TH-COBRA, a thick-hole structure for IBF reduction

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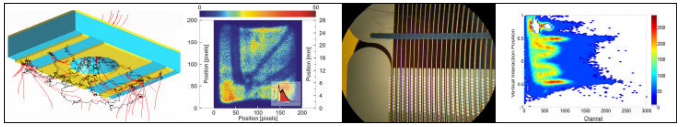
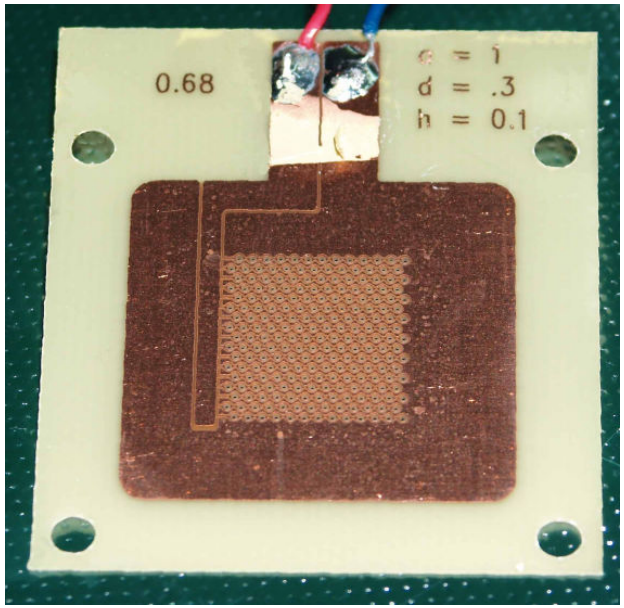
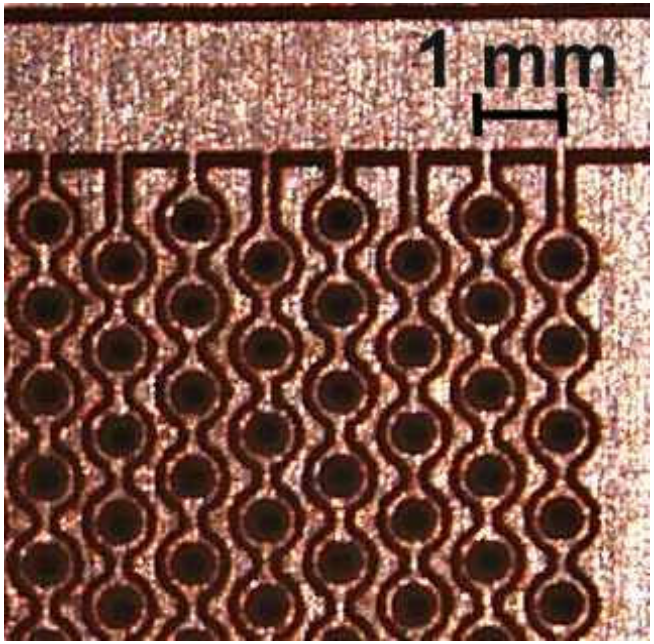


Motivation

- THCOBRA as an ion trap device:
  - Gaseous photomultipliers
    - Photo detection in visible range
    - RICH readout
  - TPCs

THCOBRA

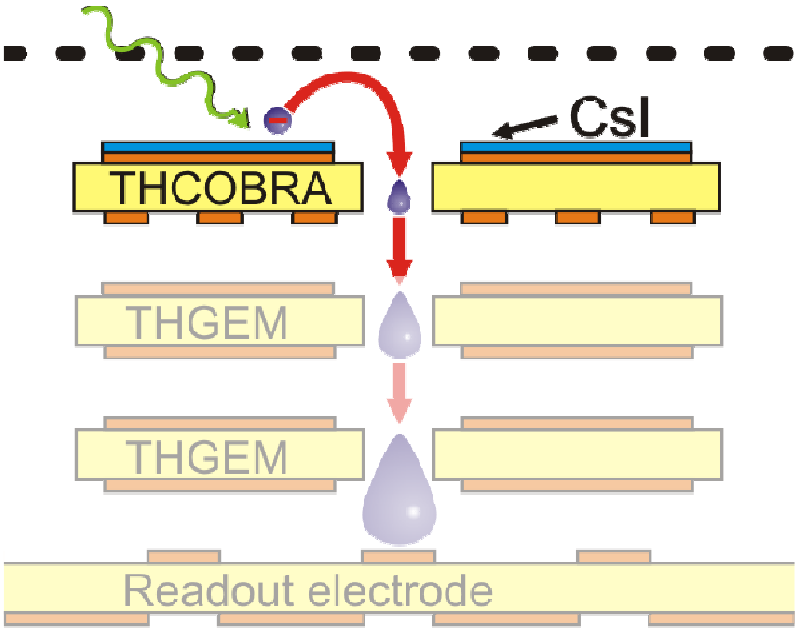




- **Actual Dimensions:**
  - Pitch = 1 mm
  - Hole diameter = 0.3 mm
  - Rim = 0.1 mm
  - Thickness = 0.4 mm

