

Ongoing activities at Saclay

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dapnia
SPP

cea

saclay



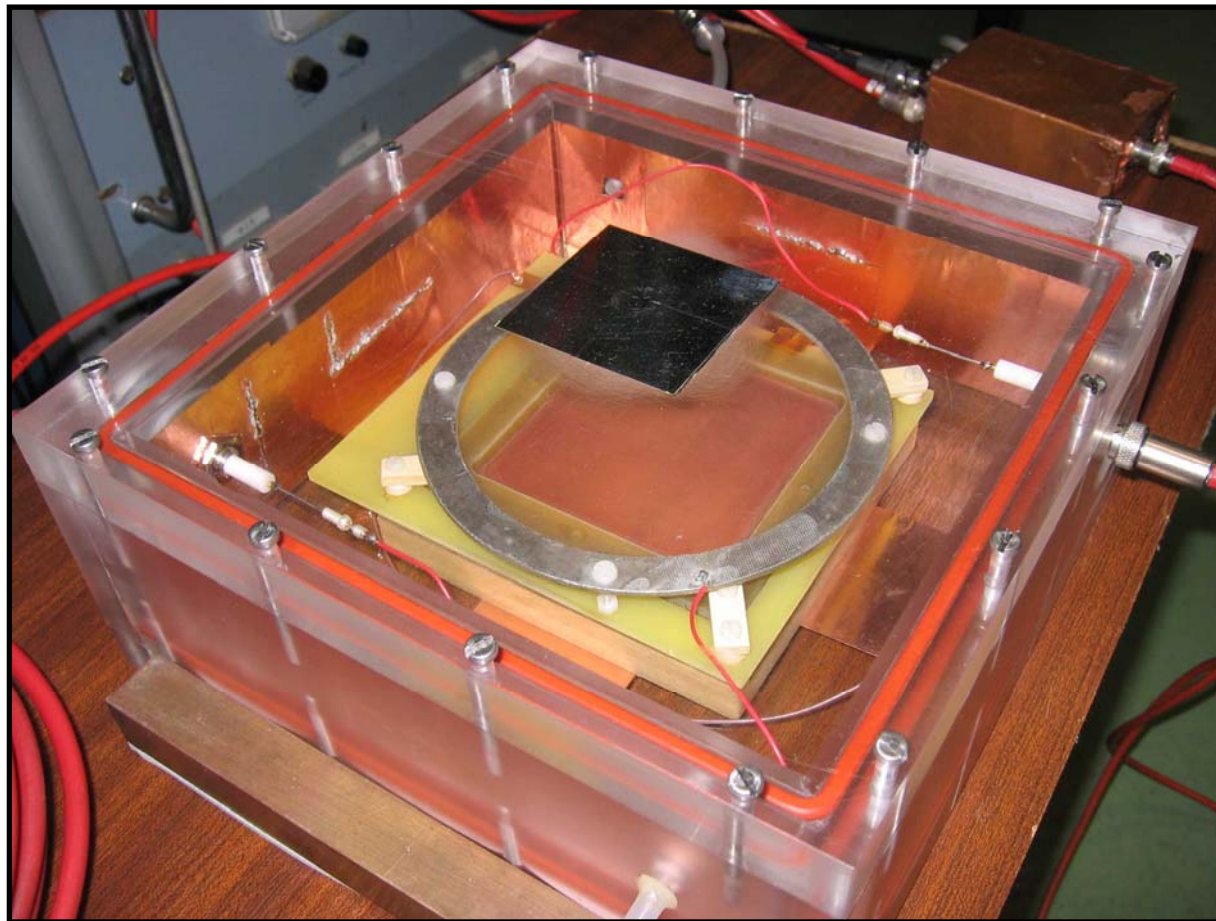
- Micromegas using a pixellised readout works
- However the weak point is the system sensitivity to sparks
- At Saclay we work on:
 - finding a gas mixture for optimal stability
 - damping the sparks (specific supply circuit)complementary to the resistive layer study at NIKHEF and to the improvement of the chip robustness at CERN



- Gain measurements using a Micromegas chamber
 - find the breakdown limit for many gas mixtures to avoid sparking
 - look for "Penning mixtures" and a stable state
- Study of detector-to-detector gain homogeneity
 - using a microbulk
- Measurement of ions backflow using various InGrid geometries (with Max Chefdeville)
- Involvement of the Saclay design shop in progress
- We are ready to test TimePix in gas
- Future activities and development in Saclay
 - design for a Mini-chamber using Medipix2 readout chip
 - SiTPC endplate for the Large Prototype

Goals:

- find gas mixture comfortable gain margin to use into a Micromegas TPC
- know as much as possible the maximum gain (to avoid spark)



Description:

- Transparent plastic box of 23 cm x 23cm x 8 cm size
- "Standard" 50 μm mesh of 10 cm x 10 cm size
- Sources:
 - Fe 55 (5.9 keV)
 - COOL-X (8.1 keV)
- Monitoring of:
 - pressure
 - H_2O
- Gas mixing system with triple mixture available

