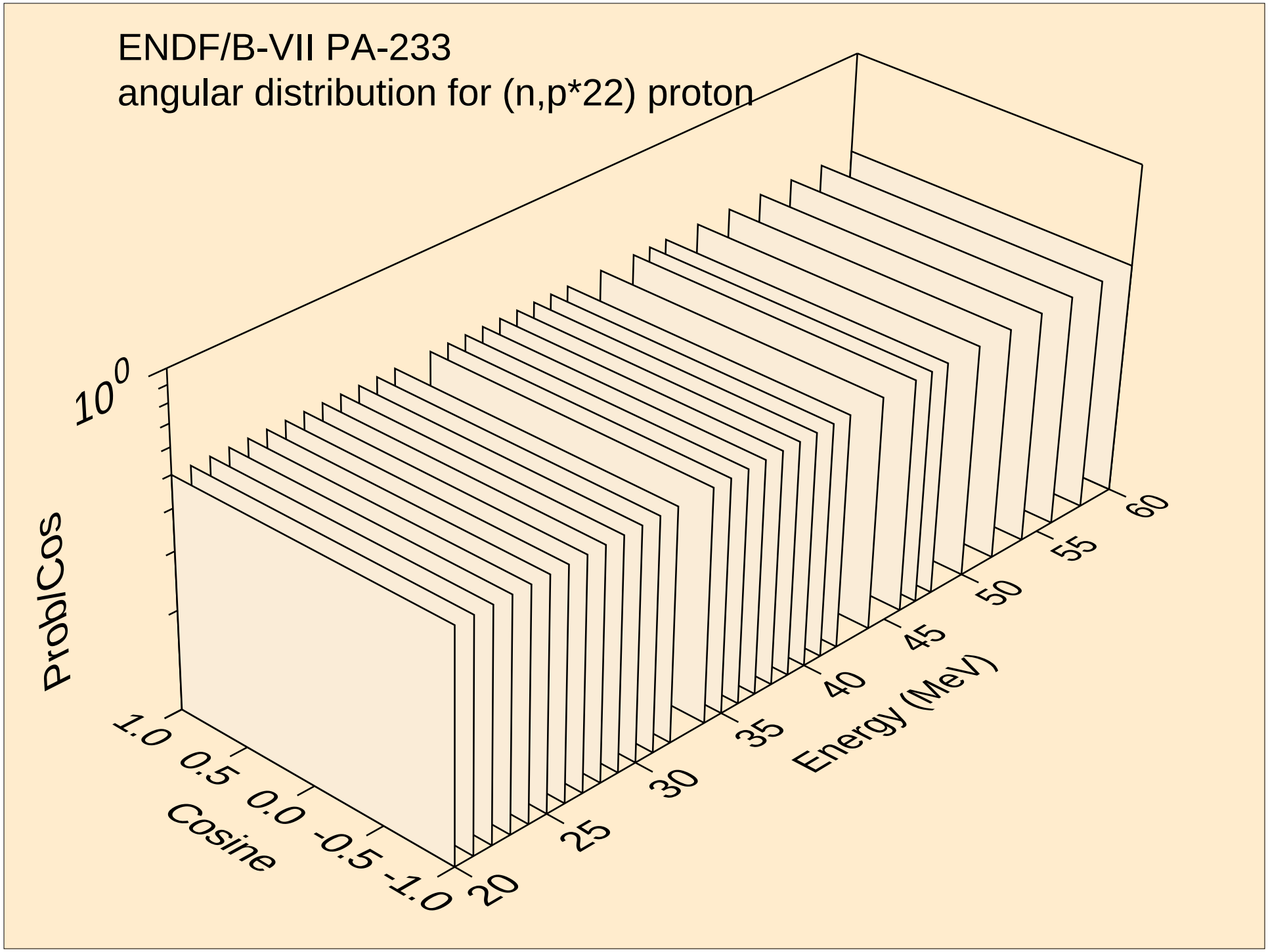

ENDF/B-VII PA-233
angular distribution for (n,p*20) proton
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

