General Overview

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Super B workshop - SLAC 6-9 Oct 2009

OUTLINE

- Introduction to the IFR

- News since Perugia workshop

- Ongoing activities

- Goal for the meeting and plans for the TDR

- Other IFR contributions

THE IFR BASELINE DESIGN

- The muon and K_L detector is build in the magnet flux return.

- It will be composed by one hexagonal barrel and 2 endcaps like in Babar.

- Plan to reuse BaBar iron structure

- Add iron to BaBar stack to improve μ ID:

  → 7-8 detection layers should be enough

- Keep longitudinal segmentation in front of stack to retain K_L ID capability.

A possible (not optimized) configuration

2 cm 14 cm 26 cm 26 cm 10 cm 10 cm
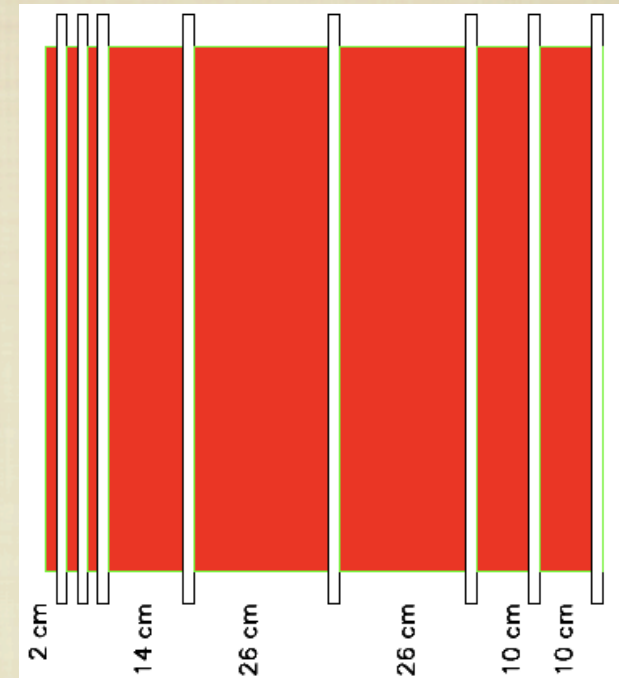
MINOS like scintillators as active material

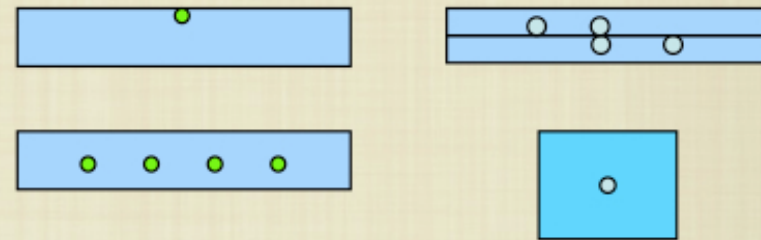WLS fiber

TiO2

to SiPM
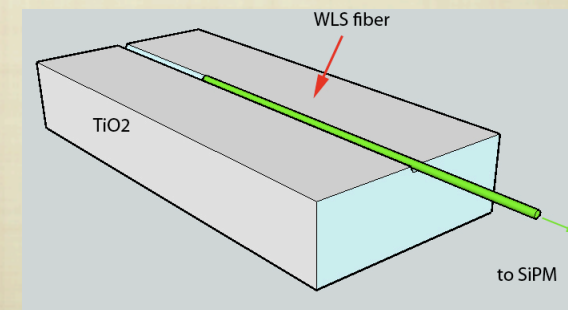
THE SCINTILLATOR BARS

We tested some different layouts
made by the FNAL-NICADD facility

R&D results will be shown in
Wander's talk

We will order soon our own layout for the prototype!!!

