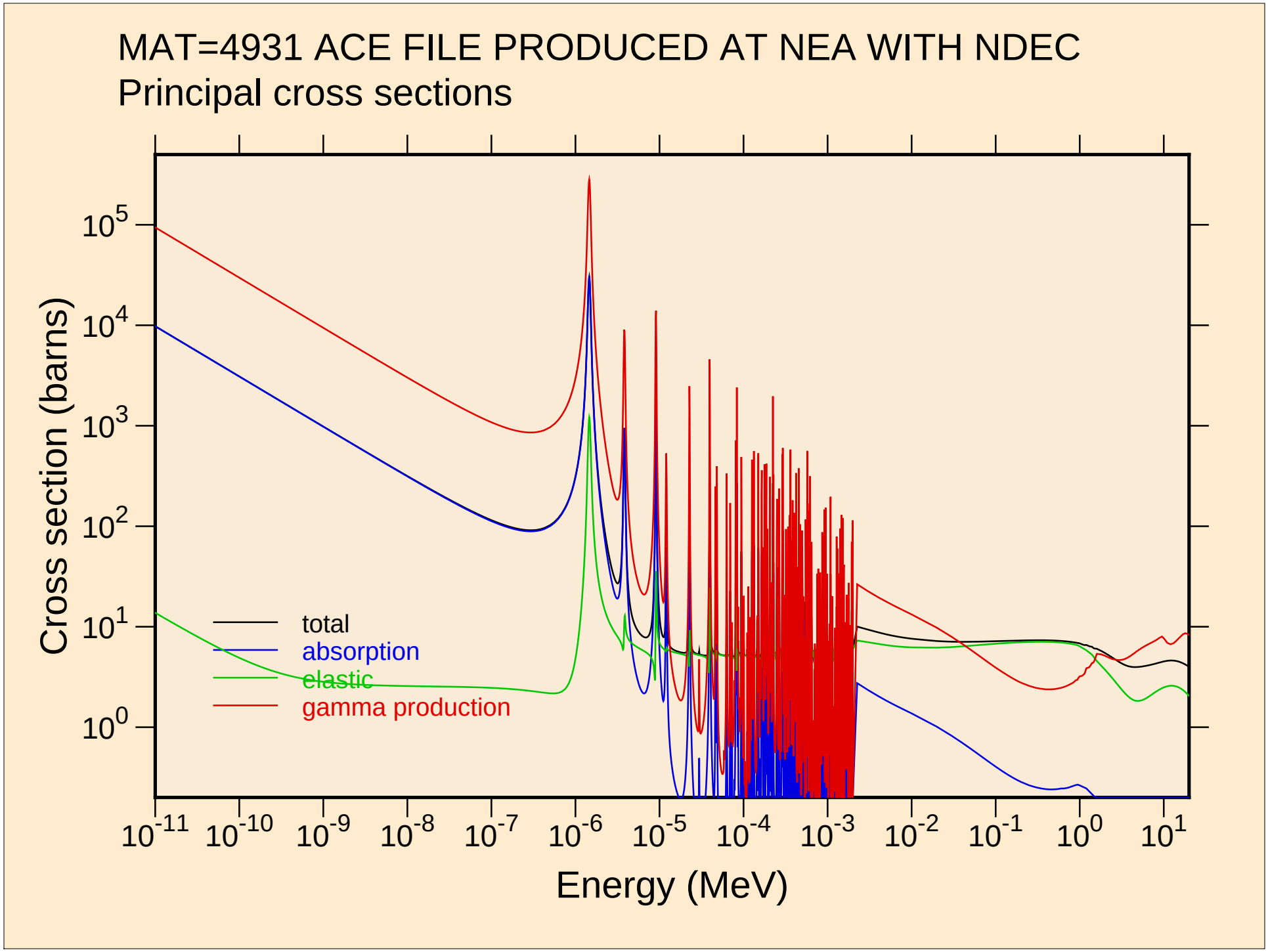
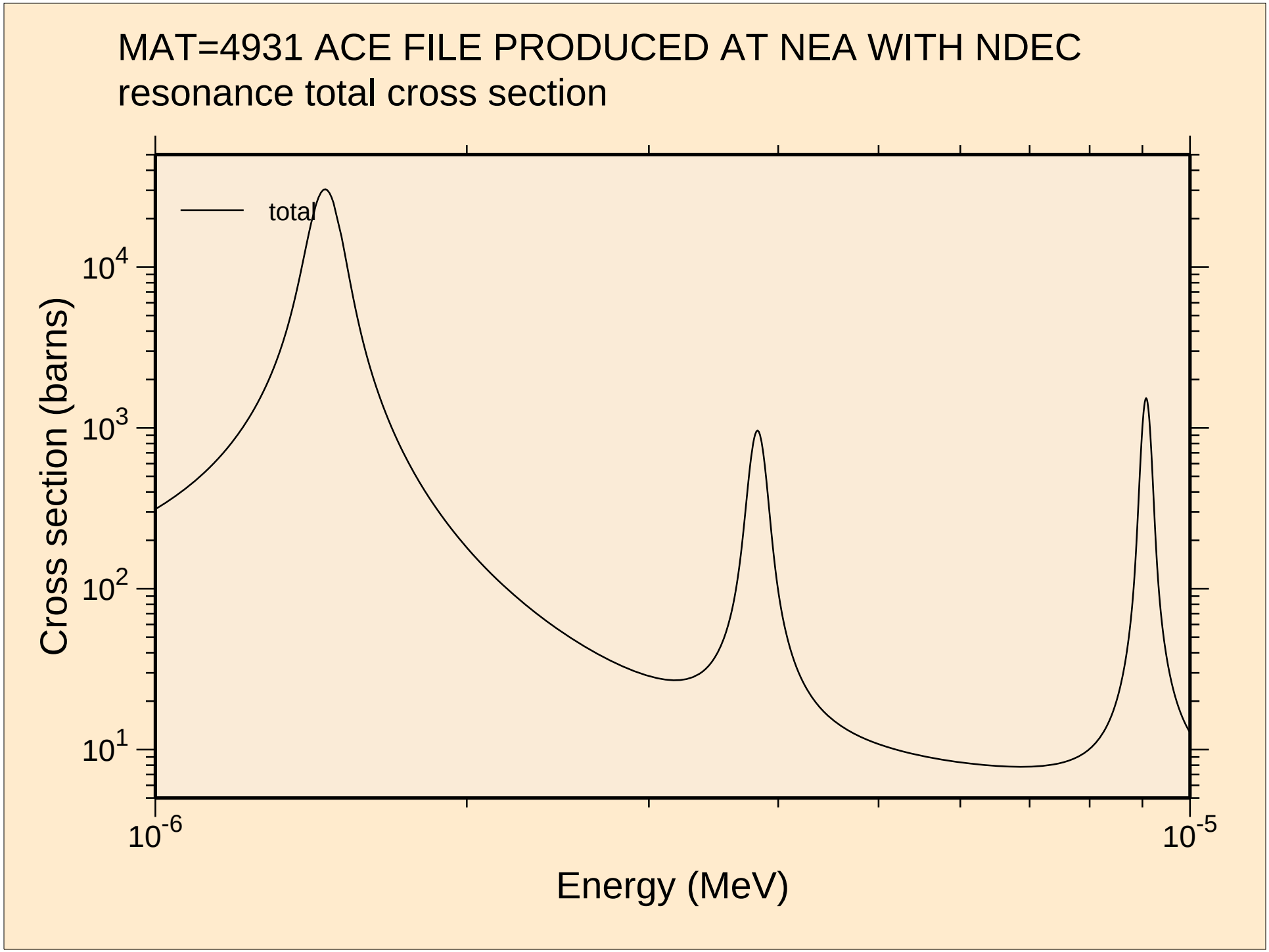
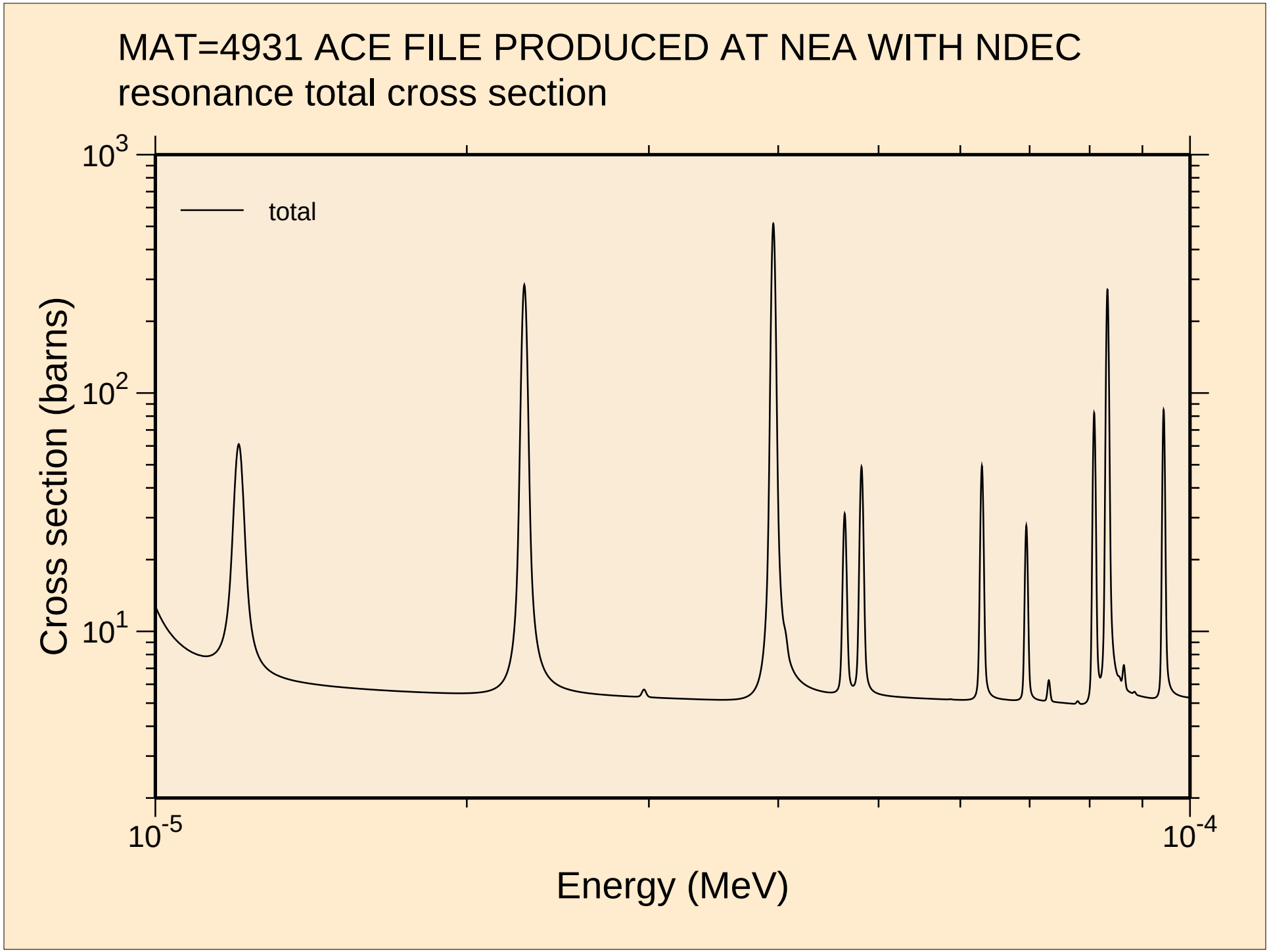
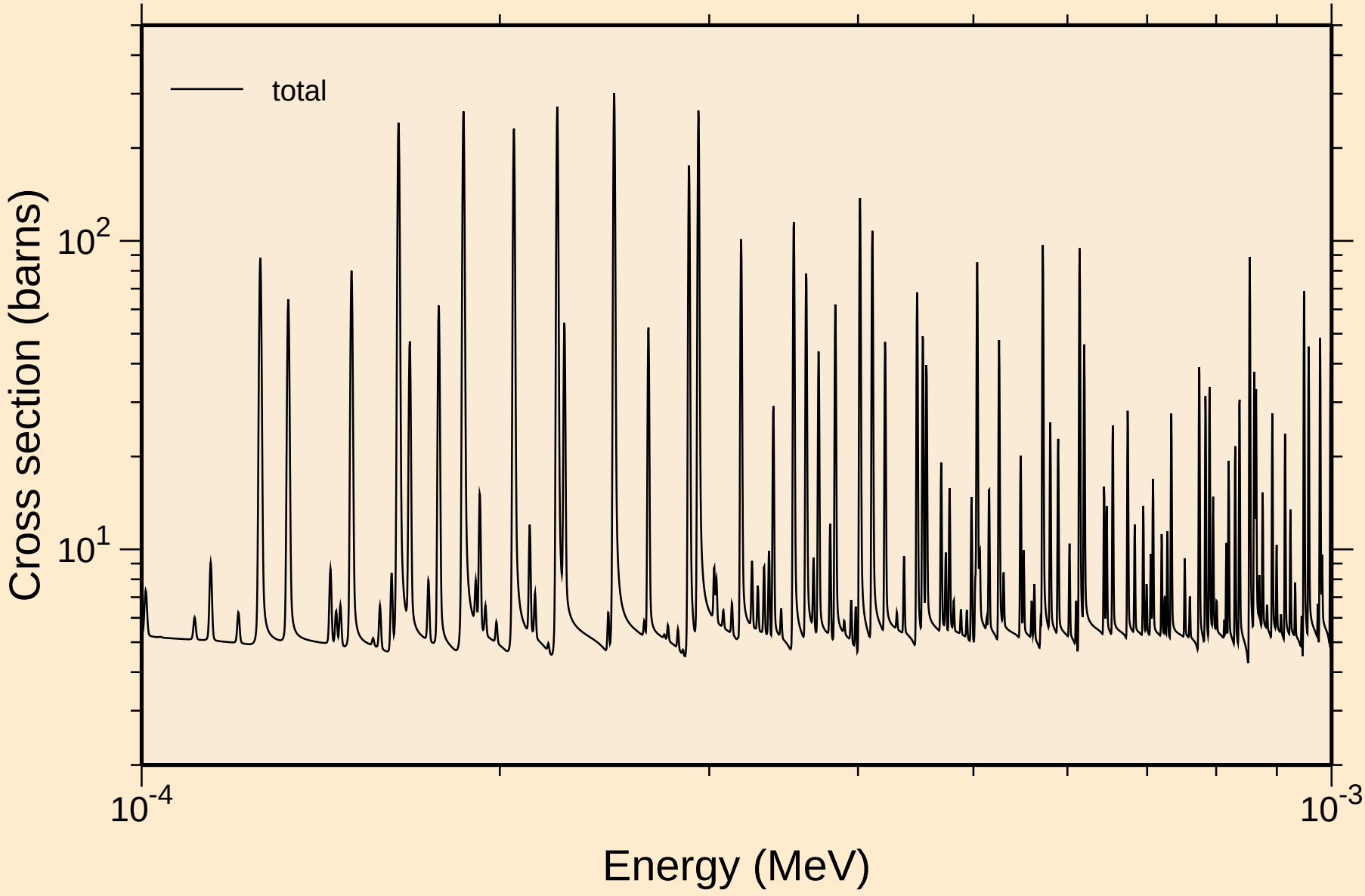
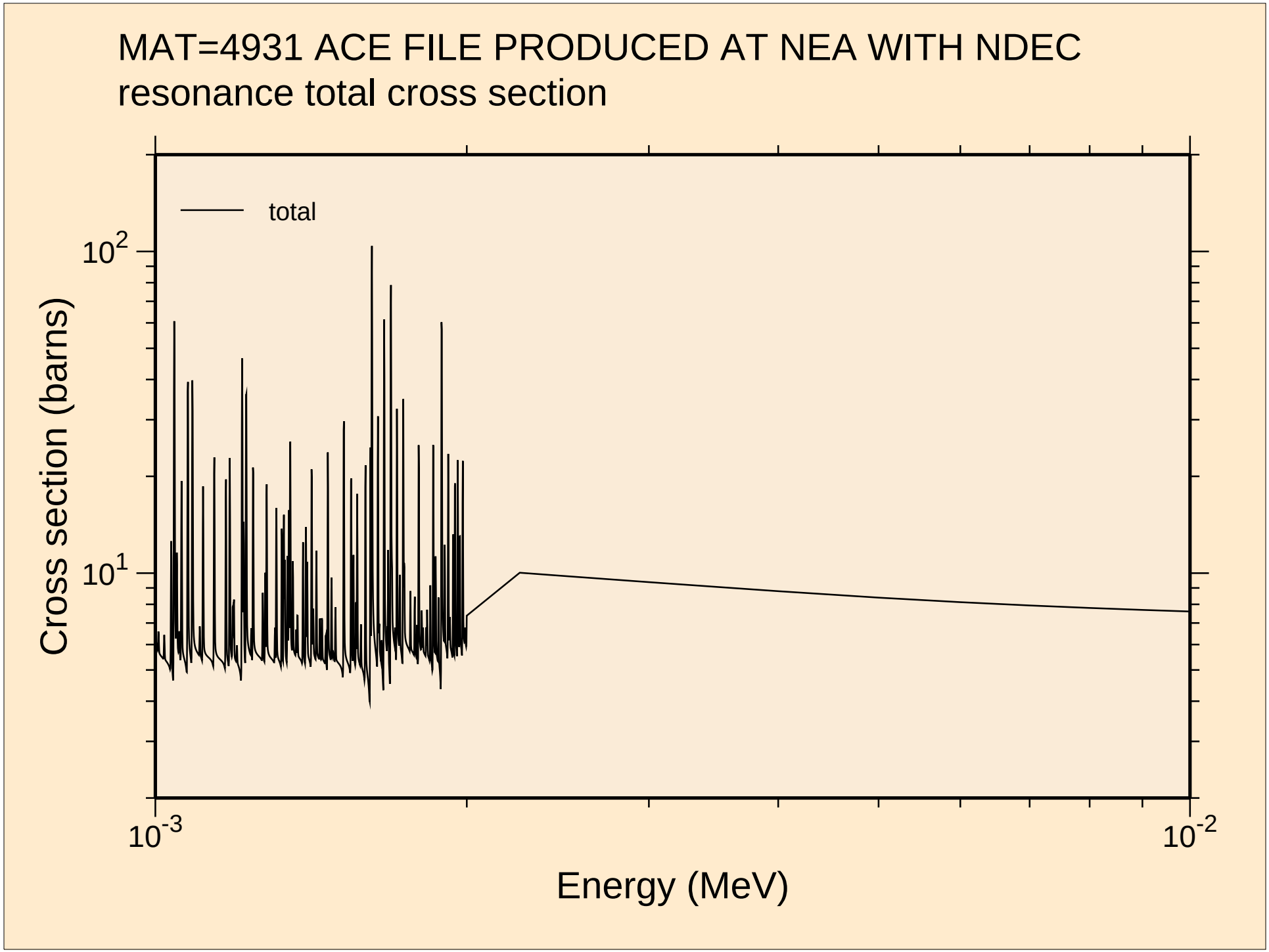

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Principal cross sections
Cross section (barns)
10^5
10^4
10^3
10^2
10^1
10^0
total
absorption
elastic
gamma production
10^{-11} 10^{-10} 10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^0 10^1
Energy (MeV)


MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
resonance total cross section
total
Cross section (barns)
10^4
10^3
10^2
10^1
10^-6
10^-5
Energy (MeV)

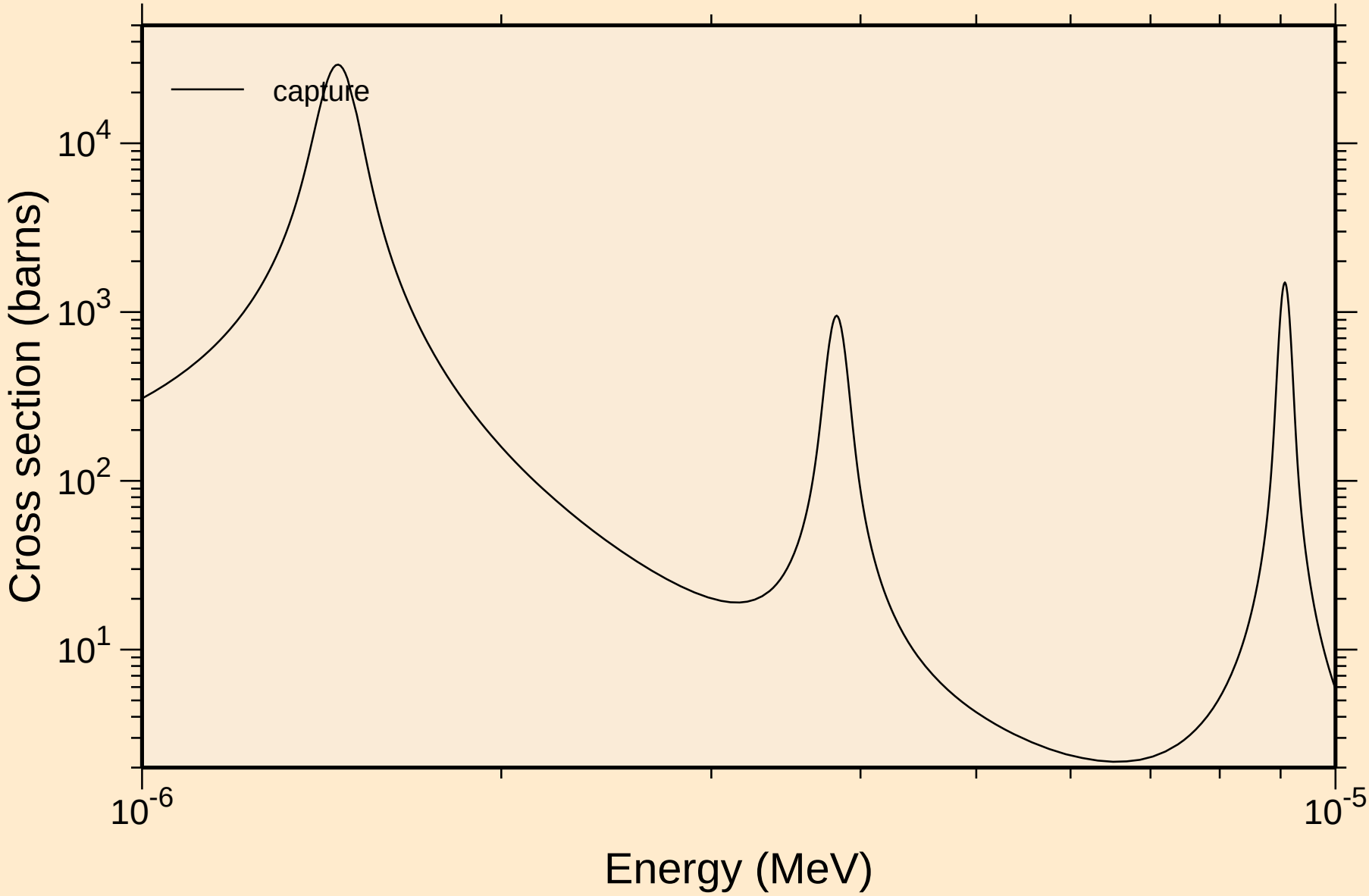

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
resonance total cross section
total
Cross section (barns)
10^3
10^2
10^1
10^-5
10^-4
Energy (MeV)

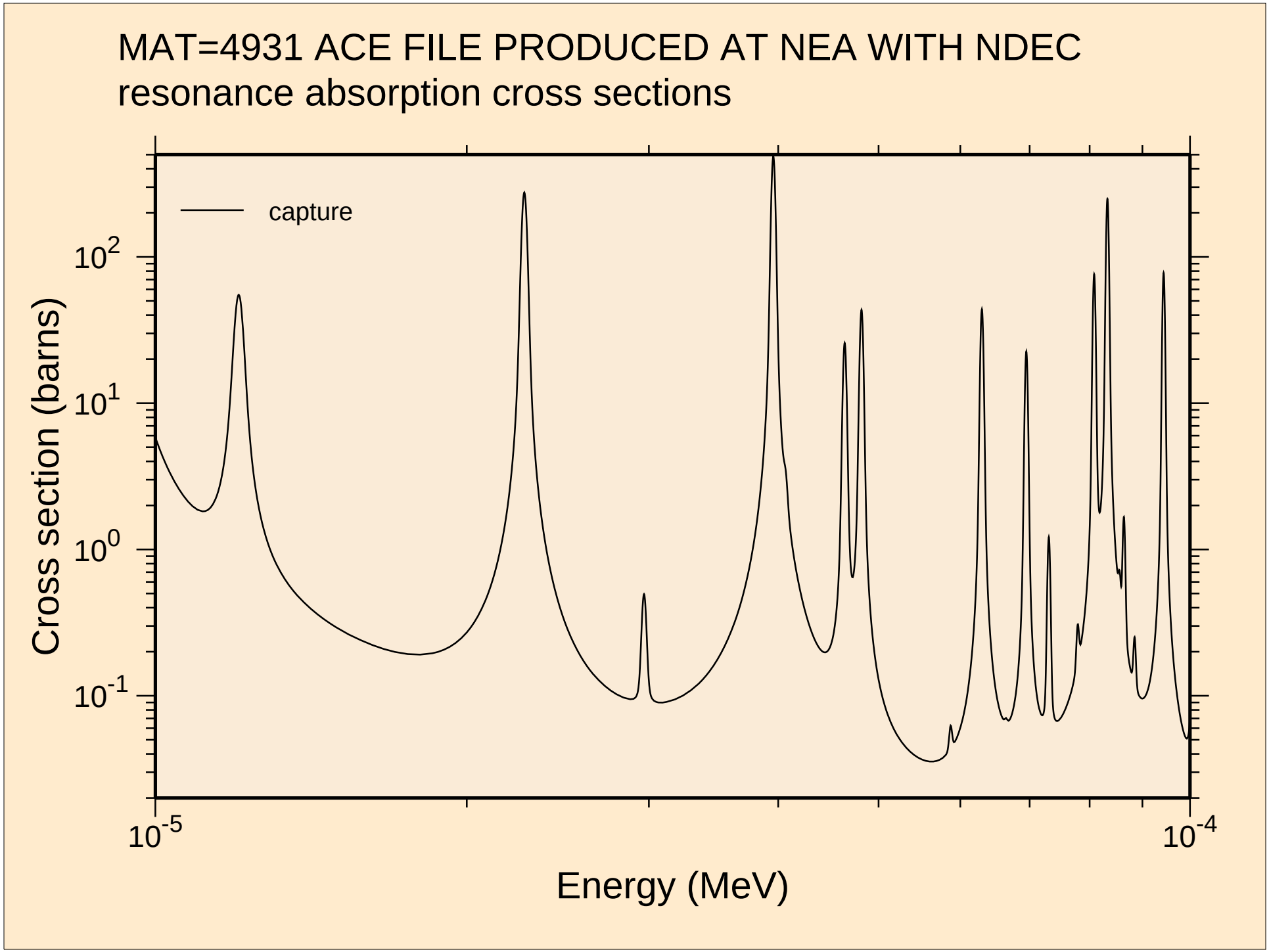
MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
resonance total cross section



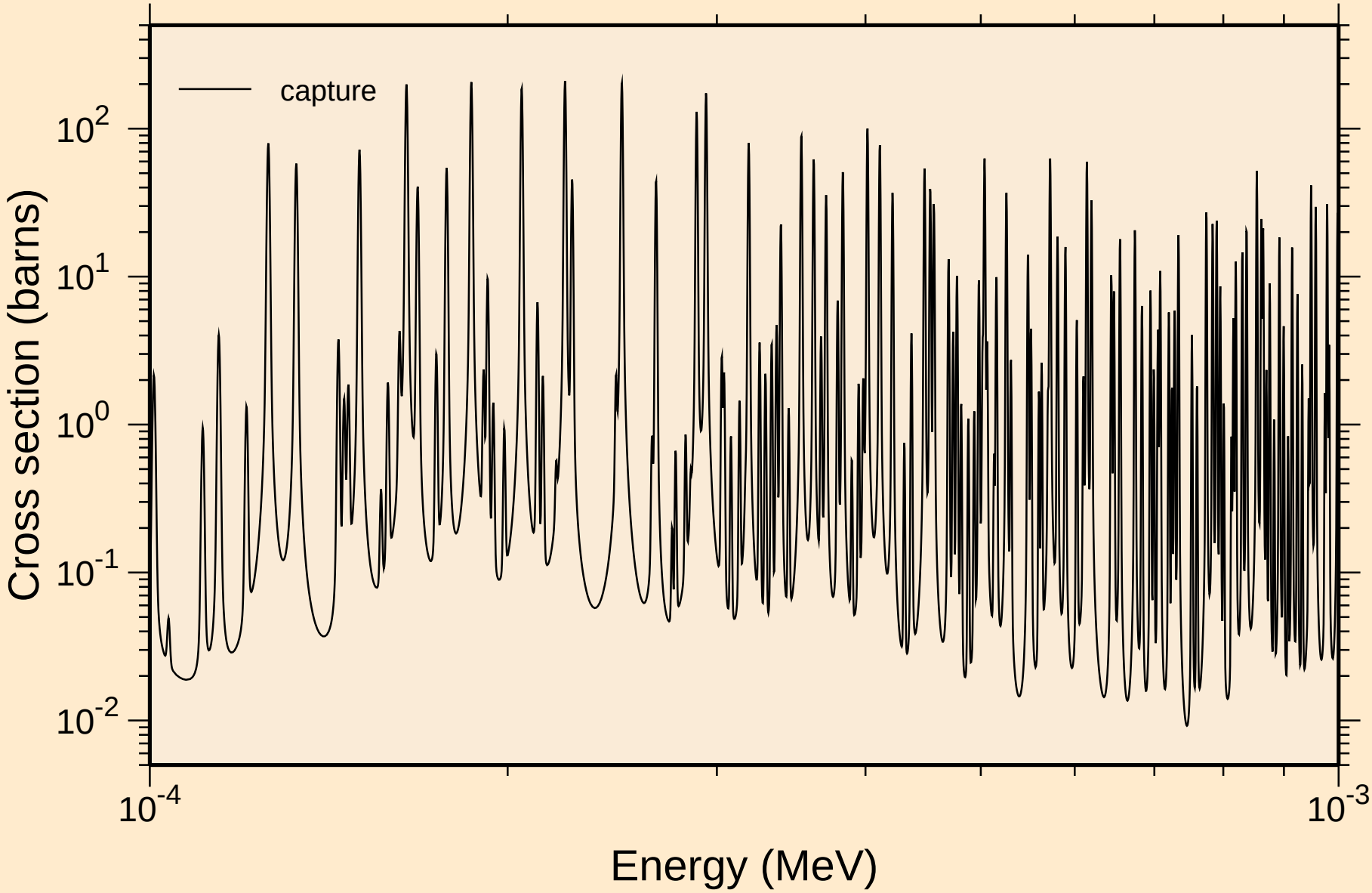

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
resonance total cross section
total
Cross section (barns)
10^2
10^1
10^-3
10^-2
Energy (MeV)

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
resonance absorption cross sections

