Cooper pair box qubits at CEA-Saclay

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The Cooper pair box is a superconducting electrical circuit that implements an artificial atom, which can be regarded as a quantum bit (qubit). Modified Cooper pair boxes like the Quantronium developped in our group[1], or like the Transmon developped in R. Schoelkopf's group at Yale[2,3], have demonstrated a long enough quantum coherence to be used for implementing 2 qubit gates. Our efforts towards the realization of an iSWAP gate based on two capacitively coupled Quantroniums will be presented. An alternative architecture in which the qubits are coupled to microwave resonators, like the transmon[3], will also be discussed and corresponding preliminary measurement will be presented.

[1] D. Vion et al., Science 296, 886 (2003)
[2] A. Wallraff et al., Nature 431, 162 (2004)
[3] J. Koch et al., Phys. Rev. A 76, 042319 (2007)