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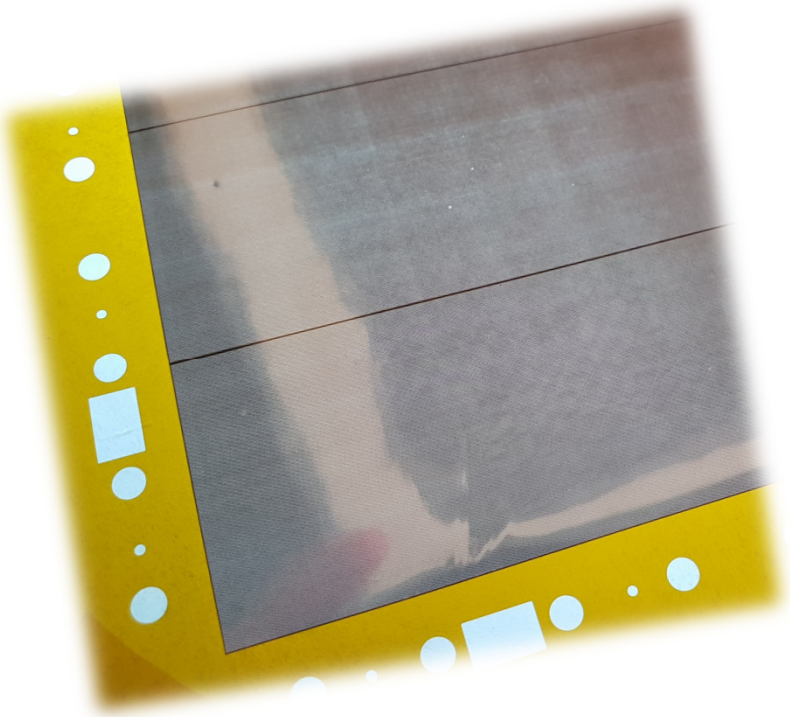
Micropack Pvt Ltd



