

PhotoCathode Godparent Review Summary

Review held: 9-JUL-2012

Members in Attendance: Kathy Harkay (ANL/APS), Jeffrey Elam (ANL/ES), John Noonan (ANL/APS), Anton Tremsin (SSL), Gary Varner (Hawaii), Matt Wetstein (ANL/UC)

The committee acknowledges the significant progress that has been made in the year since the last review, some of the notable and impressive highlights are:

- 1. Fabrication and characterization of 8" Photocathodes at SSL**
- 2. Expertise developed in PC deposition at ANL with the Burle + Chalice system**
- 3. Encouraging results in UV amorphous GaInN PCs at Wash U**

These outstanding achievements are essential to completing the initial project plan of fielding a first 8" MCP-PMT, and laying the ground work for a next phase of further Photocathode development. We note, however, the significant impact of the loss of Klaus Attenkofer in terms of nurturing theoretical input and applying fundamental material science to understanding Photocathodes. This reduced program scope has focused the activities in the near term, though in the longer term, a broader scientific program is desirable.

With the approach of the end of year 3 of the initial 3 year mandate, now is a logical time to address where the Photocathode effort is going. With this guidance, the committee makes the following recommendations and requests for further information.

1. In the near-term, the large-chamber Photocathode deposition and hot-seal system at SSL will be the only viable way to make first-article 8" LAPPDs. Therefore this effort must be funded at a level sufficient to ensure that prototypes continue to be made available until either commercialization and/or the Single Tile Factory (STF) is a viable alternative.
2. Beyond this, the committee notes that there was a clear lack of vision from the LAPPD project management on how resources should be allocated going forward. At this stage the committee notes that it makes little sense to discuss PC development plans in the abstract, since it will clearly be tied to the next stage of ANL-centered effort. Specific questions that the committee would like answered are:
 - a. The progress and experience gained with the chalice have been impressive; however how does this effort tie into what is needed next?
 - b. Can the PC component of the STF be developed separately (initially)?
 - c. What is the role of the STF if a vendor starts to make LAPPDs?
 - d. How will the cathode material for PMT production in the STF be downselected?
 - e. Are the resources available sufficient to bring the STF online? And by when?
 - f. When will the responses to the STF review committee comments be available?
3. The committee strongly recommends that a resource-loaded schedule for the STF be provided, so that the integration and viability of the PC program therein can be assessed.

4. Progress with the chalice has been impressive. To obtain the full measure of repeatability and process control, we strongly recommend that additional instrumentation be added to this set-up. In many cases these can be data loggers and sensors that can be moved or replicated on the modular STF system later.
5. Since it is expected to take time to gain experience solving the problems of an 8" PC, we strongly recommend building this modular component first, and operating it initially independently (and with as much monitoring instrumentation as is feasible), to learn what it takes to make a 20% quantum efficiency PC in that environment. Wherever possible, lessons learned from the construction and operation of the SSL chamber should be married to the valuable experience gained with the chalice operating on the Burle system. An adiabatic transfer of operations from the chalice to this new system is recommended.
6. As noted above, the intellectual leadership of the fundamental science component of the PC effort has moved to BNL. The committee realizes that it is ineffective to recommend collaboration in this effort without a clear leader at ANL. Therefore we recommend that such a person be identified at ANL and supported at a level to make collaboration on the fundamental science aspects of Photocathode development viable.
7. We reiterate that tighter coordination of the GaInN fabrication with measurement capabilities at ANL, perhaps through more regular visits by Daniel Leopold to the lab, is strongly encouraged.
8. Given the intimacy of the packaging to the growth of a successful PC, going forward, it may make more sense to merge, or at least have this committee meet jointly with the hermetic packaging (and standing STF review?) committee.