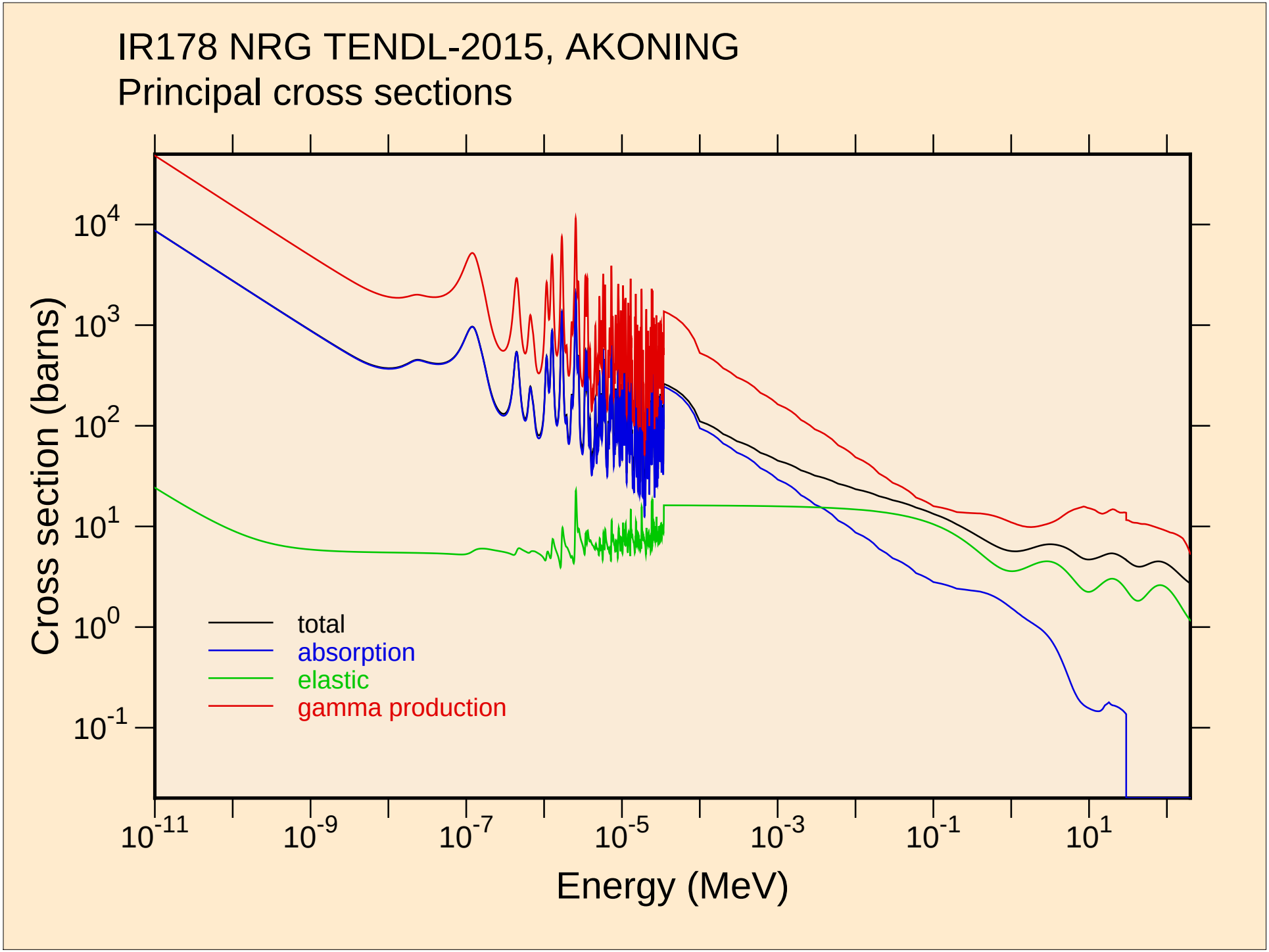
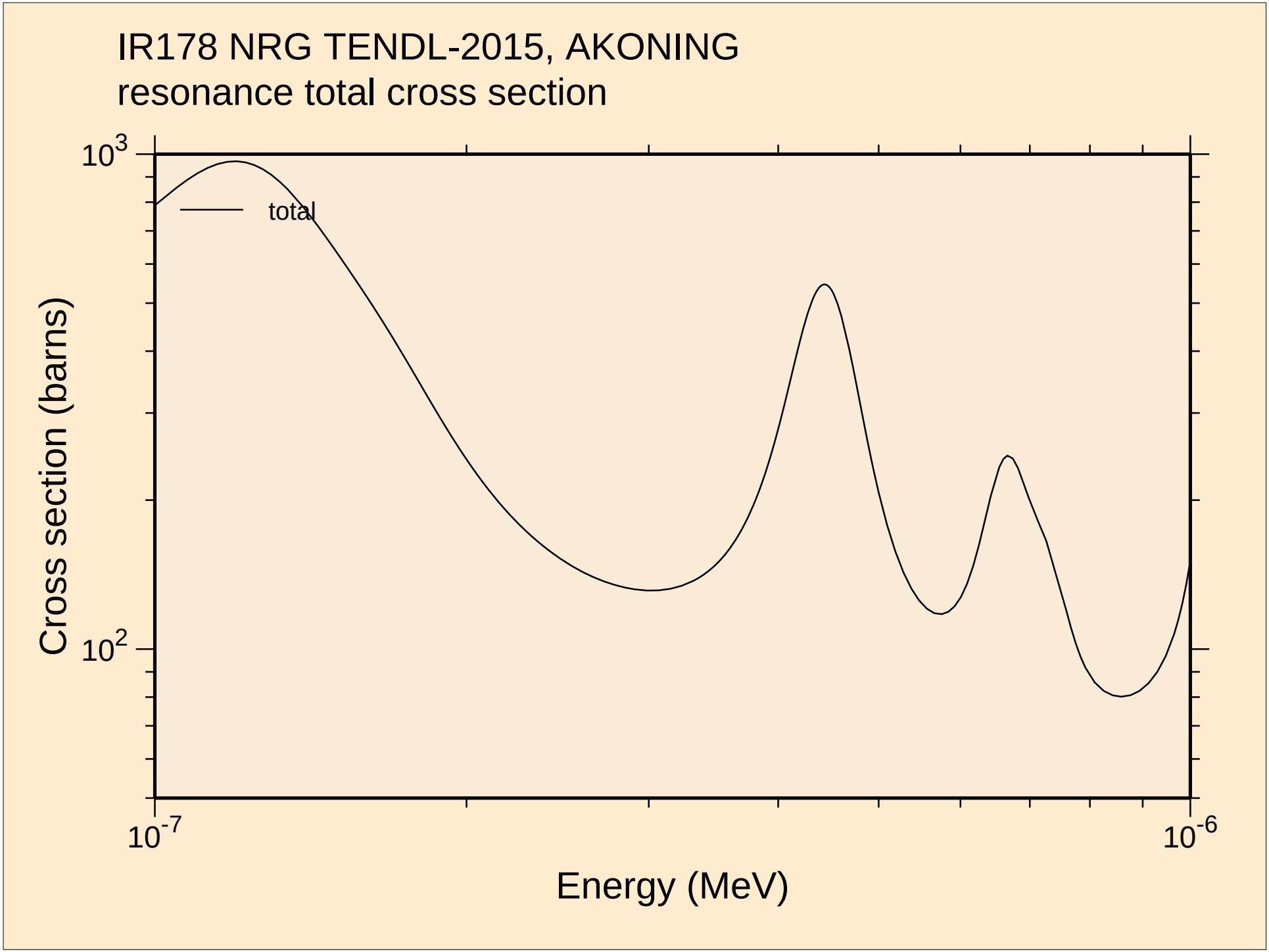
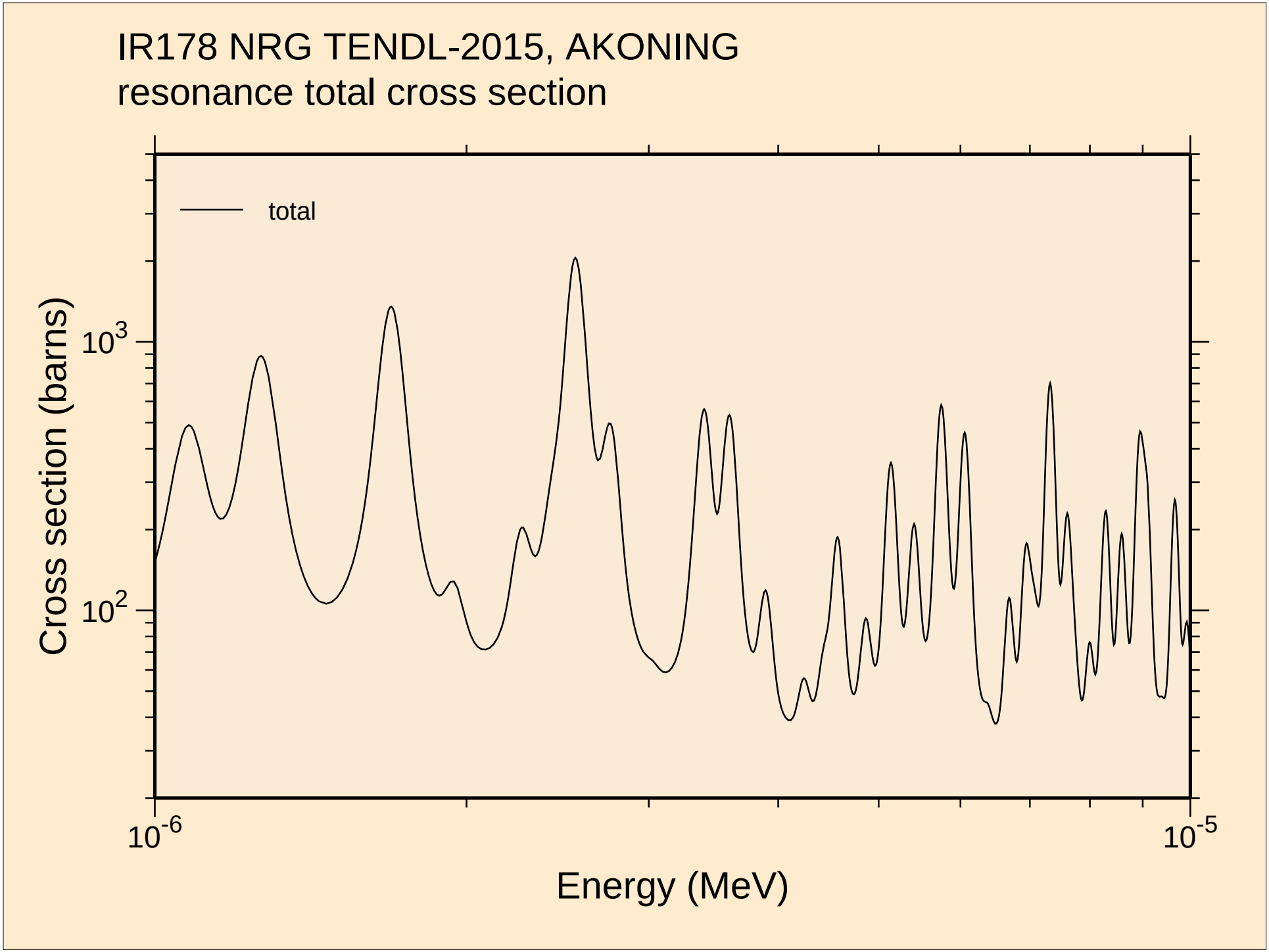
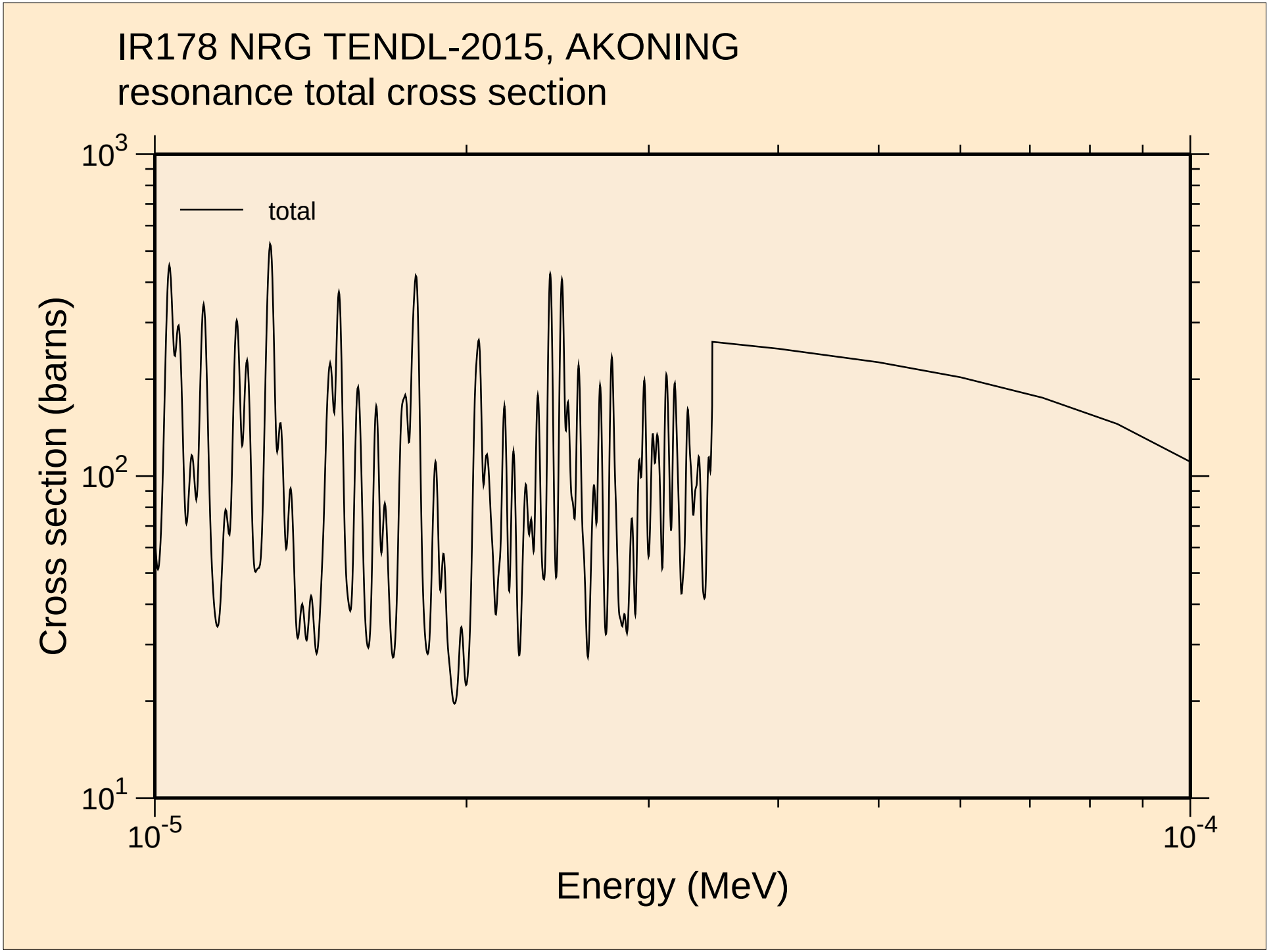
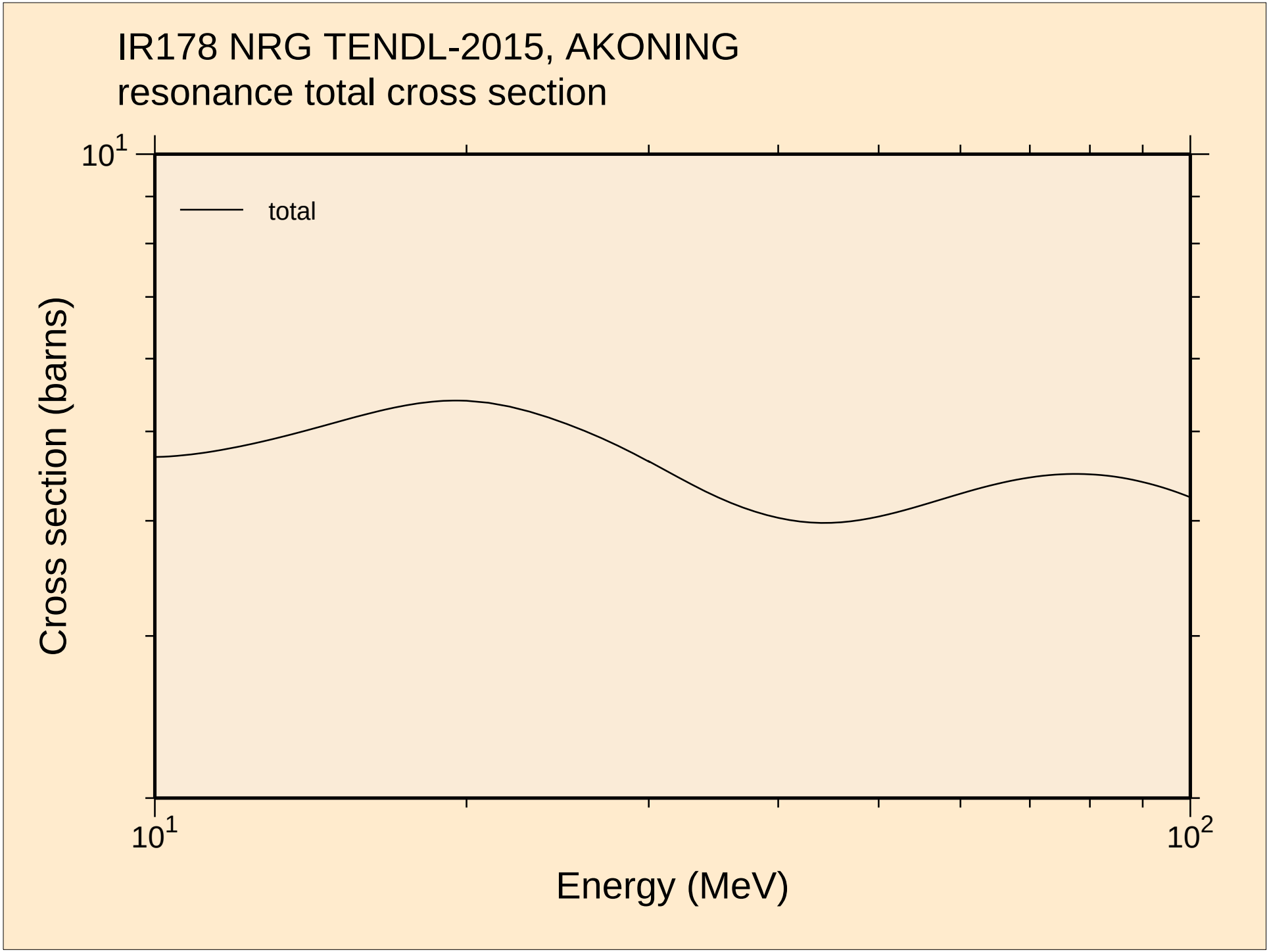
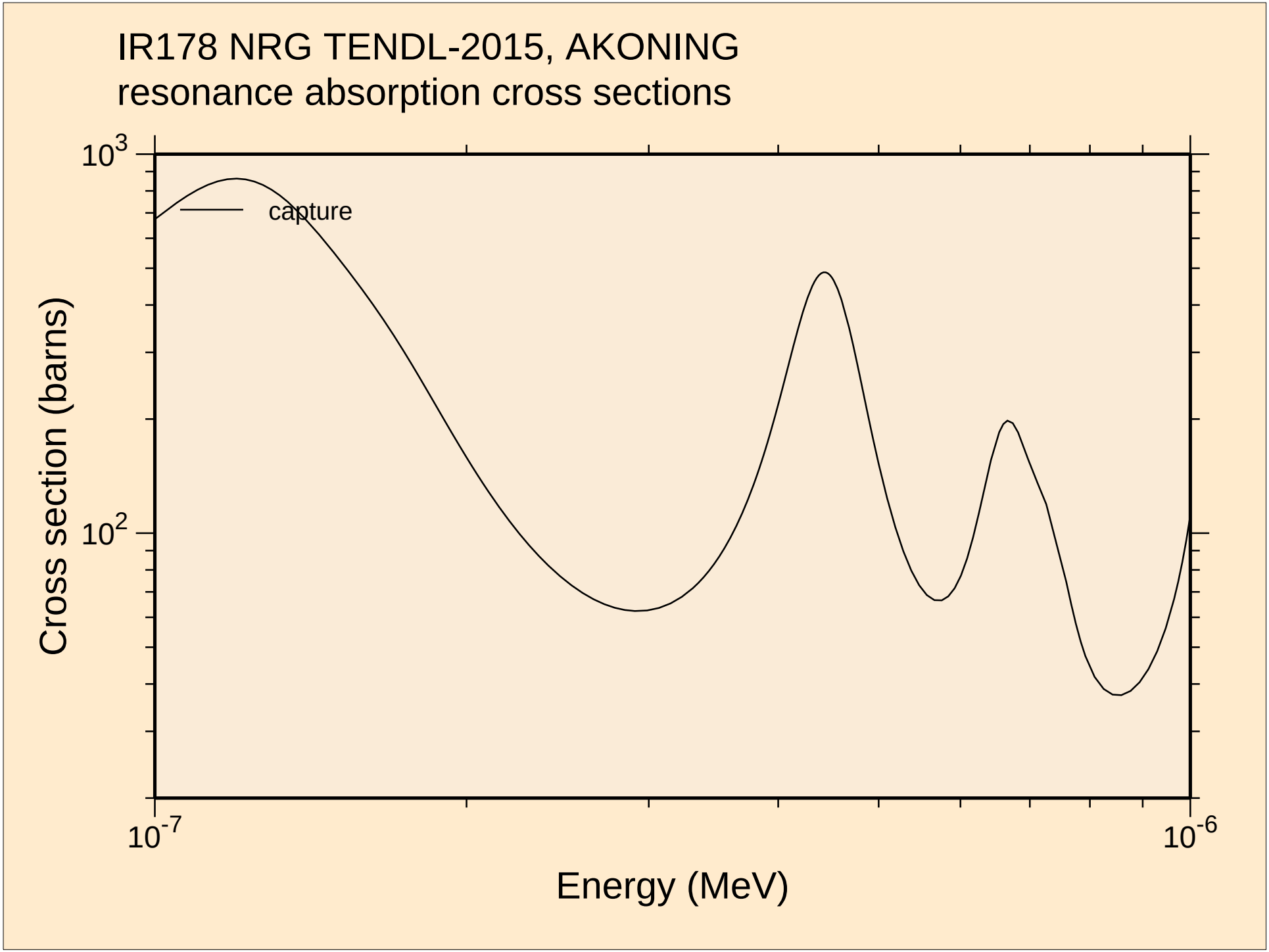

IR178 NRG TENDL-2015, AKONING
Principal cross sections
Cross section (barns)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
total
absorption
elastic
gamma production
10^{-11}
10^{-9}
10^{-7}
10^{-5}
10^{-3}
10^{-1}
10^{1}
Energy (MeV)

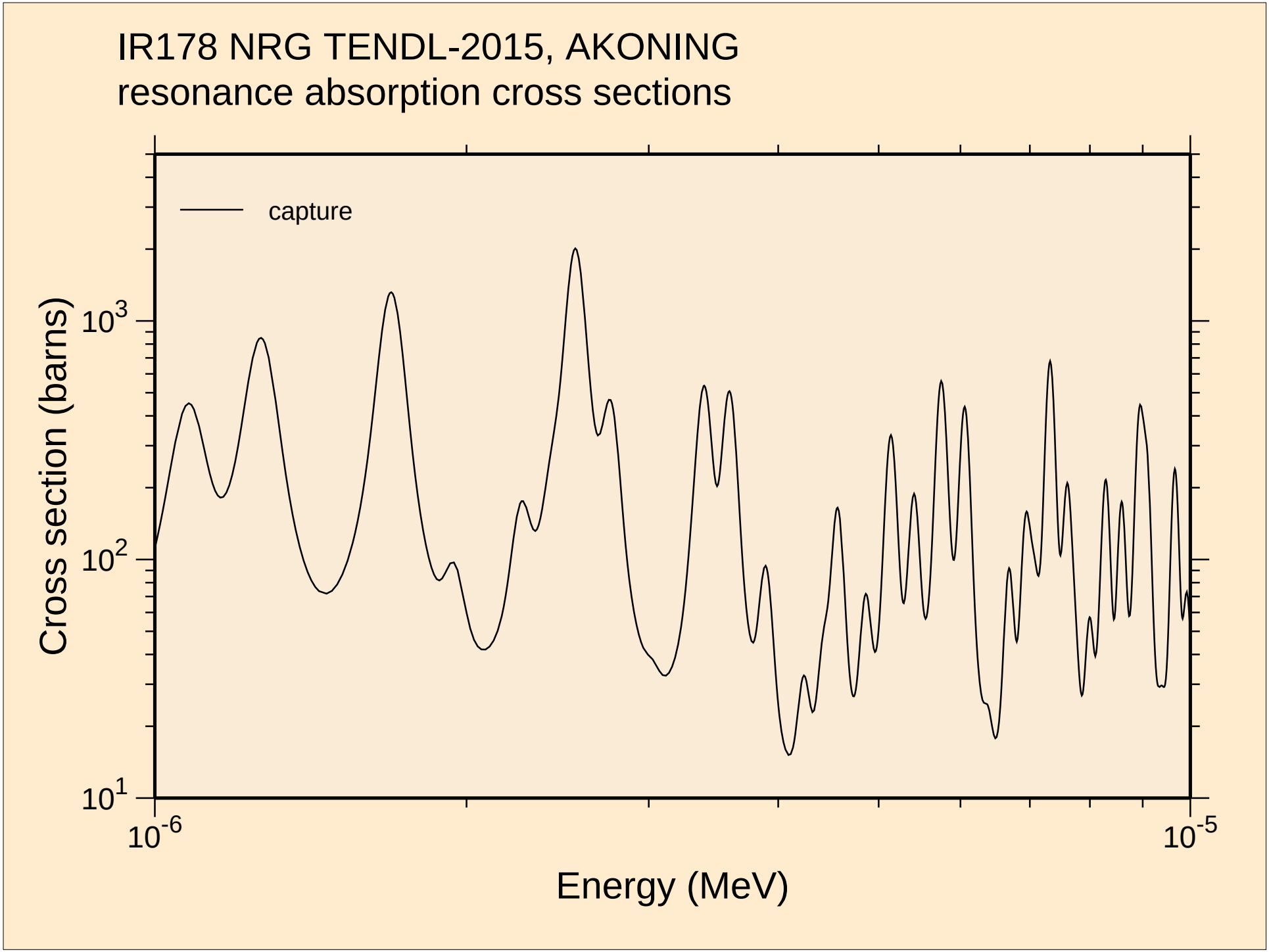

IR178 NRG TENDL-2015, AKONING
resonance total cross section
total
Cross section (barns)
10^3
10^2
10^-7
10^-6
Energy (MeV)

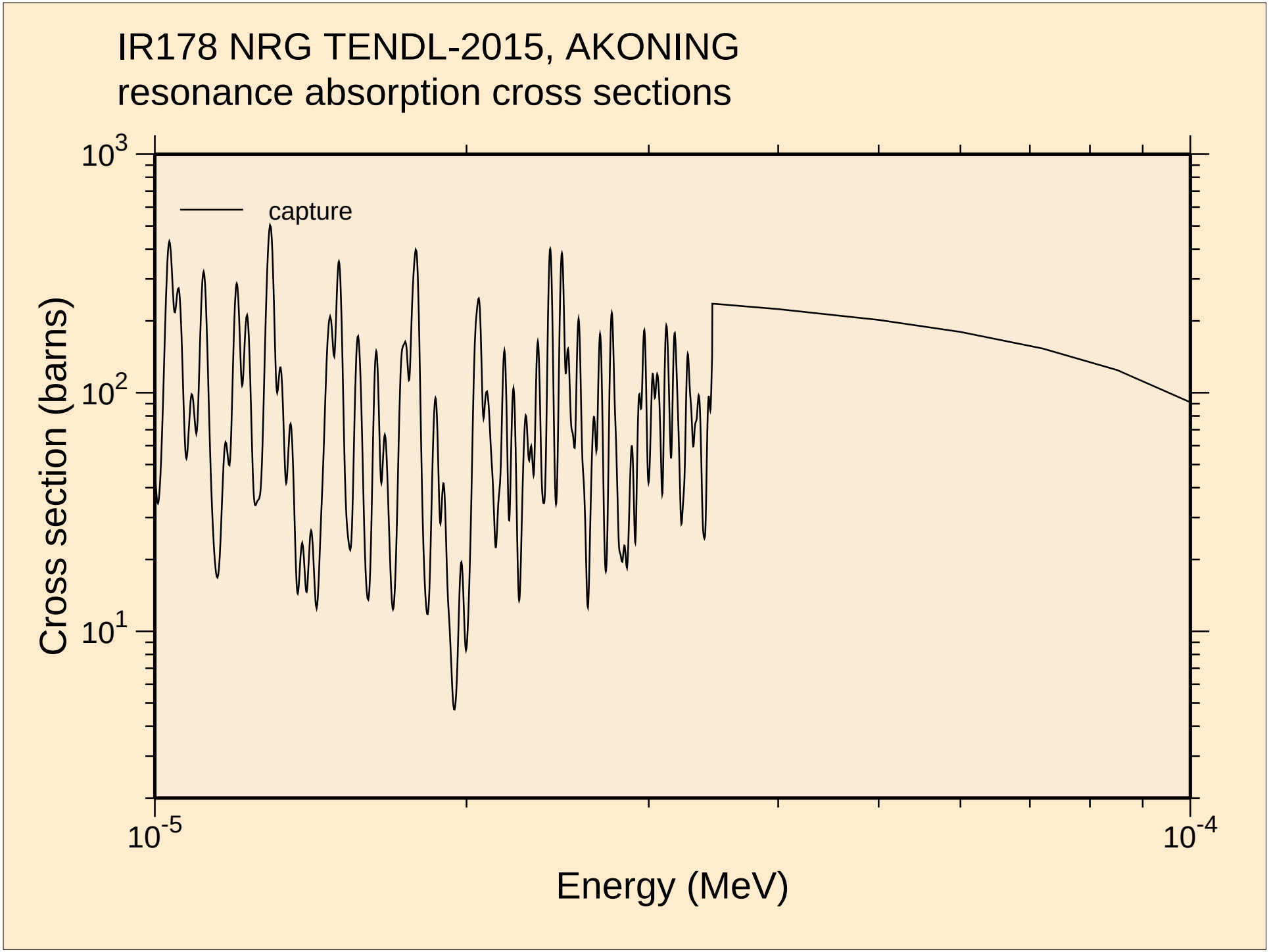

IR178 NRG TENDL-2015, AKONING
resonance total cross section
total
Cross section (barns)
10^3
10^2
10^-6
10^-5
Energy (MeV)

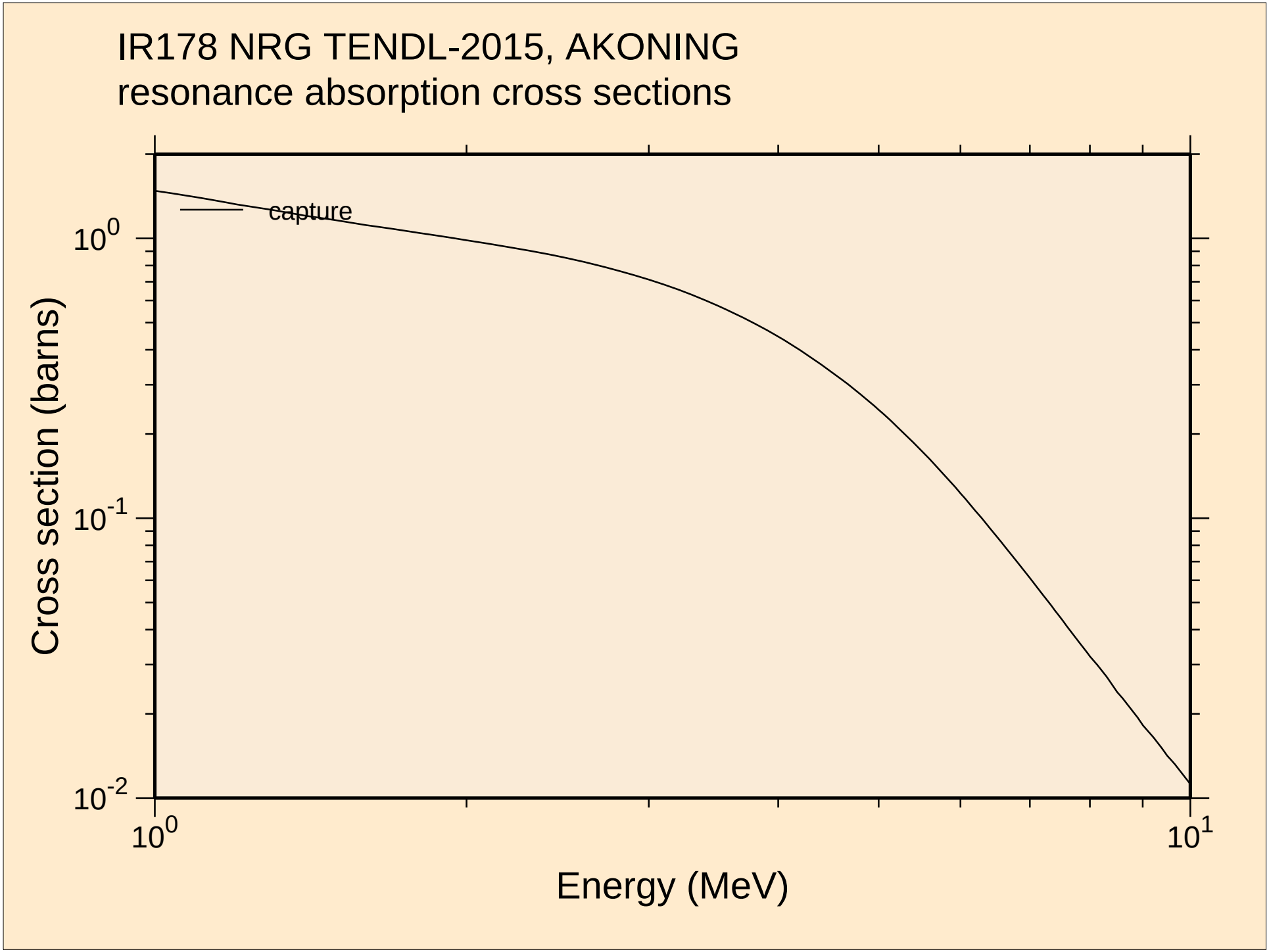

IR178 NRG TENDL-2015, AKONING
resonance total cross section
total
Cross section (barns)
10^3
10^2
10^1
10^-5
10^-4
Energy (MeV)

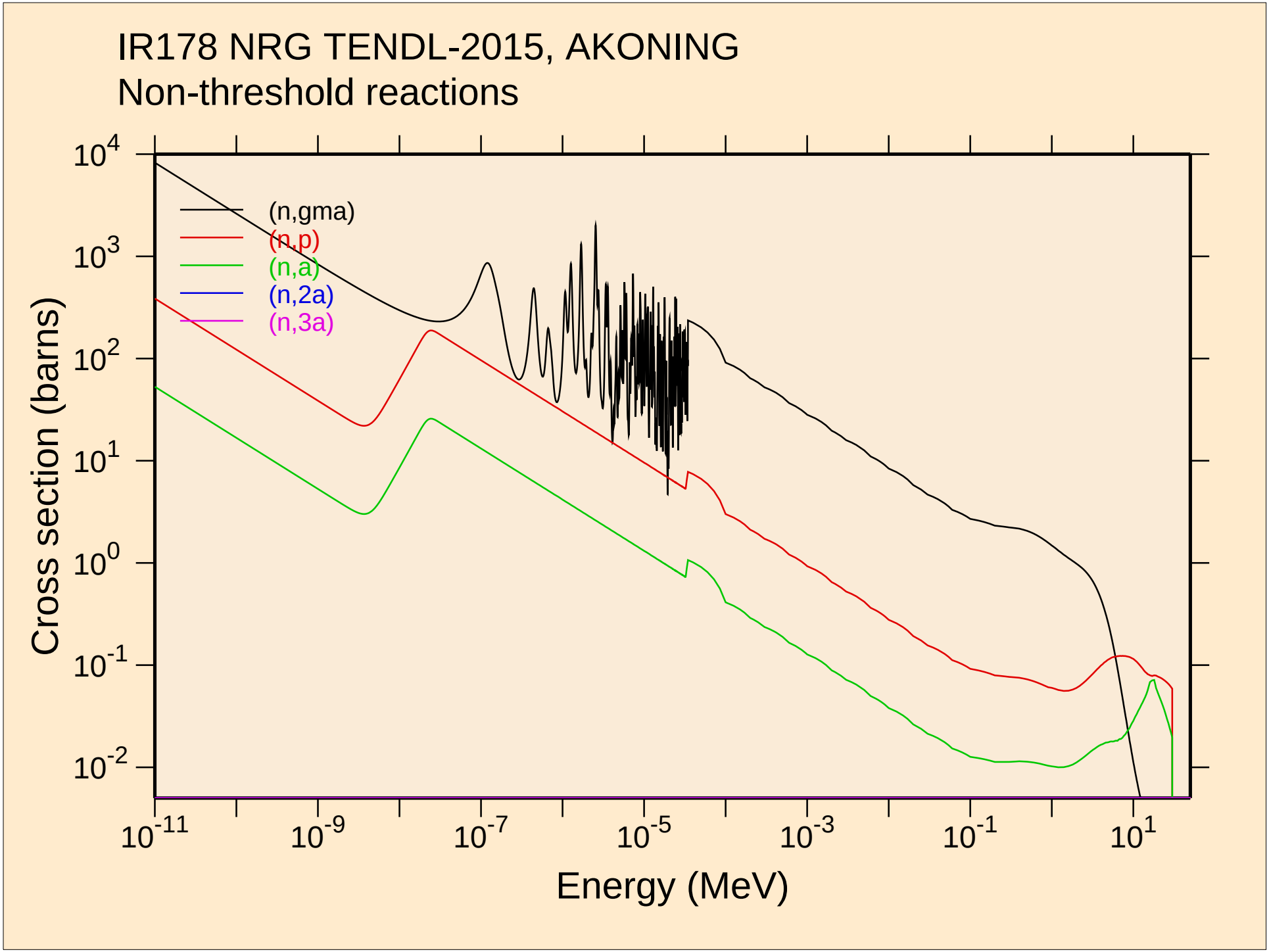

IR178 NRG TENDL-2015, AKONING
resonance total cross section
10^1
total
Cross section (barns)
10^1
10^2
Energy (MeV)

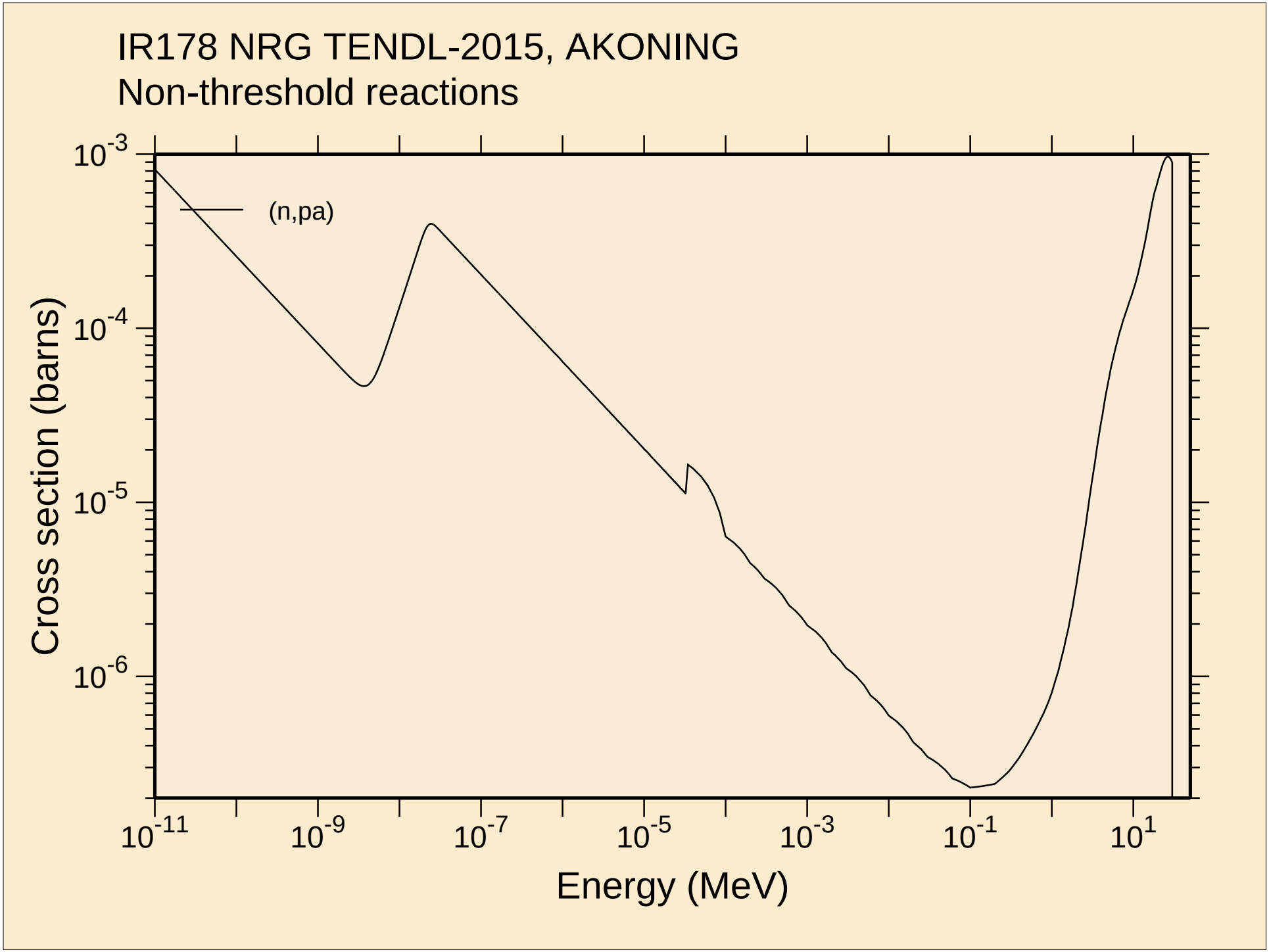

IR178 NRG TENDL-2015, AKONING
resonance absorption cross sections
capture
Cross section (barns)
10^3
10^2
10^-7
10^-6
Energy (MeV)

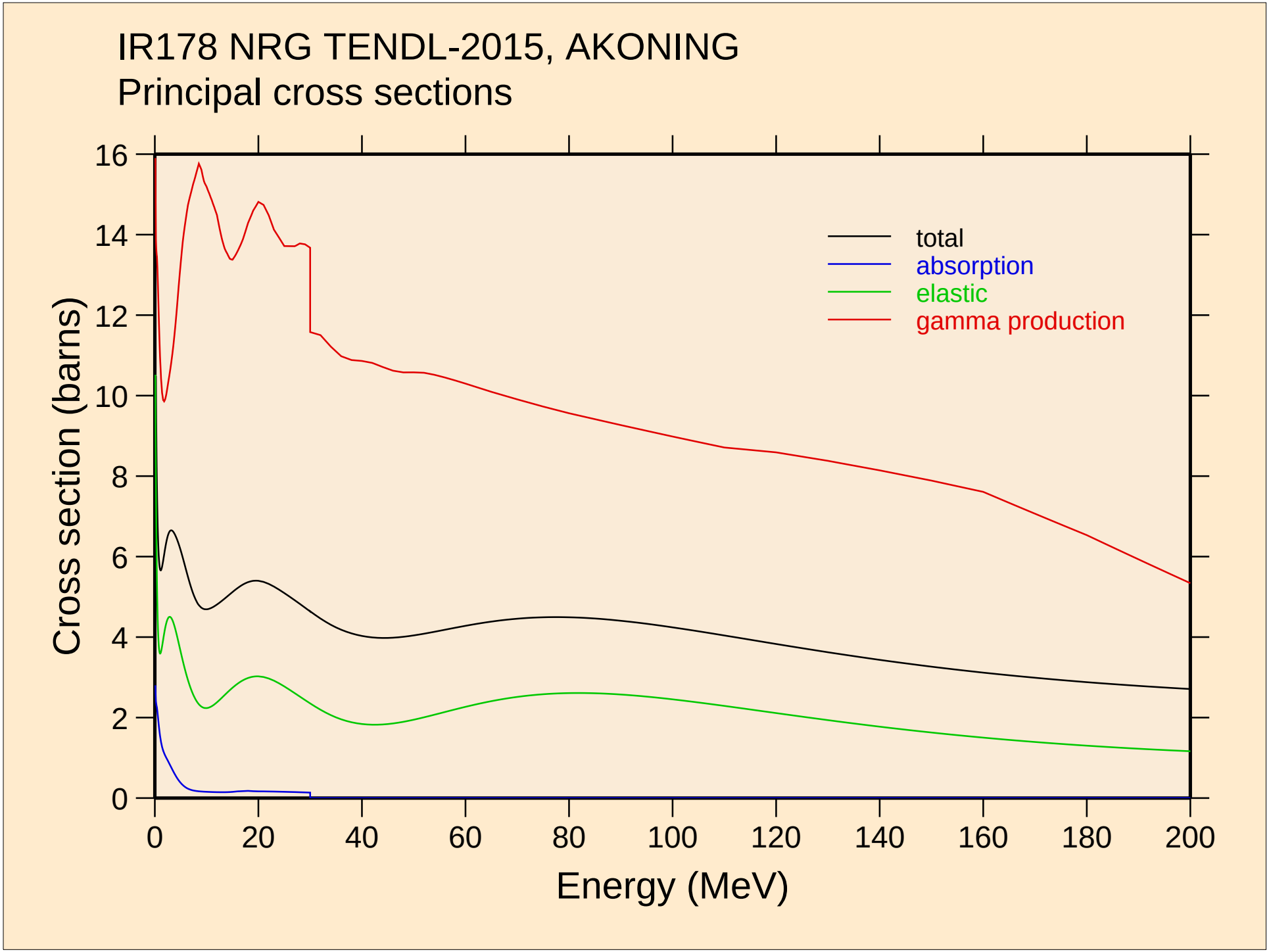

IR178 NRG TENDL-2015, AKONING
resonance absorption cross sections
capture
Cross section (barns)
10^3
10^2
10^1
10^-6
10^-5
Energy (MeV)

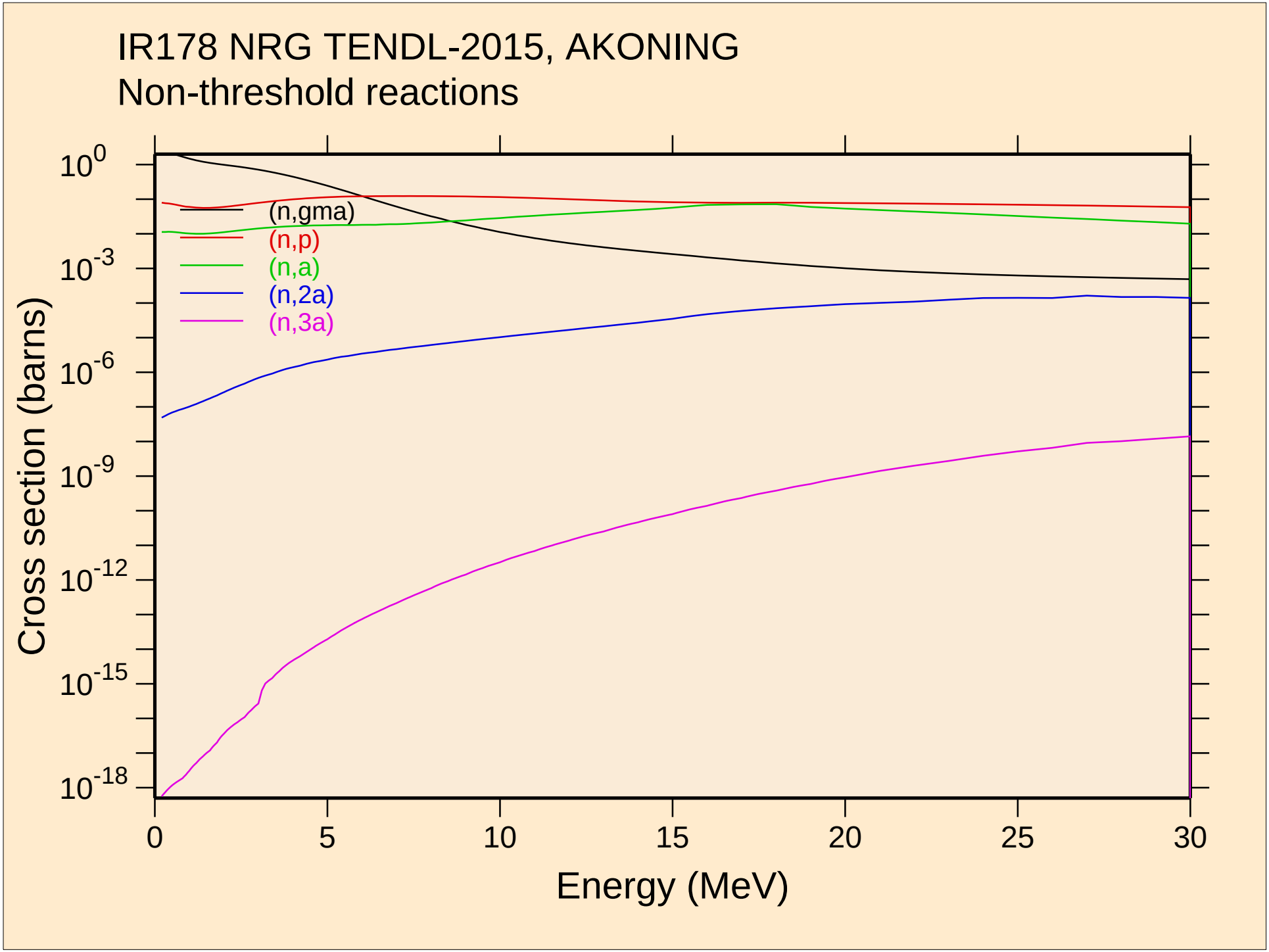

IR178 NRG TENDL-2015, AKONING
resonance absorption cross sections
capture
Cross section (barns)
10^3
10^2
10^1
10^-5
10^-4
Energy (MeV)

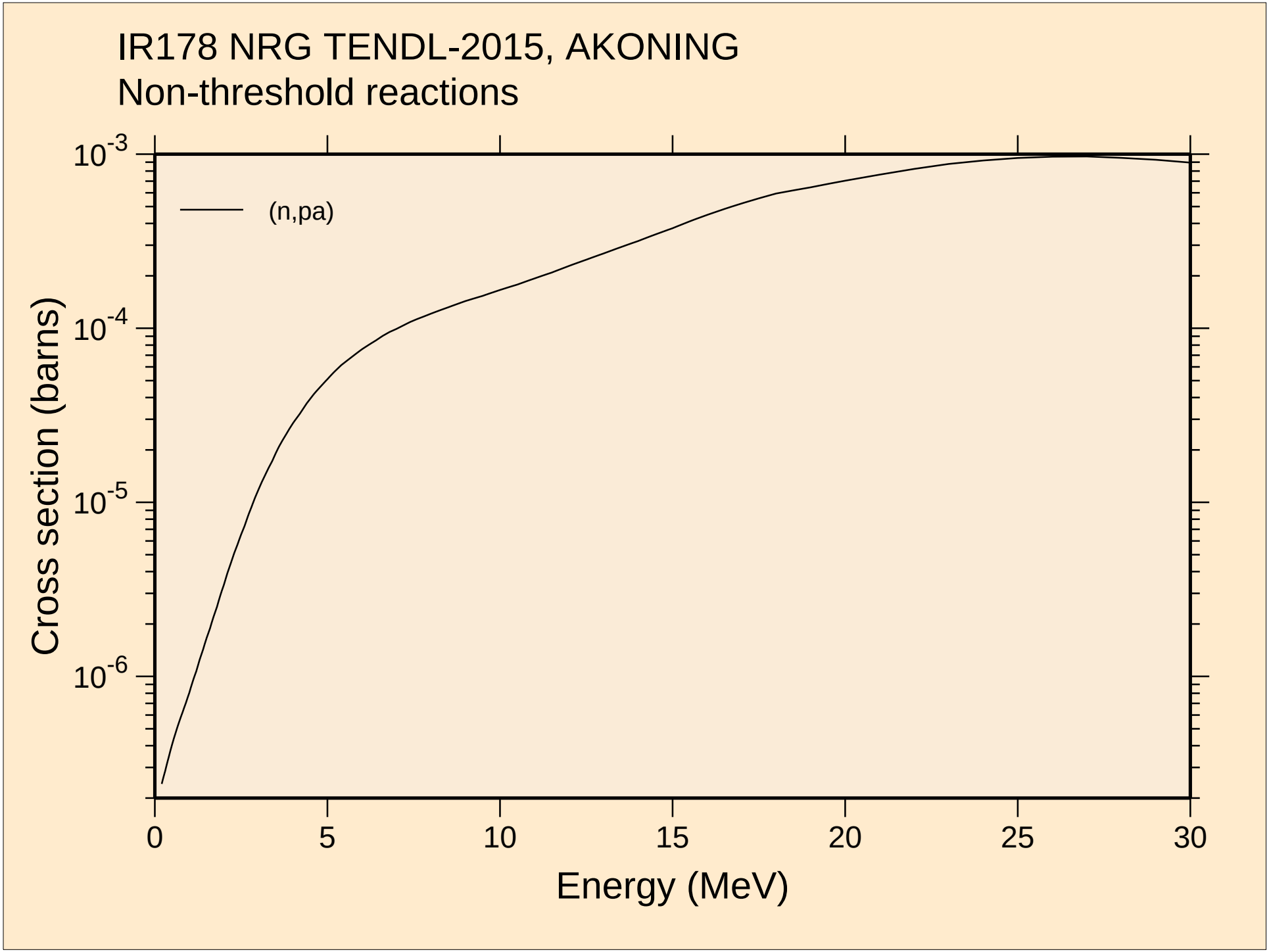

IR178 NRG TENDL-2015, AKONING
resonance absorption cross sections
capture
Cross section (barns)
10^0
10^-1
10^-2
10^0
10^1
Energy (MeV)

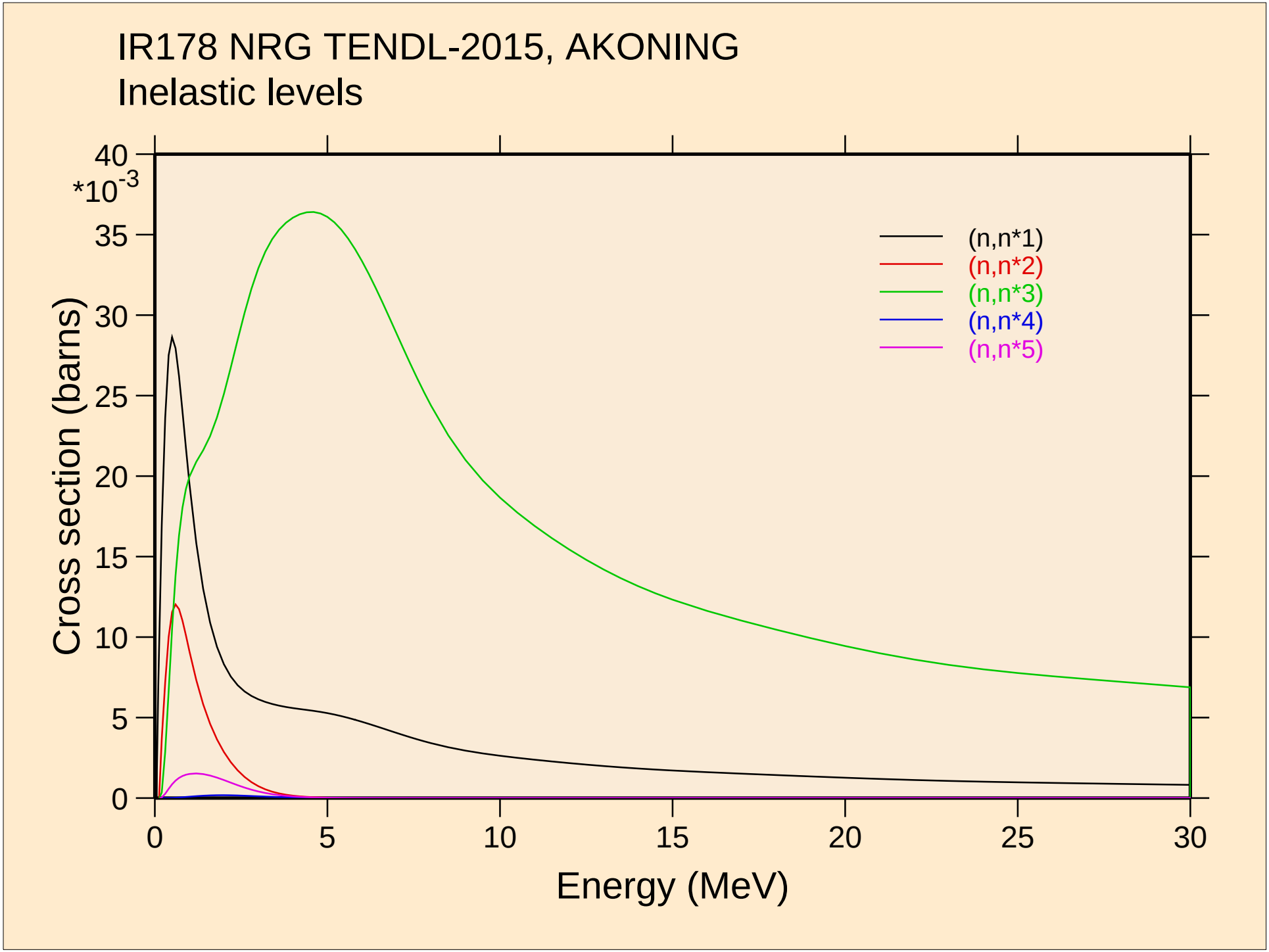

IR178 NRG TENDL-2015, AKONING
Non-threshold reactions
(n,gma)
(n,p)
(n,a)
(n,2a)
(n,3a)
Cross section (barns)
Energy (MeV)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-11
10^-9
10^-7
10^-5
10^-3
10^-1
10^1

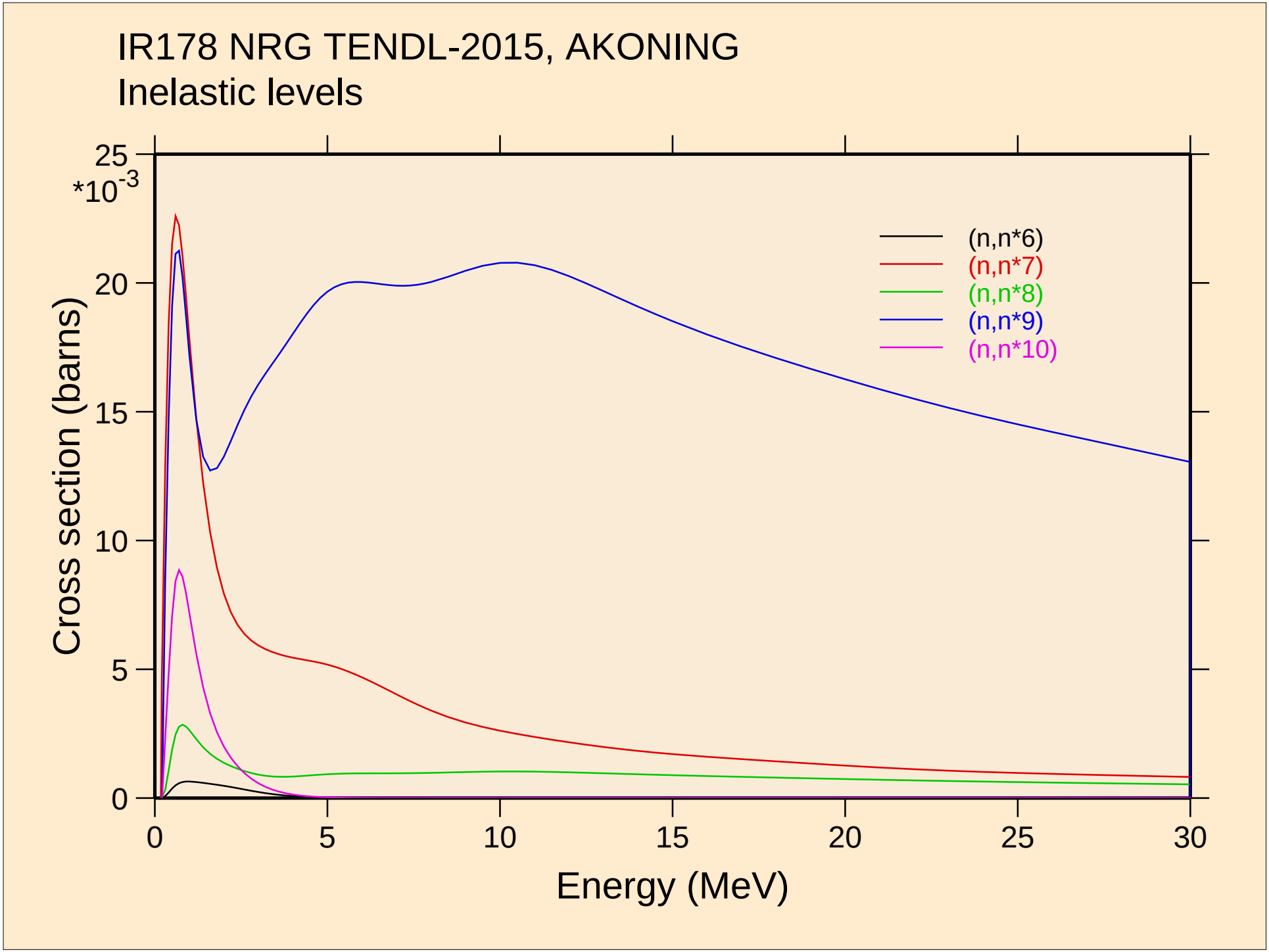

IR178 NRG TENDL-2015, AKONING
Non-threshold reactions
(n,pa)
Cross section (barns)
10-3
10-4
10-5
10-6
10-11
10-9
10-7
10-5
10-3
10-1
101
Energy (MeV)

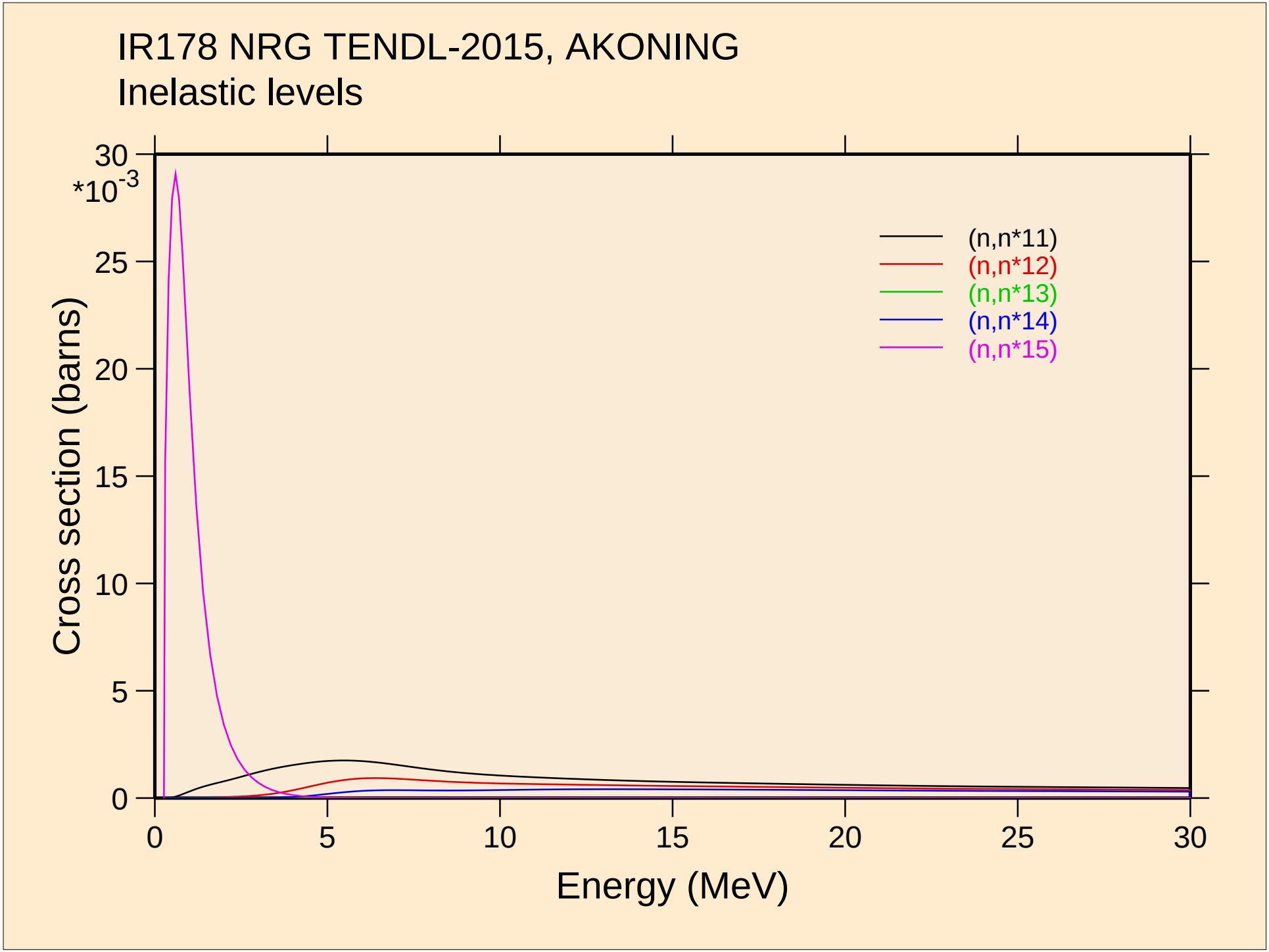

IR178 NRG TENDL-2015, AKONING
Principal cross sections
Cross section (barns)
Energy (MeV)
0
2
4
6
8
10
12
14
16
0
20
40
60
80
100
120
140
160
180
200
total
absorption
elastic
gamma production

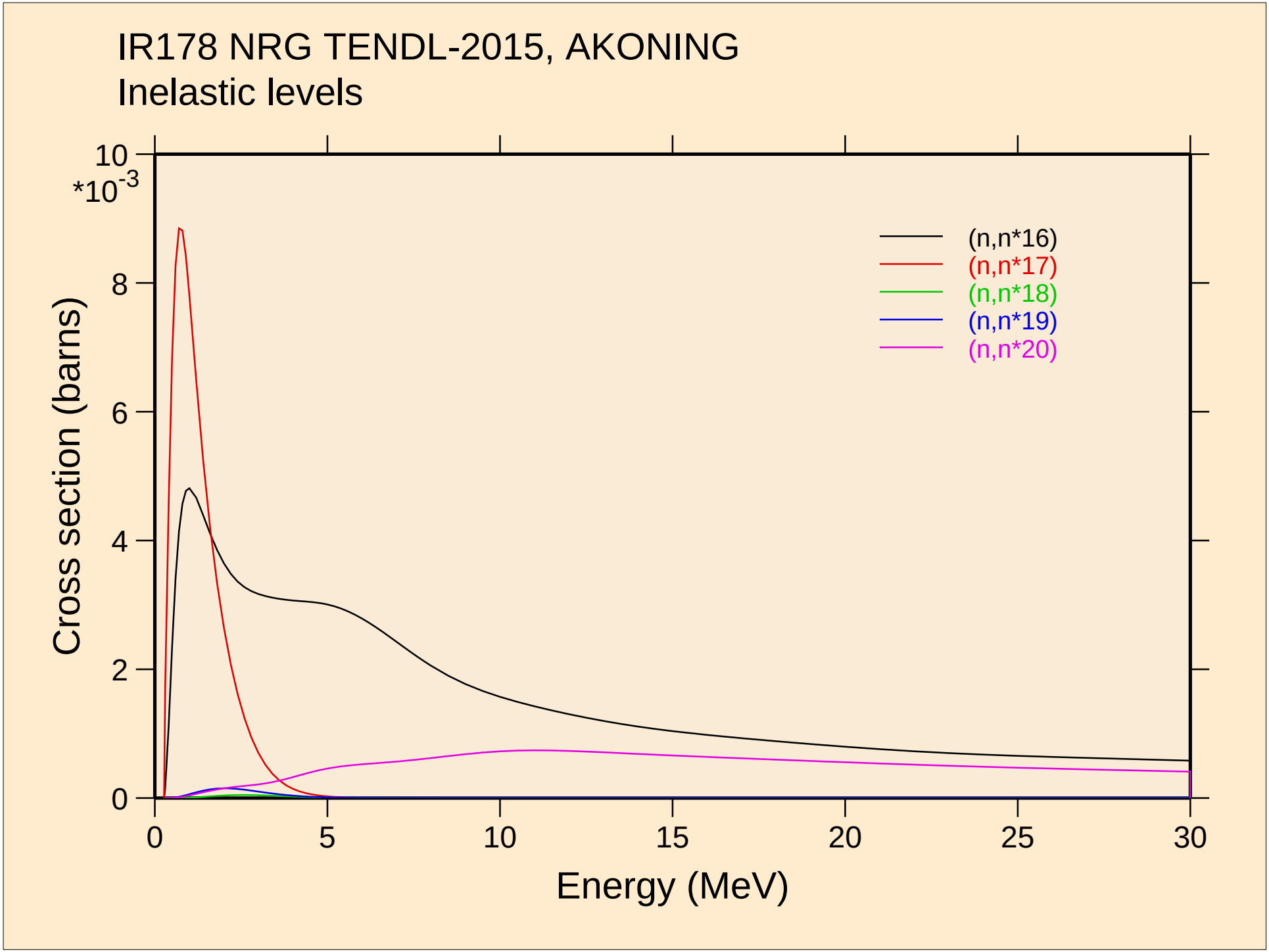

IR178 NRG TENDL-2015, AKONING
Non-threshold reactions
Cross section (barns)
Energy (MeV)
(n,gma)
(n,p)
(n,a)
(n,2a)
(n,3a)
10^0
10^-3
10^-6
10^-9
10^-12
10^-15
10^-18
0
5
10
15
20
25
30

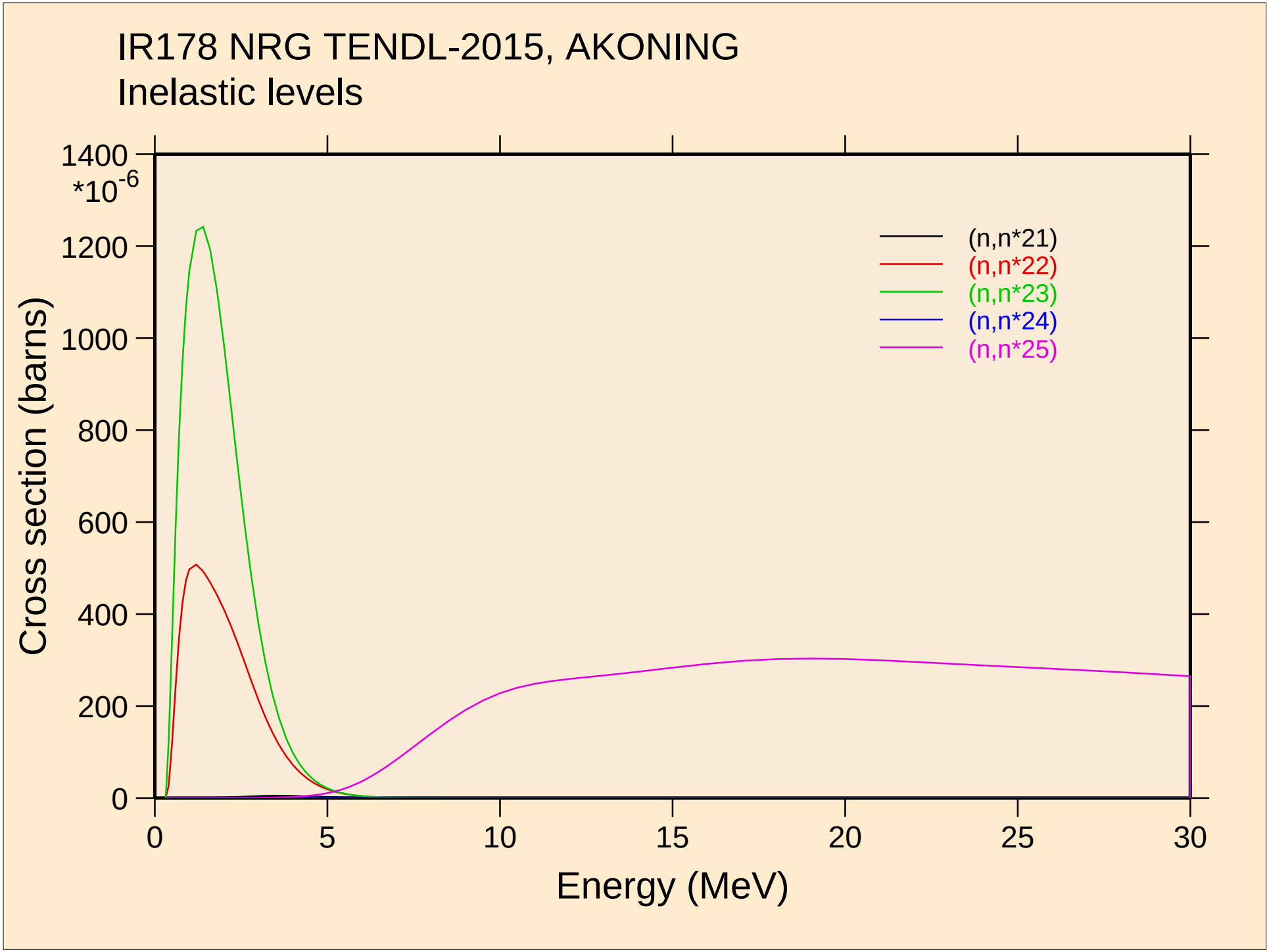

IR178 NRG TENDL-2015, AKONING
Non-threshold reactions
(n,pa)
Cross section (barns)
10-3
10-4
10-5
10-6
0
5
10
15
20
25
30
Energy (MeV)

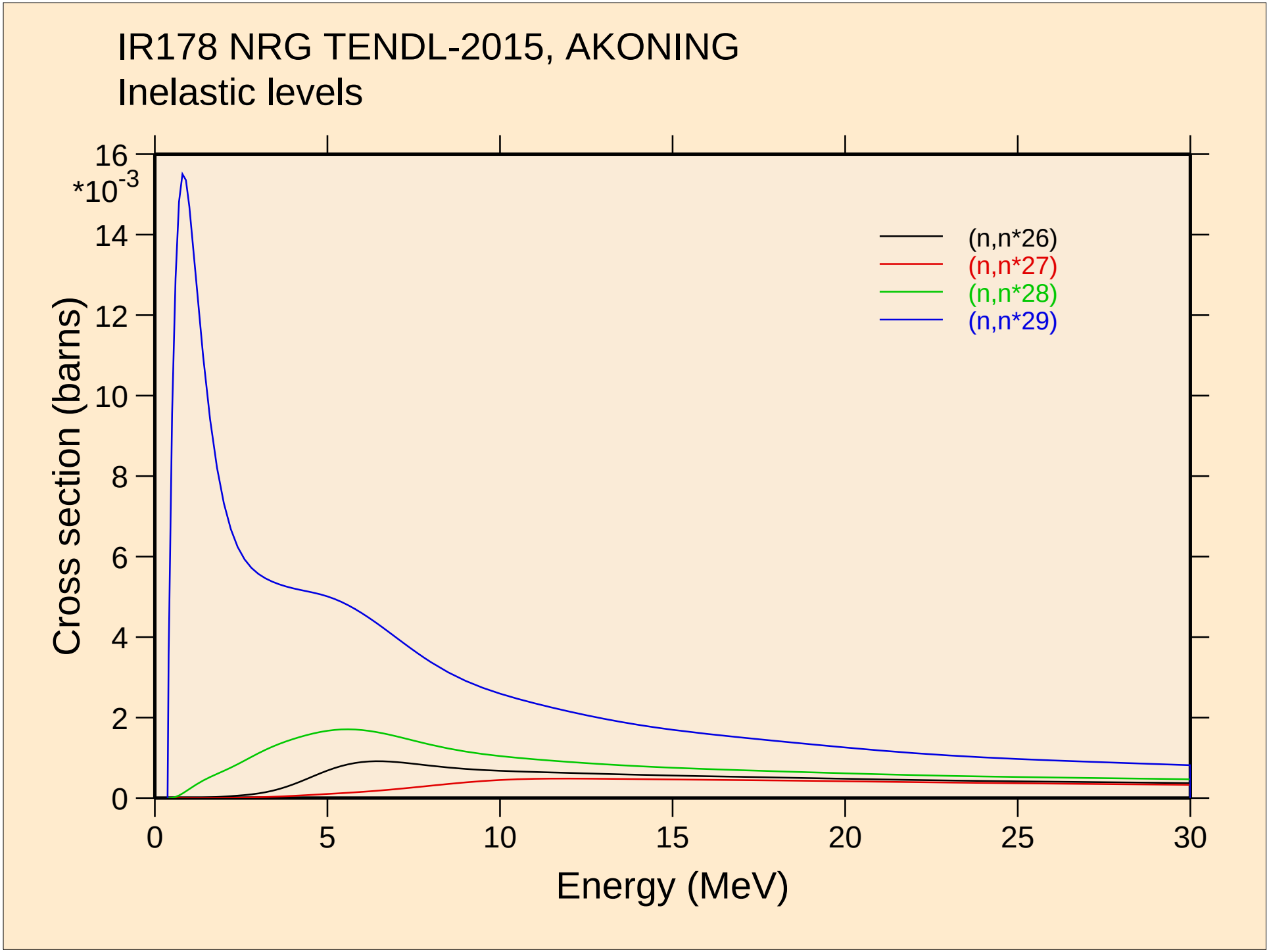

IR178 NRG TENDL-2015, AKONING
Inelastic levels
Cross section (barns)
*10-3
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
Energy (MeV)
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)
(n,n*5)

