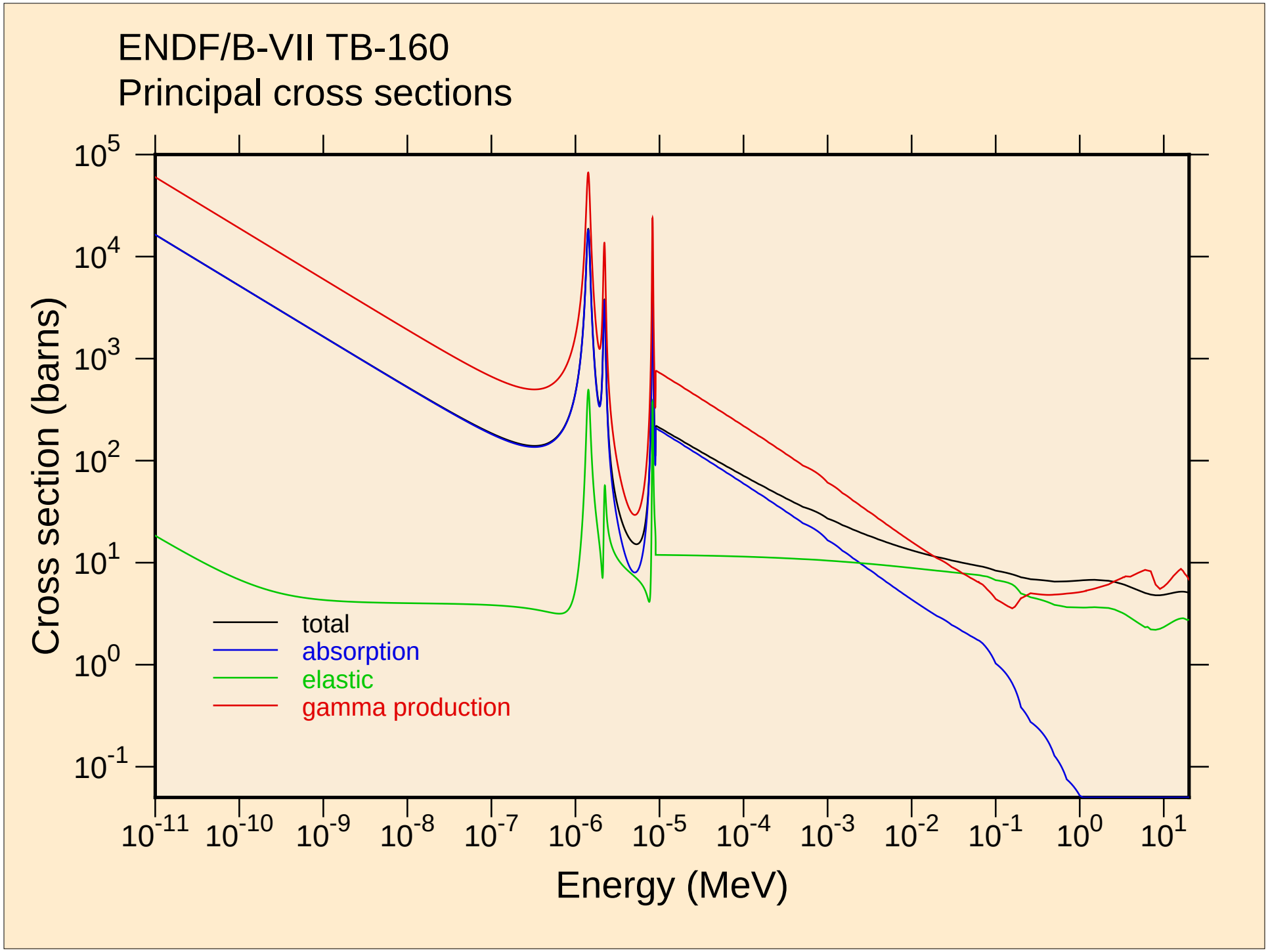
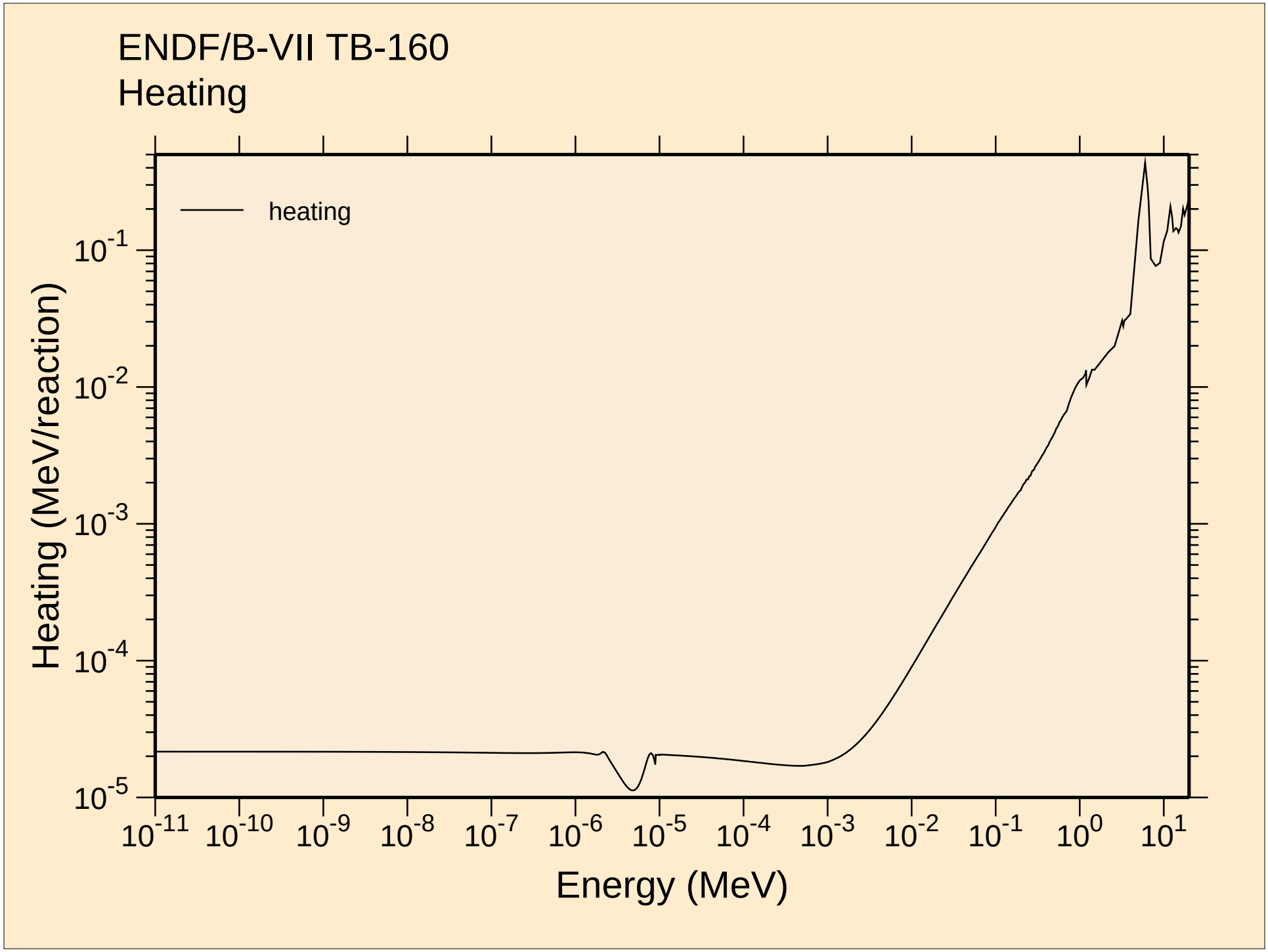
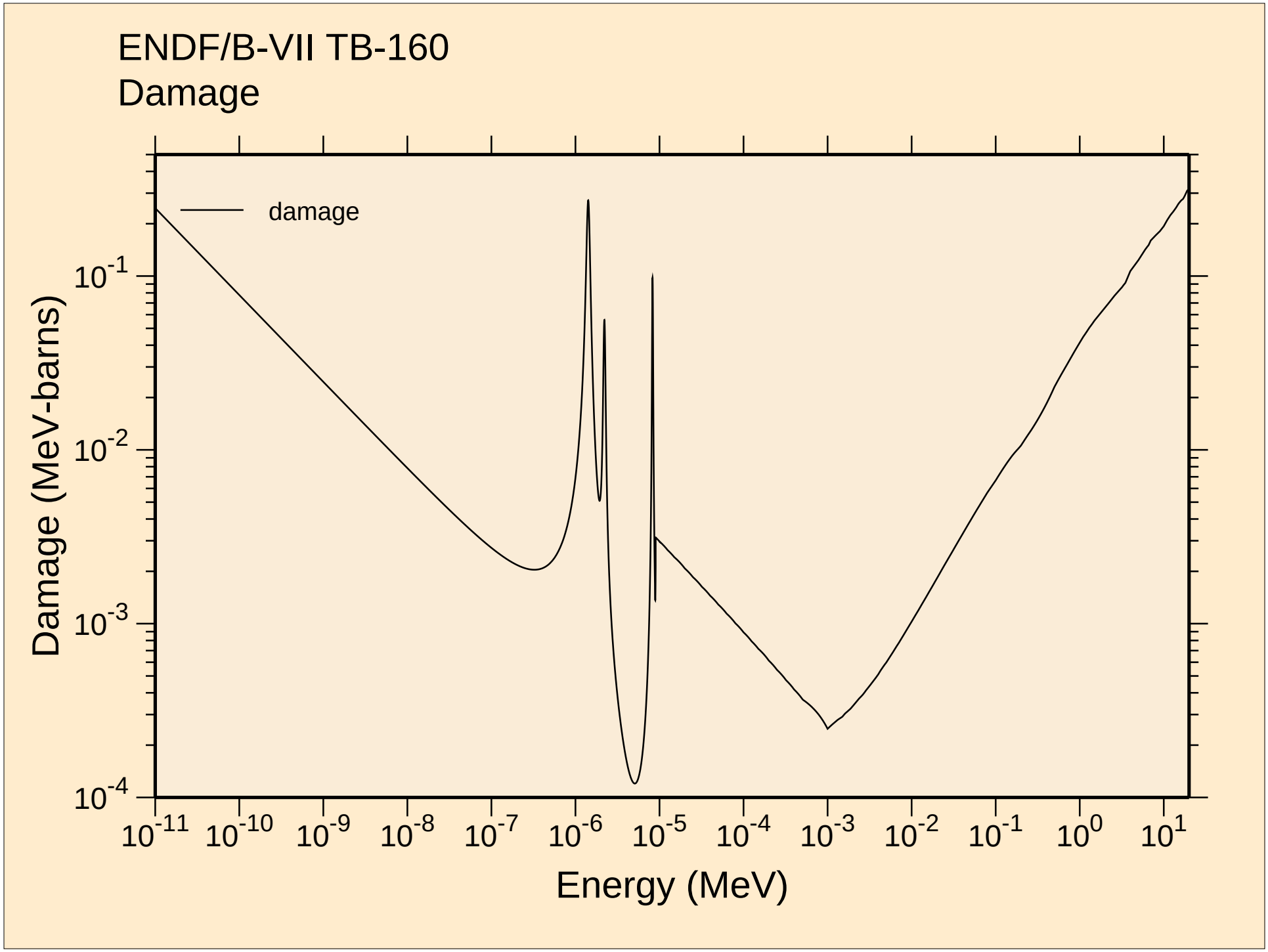
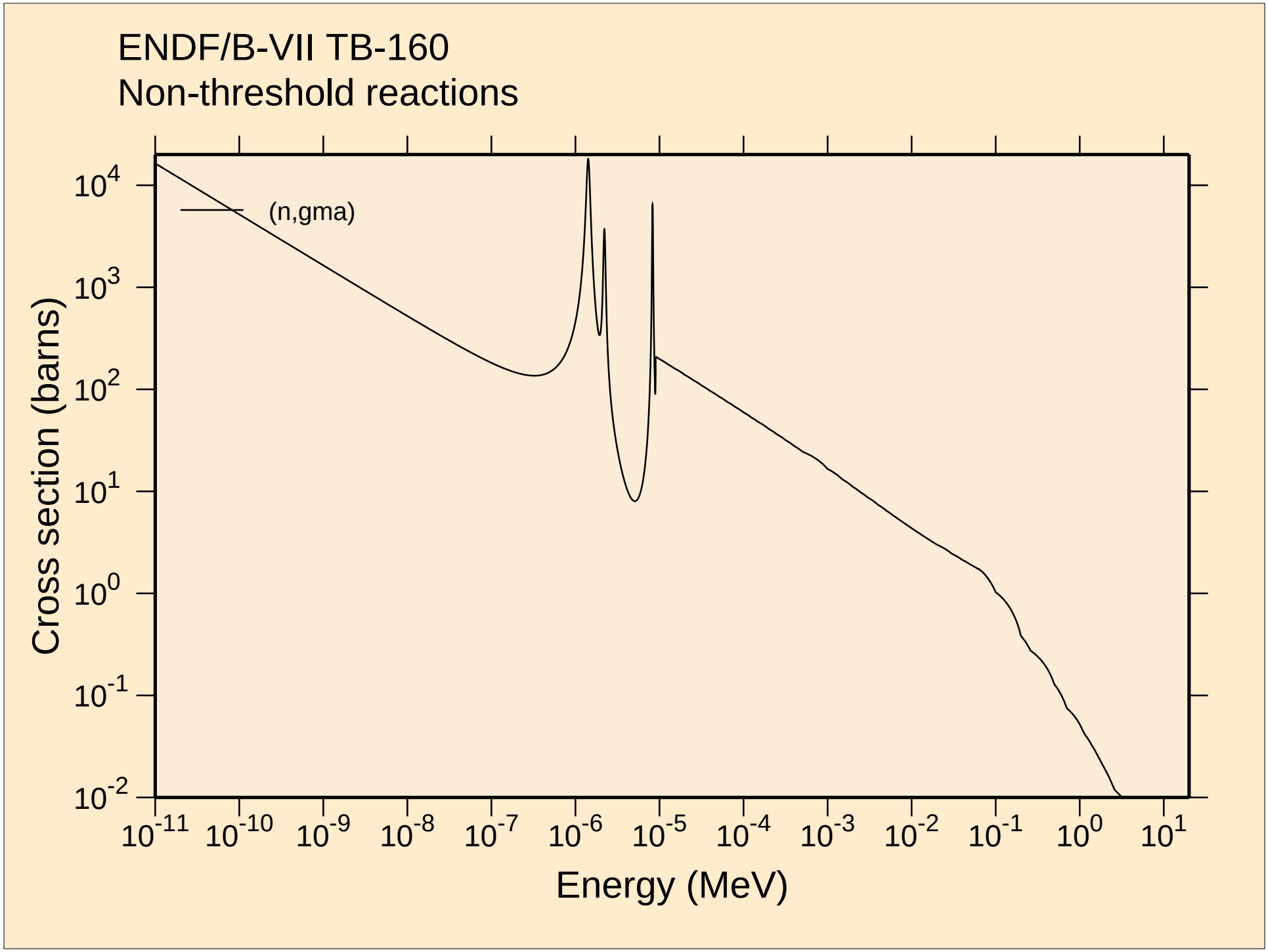
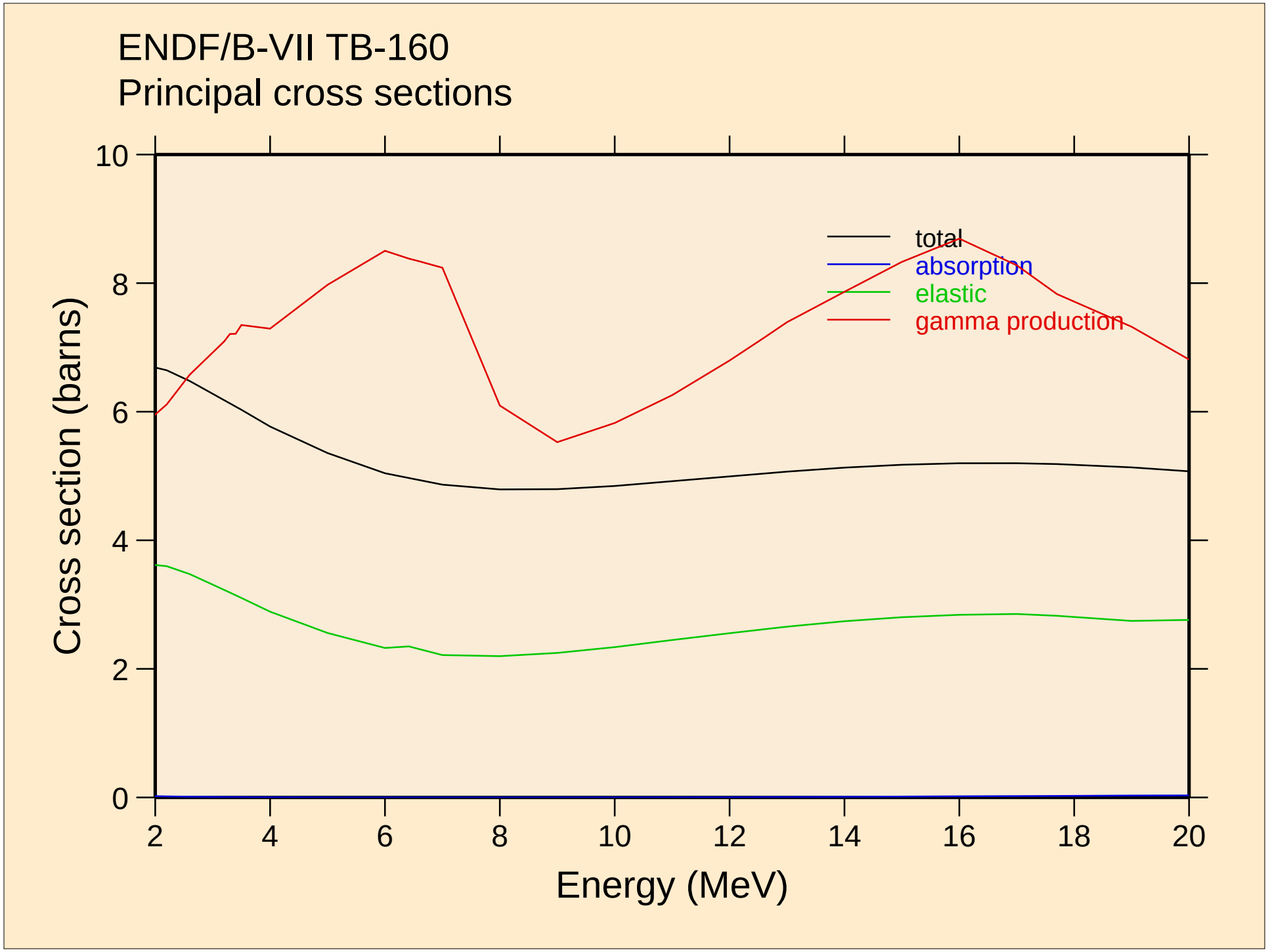
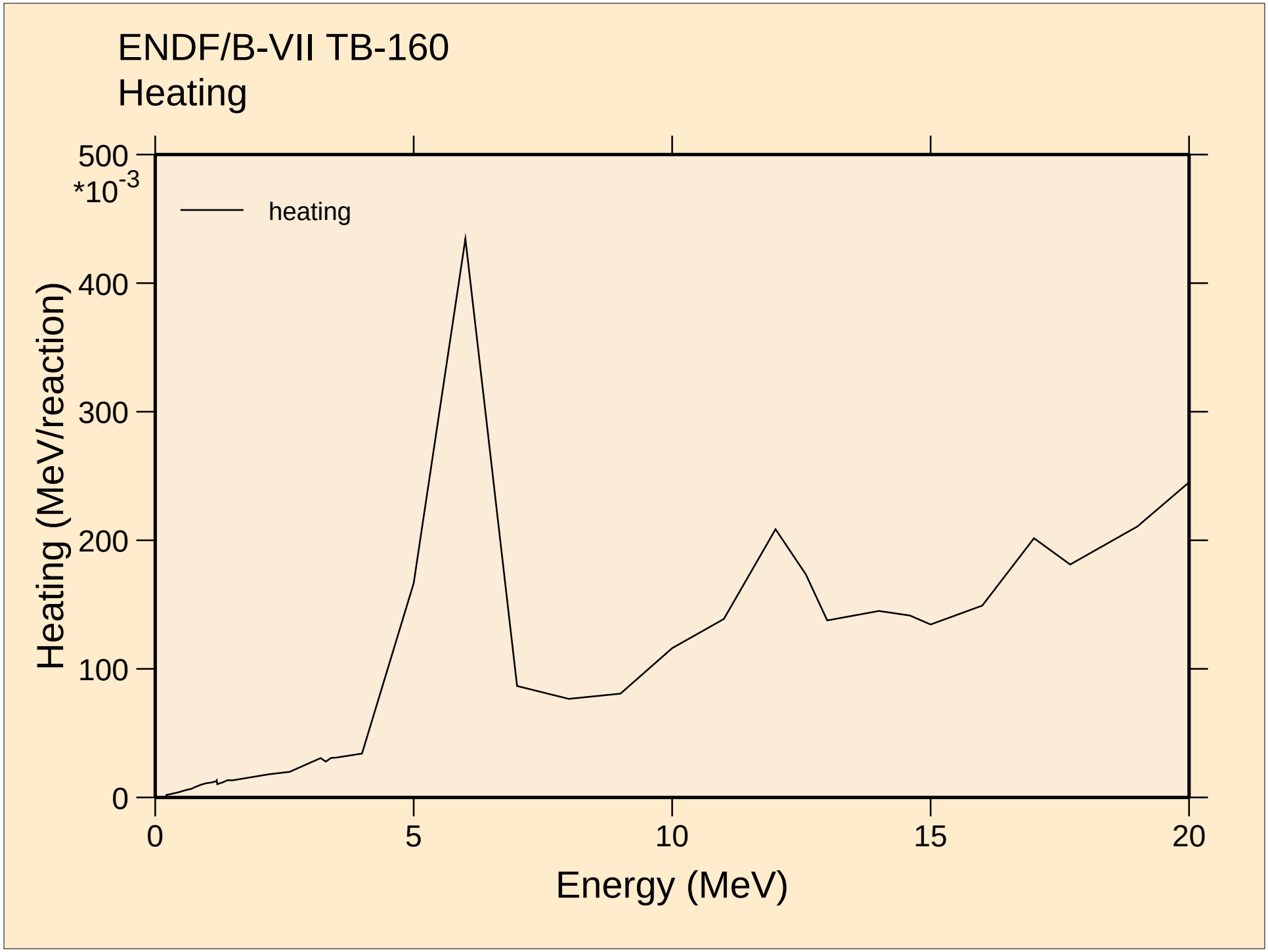

ENDF/B-VII TB-160
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-11}
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
10^{0}
10^{1}

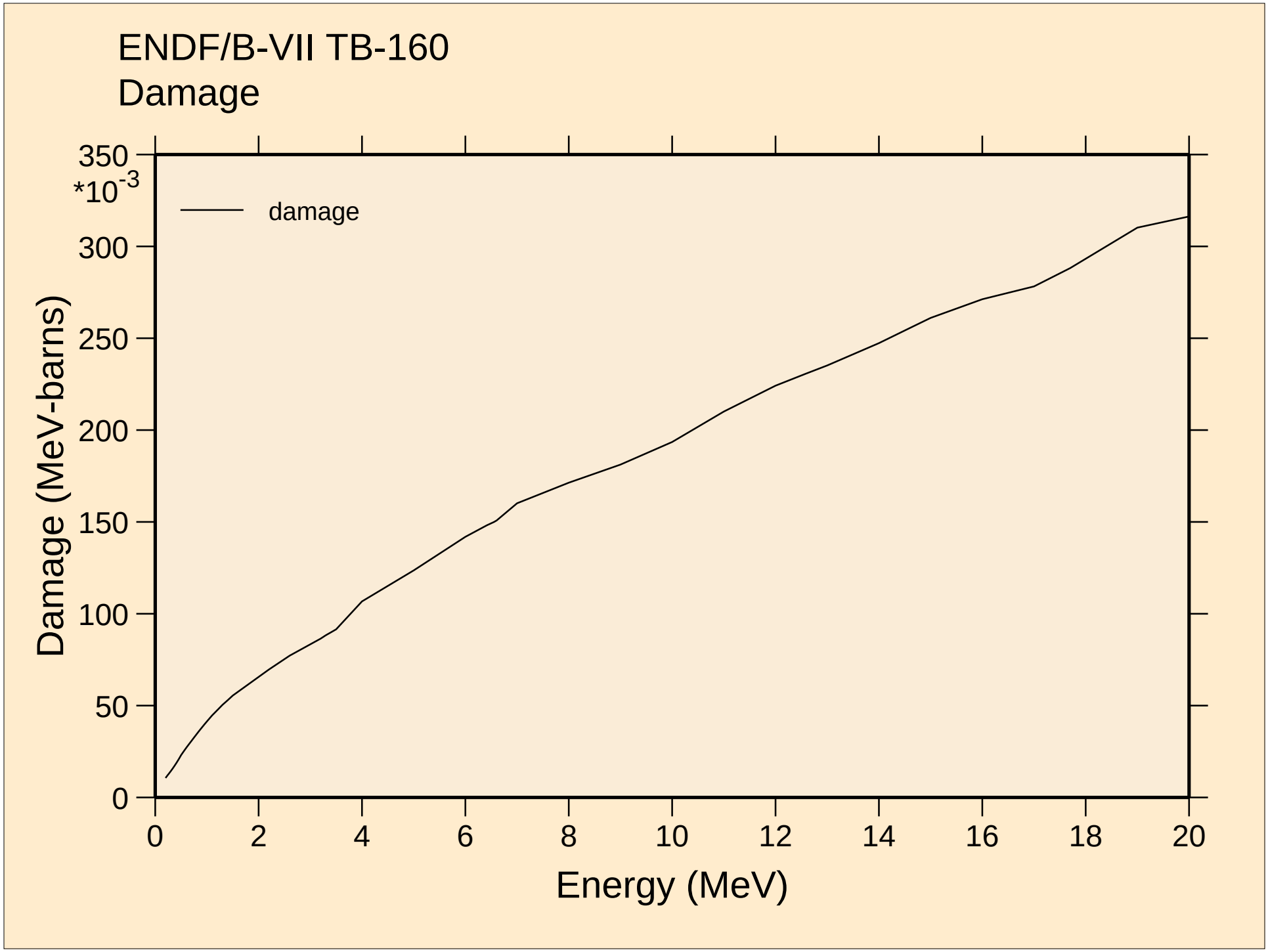

ENDF/B-VII TB-160
Heating
heating
Heating (MeV/reaction)
Energy (MeV)
10^-1
10^-2
10^-3
10^-4
10^-5
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

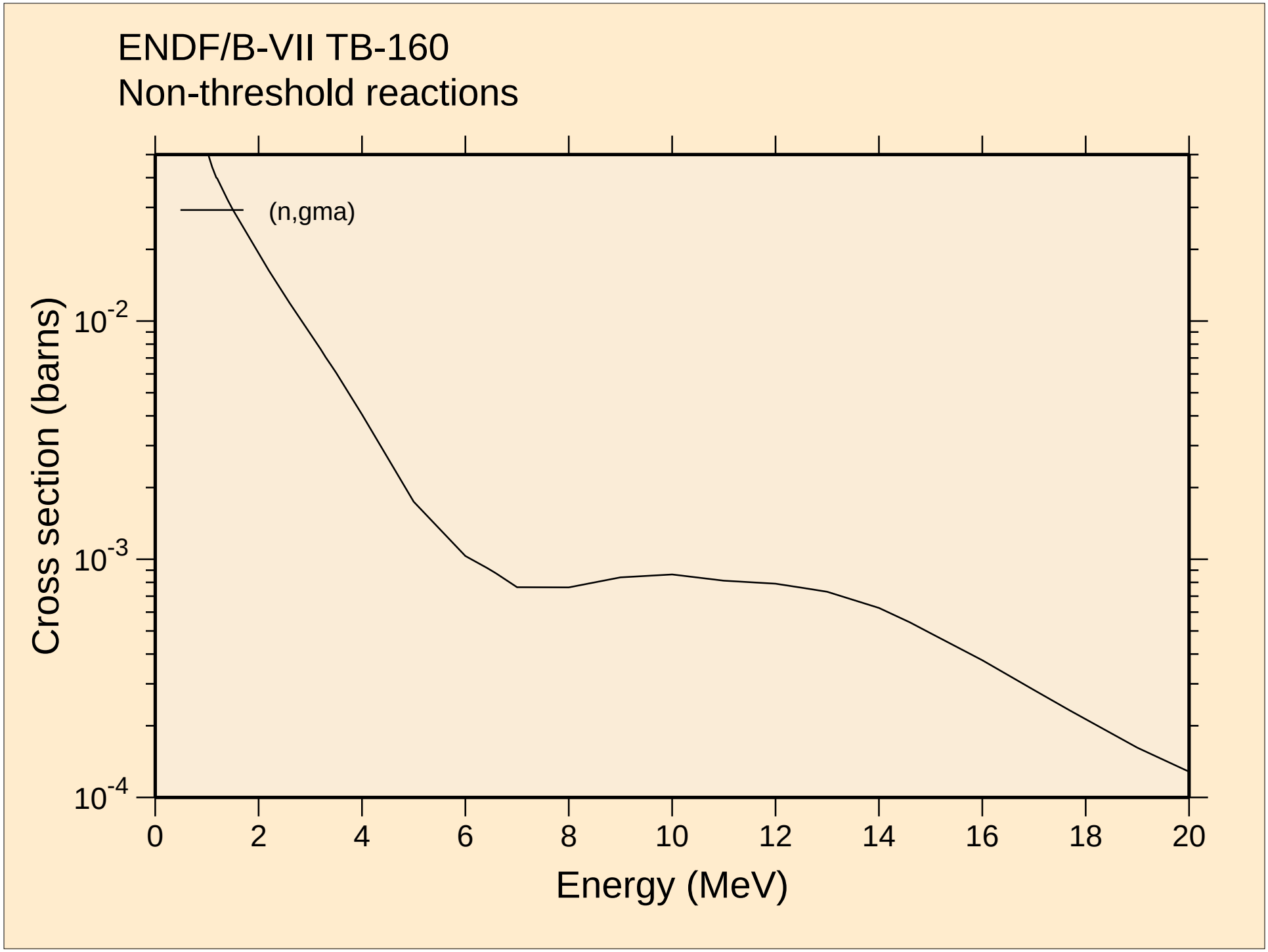

ENDF/B-VII TB-160
Damage
damage
Damage (MeV-barns)
Energy (MeV)
10^-1
10^-2
10^-3
10^-4
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

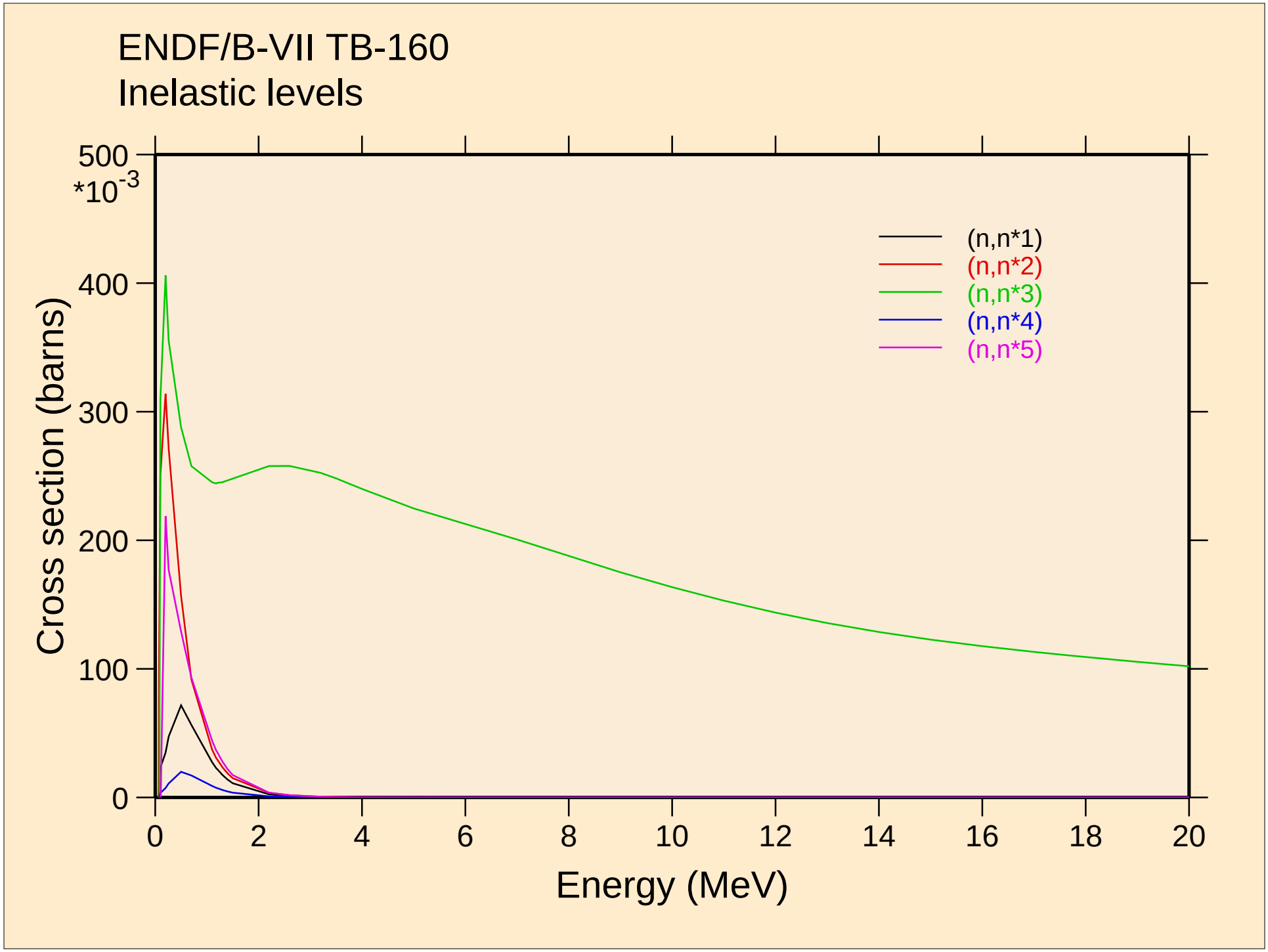

ENDF/B-VII TB-160
Non-threshold reactions
(n,gma)
Cross section (barns)
Energy (MeV)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

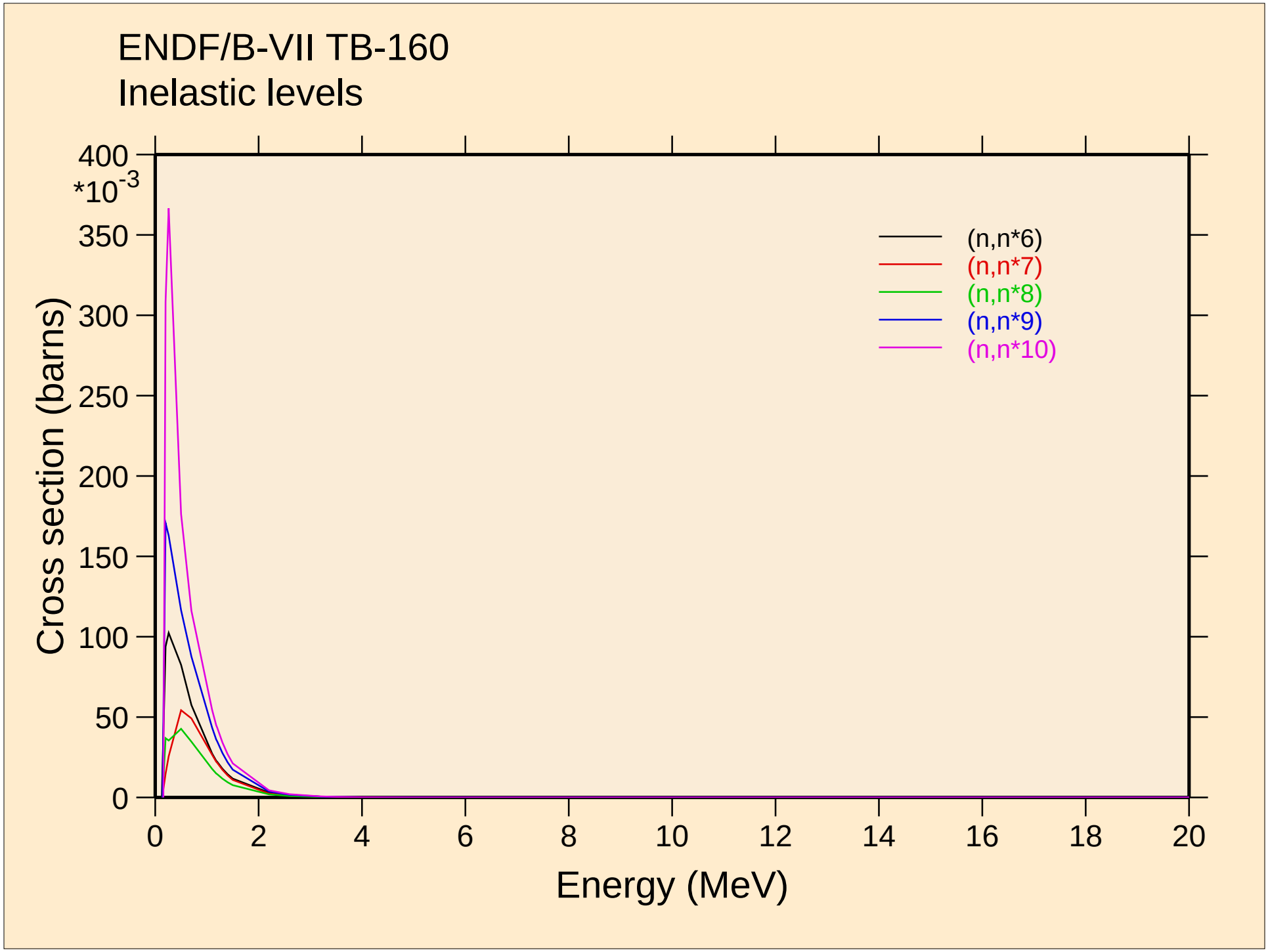

ENDF/B-VII TB-160
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
0
2
4
6
8
10
2
4
6
8
10
12
14
16
18
20

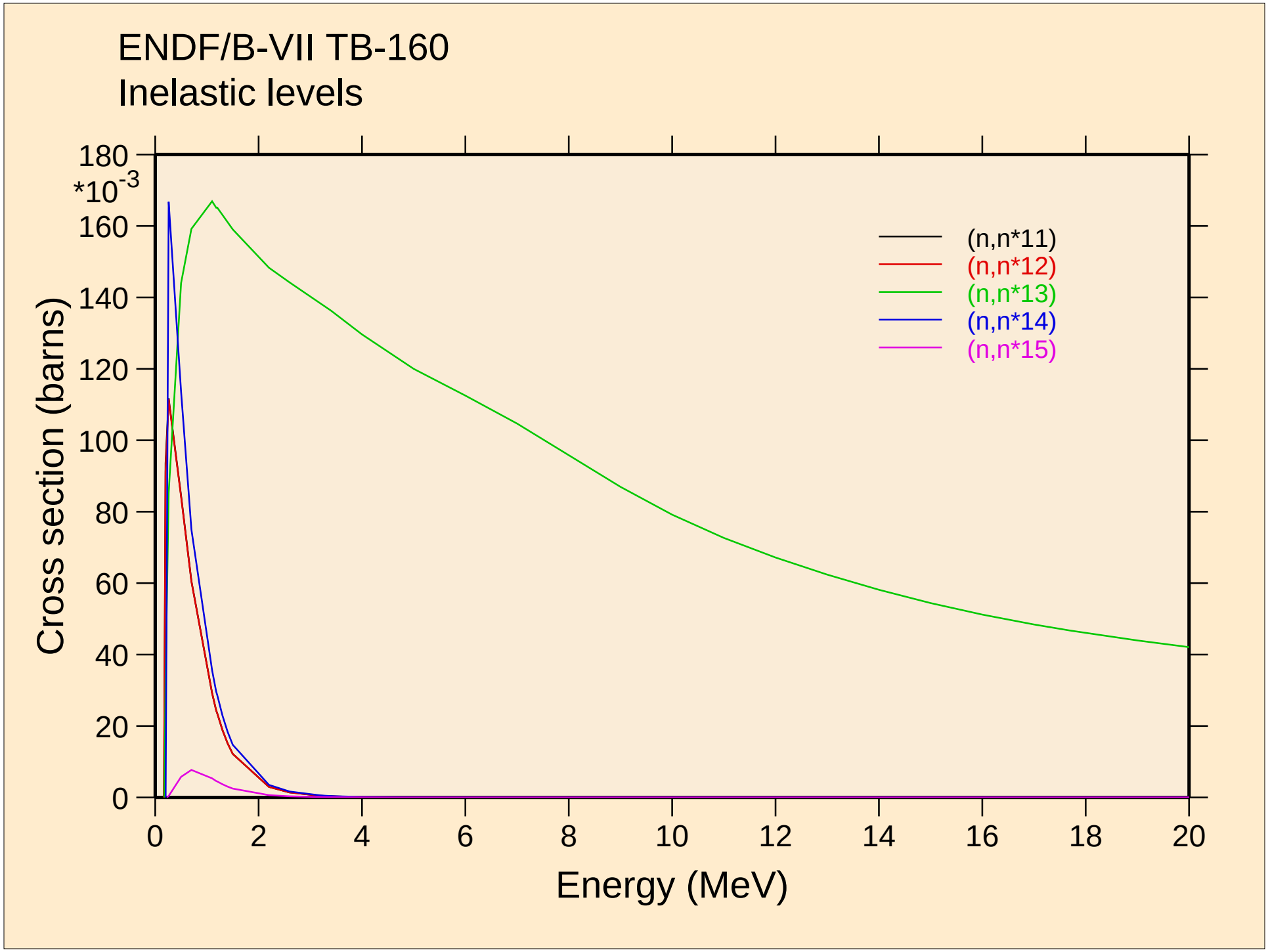

ENDF/B-VII TB-160
Heating
heating
Heating (MeV/reaction)
*10^-3
500
400
300
200
100
0
0
5
10
15
20
Energy (MeV)

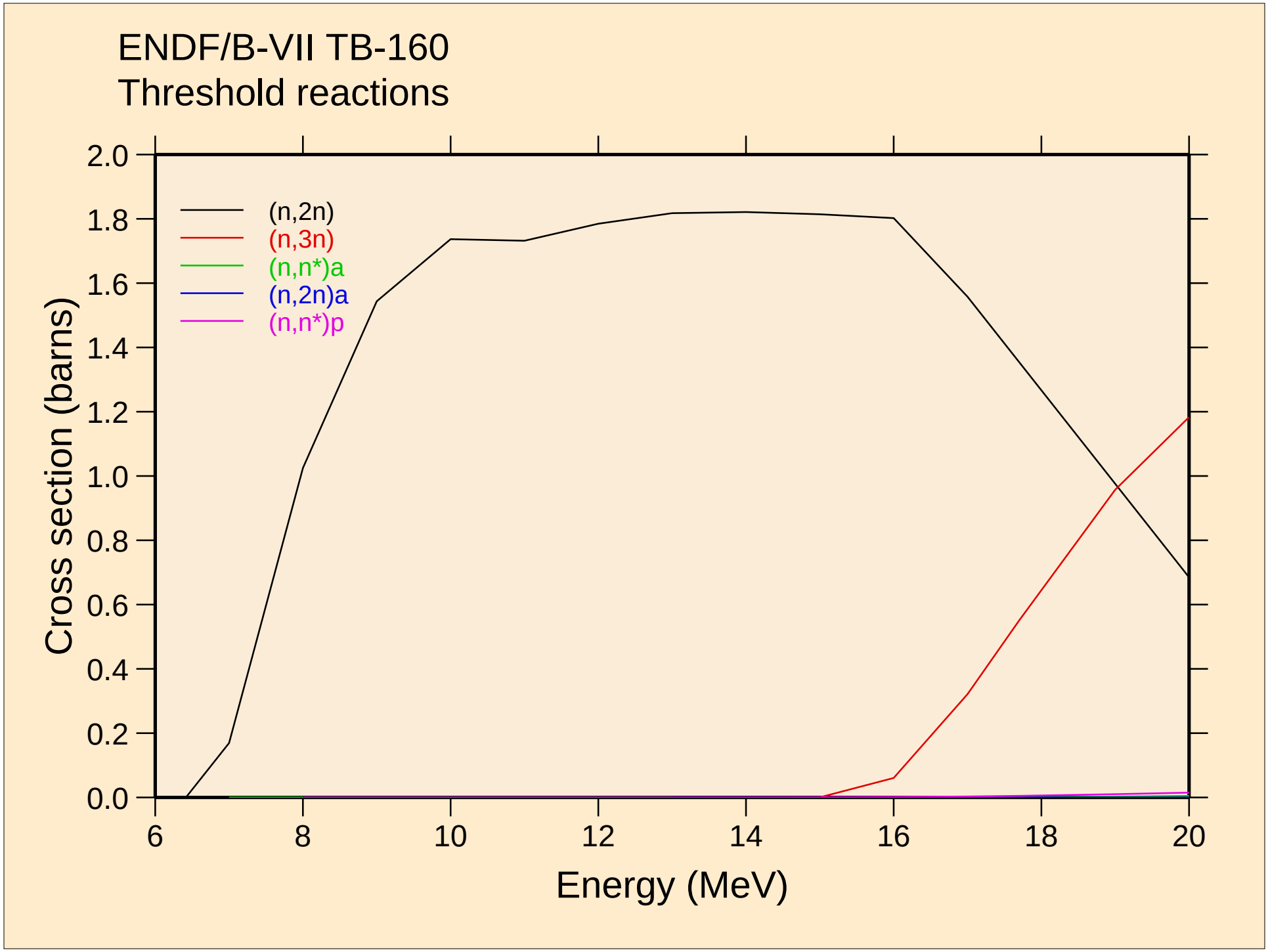

ENDF/B-VII TB-160
Damage
damage
*10-3
350
300
250
200
150
100
50
0
Damage (MeV-barns)
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