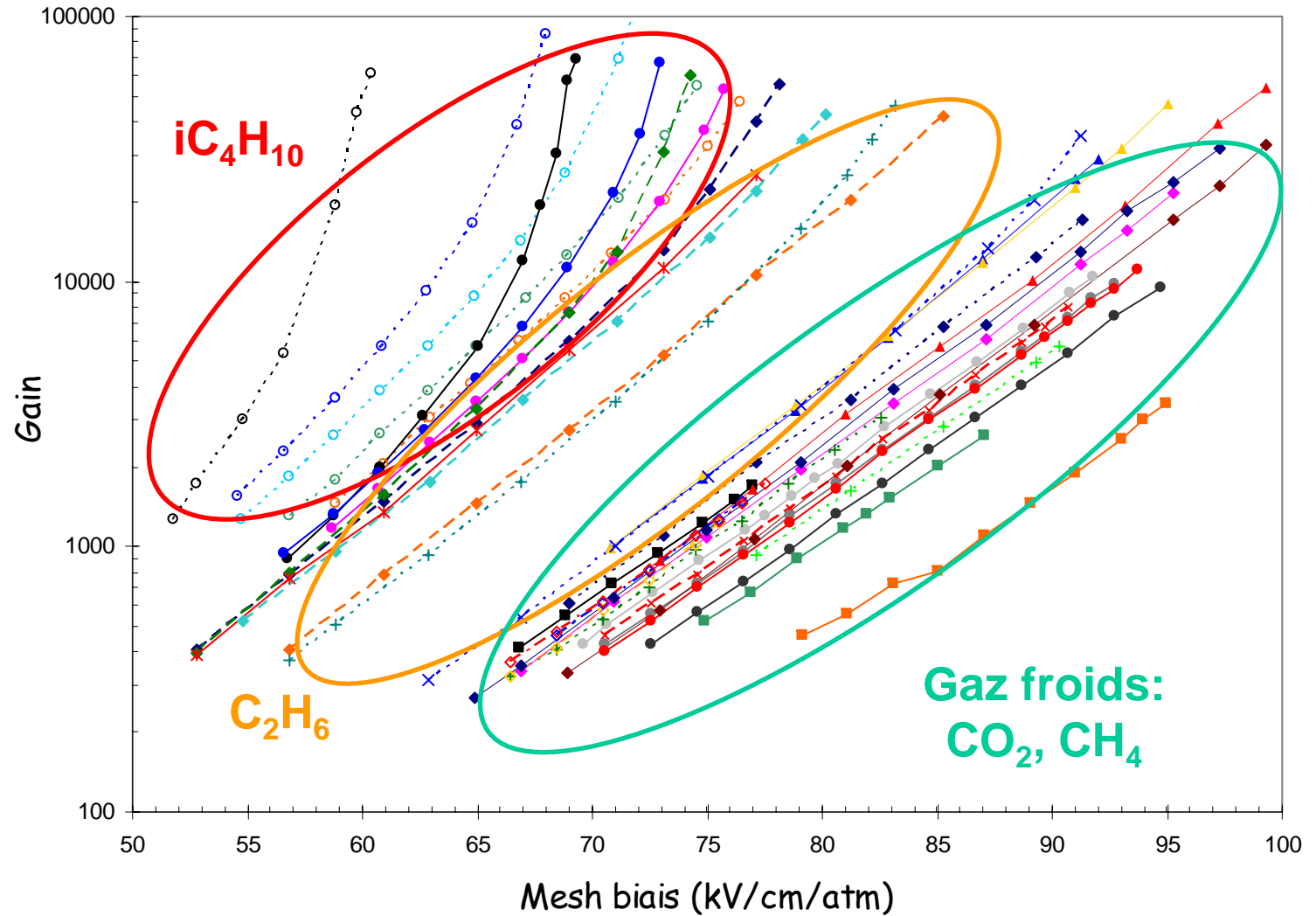


Gain measurements : summary

Mesh : 50 μm gap of 10x10 size

Mixtures of gases containing argon

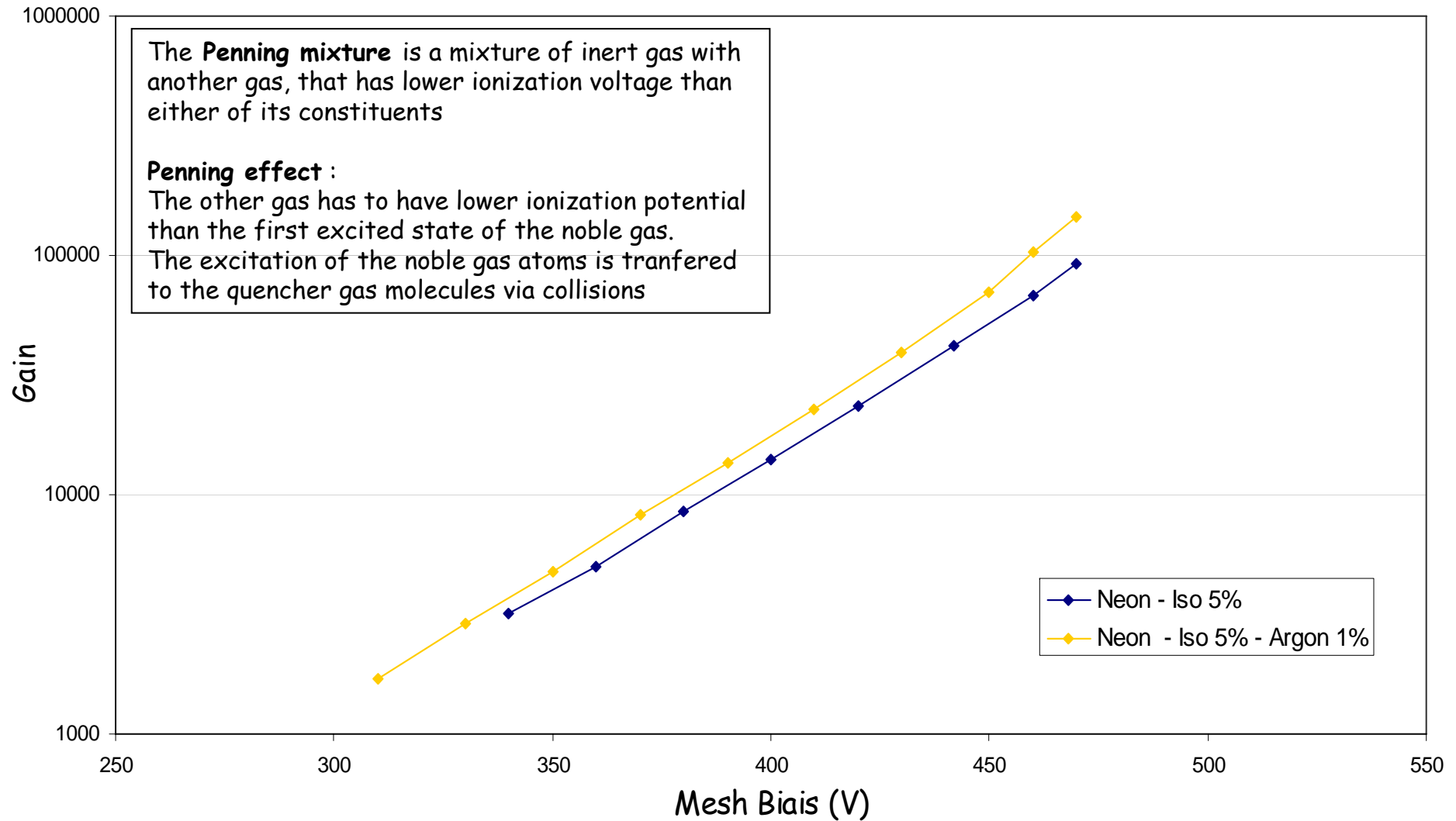
- Iso : 1%
- Iso : 2%
- Iso : 3%
- Iso : 4%
- Iso : 5%
- CF4 : 3%, Iso : 1%
- CF4 : 3%, Iso : 2%
- CF4 : 3%, Iso : 3%
- ×--- CH4 : 6.5%
- ×--- CH4 : 8%
- ×--- CH4 : 9%
- ×--- CH4 : 10%
- CH4 : 8%, CF4 : 3%
- CH4 : 8%, CF4 : 5%
- CH4 : 8%, CF4 : 10%
- CH4 : 10%, CF4 : 3%
- +--- CH4 : 5%, CO2 : 3%
- +--- CH4 : 10%, CO2 : 10%
- CO2 : 10%
- CO2 : 20%
- CO2 : 30%
- ▲--- CO2 : 10%, Iso 2%
- ▲--- CO2 : 10%, Iso 5%
- ▲--- CO2 : 10%, Iso 10%
- ◇--- CF4 : 3%, CO2 : 1%
- ◇--- CF4 : 3%, CO2 : 3%
- ◇--- CF4 : 3%, CO2 : 5%
- ◇--- Iso : 2%, CH4 : 10%
- ◇--- Iso : 5%, CH4 : 10%
- ◇--- Iso : 10%, CH4 : 10%
- ◇--- Ethane 10%
- ◇--- Ethane 5%
- ◇--- Ethane 3.5%
- ◇--- Ethane 2%
- ◇--- Ethane 3.5% - CO2 10%
- ◇--- Ethane 3.5% - CF4 3%
- ◇--- Ethane 3.5% - CF4 10%
- ◇--- Ethane 3.5% - Iso 2%