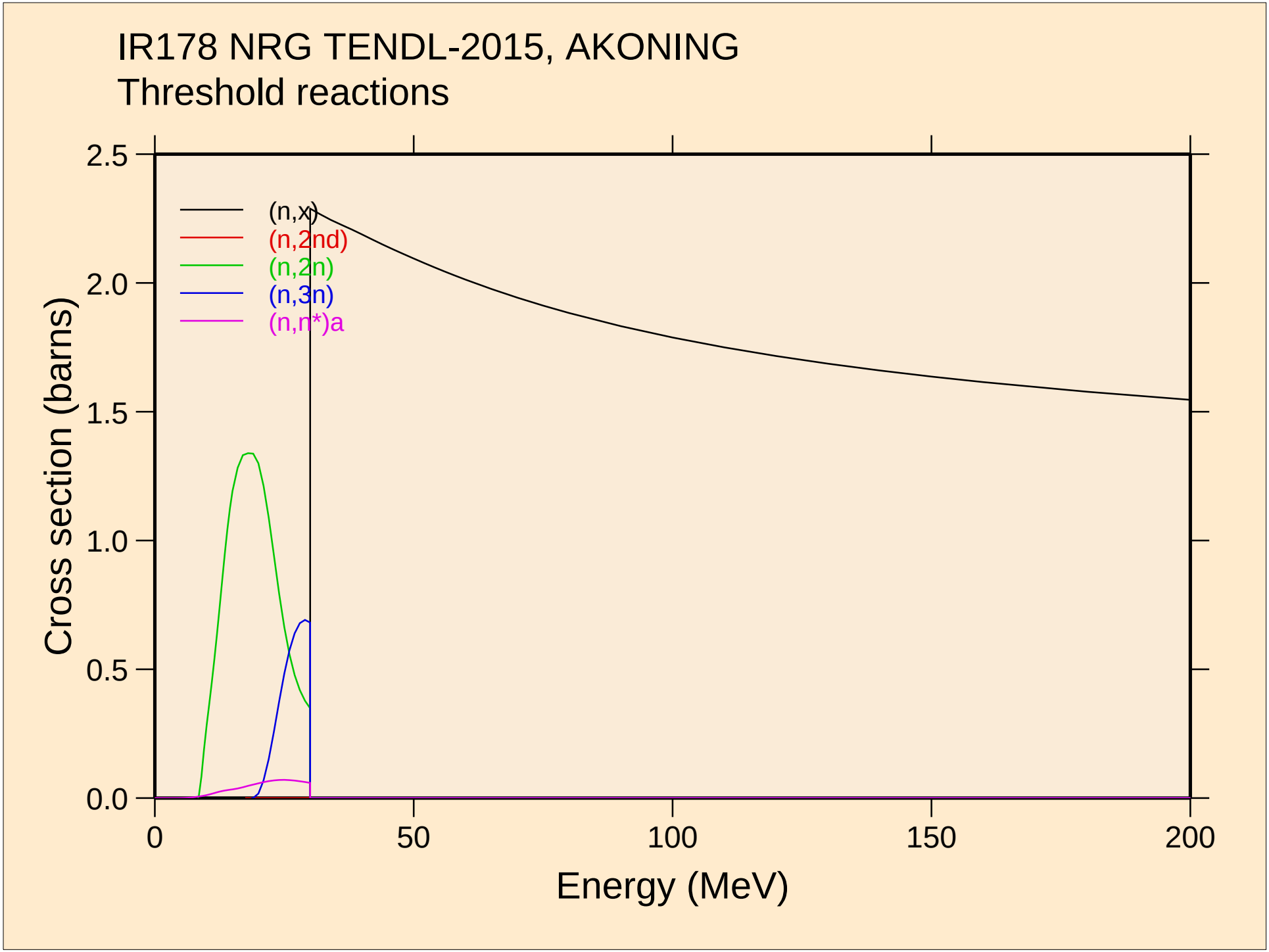

IR178 NRG TENDL-2015, AKONING
Inelastic levels
Cross section (barns)
*10-3
25
20
15
10
5
0
0
5
10
15
20
25
30
Energy (MeV)
(n,n*6)
(n,n*7)
(n,n*8)
(n,n*9)
(n,n*10)

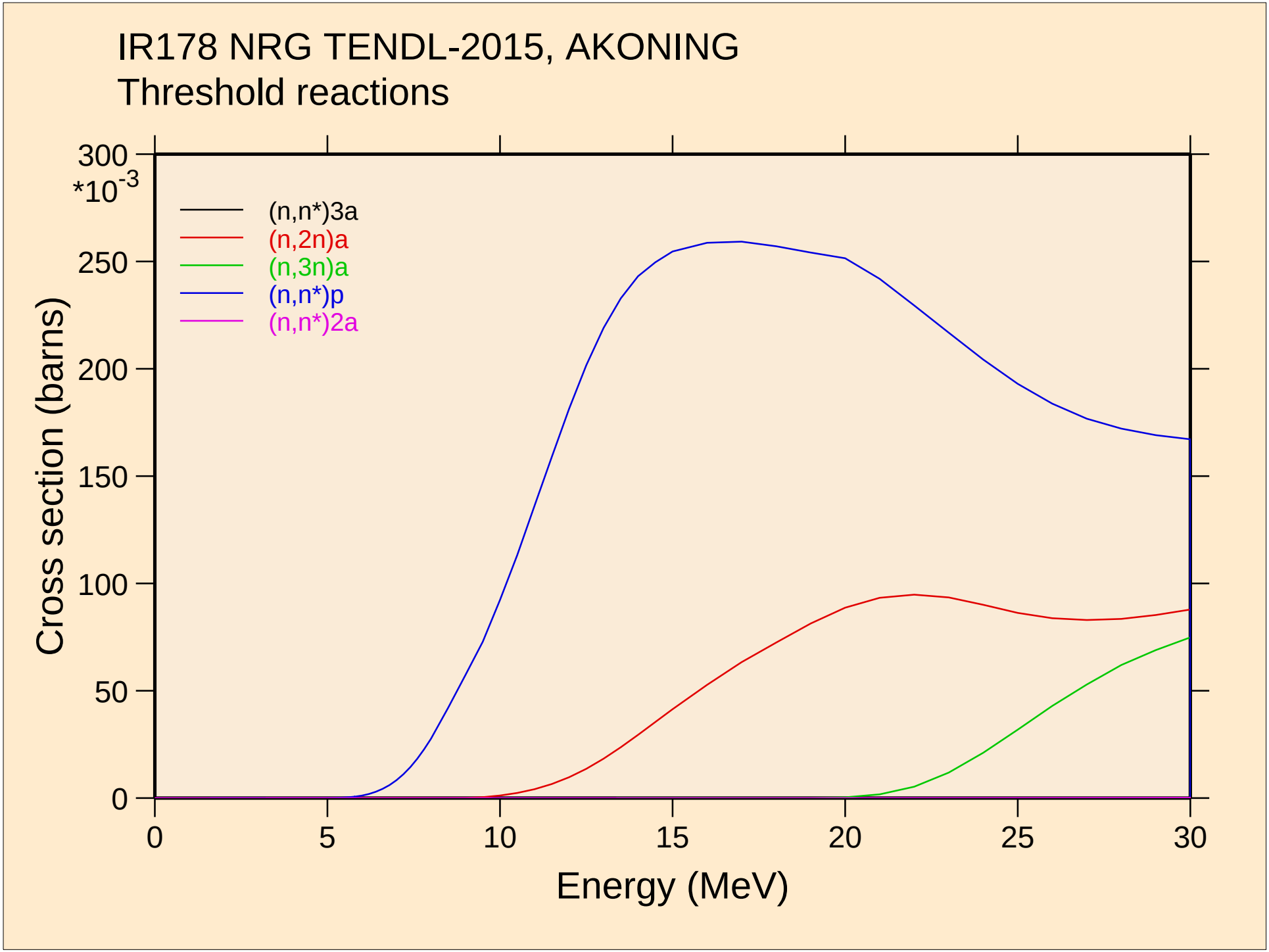

IR178 NRG TENDL-2015, AKONING
Inelastic levels
Cross section (barns)
*10-3
30
25
20
15
10
5
0
0
5
10
15
20
25
30
Energy (MeV)
(n,n*11)
(n,n*12)
(n,n*13)
(n,n*14)
(n,n*15)

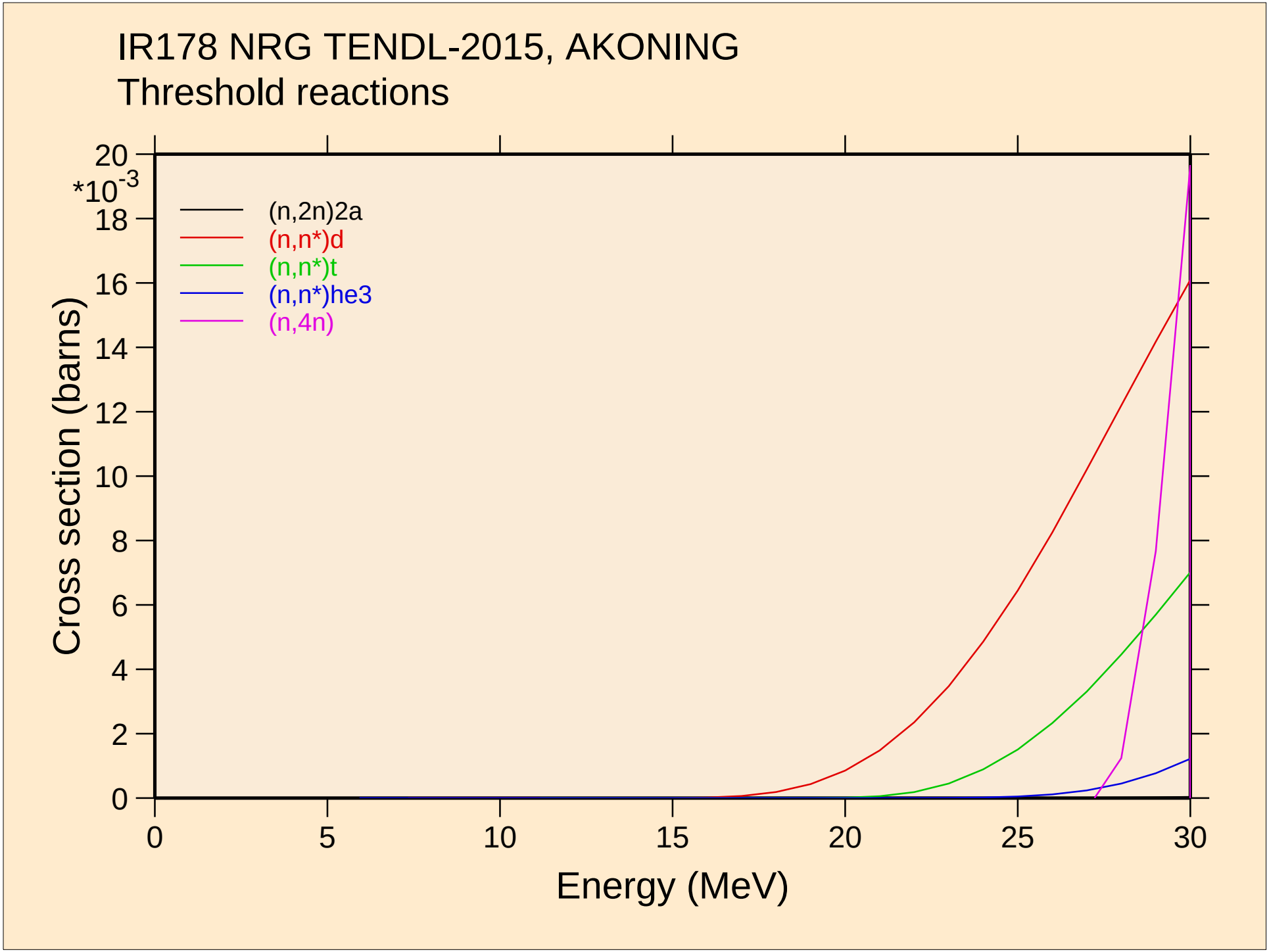

IR178 NRG TENDL-2015, AKONING
Inelastic levels
10
*10-3
8
6
4
2
0
Cross section (barns)
0
5
10
15
20
25
30
Energy (MeV)
(n,n*16)
(n,n*17)
(n,n*18)
(n,n*19)
(n,n*20)

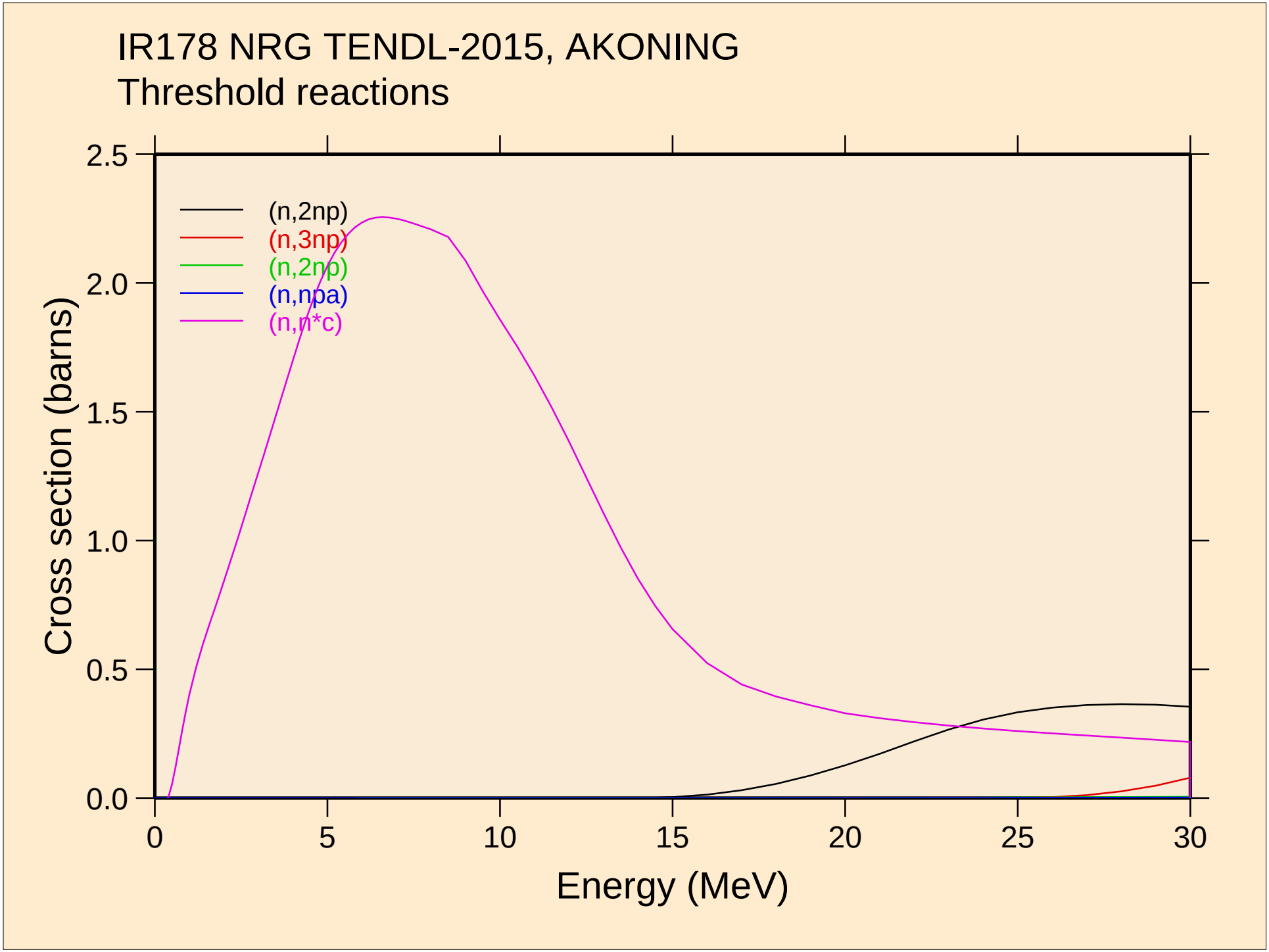

IR178 NRG TENDL-2015, AKONING
Inelastic levels
1400
*10-6
1200
1000
800
600
400
200
0
Cross section (barns)
0
5
10
15
20
25
30
Energy (MeV)
(n,n*21)
(n,n*22)
(n,n*23)
(n,n*24)
(n,n*25)

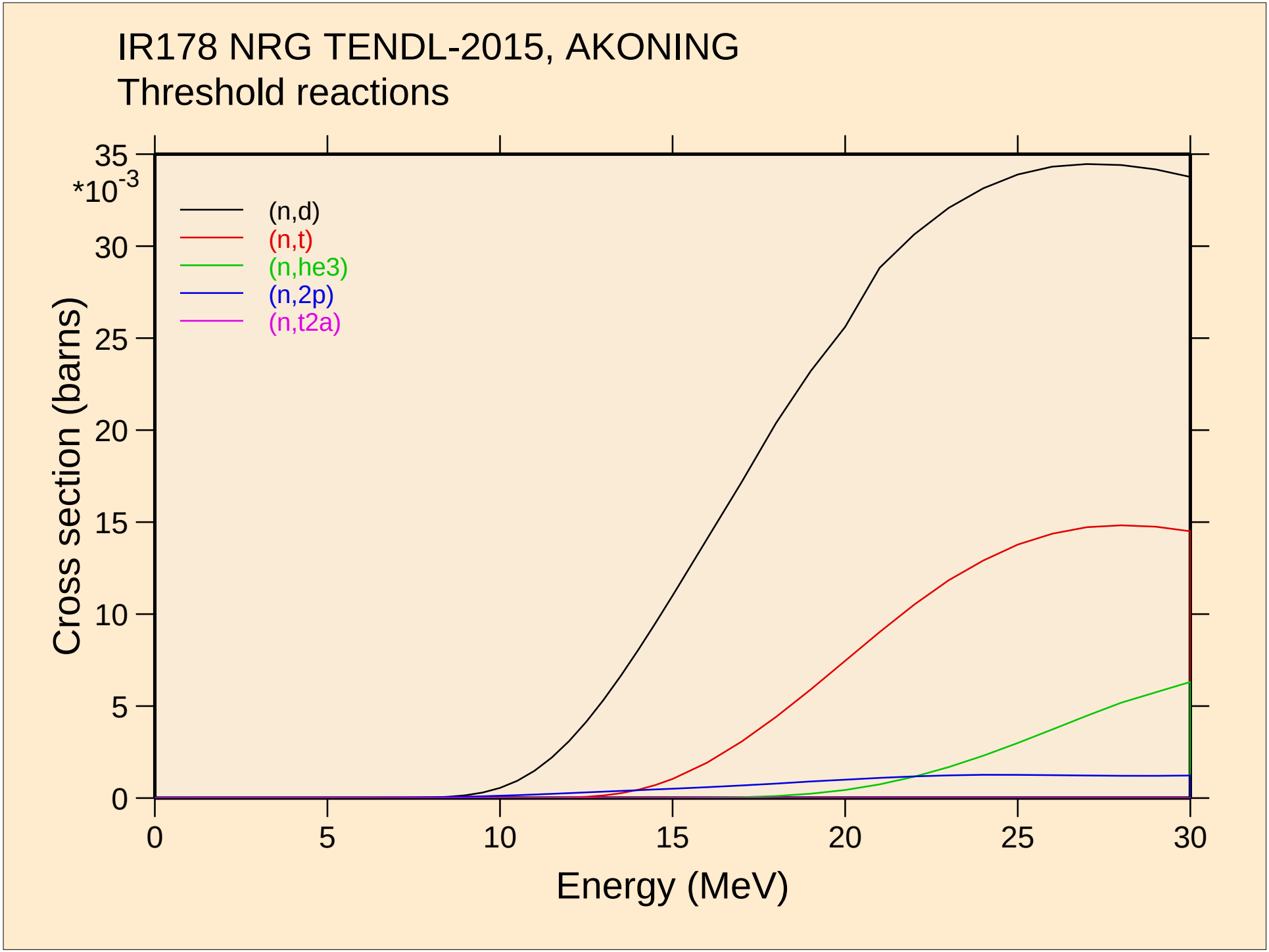

IR178 NRG TENDL-2015, AKONING
Inelastic levels
Cross section (barns)
*10-3
16
14
12
10
8
6
4
2
0
0
5
10
15
20
25
30
Energy (MeV)
(n,n*26)
(n,n*27)
(n,n*28)
(n,n*29)

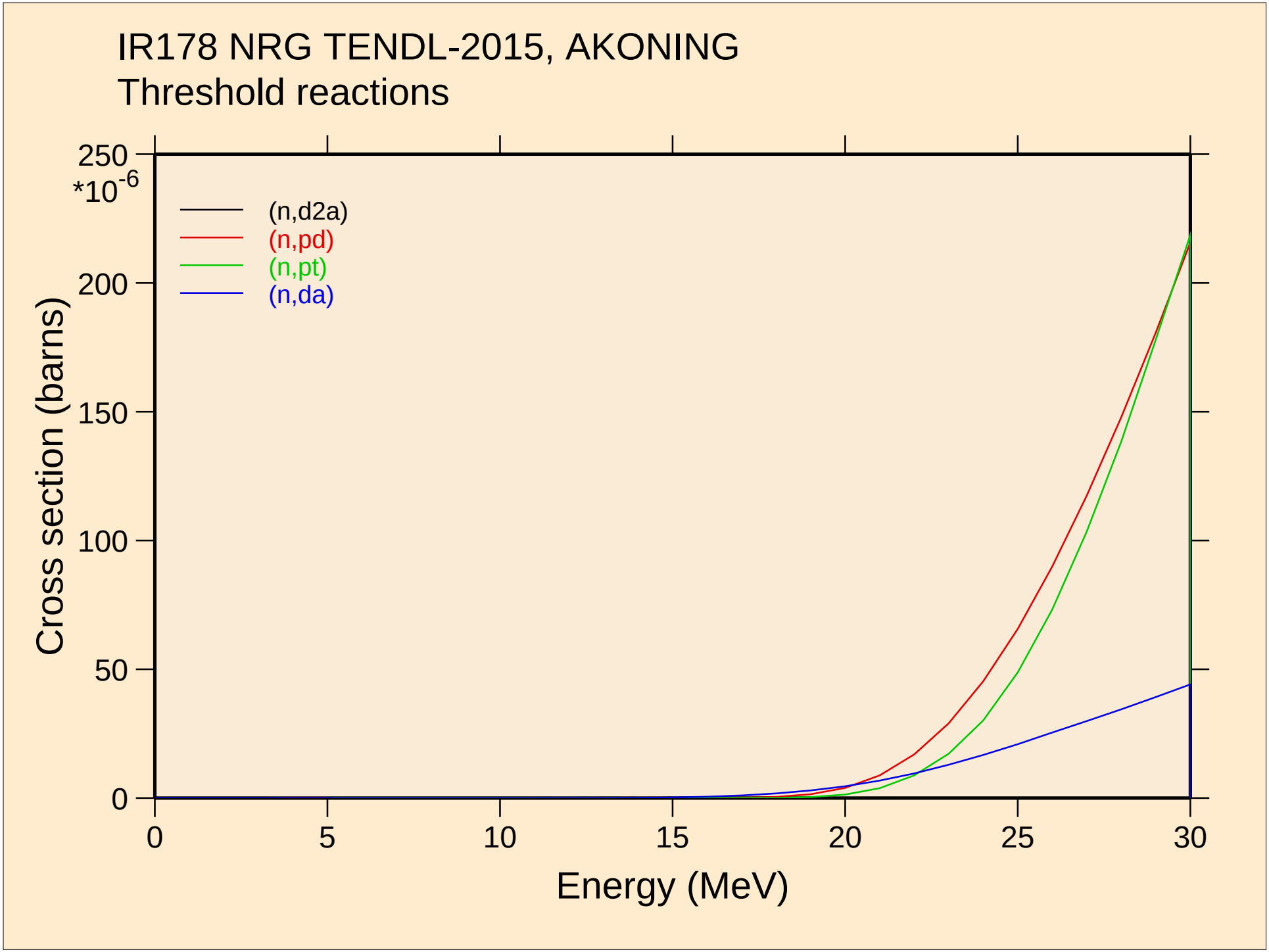

IR178 NRG TENDL-2015, AKONING
Threshold reactions
(n,x)
(n,2nd)
(n,2n)
(n,3n)
(n,n*)a
Cross section (barns)
2.5
2.0
1.5
1.0
0.5
0.0
0
50
100
150
200
Energy (MeV)

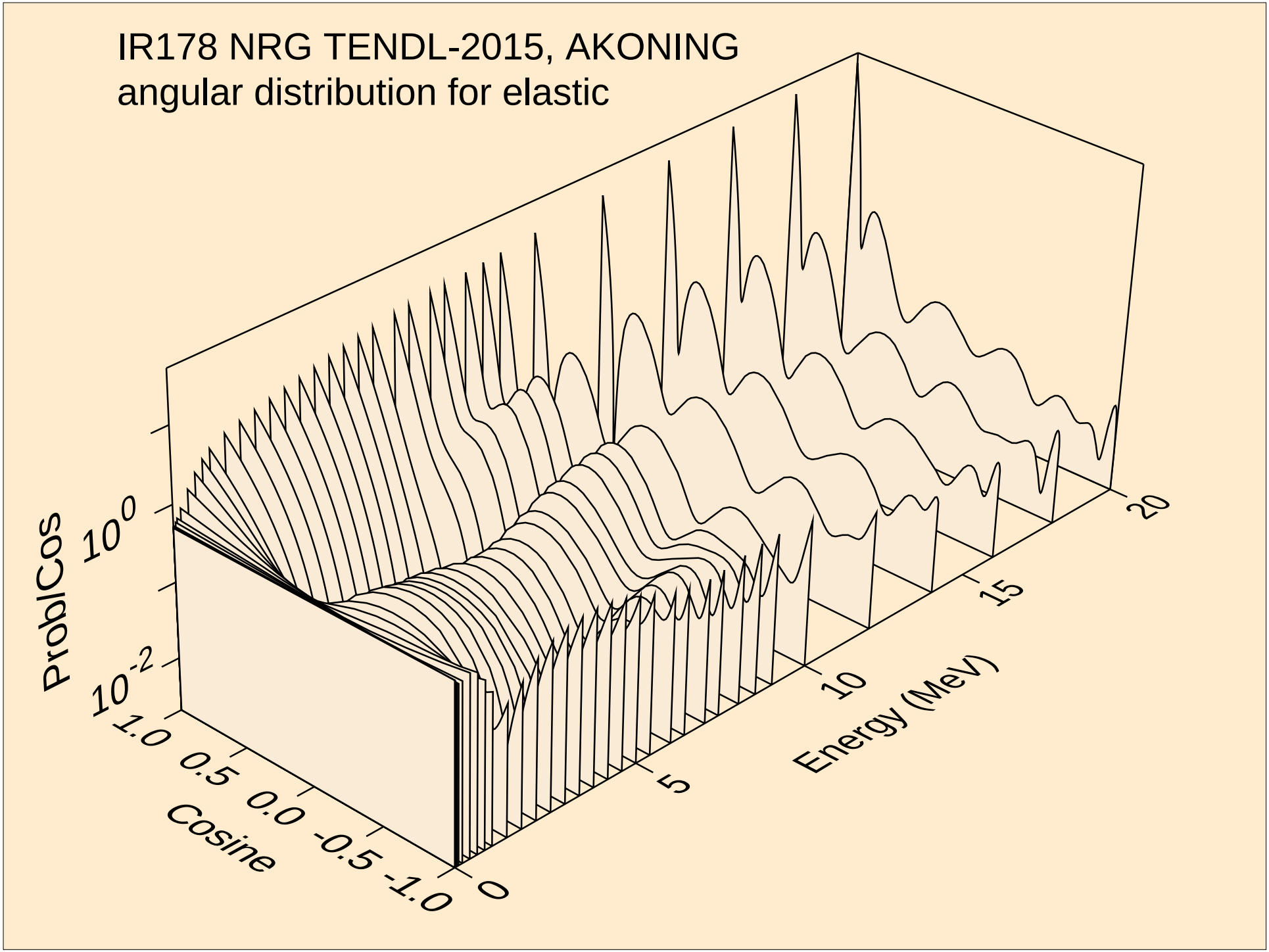

IR178 NRG TENDL-2015, AKONING
Threshold reactions
300
*10-3
250
200
150
100
50
0
Cross section (barns)
(n,n*)3a
(n,2n)a
(n,3n)a
(n,n*)p
(n,n*)2a
0
5
10
15
20
25
30
Energy (MeV)

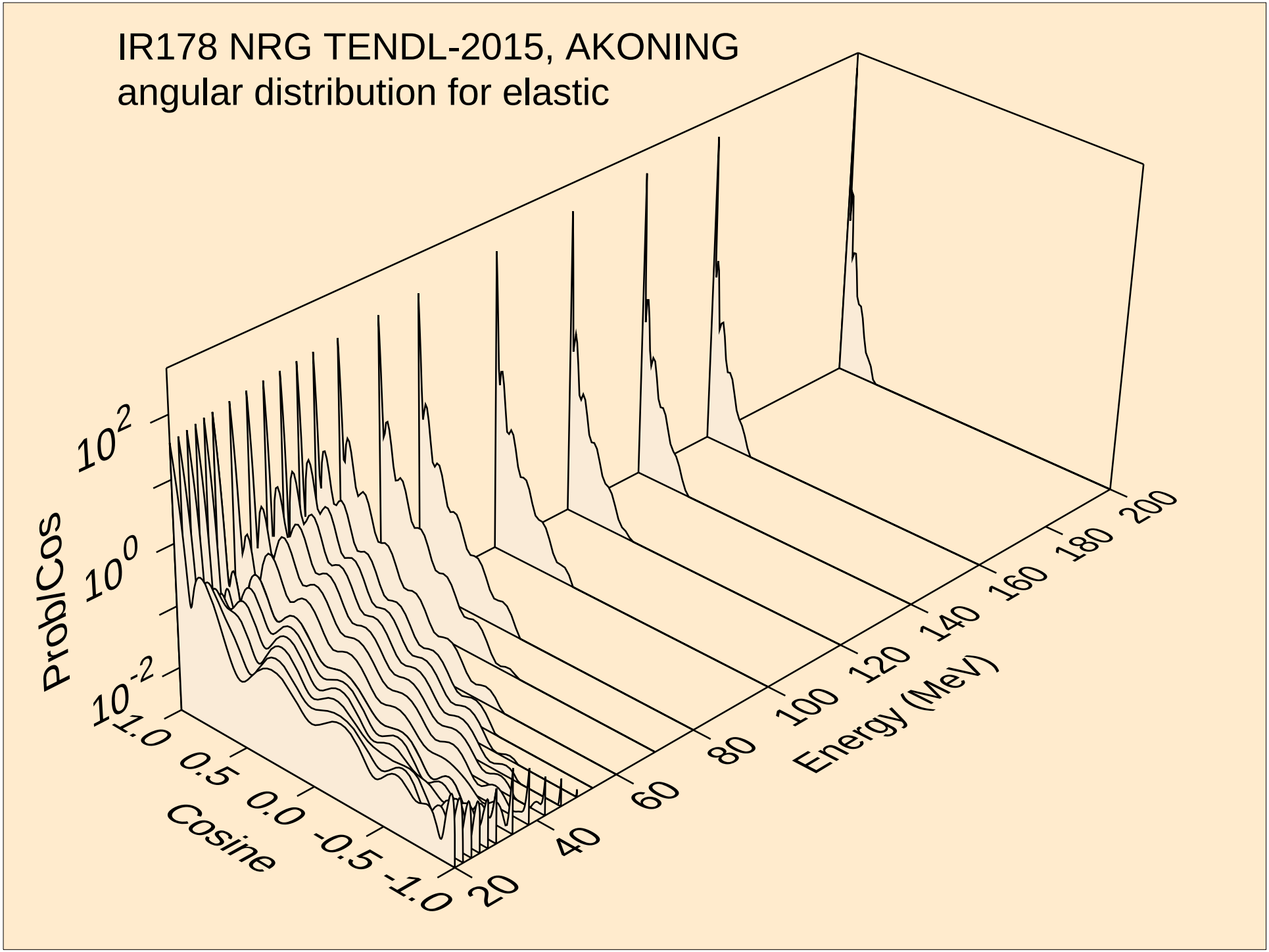

IR178 NRG TENDL-2015, AKONING
Threshold reactions
Cross section (barns)
*10-3
20
18
16
14
12
10
8
6
4
2
0
0
5
10
15
20
25
30
Energy (MeV)
(n,2n)2a
(n,n*)d
(n,n*)t
(n,n*)he3
(n,4n)

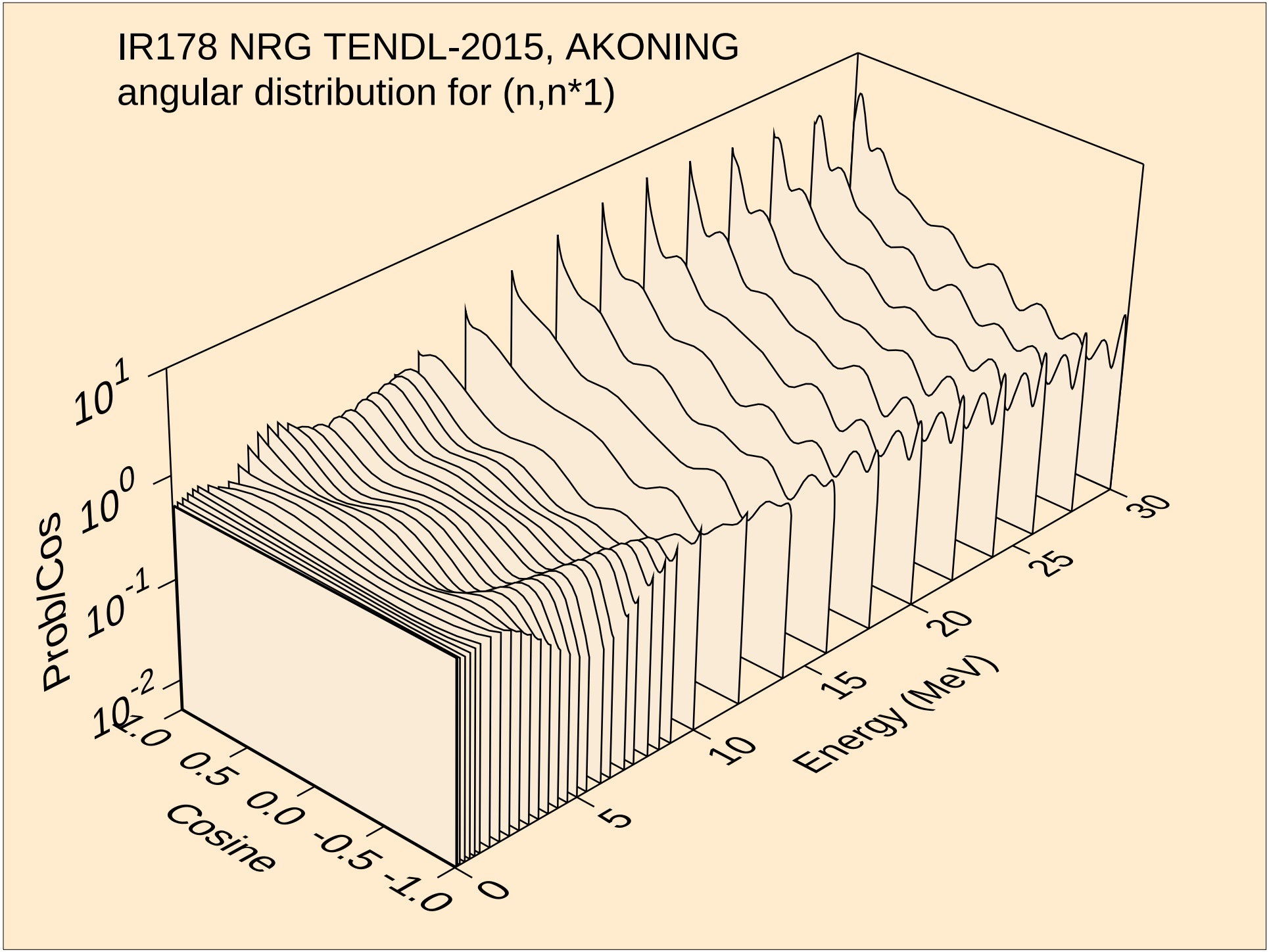

IR178 NRG TENDL-2015, AKONING
Threshold reactions
(n,2np)
(n,3np)
(n,2np)
(n,npa)
(n,n*c)
Cross section (barns)
2.5
2.0
1.5
1.0
0.5
0.0
0
5
10
15
20
25
30
Energy (MeV)

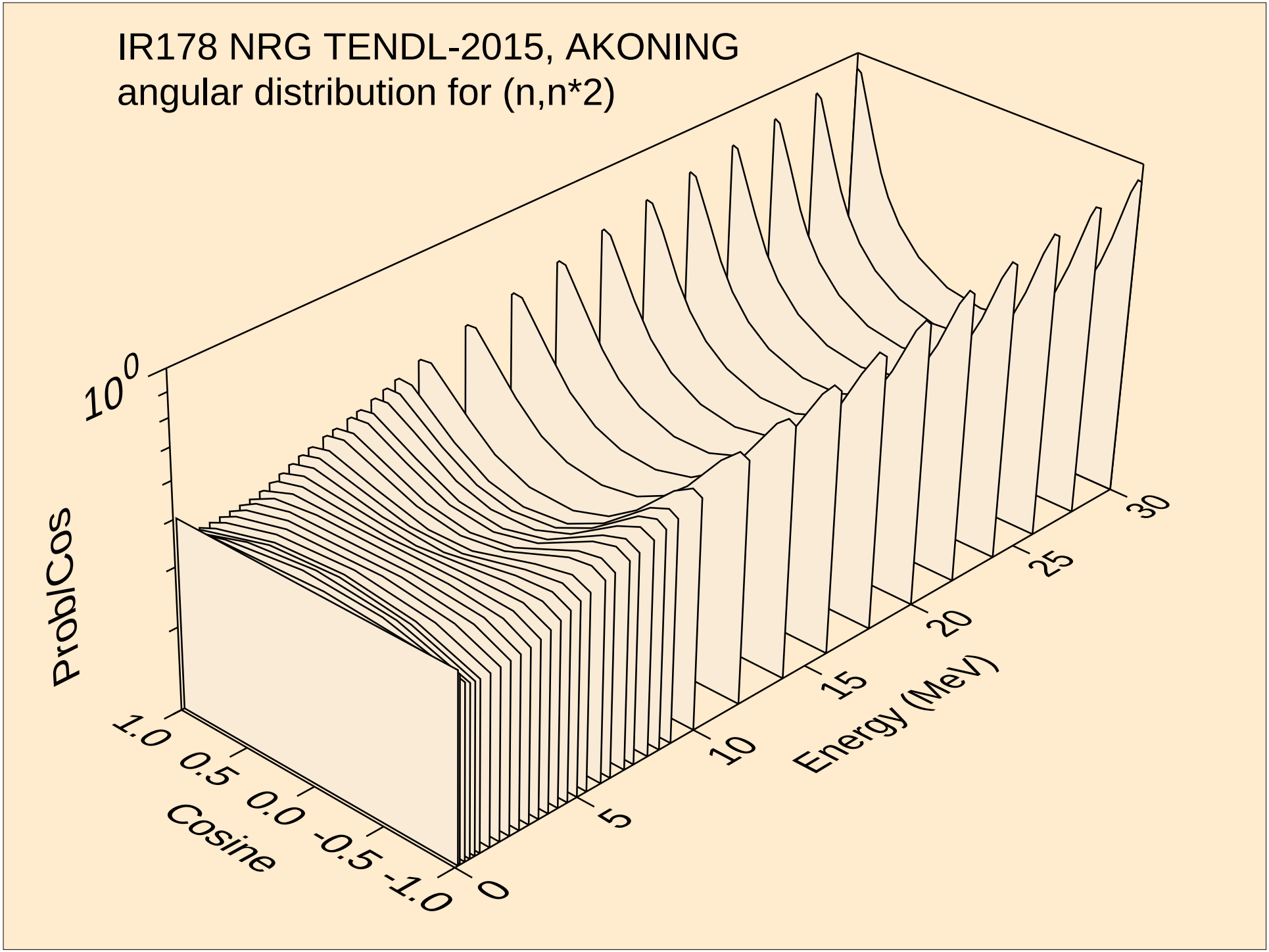

IR178 NRG TENDL-2015, AKONING
Threshold reactions
*10-3
35
30
25
20
15
10
5
0
Cross section (barns)
(n,d)
(n,t)
(n,he3)
(n,2p)
(n,t2a)
0
5
10
15
20
25
30
Energy (MeV)

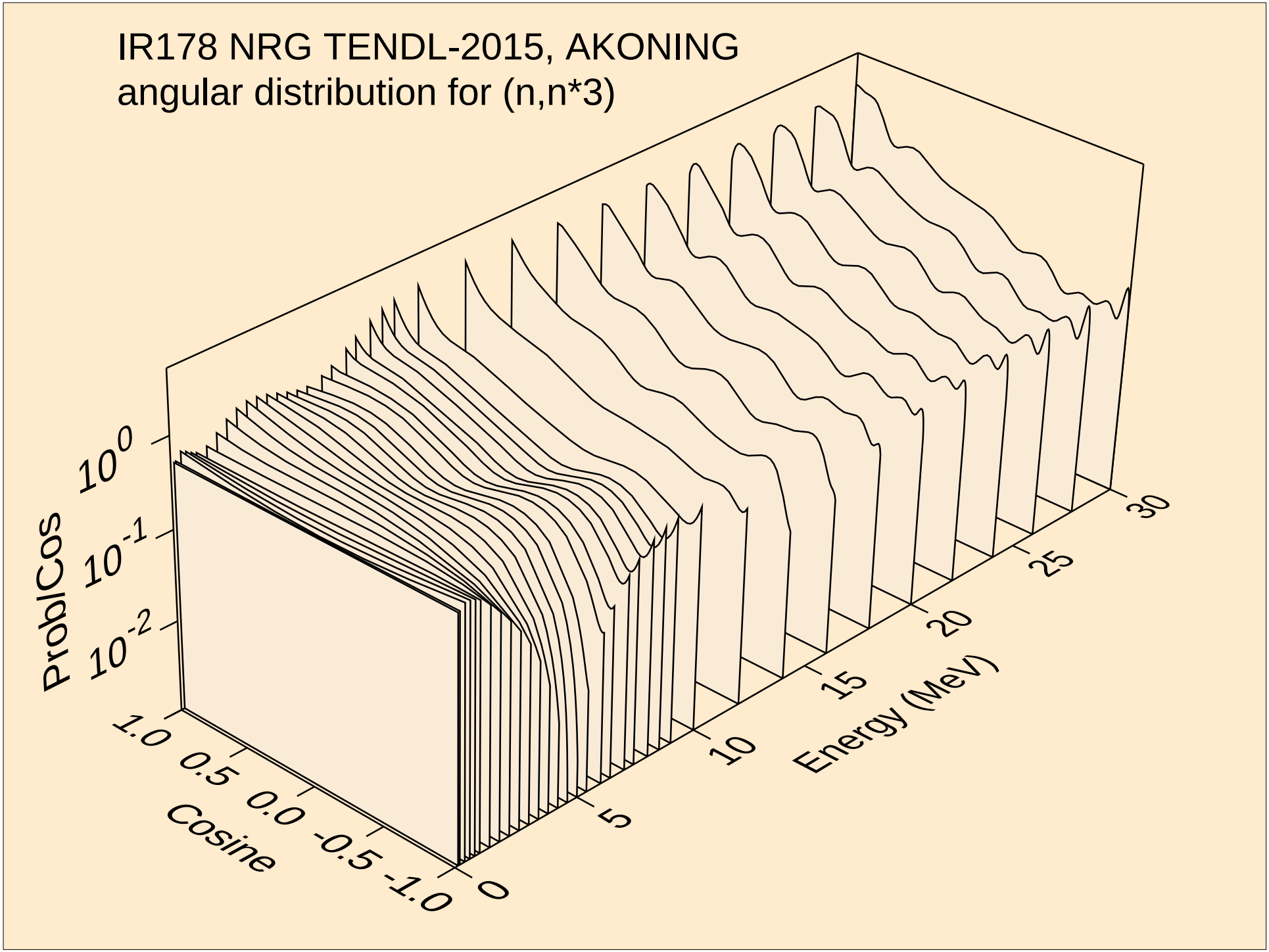

IR178 NRG TENDL-2015, AKONING
Threshold reactions
250
*10-6
200
150
100
50
0
Cross section (barns)
(n,d2a)
(n,pd)
(n,pt)
(n,da)
0
5
10
15
20
25
30
Energy (MeV)

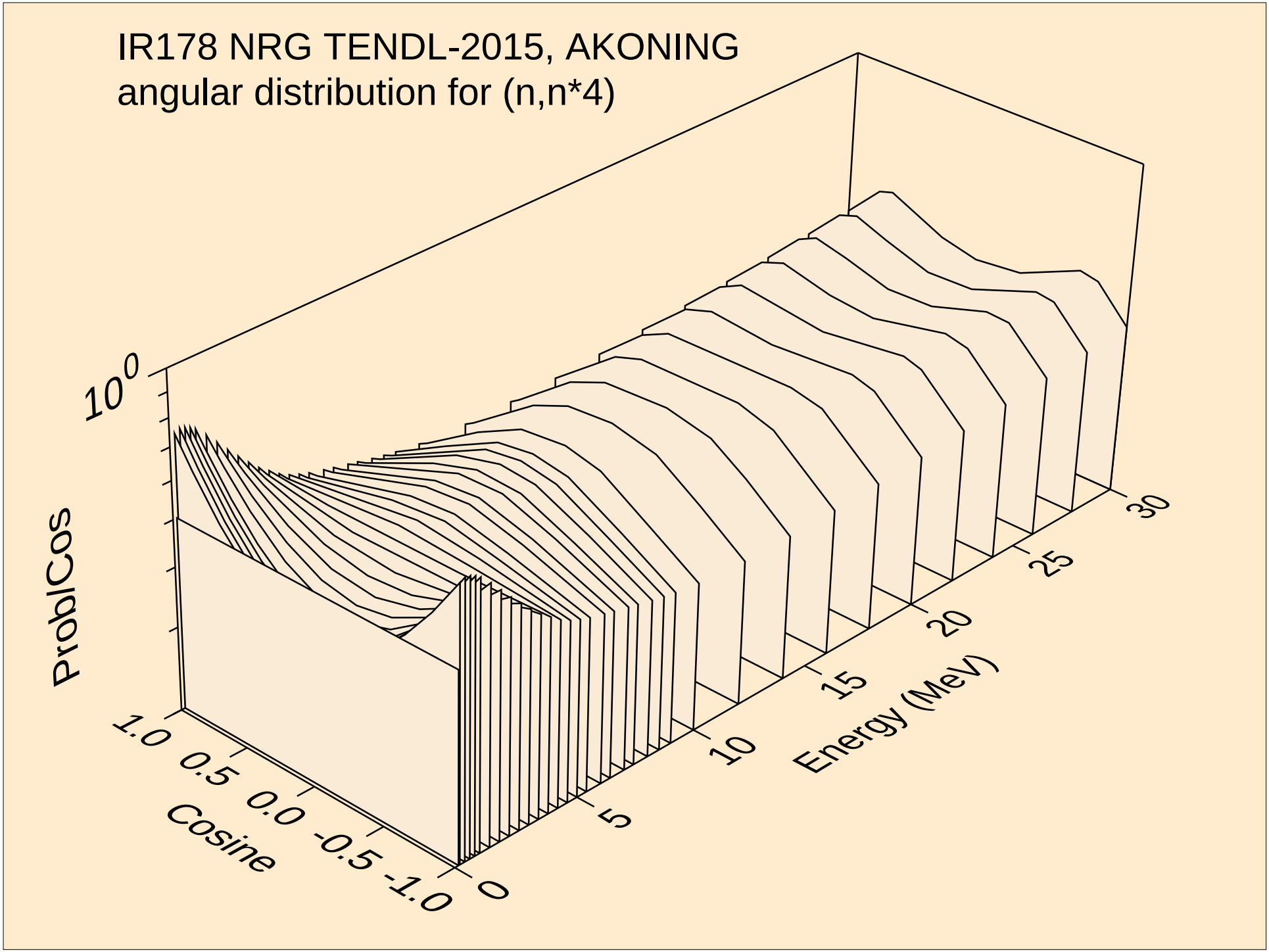

IR178 NRG TENDL-2015, AKONING
angular distribution for elastic
ProbCos
10^0
10^{-2}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

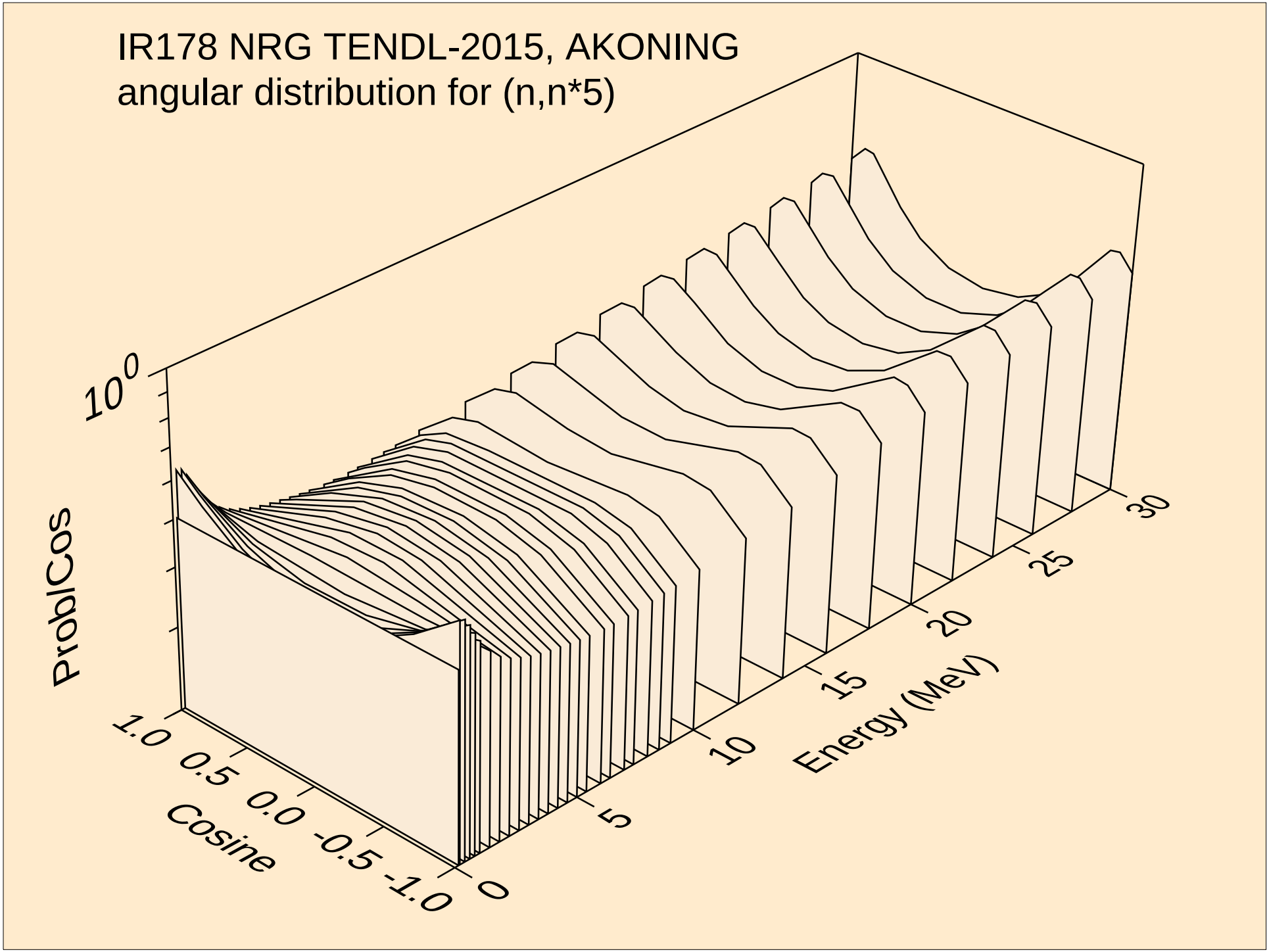

IR178 NRG TENDL-2015, AKONING
angular distribution for elastic
ProblCos
10^2
10^0
10^{-2}
1.0
0.5
0.0
-0.5
-1.0
Cosine
20
40
60
80
100
120
140
160
180
200
Energy (MeV)

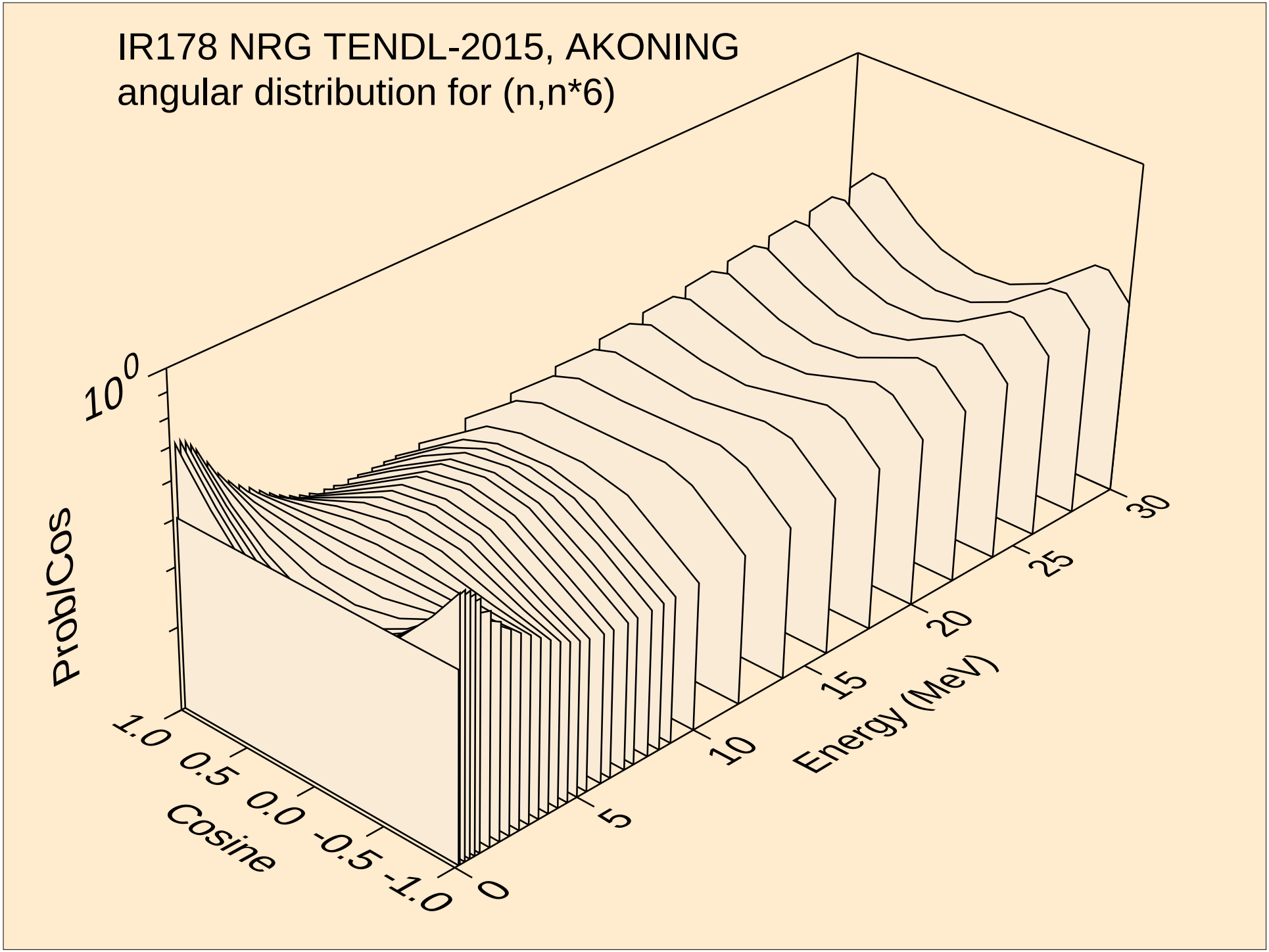

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*1)
Prob\Cos
10^1
10^0
10^-1
10^-2
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

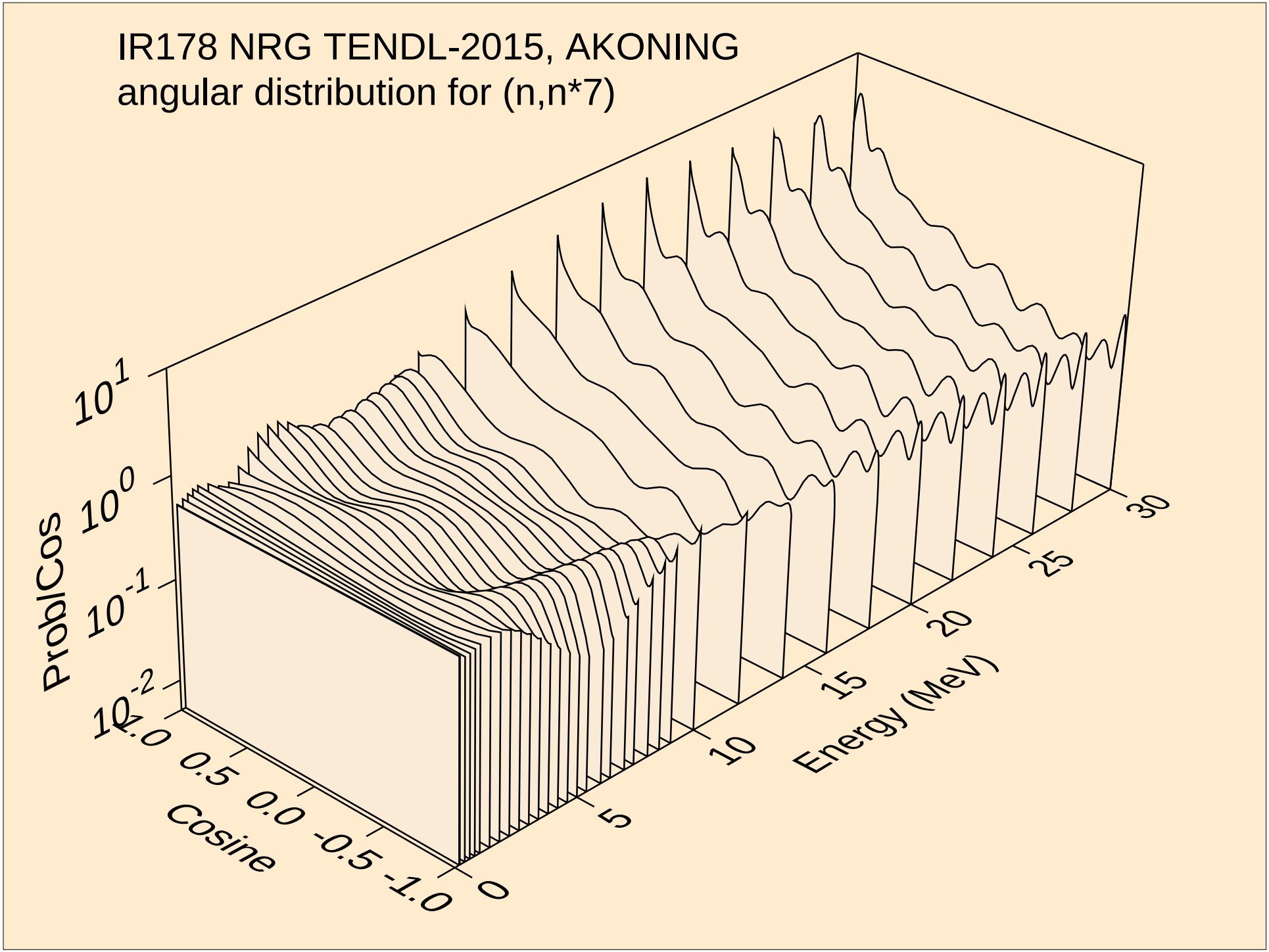

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*2)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

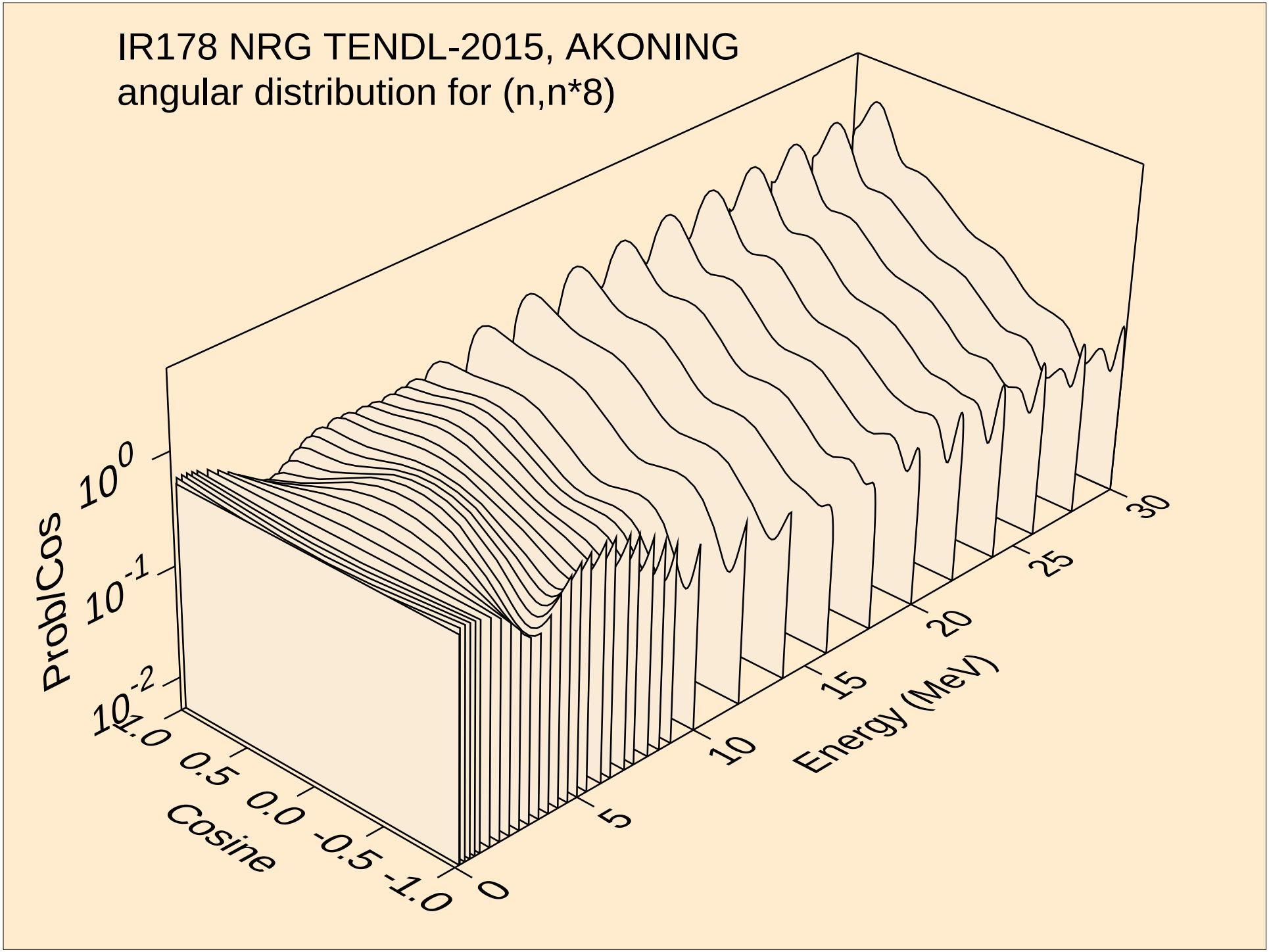

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*3)
Prob\Cos
10^{0}
10^{-1}
10^{-2}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

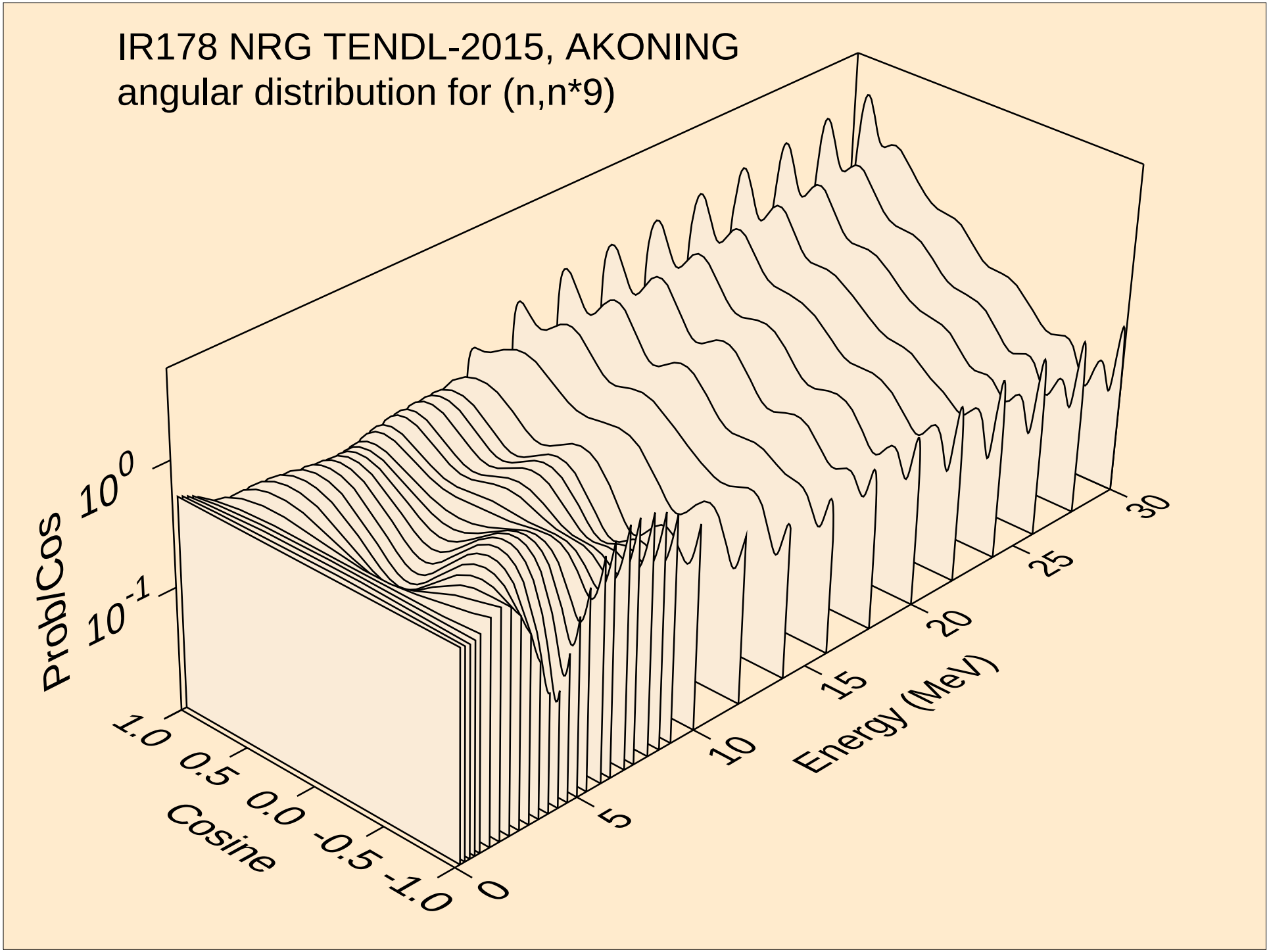

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*4)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

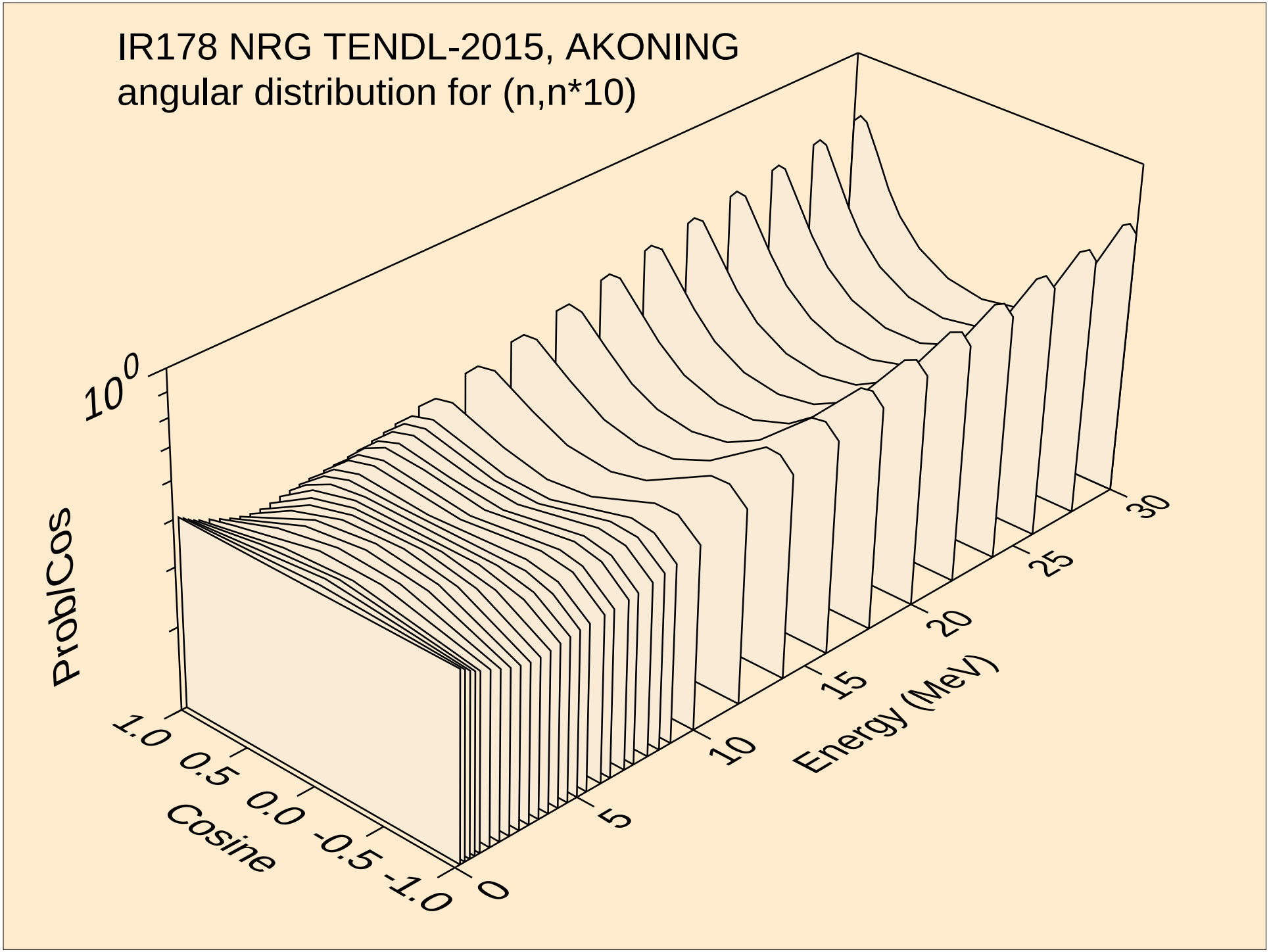

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*5)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

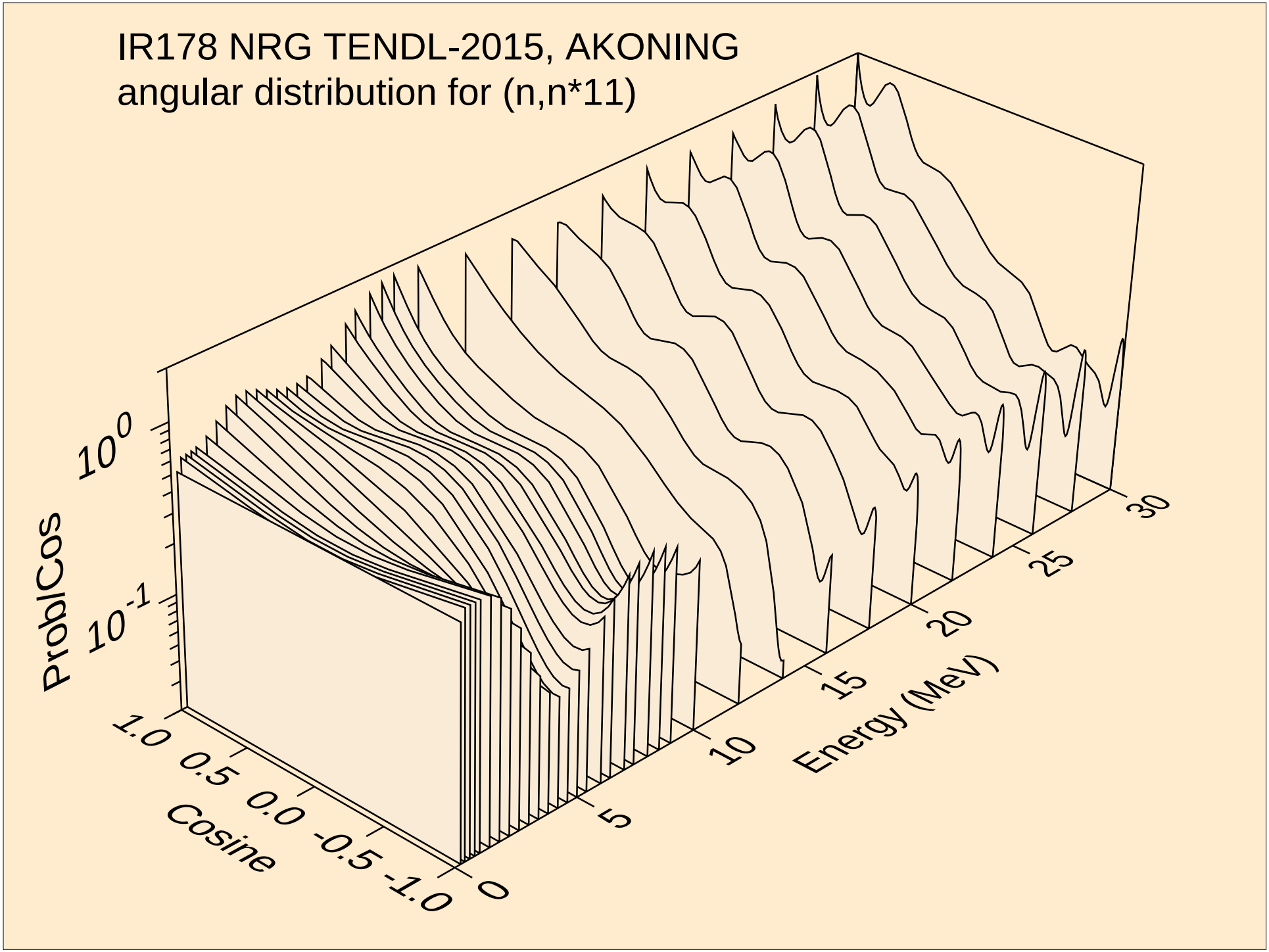

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*6)
10^0
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