GEM Fabrication Status

Nov 2018

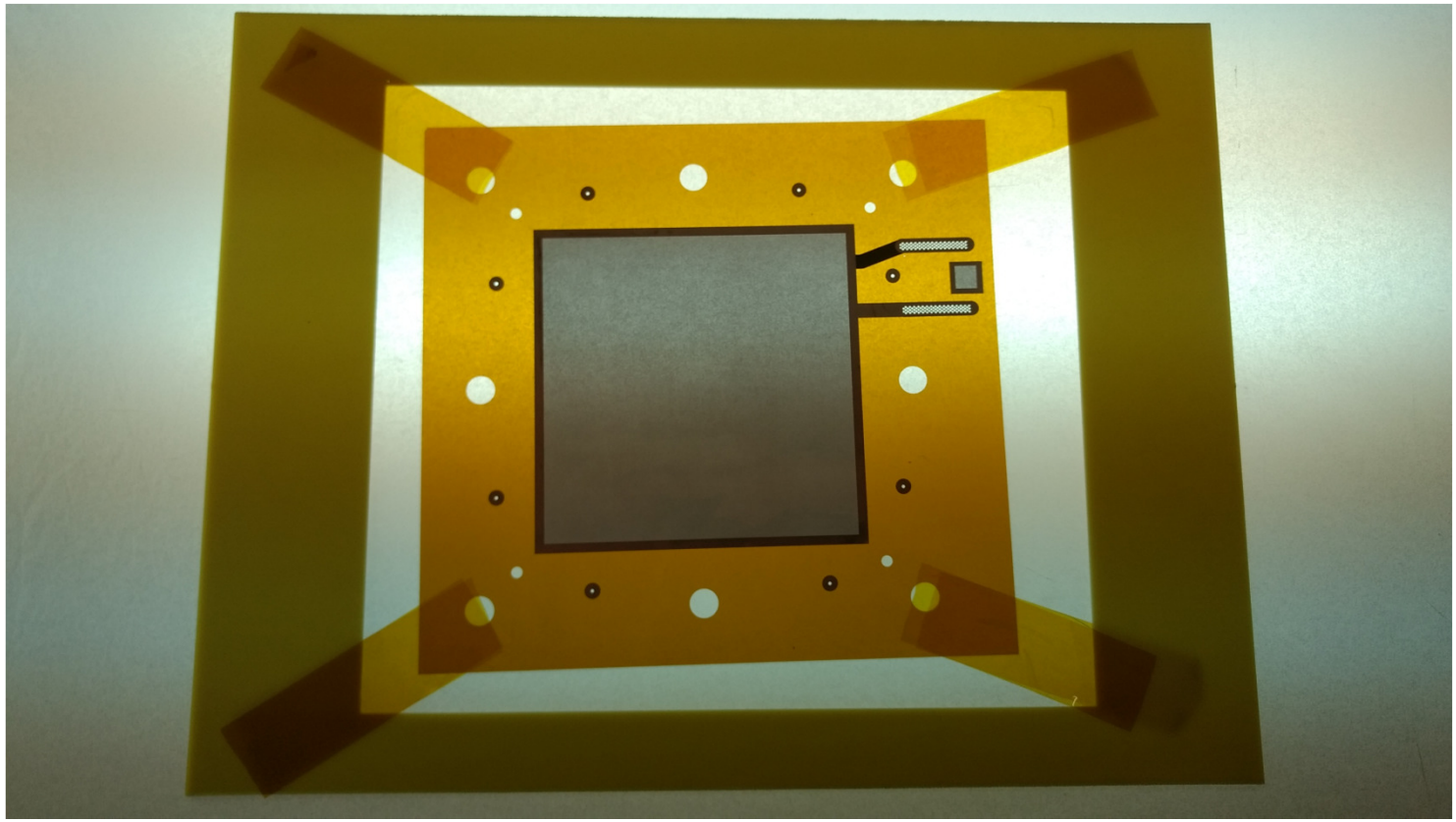
www.micropack.in

Brief Introduction

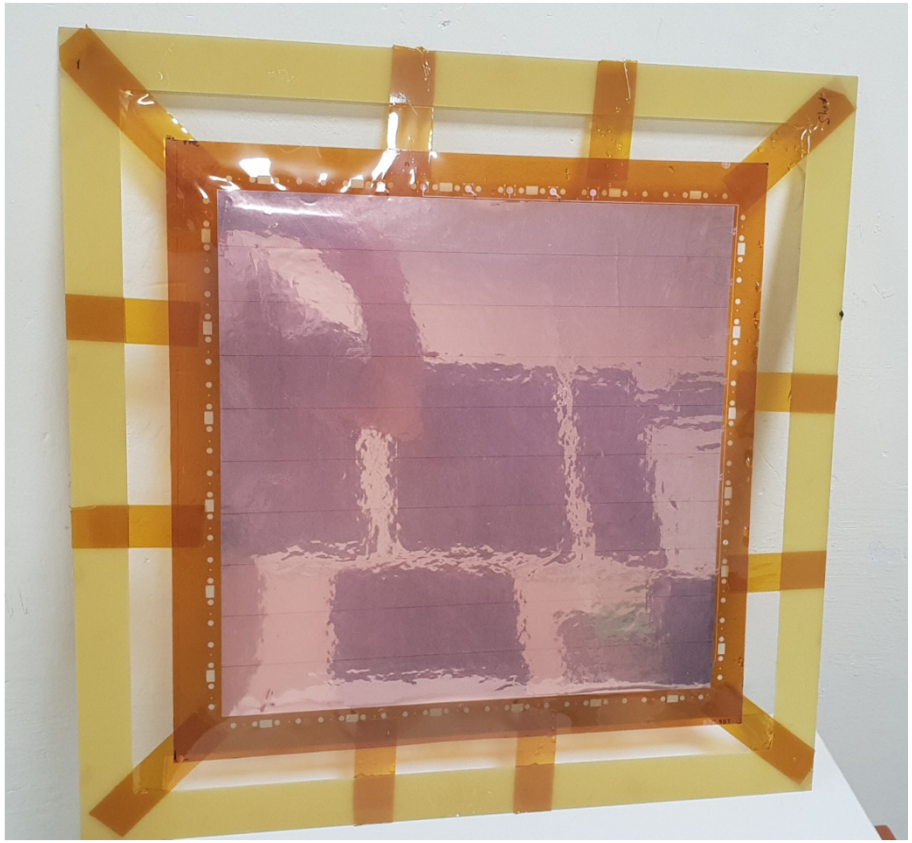
- Located at Bangalore, India.
- Micropack specializes in fabrication of **bare printed circuit boards - Gerber to bare board and caters to customers in the high reliability segment.**
- Has been associated with Indian DAE (Department of Atomic Energy) institutes for many projects in the past
- Listed as an approved vendor for CERN
- In late 2013, was introduced to GEM by BARC. Signed **ToT** with **CERN** for the fabrication of **thin GEMs in 2014**
- 2017-18 – Supplied **Long & Short Rigid GE 1/1 Drift / Readout PCBs**

Thin GEM Foil

- Initial development of Thin GEM with 100mm x 100mm active area.
- Had issues with the availability of the special raw material (FCCL) initially.
- Procured CERN approved material directly from the manufacturer in the first half of 2016.
- Since then, has been able to make significant progress in fine tuning the process to move closer to the desired results. Moved to larger sizes.
- Has been able to achieve good uniformity as well as consistency across the 100x100mm / 300x300 foils . M1 foils of 670mm x 427mm under testing
- Samples were submitted to BARC, CERN and Delhi University for final product analysis.



