Design of Atom and Single Molecule Boolean Logic gates

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Summary

An atomic scale Boolean logic gate is a single quantum system (a molecule or a surface dangling bond circuit) electronically interacting with atomic scale metallic electrodes supposed to perform alone an “M inputs - P outputs” digital logic function. All the known designs of atomic scale logic gates: semi-classical circuits, quantum Hamiltonian circuits and qubit circuits are different versions of a quantum control. Semi-classical and quantum circuit design rules will be recalled. They differ in the way the classical input data are encoded on the quantum system and how the quantum to classical conversion proceeds at the outputs. A quantum design also can benefit from decoherence coming from the interconnections in a way to be planar implanted at the surface of a passivated semiconductor as explored in the AtMol Integrated European Project.