Doppler shift as a tool for studies of resonant (p,n) reactions with RIBs. Spectroscopy of ^{7}He.

P. Boutachkov[1], G.V. Rogachev[1,5], V.Z. Goldberg[2], A. Aprahamian[1], F.D. Becchetti[3], J. P. Bychowski[4], Y. Chen[3], G. Chubarian[2], P.A. DeYoung[4], J.J. Kolata[1], L.O.Lamm[1], G.F. Peaslee[4], M. Quinn[1], B.B. Skorodumov[1], A. Wohr[1]

1. Physics Department, University of Notre Dame, Notre Dame, IN 46556
2. Texas A&M University, College Station, TX 77843
3. Physics Department, University of Michigan, Ann Arbor, MI, USA
4. Physics Department, Hope College, Holland, MI 49422
5. Current affiliation: Physics Department, Florida State University, Tallahassee, FL 32306

The availability of radioactive beams (RIB) has opened new opportunities for the investigation of exotic drip-line nuclei. But the experiments with RIBs are challenging mainly because of the low beam intensity. This leads to development of new experimental techniques and necessary to optimize the current ones.

I will report on a new method for studies of neutron rich systems through resonant (p,n) reaction with RIB. The technique consists of two steps. First an isobar analog state of the system we want to study is populated in inverse kinematics, using resonant (p,n) reaction. Then the Doppler shift of a gamma ray emitted from a known state in the created doughtier nucleus is recorded.

I will show that with thick proton target one can obtain spectroscopy information about the high isospin states populated in the interaction of the RIB with the protons. A specific example of the spectroscopy of ^{7}He and future application of the proposed method will be discussed.