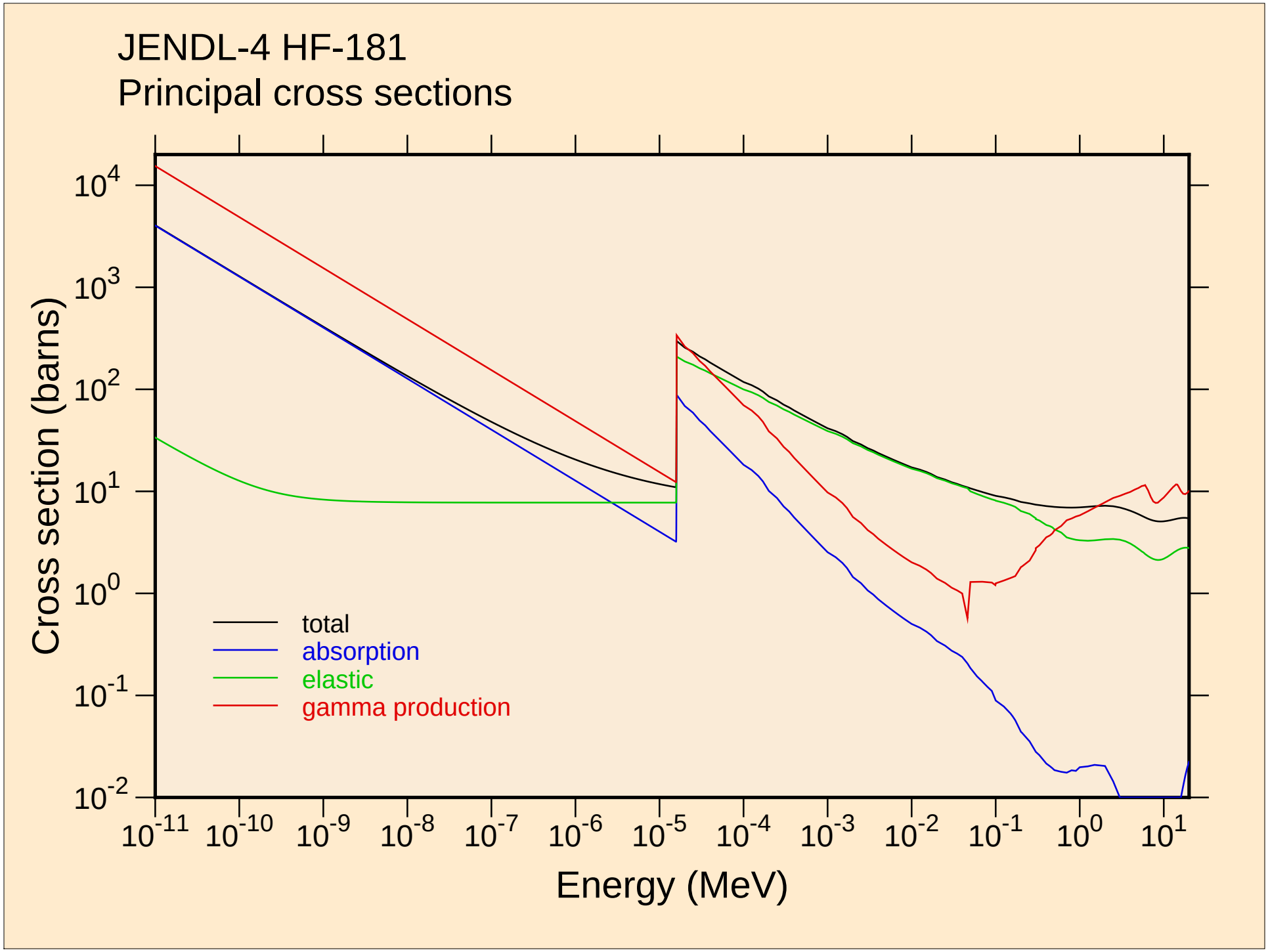
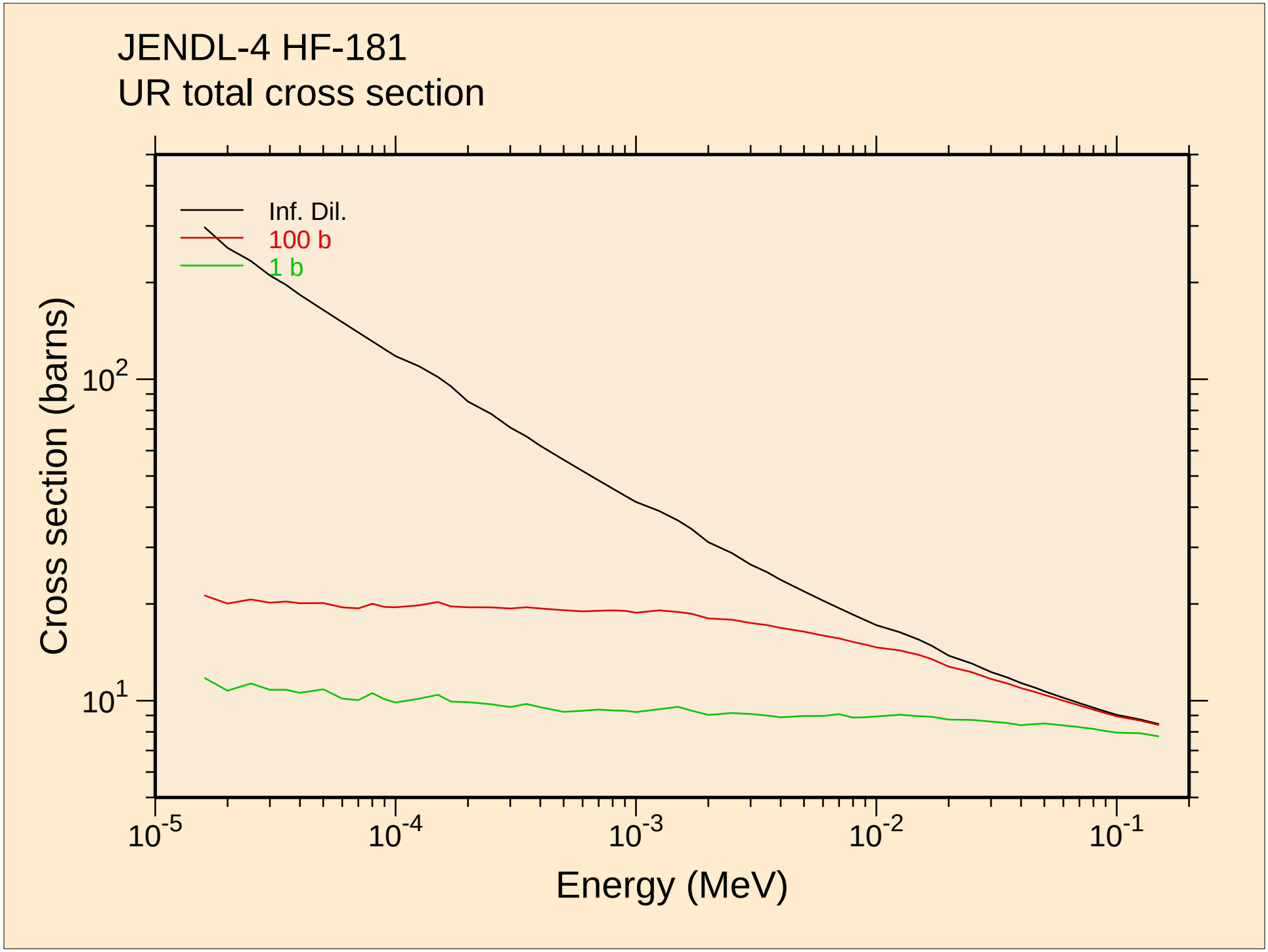
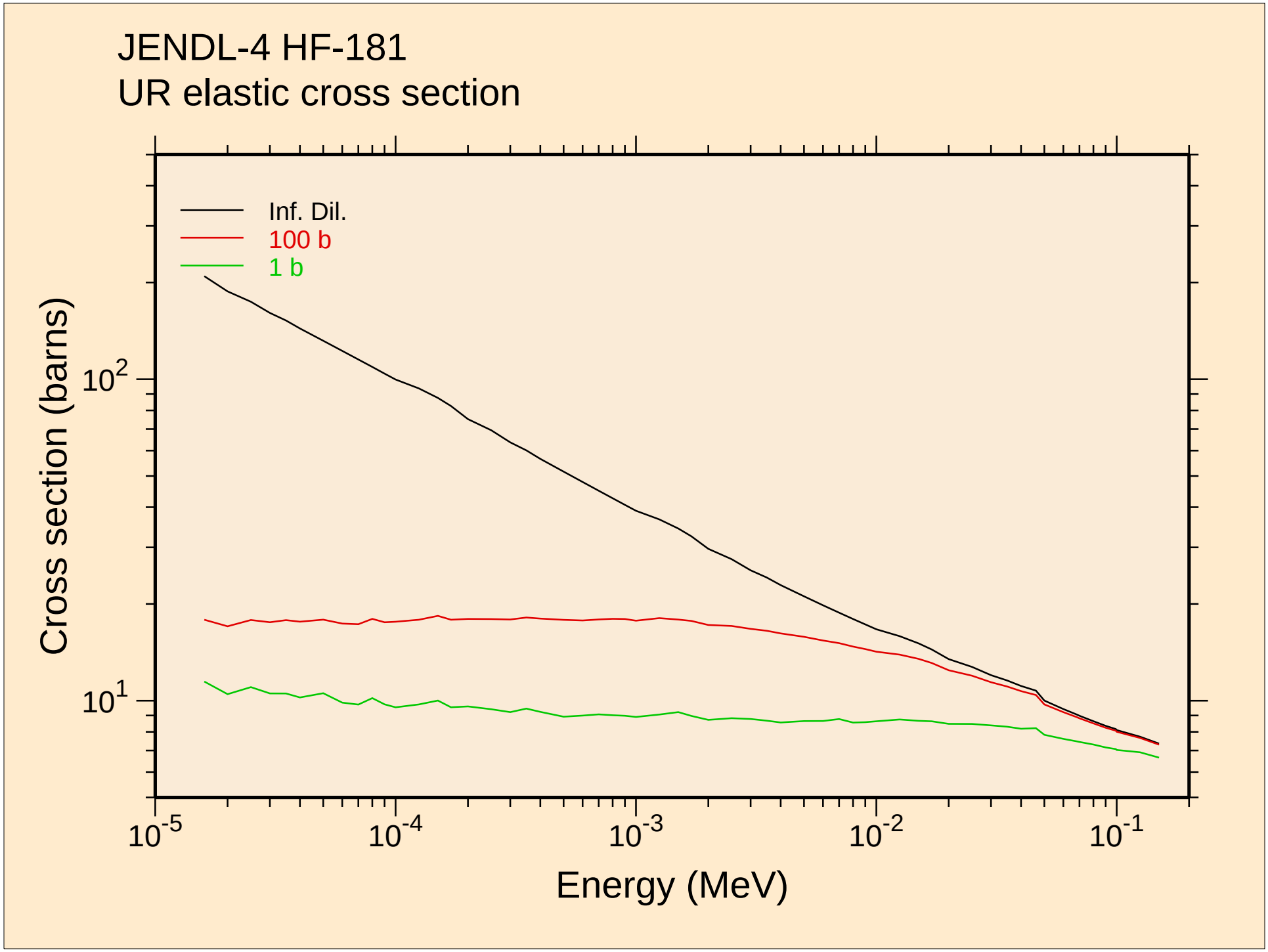
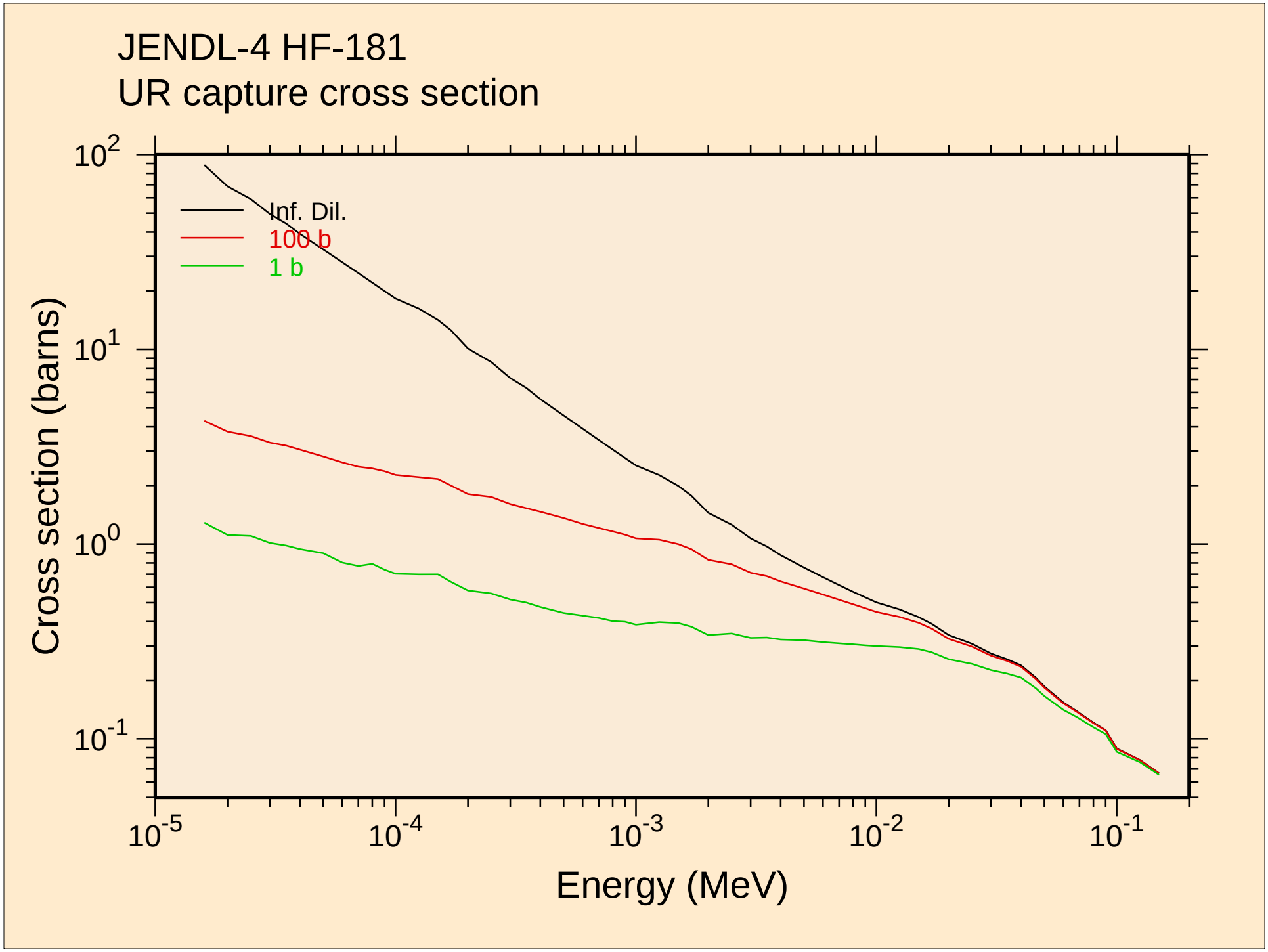
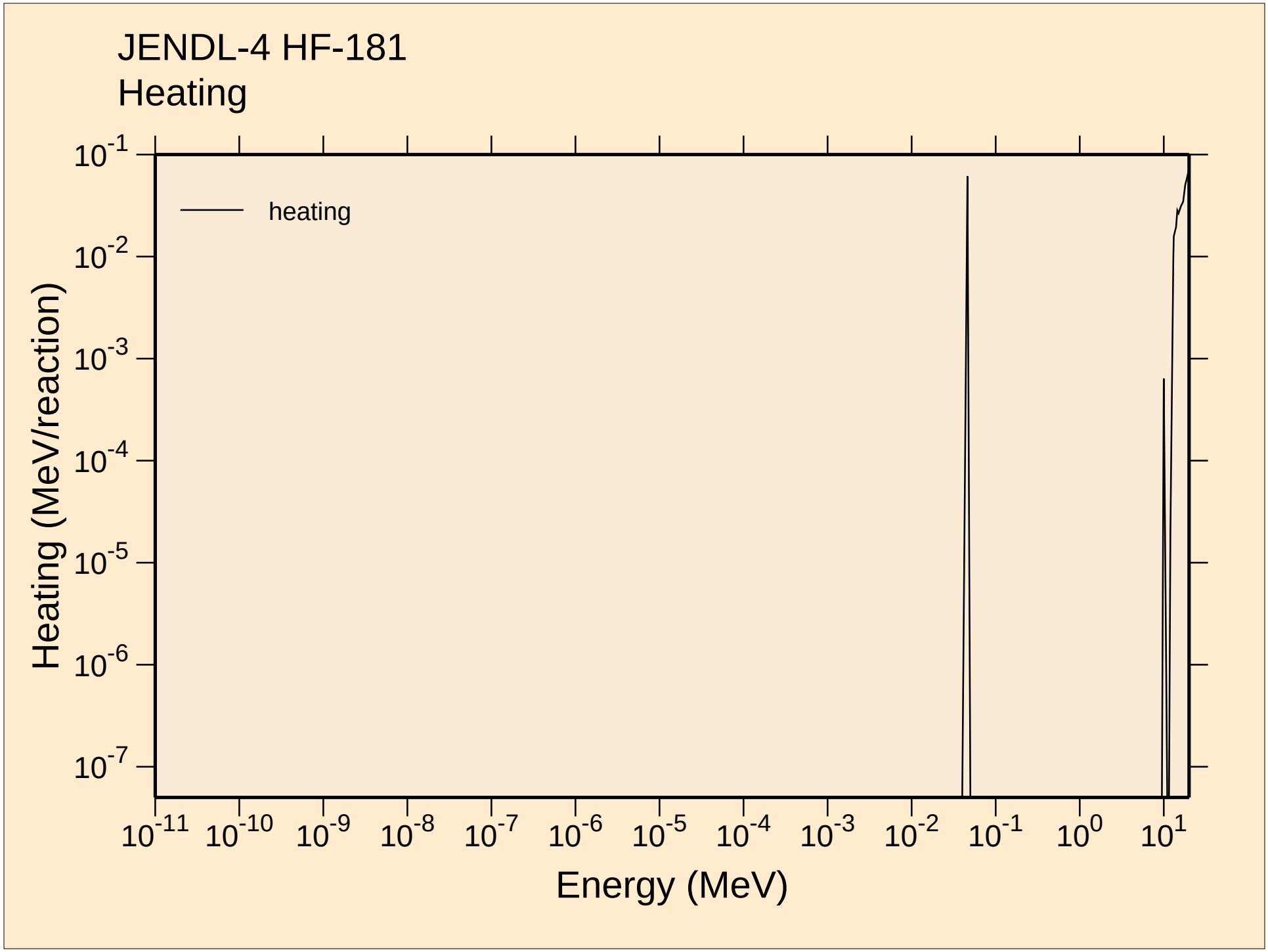
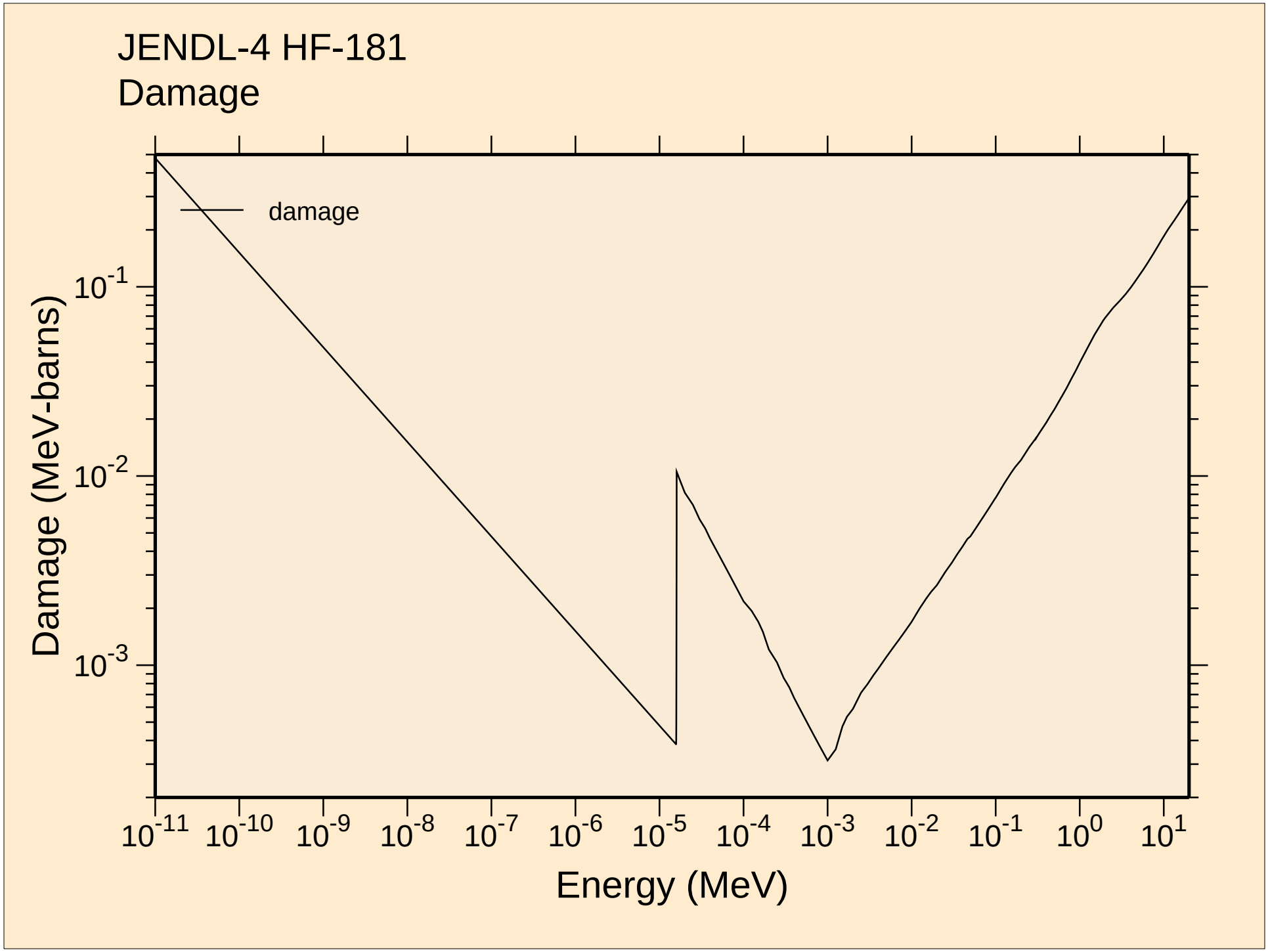

