

Progress of polarized Hydrogen-Deuteride (HD) target project for near future LEPS experiments at SPring-8

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Polarized HD target project [1] started in April 2005. The first purpose of the project is to investigate the $s\bar{s}$ -quark content of proton and neutron by measuring double polarization asymmetries for the ϕ meson photoproduction [2]. In addition, the measurement of the double polarization asymmetries provides a good opportunity to present important information to determine the spin-parity of the Θ^+ particle. We are developing the polarized HD target for near future LEPS experiments at SPring-8 [3, 4, 5].

We installed a ⁴He-cryostat, called “Transfer Cryostat (TC)”, above a dilution refrigerator (DR) for picking up and moving the polarized HD target to a storage cryostat (SC) with maintaining high polarization as shown in Fig. 1. The total length of the TC is 5.0 m. The outer-most stainless steel can consists mainly of three separated section of exterior bellows that permit contraction of 3.0 m in total. The TC consists of three concentric stainless steel tubes separated by vacuum. The outer, middle, and inner layers contain LN₂, LHe, and LHe, respectively as shown in Fig. 2. The inner layer catches the HD target using a left-hand and right-hand screw system. We can keep the temperature of the polarized HD target below 4.2 K, during the transfer process. There is a superconducting magnet, which produces a magnetic field of about 0.2 Tesla in the HD target region, on the bottom of the middle layer.

We constructed a helium recovery line. The HD target building of RCNP and the low temperature center in Suita campus were connected by a stainless steel pipes with a size of 40 mm. We can get liquid helium with an order-of-magnitude lower price than previously if helium gas after evaporation is returned to the low temperature center with a high efficiency. It is now possible for us to have a long term operation of DR with a relatively small budget.

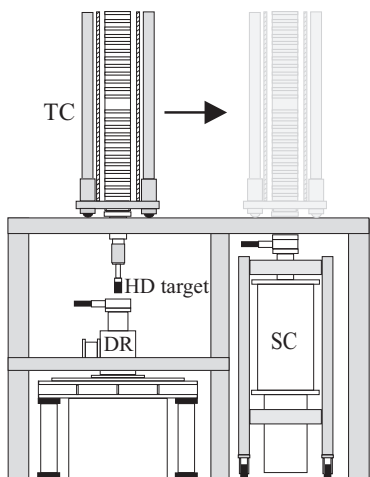


Figure 1: Schematic view of transfer system. After transferring the HD target, the polarization degree is measured by NMR technique in the SC [6].

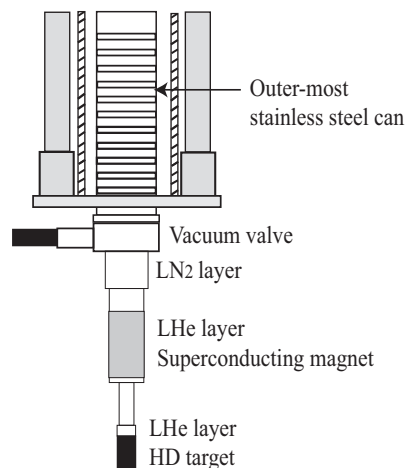


Figure 2: Enlarged schematic view of the TC. The HD target is transferred through a vacuum pipe which is not drawn.

References

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