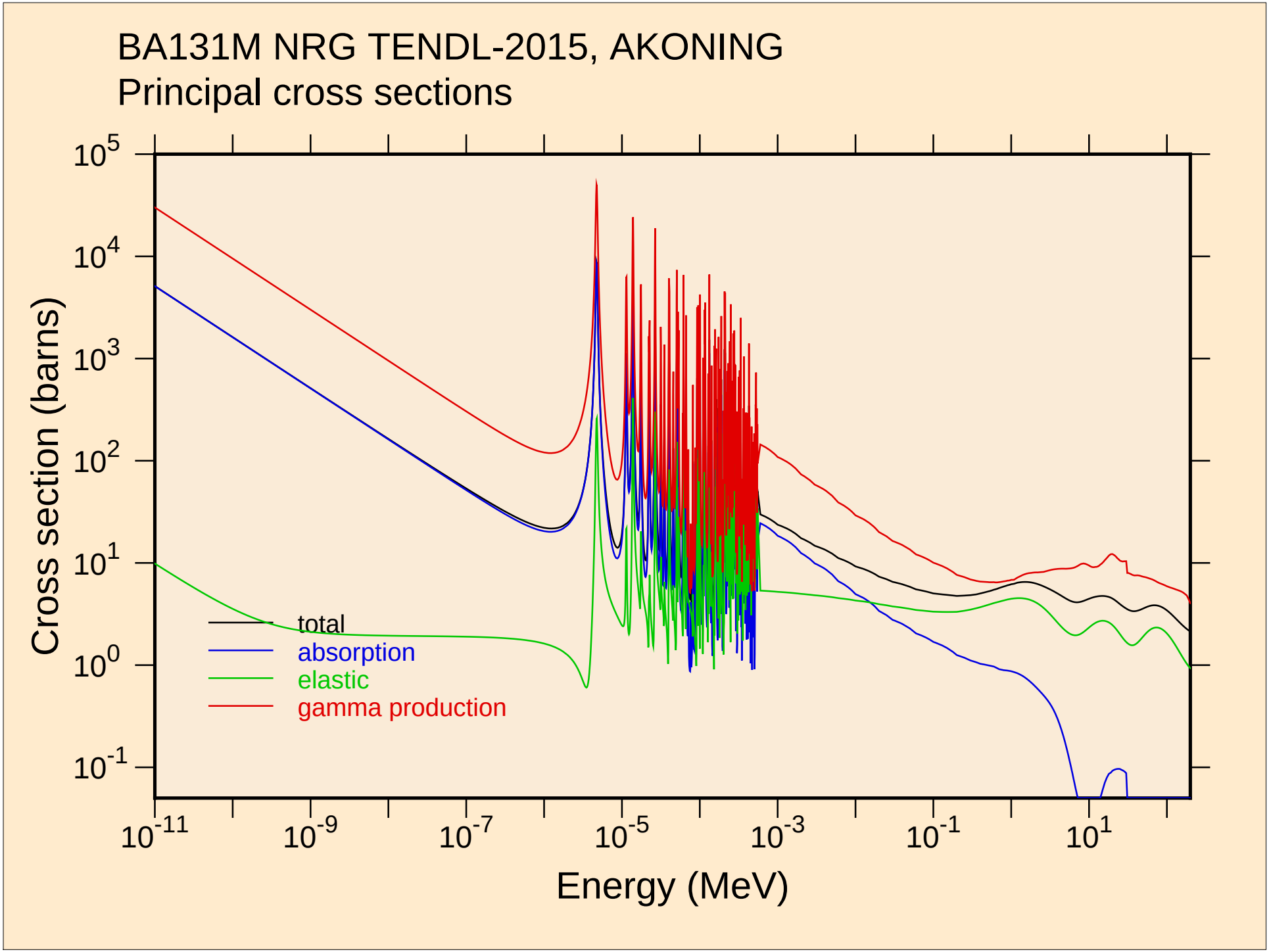
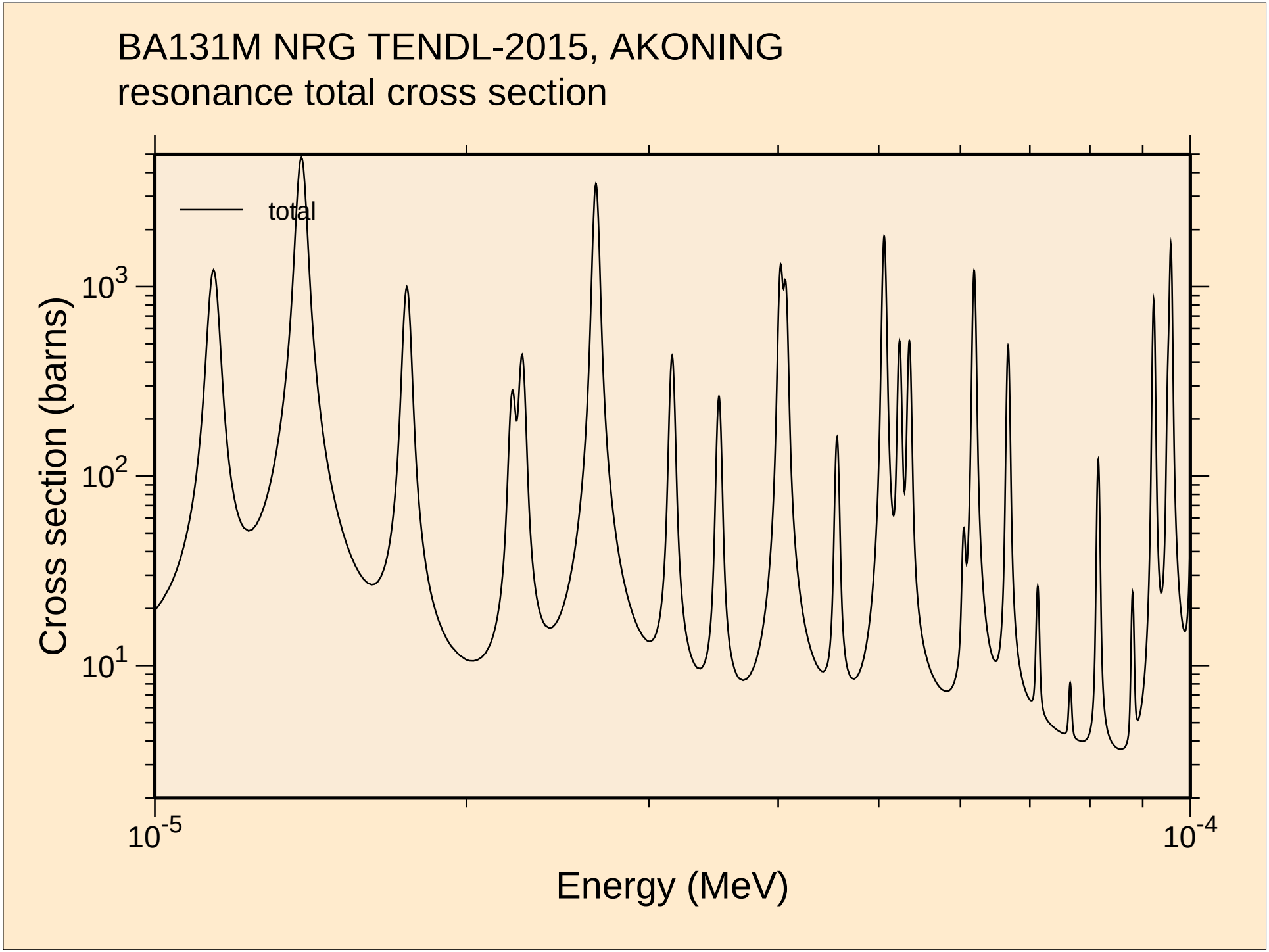
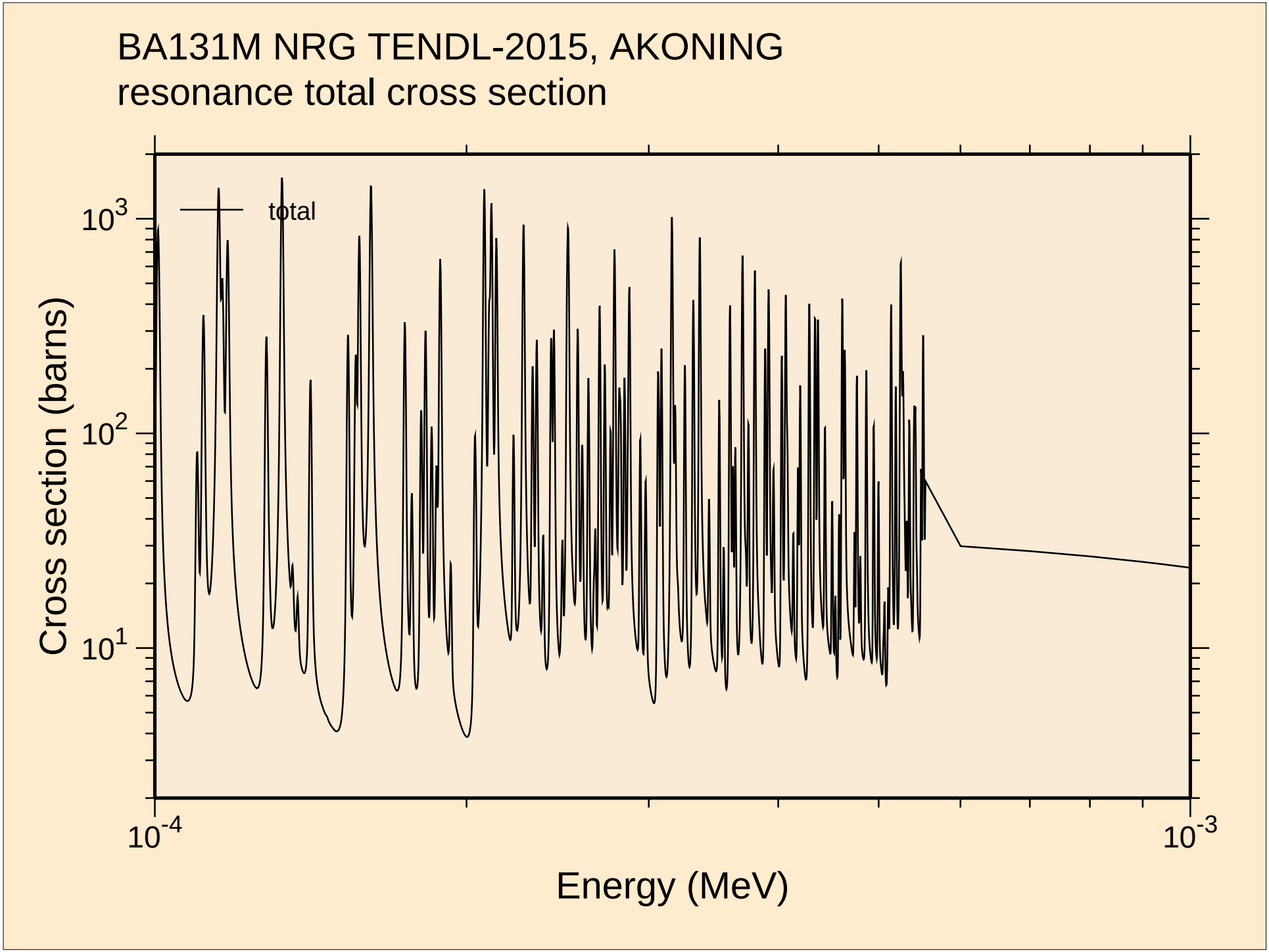
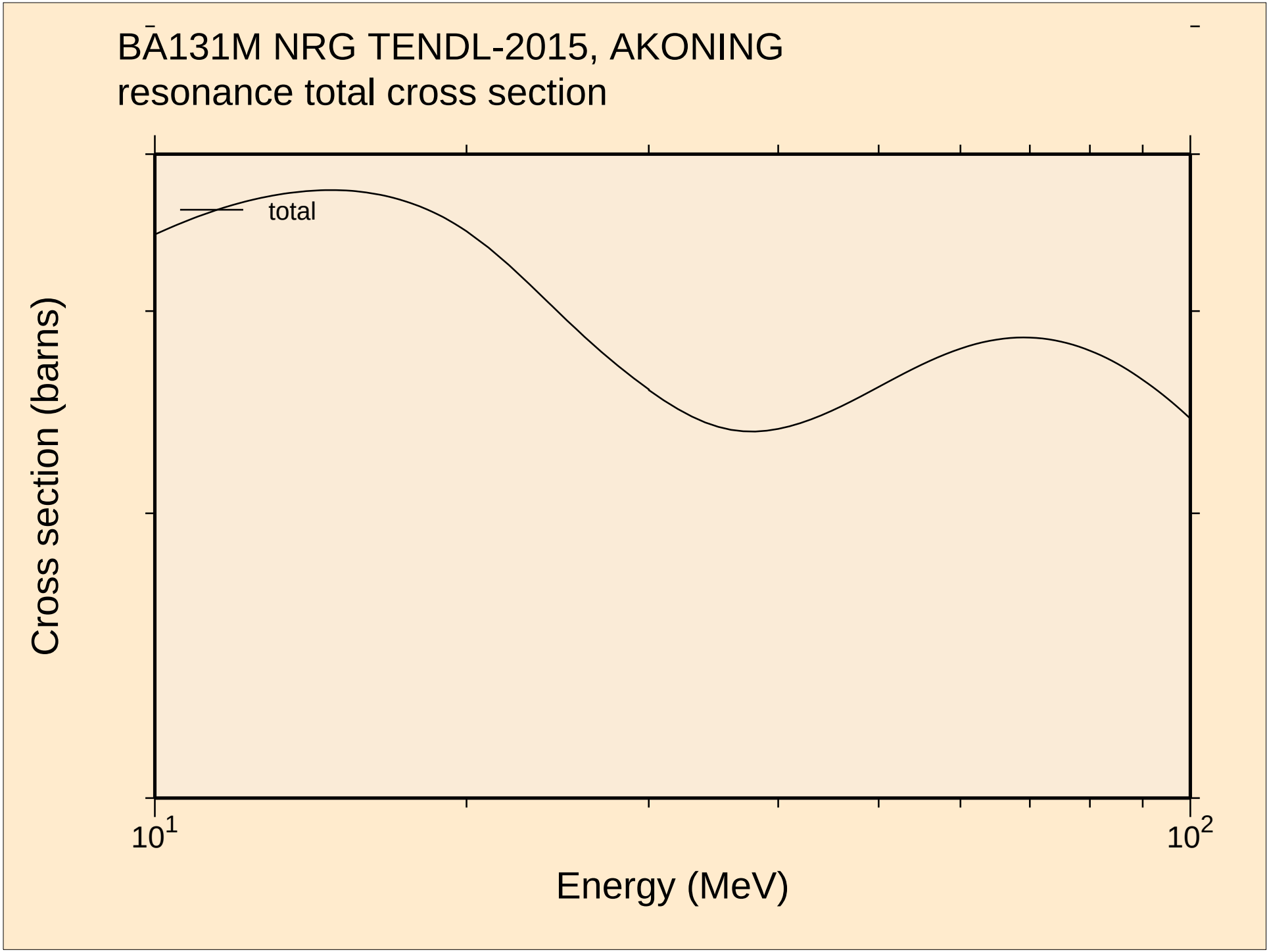
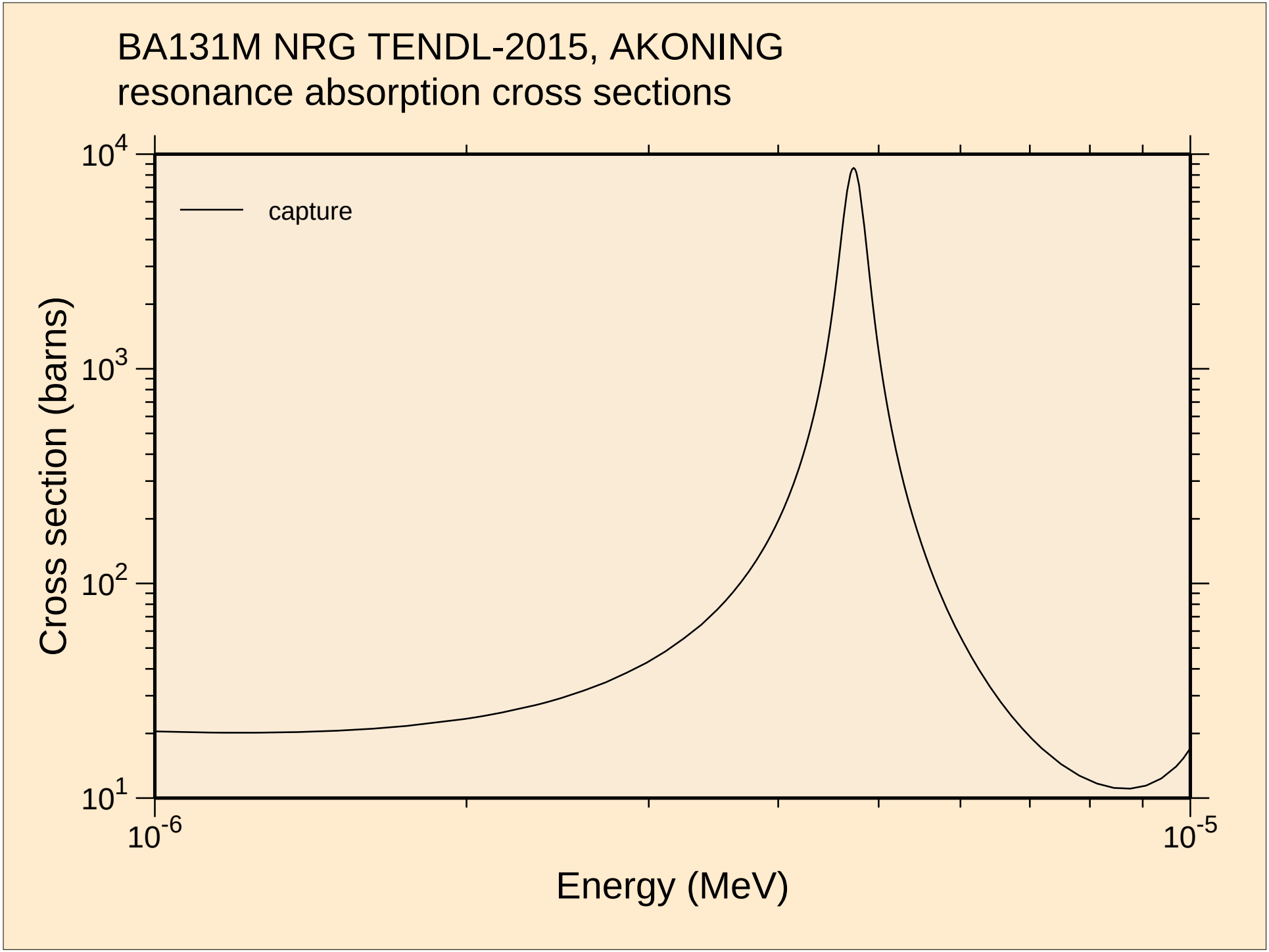
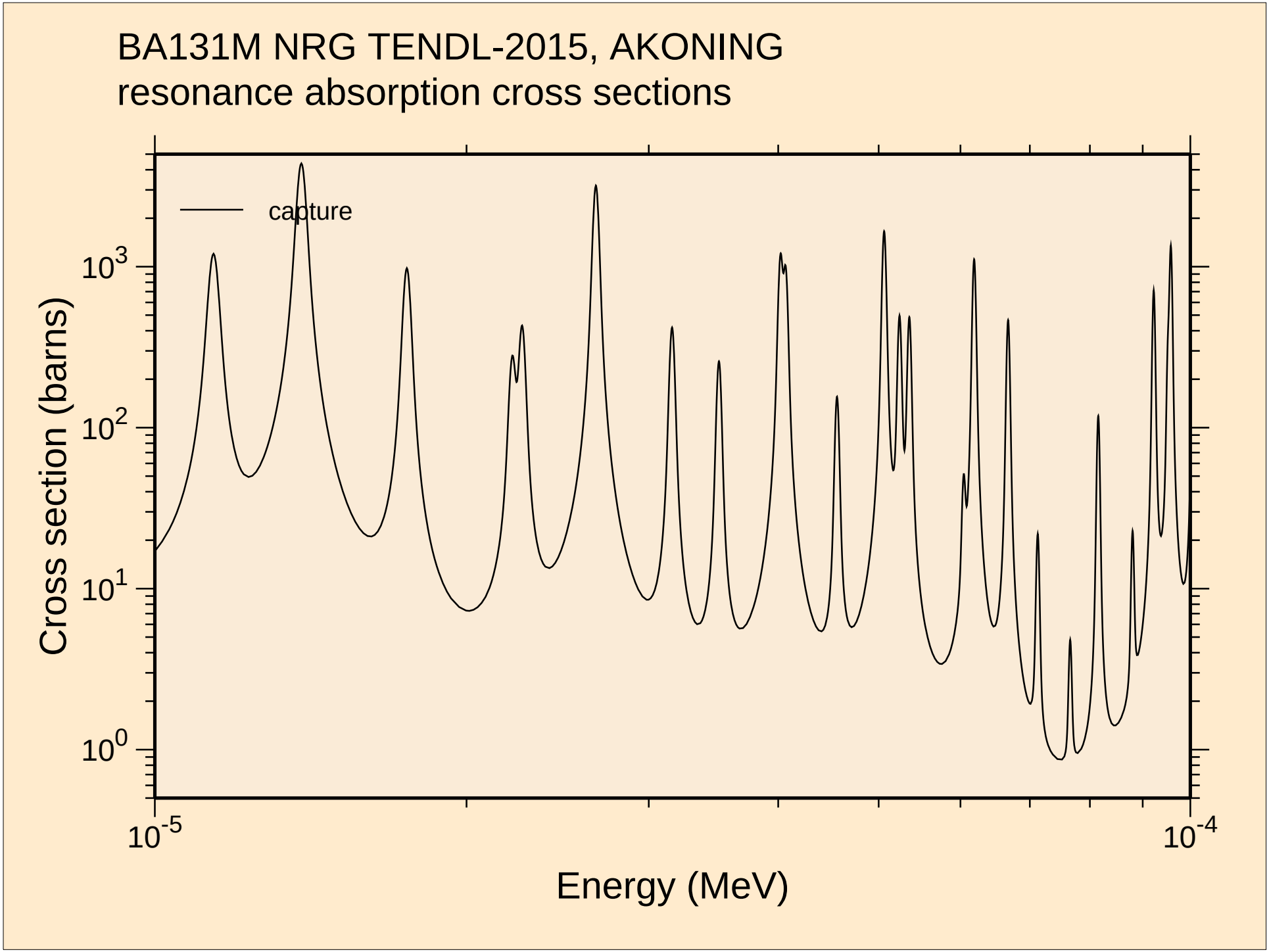

BA131M NRG TENDL-2015, AKONING
Principal cross sections
Cross section (barns)
$10^{5}$
$10^{4}$
$10^{3}$
$10^{2}$
$10^{1}$
$10^{0}$
$10^{-1}$
total
absorption
elastic
gamma production
$10^{-11}$
$10^{-9}$
$10^{-7}$
$10^{-5}$
$10^{-3}$
$10^{-1}$
$10^{1}$
Energy (MeV)

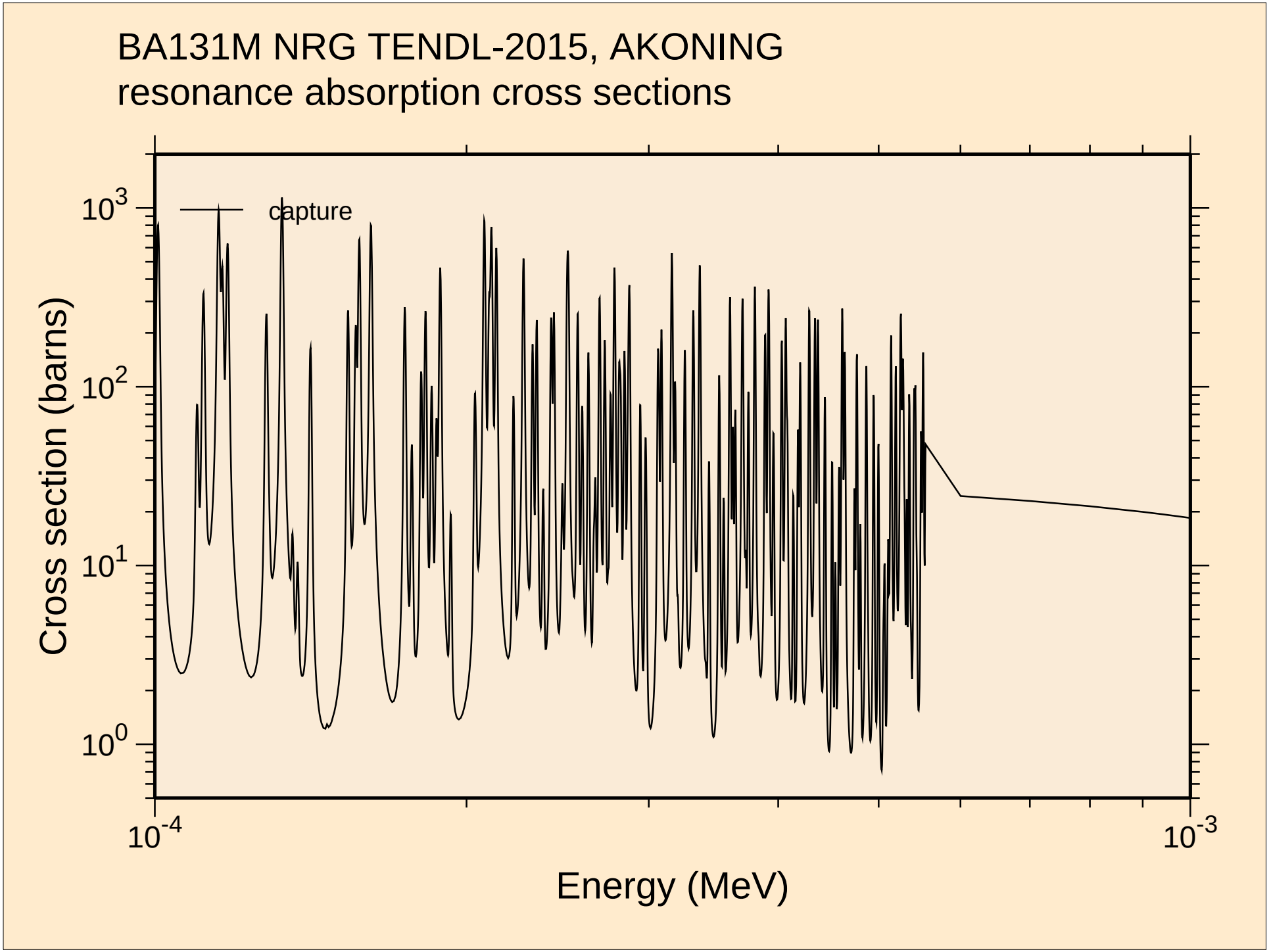

BA131M NRG TENDL-2015, AKONING
resonance total cross section
total
Cross section (barns)
10^3
10^2
10^1
10^-5
10^-4
Energy (MeV)

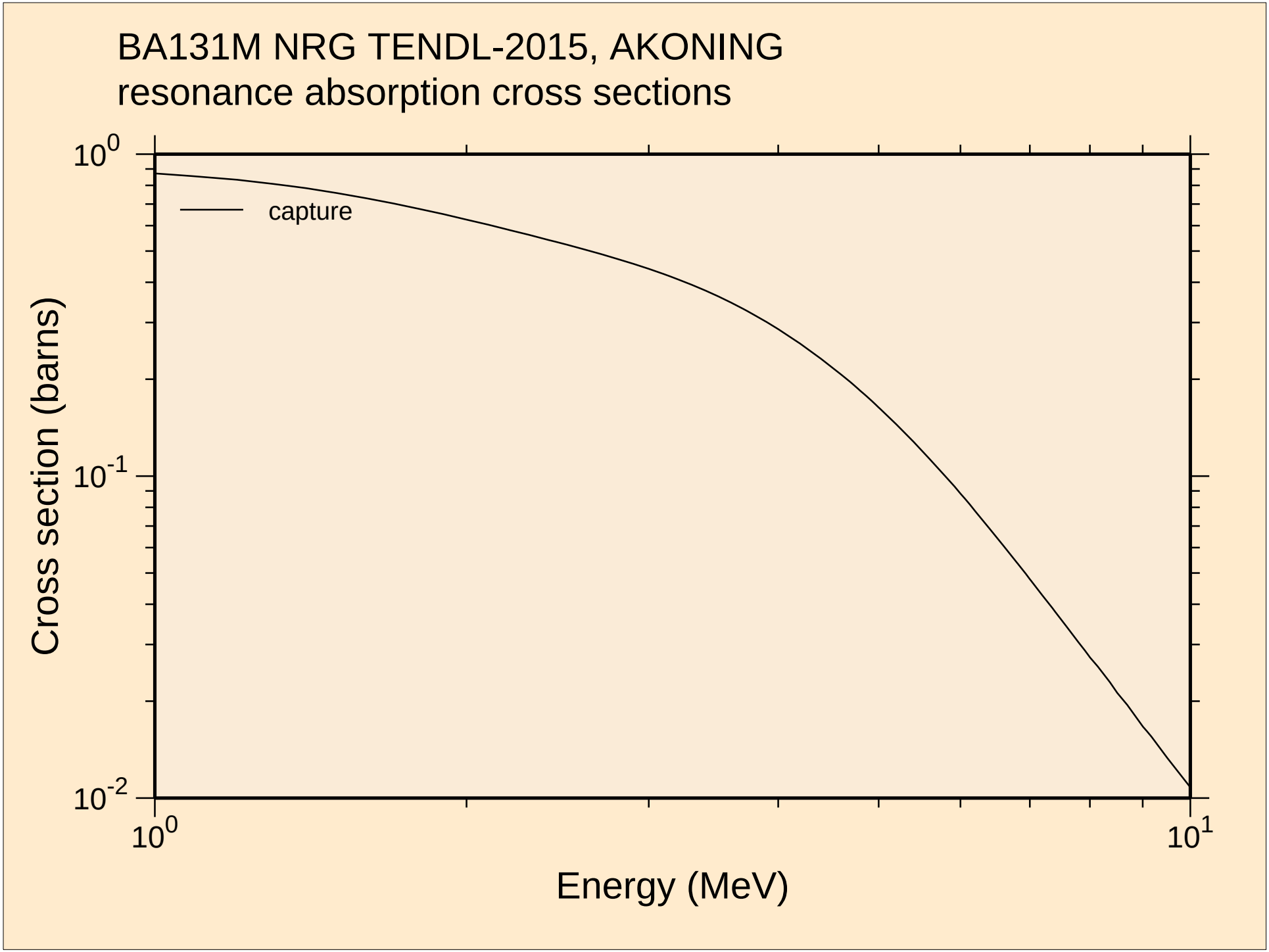

BA131M NRG TENDL-2015, AKONING
resonance total cross section
total
Cross section (barns)
10^3
10^2
10^1
10^-4
10^-3
Energy (MeV)

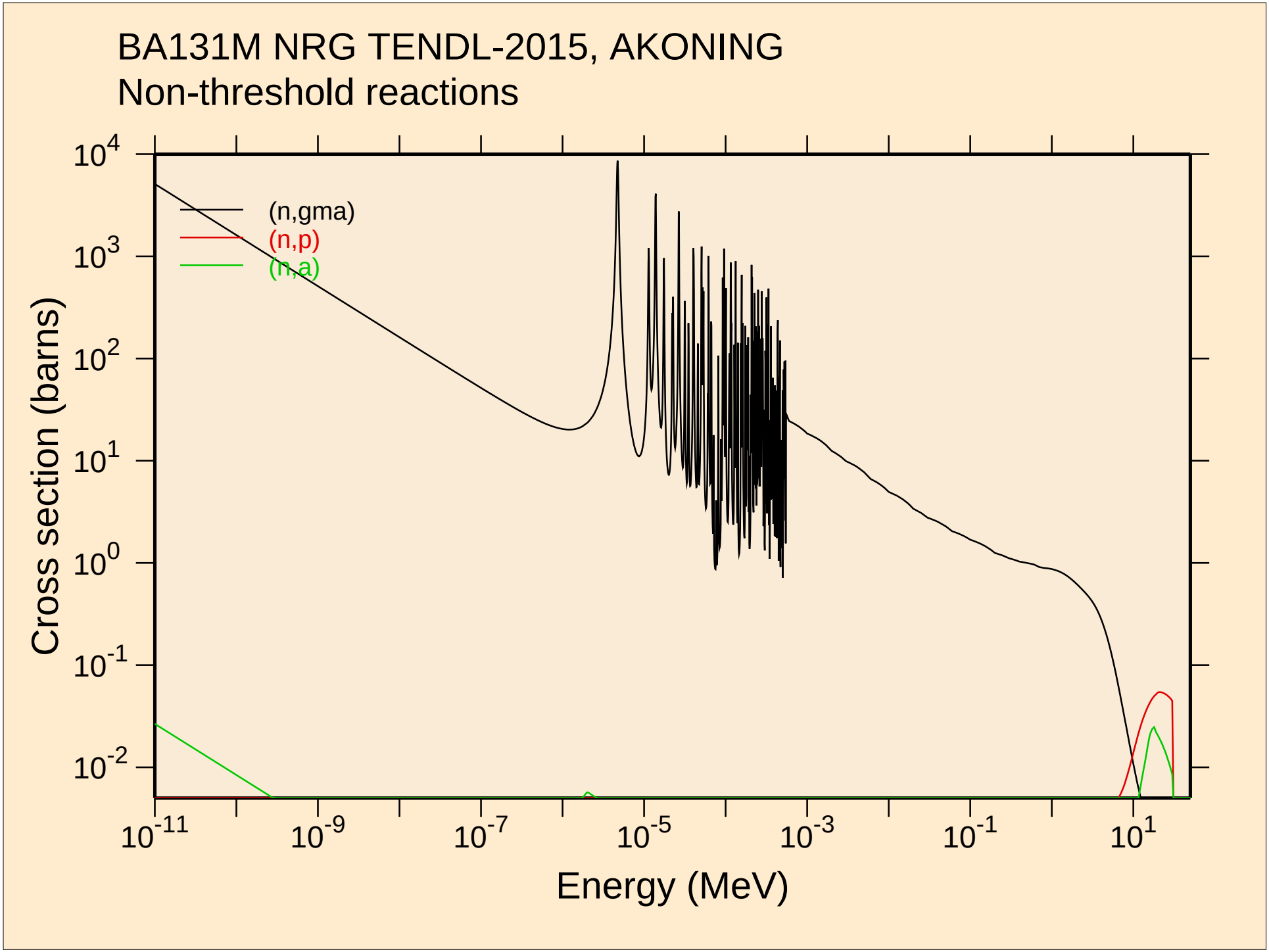

BĀ131M NRG TENDL-2015, AKONING
resonance total cross section
total
Cross section (barns)
$10^1$
$10^2$
Energy (MeV)

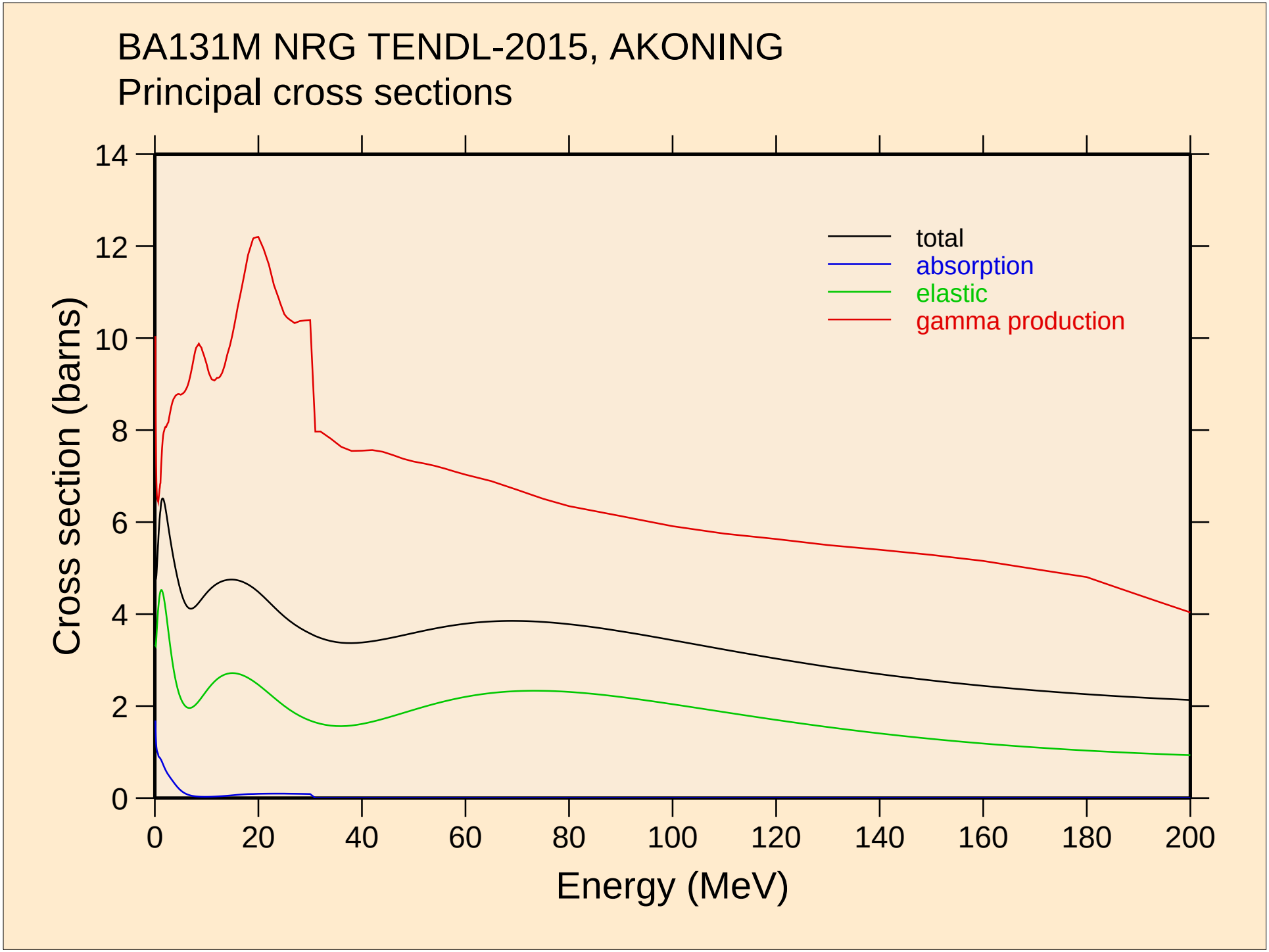

BA131M NRG TENDL-2015, AKONING
resonance absorption cross sections
capture
Cross section (barns)
10^4
10^3
10^2
10^1
10^-6
10^-5
Energy (MeV)

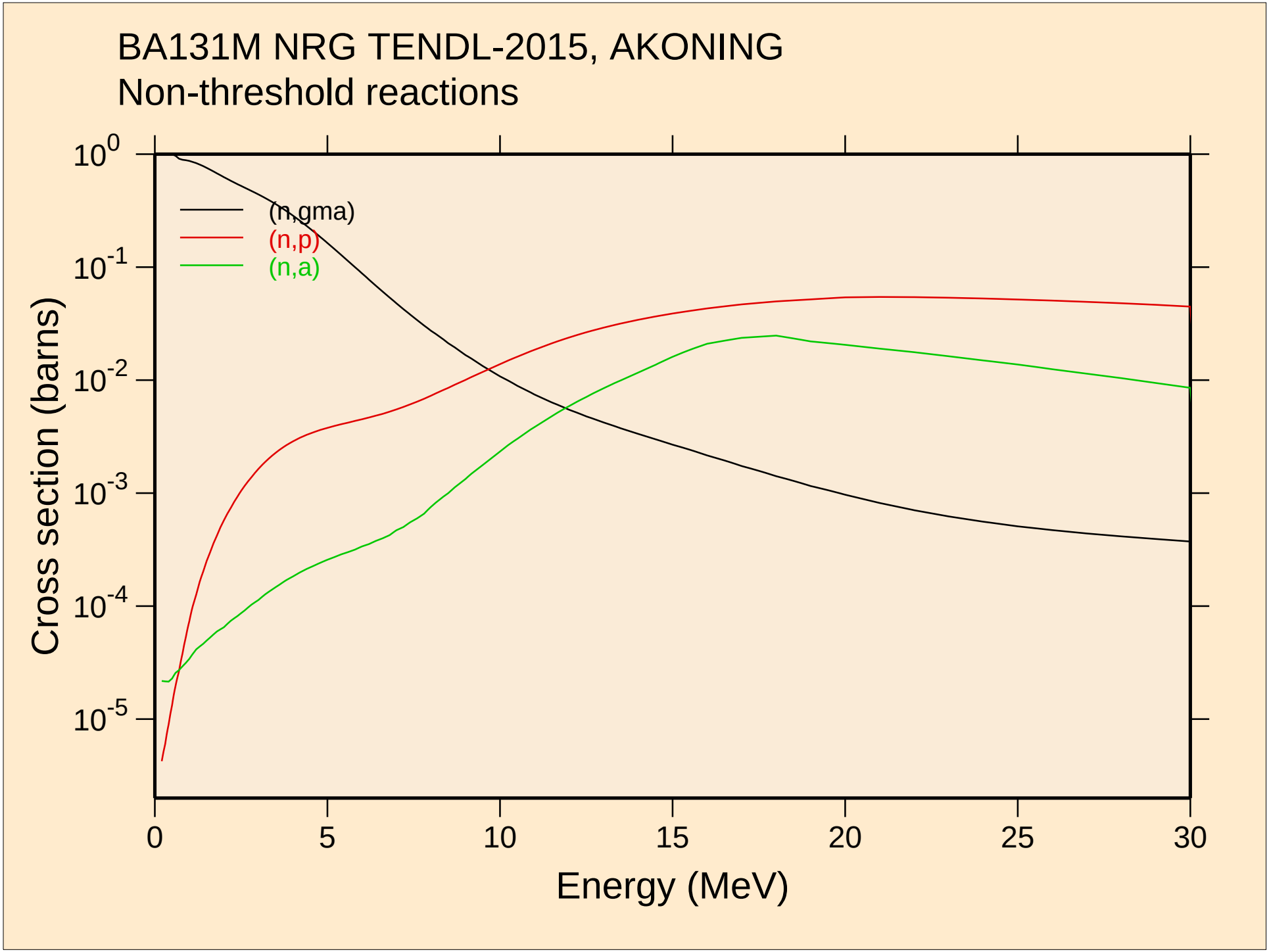

BA131M NRG TENDL-2015, AKONING
resonance absorption cross sections
capture
Cross section (barns)
10^3
10^2
10^1
10^0
10^-5
10^-4
Energy (MeV)

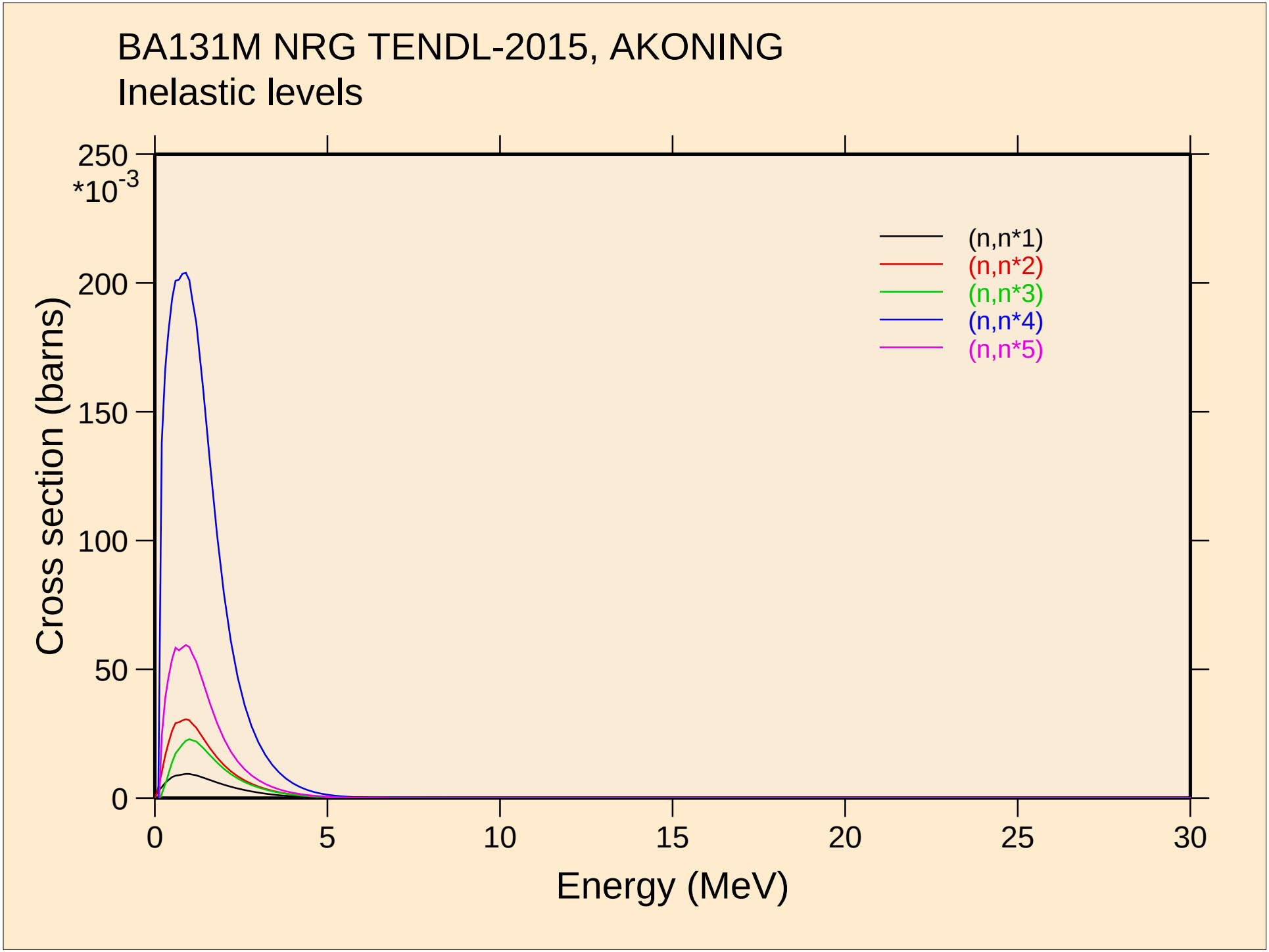

BA131M NRG TENDL-2015, AKONING
resonance absorption cross sections
capture
Cross section (barns)
$10^3$
$10^2$
$10^1$
$10^0$
$10^{-4}$
$10^{-3}$
Energy (MeV)

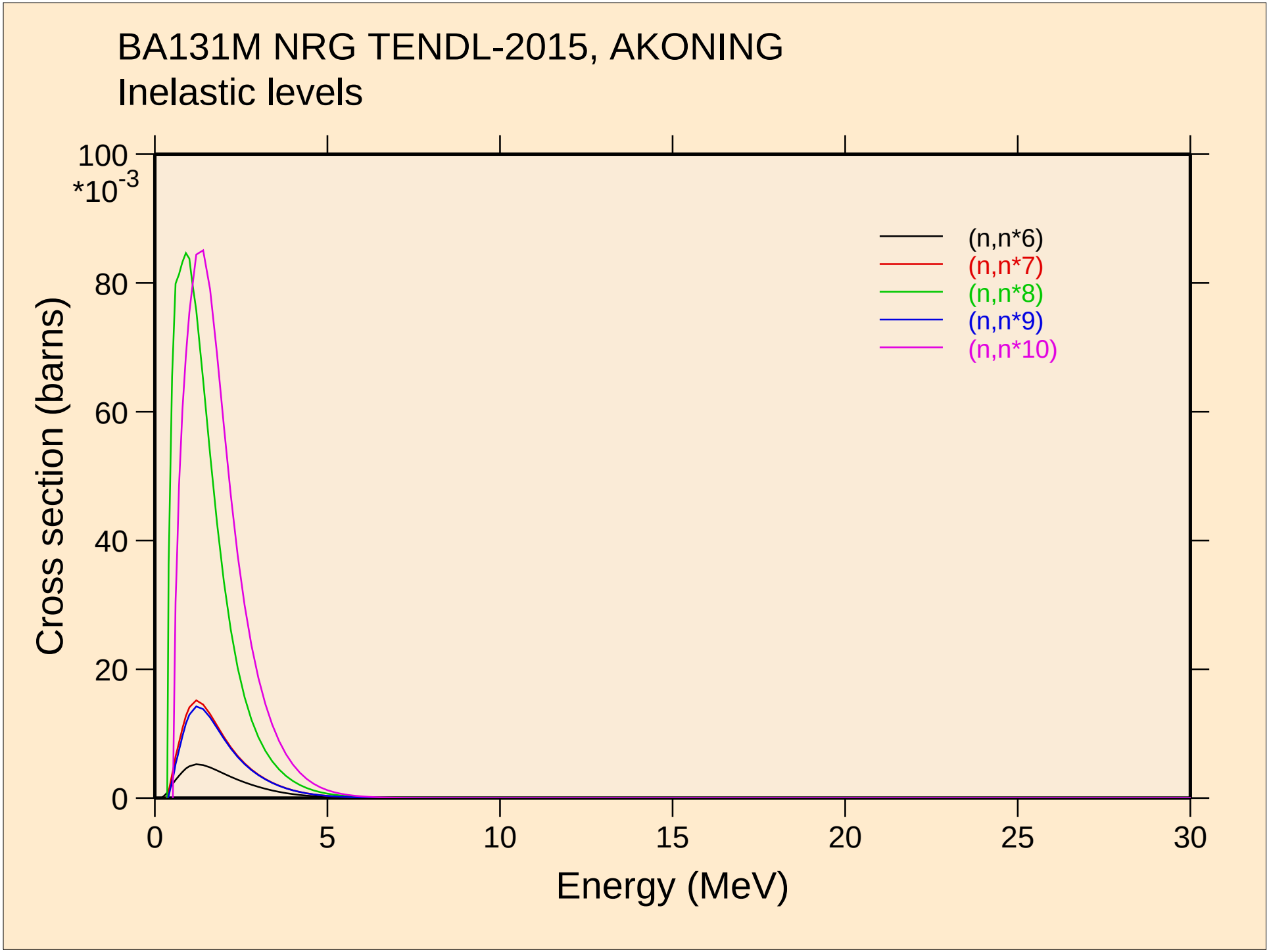

BA131M NRG TENDL-2015, AKONING
resonance absorption cross sections
capture
Cross section (barns)
10^0
10^-1
10^-2
10^0
10^1
Energy (MeV)

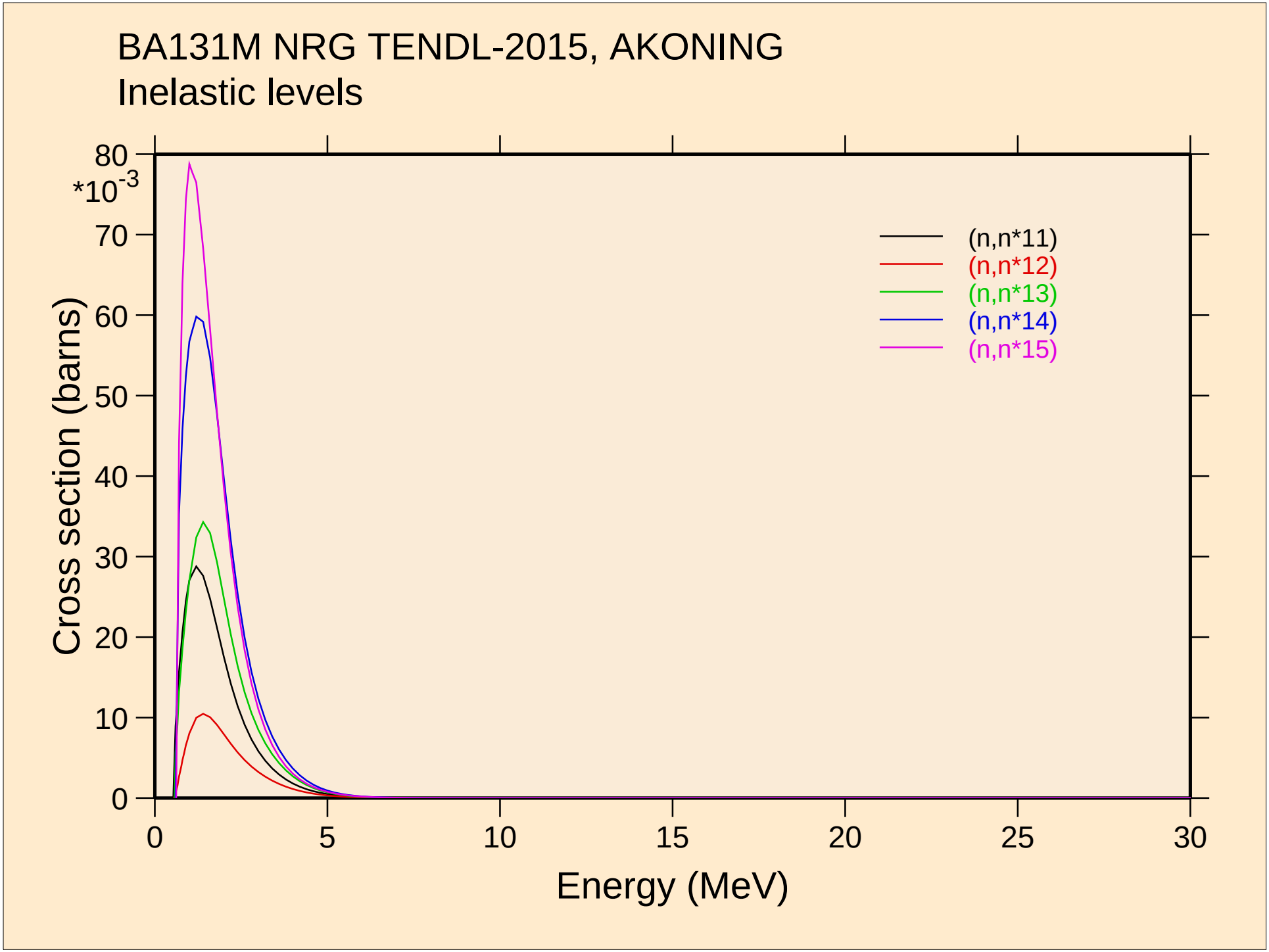

BA131M NRG TENDL-2015, AKONING
Non-threshold reactions
(n,gma)
(n,p)
(n,a)
Cross section (barns)
Energy (MeV)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-11
10^-9
10^-7
10^-5
10^-3
10^-1
10^1

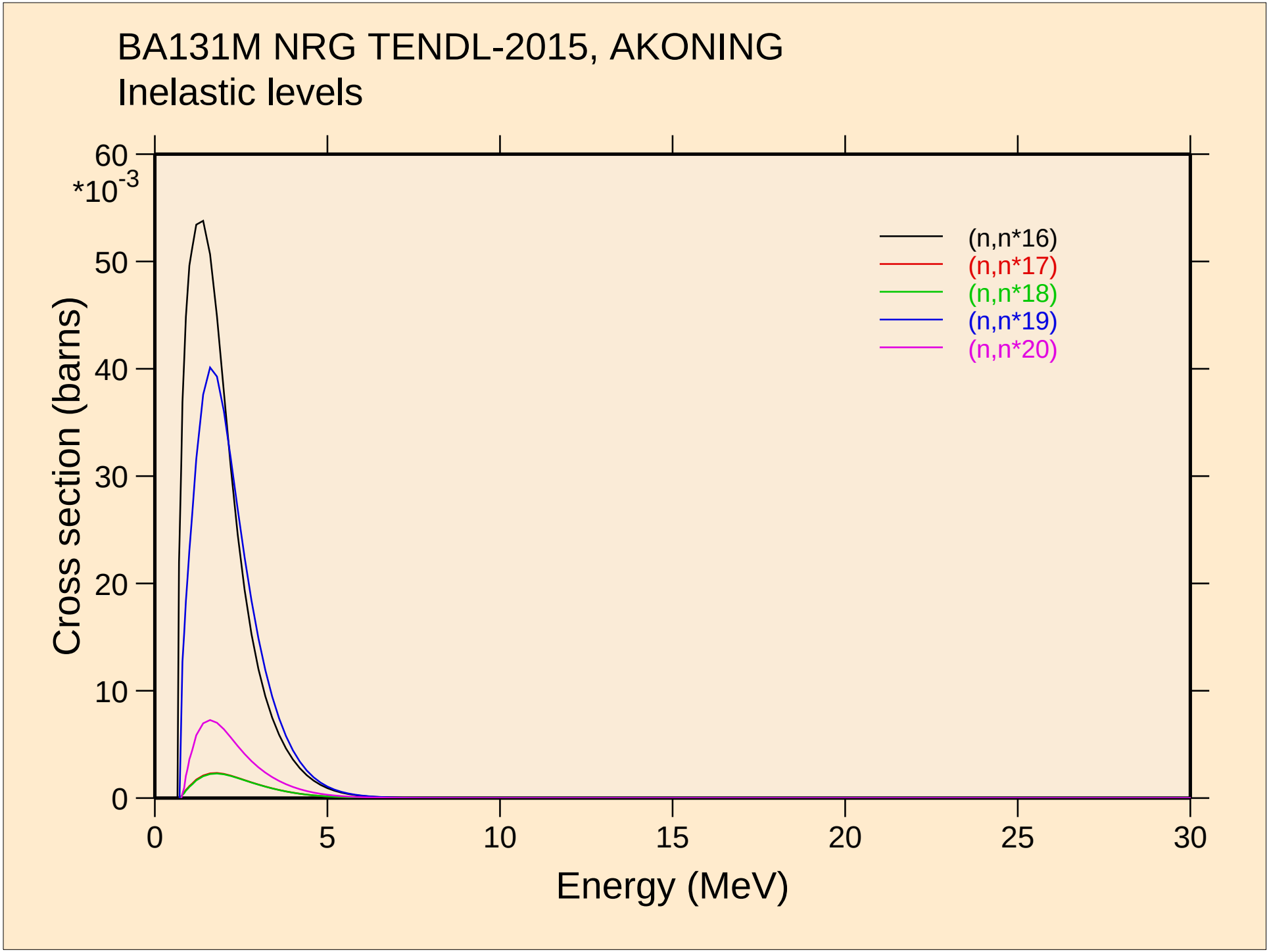

BA131M NRG TENDL-2015, AKONING
Principal cross sections
Cross section (barns)
Energy (MeV)
0
2
4
6
8
10
12
14
0
20
40
60
80
100
120
140
160
180
200
total
absorption
elastic
gamma production

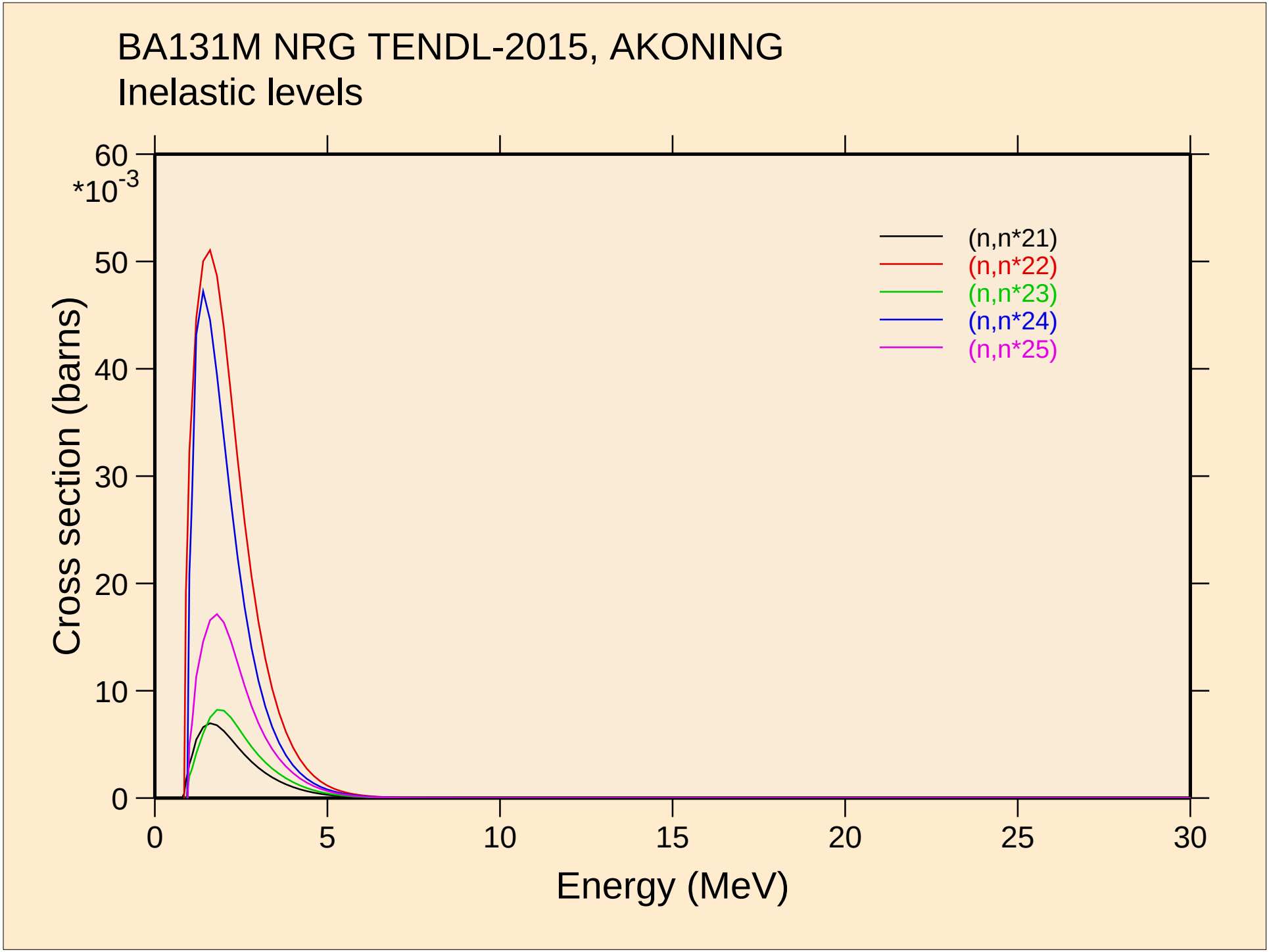

BA131M NRG TENDL-2015, AKONING
Non-threshold reactions
(n,gma)
(n,p)
(n,a)
Cross section (barns)
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
0
5
10
15
20
25
30
Energy (MeV)

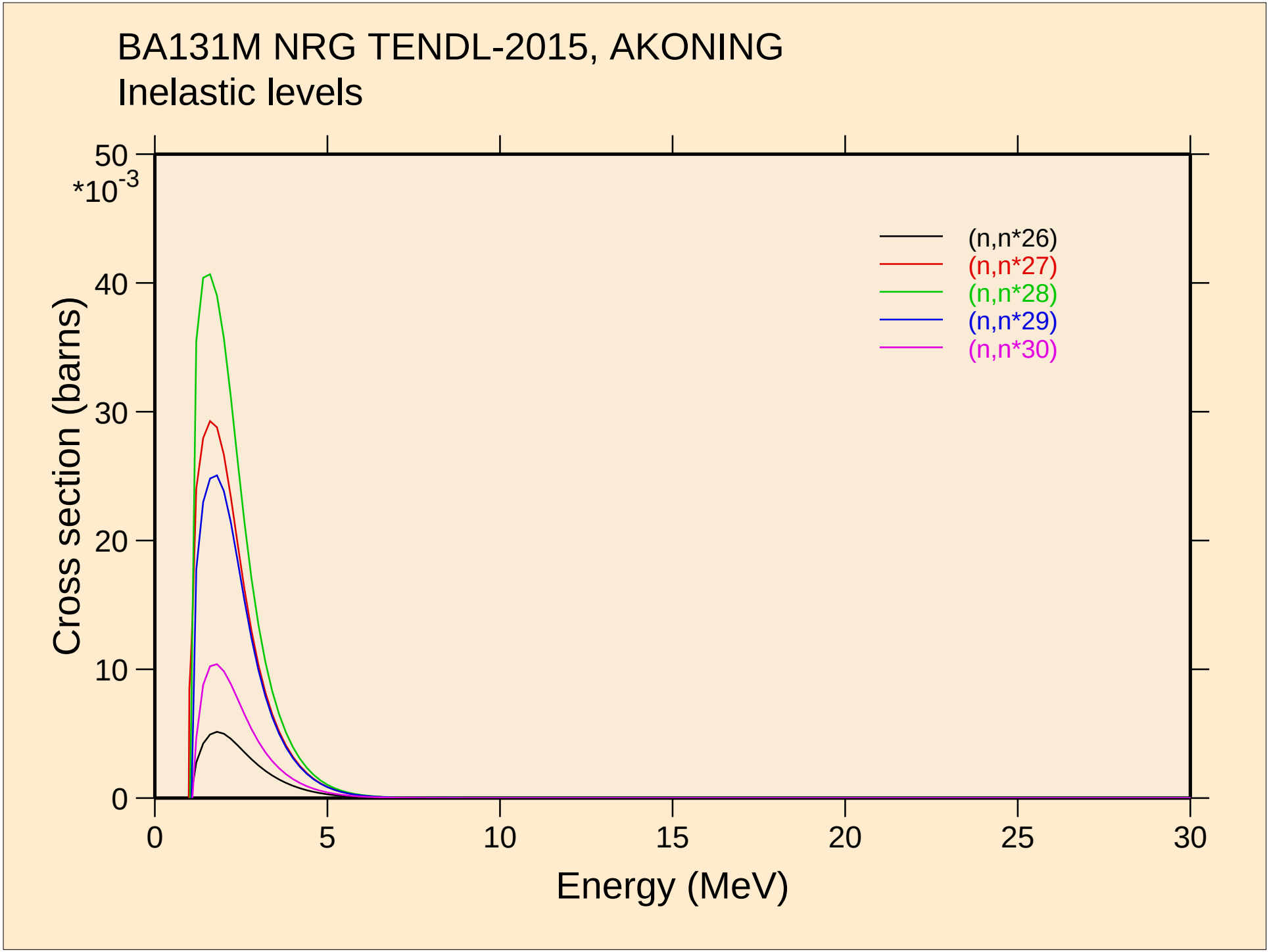

BA131M NRG TENDL-2015, AKONING
Inelastic levels
250
*10-3
200
150
100
50
0
Cross section (barns)
0
5
10
15
20
25
30
Energy (MeV)
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)
(n,n*5)

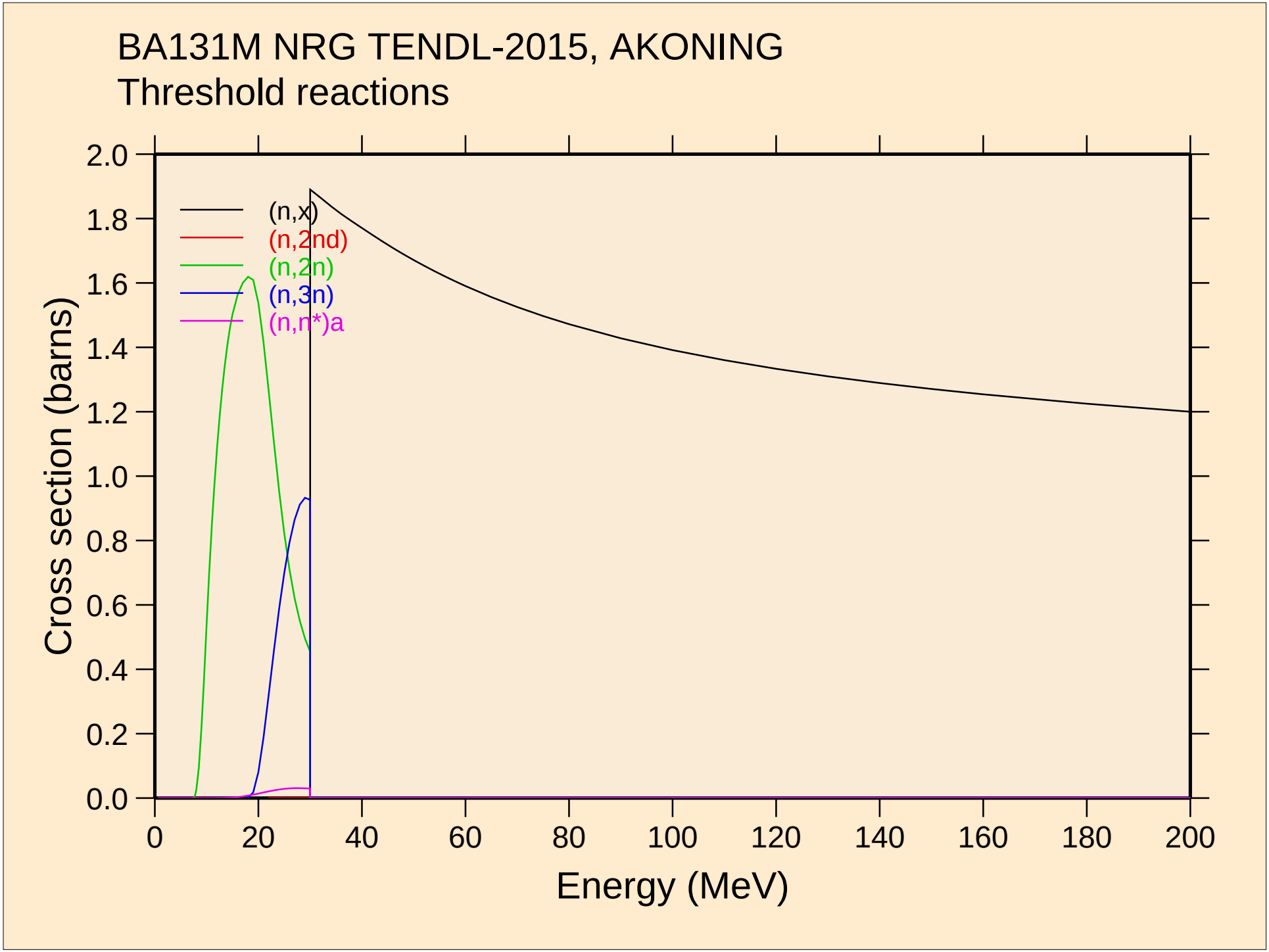

BA131M NRG TENDL-2015, AKONING
Inelastic levels
100
*10-3
80
60
40
20
0
Cross section (barns)
0
5
10
15
20
25
30
Energy (MeV)
(n,n*6)
(n,n*7)
(n,n*8)
(n,n*9)
(n,n*10)

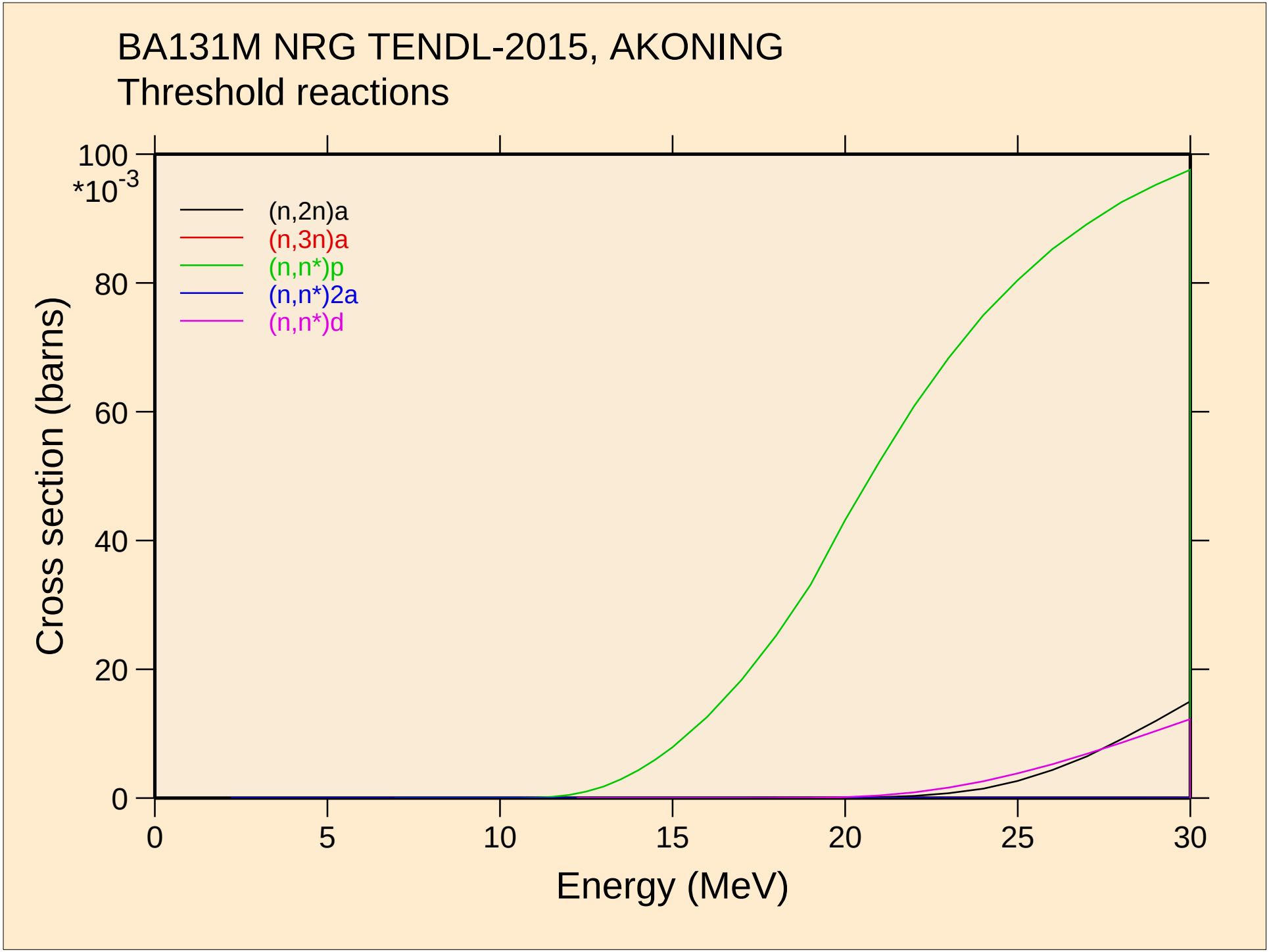

BA131M NRG TENDL-2015, AKONING
Inelastic levels
Cross section (barns)
*10-3
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
30
Energy (MeV)
(n,n*11)
(n,n*12)
(n,n*13)
(n,n*14)
(n,n*15)

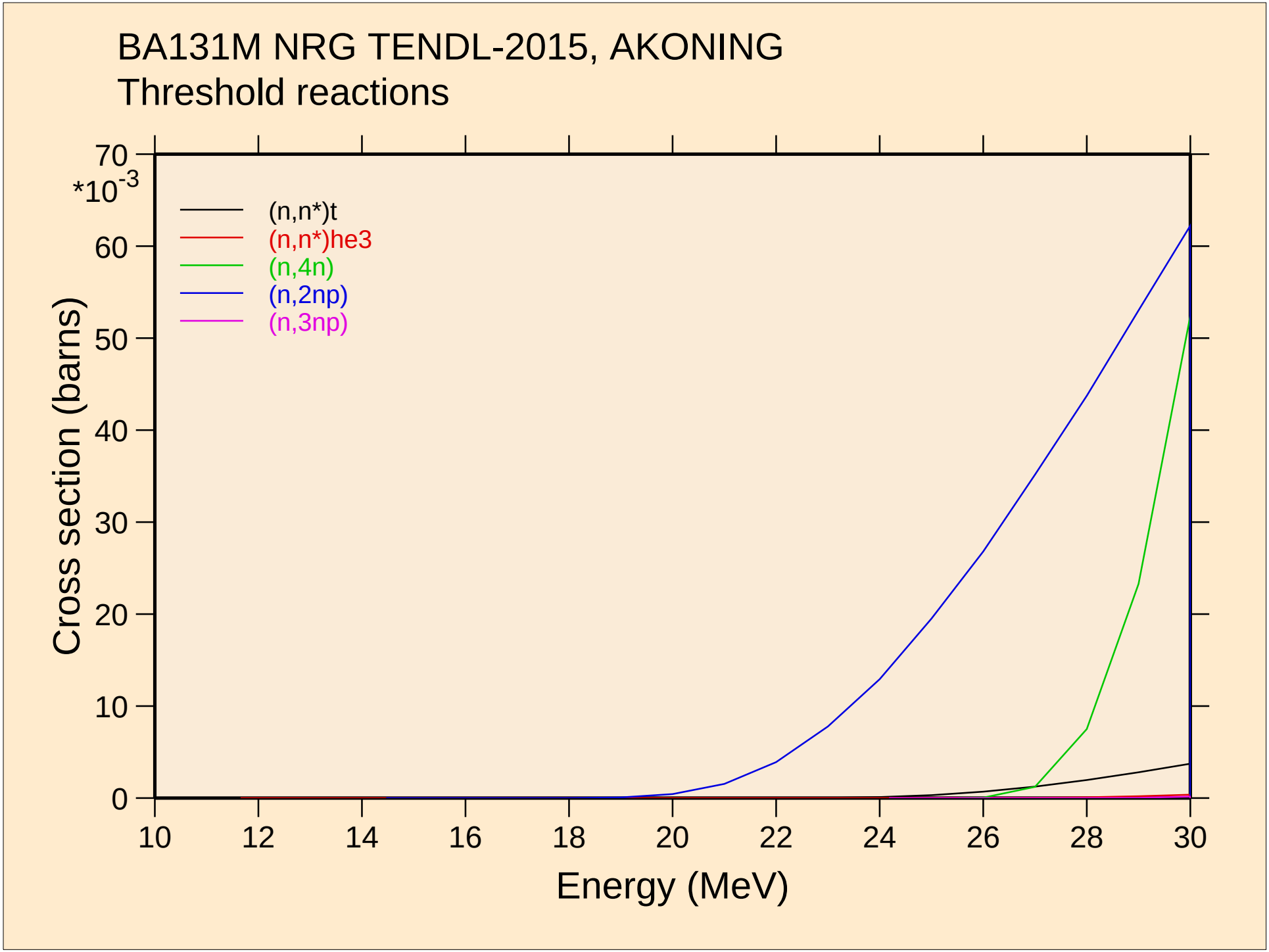

BA131M NRG TENDL-2015, AKONING
Inelastic levels
Cross section (barns)
*10-3
60
50
40
30
20
10
0
0
5
10
15
20
25
30
Energy (MeV)
(n,n*16)
(n,n*17)
(n,n*18)
(n,n*19)
(n,n*20)

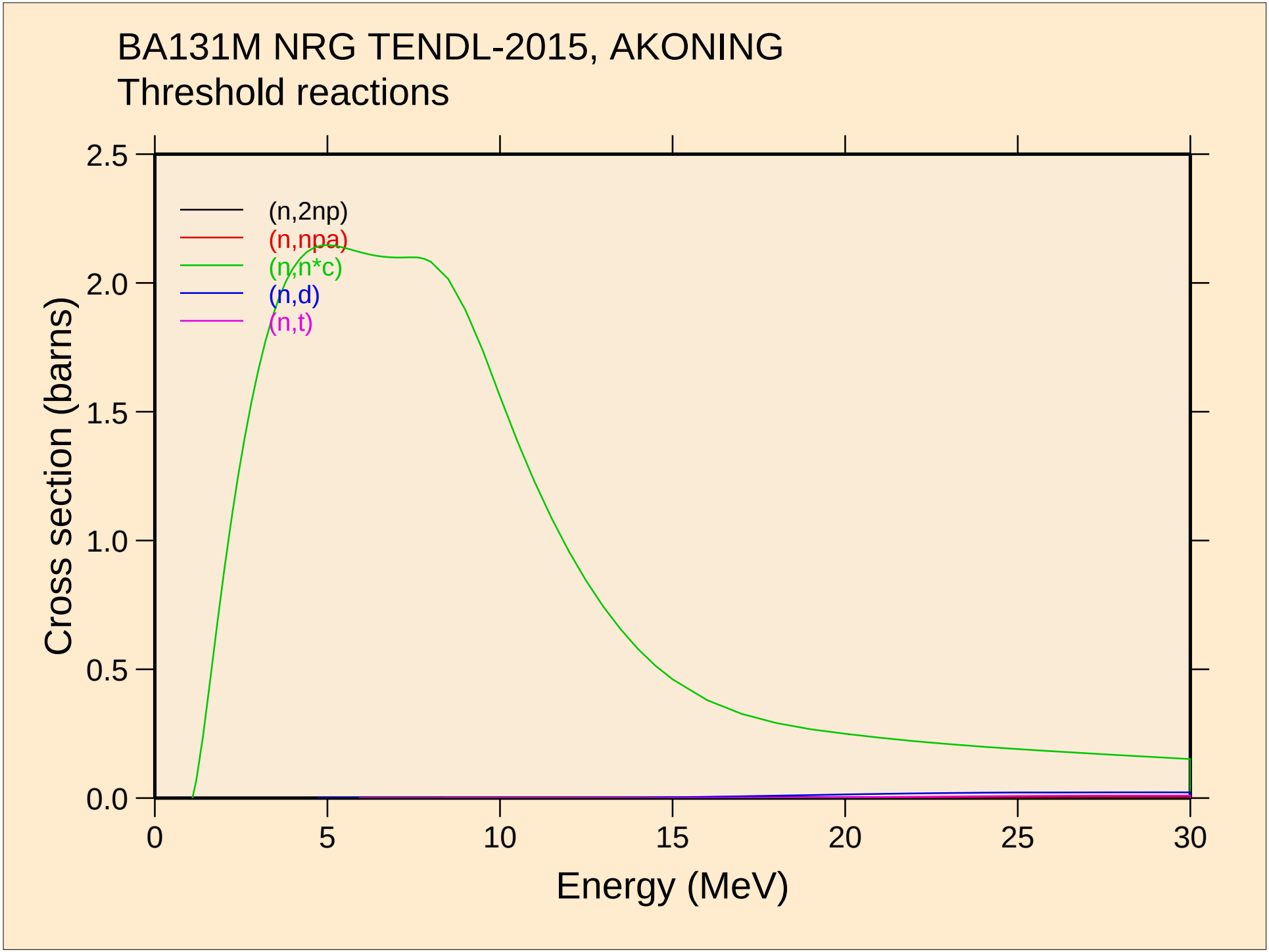

BA131M NRG TENDL-2015, AKONING
Inelastic levels
Cross section (barns)
*10-3
60
50
40
30
20
10
0
0
5
10
15
20
25
30
Energy (MeV)
(n,n*21)
(n,n*22)
(n,n*23)
(n,n*24)
(n,n*25)