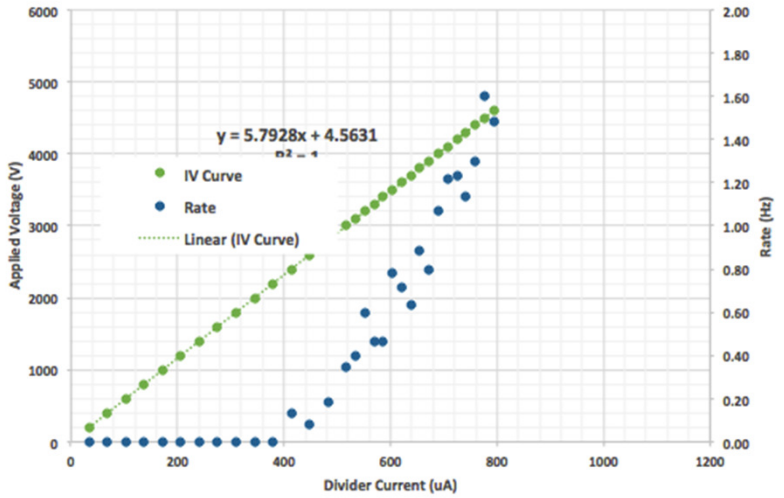
100mm x100mm active area - 70 microns dia / 140 microns pitch

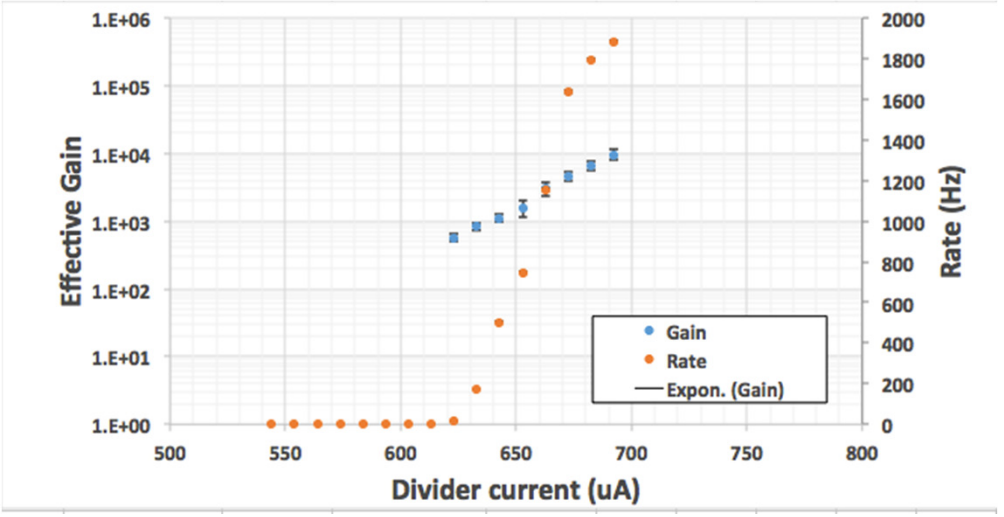


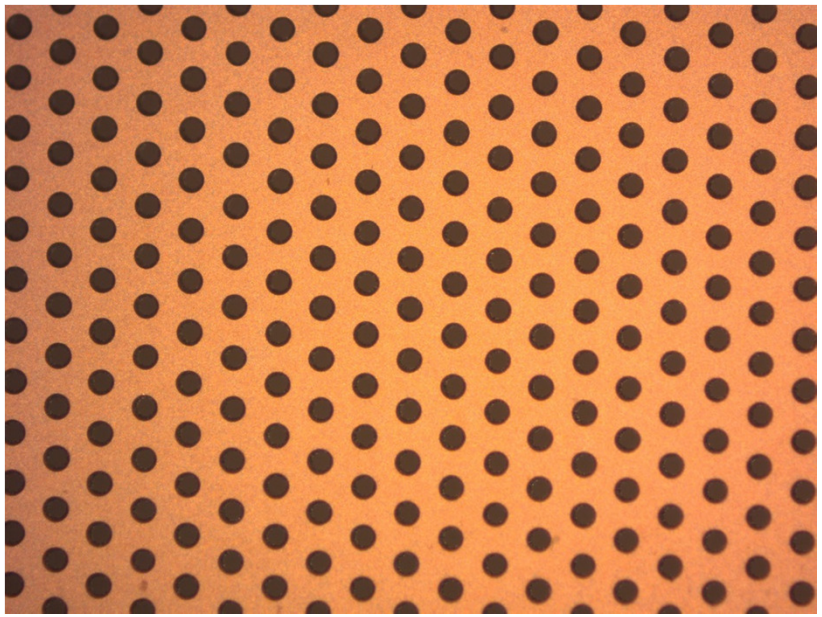
300mm x300mm active area - 70 microns dia / 140 microns pitch

