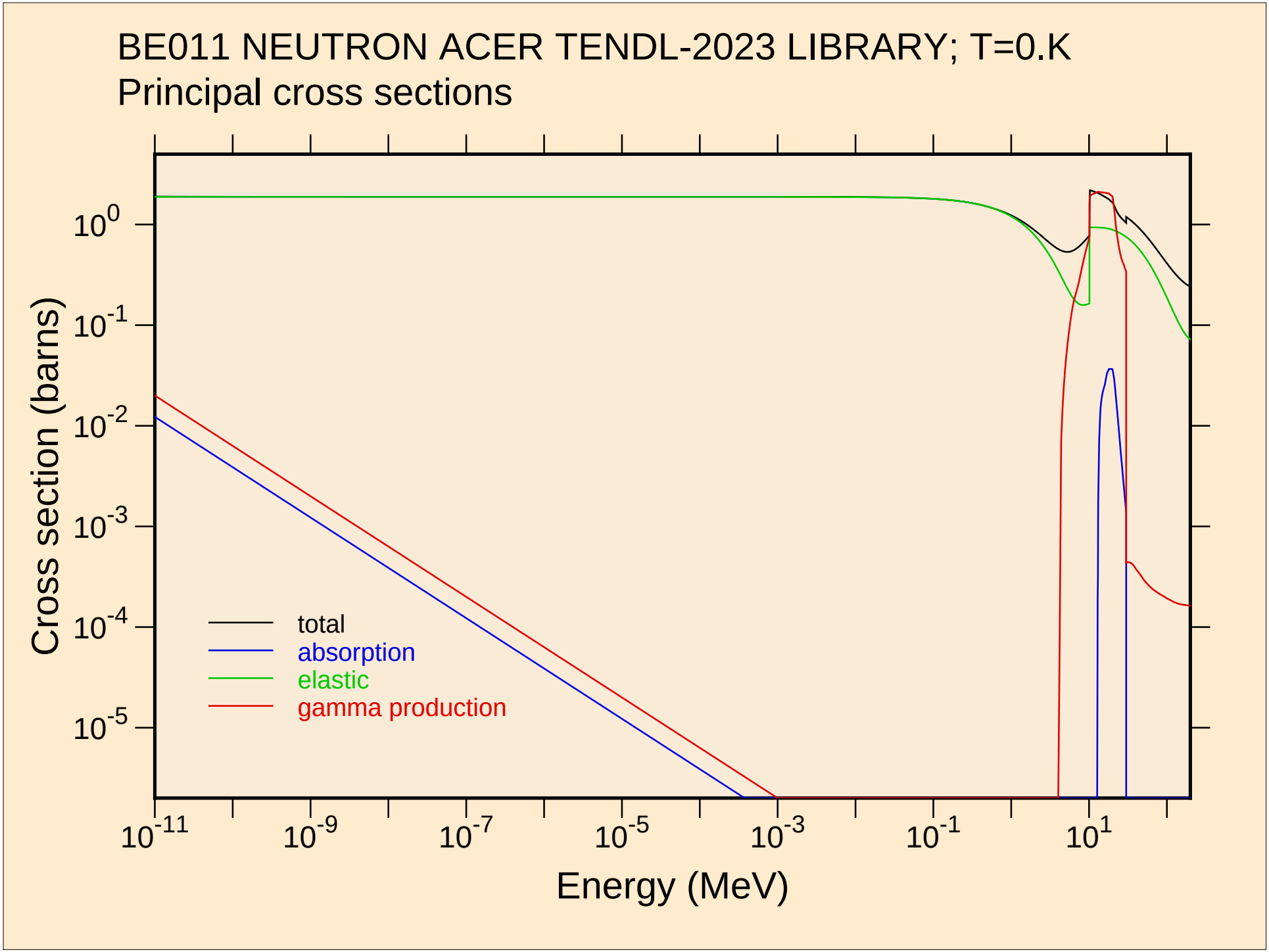
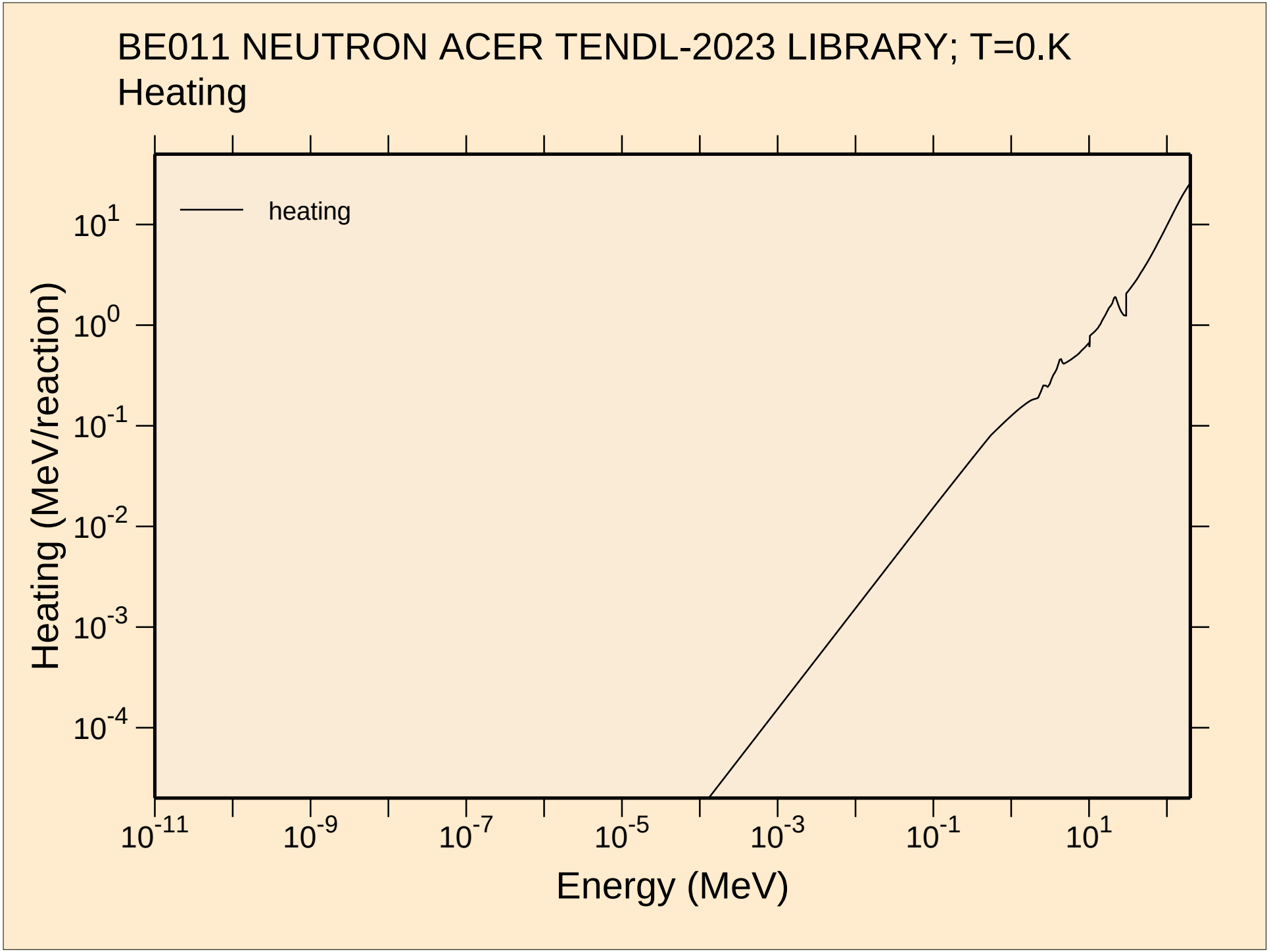
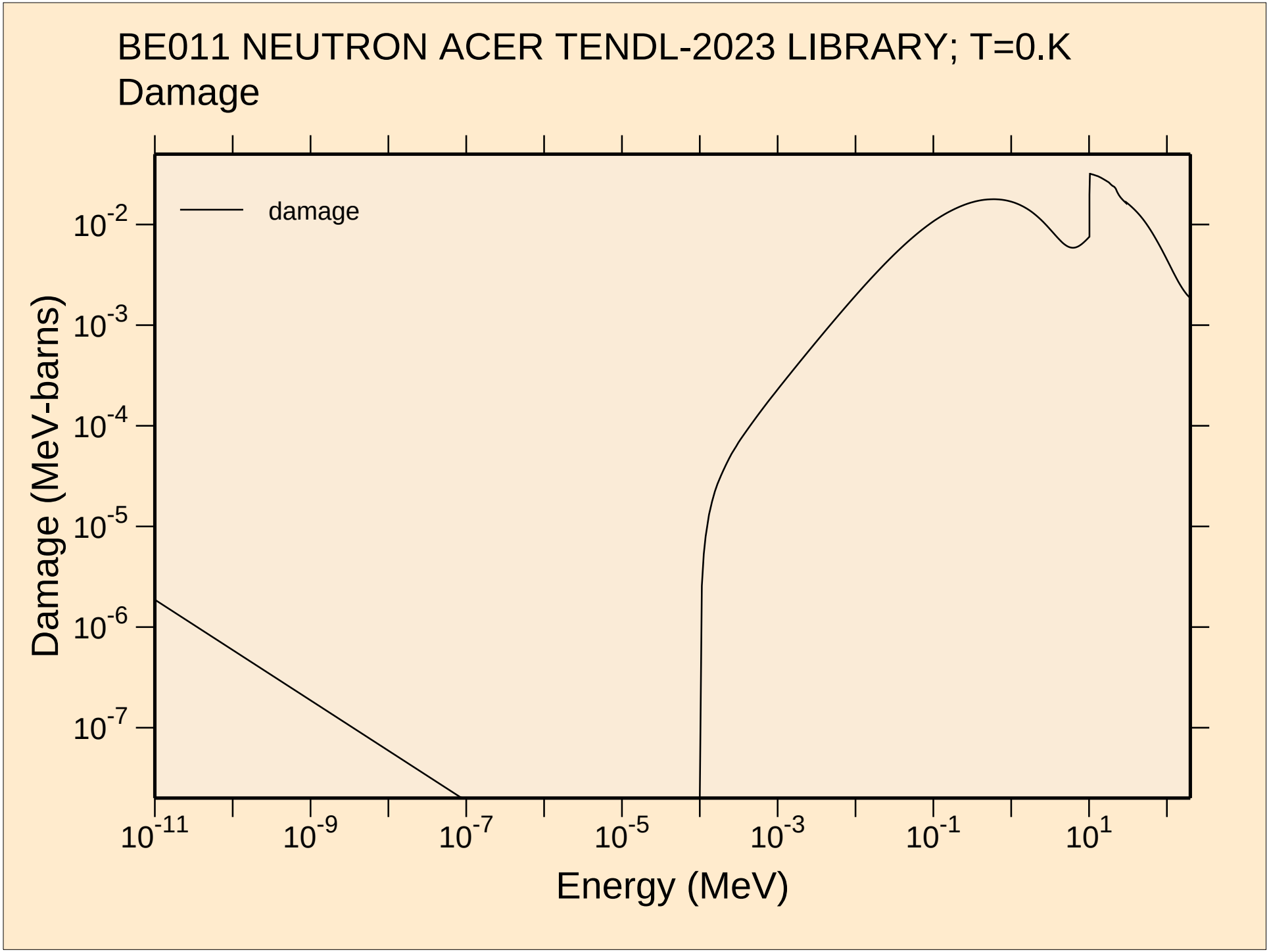
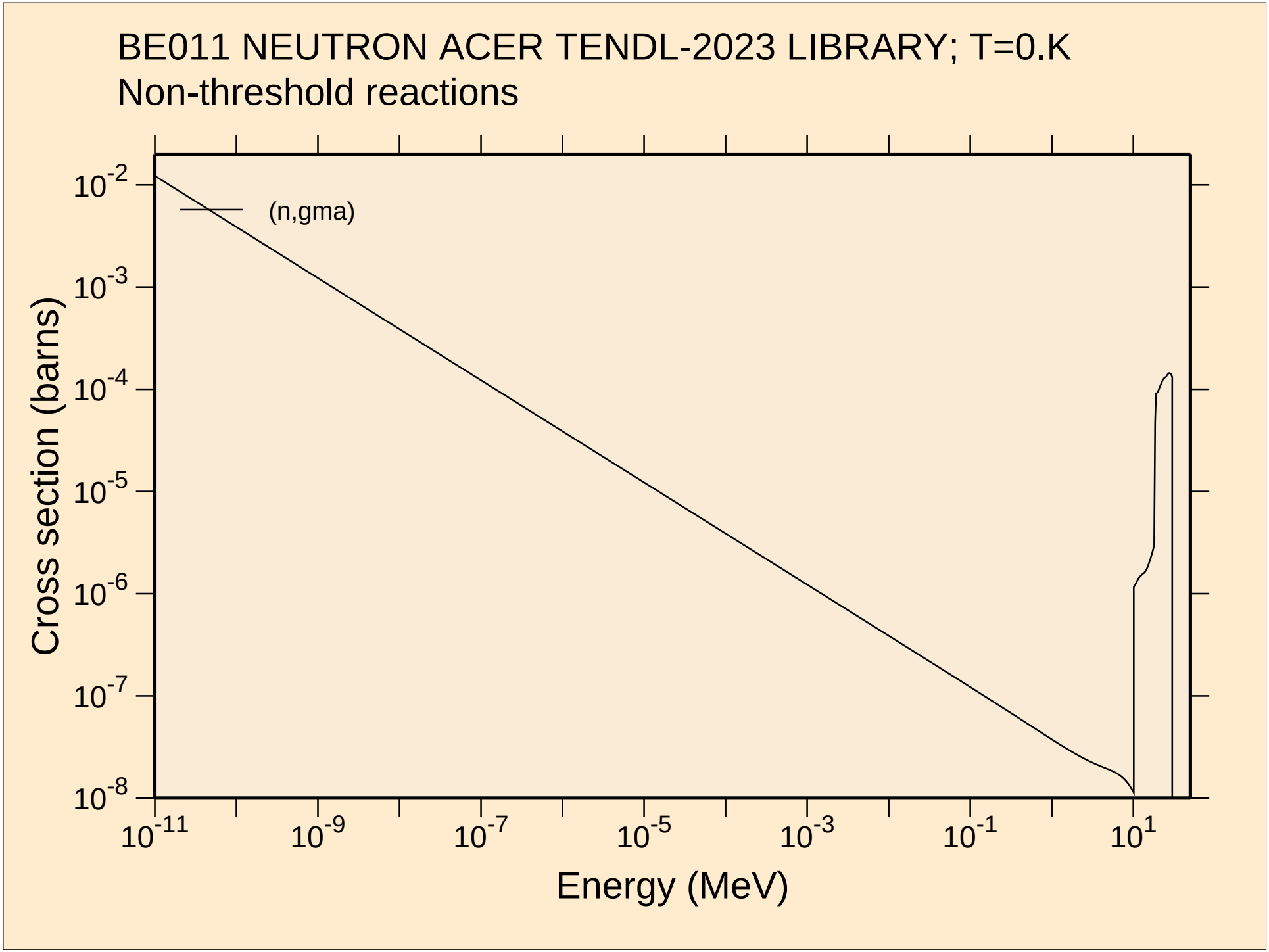
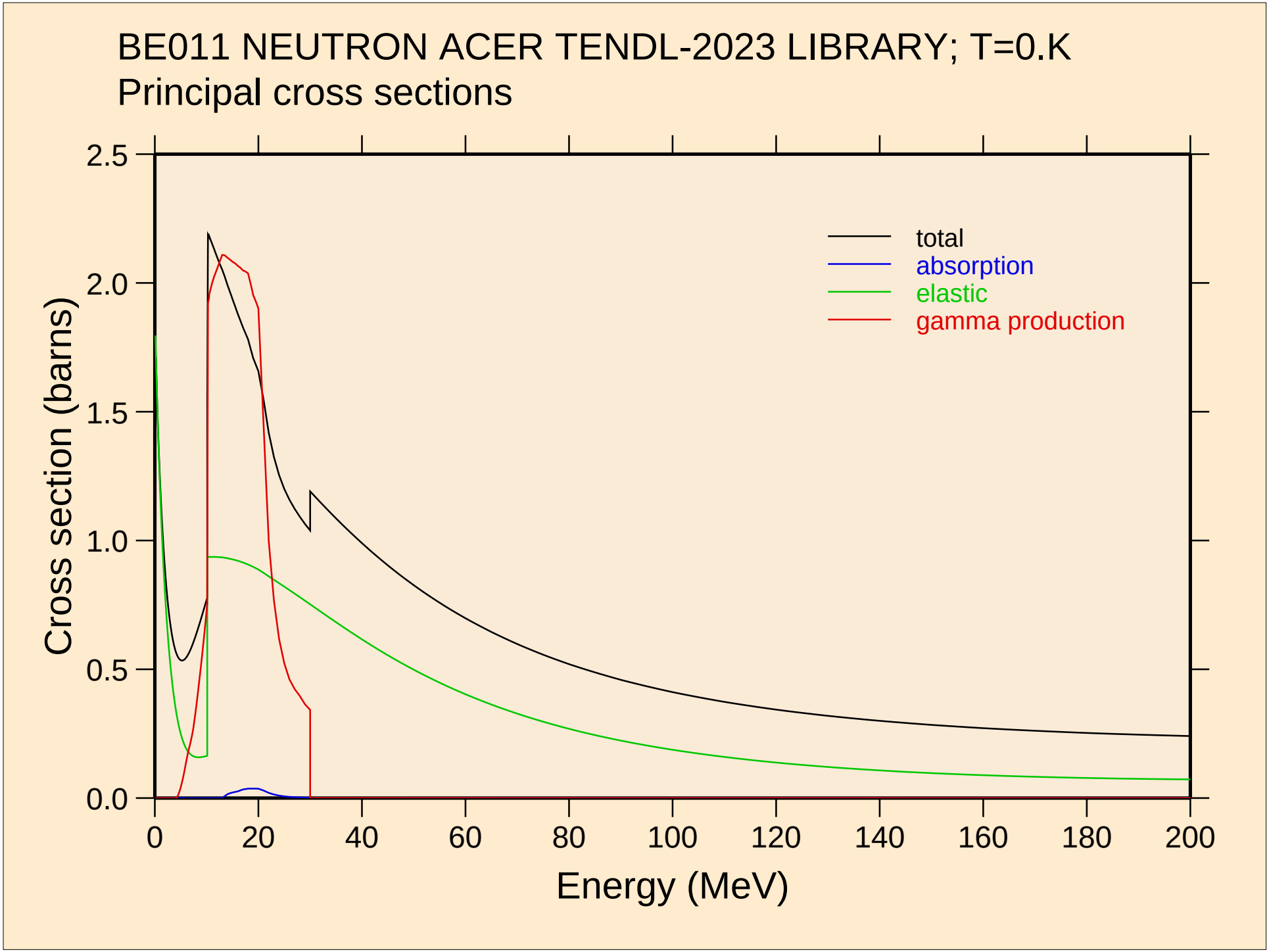
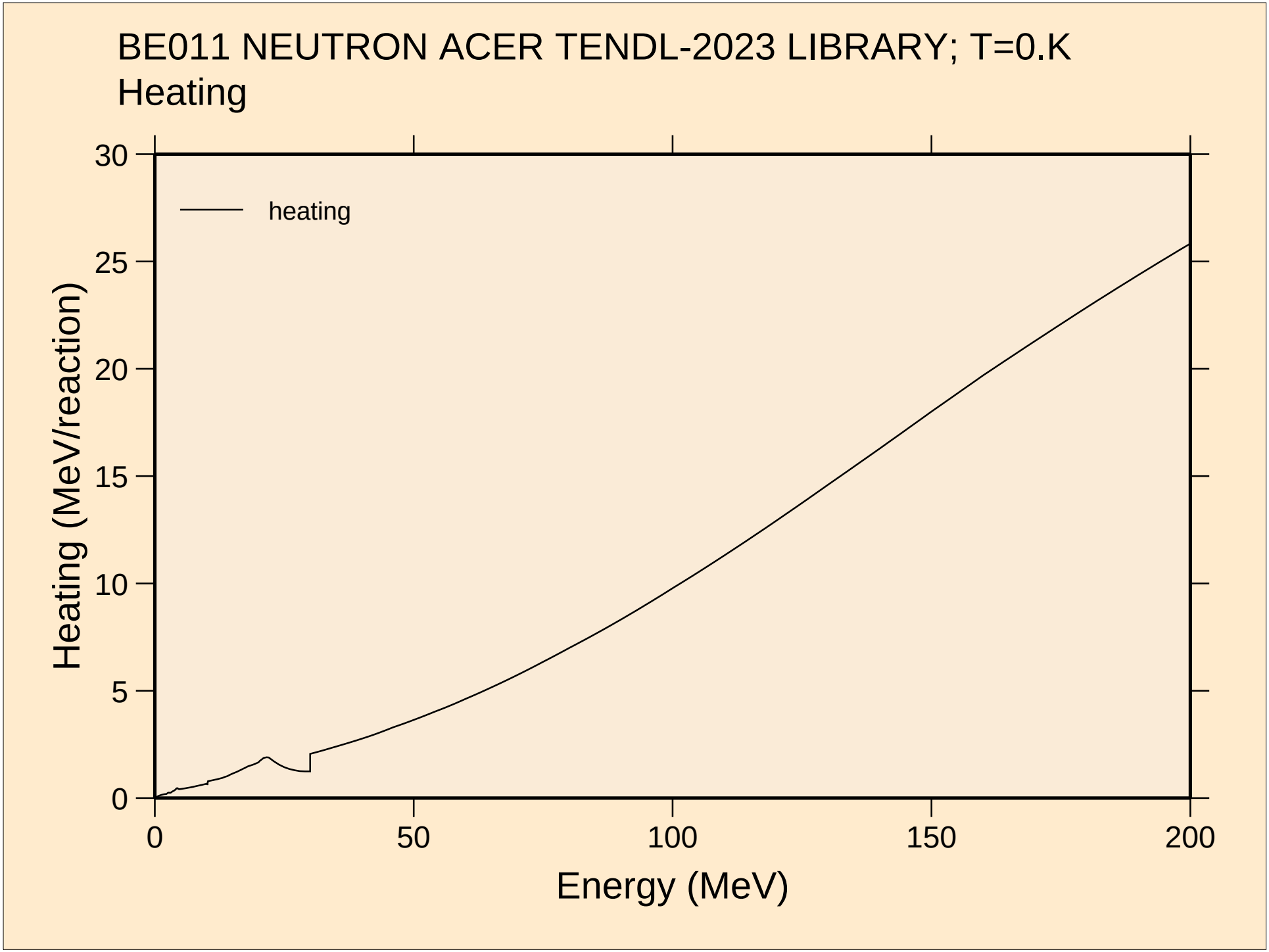

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Principal cross sections
Cross section (barns)
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
total
absorption
elastic
gamma production
10^-11
10^-9
10^-7
10^-5
10^-3
10^-1
10^1
Energy (MeV)

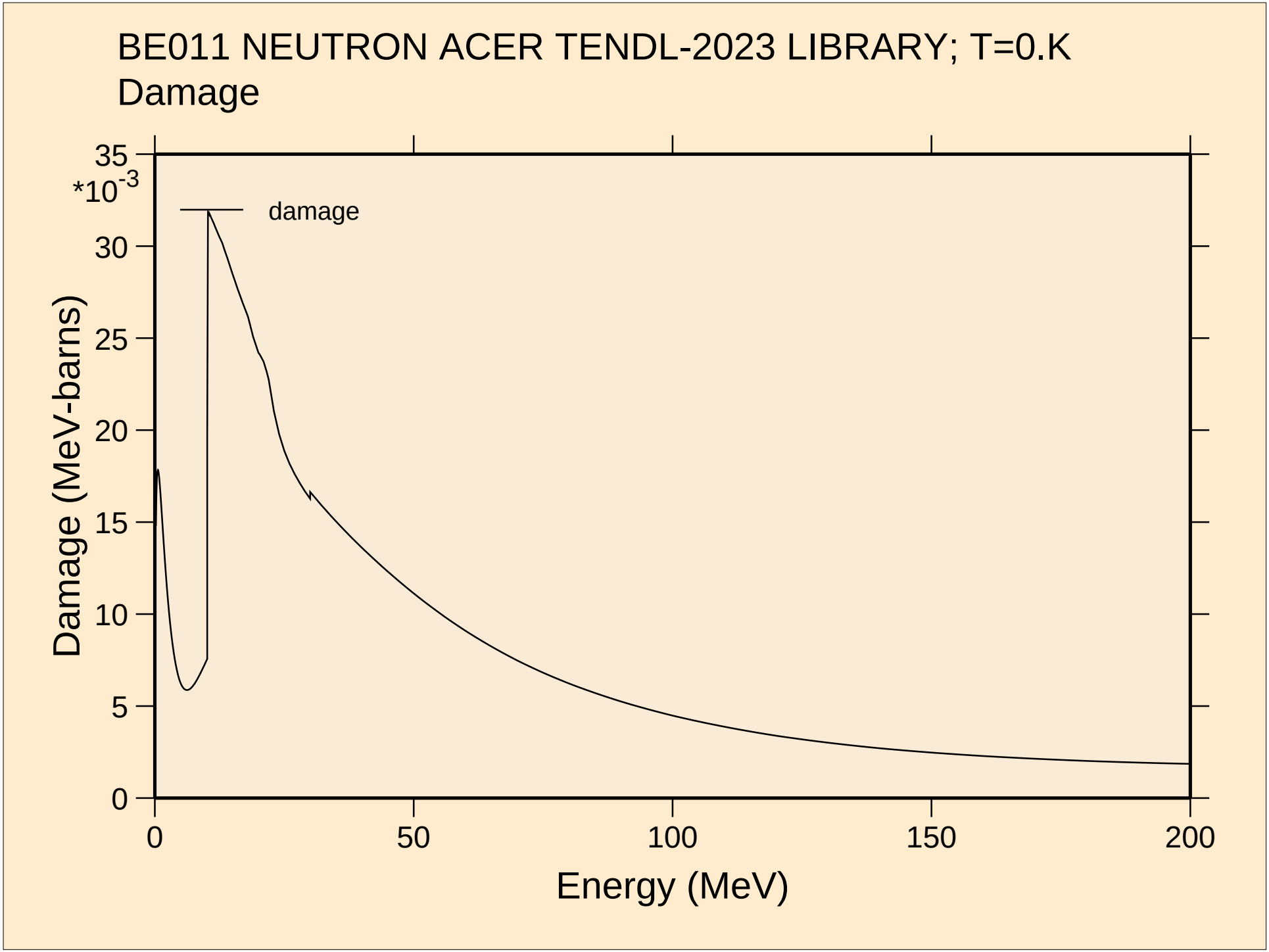

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Heating
heating
Heating (MeV/reaction)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-11}
10^{-9}
10^{-7}
10^{-5}
10^{-3}
10^{-1}
10^{1}
Energy (MeV)

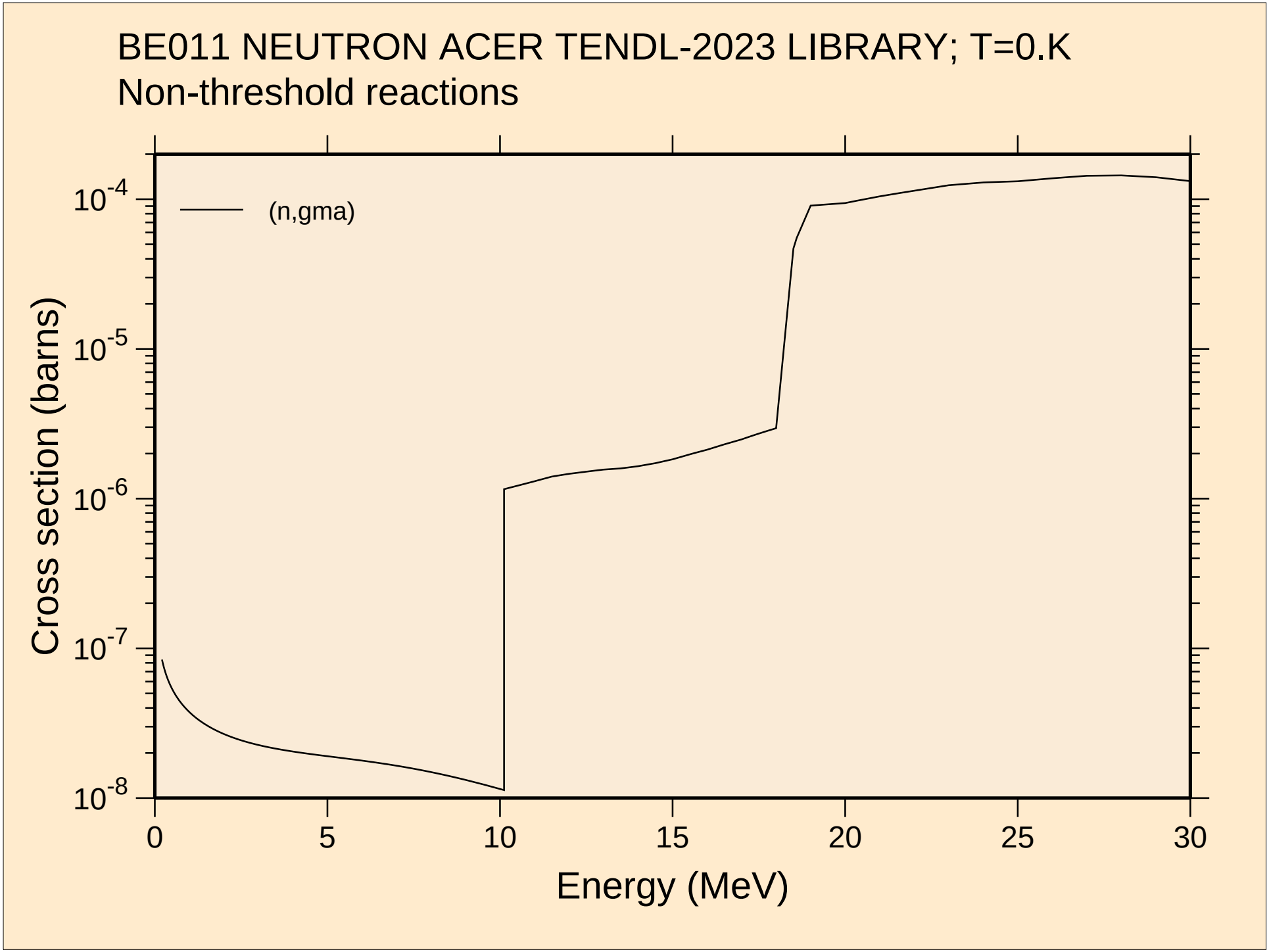

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Damage
damage
Damage (MeV-barns)
10-2
10-3
10-4
10-5
10-6
10-7
10-11
10-9
10-7
10-5
10-3
10-1
101
Energy (MeV)

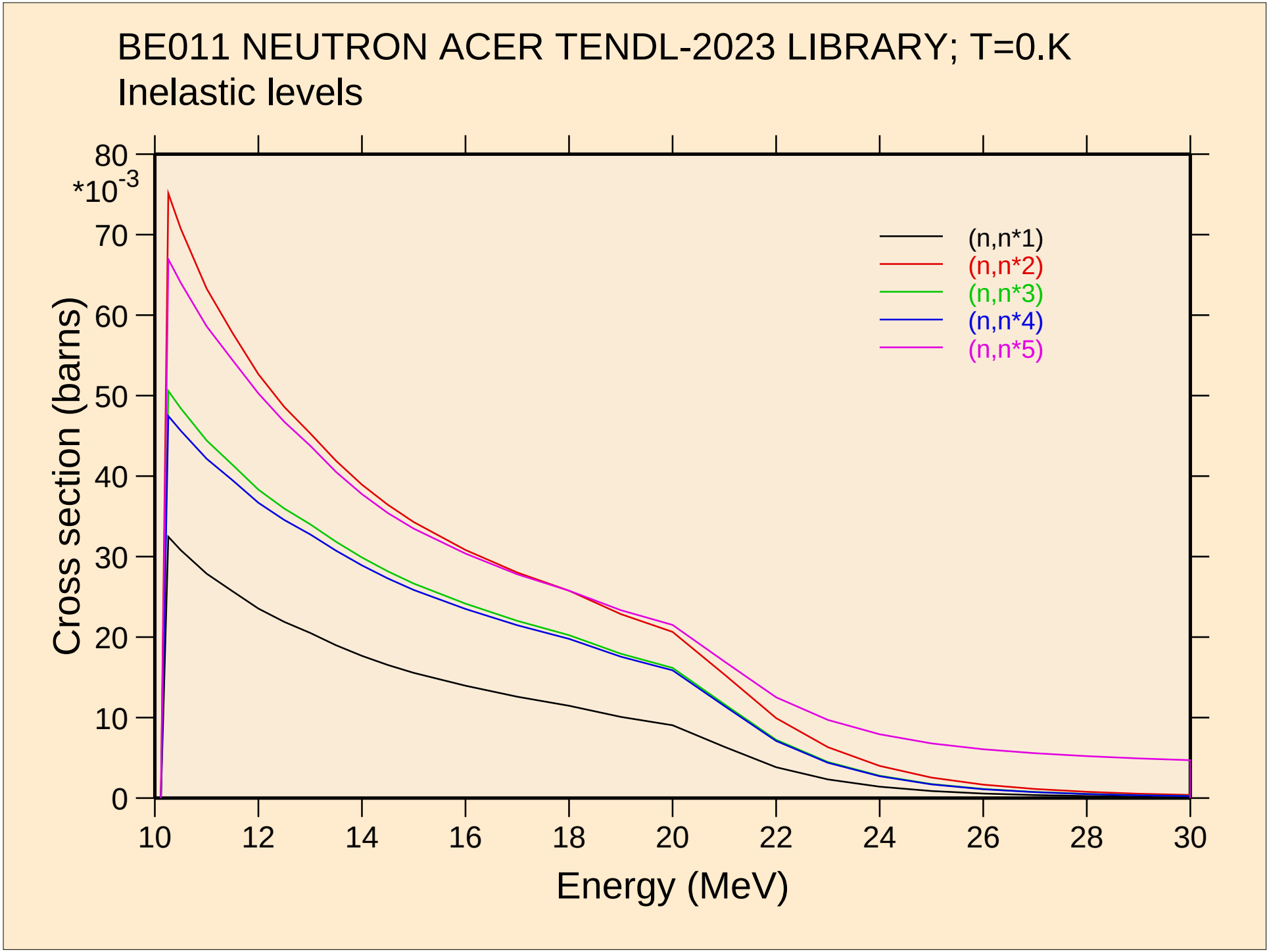

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Non-threshold reactions
(n,gma)
Cross section (barns)
10-2
10-3
10-4
10-5
10-6
10-7
10-8
10-11
10-9
10-7
10-5
10-3
10-1
101
Energy (MeV)

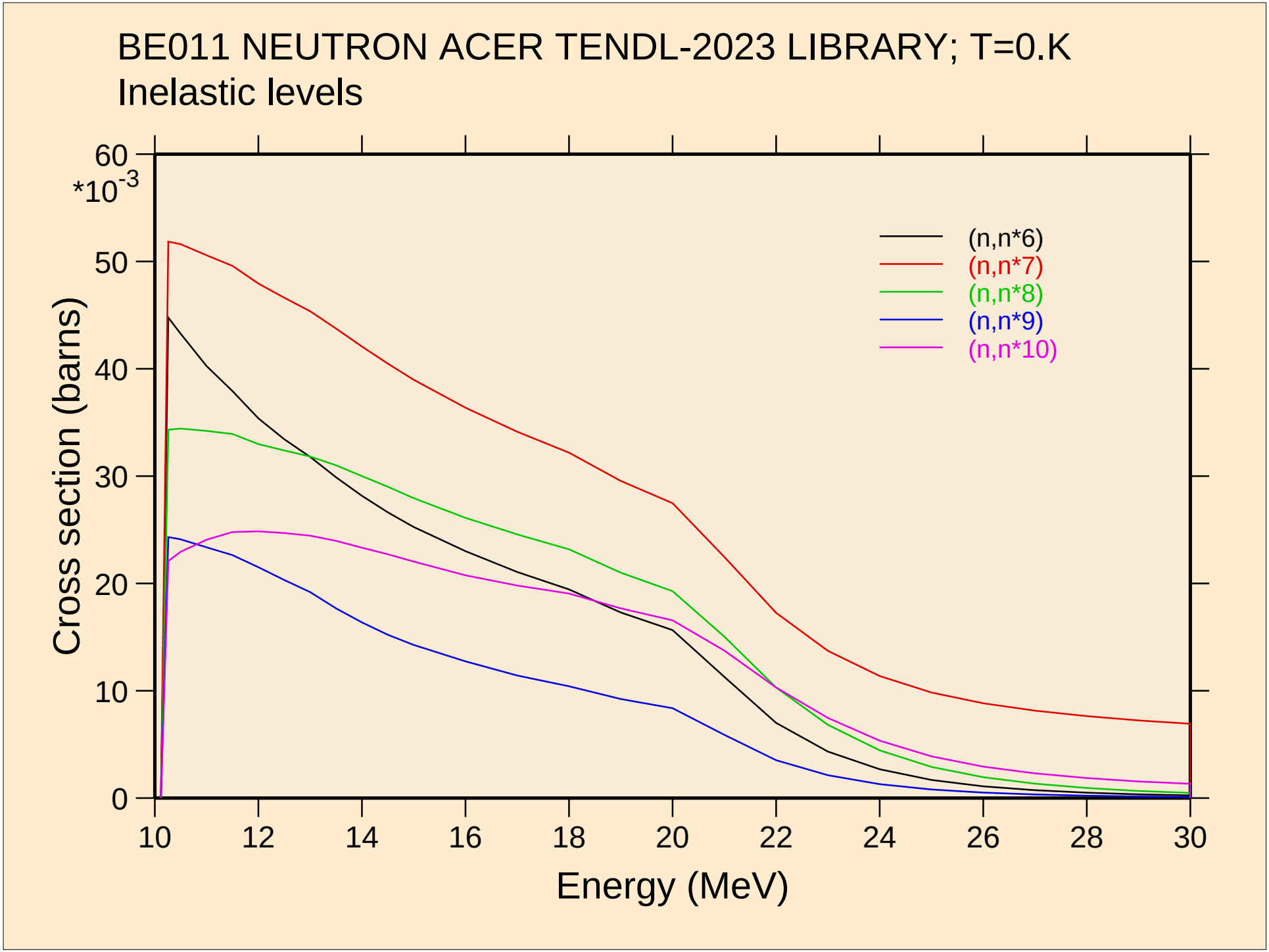

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
0.0
0.5
1.0
1.5
2.0
2.5
0
20
40
60
80
100
120
140
160
180
200

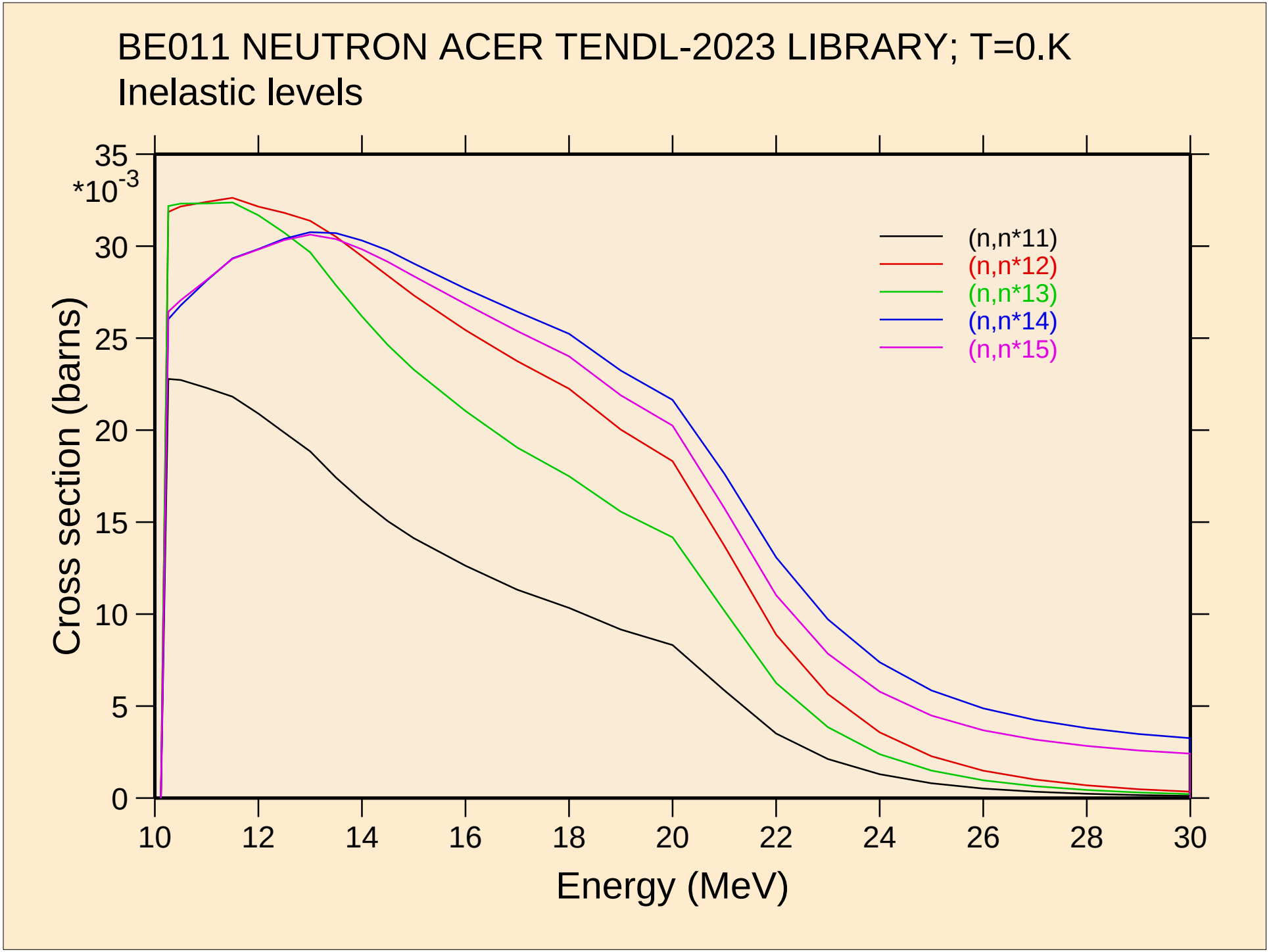

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Heating
heating
Heating (MeV/reaction)
Energy (MeV)
0
5
10
15
20
25
30
0
50
100
150
200

