Massachusetts Institute of Technology

77 Massachusetts Avenue
Cambridge, MA 02139

To: Shelav Gilad, Zilu Zhou
From: Xiaochao Zheng Jan. 22, 2001
Subject: Summary of 4He work (up to June, 2000)
URL: http://www.jlab.org/∼xiaochao/index.html#research

1. Use MCEEP to generate hbook files for

(1) 3 different beam energies.
For the medium and high beam energies (675 MeV and 855 MeV), use two final momentum settings for proton arm since this was used by Richard to calculate the cross sections;
(2) Different spectral functions are used, e.g., the spectral functions from Richard's thesis, and spectral functions from Argonne model V18; Let's call the hbooks generated from Richard's "exp", and from Argonne "arg";
(3) two different MCEEP modes were used, one for event distribution (mode +1) the other is for phase space distribution (mode 0). Here we have assumed that the histogram of mode "+1" divided by mode "0" will give out cross sections.

2. Use hbook file from "exp", mode "+1" divided by "0", to calculate the cross sections. This is to check if the correct spectral functions were used in MCEEP simultations. Plots of cross section vs. missing momentum are shown in he4-cs-bound-nocut.ps, looks good.

3. Check Q2-W distribution for each kinematics, and define 2D cuts to do the Q2-Omega matching for 3 different beam energies. Other cuts are also defined, including:

(1) Cuts in missing momentum, for example, use $10 < p_m < 20$ to select $p_m = 15$MeV/c. eight cuts are defined, from $p_m = 15$ to $p_m = 85$ MeV/c.
(2) Cuts in missing mass, to select two body break-up channel;
(3) Cuts in $\theta_{prq} < \pi/2$ and $\theta_{pq} < 0.01$, to select forward kinematics;

4. From hbook files, plot distribution of epsilon for each beam energy and 8 missing momentum. Then from the plots, get average and RMS values of epsilon for different kinematics. $Q^2 - \omega$ matching was used.

5. Define "normalized cross section" as
(cross section)*(some constant)*((1-epsilon)*qmu2*recfac/(qmag));

This is expected to be $T + \epsilon \times L$, from the definition of Jiang Chen's thesis.

Extract "normalized cross section" for "exp" and "argonne", respectively.
"Forward kinematics", 8 different missing momentum, $Q^2 - \omega$ matching are used.
Please see plots "normcs-exp.ps" and "normcs-argonne.ps";

6. Use linear fit to extract "L" and "T" for "exp" and "argonne", respectively.
"L/T" is also plotted for "exp" and "argonne", finally (L/T)exp/(L/T)arg is plotted.
Please see file "he4-lt.ps" for these 4 plots.

Problems:

(1)The cross sections obtained from argonne and exp spectral functions are different by about a factor of 2.

(2)In the last plot, (L/T)exp/(L/T)arg is about 1, except the point of $p_m = 65$ MeV/c.

(3)Difficult to find time to do "future work", is there is any.

