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High Temperature Chip Scale Atomic Clock

We present the development of alkali-alloy-based vapor cells for operating Chip-Scale Atomic Clocks (CSAC) at ambient temperatures up to 105 ℃. Potassium is chosen for a better miscibility as compared with gold for the designed operating temperature. The caesium vapor density is reduced as predicted by the Raoult's law through mixing a controlled amount of potassium metal in the vapor cell. We have demonstrated vapor pressure suppression equivalent to 20 ℃. We have measured the collisional broadening due to potassium-caesium collisions and concluded it to be negligible. We will present experimental data demonstrating short- and long-term clock frequency performance as well as temperature sensitivity.

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