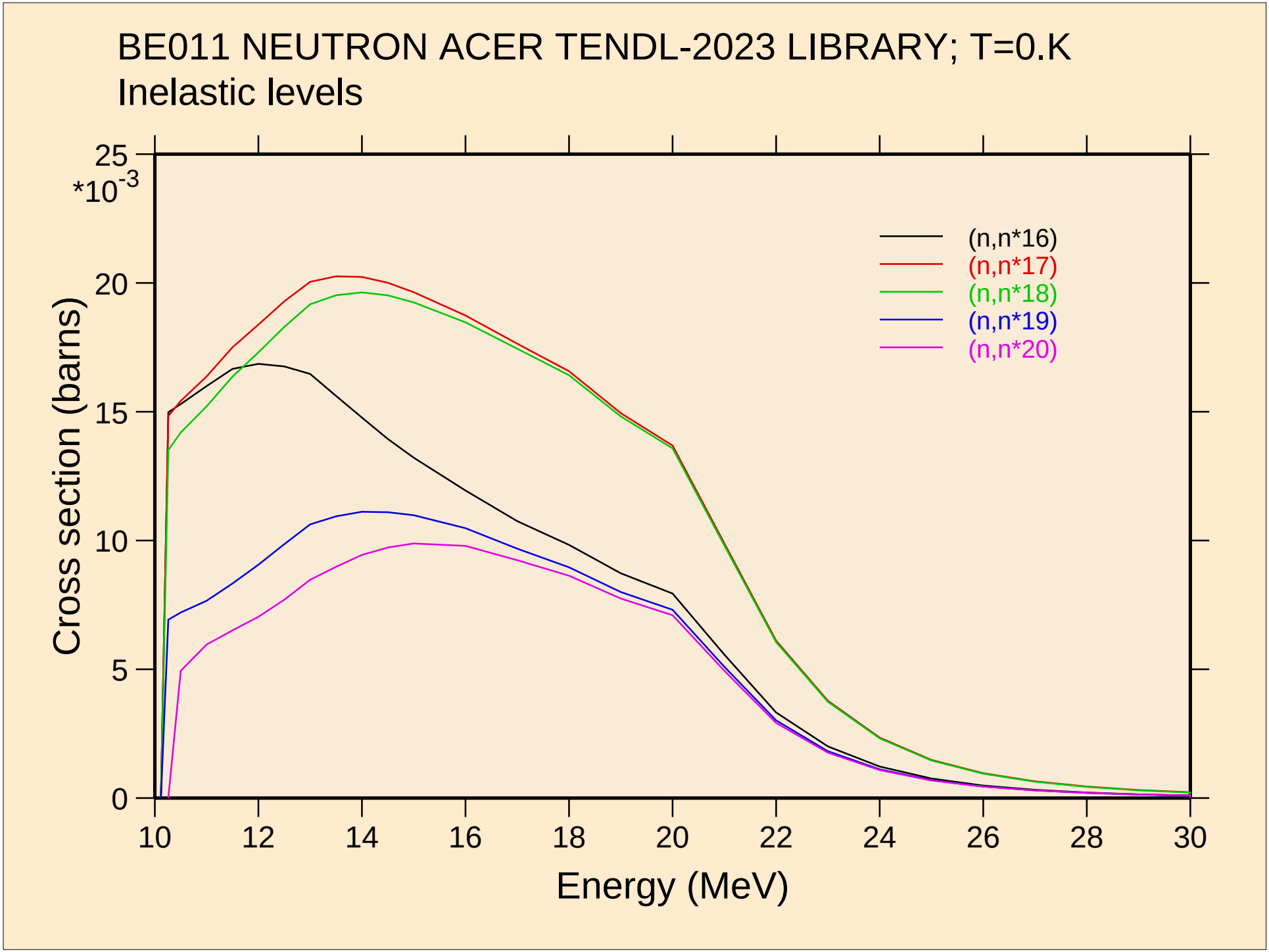

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Damage
*10-3
damage
35
30
25
20
15
10
5
0
Damage (MeV-barns)
0
50
100
150
200
Energy (MeV)

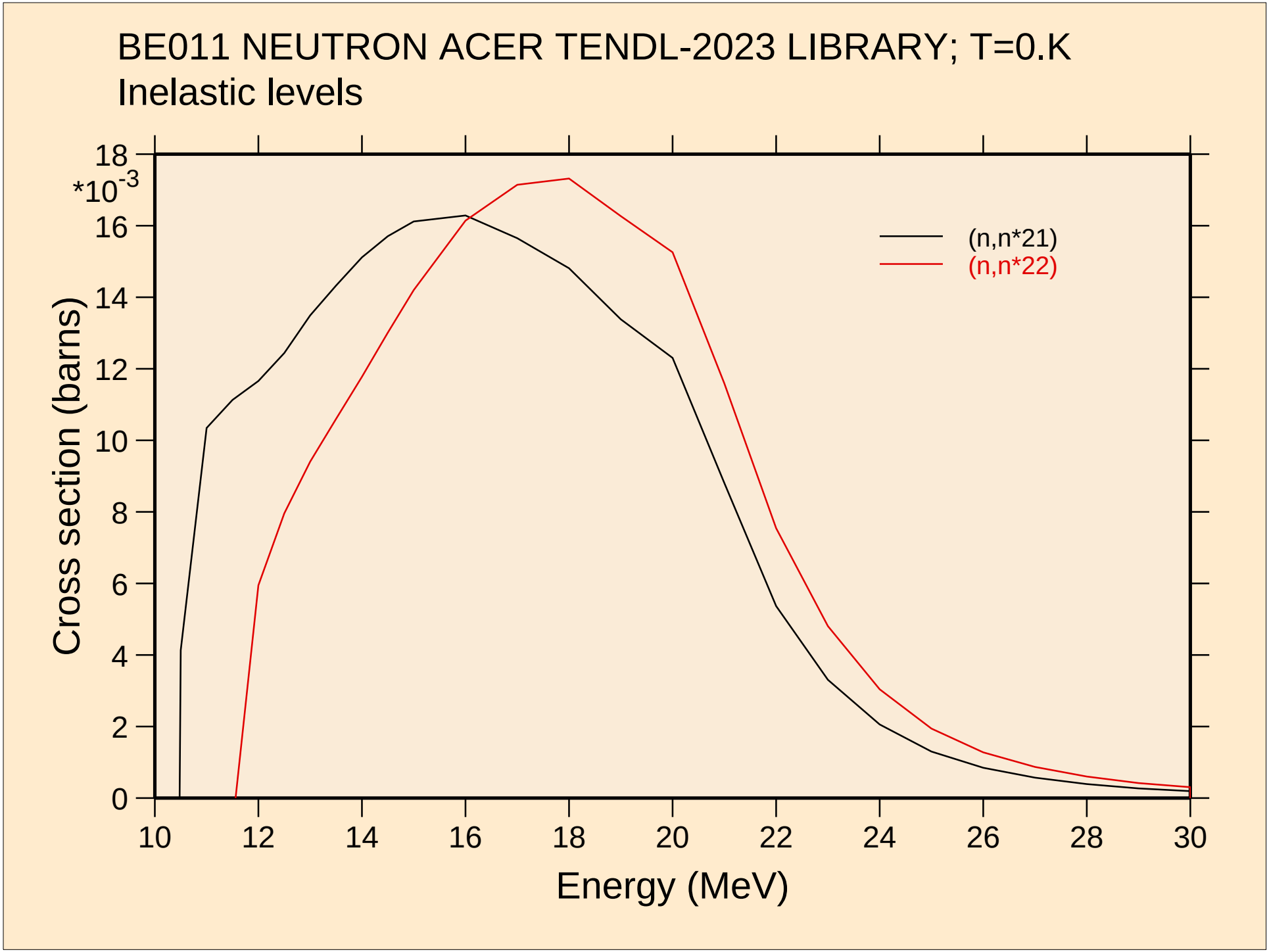

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Non-threshold reactions
(n,gma)
Cross section (barns)
10-4
10-5
10-6
10-7
10-8
0
5
10
15
20
25
30
Energy (MeV)

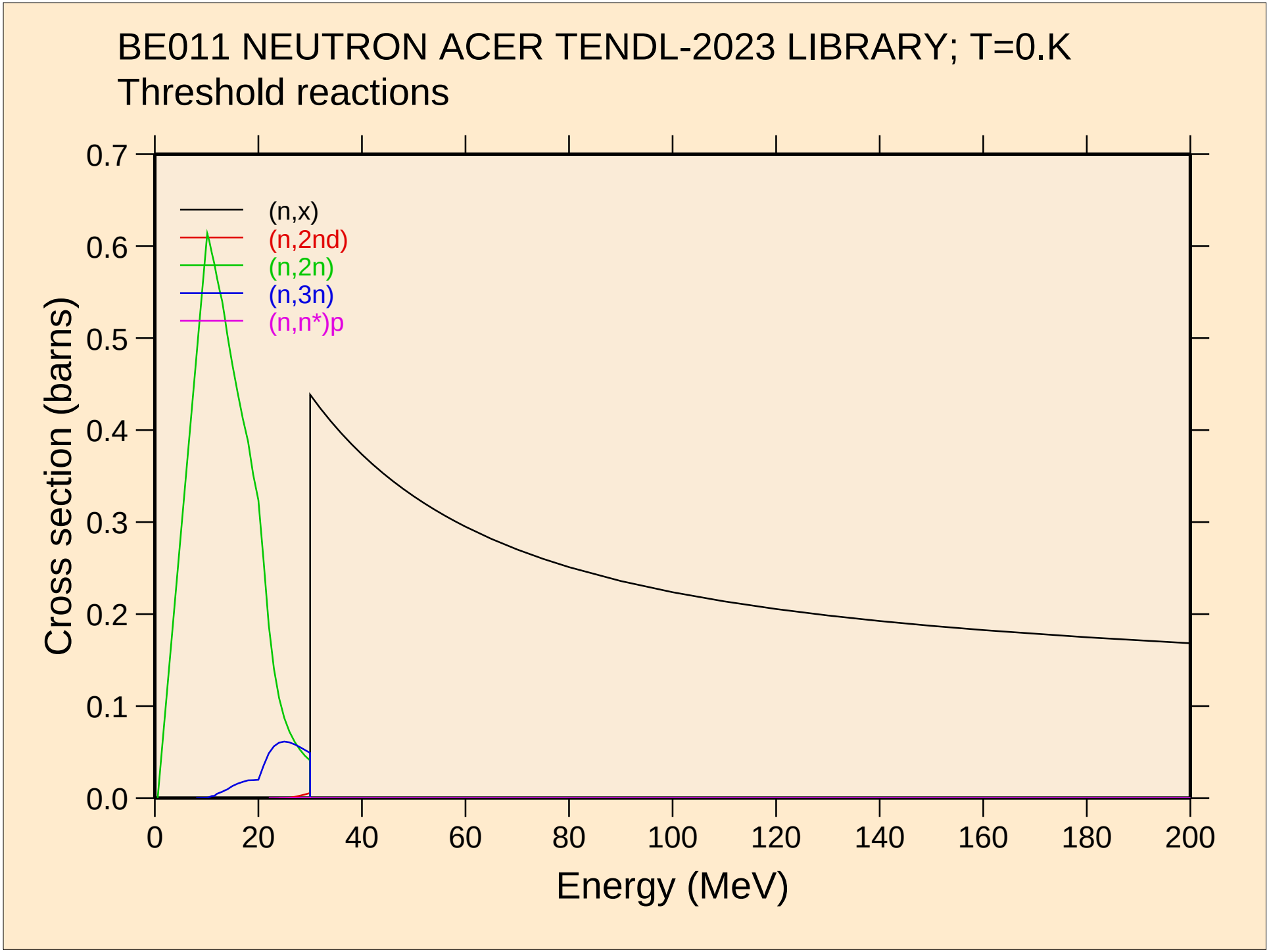

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Inelastic levels
Cross section (barns)
*10-3
80
70
60
50
40
30
20
10
0
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)
(n,n*5)

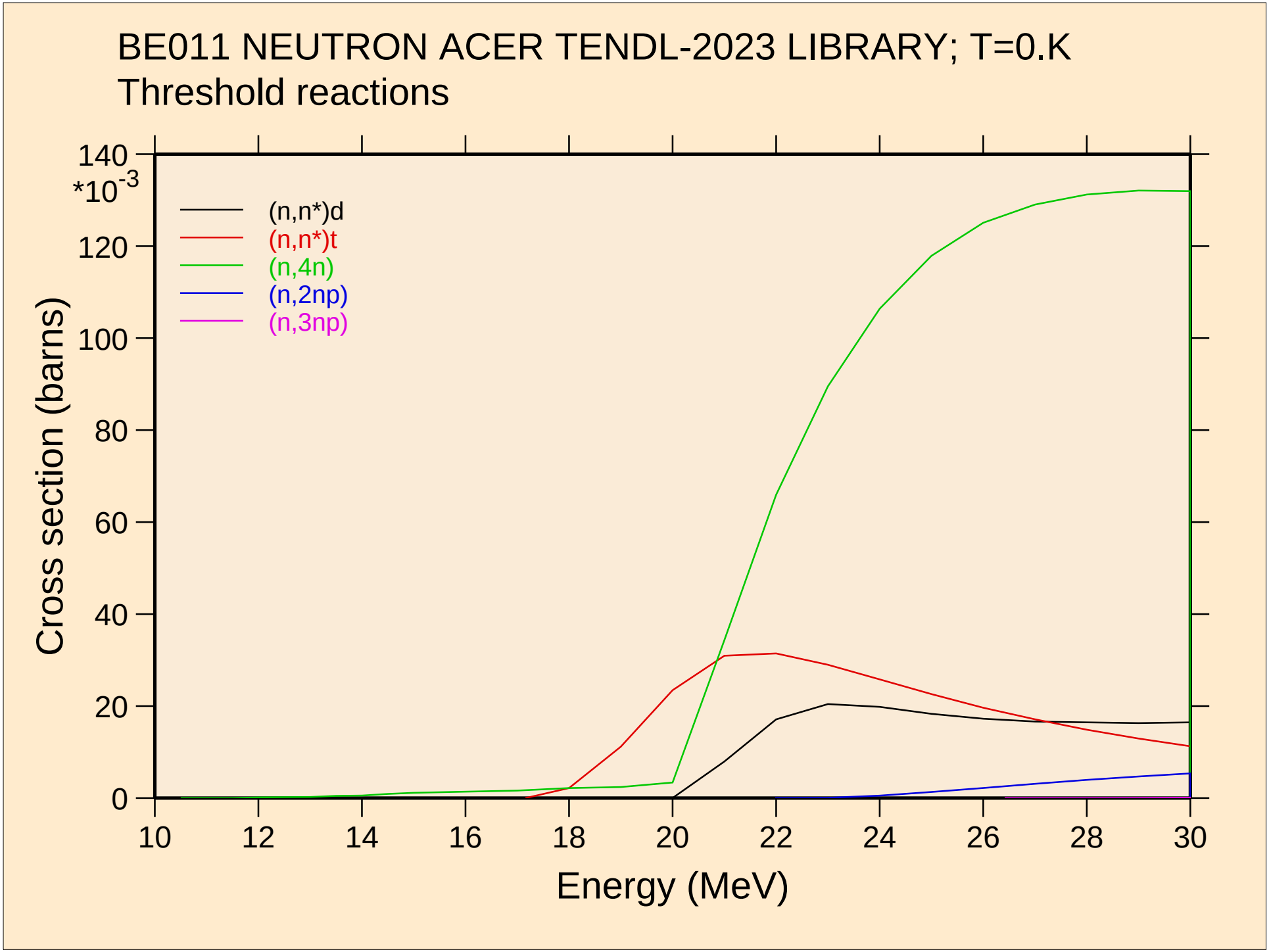

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Inelastic levels
Cross section (barns)
*10-3
60
50
40
30
20
10
0
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)
(n,n*6)
(n,n*7)
(n,n*8)
(n,n*9)
(n,n*10)

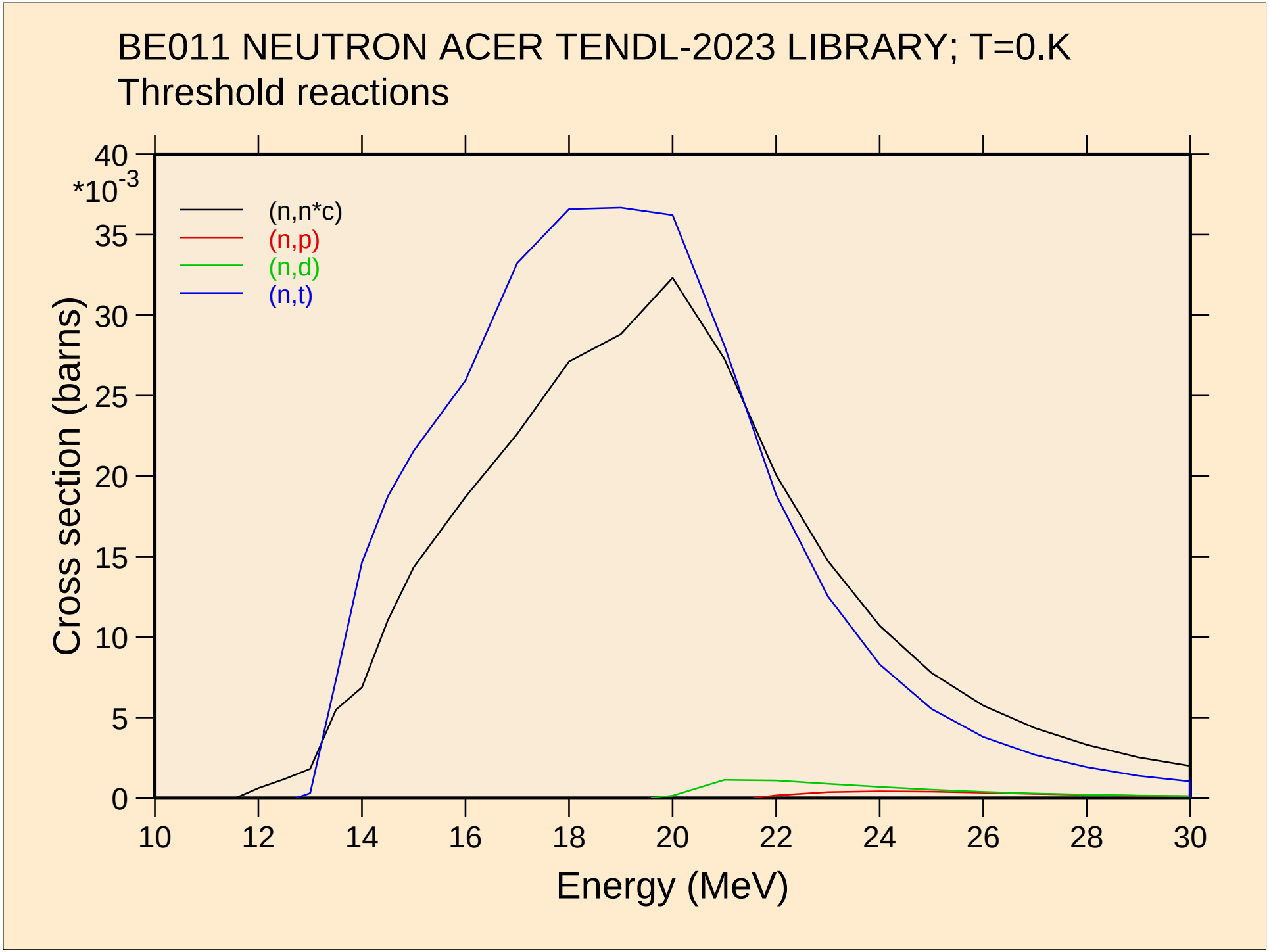

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Inelastic levels
Cross section (barns)
*10-3
35
30
25
20
15
10
5
0
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)
(n,n*11)
(n,n*12)
(n,n*13)
(n,n*14)
(n,n*15)

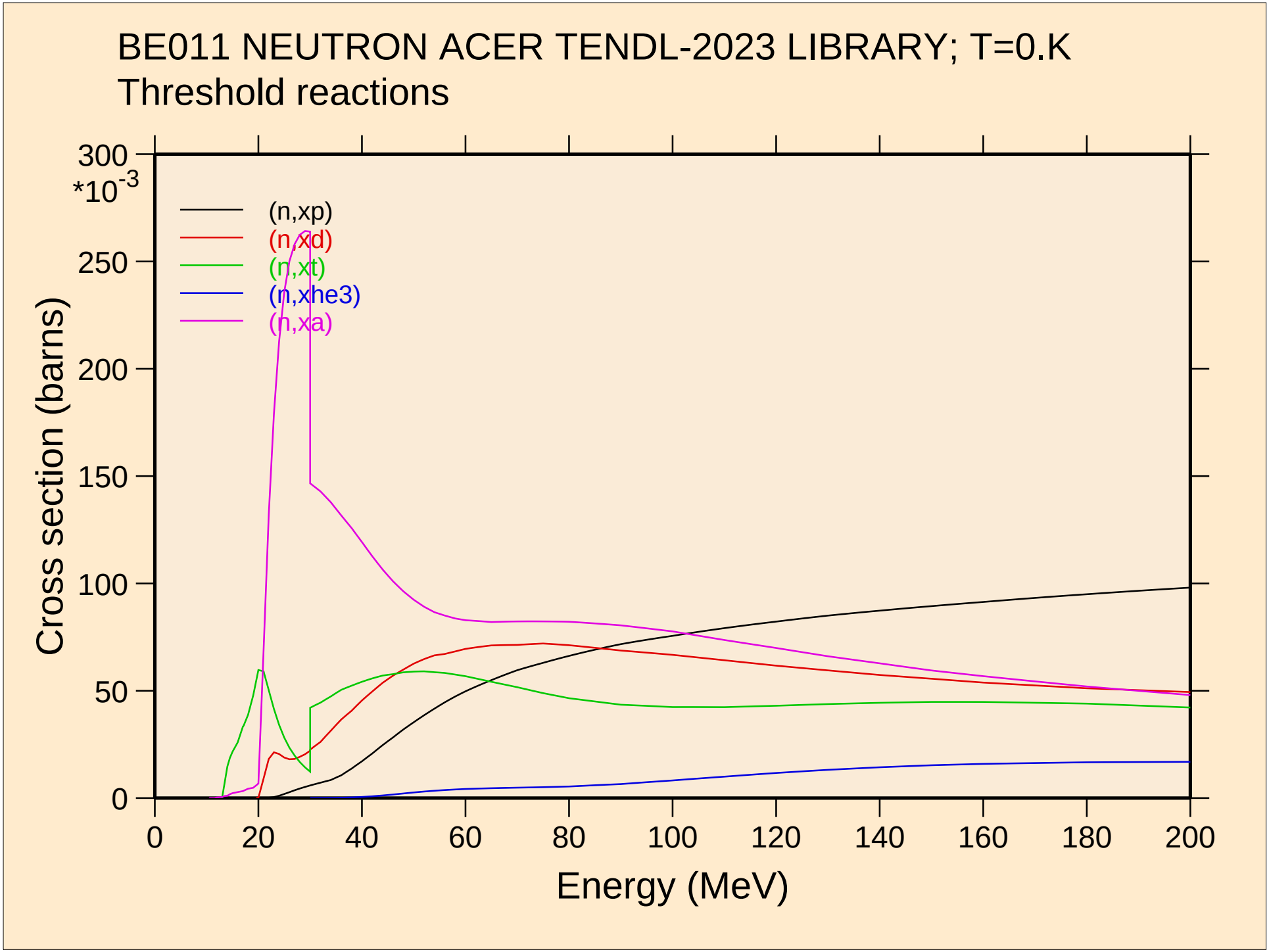

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Inelastic levels
*10-3
25
20
15
10
5
0
Cross section (barns)
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)
(n,n*16)
(n,n*17)
(n,n*18)
(n,n*19)
(n,n*20)

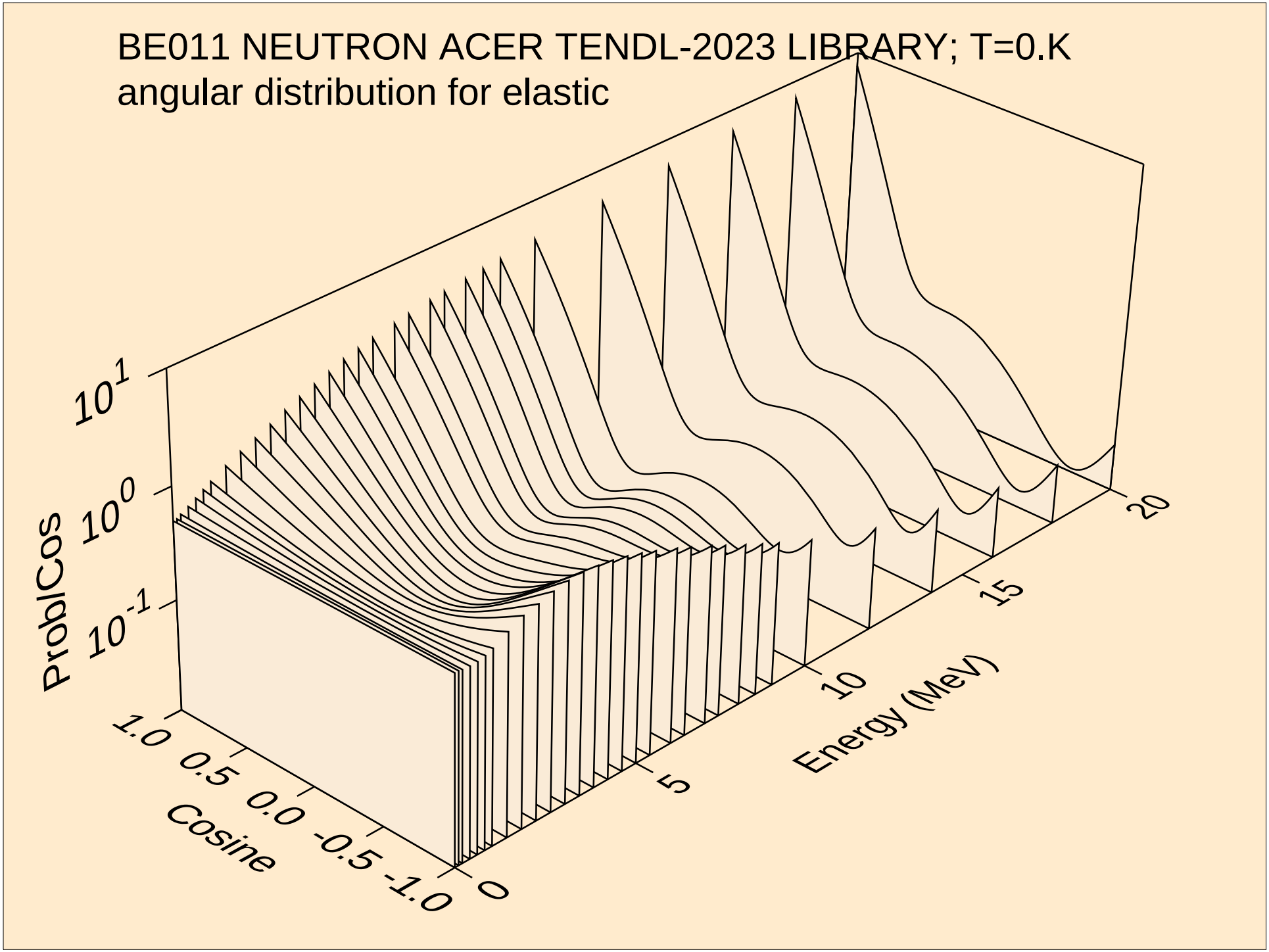

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Inelastic levels
*10-3
Cross section (barns)
Energy (MeV)
(n,n*21)
(n,n*22)
0
2
4
6
8
10
12
14
16
18
10
12
14
16
18
20
22
24
26
28
30

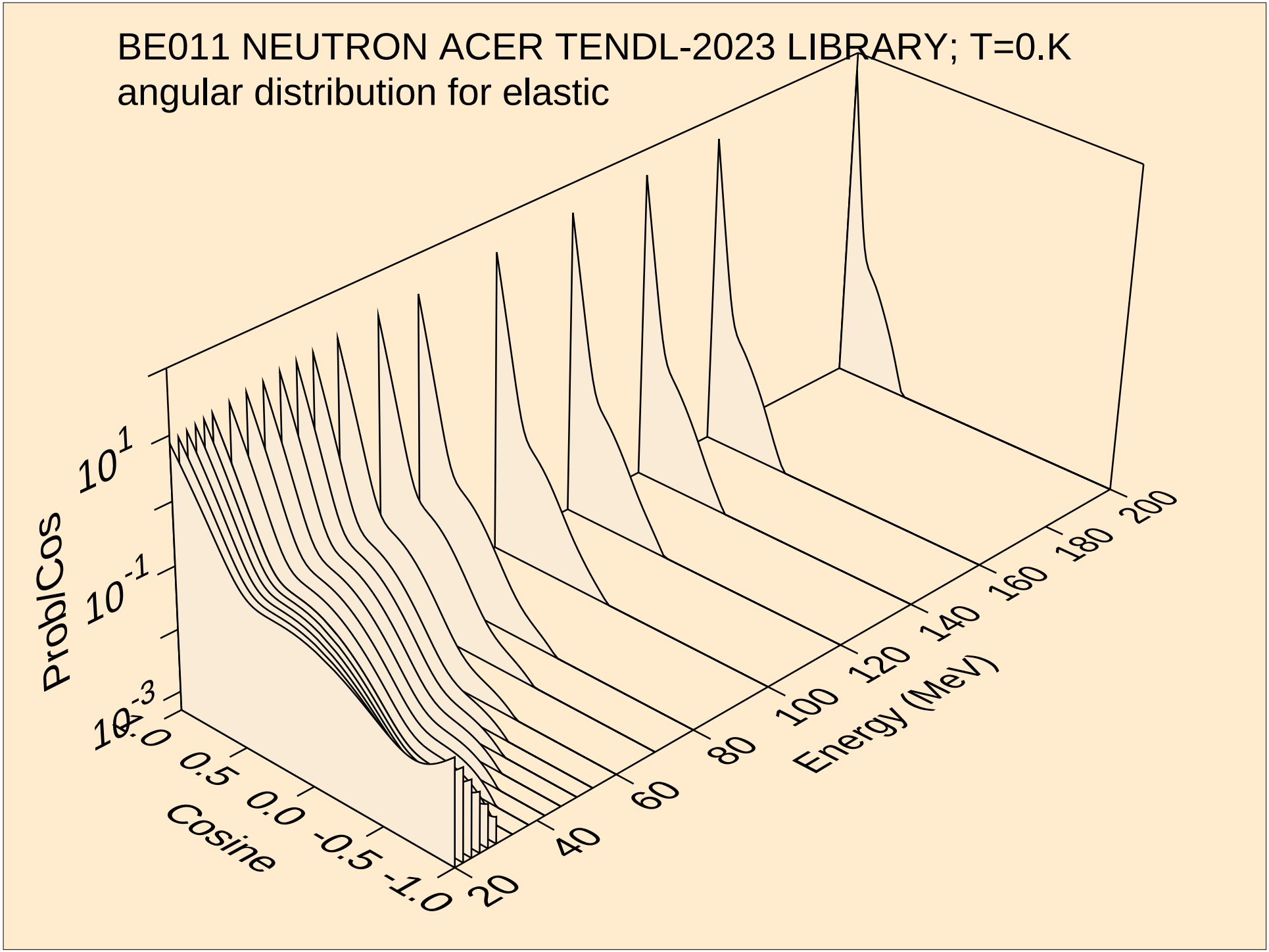

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Threshold reactions
(n,x)
(n,2nd)
(n,2n)
(n,3n)
(n,n*)p
Cross section (barns)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0
20
40
60
80
100
120
140
160
180
200
Energy (MeV)

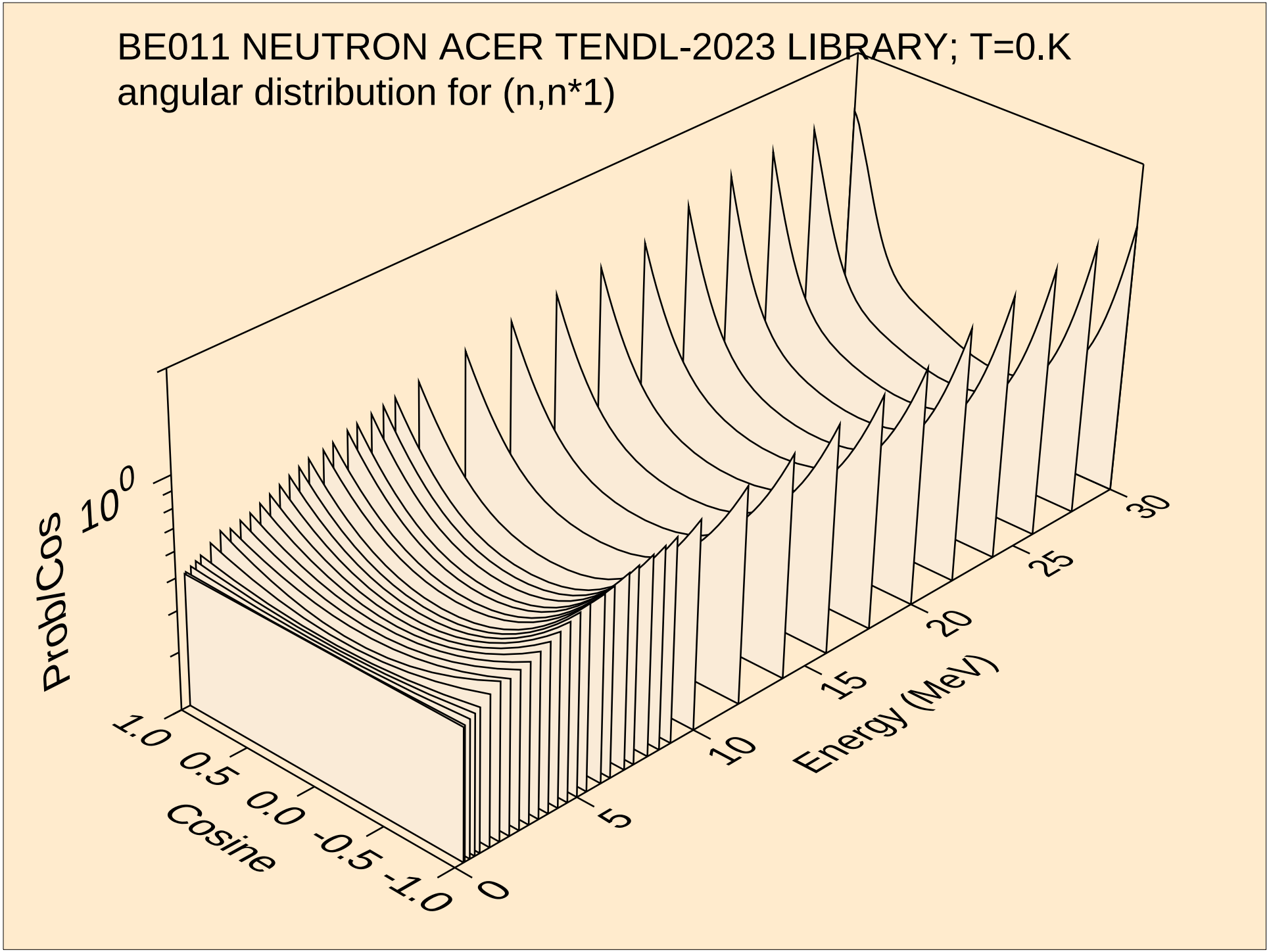

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Threshold reactions
140
*10-3
120
100
80
60
40
20
0
Cross section (barns)
(n,n*)d
(n,n*)t
(n,4n)
(n,2np)
(n,3np)
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

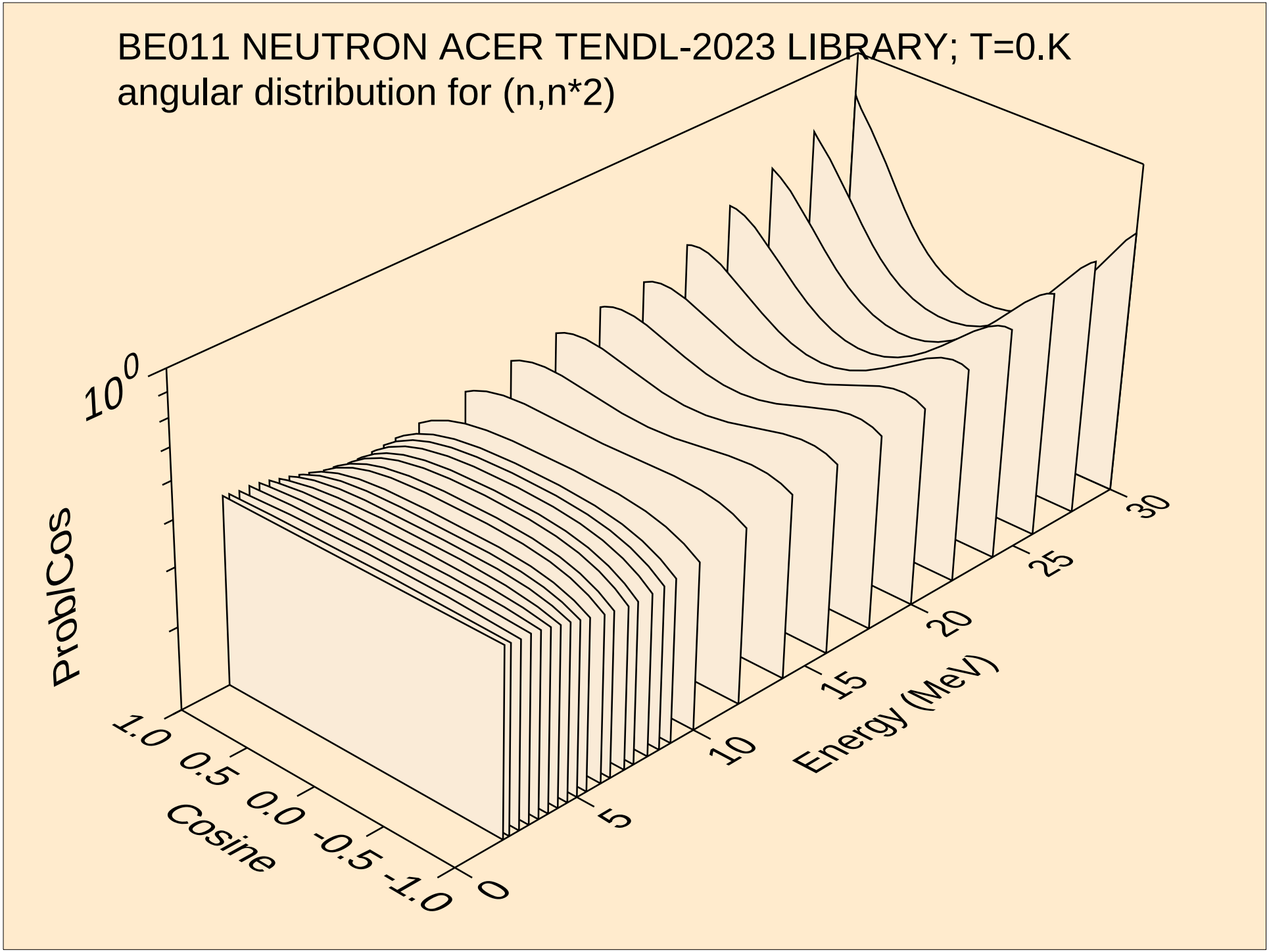

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Threshold reactions
*10-3
40
35
30
25
20
15
10
5
0
Cross section (barns)
(n,n*c)
(n,p)
(n,d)
(n,t)
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