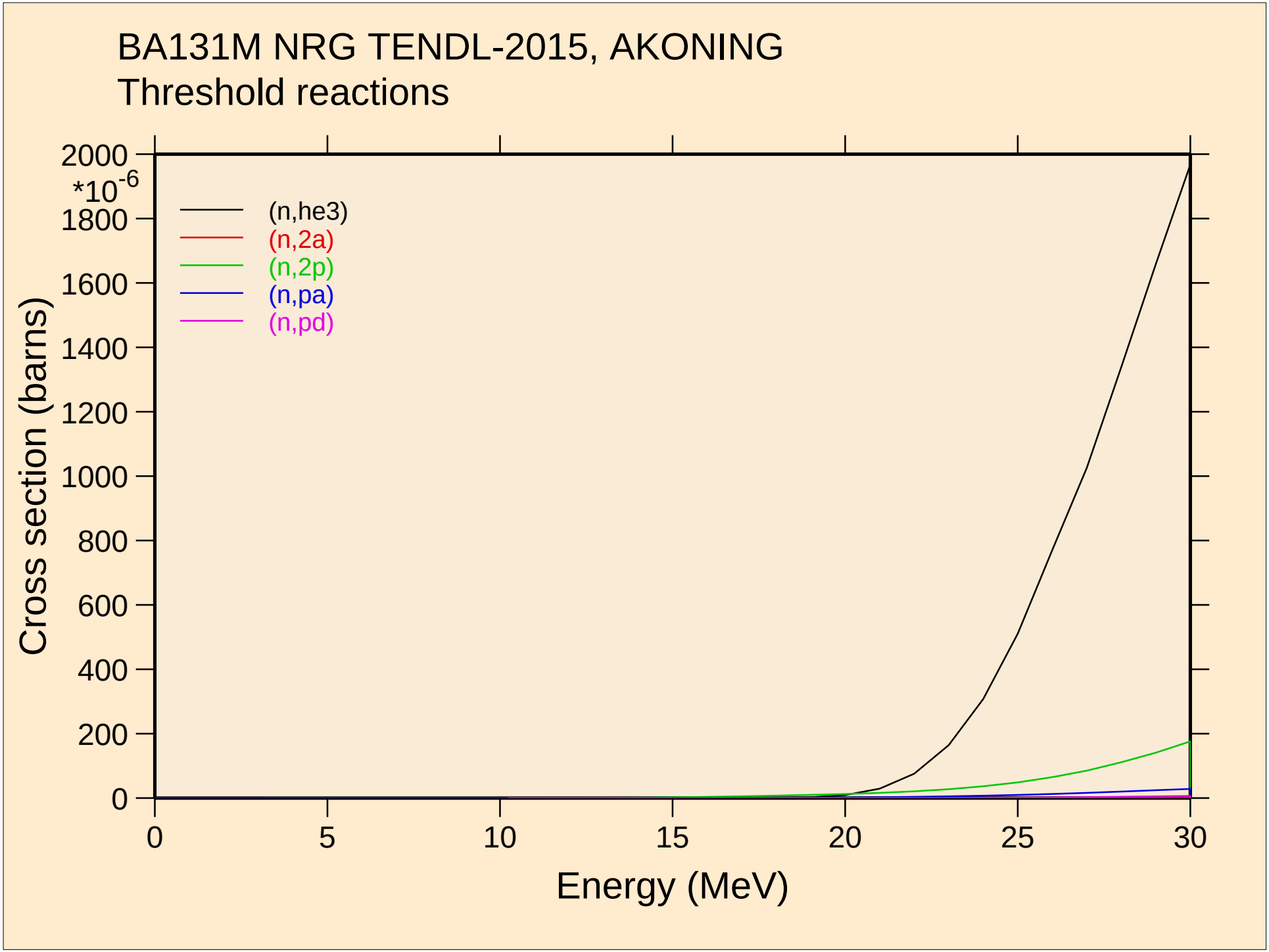

BA131M NRG TENDL-2015, AKONING
Inelastic levels
50
*10-3
40
30
20
10
0
Cross section (barns)
0
5
10
15
20
25
30
Energy (MeV)
(n,n*26)
(n,n*27)
(n,n*28)
(n,n*29)
(n,n*30)

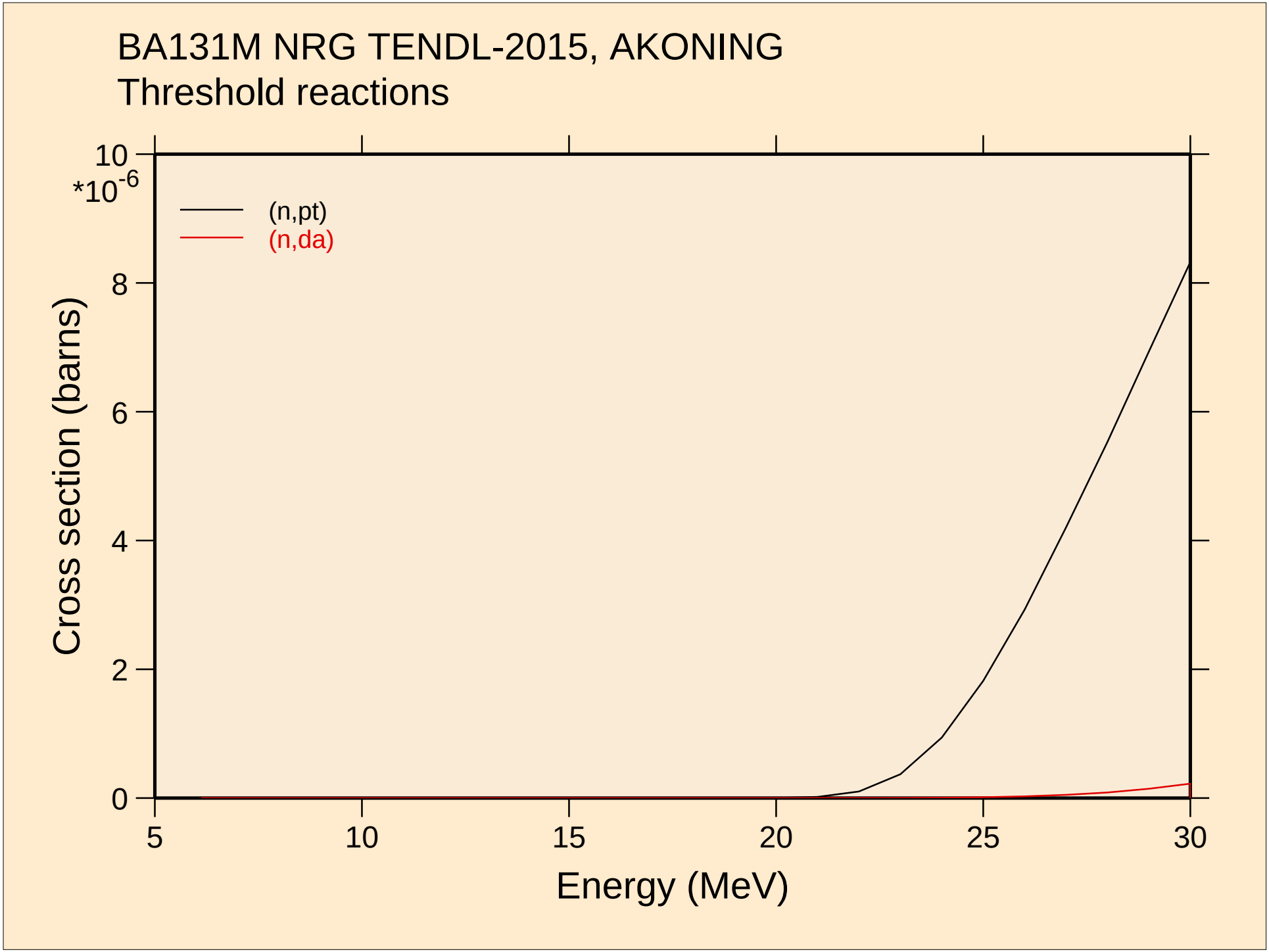

BA131M NRG TENDL-2015, AKONING
Threshold reactions
Cross section (barns)
Energy (MeV)
(n,x)
(n,2nd)
(n,2n)
(n,3n)
(n,n*)a
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
0
20
40
60
80
100
120
140
160
180
200

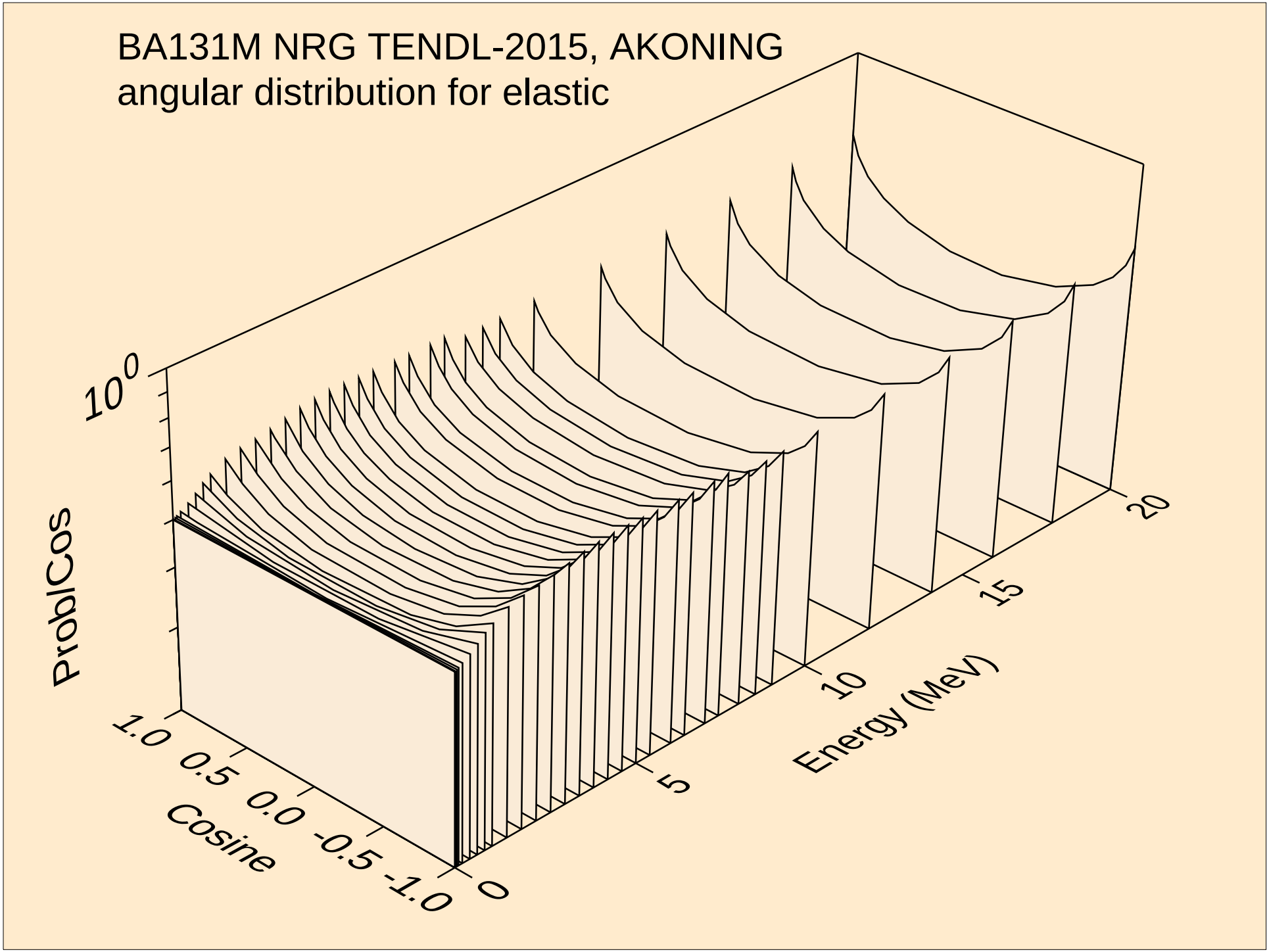

BA131M NRG TENDL-2015, AKONING
Threshold reactions
100
*10-3
80
60
40
20
0
Cross section (barns)
(n,2n)a
(n,3n)a
(n,n*)p
(n,n*)2a
(n,n*)d
0
5
10
15
20
25
30
Energy (MeV)

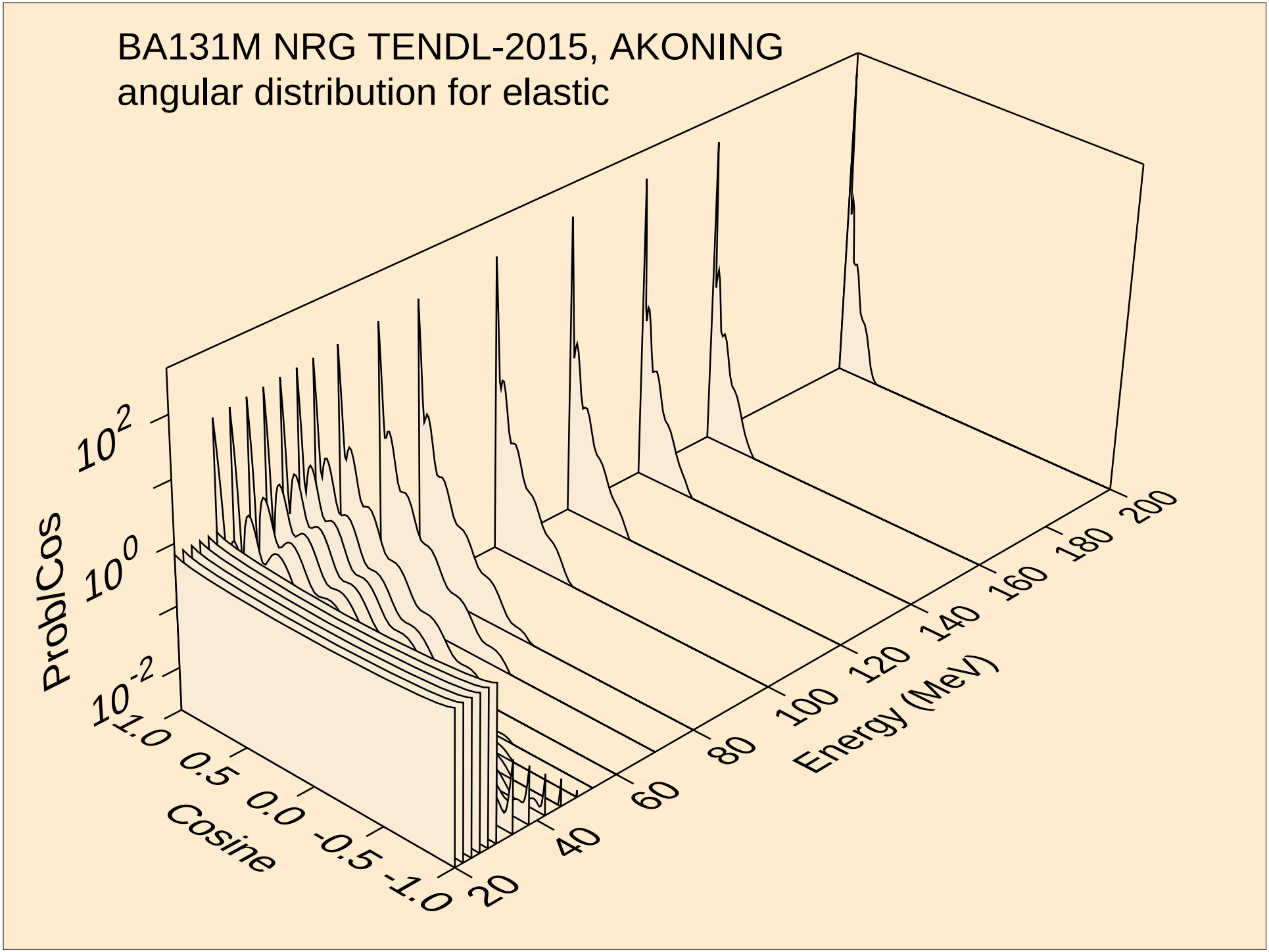

BA131M NRG TENDL-2015, AKONING
Threshold reactions
*10-3
70
60
50
40
30
20
10
0
Cross section (barns)
(n,n*)t
(n,n*)he3
(n,4n)
(n,2np)
(n,3np)
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

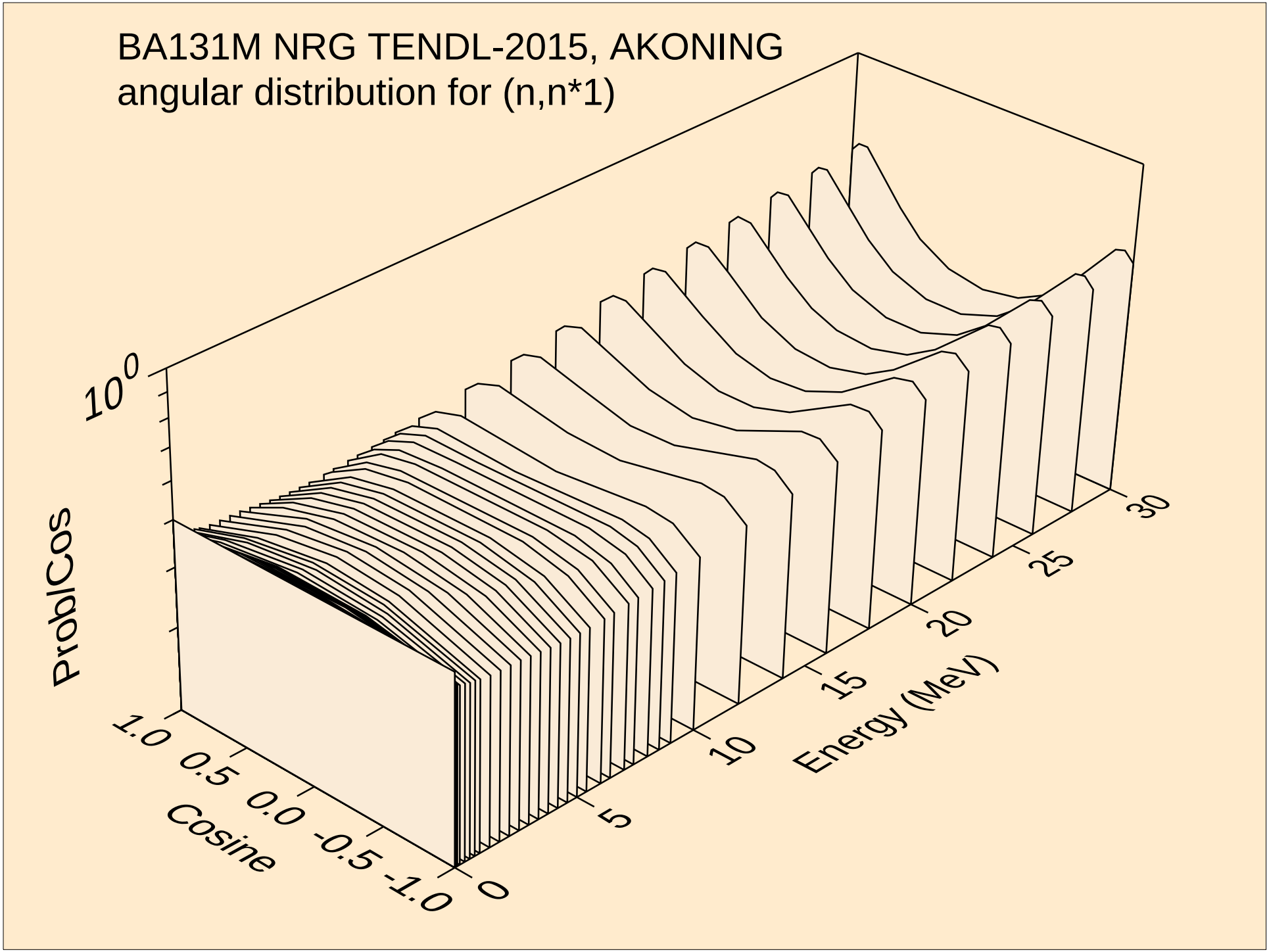

BA131M NRG TENDL-2015, AKONING
Threshold reactions
(n,2np)
(n,npa)
(n,n*c)
(n,d)
(n,t)
Cross section (barns)
Energy (MeV)
0.0
0.5
1.0
1.5
2.0
2.5
0
5
10
15
20
25
30

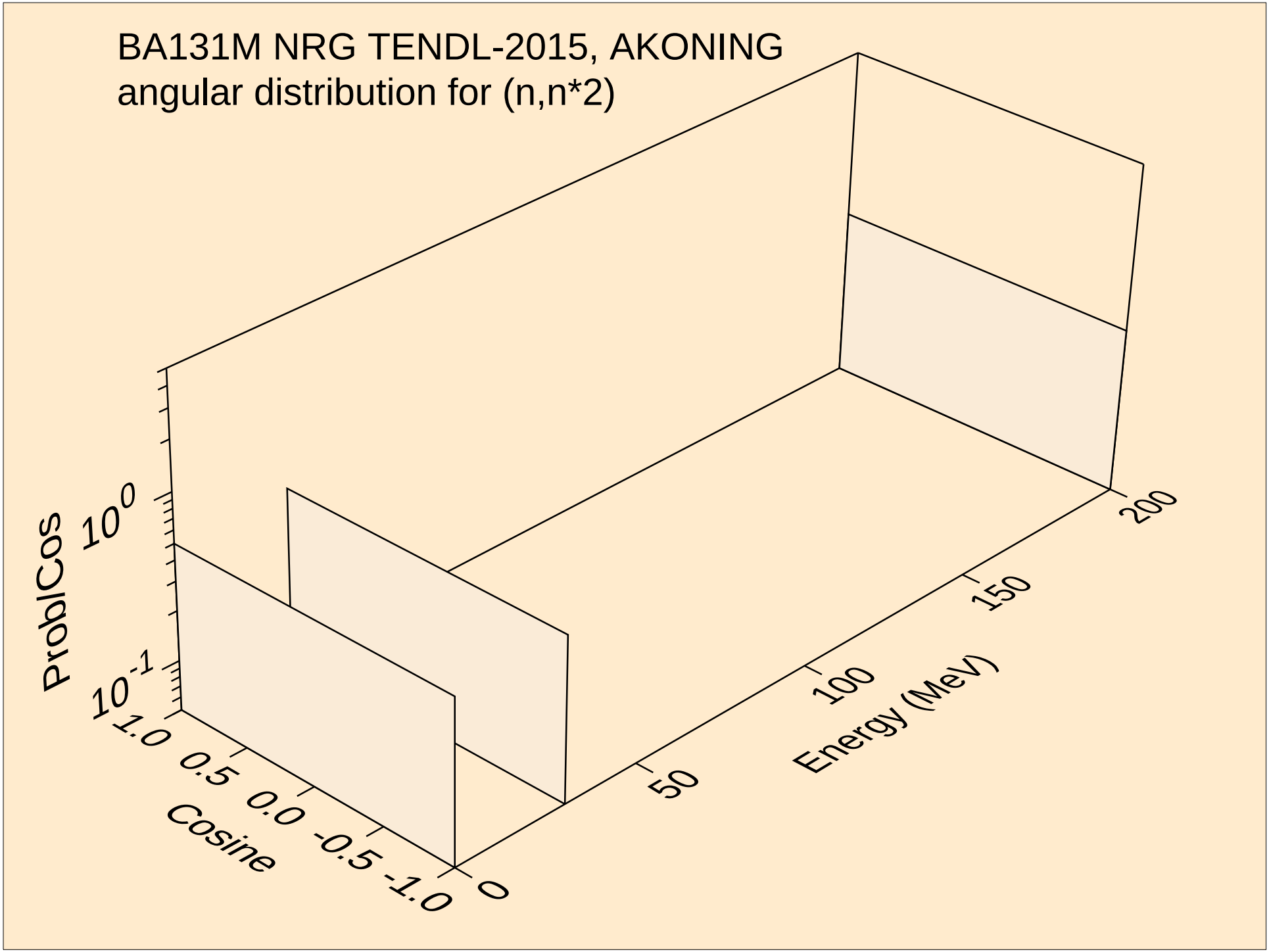

BA131M NRG TENDL-2015, AKONING
Threshold reactions
Cross section (barns)
*10-6
2000
1800
1600
1400
1200
1000
800
600
400
200
0
(n,he3)
(n,2a)
(n,2p)
(n,pa)
(n,pd)
0
5
10
15
20
25
30
Energy (MeV)

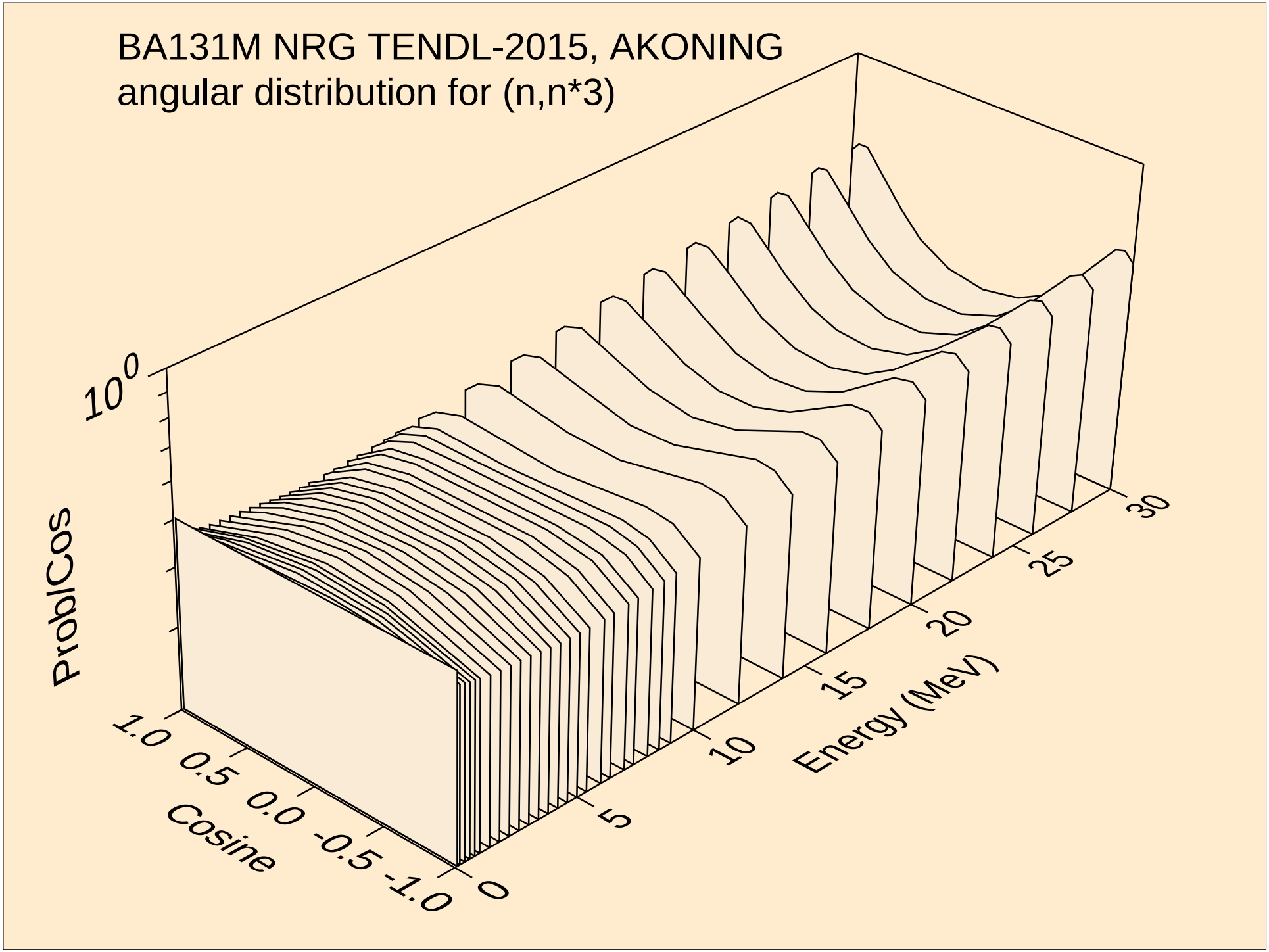

BA131M NRG TENDL-2015, AKONING
Threshold reactions
10
*10-6
8
6
4
2
0
(n,pt)
(n,da)
Cross section (barns)
5
10
15
20
25
30
Energy (MeV)

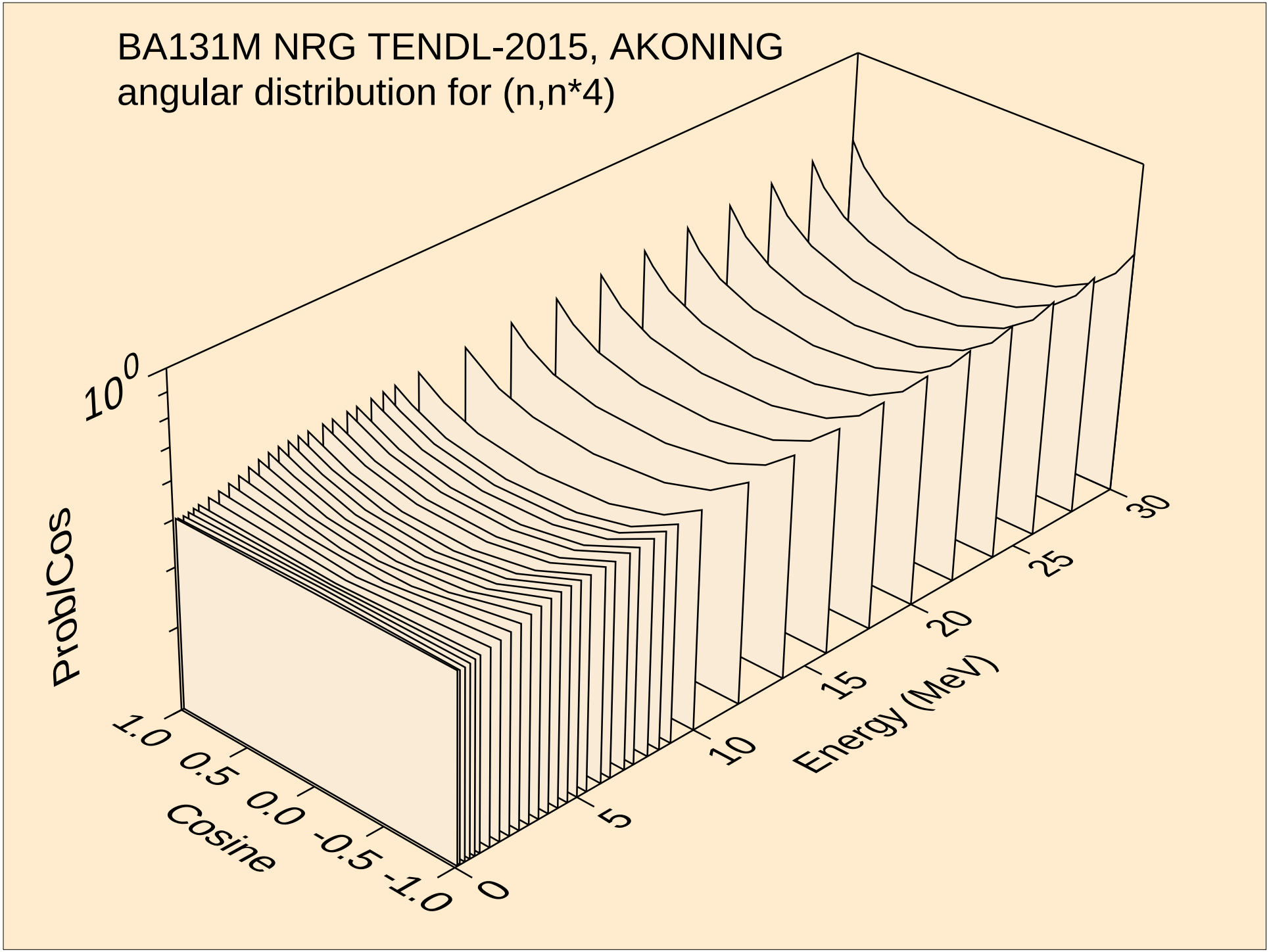

BA131M NRG TENDL-2015, AKONING
angular distribution for elastic
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

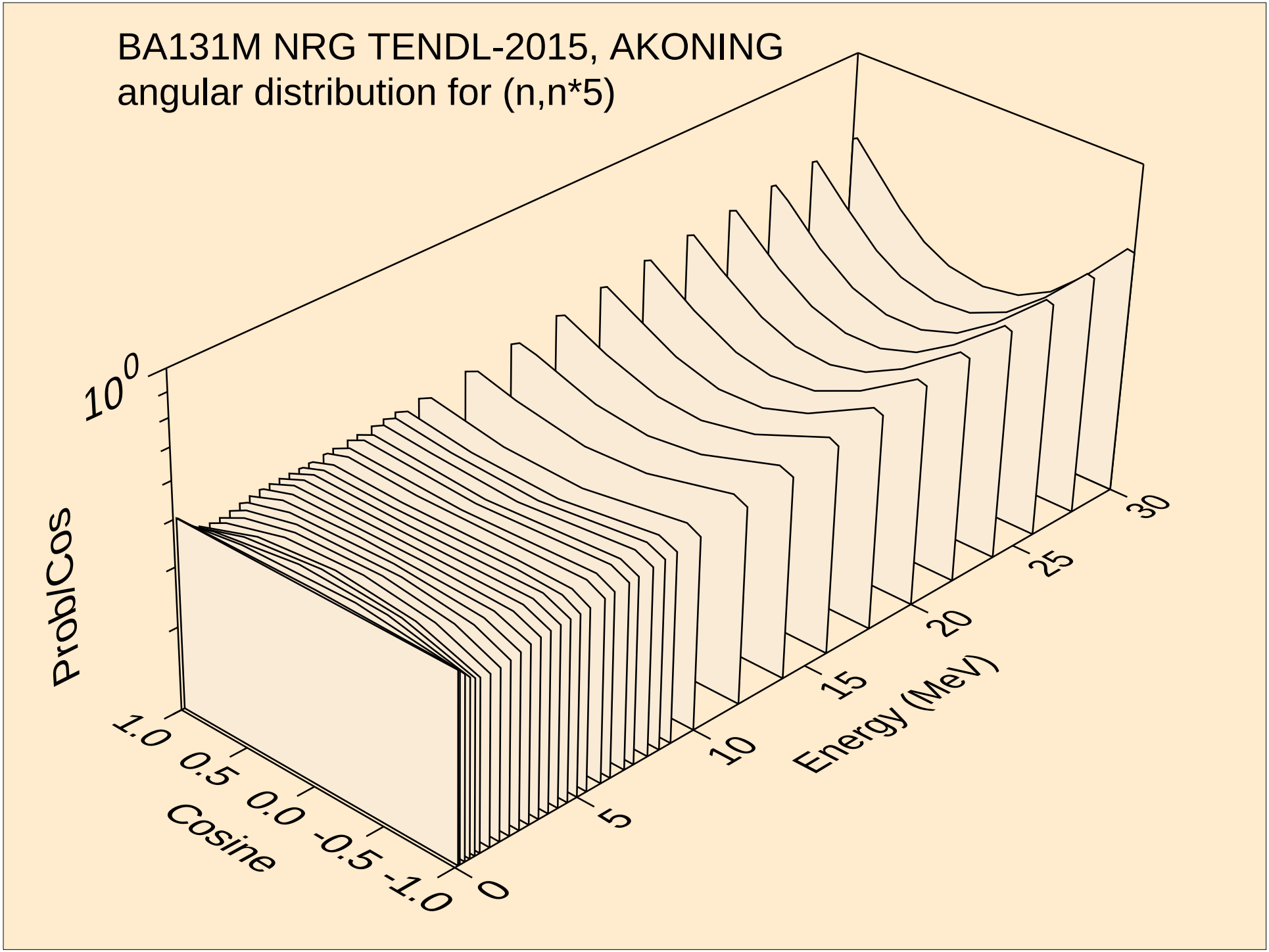

BA131M NRG TENDL-2015, AKONING
angular distribution for elastic
ProbCos
$10^{2}$
$10^{0}$
$10^{-2}$
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
20
40
60
80
100
120
140
160
180
200

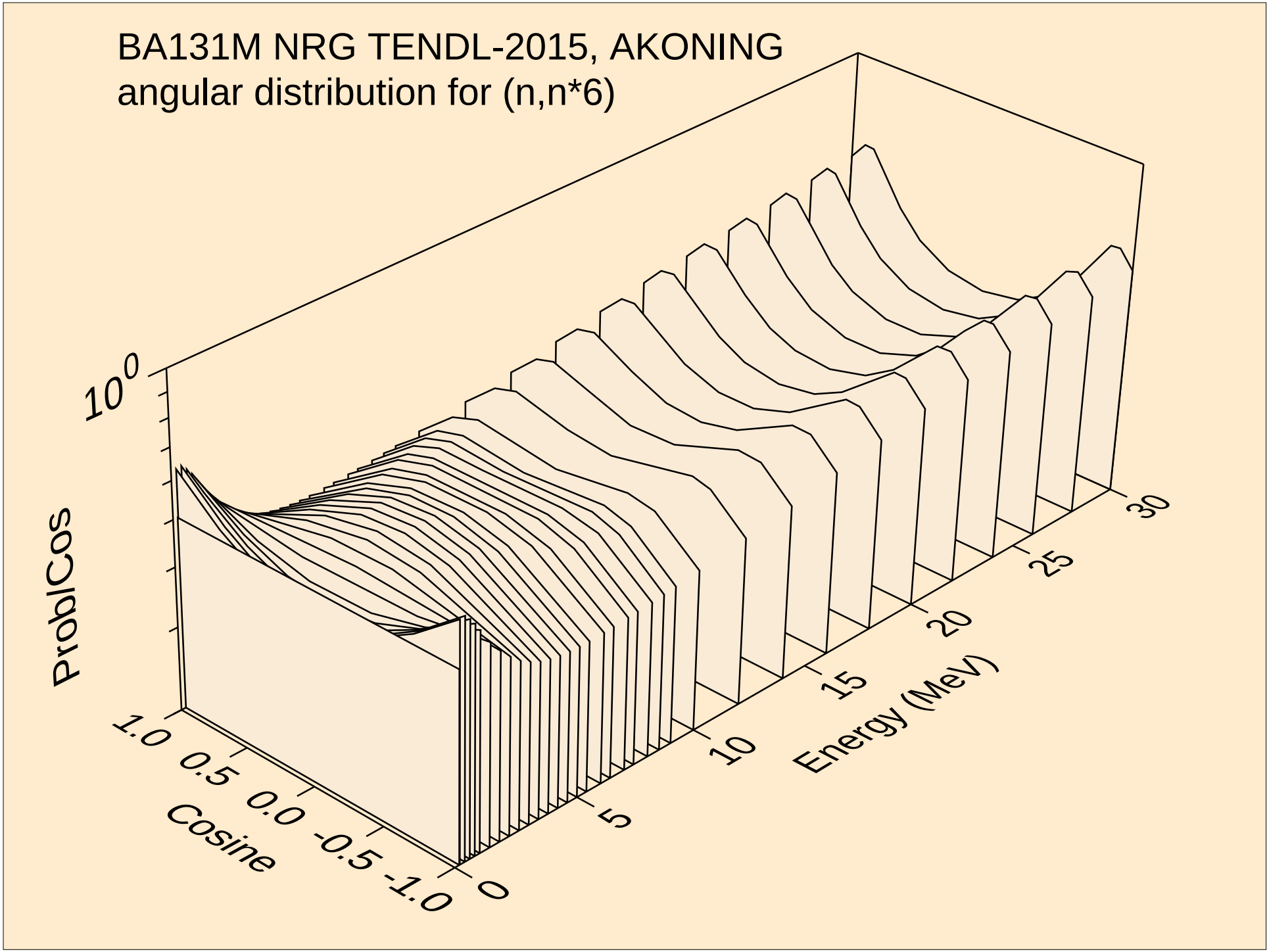

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*1)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

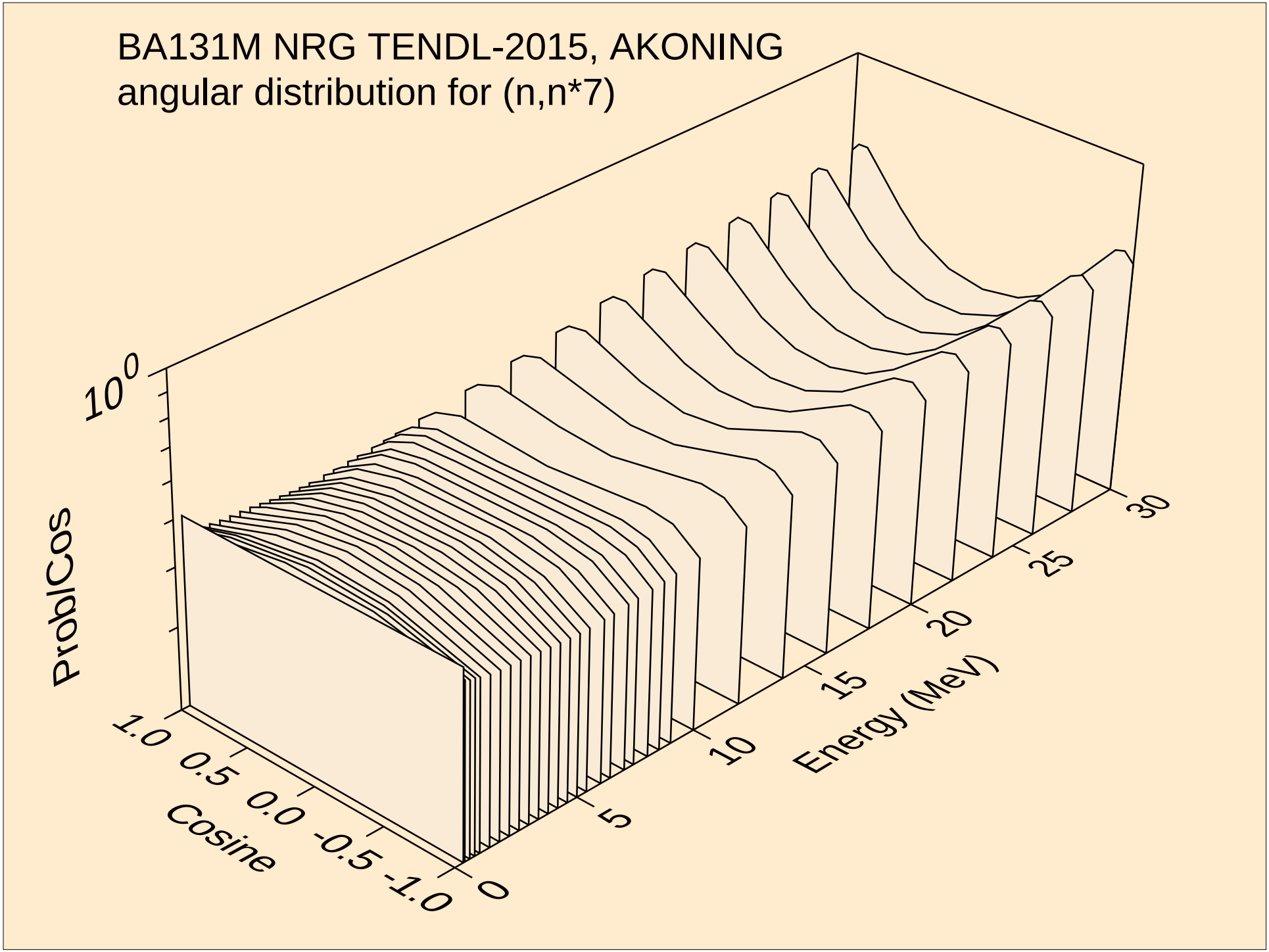

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*2)
ProbCos
$10^{0}$
$10^{-1}$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
50
100
150
200
Energy (MeV)

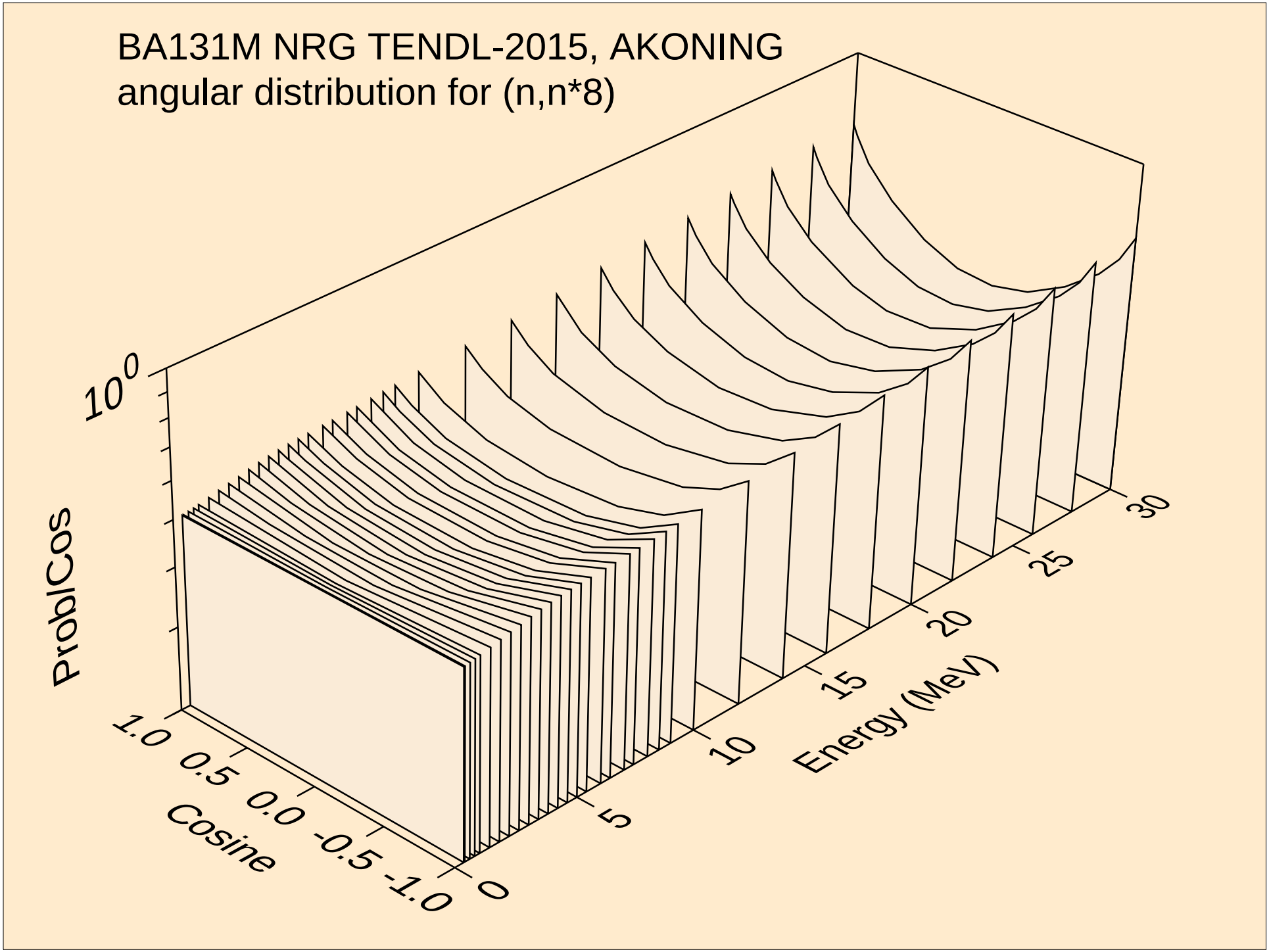

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*3)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

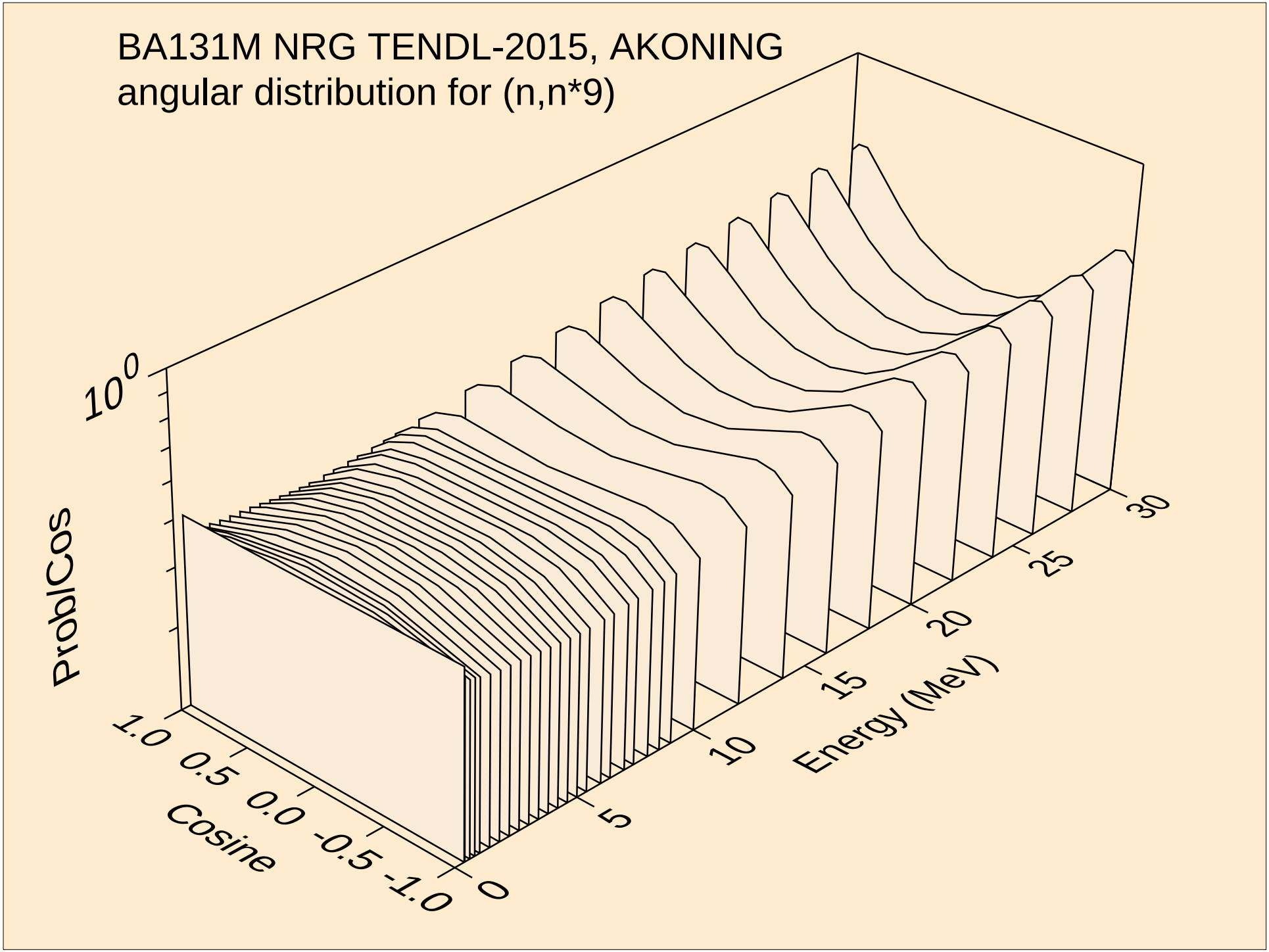

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*4)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

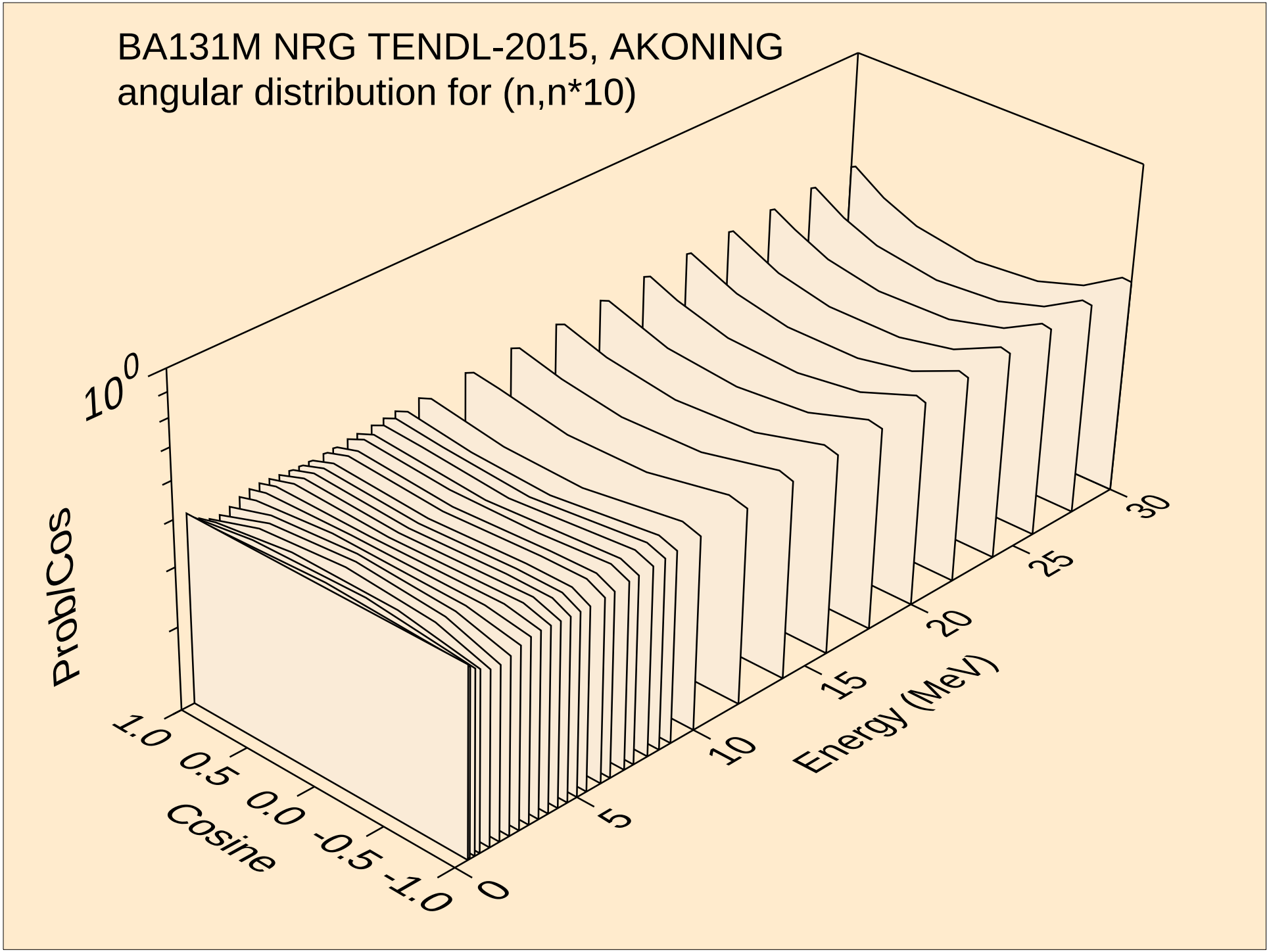

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*5)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

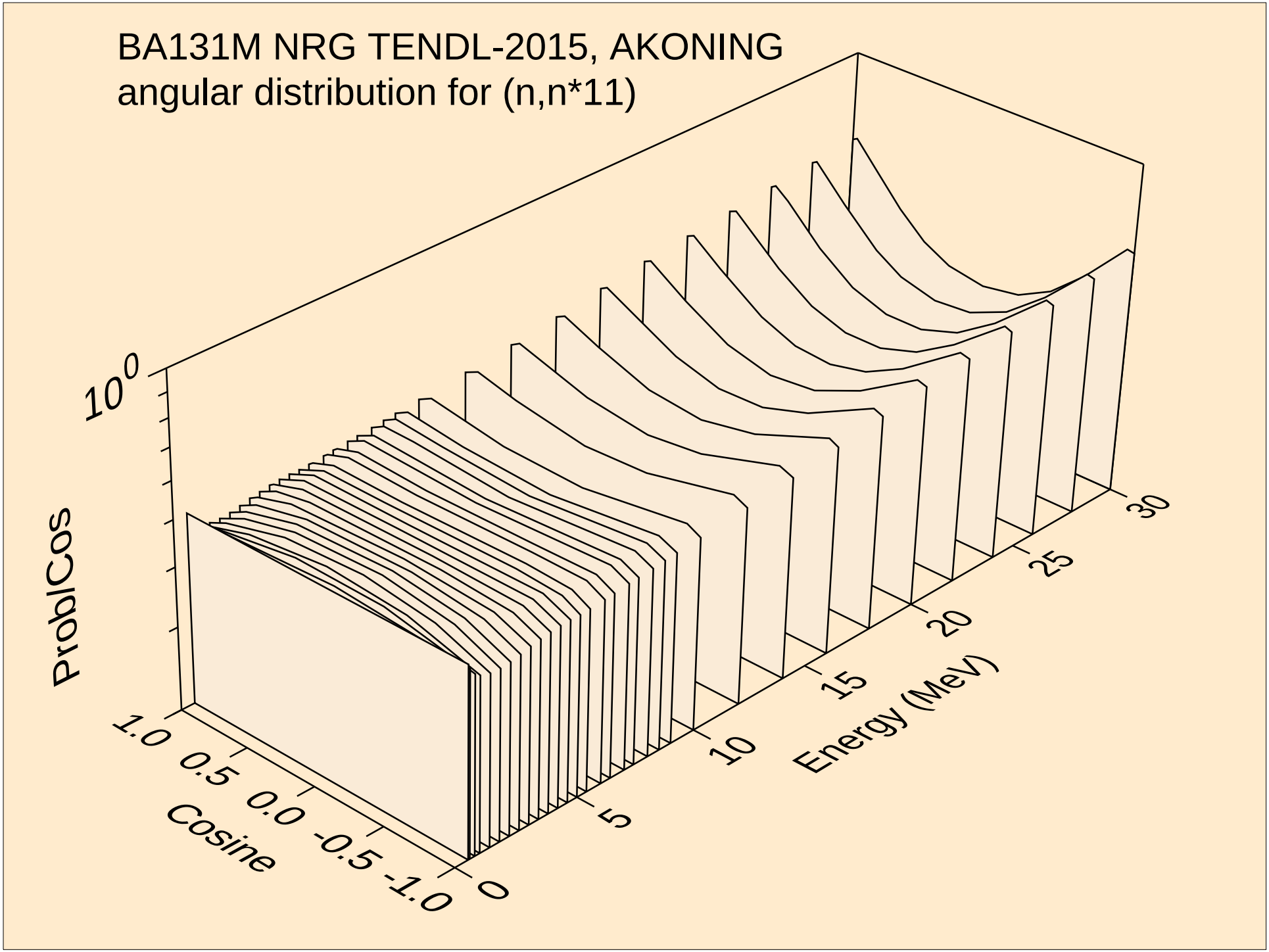

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*6)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

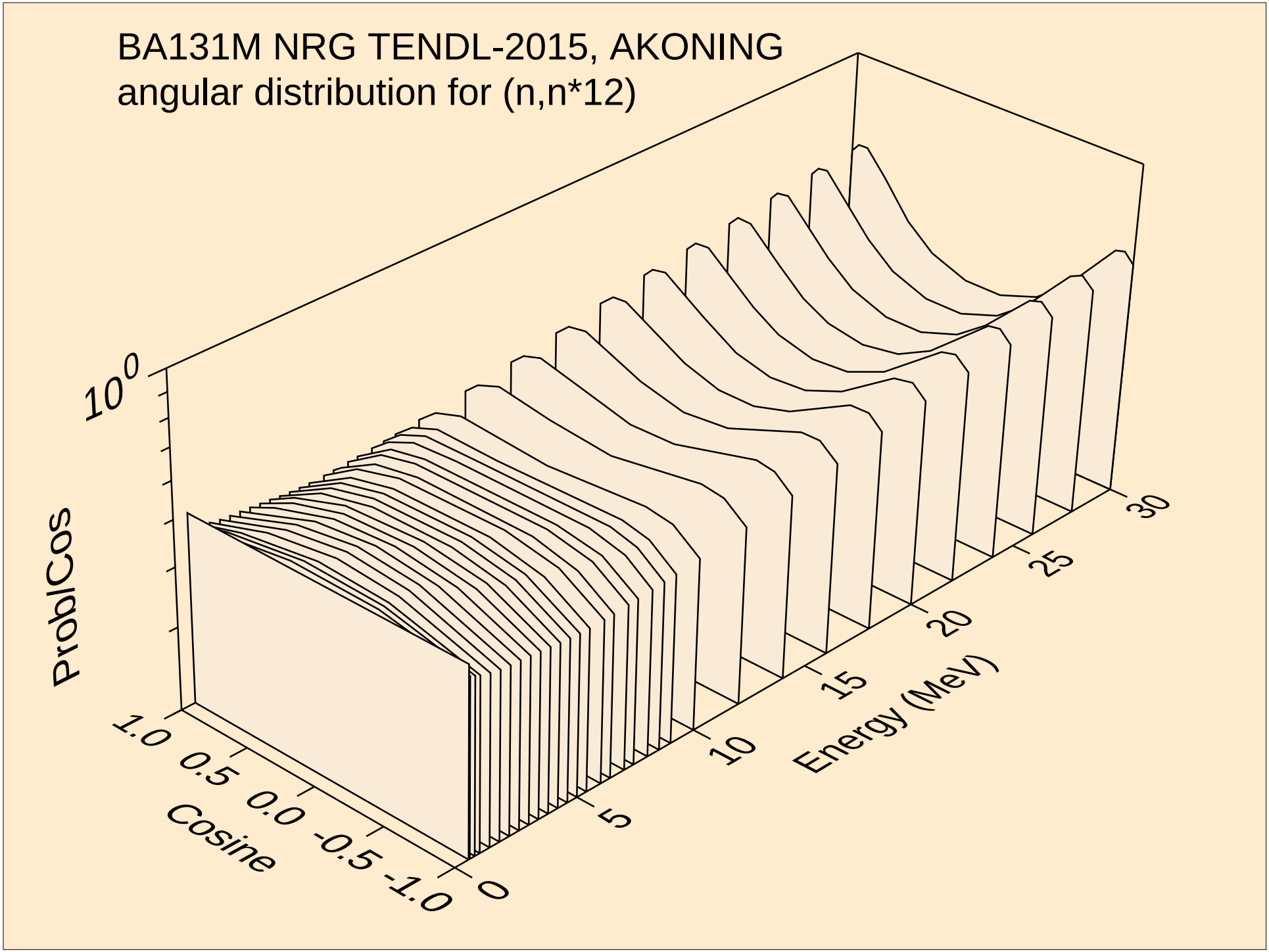

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*7)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

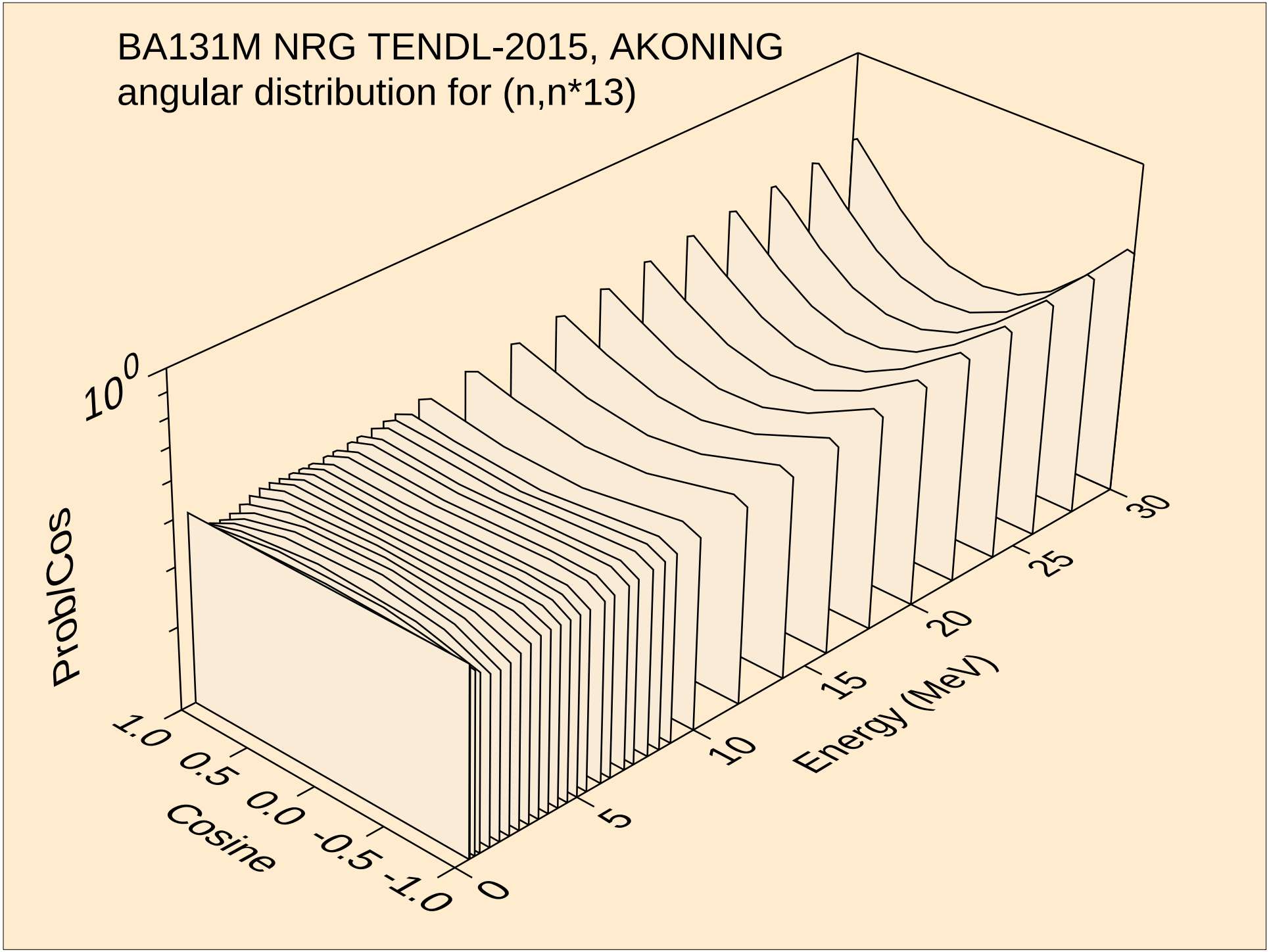

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*8)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

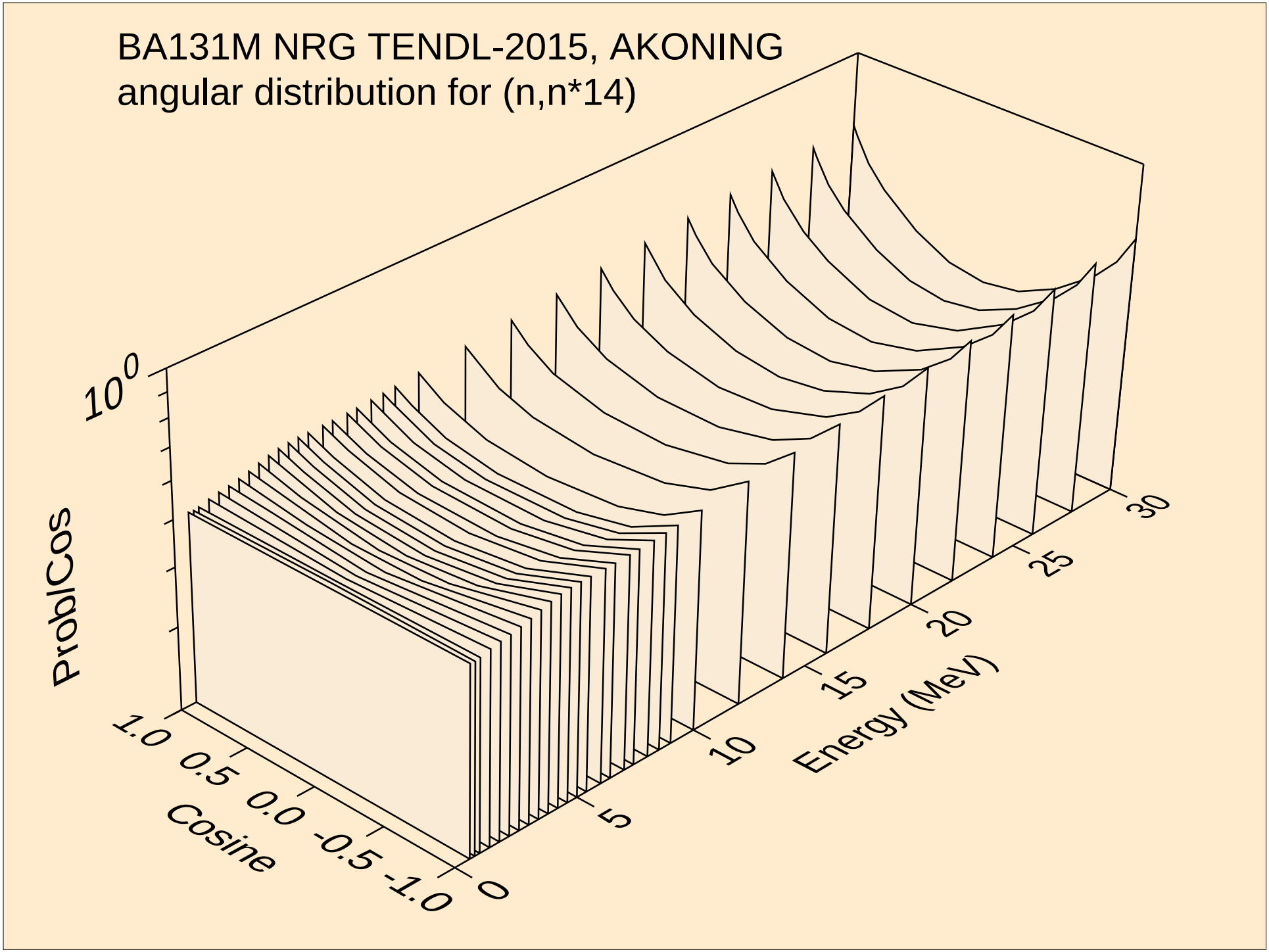

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*9)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

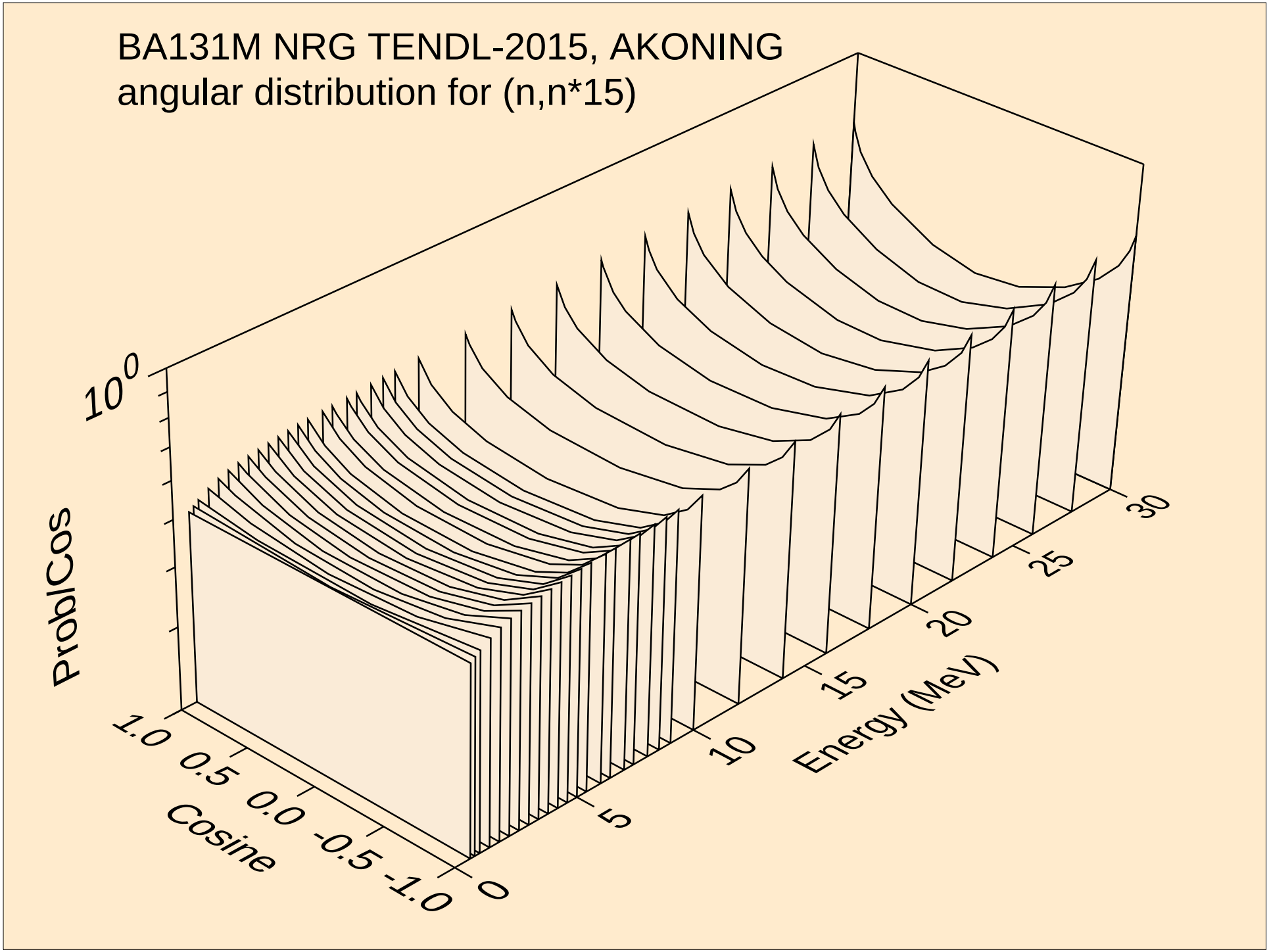

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*10)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

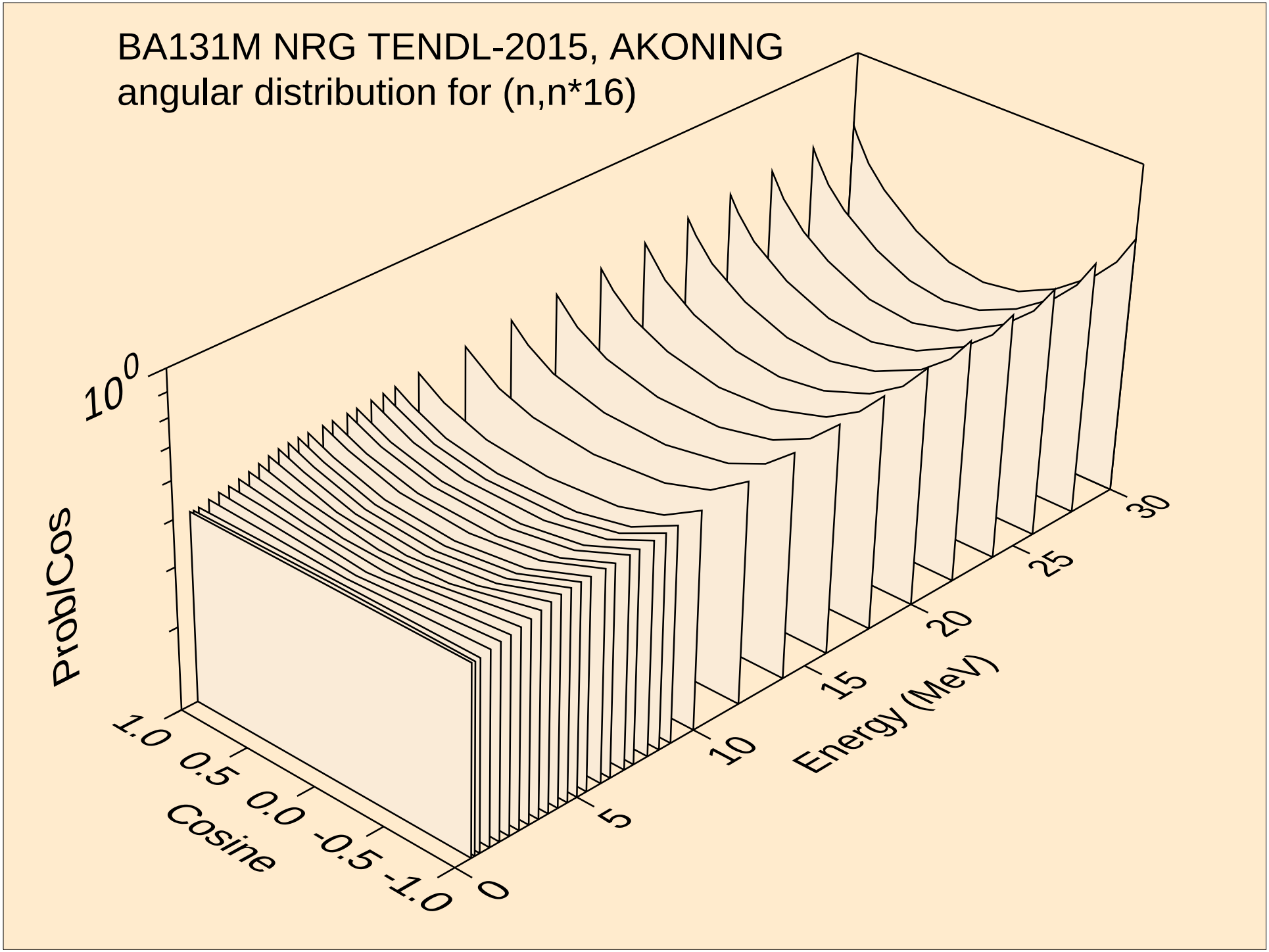

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*11)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

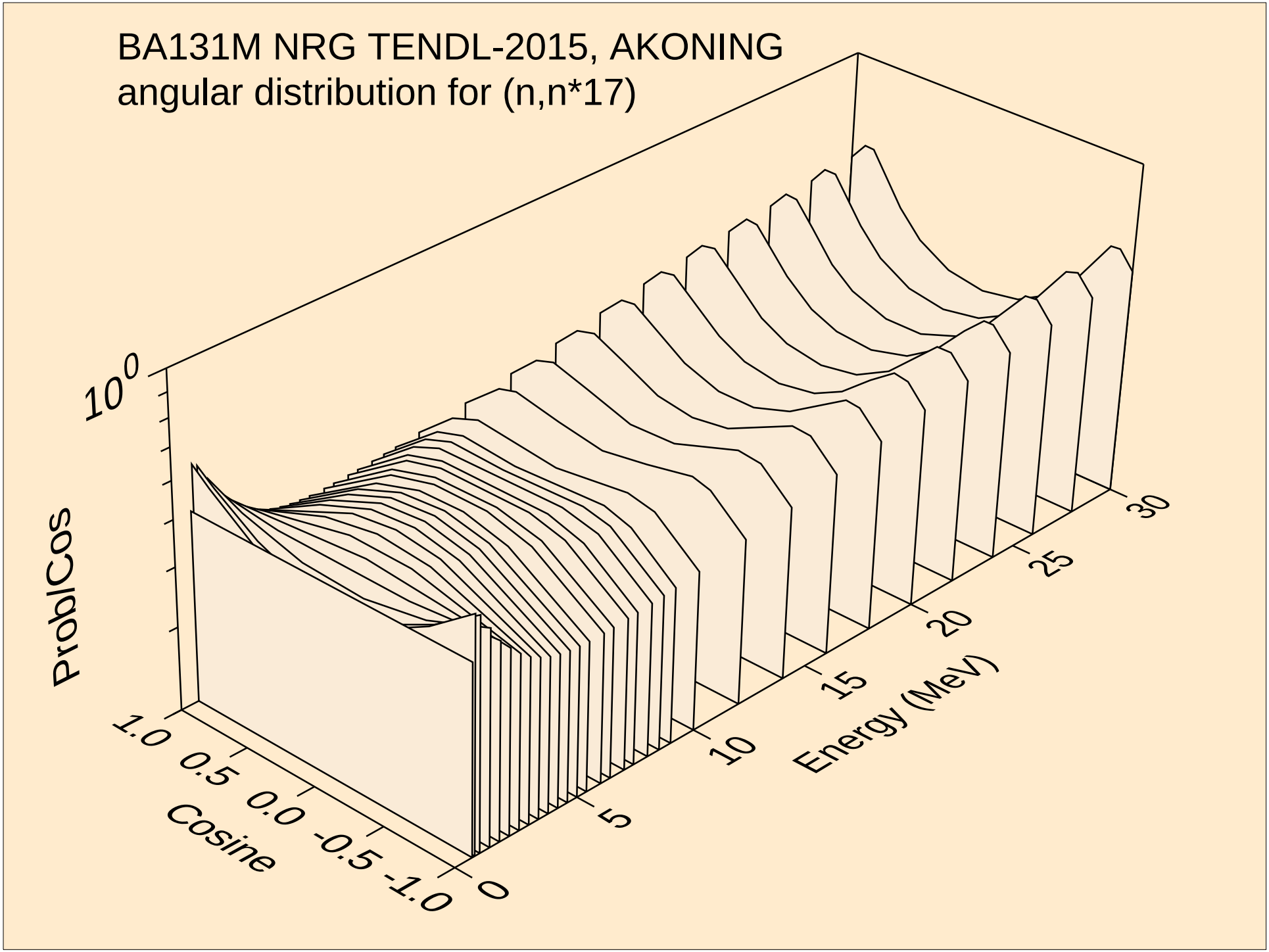

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*12)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

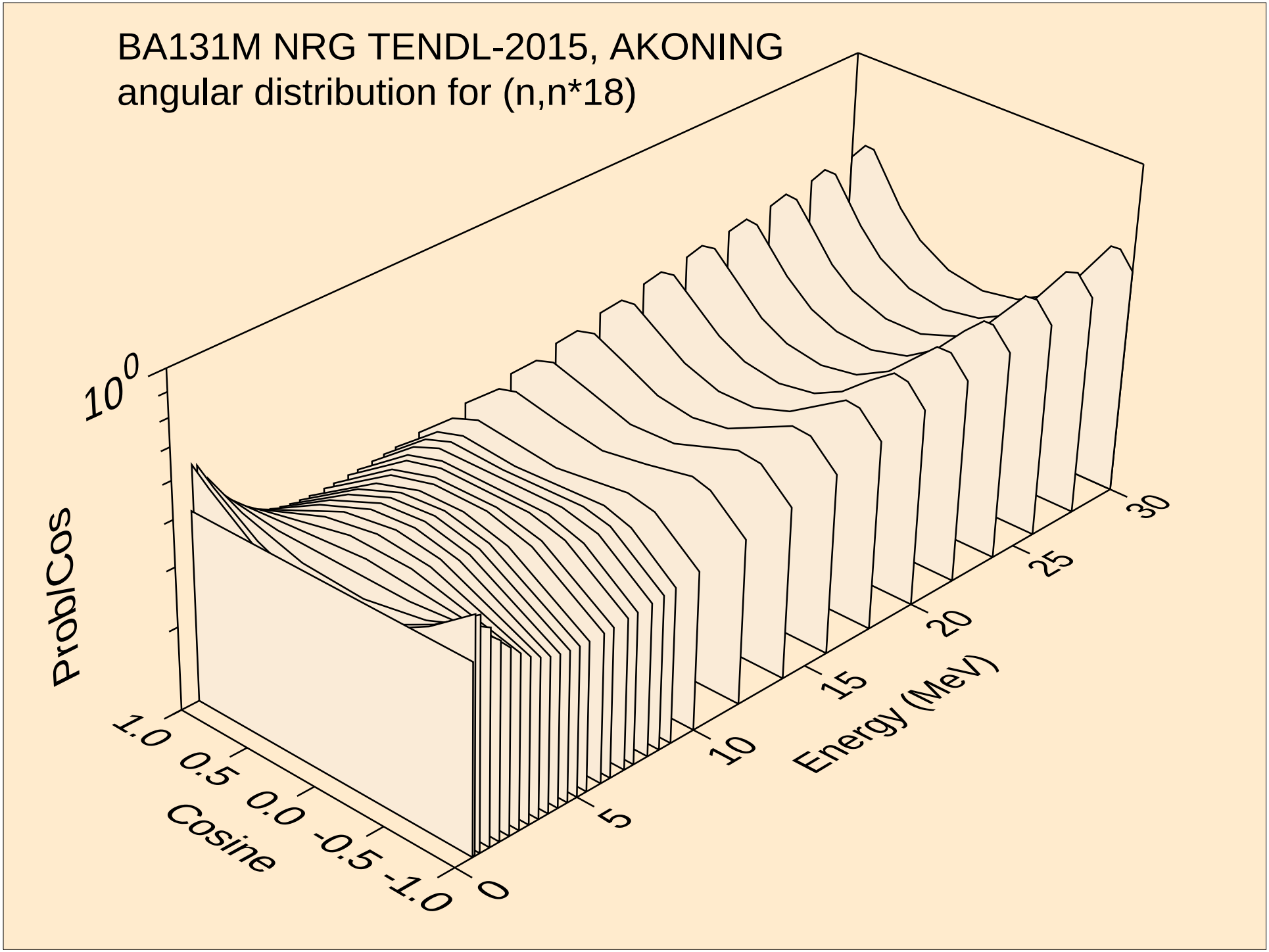

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*13)
ProbCos
$10^0$
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
5
10
15
20
25
30