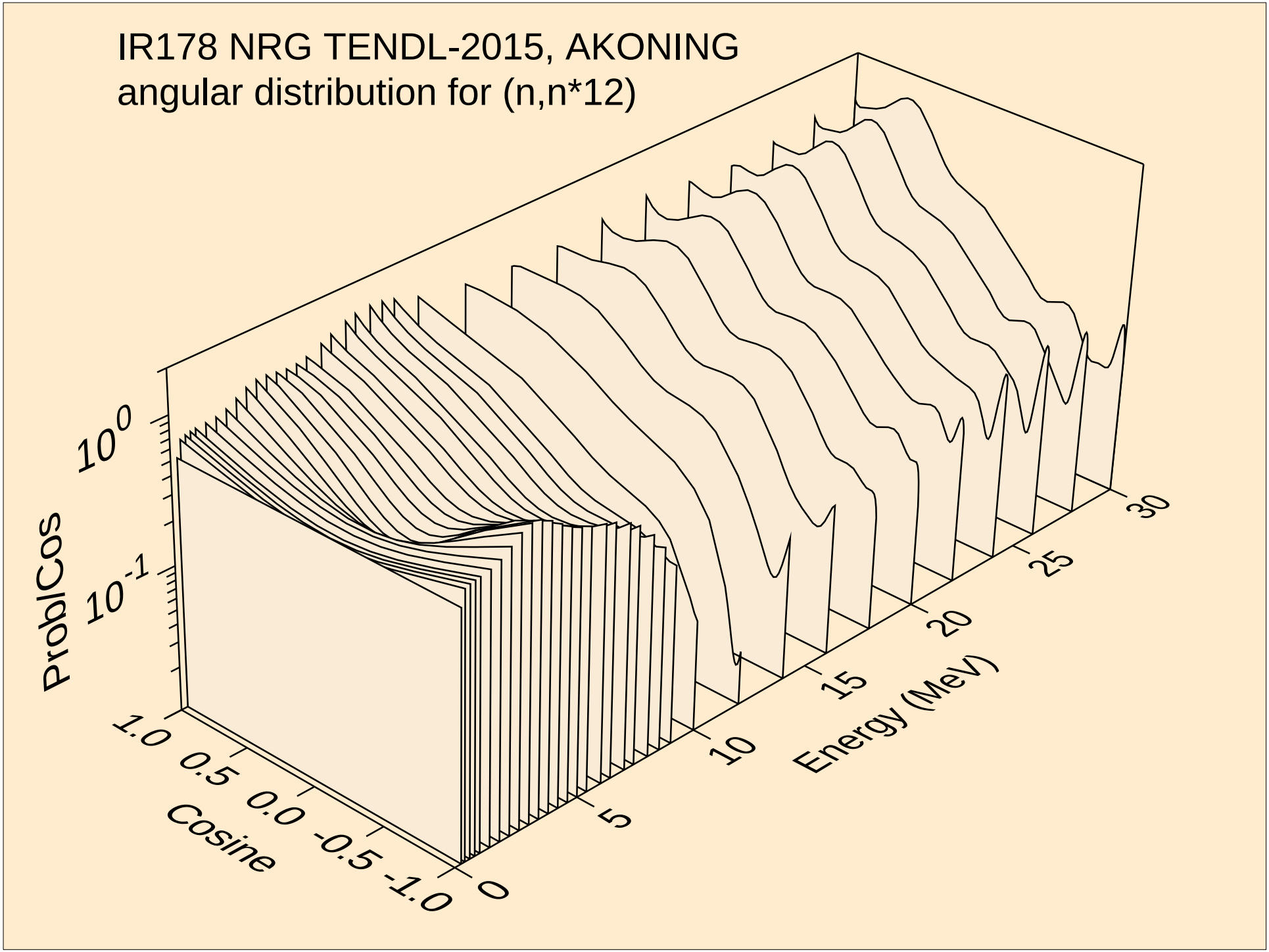

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*7)
Prob\Cos
10^1
10^0
10^-1
10^-2
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

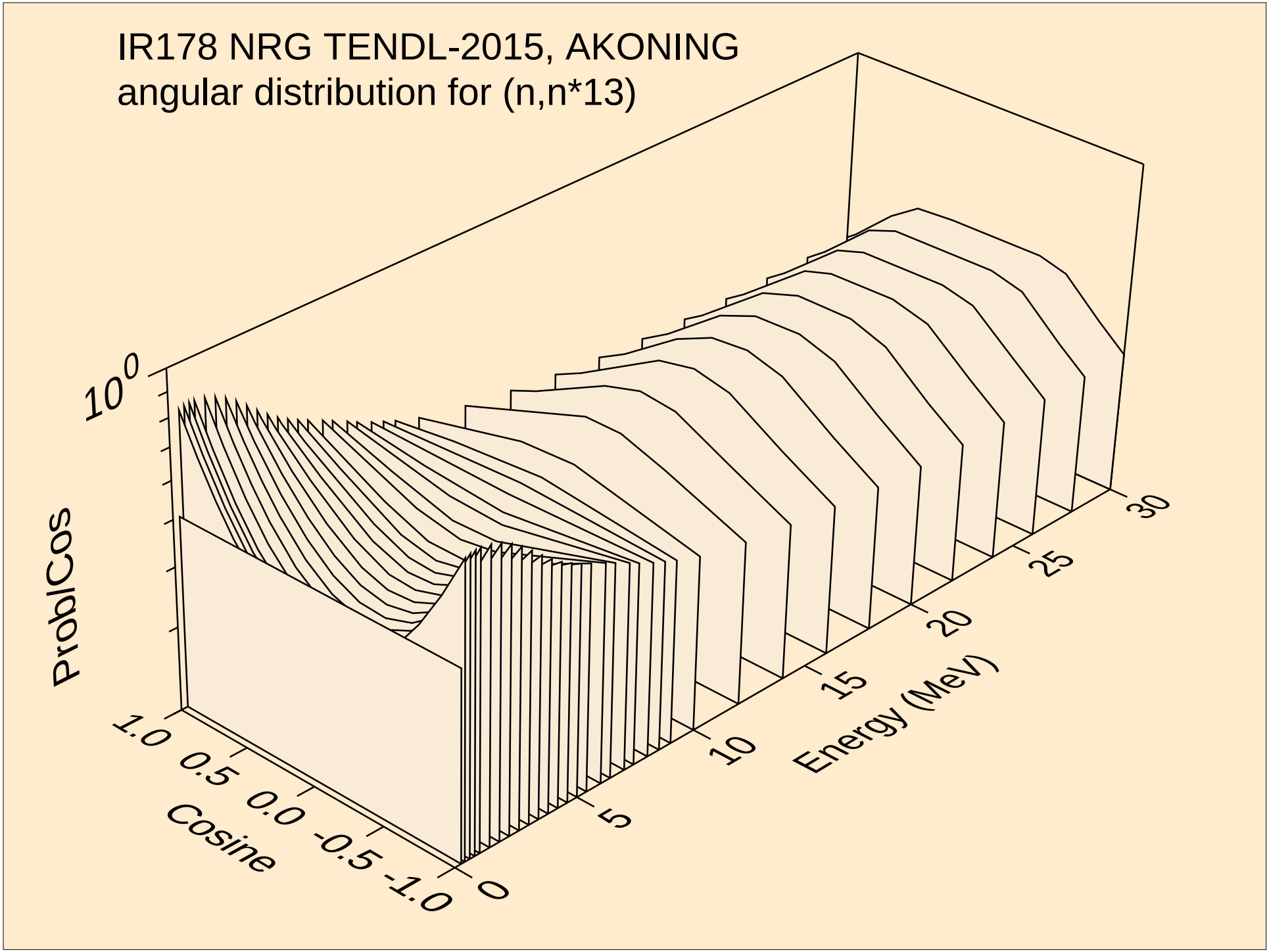

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*8)
Prob\Cos
10^0
10^-1
10^-2
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

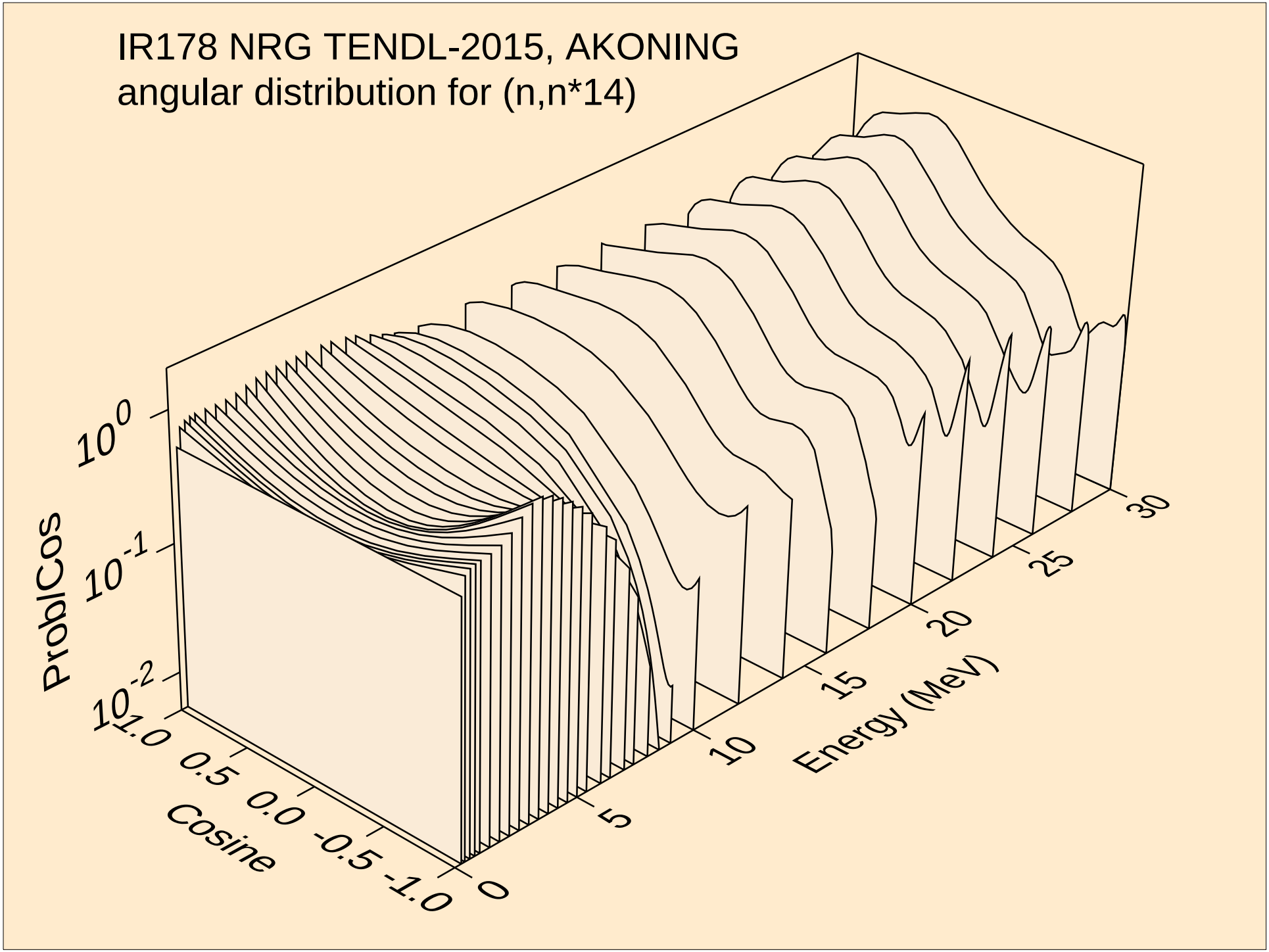

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*9)
ProbCos
10^{0}
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

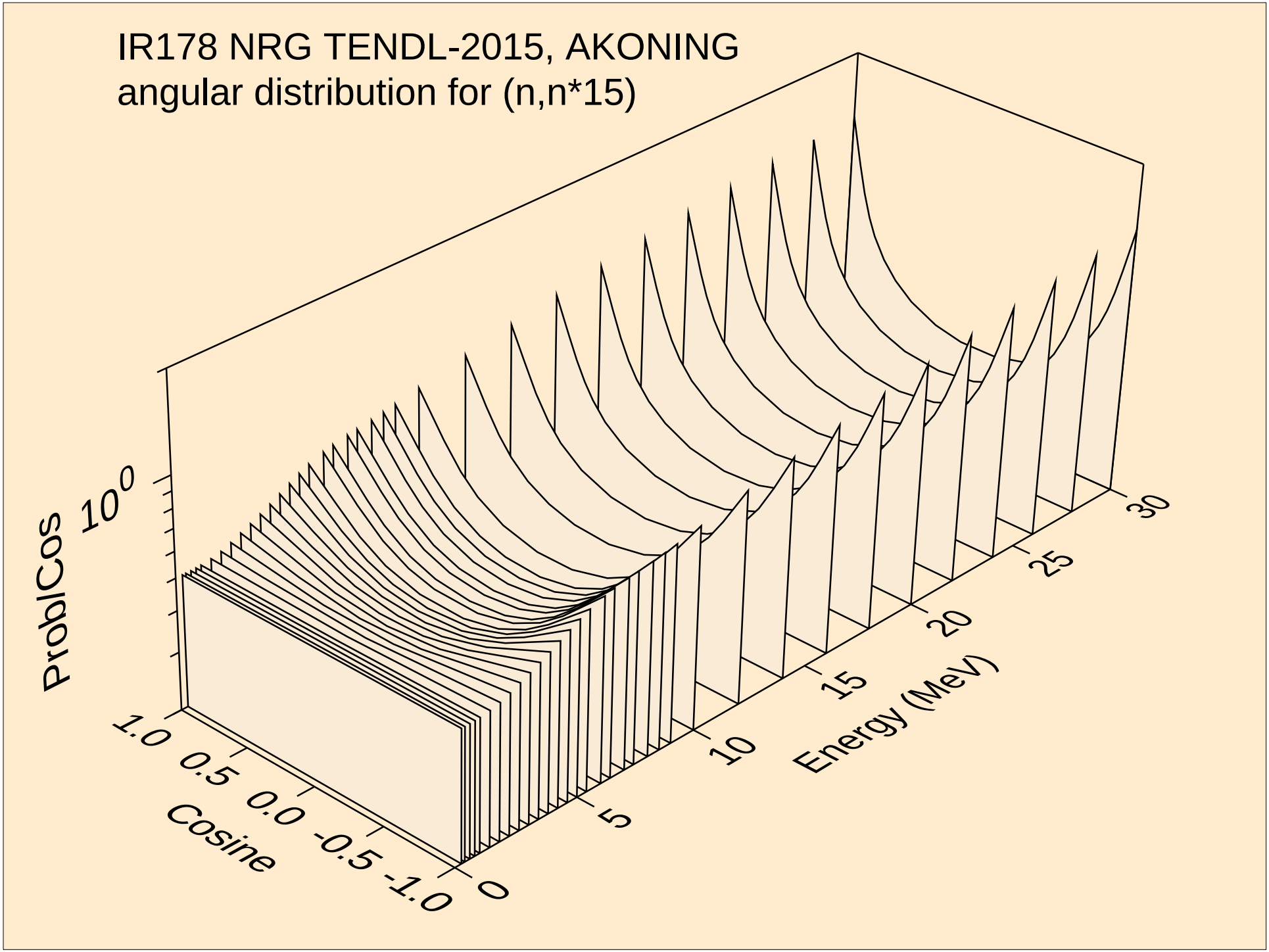

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*10)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

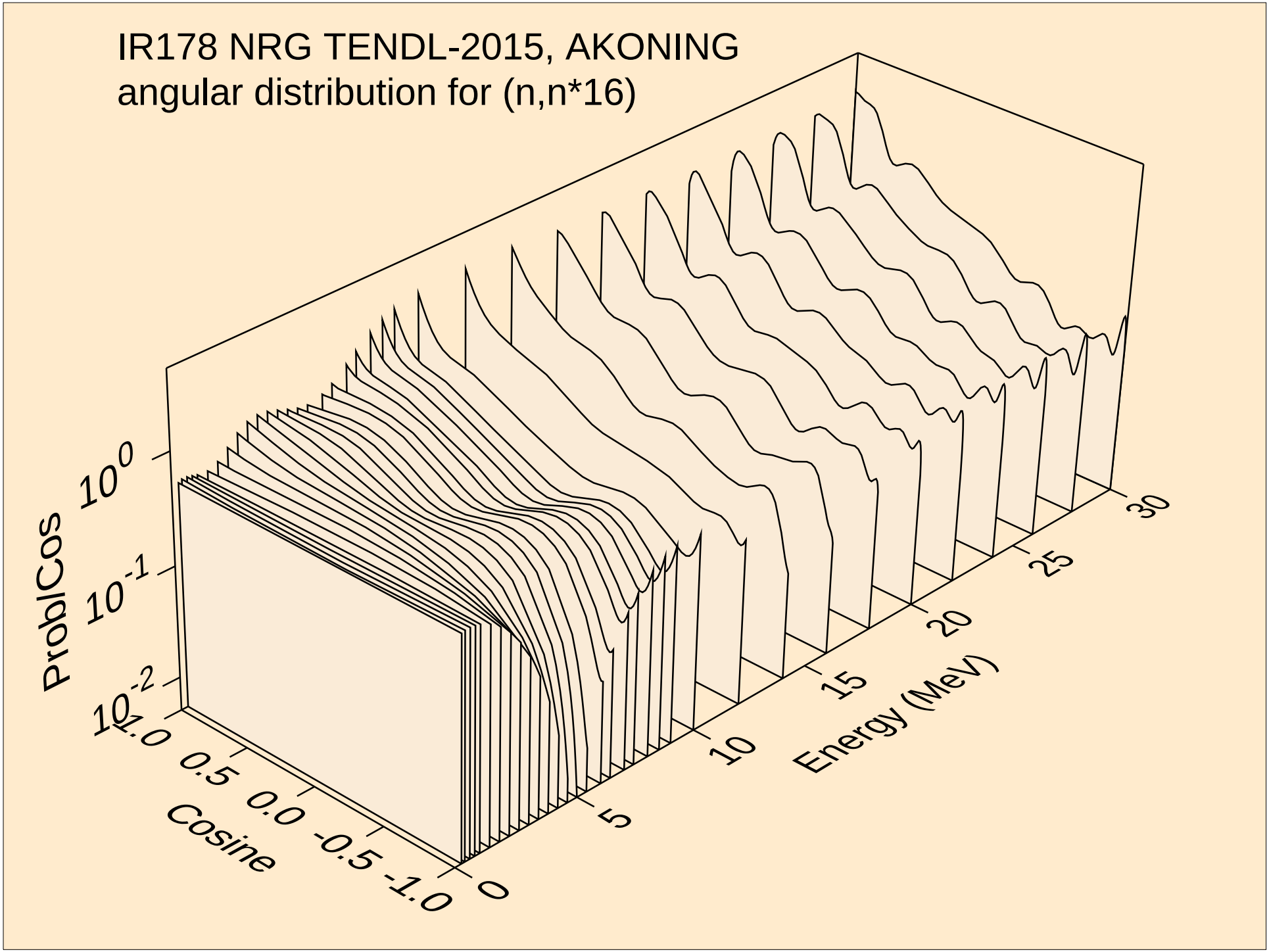

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*11)
ProbCos
10^{0}
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

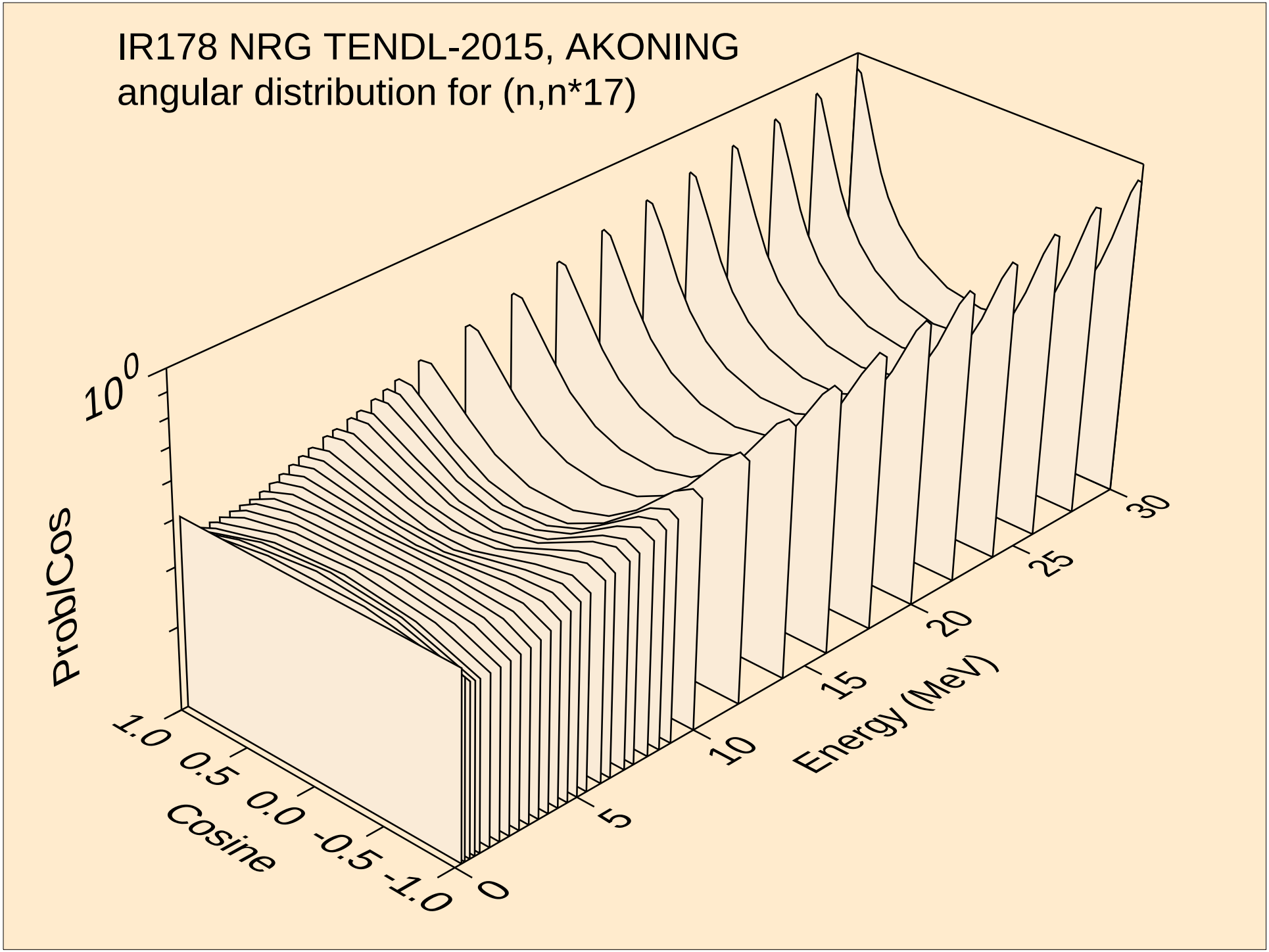

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*12)
ProbCos
10^{0}
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

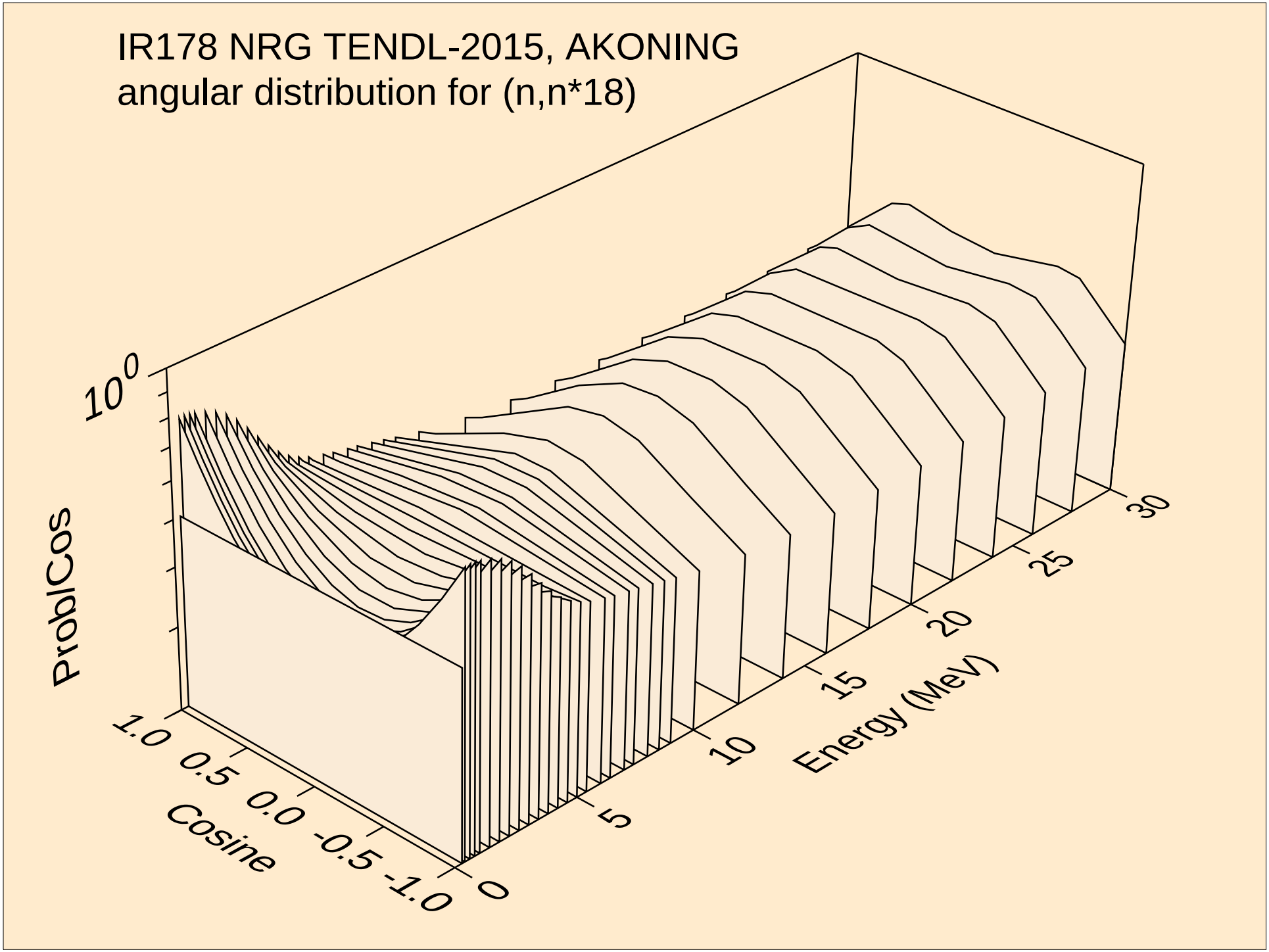

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*13)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

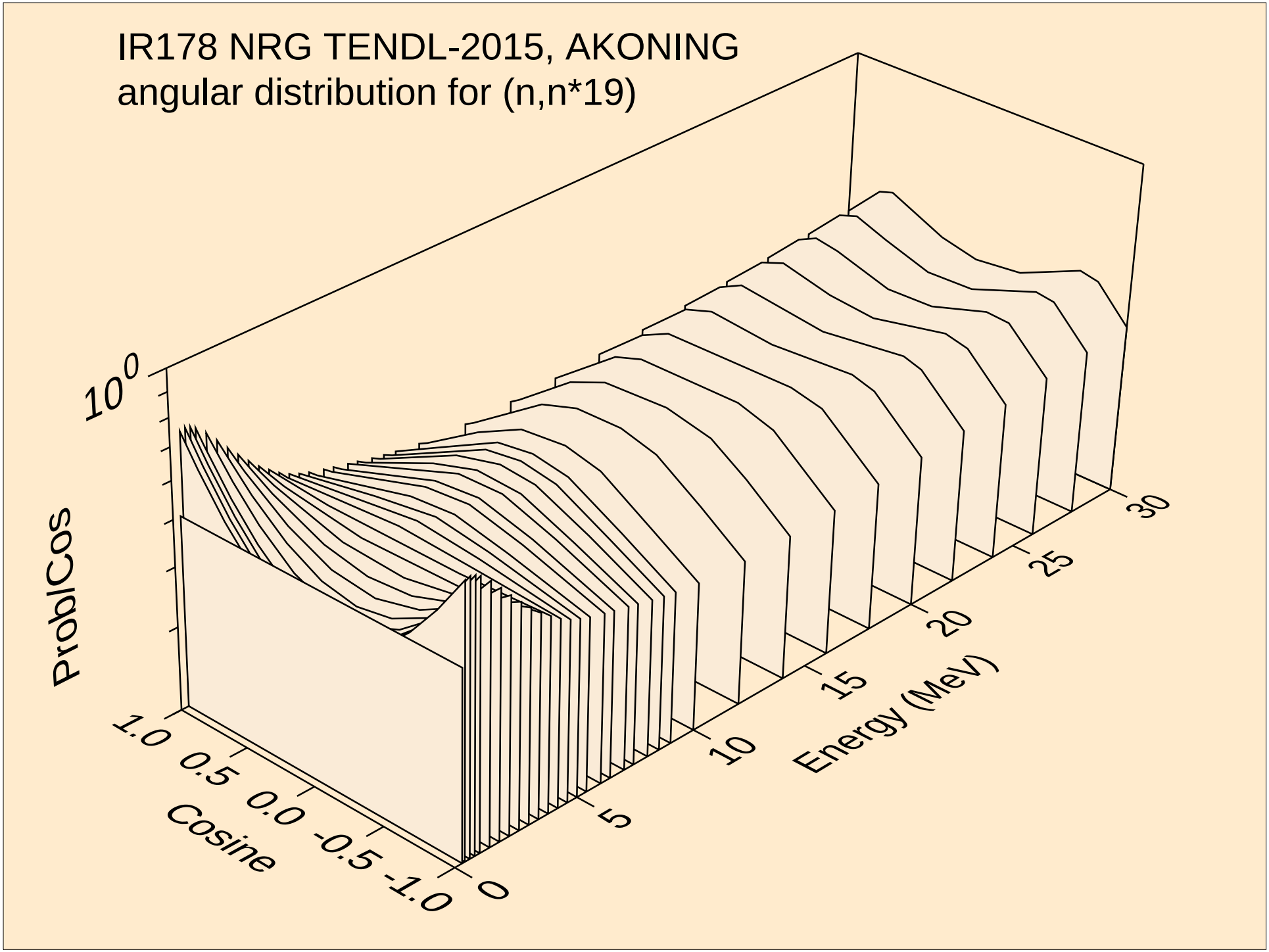

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*14)
ProbCos
10^{0}
10^{-1}
10^{-2}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

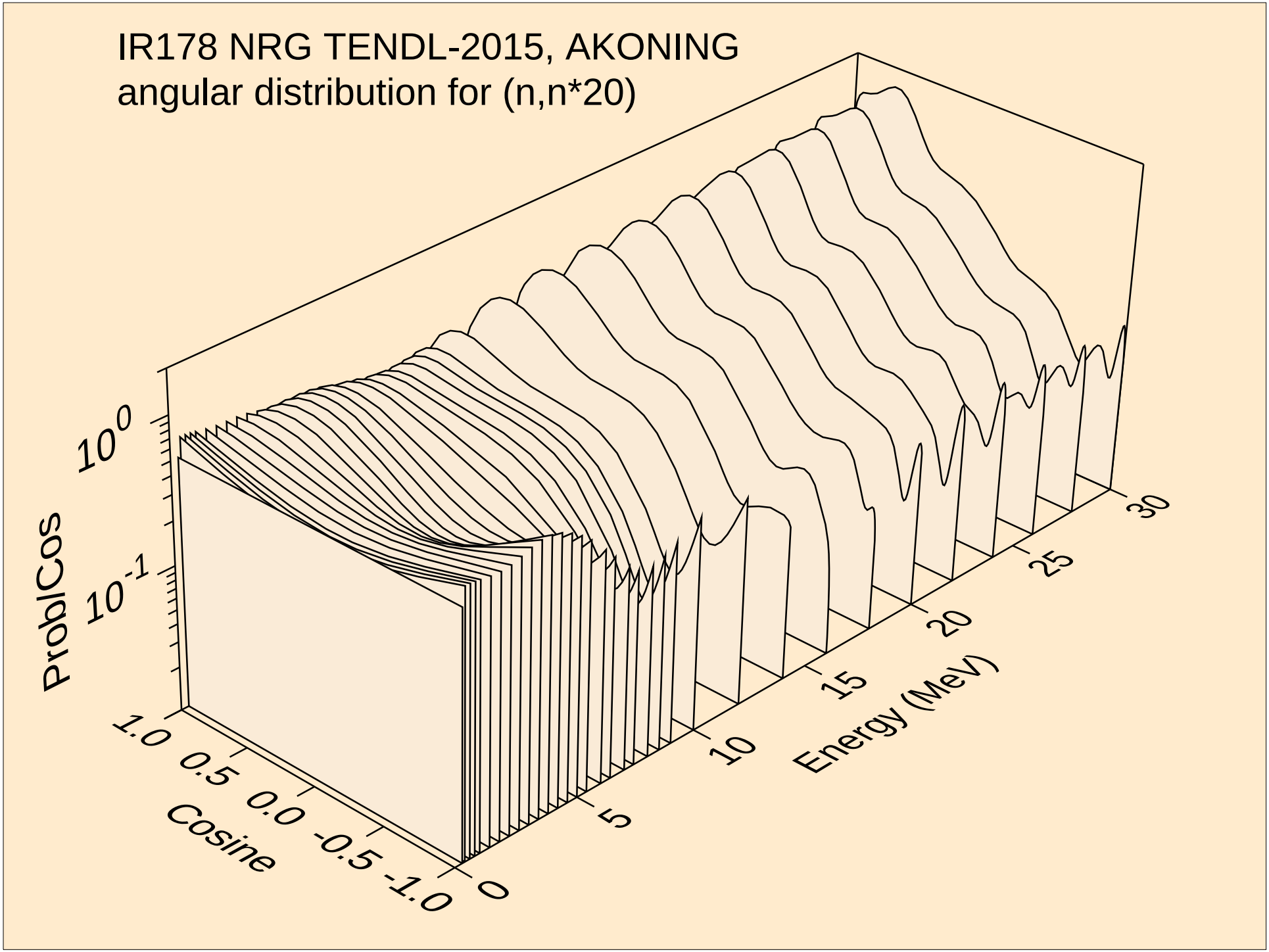

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*15)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

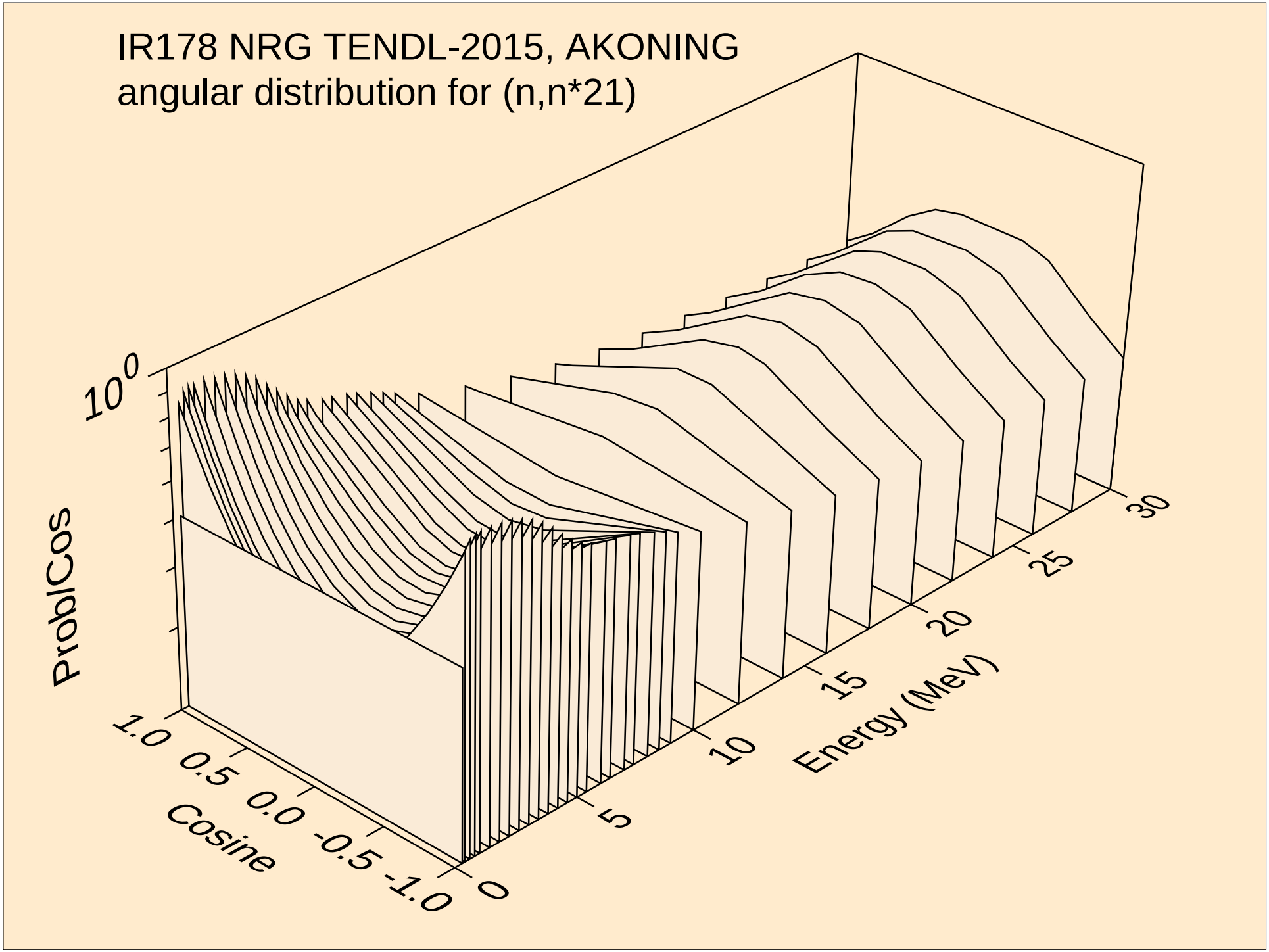

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*16)
Prob\Cos
10^0
10^-1
10^-2
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

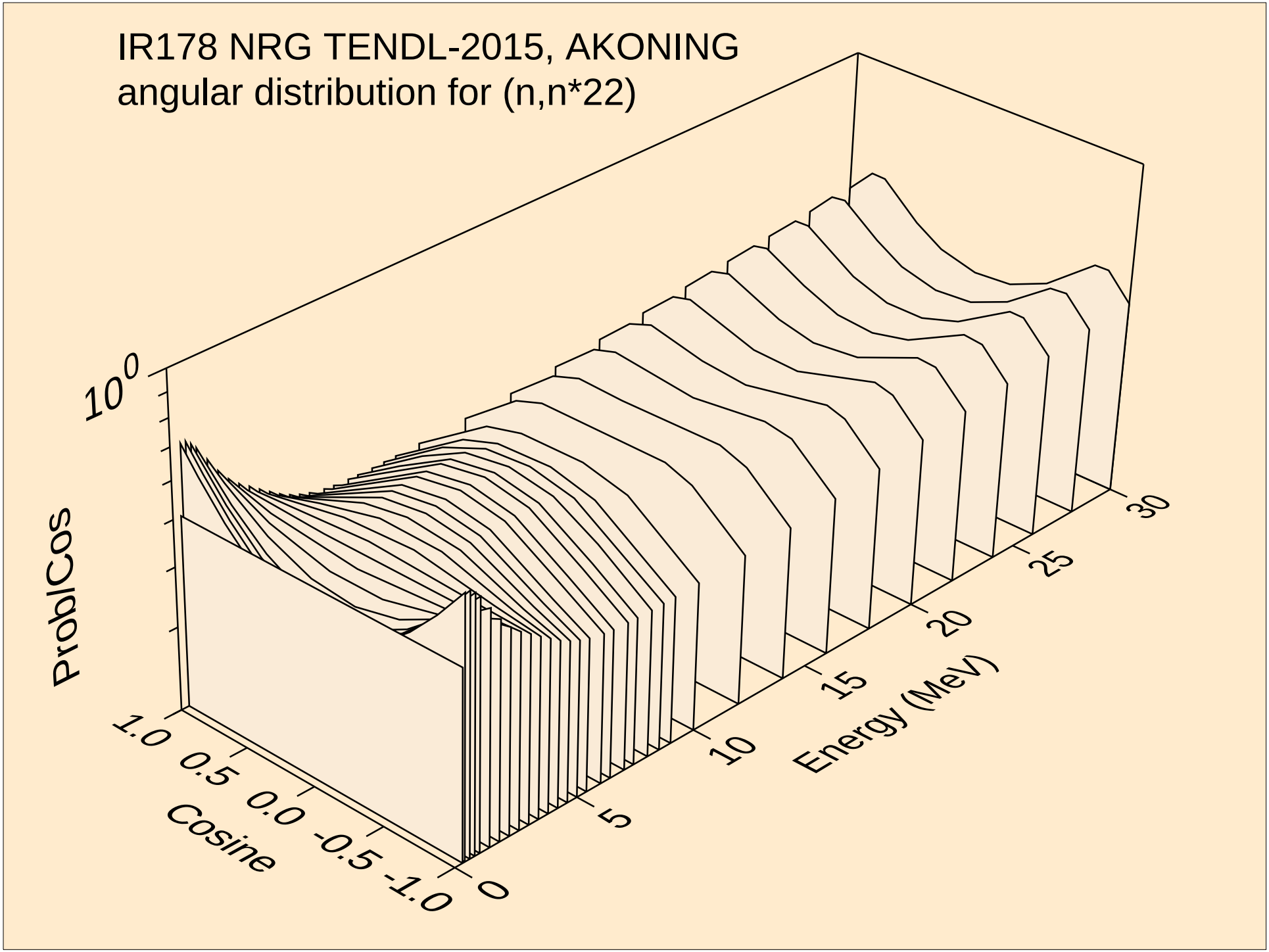

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*17)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

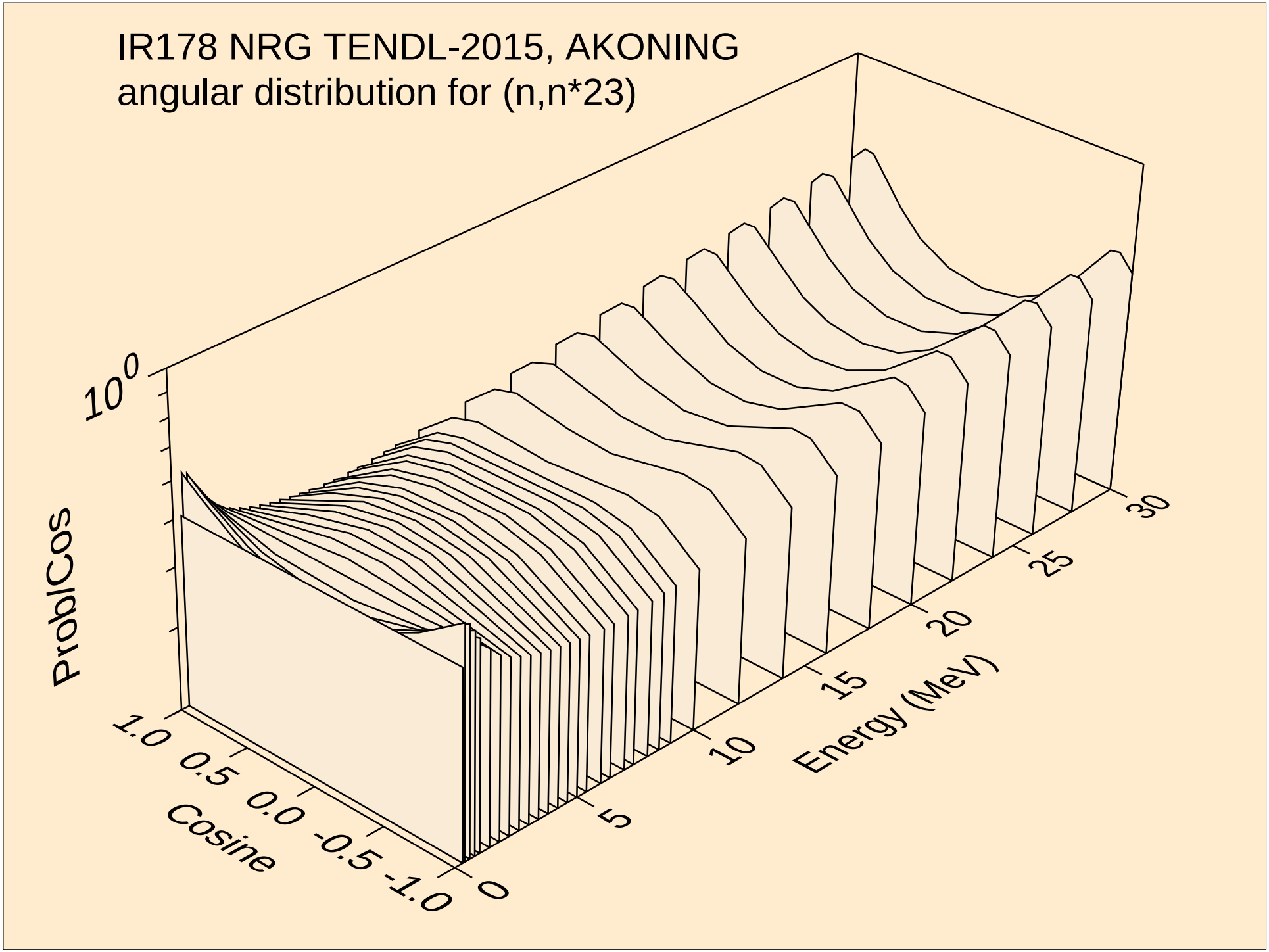

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*18)
10^0
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

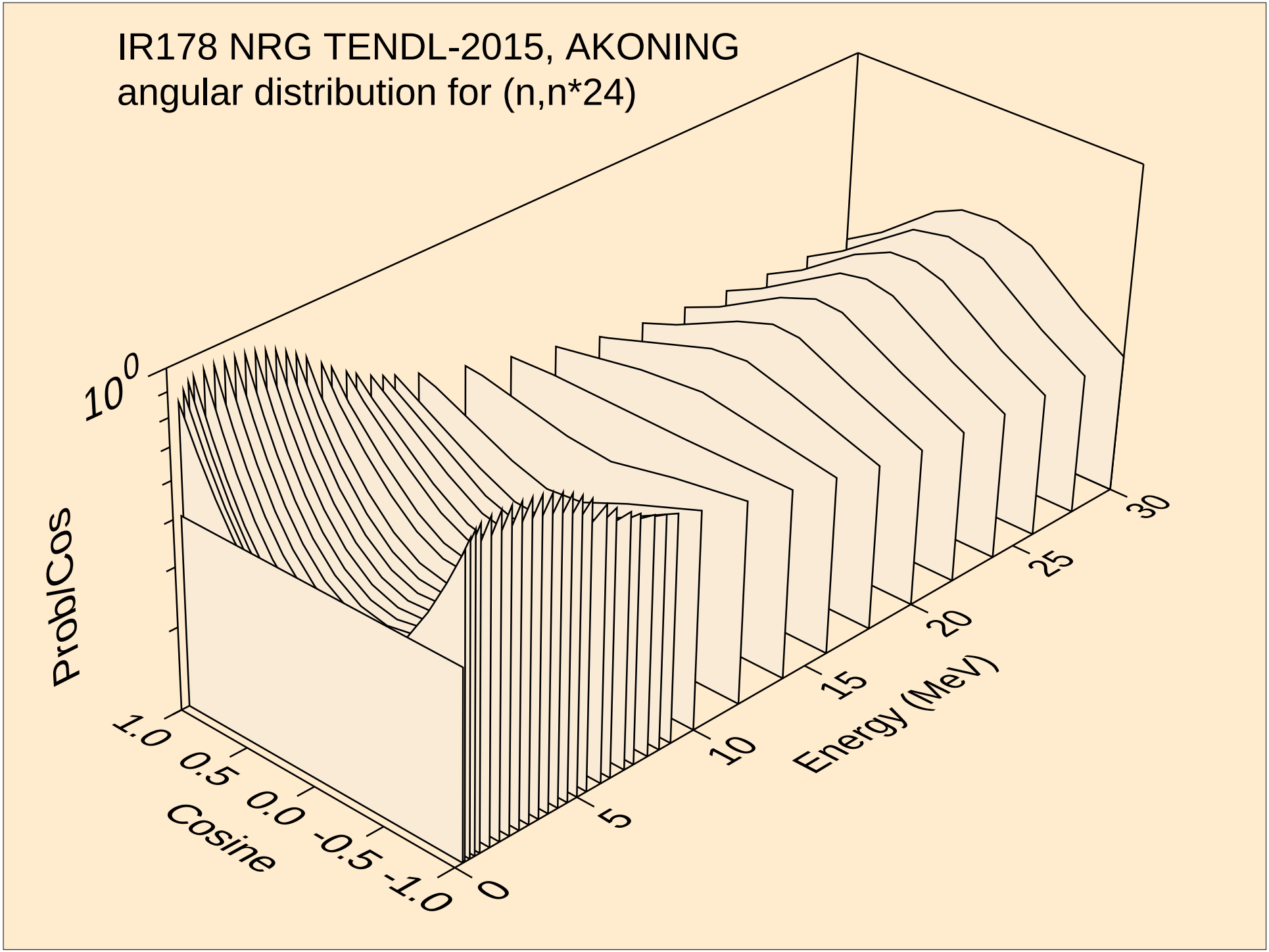

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*19)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

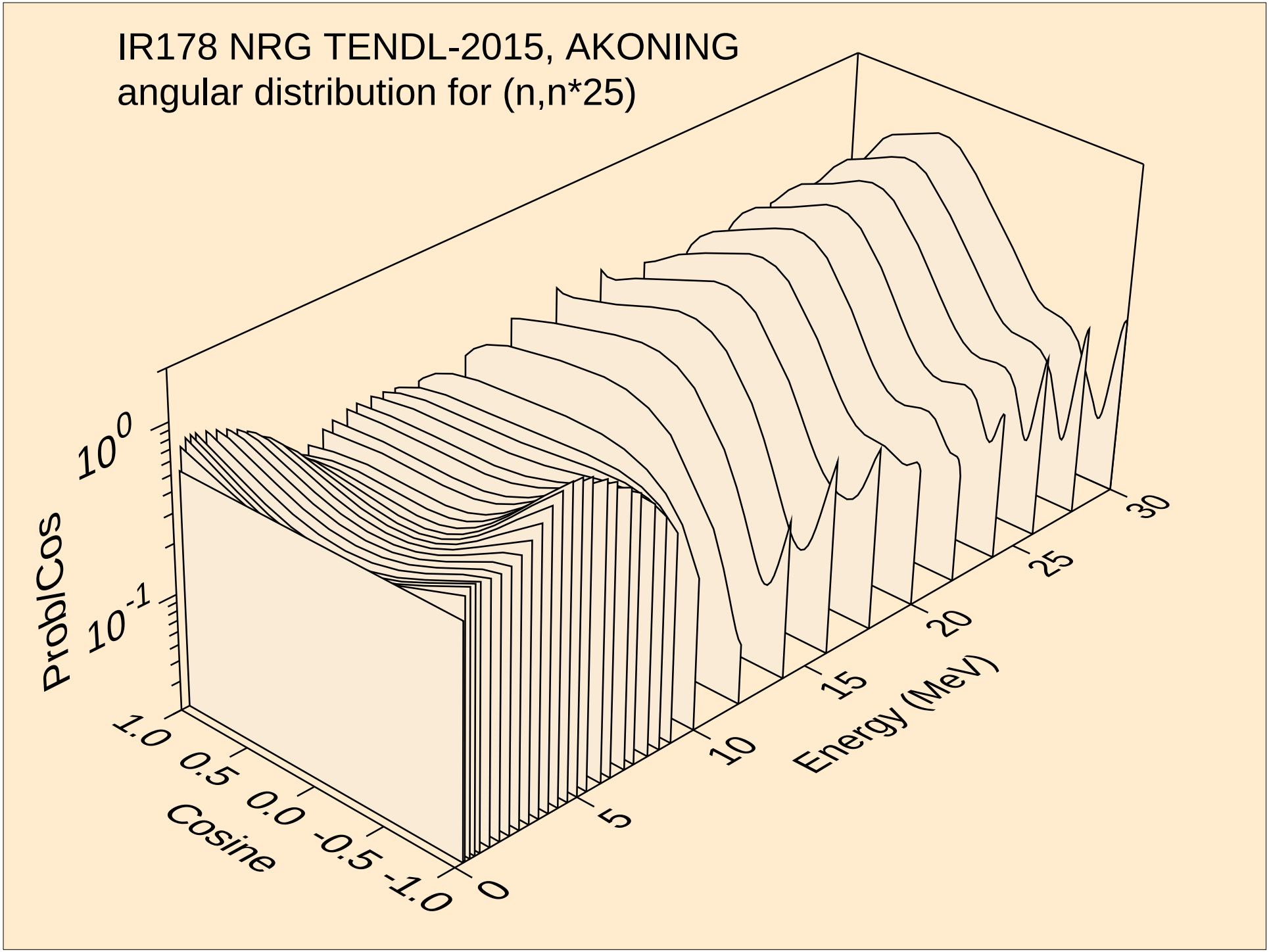

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*20)
ProbCos
10^{0}
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

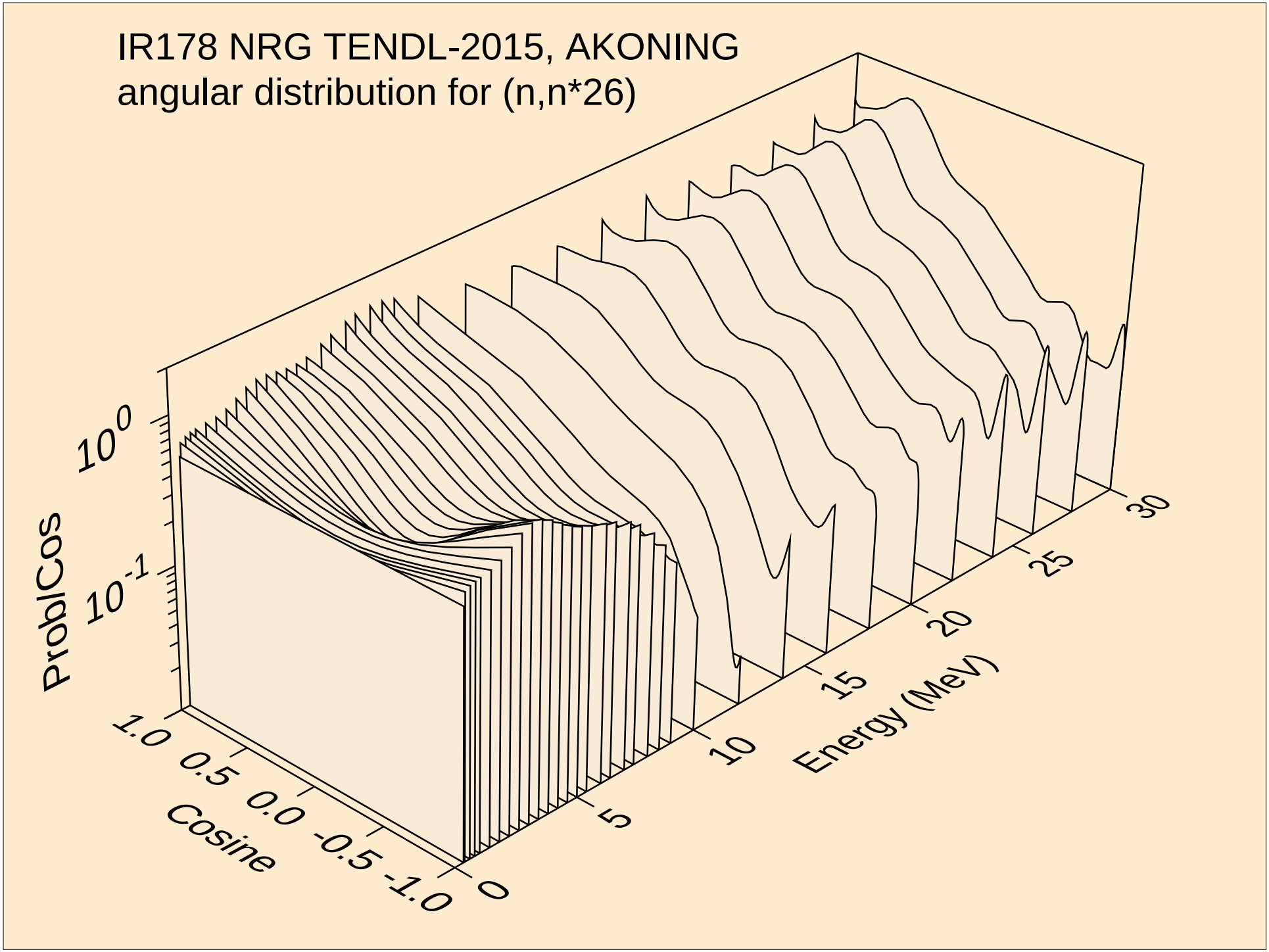

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*21)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

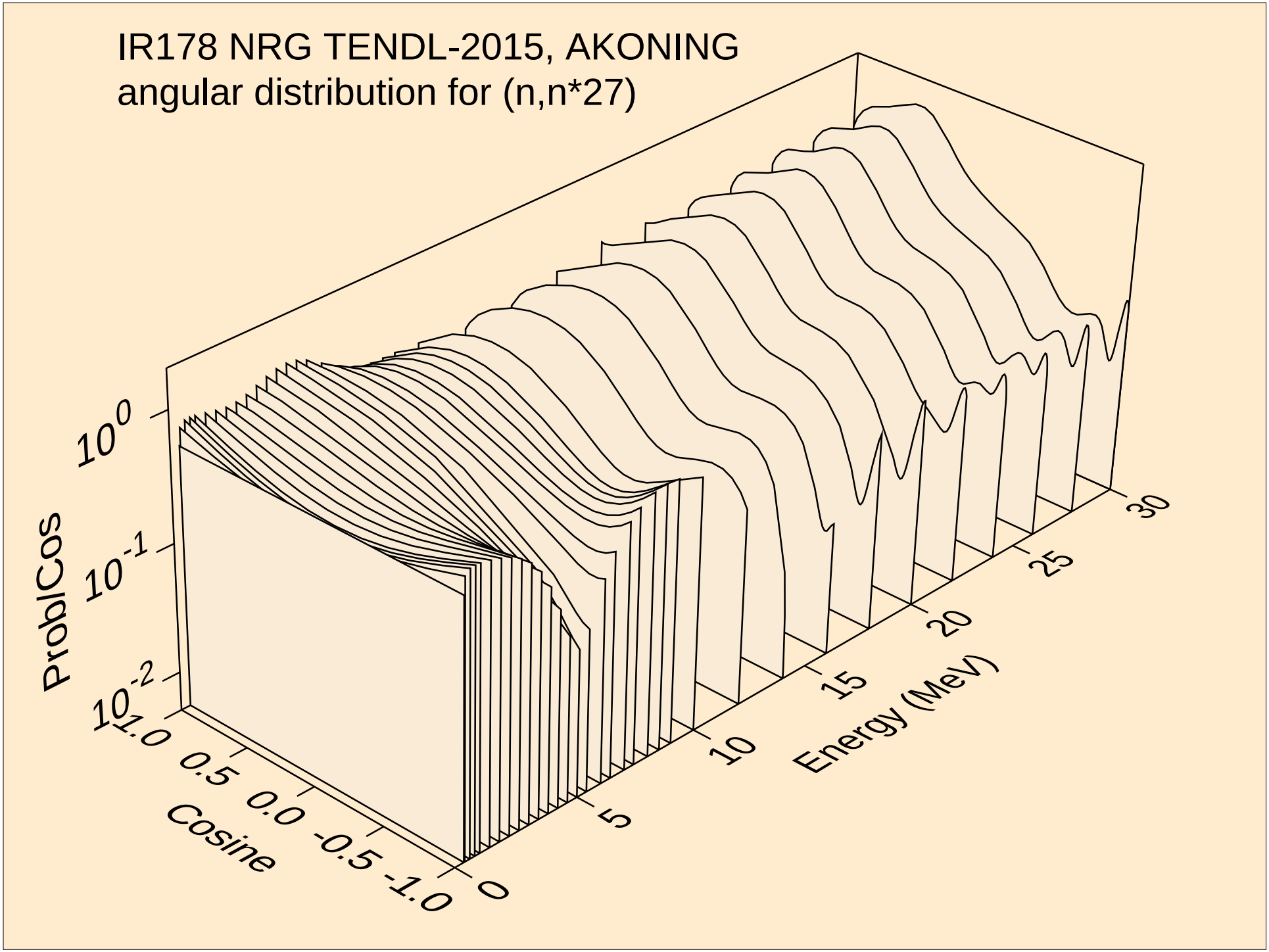

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*22)
10^0
ProbICos
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

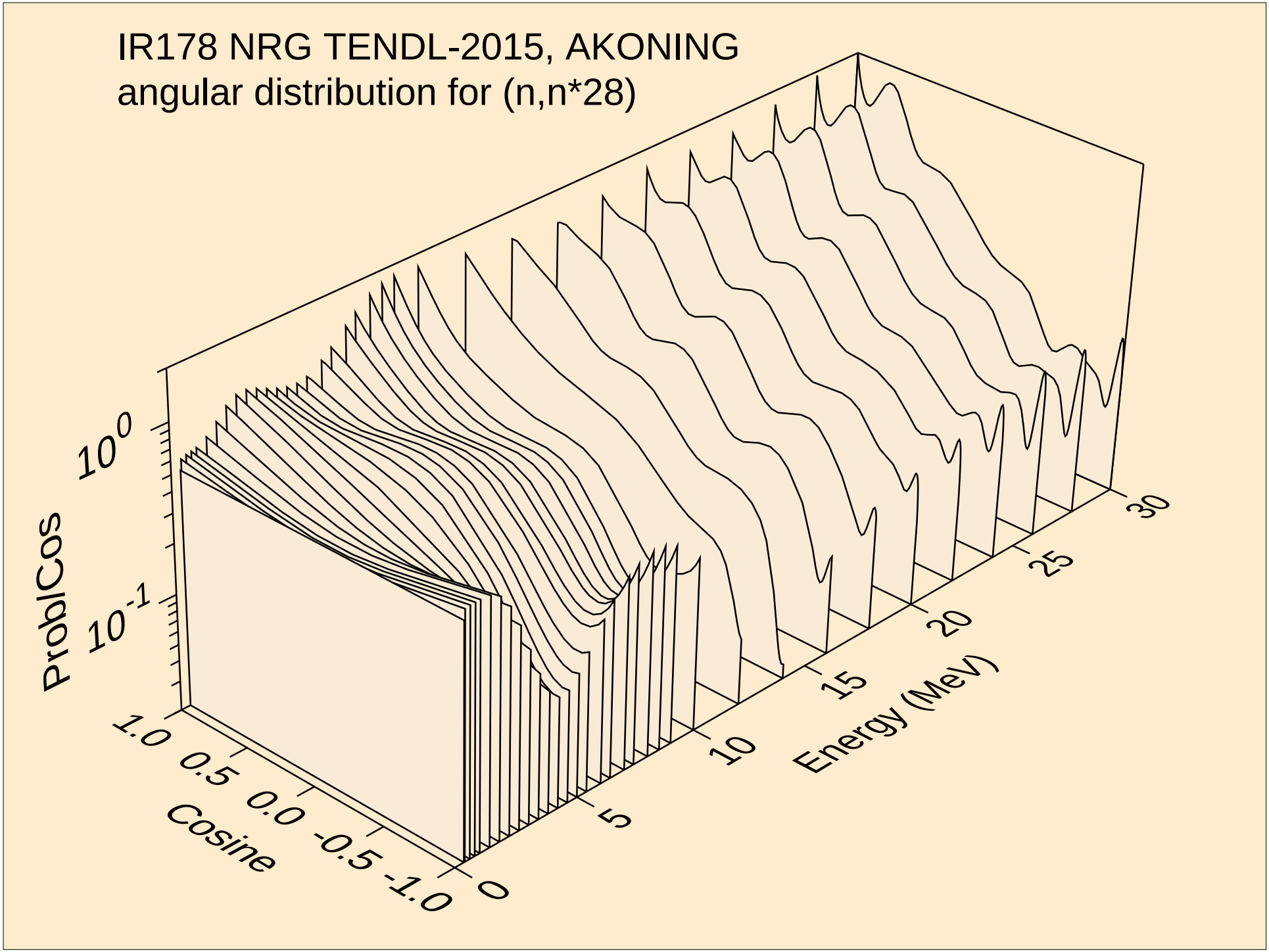

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*23)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

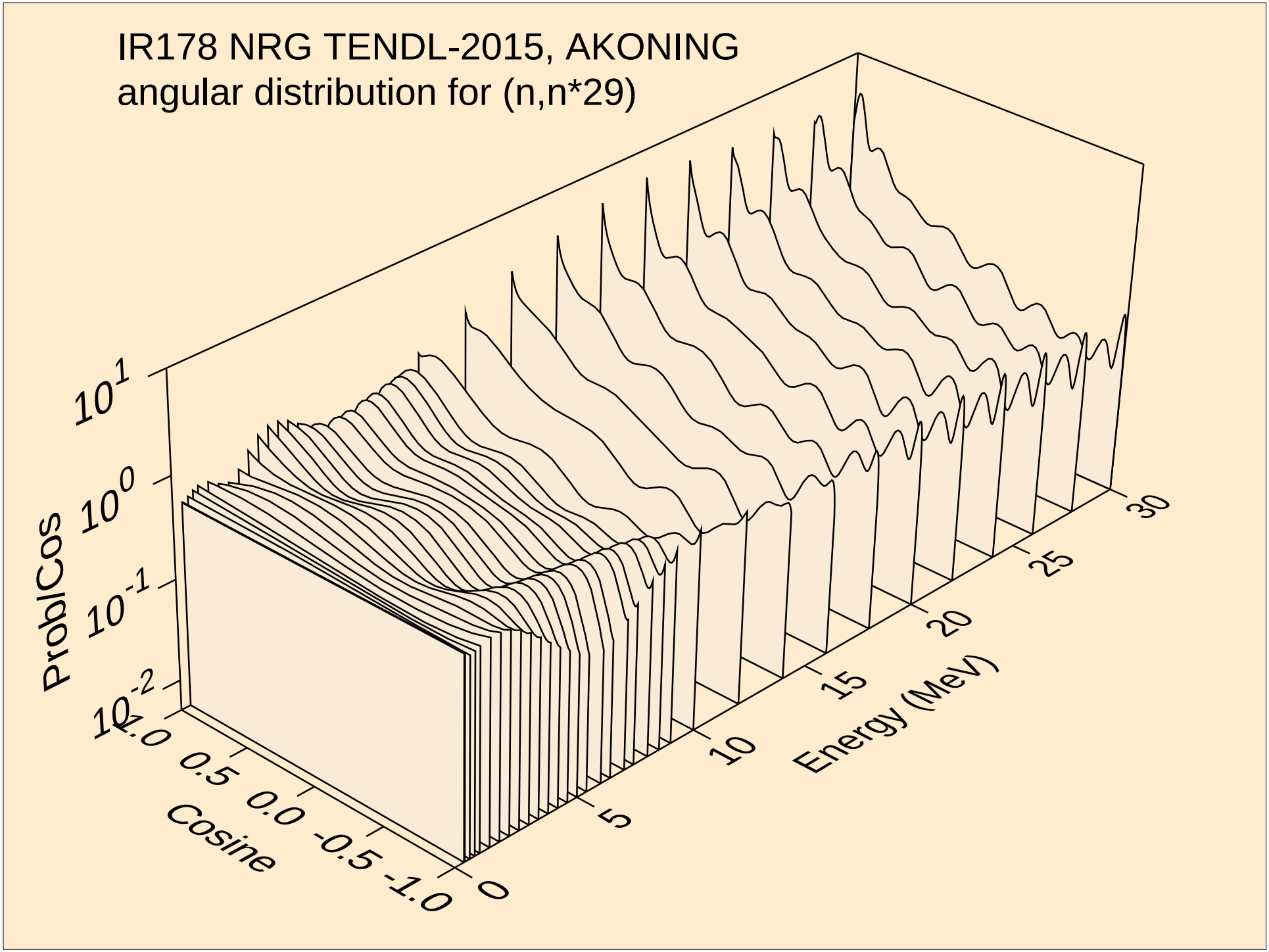

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*24)
ProbICos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

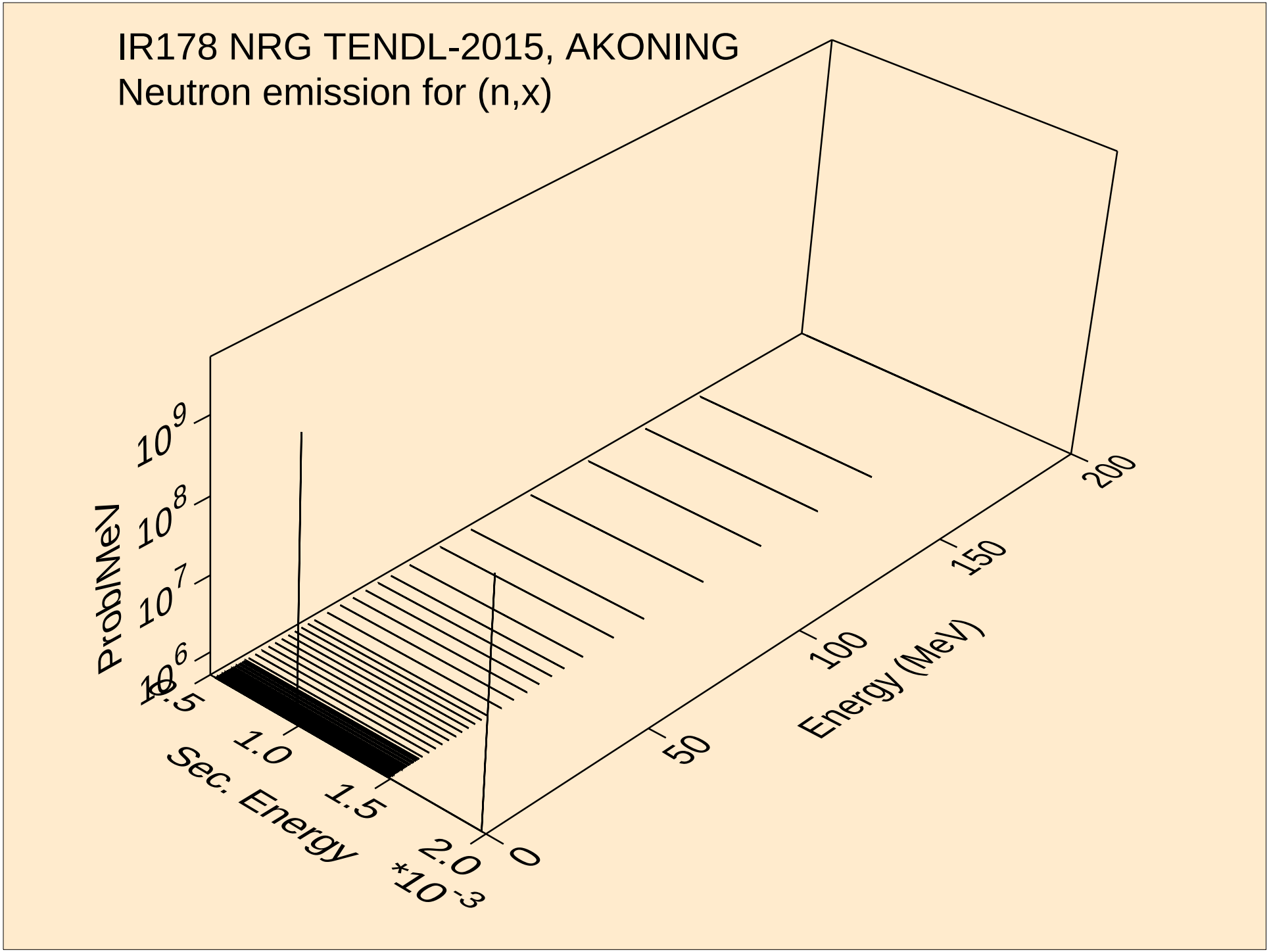

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*25)
ProbCos
10^{0}
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

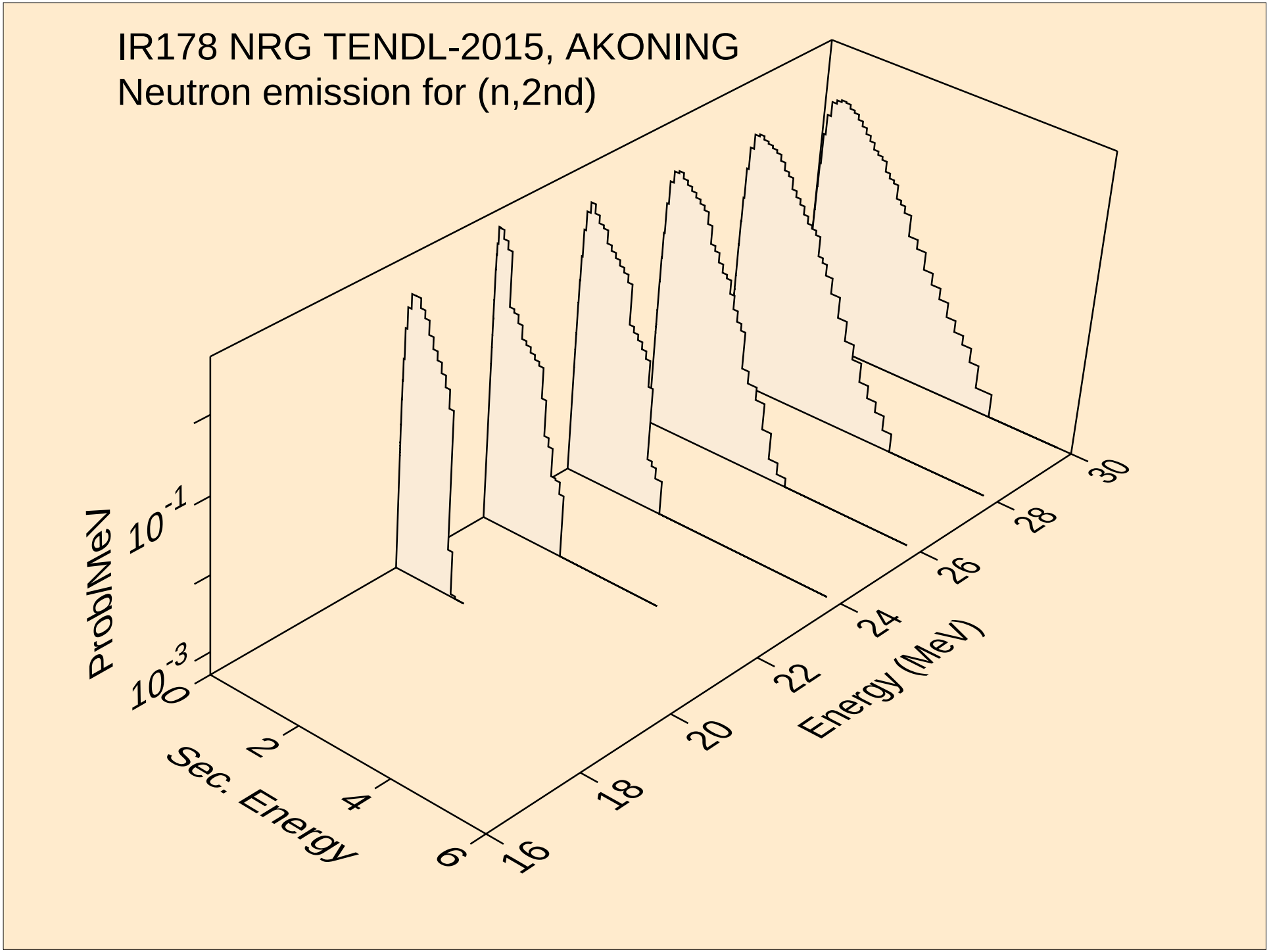

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*26)
ProbCos
10^{0}
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

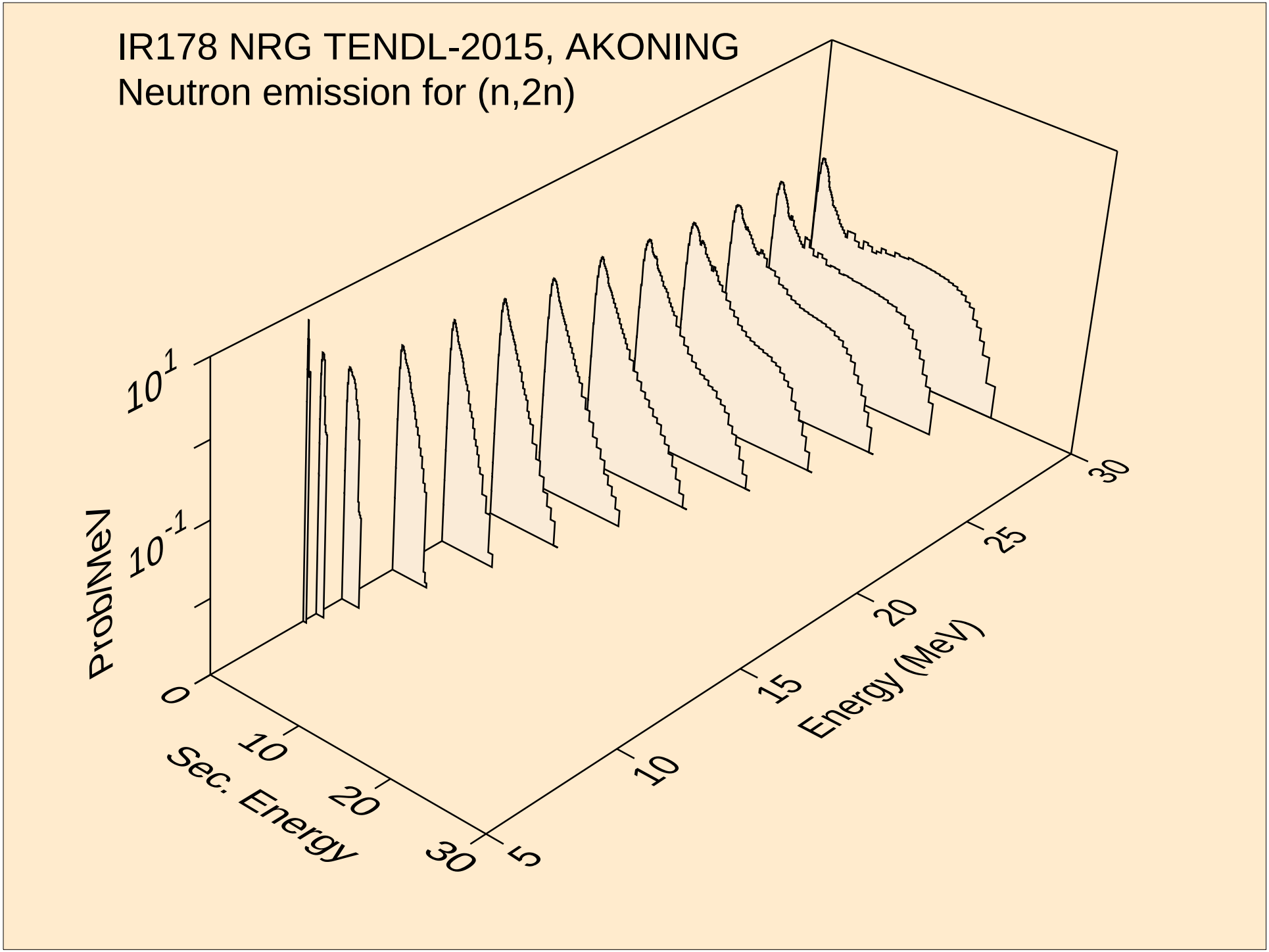

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*27)
ProbCos
10^{0}
10^{-1}
10^{-2}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

