Steady-state entanglement with superconducting qubits

Fact Sheet

Project Information

Suptango
Grant agreement ID: 618353
Status
Closed project

Start date
End date
1 September 2014 31 August 2018

Funded under FP7-PEOPLE
Overall budget € 100 000
EU contribution € 100 000

Coordinated by
CHALMERS TEKNISKA HOEGSKOLA AB
Sweden

Objective

Quantum entanglement is the key resource that makes quantum information-processing machines more powerful than classical ones. In this project in quantum-mechanical engineering with superconducting qubits – electronic circuits that are engineered “artificial atoms” – I will create quantum-entangled steady states that never decay, as long as the qubits are subject to external microwave drive fields. I will do this by designing the driving protocol and the qubits’ dissipative environment – “quantum bath engineering” – in a circuit-QED architecture with carefully designed qubit-resonator couplings and resonator loss rate. The dominating transition rate can then act to prepare the system, rapidly and with high fidelity, in the desired singlet as a steady state of the dissipative time evolution. This is a new concept: only very few related experiments have been done with other physical systems, and none with superconducting qubits. Compared to the standard way of preparing entangled states – by one- and two-qubit unitary gate operations – this scheme has several advantages, chiefly the resilience to energy relaxation of the qubits because the
induced transitions and the relaxation processes bring the system back to the desired state.

I already have preliminary and promising results in this project, and good international collaborations. The excellent infrastructure and great environment at Chalmers University will help me succeed, which in turn will ensure my integration into the European research community.

This research field is internationally very competitive, in particular as superconducting qubits are emerging as the perhaps most viable type of system to base future quantum computers and quantum simulators on. It should therefore be a strategic interest for the EU to continue being on the forefront in quantum technologies.

**Field of science**

/ engineering and technology/electrical engineering, electronic engineering, information engineering/electronic engineering/computer hardware/quantum computer
/natural sciences/physical sciences/electromagnetism and electronics/electrical conductivity/superconductor

**Programme(s)**

**Topic(s)**

**Call for proposal**

FP7-PEOPLE-2013-CIG

**Funding Scheme**

MC-CIG - Support for training and career development of researcher (CIG)

**Coordinator**

CHALMERS TEKNISKA HOEGSKOLA AB

- Address: 41296 Goeteborg
- Activity type: Higher or Secondary Education Establishments
- EU contribution: € 100 000
Sweden

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