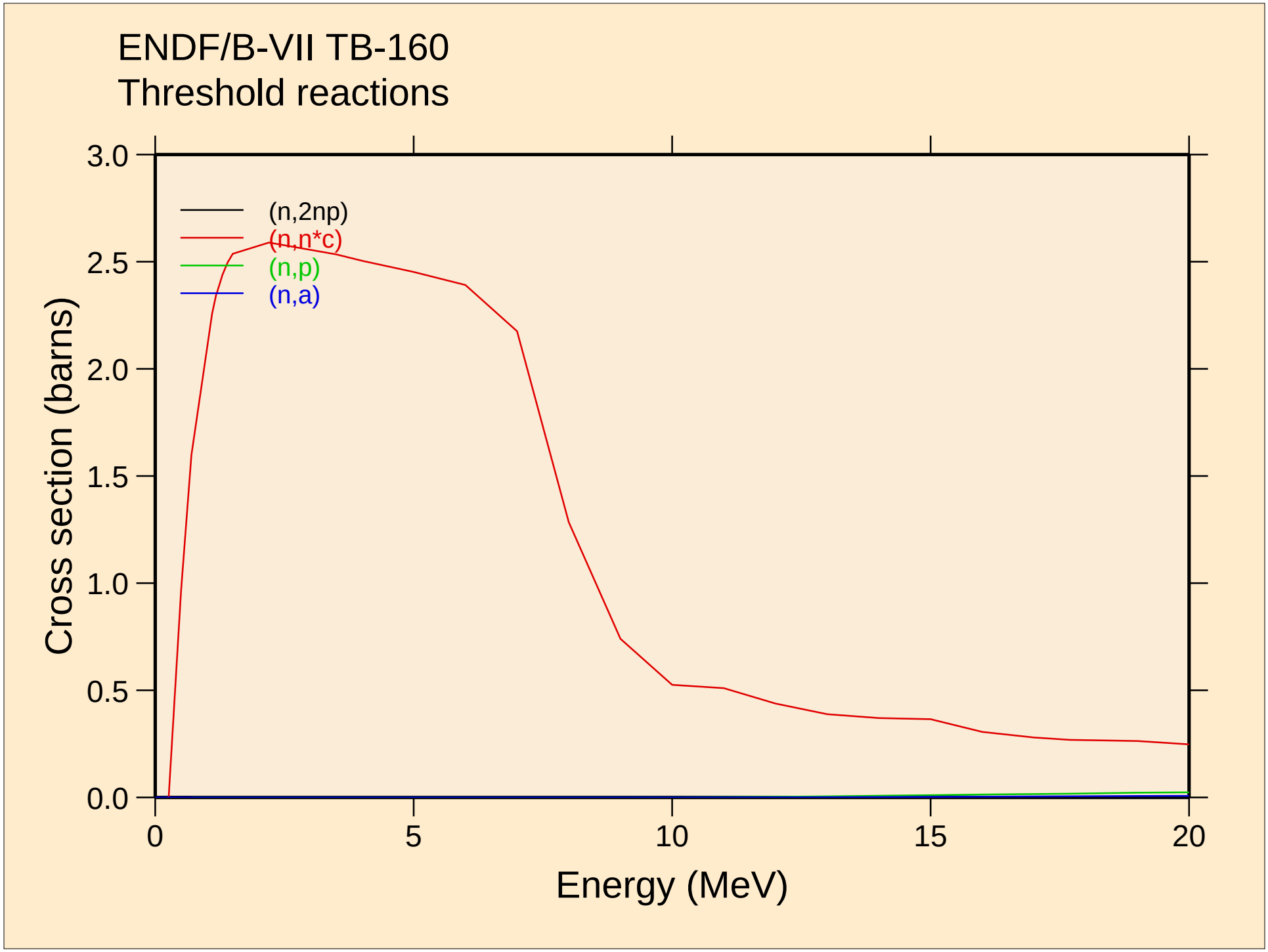

ENDF/B-VII TB-160
Non-threshold reactions
(n,gma)
Cross section (barns)
10-2
10-3
10-4
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

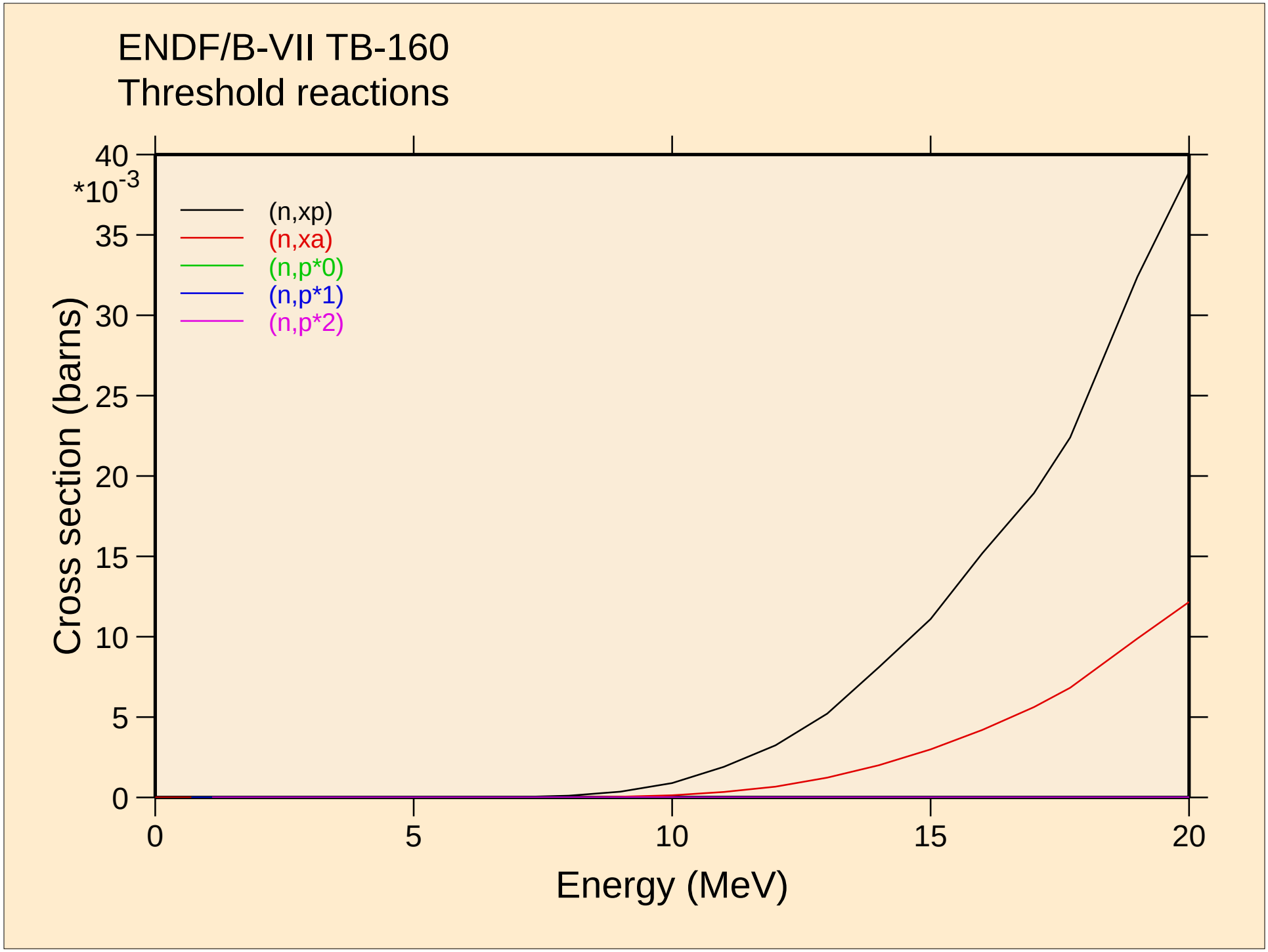

ENDF/B-VII TB-160
Inelastic levels
Cross section (barns)
*10^-3
500
400
300
200
100
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)
(n,n*5)

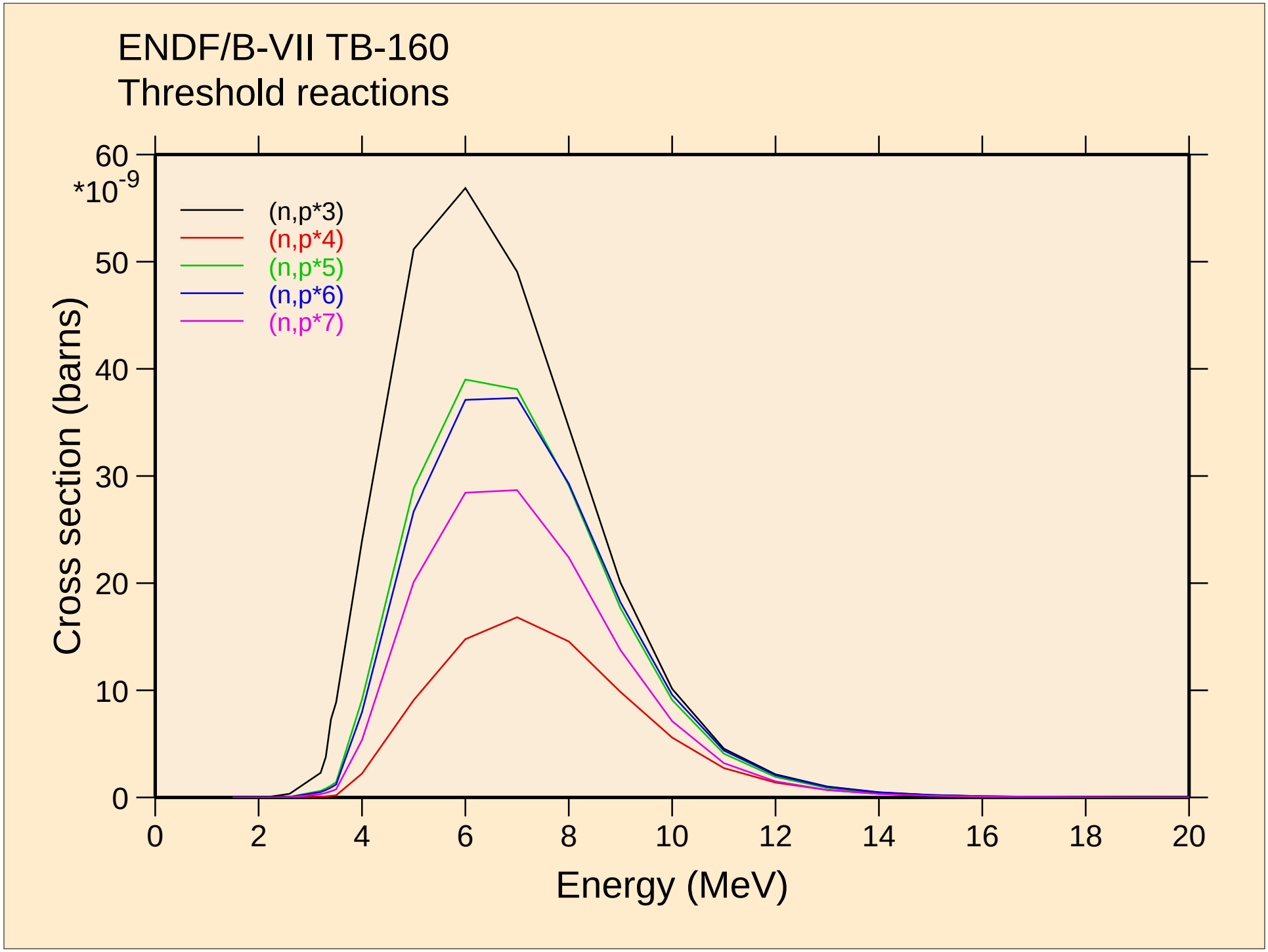

ENDF/B-VII TB-160
Inelastic levels
Cross section (barns)
*10^-3
400
350
300
250
200
150
100
50
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*6)
(n,n*7)
(n,n*8)
(n,n*9)
(n,n*10)

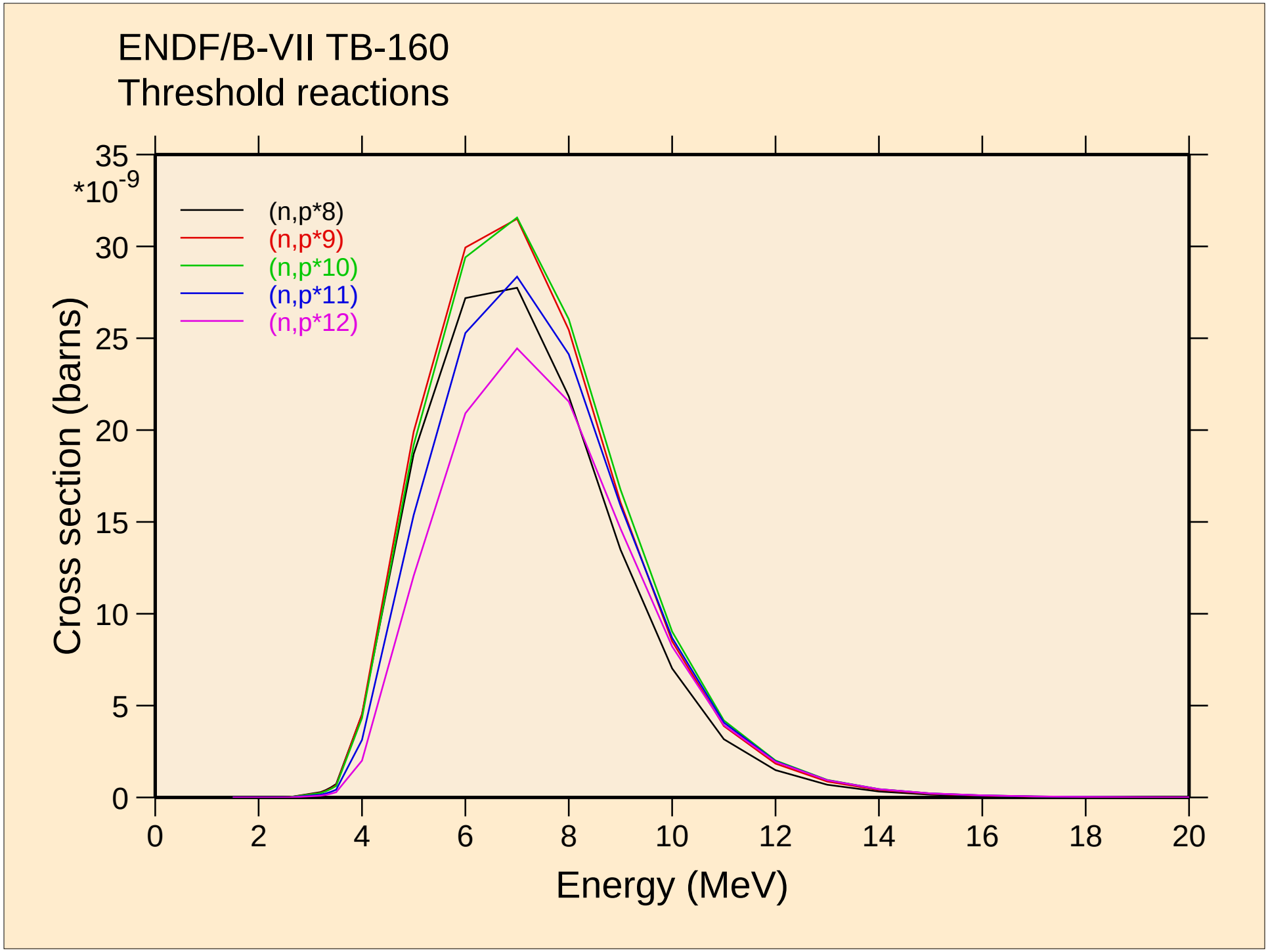

ENDF/B-VII TB-160
Inelastic levels
Cross section (barns)
*10^-3
180
160
140
120
100
80
60
40
20
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*11)
(n,n*12)
(n,n*13)
(n,n*14)
(n,n*15)

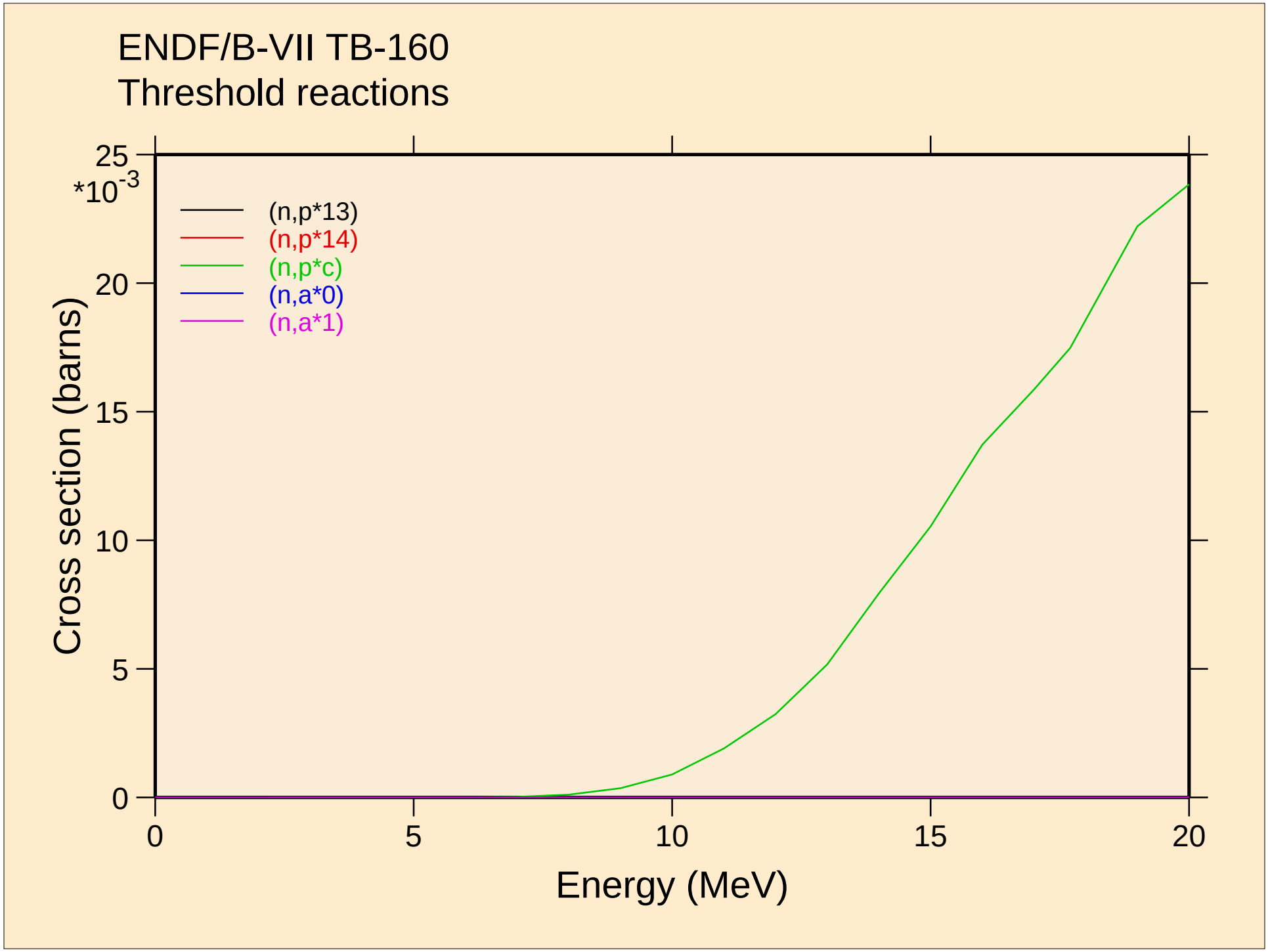

ENDF/B-VII TB-160
Threshold reactions
(n,2n)
(n,3n)
(n,n*)a
(n,2n)a
(n,n*)p
Cross section (barns)
Energy (MeV)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
6
8
10
12
14
16
18
20

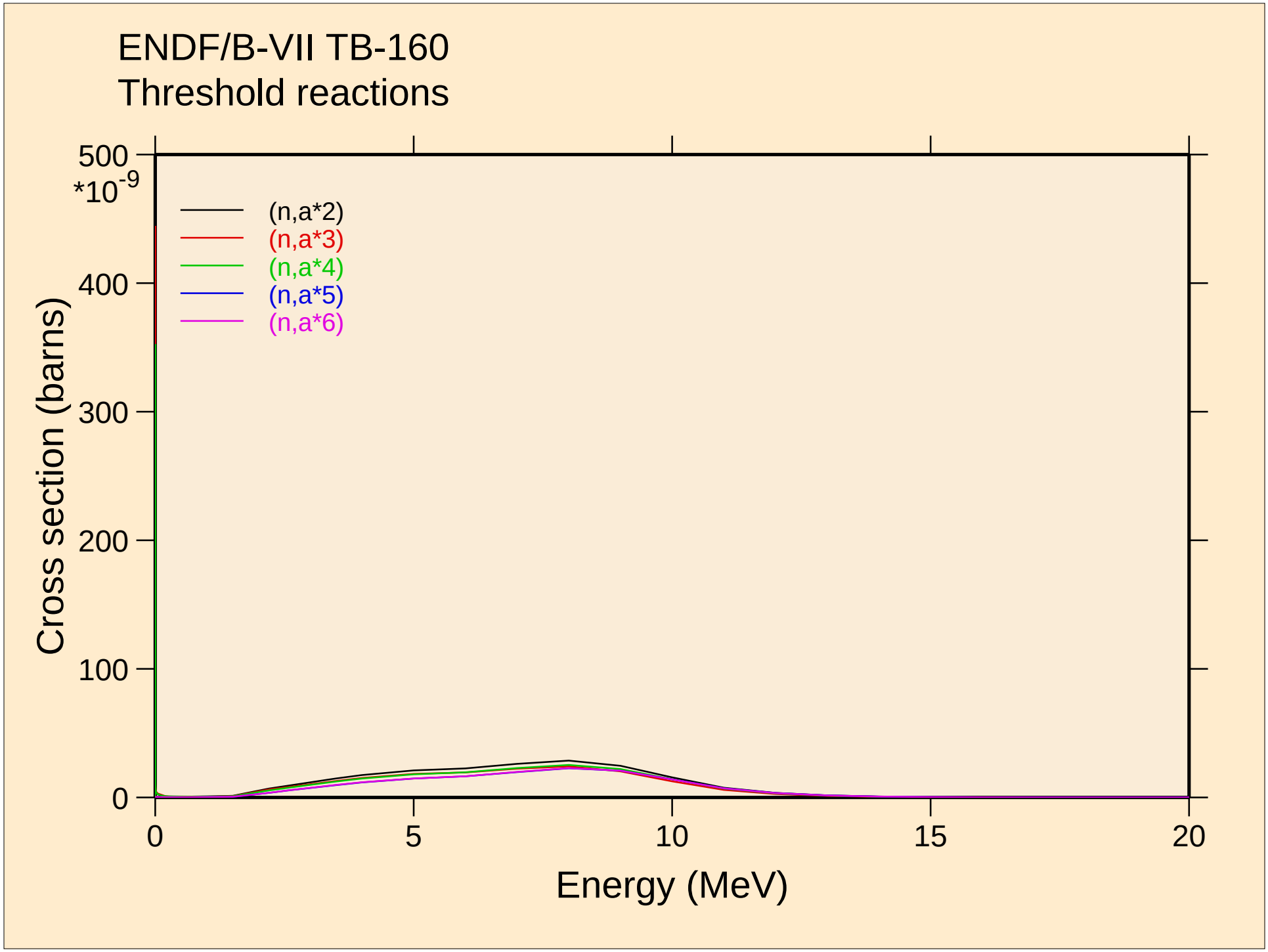

ENDF/B-VII TB-160
Threshold reactions
(n,2np)
(n,n*c)
(n,p)
(n,a)
Cross section (barns)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
5
10
15
20
Energy (MeV)

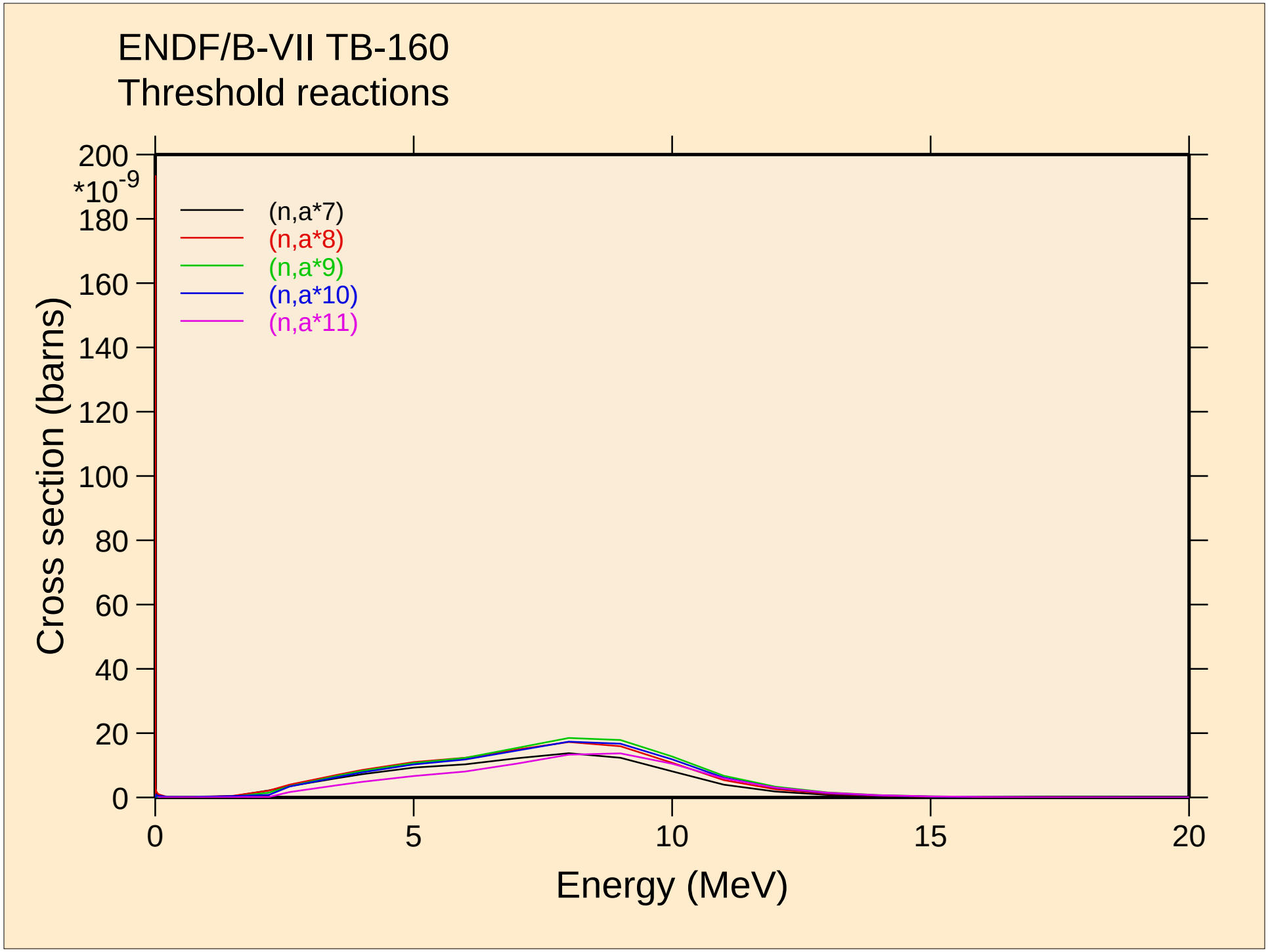

ENDF/B-VII TB-160
Threshold reactions
*10-3
40
35
30
25
20
15
10
5
0
Cross section (barns)
(n,xp)
(n,xa)
(n,p*0)
(n,p*1)
(n,p*2)
0
5
10
15
20
Energy (MeV)

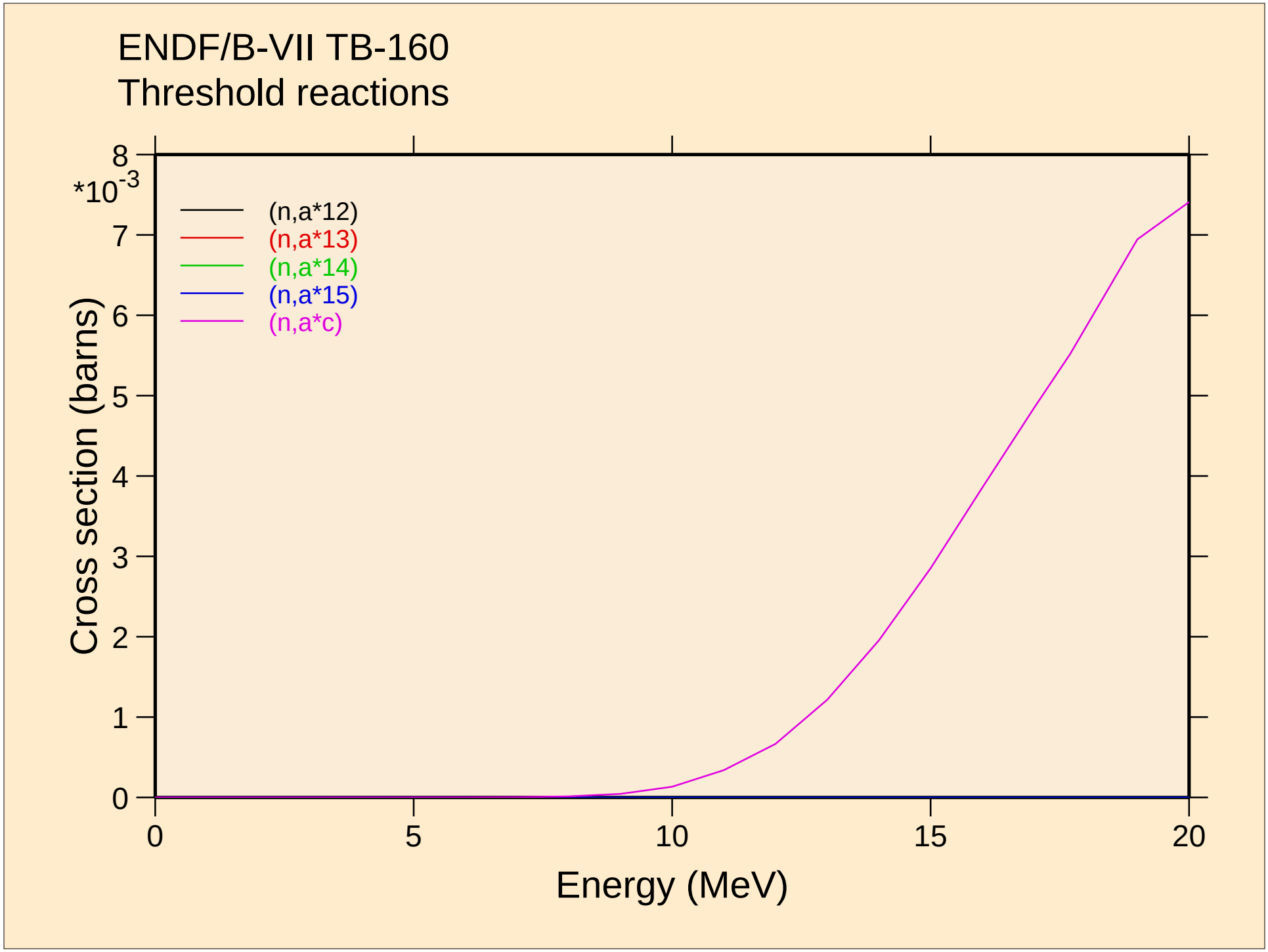

ENDF/B-VII TB-160
Threshold reactions
*10^-9
(n,p*3)
(n,p*4)
(n,p*5)
(n,p*6)
(n,p*7)
Cross section (barns)
Energy (MeV)
0
10
20
30
40
50
60
0
2
4
6
8
10
12
14
16
18
20


ENDF/B-VII TB-160
Threshold reactions
*10^-9
(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
35
0
2
4
6
8
10
12
14
16
18
20

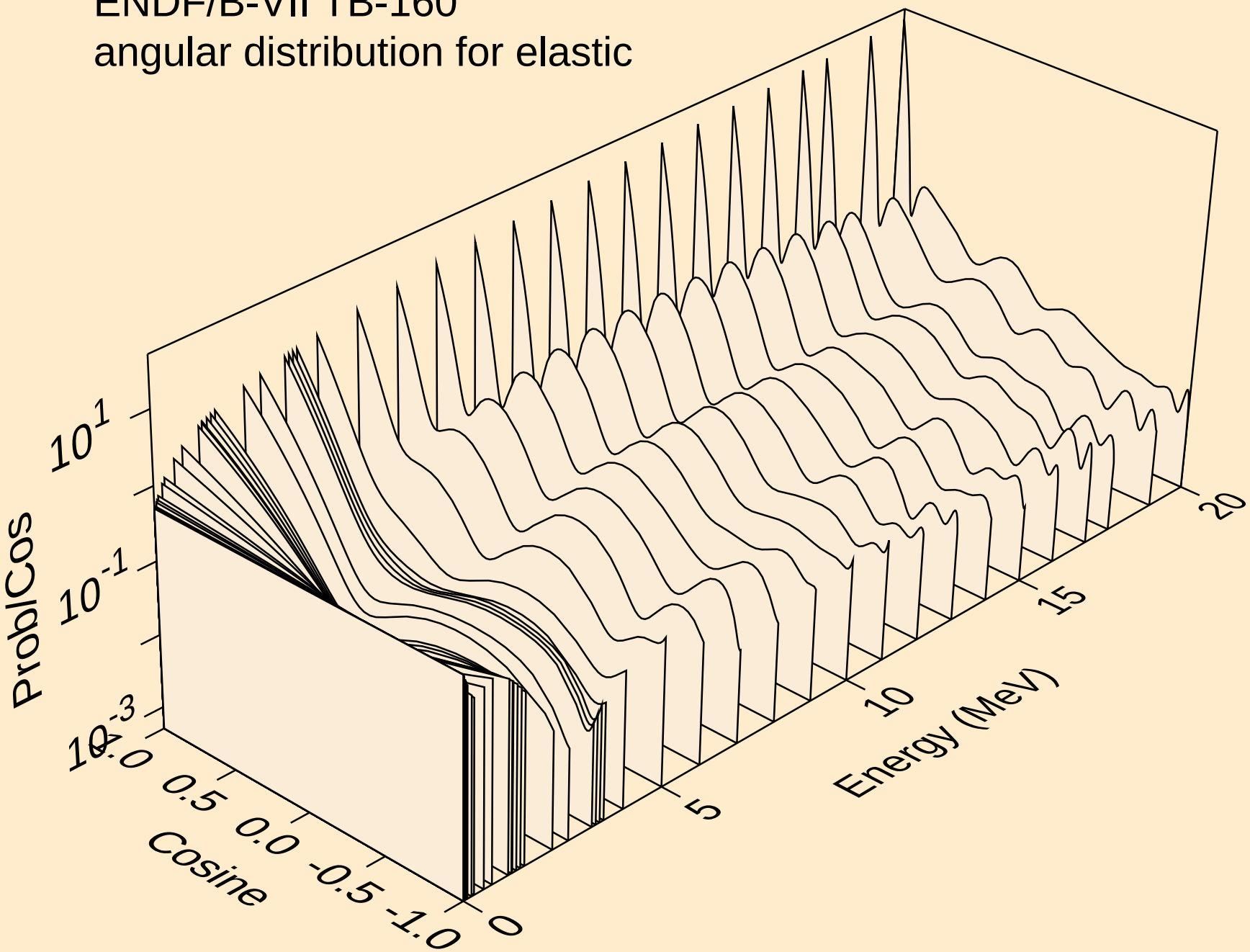

ENDF/B-VII TB-160
Threshold reactions
*10-3
(n,p*13)
(n,p*14)
(n,p*c)
(n,a*0)
(n,a*1)
Cross section (barns)
Energy (MeV)
0
5
10
15
20
25

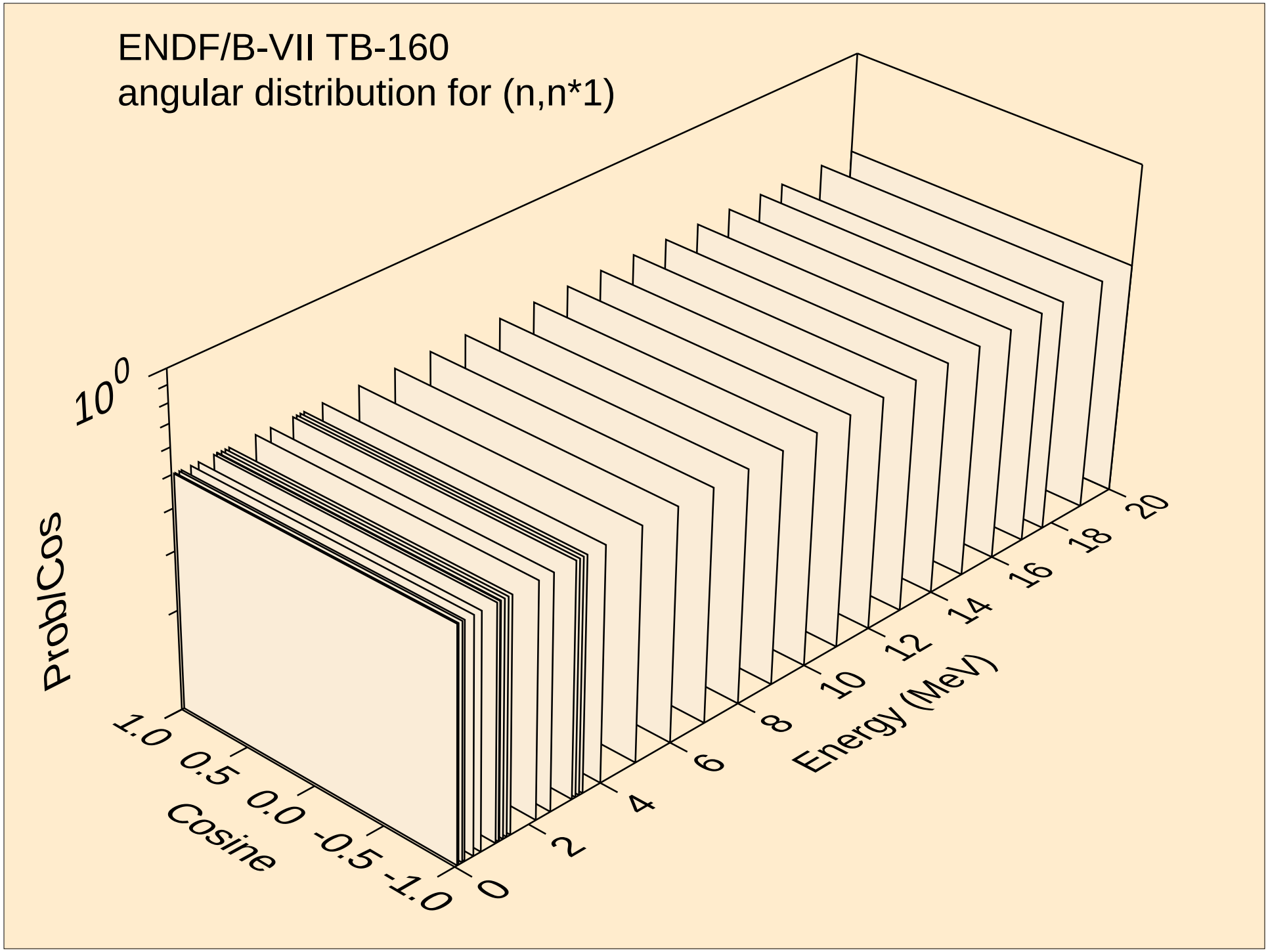

ENDF/B-VII TB-160
Threshold reactions
500
*10-9
400
300
200
100
0
Cross section (barns)
(n,a*2)
(n,a*3)
(n,a*4)
(n,a*5)
(n,a*6)
0
5
10
15
20
Energy (MeV)

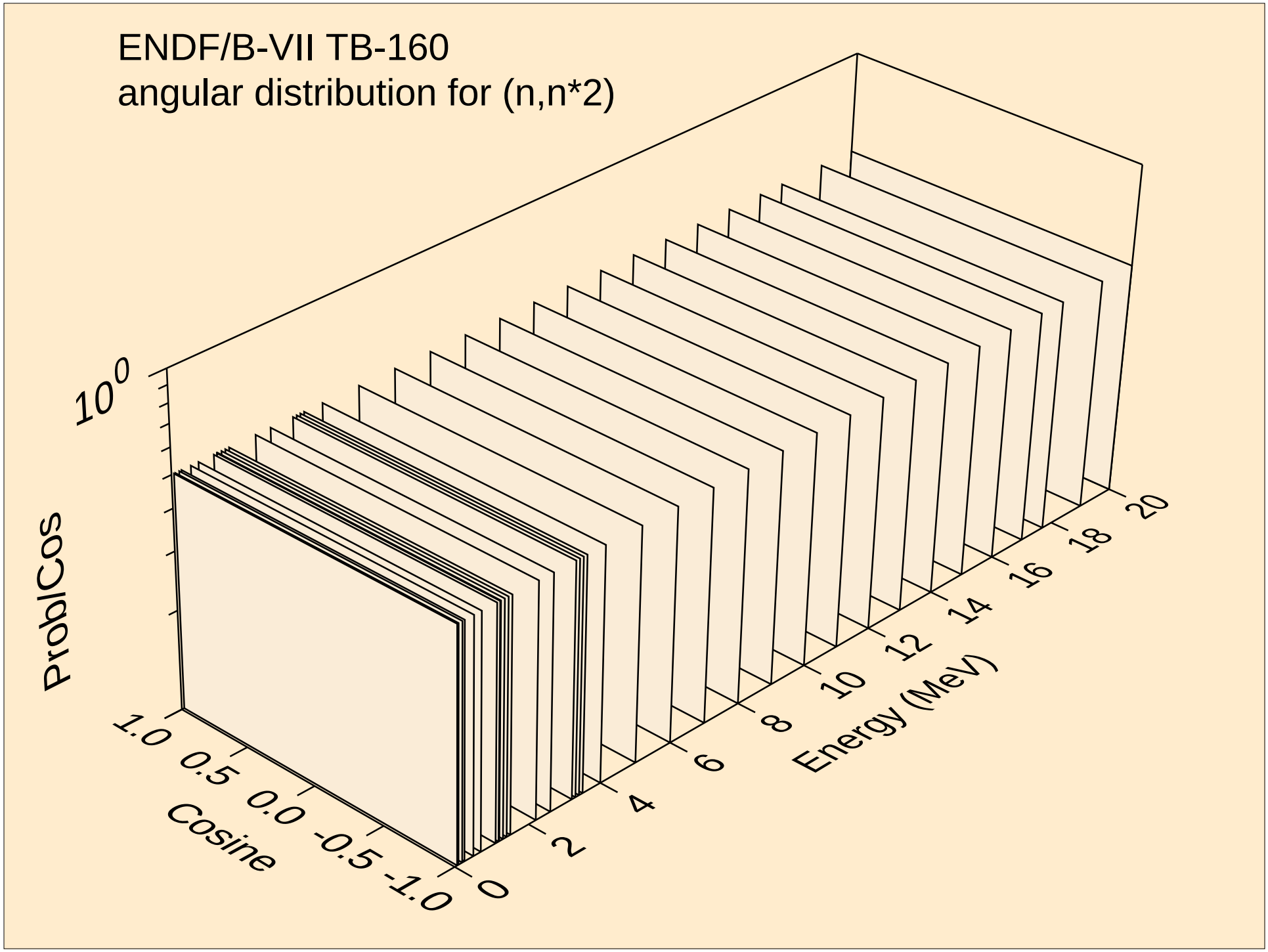

ENDF/B-VII TB-160
Threshold reactions
*10^-9
(n,a*7)
(n,a*8)
(n,a*9)
(n,a*10)
(n,a*11)
Cross section (barns)
Energy (MeV)
0
20
40
60
80
100
120
140
160
180
200
0
5
10
15
20