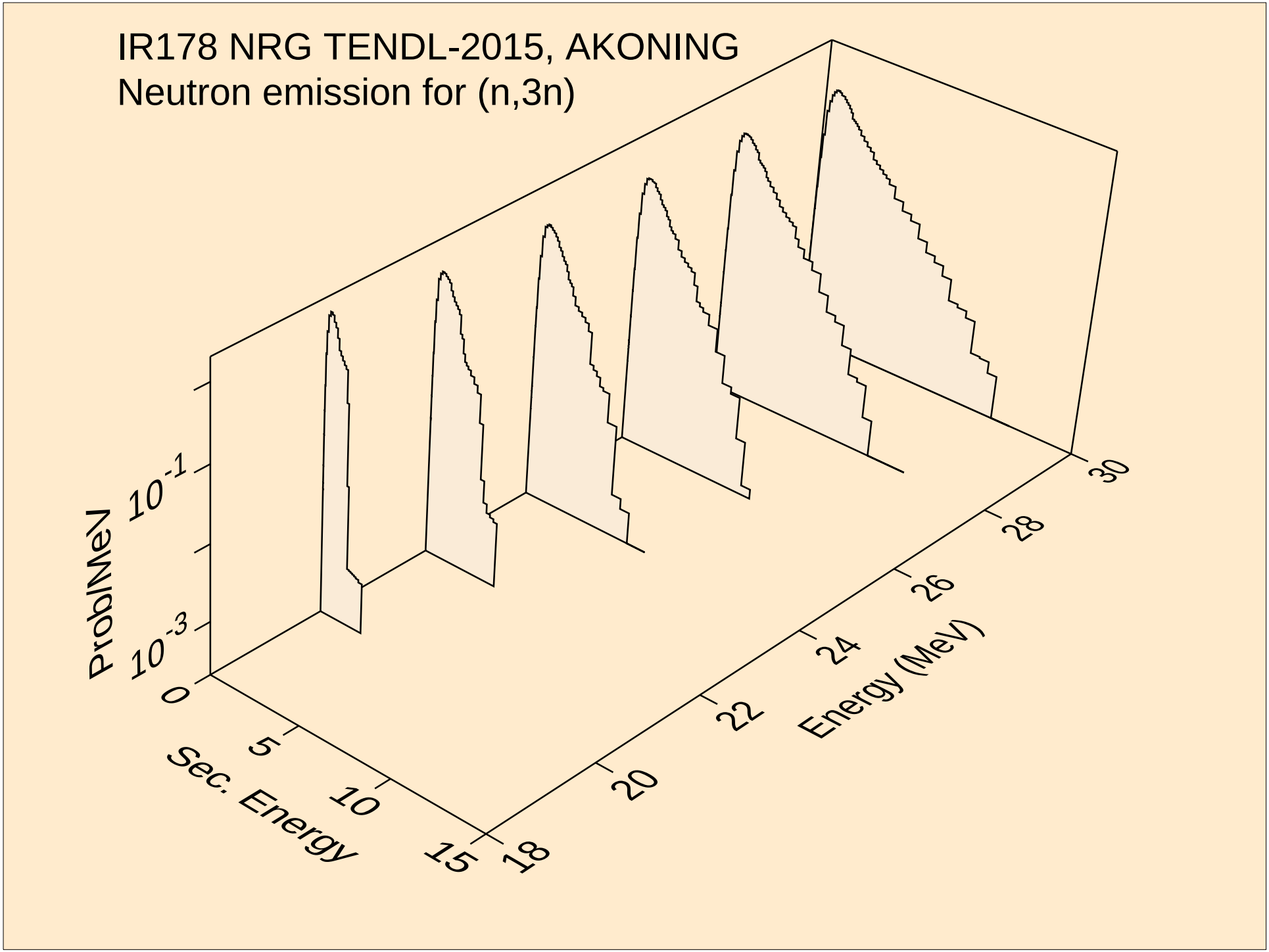

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*28)
Prob\Cos
10^{0}
10^{-1}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

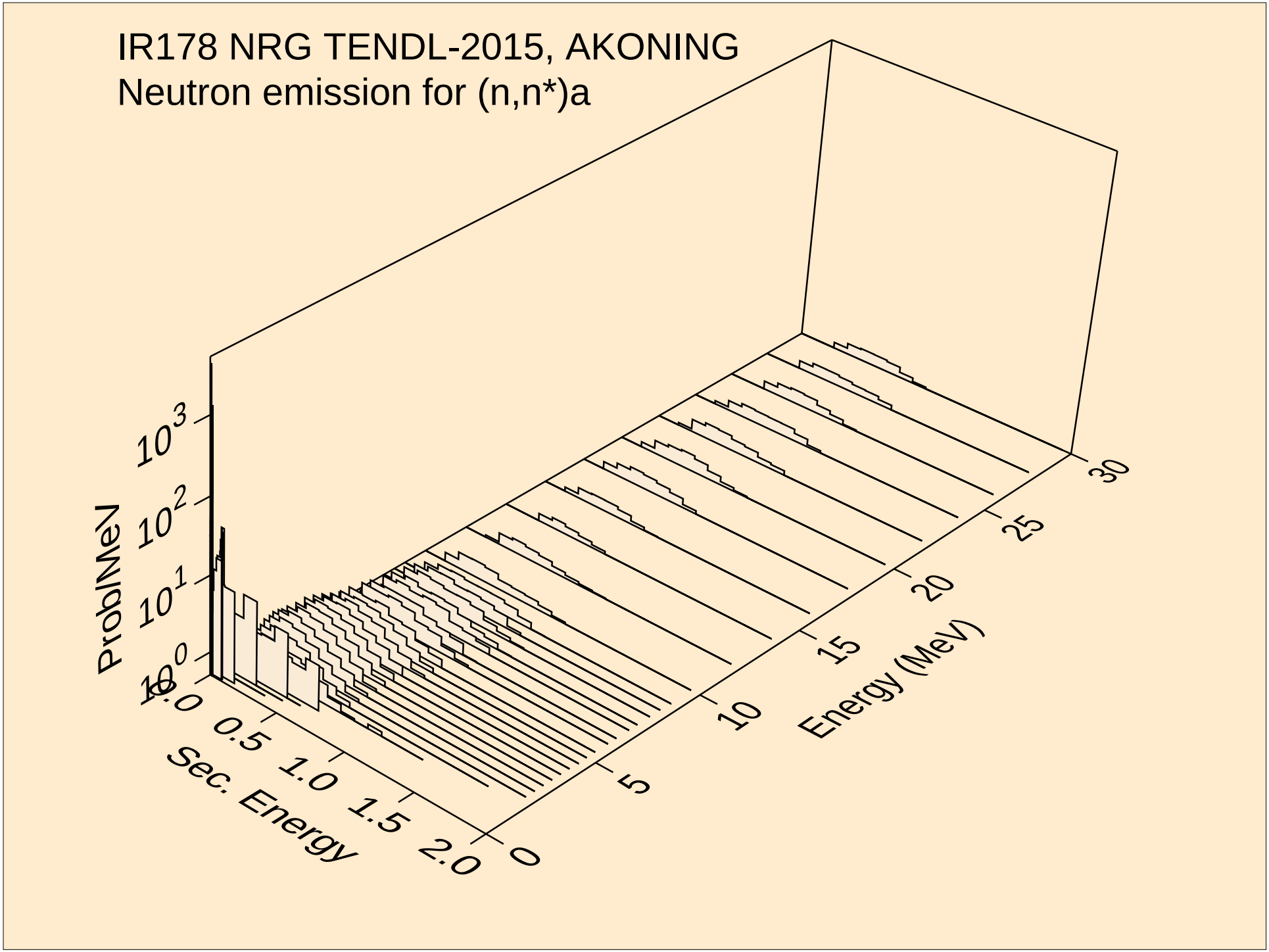

IR178 NRG TENDL-2015, AKONING
angular distribution for (n,n*29)
Prob\Cos
10^1
10^0
10^-1
10^-2
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
25
30
Energy (MeV)

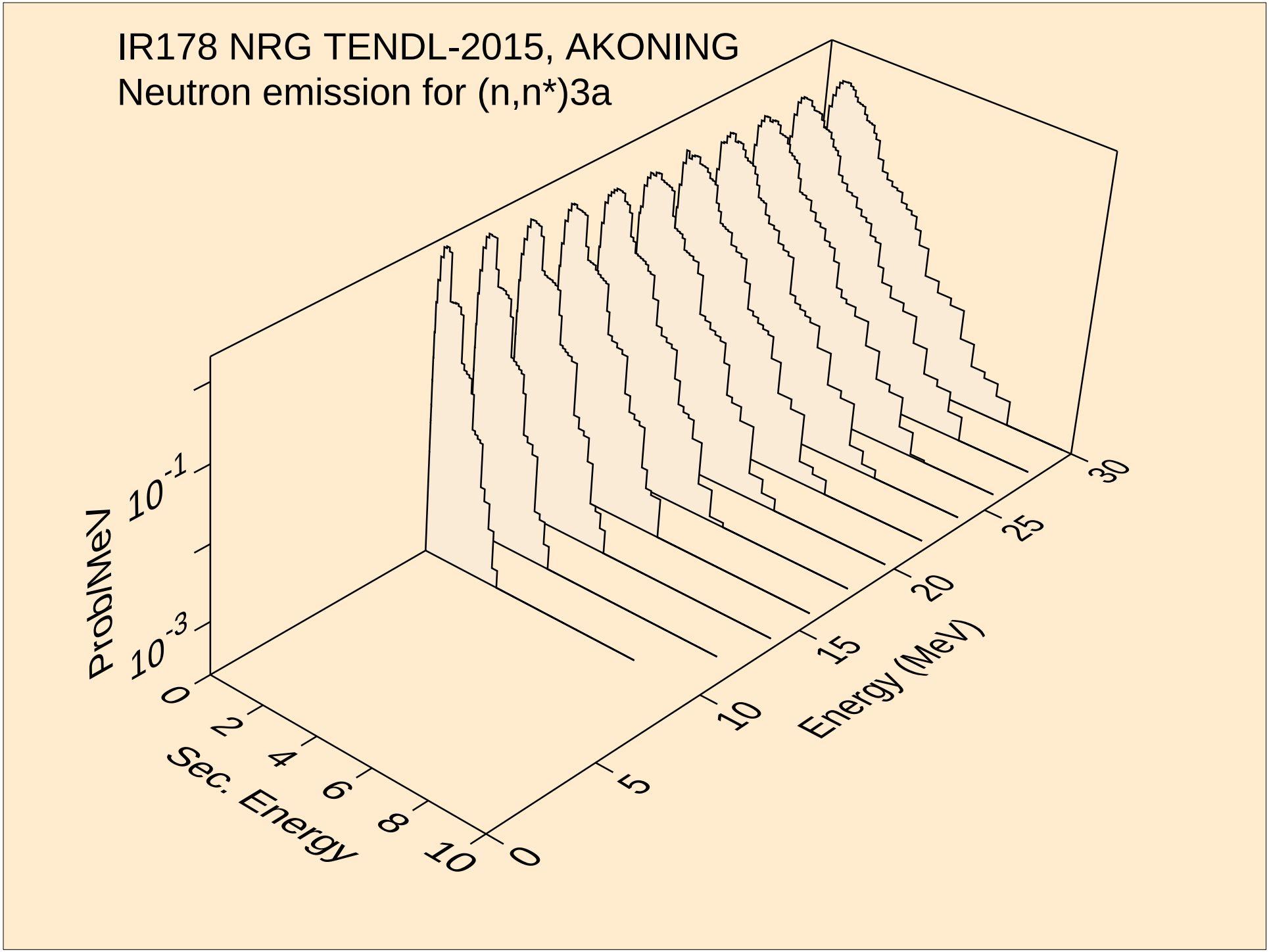

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,x)
Prob/MeV
10^{9}
10^{8}
10^{7}
10^{6}
0.5
1.0
1.5
2.0
Sec. Energy
*10-3
0
50
100
150
200
Energy (MeV)

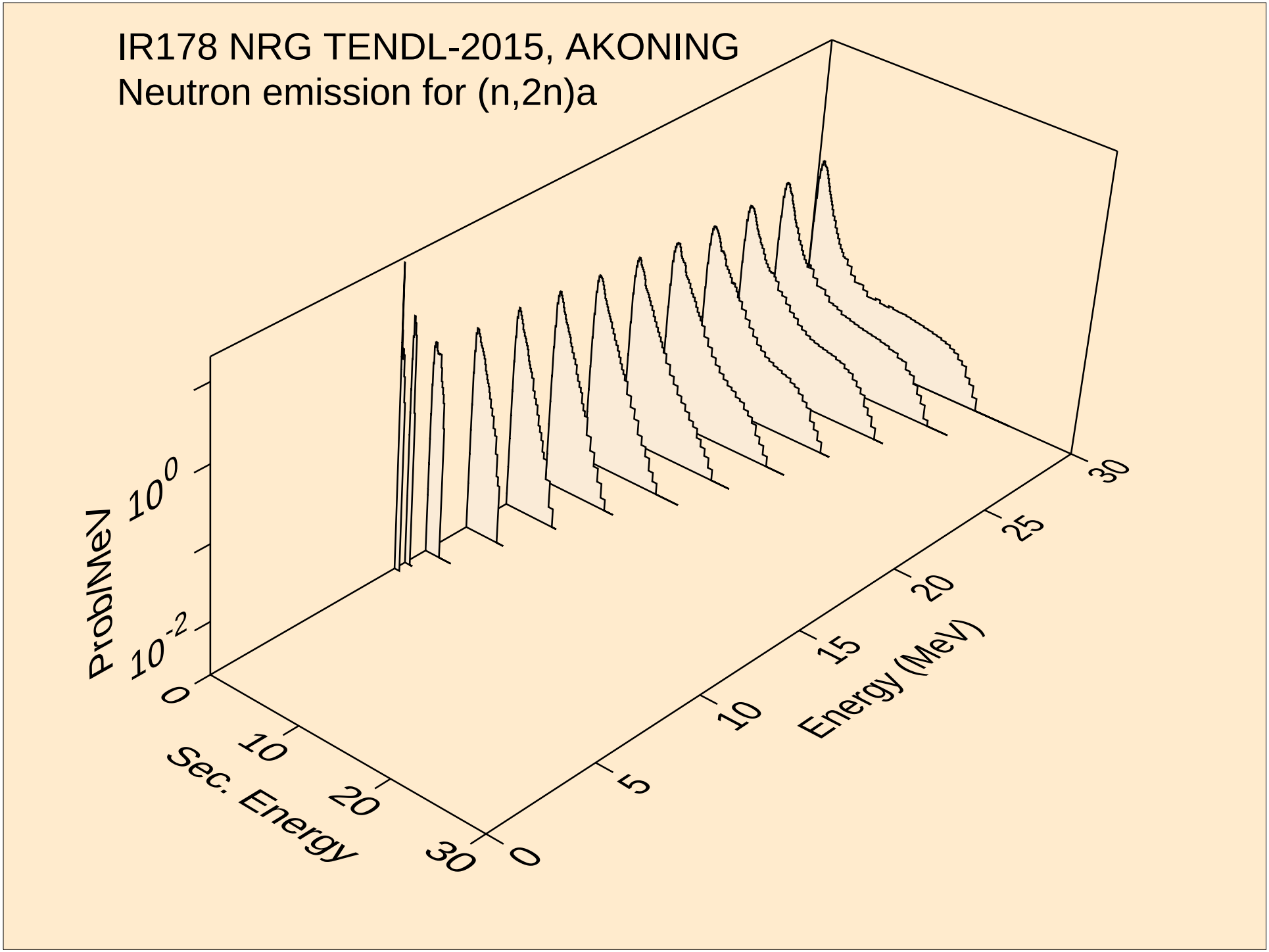

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,2nd)
Prob/MeV
10-1
10-3
0
2
4
6
Sec. Energy
16
18
20
22
24
26
28
30
Energy (MeV)

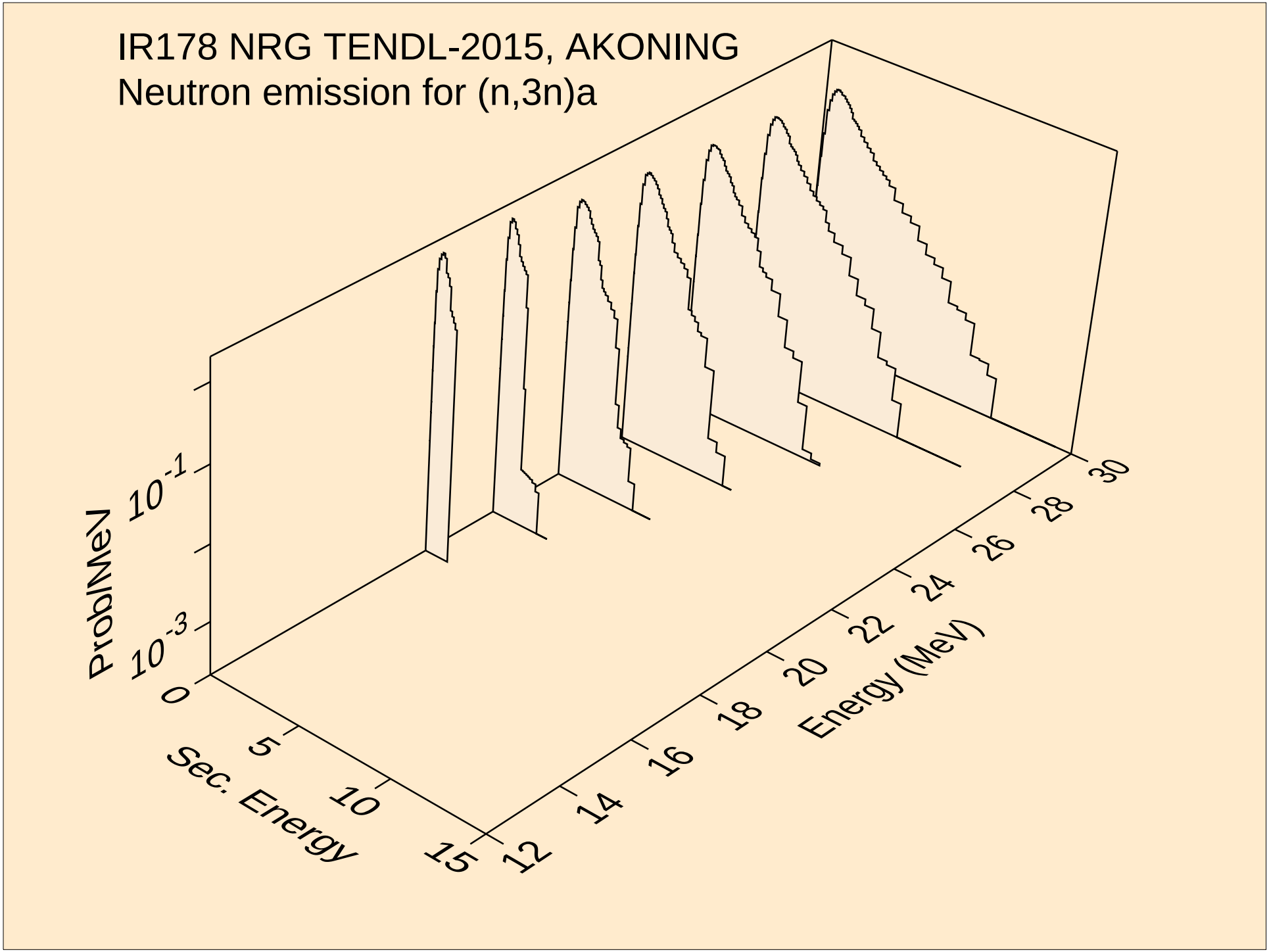

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,2n)
Prob/MeV
10^{1}
10^{-1}
0
Sec. Energy
10
20
30
Energy (MeV)
5
10
15
20
25
30

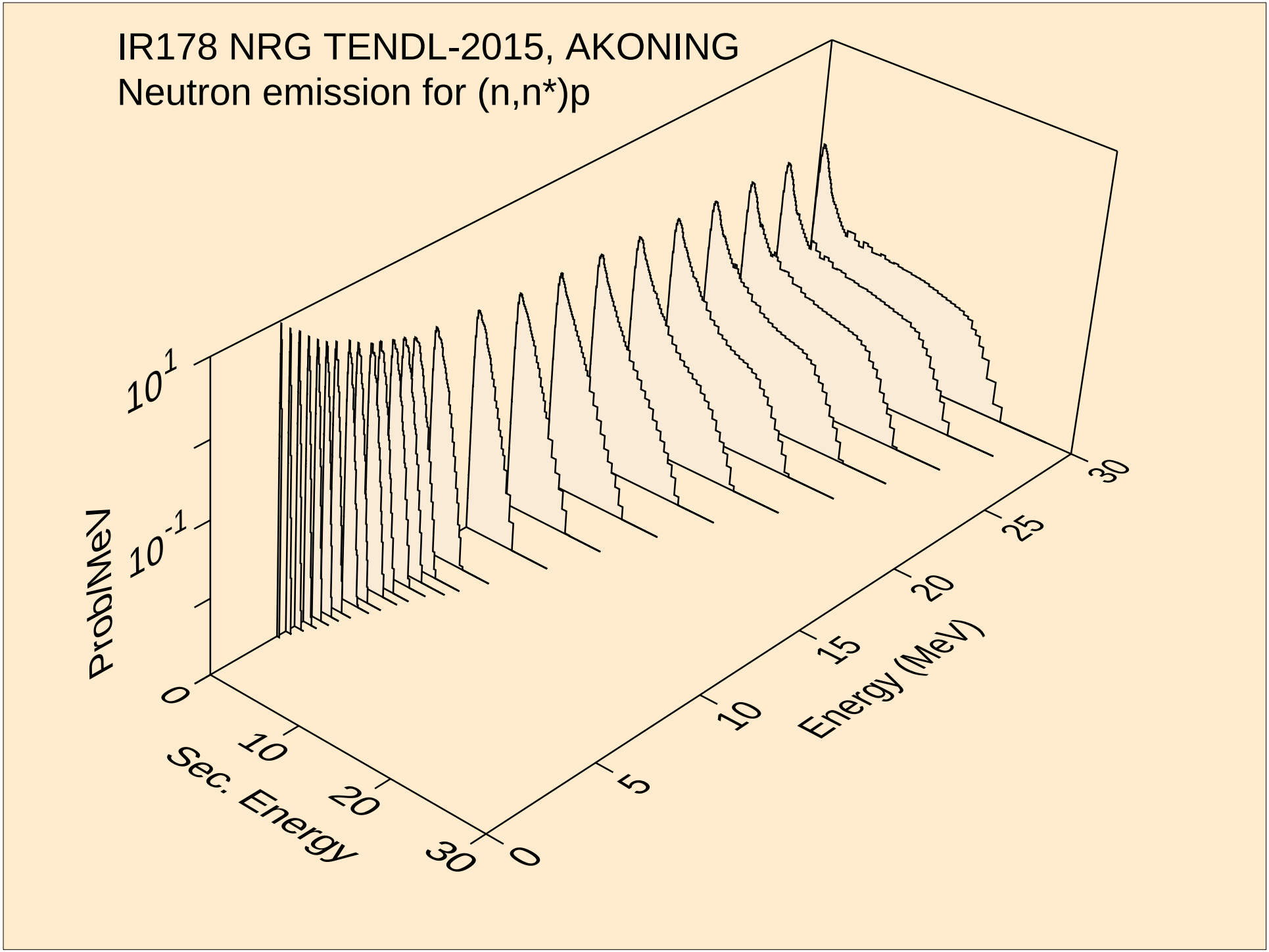

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,3n)
Prob/MeV
10-1
10-3
0
Sec. Energy
5
10
15
18
20
22
24
26
28
30
Energy (MeV)

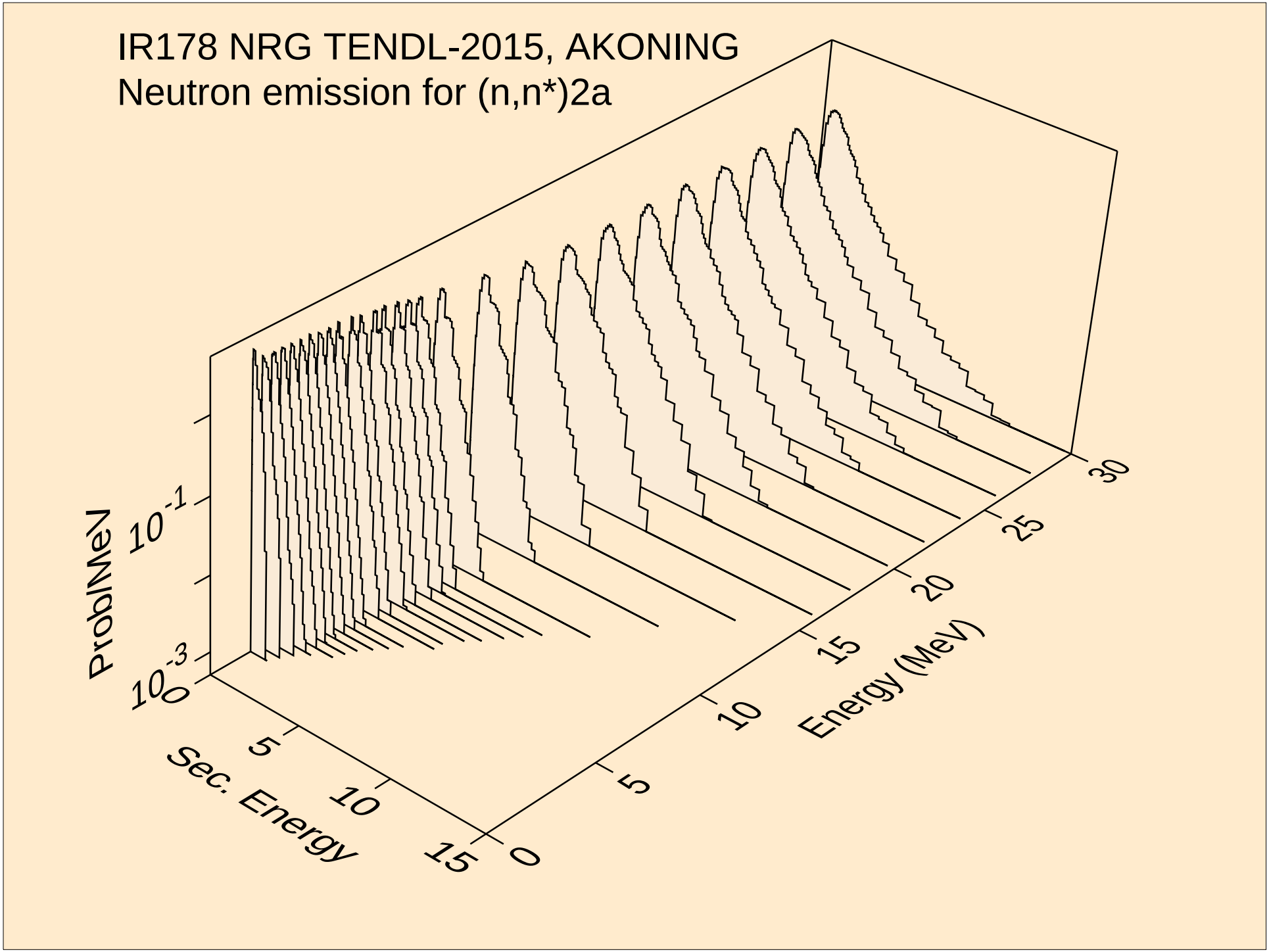

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,n*)a
Prob/MeV
10^3
10^2
10^1
10^0
0.0
0.5
1.0
1.5
2.0
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

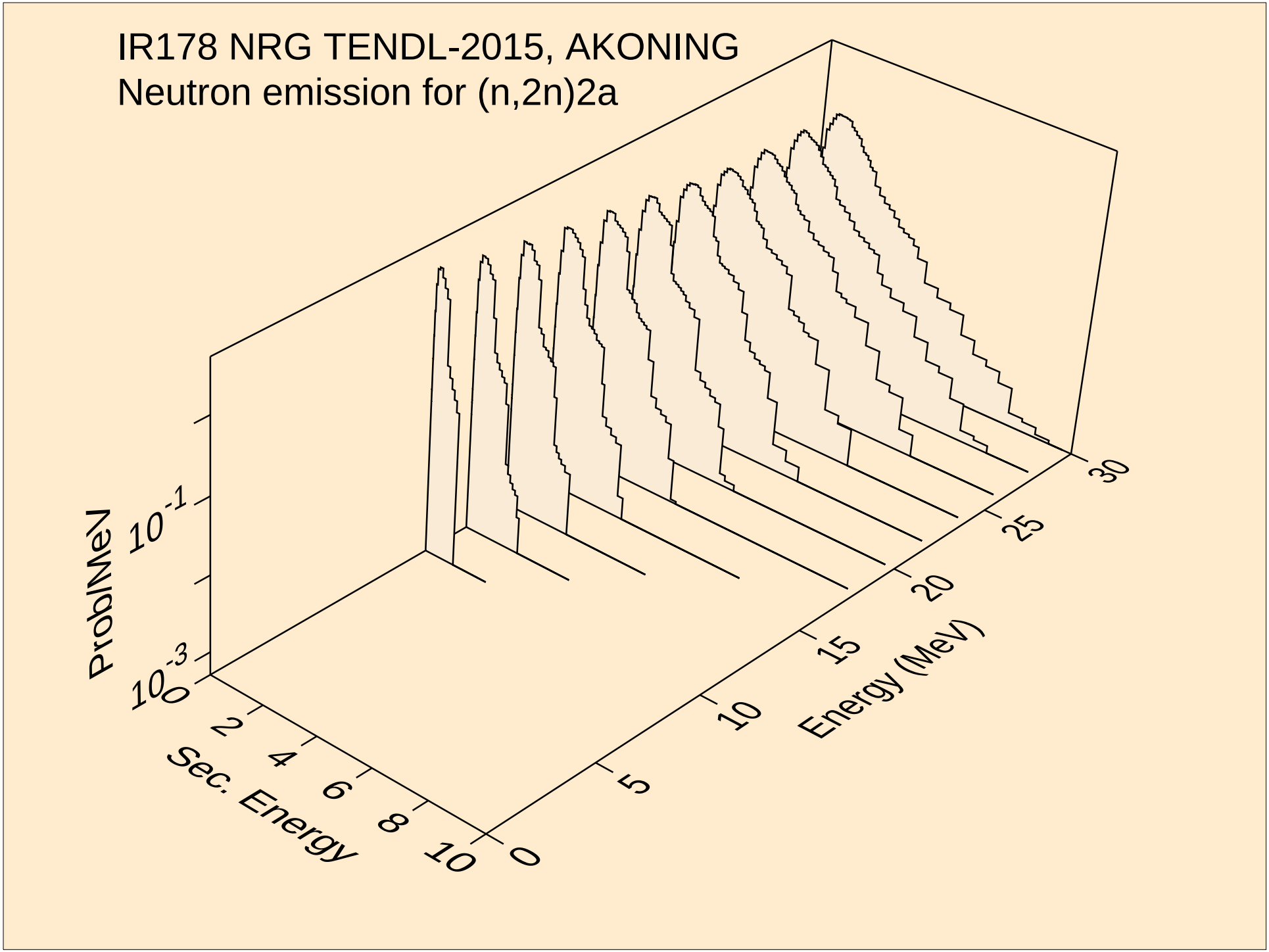

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,n*)3a
Prob/MeV
10-1
10-3
0
2
4
6
8
10
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

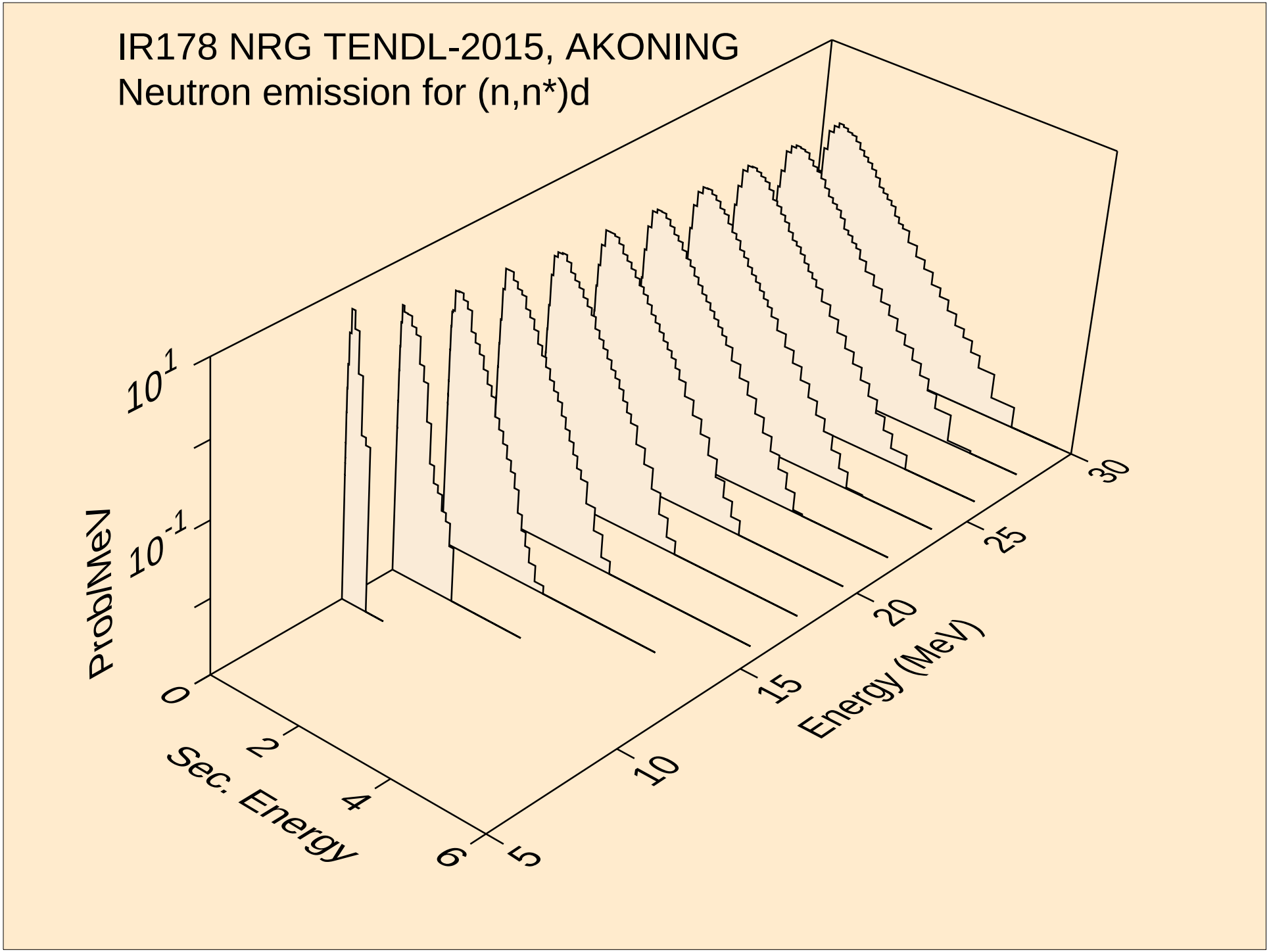

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,2n)a
Prob/MeV
10^0
10^-2
0
10
20
30
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

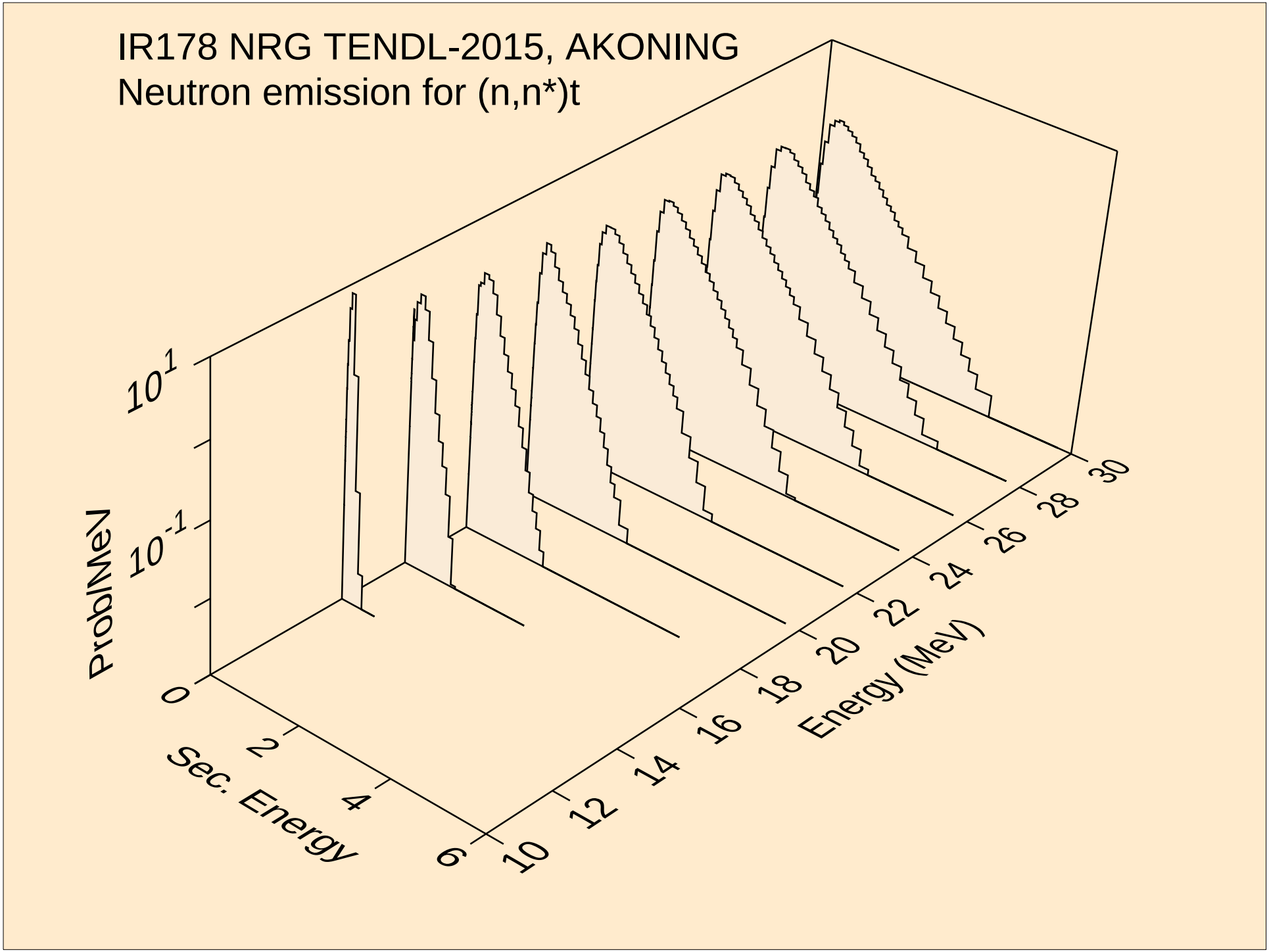

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,3n)a
Prob/MeV
10-1
10-3
0
Sec. Energy
5
10
15
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

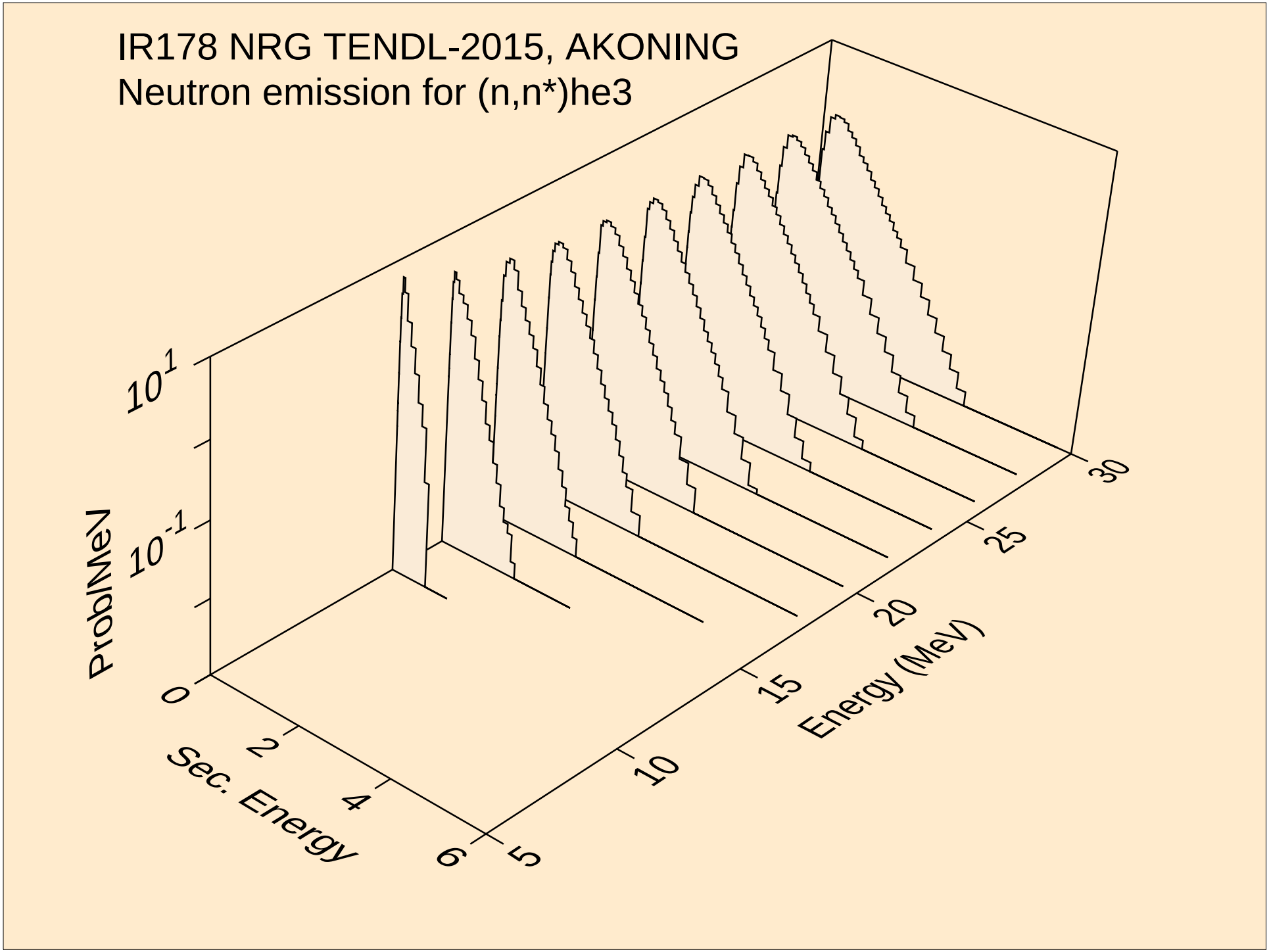

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,n*)p
Prob/MeV
10^1
10^-1
0
Sec. Energy
10
20
30
0
5
10
15
20
25
30
Energy (MeV)

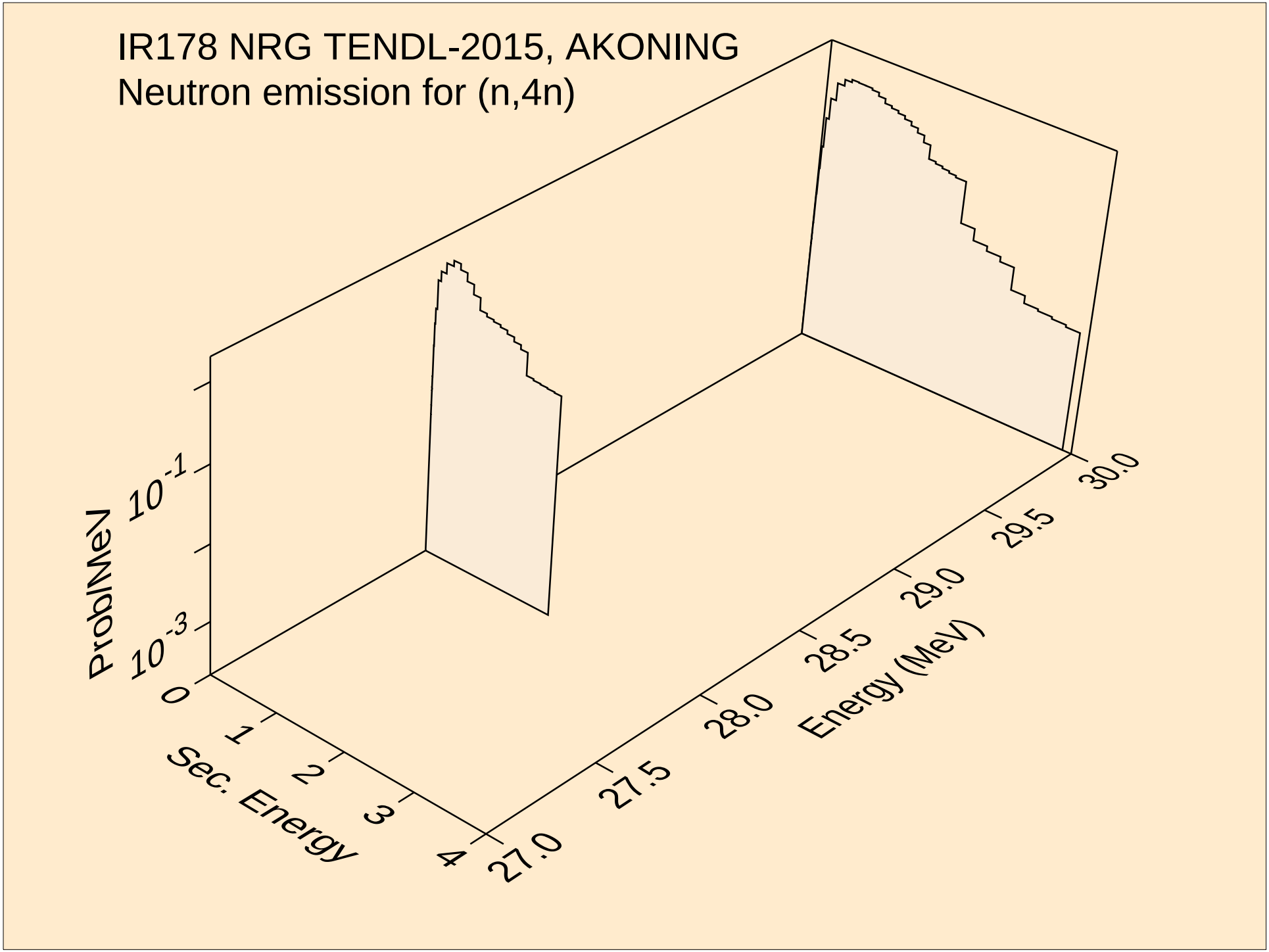

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,n*)2a
Prob/MeV
10-1
10-3
0
5
10
15
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

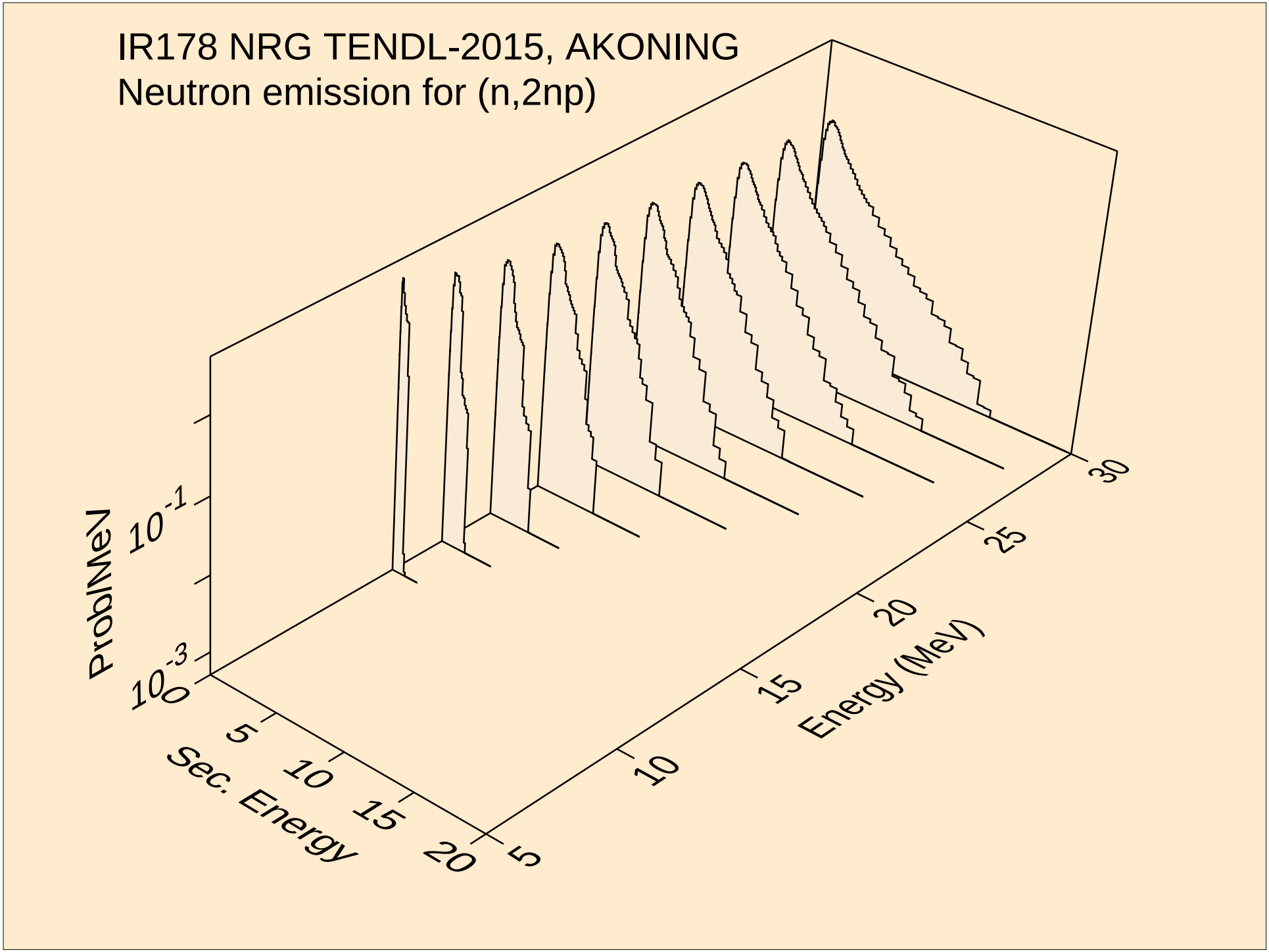

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,2n)2a
Prob/MeV
10-1
10-3
0
2
4
6
8
10
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

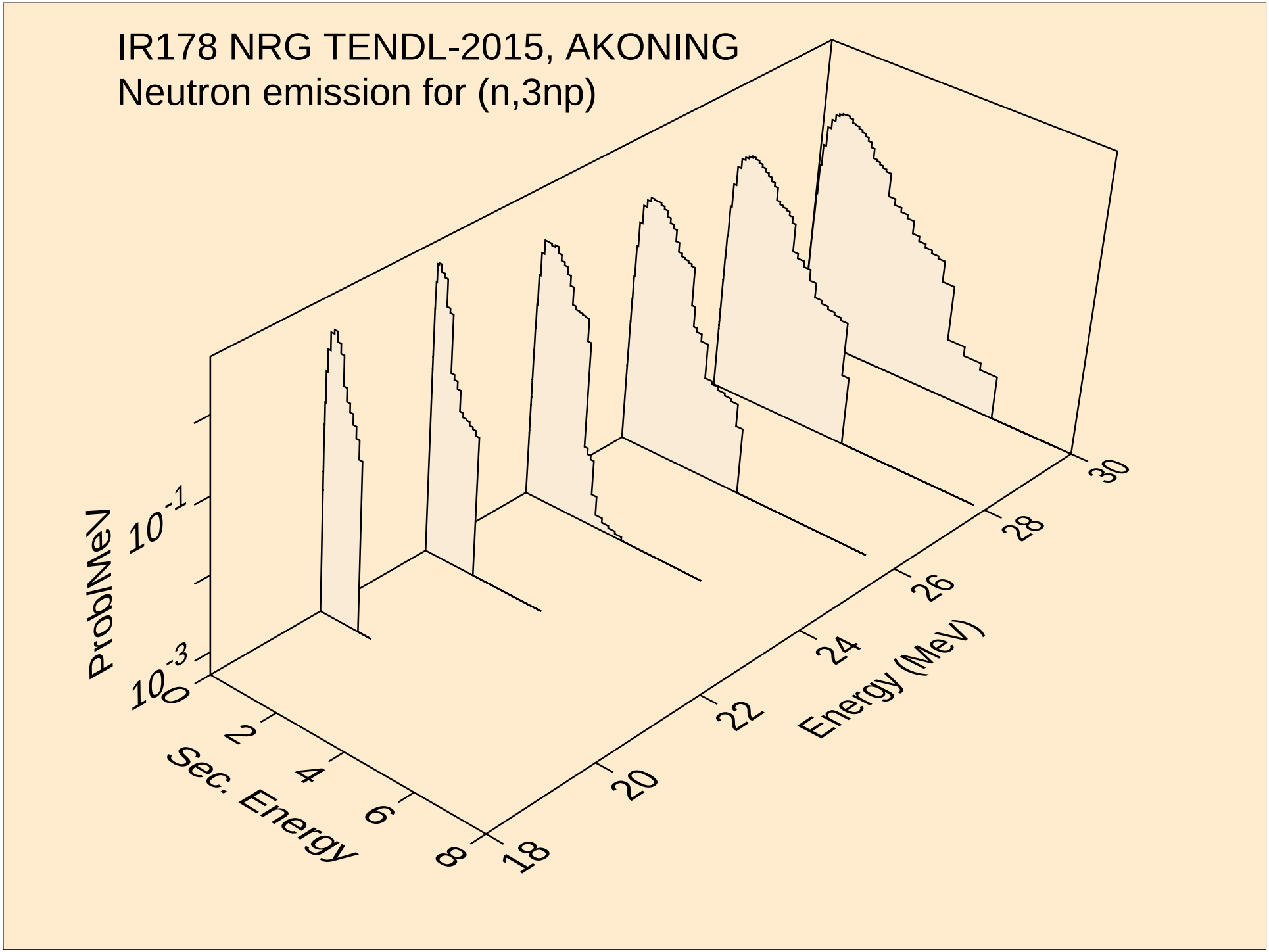

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,n*)d
Prob/MeV
10^1
10^-1
0
2
4
6
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

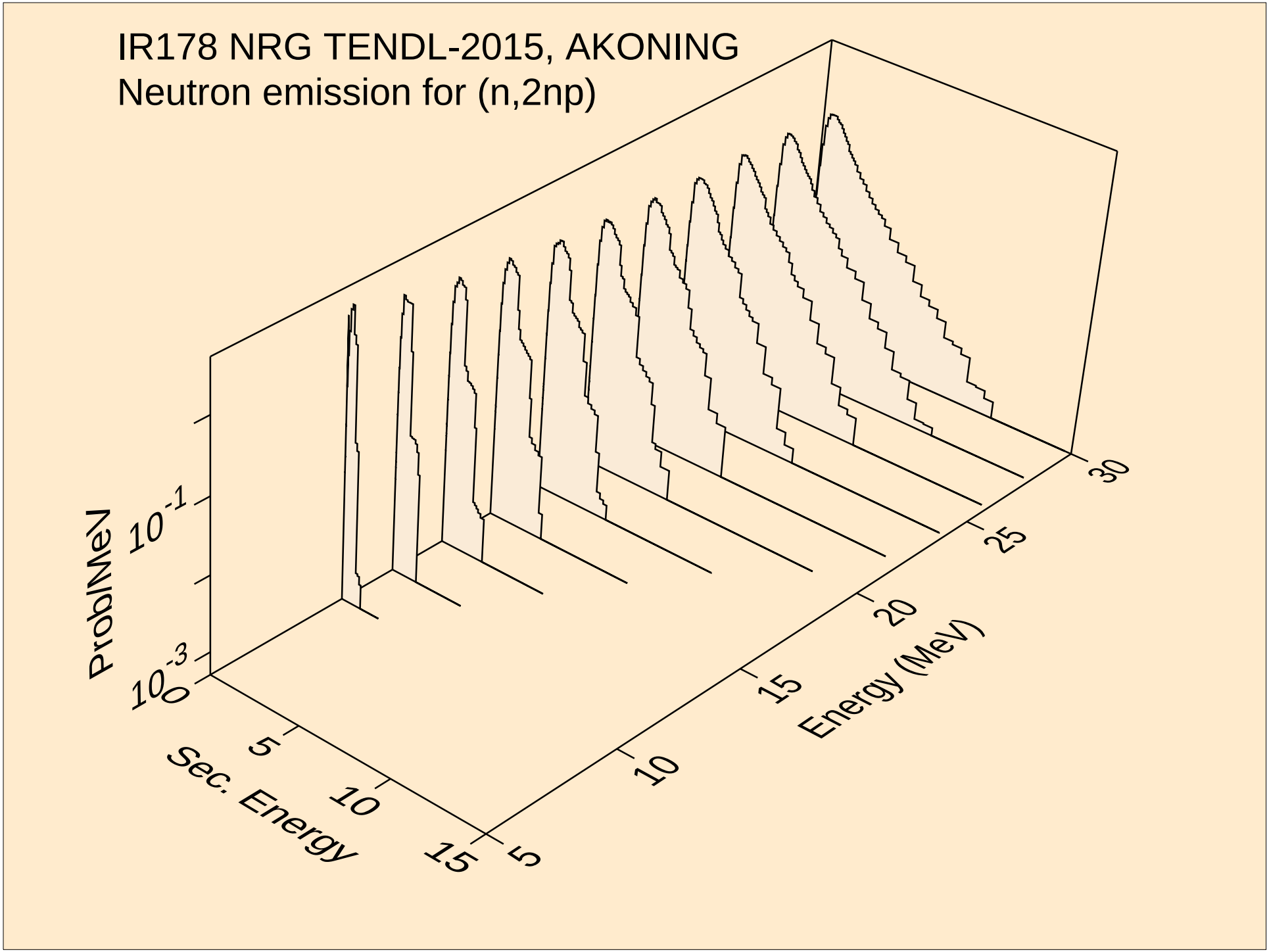

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,n*)t
Prob/MeV
10^1
10^-1
0
2
4
6
Sec. Energy
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

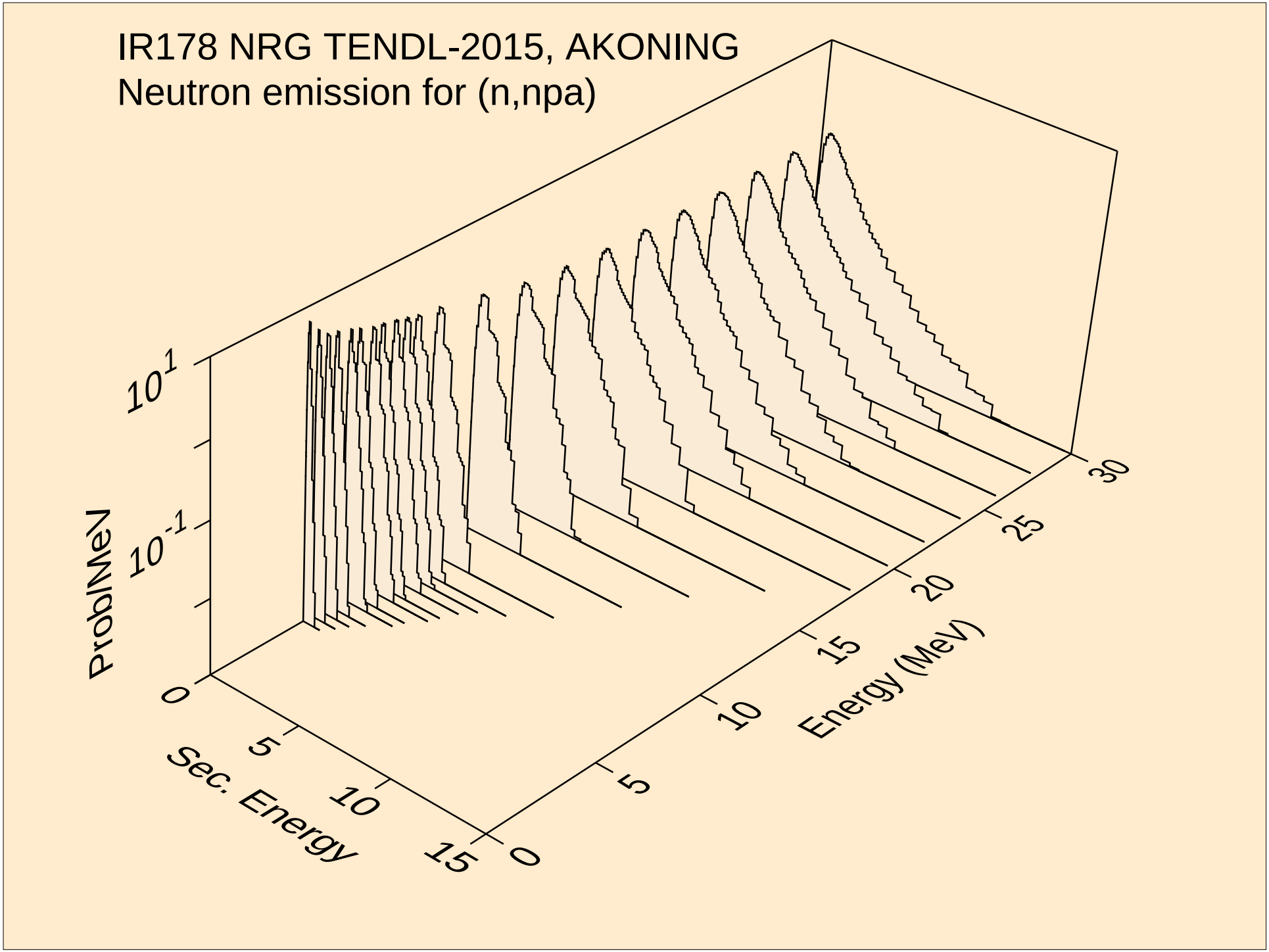

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,n*)he3
Prob/MeV
10^{1}
10^{-1}
0
2
4
6
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

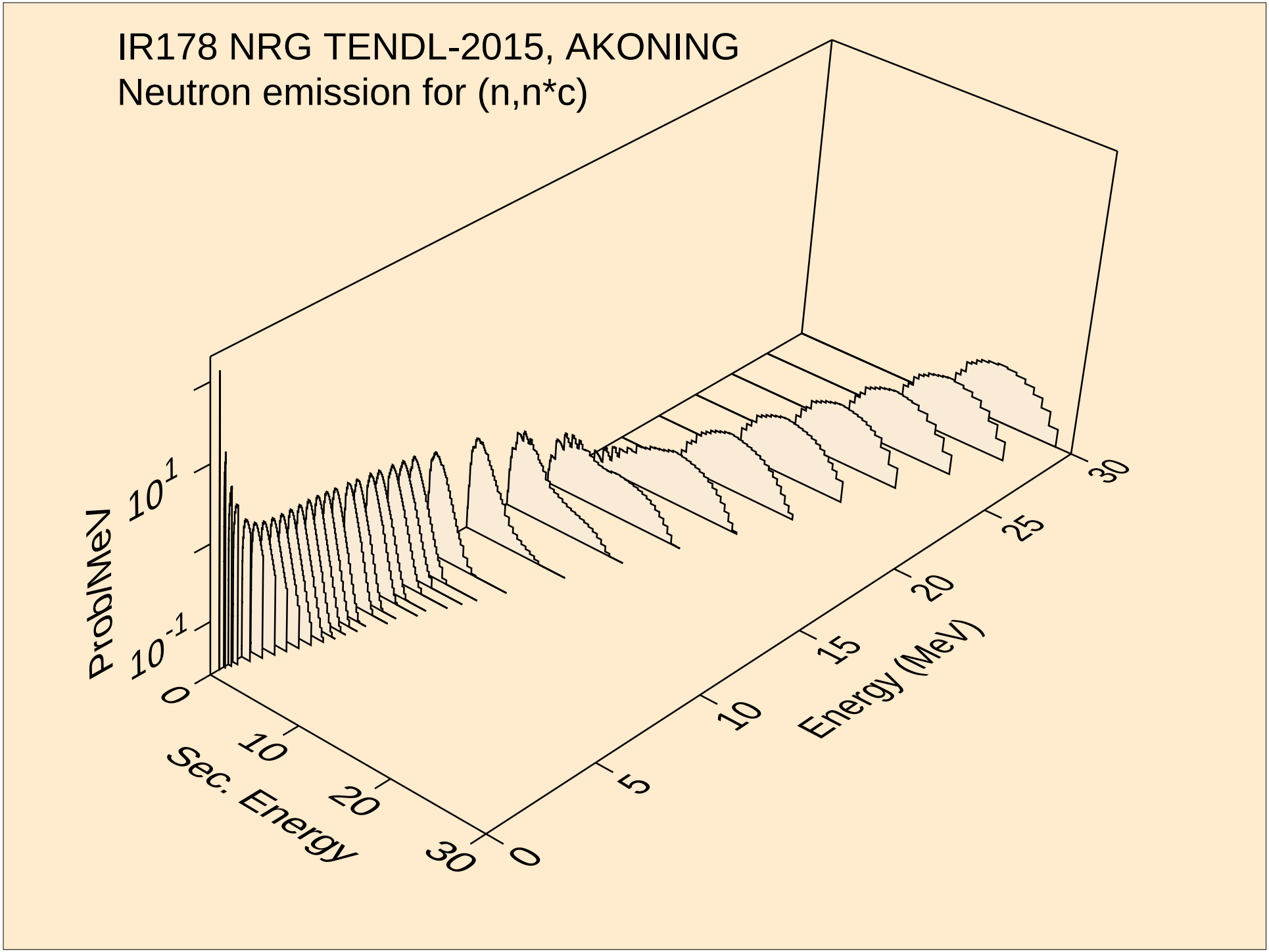

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,4n)
Prob/MeV
10-1
10-3
0
Sec. Energy
1
2
3
4
27.0
27.5
28.0
28.5
29.0
29.5
30.0
Energy (MeV)

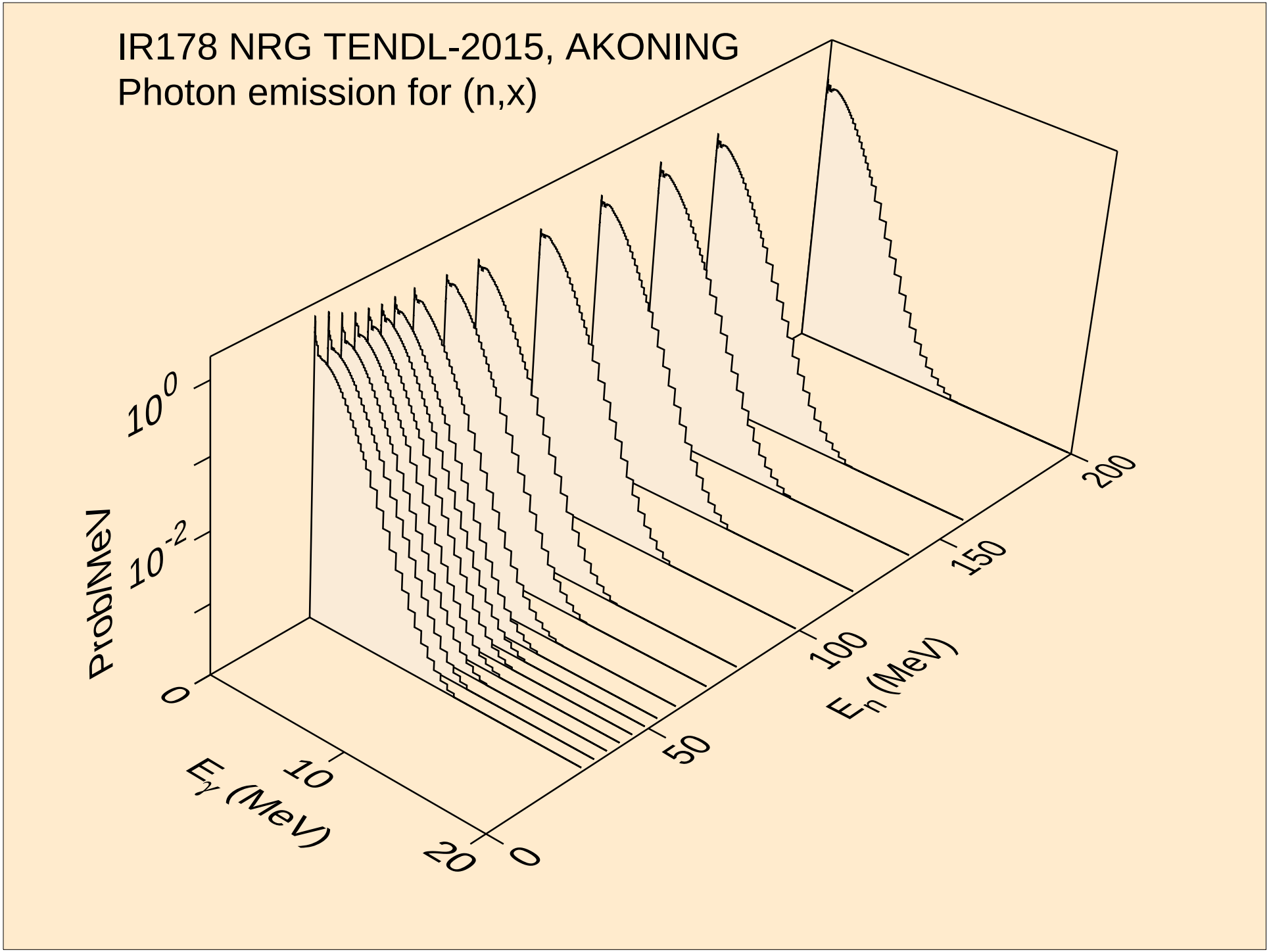

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,2np)
Prob/MeV
10-1
10-3
0
5
10
15
20
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

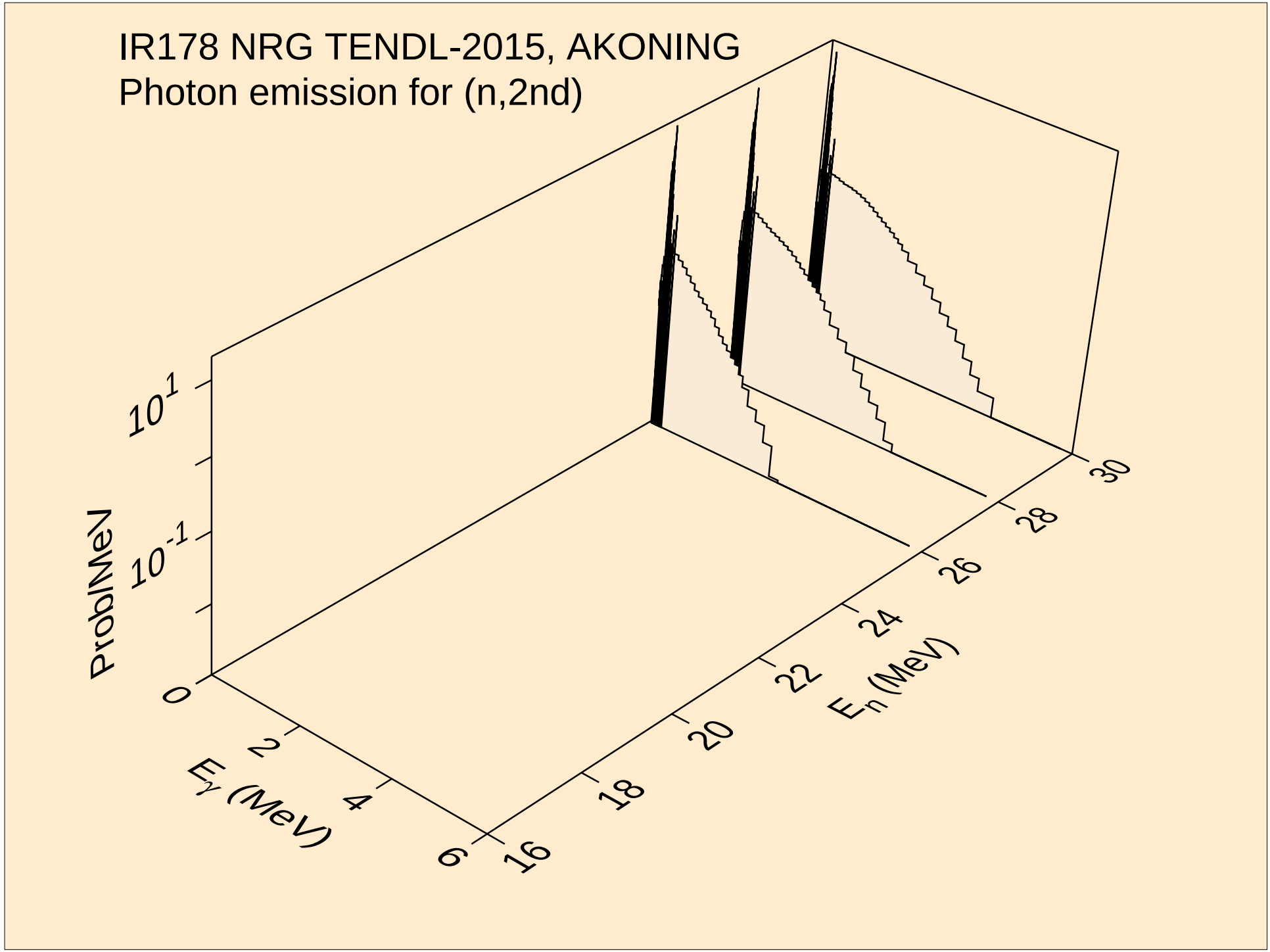

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,3np)
Prob/MeV
10-1
10-3
0
2
4
6
8
Sec. Energy
18
20
22
24
26
28
30
Energy (MeV)

