Characterization of the Swiss Spallation Neutron Source as a Site for Neutrino Experiments

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CHIPP Particle Physics Winter School

24th January 2025, Gstaad

ETH zürich

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Swiss Institute of Particle Physics

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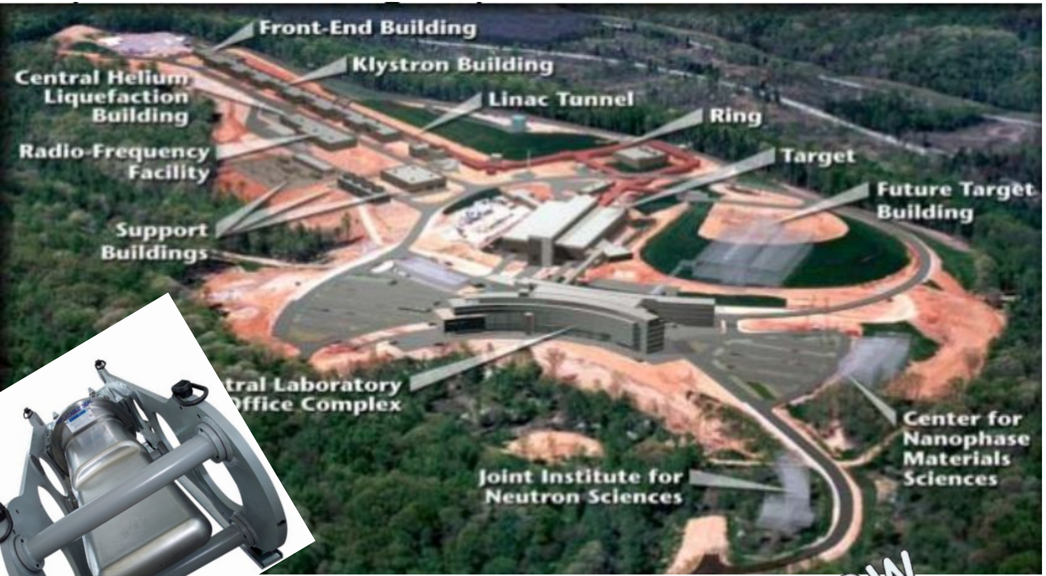
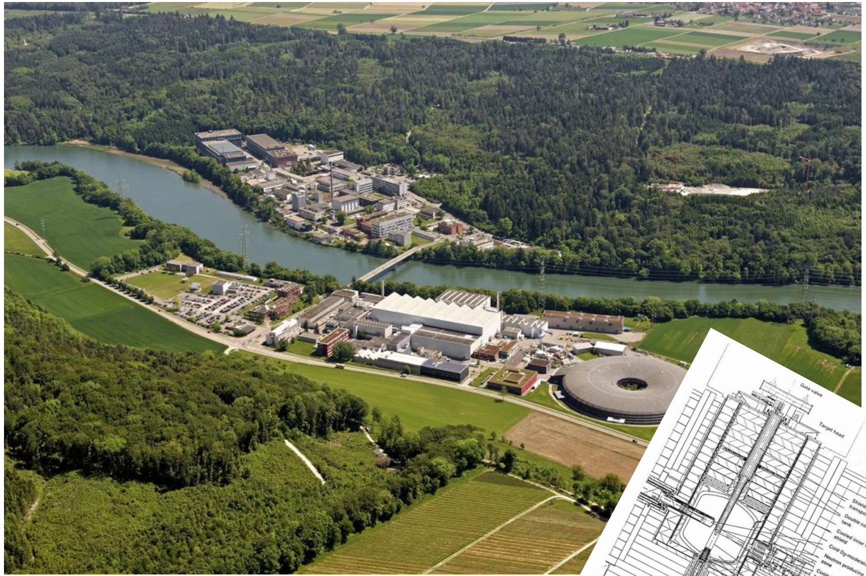
Neutrinos in Switzerland?