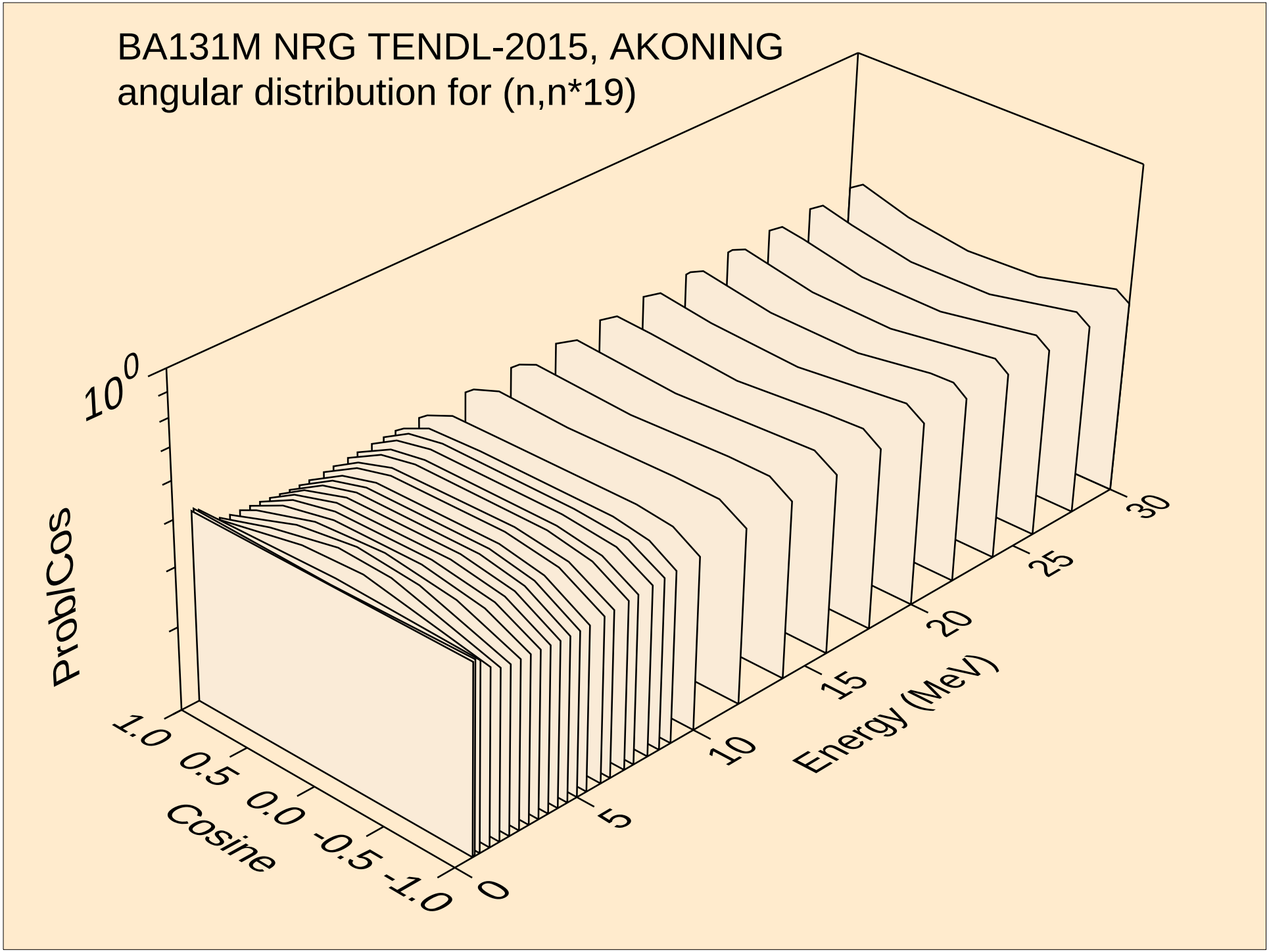

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*14)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

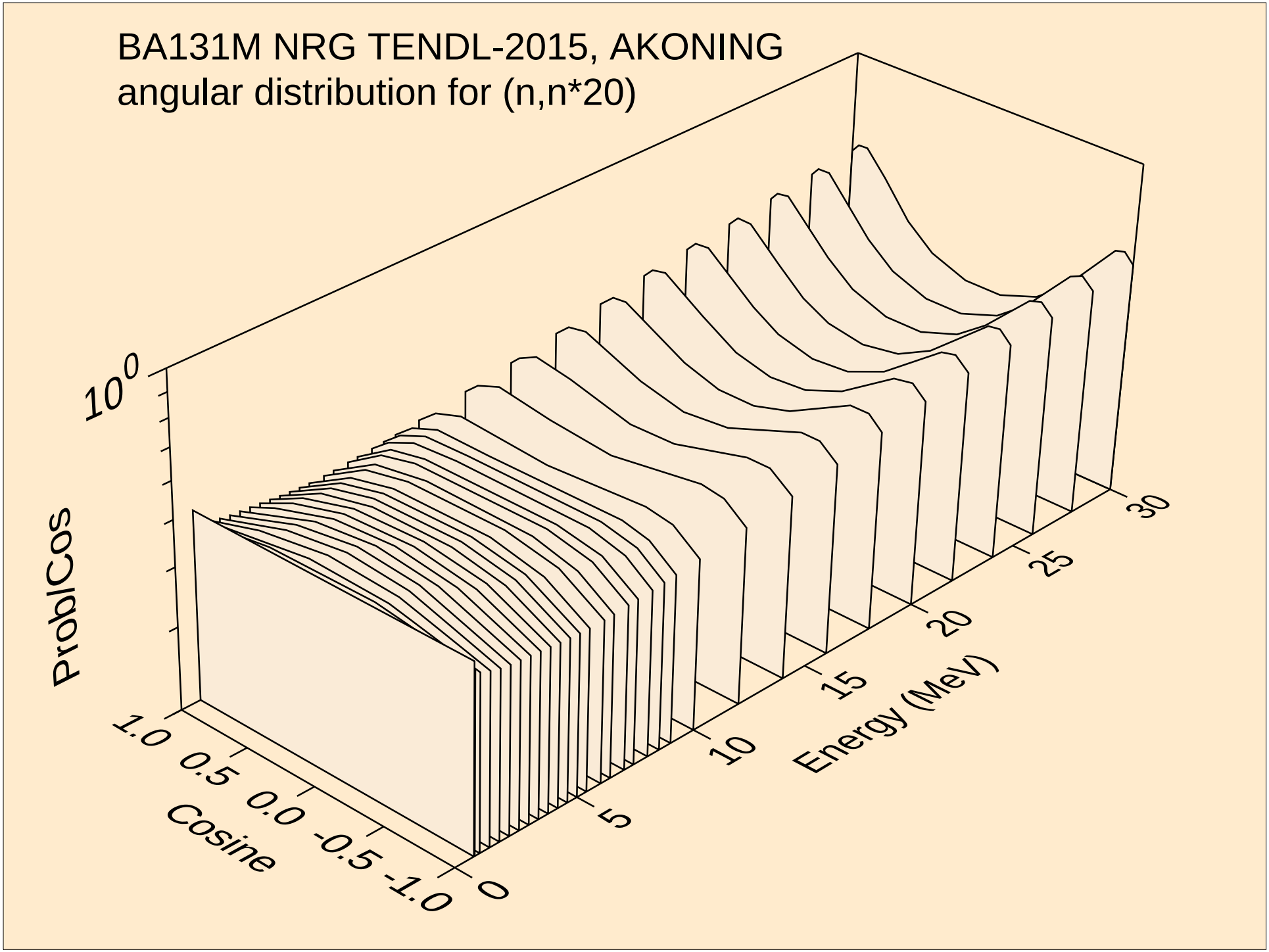

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*15)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

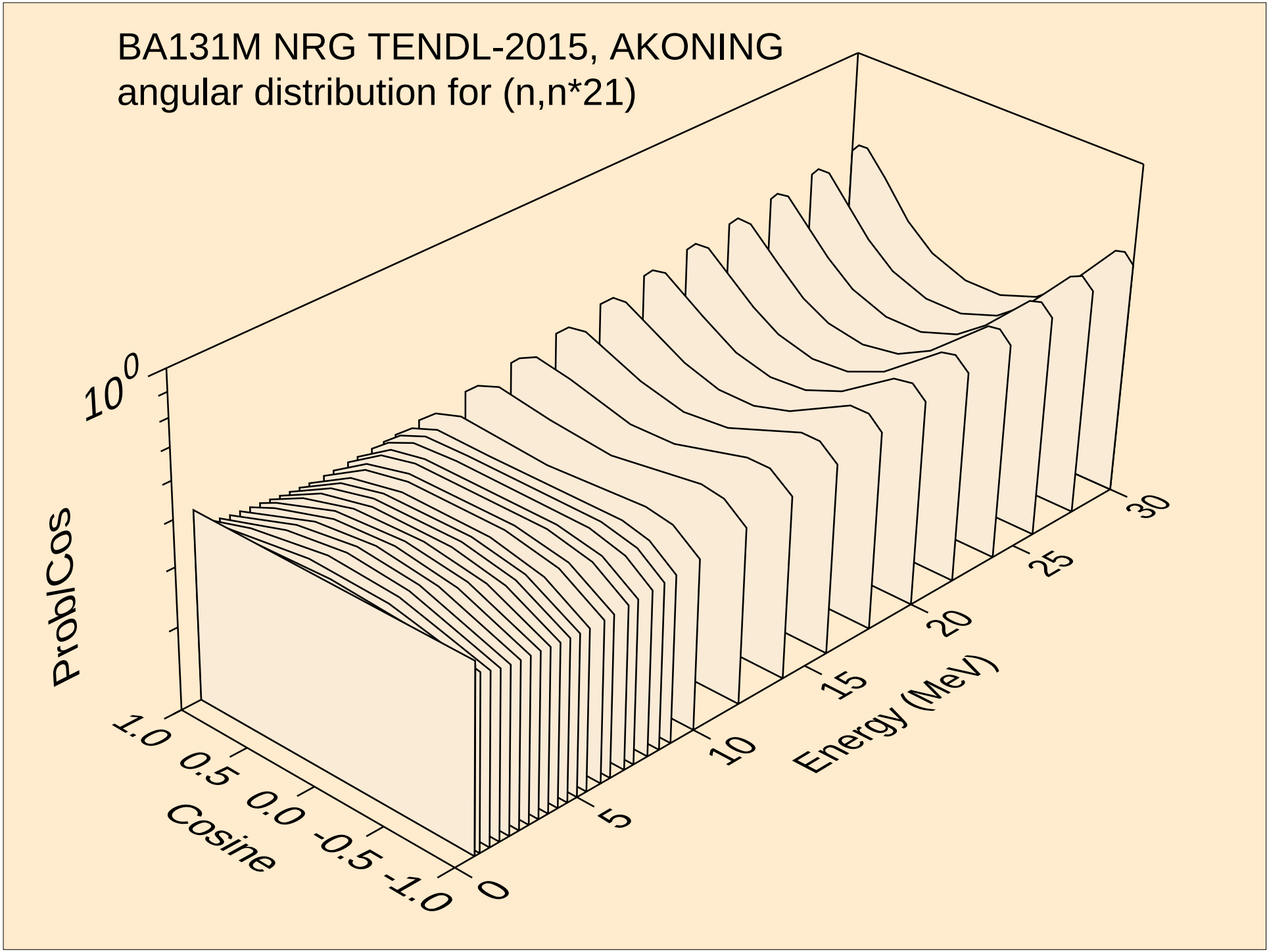

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*16)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

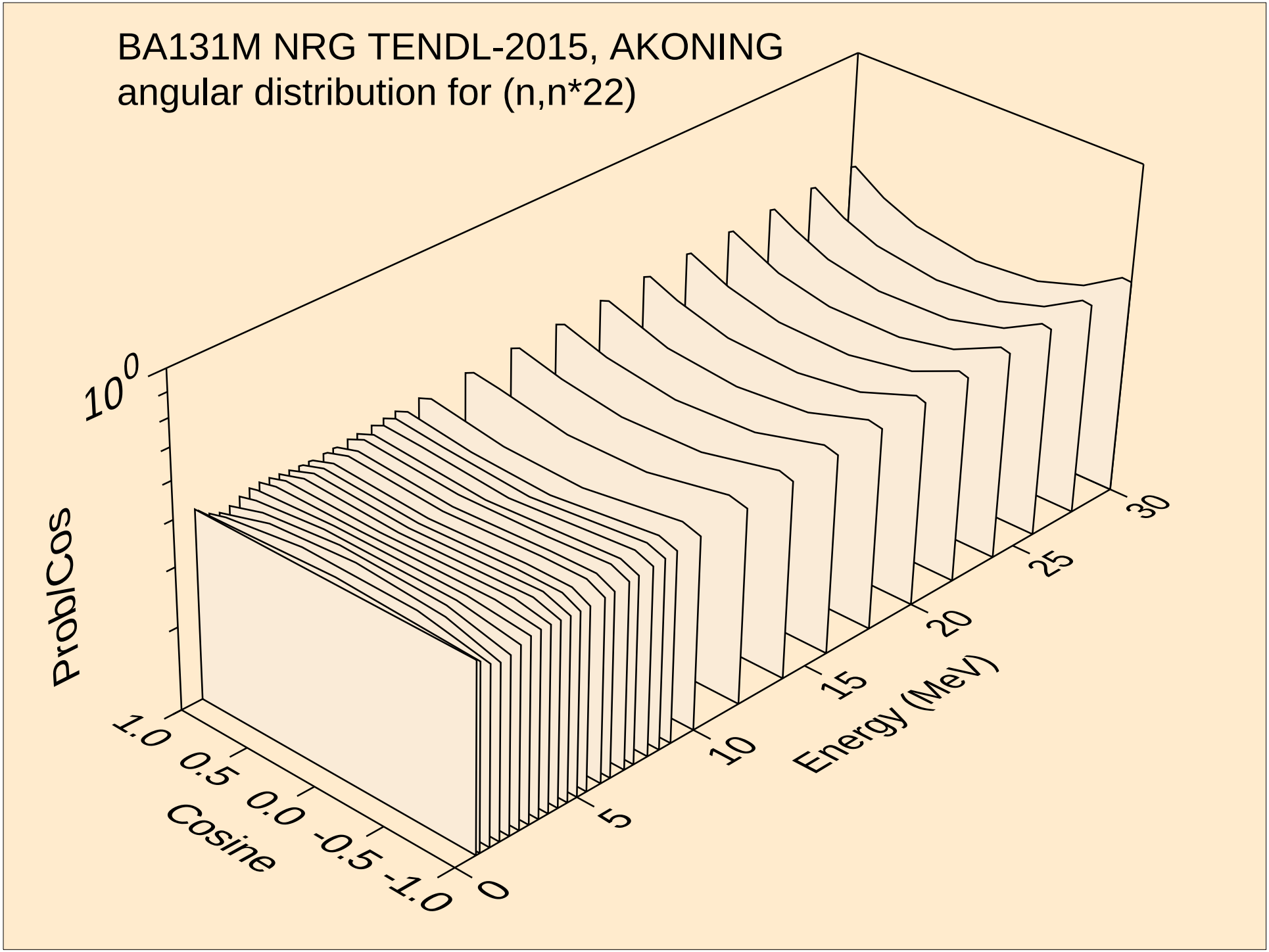

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*17)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

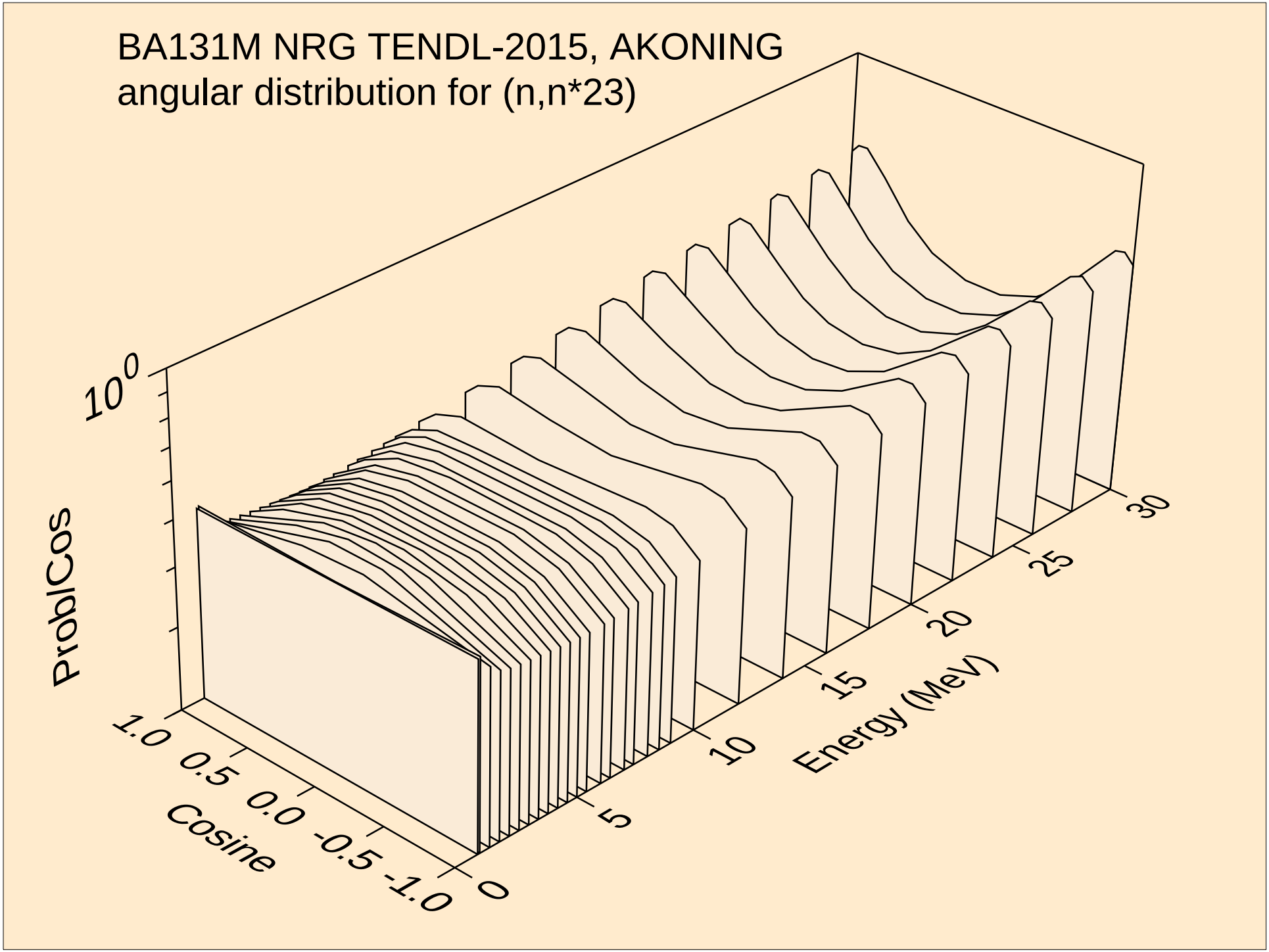

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*18)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

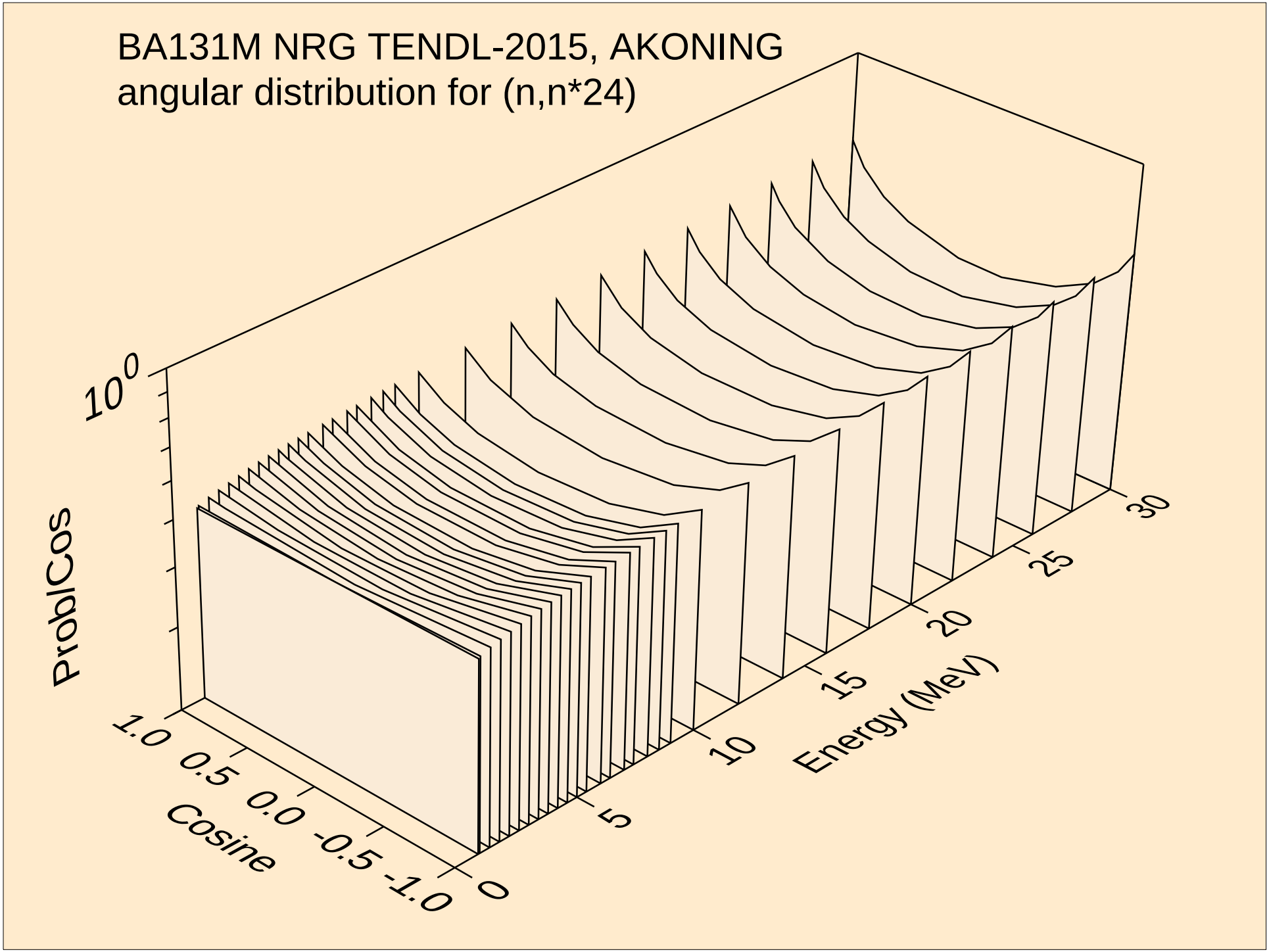

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*19)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

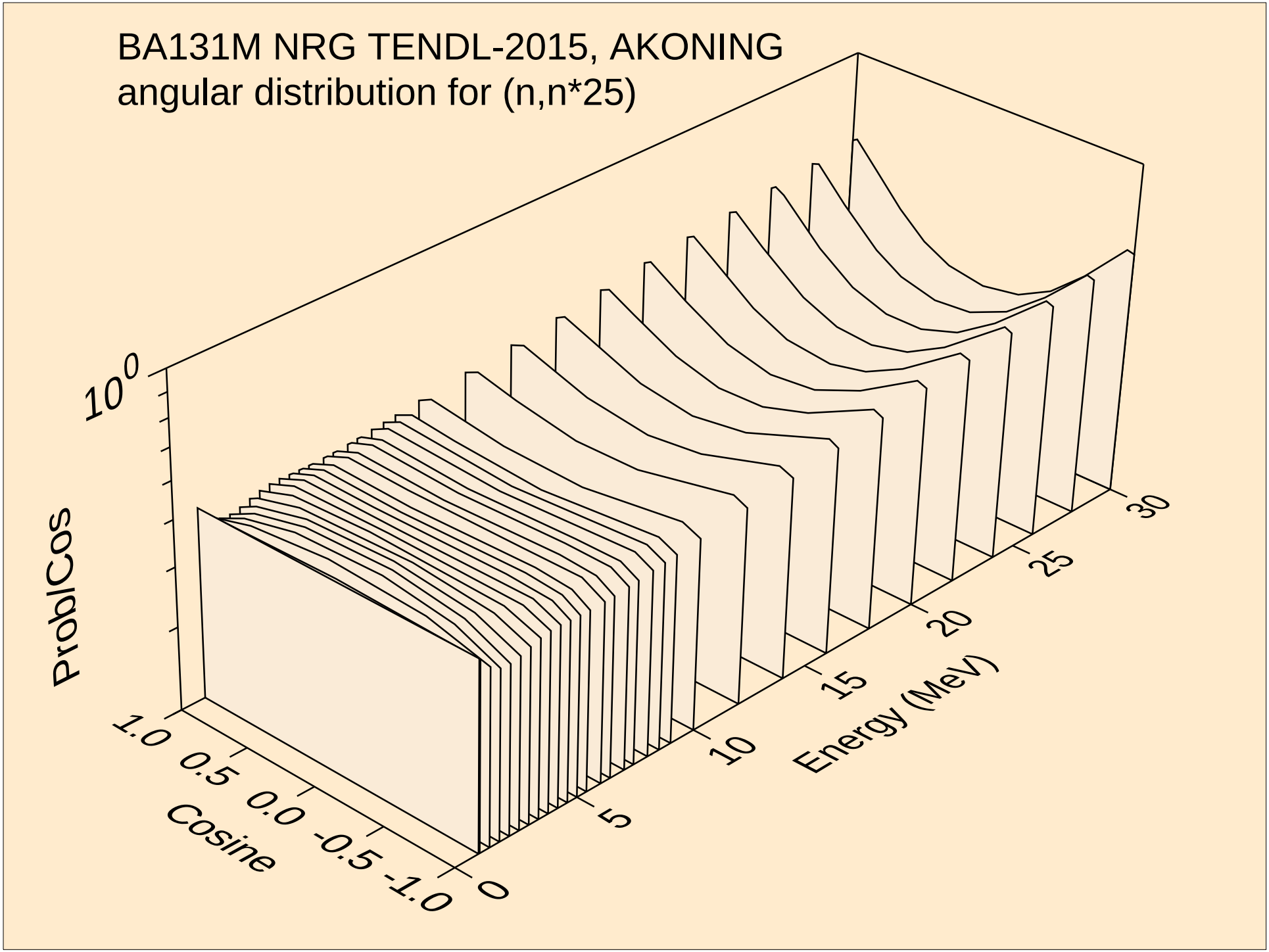

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*20)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

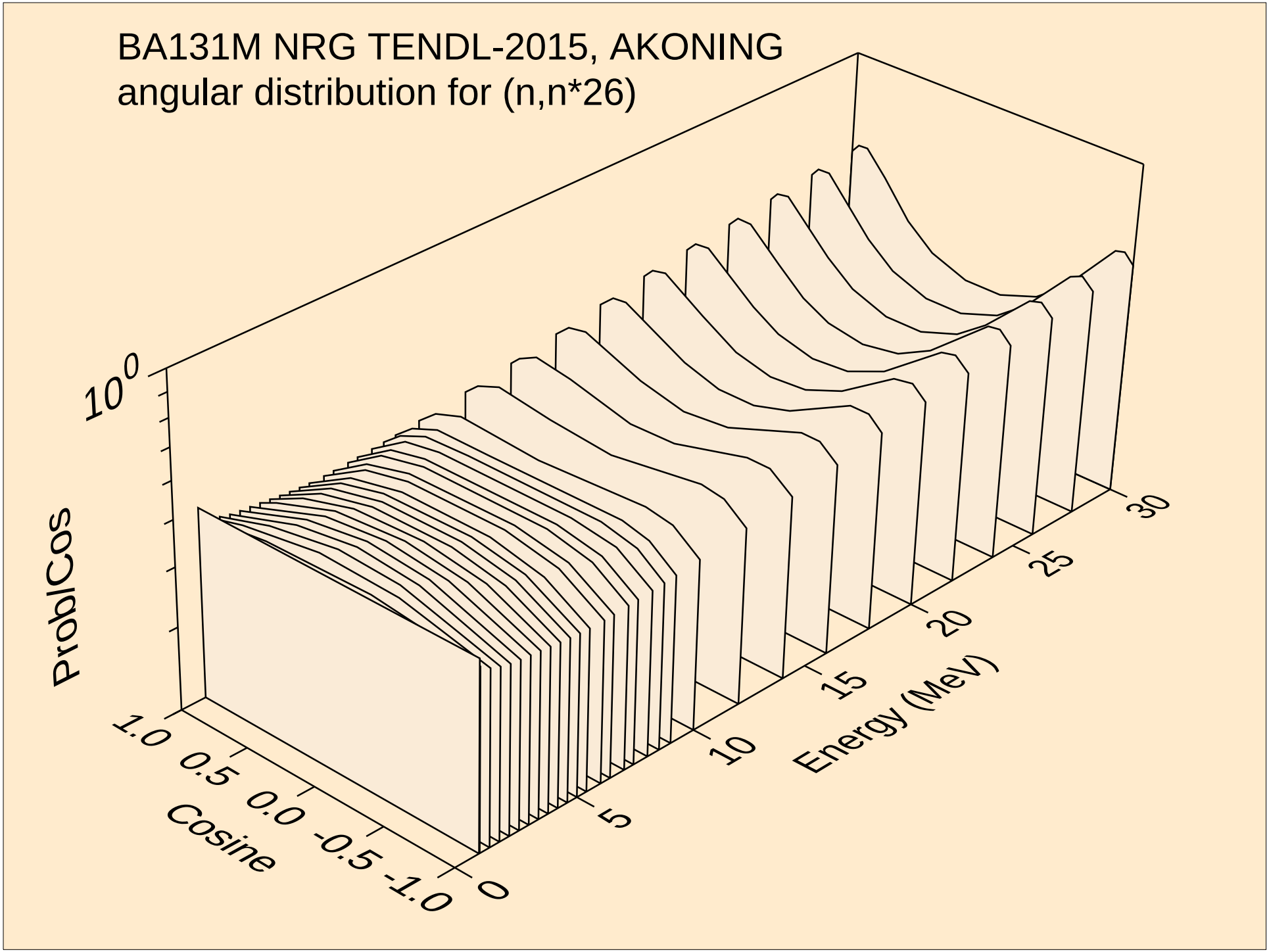

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*21)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

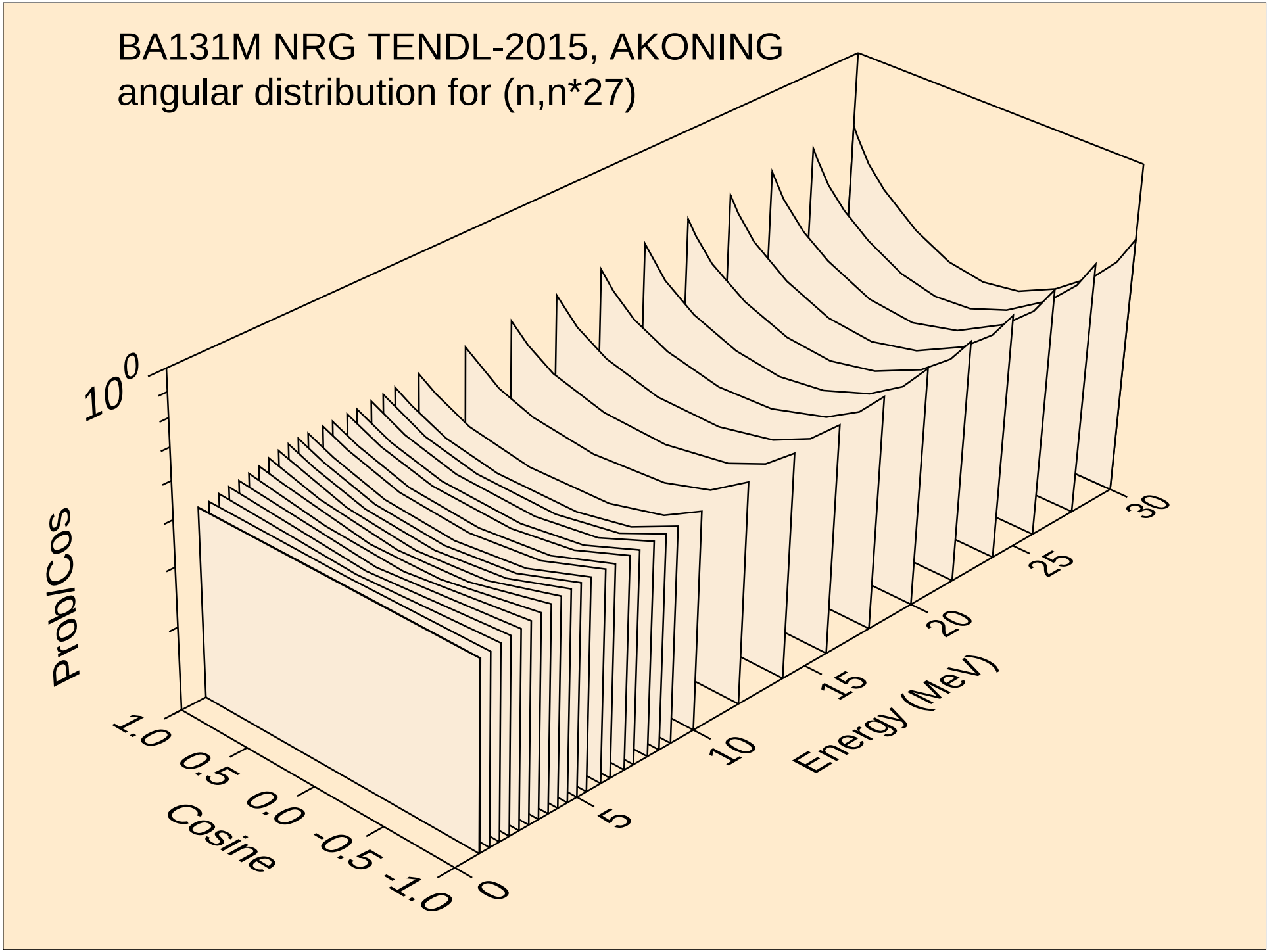

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*22)
$10^0$
ProbCos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

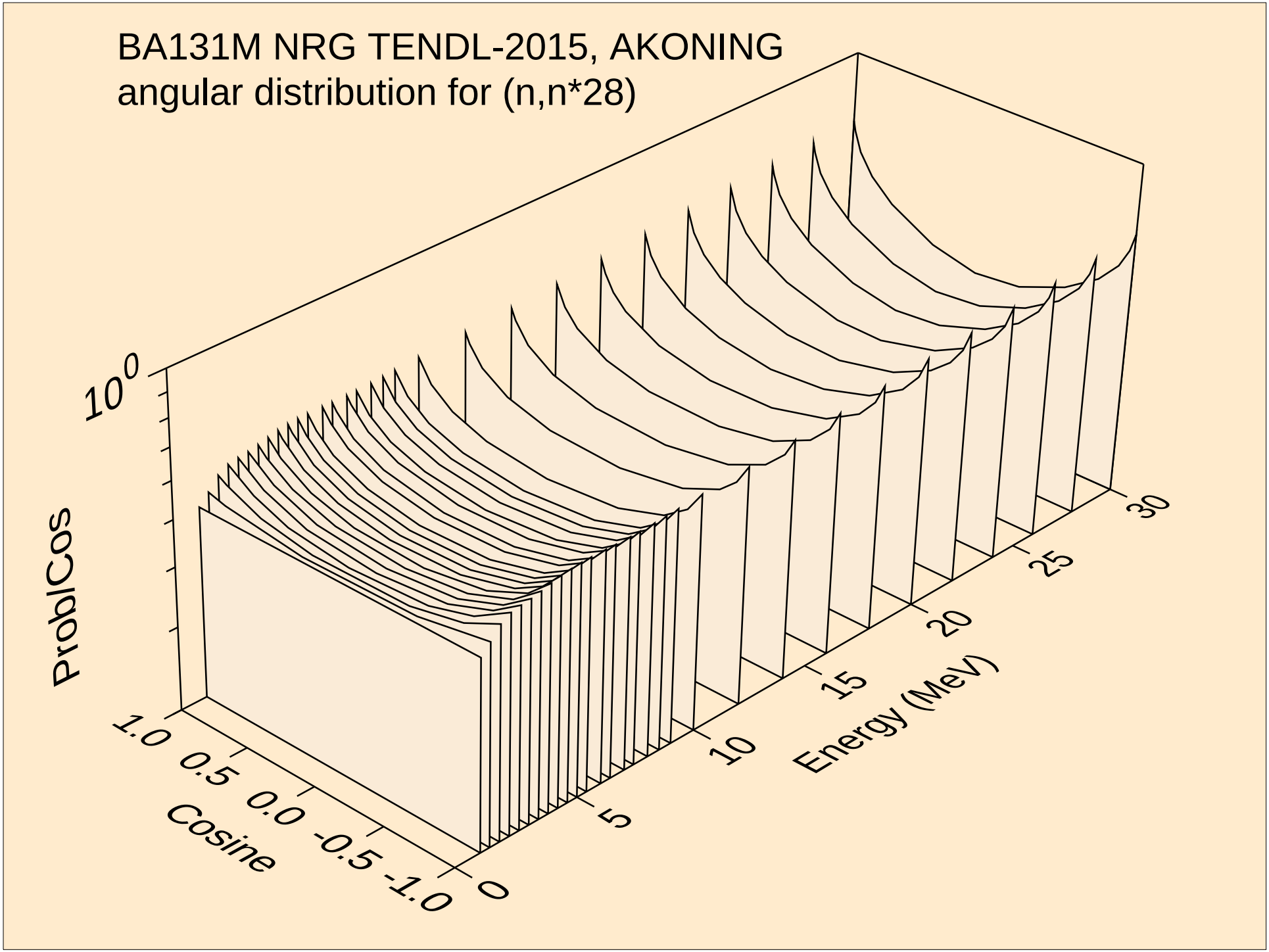

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*23)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

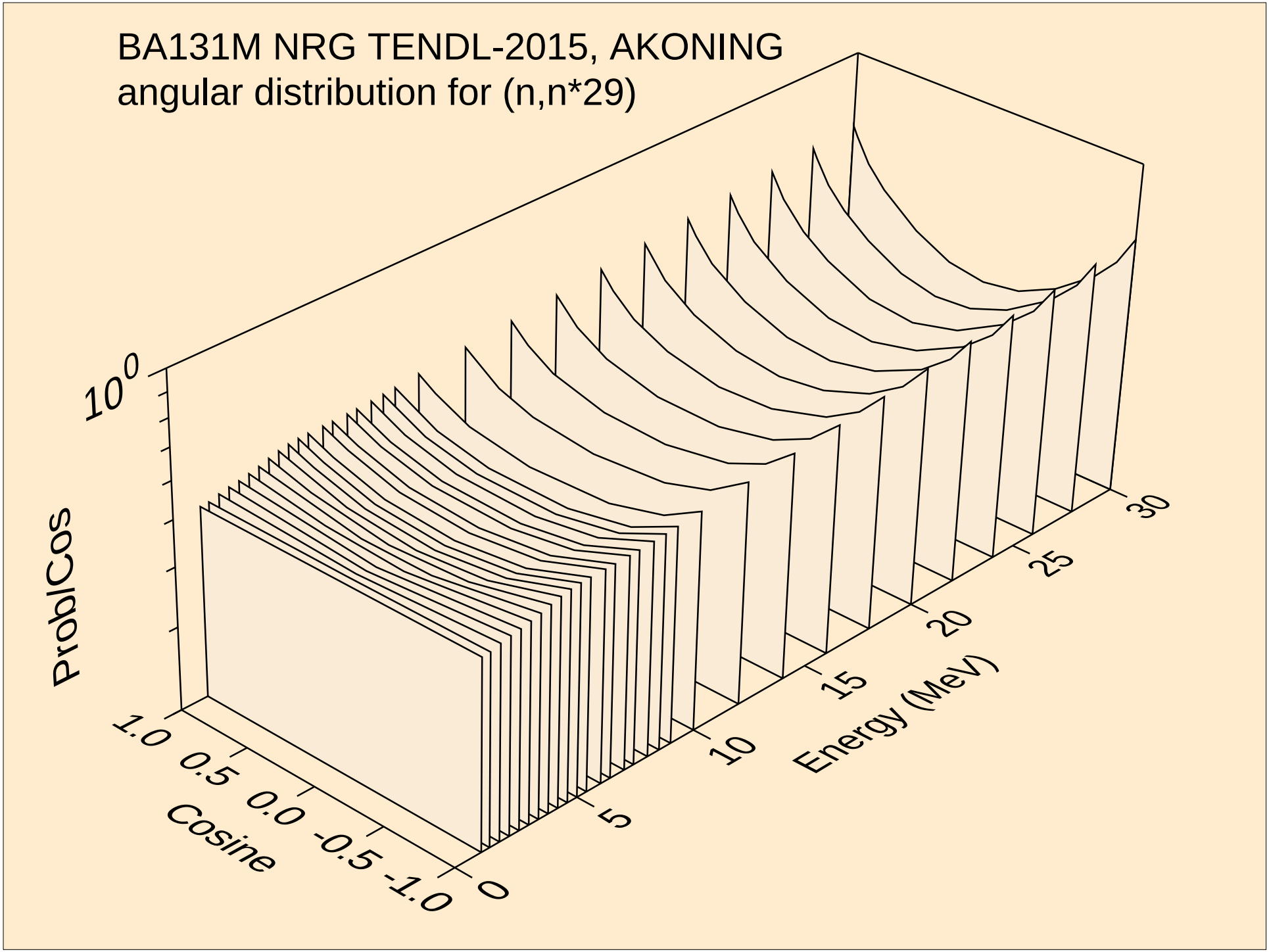

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*24)
ProbCos
$10^0$
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
5
10
15
20
25
30

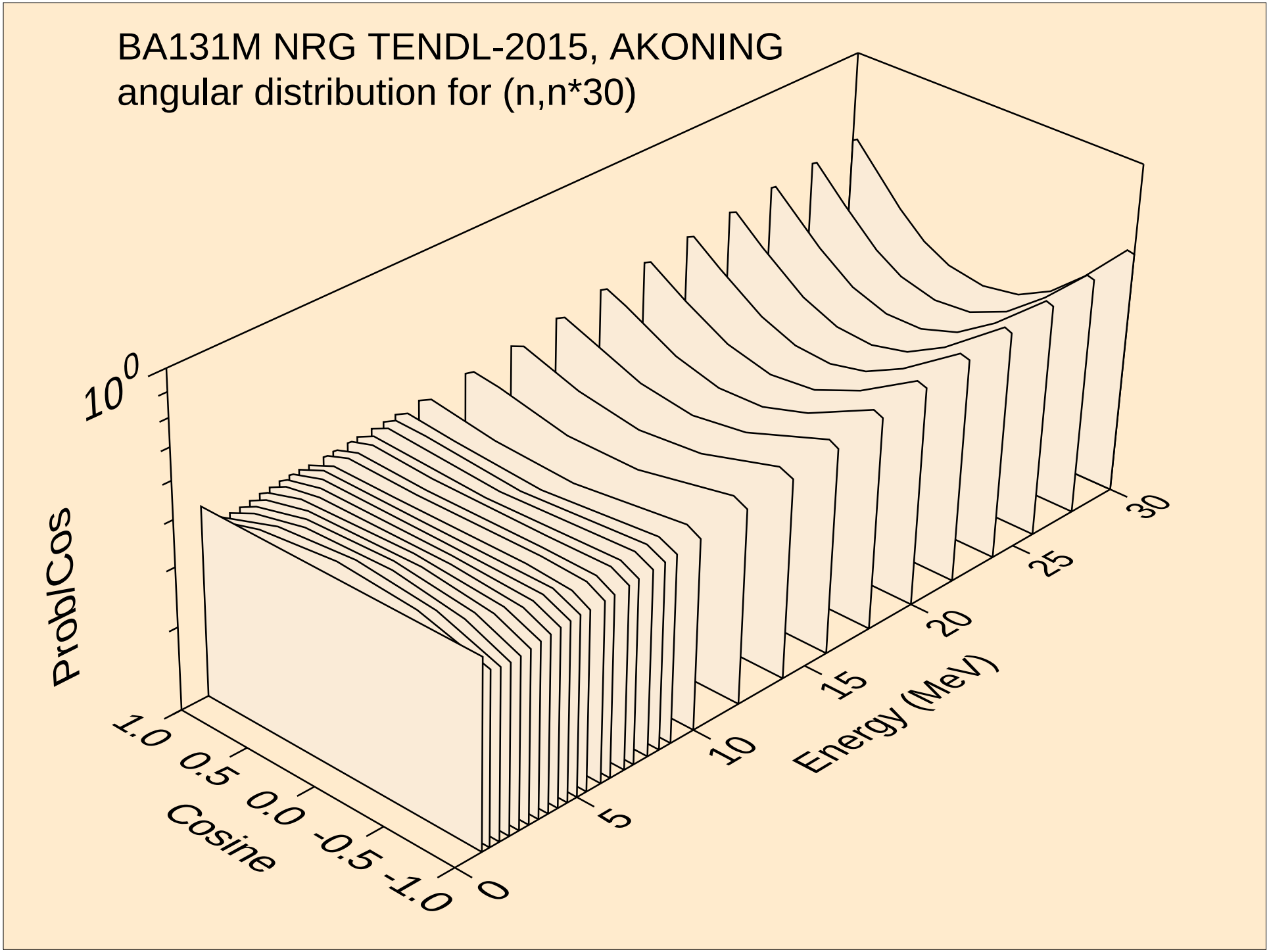

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*25)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

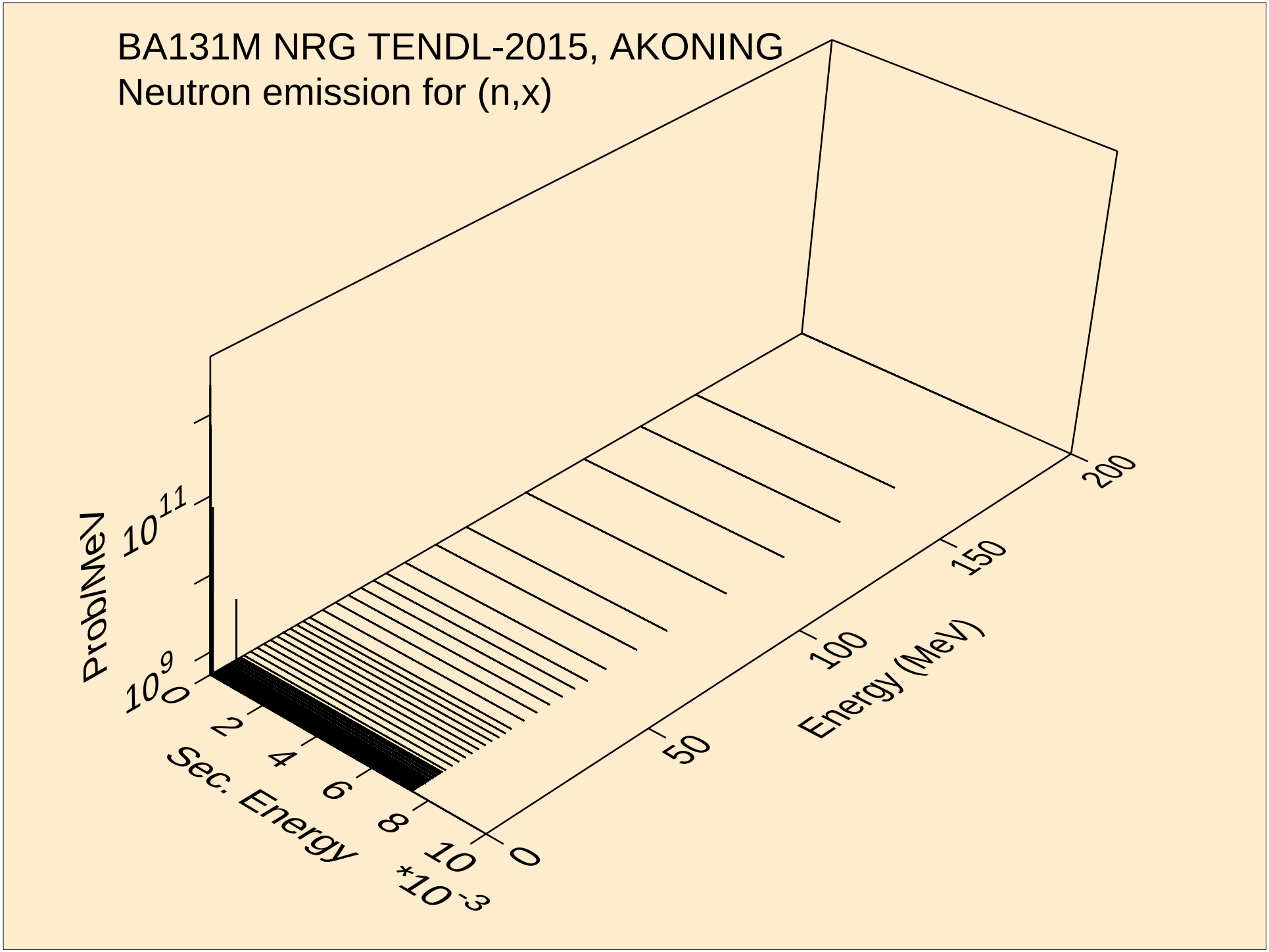

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*26)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

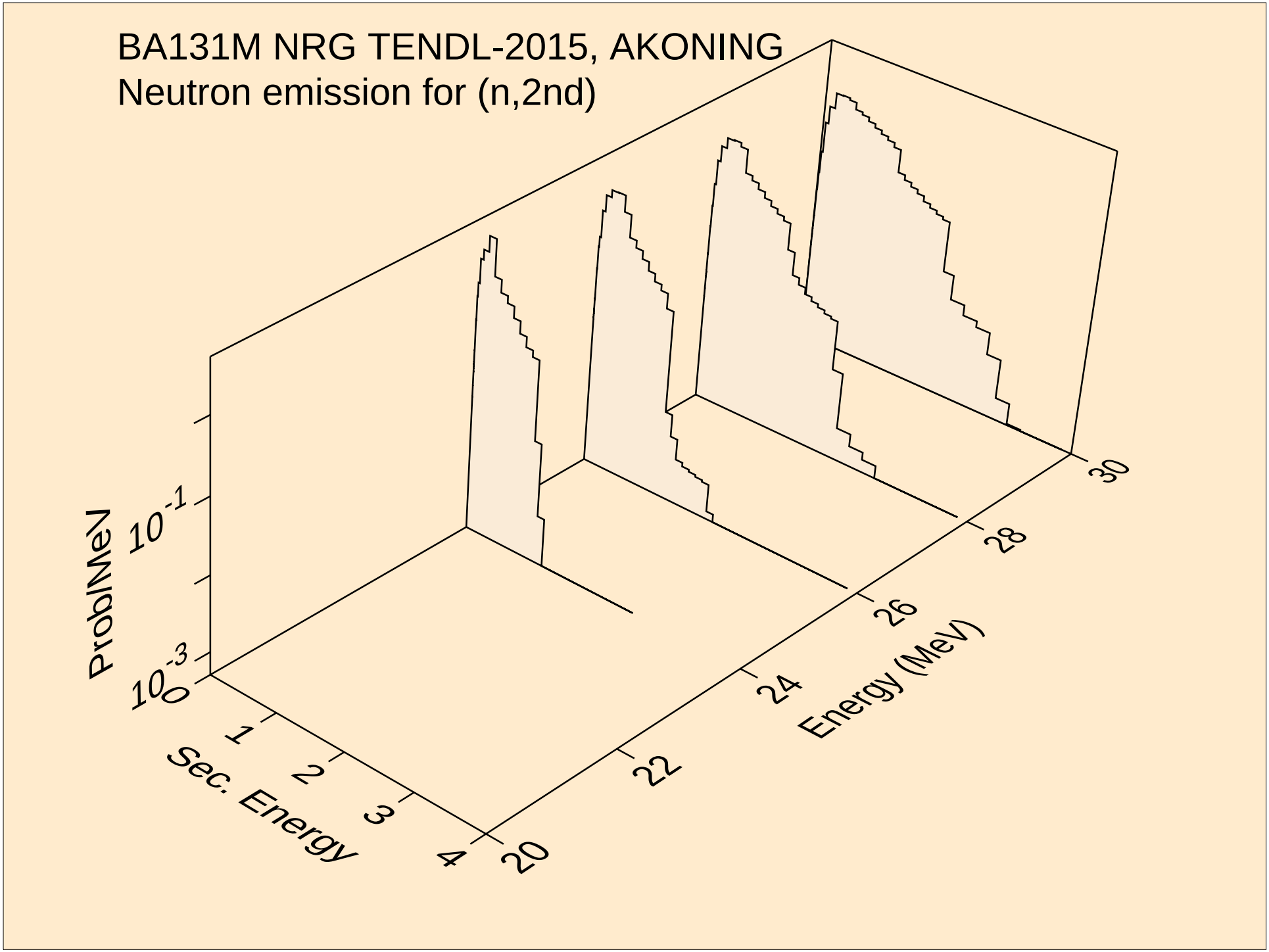

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*27)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

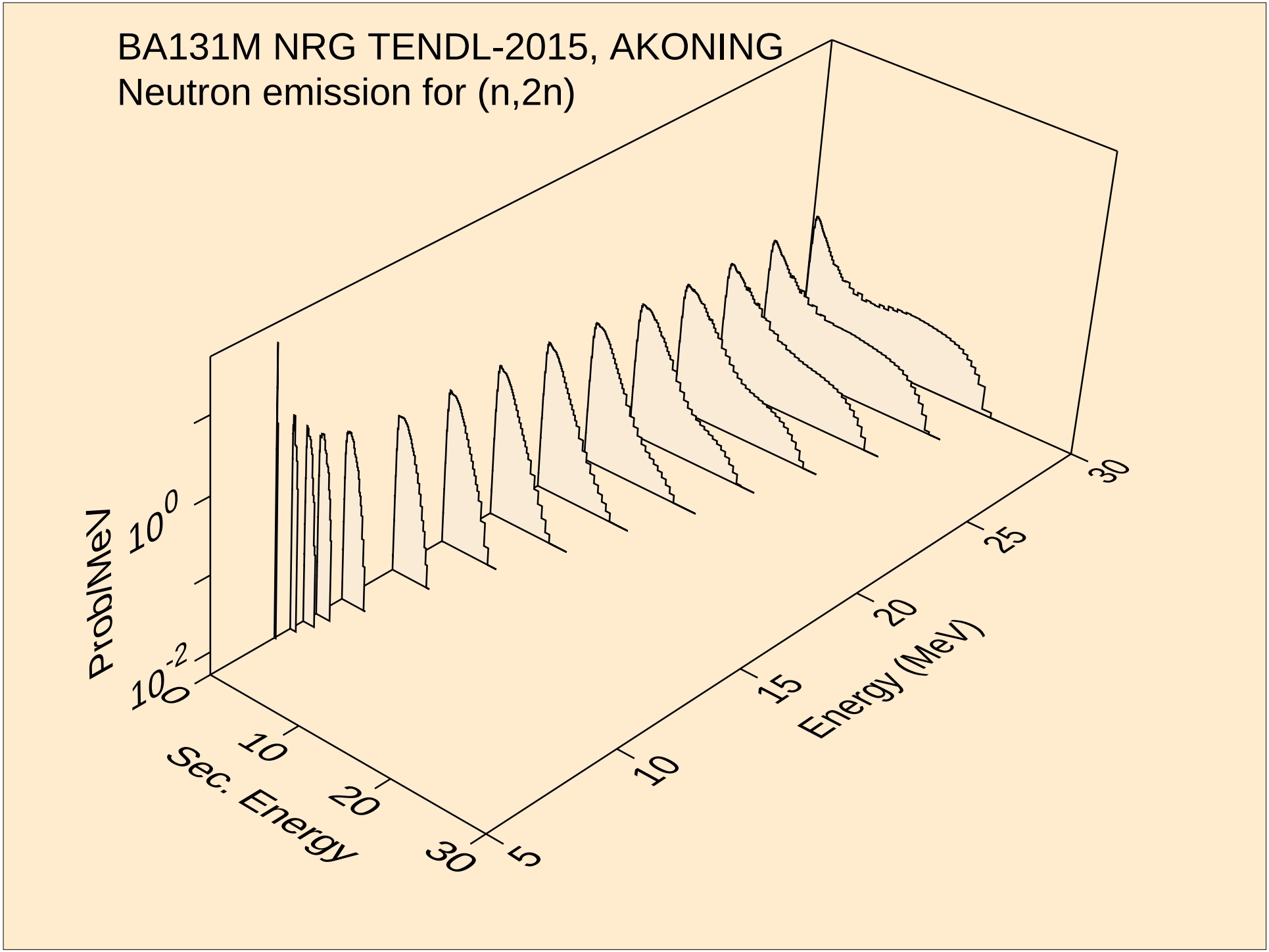

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*28)
$10^0$
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

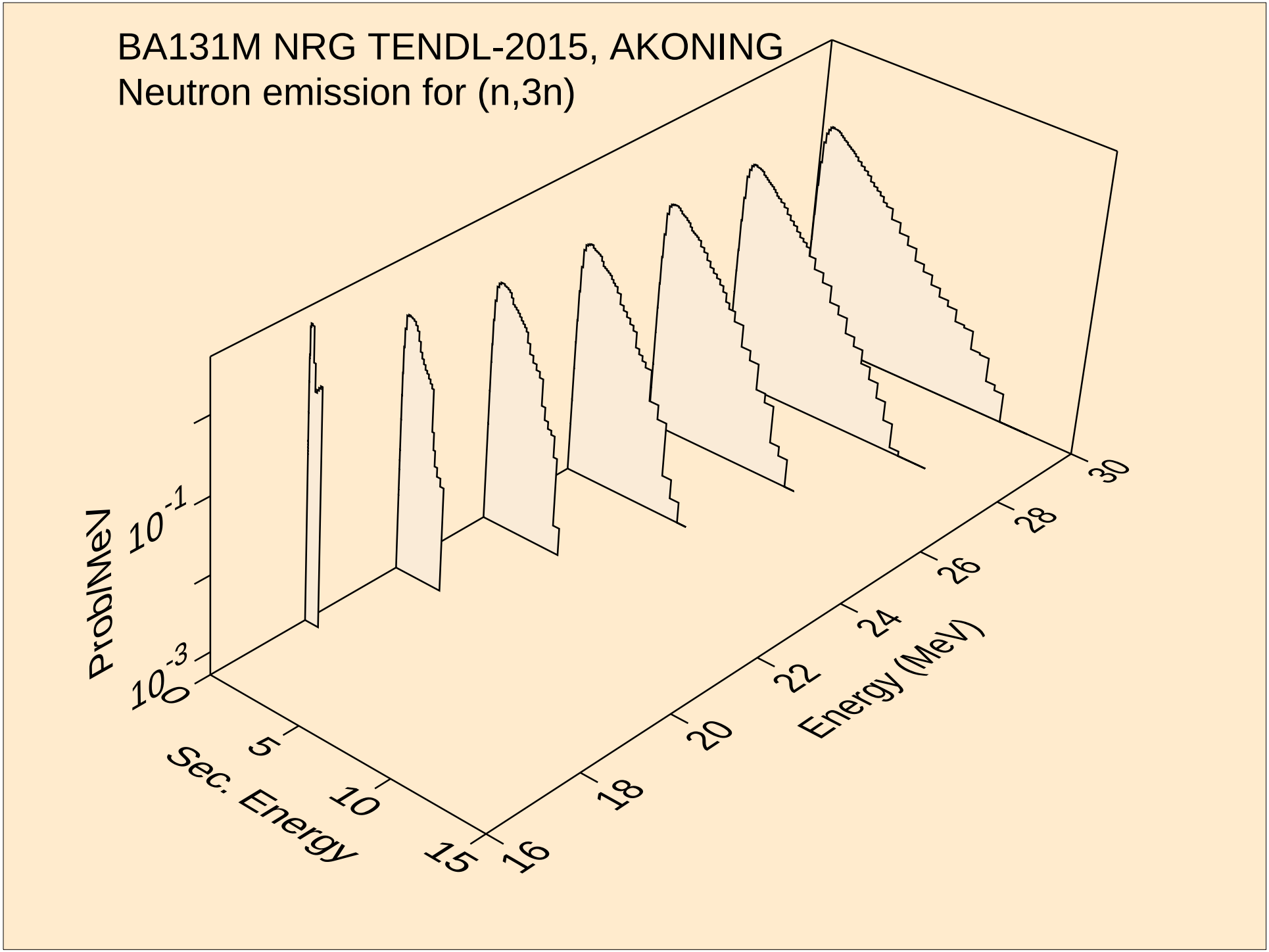

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*29)
$10^0$
Prob\Cos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

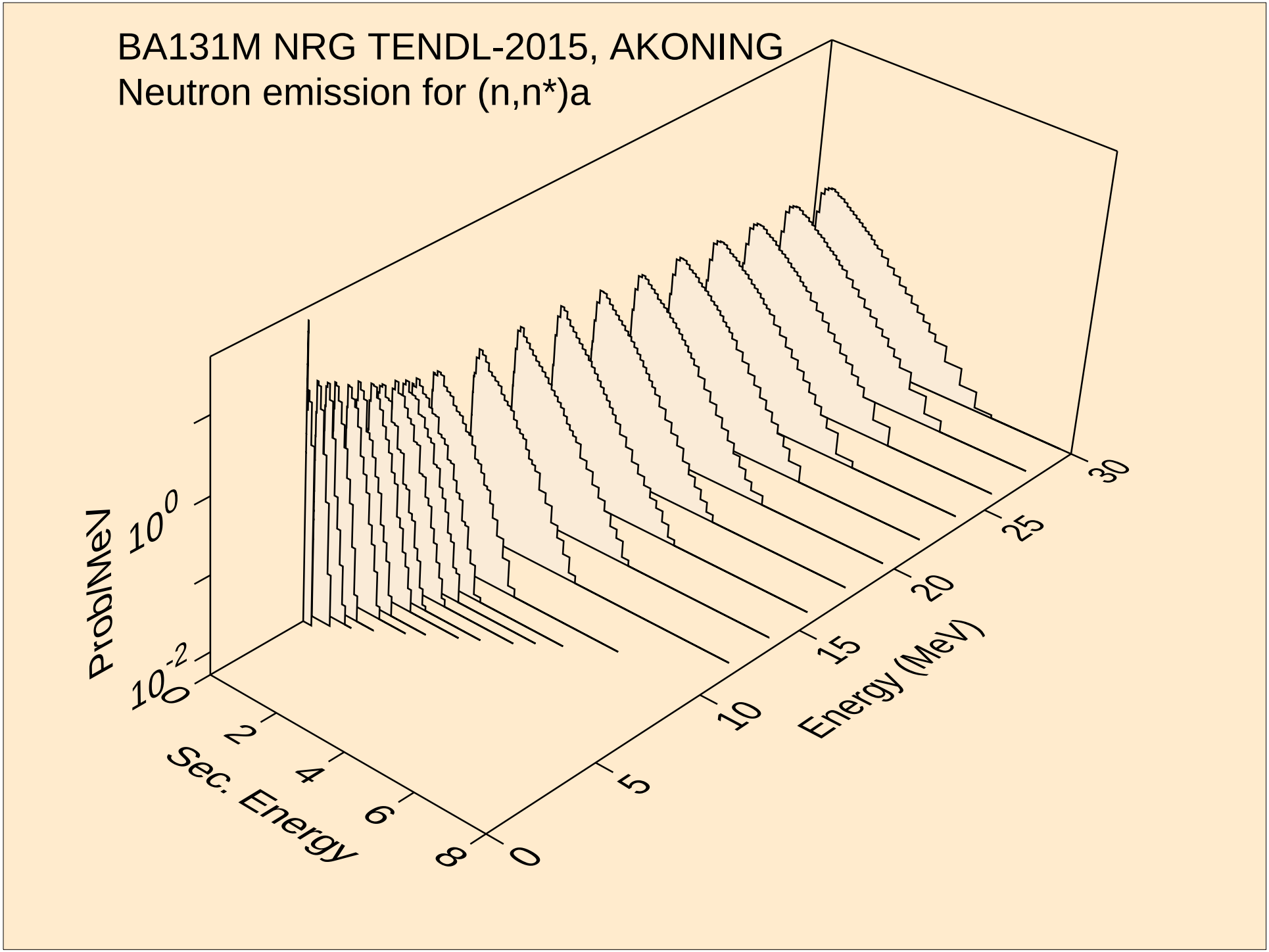

BA131M NRG TENDL-2015, AKONING
angular distribution for (n,n*30)
ProbICos
$10^0$
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

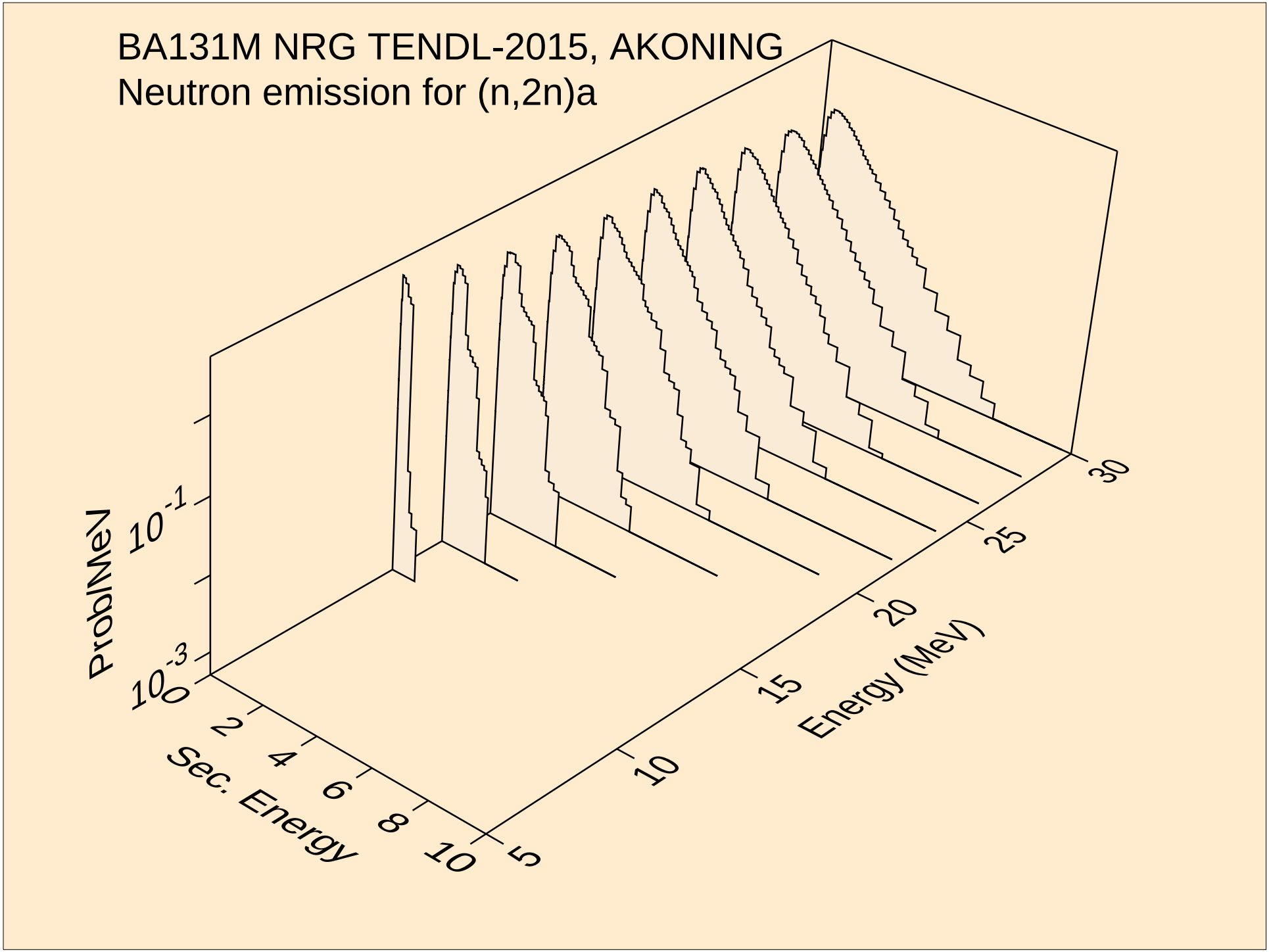

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,x)
Prob/MeV
10^11
10^9
0
2
4
6
8
10
*10^-3
Sec. Energy
0
50
100
150
200
Energy (MeV)

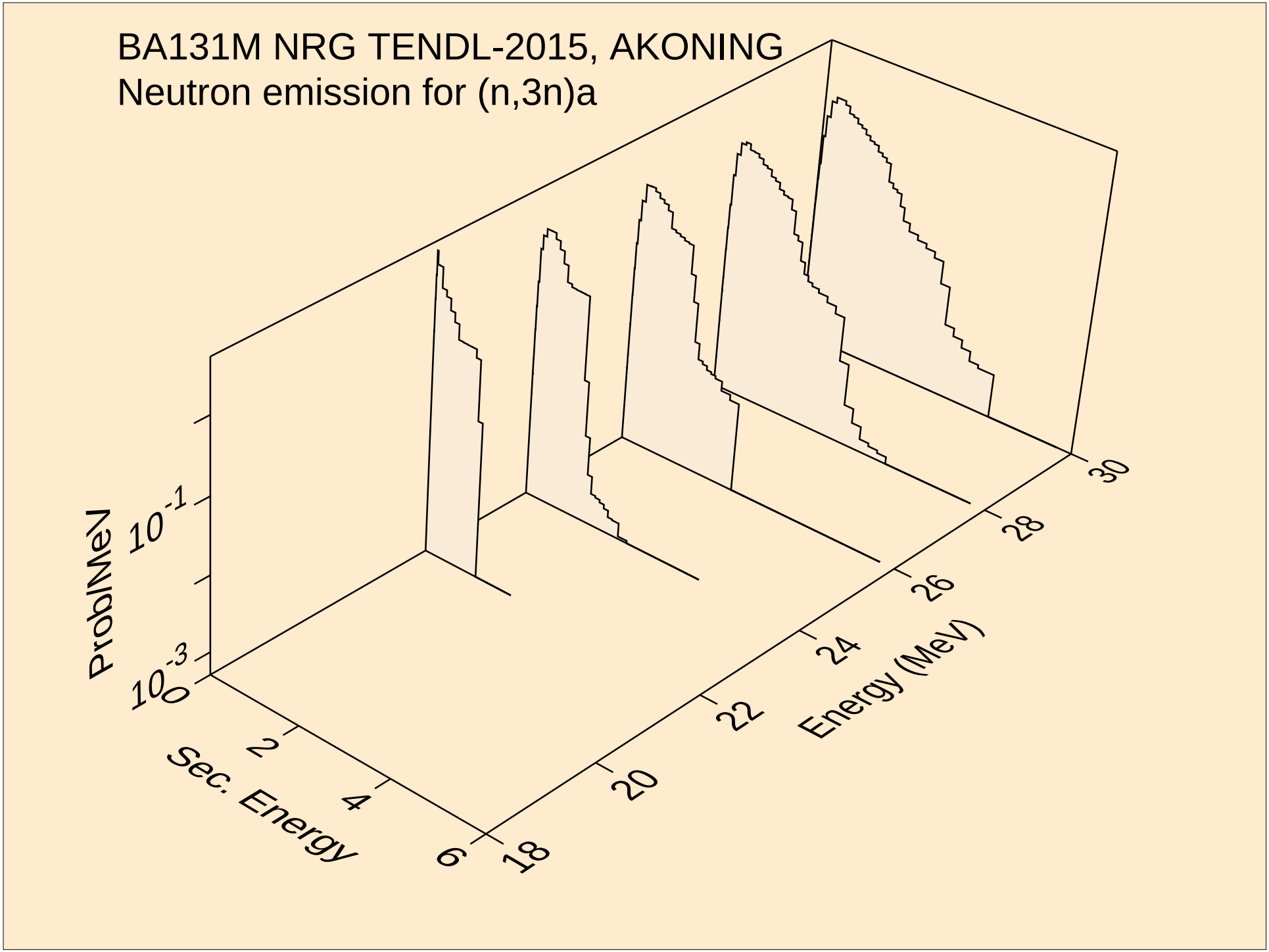

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,2nd)
Prob/MeV
10-1
10-3
0
1
2
3
4
Sec. Energy
20
22
24
26
28
30
Energy (MeV)

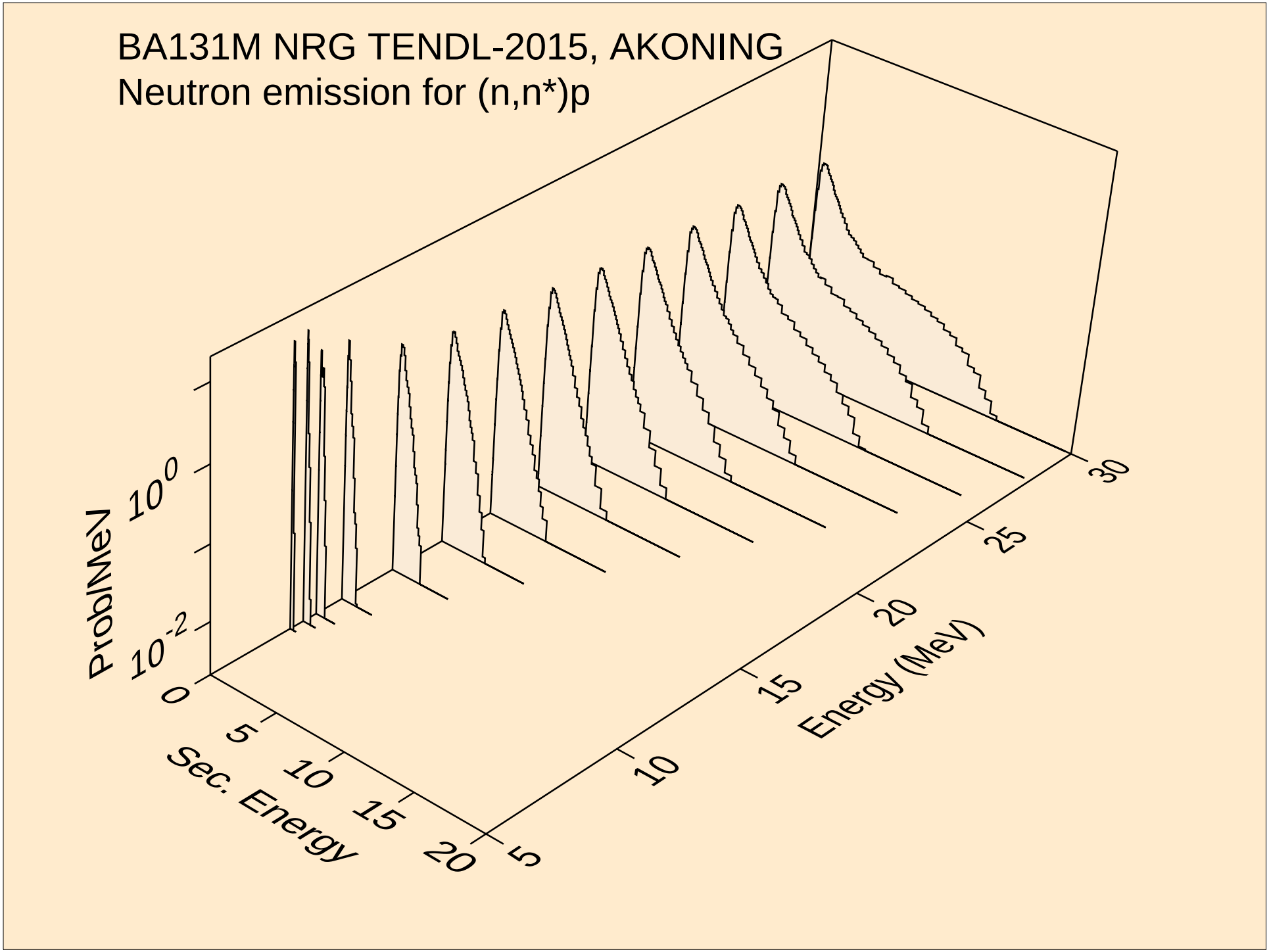

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,2n)
Prob/MeV
$10^{0}$
$10^{-2}$
0
10
20
30
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

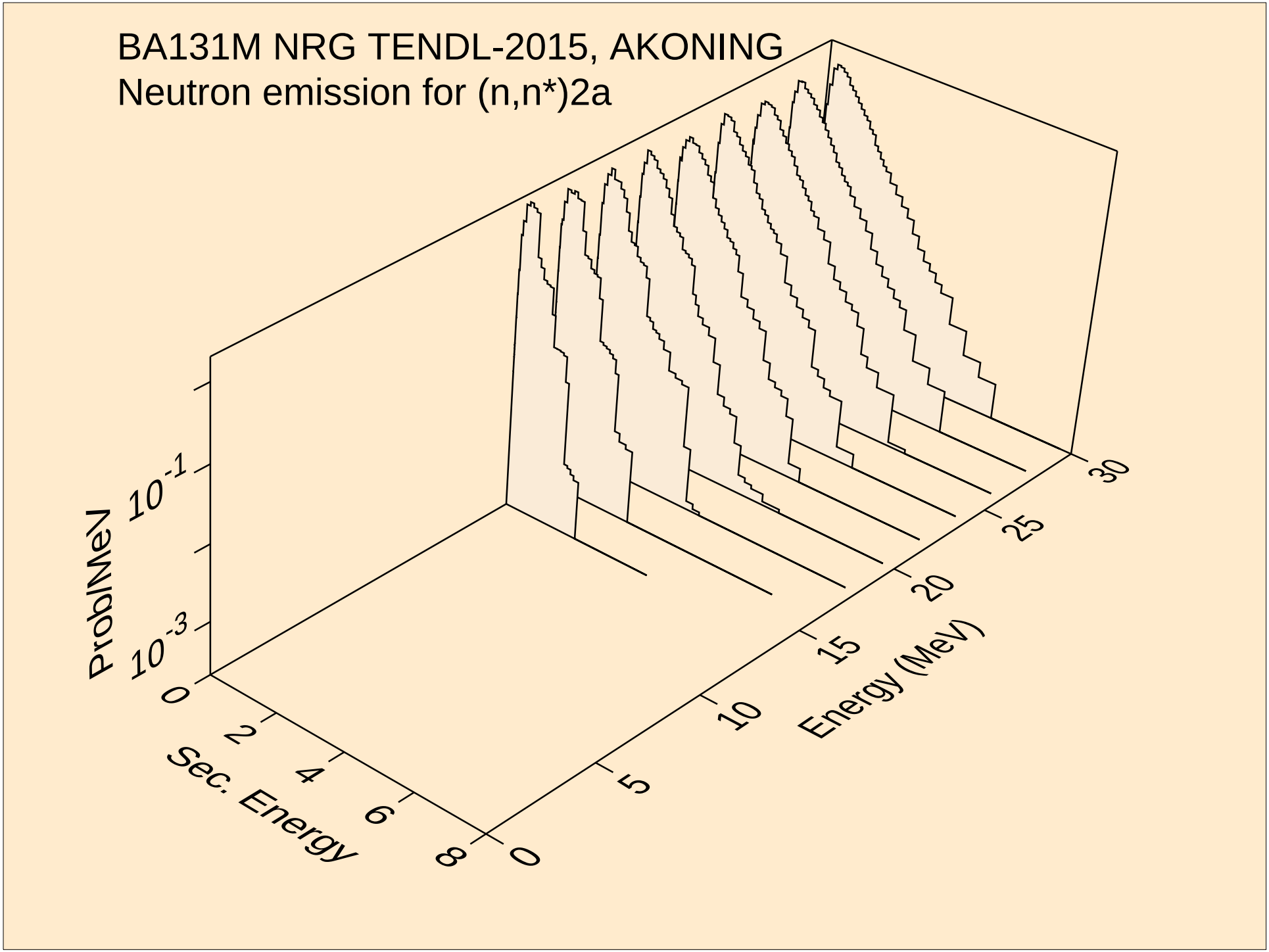

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,3n)
Prob/MeV
10-1
10-3
0
5
10
15
16
18
20
22
24
26
28
30
Sec. Energy
Energy (MeV)

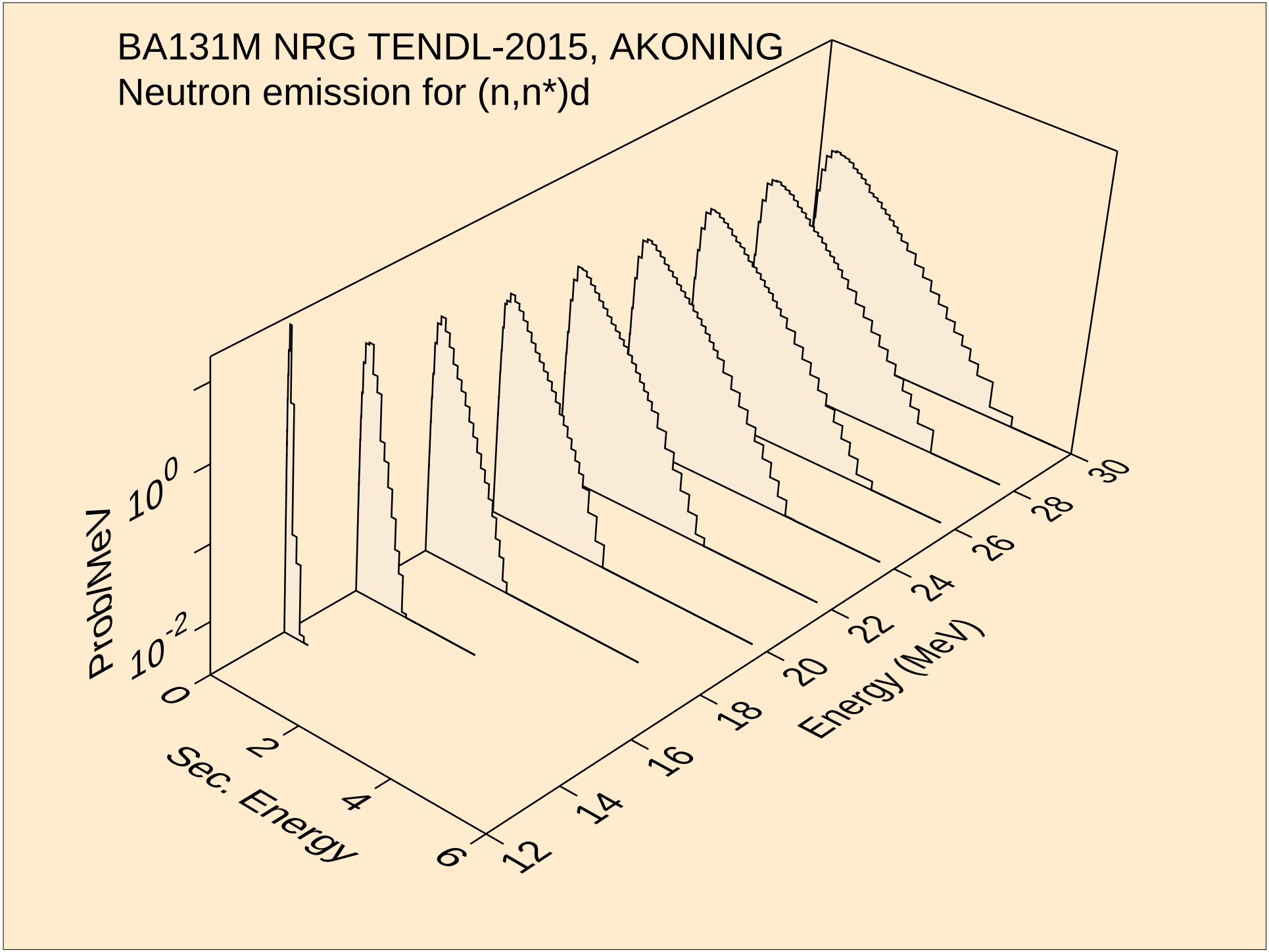

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,n*)a
Prob/MeV
$10^{0}$
$10^{-2}$
0
2
4
6
8
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

