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Adaptive Quantum Design for Nanoscience STEPHAN HAAS, JASON THALKEN, Department of Physics & Astronomy, University of Southern California, Los Angeles, CA 90089-0484, ANTHONY LEVI, Department of Electrical Engineering, University of Southern California, Los Angeles, CA 90089-2533 — Recent advances in nano-technology have enabled us to construct ultra-small opto-electronic devices, such as filters, modulators, and resonators. Material response functions can be made to order on the atomic level by explicitely breaking symmetries, such as relative widths in quasi-one-dimensional multi-layer dielectric filter arrays. This requires new software tools that optimize desired material response characteristics by finding the global minimum in large parameter landscapes of possible solutions. In this talk, we show examples of this adaptive quantum design, including optical filters in one and two dimensions and a quantum mechanical tight-binding model. Numerical optimization techniques, such as simulated annealing and the genetic algorithm, will be discussed briefly. This approach is useful in the design of a new generation of nano-devices.

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