

## 1 POLARIZED TARGETS for E159 and E161

- Proposals had the same target system (dilution fridge + 7T magnet) for both experiments.
- RPC meeting in Jan. 2002, working decision made to use E143/155 target for E159. Better aperture for hadrons.
- 7T magnet design changed due to corporate change at Oxford Instruments.
- Standard 7T NMR magnet under consideration and study (see E161 Web site)

## 2 E161

- Dilution refrigerator for E161 shown in Fig. 1
- Two pronged approach:
  - 1) Modify old CERN fridge and assemble at UVA and test
  - 2) Modify test and run Los Alamos fridge (similar design to above CERN fridge)
- $^6\text{LiD}$  will be target material
- Fig. 2 shows world data on deuteron polarization vs magnetic field  
The fits are to  $\frac{1}{T_s}$  where  $T_s$  is the spin temperature and related to the lattice temperature
- Recent data from COMPASS shows  $P_D = +56\%$  and  $-48\%$  at 2.5T

and  $\sim 300\text{mK}$

A  $\frac{1}{T_s}$  fit implies  $P_D \sim 90\%$  at 6.5T!

But COMPASS fridge ( from SMC ) is more powerful than ours and we expect  $> 60\%$

Two EIO tubes with frequency  $\sim 185$  GHz have been ordered by

SLAC  
UVA has frequency and power measuring components at this frequency

Magnet purchase is on hold until FY2003

### 3 E159

Proposed E159 system shown in Fig. 3

Same as used in E143/E155/E155X and more recently in GeN at JLAB

Material probably  $^{15}\text{NH}_3$  and  $^{15}\text{ND}_3$

95% proton and 48% deuteron polarizations achieved in GeN

Deuteron signal at 46% shown in Fig. 4

Fig. 5 shows radiation damage to  $\text{ND}_3$  at 100nA

There will be radiation damage from the photon beam

Will study this with EGS4

Fig. 6 shows data from eg1b at JLAB where the rastering did not

cover the complete face of the target.

The NMR coils were outside the target material and the figure

shows the deviation between polarization measured with NMR and a scattering reaction.

Studies of the differential rad. damage with a photon beam have been made by G. Court et al., NIM 177, 281 (1980)

We will study this further

Finally, the Bochum group have discovered that d-butanol irradiated with  $\sim 10^{15}$  e  $\text{cm}^{-2}$  gave 70% polarization at 5T and  $\sim 300\text{mK}$

