

# Baseline for forward EMC in TDR

## Introduction

Frank Porter

Caltech

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# Forward EMC Advisory Committee

## Advisory Committee on Forward Technology

Giuseppe Finocchiaro

Chris Hearty, chair

Eugenio Paoloni

Matteo Rama

Bill Wisniewski

Thanks!

# Forward technology – Background

- ▶ LYSO in a thin structure is technically optimal for forward EMC. This is current baseline
- ▶ If we can't mitigate backgrounds, the barrel performance is degraded, and a highly performant forward calorimeter is difficult to justify (i.e., pay for).
- ▶ Alternative forward schemes under discussion:
  - ▶ Use BaBar endcap structure
    - ▶ Flexible enough to accommodate all crystal options
  - ▶ Hybrid LYSO/existing *BABAR* endcap crystals
  - ▶ Pure CsI
  - ▶ BGO
  - ▶ PWO

## Charge for advisory committee

Provide input on the following questions:

1. Five times background seems to be a reasonable criterion for radiation hardness, providing a safety margin for the survival of the detector. However, as a criterion for optimizing detector cost/performance, this seems less clear. What should the criterion be for this optimization?
2. Can the present backgrounds be significantly mitigated?
3. A set of costs for various forward calorimeter technologies has been developed, based on some assumptions. Are these assumptions and costs plausible? If not, what revisions should be made?

The focus should be on the baseline choice in the TDR. Independent of this choice, the TDR will also include a discussion of potential alternatives and the R&D being pursued.

TDR draft (text) deadline is Elba meeting

## REFERENCE SLIDES

## Reference - Crystal Properties

Crystal	LY <sup>1</sup>	X <sub>0</sub> cm	r <sub>M</sub> cm	Rad hard	d(LY)/dT %/°C	τ <sub>decay</sub> ns	λ <sub>max</sub> 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	rate dep.	-0.9	300	480
PbWO <sub>4</sub>	0.0029	0.89	2.00	rate dep.	-2.7	10	420

(Mostly from RPP)

<sup>1</sup>Relative to NaI(Tl), small crystals, corrected for QE, room T

## Reference - Some cost estimates

Option	Number of new crystals	New crystal volume (cc)	Crystal cost/cc (\$)	Crystal cost (M\$)	Photo-detectors (M\$)	Laser/LED system (M\$)	Mounting structure (M\$)	Total cost (M\$)
LYSO full (baseline)	4500	401622	25.00	10.04	0.57	-	2.27	12.88
LYSO old structure	3600	401622	25.00	10.04	0.57	-	0.25	10.86
Hybrid (CsI(Tl)+LYSO)								
3 CsI(Tl) + 6 LYSO	2160	244734	25.00	6.19	0.49	-	0.25	6.93
4 CsI(Tl) + 5 LYSO	1760	197911	25.00	4.95	0.40	-	0.25	5.60
5 CsI(Tl) + 4 LYSO	1360	153783	25.00	3.84	0.31	-	0.25	4.40
Pure CsI	900	692220	5.09	3.52	0.56	-	0.25	4.33
BGO	4500	392181	9.00	3.53	0.57	1.2-3.0	2.27	7.57-9.37
PbWO <sub>4</sub>	4500	305714	5.00	1.53	0.57	1.2-3.0	2.27	5.57-7.37

(Chih-hsiang Cheng and David Hitlin)