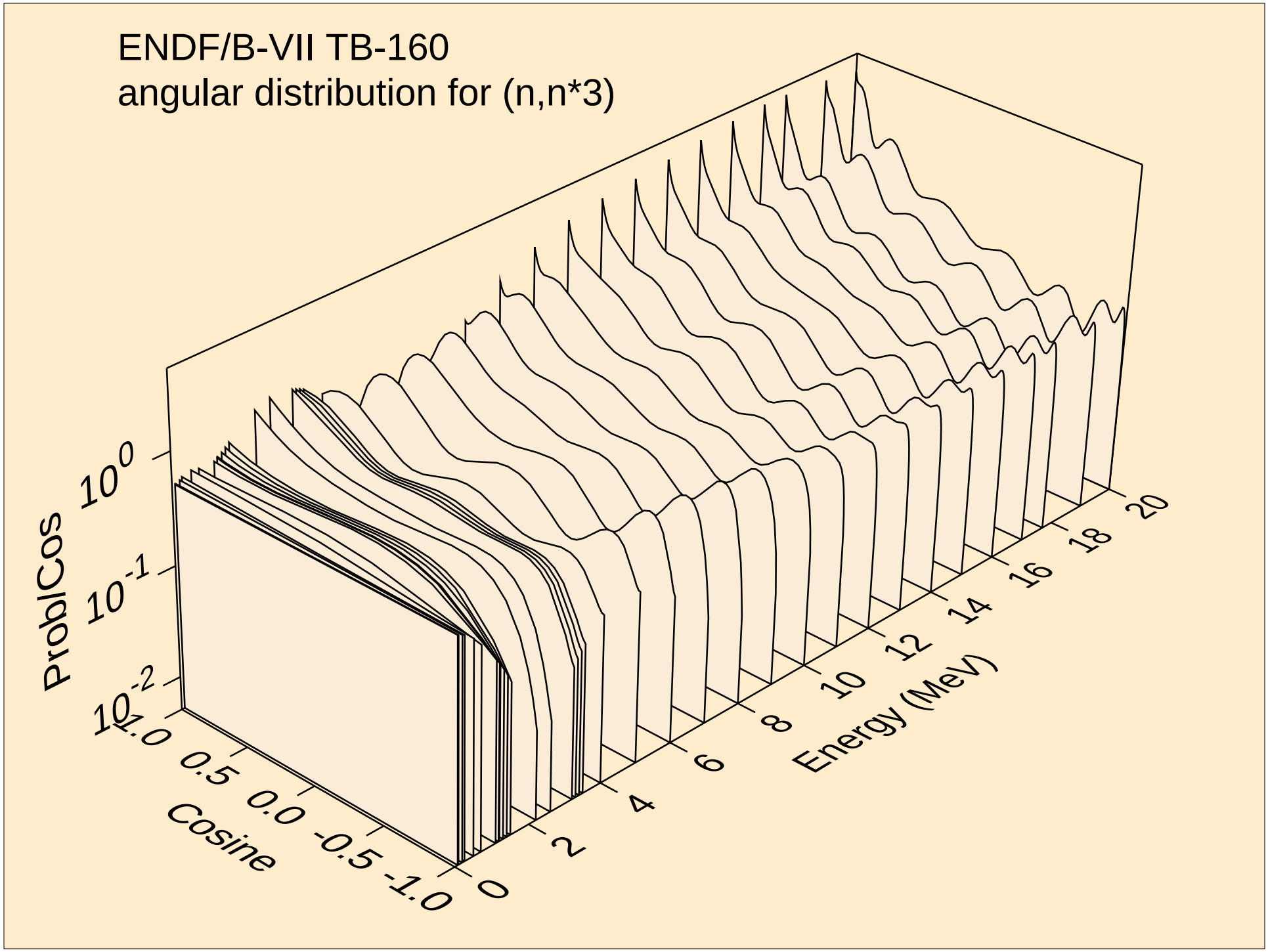

ENDF/B-VII TB-160
Threshold reactions
*10-3
(n,a*12)
(n,a*13)
(n,a*14)
(n,a*15)
(n,a*c)
Cross section (barns)
Energy (MeV)
0
1
2
3
4
5
6
7
8
0
5
10
15
20

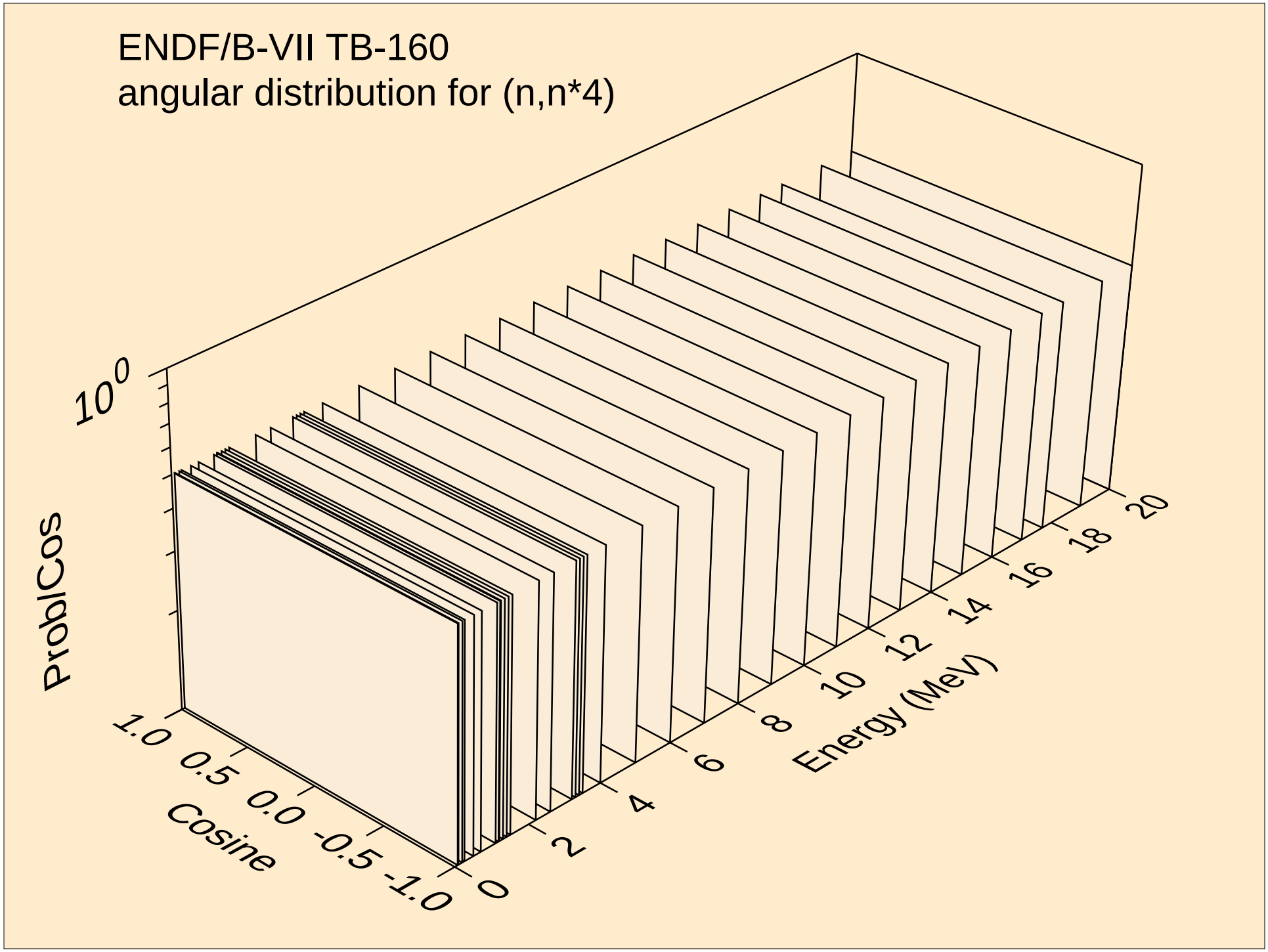
ENDF/B-VII TB-160
angular distribution for elastic

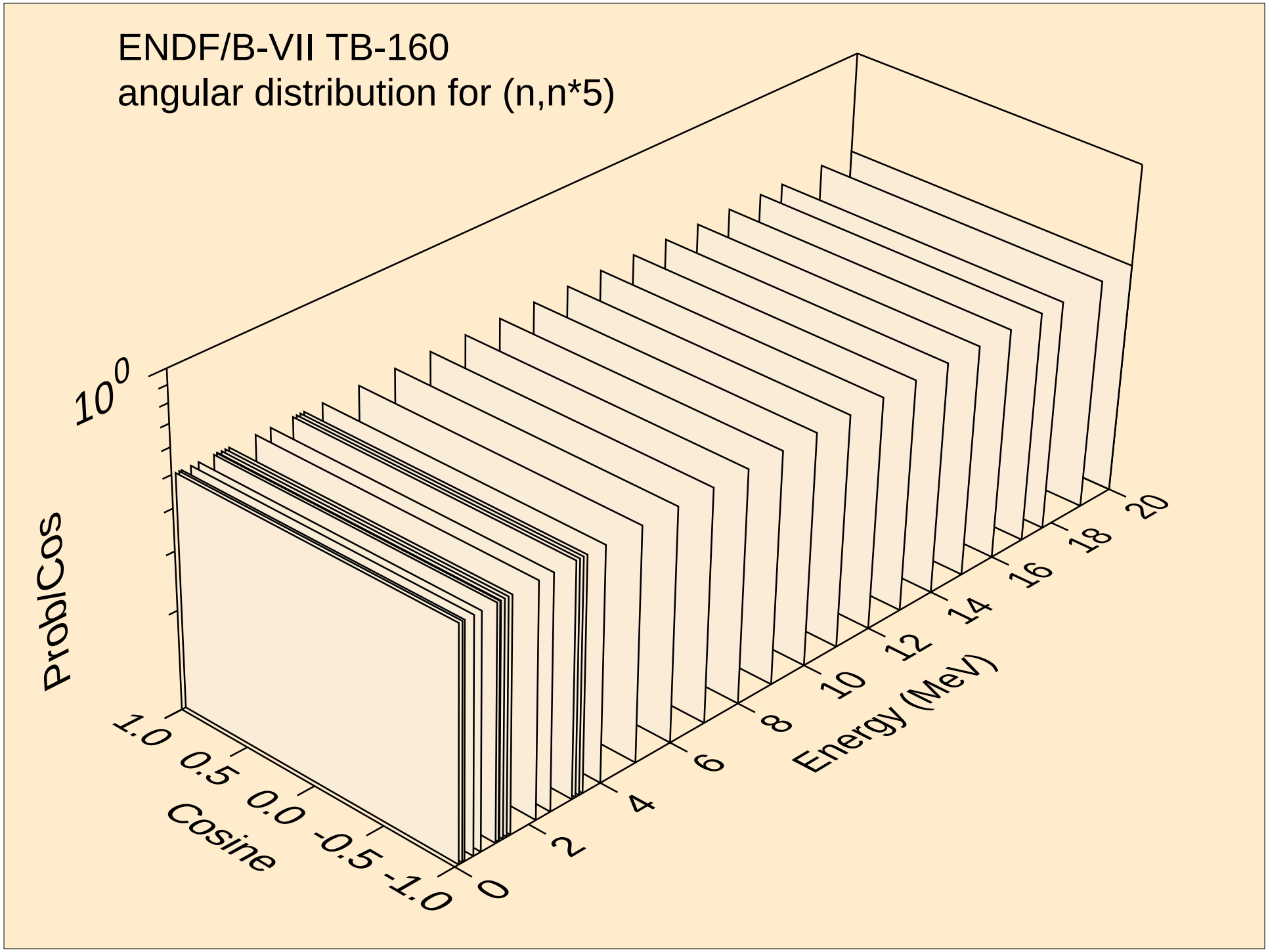


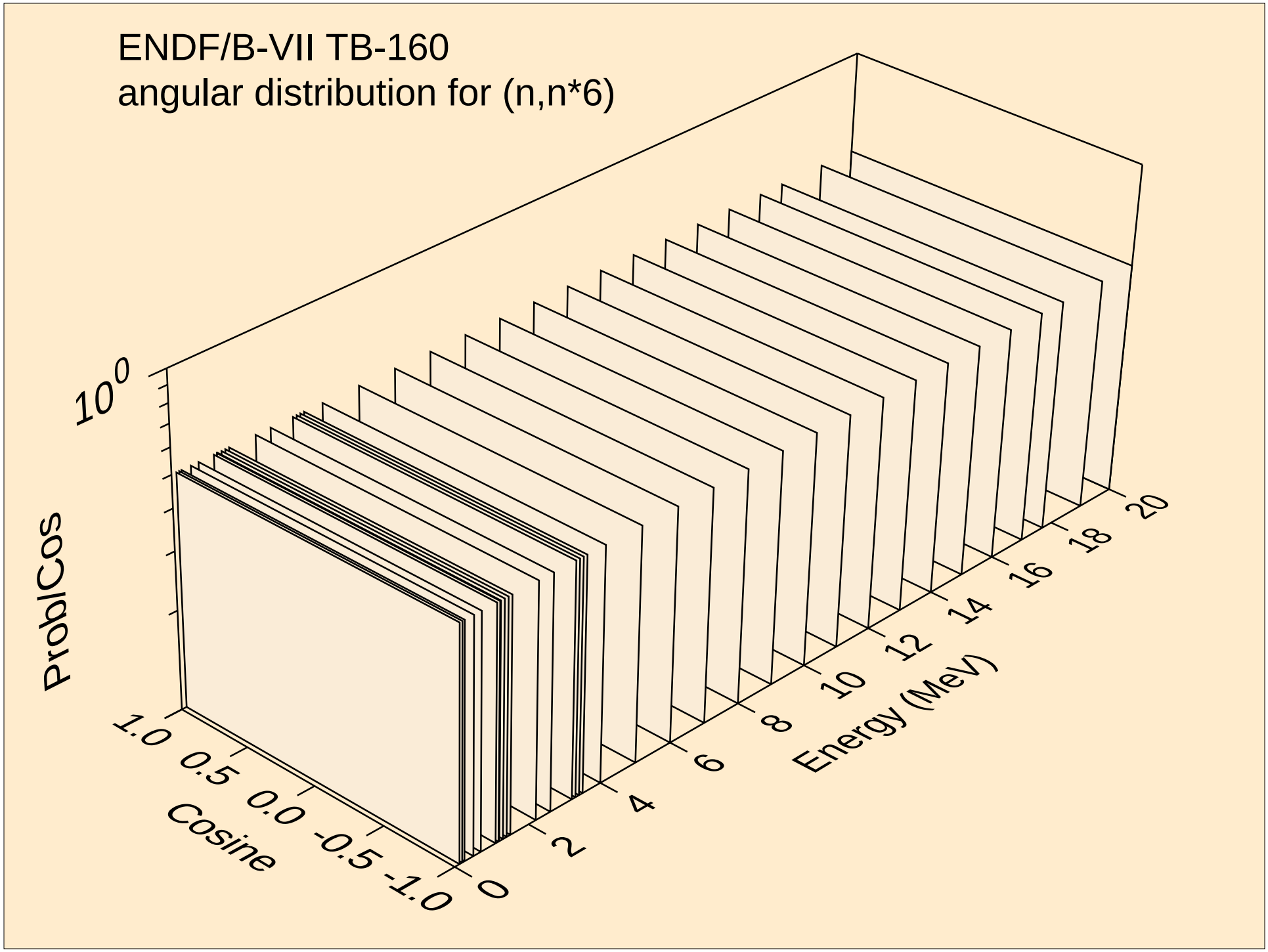

ENDF/B-VII TB-160
angular distribution for (n,n*1)
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

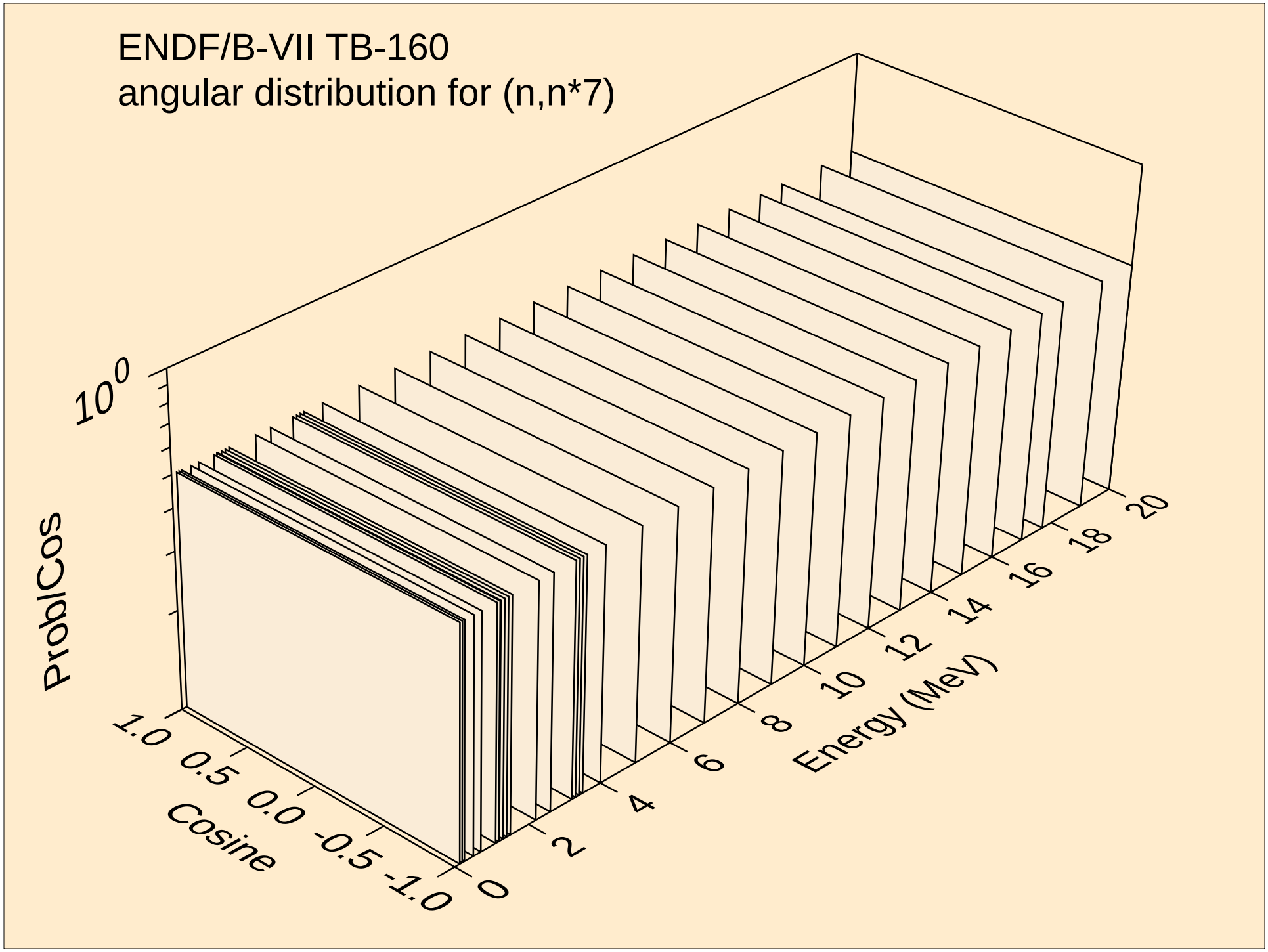

ENDF/B-VII TB-160
angular distribution for (n,n*2)
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

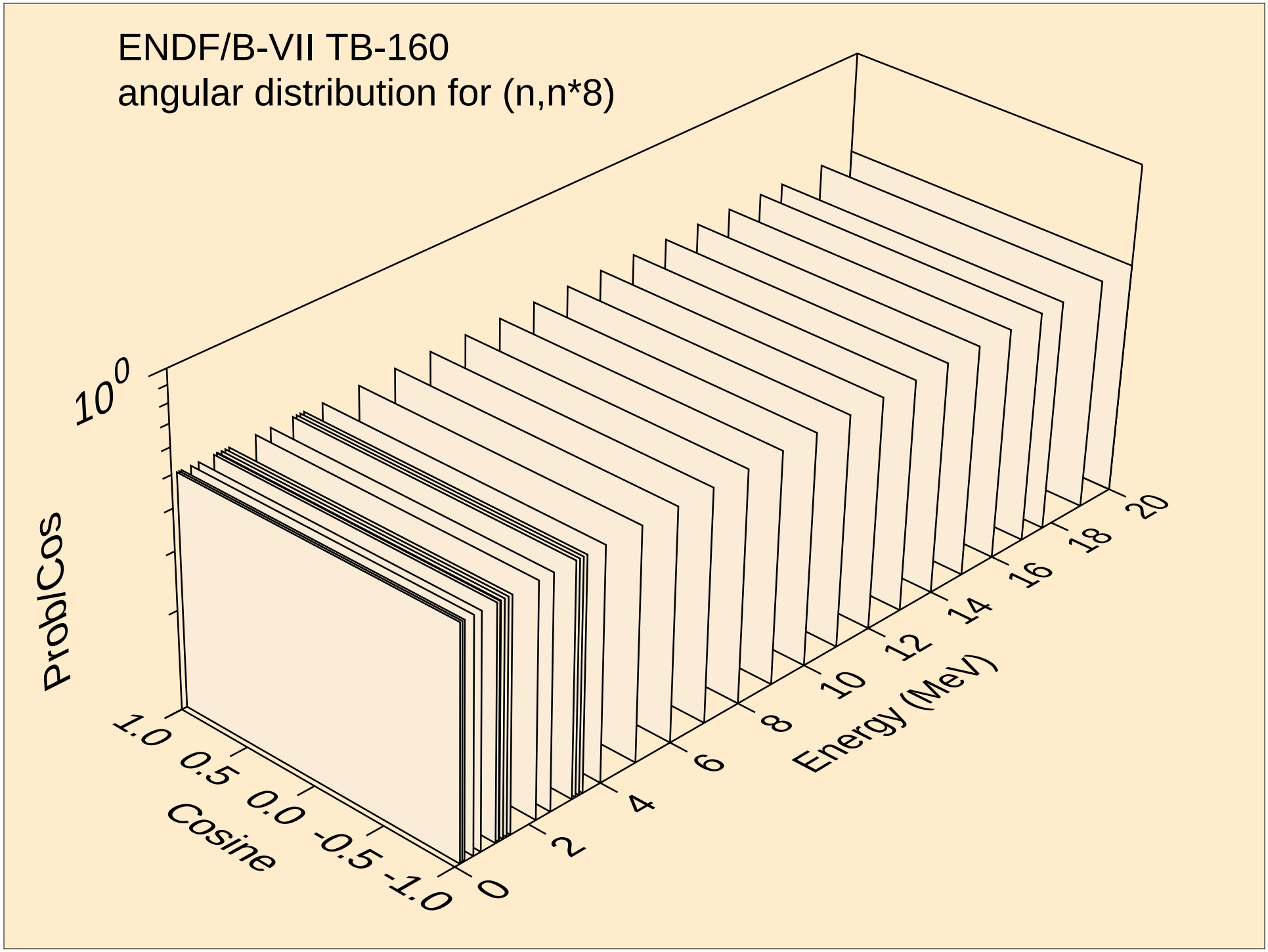

ENDF/B-VII TB-160
angular distribution for (n,n*3)
ProbCos
10^{0}
10^{-1}
10^{-2}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

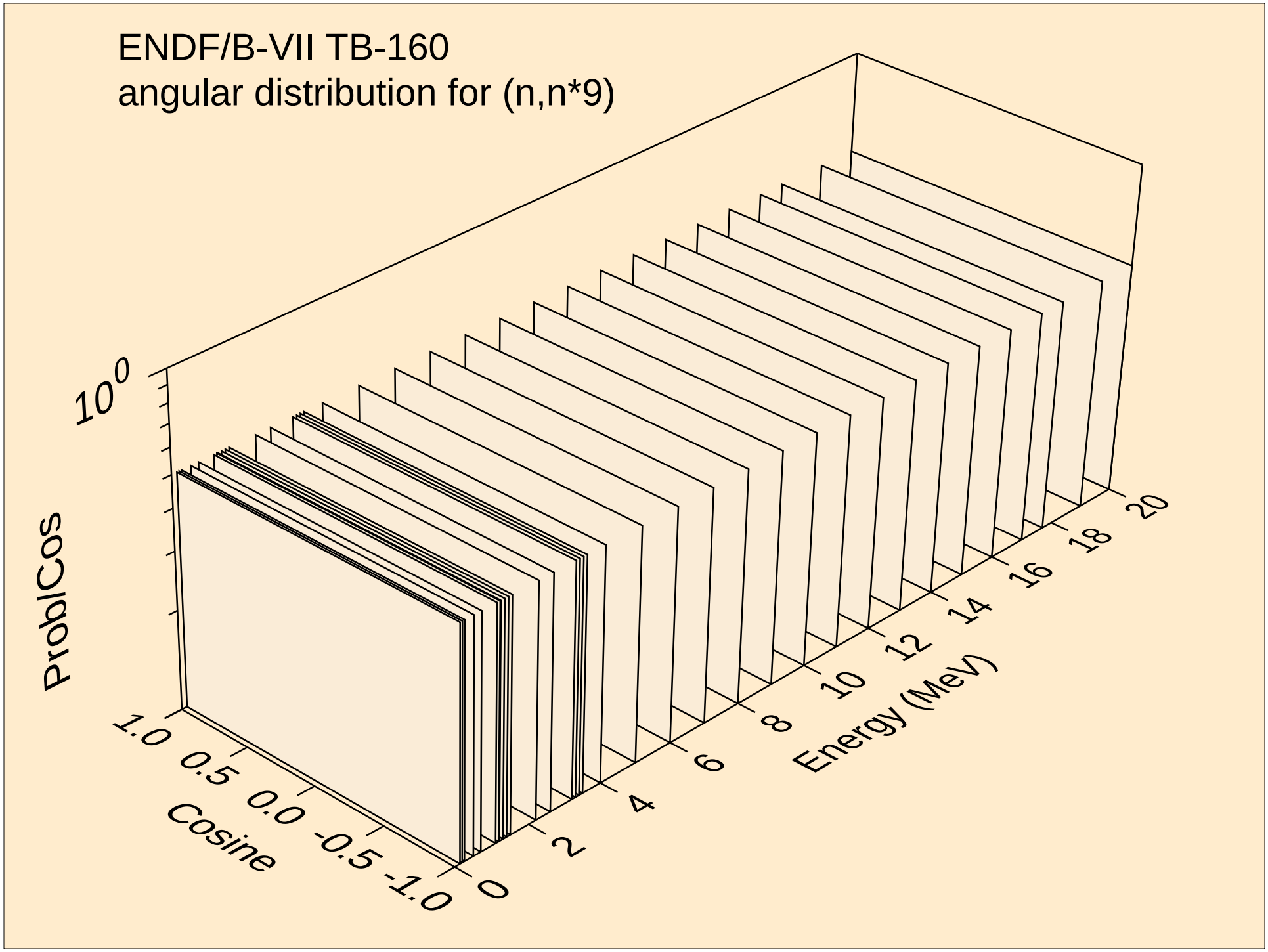

ENDF/B-VII TB-160
angular distribution for (n,n*4)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

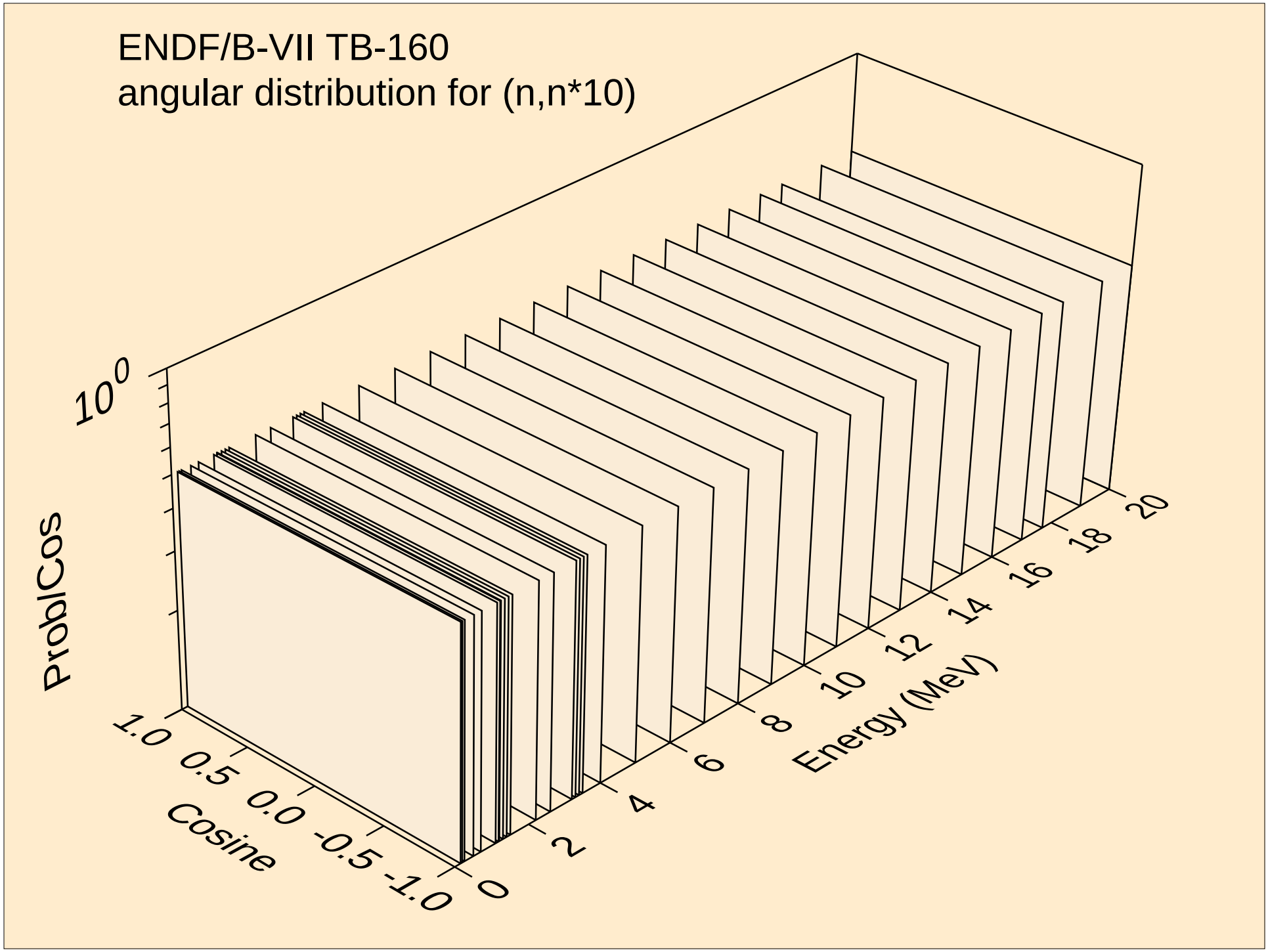

ENDF/B-VII TB-160
angular distribution for (n,n*5)
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

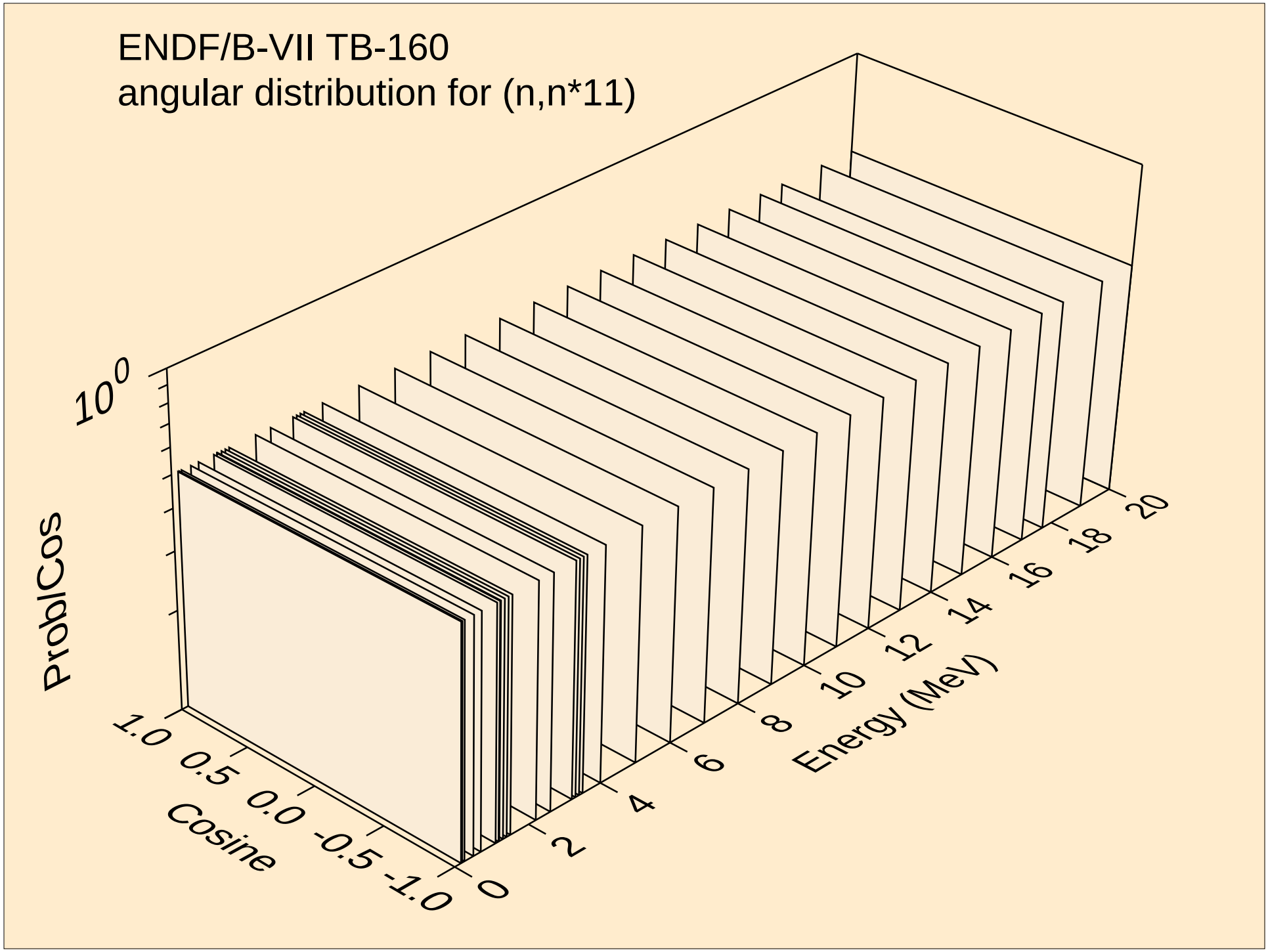

ENDF/B-VII TB-160
angular distribution for (n,n*6)
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

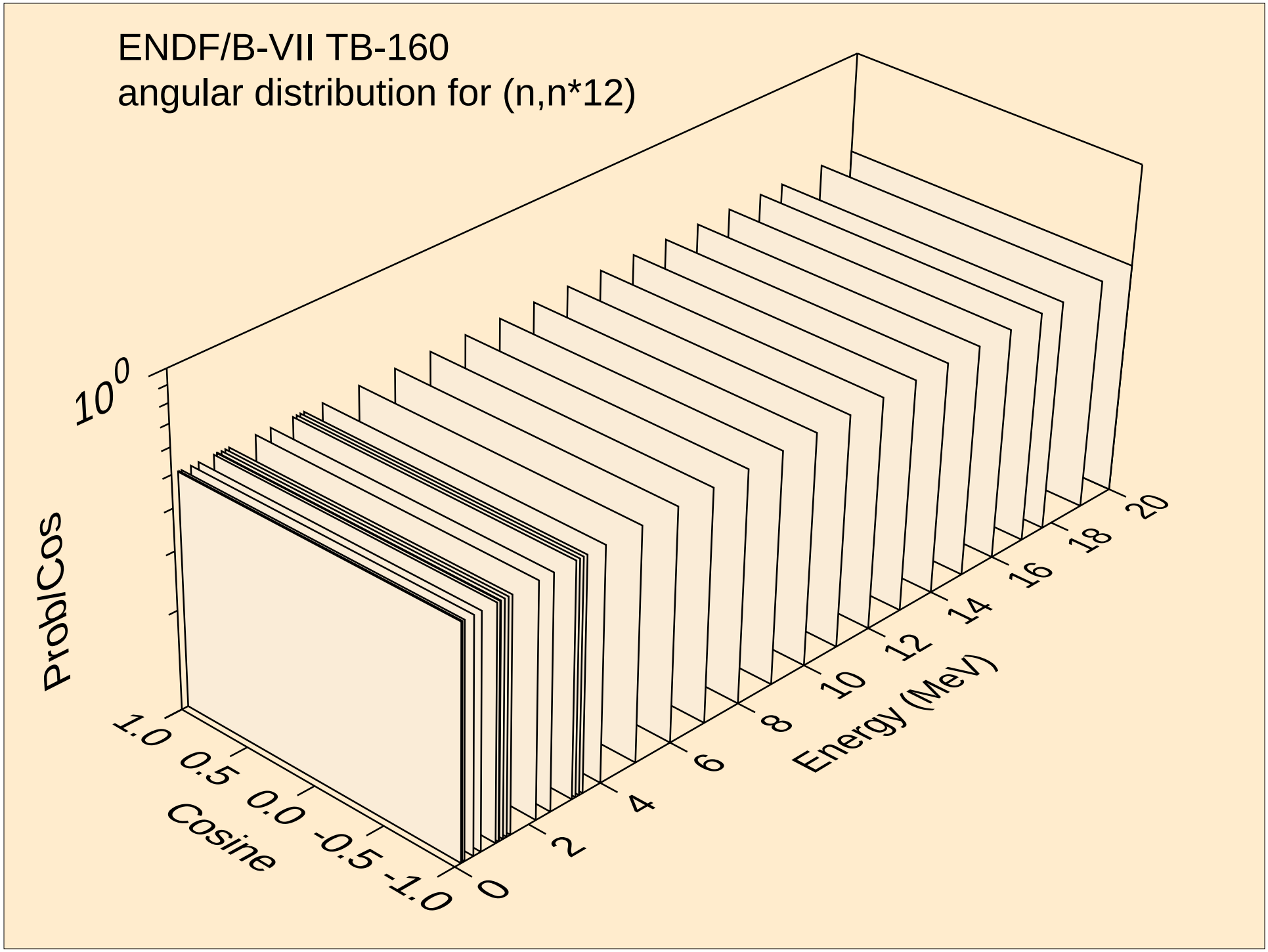

ENDF/B-VII TB-160
angular distribution for (n,n*7)
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

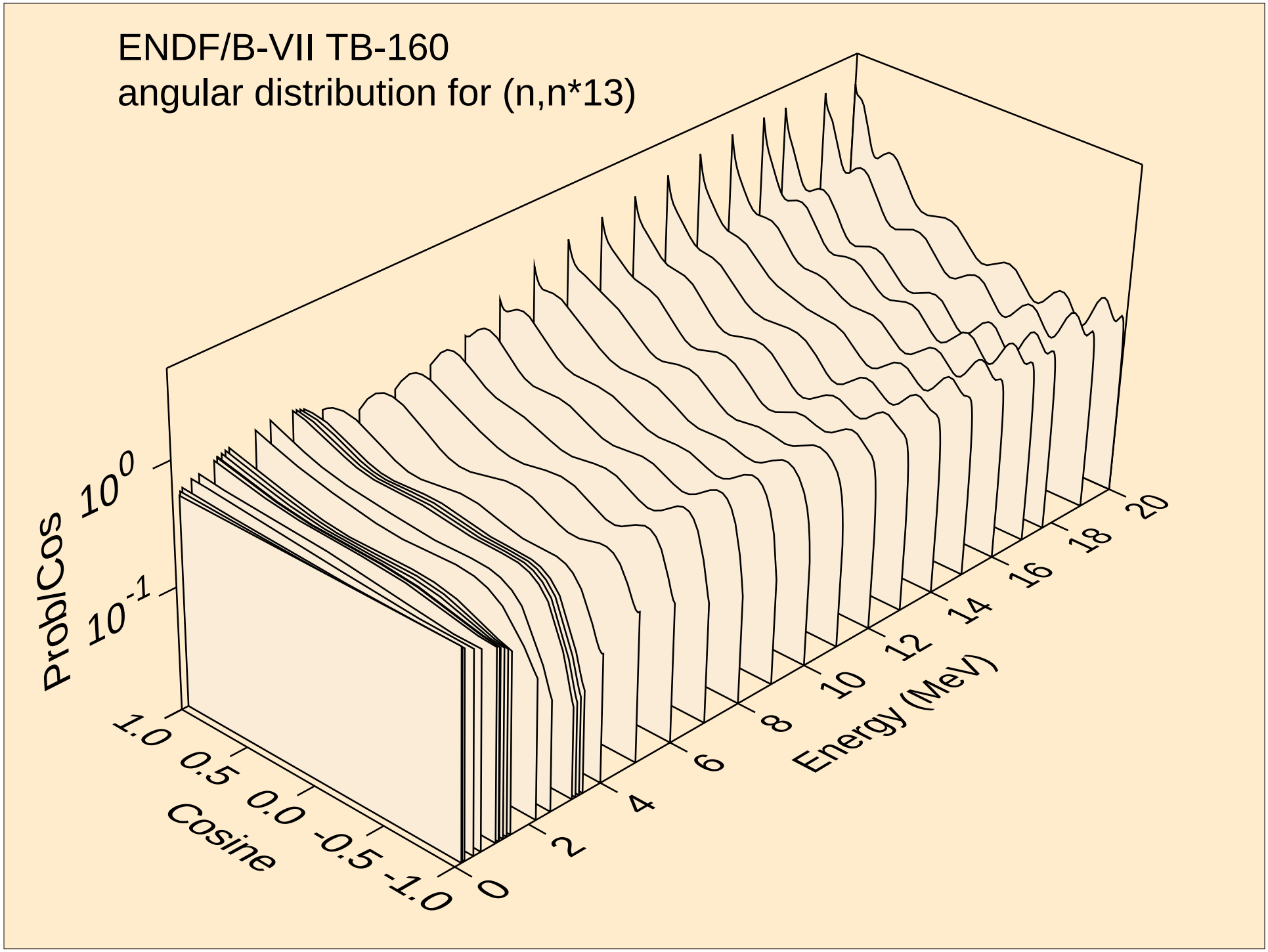

ENDF/B-VII TB-160
angular distribution for (n,n*8)
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

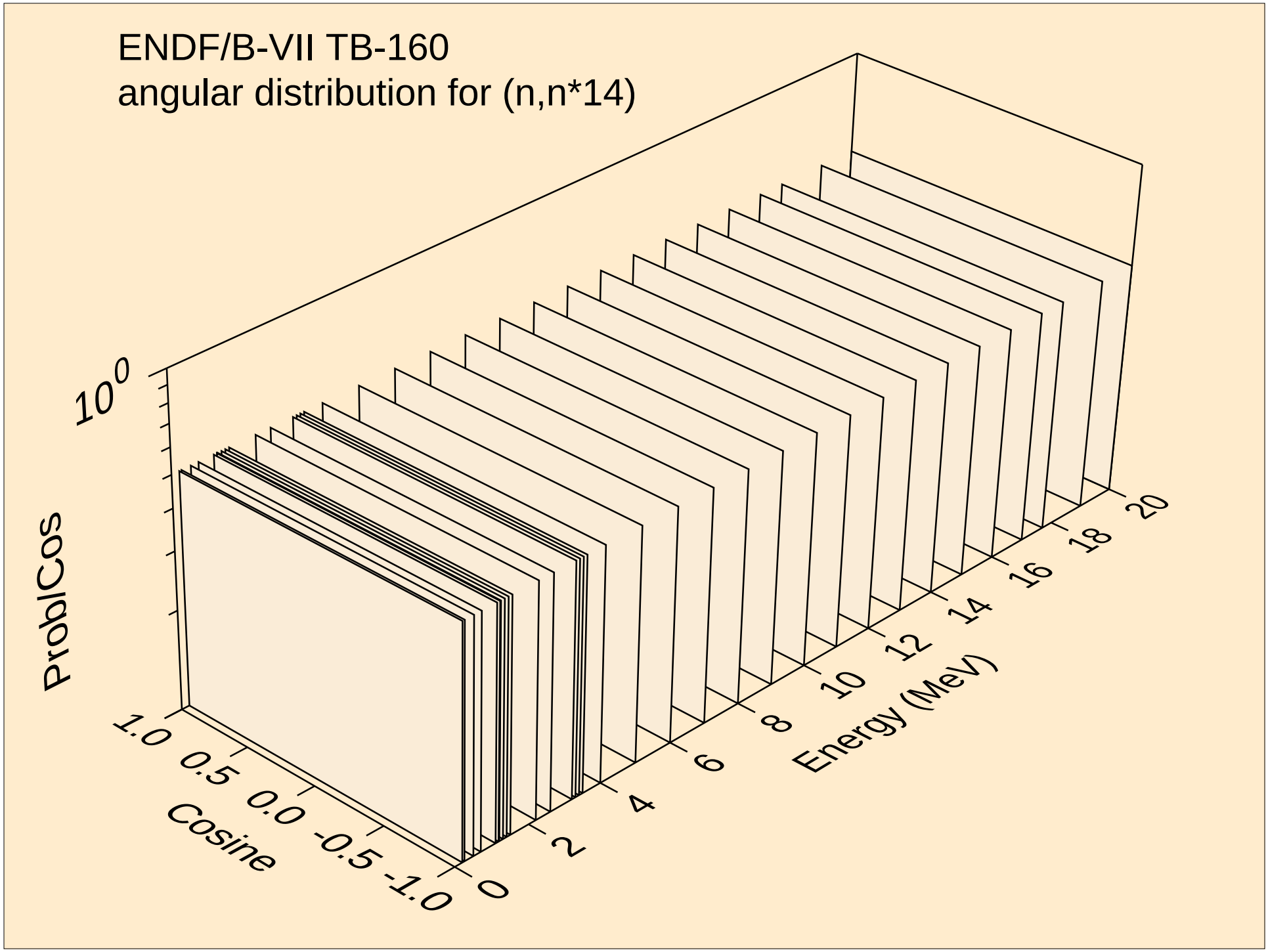

ENDF/B-VII TB-160
angular distribution for (n,n*9)
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