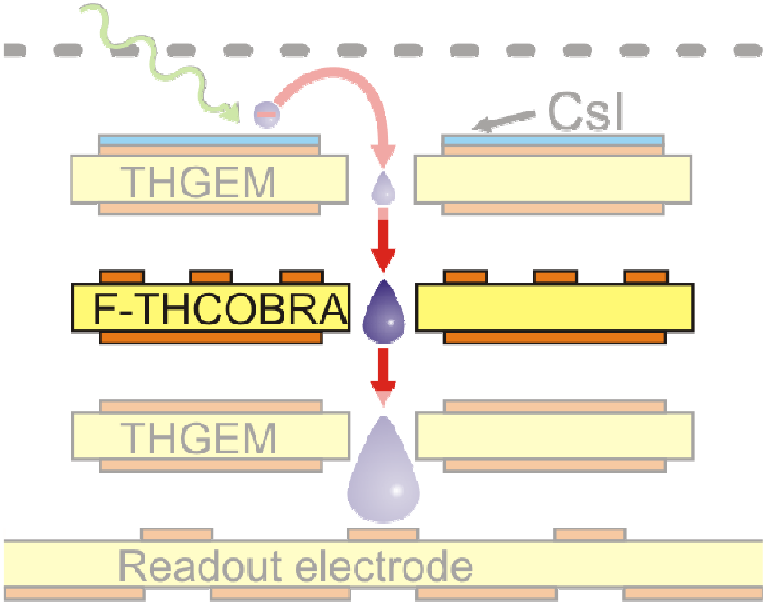
Detectors Configuration

THGEM-THCOBRA



- **Position:**
  - 1st stage

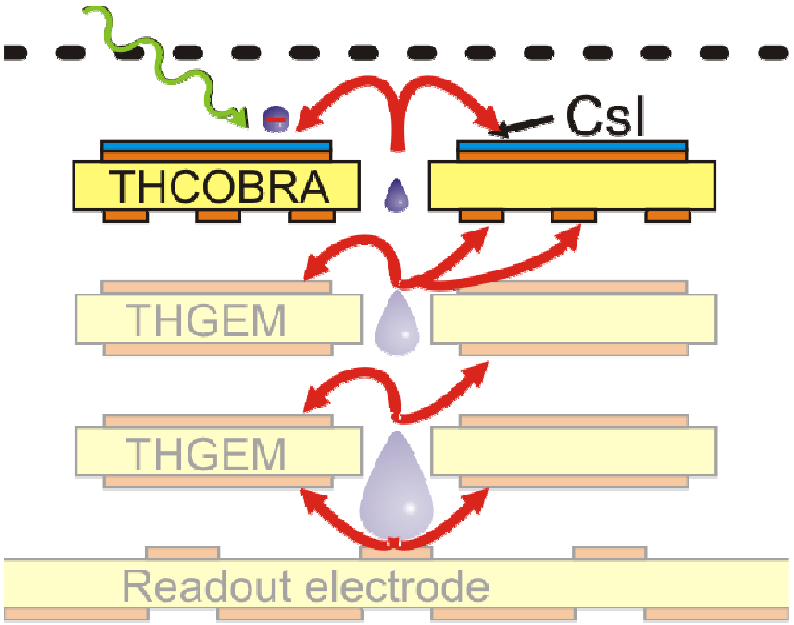
THGEM-FTHCOBRA



- **Position:**
  - 2nd stage

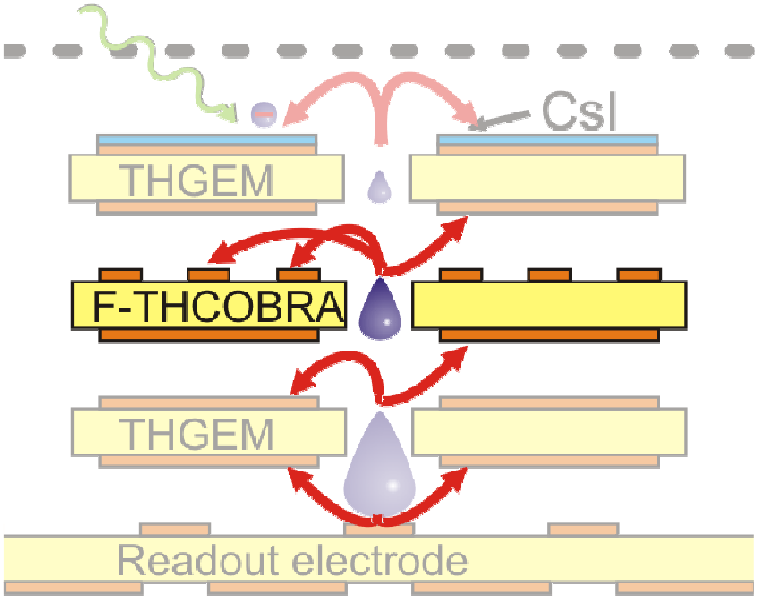
Detectors Configuration

THGEM-THCOBRA



- **Position:**
  - 1st stage

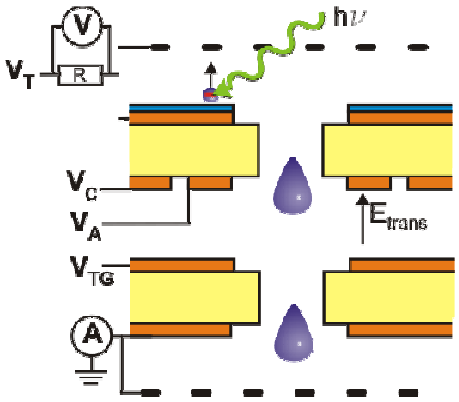
THGEM-FTHCOBRA



- **Position:**
