A BETTER UNDERSTANDING OF THE GAS GAIN IN GEM DETECTORS

EP-DT-Training-Seminar

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ABOUT MYSELF:

Education:

Master student in physics and astronomy at the Vrije Universiteit Brussel Belgium.

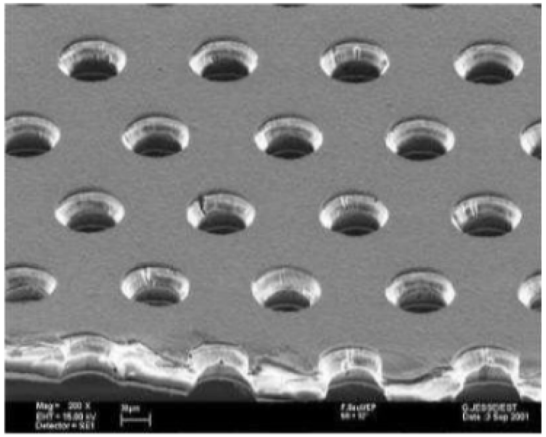
Bachelors thesis:

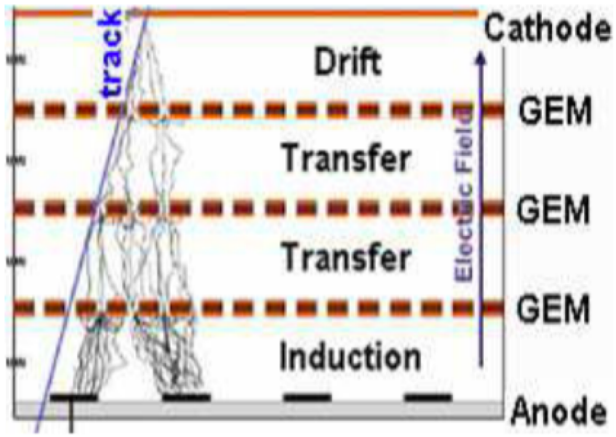
An original theoretical study concerning the precise definition of chaos in quantum mechanics.

CONTENTS:

GAS GAIN SIMULATIONS:

For Gas Electron Multiplier (GEM) detectors a quantitative understanding of the gas gain is still lacking.



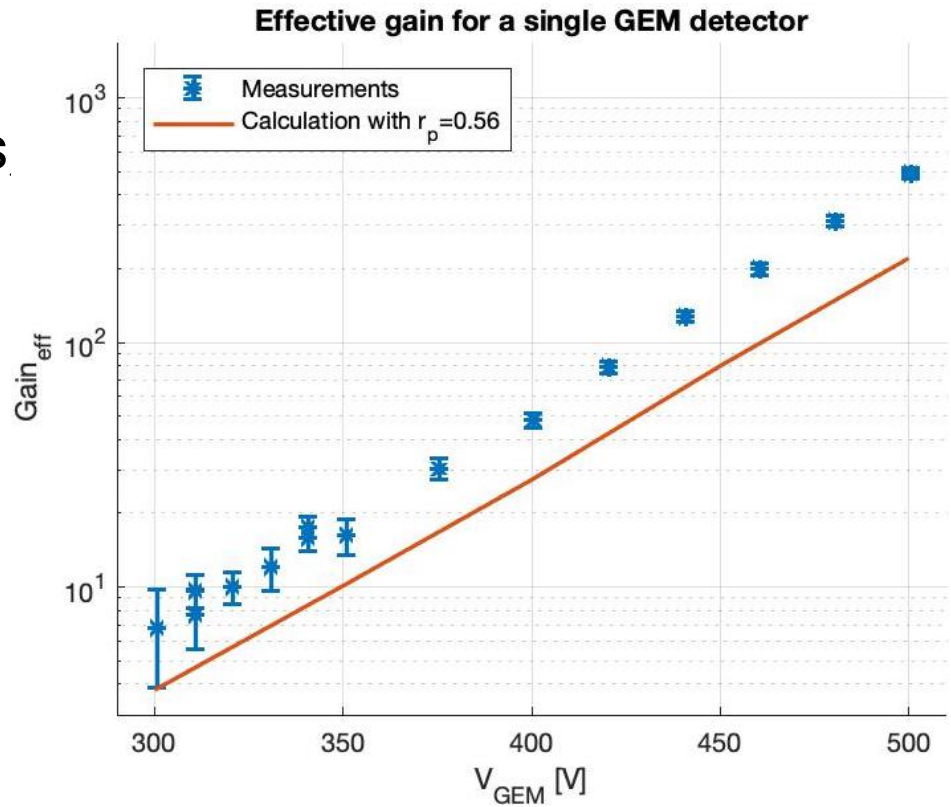


Gas gain = the multiplication factor between initial and final amount of electrons.

