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Construction and test of the large GEM tracking detector for the Super BigBite Spectrometer at JLab

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The Super BigBite Spectrometer (SBS) is currently being instrumented at JLab to investigate nucleon structure at high 4-momentum transfer Q^2 offered by the 12 GeV electron beam upgrade. Being an optimally cost-effective solution for precision tracking over large areas in a high-rate environment, the large Gas Electron Multiplier (GEM) detector has become the key component in SBS tracking system. Our group at UVa is responsible for the design, construction, and implementation of ten 2D GEM tracking layers for the SBS. Each tracking layer has an active area of $60 \times 200 \text{ cm}^2$ and is made out of four $60 \times 50 \text{ cm}^2$ GEM modules. Forty $60 \times 50 \text{ cm}^2$ GEM modules have been successfully fabricated and tested in our laboratory and meet SBS design requirements. Fabricating procedures, quality controls used in each construction step, and testing of the GEM module will be reported in detail.

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