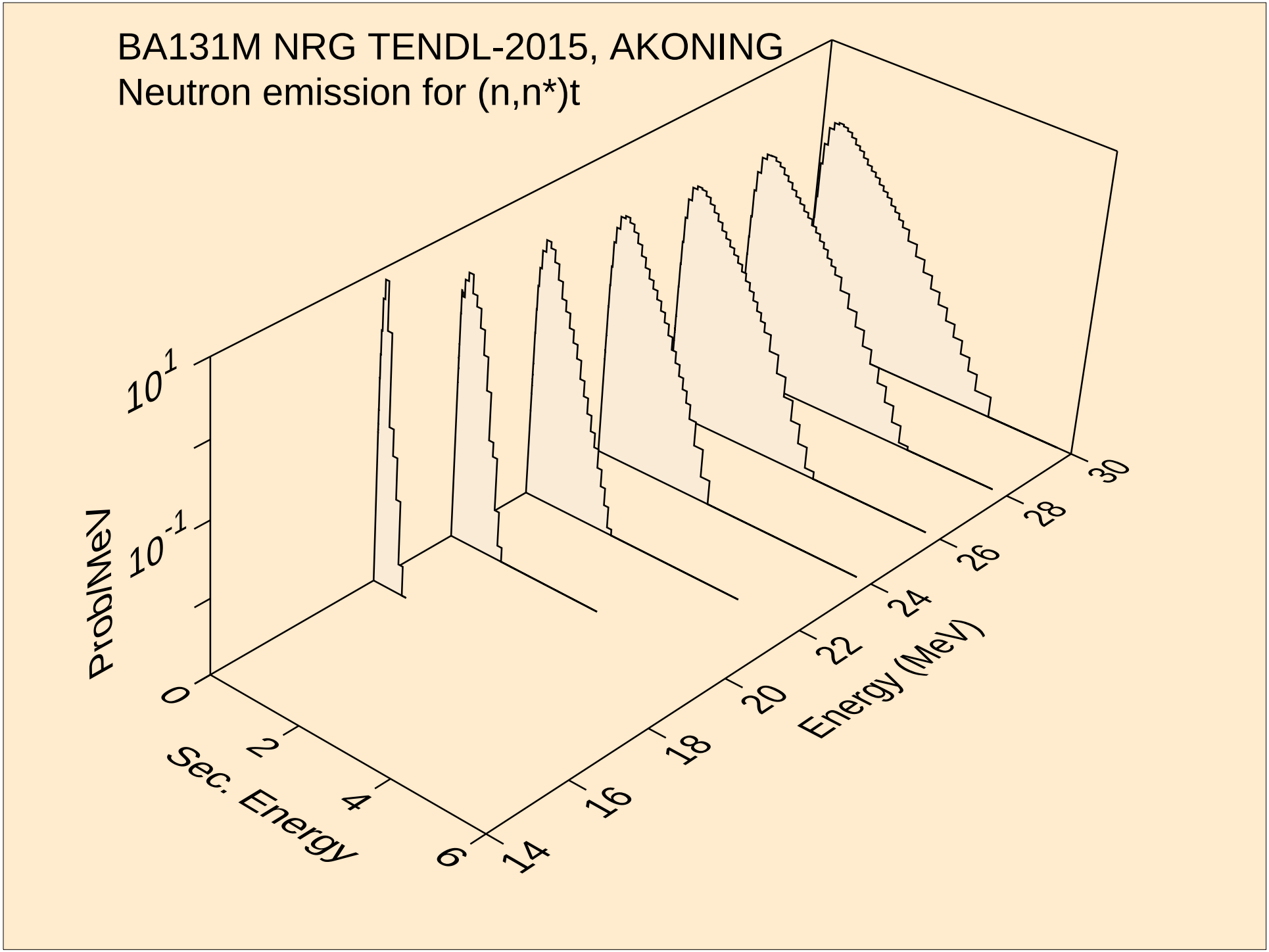

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,2n)a
Prob/MeV
10-1
10-3
0
2
4
6
8
10
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

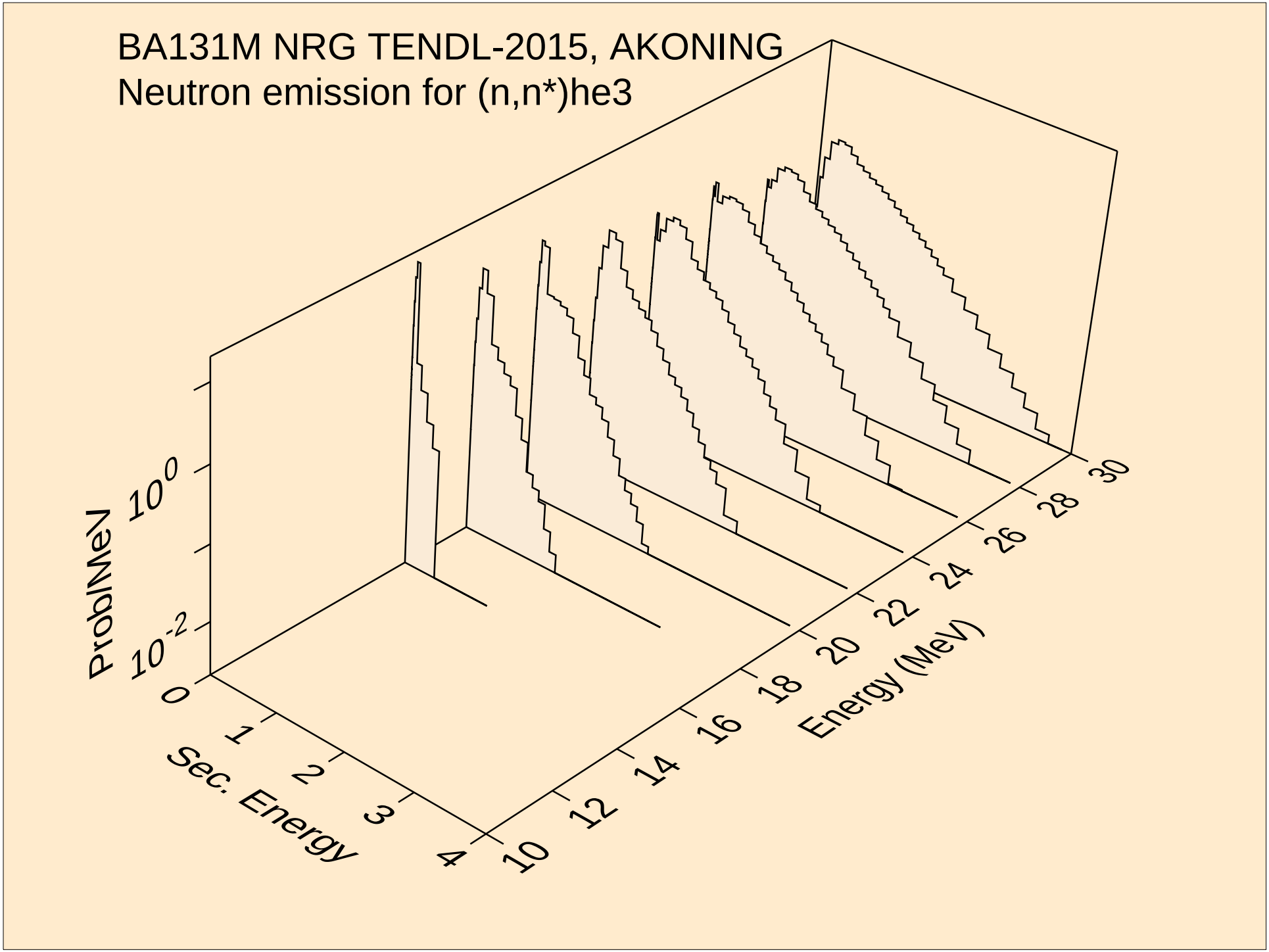

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,3n)a
Prob/MeV
10-1
10-3
0
2
4
6
Sec. Energy
18
20
22
24
26
28
30
Energy (MeV)

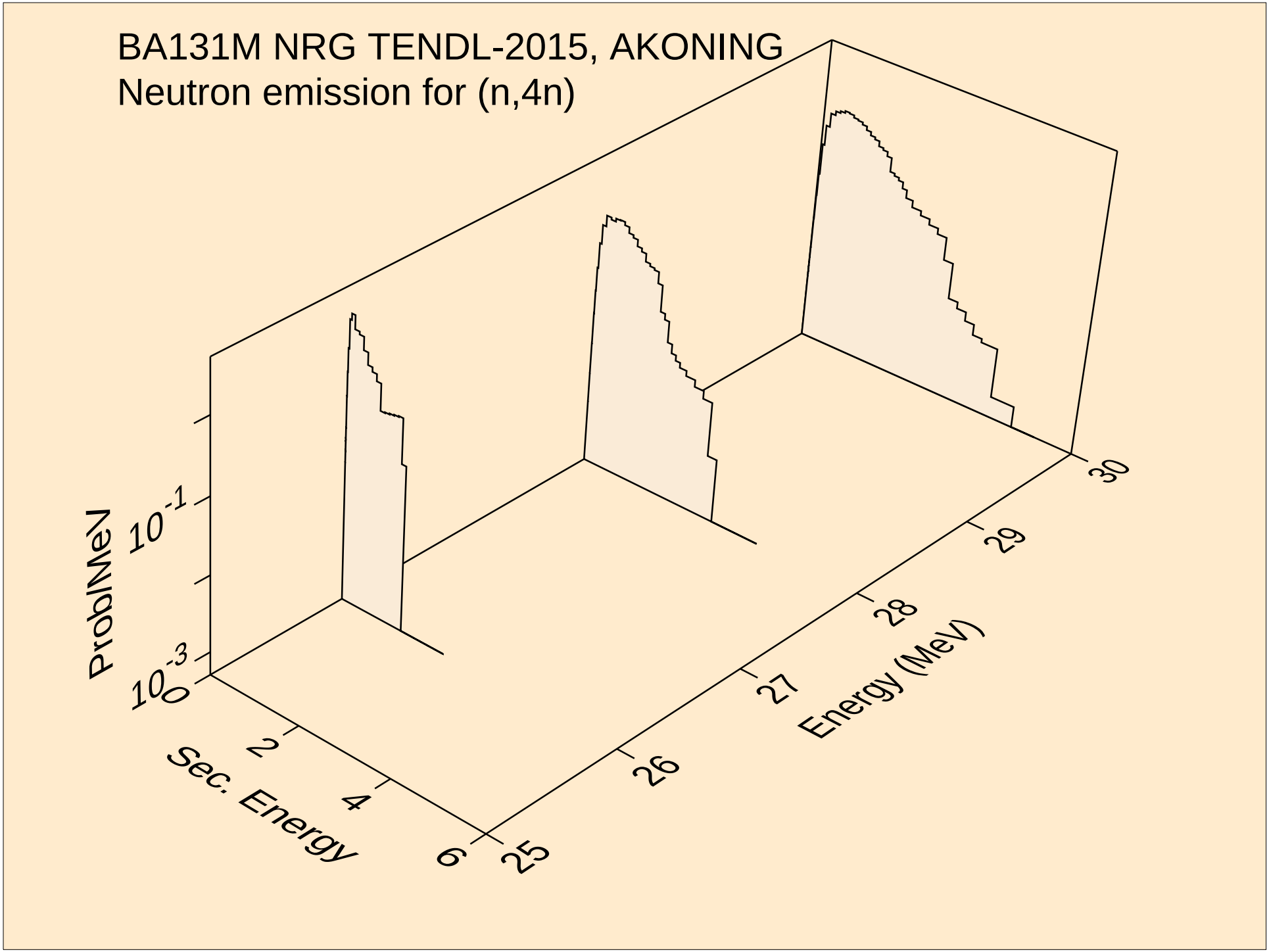

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,n*)p
Prob/MeV
$10^{0}$
$10^{-2}$
0
5
10
15
20
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

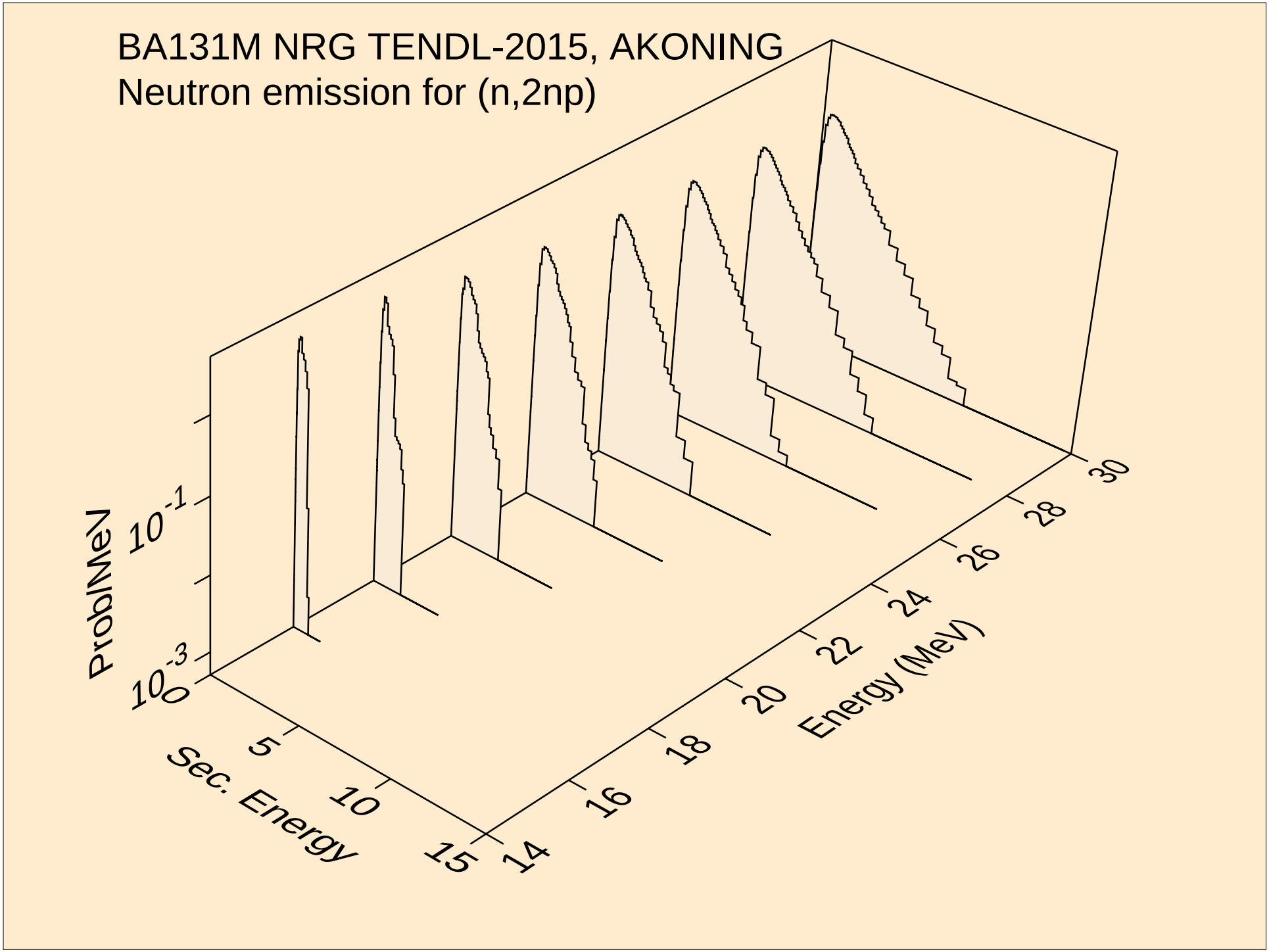

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,n*)2a
Prob/MeV
10-1
10-3
0
2
4
6
8
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

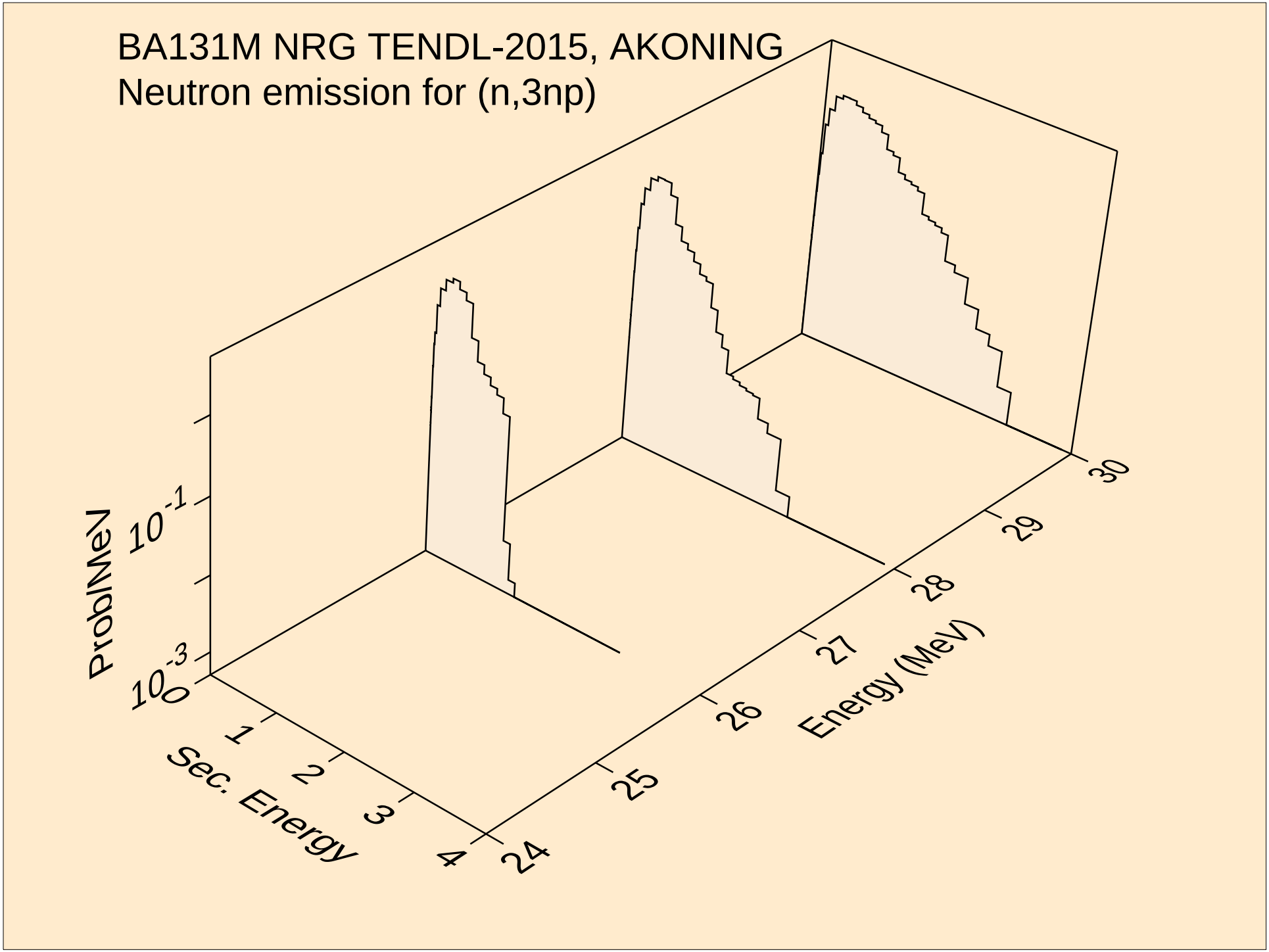

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,n*)d
Prob/MeV
$10^{0}$
$10^{-2}$
0
2
4
6
Sec. Energy
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

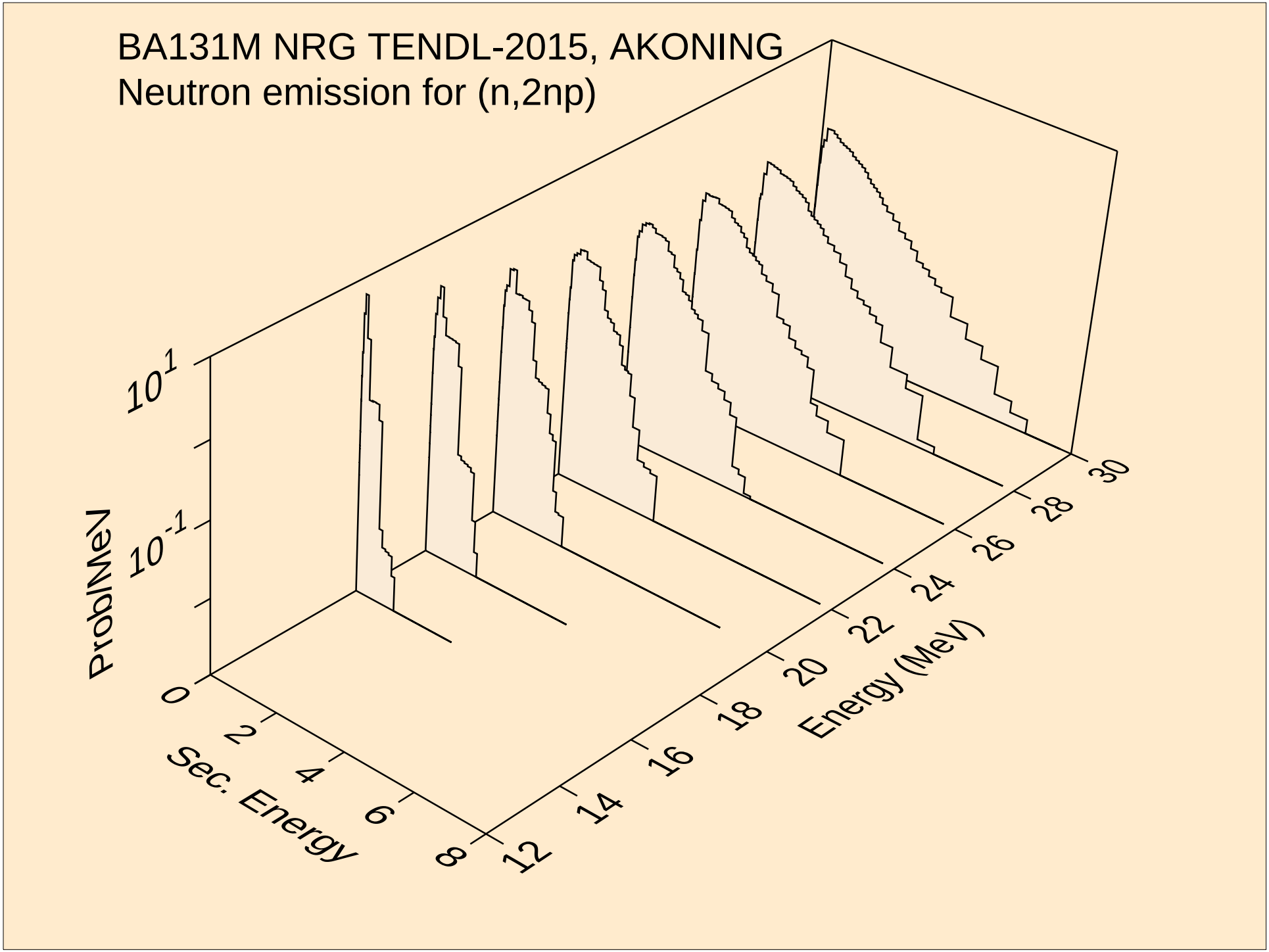

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,n*)t
Prob/MeV
10^1
10^-1
0
2
4
6
Sec. Energy
14
16
18
20
22
24
26
28
30
Energy (MeV)

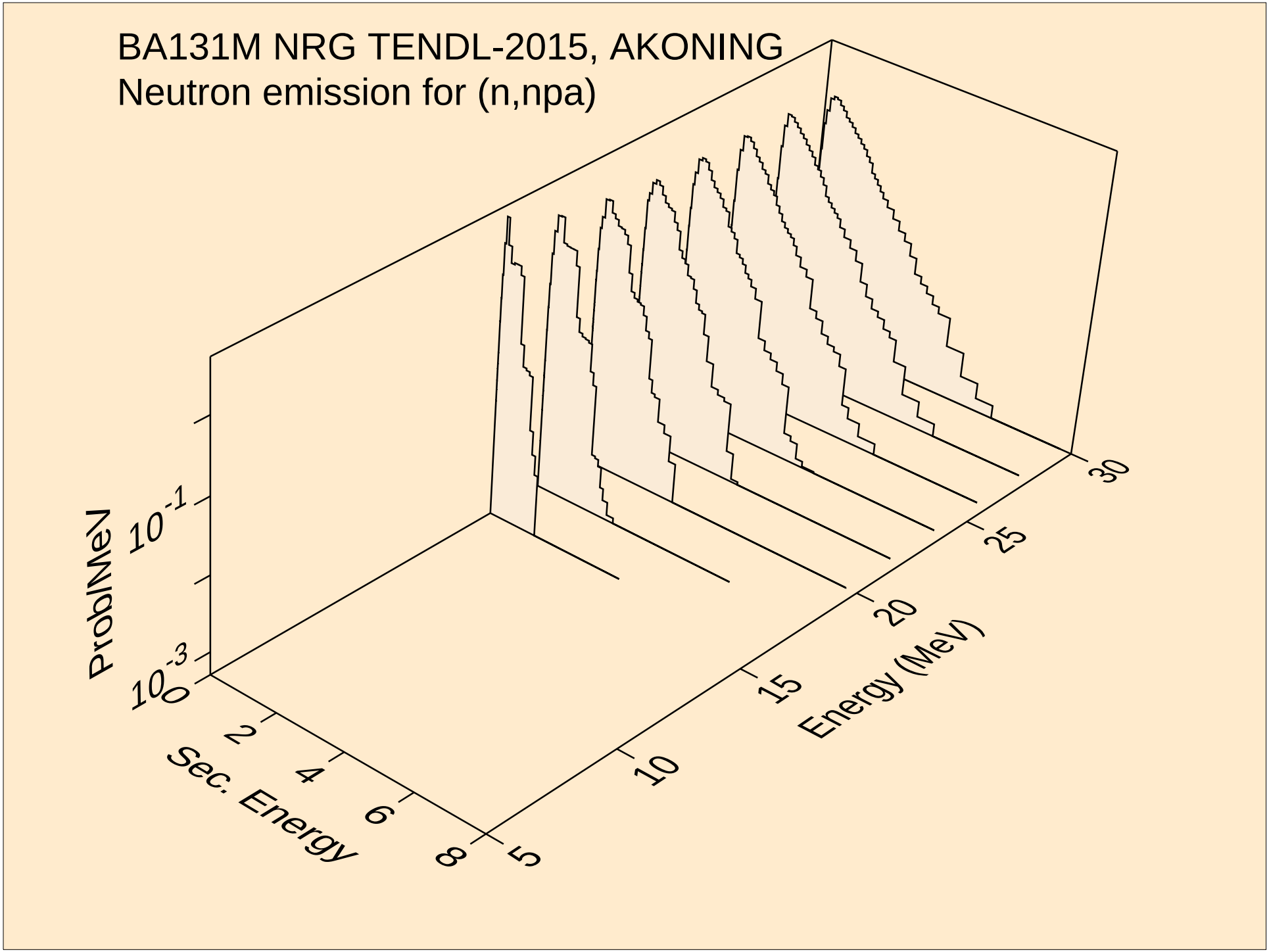

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,n*)he3
Prob/MeV
$10^{0}$
$10^{-2}$
0
1
2
3
4
Sec. Energy
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

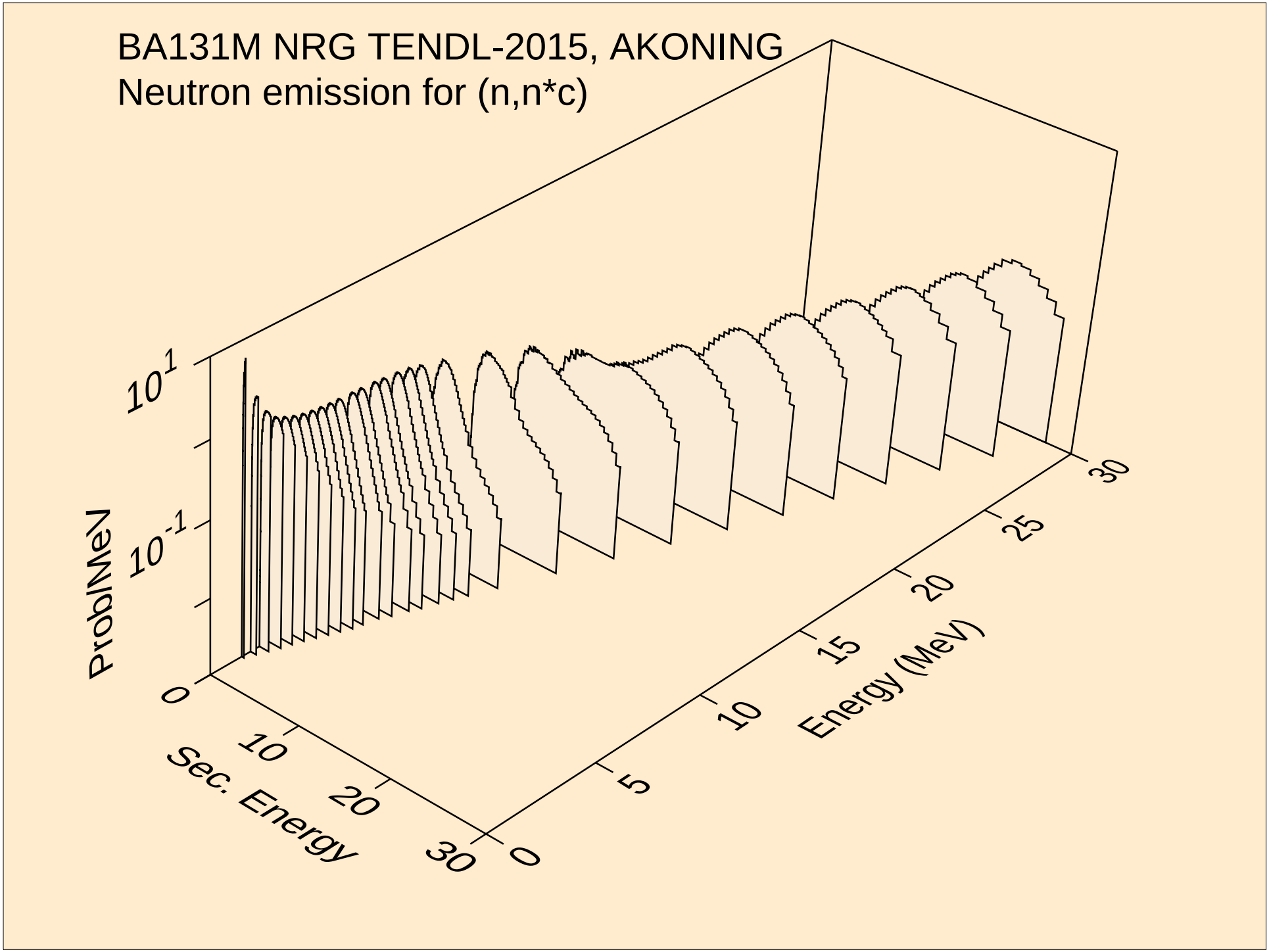

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,4n)
Prob/MeV
10-1
10-3
0
2
4
6
Sec. Energy
25
26
27
28
29
30
Energy (MeV)

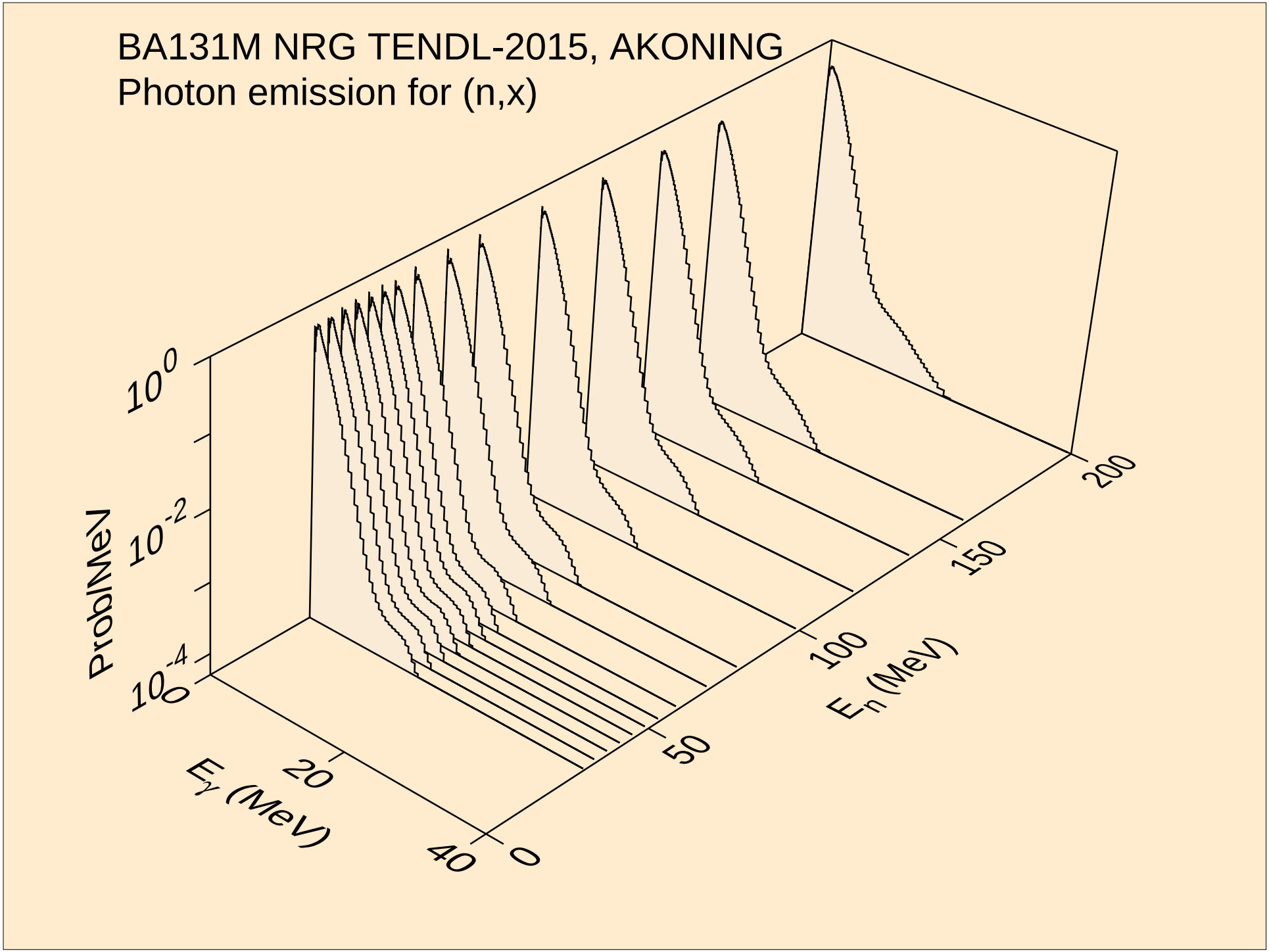

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,2np)
Prob/MeV
10-1
10-3
0
5
10
15
Sec. Energy
14
16
18
20
22
24
26
28
30
Energy (MeV)

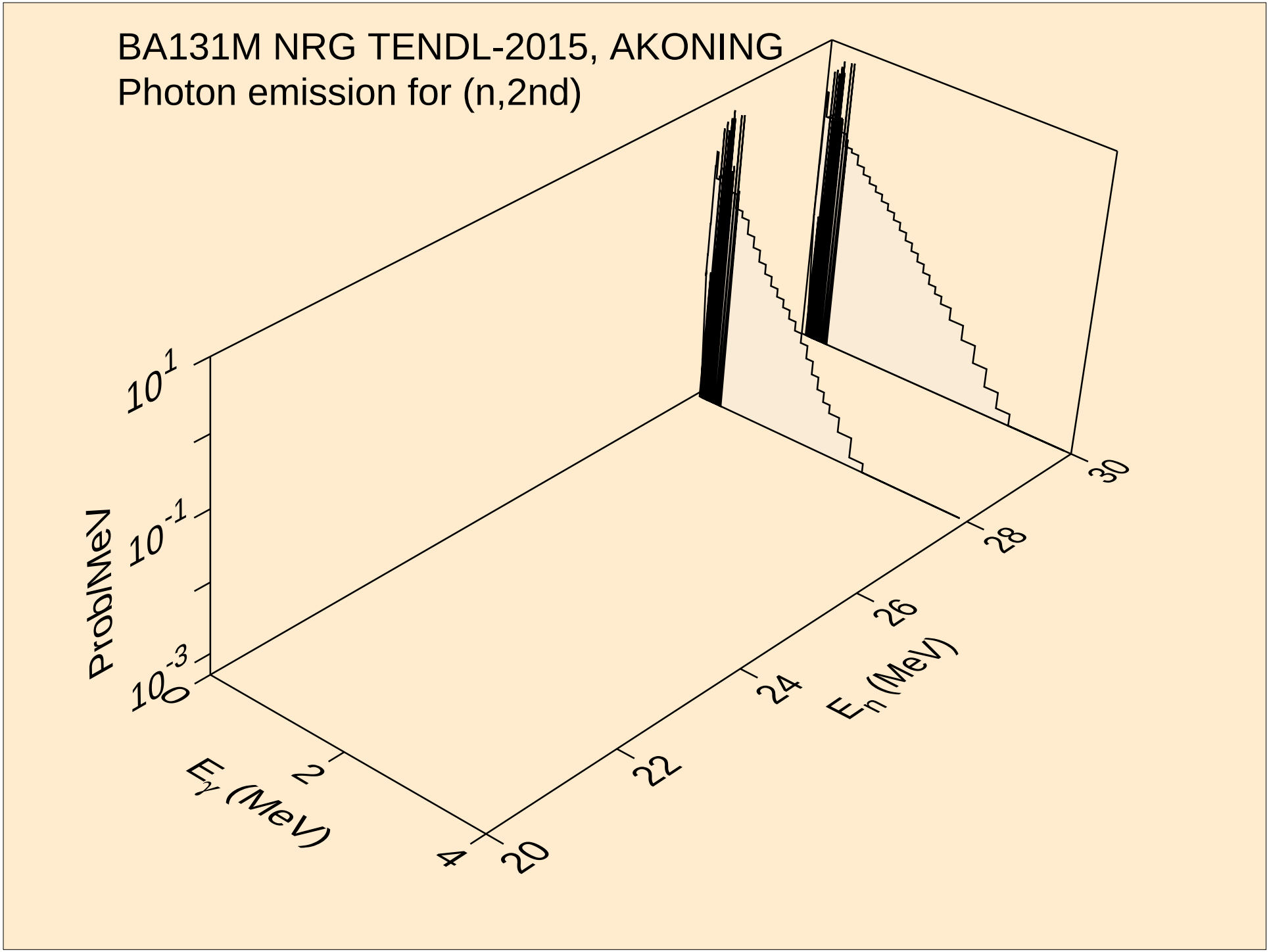

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,3np)
Prob/MeV
10-1
10-3
0
Sec. Energy
1
2
3
4
24
25
26
27
28
29
30
Energy (MeV)

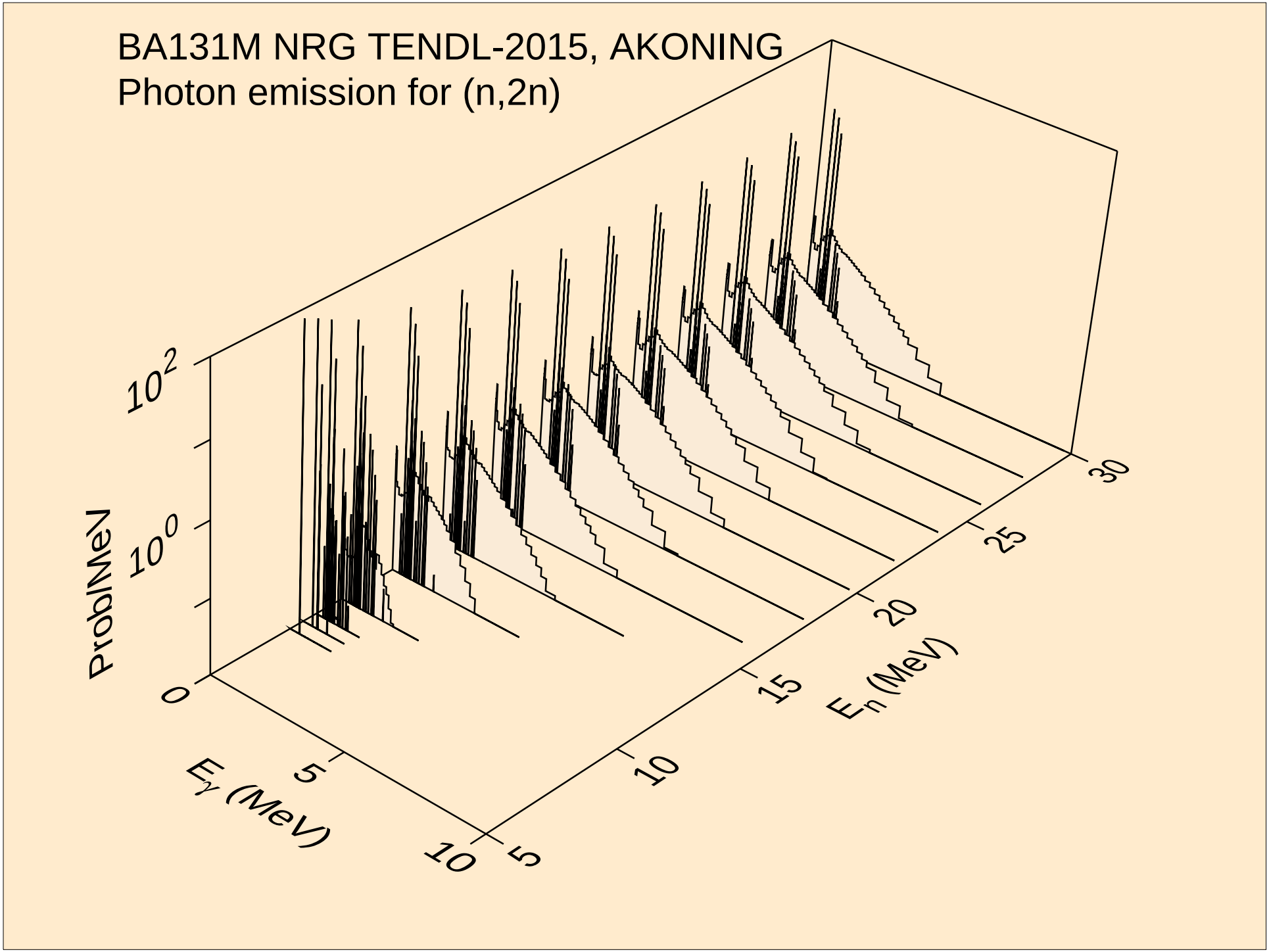

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,2np)
Prob/MeV
$10^{1}$
$10^{-1}$
0
2
4
6
8
Sec. Energy
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

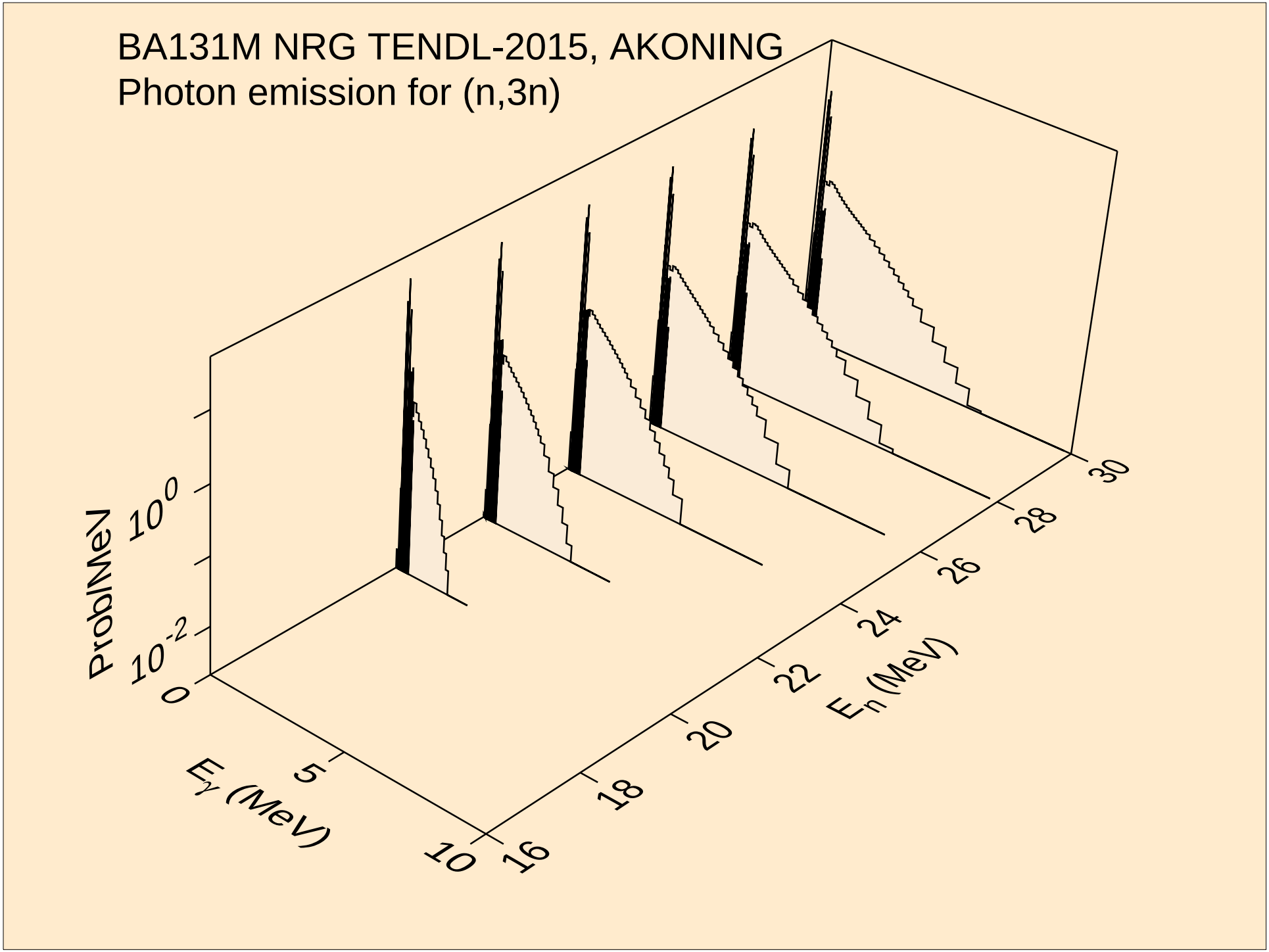

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,npa)
Prob/MeV
10-1
10-3
0
2
4
6
8
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

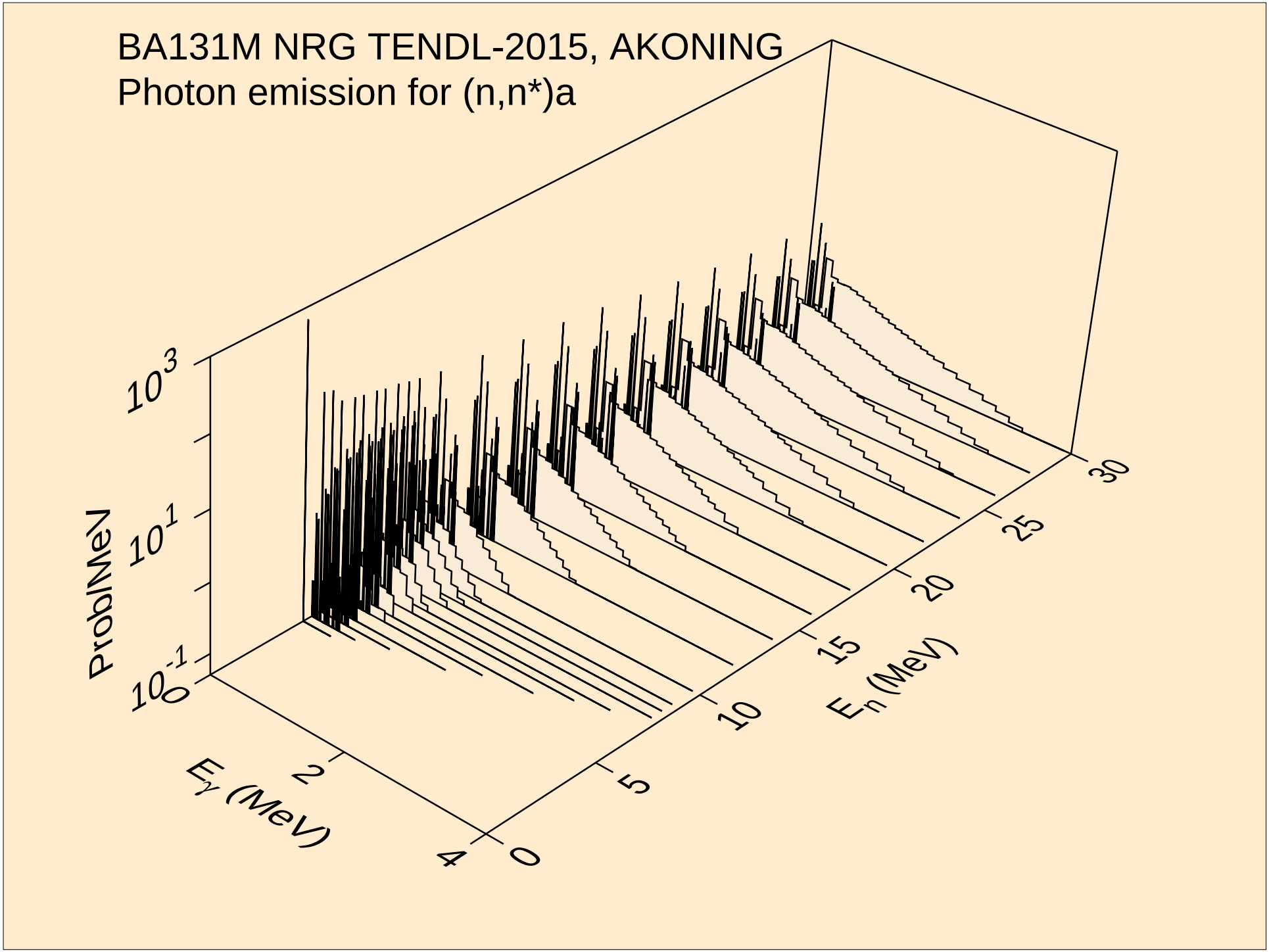

BA131M NRG TENDL-2015, AKONING
Neutron emission for (n,n*c)
Prob/MeV
$10^{1}$
$10^{-1}$
0
10
20
30
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

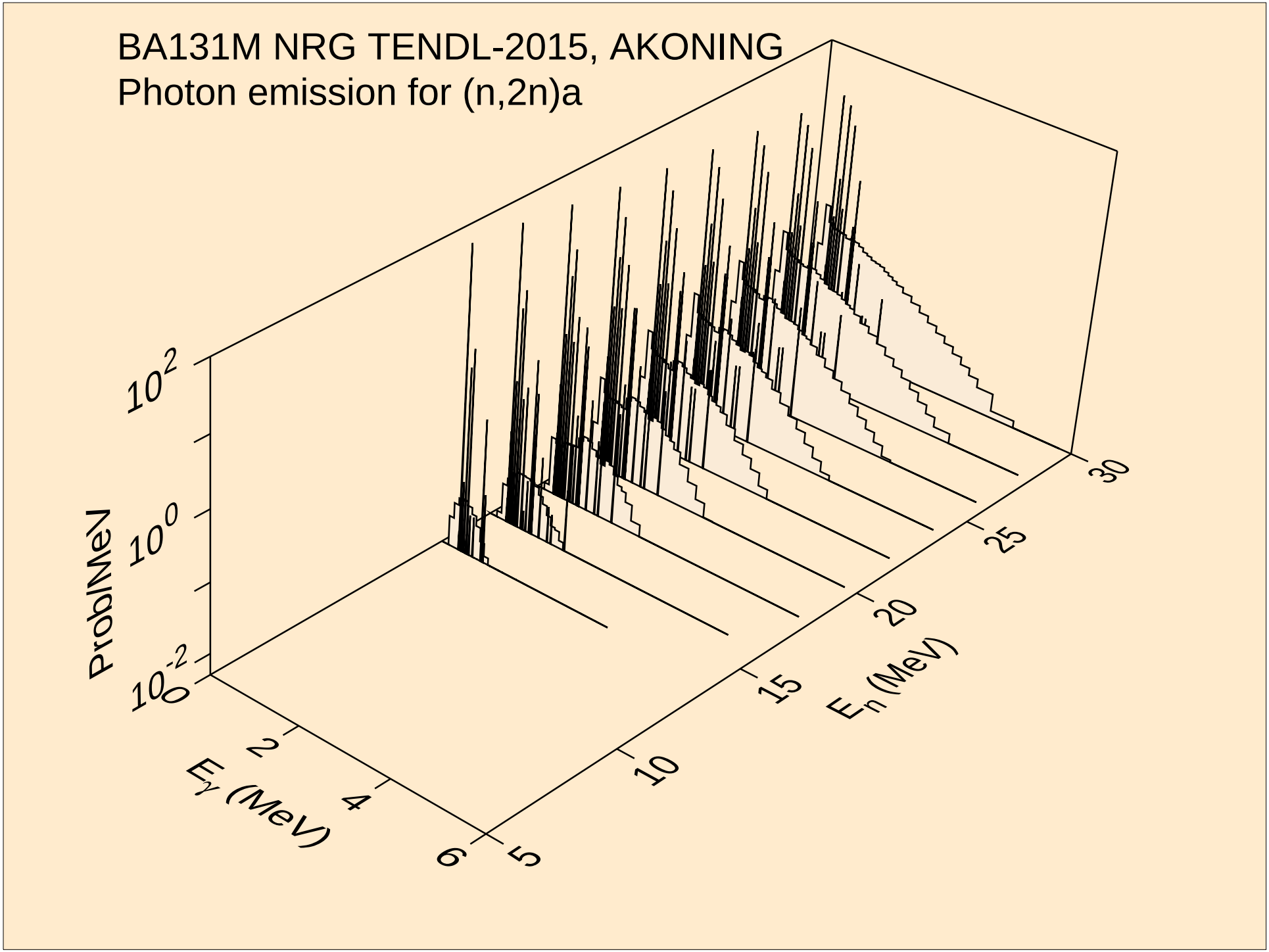

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,x)
Prob/MeV
$10^{0}$
$10^{-2}$
$10^{-4}$
0
20
40
$E_\gamma$ (MeV)
50
100
150
200
$E_n$ (MeV)

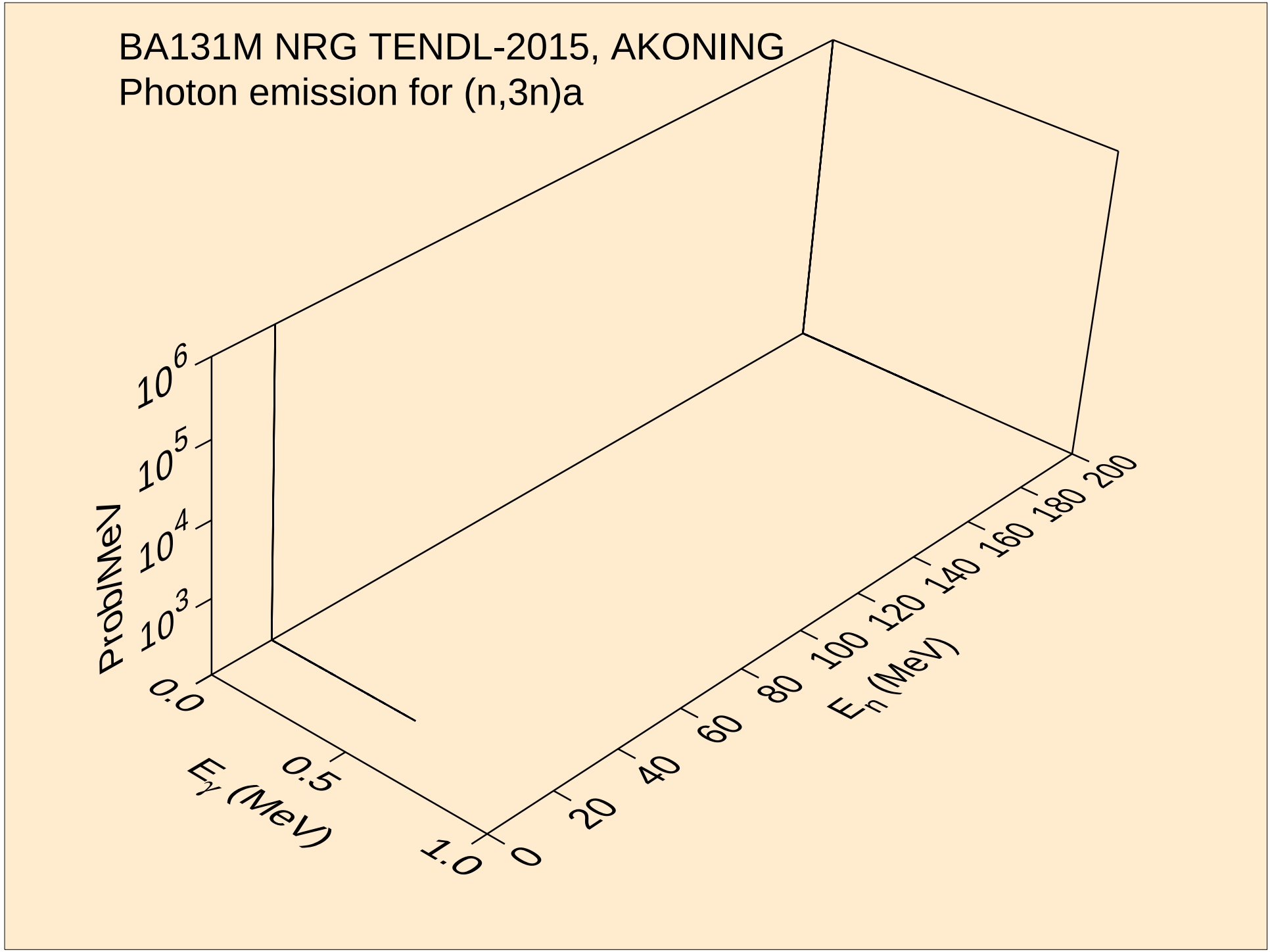

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,2nd)
Prob/MeV
$10^{1}$
$10^{-1}$
$10^{-3}$
0
2
4
$E_\gamma$ (MeV)
20
22
24
26
28
30
$E_n$ (MeV)

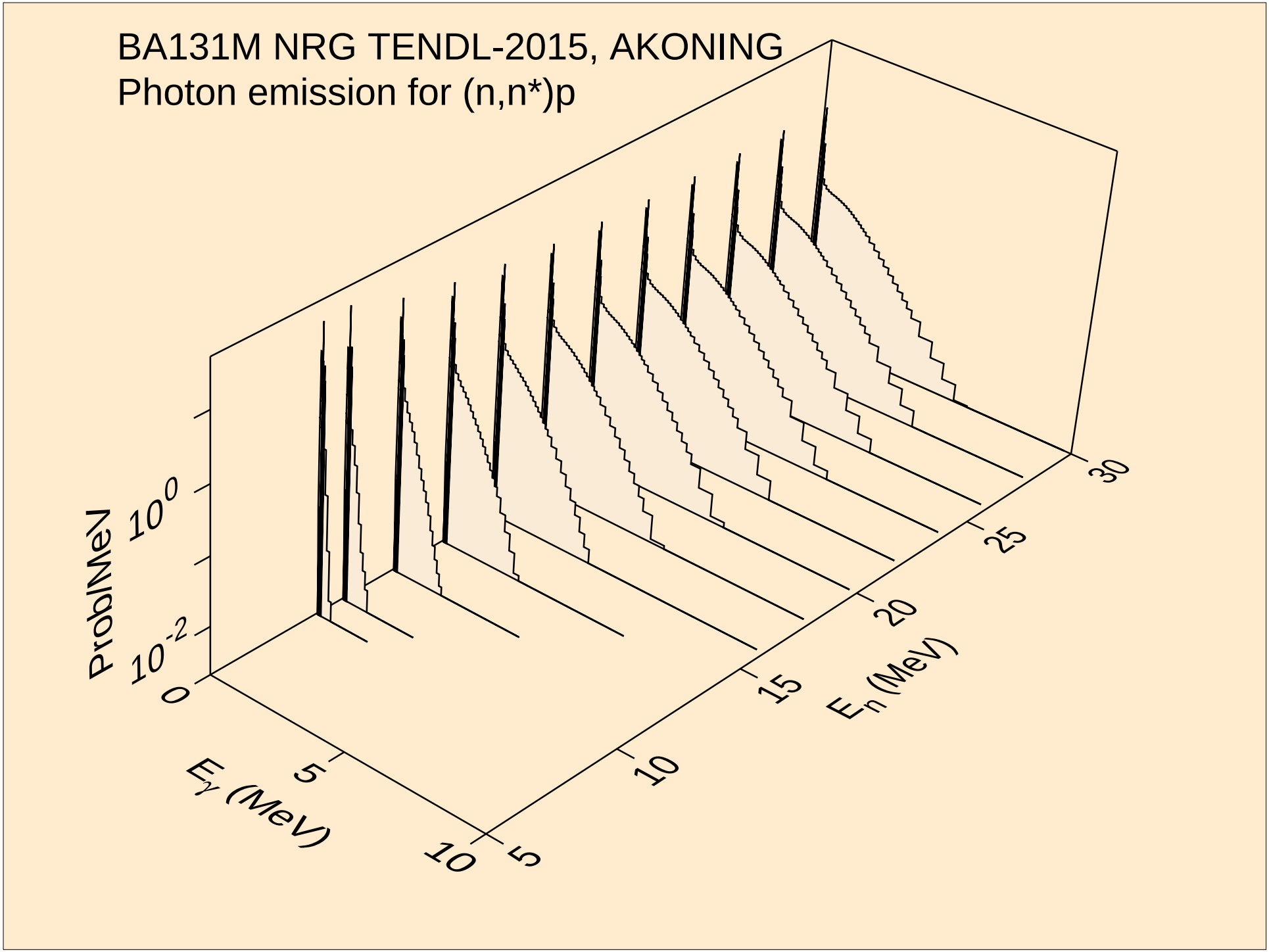

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,2n)
Prob/MeV
$10^2$
$10^0$
0
5
10
$E_\gamma$ (MeV)
5
10
15
20
25
30
$E_n$ (MeV)

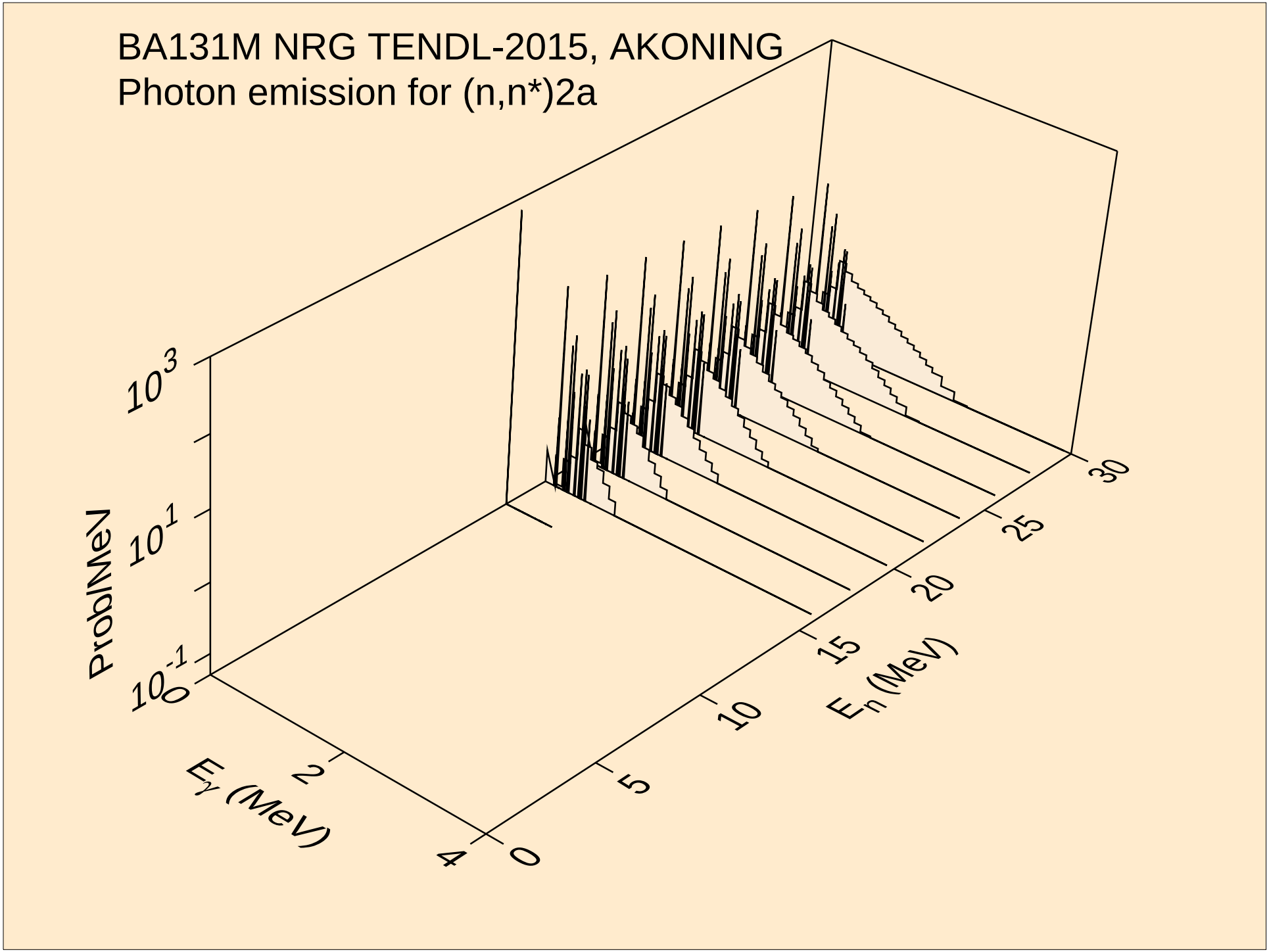

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,3n)
Prob/MeV
10^0
10^-2
0
5
10
Eγ (MeV)
16
18
20
22
24
26
28
30
En (MeV)

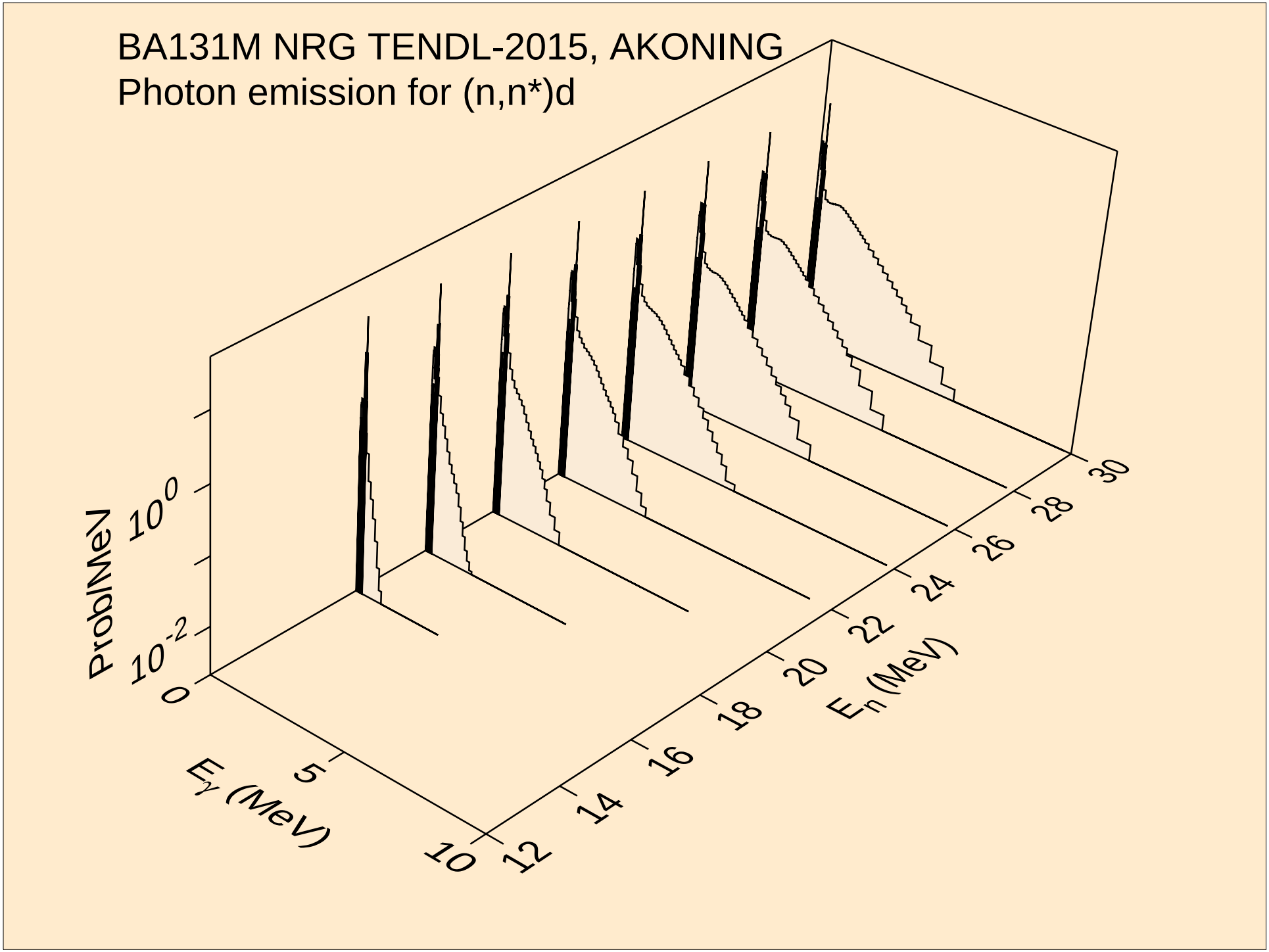

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*)a
Prob/MeV
$10^{3}$
$10^{1}$
$10^{-1}$
$E_\gamma$ (MeV)
0
2
4
$E_n$ (MeV)
0
5
10
15
20
25
30

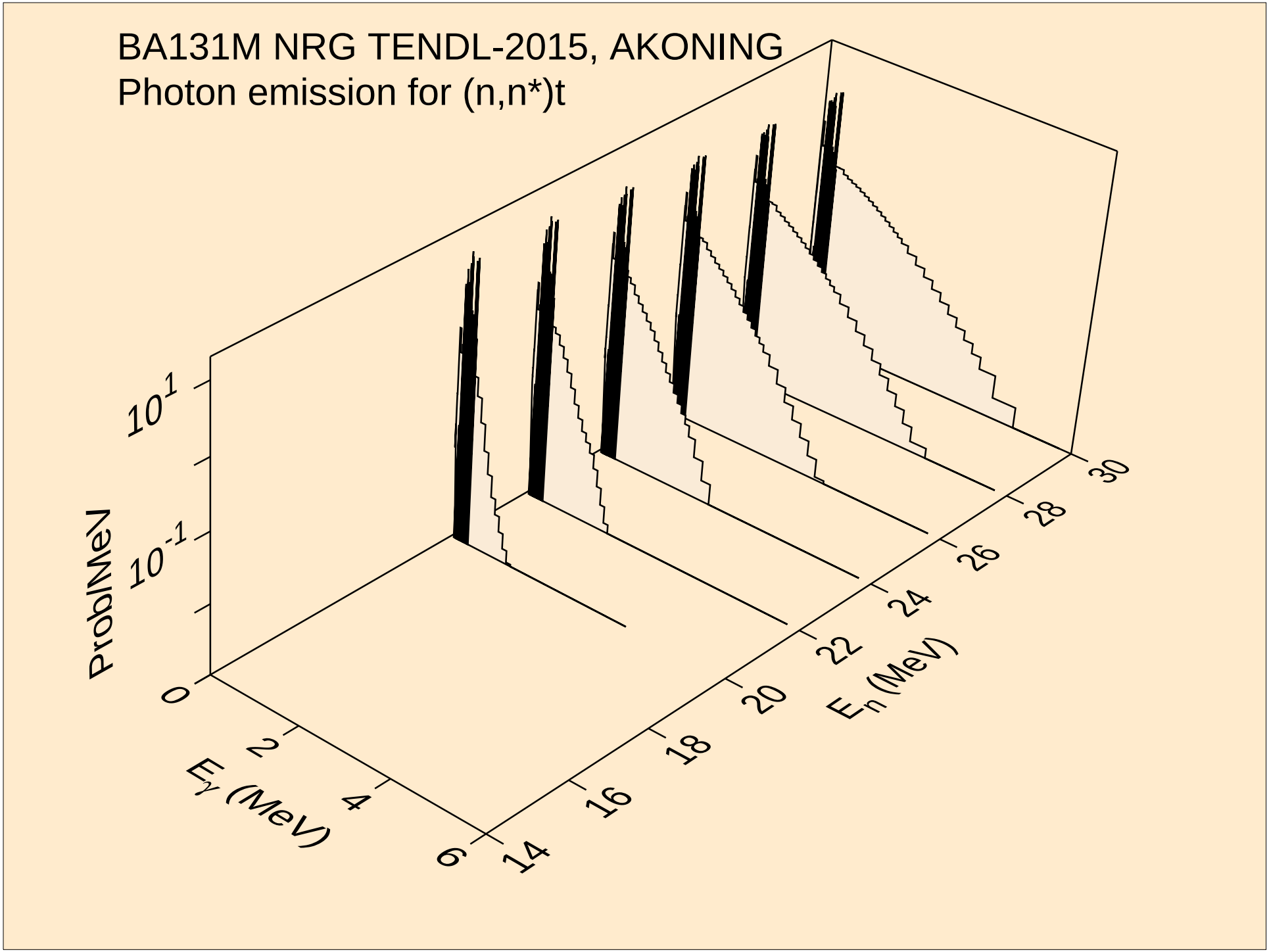

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,2n)a
Prob/MeV
$10^{2}$
$10^{0}$
$10^{-2}$
0
2
4
6
$E_\gamma$ (MeV)
5
10
15
20
25
30
$E_n$ (MeV)

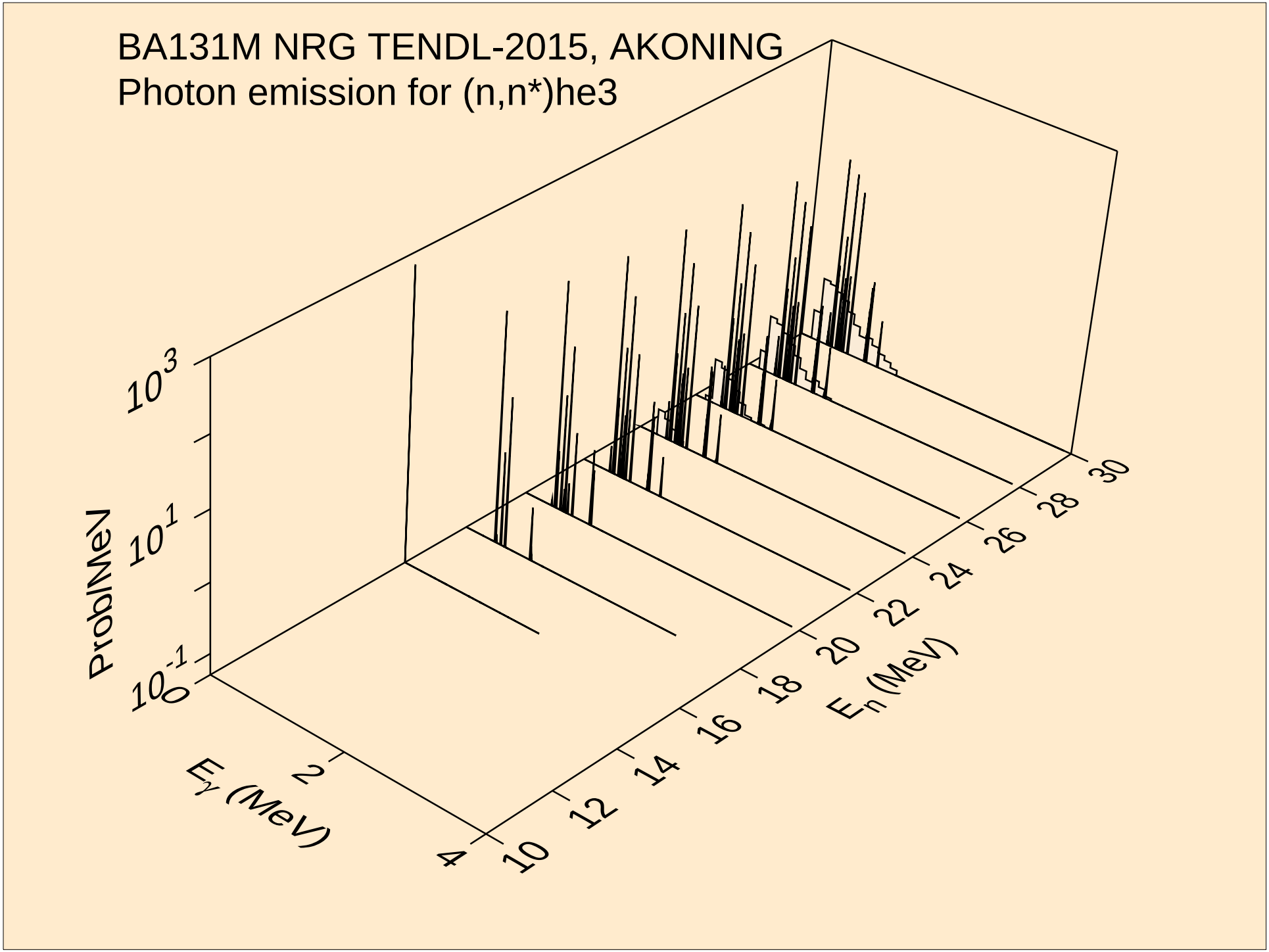

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,3n)a
Prob/MeV
$10^6$
$10^5$
$10^4$
$10^3$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

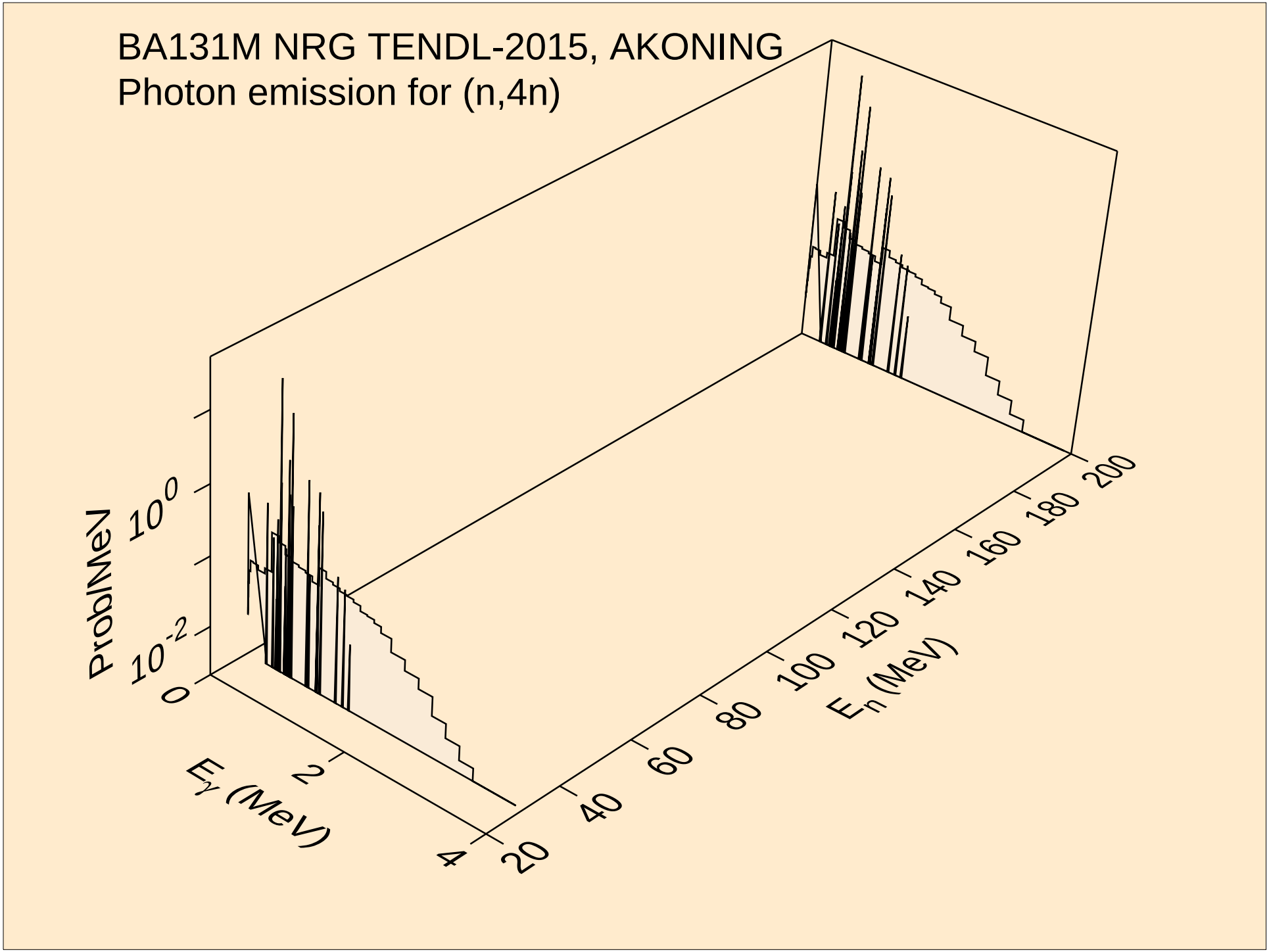

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*)p
Prob/MeV
10^0
10^-2
0
5
10
E_γ (MeV)
5
10
15
20
25
30
E_n (MeV)

