Notes on February 2002 experiment with iron spheres.

This experiment was devoted to completion of the experimental study of the iron spheres. Both the thin (~3 cm thick) and the thick (~8 cm thick) iron spheres were used during this beam time. The details of both iron spheres are shown on the web site:

http://inpp.ohiou.edu/~massey/NERI.html

Additional work was done at the before this measurement to remove as much void space as possible in the thin sphere. (This void space was from the bolts which had made up the fixture used in the fabrication of the sphere.)

Reaction	Angles(degrees)
^{15}N(p,n), Sphere out, E_p = 5.1 MeV	0,15,45,60,90,100,120,135
^{15}N(p,n), Thin Sphere in, E_p = 5.1 MeV	0,45,90,120,135
^{15}N(p,n), Thick Sphere In, E_p = 5.1 MeV	0,45,90,120,135
d(d,n), sphere out, E_d = 3.0 MeV	0,15,45,60,90,100,120,135
d(d,n), Thick sphere in, E_d = 3.0 MeV	0,45,90,120,135
d(d,n), sphere out, E_d = 5.0 MeV	0,15,45,60,90,100,120,135
d(d,n), thick sphere in, E_d = 5.0 MeV	0,45,90,120,135
d(d,n), sphere out, E_d = 7.0 MeV	0,15,45,60,90,100,120,135
d(d,n), thick sphere in, E_d = 7.0 MeV	0,45,90,120,135
All energies refer to energy of the beam striking the gas.	

Analysis Notes:

Almost all of the data has been taken with a single NE213 2.0 inches thick by 5.0 inches in diameter neutron detector at a distance of 5.0554 meters to the center of the detector. Lead shielding was place around the detector array. This is seen in the pictures in the setup in

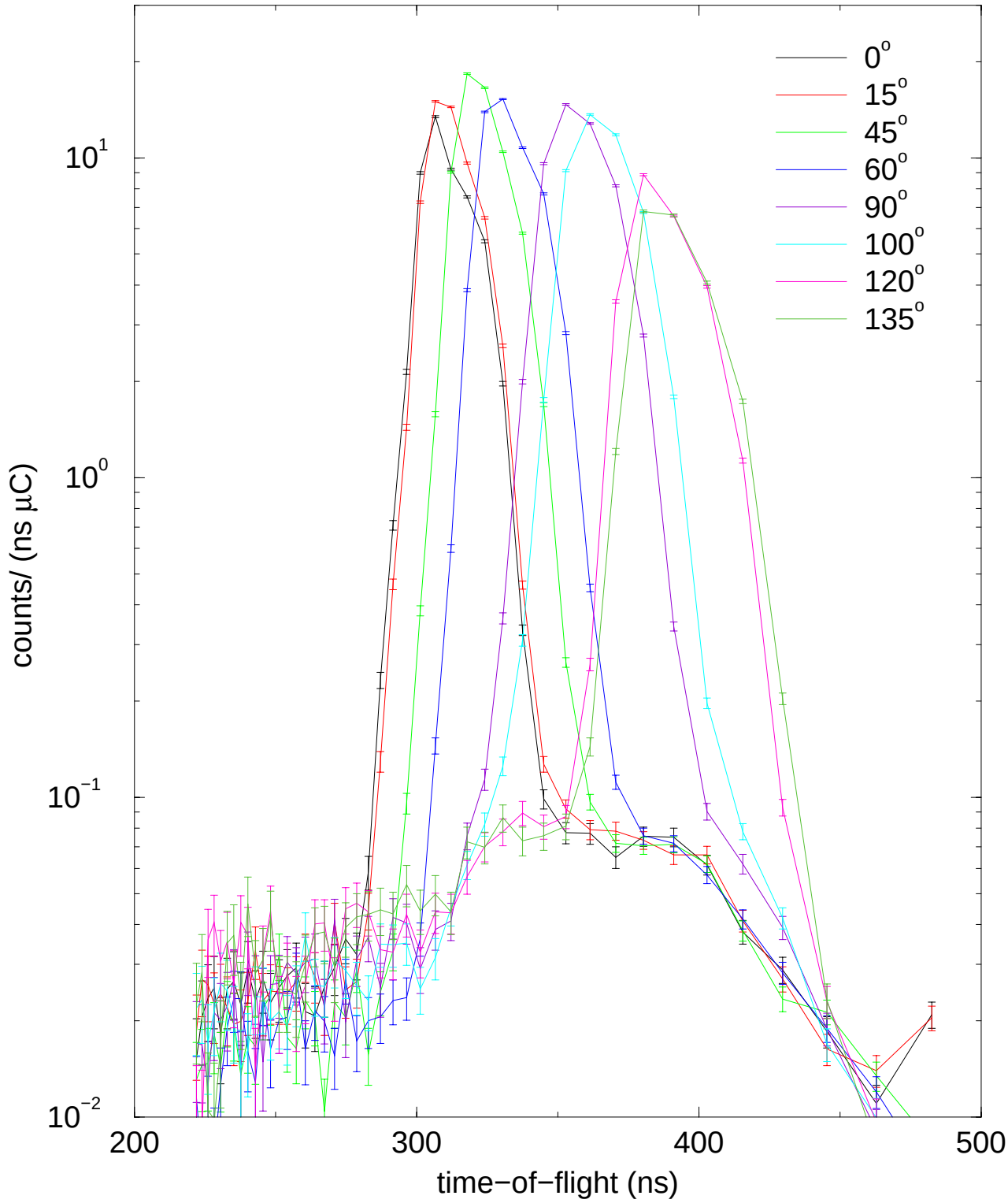
http://inpp.ohiou.edu/~massey/pictures_202.html. The pictures Feb06_03.jpg and Feb06_04.jpg show this best. Some data was taken with a lithium glass detector. This consisted of efficiency data and a measurement at 90 degrees with the thin iron sphere and the $^{15}N(p,n)$ source reaction at 5.1 MeV incident on the gas.