Gain measurements : Penning effect

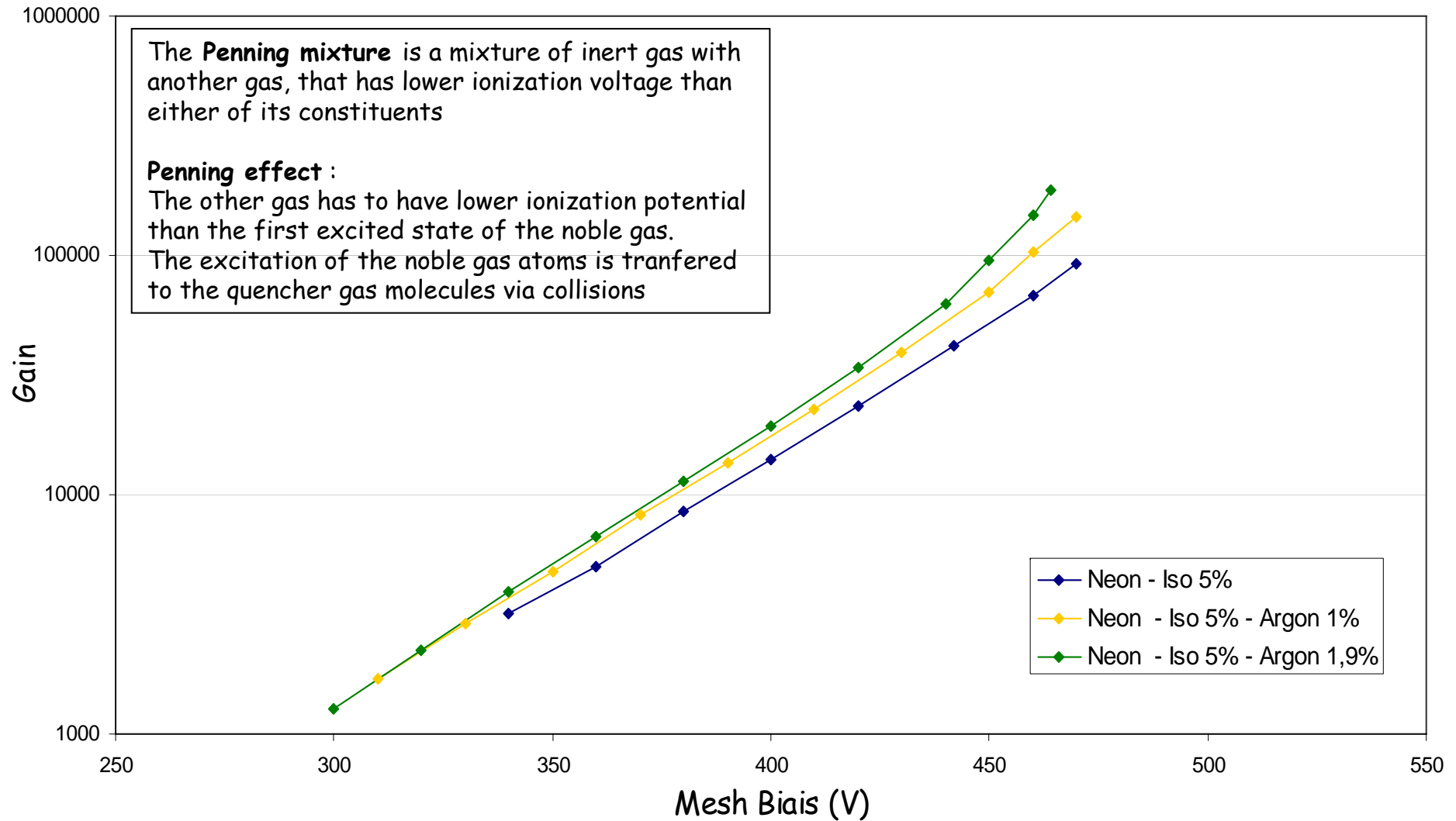
Ne/Argon - Iso 5%





Gain measurements : Penning effect

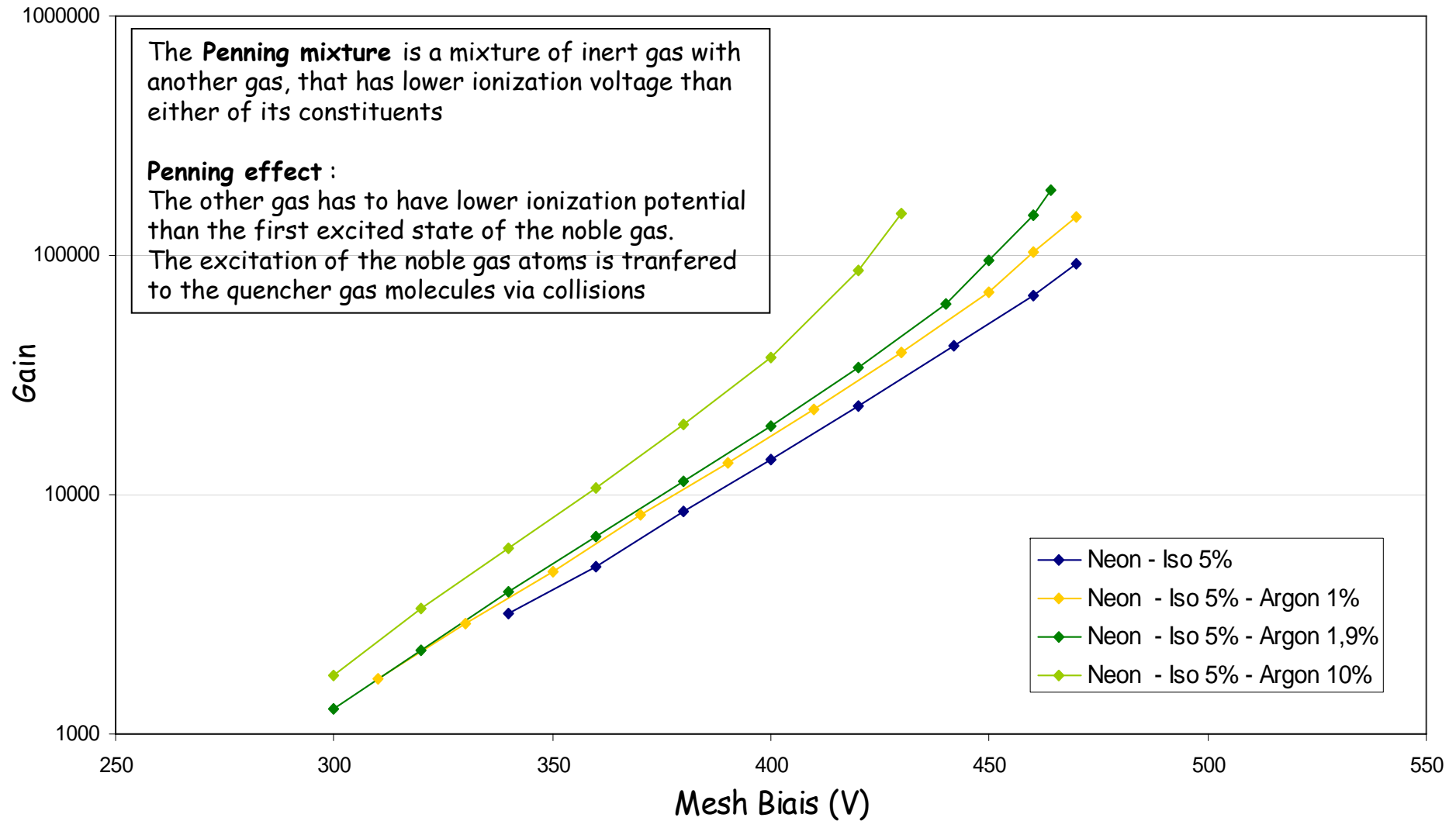
Ne/Argon - Iso 5%