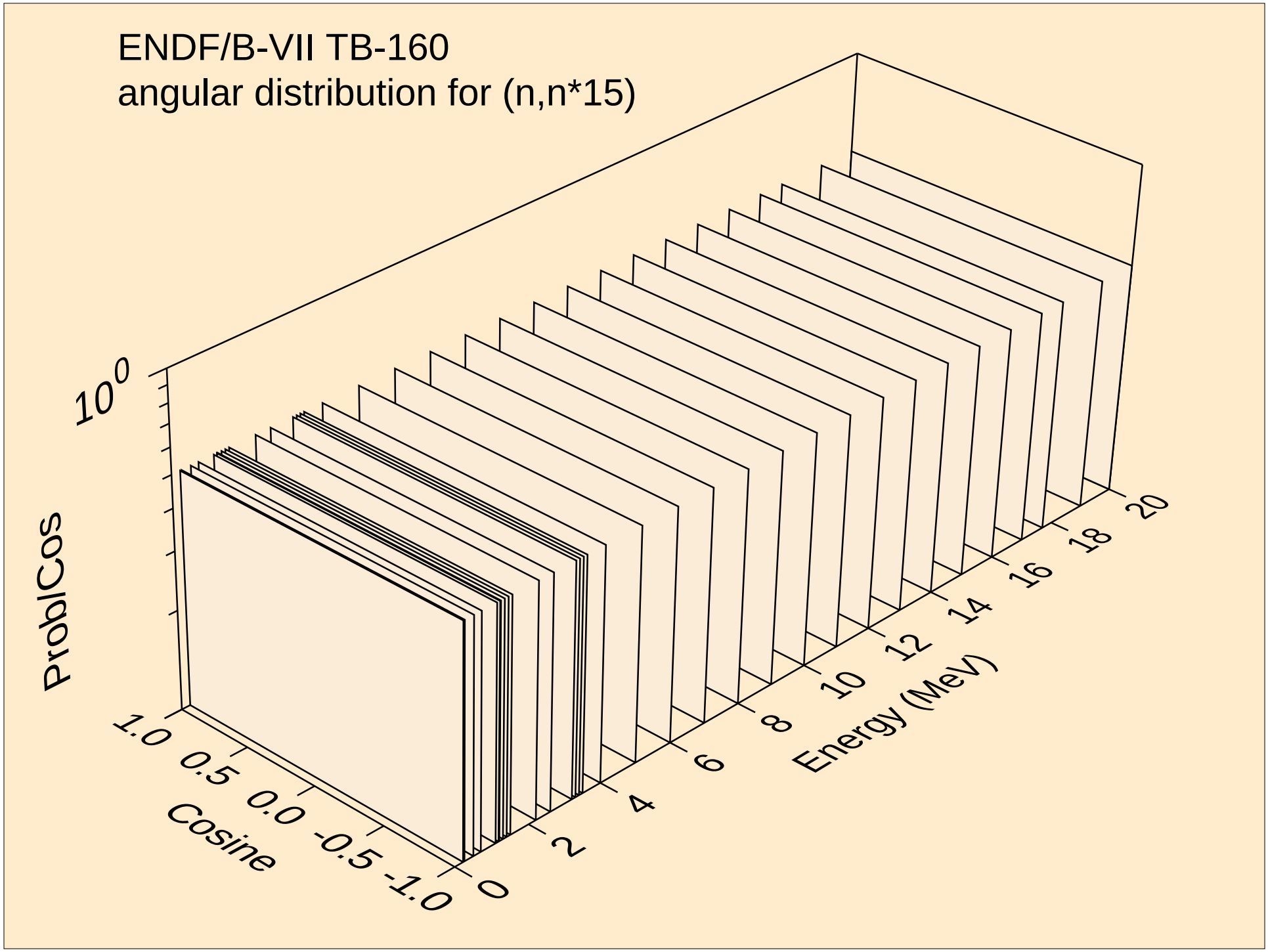

ENDF/B-VII TB-160
angular distribution for (n,n*10)
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


ENDF/B-VII TB-160
angular distribution for (n,n*11)
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)

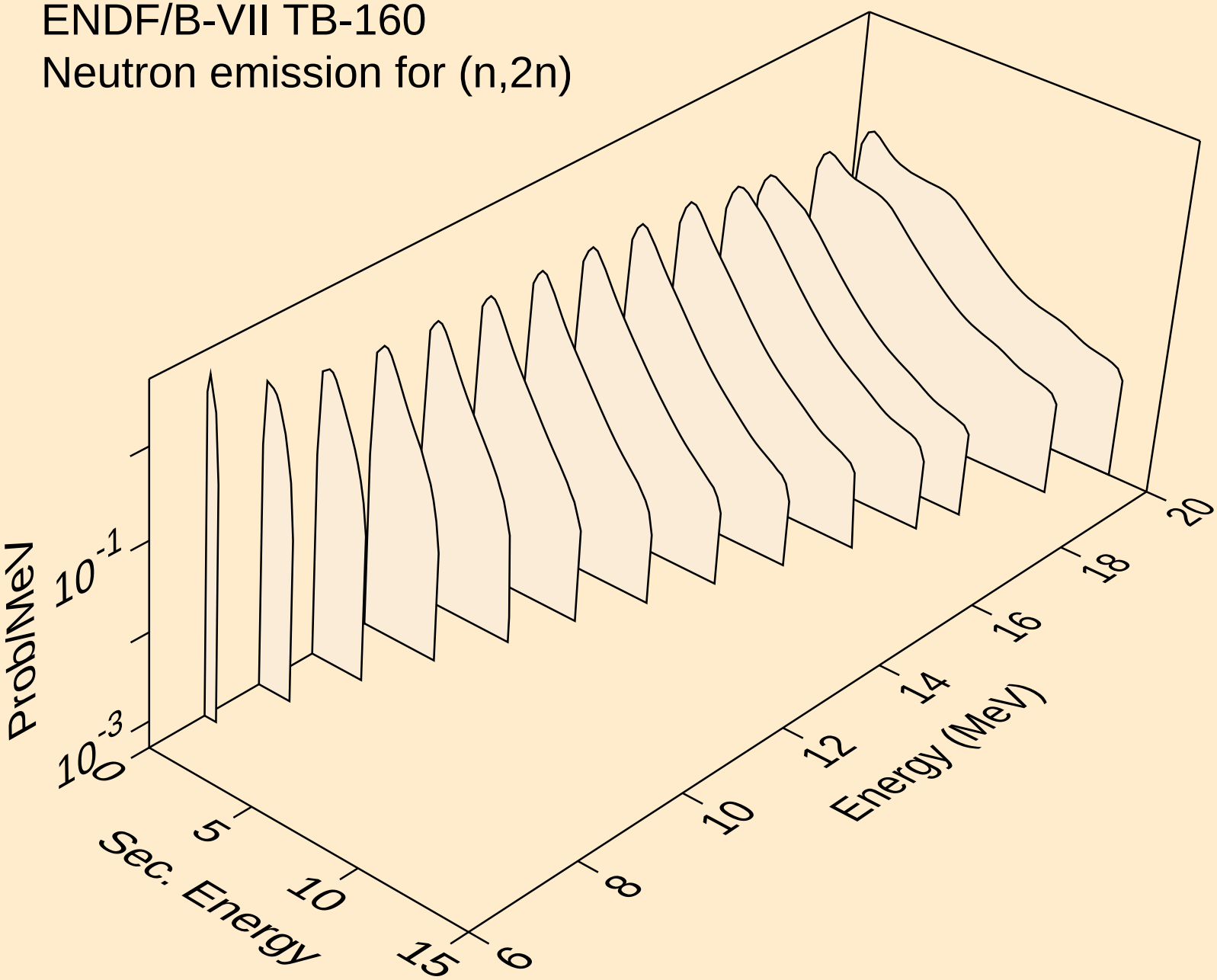

ENDF/B-VII TB-160
angular distribution for (n,n*12)
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

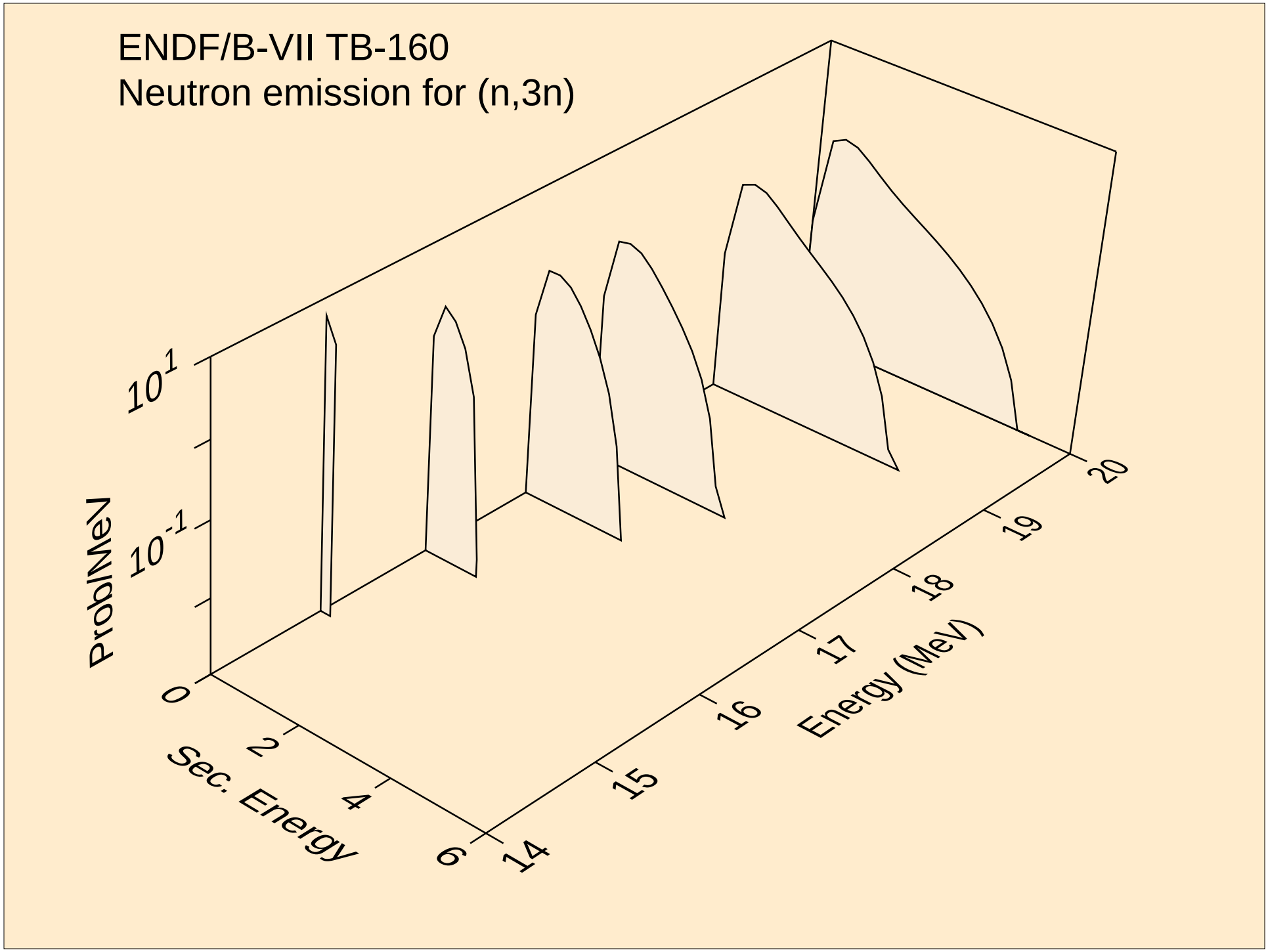

ENDF/B-VII TB-160
angular distribution for (n,n*13)
ProbCos
10^0
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


ENDF/B-VII TB-160
angular distribution for (n,n*14)
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)

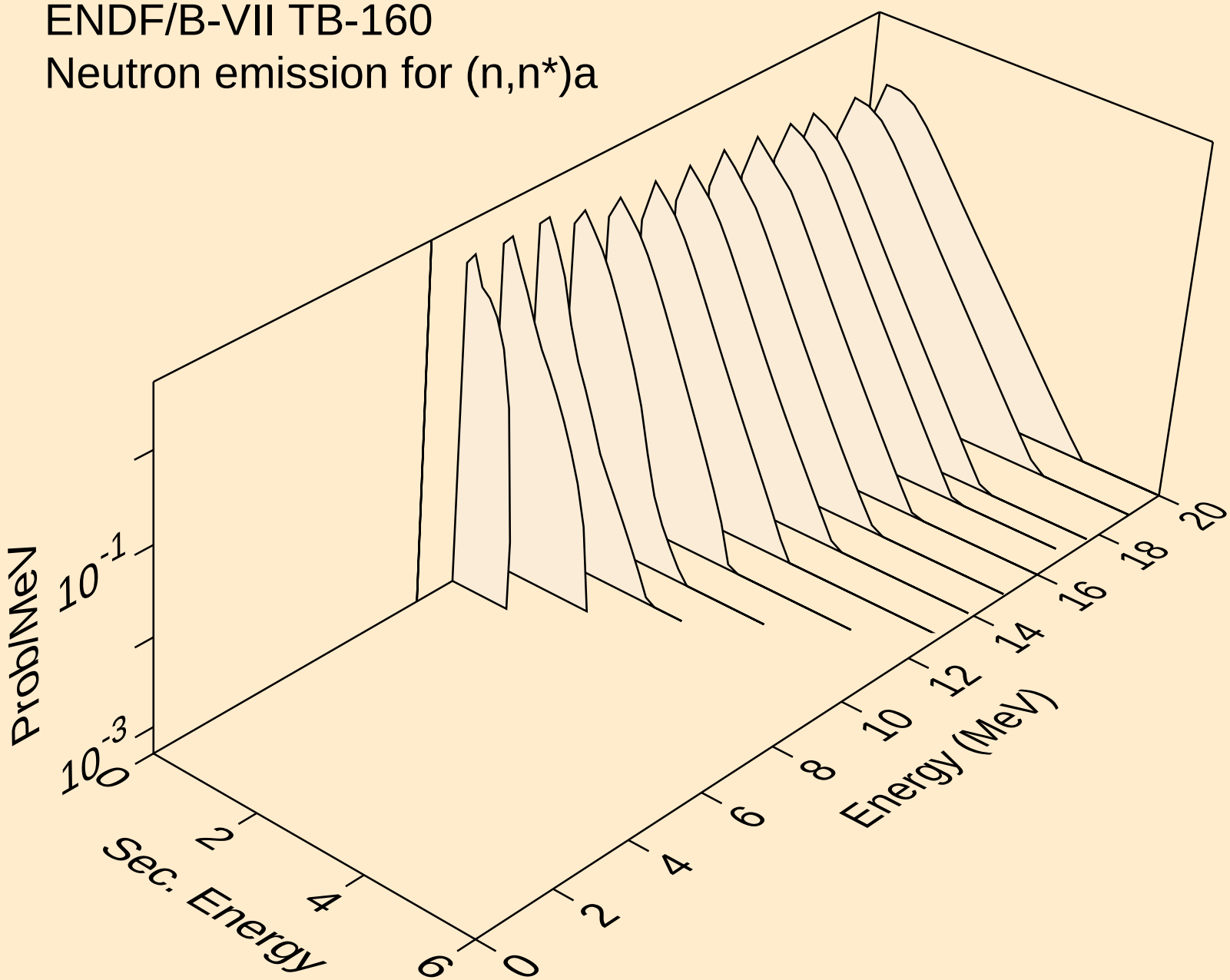

ENDF/B-VII TB-160
angular distribution for (n,n*15)
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

ENDF/B-VII TB-160
Neutron emission for (n,2n)

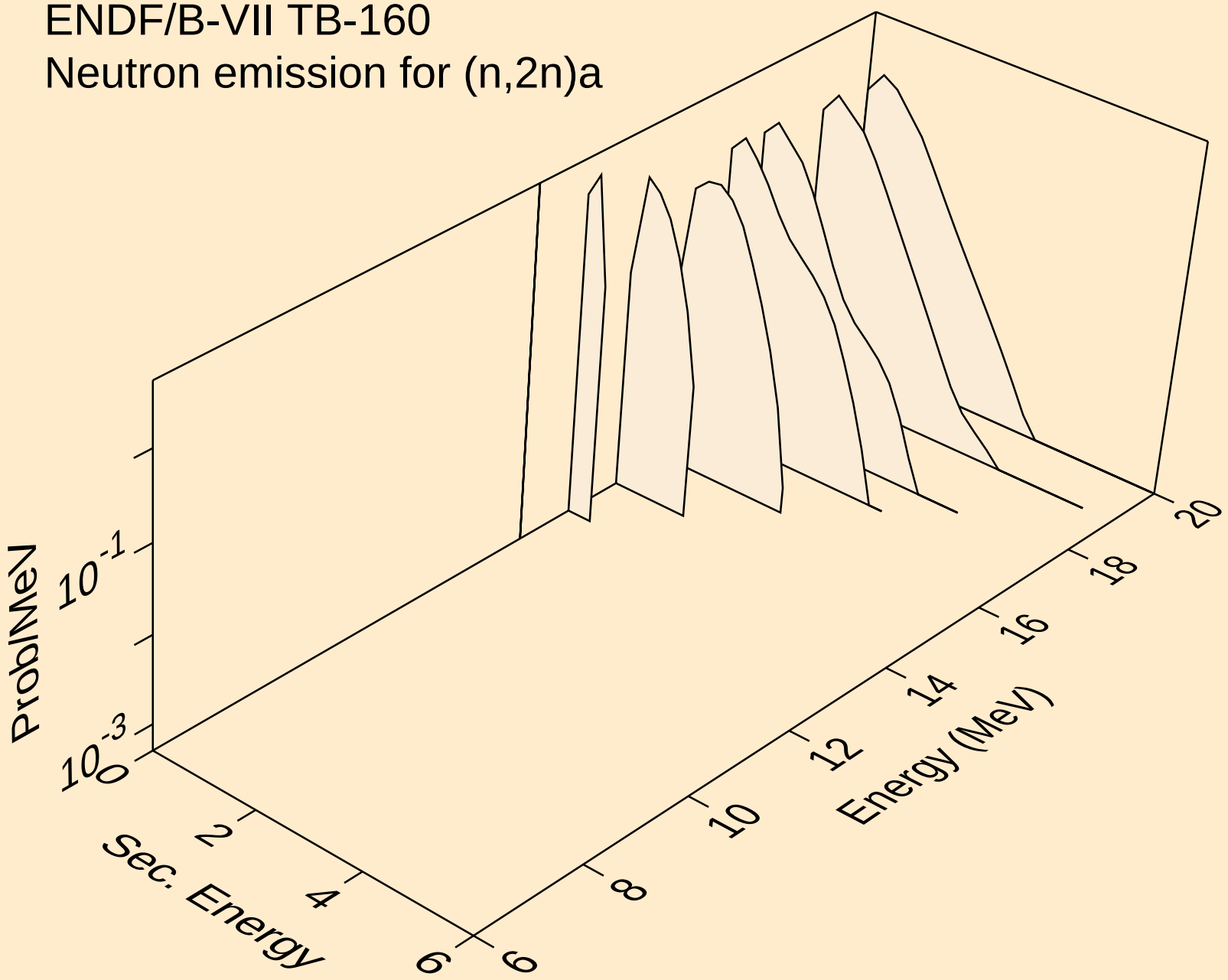



ENDF/B-VII TB-160
Neutron emission for (n,3n)
Prob/MeV
10^{1}
10^{-1}
0
2
4
6
Sec. Energy
14
15
16
17
18
19
20
Energy (MeV)

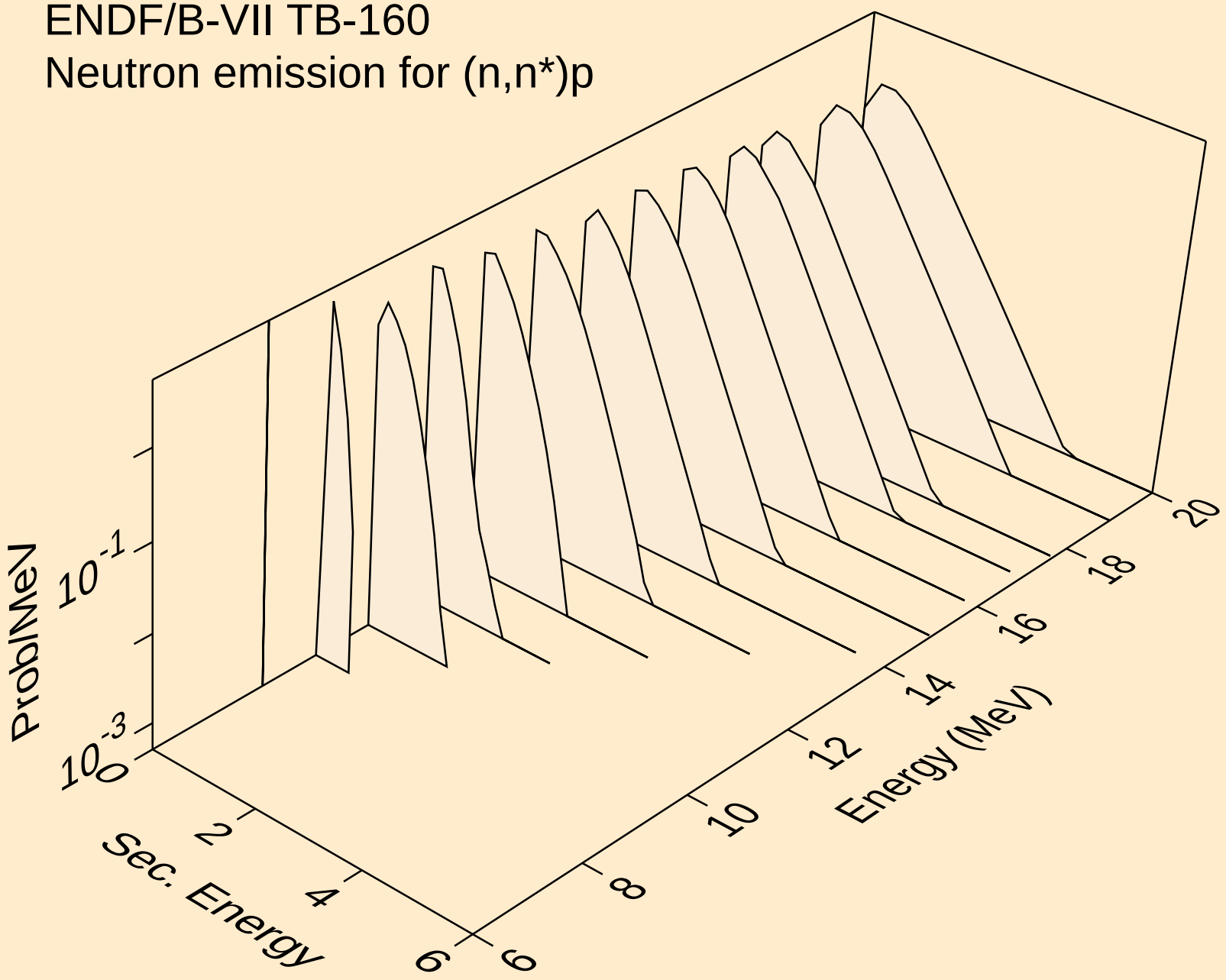
ENDF/B-VII TB-160
Neutron emission for (n,n*)a

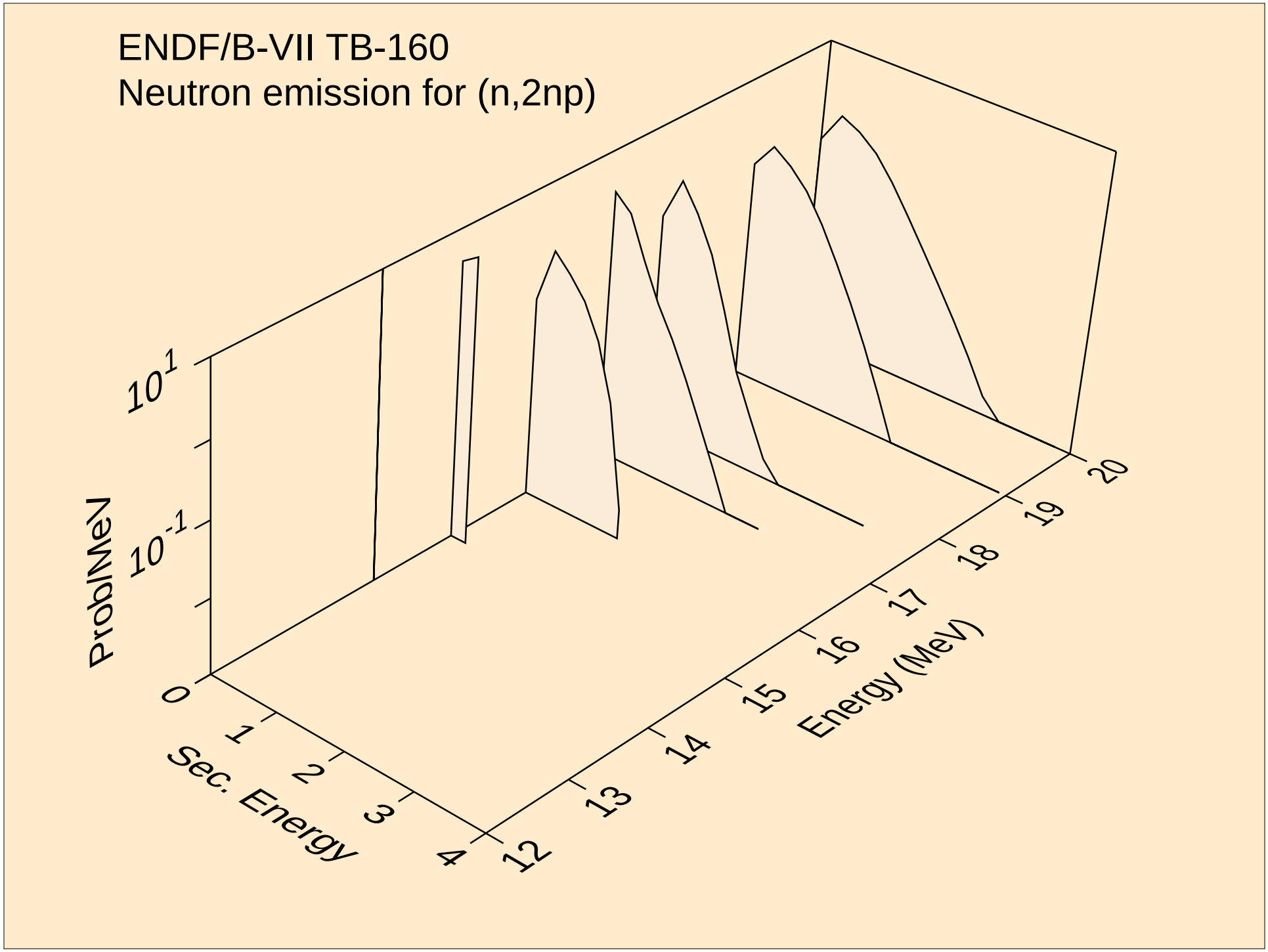


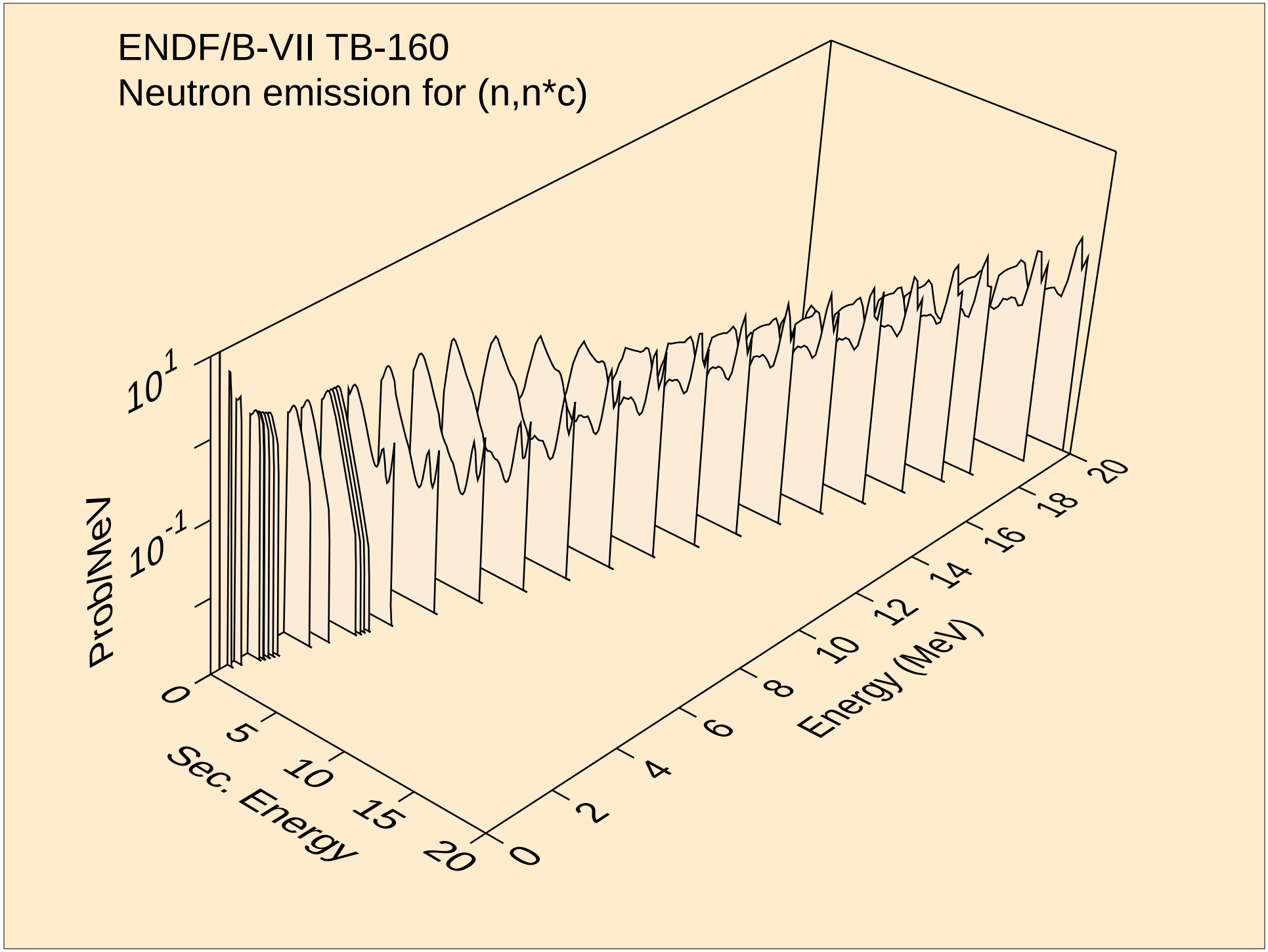
ENDF/B-VII TB-160
Neutron emission for (n,2n)a



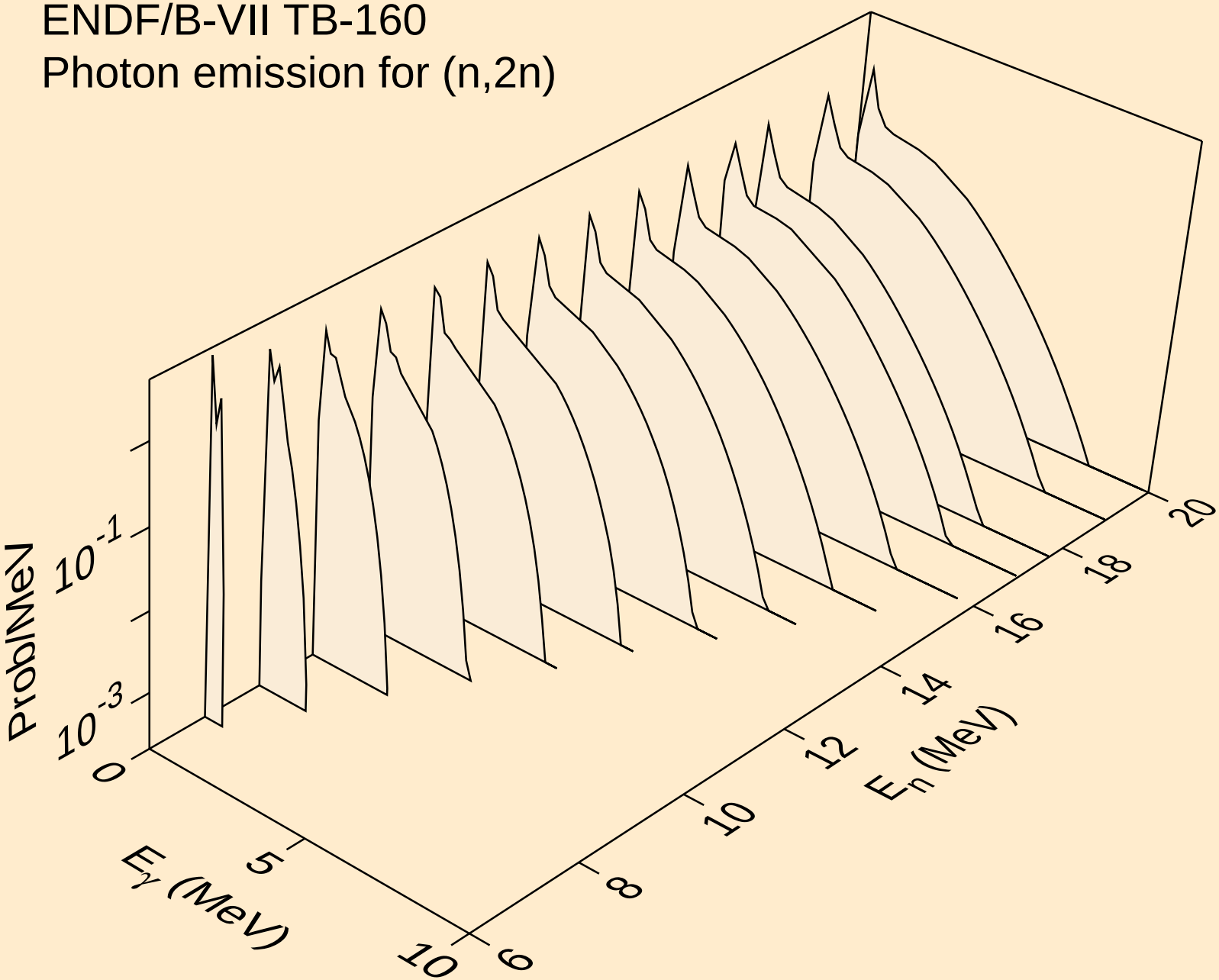
ENDF/B-VII TB-160
Neutron emission for (n,n*)p



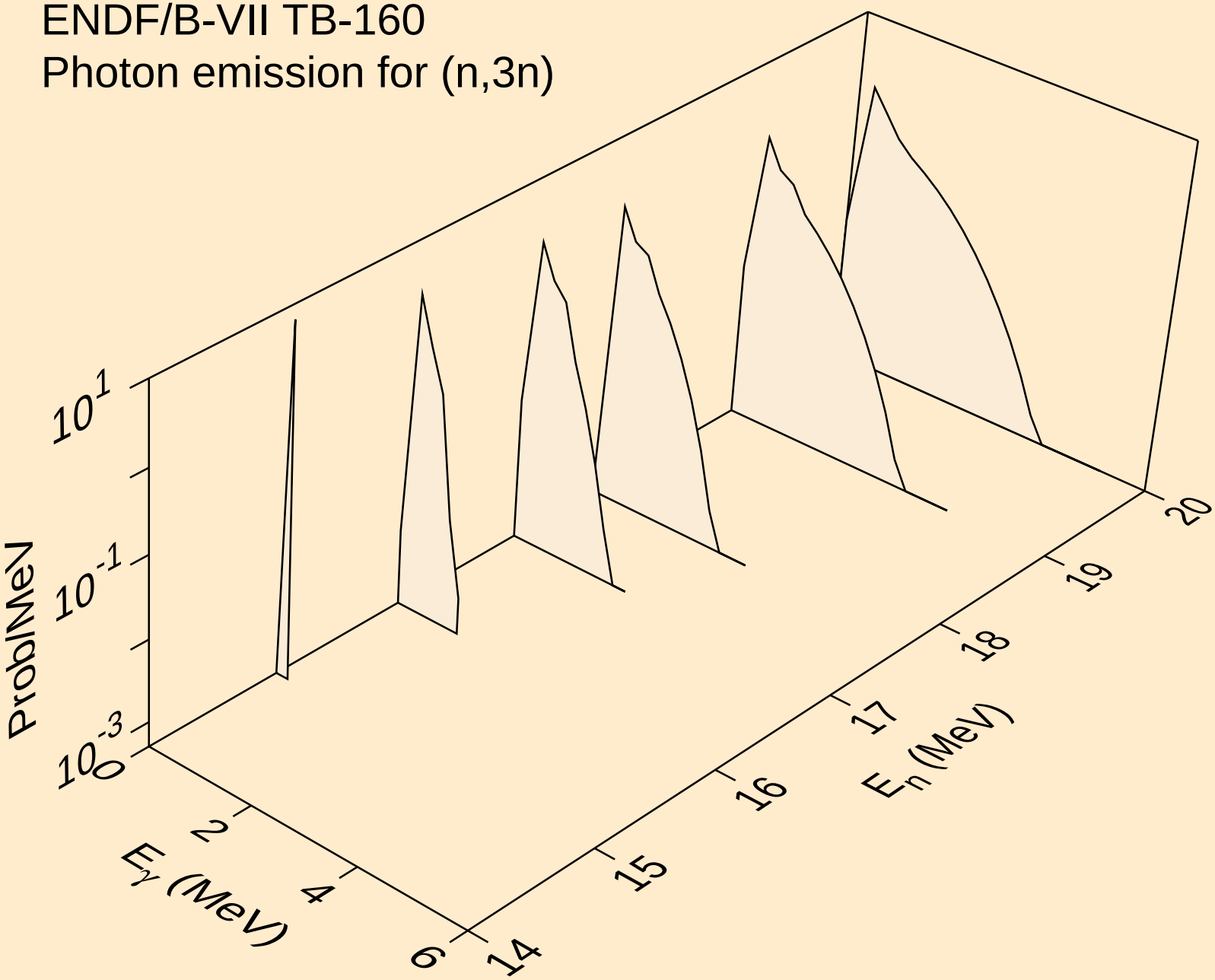

ENDF/B-VII TB-160
Neutron emission for (n,2np)
Prob/MeV
10^{1}
10^{-1}
0
Sec. Energy
1
2
3
4
Energy (MeV)
12
13
14
15
16
17
18
19
20


ENDF/B-VII TB-160
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)

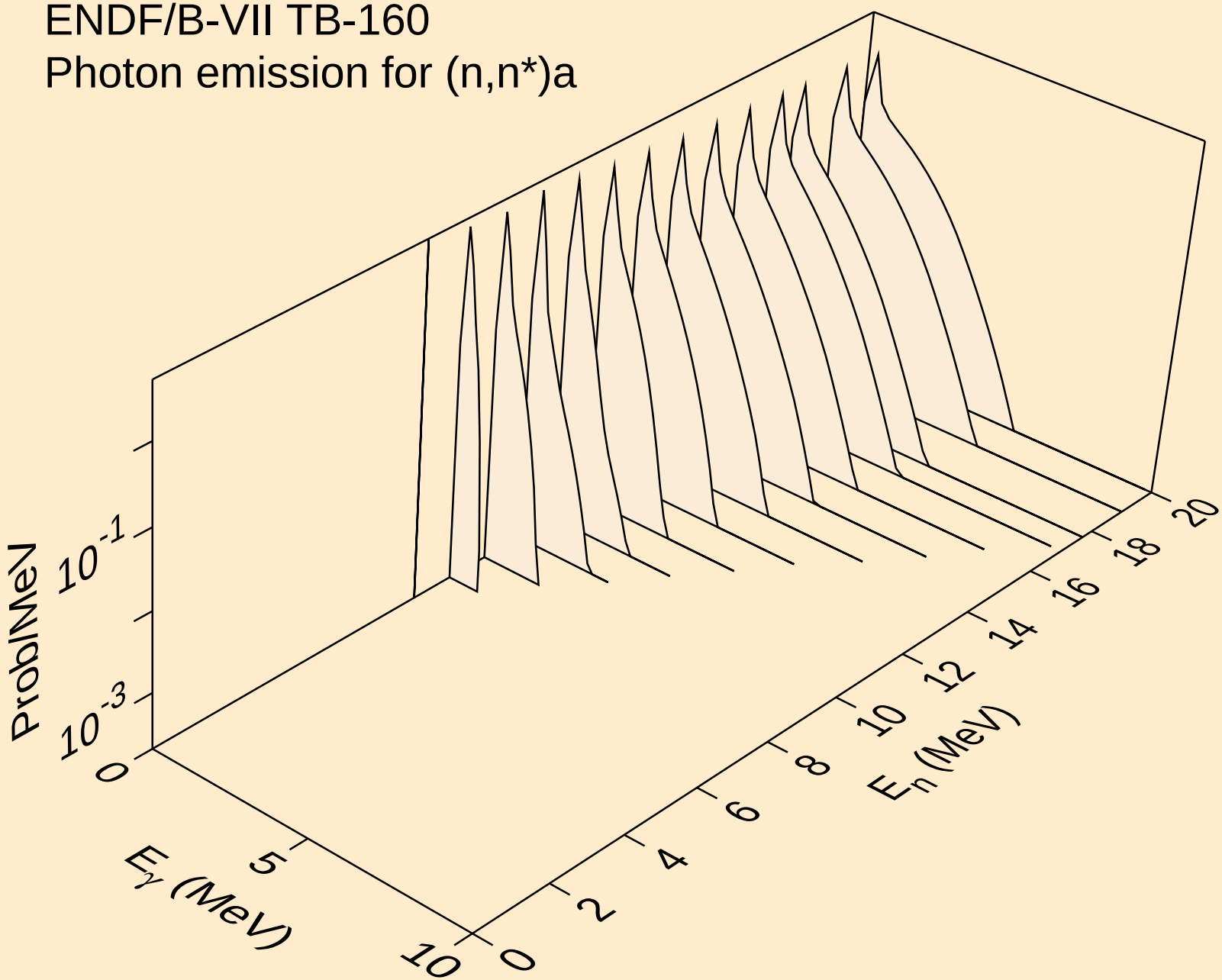
ENDF/B-VII TB-160
Photon emission for (n,2n)



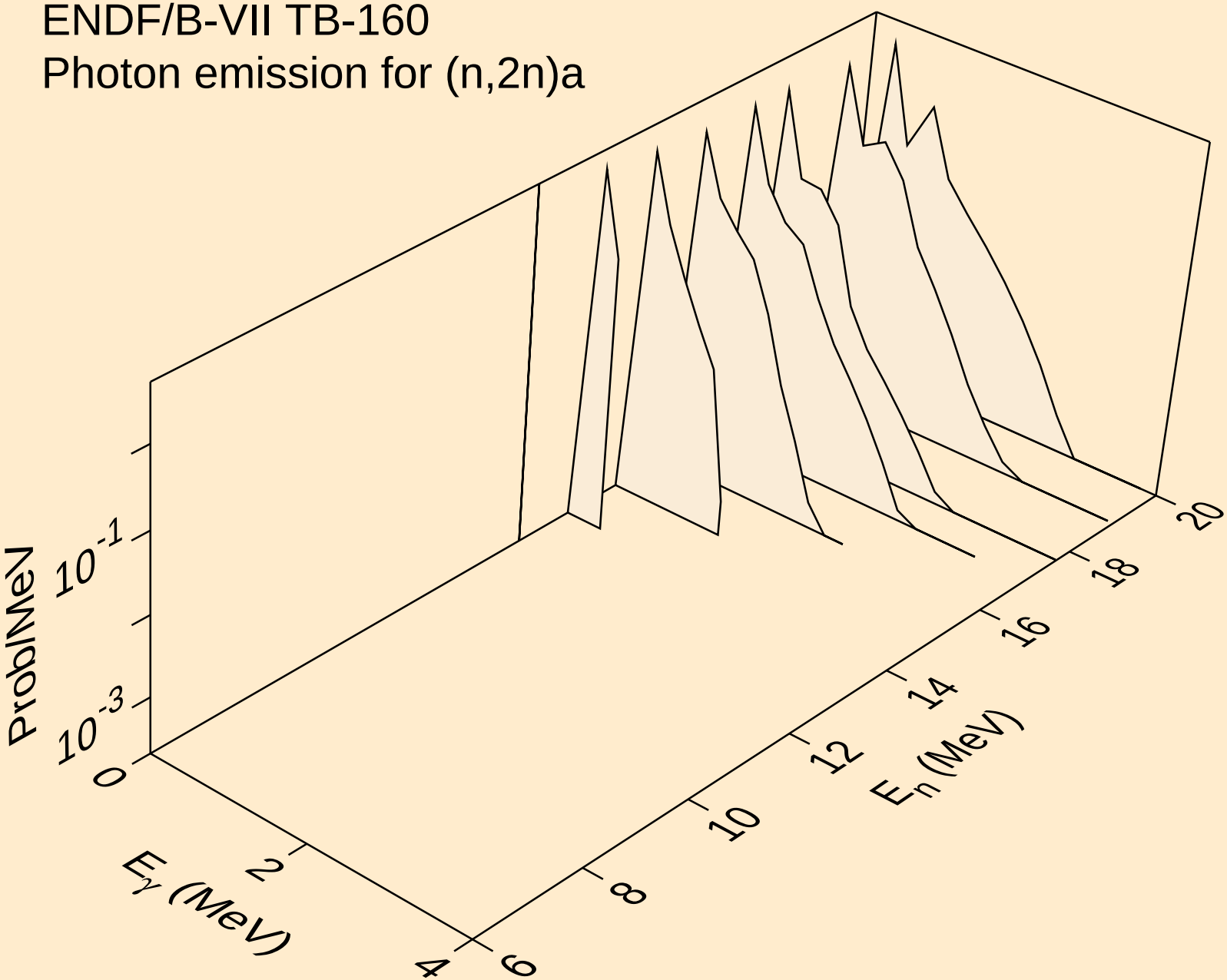
ENDF/B-VII TB-160
Photon emission for (n,3n)