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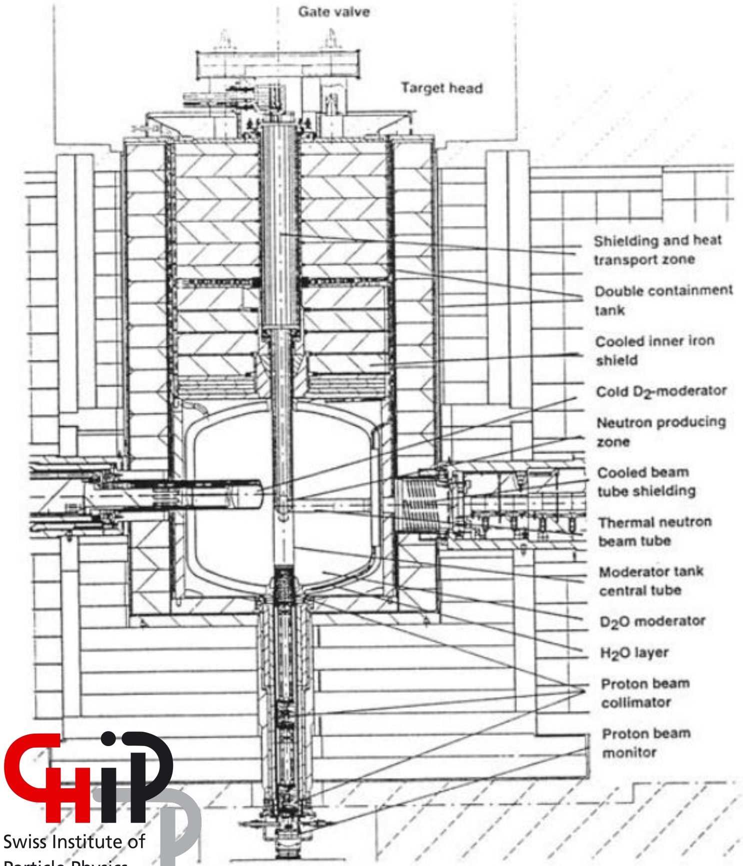
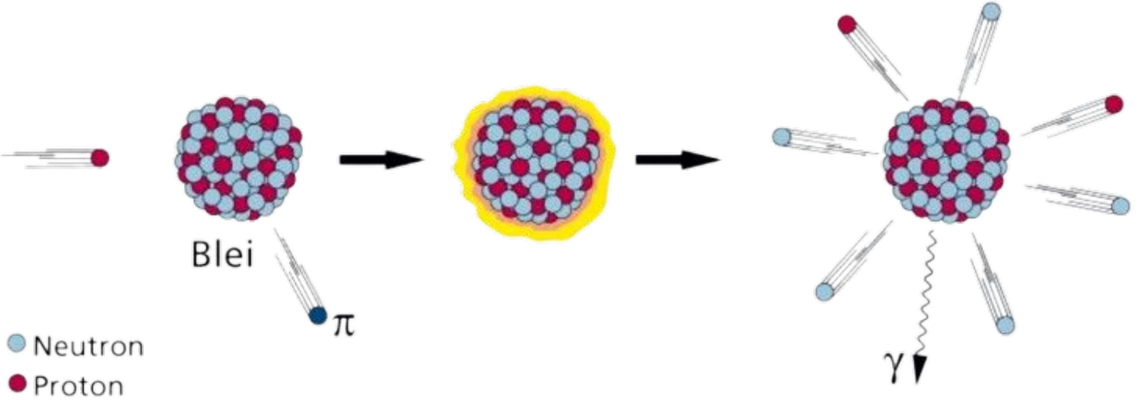
SINQ - Spallation Source





$$\pi^{\pm} \rightarrow \mu^{\pm} + \nu_{\mu}/\overline{\nu_{\mu}}$$
$$\mu^{\pm} \rightarrow e^{\pm} + \nu_{e}/\overline{\nu_{e}} + \overline{\nu_{\mu}}/\nu_{\mu}$$

