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Innovative design and construction technique for the Cylindrical GEM detector for the BESIII experiment

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Gas detector are very light instrument used in high energy physics to measure the particle properties: position and momentum.
Through high electric field is possible to use the Gas Electron Multiplier (GEM) technology to detect the particles and to exploit the its properties to construct a large area detector, such as the new IT for BESIII. The state of the art in the GEM production allow to create very large area GEM foils (up to 50x100 cm2) and thanks to the small thickness of these foil is it possible to shape it to the desired form: a Cylindrical Gas Electron Multiplier (CGEM) is then proposed.

The innovative construction technique based on Rohacell, a PMI foam, will give solidity to cathode and anode with a very low impact on material budget. The entire detector is sustained by permaglass rings glued at the edges. These rings are use to assembly the CGEM together with a dedicated Vertical Insertion System and moreover there is placed the On-Detector electronic. The anode has been improved w.r.t. the state of the art through a jagged readout that minimize the inter-strip capacitance.

The mechanical challenge of this detector requires a precision of the entire geometry within few hundreds of microns in the whole area.
In this presentation will be presented an overview of the construction technique and the validation of this technique through the realization of a CGEM and its first tests.
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