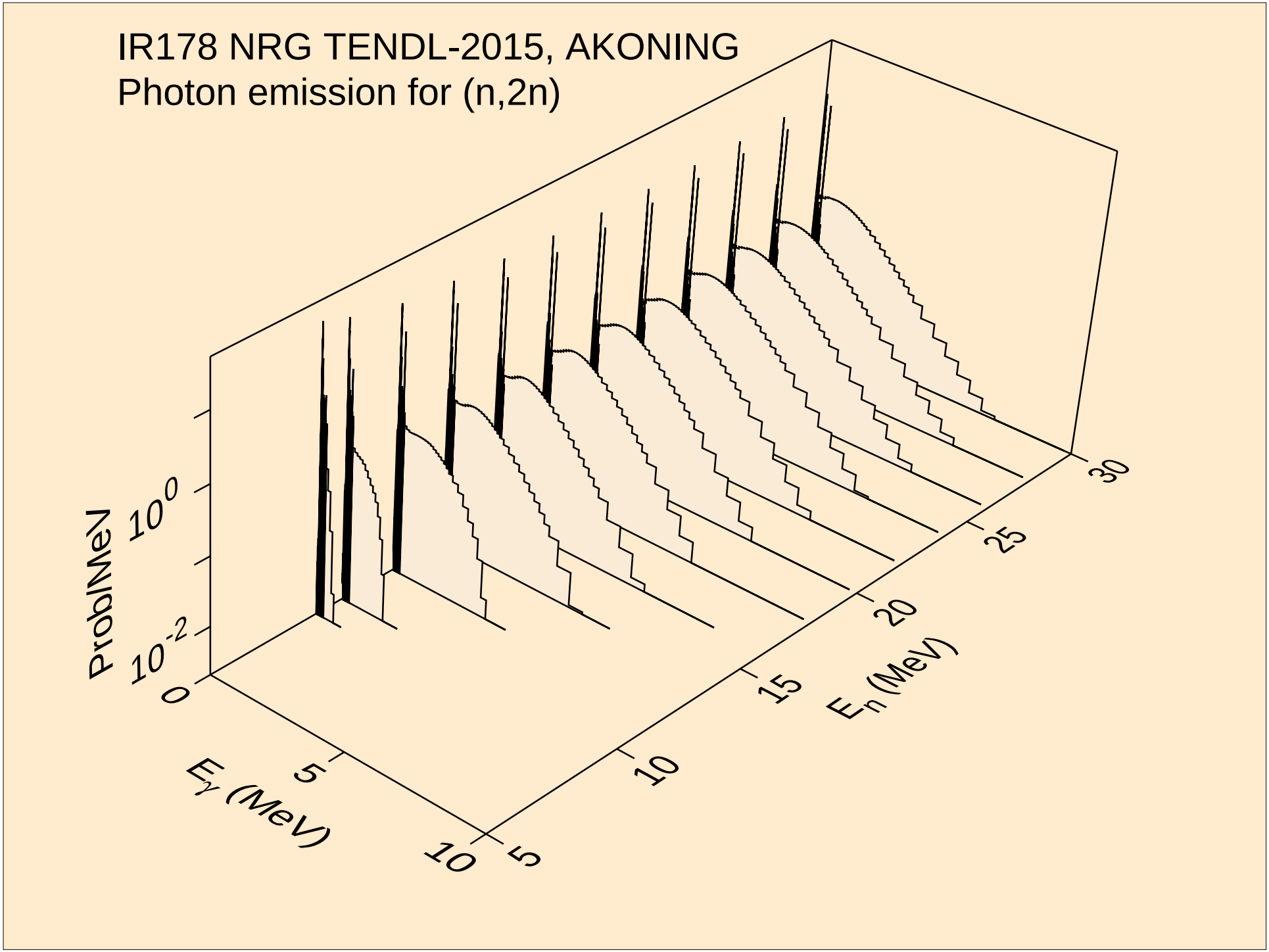

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,2np)
Prob/MeV
10^-1
10^-3
0
5
10
15
Sec. Energy
5
10
15
20
25
30
Energy (MeV)

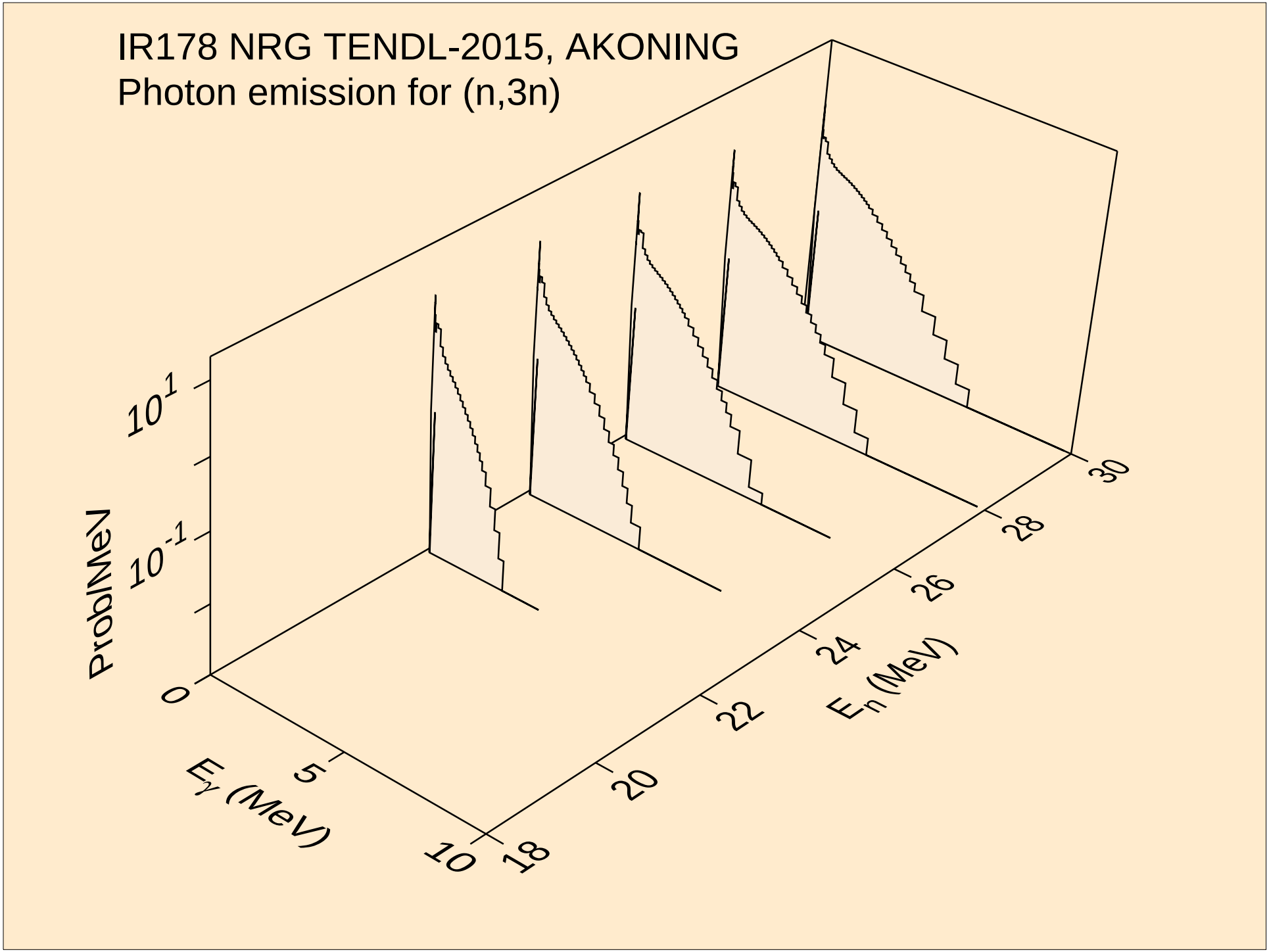

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,npa)
Prob/MeV
10^{1}
10^{-1}
0
5
10
15
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

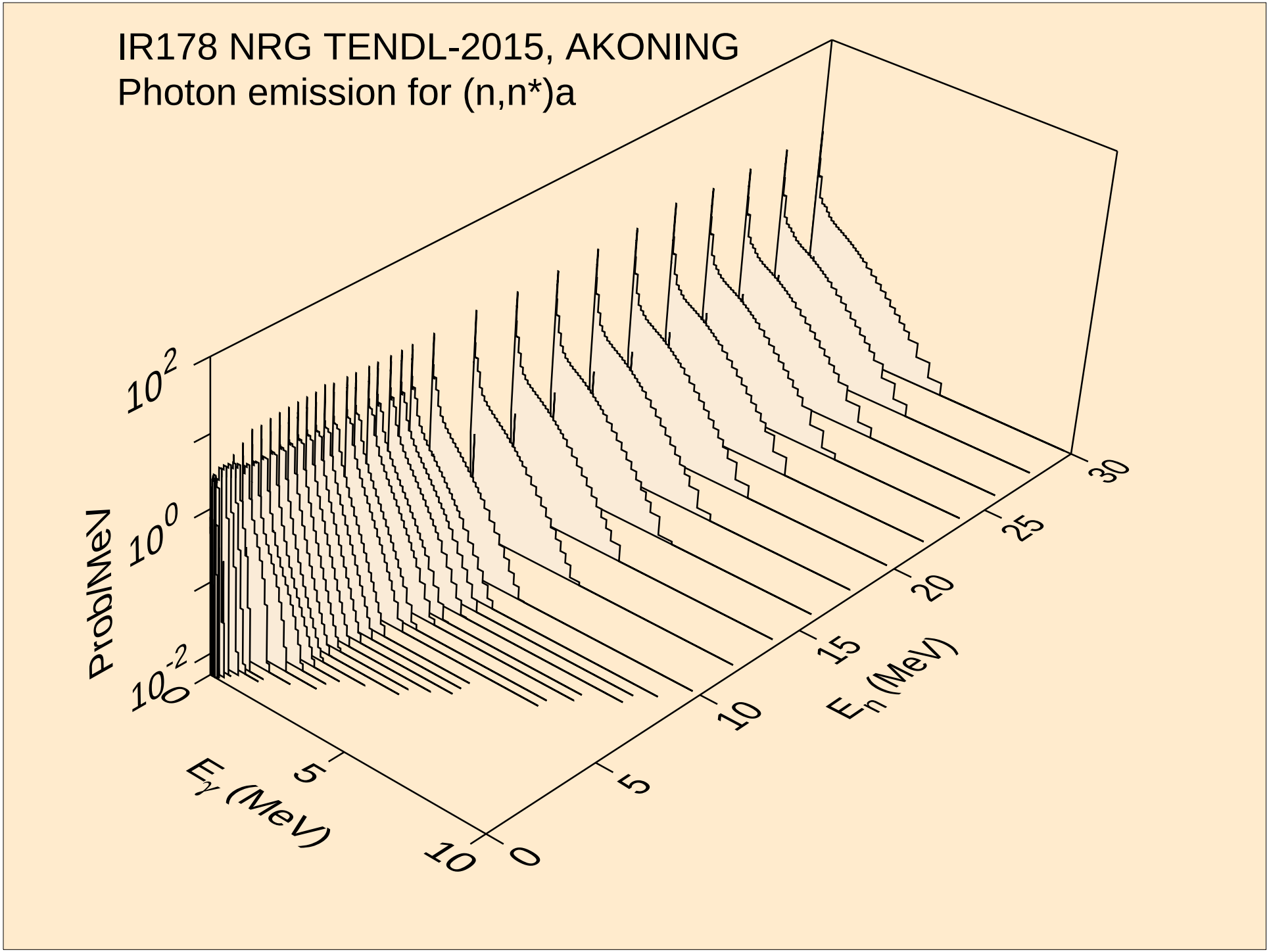

IR178 NRG TENDL-2015, AKONING
Neutron emission for (n,n*c)
Prob/MeV
10^{1}
10^{-1}
0
10
20
30
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

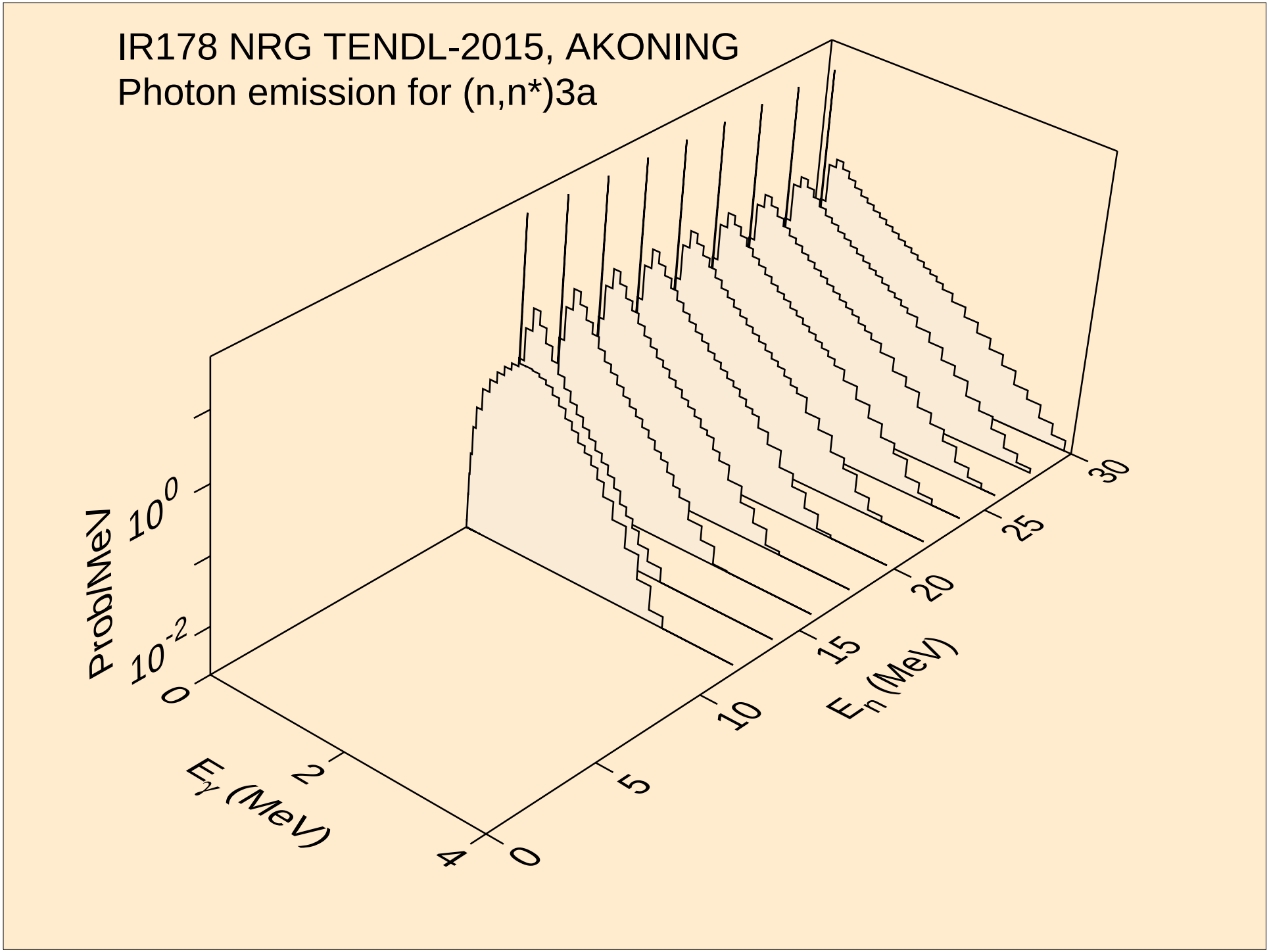

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,x)
Prob/MeV
10^{0}
10^{-2}
0
10
20
E_γ (MeV)
0
50
100
150
200
E_n (MeV)

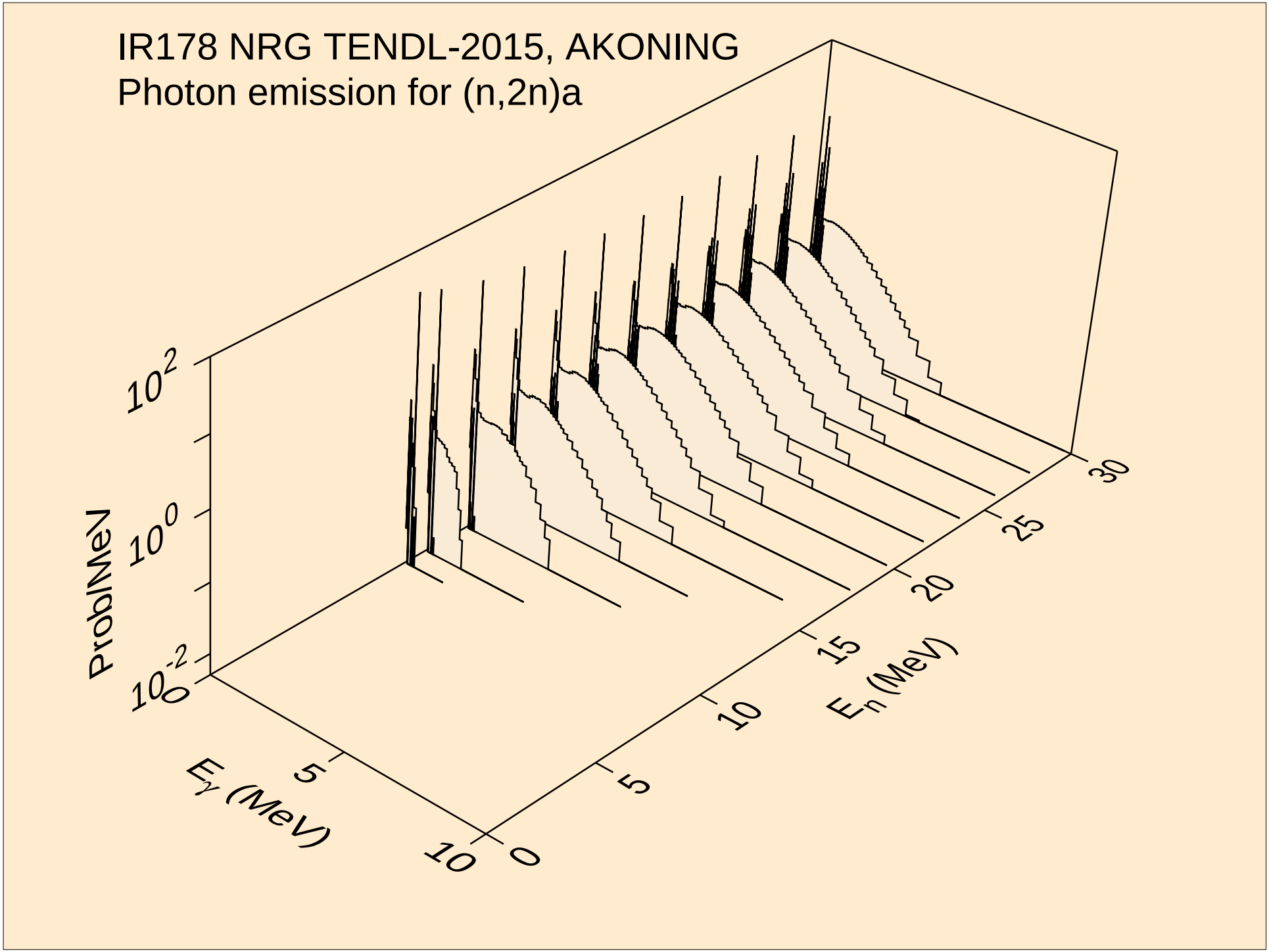

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,2nd)
Prob/MeV
10^{1}
10^{-1}
0
2
4
6
E_γ (MeV)
16
18
20
22
24
26
28
30
E_n (MeV)

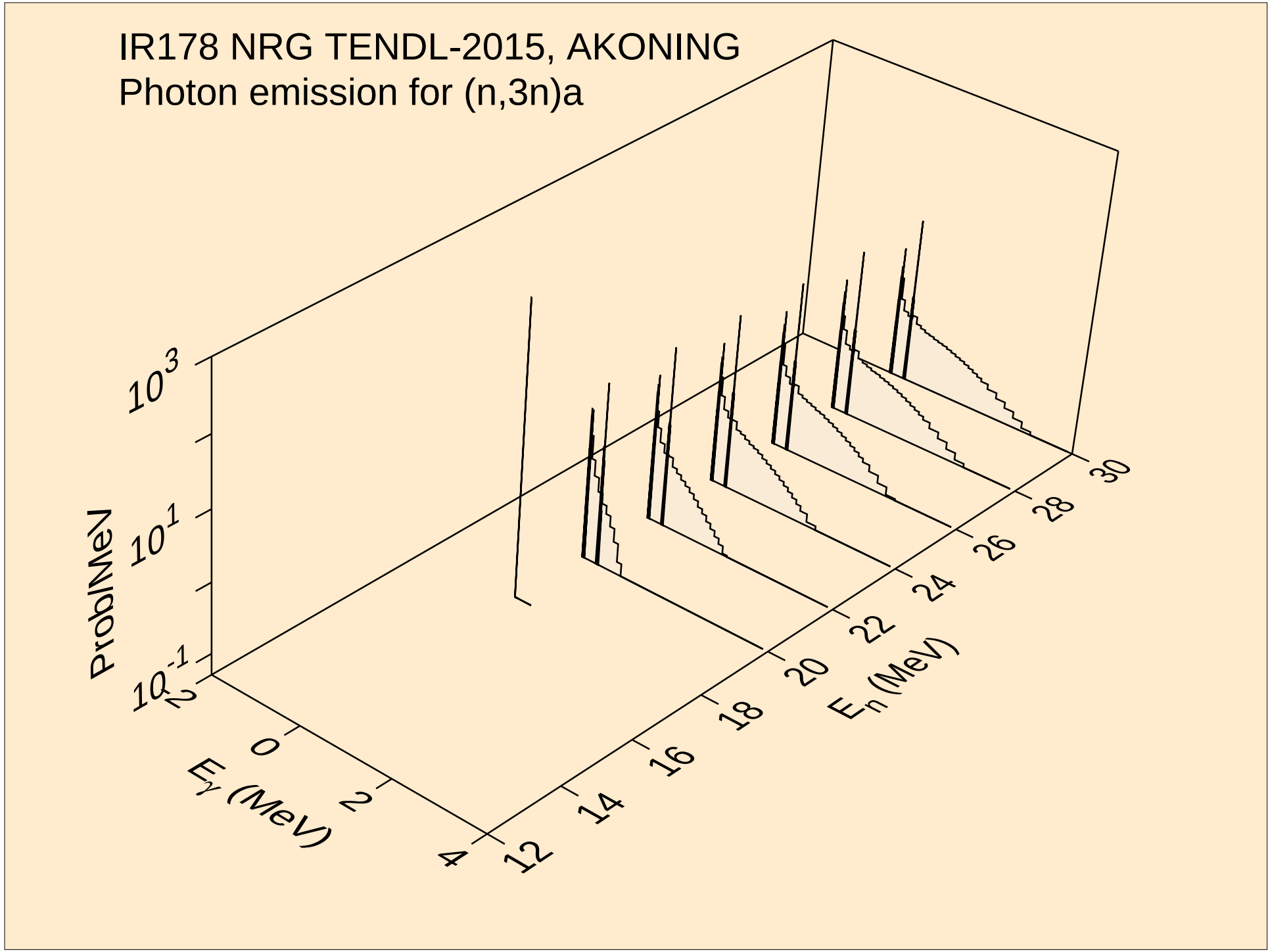

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,2n)
Prob/MeV
10^0
10^-2
0
E_γ (MeV)
5
10
5
10
15
20
25
30
E_n (MeV)

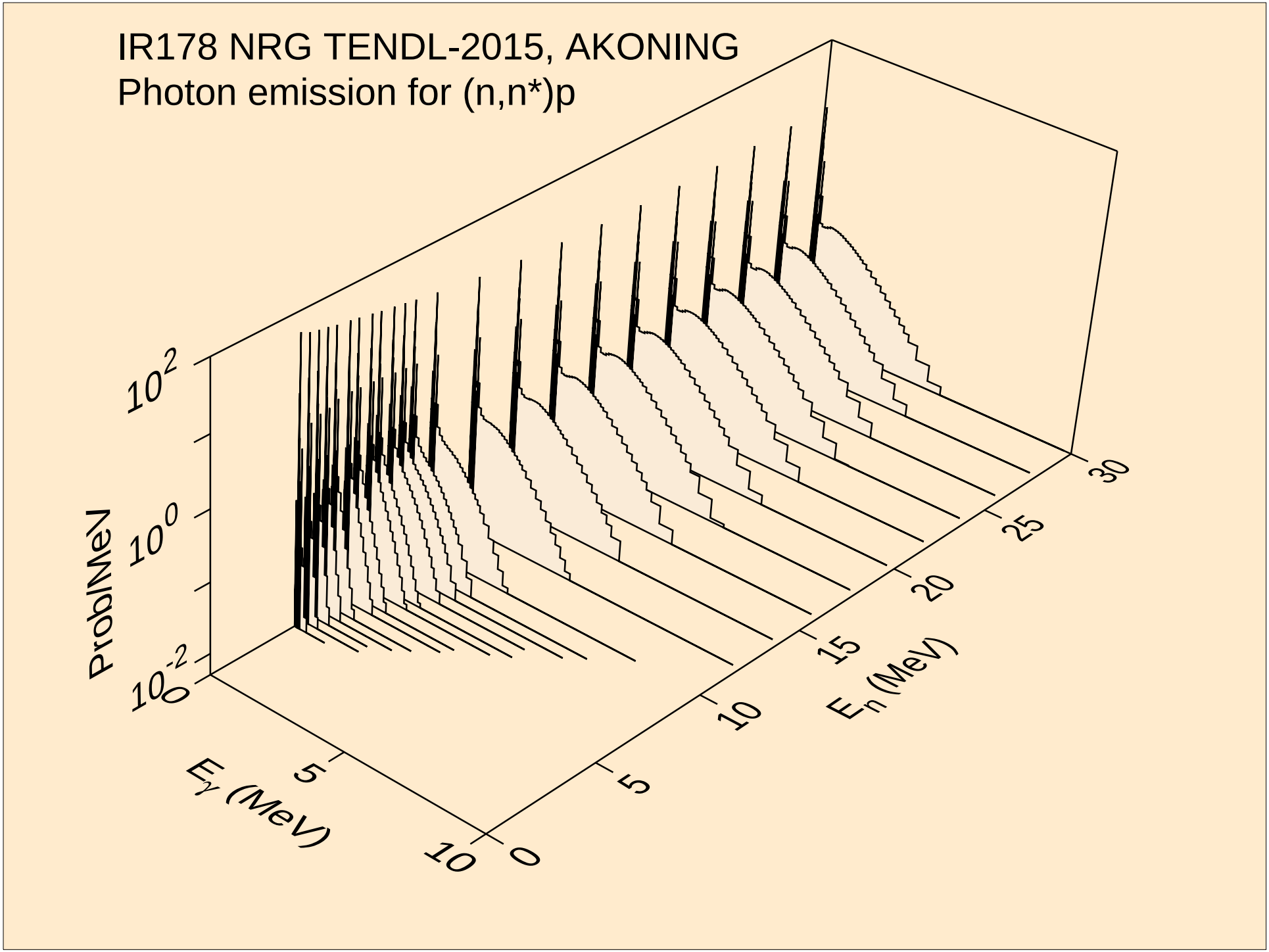

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,3n)
Prob/MeV
10^{1}
10^{-1}
0
E_γ (MeV)
5
10
18
20
22
24
26
28
30
E_n (MeV)

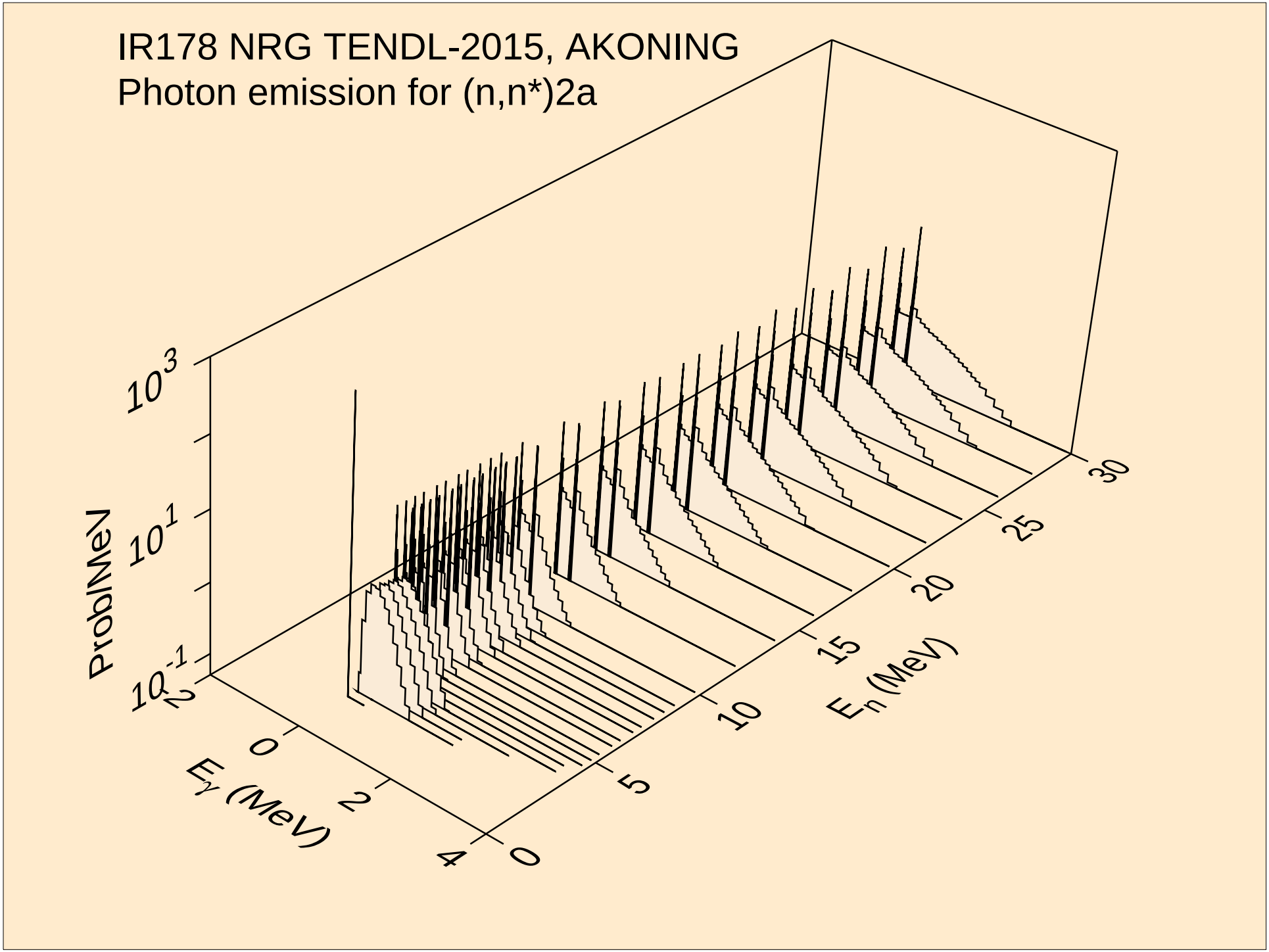

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,n*)a
Prob/MeV
10^{2}
10^{0}
10^{-2}
0
5
10
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

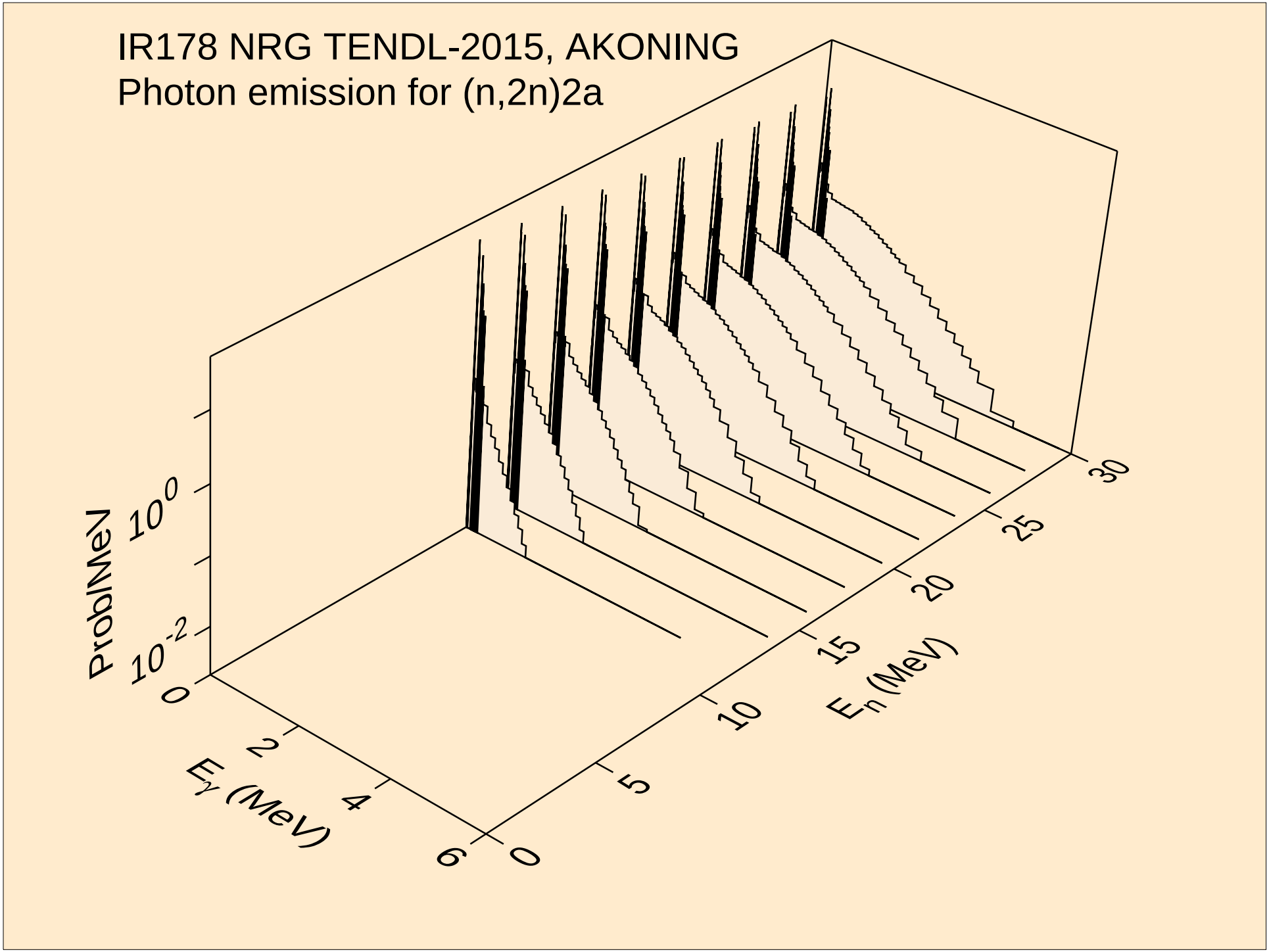

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,n*)3a
Prob/MeV
10^0
10^-2
0
2
4
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

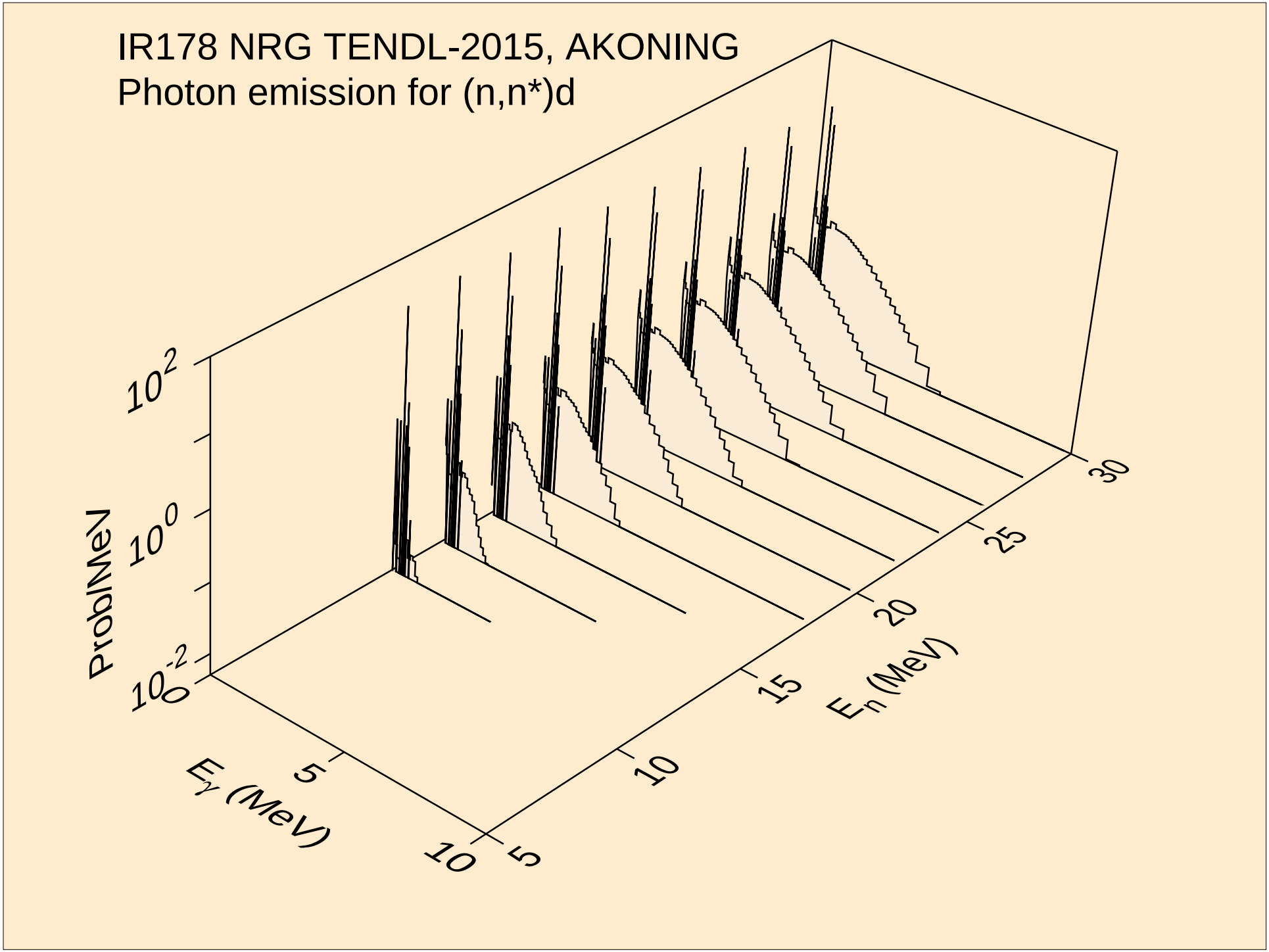

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,2n)a
Prob/MeV
10^{2}
10^{0}
10^{-2}
0
5
10
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

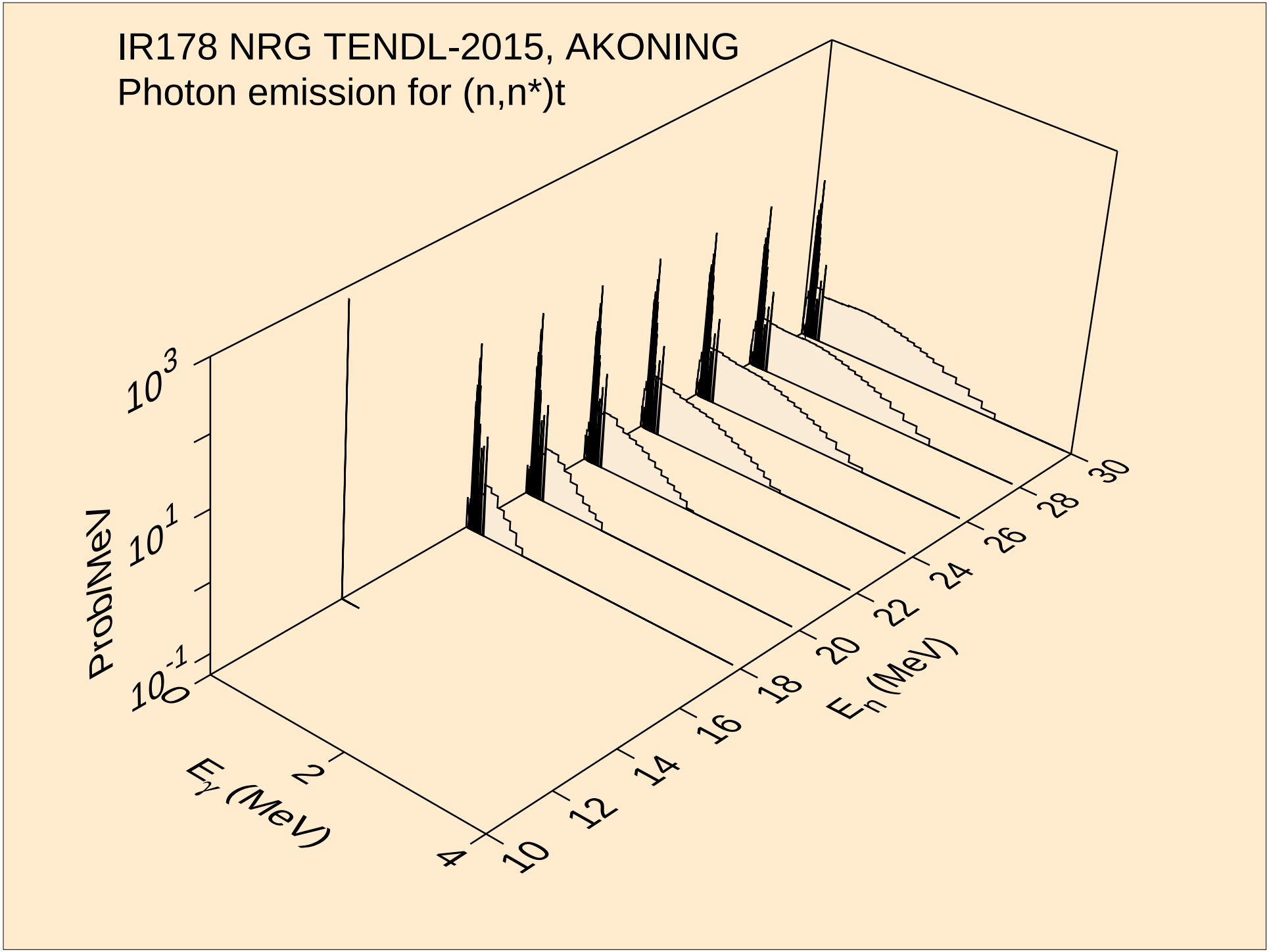

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,3n)a
Prob/MeV
10^{3}
10^{1}
10^{-1}
E_γ (MeV)
-2
0
2
4
E_n (MeV)
12
14
16
18
20
22
24
26
28
30

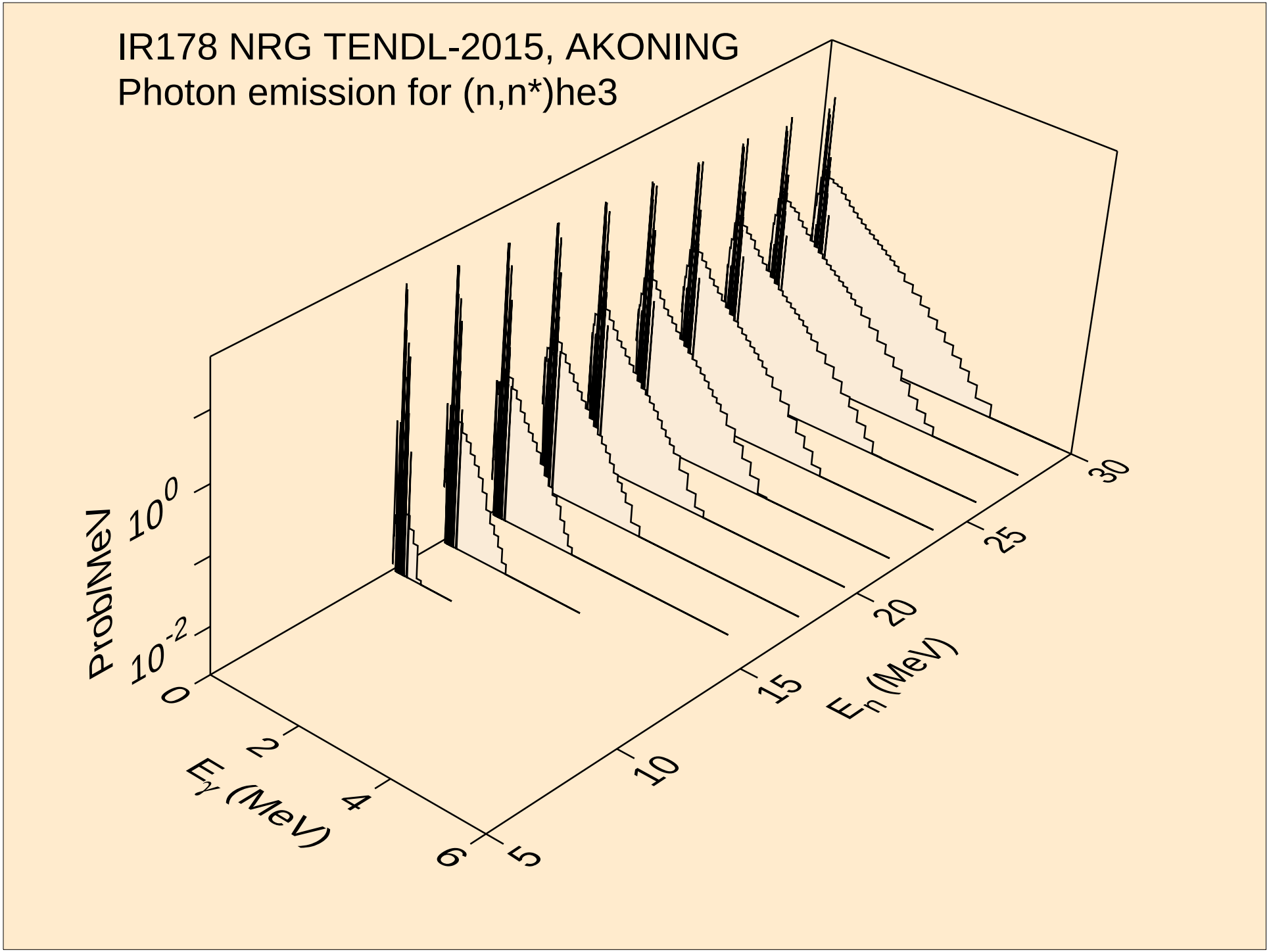

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,n*)p
Prob/MeV
10^{2}
10^{0}
10^{-2}
E_γ (MeV)
0
5
10
E_n (MeV)
0
5
10
15
20
25
30

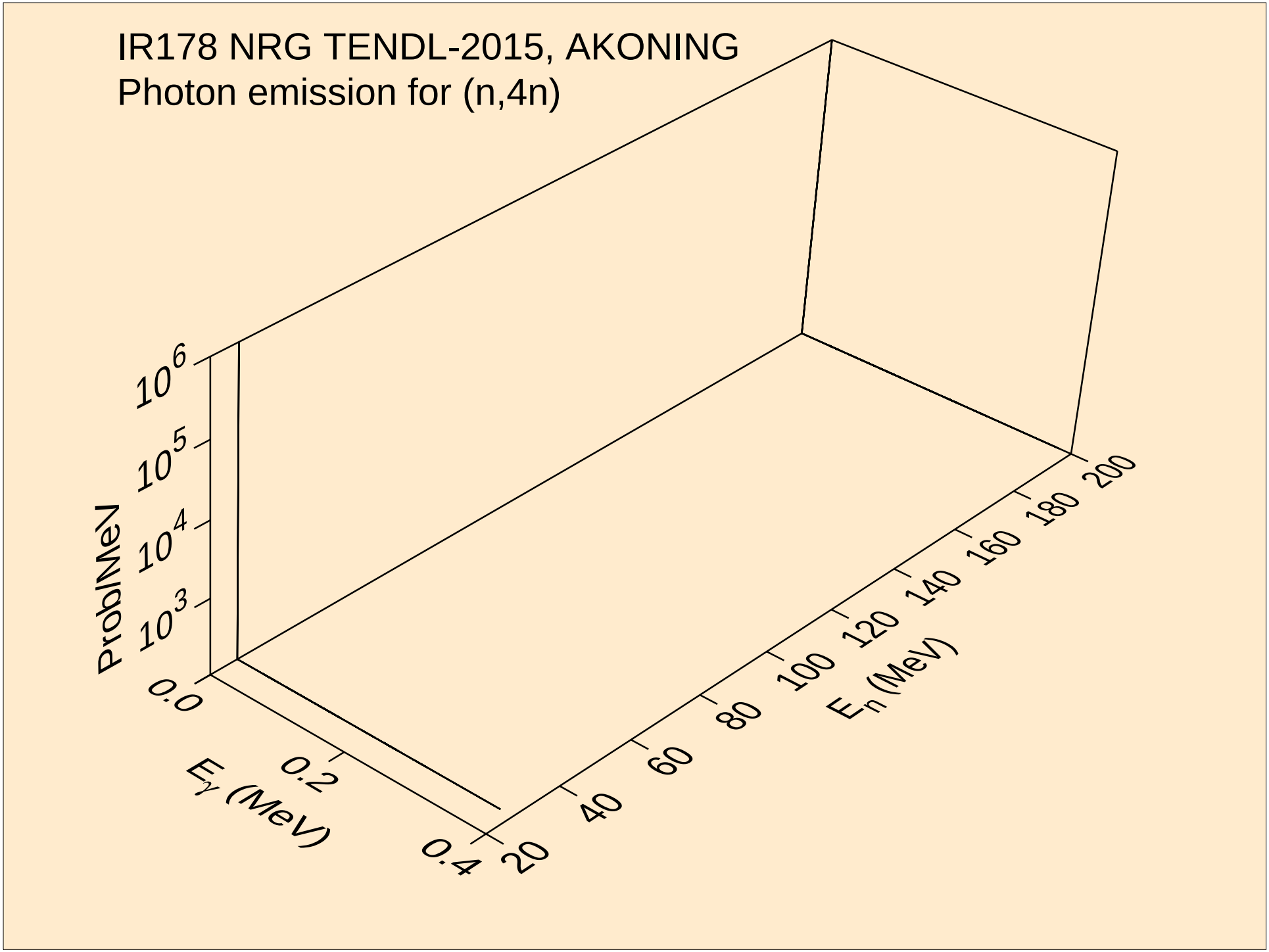

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,n*)2a
Prob/MeV
10^{3}
10^{1}
10^{-1}
E_γ (MeV)
0
2
4
E_n (MeV)
0
5
10
15
20
25
30

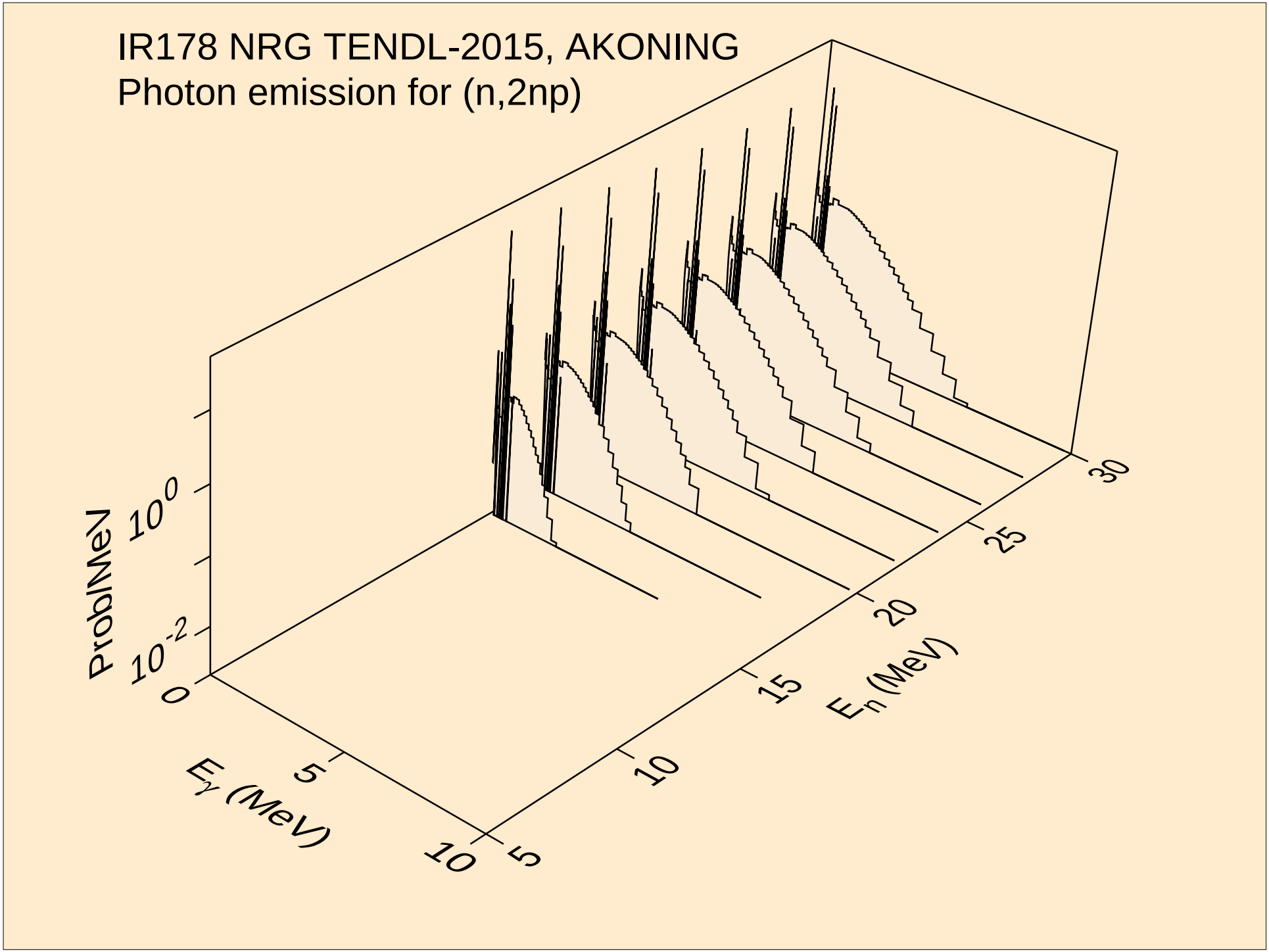

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,2n)2a
Prob/MeV
10^0
10^-2
0
2
4
6
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

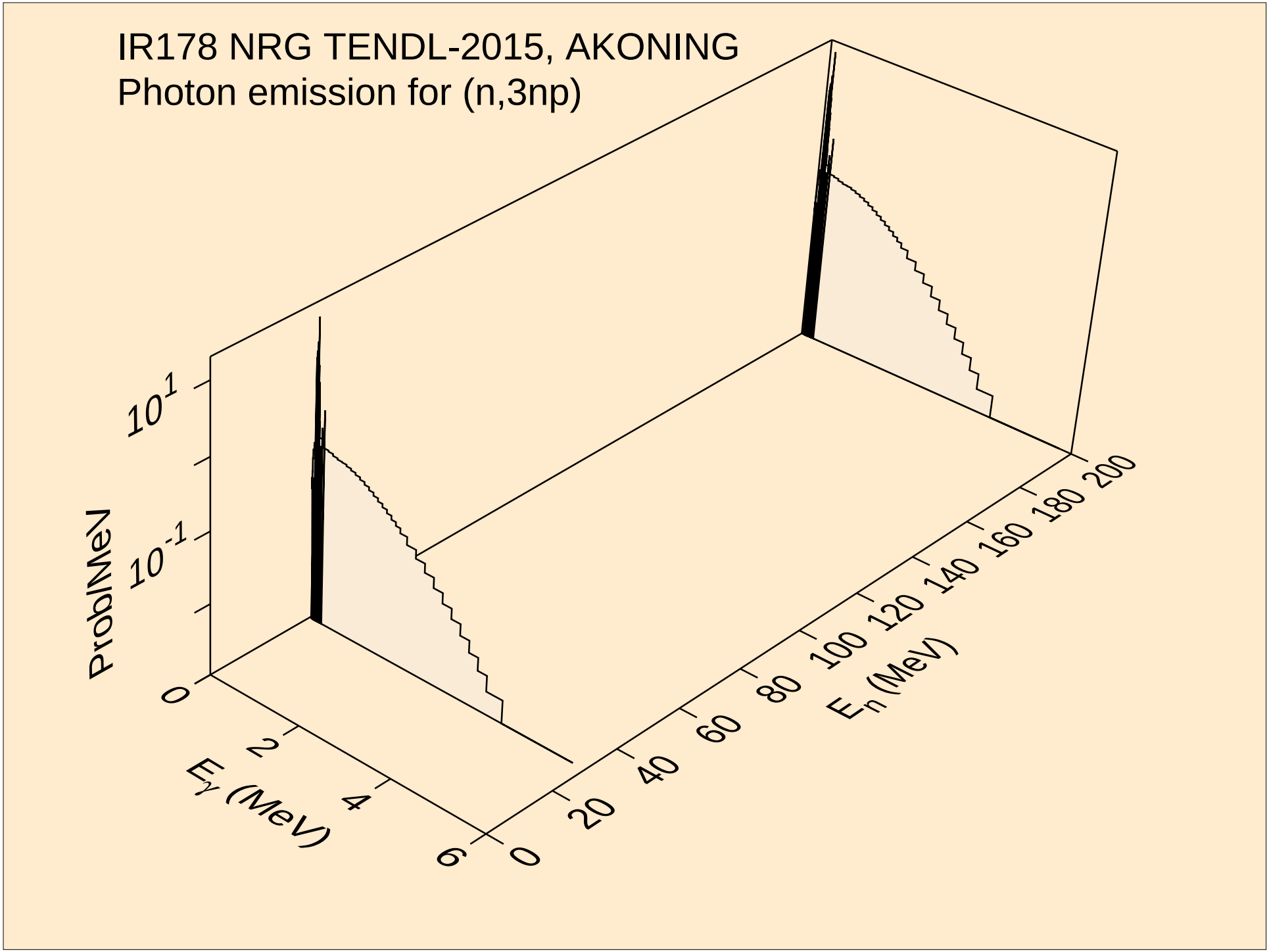

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,n*)d
Prob/MeV
10^{2}
10^{0}
10^{-2}
0
5
10
E_γ (MeV)
5
10
15
20
25
30
E_n (MeV)

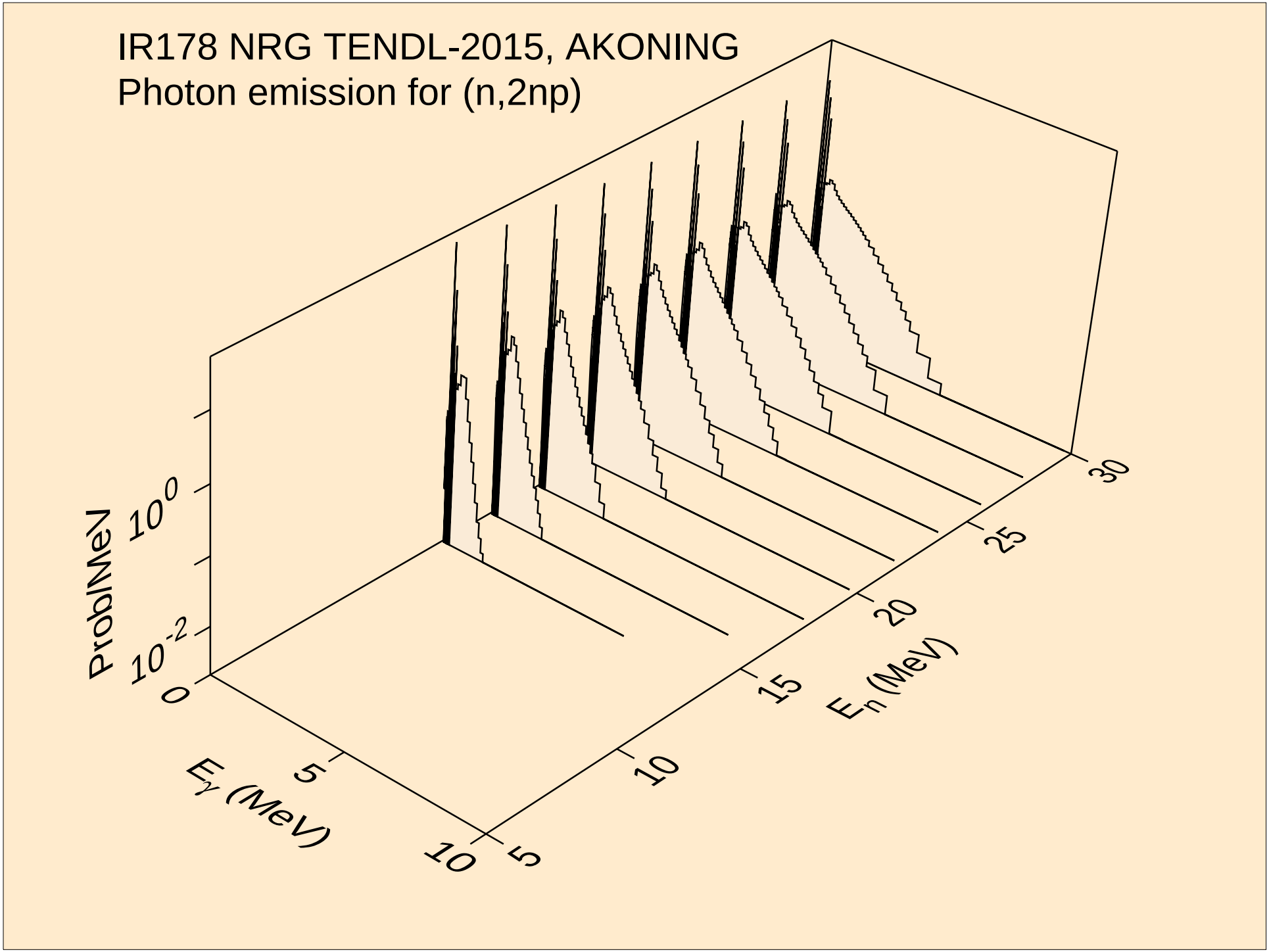

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,n*)t
Prob/MeV
10^{3}
10^{1}
10^{-1}
0
2
4
E_γ (MeV)
10
12
14
16
18
20
22
24
26
28
30
E_n (MeV)

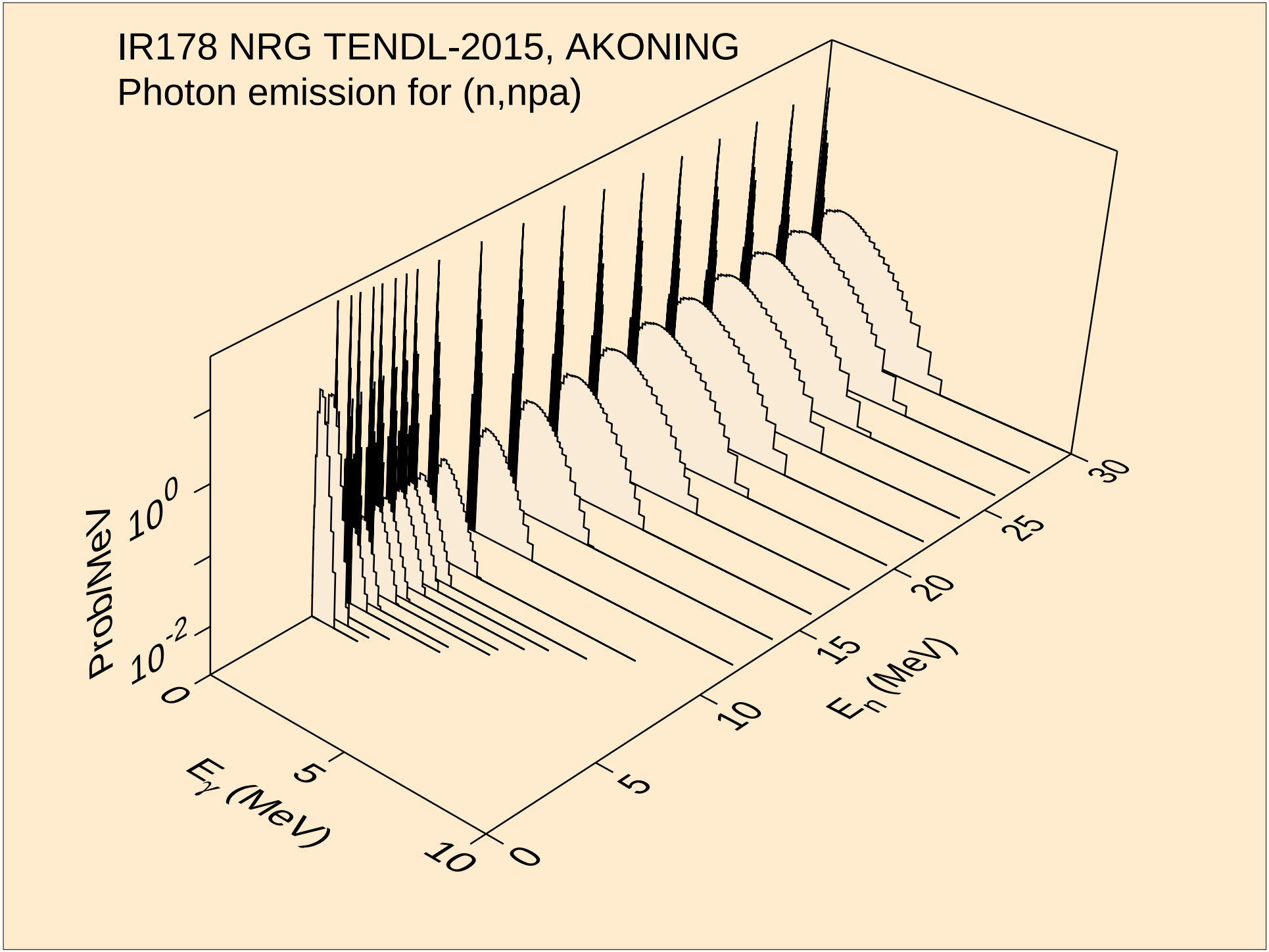

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,n*)he3
Prob/MeV
10^0
10^-2
0
2
4
6
Eγ (MeV)
5
10
15
20
25
30
En (MeV)

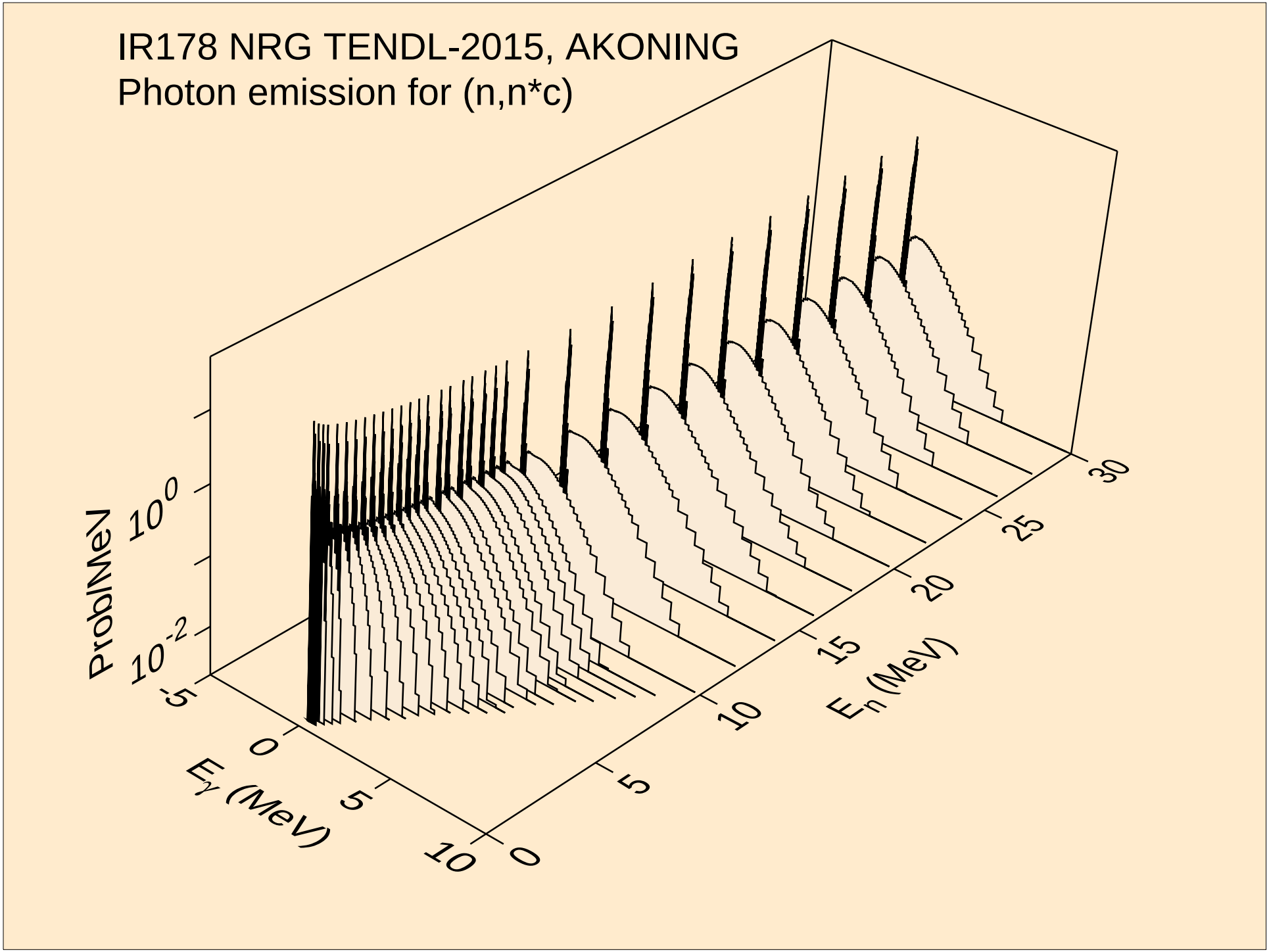

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,4n)
Prob/MeV
10^6
10^5
10^4
10^3
0.0
0.2
0.4
E_γ (MeV)
20
40
60
80
100
120
140
160
180
200
E_n (MeV)

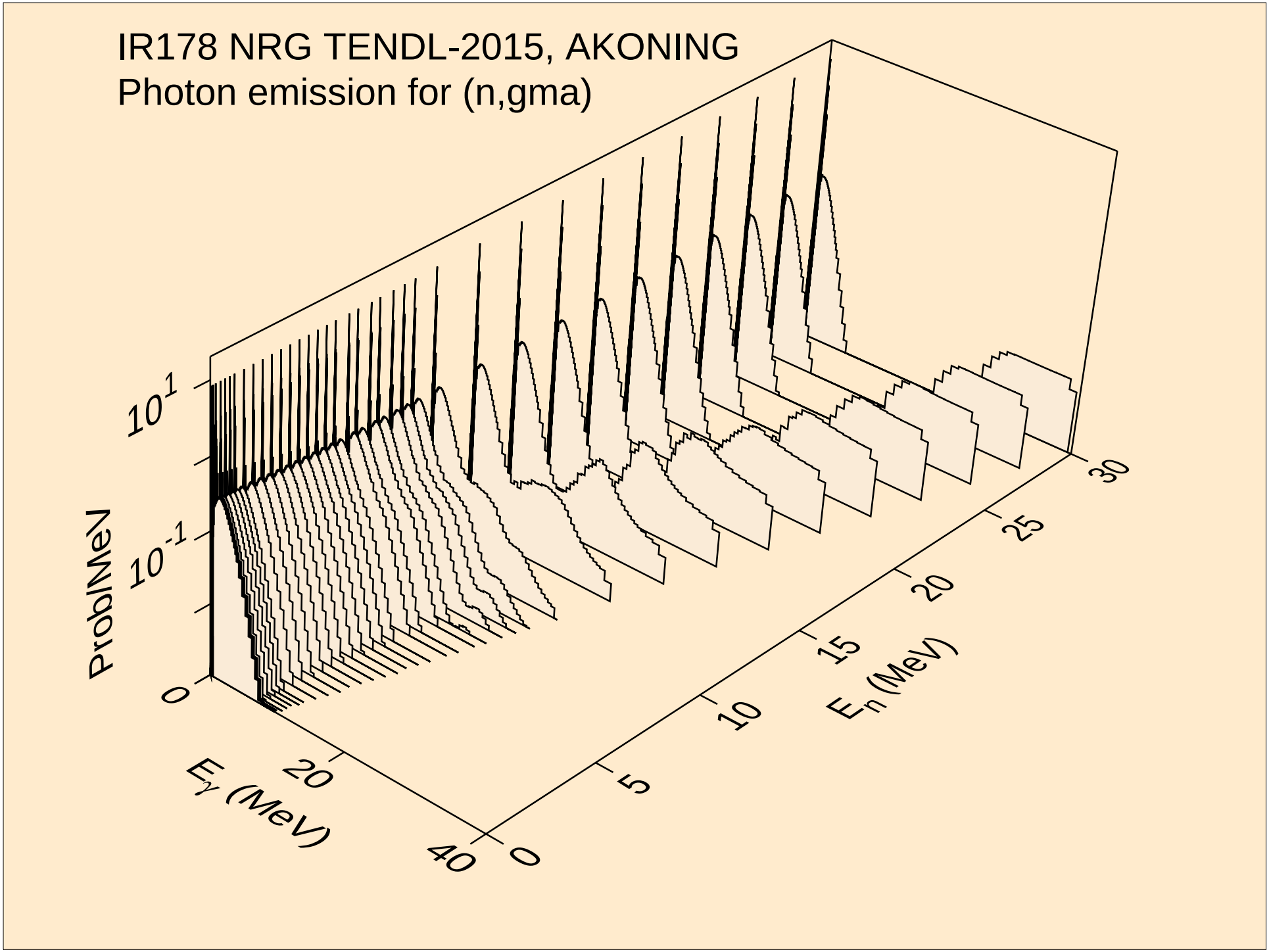

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,2np)
Prob/MeV
10^{0}
10^{-2}
0
E_γ (MeV)
5
10
5
10
15
20
25
30
E_n (MeV)

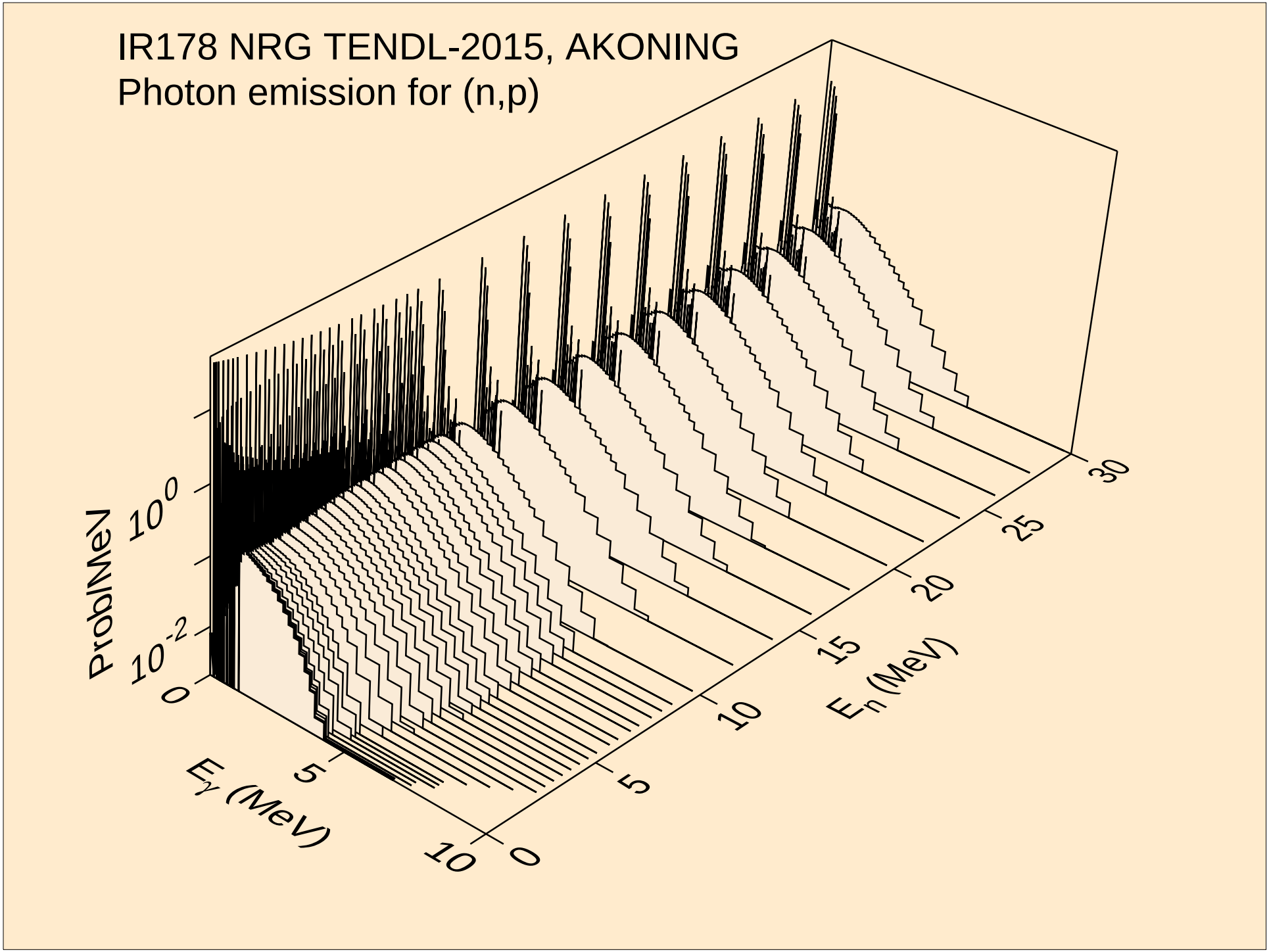

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,3np)
Prob/MeV
10^{1}
10^{-1}
0
2
4
6
E_γ (MeV)
0
20
40
60
80
100
120
140
160
180
200
E_n (MeV)