THE WLS FIBERS

- Kuraray Y11-175 f=1.2mm, round, double cladding

  - Trapping efficiency = 5.4%

  - Attenuation length ~3.5m

  - Emission peak: 476nm

    Better light yield

    Worst time resolution

    Good for binary readout

- Bicron BCF-92 f=1mm, round, multiclad

  - Trapping efficiency = 5.6%

  - Attenuation length ~3.5m

  - Emission peak 492 nm

    Better time resolution

    Worst light yield

    Good for TDC readout

  - Decay time 2.7 ns (Y11-200 ~10ns)

THE PHOTODETECTORS

- Geiger mode APDs: MPPC (Hamamatsu), SiPM (FBK- IRST)
  - G >10^5
  - DE ≈ 40% (530nm) (DE = Q.E x Fill factor x Aval. prob.)
  - ~ 1ns risetime
  - ≈ 10 times less sensitive to V and T variations w.r.t. APDs
  - Low bias voltage (50-70V)
  - Dark current rate @ room temperature :

$$\begin{cases} \dfrac{\Delta G}{G} = 7 \cdot \dfrac{\Delta V}{V} \\ \dfrac{\Delta G}{G} = 1.3 \cdot \dfrac{\Delta T}{T} \end{cases}$$

$$\begin{cases} \text{100s of kHz thr = 0.5 phe} \\ \text{few kHz if thr = 1.5 phe} \end{cases}$$

MPPC higher gain and Q.E. - SiPM better time resolution

THE NEUTRON ISSUE

- SiPM/MPPC aging tests appeared in literature indicate that neutron irradiation ~~can be~~ *is* an issue.

  See IFR session at Perugia meeting

- Waiting for simulations, in the worst case scenario we have to bring all the photodetectors out of the detector:

  4m of WLS + 10m of clear fibers

  Reduction of factor 2 in number of p.e. to be recovered, keeping the same time resolution

  4 fibers/scintill-bar on 2x2 mm^2 SiPM (or array of 4 1x1 mm^2 MPPC)

  1.2mm fibers (ordered from Kuraray , expected end Feb.)

 1.5mm clear fibers (ordered from Kuraray , expected end Feb.)

  Coupling WLS/clear fiber

  NOT feasible

  see Wander's talk at Perugia meeting

READOUT OPTIONS

- Baseline option: read one coordinate with the bar position and the other with the arrival time of the signal

  - Need a time resolution ~1ns to have ~20cm

  - Read 2 coordinates with the same bar

  - Time distribution helps reducing the SiPM noise

1ns time resolution

1st option TDC readout

2nd option binary readout
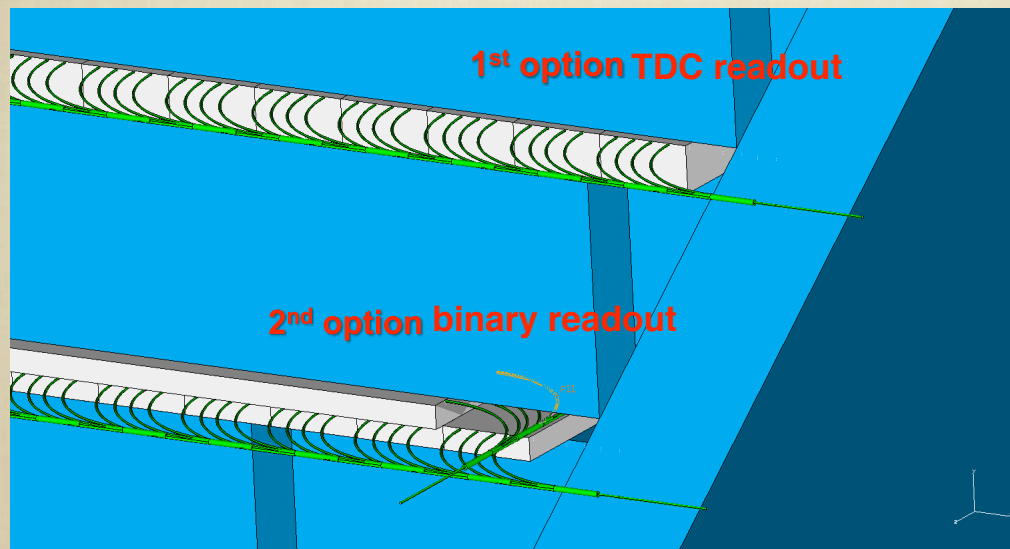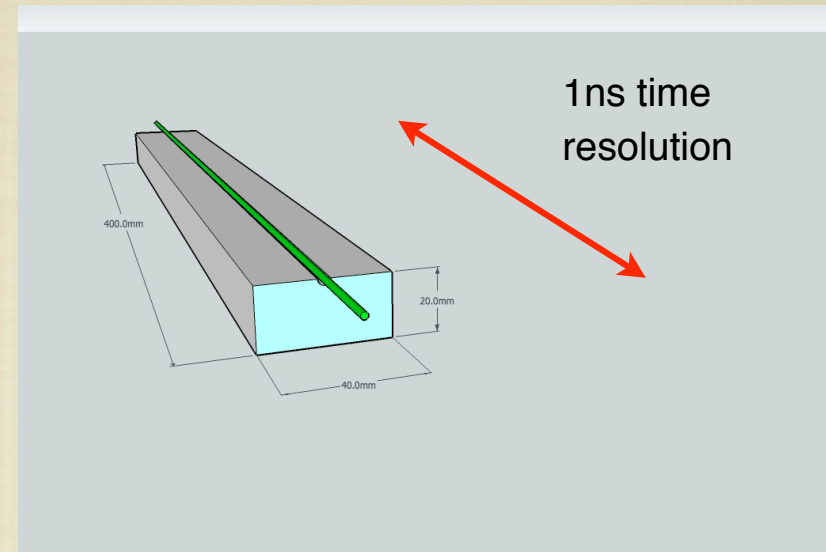
- As 2-nd option we are considering also the "double coord layout": orthogonal scintillator bars, 1cm thick.

