Portable NMR polarimeter system for polarized HD target

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We have been developing a polarized HD target \cite{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 $\gamma p \rightarrow K^+\Lambda(1520)$ cross sections \cite{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 \cite{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 \cite{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.](image1)

![Figure 2: The NMR signals measured by the portable NMR system. The horizontal axis is the magnetic field.](image2)

<table>
<thead>
<tr>
<th></th>
<th>Weight</th>
<th>Size</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Conventional system</td>
<td>80 kg</td>
<td>600 mm x 600 mm x 2100 mm</td>
<td>$60,000$</td>
</tr>
<tr>
<td>Portable system</td>
<td>7.1 kg</td>
<td>250 mm x 200 mm x 200 mm</td>
<td>$15,000$</td>
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References