Polarization and transmission of positrons in Cornell-type flux concentrator
+ 2 bending magnets

Abstract.
Beam dynamics simulation was performed to determine transmission efficiency and average polarization of the positron beam for test experiment. Transport system consists of production target, Cornell-type flux concentrator and two bending magnets. Results of simulations indicate that transmission efficiency is 1.4%. Polarization of the beam after transport system is 54%. Comparison of transmission and polarization for different schemes is presented.

Parameters of the structure

Initial positron distribution:
Polarized positrons generated by EGS program

Target field
Magnetic field at the target 0

Flux concentrator: Cornell-type
Max field 0.8 Tesla
Aperture 1.5 cm
Field length 8 cm

Bending magnets
Number of bending magnets 2
Bending angle 90°, - 90°
Bending radius, R 17 cm
Aperture d_x x d_y 2.5 cm x 2.5 cm
Magnetic field 0.11 Tesla
Experimental setup.

Magnetic field of Cornell-type flux concentrator.

Polarized positrons after transport line with Cornell flux concentrator, aperture 2.5 cm x 2.5 cm.

<table>
<thead>
<tr>
<th>B, Tesla</th>
<th>Energy range, MeV</th>
<th>Positron transmission</th>
<th>Polarization</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.11</td>
<td>4.0 - 6.5</td>
<td>1.38e-02</td>
<td>0.54</td>
</tr>
</tbody>
</table>
Polarized beam after 0.11 Tesla transport line, aperture 2.5 cm x 2.5 cm.
Polarized positrons after different transport lines, aperture 2.5 cm x 2.5 cm.

<table>
<thead>
<tr>
<th>Transport line</th>
<th>B, Tesla</th>
<th>Energy range, MeV</th>
<th>Positron transmission</th>
<th>Polarization</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLAC flux concentrator + 2 bending magnets (BM)</td>
<td>0.11</td>
<td>4.0 – 6.5</td>
<td>3.5e-0.2</td>
<td>0.61</td>
</tr>
<tr>
<td>Cornell flux concentrator + 2 BM</td>
<td>0.11</td>
<td>4.0 – 6.5</td>
<td>1.38e-02</td>
<td>0.54</td>
</tr>
<tr>
<td>No flux concentrator, no drift + 2 BM</td>
<td>0.11</td>
<td>4.0 – 6.5</td>
<td>0.97e-0.2</td>
<td>0.68</td>
</tr>
<tr>
<td>No flux concentrator, 18 cm drift between target and first bending magnet + 2 BM</td>
<td>0.11</td>
<td>4.0 – 6.5</td>
<td>0.40e-02</td>
<td>0.61</td>
</tr>
</tbody>
</table>