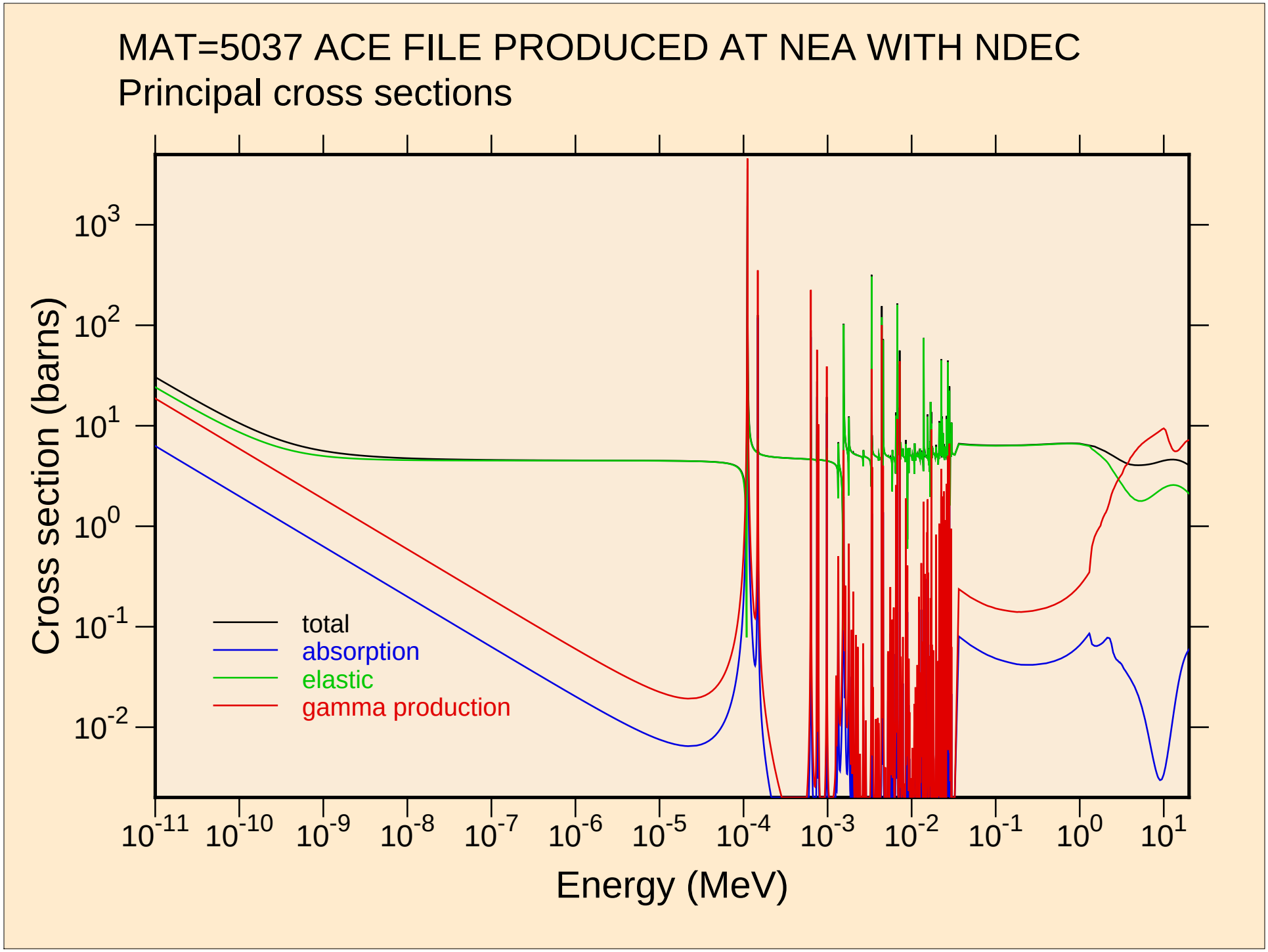
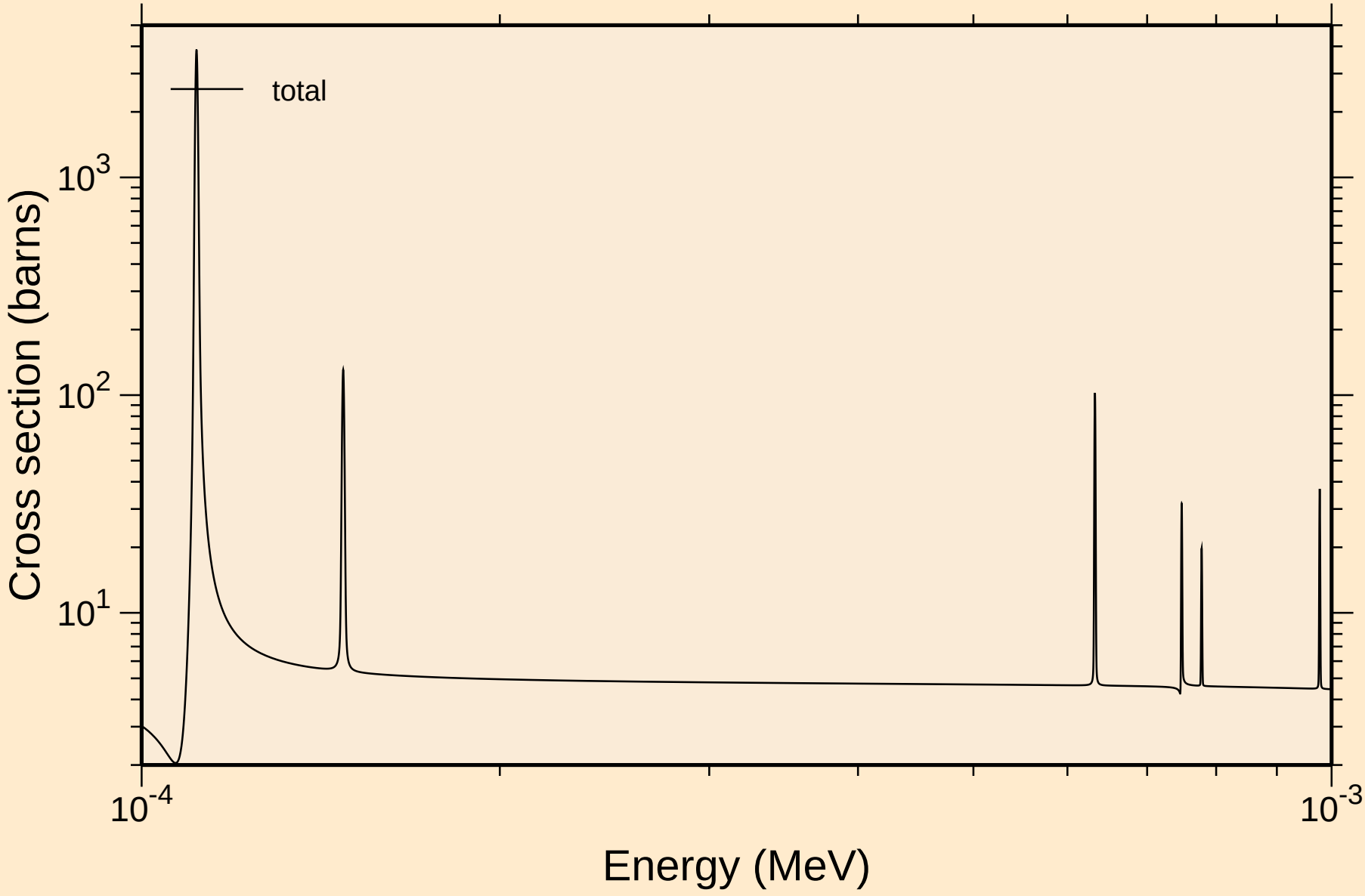
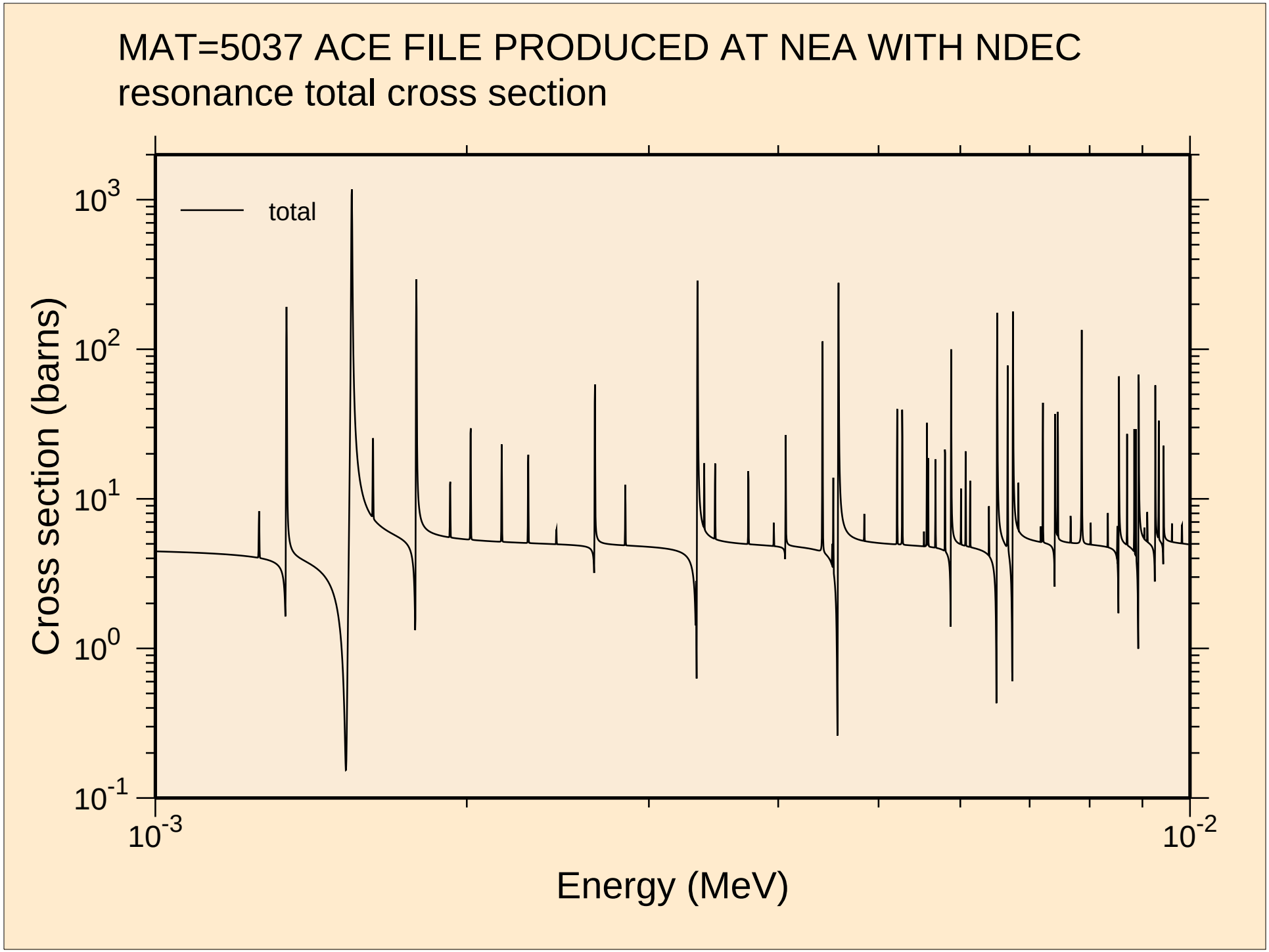
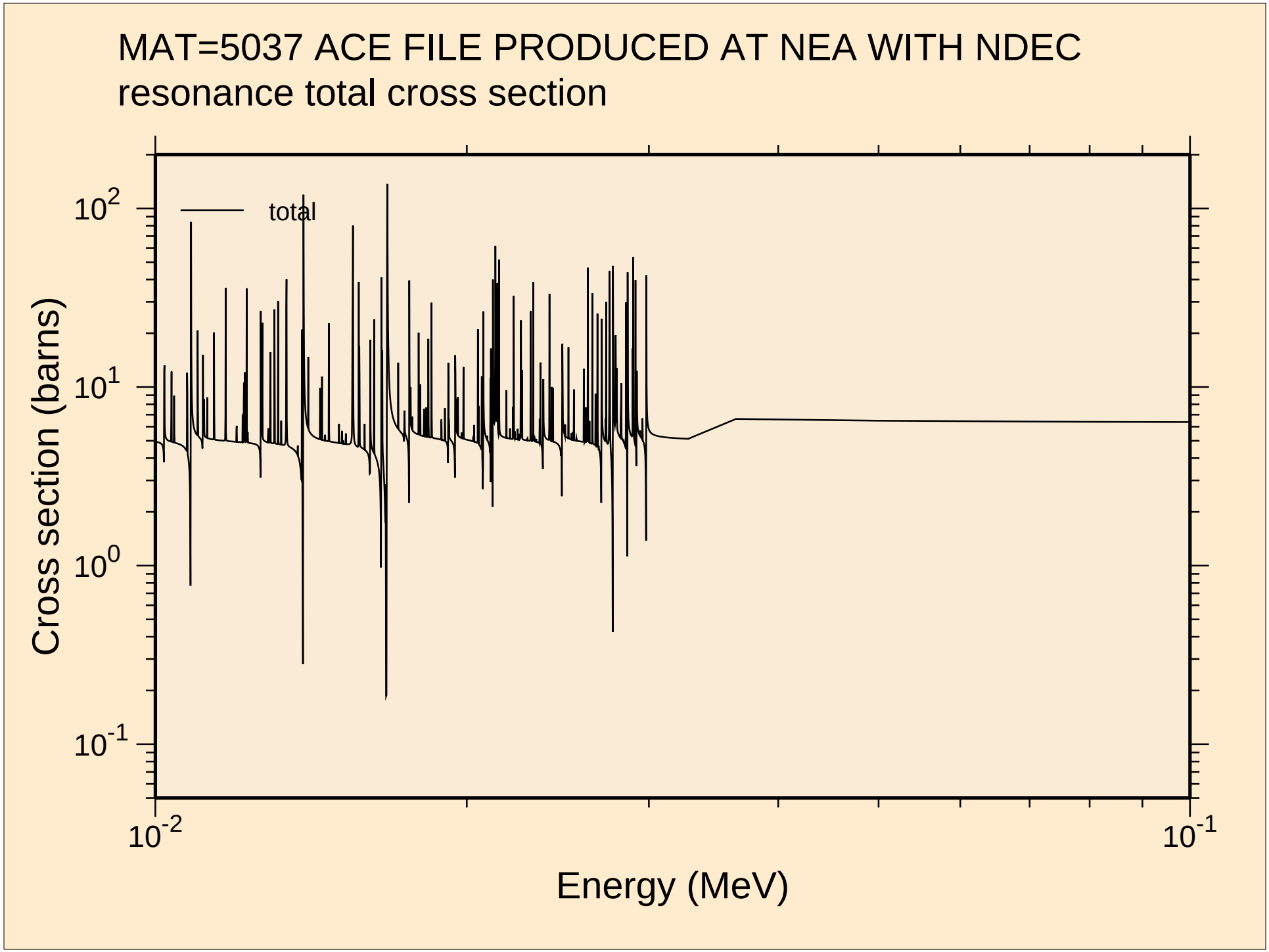
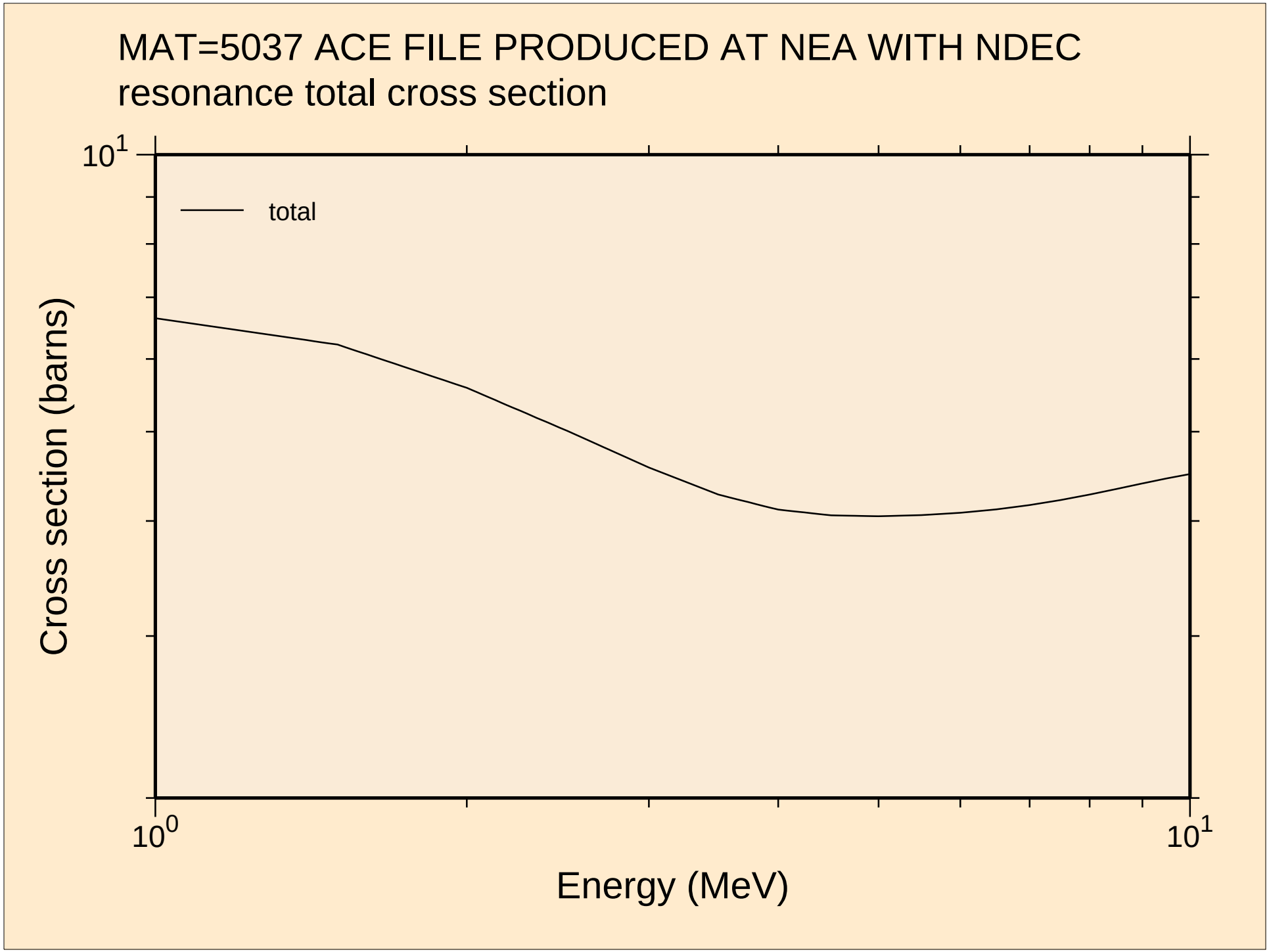

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Principal cross sections
Cross section (barns)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
total
absorption
elastic
gamma production
10^{-11} 10^{-10} 10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1}
Energy (MeV)

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
resonance total cross section

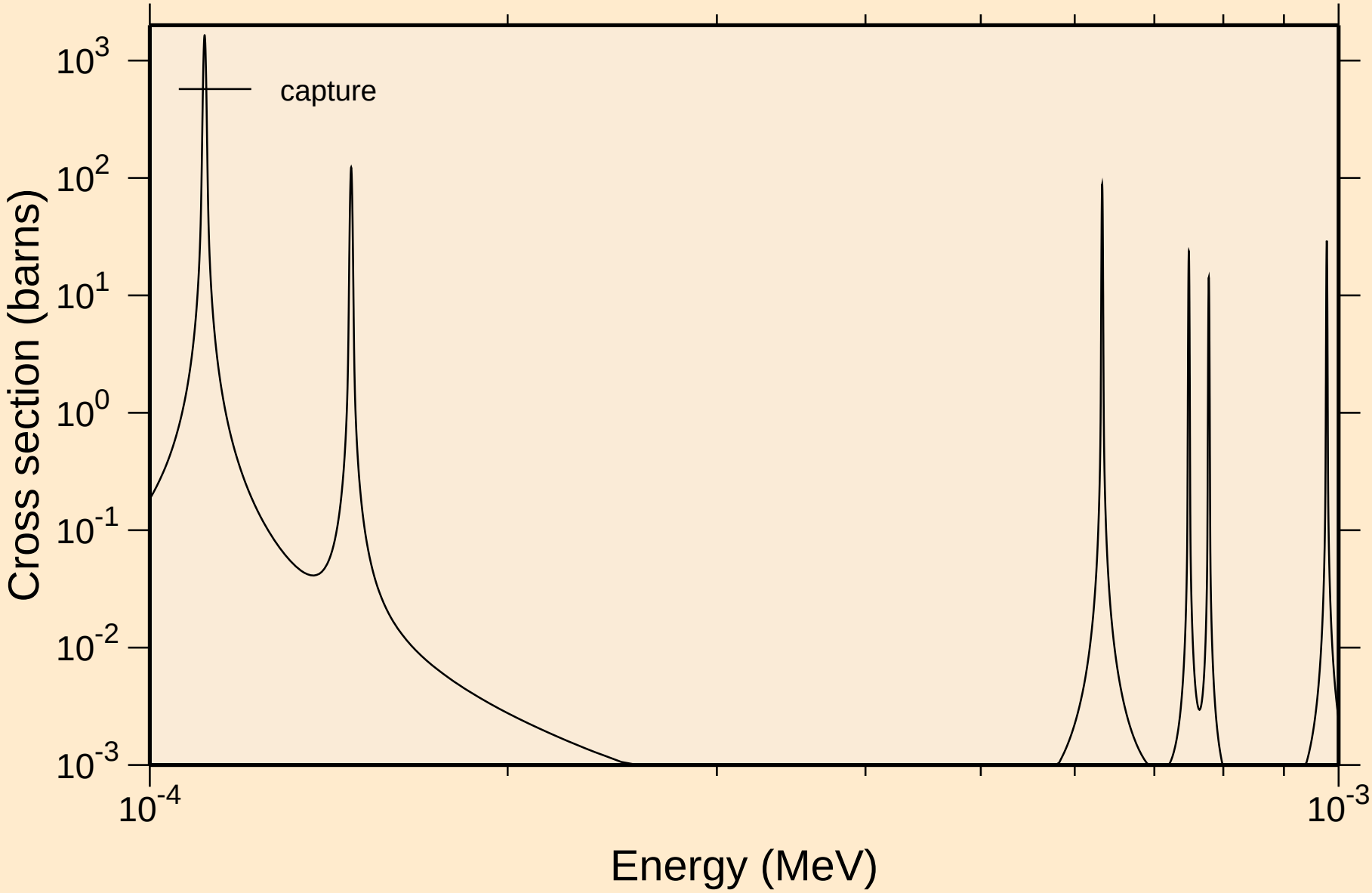



MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
resonance total cross section
total
Cross section (barns)
10^3
10^2
10^1
10^0
10^-1
10^-3
10^-2
Energy (MeV)

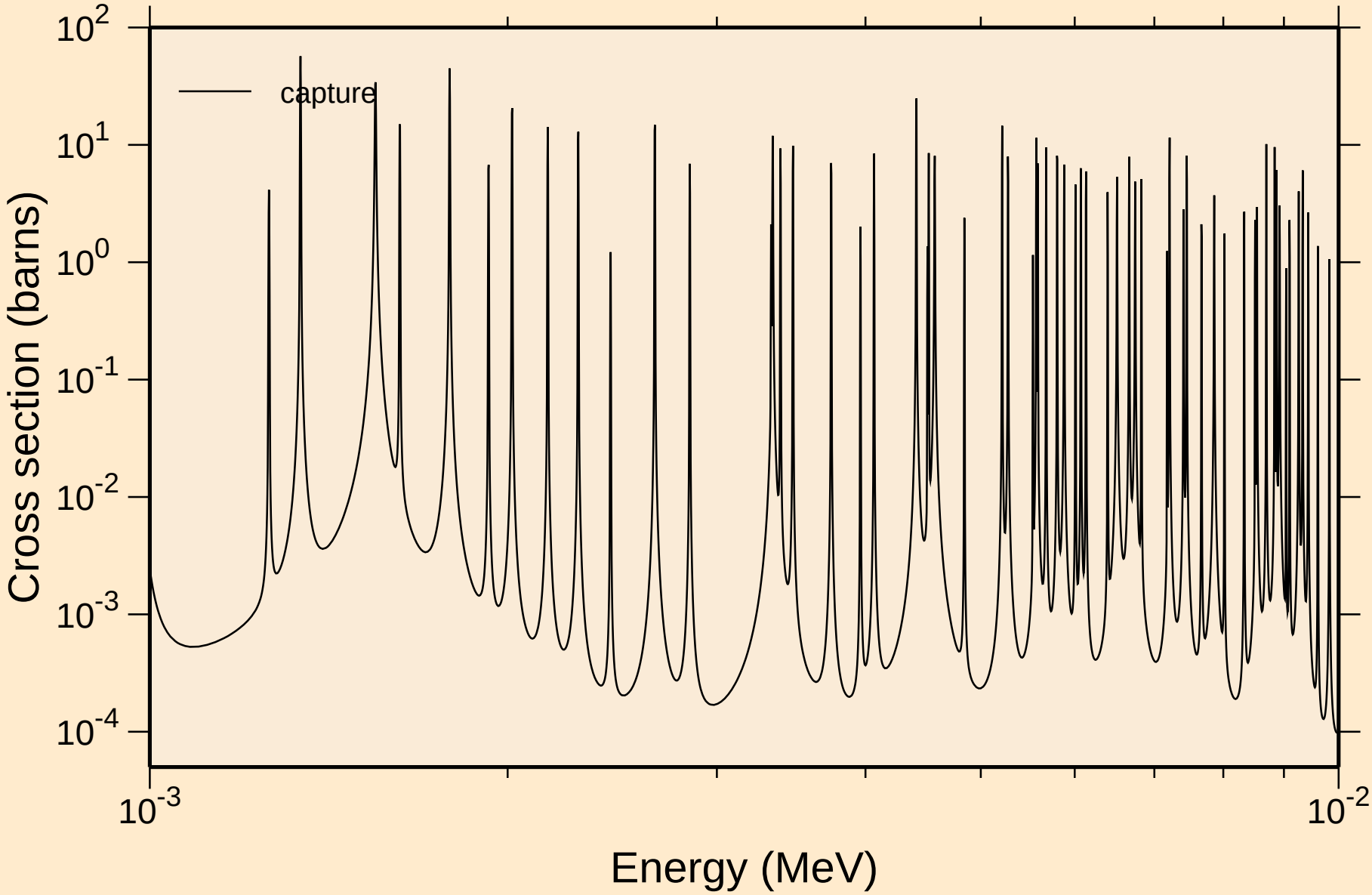

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
resonance total cross section
total
Cross section (barns)
10^2
10^1
10^0
10^-1
10^-2
10^-1
Energy (MeV)

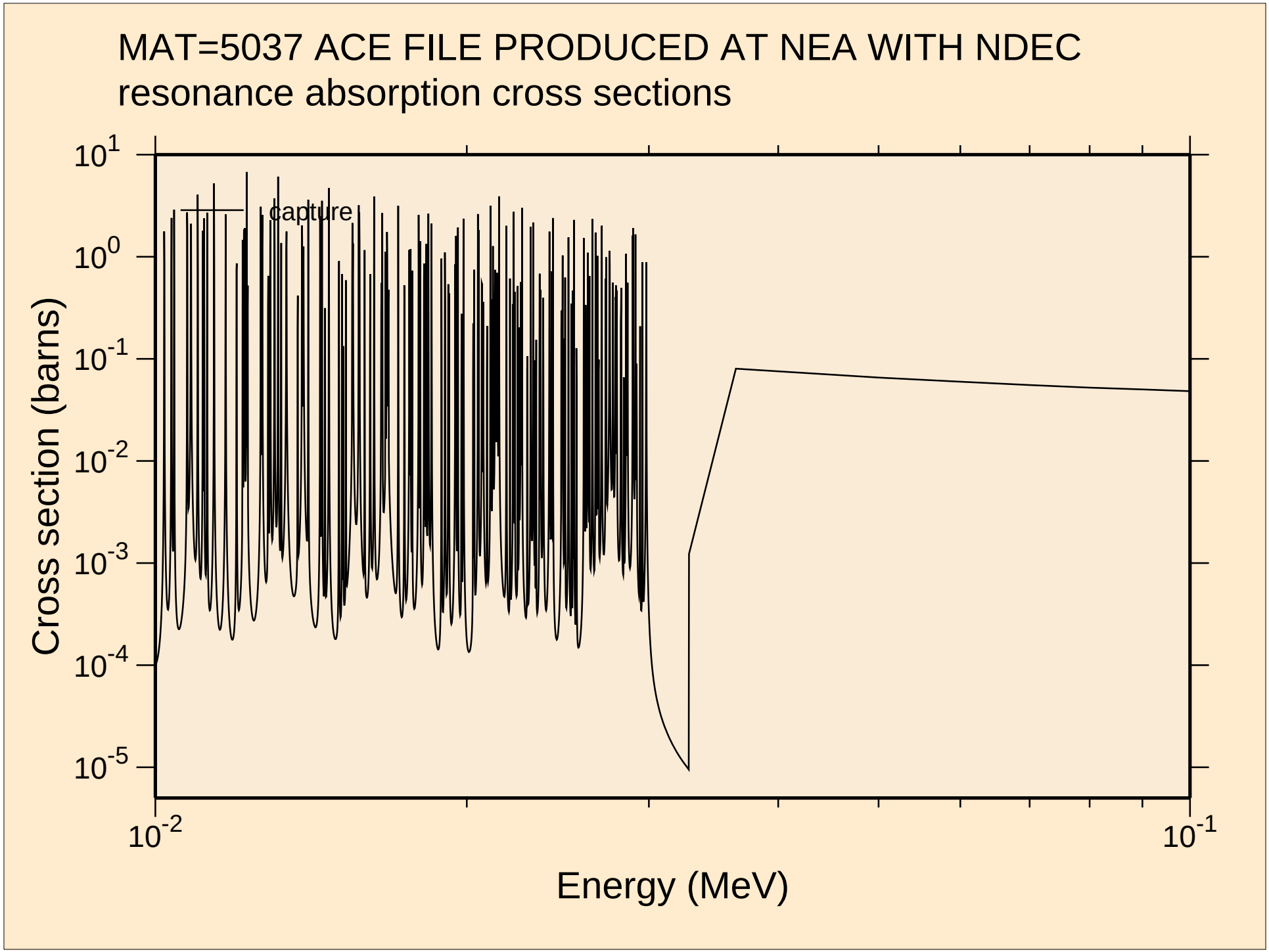

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
resonance total cross section
10^1
total
Cross section (barns)
10^0
10^1
Energy (MeV)

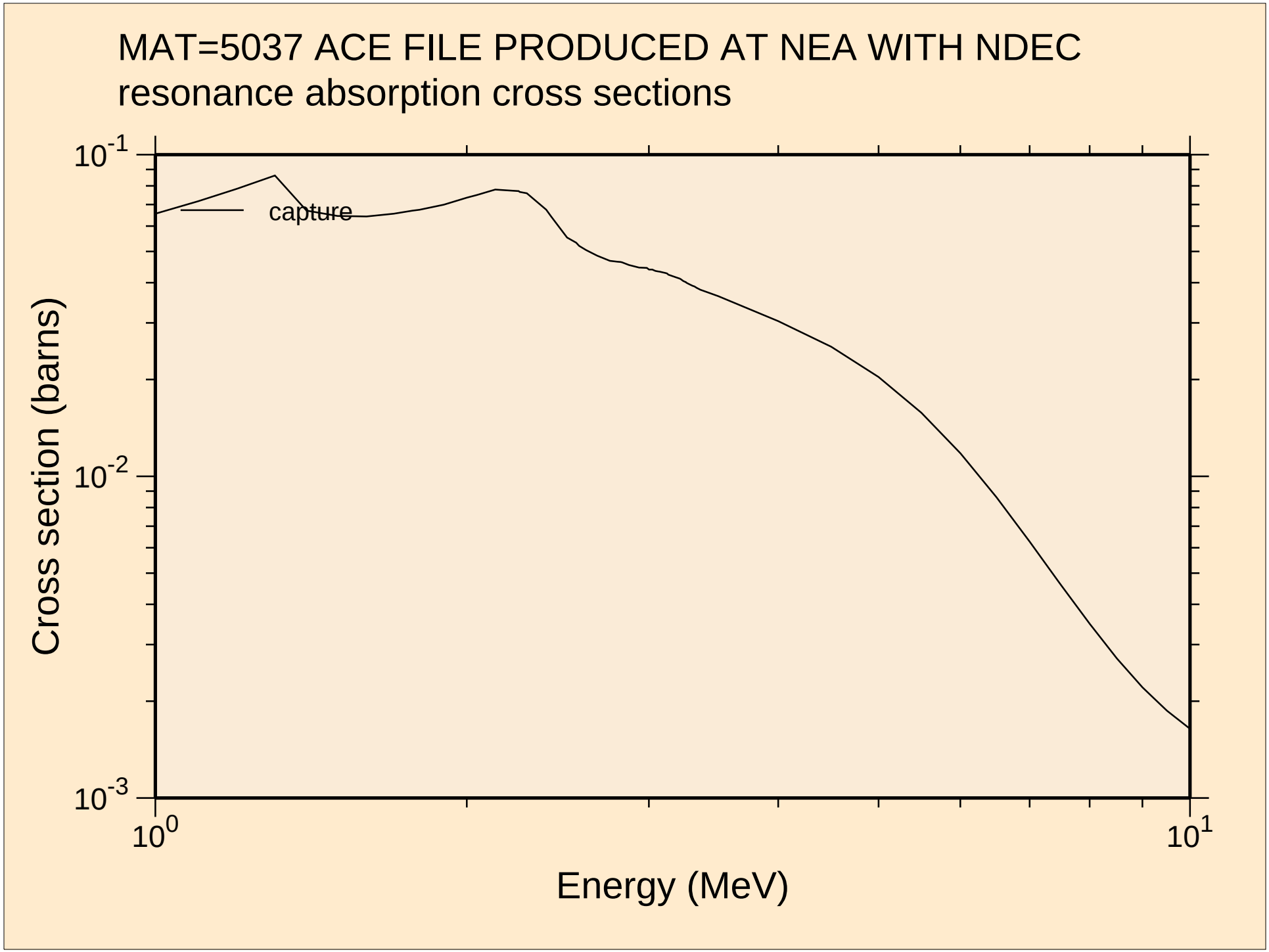
MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
resonance absorption cross sections

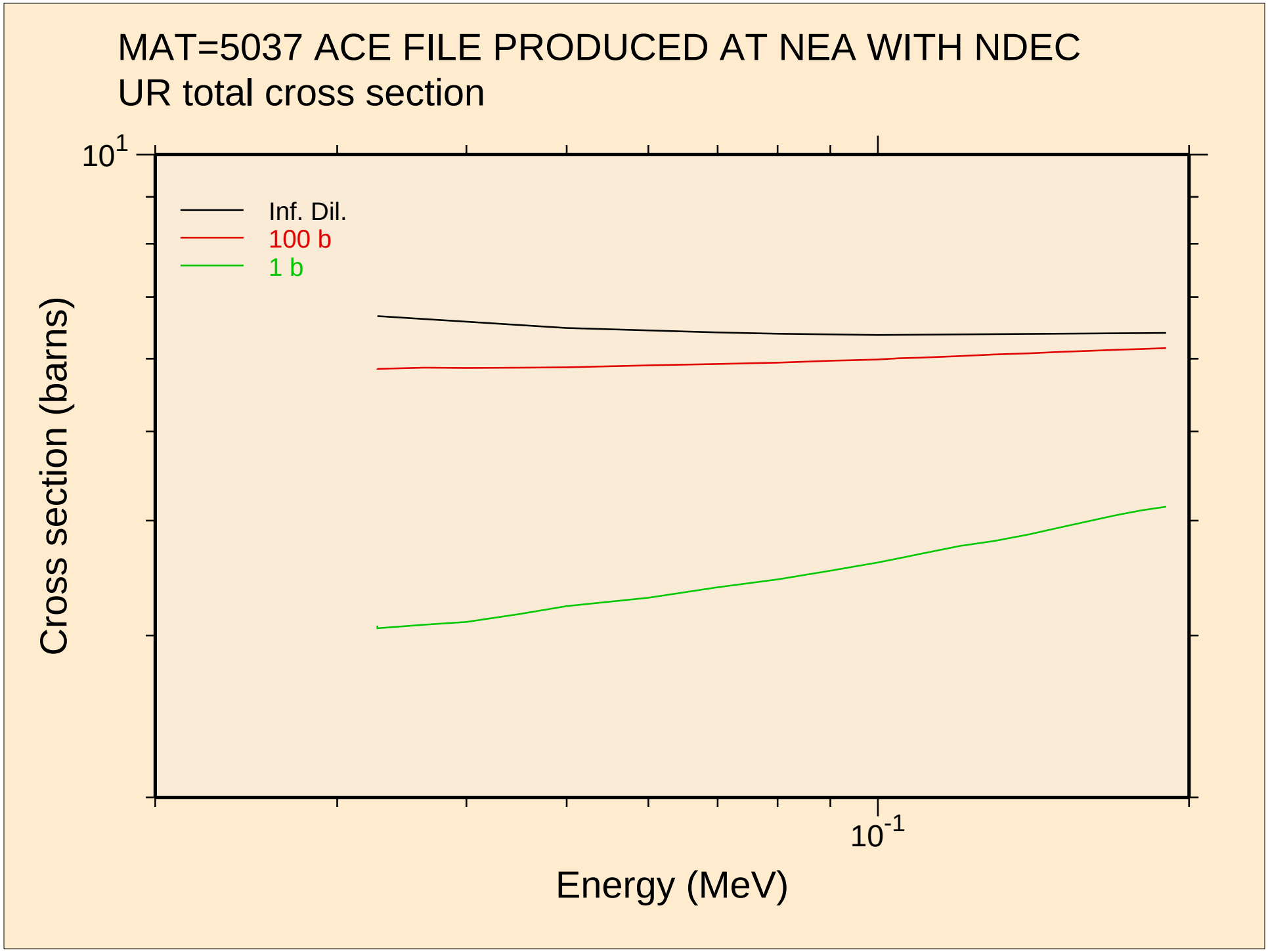


MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
resonance absorption cross sections

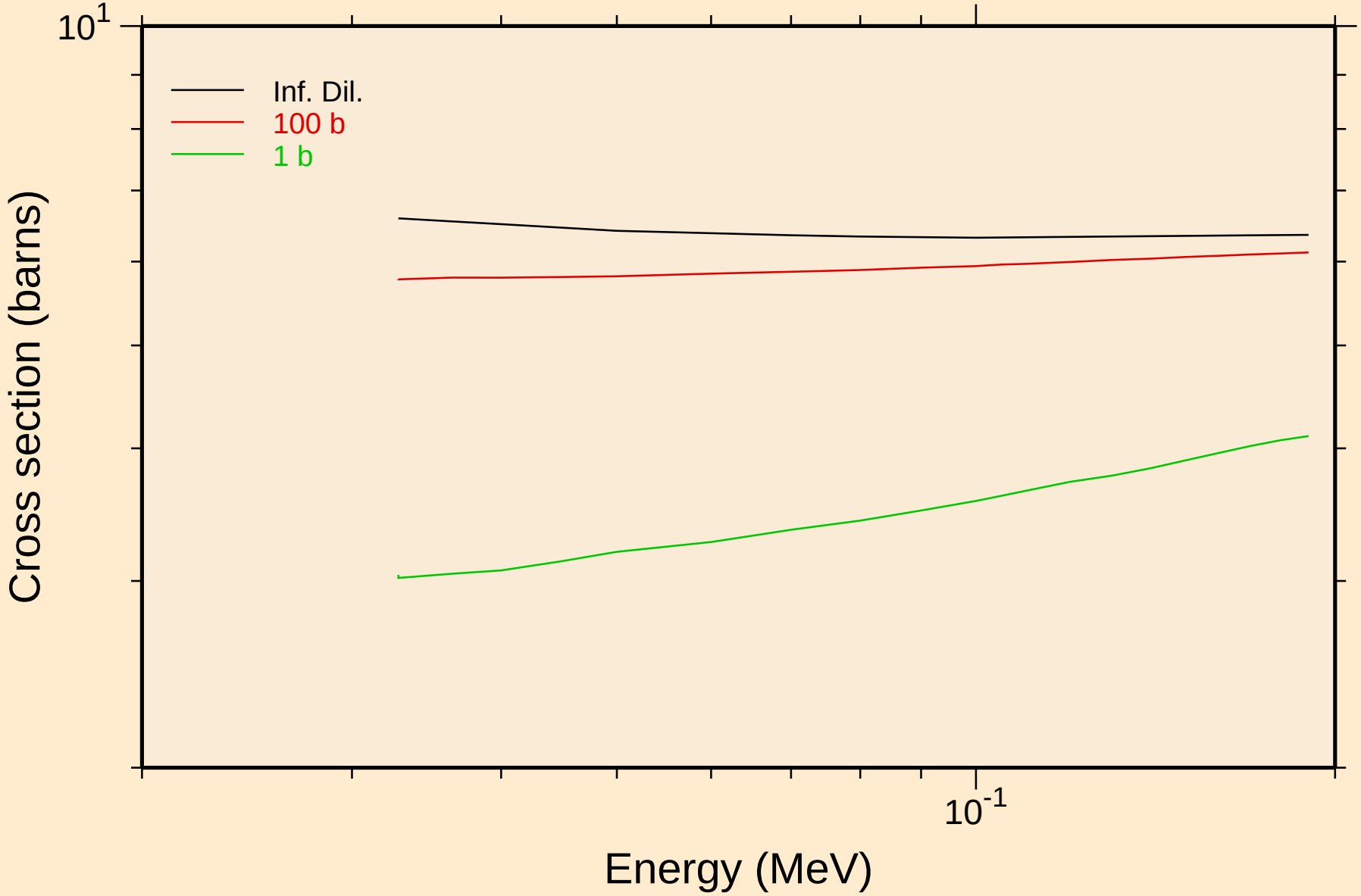


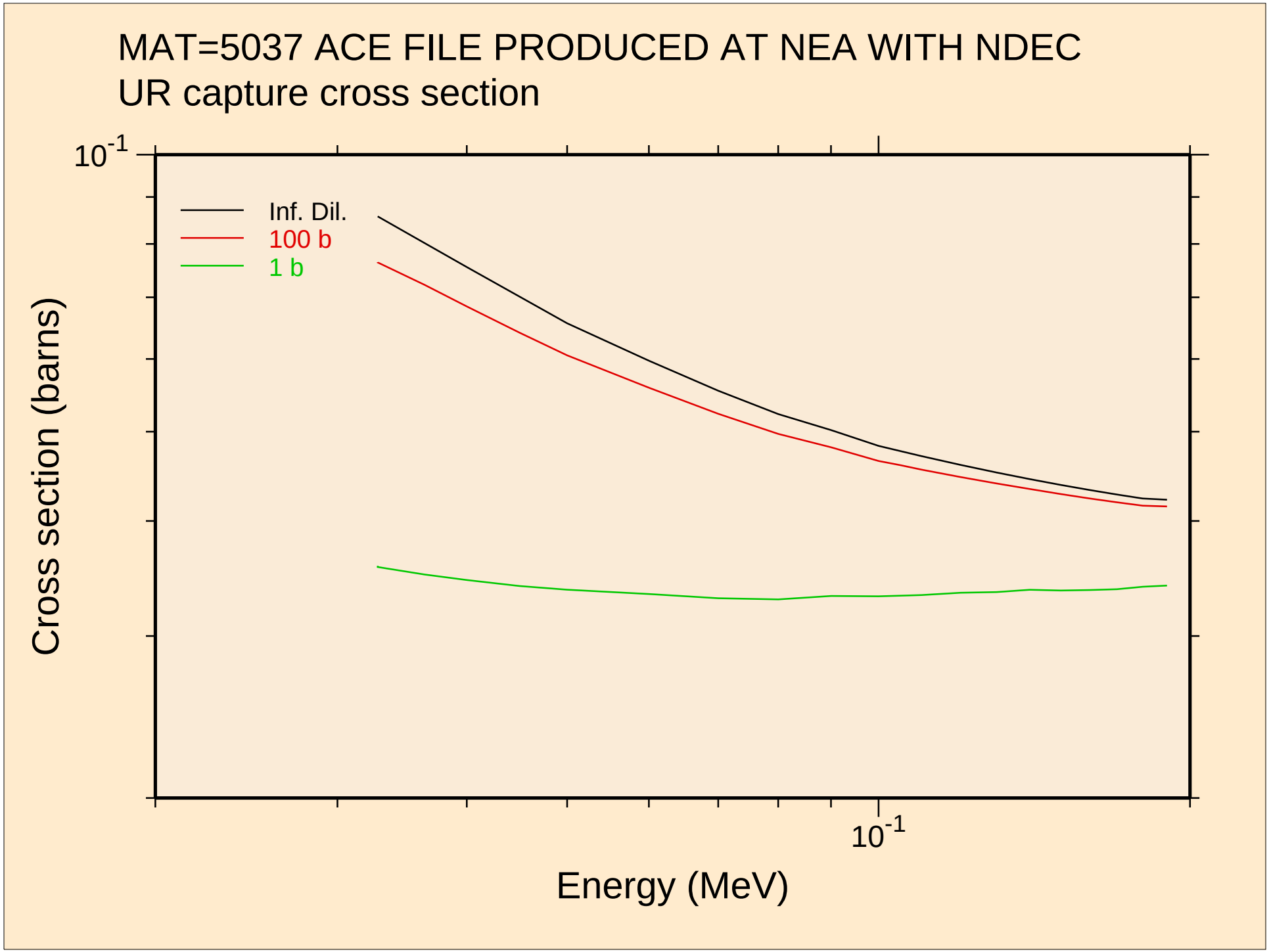

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
resonance absorption cross sections
capture
Cross section (barns)
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
10^-2
10^-1
Energy (MeV)