JENDL-4 HF-181
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production

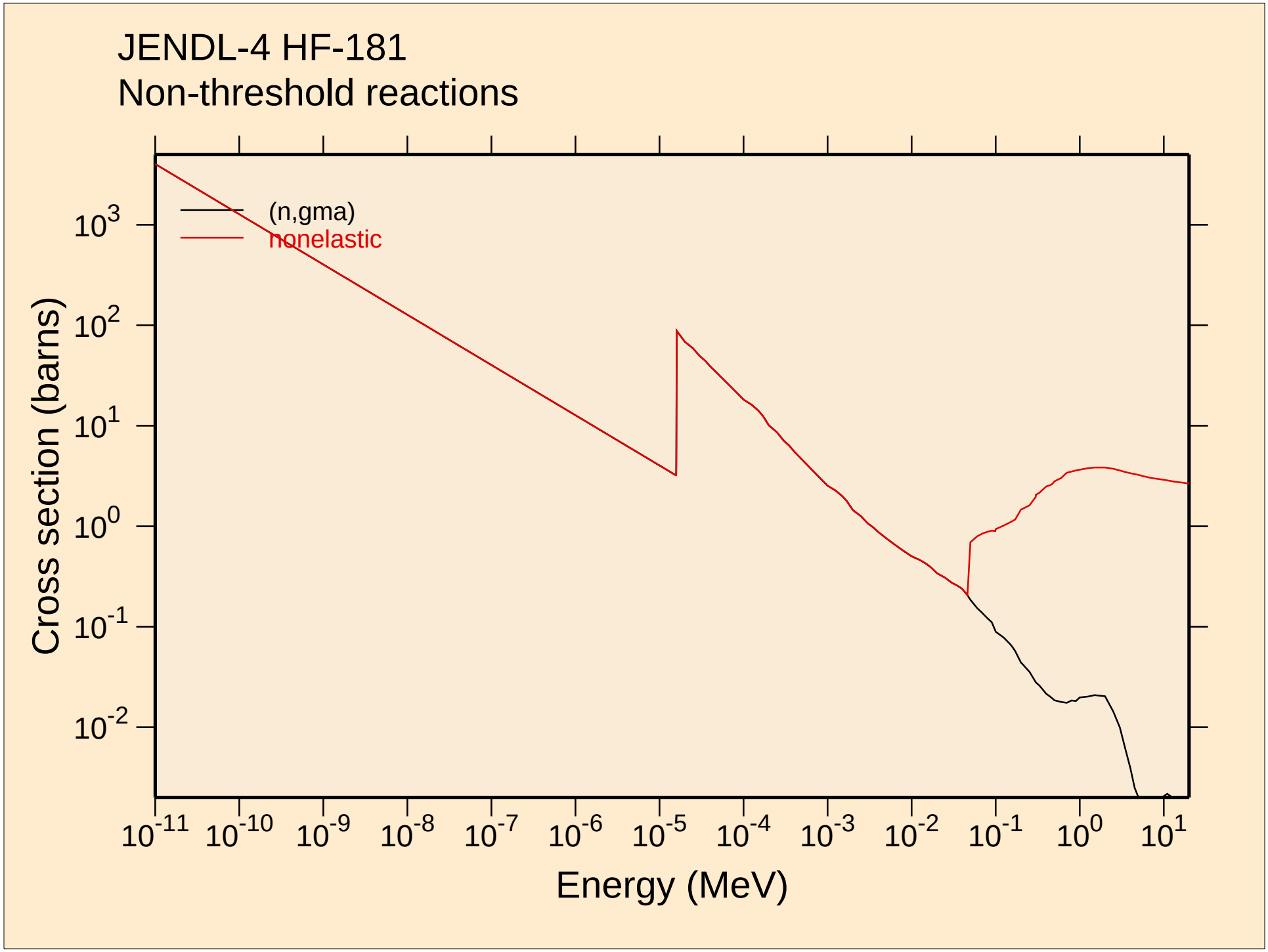

JENDL-4 HF-181
UR total cross section
Inf. Dil.
100 b
1 b
Cross section (barns)
10^2
10^1
10^-5
10^-4
10^-3
10^-2
10^-1
Energy (MeV)

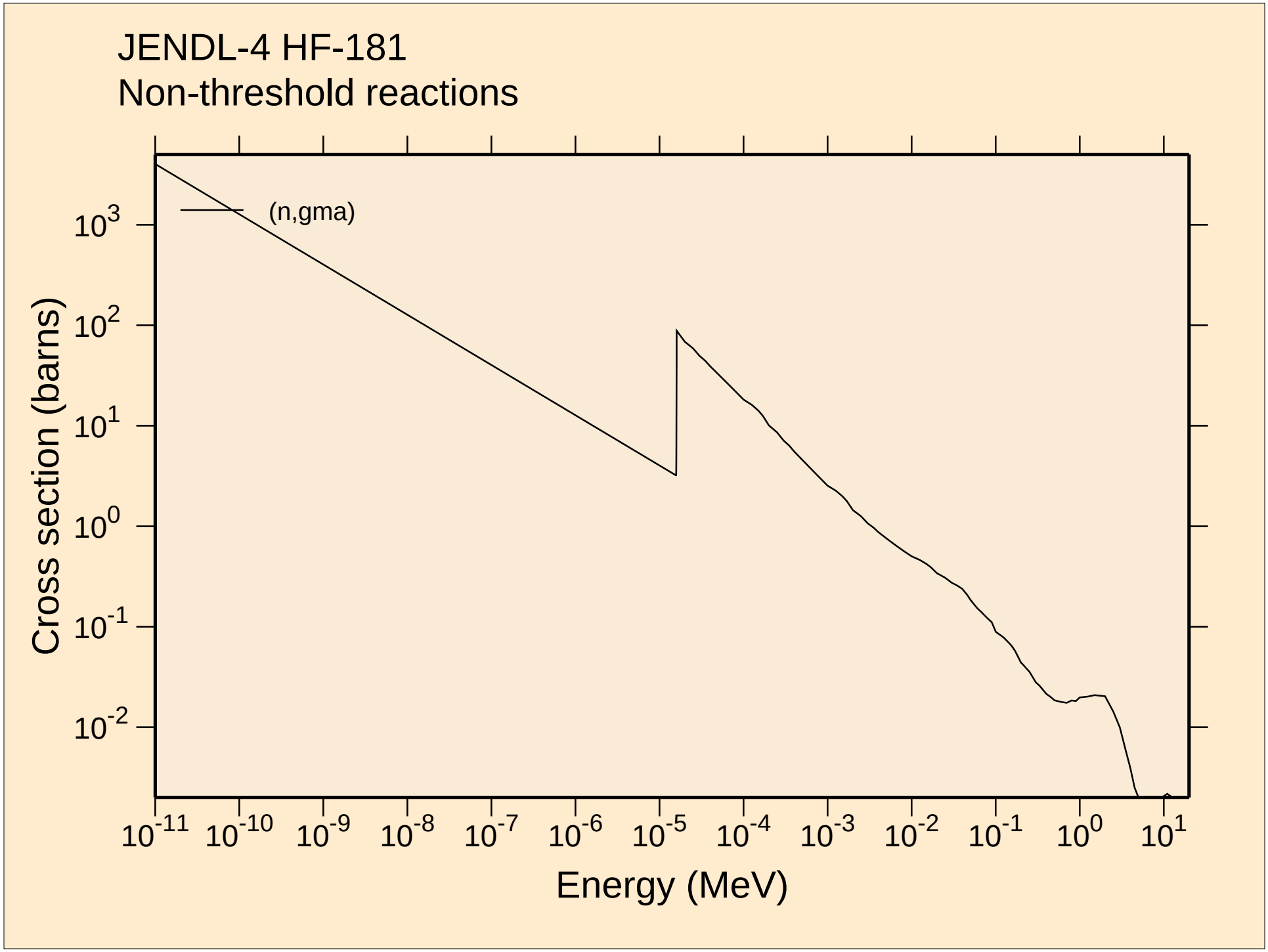

JENDL-4 HF-181
UR elastic cross section
Inf. Dil.
100 b
1 b
Cross section (barns)
10^2
10^1
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
Energy (MeV)

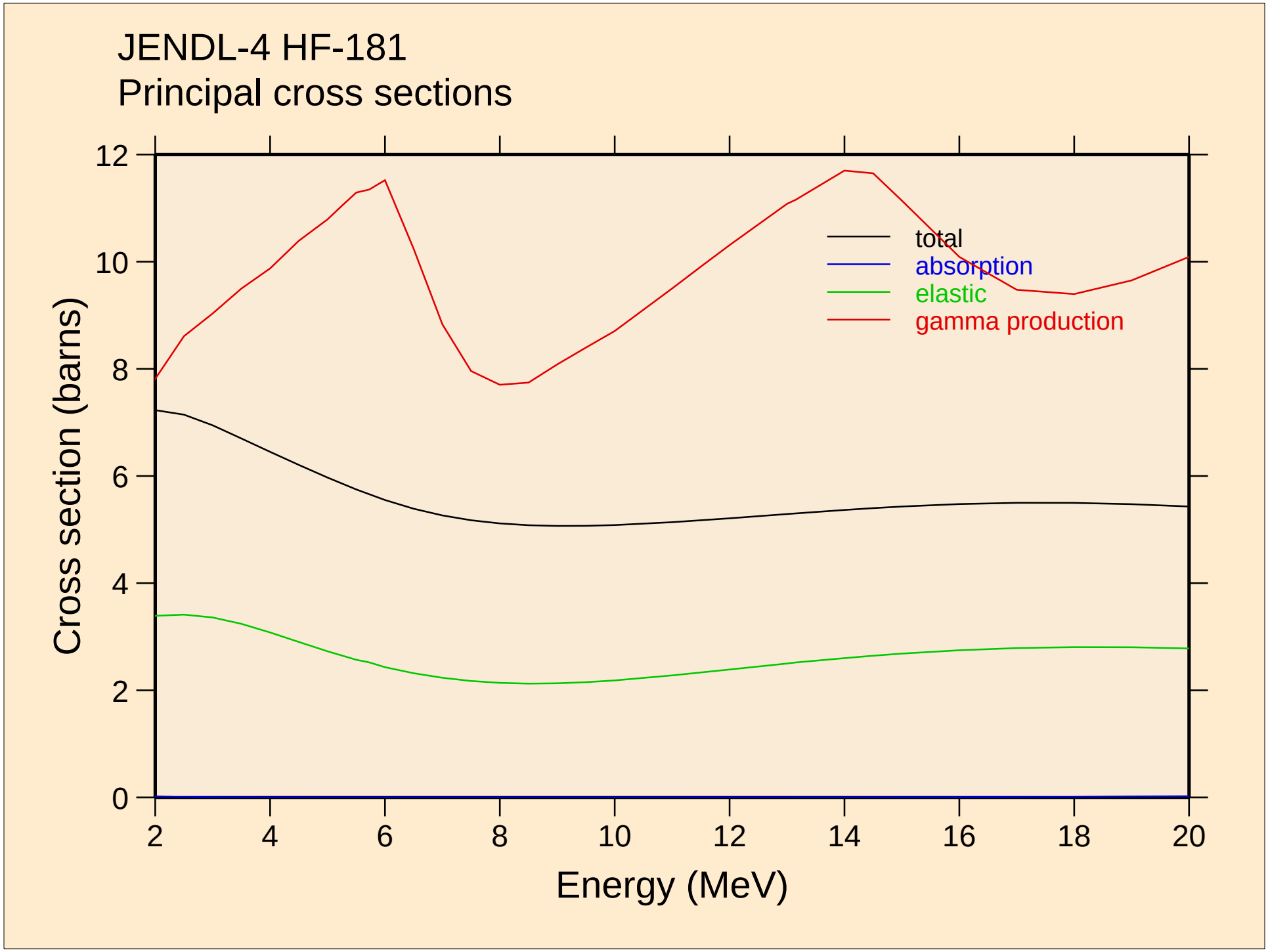

JENDL-4 HF-181
UR capture cross section
Inf. Dil.
100 b
1 b
Cross section (barns)
Energy (MeV)
10^2
10^1
10^0
10^-1
10^-5
10^-4
10^-3
10^-2
10^-1

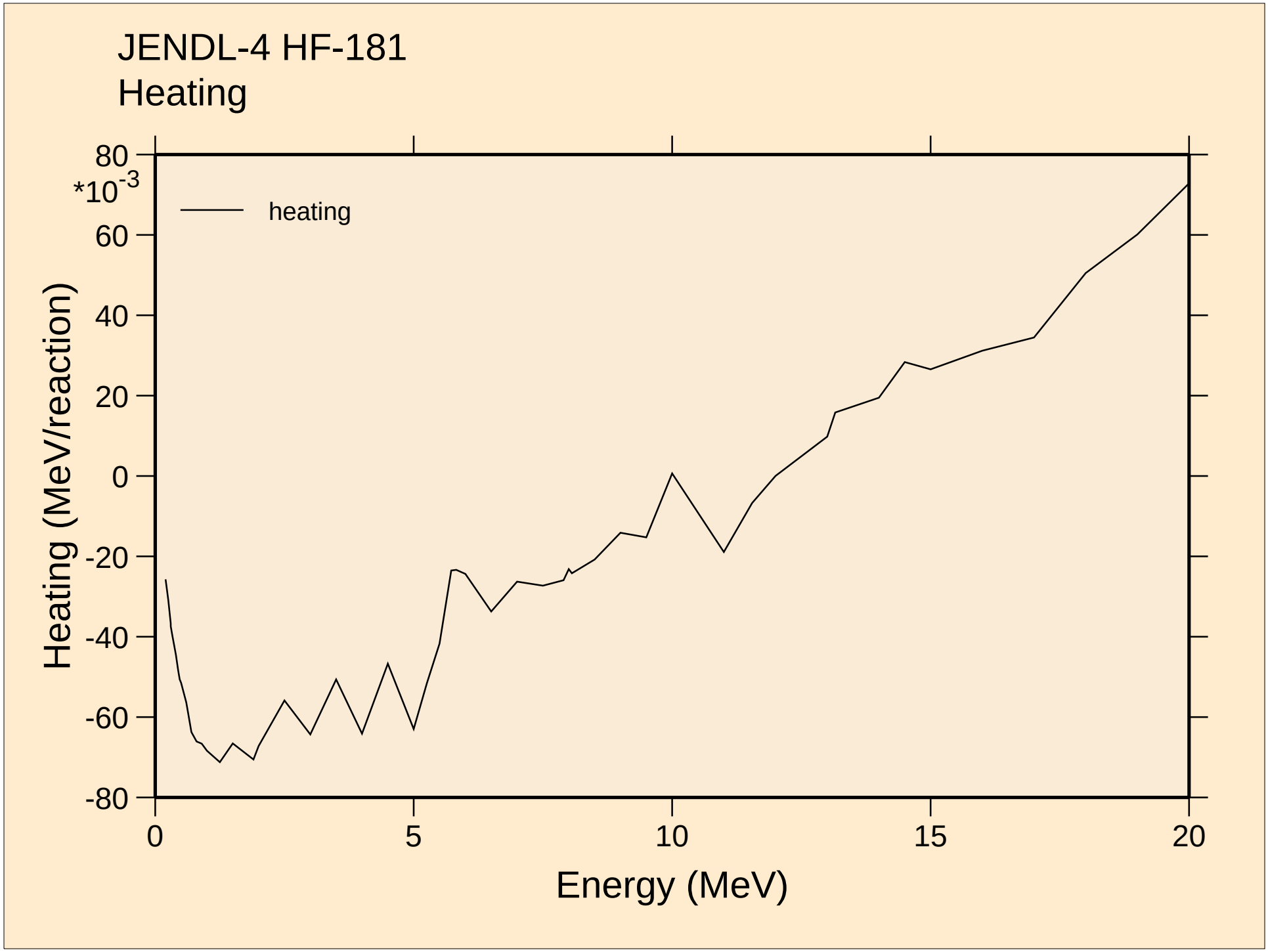

JENDL-4 HF-181
Heating
heating
Heating (MeV/reaction)
Energy (MeV)
10-1
10-2
10-3
10-4
10-5
10-6
10-7
10-11
10-10
10-9
10-8
10-7
10-6
10-5
10-4
10-3
10-2
10-1
100
101

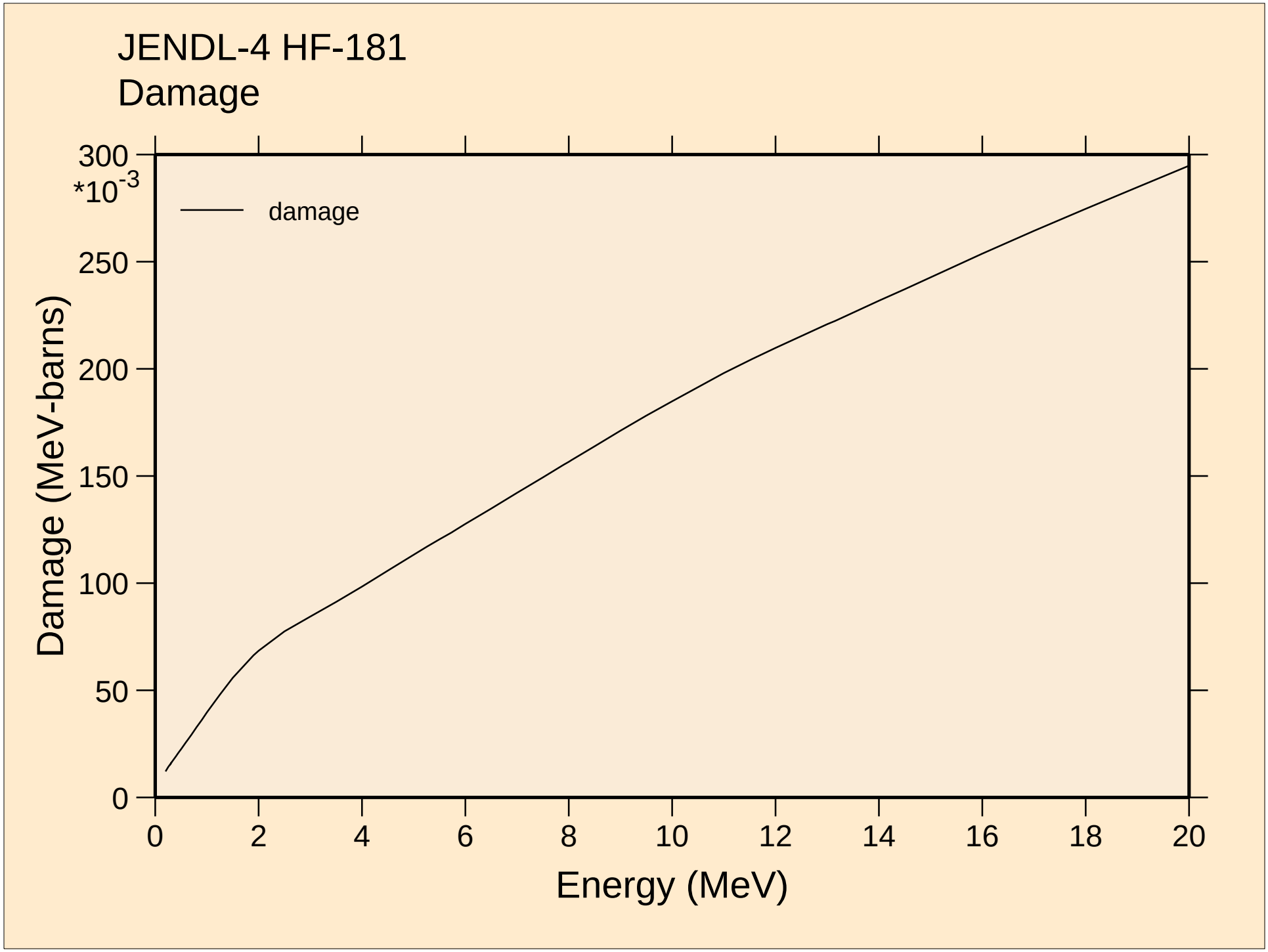

JENDL-4 HF-181
Damage
damage
Damage (MeV-barns)
10-1
10-2
10-3
10-11
10-10
10-9
10-8
10-7
10-6
10-5
10-4
10-3
10-2
10-1
100
101
Energy (MeV)

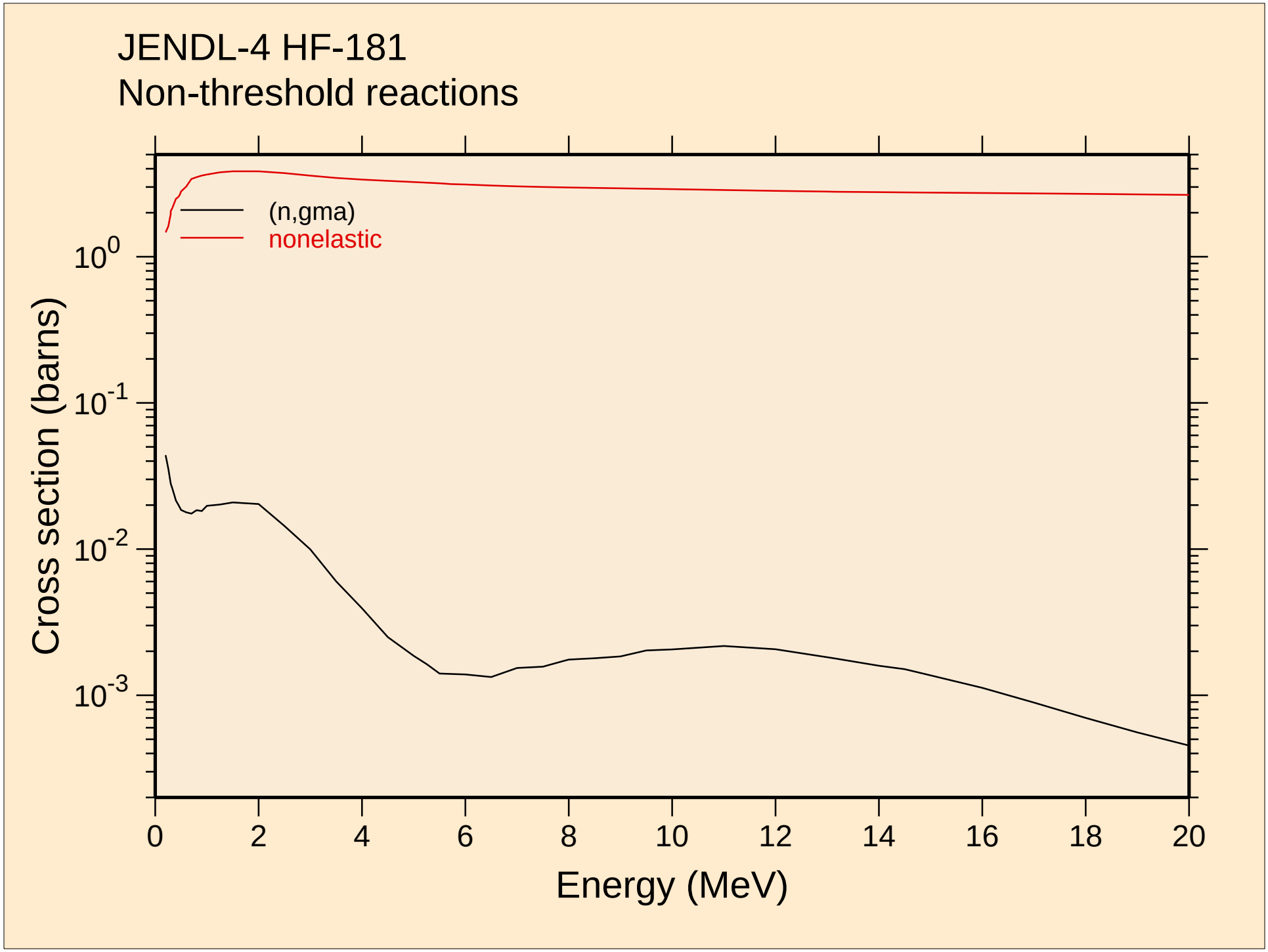

JENDL-4 HF-181
Non-threshold reactions
(n,gma)
nonelastic
Cross section (barns)
Energy (MeV)
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-11
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1