Gain measurements : Penning effect

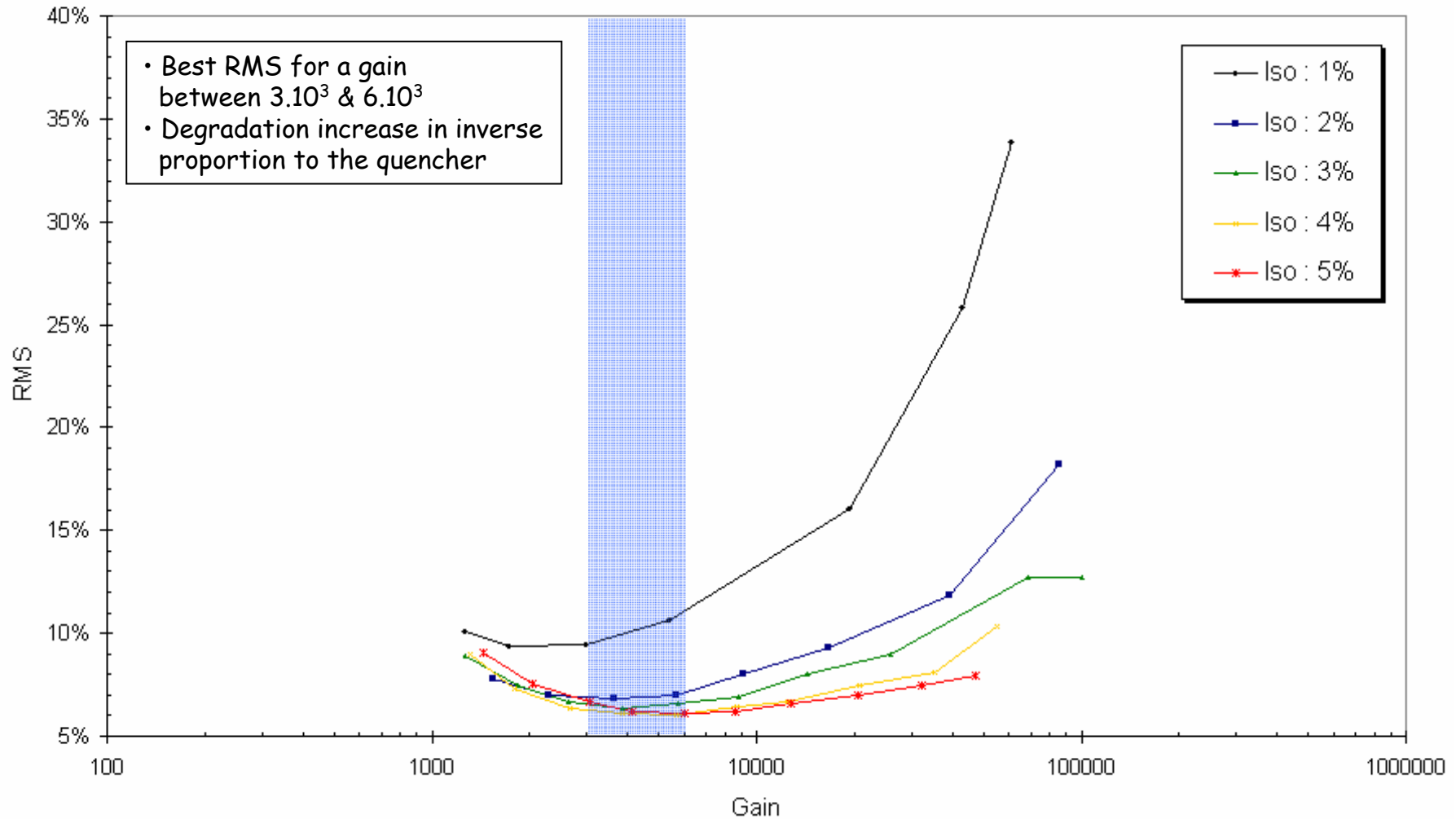
Ne/Argon - Iso 5%





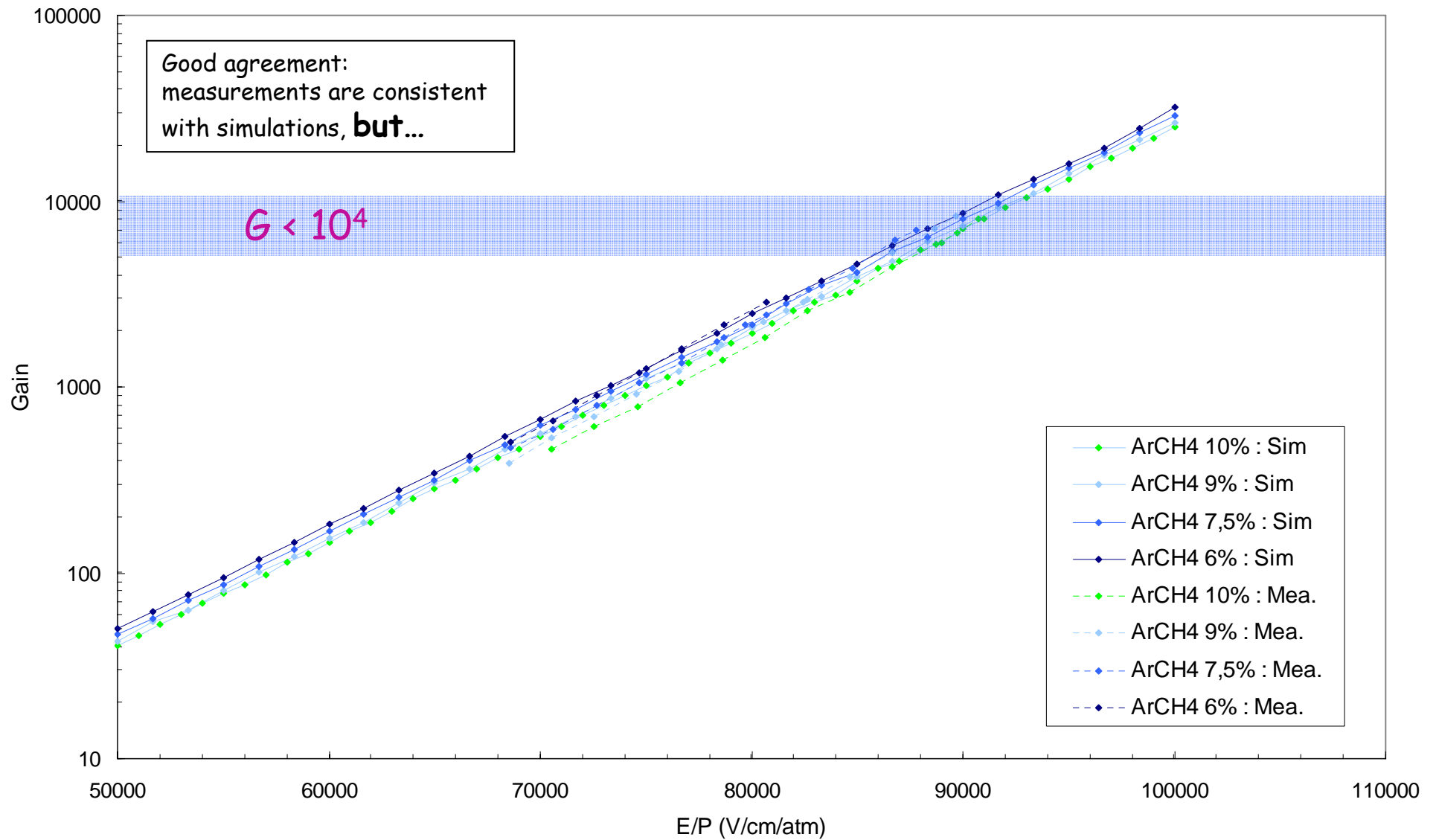
Resolution vs. gain

Argon/Isobutane



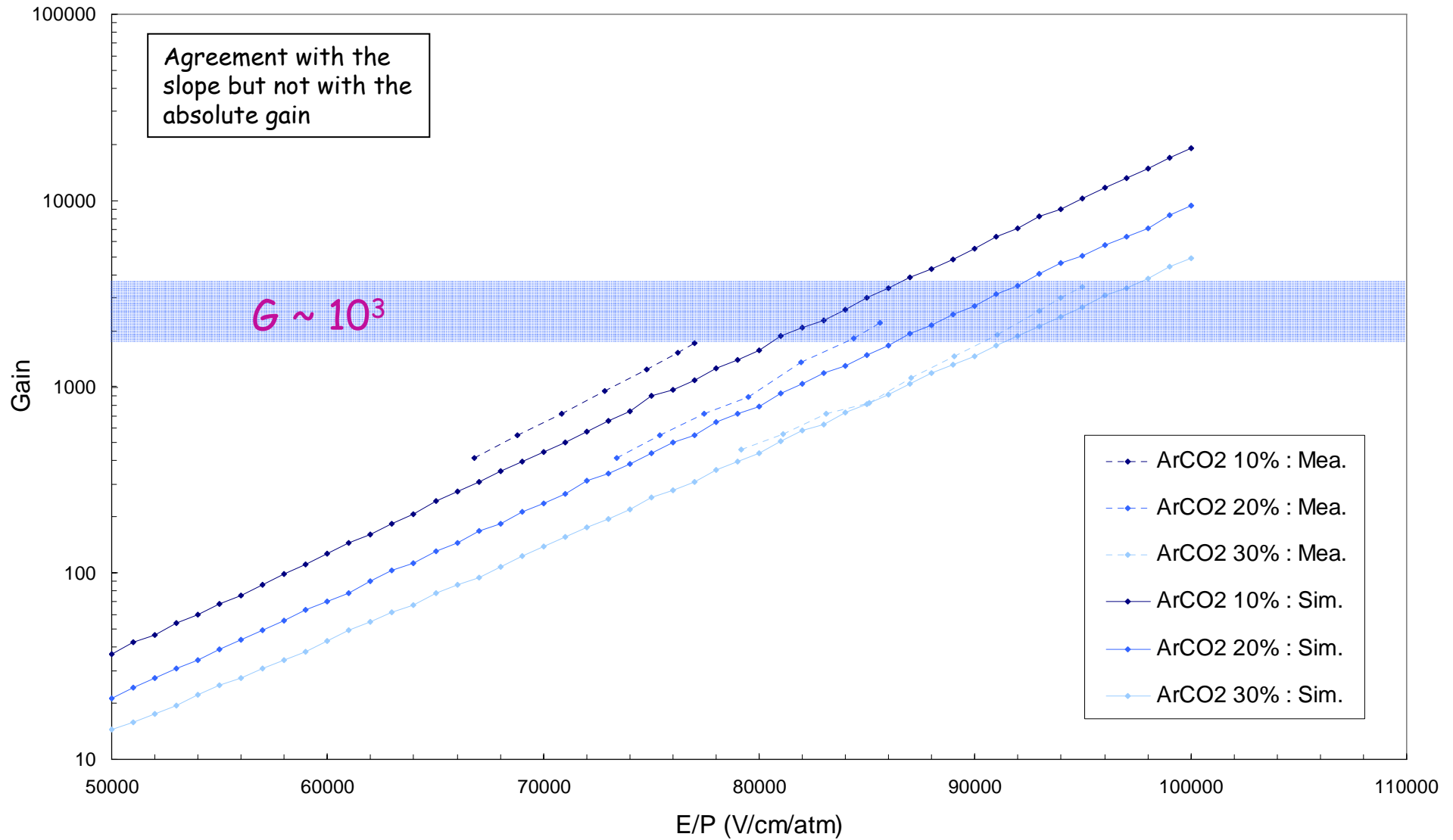