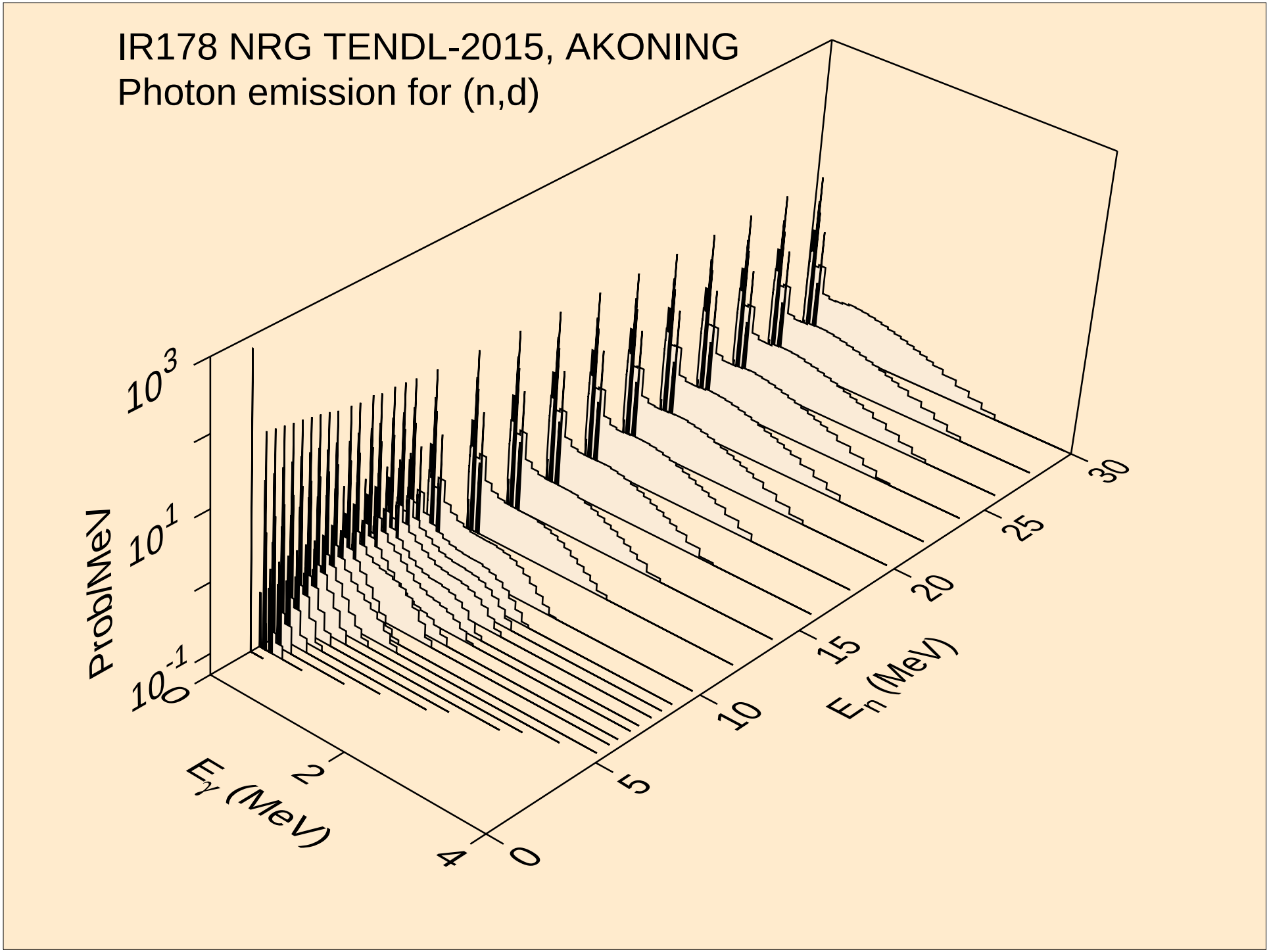

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,2np)
Prob/MeV
10^0
10^-2
0
5
10
E_γ (MeV)
5
10
15
20
25
30
E_n (MeV)

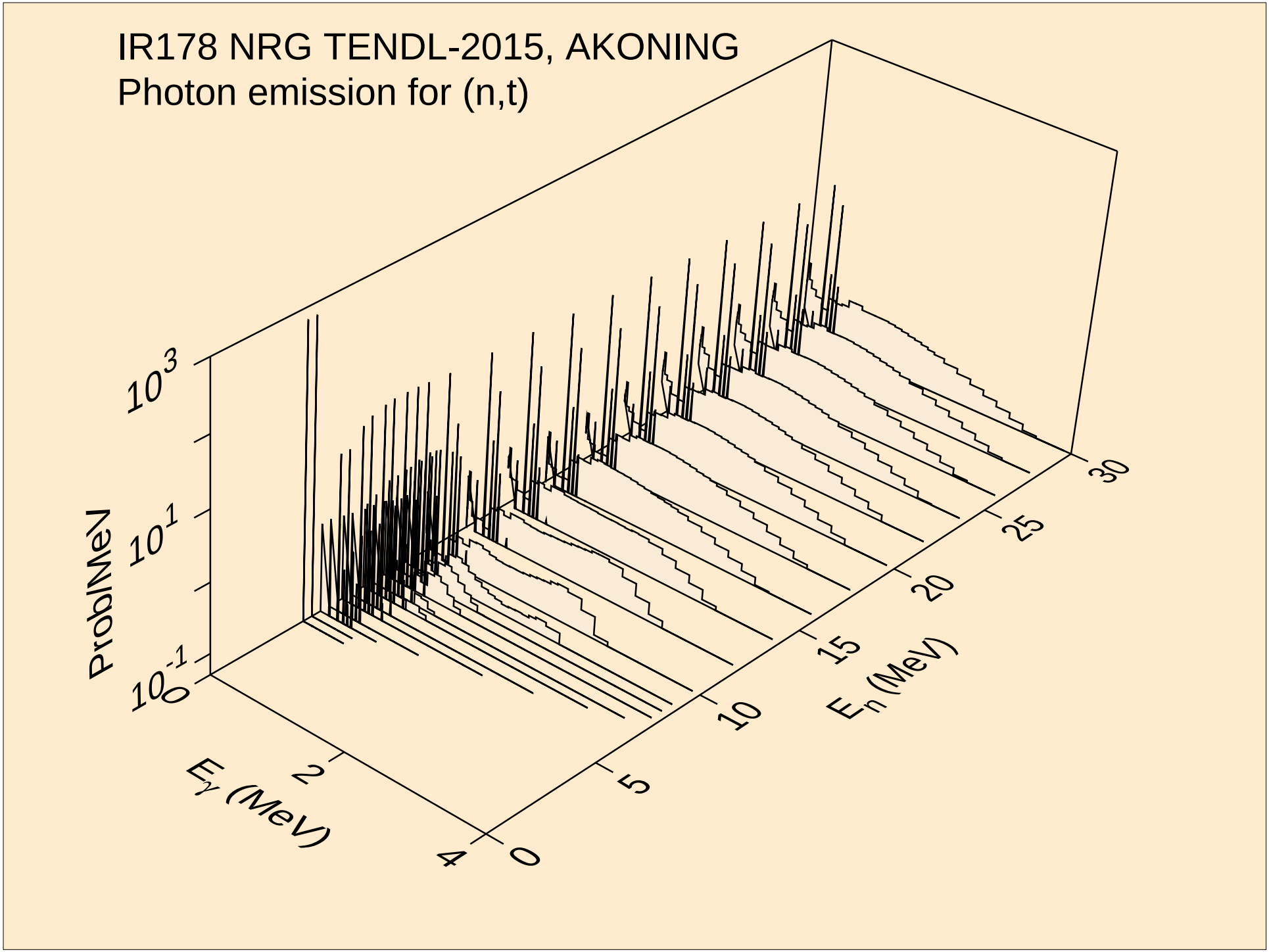

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,npa)
Prob/MeV
10^{0}
10^{-2}
0
5
10
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

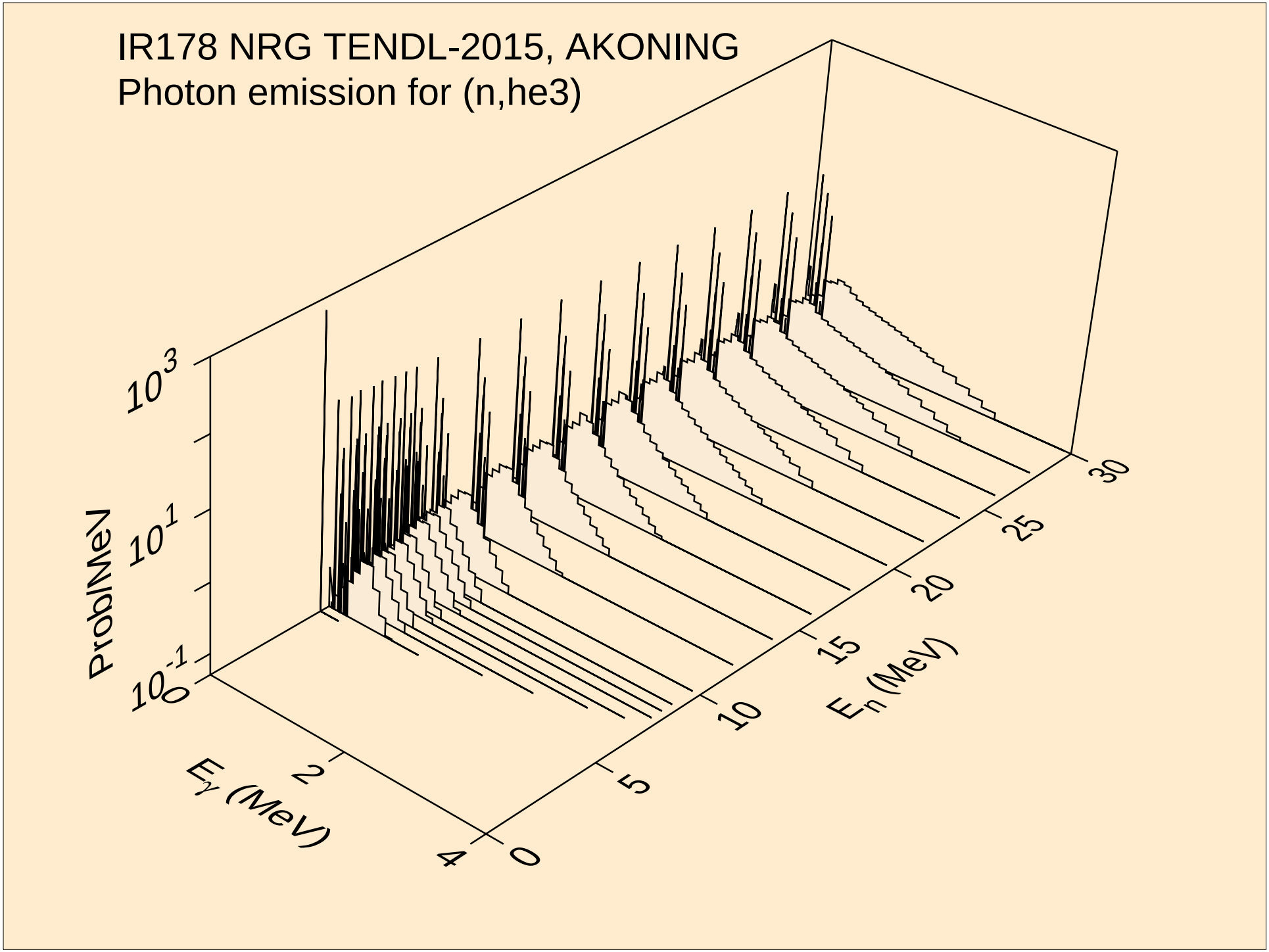

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,n*c)
Prob/MeV
10^{0}
10^{-2}
-5
0
5
10
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

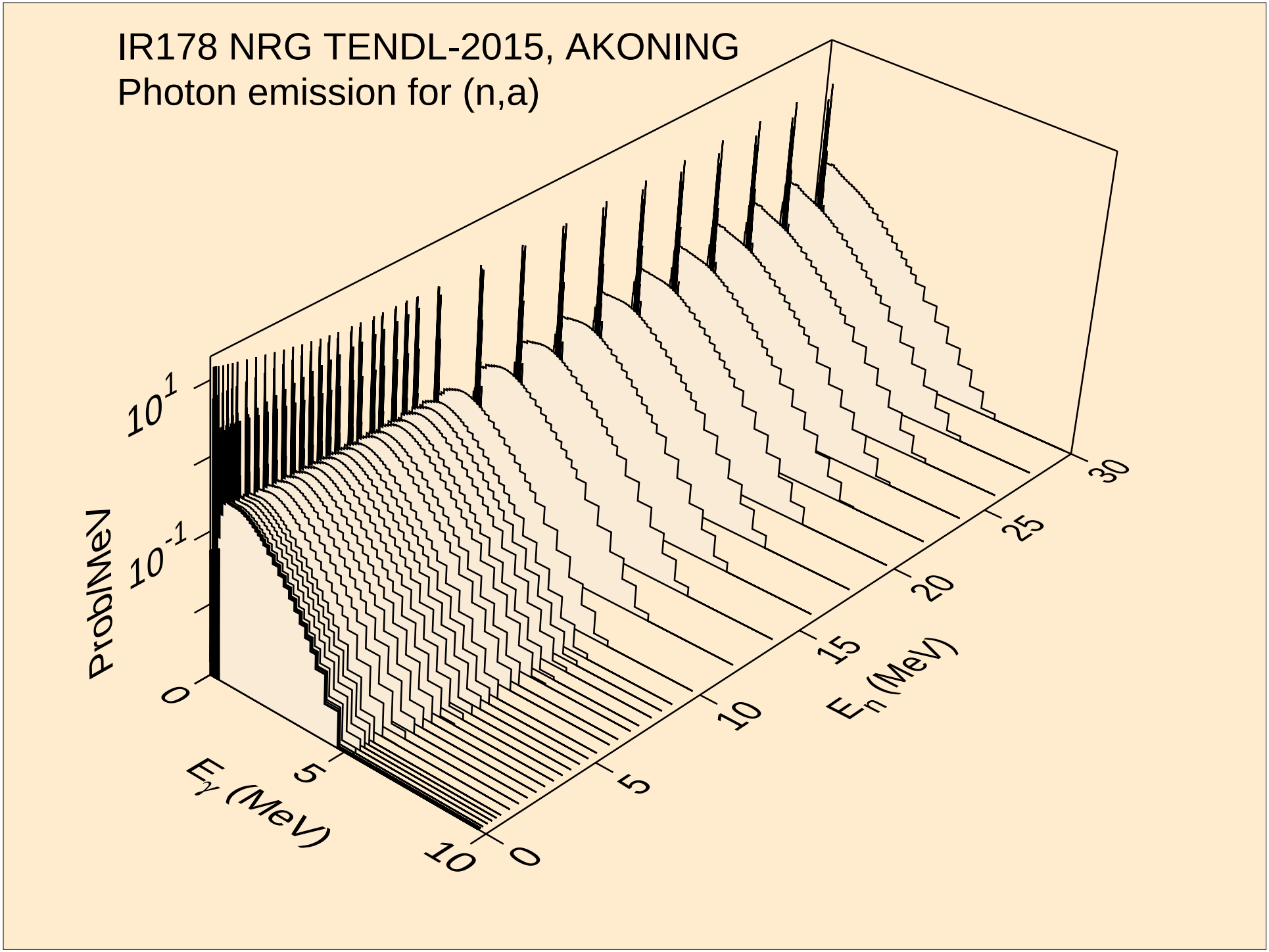

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,gma)
Prob/MeV
10^{1}
10^{-1}
0
E_γ (MeV)
20
40
0
5
10
15
20
25
30
E_n (MeV)

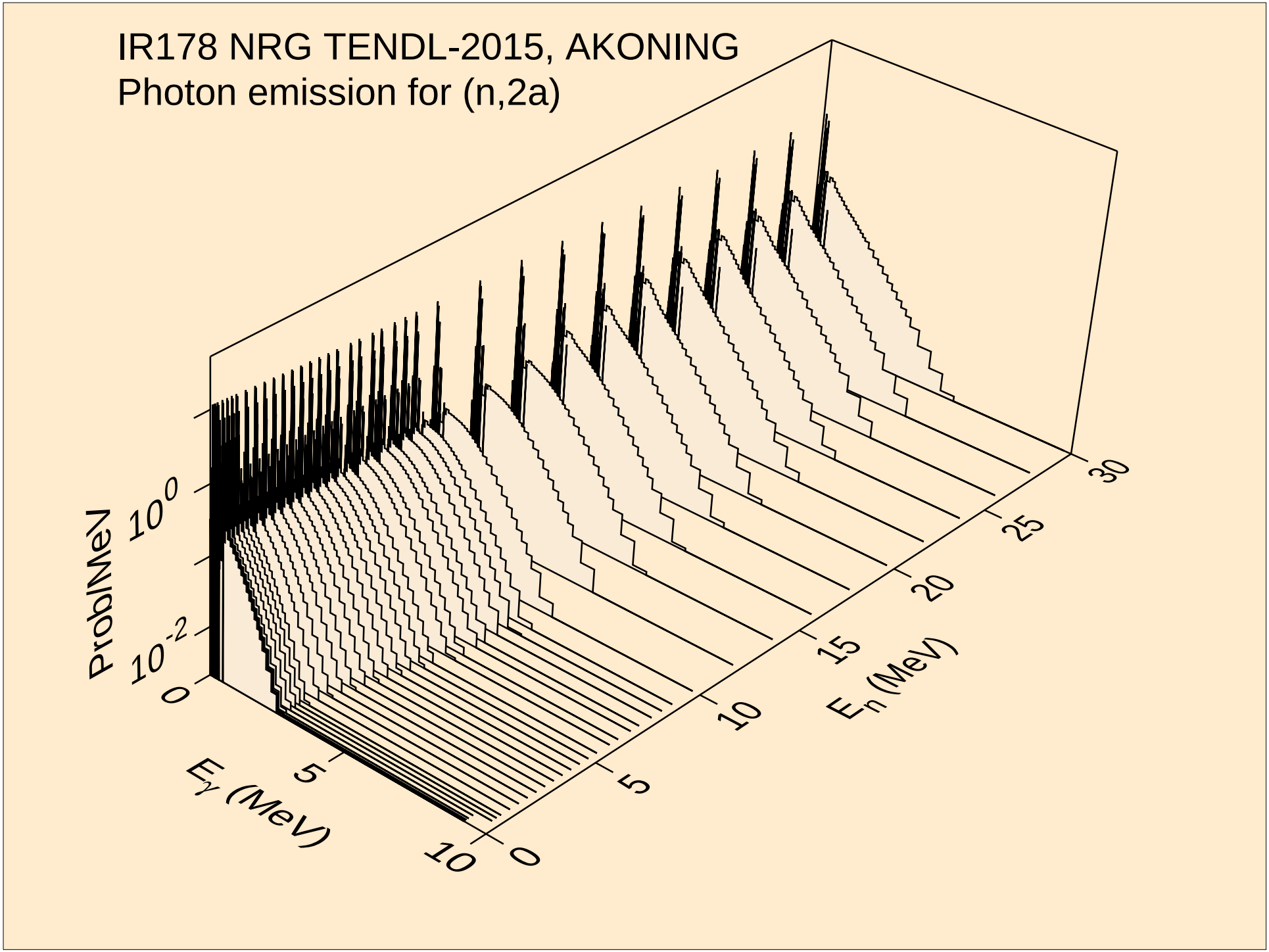

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,p)
Prob/MeV
10^0
10^-2
0
E_γ (MeV)
5
10
0
5
10
15
20
25
30
E_n (MeV)

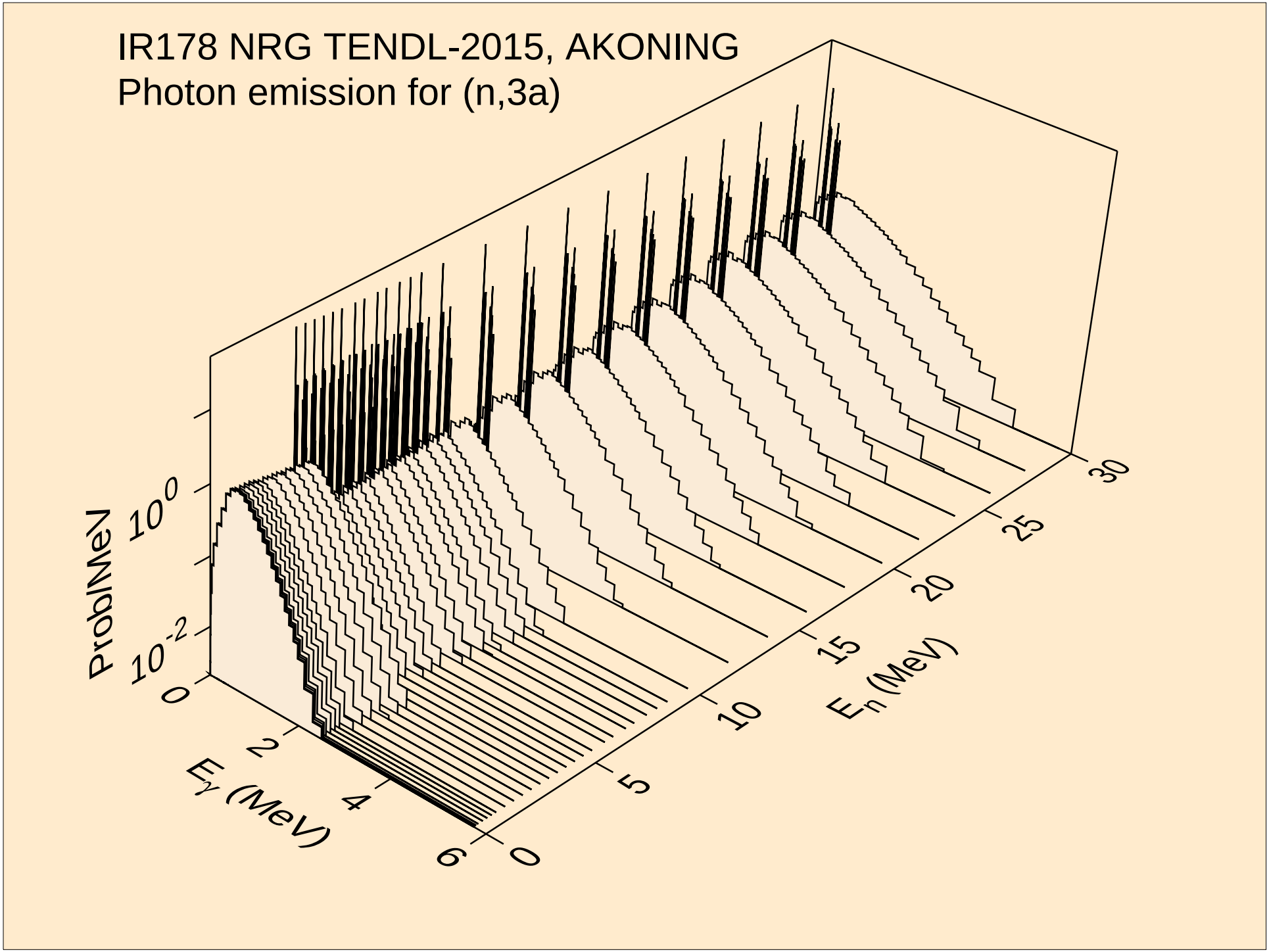

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,d)
Prob/MeV
10^{3}
10^{1}
10^{-1}
0
2
4
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

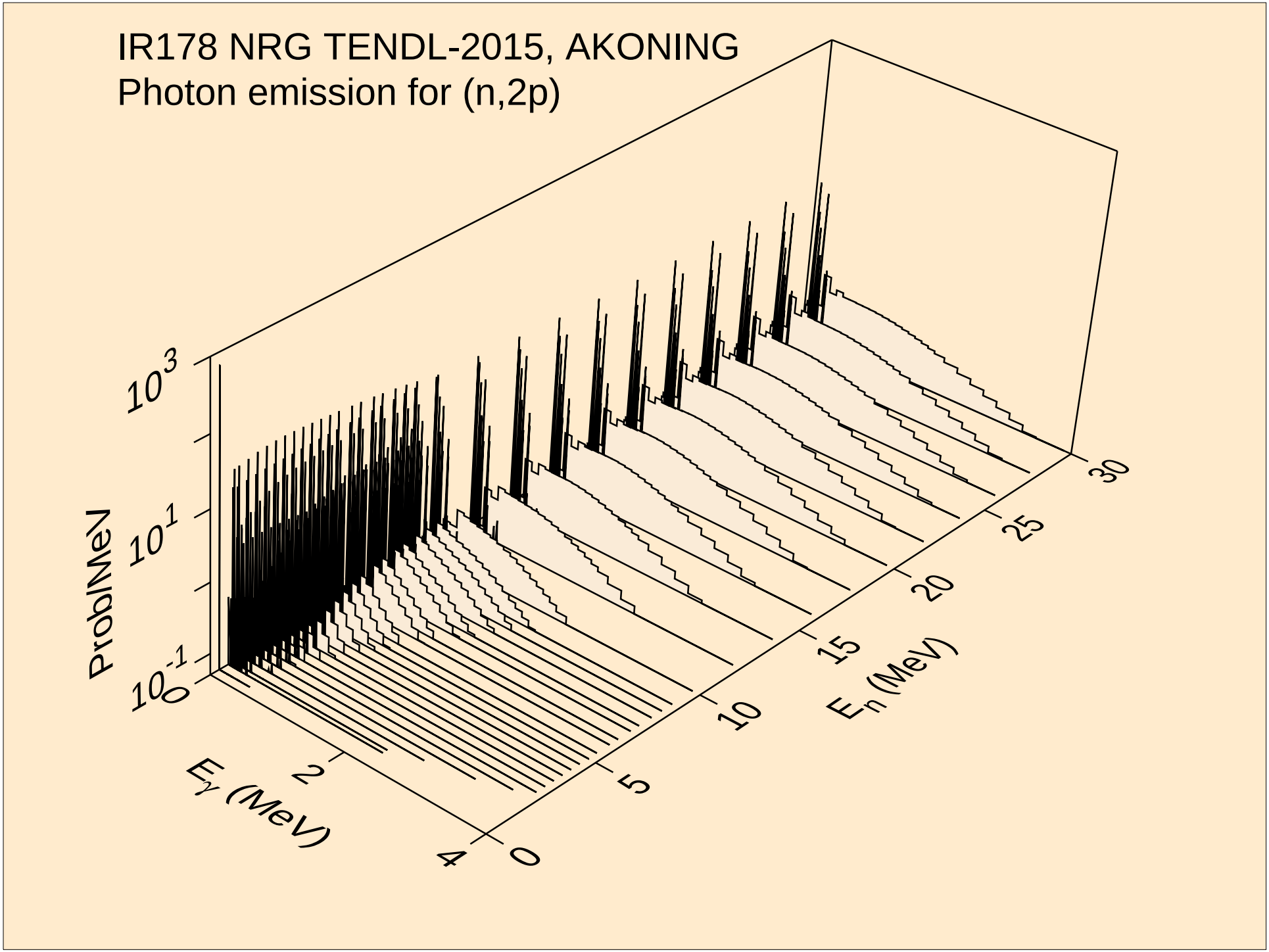

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,t)
Prob/MeV
10^{3}
10^{1}
10^{-1}
E_γ (MeV)
0
2
4
E_n (MeV)
0
5
10
15
20
25
30

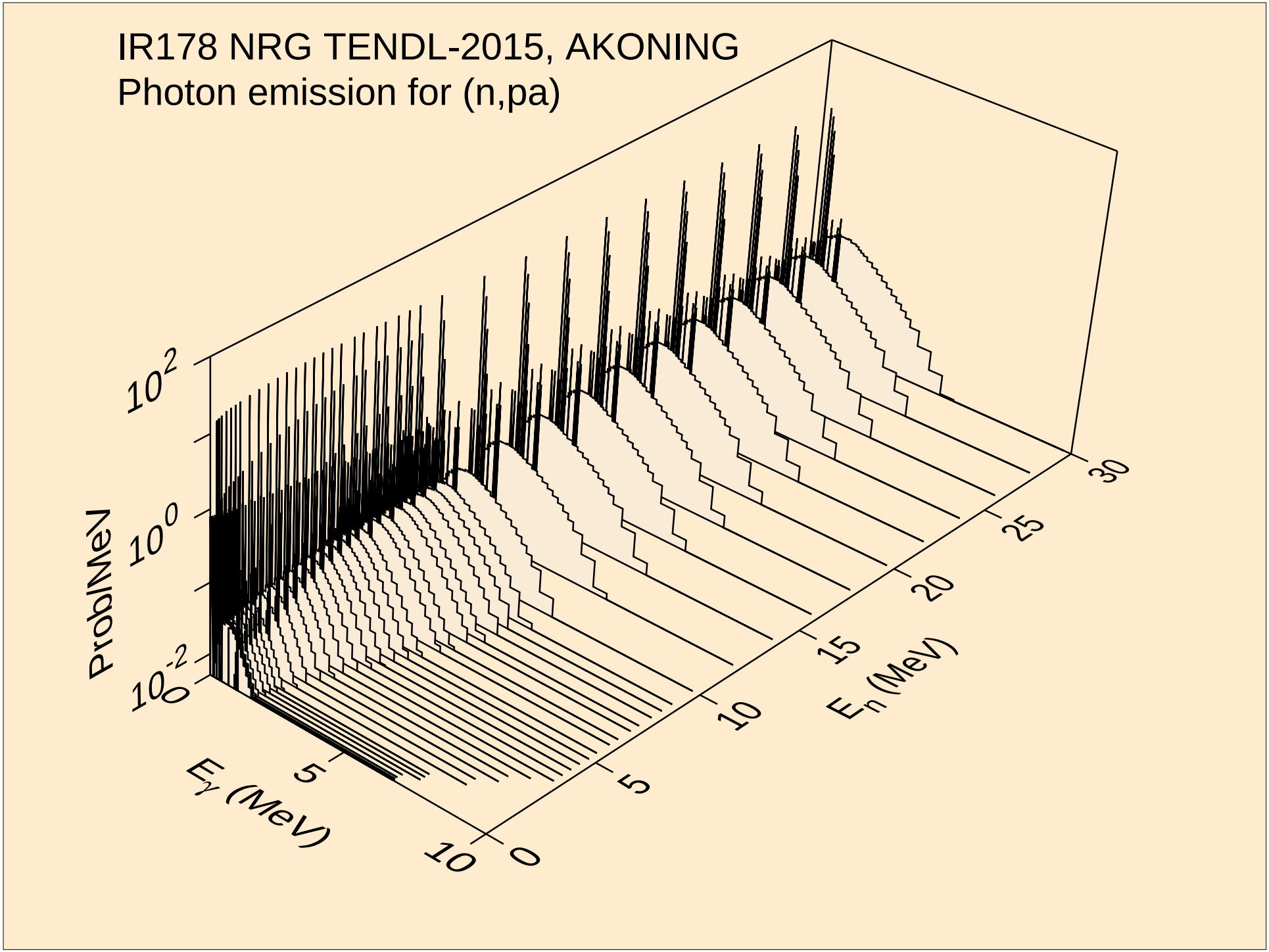

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,he3)
Prob/MeV
10^{3}
10^{1}
10^{-1}
E_γ (MeV)
0
2
4
E_n (MeV)
0
5
10
15
20
25
30

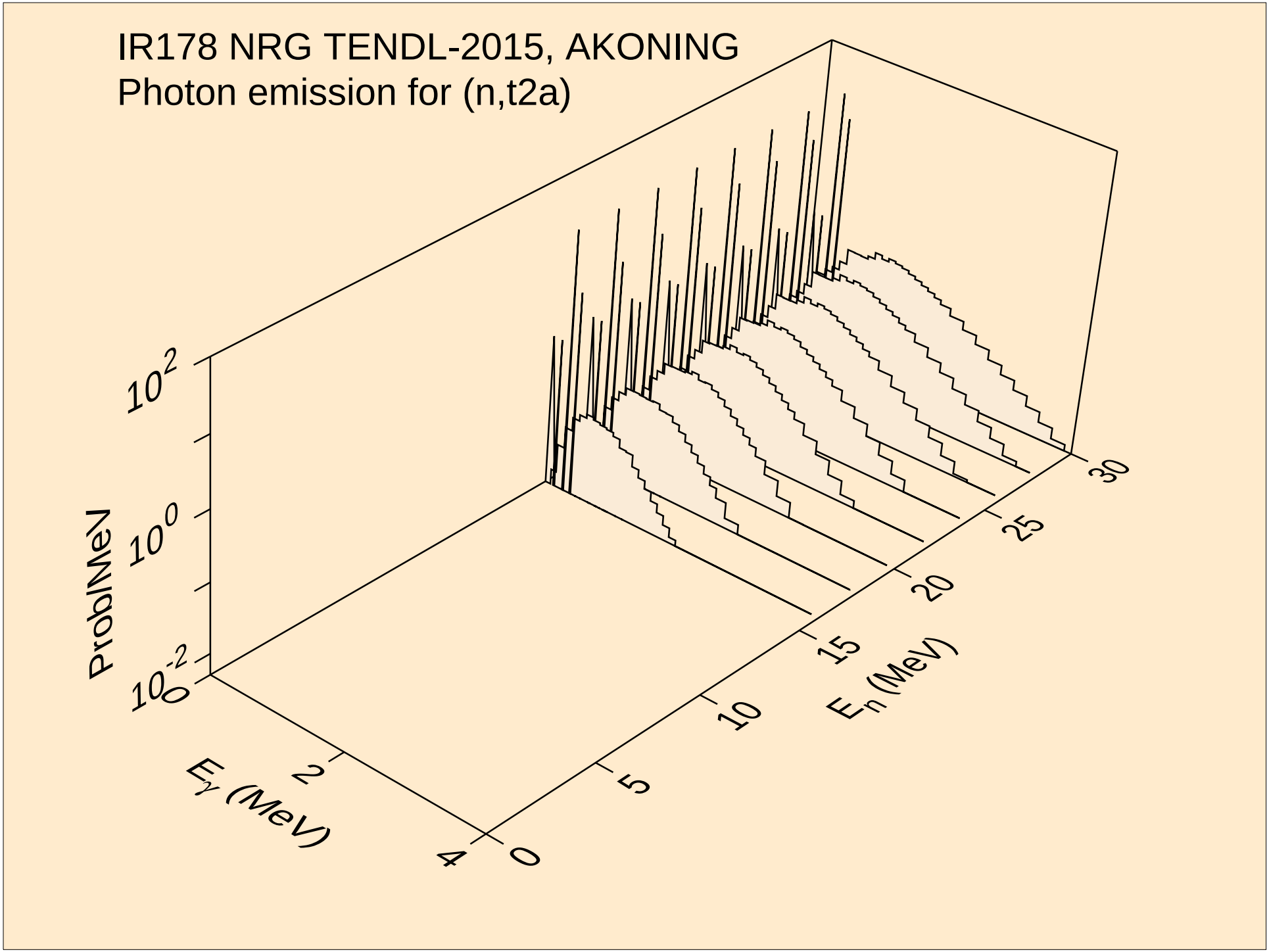

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,a)
Prob/MeV
10^{1}
10^{-1}
0
E_γ (MeV)
5
10
0
5
10
15
20
25
30
E_n (MeV)

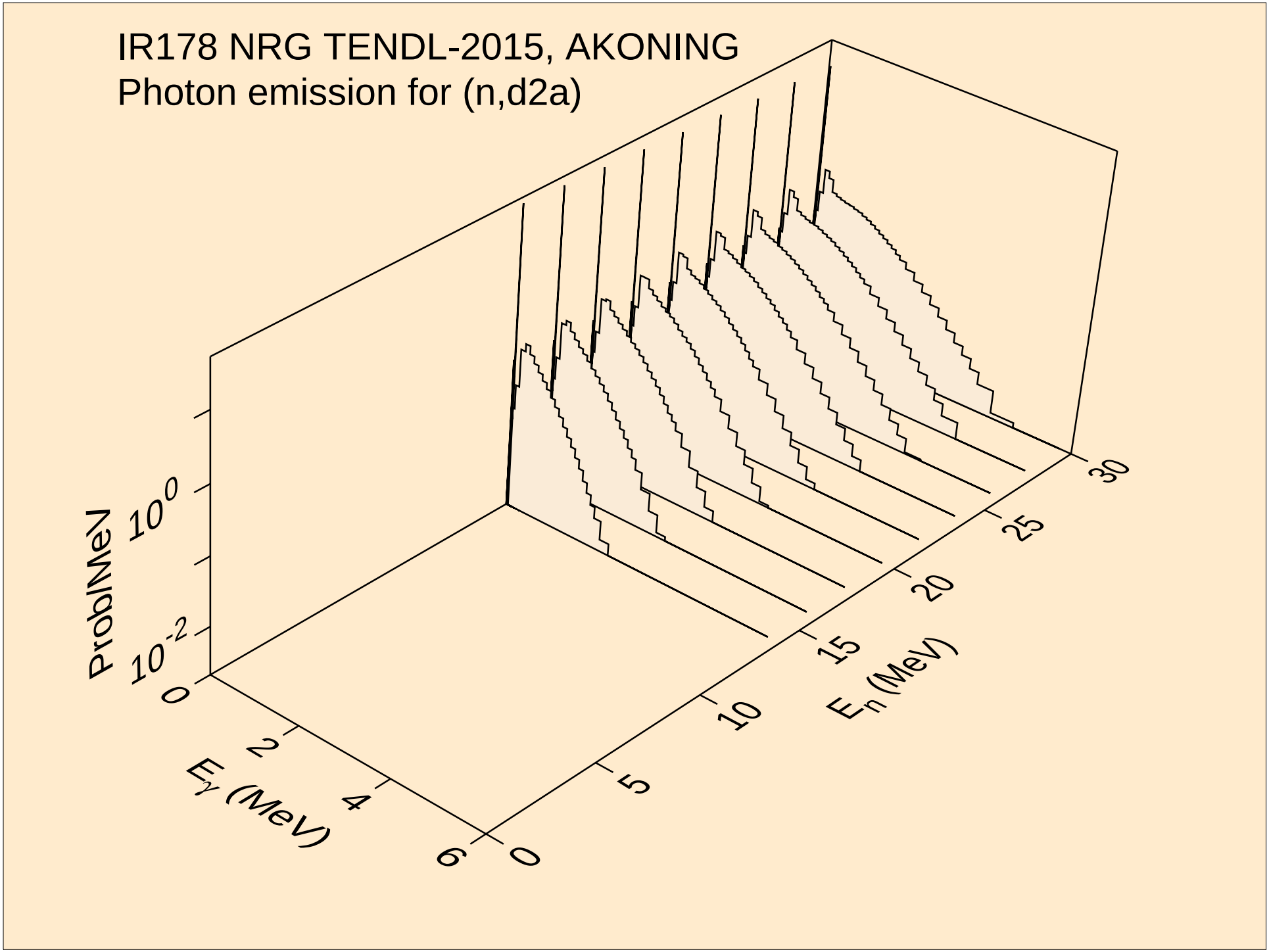

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,2a)
Prob/MeV
10^0
10^-2
0
E_γ (MeV)
0
5
10
E_n (MeV)
0
5
10
15
20
25
30

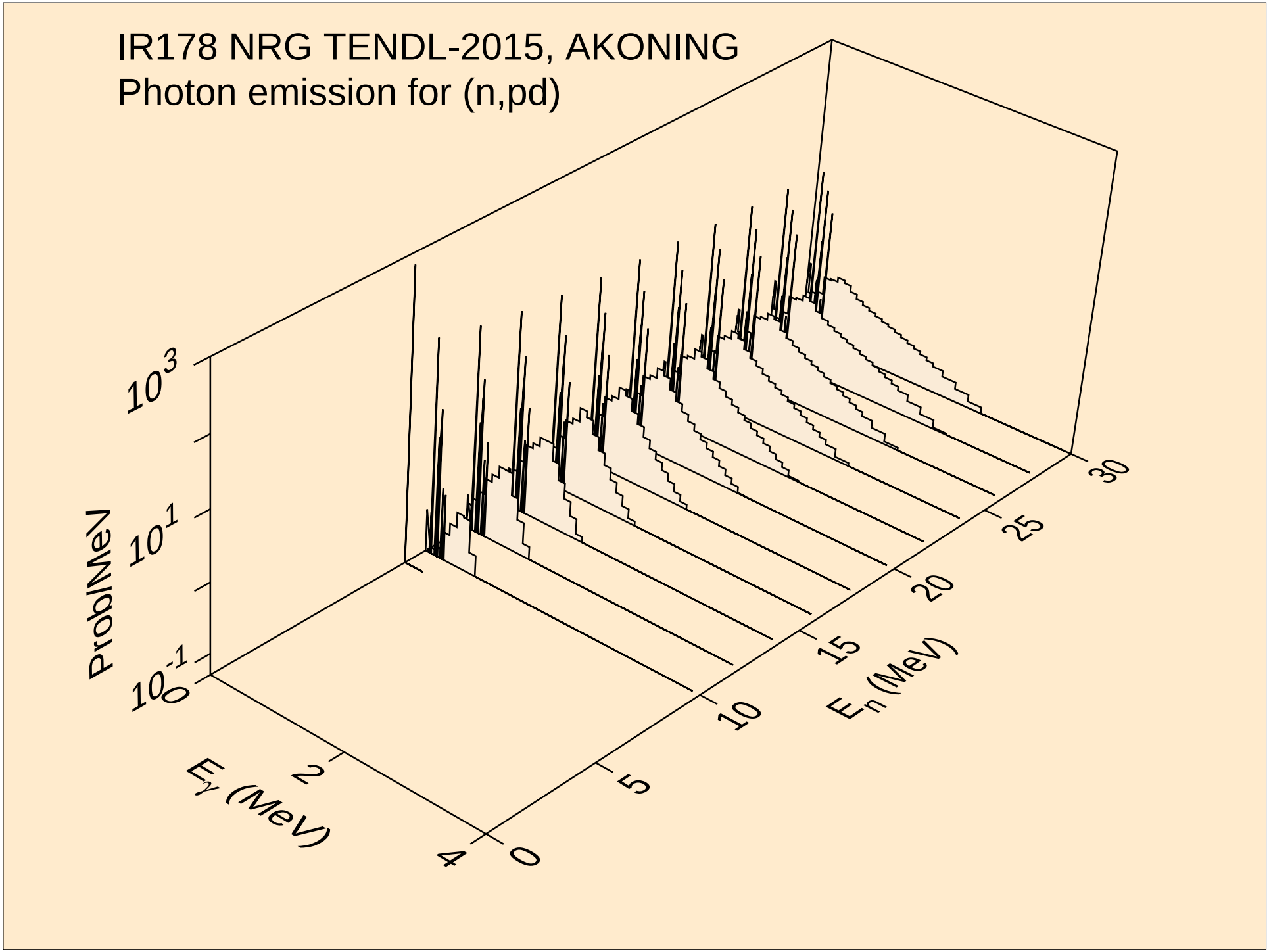

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,3a)
Prob/MeV
10^{0}
10^{-2}
0
2
4
6
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

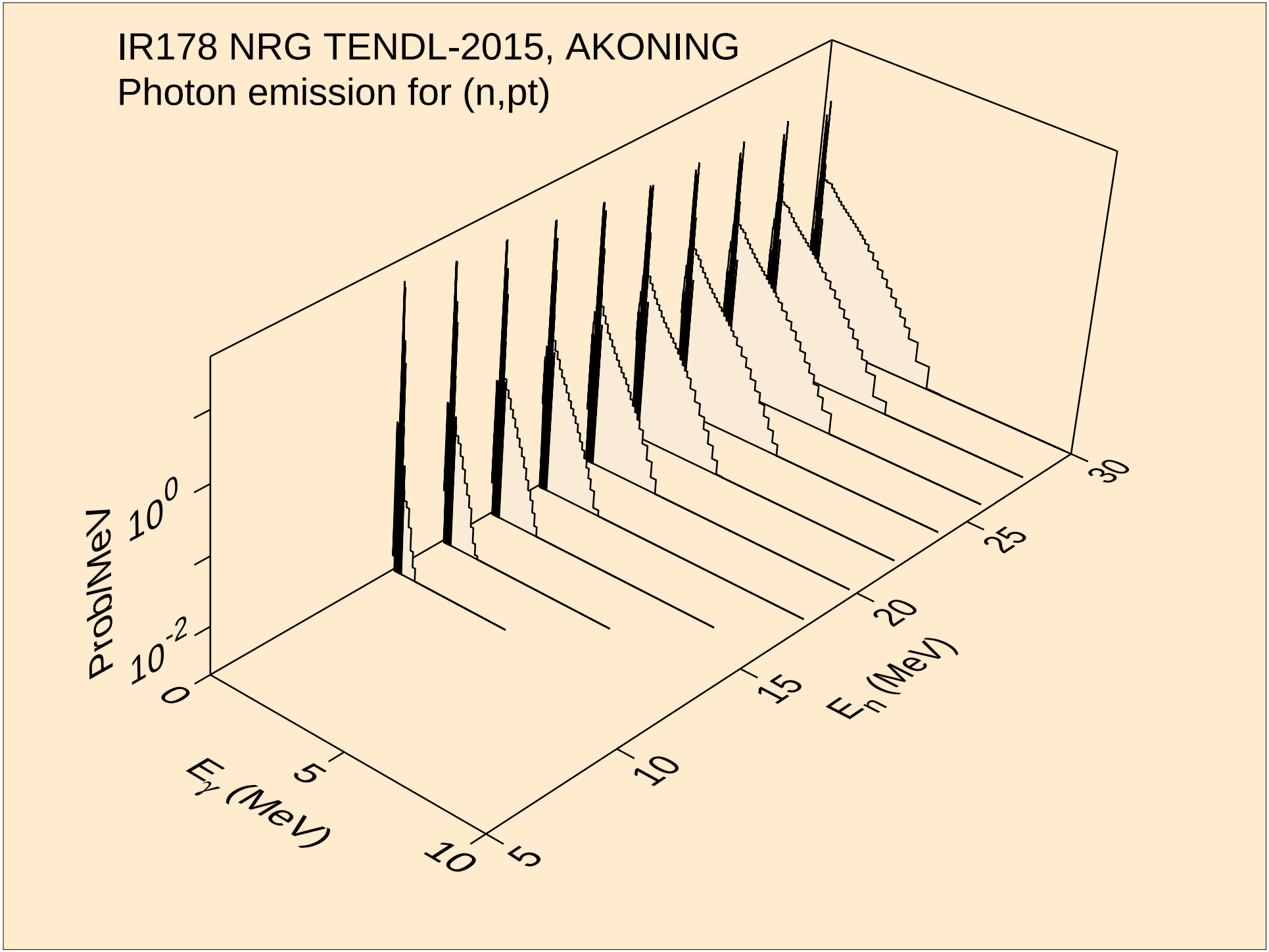

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,2p)
Prob/MeV
10^{3}
10^{1}
10^{-1}
0
2
4
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

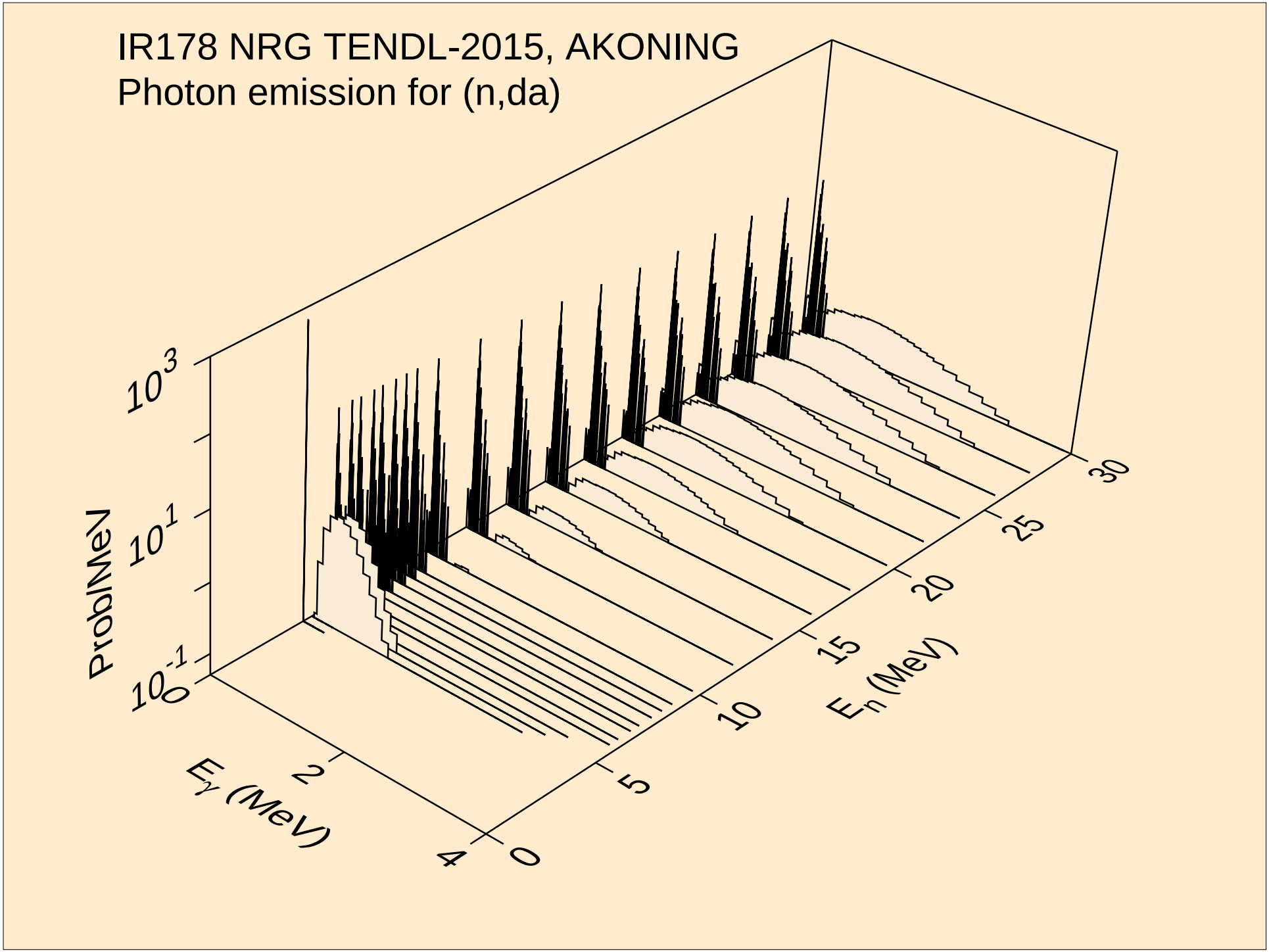

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,pa)
Prob/MeV
10^{2}
10^{0}
10^{-2}
0
5
10
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

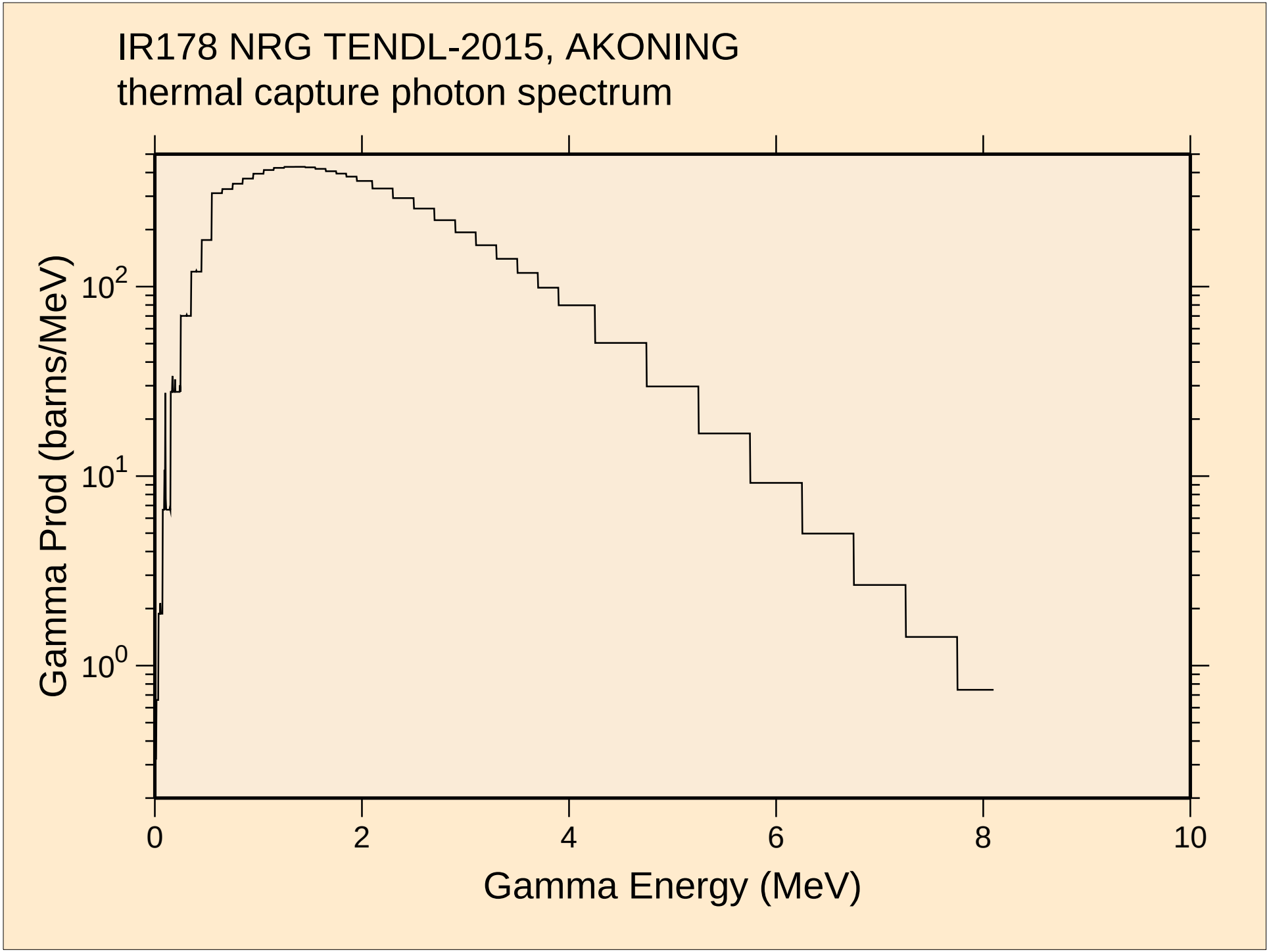

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,t2a)
Prob/MeV
10^{2}
10^{0}
10^{-2}
E_γ (MeV)
0
2
4
E_n (MeV)
0
5
10
15
20
25
30

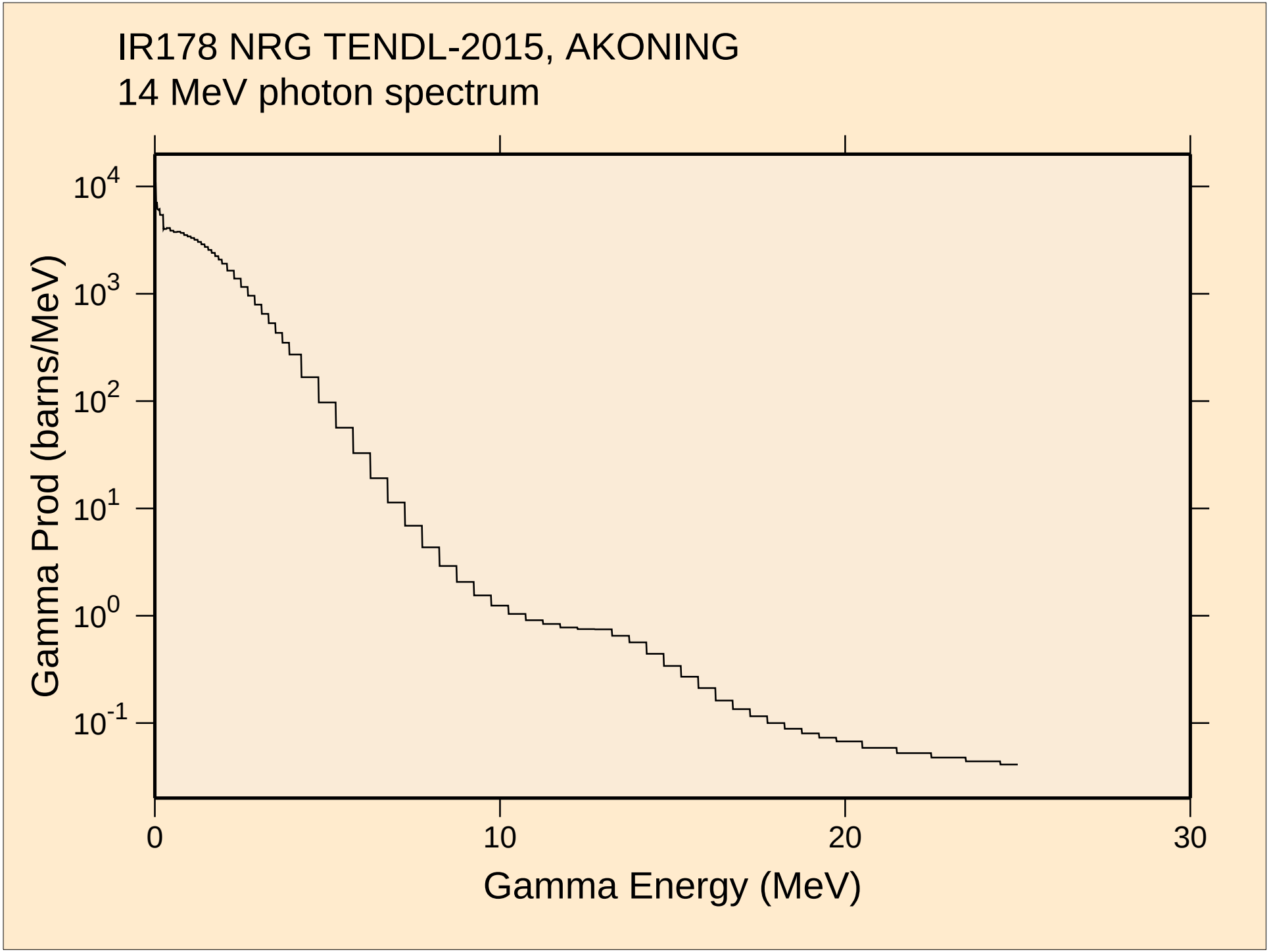

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,d2a)
Prob/MeV
10^{0}
10^{-2}
0
2
4
6
E_γ (MeV)
0
5
10
15
20
25
30
E_n (MeV)

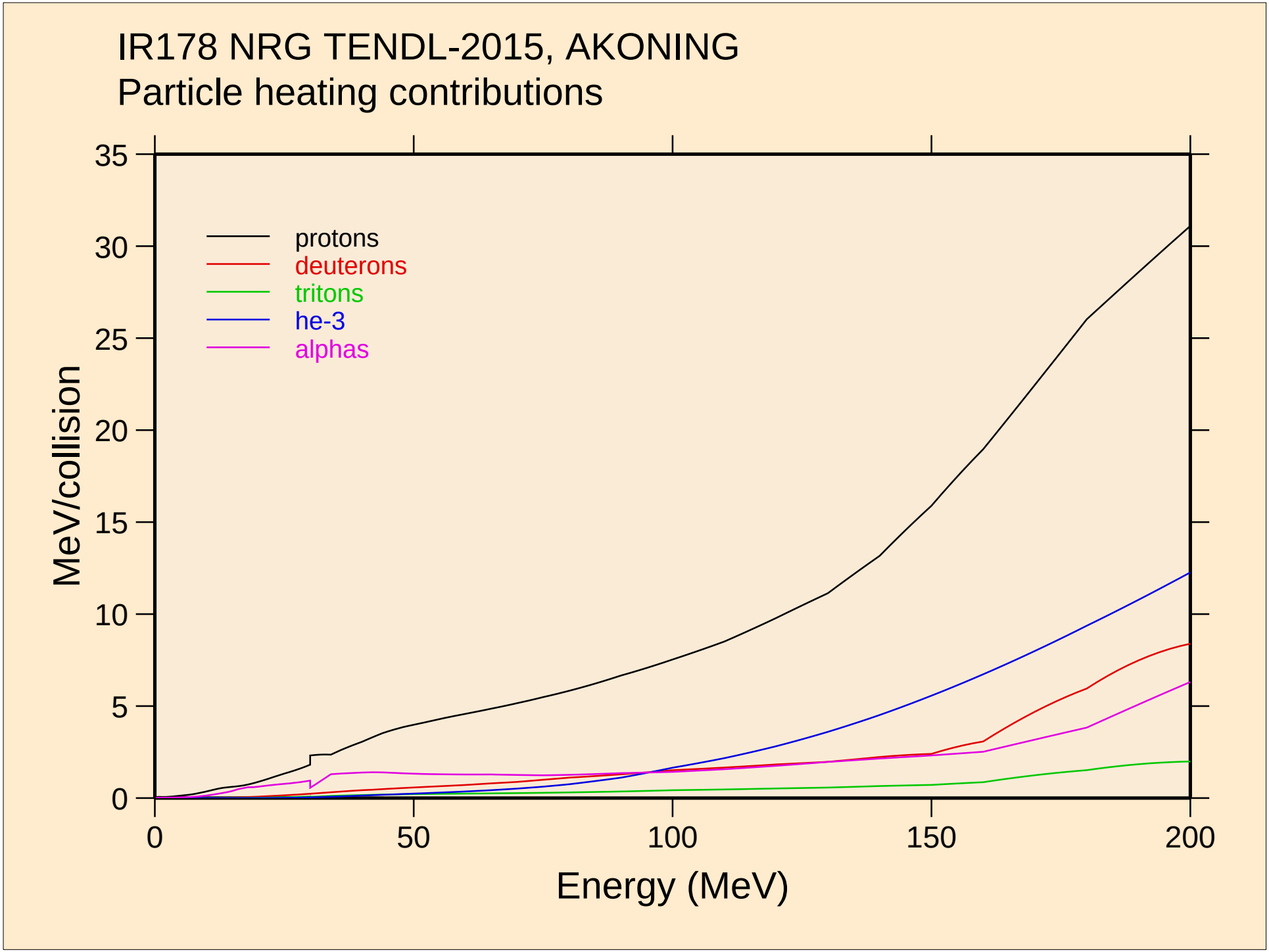

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,pd)
Prob/MeV
10^{3}
10^{1}
10^{-1}
E_γ (MeV)
0
2
4
E_n (MeV)
0
5
10
15
20
25
30

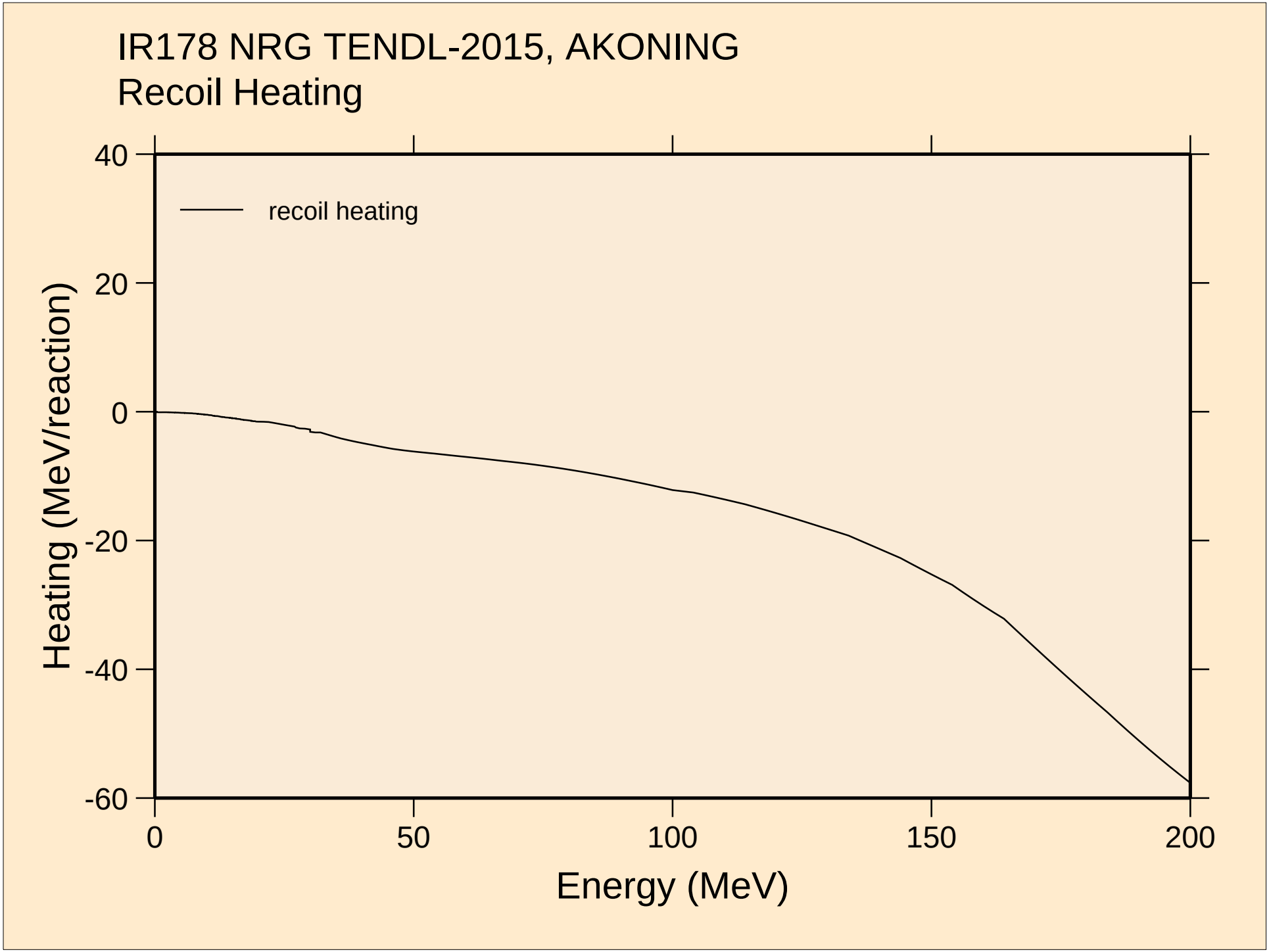

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,pt)
Prob/MeV
10^{0}
10^{-2}
0
E_γ (MeV)
5
10
5
10
15
20
25
30
E_n (MeV)

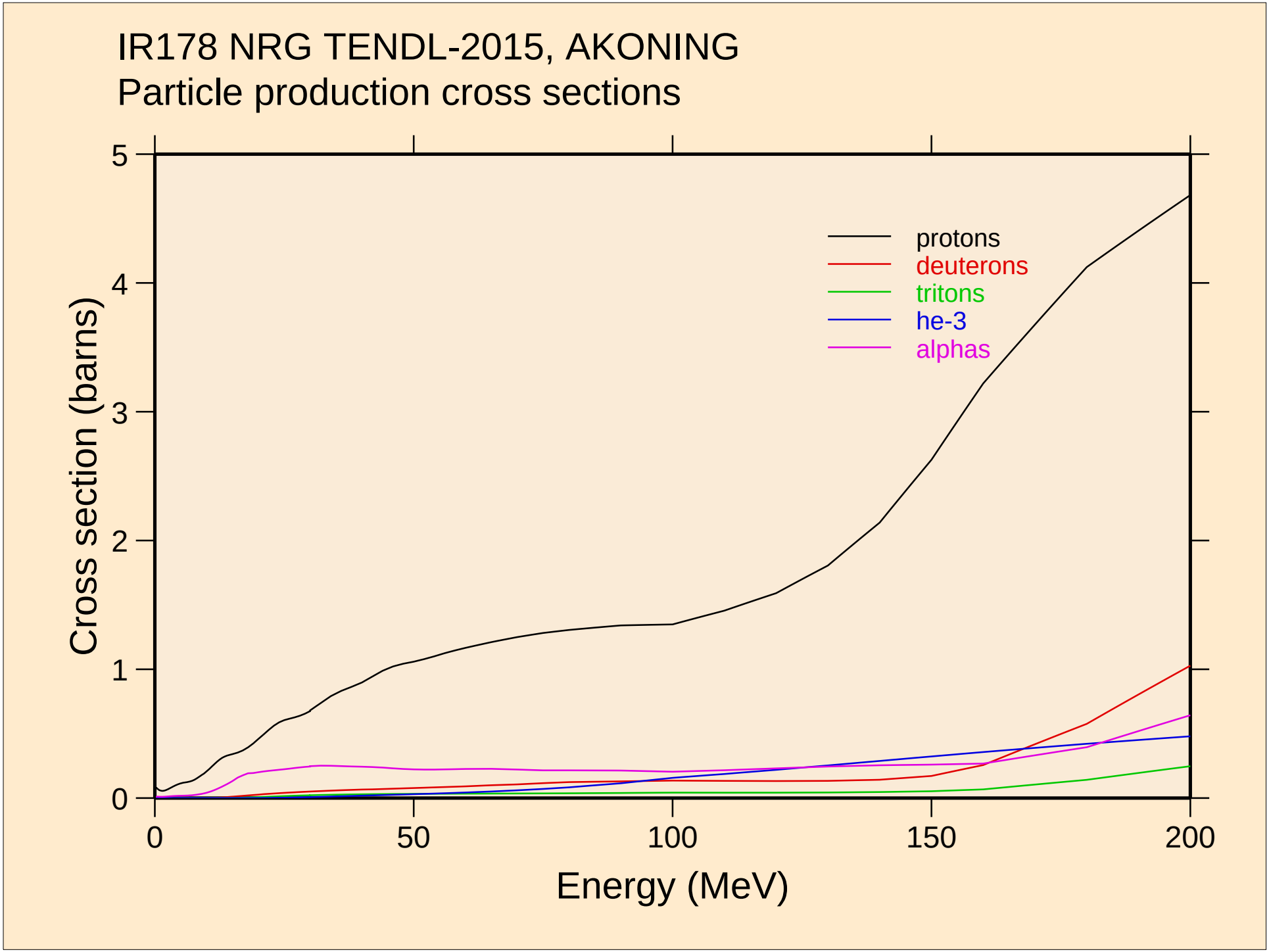

IR178 NRG TENDL-2015, AKONING
Photon emission for (n,da)
Prob/MeV
10^{3}
10^{1}
10^{-1}
E_γ (MeV)
0
2
4
E_n (MeV)
0
5
10
15
20
25
30

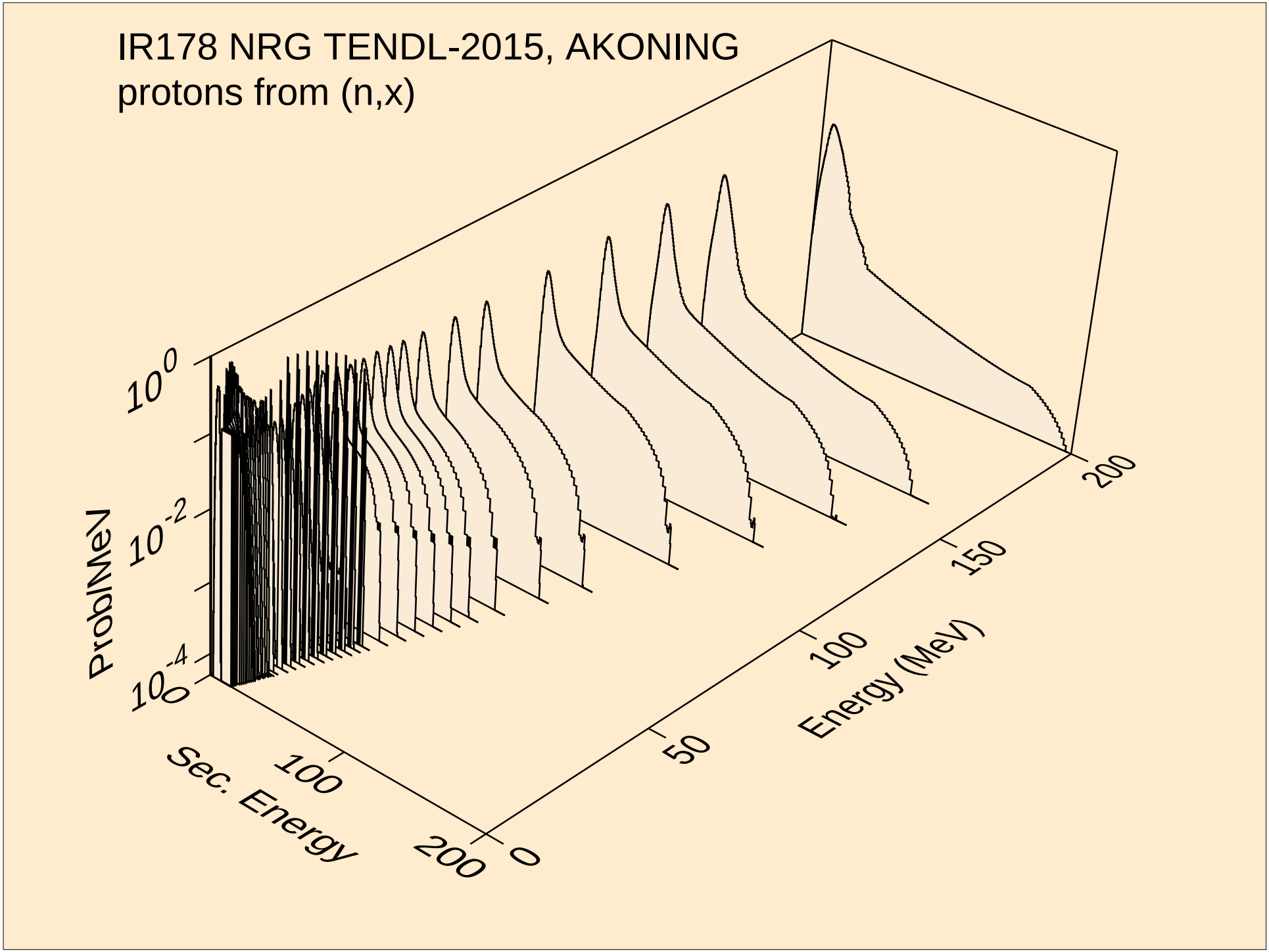

IR178 NRG TENDL-2015, AKONING
thermal capture photon spectrum
Gamma Prod (barns/MeV)
10^2
10^1
10^0
0
2
4
6
8
10
Gamma Energy (MeV)

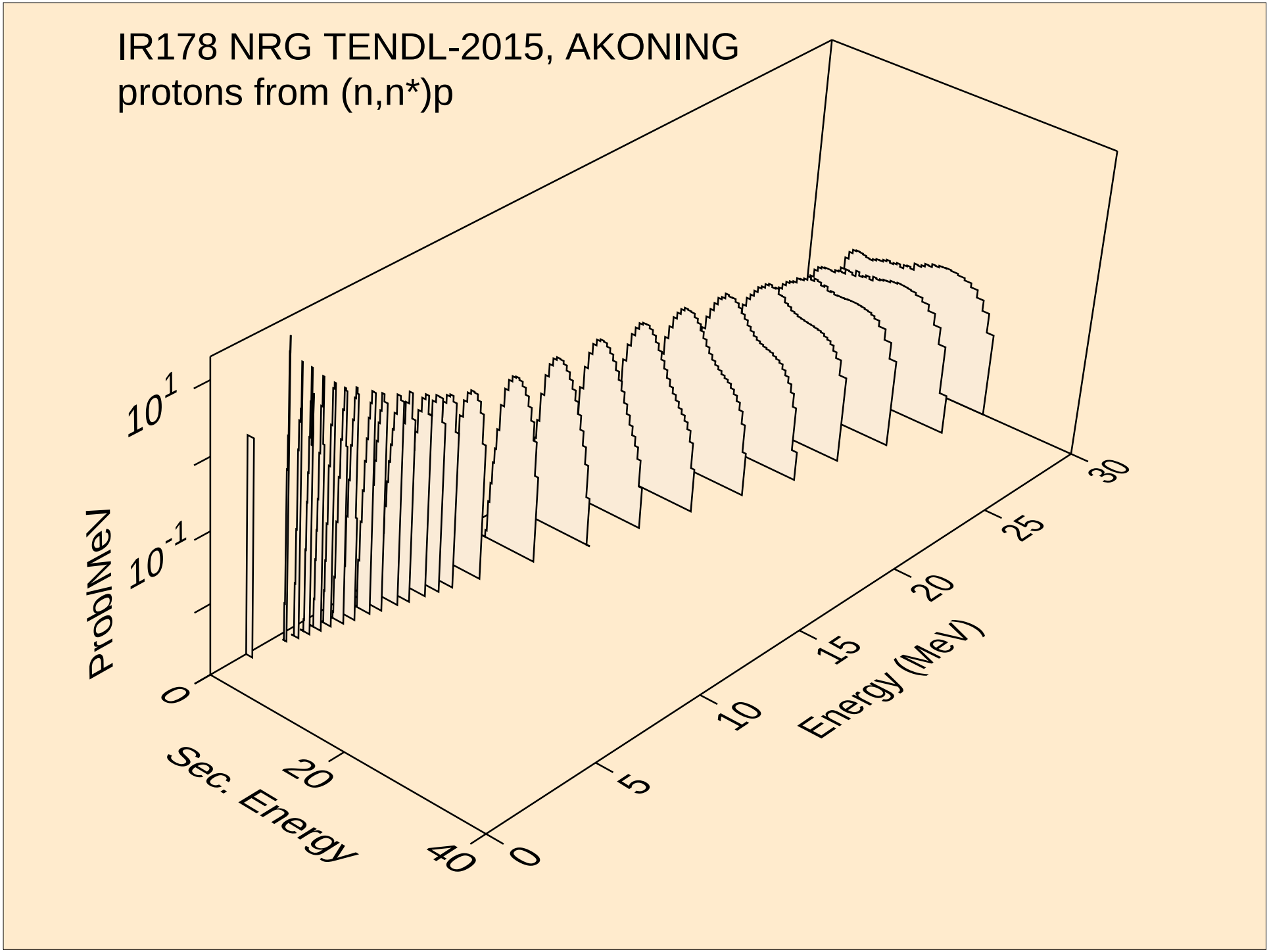

IR178 NRG TENDL-2015, AKONING
14 MeV photon spectrum
Gamma Prod (barns/MeV)
10^4
10^3
10^2
10^1
10^0
10^-1
0
10
20
30
Gamma Energy (MeV)