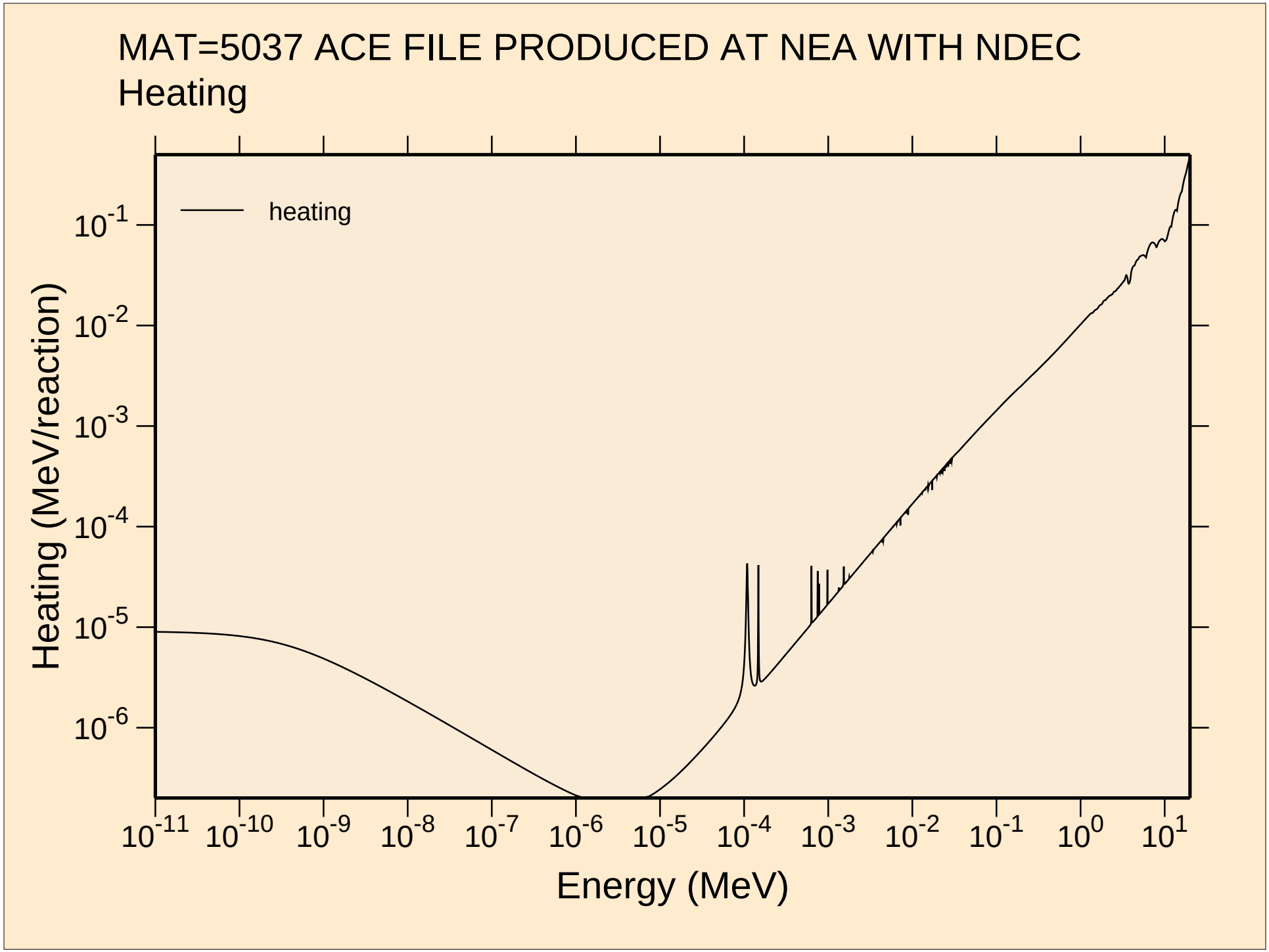

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
resonance absorption cross sections
capture
Cross section (barns)
10-1
10-2
10-3
100
101
Energy (MeV)

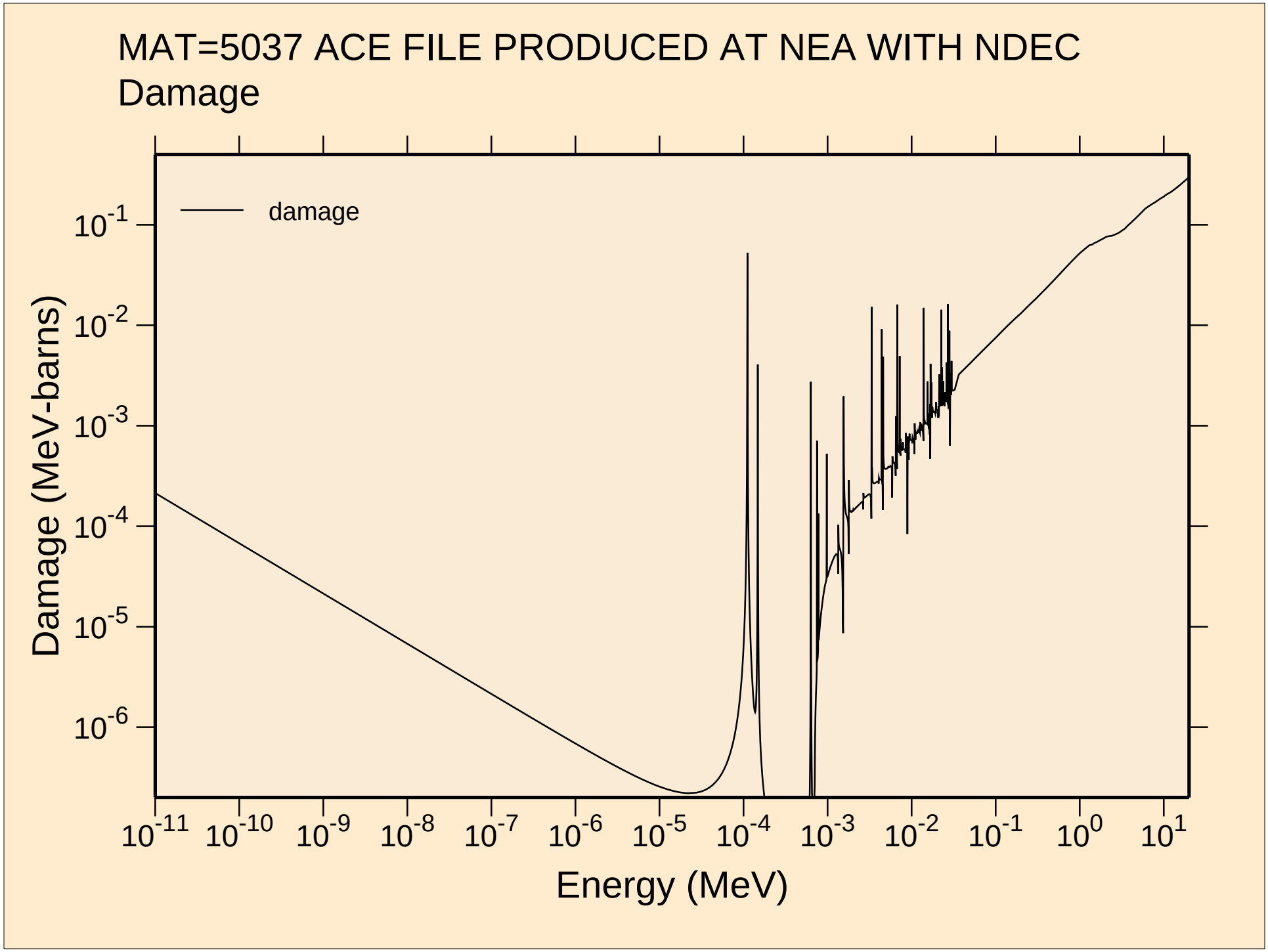

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
UR total cross section
10^1
Inf. Dil.
100 b
1 b
Cross section (barns)
10^{-1}
Energy (MeV)

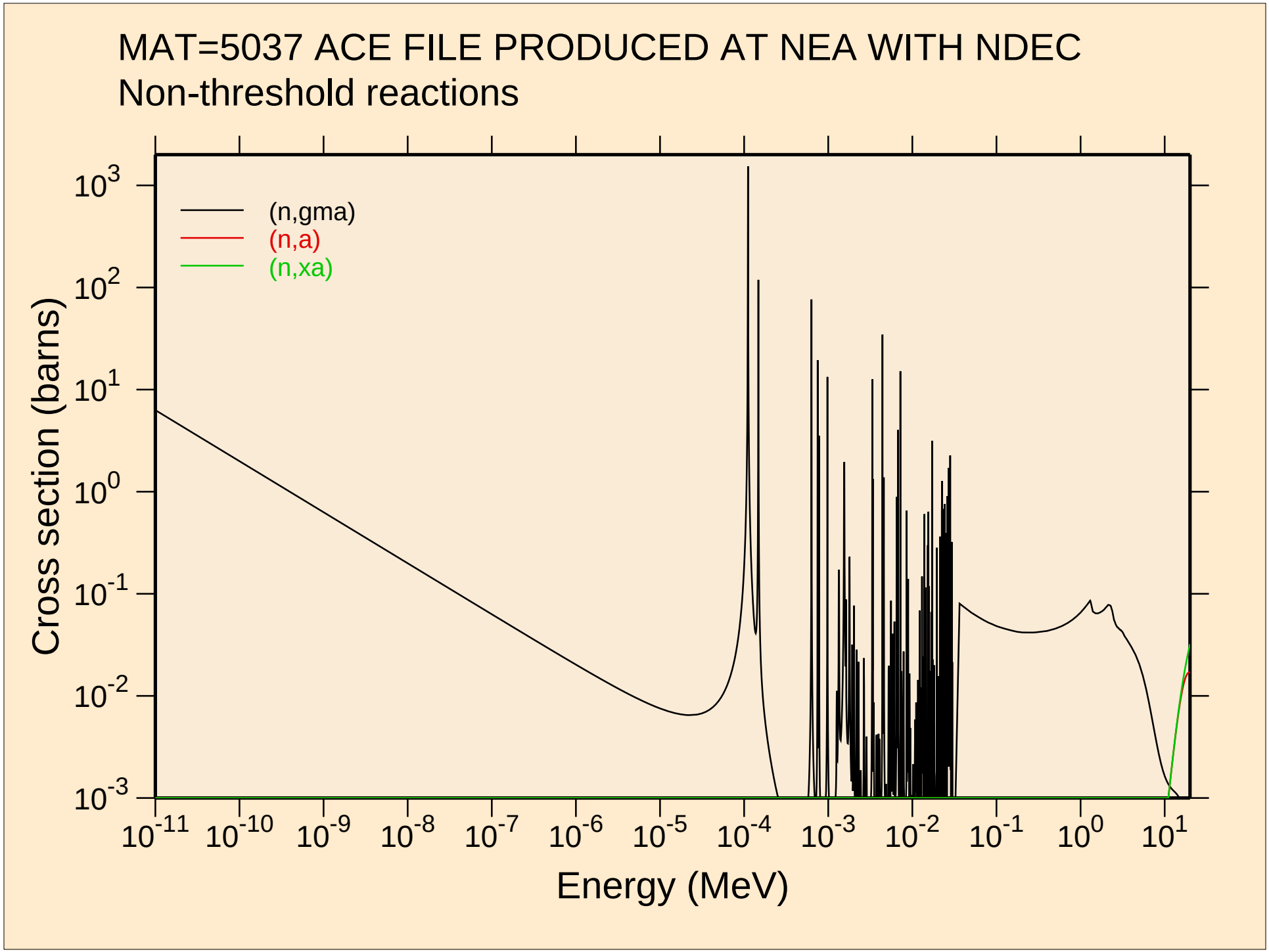
MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
UR elastic cross section

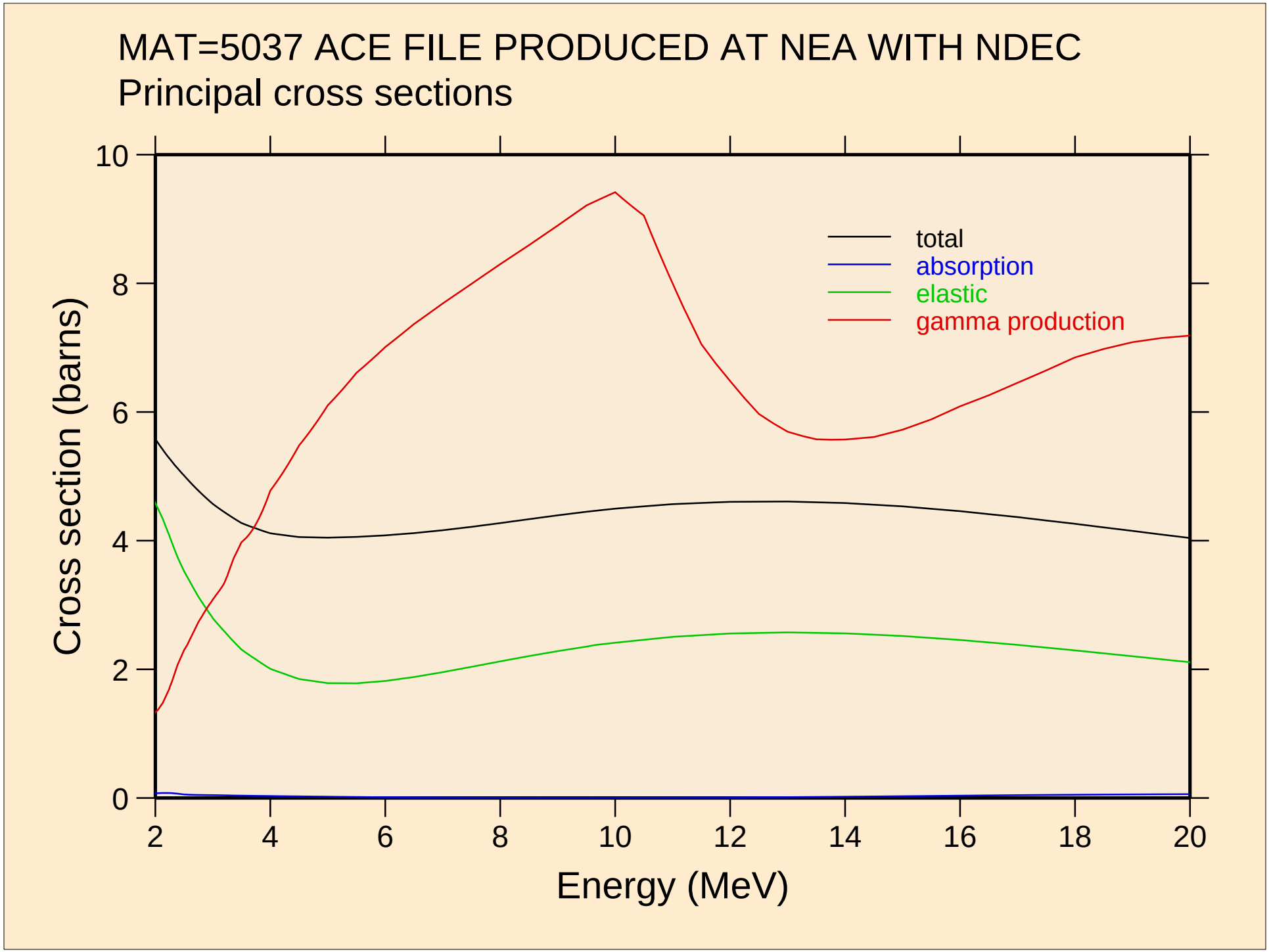


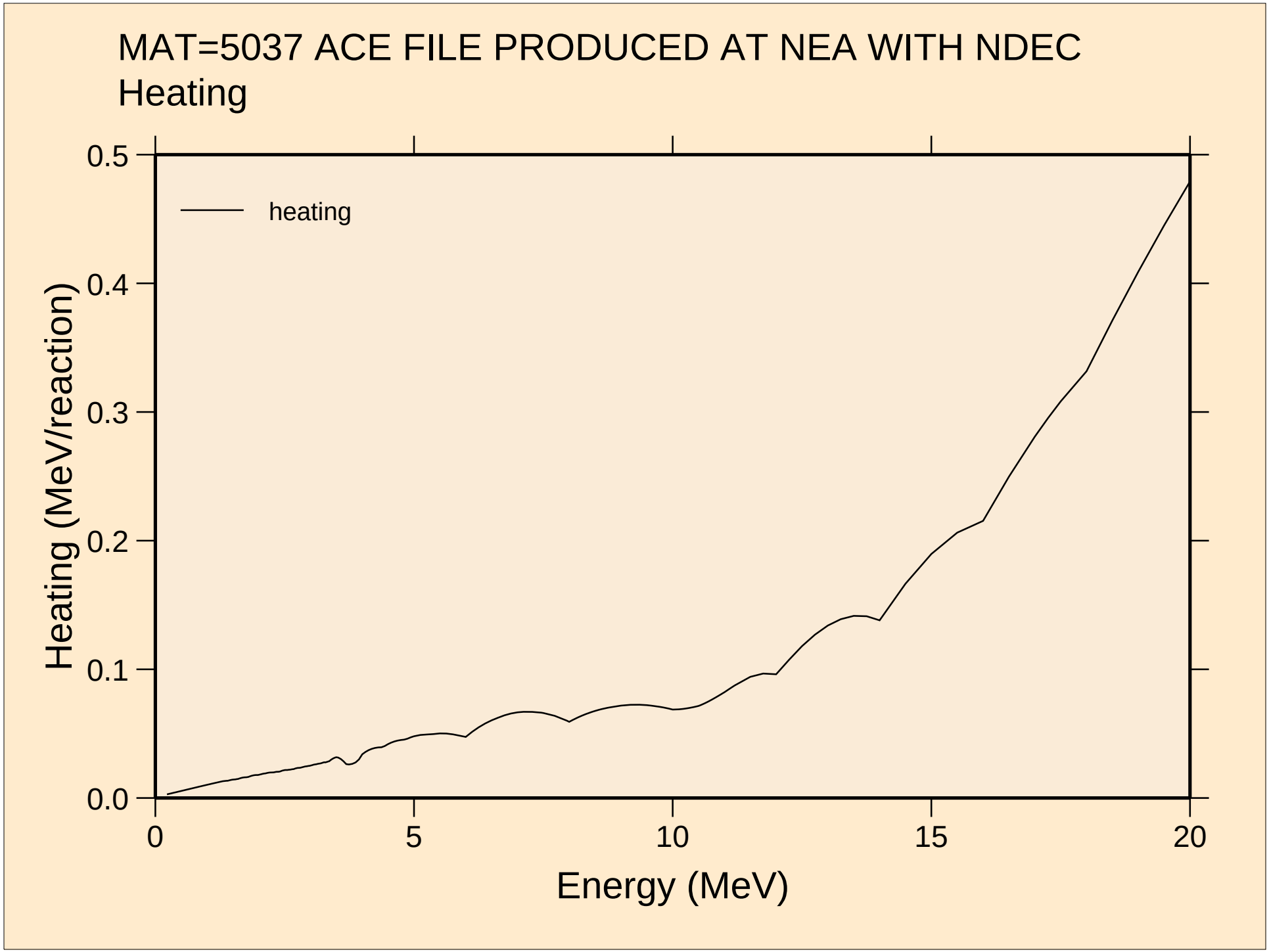

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
UR capture cross section
10-1
Inf. Dil.
100 b
1 b
Cross section (barns)
10-1
Energy (MeV)

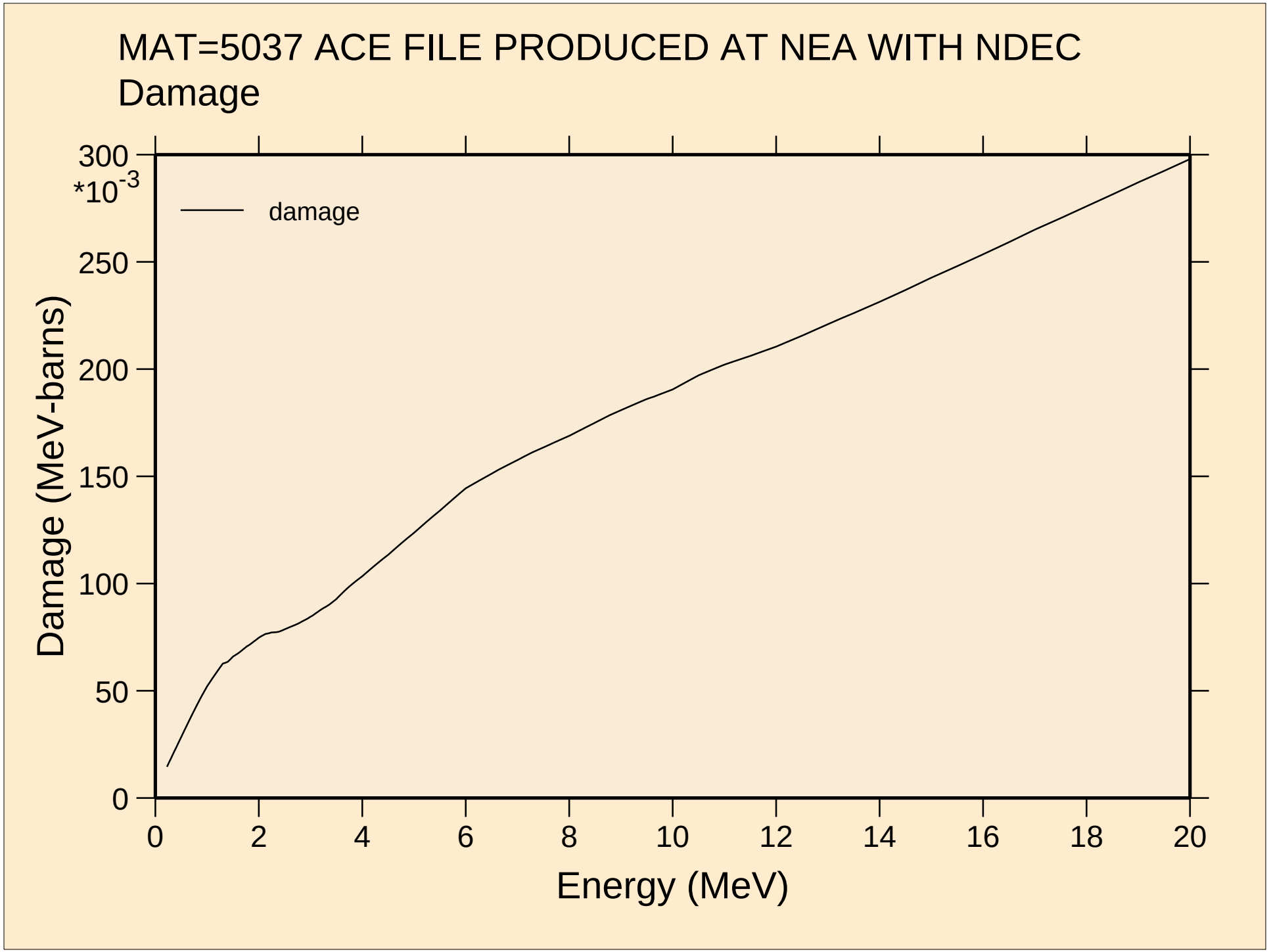

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Heating
heating
Heating (MeV/reaction)
10-1
10-2
10-3
10-4
10-5
10-6
10-11 10-10 10-9 10-8 10-7 10-6 10-5 10-4 10-3 10-2 10-1 100 101
Energy (MeV)

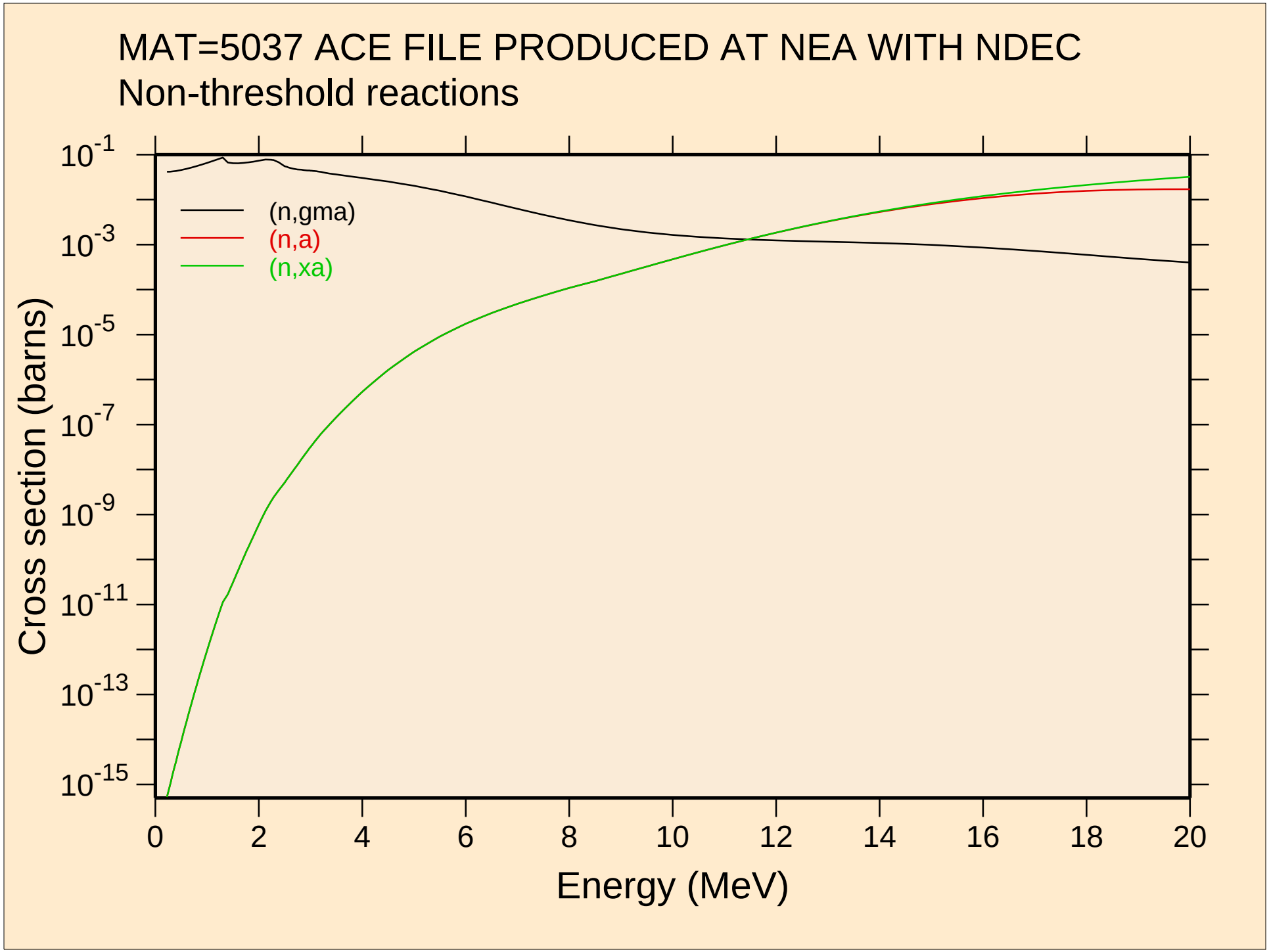

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Damage
damage
Damage (MeV-barns)
10-1
10-2
10-3
10-4
10-5
10-6
10-11 10-10 10-9 10-8 10-7 10-6 10-5 10-4 10-3 10-2 10-1 100 101
Energy (MeV)

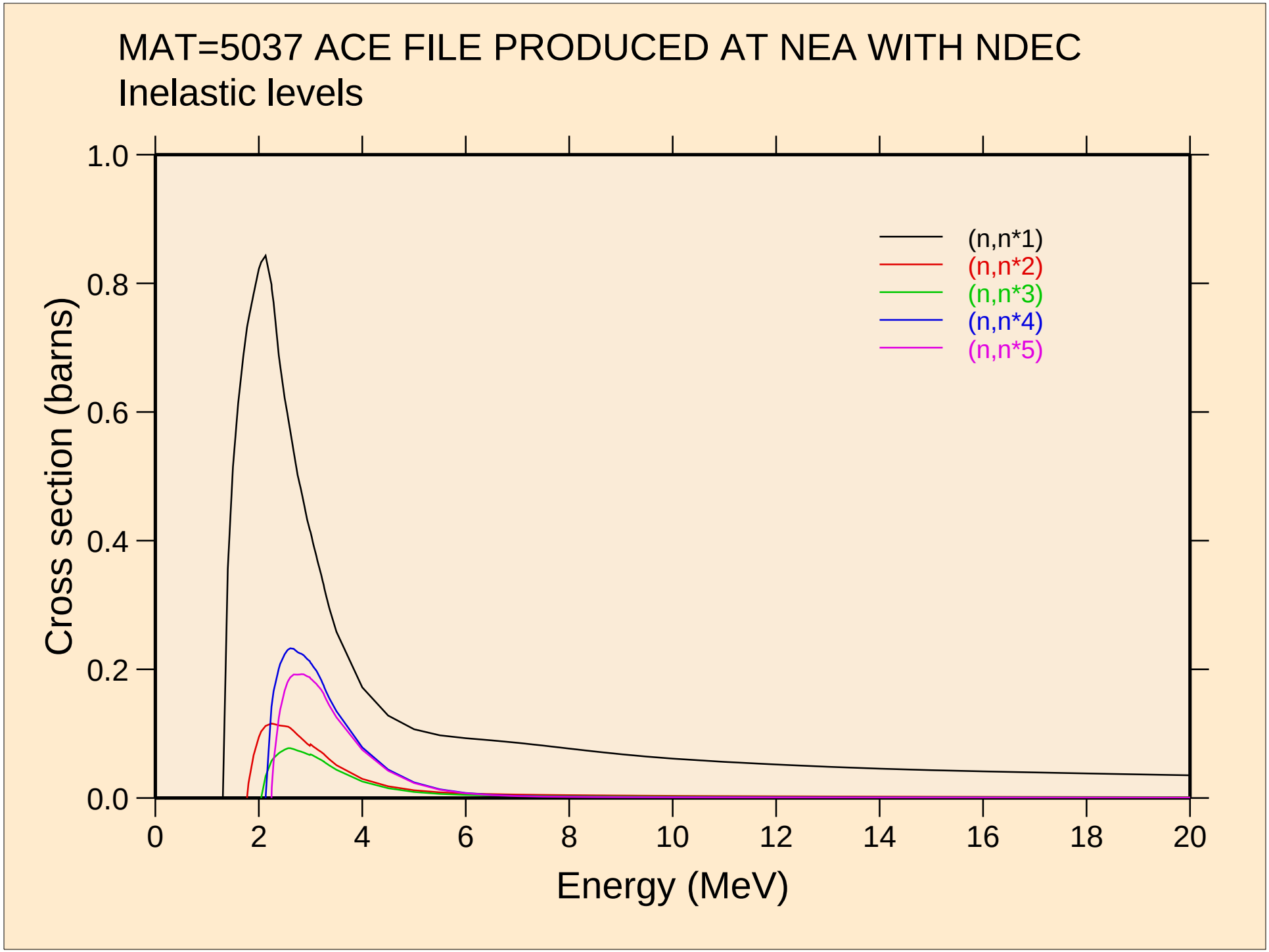

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Non-threshold reactions
(n,gma)
(n,a)
(n,xa)
Cross section (barns)
Energy (MeV)
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

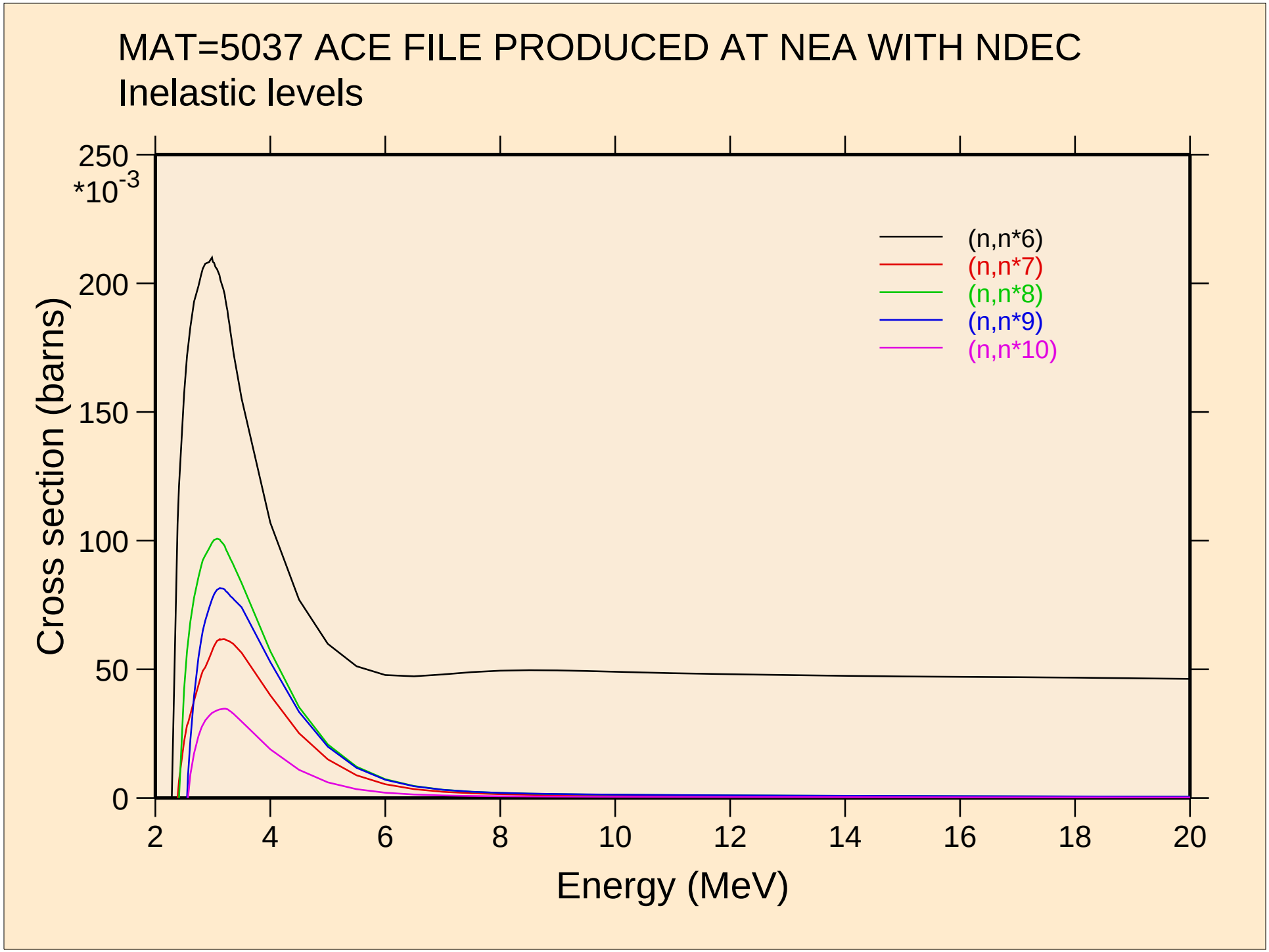

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
0
2
4
6
8
10
2
4
6
8
10
12
14
16
18
20

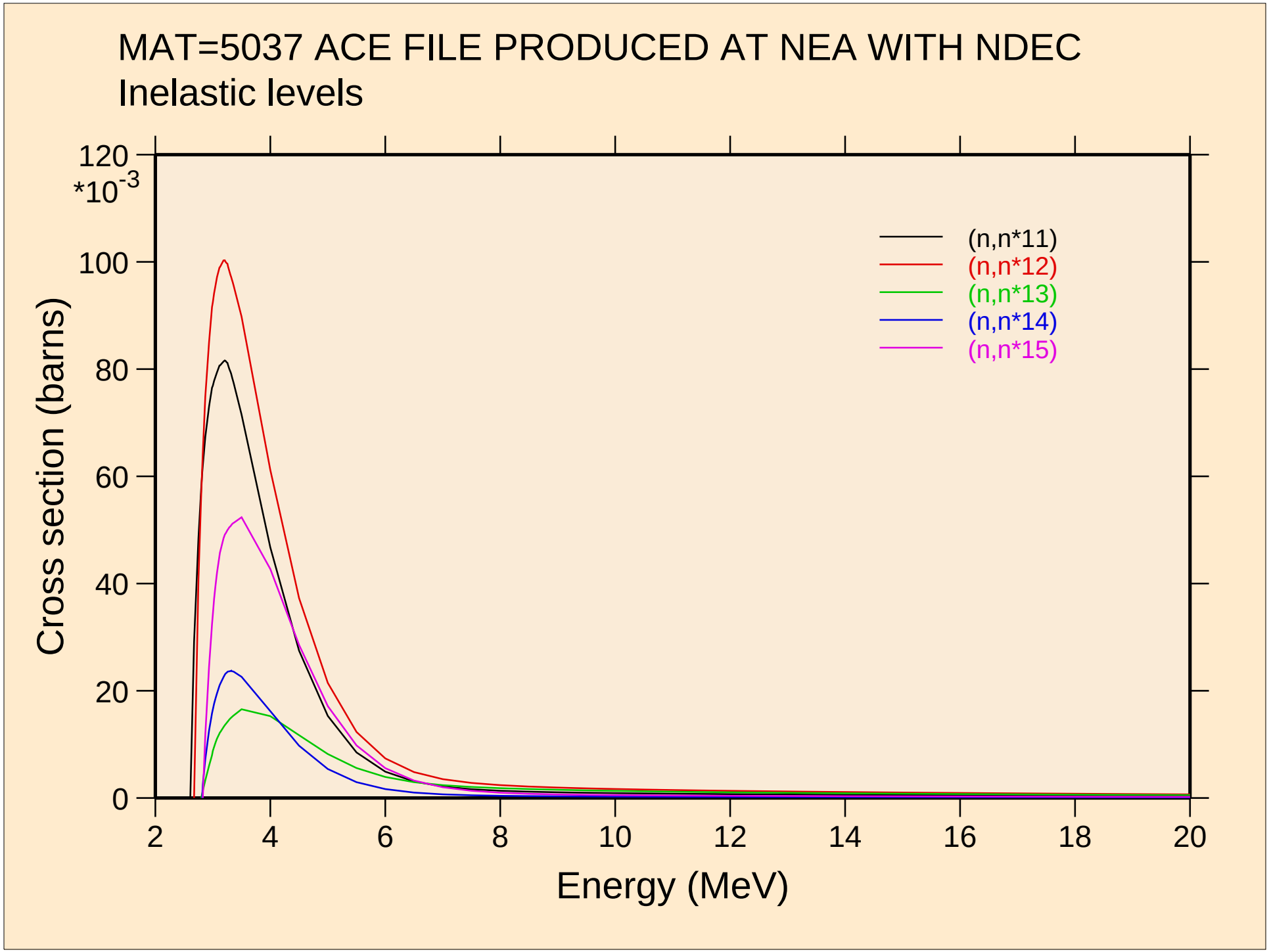

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Heating
heating
Heating (MeV/reaction)
0.0
0.1
0.2
0.3
0.4
0.5
0
5
10
15
20
Energy (MeV)