Figure 1: he4-cs-bound-nocut.ps

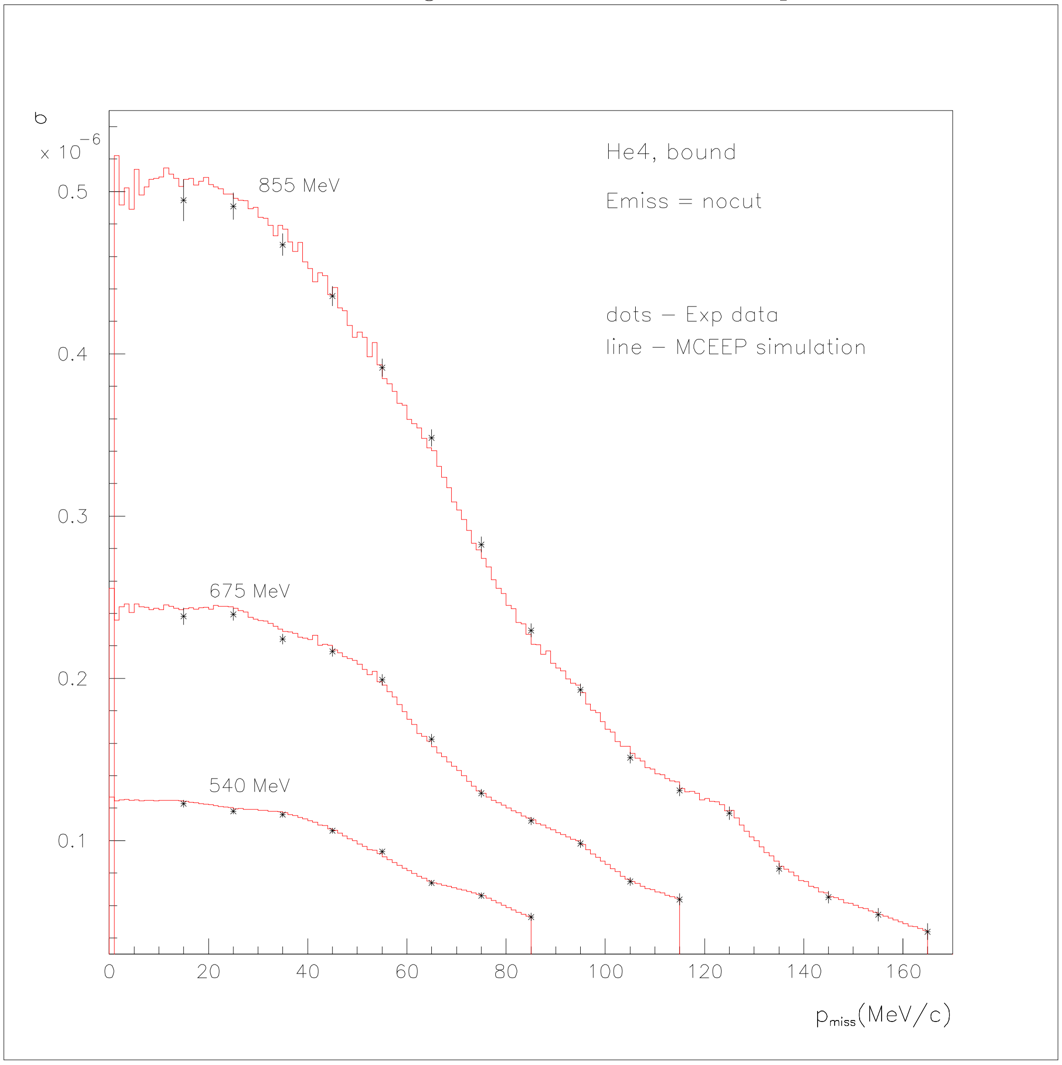

Figure 2: normcs-exp.ps

