Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Alkali-Metal Mixture for Synthetic Alkali Vapor Density Reduction[1] 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 $\sim 10^8/\mathrm{cm}^3$ 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.

[1]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.

Justin Brown
Physical Sciences Inc.

Date submitted: 25 Jan 2018 Electronic form version 1.4