

Overview of MCP Program

Bob Wagner
for LAPPD2 Collaboration
MCP Godparent Review
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Main Focus Areas of MCP Development

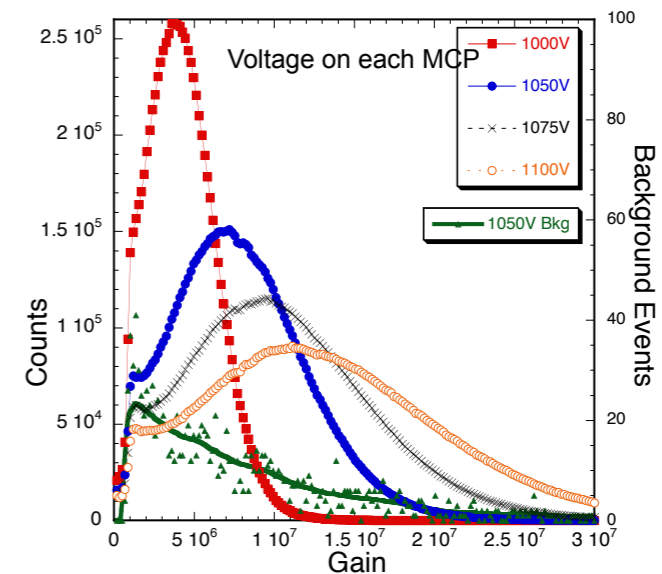
- ▶ Glass Capillary Array Development – Incom, Inc.
- ▶ Electroding
 - Fermilab Thin Film Lab
 - Space Sciences Laboratory – Univ. of California/Berkeley
- ▶ ALD Process Development – Argonne ALD Group
- ▶ MCP Testing
 - SSL
 - Gain, Uniformity, Lifetime, Quality Control
 - UChicago/Argonne APS
 - Timing, Gain, Aging, Readout



MCP Development Program - Impressive Success

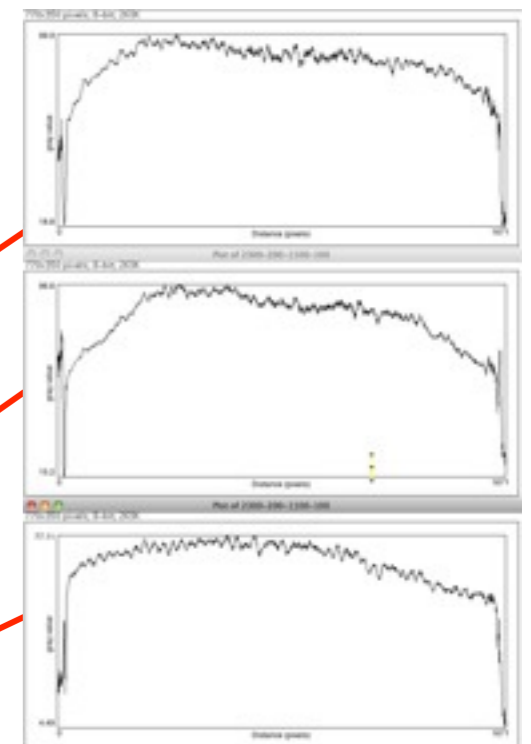
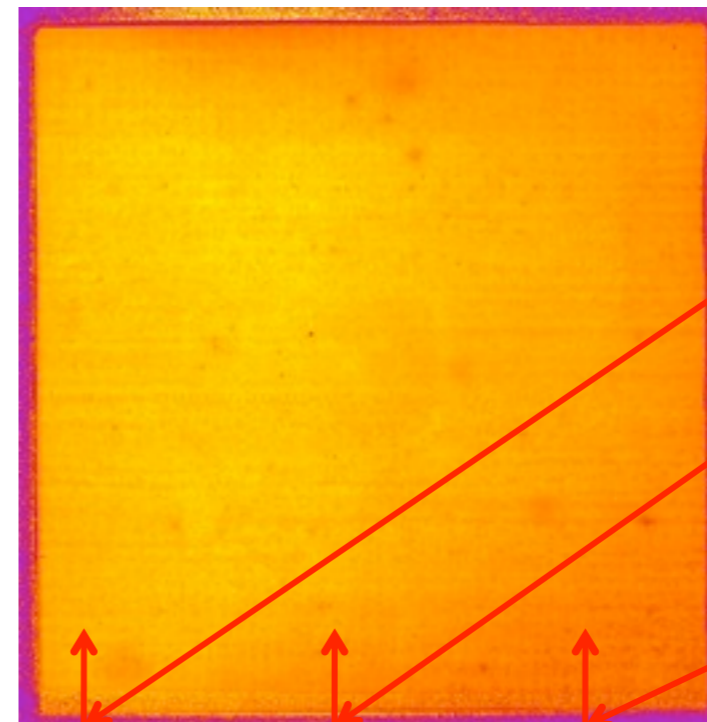
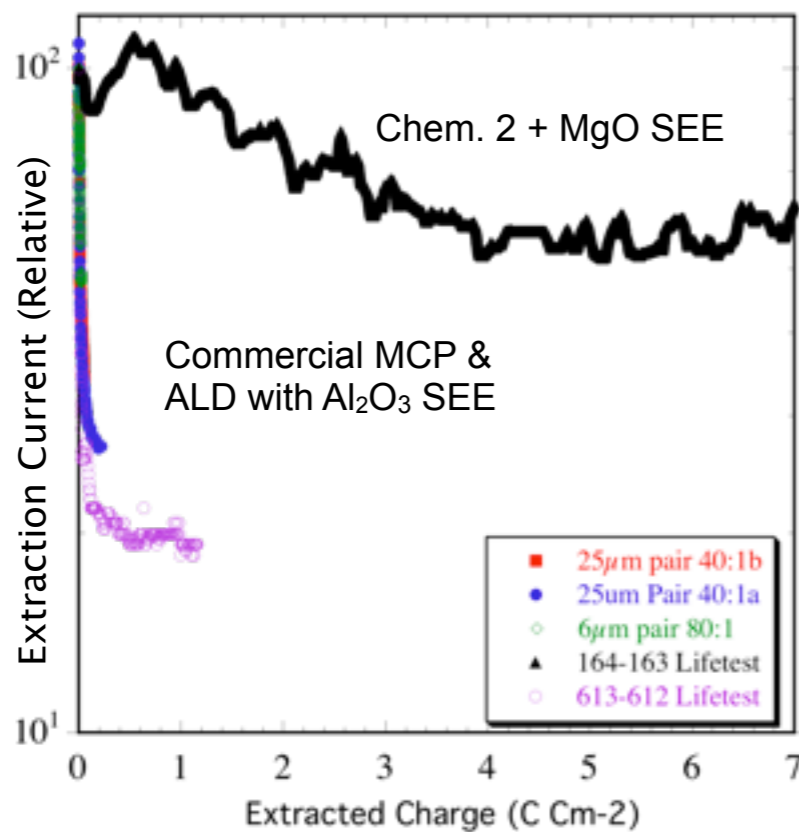
- ▶ Routinely making 8"×8" MCPs with pairwise gain 10^{6-7} ($>10^3$ per plate)
- ▶ Uniformity of gain has been greatly improved in recent months
- ▶ Gain stability of MgO SEY plates is far better than Pb glass MCPs after initial conditioning
- ▶ Recognized with R&D100 award in 2012