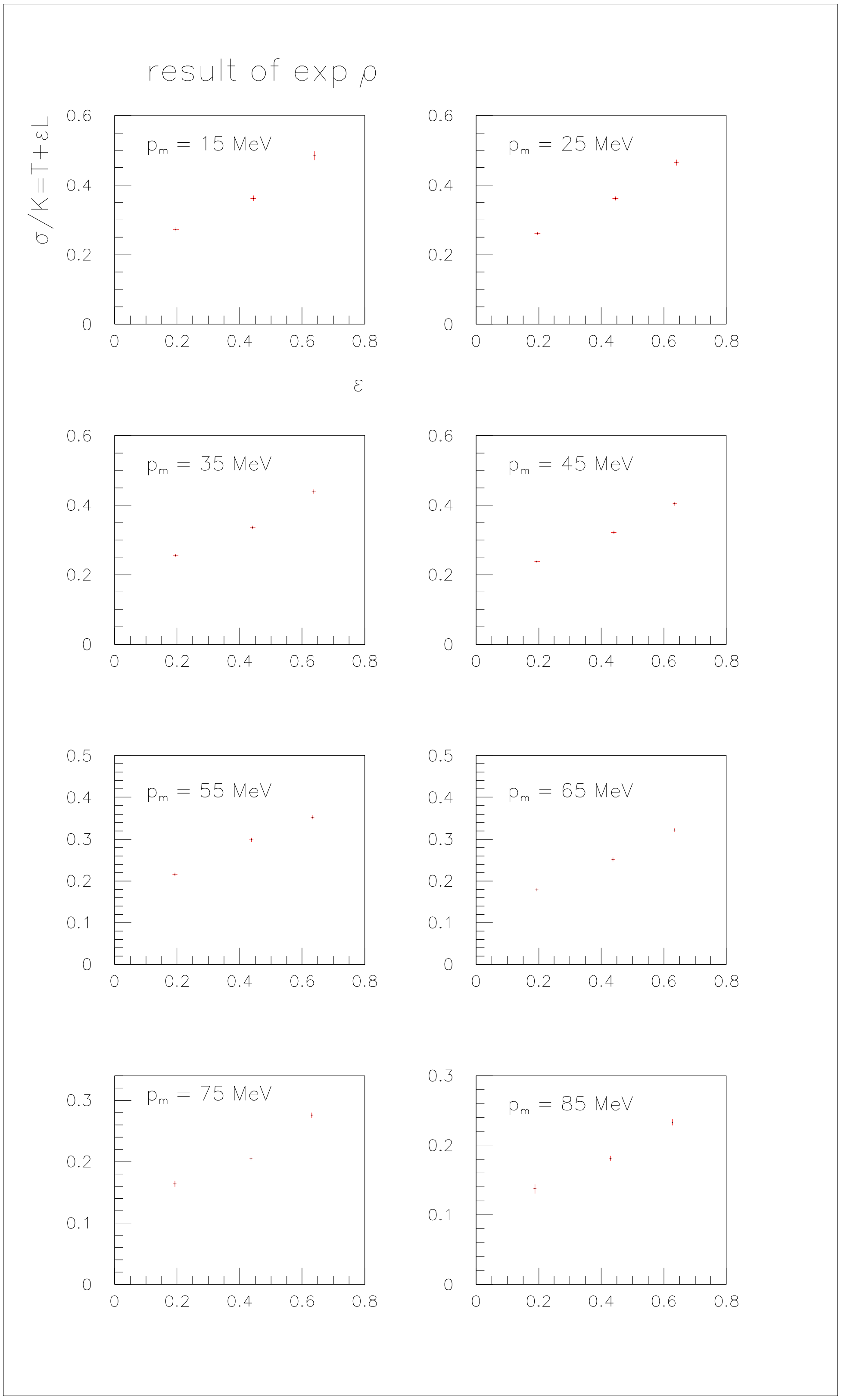

Figure 3: normcs-argonne.ps

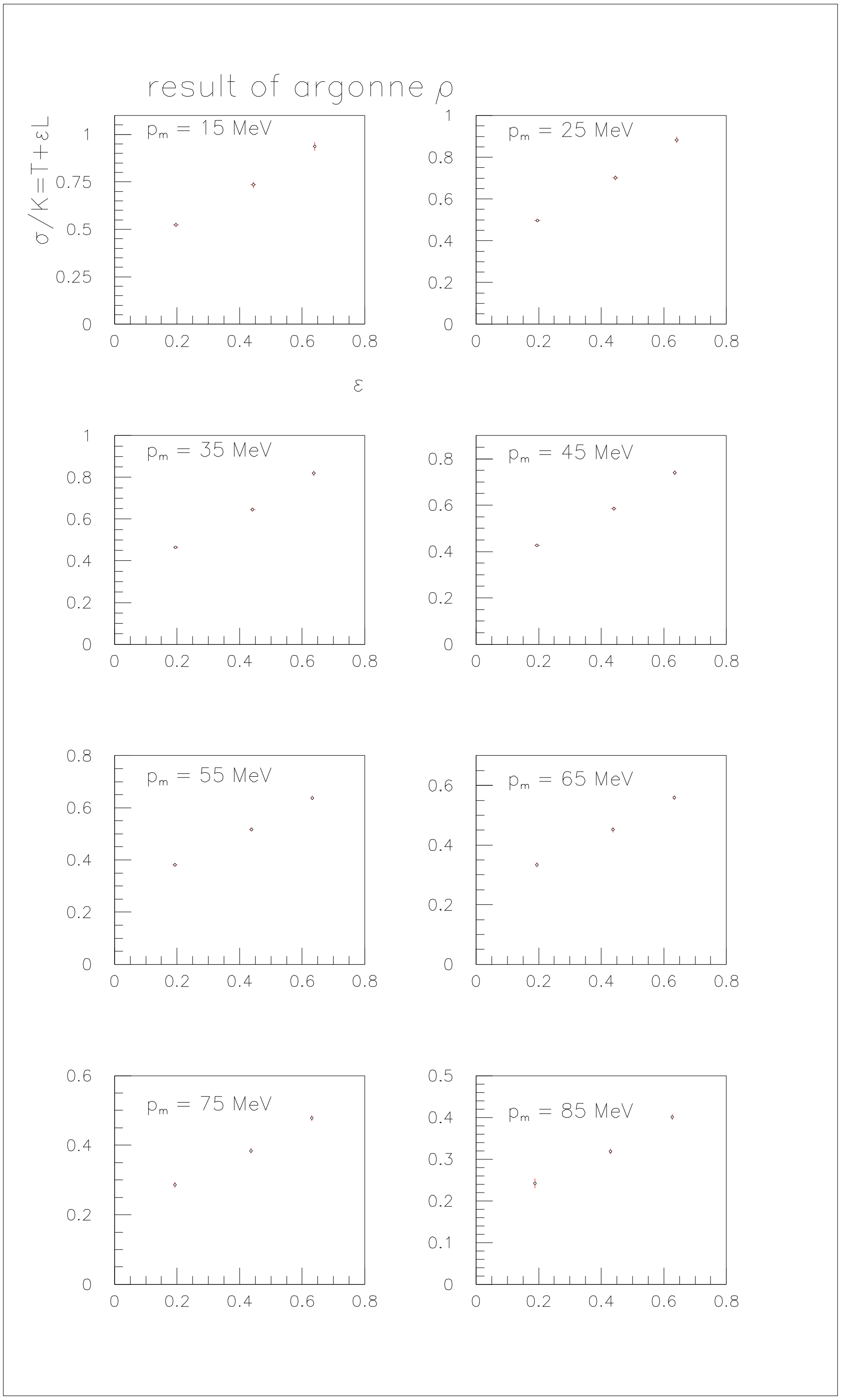

Figure 4: he4-lt.ps