

# Summary of the workshop on “X-ray Optics and Ray Tracing: Status and Needs”

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## I. INTRODUCTION

A workshop on X-ray Optics and Ray Tracing was held at the Synchrotron Radiation Instrumentation conference held at Argonne, on October 18 1995. The object of the workshop was to exchange experience in ray-tracing calculations between the largest synchrotron radiation facilities. The introduction was carried out by Franco Cerrina, who made a review presentation of SHADOW, the only ray-tracing code that can be used for almost all the synchrotron radiation applications and surely the most wide-spread and complete one. Then a total of seven speakers presented in short talks (20 minutes) their experience in the use of SHADOW at their respective facilities, their developments, suggestions, wishes, and complaints about some points of the package. Some of the presentations are available as contributed papers to the SRI'95 proceedings. In general, the speakers (representing all the U.S. Department of Energy synchrotron radiation sources) felt that the program was an essential part of the facilities experimental development.

## II. SUMMARY OF PRESENTATIONS

F. Cerrina presented an overview of SHADOW, its basic capabilities, its various utilities, and its file structure. He stated that the file I/O nature of SHADOW is a key feature of SHADOW and the root of its flexibility and extendibility; it may be the reason for its long life (more than 10 years) and its present validity. This was confirmed by more than one speaker, and it was concluded that this file-oriented structure must be preserved.

The workshop speakers presented overviews of fields in which SHADOW has proven to be extremely useful. At every facility, a large number of beamline optics has been designed and verified using the program. The presentations included applications in:

1. mirror optics, from microscopes to x-ray lithography beamlines
2. grating monochromators, fixed and variable line spacing
3. capillary optics
4. crystal optics, both in reflection and transmission
5. polarized sources and polarization transfer

The overall consensus of the workshop speakers was a universal agreement for continuing to support SHADOW in the synchrotron radiation community. Current limitations (see below) are perceived as a growth opportunity for the program, and the continued need for the availability of the program was reaffirmed.

## III. RECOMMENDATIONS FROM THE WORKSHOP ORGANIZERS

The workshop organizers agreed that the free distribution policy of SHADOW should be maintained. The possibility for asking for a contribution from each laboratory using SHADOW has been rejected due to the fact that almost all the users are from nonprofit research laboratories maintained by government funds. It was agreed that a full-time person to take care of the distribution, new version releases, contact with the users, and to write and update documentation is necessary.

Most users want a graphical interface for SHADOW, but there exists no consensus on the choice of interface software (TCK-TL, IDL, Mathematica, MATLAB, etc.). Moreover, this project would require at least two man years of effort to complete, which is not presently available. The recommendation of the workshop organizers is that the developers should concentrate their efforts on the core routines in SHADOW, maintaining the present interface. SHADOW users can and should be encouraged to contribute graphical applications on their preferred platforms and software package and to develop pre- and post-processors for their specific needs. This is effectively possible due to the file-oriented structure of SHADOW, and it was also demonstrated by several speakers.

The workshop organizers want to stress to the SHADOW users community that SHADOW is really a quite “open” code, and user contributions are not only possible but also encouraged. Whereas the SHADOW developers control the “official” code revisions and releases, anyone can contribute routines or interfaces. User contributions that are especially useful and of general applicability may be incorporated (with the obvious author’s agreement and collaboration) to the official version, after exhaustive testing, debugging, and multi-platform support. One very effective way of getting these routines incorporated into “official” SHADOW is for

the contributor to visit the developers and participate in the incorporation of their code.

Recommendations can be summarized in the following points:

1. Maintain SHADOW source at one location (University of Wisconsin) as is done now.
2. Develop a WWW site for SHADOW, based at the University of Wisconsin. The WWW site would allow SHADOW users to contribute routines, interfaces, etc., that all users could retrieve (repository). Also, the WWW site should include a location for SHADOW users to store SHADOW input files and documentation for any sources or beamlines that they may wish to contribute to the SHADOW community.
3. Generate an e-mail list (e.g., an e-mail listserver) of SHADOW users for the purpose of inter-communication of problems and developments regarding SHADOW. This would provide a means for users to easily direct questions to and receive answers from the entire SHADOW community. The answering of questions and the solution of problems would be more efficiently, and more evenly, shared

within the SHADOW community. These questions/answers should be archived, and in a short time a FAQ (frequently asked questions) list on SHADOW would be available.

4. Hire a support staff to help users, new and old, with general problems regarding the installation and use of SHADOW and SHADOW program development. The Department of Energy is identified as the most likely source of support, since the main users are the DOE national laboratories. The DOE lab-based nature of the activity will provide continuity for the support of SHADOW. In addition, other possible financial sources (as the NATO or the European Union support) should be solicited, possibly for a post-doc position dedicated to SHADOW program development.
5. The present workshop has proven very useful, and other annual or biannual meetings of this type should be studied. Consider, for example, a "SHADOW school" (e.g., a NATO summer school course for Europe, "short courses" at U.S. facilities users' meetings and at national and international SRI conferences).