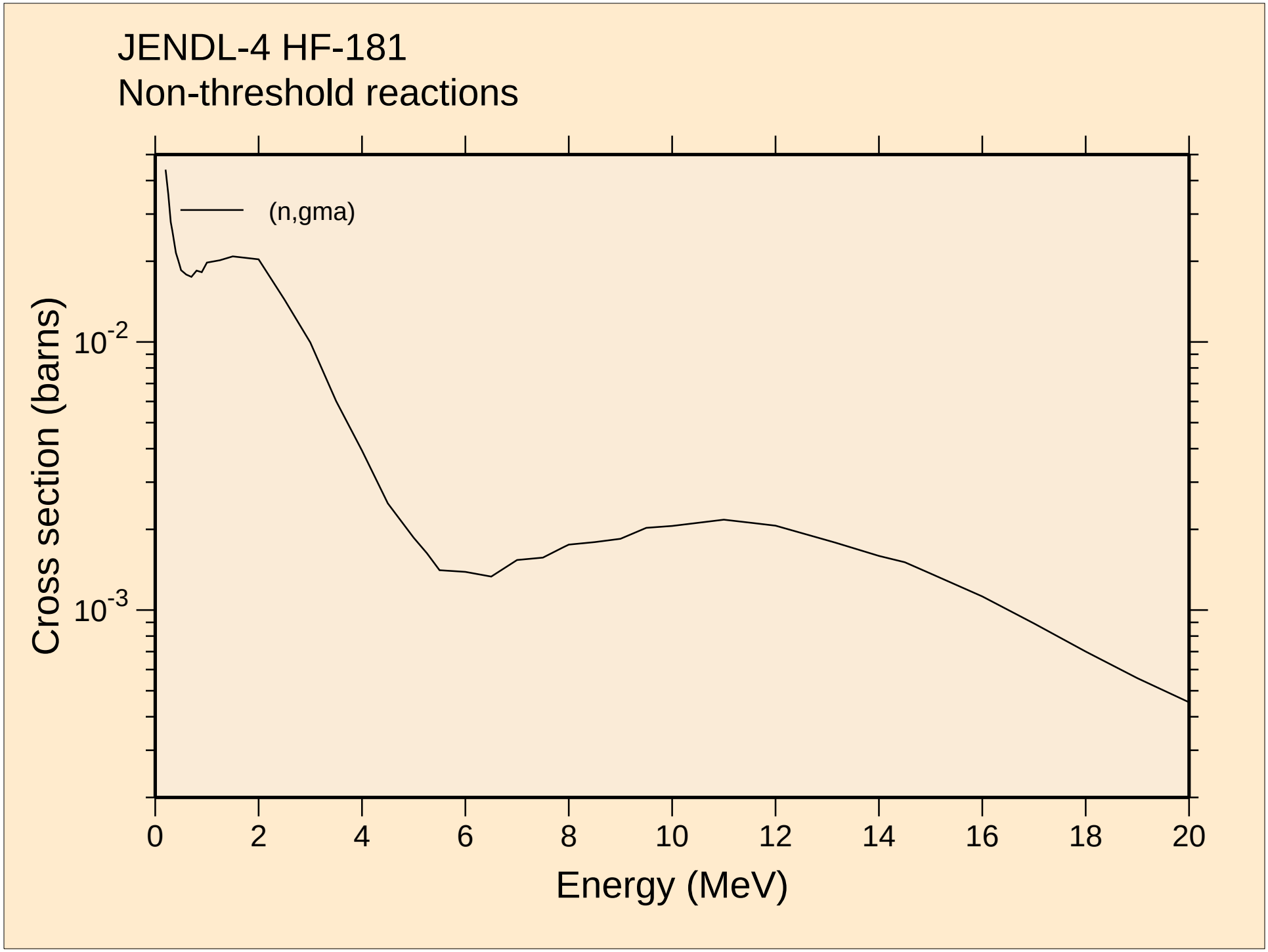

JENDL-4 HF-181
Non-threshold reactions
(n,gma)
Cross section (barns)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-11} 10^{-10} 10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1}
Energy (MeV)

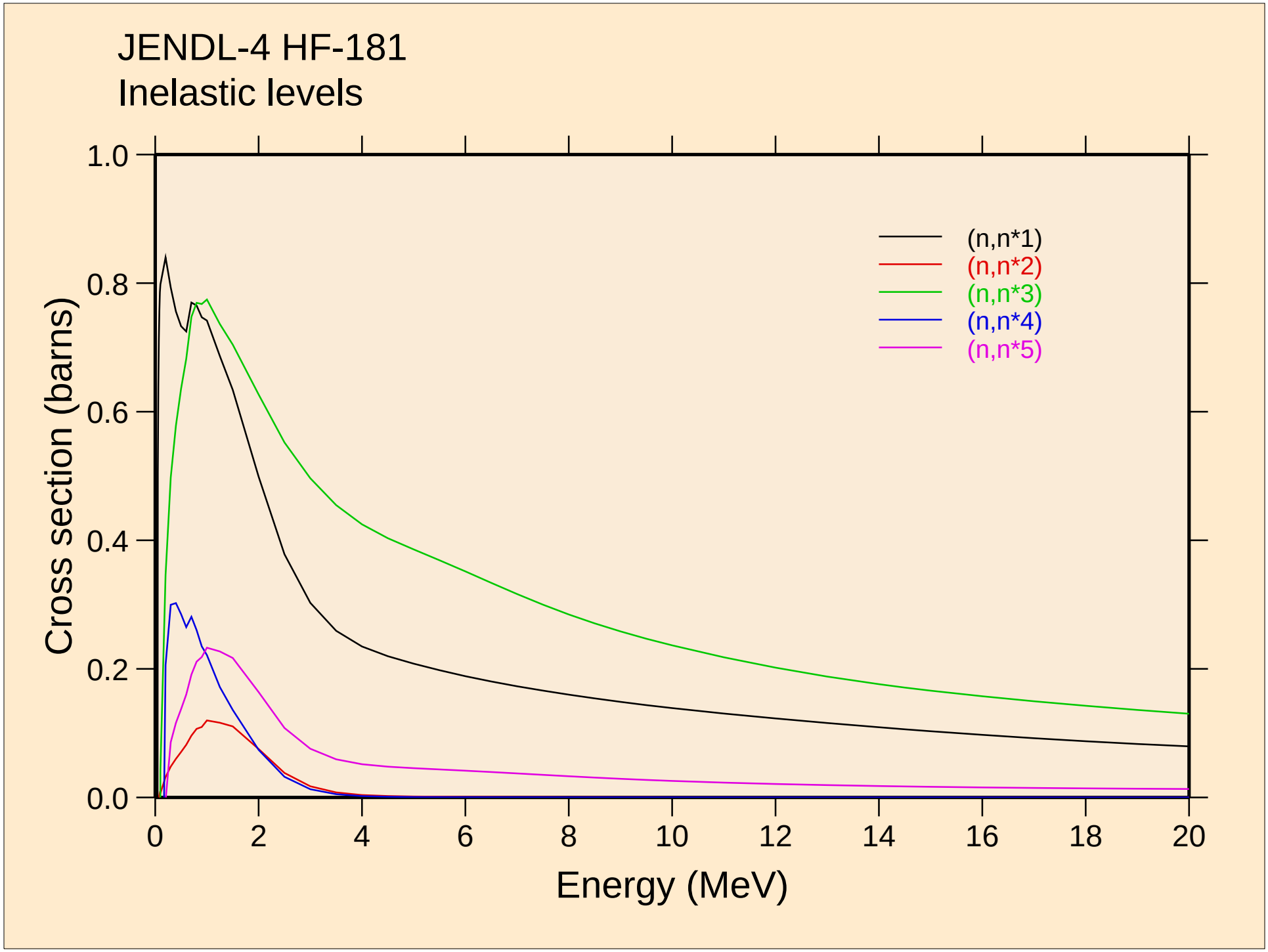

JENDL-4 HF-181
Principal cross sections
Cross section (barns)
Energy (MeV)
total
absorption
elastic
gamma production
0
2
4
6
8
10
12
2
4
6
8
10
12
14
16
18
20

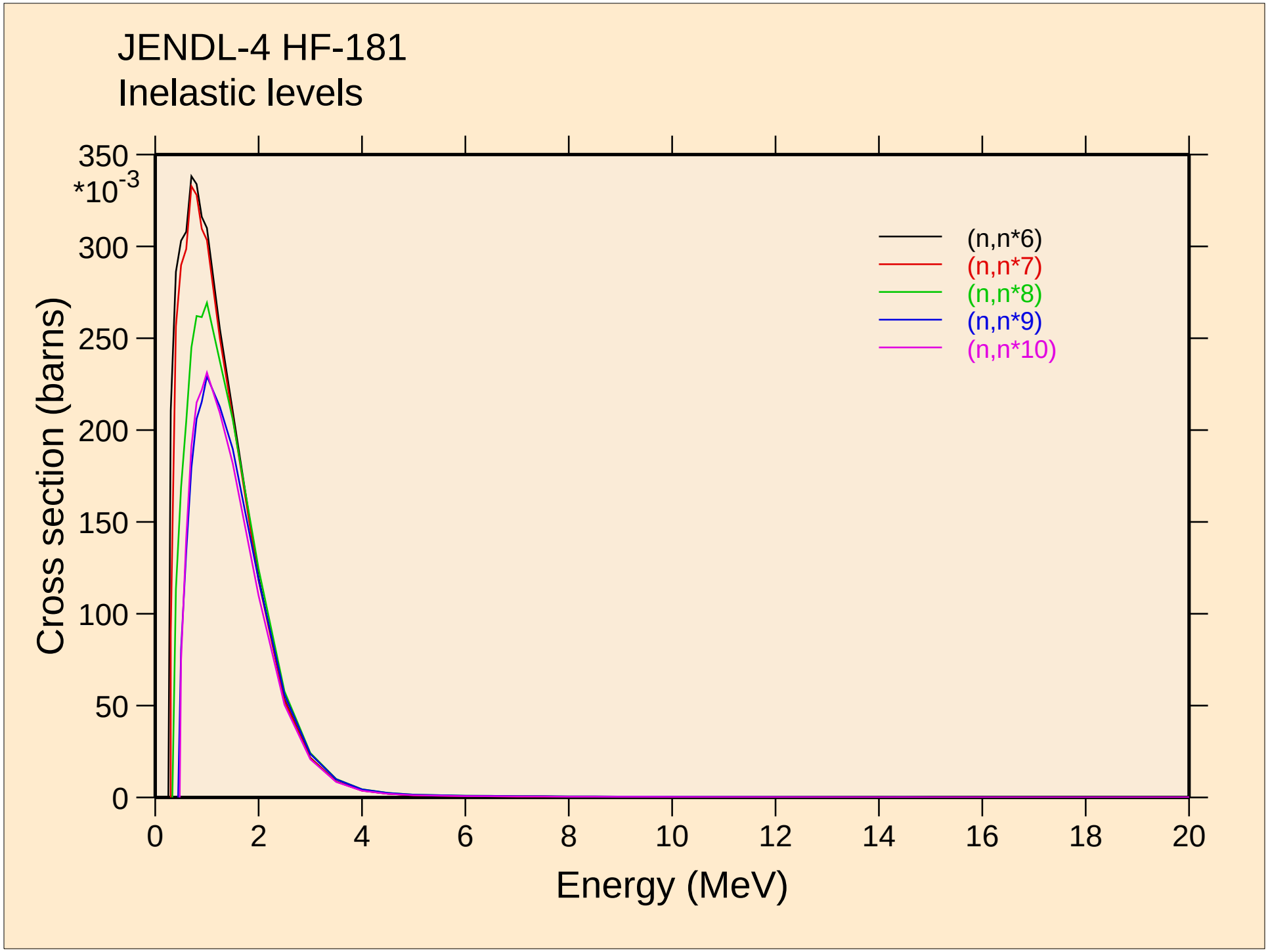

JENDL-4 HF-181
Heating
heating
*10-3
80
60
40
20
0
-20
-40
-60
-80
Heating (MeV/reaction)
0
5
10
15
20
Energy (MeV)

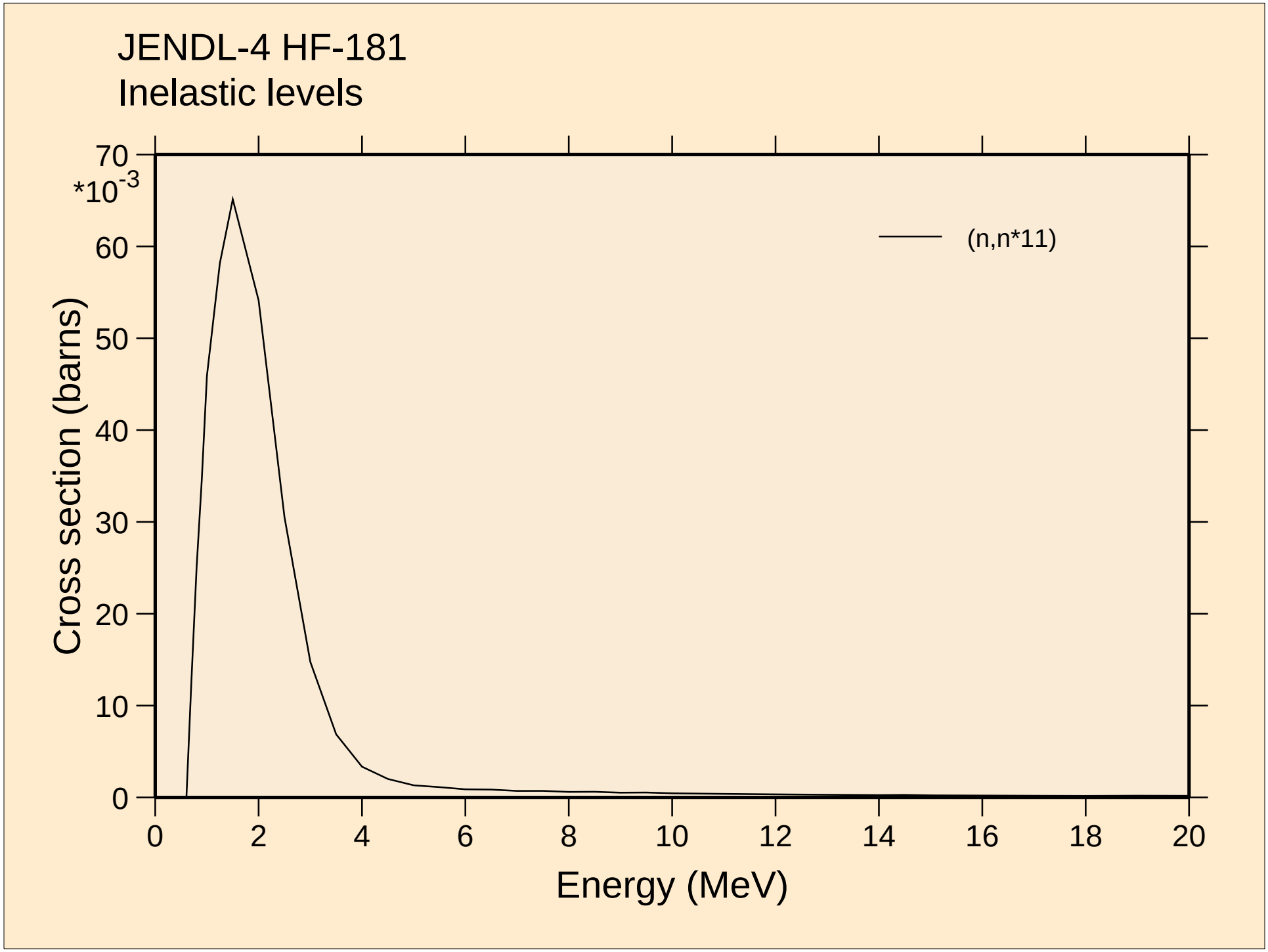

JENDL-4 HF-181
Damage
damage
Damage (MeV-barns)
*10-3
300
250
200
150
100
50
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

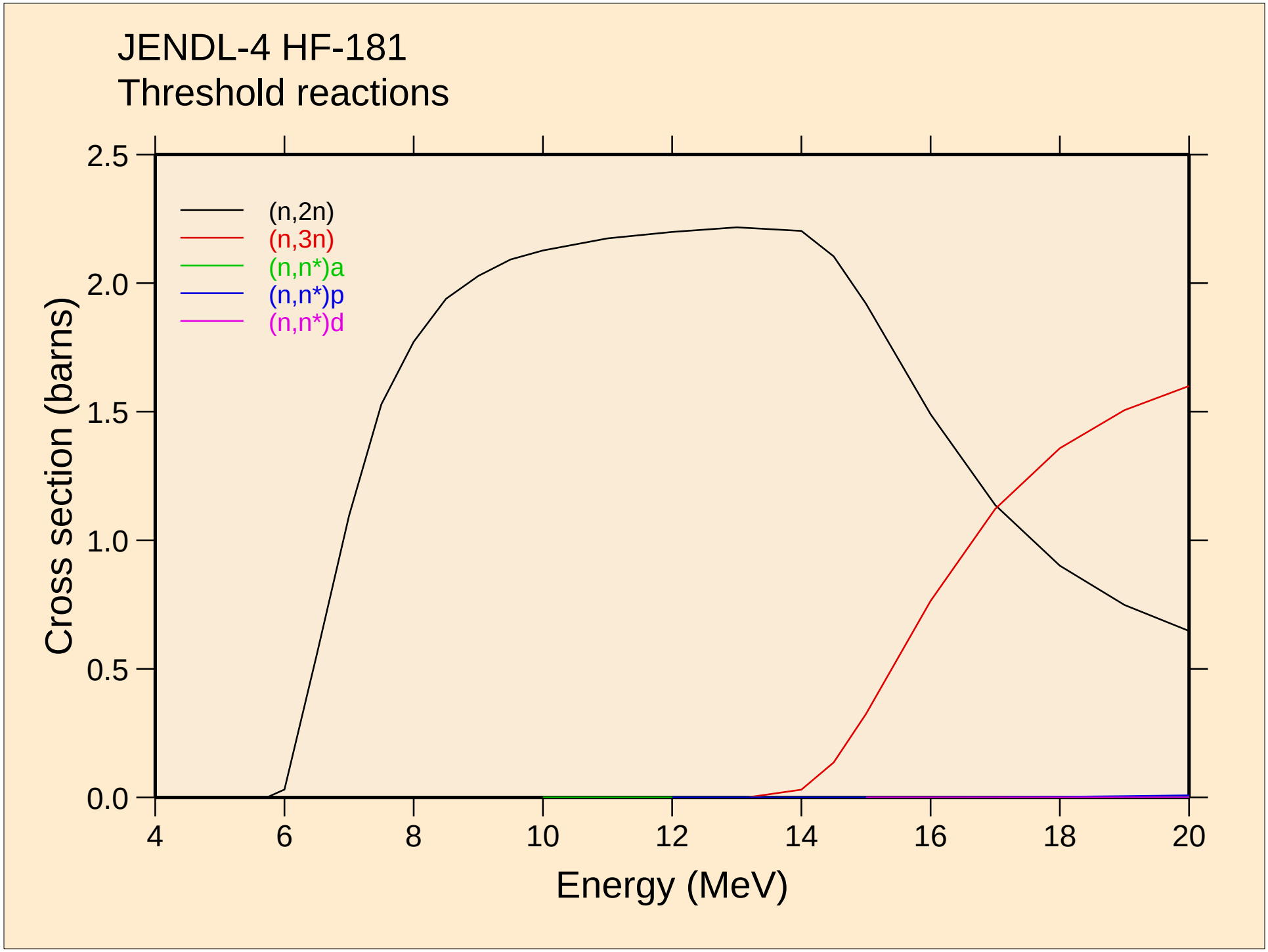

JENDL-4 HF-181
Non-threshold reactions
(n,gma)
nonelastic
Cross section (barns)
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

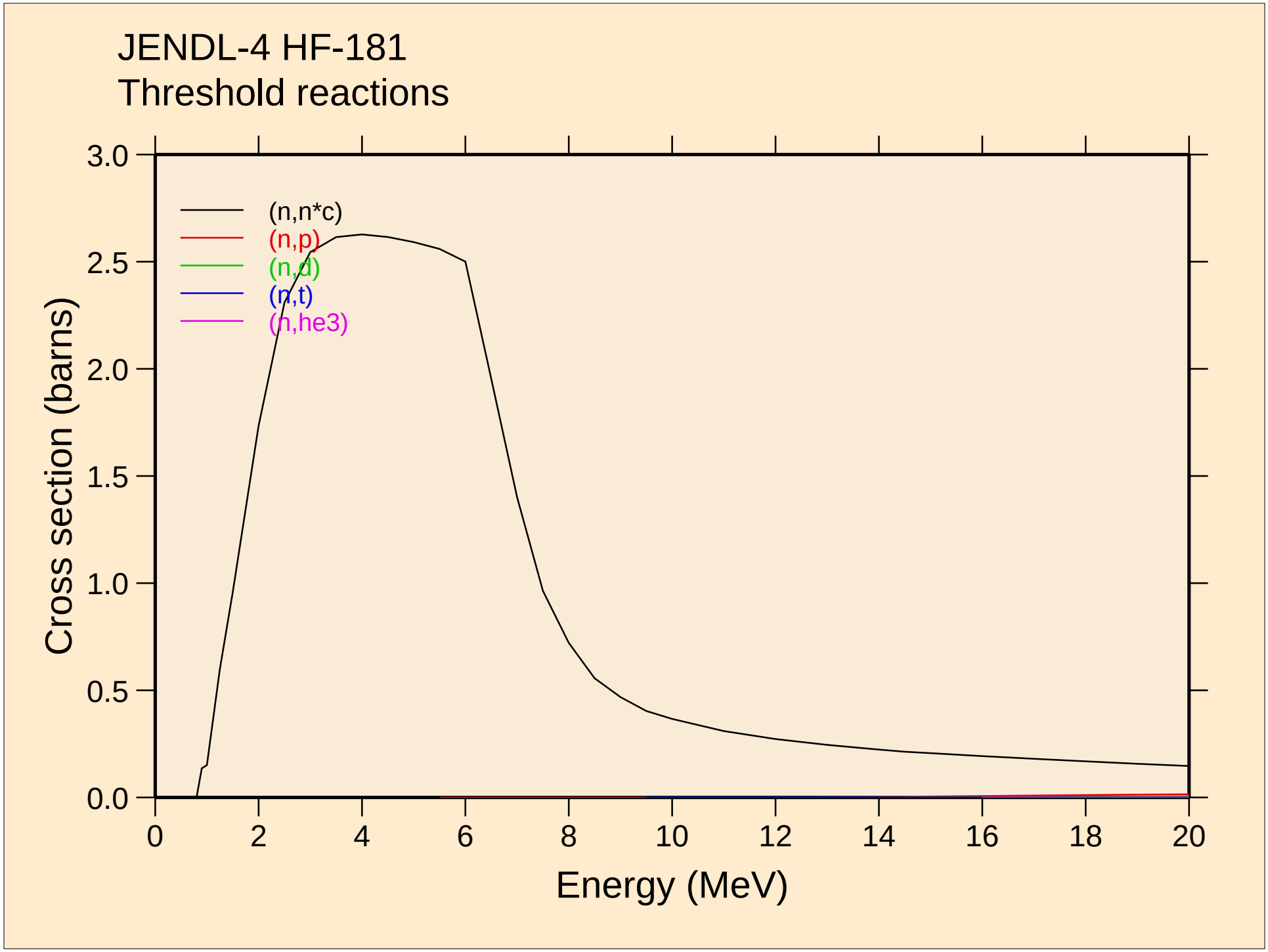

JENDL-4 HF-181
Non-threshold reactions
(n,gma)
Cross section (barns)
10-2
10-3
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