This opens up the possibility of using a dilution fridge with the E159 5T magnet

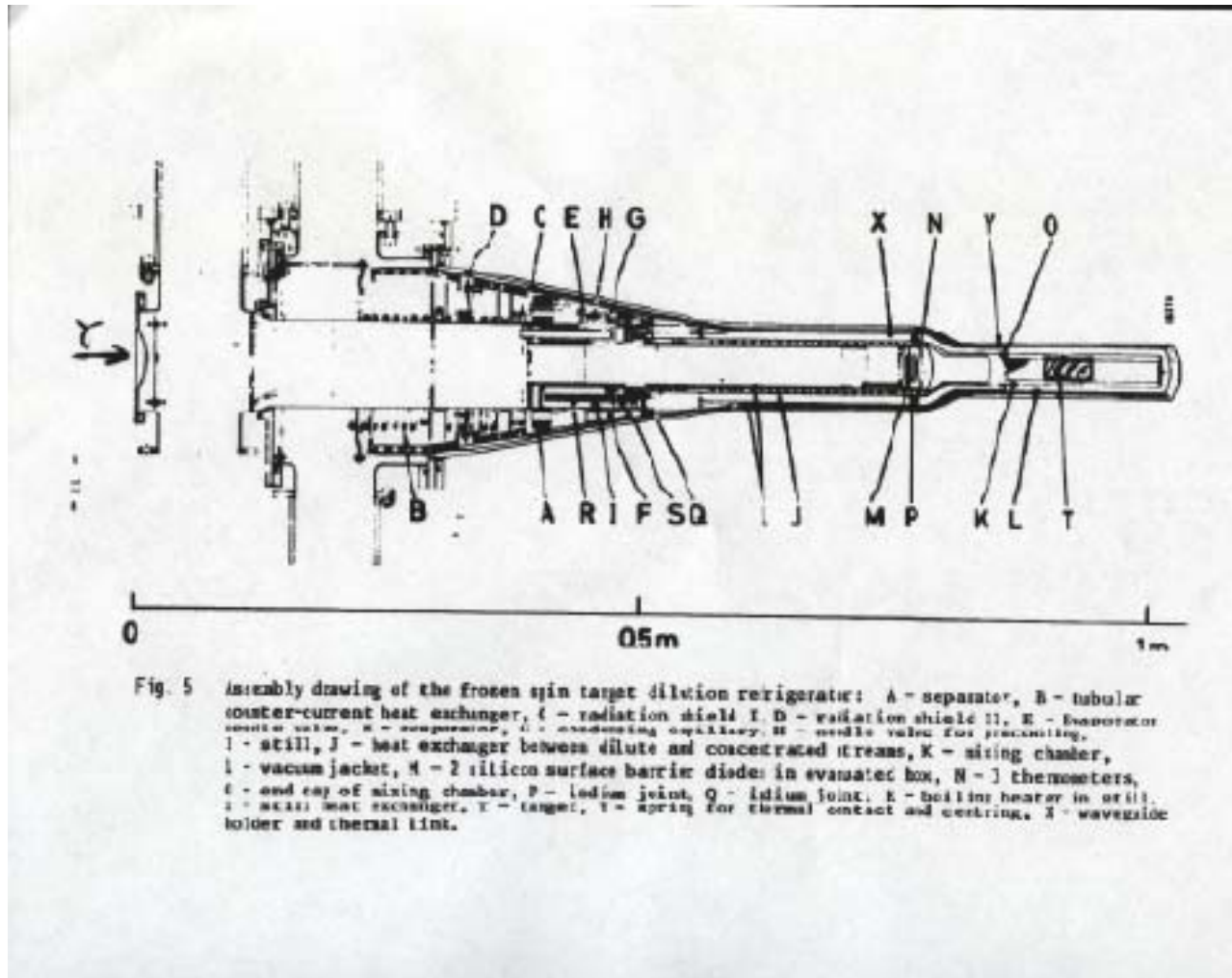


Figure 1: Dilution fridge for E161

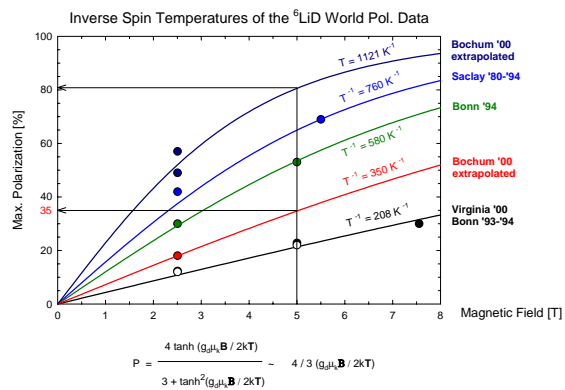


Figure 2: World LiD Polarization

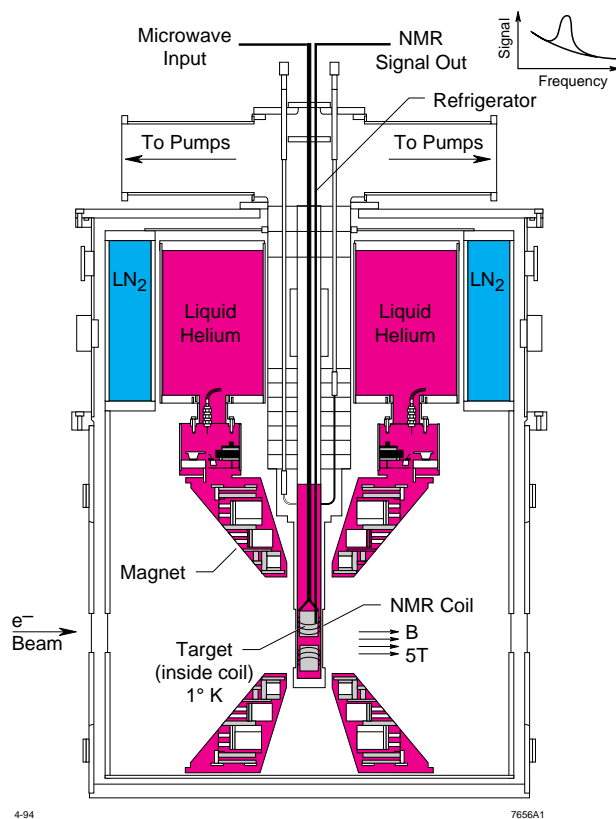


Figure 3: Target system for E159