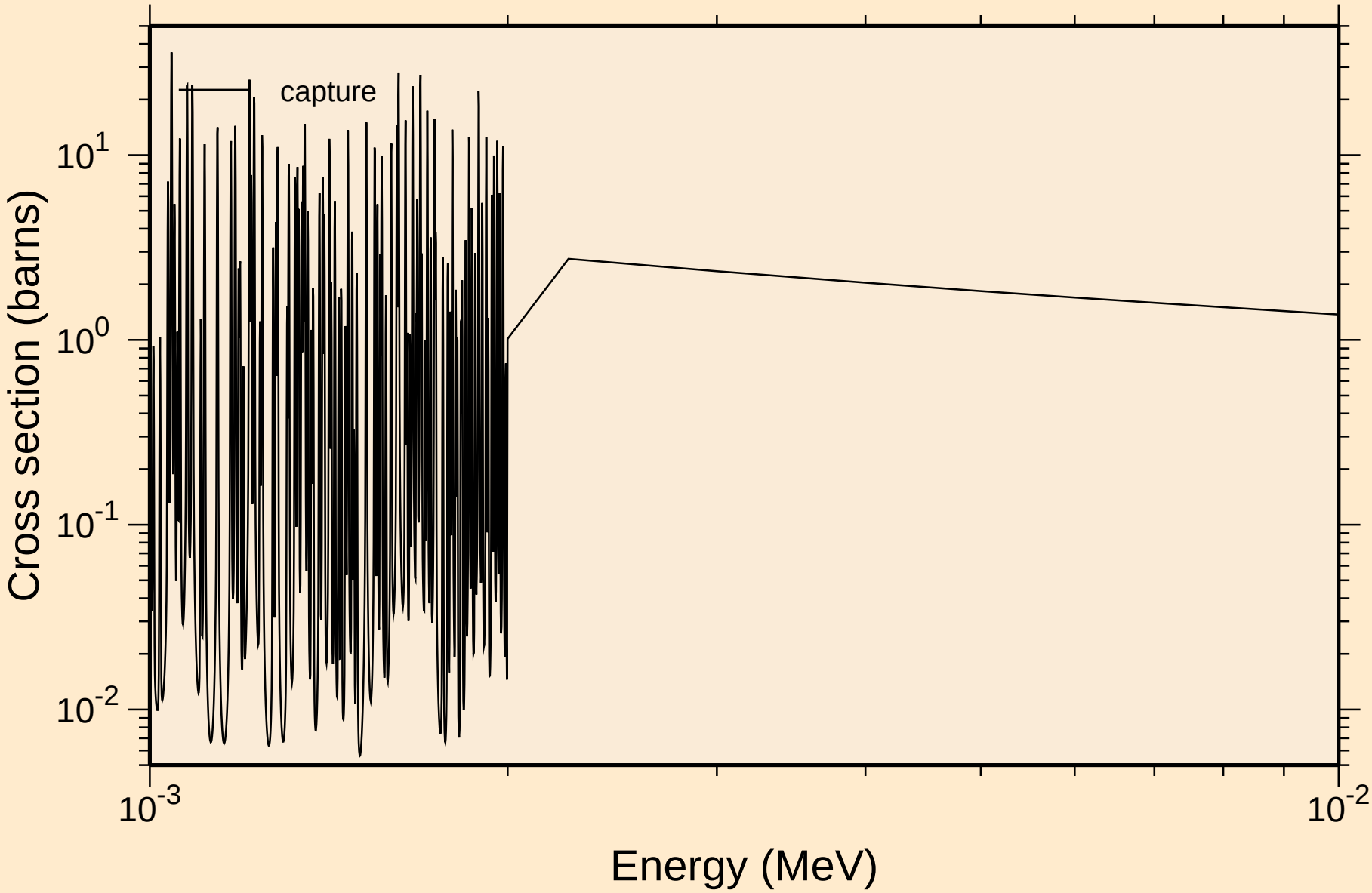


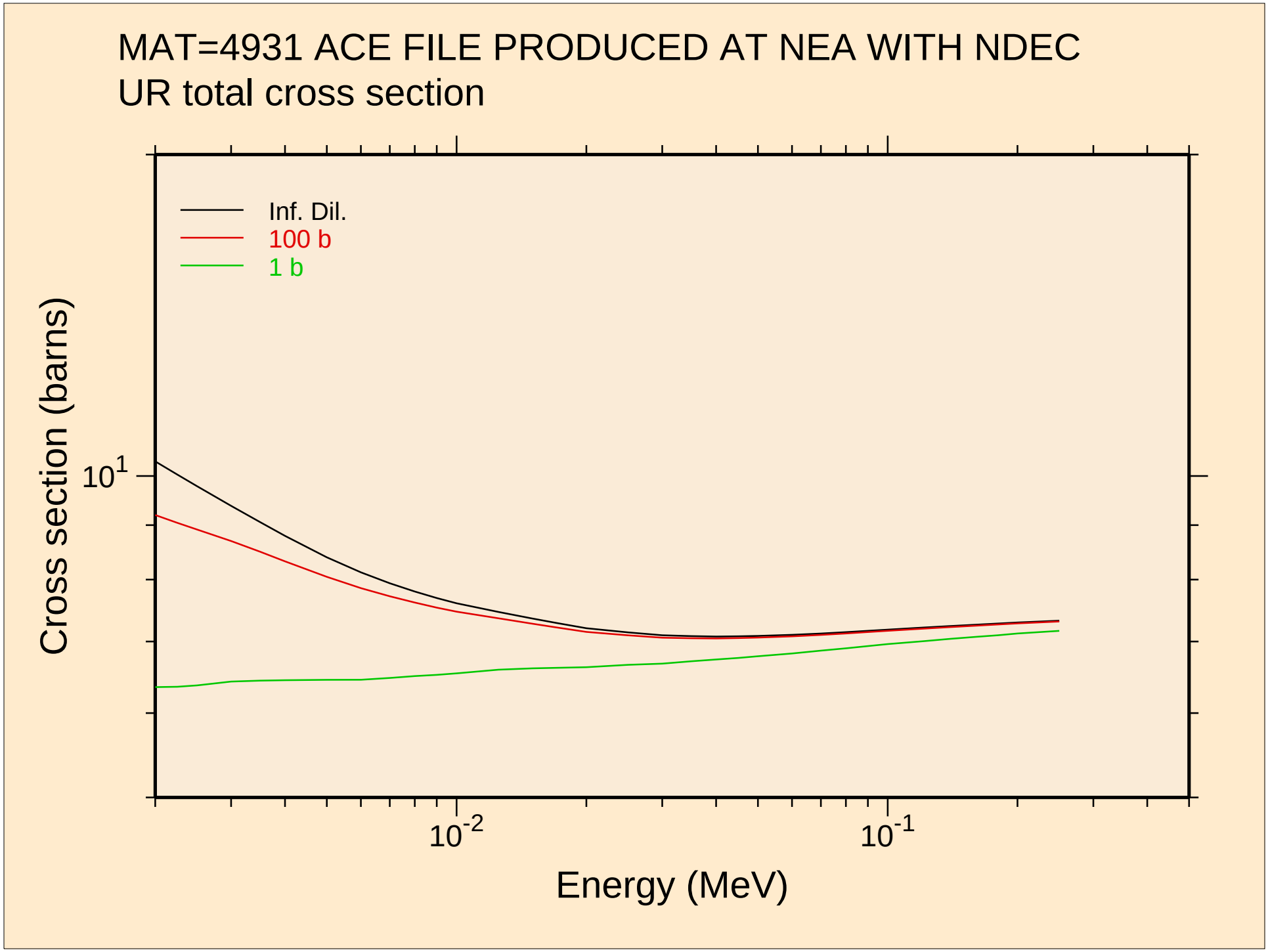

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
resonance absorption cross sections
capture
Cross section (barns)
10^2
10^1
10^0
10^-1
10^-5
10^-4
Energy (MeV)

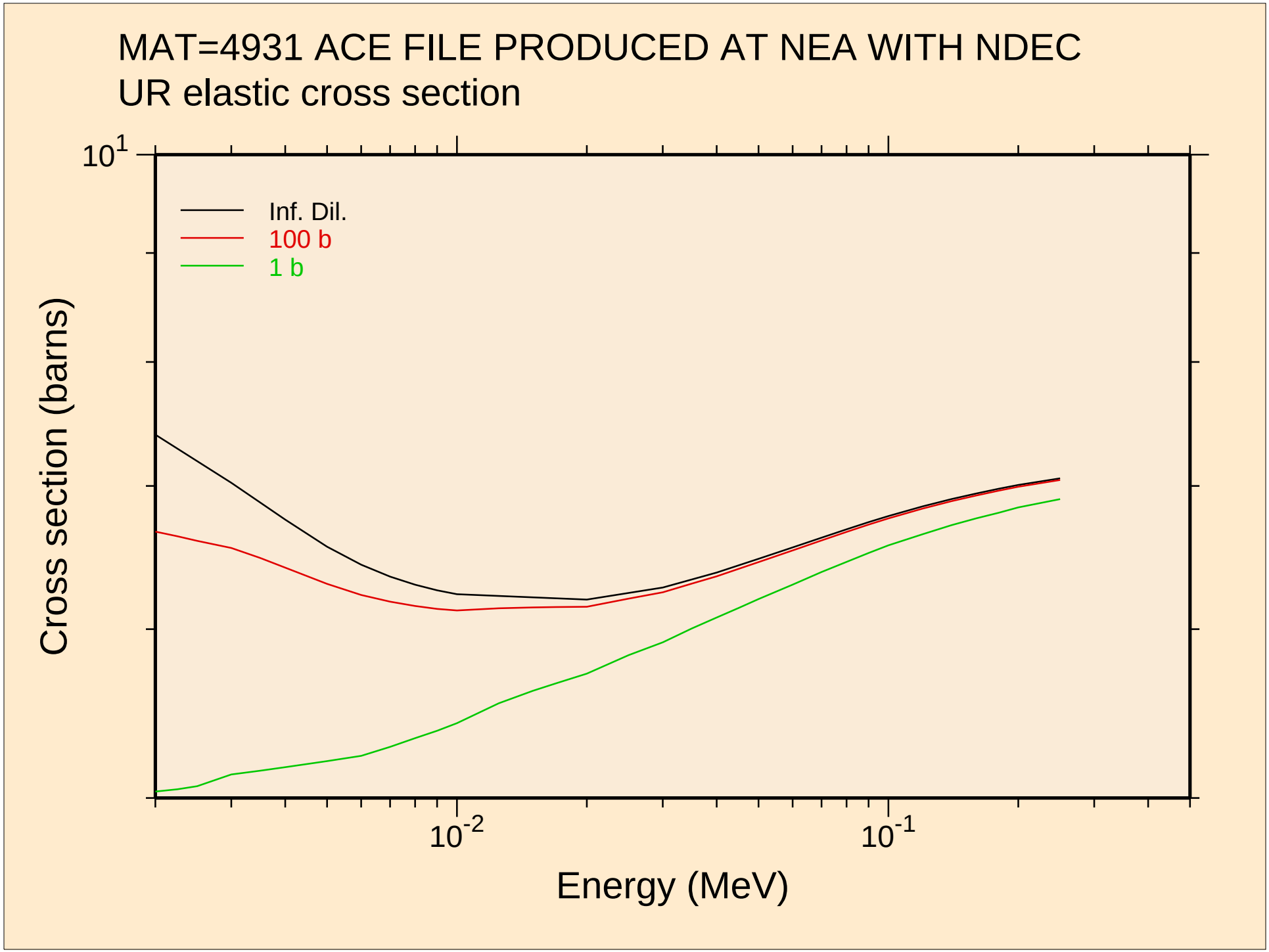
MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
resonance absorption cross sections



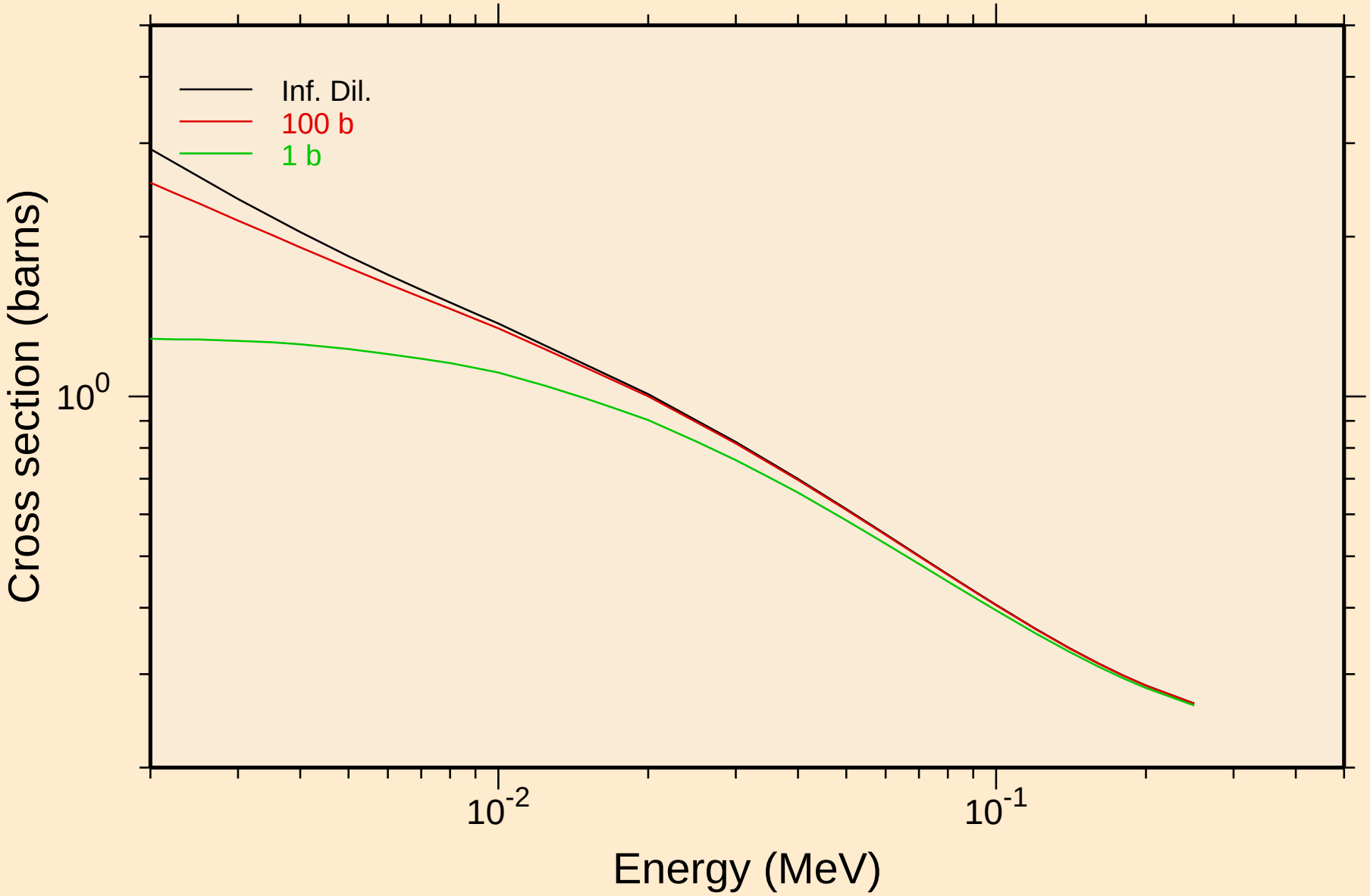
MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
resonance absorption cross sections

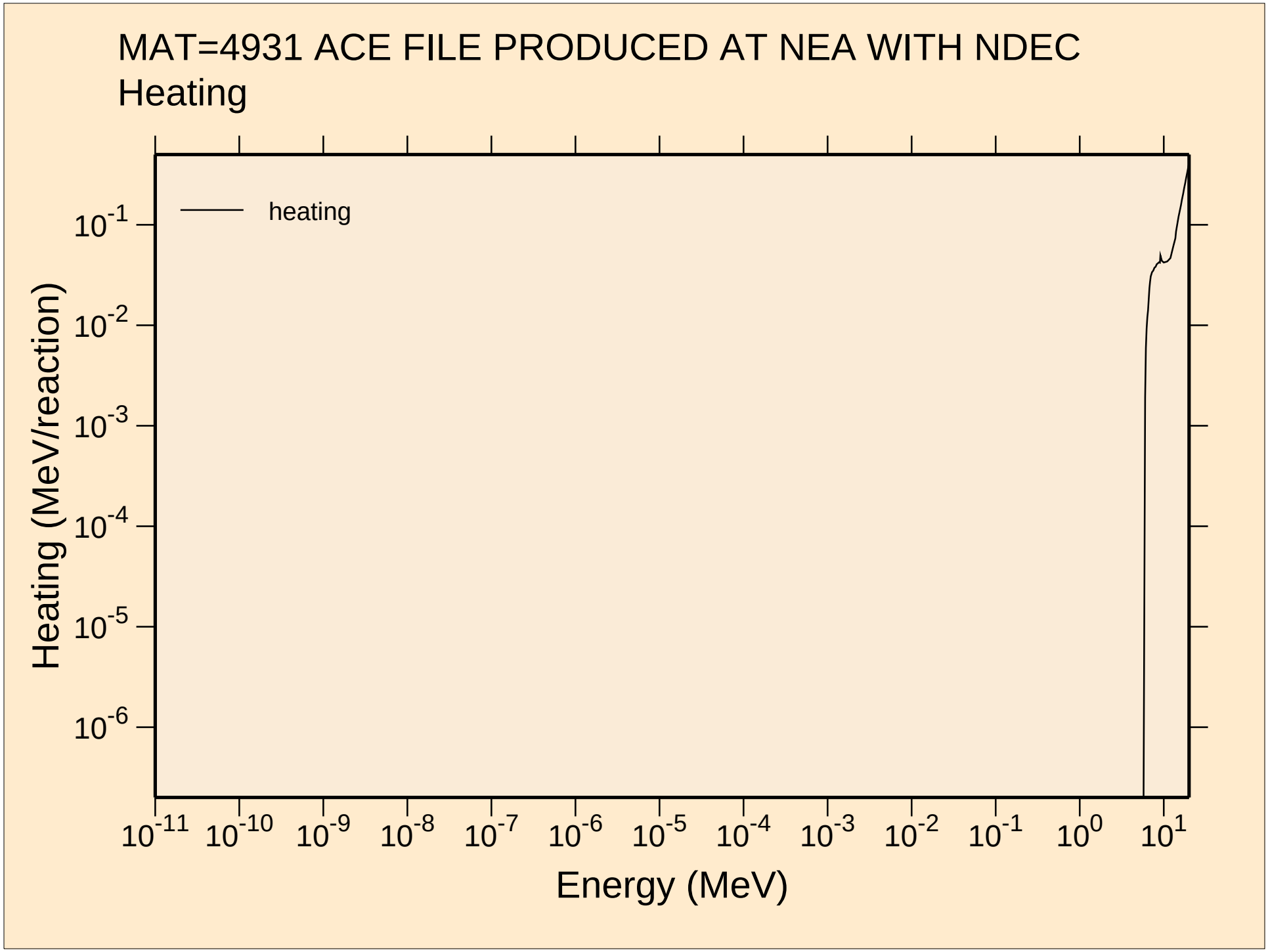


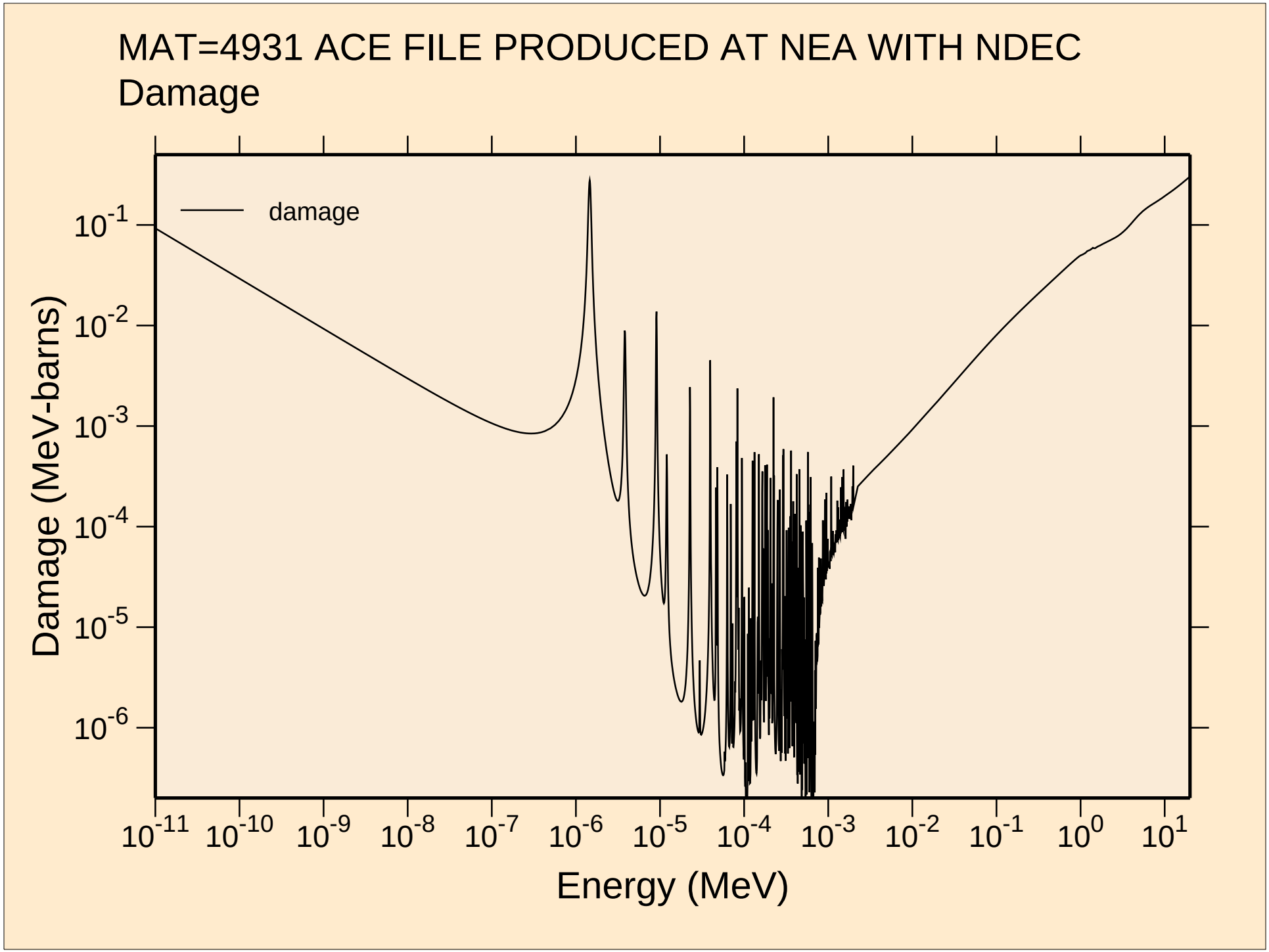

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
UR total cross section
Inf. Dil.
100 b
1 b
Cross section (barns)
10^1
10^-2
10^-1
Energy (MeV)

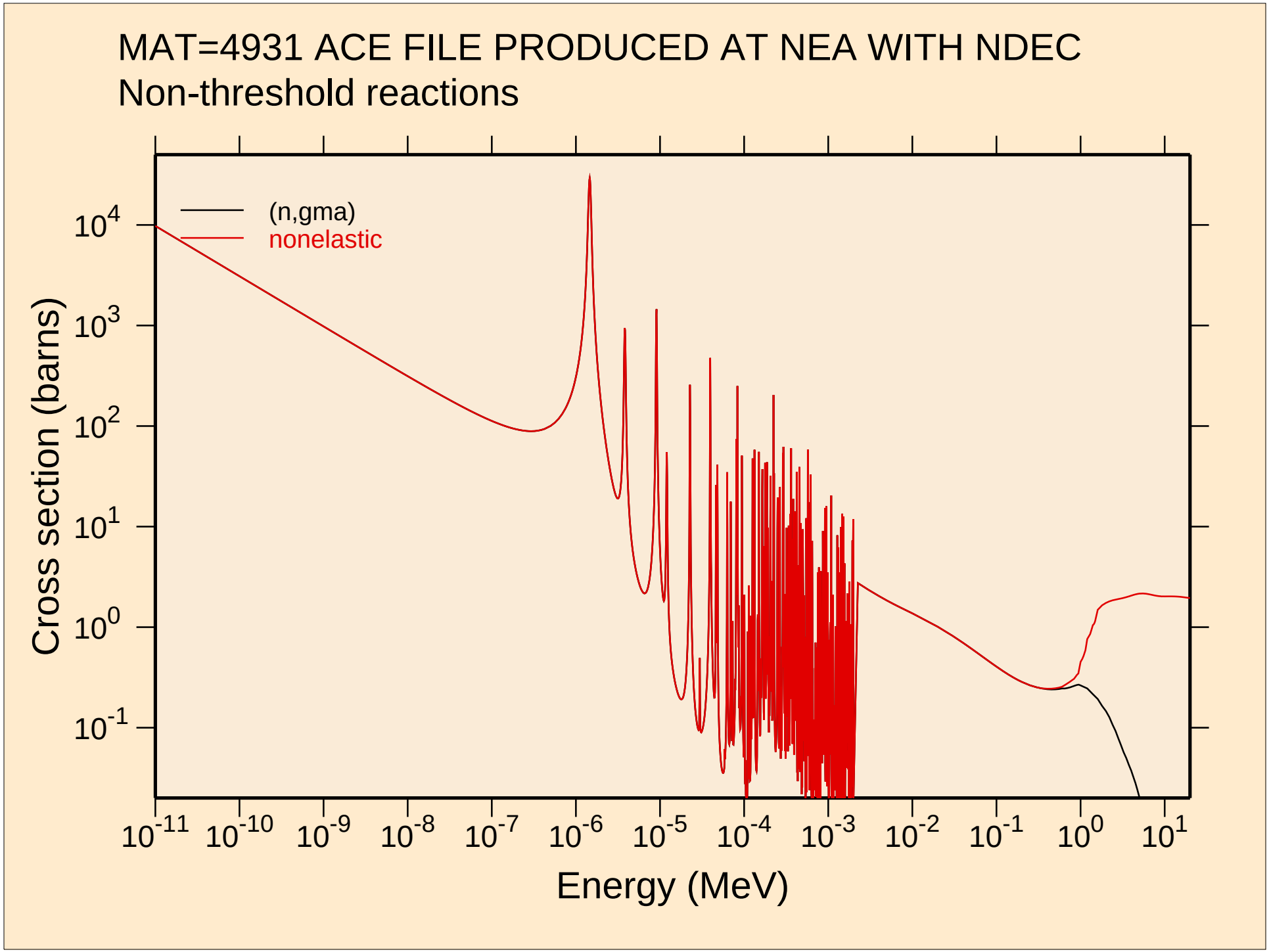

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
UR elastic cross section
10^1
Inf. Dil.
100 b
1 b
Cross section (barns)
10^{-2}
10^{-1}
Energy (MeV)

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
UR capture cross section

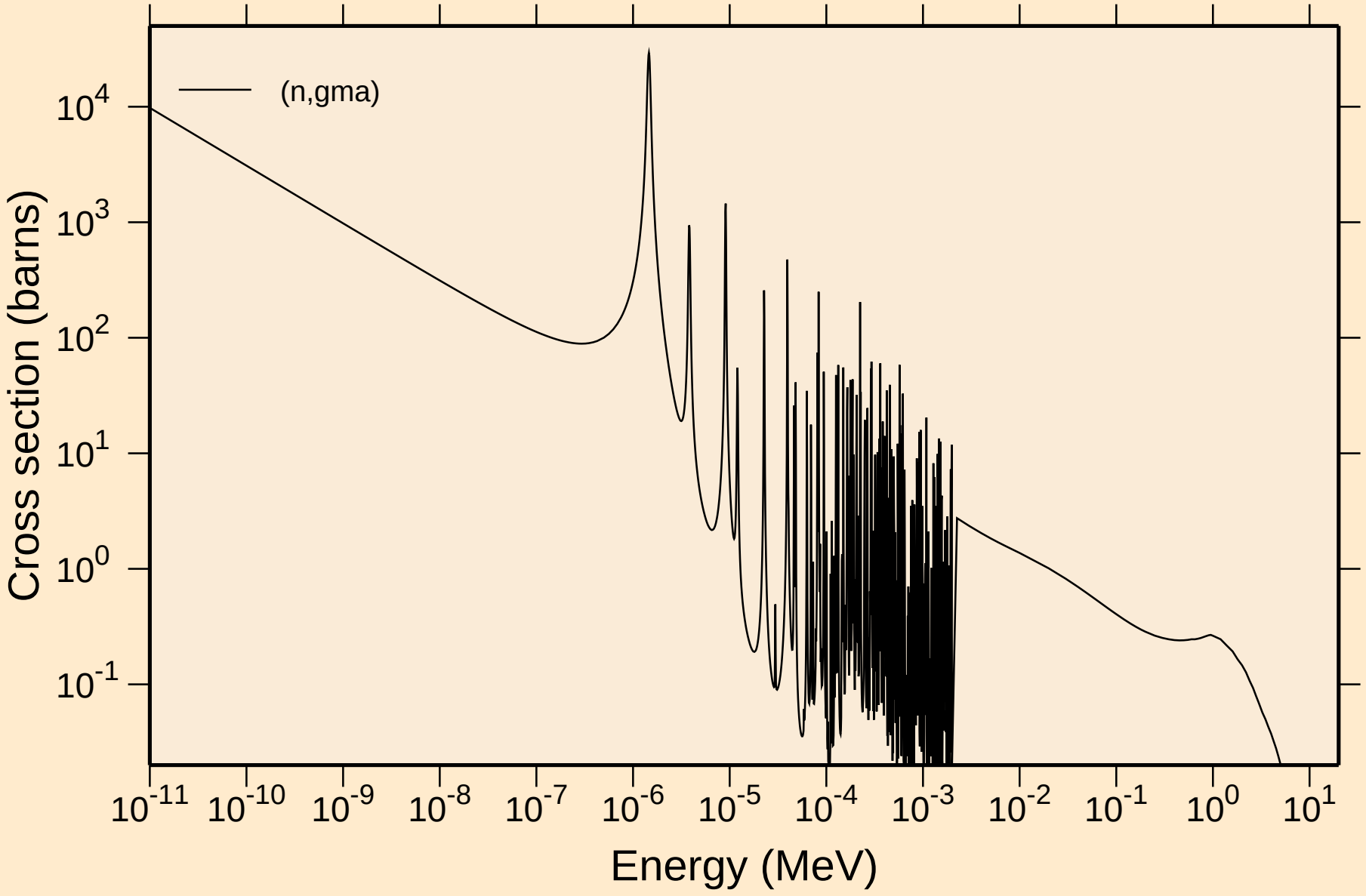


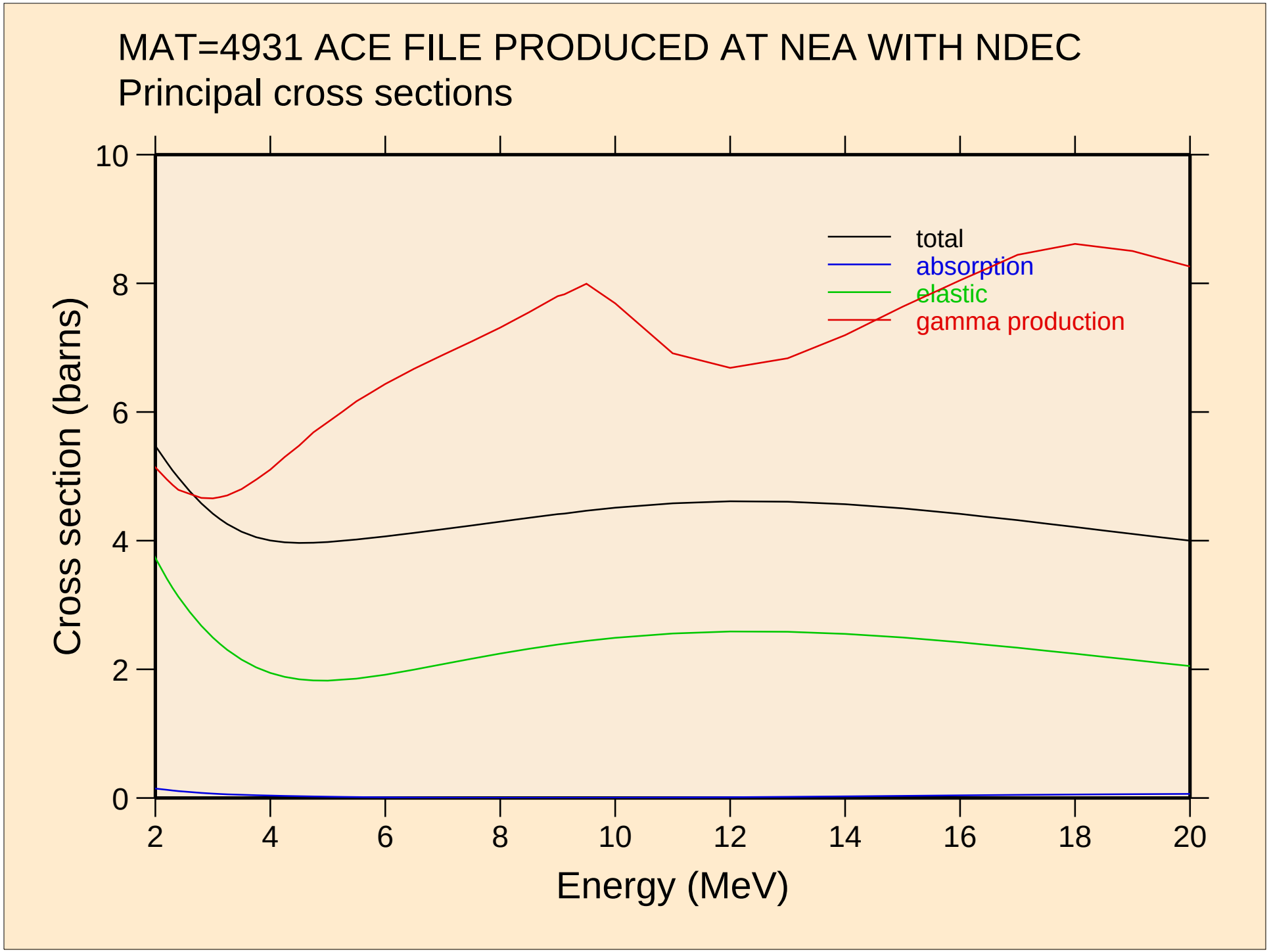

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Heating
heating
Heating (MeV/reaction)
10-1
10-2
10-3
10-4
10-5
10-6
10-11 10-10 10-9 10-8 10-7 10-6 10-5 10-4 10-3 10-2 10-1 100 101
Energy (MeV)

