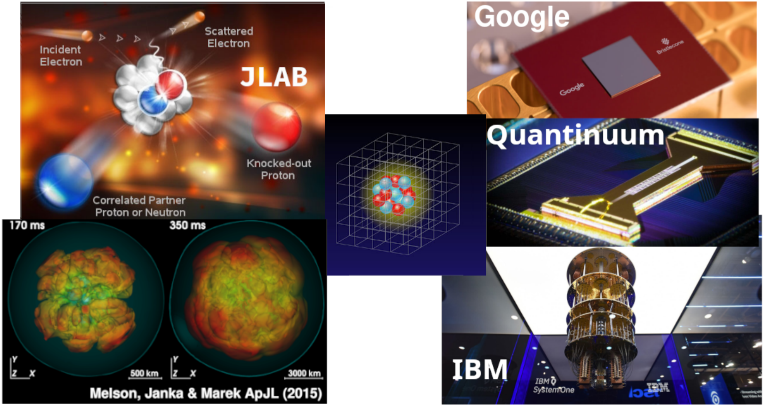
Introduction to QUART&T WP1

Alessandro Roggero



Zoom – 21 February, 2025

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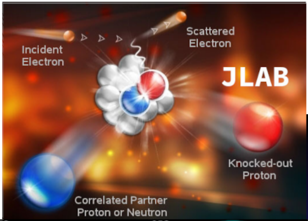

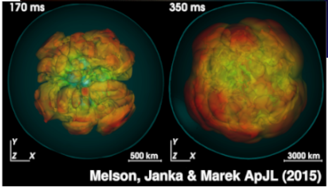

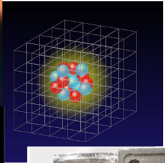

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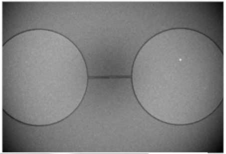

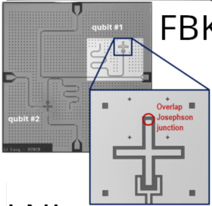

FBK

LNL

TIFPA INFN

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Quantum Simulations

Quantum System we have control over

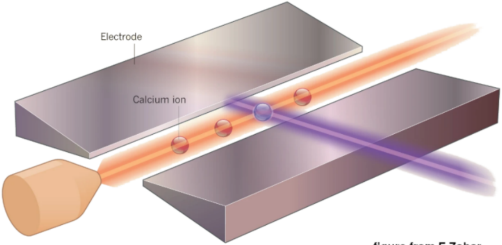
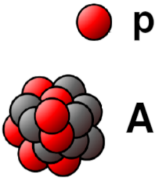


figure from E.Zohar

Quantum System we want to simulate



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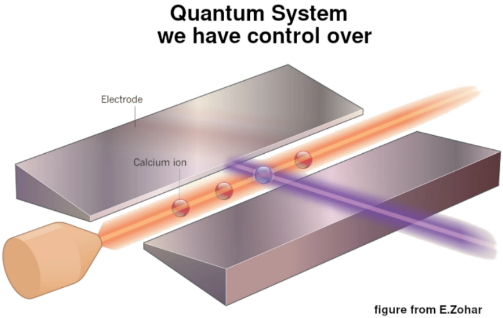

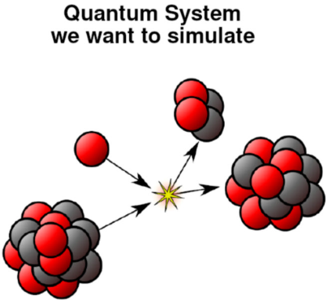

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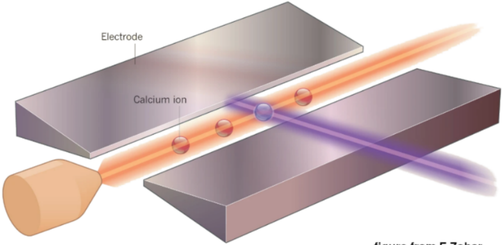

figure from E.Zohar

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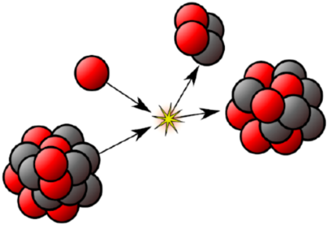

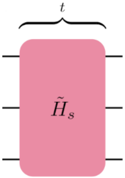

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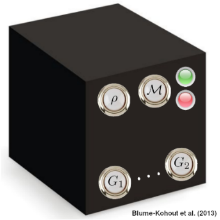

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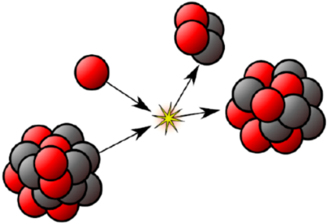

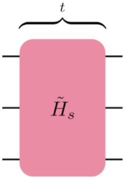

Quantum Simulations

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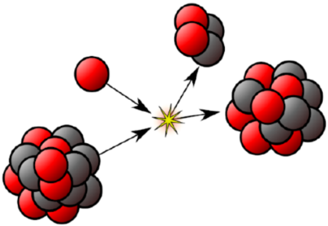

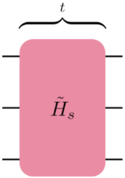

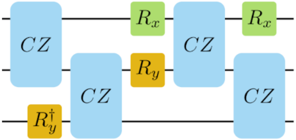

Quantum Simulations

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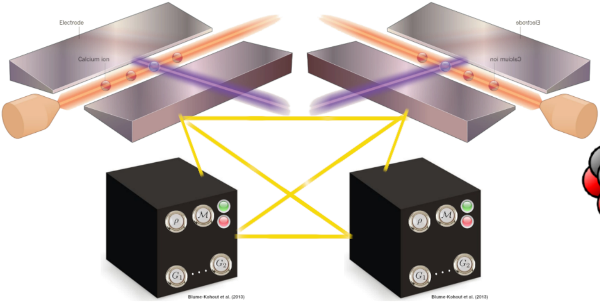

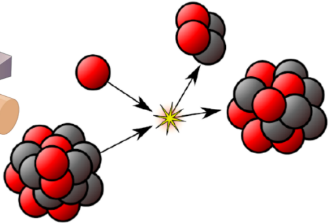

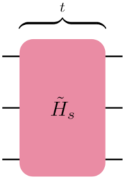

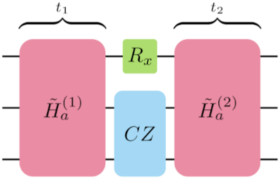

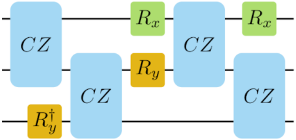

WP1 of QUART&T

Objectives

Design and implementation of **benchmark quantum simulations** for models of relevance to **fundamental physics theories**. Development and testing of hardware specific **error mitigation protocols** and their interplay with **optimal control techniques**.

first year identify and develop suitable benchmarks

second year co-design in sync with hardware developments

third year simulation on QUART&T hardware

What physical theories we have in mind?

- simple nuclear reactions
- neutrino flavor oscillations
- lattice field theories
- quantum gravity

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first year	identify and develop suitable benchmarks
second year	co-design in sync with hardware developments
third year	simulation on QUART&T hardware

What physical theories we have in mind?

- simple nuclear reactions (see Francesco's talk)
- neutrino flavor oscillations (see my next talk)
- lattice field theories
- quantum gravity