INDUSTRIAL HIGH ENERGY ELECTRON ACCELERATORS TYPE ILU


Budker INP SB RAS, Novosibirsk, Russia
Introduction

- The ILU electron accelerators are produced by Budker Institute of Nuclear Physics for more than 40 years. They cover the energy range from 0.8 to 5 MeV, the beam power is up to 50 kW.
- ILU accelerators are reliable machines that are working for decades in the research and industrial installations.
- The ILU machines use RF voltage for acceleration of the electron beam, so they are very compact and need relatively small radiation bunker because they do not need the tank for gas insulation.
# ILU Accelerators

<table>
<thead>
<tr>
<th>Parameters</th>
<th>ILU-6</th>
<th>ILU-8</th>
<th>ILU-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electron Energy</td>
<td>1.7-2.5 MeV</td>
<td>0.8-1 MeV</td>
<td>4-5 MeV</td>
</tr>
<tr>
<td>Beam Power</td>
<td>20 kW</td>
<td>20 kW</td>
<td>50 kW</td>
</tr>
<tr>
<td>Local Shield Weight</td>
<td></td>
<td>76 t</td>
<td></td>
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</tbody>
</table>
ILU-8 in Local Shield

- Energy 0.8-1 MeV
- Treatment of wires, tubes, films
ILU-8 in Local Shield

• Beam extraction device for 4-sided irradiation allows to increase beam usage efficiency comparing with 2 sided irradiation
• No cable twist
ILU-8 in Local Shield in Japan

- Energy 0.8-1 MeV
2-windowed beam extraction device.
ILU-10

- Energy 4-5 MeV
- Beam power 50 kW
- Elaboration of treatment technologies for thick cables and polymer pipes
- Sterilization of medical products
ILU-10 in Poland, 2008

- Energy 5 MeV
- Beam power 50 kW
- Treatment of polymer pipes
- Treatment of cables
Sterilization in BINP

- Linear scanner and packed medical products to be sterilized
Sterilization in Biisk based on ILU-6
<table>
<thead>
<tr>
<th>N</th>
<th>Accelerator</th>
<th>Place</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ILU-8</td>
<td>Japan</td>
<td>Sterilization of plastic packs</td>
</tr>
<tr>
<td>2</td>
<td>ILU-8</td>
<td>Moscow</td>
<td>PE-Foam</td>
</tr>
<tr>
<td>3</td>
<td>ILU-10</td>
<td>Poland</td>
<td>Thermo-shrinkable tubes and polymer pipes for hot water supply.</td>
</tr>
<tr>
<td>4</td>
<td>ILU-6</td>
<td>Altay region</td>
<td>Sterilization of pharmaceutical raw.</td>
</tr>
<tr>
<td>5</td>
<td>ILU-10</td>
<td>Novosibirsk</td>
<td>Producing of pharmaceutical products</td>
</tr>
<tr>
<td>6</td>
<td>ILU-10-M</td>
<td>Krasnoyarsk</td>
<td>Irradiation center</td>
</tr>
<tr>
<td>7</td>
<td>ILU-8</td>
<td>Cheboksary</td>
<td>Cable treatment</td>
</tr>
</tbody>
</table>
ILU accelerators are used in industry for:

- Plastic cross-linking
  - Irradiation of cables
  - Producing of thermo-shrinkable tubes.
  - Producing plastic pipes and fittings for hot water supply systems.
  - Producing of PE foam with close cells.
- Sterilization of single use medical goods in packs.
  - Syringes, medical clothes, tools and etc.
- Production of pharmacological goods.
- Sterilization of pharmacological goods.
- Sterilization of food containers.
- Food pasteurization.
- Improving of properties of semiconductors.
ILU Accelerators in the World
Conclusion

• Accelerator market is expanding by new technologies (pharmaceutics, sterilization, large diameter pipes, etc.)
• Market requires high energy accelerators. BINP is developing new 7.5-10 MeV 100 kW machine.
• Russian market becomes main market for BINP accelerators.
• High energy ILU-10 accelerator and compact ILU-8 accelerator are demanded by market now.
Thank you for your attention
Due to the special magnetic lens the beam profile may be formed along the output window.