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A novel idea for an ultra-light cylindrical GEM based vertex detector DANILO DOMENICI, GIOVANNI BENCIVENNI, ENZO IACUESSA, STEFANO LAUCIANI, FABRIZIO MURTAS, LNF - INFN — An ultra-light cylindrical triple-GEM detector for vertex purposes is being developed. The cathode, the three GEMs and the anode are five concentric cylinders, obtained winding parallelogram-shaped foils, with a resulting helicoidal junction overlap (<3 mm wide). The result is a wholly cylindrical GEM, almost free of dead-zones and without support frames inside the active area, fruitfully usable as a vertex detector. The detector is also extremely light: considering that the material used is mainly kapton, and the possibility to reduce the copper layer thickness to $2\mu\text{m}$, a single tracking layer can have a material budget as low as 0.2% of X_0 . The readout of the detector is performed with large stereo angle U-V strip layers: one directly realized on the anode electrode, and the other onto the bottom side of the third GEM foil. Considering a large stereo angle of about 40 degrees and a strip pitch of $400\mu\text{m}$, the spatial resolutions achievable are $\sigma_{r\phi} \simeq \sigma_z \sim 200\mu\text{m}$. In order to avoid ambiguity in the position reconstruction the right strips crossing angle, corresponding to the winding angle, must be $\text{tg}\theta = L/\pi R$ (where L is the length of the vertex detector and R its radius). The mechanical assembly of one single layer is described and preliminary results obtained with an $\text{Ar}/\text{CO}_2 = 70/30$ gas mixture are discussed.

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