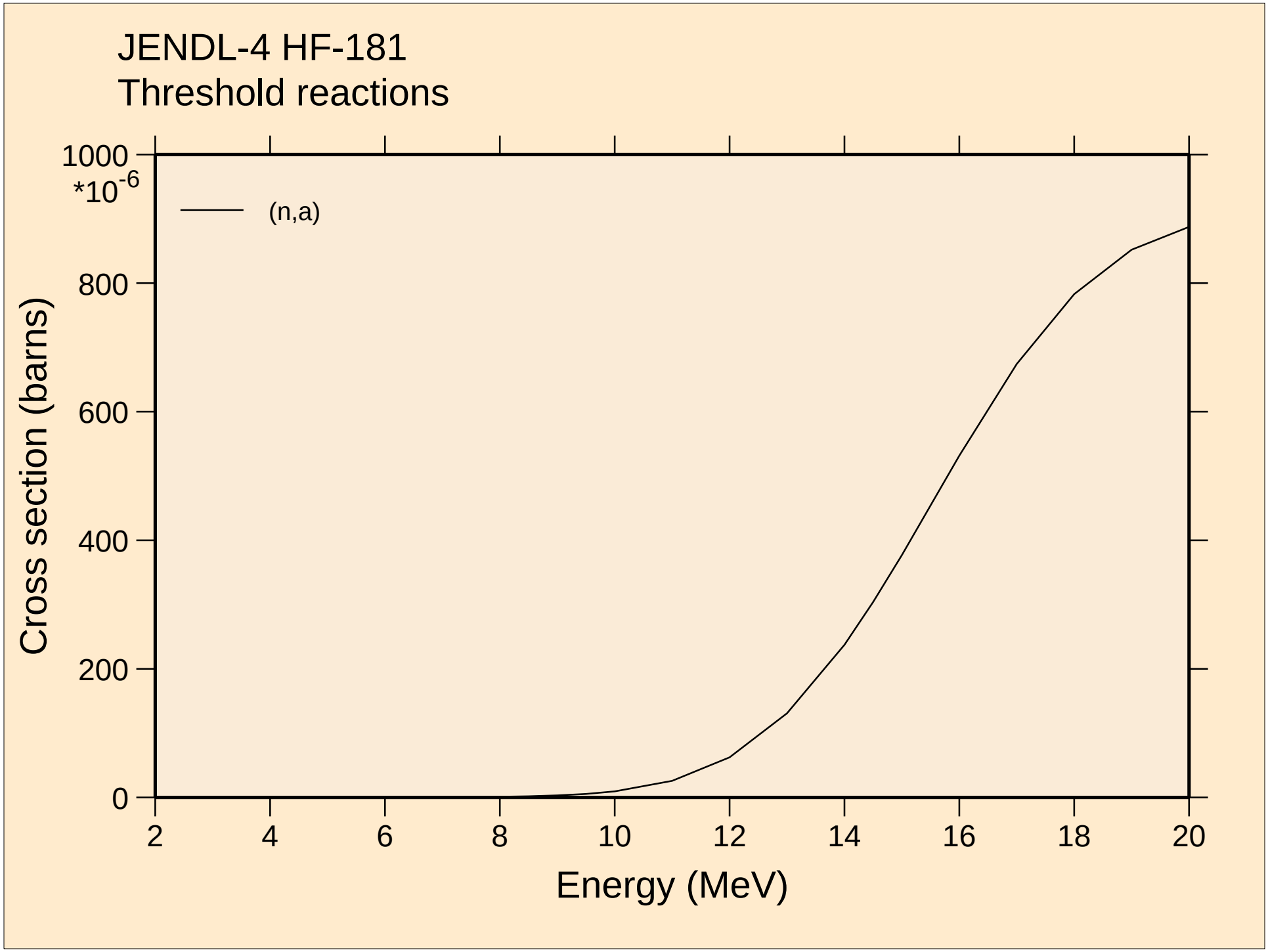

JENDL-4 HF-181
Inelastic levels
Cross section (barns)
Energy (MeV)
(n,n*1)
(n,n*2)
(n,n*3)
(n,n*4)
(n,n*5)
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
16
18
20

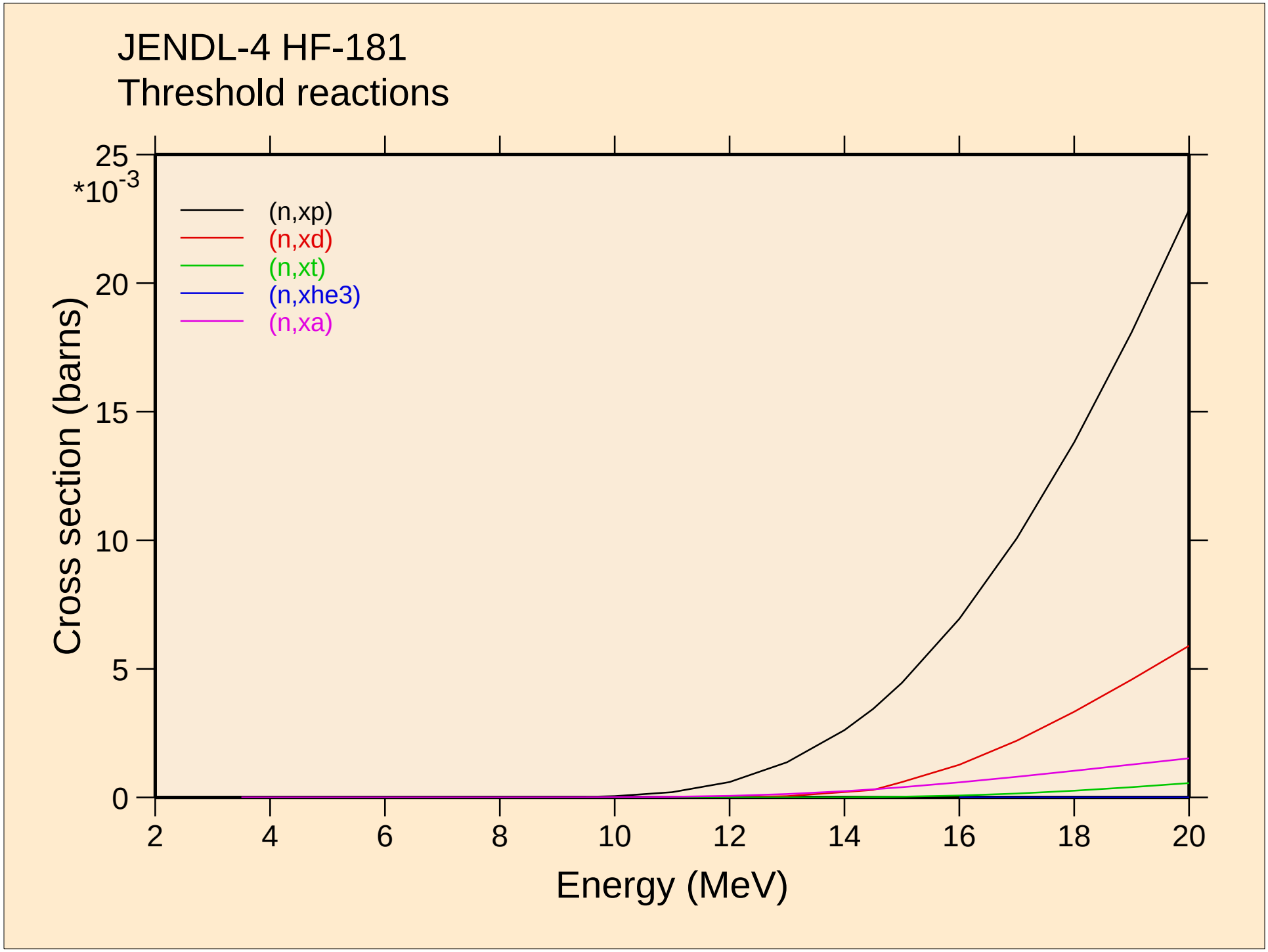

JENDL-4 HF-181
Inelastic levels
Cross section (barns)
*10^-3
350
300
250
200
150
100
50
0
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)
(n,n*6)
(n,n*7)
(n,n*8)
(n,n*9)
(n,n*10)

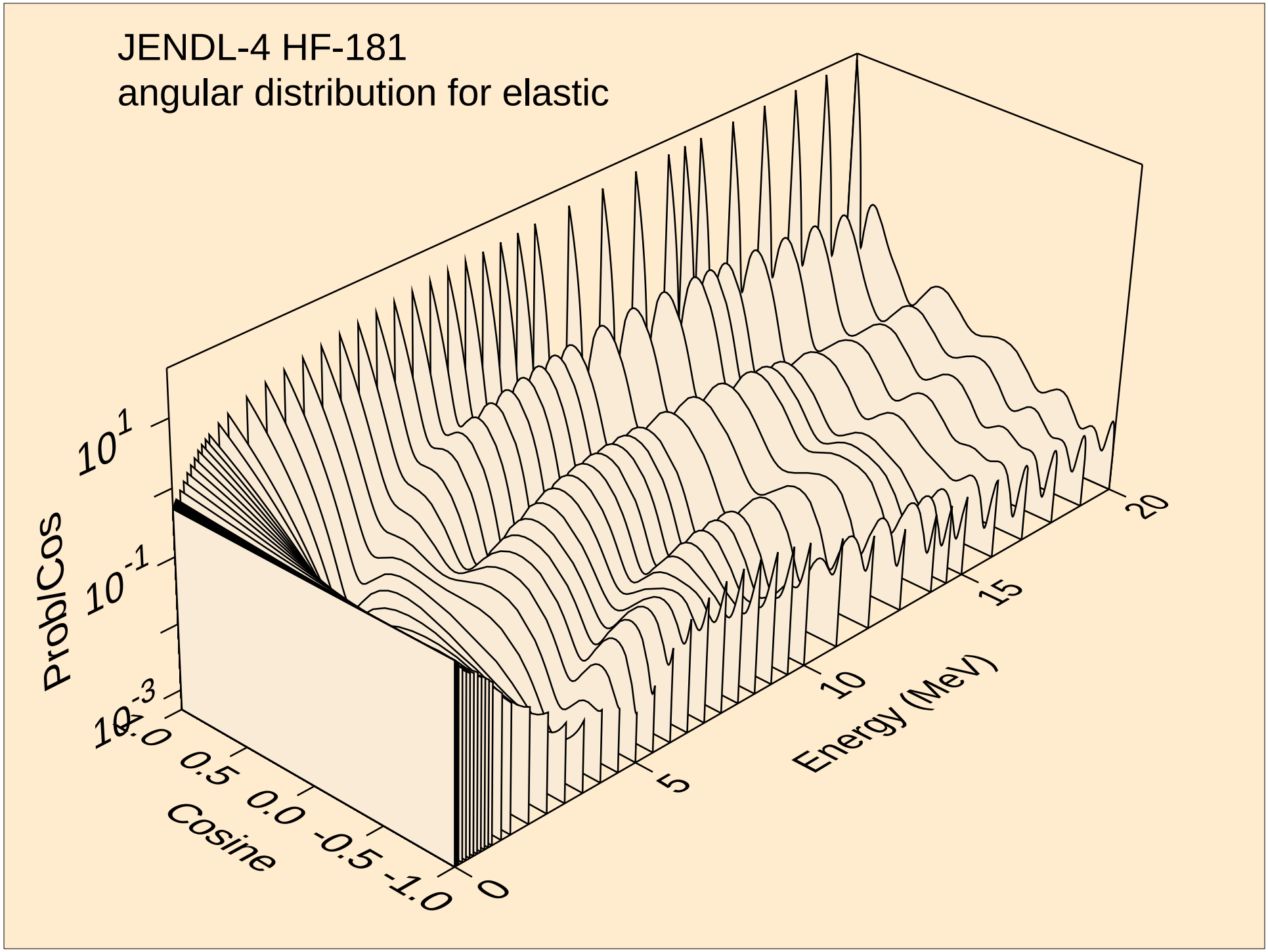

JENDL-4 HF-181
Inelastic levels
*10-3
70
60
50
40
30
20
10
0
Cross section (barns)
(n,n*11)
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

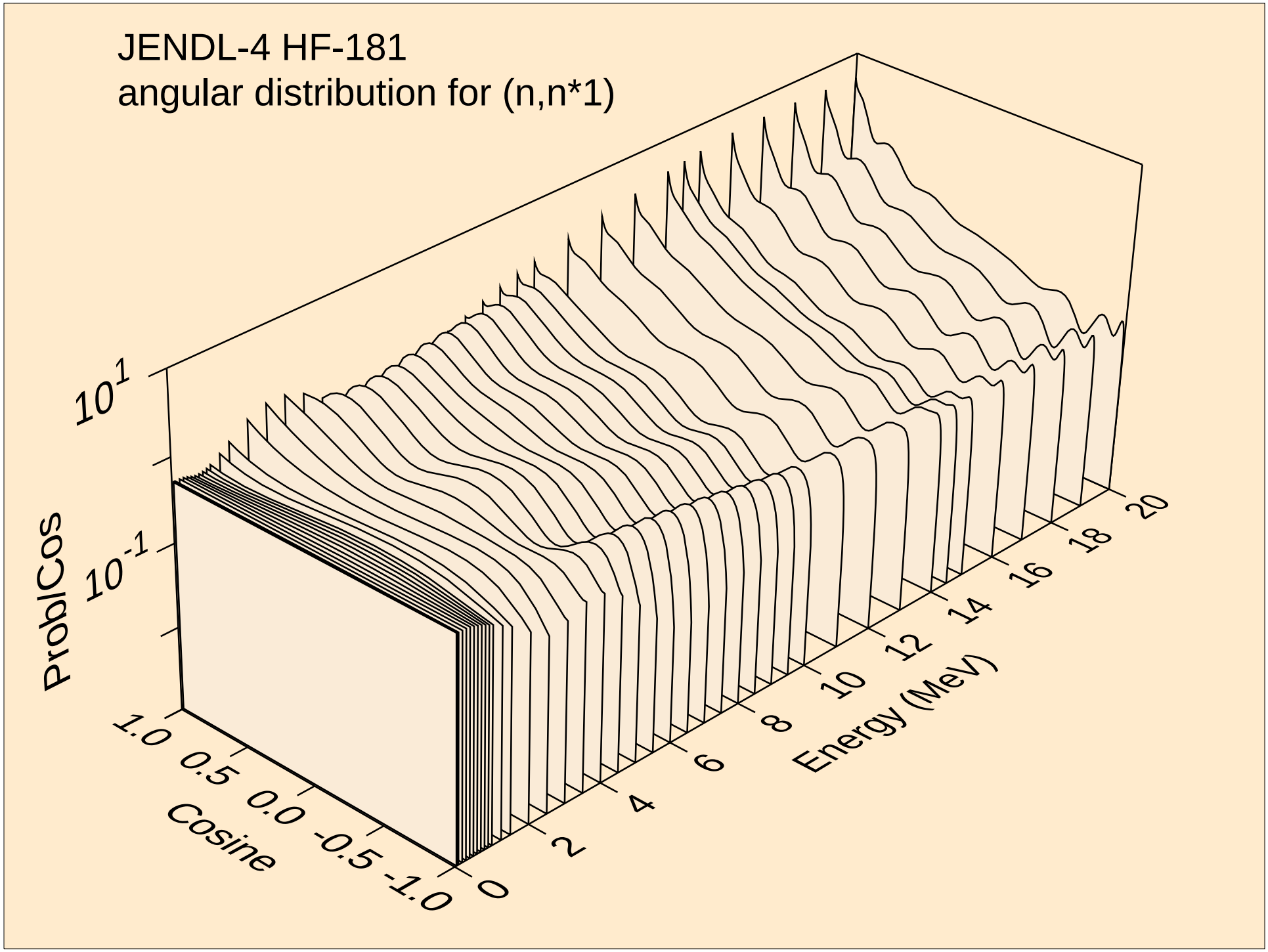

JENDL-4 HF-181
Threshold reactions
(n,2n)
(n,3n)
(n,n*)a
(n,n*)p
(n,n*)d
Cross section (barns)
Energy (MeV)
0.0
0.5
1.0
1.5
2.0
2.5
4
6
8
10
12
14
16
18
20

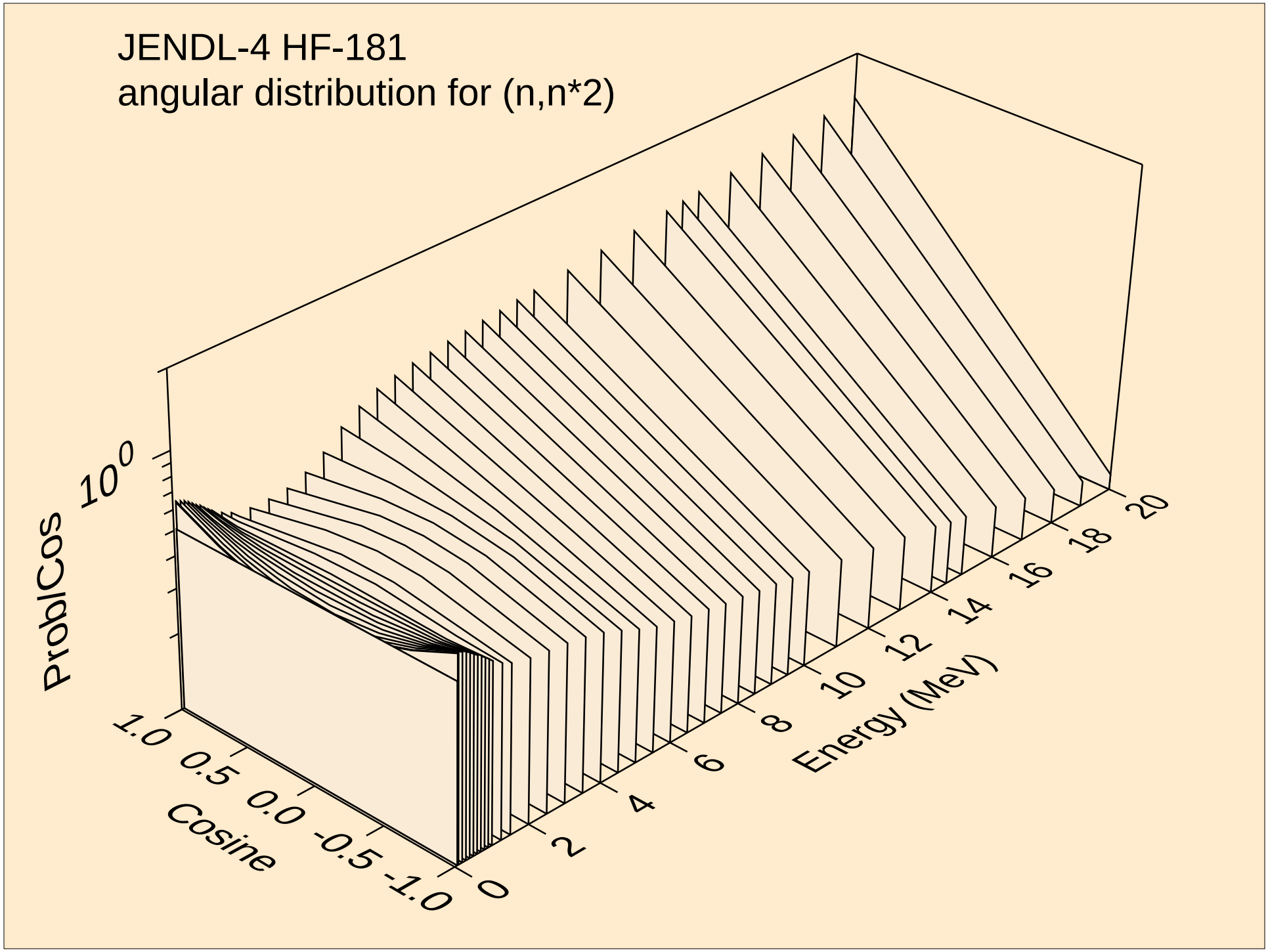

JENDL-4 HF-181
Threshold reactions
(n,n*c)
(n,p)
(n,d)
(n,t)
(n,he3)
Cross section (barns)
Energy (MeV)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
2
4
6
8
10
12
14
16
18
20

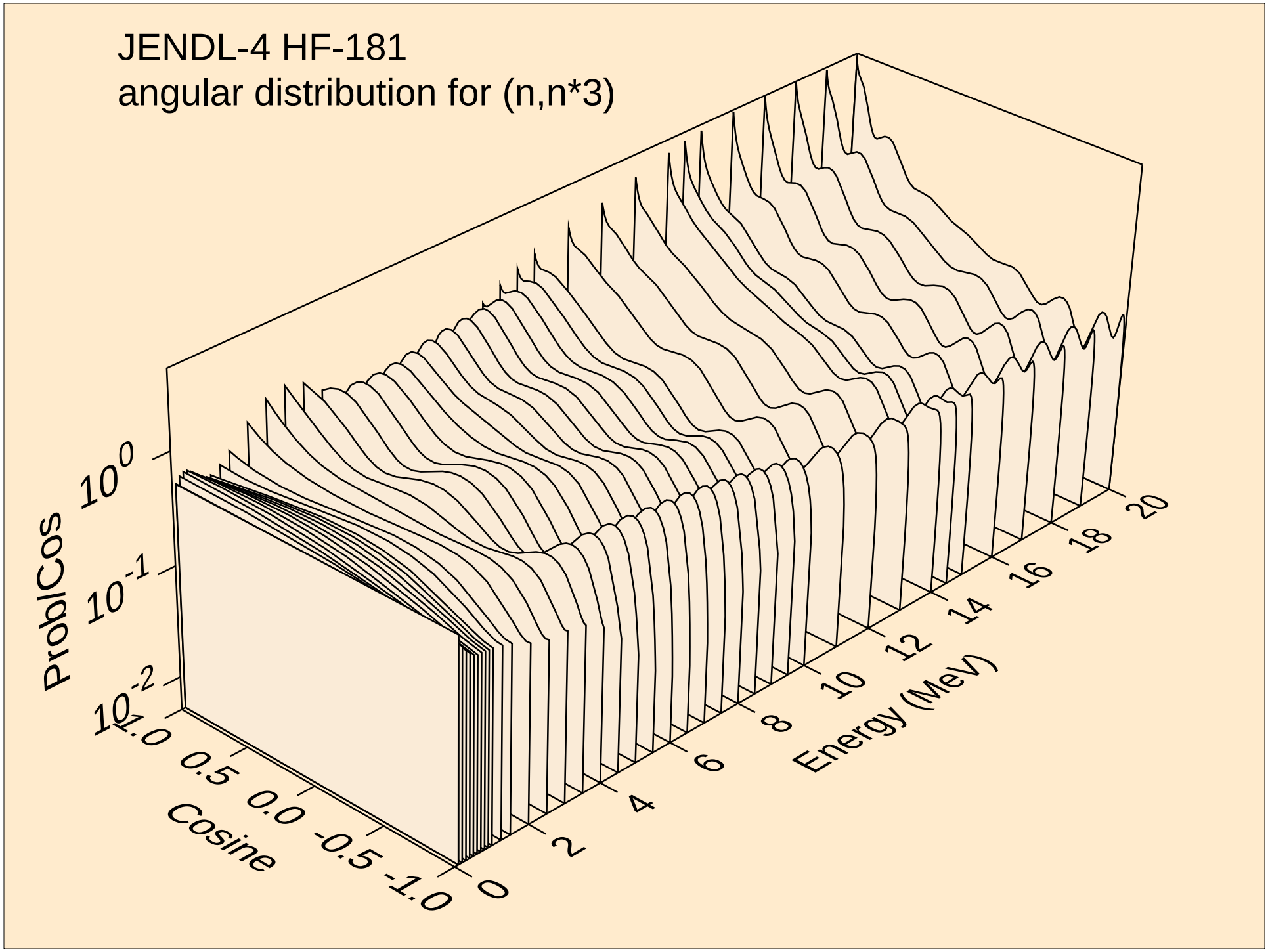

JENDL-4 HF-181
Threshold reactions
(n,a)
Cross section (barns)
*10-6
1000
800
600
400
200
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

