

THGEM gain calculation using Garfield: The solution for discrepancies to the experimental data

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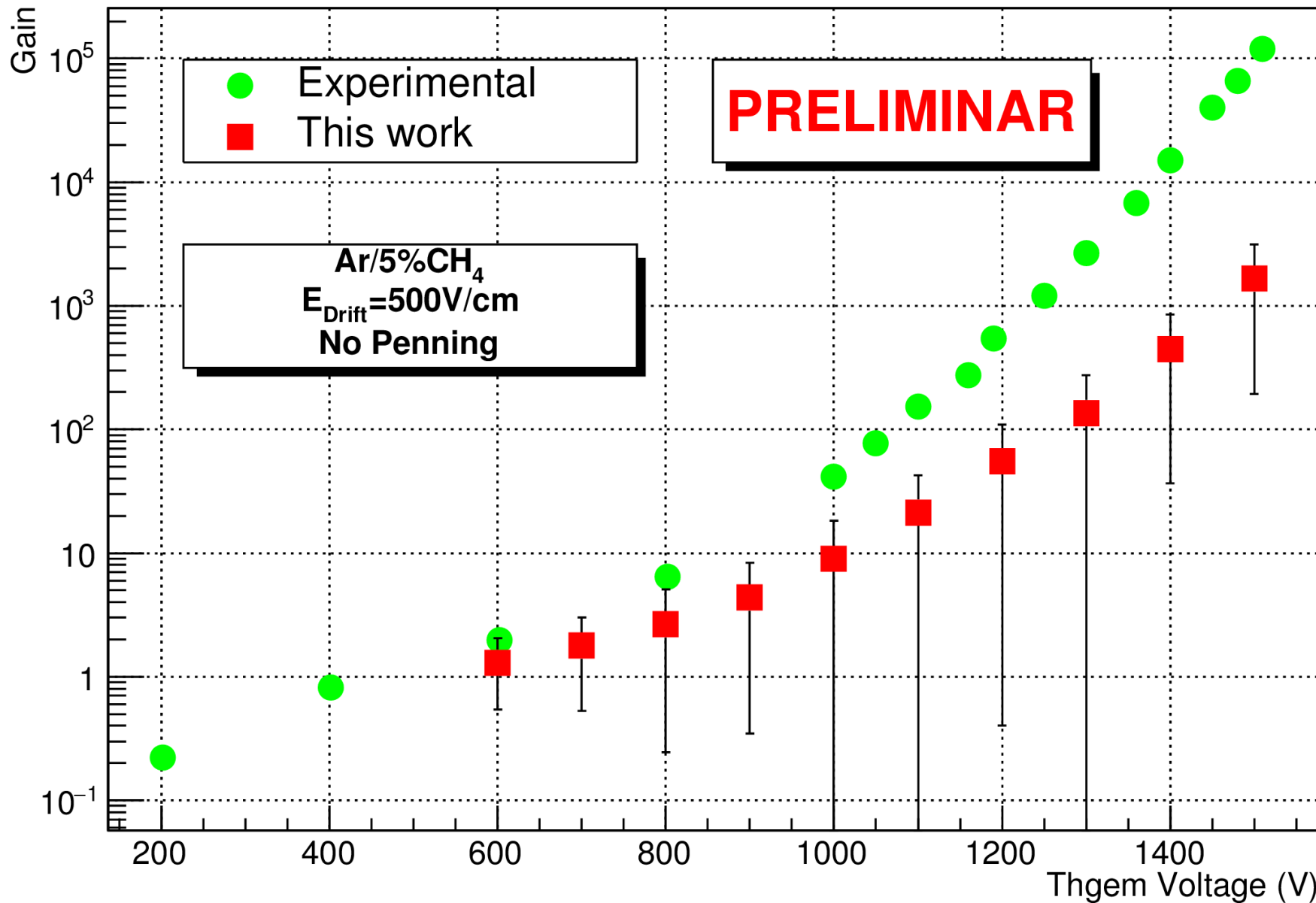


The problem:

- Garfield was known to fail on THGEM gain calculations
 - Sometimes 2 order of magnitude for high gains
 - Untrusted works when gain was required
 - Users have tested different FEM software (ansys, elmer, etc..) trying to find a solution
 - Problem still unsolved.