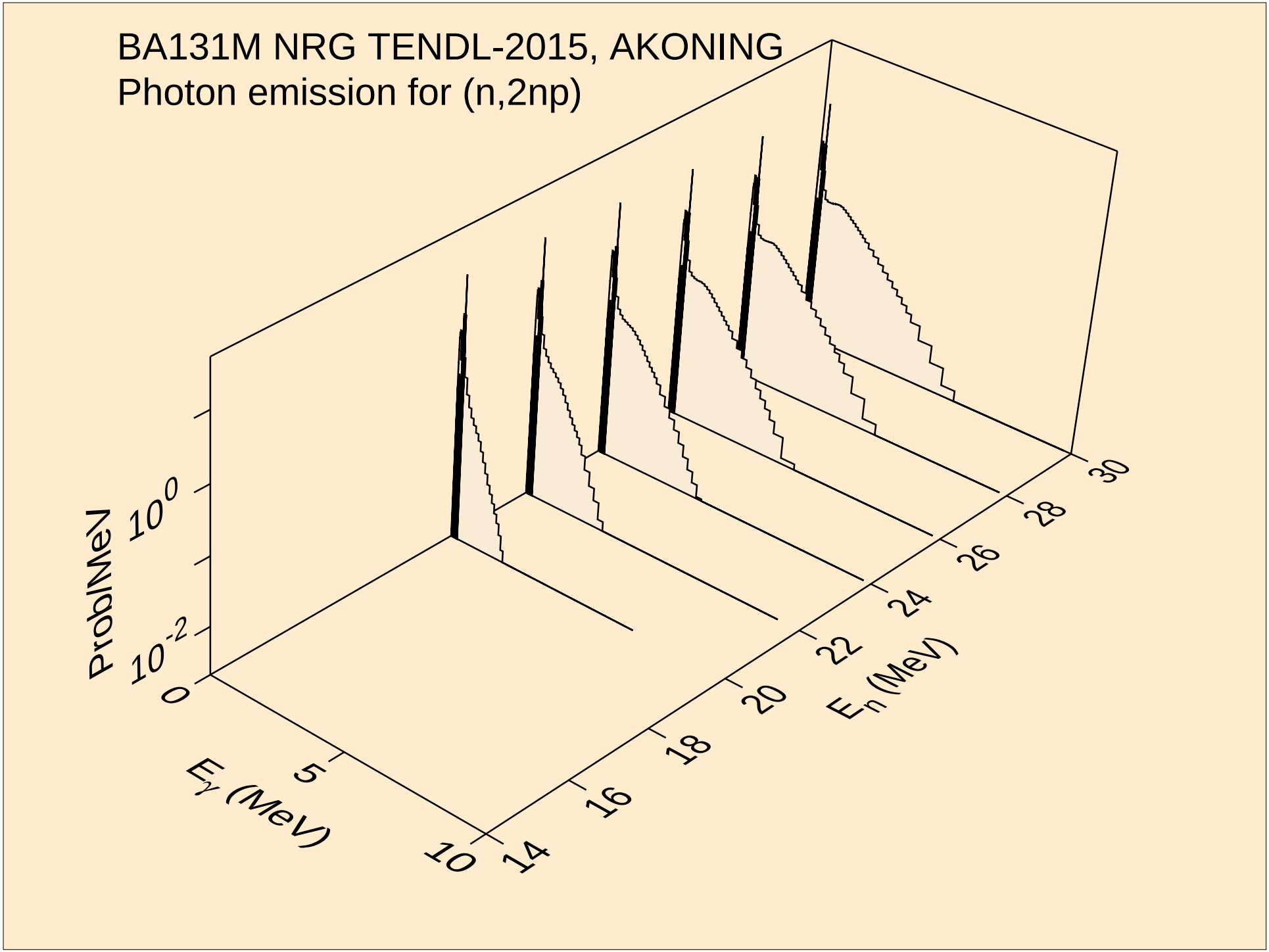

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*)2a
Prob/MeV
$10^{3}$
$10^{1}$
$10^{-1}$
$E_\gamma$ (MeV)
0
2
4
$E_n$ (MeV)
0
5
10
15
20
25
30

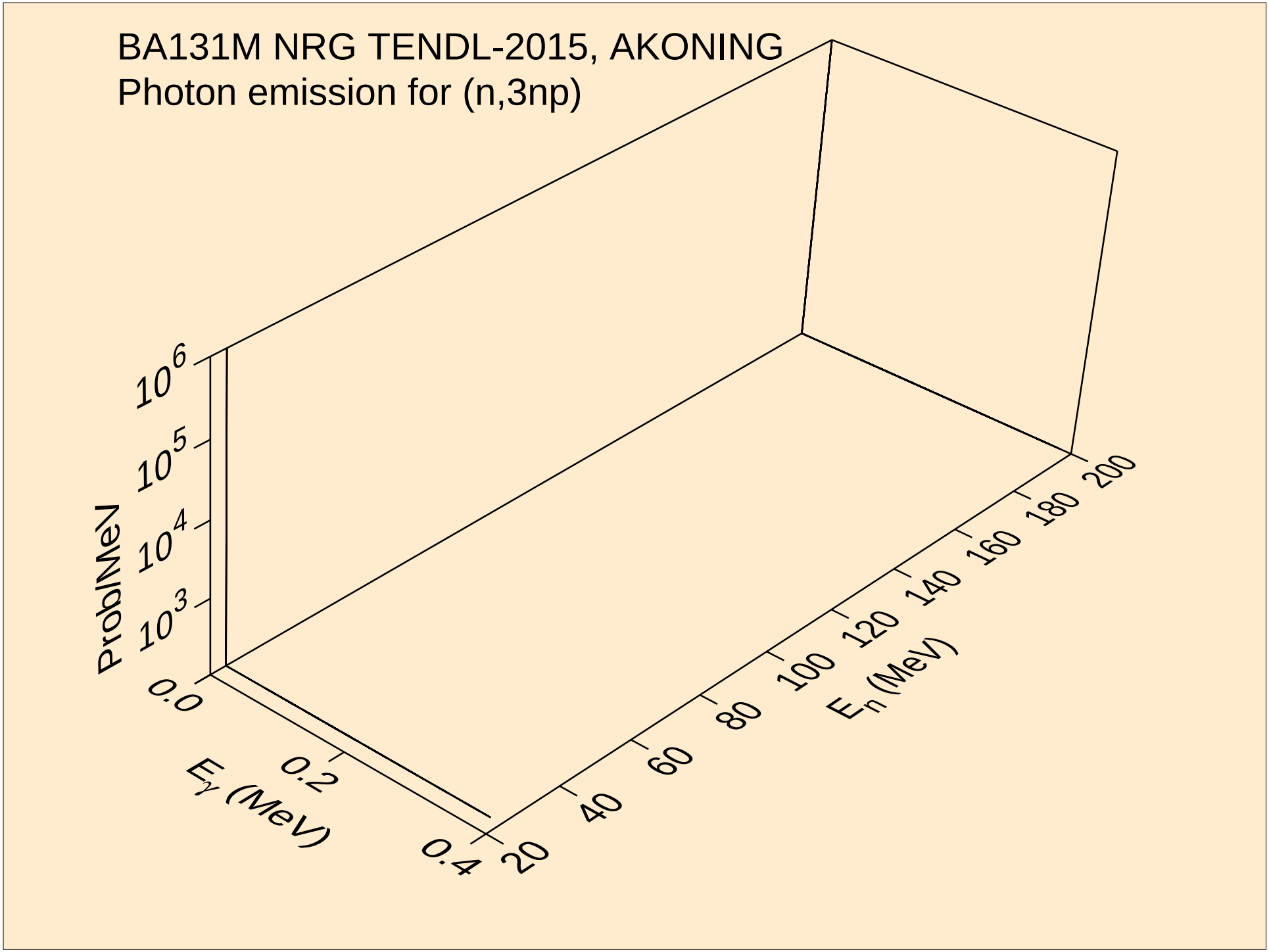

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*)d
Prob/MeV
10^0
10^-2
0
5
10
Eγ (MeV)
12
14
16
18
20
22
24
26
28
30
En (MeV)

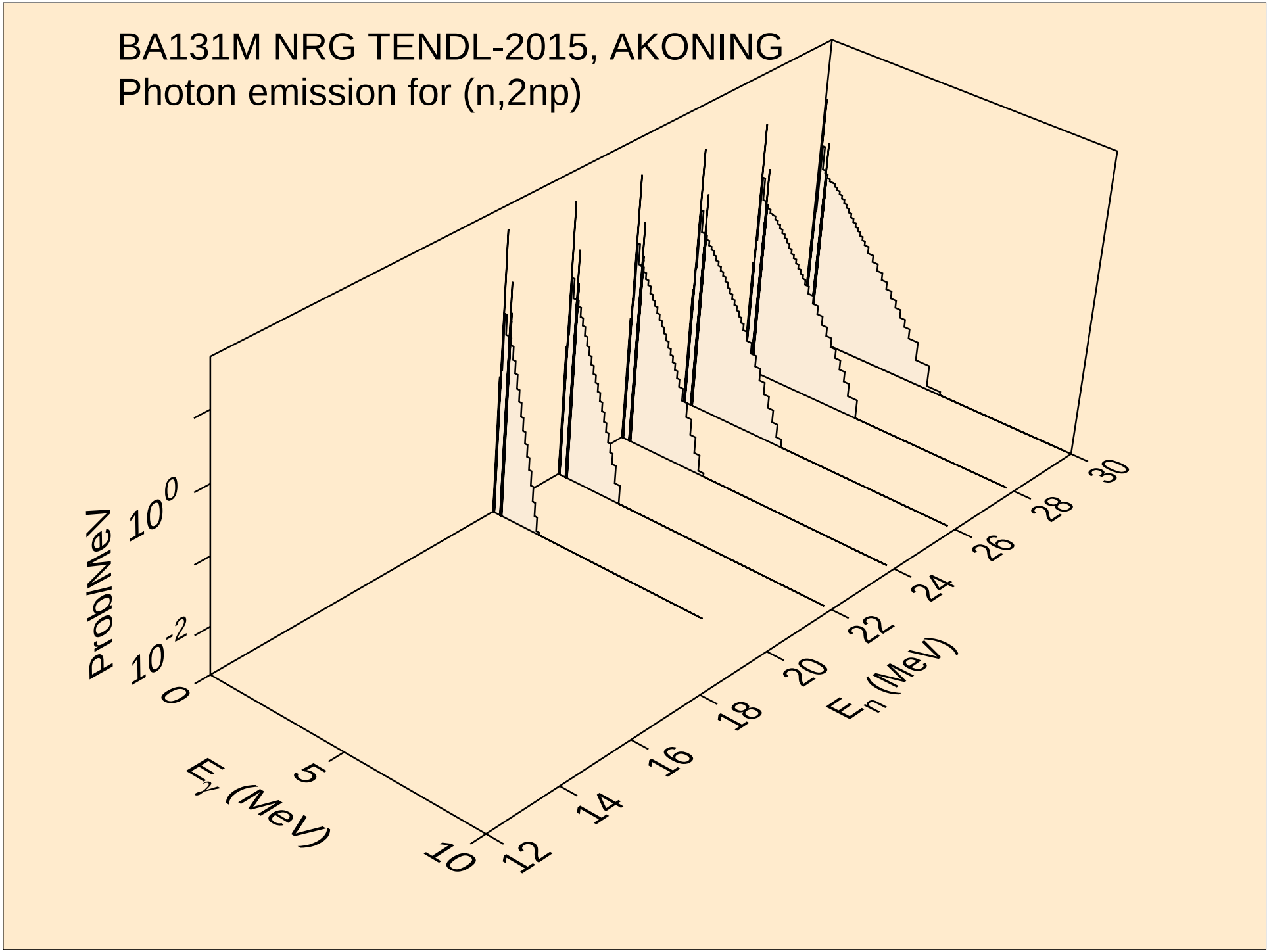

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*)t
Prob/MeV
10^1
10^-1
0
2
4
6
E_γ (MeV)
14
16
18
20
22
24
26
28
30
E_n (MeV)

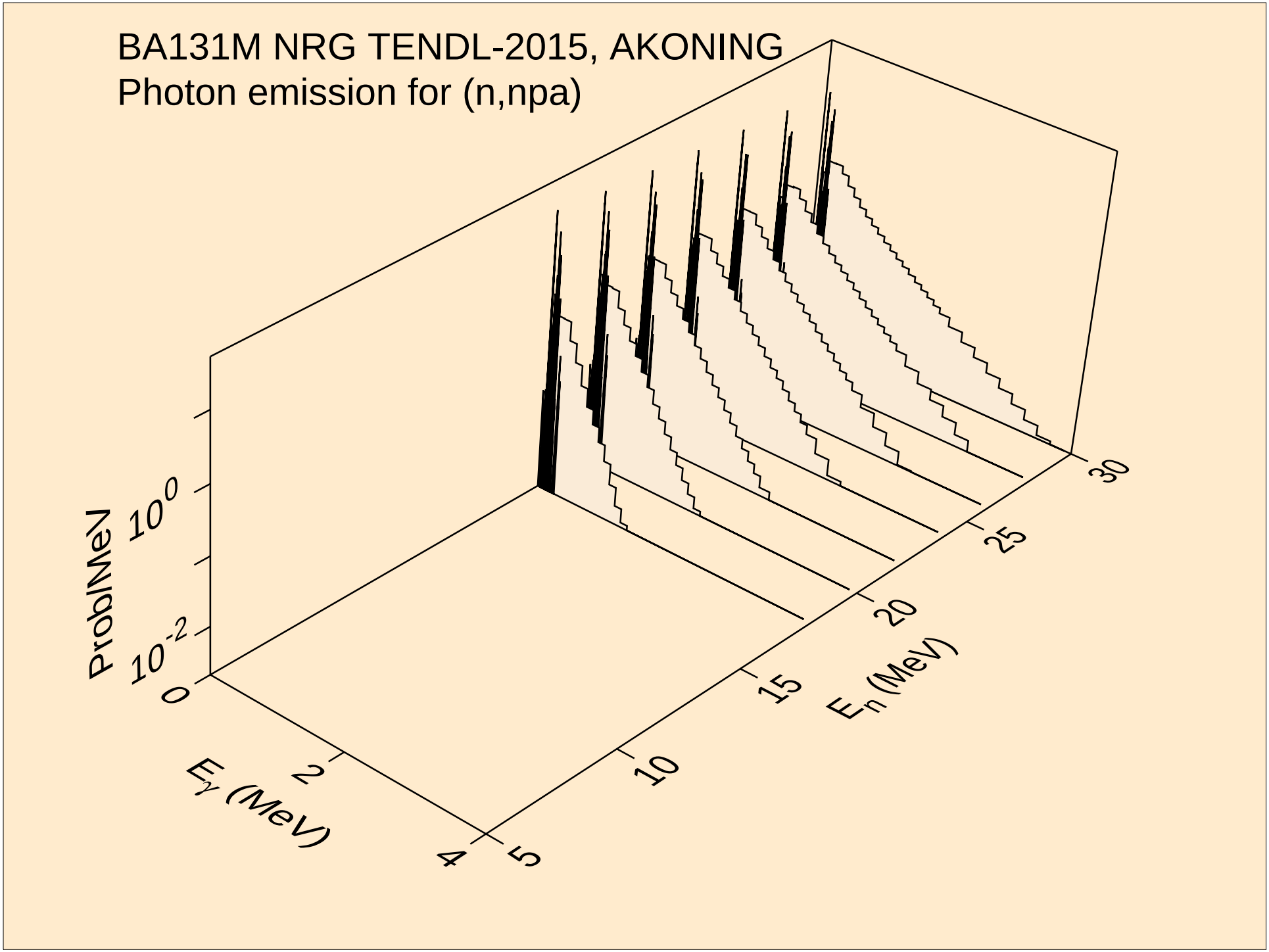

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*)he3
Prob/MeV
$10^{3}$
$10^{1}$
$10^{-1}$
0
2
4
$E_\gamma$ (MeV)
10
12
14
16
18
20
22
24
26
28
30
$E_n$ (MeV)

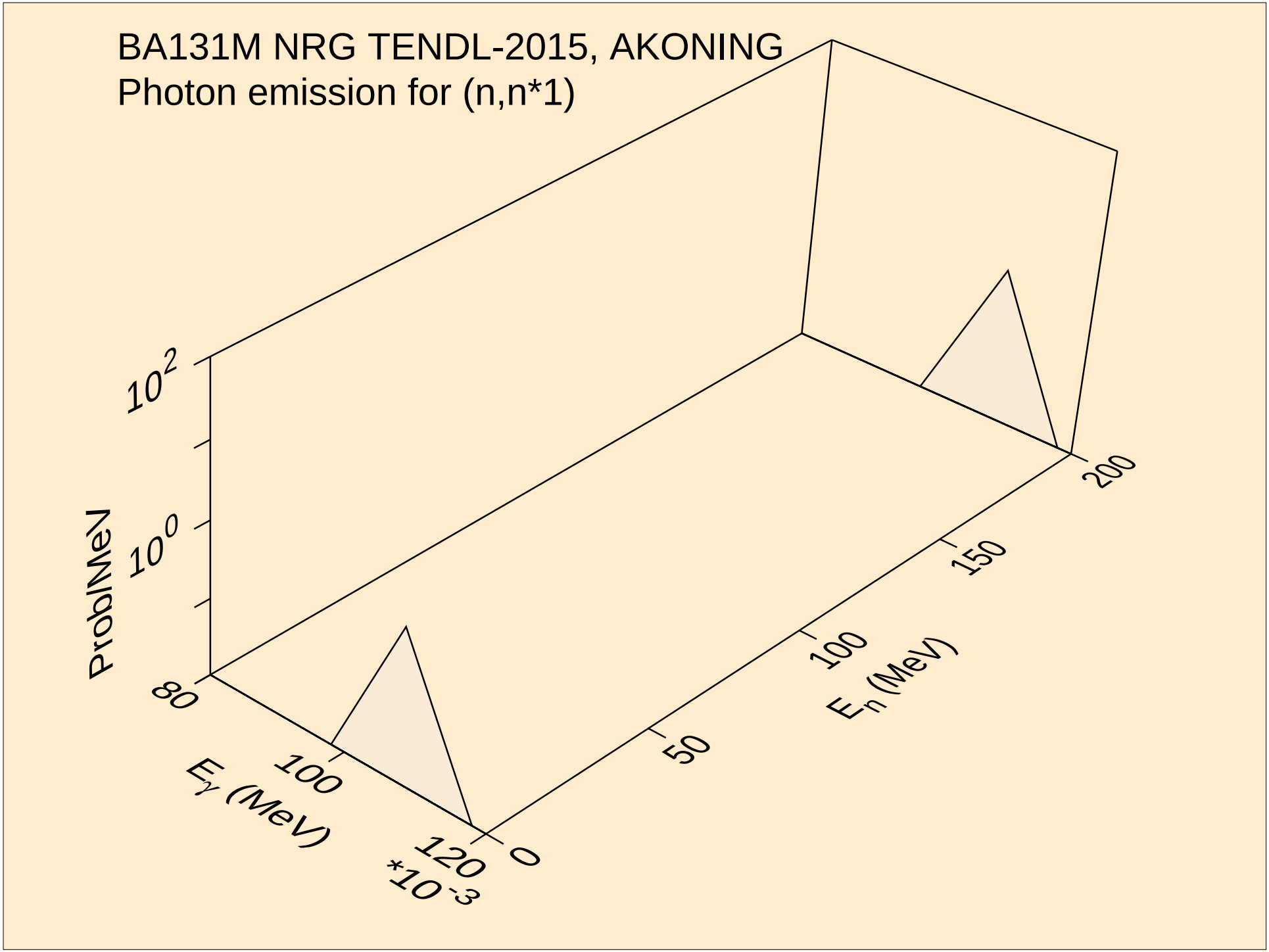

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,4n)
Prob/MeV
10^0
10^-2
0
2
4
E_γ (MeV)
20
40
60
80
100
120
140
160
180
200
E_n (MeV)

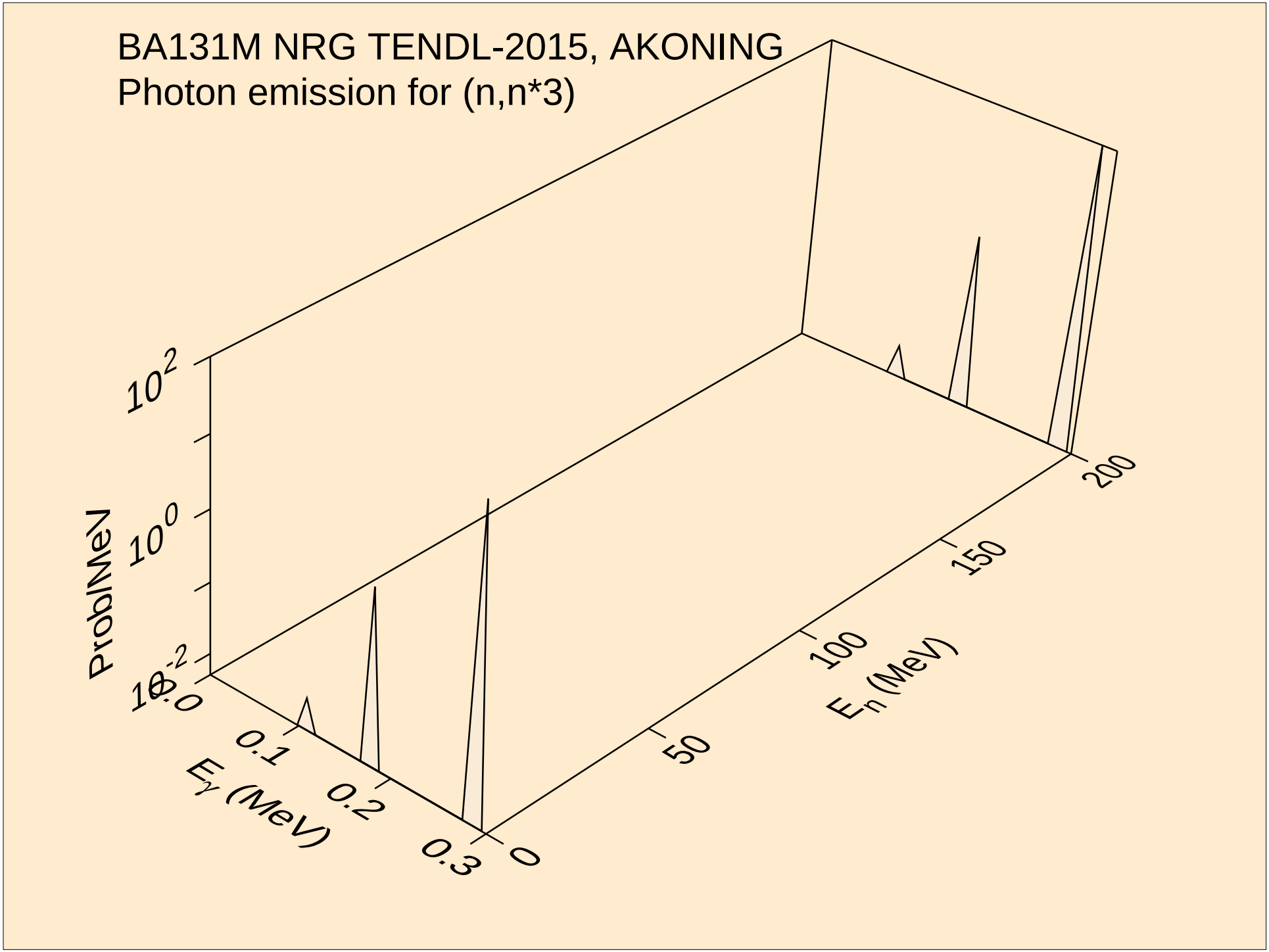

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,2np)
Prob/MeV
$10^{0}$
$10^{-2}$
0
$E_\gamma$ (MeV)
5
10
14
16
18
20
22
24
26
28
30
$E_n$ (MeV)

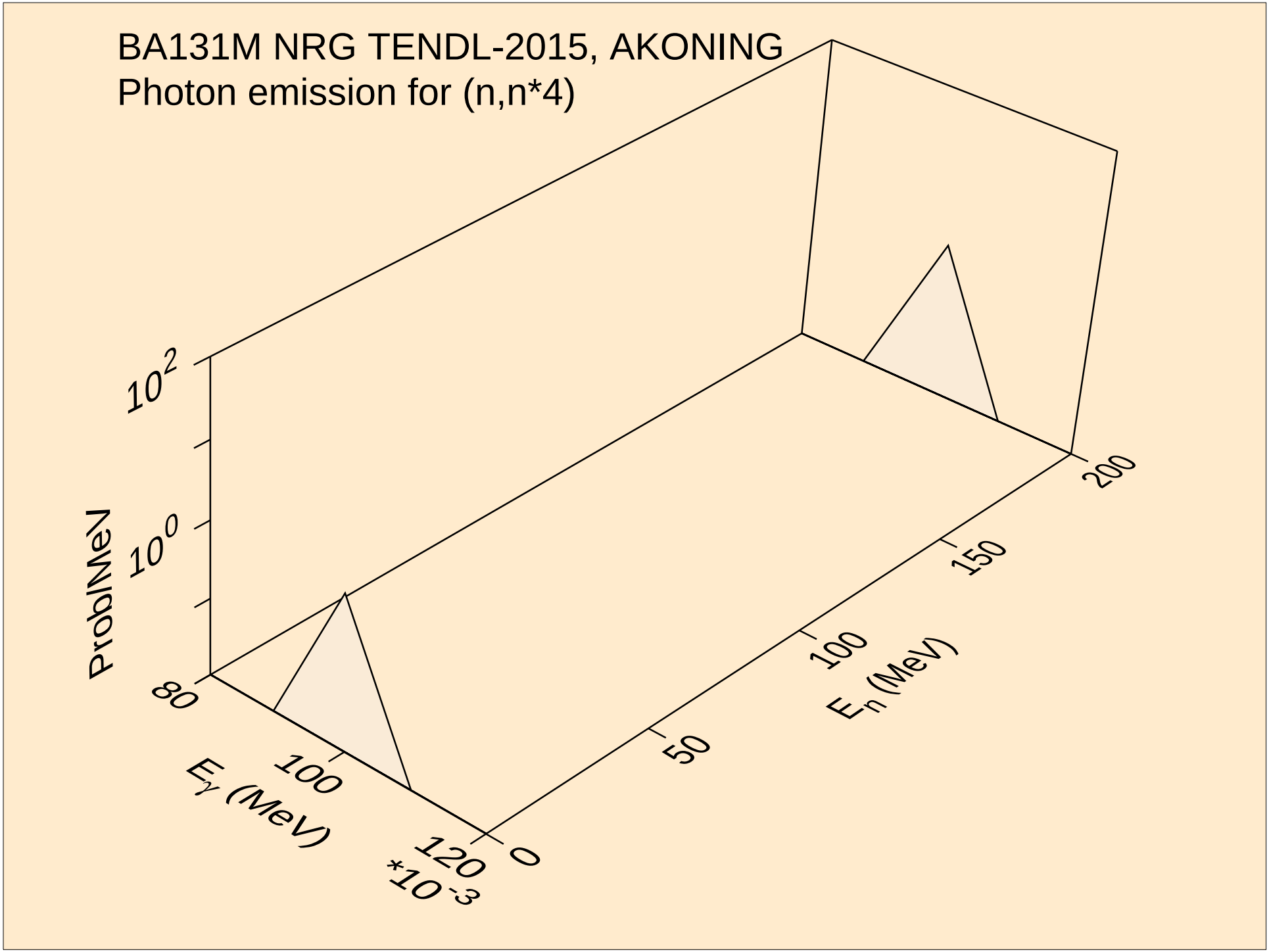

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,3np)
Prob/MeV
$10^6$
$10^5$
$10^4$
$10^3$
0.0
0.2
0.4
$E_\gamma$ (MeV)
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

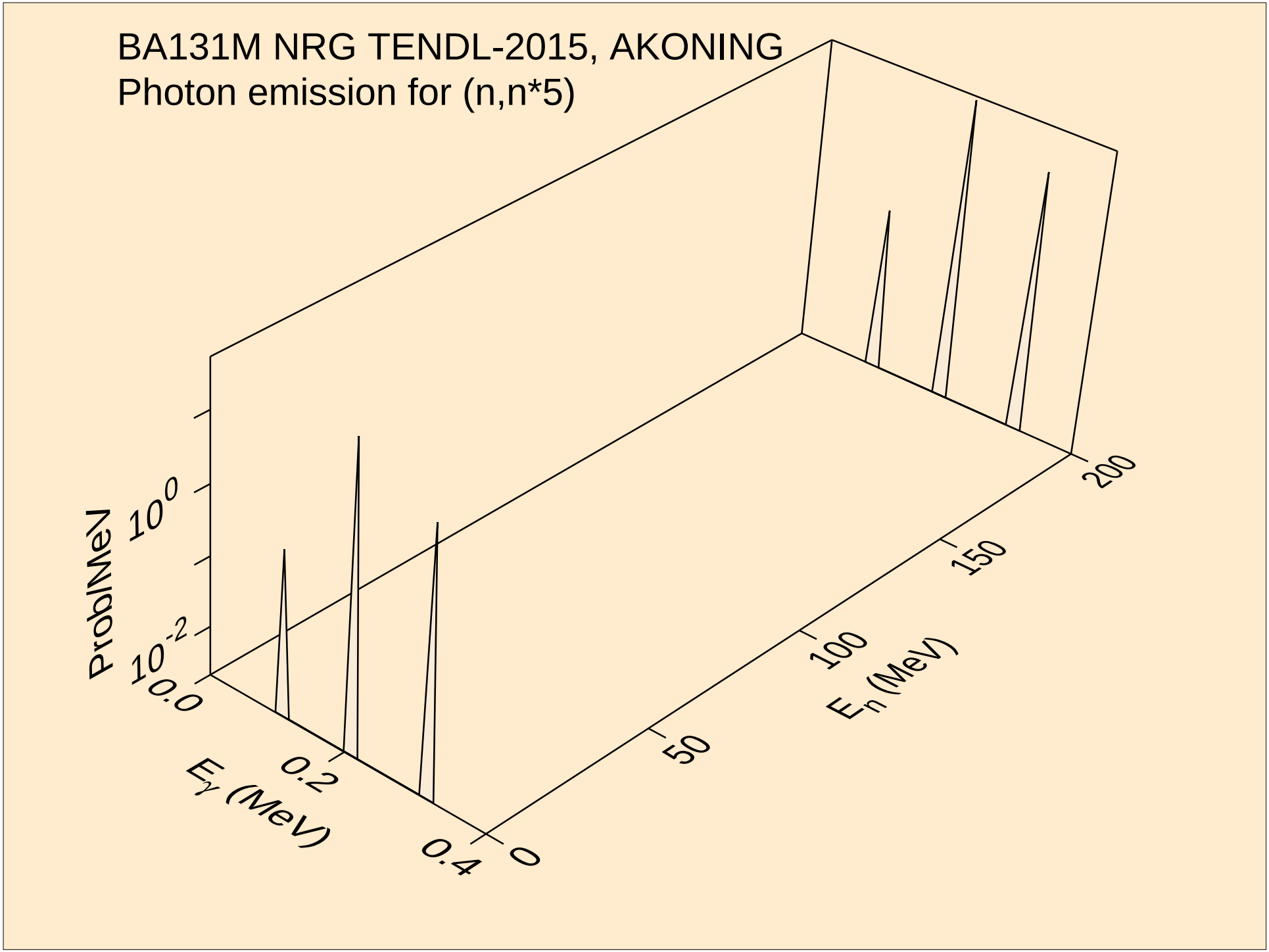

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,2np)
Prob/MeV
10^0
10^-2
0
5
10
Eγ (MeV)
12
14
16
18
20
22
24
26
28
30
En (MeV)

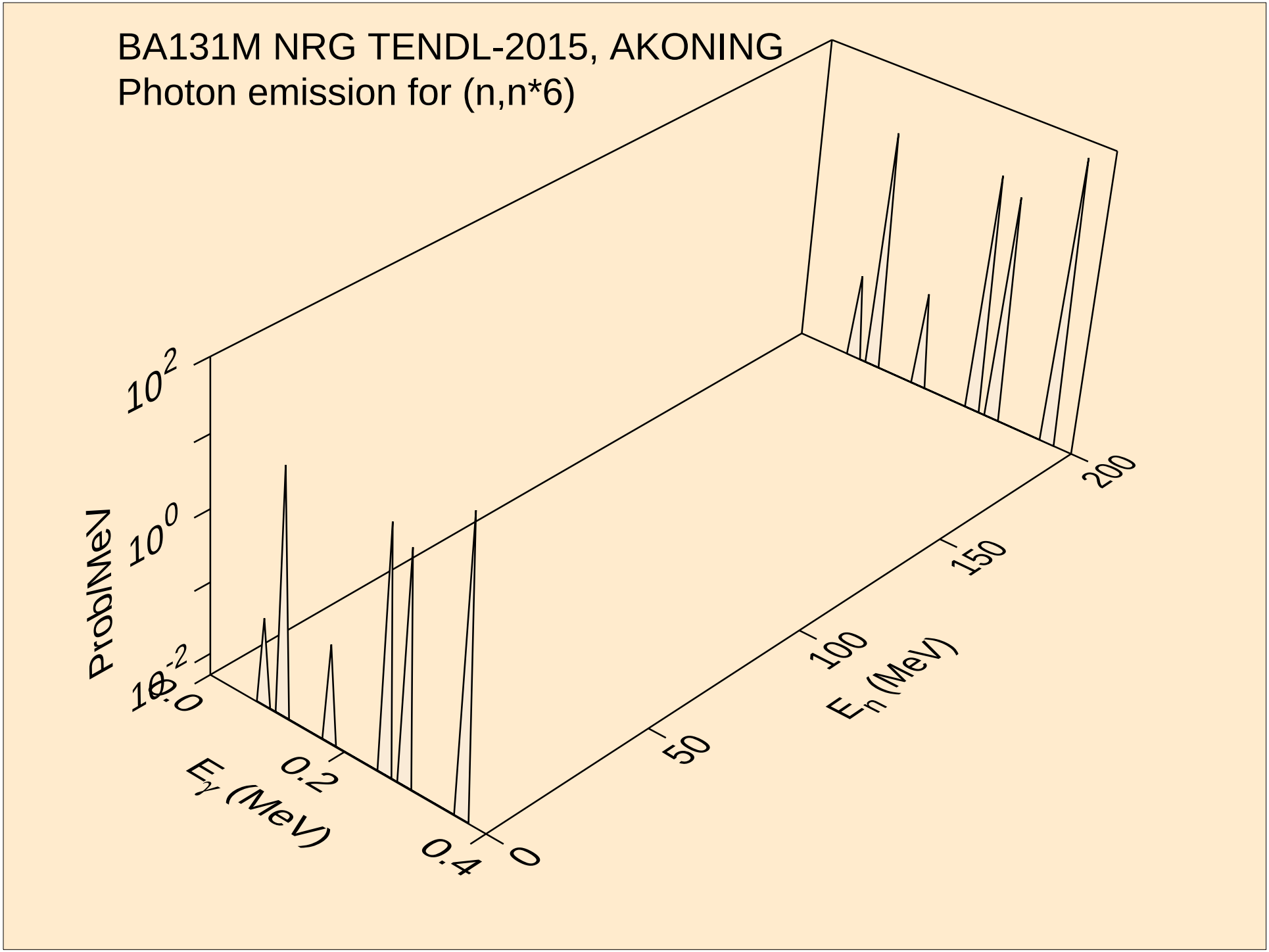

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,npa)
Prob/MeV
10^0
10^-2
0
2
4
E_γ (MeV)
5
10
15
20
25
30
E_n (MeV)

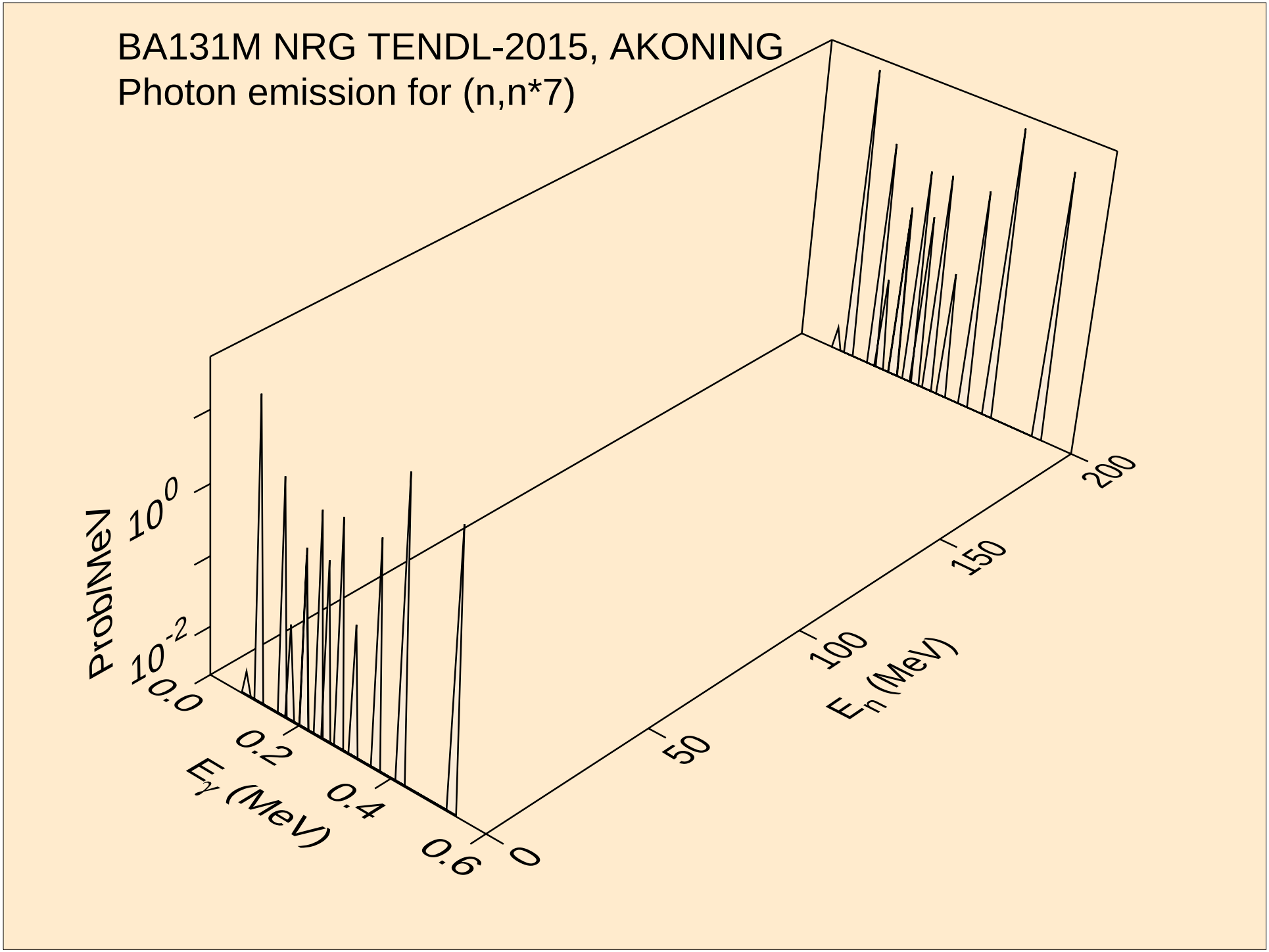

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*1)
Prob/MeV
$10^2$
$10^0$
80
100
$E_\gamma$ (MeV)
120
*10 -3
0
50
100
150
200
$E_n$ (MeV)

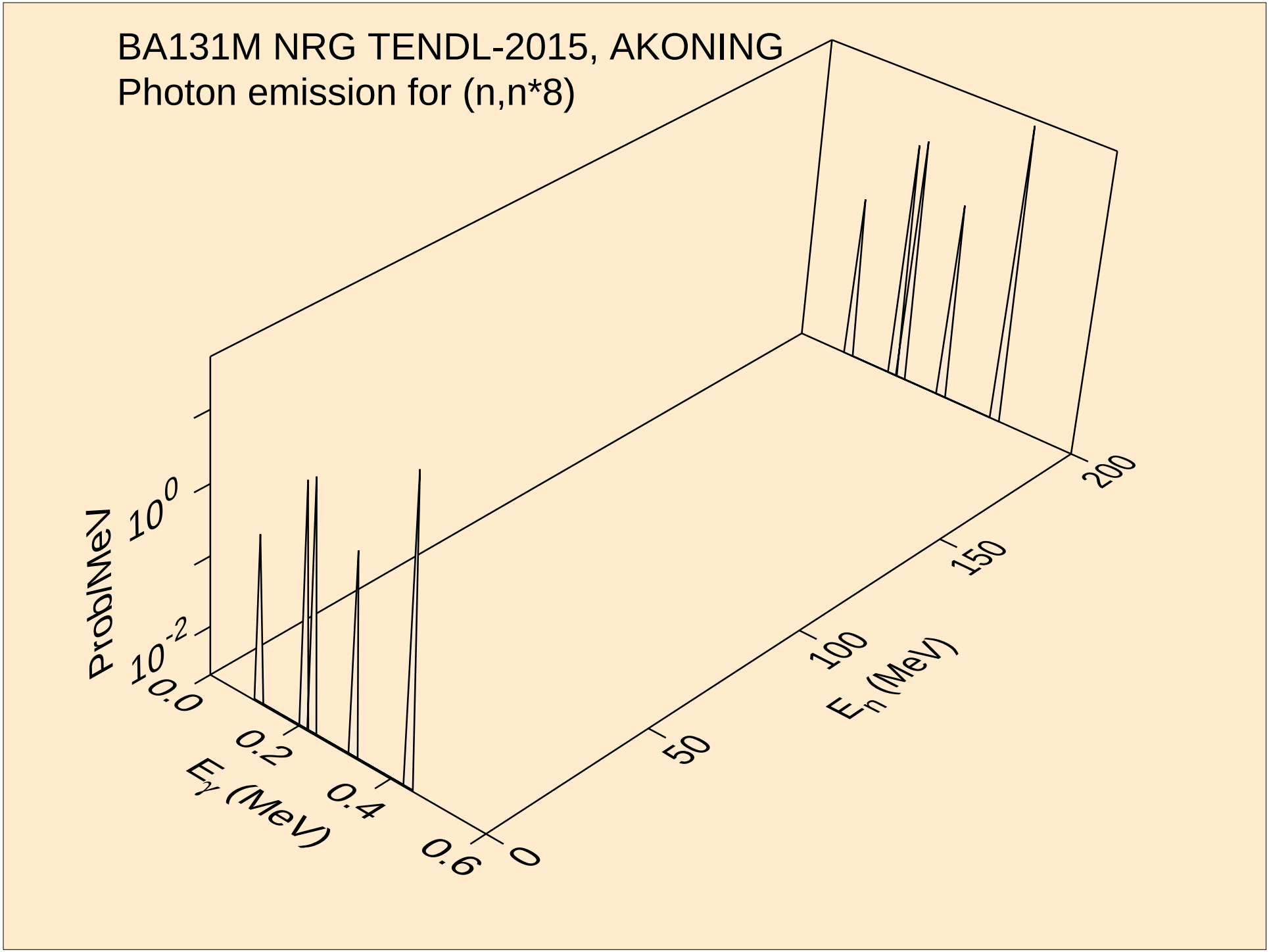

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*3)
Prob/MeV
$10^{2}$
$10^{0}$
$10^{-2}$
0.0
0.1
0.2
0.3
$E_\gamma$ (MeV)
0
50
100
150
200
$E_n$ (MeV)

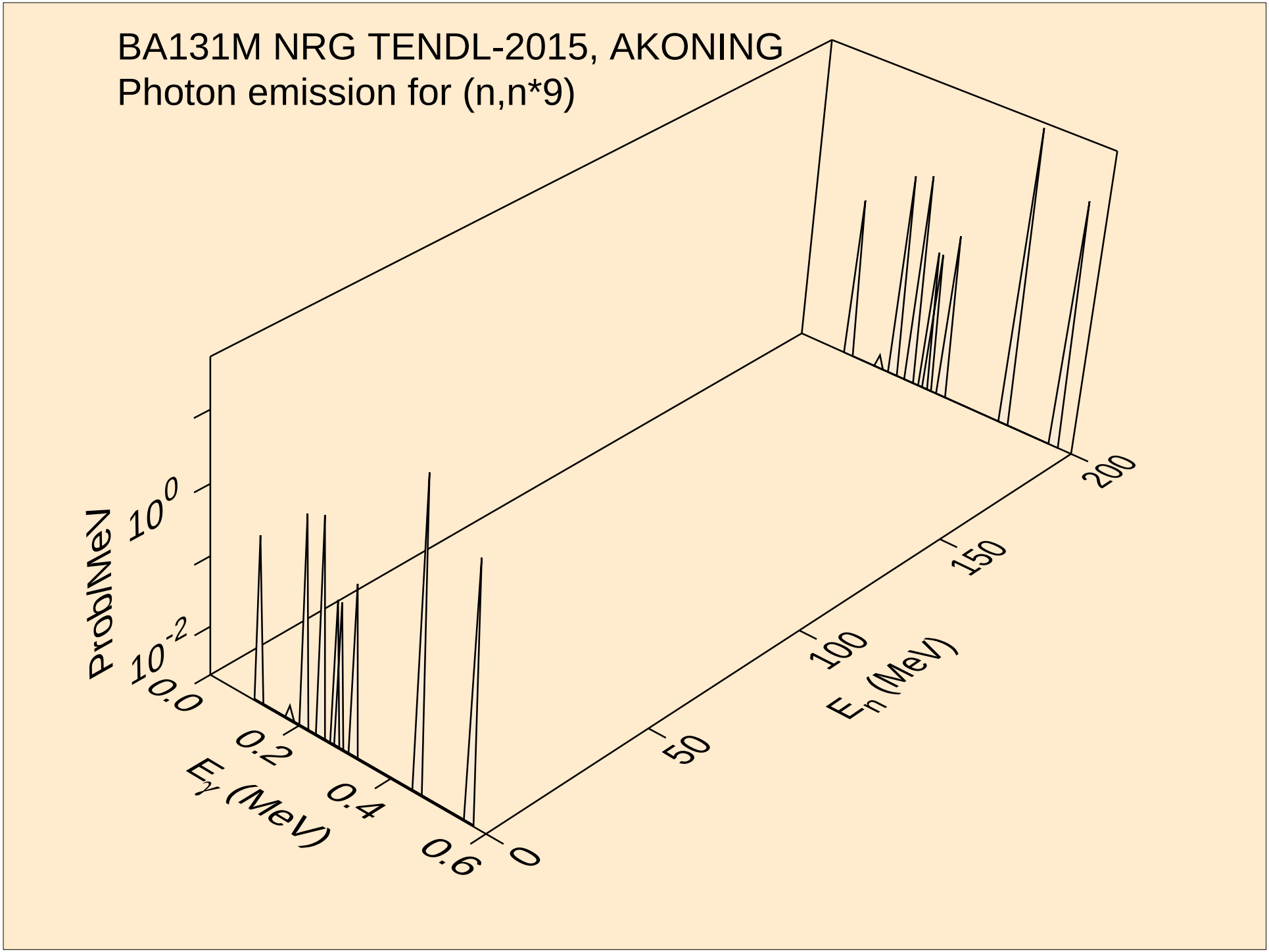

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*4)
Prob/MeV
$10^2$
$10^0$
80
100
$E_\gamma$ (MeV)
120
*10 -3
0
50
100
150
200
$E_n$ (MeV)

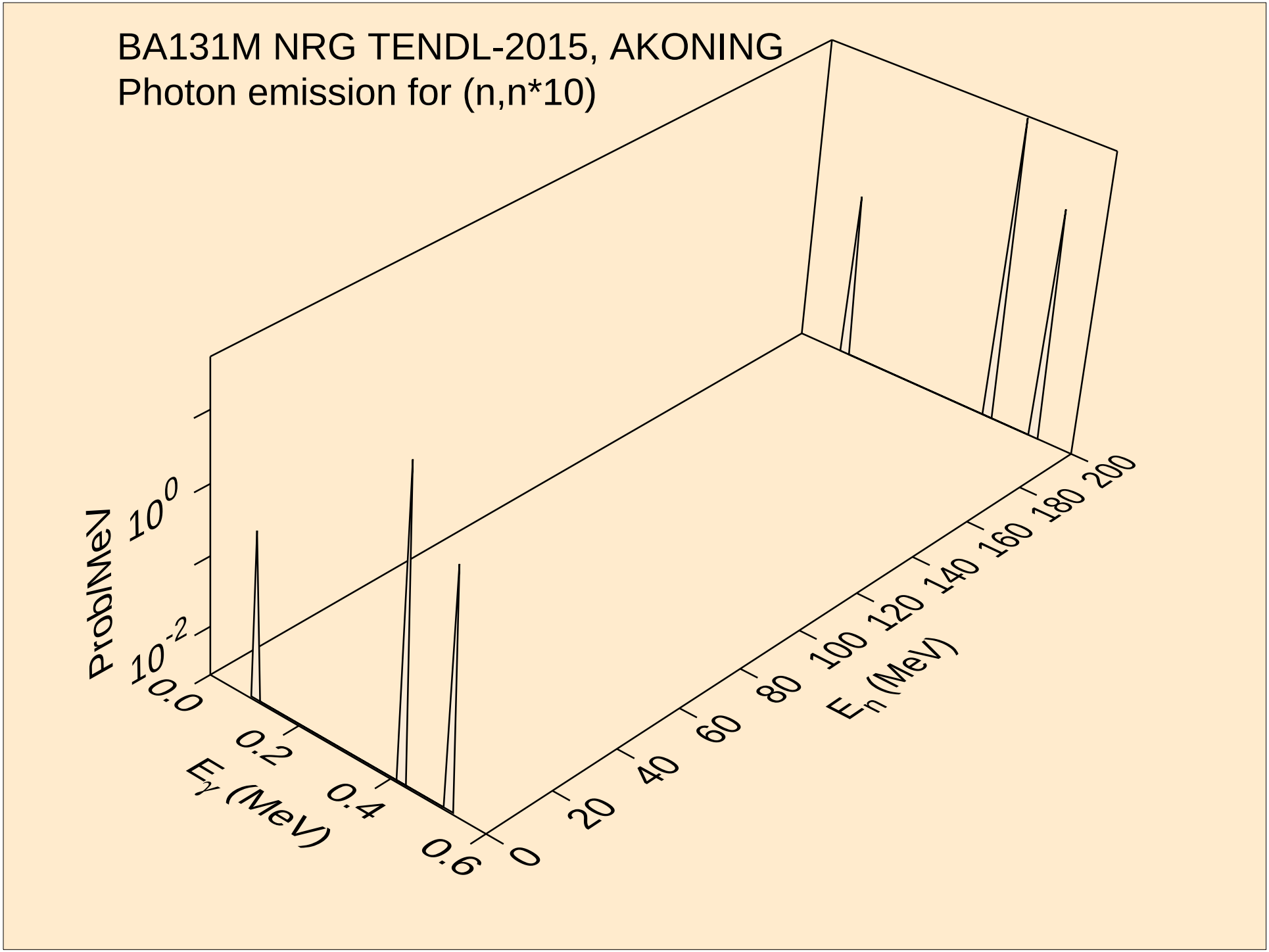

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*5)
Prob/MeV
10^0
10^-2
0.0
0.2
0.4
E_γ (MeV)
0
50
100
150
200
E_n (MeV)

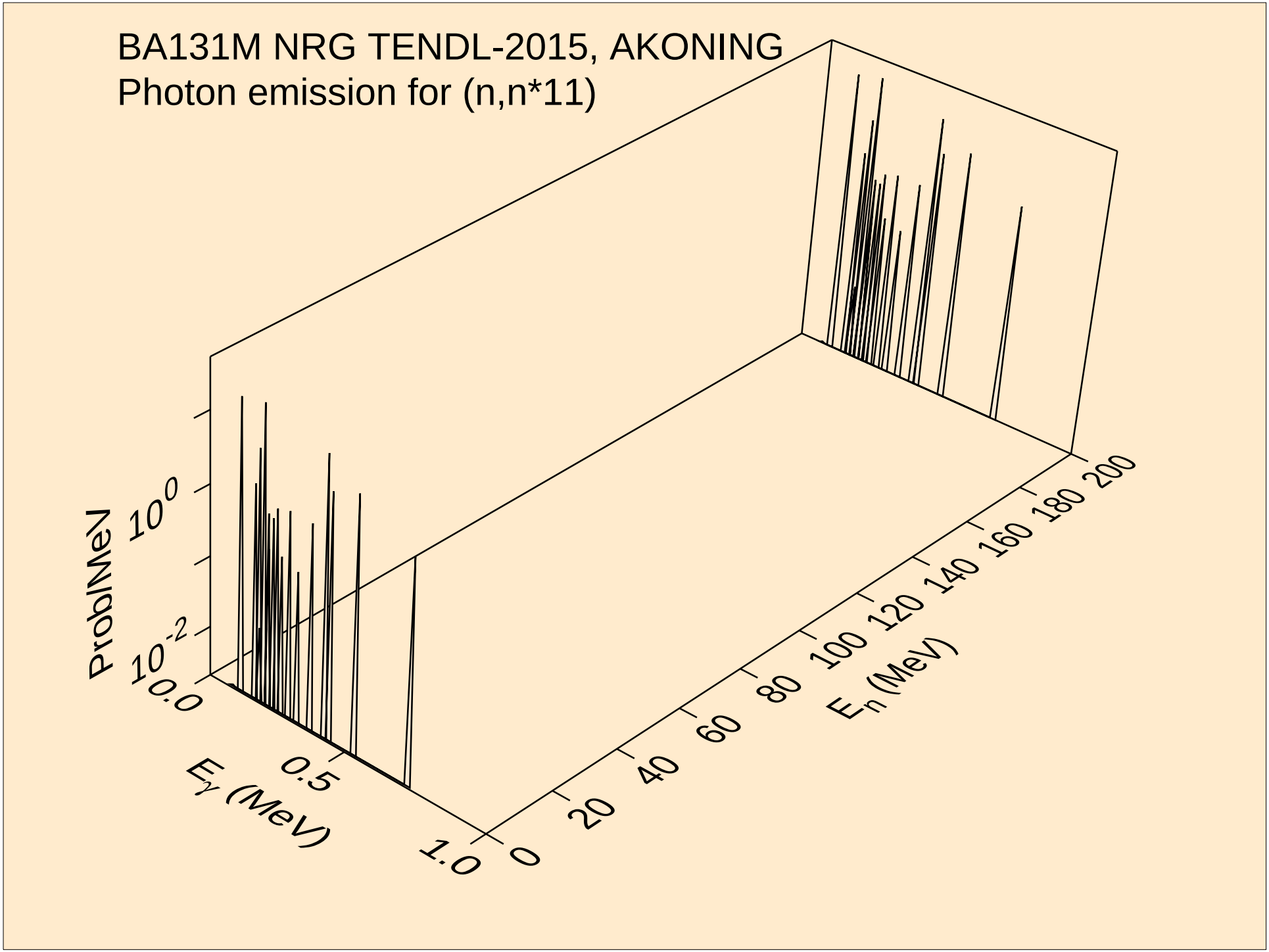

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*6)
Prob/MeV
$10^{2}$
$10^{0}$
$10^{-2}$
0.0
0.2
0.4
$E_\gamma$ (MeV)
0
50
100
150
200
$E_n$ (MeV)

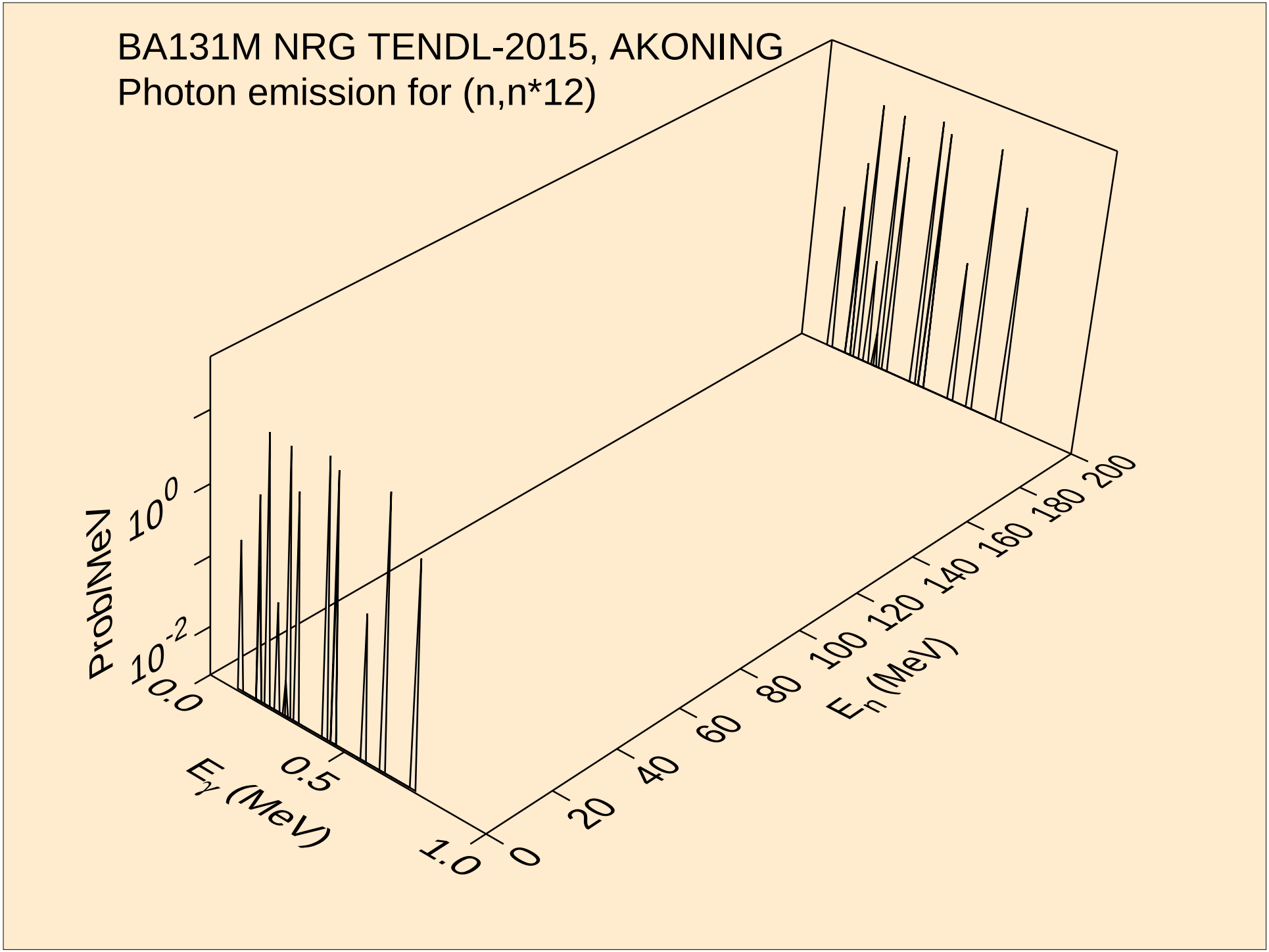

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*7)
Prob/MeV
10^0
10^-2
0.0
0.2
0.4
0.6
E_γ (MeV)
0
50
100
150
200
E_n (MeV)

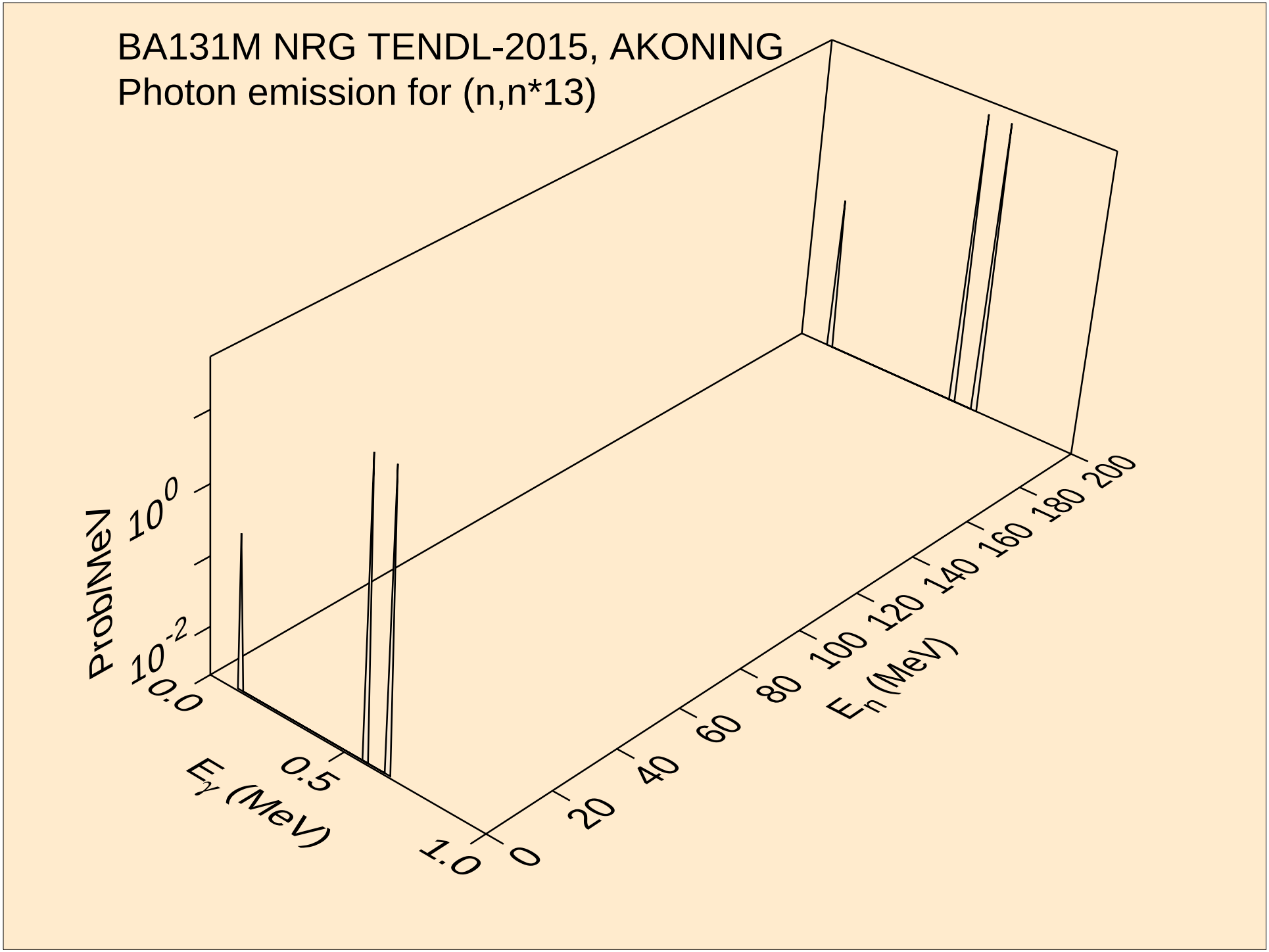

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*8)
Prob/MeV
10^0
10^-2
0.0
0.2
0.4
0.6
E_γ (MeV)
0
50
100
150
200
E_n (MeV)

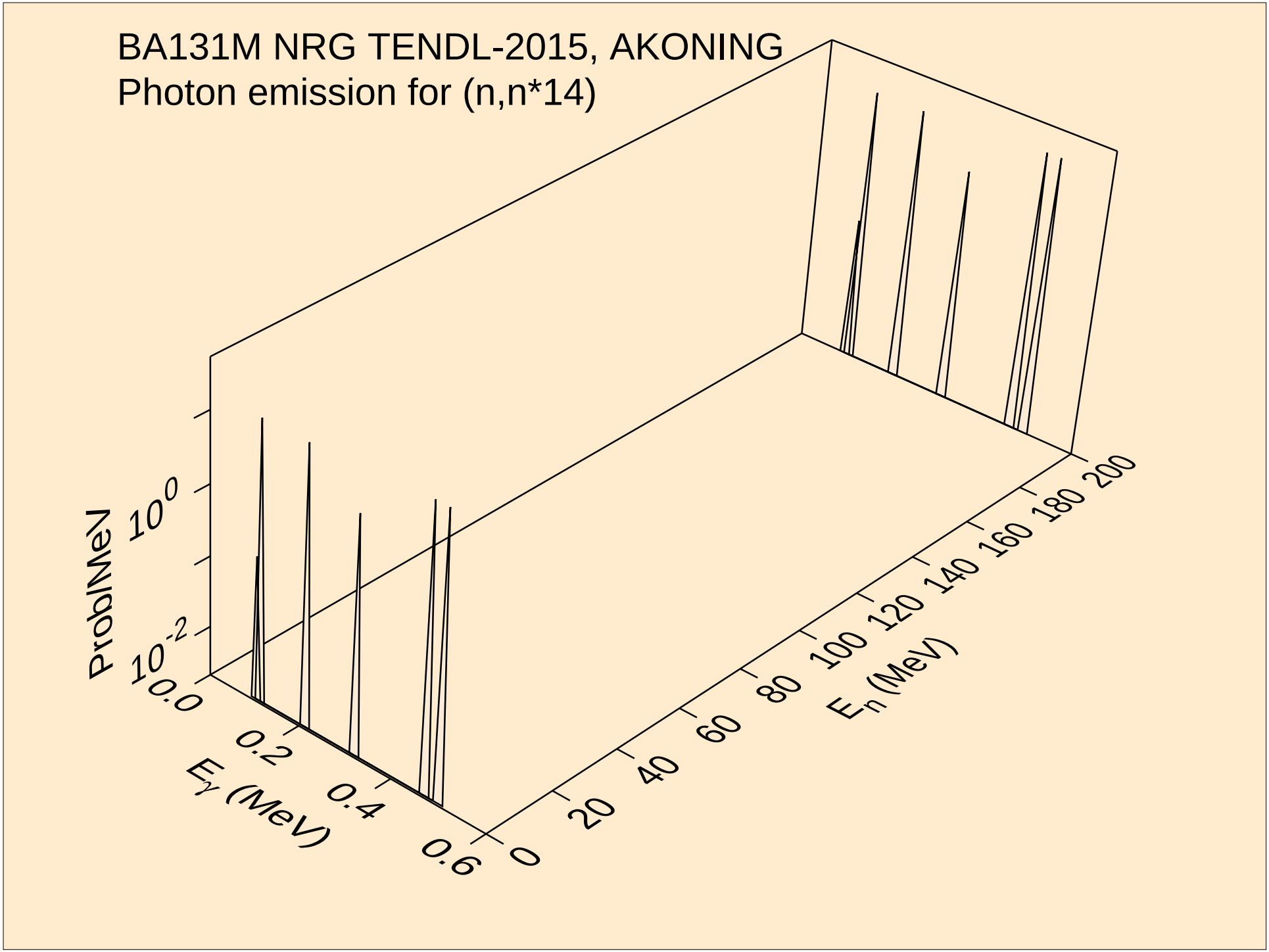

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*9)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.2
0.4
0.6
$E_\gamma$ (MeV)
0
50
100
150
200
$E_n$ (MeV)

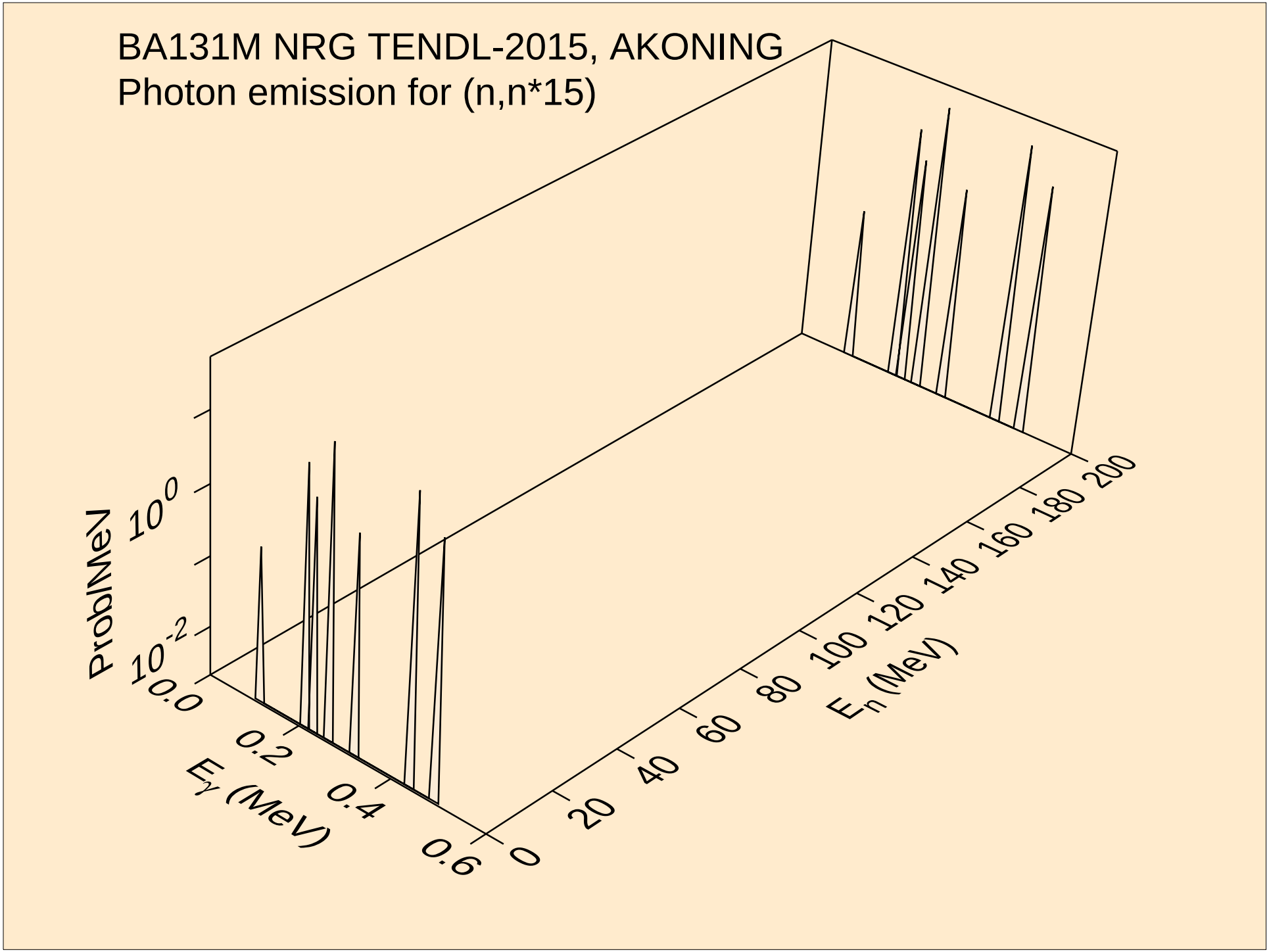

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*10)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.2
0.4
0.6
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

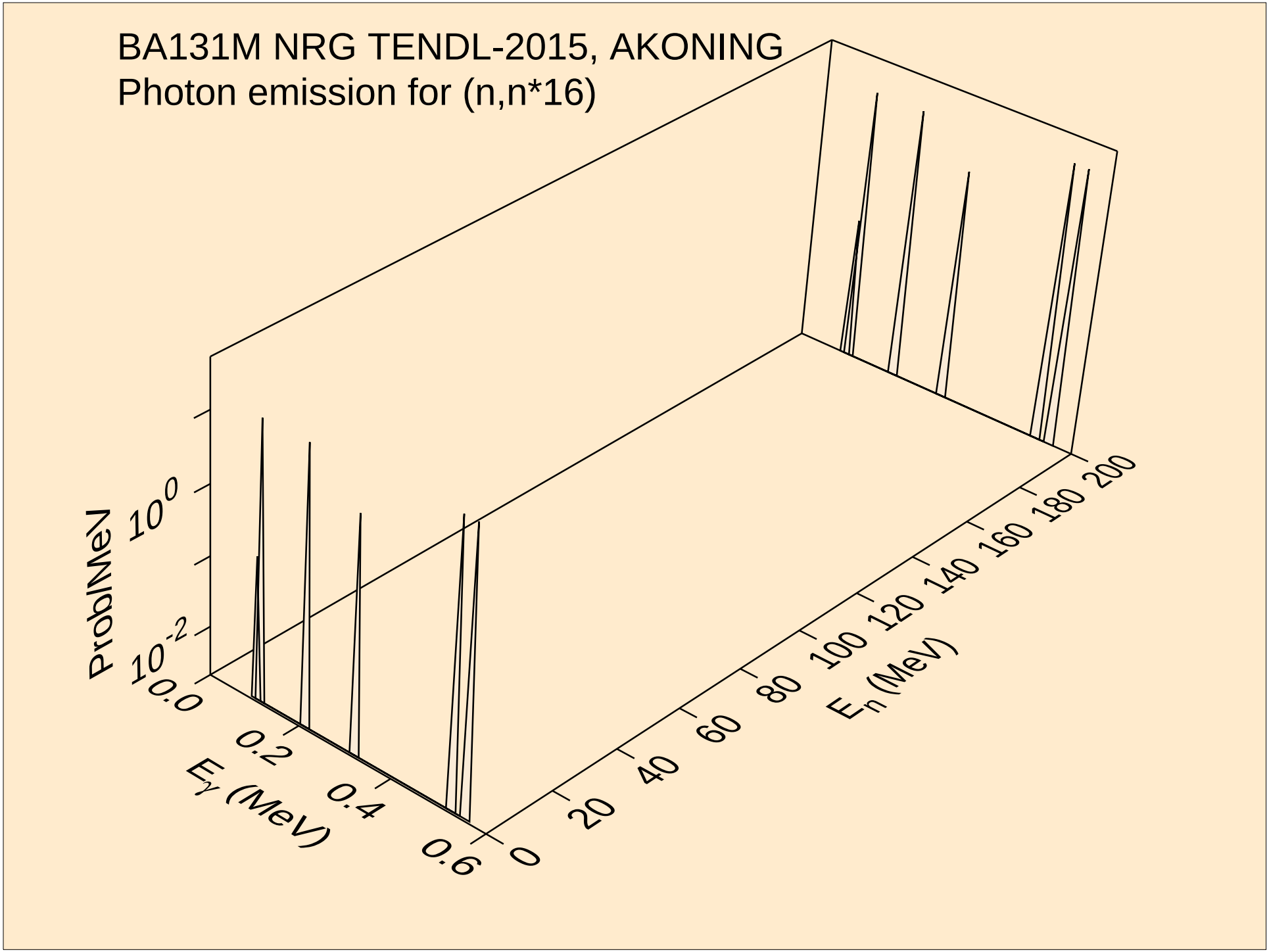

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*11)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

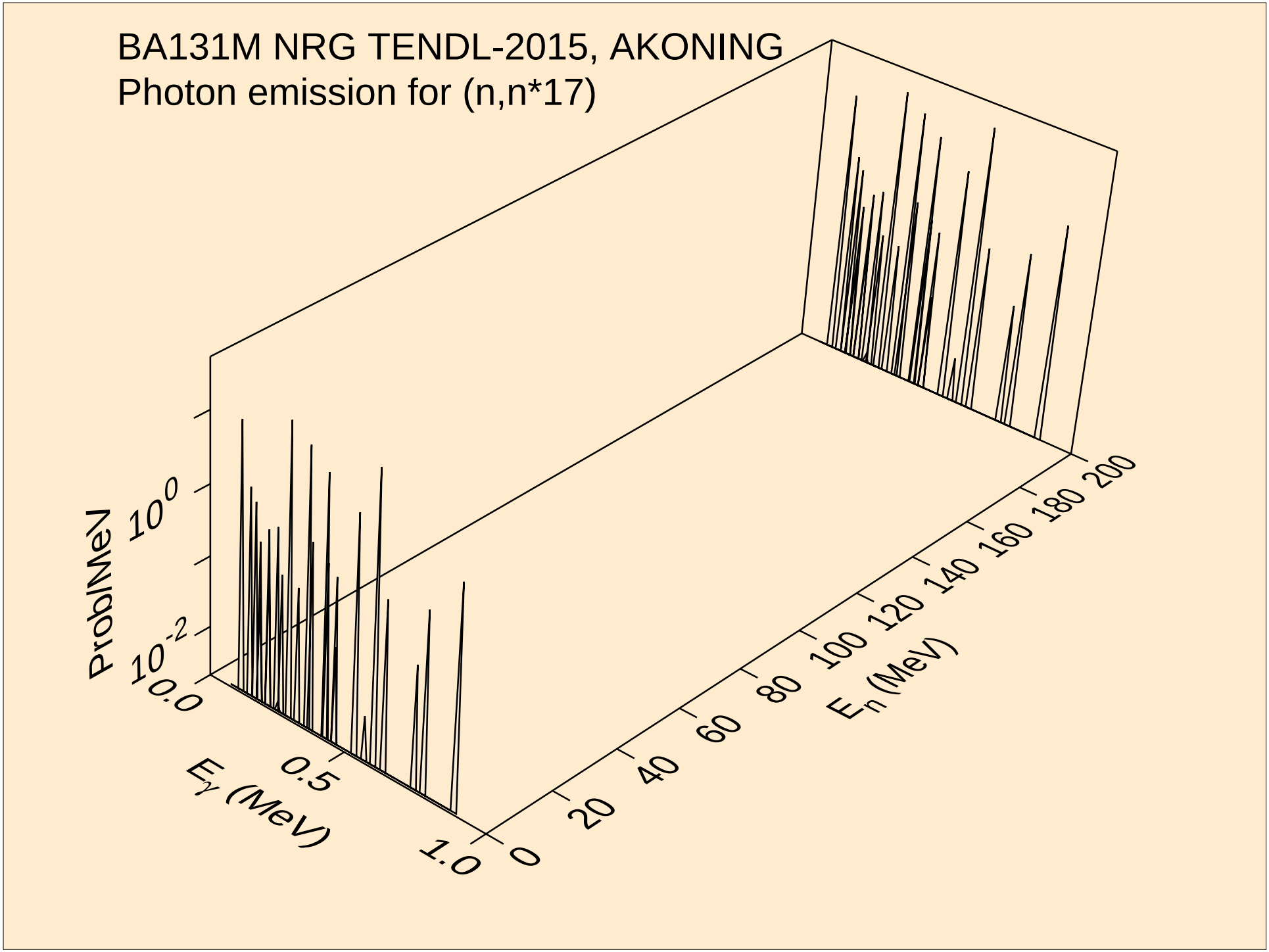

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*12)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

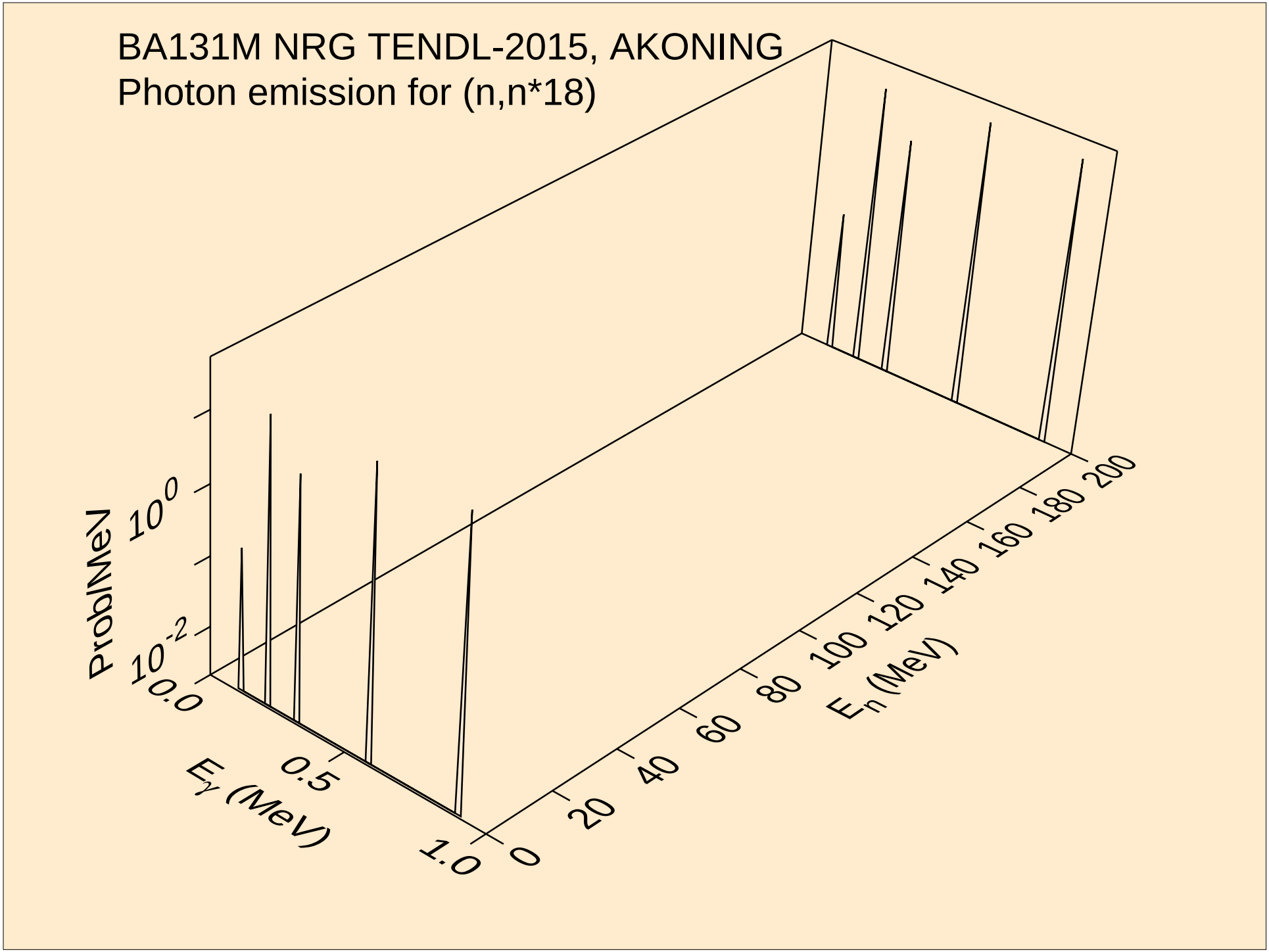

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*13)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

