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A real x-y microbulk Micromegas with segmented mesh

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We present for a first time, the development of Micromegas detectors based on Microbulk technology with segmented mesh. The space charge produced within the amplification volume induces both signals and the mesh strips provide the y coordinate while the anode strips the x coordinate. The manufacturing of a segmented mesh simplifies the x-y readout that up to now was produced in a complicated and delicate way due to the x-y strips formation (x-pads link in the front and y-pads link via through holes in the back plane) and had a high risk of deteriorating the detector quality or even damaging the detector in the last stages of construction. This R&D is a project supported by the RD51 collaboration. The design and manufacturing has been optimized and produced segmented mesh Microbulk Micromegas with excellent properties in Energy resolution, stability and good position resolution. We have designed appropriate FE-electronics for providing the bias HV to every individual mesh strip and reading it out. The design aims to an ultra low background, ultra low threshold detector appropriate for rare event searches, thanks to its low material budget that may further improve the excellent Microbulk technology background properties close to $\sim(\text{few}) \times 10^{-7}$ cnts/keV/cm²/s. We will present details of the design and the manufacturing of the segmented mesh microbulk, results on the detector performance, prospects for further improvements and possibilities that open for rare processes, neutron detection and other applications. We believe that this design constitutes a break-through in the Micro Pattern Gaseous Detectors developments.

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