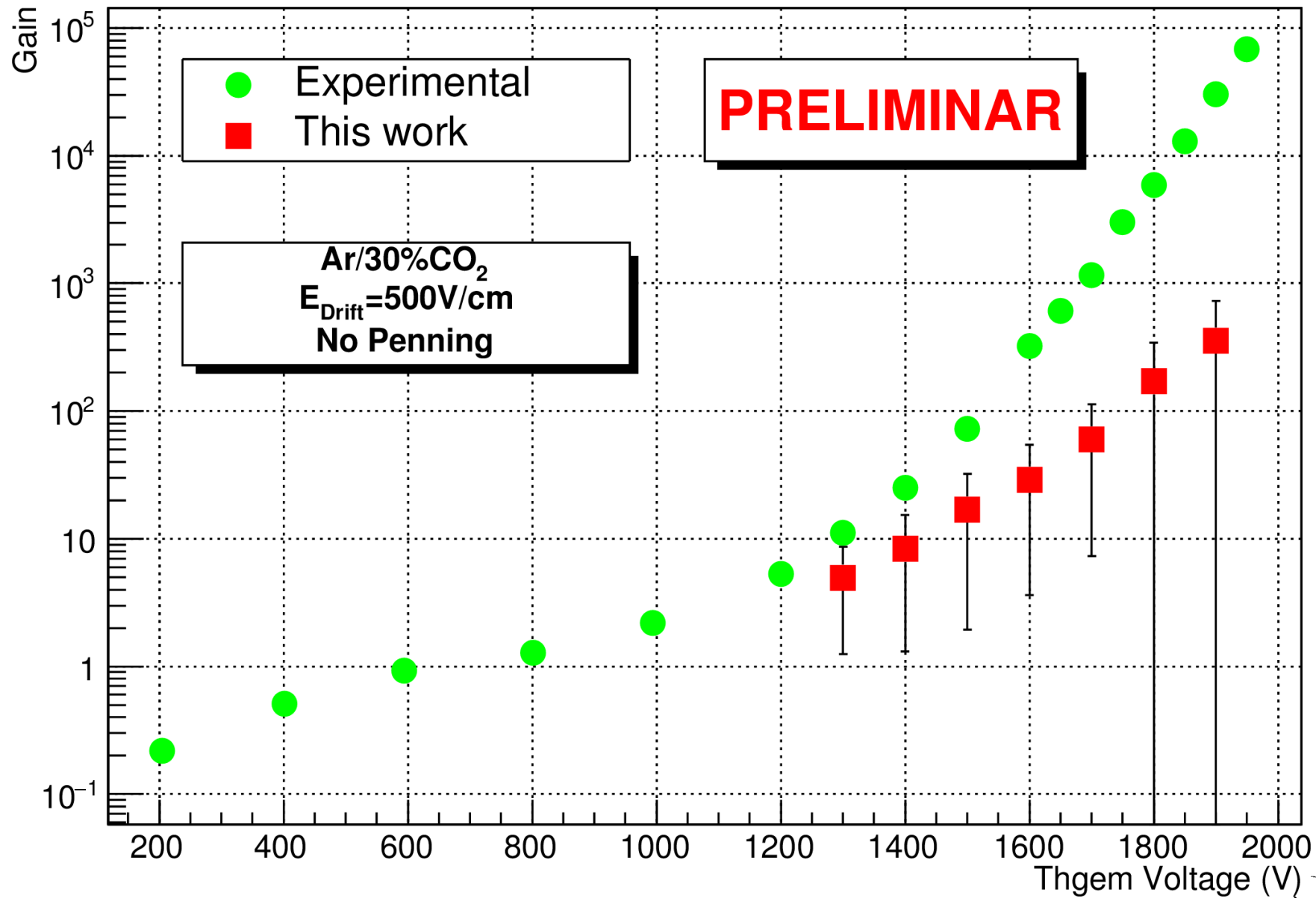


The problem:



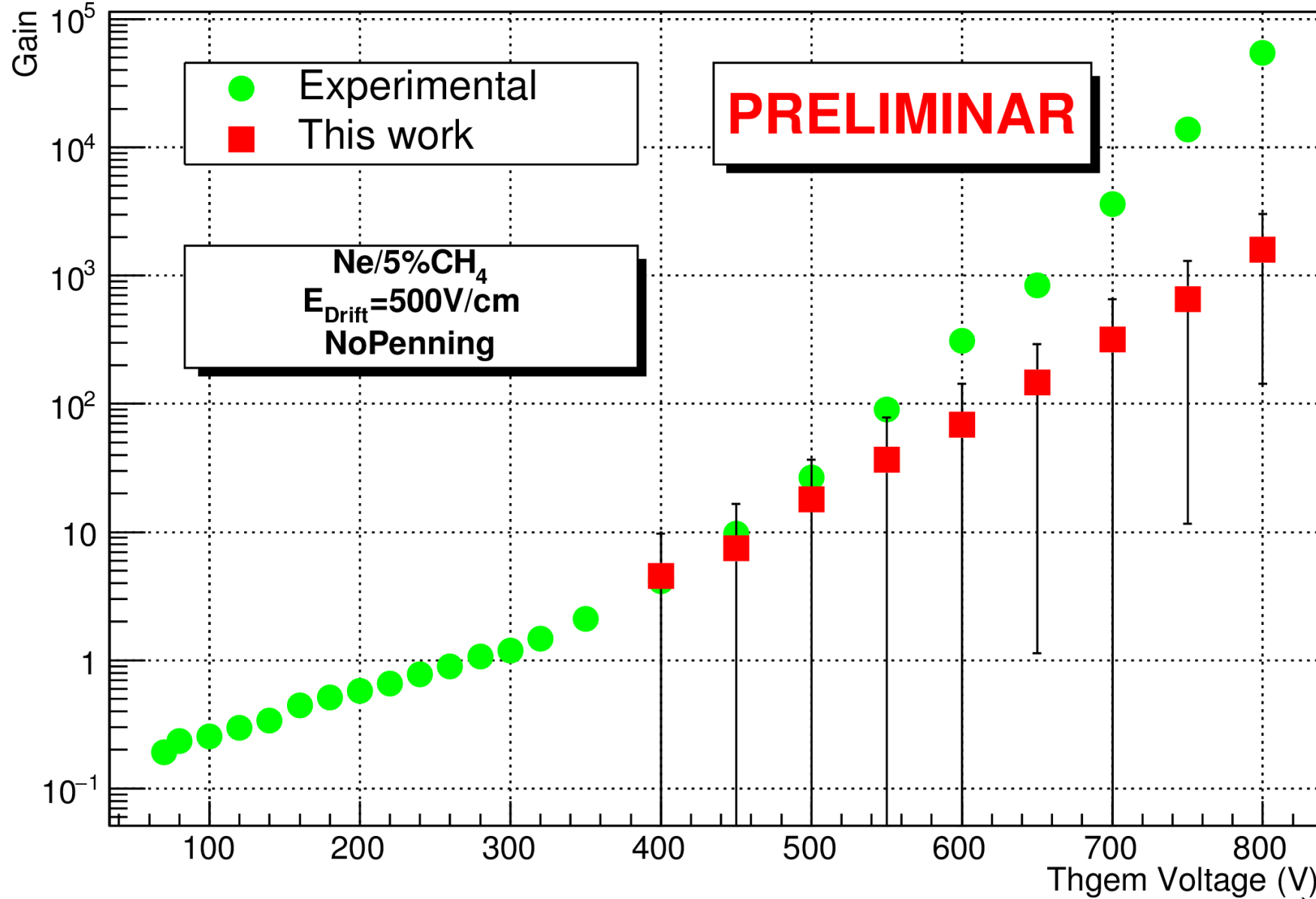
Experimental values from: NIMA 558 (2006) 475–489