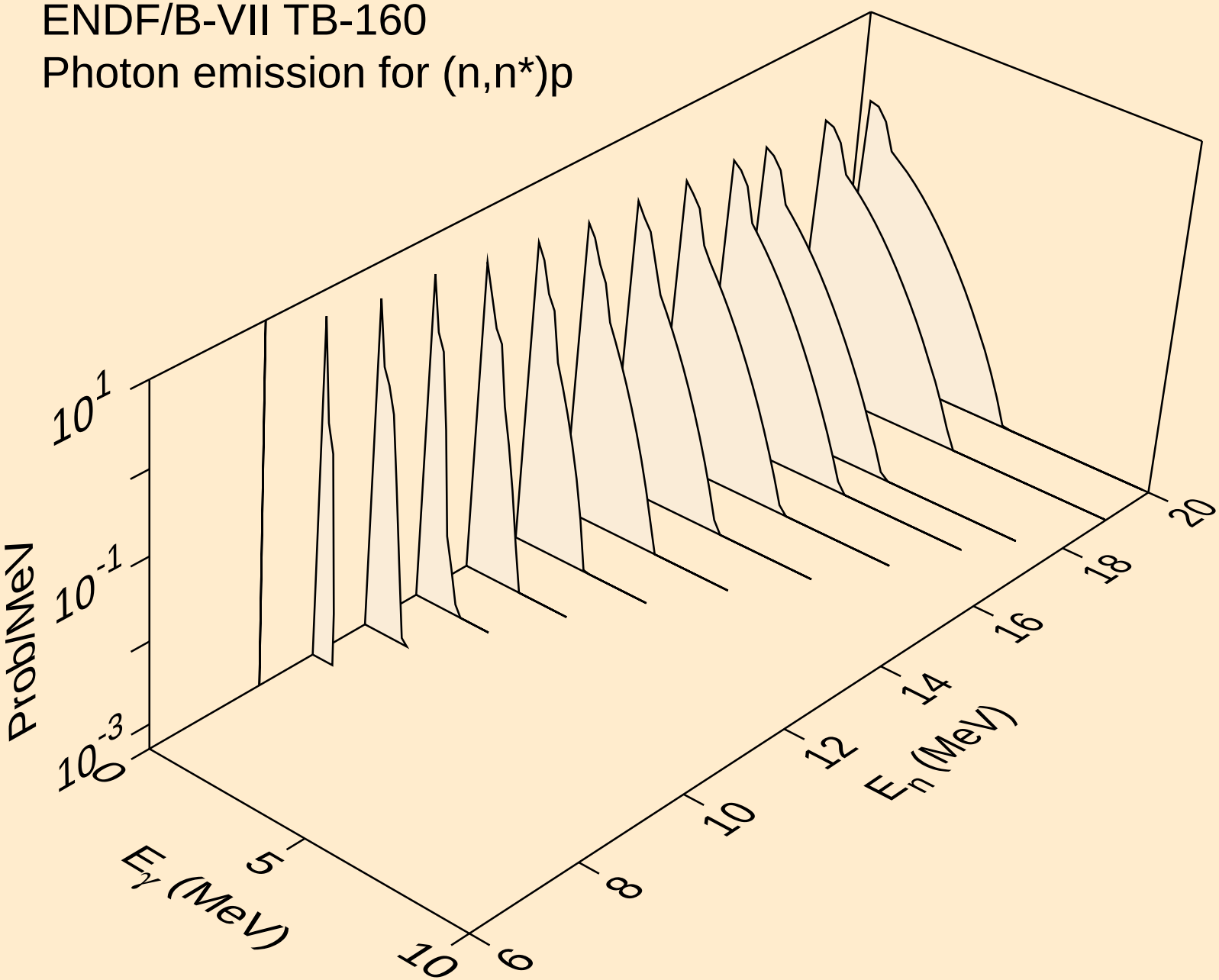
ENDF/B-VII TB-160
Photon emission for (n,n*)a



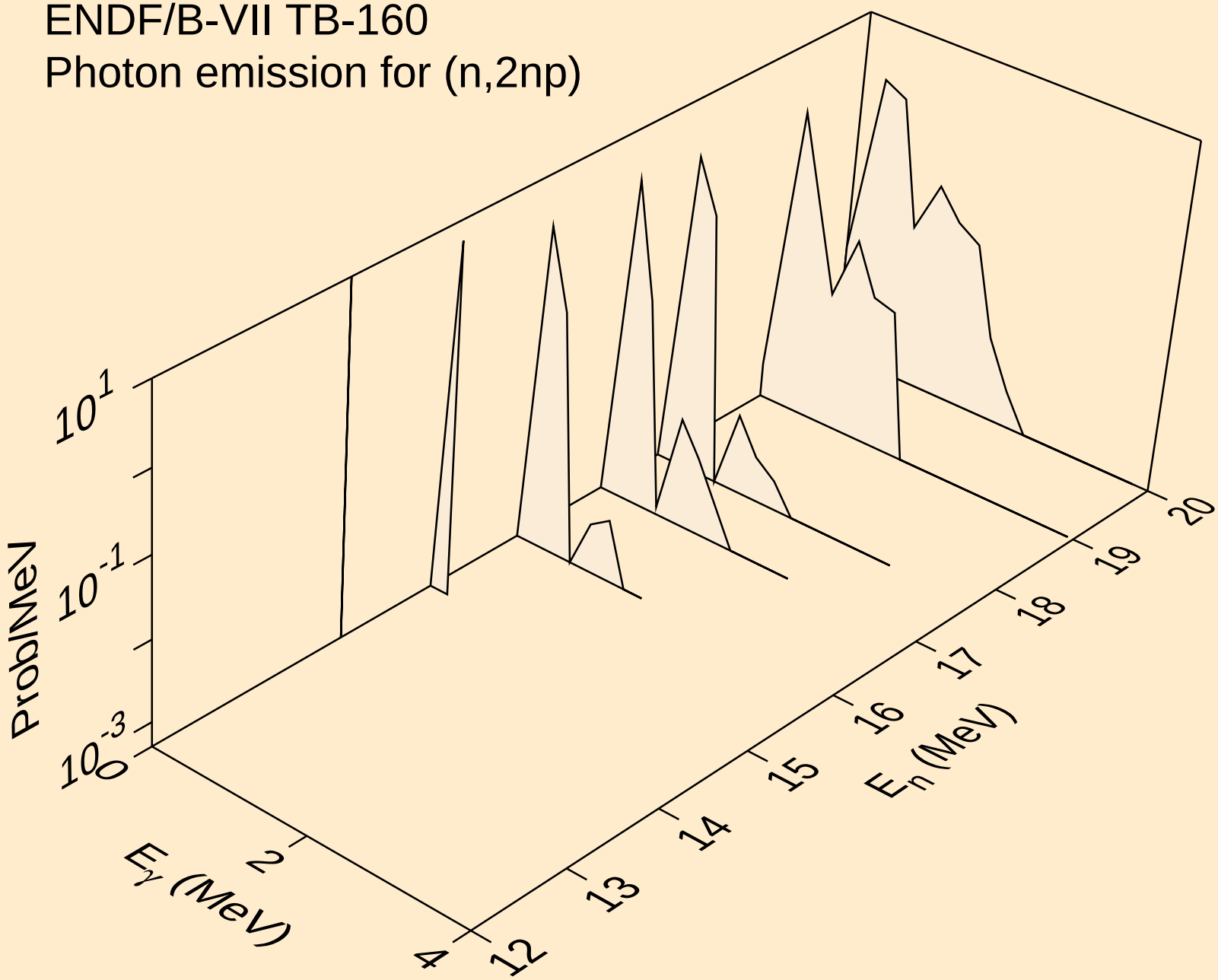
ENDF/B-VII TB-160
Photon emission for (n,2n)a



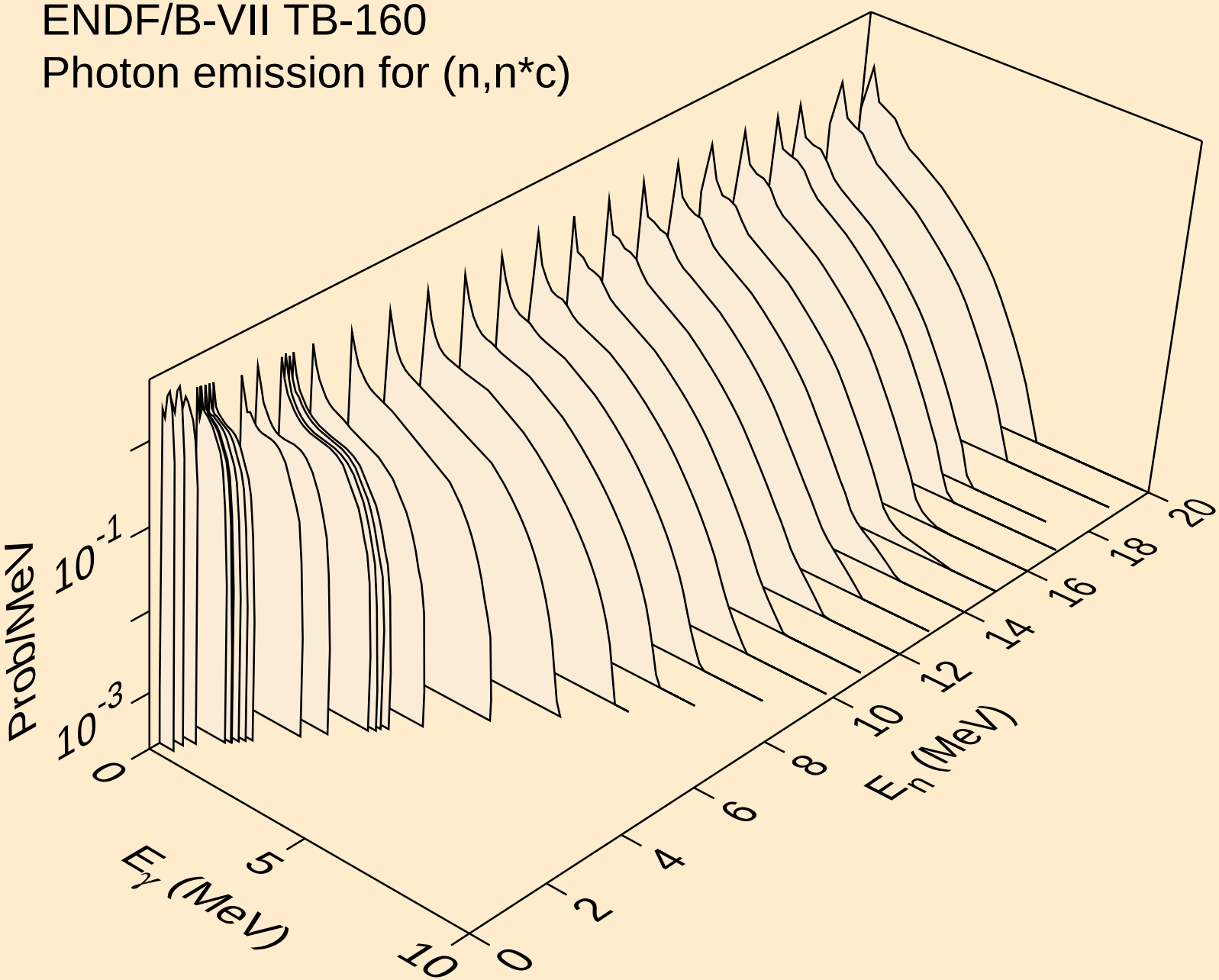
ENDF/B-VII TB-160
Photon emission for (n,n*)p



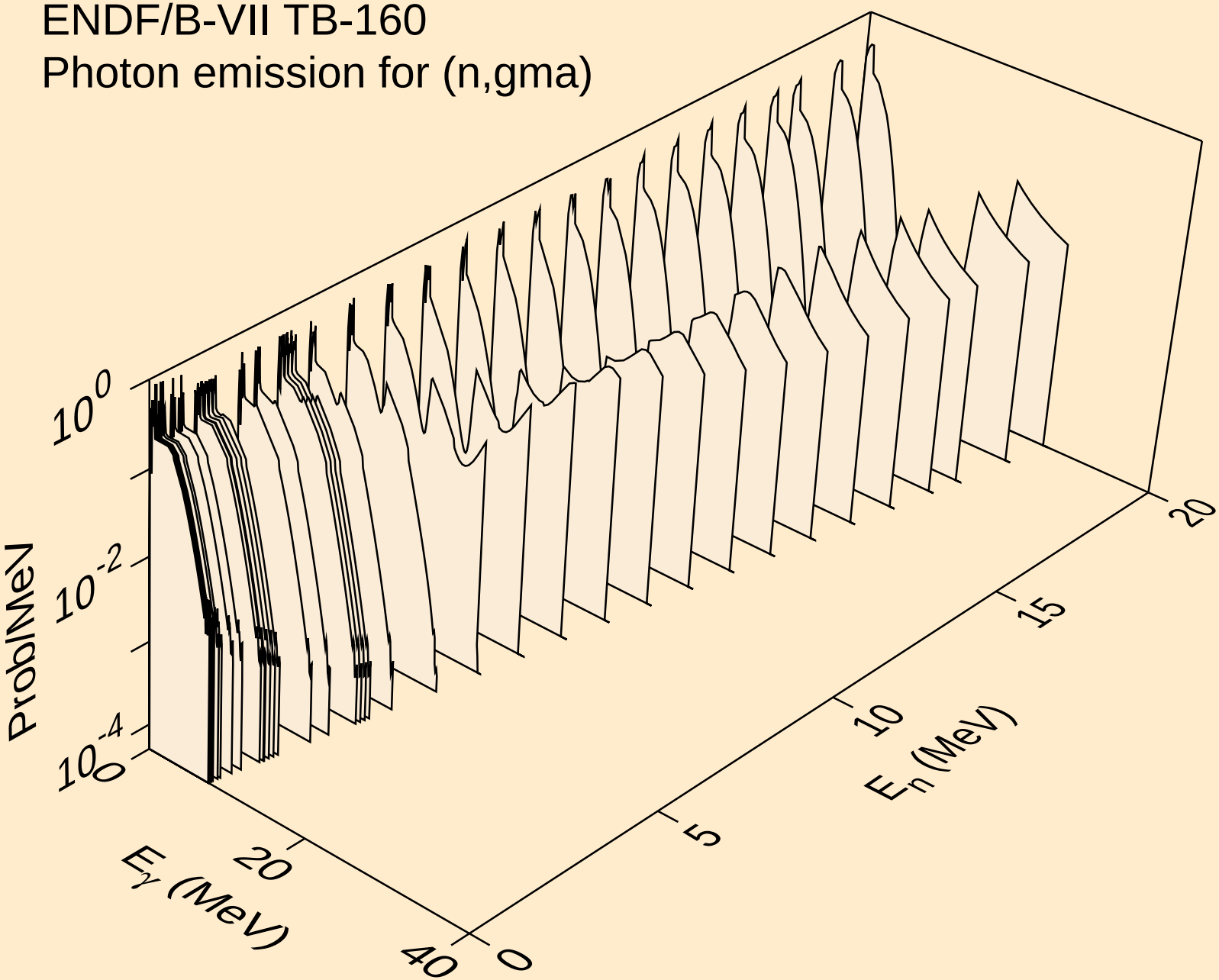
ENDF/B-VII TB-160
Photon emission for (n,2np)

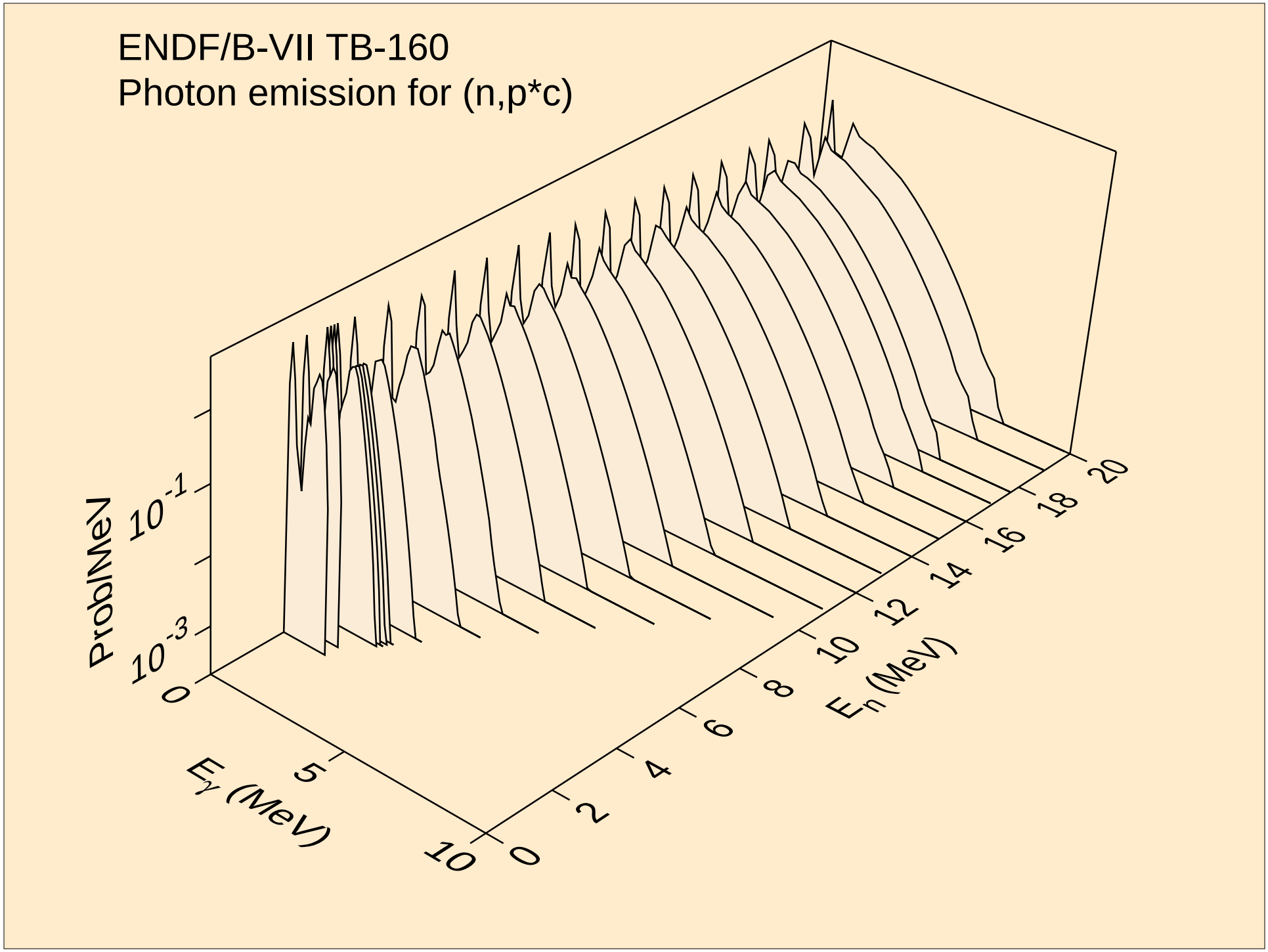


ENDF/B-VII TB-160
Photon emission for (n,n*c)

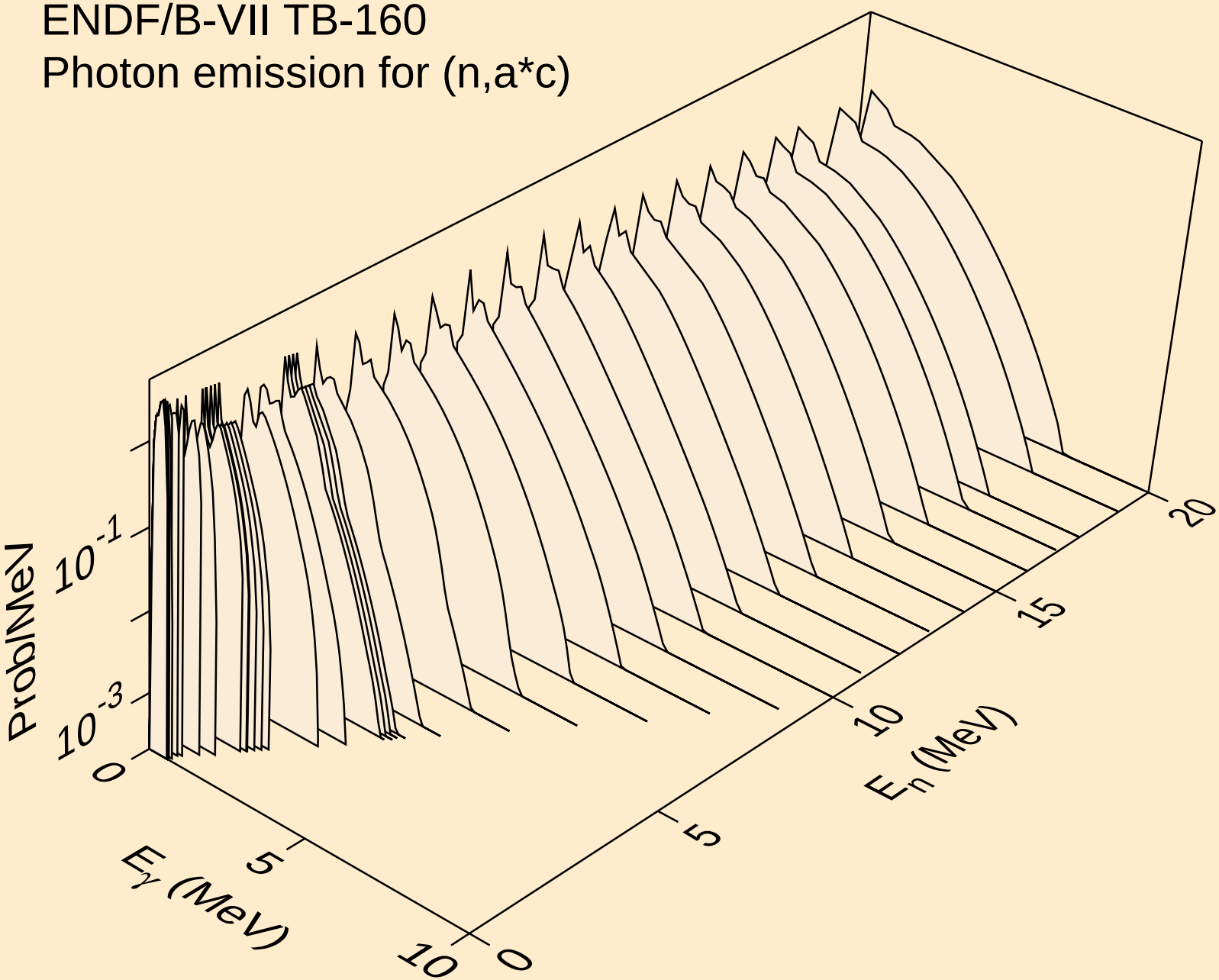


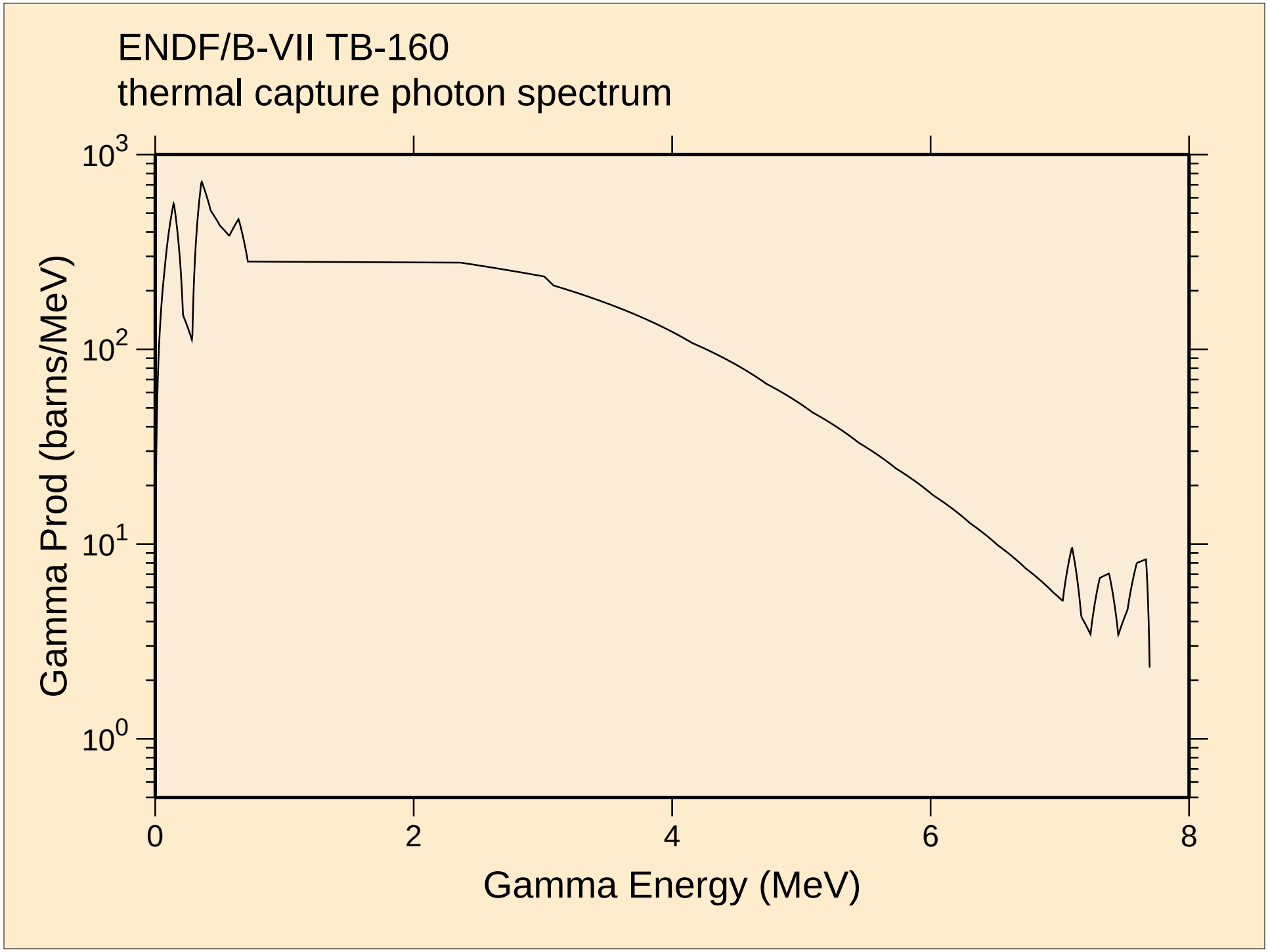
ENDF/B-VII TB-160
Photon emission for (n,gma)

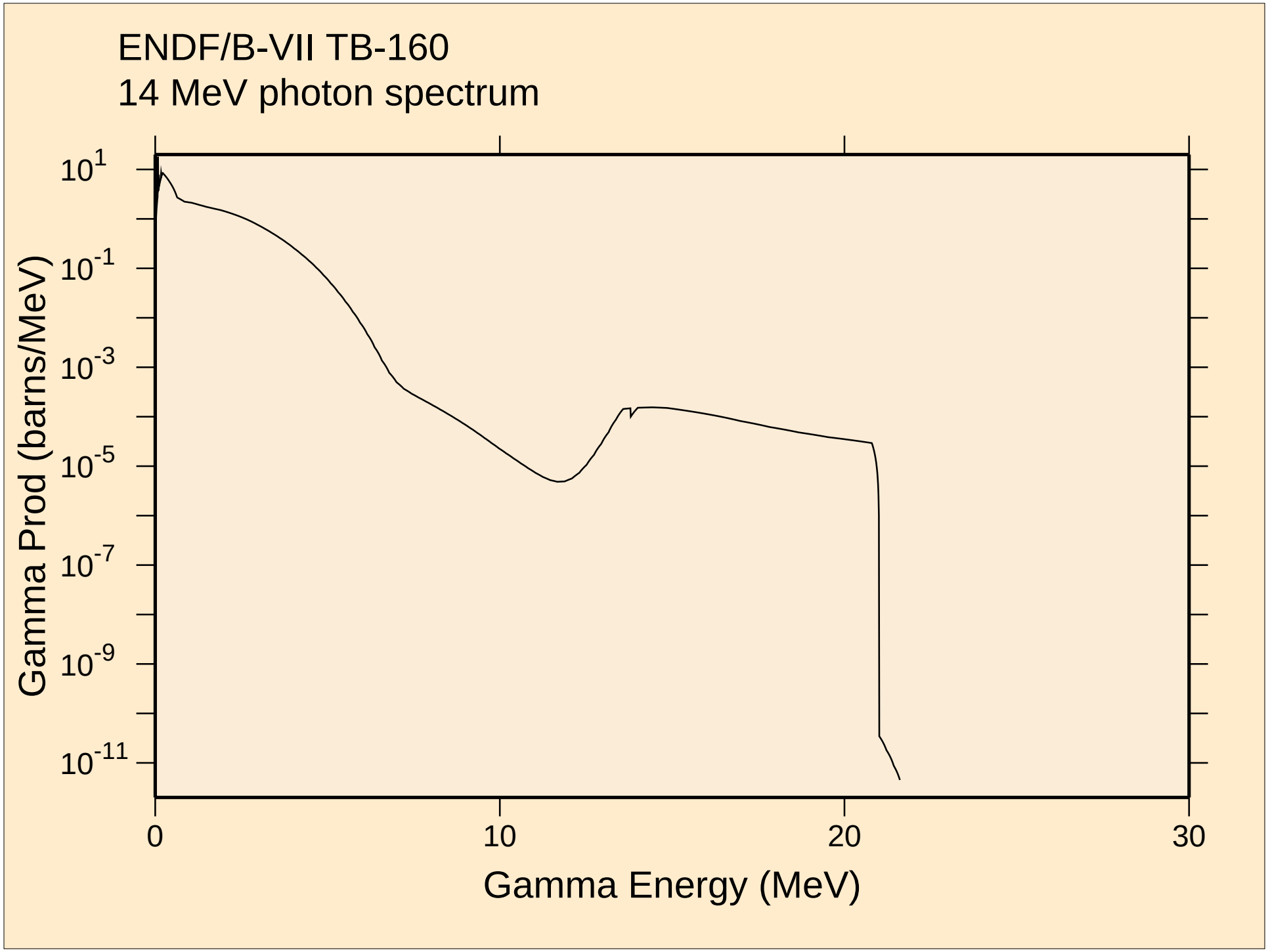


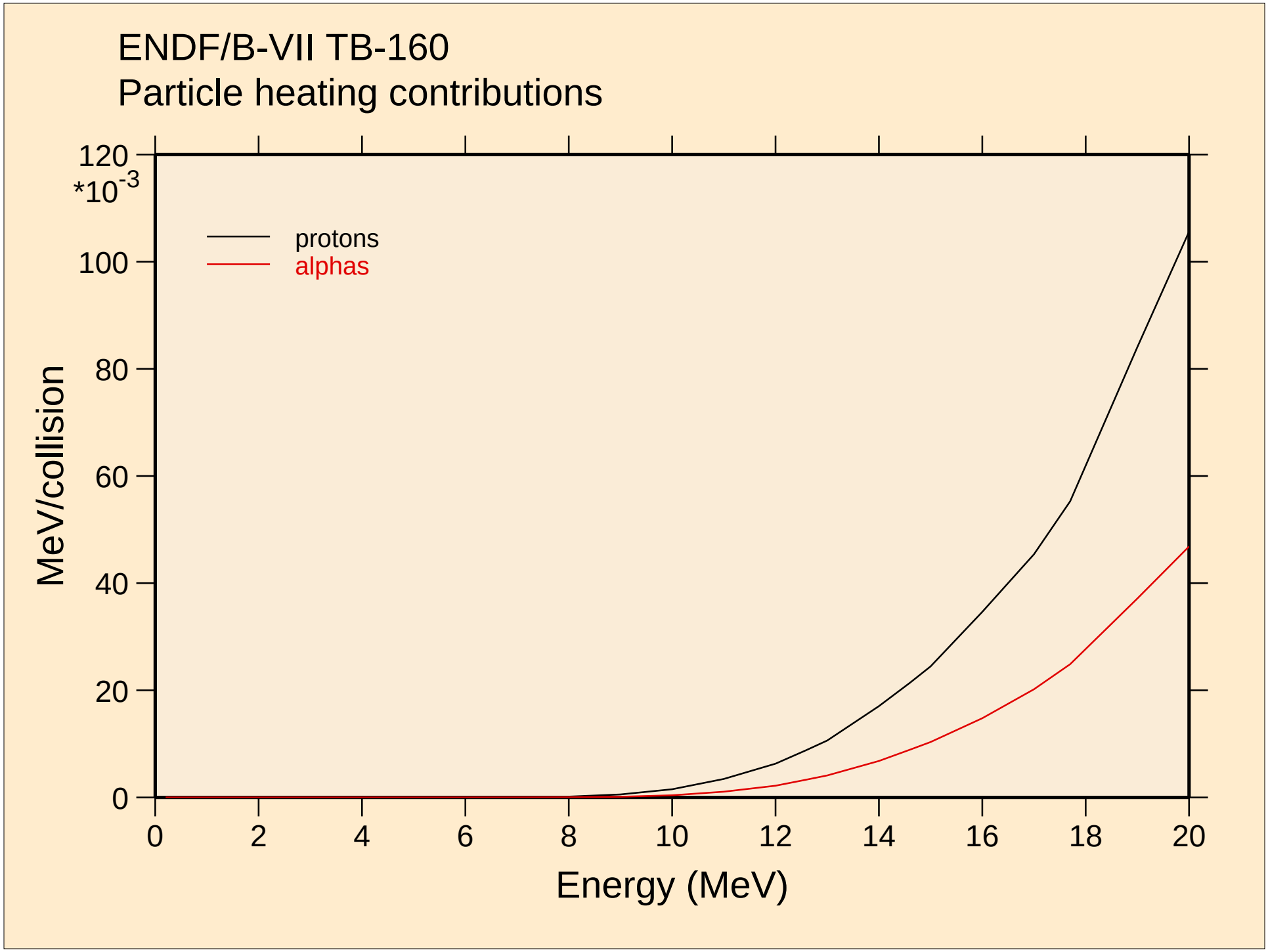

ENDF/B-VII TB-160
Photon emission for (n,p*c)
Prob/MeV
10^{-1}
10^{-3}
0
5
10
E_γ (MeV)
0
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

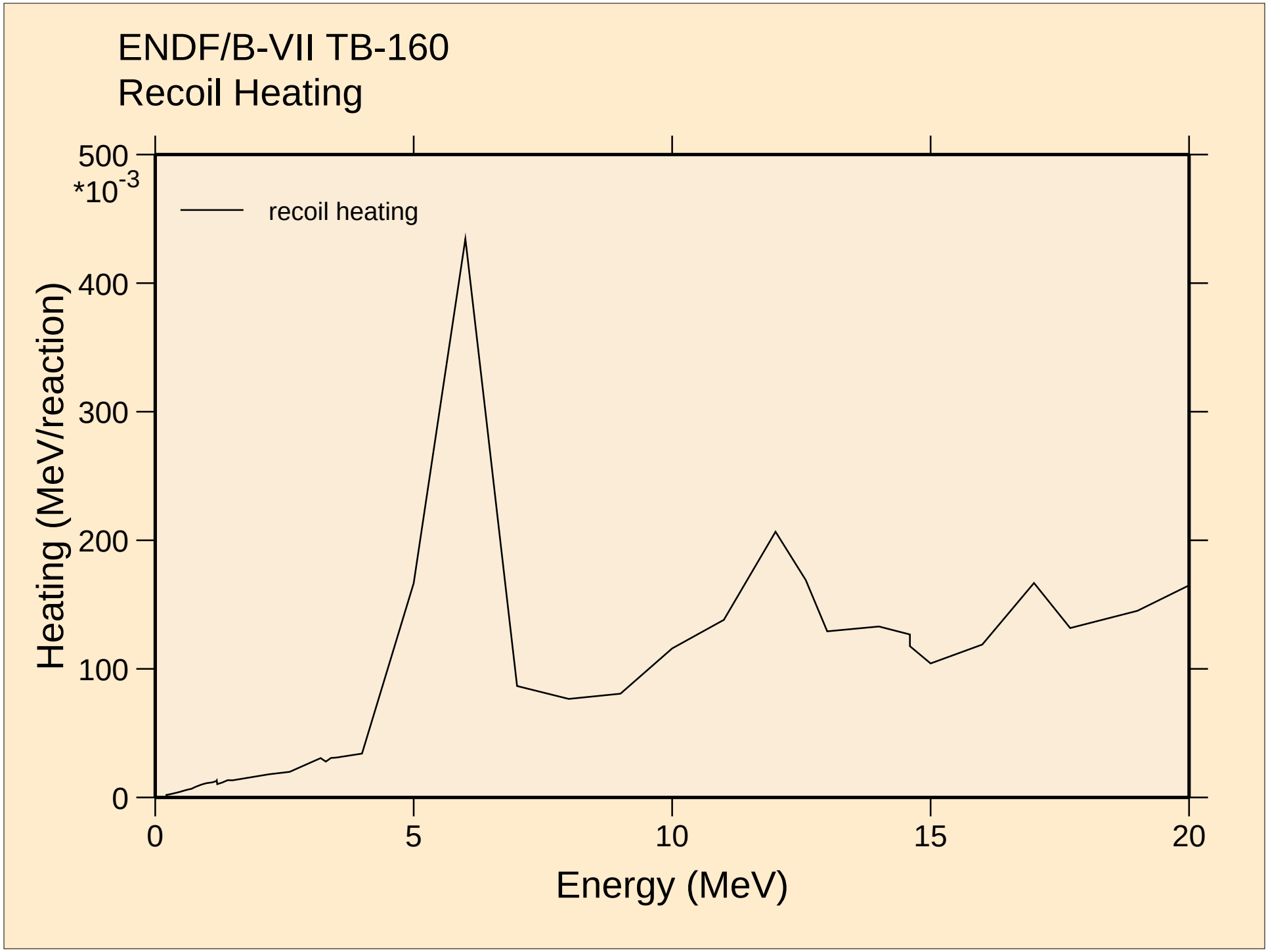
ENDF/B-VII TB-160
Photon emission for (n,a*c)

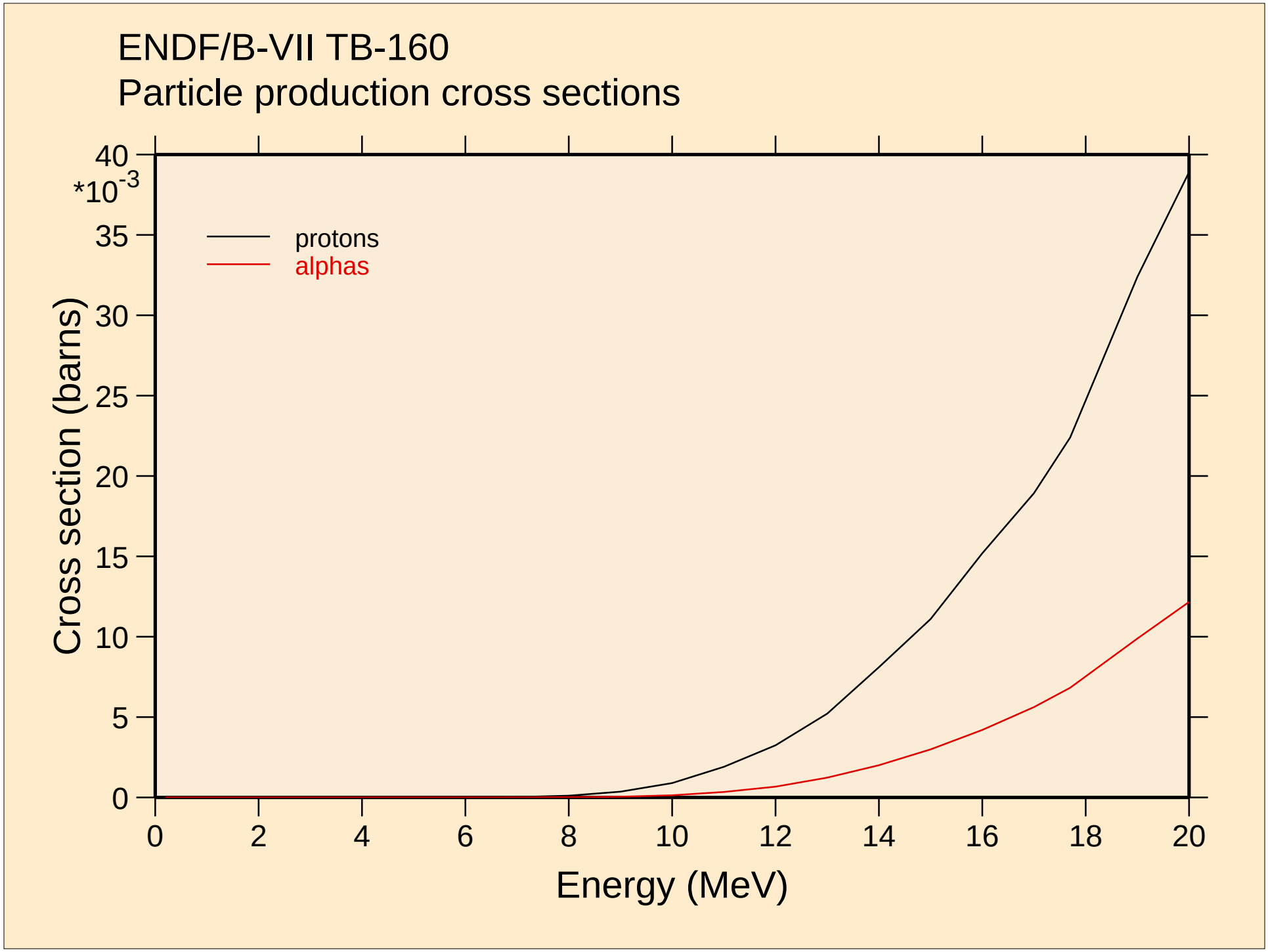


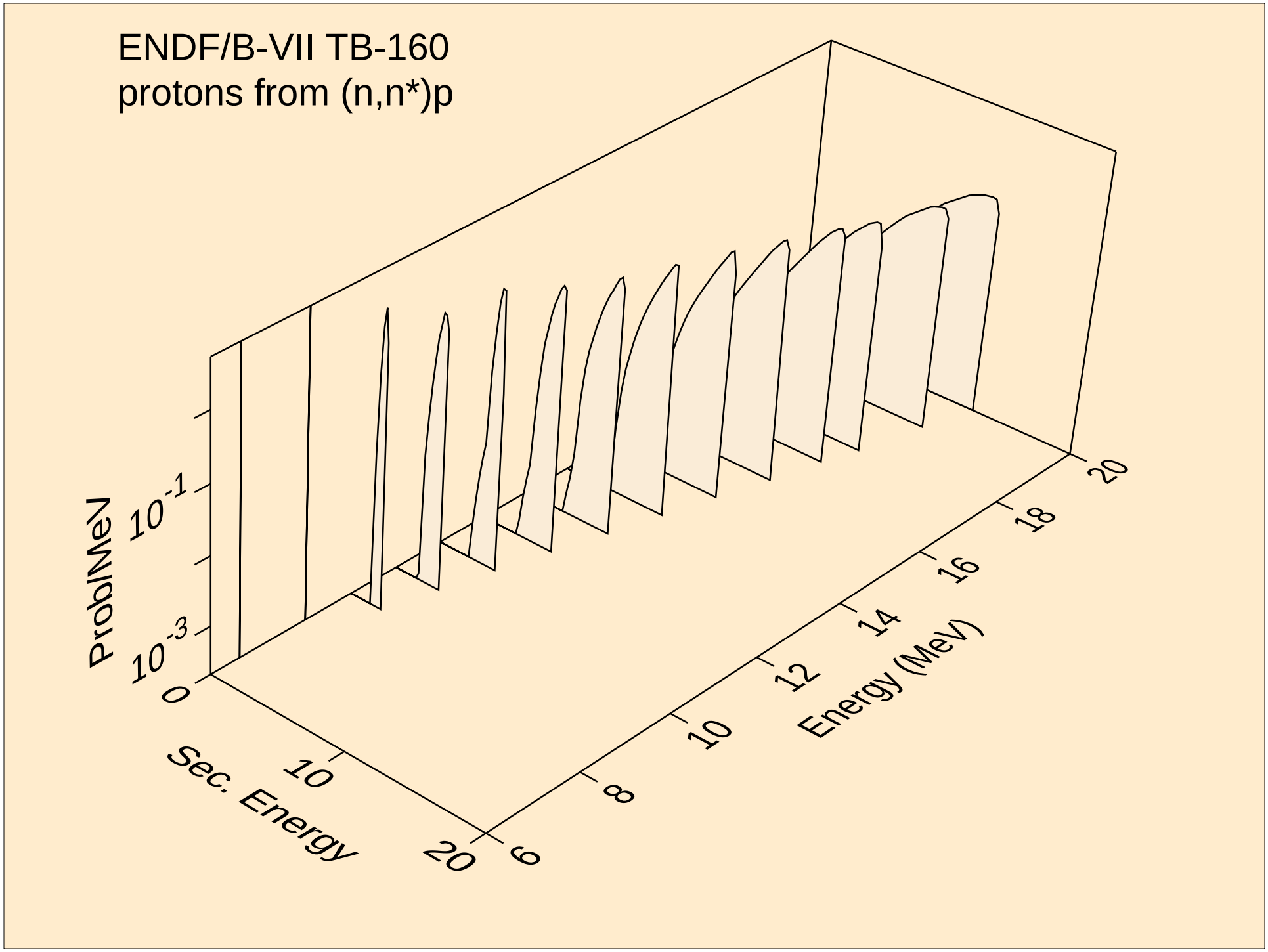

ENDF/B-VII TB-160
thermal capture photon spectrum
Gamma Prod (barns/MeV)
10^3
10^2
10^1
10^0
0
2
4
6
8
Gamma Energy (MeV)

