

High Energy Analysis at KamLAND and Application to Dark Matter Search

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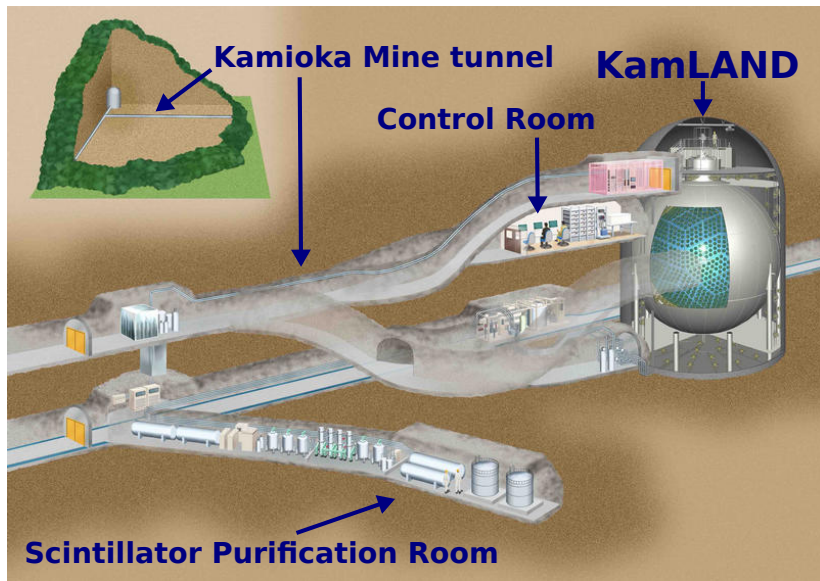
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Overview

KamLAND: ν detector in Japan



KamLAND: features

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- ▶ Commissioned: 2001
- ▶ Detector medium: liquid scintillator
- ▶ Size: 1 kt
- ▶ Photomultiplier tubes:
1325 17-inch, 779 20-inch (Hamamatsu), 34 %
photo-coverage
- ▶ Analysis ν energy: \sim MeV
- ▶ Energy resolution: 7.0 ± 0.1 %
- ▶ Vertex resolution: 13.8 ± 2.3 cm/ $\sqrt{E(\text{MeV})}$

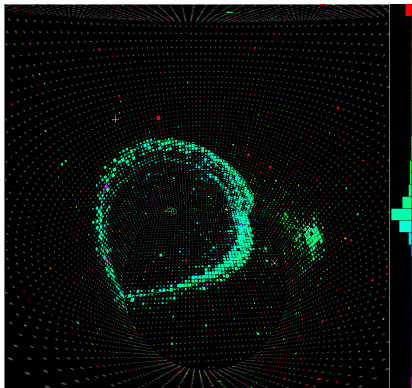
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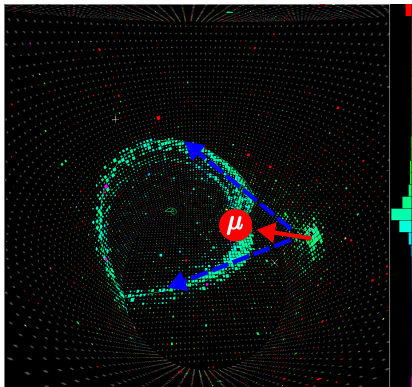
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- ▶ Directional sensitivity: NONE
- ▶ No analysis at higher energies

In water...



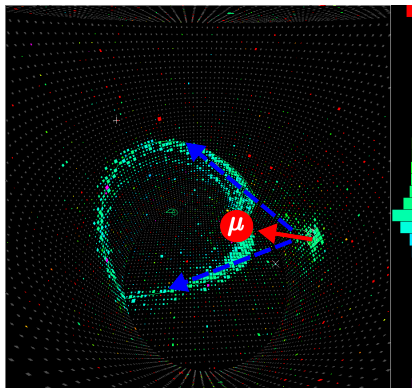
- Cherenkov rings

In water...



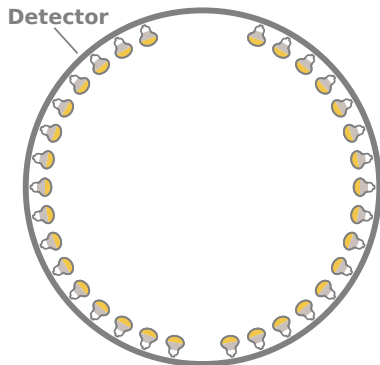
- ▶ Cherenkov rings
- ▶ Tell charged particle direction

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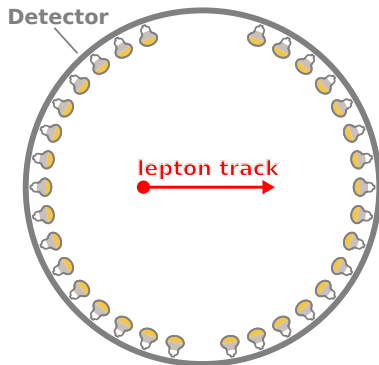


- ▶ Cherenkov rings
- ▶ Tell charged particle direction
- ▶ Can we do something similar in scintillator?

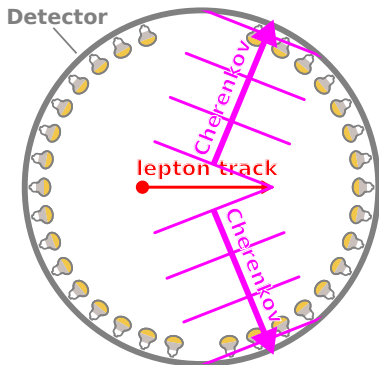
In scintillator...



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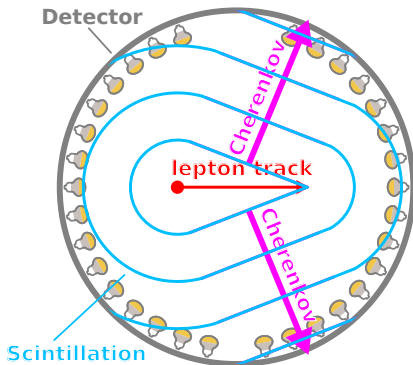


In scintillator...



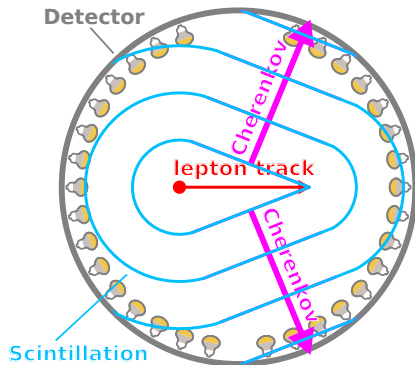
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In scintillator...



- ▶ Cherenkov is emitted
- ▶ Along with isotropic Scintillation

In scintillator...



- ▶ Cherenkov is emitted
- ▶ Along with isotropic Scintillation
- ▶ \implies Cannot simply use Cherenkov for directionality

The problem is exacerbated...