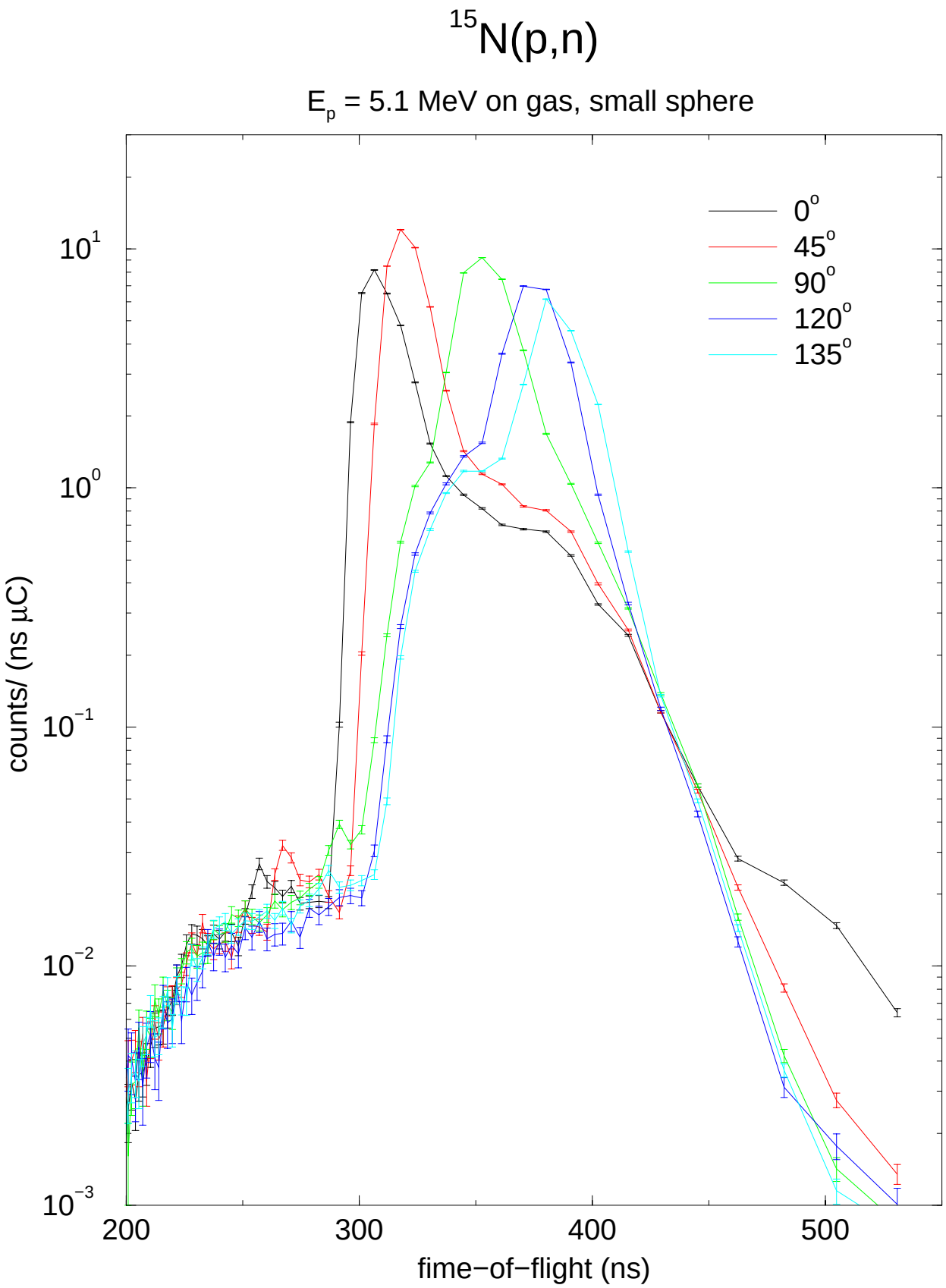
The time calibration for all spectra was accomplished by use of both an external time standard and a random for differential non-linearity. Using these calibrations the time/channel was determined for each channel and used in the program **chttof_Fe**. The calculation of the energy was done using the program **tofte2_psd**. A spectrum without a pulse shape discrimination, psd, cut was used to determine the centroid of the gamma peak as the gamma peak was quite weak when the psd cut was applied.