  - 2nd stage

THCOBRA Experimental Results

IBF vs V_{AC}

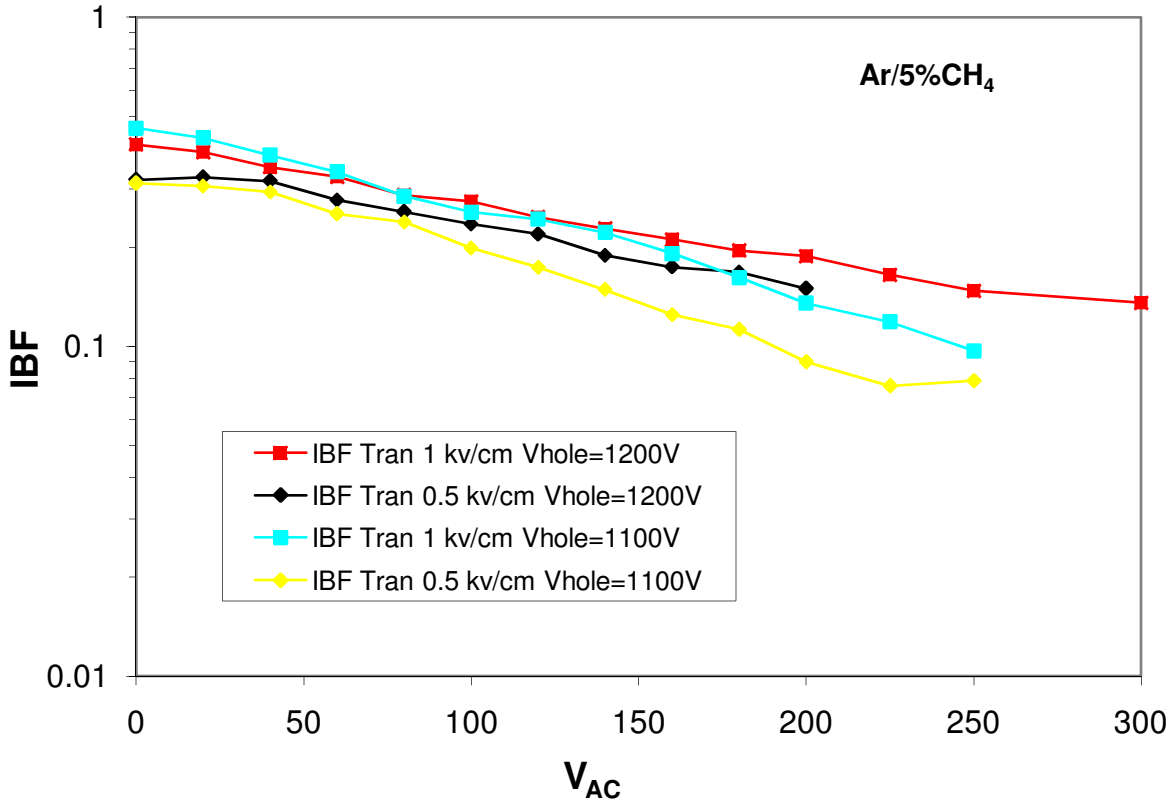


Hole Voltage	Gain
900	1E01
1100	1E02
1200	1E03
1400	1E04

Transfer Field

0.5 kV/cm

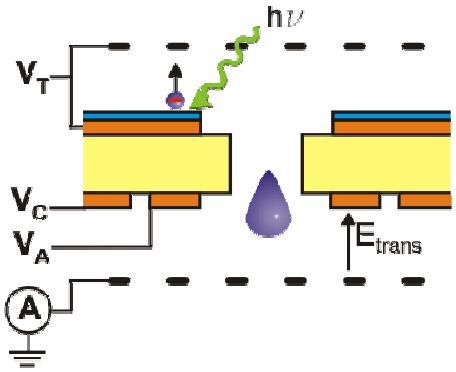
1.0 kV/cm



IBF redution ~ 5

THCOBRA Experimental Results

Visible Gain vs V_{AC}



Hole Voltage	Gain
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Transfer Field