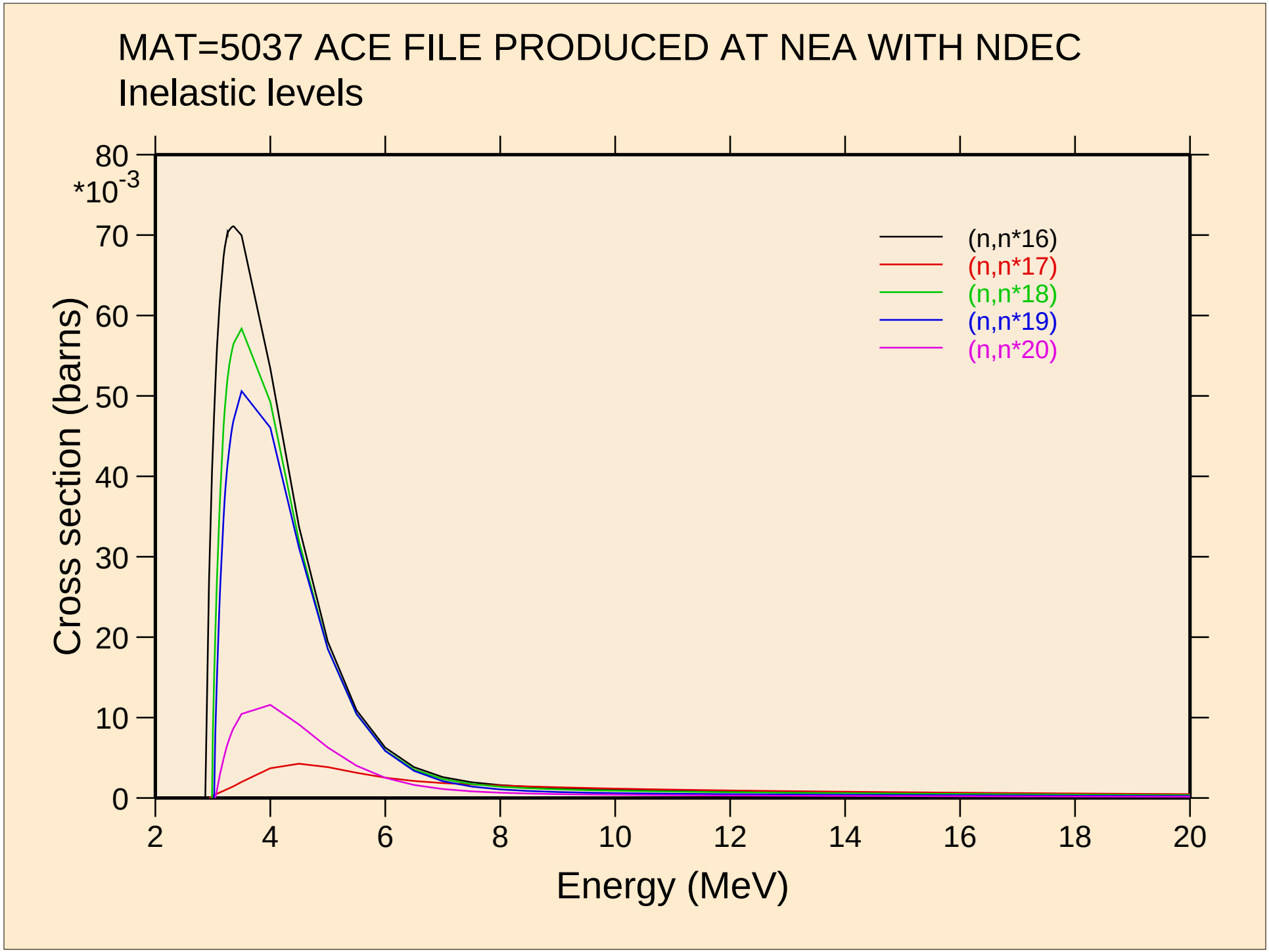

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Damage
300
*10-3
damage
250
200
150
100
50
0
Damage (MeV-barns)
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

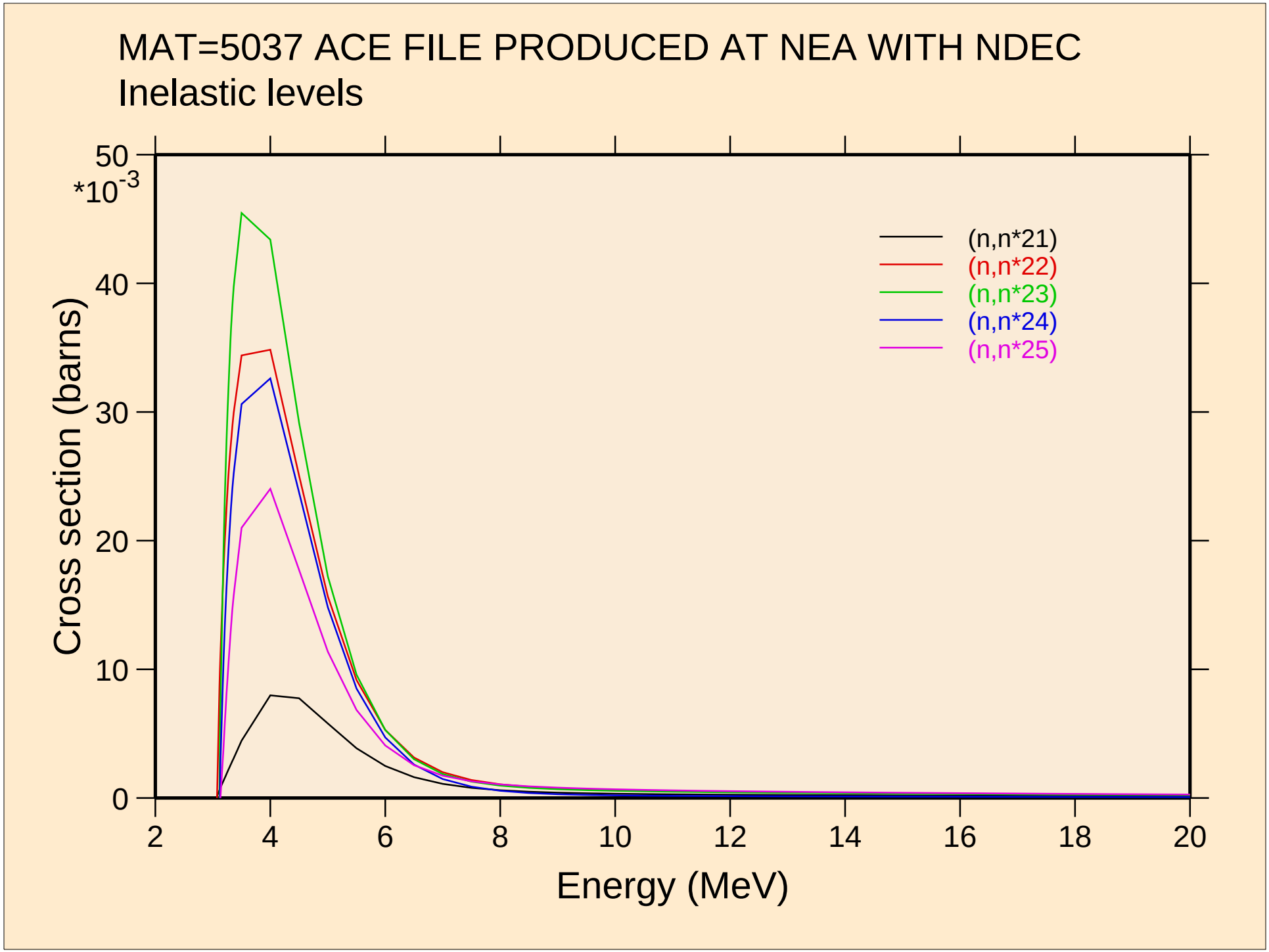

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Non-threshold reactions
(n,gma)
(n,a)
(n,xa)
Cross section (barns)
10-1
10-3
10-5
10-7
10-9
10-11
10-13
10-15
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

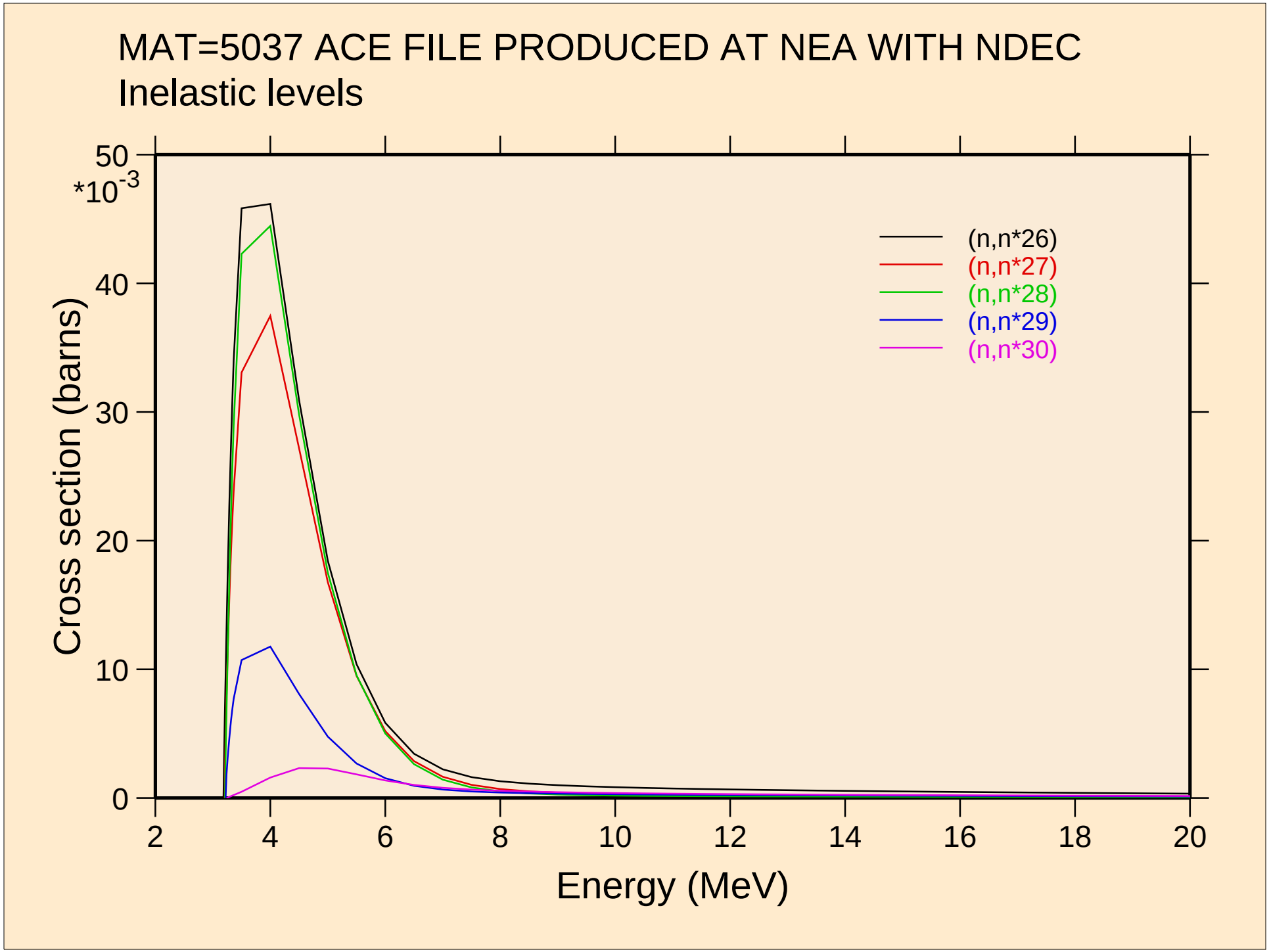

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
Cross section (barns)
Energy (MeV)
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8
10
12
14
16
18
20
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)
(n,n*5)

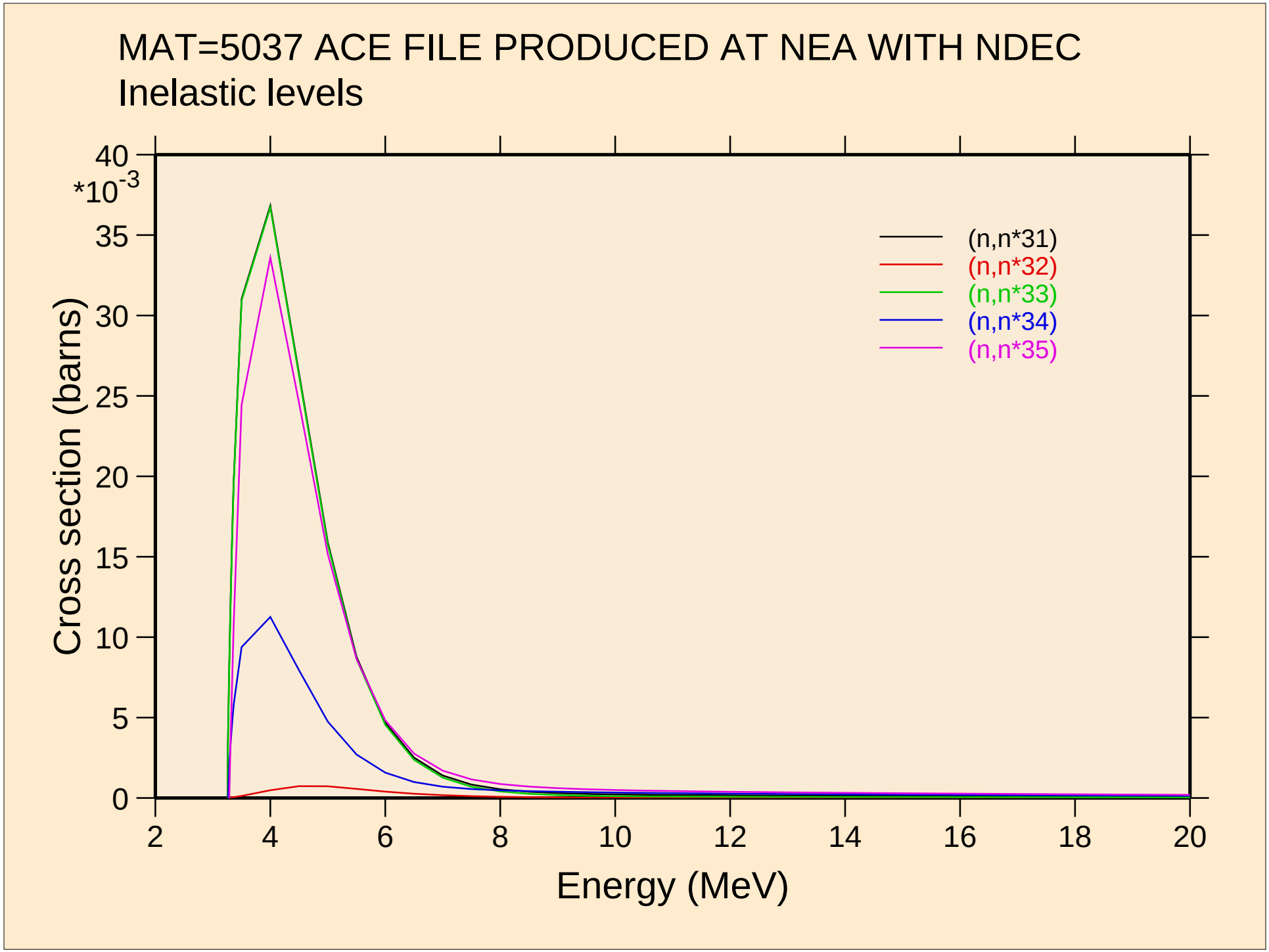

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
250
*10-3
200
150
100
50
0
Cross section (barns)
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*6)
(n,n*7)
(n,n*8)
(n,n*9)
(n,n*10)

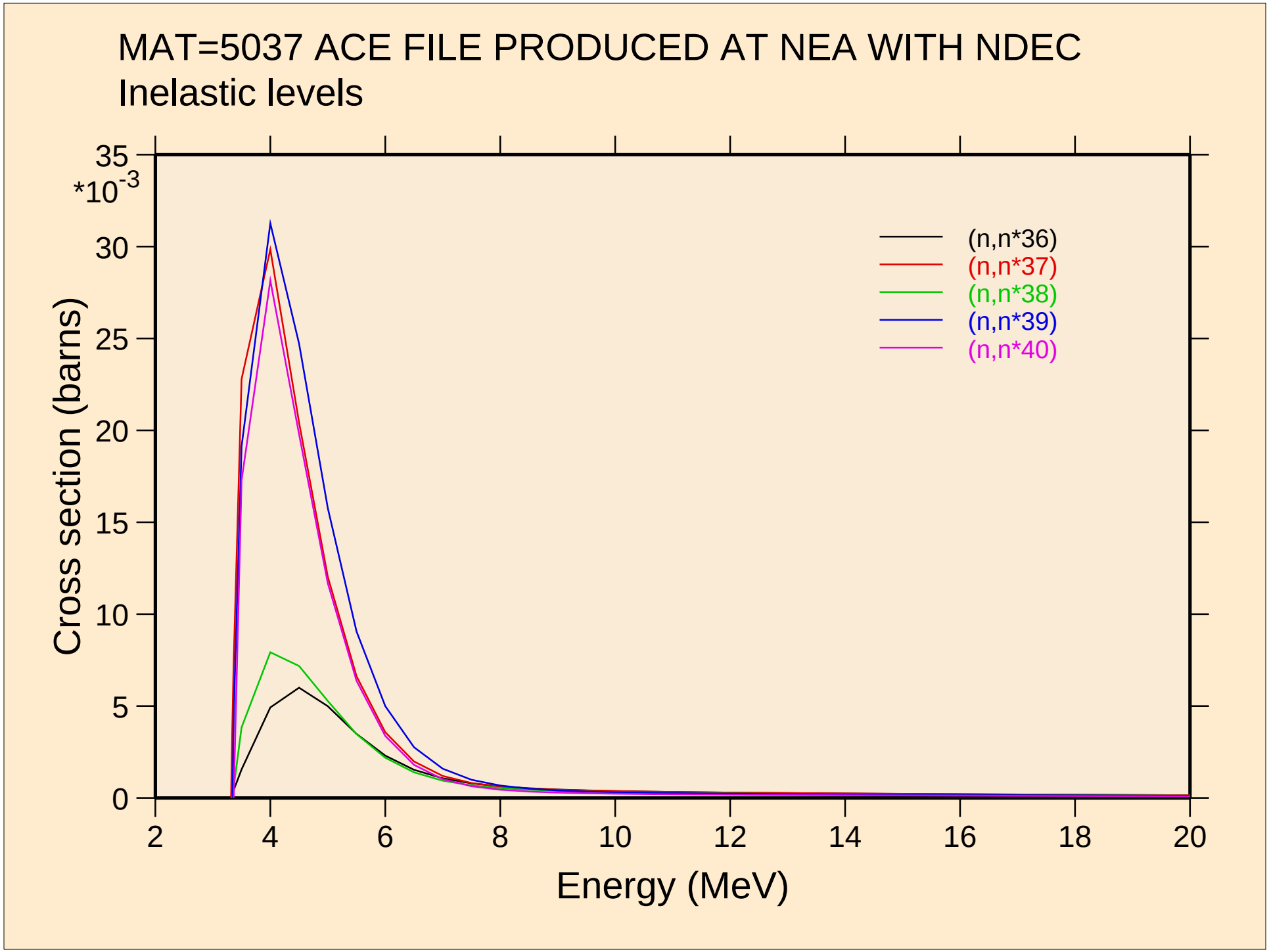

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
120
*10-3
100
80
60
40
20
0
Cross section (barns)
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*11)
(n,n*12)
(n,n*13)
(n,n*14)
(n,n*15)

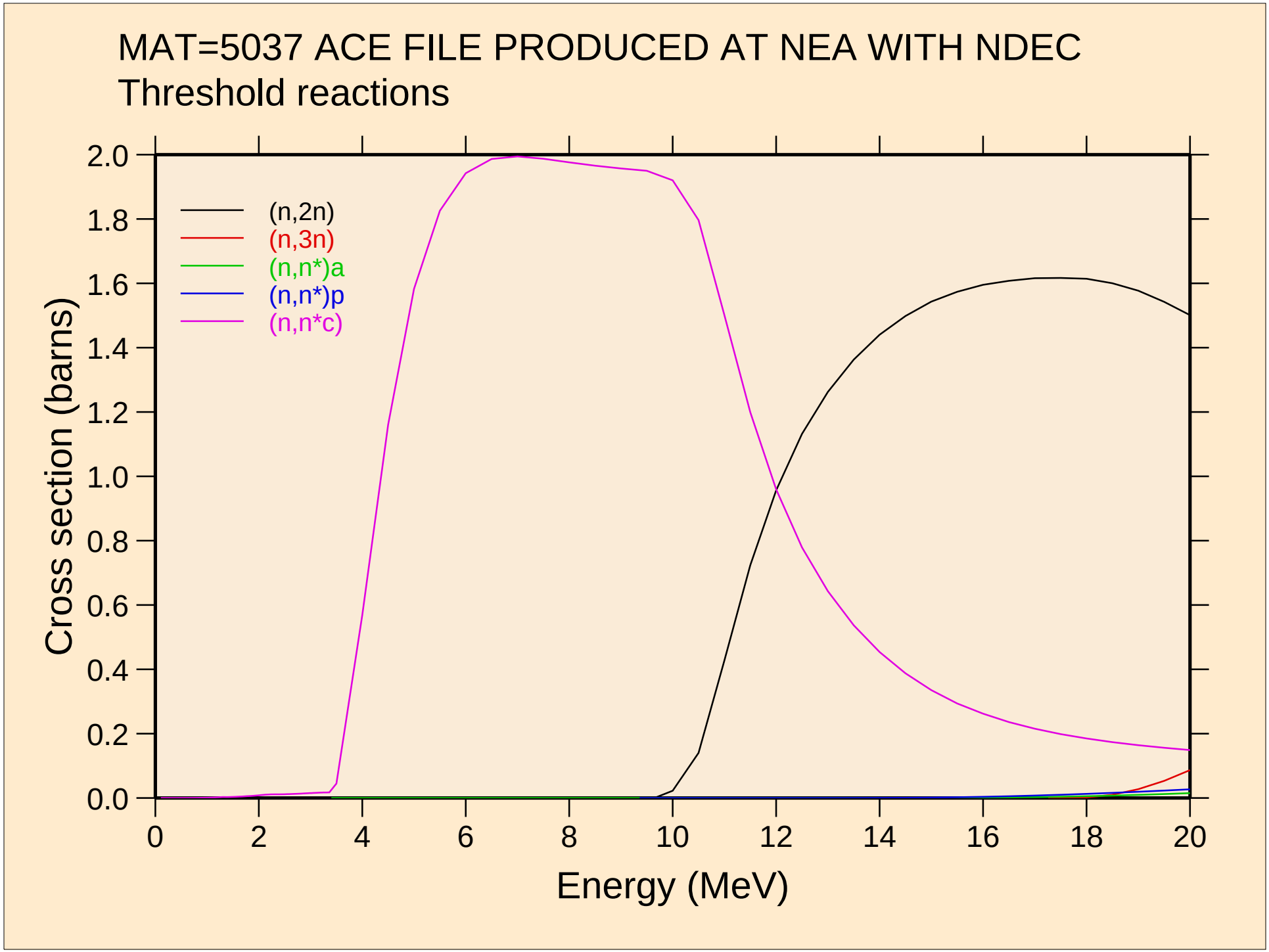

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
Cross section (barns)
*10-3
80
70
60
50
40
30
20
10
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*16)
(n,n*17)
(n,n*18)
(n,n*19)
(n,n*20)

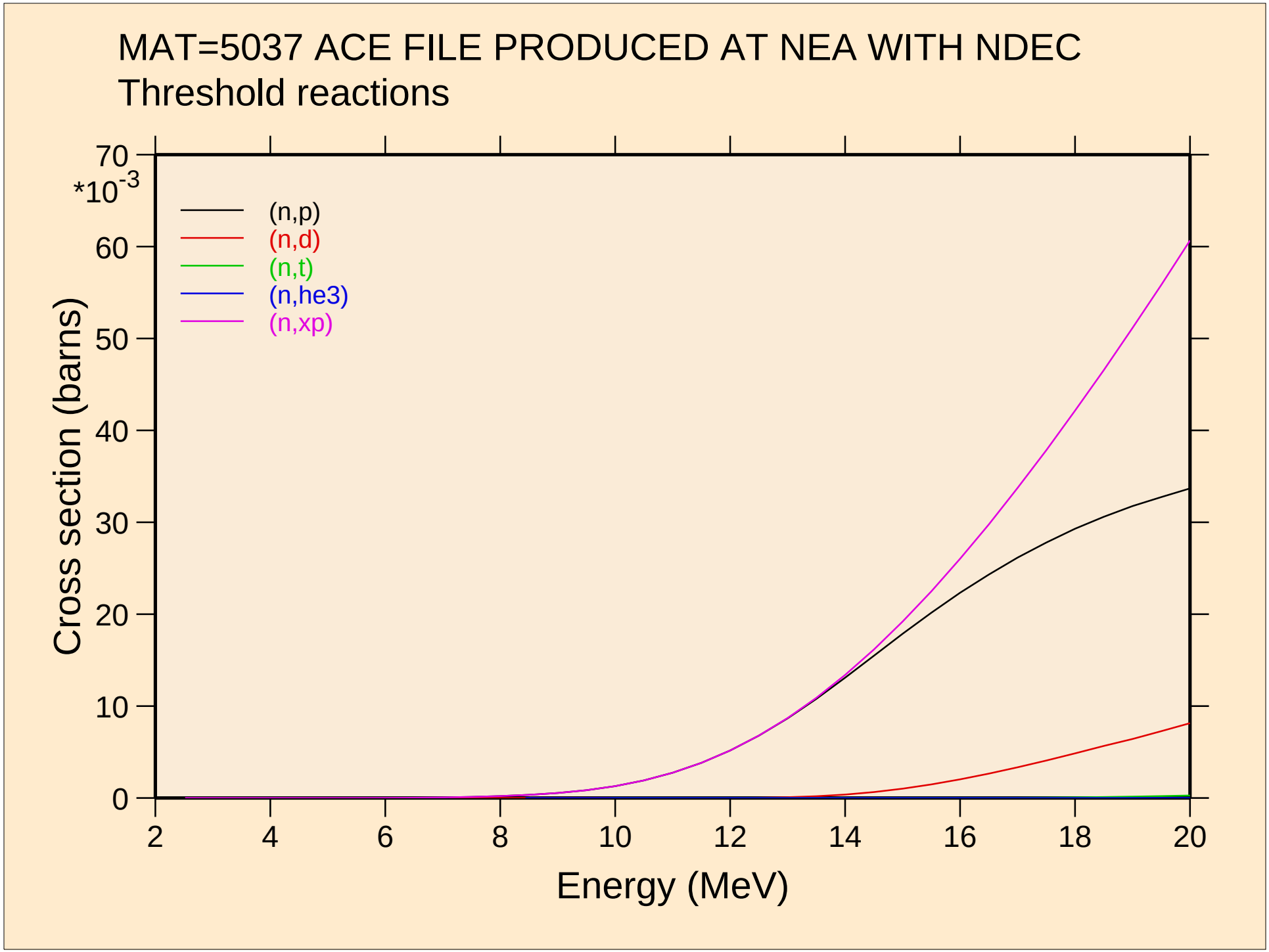

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
Cross section (barns)
*10-3
50
40
30
20
10
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*21)
(n,n*22)
(n,n*23)
(n,n*24)
(n,n*25)

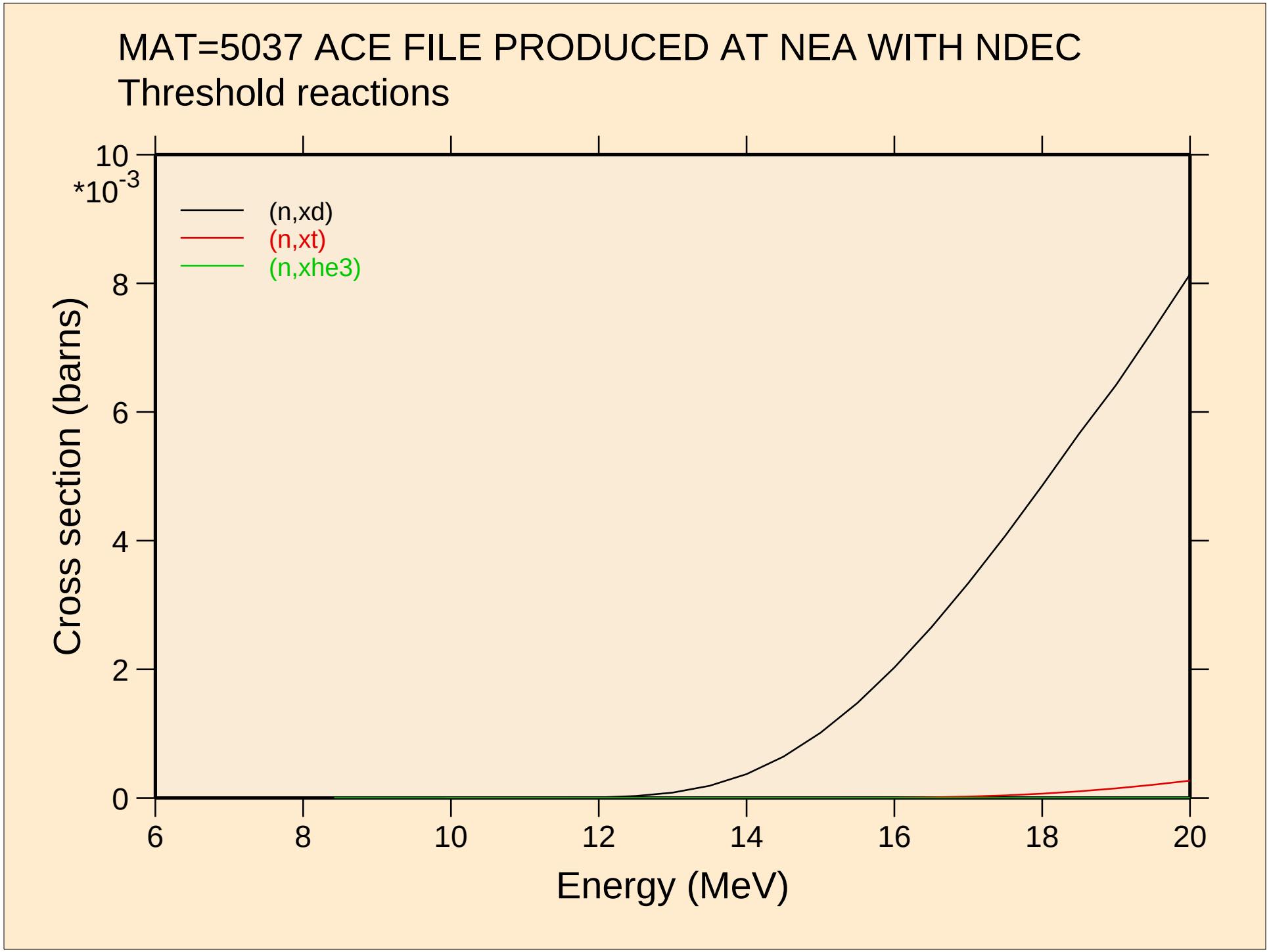

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
Cross section (barns)
*10-3
50
40
30
20
10
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*26)
(n,n*27)
(n,n*28)
(n,n*29)
(n,n*30)

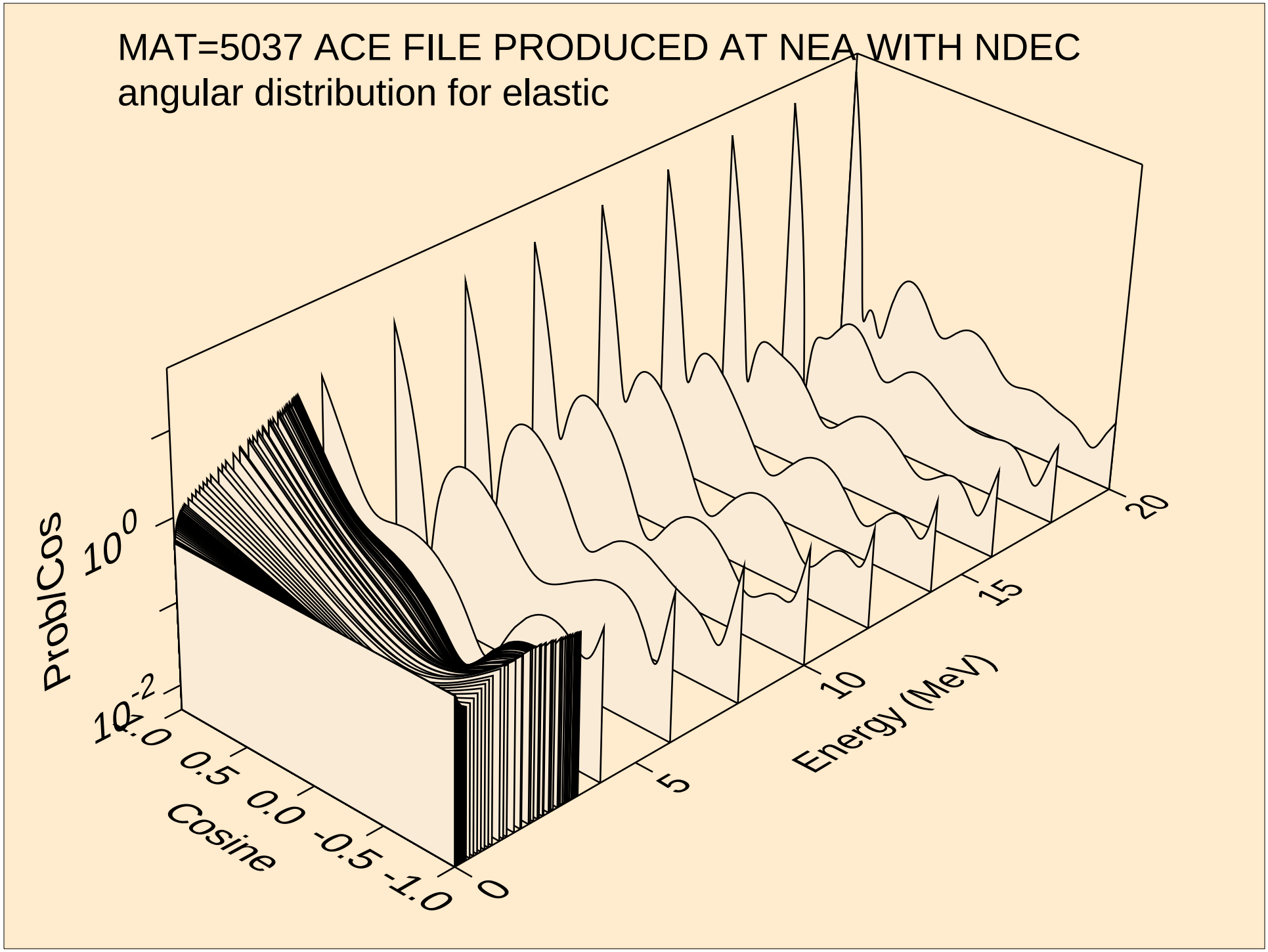

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
Cross section (barns)
*10-3
40
35
30
25
20
15
10
5
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*31)
(n,n*32)
(n,n*33)
(n,n*34)
(n,n*35)

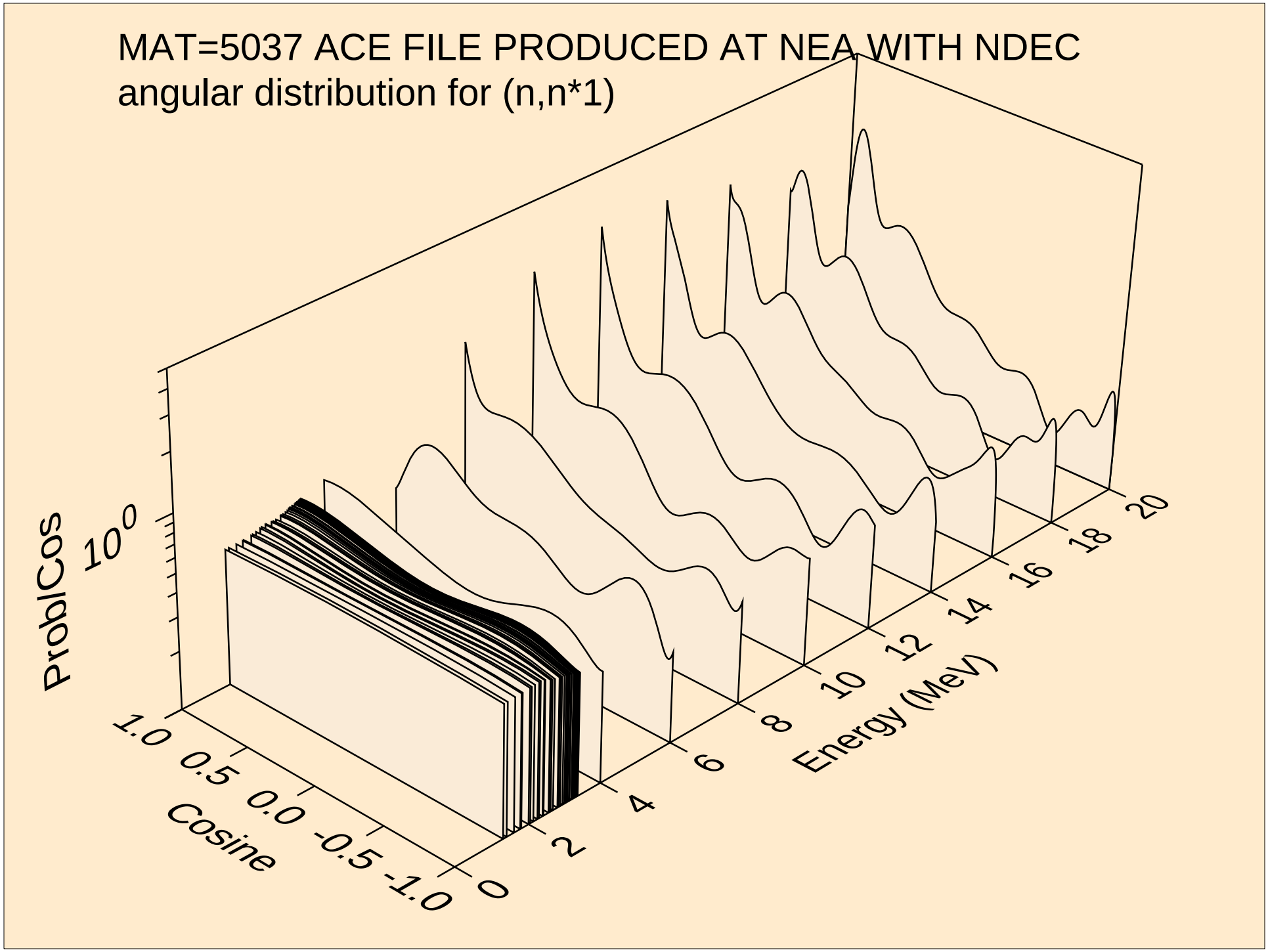

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
*10-3
35
30
25
20
15
10
5
0
Cross section (barns)
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*36)
(n,n*37)
(n,n*38)
(n,n*39)
(n,n*40)

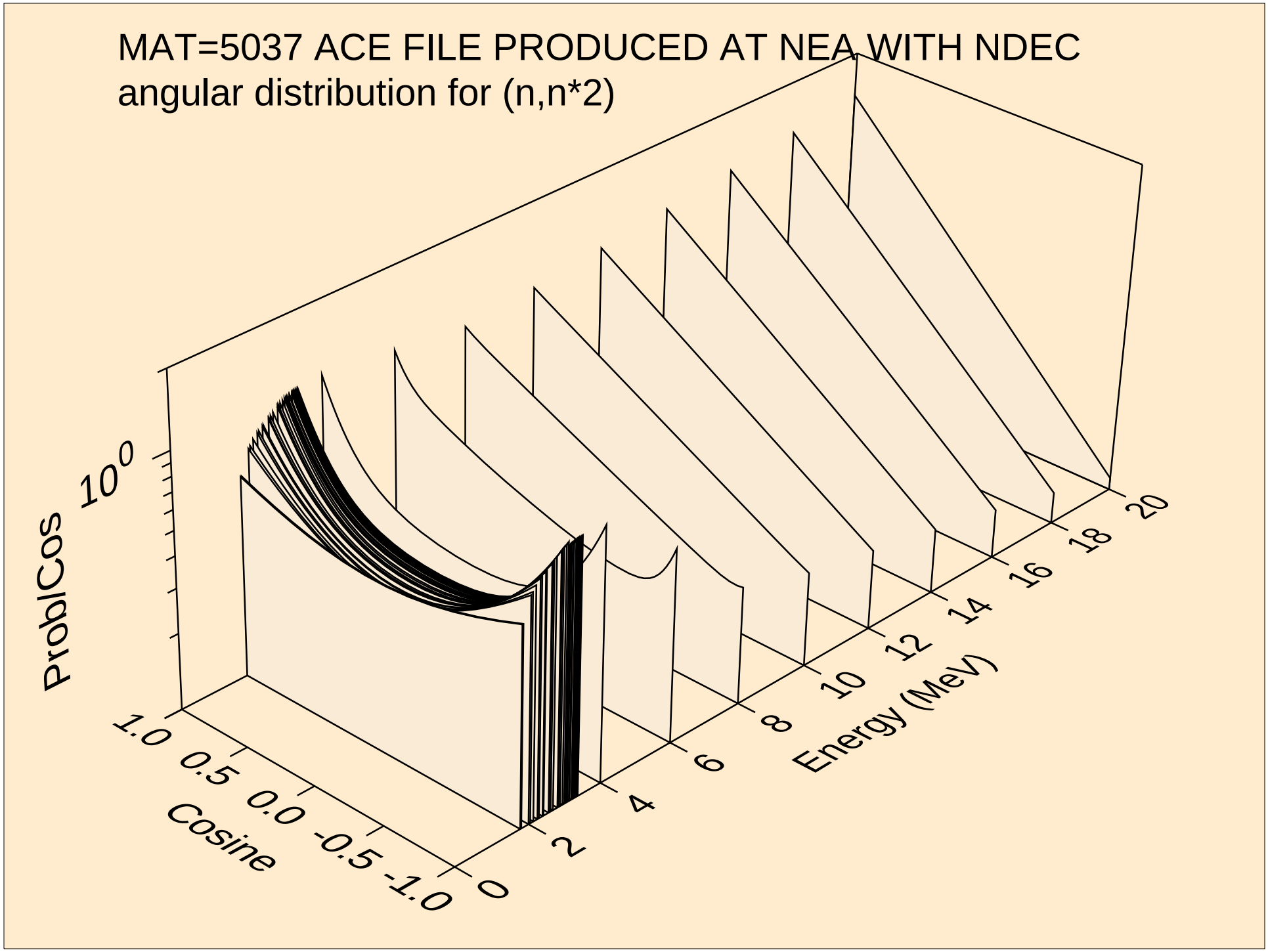

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Threshold reactions
(n,2n)
(n,3n)
(n,n*)a
(n,n*)p
(n,n*c)
Cross section (barns)
Energy (MeV)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
0
2
4
6
8
10
12
14
16
18
20