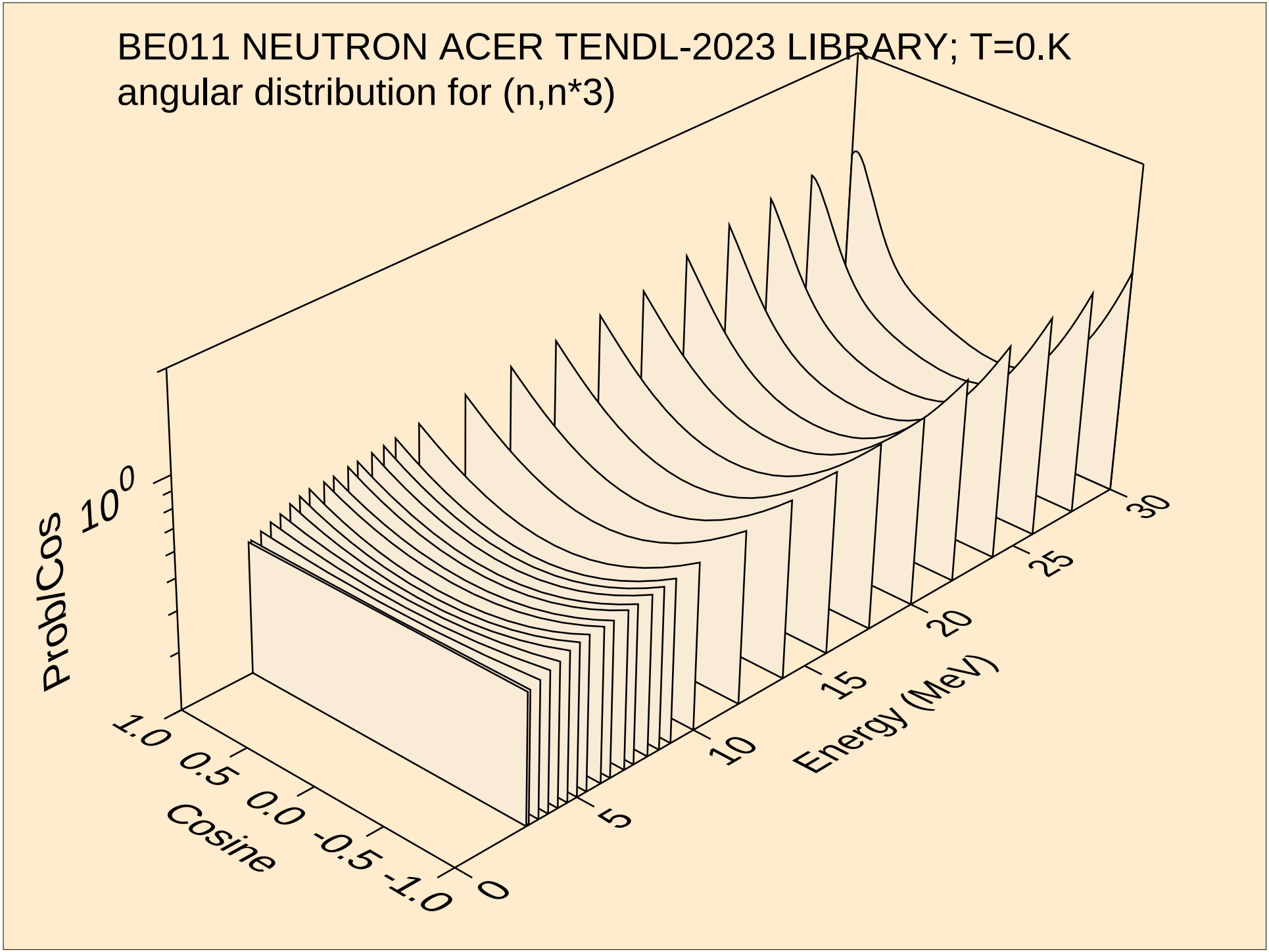

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Threshold reactions
300
*10-3
250
200
150
100
50
0
Cross section (barns)
(n,xp)
(n,xd)
(n,xt)
(n,xhe3)
(n,xa)
0
20
40
60
80
100
120
140
160
180
200
Energy (MeV)

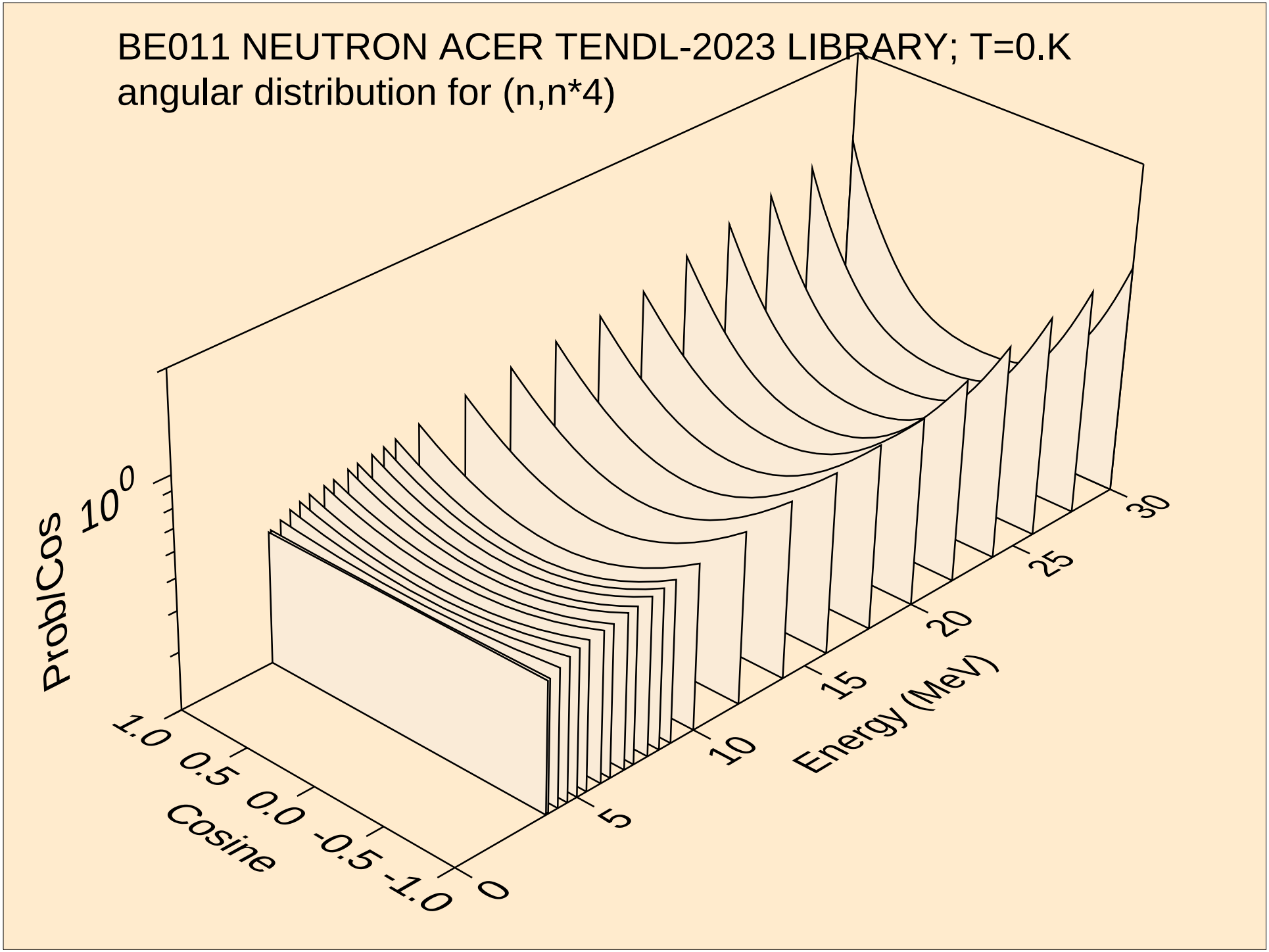

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for elastic
ProbICos
10^{1}
10^{0}
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

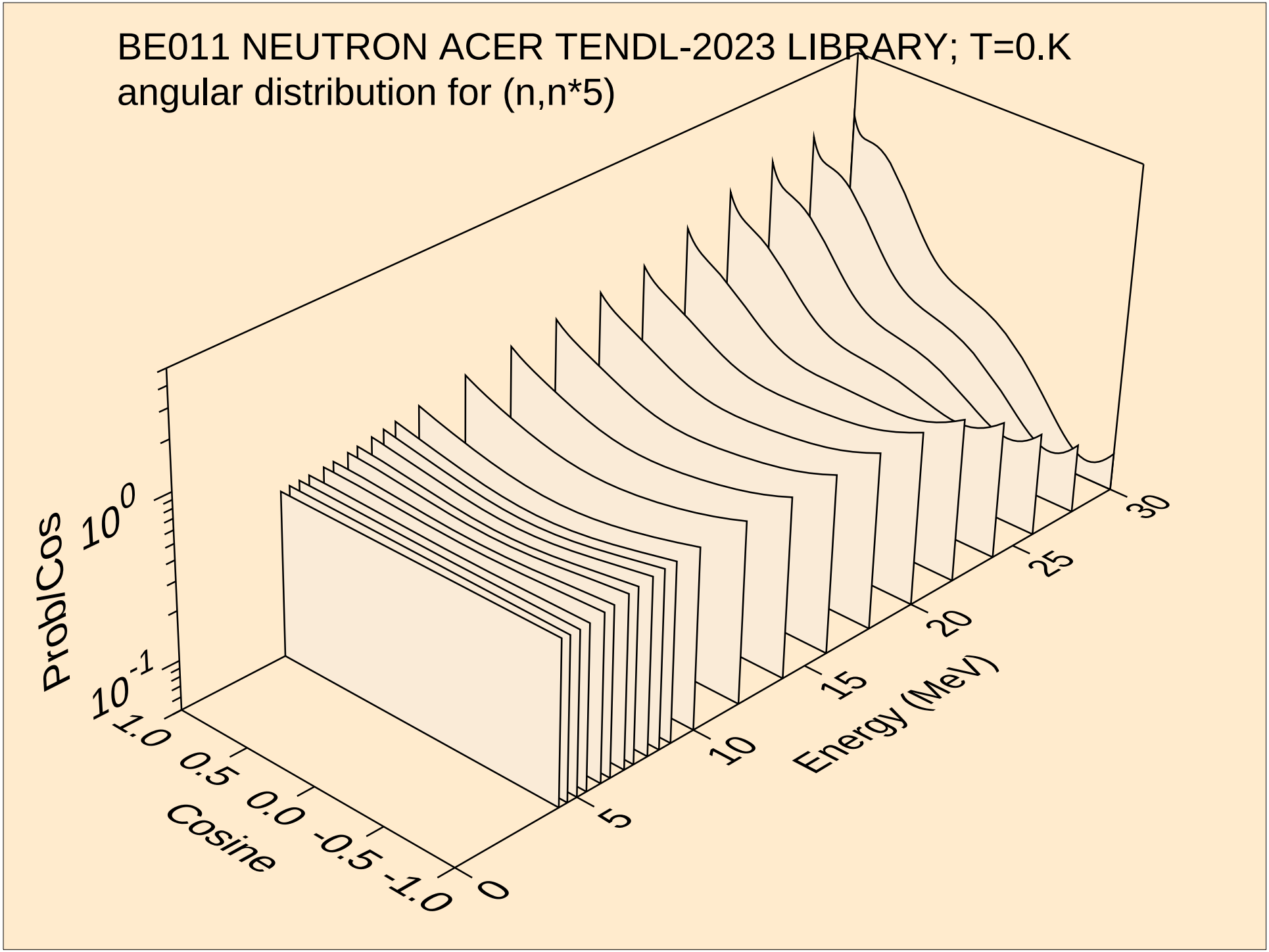

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for elastic
Prob\Cos
10^1
10^-1
10^-3
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
40
60
80
100
120
140
160
180
200
Energy (MeV)

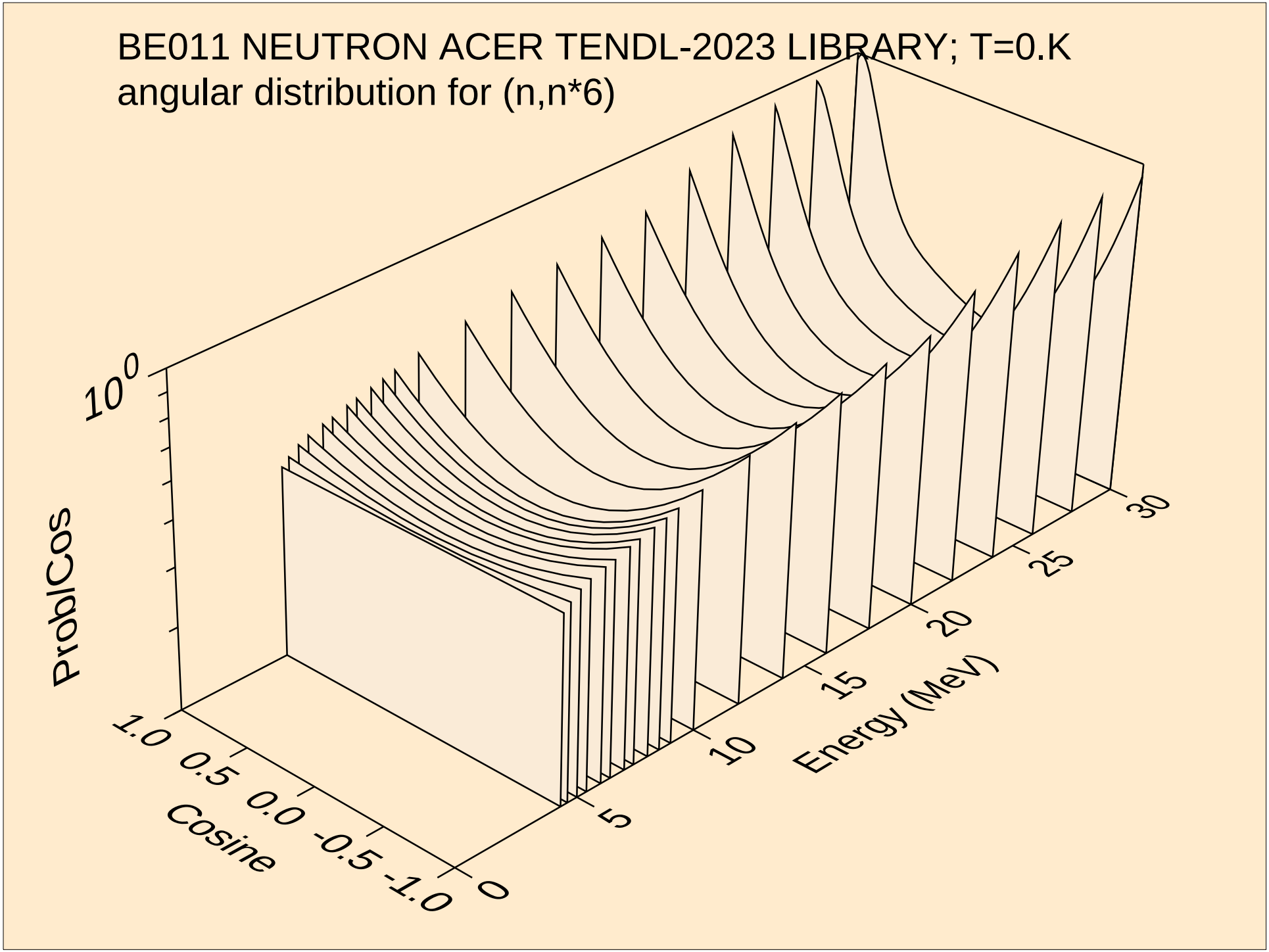

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*1)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

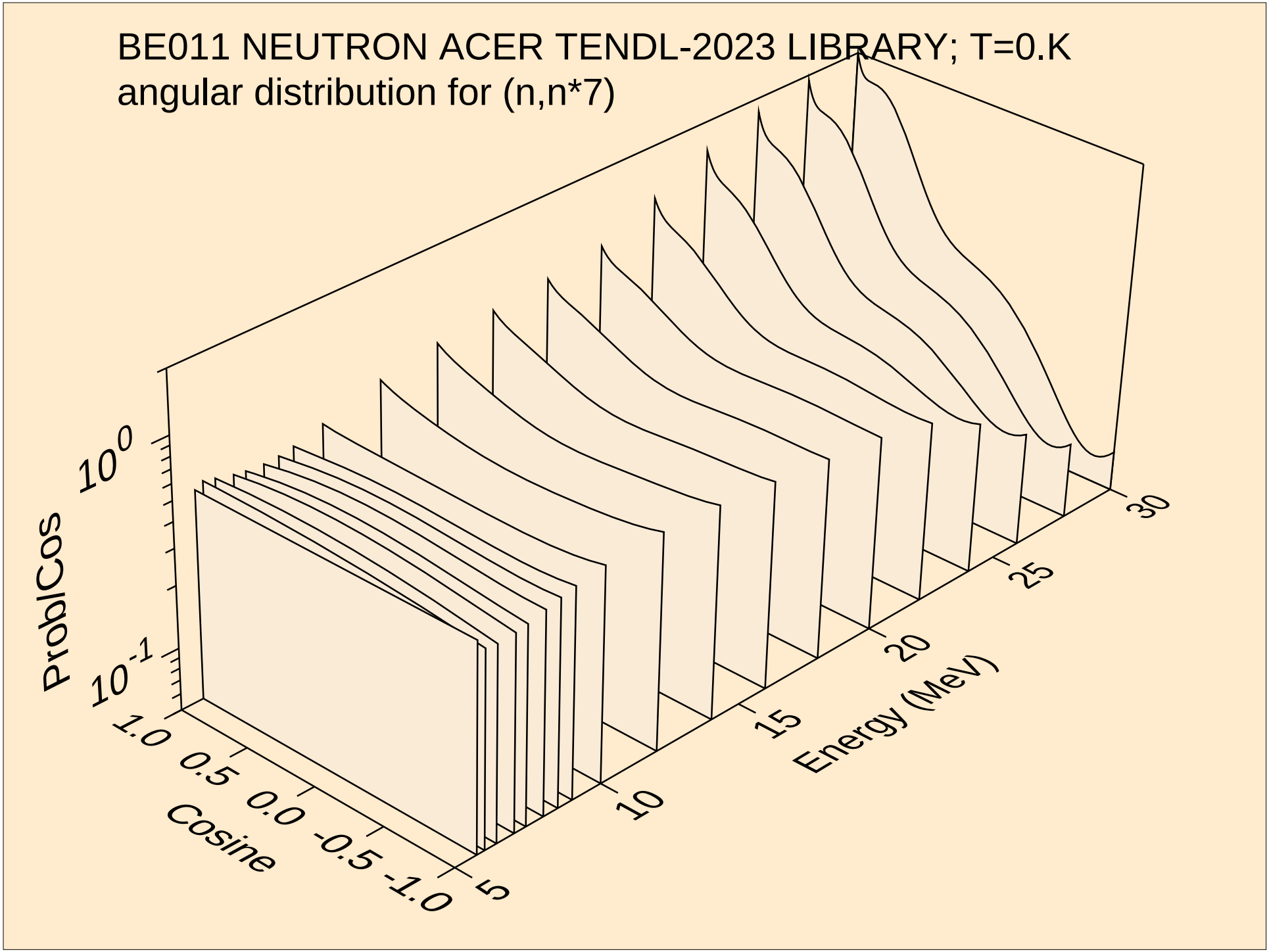

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*2)
10^0
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

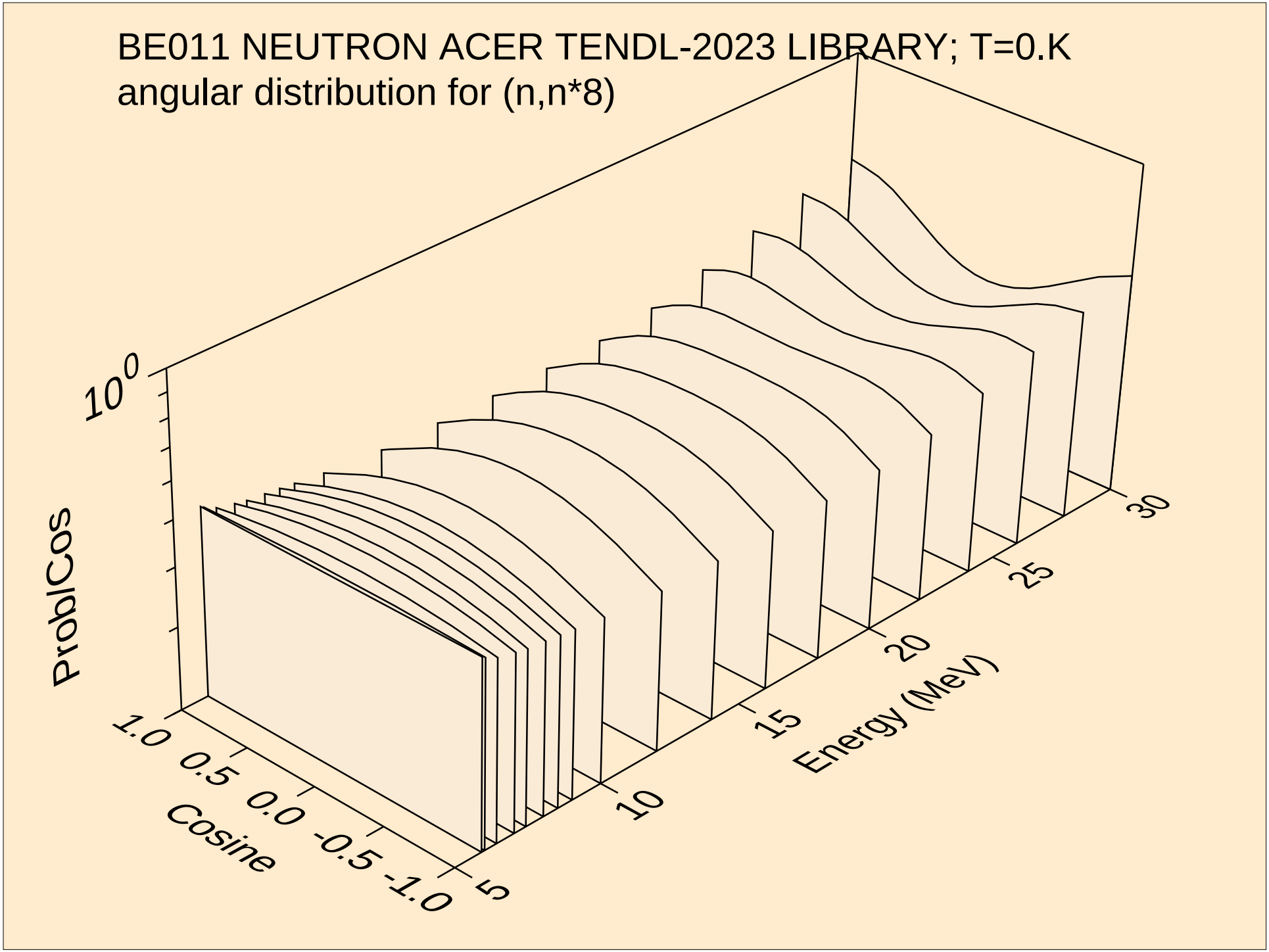

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*3)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

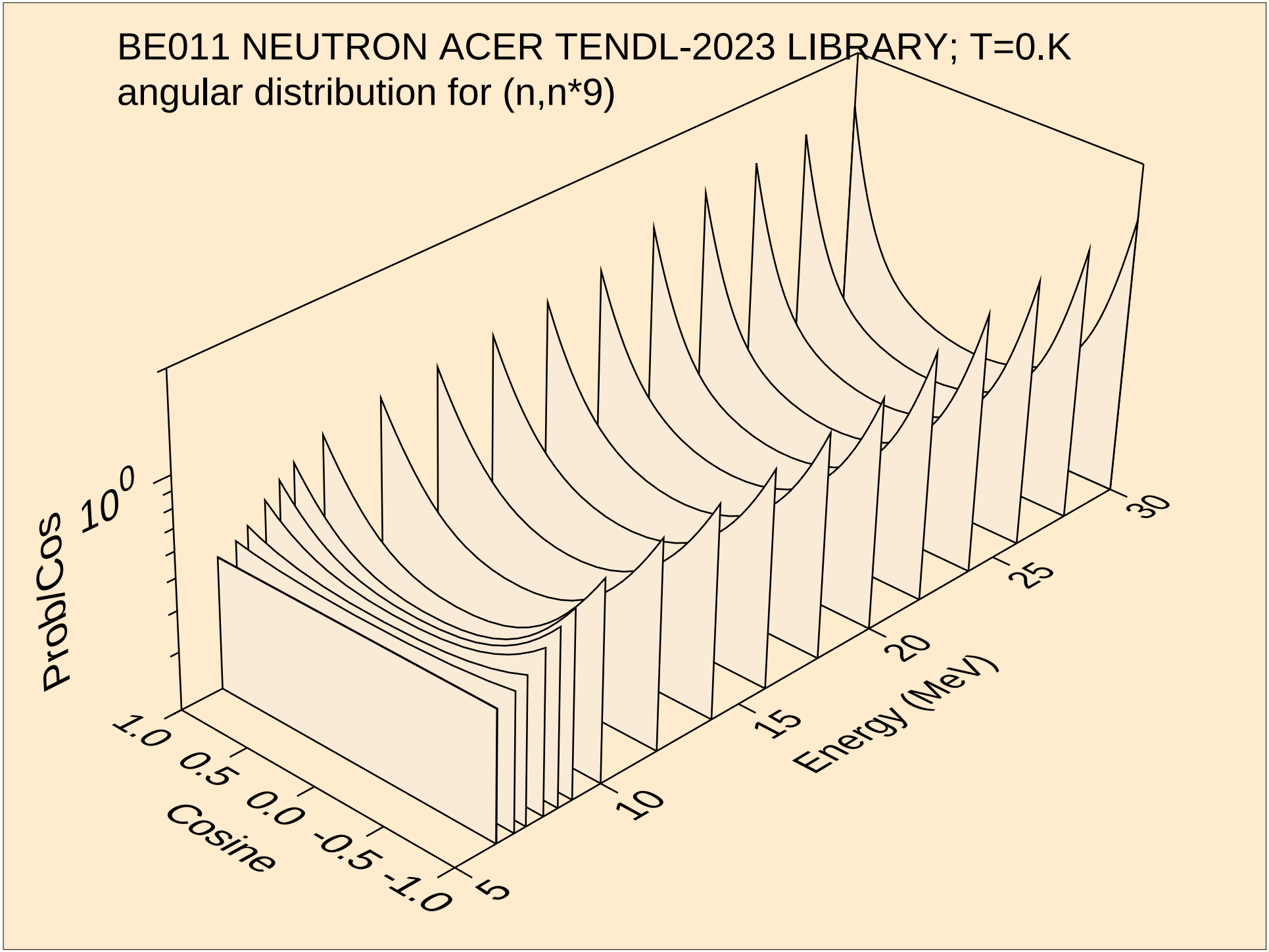

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*4)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

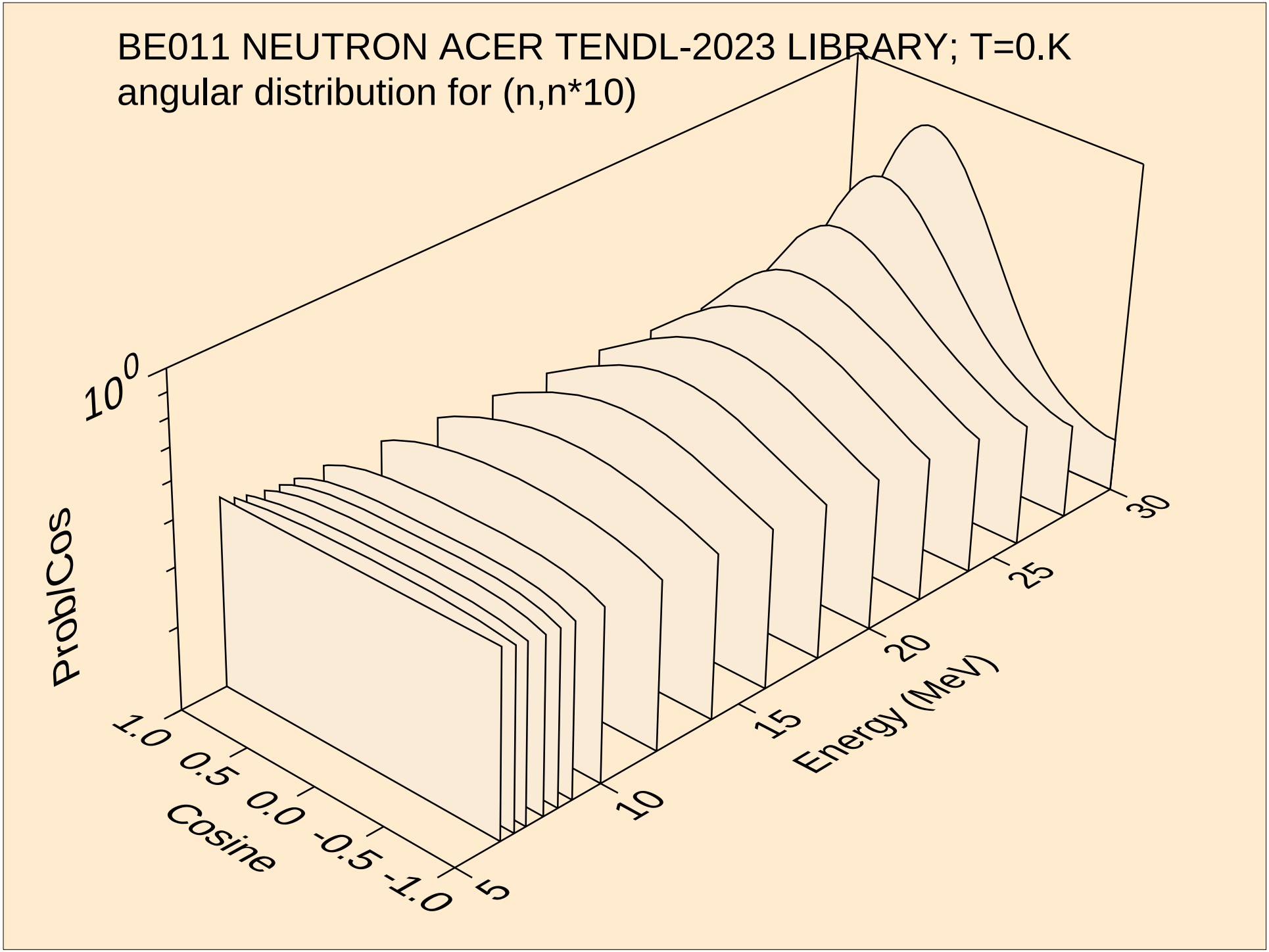

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*5)
Prob\Cos
10^0
10^-1
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

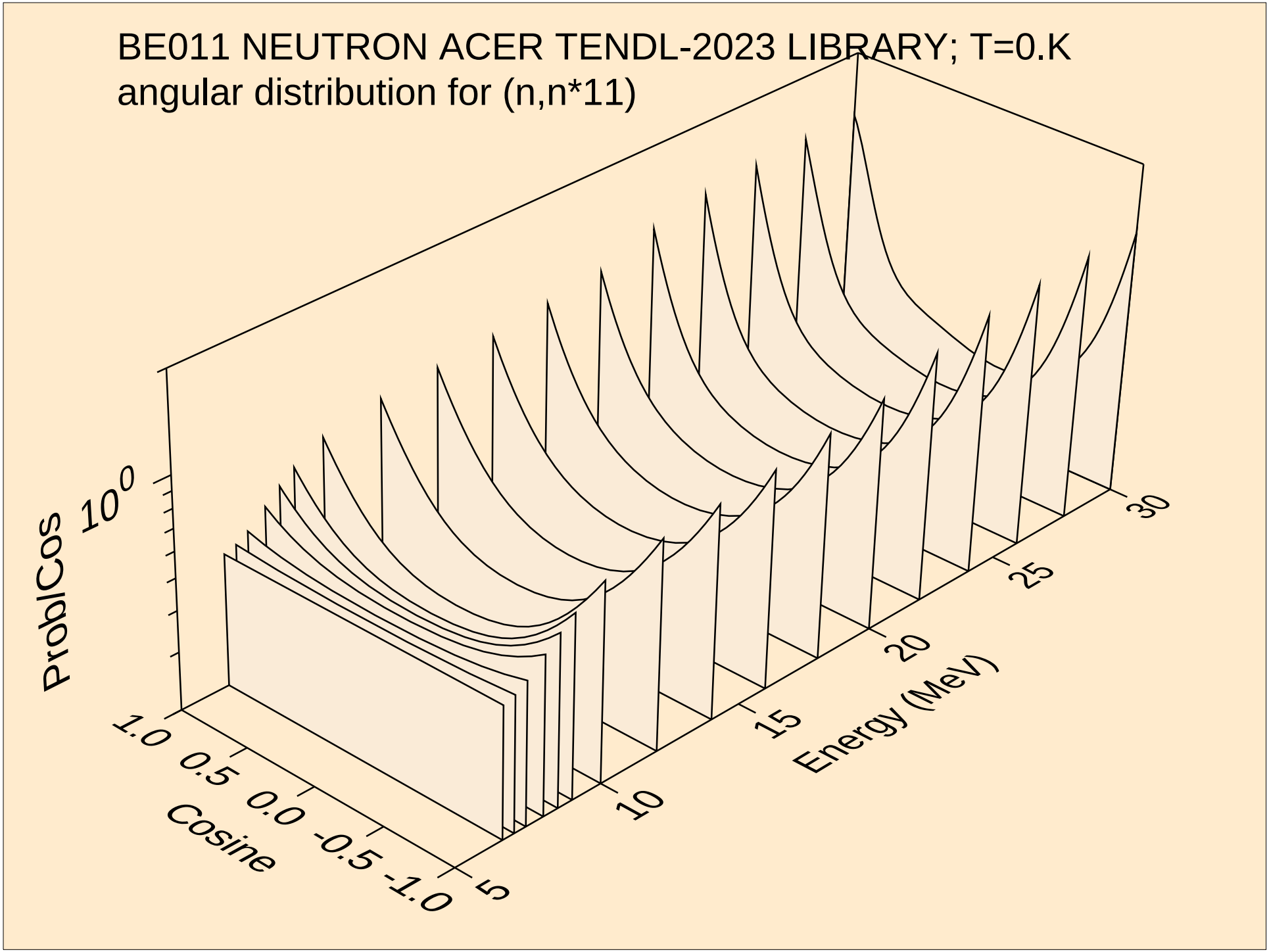

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*6)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

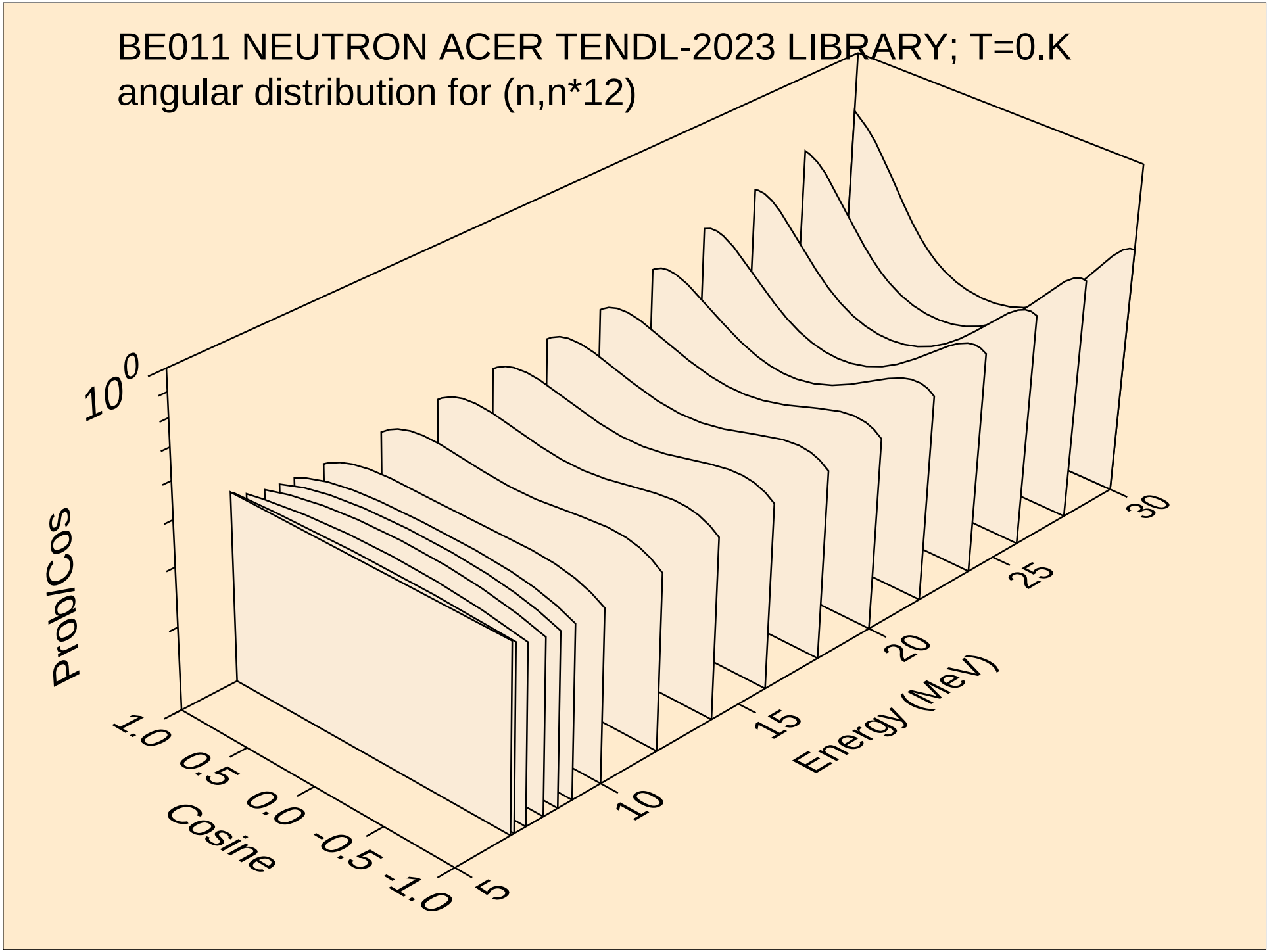

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*7)
Prob\Cos
10^0
10^-1
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

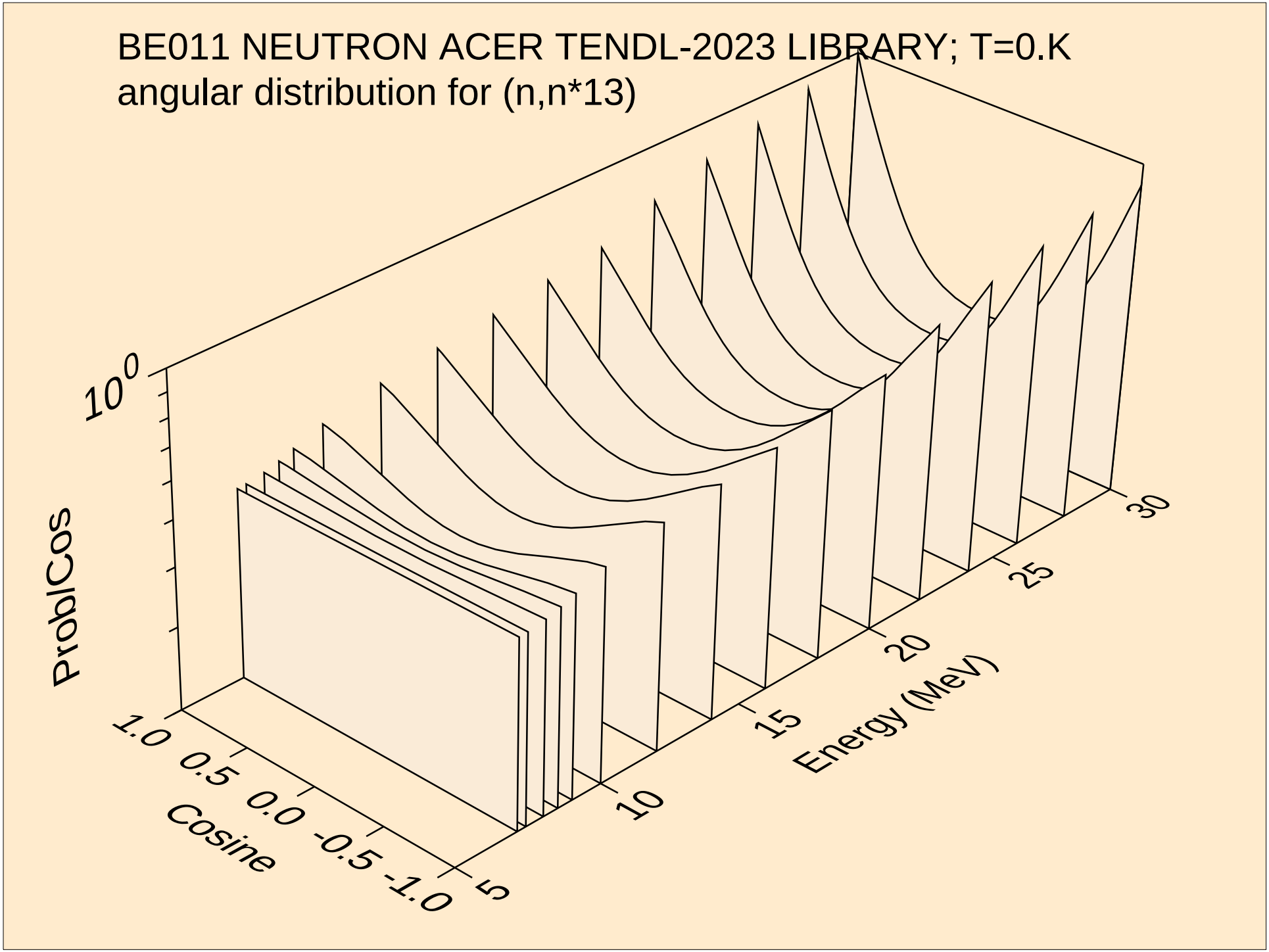

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*8)
10^0
Prob\Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