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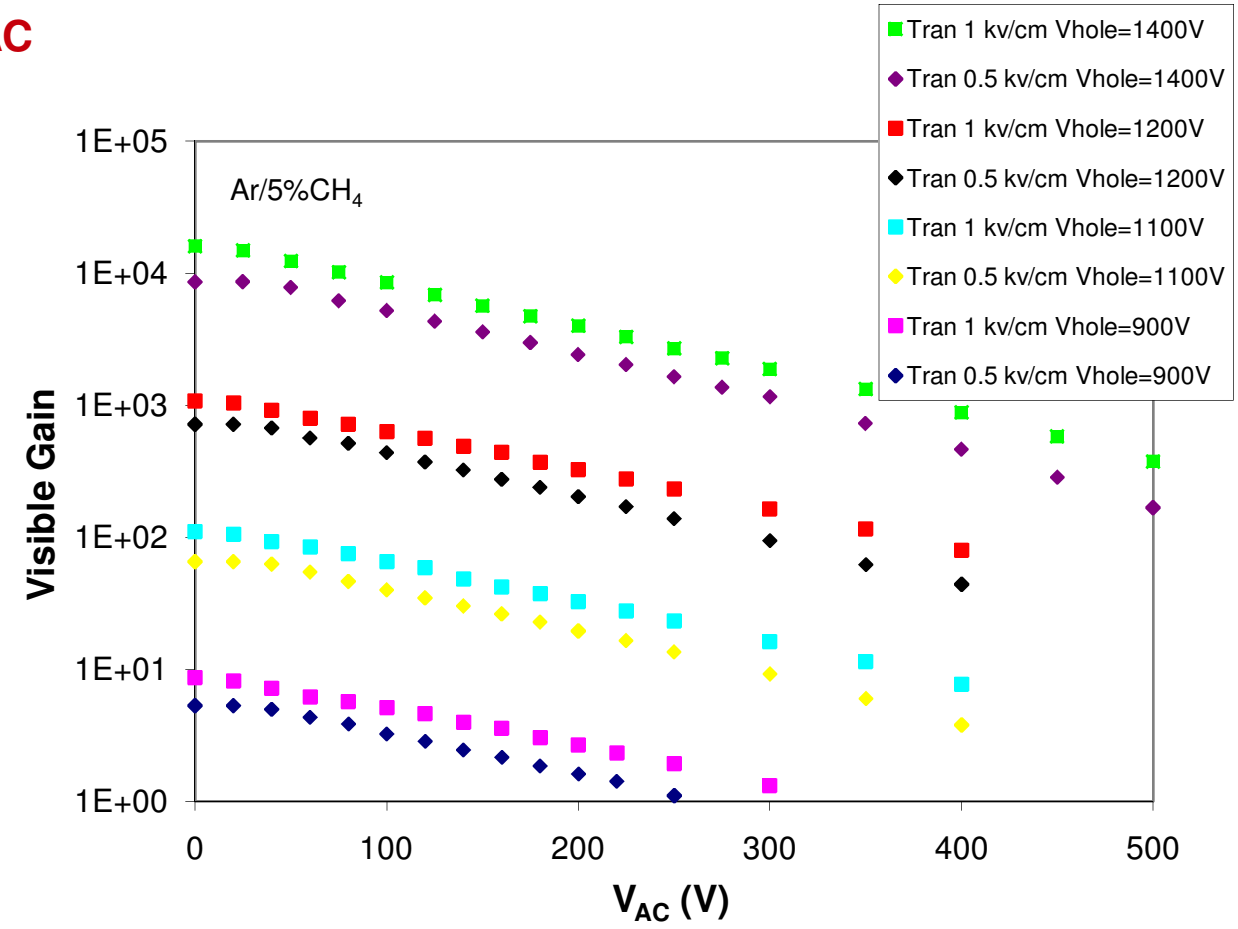
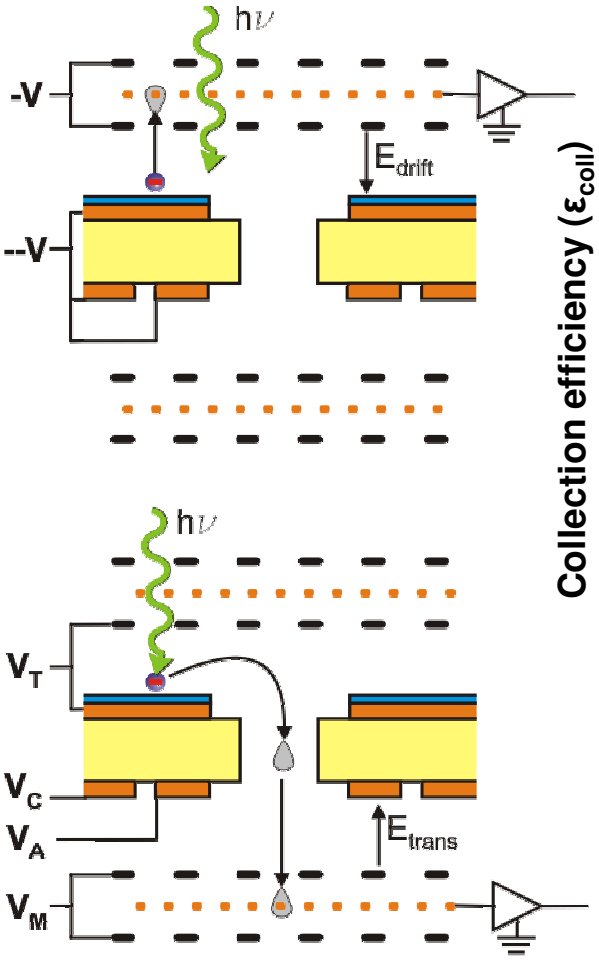
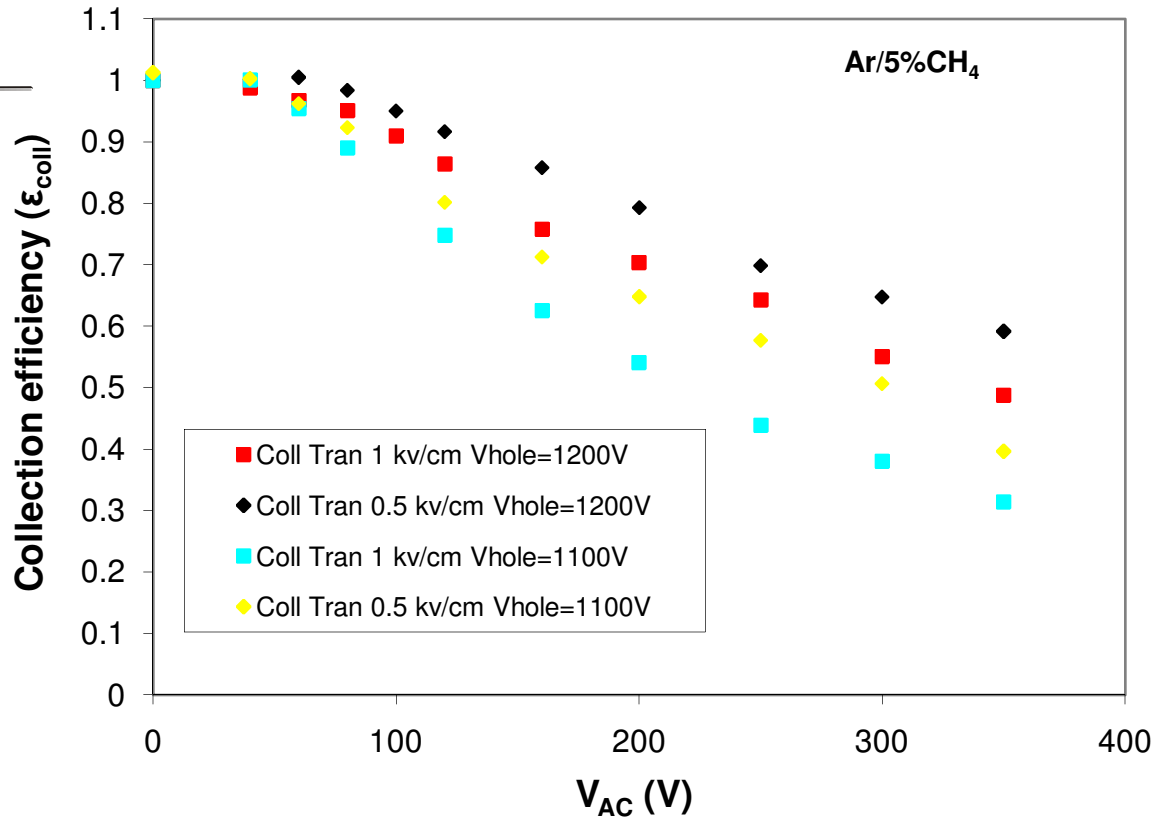


