Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Alkali-Metal Mixture for Synthetic Alkali Vapor Density Reduction
JUSTIN BROWN, COLIN HESSEL, JOEL HENSLEY, Physical Sciences Inc. — Physical Sciences Inc. (PSI) has demonstrated a method to synthetically reduce the equilibrium saturated vapor density of alkali atoms through the use of an alkali-metal mixture. The reduction is based on the physical principle of Raoult’s Law where the vapor density of components in a mixture is reduced by the mole fraction represented in the mixture and can be continuously adjusted with the mixing ratio. PSI has produced a series of alkali-metal mixtures demonstrating controllable reduction of the rubidium vapor density by up to 10,000 at equilibrium. Binary and ternary rubidium mixtures with sodium and lithium have produced rubidium densities of $\sim 10^8$/cm$^3$ with total vacuum pressures of $10^{-7} - 10^{-8}$ Torr at 85°C to provide vacuum conditions compatible with operation of a magneto-optical trap (MOT) at 85°C. The alkali mixture provides a new passive atom source for portable atom-based sensors operating outside the laboratory where lowest power thermal regulation over the 0°C-85°C commercial temperature range occurs at elevated temperatures using only a heater.

This work was supported under DARPA contract HR0011-16-C-0127. The views, opinions and/or findings expressed are those of the author and should not be interpreted as representing the official views or policies of the DoD or the U.S. Govt.