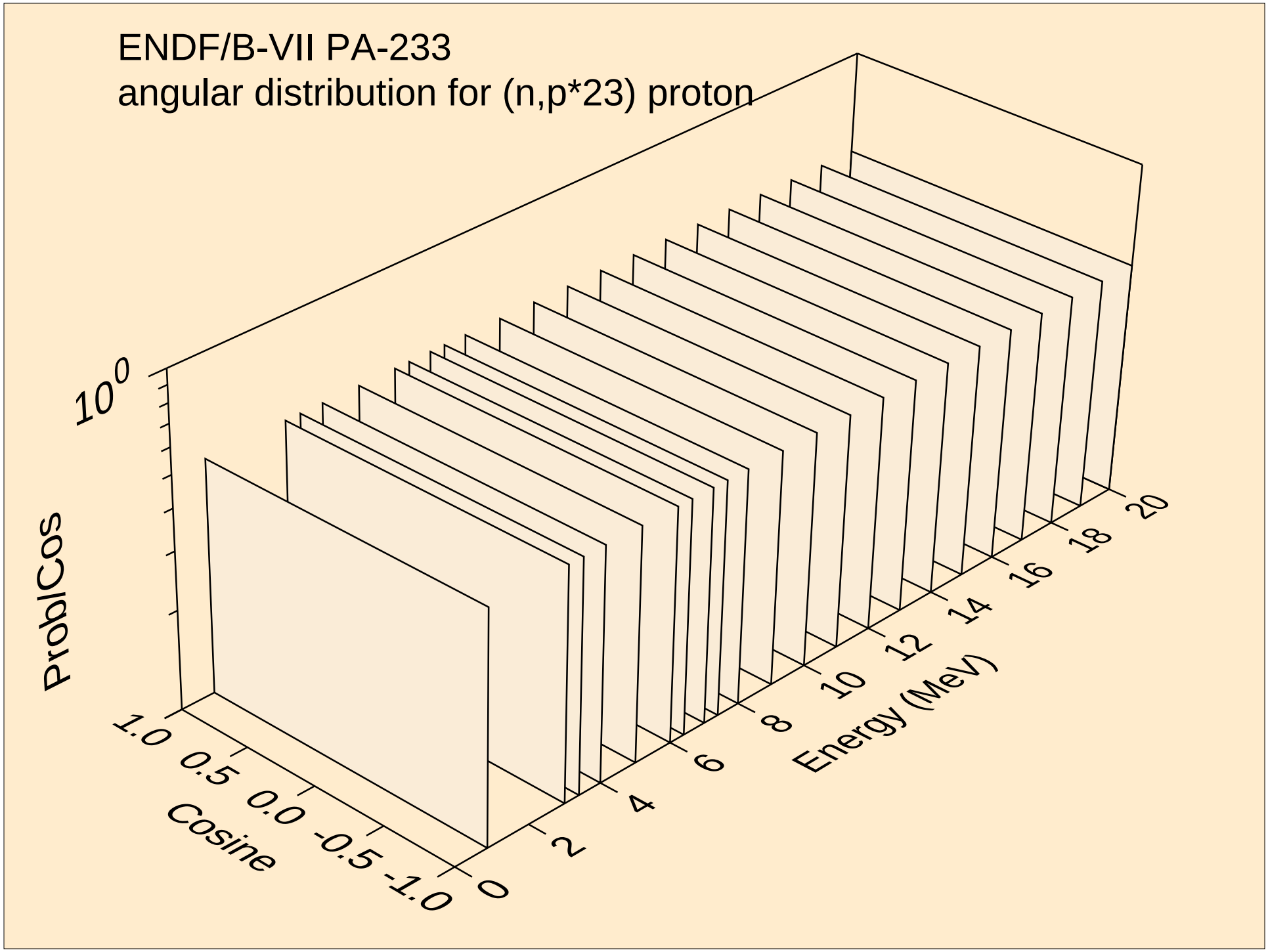

ENDF/B-VII PA-233
angular distribution for (n,p*20) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)