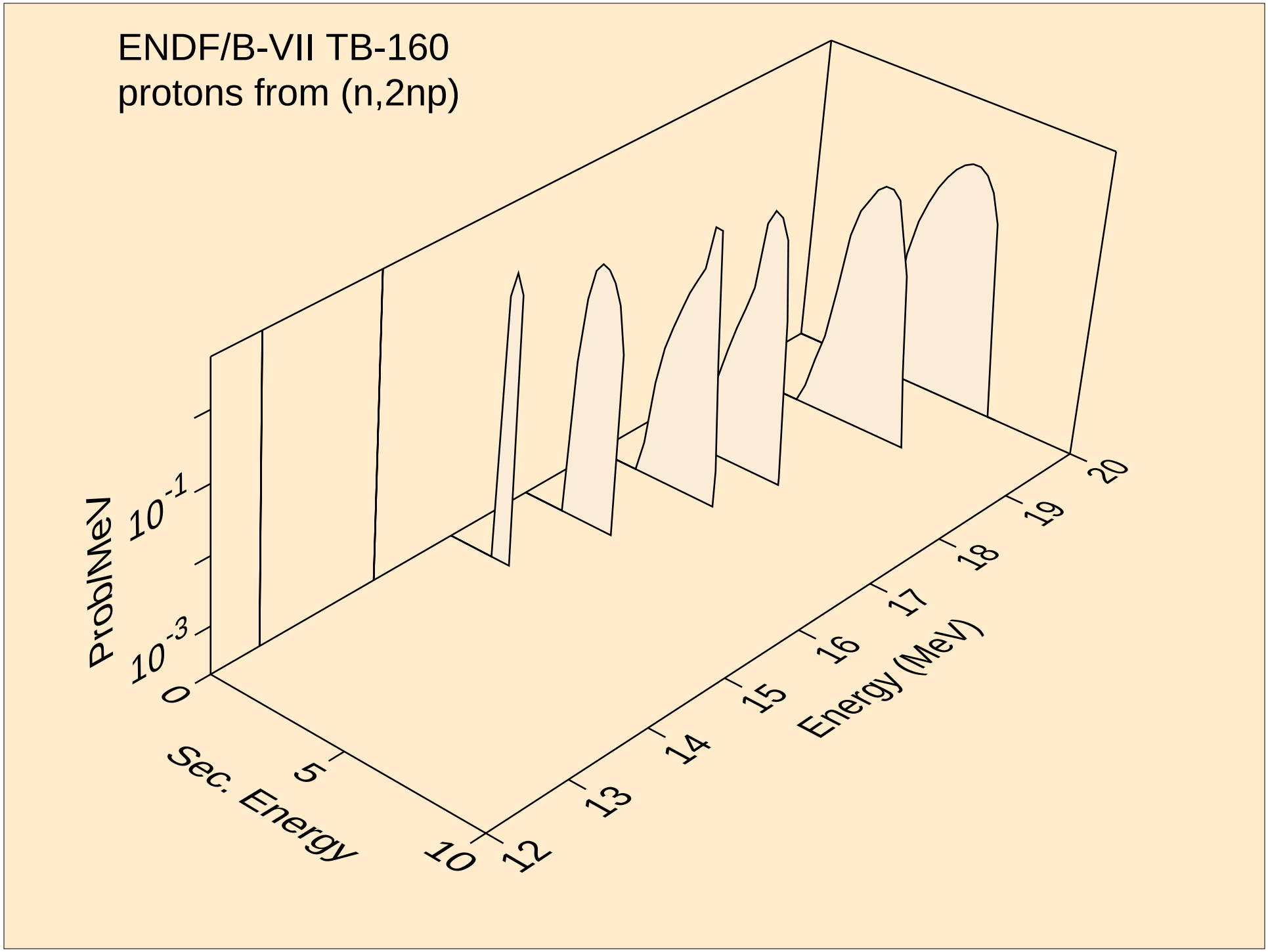

ENDF/B-VII TB-160
14 MeV photon spectrum
Gamma Prod (barns/MeV)
10^1
10^-1
10^-3
10^-5
10^-7
10^-9
10^-11
0
10
20
30
Gamma Energy (MeV)

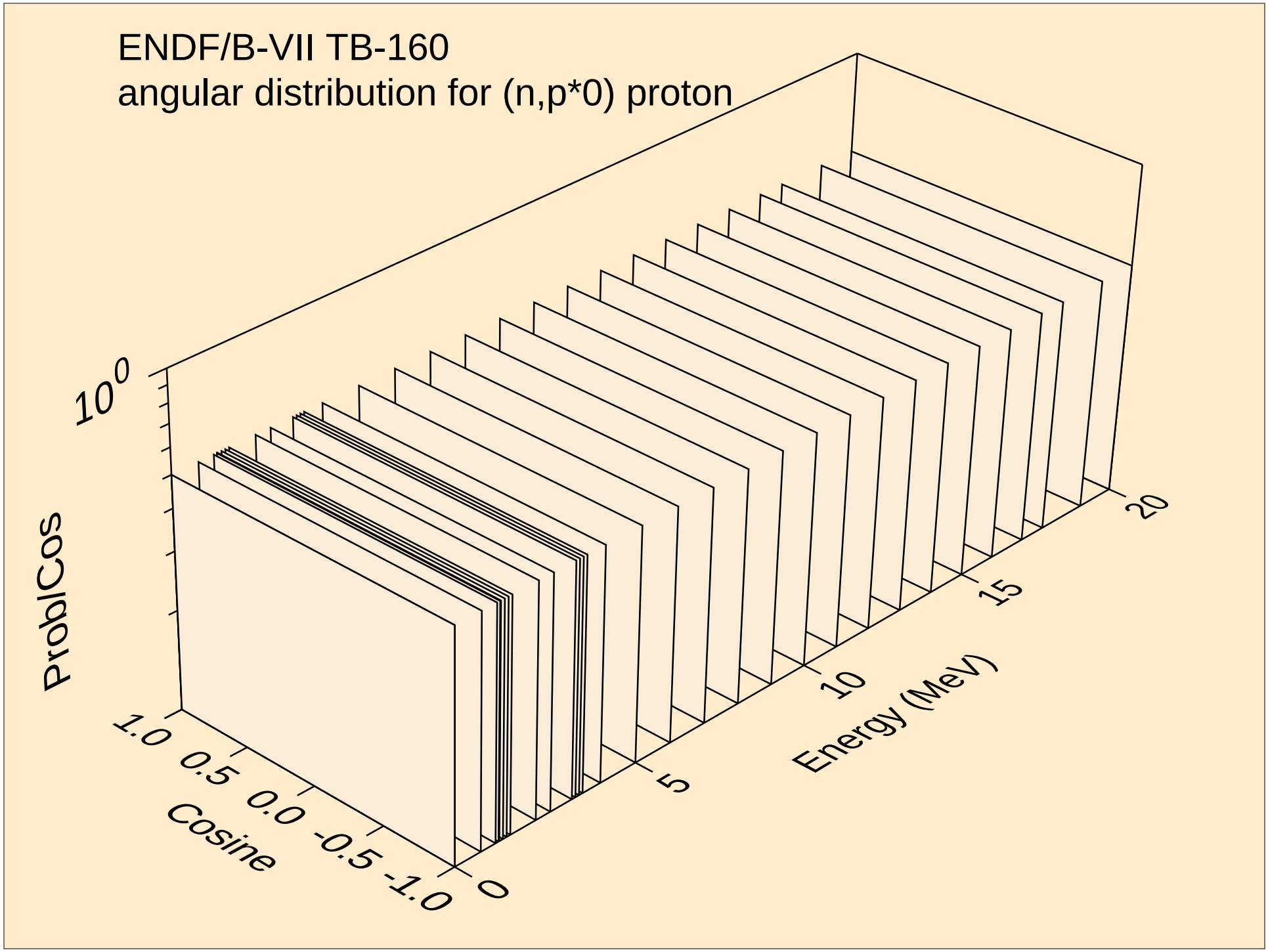

ENDF/B-VII TB-160
Particle heating contributions
120
*10-3
100
80
60
40
20
0
MeV/collision
protons
alphas
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

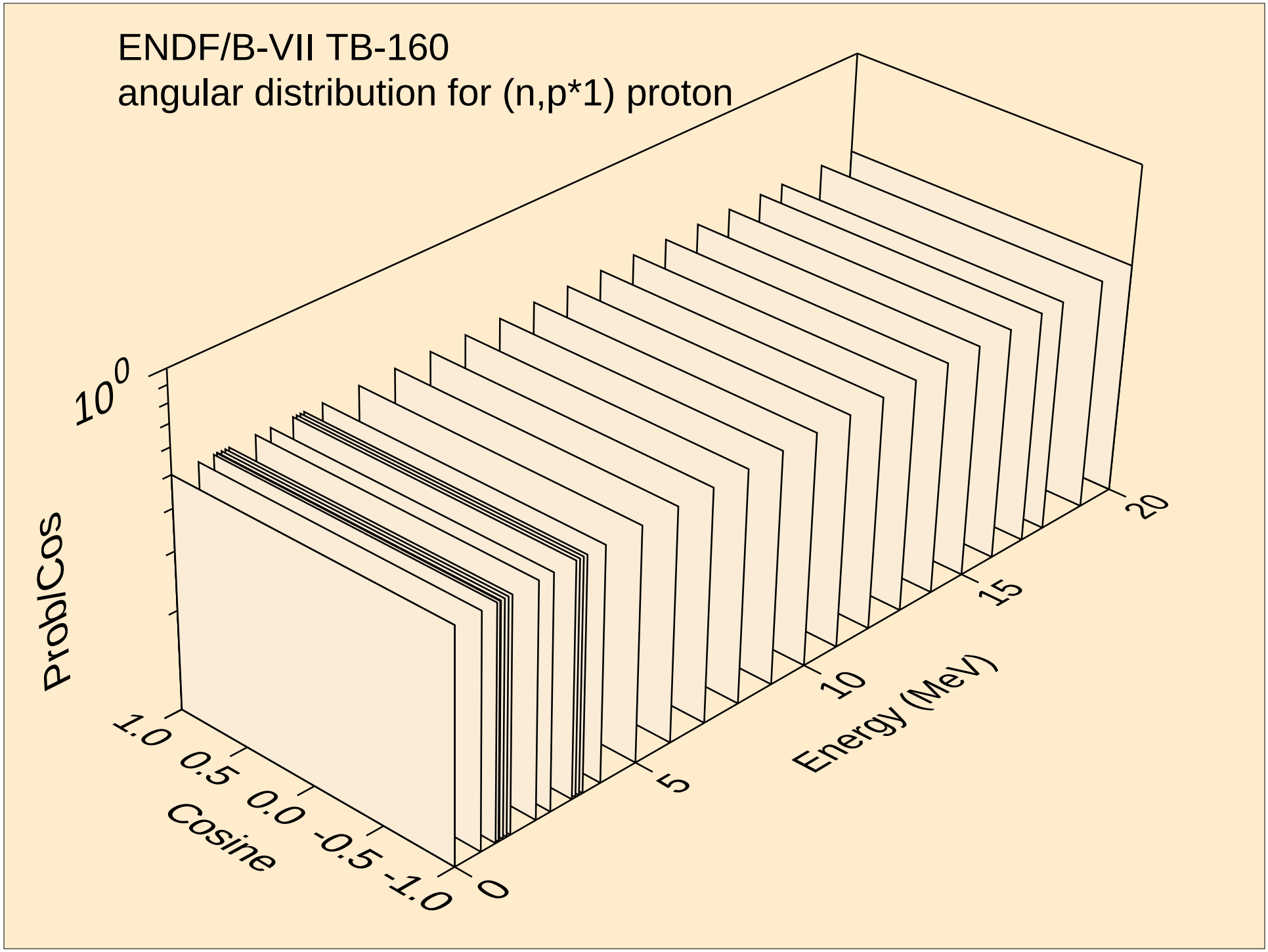

ENDF/B-VII TB-160
Recoil Heating
recoil heating
Heating (MeV/reaction)
*10^-3
500
400
300
200
100
0
0
5
10
15
20
Energy (MeV)

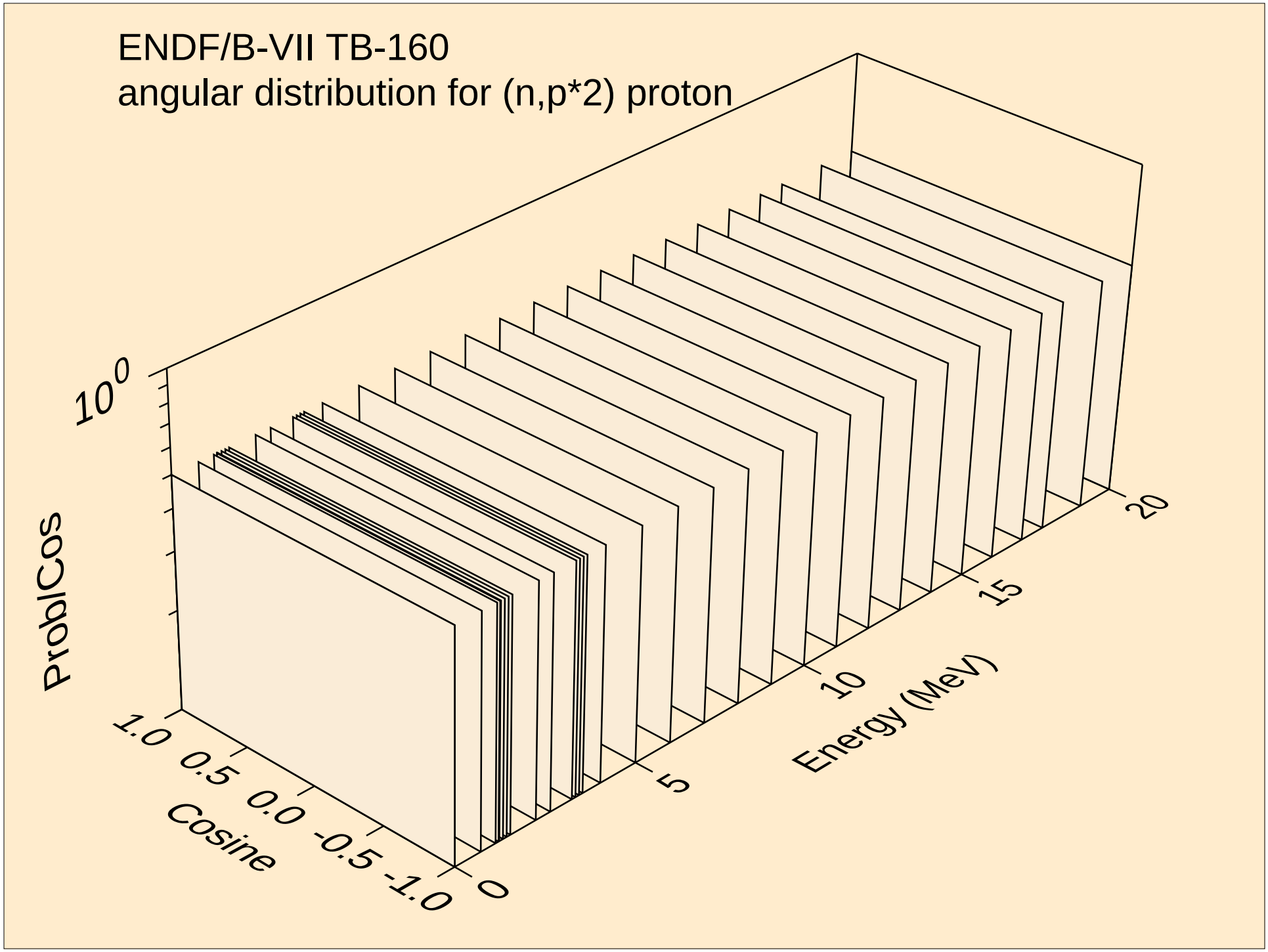

ENDF/B-VII TB-160
Particle production cross sections
*10-3
40
35
30
25
20
15
10
5
0
Cross section (barns)
protons
alphas
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

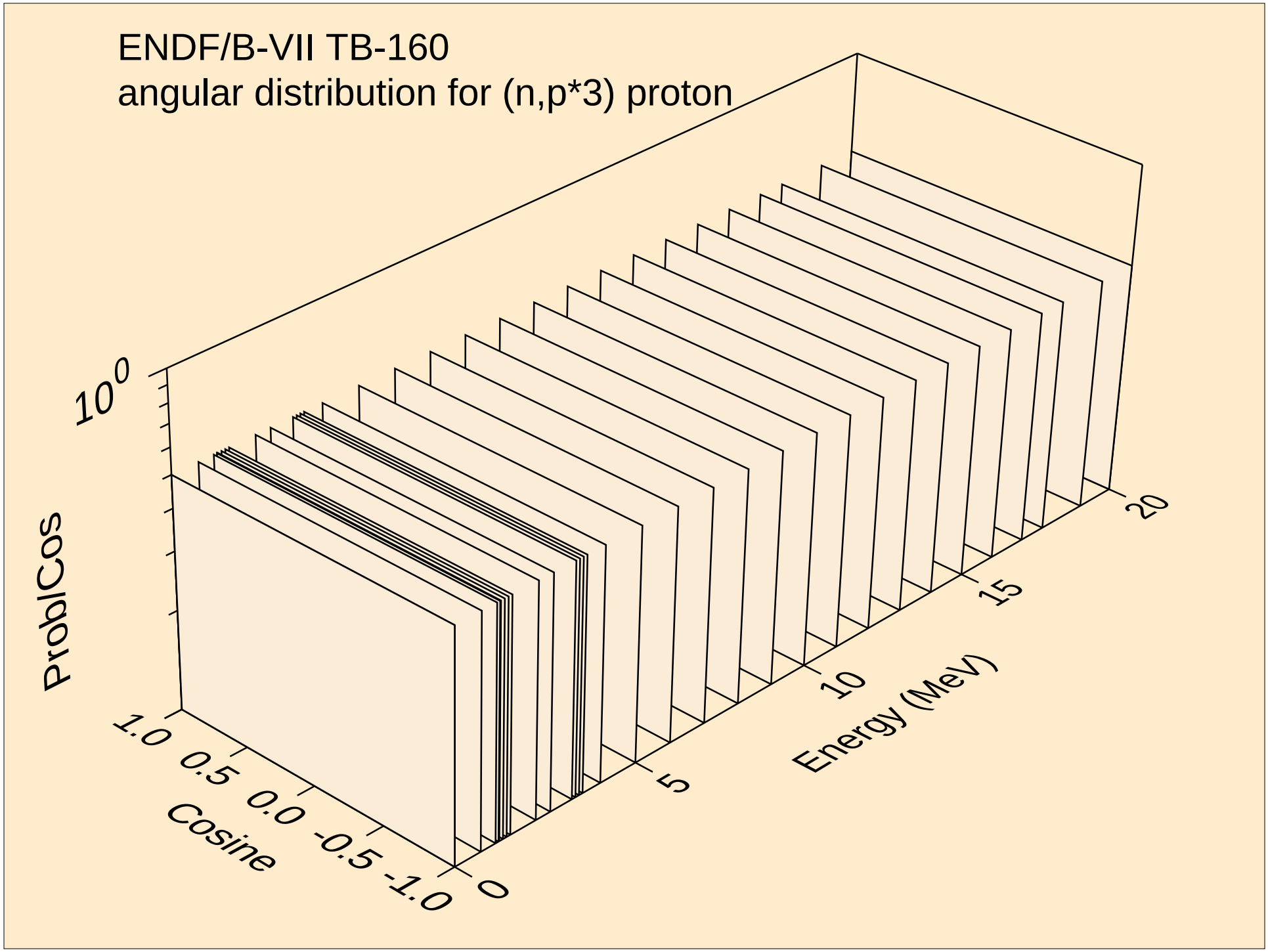

ENDF/B-VII TB-160
protons from (n,n*)p
Prob/MeV
10^-1
10^-3
0
Sec. Energy
10
20
6
8
10
12
14
16
18
20
Energy (MeV)

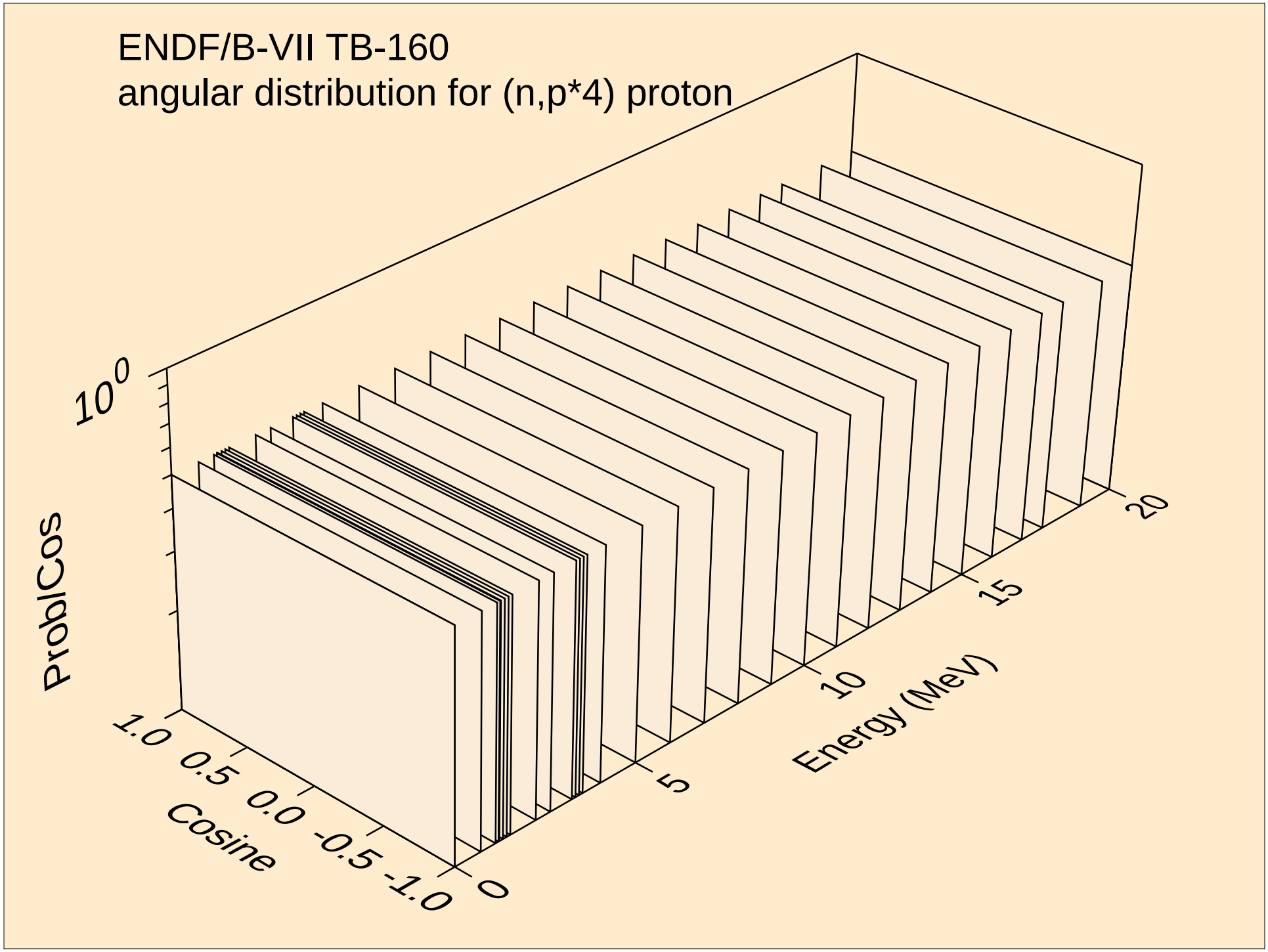

ENDF/B-VII TB-160
protons from (n,2np)
Prob/MeV
10^-1
10^-3
0
Sec. Energy
5
10
12
13
14
15
16
17
18
19
20
Energy (MeV)

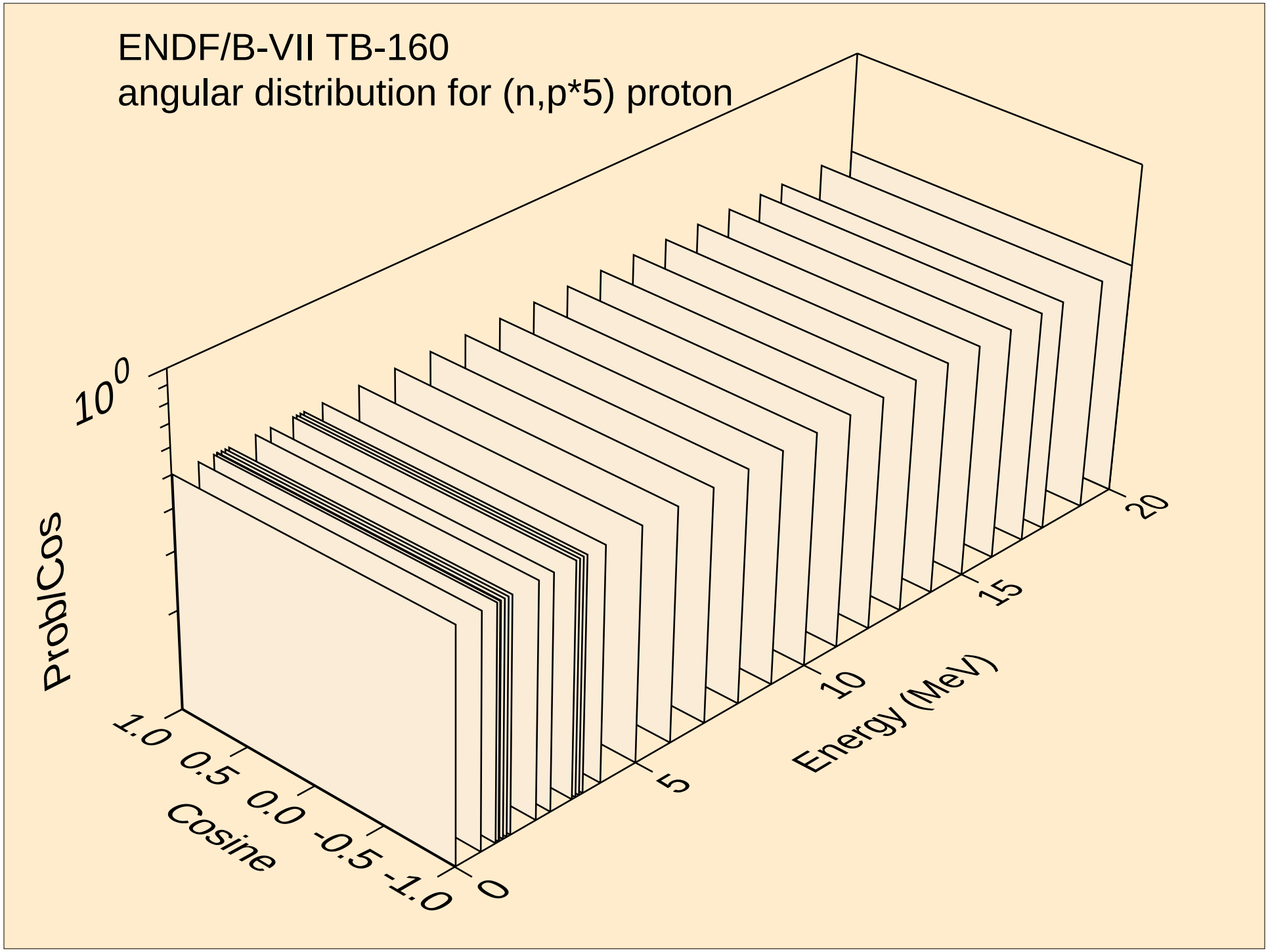

ENDF/B-VII TB-160
angular distribution for (n,p*0) proton
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

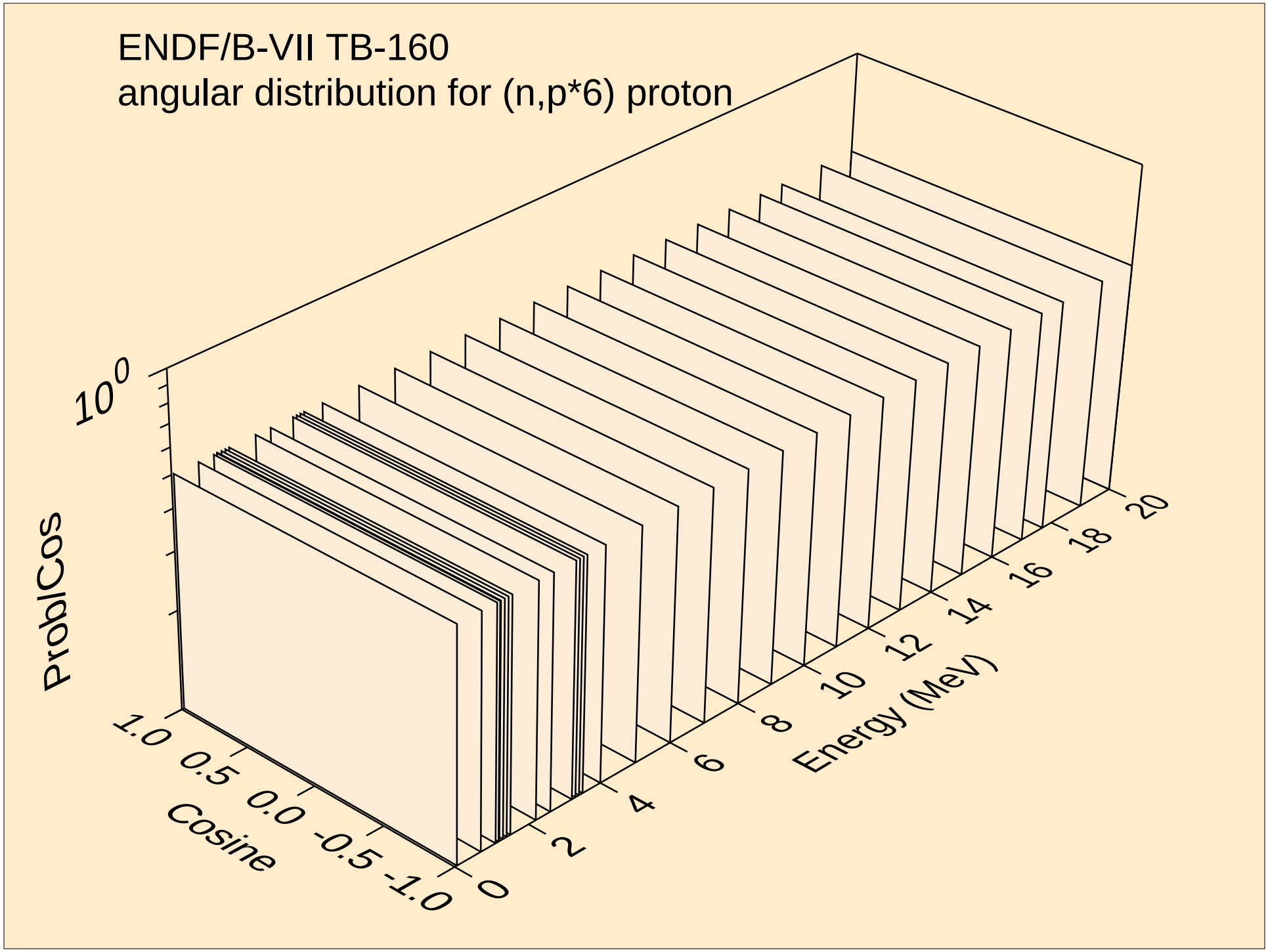

ENDF/B-VII TB-160
angular distribution for (n,p*1) proton
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

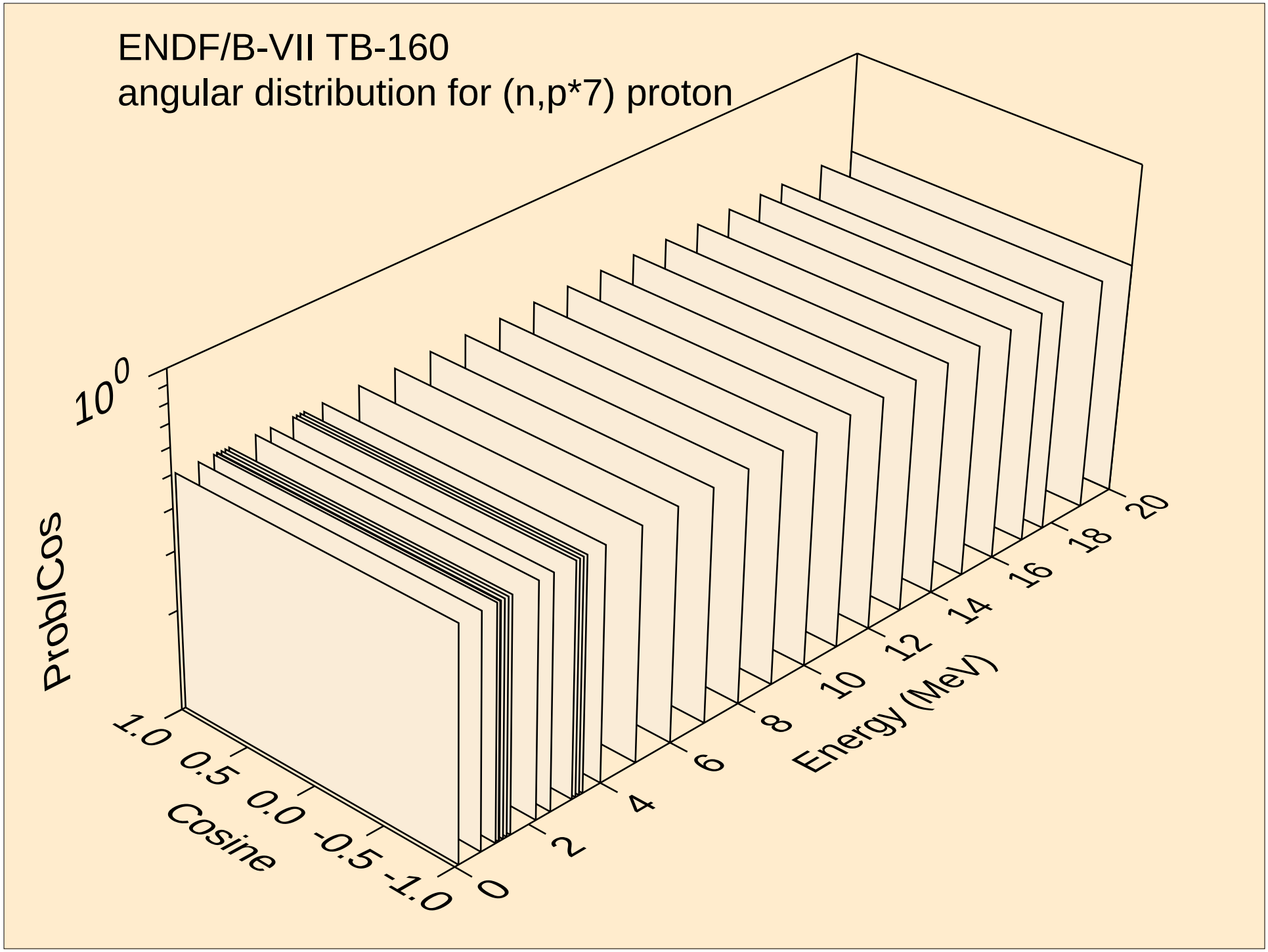

ENDF/B-VII TB-160
angular distribution for (n,p*2) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

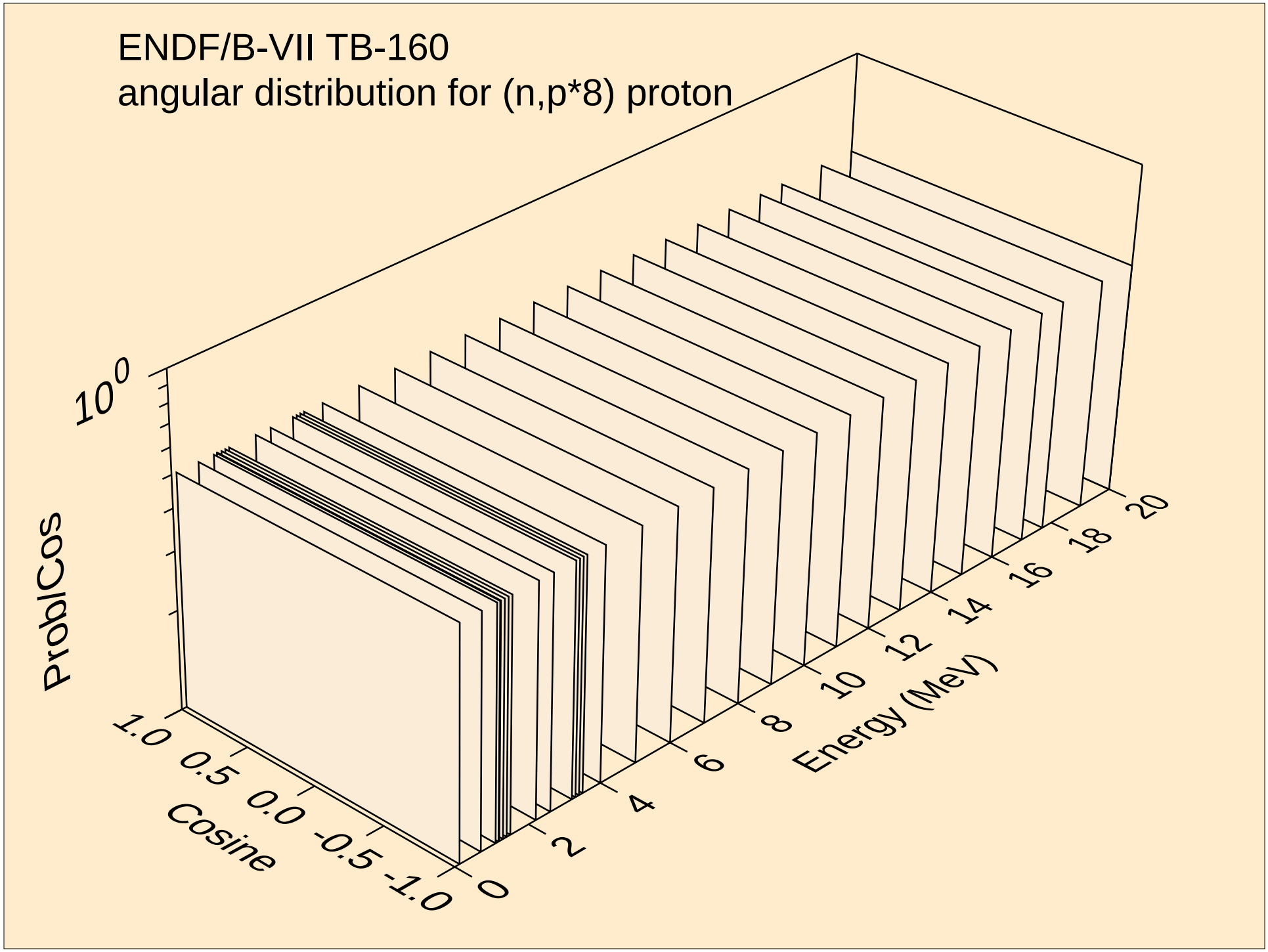

ENDF/B-VII TB-160
angular distribution for (n,p*3) proton
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

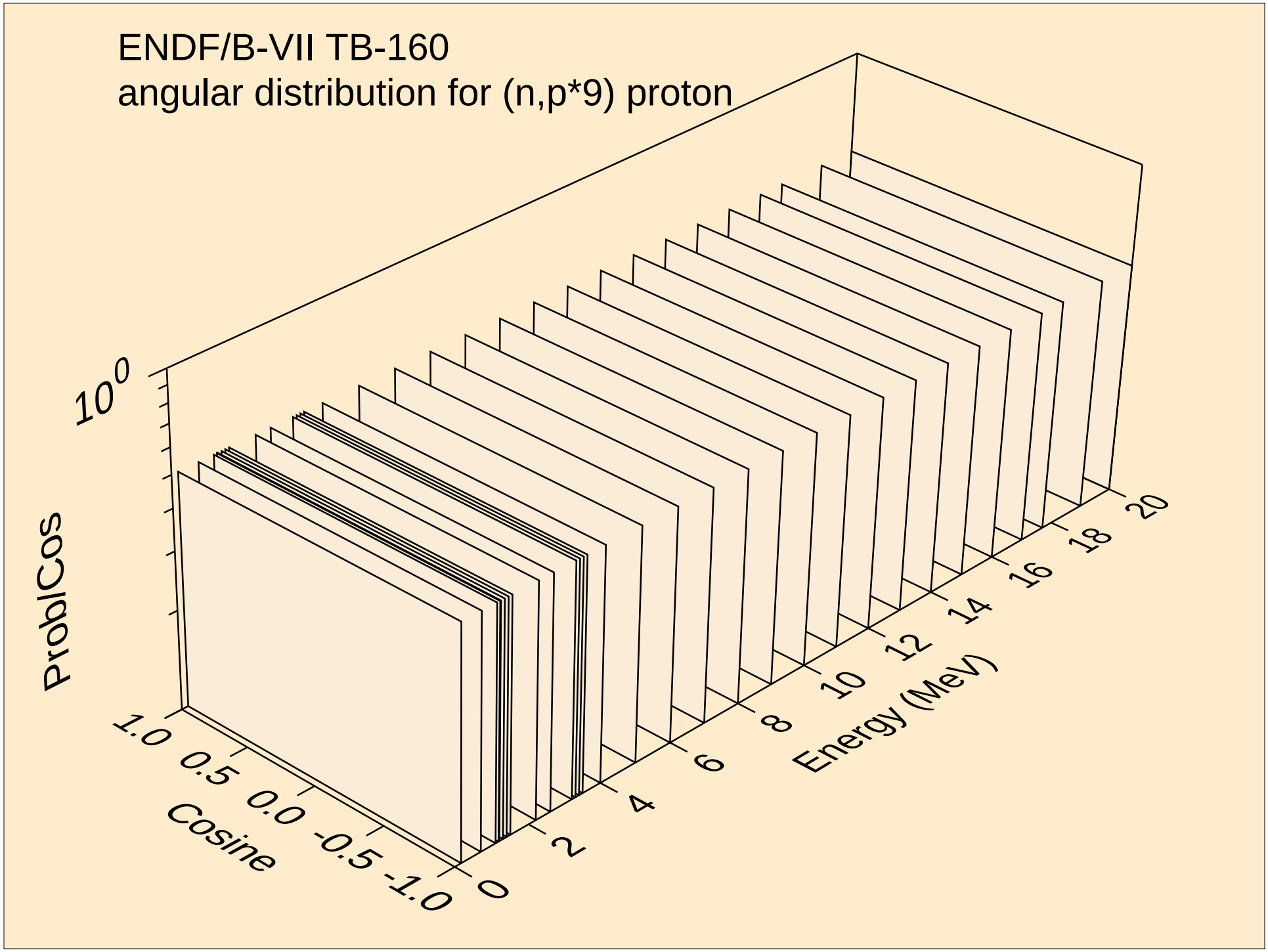

ENDF/B-VII TB-160
angular distribution for (n,p*4) proton
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

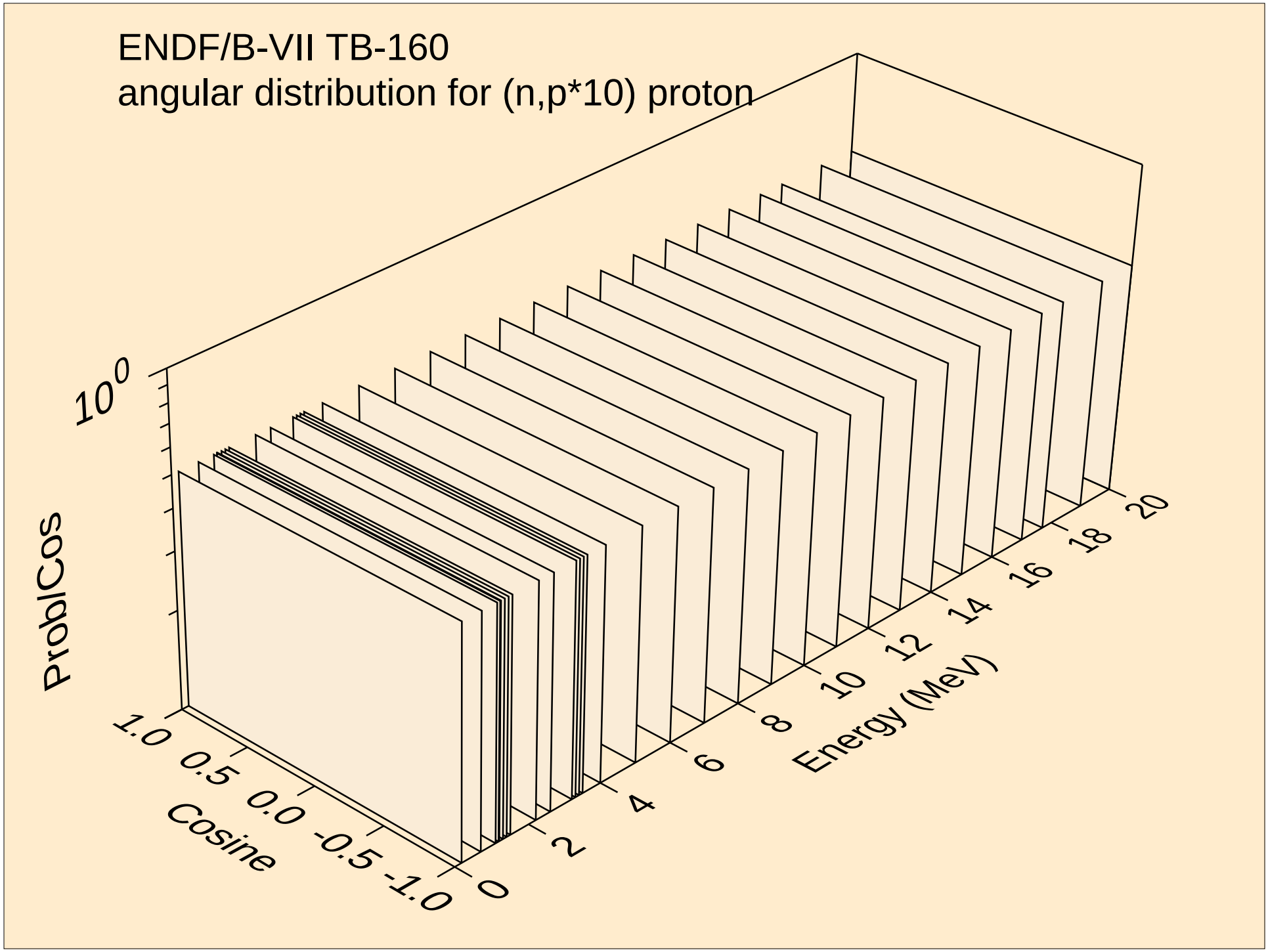

ENDF/B-VII TB-160
angular distribution for (n,p*5) proton
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