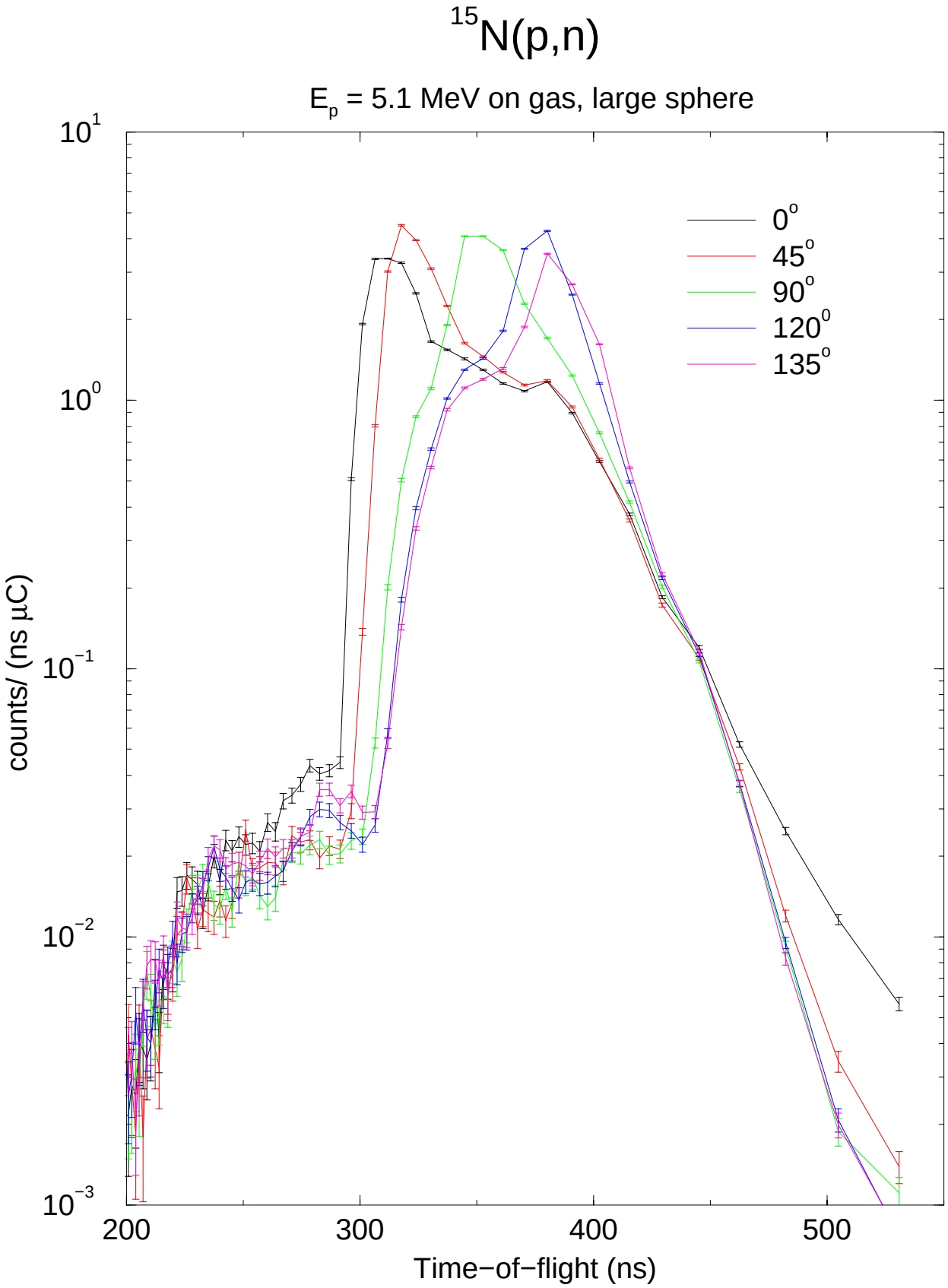
Efficiencies were determined by measurement of the Al(d,n) neutron spectrum at 120 degrees and comparison of that spectrum to the neutron yield measured with a ^{235}U fission chamber. This calibration is good from 200 keV to 14 MeV. The data sets have been truncated to reflect this range in validity.