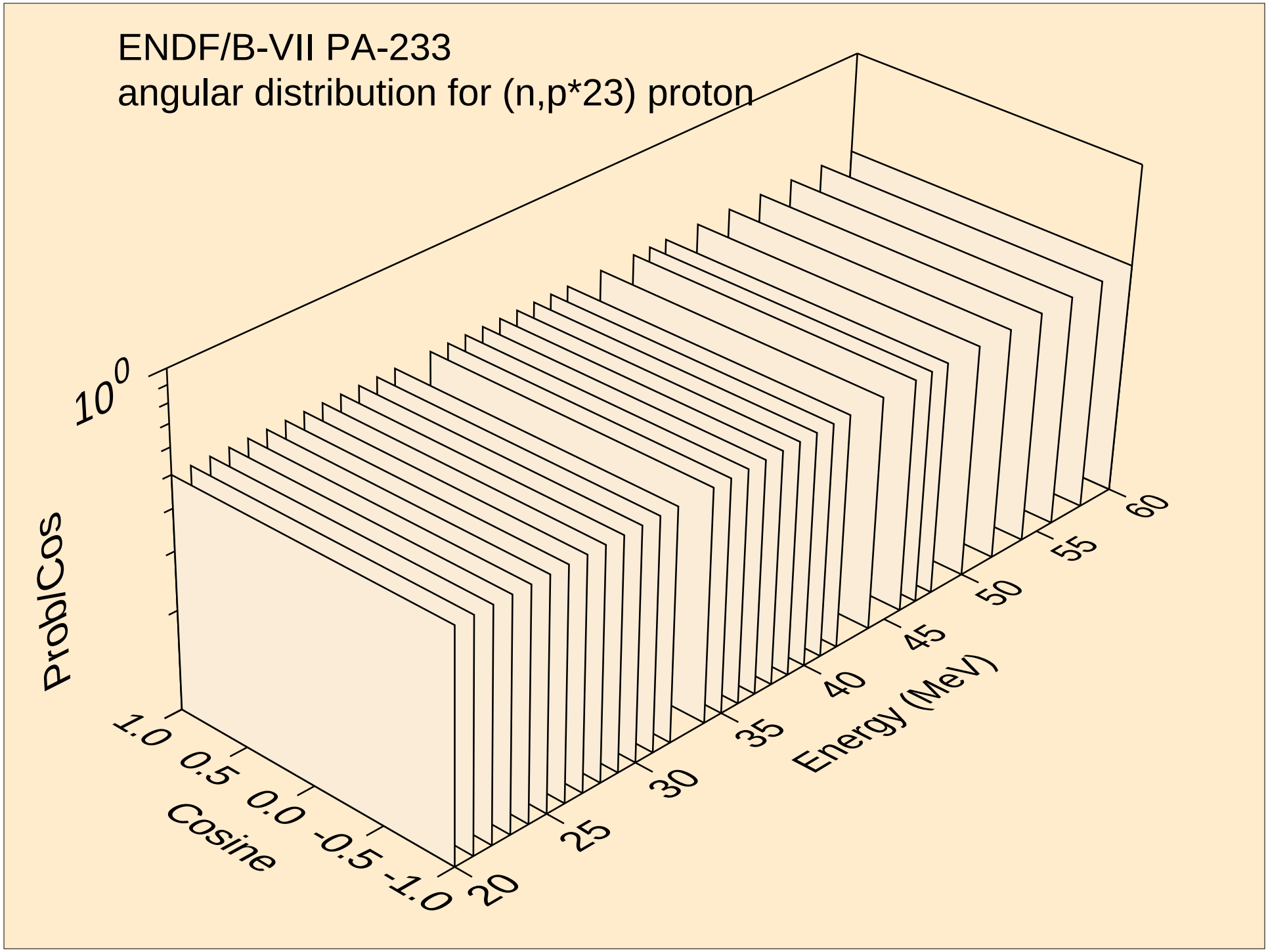

ENDF/B-VII PA-233
angular distribution for (n,p*21) proton
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