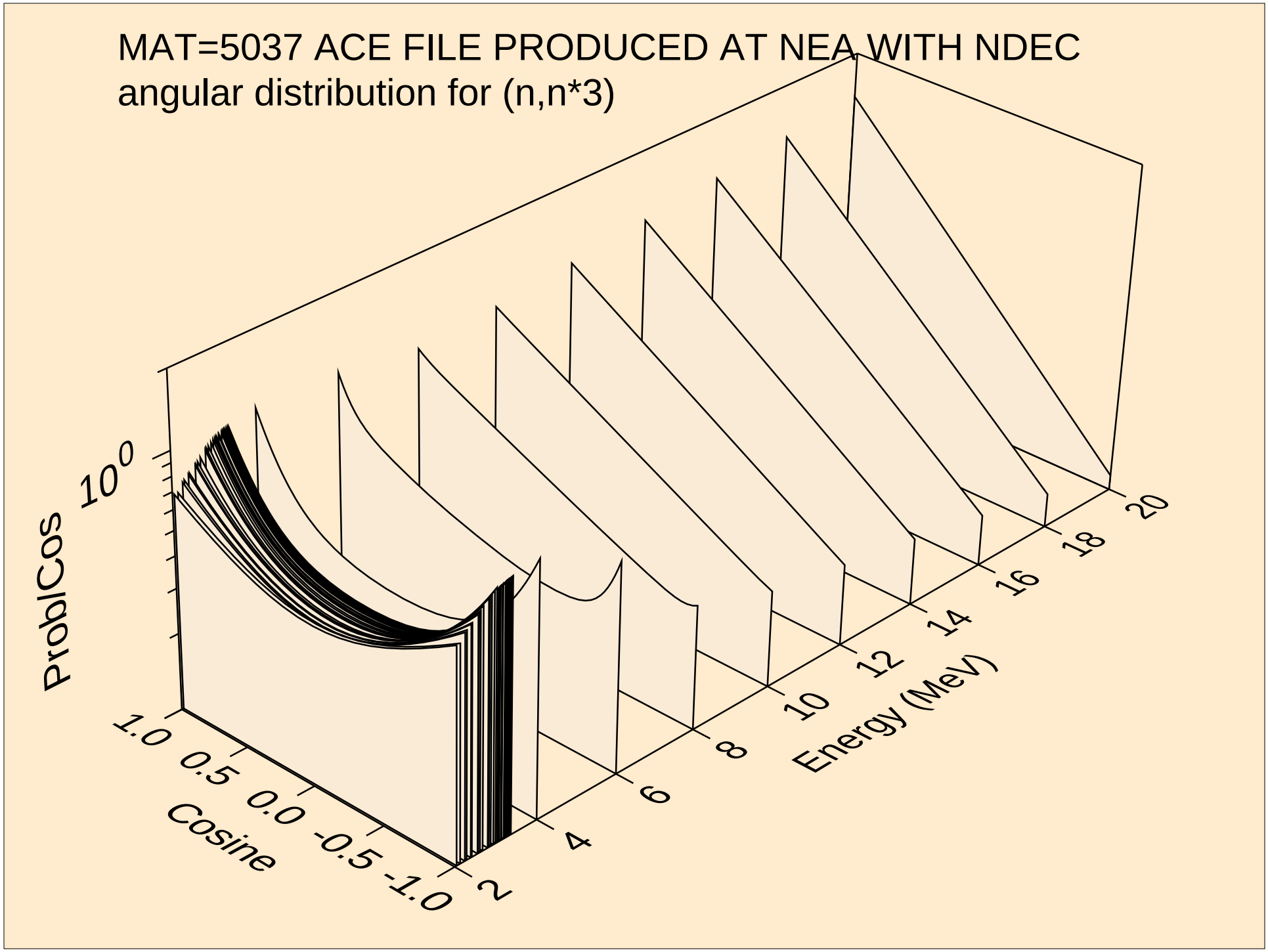

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Threshold reactions
*10-3
70
60
50
40
30
20
10
0
Cross section (barns)
(n,p)
(n,d)
(n,t)
(n,he3)
(n,xp)
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

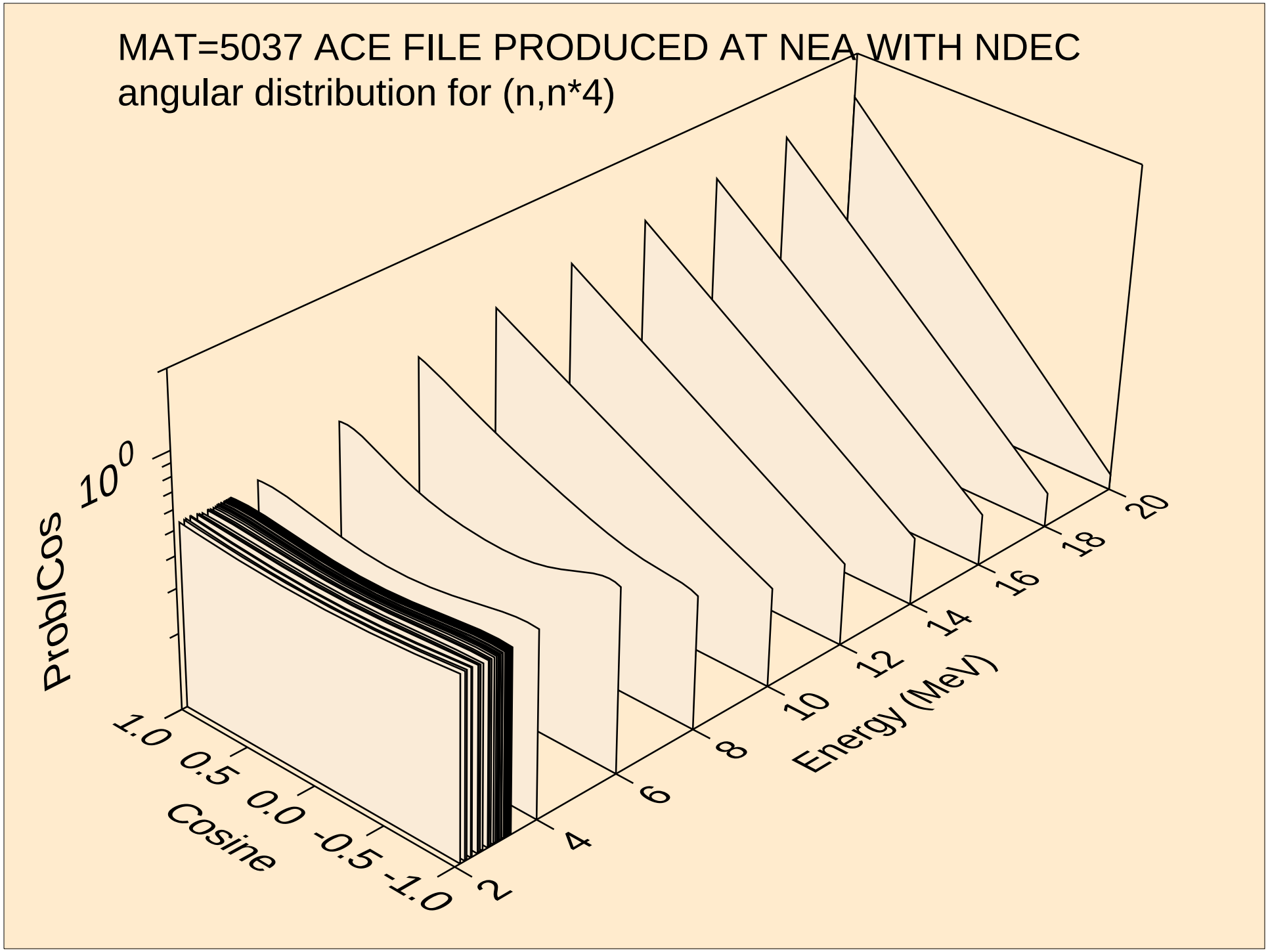

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Threshold reactions
10
*10-3
8
6
4
2
0
Cross section (barns)
(n,xd)
(n,xt)
(n,xhe3)
6
8
10
12
14
16
18
20
Energy (MeV)

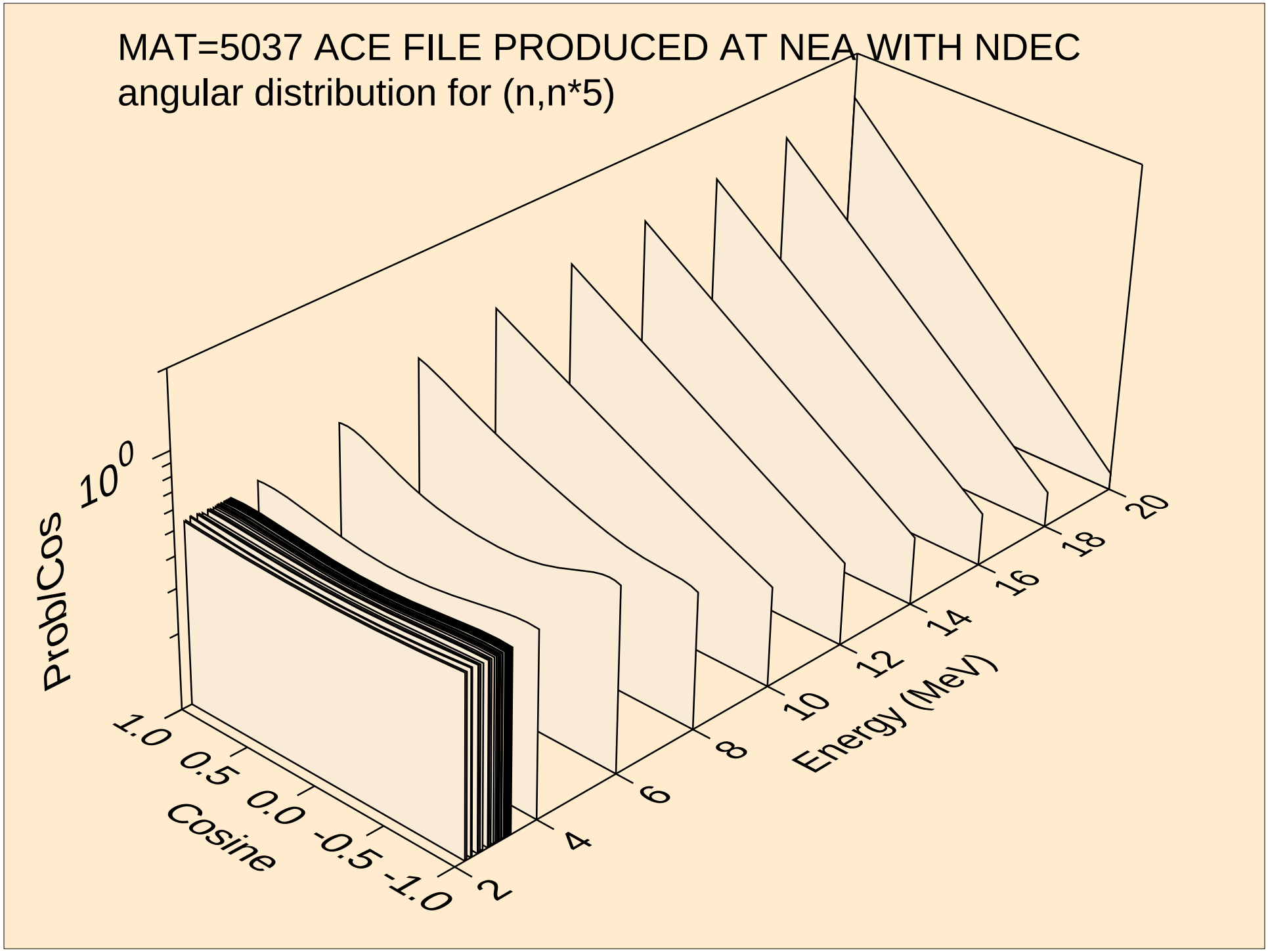

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for elastic
ProbICos
10^0
10^-2
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

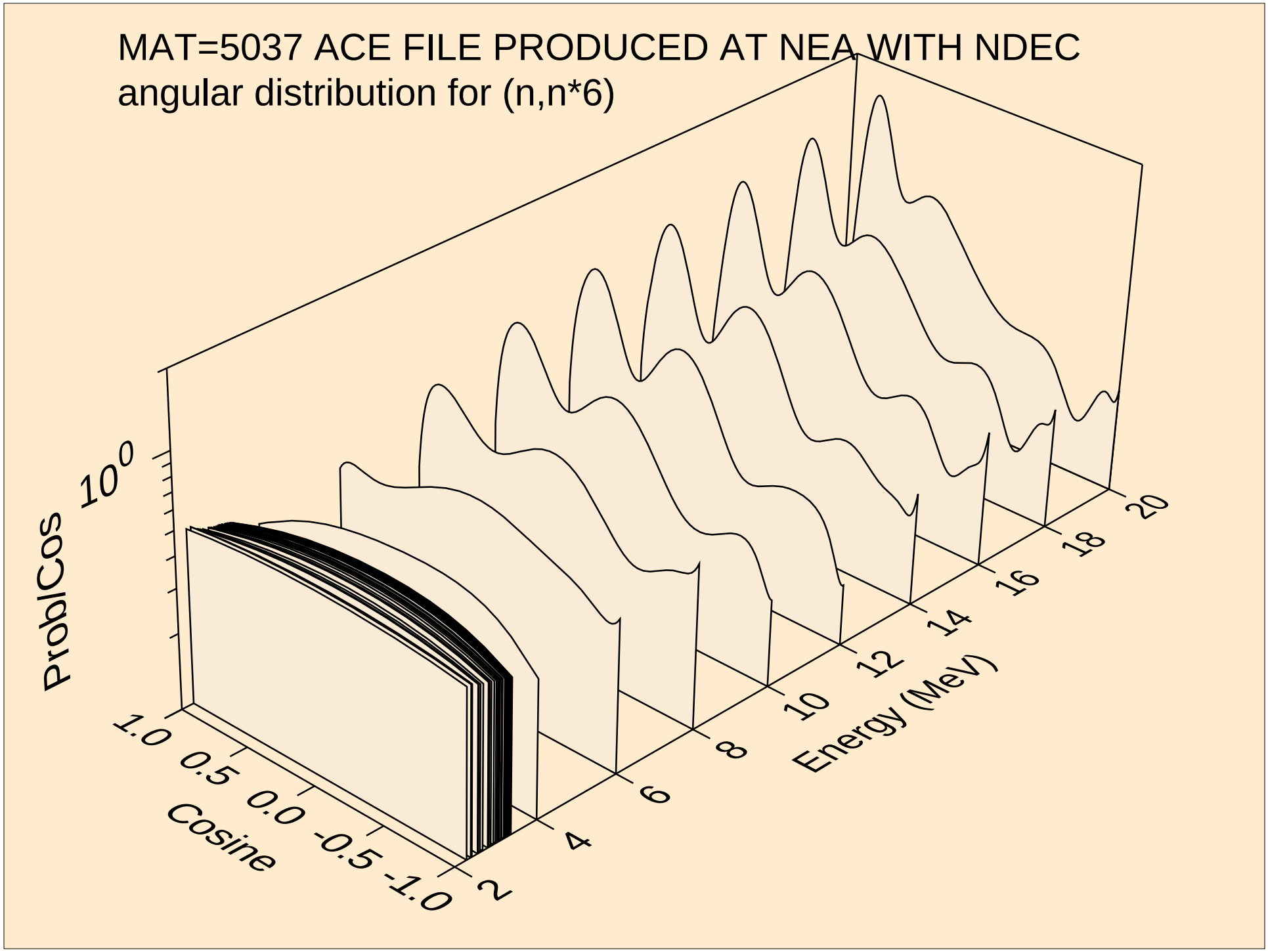

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*1)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

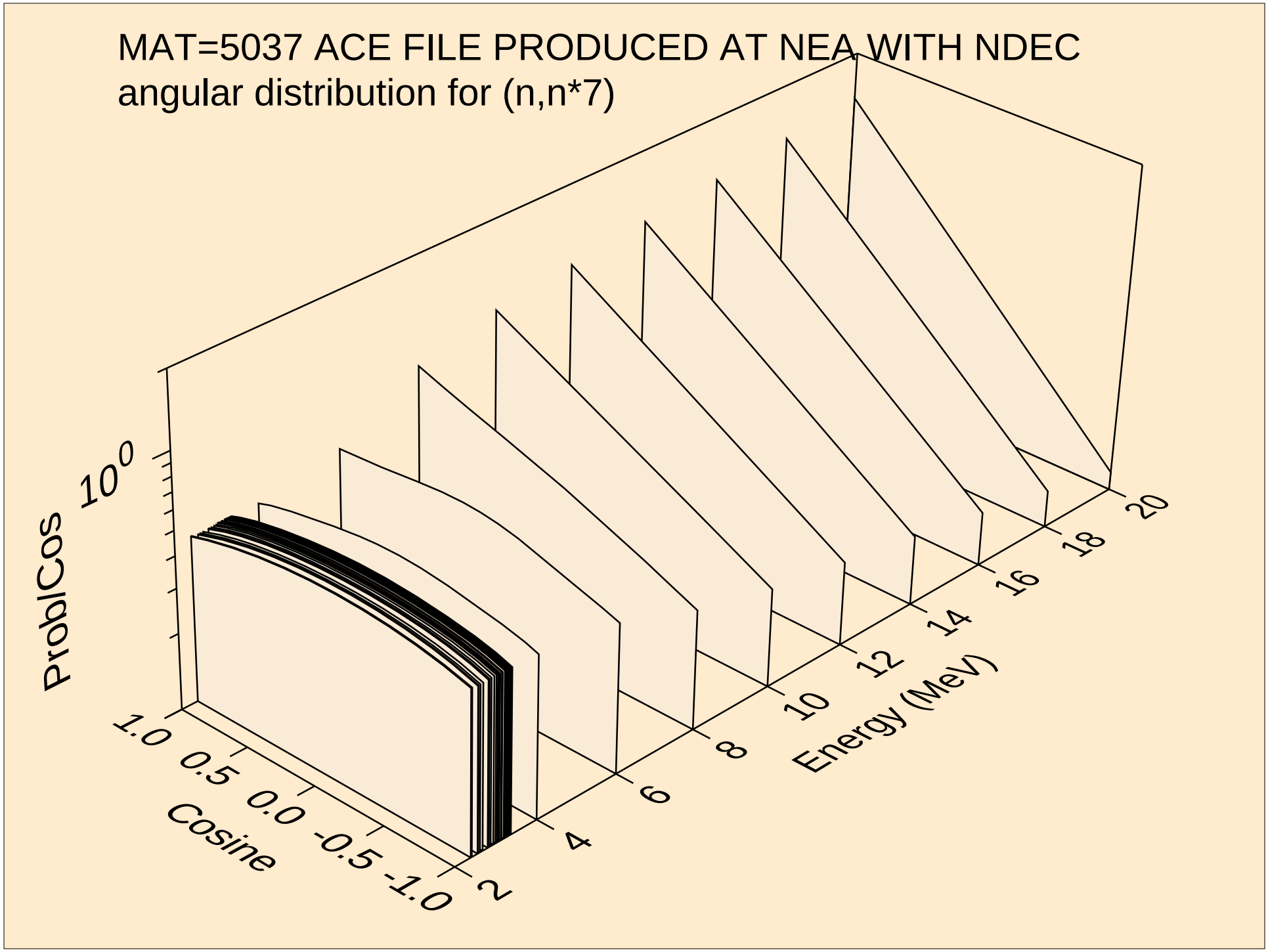

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*2)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

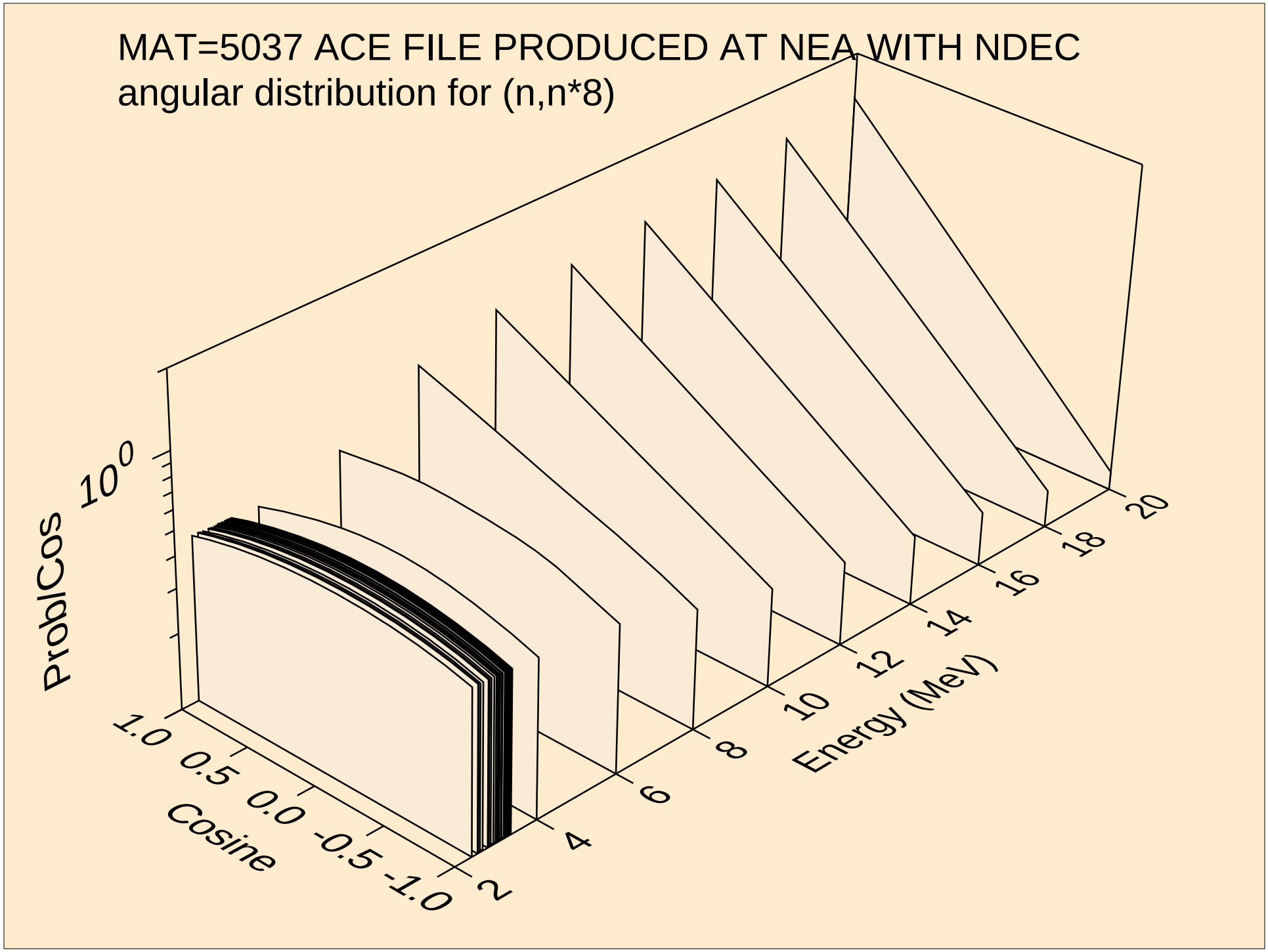

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*3)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

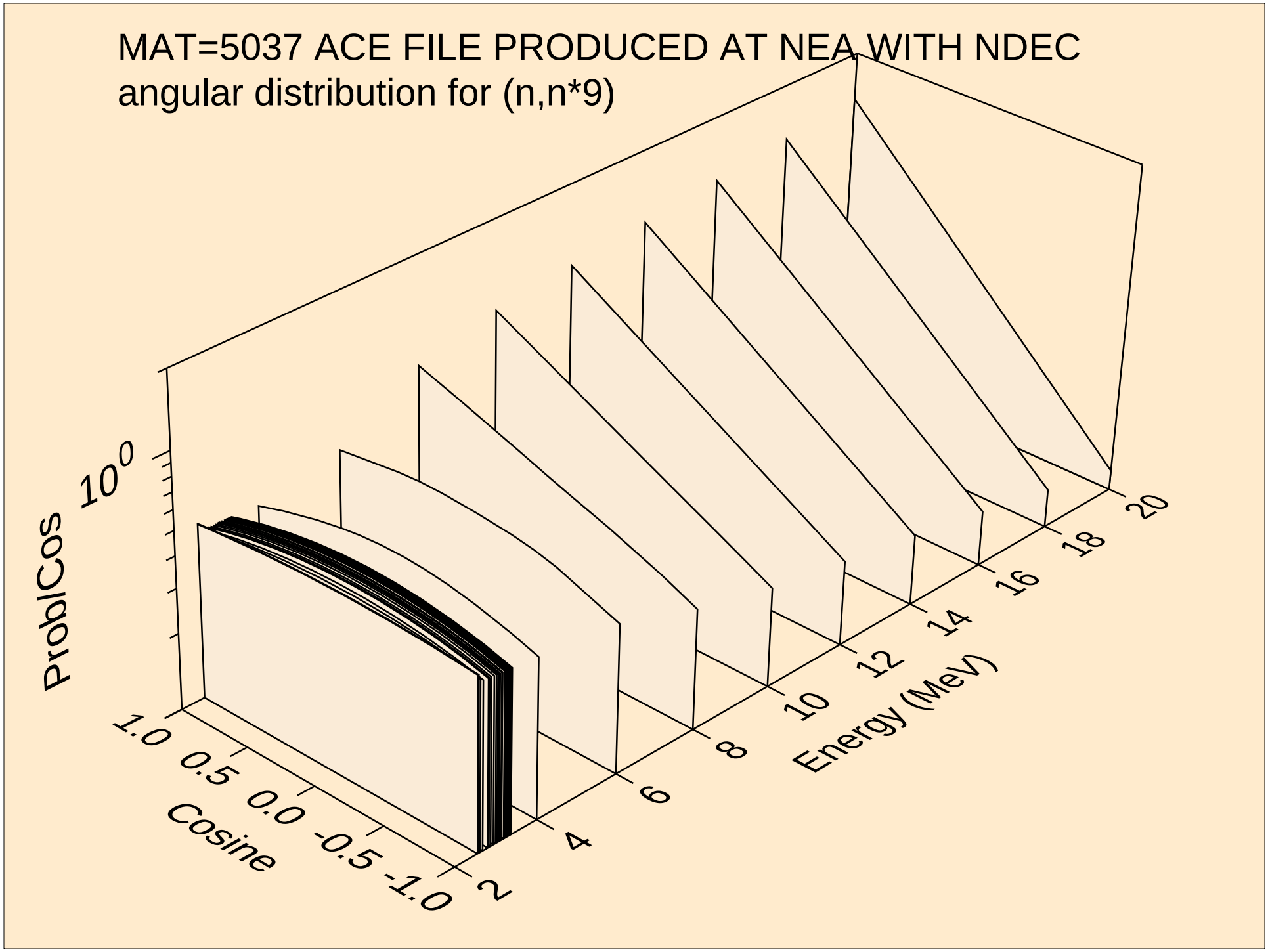

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*4)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

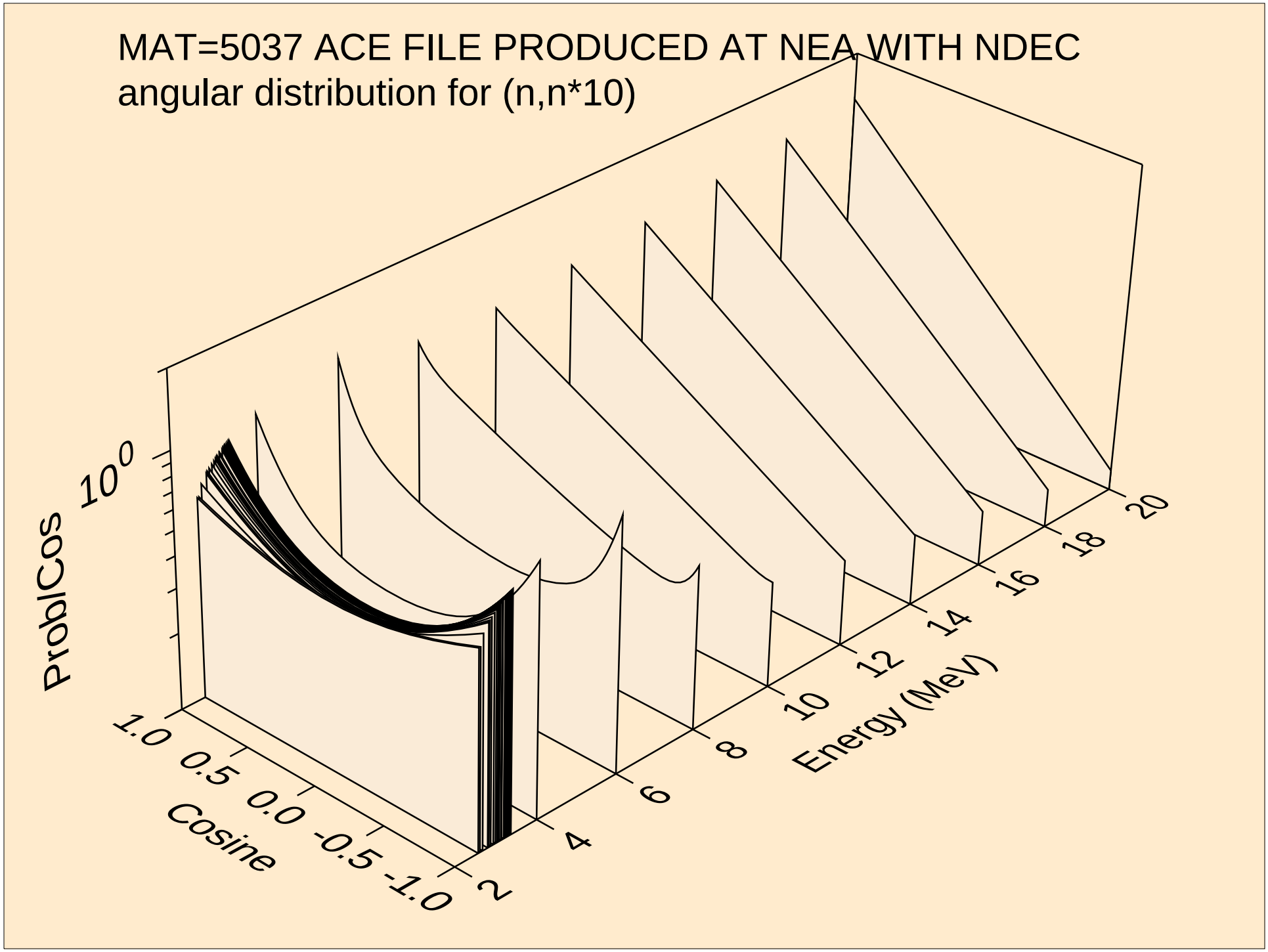

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*5)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

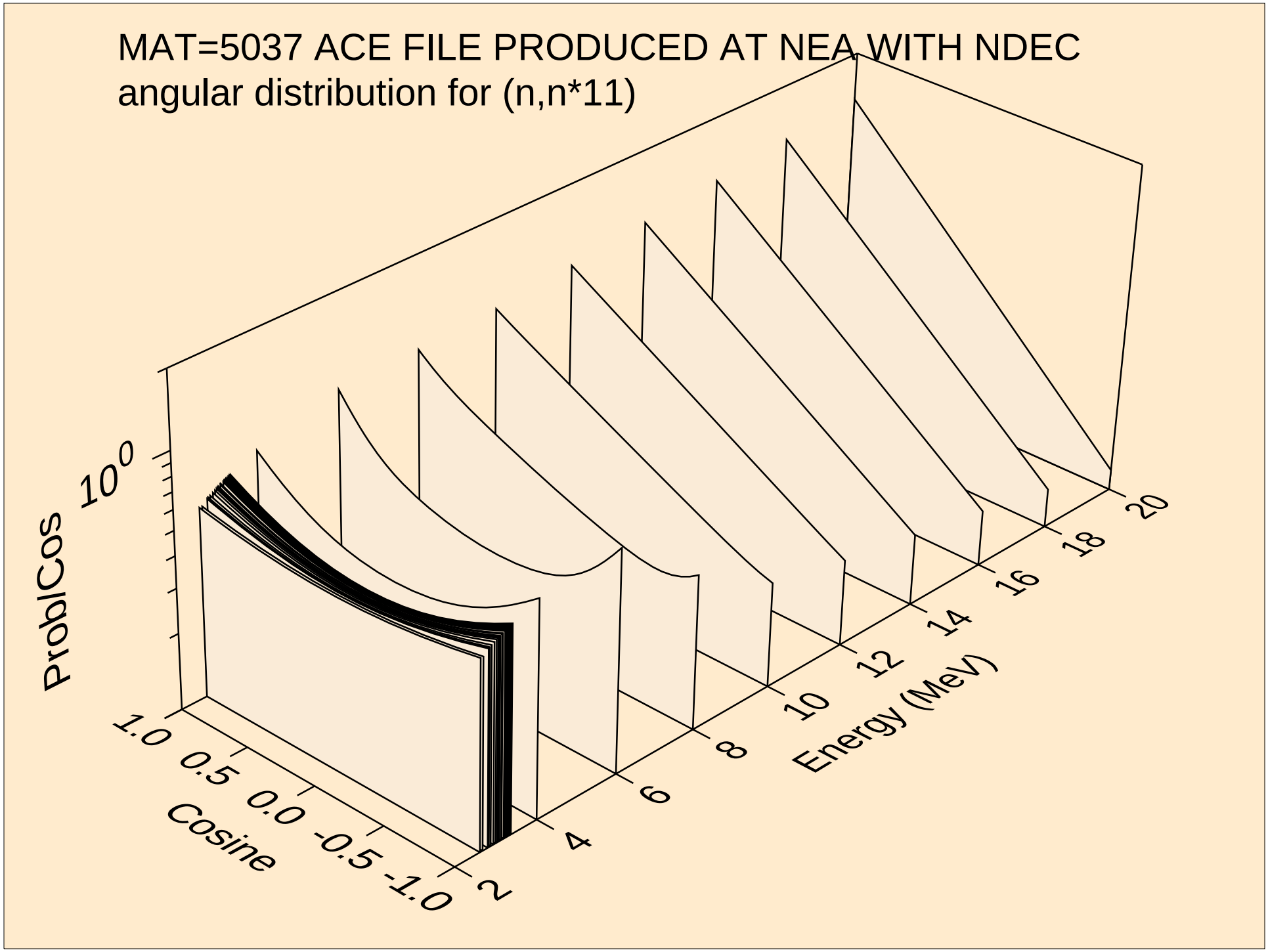

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*6)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

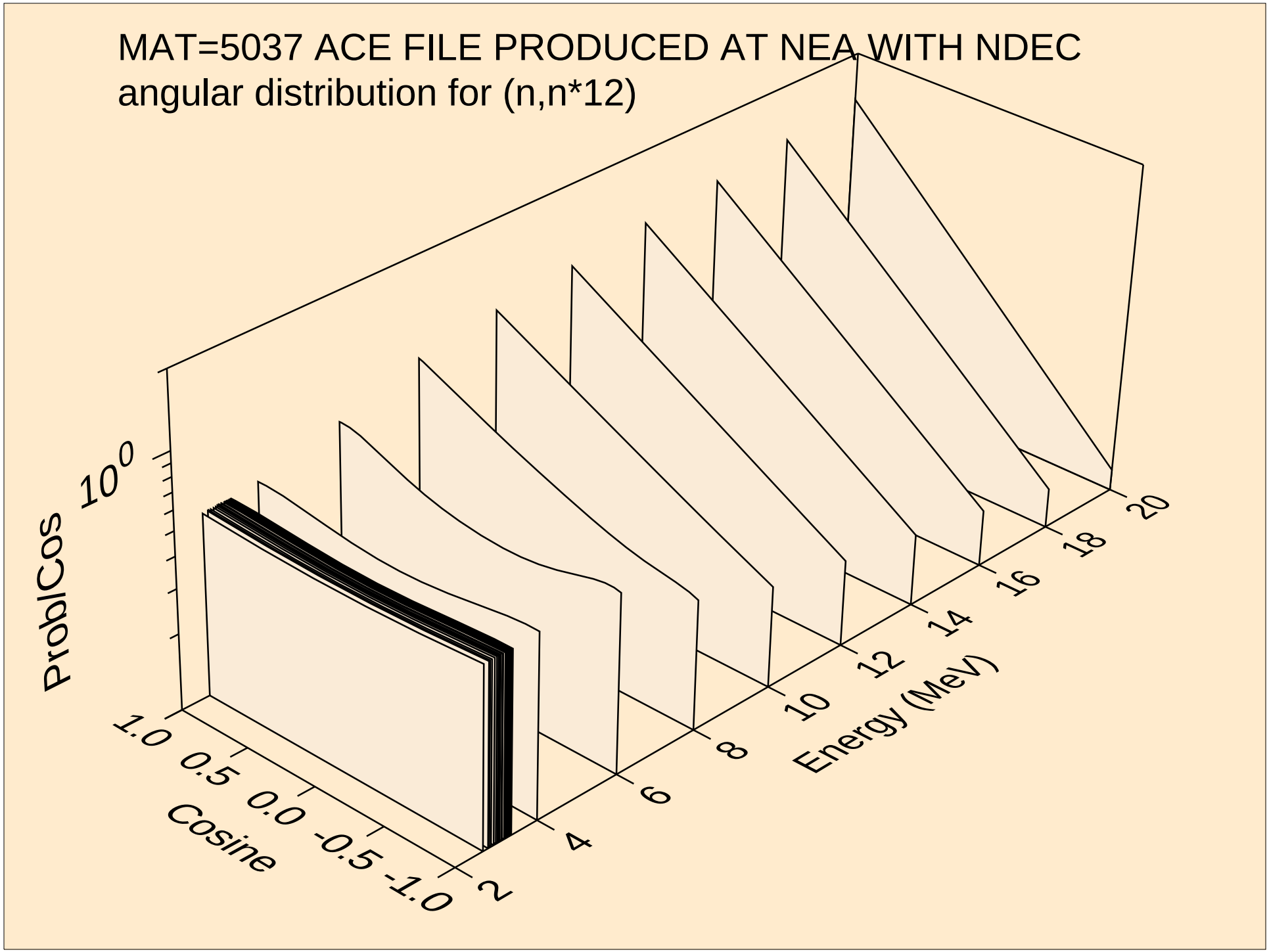

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*7)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

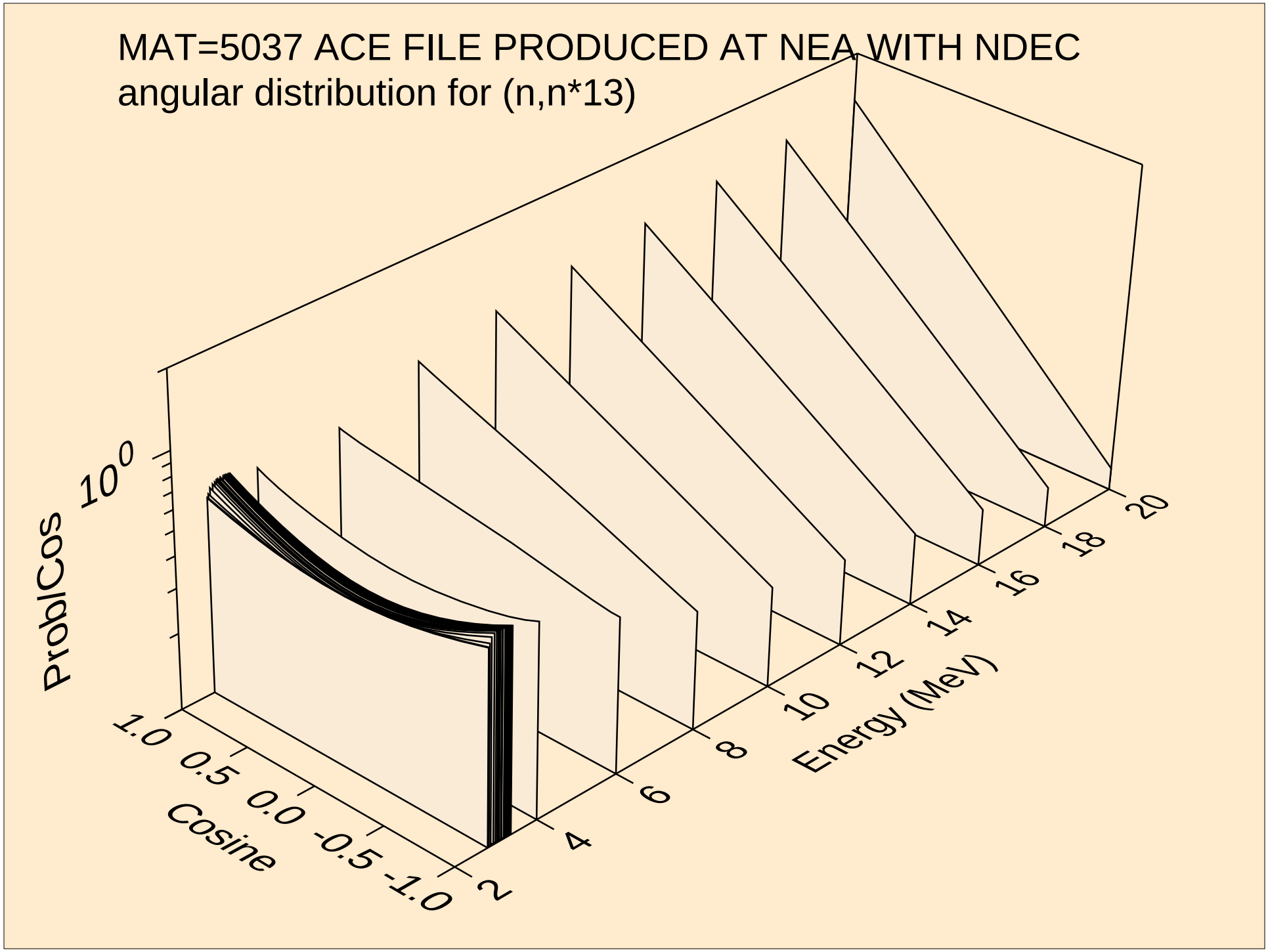

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*8)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

