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**Flux qubits in 3D cavities** MICHAEL STERN, YUIMARU KUBO, CECILE GREZES, DENIS VION, DANIEL ESTEVE, PATRICE BERTET, CEA-Saclay — The flux qubitis often considered as a major design for the future of quantum integrated circuits and its properties have triggered intense interest in the last decade. This superconducting circuit behaves as a two-level system, each level being characterized bythe direction of a macroscopic permanent current flowing in the loop of the qubit. The permanent current, typically of the order of several hundreds of nAs, generates a large magnetic dipole, which offers interesting prospects for hybrid quantum circuits. However, the flux qubit suffers from limited and irreproducible lifetimes which partially prevent these potential applications. Recently, a novel architecture where qubits are placed in a three dimensional cavity was introduced for transmon qubit. It was shown that coherence properties can be greatly improved. In this work, we present the first measurements of flux qubits in a three dimensional cavity and show that they can reach long and apparently more reproducible T1. The qubits were formed on a sapphire substrate and were measured by coupling them inductively to an on-chip superconducting resonator embedded in a three dimensional copper cavity. We show that all the measured flux qubits exhibit an intrinsic T1 comprised between 5 and 13 us.

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