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Nuclear moment measurements on neutron-rich nuclei[1]

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Two techniques have recently been proved workable to measure the magnetic moments (or g factors) of short-lived excited nuclear states in exotic nuclei produced as radioactive beams. These are the high-velocity transient-field technique (HVTF) [1,2], which has been demonstrated to be applicable to relatively low-Z isotopes produced by fast fragmentation, and the recoil-in-vacuum (RIV) technique, which has been applied to heavier nuclei near ^{132}Sn [3,4]. This talk will report, firstly, on the analysis of recent moment measurements in neutron-rich nuclei, and, secondly, on the further development of the techniques for applications to new regions of the nuclear chart, with an emphasis on the opportunities opened up by the gamma-ray tracking array GRETINA. Progress on recently performed HVTF measurements, including the neutron-rich isotopes $^{42-46}$Ar at NSCL, will be discussed, along with experimental work to extend the technique towards higher Z and the N=40 region. The feasibility of a HVTF g-factor measurement on the first-excited state in ^{32}Mg, taking advantage of GRETINA, will also be evaluated. For slower beams with 2 – 5 MeV/nucleon, the RIV technique has advantages: these g-factor experiments are essentially identical to a B(E2) measurement, but with sufficient statistics to measure the particle-gamma angular correlations. Detailed studies of the free ion hyperfine fields, which must be characterized and understood for these moment measurements, have commenced using stable beams at the Australian National University. The results will be described with the view to future applications to moment measurements in the N=34, N=40 and A$\sim$100 regions, using re-accelerated radioactive beams and GRETINA.

[1] A.D. Davies et al. Phys. Rev. Lett. 96, 112503 (2006).
[2] A.E. Stuchbery et al. Phys. Rev. C 74, 054307 (2006).
[3] N.J. Stone et al. Phys. Rev. Lett. 94, 192501 (2005).
[4] A.E. Stuchbery and N.J. Stone, Phys. Rev. C 76, 034307 (2007).

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