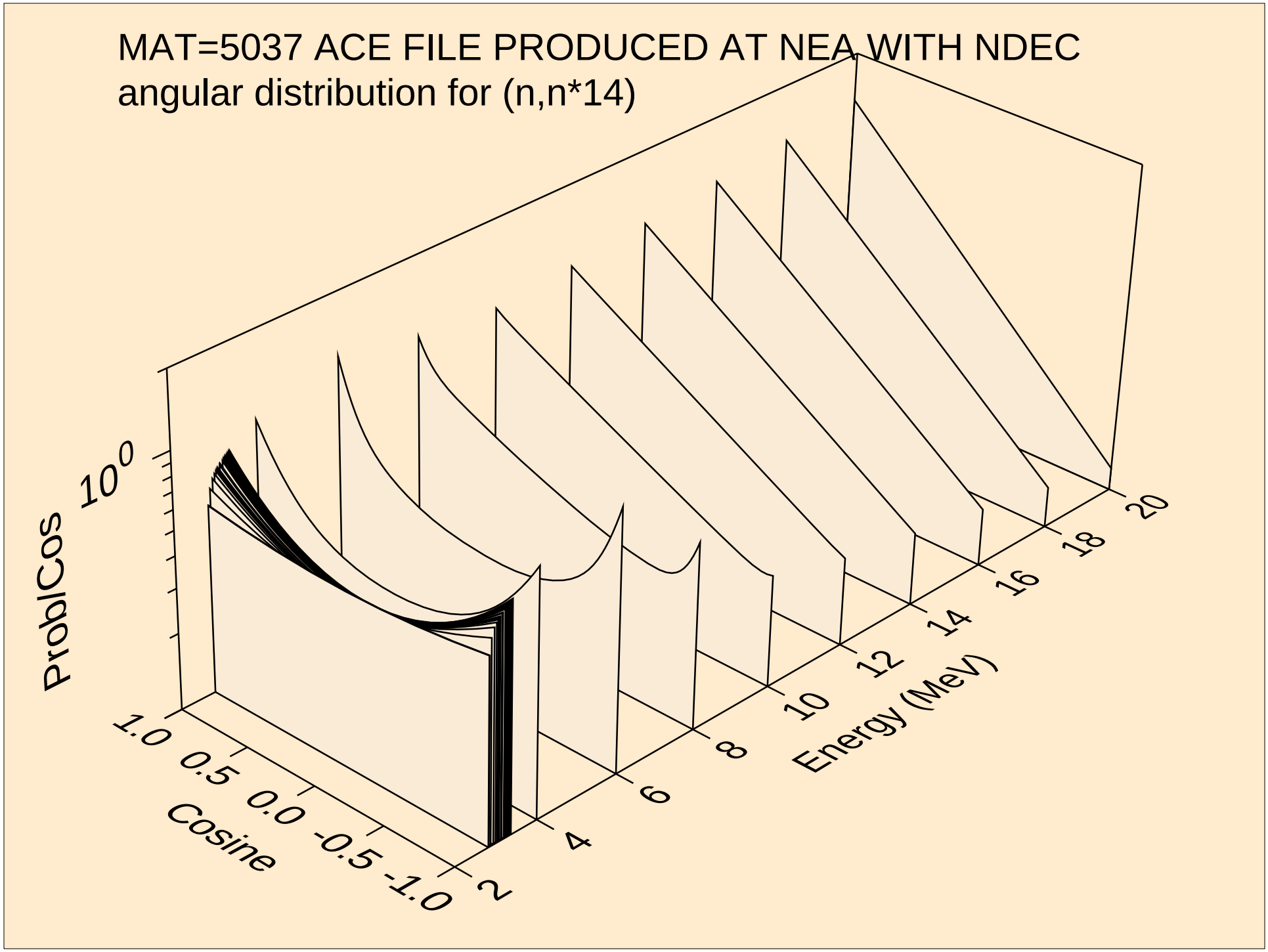

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*9)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

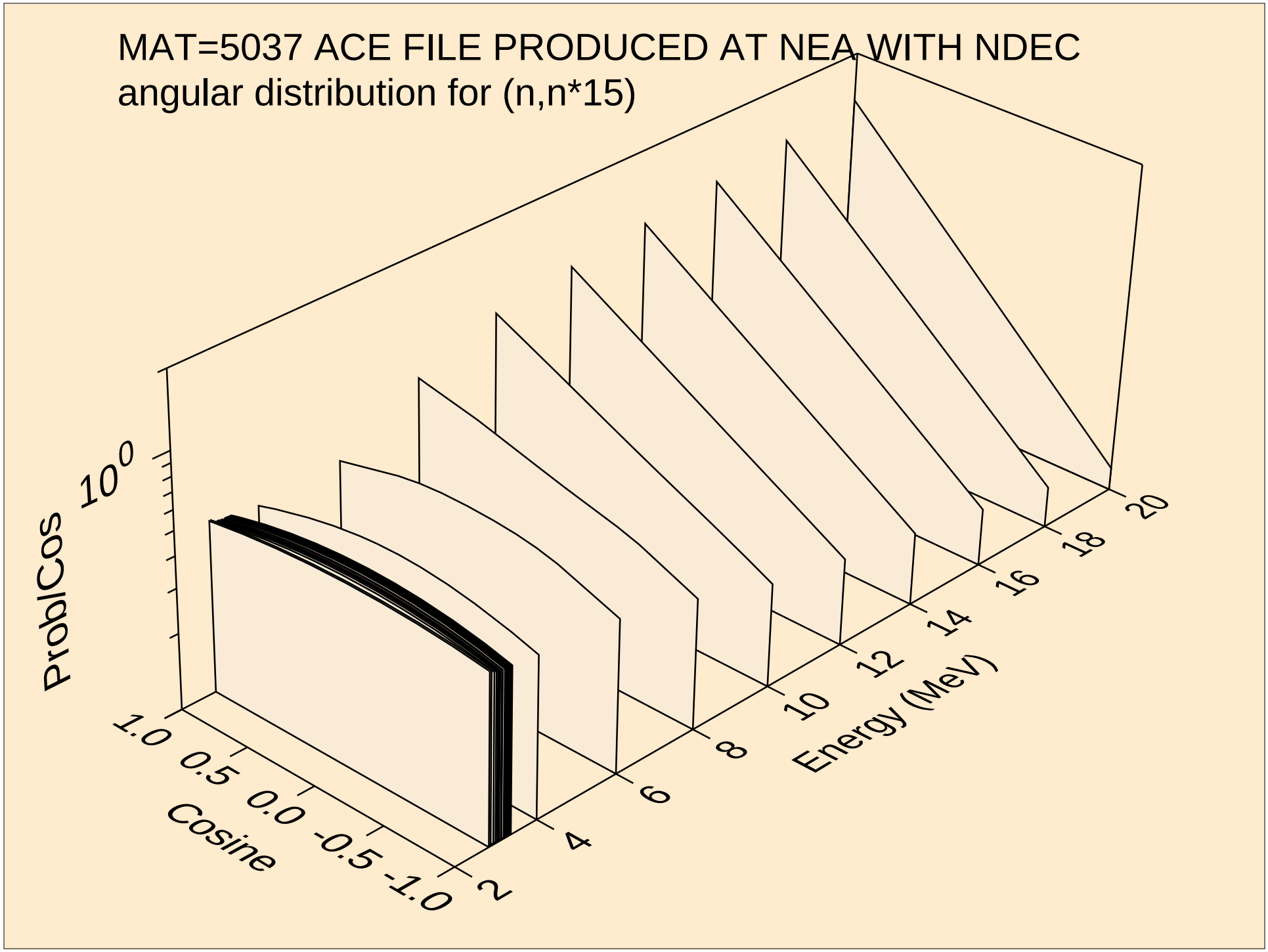

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*10)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

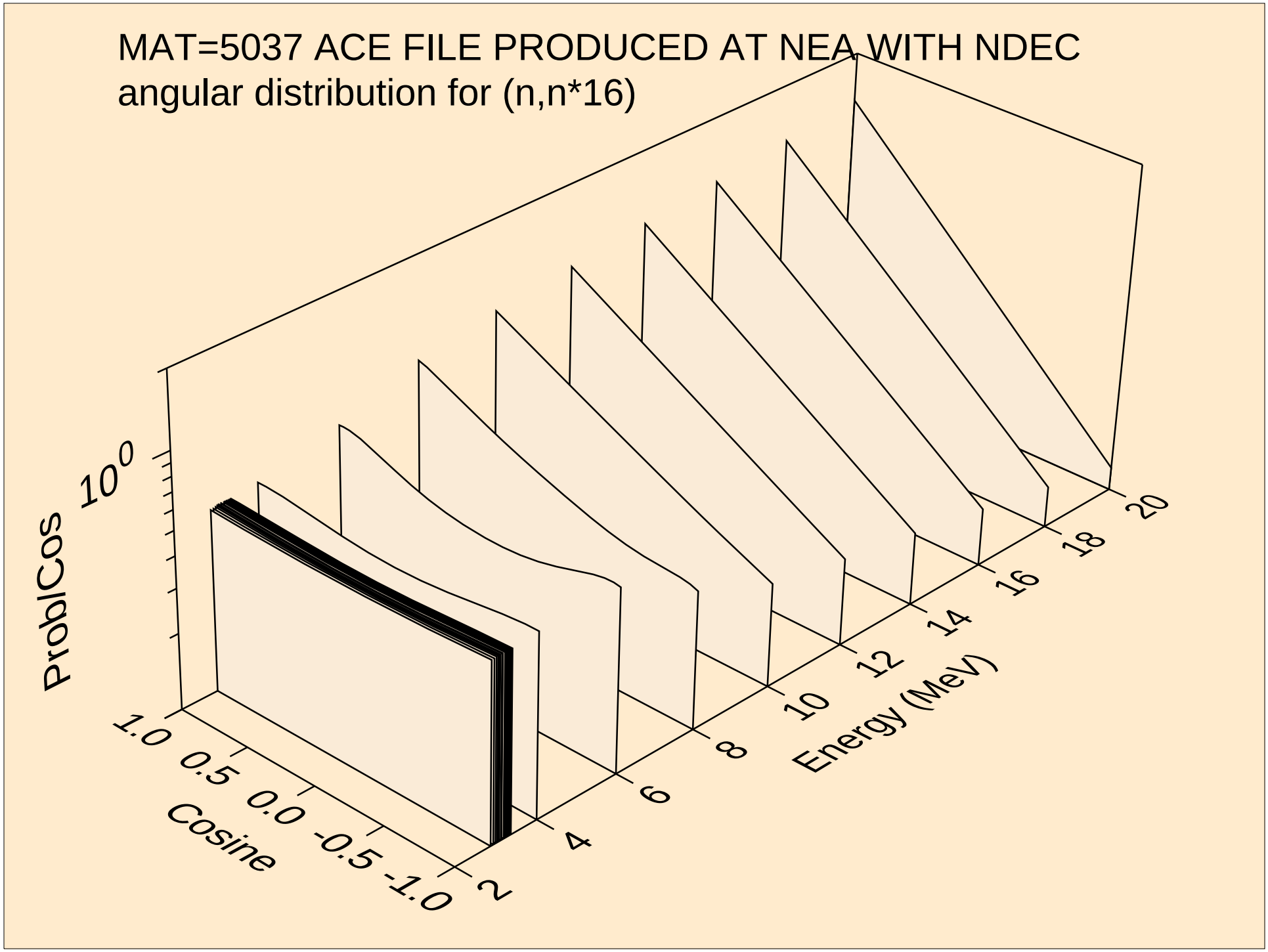

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*11)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

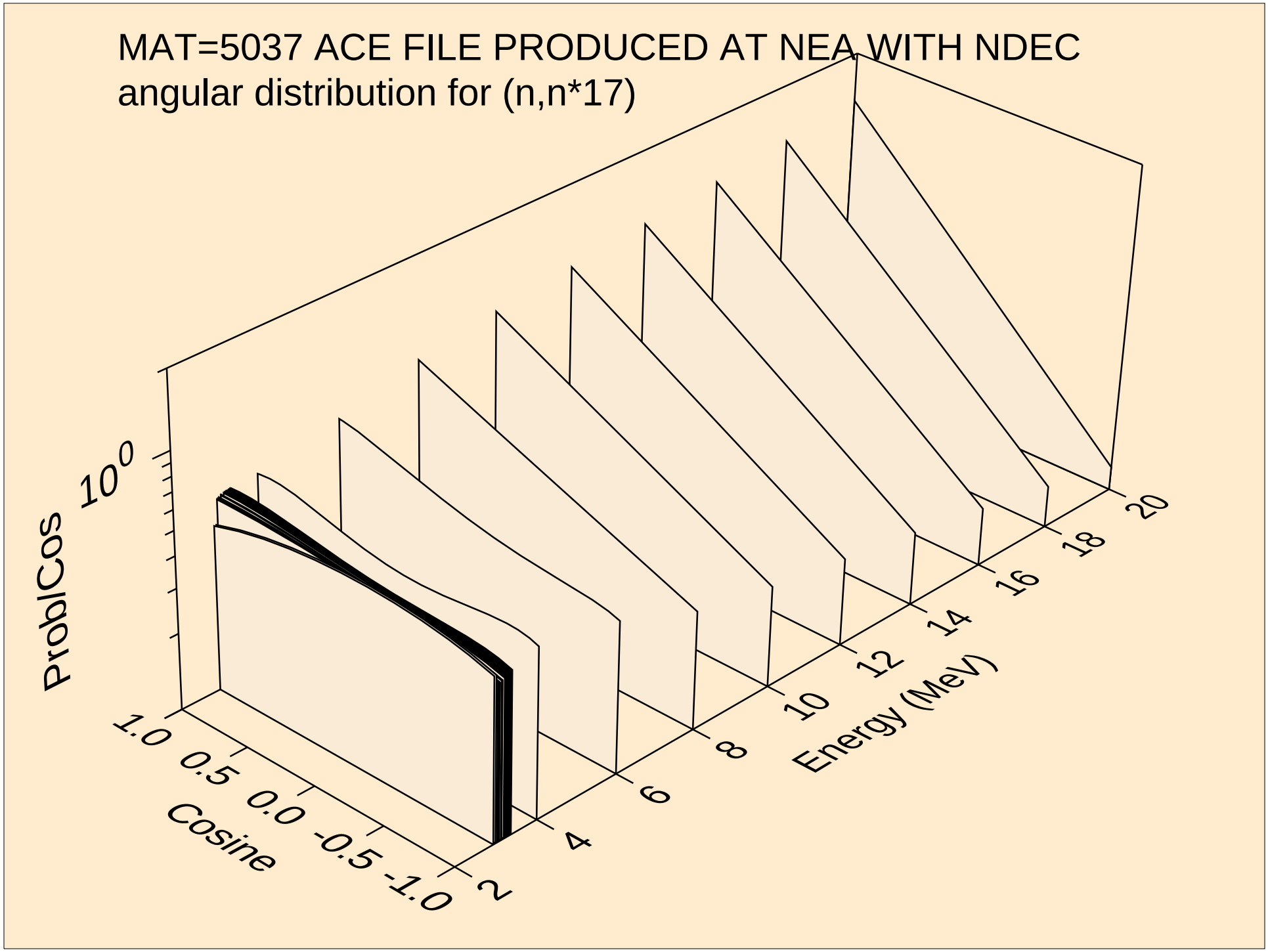

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*12)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

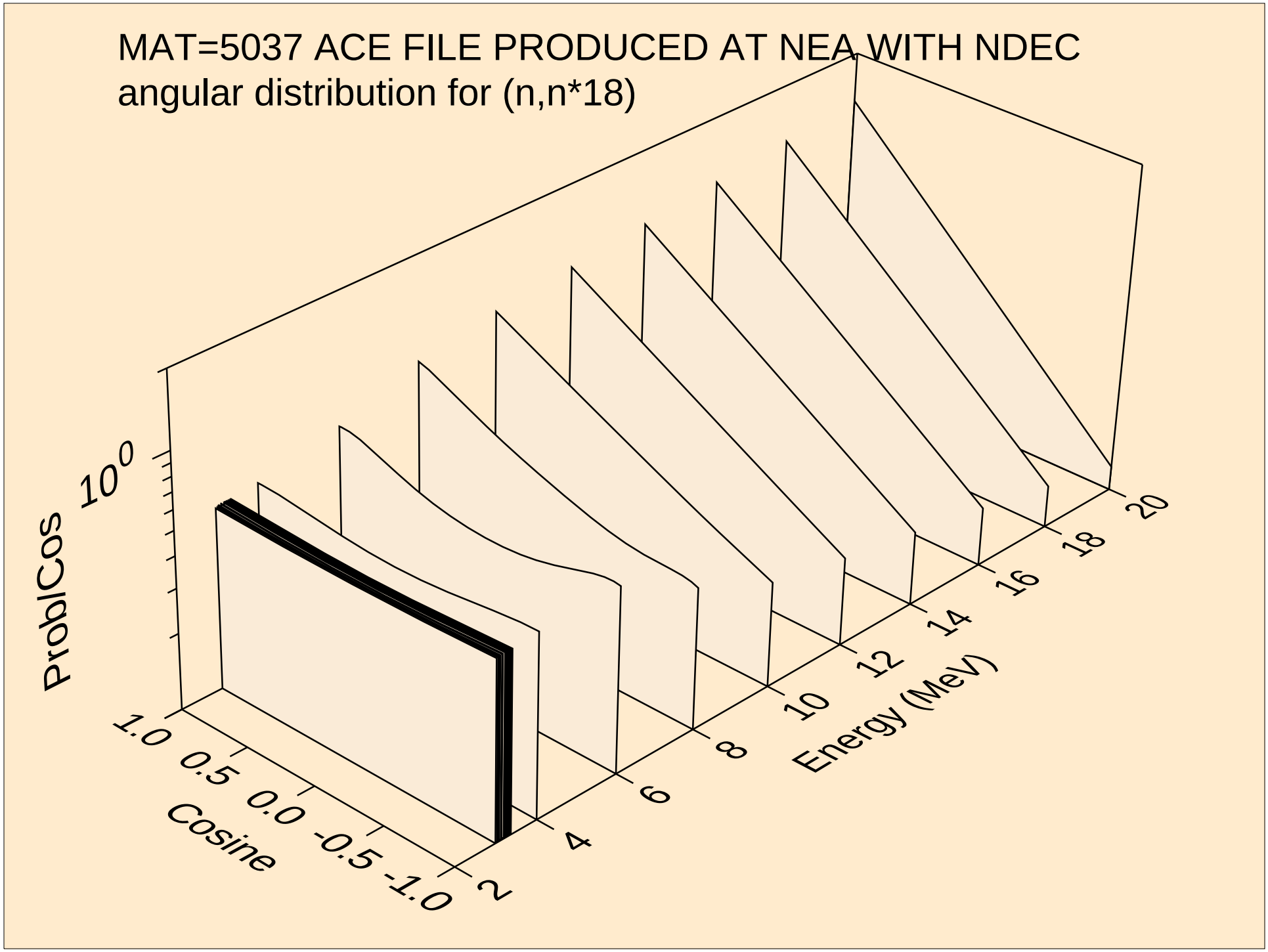

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*13)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

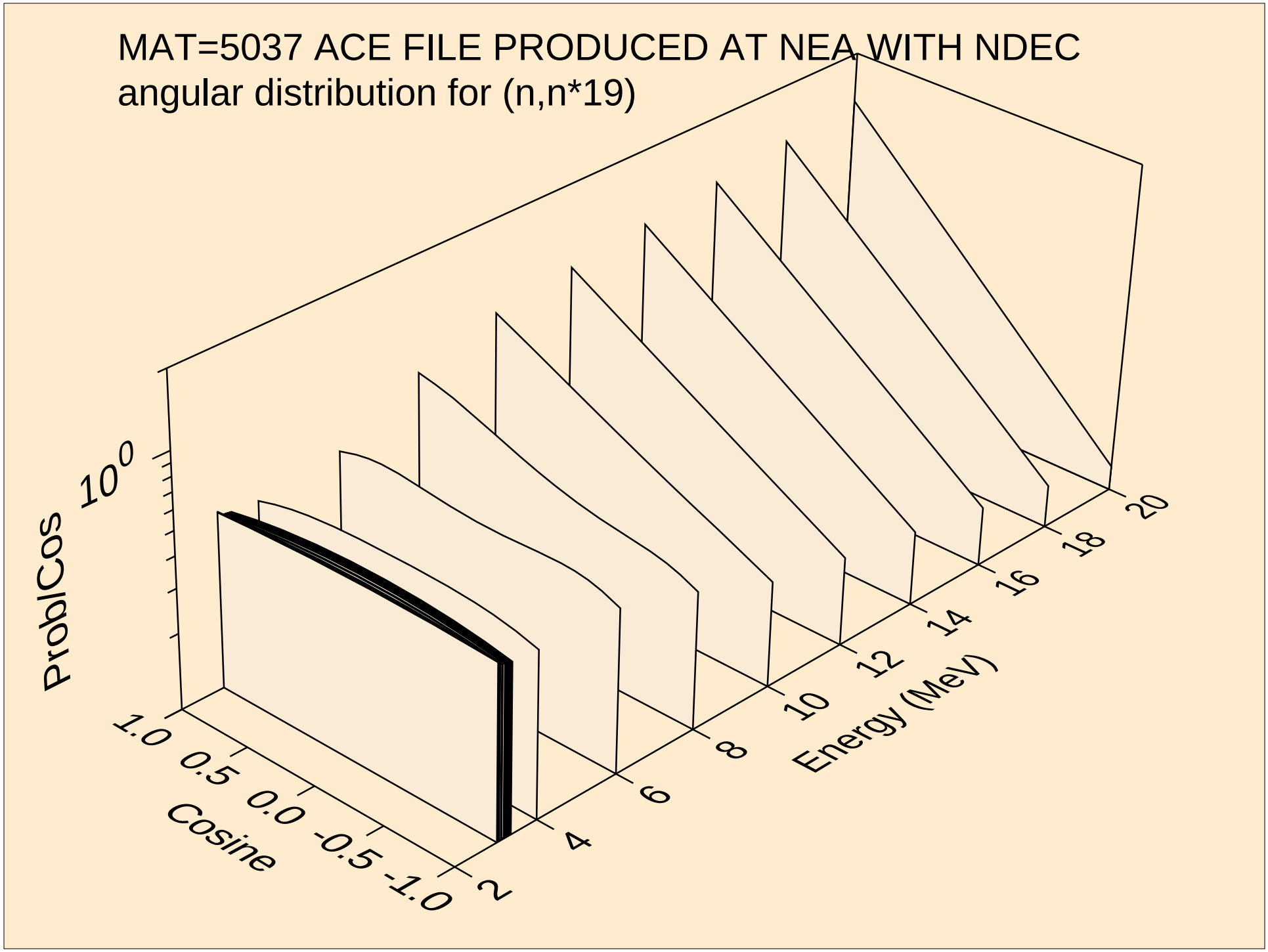

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*14)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

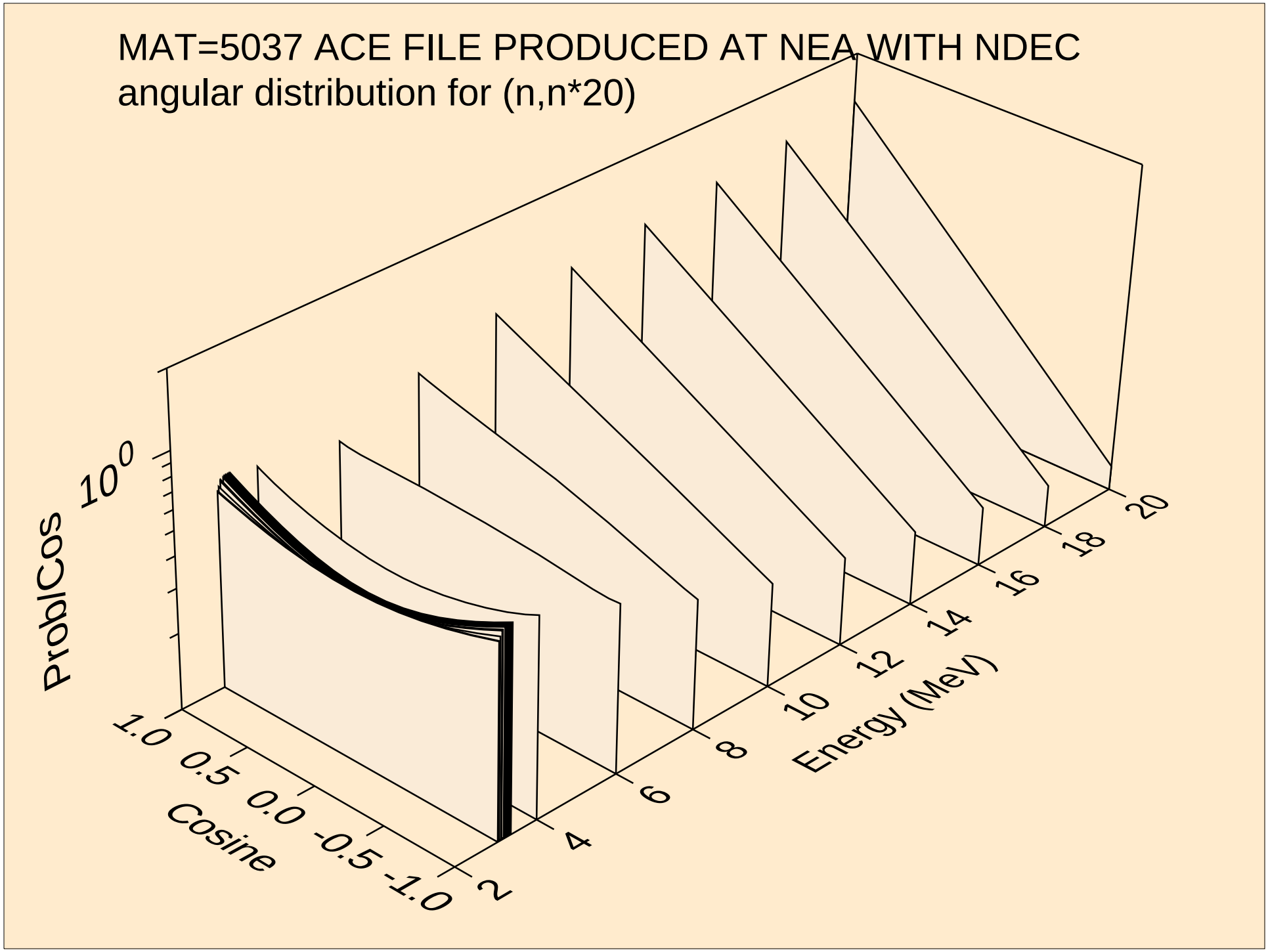

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*15)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

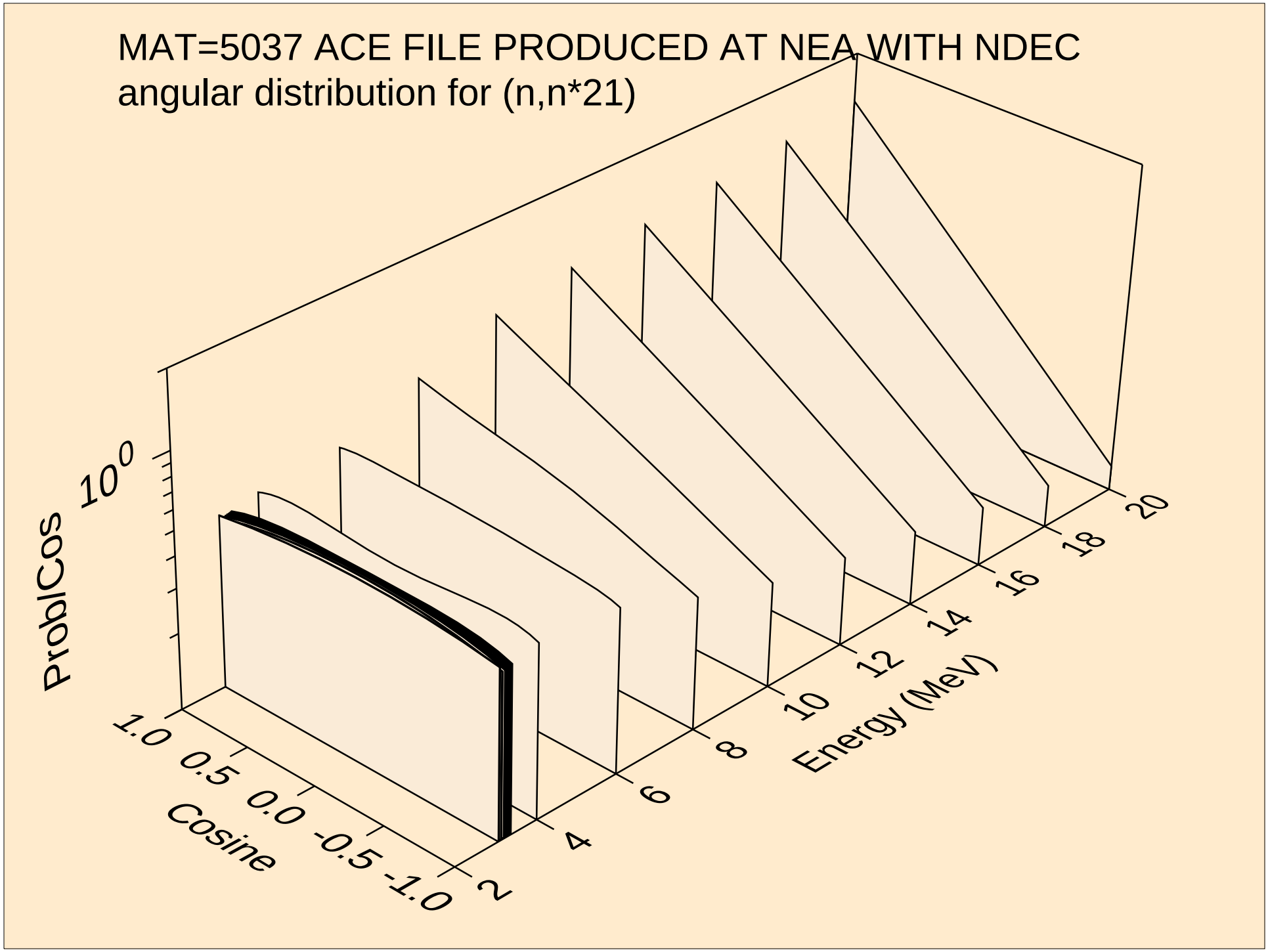

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*16)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

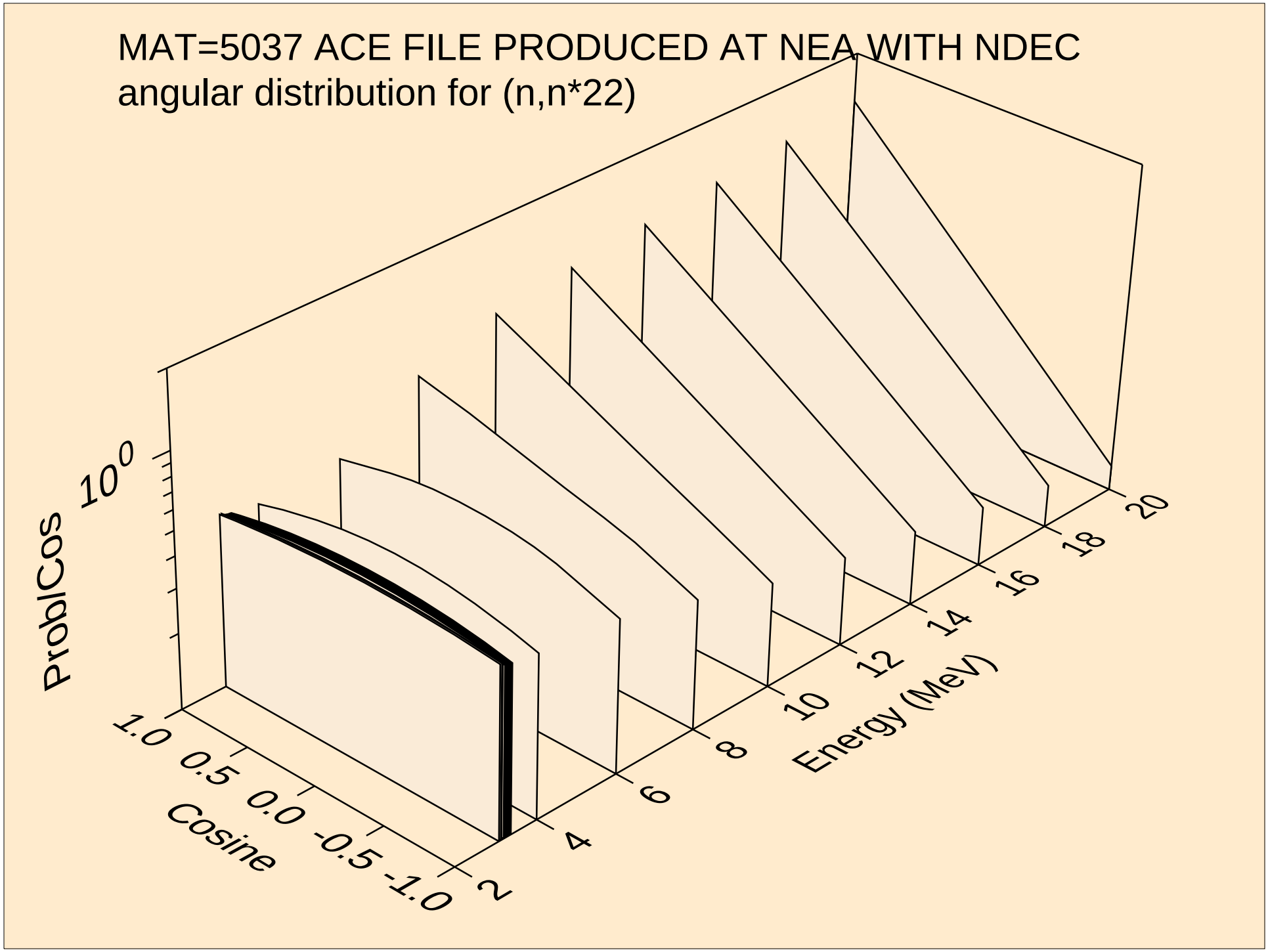

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*17)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

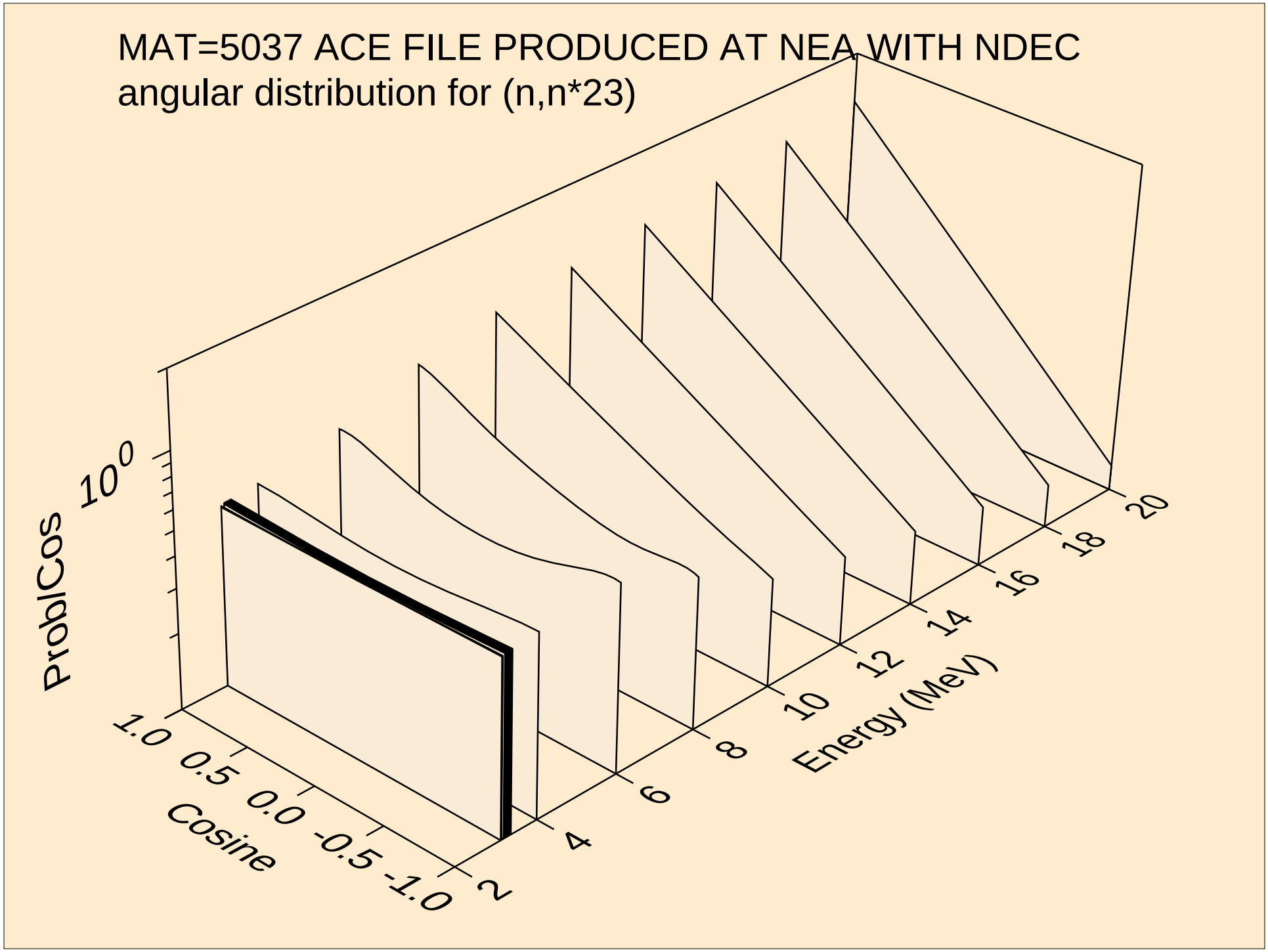

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*18)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

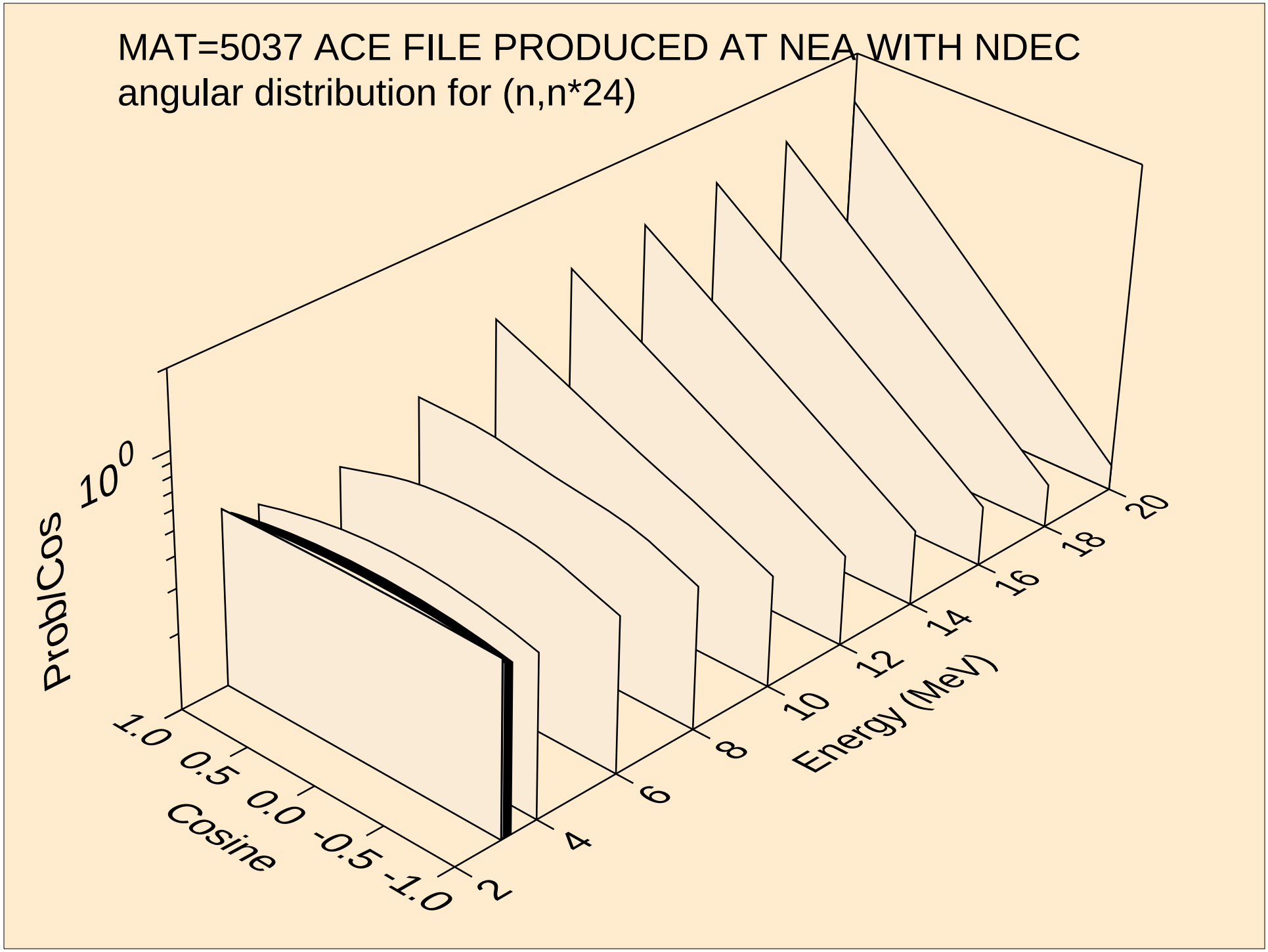

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*19)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

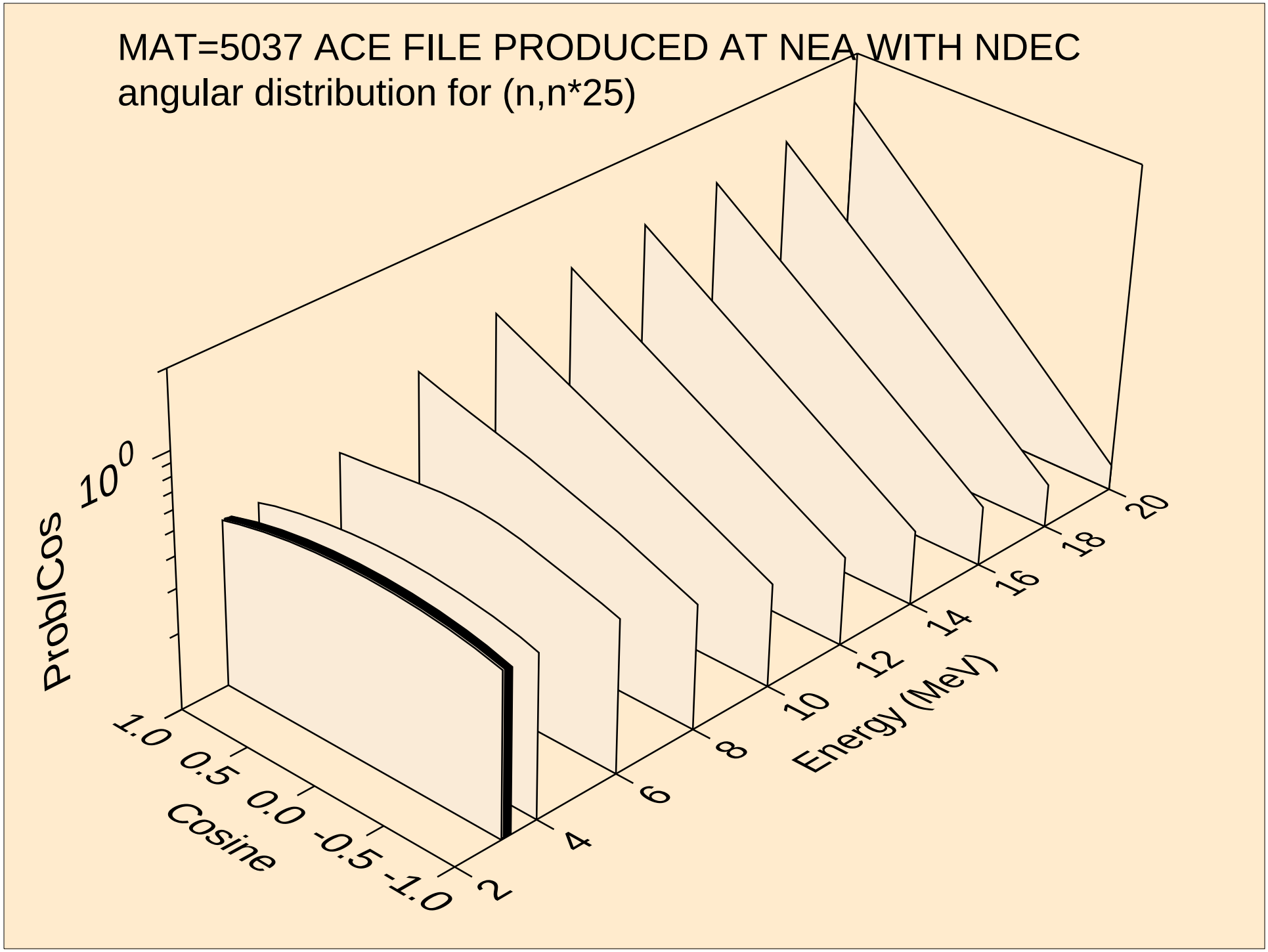

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*20)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