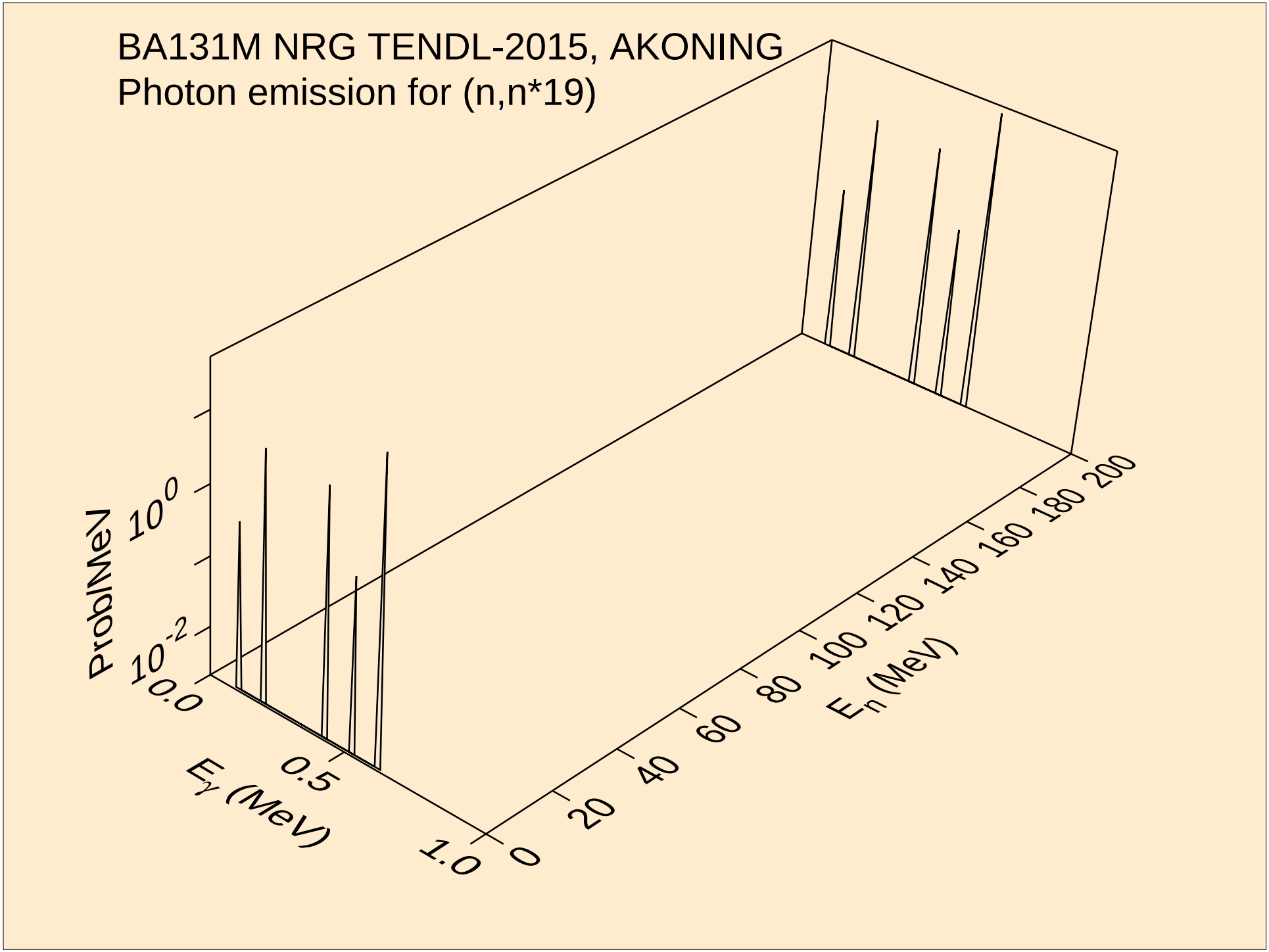

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*14)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.2
0.4
0.6
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

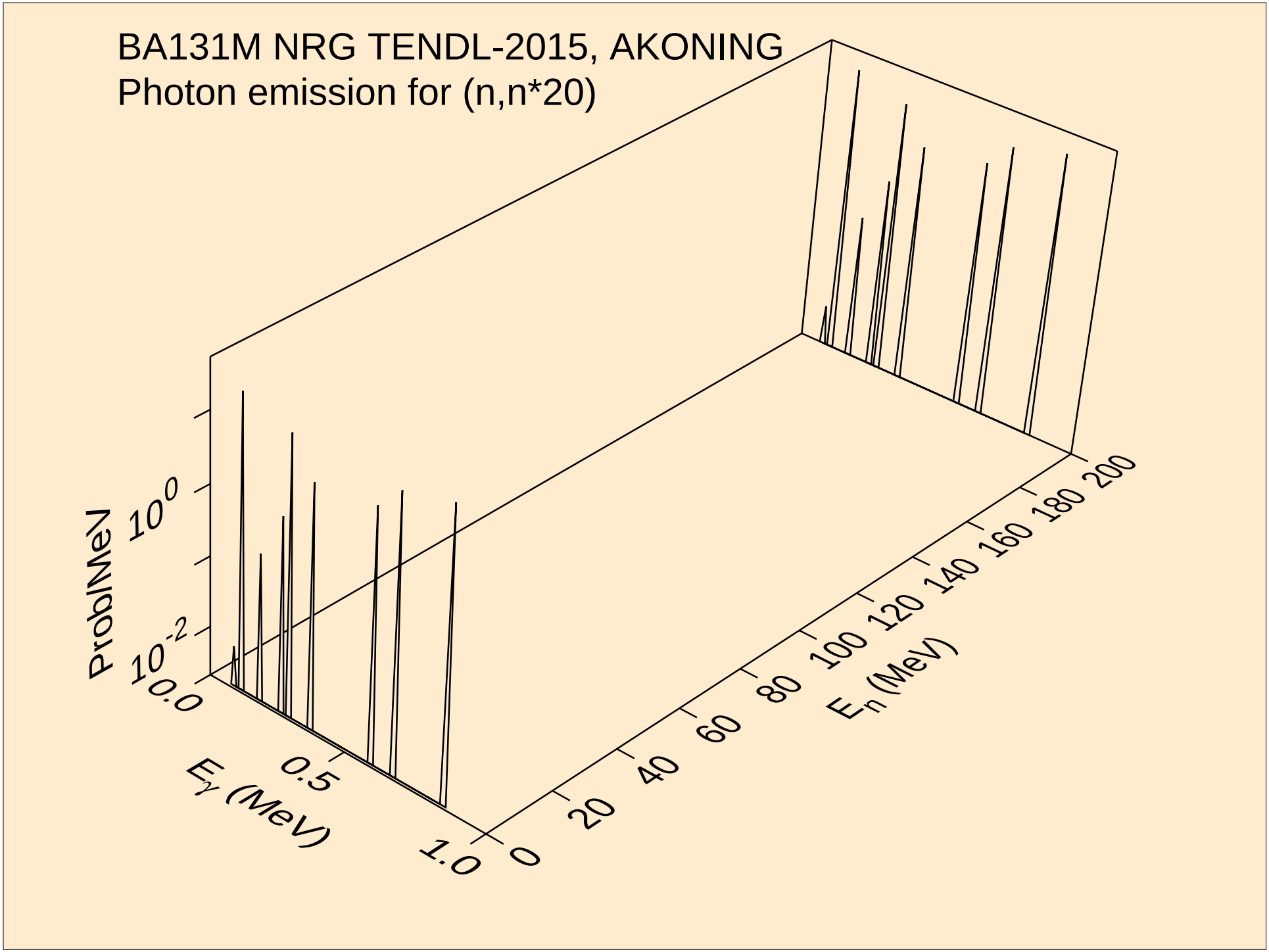

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*15)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.2
0.4
0.6
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

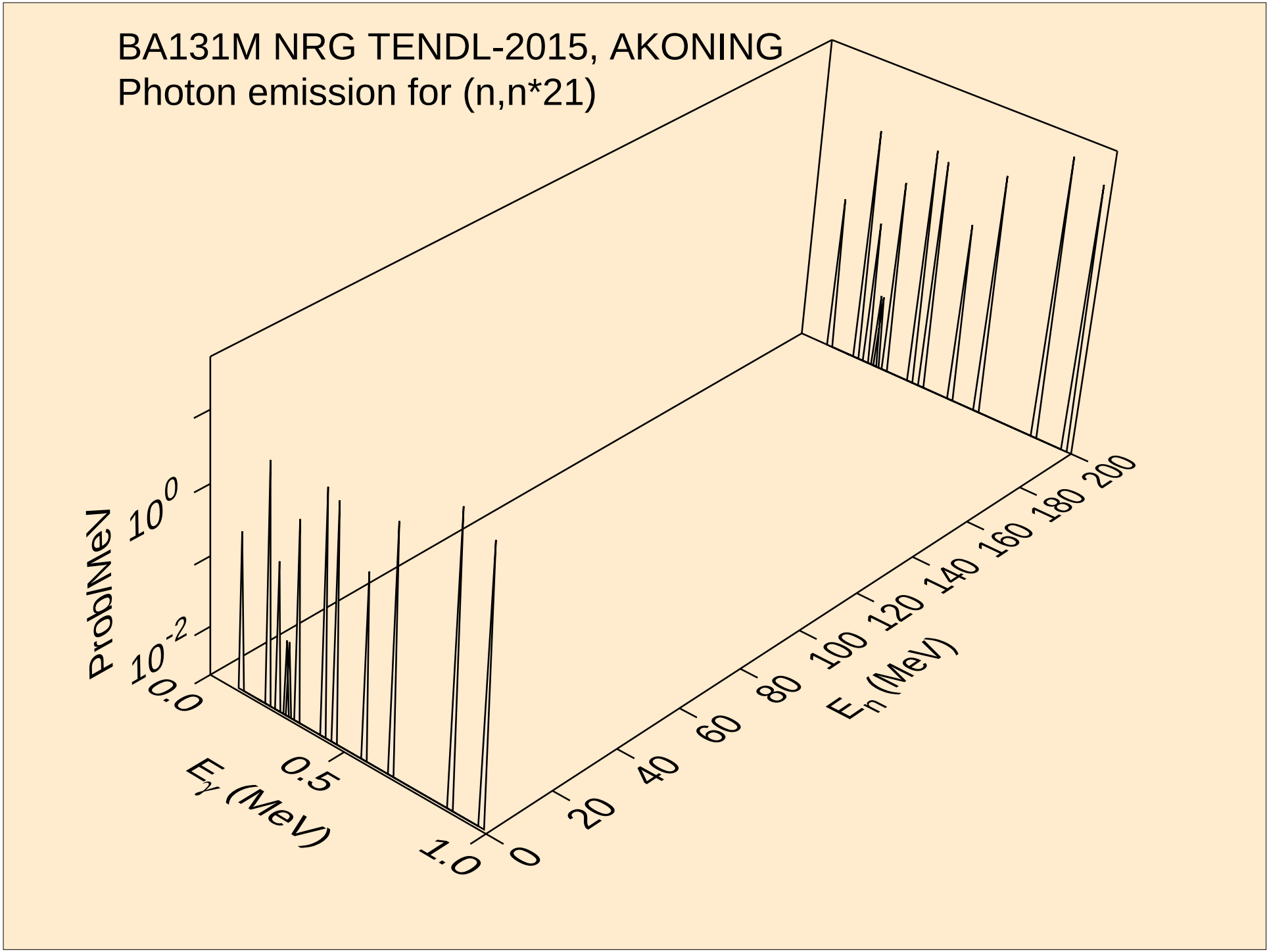

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*16)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.2
0.4
0.6
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

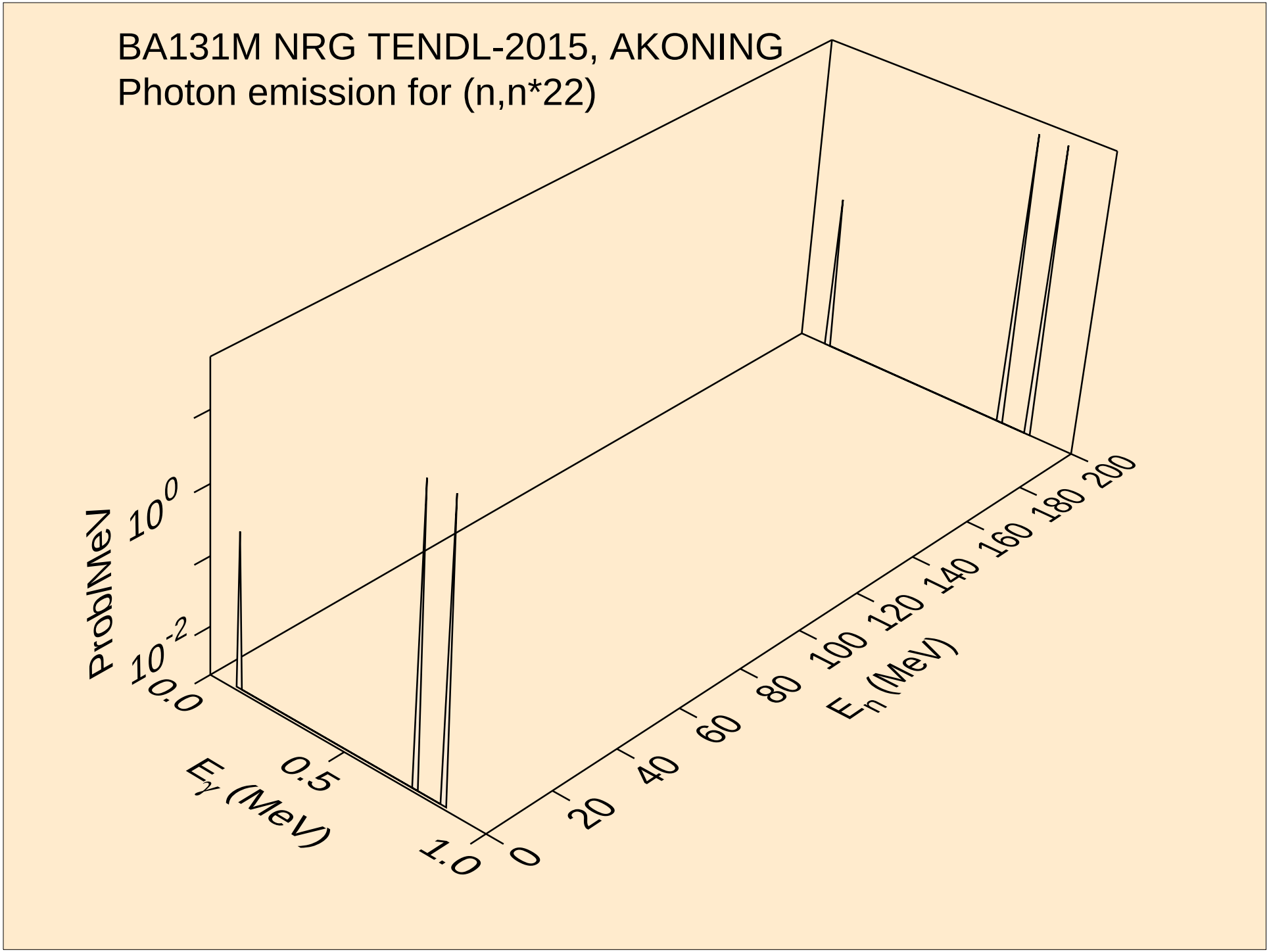

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*17)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

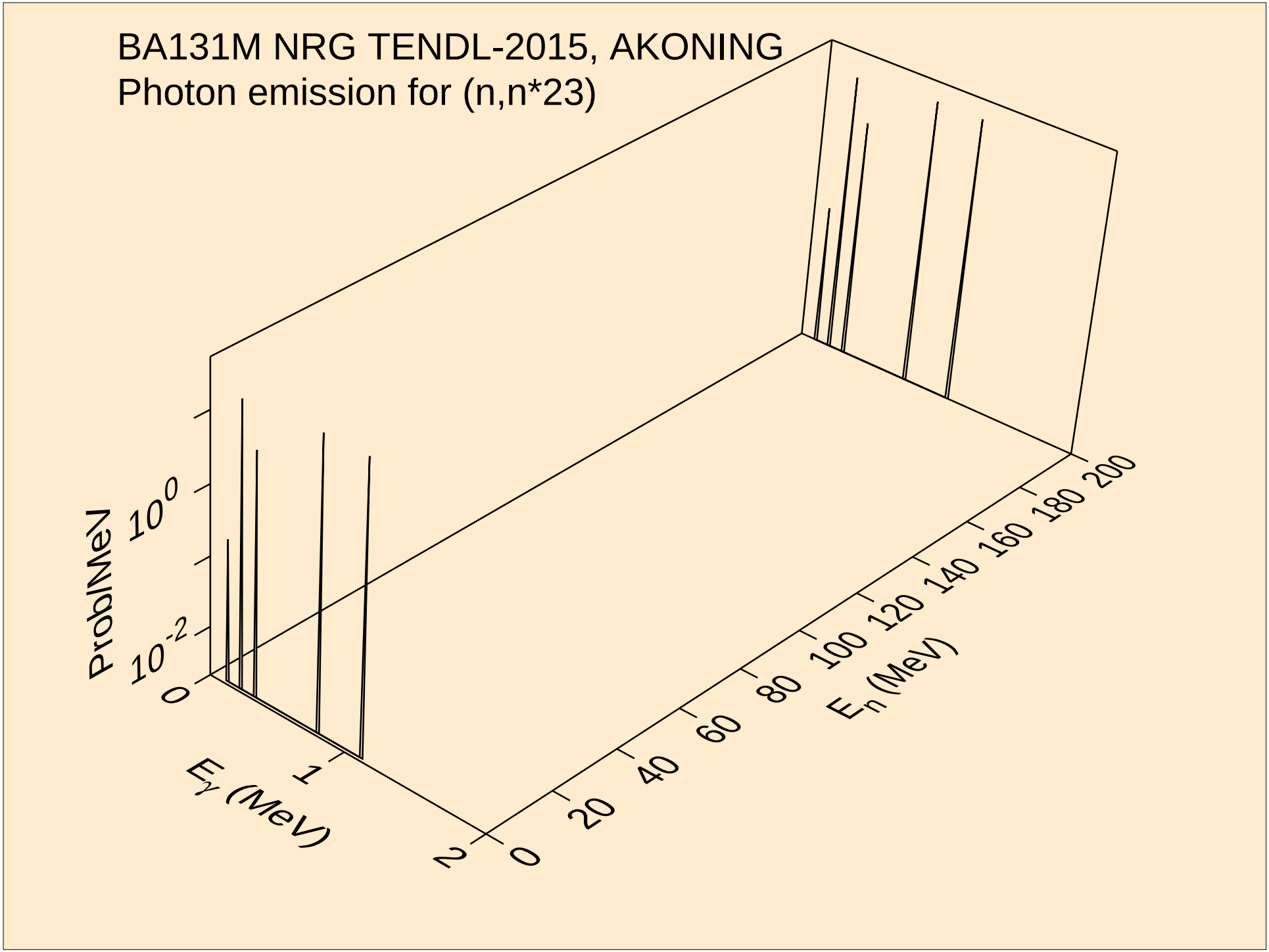

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*18)
Prob/MeV
10^0
10^-2
0.0
0.5
1.0
Eγ (MeV)
0
20
40
60
80
100
120
140
160
180
200
En (MeV)

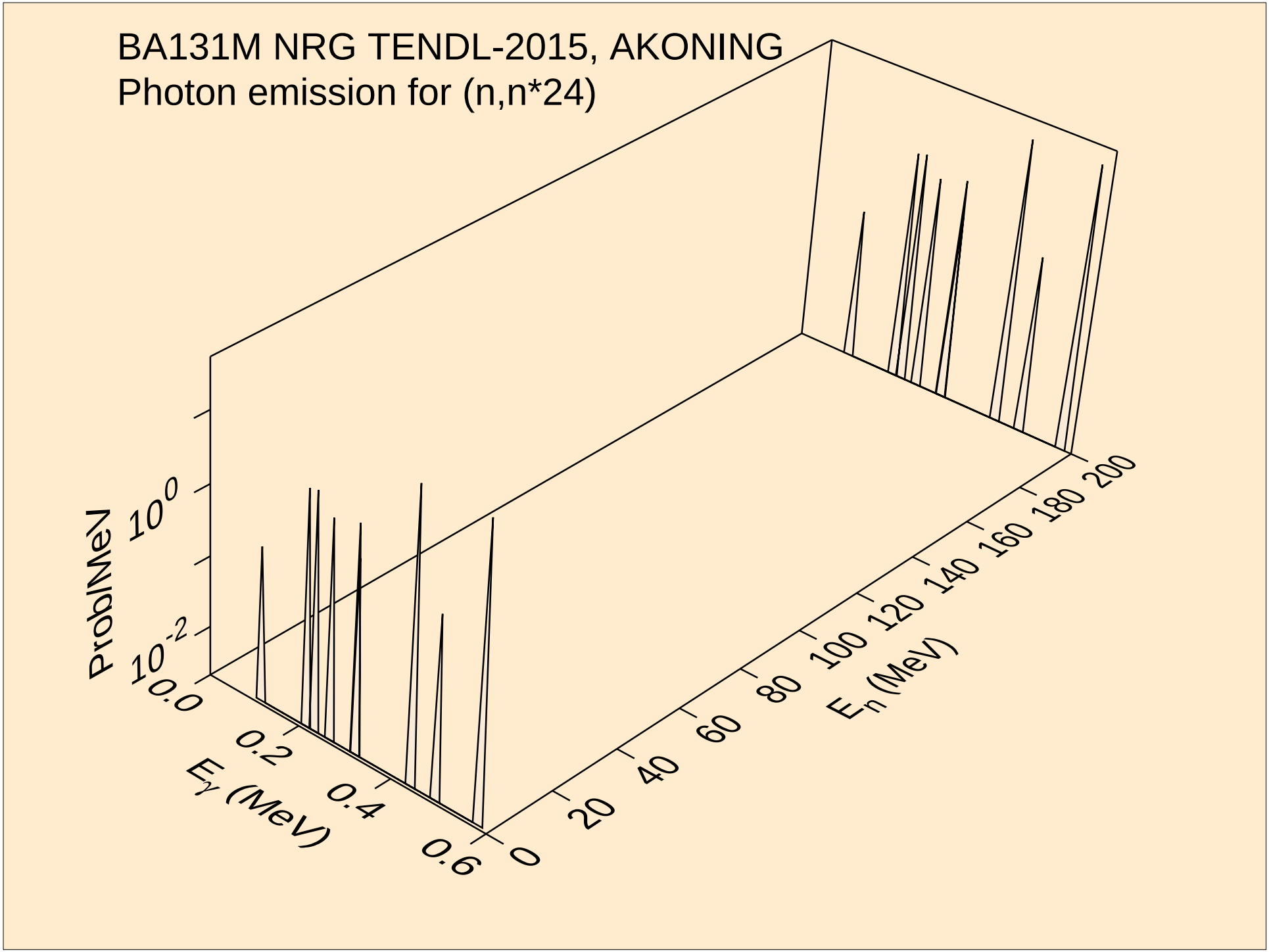

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*19)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

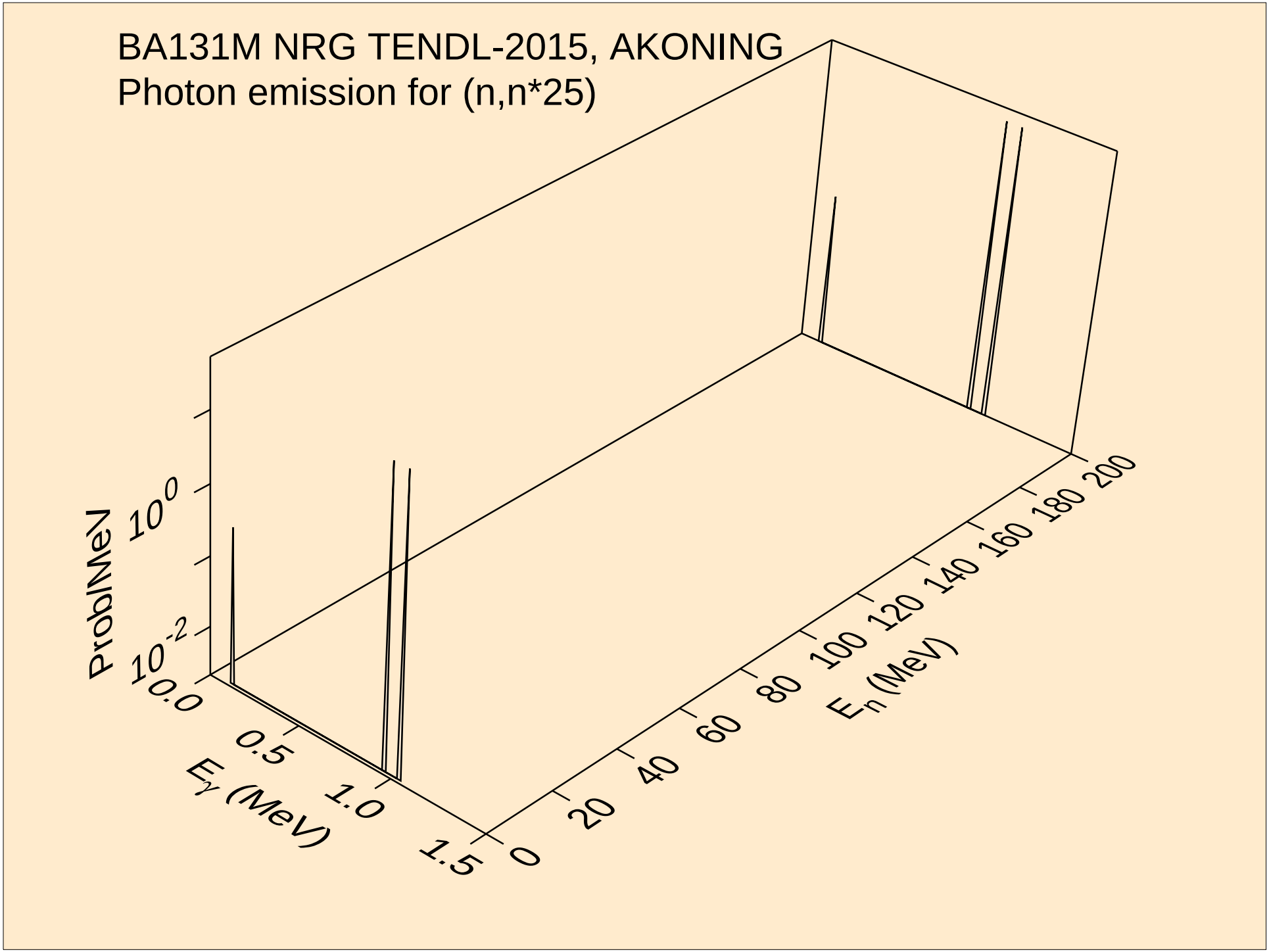

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*20)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

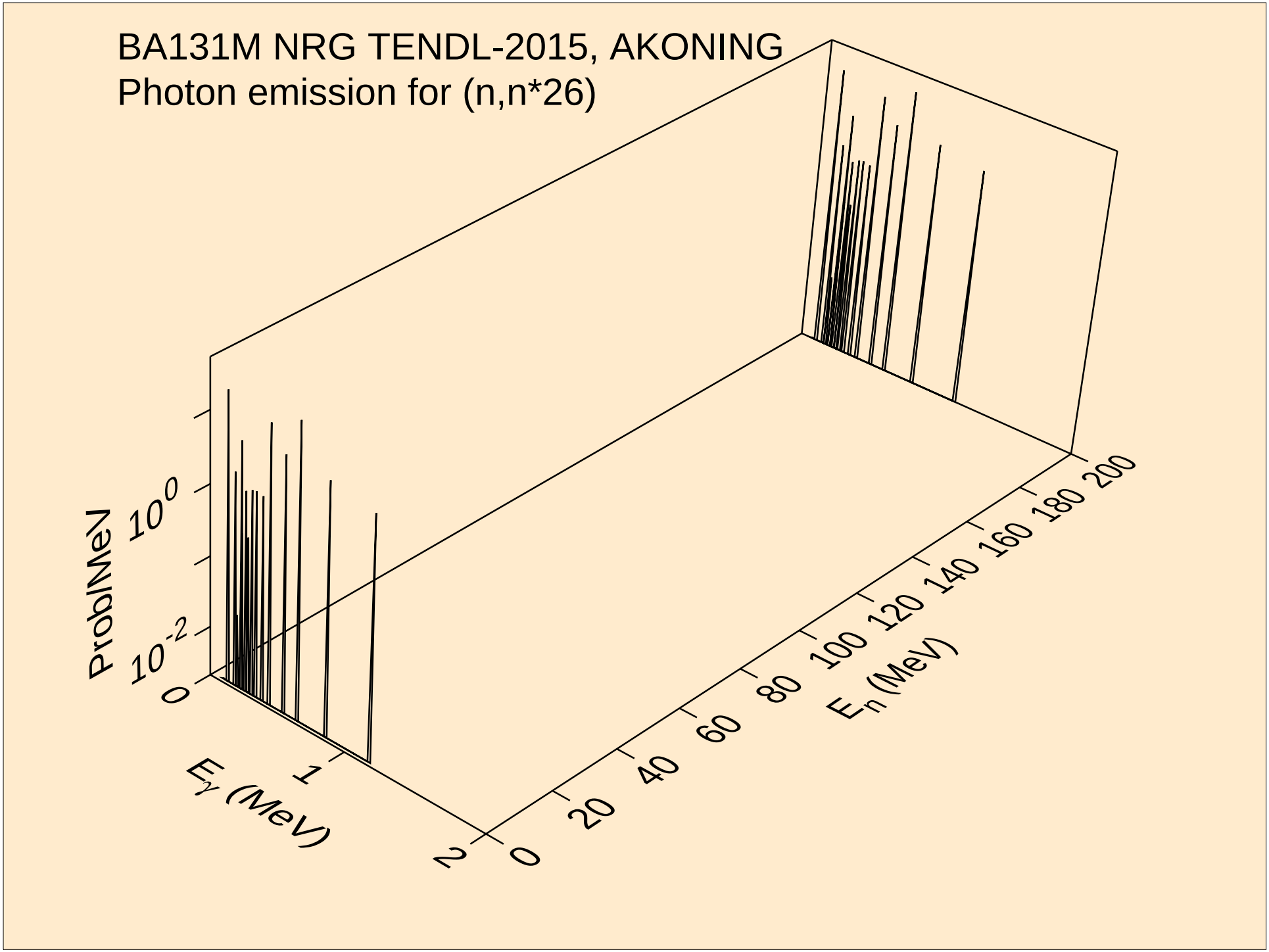

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*21)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

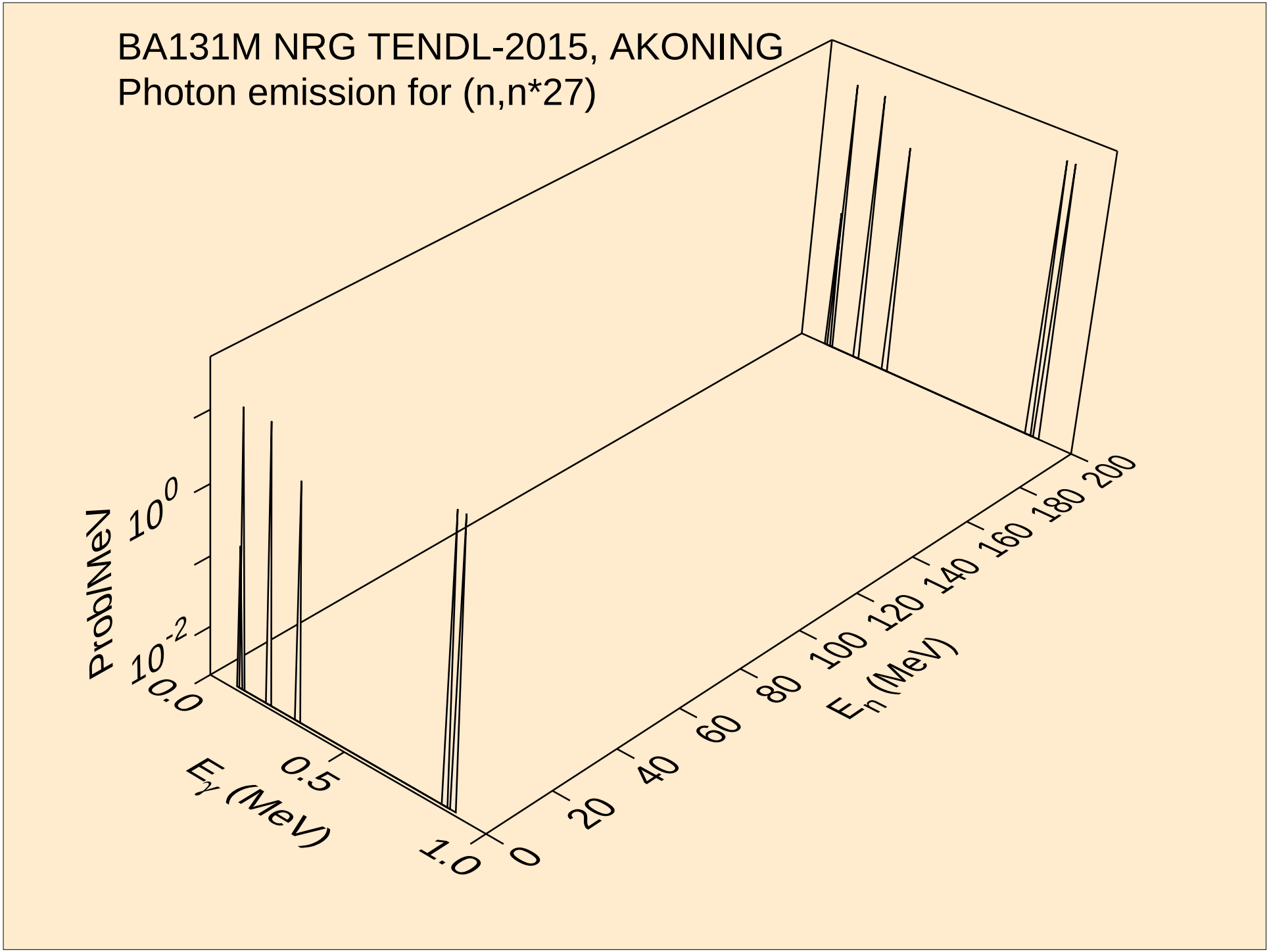

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*22)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

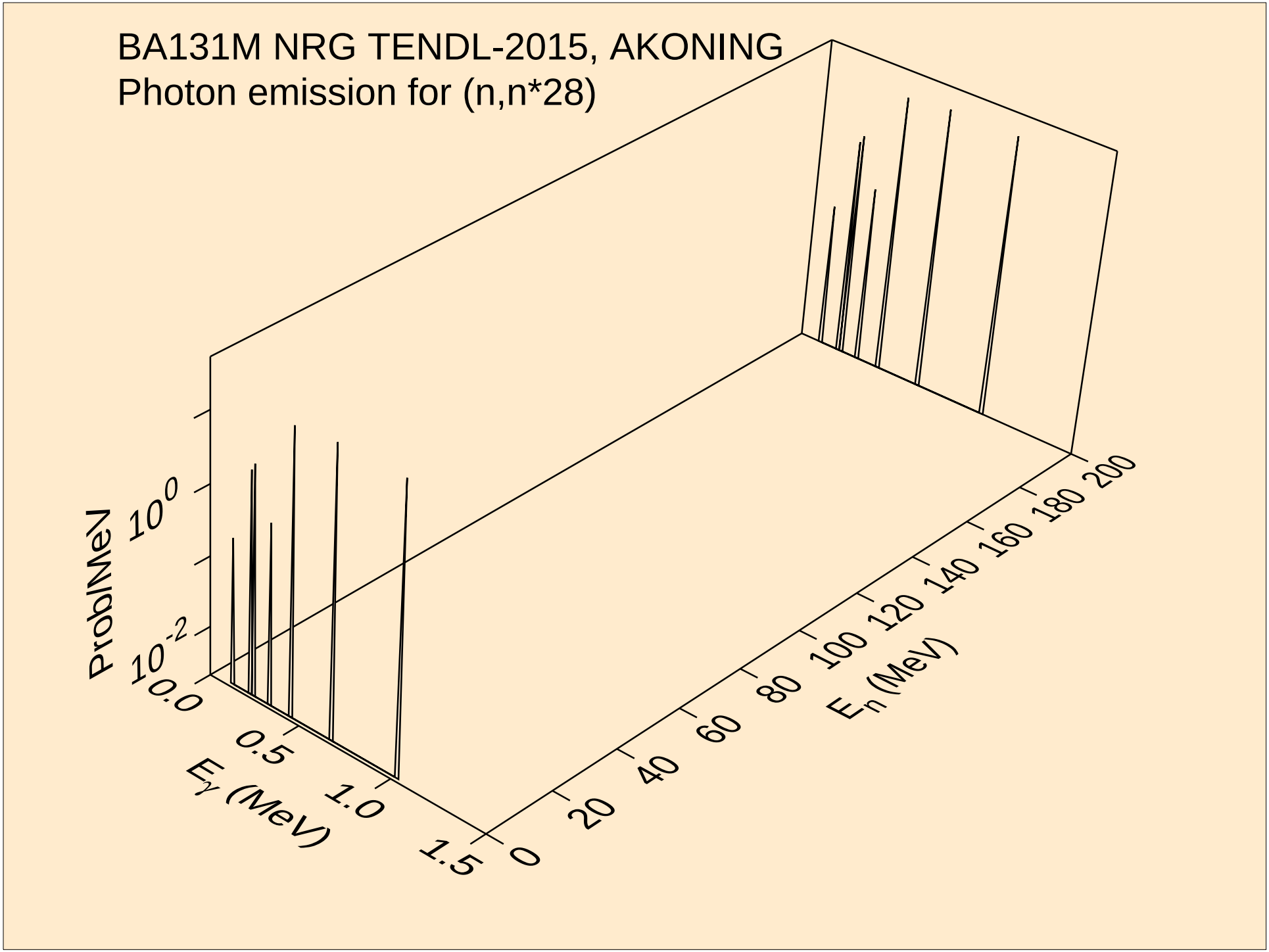

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*23)
Prob/MeV
10^0
10^-2
0
1
2
Eγ (MeV)
0
20
40
60
80
100
120
140
160
180
200
En (MeV)

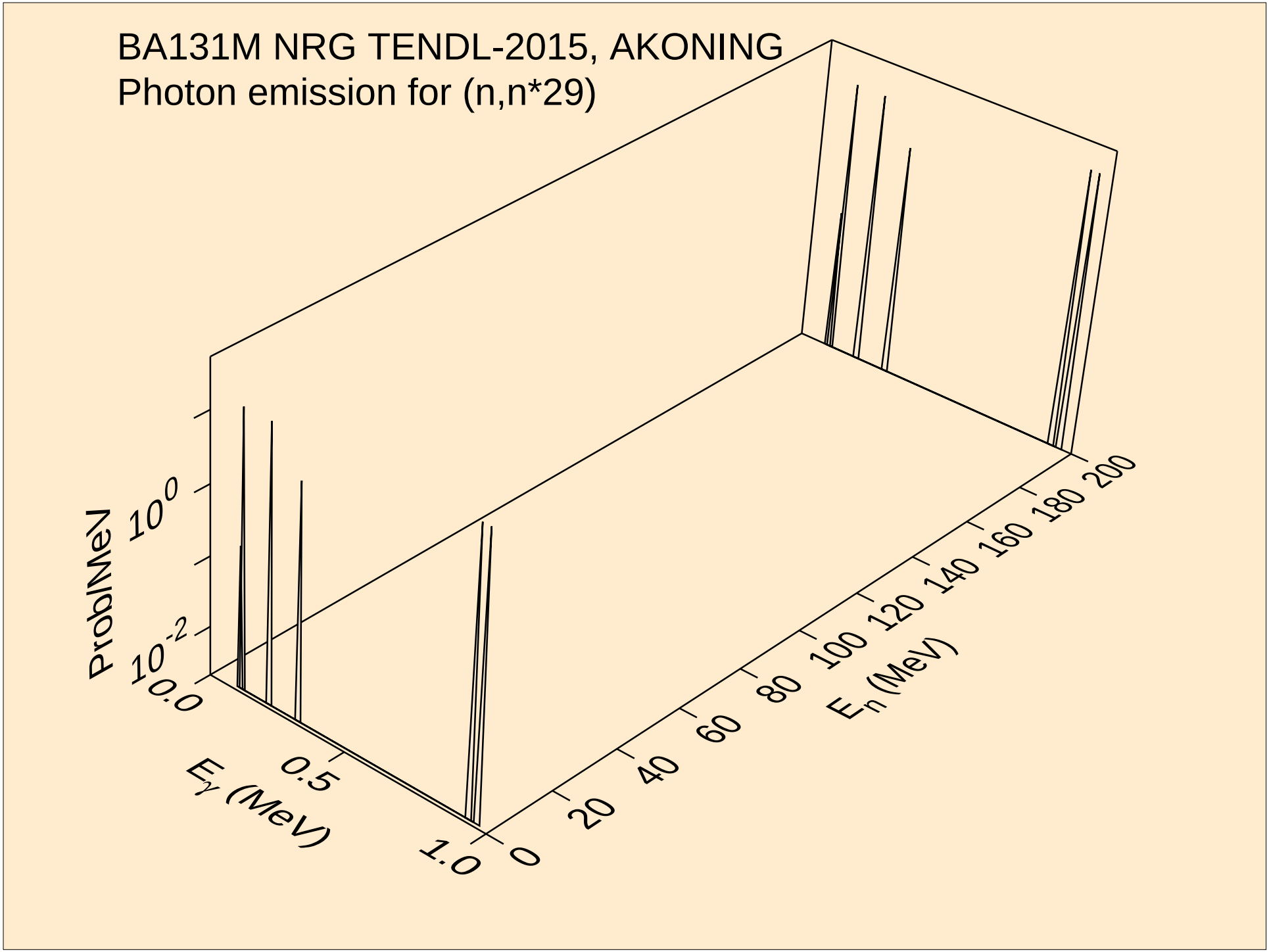

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*24)
Prob/MeV
10^0
10^-2
0.0
0.2
0.4
0.6
E_γ (MeV)
0
20
40
60
80
100
120
140
160
180
200
E_n (MeV)

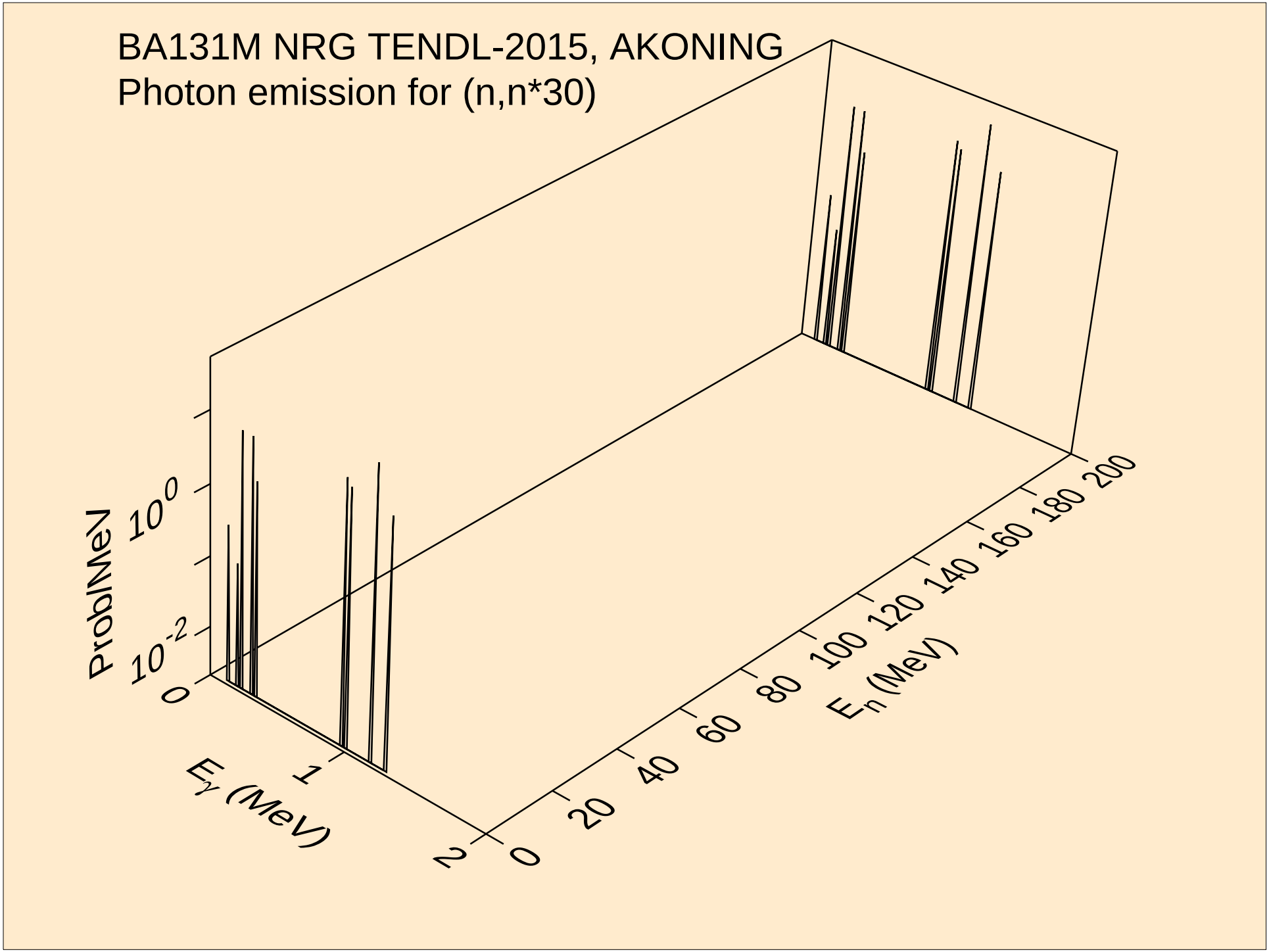

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*25)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
1.5
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

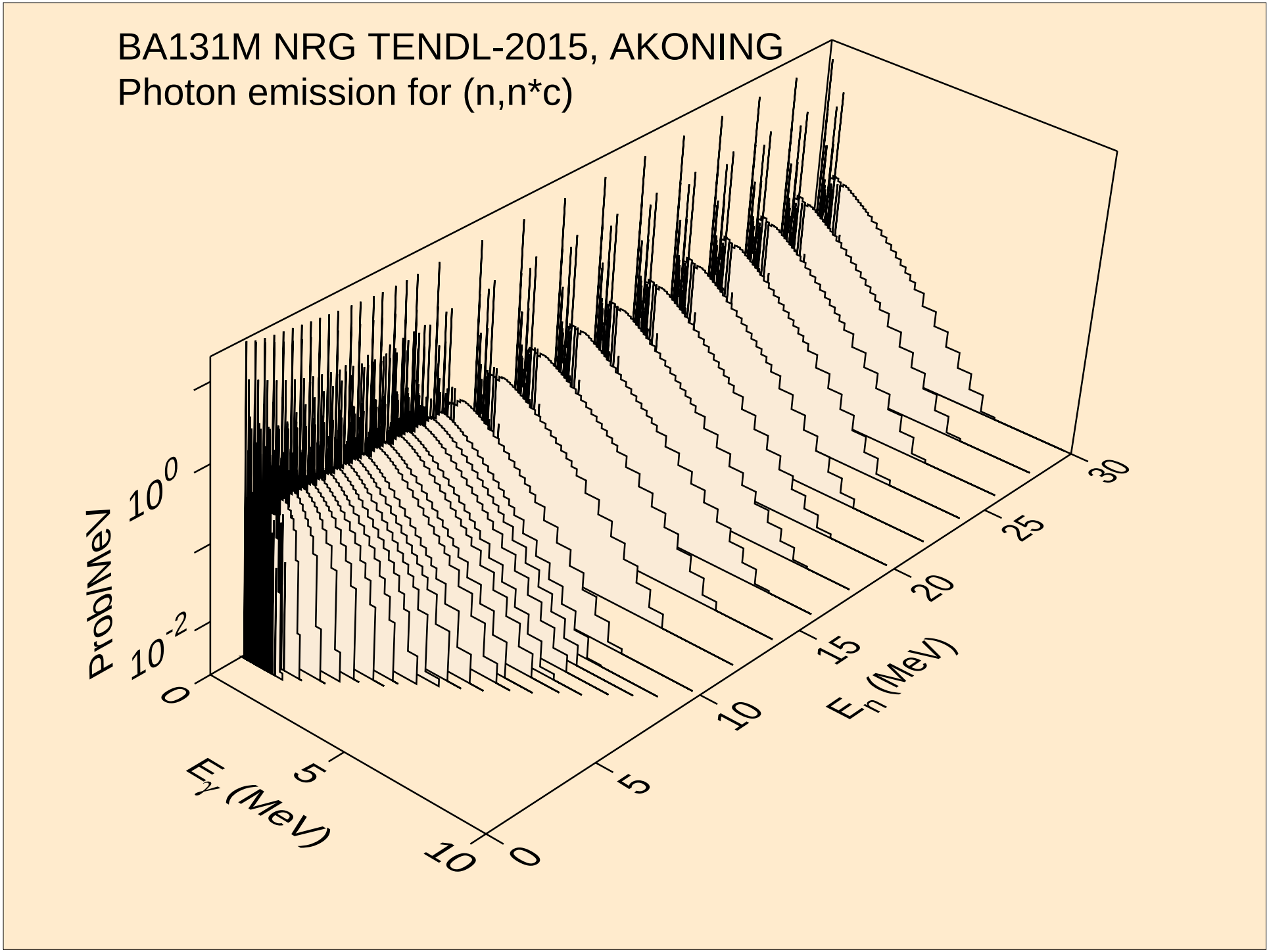

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*26)
Prob/MeV
10^0
10^-2
0
1
2
Eγ (MeV)
0
20
40
60
80
100
120
140
160
180
200
En (MeV)

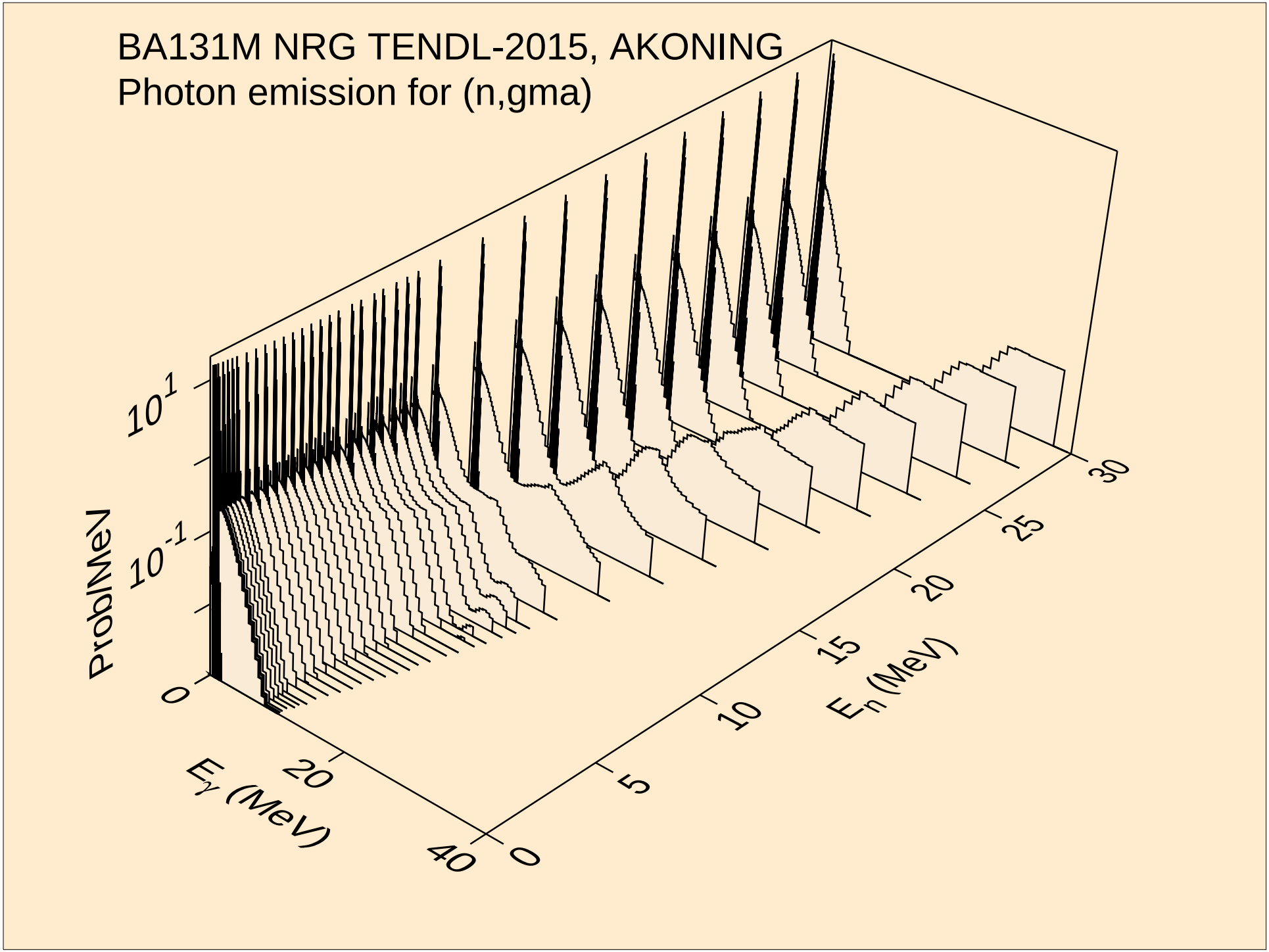

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*27)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

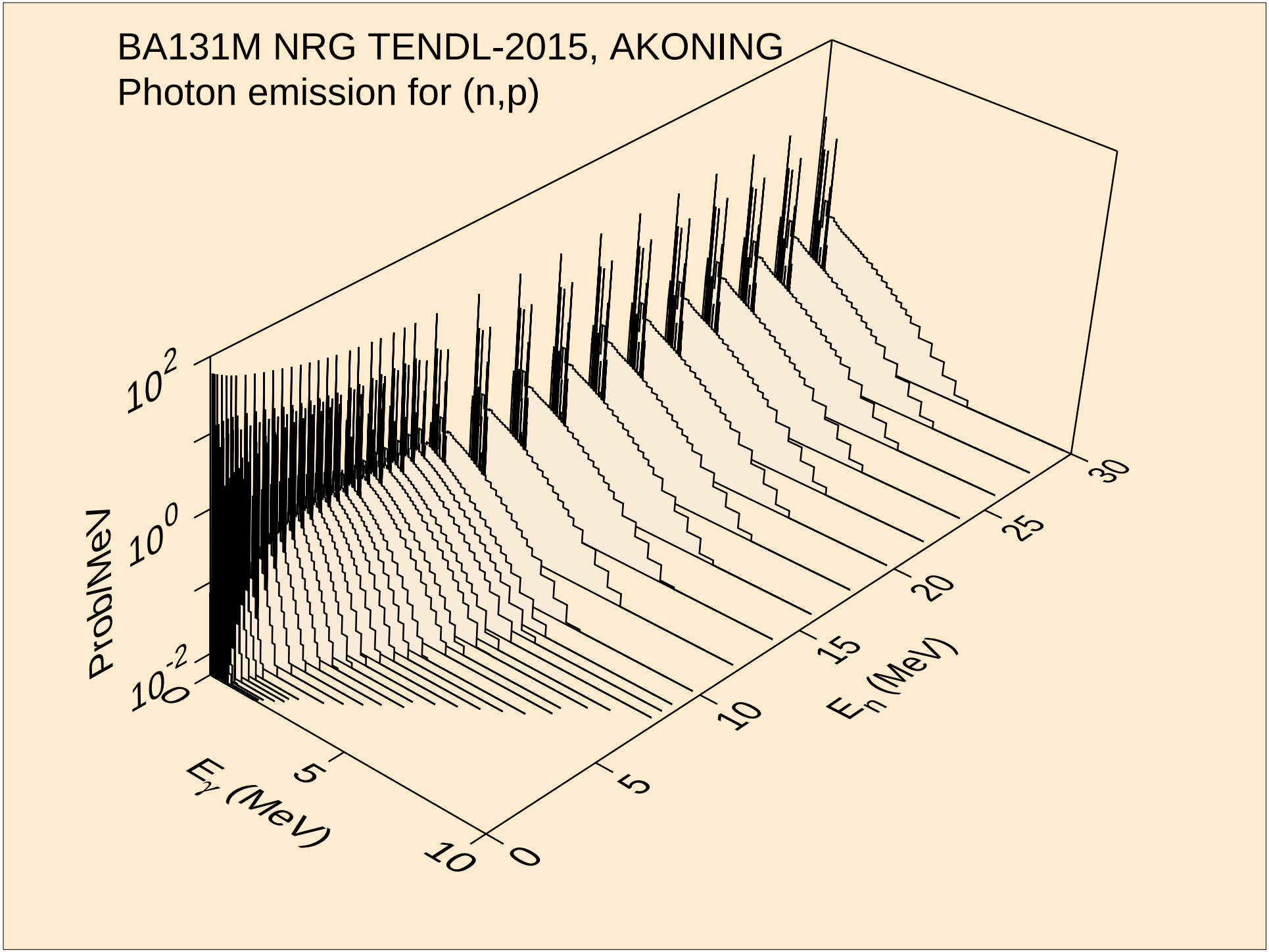

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*28)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
1.5
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

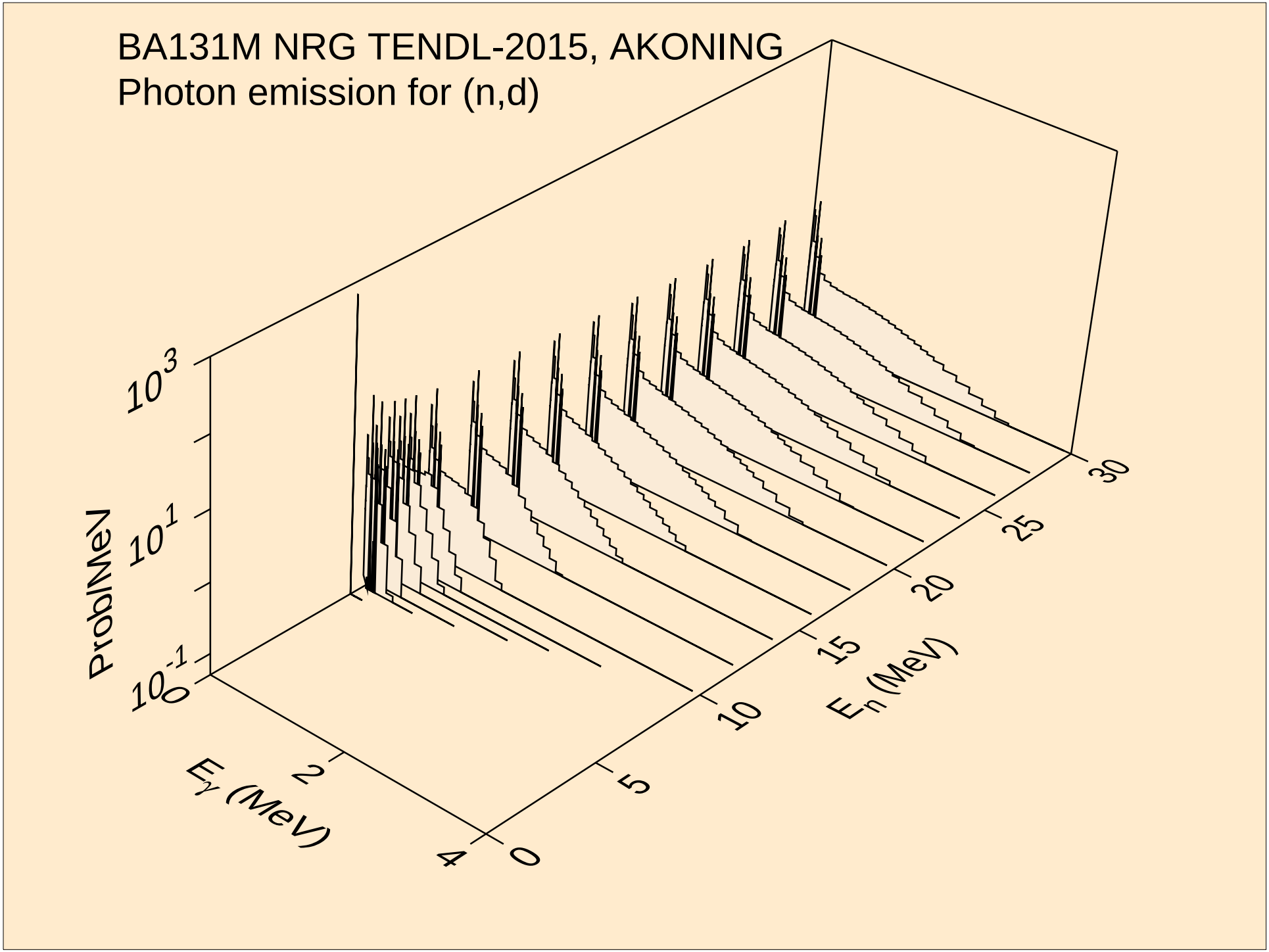

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*29)
Prob/MeV
$10^{0}$
$10^{-2}$
0.0
0.5
1.0
$E_\gamma$ (MeV)
0
20
40
60
80
100
120
140
160
180
200
$E_n$ (MeV)

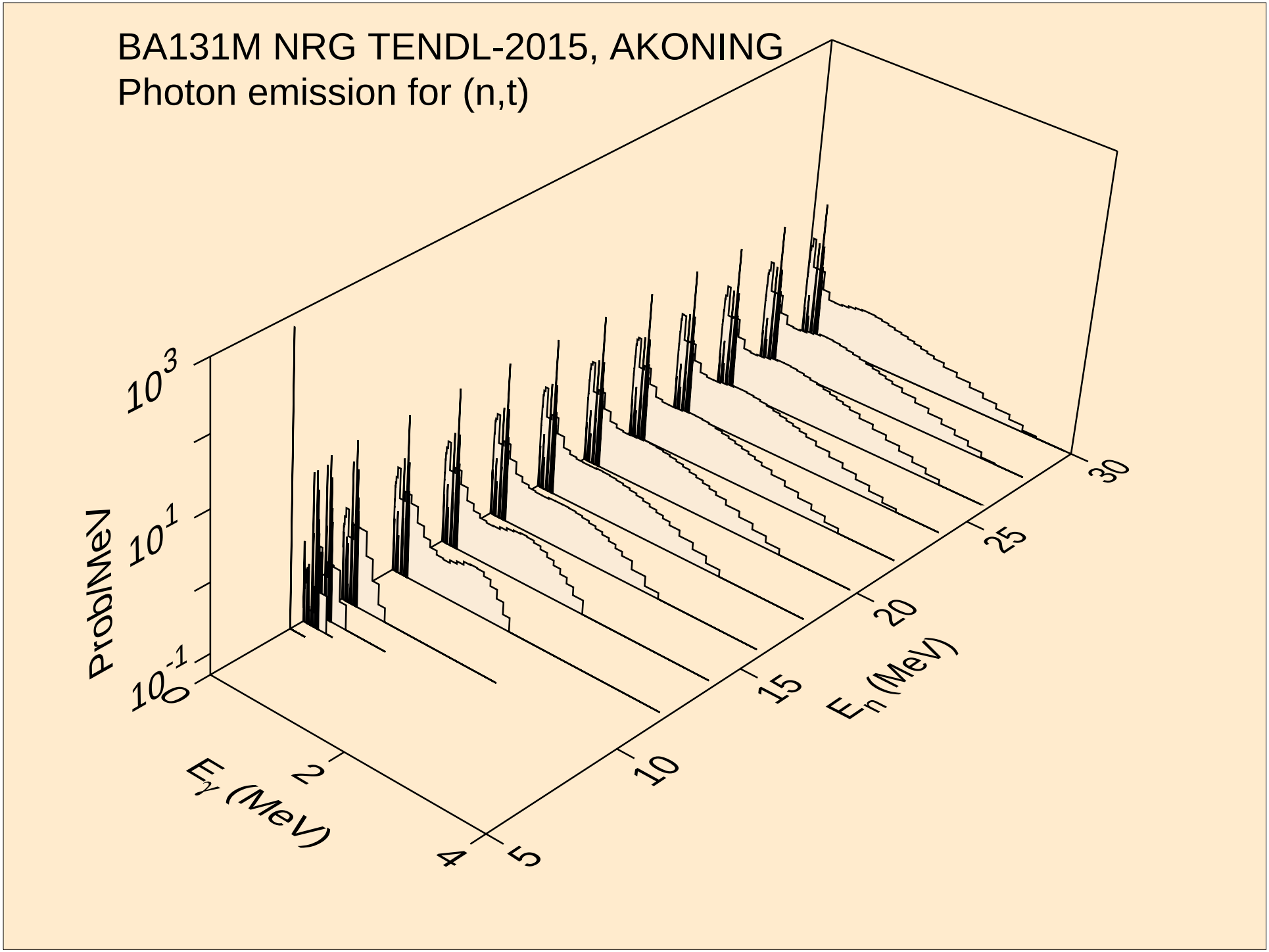

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*30)
Prob/MeV
10^0
10^-2
0
1
2
Eγ (MeV)
0
20
40
60
80
100
120
140
160
180
200
En (MeV)

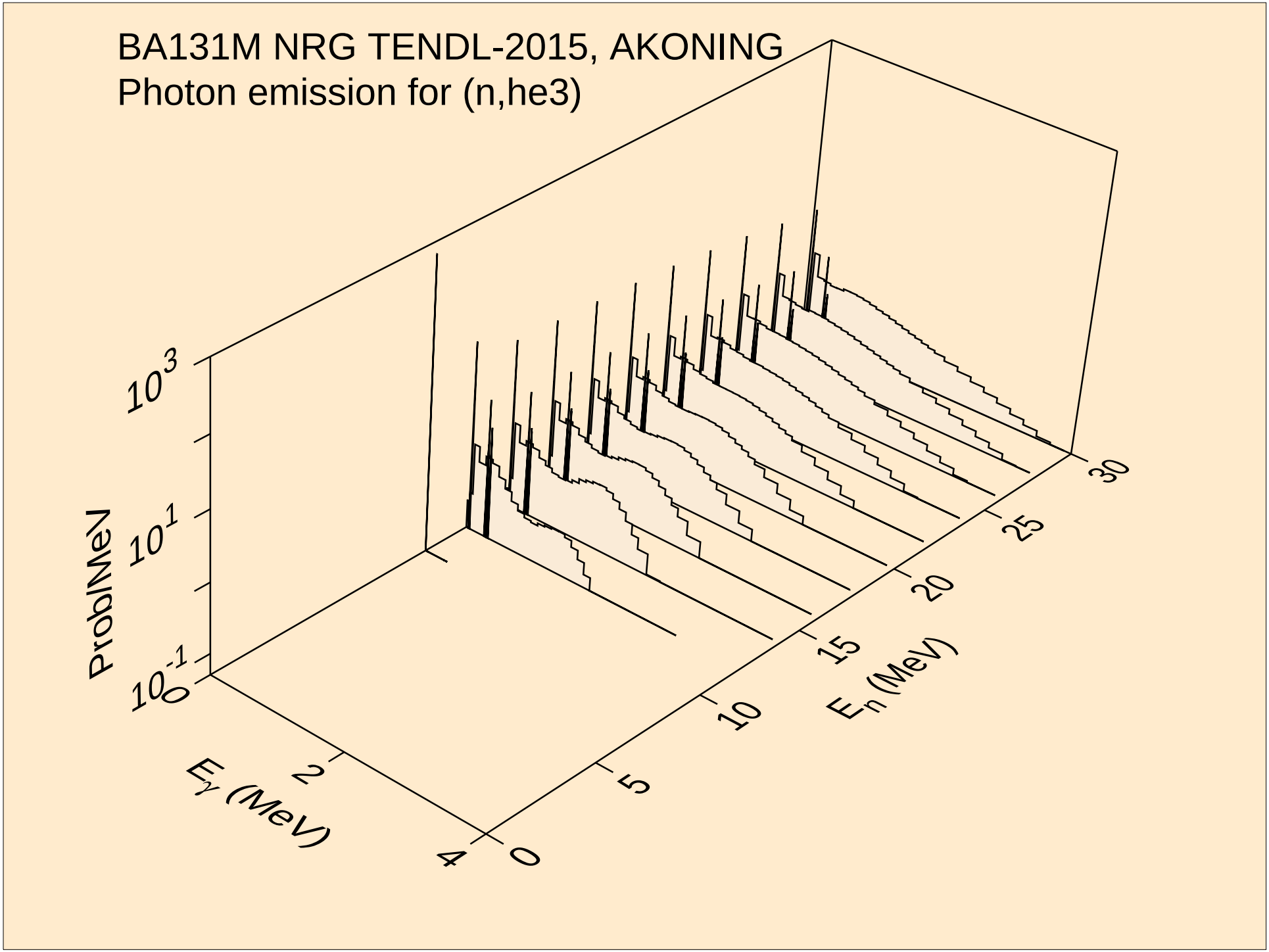

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,n*c)
Prob/MeV
10^0
10^-2
0
E_γ (MeV)
5
10
0
5
10
15
20
25
30
E_n (MeV)

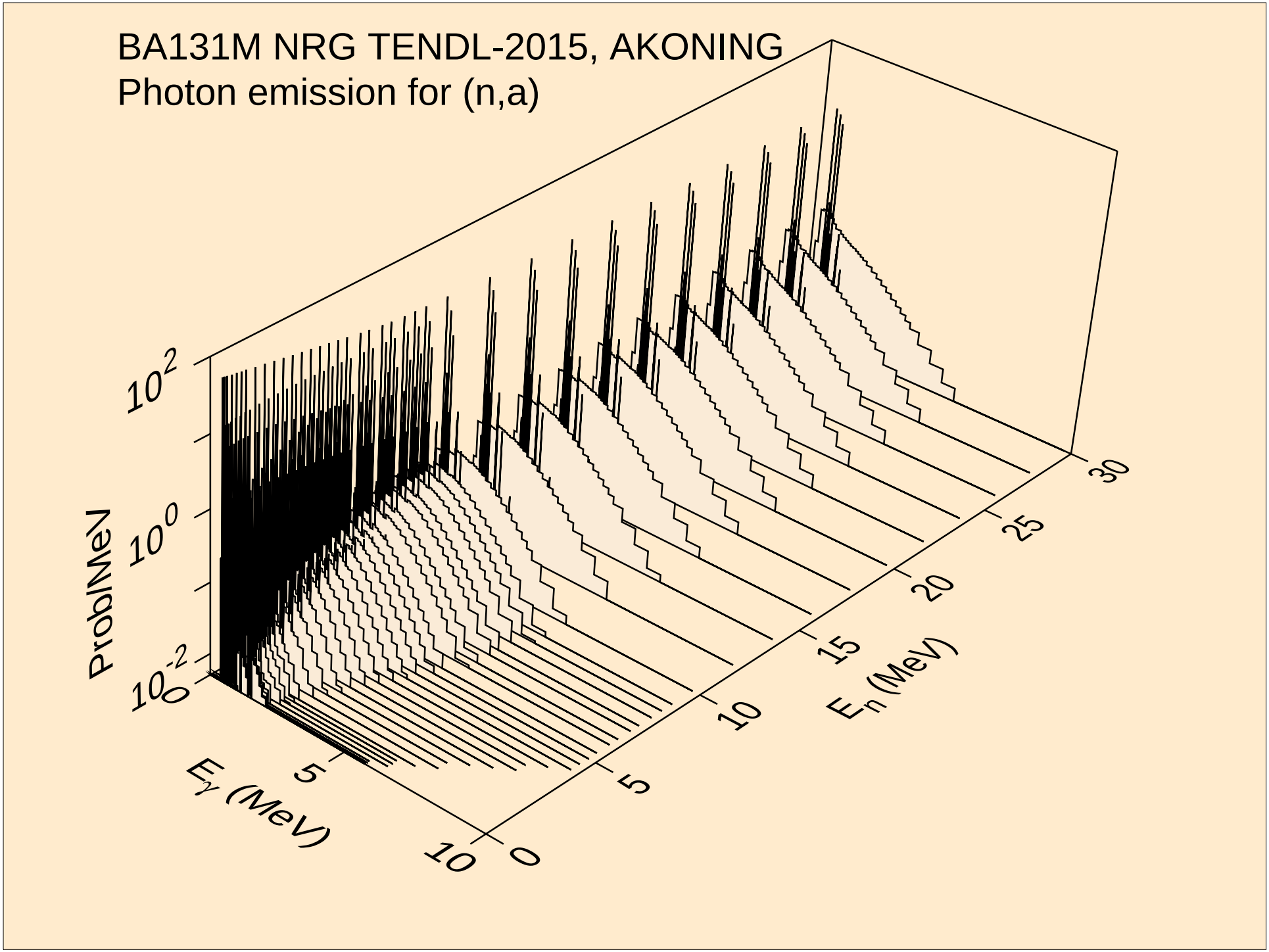

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,gma)
Prob/MeV
$10^{1}$
$10^{-1}$
0
20
40
$E_\gamma$ (MeV)
0
5
10
15
20
25
30
$E_n$ (MeV)

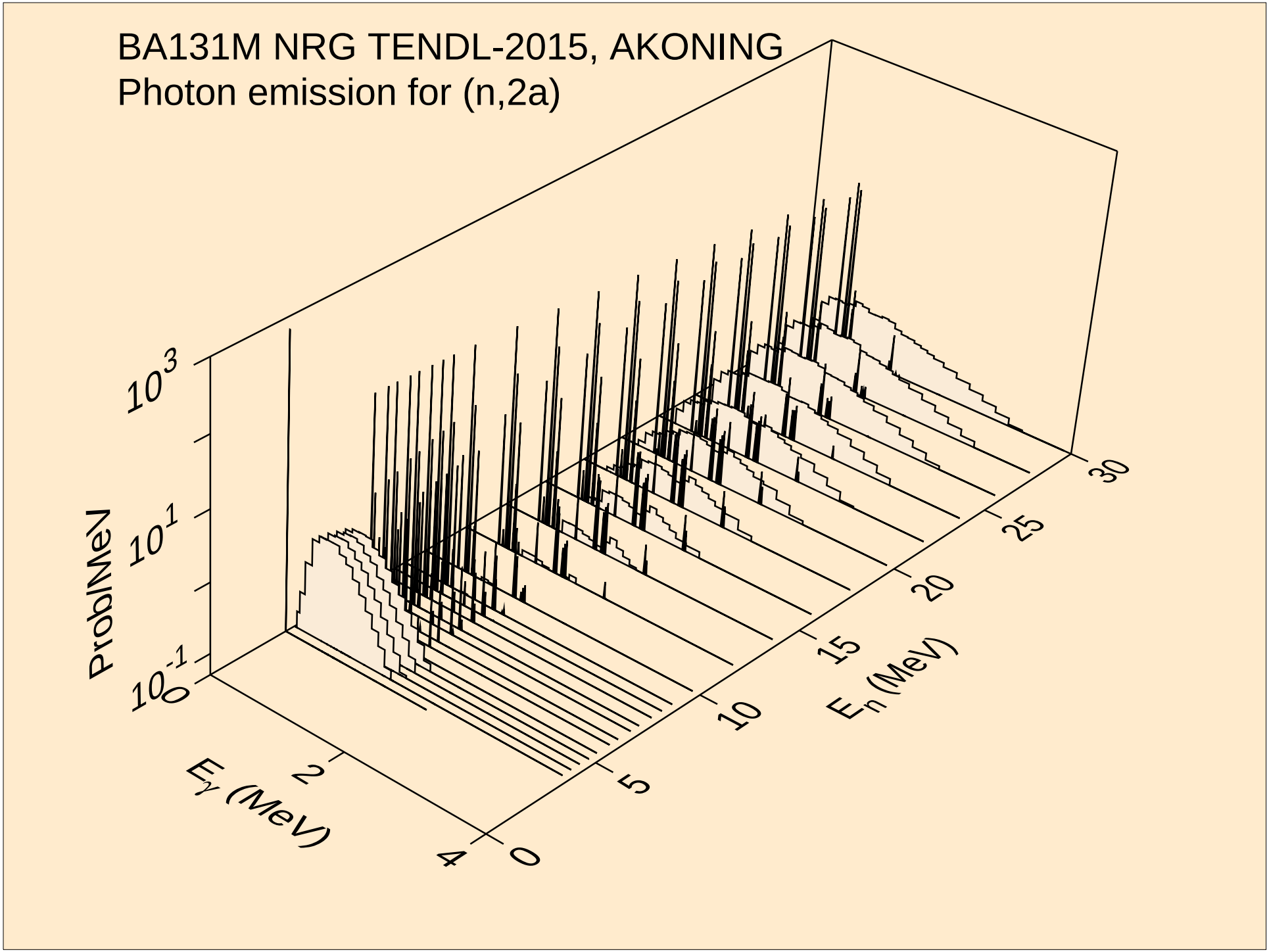

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,p)
Prob/MeV
$10^{2}$
$10^{0}$
$10^{-2}$
0
5
10
$E_\gamma$ (MeV)
0
5
10
15
20
25
30
$E_n$ (MeV)

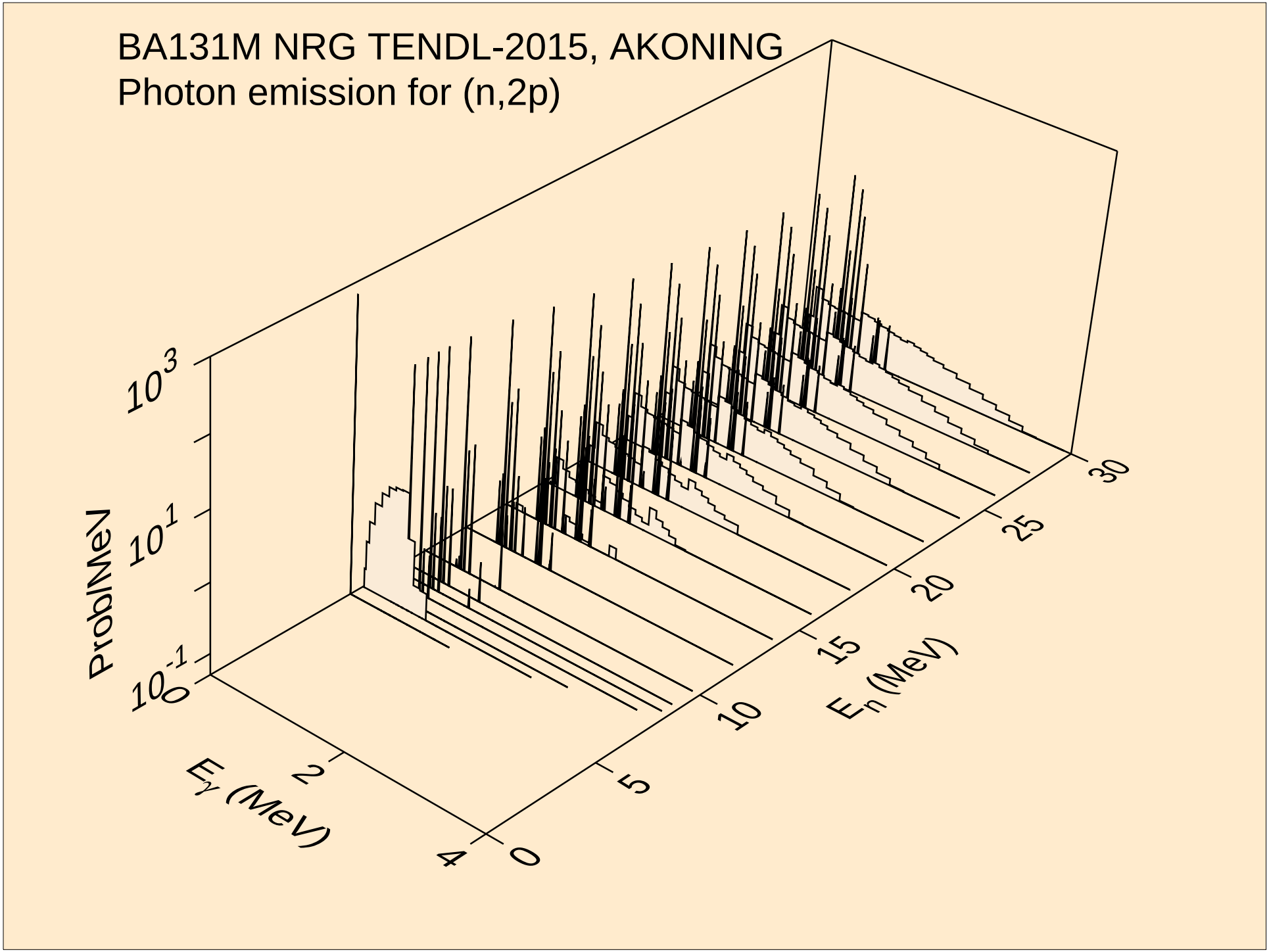

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,d)
Prob/MeV
$10^{3}$
$10^{1}$
$10^{-1}$
$E_\gamma$ (MeV)
0
2
4
$E_n$ (MeV)
0
5
10
15
20
25
30

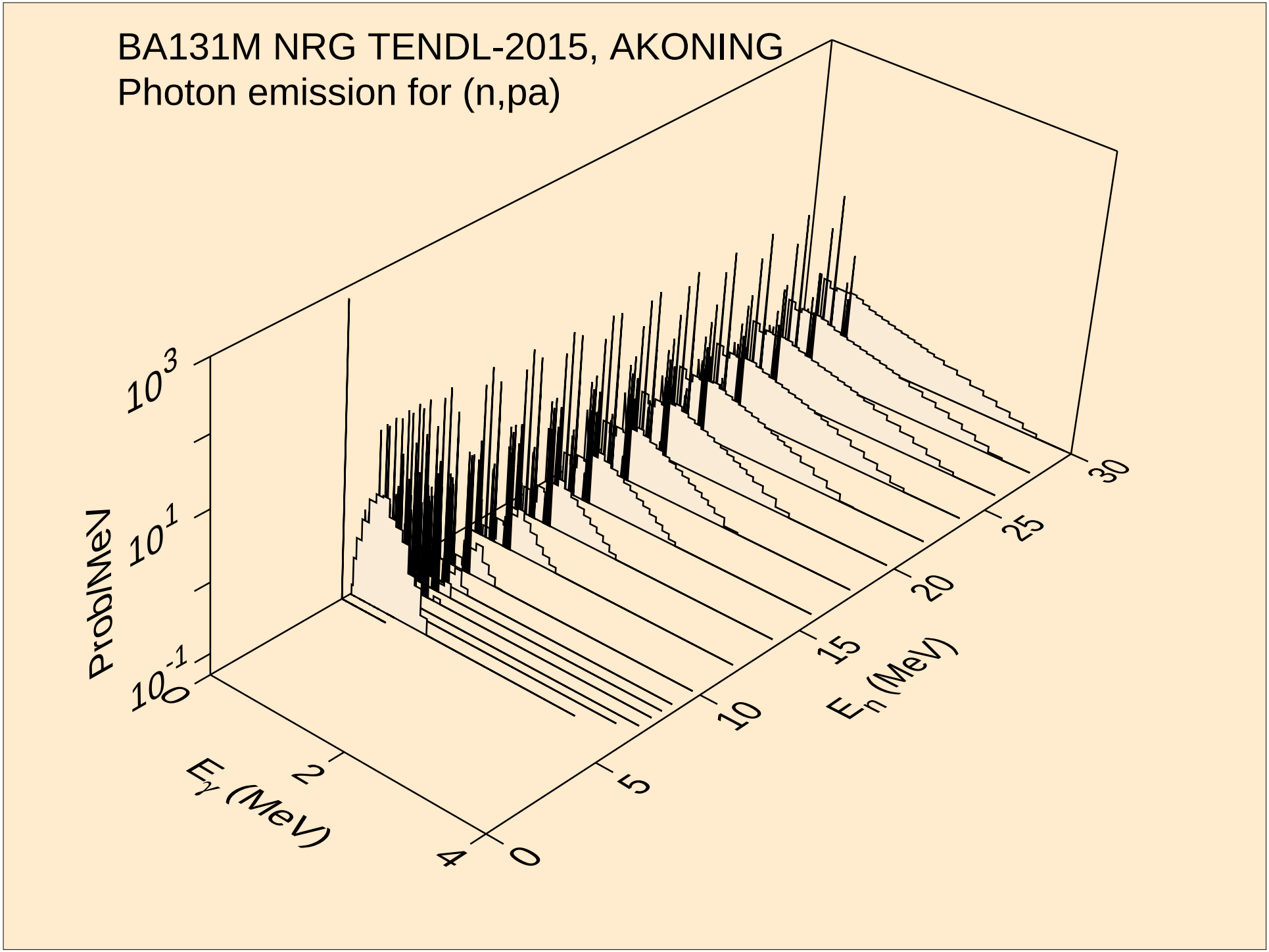

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,t)
Prob/MeV
$10^{3}$
$10^{1}$
$10^{-1}$
0
2
4
$E_\gamma$ (MeV)
5
10
15
20
25
30
$E_n$ (MeV)