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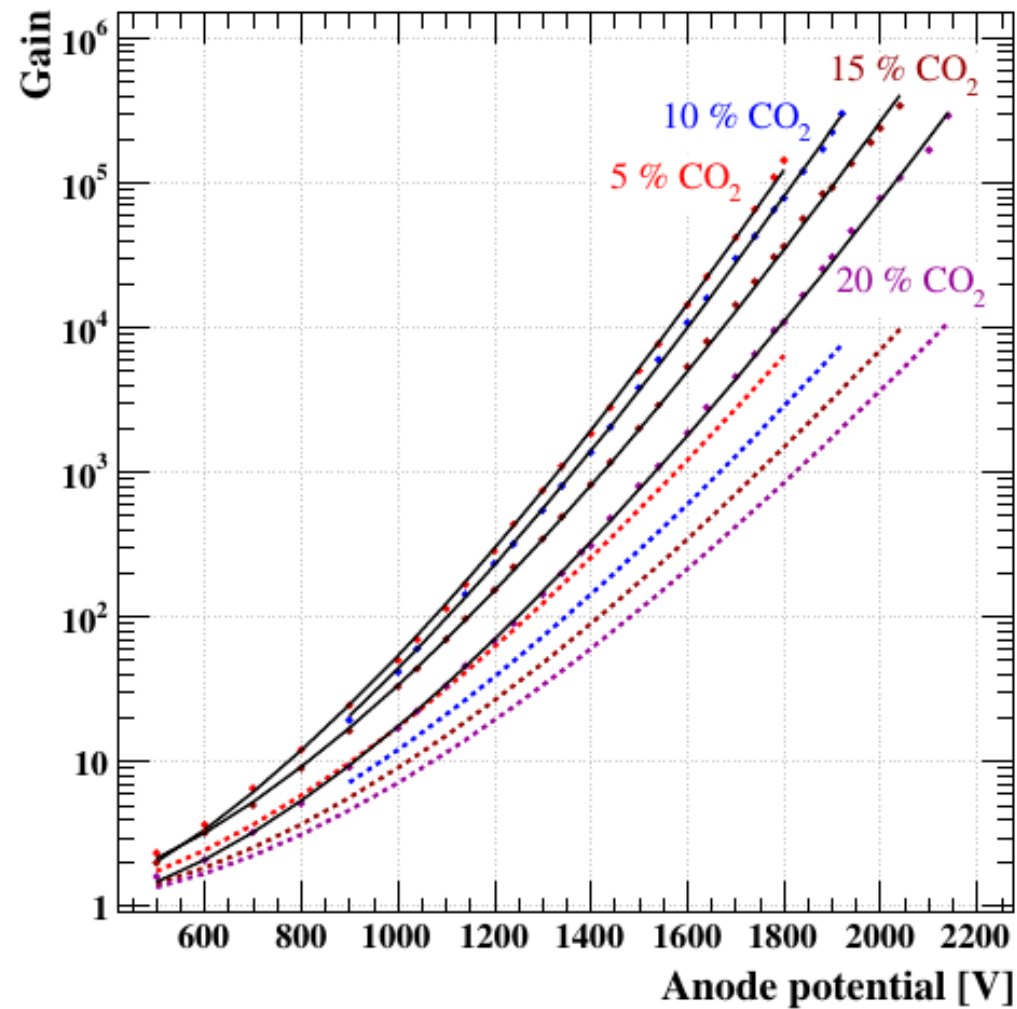
The problem:



Experimental values from: 2010 JINST 5 P01002

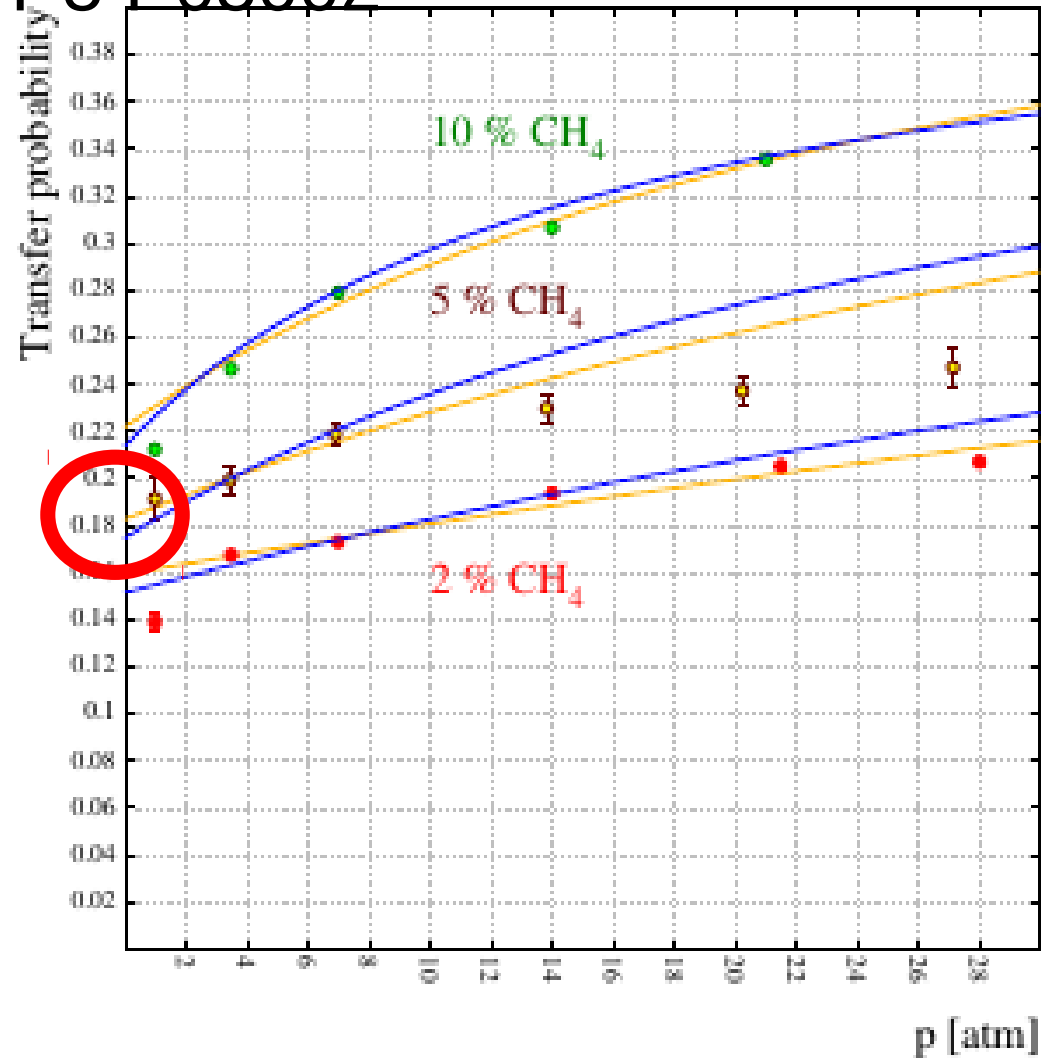
The tip:

- Ozkan paper:
 - 2010 JINST 5 P05002



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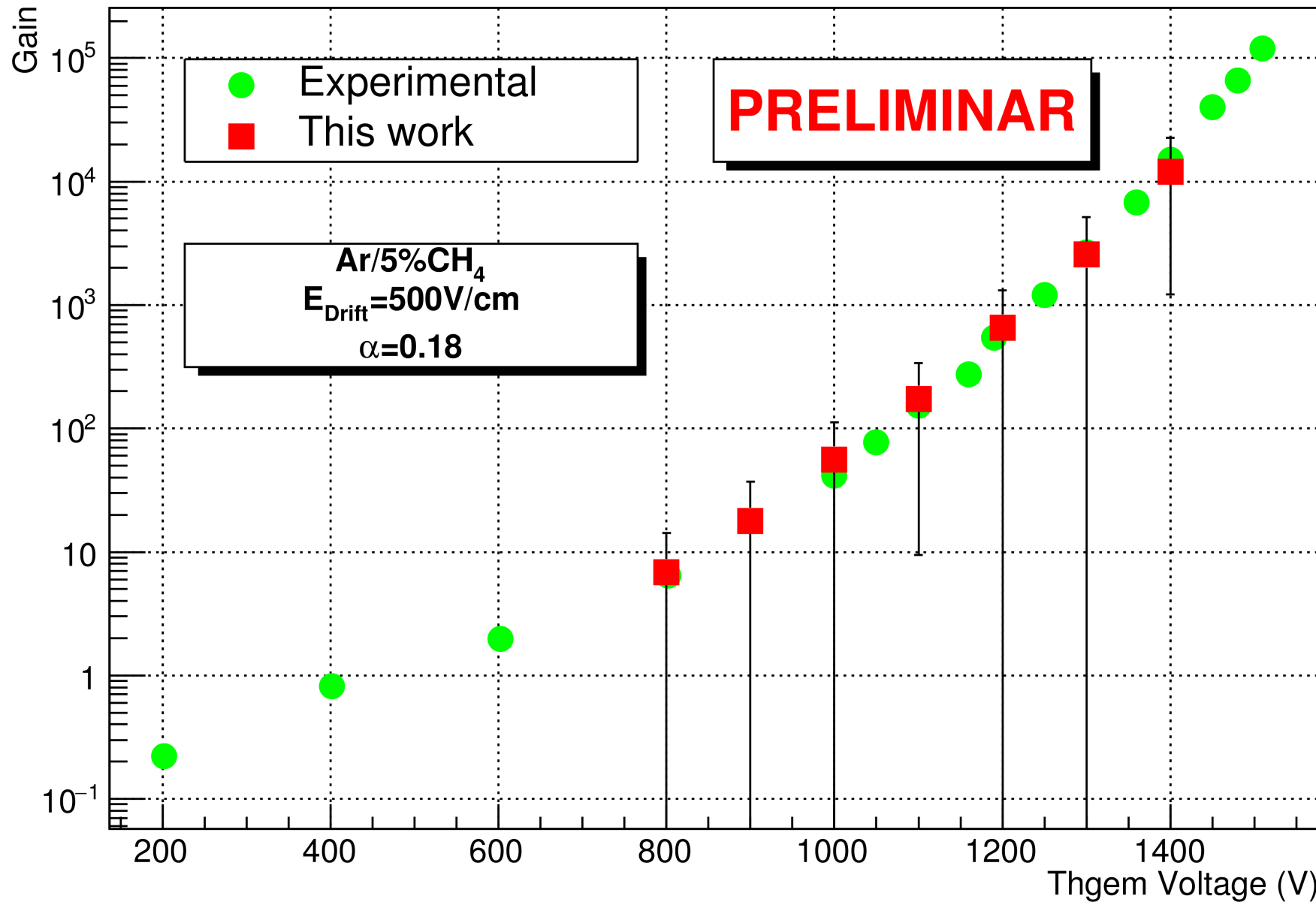
Conditions:

- **Software: Gmsh+Elmer + Garfield**
 - Changed elmer script from garfield examples*
 - THGEM
 - $t=0.4\text{mm}$
 - $p=0.5\text{mm}$
 - $d=0.3\text{mm}$
 - $r=0.1\text{mm}$
 - `gas->EnablePenningTransfer(0.18, 0.);`

* <http://garfieldpp.web.cern.ch/garfieldpp/examples/elmer/>



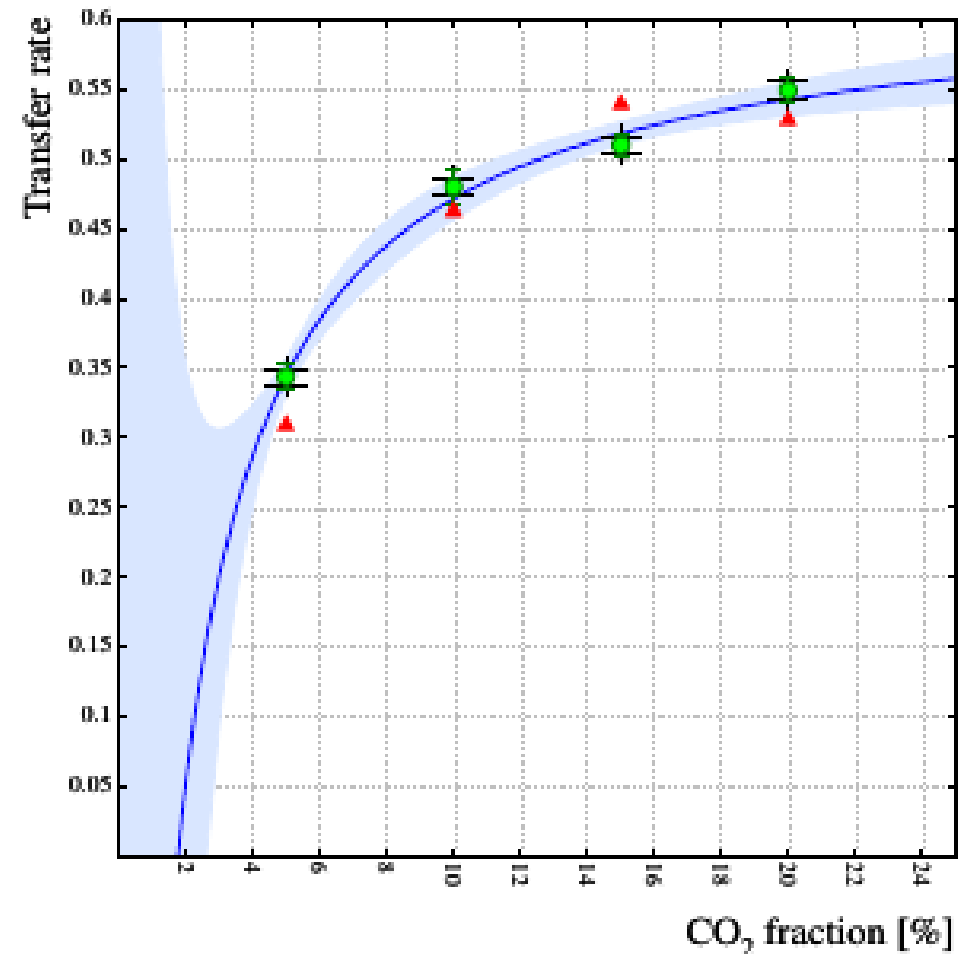
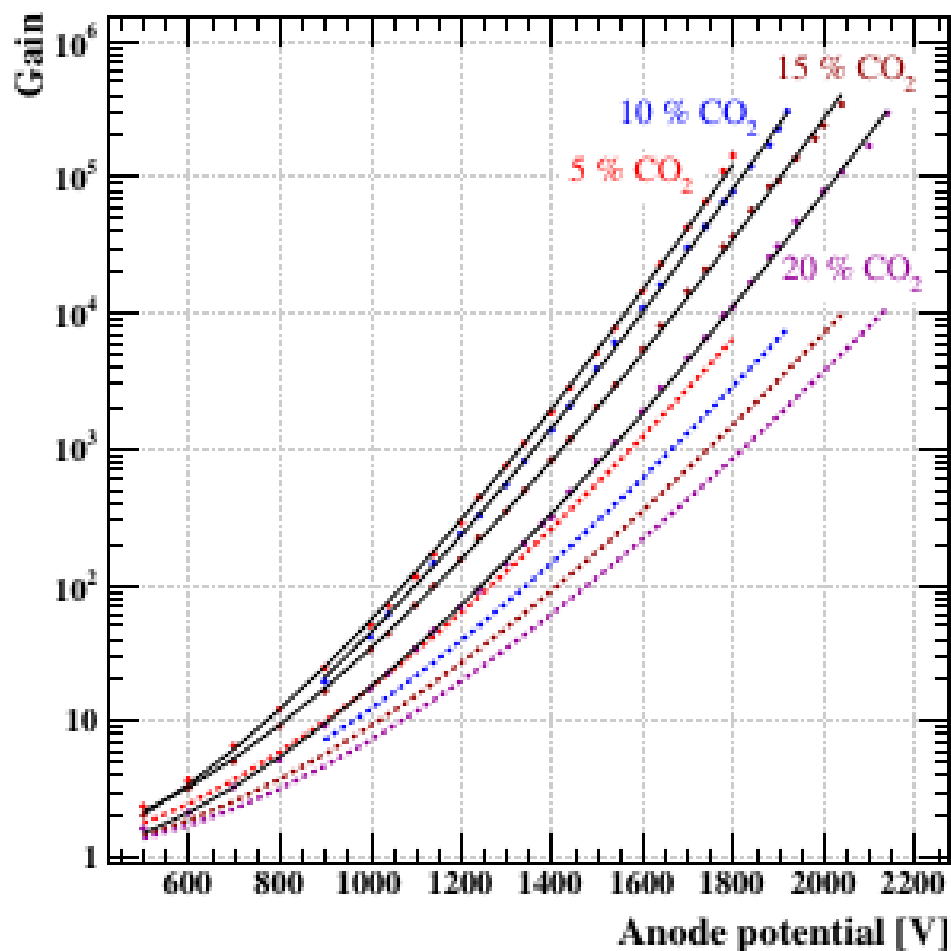
Results:



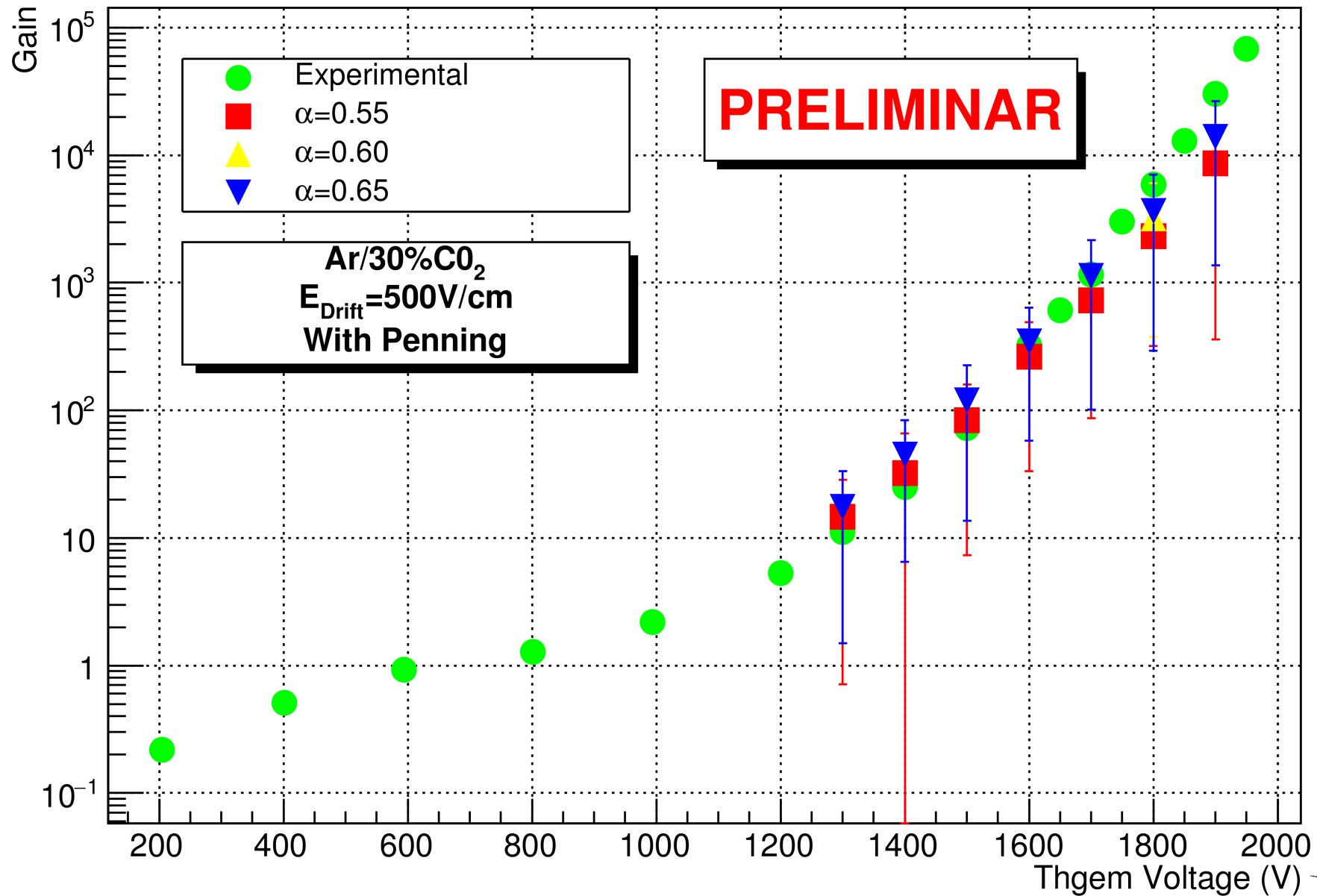
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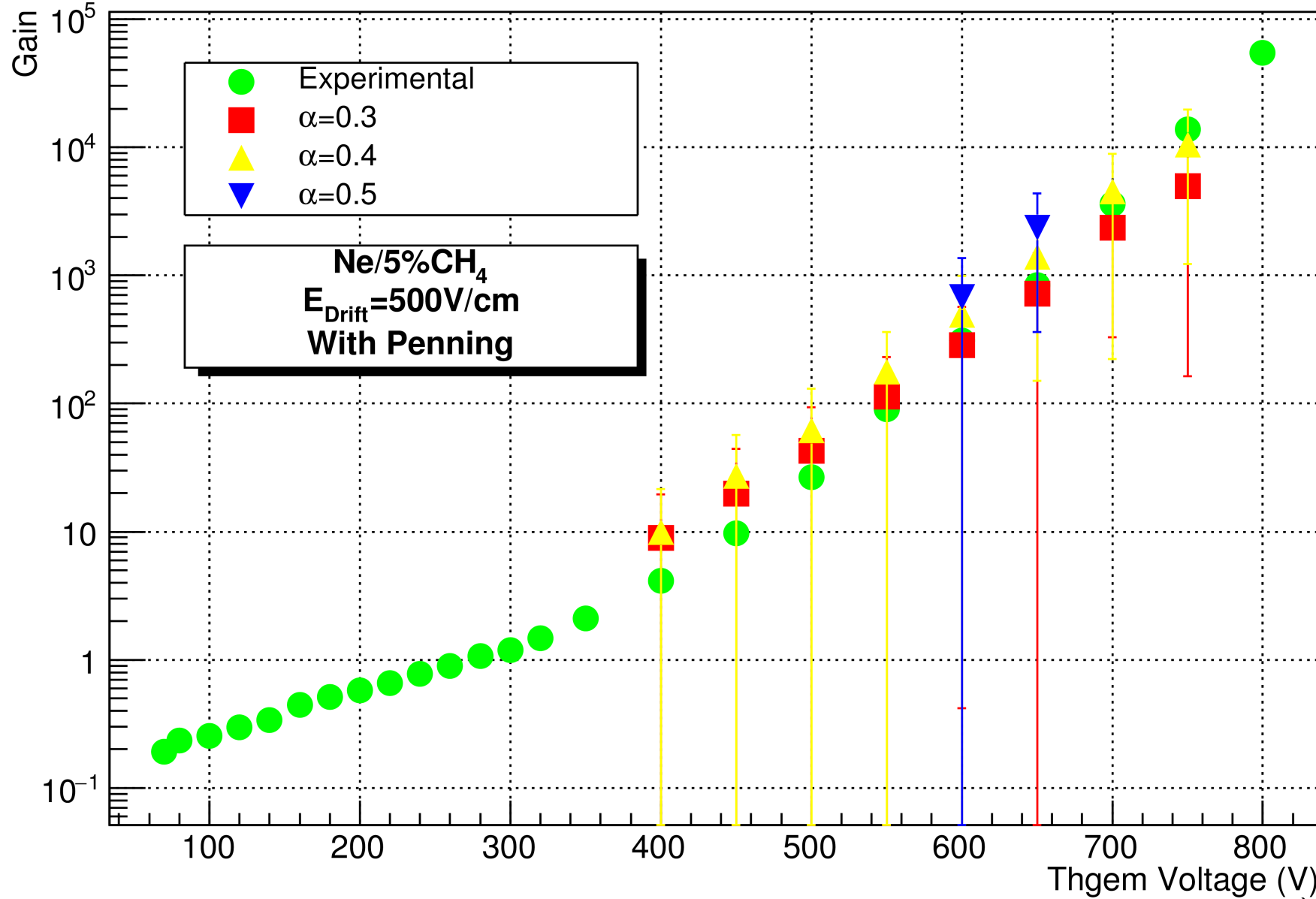