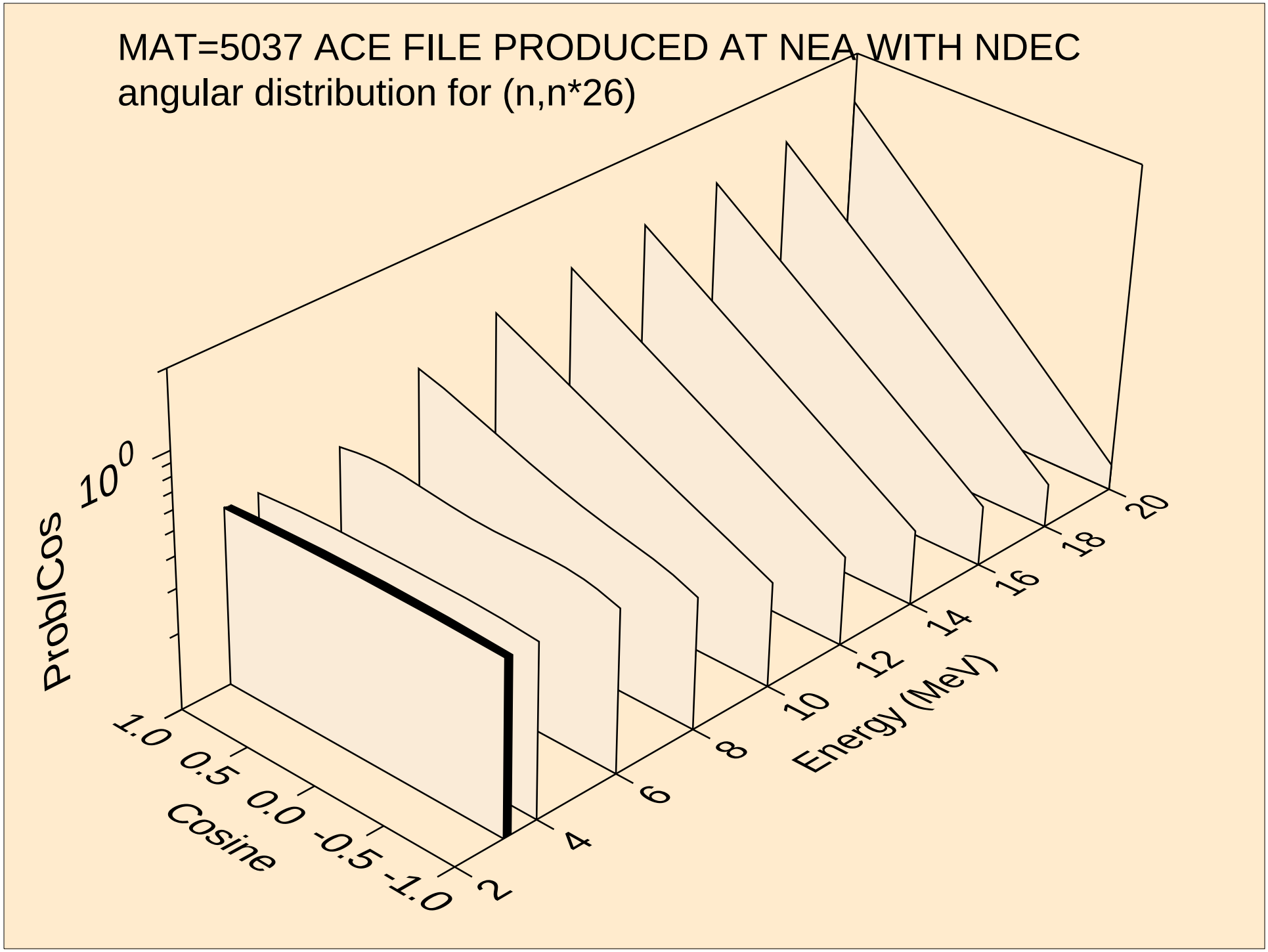

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*21)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

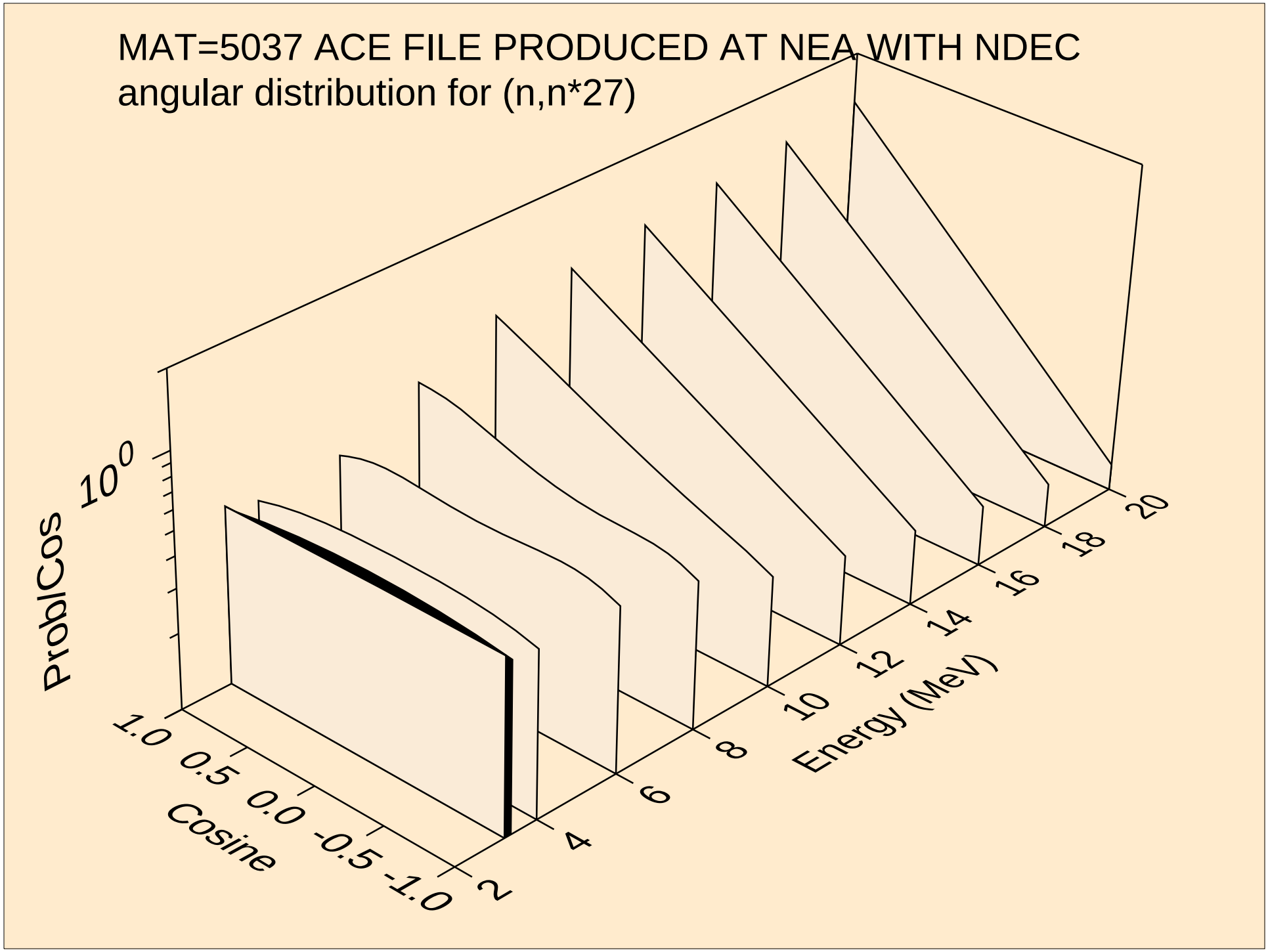

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*22)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

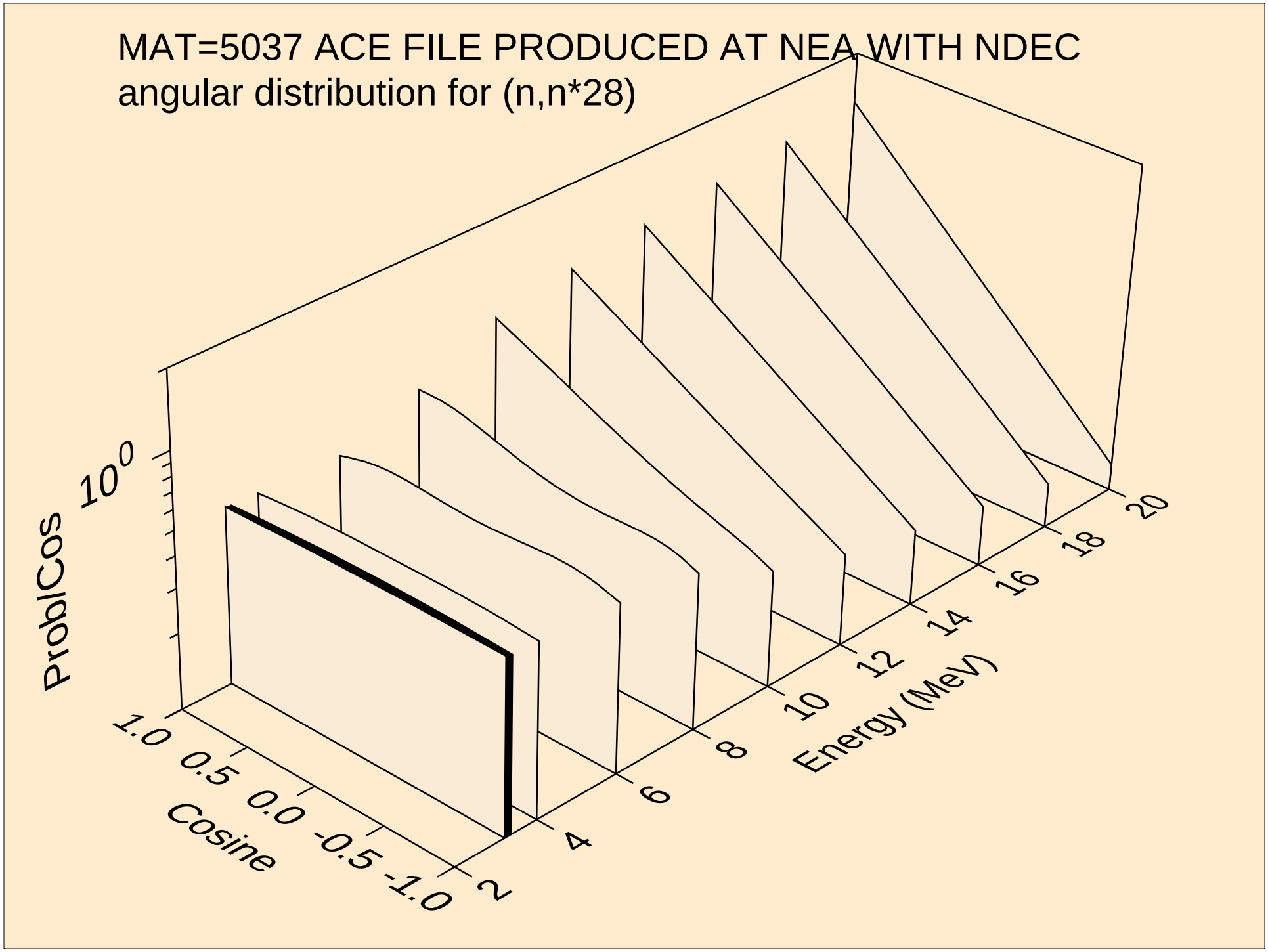

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*23)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

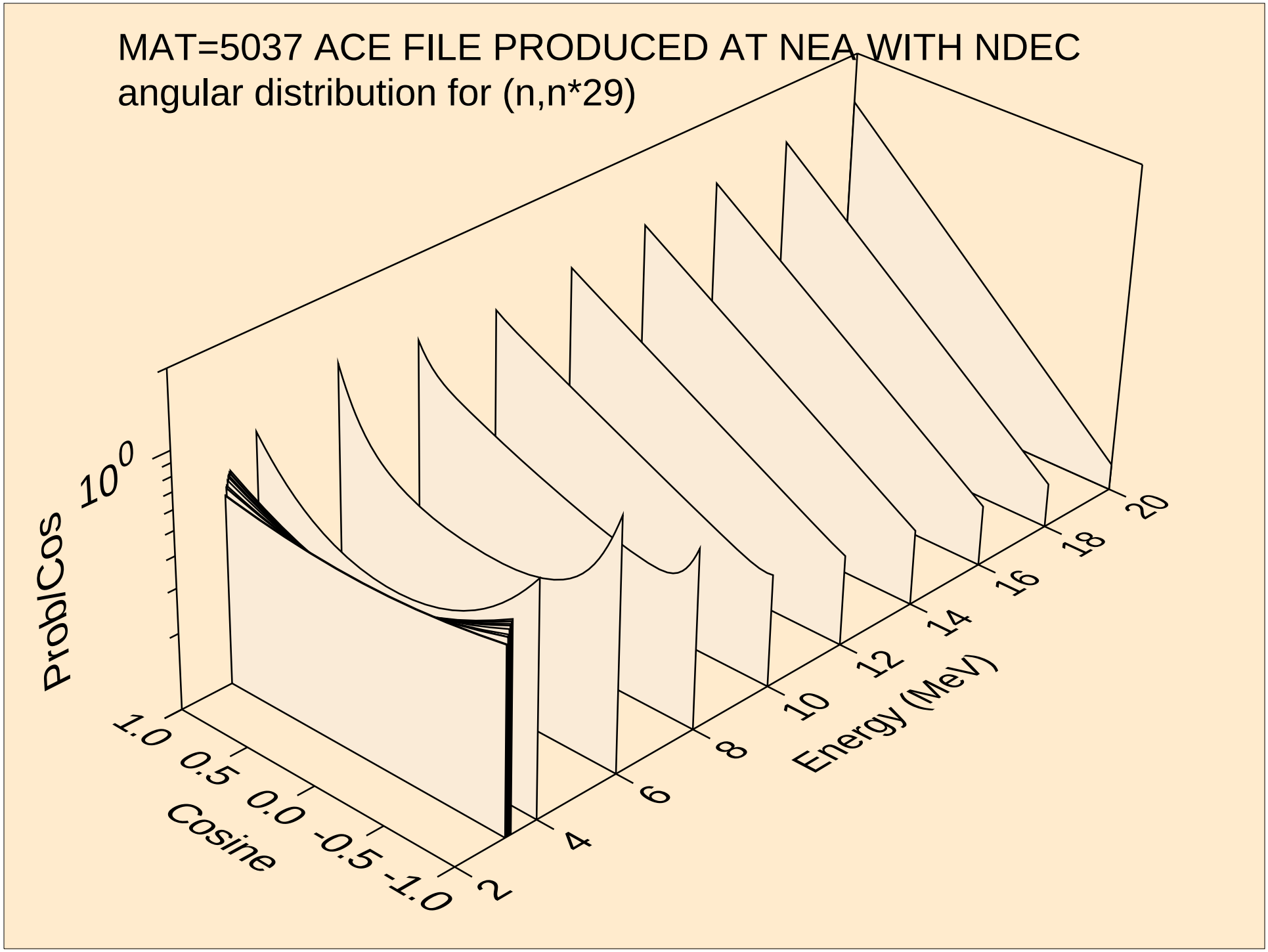

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*24)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

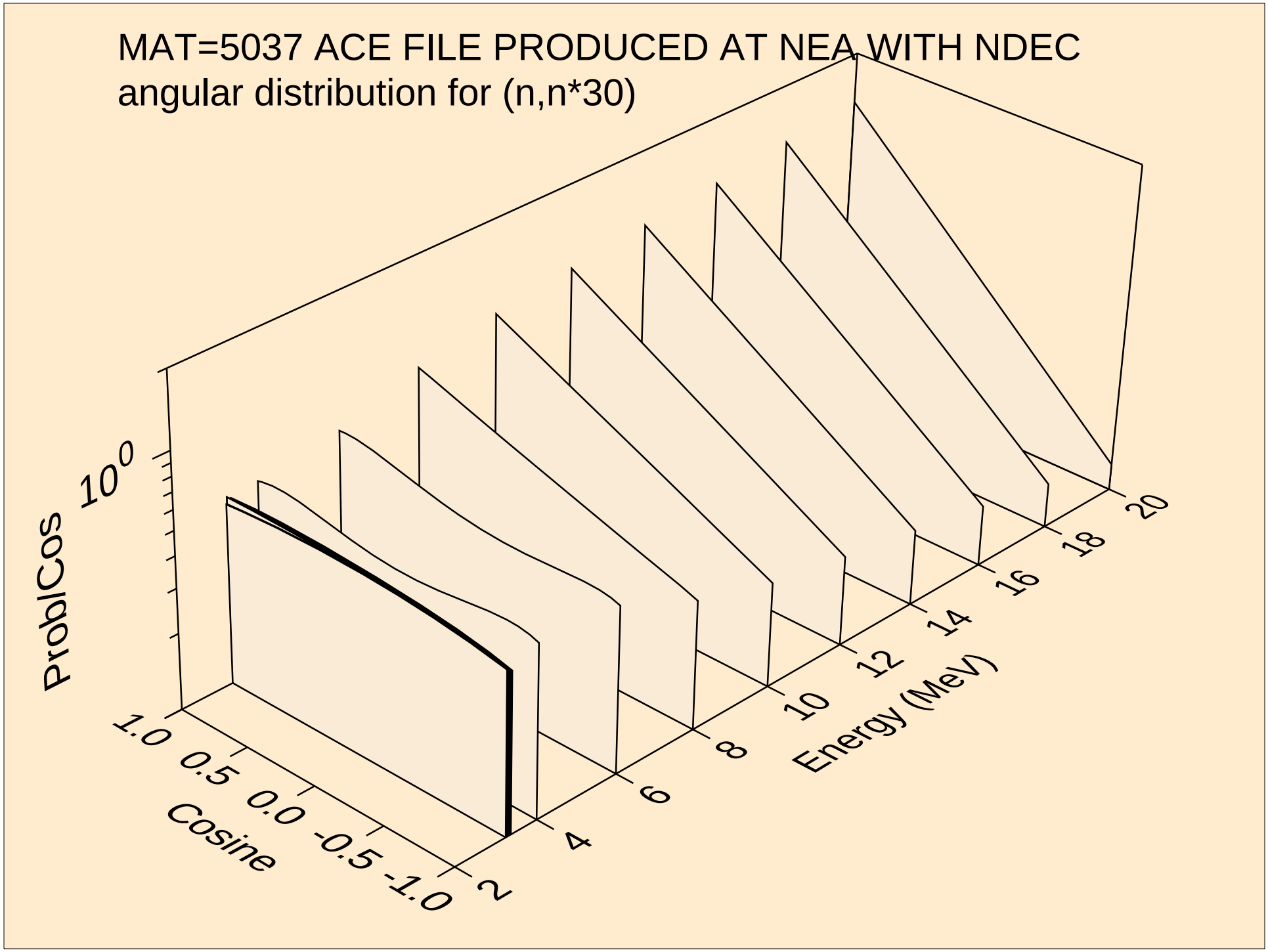

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*25)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

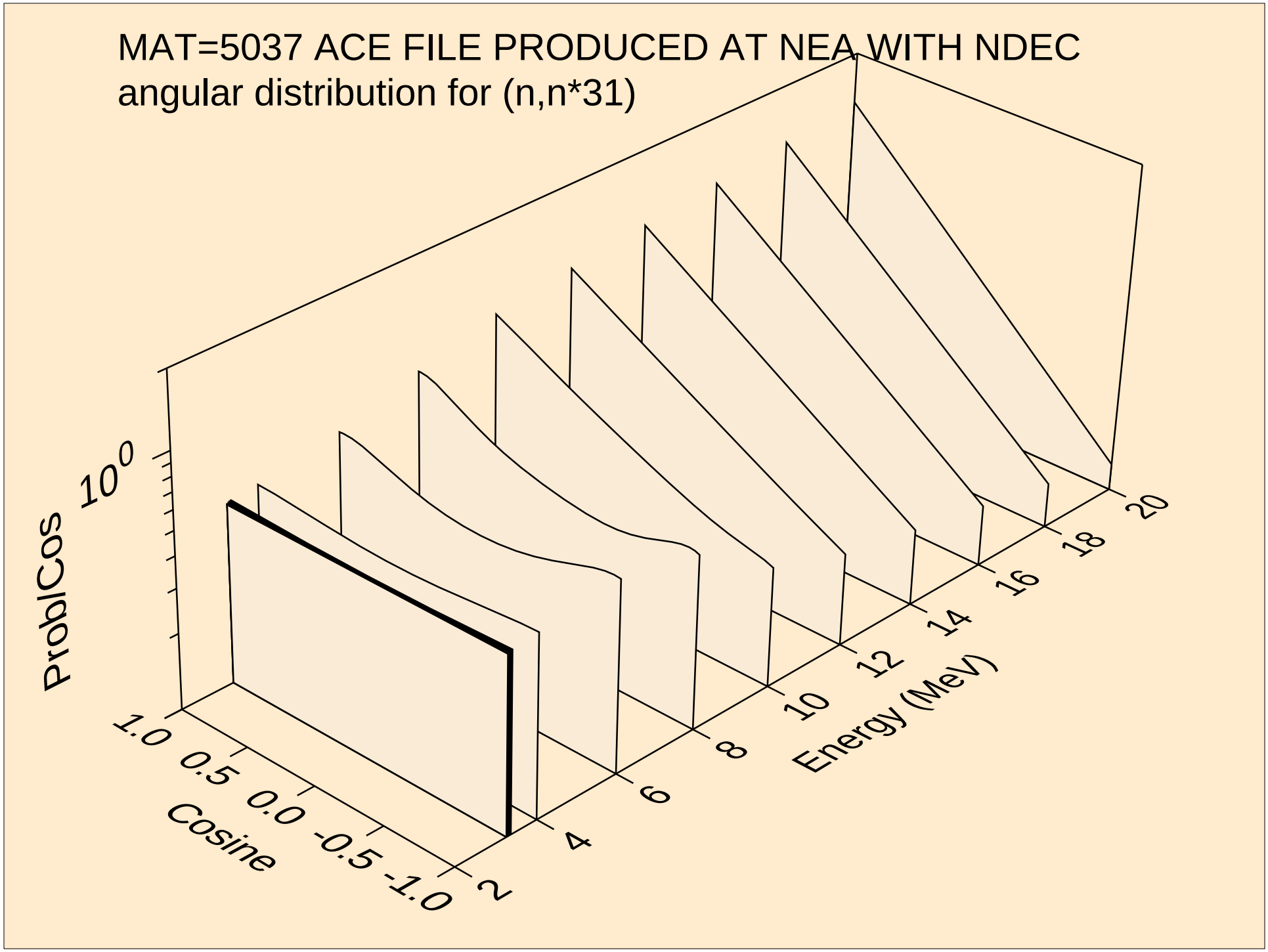

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*26)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

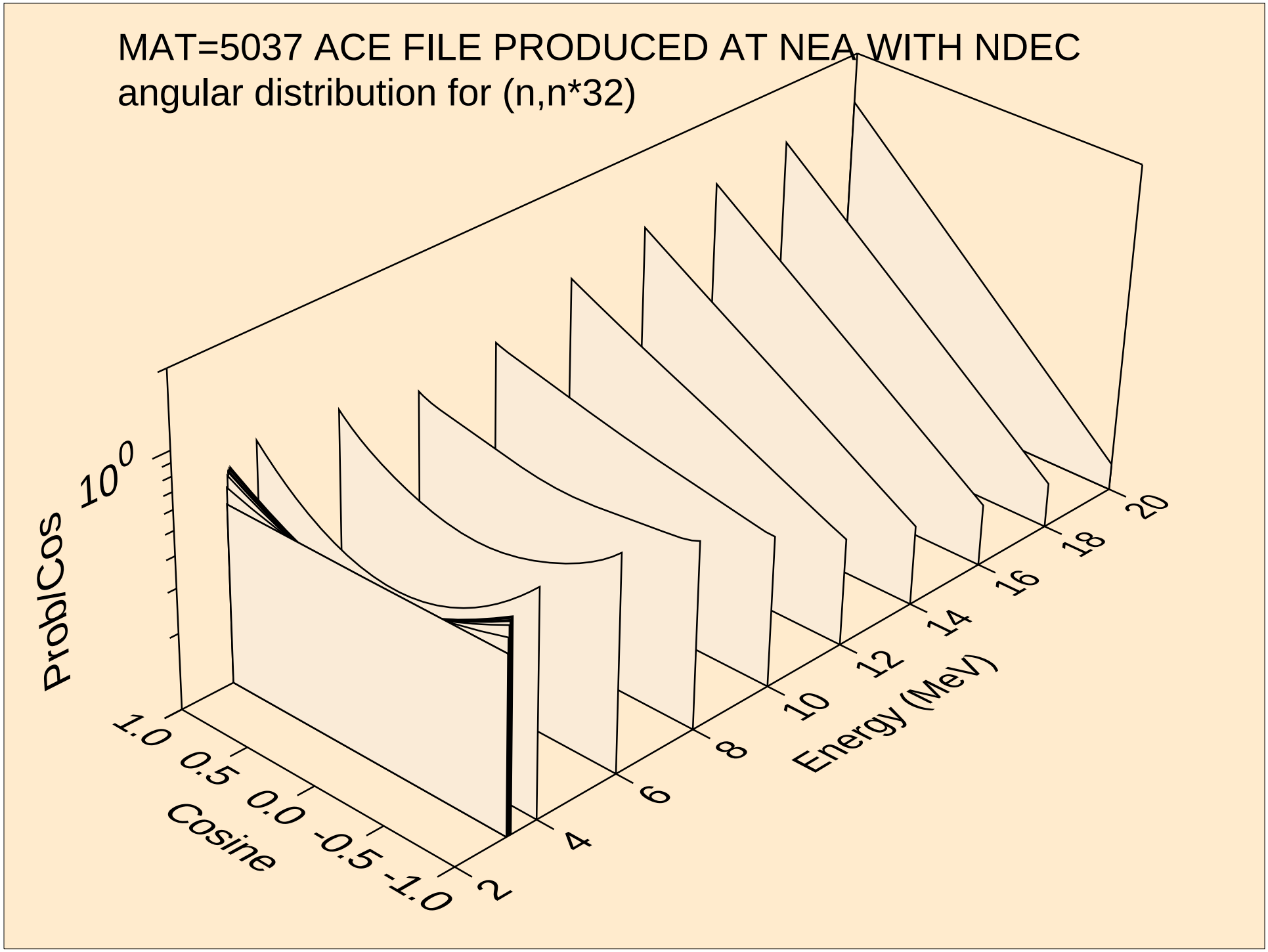

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*27)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

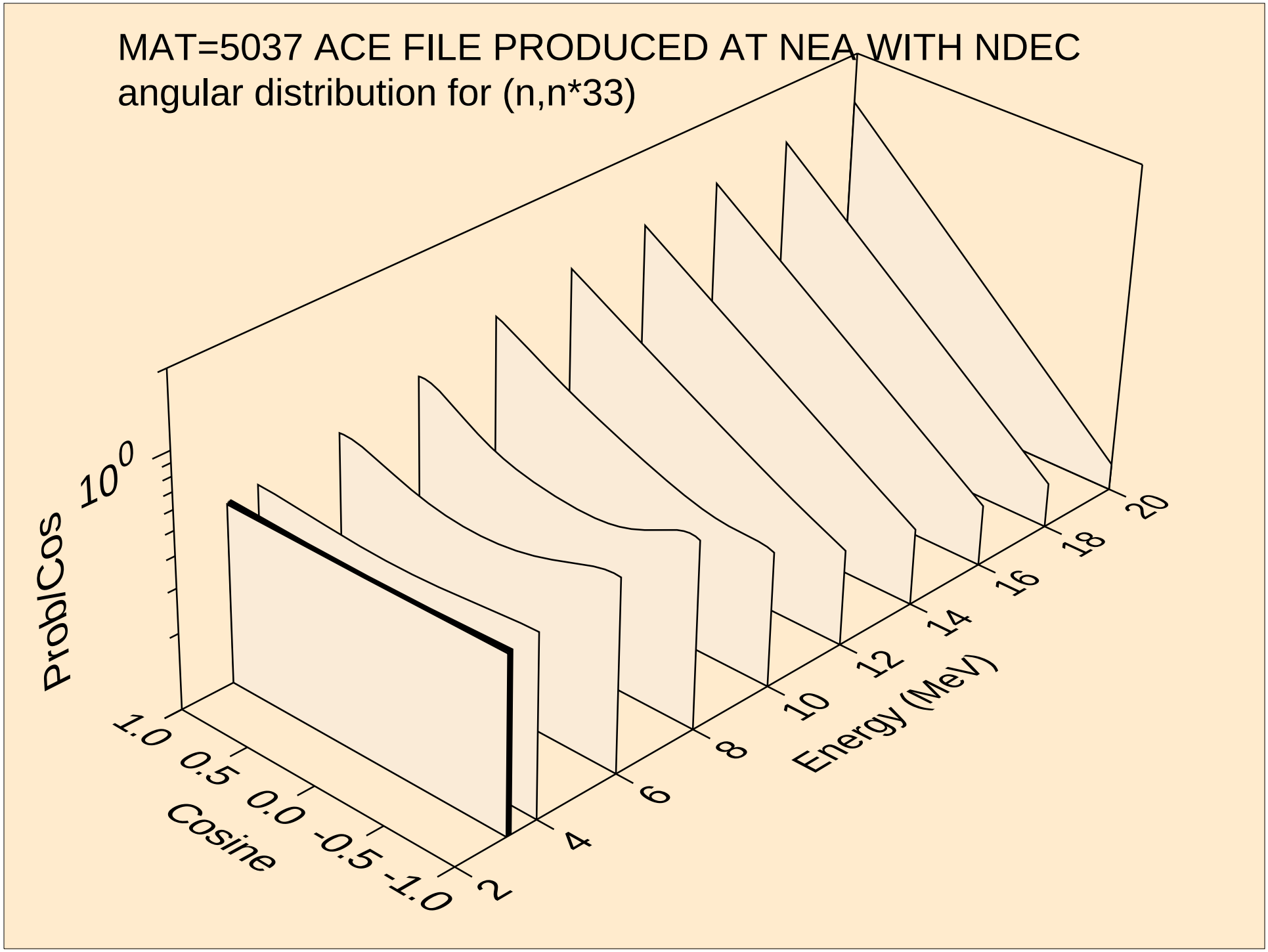

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*28)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

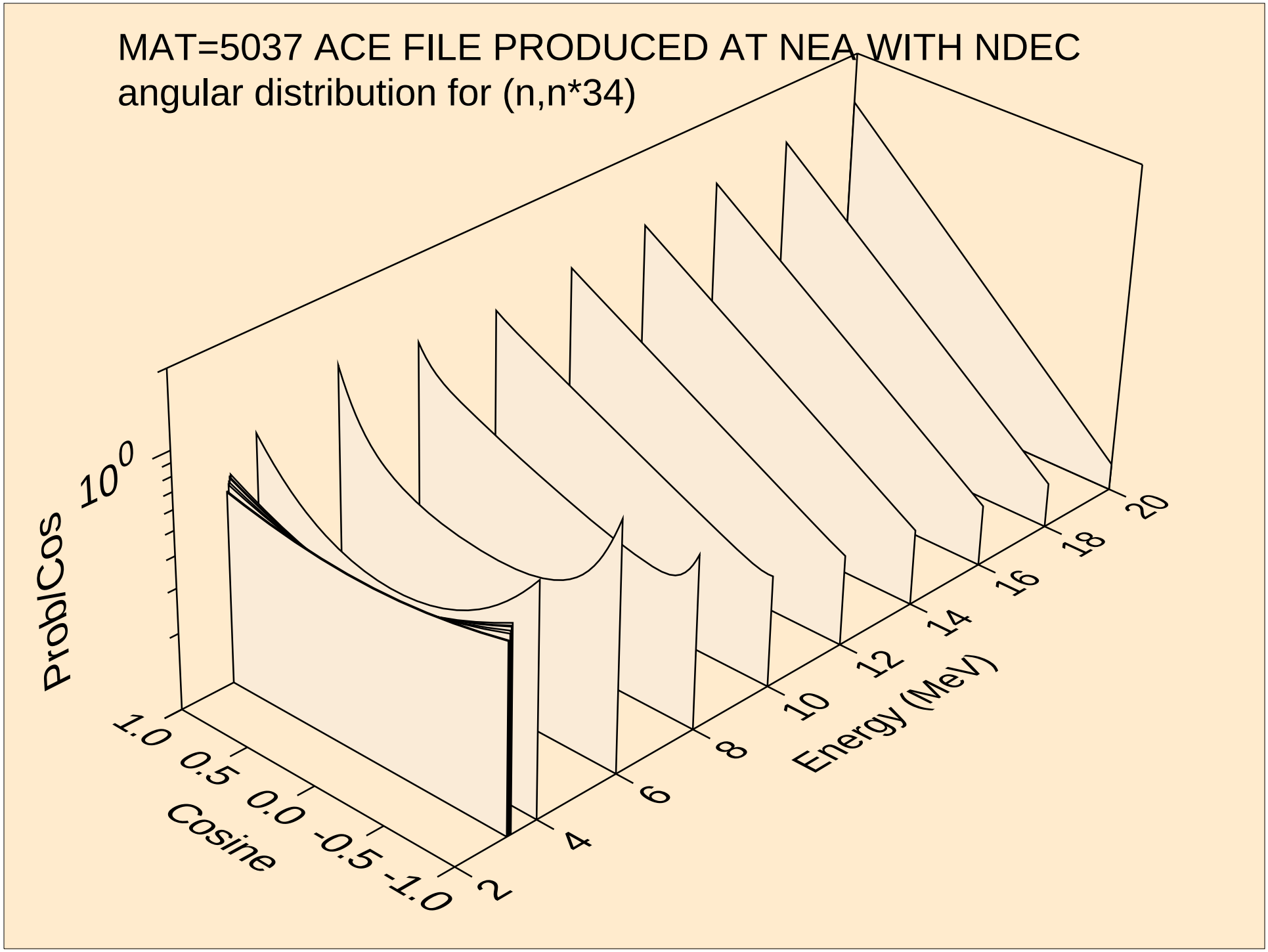

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*29)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

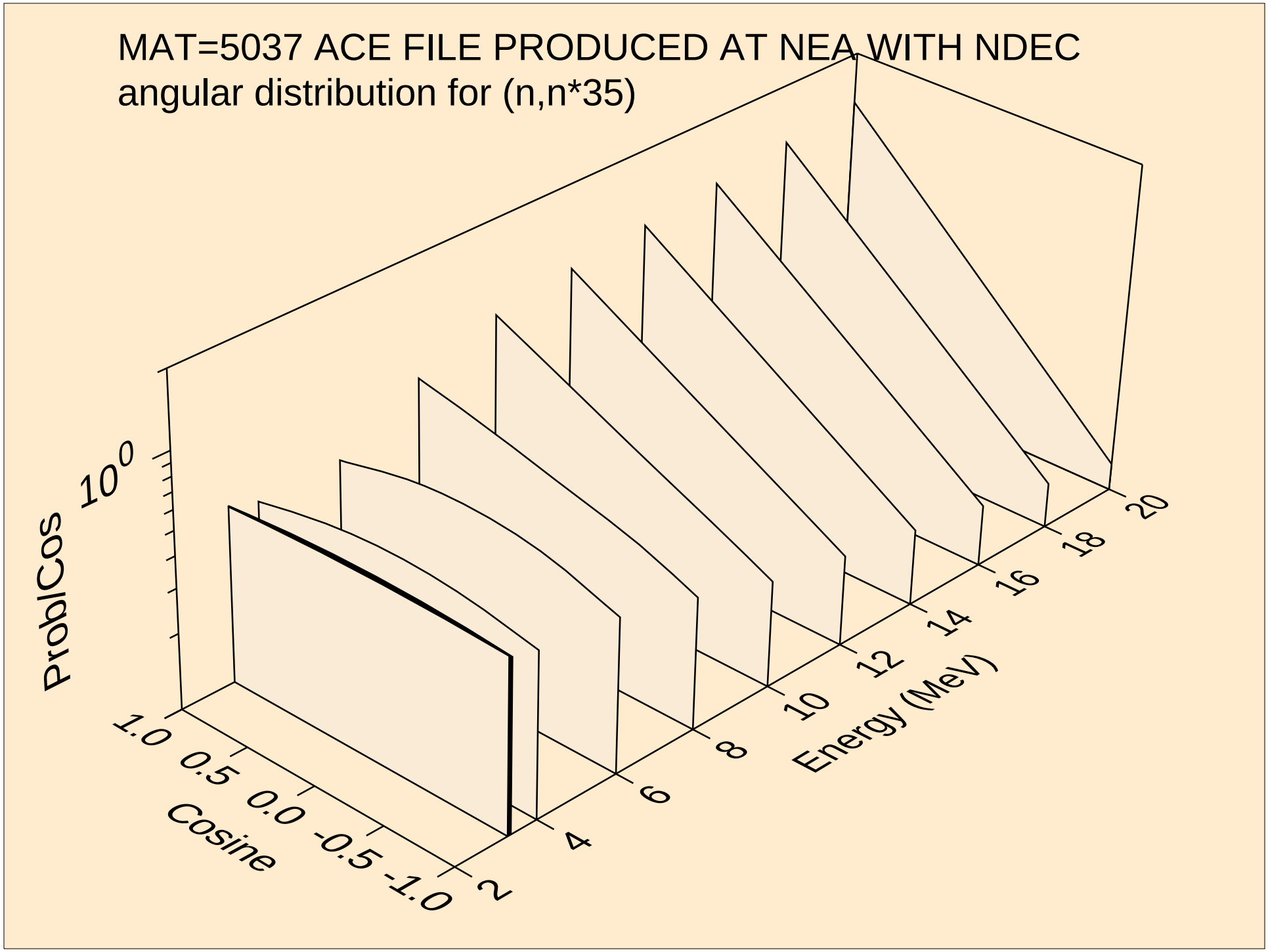

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*30)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

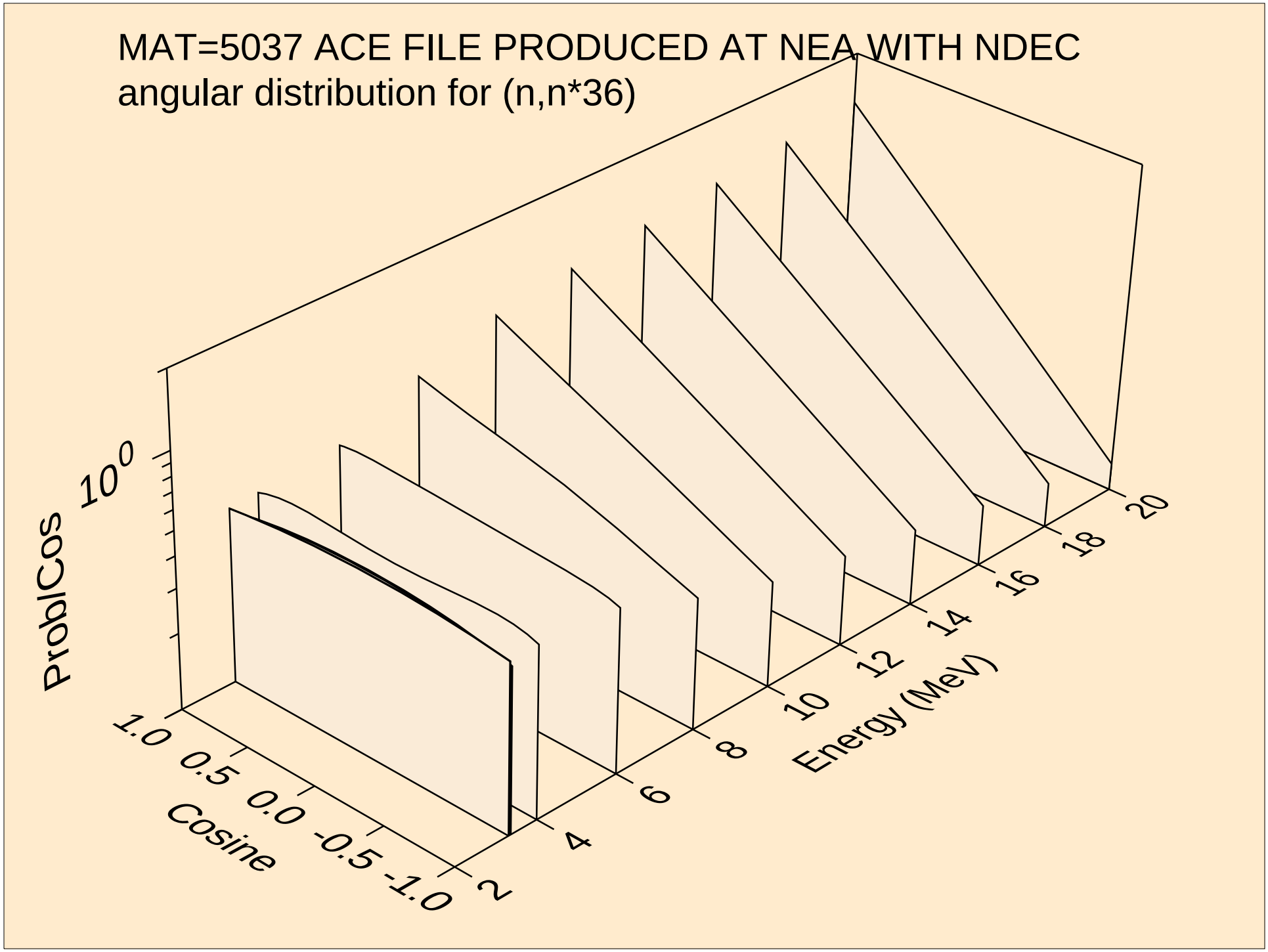

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*31)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

