GEM foils production status and plans @ Techtra
The beginning: December 2002

GEM manufacturing upon CERN licence

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Machinery for „small“ GEM production.

- A cleanroom
- PCB laminator
- PCB developer - etcher
- Kapton etching machine - processing baths
- Exposure Unit

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„Small” GEMs

Since 2010 Techtra has produced over 1700 small GEM foils.

Different:
• sizes
• shapes
• pitch
• hole diameter
„Small” GEMs technological limits:

- Total dimension: 40x55cm²
- Active area: 30x40cm²
- Foils can be produced with „double mask” or „single mask” technique

Production yield: about 90%
Photomasks

Pitch 140µm, dot 60µm

Pitch 50µm, dot 30-35µm
Foil photomask

Pitch 50µm, dot 30µm
Glass photomask
Machinery for „BIG” GEM production

Exposure unit

PCB developer

Copper etcher

Kapton etching „industrial” PROTOTYPE

Machinery suitable for production of 2 meters long GEMs

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Problems with Kapton etching PROTOTYPE

- non uniform spraying system
- foils blocks itselfs inside the machine.
- chemistry and fumes leakages from: pumps, pipes joints, ect
- non compatibility of used materials
- many more....

After 1 month work, the plastic parts were worn.

Worn conveyor rollers and endcaps leads to kapton foils destruction

Openings uniformity test

Destructed Kapton foil
A prototype machine causes many problems:

- Very low production yield - about 30%
- Time and resource consuming
- Needs constant tuning, testing, repairing, etc.

Recent production at Techtra. Over 15 foils was done.

Leakage currents: 8-20 nA @600V@30%HR per foil
BIG GEMs

• The only visible solution is to step back to processing baths technique

• Exchange of baths is necessary

Two companies are ready to dispose old baths set and to design, build and install a new set of Kapton etching bath, fumes extractors, wasted water treatment station, etc.

Techtra would like to established a collaboration dedicated to beam tests of our big GEMs. The validation should involve:

- Gain mapping
- Gas leakage testing
- Mechanical assembly tests, etc.
Quality check: optical measurements

Local uniformity test
Quality check: HV tests

@30 %HR Leakage current below 1nA @100cm2 @600V

All testing steps parameters (voltage value, time of each step, etc.) can be set independently.

HV testing stand
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GEM detectors sets @ Techtra

Commercially available detector.

Data visualization software - window with spectral graph

Data visualization software - main window


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Our Core GEM-team

RD51 collaboration

GEM detector, Techtra

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