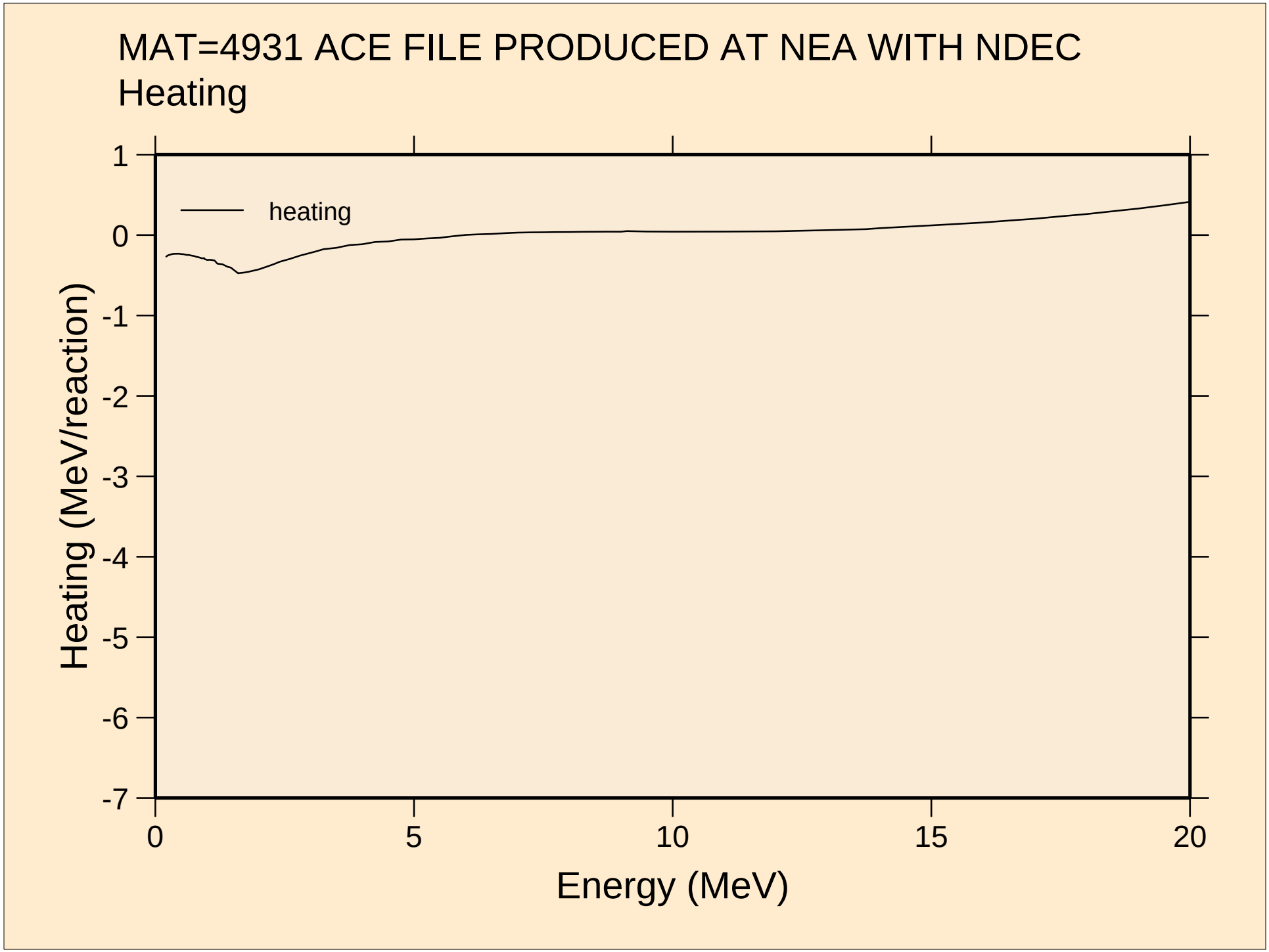

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Damage
damage
Damage (MeV-barns)
10-1
10-2
10-3
10-4
10-5
10-6
10-11 10-10 10-9 10-8 10-7 10-6 10-5 10-4 10-3 10-2 10-1 100 101
Energy (MeV)

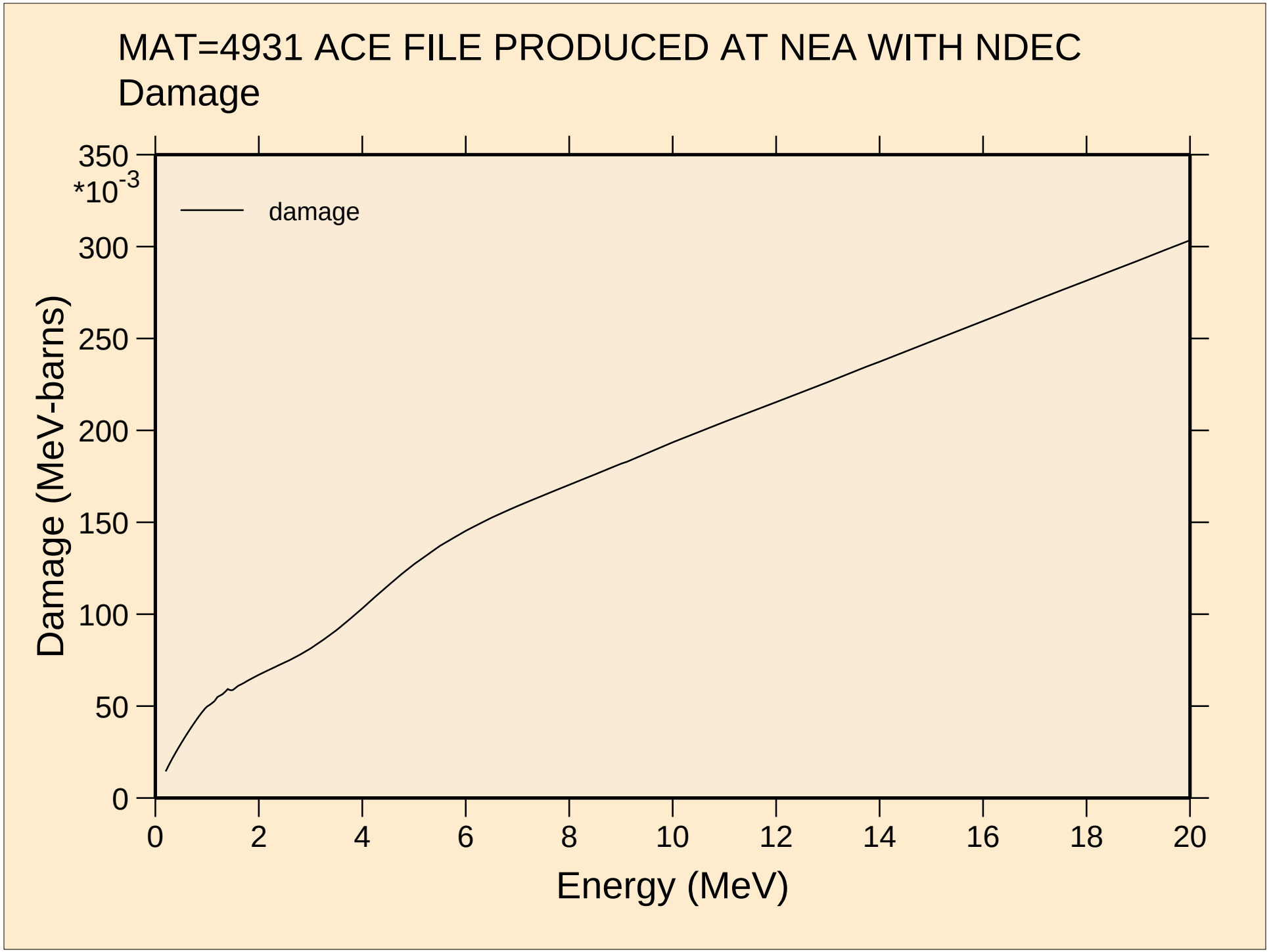

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Non-threshold reactions
(n,gma)
nonelastic
Cross section (barns)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-11 10^-10 10^-9 10^-8 10^-7 10^-6 10^-5 10^-4 10^-3 10^-2 10^-1 10^0 10^1
Energy (MeV)

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Non-threshold reactions

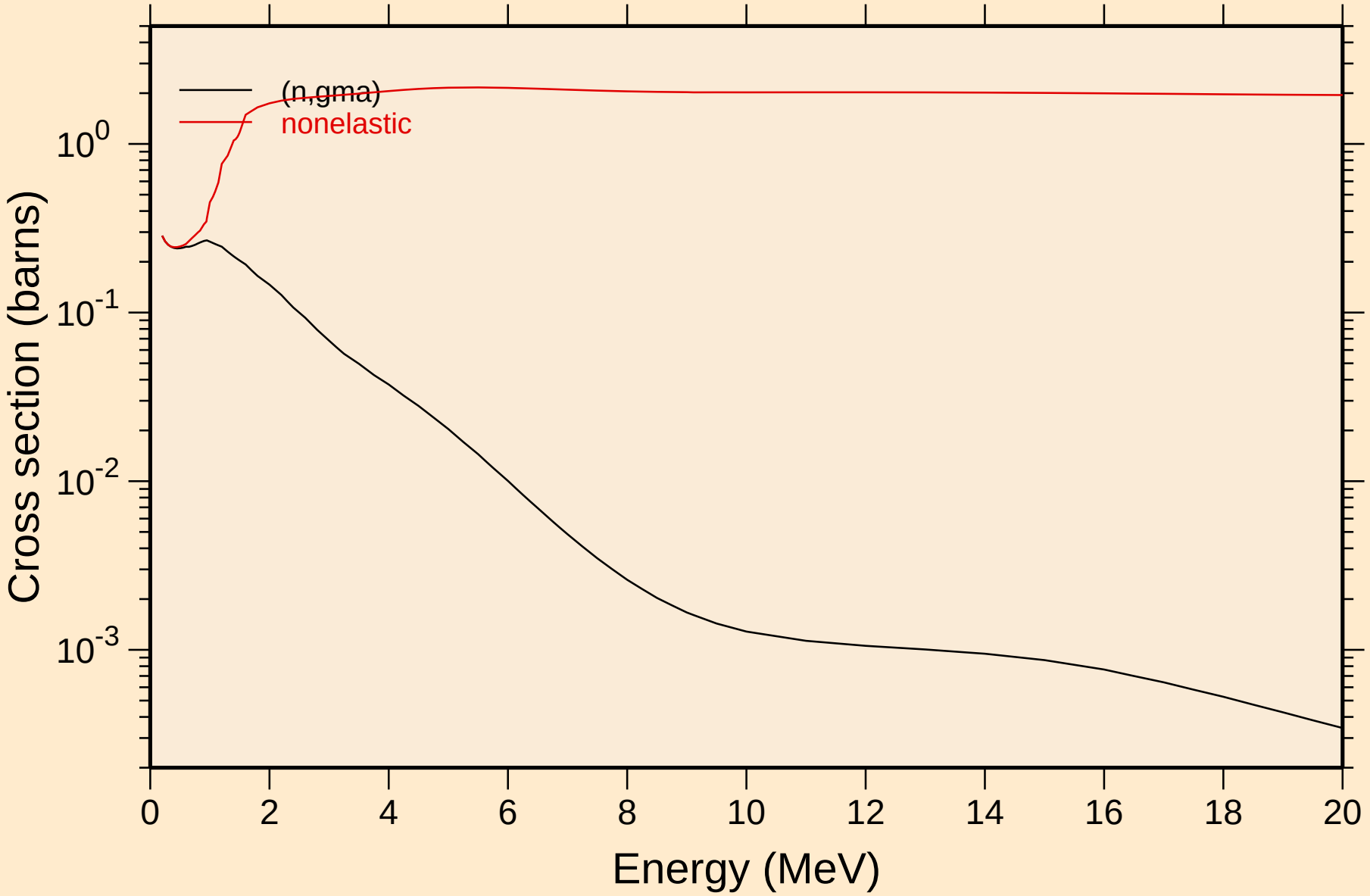



MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
0
2
4
6
8
10
2
4
6
8
10
12
14
16
18
20

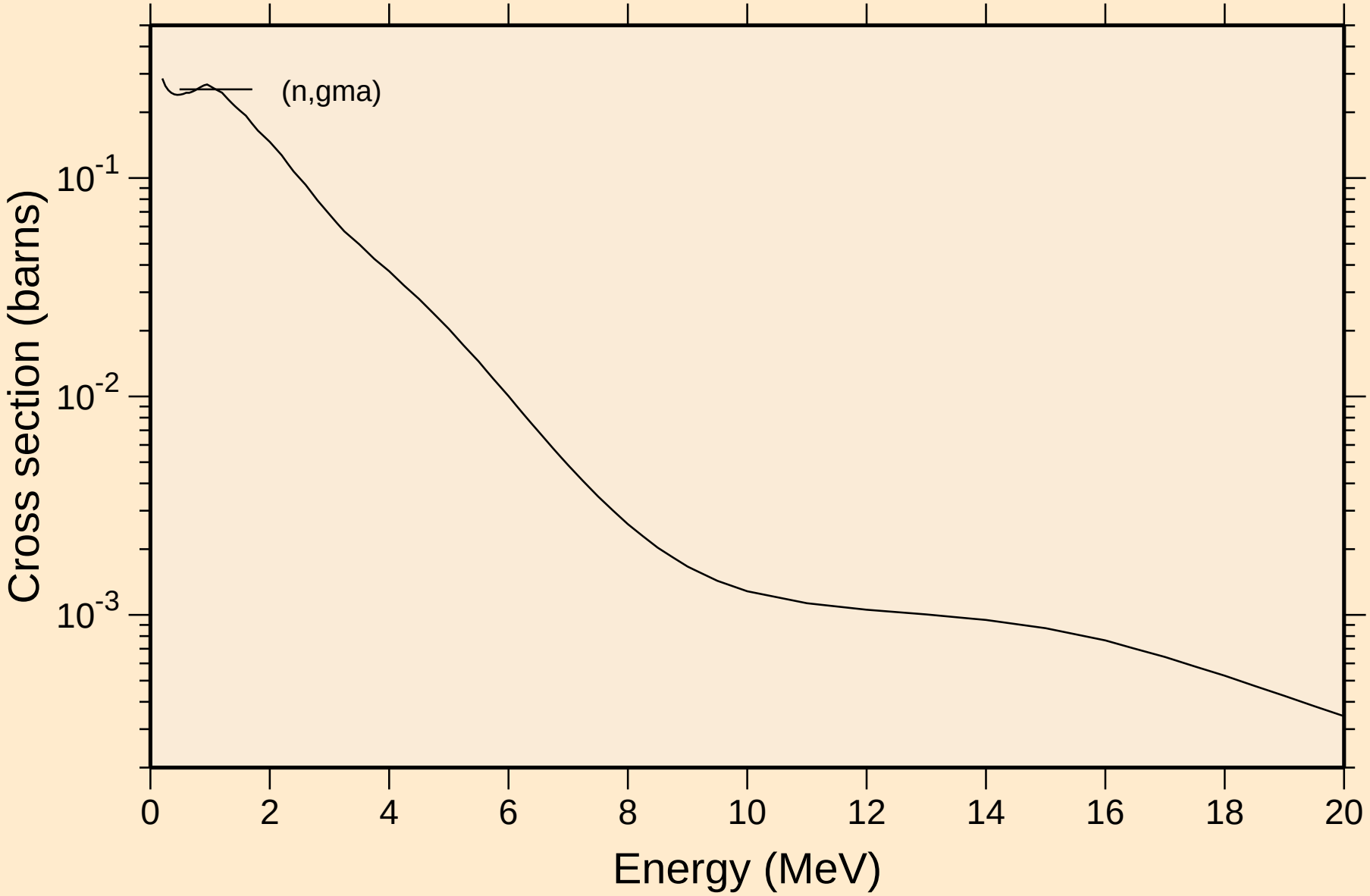

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Heating
heating
Heating (MeV/reaction)
1
0
-1
-2
-3
-4
-5
-6
-7
0
5
10
15
20
Energy (MeV)

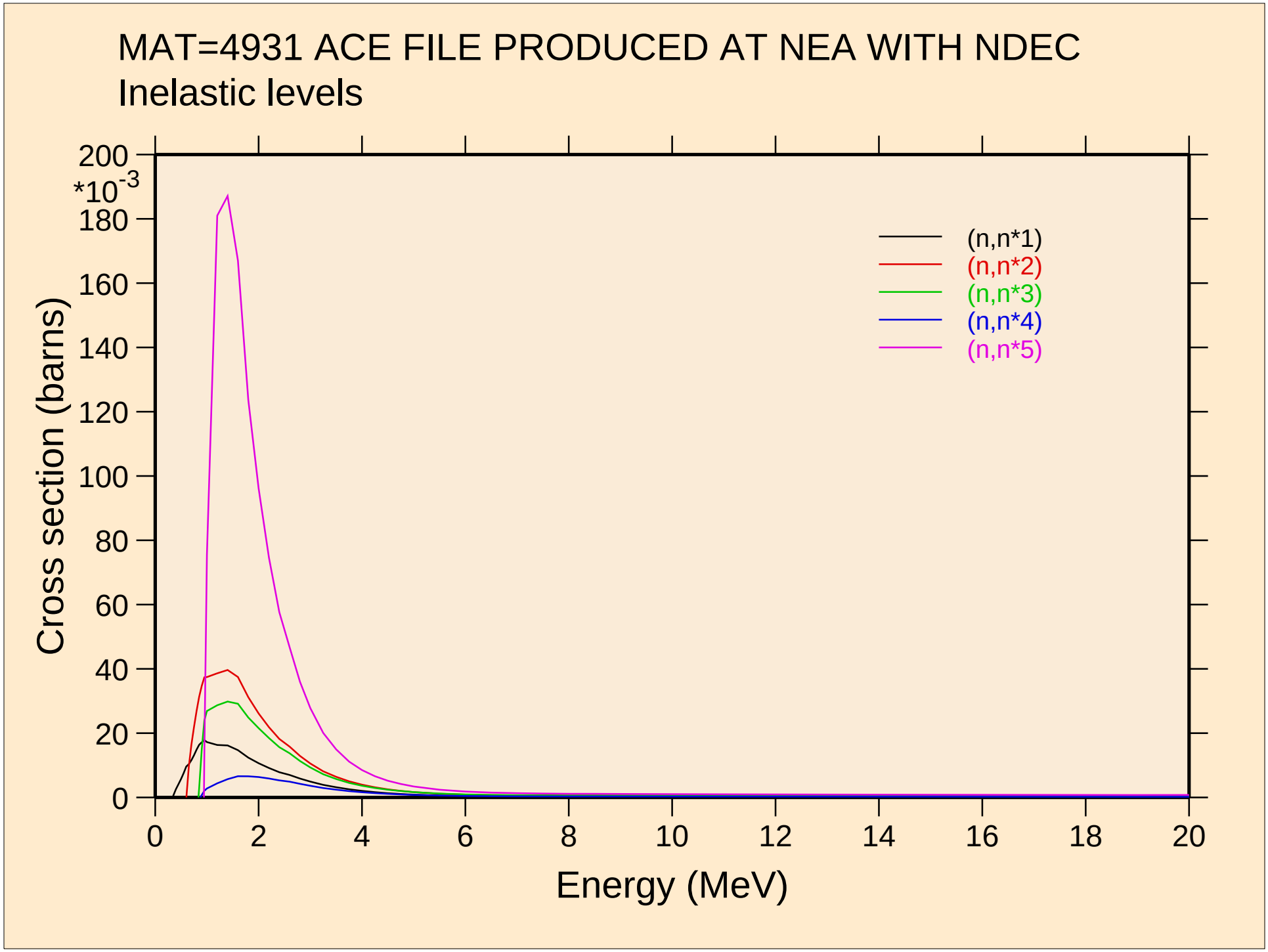

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Damage
350
*10-3
300
250
200
150
100
50
0
damage
Damage (MeV-barns)
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

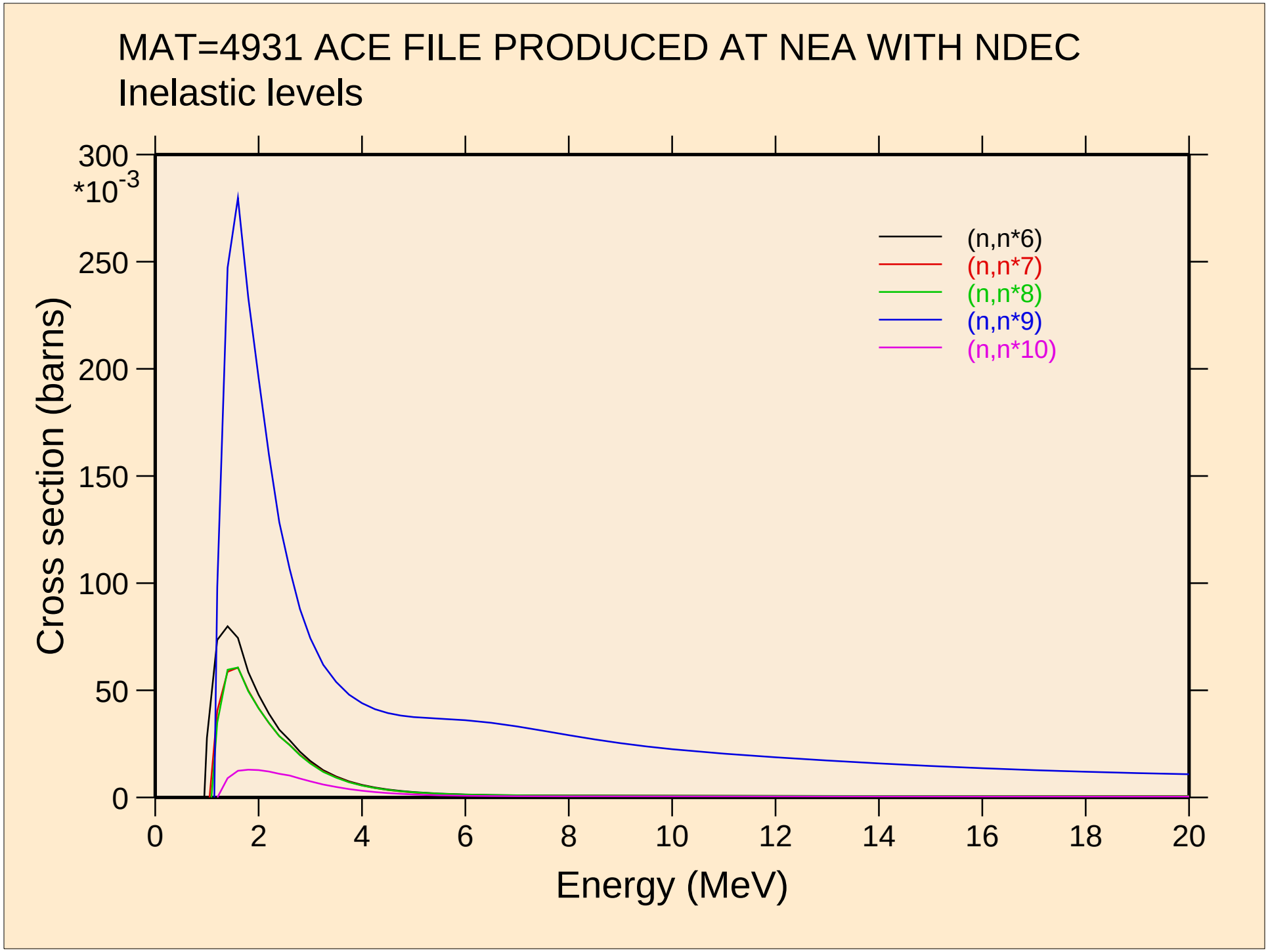
MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Non-threshold reactions

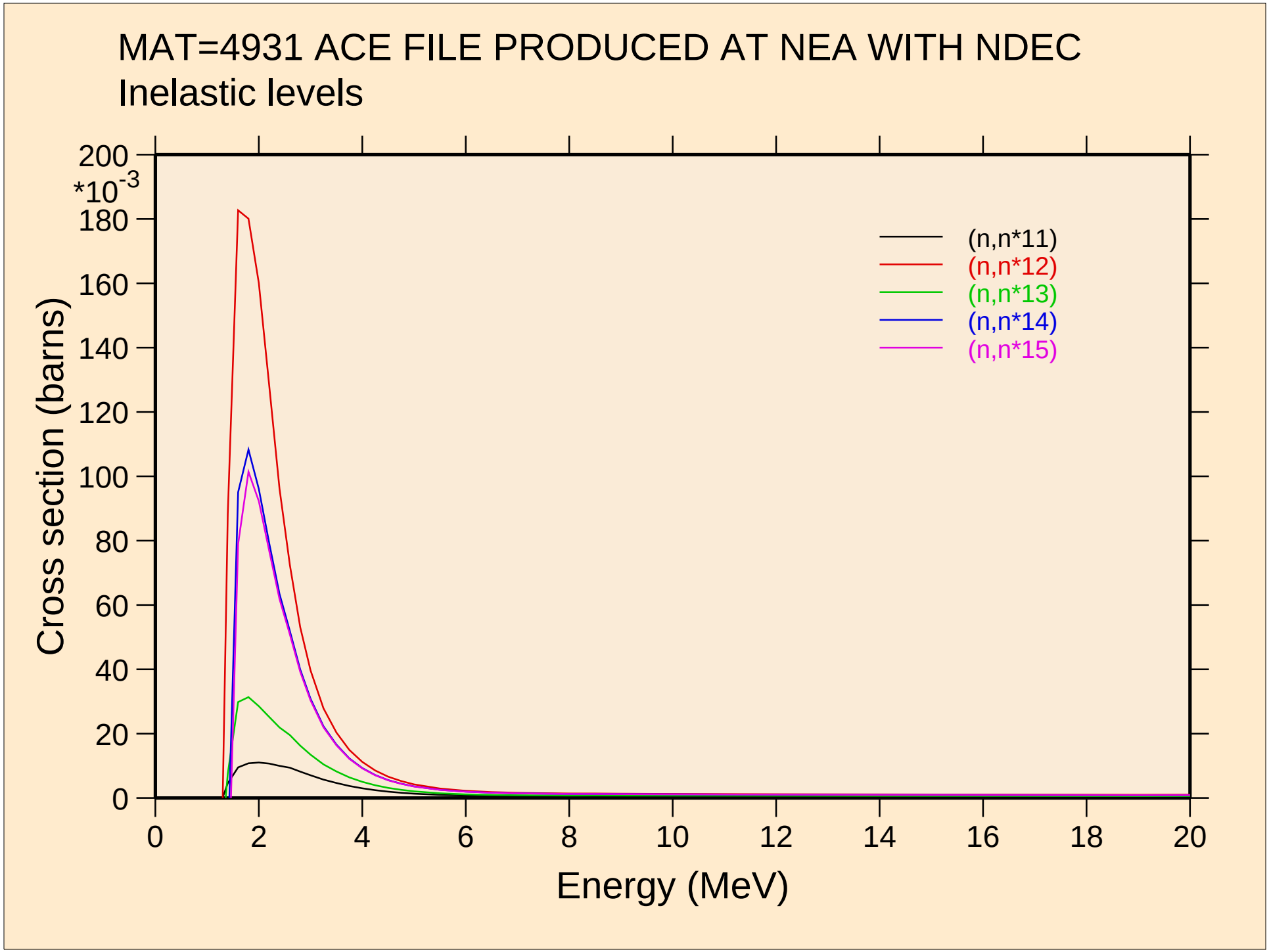


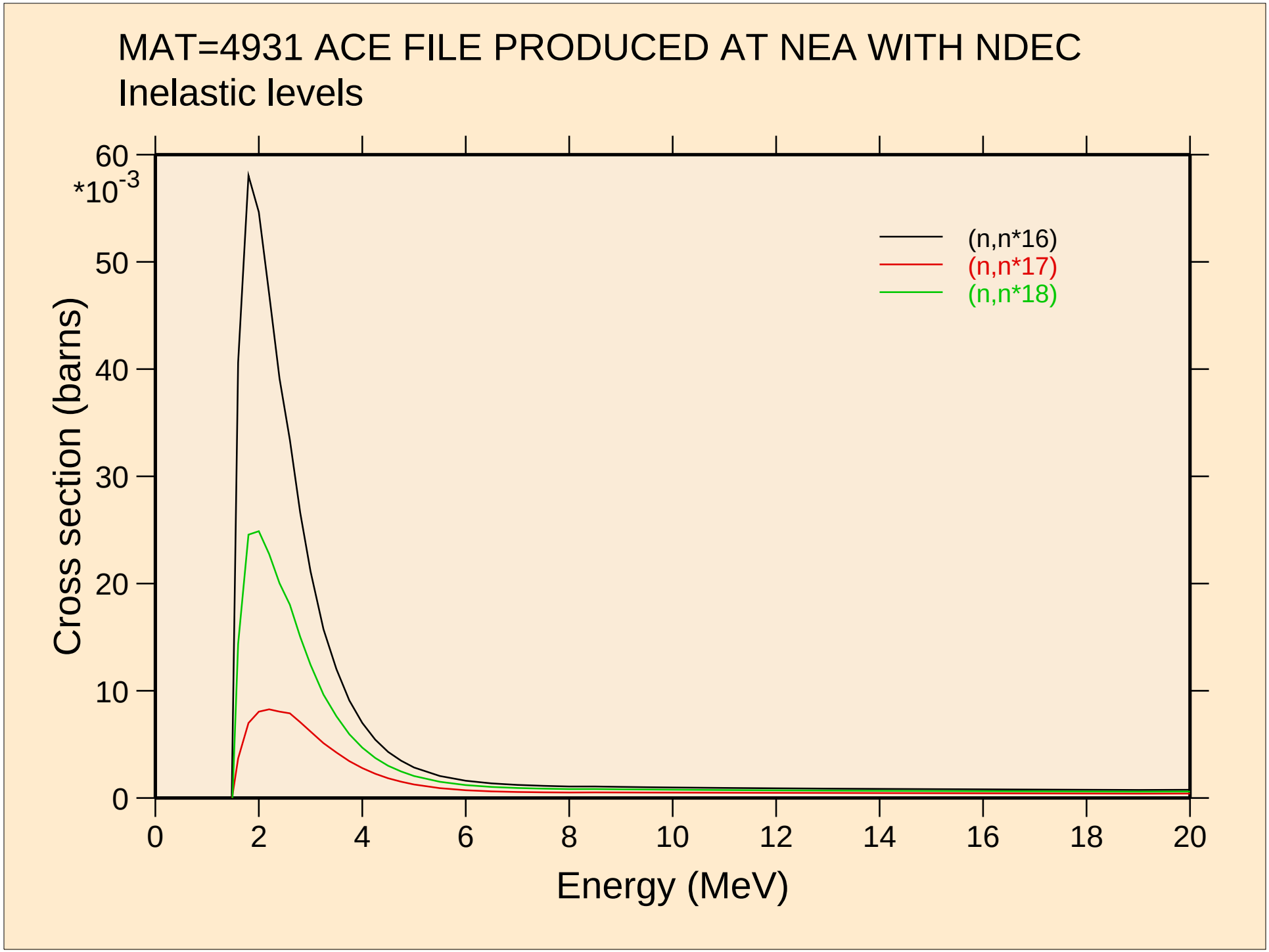
MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Non-threshold reactions

