Robotic assembly of high-quality Carbon Nanotubes Quantum dot devices

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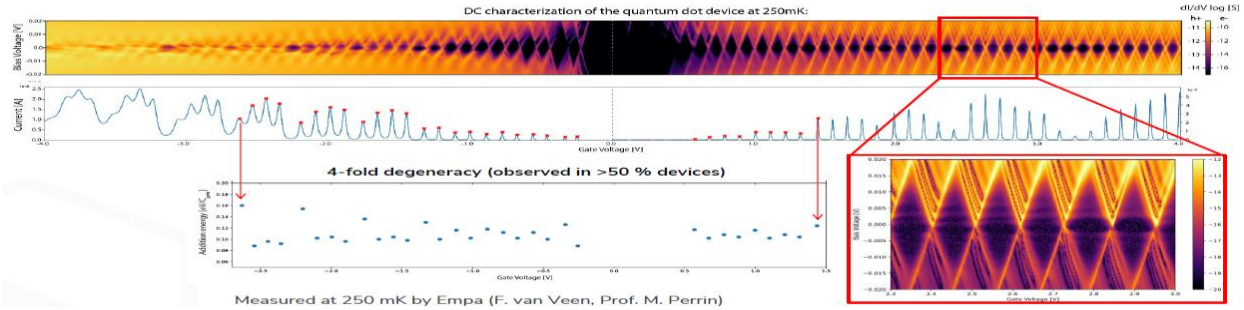

Figure 1: Ultra clean and ordered CNT quantum dot

Several studies have demonstrated the unique properties of CNTs as host materials in quantum computing with a very high potential for scalability [1,2] However, to enable any robust industrial application of these kinds of materials, one needs to gain a better understanding and control of their properties. In the case of CNTs, reproducible and robust chirality control during growth as well as large scale integration has not been demonstrated yet. Developments of wafer scale methods for integration and characterization are crucial to bridge this milestone. Chiral, a spin-off of ETH Zurich, combines high precision robotics, machine vision and advanced data analysis to develop high speed and high precision robots that can assemble high quality nanomaterials on a 4-inch wafer with more than 100 transfers per hour. In this talk, I will present our workflow for the growth and integration of high quality SWCNT into a FET geometry. Several robotic and machine learning techniques have been combined to reach a 4inch wafer efficient for all the steps including the growth, characterization, and transfer. We also developed different recipes for the cleaning of the electrodes and the selection of the tubes prior to transfer that lead to a very high yield of clean devices [3,4]. The cleanliness of the devices is confirmed by large statistics of transport data at low temperatures showing highly ordered quantum dots and the ultimate order proof, four-fold degeneracy.

References

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