AVENUES OF EXPLORATION:

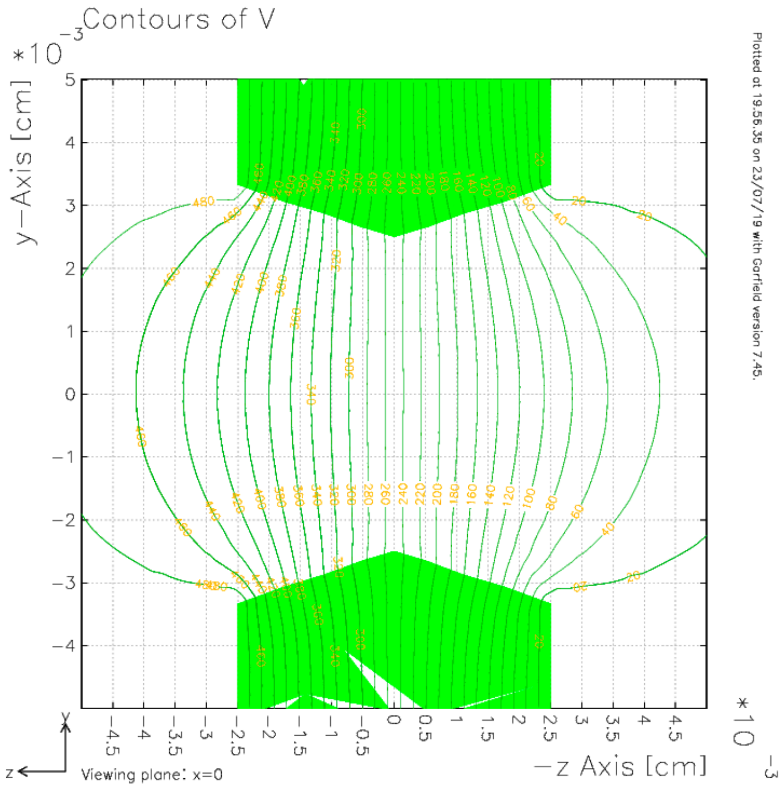
We are exploring this discrepancy between experiment and theory in the following ways:

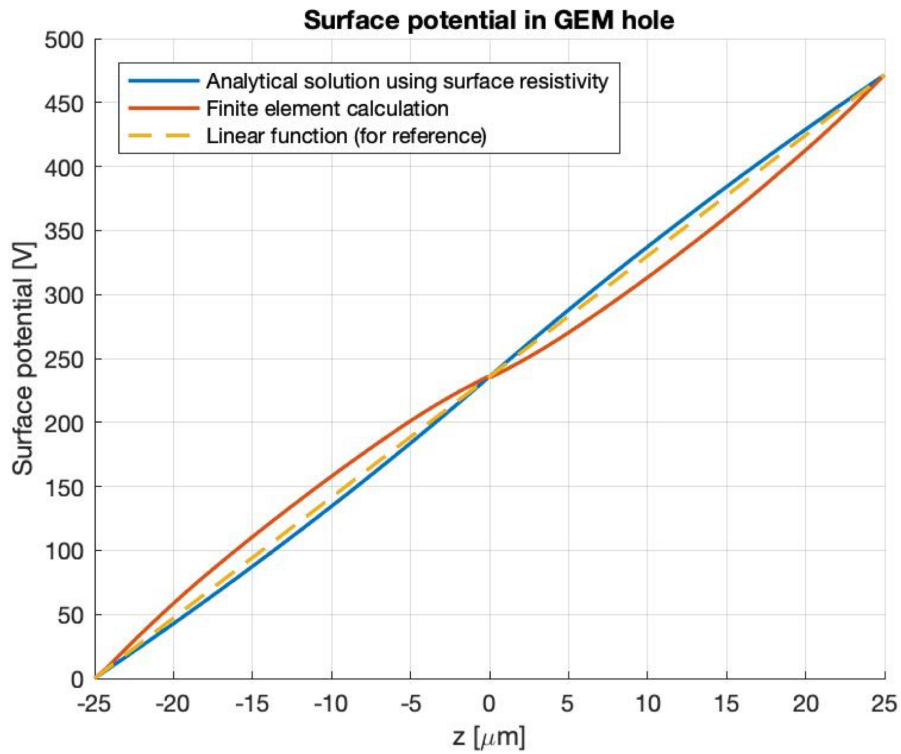
- shortcomings for finite element field calculations
- modeling the drift of an electron,
- Penning transfer,
- **surface potential calculations** and
- **asymmetry in GEM hole geometry**.



