

## Advances Towards and Beyond the Proton Dripline with Recoil-Isomer Tagging.

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This talk will review the past, present and future status of the recoil-isomer tagging research programme which has been used to access isomeric states at and *beyond* the mass  $\approx 140$  proton dripline. The recoil-isomer tagging technique was first used at the University of Jyväskylä in 1998 to establish the prompt rotational band on a  $K^\pi = 8^-$  isomeric state in  $^{138}\text{Gd}$  [1]. Since that time a series of experiments have been performed which have studied isomeric states in the  $N = 77$  isotones  $^{140}_{63}\text{Eu}_{77}$  [2],  $^{142}_{65}\text{Tb}_{77}$  and  $^{144}_{67}\text{Ho}_{77}$  [3], and in the  $N = 74$  K-isomer chain,  $^{138}_{64}\text{Gd}_{74}$  [1] and  $^{140}_{66}\text{Dy}_{74}$  [4]. These experiments have revealed valuable *first* information about deformations, single-particle excitation energies and hindrance factors in nuclei at and beyond the proton dripline where little or no information previously existed.

The results of the most-recent experiment will be shown where new isomeric states have been established in  $^{143}_{66}\text{Dy}_{77}$  [5],  $^{136}_{61}\text{Pm}_{75}$ , and  $^{139}_{64}\text{Gd}_{75}$  and a further two isomers which are currently unplaced. Finally, the talk will conclude with a discussion of the future prospects for this research which includes increases in the efficiency of the recoil-isomer tagging technique with a new gas detector which was designed and built at the University of Manchester.

[1] D.M.Cullen *et al.*, Phys. Rev. **C58** (1998) 846.

[2] D.M.Cullen *et al.*, Phys. Rev. **C66** (2002) 034308.

[3] C. Scholey *et al.*, Phys. Rev. **C63** (2001) 034321.

[4] D.M.Cullen *et al.*, Phys. Lett. **B529** (2002) 42.

[5] S. Rigby *et al.*, J. Phys. G. (NUSTAR05 Conference proceedings) in press.