All data with the present psd cut have been copied to the Feb02_logsheet.xls file and distributed to all participants in the collaboration. This file and this pdf file will also be posted to the NERI iron spheres website. Plots of all of the data have been appended to this pdf file.

PLEASE LET ME KNOW IF YOU HAVE PROBLEMS OR QUESTIONS ON THIS DATA!!

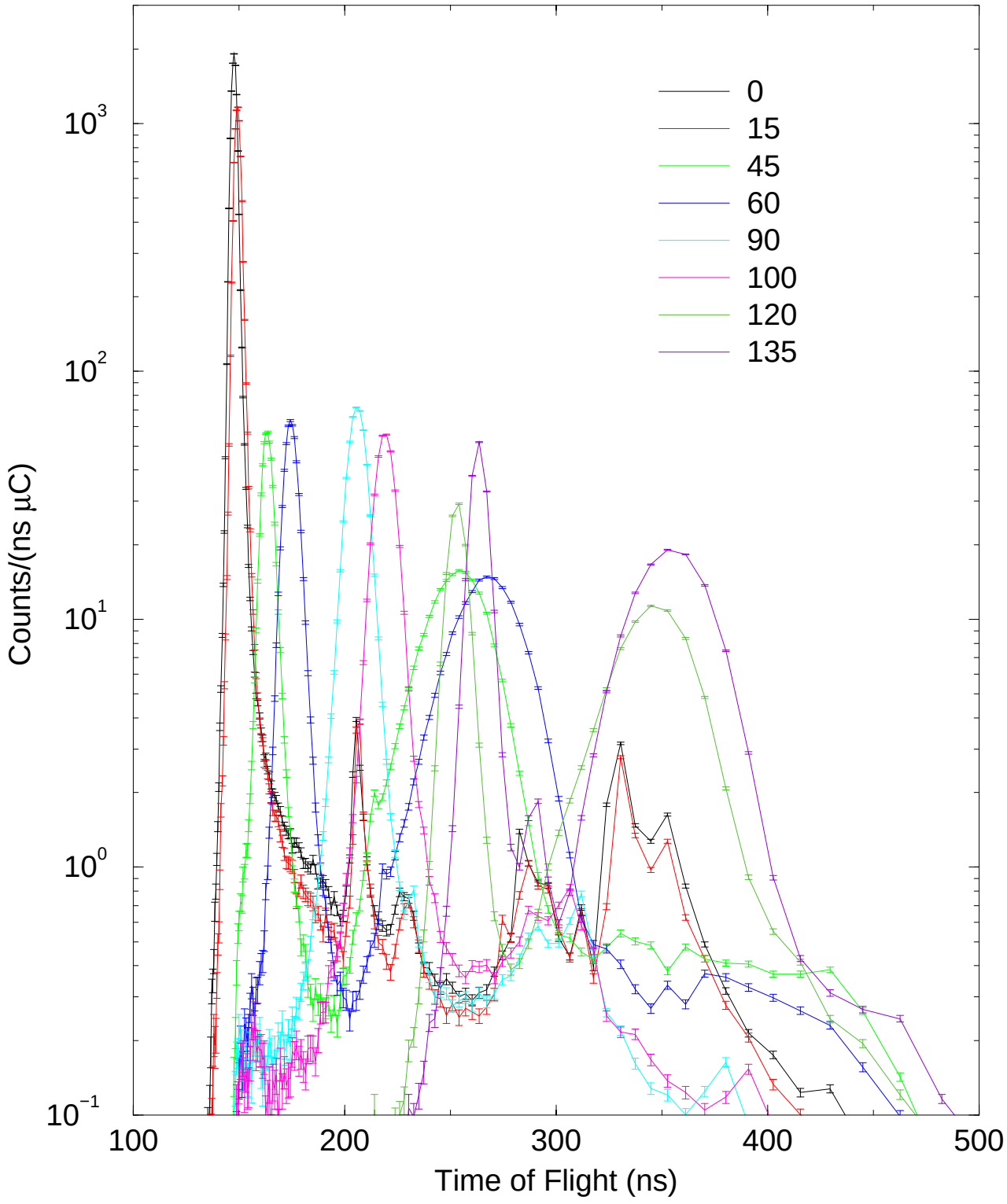

^{15}N(p,n)
E_p = 5.1 MeV on gas, Sphere out
0°
15°
45°
60°
90°
100°
120°
135°
10^1
10^0
10^{-1}
10^{-2}
counts/ (ns μC)
200
300
400
500
time−of−flight (ns)


^{15}N(p,n)
E_p = 5.1 MeV on gas, small sphere
0°
45°
90°
120°
135°
counts/ (ns μC)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
200
300
400
500
fime−of−flight (ns)


^{15}N(p,n)
E_p = 5.1 MeV on gas, large sphere
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
counts/ (ns μC)
200
300
400
500
Time−of−flight (ns)
0°
45°
90°
120°
135°

