

15th International Conference on Muon Spin Rotation, Relaxation and Resonance



Contribution ID: 142

Type: Oral

Muons and Quantum Computing Hardware: Challenges and Opportunities

Thursday, 1 September 2022 10:40 (40 minutes)

One might wonder: what do muons have to do with quantum computing? I will argue that environmental muons and ionizing radiation in general represent a source of noise and dissipation which until recently has been underestimated in the quantum devices community. I will present measurements performed in the deep-underground laboratory of Gran Sasso [1] which show a significant improvement in the performance of superconducting quantum hardware thanks to the shielding provided by 1.6 Km of granite. On the other hand, low energy muon beams engineered at dedicated large-scale facilities represent a powerful materials characterization tool, and as such might play a role in the understanding and mitigation of material defects in superconducting and semiconducting quantum hardware.

[1] Cardani, Valenti et al., Nature Comm. 12, 2733 (2021)

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Session Classification: Invited Talks

Track Classification: Superconductivity