Simulation vs. measurements : Ar/CH₄



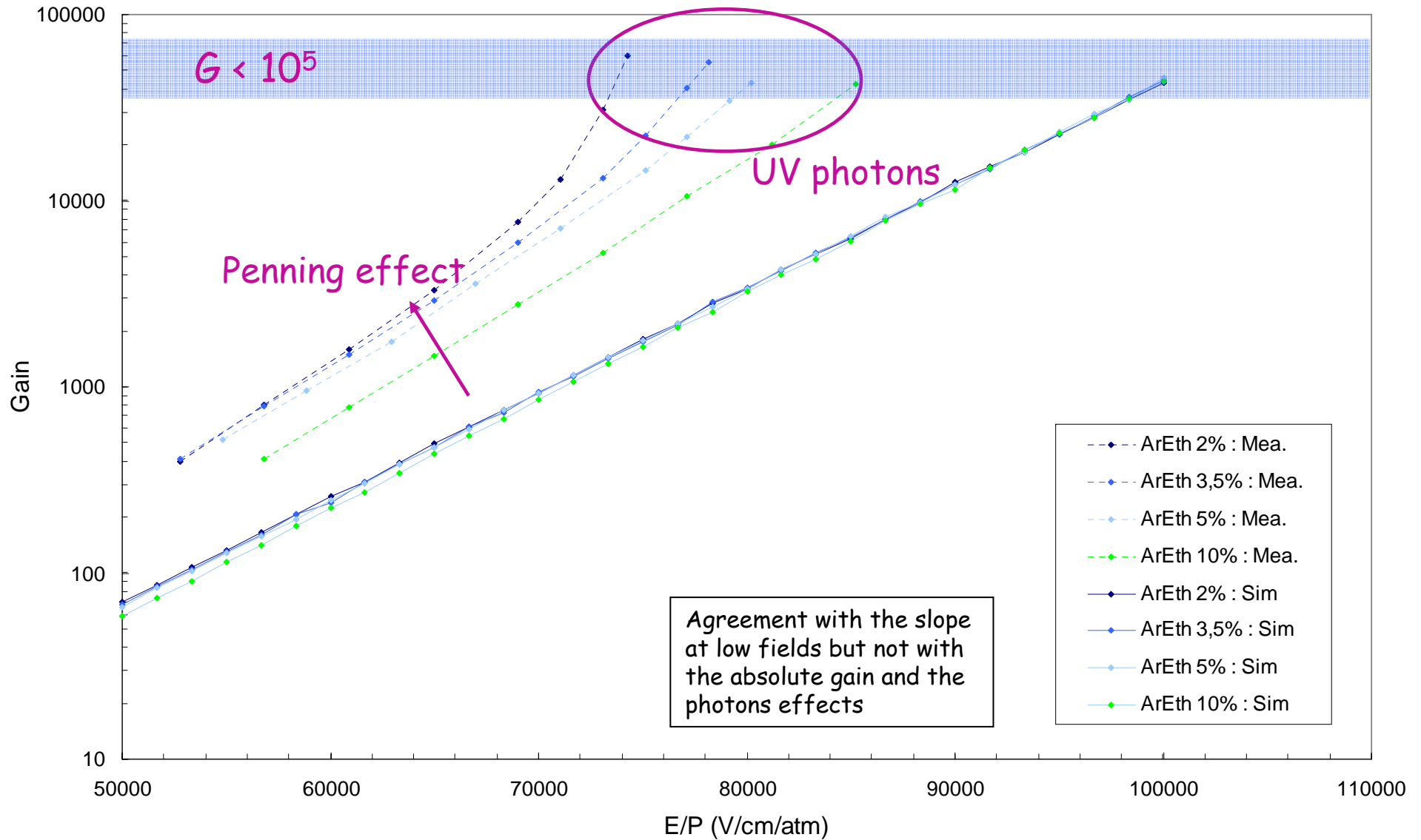


Simulation vs. measurements : Ar/CO₂



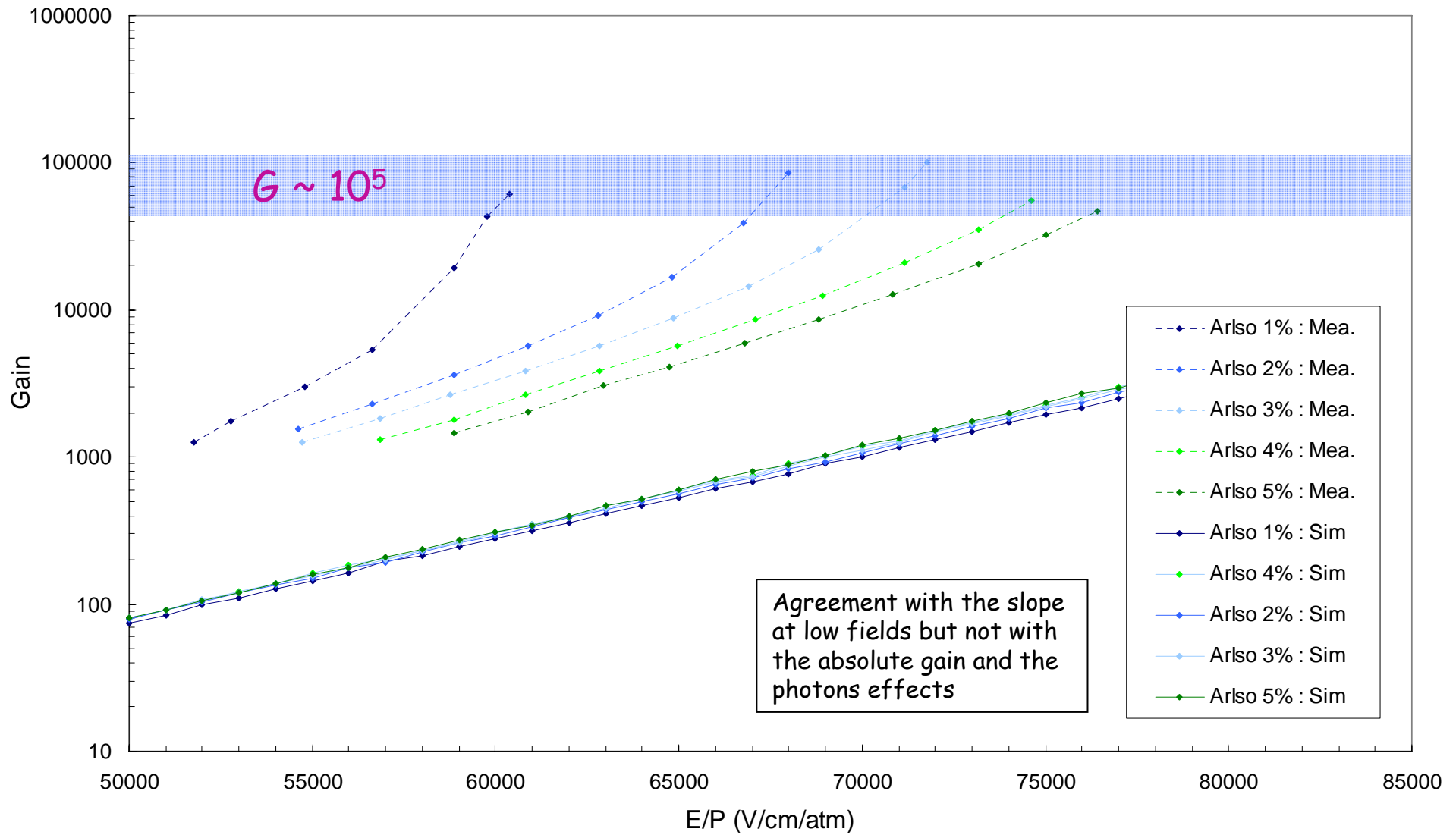


Simulation vs. measurements : Ar/C₂H₆





