Contribution ID: **104** Type: **Contributed Oral/Poster**

Island of inversion by microscopically derived shell-model Hamiltonian

Tuesday, 12 July 2016 17:20 (15 minutes)

We present the first application of the newly developed theory, EKK, of
effective nucleon-nucleon interactions to the structure of exotic nuclei.
This theory, a novel revision of many-body perturbation theory,
enables us to perform shell-model calculations with several major shells (for instance, sd+pf shells).
Using the Entem-Machleidt QCD-based chiral EFT interaction and the Fujita-Miyazawa three-body force,
exotic neutron-rich Ne, Mg and Si isotopes are studied systematically, with a good description of
ground-state energies, first 2+ and 4+ levels, and E2 transitions,
as the first shell-model calculation for the island of inversion
without two-body matrix elements fitted to experiment.
The drip lines are predicted.
We show effective single-particle energies from this interaction, exhibiting the shell evolution
produced by the chiral EFT interaction + three-body force.
Obviously, proposed configuration patterns can be exciting objects of direct reaction studies.

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Track Classification: Probing the nuclear force through direct reactions