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**Cold Atom Sensing: Gravity, Tomography, and Gyroscopes**

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The ability to use lasers to cool atoms to micro-Kelvin temperatures and subsequently control their quantum mechanical behavior has led to the development of exquisitely precise 'quantum' sensors. Our LLNL - AOSense, Inc. collaboration is pursuing diverse applications of these atom interferometer sensors that directly exploit their extraordinary accuracy, scale factor stability, low noise and bias drift characteristics. Specifically, atom interferometers configured as Sagnac gyroscopes potentially enable precise 'dead reckoning' navigation without the aid of GPS; while when configured to make near field measurements of gravitational perturbations, they enable real time ‘gravity tomographic’ detection of dense, localized, illicit objects above the background gravitational signatures in passing vehicles. After reviewing the physics of atom interferometry in atomic fountain-Mach-Zehnder and Sagnac configurations, I will describe the development of a 'gravity tomography' signal analysis system for vehicle portals, including the optimal synthesis of gravitational sensor signals with complementary radiation detection.

**Wilson Hall, One West**