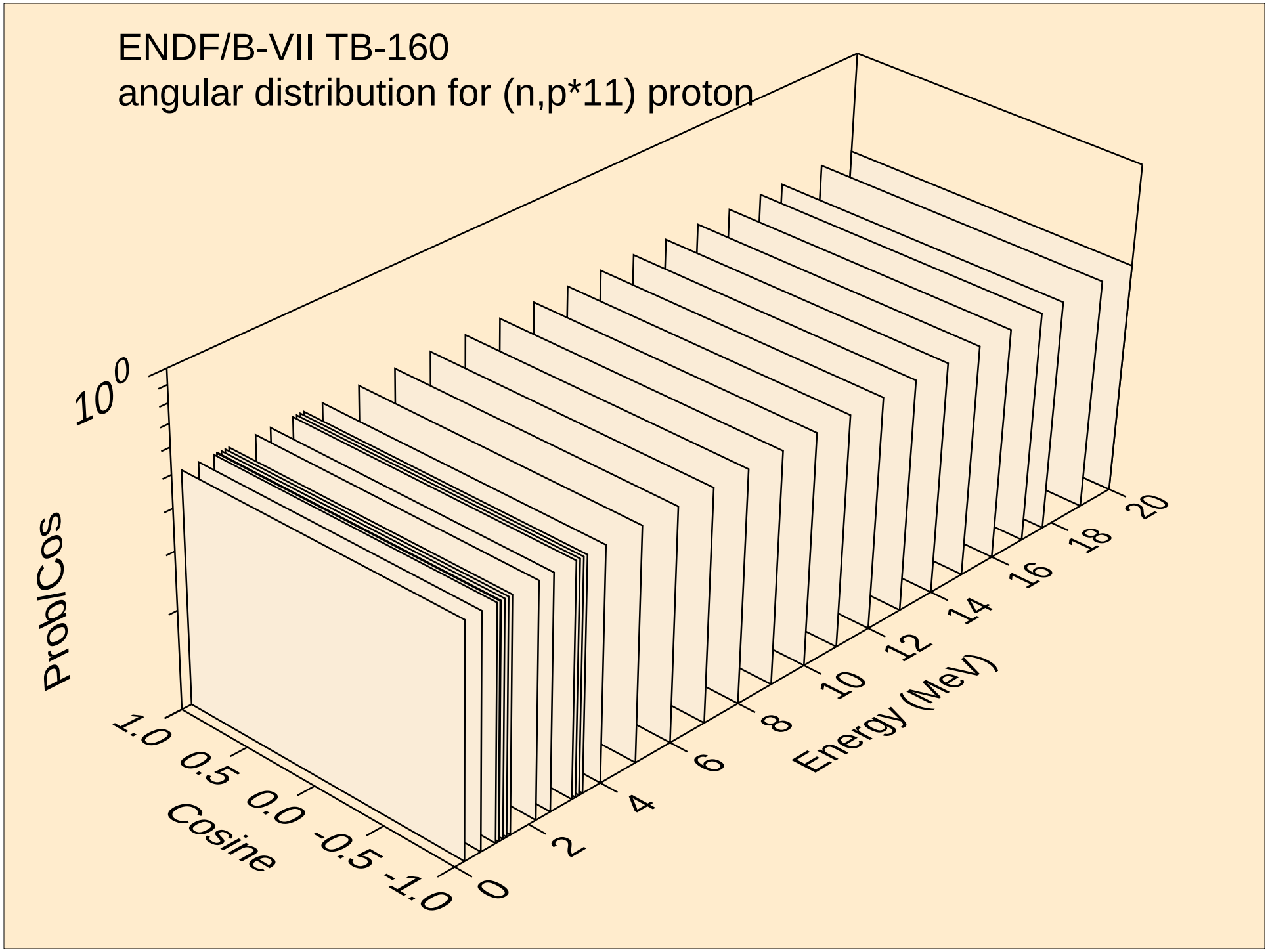

ENDF/B-VII TB-160
angular distribution for (n,p*6) proton
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

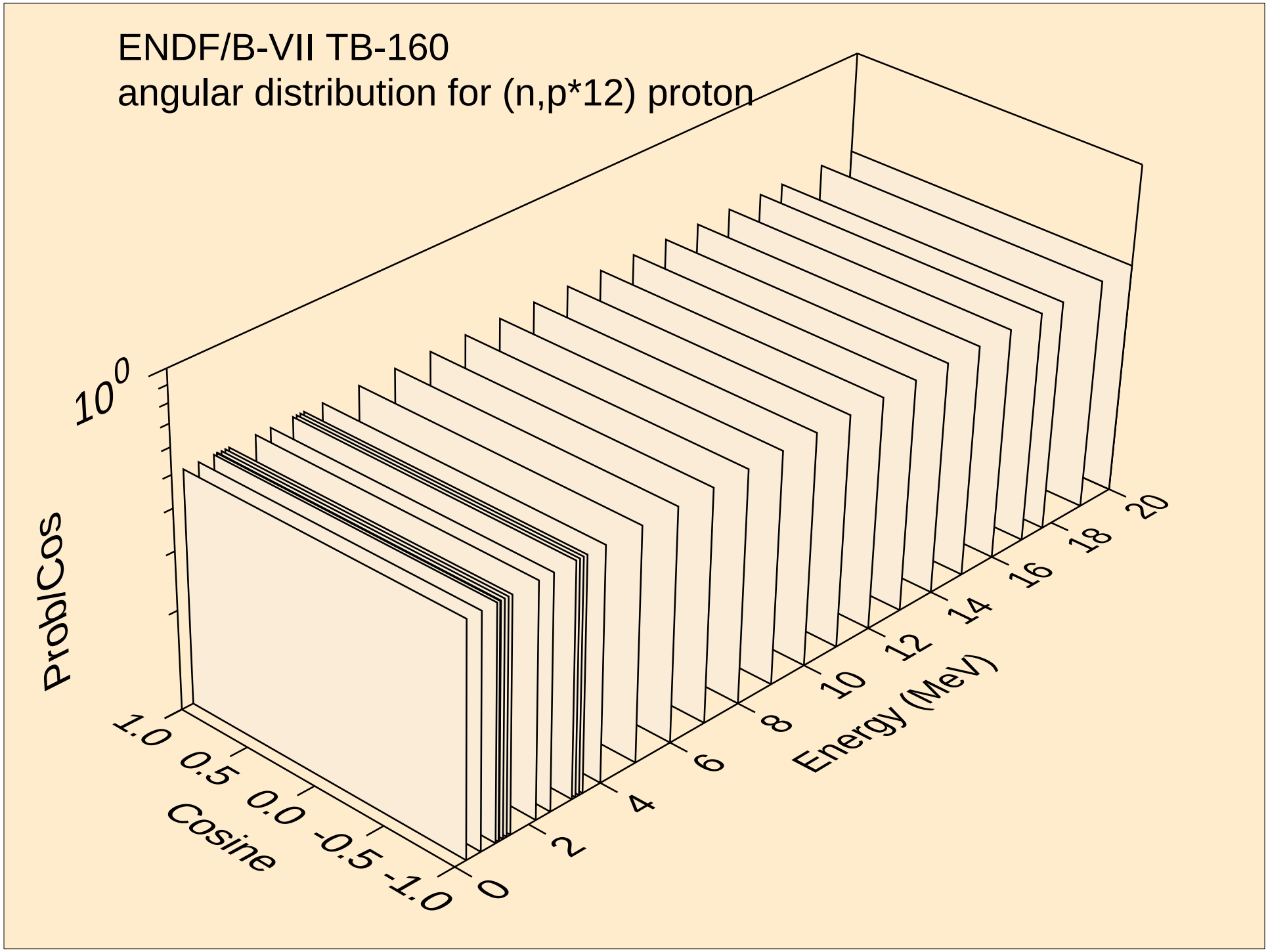

ENDF/B-VII TB-160
angular distribution for (n,p*7) proton
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

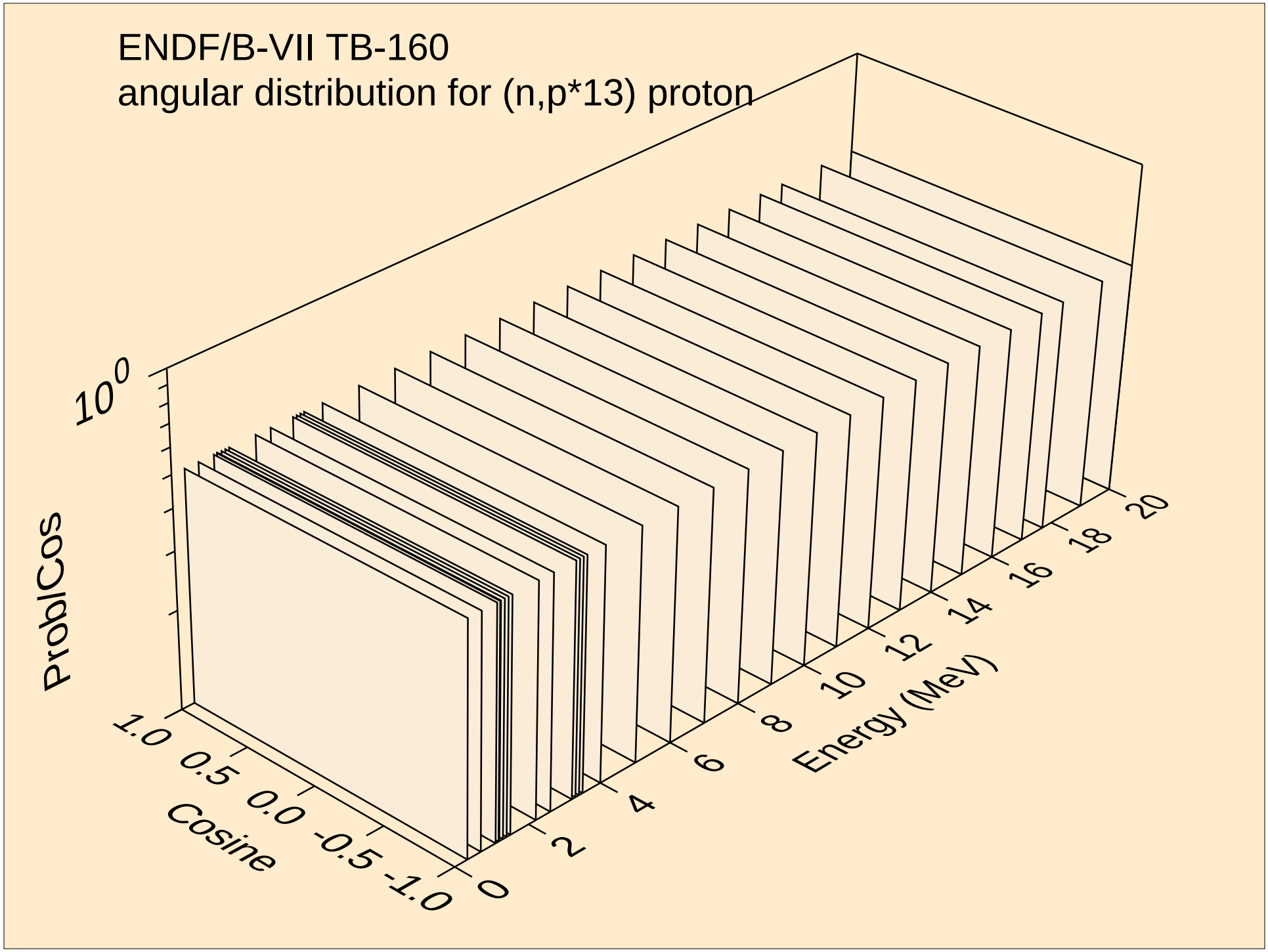

ENDF/B-VII TB-160
angular distribution for (n,p*8) proton
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

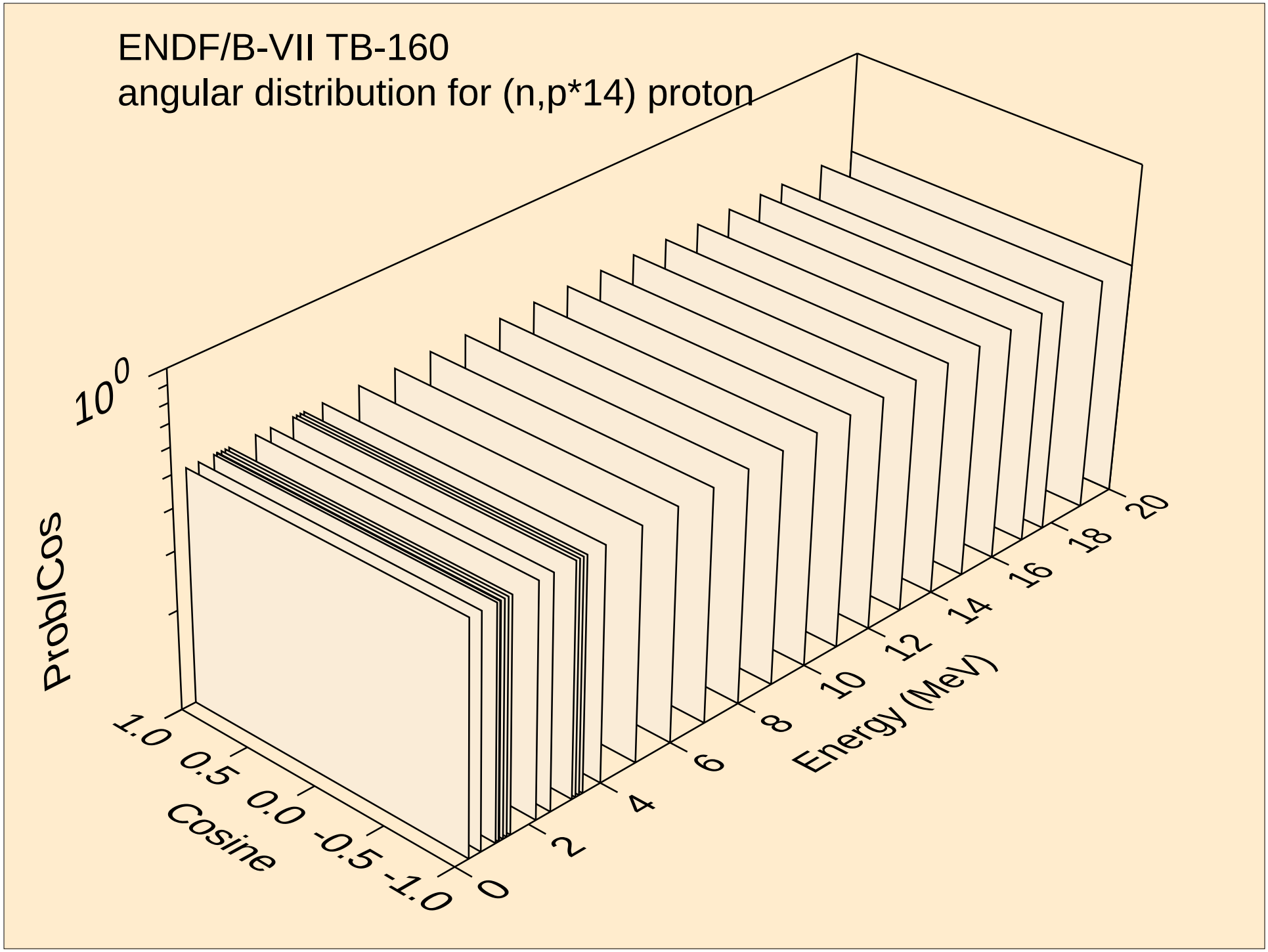

ENDF/B-VII TB-160
angular distribution for (n,p*9) proton
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

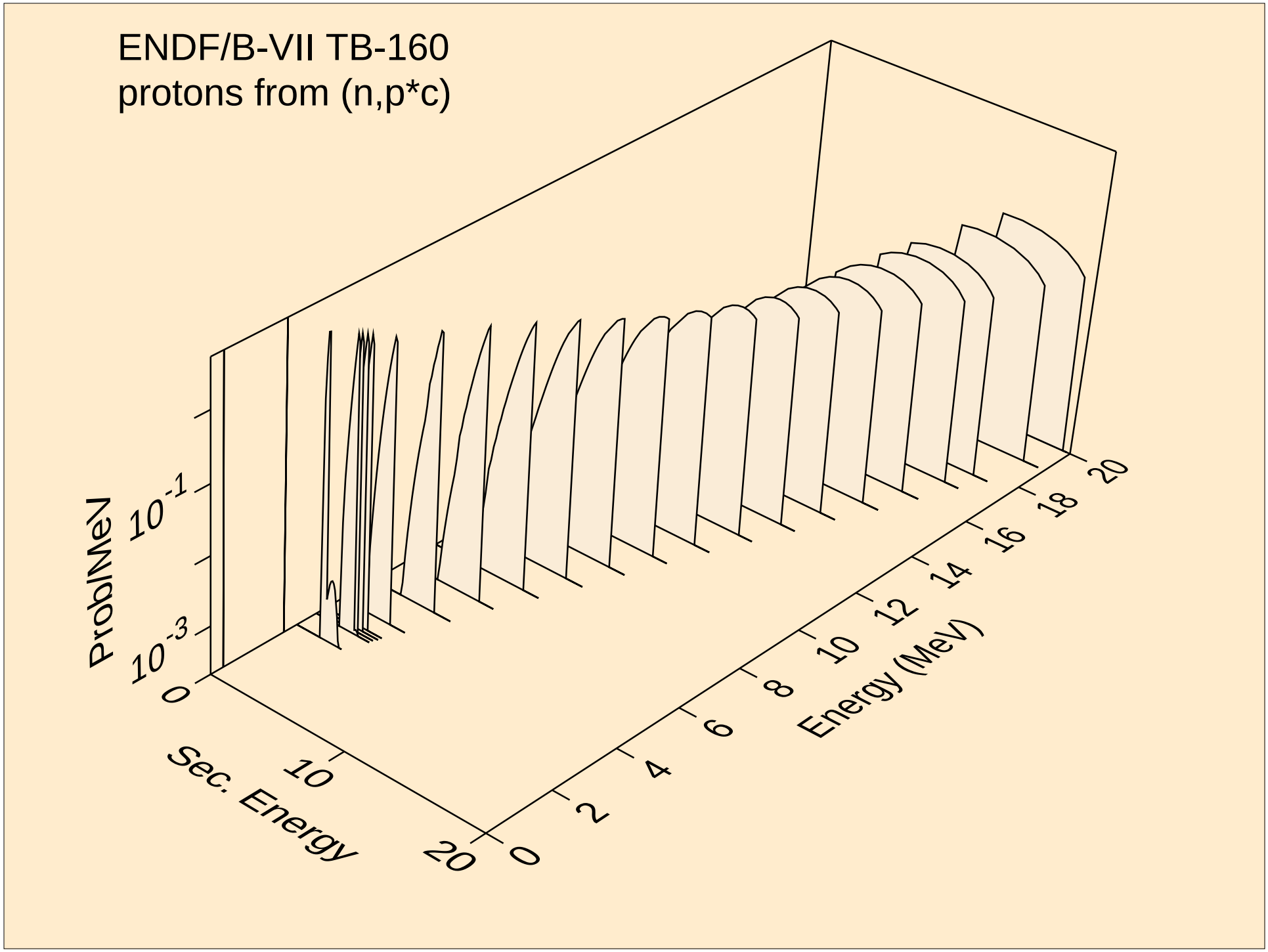

ENDF/B-VII TB-160
angular distribution for (n,p*10) proton
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

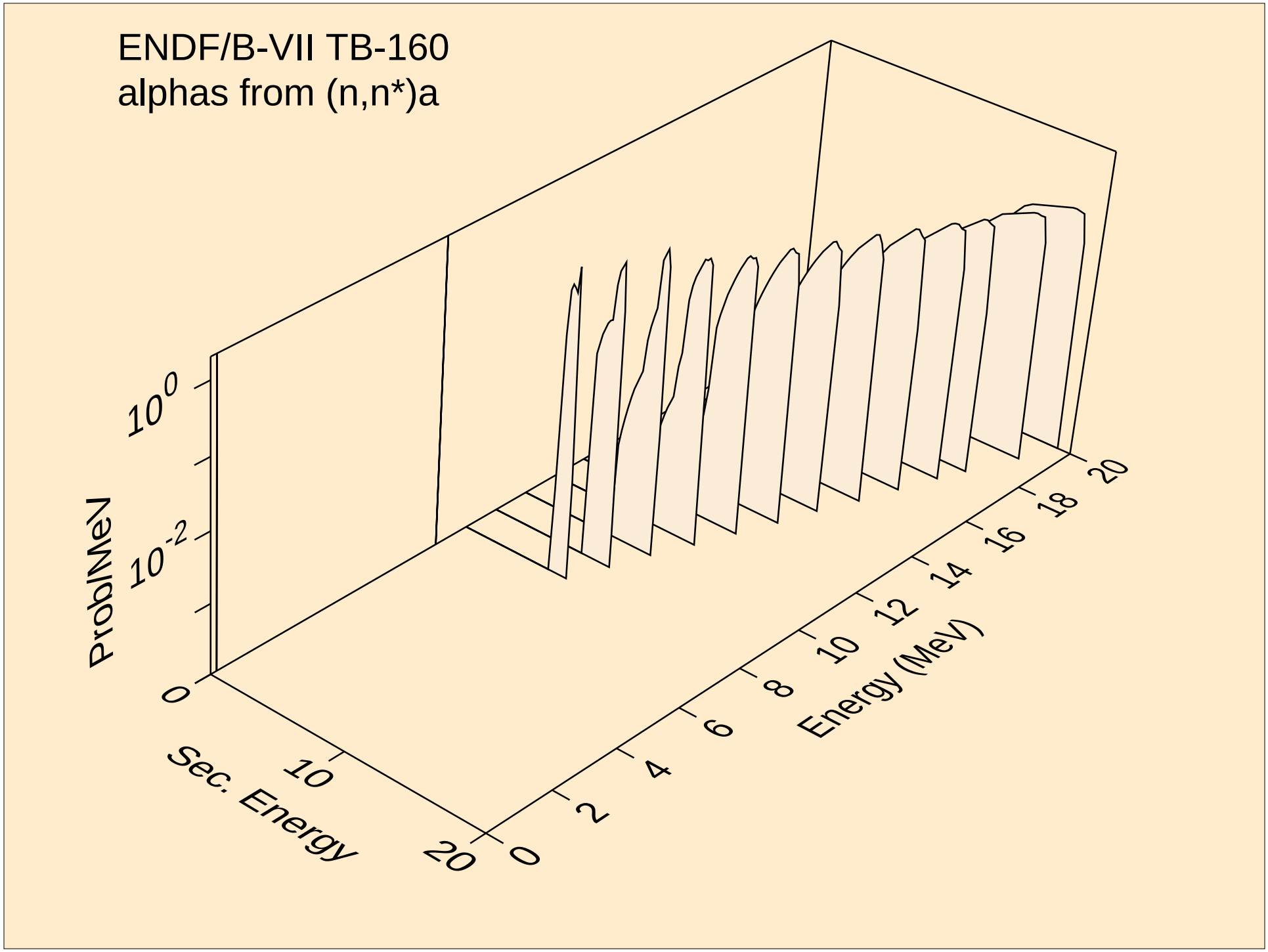

ENDF/B-VII TB-160
angular distribution for (n,p*11) proton
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

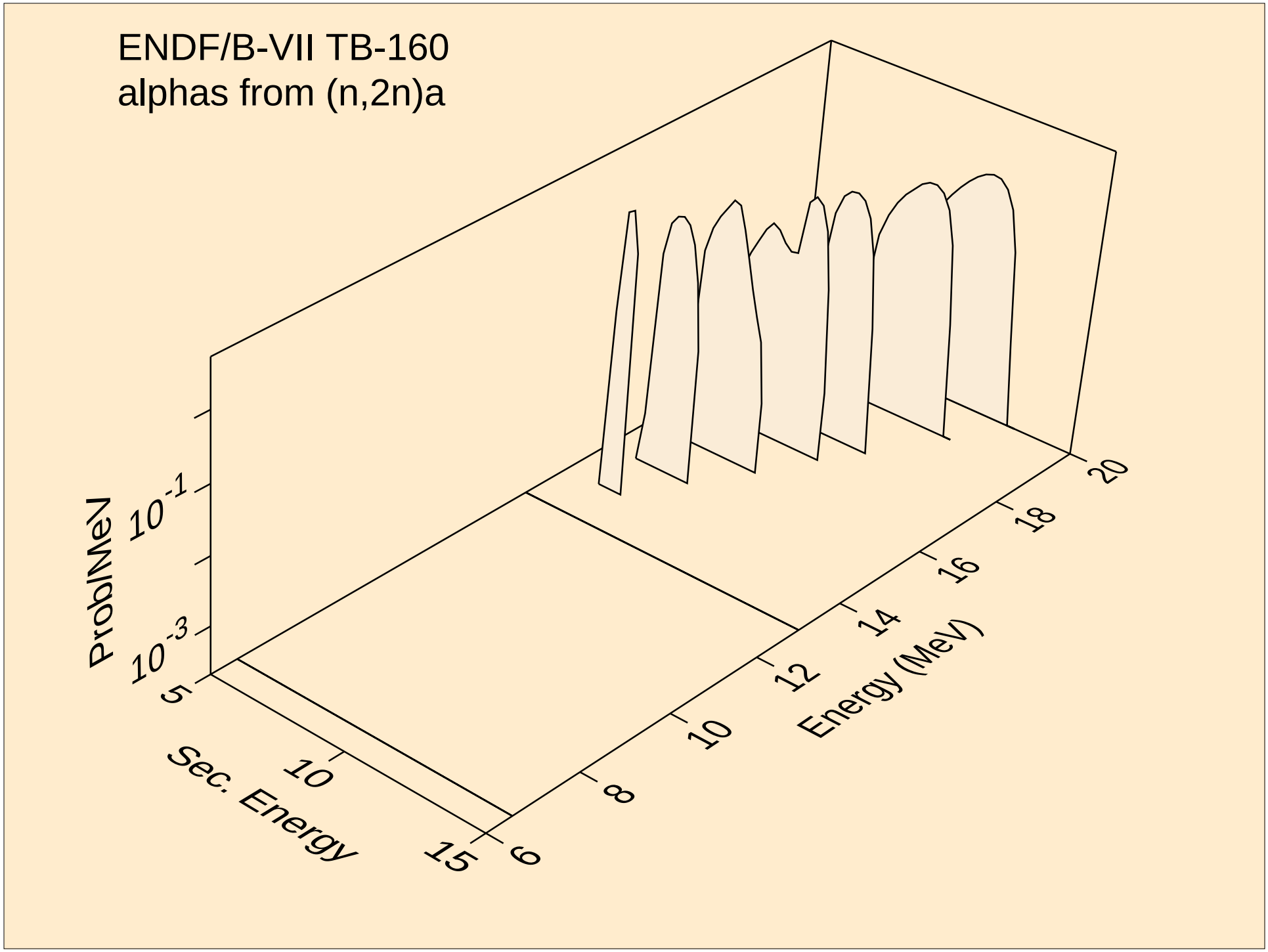

ENDF/B-VII TB-160
angular distribution for (n,p*12) proton
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

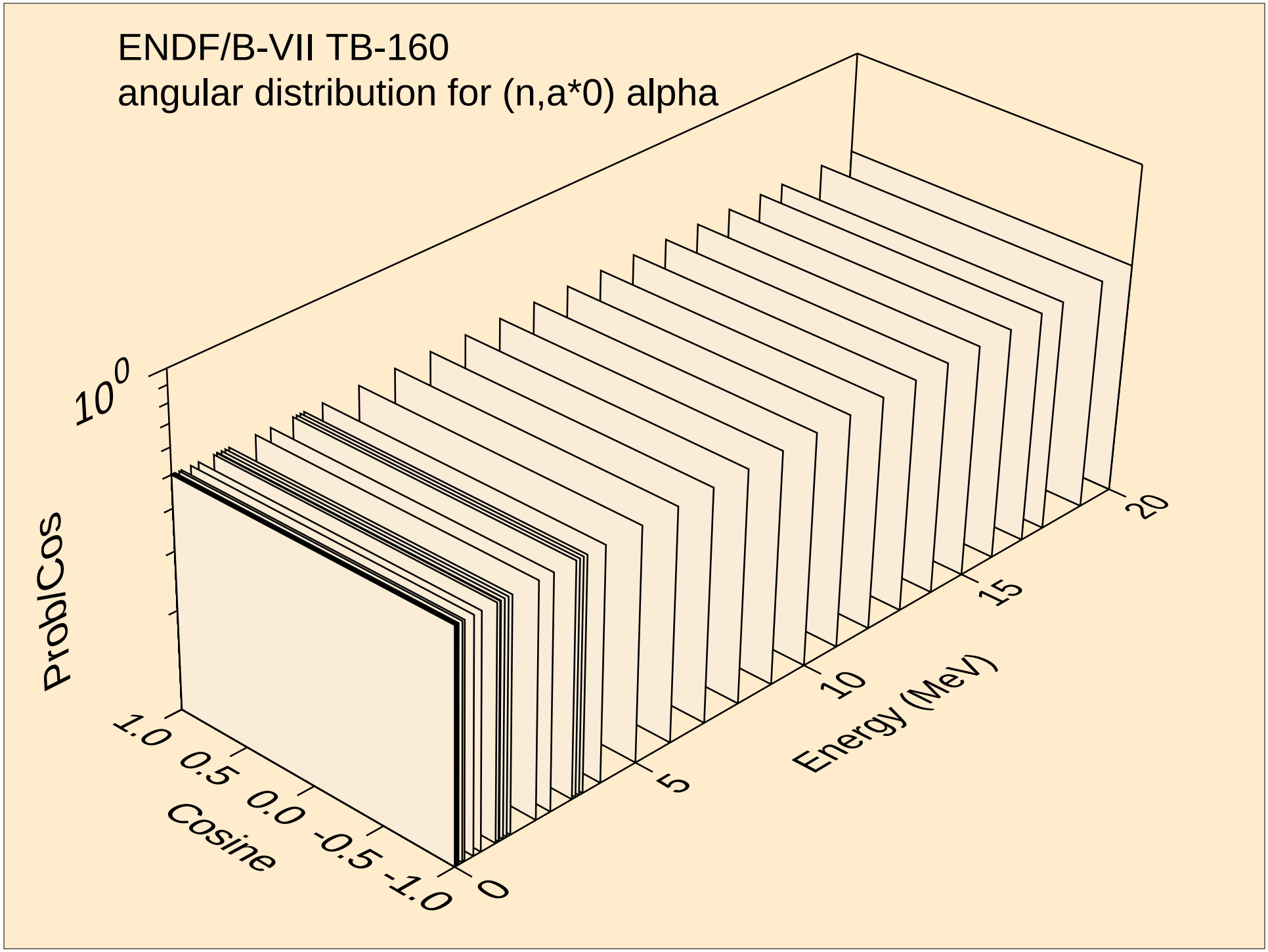

ENDF/B-VII TB-160
angular distribution for (n,p*13) proton
10^0
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

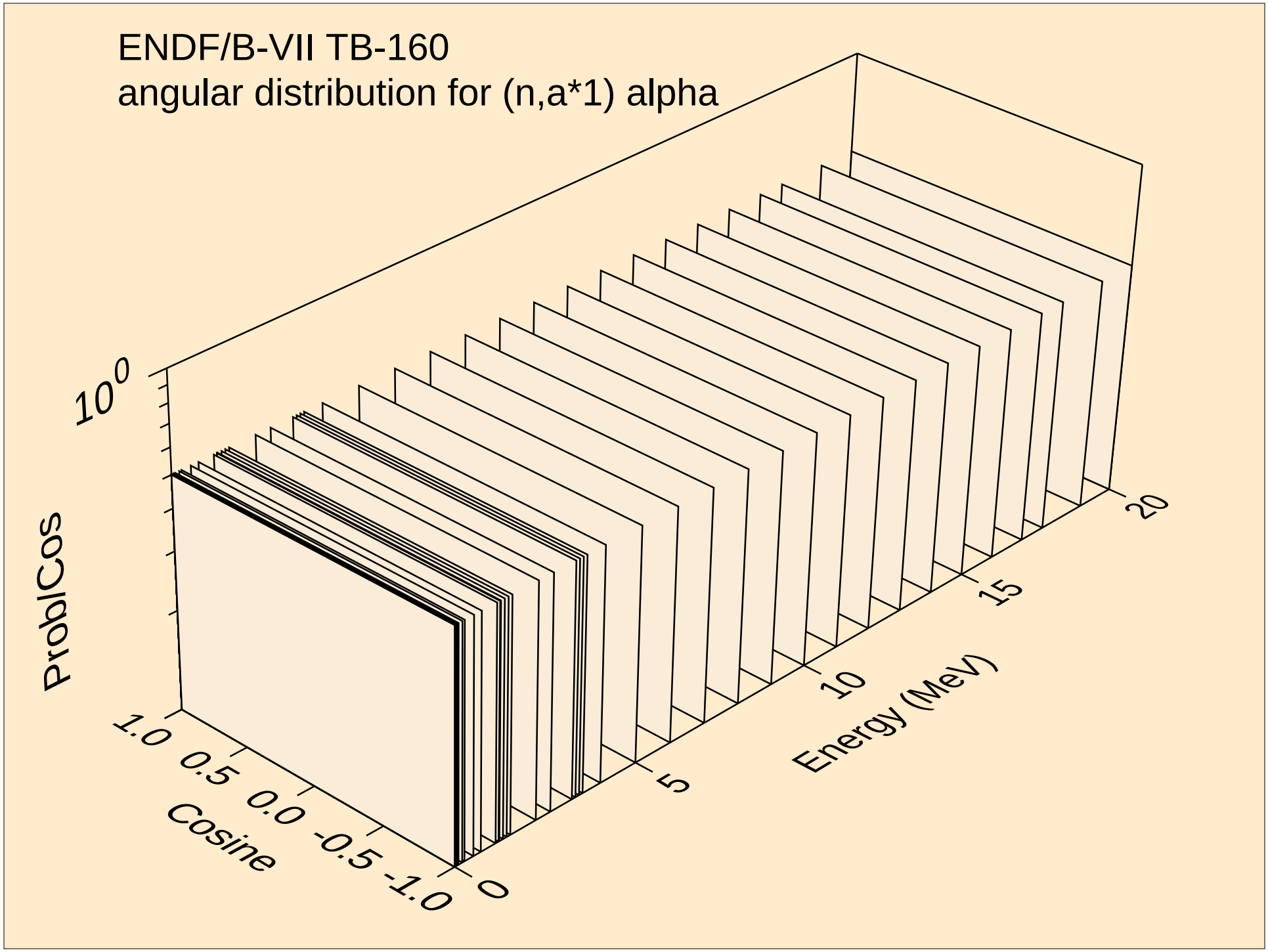

ENDF/B-VII TB-160
angular distribution for (n,p*14) proton
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

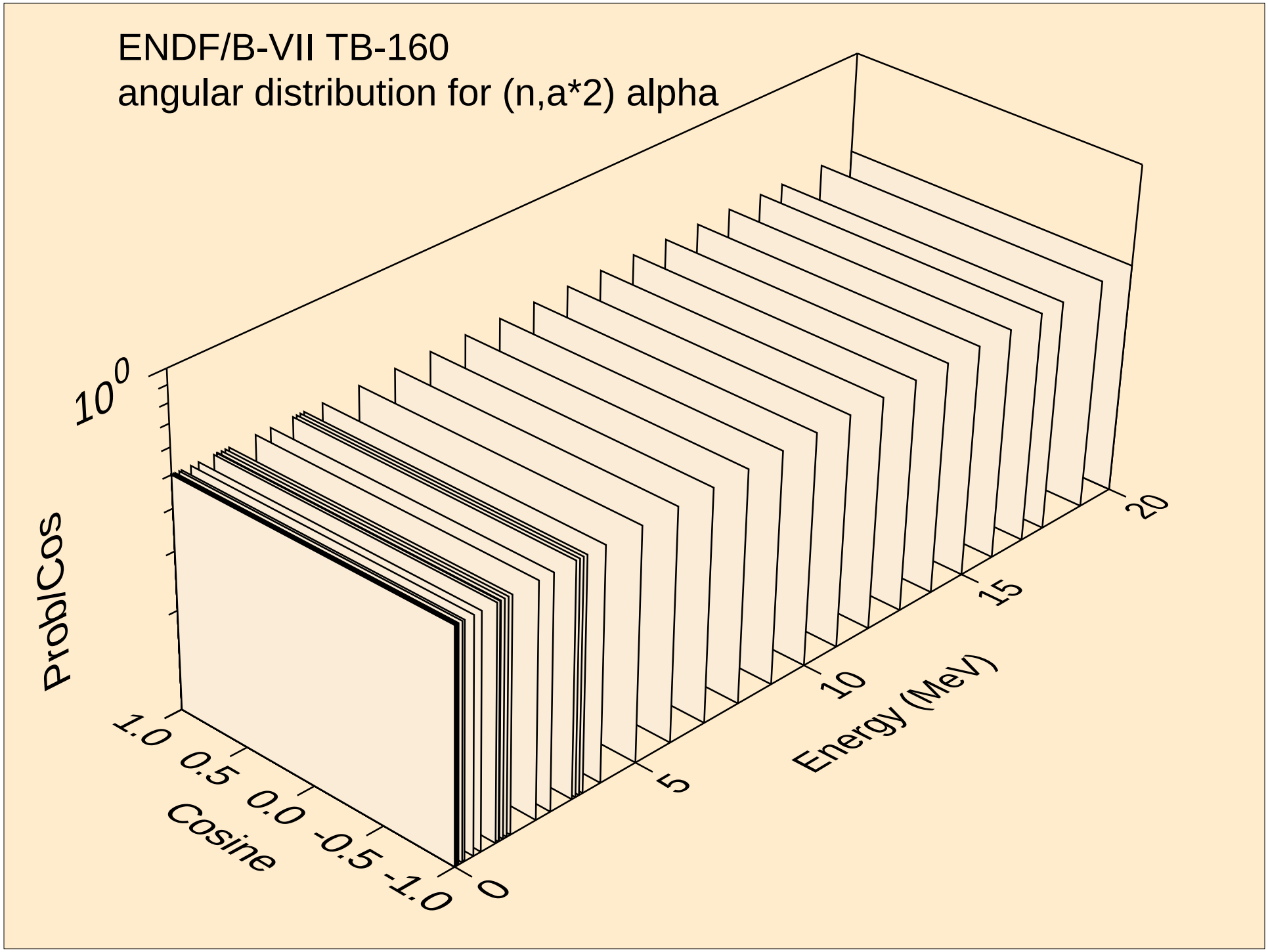

ENDF/B-VII TB-160
protons from (n,p*c)
Prob/MeV
10^{-1}
10^{-3}
0
10
20
Sec. Energy
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

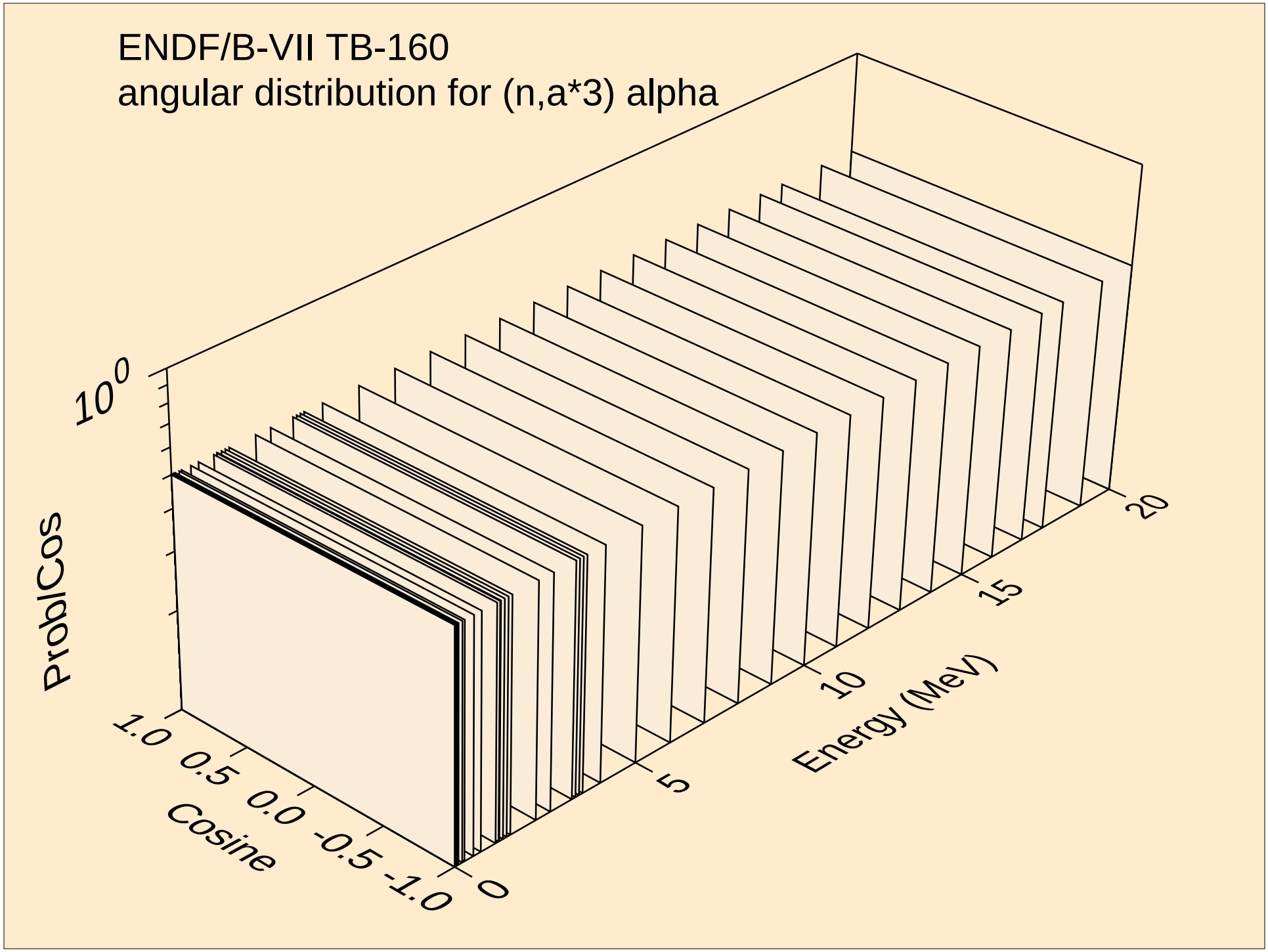

ENDF/B-VII TB-160
alphas from (n,n*)a
Prob/MeV
10^0
10^{-2}
0
10
20
Sec. Energy
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

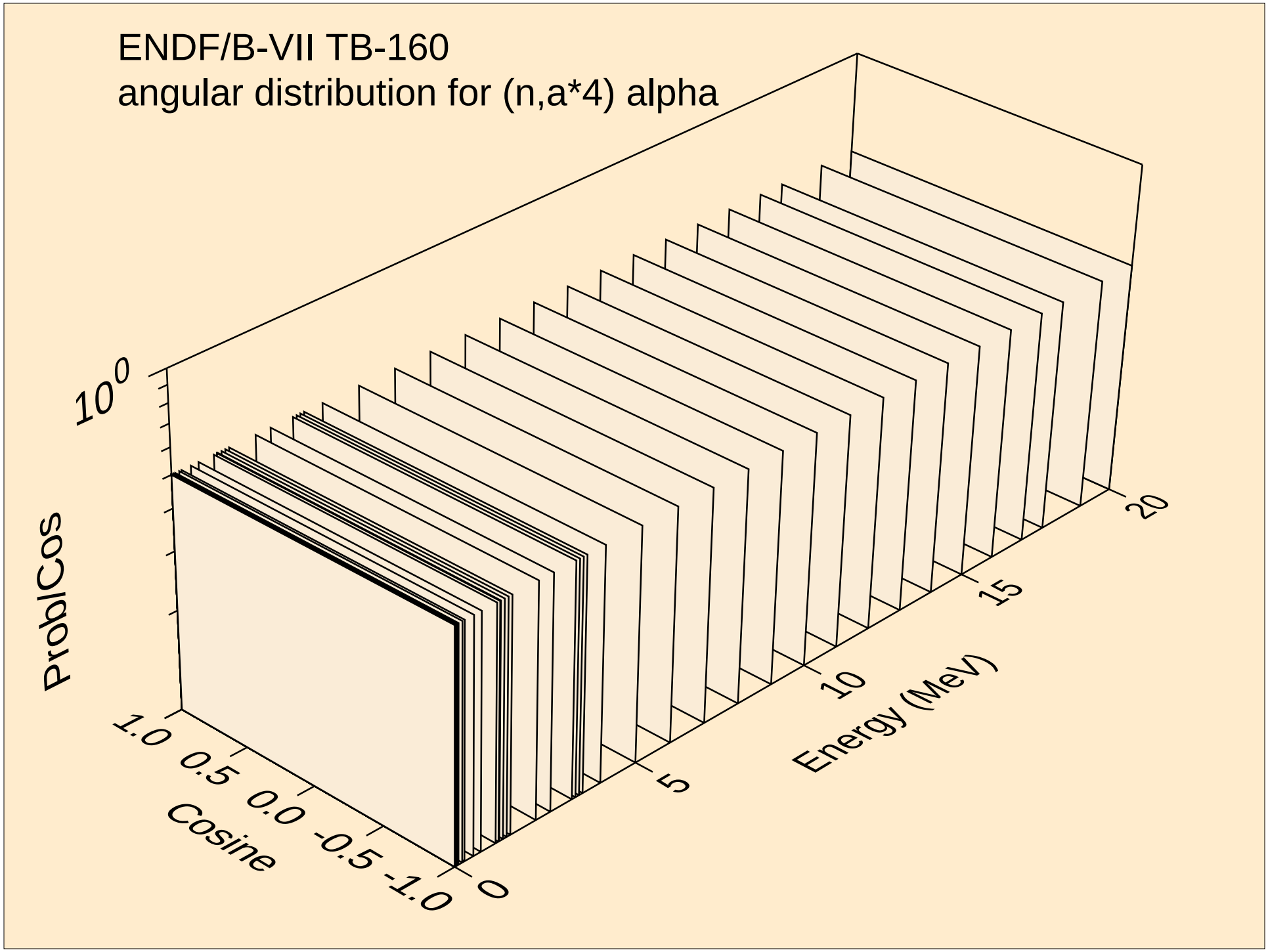

ENDF/B-VII TB-160
alphas from (n,2n)a
Prob/MeV
10^-1
10^-3
5
10
15
Sec. Energy
6
8
10
12
14
16
18
20
Energy (MeV)

