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# Research and Development of Commercially Manufactured Large GEM Foils (12' + 3')

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Many current experiments are already using detectors which consist of large area GEMs and with even more future experiments proposing new detectors that utilize very large-area GEMs, there is a need for commercially available GEM foils. Currenty CERN is the only main distributor of GEM foils, however with the growing interest in GEM technology, keeping up with the increasing demand for GEMs will be difficult. Thus the commercialization of GEMs has been established by Tech-Etch Inc. of Plymouth, MA, USA using the single-mask technique, which is capable of producing GEM foils over a meter long.

To date Tech-Etch has succefully manufactured $10 \times 10 \, \text{cm}^2$ and $40 \times 40 \, \text{cm}^2$ GEM foils. We will report on the electrical and geometrical properties, along with the inner and outer hole diameter size uniformity of these foils. Using our electrical and optical measurement setup, we also measured $10 \times 10 \, \text{cm}^2$ GEM foils produced by CERN for a direct comparison to the foils produced by Tech-Etch. Furthermore, Tech-Etch has now begun producing even larger GEMs of $50 \times 50 \, \text{cm}^2$, which are currently under active analysis.

The Tech-Etch foils were found to have excellent electrical properties. The measured mean optical properties were found to reflect the desired parameters and are consistent with those measured in double-mask GEM foils, and show good hole diameter uniformity over the active area. These foils are well suited for future applications in nuclear and particle physics where large-area tracking devices are needed such as at the LHC and at a future Electron-Ion Collider facility.

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