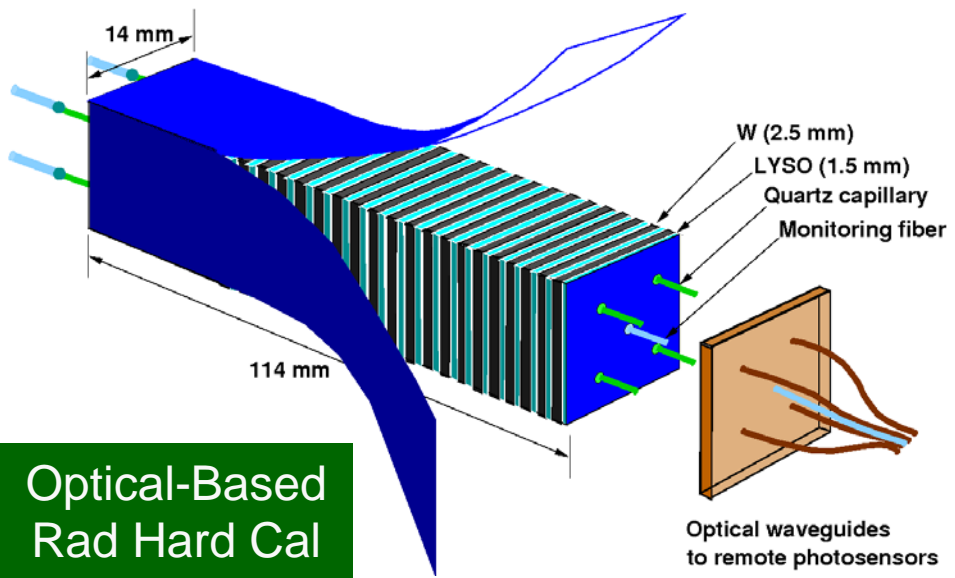
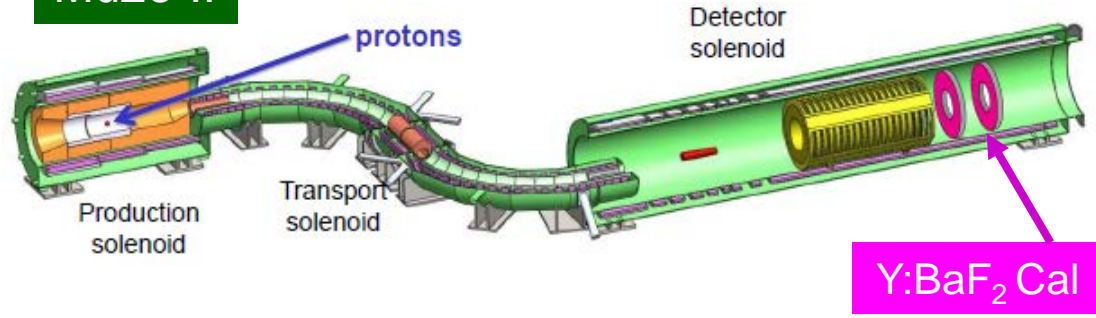


Ultrafast Barium Fluoride Crystals for Future HEP Experiments (I)

With sub-ns decay time/FWHM pulse width and excellent radiation hardness BaF_2 is an ultrafast inorganic scintillator for future HEP calorimeters at the energy and intensity frontiers

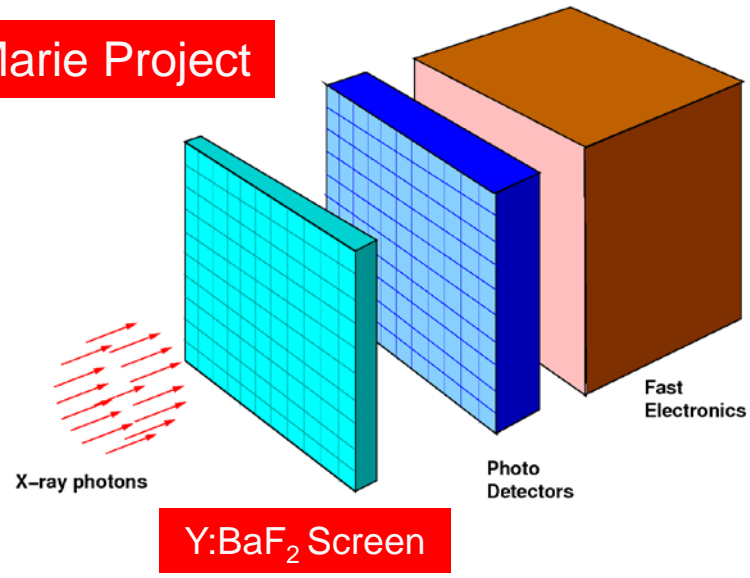
Yttrium doping is found effective in suppressing the slow scintillation component with 600 ns decay time in BaF_2 . $\text{Y}:\text{BaF}_2$ is also attractive for an ultrafast front imager for the FEL based GHz hard x-ray imaging.

