QuMIC

Qubits Control by Microwave Integrated Circuits

supracon® SQUID and Microfabrication Technologies

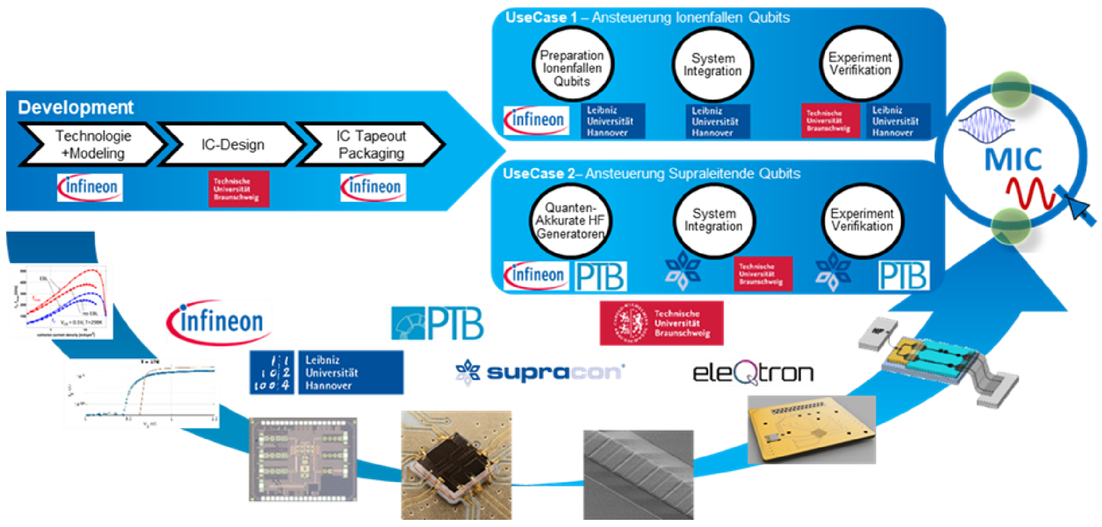
Scalable manufacturing technology for superconducting circuits for Qubit control

Project Description

The QuMIC project researches and develops novel highly integrated BiCMOS chips at high frequencies (>10 GHz) and their hybrid integration with quantum electronics (ion trap and superconducting chips). This leads to a significant miniaturization (by 8 orders of magnitude!) of the existing high-frequency electronics for driving quantum gates based on trapped ions and superconducting qubits. This approach enables the scalability of a quantum computer to a large number of qubits and a drastic reduction in the required high-frequency lines.

Key Facts

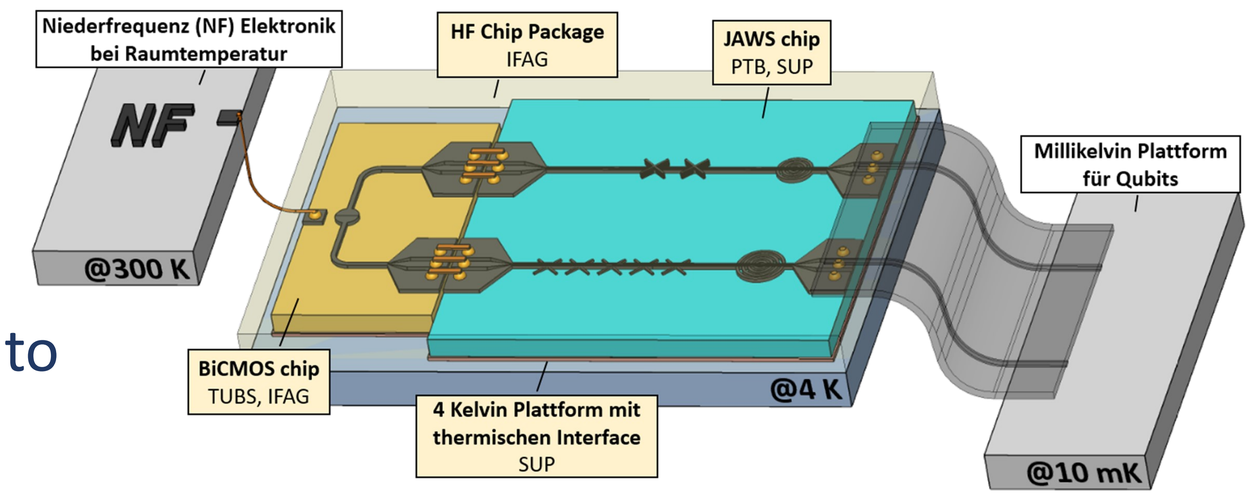
Start: 1st October 2021, 36 Months
Costs: 6.2 Mio €
Funding: 4.4 Mio €
Coordinator: Infineon Technologies AG
Consortium: 5 Partners



Partner's contribution

Concept for multi chip module for Qubit control

BiCMOS chip as arbitrary pulse generator up to 100 Gbps, generates freely programmable pulse sequence, which is quantised by the downstream superconducting JAWS chip.



⇒ ideally suited for control and readout of qubits, due to quantisation that ensures minimal noise, no drift and highest stability

⇒ no parasitic reduction of the coherence times of the qubit

Realization of manufacturing technology for JAWS

Concept for cooling the multi chip module at around 4 K

Effective dissipation of on-chip heat through thermal interface

- Suitable for vacuum applications
- Interface junctions limit dissipation of on-chip heat at low temperatures below 10 Kelvin,
- Avoidance of on-chip temperature gradients through backside metallization of circuits
- Implementation of high-frequency transitions by Infineon for low-reflection pulse transmission with up to 100 Gbps between circuits

SPONSORED BY THE

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