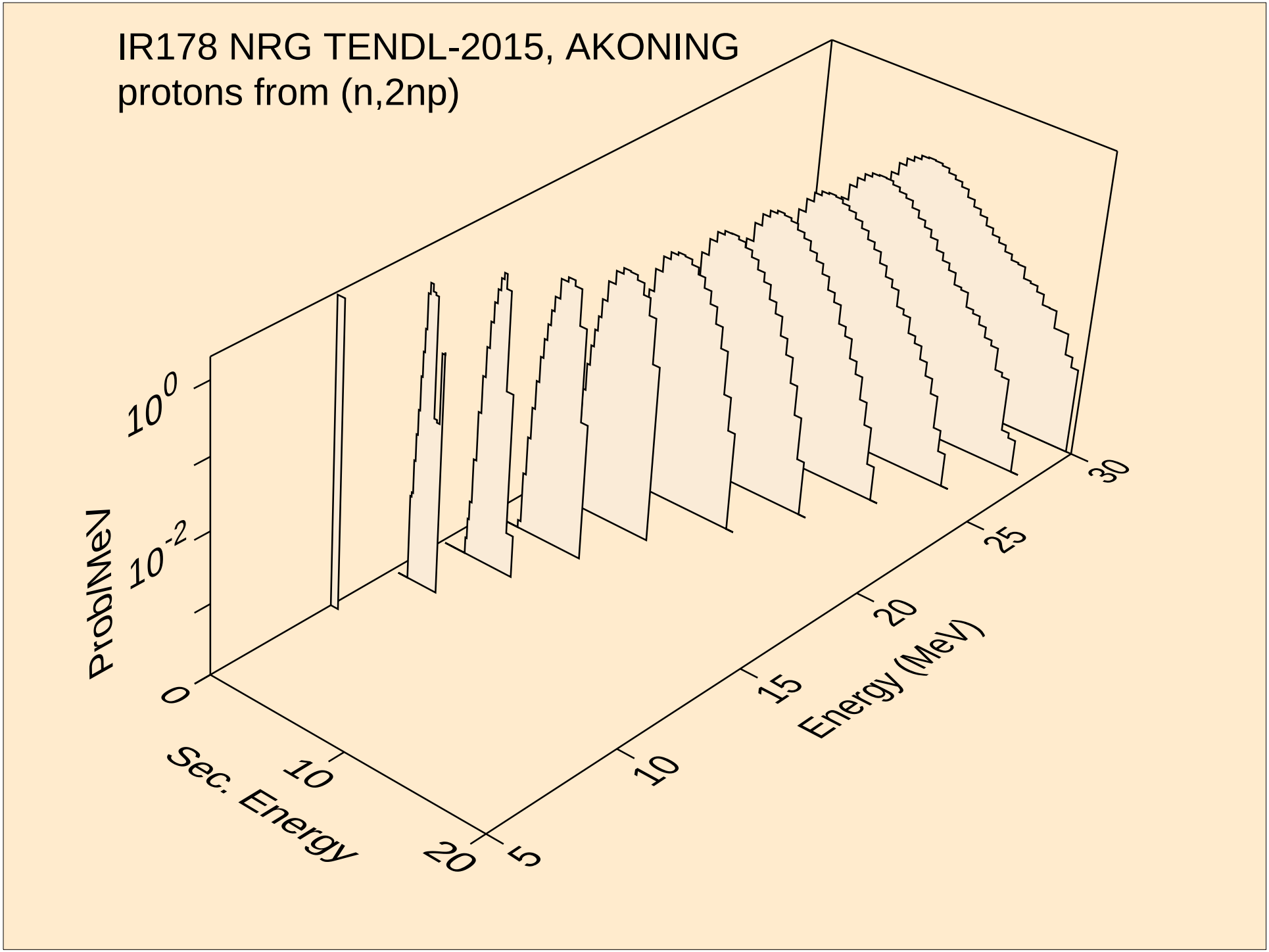

IR178 NRG TENDL-2015, AKONING
Particle heating contributions
protons
deuterons
tritons
he-3
alphas
MeV/collision
Energy (MeV)
0
5
10
15
20
25
30
35
0
50
100
150
200

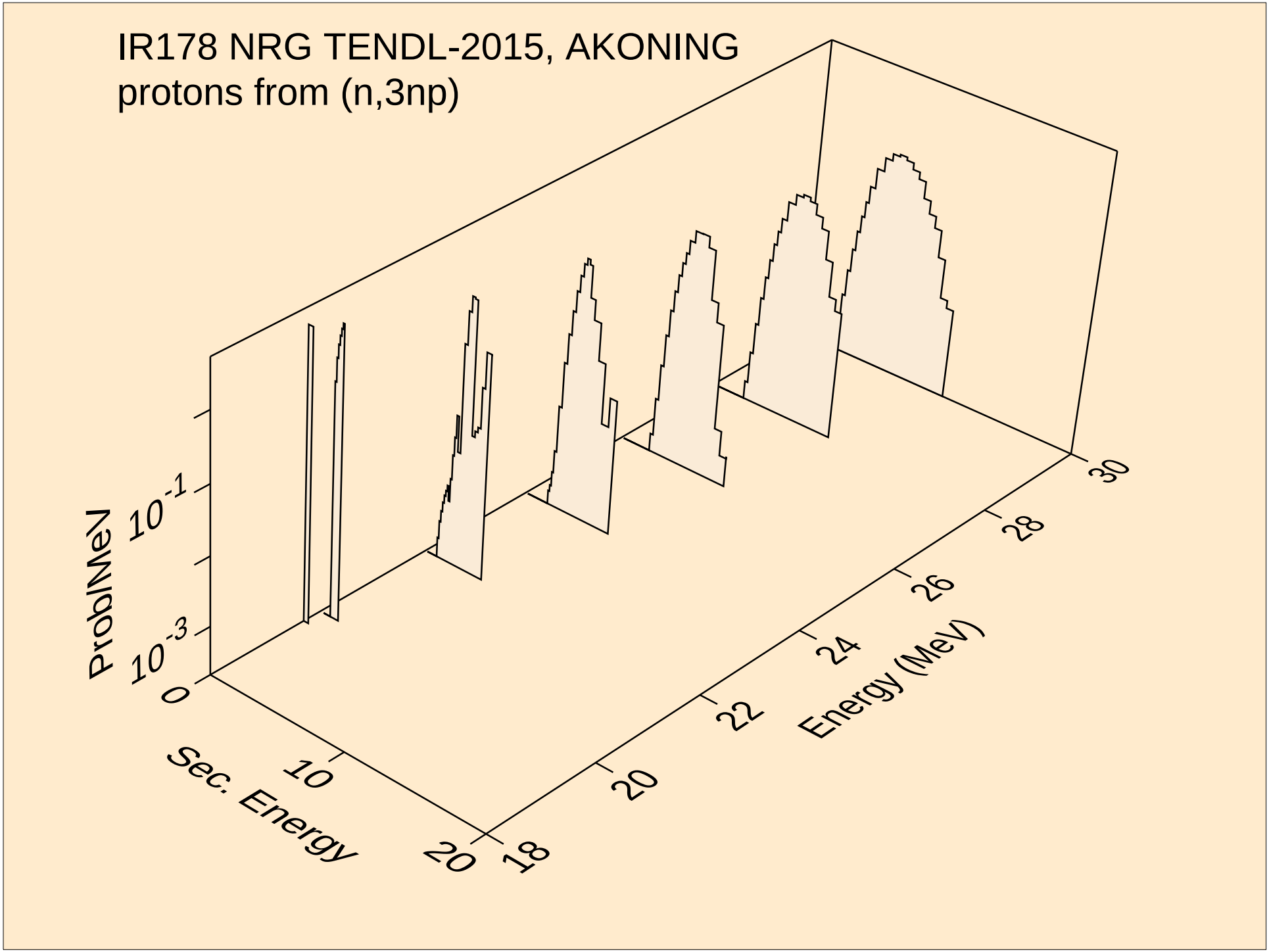

IR178 NRG TENDL-2015, AKONING
Recoil Heating
recoil heating
Heating (MeV/reaction)
40
20
0
-20
-40
-60
0
50
100
150
200
Energy (MeV)

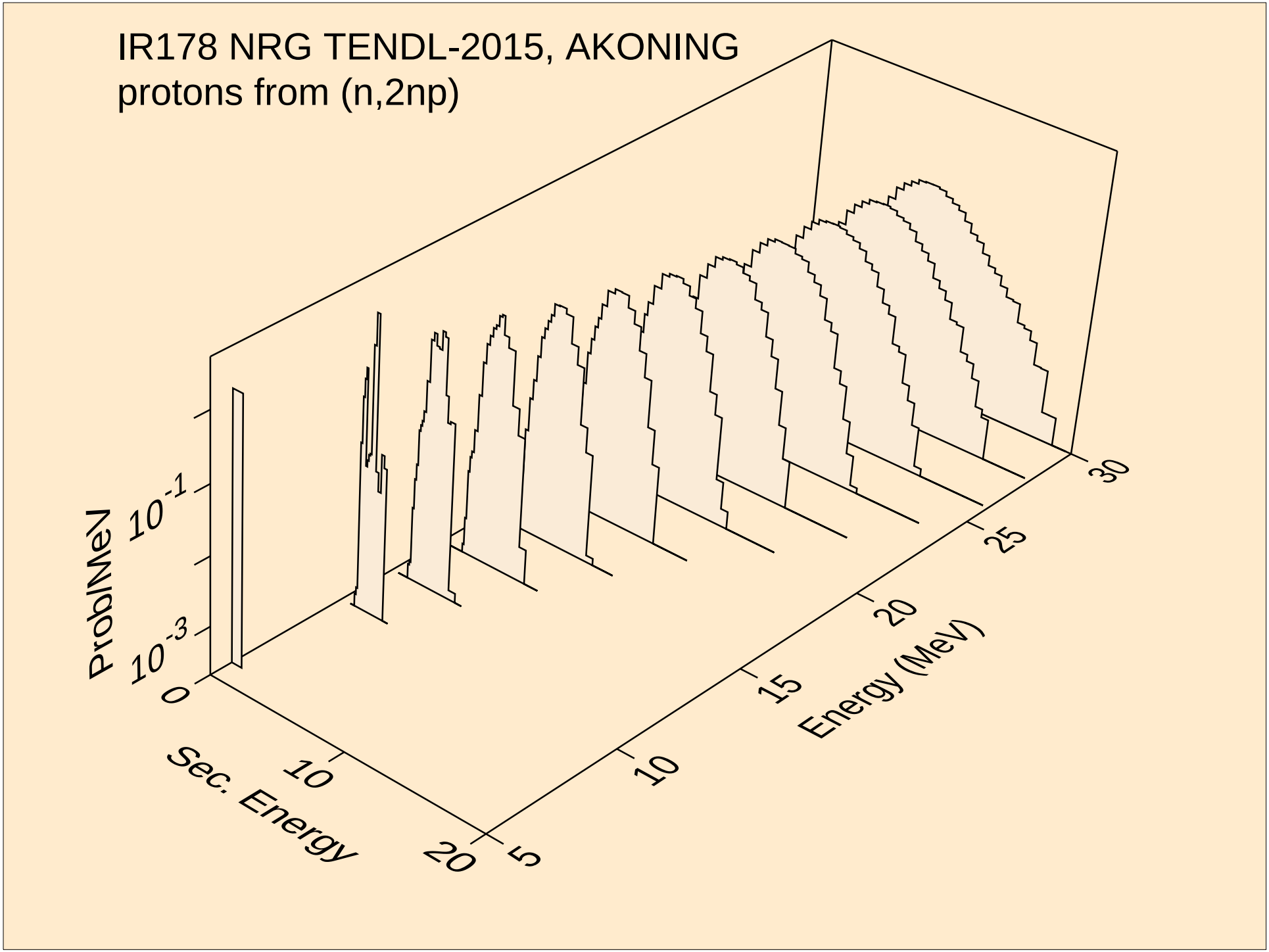

IR178 NRG TENDL-2015, AKONING
Particle production cross sections
Cross section (barns)
Energy (MeV)
0
1
2
3
4
5
0
50
100
150
200
protons
deuterons
tritons
he-3
alphas

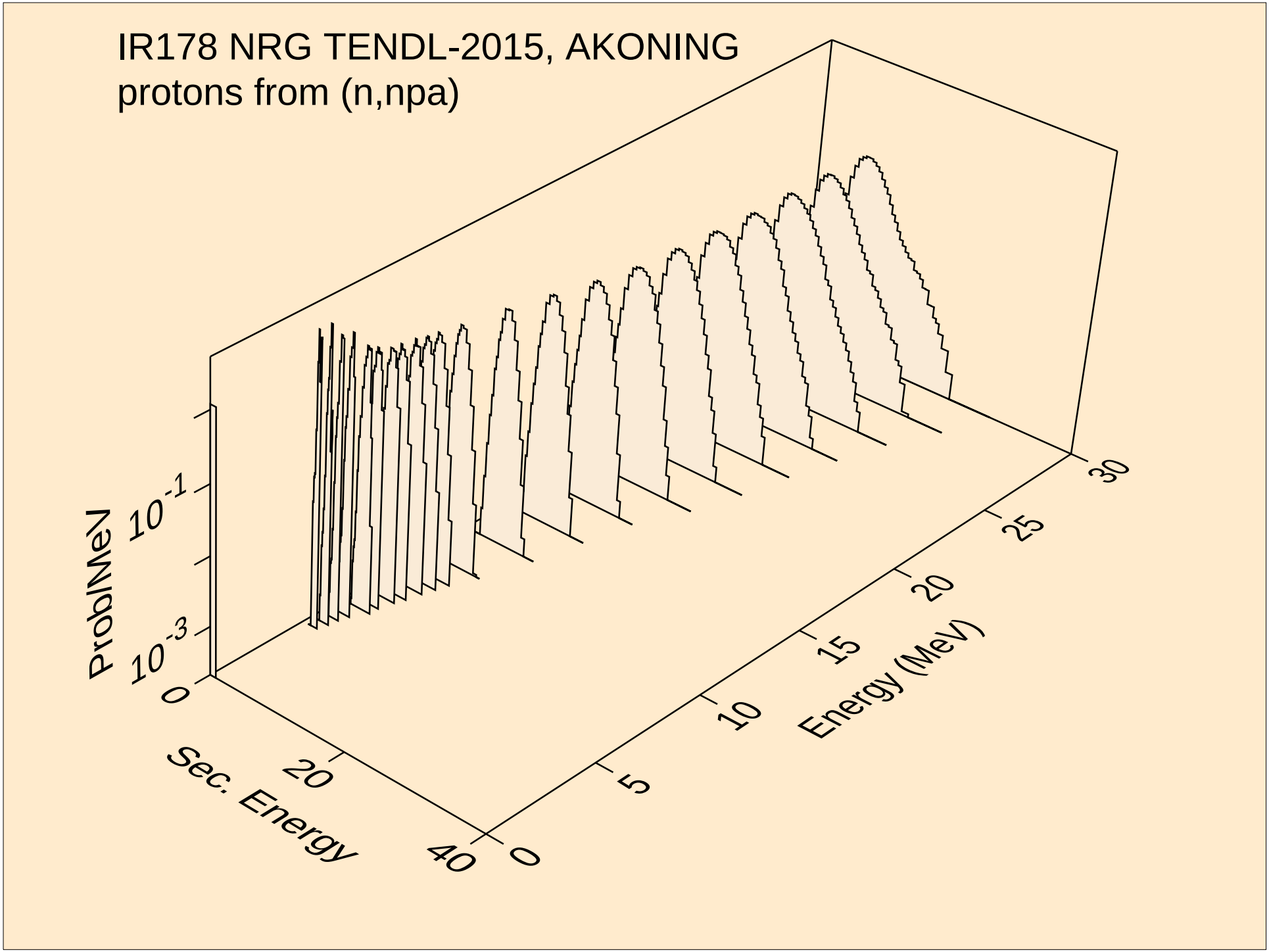

IR178 NRG TENDL-2015, AKONING
protons from (n,x)
Prob/MeV
10^{0}
10^{-2}
10^{-4}
0
100
200
Sec. Energy
0
50
100
150
200
Energy (MeV)

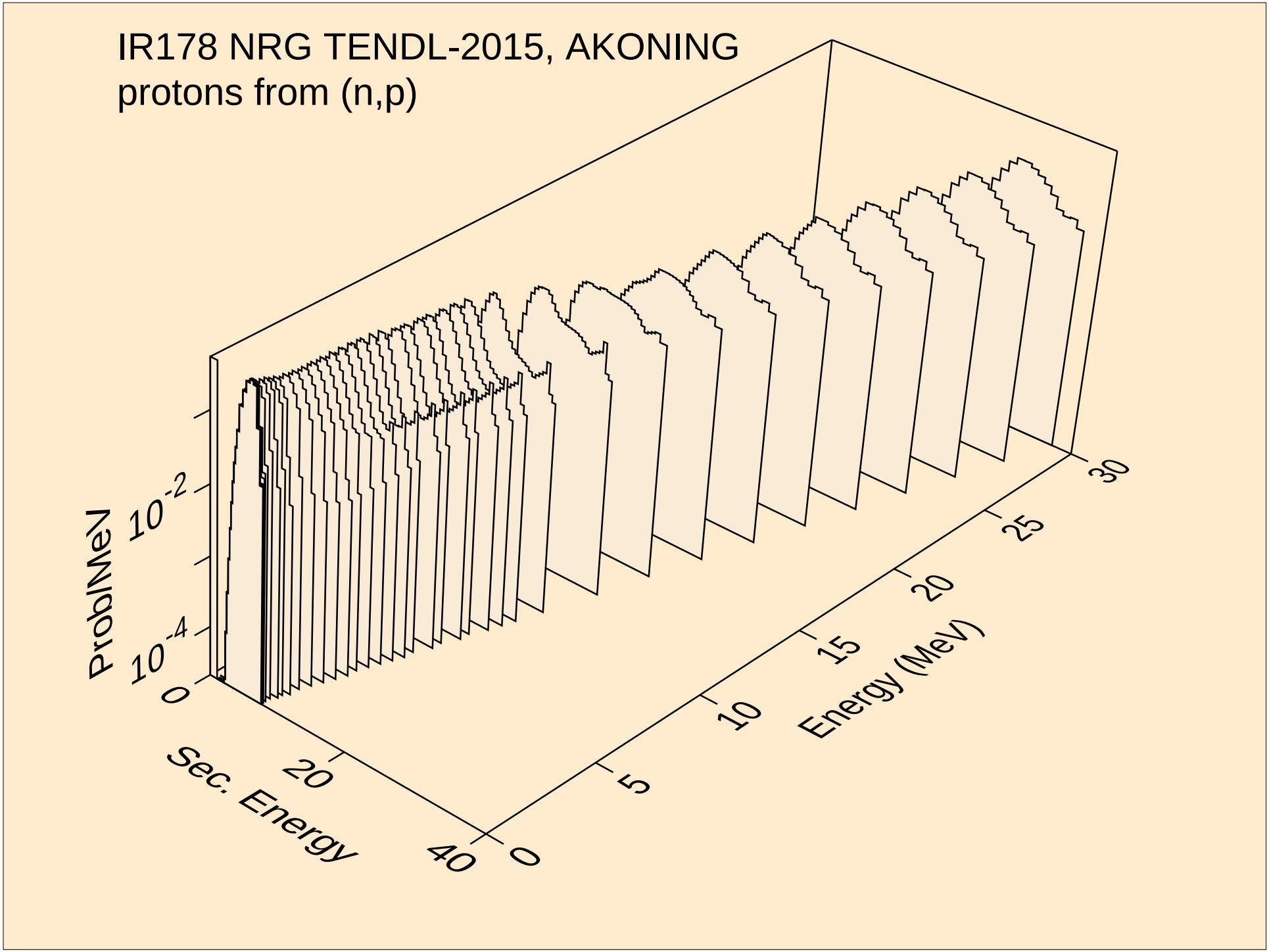

IR178 NRG TENDL-2015, AKONING
protons from (n,n*)p
Prob/MeV
10^1
10^-1
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

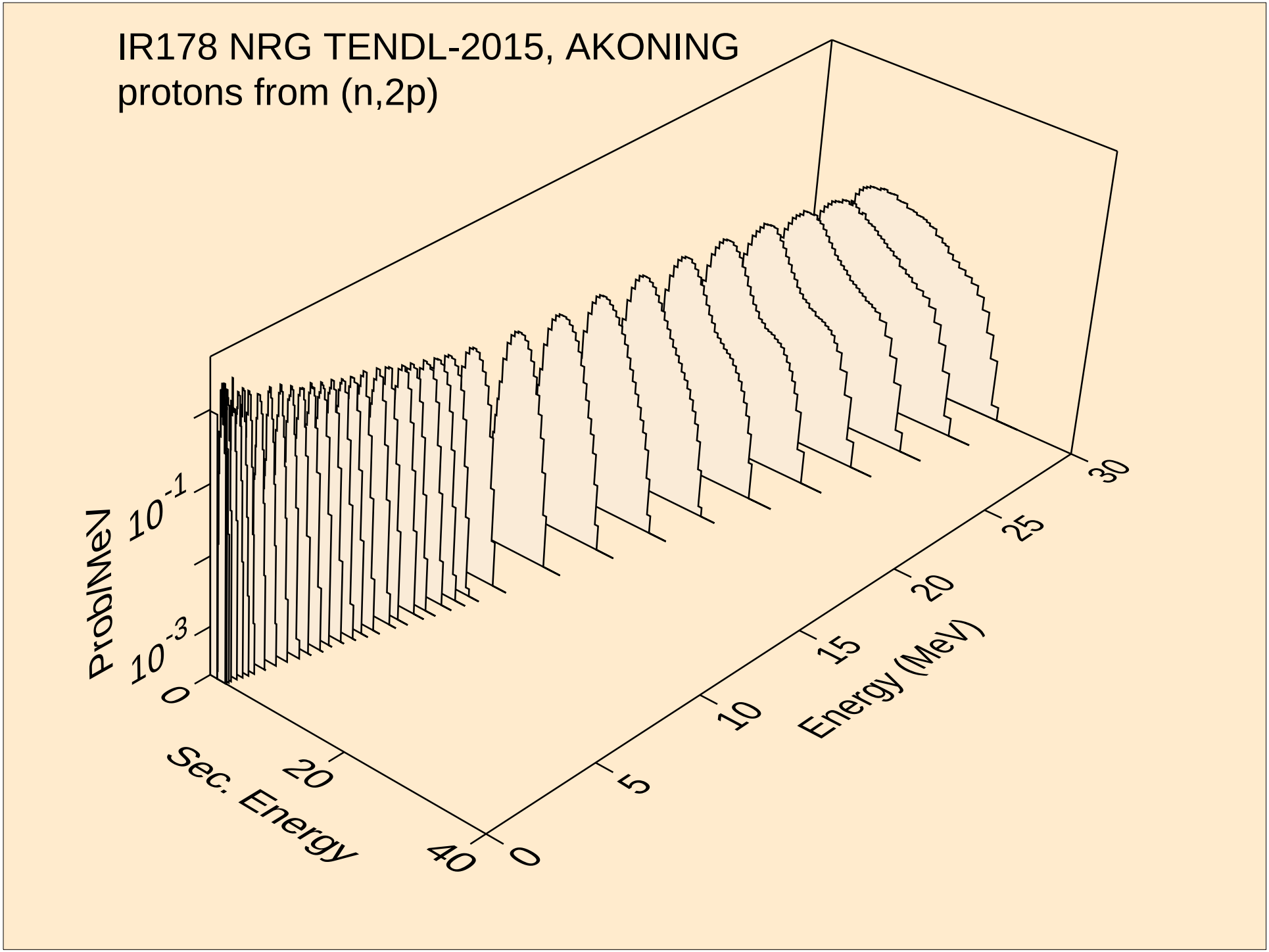

IR178 NRG TENDL-2015, AKONING
protons from (n,2np)
Prob/MeV
10^{0}
10^{-2}
0
Sec. Energy
10
20
5
10
15
20
25
30
Energy (MeV)

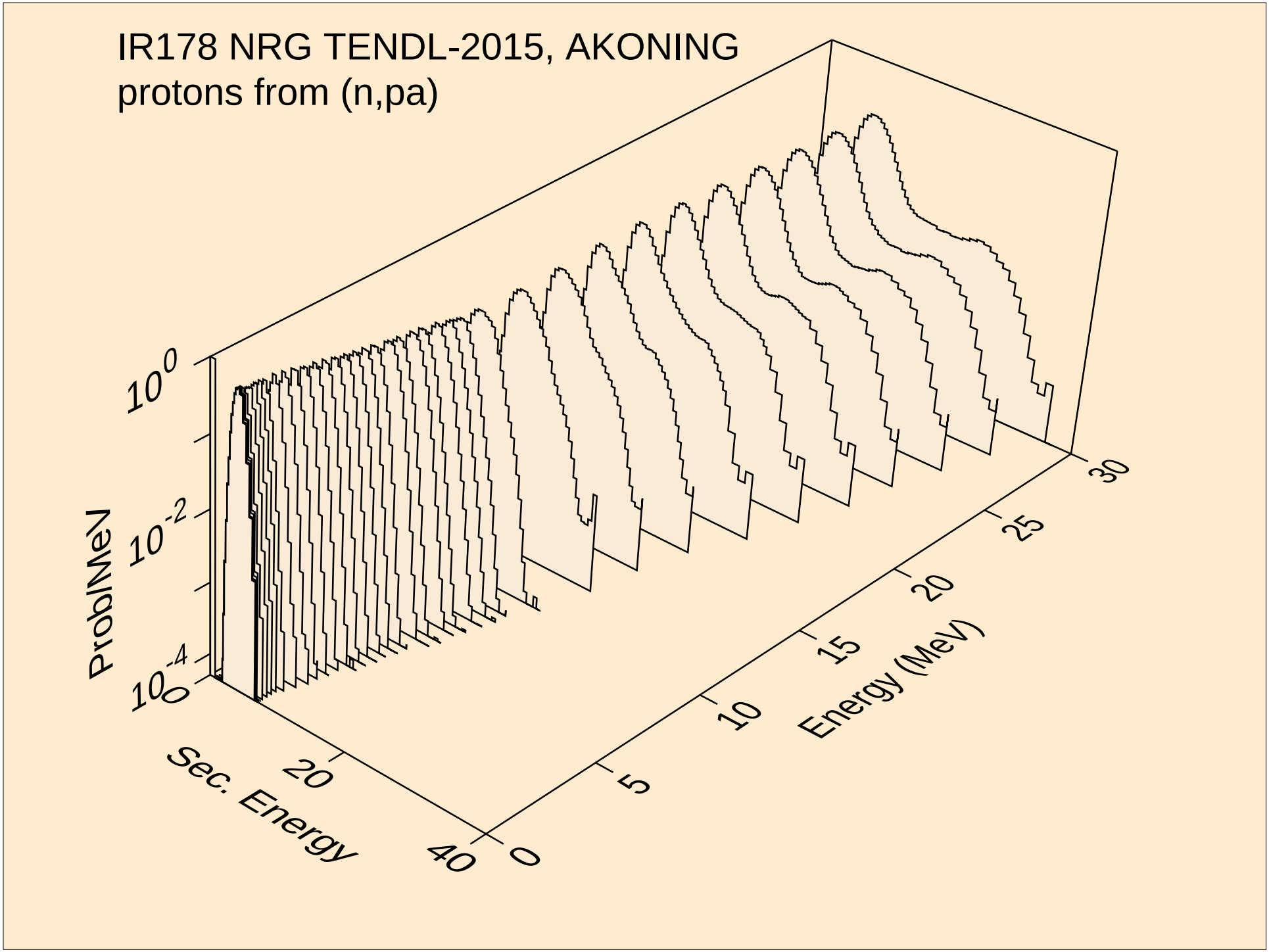

IR178 NRG TENDL-2015, AKONING
protons from (n,3np)
Prob/MeV
10^-1
10^-3
0
Sec. Energy
10
20
18
20
22
24
26
28
30
Energy (MeV)

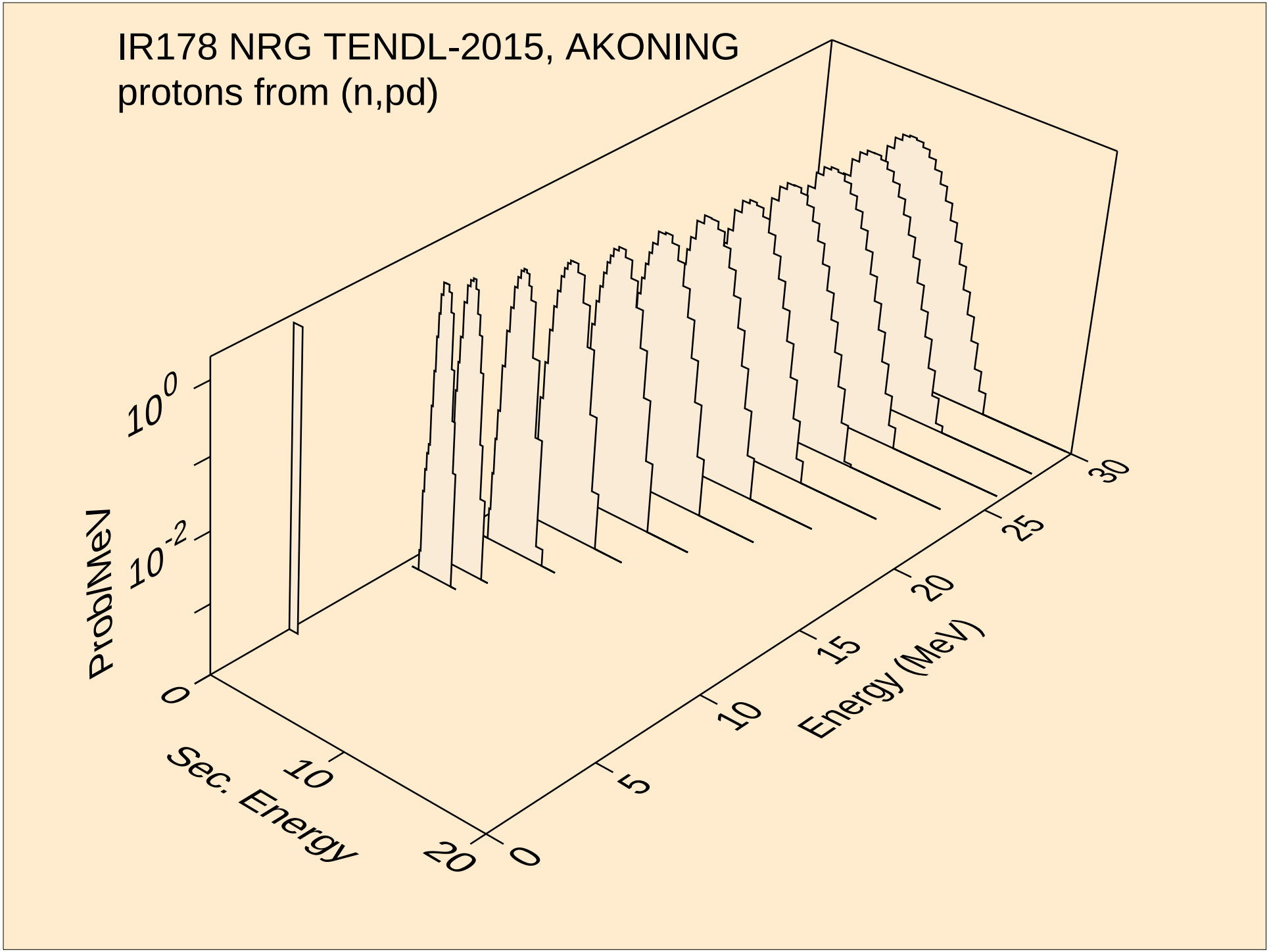

IR178 NRG TENDL-2015, AKONING
protons from (n,2np)
Prob/MeV
10-1
10-3
0
Sec. Energy
10
20
5
10
15
20
25
30
Energy (MeV)

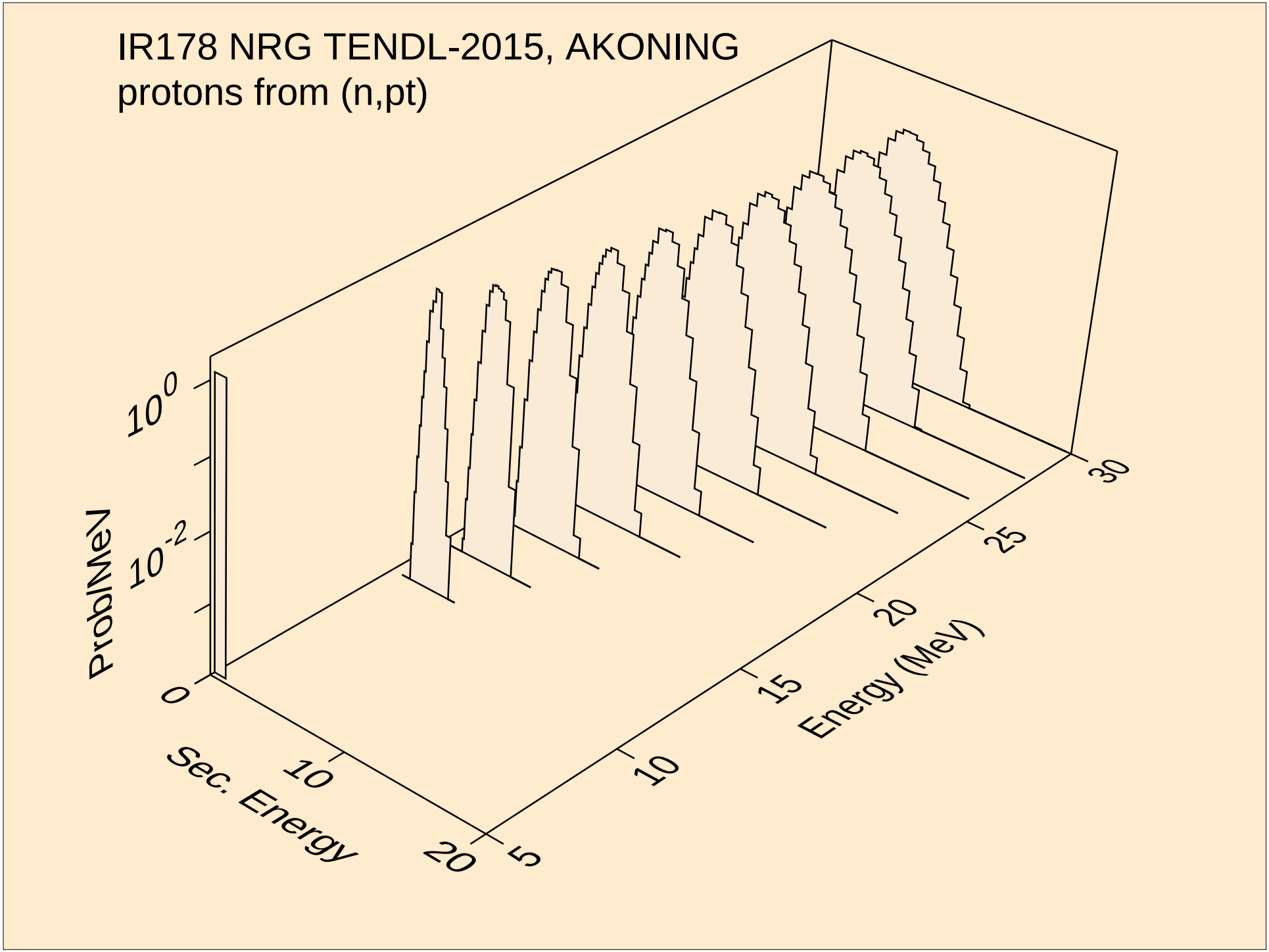

IR178 NRG TENDL-2015, AKONING
protons from (n,npa)
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

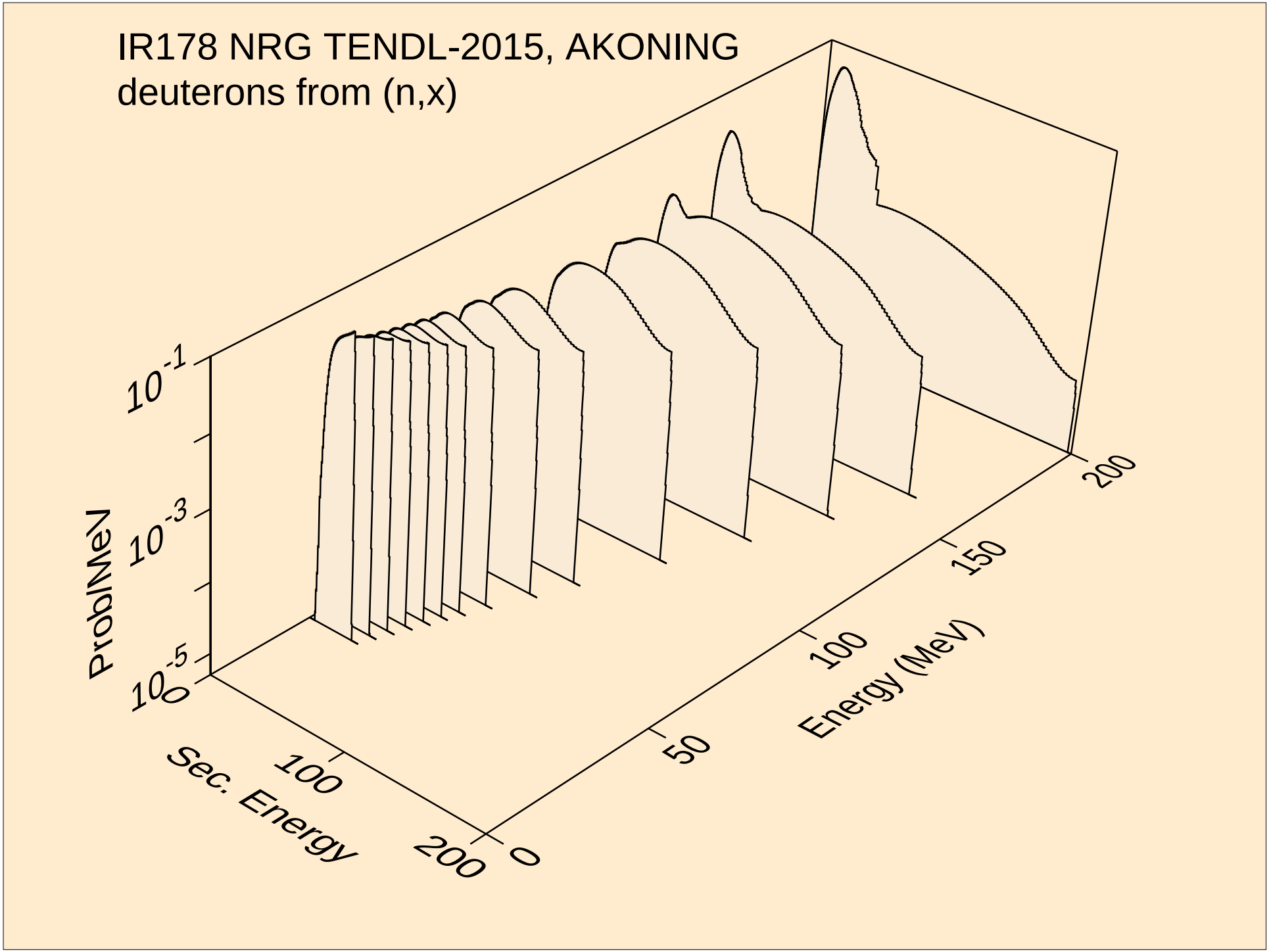

IR178 NRG TENDL-2015, AKONING
protons from (n,p)
Prob/MeV
10-2
10-4
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

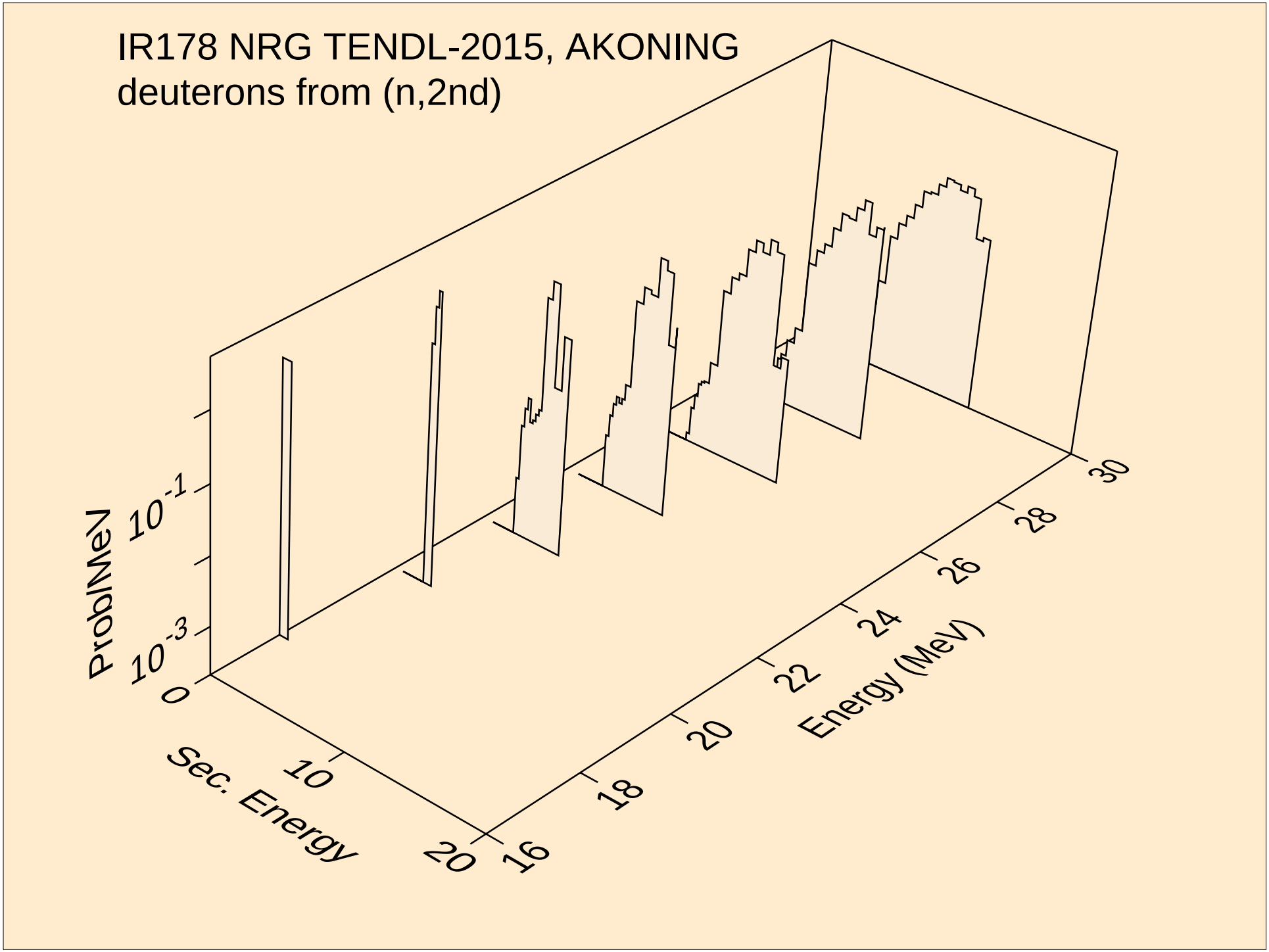

IR178 NRG TENDL-2015, AKONING
protons from (n,2p)
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

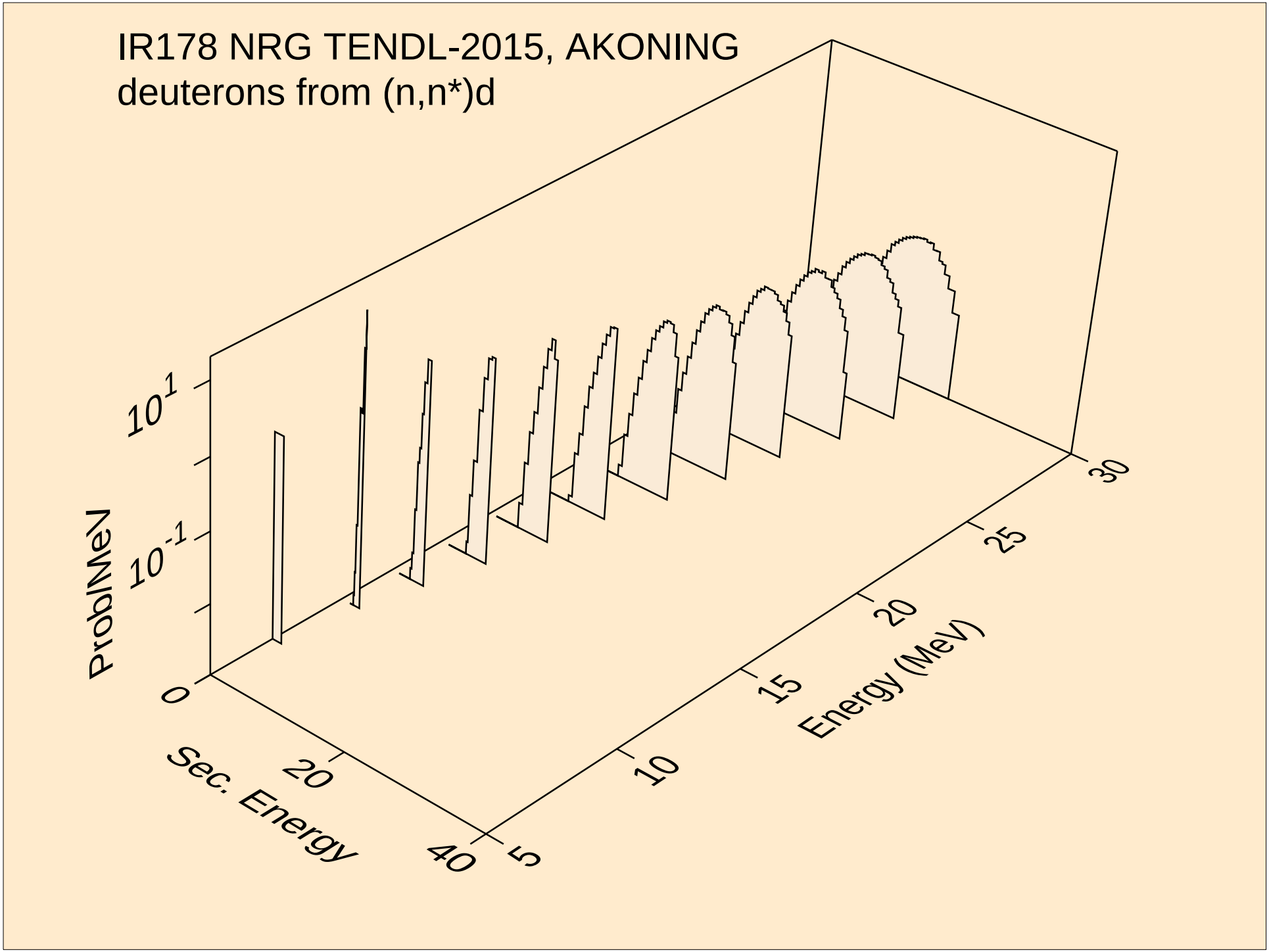

IR178 NRG TENDL-2015, AKONING
protons from (n,pa)
Prob/MeV
10^0
10^-2
10^-4
0
20
40
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

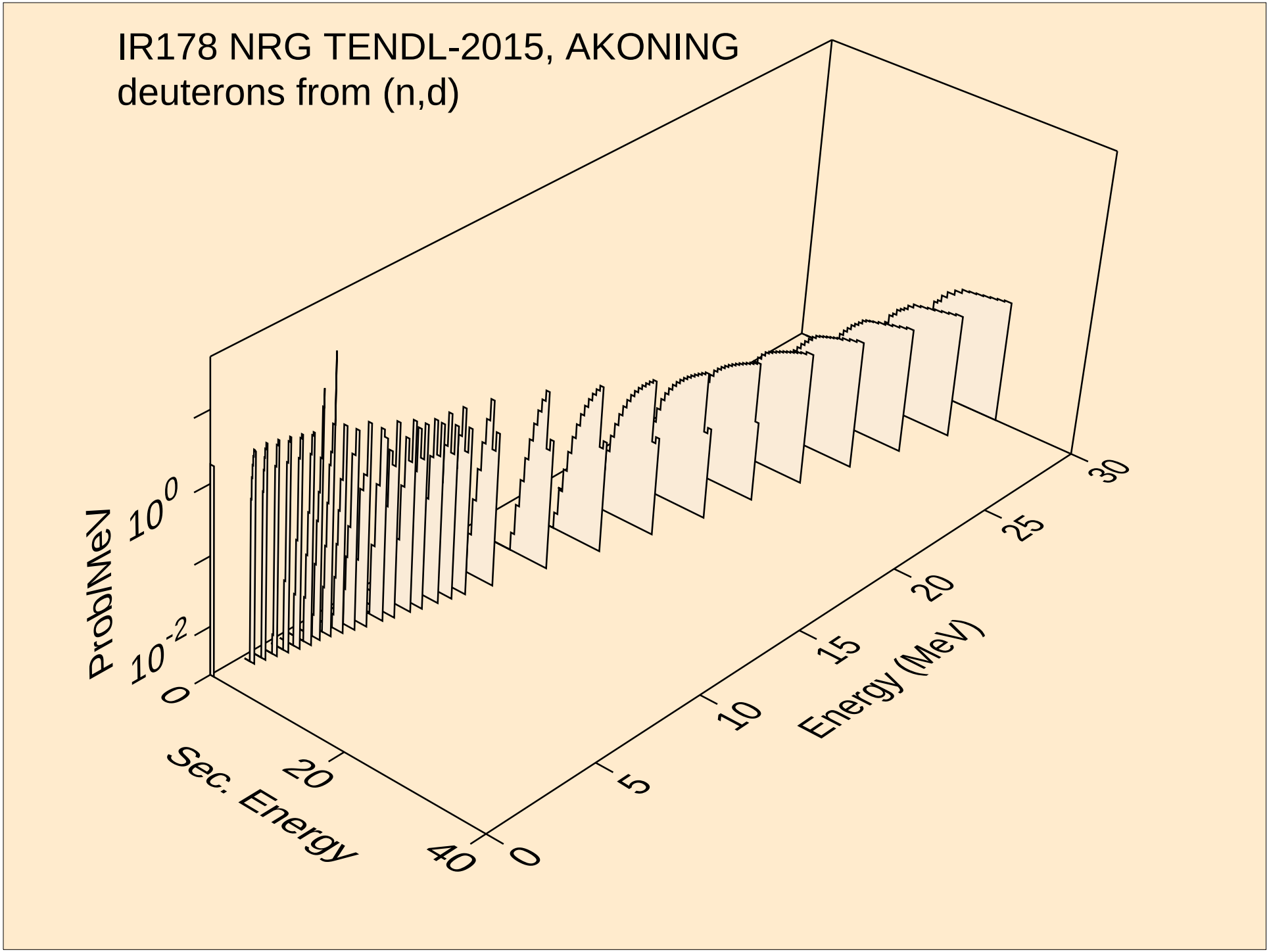

IR178 NRG TENDL-2015, AKONING
protons from (n,pd)
Prob/MeV
10^{0}
10^{-2}
0
10
Sec. Energy
20
0
5
10
15
20
25
30
Energy (MeV)

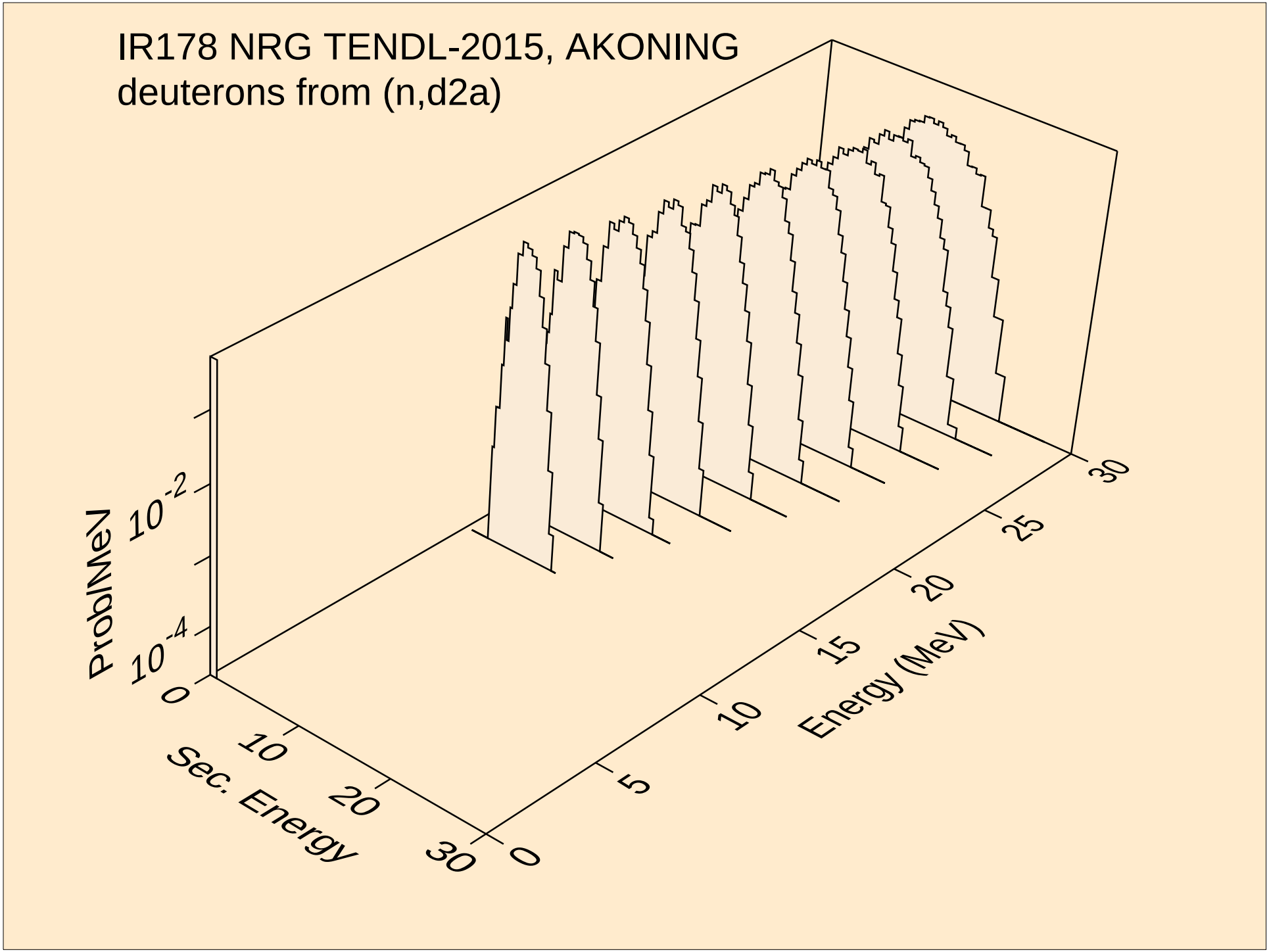

IR178 NRG TENDL-2015, AKONING
protons from (n,pt)
Prob/MeV
10^{0}
10^{-2}
0
Sec. Energy
10
20
5
10
15
20
25
30
Energy (MeV)

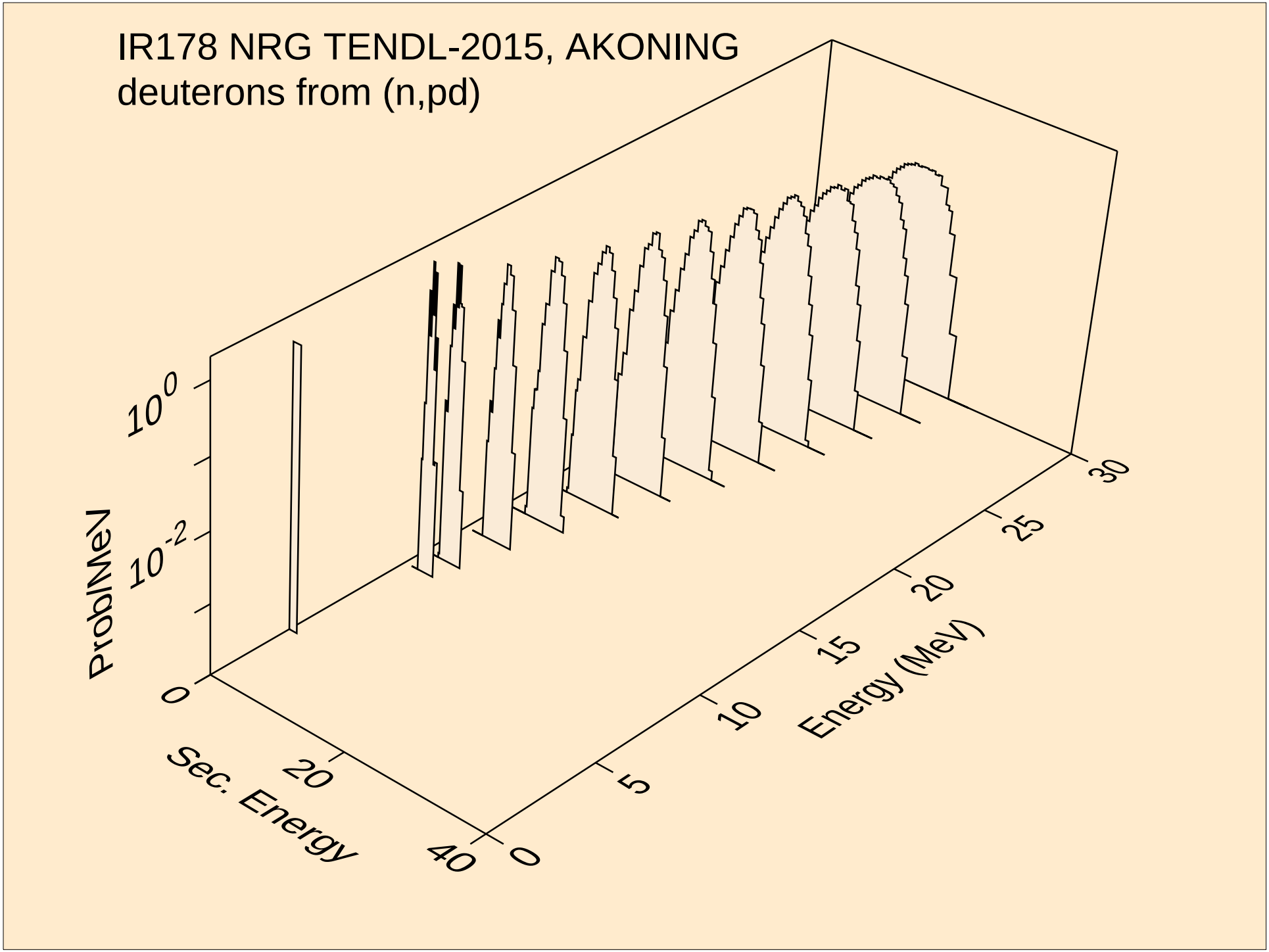

IR178 NRG TENDL-2015, AKONING
deuterons from (n,x)
Prob/MeV
10-1
10-3
10-5
0
100
200
Sec. Energy
0
50
100
150
200
Energy (MeV)

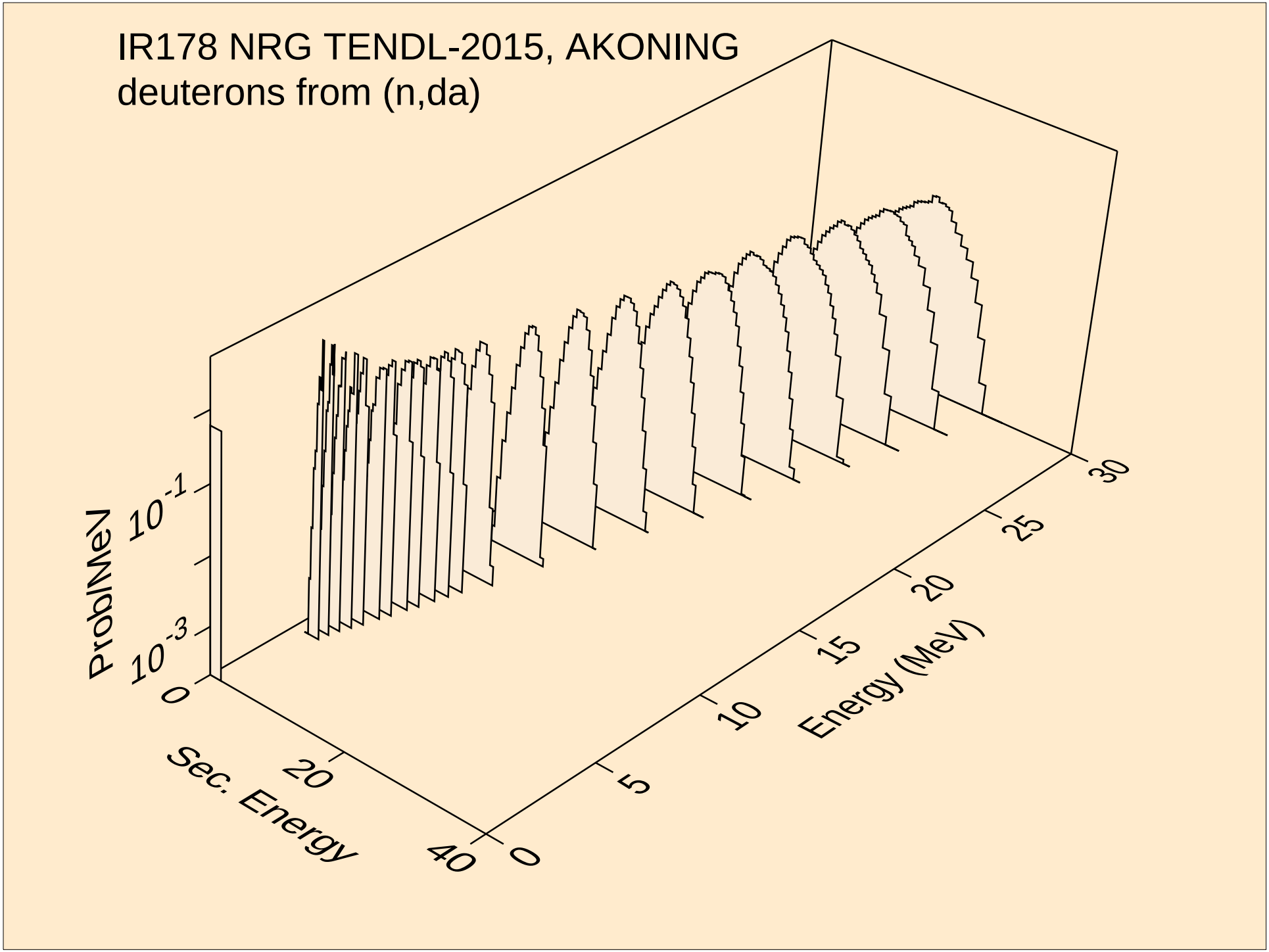

IR178 NRG TENDL-2015, AKONING
deuterons from (n,2nd)
Prob/MeV
10-1
10-3
0
Sec. Energy
10
20
16
18
20
22
24
26
28
30
Energy (MeV)

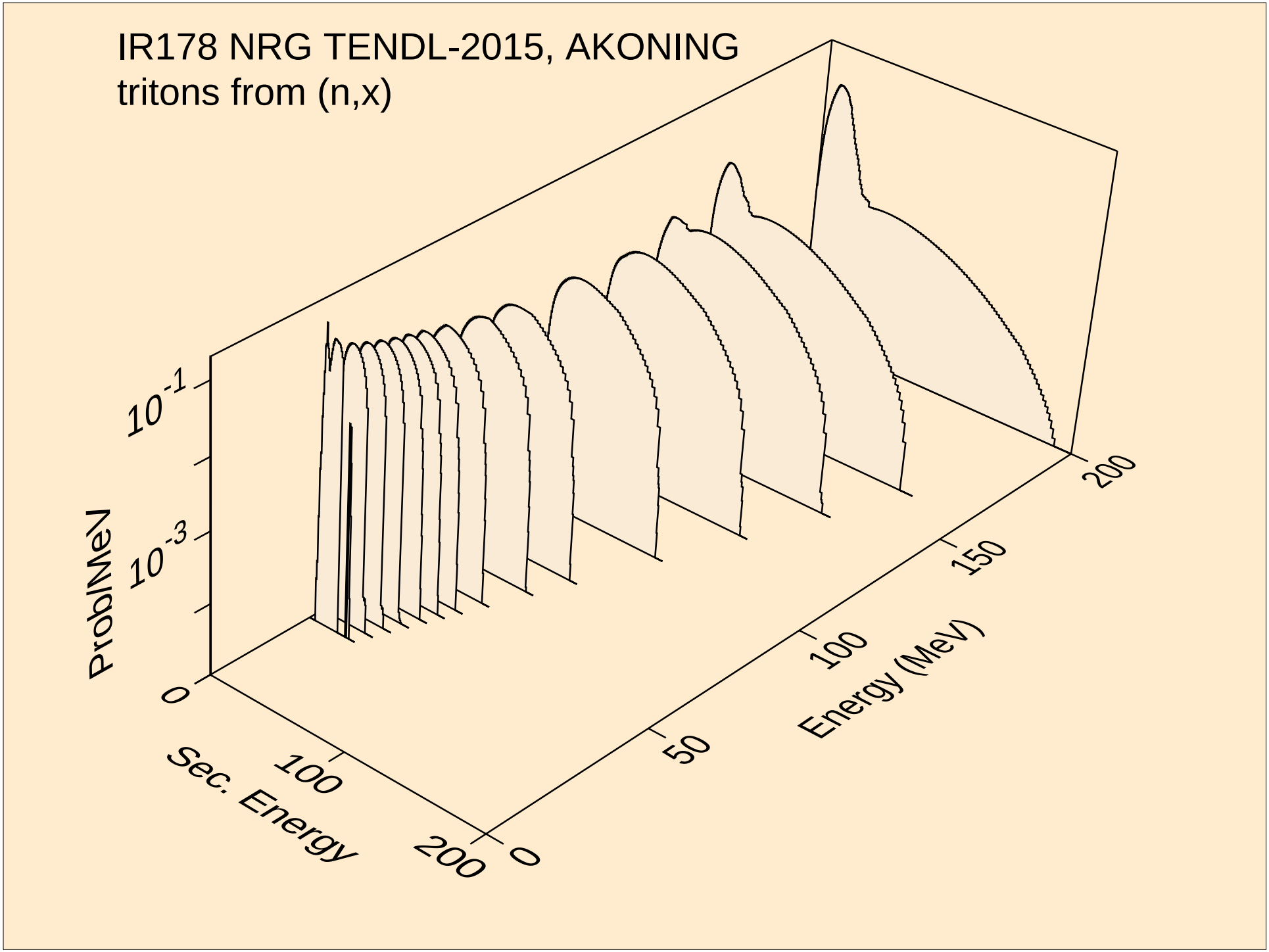

IR178 NRG TENDL-2015, AKONING
deuterons from (n,n*)d
Prob/MeV
10^1
10^-1
0
Sec. Energy
20
40
5
10
15
20
25
30
Energy (MeV)

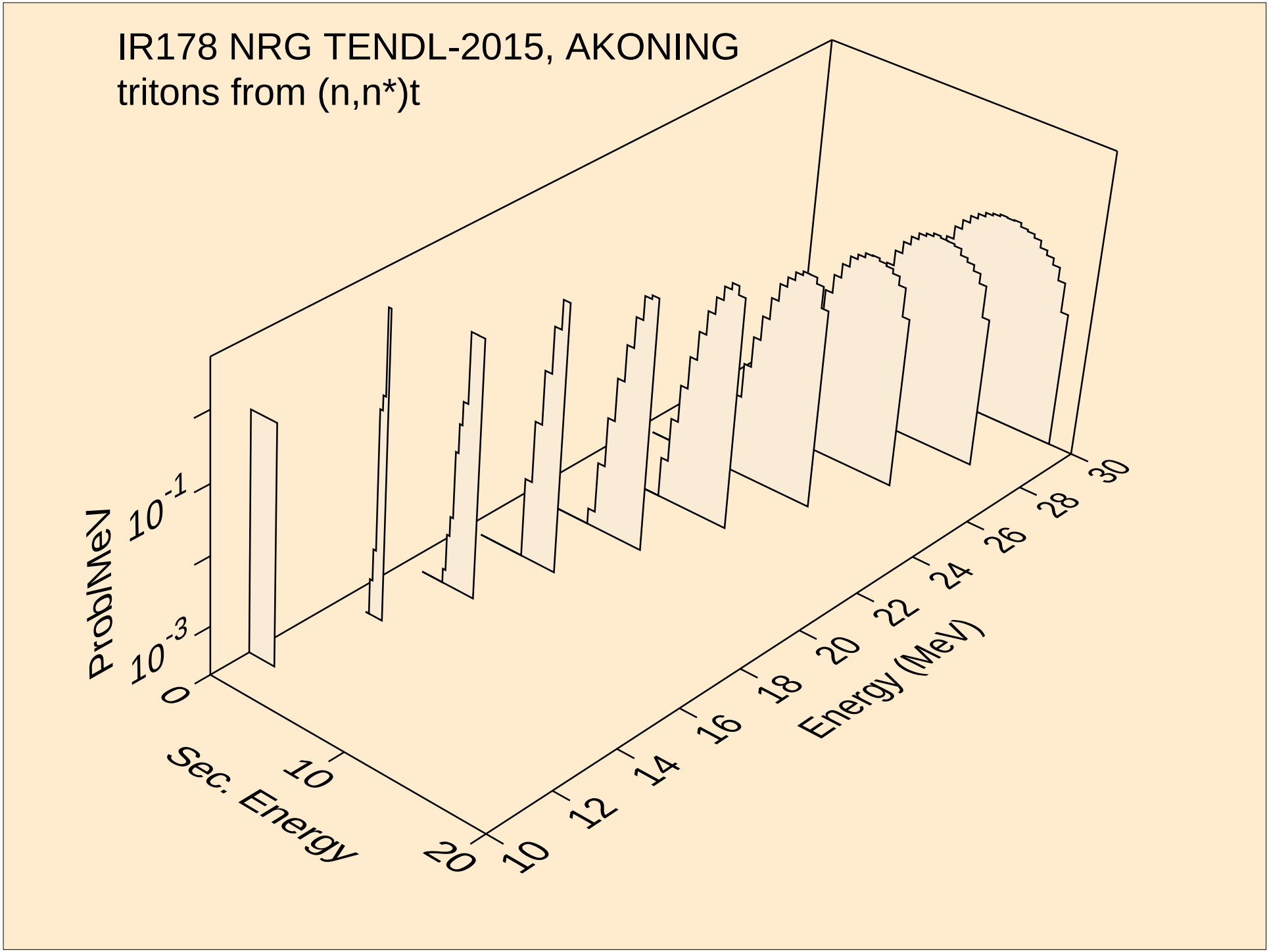

IR178 NRG TENDL-2015, AKONING
deuterons from (n,d)
Prob/MeV
10^0
10^-2
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

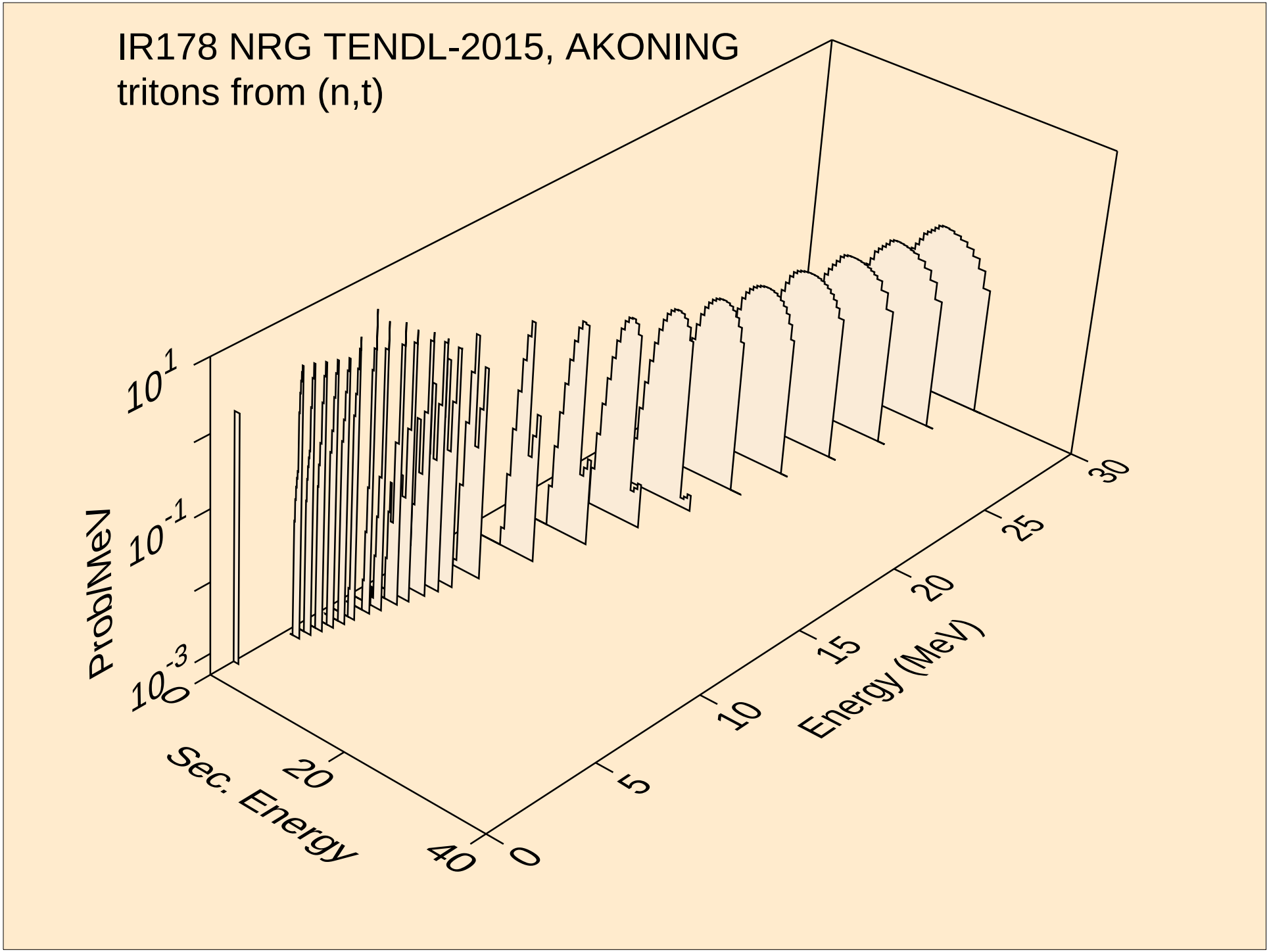

IR178 NRG TENDL-2015, AKONING
deuterons from (n,d2a)
Prob/MeV
10-2
10-4
0
10
20
30
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