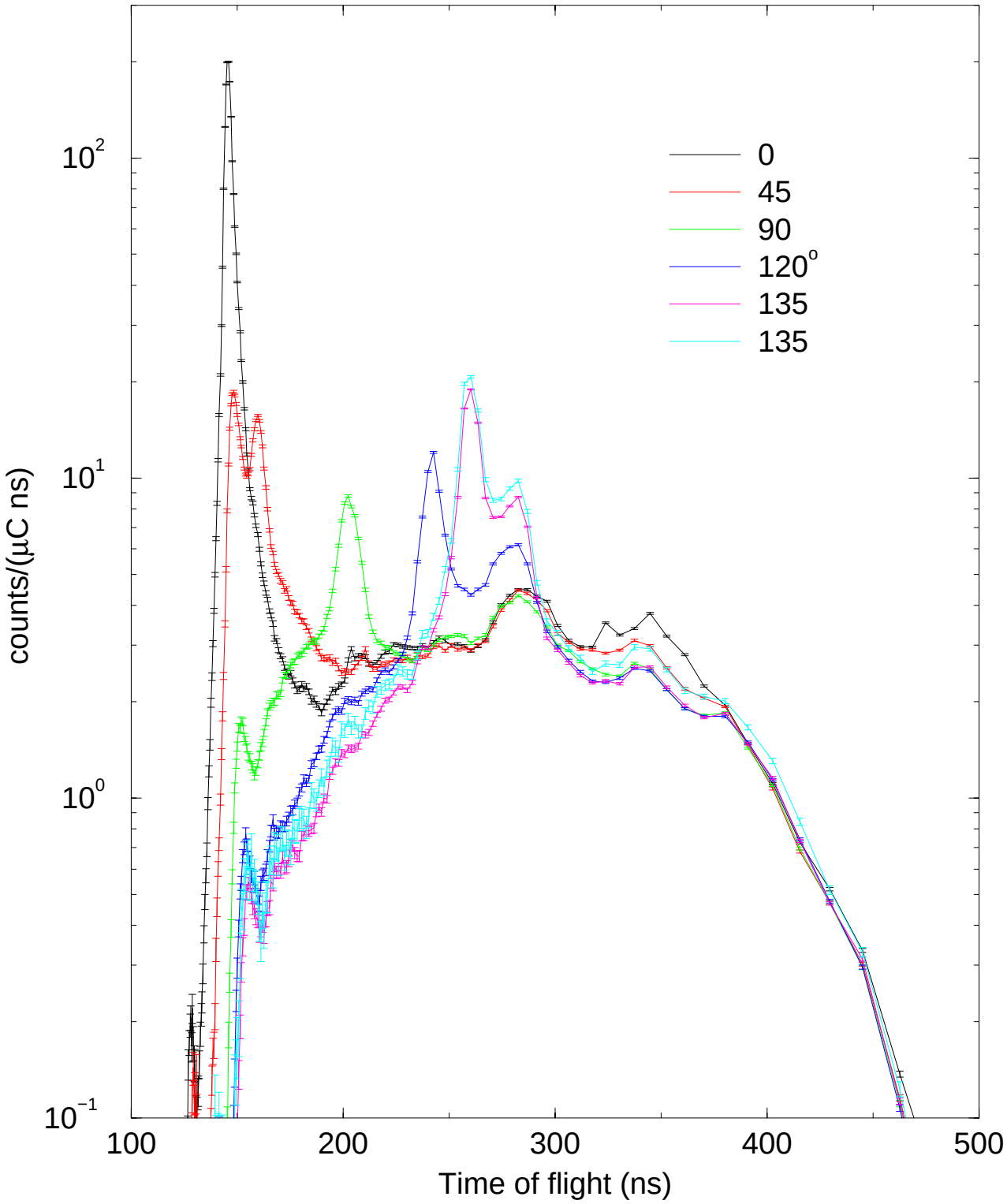
d(d,n) reaction

E_d = 3.0 MeV