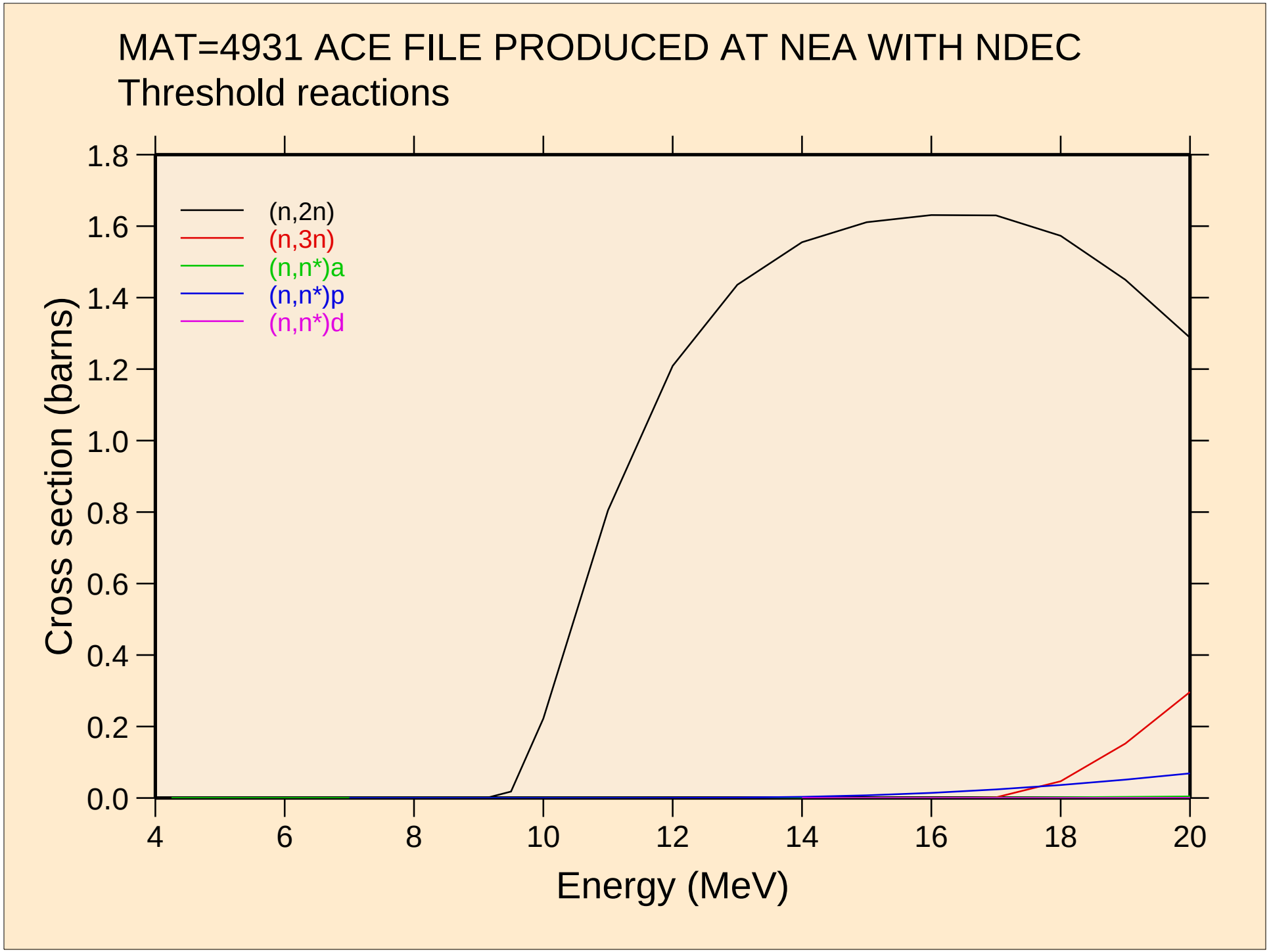


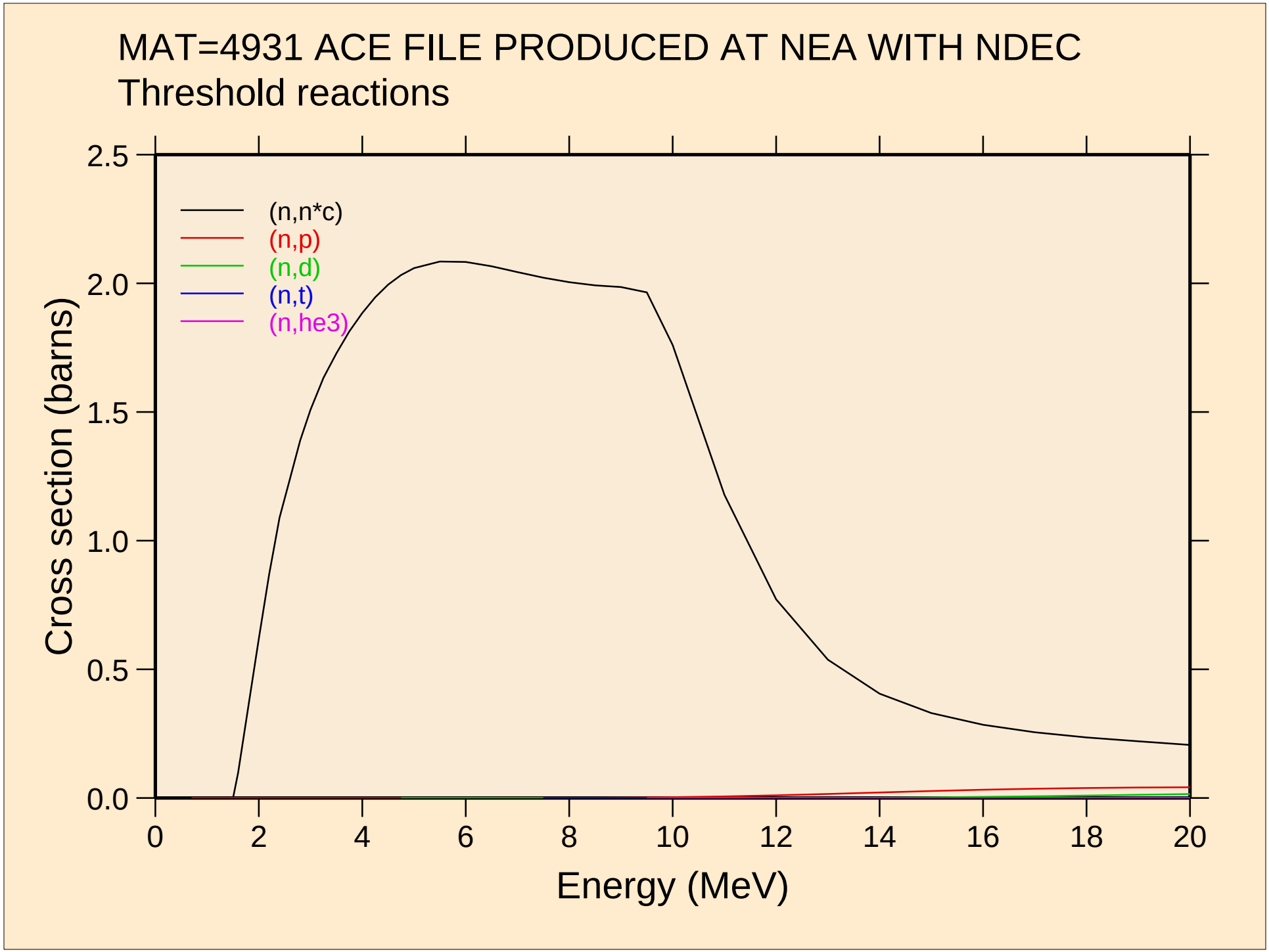

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
Cross section (barns)
*10-3
200
180
160
140
120
100
80
60
40
20
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)
(n,n*5)


MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
Cross section (barns)
*10-3
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)

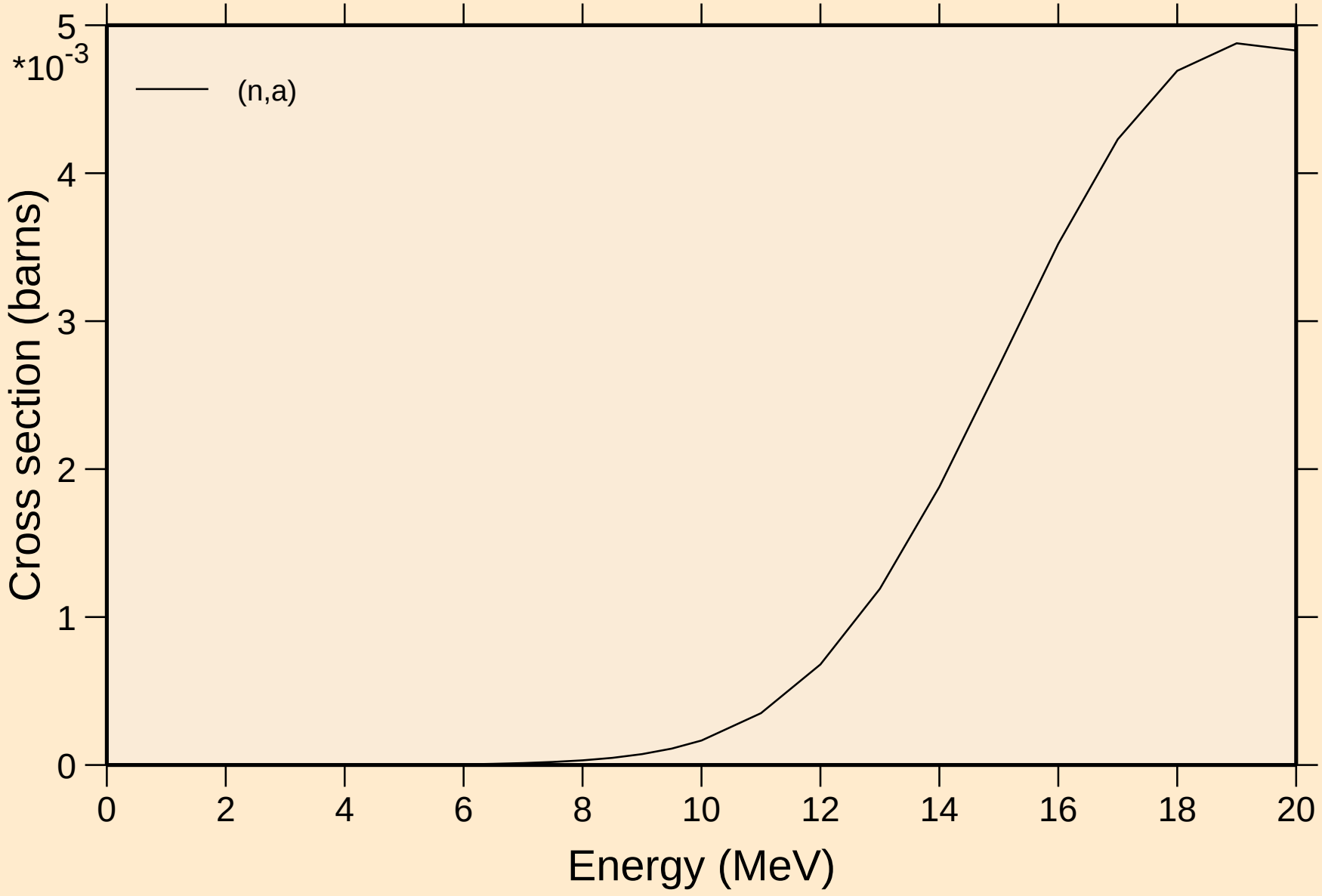

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
Cross section (barns)
*10-3
200
180
160
140
120
100
80
60
40
20
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*11)
(n,n*12)
(n,n*13)
(n,n*14)
(n,n*15)

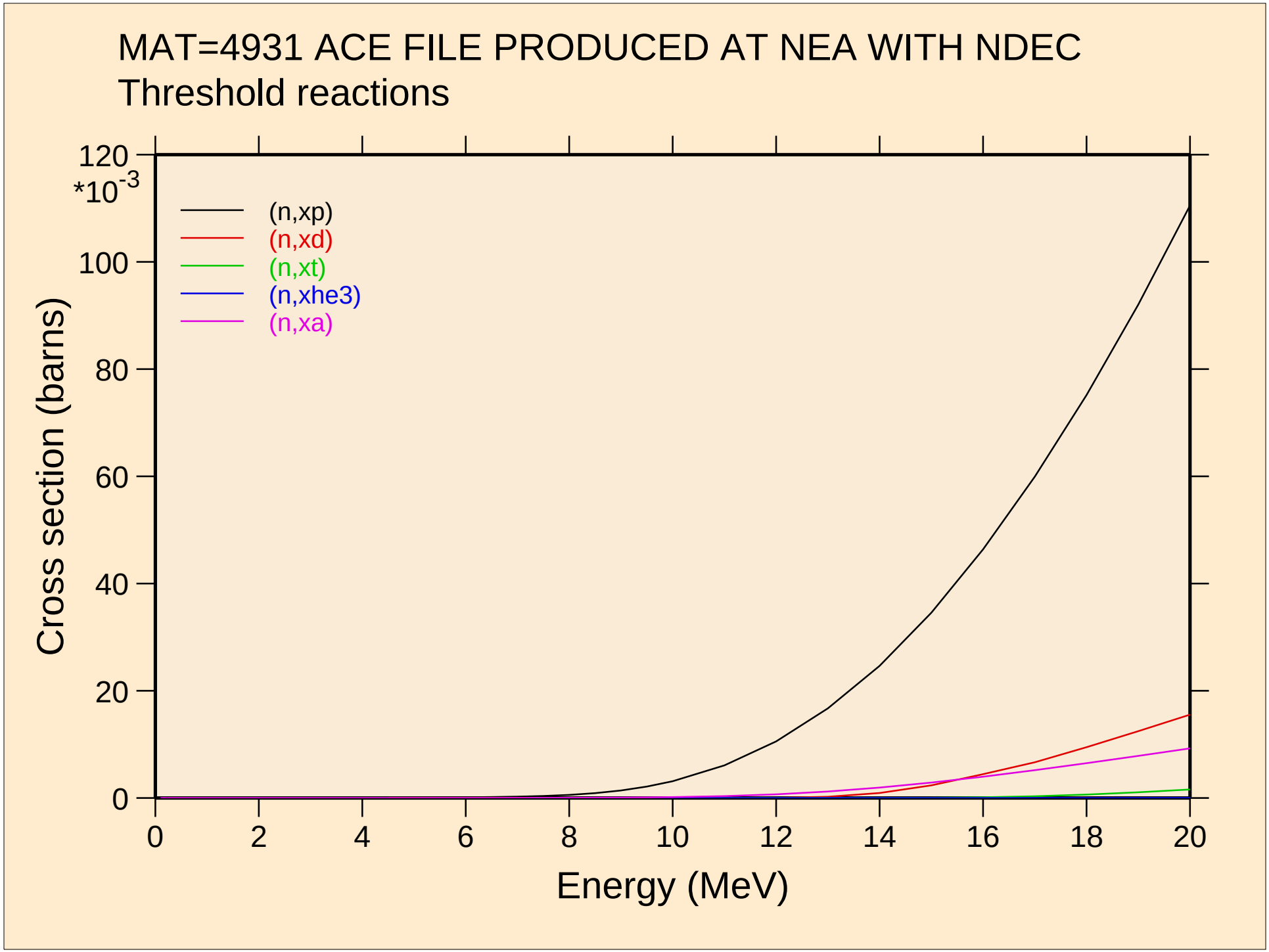

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Inelastic levels
Cross section (barns)
*10-3
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*16)
(n,n*17)
(n,n*18)

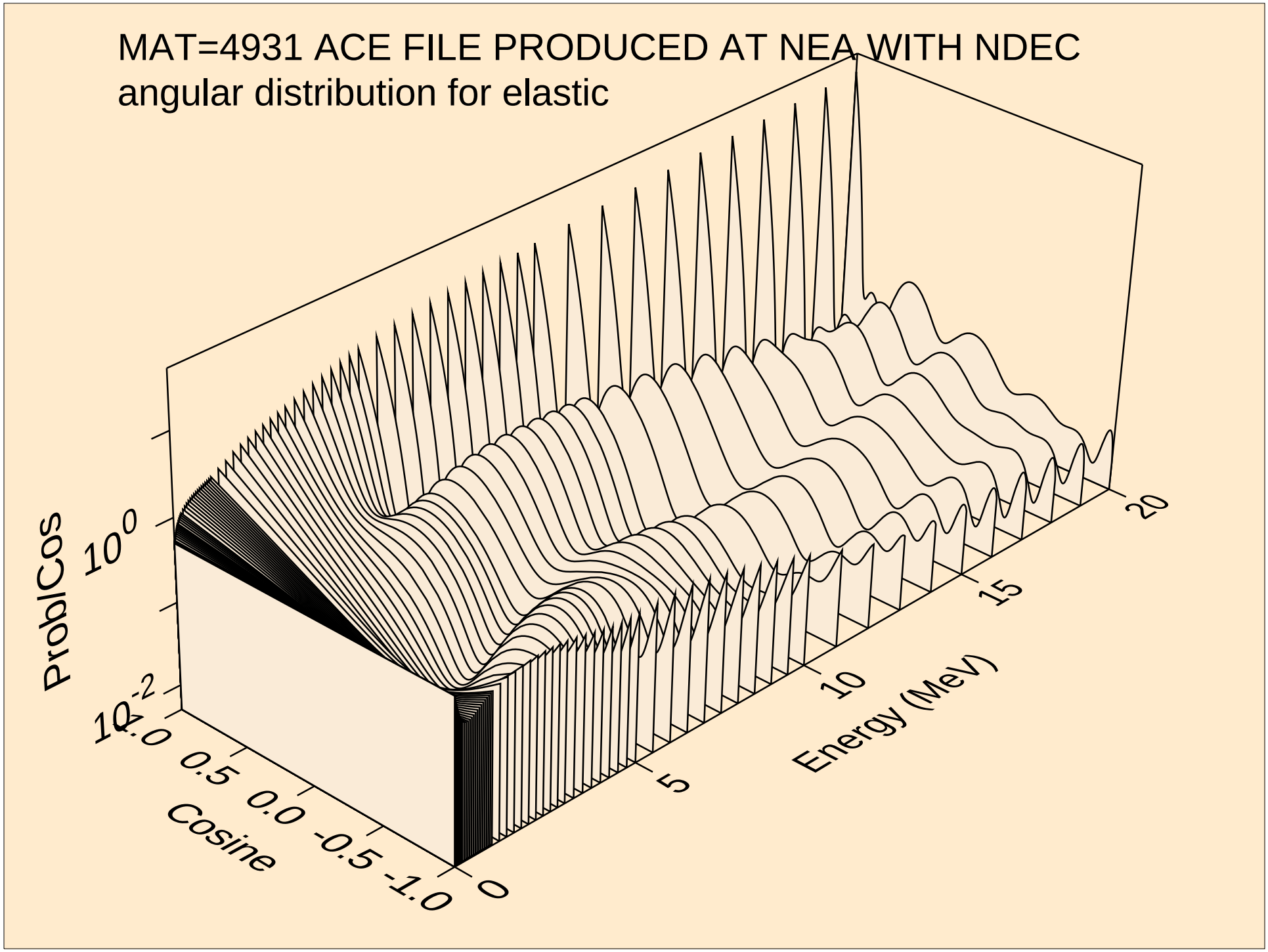

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Threshold reactions
(n,2n)
(n,3n)
(n,n*)a
(n,n*)p
(n,n*)d
Cross section (barns)
Energy (MeV)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
4
6
8
10
12
14
16
18
20

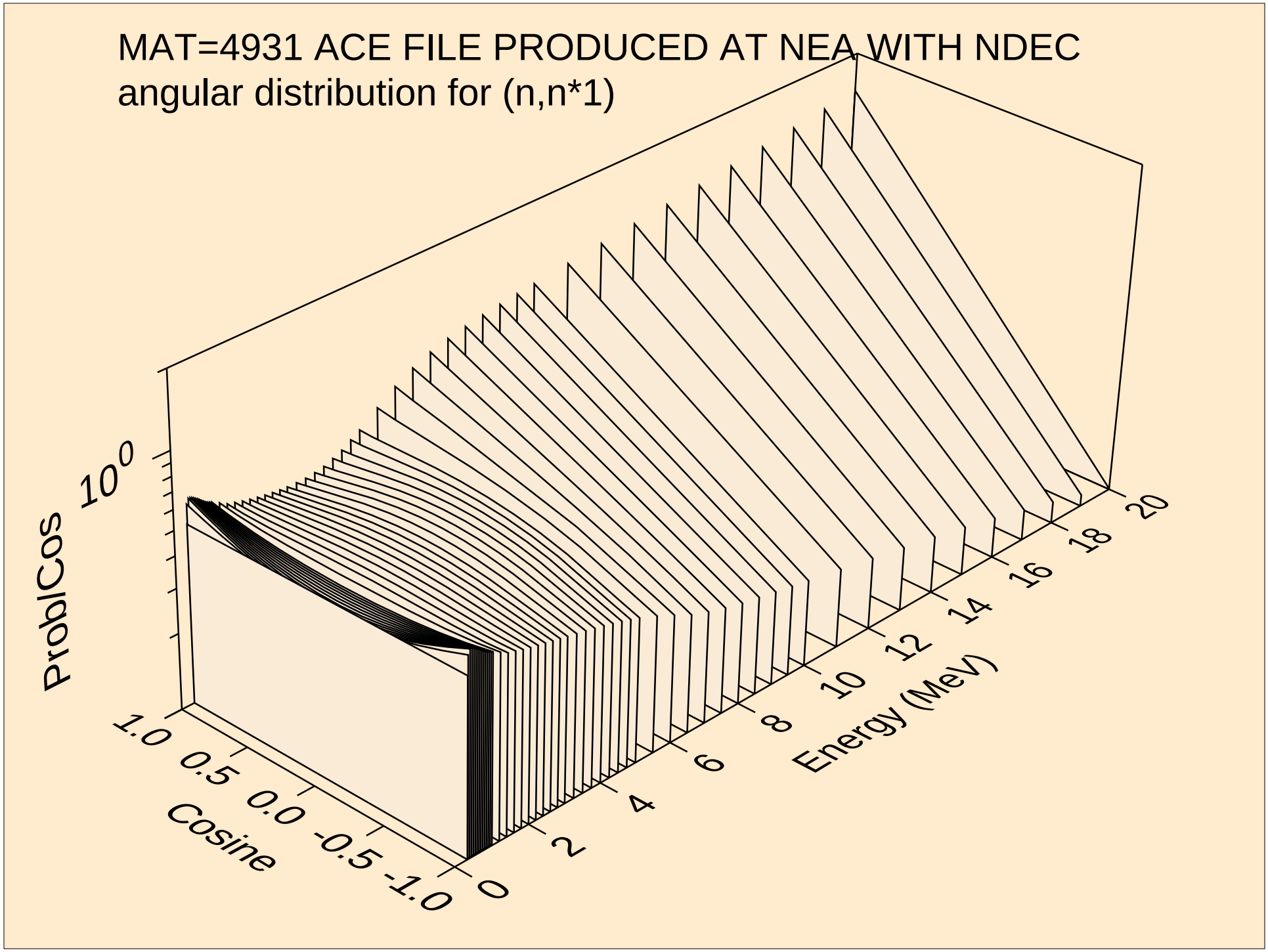

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Threshold reactions
(n,n*c)
(n,p)
(n,d)
(n,t)
(n,he3)
Cross section (barns)
Energy (MeV)
0.0
0.5
1.0
1.5
2.0
2.5
0
2
4
6
8
10
12
14
16
18
20

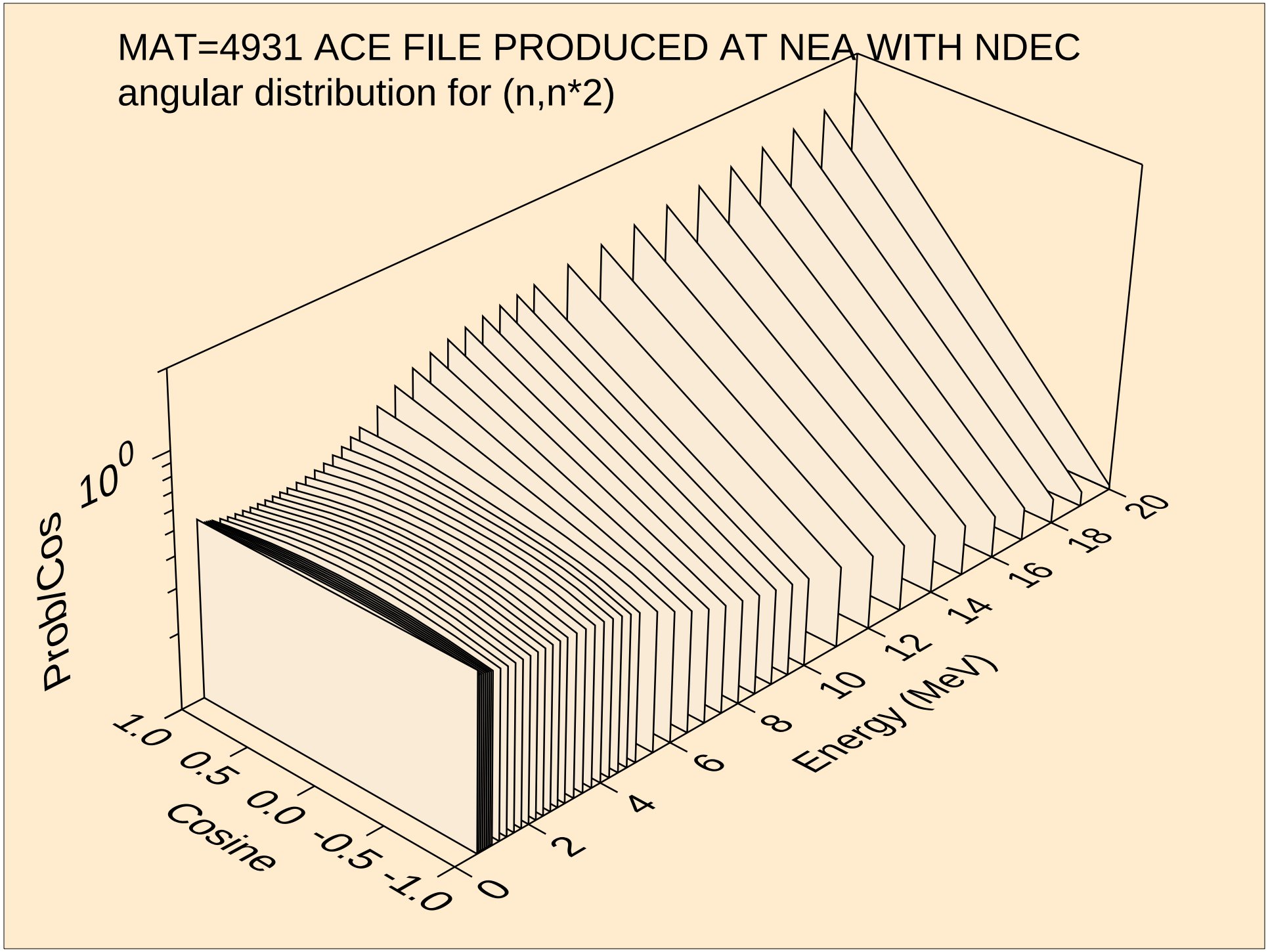
MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Threshold reactions