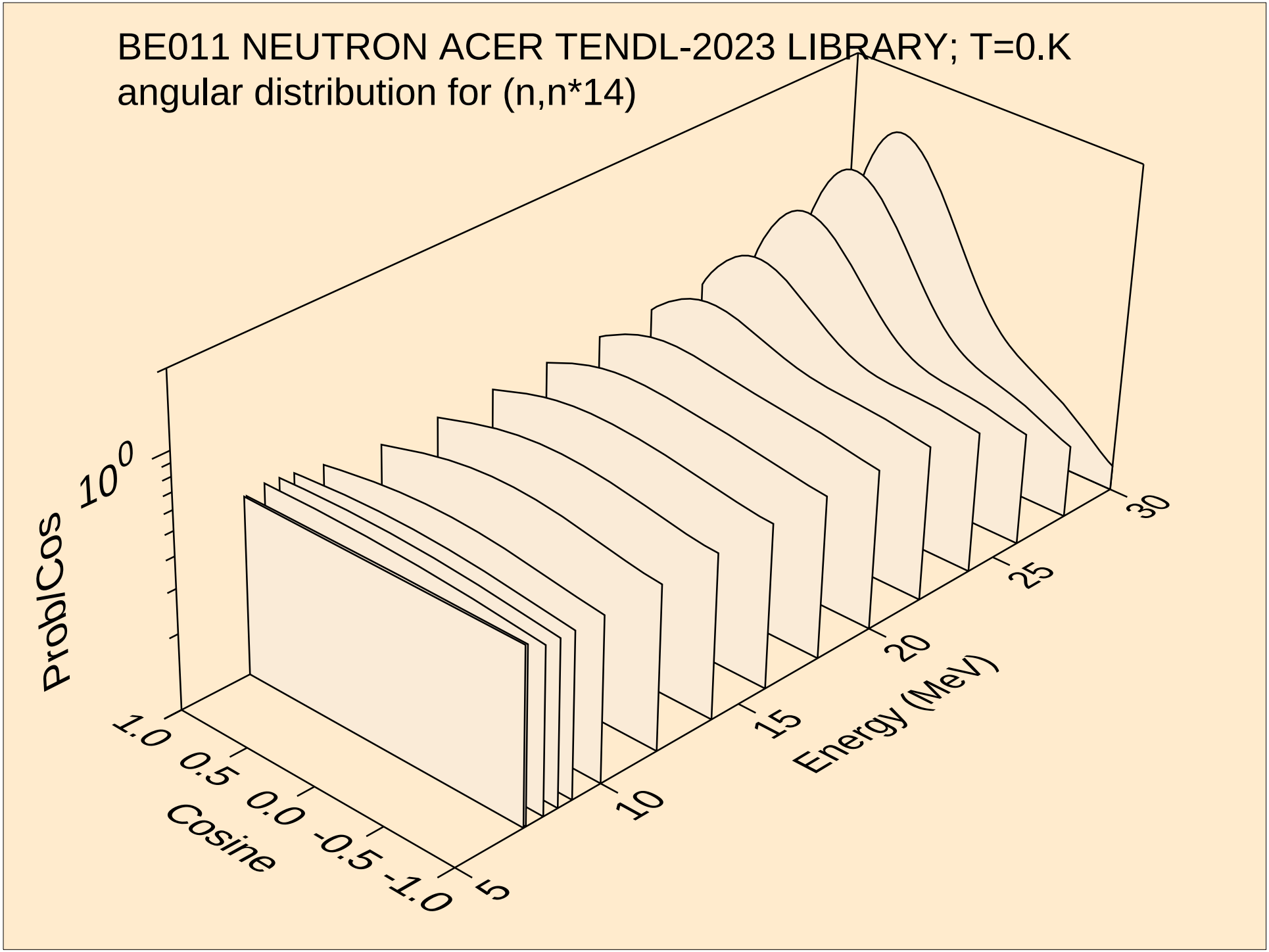

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*9)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

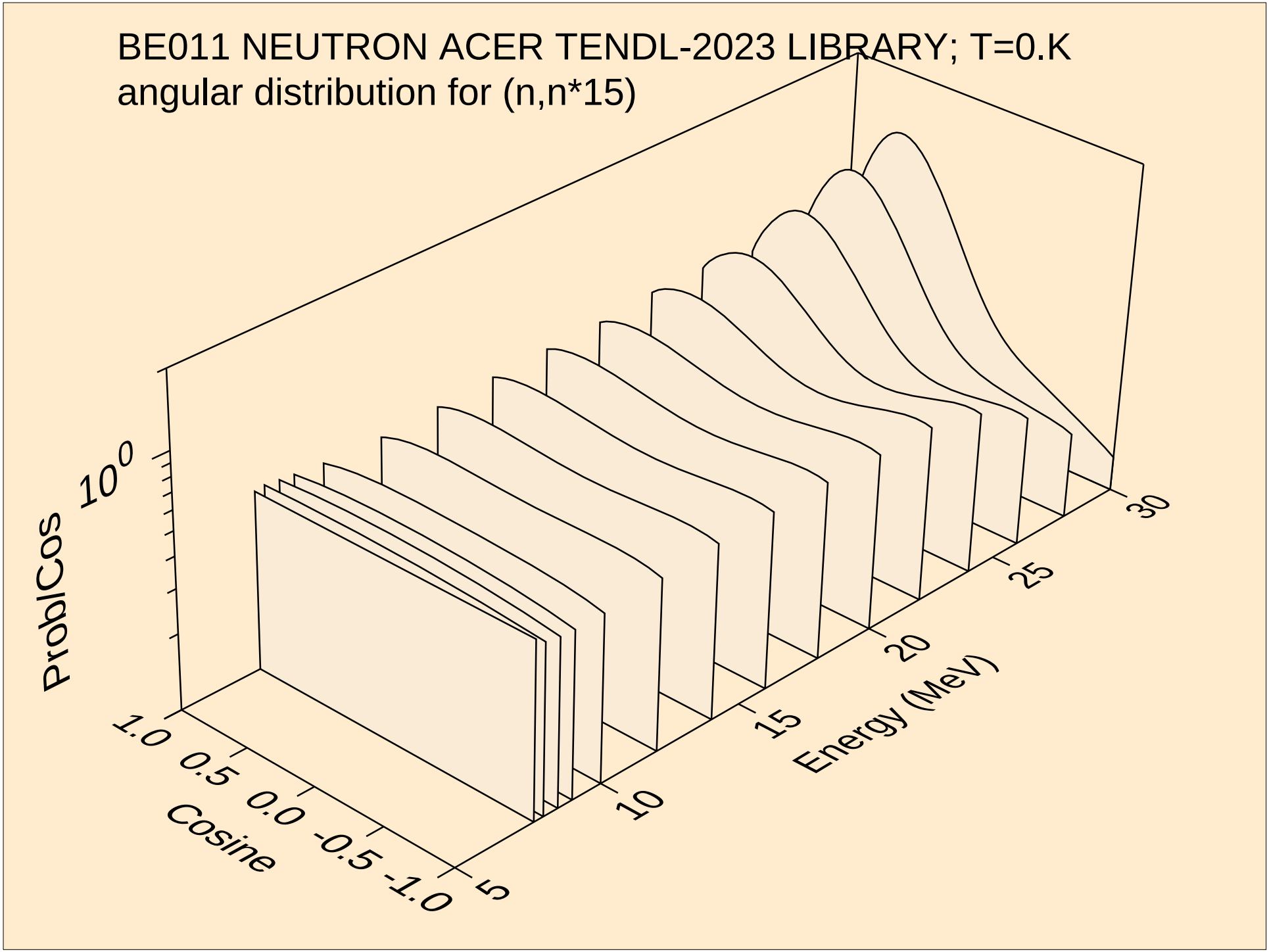

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*10)
10^0
Prob\Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

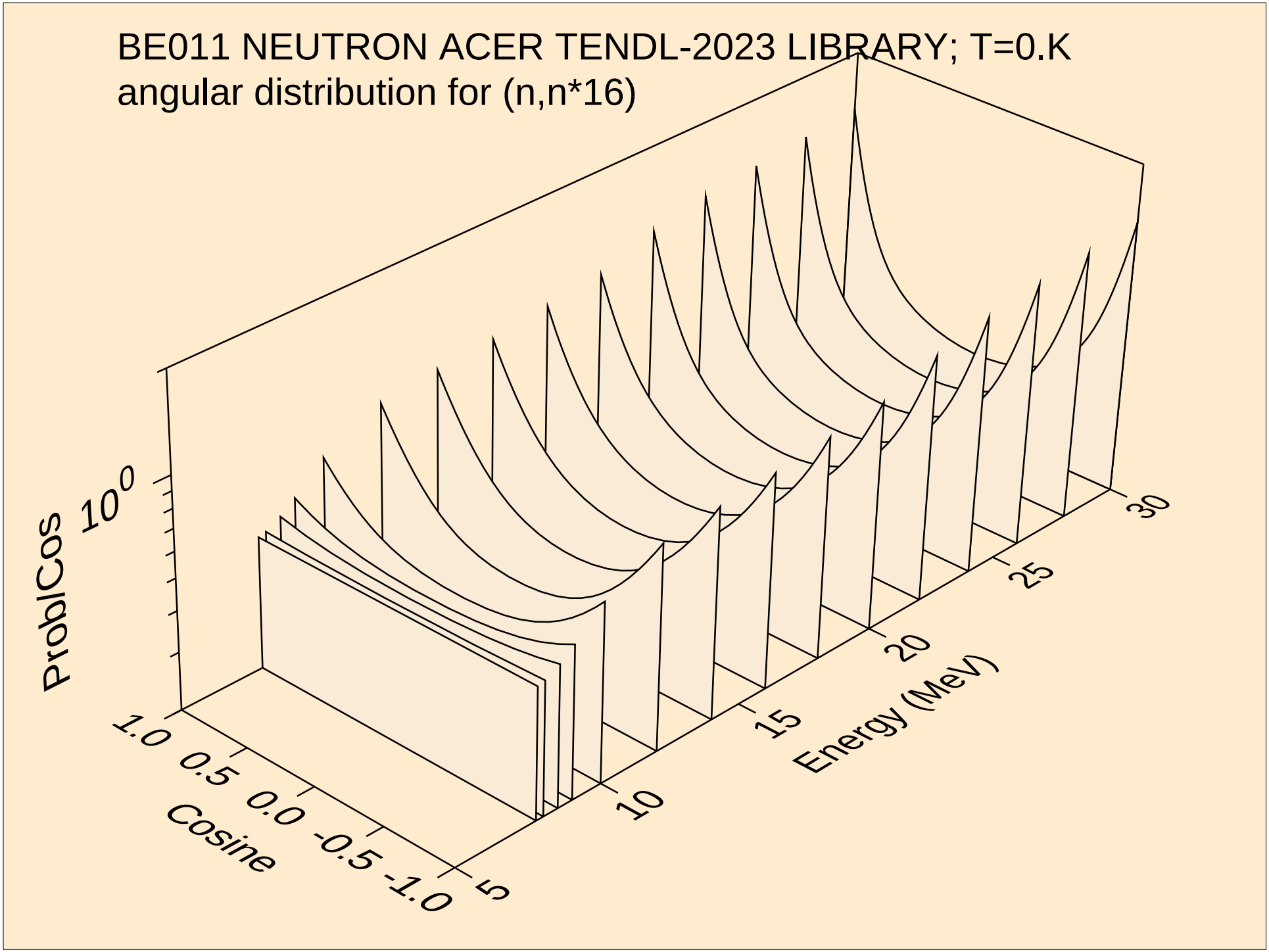

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*11)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

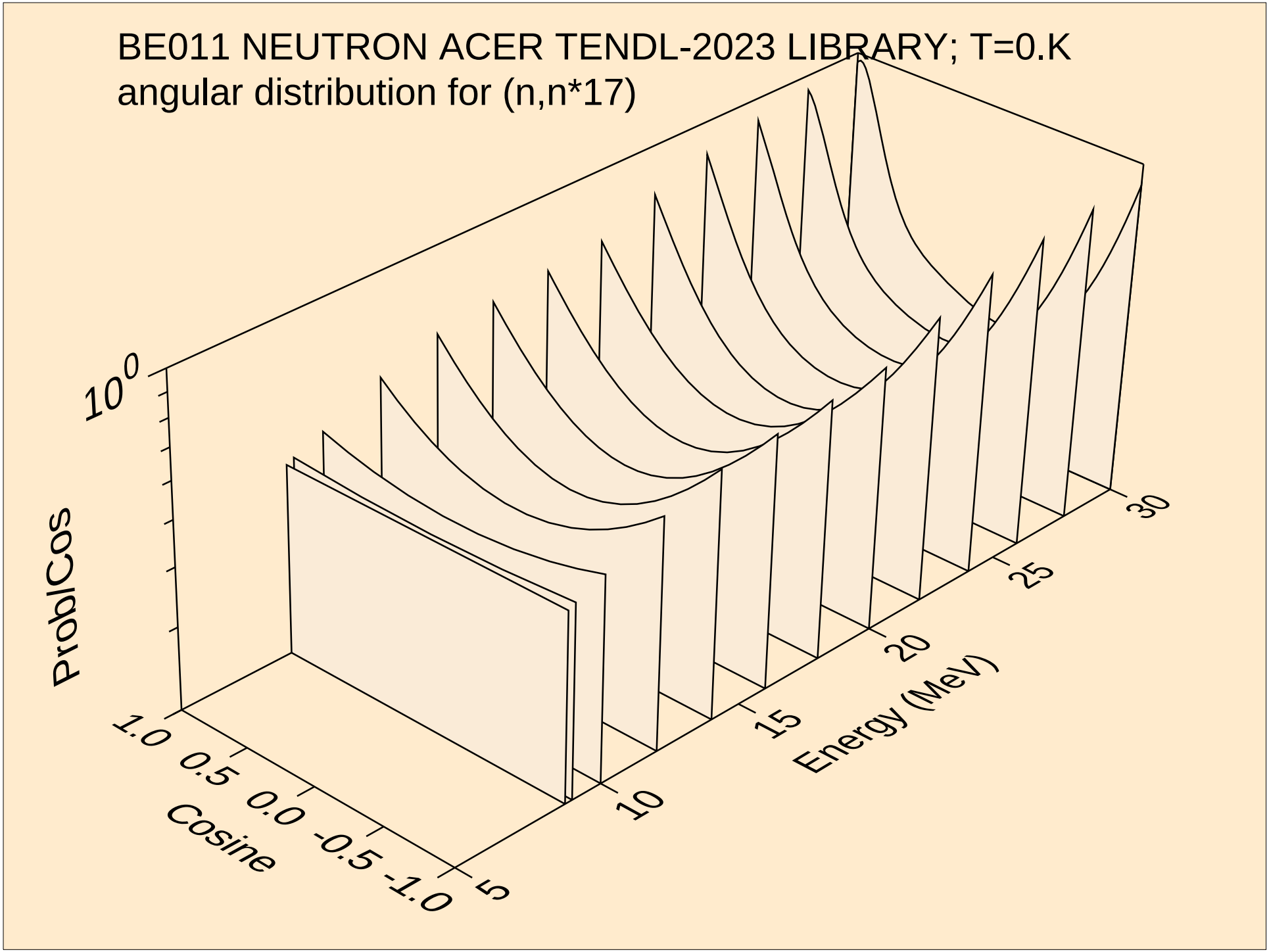

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*12)
10^0
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

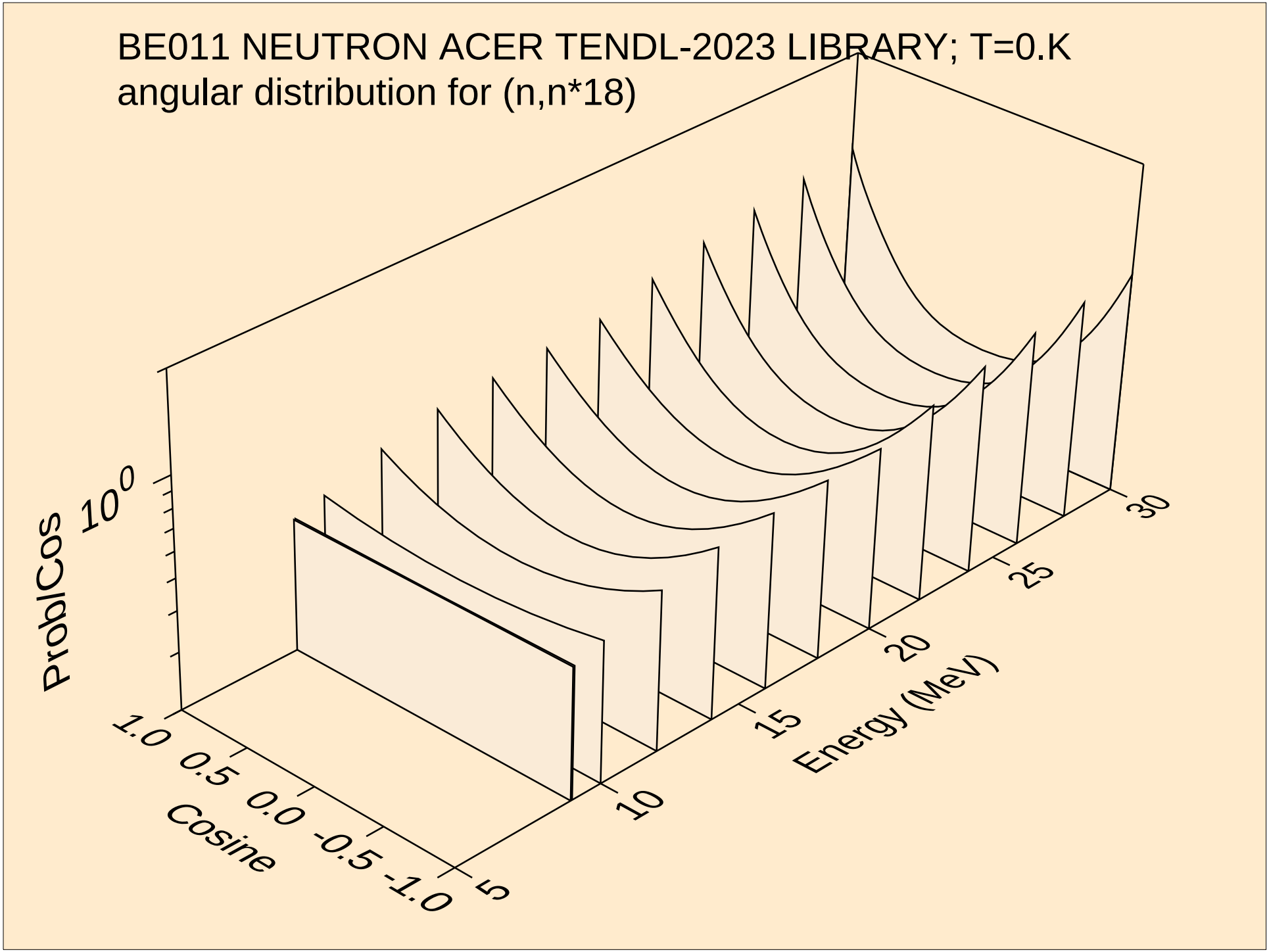

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*13)
10^0
Prob\Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

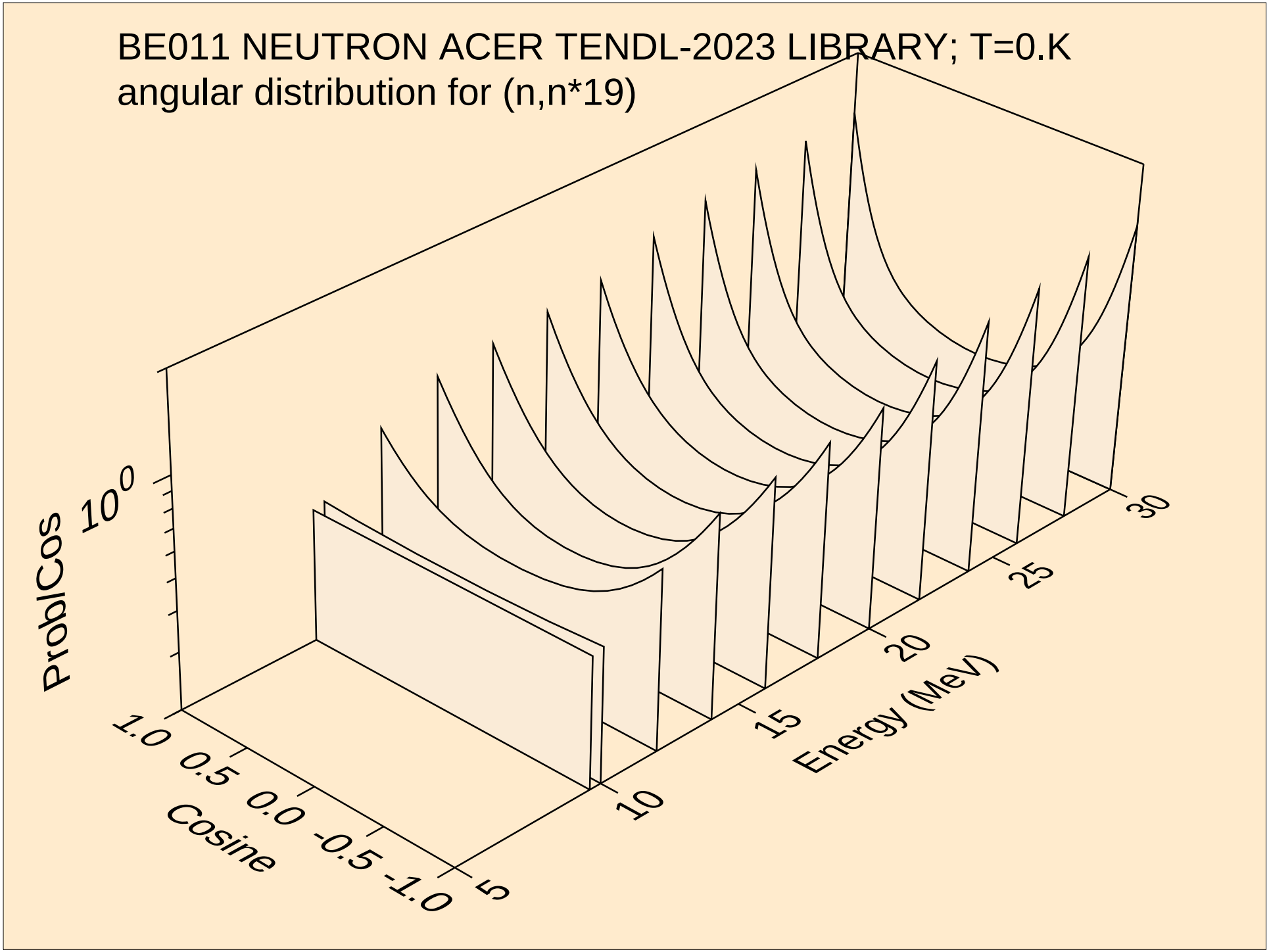

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*14)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

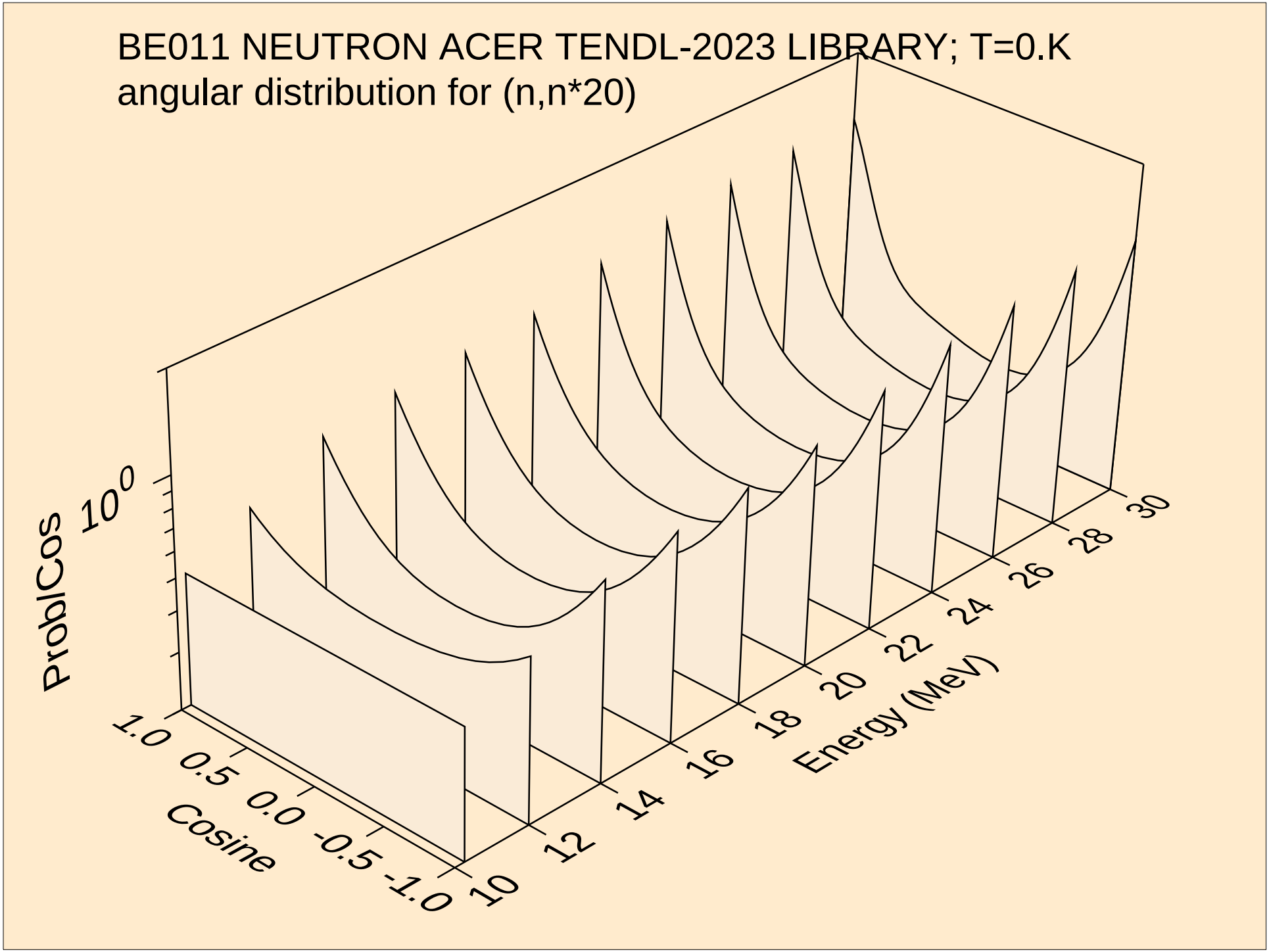

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*15)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

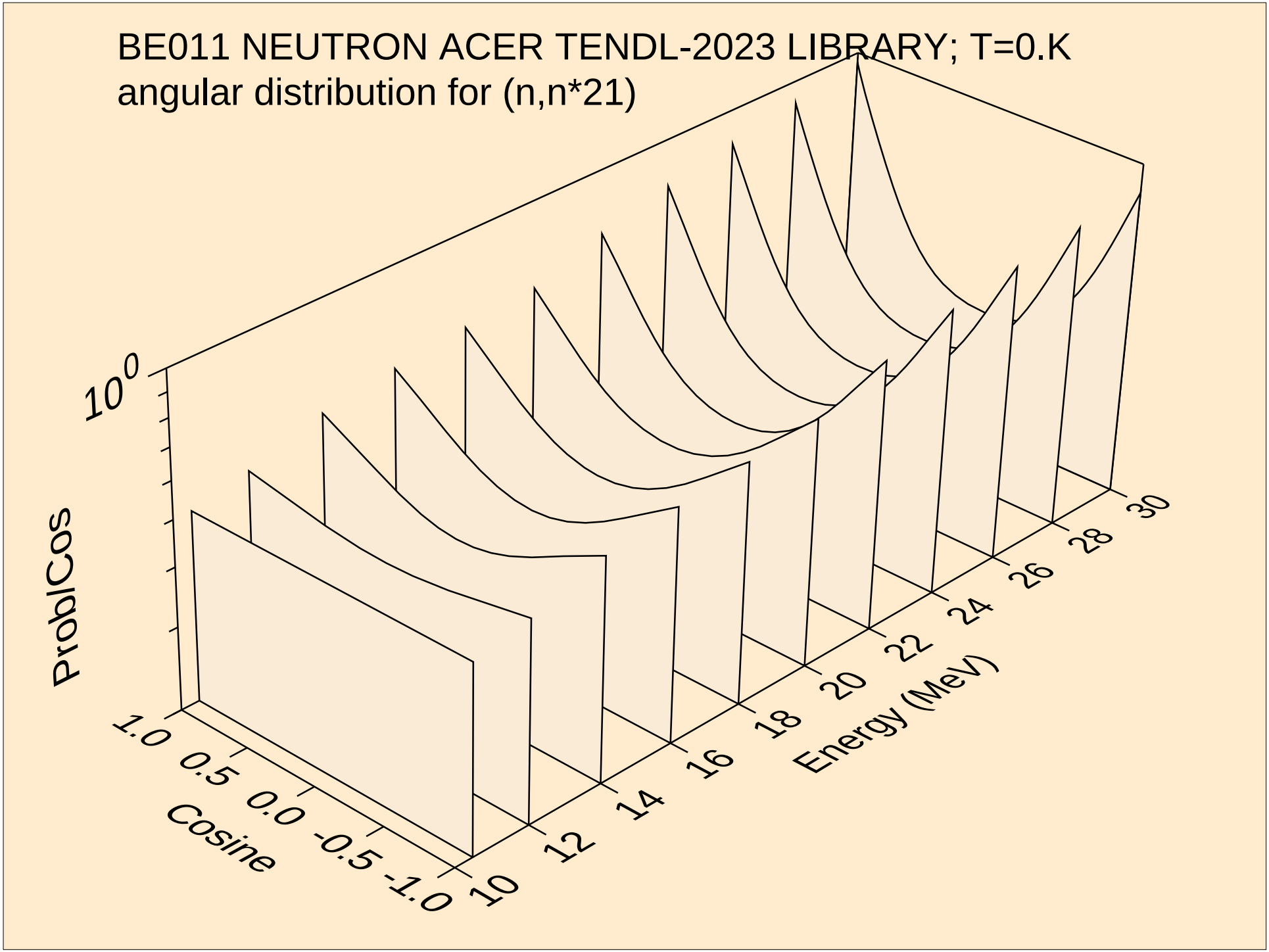

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*16)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

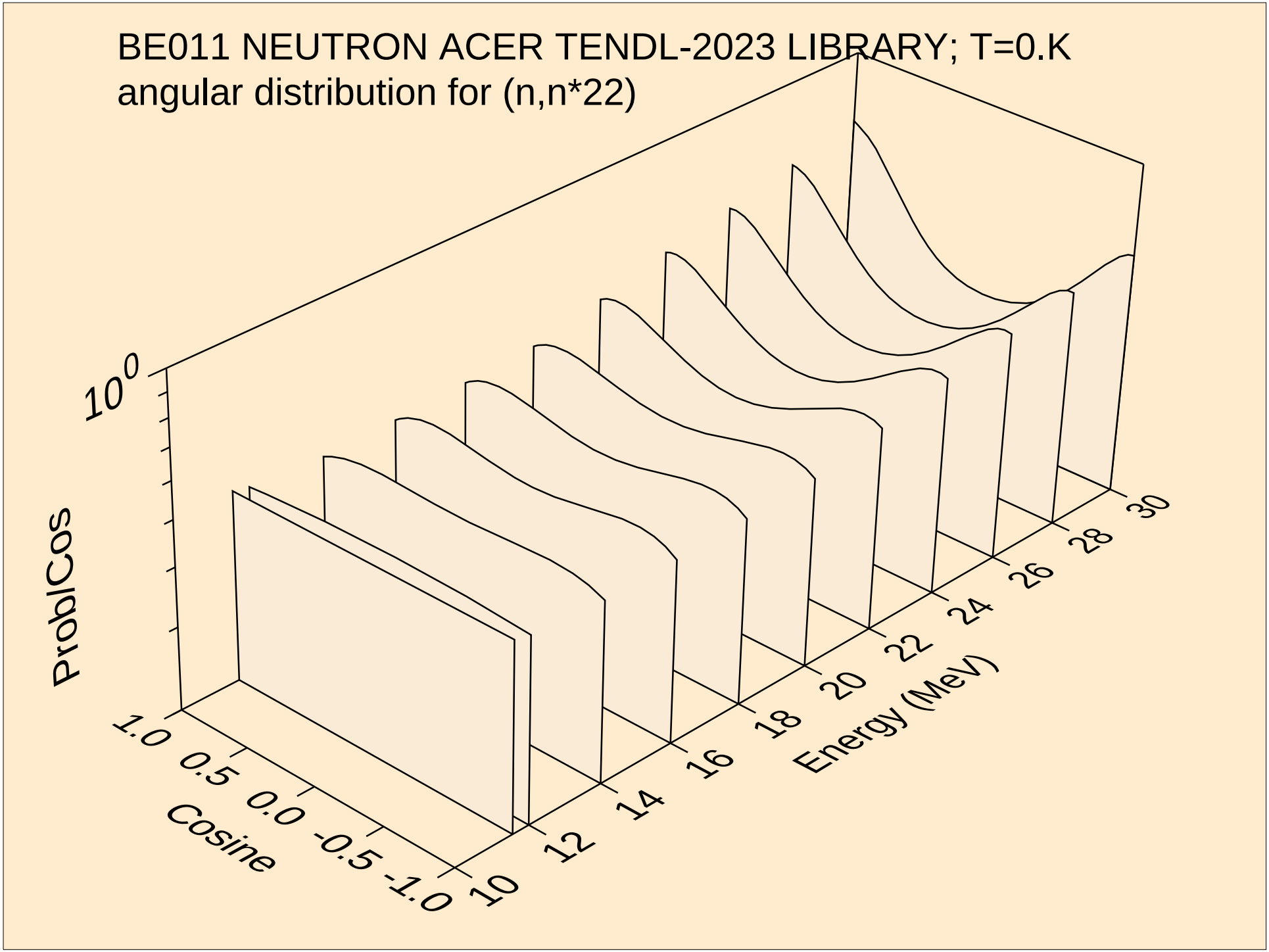

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*17)
10^0
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

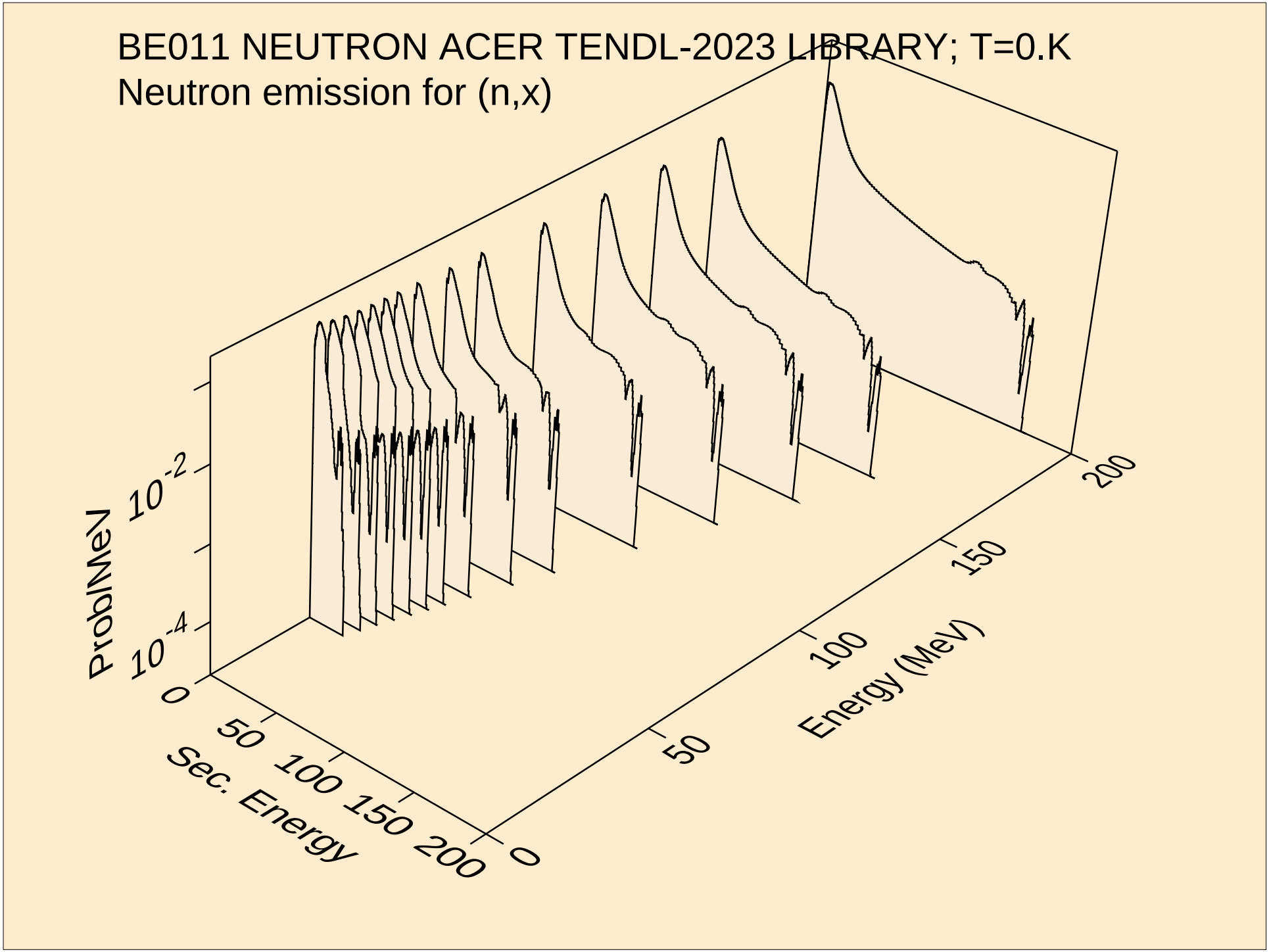

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*18)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

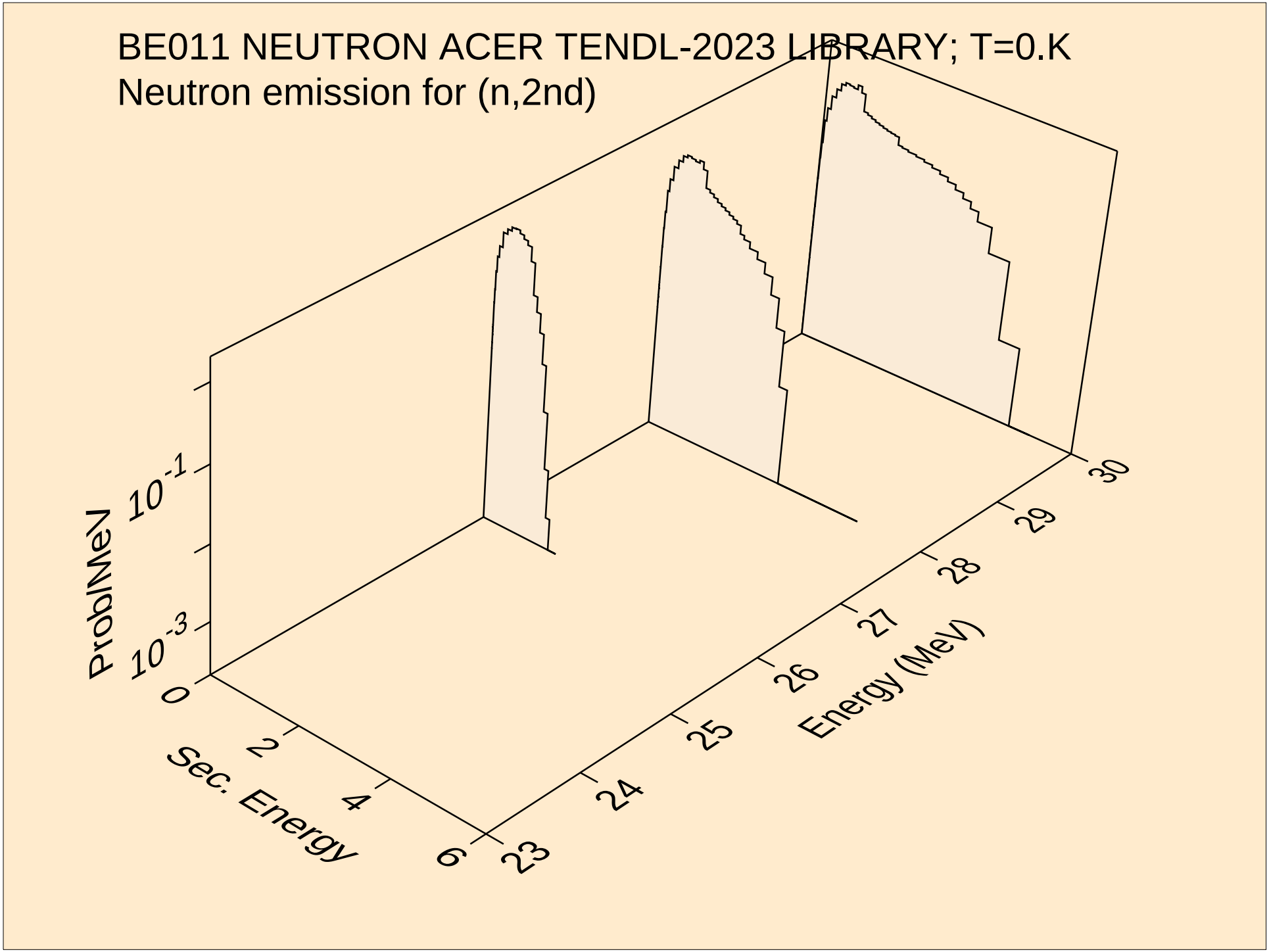

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*19)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
5
10
15
20
25
30
Energy (MeV)