Good ε_{coll} is expected

THCOBRA Experimental Results

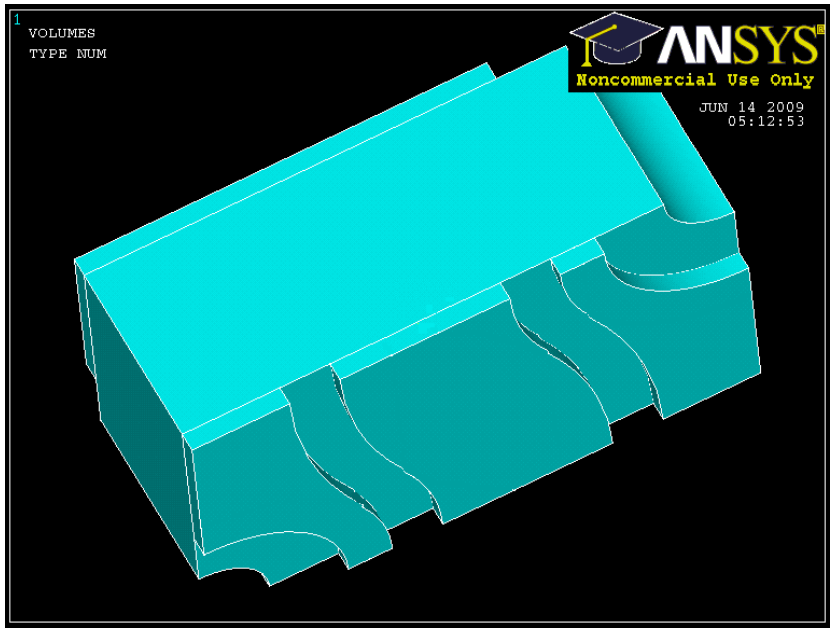
Collection Efficiency (ε_{coll}) vs V_{AC}



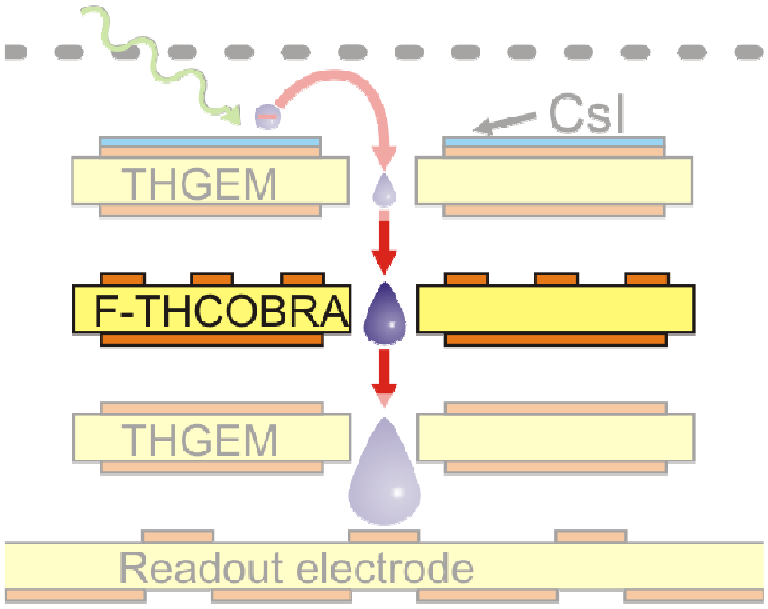


- ε_{coll} different behaviour than expected
  - Strong E_{trans} dependence on extra electrode voltage

Flipped-THCOBRA configuration



THGEM-FTHCOBRA

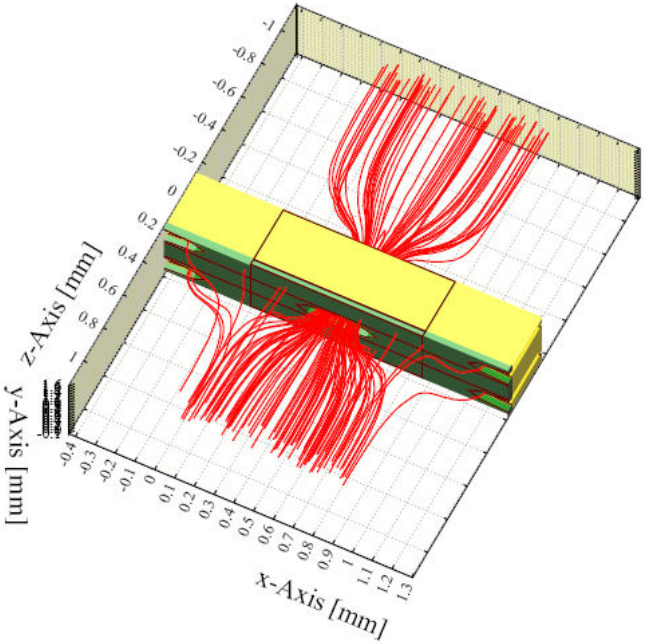


- **Simulated Dimensions:**
  - Pitch = 0.87 mm
  - Hole diameter = 0.21 mm
  - Rim = 0.11 mm
  - Thickness = 0.36 mm

