High-Spin Spectroscopy Near ^{56}Ni*

W. Reviol[1], D.G. Sarantites[1], R.J. Charity[1], V. Tomov[1], D. Rudolph[2], R.M. Clark[3], P. Fallon[3], A.O. Macchiavelli[3], M. Cromaz[3], M.P. Carpenter[4], D. Seweryniak[4], and J. Dobaczewski[5]

[1]*Department of Chemistry, Washington University, St. Louis, MO 63132, USA*
[2] *Department of Physics, Lund University, S-22100 Lund, Sweden*
[3] *Nuclear Science Division, Lawrence Berkeley National Lab., Berkeley, CA 94720, USA*
[4] *Physics Division, Argonne National Laboratory, Argonne, IL 60439, USA*
[5] *Institute of Theoretical Physics, Warsaw University, PL-00681, Warsaw, Poland*

High-spin studies in the nuclear region around ^{56}Ni haven been topical for several years now. Benefiting from powerful detection devices, impressive results have been obtained such as the observation of highly and superdeformed rotational bands in second (or third) minima of Ni, Cu and Zn nuclei [1-3]. In a recent 2-day experiment using Gammasphere, the Microball, and the new Neutron Shell (30 liquid scintillator counters) [4], we have studied the evaporation residues in the $^{32}S + ^{28}Si \rightarrow ^{60}Zn^*$ reaction at 130 MeV. Some highlights of our findings are summarized below.

In ^{57}Ni (2pn channel) and ^{57}Co (3p), highly deformed rotational bands are newly observed [5]. The bands in ^{57}Co, which are signature partner bands, are particularly interesting. Their observation extends the mass 60 region of large deformation below Z = 28 and provides an important test for the picture of particle-hole excitations across this shell gap. Their magnetic properties (B(M1) values for the interband transitions) are discussed in the context of possible configuration assignments. The features of the new bands are theoretically described by Skyrme Hartree-Fock calculations.

The level schemes for the N = Z nucleus ^{54}Co (αpn) and its neighboring isotope ^{56}Co (3pn) have also been extended significantly towards higher spin. The newly observed states are exclusively located in the first, spherical minimum. Calculations to obtain a shell model description for these states are under way.

A follow-up experiment will enable us to study the products from the $^{60}Zn^*$ compound system with higher statistical accuracy. First results from this experiment should be available by the time of this conference.

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[4] http://wunmr.wustl.edu/~dgs/NeutronShell.
[5] W. Reviol et al., Nucl. Phys. A, in press.

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