Mu2e-II

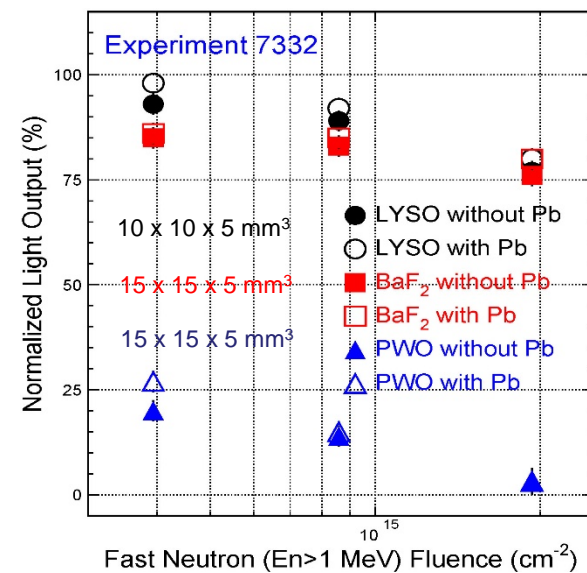
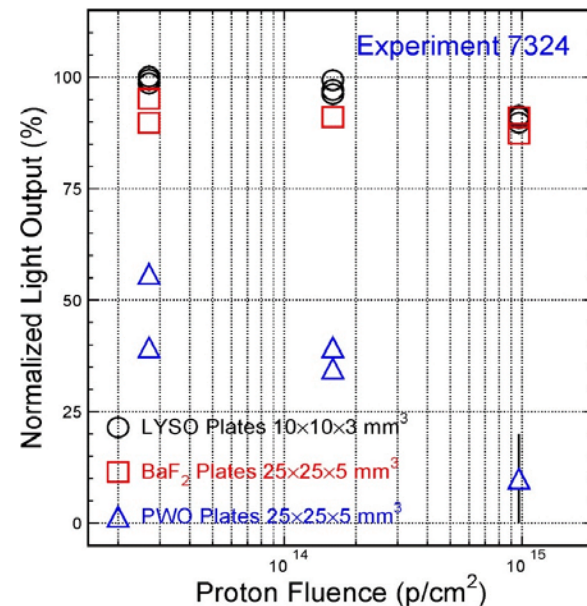
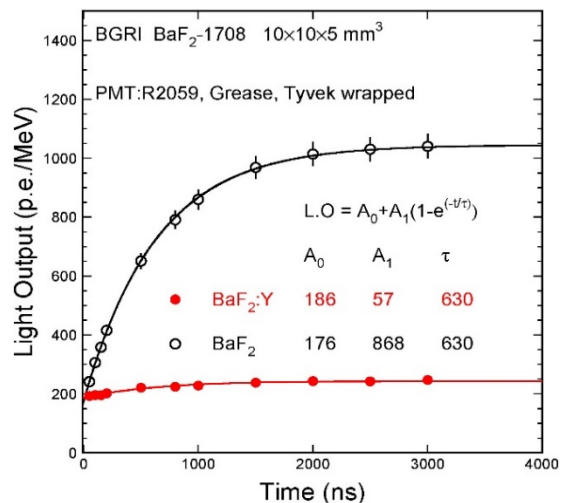
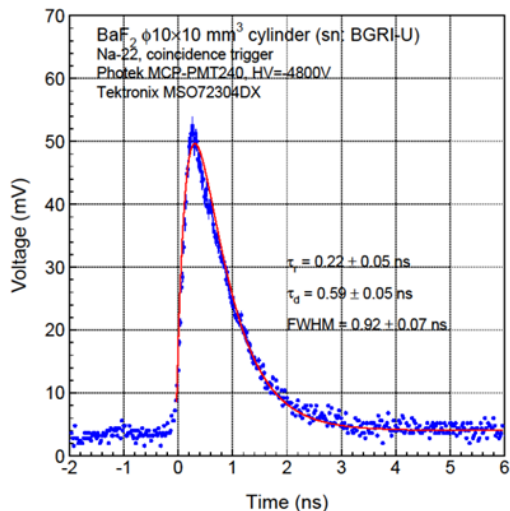


Optical-Based Rad Hard Cal

Marie Project



Ultrafast Barium Fluoride Crystals for Future HEP Experiments (II)



	LYSO:Ce,Ca	ZnO:Ga	BaF ₂ :Y	YAP:Yb	LuAG:Ce	LaBr ₃ :Ce
Density (g/cm ³)	7.4	5.67	4.89	5.35	6.76	5.29
Melting Points (°C)	2050	1975	1280	1870	2060	783
X ₀ (cm)	1.14	2.51	2.03	2.77	1.45	1.88
R _M (cm)	2.07	2.28	3.1	2.4	2.15	2.85
λ ₁ (cm)	20.9	22.2	30.7	22.4	20.6	30.4
Z _{eff}	64.8	27.7	51.6	31.9	60.3	45.6
dE/dX (MeV/cm)	9.55	8.42	6.52	8.05	9.22	6.9
λ _{peak} ^a (nm)	420	380	300 220	350	520	360
Refractive Index ^b	1.82	2.1	1.5	1.96	1.84	1.9
Normalized Light Yield ^{a,c}	100	6.6 ^c	1.7 4.8	0.19 ^e	35 ^f 48 ^f	153
Total Light Yield (ph/MeV)	30,000	2,000 ^e	2,000	57 ^e	25,000 ^f	46,000
Decay Time ^a (ns)	40	<1	600 0.6	1.5	820 50	20
Light Yield in 1 st ns (photons/MeV)	740	610 ^e	1200	28 ^e	240	2,200
40 keV Att. Length (1/e, mm)	0.185	0.407	0.106	0.314	0.251	0.131