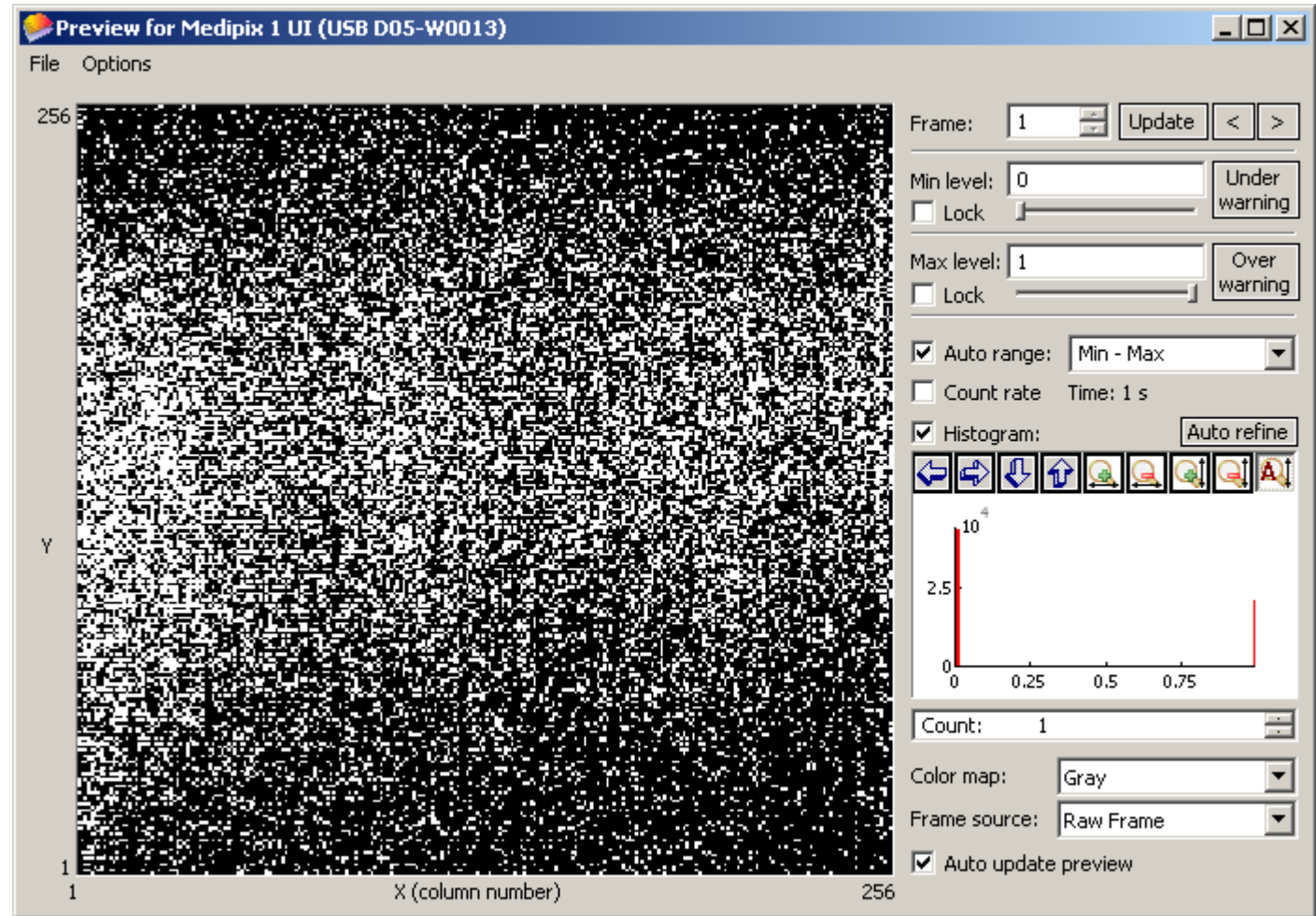
Simulation vs. measurements : Ar/ iC_4H_{10}



MUROS2



USB
Interface



Ready to test TimePix !

MEDIPIX2

- 55 μm pixels
- Direct X-ray conversion
- selection of window in energy
- 13-bit counter per pixel

+

MICROME GAS

- no ExB effect
- good for 2-track separation
- high gain
- very fast electron signal on the anode plane
- very small ion feedback in the space cheap
- robust and easy to implement