SURFACE POTENTIAL CALCULATIONS:

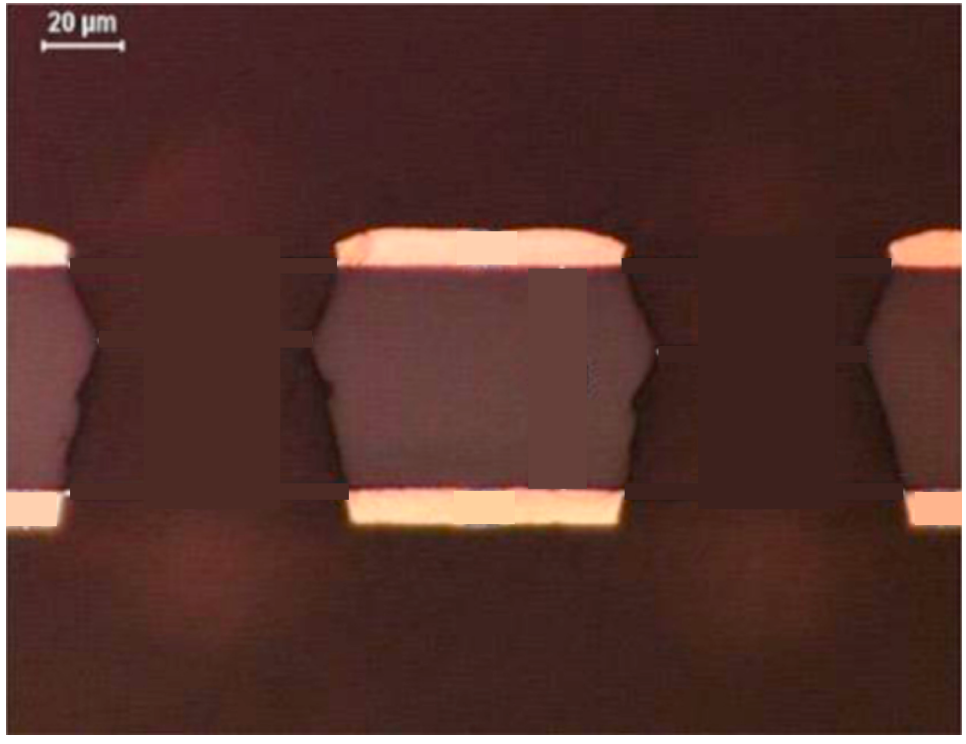
Besides the accumulation of avalanche charge on the GEM we calculate the surface potential using the surface resistivity of polyimide.