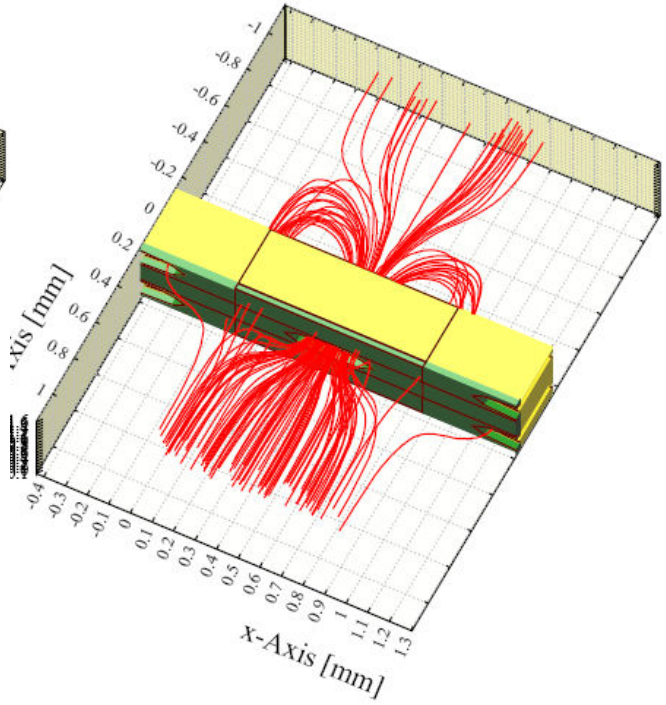
Flipped-THCOBRA Simulation Results

Simulated Ion Paths

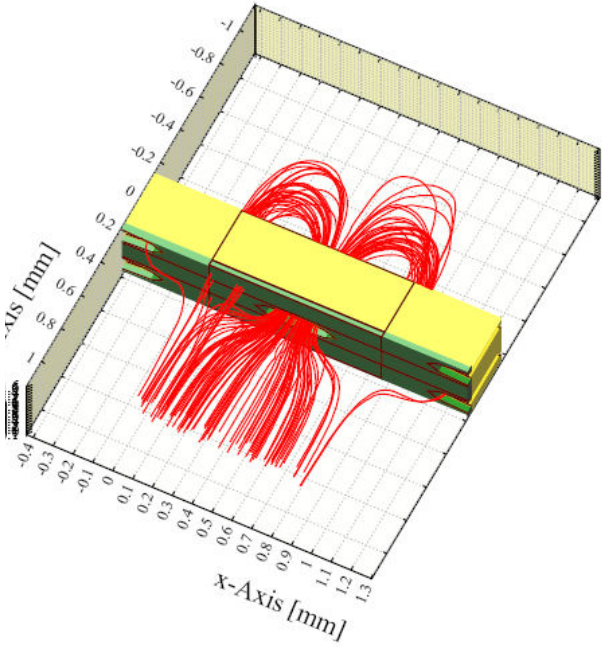
$V_{AC} = 0$



$V_{AC} = 120$

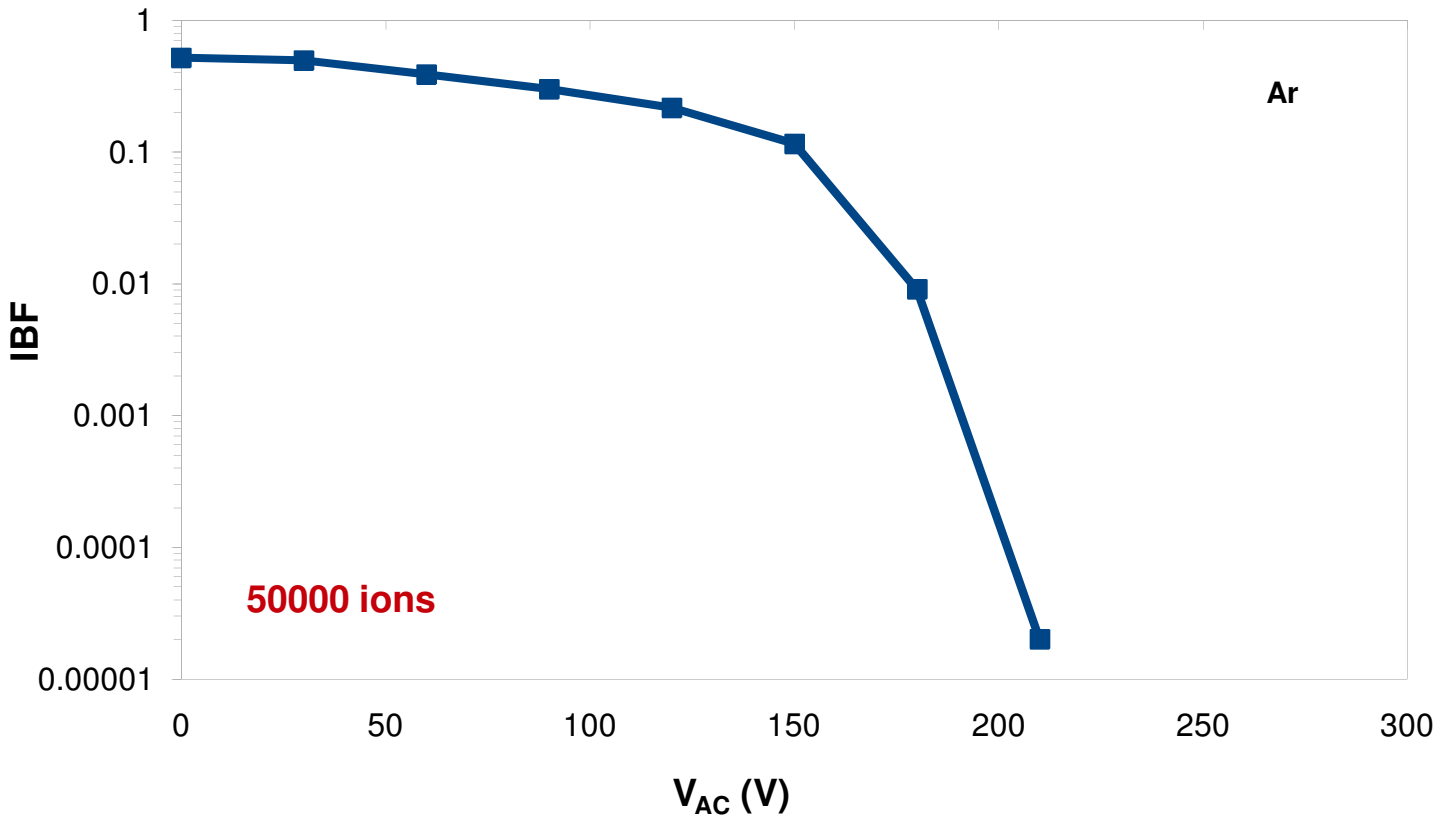


$V_{AC} = 180$



Flipped-THCOBRA Simulation Results

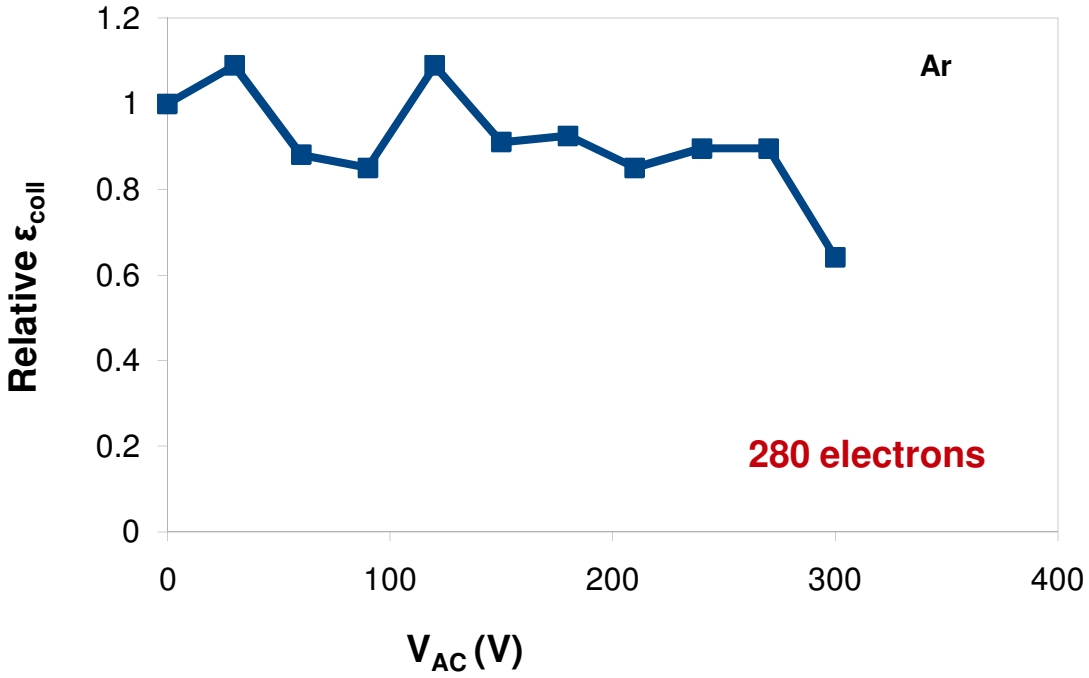