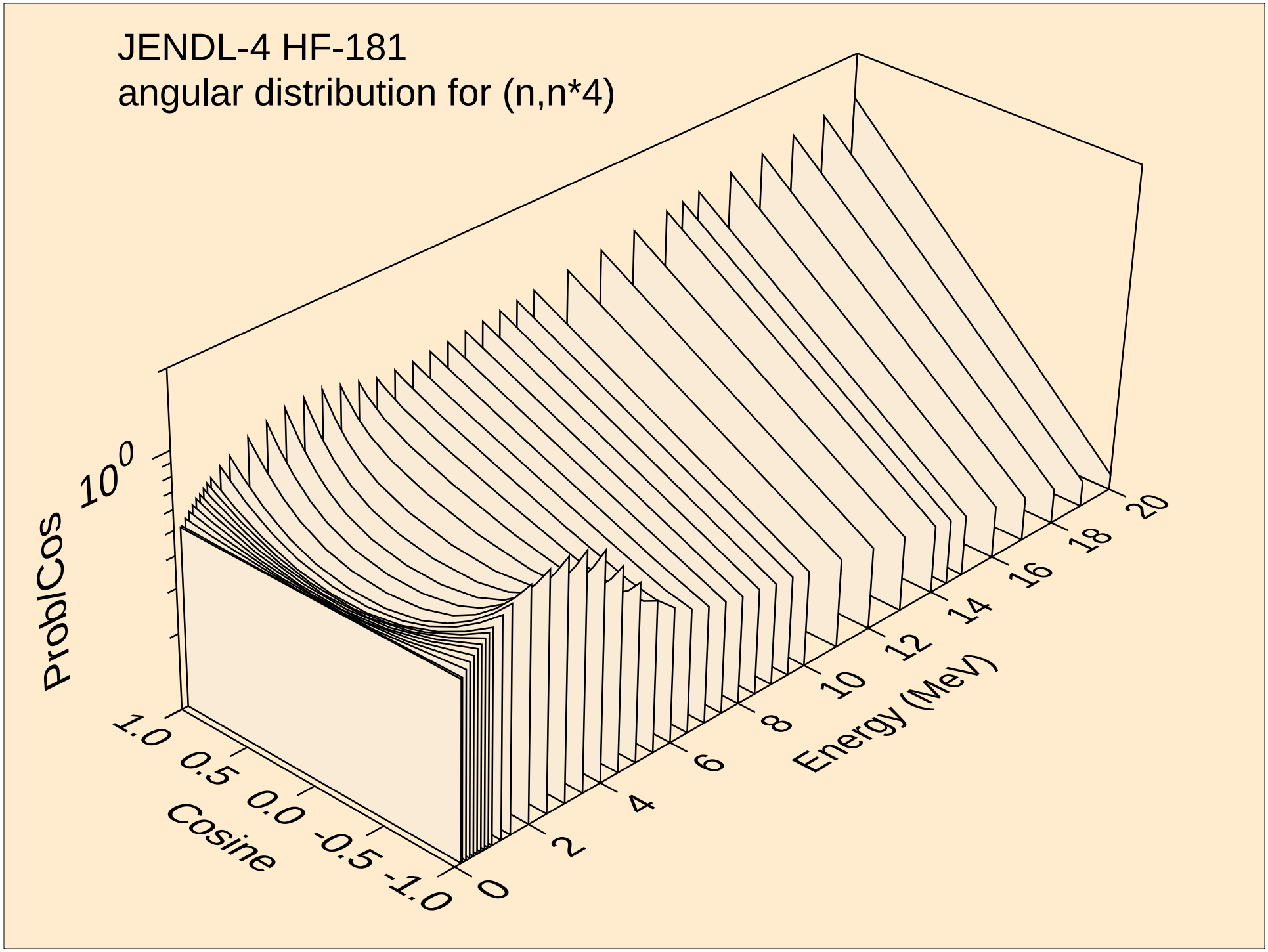

JENDL-4 HF-181
Threshold reactions
*10^-3
(n,xp)
(n,xd)
(n,xt)
(n,xhe3)
(n,xa)
Cross section (barns)
Energy (MeV)
0
5
10
15
20
25
2
4
6
8
10
12
14
16
18
20

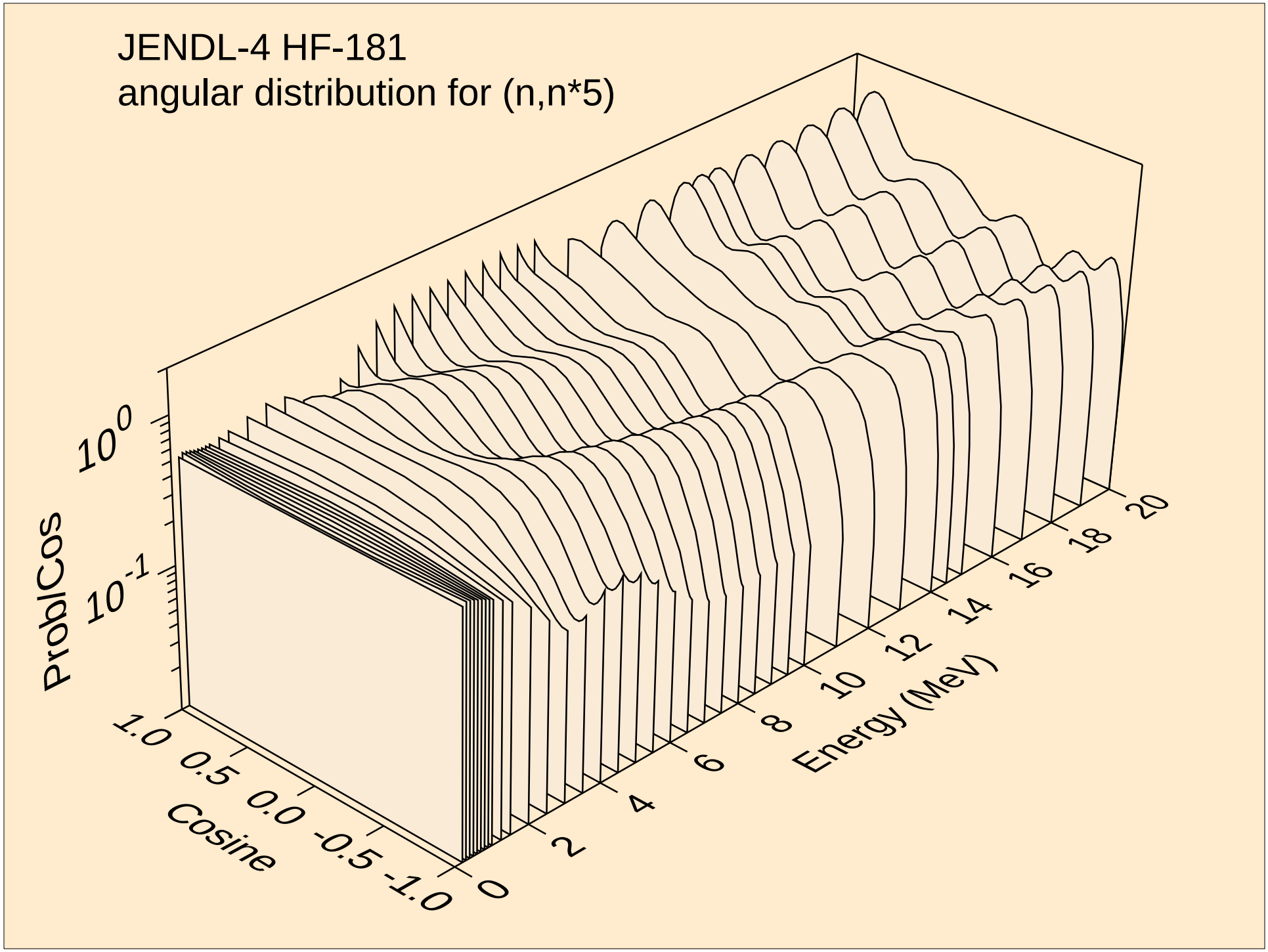

JENDL-4 HF-181
angular distribution for elastic
ProblCos
10^{1}
10^{-1}
10^{-3}
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
5
10
15
20
Energy (MeV)

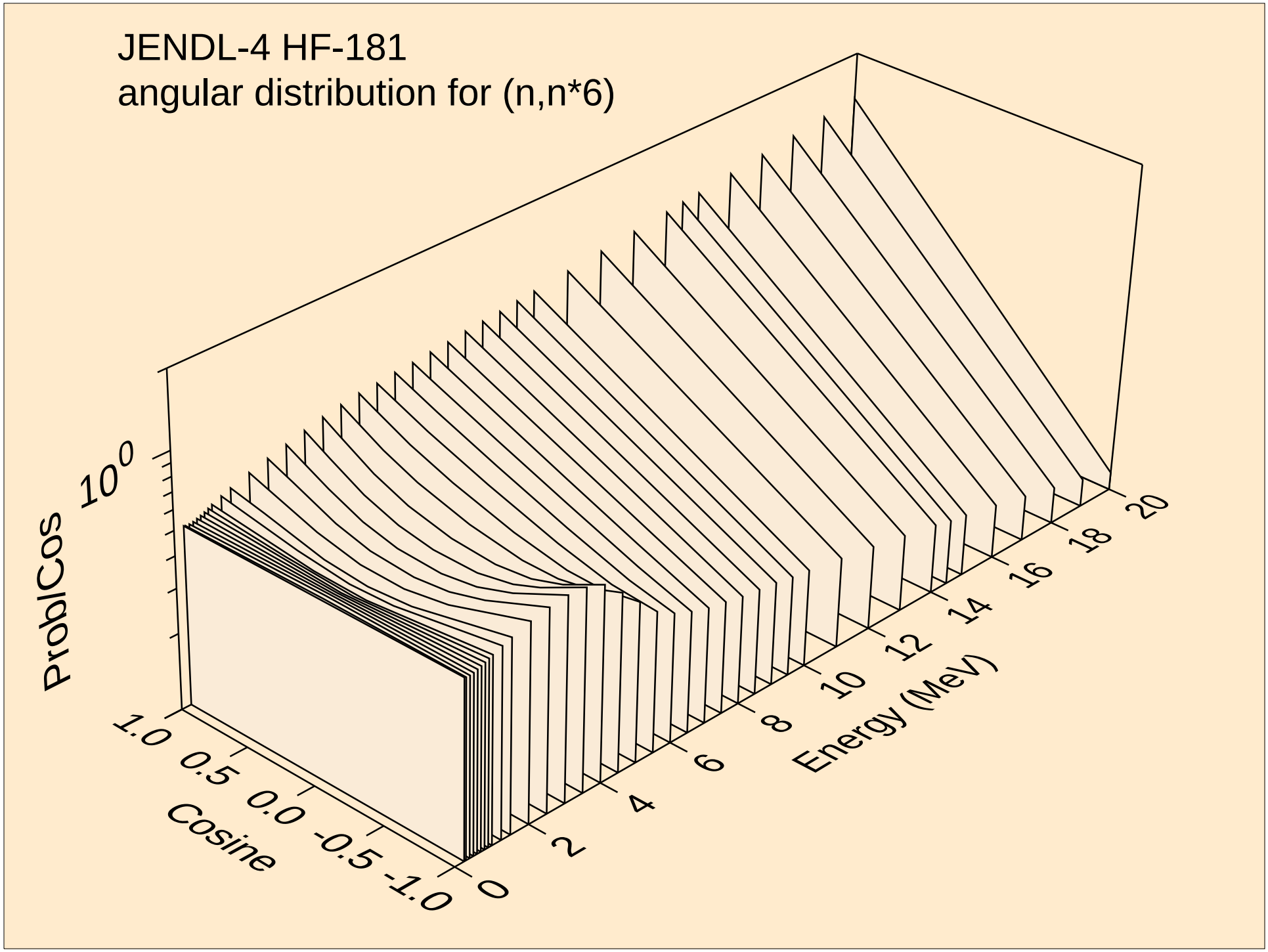

JENDL-4 HF-181
angular distribution for (n,n*1)
ProbCos
10^{1}
10^{-1}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

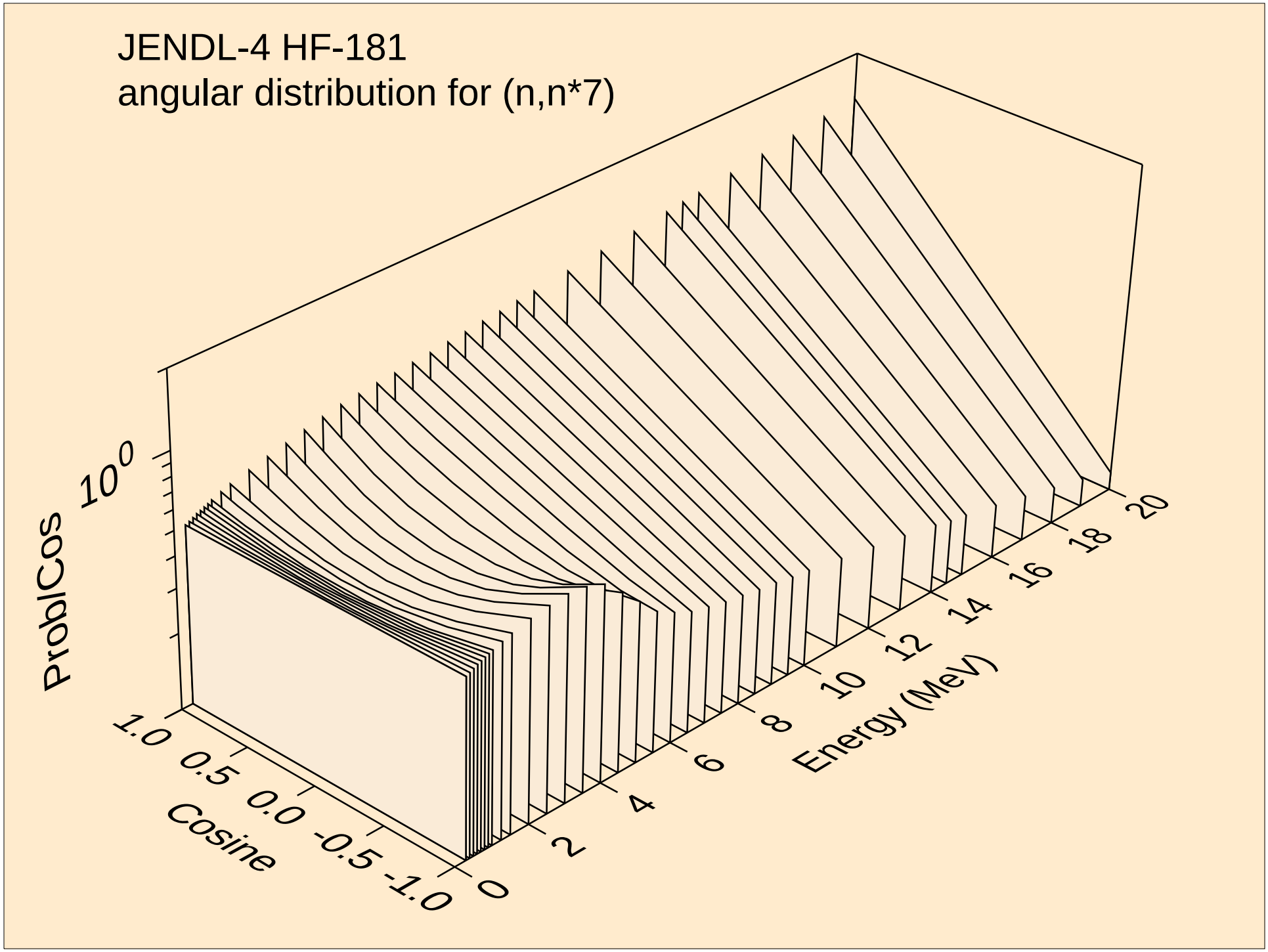

JENDL-4 HF-181
angular distribution for (n,n*2)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

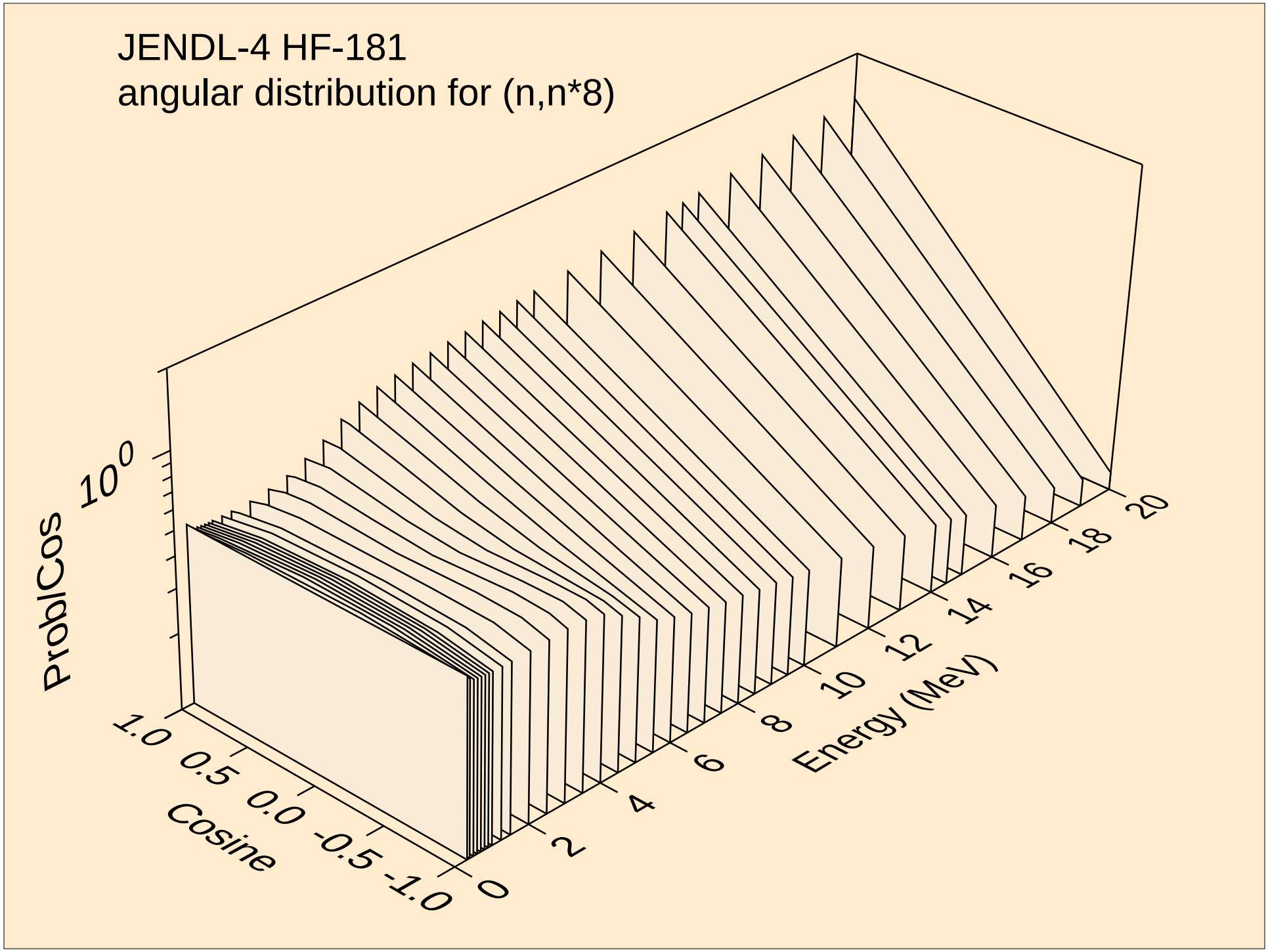

JENDL-4 HF-181
angular distribution for (n,n*3)
ProbCos
10^{0}
10^{-1}
10^{-2}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

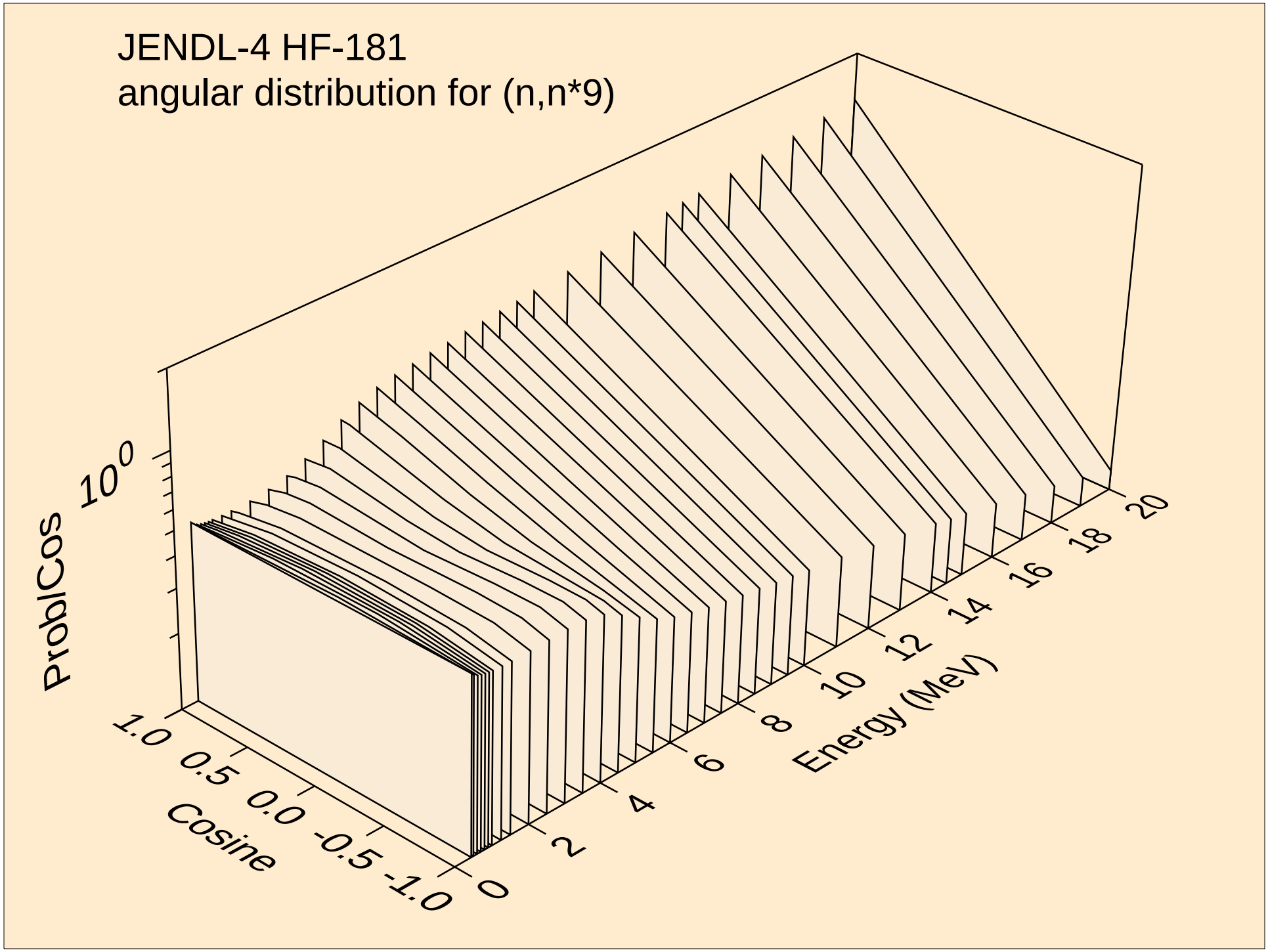

JENDL-4 HF-181
angular distribution for (n,n*4)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