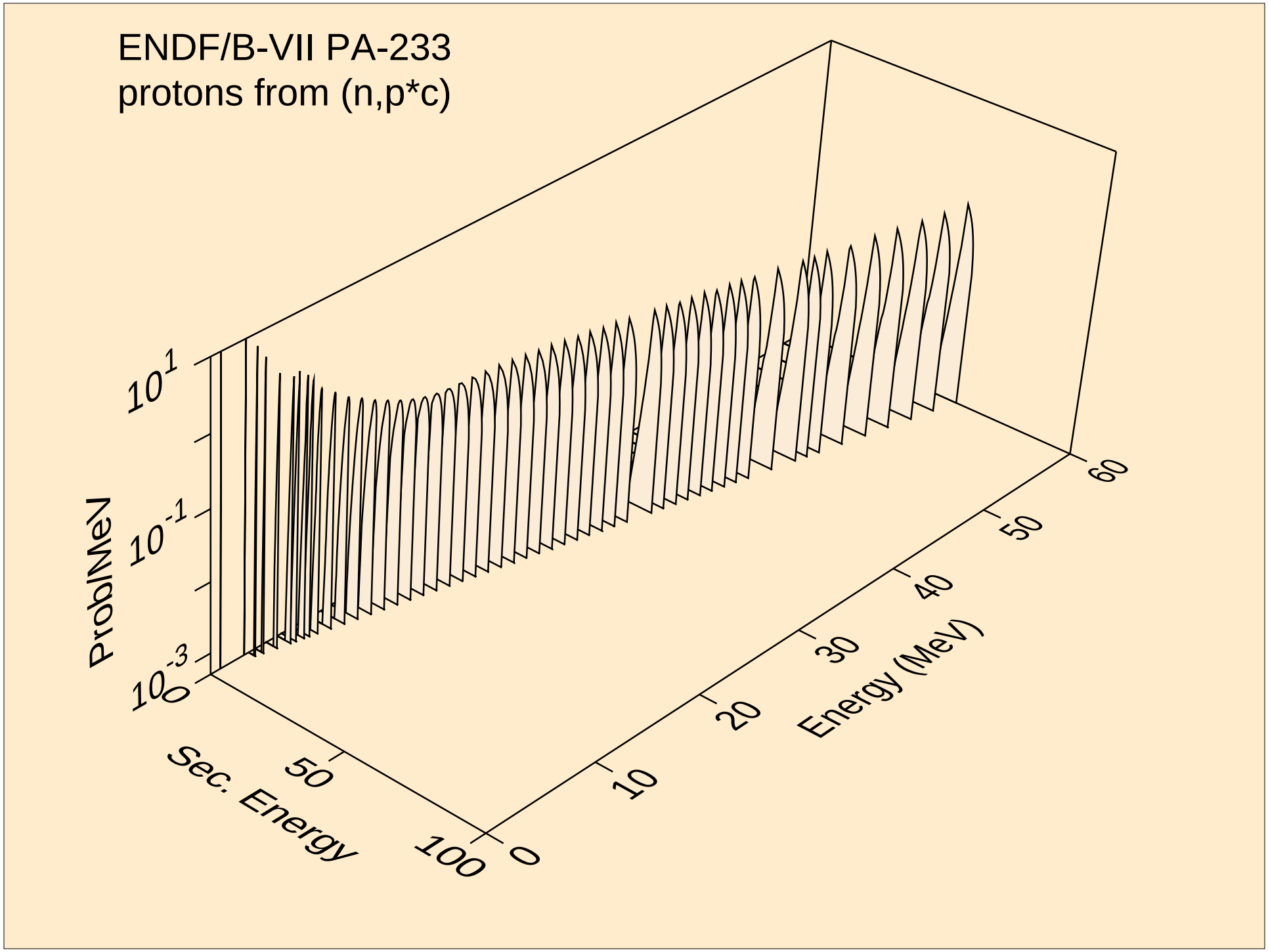

ENDF/B-VII PA-233
angular distribution for (n,p*21) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)


ENDF/B-VII PA-233
angular distribution for (n,p*22) proton
10^0
ProblCos
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 PA-233
angular distribution for (n,p*22) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)


ENDF/B-VII PA-233
angular distribution for (n,p*23) proton
10^0
ProblCos
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 PA-233
angular distribution for (n,p*23) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
25
30
35
40
45
50
55
60
Energy (MeV)


ENDF/B-VII PA-233
protons from (n,p*c)
Prob/MeV
10^{1}
10^{-1}
10^{-3}
Sec. Energy
0
50
100
Energy (MeV)
0
10
20
30
40
50
60