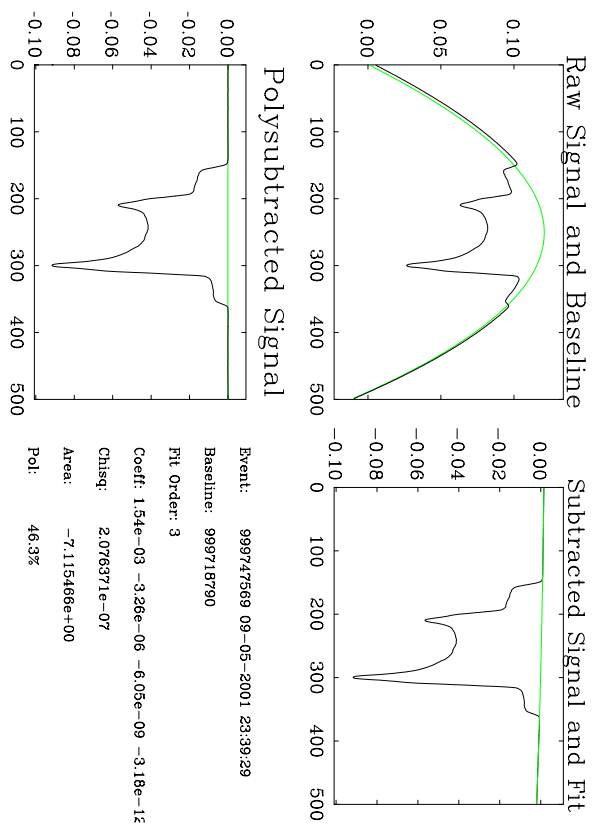


Figure 4: NMR signal at 46% polarization

### Gen Target Performance, 10Sep01

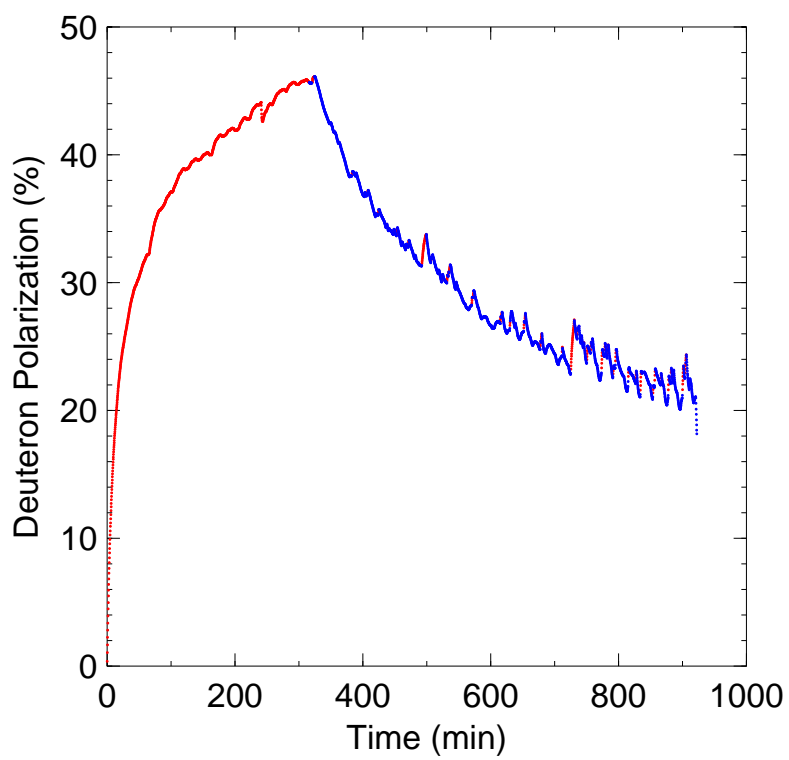


Figure 5: ND3 NMR signal



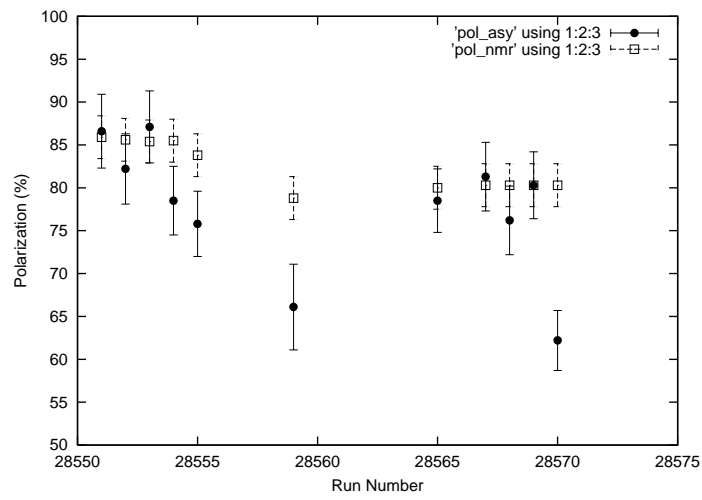


Figure 6: Polarization for eg1b target as a function of Run number (Dose) as measured by a scattering reaction and NMR