$G=4 \times 10^6$ @ 1000V



Pulse height amplitude distributions. MCP pair, 20 μ m pores, 8 $^\circ$ bias, 60:1 L/d, 0.7mm pair gap with 300V bias. 3000 sec background.

graphic: Ossy Siegmund, SSL



Y gain slices

Additional Field for Division /Organization/Sponsor/Meeting name



Major Challenges for MCP Development

- ▶ Effort
 - Anil Mane, Jeff Elam, Joe Libera, Aileen O'Mahony (Incom)
 - Recently added technician help for ALD and QC
 - ALD Group still needs people help for MCP production work
- ▶ Production of supply of plates of sufficient quality for sealing in detectors
- ▶ Cleanliness
 - Needs attention throughout process
 - MCA production at Incom; Electroding at Fermilab; ALD, annealing, packaging, shipping at Argonne, insertion into devices at APS
 - All groups are striving to improve handling techniques
- ▶ Understanding characteristics of ALD plates
 - Why is MgO so much better than Al_2O_3 ?
 - What happens in the annealing process? Why resistance changes/broadening?
 - What causes hotspots to develop?
 - What pores qualities determine MCP quality: uniformity, hotspots, gain, lifetime?
 - What is long term behavior of plates? Lifetime testing?
- ▶ Equipment needs for efficient production
 - Evaporator capability at Argonne
 - Cleaning
 - Plasma Etch
 - more clean room/hood facility
 - Measurement
 - Phosphor imager at Argonne
 - Vacuum oven



Topics for Discussion

- ▶ What effort is needed for ALD group and how does LAPPD2 provide it?
- ▶ Balancing needs of LAPPD2 with Incom STTR
- ▶ Prioritization of Chem1/Al₂O₃/MgO w.r.t. ALD of grid spacer w.r.t new material development
- ▶ What is the test program plan for “qualifying” MCP plates for detector use?
- ▶ What are the critical equipment needs of the ALD group?
- ▶ Plan for assuring best practice handling of disks/plates from beginning to sealed in a detector

