Abstract Submitted
for the NWS15 Meeting of
The American Physical Society

One-dimensional Fermi gas with a single impurity in a harmonic trap: Perturbative description of the upper branch[1] SEYED EBRAHIM GHARASHI, X.Y. YIN, YANGQIAN YAN, D. BLUME, Washington State University — The transition from "few to many" has recently been probed experimentally in an ultracold harmonically confined one-dimensional lithium gas, in which a single impurity atom interacts with a background gas consisting of one, two, or more identical fermions [A. N. Wenz *et al.*, Science **342**, 457 (2013)]. For repulsive interactions between the background or majority atoms and the impurity, the interaction energy for relatively moderate system sizes was analyzed and found to converge toward the corresponding expression for an infinitely large Fermi gas. Motivated by these experimental results, we apply perturbative techniques to determine the interaction energy for weak and strong coupling strengths and derive approximate descriptions for the interaction energy for repulsive interactions with varying strength between the impurity and the majority atoms and any number of majority atoms.

[1]Support by the NSF is gratefully acknowledged.

Seyed Ebrahim Gharashi
Washington State University

Date submitted: 06 Apr 2015 Electronic form version 1.4