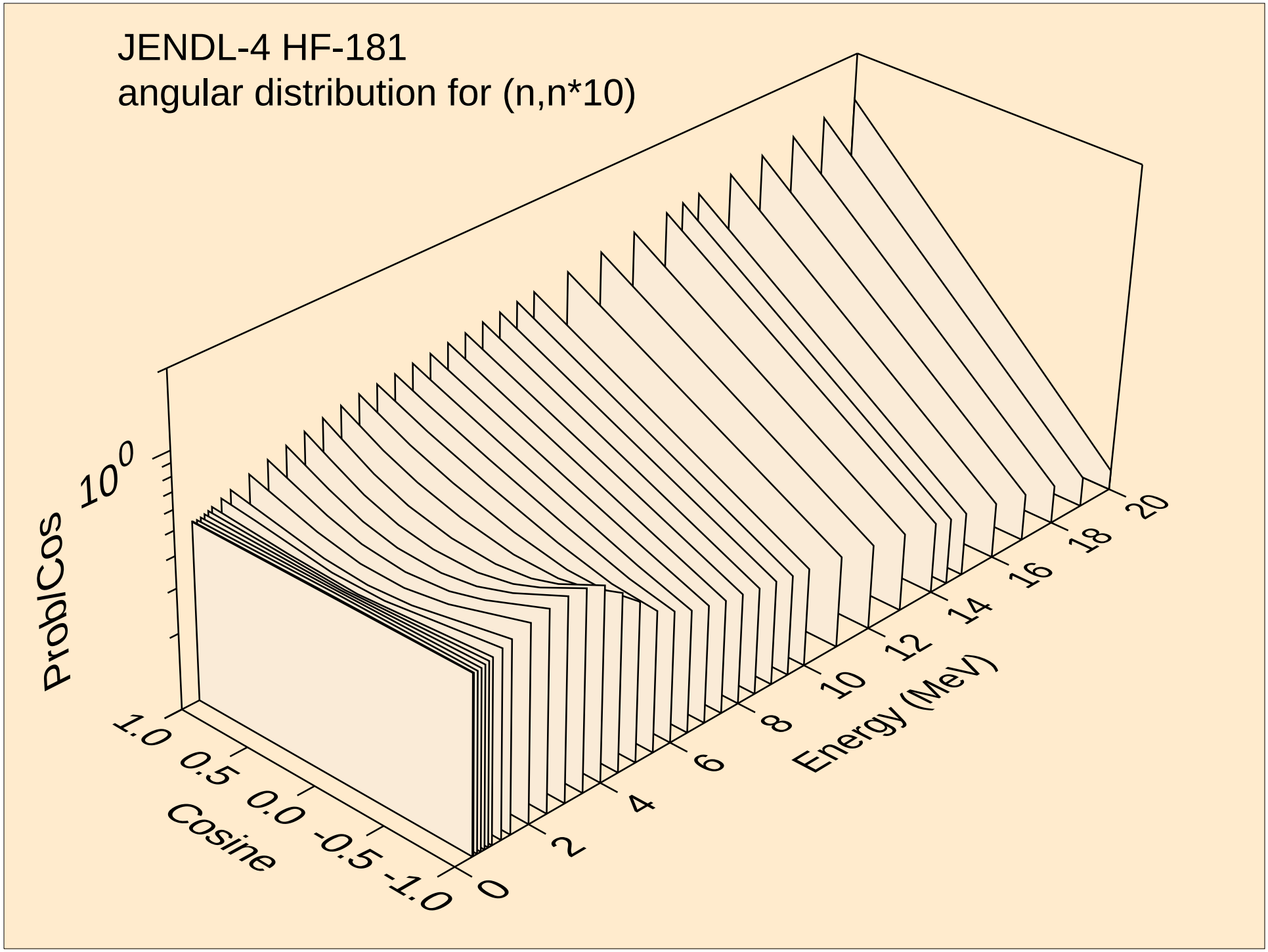

JENDL-4 HF-181
angular distribution for (n,n*5)
ProbCos
10^0
10^{-1}
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

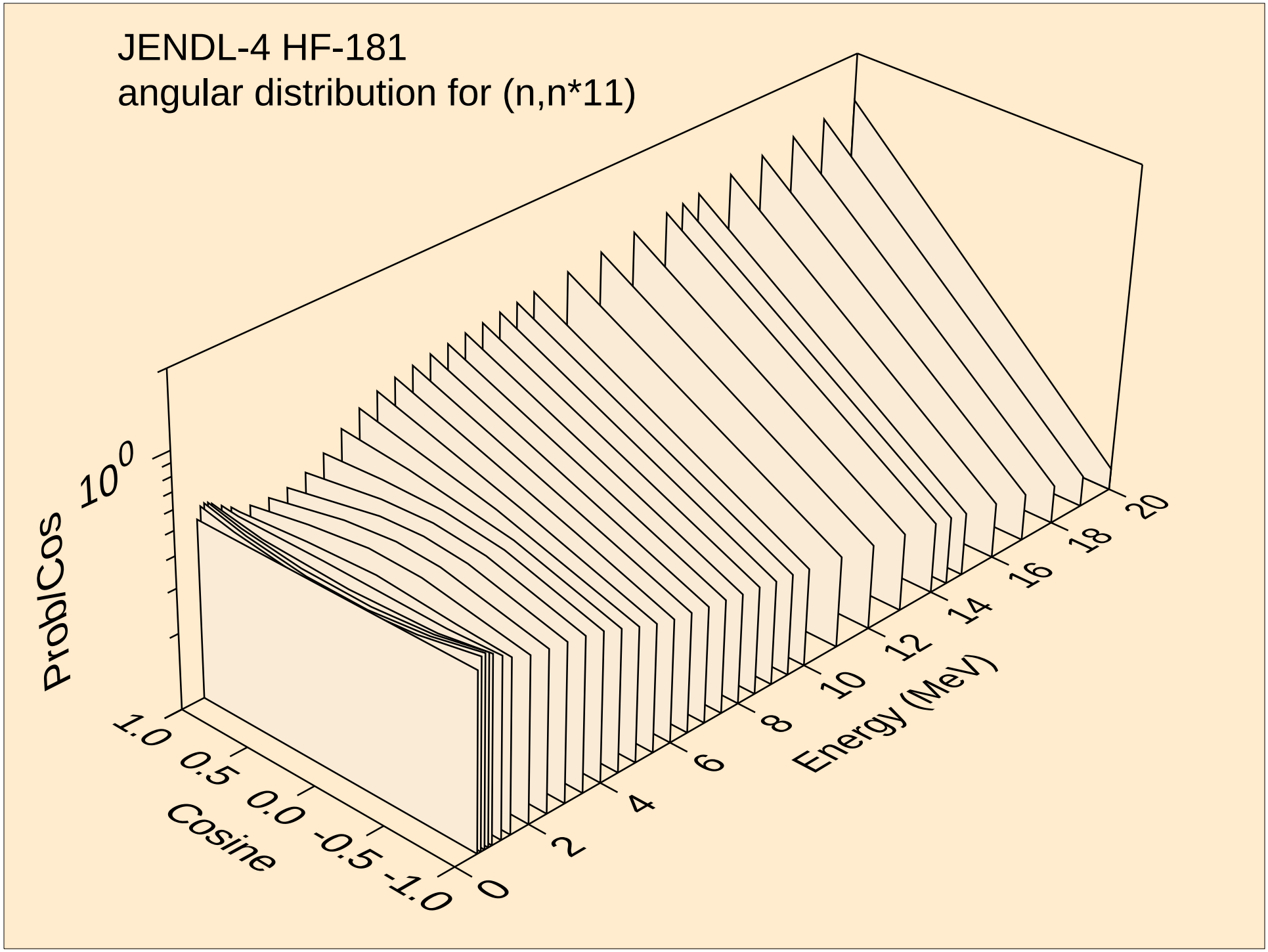

JENDL-4 HF-181
angular distribution for (n,n*6)
ProblCos
10^0
1.0
0.5
0.0
-0.5
-1.0
Cosine
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

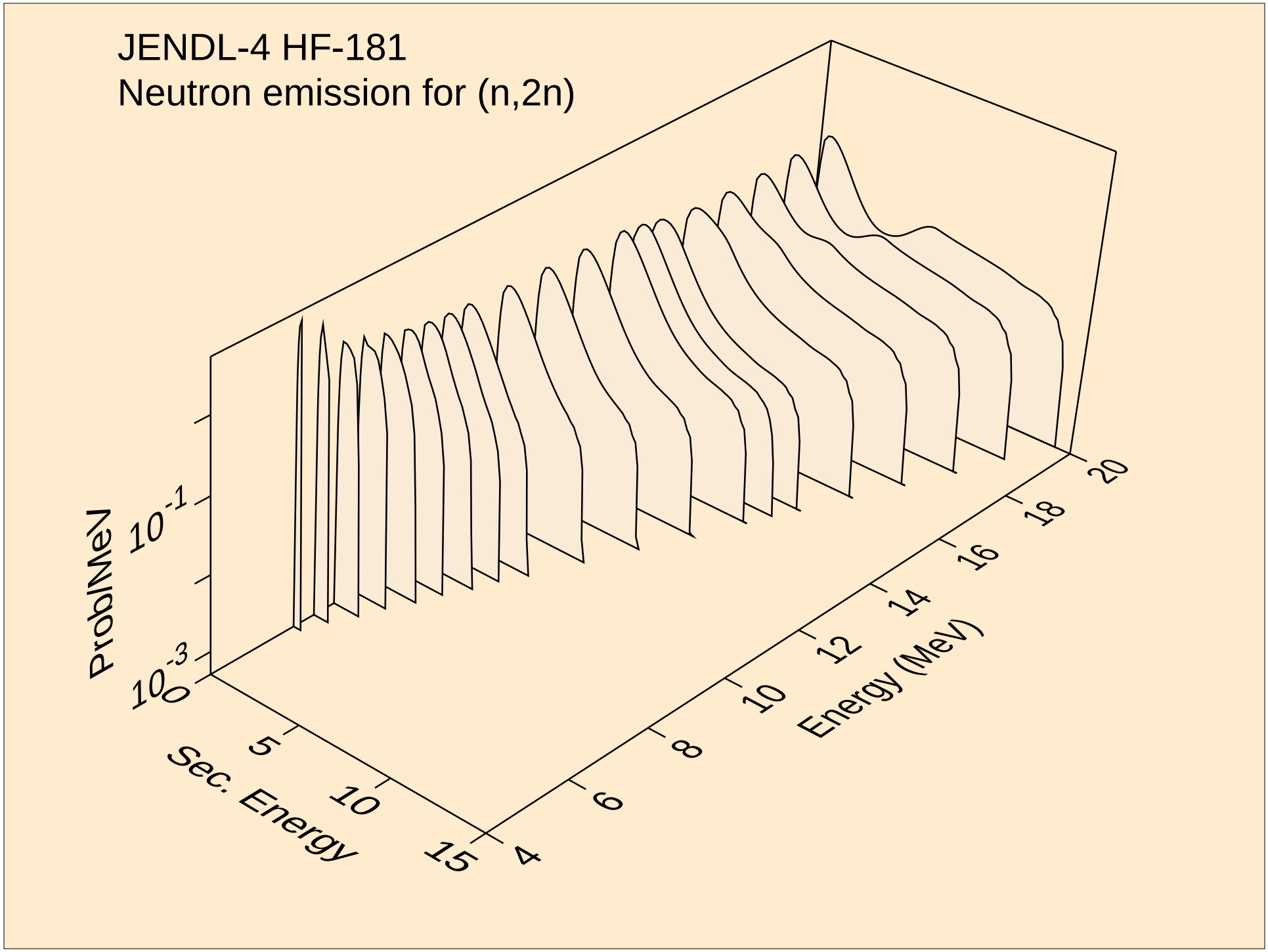

JENDL-4 HF-181
angular distribution for (n,n*7)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

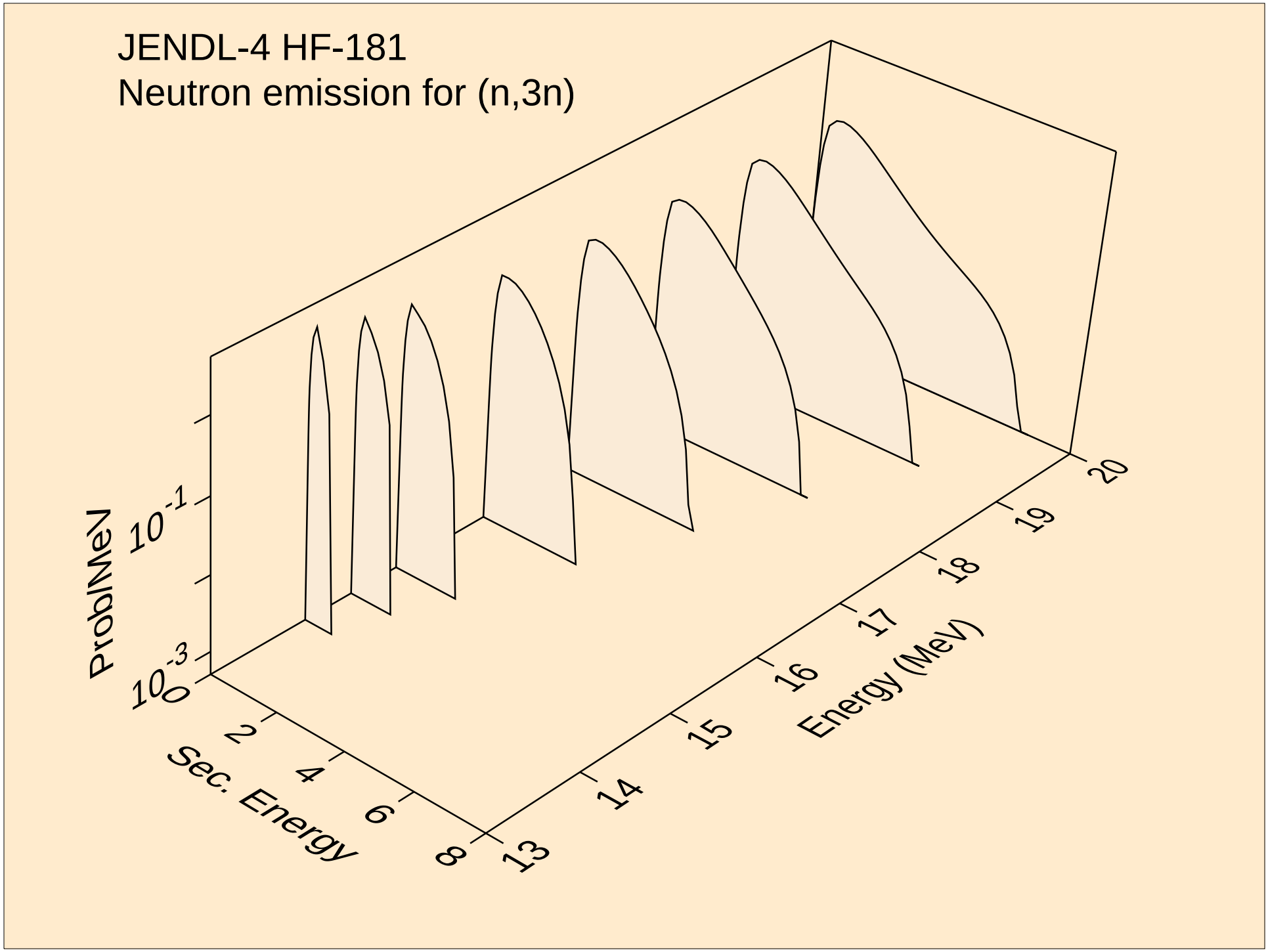

JENDL-4 HF-181
angular distribution for (n,n*8)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20


JENDL-4 HF-181
angular distribution for (n,n*9)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

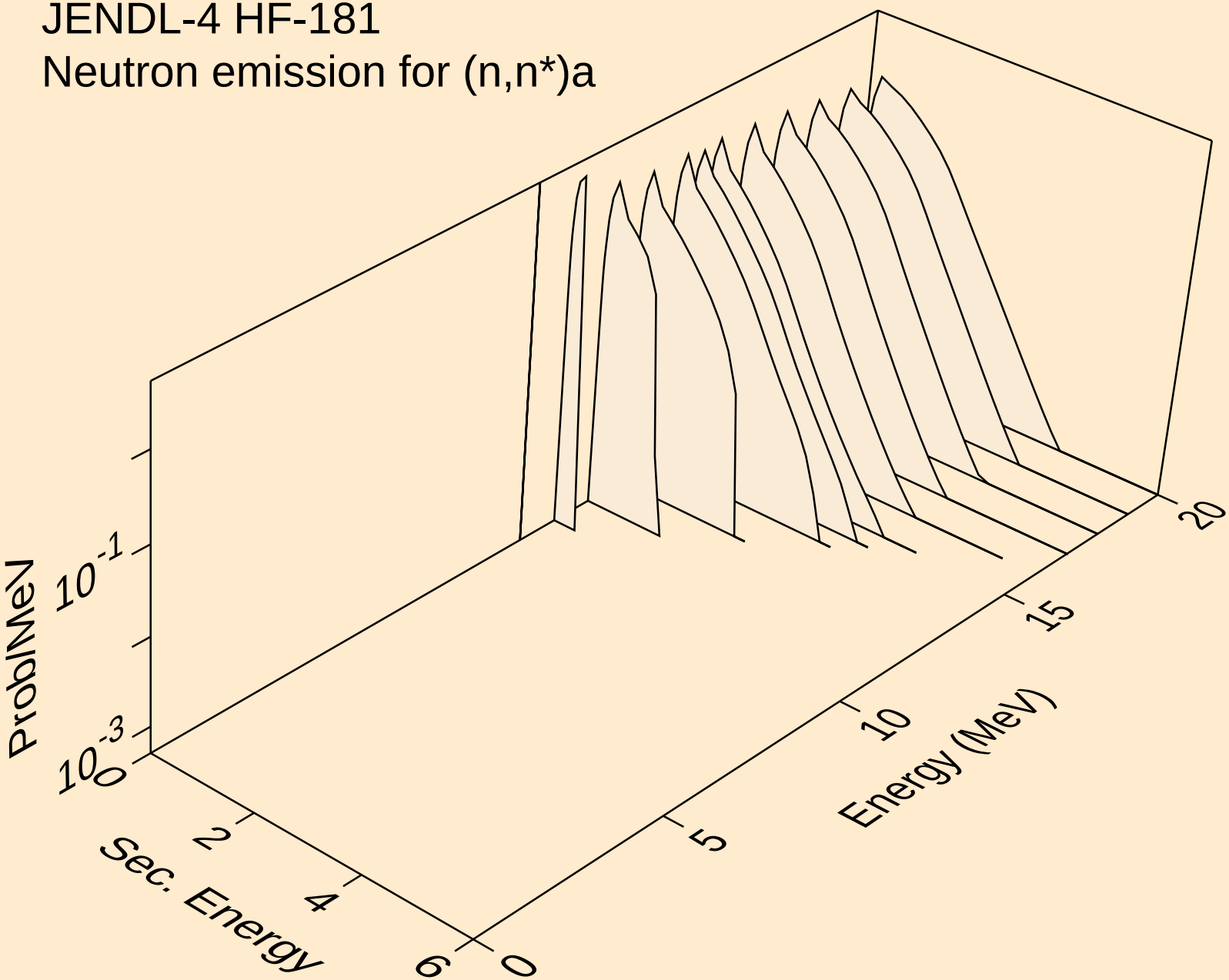

JENDL-4 HF-181
angular distribution for (n,n*10)
ProblCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

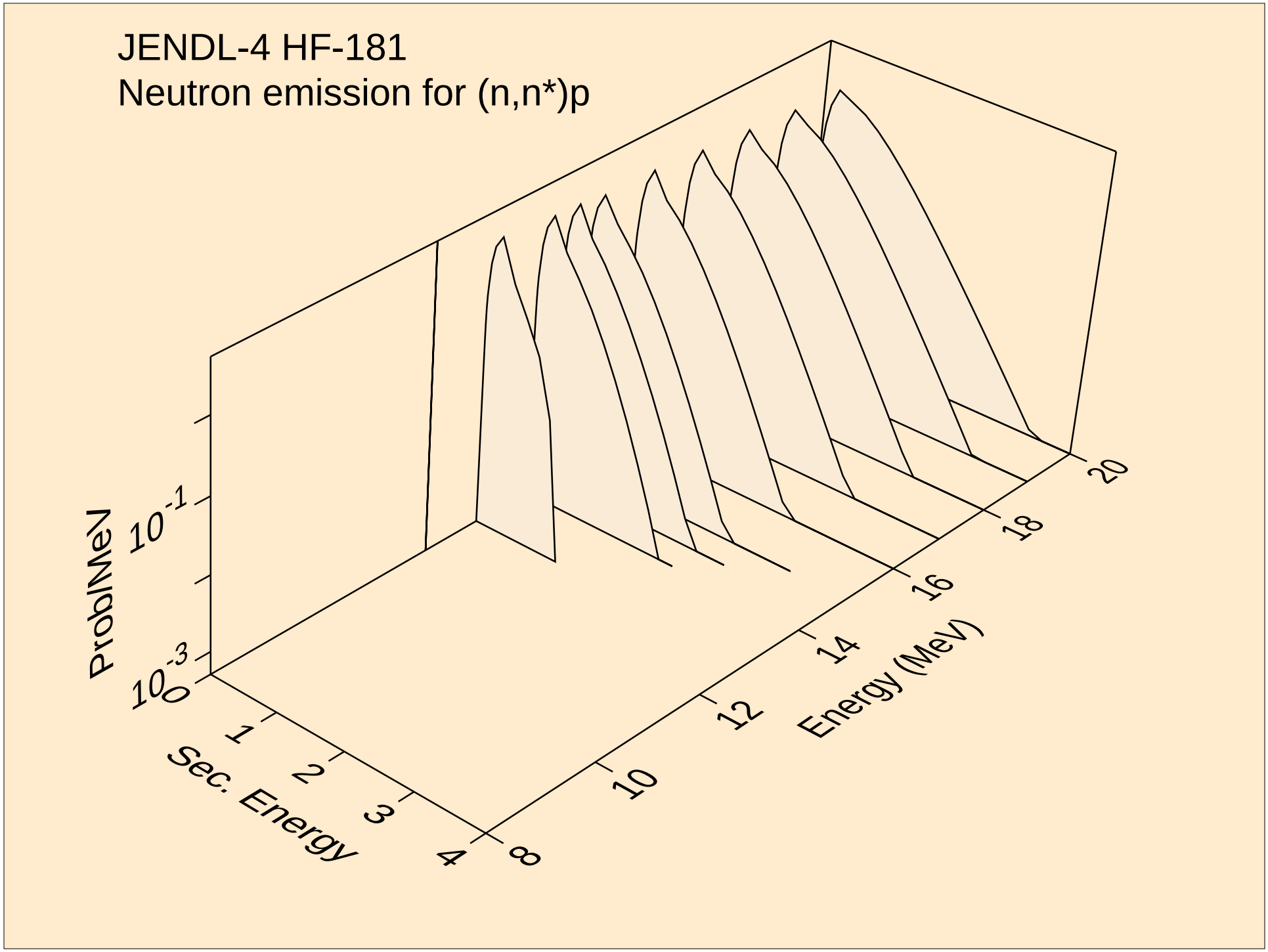

JENDL-4 HF-181
angular distribution for (n,n*11)
ProbCos
10^0
Cosine
1.0
0.5
0.0
-0.5
-1.0
Energy (MeV)
0
2
4
6
8
10
12
14
16
18
20