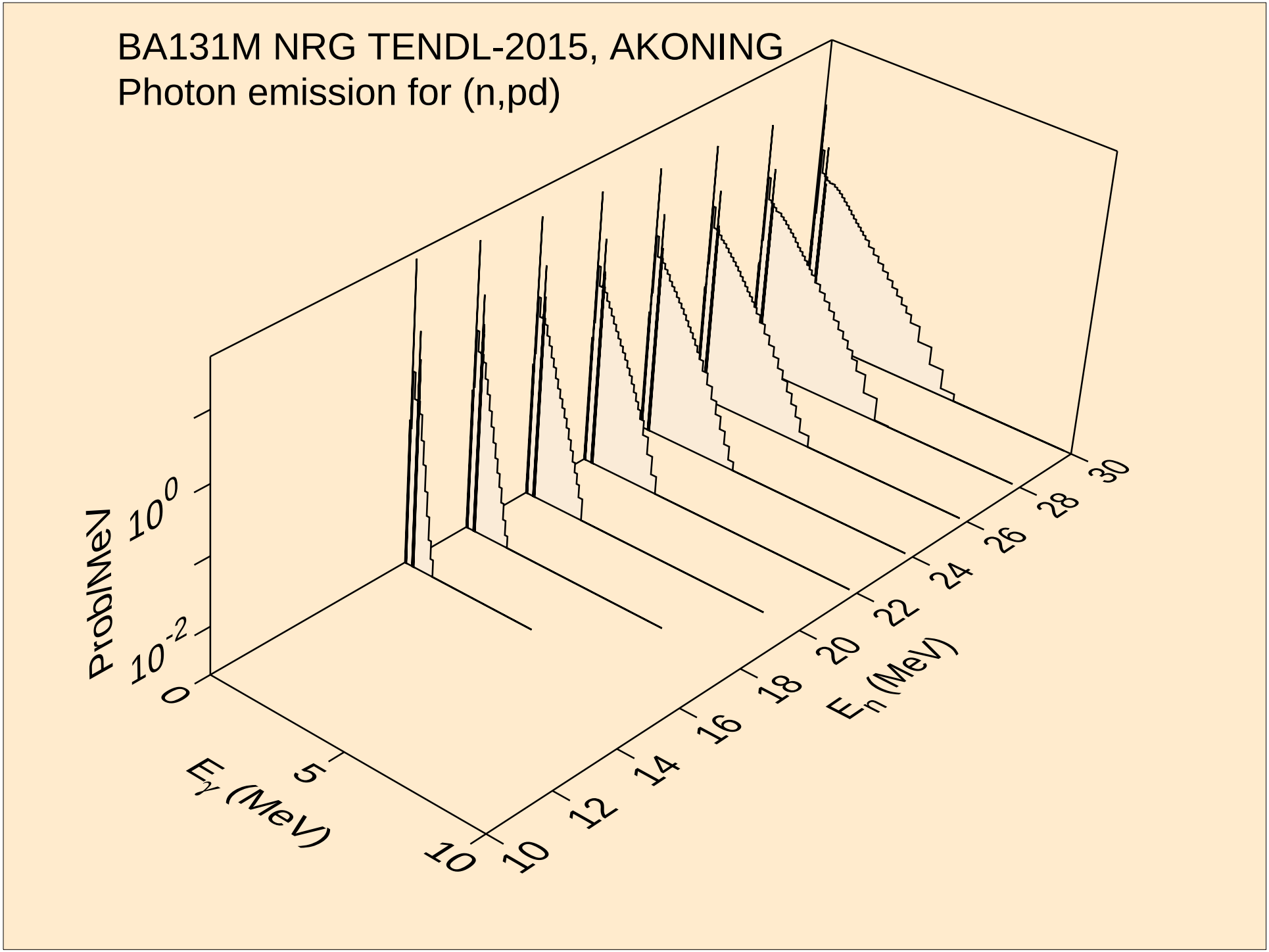

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,he3)
Prob/MeV
$10^{3}$
$10^{1}$
$10^{-1}$
$E_\gamma$ (MeV)
0
2
4
$E_n$ (MeV)
0
5
10
15
20
25
30

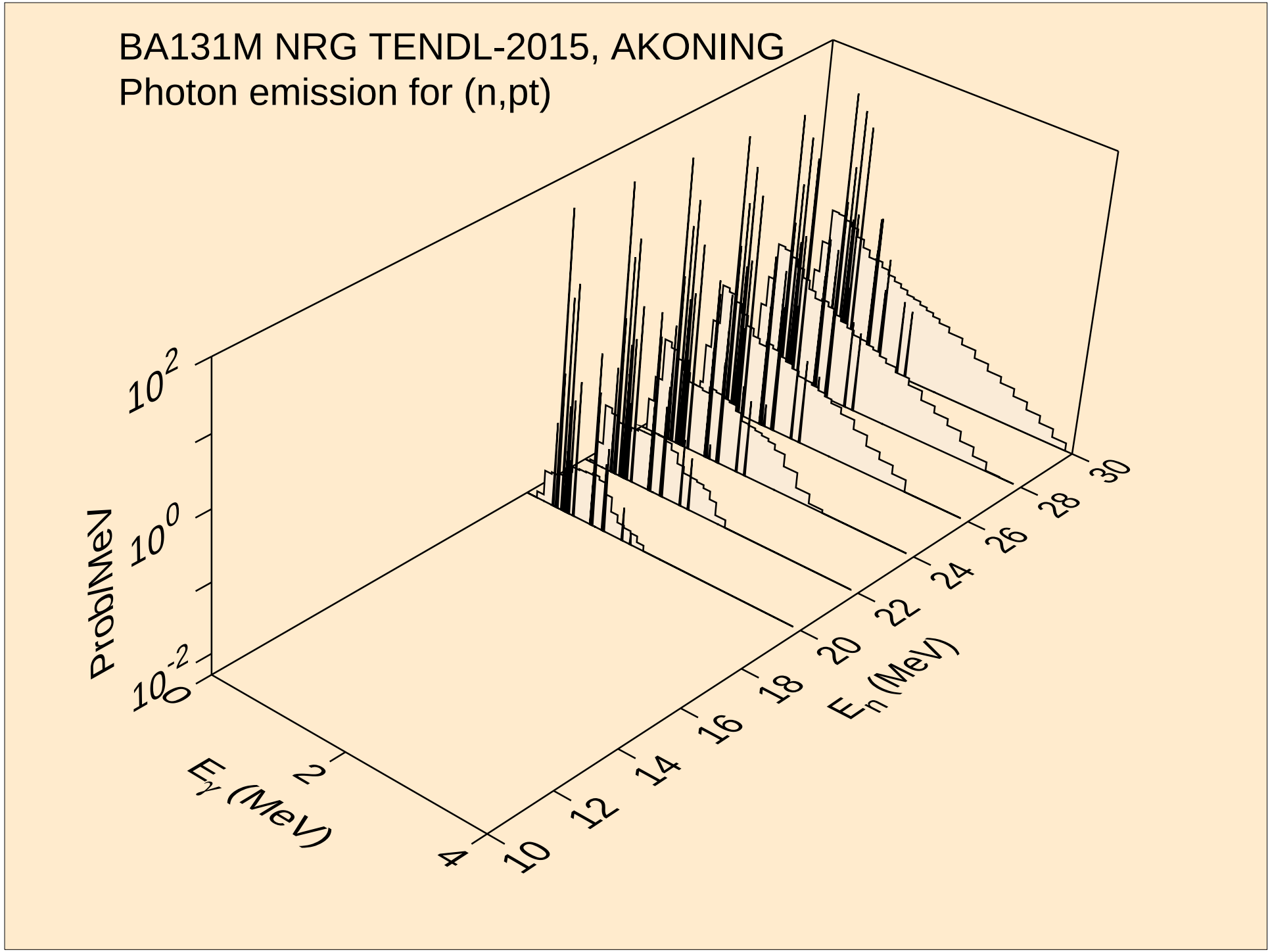

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,a)
Prob/MeV
$10^{2}$
$10^{0}$
$10^{-2}$
$E_\gamma$ (MeV)
0
5
10
$E_n$ (MeV)
0
5
10
15
20
25
30

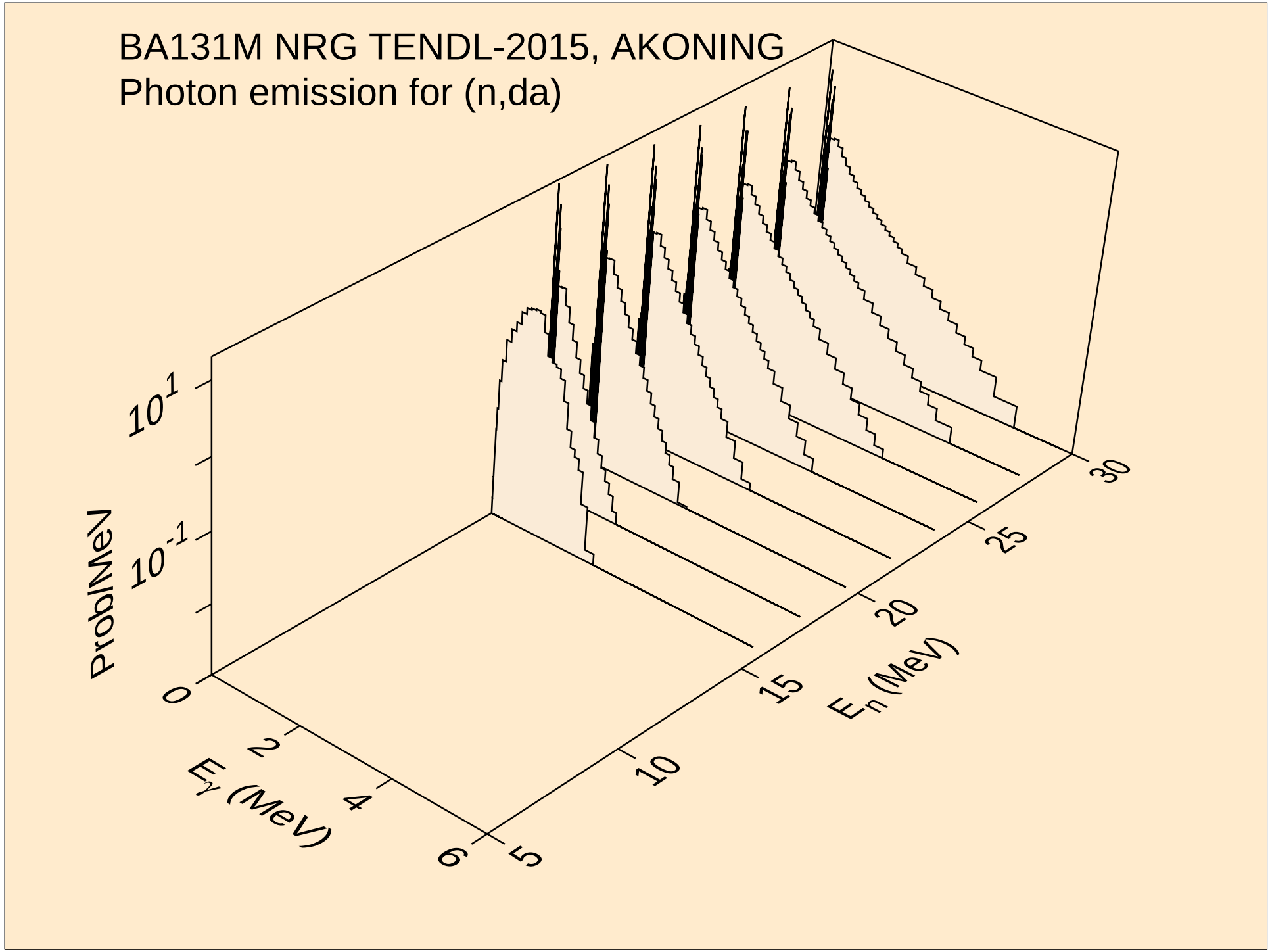

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,2a)
Prob/MeV
$10^{3}$
$10^{1}$
$10^{-1}$
$E_\gamma$ (MeV)
0
2
4
$E_n$ (MeV)
0
5
10
15
20
25
30

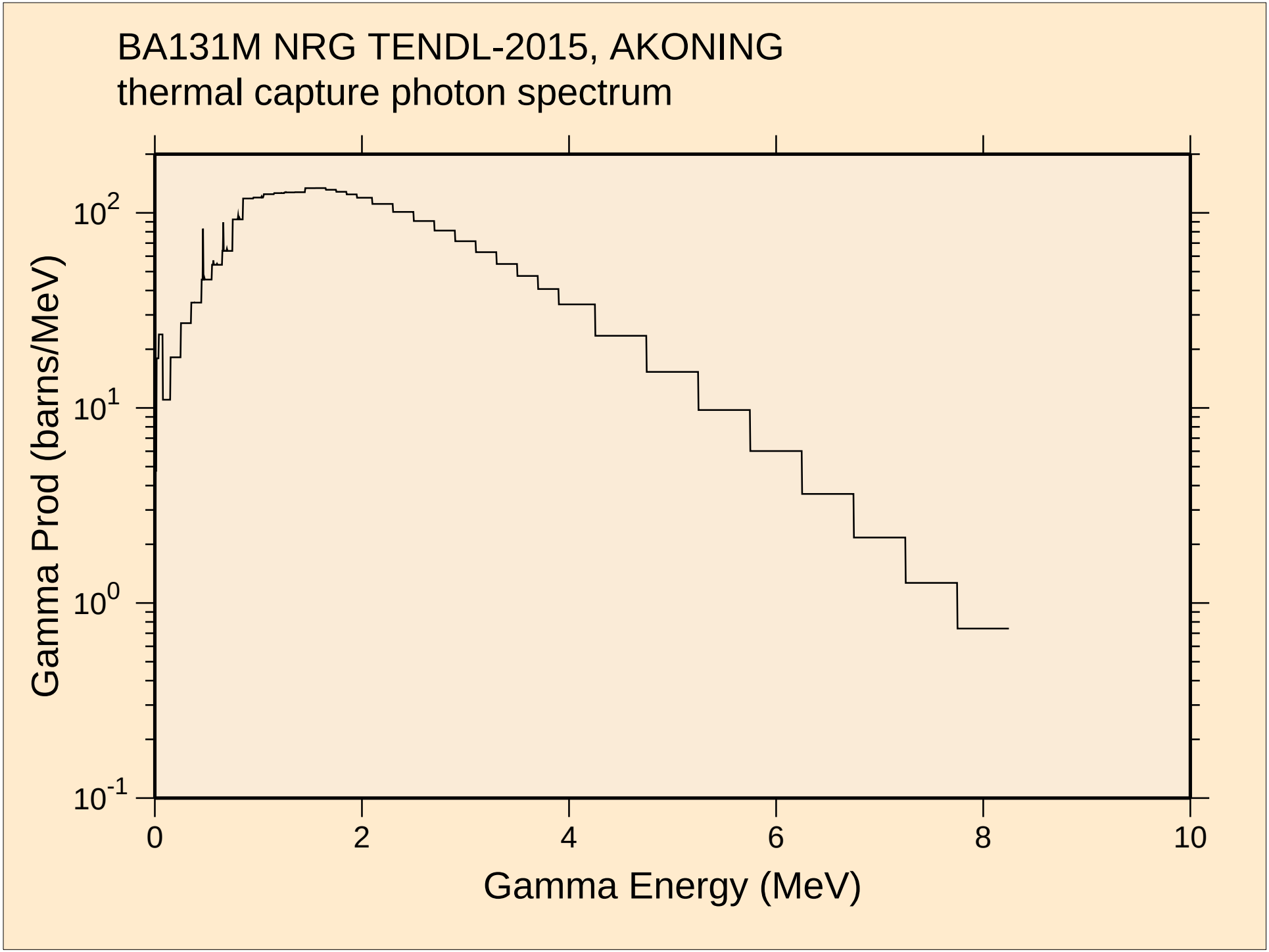

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,2p)
Prob/MeV
$10^{3}$
$10^{1}$
$10^{-1}$
$E_\gamma$ (MeV)
0
2
4
$E_n$ (MeV)
0
5
10
15
20
25
30

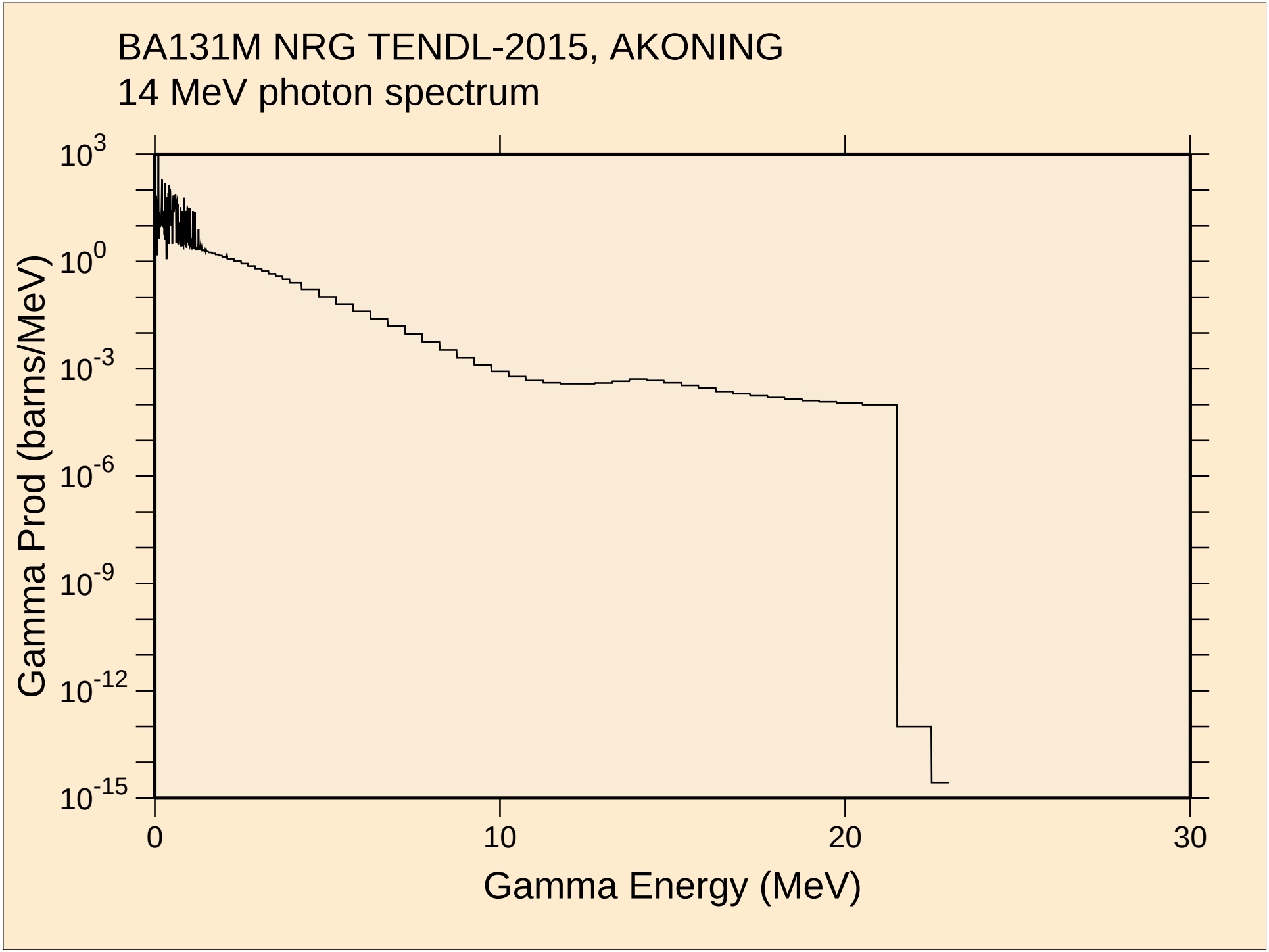

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,pa)
Prob/MeV
$10^{3}$
$10^{1}$
$10^{-1}$
$E_\gamma$ (MeV)
0
2
4
$E_n$ (MeV)
0
5
10
15
20
25
30

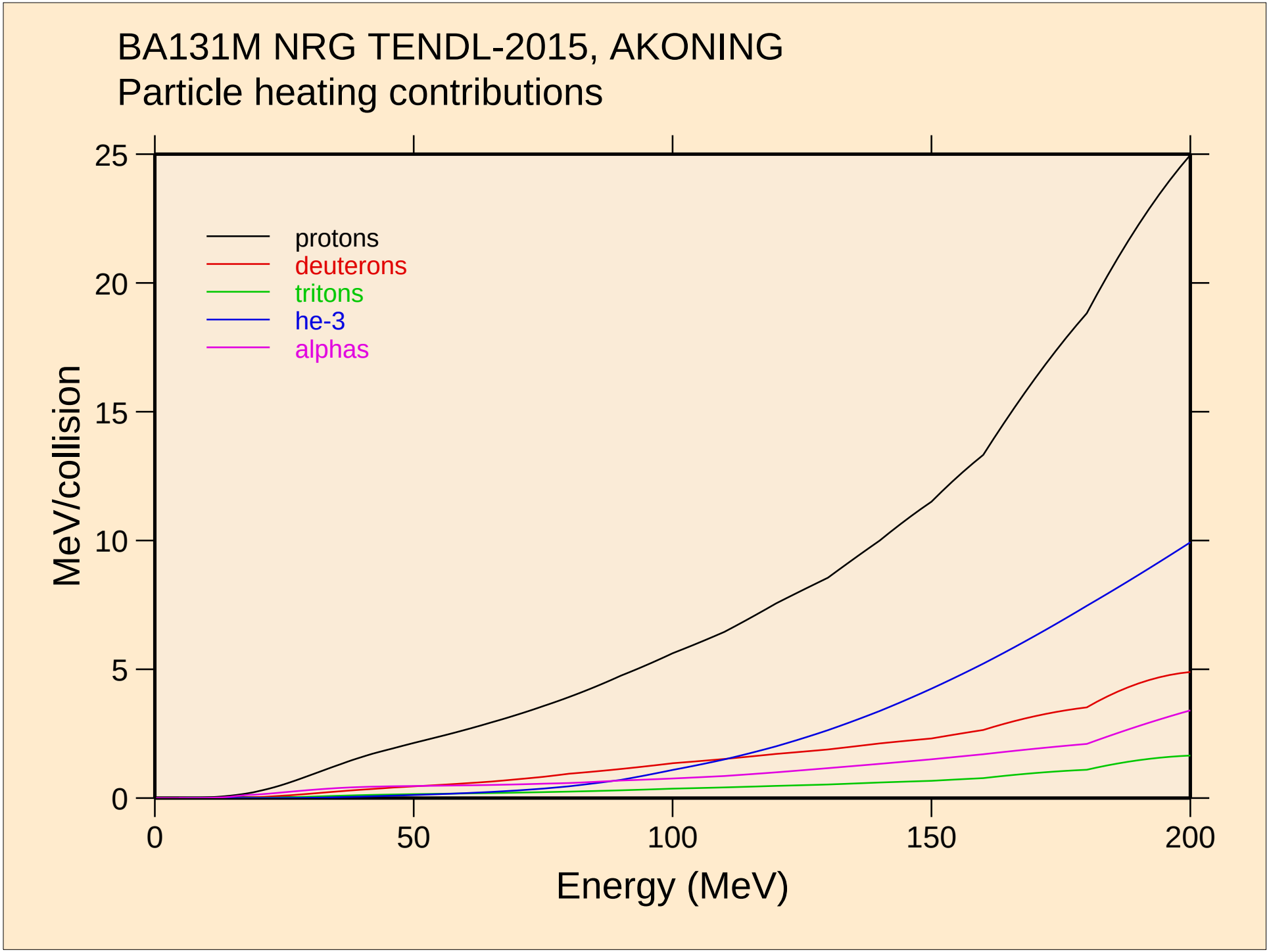

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,pd)
Prob/MeV
10^0
10^-2
0
5
10
Eγ (MeV)
10
12
14
16
18
20
22
24
26
28
30
En (MeV)

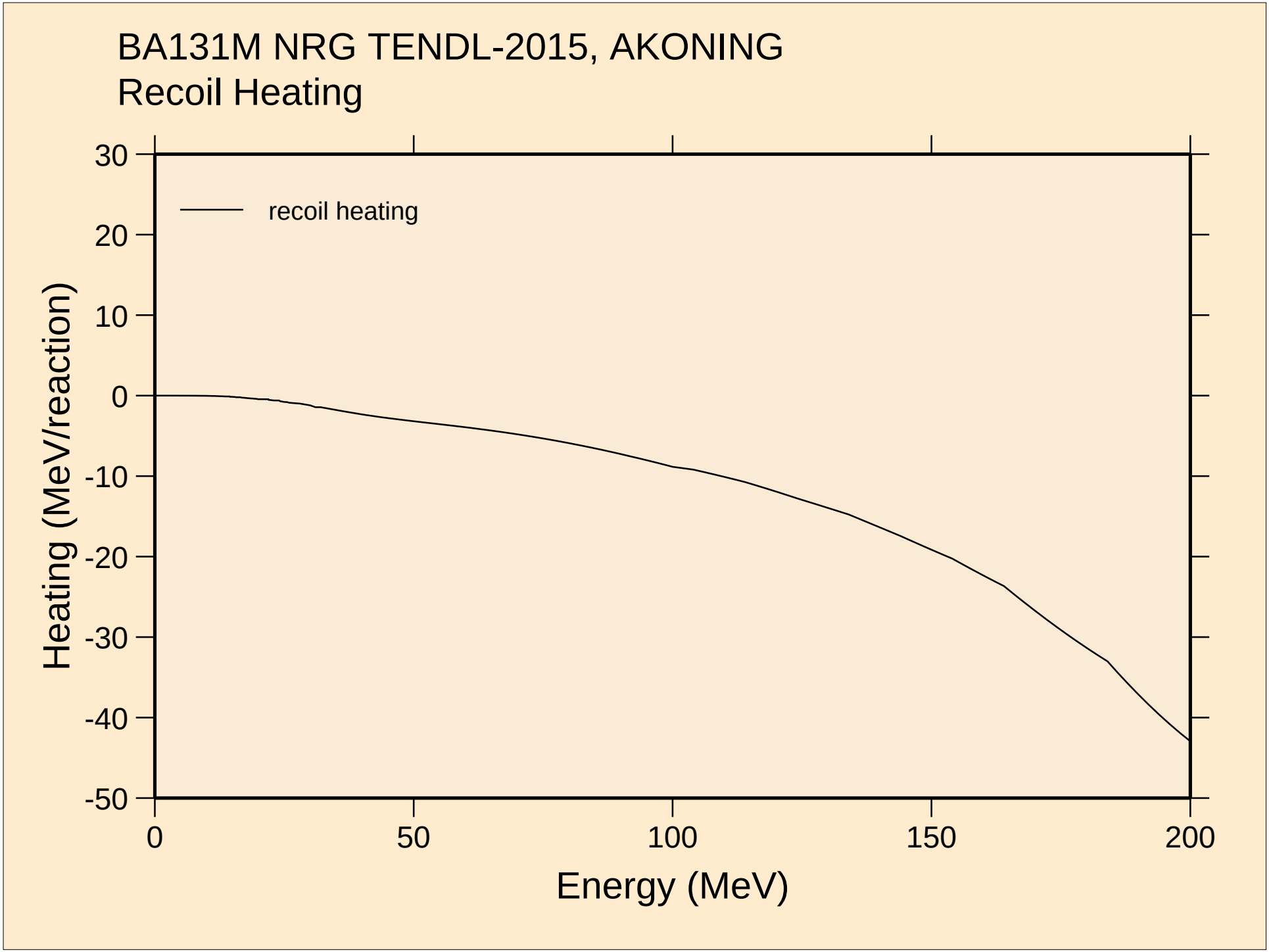

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,pt)
Prob/MeV
$10^{2}$
$10^{0}$
$10^{-2}$
0
2
4
$E_\gamma$ (MeV)
10
12
14
16
18
20
22
24
26
28
30
$E_n$ (MeV)

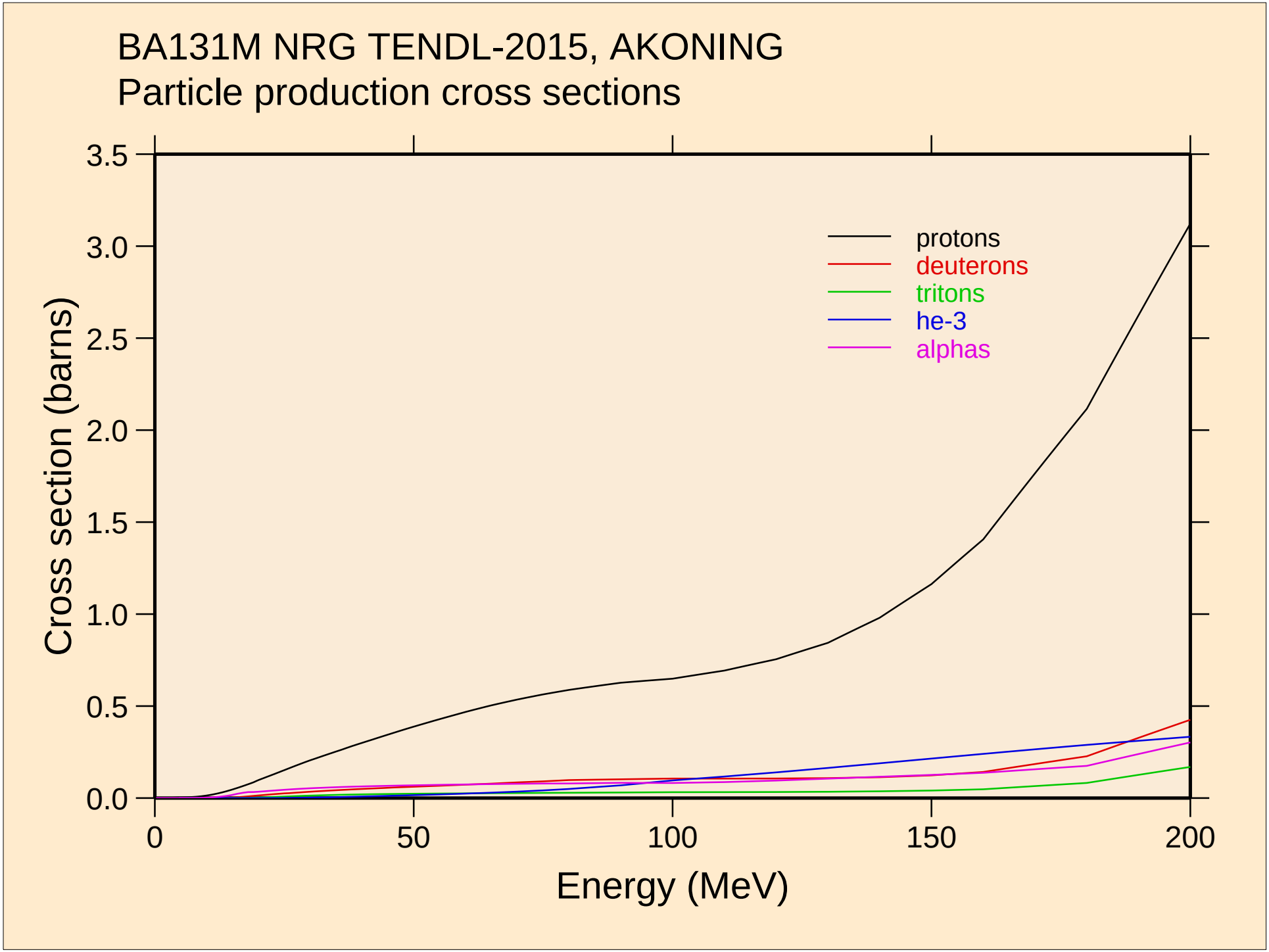

BA131M NRG TENDL-2015, AKONING
Photon emission for (n,da)
Prob/MeV
$10^{1}$
$10^{-1}$
0
2
4
6
$E_\gamma$ (MeV)
5
10
15
20
25
30
$E_n$ (MeV)

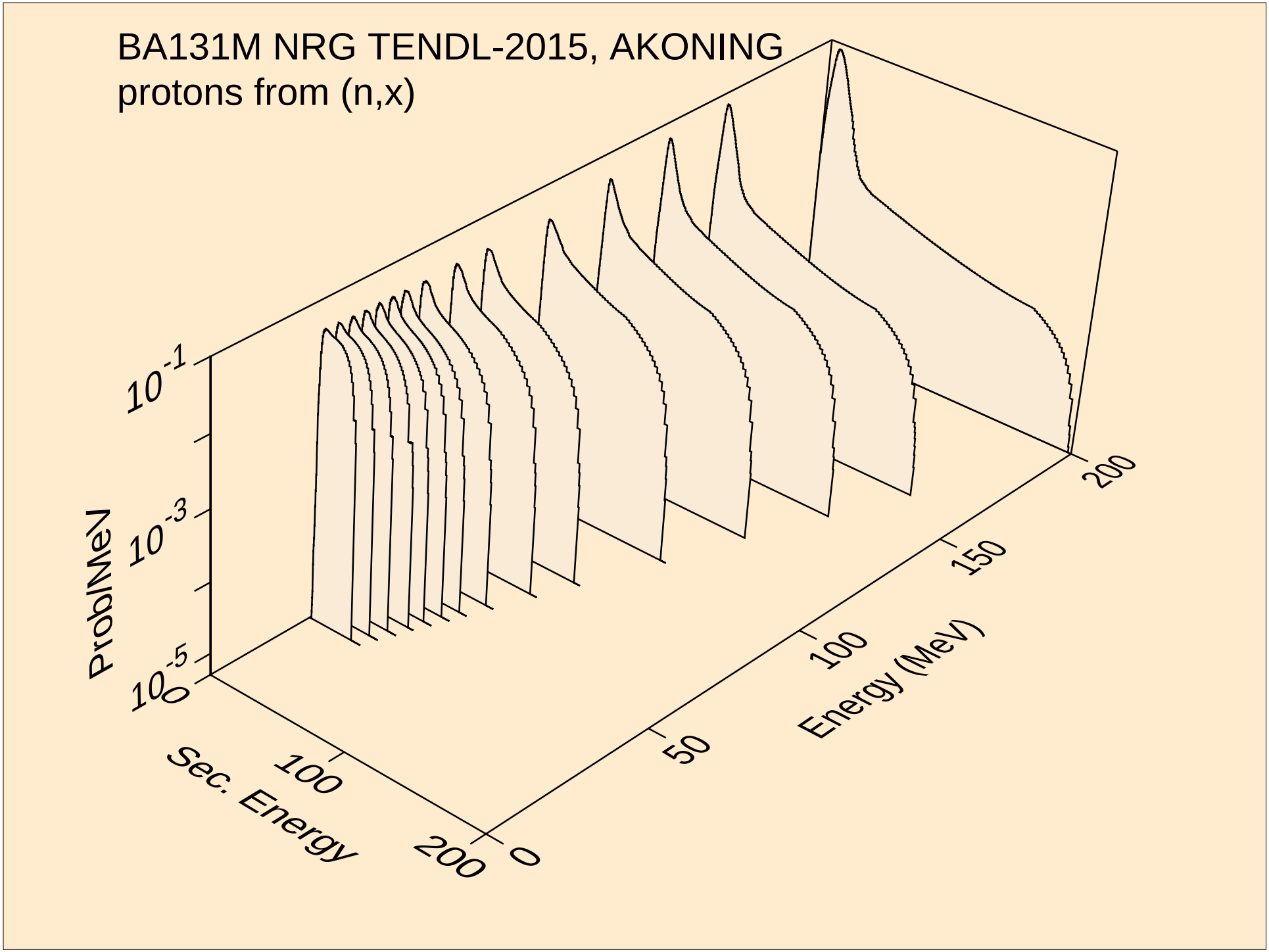

BA131M NRG TENDL-2015, AKONING
thermal capture photon spectrum
Gamma Prod (barns/MeV)
10^2
10^1
10^0
10^-1
0
2
4
6
8
10
Gamma Energy (MeV)

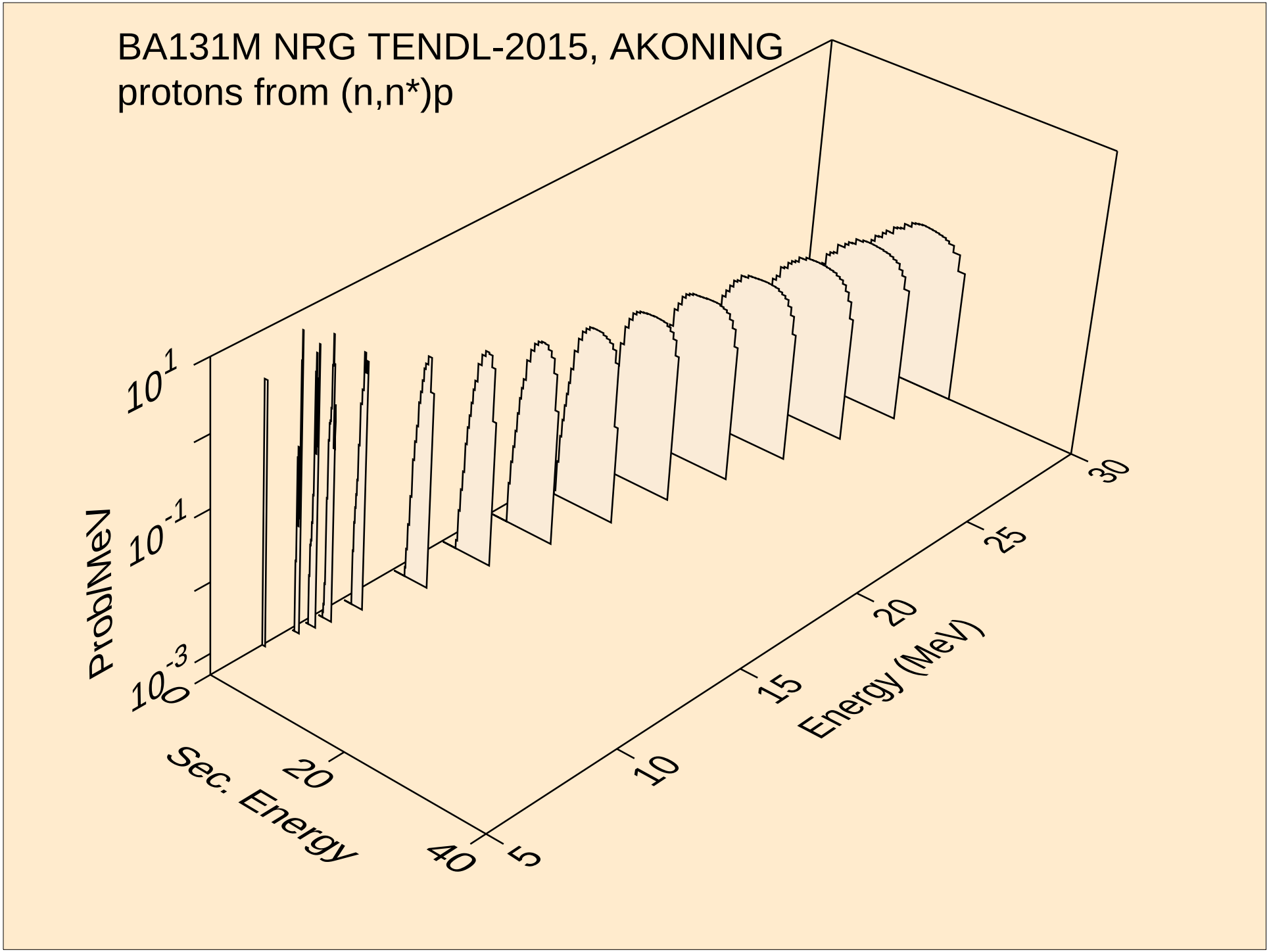

BA131M NRG TENDL-2015, AKONING
14 MeV photon spectrum
Gamma Prod (barns/MeV)
10^3
10^0
10^-3
10^-6
10^-9
10^-12
10^-15
0
10
20
30
Gamma Energy (MeV)

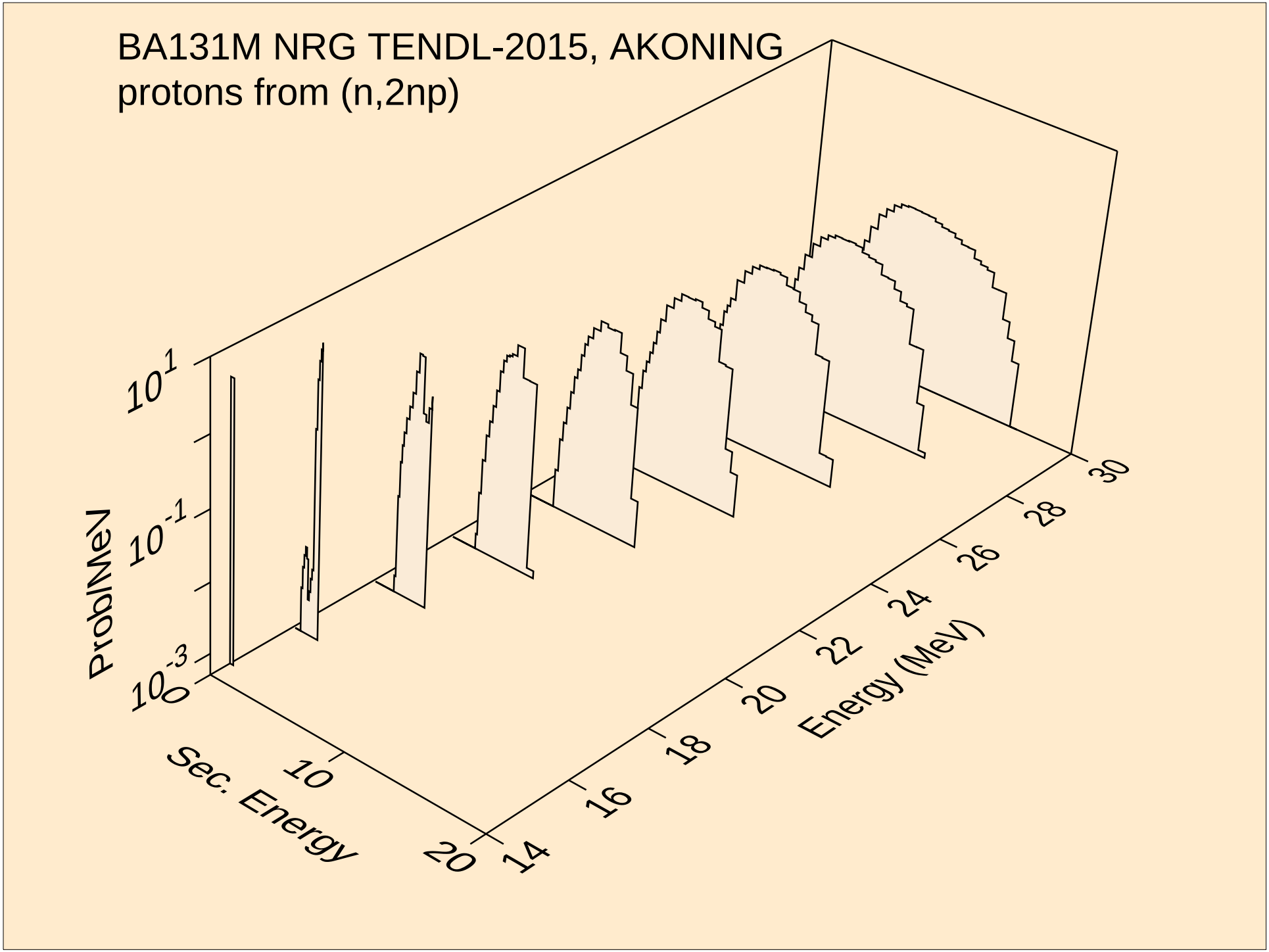

BA131M NRG TENDL-2015, AKONING
Particle heating contributions
protons
deuterons
tritons
he-3
alphas
MeV/collision
Energy (MeV)
0
5
10
15
20
25
0
50
100
150
200

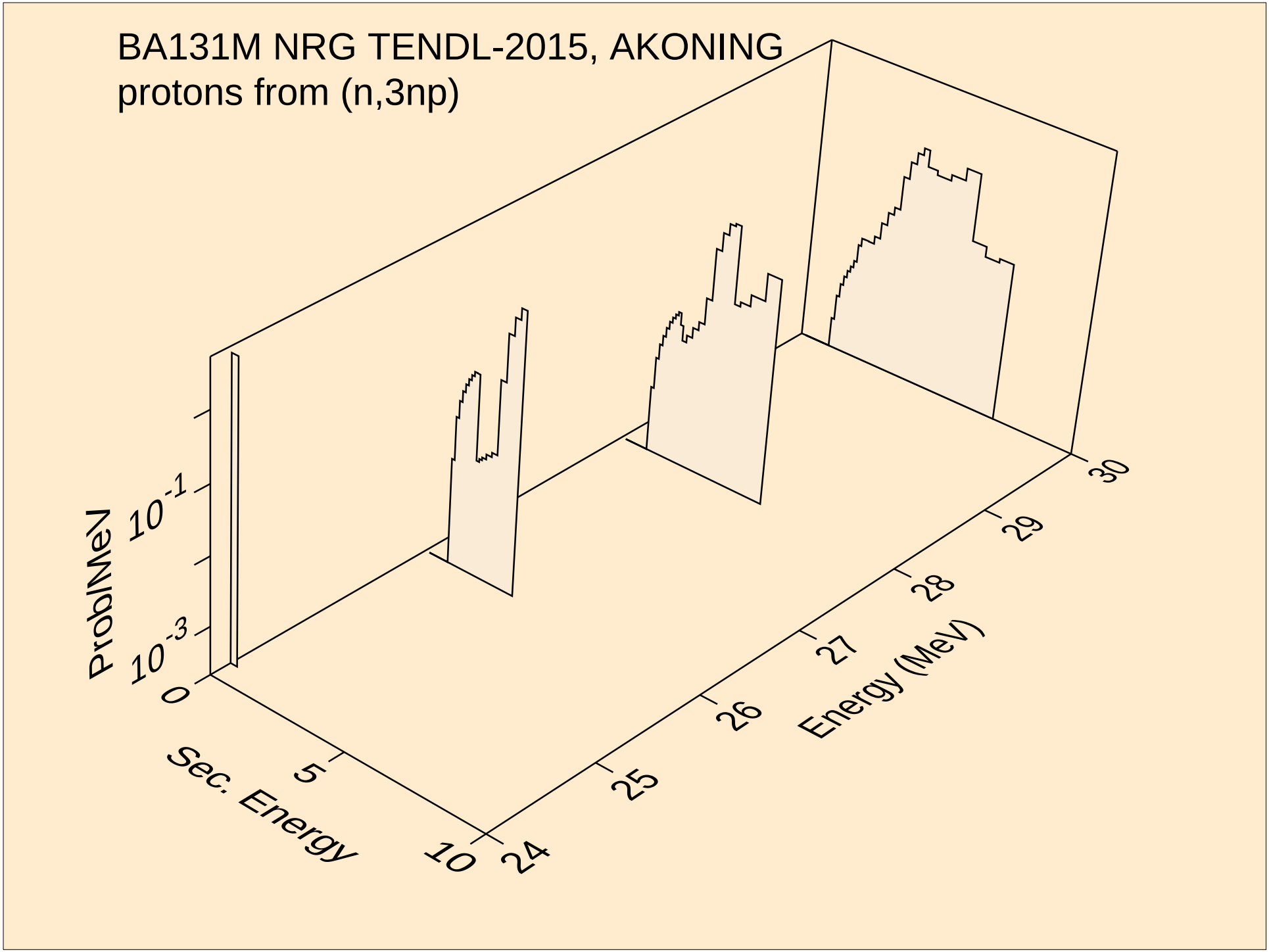

BA131M NRG TENDL-2015, AKONING
Recoil Heating
recoil heating
Heating (MeV/reaction)
30
20
10
0
-10
-20
-30
-40
-50
0
50
100
150
200
Energy (MeV)

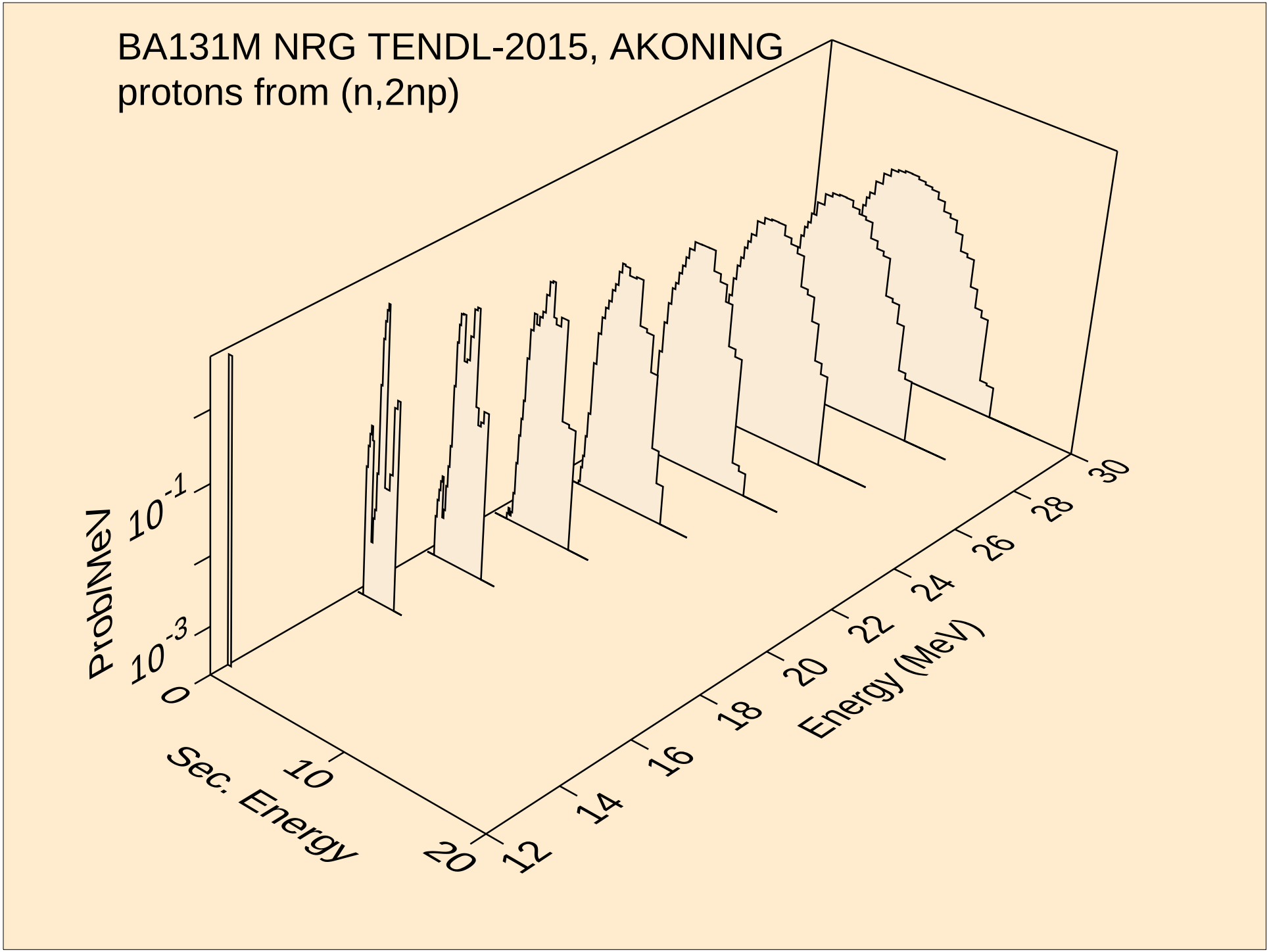

BA131M NRG TENDL-2015, AKONING
Particle production cross sections
Cross section (barns)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
50
100
150
200
Energy (MeV)
protons
deuterons
tritons
he-3
alphas

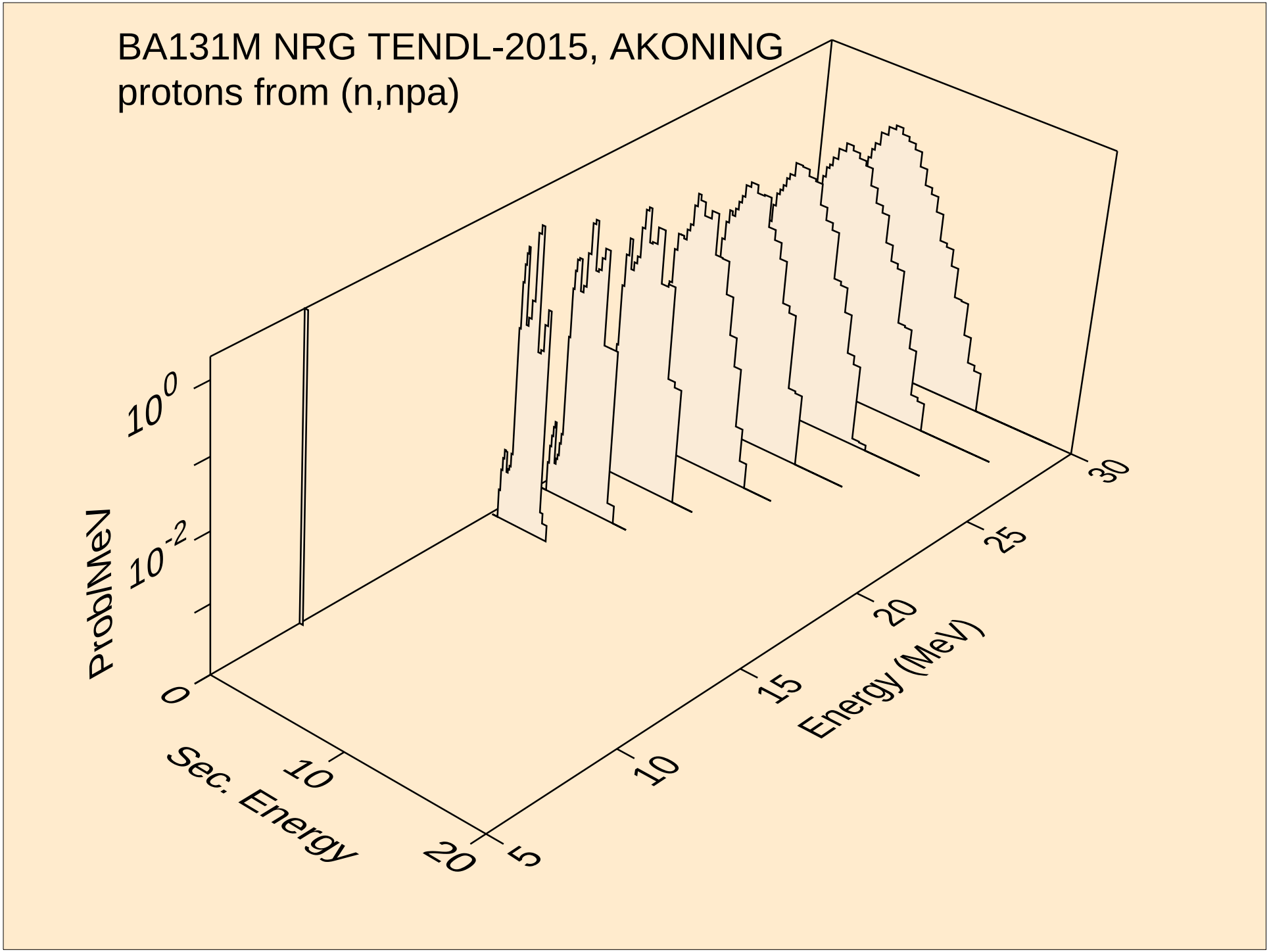

BA131M NRG TENDL-2015, AKONING
protons from (n,x)
Prob/MeV
10-1
10-3
10-5
0
100
200
Sec. Energy
0
50
100
150
200
Energy (MeV)

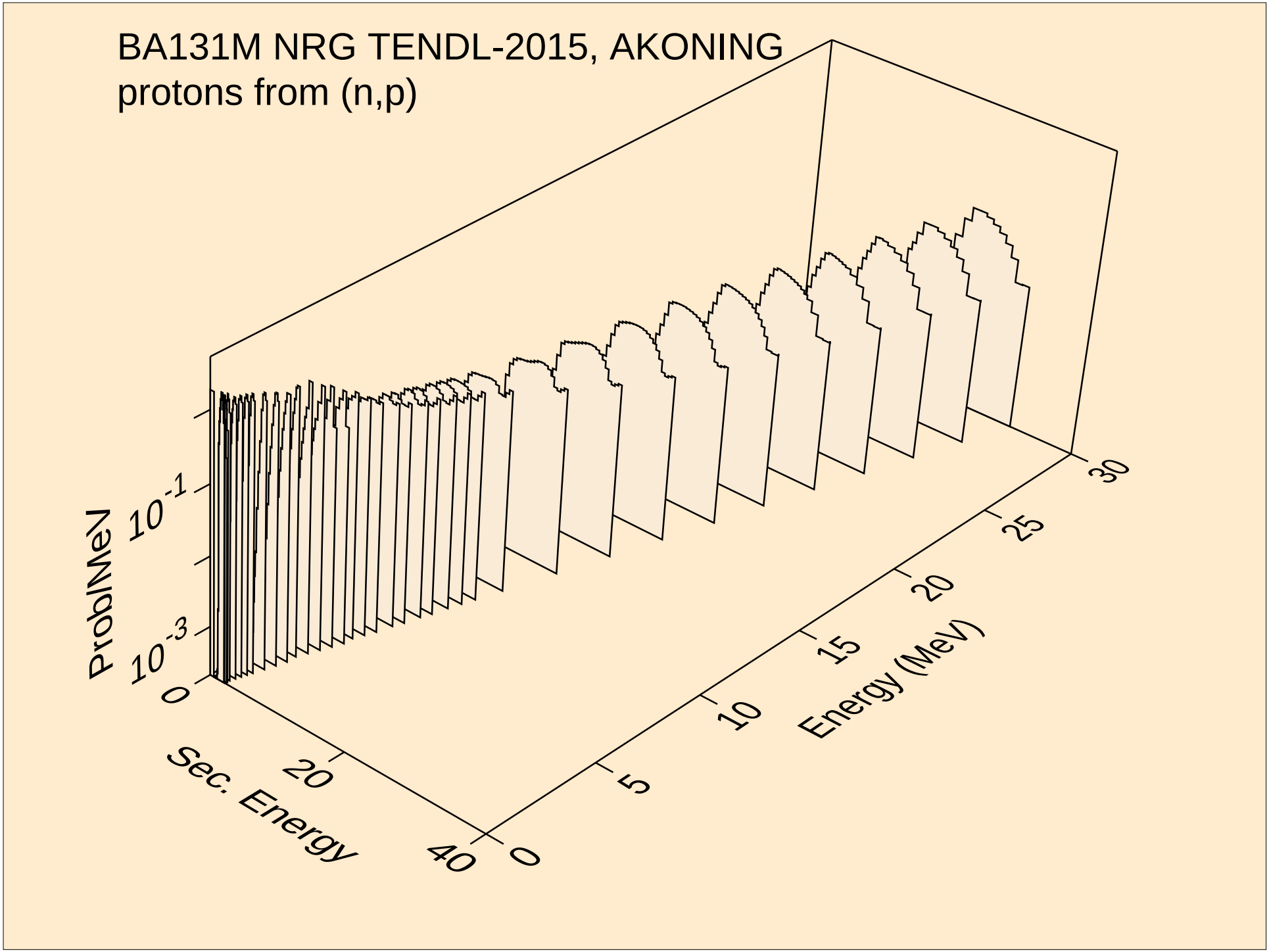

BA131M NRG TENDL-2015, AKONING
protons from (n,n*)p
Prob/MeV
$10^{1}$
$10^{-1}$
$10^{-3}$
0
20
40
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

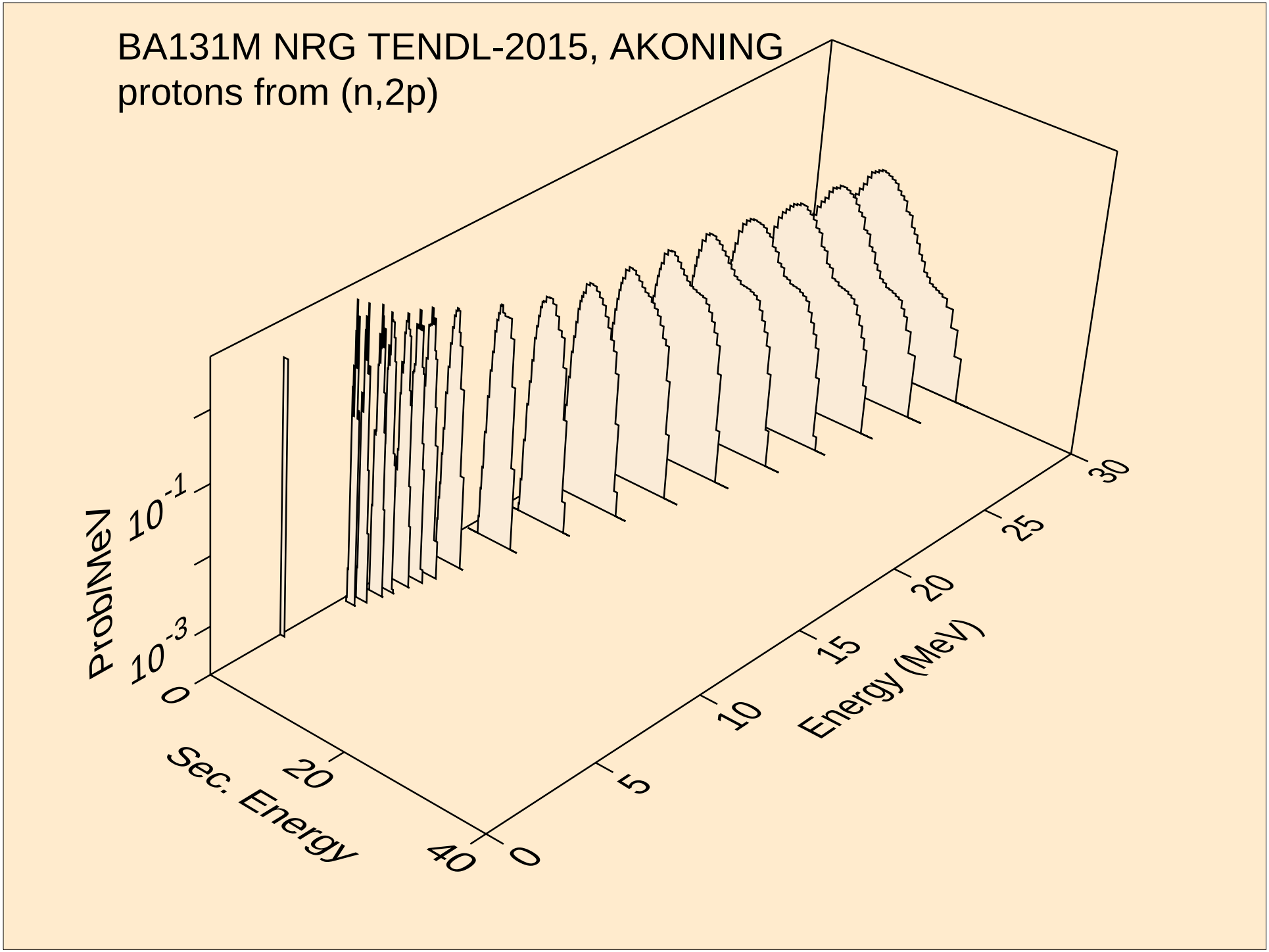

BA131M NRG TENDL-2015, AKONING
protons from (n,2np)
Prob/MeV
$10^{1}$
$10^{-1}$
$10^{-3}$
0
Sec. Energy
10
20
14
16
18
20
22
24
26
28
30
Energy (MeV)

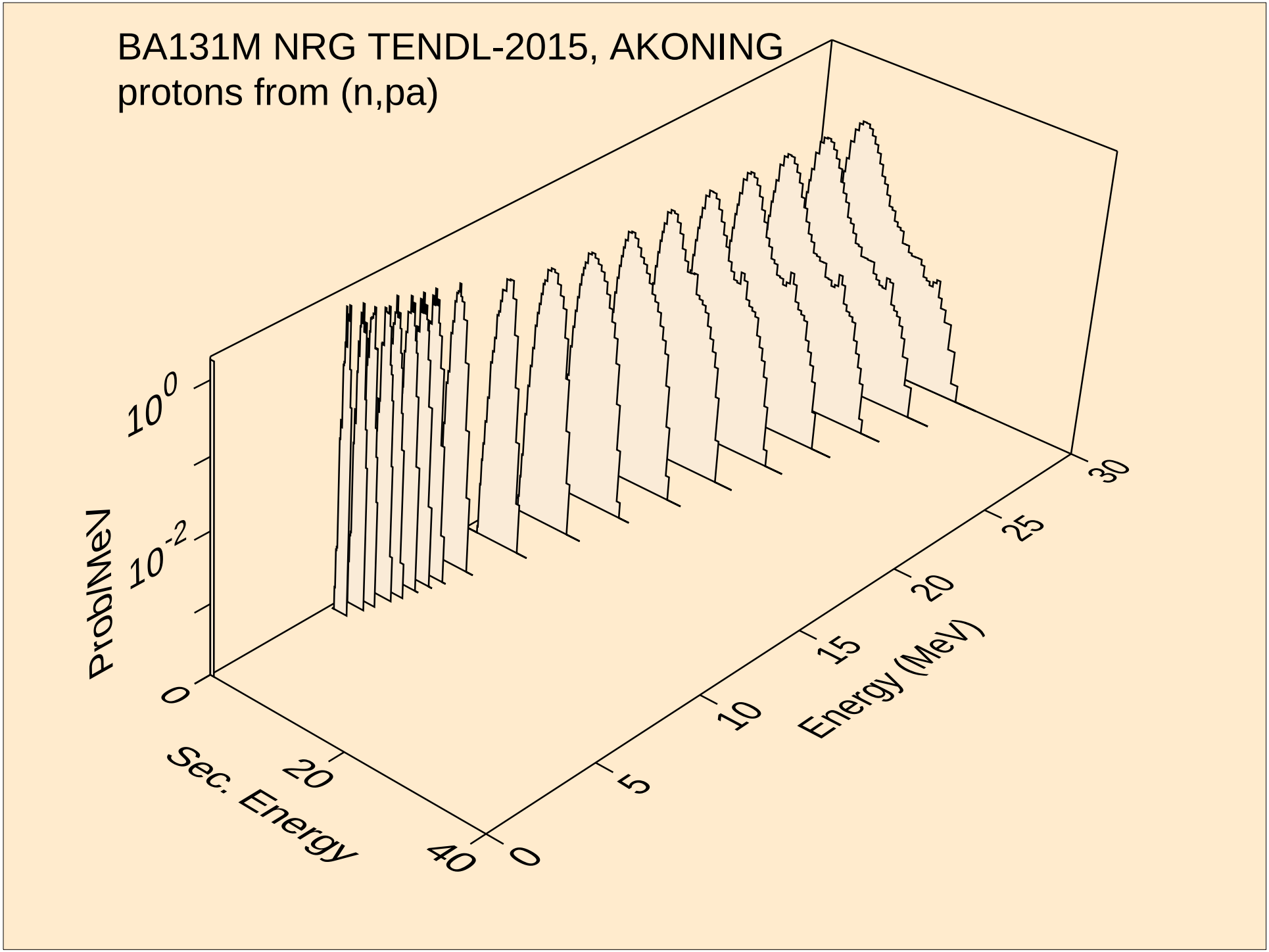

BA131M NRG TENDL-2015, AKONING
protons from (n,3np)
Prob/MeV
10-1
10-3
0
Sec. Energy
5
10
24
25
26
27
28
29
30
Energy (MeV)

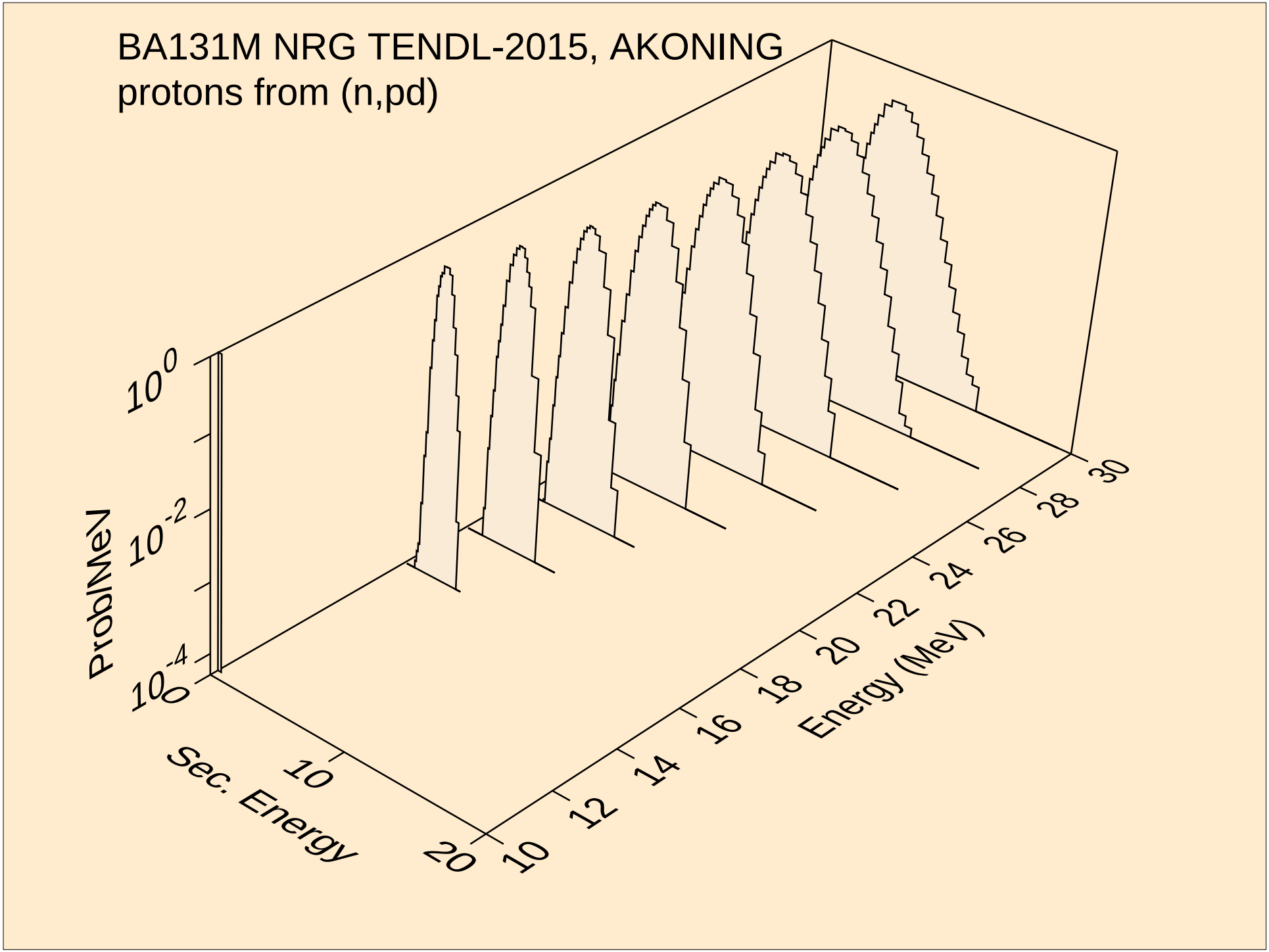

BA131M NRG TENDL-2015, AKONING
protons from (n,2np)
Prob/MeV
10-1
10-3
0
Sec. Energy
10
20
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

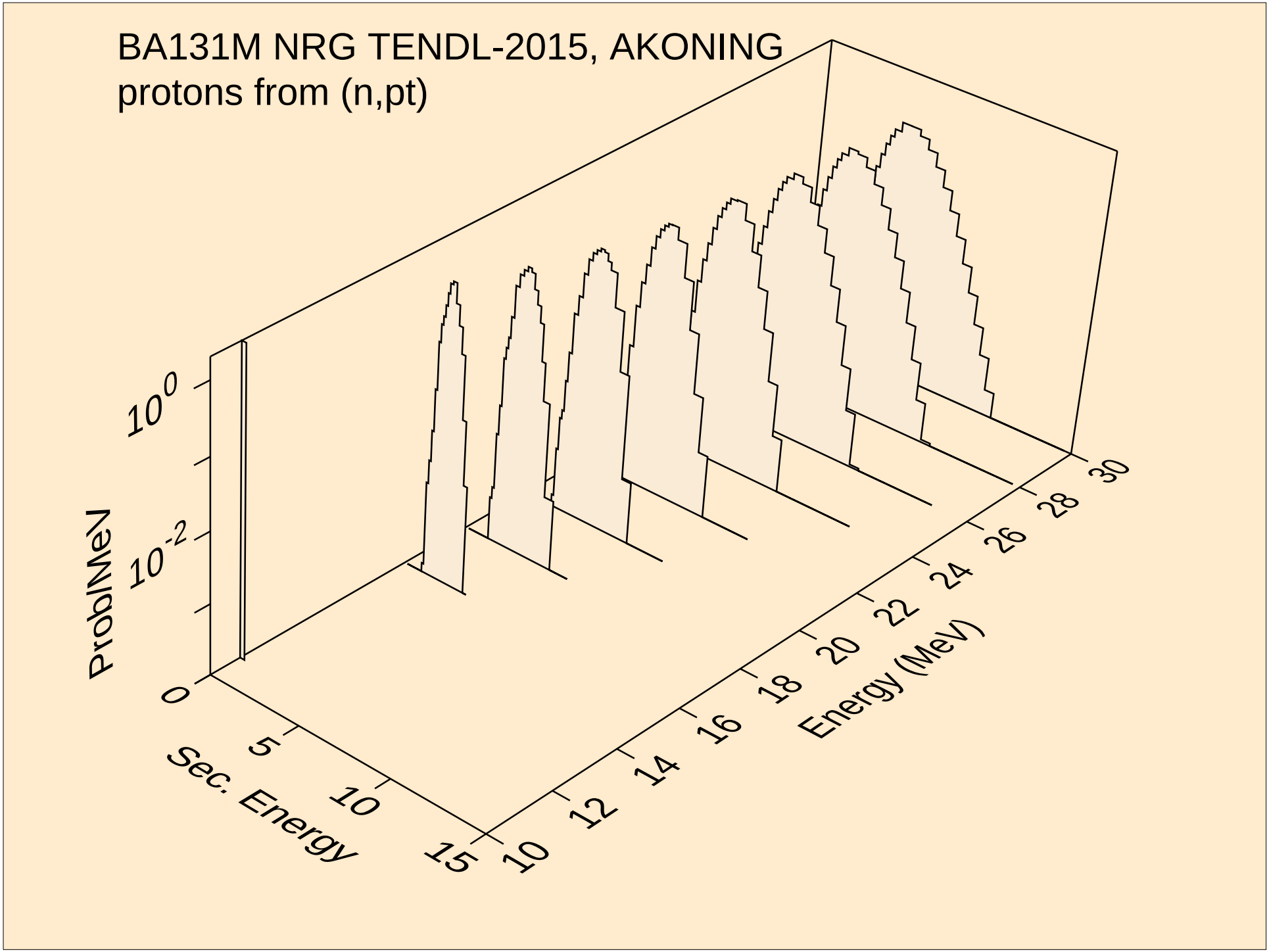

BA131M NRG TENDL-2015, AKONING
protons from (n,npa)
Prob/MeV
10^0
10^-2
0
Sec. Energy
10
20
5
10
15
20
25
30
Energy (MeV)

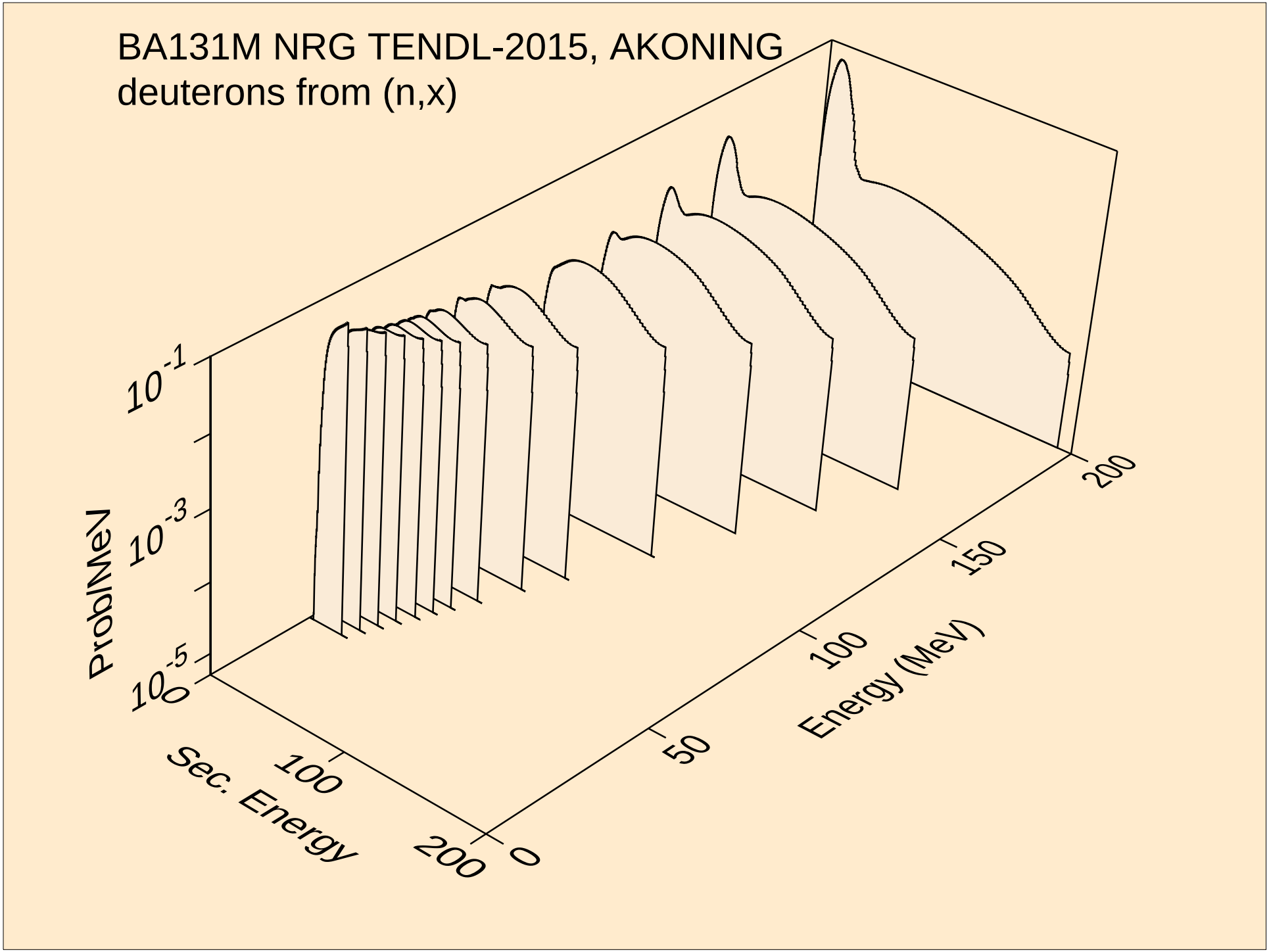

BA131M NRG TENDL-2015, AKONING
protons from (n,p)
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

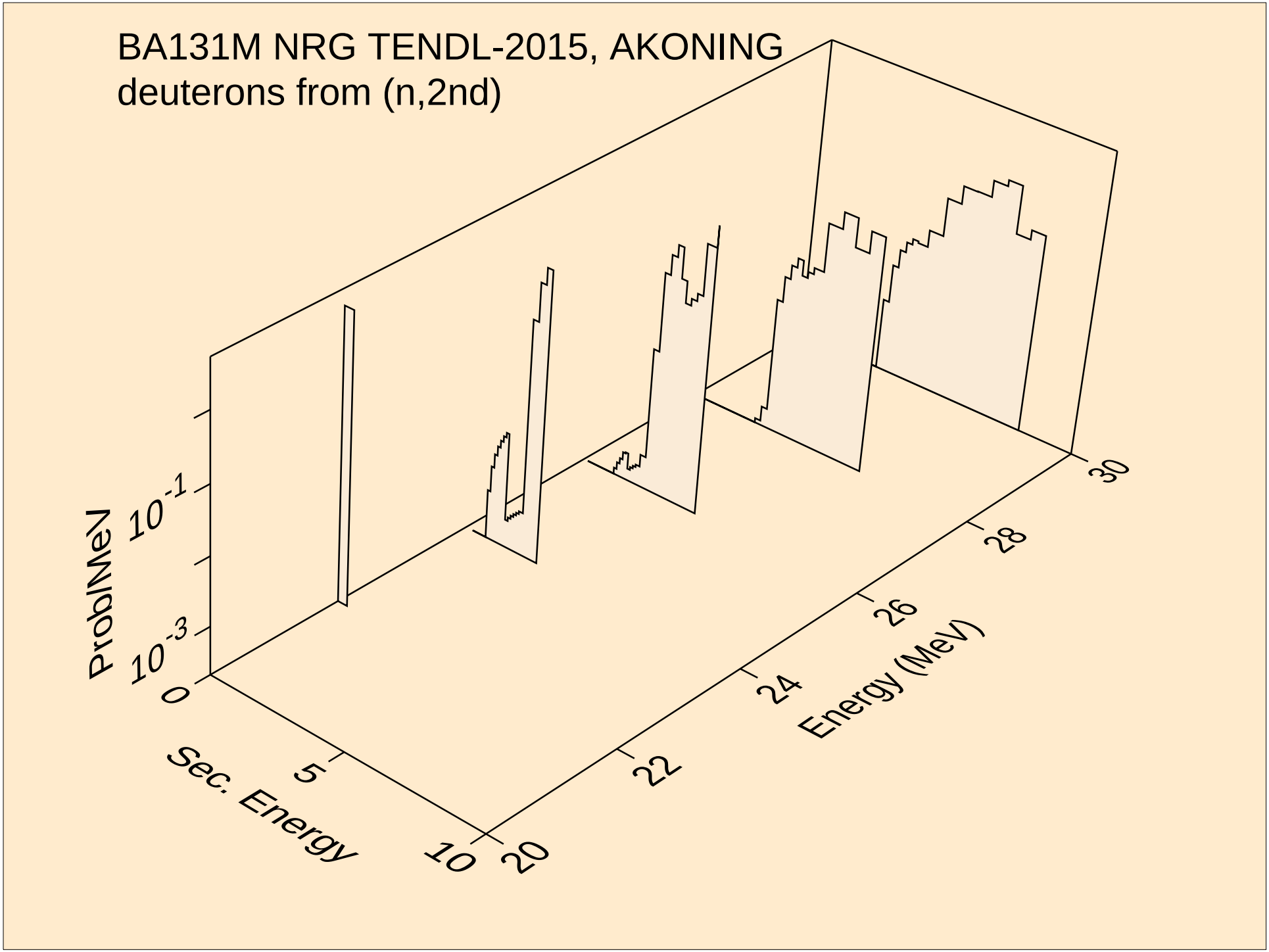

BA131M NRG TENDL-2015, AKONING
protons from (n,2p)
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