Delhi University built a 3/2/2/2 gap configuration detector using Micropack 300x300 foil

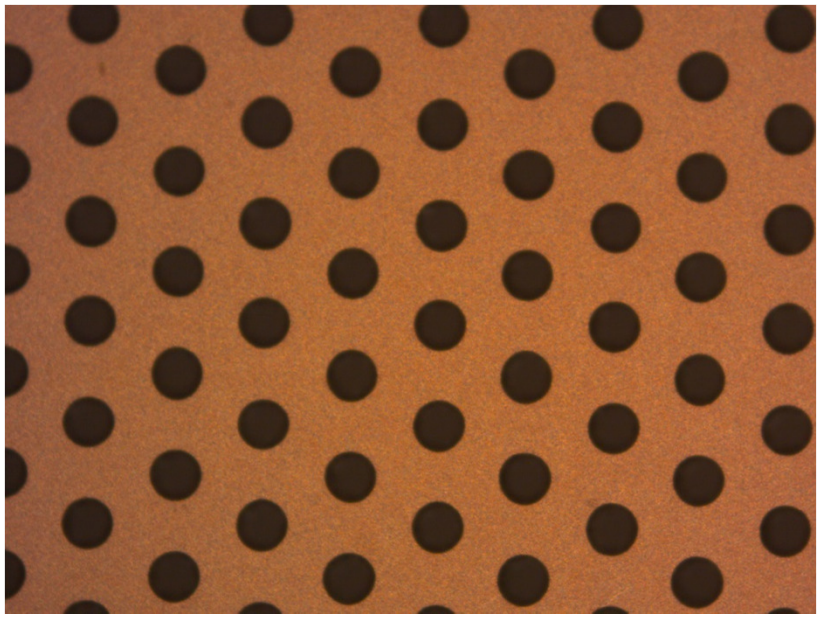
Feedback from DU: "*Basic measurements like high voltage, spurious signal and gain was measured. Results are very good nothing, strange behavior was observed during the measurement from foils and the spurious signal rate is < 2 Hz and at the divider current of 700uA, the gain observed is ~10000 which is as expected for this gap configuration.*"







