

EMC Discussion Slides

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Issues for TDR

- ▶ Shipping/refurbishing of barrel
 - ▶ Does it need to be disassembled for shipping?
 - ▶ Do we need to change preamps (this is baseline)
 - ▶ Do we need to change PIN diodes (this is not baseline)
- ▶ Does backward EMC capture beampipe (this is baseline)?
- ▶ What should we include for alternative forward technology?

Crystal properties

Crystal	LY ¹	X_0 cm	r_M cm	Rad hard	$d(LY)/dT$ %/°C	τ_{decay} ns	λ_{max} nm
NaI(Tl)	1	2.59	4.13	no	-0.2	230	410
LYSO(Ce)	0.83	1.14	2.07	yes	-0.2	40	402
CsI(Tl)	1.65	1.86	3.57	no	0.3	1300	560
CsI	0.036	1.86	3.57	maybe	-1.3	35	420
BGO	0.21	1.12	2.23	maybe ²	-0.9	300	480
PbWO ₄	0.0029	0.89	2.00	no	-2.7	10	420

(Mostly from RPP)

¹Relative to NaI(Tl), small crystals, corrected for QE, room T

²Initial loss of LY, then stable at high doses (10s of Mrad)

Technical Possibilities – Forward EMC

1. Baseline: LYSO with new mechanical support structure
2. Alternatives:
 - 2.1 LYSO in BaBar support structure
 - 2.2 Partial BaBar CsI(Tl), LYSO in BaBar support structure
(Variants: staged upgrade approach; Could be in new structure as “complete” upgrade.)
 - 2.3 BGO in new mechanical support structure
 - 2.4 BGO in BaBar support structure
 - 2.5 Pure CsI in BaBar support structure

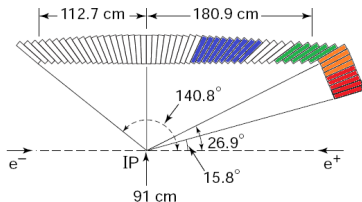
	LYSO	LYSO/CsI(Tl)	BGO	Pure CsI
New Support	baseline		alternative	
BaBar Support	alternative	alternative	alternative	alternative

(LYSO and BGO in BaBar support would be four crystals per cell.)

Crystal cost summary

Option	Number of New Crystals	New Crystal Volume (cc)	Cost/cc (\$)	Crystal Cost (M\$)
Pure CsI	900	680140	7.35	5.00
LYSO full	3600	330559	25.00	8.26
3 CsI(Tl)/6 LYSO	2160	195590	25.00	4.89
4 CsI(Tl)/5 LYSO	1760	156412	25.00	3.91
5 CsI(Tl)/4 LYSO	1360	118672	25.00	2.97
BGO	3600	330000	9.00	2.97

[All assume reuse of BaBar supports; no readout costs are included.]



Radiation

Needs to be updated to latest background estimates

- ▶ Radiative Bhabha: 3 krad/yr (?)
 - ▶ $1 \text{ yr} = 2 \times 10^7 \text{ s} \Rightarrow 0.6 \text{ rad/hr}$
 - ▶ Times 5 implies design for 3 rad/hr
- ▶ Other sources (neutrons, Touschek, beam gas, ...)
 - ▶ Comparable contribution(?), implies design for 3 rad/hr
- ▶ Total dose rate to design to: 6 rad/hr (?)
- ▶ Issues
 - ▶ Machine physics
 - ▶ Variation with time
 - ▶ Effect on uniformity

BaBar radiation