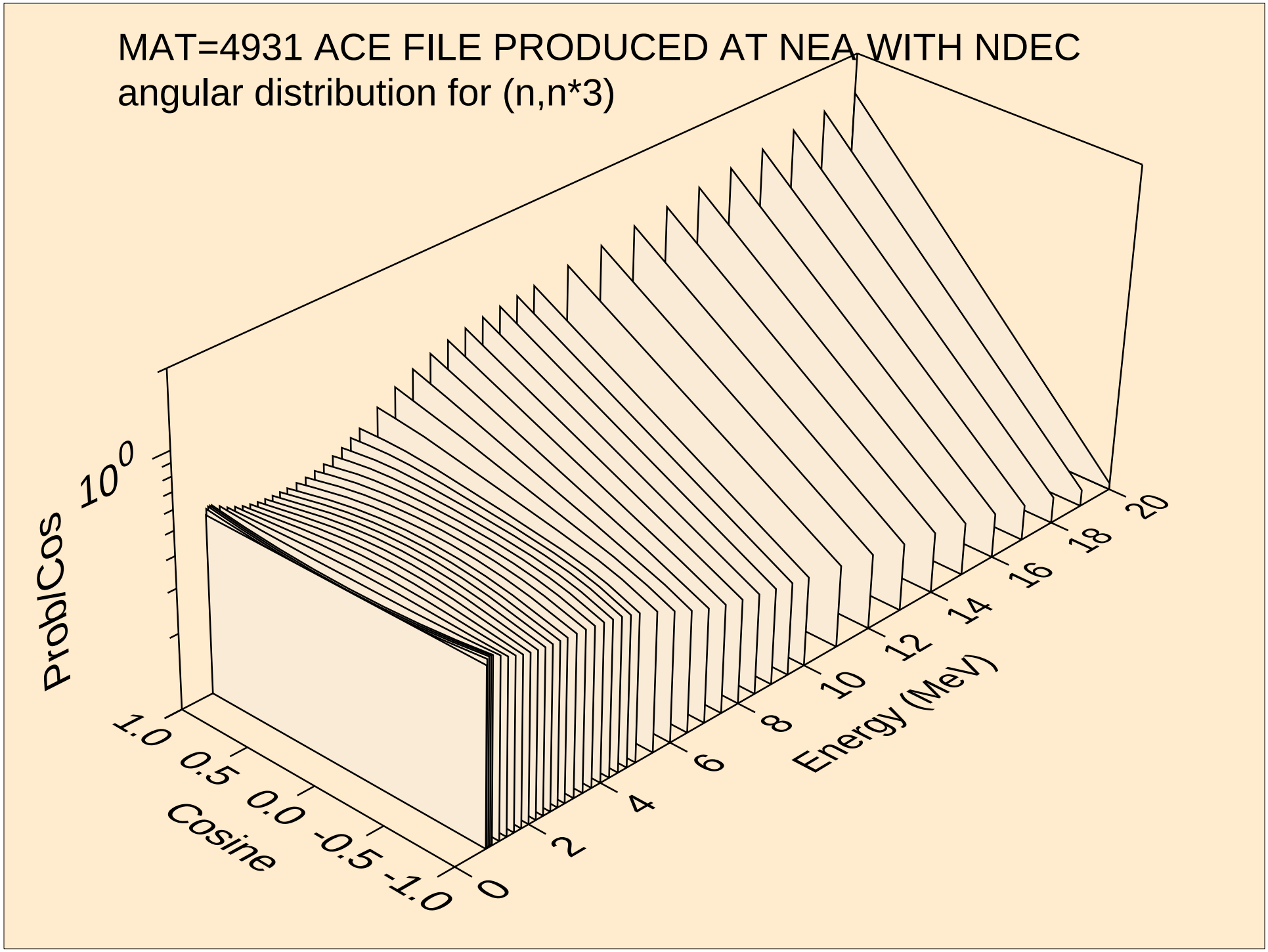


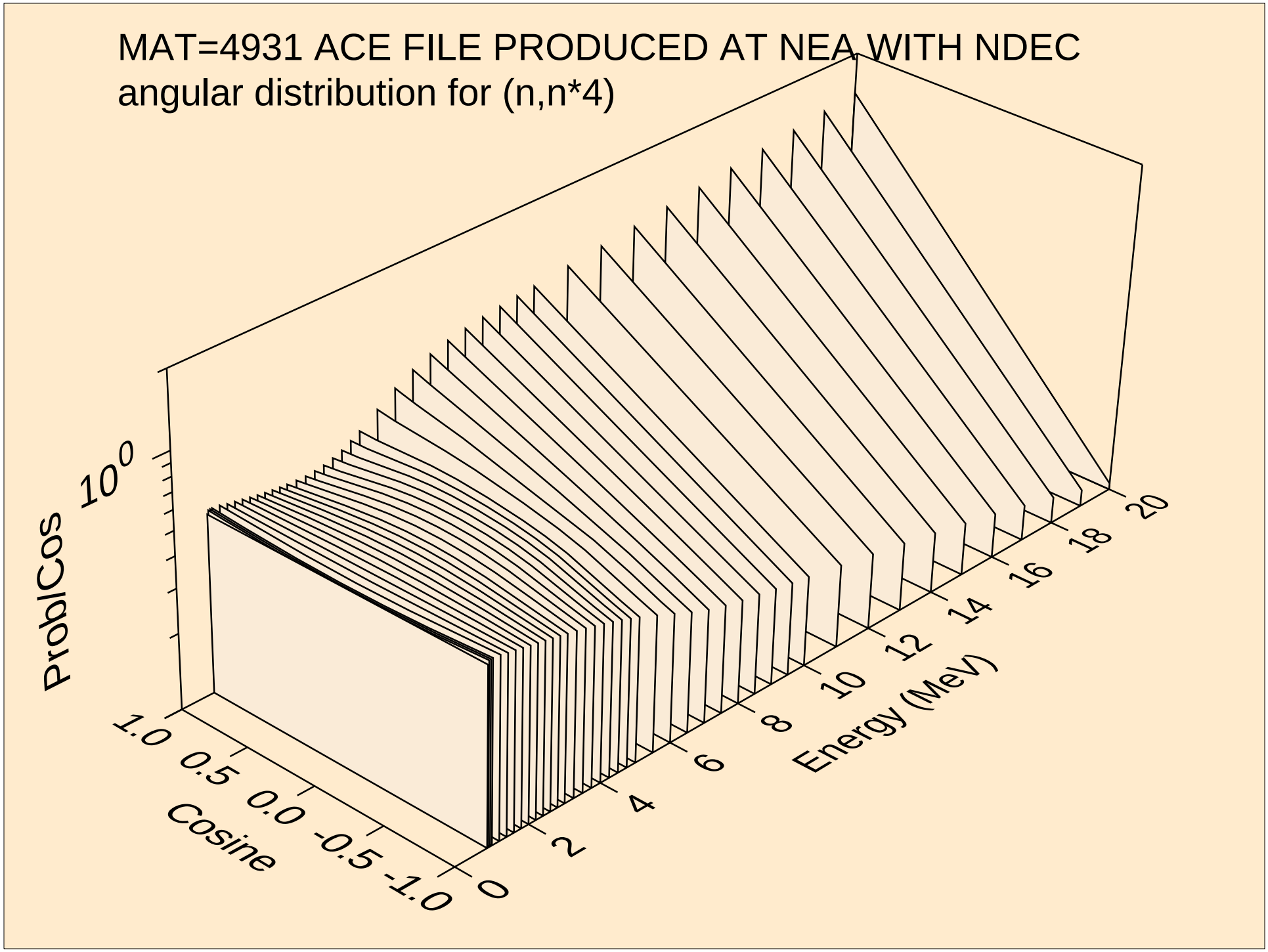

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Threshold reactions
120
*10-3
100
80
60
40
20
0
Cross section (barns)
(n,xp)
(n,xd)
(n,xt)
(n,xhe3)
(n,xa)
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

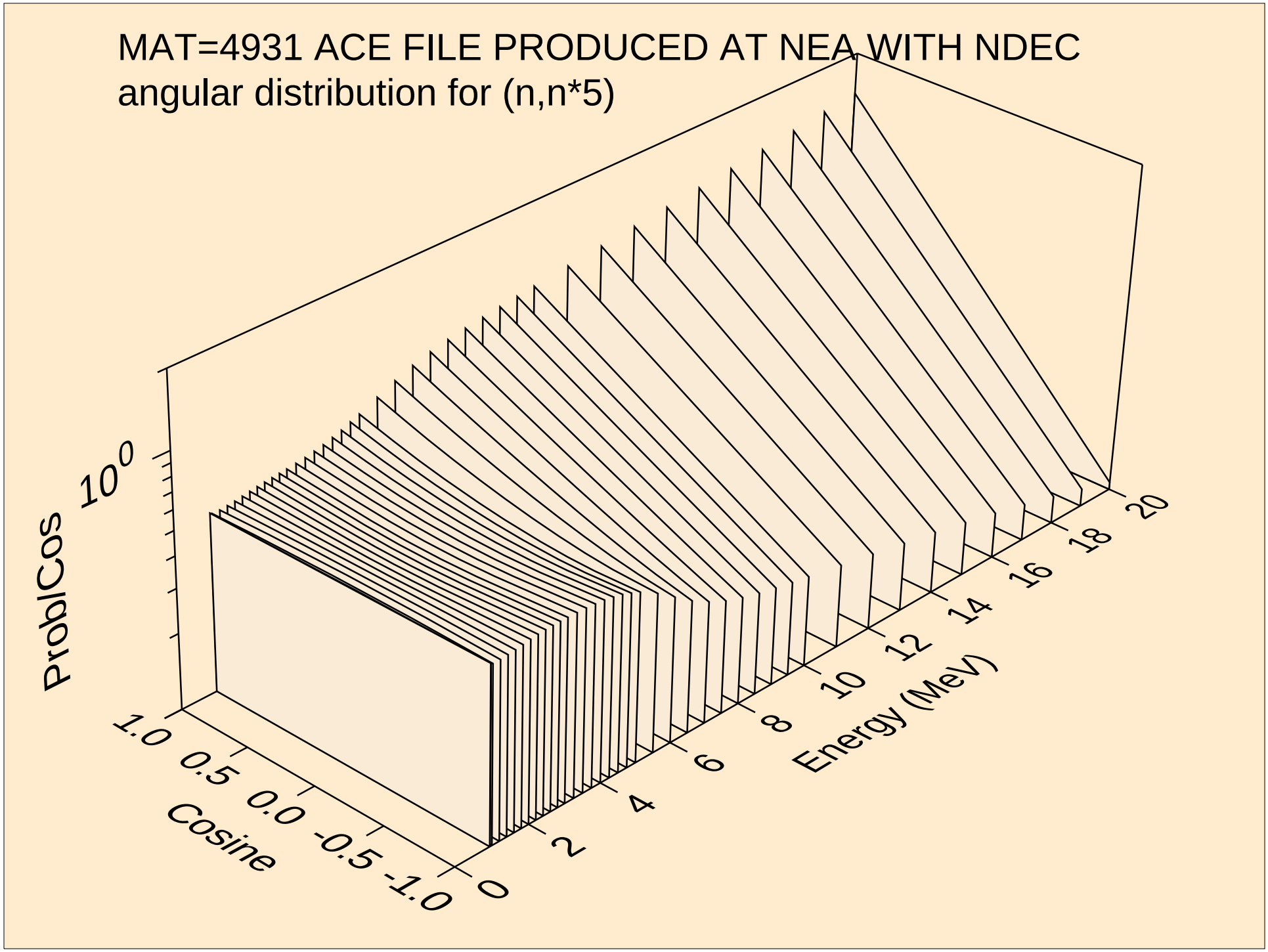

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for elastic
ProbICos
10^0
10^-2
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

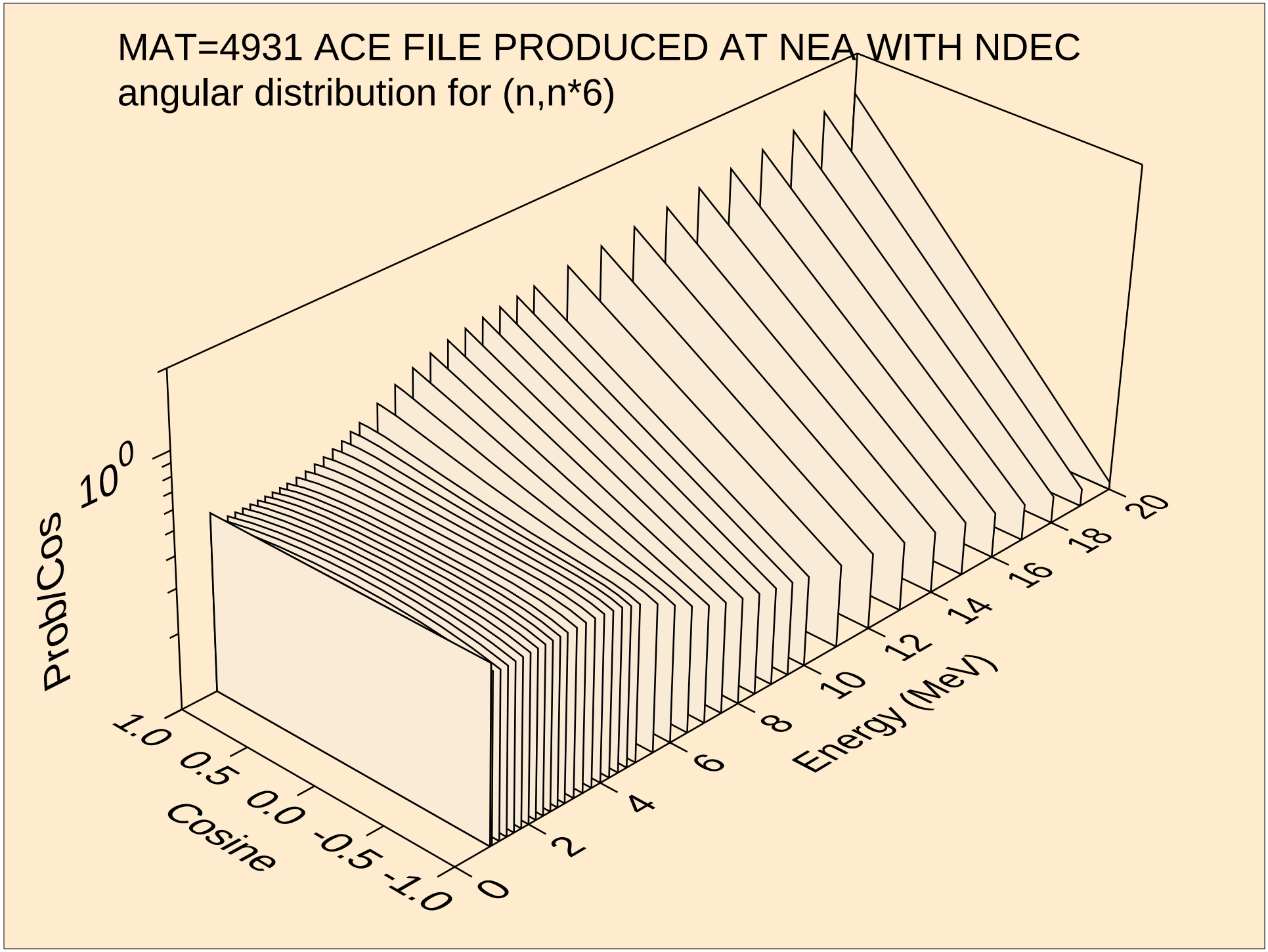

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*1)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

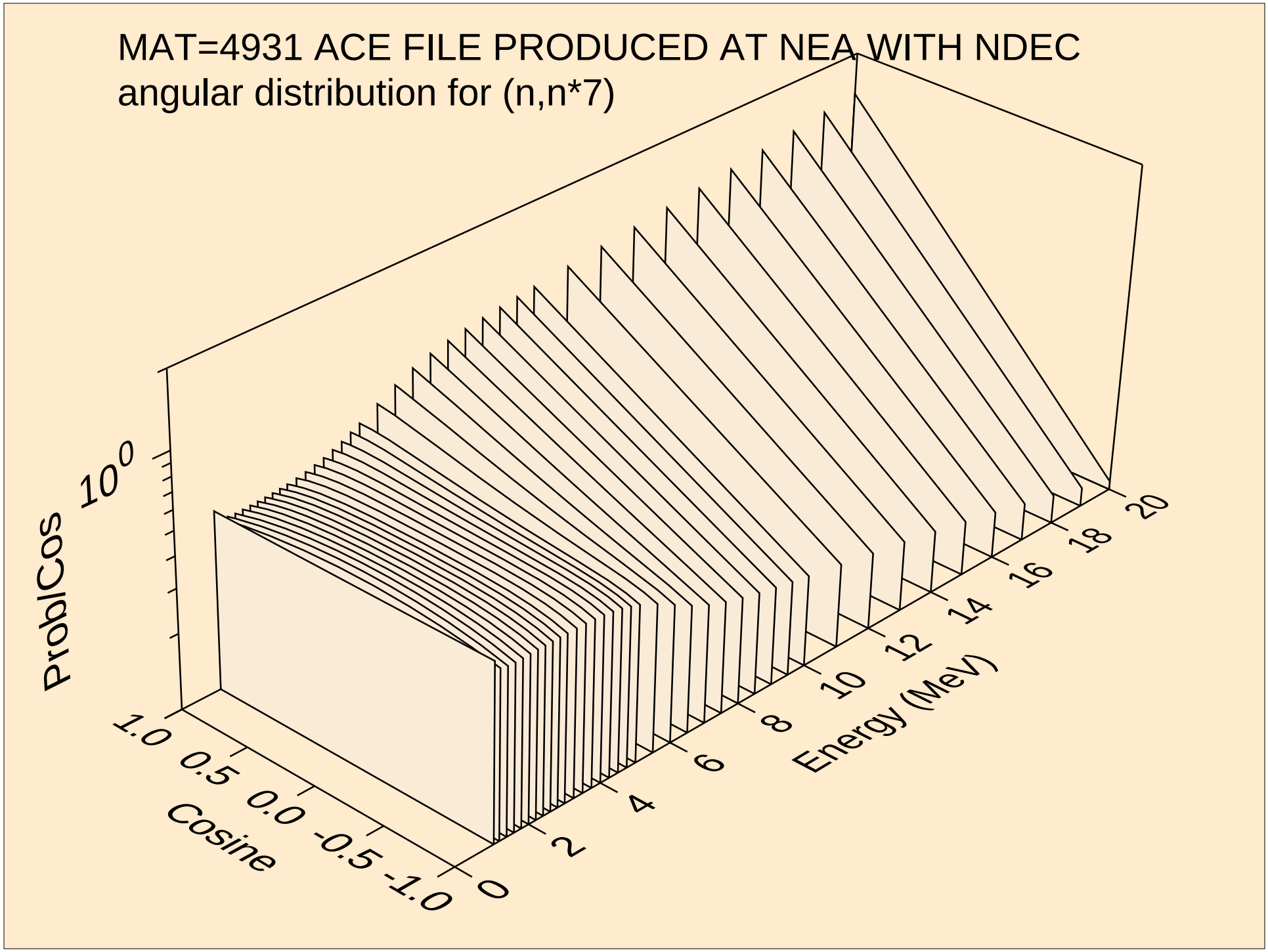

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*2)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

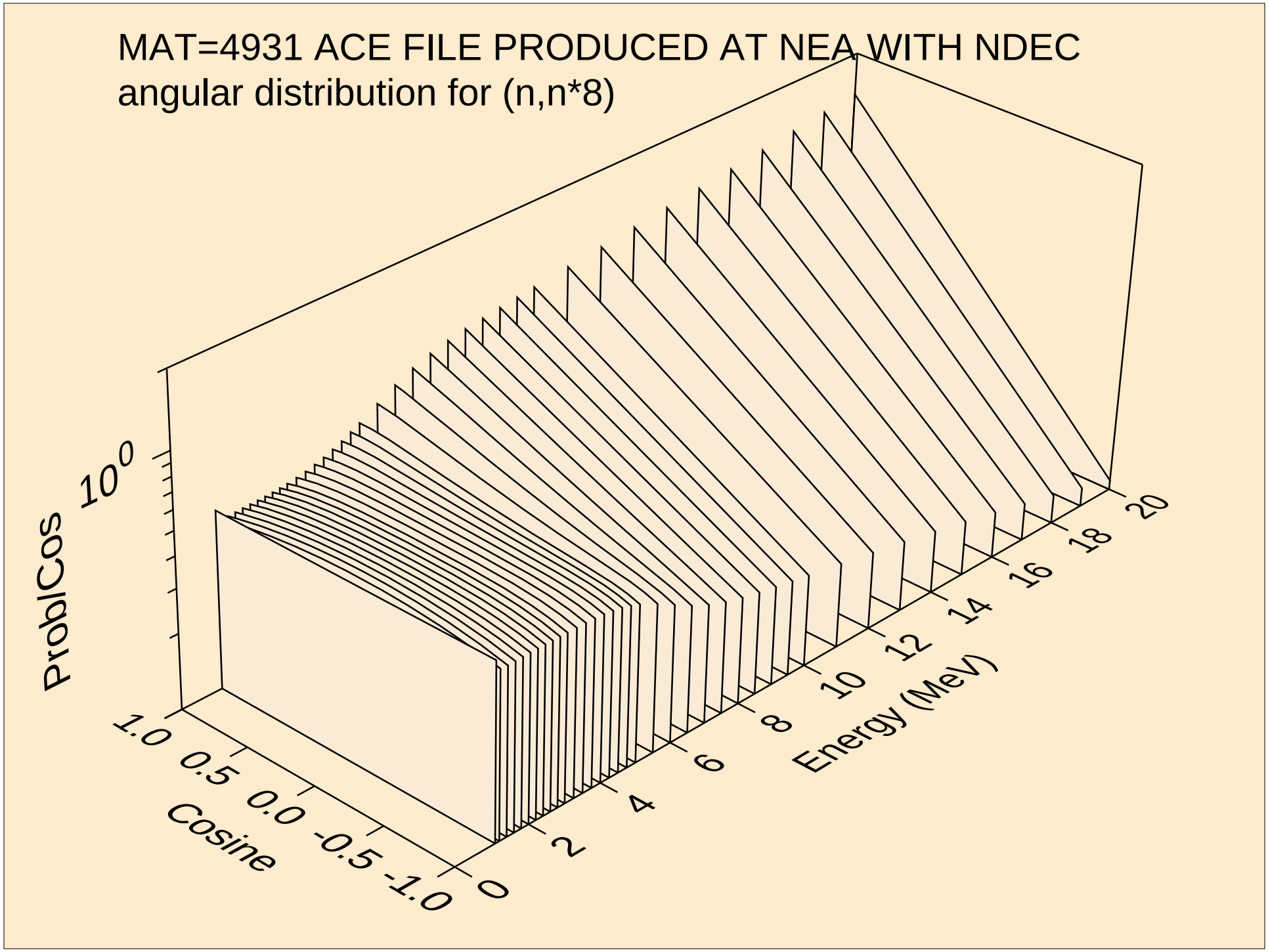

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*3)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

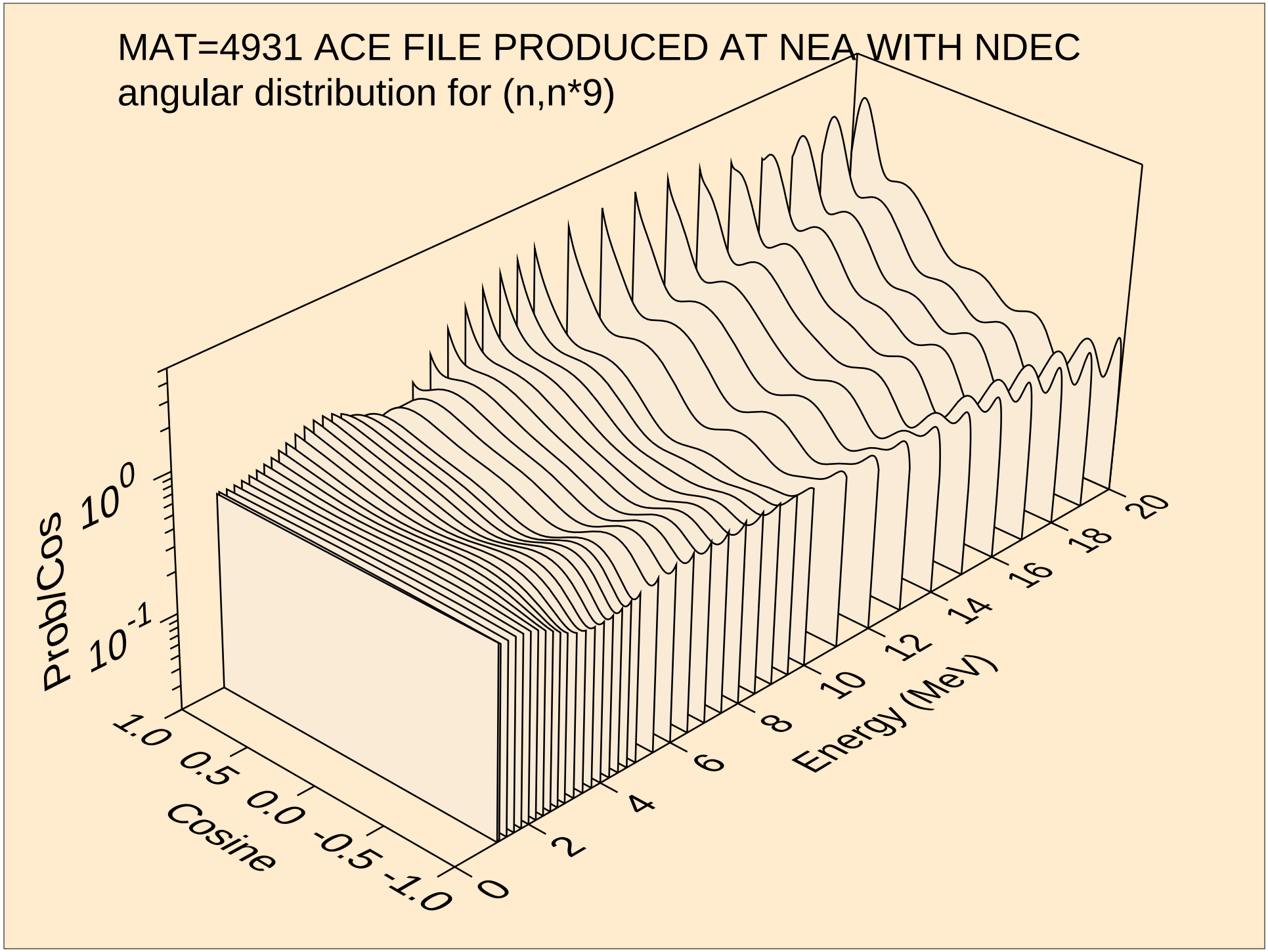

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*4)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

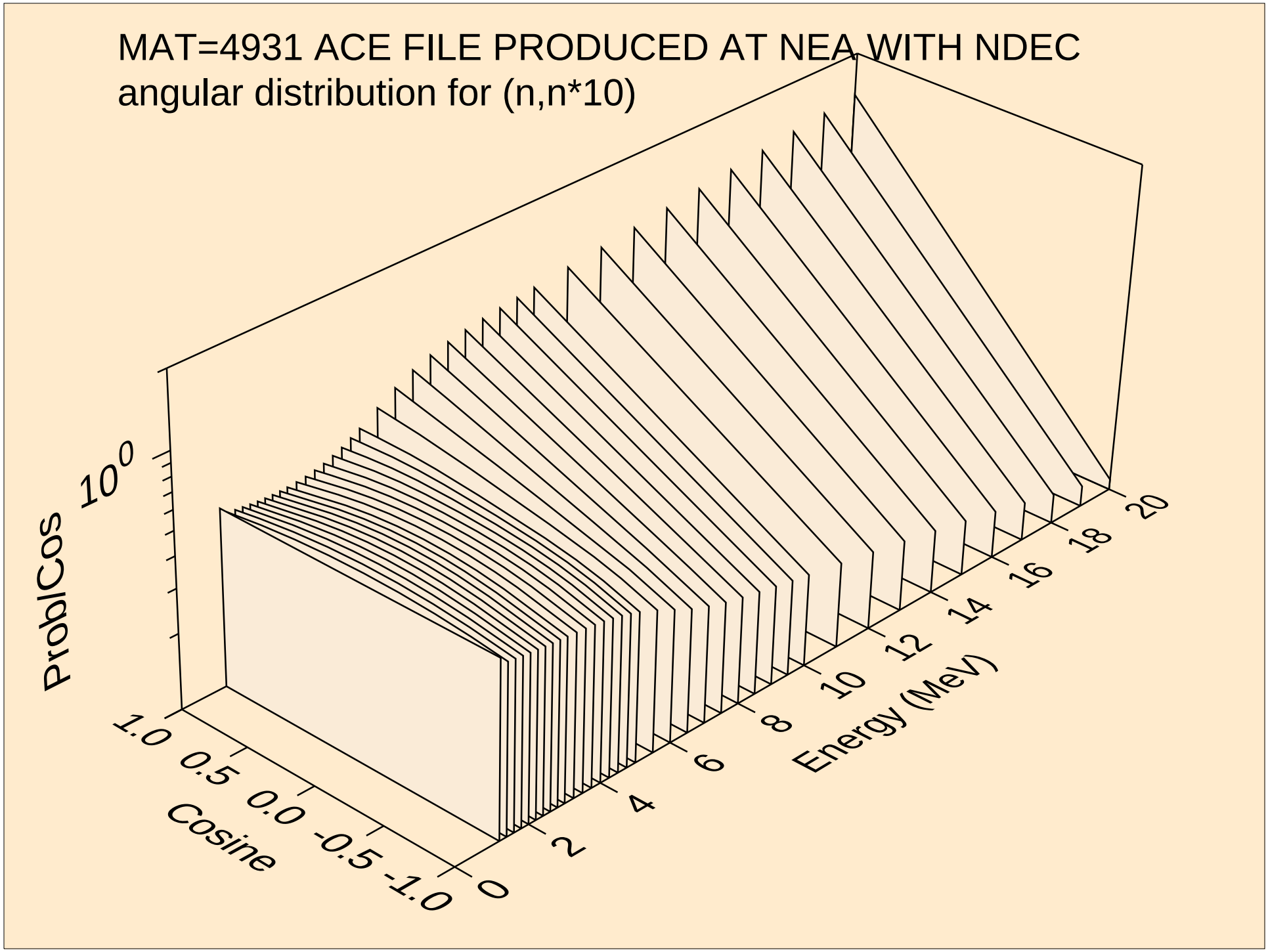

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*5)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

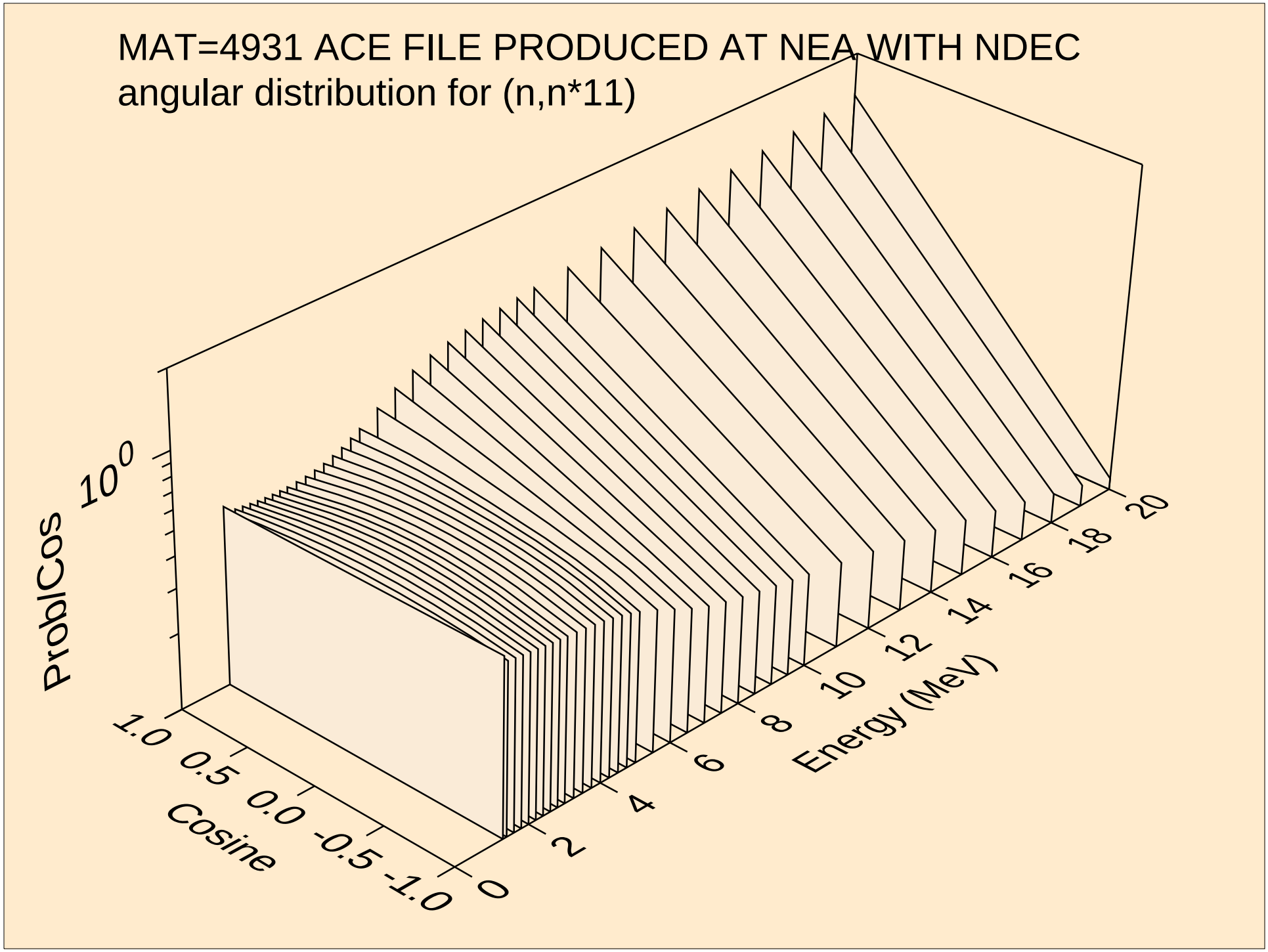

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*6)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