50 X magnification



100 X magnification

100mm x100mm active area - 70 microns dia / 140 microns pitch

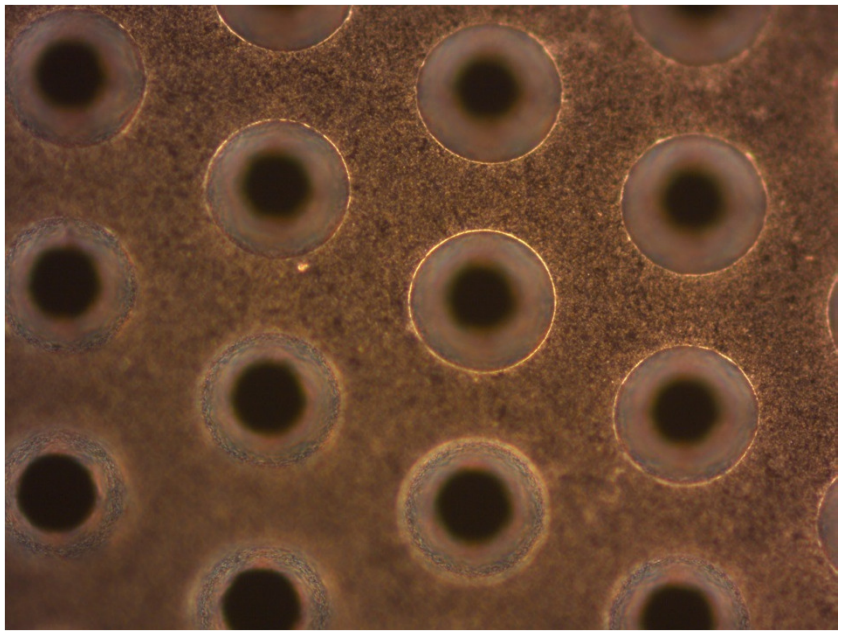


Image focused to the outer copper ring

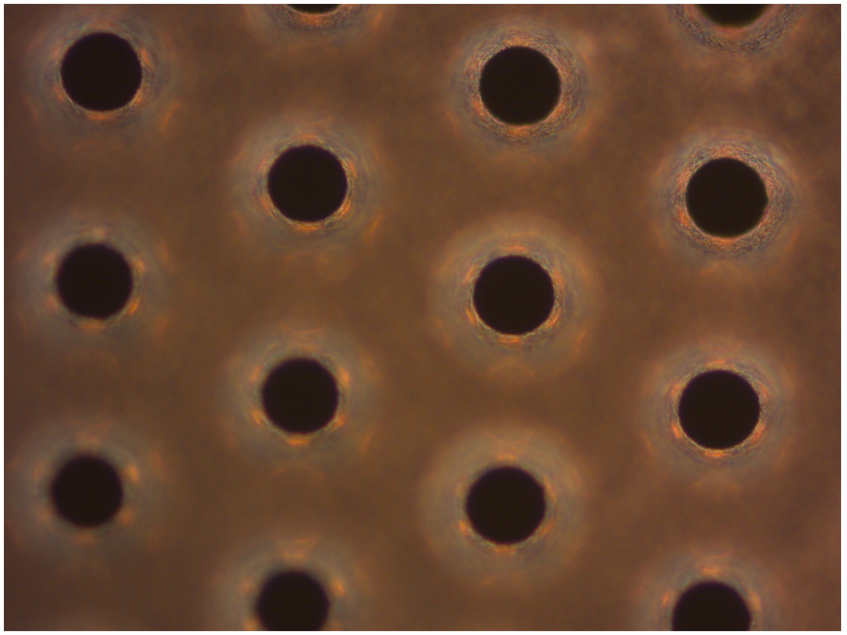
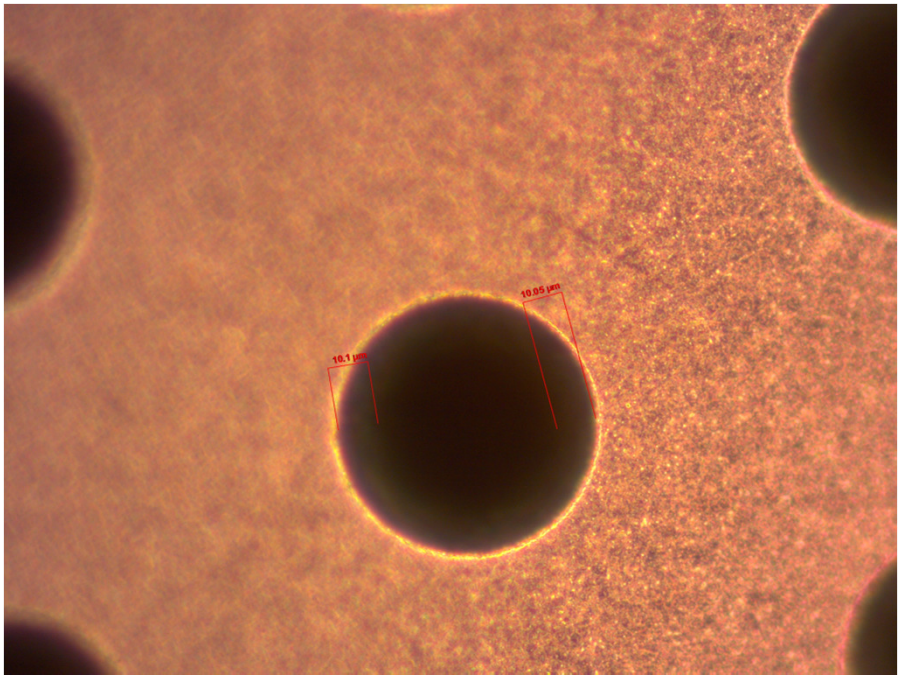
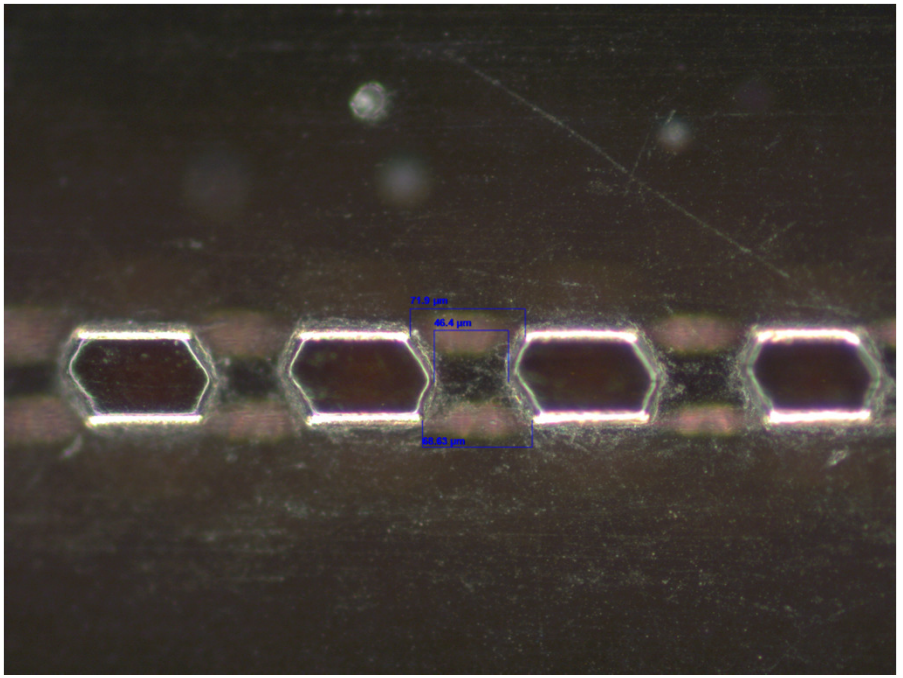