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Estimated Neutrino Output

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Origin	ν_μ	$\bar{\nu_\mu}$	ν_e	$\bar{\nu_e}$
π^+	$2.3 \cdot 10^{14}$			
μ^+		$2.3 \cdot 10^{14}$	$2.3 \cdot 10^{14}$	
β^+ Nuclide Decay		$5.5 \cdot 10^{15}$		
π^-		$1.2 \cdot 10^{12}$		
μ^-	$1.2 \cdot 10^{12}$			$1.2 \cdot 10^{12}$
β^- Nuclide Decay				$8.5 \cdot 10^{13}$

Atchison et. al., Neutrinos in the Neutron Spallation Source

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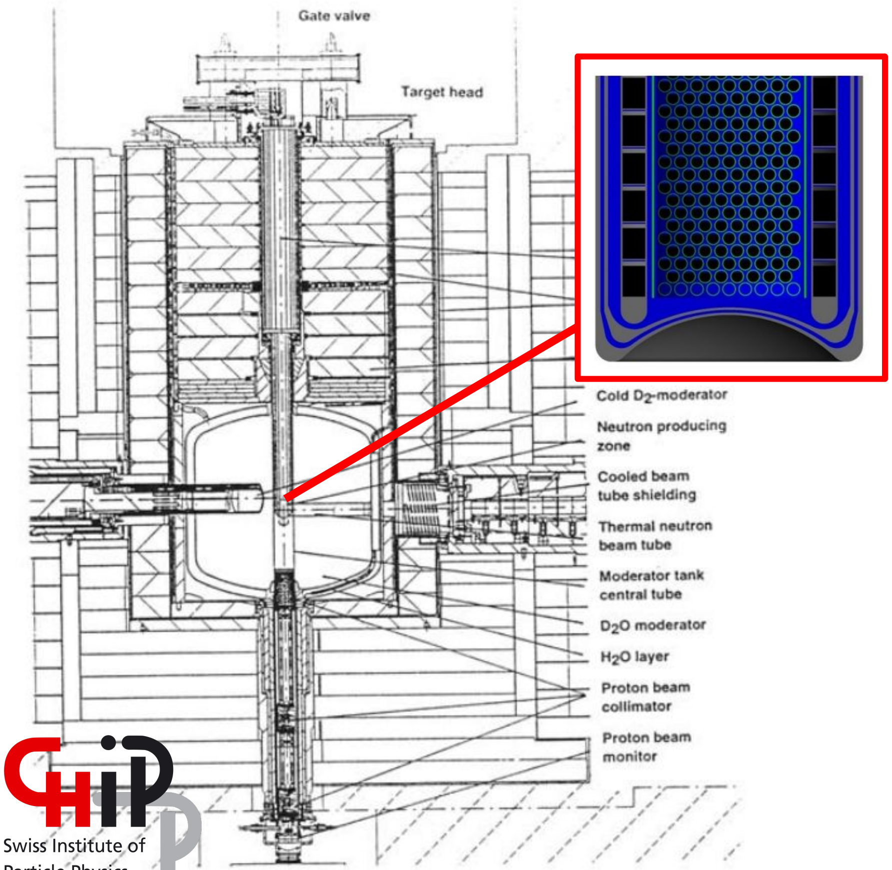