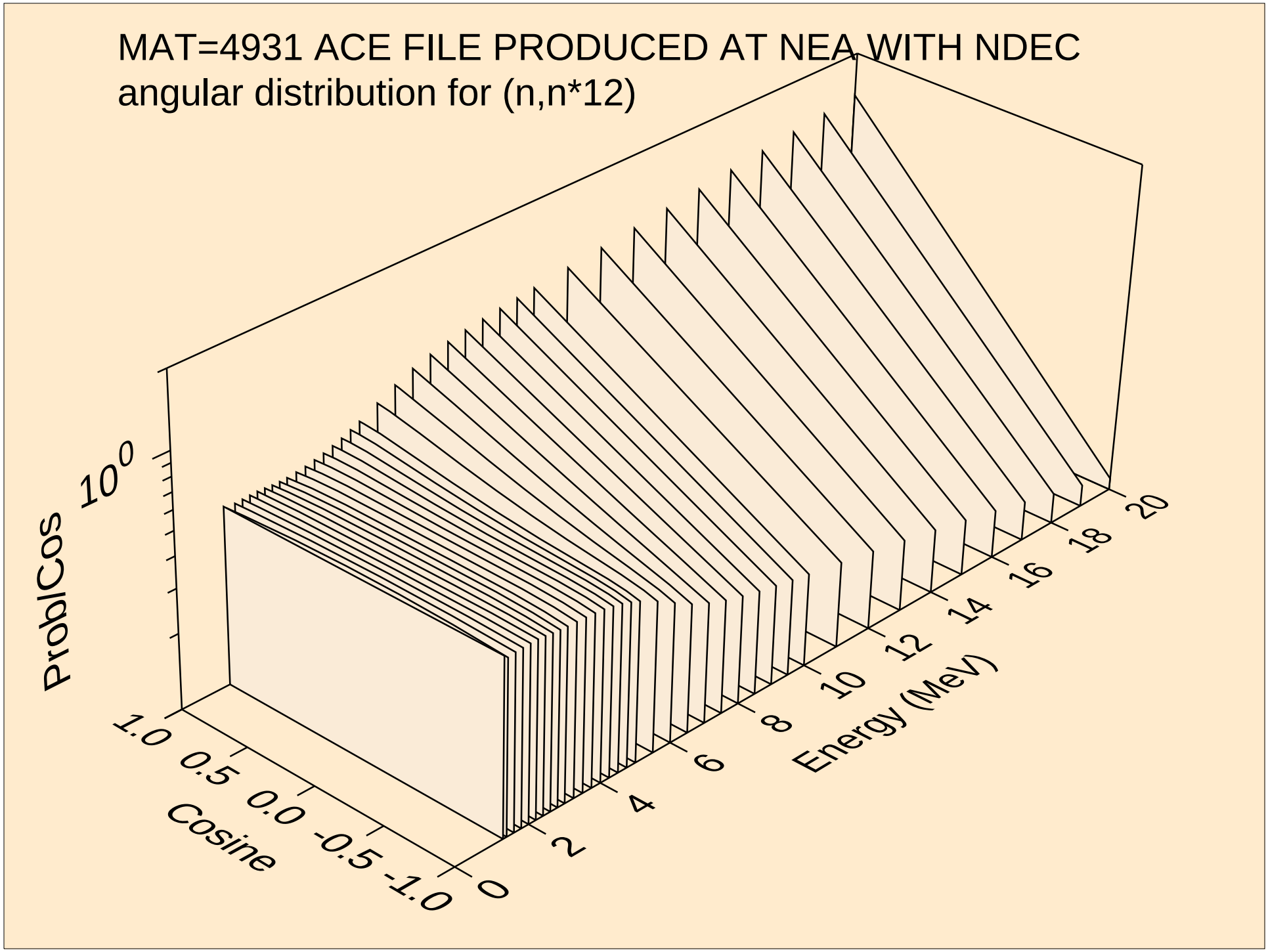

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*7)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

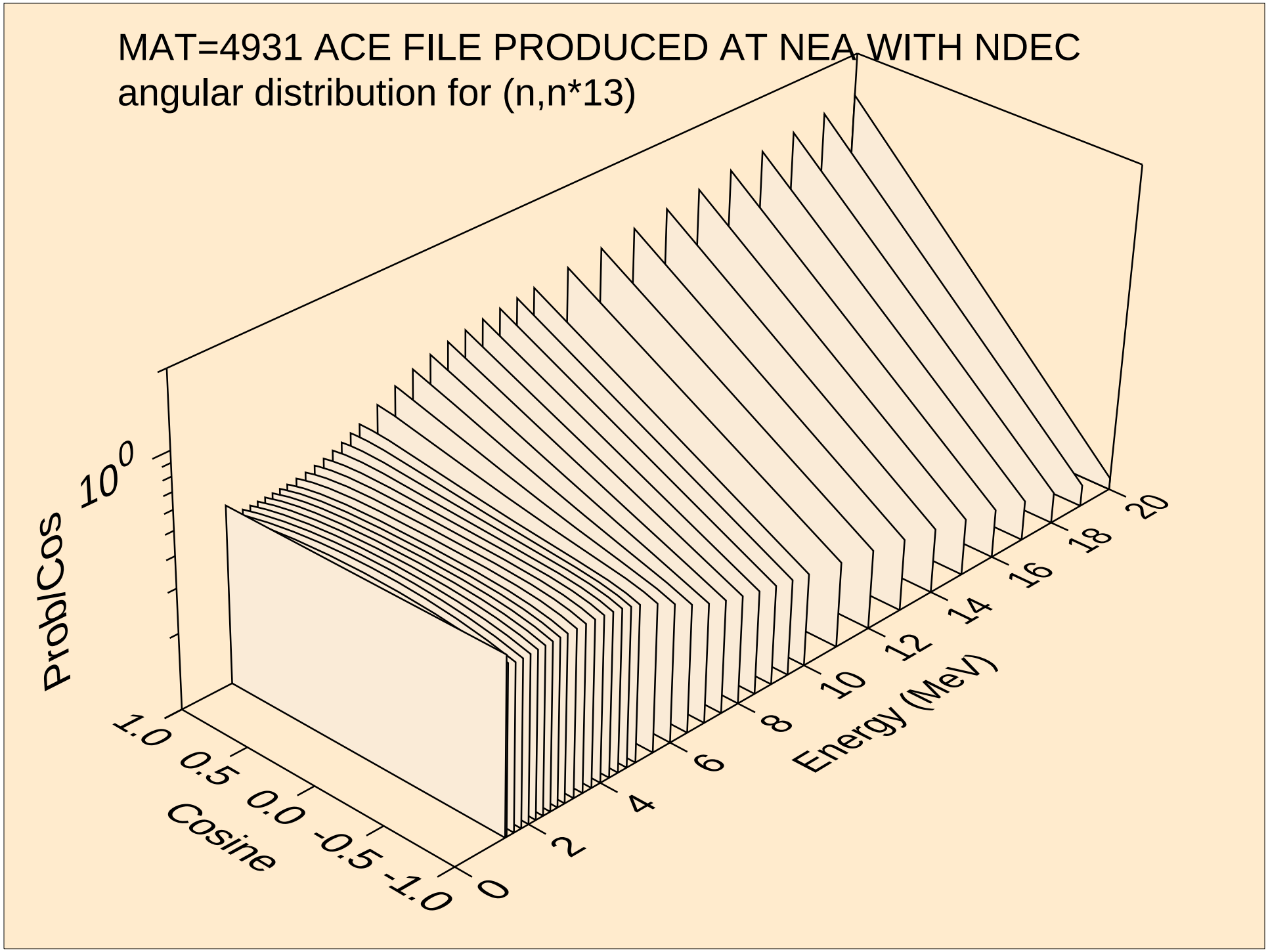

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*8)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

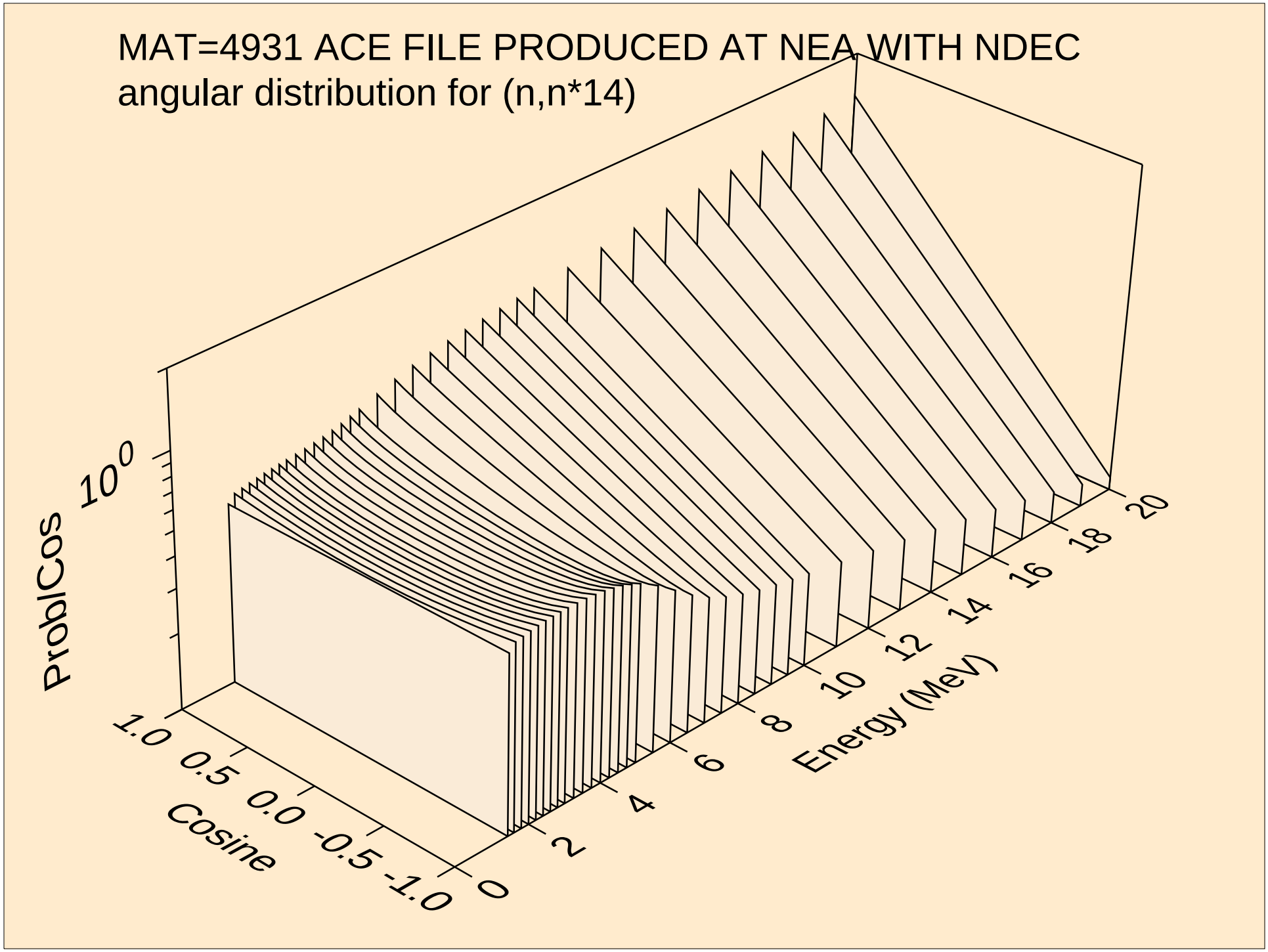

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*9)
ProbICos
10^0
10^-1
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

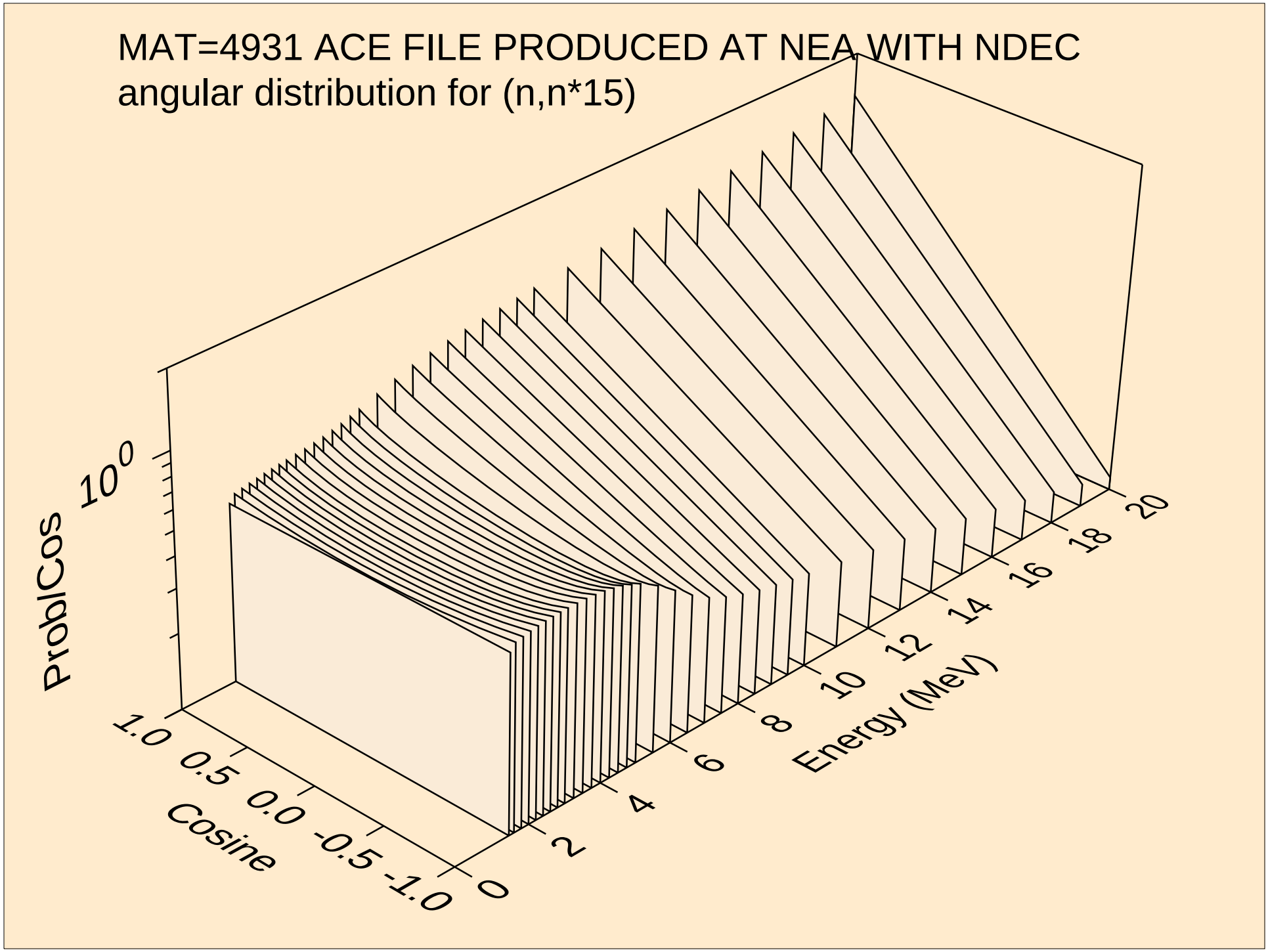

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*10)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

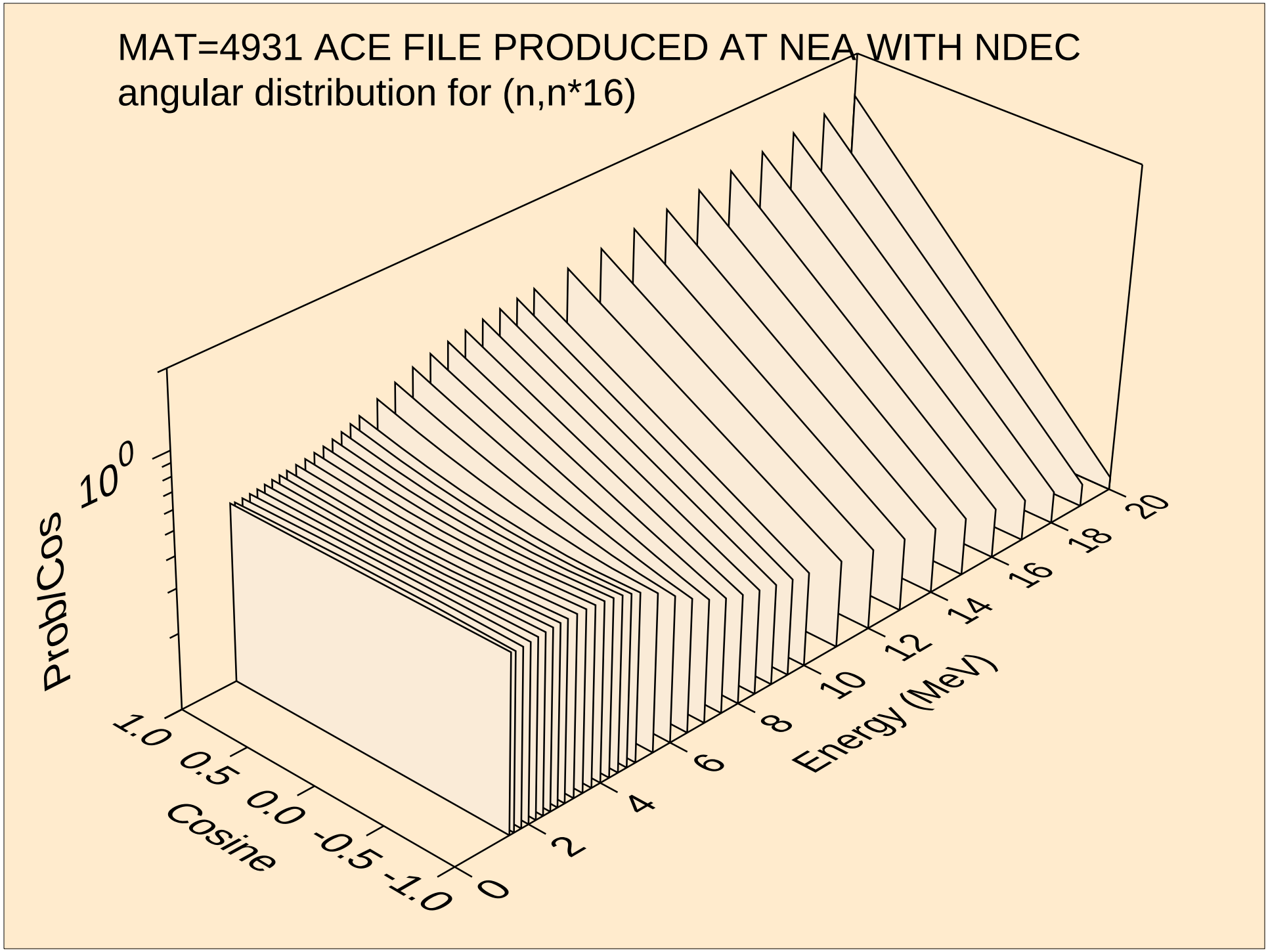

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*11)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

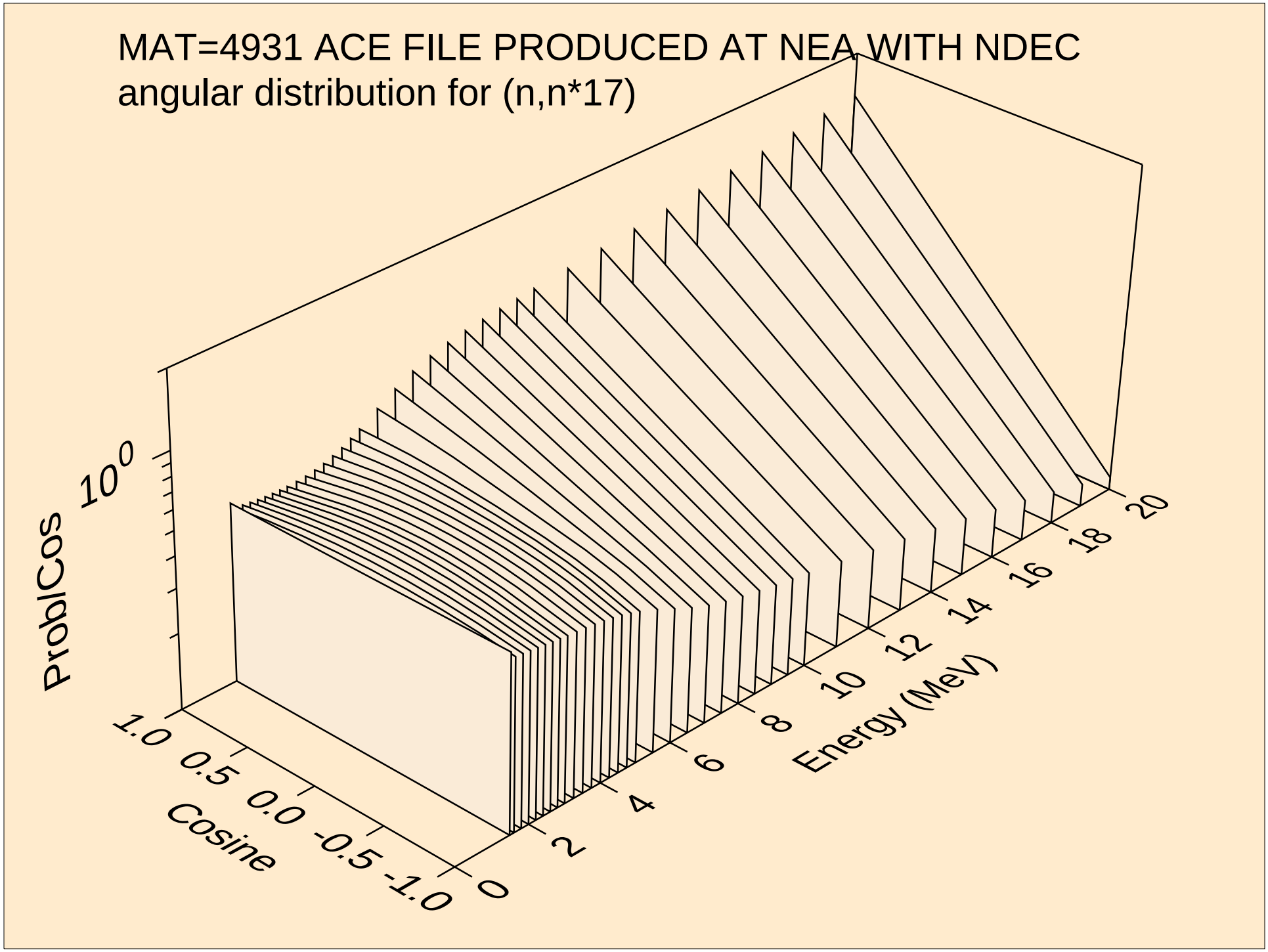

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*12)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

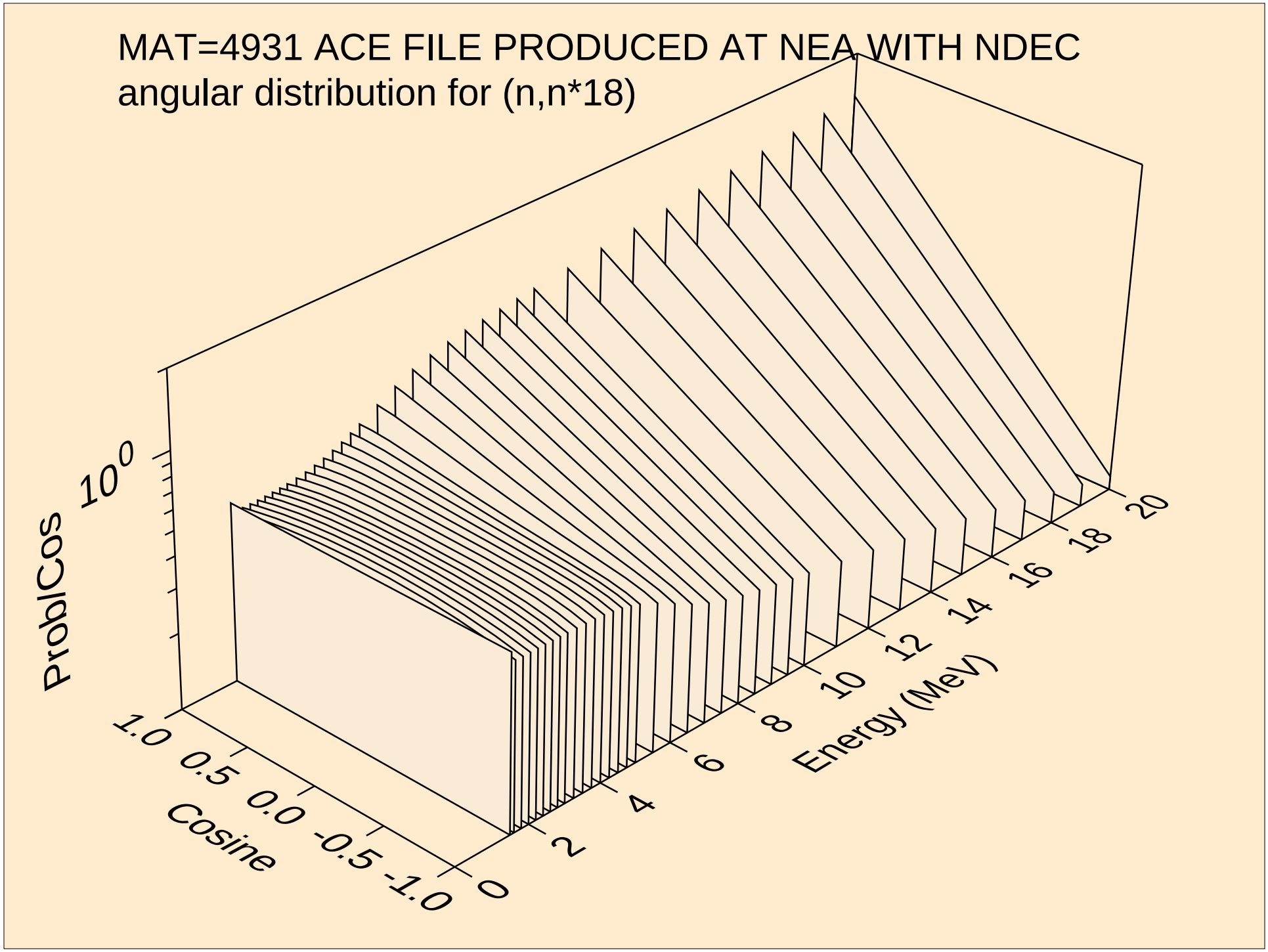

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*13)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

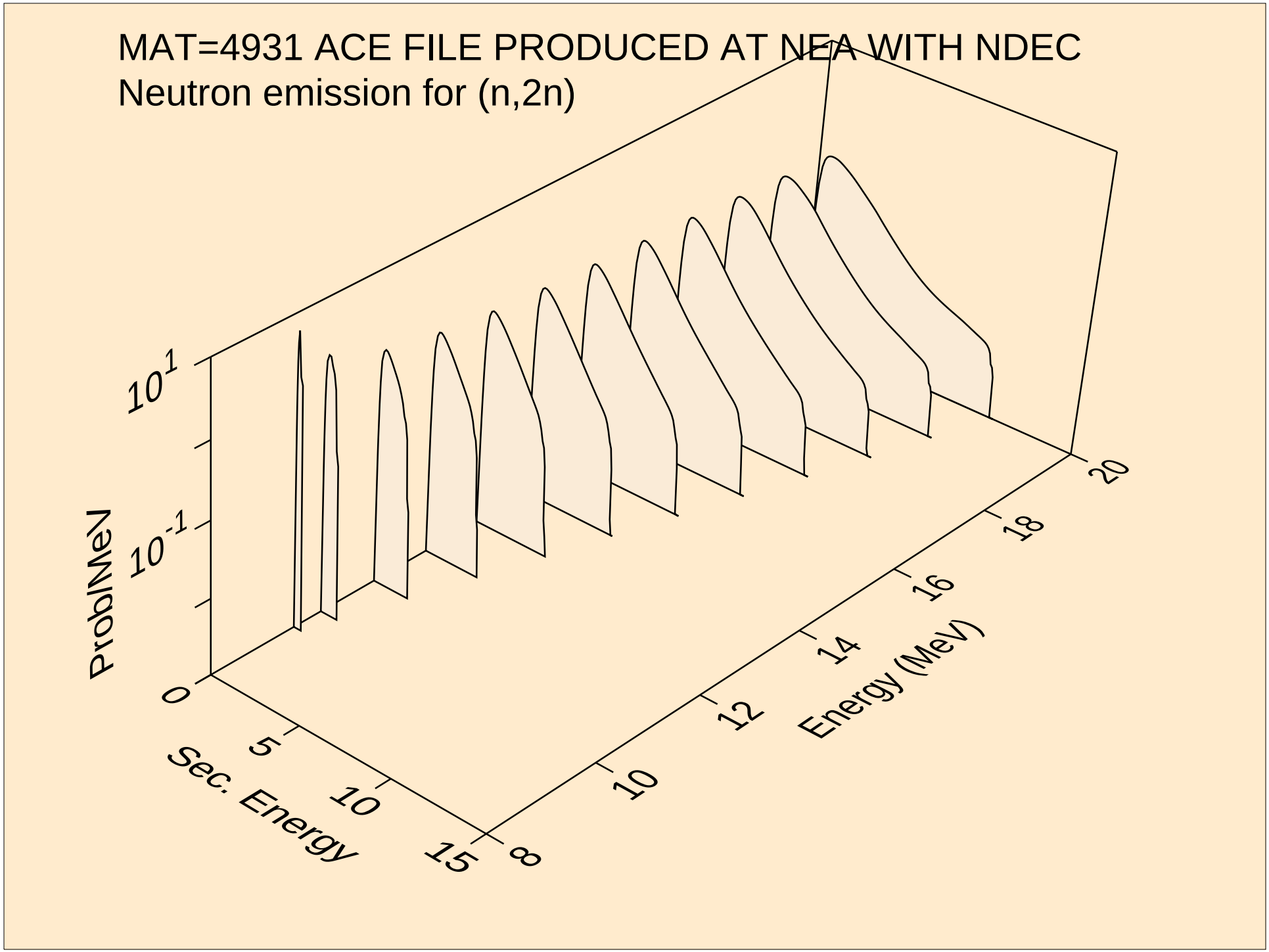

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*14)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

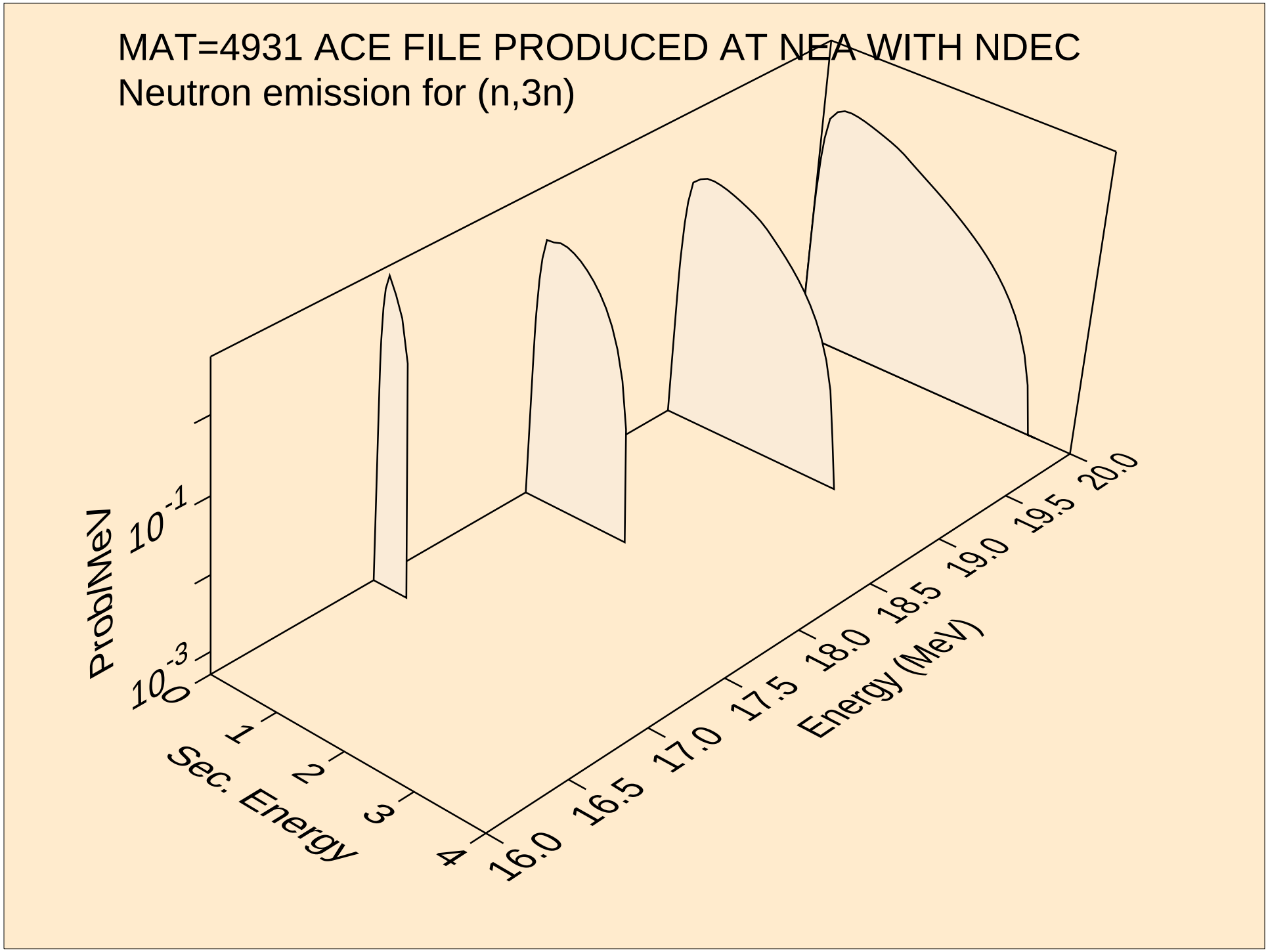

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*15)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

