GlueX Document
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Photon Yields - Various Lead Glasses

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At our recent collaboration meeting we discussed the possibility of using radiation hard lead glass for the central region of FCAL. In Figure 1 we show the transmission as a function of wavelength for a new lead glass bar of the type used in E852 and Radphi, a bar of the same type that was damaged by radiation in Radphi and for F101[1]. The Radphi block transmission measurements were made through 4 cm of glass (the transverse dimension) using a spectrophotometer. The transmission recorded by the spectrophotometer is not corrected for losses due to reflections. Ignoring any absorption of light in the glass, the fraction transmitted accounting for reflections at two surfaces should be $(4n/(n+1)^2)^2$ or 89.1% for $n = 1.62$. The radiation damaged block measurement was made a 2.5 cm from the upstream end of the bar where the darkening was maximum.

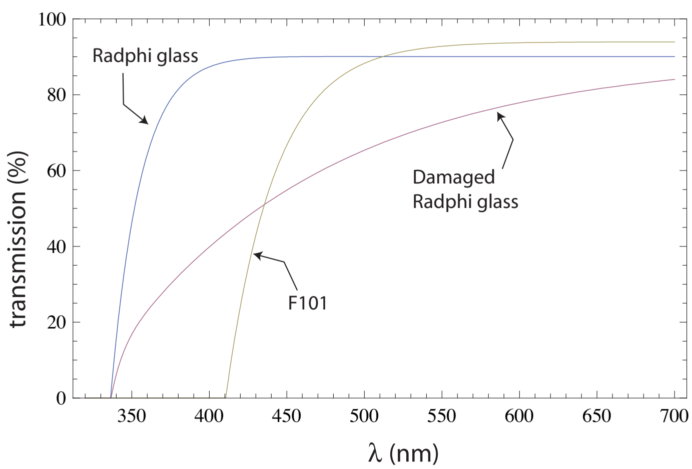

Figure 1: Transmission as a function of wavelength for a new lead glass bar of the type used in E852 and Radphi, a bar of the same type that was damaged by radiation in Radphi and for F101.

The absolute quantum efficiency of three FE-84-3 phototubes was measured for us[2] by Hamamatsu. The curve in Figure 2 is a fit to the quantum efficiency measurements presented in reference 2. Figure 3 shows the relative photon yields for the the Radphi and F101 transmissions, convolved with the expected Cerenkov light yield ($\propto 1/\lambda^2$) and the quantum efficiency. The integrals of these curves for the undamaged Raphi block to the damaged blocked to F101 are in the ratio of 1.0:0.60:0.55.

[1] The data for the F101 was obtained from a plot in the talk by A. Vandenbrouke and C. Miller titled *Simulation of the HERMES Lead Glass Calorimeter Using a LUT* at the XIIth International Conference on Calorimetry in High Energy Physics, Chicago, June 2006

[2] B. B. Brabson *et al*, Nucl. Instr. and Meth. **A332** (1993) 419.

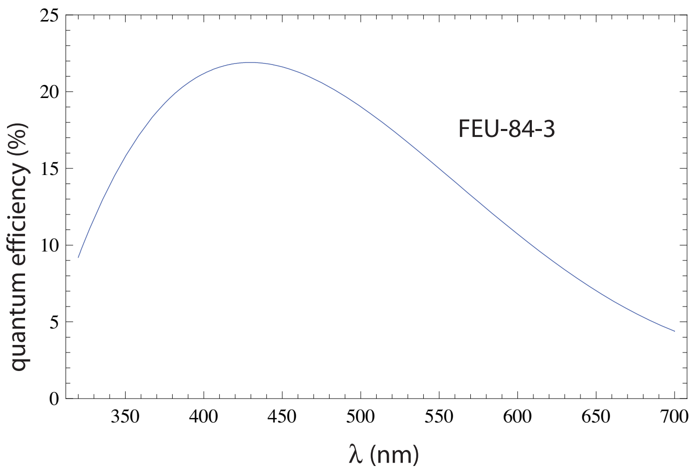

Figure 2: Caption Quantum efficiency of the FEU-83-4 as a function of wavelength. See reference 2 for details.

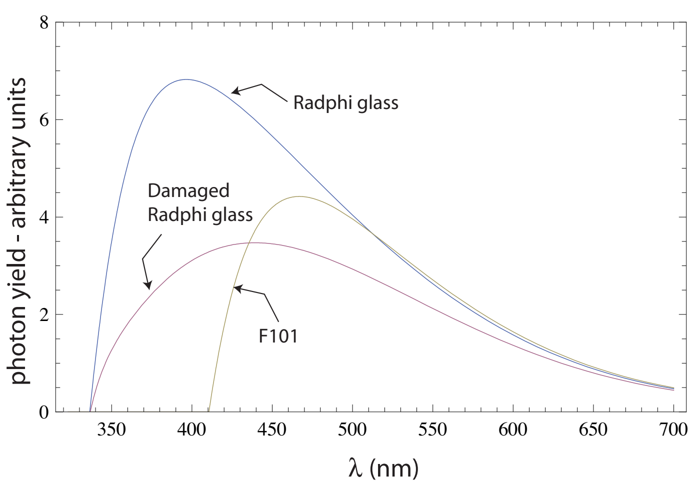

Figure 3: The relative photon yields for the the Radphi and F101 transmissions, convolved with the expected Cerenkov light yield ($\propto 1/\lambda^2$) and the quantum efficiency. The integrals of these curves for the undamaged Raphi block to the damaged blocked to F101 are in the ratio of 1.0:0.60:0.55.