Triggering on SN Burst Neutrinos at DUNE

Sn / radiological / noise simulations

Hit-clustering

Clustering efficiency & background acceptance different clustering configurations

Burst trigger

SN Distance, (kpc)

0 10 20 30 40 50

Efficiency x SN Probability

Eff: 0.91, Bkgd: 19.11Hz
Eff: 0.88, Bkgd: 5.81Hz
Eff: 0.86, Bkgd: 3.87Hz
Eff: 0.81, Bkgd: 1.66Hz
Eff: 0.70, Bkgd: 0.43Hz
Eff: 0.58, Bkgd: 0.10Hz

SN Probability

Efficency x SN Probability

Eff: 0.91, Bkgd: 19.11Hz
Eff: 0.88, Bkgd: 5.81Hz
Eff: 0.86, Bkgd: 3.87Hz
Eff: 0.81, Bkgd: 1.66Hz
Eff: 0.70, Bkgd: 0.43Hz
Eff: 0.58, Bkgd: 0.10Hz

SN Distance, (kpc)

Assuming a fake burst trigger rate of 1/month, what is our SN sensitivity vs. distance?

Close SN, easy to trigger

Galaxy edge, harder to trigger

Require larger clusters to increase sensitivity

LMC

Milky Way
In 10 kT

Conclusion: Can trigger on nearby SN easily. Capturing 1/5 of SN coming from LMC requires more work and is more dependent on our assumptions (e.g. simulation of radiological backgrounds).

Slide 1: 1/month fake trigger rate. Trade off between efficiency and this rate?

Galactic Neighbourhood Coverage

<table>
<thead>
<tr>
<th>Individual Marley Efficiency &amp; 10kt Background Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eff: 0.91, Bkgd: 19.11Hz</td>
</tr>
<tr>
<td>Eff: 0.88, Bkgd: 5.81Hz</td>
</tr>
<tr>
<td>Eff: 0.86, Bkgd: 3.87Hz</td>
</tr>
<tr>
<td>Eff: 0.81, Bkgd: 1.66Hz</td>
</tr>
<tr>
<td>Eff: 0.70, Bkgd: 0.43Hz</td>
</tr>
<tr>
<td>Eff: 0.58, Bkgd: 0.10Hz</td>
</tr>
</tbody>
</table>

Trigger on 98% of SN in the neighbourhood, issuing 1 fake trigger per month.