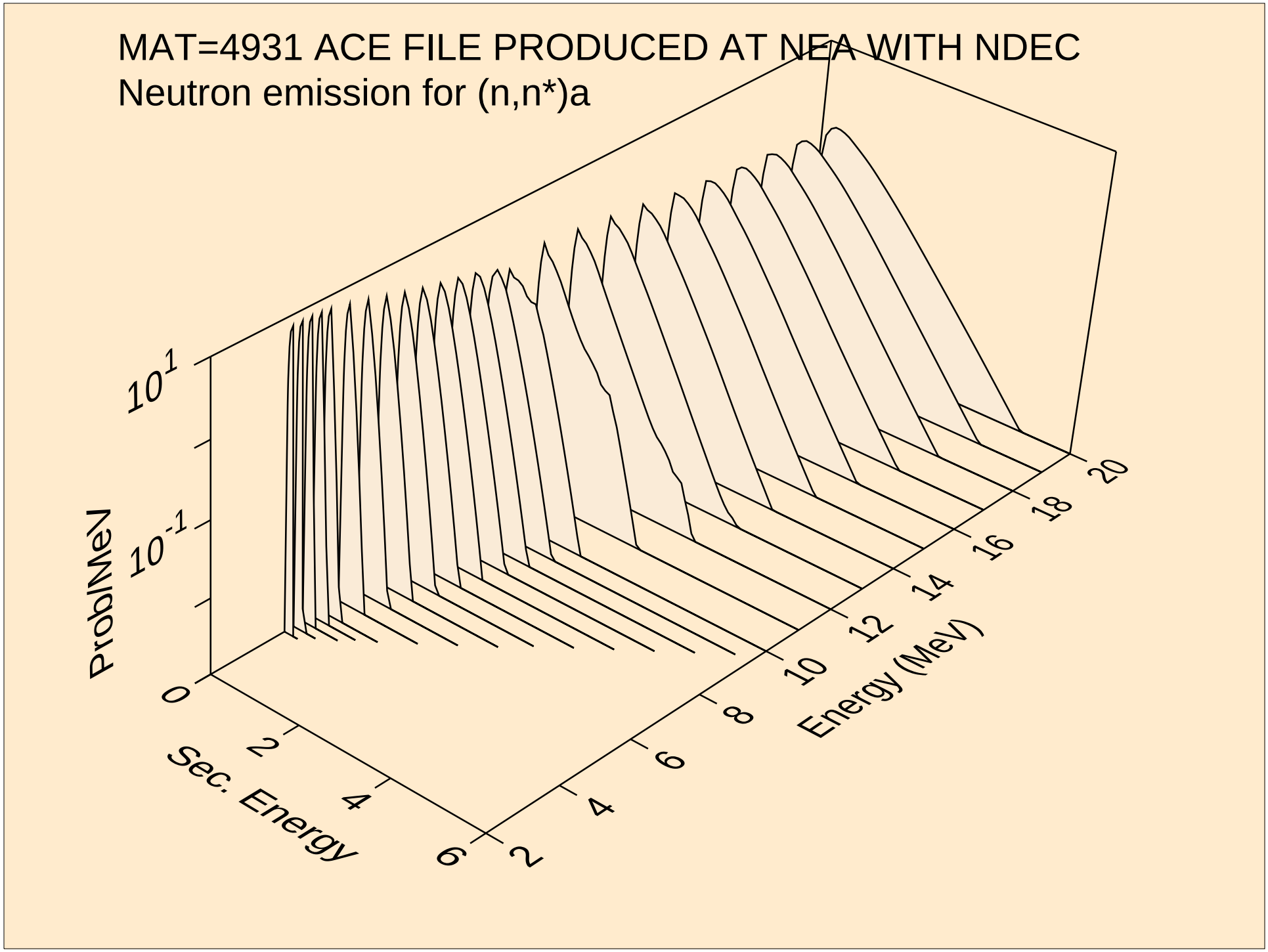

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*16)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

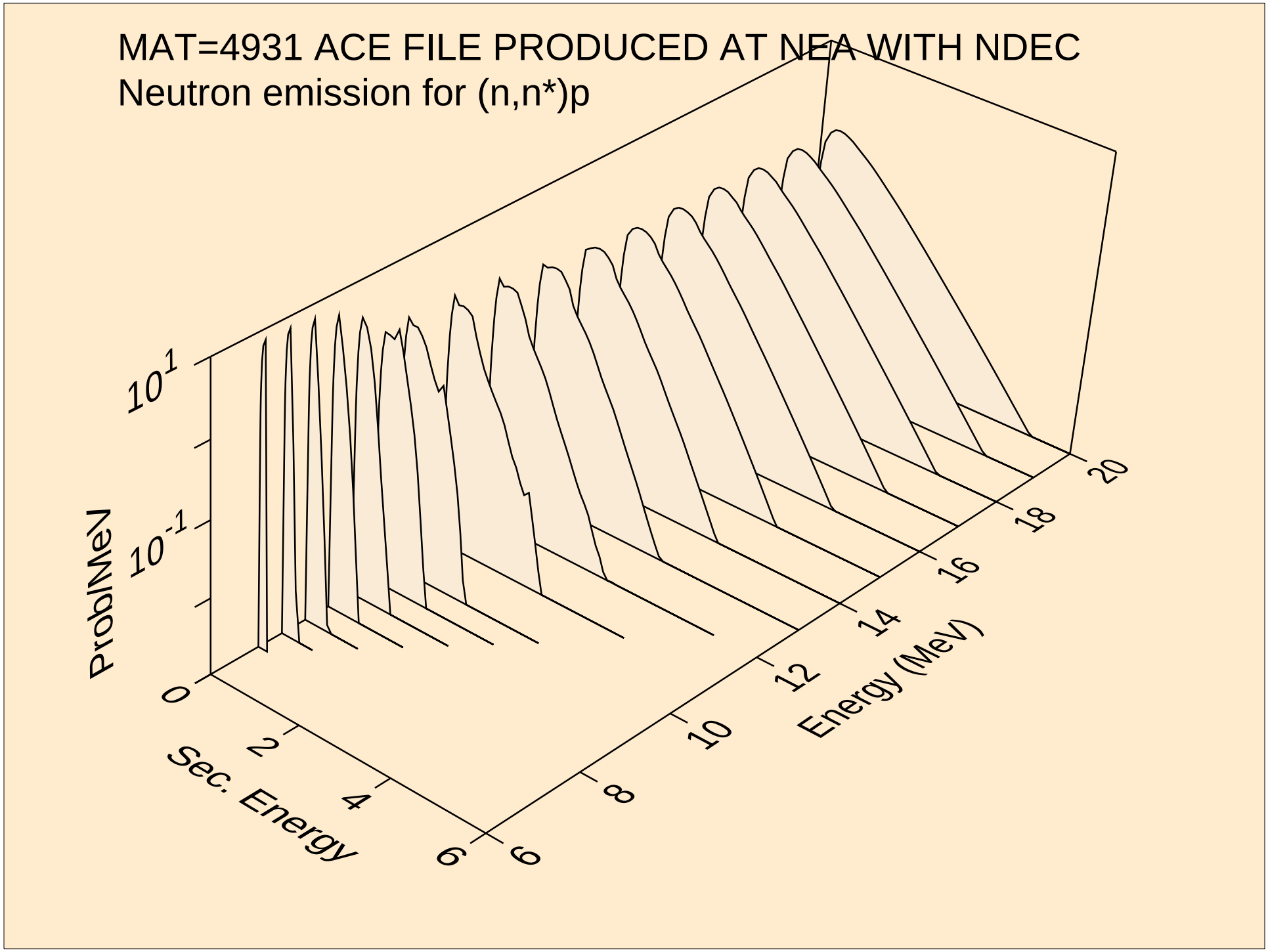

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*17)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

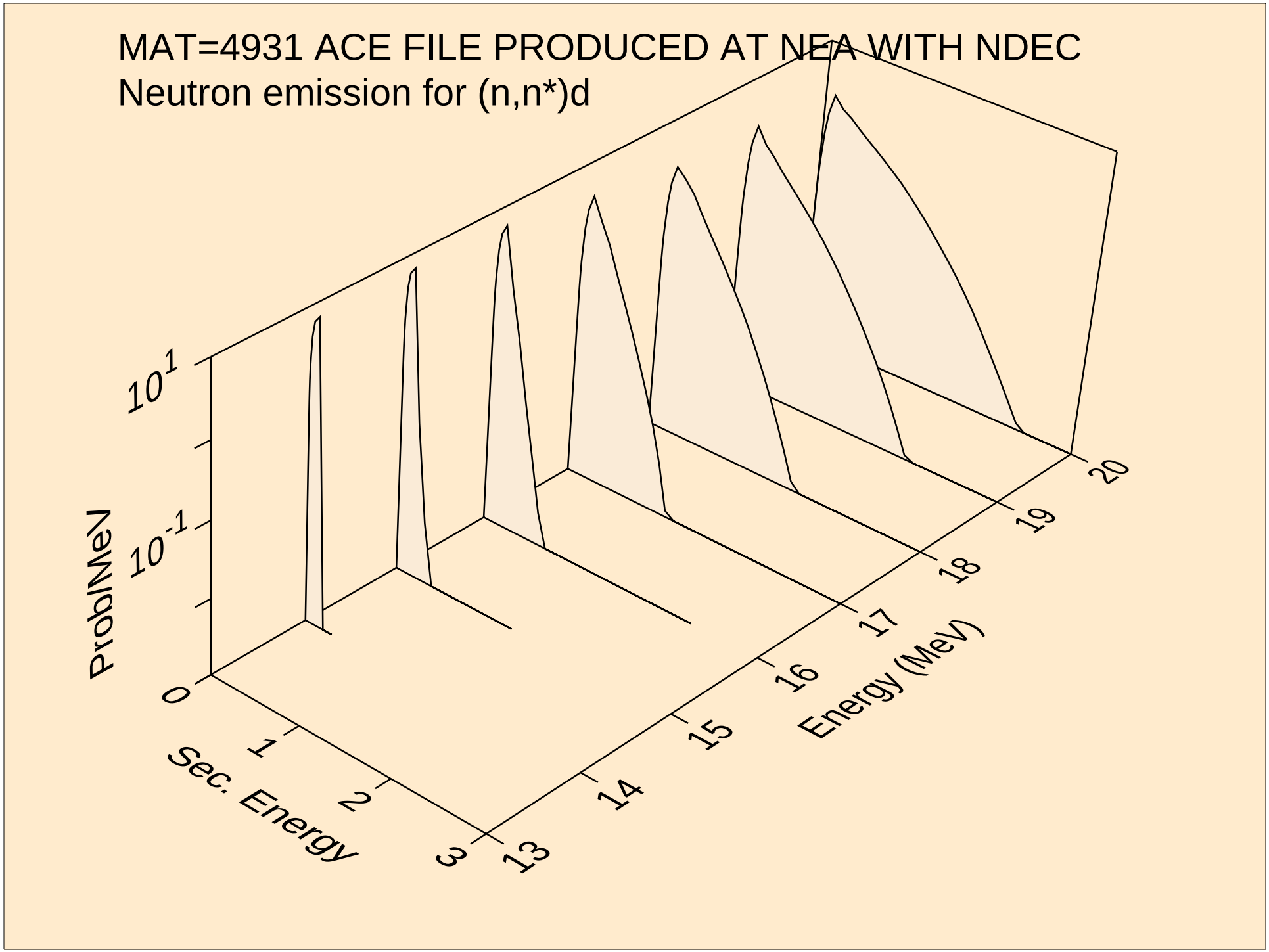

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
angular distribution for (n,n*18)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

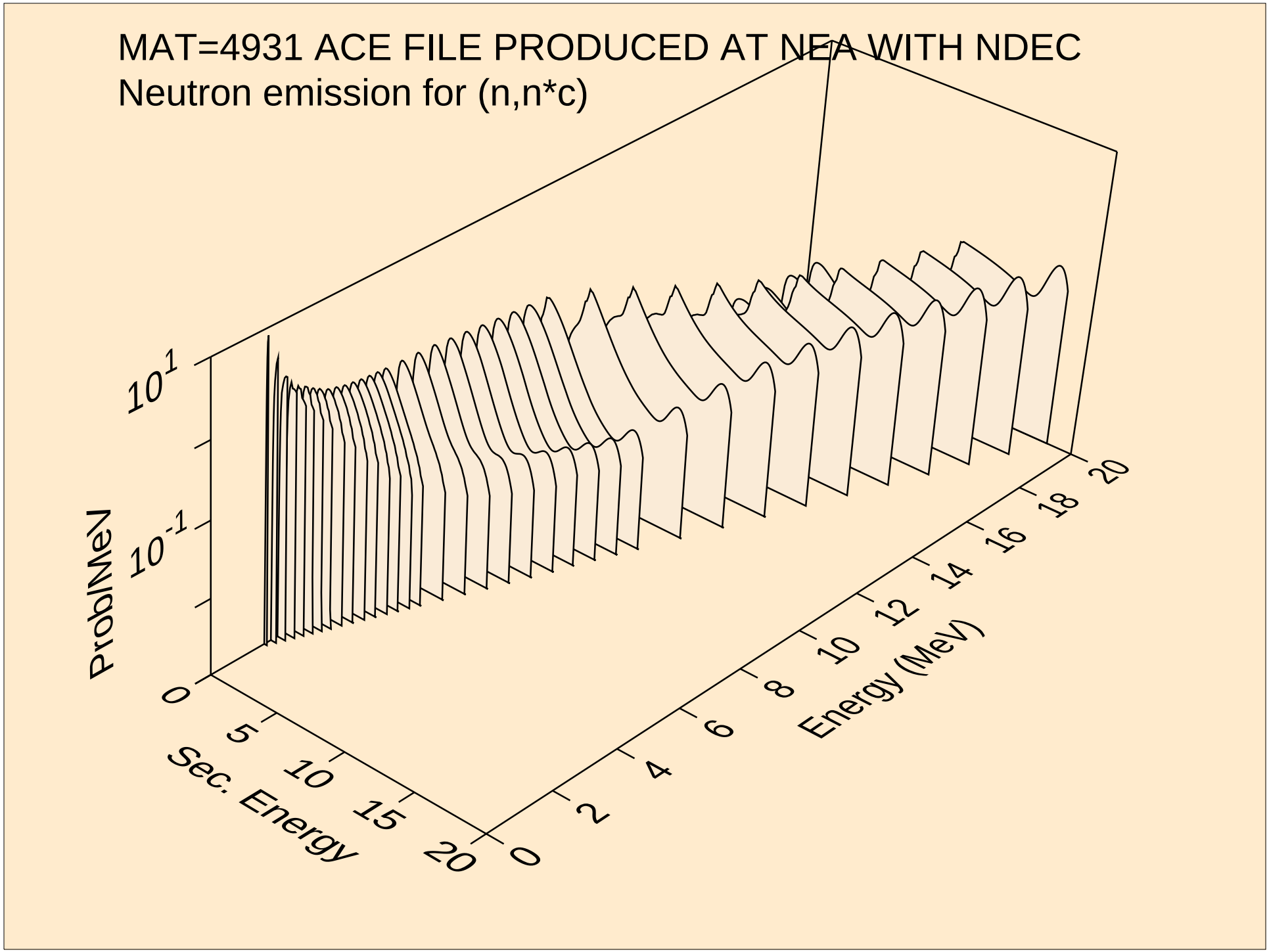

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,2n)
Prob/MeV
10^{1}
10^{-1}
0
Sec. Energy
5
10
15
∞
Energy (MeV)
10
12
14
16
18
20

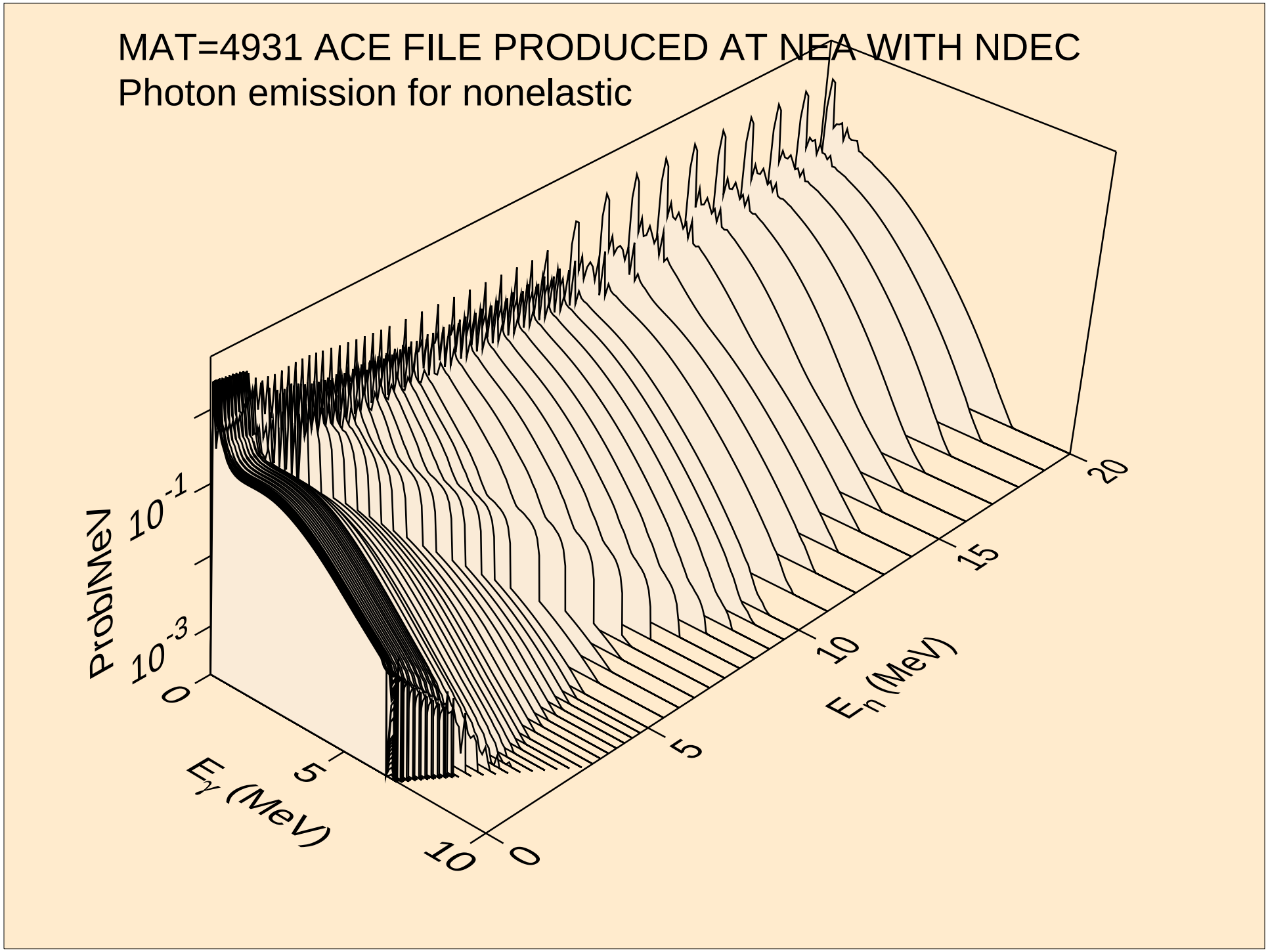

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,3n)
Prob/MeV
10-1
10-3
0
1
2
3
4
Sec. Energy
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5
20.0
Energy (MeV)

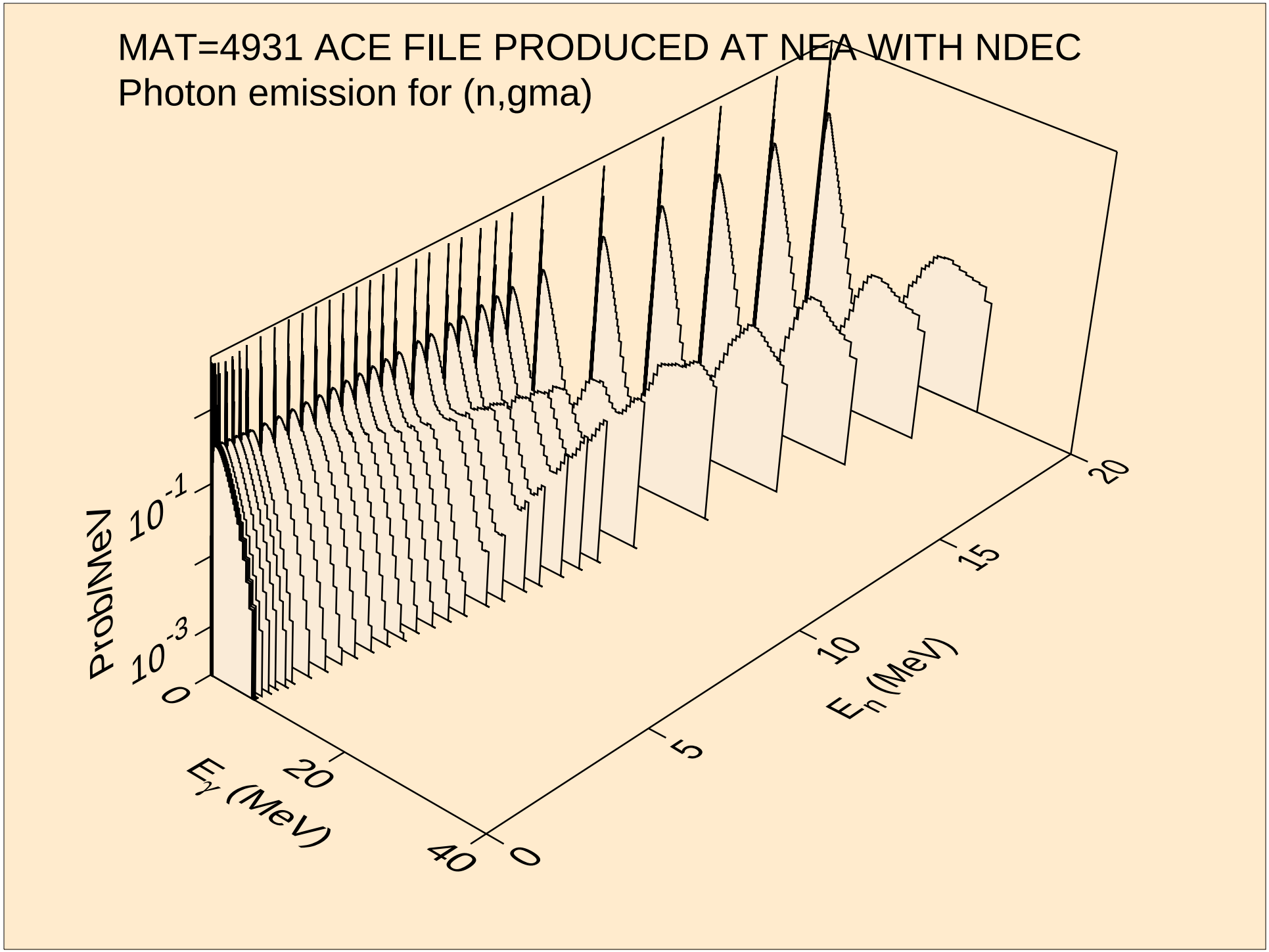

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,n*)a
Prob/MeV
10^1
10^-1
0
Sec. Energy
2
4
6
Energy (MeV)
2
4
6
8
10
12
14
16
18
20

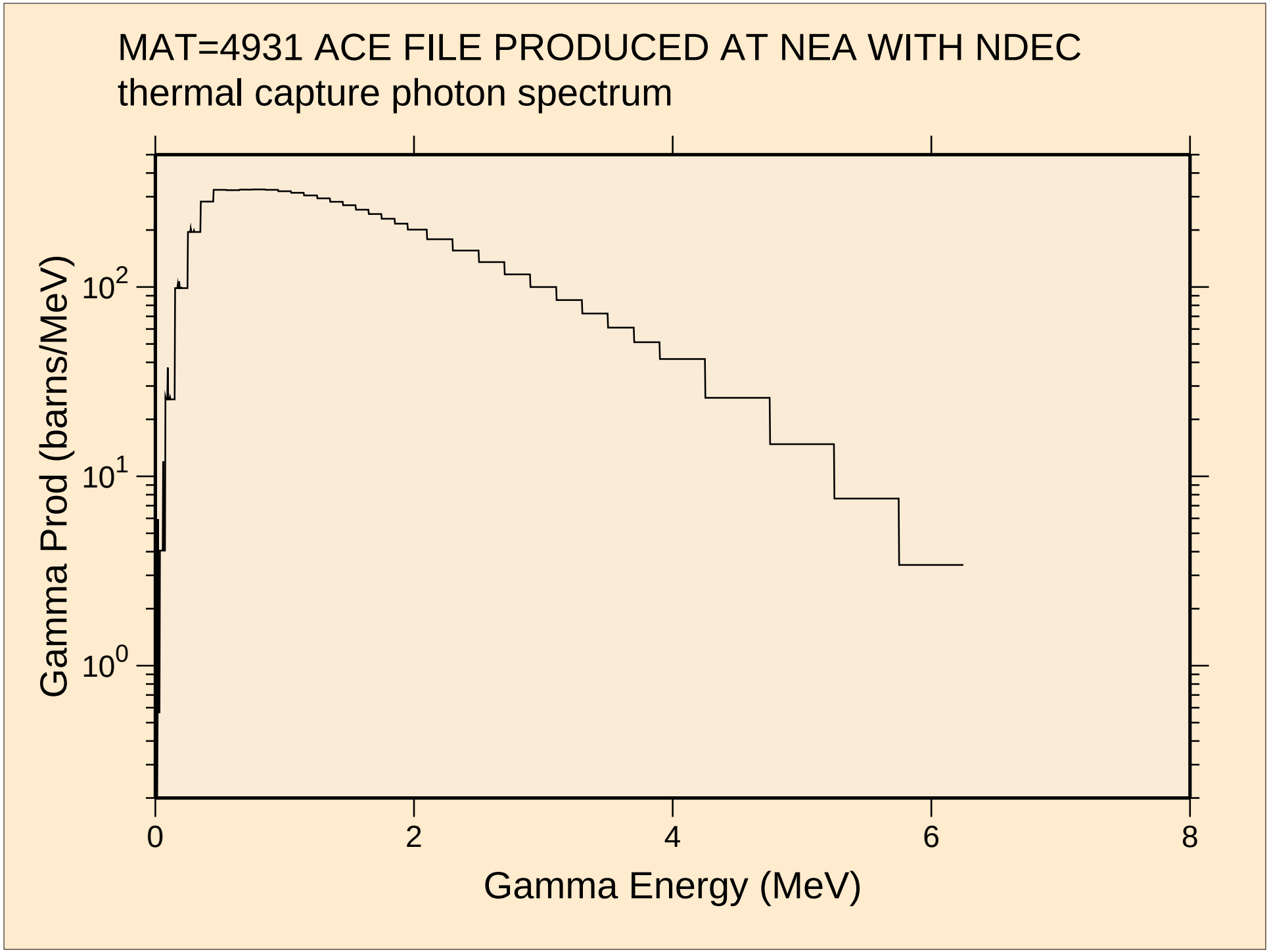

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,n*)p
Prob/MeV
10^1
10^-1
0
2
4
6
Sec. Energy
8
10
12
14
16
18
20
Energy (MeV)


MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,n*)d
Prob/MeV
10^1
10^-1
0
1
2
3
Sec. Energy
13
14
15
16
17
18
19
20
Energy (MeV)

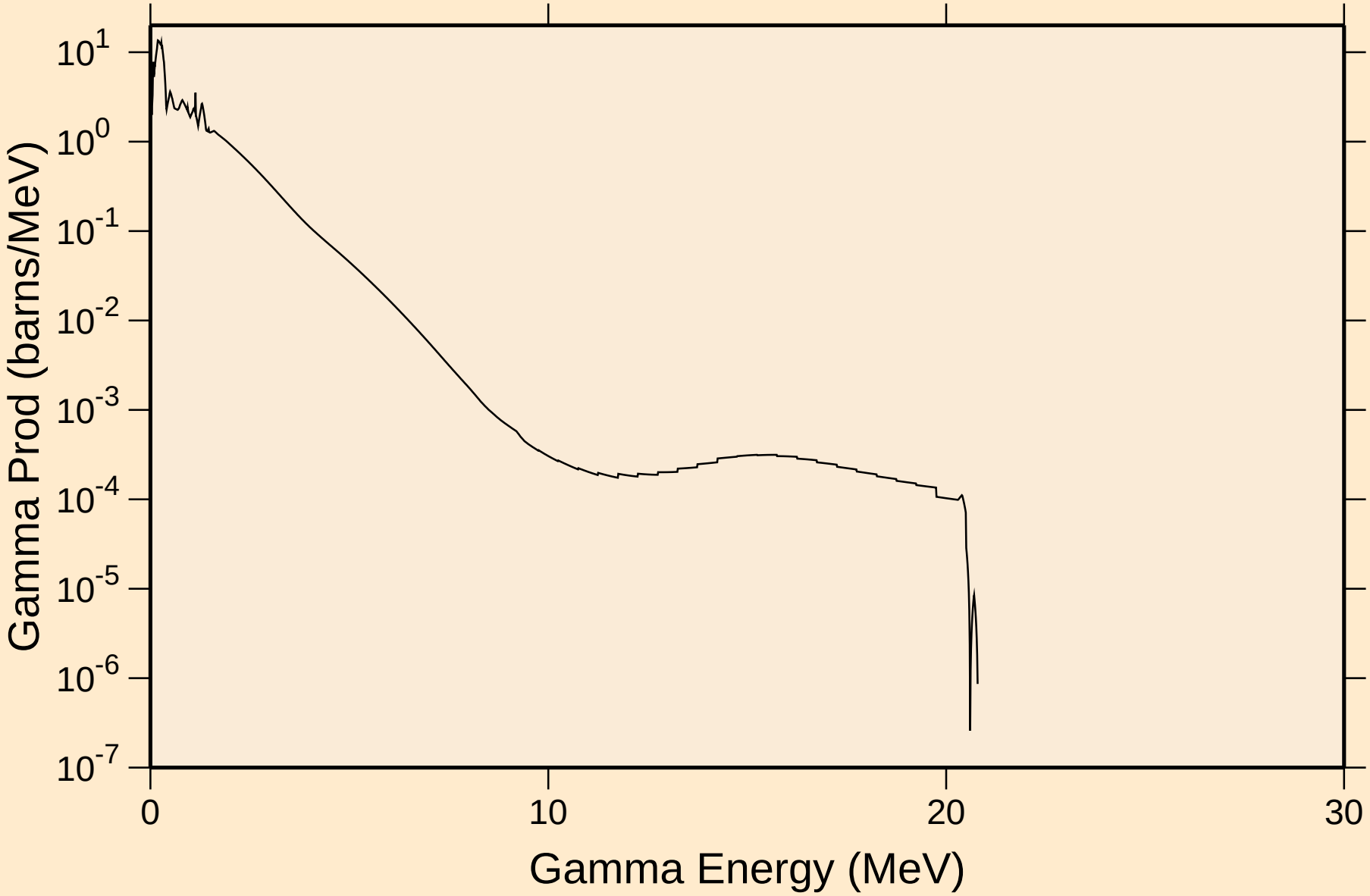

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Neutron emission for (n,n*c)
Prob/MeV
10^{1}
10^{-1}
0
5
10
15
20
Sec. Energy
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