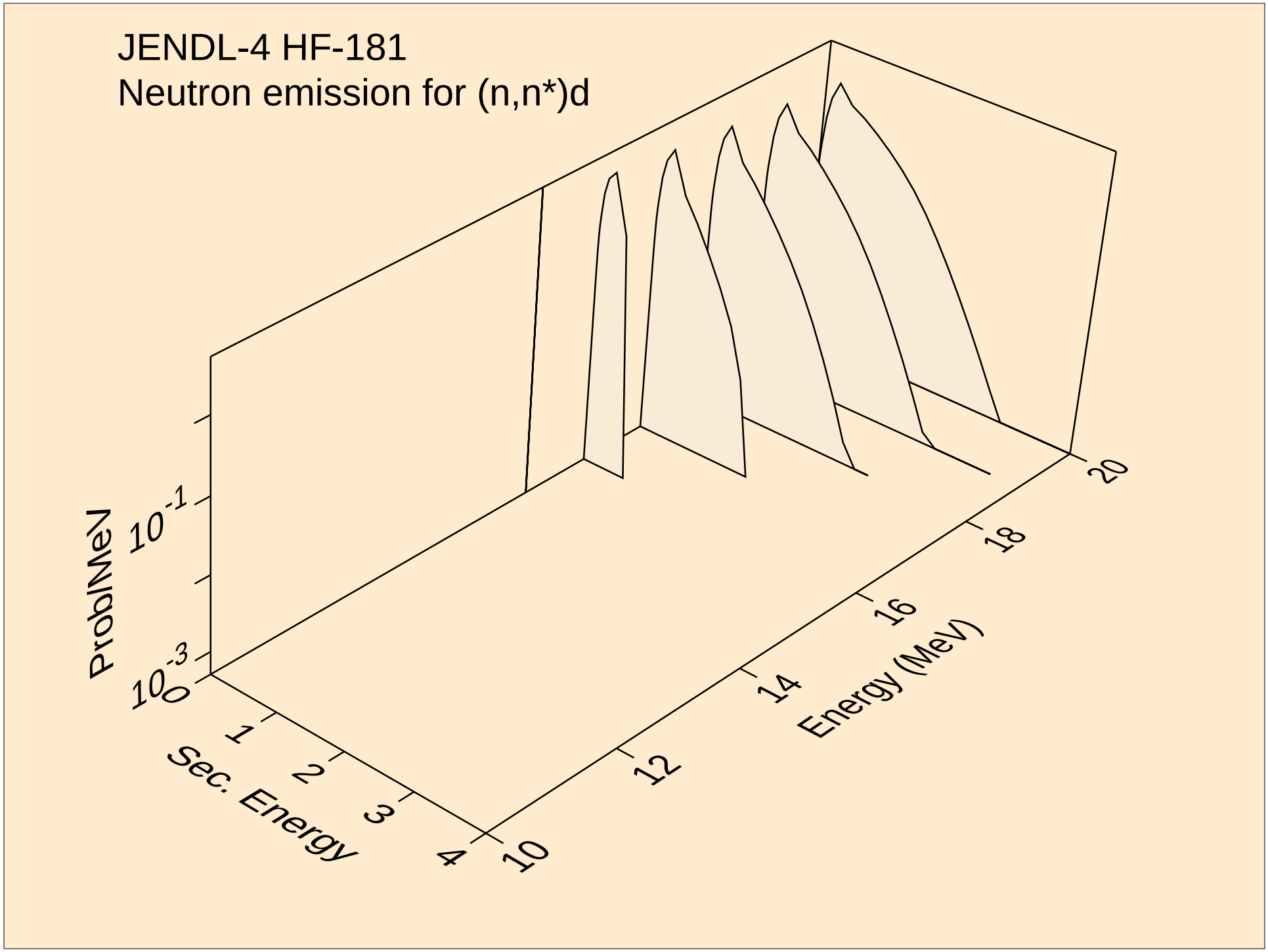

JENDL-4 HF-181
Neutron emission for (n,2n)
Prob/MeV
10^{-1}
10^{-3}
0
5
10
15
Sec. Energy
4
6
8
10
12
14
16
18
20
Energy (MeV)

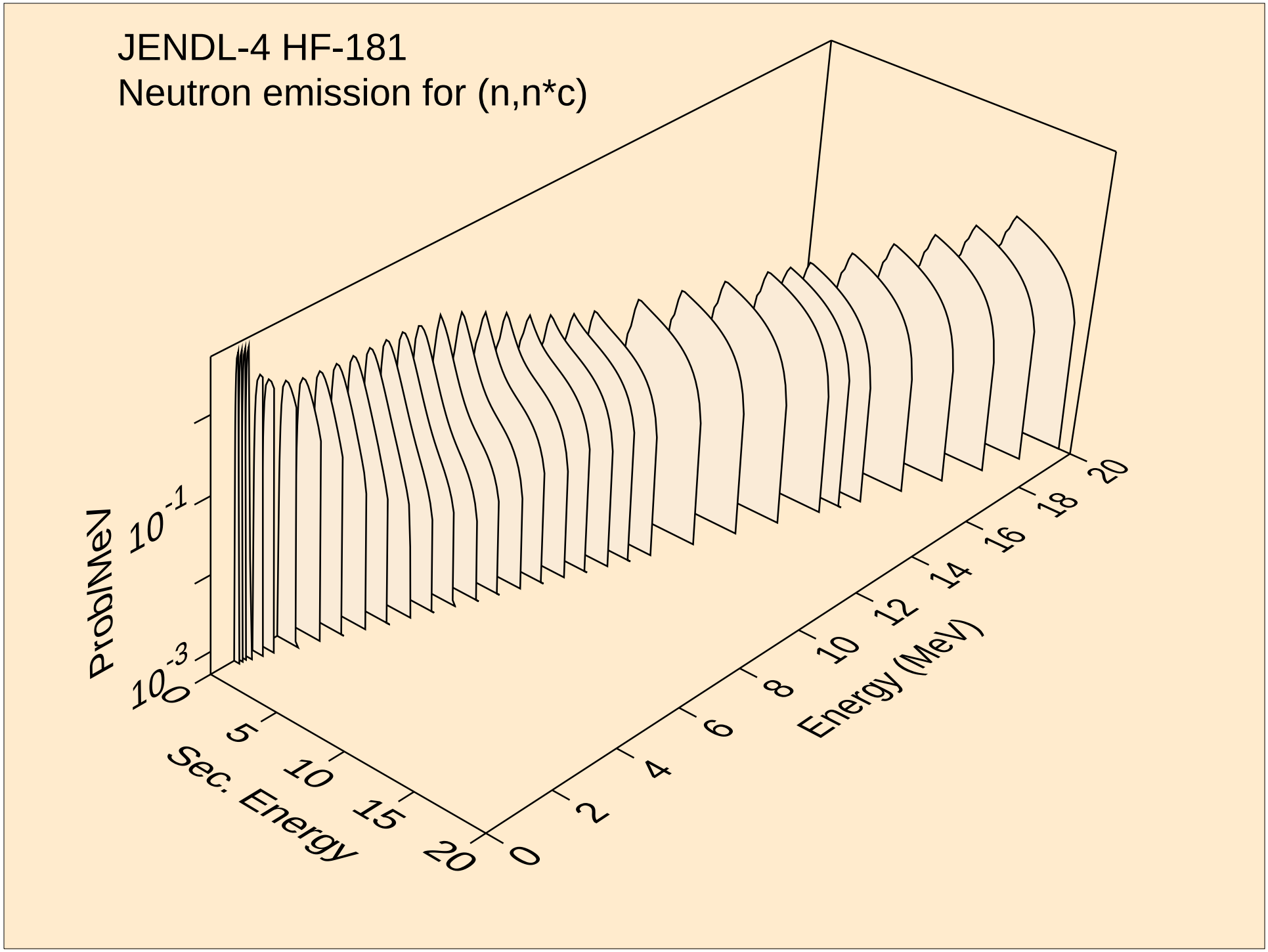

JENDL-4 HF-181
Neutron emission for (n,3n)
Prob/MeV
10^{-1}
10^{-3}
0
2
4
6
8
Sec. Energy
13
14
15
16
17
18
19
20
Energy (MeV)

JENDL-4 HF-181
Neutron emission for (n,n*)a

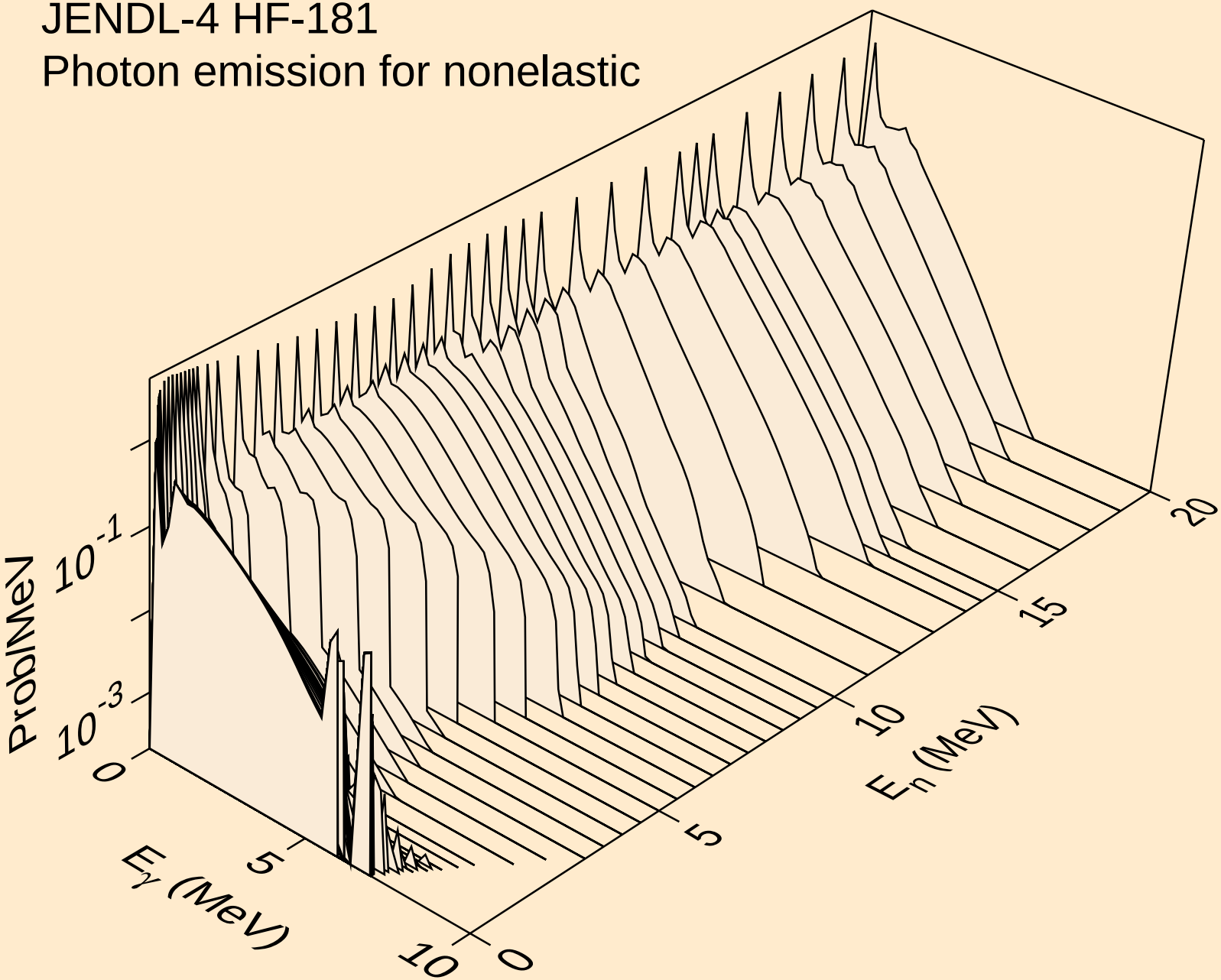


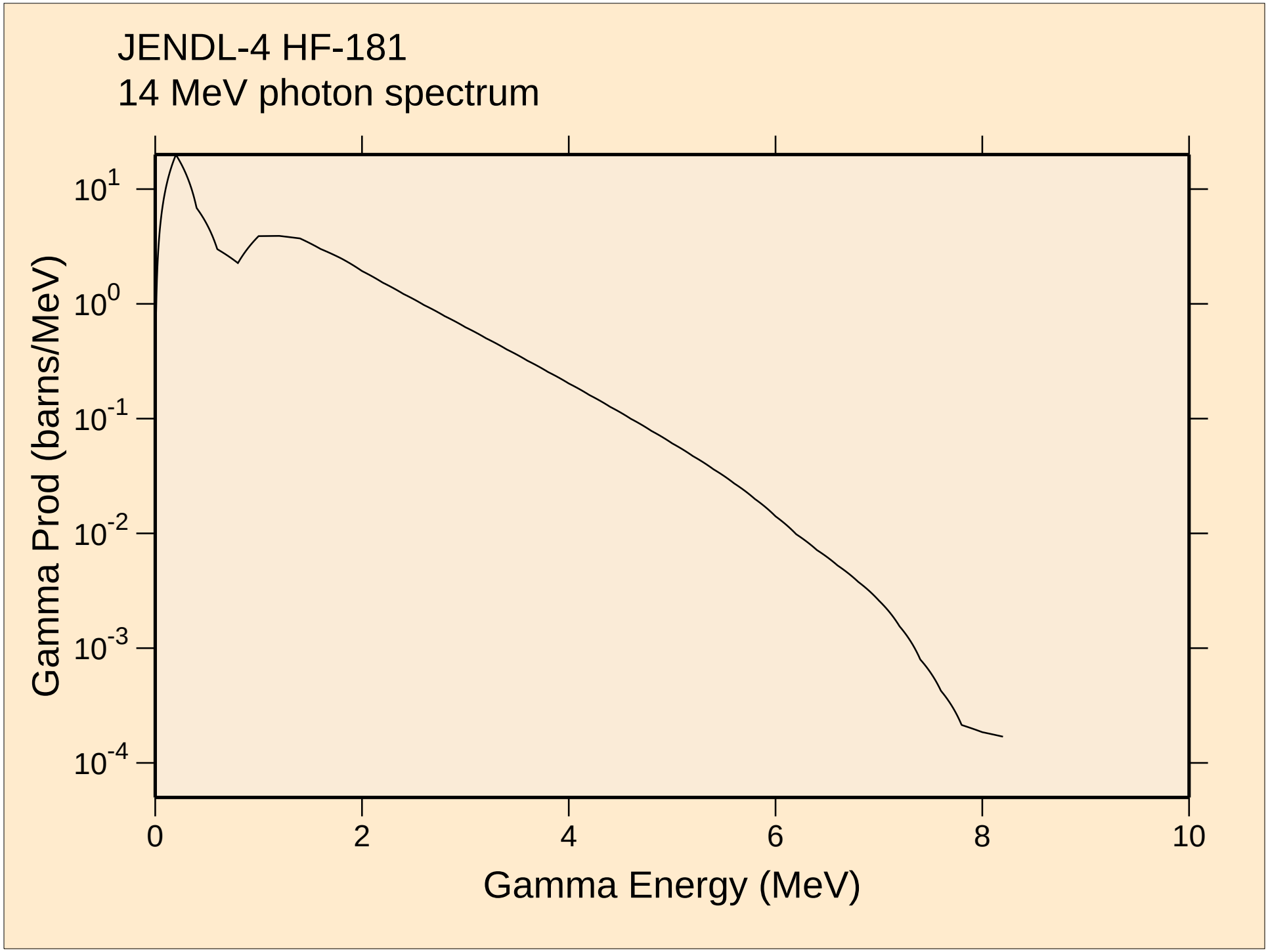

JENDL-4 HF-181
Neutron emission for (n,n*)p
Prob/MeV
10^-1
10^-3
0
1
2
3
4
Sec. Energy
8
10
12
14
16
18
20
Energy (MeV)

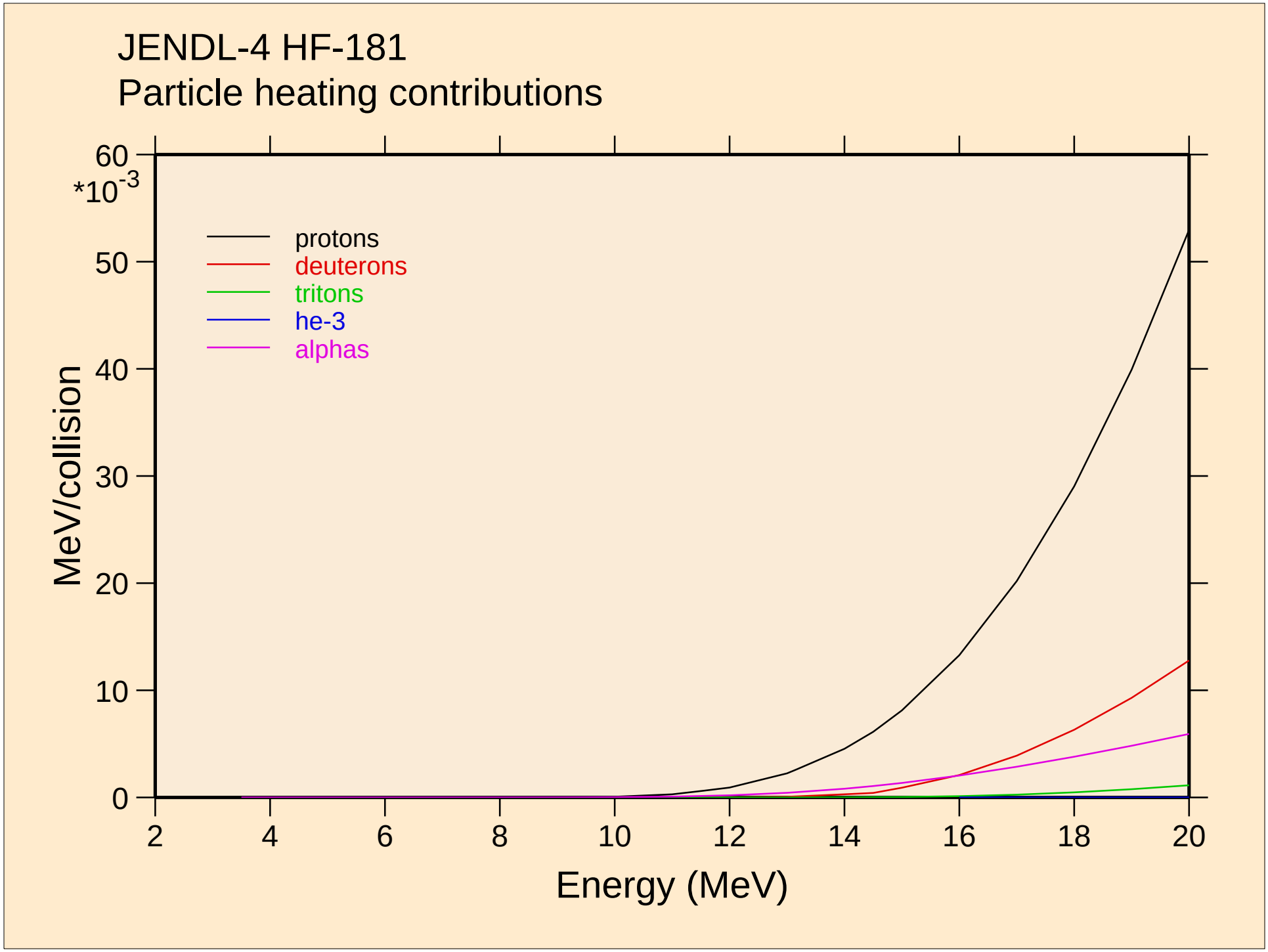

JENDL-4 HF-181
Neutron emission for (n,n*)d
Prob/MeV
10^-1
10^-3
0
1
2
3
4
Sec. Energy
10
12
14
16
18
20
Energy (MeV)

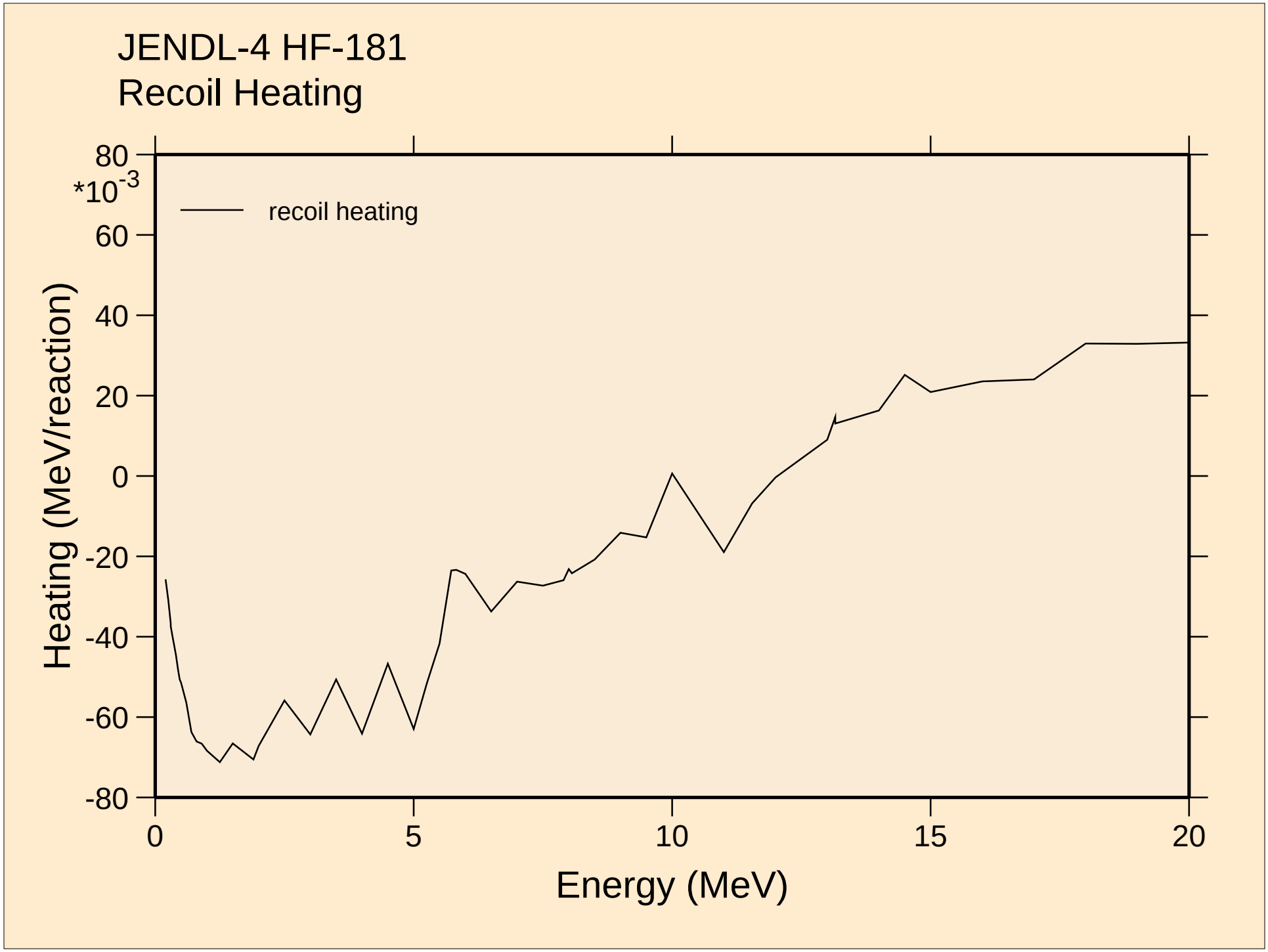

JENDL-4 HF-181
Neutron emission for (n,n*c)
Prob/MeV
10^{-1}
10^{-3}
0
5
10
15
20
Sec. Energy
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

