# FIRST OBSERVATION OF PROTON EMISSION FROM DEFORMED STATES IN $^{140}$Ho AND $^{141m}$Ho

K. Rykaczewski, J. C. Batchelder[1], C. R. Bingham[2], R. Grzywacz[2,3], C. J. Gross[1], J. F. Mas, J. W. McConnell, K. S. Toth, A. Piechaczek[4], E. F. Zganjar[4], T. Ginter[5], B. D. MacDonald[6], J. J. Ressler[7], W. Walters[7], T. Davinson[8], R. C. Slinger[8], P. J. Woods[8], Z. Janas[3] and M. Karny[3]

New proton emitters, $^{140}$Ho and $^{141m}$Ho, located in the region of deformed nuclei were identified at HRIBF (ORNL) using a fusion-evaporation reaction of a $^{54}$Fe beam (315 MeV) on a $^{92}$Mo target (0.91 mg/cm$^2$). Reaction products were selected by means of the Recoil Mass Spectrometer (RMS). Energy loss and position of the ions transmitted to the final focus of RMS were recorded using the Position Sensitive Avalanche Counter. After slowing down in Ni degrador to about 35 MeV, the products were implanted into a 64 microns thick Double-Sided Silicon Strip Detector having 40 x 40, 1 mm wide strips. The position, amplitude and time for recoil implantation, as well as for decay signals were measured. The recently observed proton emitter [9] $^{141gs}$Ho ($E_p$ = 1.17 MeV, $T_{1/2} \approx$ 4 ms), as well as two new proton radioactivities were detected. Position correlations allowed us to separate the proton activities at A = 141 and A = 140. A new proton line at A = 141 ($E_p$ = 1.23(2) MeV and $T_{1/2} \approx 8\mu$s) was assigned to the decay of $^{141m}$Ho (see fig. 1). Measured decay properties and the calculations including minimization of total energy surface with respect to [$\beta_2$, $\beta_4$, $\beta_6$] deformation space [10] suggest 7/2$^-$[523] and 1/2$^+$[411] proton orbitals for the configurations of $^{141gs}$Ho and $^{141m}$Ho, respectively. The next proton bandhead in $^{141}$Ho, 5/2$^-$[532], is expected to lie about 250 keV above the ground-state. The deformation parameters for all discussed $^{141}$Ho states have been calculated to be about $\beta_2$ = 0.27, $\beta_4$ = -0.067 and $\beta_6$ = 0.01 [10]. The proton line seen in Fig. 1, correlated with the implantation of A = 140 recoils ($E_p$ = 1.086(10) MeV and $T_{1/2} \approx$ 6 ms) and was assigned to the decay of $^{140gs}$Ho. The structure of this odd-odd emitter could be described as a coupling of 7/2$^-$[523] proton to the 7/2$^-$[514] or 5/2$^+$[402] neutron orbital, since these two configurations are predicted to be nearly degenerate [10].

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[1]Oak Ridge Institute for Science and Education, Oak Ridge, TN 37831.
[2]University of Tennessee, Knoxville, TN 37996.
[3]University of Warsaw, Warsaw, Poland.
[4]Lousiana State University, Baton Rouge, LA 70803.
[5]Vanderbilt University, Nashville, TN 37235.
[6]Georgia Institute of Technology, Atlanta, GA 30332.
[7]University of Maryland, College Park, MD 20742.
[8]University of Edinburgh, Edinburgh EH9 3JZ, United Kingdom.
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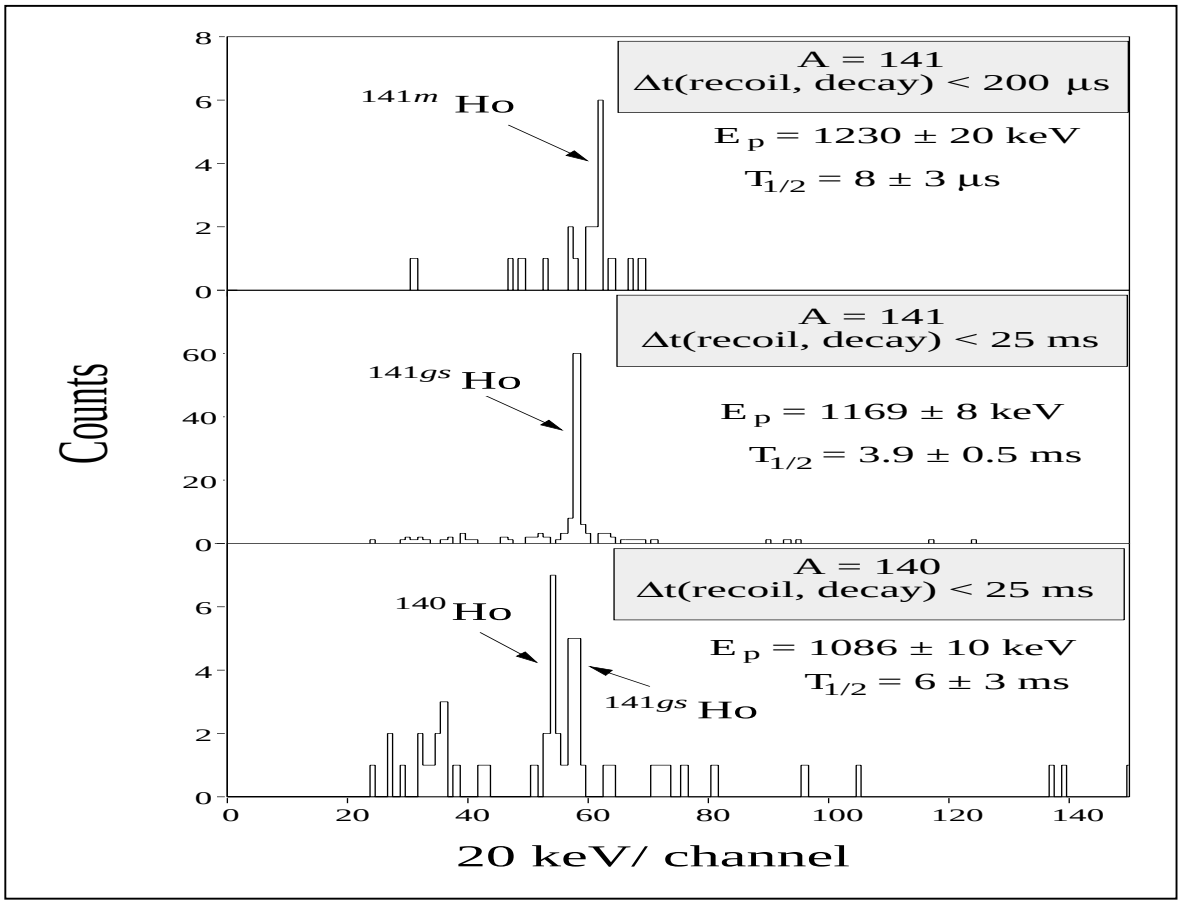


Fig. 1: Proton energy spectra recorded during the 30-hours experiment at HRIBF. The respective time and mass gates were applied to enhance the peak to background ratio.