

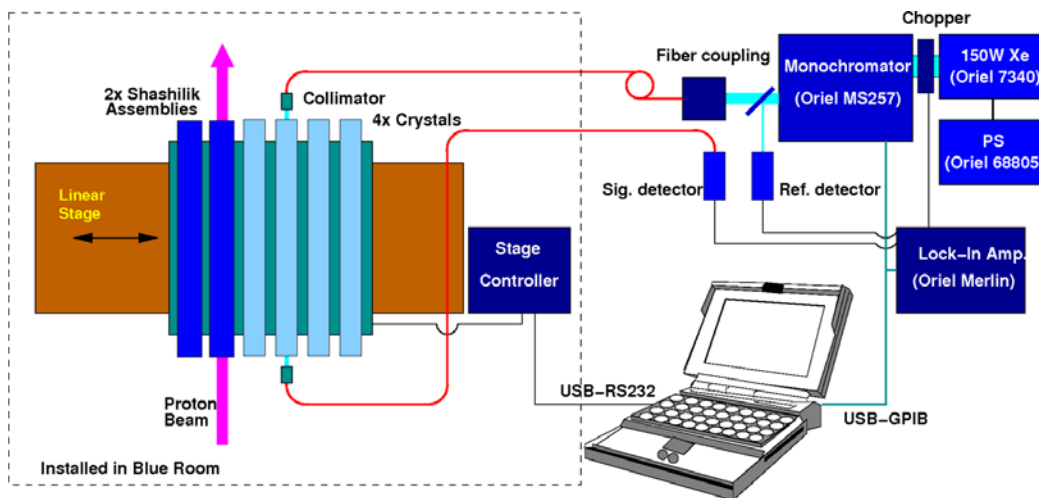
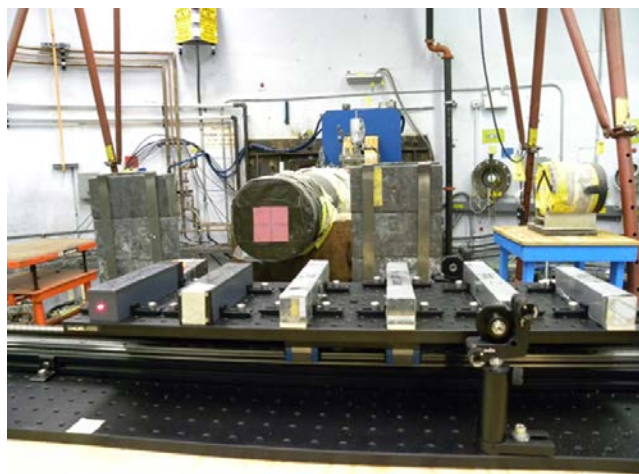
Radiation Damage Induced by 800 MeV Protons in Fast Crystal Scintillators