Image focused to the inner PI ring



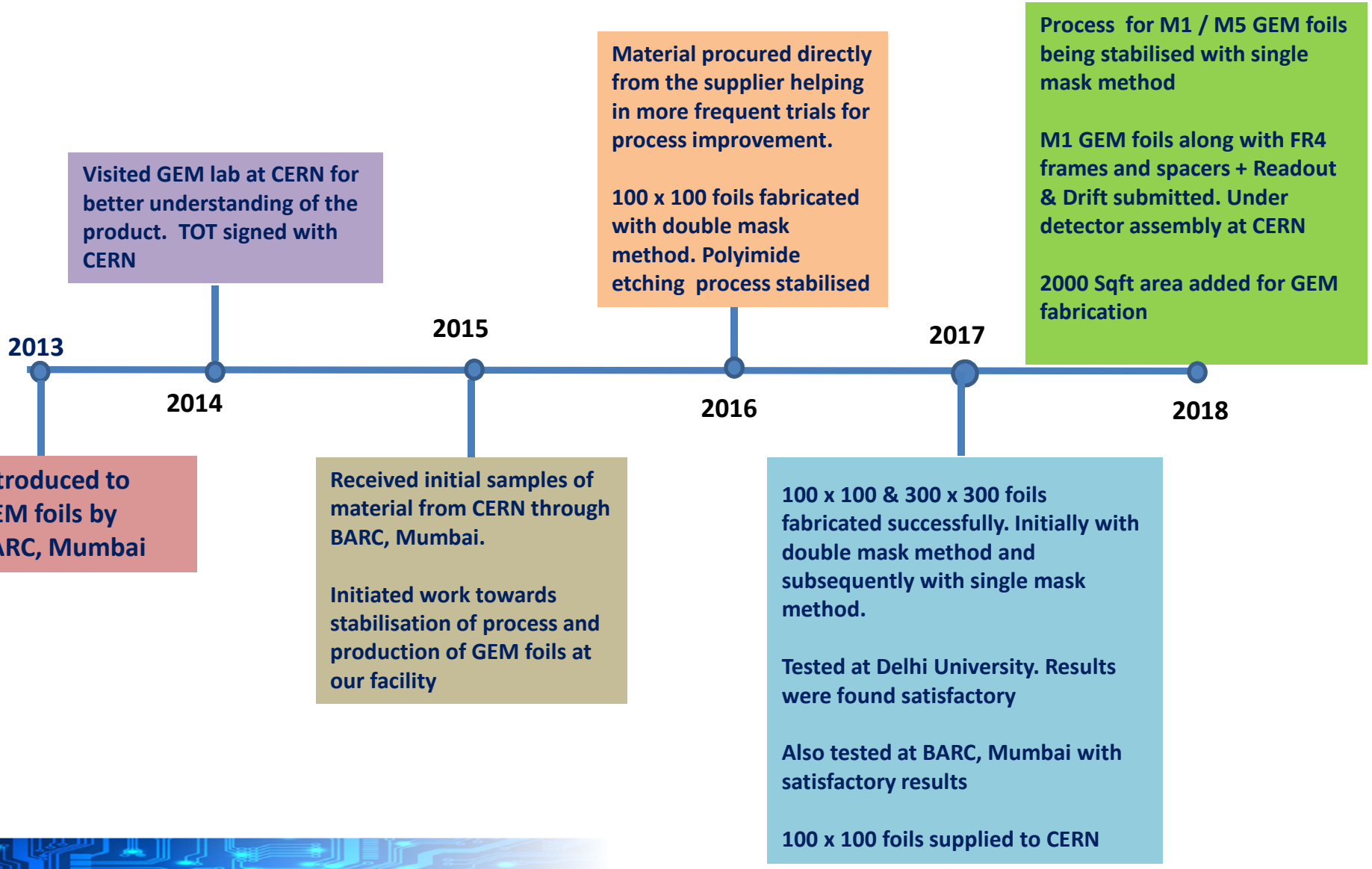


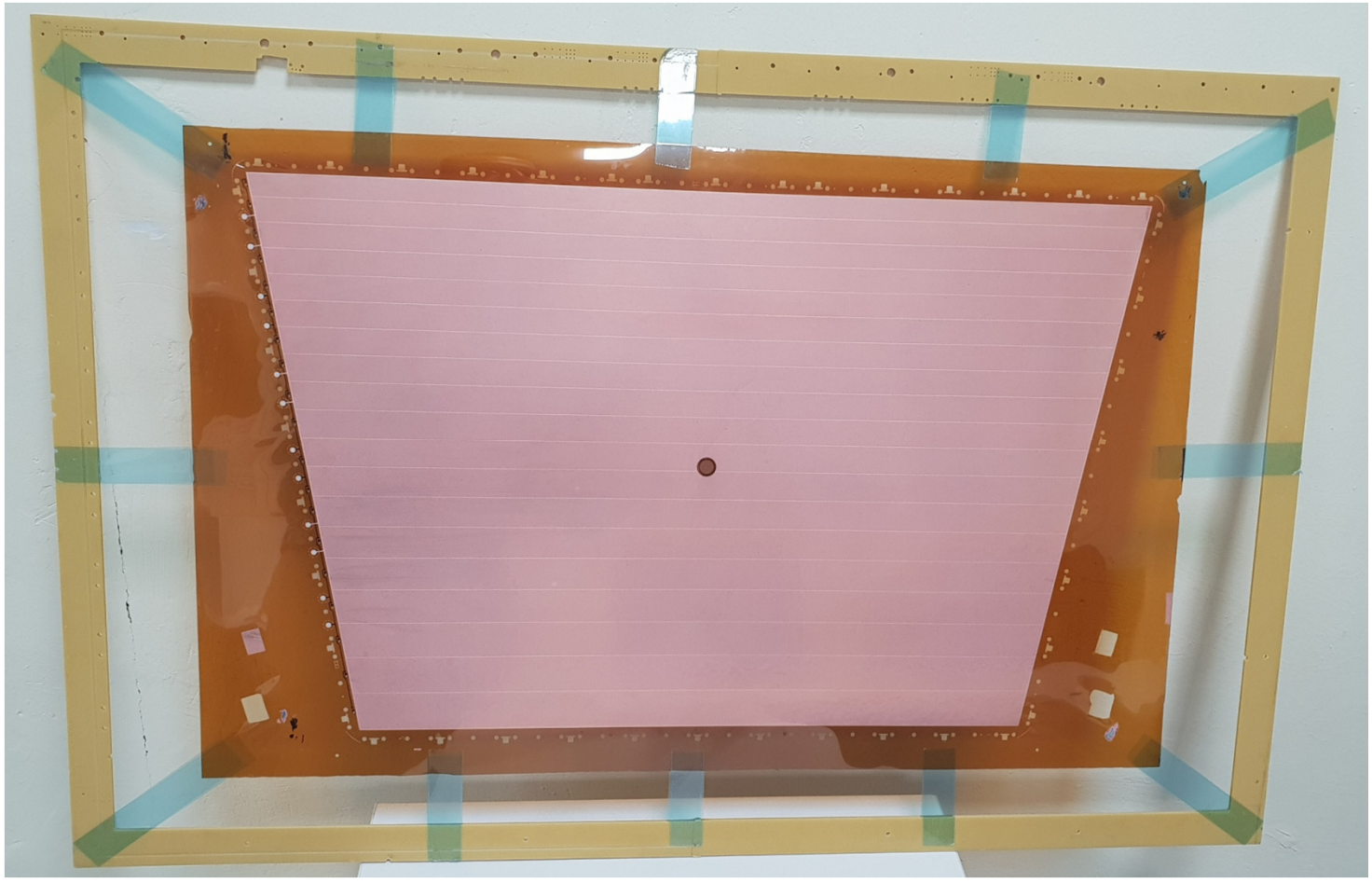
Consistent Double cone profile (section image of the coupon) –
Images from single mask GEM

