Abstract
The Low Energy Neutron Source (LENS) at Indiana University will provide moderated neutrons in the meV energy range for materials and neutron physics research as well as MeV energy range neutrons for creating a high flux neutron test environment. Neutrons will be generated by colliding 13 MeV protons with a Be target. Since December 2004, using an existing AccSys PL-7 RFQ and DTL, we have been able to deliver a 0.5% duty factor, 10 mA, 7 MeV beam to a Be target mounted next to a 3.6K methane moderator. In 2007, an additional 7 MeV to 13 MeV DTL section will be added and klystrons will be used to power the RFQ and DTL sections. This will improve the output to about 3% duty factor with 20 mA at 13 MeV. A new 75 keV, 100 mA proton injector and 100 mA, high duty factor RFQ is being constructed to replace the original 3 MeV RFQ at a later date. The peak beam current available from the new injector and RFQ will increase to 50 mA with a duty factor of at least 5% or up to 100 mA with lower duty factor. In addition, a conceptual plan has been developed for a 13 MeV to 22 MeV DTL which will boost the maximum instantaneous flux available from the neutron source up to about $10^{12}$ n/s/cm².

Table 1. Upgrade Path for the LENS proton Linac. The upgrade to LENS Phase 2 will be completed in 2007.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Proton Energy</th>
<th>Comments</th>
<th>Peak Proton Intensity</th>
<th>Average Current</th>
<th>Duty Factor (beam)</th>
<th>Status</th>
<th>(n)-flux (n/s/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7 MeV</td>
<td>Present Configuration</td>
<td>10 mA</td>
<td>0.03 mA</td>
<td>.004</td>
<td>Existing</td>
<td>1.0 x 10**8</td>
</tr>
<tr>
<td>2</td>
<td>13 MeV</td>
<td>Klystrons and DTL added</td>
<td>20 mA</td>
<td>0.15 mA</td>
<td>.010</td>
<td>Under construction</td>
<td>2.2 x 10**9</td>
</tr>
<tr>
<td>3</td>
<td>13 MeV</td>
<td>4 Ampere, 100 kV power supply added</td>
<td>20 mA</td>
<td>0.38 mA</td>
<td>.024</td>
<td>Future</td>
<td>5.0 x 10**9</td>
</tr>
<tr>
<td>4</td>
<td>13 MeV</td>
<td>New RFQ and 75 keV, 100 mA proton injector</td>
<td>50 mA</td>
<td>1.2 mA</td>
<td>.024</td>
<td>RFQ under construction</td>
<td>1.6 x 10**10</td>
</tr>
</tbody>
</table>
Construction Plans for the LENS Proton Linac (cont.)

In order to realize an increase in the duty factor, a higher power modulator will be installed. During the early stages of the LENS project, IUCF salvaged a considerable amount of equipment from the Ballistic Missile Early Warning System (BMEWS) site at Clear AFS in Alaska. Modulator power supplies with an output voltage and current of 110 kV and 4 Amperes were obtained and transported to Indiana. These power supplies must be refurbished and an AC substation installed before they may be used to power the klystron modulators. In addition, a second capacitor bank and crowbar system must be installed. In this case, one klystron will operate with a 1 Ampere supply and the remaining two will be supplied with a 4 Ampere supply. This will increase our possible duty factor by 2 1/2 times.

Beam Transport and Diagnostics

Real time parameters of the proton beam hitting the Be target is the essential information for analysis of the LENS performance. A Bergoz Current Transformer (CT) installed in the location close to the Be target will provide such an information. This CT and another CT installed at the end of the DTL are planned to be a part of the Beam Spill Control System (BSCS). The BSCS is supposed to detect any unwanted beam loss and take action to save the equipment.

REFERENCES

[7] TechSource, Inc. PO Box 31057, Santa Fe, NM 87594-1057