Calculated IBF vs V_{AC}



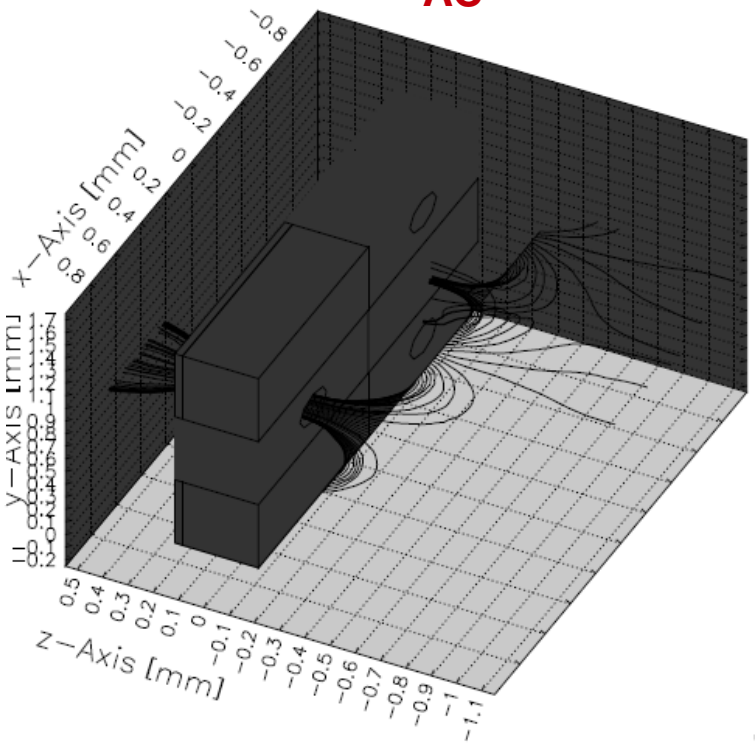
Strong IBF redution

Flipped-THCOBRA Simulation Results

Calculated Collection Efficiency (ε_{coll}) vs V_{AC}



V_{AC} = 210



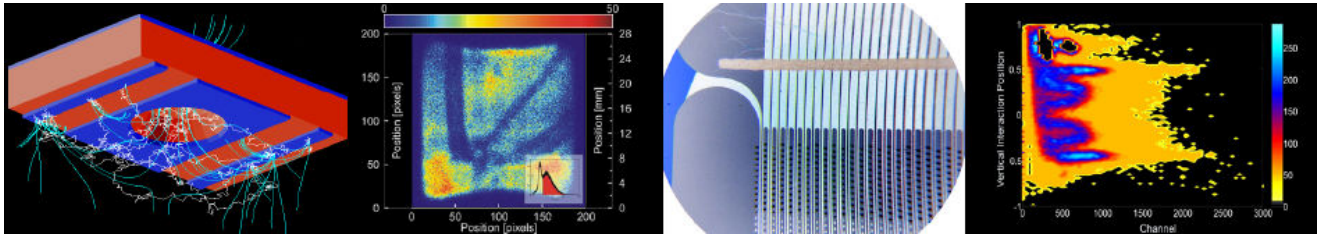
After a certain V_{AC} value, electron drift lines are inverted

