Portable NMR polarimeter system for polarized HD target

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We have been developing a polarized HD target [1] for future LEPS experiments. Introducing the polarized HD target to the LEPS experiments is very important for various studies, for example, the bump structure found in the $\gamma p \to K^+\Lambda(1520)$ cross sections [2]. The polarized HD target is produced at RCNP and transported to SPring-8 which is 130 km distant from RCNP. The polarization of the target should be measured at both places by using the same NMR polarimeter system. However, a conventional NMR system is large and heavy for a long-distance transportation. For this purpose, a portable NMR polarimeter system is desired.

We have produced the portable NMR polarimeter system [3] by replacing the devices in the conventional system with the software system with PCI eXtensions for Instrumentation (PXI). Fig. 1 shows a photograph of the portable NMR system. Fig. 2 shows NMR signals observed for hydrogen and fluorine at 1.5 K with an RF frequency of 29.45 MHz. The S/N ratios of the NMR signals are found to be good enough for stable measurements of the polarization of the HD target [3]. We succeeded in downsizing the weight of the NMR system from 80 to 7.1 kg and reducing the cost to 25% as shown in Table 1.

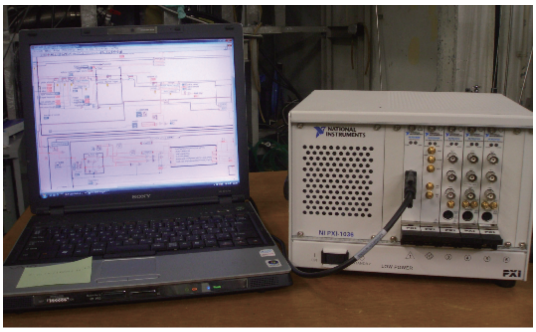

Figure 1: The portable NMR polarimeter system consisting of a PXI system and a laptop PC.

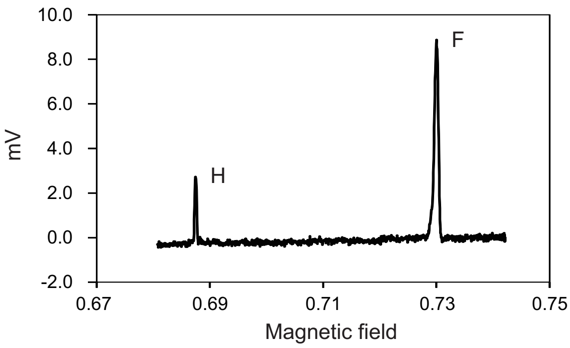

Figure 2: The NMR signals measured by the portable NMR system. The horizontal axis is the magnetic field.

Table 1: Comparison of weight, size, and cost between the conventional and portable systems.

	Weight	Size	Cost
Conventional system	80 kg	600 mm x 600 mm x 2100 mm	$60,000
Portable system	7.1 kg	250 mm x 200 mm x 200 mm	$15,000

References

1. M. Fujiwara *et al.*, Photoproduction experiment with polarized HD target at SPring-8, LEPS/RCNP proposal (2003).
2. H. Kohri *et al.*, Phys. Rev. Lett. 104 (2010) 172001.
3. T. Ohta *et al.*, Nucl. Instr. and Meth. A 633 (2011) 46.