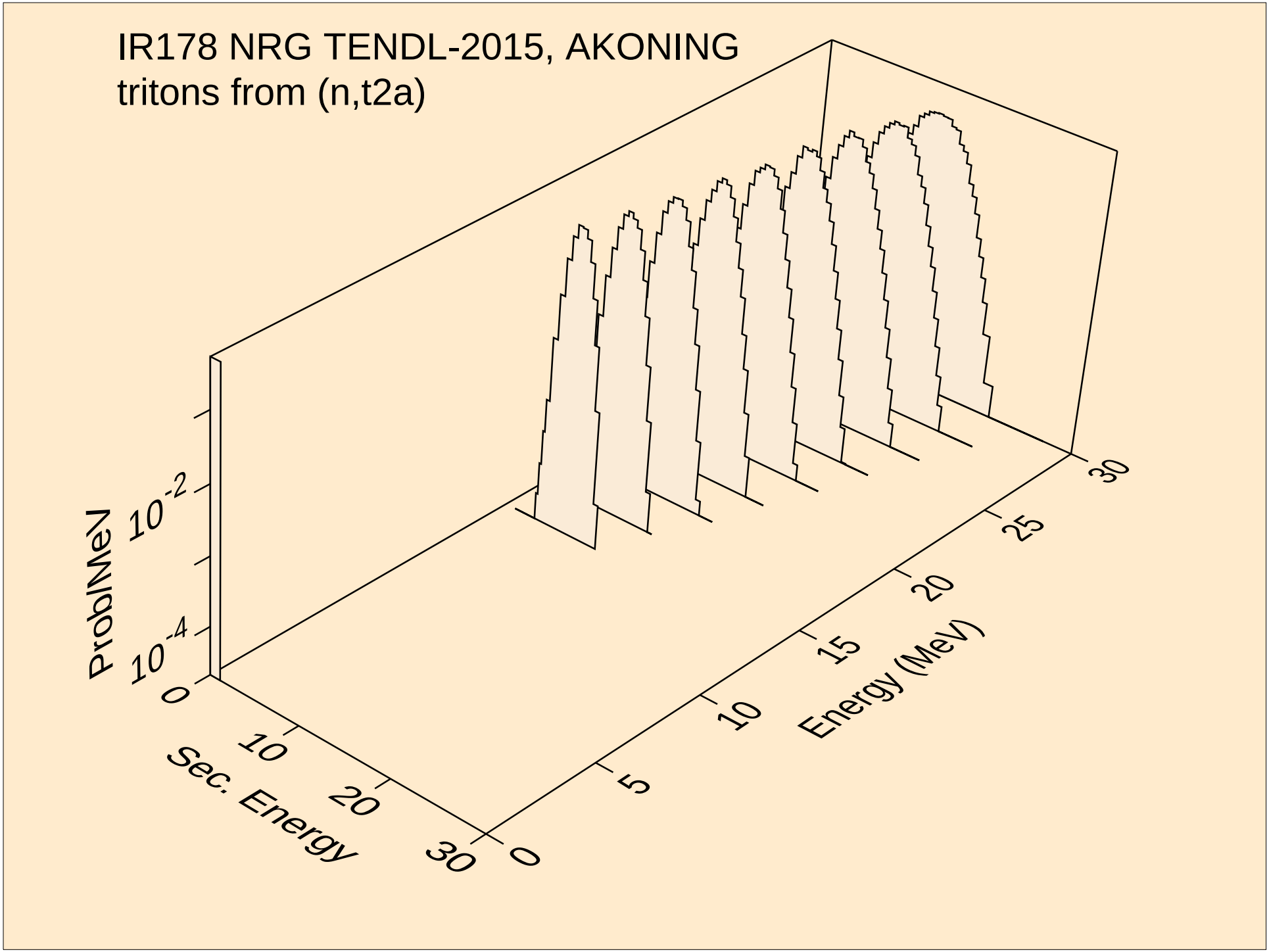

IR178 NRG TENDL-2015, AKONING
deuterons from (n,pd)
Prob/MeV
10^0
10^-2
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

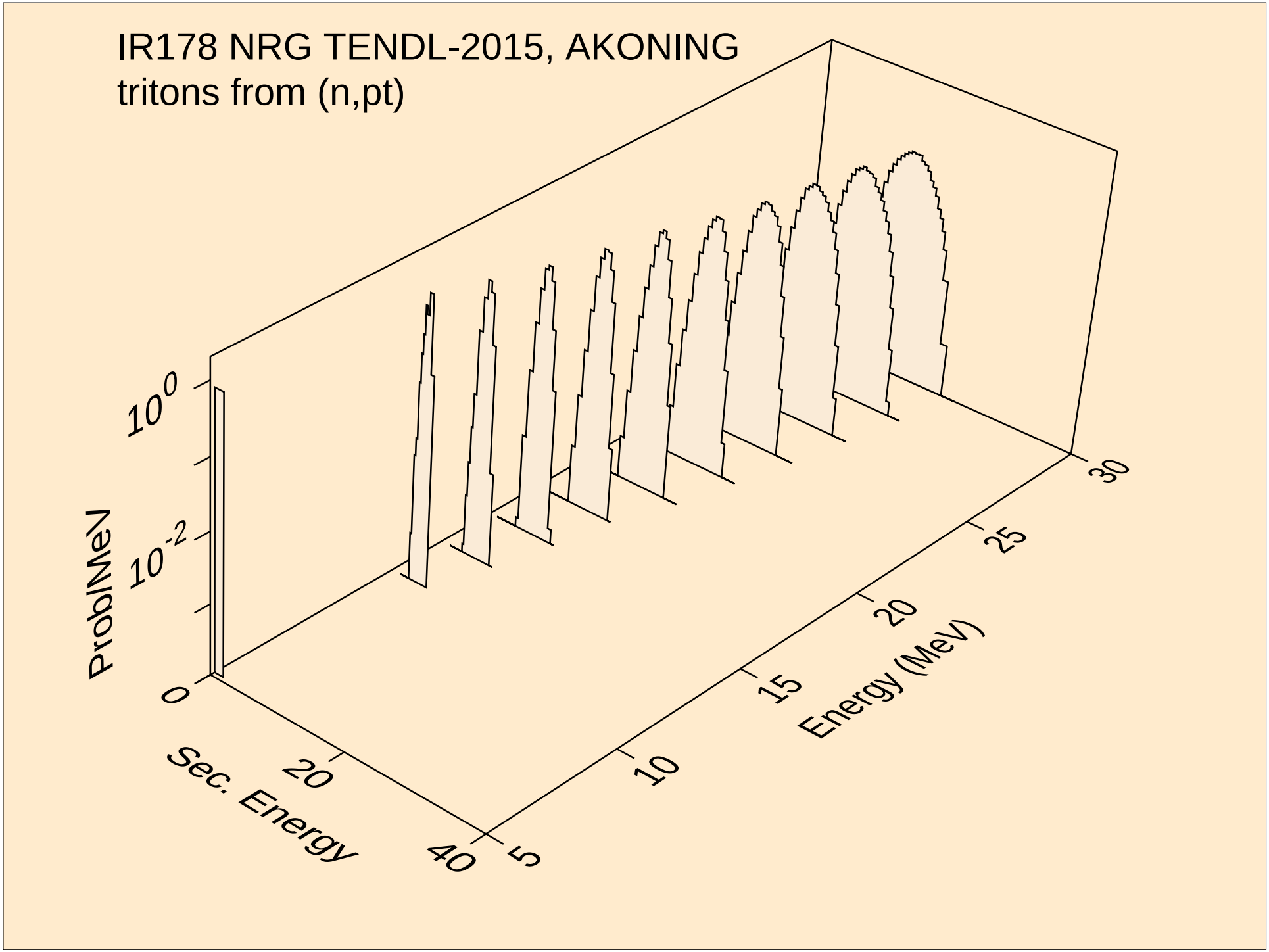

IR178 NRG TENDL-2015, AKONING
deuterons from (n,da)
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

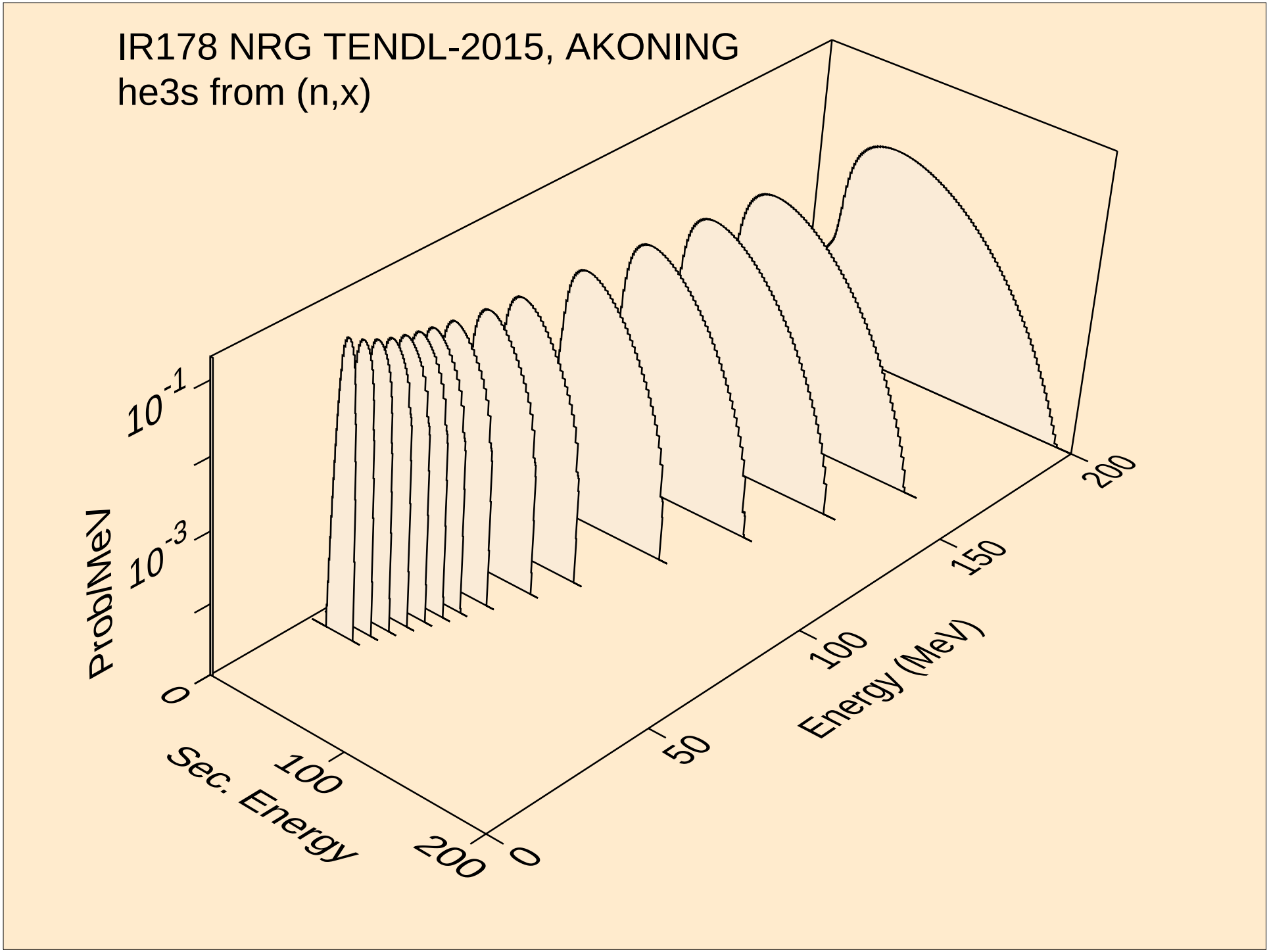

IR178 NRG TENDL-2015, AKONING
tritons from (n,x)
Prob/MeV
10-1
10-3
0
Sec. Energy
100
200
0
50
100
150
200
Energy (MeV)

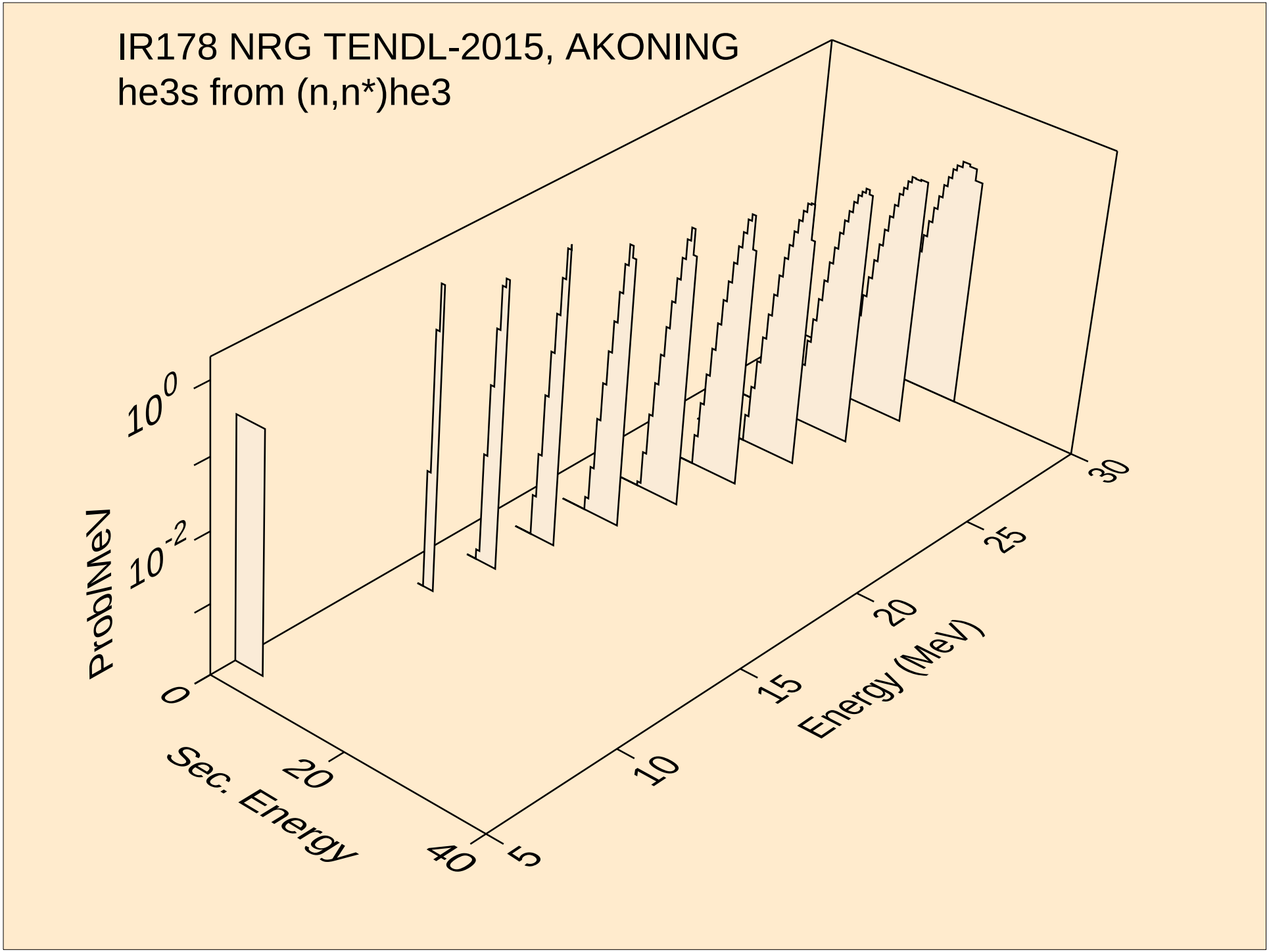

IR178 NRG TENDL-2015, AKONING
tritons from (n,n*)t
Prob/MeV
10-1
10-3
0
Sec. Energy
10
20
10
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

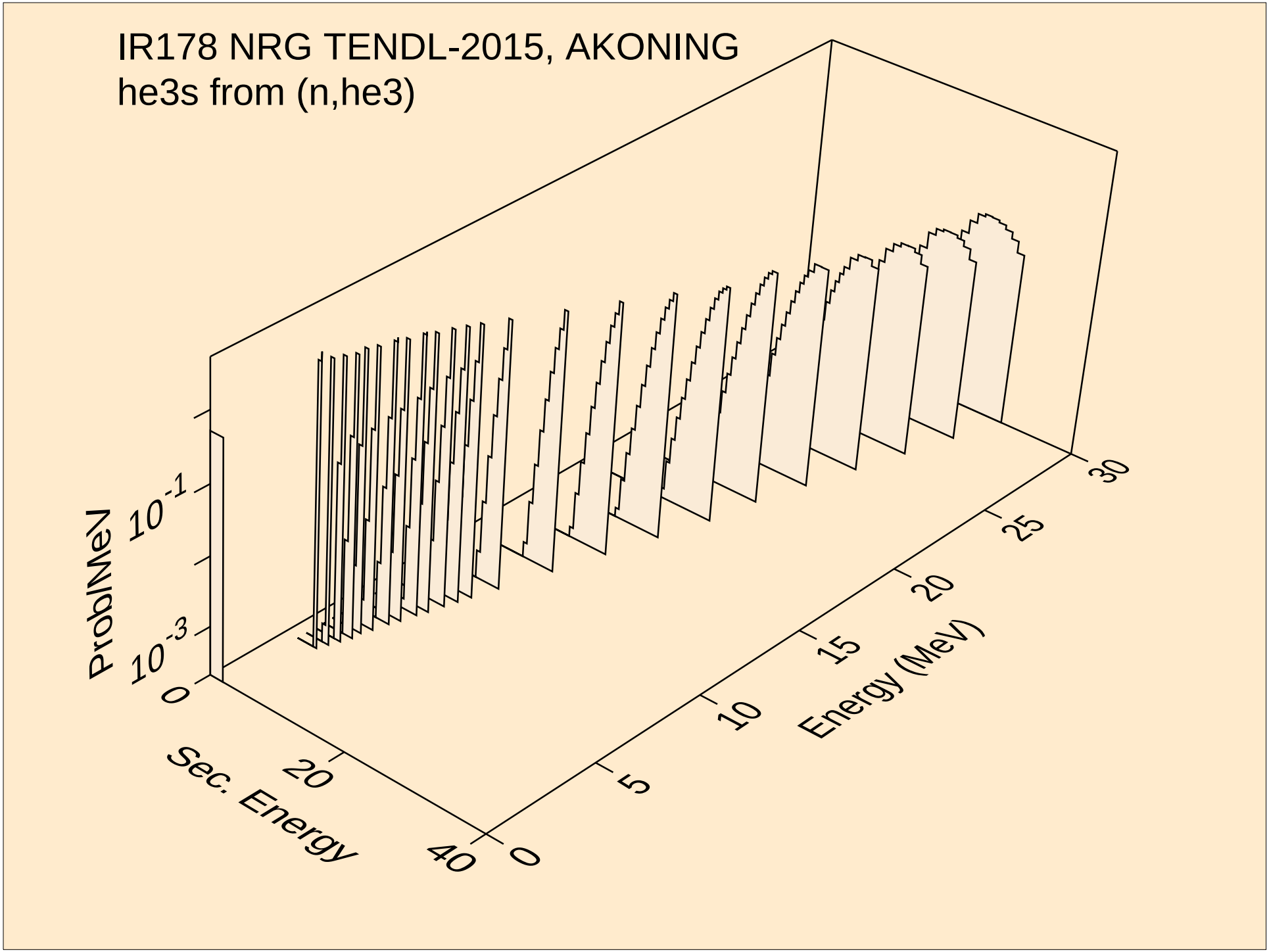

IR178 NRG TENDL-2015, AKONING
tritons from (n,t)
Prob/MeV
10^1
10^-1
10^-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

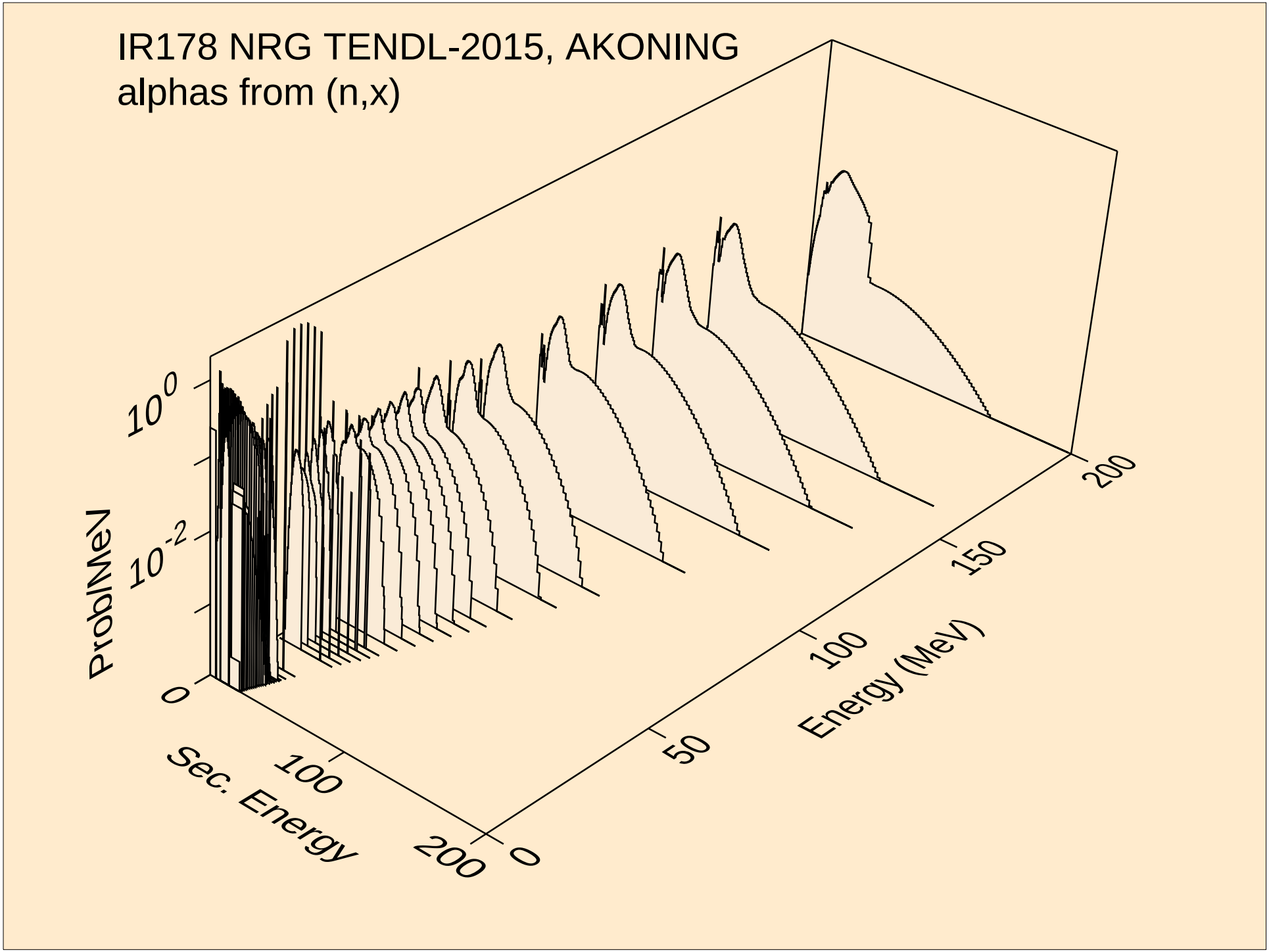

IR178 NRG TENDL-2015, AKONING
tritons from (n,t2a)
Prob/MeV
10-2
10-4
0
10
20
30
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

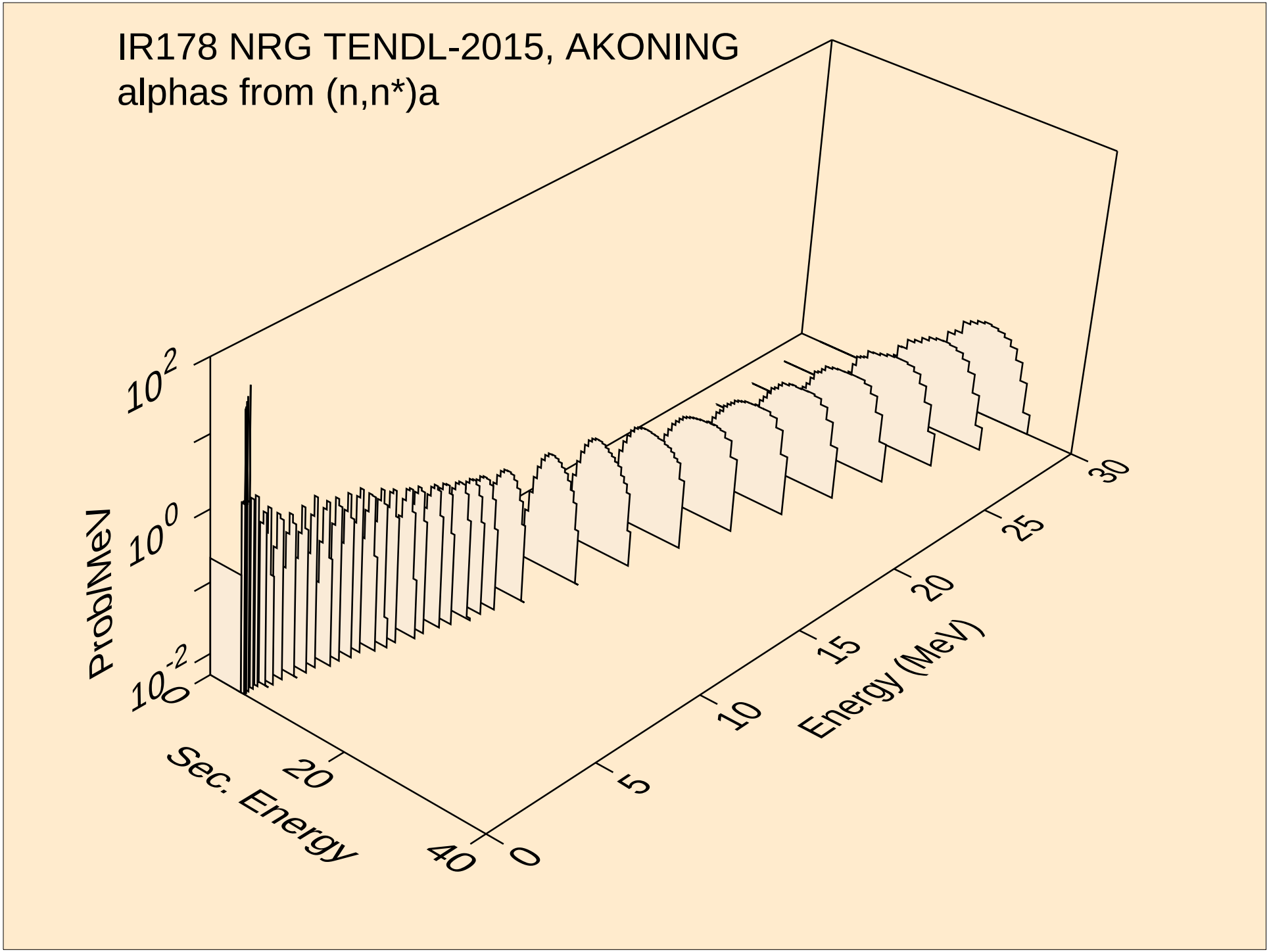

IR178 NRG TENDL-2015, AKONING
tritons from (n,pt)
Prob/MeV
10^0
10^-2
0
Sec. Energy
20
40
5
10
15
Energy (MeV)
20
25
30

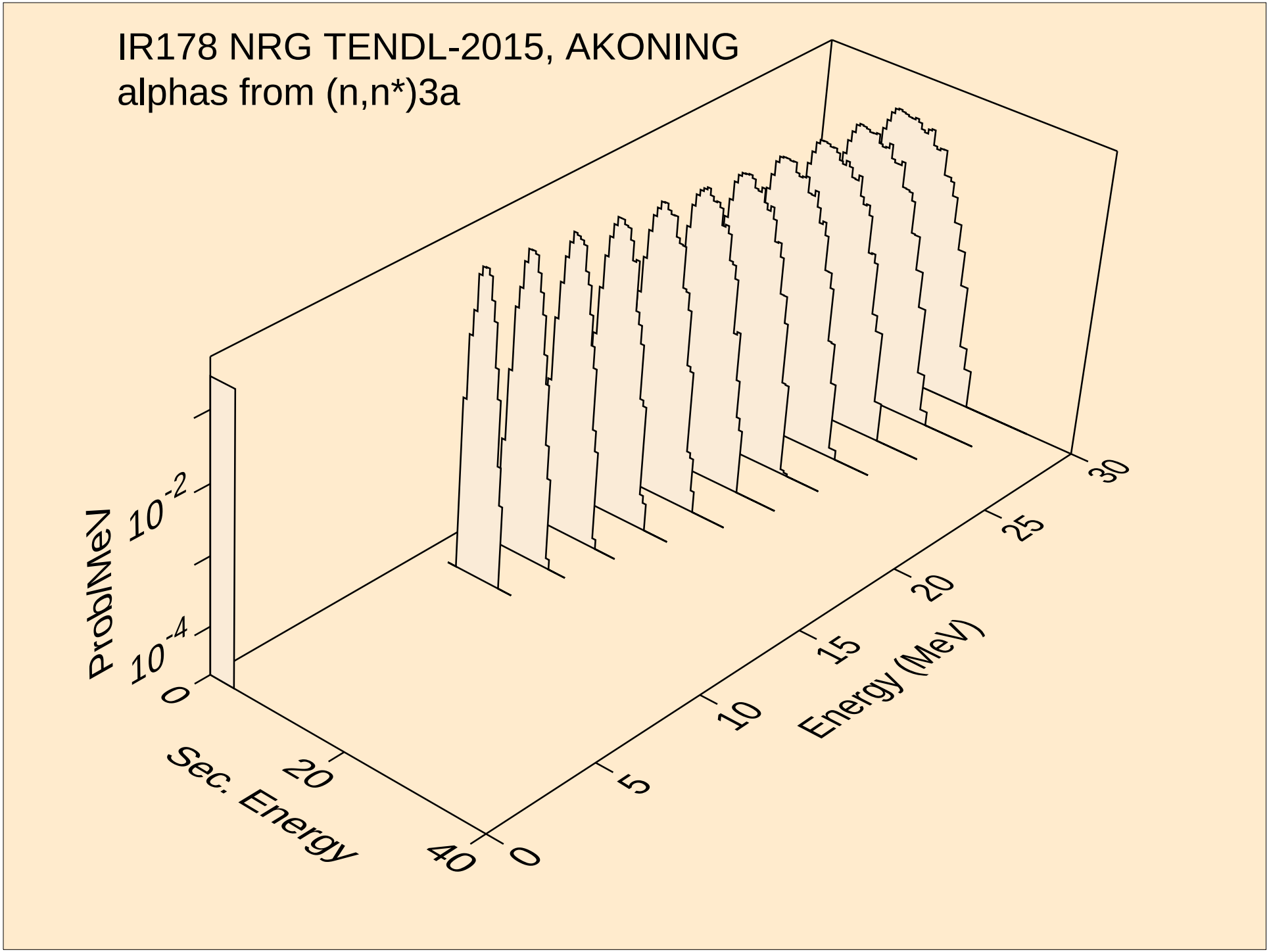

IR178 NRG TENDL-2015, AKONING
he3s from (n,x)
Prob/MeV
10-1
10-3
0
Sec. Energy
100
200
0
50
100
150
200
Energy (MeV)

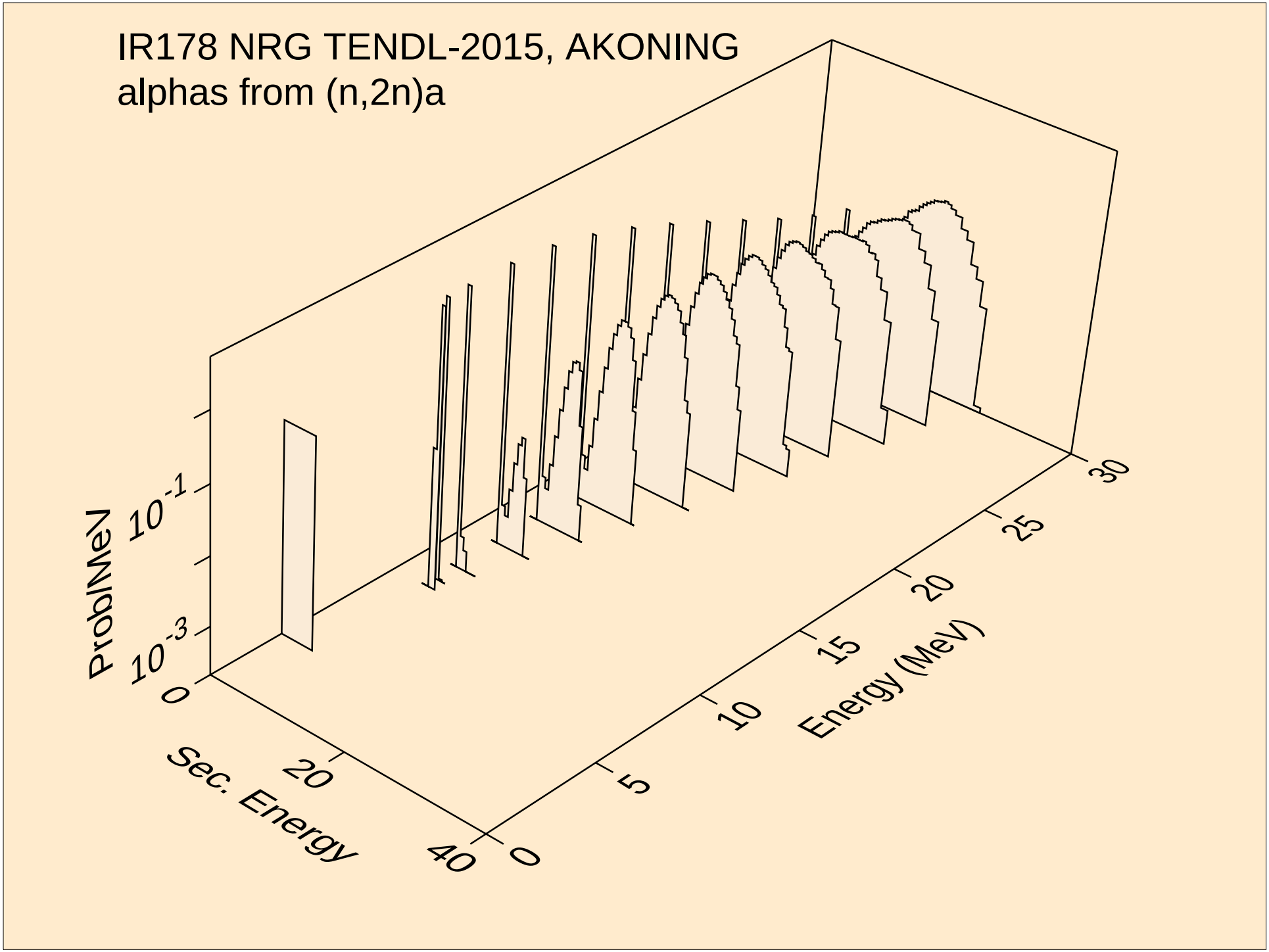

IR178 NRG TENDL-2015, AKONING
he3s from (n,n*)he3
Prob/MeV
10^0
10^-2
0
Sec. Energy
20
40
5
10
15
20
25
30
Energy (MeV)

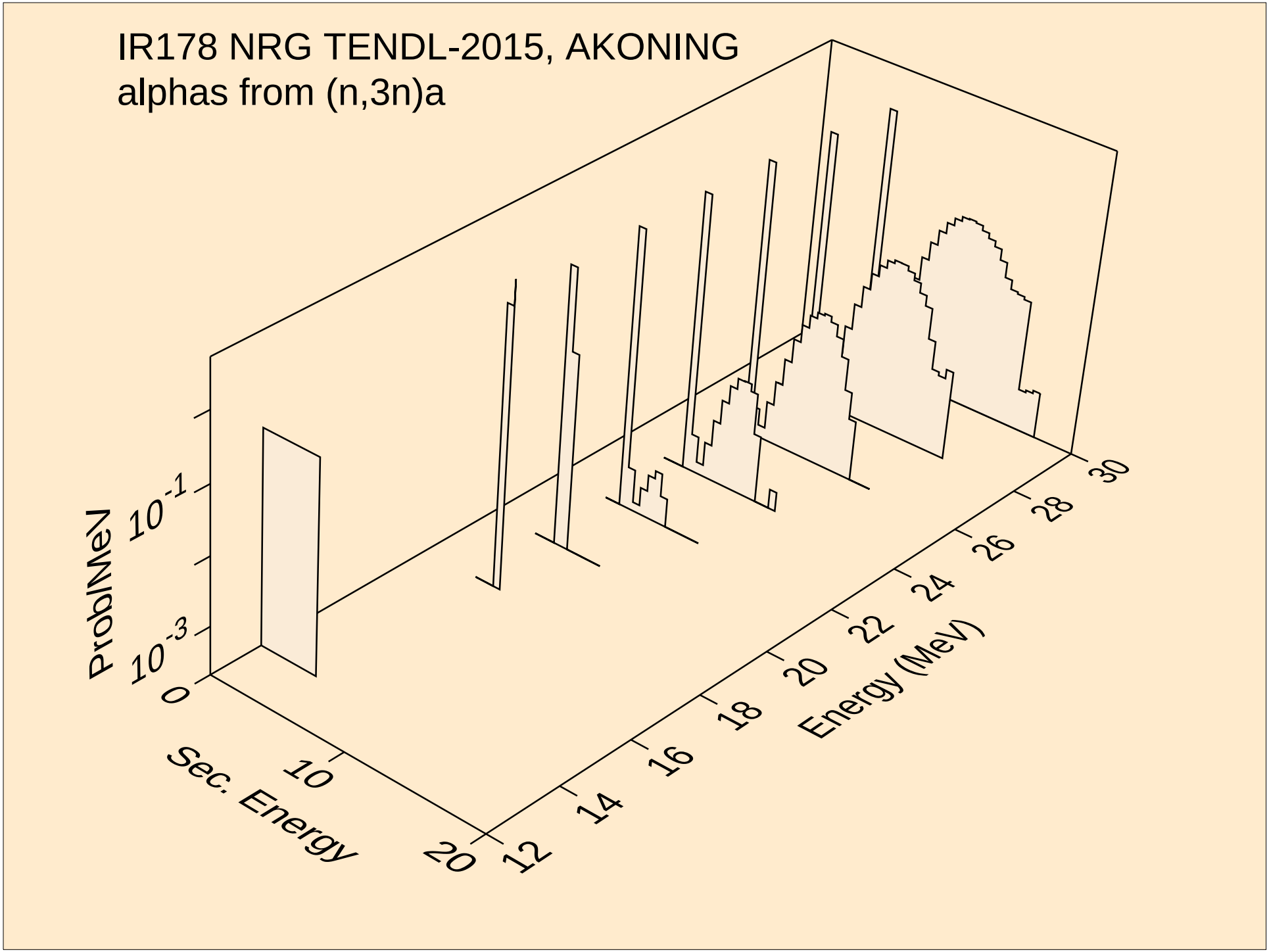

IR178 NRG TENDL-2015, AKONING
he3s from (n,he3)
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

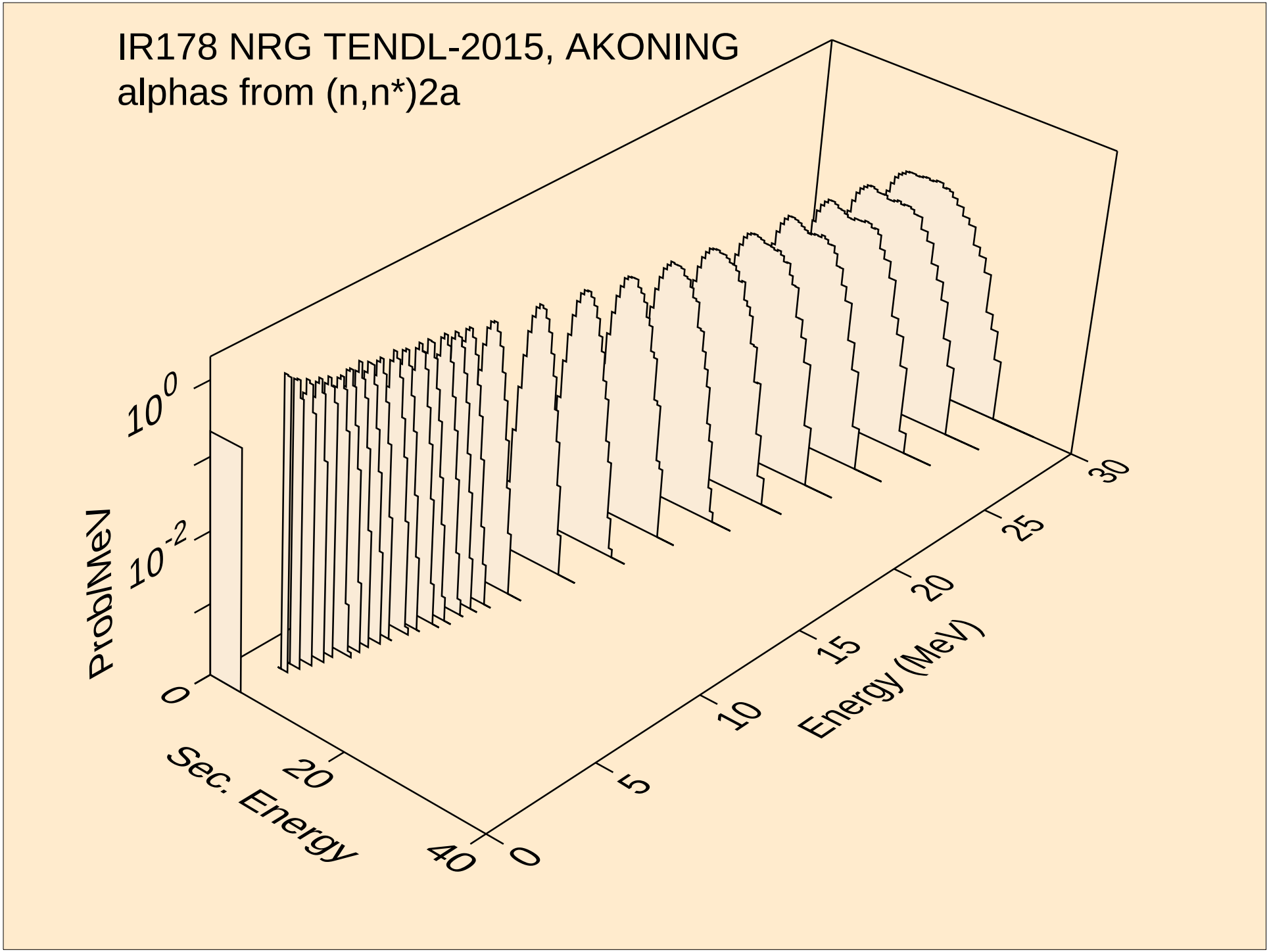

IR178 NRG TENDL-2015, AKONING
alphas from (n,x)
Prob/MeV
10^{0}
10^{-2}
0
Sec. Energy
100
200
0
50
100
150
200
Energy (MeV)

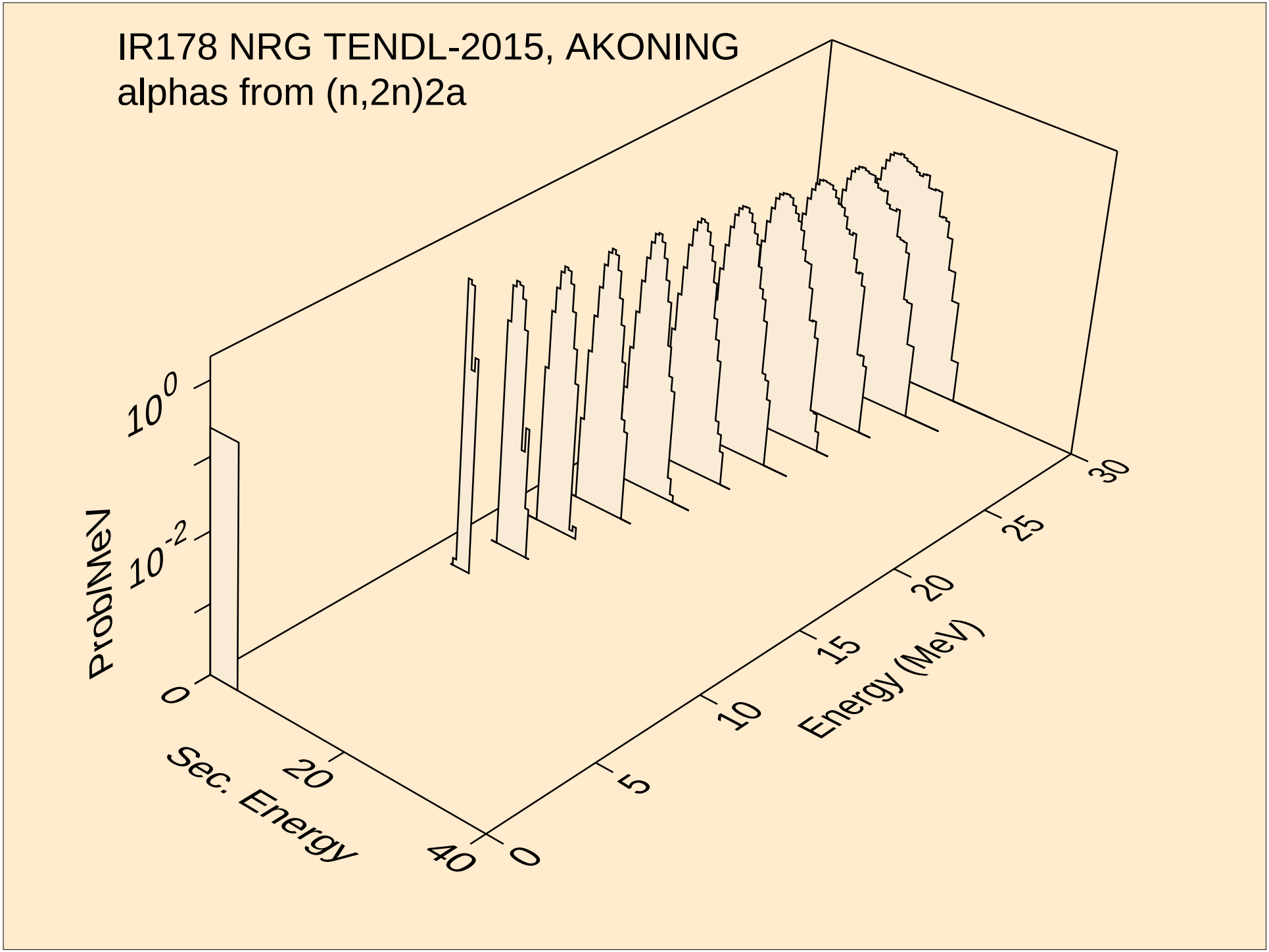

IR178 NRG TENDL-2015, AKONING
alphas from (n,n*)a
Prob/MeV
10^{2}
10^{0}
10^{-2}
0
20
40
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

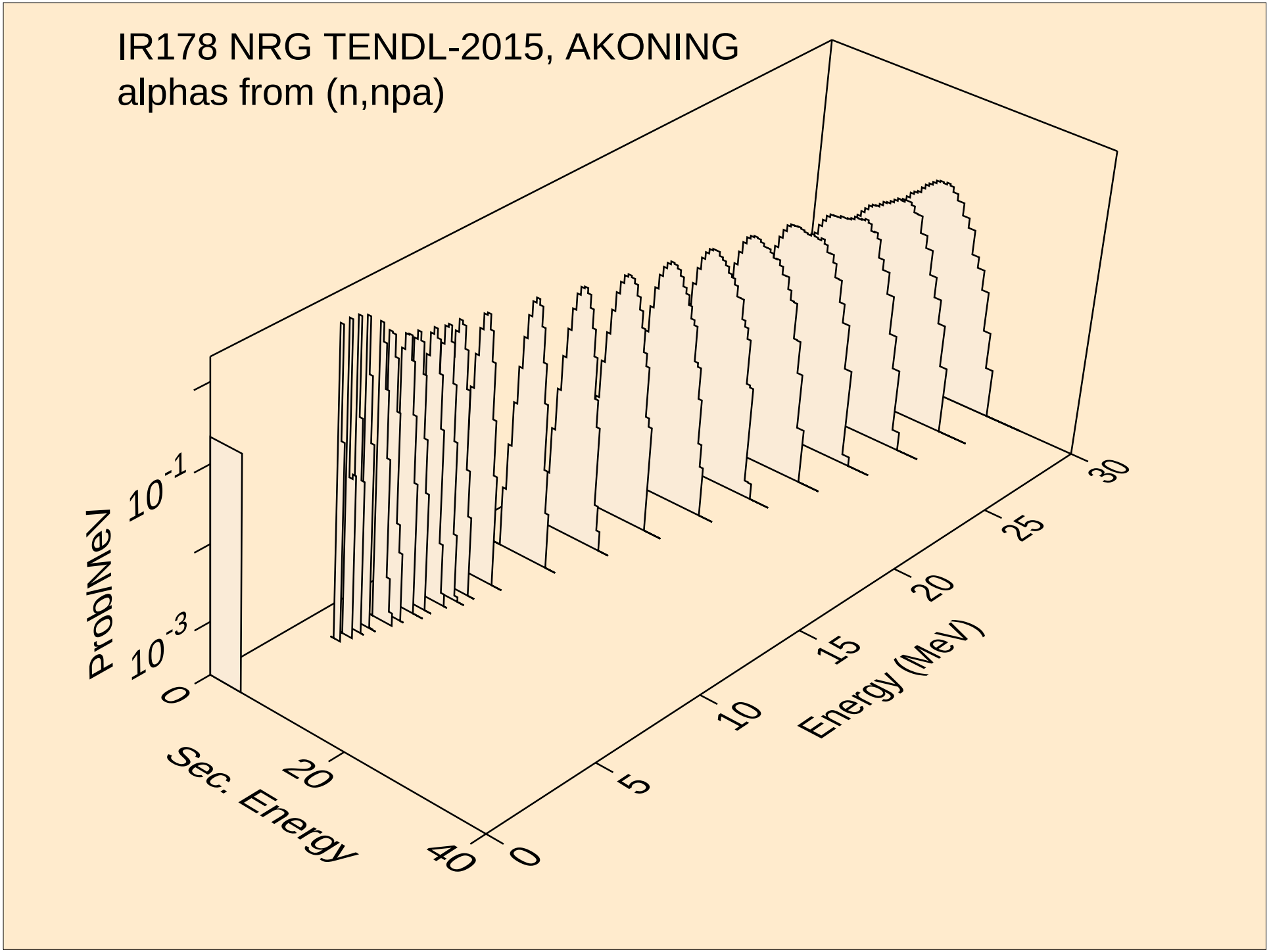

IR178 NRG TENDL-2015, AKONING
alphas from (n,n*)3a
Prob/MeV
10-2
10-4
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

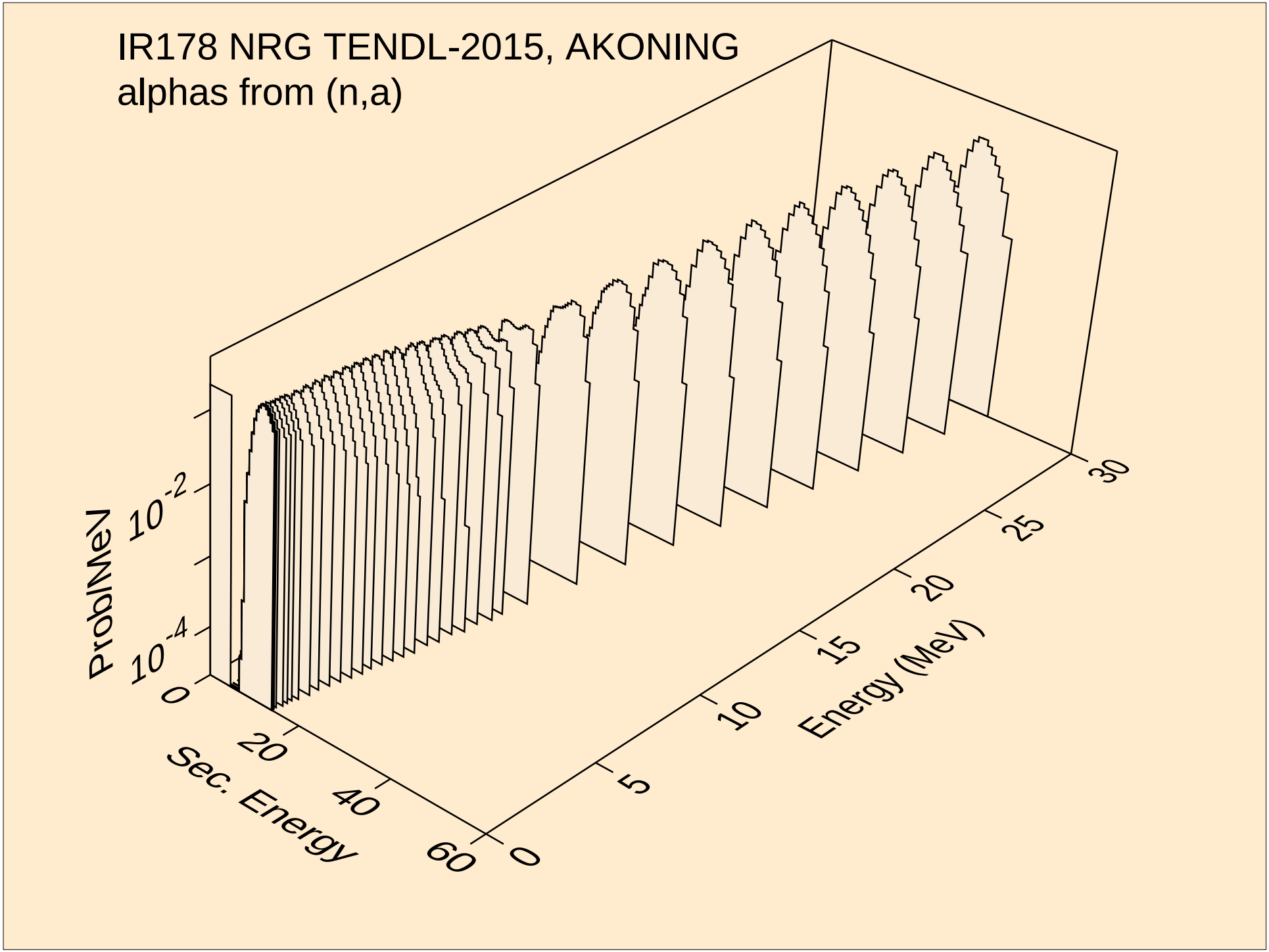

IR178 NRG TENDL-2015, AKONING
alphas from (n,2n)a
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

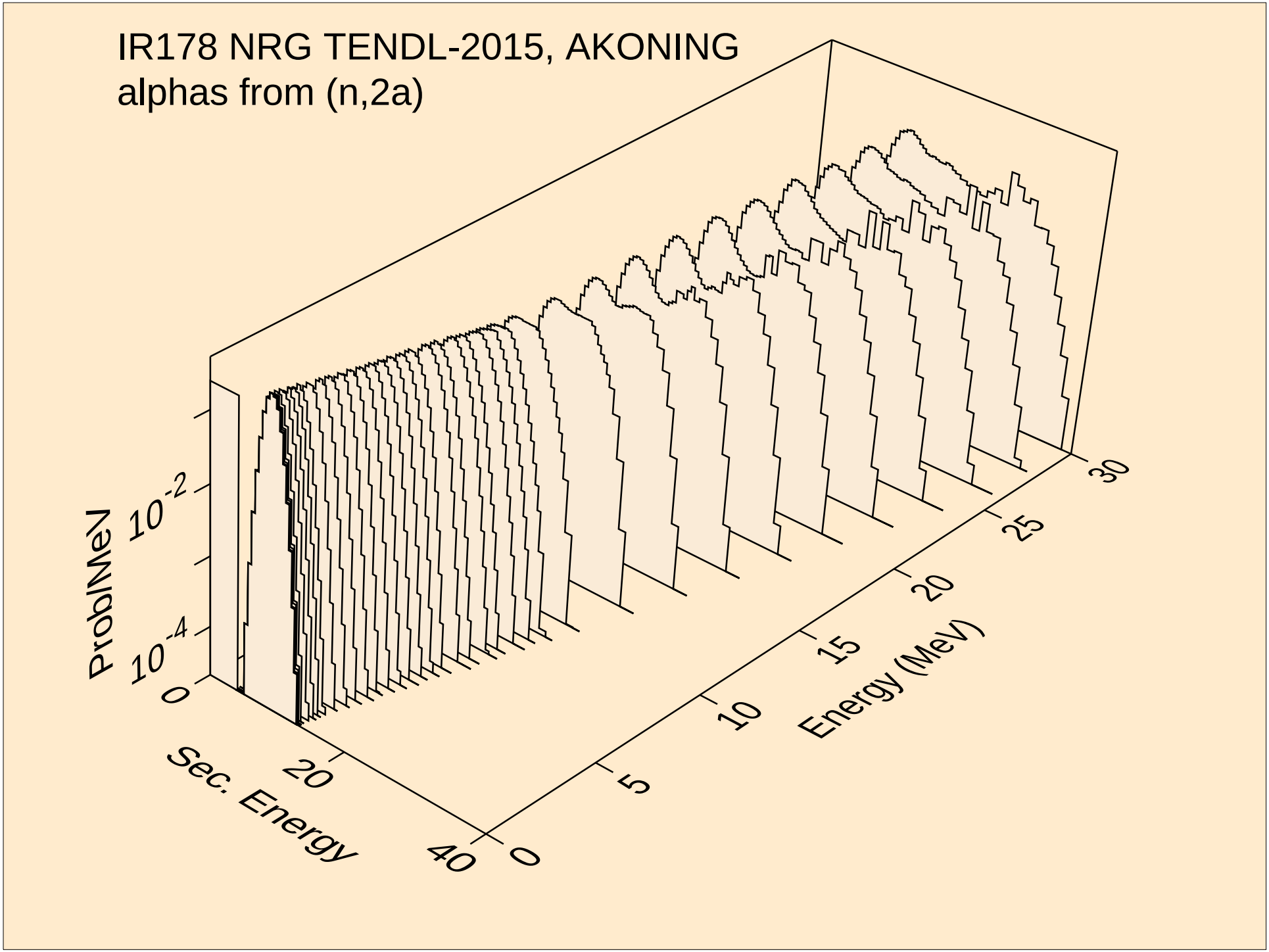

IR178 NRG TENDL-2015, AKONING
alphas from (n,3n)a
Prob/MeV
10^-1
10^-3
0
Sec. Energy
10
20
12
14
16
18
20
22
24
26
28
30
Energy (MeV)

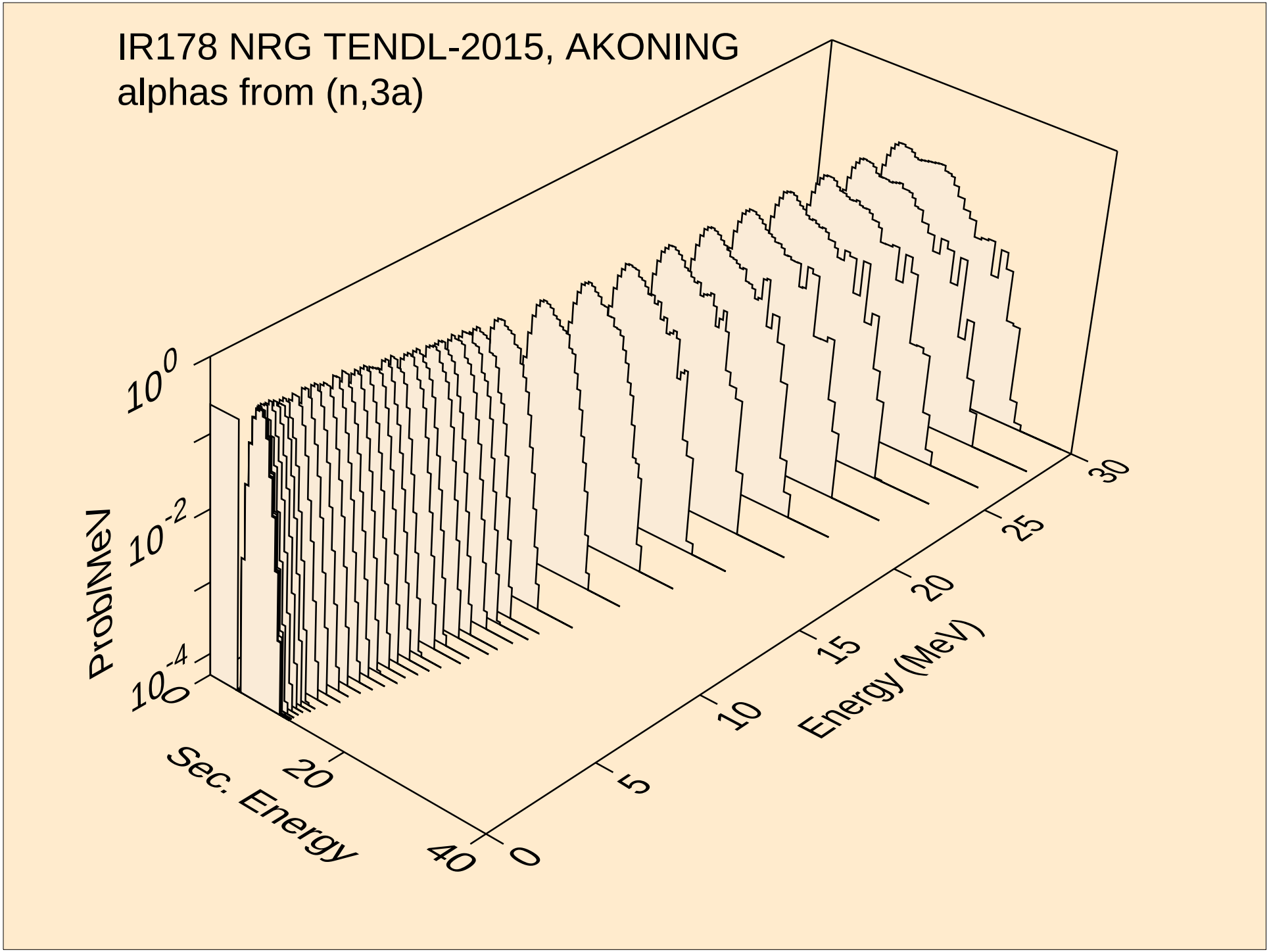

IR178 NRG TENDL-2015, AKONING
alphas from (n,n*)2a
Prob/MeV
10^0
10^-2
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

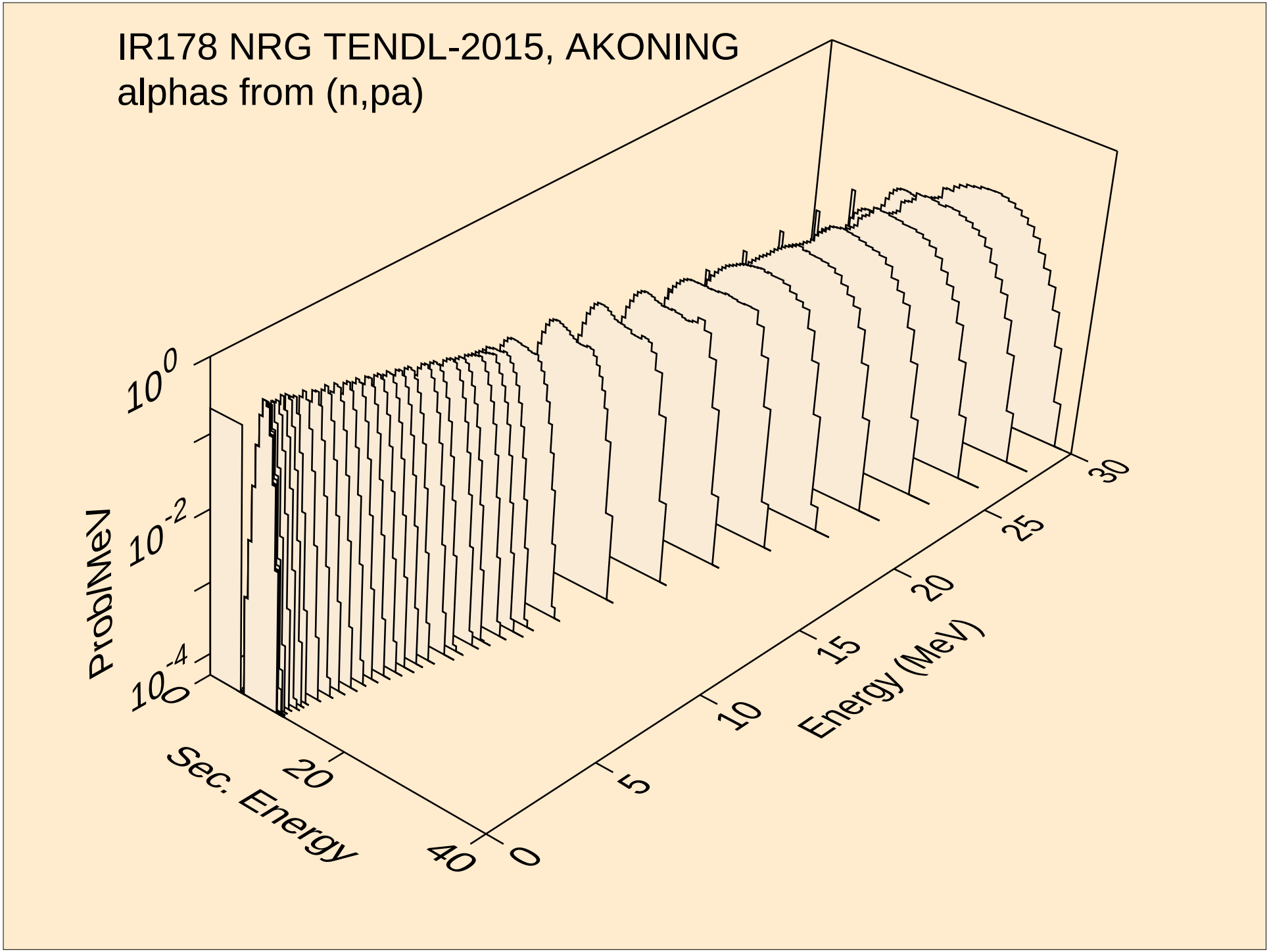

IR178 NRG TENDL-2015, AKONING
alphas from (n,2n)2a
Prob/MeV
10^0
10^-2
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

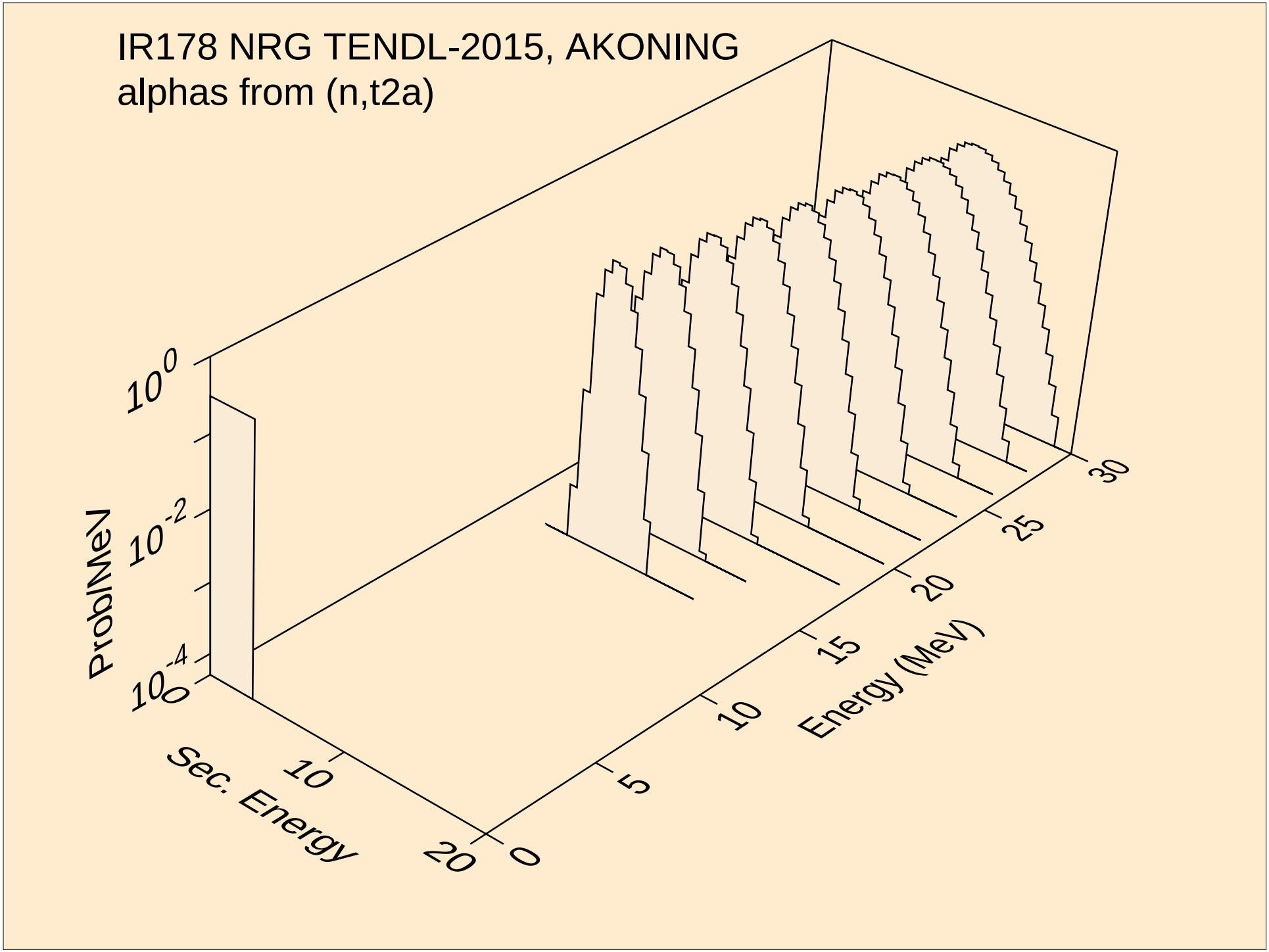

IR178 NRG TENDL-2015, AKONING
alphas from (n,npa)
Prob/MeV
10-1
10-3
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)

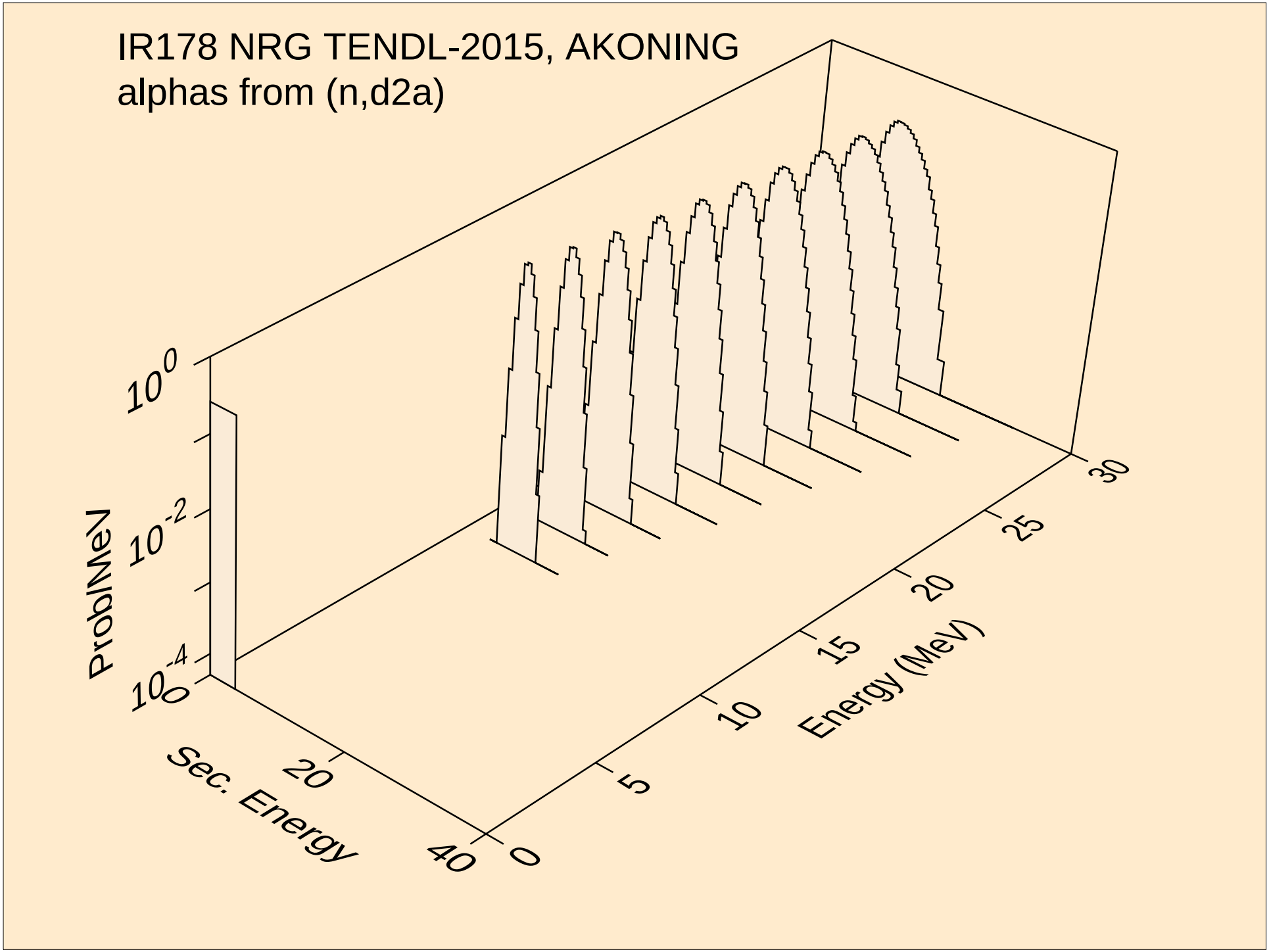

IR178 NRG TENDL-2015, AKONING
alphas from (n,a)
Prob/MeV
10-2
10-4
0
20
40
60
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)

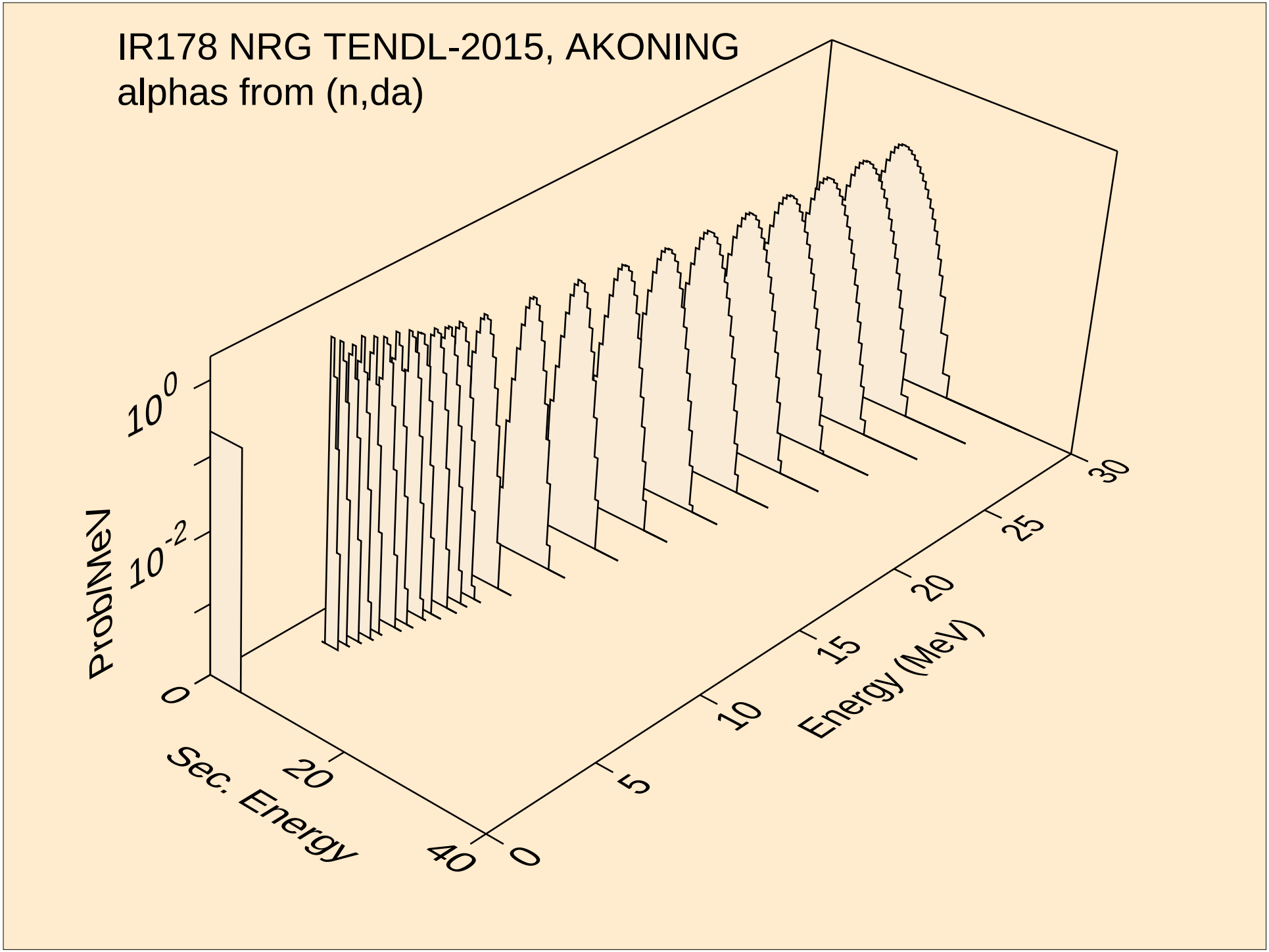

IR178 NRG TENDL-2015, AKONING
alphas from (n,2a)
Prob/MeV
10-2
10-4
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)


IR178 NRG TENDL-2015, AKONING
alphas from (n,3a)
Prob/MeV
10^{0}
10^{-2}
10^{-4}
0
20
40
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)


IR178 NRG TENDL-2015, AKONING
alphas from (n,pa)
Prob/MeV
10^{0}
10^{-2}
10^{-4}
0
20
40
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)


IR178 NRG TENDL-2015, AKONING
alphas from (n,t2a)
Prob/MeV
10^{0}
10^{-2}
10^{-4}
0
10
20
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)


IR178 NRG TENDL-2015, AKONING
alphas from (n,d2a)
Prob/MeV
10^{0}
10^{-2}
10^{-4}
0
20
40
Sec. Energy
0
5
10
15
20
25
30
Energy (MeV)


IR178 NRG TENDL-2015, AKONING
alphas from (n,da)
Prob/MeV
10^0
10^-2
0
Sec. Energy
20
40
0
5
10
15
20
25
30
Energy (MeV)