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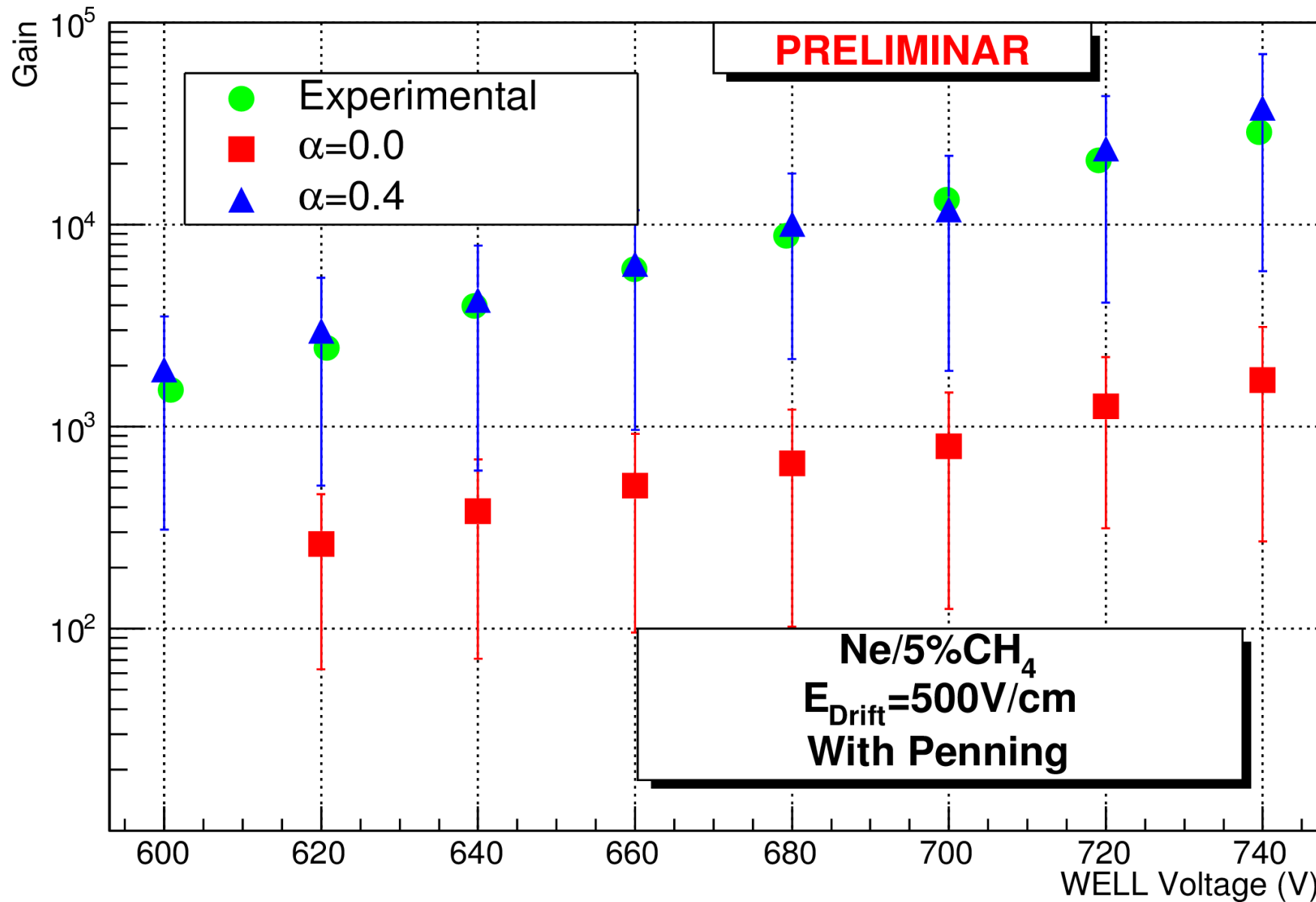
Experimental values from: 2010 JINST 5 P01002