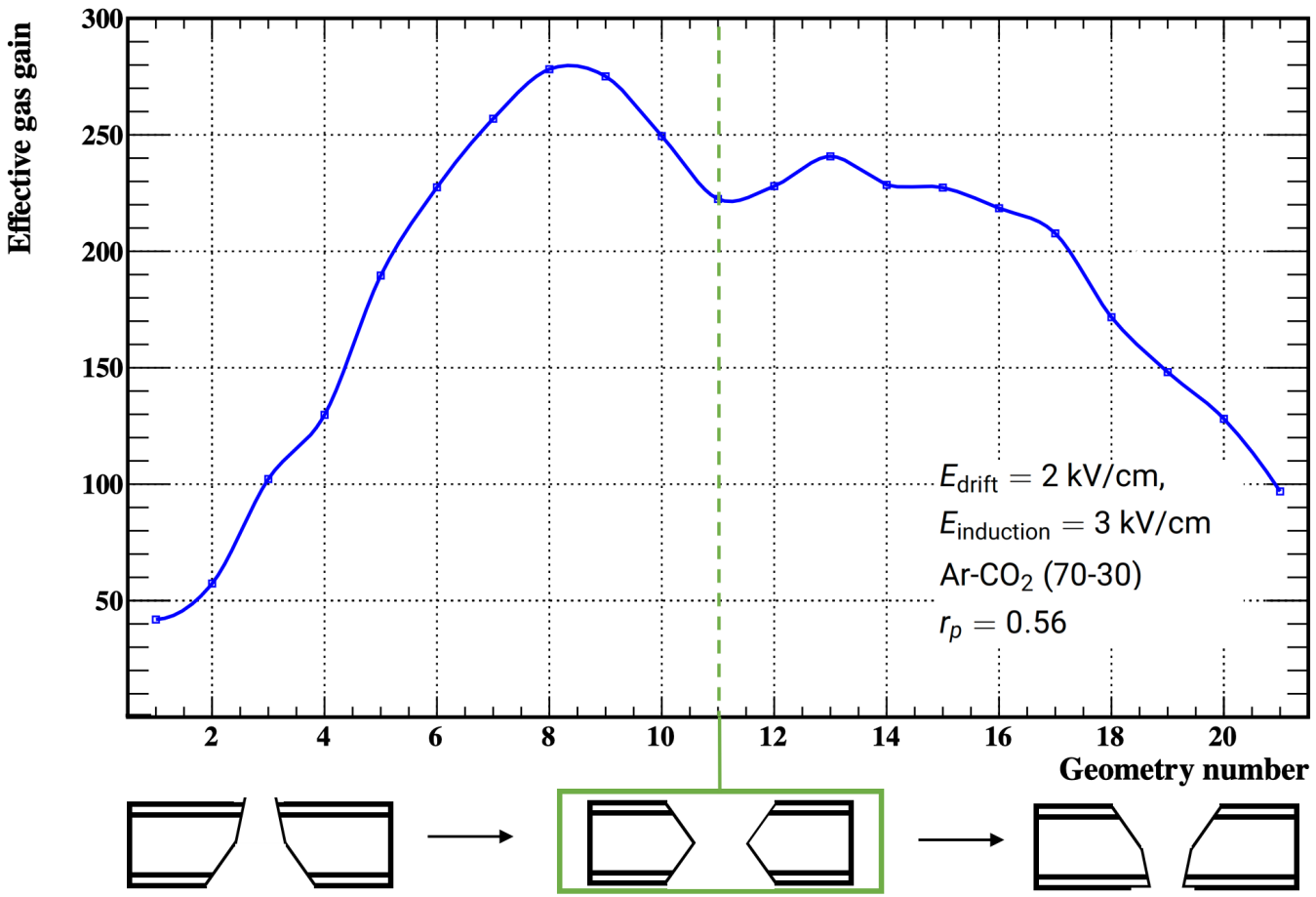
ASYMMETRY OF GEM GEOMETRY:

Asymmetries in the geometry of a GEM can occur due to the etching processes.



ASYMMETRY OF GEM GEOMETRY:

A difference in diameter between the bottom and top hole has an impact on the gas gain.



SUMMER(Y):

In my search to find the difference in the simulated and measured gas gain I have learned:

- theory behind gas detectors,
- assembling and operating a GEM detector,
- simulation techniques,
- working with ANSYS® software and ROOT and
- the inner workings of CERN.

Still 5 weeks left to continue with my project.

ACKNOWLEDGEMENTS:

I want to express my gratitude to Rob Veenhof and Eraldo Oliveri for there guidance and support.

A special thanks to the whole EP-DT-DD team for the amazing experience!

Thank you for your attention!

M. Alfonsi *et al.*, CERN-LHCC-2008-011.

J. Merlin, Doctoral Thesis, University of Strasbourg (2016).

F. Sauli, Nucl. Instrum. Meth. A **805** (2016) 2-24.