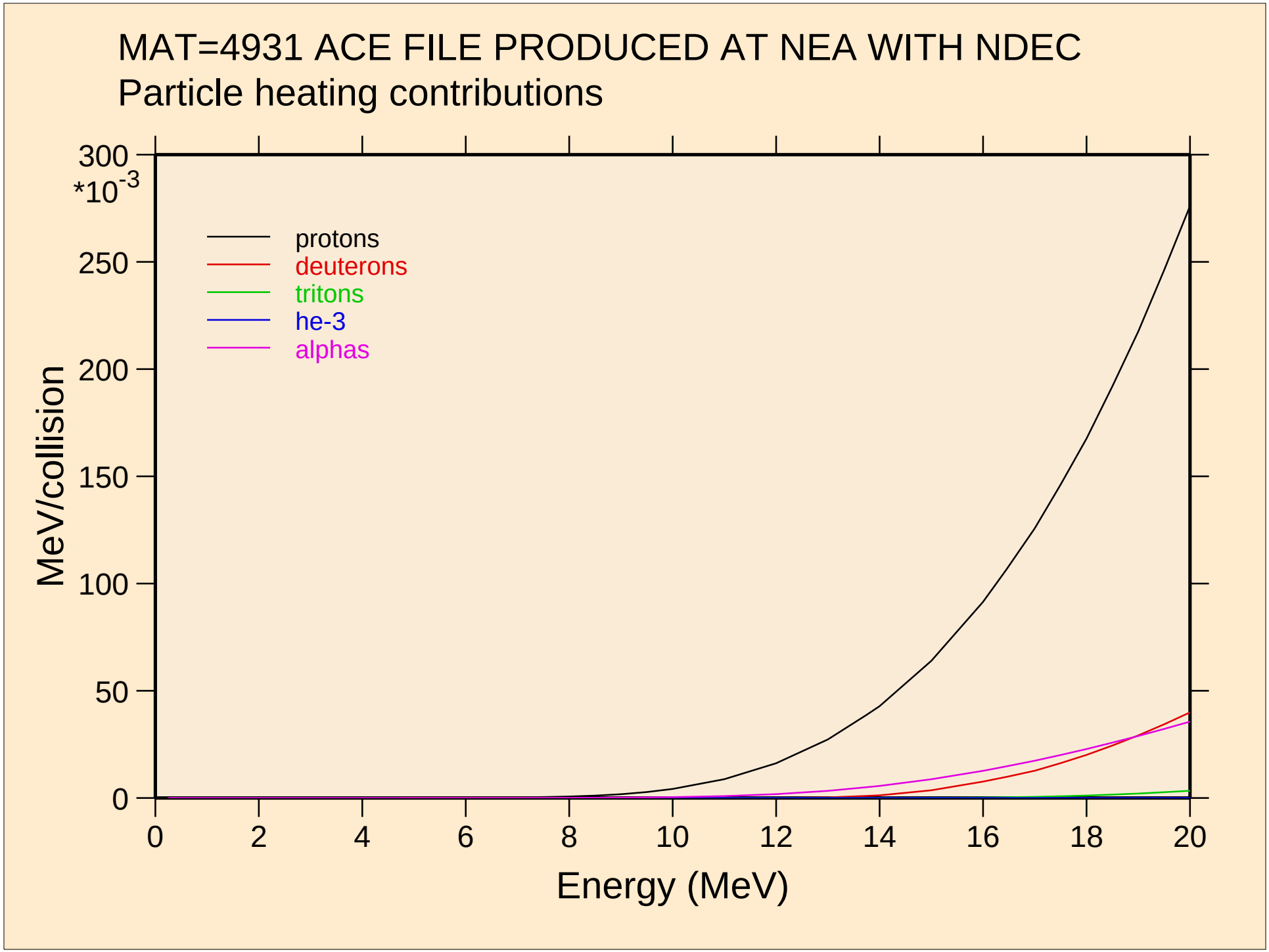

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Photon emission for nonelastic
Prob/MeV
10-1
10-3
0
Eγ (MeV)
5
10
0
5
10
15
20
En (MeV)

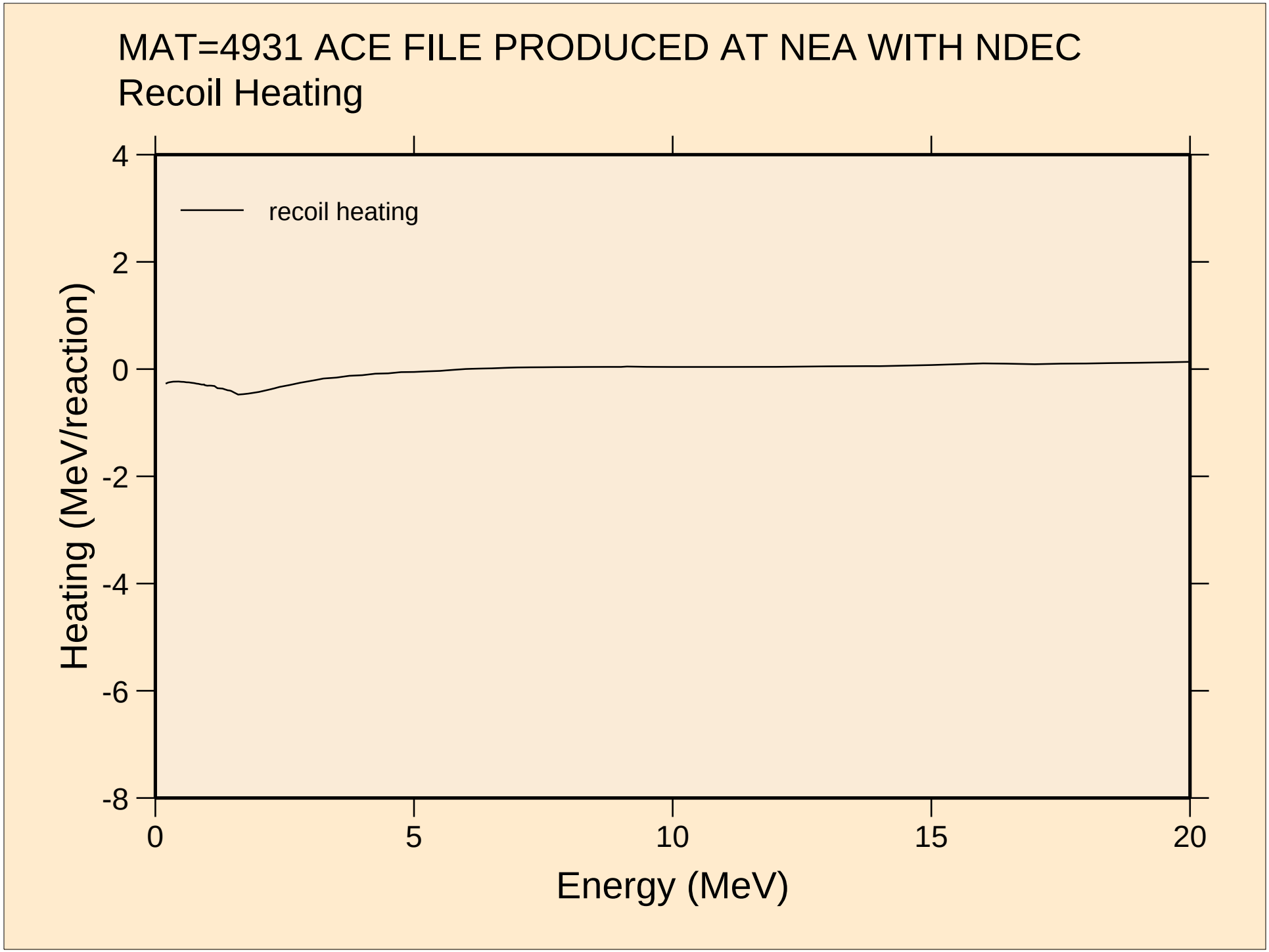

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Photon emission for (n,gma)
Prob/MeV
10-1
10-3
0
Eγ (MeV)
20
40
0
5
10
15
20
En (MeV)

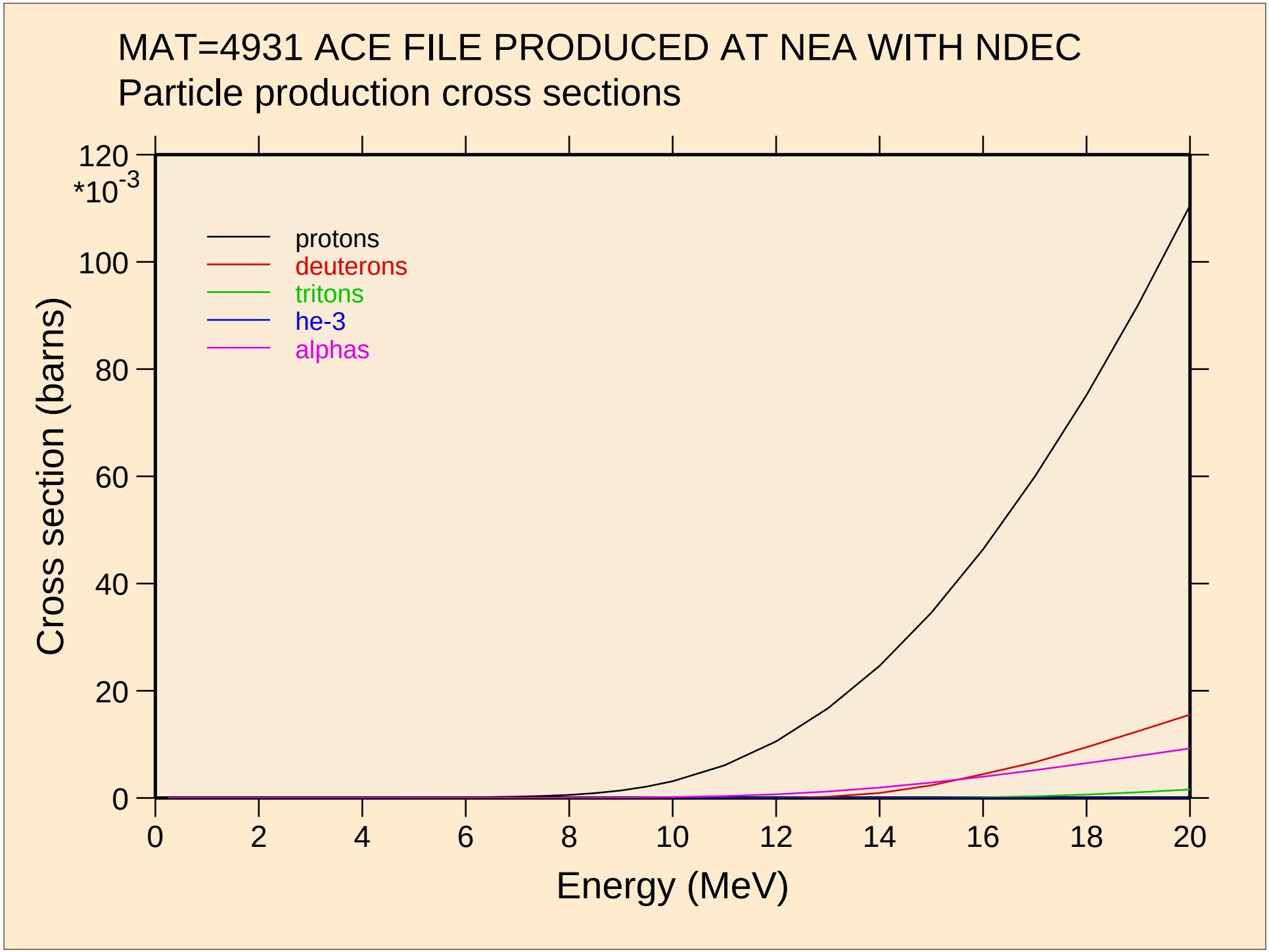

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
thermal capture photon spectrum
Gamma Prod (barns/MeV)
10^2
10^1
10^0
0
2
4
6
8
Gamma Energy (MeV)

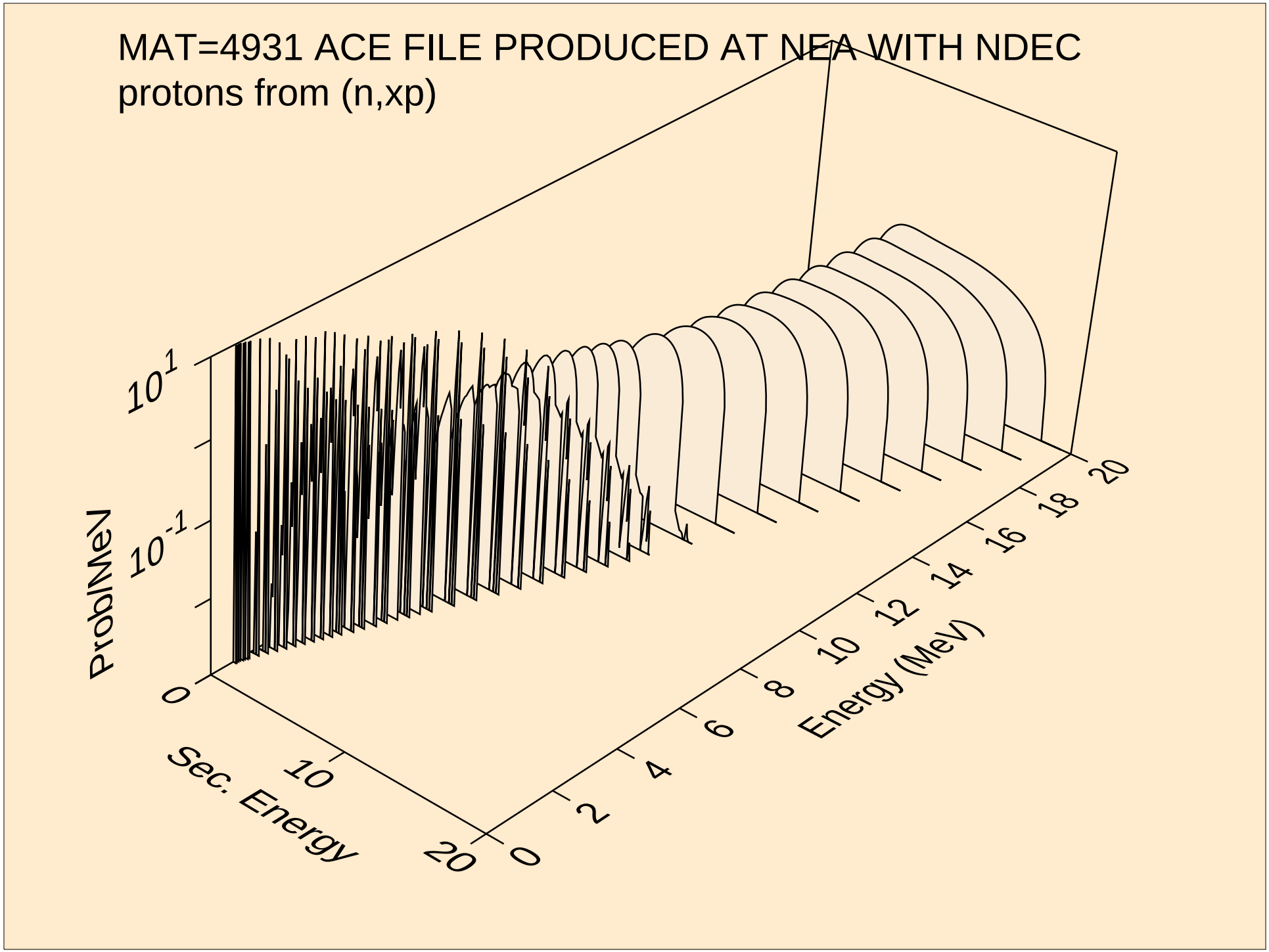
MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
14 MeV photon spectrum

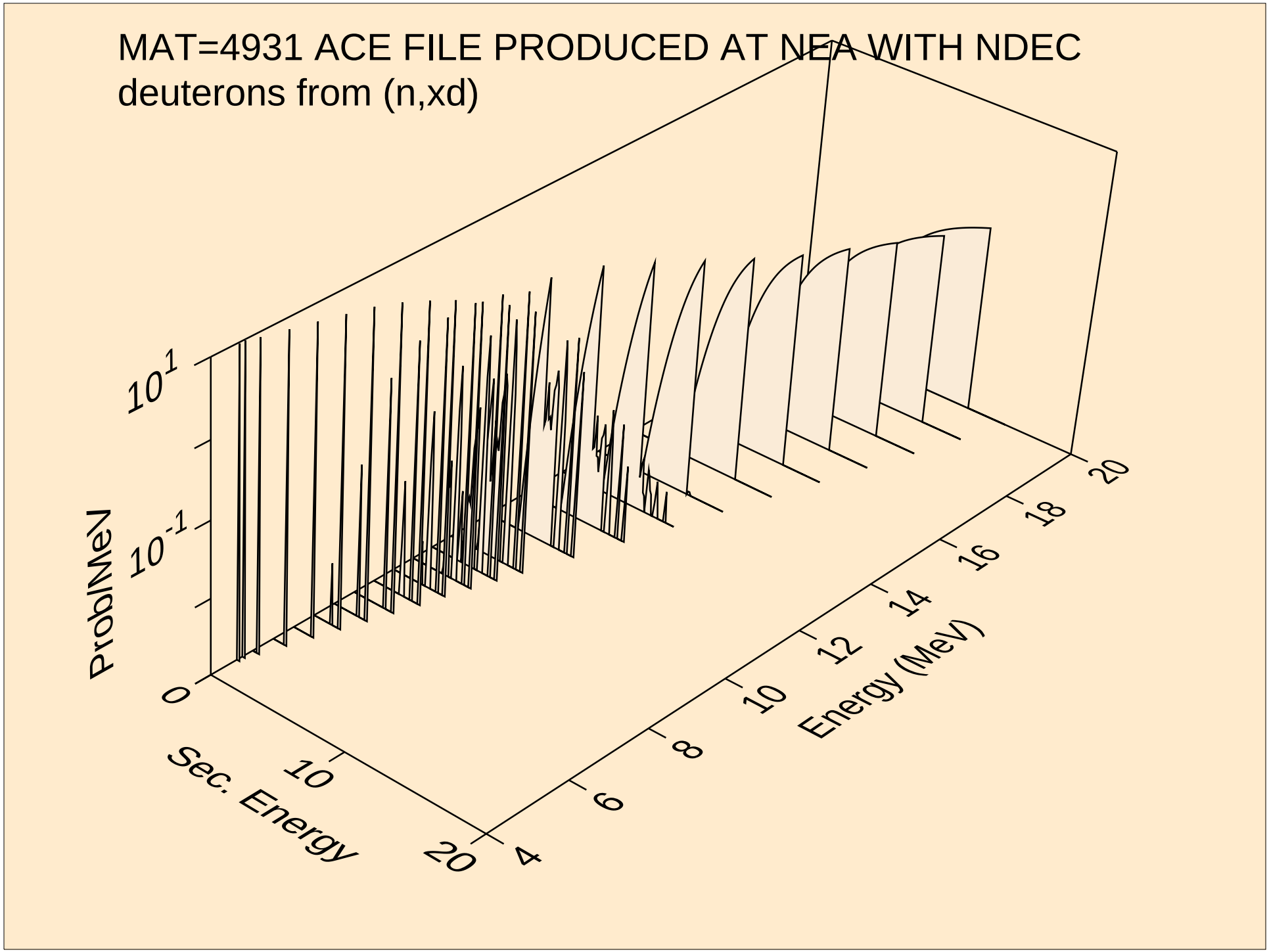


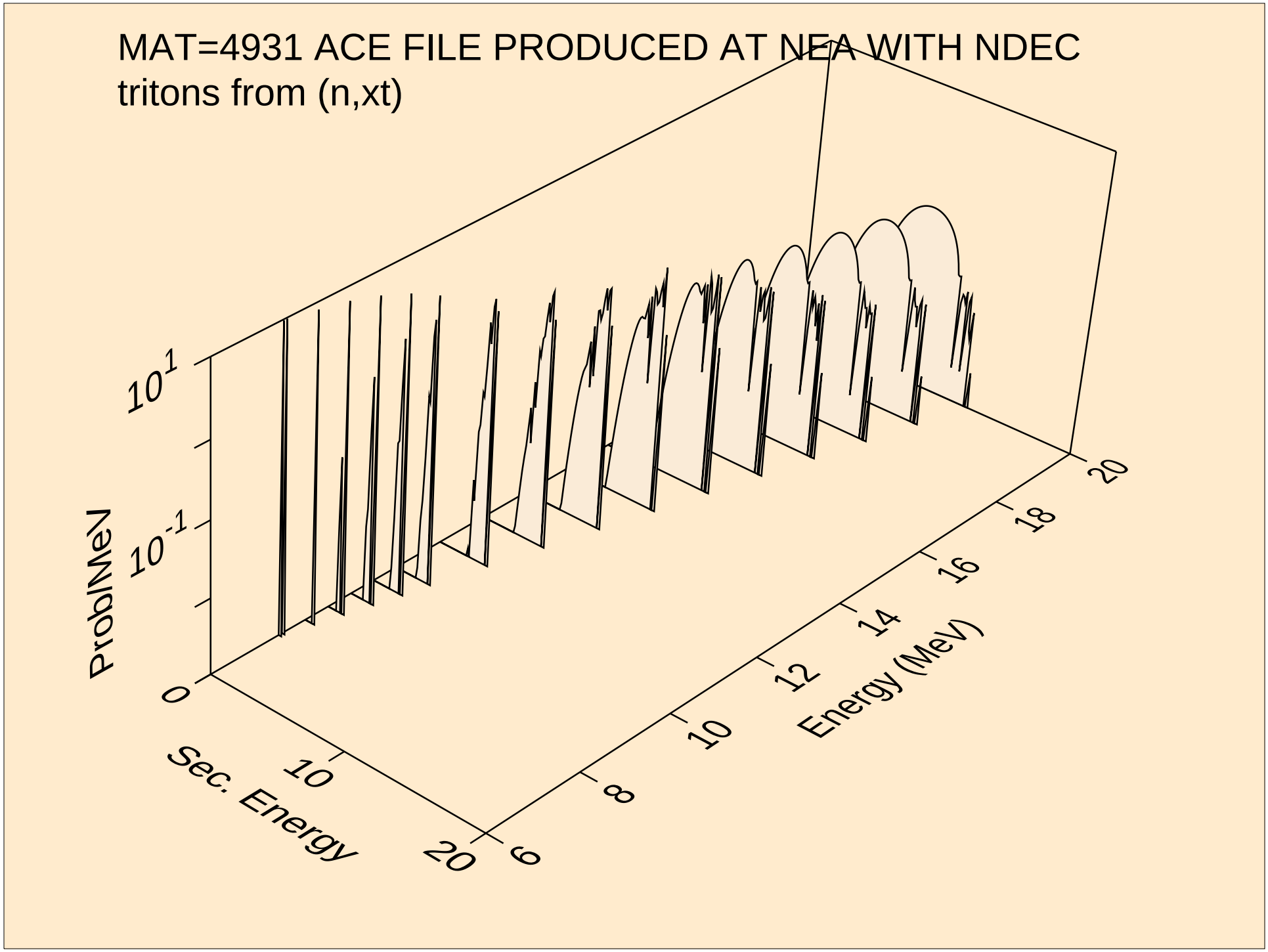

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Particle heating contributions
300
*10-3
250
200
150
100
50
0
MeV/collision
protons
deuterons
tritons
he-3
alphas
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

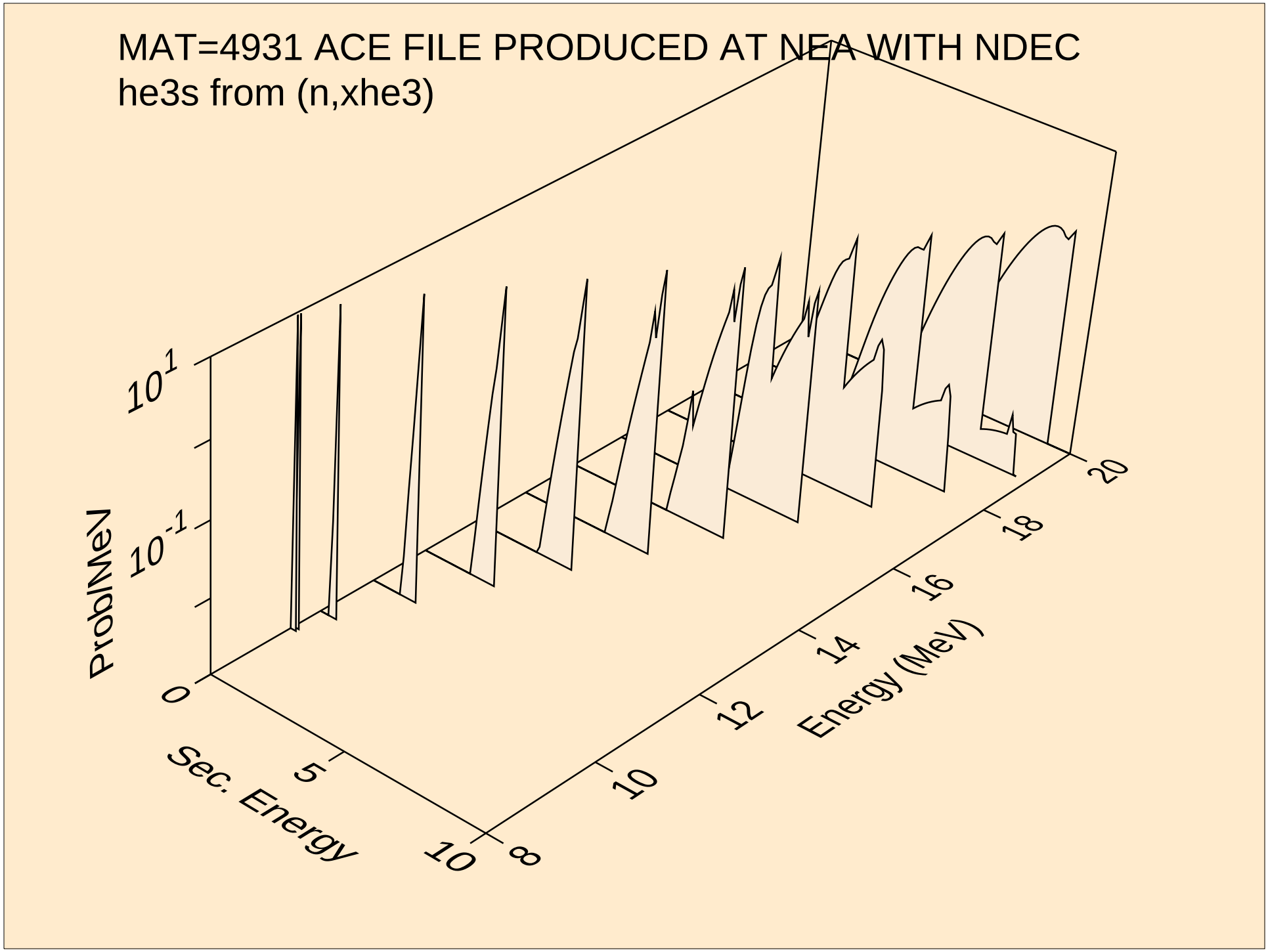

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Recoil Heating
recoil heating
Heating (MeV/reaction)
4
2
0
-2
-4
-6
-8
0
5
10
15
20
Energy (MeV)

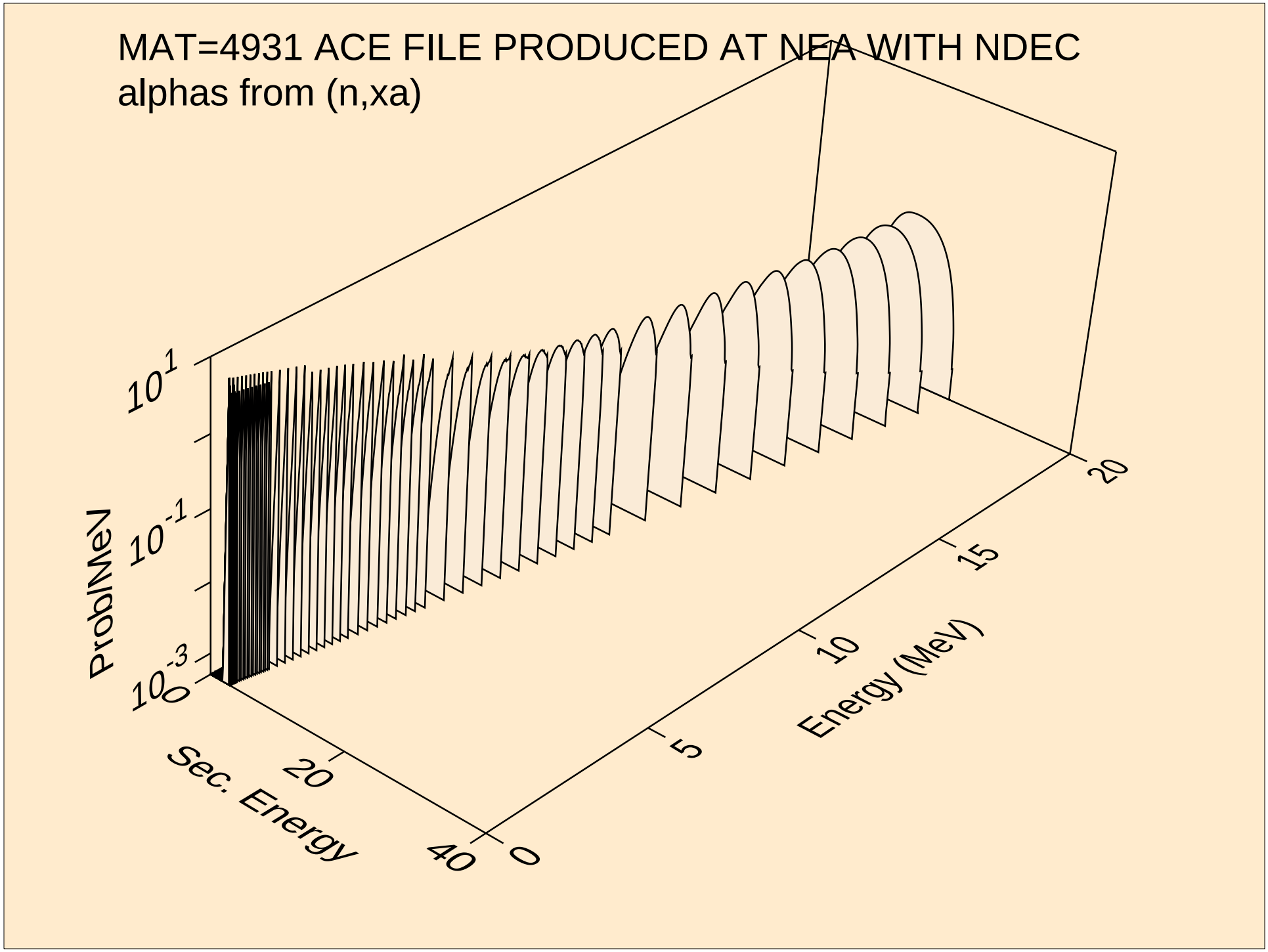

MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
Particle production cross sections
120
*10-3
100
80
60
40
20
0
Cross section (barns)
protons
deuterons
tritons
he-3
alphas
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
protons from (n,xp)
Prob/MeV
10^{1}
10^{-1}
0
10
20
Sec. Energy
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
deuterons from (n,xd)
Prob/MeV
10^{1}
10^{-1}
0
10
20
Sec. Energy
4
6
8
10
12
14
16
18
20
Energy (MeV)


MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
tritons from (n,xt)
Prob/MeV
10^{1}
10^{-1}
0
Sec. Energy
10
20
6
8
10
12
14
16
18
20
Energy (MeV)


MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
he3s from (n,xhe3)
Prob/MeV
10^{1}
10^{-1}
0
5
10
Sec. Energy
8
10
12
14
16
18
20
Energy (MeV)


MAT=4931 ACE FILE PRODUCED AT NEA WITH NDEC
alphas from (n,xa)
Prob/MeV
10^1
10^-1
10^-3
0
20
40
Sec. Energy
0
5
10
15
20
Energy (MeV)