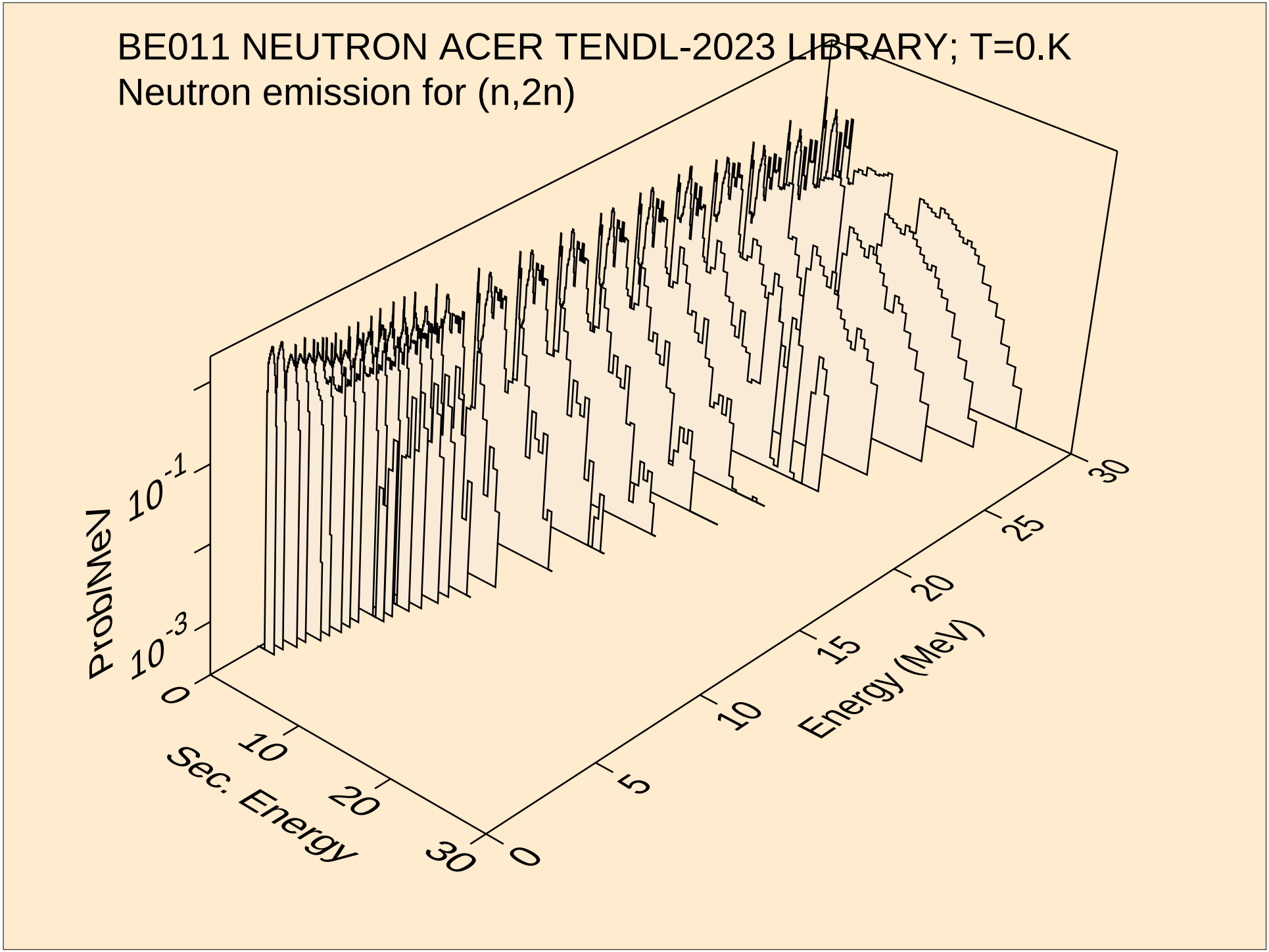

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*20)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

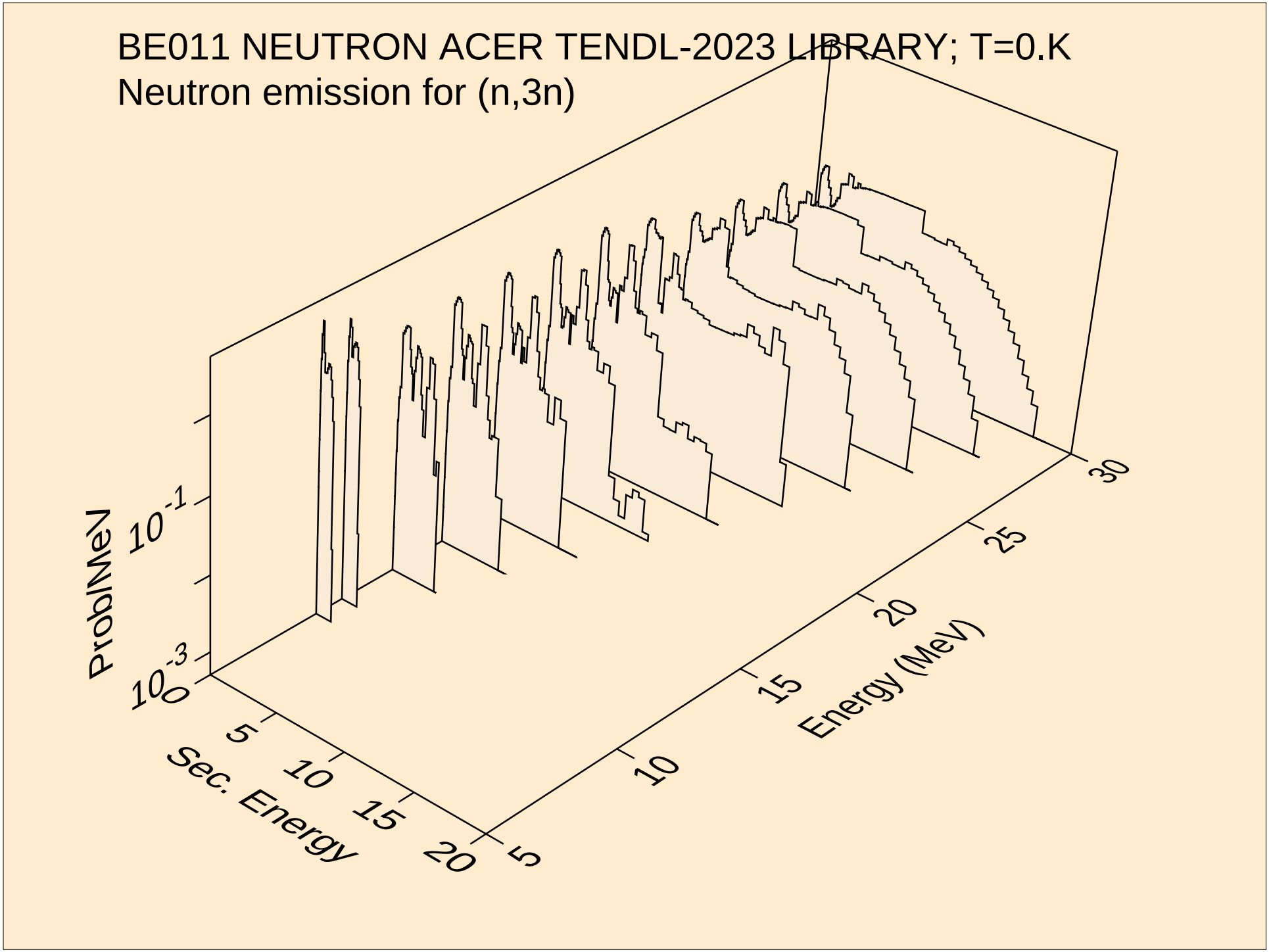

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*21)
10^0
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

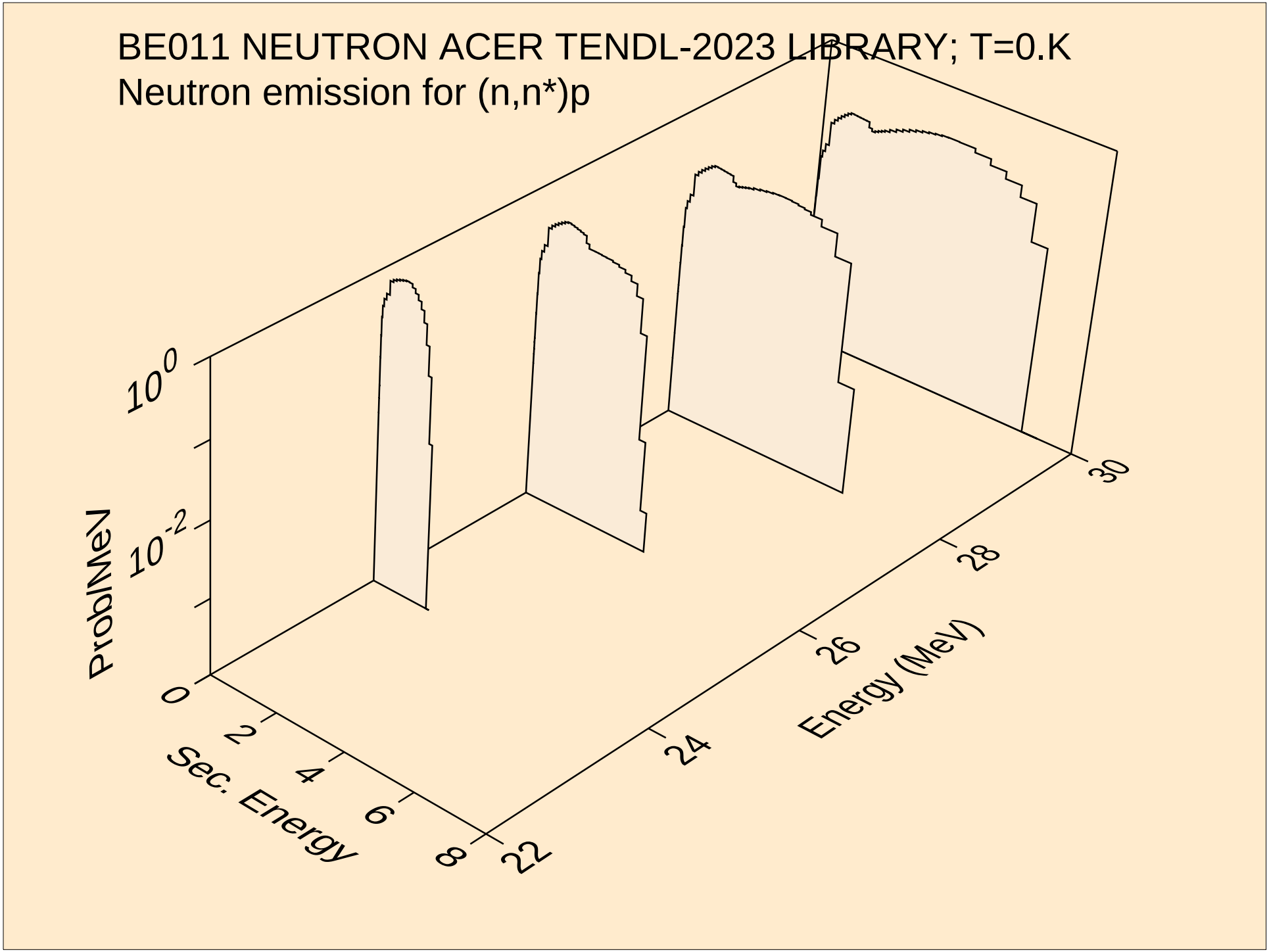

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
angular distribution for (n,n*22)
10^0
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

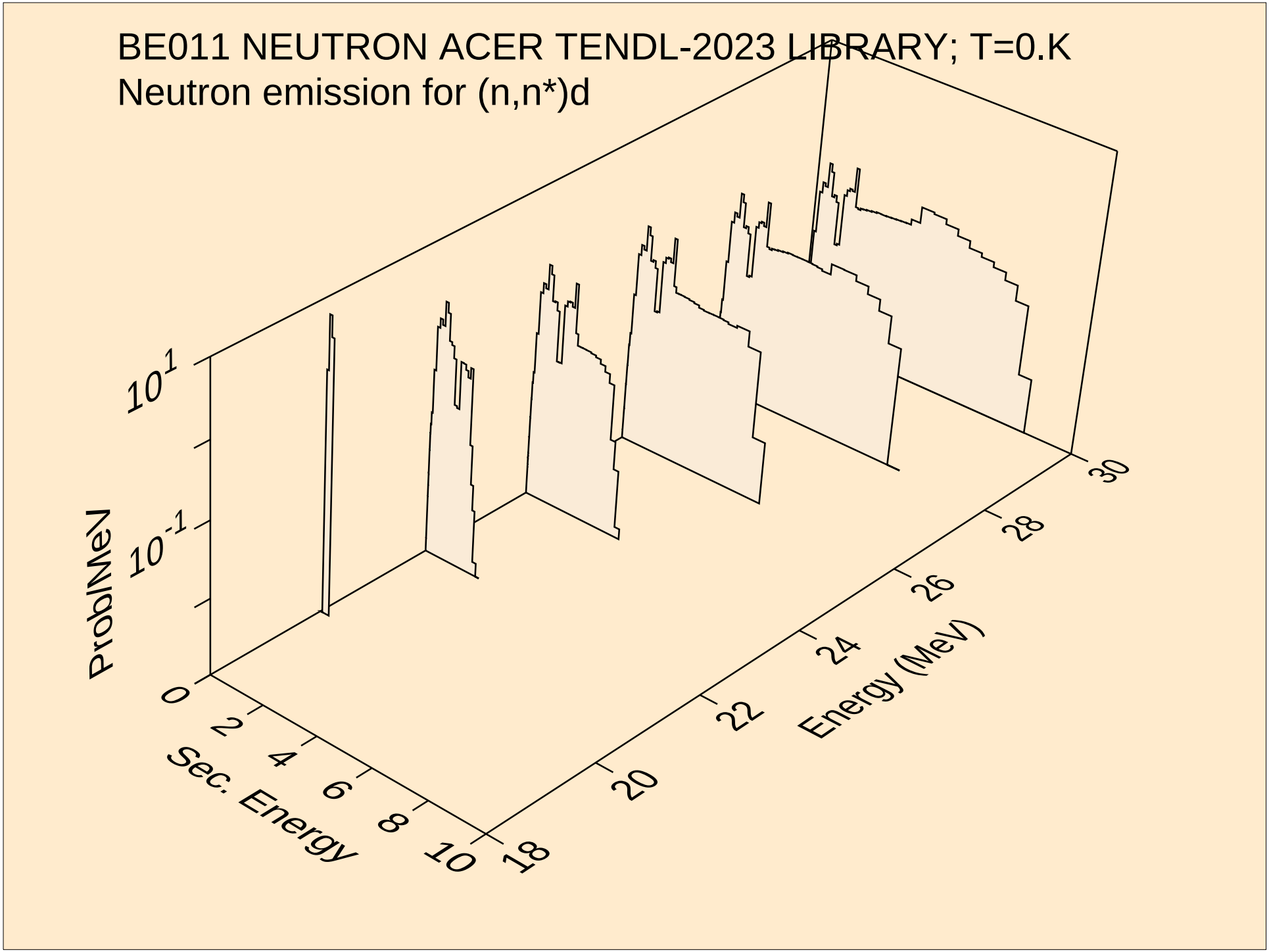

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,x)
Prob/MeV
10-2
10-4
0
50
100
150
200
Sec. Energy
0
50
100
150
200
Energy (MeV)

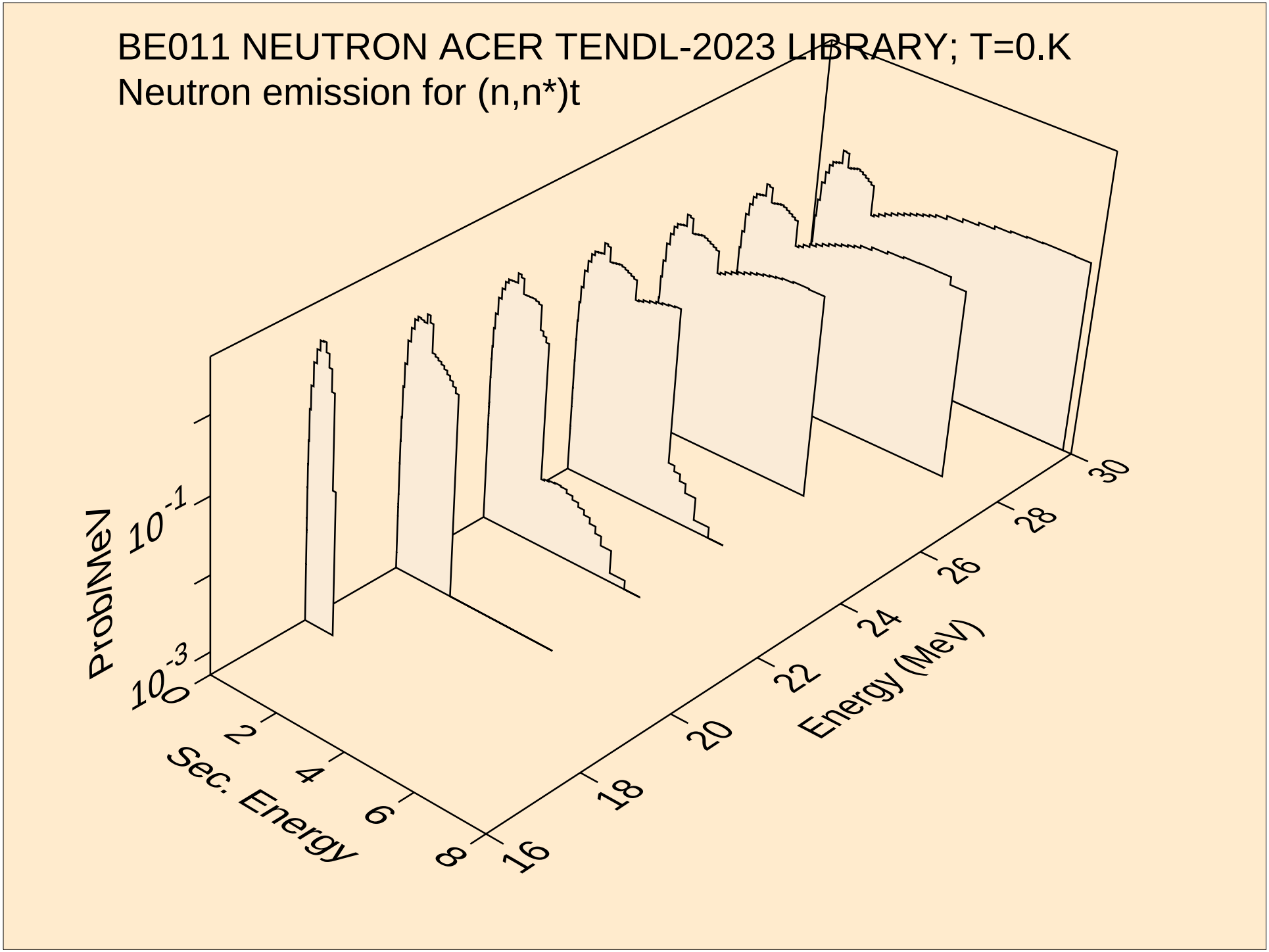

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,2nd)
Prob/MeV
10-1
10-3
0
Sec. Energy
2
4
6
23
24
25
26
27
28
29
30
Energy (MeV)

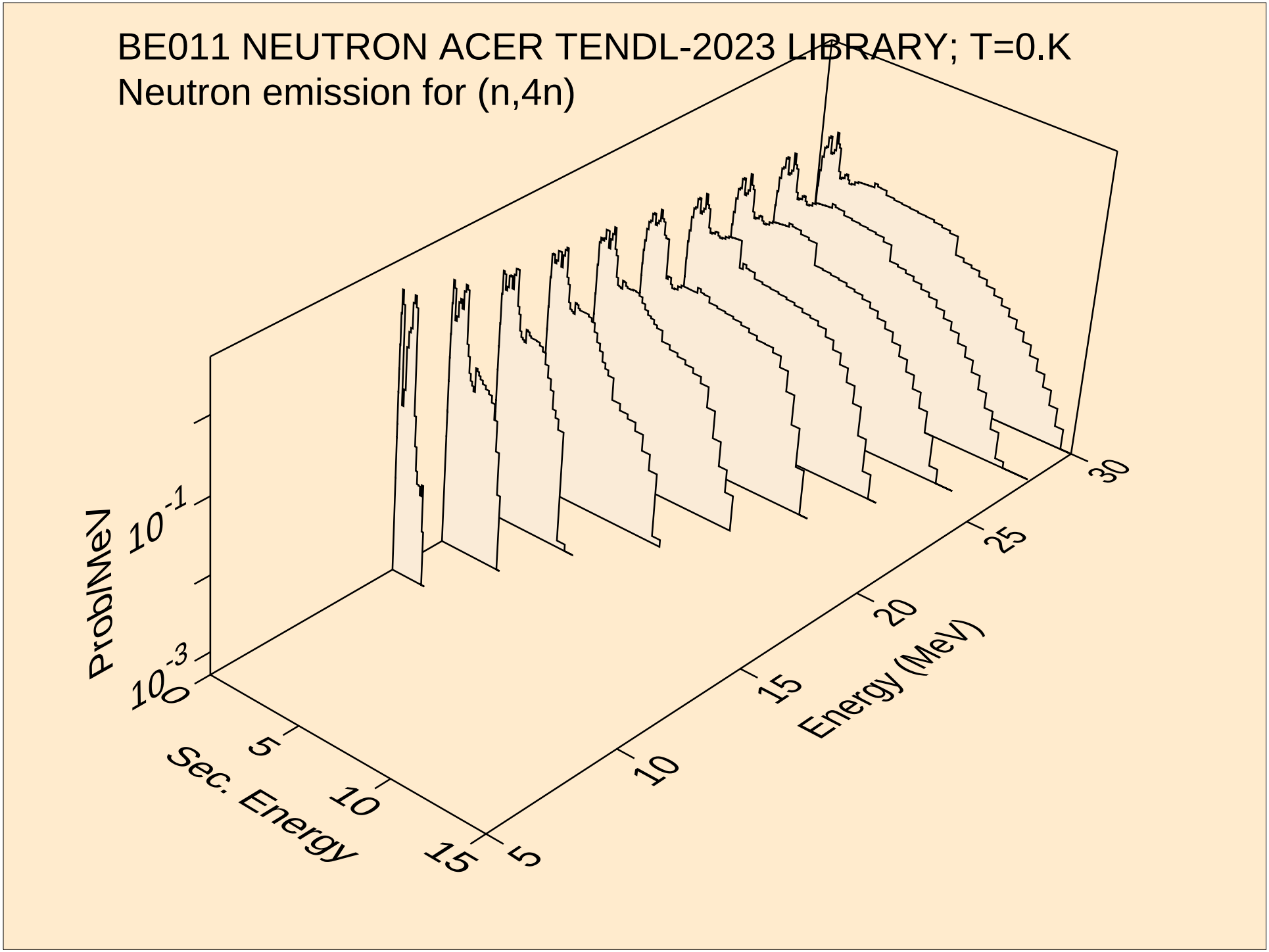

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,2n)
Prob/MeV
10-1
10-3
0
10
20
30
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

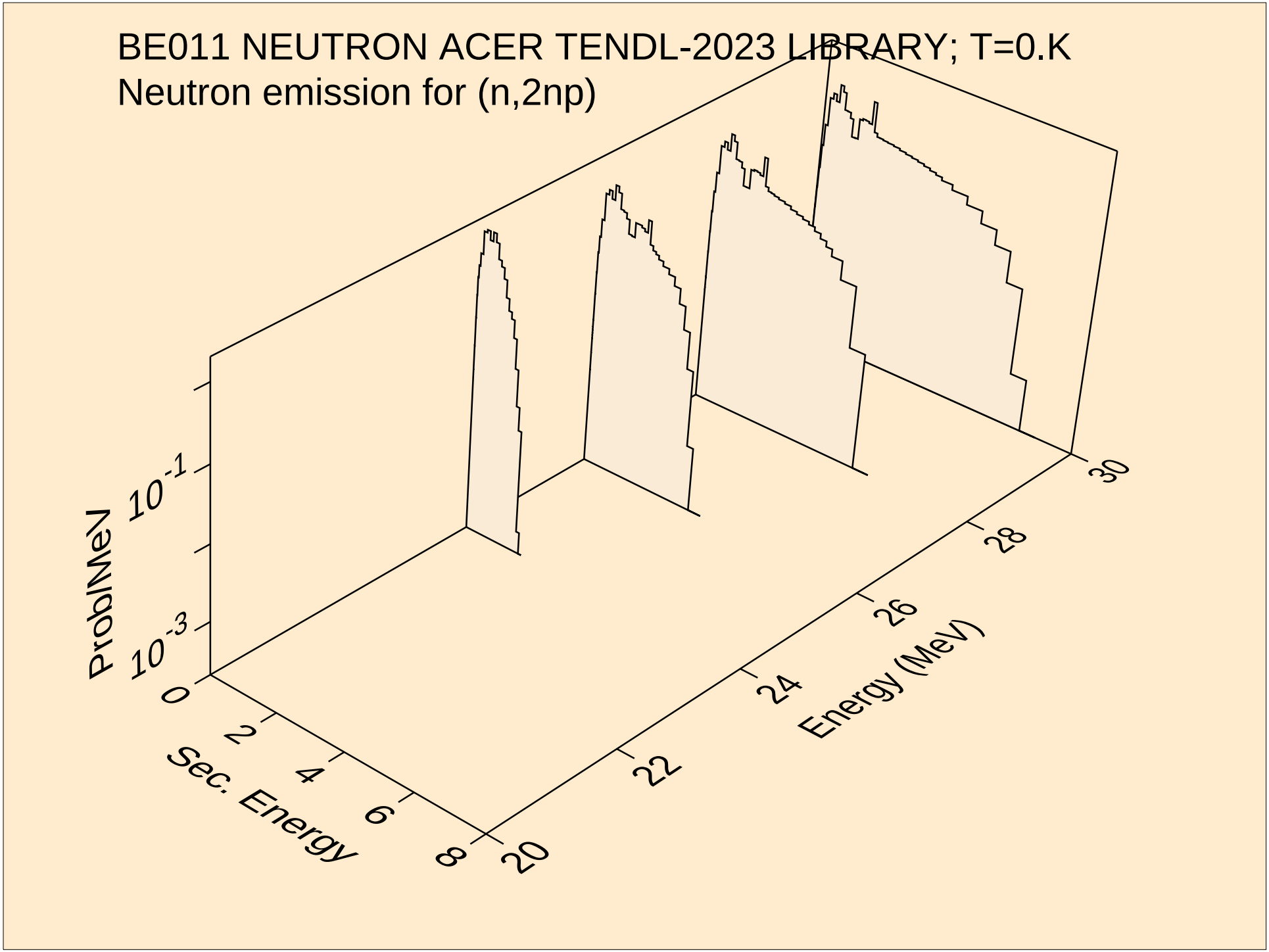

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,3n)
Prob/MeV
10-1
10-3
0
5
10
15
20
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

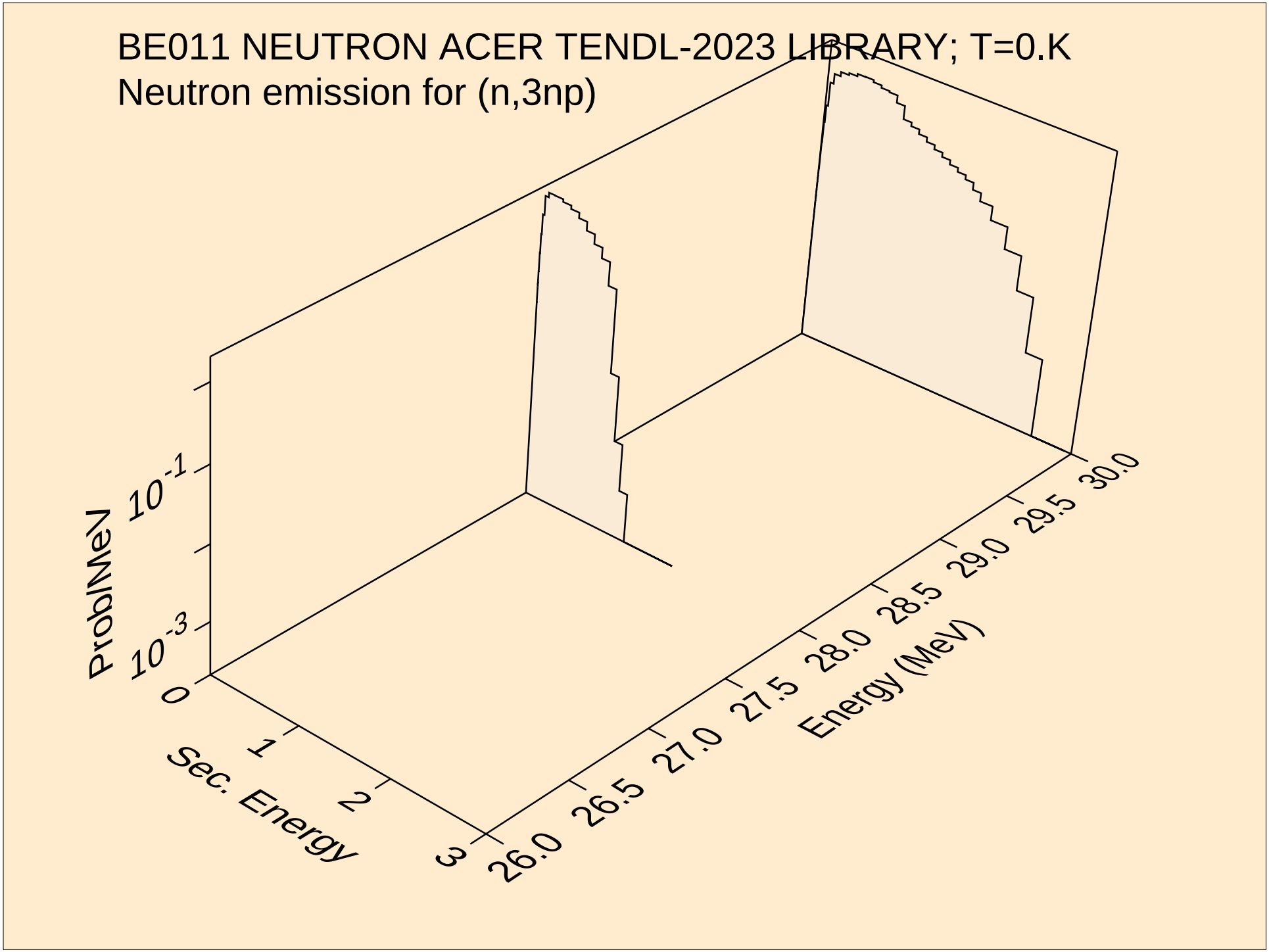

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,n*)p
Prob/MeV
10^0
10^-2
0
2
4
6
8
Sec. Energy
22
24
26
28
30
Energy (MeV)

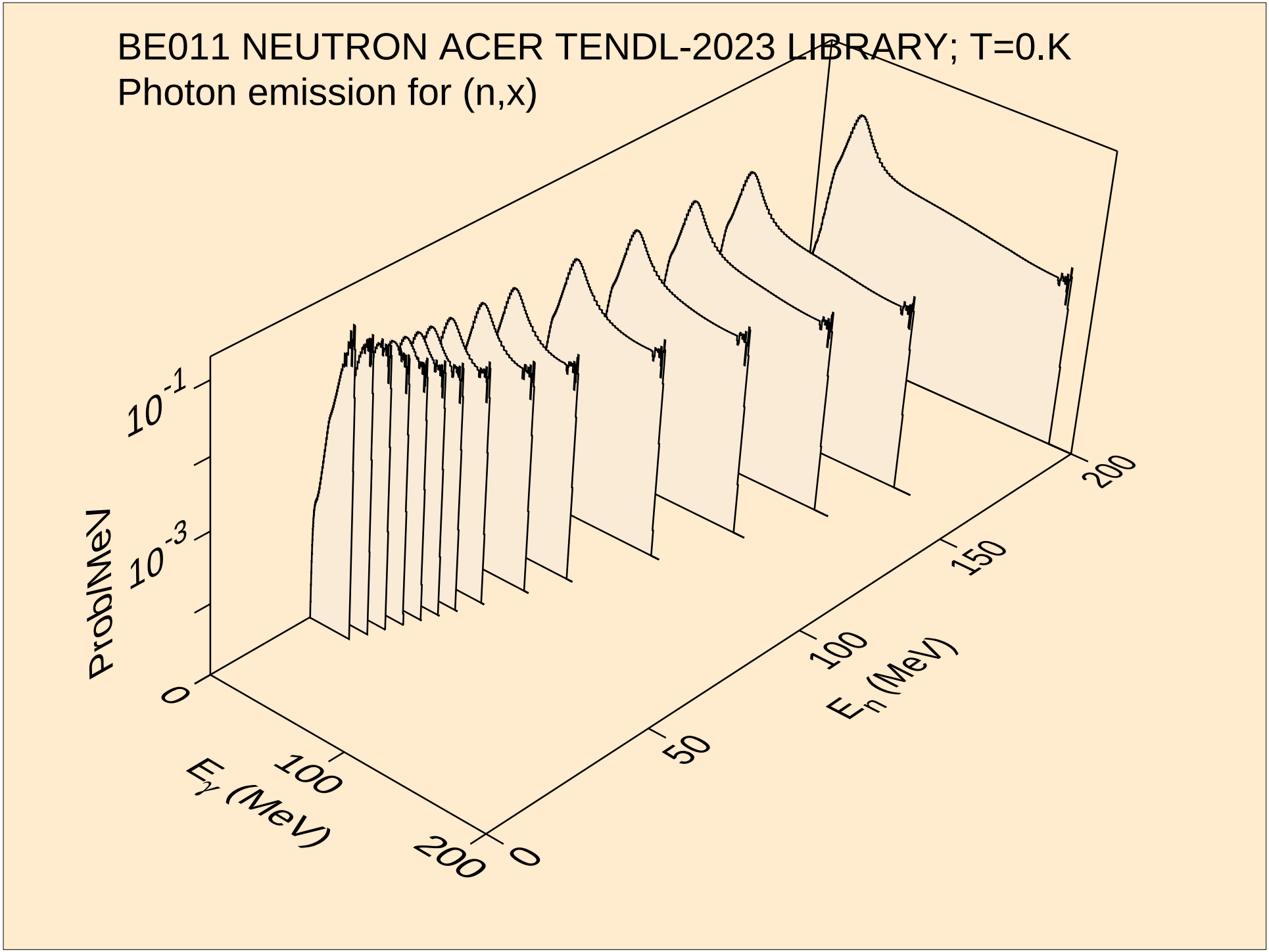

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,n*)d
Prob/MeV
10^1
10^-1
0
2
4
6
8
10
Sec. Energy
18
20
22
24
26
28
30
Energy (MeV)

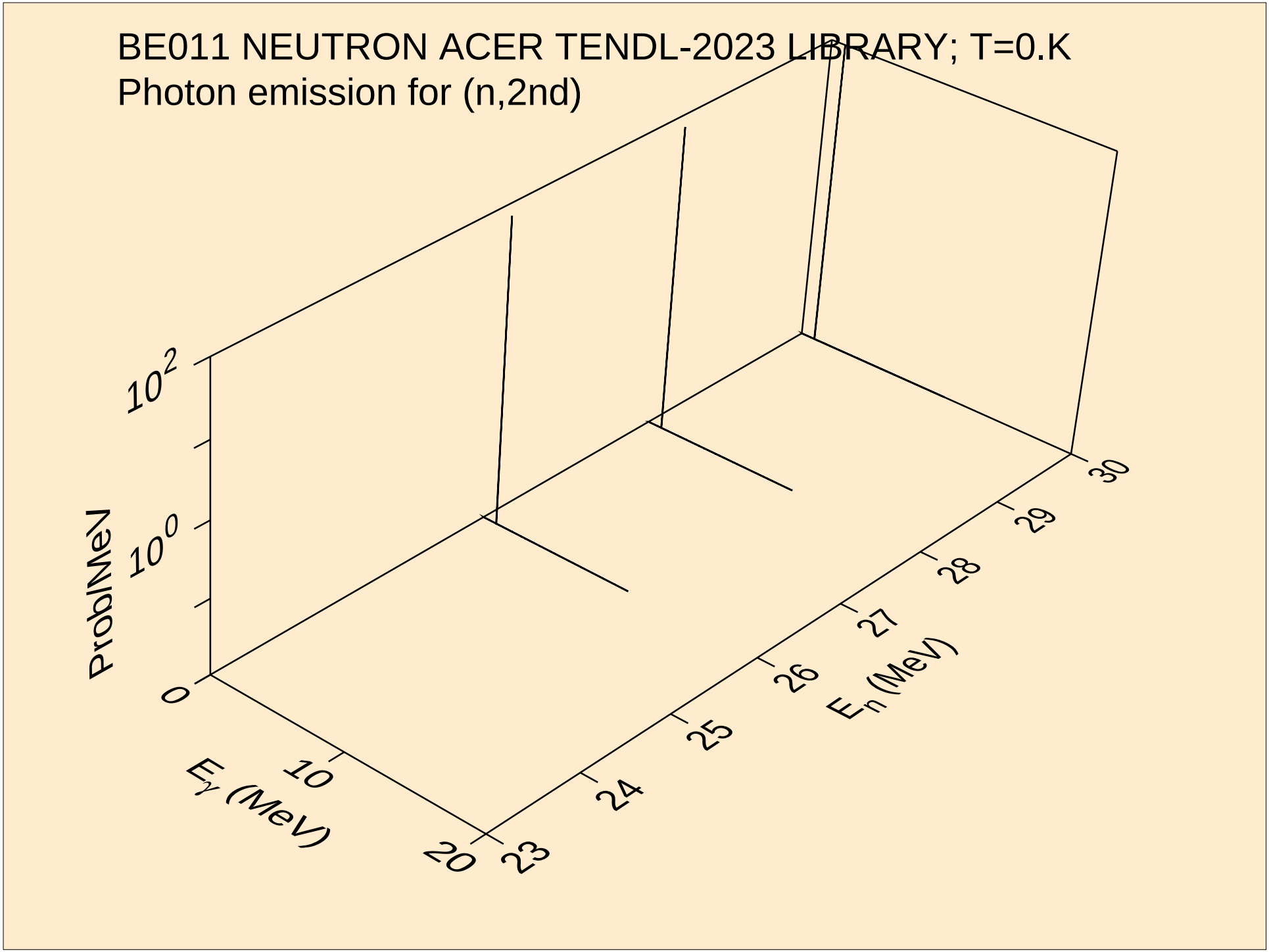

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,n*)t
Prob/MeV
10-1
10-3
0
2
4
6
8
Sec. Energy
16
18
20
22
24
26
28
30
Energy (MeV)

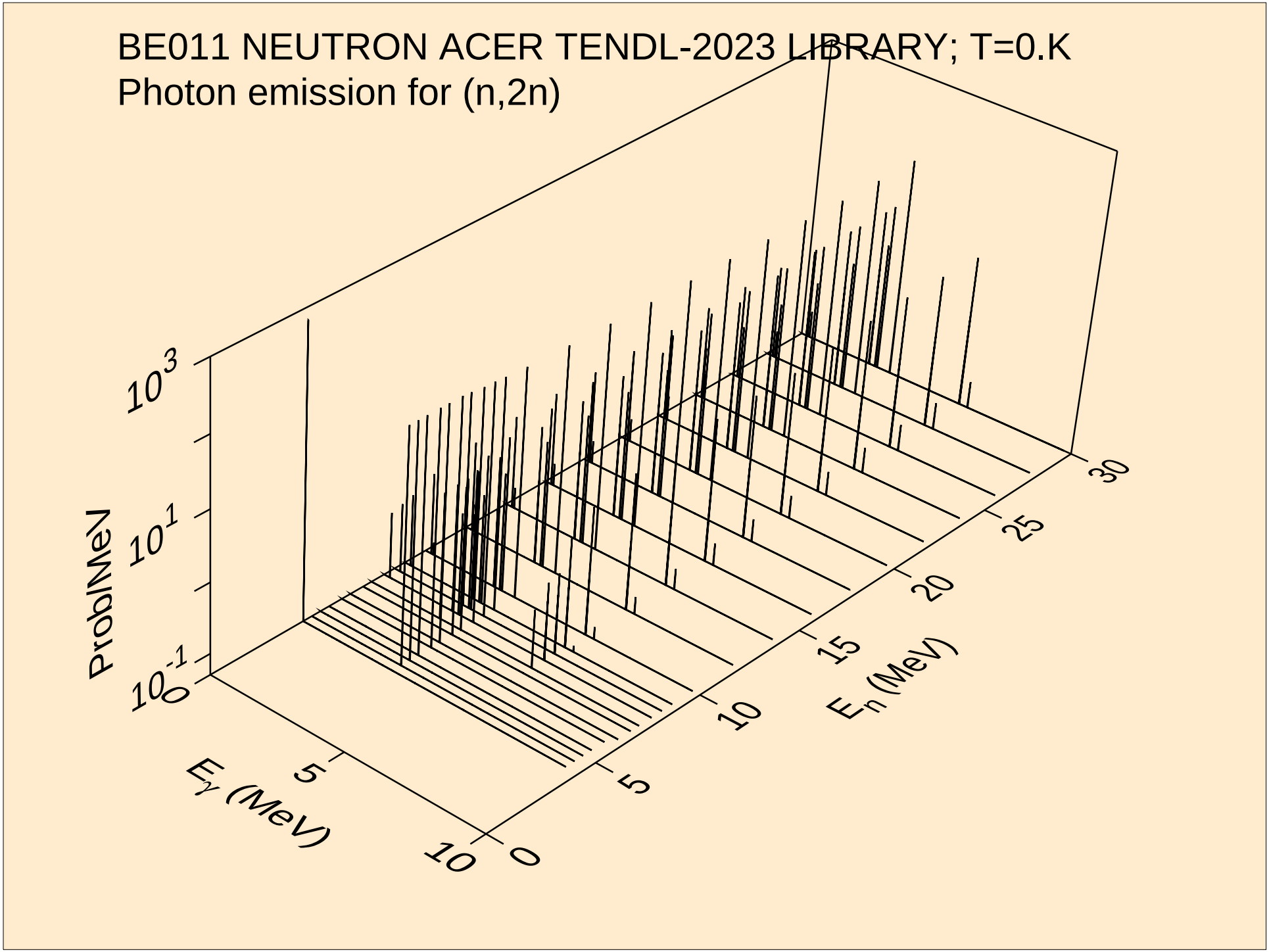

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,4n)
Prob/MeV
10-1
10-3
0
5
10
15
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

