# AbstractID: 4563 Title: Plastic scintillator preparation and coupling in scintillation dosimetry

**Introduction:** One way to improve the performance of scintillation dosimeters is to increase the light collection efficiency at the coupling interfaces of the detector. The present work present a detailed study of scintillating fiber preparation and their coupling to clear optical fibers in order to minimize light losses and to increase the light signal collected.

**Methods and Materials:** Surface polishing with aluminum oxide sheets, reflector coating with MgO and use of eight different coupling agents (air, three optical gels, optical curing, ultraviolet curing, cyanoacrylate glue and acetone) were considered. For each coupling technique, ten samples were prepared. The procedure followed was: first, both the scintillating fiber and the optical fiber were cut. Then, each extremity was cleaned and polished. Finally the coupling between the scintillating fiber and the optical fiber was made either in a polyethylene cylinder or in a V-grooved support depending on the kind of coupling agent used. To produce a large quantity of light, a UV lamp was used to stimulate scintillation.

**Results:** A typical series of similar couplings showed a standard deviation equal to 10 %. This can be explained by the difference in the surface quality and the alignment of the scintillating fiber over the optical fiber. Surface polishing improves the light collection by approximately 65 % and a reflective coating on the distal end of the scintillator by approximately 40 %. For the coupling agents, the best results were obtained using an optical gel.

**Conclusion:** In plastic scintillation dosimetry, there is usually a compromise to be made between the spatial resolution of the probe (i.e. its size) and the total signal collected by the photodetector. Since a large amount of the light produced inside the scintillator is usually lost, a better collection efficiency will result in improved spatial resolution for a given signal intensity.