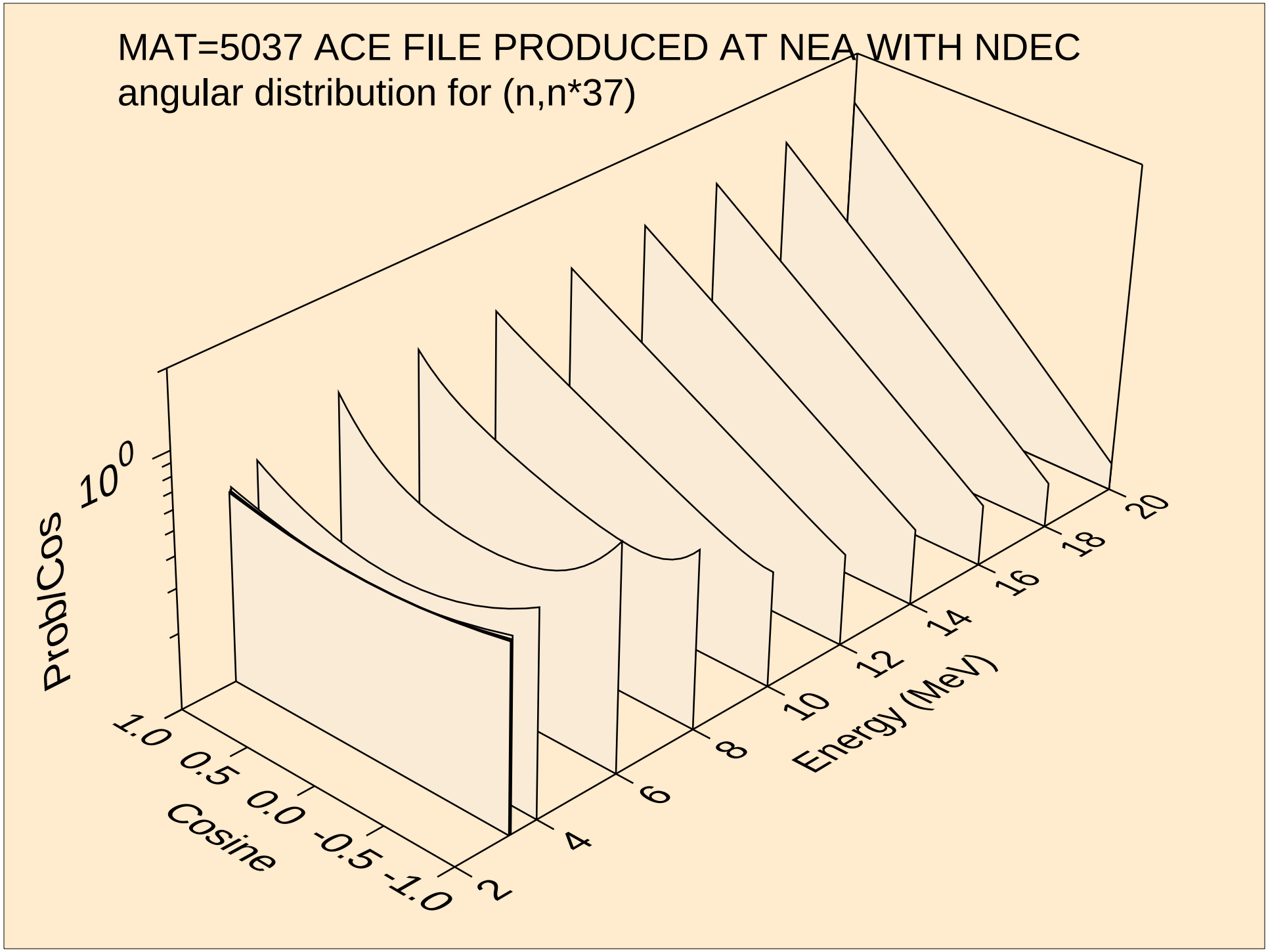

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*32)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

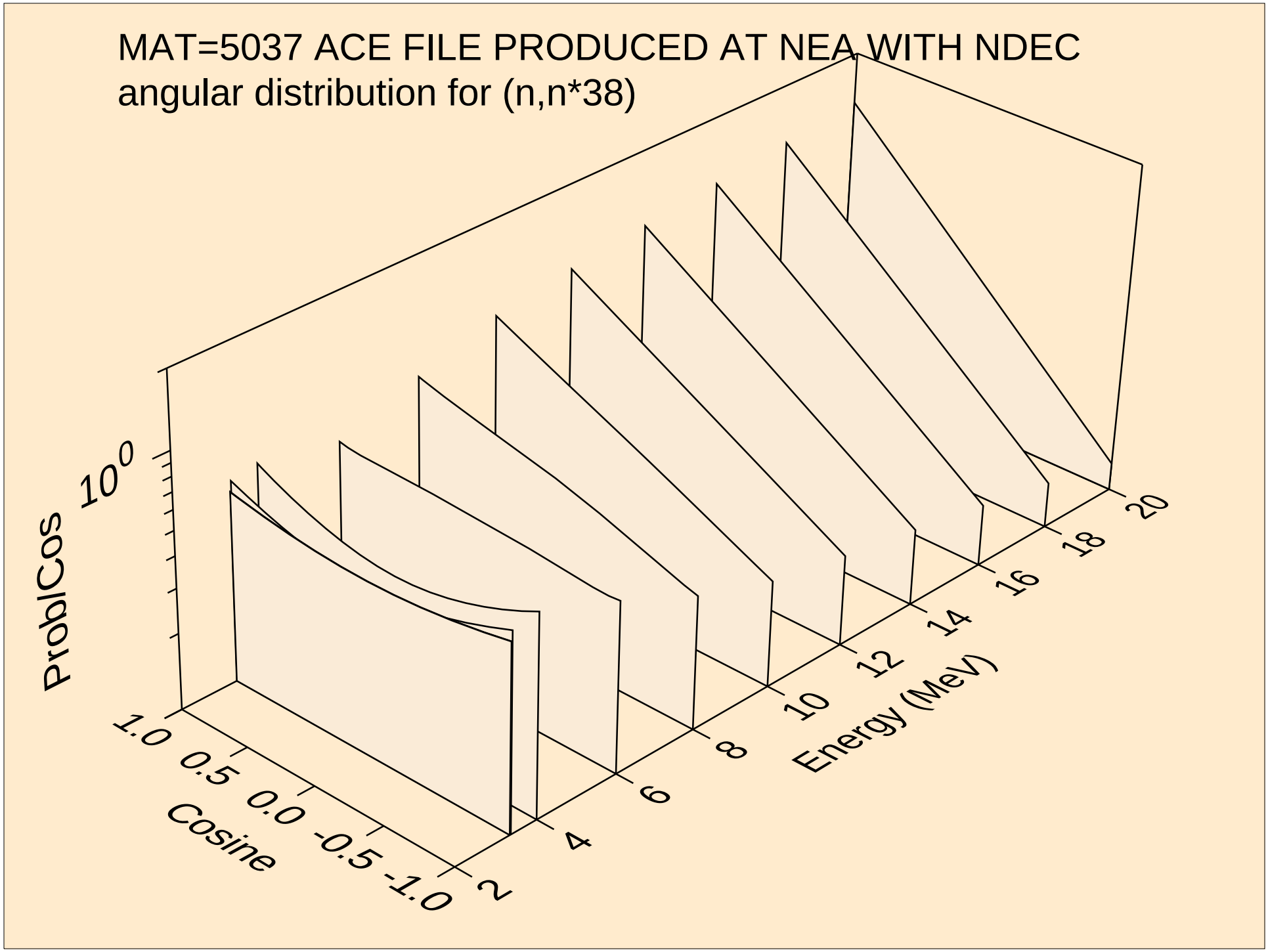

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*33)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

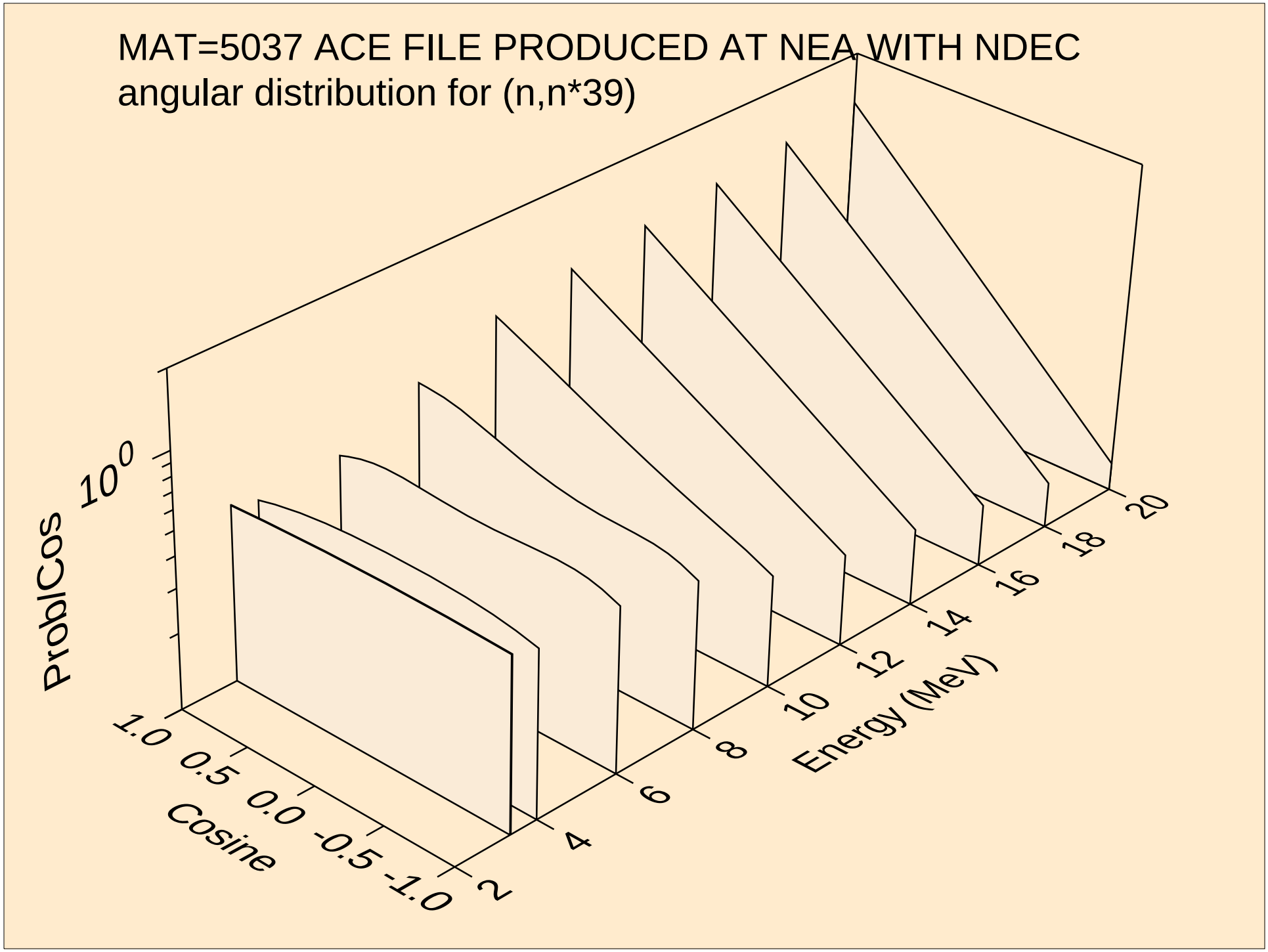

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*34)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

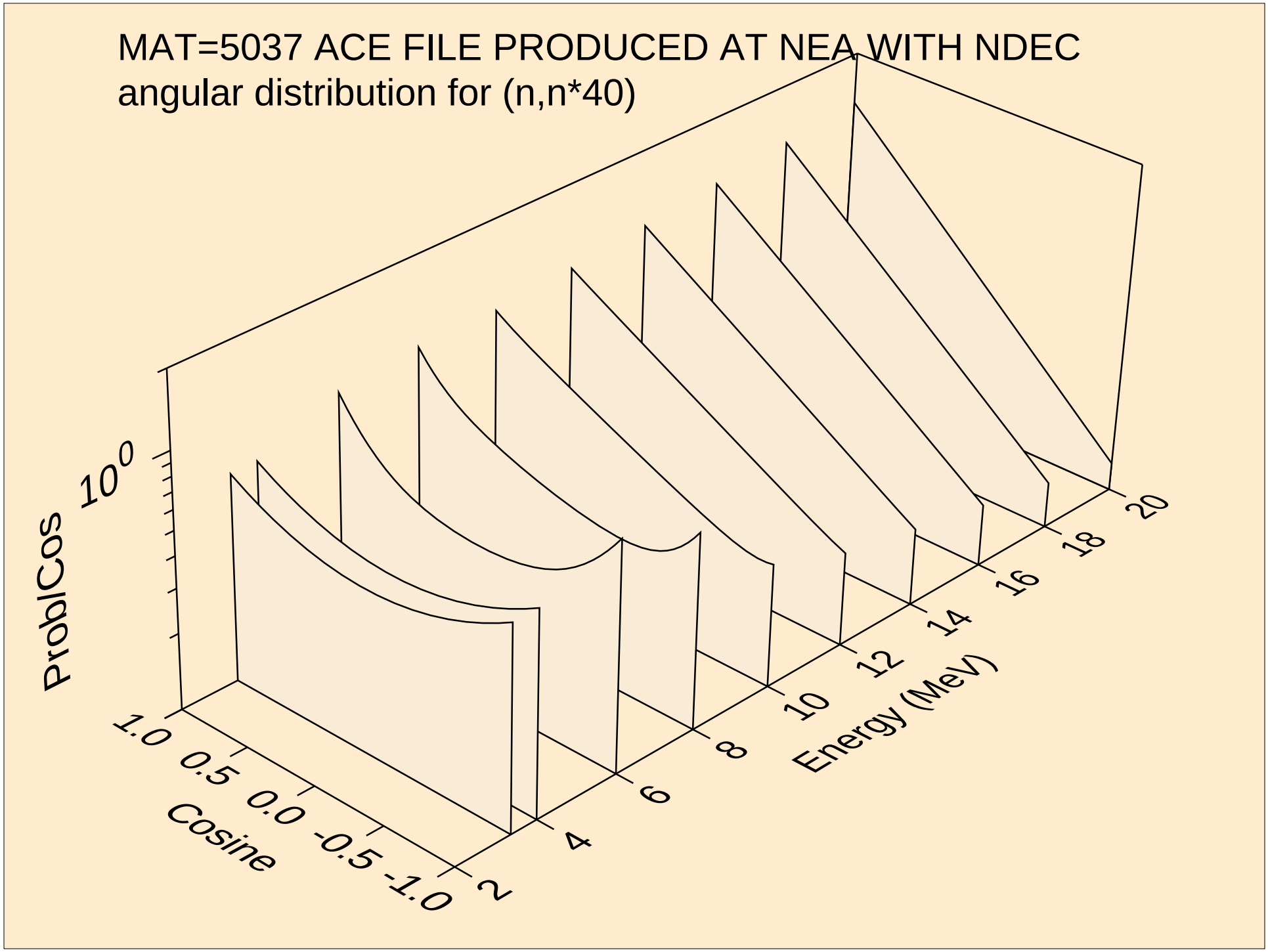

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*35)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

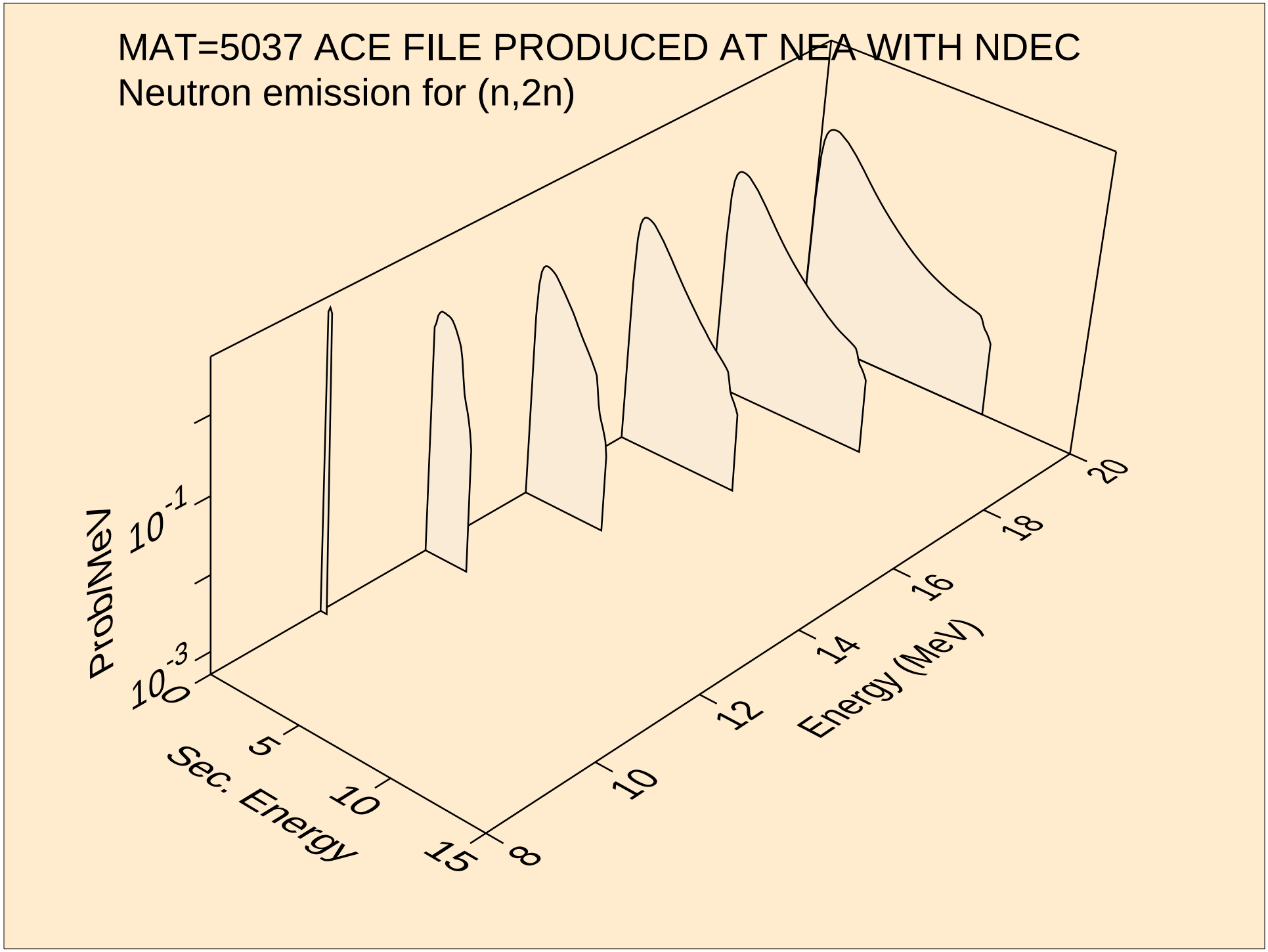

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*36)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

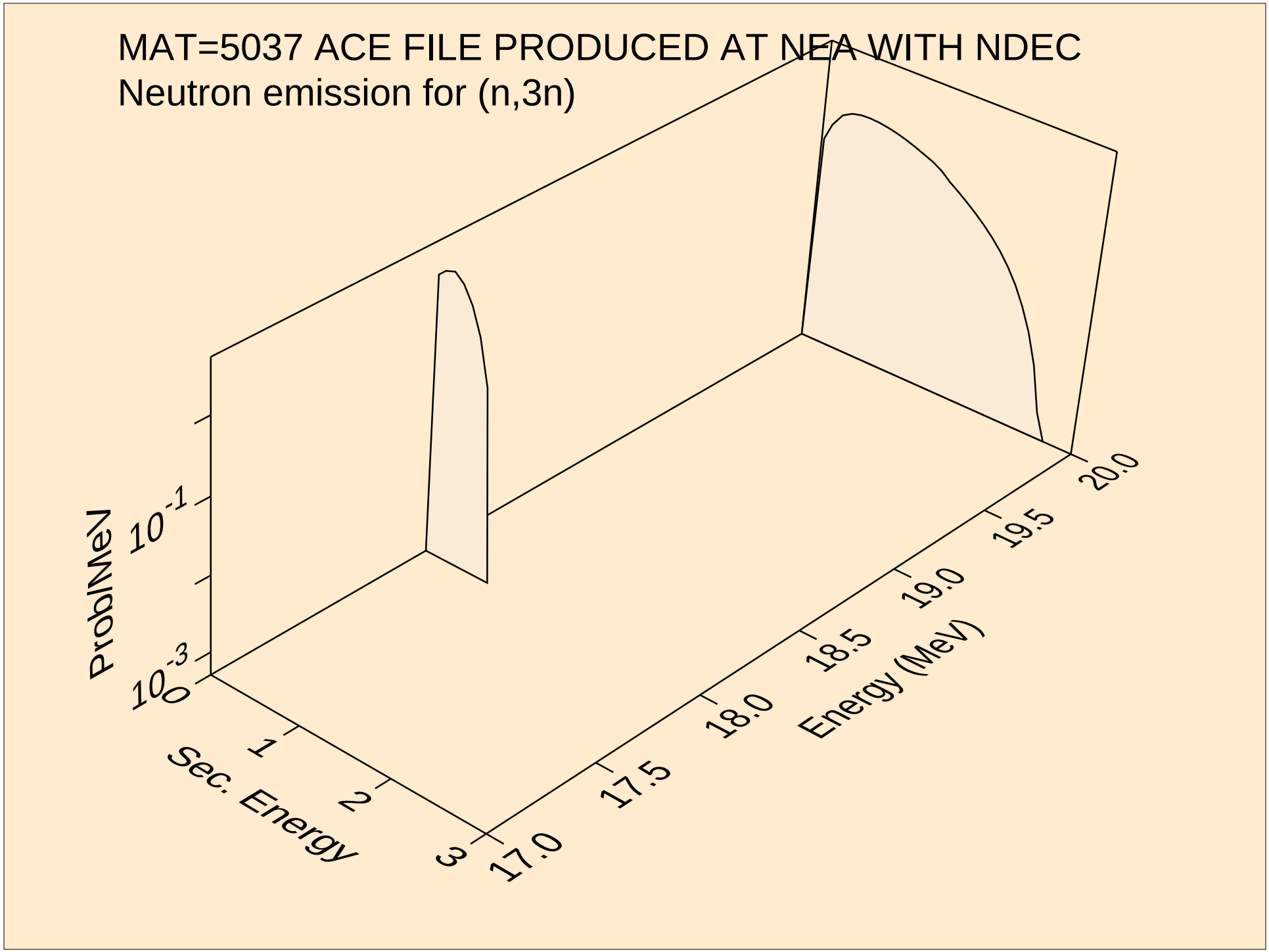

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*37)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

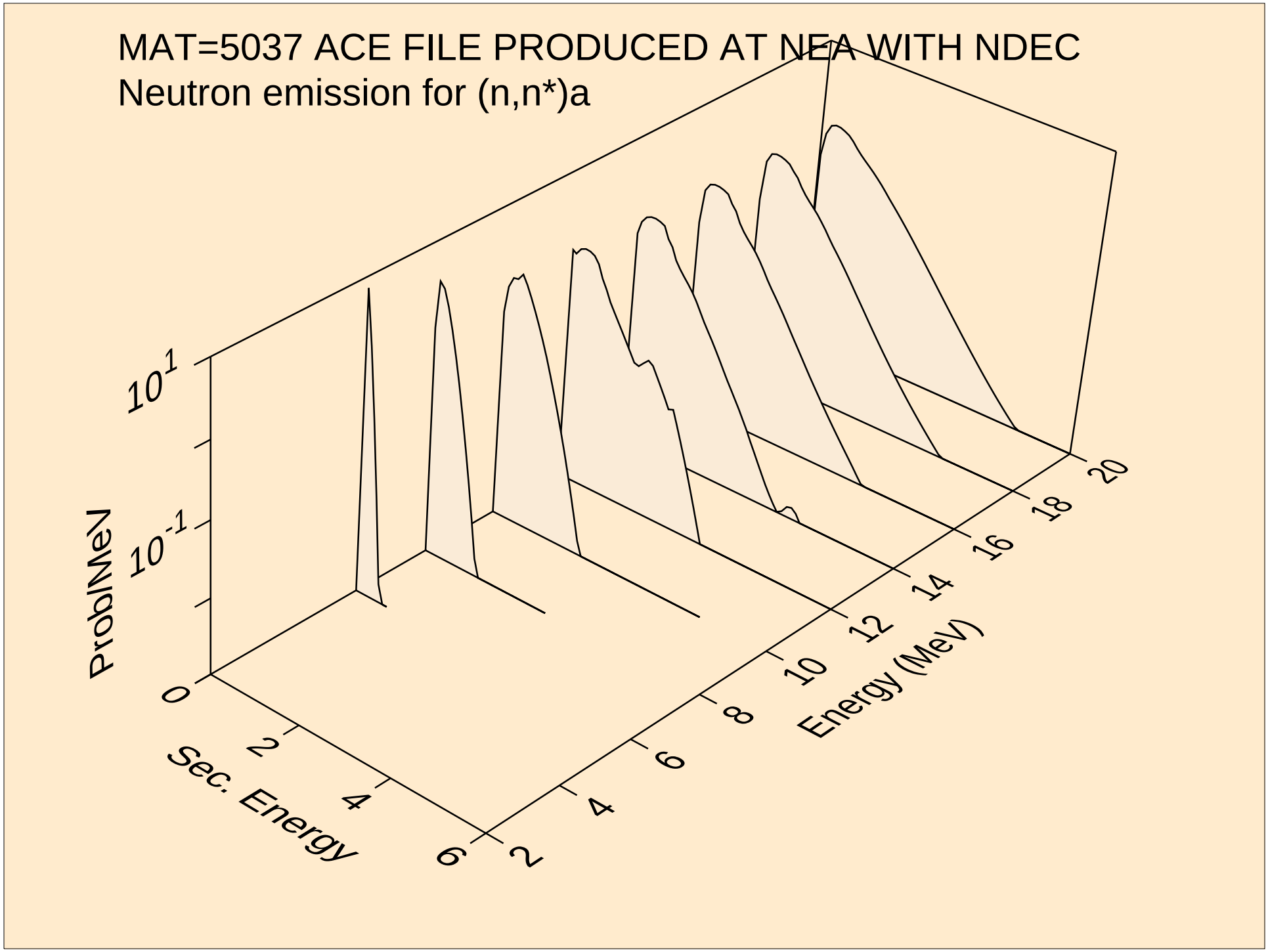

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*38)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

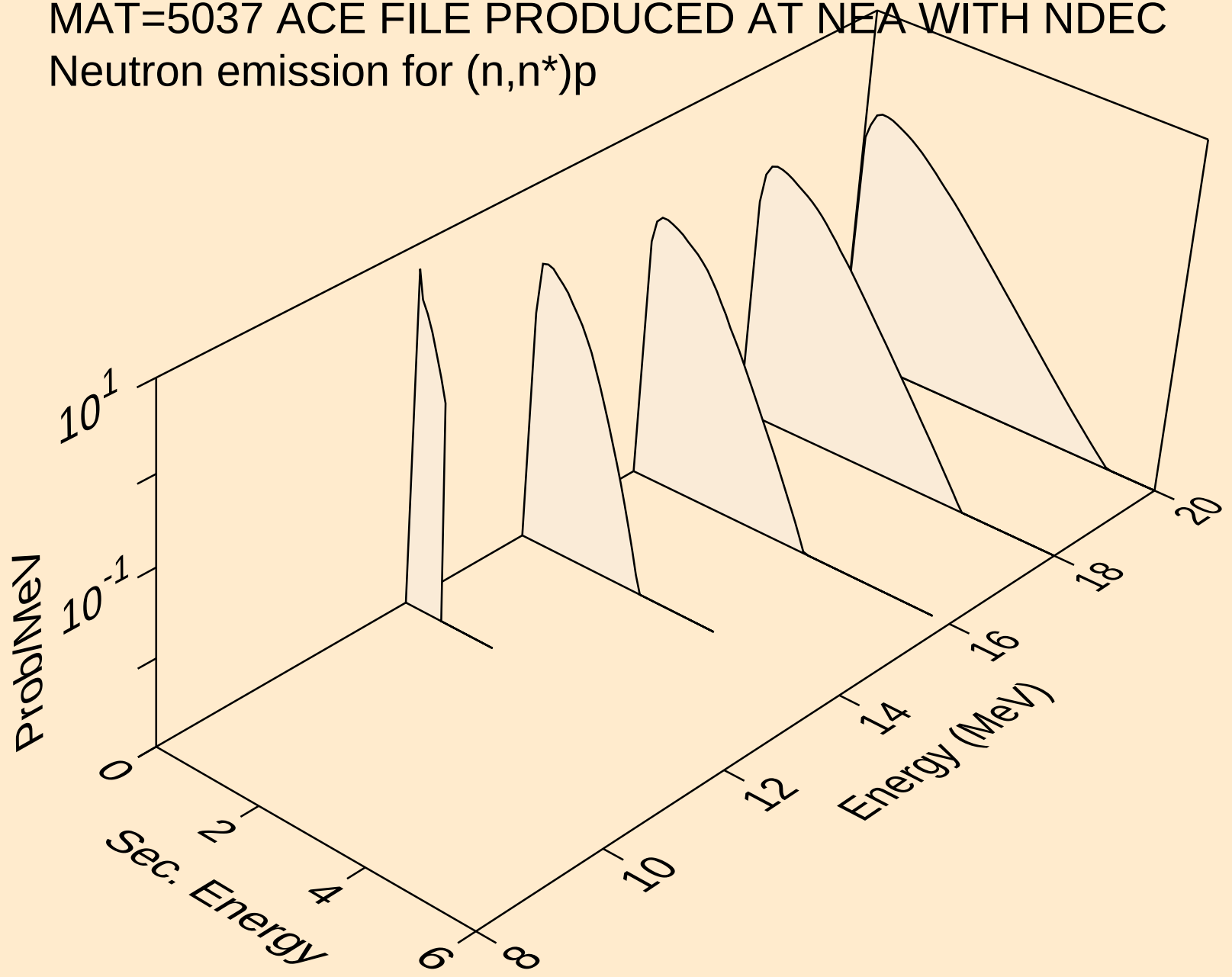

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*39)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

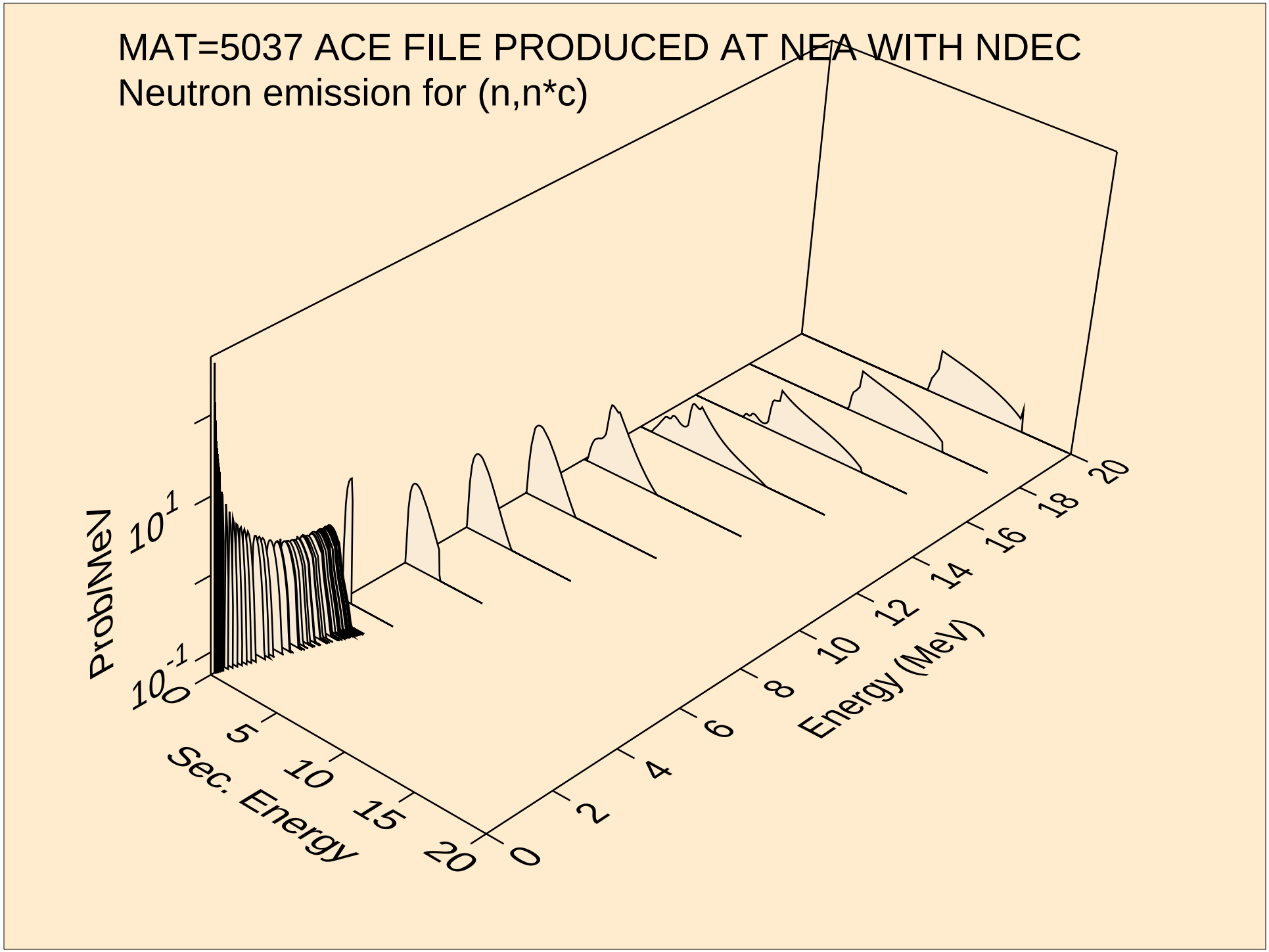

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*40)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

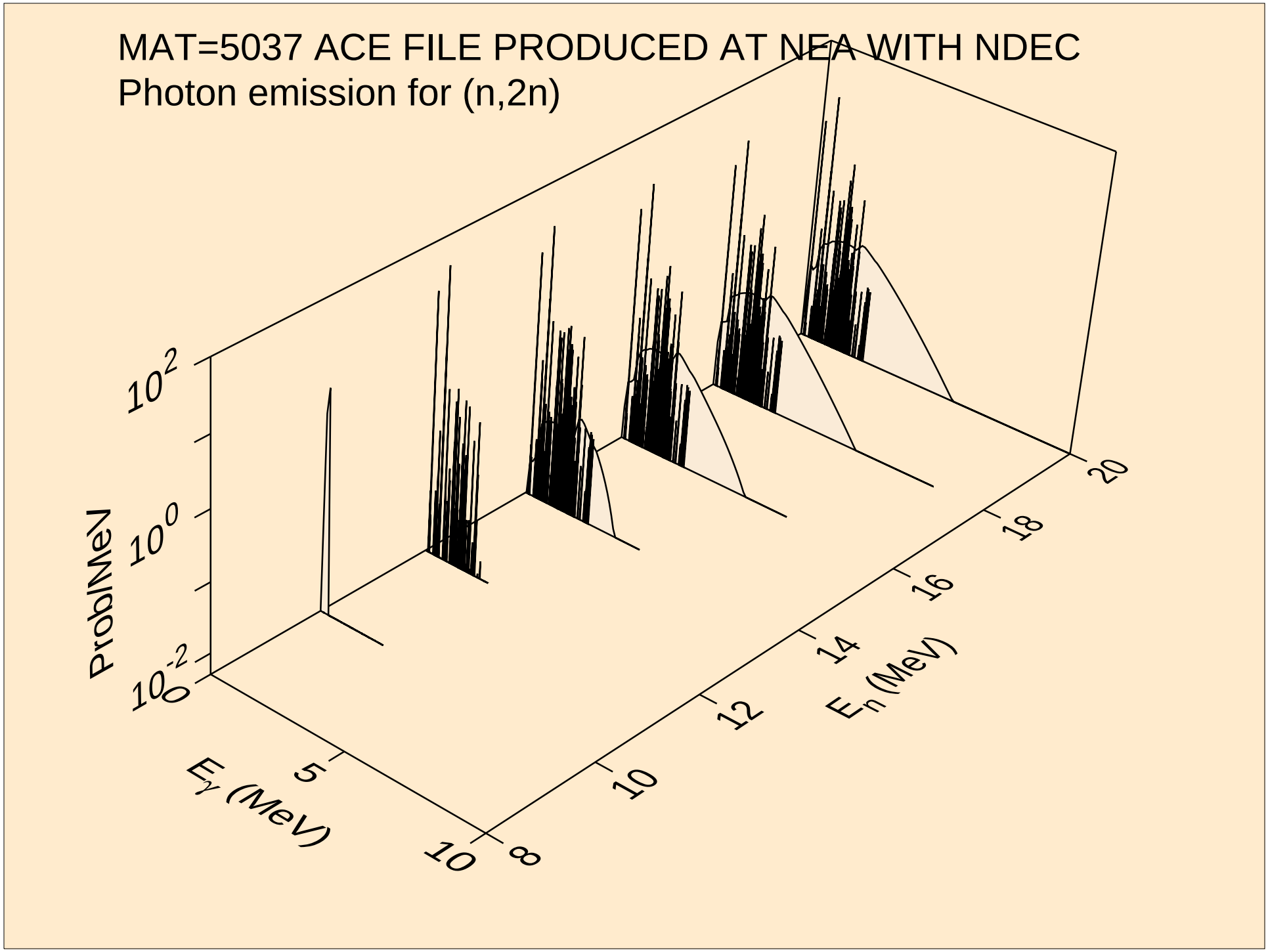

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,2n)
Prob/MeV
10-1
10-3
0
5
10
15
Sec. Energy
8
10
12
14
16
18
20
Energy (MeV)

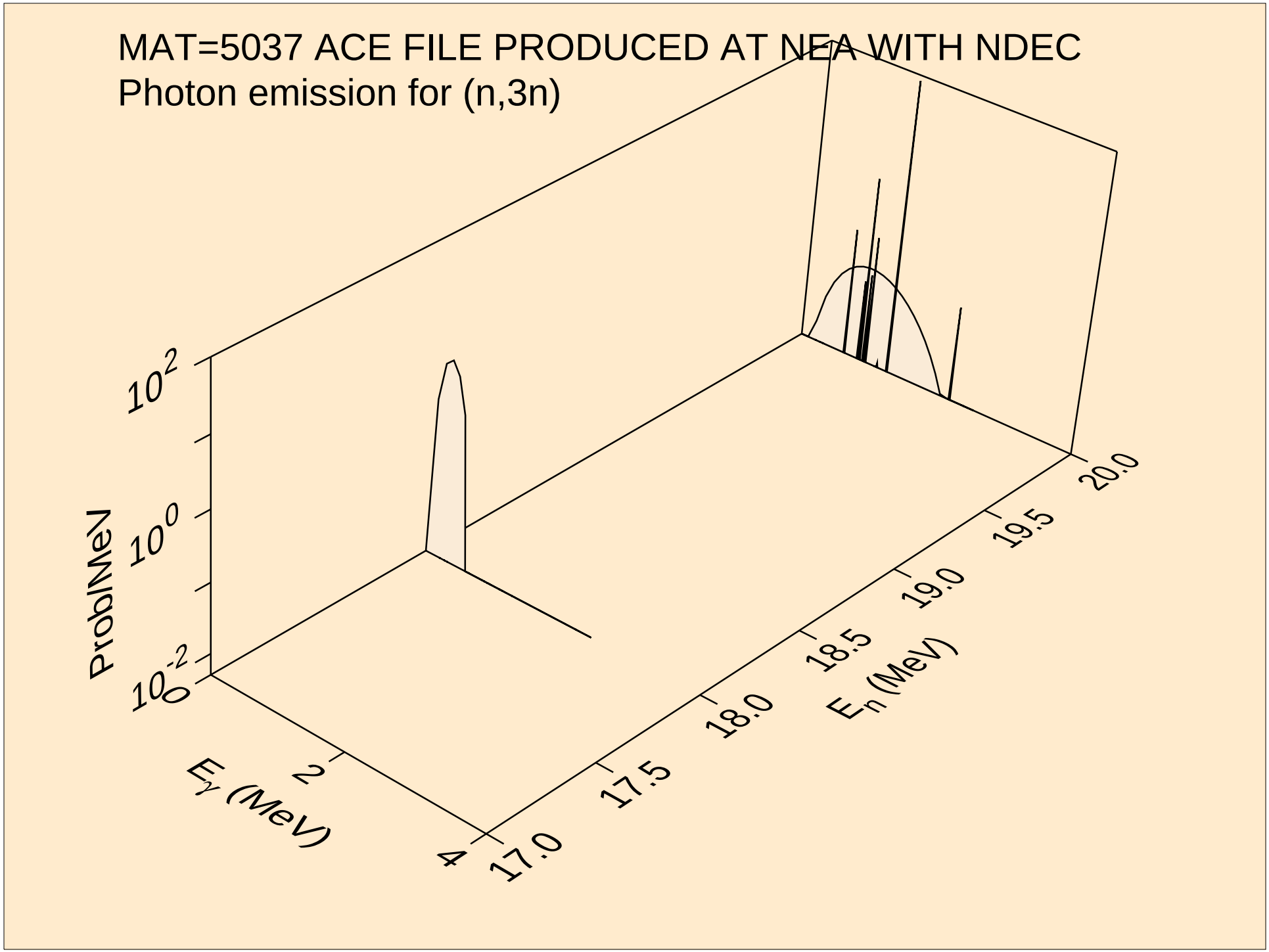

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,3n)
Prob/MeV
10-1
10-3
0
1
2
3
Sec. Energy
17.0
17.5
18.0
18.5
19.0
19.5
20.0
Energy (MeV)