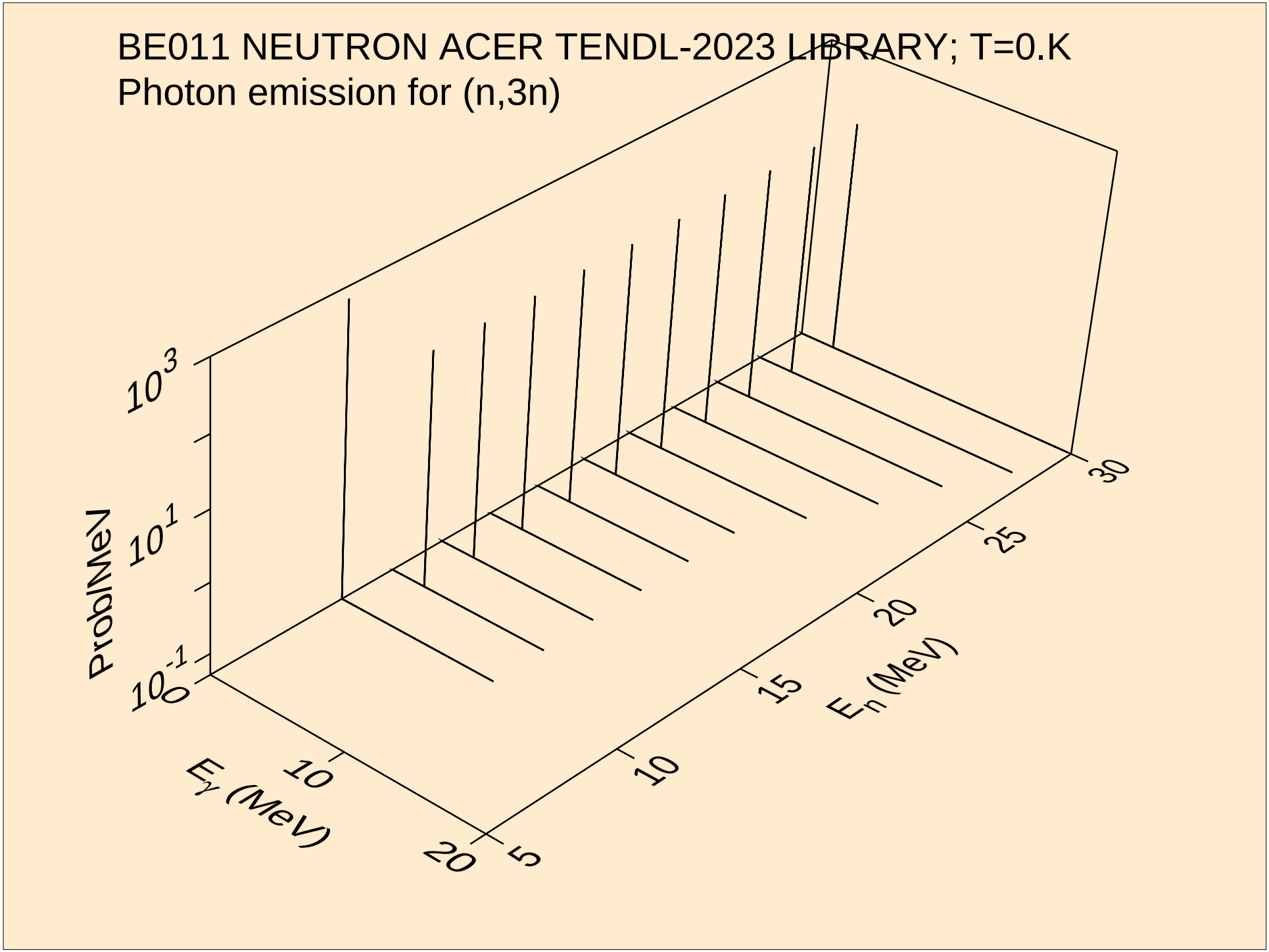

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,2np)
Prob/MeV
10-1
10-3
0
2
4
6
8
Sec. Energy
20
22
24
26
28
30
Energy (MeV)

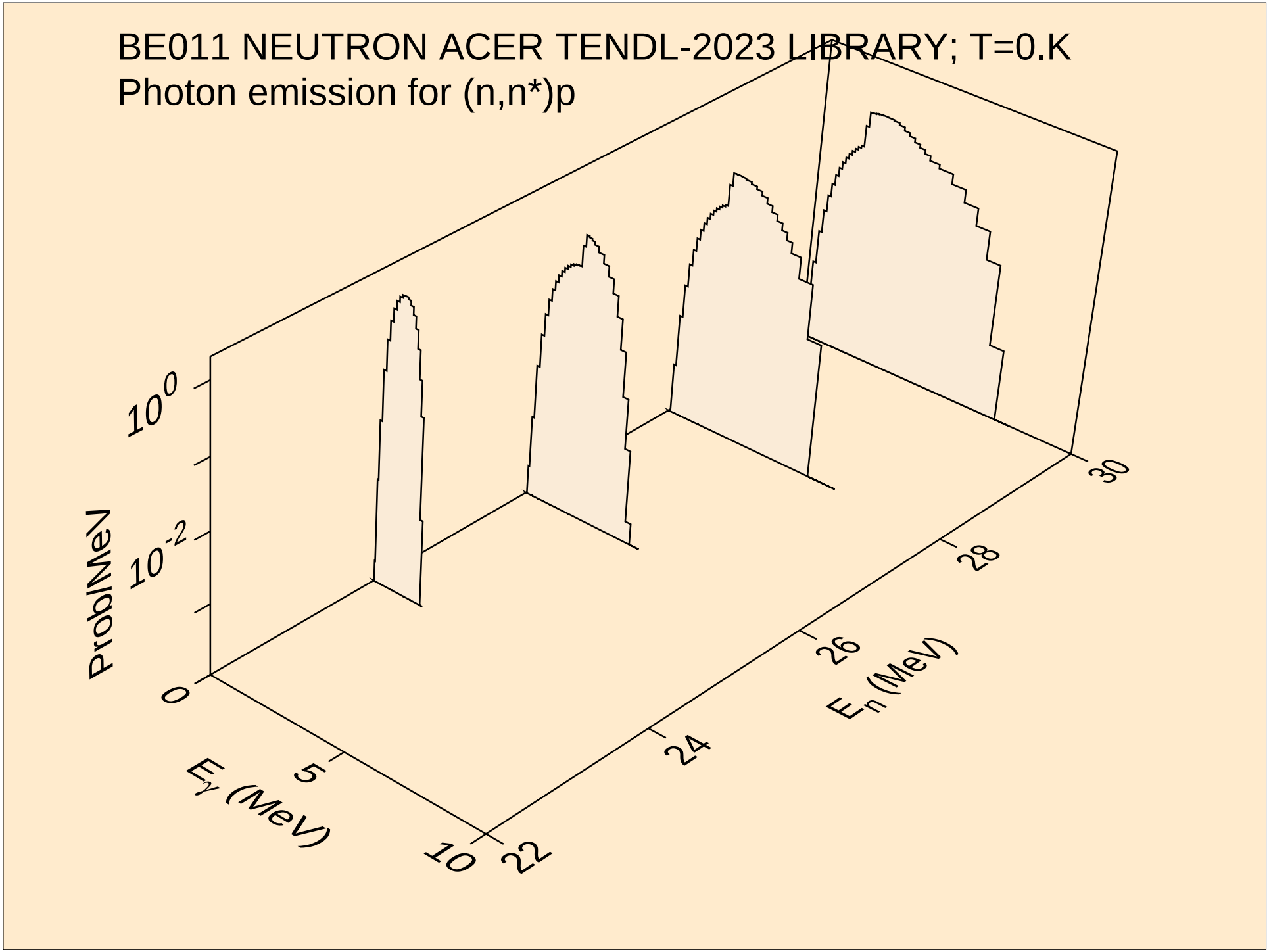

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Neutron emission for (n,3np)
Prob/MeV
10-1
10-3
0
Sec. Energy
1
2
3
26.0
26.5
27.0
27.5
28.0
28.5
29.0
29.5
30.0
Energy (MeV)

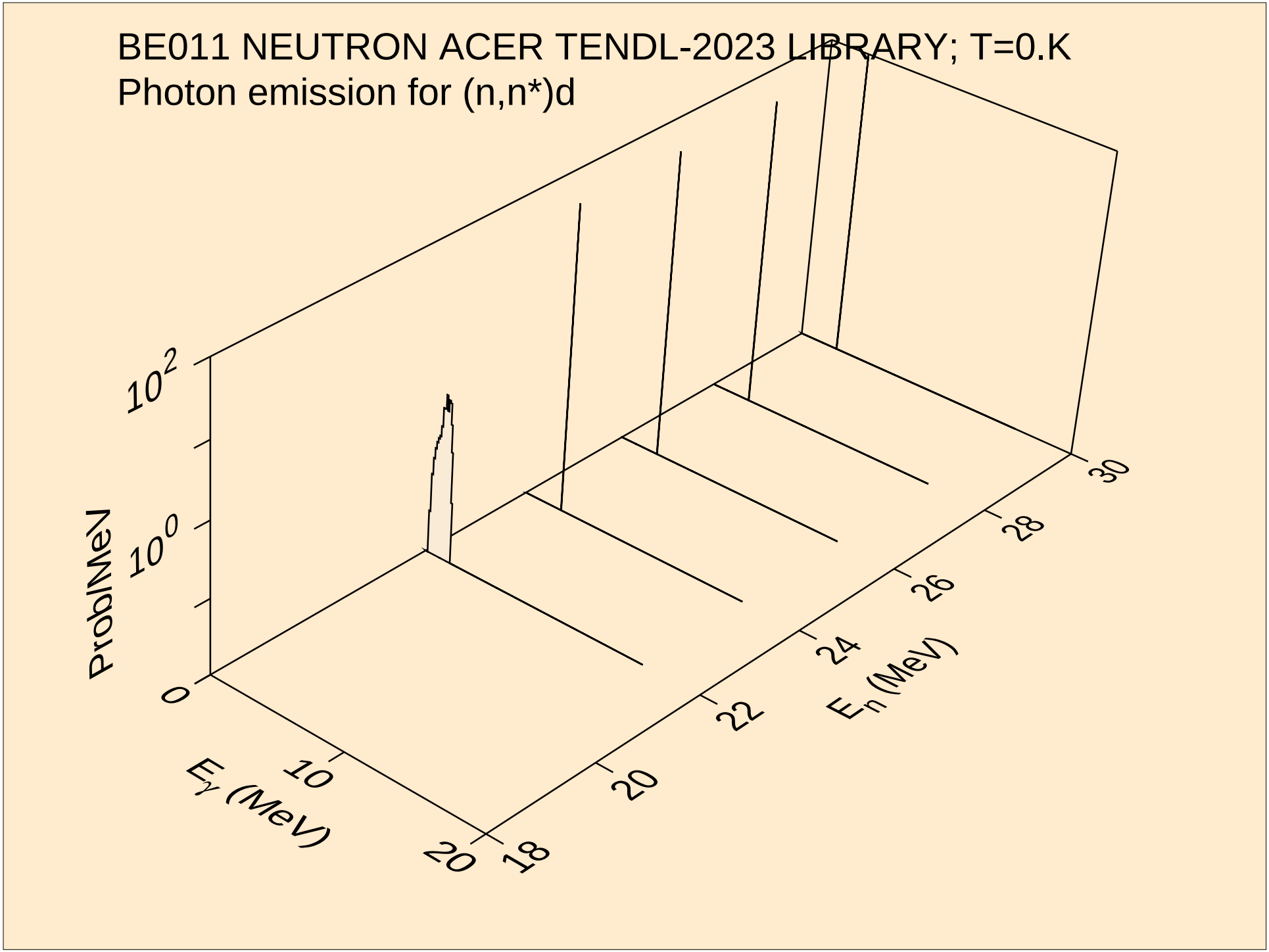

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,x)
Prob/MeV
10-1
10-3
0
100
200
Eγ (MeV)
0
50
100
150
200
En (MeV)

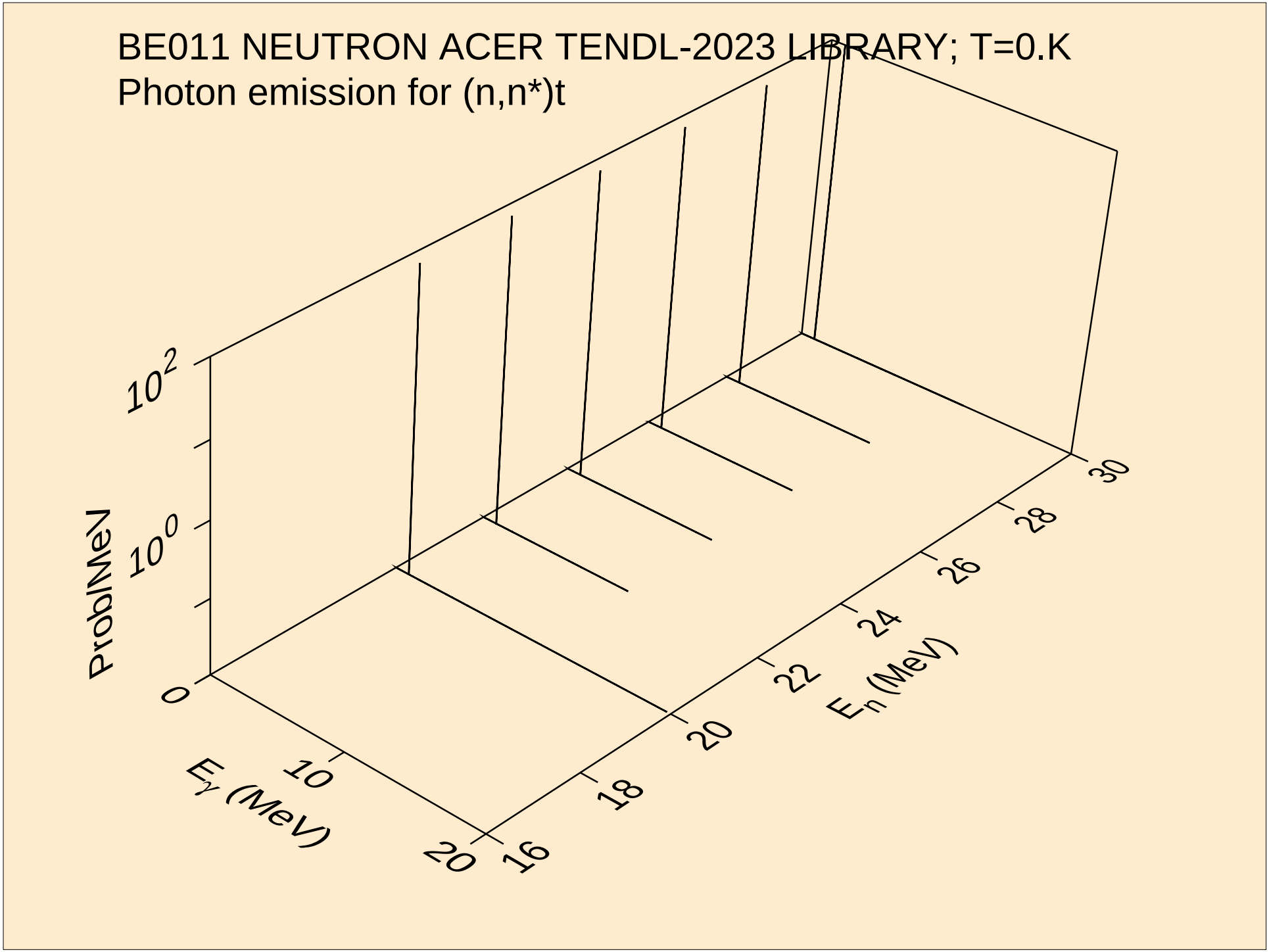

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,2nd)
Prob/MeV
10^2
10^0
0
E_γ (MeV)
10
20
23
24
25
26
27
28
29
30
E_n (MeV)

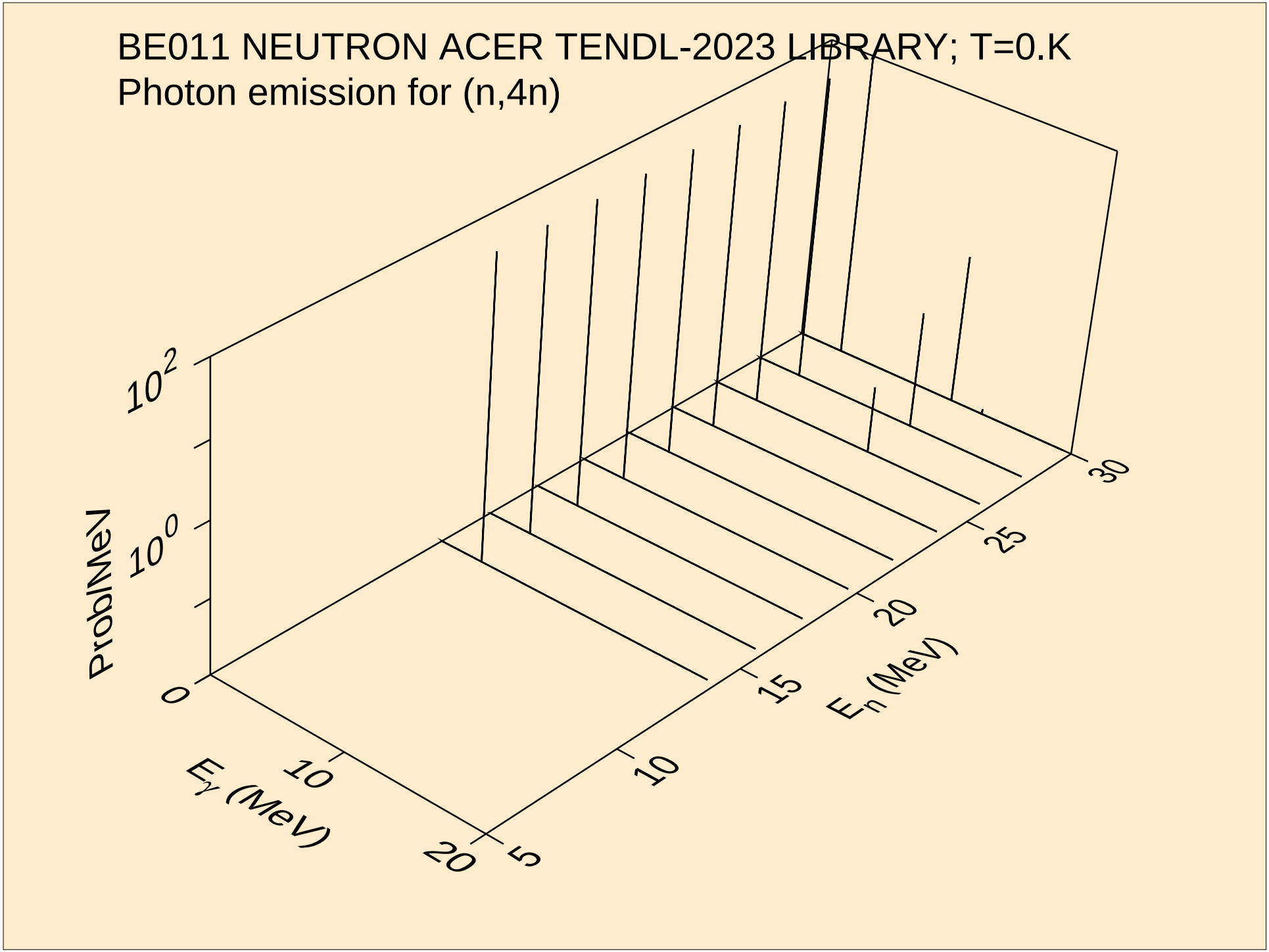

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,2n)
Prob/MeV
10^{3}
10^{1}
10^{-1}
0
5
10
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

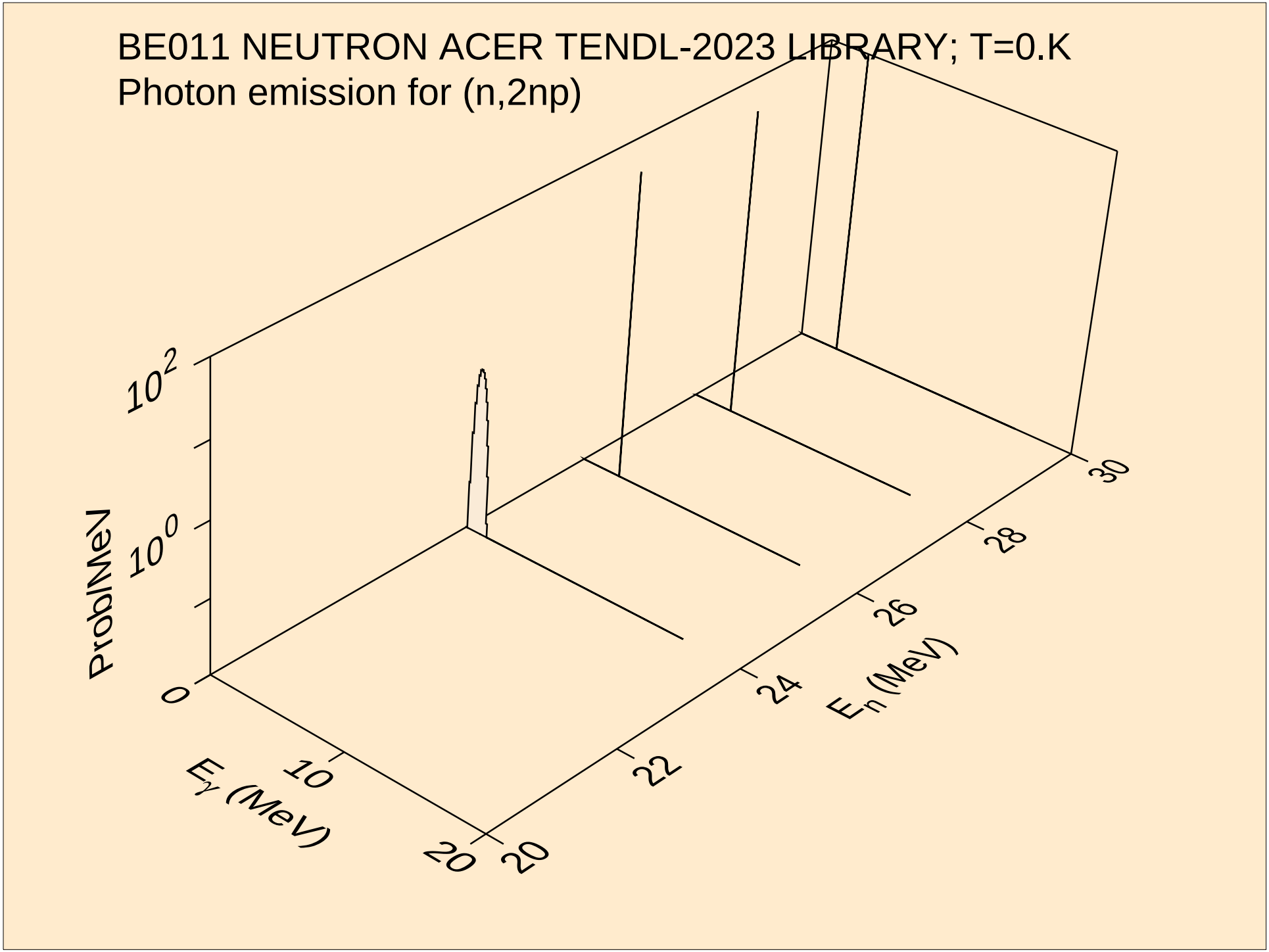

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,3n)
Prob/MeV
10^{3}
10^{1}
10^{-1}
0
10
20
E_γ (MeV)
5
10
15
20
25
30
E_n (MeV)

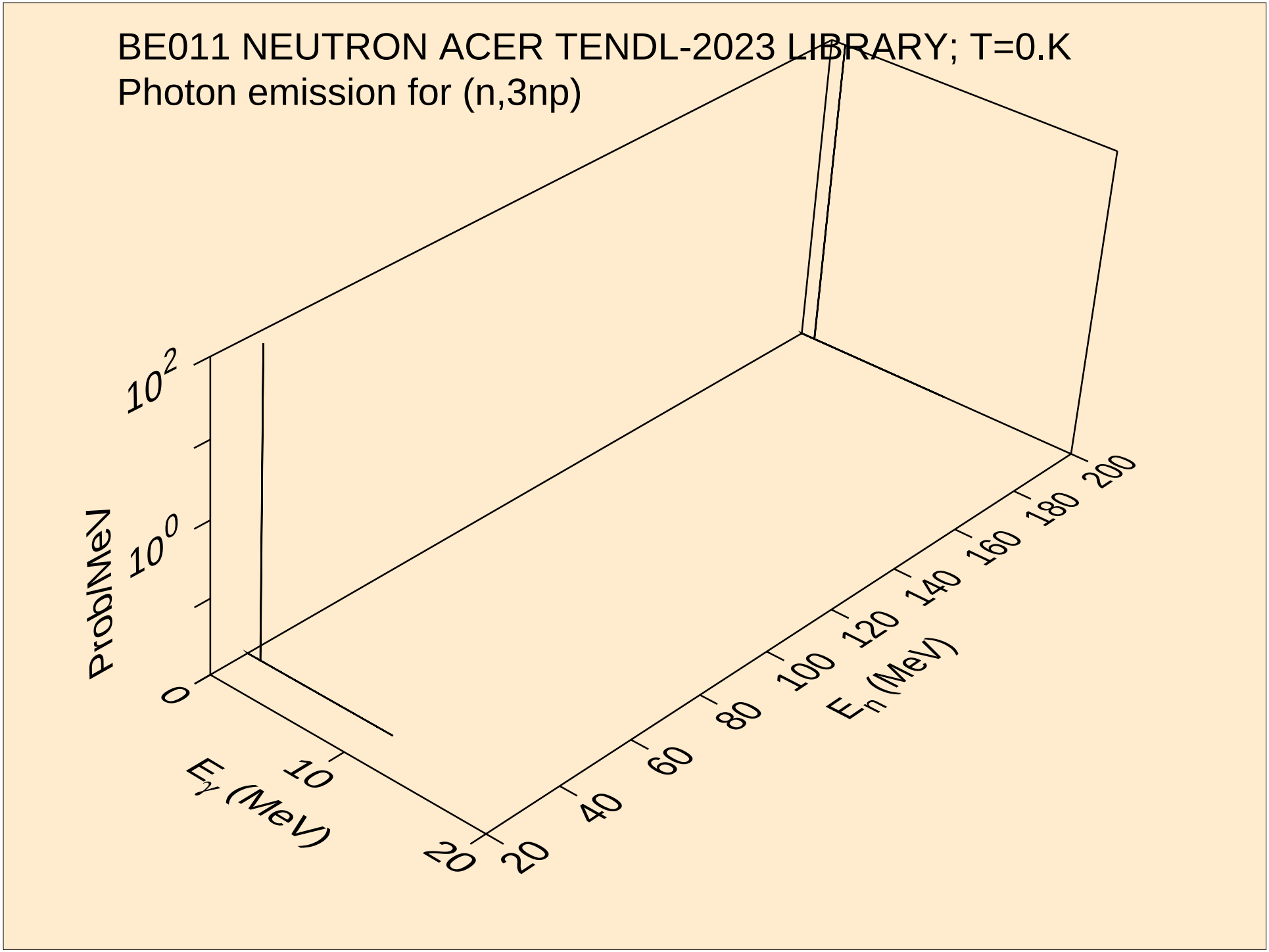

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,n*)p
Prob/MeV
10^0
10^-2
0
5
10
Eγ (MeV)
22
24
26
28
30
En (MeV)

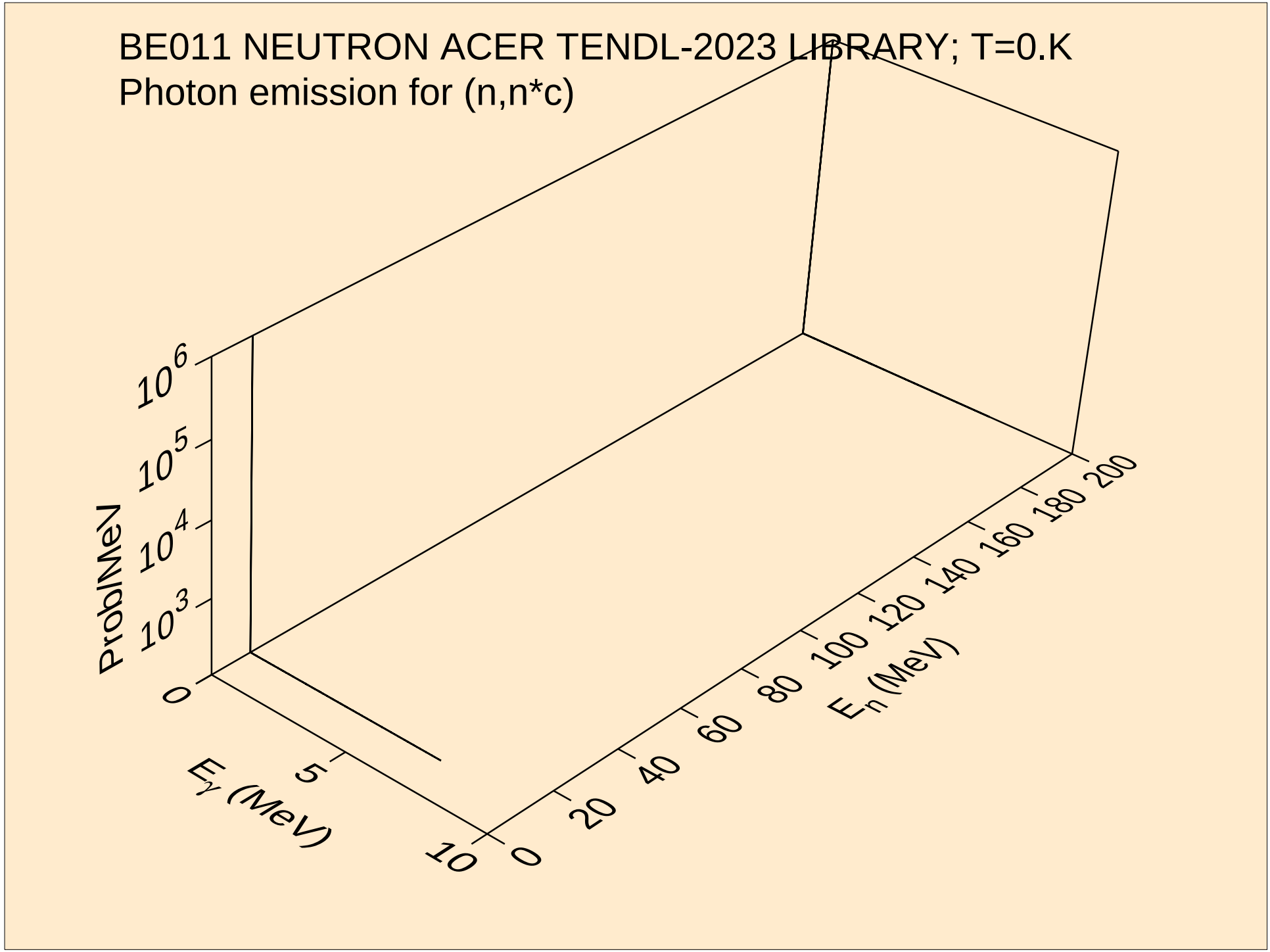

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,n*)d
Prob/MeV
10^2
10^0
0
E_γ (MeV)
10
20
18
20
22
24
26
28
30
E_n (MeV)

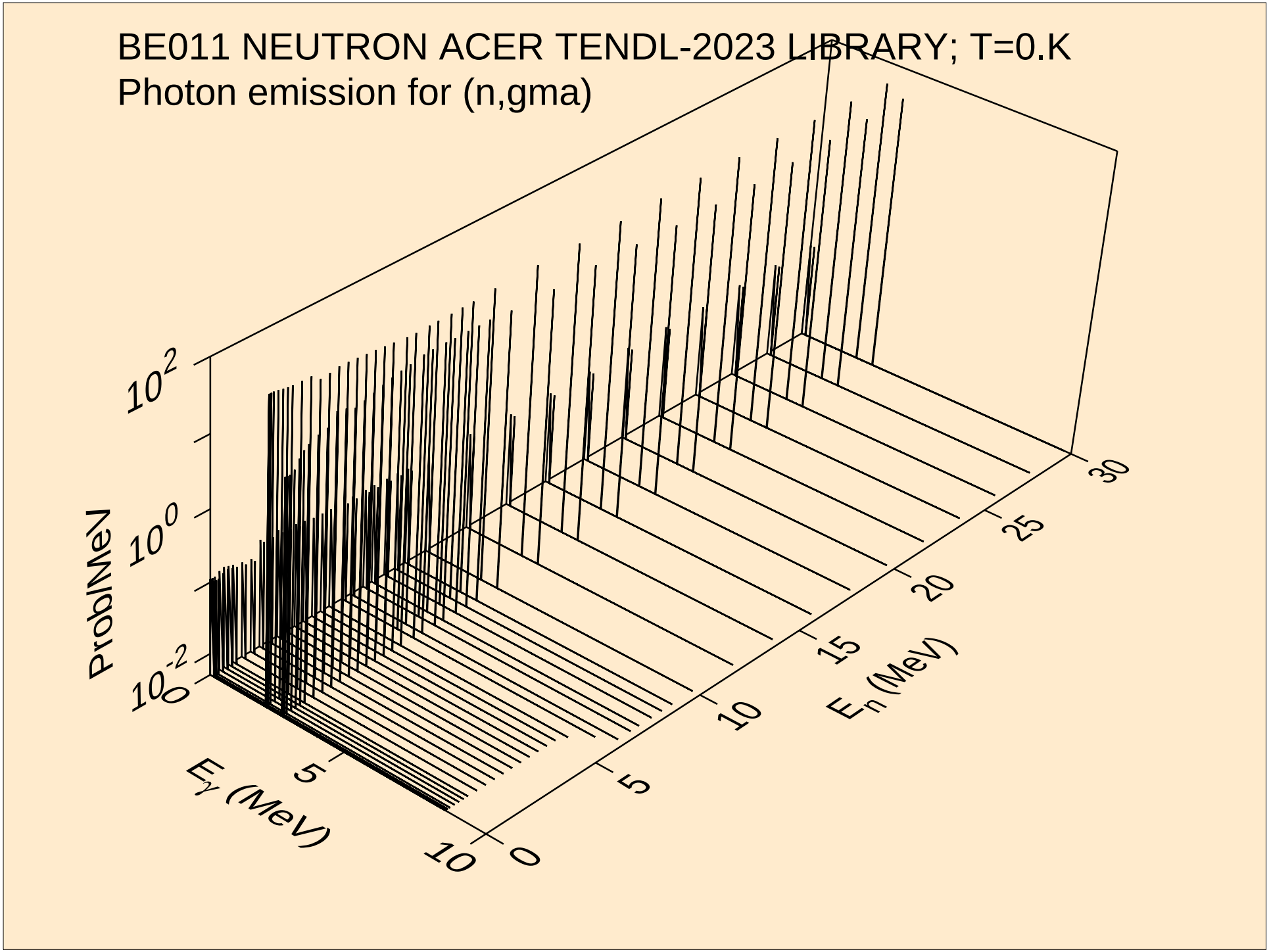

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,n*)t
Prob/MeV
10^2
10^0
0
E_γ (MeV)
10
20
16
18
20
22
24
26
28
30
E_n (MeV)

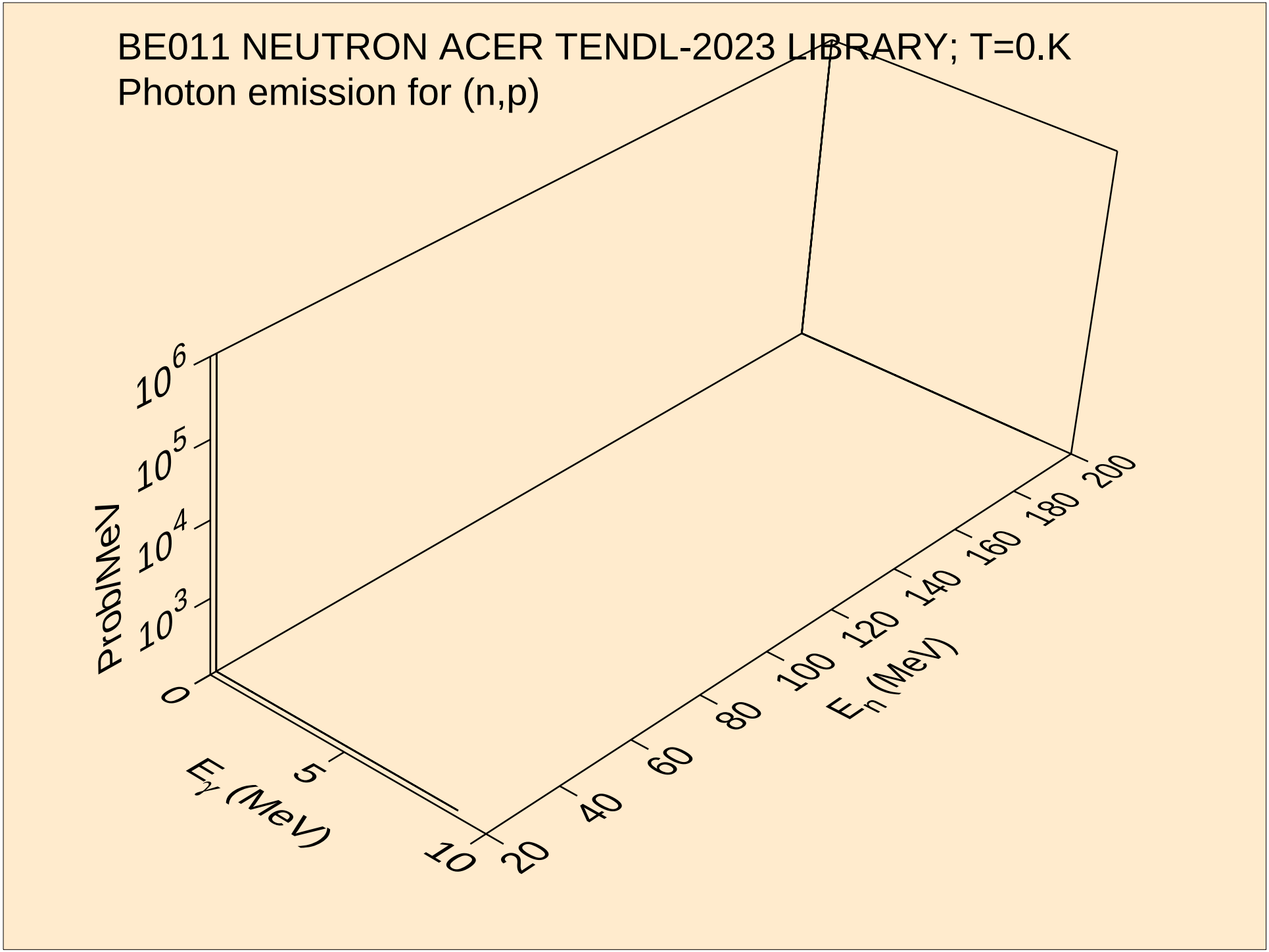

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,4n)
Prob/MeV
10^2
10^0
0
E_γ (MeV)
10
20
5
10
15
20
25
30
E_n (MeV)