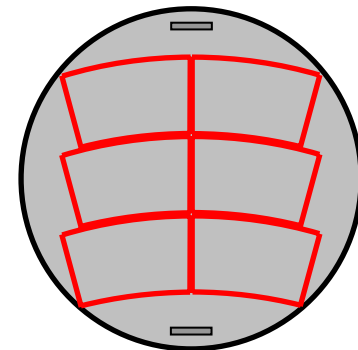
Mini-chamber



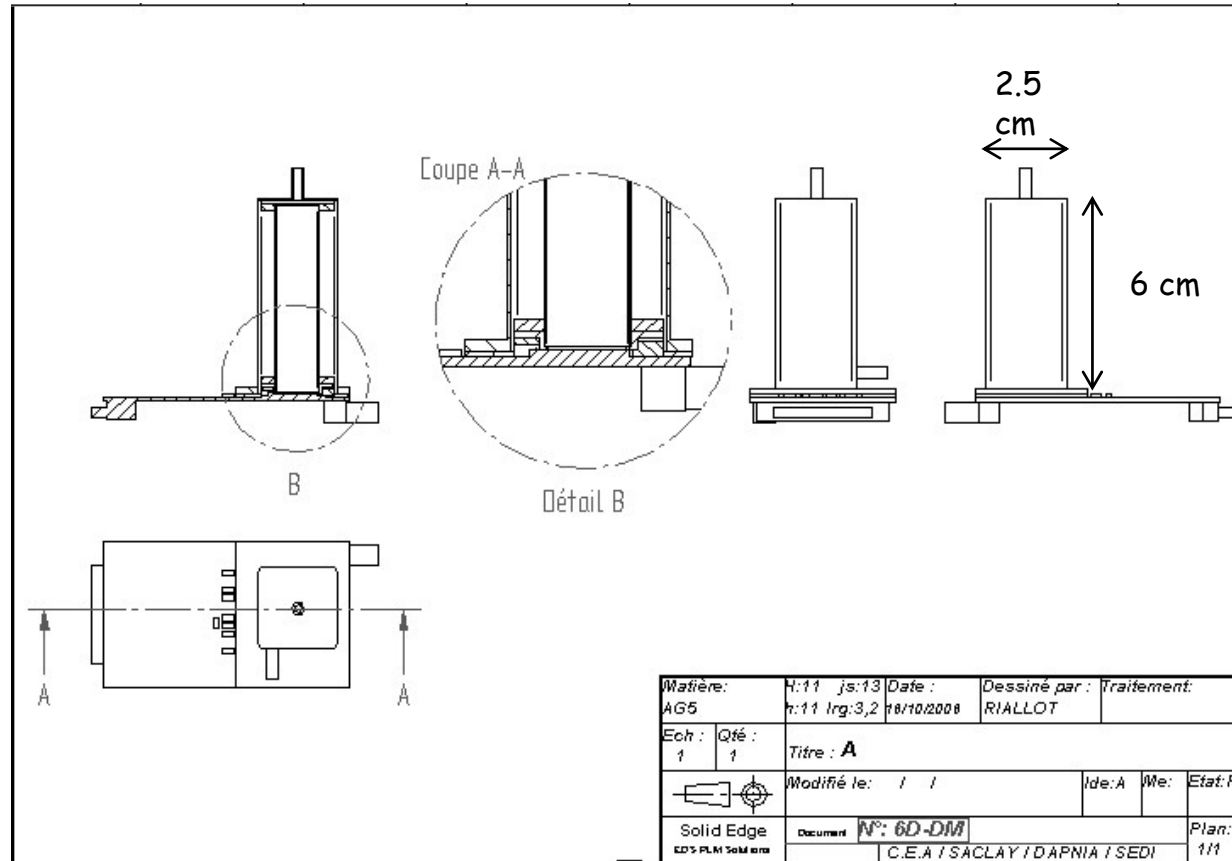
SiTPC endplate

+

Large Prototype



Design plan:



M. RIALLOT (DAPNIA/SEDI)

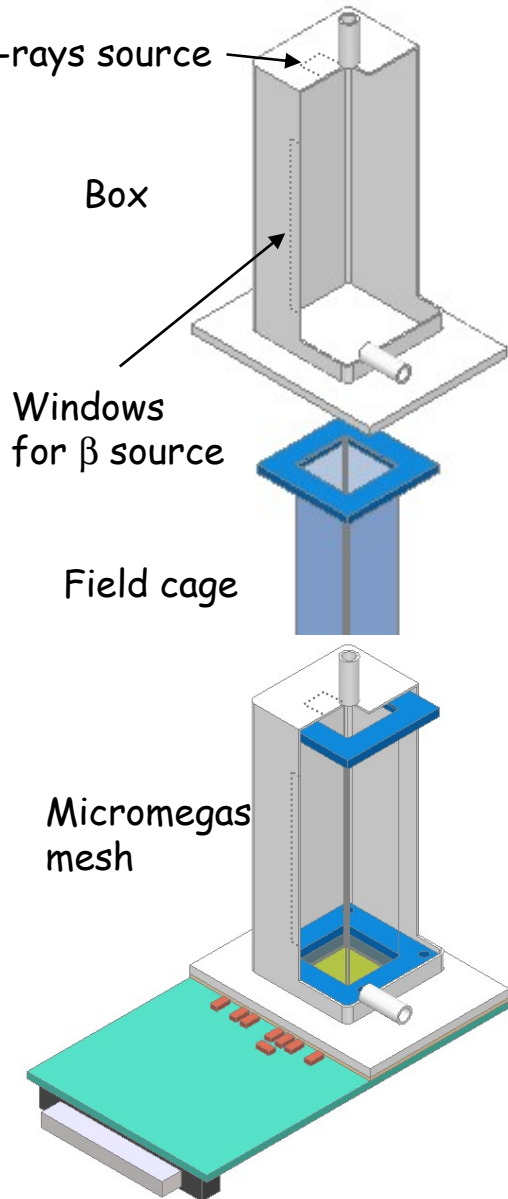
Windows for X-rays source

Box

Windows for β source

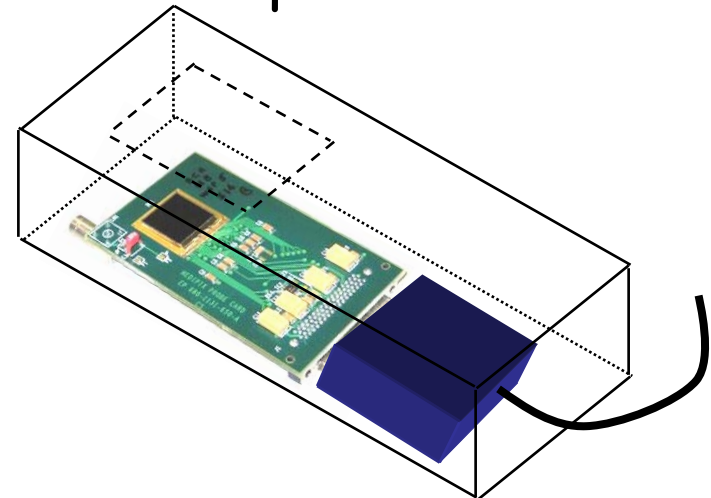
Field cage

Micromegas mesh



Medipix2 readout chip

- Gain measurements with He, Ne mixtures (double or triple) using the same Micromegas detector
- These should help us to choose a gas mixture with a voltage providing a stable state to operate with the Medipix2 chip
- Build a small box of 20 cm x 8 cm x 4 cm to put a Medipix2 + Micromegas in the gas
- Measurements with sources...





Conclusion

- Continue on the understanding of the gas properties using Micromegas detector
- Observations with the Mini-chamber with Micromegas and Medipix2 readout chip
- Mini-chamber -> Large Prototype...