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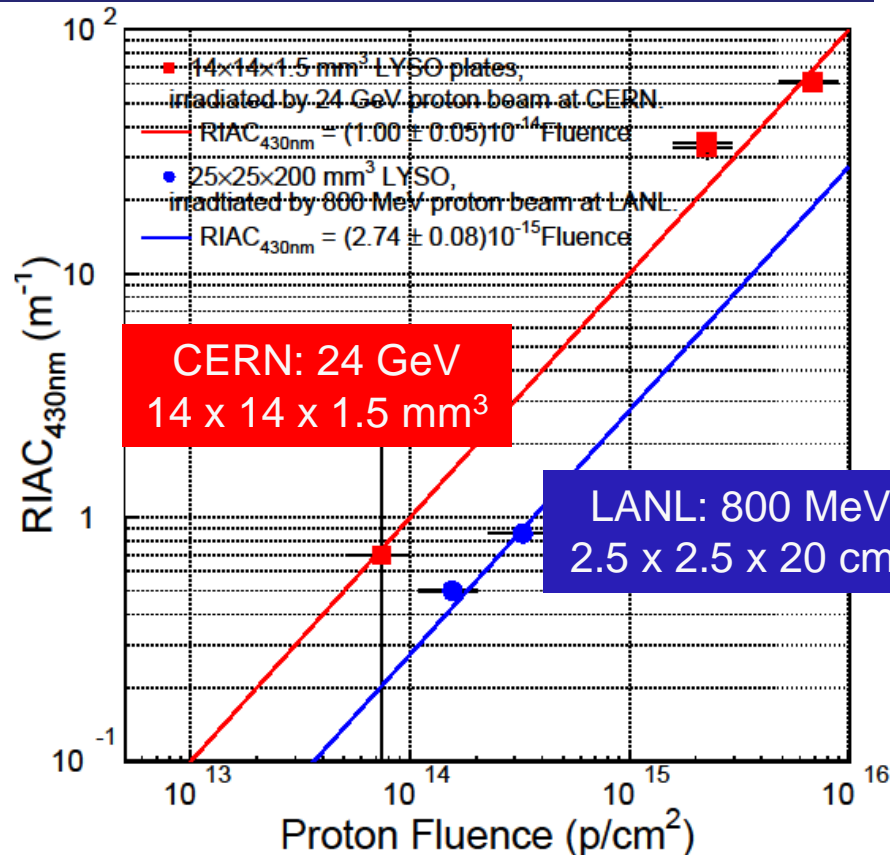
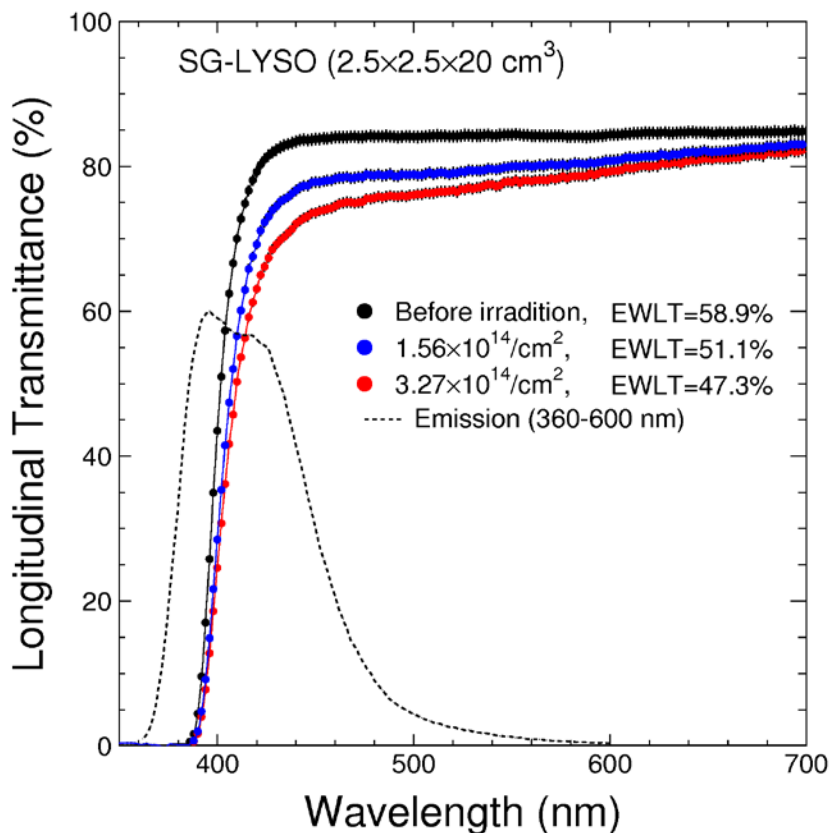
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- Six samples were loaded on a remote controlled linear stage: one LYSO/W/Y-11 Shashlik cell, one box containing four 6 cm long sealed capillaries and three Y-11 WLS fibers and four large size crystals (LYSO, LFS, BGO and CeF_3).
- An optical fiber and lock-in amplifier based spectrophotometer used to measure longitudinal transmittance (LT) of crystal samples before, during and after irradiations.
- Because of a power blackout, only the box, LYSO and CeF_3 were irradiated with a fluence of 2.7, 3.3 and 1.4×10^{14} p/cm² respectively.

Radiation Damage in Fast Crystal Scintillators Induced by 800 MeV Protons

- The LYSO of $2.5 \times 2.5 \times 20 \text{ cm}^3$ was irradiated to $3.3 \times 10^{14} \text{ p/cm}^2$.
- The emission weighted radiation induced absorption (EWRIAC) is about 1 m^{-1} , indicating excellent radiation hardness of LYSO against charged hadrons.
- The result is consistent within a factor of 3 with $14 \times 14 \times 1.5 \text{ mm}^3$ LYSO plates irradiated up to $7 \times 10^{15} \text{ p/cm}^2$ by 24 GeV protons at CERN.



Scintillators Induced by 800 MeV Protons

- An order of magnitude larger absorption was observed in the CeF_3 of $2.2^2 \times 2.6^2 \times 15 \text{ cm}^3$, after $1.4 \times 10^{14} \text{ p/cm}^2$ irradiation, partly due to its poor quality since it was grown 20 years ago. More test with optimized samples is needed.
- Two quartz capillaries filled with DSB based liquid scintillator show consistent emission spectra, measured 76 days after an irradiation of $2.7 \times 10^{14} \text{ p/cm}^2$ as compared to un-irradiated one.