on gas, sphere_out

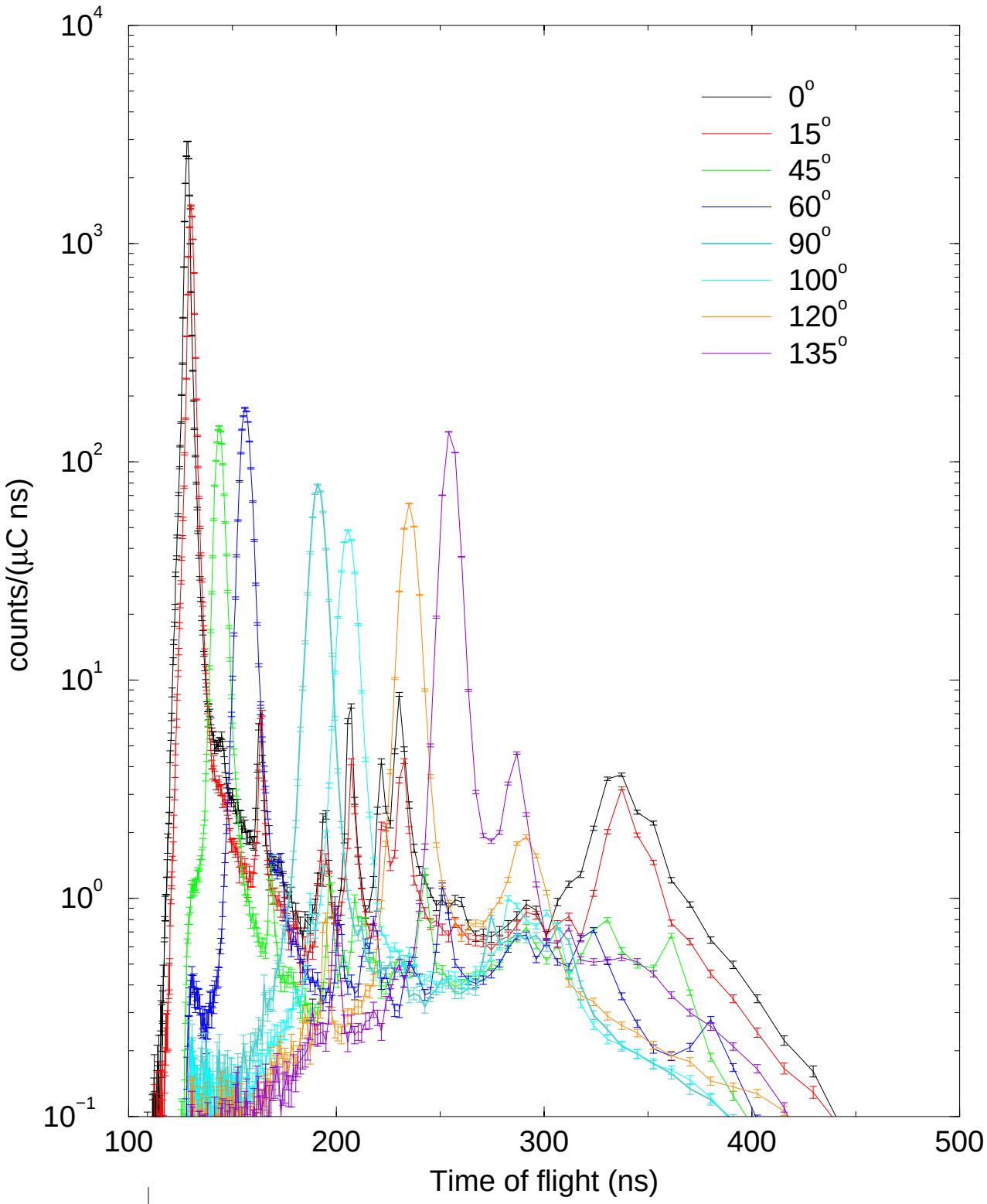


d(d,n)

