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Novel Charge Readouts for a CYGNUS-10 Directional Detector at Boulby

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The CYGNUS collaboration is developing a range of approaches towards a global dark matter experiment in the form of an array of nuclear recoil direction sensitive detectors, distributed at multiple underground sites. Here we describe demonstration of two new hybrid TPC charge readout concepts for CYGNUS, capable of use with SF6 negative ion gas. The first comprises a thick GEM gain stage coupled to a multi-wire plane with 600 micron position resolution. The second combines a micromegas strip readout with a new form of gain stage specifically designed for SF6 operation. This is a hybrid GEM geometry that incorporates multiple internal meshes within the GEM holes to provide two separate internal gain stages. Performance characteristics are presented, including data on ionisation track reconstruction, and implications discussed for development of a CYGNUS-10 experiment at the Boulby underground site.

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