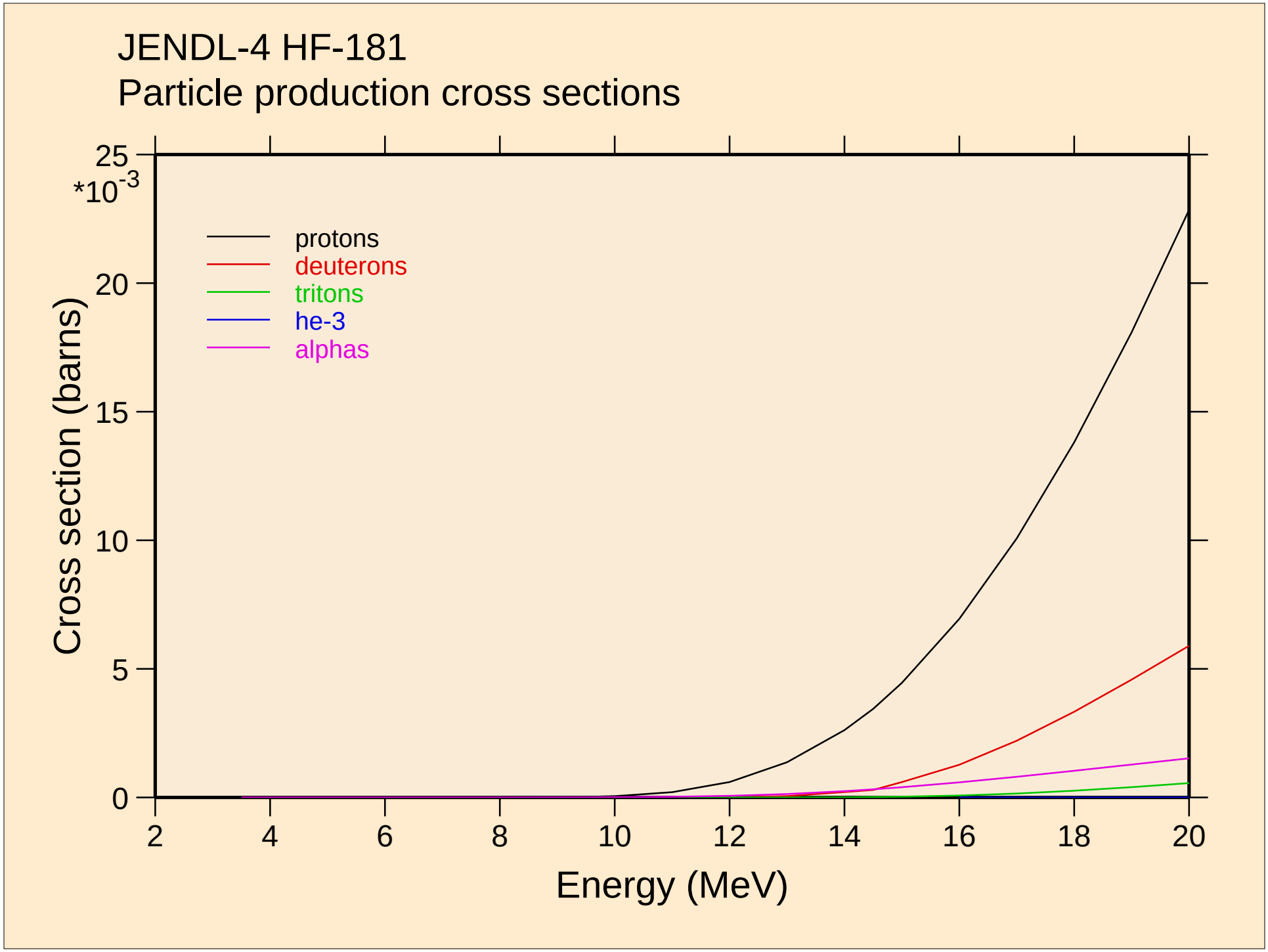
JENDL-4 HF-181
Photon emission for nonelastic

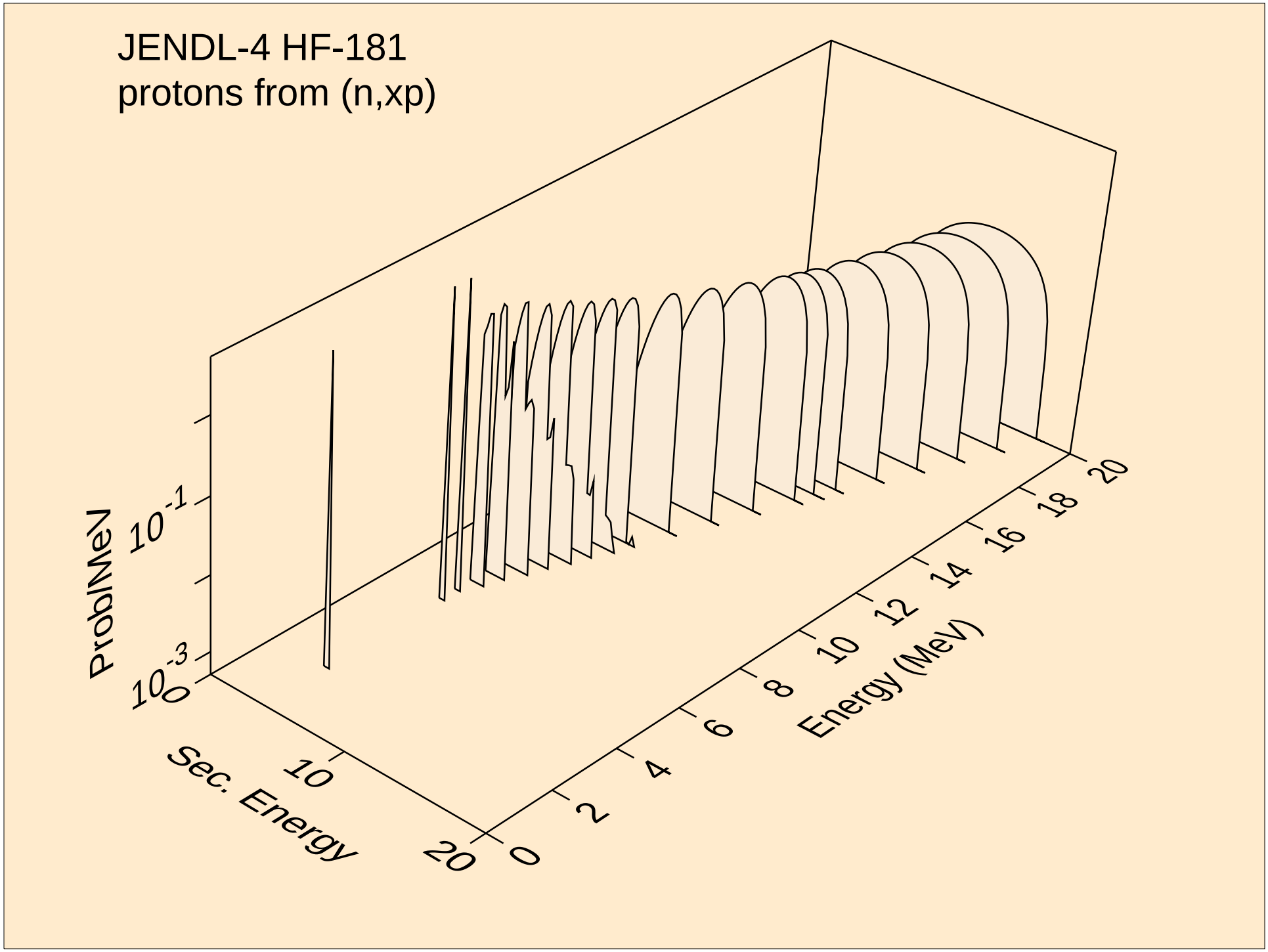


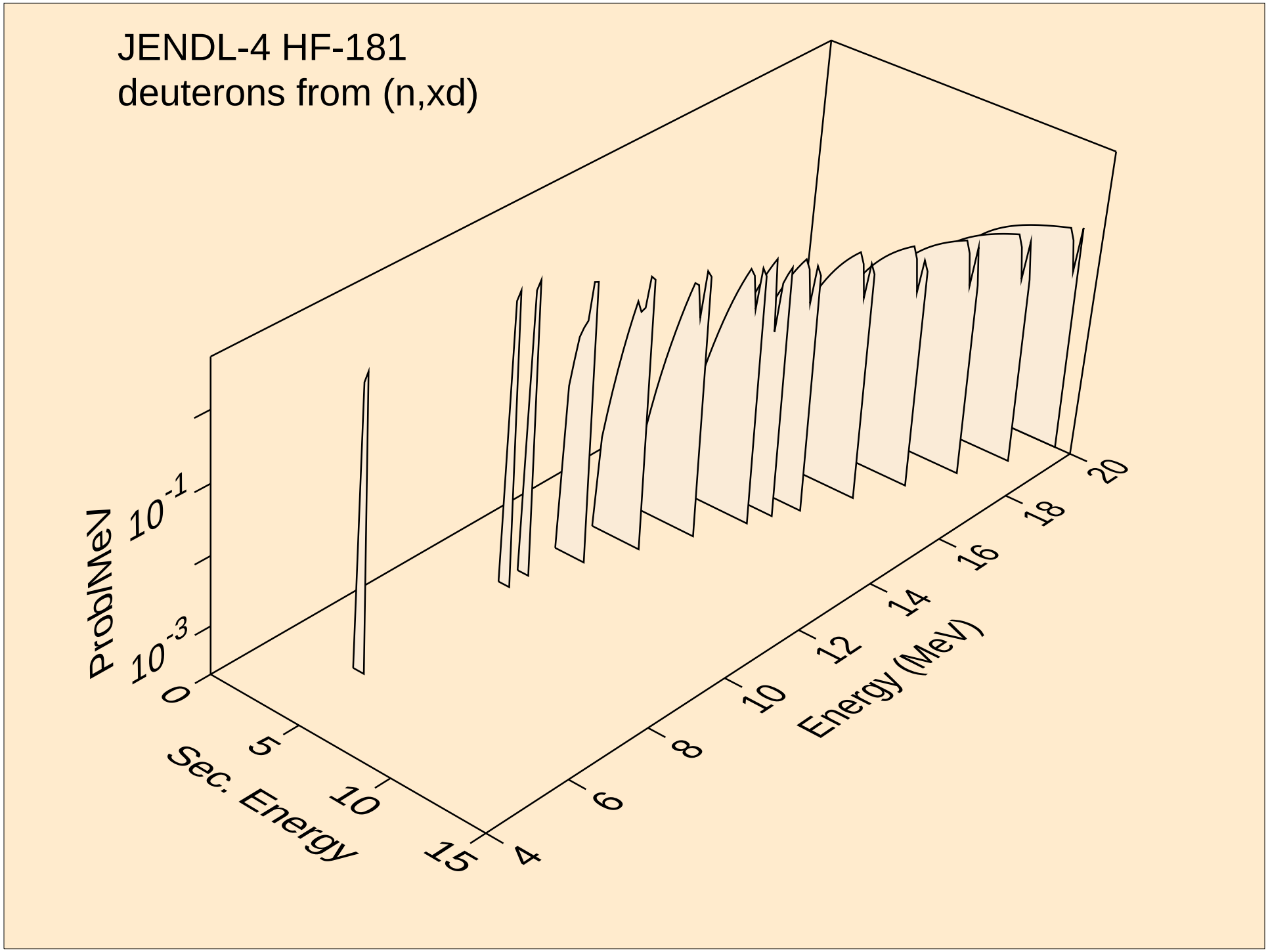

JENDL-4 HF-181
14 MeV photon spectrum
Gamma Prod (barns/MeV)
10^1
10^0
10^-1
10^-2
10^-3
10^-4
0
2
4
6
8
10
Gamma Energy (MeV)

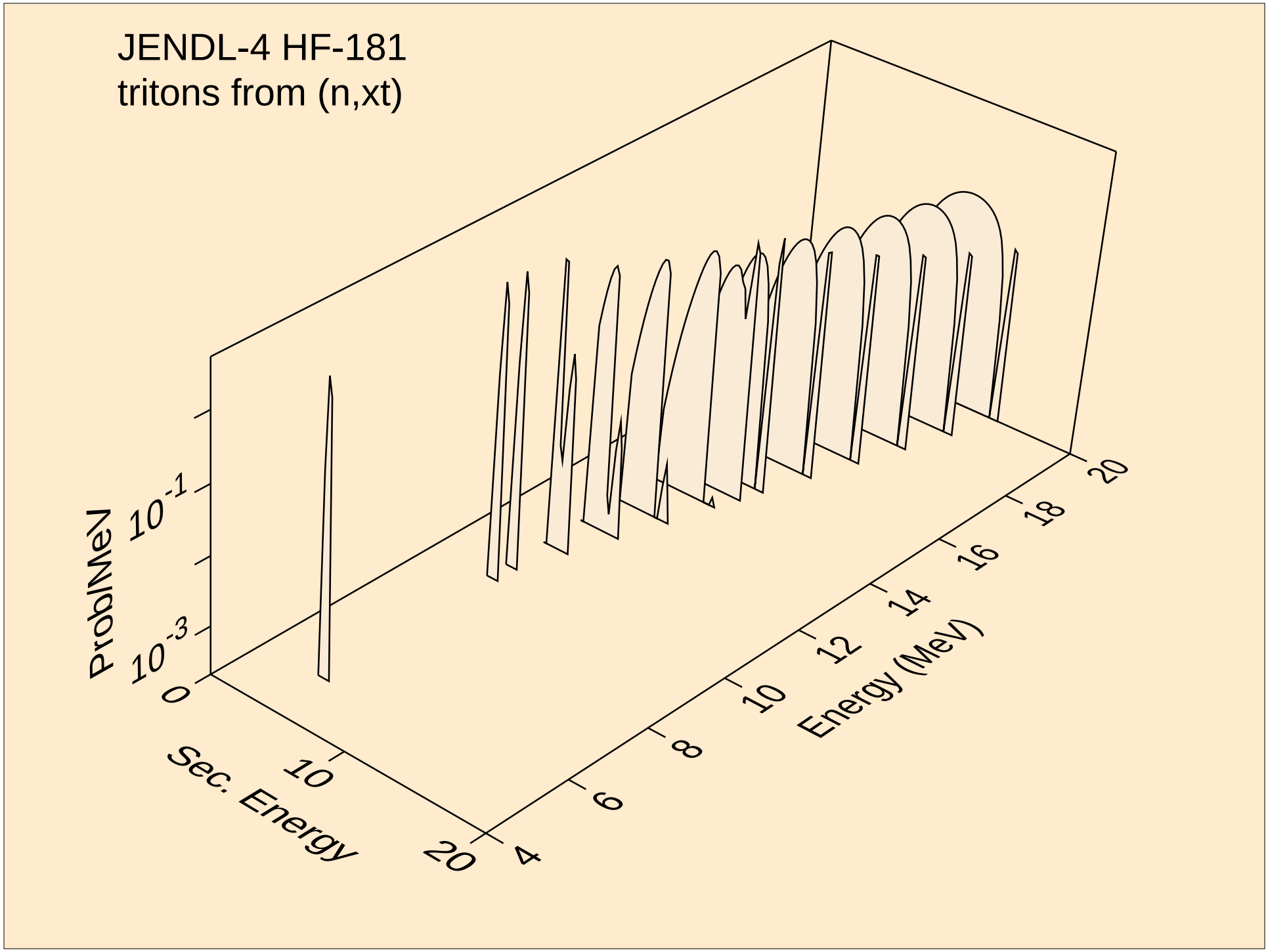

JENDL-4 HF-181
Particle heating contributions
*10-3
60
50
40
30
20
10
0
MeV/collision
protons
deuterons
tritons
he-3
alphas
2
4
6
8
10
12
14
16
18
20
Energy (MeV)

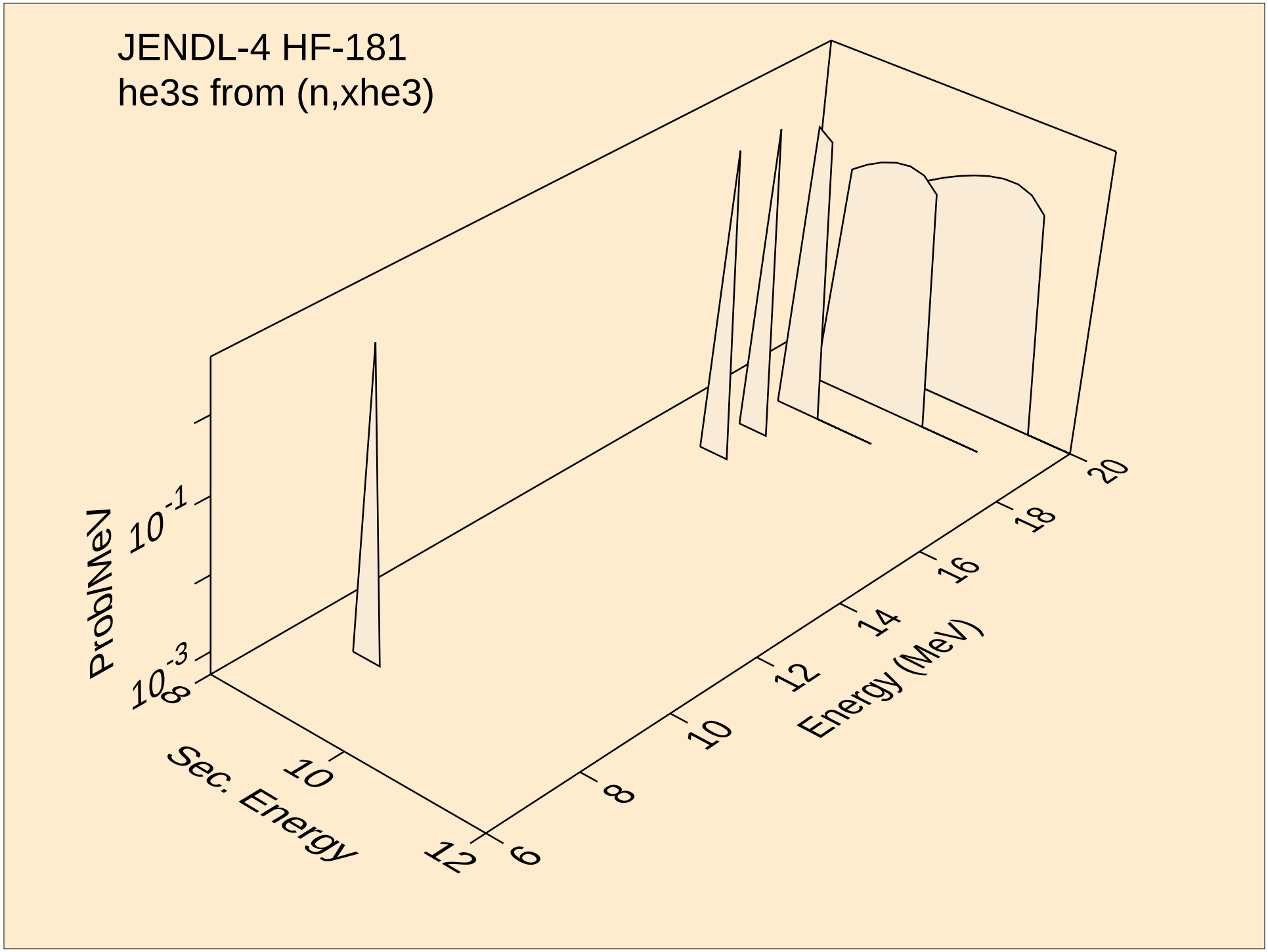

JENDL-4 HF-181
Recoil Heating
recoil heating
*10-3
80
60
40
20
0
-20
-40
-60
-80
Heating (MeV/reaction)
0
5
10
15
20
Energy (MeV)

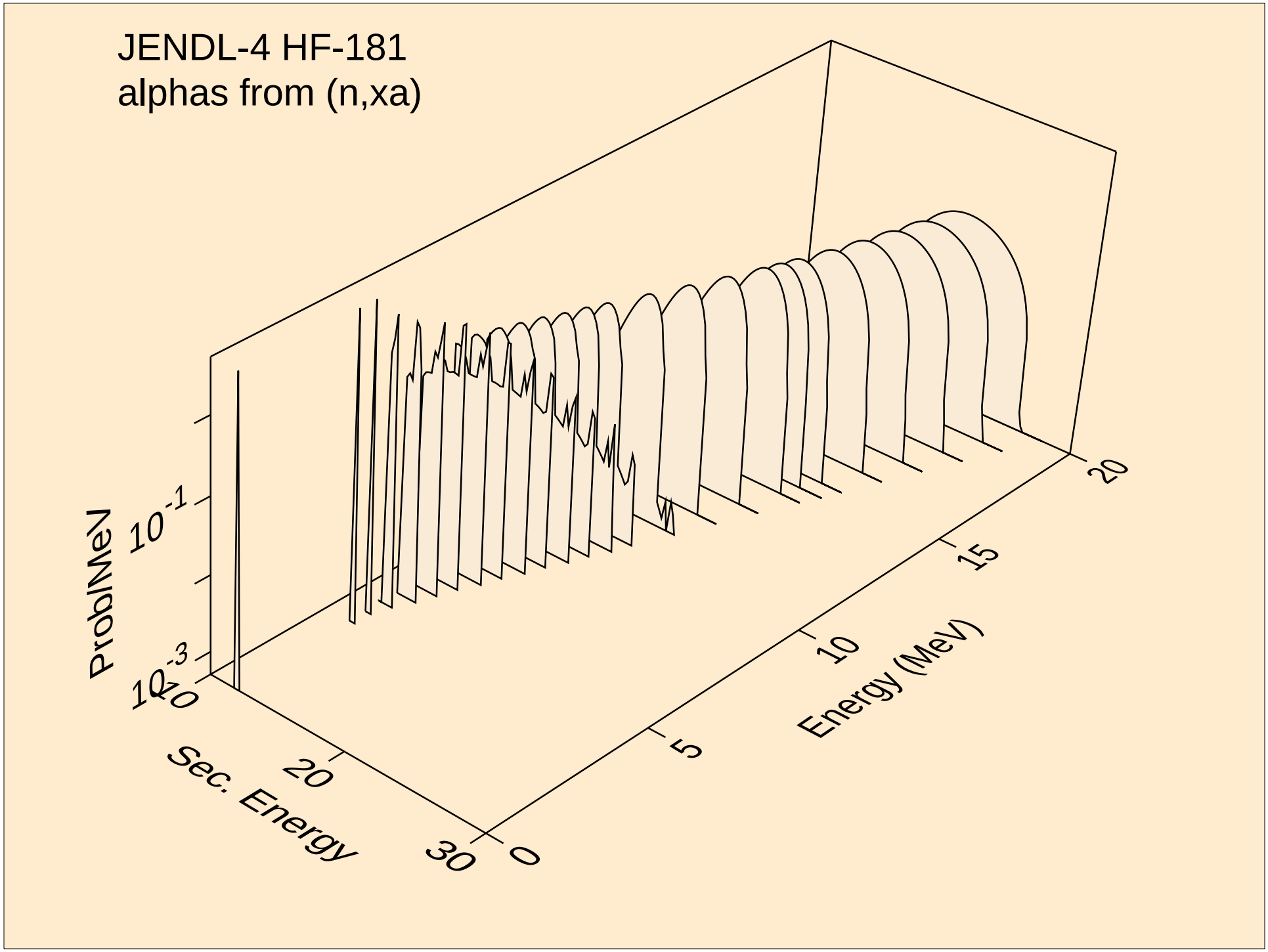

JENDL-4 HF-181
Particle production cross sections
*10^-3
25
20
15
10
5
0
Cross section (barns)
protons
deuterons
tritons
he-3
alphas
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


JENDL-4 HF-181
protons from (n,xp)
Prob/MeV
10^{-1}
10^{-3}
0
10
20
Sec. Energy
0
2
4
6
8
10
12
14
16
18
20
Energy (MeV)


JENDL-4 HF-181
deuterons from (n,xd)
Prob/MeV
10^-1
10^-3
0
5
10
15
Sec. Energy
4
6
8
10
12
14
16
18
20
Energy (MeV)


JENDL-4 HF-181
tritons from (n,xt)
Prob/MeV
10^-1
10^-3
0
Sec. Energy
10
20
4
6
8
10
12
14
16
18
20
Energy (MeV)


JENDL-4 HF-181
he3s from (n,xhe3)
Prob/MeV
10^-1
10^-3
Sec. Energy
8
10
12
Energy (MeV)
6
8
10
12
14
16
18
20


JENDL-4 HF-181
alphas from (n,xa)
Prob/MeV
10^-1
10^-3
Sec. Energy
0
20
30
Energy (MeV)
0
5
10
15
20