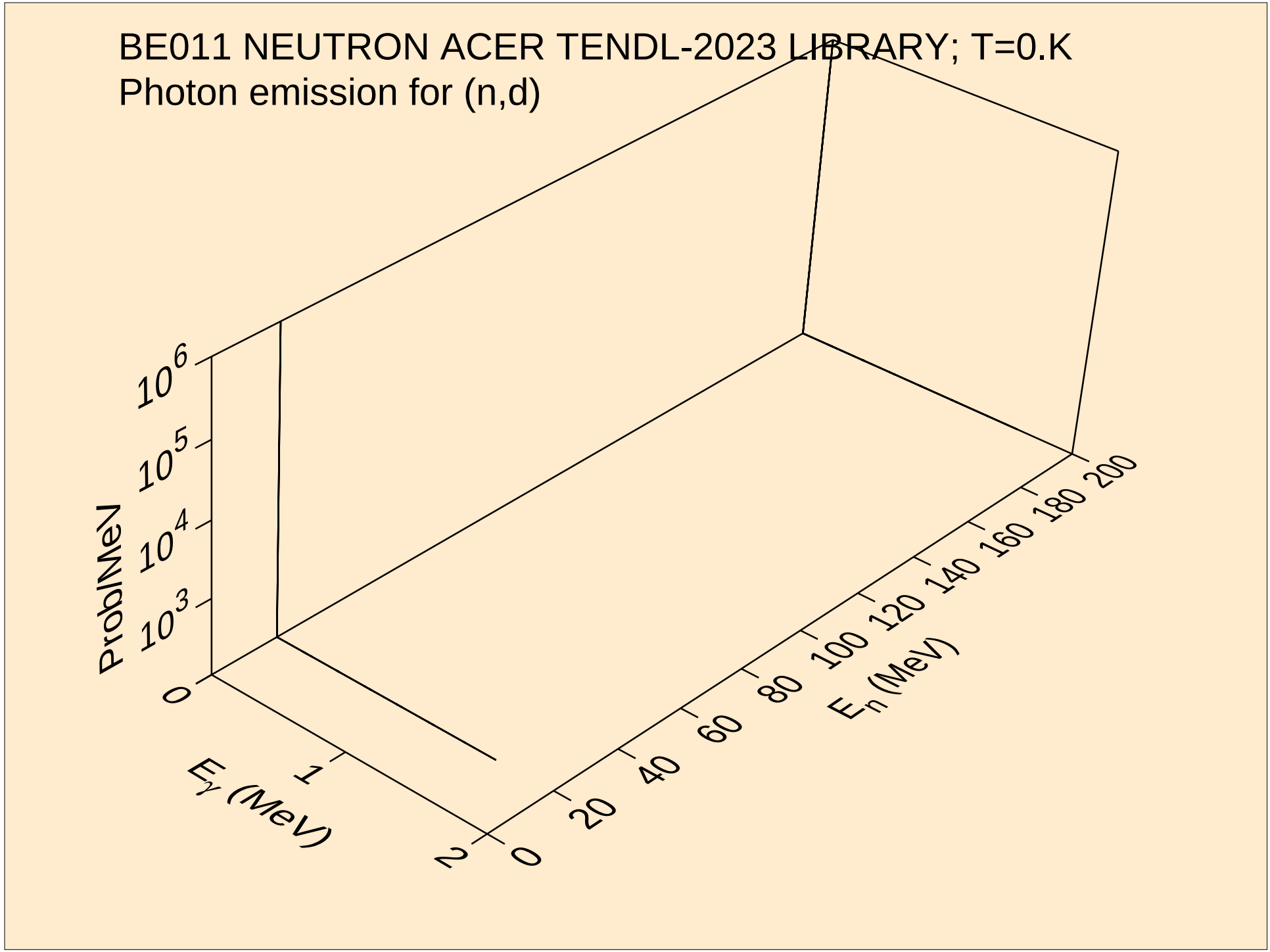

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,2np)
Prob/MeV
10^2
10^0
0
E_γ (MeV)
0
10
20
20
22
24
26
28
30
E_n (MeV)

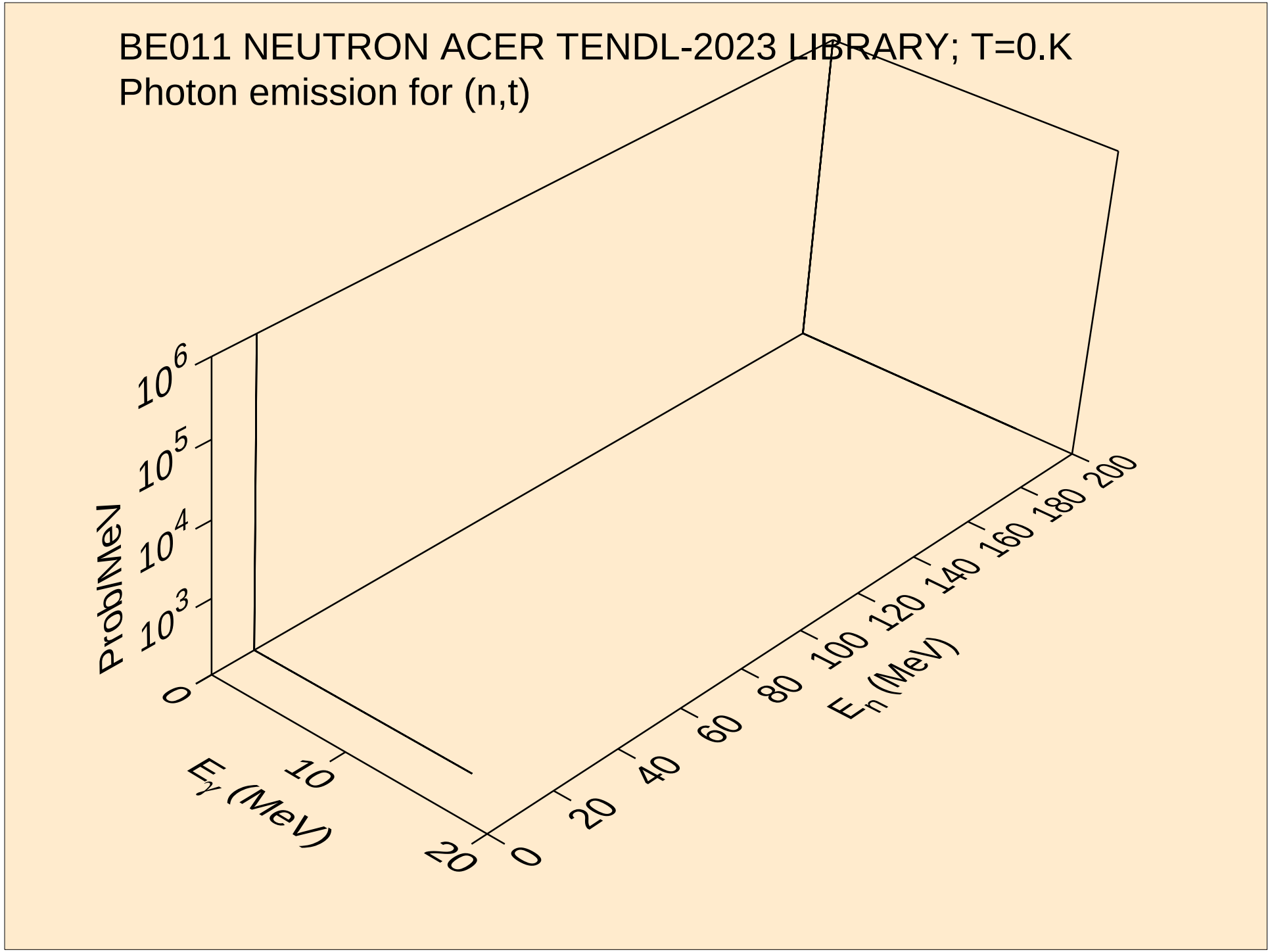

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,3np)
Prob/MeV
10^2
10^0
0
E_γ (MeV)
10
20
20
40
60
80
100
120
140
160
180
200
E_n (MeV)

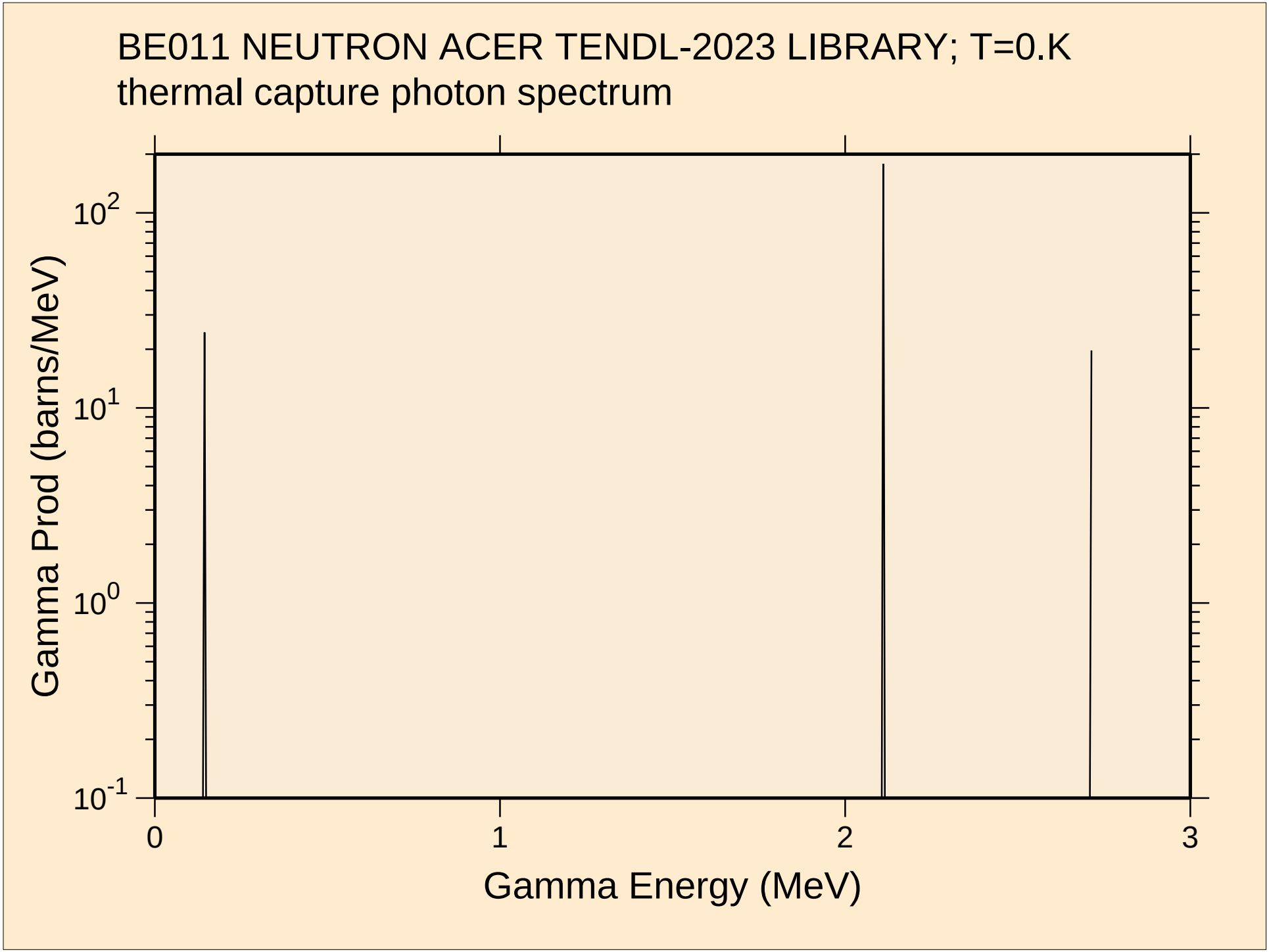

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,n*c)
Prob/MeV
10^6
10^5
10^4
10^3
0
E_γ (MeV)
0
5
10
E_n (MeV)
0
20
40
60
80
100
120
140
160
180
200

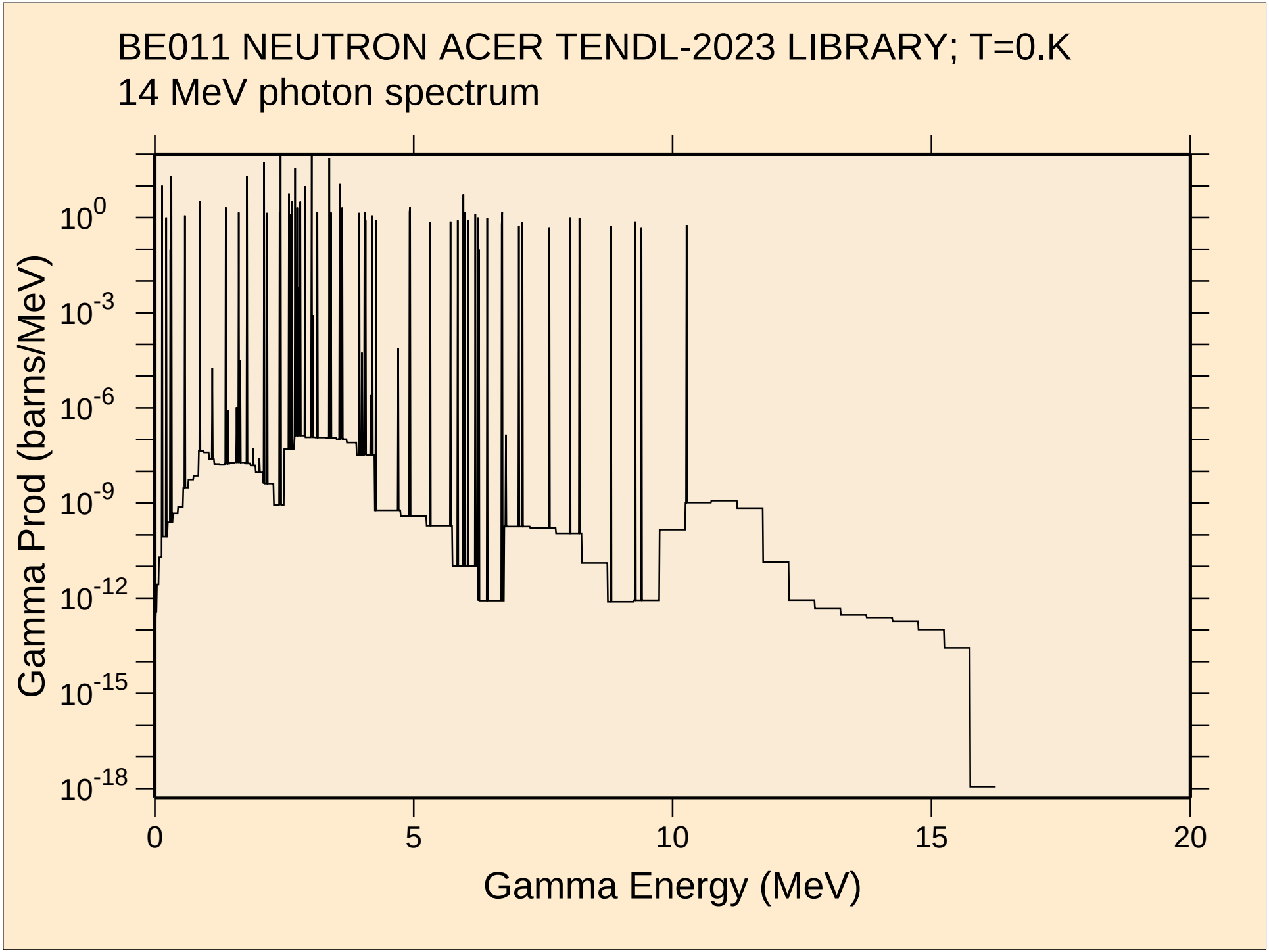

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,gma)
Prob/MeV
10^{2}
10^{0}
10^{-2}
0
5
10
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

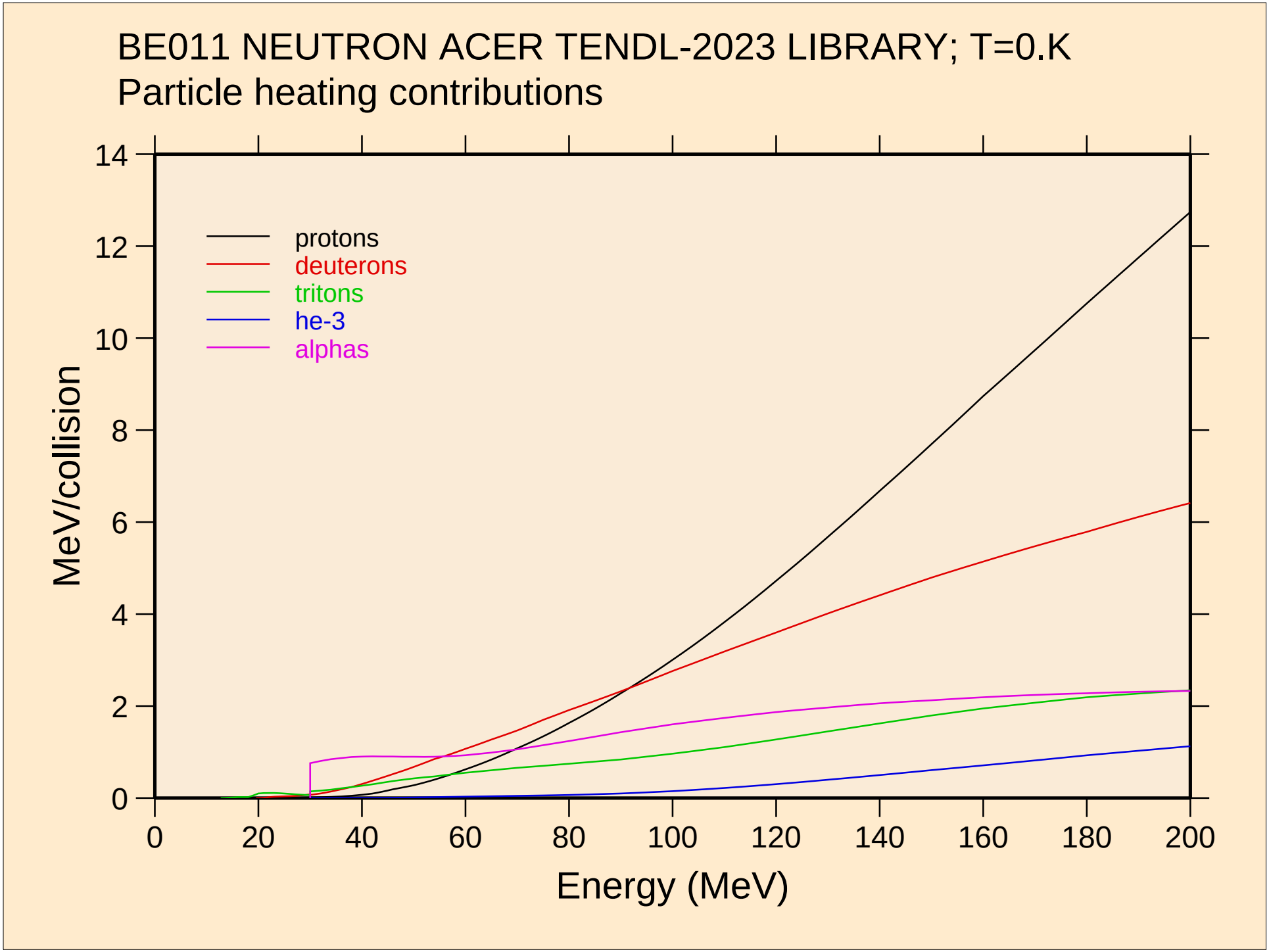

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,p)
Prob/MeV
10^6
10^5
10^4
10^3
0
E_γ (MeV)
5
10
20
40
60
80
100
120
140
160
180
200
E_n (MeV)

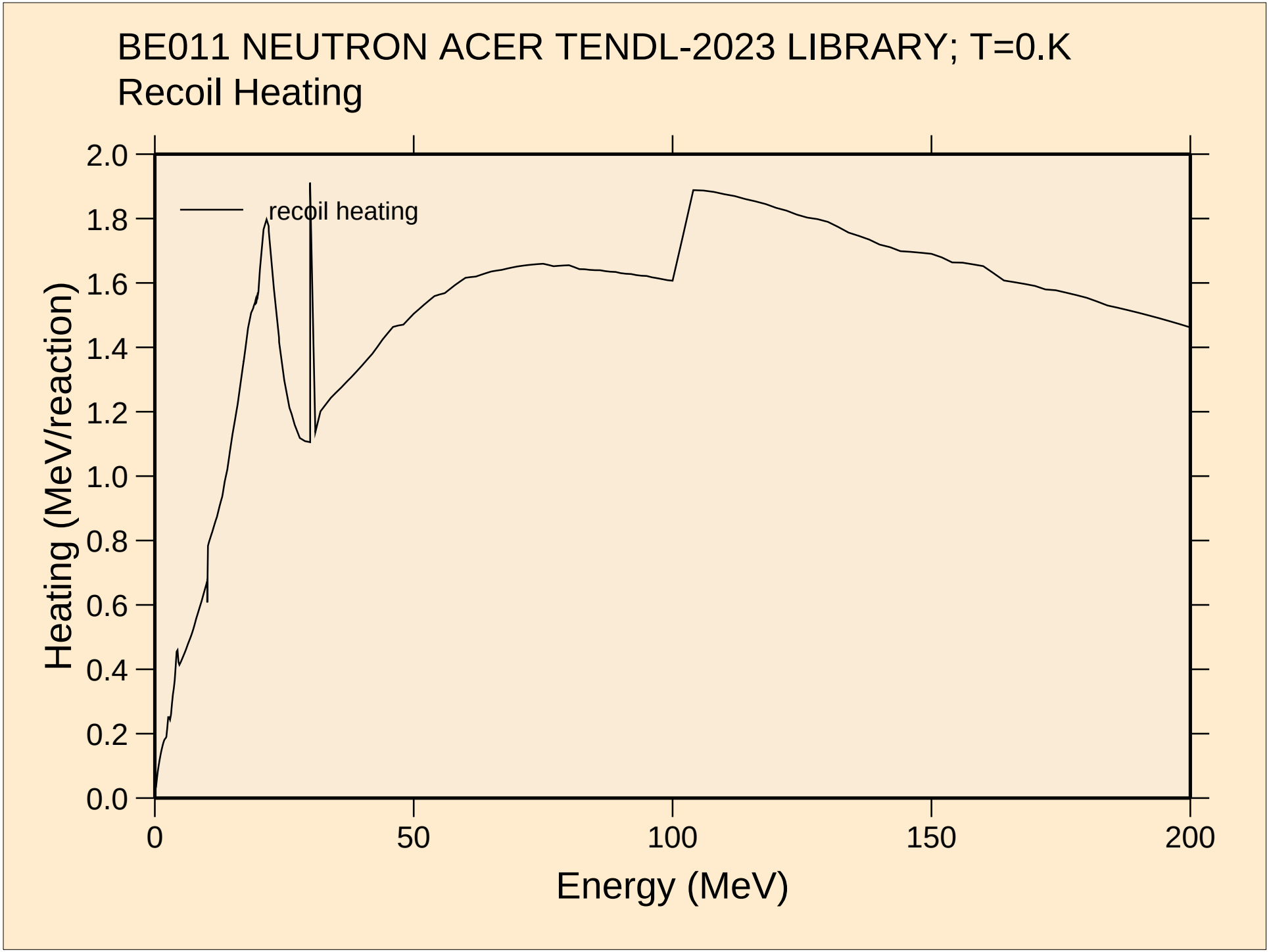

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,d)
Prob/MeV
10^6
10^5
10^4
10^3
0
E_γ (MeV)
0
1
2
E_n (MeV)
0
20
40
60
80
100
120
140
160
180
200

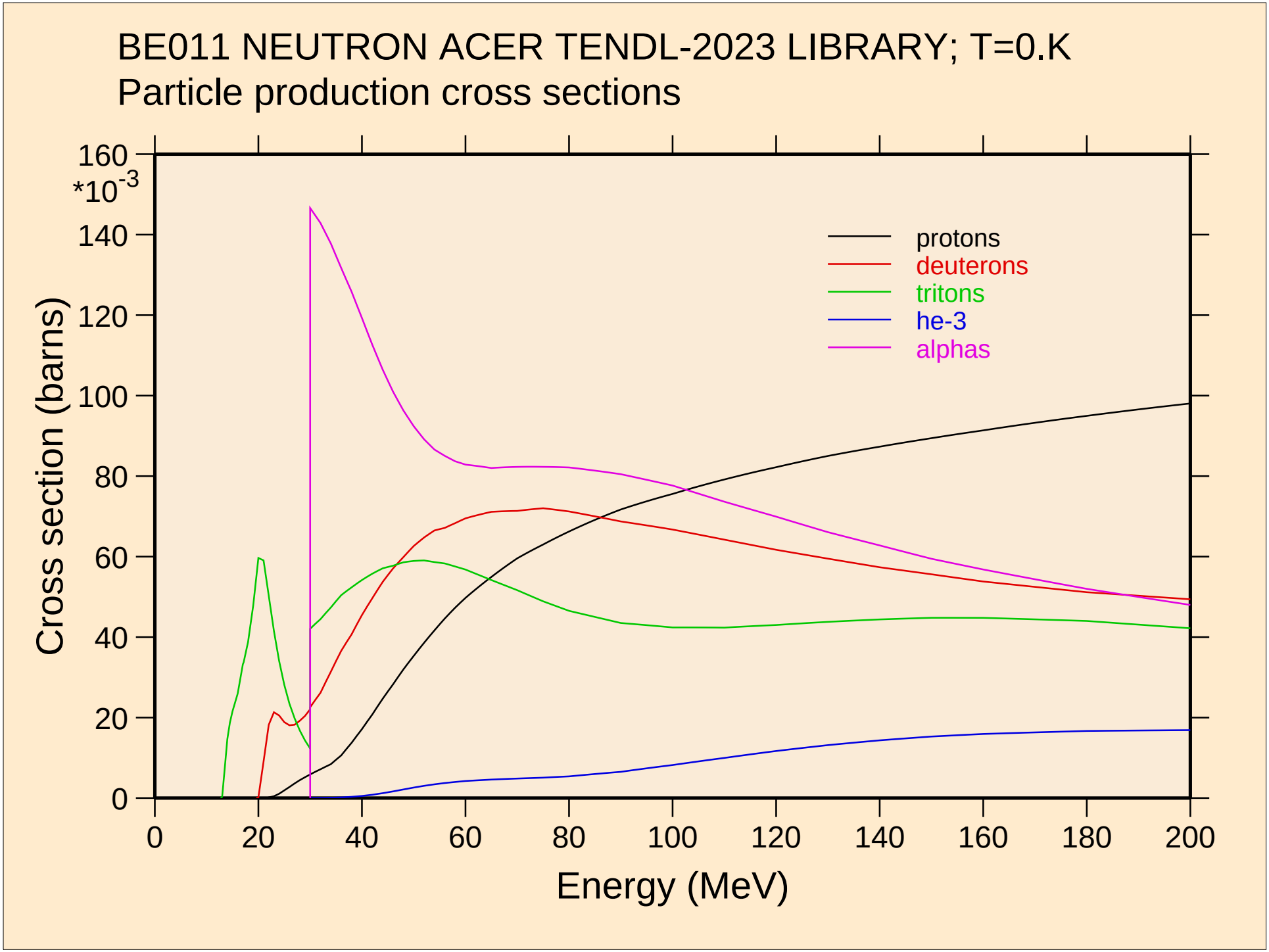

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Photon emission for (n,t)
Prob/MeV
10^6
10^5
10^4
10^3
0
E_γ (MeV)
0
10
20
E_n (MeV)
0
20
40
60
80
100
120
140
160
180
200

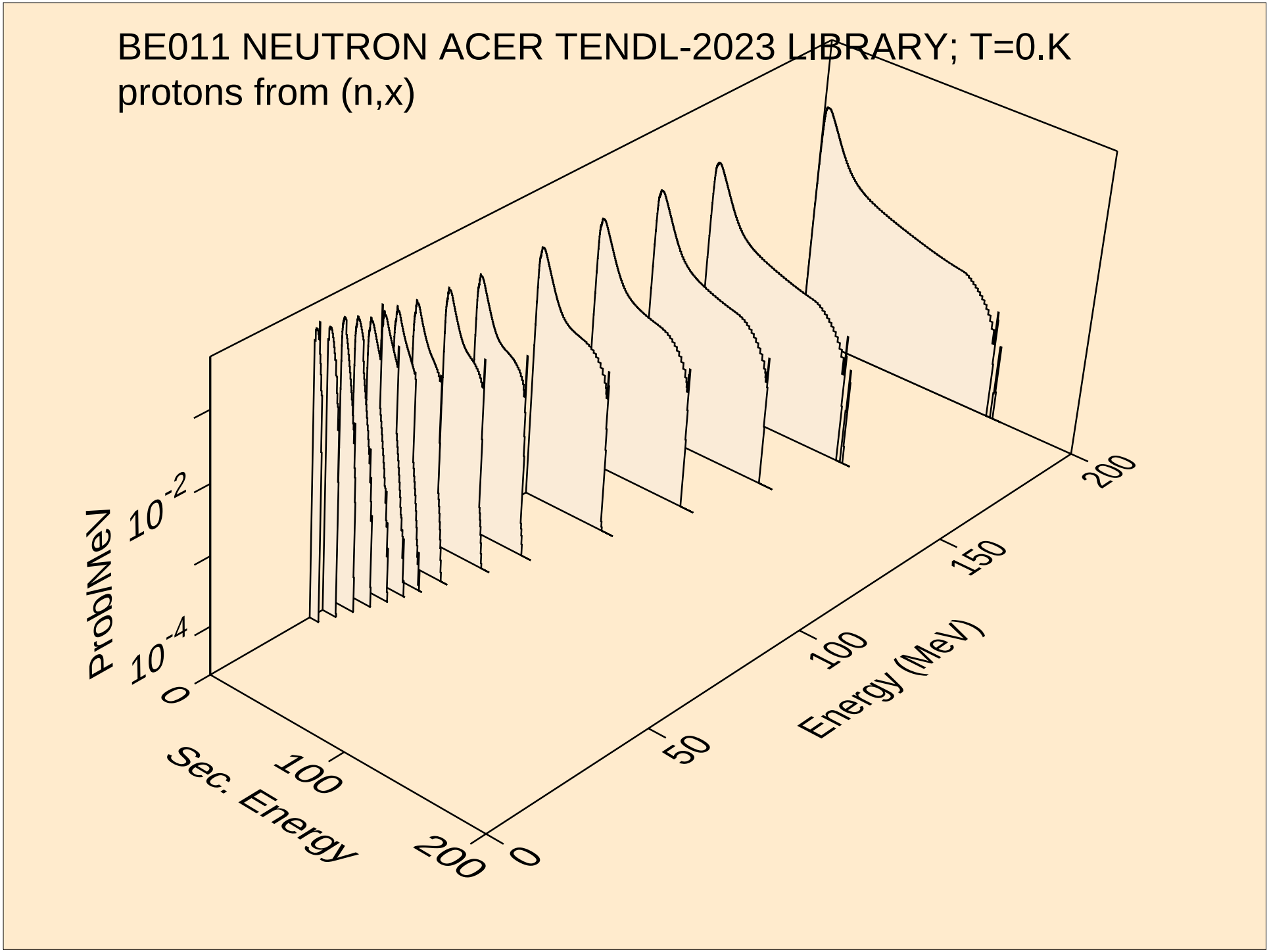

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
thermal capture photon spectrum
Gamma Prod (barns/MeV)
10^2
10^1
10^0
10^-1
0
1
2
3
Gamma Energy (MeV)

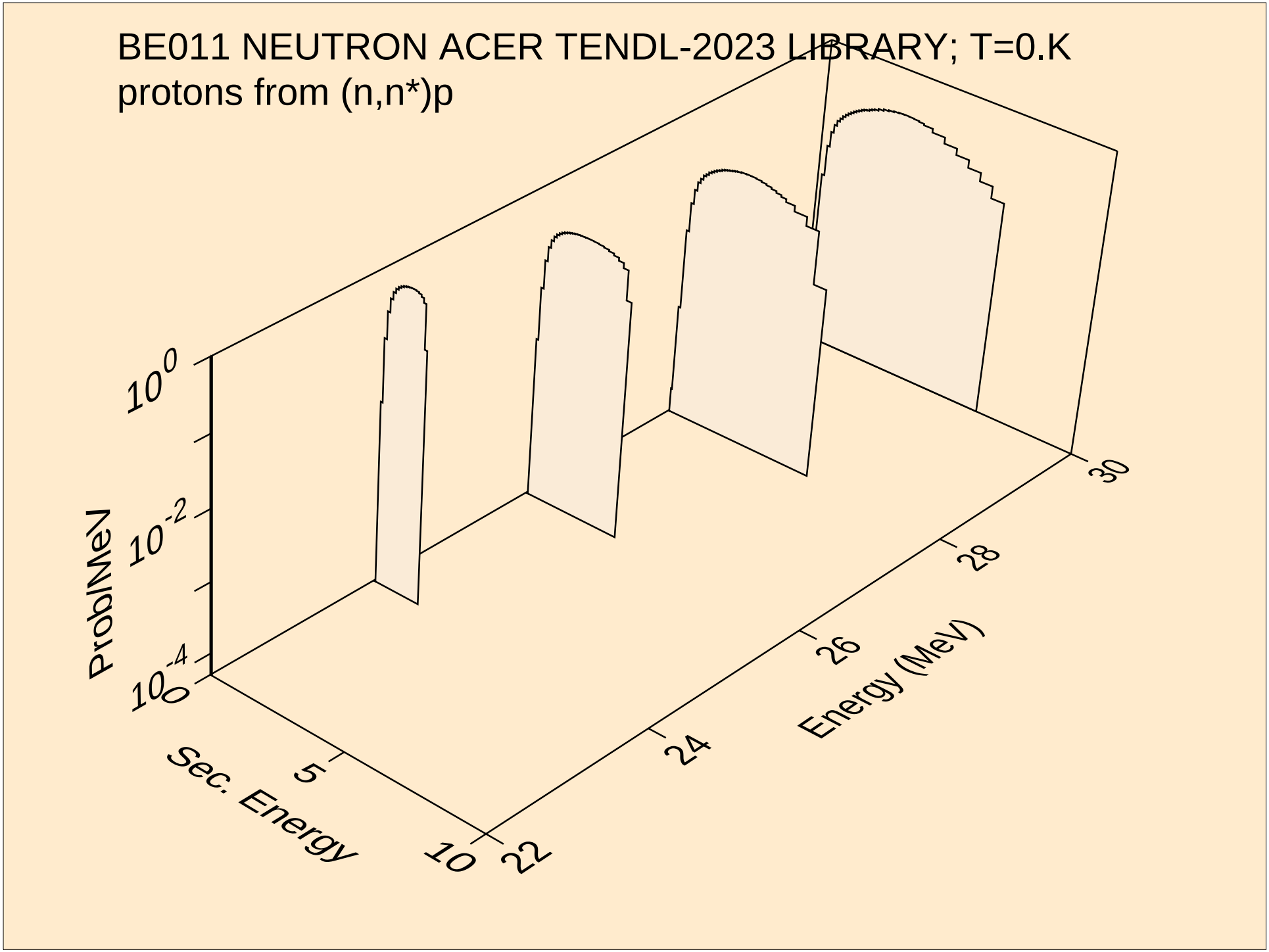

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
14 MeV photon spectrum
Gamma Prod (barns/MeV)
10^0
10^-3
10^-6
10^-9
10^-12
10^-15
10^-18
0
5
10
15
20
Gamma Energy (MeV)

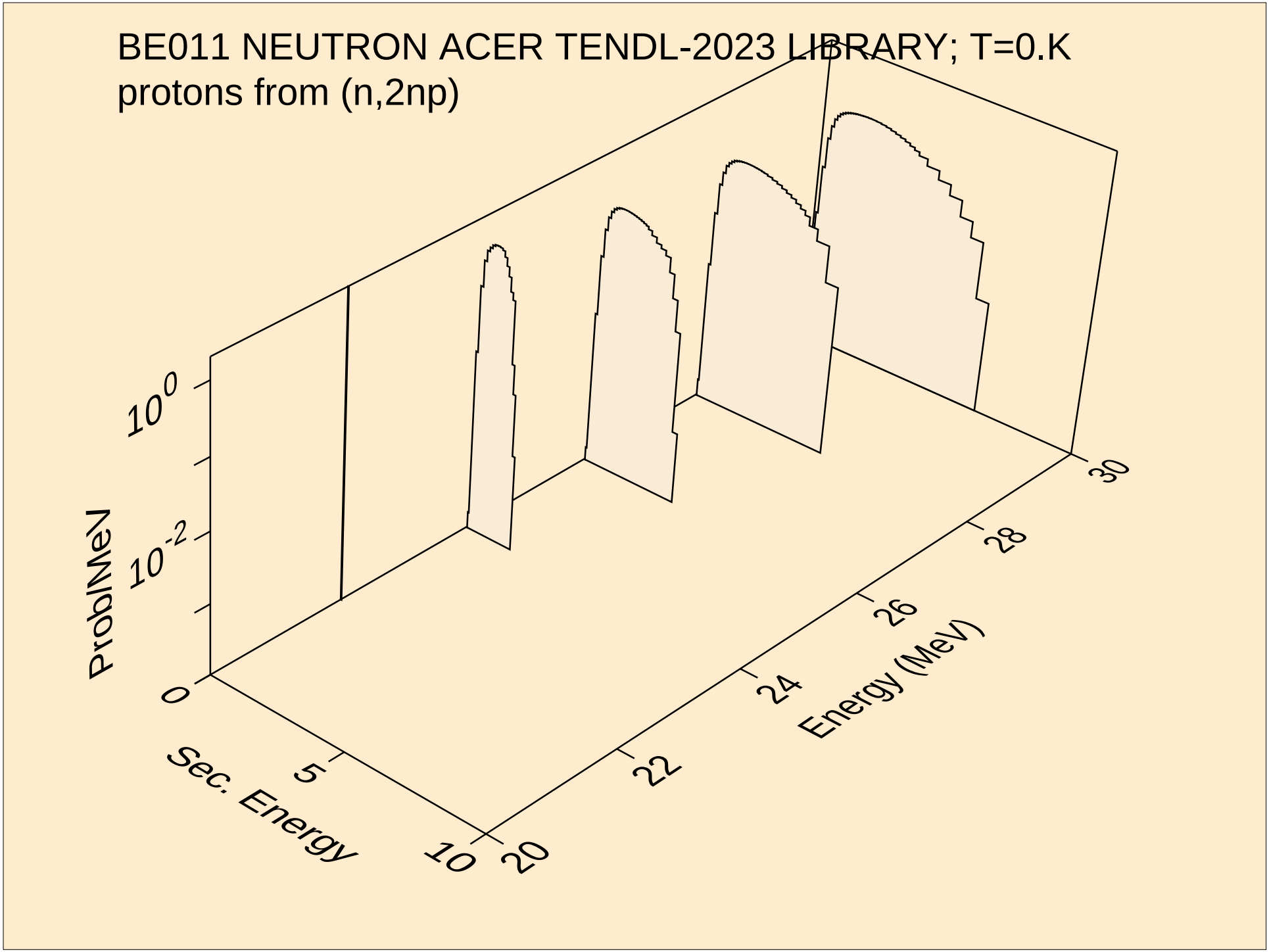

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Particle heating contributions
protons
deuterons
tritons
he-3
alphas
MeV/collision
Energy (MeV)
0
2
4
6
8
10
12
14
0
20
40
60
80
100
120
140
160
180
200

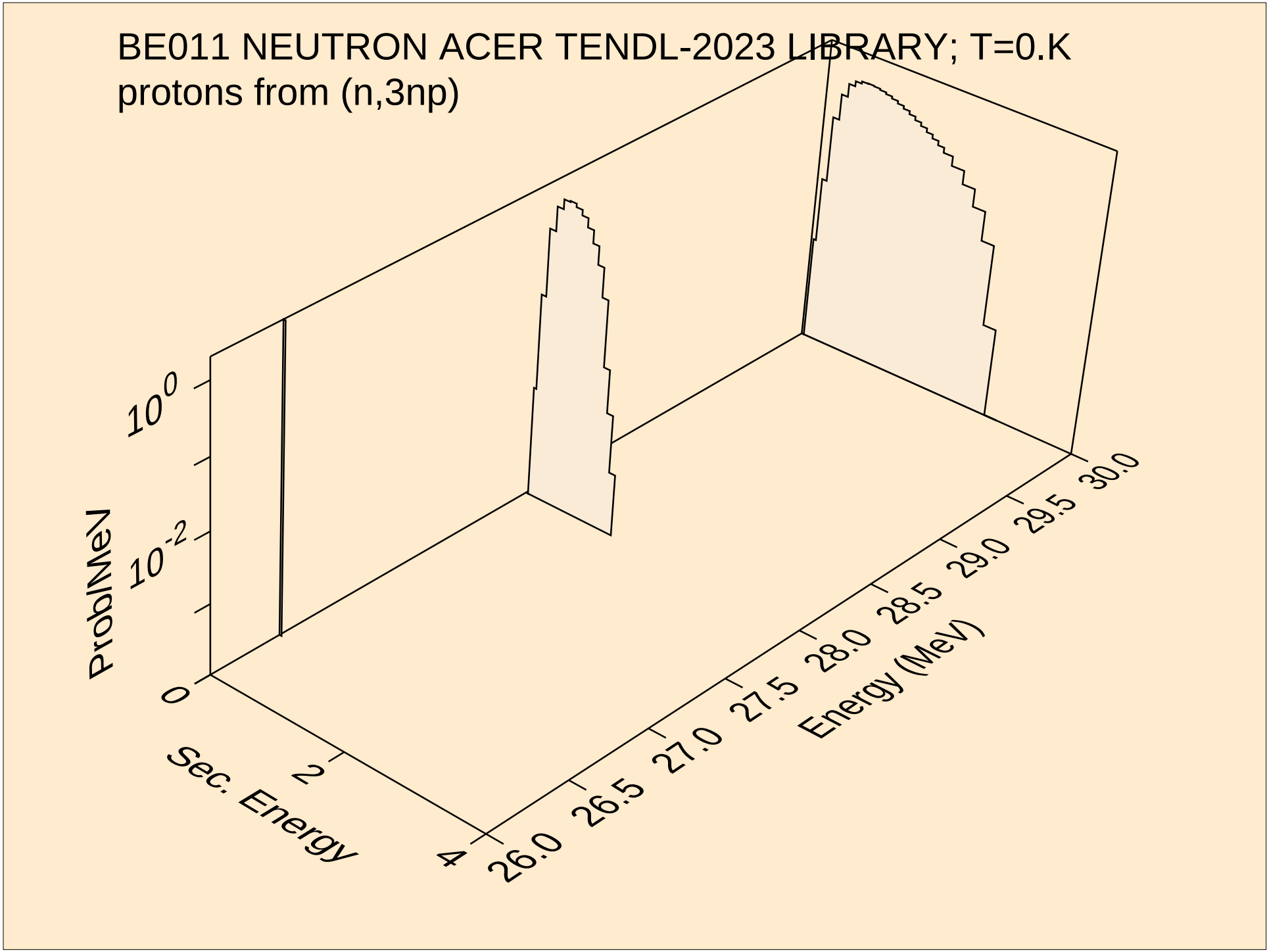

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Recoil Heating
recoil heating
Heating (MeV/reaction)
Energy (MeV)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
0
50
100
150
200

