ARGONNE NATIONAL LABORATORY

HIGH ENERGY PHYSICS DIVISION

ARGONNE WAKEFIELD ACCELERATOR

UNREVIEWED SAFETY ISSUE DETERMINATION (USID)

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Introduction

If an activity at AWA has the potential to go beyond the scope of the approved safety envelope as defined by the SAD, then it shall be reported to and reviewed by the Division Safety Officer (DSO) and/or Division Director (DD). The DSO and/or DD will initiate a process to determine if there are inadequacies, and subsequently resolve them.

The AWA facility is relatively small and flexible. There are no outside "users", in the sense that there are "users" in larger facilities. The AWA group members are the people running the facility and carrying out the experiments. Occasionally there are collaborators that come from other institutions to do joint experiments with AWA. Any installation of equipment or modifications in the facility are done by AWA personnel, and these are always discussed in the weekly Monday morning group meeting. Thus, the entire group, including students and possibly collaborators, are fully aware of any changes in the facility and any implications that these changes may cause.

In terms of generated radiation, it is basically not possible to exceed the Accelerator Safety Envelope (ASE) without major facility upgrades. The maximum beam energy that can presently be achieved is approximately 15 MeV, which is well below the 20 MeV specified in the ASE. To increase the beam energy it would be necessary to have more rf power available, by adding a second klystron to the facility, or to replace the present linac structures with other ones of higher shunt impedance. The maximum charge generated in each rf pulse is presently 150 nC, well below the 400 nC specified in the ASE, and is limited by the quantum efficiency of the photocathode and the amount of laser energy in each pulse. The maximum repetition rate is set by the rf and laser systems, both capable of reaching 10 pps, which is also much lower than the 30 pps specified in the ASE.

Thus, in the absence of major facility upgrades, the safety analysis of new experiments and modifications in the facility is, in practice, focused on non-radiation related issues: electrical safety, soundness of mechanical structures, use of compressed gases, etc.

Classification of Experiments and Facility Modifications

The AWA beamline is modified quite often, because most of the activities in the facility are the testing of various wakefield structure prototypes. Each of these wakefield structures is installed in the beamline for a few weeks, and the AWA beam is passed through the structure to test its rf properties. The installation and testing of these structures is relatively simple and does not imply any new safety hazards. (Hereafter experiments and facility modifications are referred to simply as modifications.)

Modifications in the AWA facility are divided into three categories:

1. Modifications that are clearly within the scope of experiments described in the SAD. These

are, for the most part, the installation and testing of new wakefield structures or beam diagnostics in the beamline, and they only need to be approved by the AWA group leader.

2. Modifications which are within the intent of the SAD but are not explicitly described. These comprise more than the simple removal and installation of beamline components. And, although clearly within the ASE, may involve a substantial new installation or the use of uncommon equipment in the AWA vault. Modifications in this category need to be approved by the DSO.

3. Modifications which are not clearly within the intent of the SAD should be referred to a review committee, with the approval authority being the Division Director (DD) or an individual to whom the DD has formally delegated that authority.

The group leader will determine the classification of a modification after consultation with other scientific and engineering staff members of the project. The vast majority of modifications will fall under category (1) and will require no special approval by the DSO or DD.

Category (2) modifications will be communicated to the DSO by the AWA group leader. They will be reviewed by the DSO, who can obviously request assistance from other personnel, to determine if the modifications have any negative impact on the safe operation of the facility, and if any preventive measures are needed. Records of the final approval by the DSO will be kept.

Category (3) modifications will be reviewed by a committee at the request of the DD, and may trigger a review and update of the SAD. Records of the safety review performed by the committee will be kept, as well as records of the final approval by the DD.