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(I) Applying Atom-Defined Building Tools to Make Quantum Sensing Devices

Tuesday 8 June 2021 13:00 (20 minutes)

After 3 decades of preparation, tools and procedures for reproducible fabrication of atom-perfect silicon structures have matured to a point where it has now become possible to build proto-devices while also planning viable atom-scale manufacturing. In the beginning, device complexity and production rates will be low while manufacturing costs are high, challenges that must be offset by the high value of select initial products. Inherent attributes including ultra high speed, ultra small size/weight/power, variance-free manufacture and routine access to some quantum effects are waiting to be harnessed.
A glimpse of our current capabilities will be shown by examples including structures we can make, unique electronic properties of those, chemical and electromagnetic sensing capabilities and fabrication automation through machine learning.
Near term device objectives such as a quantum metrological current standard, an unusually high temperature capable quantum metrology-based standard thermometer, and a uniquely portable, due to low power consumption, quantum random number generator will be mentioned.
Collaborative work with Professor Konrad Walus, EE, UBC, that shows the unprecedented low power consumption of binary and analog atom-defined silicon circuitry will be briefly sketched.

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