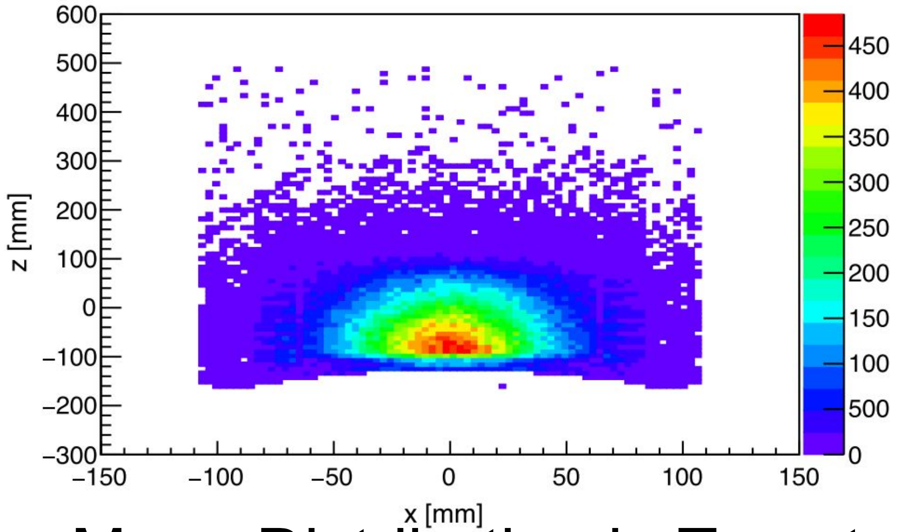
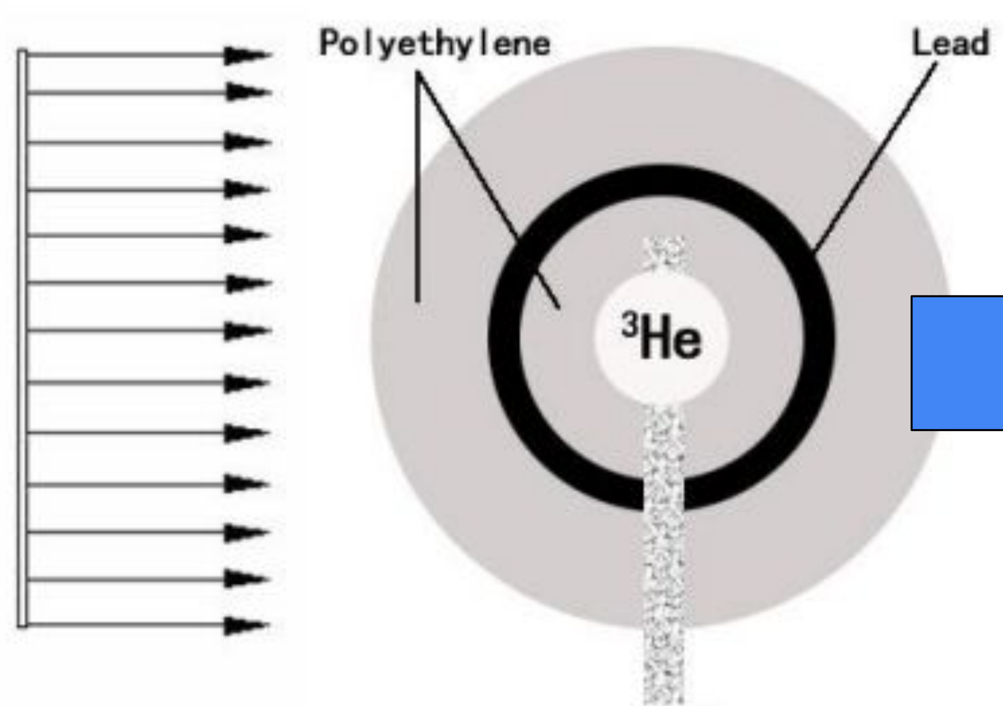
Simulation of SINQ Output





Muon Distribution in Target by A. Knecht et. al.

Background Estimates



Detector Characterization

$$n + ^3He \rightarrow ^3H + p$$

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What can we measure?

- First results by COHERENT for weak mixing angle measurement
- Dark Matter Searches
- Possible New Physics
- Probing Nuclear Physics

Thank You!

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