Internal verification @ Micropack:

1. **Optical Inspection – Outer copper Hole diameter / Inner Hole diameter / Uniformity**
2. **Insulation resistance – @ 600 V DC**

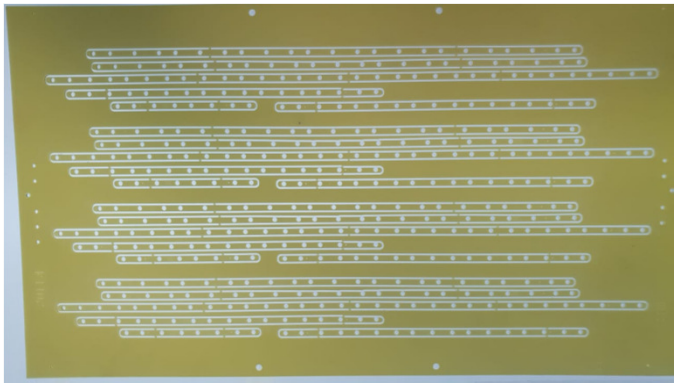
GEM – Our journey so far

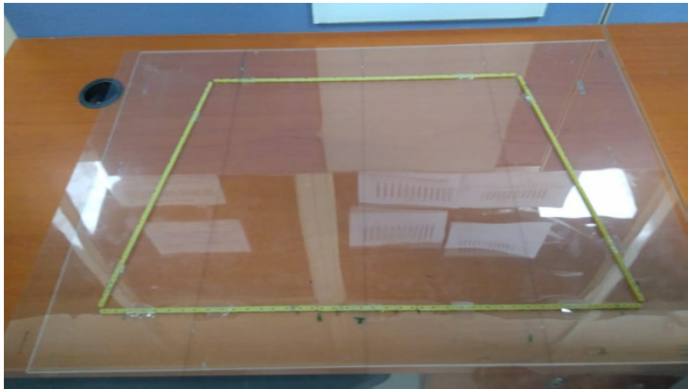




M1 GEM Foil - 670mm x 427mm active area with resistors assembled - 70 microns dia / 140 microns pitch

- 3 #s of M1 GEM foils despatched to CERN for detector assembly
- M1 Readout and Drift PCBs also supplied
- All the FR4 spacers and the FR4 frames / Plexi glass required for the detector assembly also supplied along with the GEM foils
- Detector assembly currently under progress at CERN. Being done by team from Delhi University

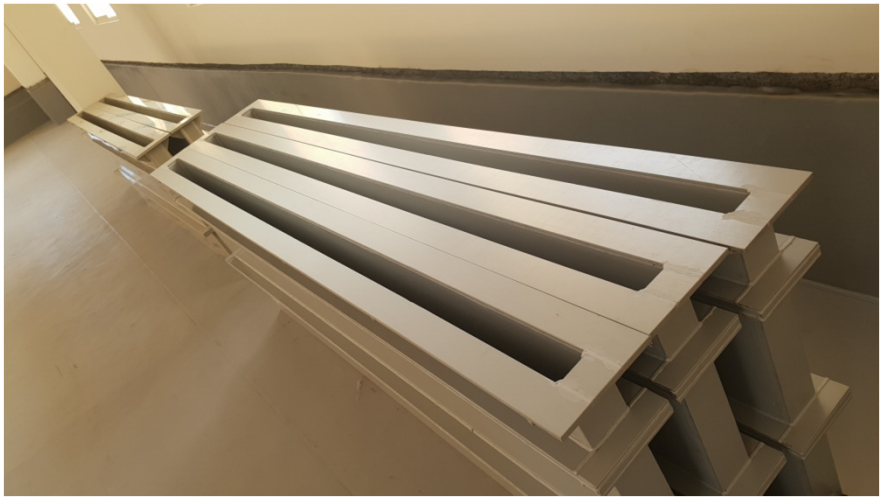




Road ahead

- New GEM fabrication floor of about 2000 Sqft has almost been completed – 1000 Sqft for wet processing / 1000 Sqft for exposing + testing

- 16 new tanks for chemical processes and to accommodate 2 meter long foils fabricated . Will be operational by Dec end




ROCHLING
Polystone

- **New scanning type LED exposure machine with more 2 metre span ordered. This will help in better hole definition and accuracy. Expected to be installed January 2019**

Micropack acknowledge the continued support from

Rui De Oliveira , Alexis Rodrigues, Michele Bianco and Archana Sharma from CERN

Naimuddhin, Ashok and Mohit Gola from Delhi University, India

Lalit Pant from BARC, Mumbai, India

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MICROPACK PRIVATE LIMITED

Thank You