3.0 Mev , large sphere in



d(d,n) 5.0 Mev sphere out



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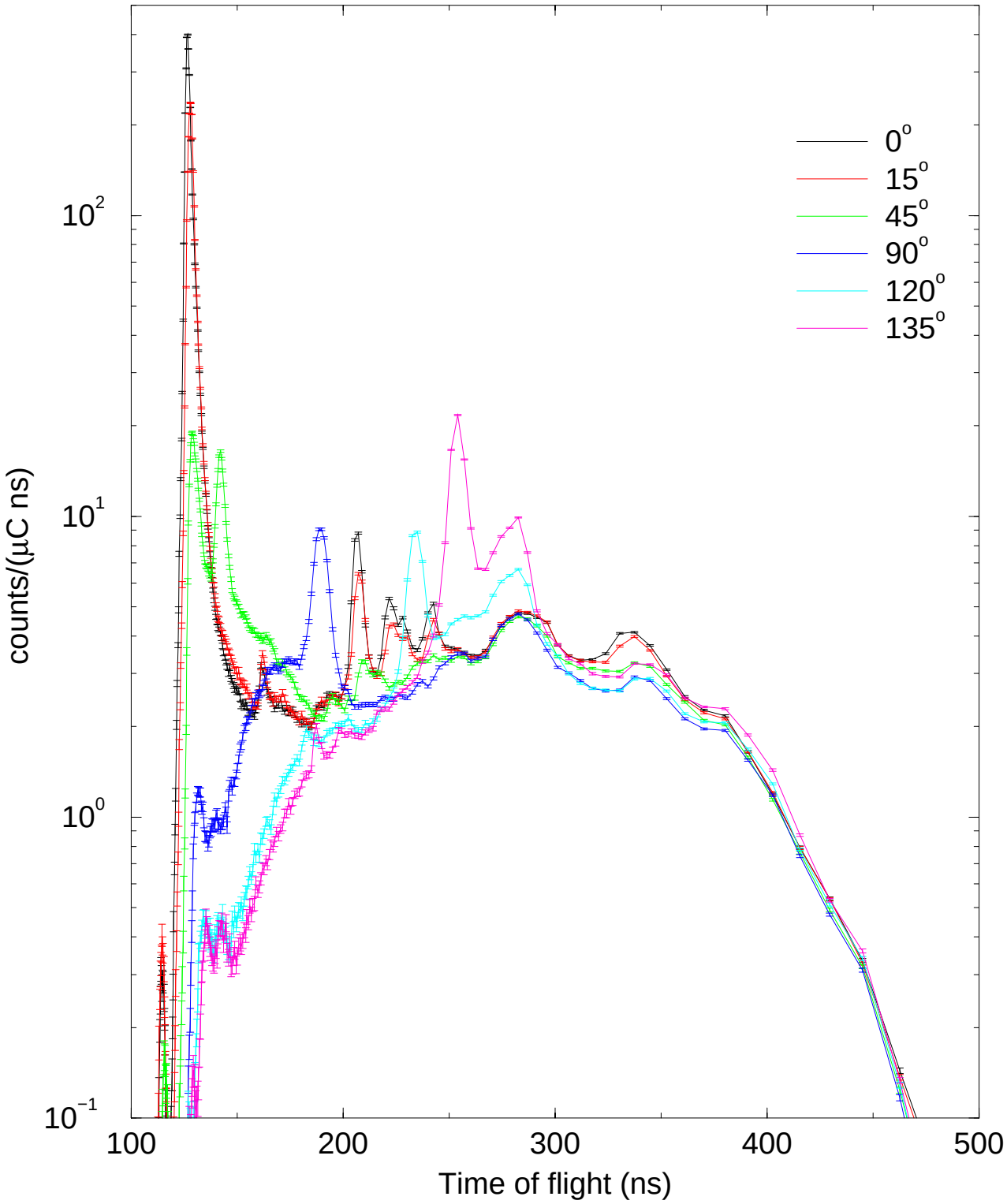
