

Overview Of ANL's Photocathode Effort - What A Difference A Year Makes

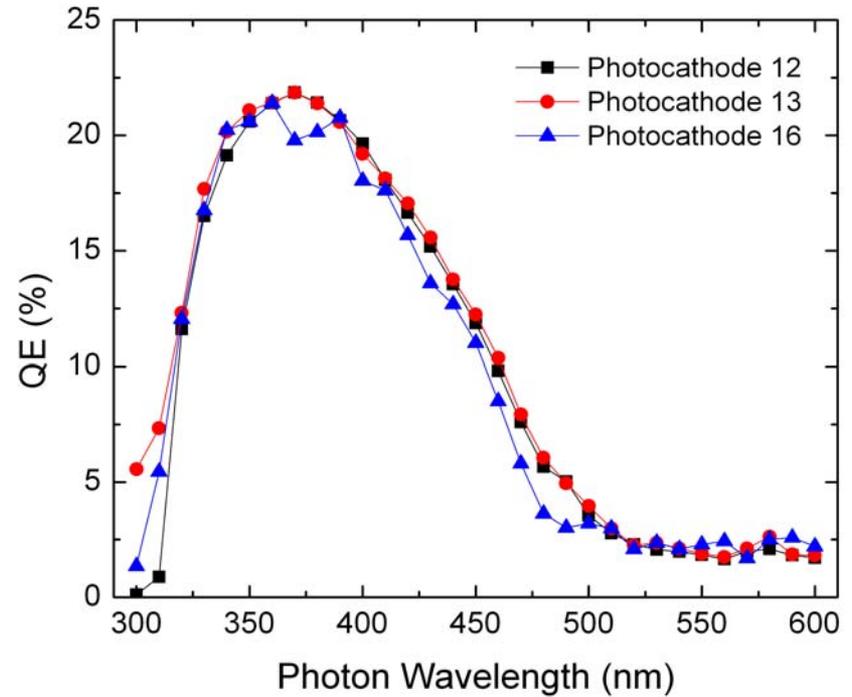
Zikri Yusof (HEP/ANL)

On behalf of HEP/ANL Photocathode Group

Events And Accomplishments Since The Last Godparent Review

- We lost Klaus;
- The Photocathode Laboratory is functional;
- The Burle System installed and fully operational in the new Photocathode Laboratory;
- Successfully produced photocathodes in PMTs with QE ~25% at 400 nm;
- Finished design and construction of the glass chalice;
- Installed glass chalice onto the Burle System;
- Produced 4"x4" photocathodes with QE ~15-18%;
- Produced ~7" "diameter" photocathodes with QE ~15%;
- We are sharing a technician that has been dedicated to the detector group.

Burle System Fully Operational In New Photocathode Laboratory



- Produced several KCsSb photocathodes in PMTs;
- Refined recipe;

Glass Chalice Installed In Burle System



- Study if the Burle recipe can be scaled up to 4"x4" photocathode and larger;
- The chalice is now installed and operational;
- Have produced 4"x4" and 7" photocathodes.

Recommendations From Last Godparent Review

1. **To fully comprehend and exploit the measurement results from the exciting new tools being developed in the photocathode lab and the user facility effort, further theoretical input is needed. We recommend redoubling efforts to strengthen such collaboration with theorists, perhaps through invitations to university-based groups. In particular we would like to see the topic requested: *Theory-Driven Materials & Simulation* actually addressed.**

No effort in theoretical work has been done since Klaus left.

2. **The committee notes there was no presentation on dark current and noise rates for the photocathodes presented. Since this is a rather important or even dominant factor in the development of a large area photodetector, we request that a white paper on this subject be prepared by the time of the next review.**

While dark current levels were monitored during photocathode fabrication in PMTs, no systematic studies were done. Photocathode fabrication in the glass chalice is still being refined, and a study of dark current may be possible once an optimized photocathode has been fabricated.

3. **Outfitting, commissioning and maintaining the equipment in the Photocathode Laboratory looks to be a very large endeavor. The committee raised concerns that dedicated engineering and technician staff be committed to this project, to ensure that sufficient technical support is available to permit the scientists to make optimal use of their time and the facilities.**

Jeff Williams, a technician dedicated to the detector group, has been hired.



Recommendations From Last Godparent Review (cont.)

4. **Given the complexity and interplay required for a combined sample preparation, growth, testing and characterization lab, the committee requests a document from the management detailing how the lab will be organized, who will be involved, and how the decision-making process will be realized.**

This continues to be an issue. A full-time person to manage the photocathode effort within the detector group is needed.

5. **Compatibility of the photocathode fabrication with the broader sealed-tube assembly process is a critical issue that should be addressed in close coordination with the development of the vacuum assembly design. In particular, the difference in the temperatures required for the photocathode deposition and tube sealing and necessary cool down periods need to be investigated. We request a detailed test program from the ANL effort that addresses the issues raised.**

This issue was discussed during the Single-Tile Factory review, and I refer you to the report and responses/mitigation from that review.



Summary

- Significant progress has been made since the last GP Review – facility, photocathode in PMTs, and glass chalice.
- The photocathode recipe from Burle PMTs has been scaled up to 4”x4” and 7” photocathodes.
- Theoretical work has come to a grinding halt.
- The management of the ANL Photocathode effort within the Detector Group is still an issue.

