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Tailoring the Radiation Hardness of Fused Silica

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Imaging Cherenkov detectors play an important role in modern particle and nuclear physics experiments. DIRC-type Cherenkov counters offer the advantage of a very compact detector design by employing solid radiator materials. The optical quality of such materials is paramount and has to withstand the radiation environment of modern high luminosity experiments without significant degradation.

The upcoming PANDA experiment at FAIR will rely on DIRC counters for precision particle identification over a wide momentum range. Synthetic fused silica is the radiator material of choice for these detectors. Investigations of the radiation hardness of different types of fused silica showed significant differences especially in the blue-UV region.

Radiation hardness studies on different types of Heraeus Suprasil fused silica led to the discovery of defect mechanisms that are well known for UV laser irradiation also being present for ionising radiation.

Evidence for these defect mechanisms and the relevant parameters that govern them will be presented. Using these results the composition of synthetic fused silica can be adjusted to improve its radiation hardness according to experimental requirements.

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plenary

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