



- 1 Inner part of the cryostat
- 2 Fiber coil at the cryostat

IRRADIATION AT CRYOGENIC TEMPERATURE

Nuclear Effects in Electronics and Optics

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Fraunhofer INT provides a cryostat for irradiation tests at low temperatures. During irradiation temperatures from 20 K to 350 K can be obtained.

So far the current setup has been used to investigate the radiation induced attenuation of glass fibers at a Co-60 gamma source. The optical fiber coil is placed inside a helium-filled sample chamber (\varnothing 120 mm, height 50 mm). The helium is used as exchange gas and provides a uniform temperature distribution within the fiber. Capillaries (\varnothing 2 mm) lead the optical fiber from the sample chamber to the outside. The measurement can thus take place online during the irradiation.

Glass fiber at low temperature

Optical fibers are routinely used in harsh environments for signal transmission or sensor applications, for example in space or in accelerators such as the Large Hadron Collider (LHC) at CERN. Besides very high or very low temperatures the optical fibers are

exposed to vacuum and ionizing radiation. Isolated, these influences have been extensively studied for their effect on optical fibers, but in combination their effect has not been fully tested.

However, the effect of the low temperature is tremendous. The figure below shows the radiation-induced optical attenuation of the standard SMF fiber 28e. It is seen that the attenuation at low temperature (green) is up to 1000-times greater than at room temperature (orange). At low temperatures, the fibers are thus considerably more sensitive to radiation.

