

# Building the Next Generation Atom Trap Trace Analysis

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Abstract

## I. INTRODUCTION

## II. THEORY

Krypton is one of the noble gases, its outer electron shell is completely filled, as such the energy gap between the ground energy state and the first excited state is large (XXXX). Therefore to laser cool from the ground state would require (123nm?) light which is not currently possible experimentally. To be able to trap krypton atoms they need to be in an excited state and that state needs to be metastable so that the atoms cannot decay while we are cooling and trading them.

To get the kryptons to the metastable state we used a 215nm light to drive a two-photon transition from the ground state, through the ZZZZZZ state to the XXXXXX state. Throughout our calculations we call the ground state 'state 1' and the XXXXXX state 'state 2.' The ZZZZZZ state is not important for our experiment; it is just a intermediate state between the ground state and the XXXXXX state. From the XXXXXX state the atom will either decay to the ground state (through the ZZZZZZ state) or it will decay to a metastable state, the YYYYYY state. We called this metastable state 'state 3.' The last possibility is that the atom can ionize either from the the XXXXXX state or the metastable YYYYYY state.

Atom trap trace analysis counts atoms that have been trapped so it is limited by the number of atoms in the metastable state. To determine the efficiency of our set up, we needed to calculate the percentage of krypton atoms that ended up in the

### III. METHODS

### IV. RESULTS

### V. ANALYSIS

### VI. DISCUSSION

### VII. CONCLUSION

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