Conditions:

- Software: Ansys + Garfield
 - THWELL
 - $t=0.4\text{mm}$
 - $P=1.0\text{mm}$
 - $d=0.5\text{mm}$
 - $r=0.1\text{mm}$
 - Ne/5%CH₄
 - Penning fraction = 0.4;

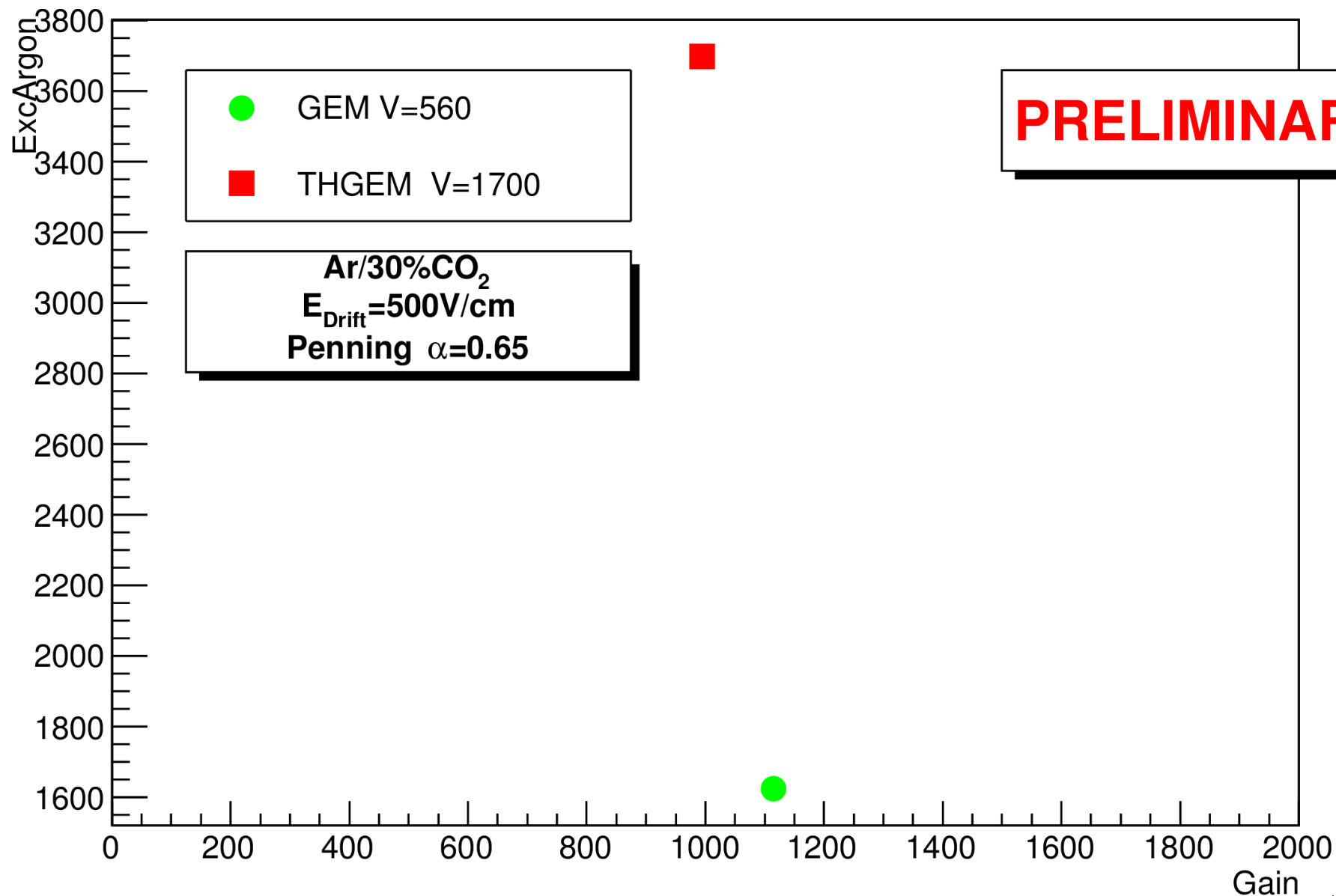


Results:



Experimental values from: 2014 JINST 9 P04011

Why not such difference in GEM?



Conclusions and Future Work

- **Preliminary results:**
 - THGEM problem with garfield seams solved.
 - Need more statistics
 - Other micropatterned structures: RPWELL, etc...
 - Already testes → Problems in the electrical properties of Semitron
 - Possibility to use garfield to extract penning factors from experimental results for unconventional mixtures