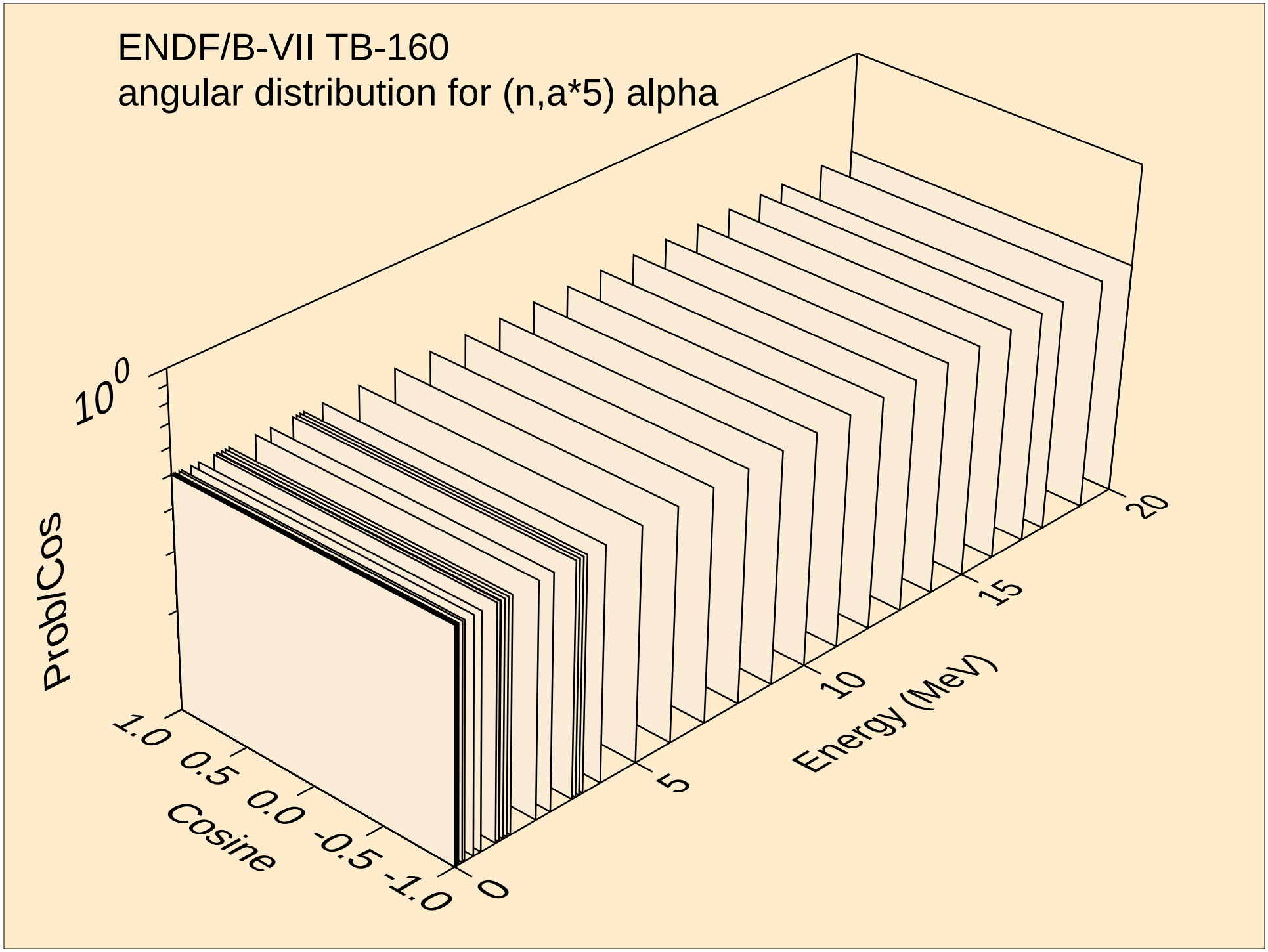

ENDF/B-VII TB-160
angular distribution for (n,a*0) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

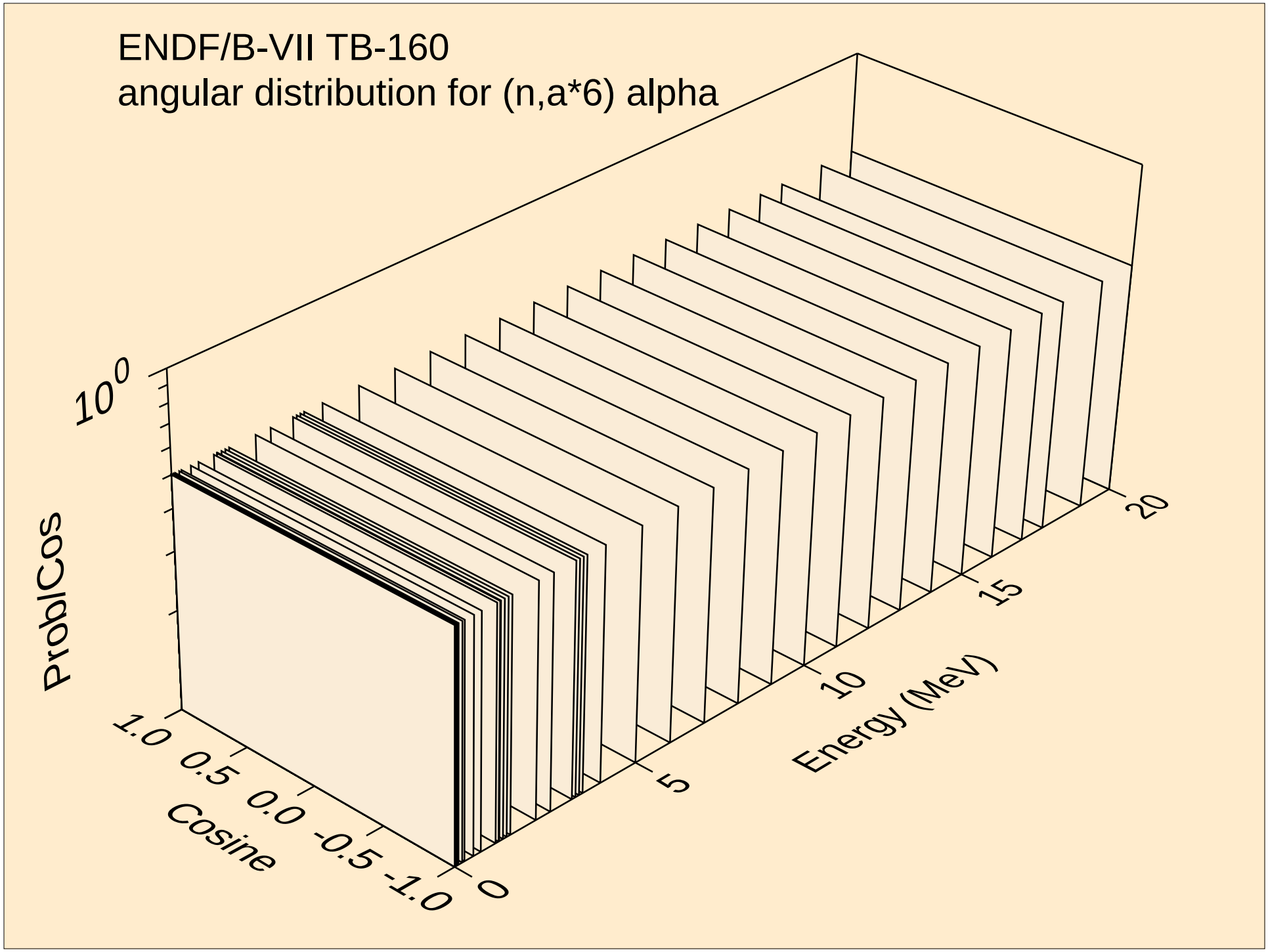

ENDF/B-VII TB-160
angular distribution for (n,a*1) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

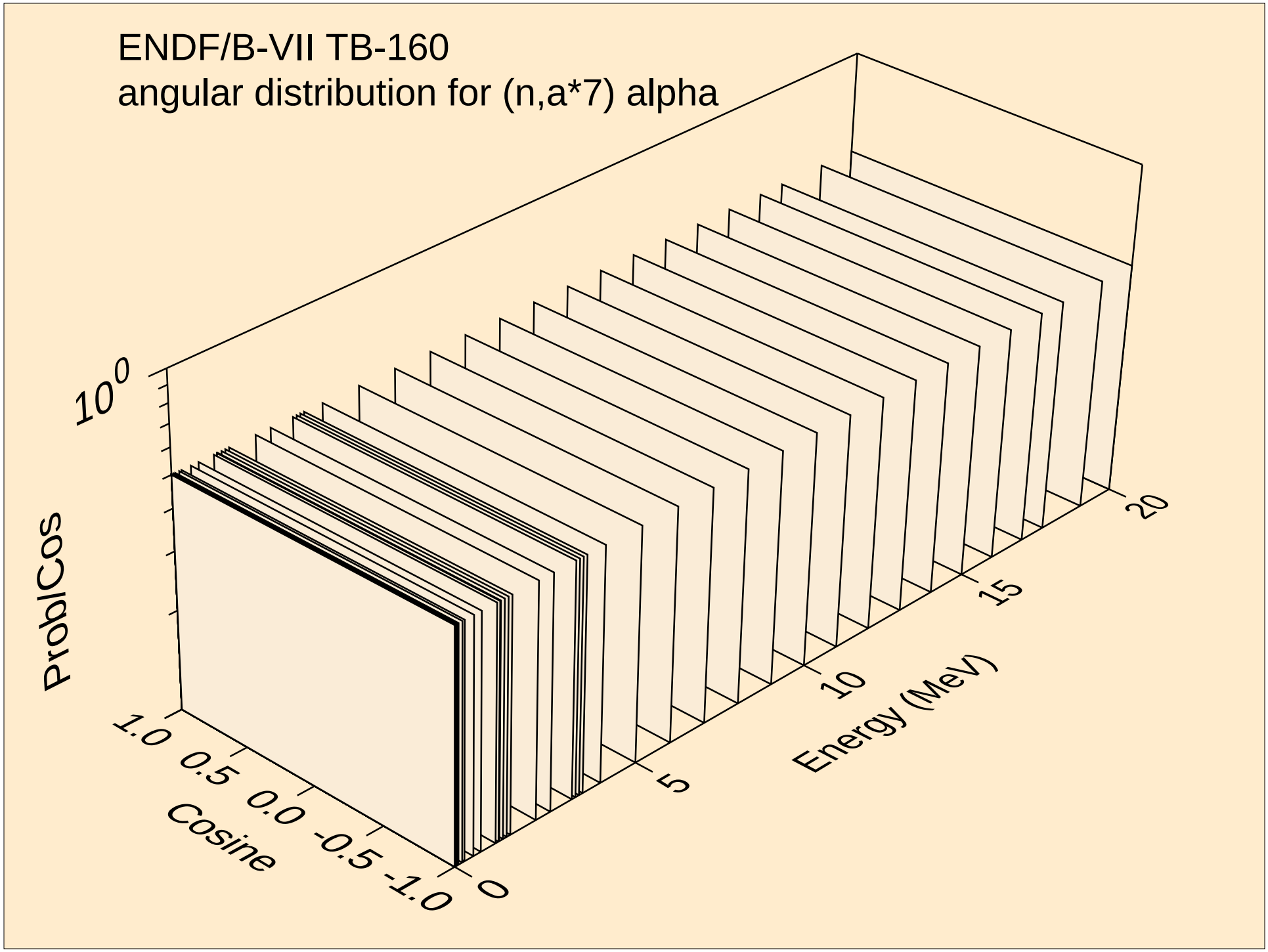

ENDF/B-VII TB-160
angular distribution for (n,a*2) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

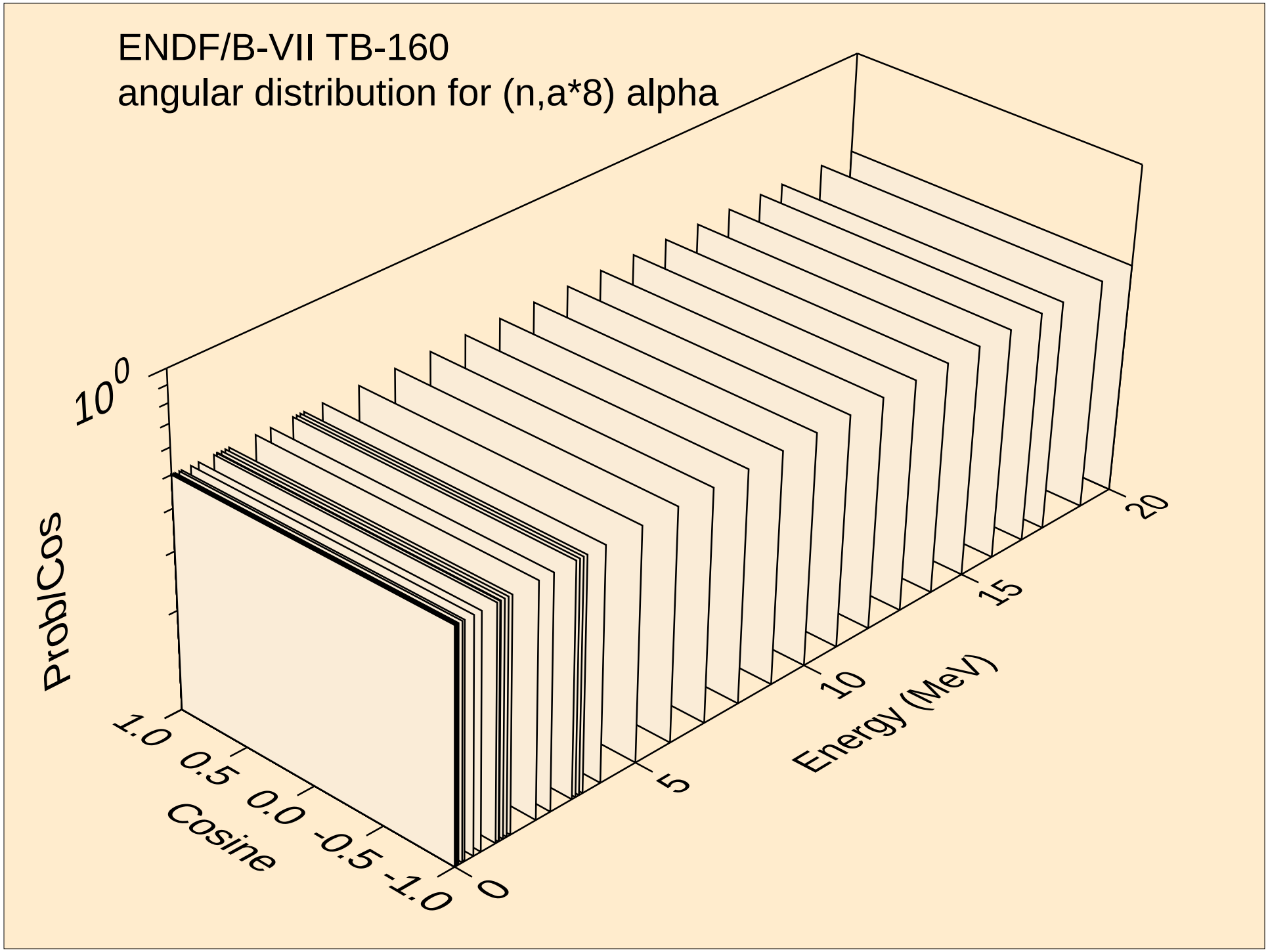

ENDF/B-VII TB-160
angular distribution for (n,a*3) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

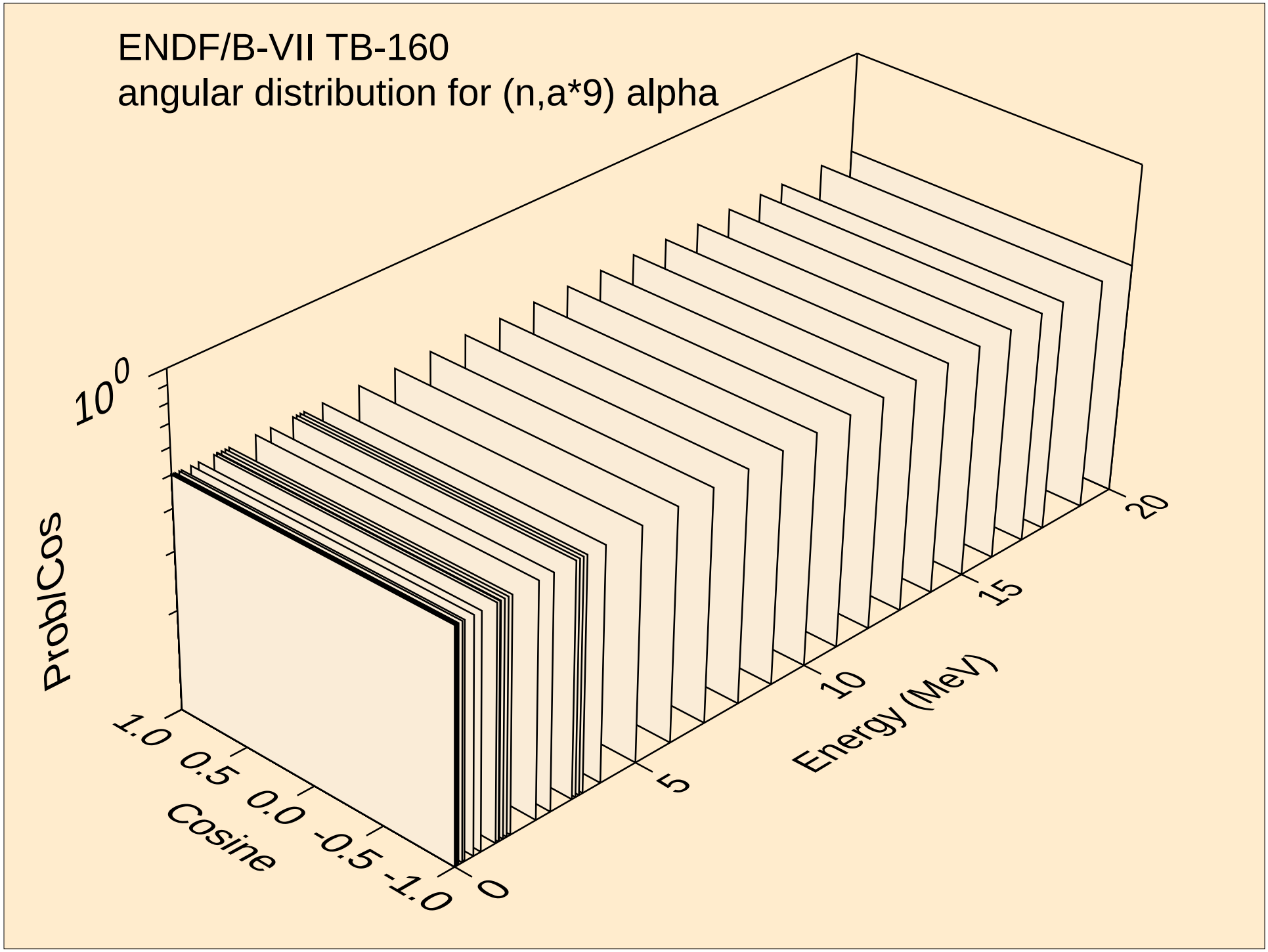

ENDF/B-VII TB-160
angular distribution for (n,a*4) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

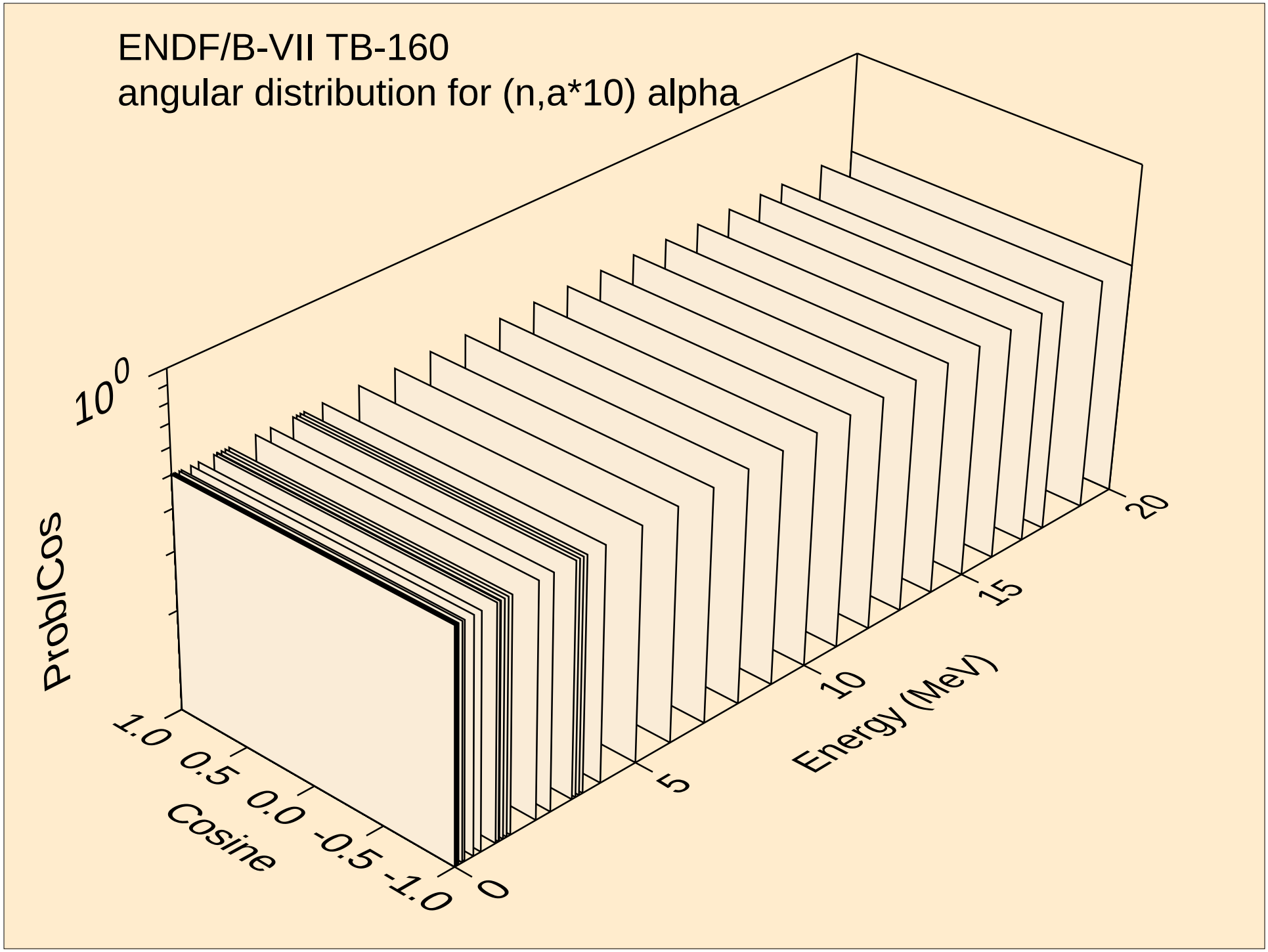

ENDF/B-VII TB-160
angular distribution for (n,a*5) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

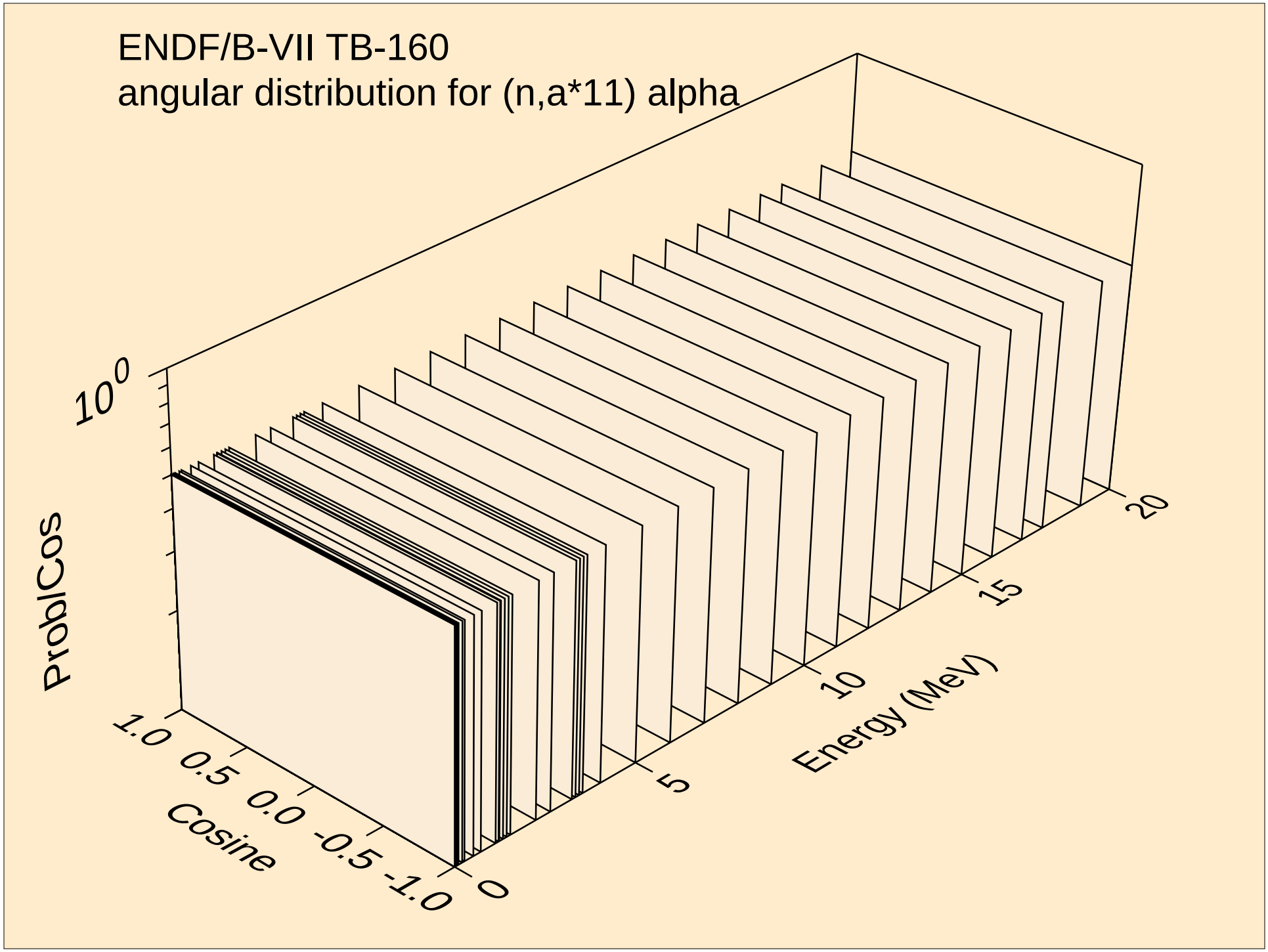

ENDF/B-VII TB-160
angular distribution for (n,a*6) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

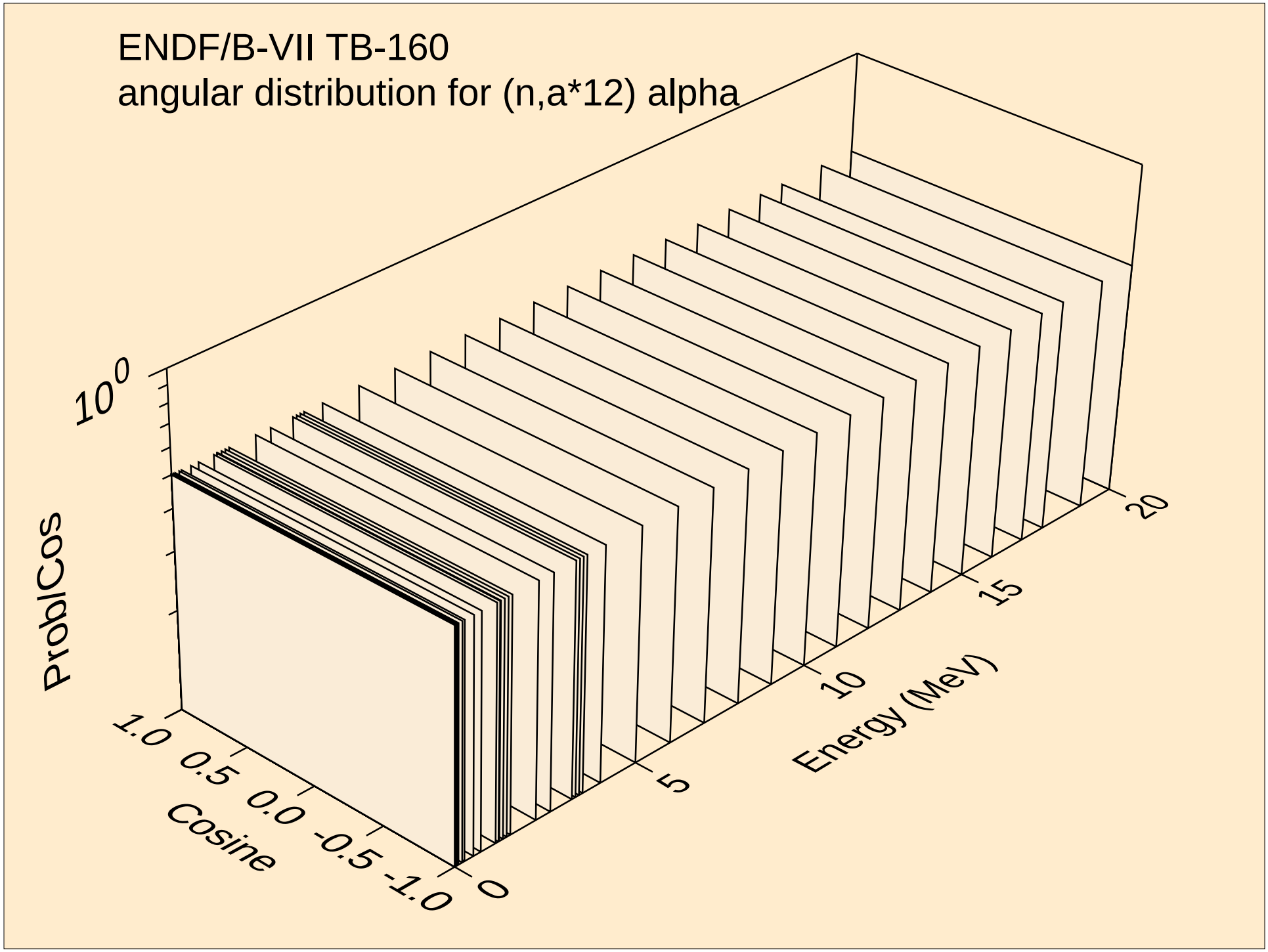

ENDF/B-VII TB-160
angular distribution for (n,a*7) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

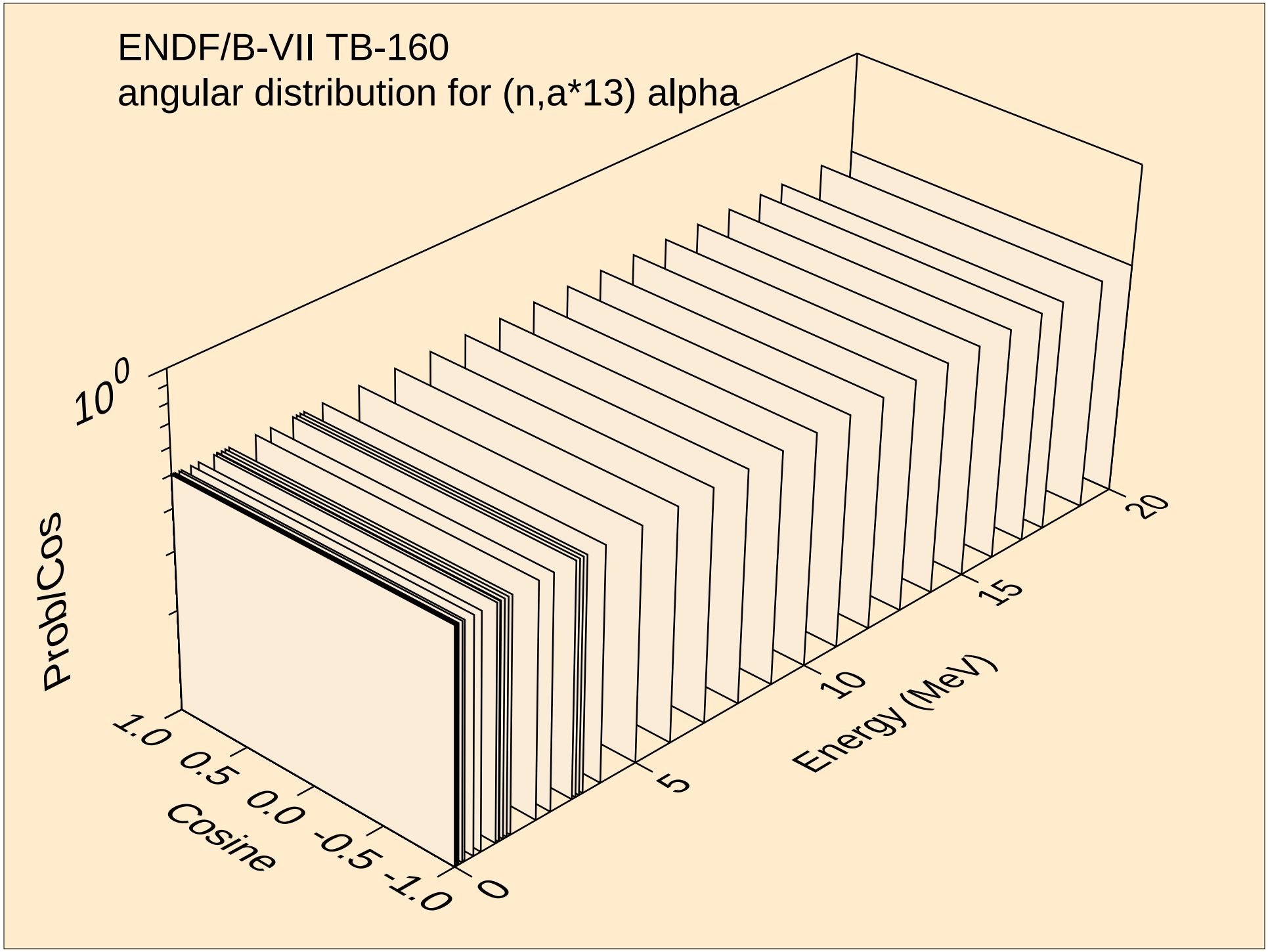

ENDF/B-VII TB-160
angular distribution for (n,a*8) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

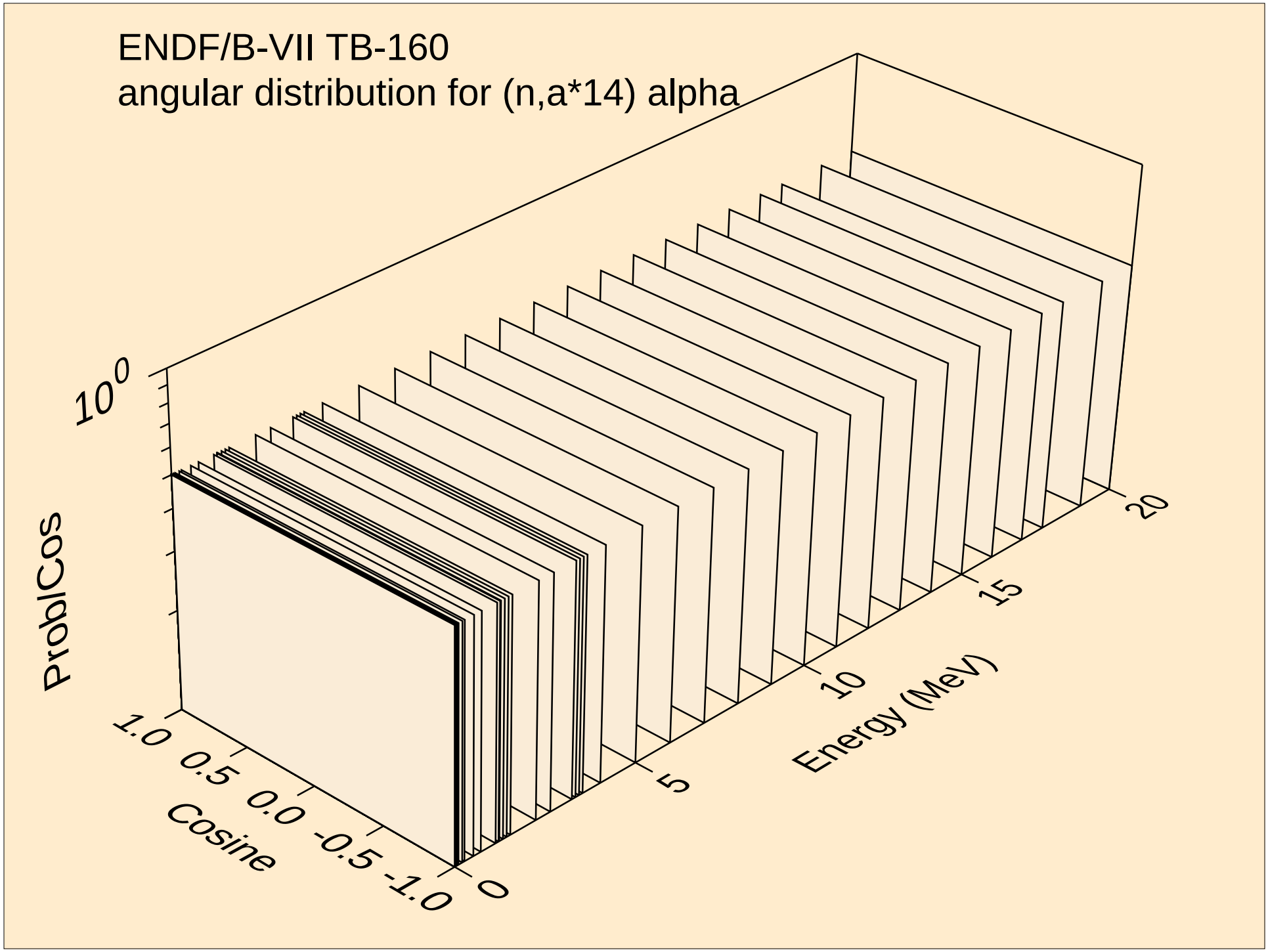

ENDF/B-VII TB-160
angular distribution for (n,a*9) alpha
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

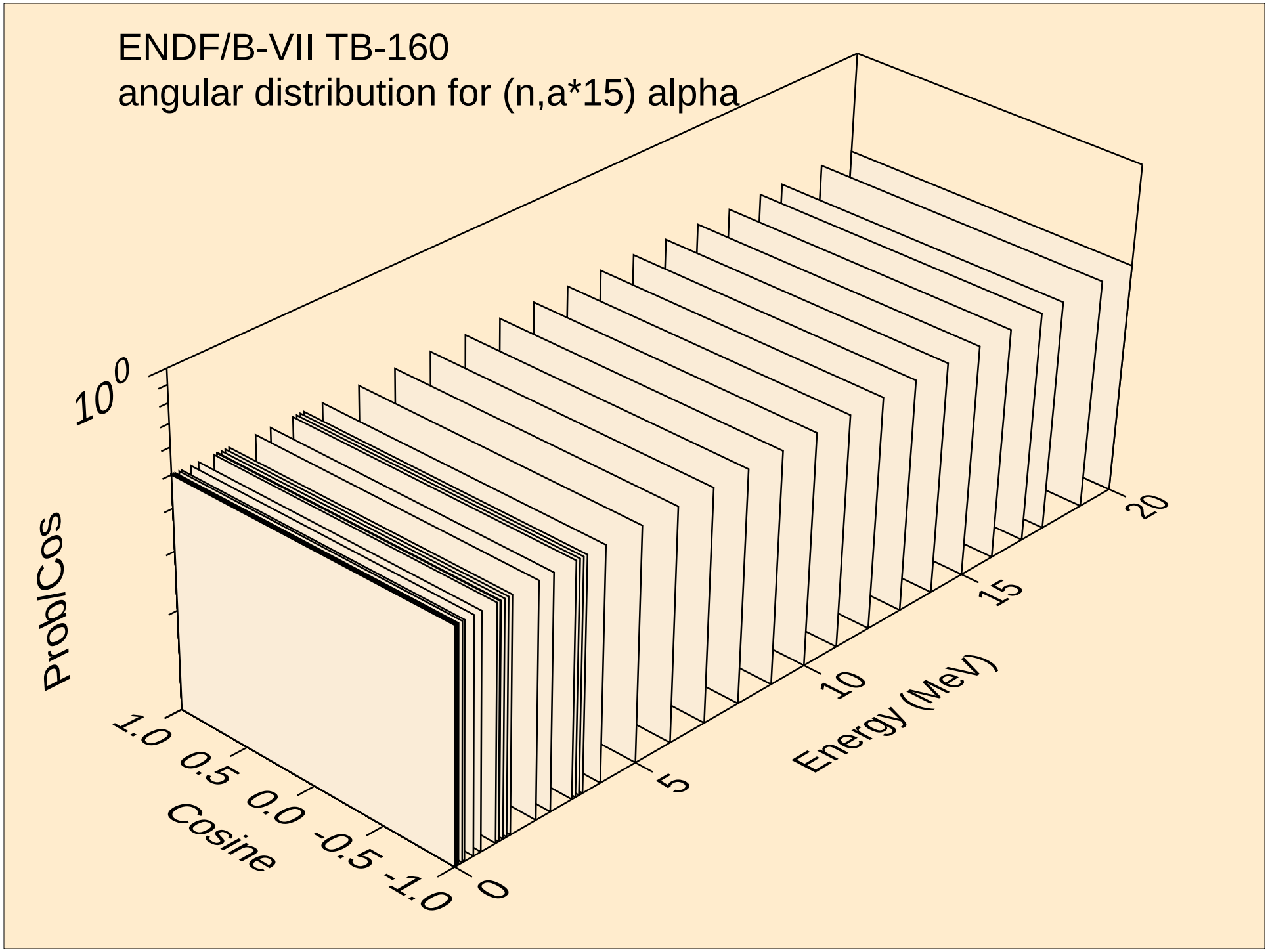

ENDF/B-VII TB-160
angular distribution for (n,a*10) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

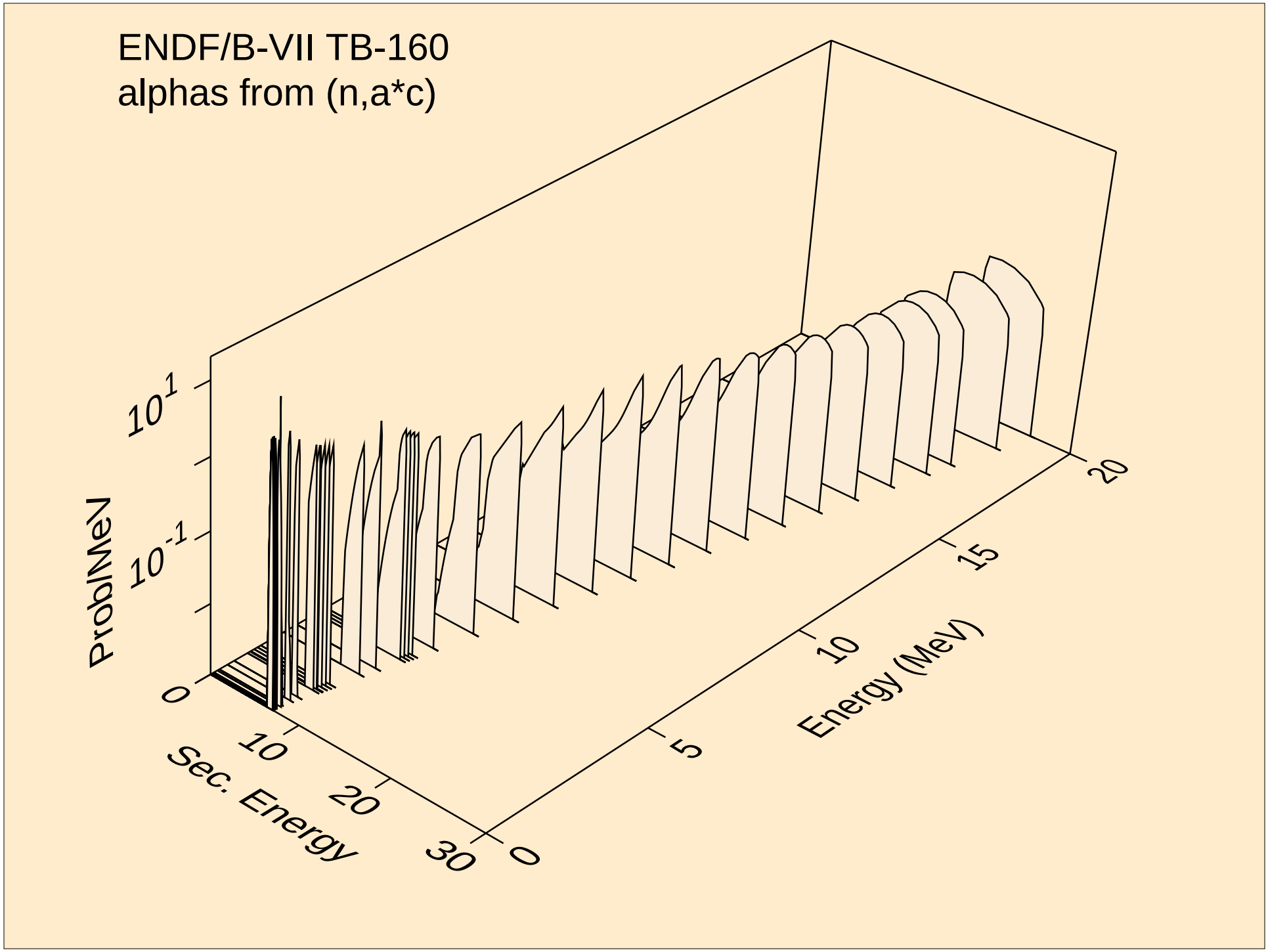

ENDF/B-VII TB-160
angular distribution for (n,a*11) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)


ENDF/B-VII TB-160
angular distribution for (n,a*12) alpha
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)


ENDF/B-VII TB-160
angular distribution for (n,a*13) alpha
10^0
Prob/Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)


ENDF/B-VII TB-160
angular distribution for (n,a*14) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)


ENDF/B-VII TB-160
angular distribution for (n,a*15) alpha
10^0
ProblCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)


ENDF/B-VII TB-160
alphas from (n,a*c)
Prob/MeV
10^{1}
10^{-1}
0
10
20
30
Sec. Energy
0
5
10
15
20
Energy (MeV)