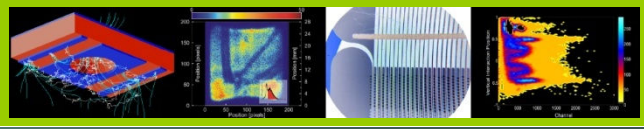
- **Drift field compensation**

Conclusions & future work

- **Both configurations shows IBF reduction**
  - **THCOBRA**
    - **IBF reduction about 5 @ G > 100**
    - **New results for THCOBRA ε_{COLL} are needed due to transfer field (E_{trans}) variation**
  - **Flipped THCOBRA**
    - **High level of IBF reduction**
    - **Good ε_{Coll} (higher statistics will be considered)**
    - **Experimental results are needed (in course)**
- **Future (in course) Work**
  - **Optimize THCOBRA geometry will be studied using simulation.**
  - **Implementation of THCOBRA +THGEM and F-THCOBRA+THGEM detector configurations will be done and studied**

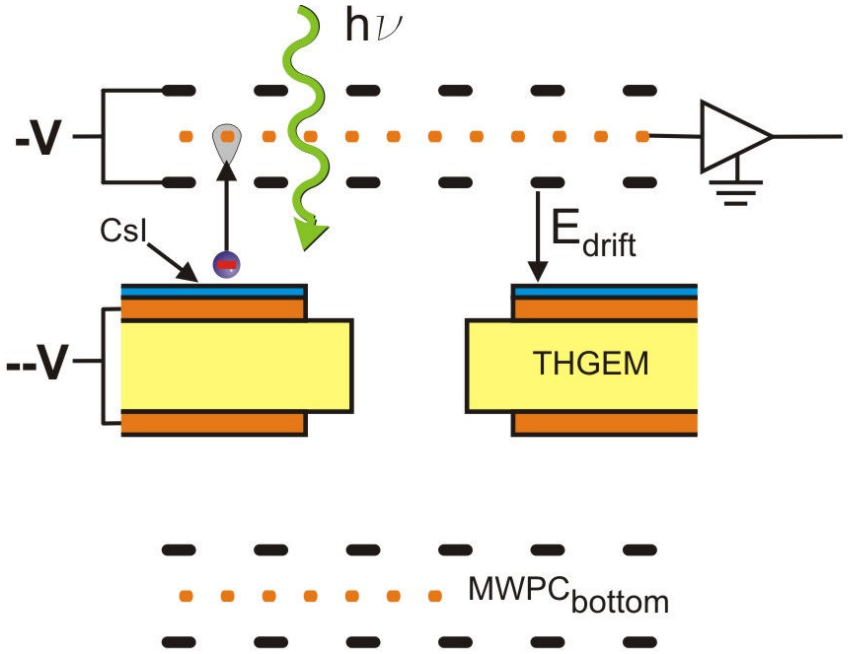
Thanks for your attention

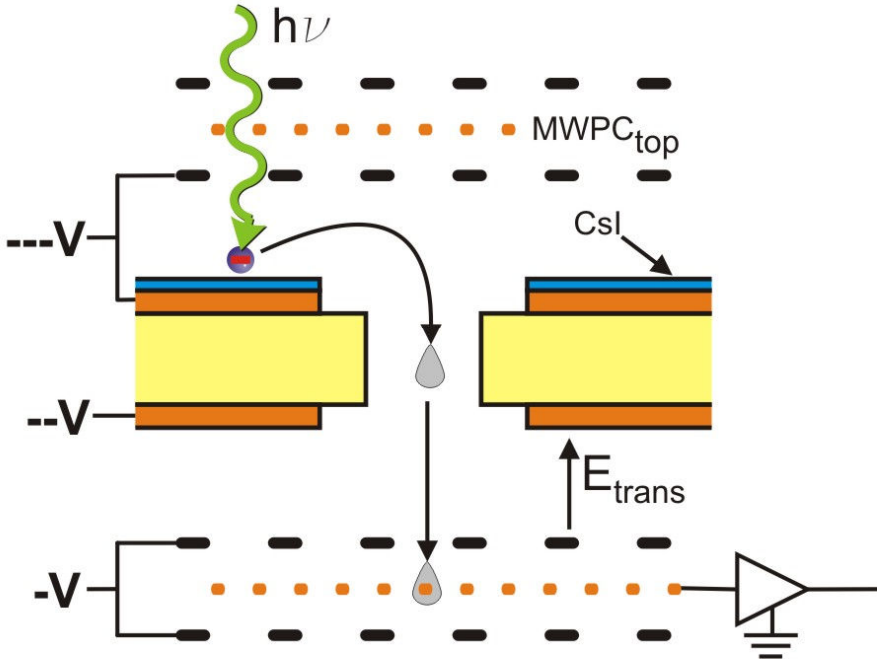




Backup Slides

Collection efficiency (ε_{coll})





Collection efficiency (ε_{coll})

$$\varepsilon_{coll} = \frac{N_{THGEM}}{N_{ref}}$$