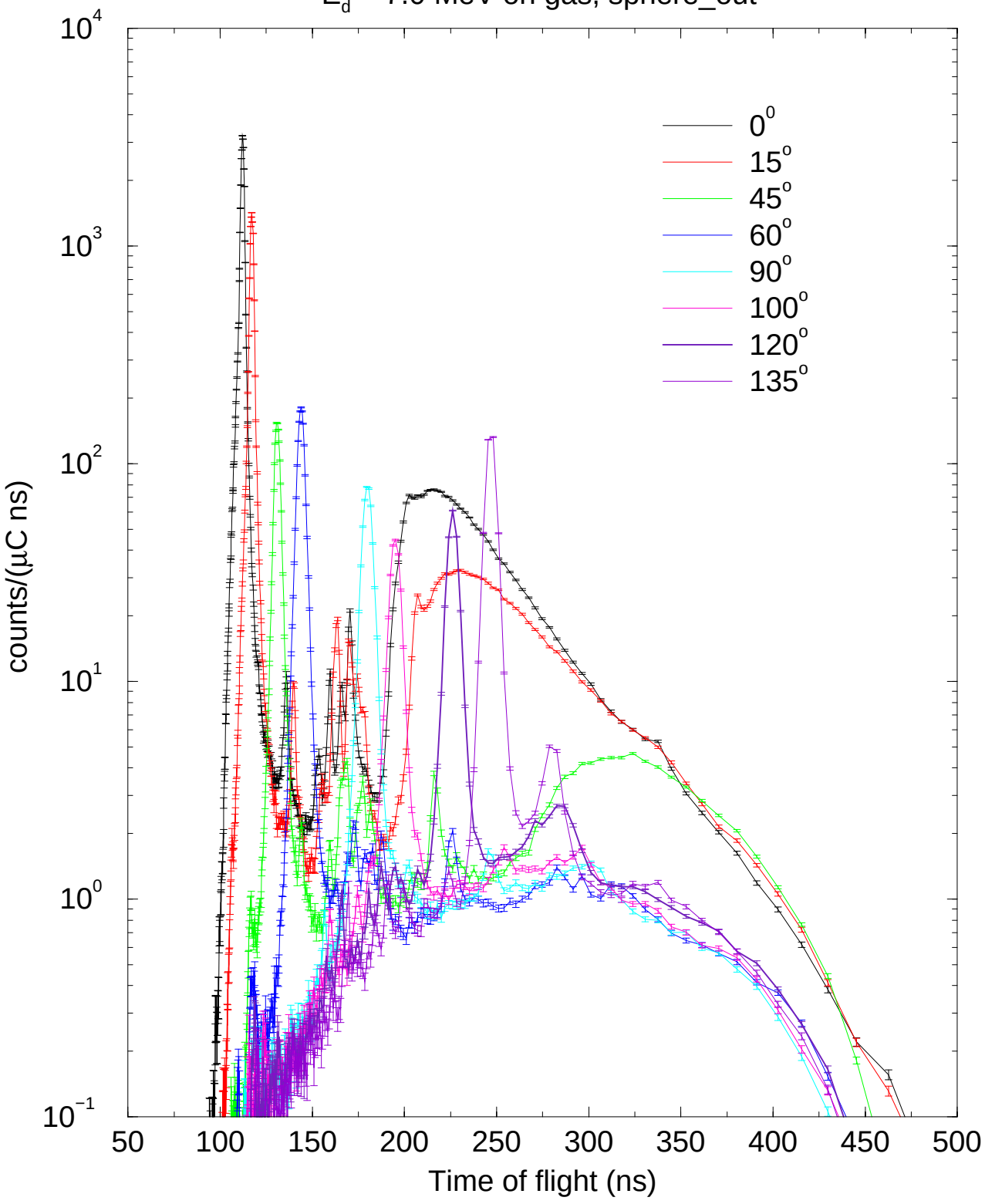
d(d,n)

E_d = 5.0 Mev, large sphere in



d(d,n) reaction



d(d,n) reaction