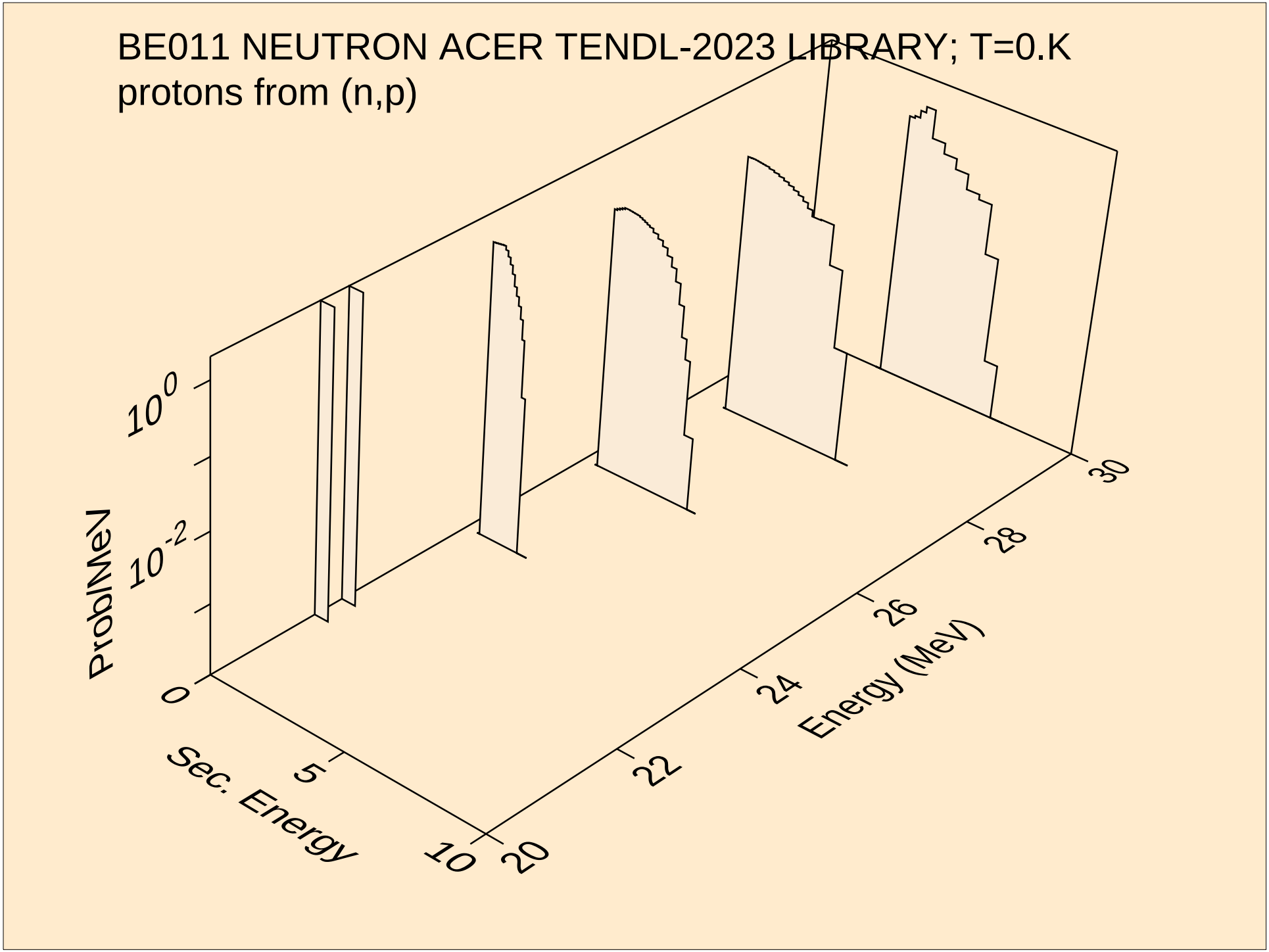

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
Particle production cross sections
Cross section (barns)
*10-3
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
180
200
Energy (MeV)
protons
deuterons
tritons
he-3
alphas

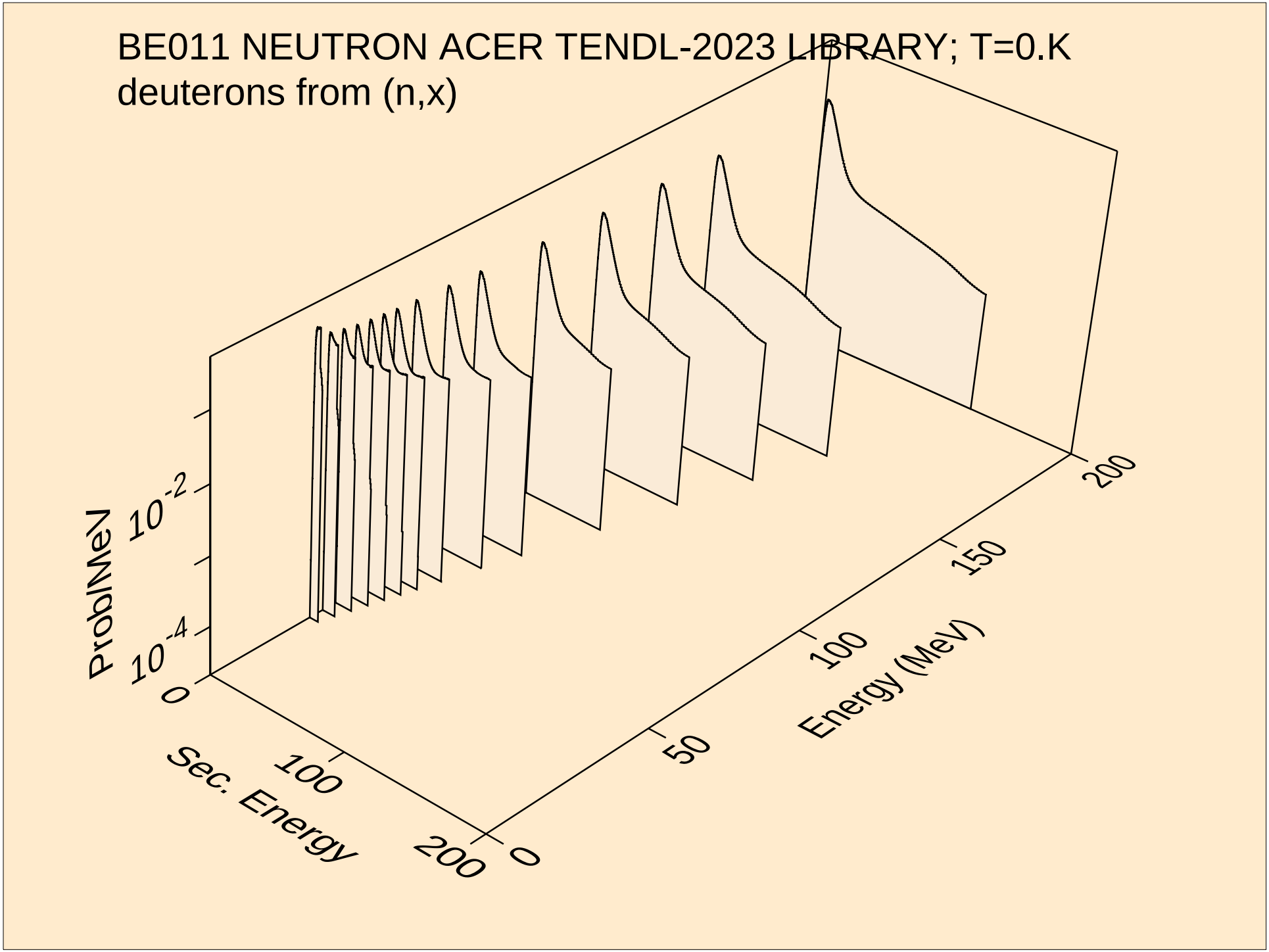

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
protons from (n,x)
Prob/MeV
10-2
10-4
0
Sec. Energy
100
200
0
50
100
150
200
Energy (MeV)

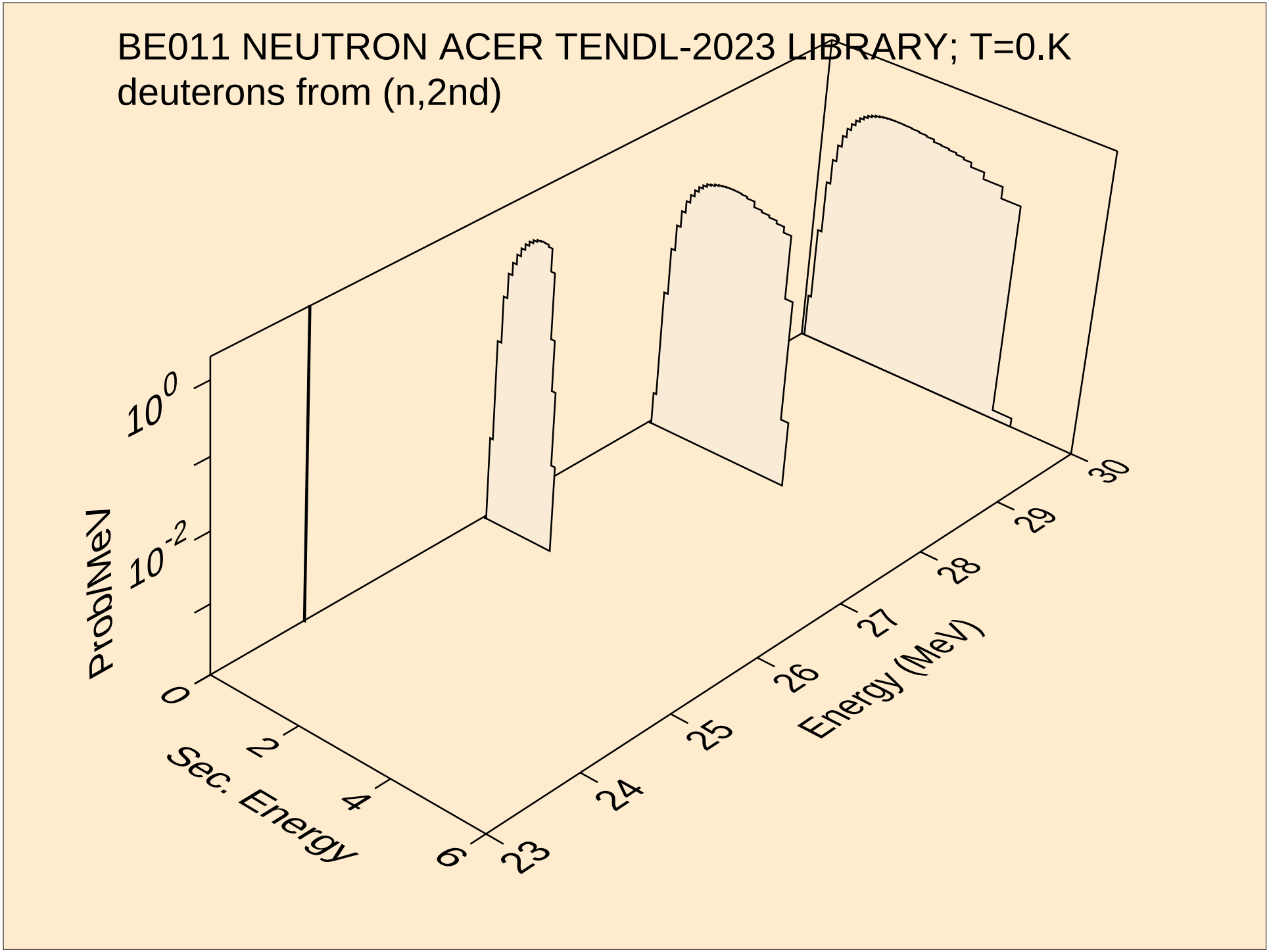

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
protons from (n,n*)p
Prob/MeV
10^0
10^-2
10^-4
Sec. Energy
0
5
10
Energy (MeV)
22
24
26
28
30

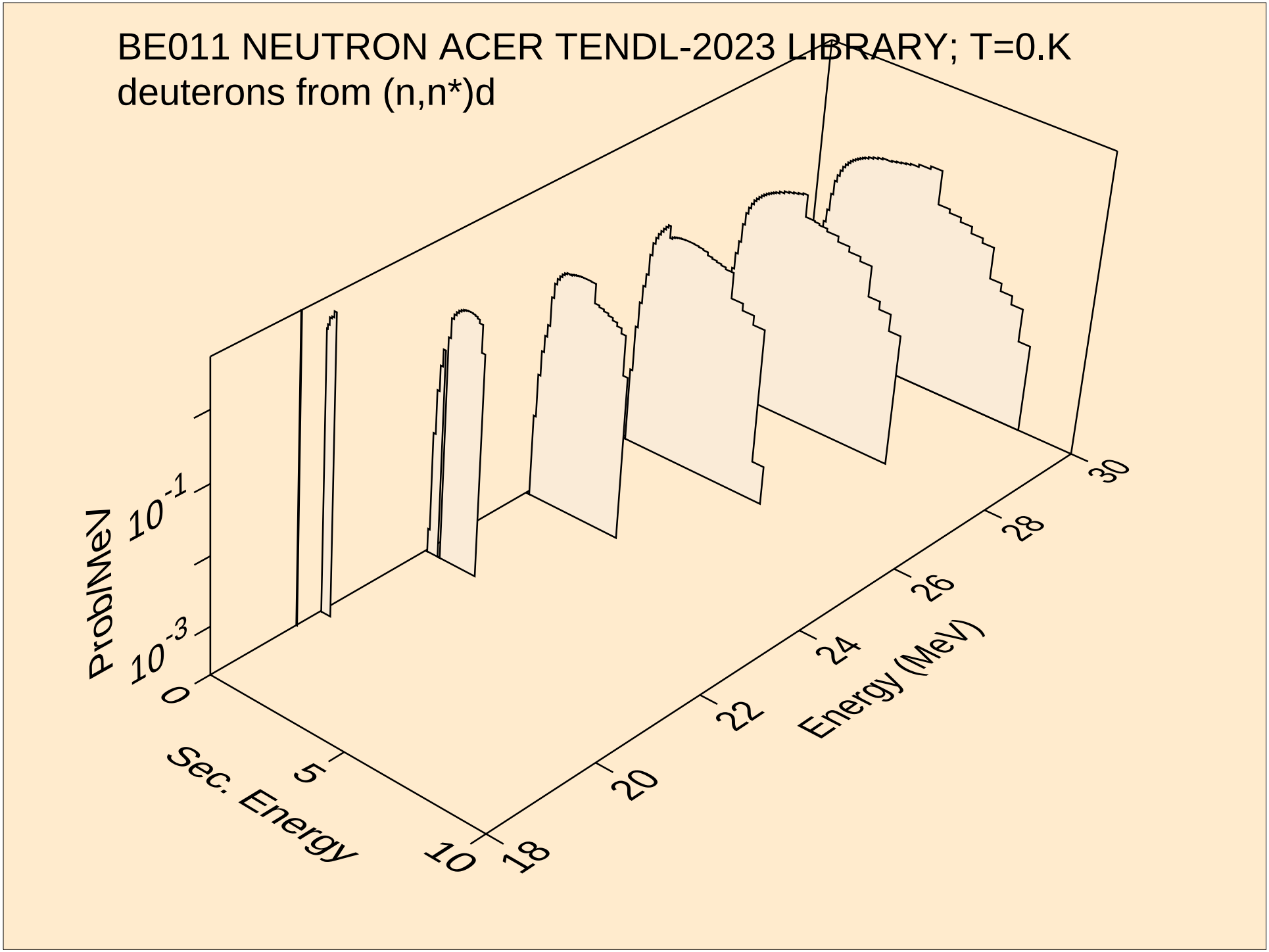

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
protons from (n,2np)
Prob/MeV
10^0
10^-2
0
Sec. Energy
5
10
20
22
24
Energy (MeV)
26
28
30

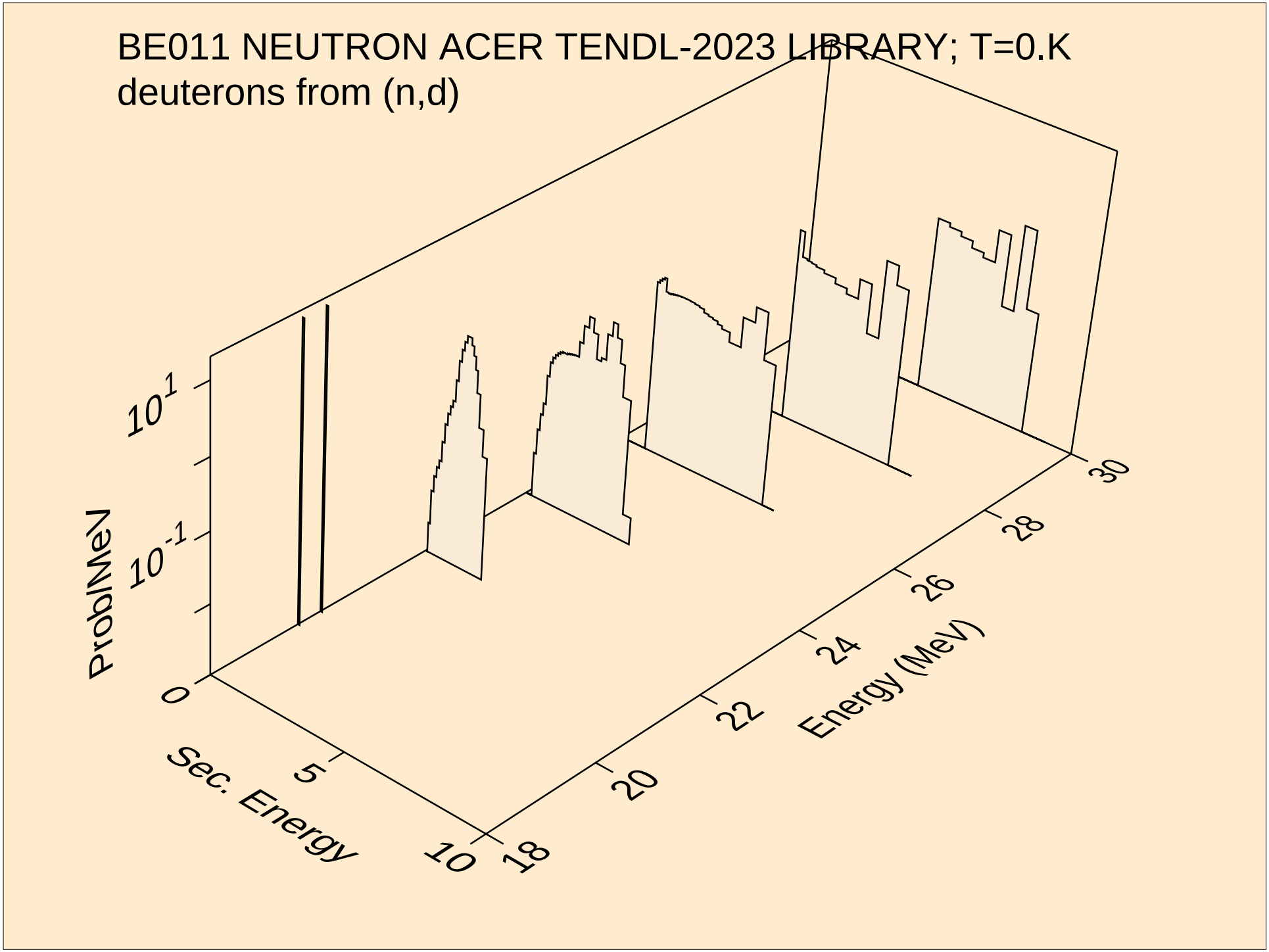

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
protons from (n,3np)
Prob/MeV
10^0
10^-2
0
Sec. Energy
2
4
26.0
26.5
27.0
27.5
28.0
28.5
29.0
29.5
30.0
Energy (MeV)

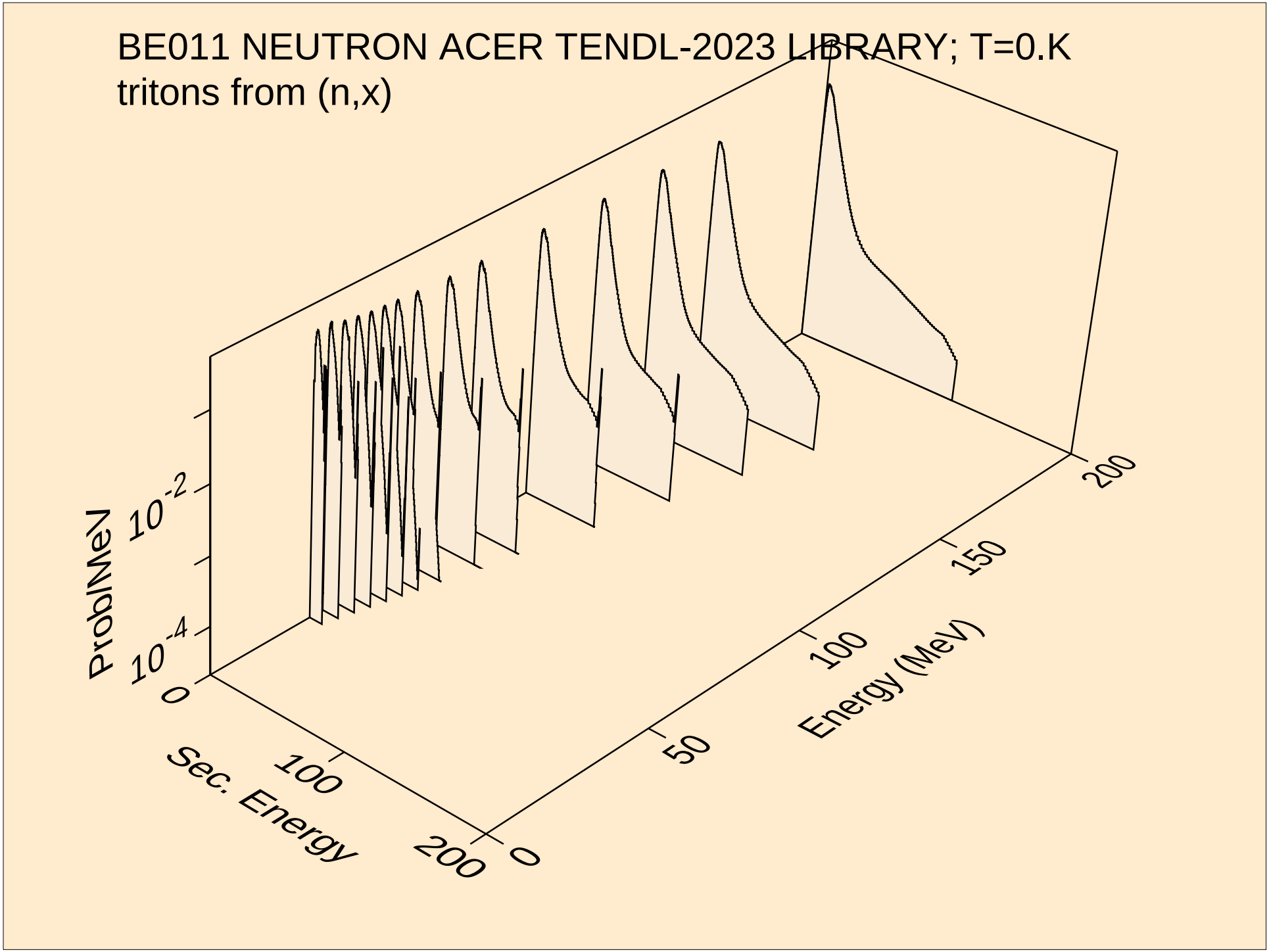

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
protons from (n,p)
Prob/MeV
10^0
10^-2
0
Sec. Energy
5
10
20
22
24
Energy (MeV)
26
28
30

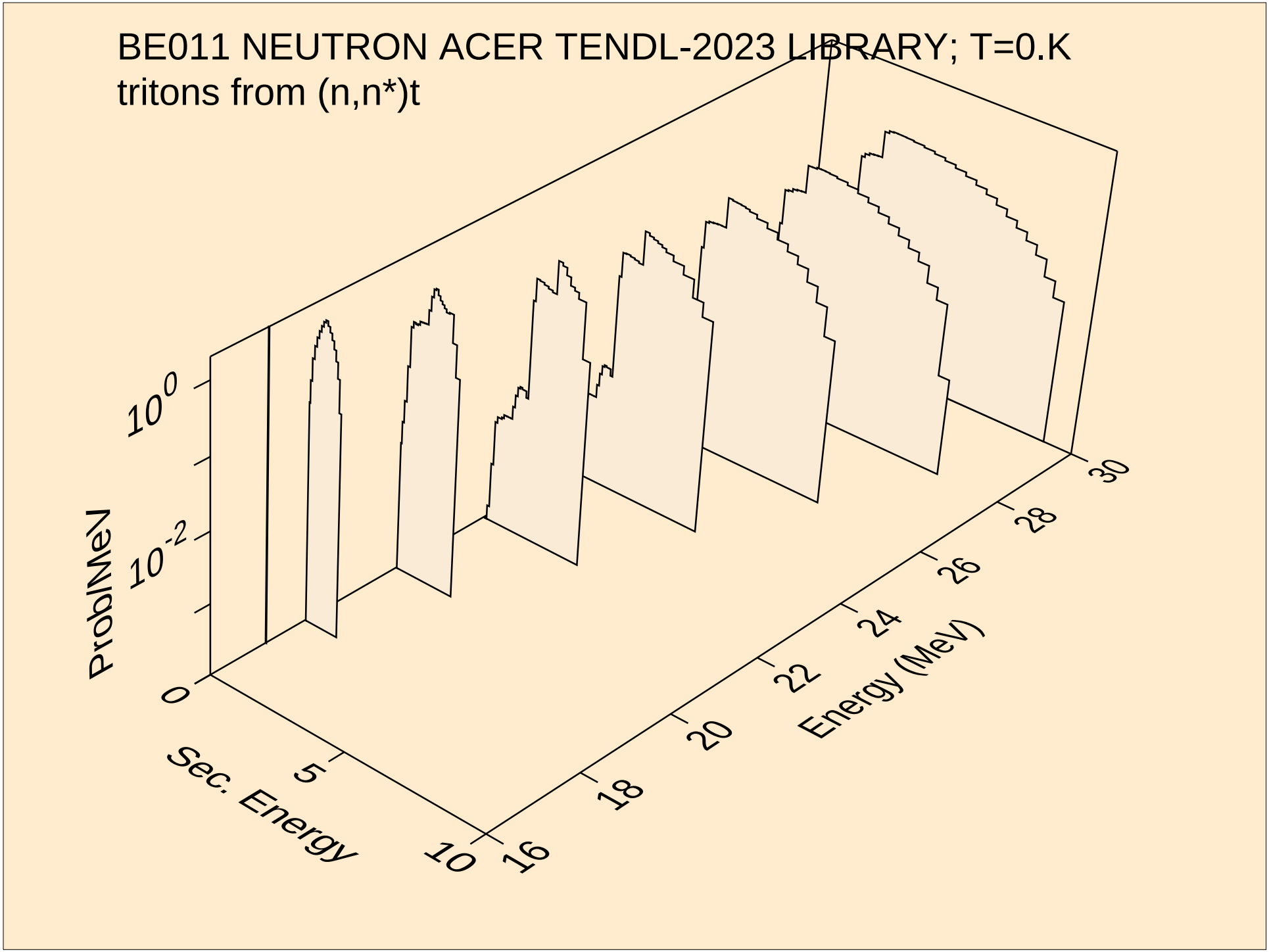

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
deuterons from (n,x)
Prob/MeV
10-2
10-4
0
Sec. Energy
100
200
0
50
100
150
200
Energy (MeV)

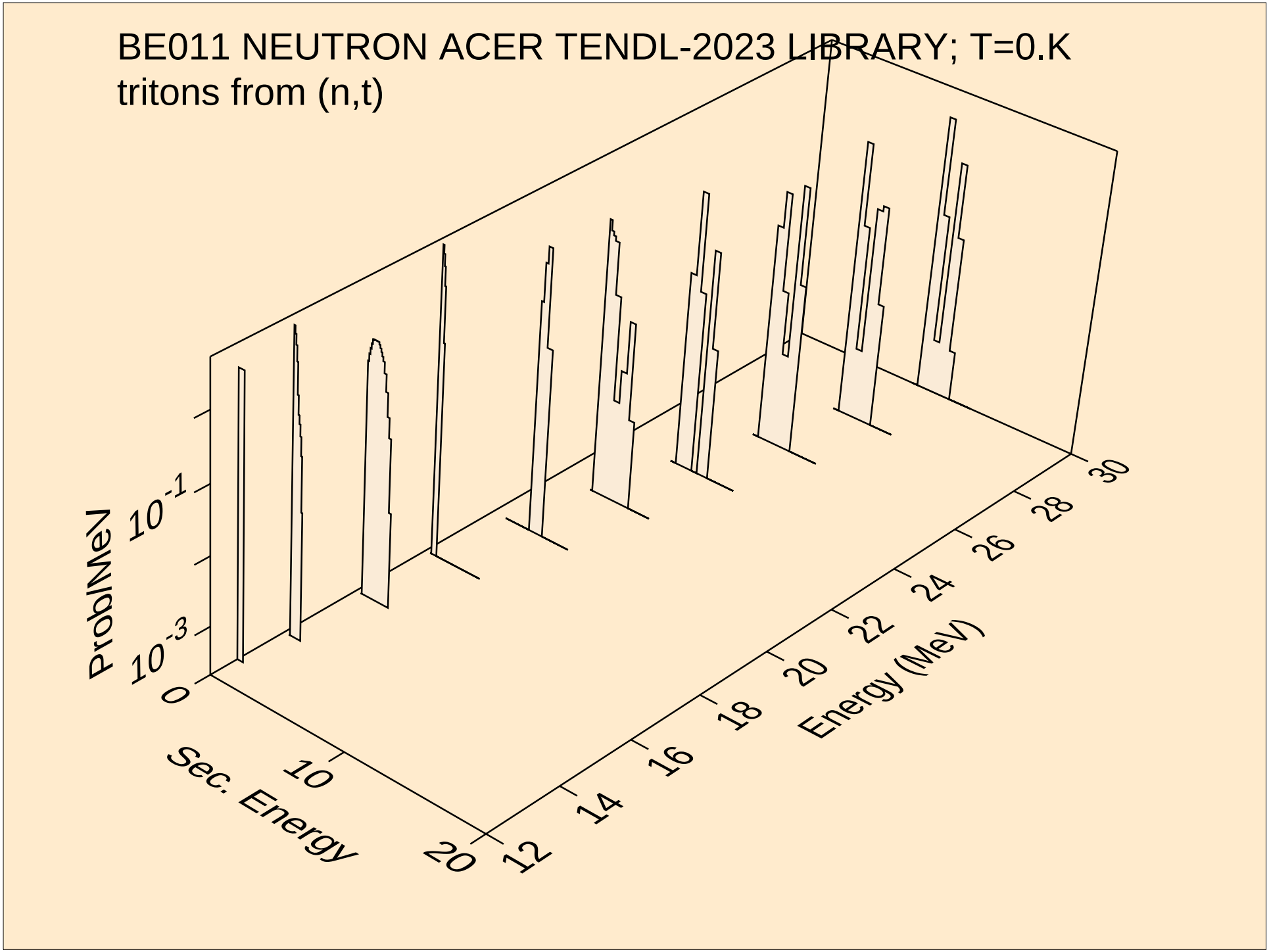

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
deuterons from (n,2nd)
Prob/MeV
10^0
10^-2
0
Sec. Energy
2
4
6
Energy (MeV)
23
24
25
26
27
28
29
30

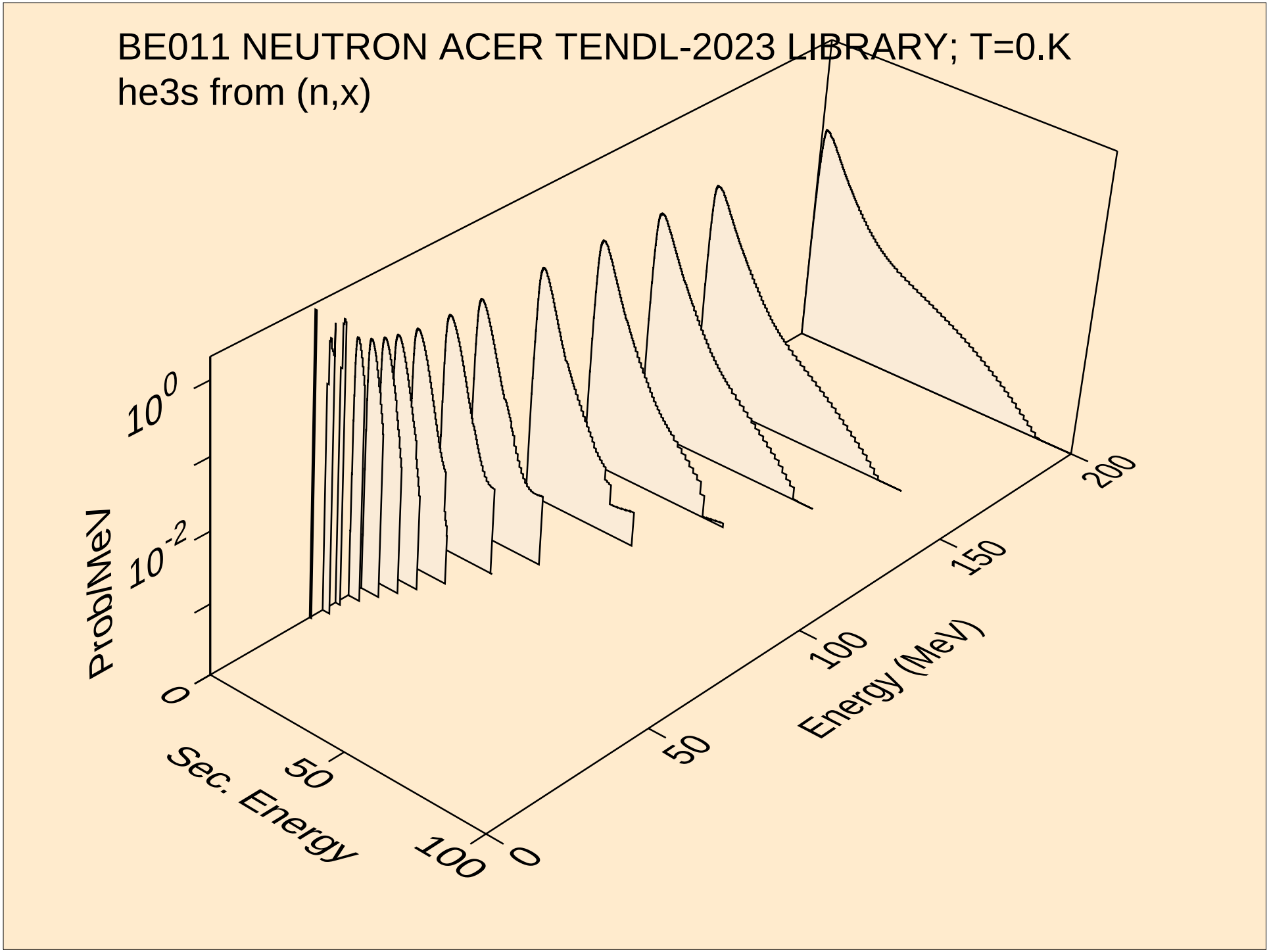

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
deuterons from (n,n*)d
Prob/MeV
10-1
10-3
0
Sec. Energy
5
10
18
20
22
24
26
28
30
Energy (MeV)

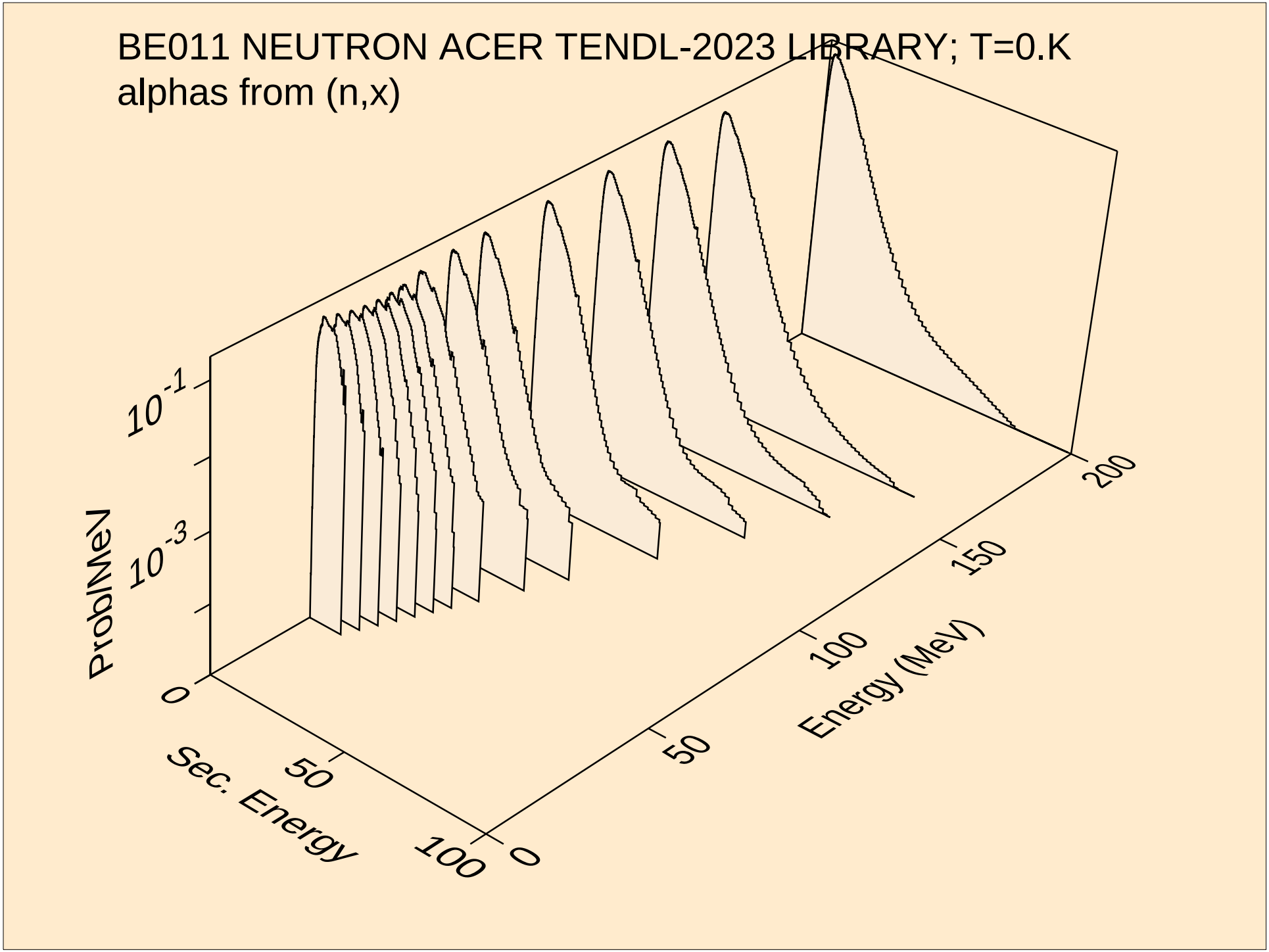

BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
deuterons from (n,d)
Prob/MeV
10^1
10^-1
0
Sec. Energy
5
10
18
20
22
24
26
28
30
Energy (MeV)


BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
tritons from (n,x)
Prob/MeV
10-2
10-4
0
Sec. Energy
100
200
0
50
100
150
200
Energy (MeV)


BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
tritons from (n,n*)t
Prob/MeV
10^0
10^-2
0
Sec. Energy
5
10
16
18
20
22
24
26
28
30
Energy (MeV)


BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
tritons from (n,t)
Prob/MeV
10-1
10-3
0
Sec. Energy
10
20
12
14
16
18
20
22
24
26
28
30
Energy (MeV)


BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
he3s from (n,x)
Prob/MeV
10^0
10^-2
0
Sec. Energy
50
100
0
50
100
150
200
Energy (MeV)


BE011 NEUTRON ACER TENDL-2023 LIBRARY; T=0.K
alphas from (n,x)
Prob/MeV
10-1
10-3
0
Sec. Energy
50
100
0
50
100
150
200
Energy (MeV)