Limits on Compton interaction knowledge for a monolithic scintillator

6º Congreso SEFM - SEPR

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ERC Horizon 2020 grant agreement No 695536
- Patient injected with radioactive tracer.
- Using the LORs one reconstructs the functional image of the body.
- Hot spots are likely to be tumours.
Detectors are formed by scintillating crystals (very dense materials to stop the gamma rays).

Compton interactions are very likely to occur $\sim 50\%$.

Worsens image resolution and contrast (we loose information in the first interaction).
Reconstructed Image

Limits on Compton interaction knowledge for a monolithic scintillator
Developed Method

- Look for symmetry axes.
- Project the energy bins.
Material Testing

Crystal Testing

<table>
<thead>
<tr>
<th>Treatment</th>
<th>CRT (ps FWHM)</th>
<th>Spatial resolution (mm)</th>
<th>Energy resolution (% FWHM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black - T1</td>
<td>440</td>
<td>1.7</td>
<td>38.7</td>
</tr>
<tr>
<td>Black - T2</td>
<td>1230</td>
<td>1.5</td>
<td>23.3</td>
</tr>
<tr>
<td>RR - T1</td>
<td>364</td>
<td>1.4</td>
<td>28.1</td>
</tr>
<tr>
<td>RR - T2</td>
<td>804</td>
<td>1.4</td>
<td>18.2</td>
</tr>
<tr>
<td>White - T1</td>
<td>340</td>
<td>2.9</td>
<td>20.4</td>
</tr>
<tr>
<td>White - T2</td>
<td>640</td>
<td>2.1</td>
<td>12.3</td>
</tr>
</tbody>
</table>
Limitations and Drawbacks

- Only Compton interactions that are sufficiently far away from each other can be detected.
- There is a small percentage of this kind of events (10-20%).
- DOI information is difficult to recover for the two interactions.

Parallel approach, multi-layer configuration.

Thank you!