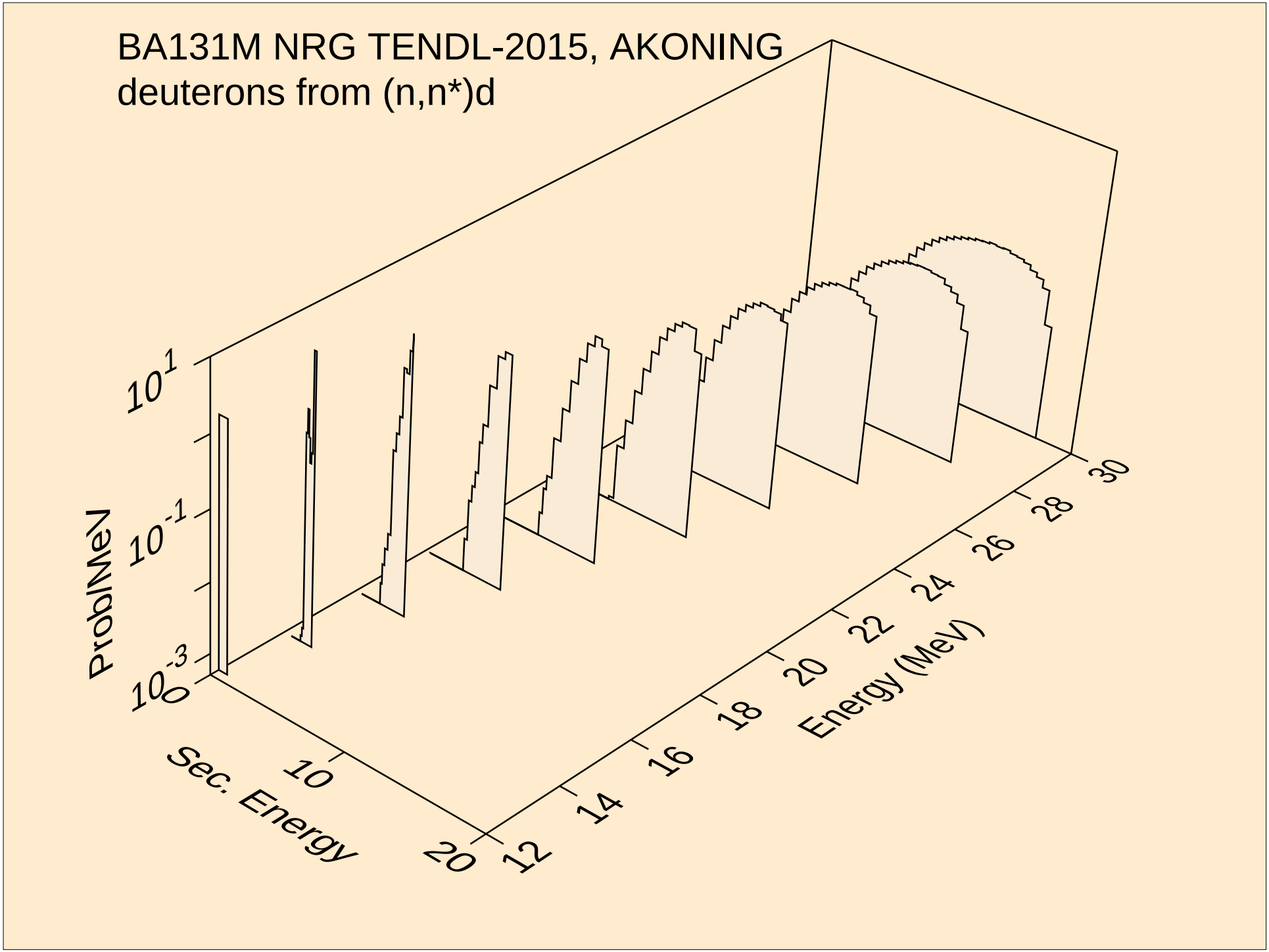

BA131M NRG TENDL-2015, AKONING
protons from (n,pa)
Prob/MeV
$10^{0}$
$10^{-2}$
0
Sec. Energy
20
40
0
5
10
15
Energy (MeV)
20
25
30

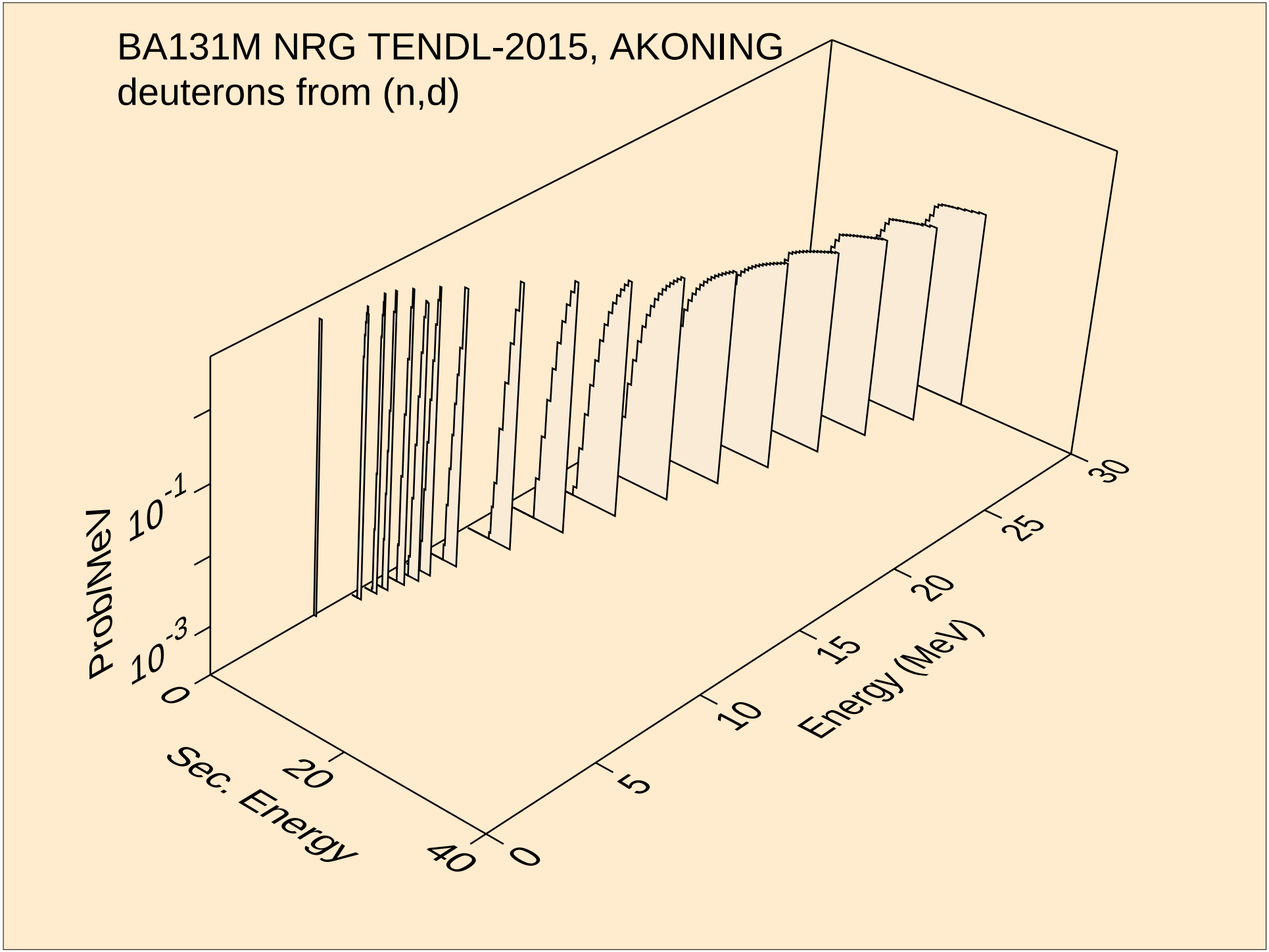

BA131M NRG TENDL-2015, AKONING
protons from (n,pd)
Prob/MeV
$10^{0}$
$10^{-2}$
$10^{-4}$
0
10
20
Sec. Energy
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

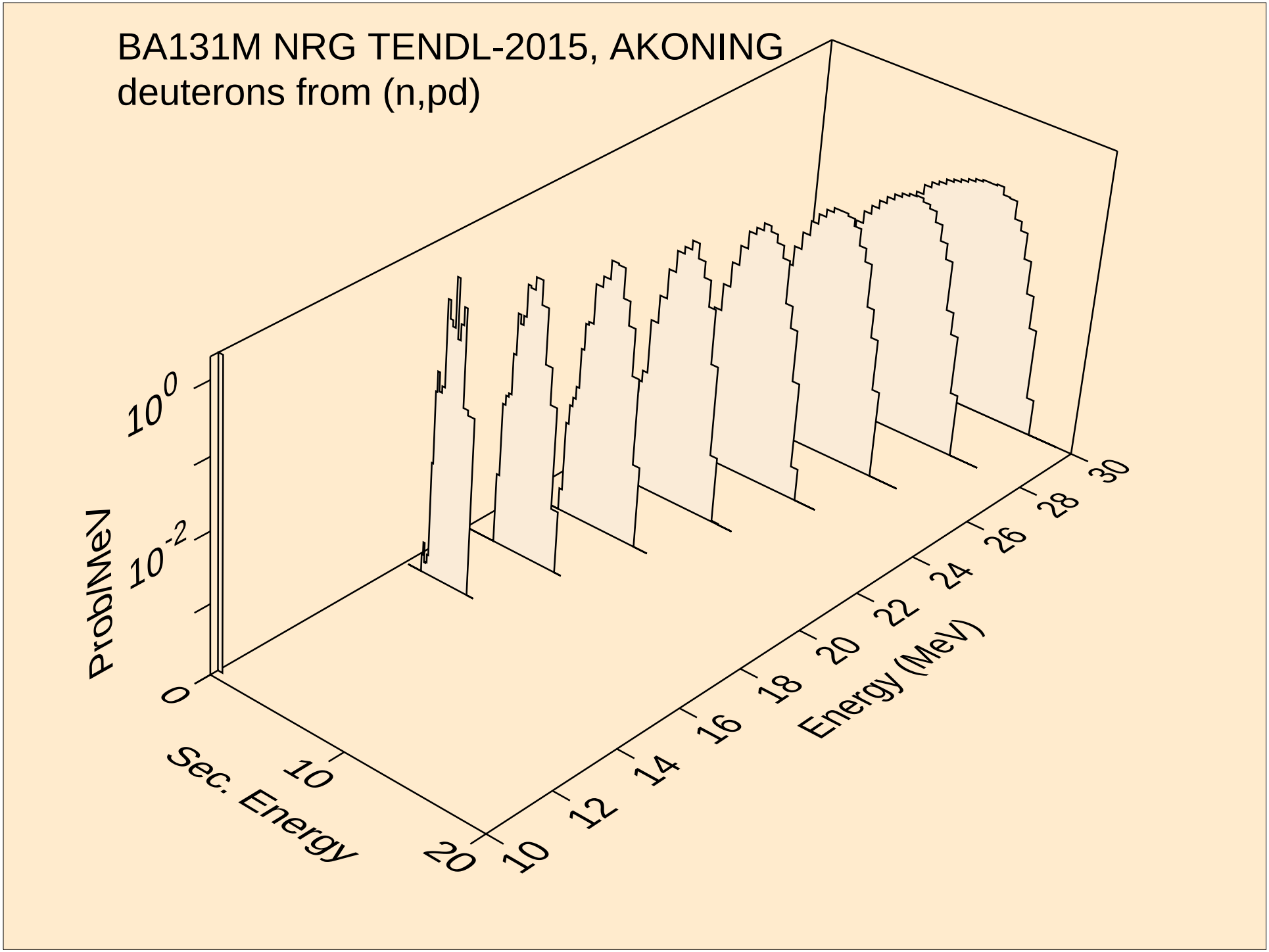

BA131M NRG TENDL-2015, AKONING
protons from (n,pt)
Prob/MeV
$10^{0}$
$10^{-2}$
0
Sec. Energy
5
10
15
Energy (MeV)
10
12
14
16
18
20
22
24
26
28
30

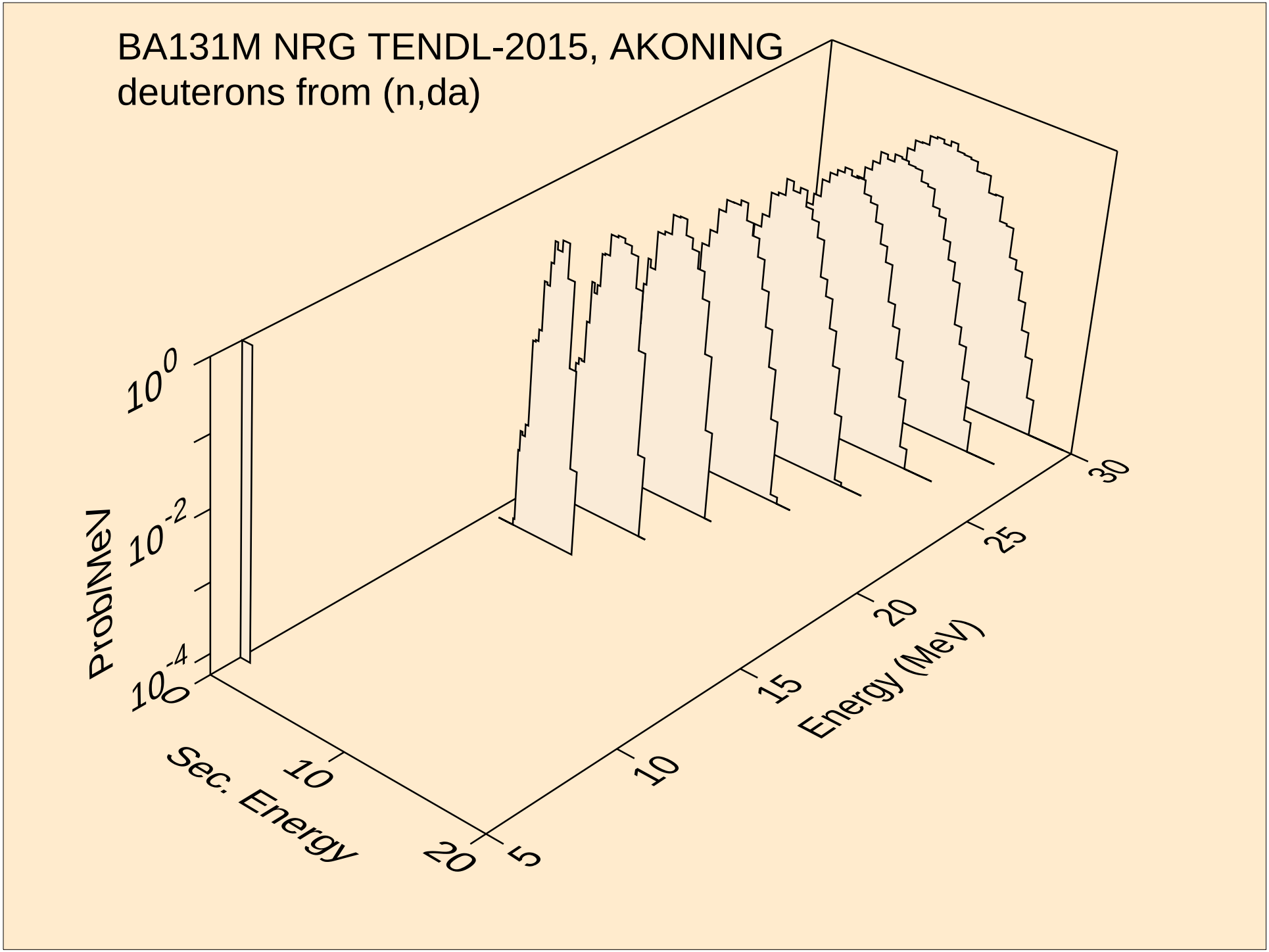

BA131M NRG TENDL-2015, AKONING
deuterons from (n,x)
Prob/MeV
10-1
10-3
10-5
0
100
200
Sec. Energy
0
50
100
150
200
Energy (MeV)

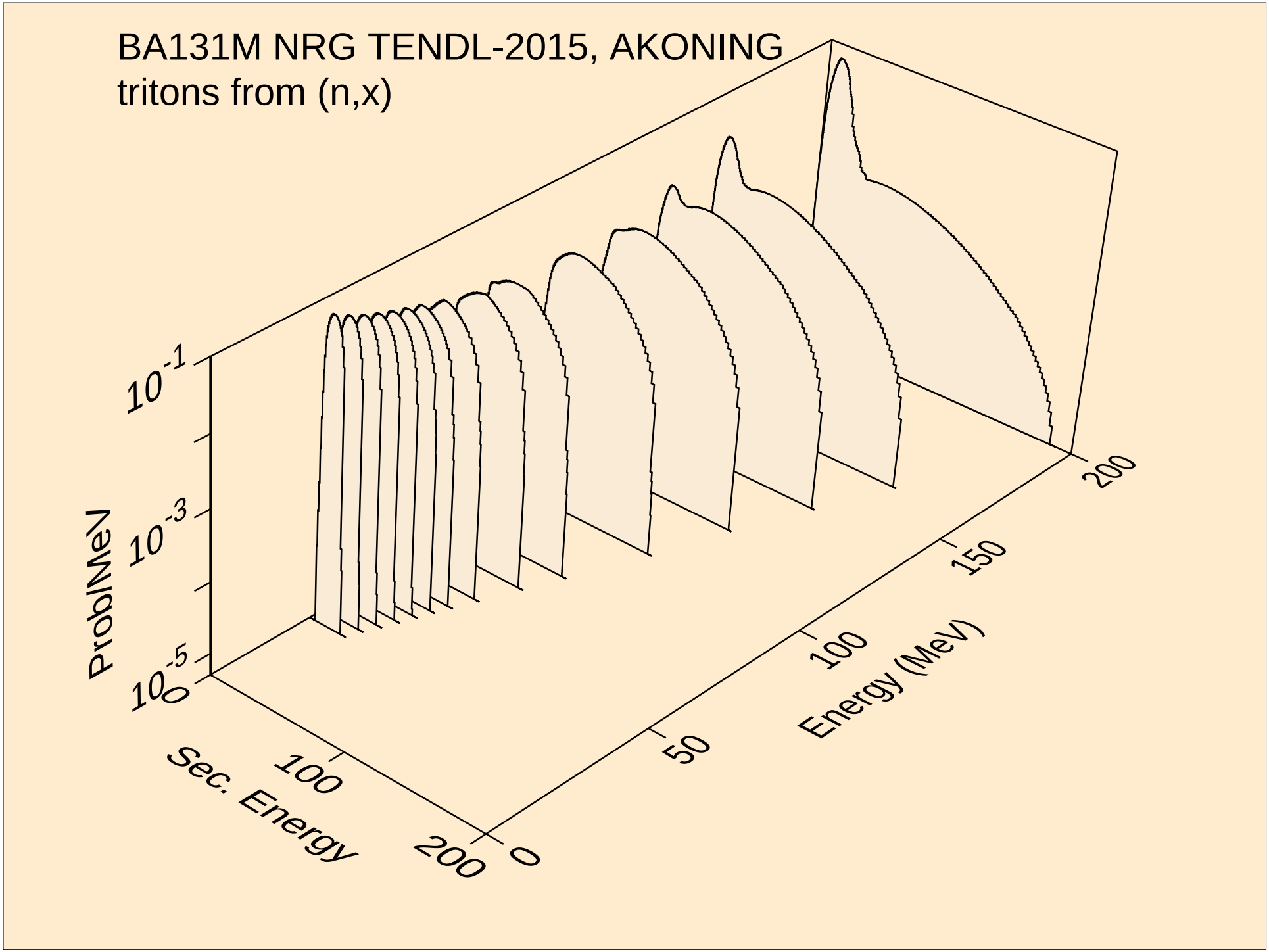

BA131M NRG TENDL-2015, AKONING
deuterons from (n,2nd)
Prob/MeV
10-1
10-3
0
Sec. Energy
5
10
20
22
24
26
28
30
Energy (MeV)

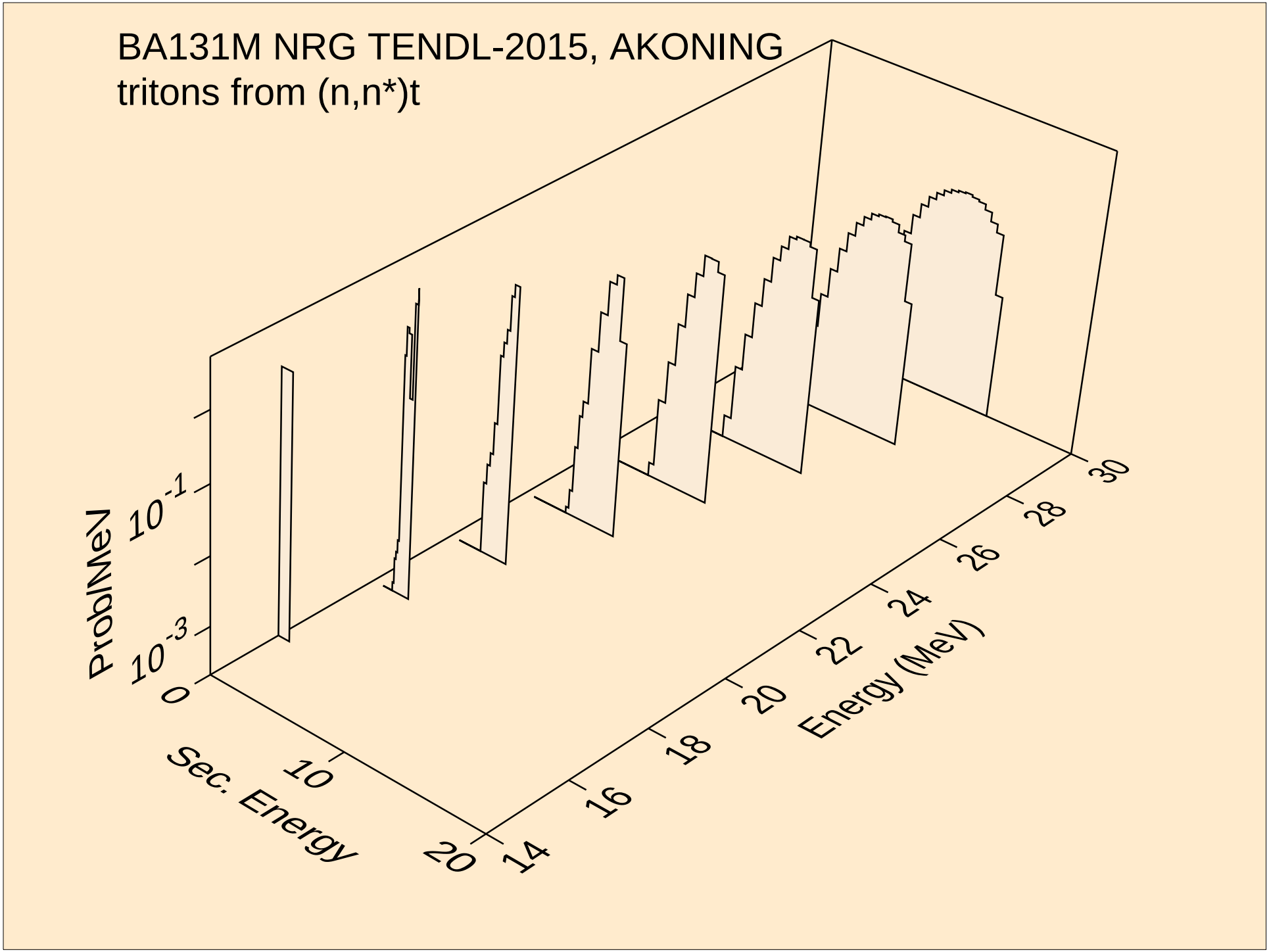

BA131M NRG TENDL-2015, AKONING
deuterons from (n,n*)d
Prob/MeV
$10^{1}$
$10^{-1}$
$10^{-3}$
0
10
20
Sec. Energy
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

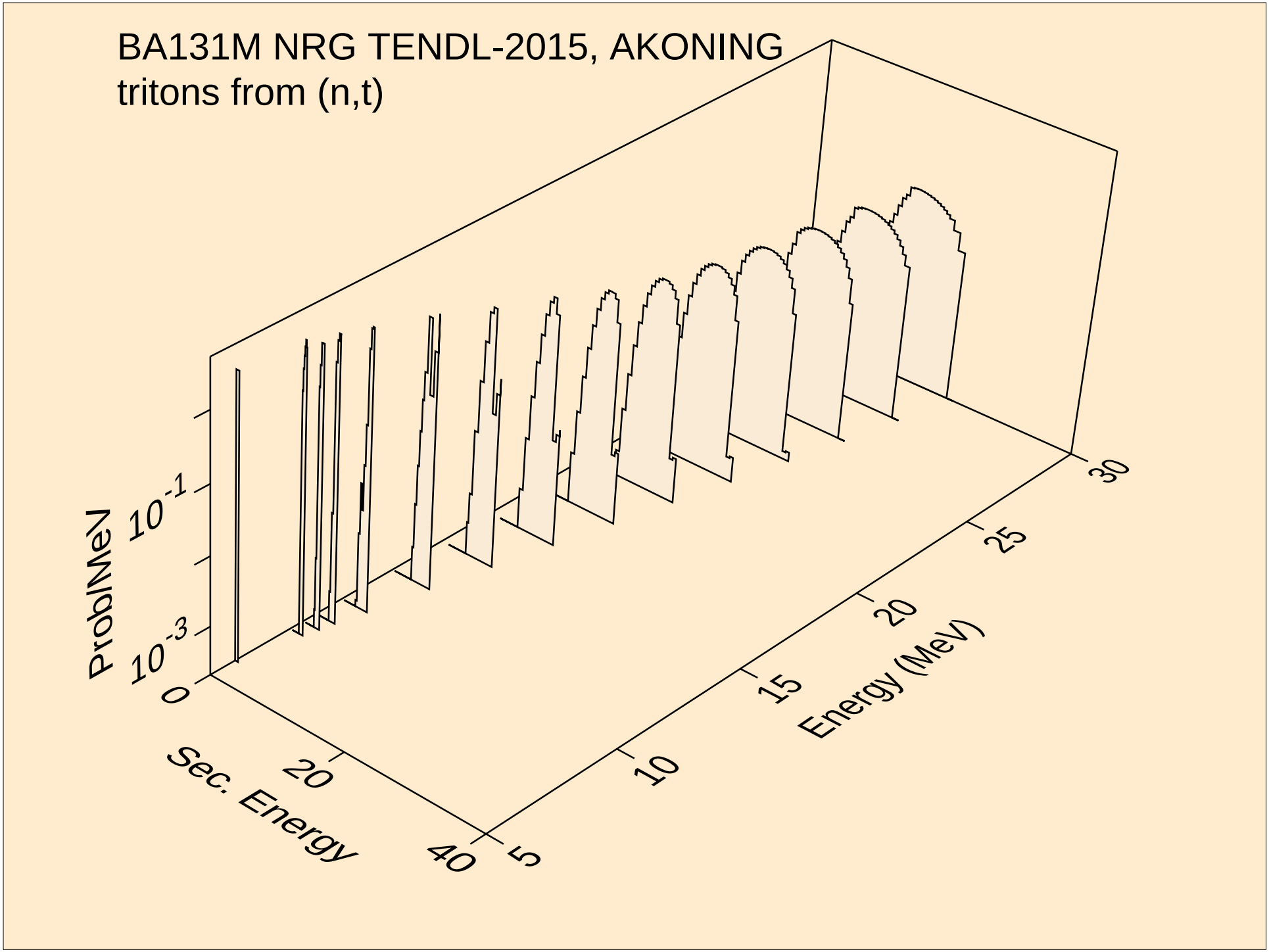

BA131M NRG TENDL-2015, AKONING
deuterons from (n,d)
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

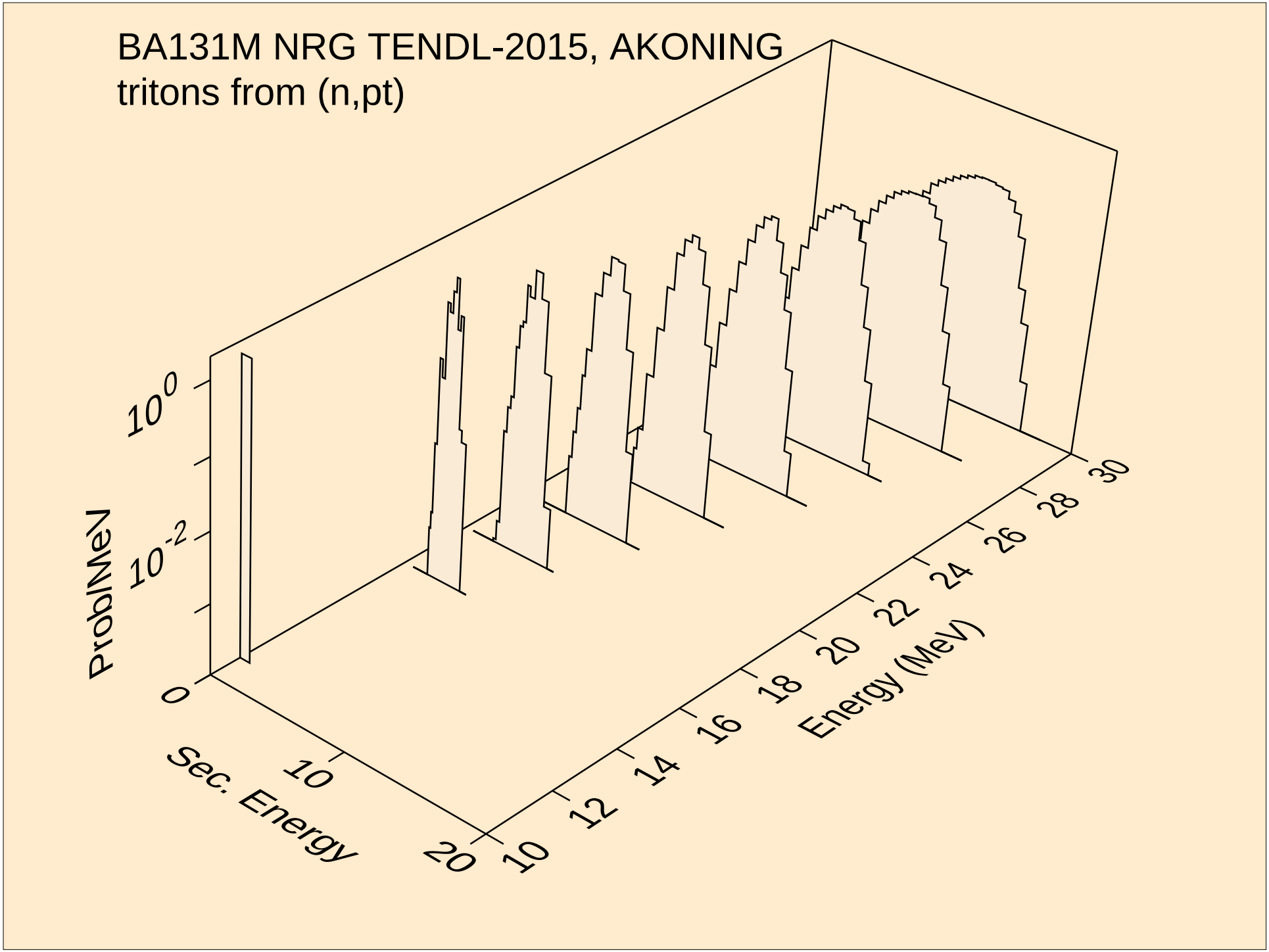

BA131M NRG TENDL-2015, AKONING
deuterons from (n,pd)
Prob/MeV
$10^{0}$
$10^{-2}$
0
Sec. Energy
10
20
Energy (MeV)
10
12
14
16
18
20
22
24
26
28
30

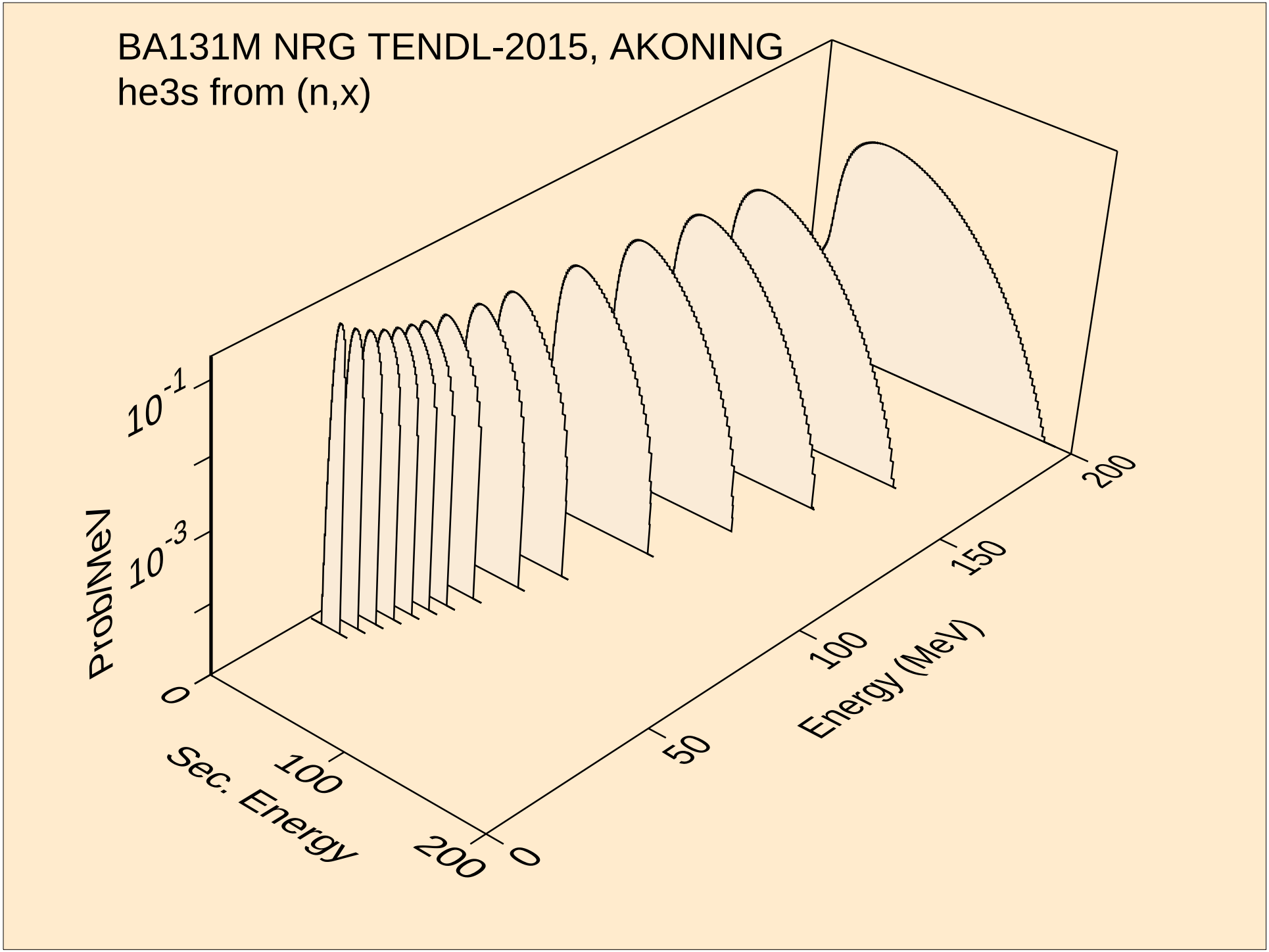

BA131M NRG TENDL-2015, AKONING
deuterons from (n,da)
Prob/MeV
10^0
10^-2
10^-4
0
Sec. Energy
10
20
5
10
15
20
25
30
Energy (MeV)

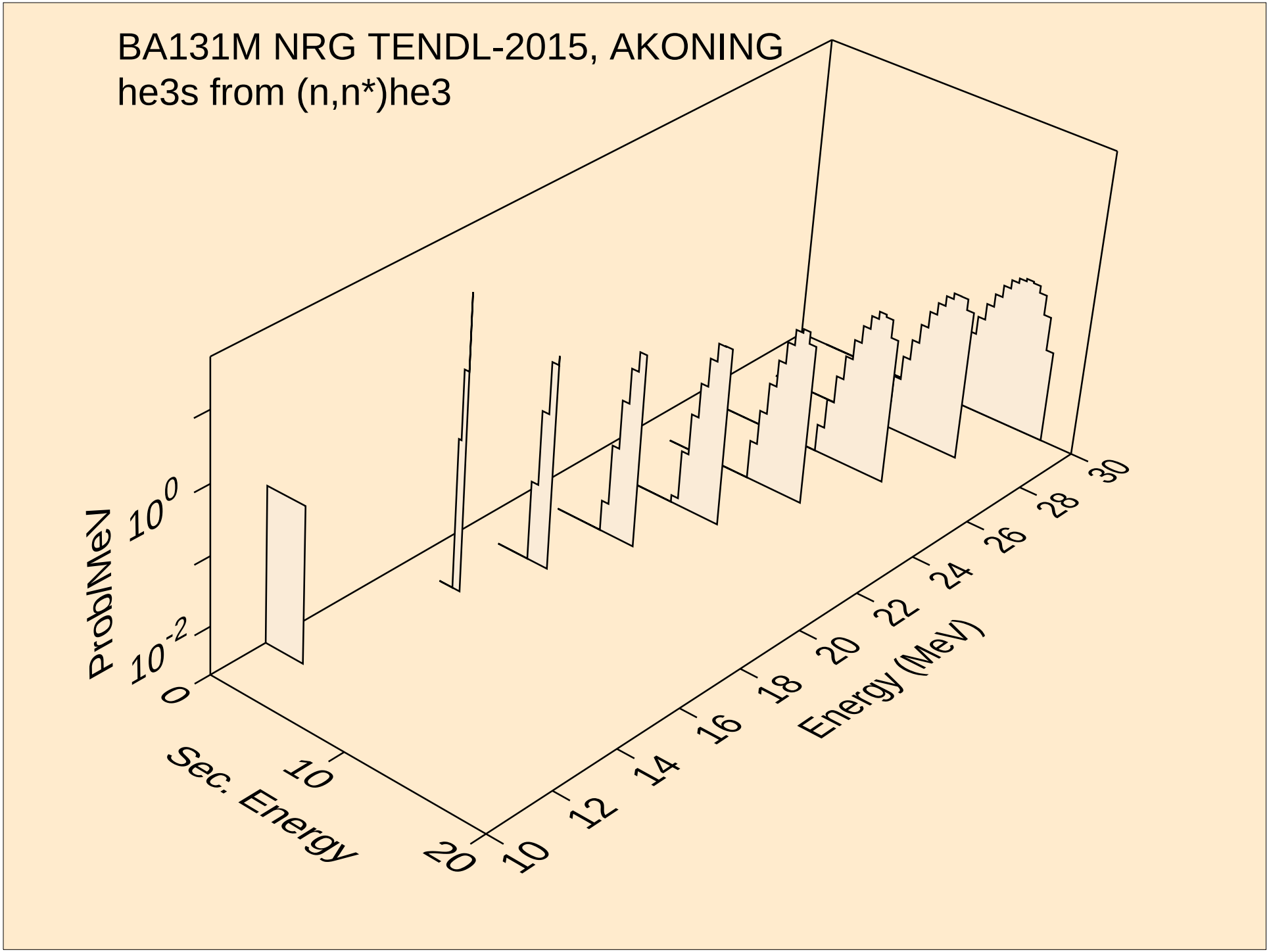

BA131M NRG TENDL-2015, AKONING
tritons from (n,x)
Prob/MeV
10-1
10-3
10-5
0
100
200
Sec. Energy
0
50
100
150
200
Energy (MeV)

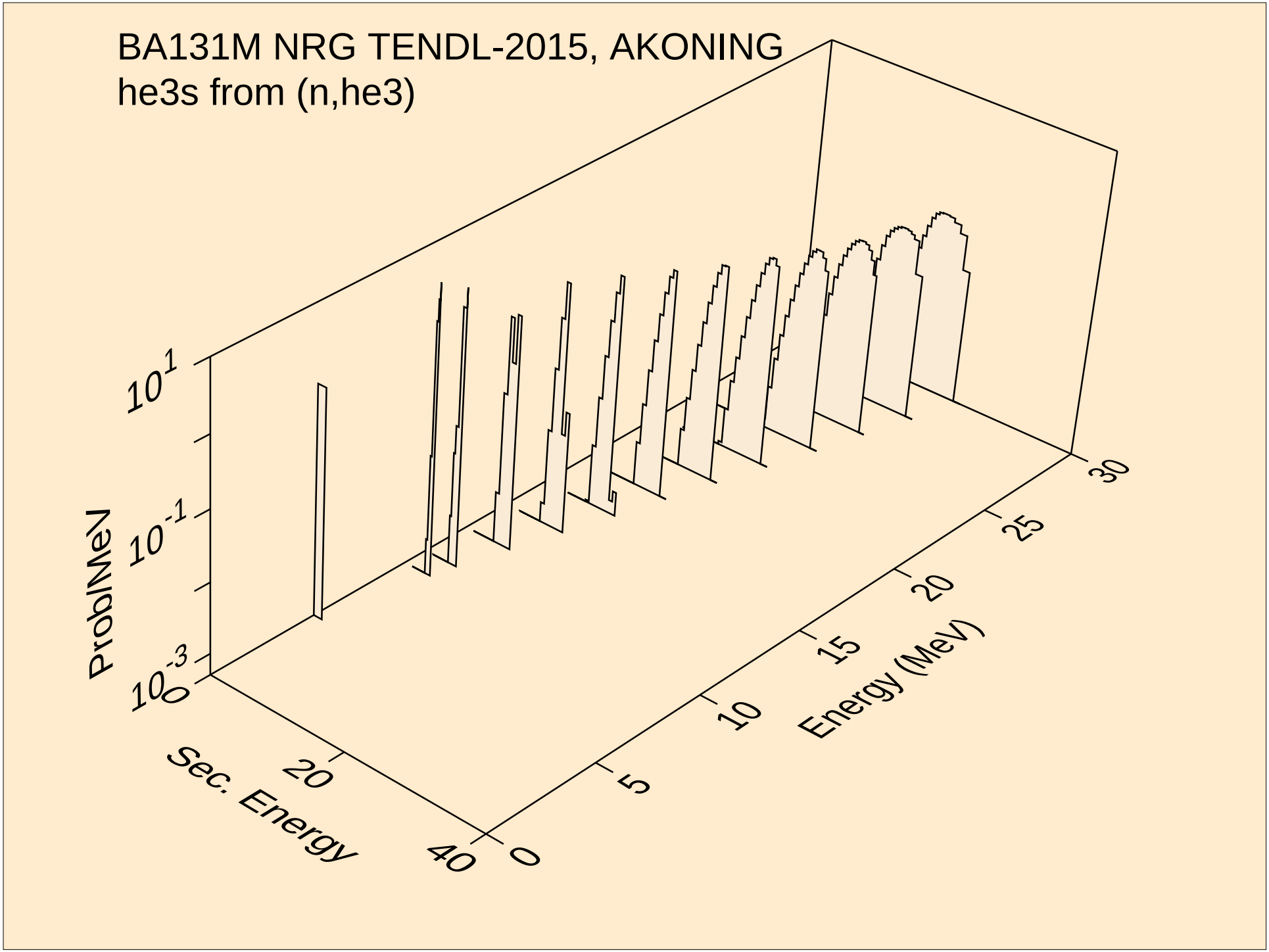

BA131M NRG TENDL-2015, AKONING
tritons from (n,n*)t
Prob/MeV
10-1
10-3
0
Sec. Energy
10
20
14
16
18
20
22
24
26
28
30
Energy (MeV)

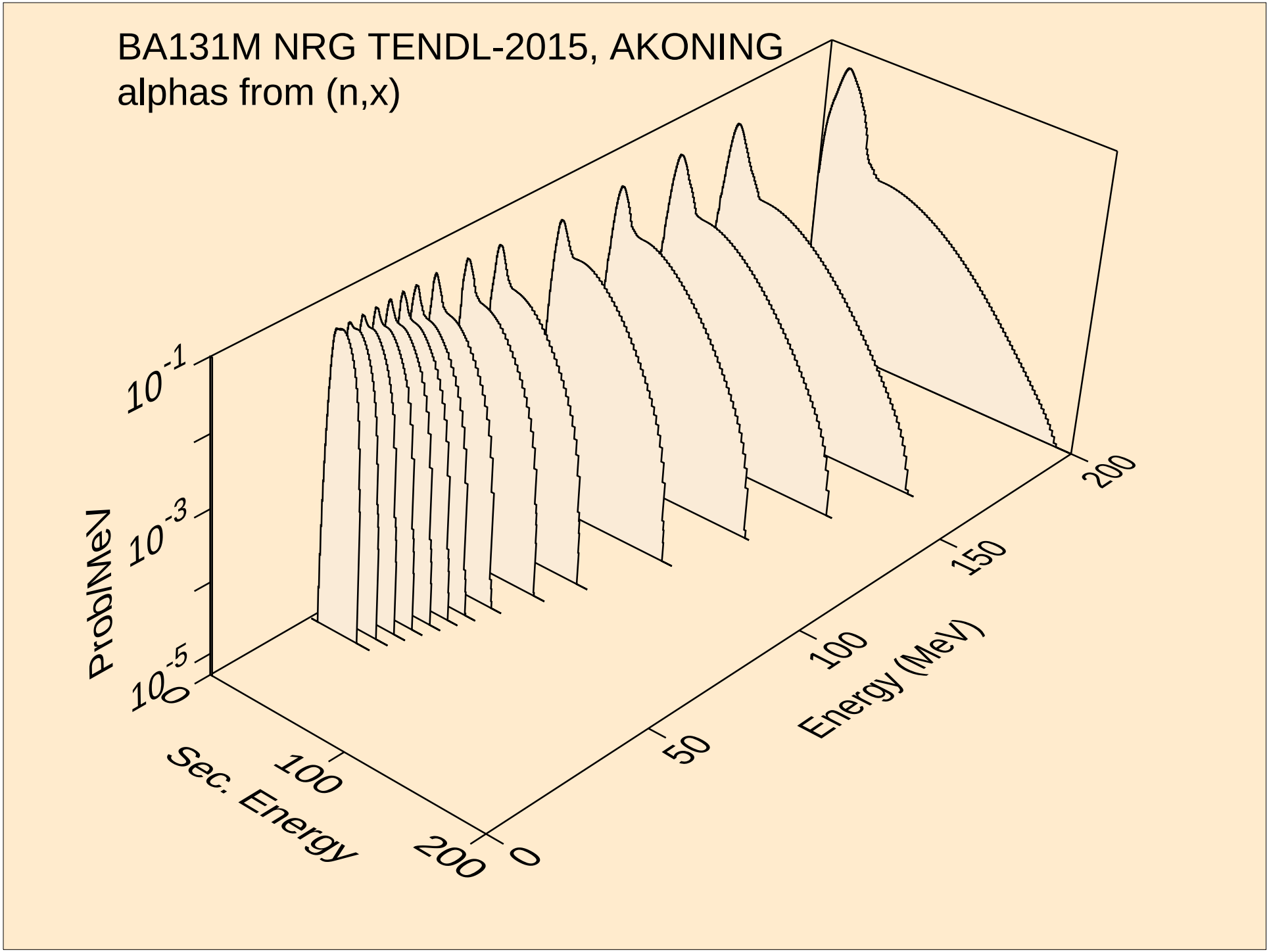

BA131M NRG TENDL-2015, AKONING
tritons from (n,t)
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
5
10
15
20
25
30
Energy (MeV)

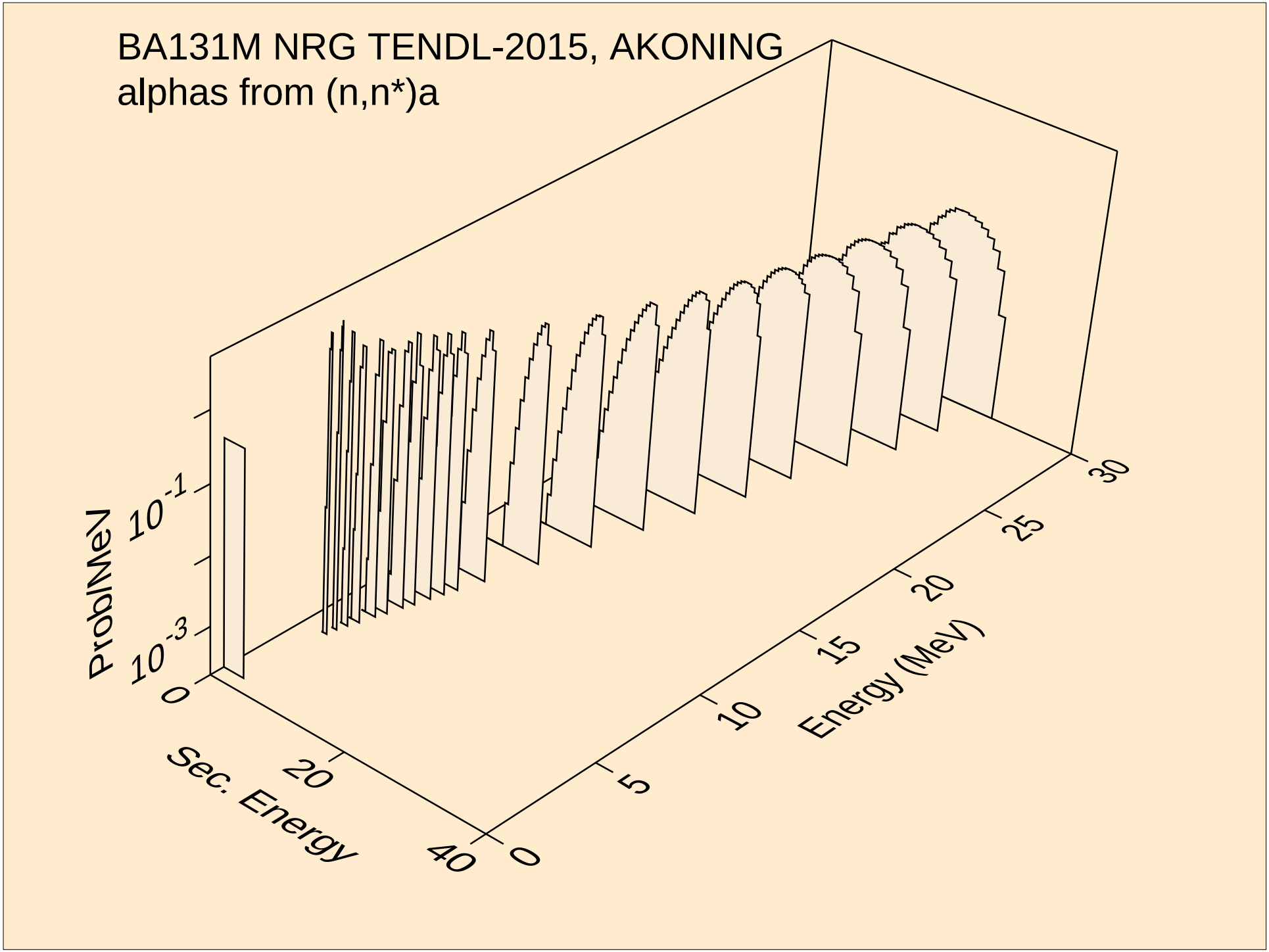

BA131M NRG TENDL-2015, AKONING
tritons from (n,pt)
Prob/MeV
$10^{0}$
$10^{-2}$
0
Sec. Energy
10
20
Energy (MeV)
10
12
14
16
18
20
22
24
26
28
30

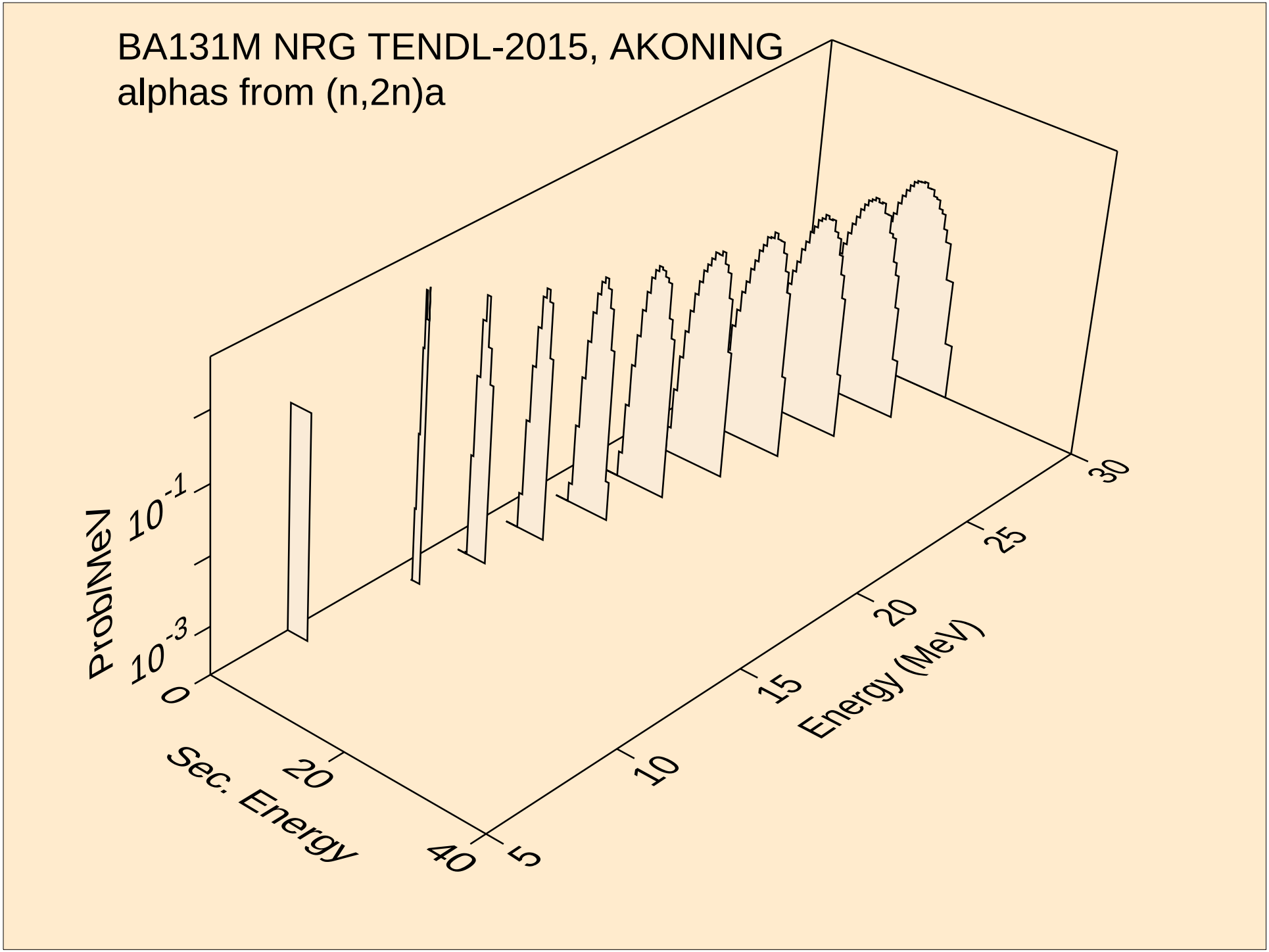

BA131M NRG TENDL-2015, AKONING
he3s from (n,x)
Prob/MeV
10-1
10-3
0
Sec. Energy
100
200
0
50
100
150
200
Energy (MeV)

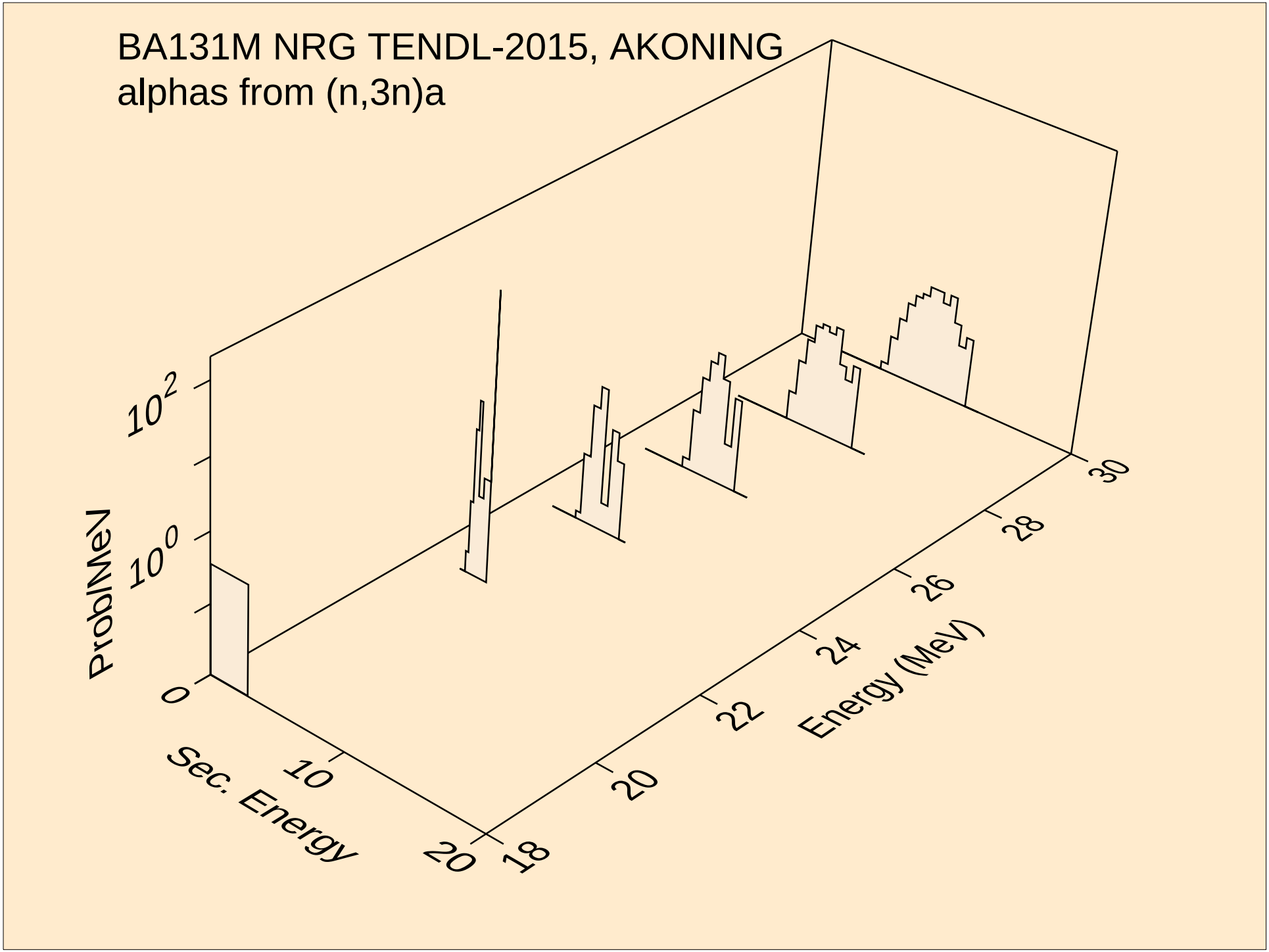

BA131M NRG TENDL-2015, AKONING
he3s from (n,n*)he3
Prob/MeV
10^0
10^-2
0
Sec. Energy
10
20
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

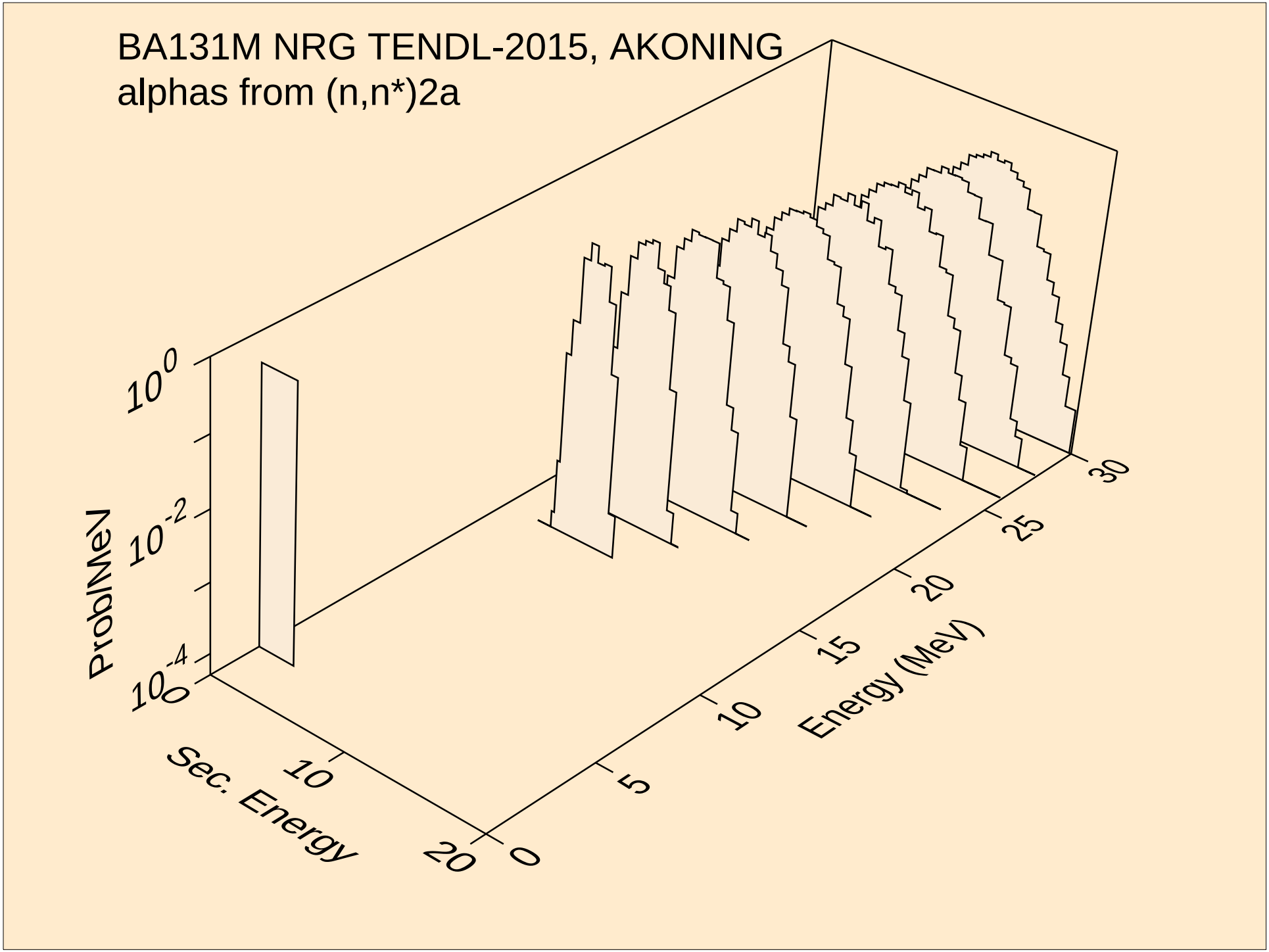

BA131M NRG TENDL-2015, AKONING
he3s from (n,he3)
Prob/MeV
10^1
10^-1
10^-3
0
20
40
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

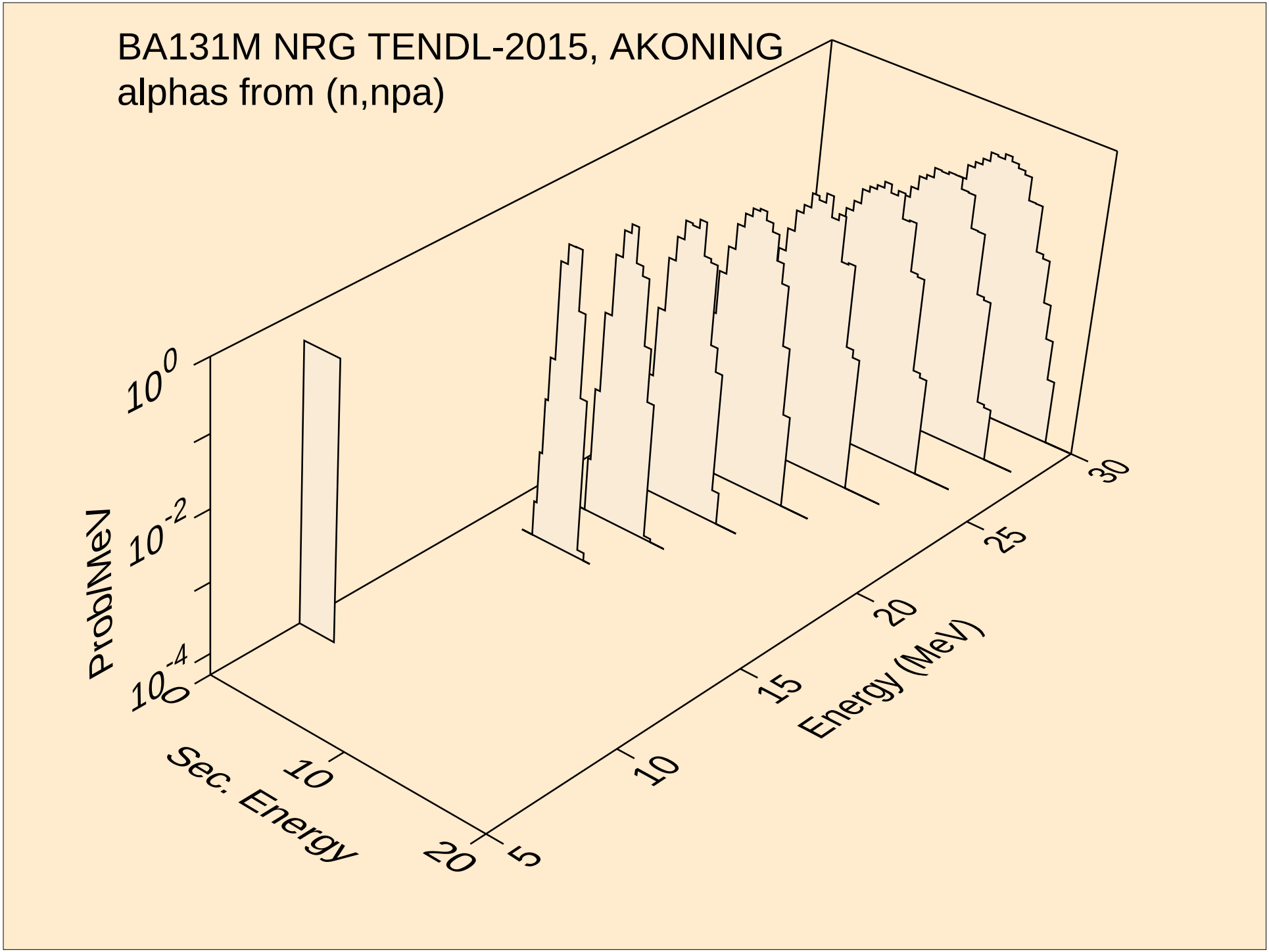

BA131M NRG TENDL-2015, AKONING
alphas from (n,x)
Prob/MeV
10-1
10-3
10-5
0
100
200
Sec. Energy
0
50
100
150
200
Energy (MeV)

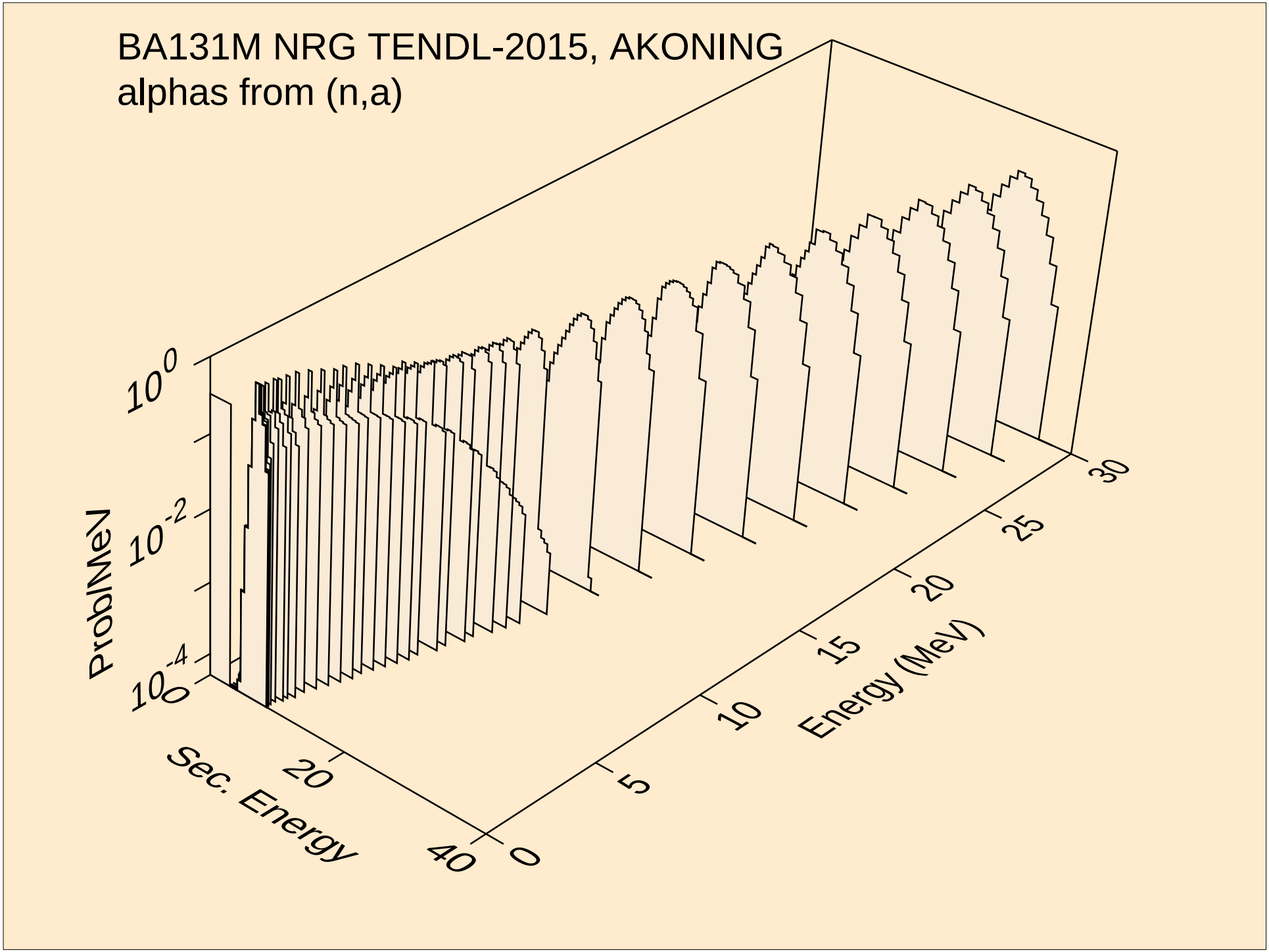

BA131M NRG TENDL-2015, AKONING
alphas from (n,n*)a
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

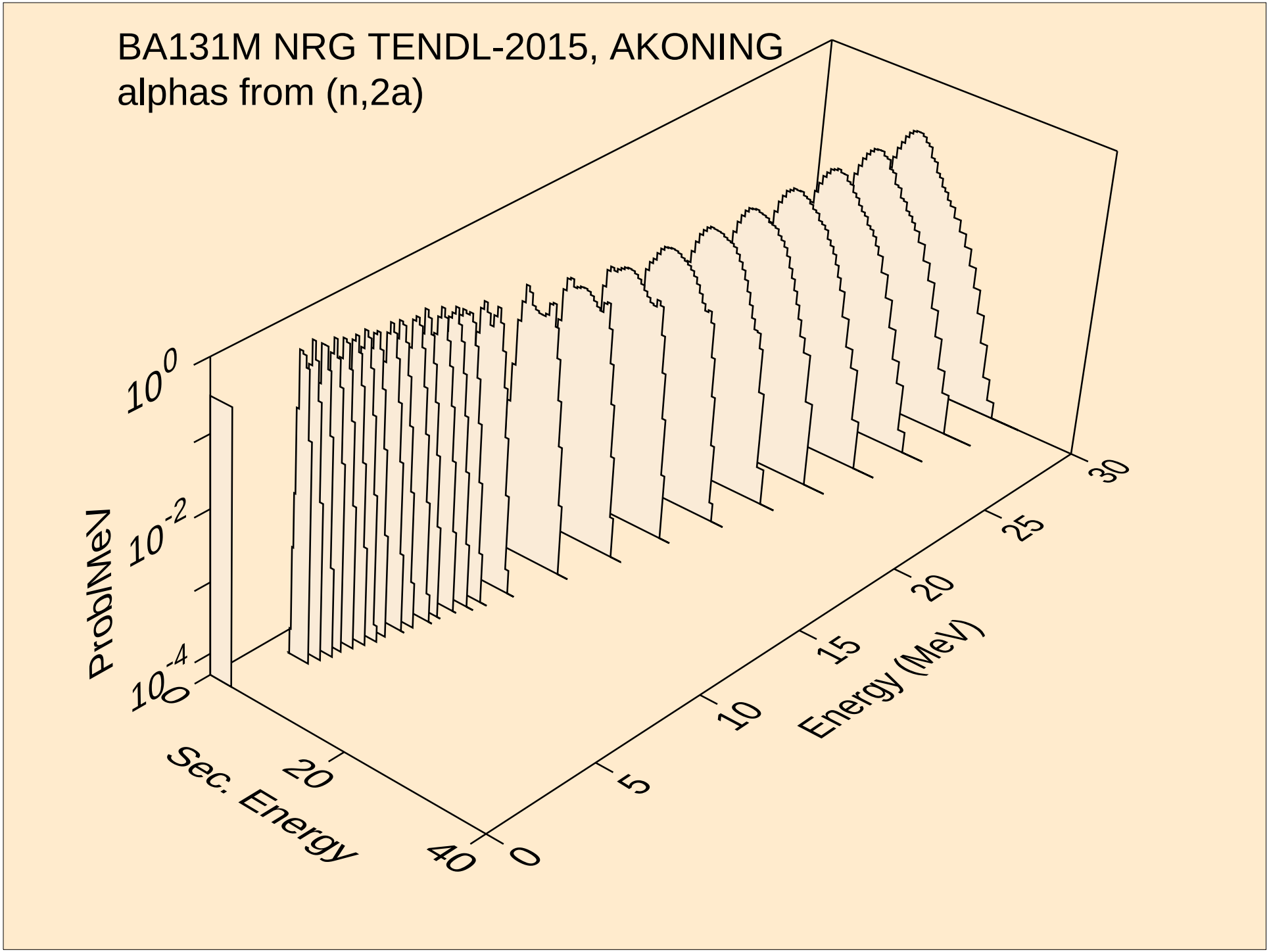

BA131M NRG TENDL-2015, AKONING
alphas from (n,2n)a
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
5
10
15
20
25
30
Energy (MeV)

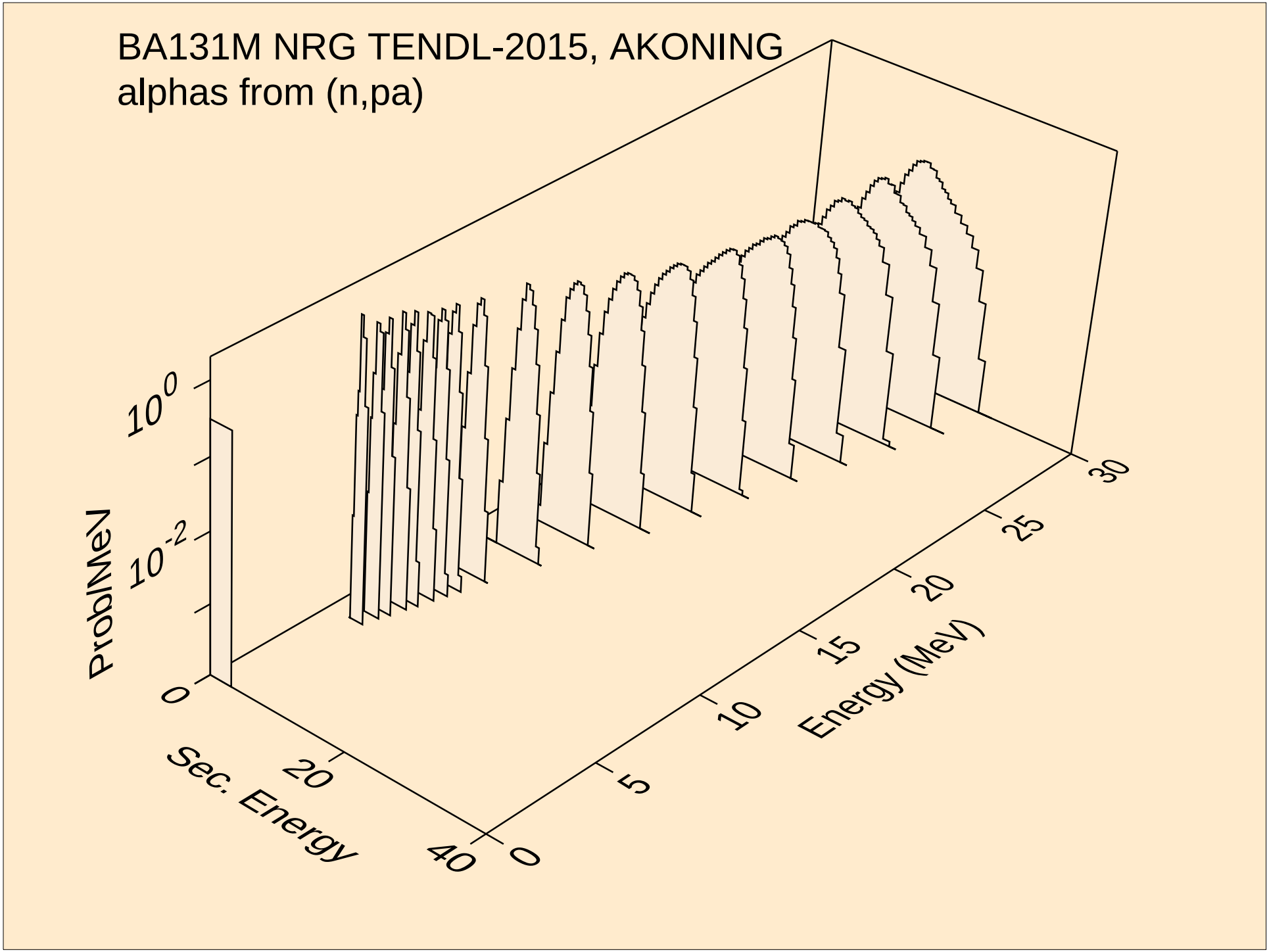

BA131M NRG TENDL-2015, AKONING
alphas from (n,3n)a
Prob/MeV
$10^2$
$10^0$
0
Sec. Energy
10
20
18
20
22
24
26
28
30
Energy (MeV)

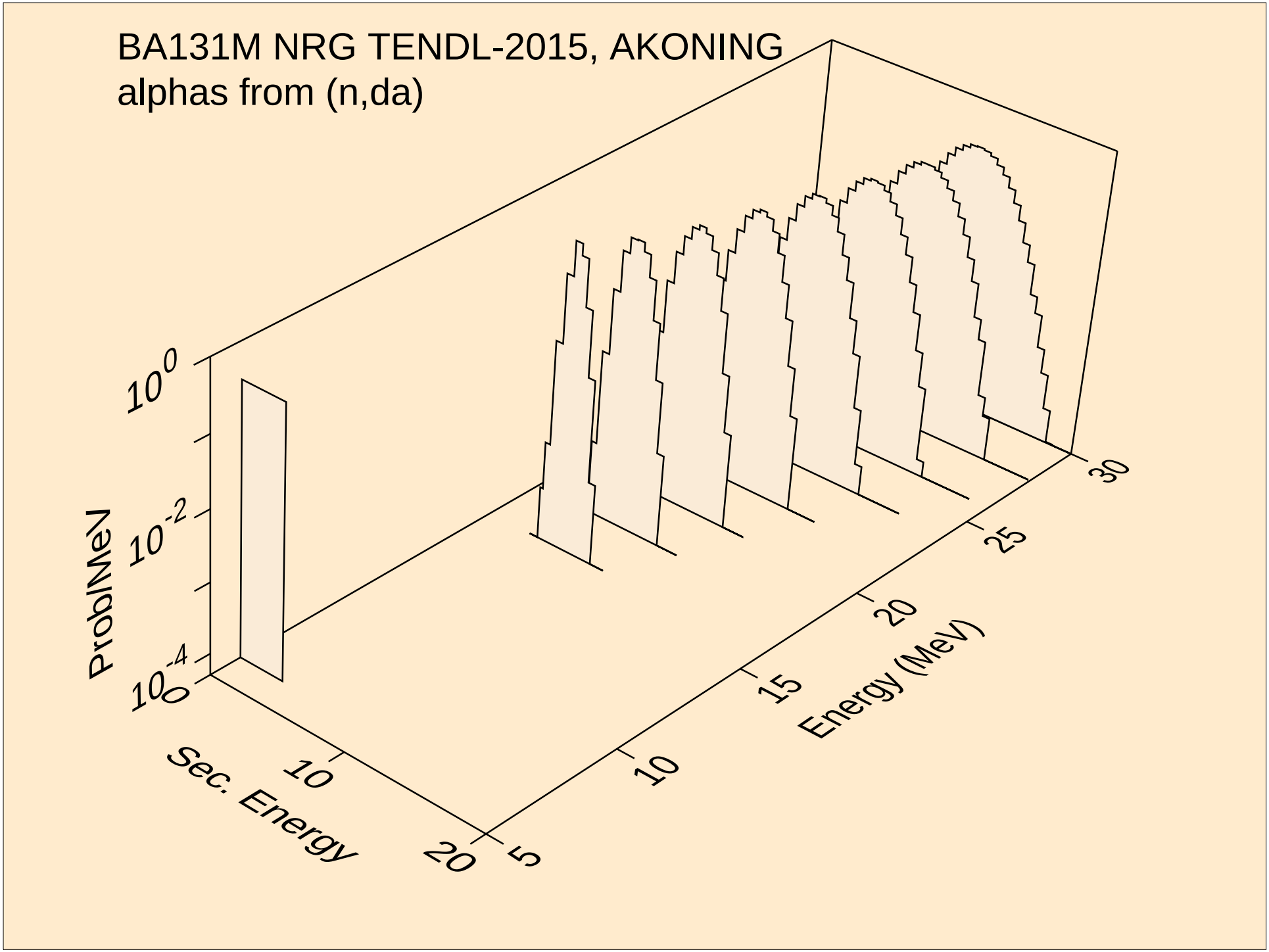

BA131M NRG TENDL-2015, AKONING
alphas from (n,n*)2a
Prob/MeV
$10^{0}$
$10^{-2}$
$10^{-4}$
Sec. Energy
0
10
20
Energy (MeV)
0
5
10
15
20
25
30


BA131M NRG TENDL-2015, AKONING
alphas from (n,npa)
Prob/MeV
10^0
10^-2
10^-4
0
Sec. Energy
10
20
5
10
15
20
25
30
Energy (MeV)


BA131M NRG TENDL-2015, AKONING
alphas from (n,a)
Prob/MeV
$10^{0}$
$10^{-2}$
$10^{-4}$
0
20
40
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)


BA131M NRG TENDL-2015, AKONING
alphas from (n,2a)
Prob/MeV
10^0
10^-2
10^-4
Sec. Energy
0
20
40
Energy (MeV)
0
5
10
15
20
25
30


BA131M NRG TENDL-2015, AKONING
alphas from (n,pa)
Prob/MeV
10^0
10^-2
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)


BA131M NRG TENDL-2015, AKONING
alphas from (n,da)
Prob/MeV
10^0
10^-2
10^-4
0
Sec. Energy
10
20
5
10
15
20
25
30
Energy (MeV)