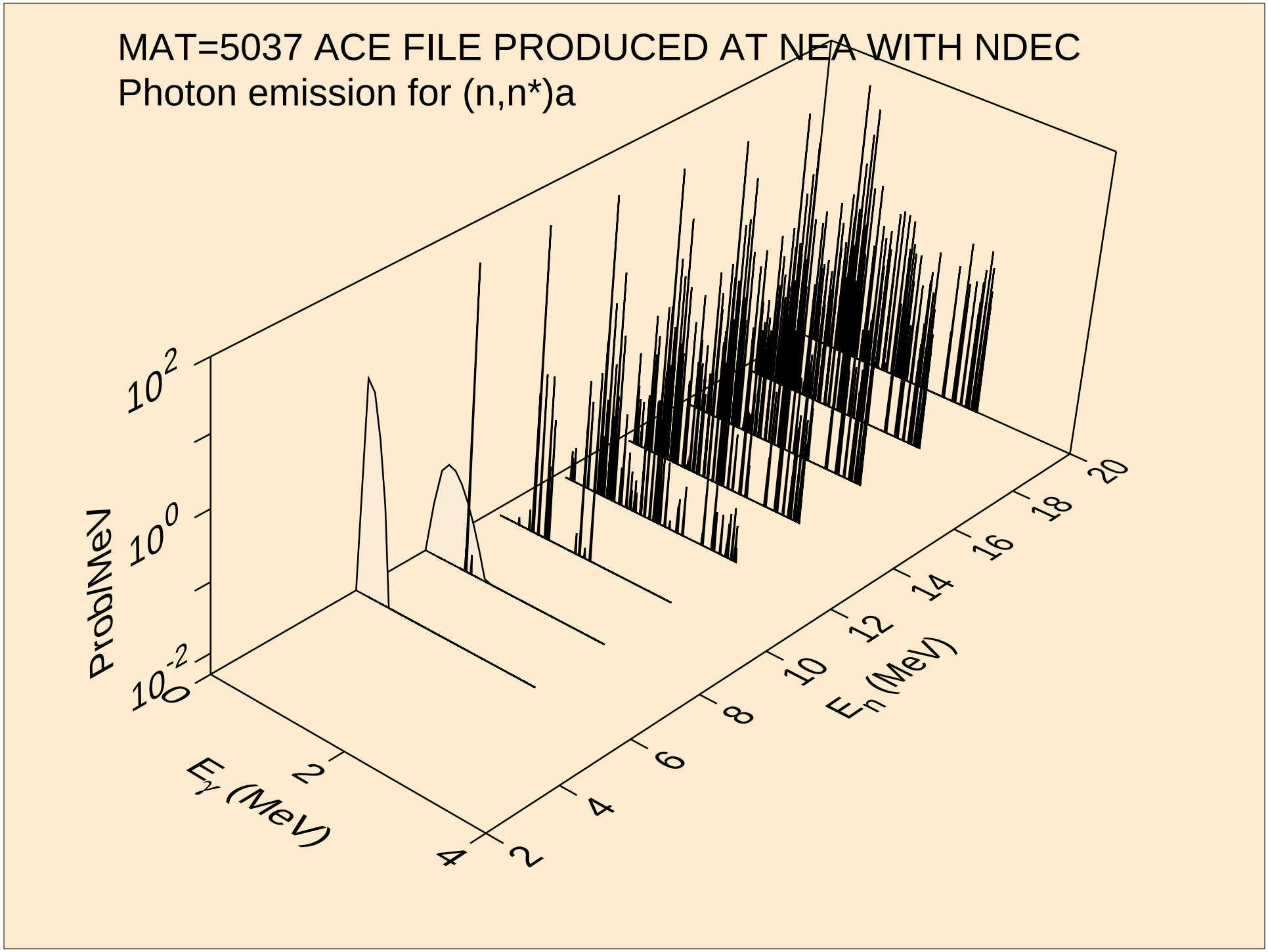

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,n*)a
Prob/MeV
10^1
10^-1
0
Sec. Energy
2
4
6
Energy (MeV)
2
4
6
8
10
12
14
16
18
20

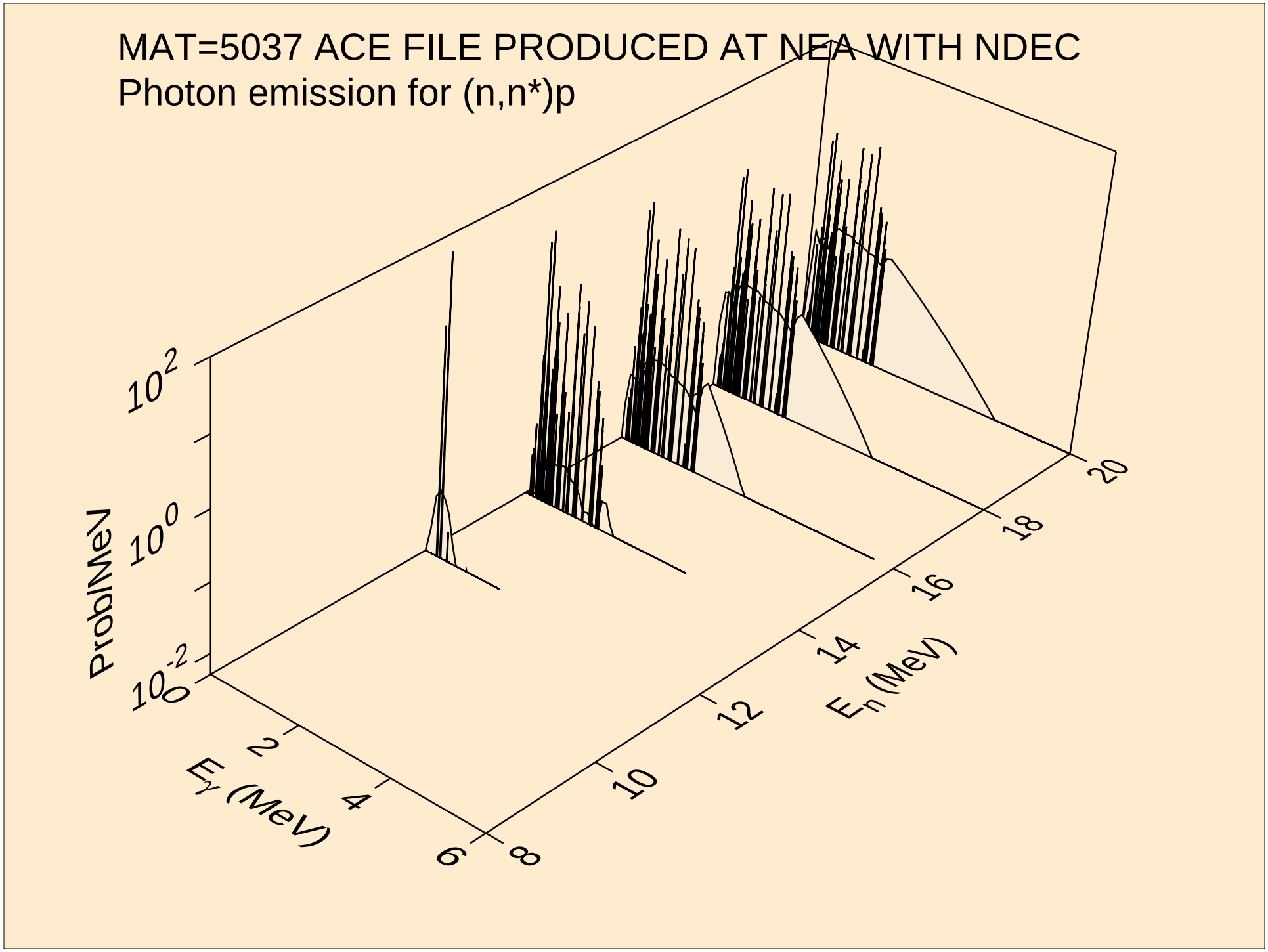

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,n*)p
Prob/MeV
10^1
10^-1
0
Sec. Energy
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

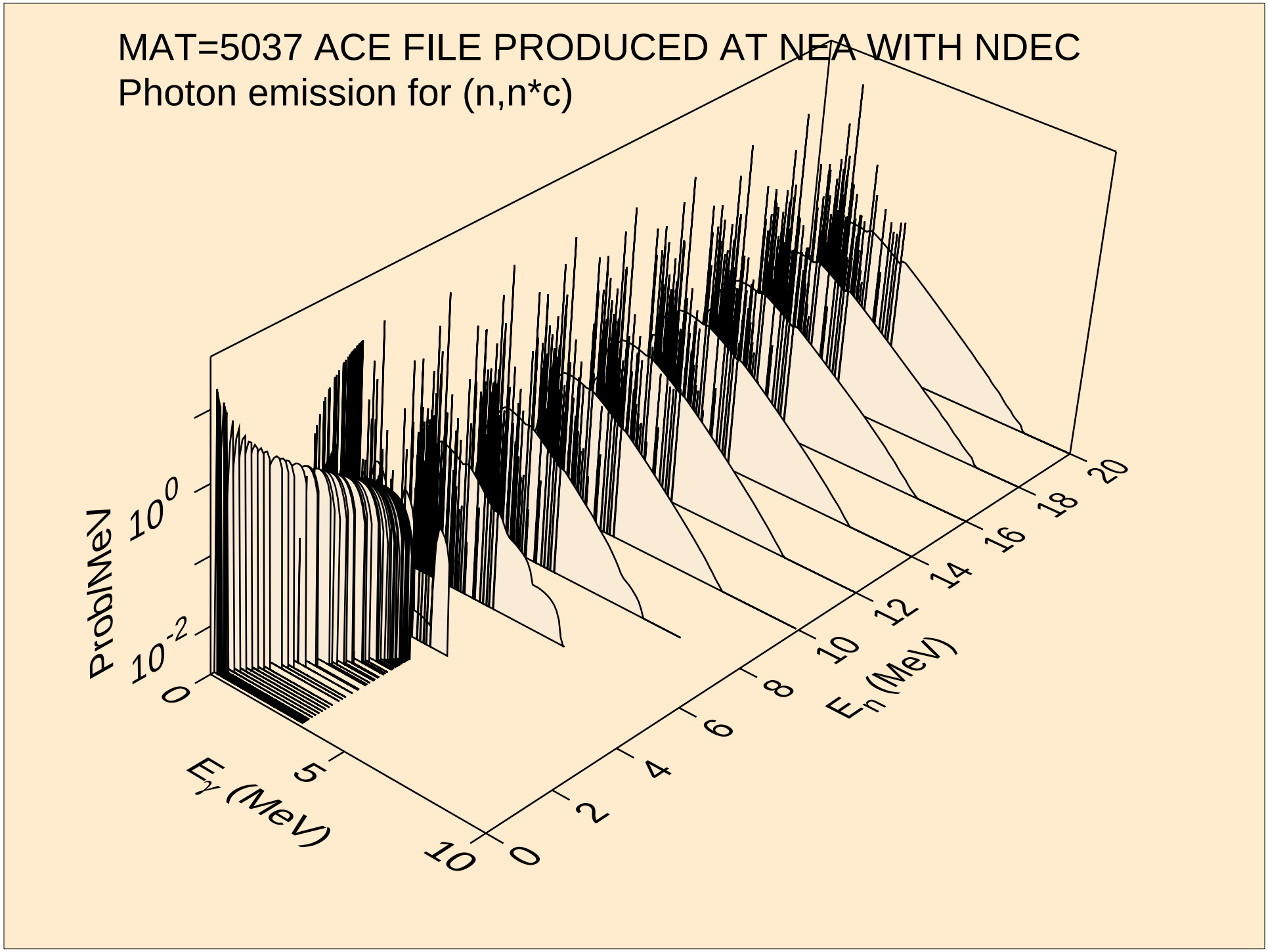

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,n*c)
Prob/MeV
10^1
10^-1
0
5
10
15
20
Sec. Energy
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

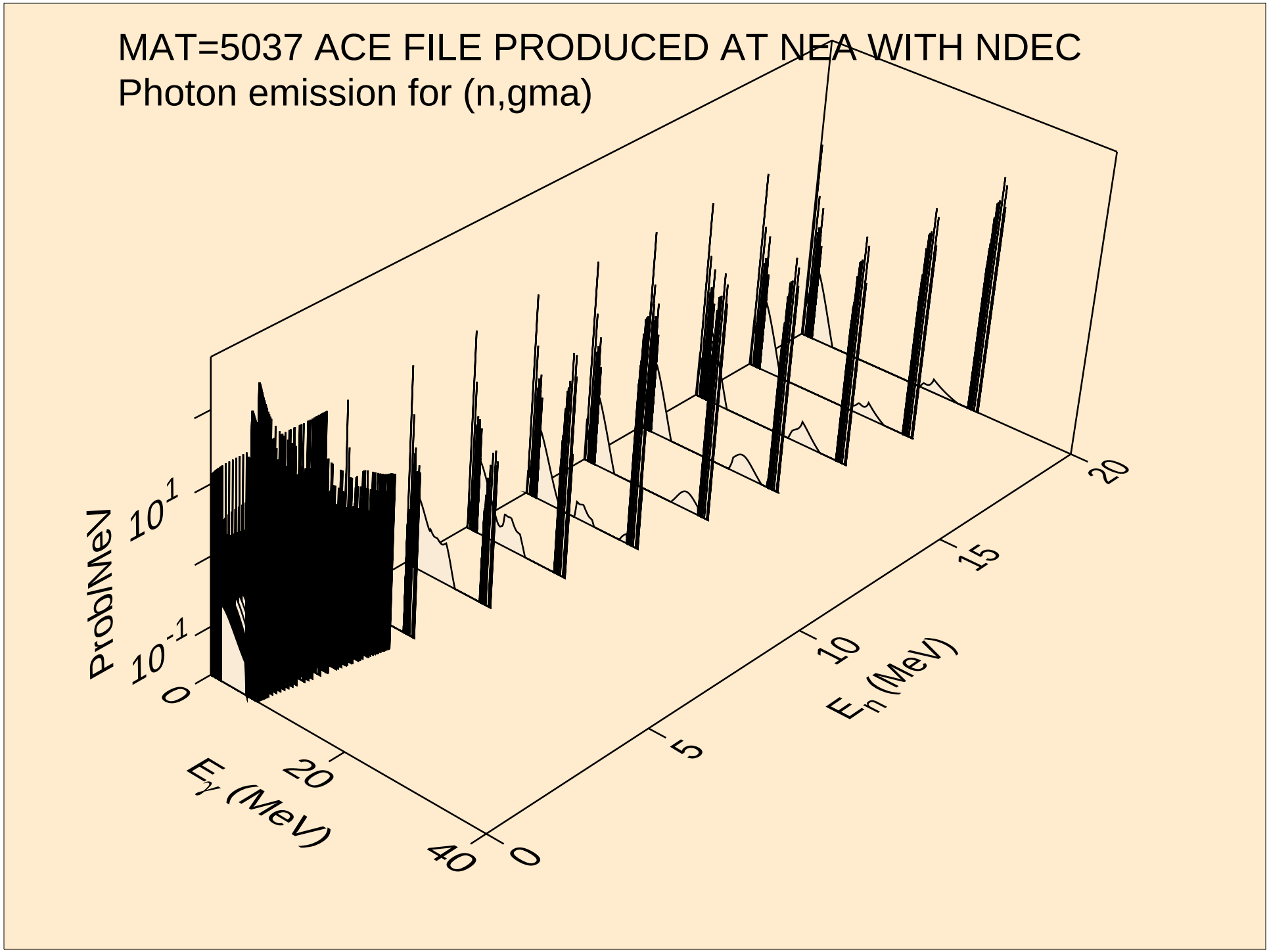

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Photon emission for (n,2n)
Prob/MeV
10^{2}
10^{0}
10^{-2}
0
5
10
E_γ (MeV)
8
10
12
14
16
18
20
E_n (MeV)


MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Photon emission for (n,3n)
Prob/MeV
10^{2}
10^{0}
10^{-2}
0
2
4
E_γ (MeV)
17.0
17.5
18.0
18.5
19.0
19.5
20.0
E_n (MeV)

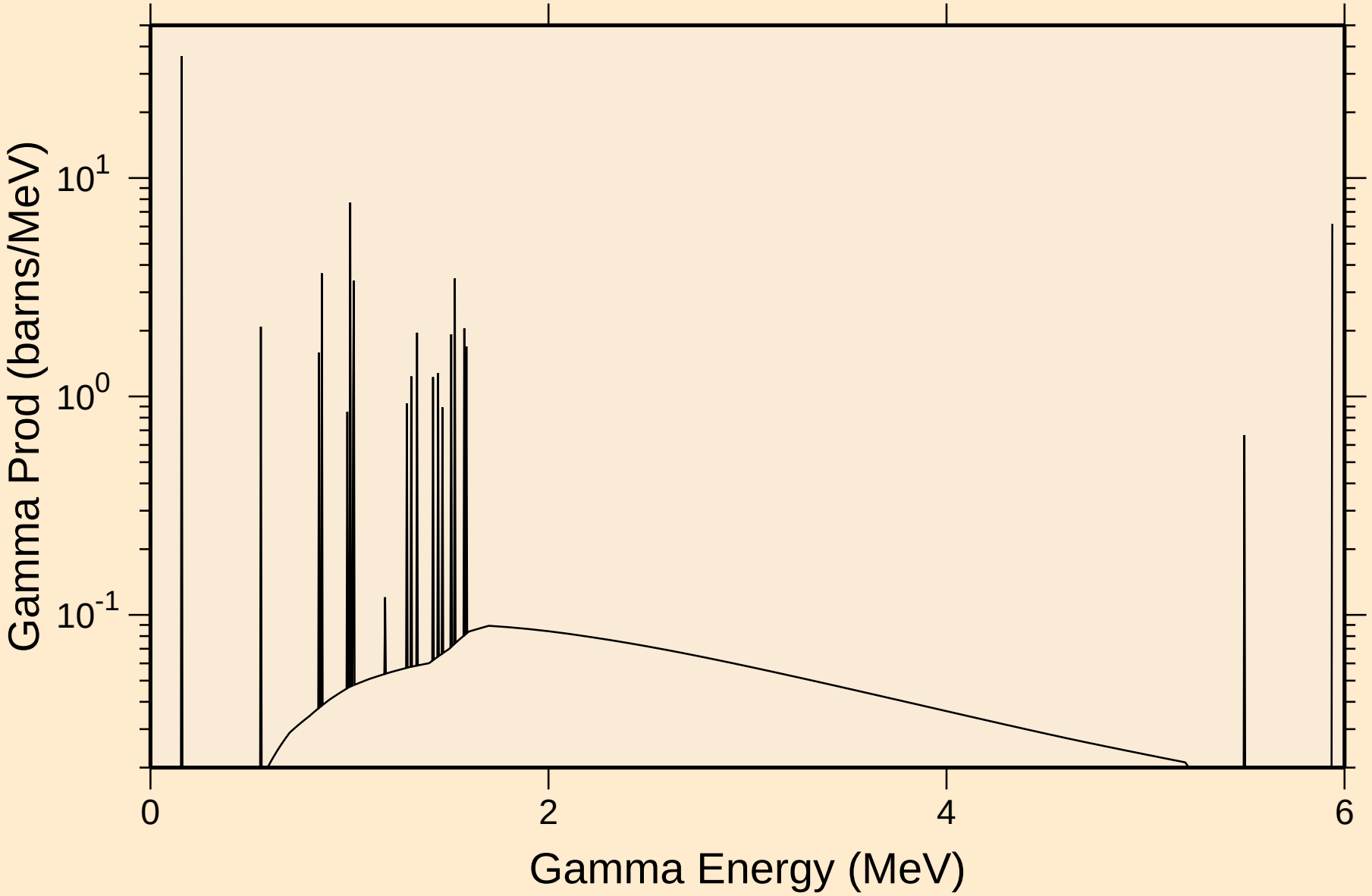

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Photon emission for (n,n*)a
Prob/MeV
10^{2}
10^{0}
10^{-2}
E_γ (MeV)
0
2
4
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

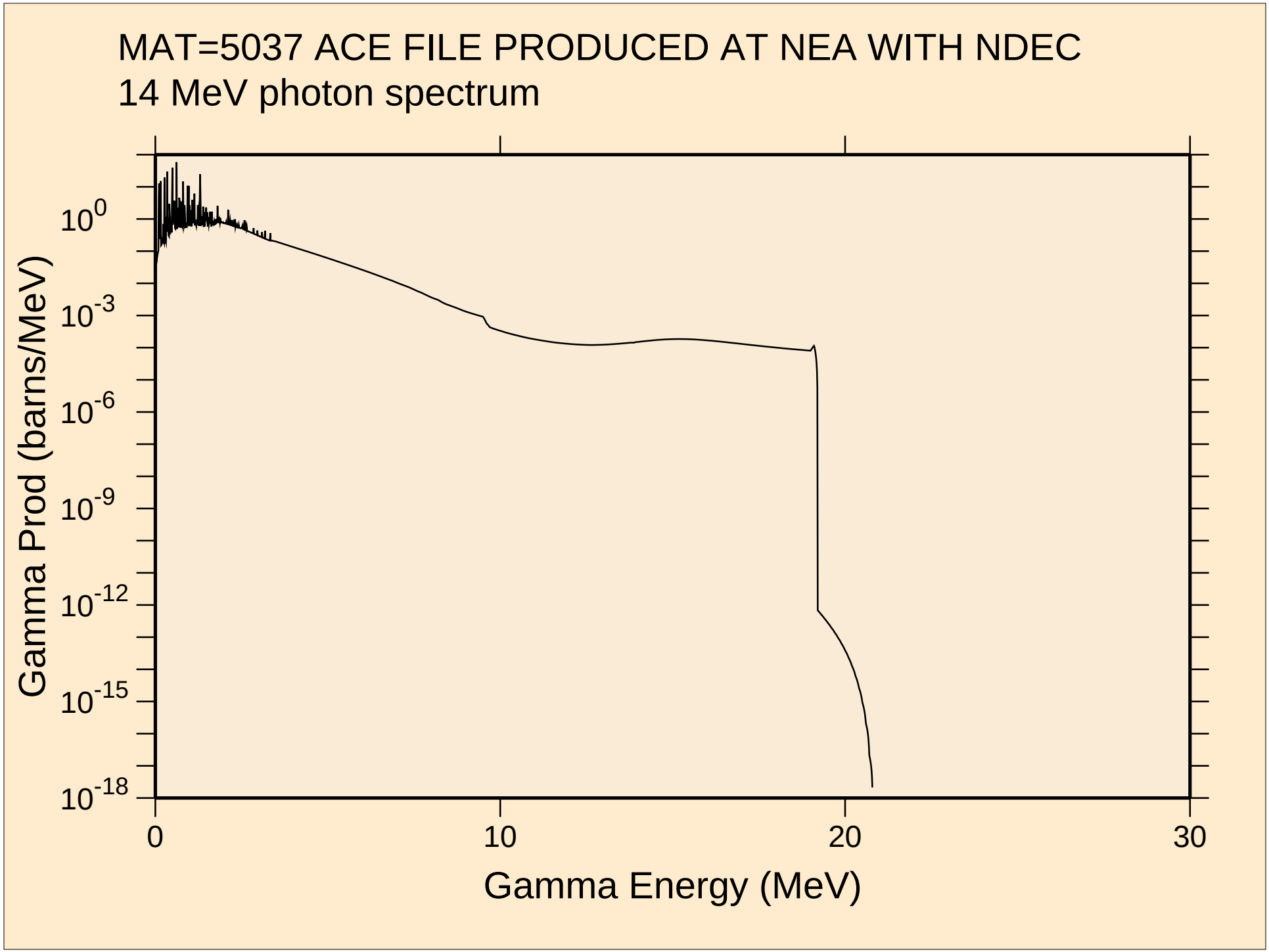

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Photon emission for (n,n*)p
Prob/MeV
10^{2}
10^{0}
10^{-2}
0
2
4
6
8
E_γ (MeV)
10
12
14
16
18
20
E_n (MeV)

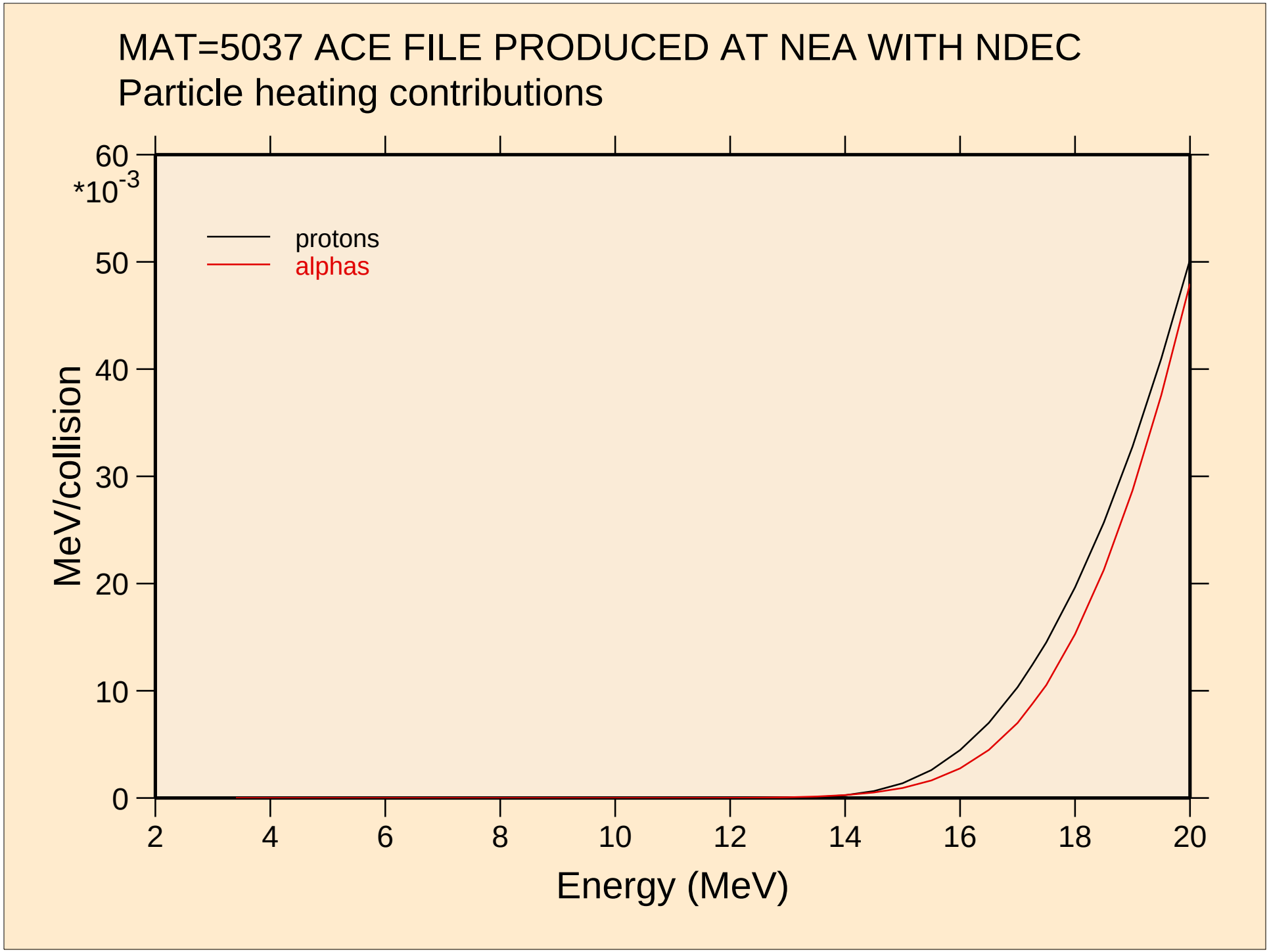

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Photon emission for (n,n*c)
Prob/MeV
10^0
10^-2
0
E_γ (MeV)
5
10
0
2
4
6
8
10
12
14
16
18
20
E_n (MeV)

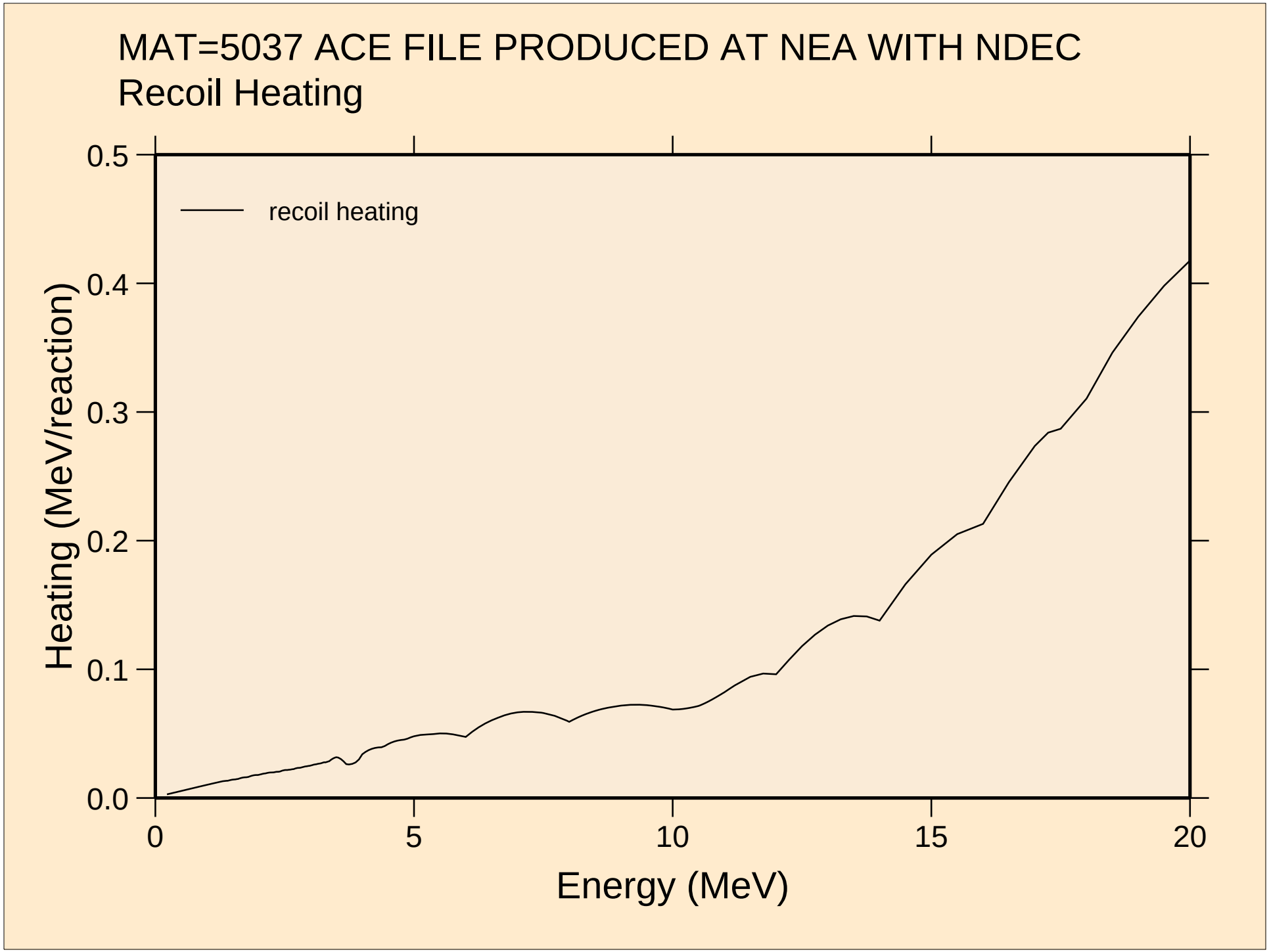

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Photon emission for (n,gma)
Prob/MeV
10^1
10^-1
0
E_γ (MeV)
20
40
0
5
10
15
20
E_n (MeV)

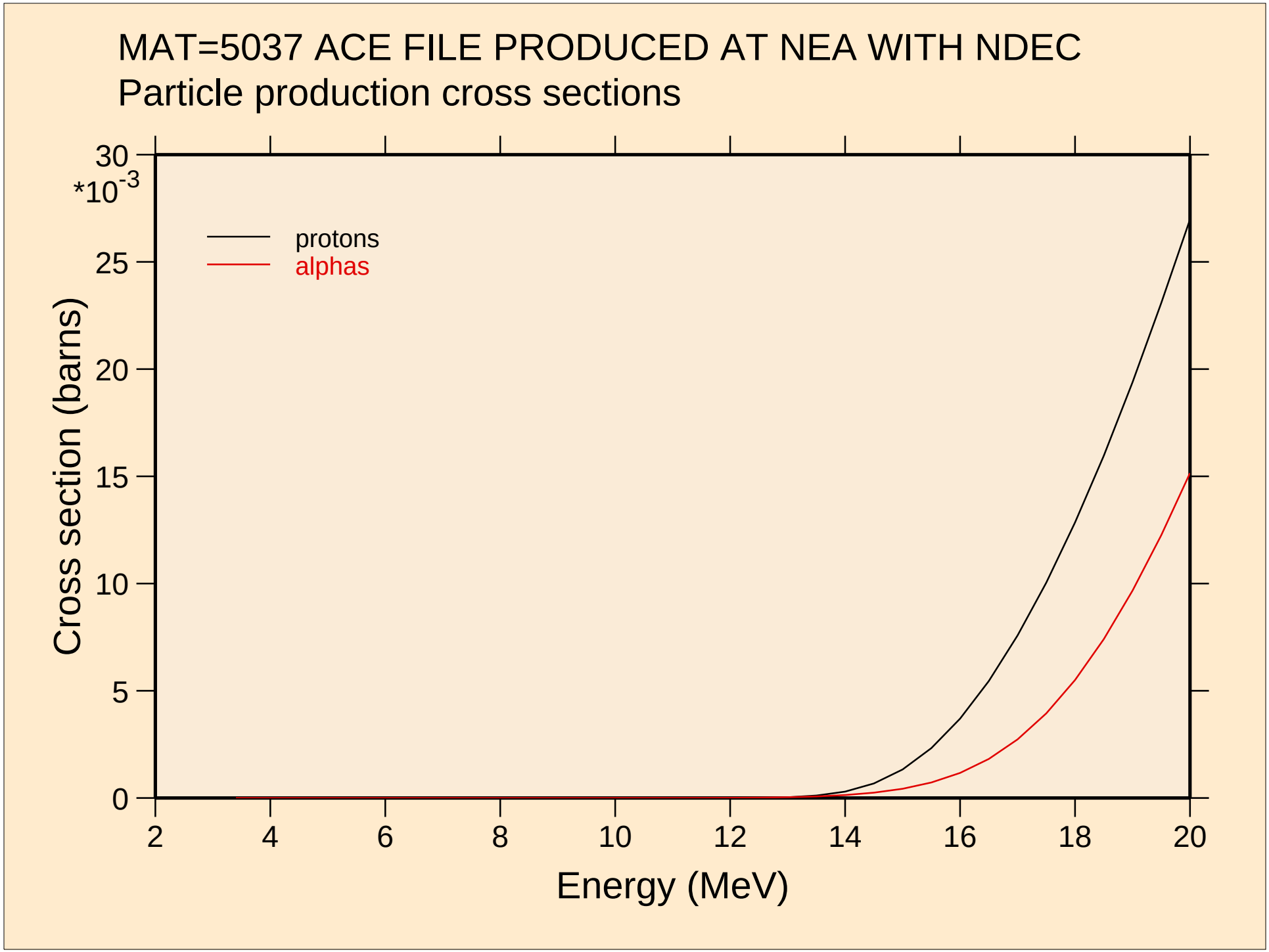
MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
thermal capture photon spectrum

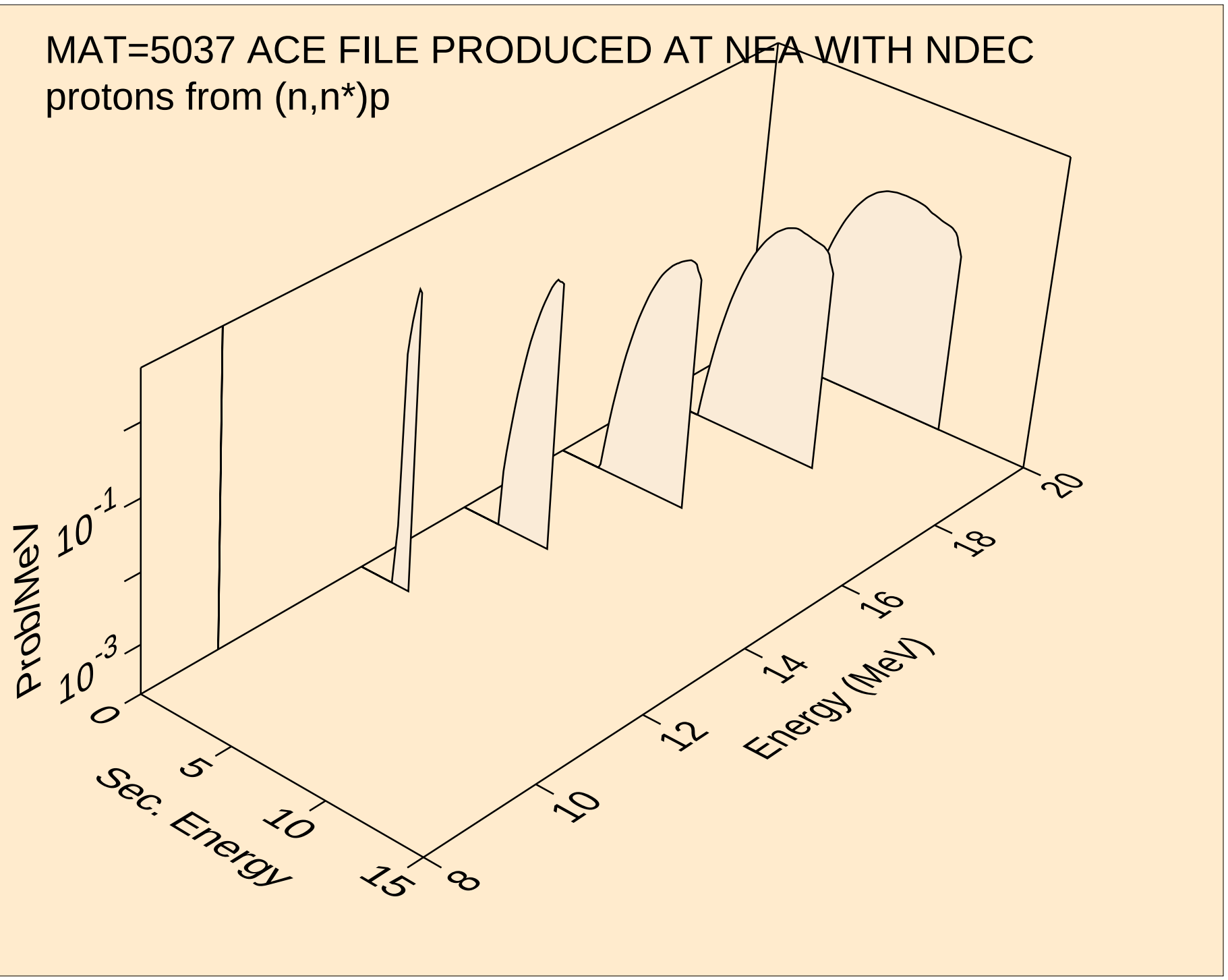


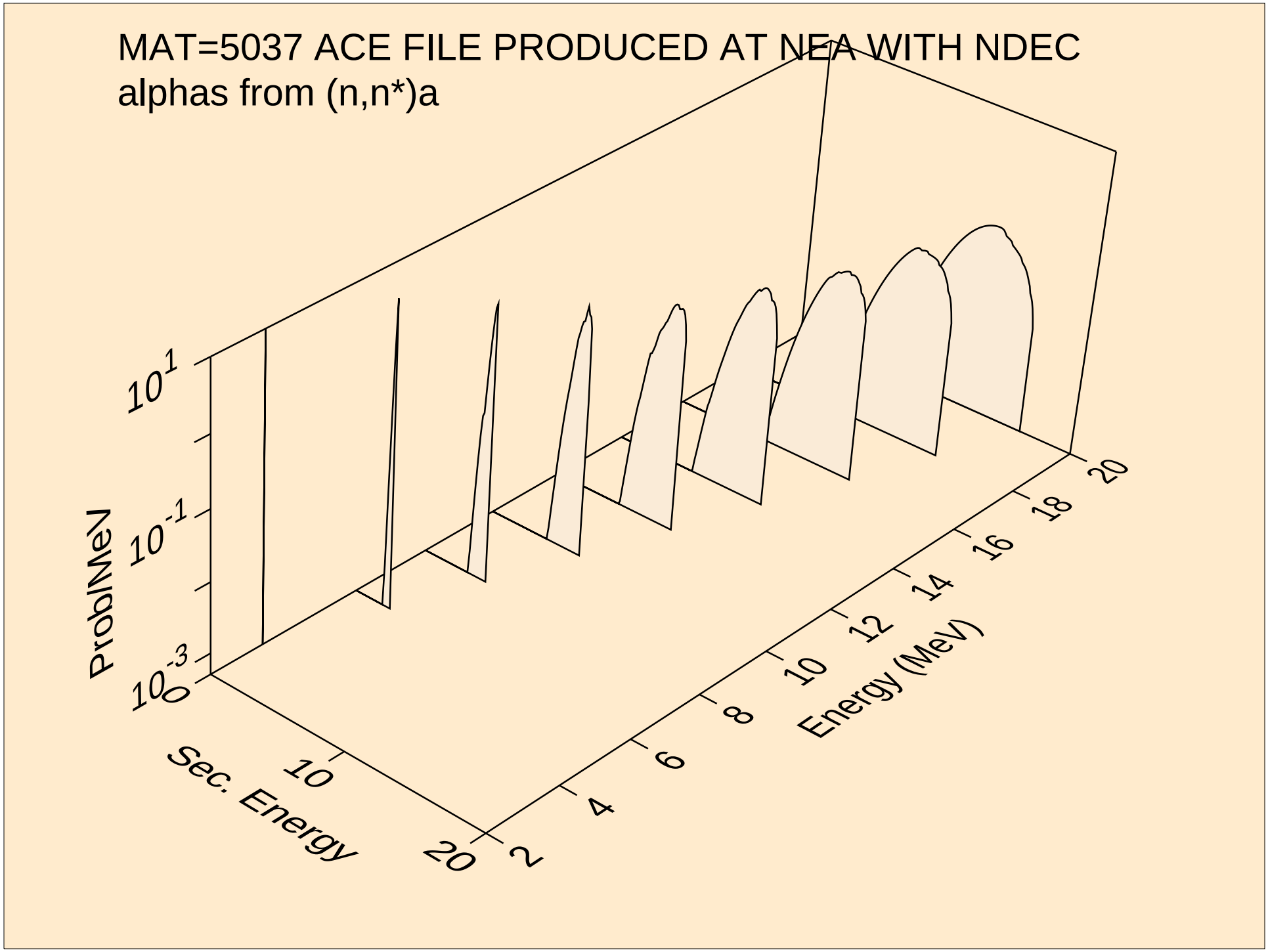

MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
14 MeV photon spectrum
Gamma Prod (barns/MeV)
10^0
10^-3
10^-6
10^-9
10^-12
10^-15
10^-18
0
10
20
30
Gamma Energy (MeV)


MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Particle heating contributions
protons
alphas
MeV/collision
*10-3
60
50
40
30
20
10
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Recoil Heating
recoil heating
Heating (MeV/reaction)
0.0
0.1
0.2
0.3
0.4
0.5
0
5
10
15
20
Energy (MeV)


MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
Particle production cross sections
*10-3
30
25
20
15
10
5
0
protons
alphas
Cross section (barns)
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
protons from (n,n*)p
Prob/MeV
10-1
10-3
0
5
10
15
Sec. Energy
8
10
12
14
16
18
20
Energy (MeV)


MAT=5037 ACE FILE PRODUCED AT NEA WITH NDEC
alphas from (n,n*)a
Prob/MeV
10^{1}
10^{-1}
10^{-3}
0
10
20
Sec. Energy
2
4
6
8
10
12
14
16
18
20
Energy (MeV)