  - binary readout (but better spatial resolution)

  - mechanically rather complicated for the barrel)

  - Single counts probably ok with 40MHz sampling

Both will be tested on a full scale prototype

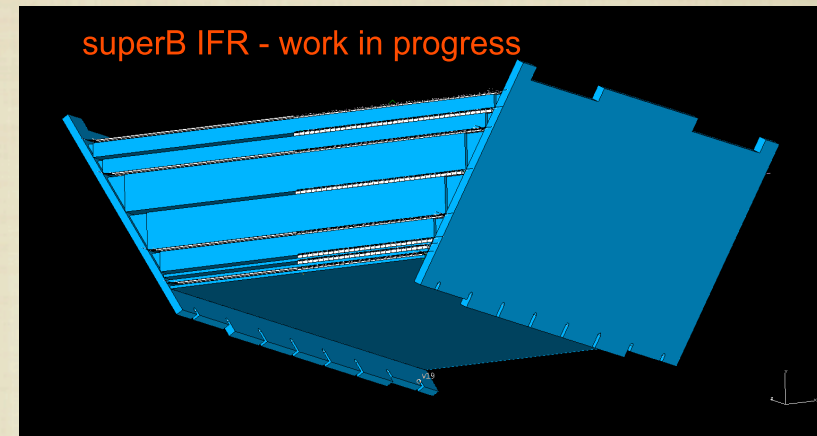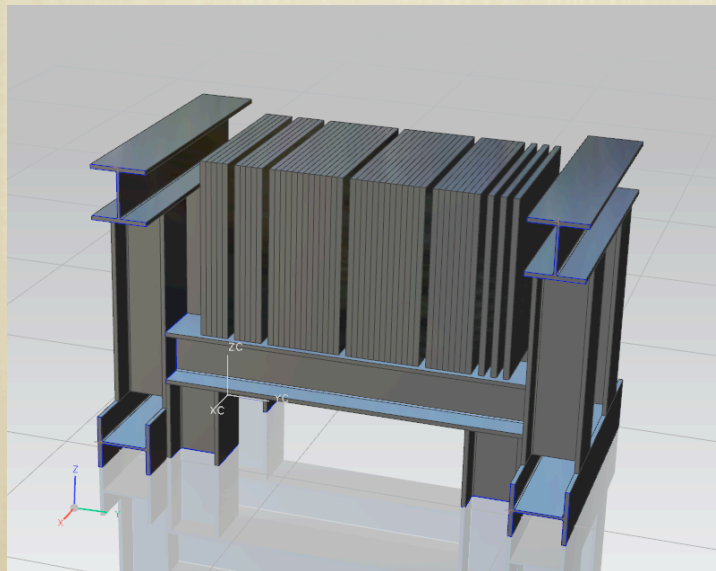# ONGOING ACTIVITIES

R&D

Now that the baseline has been established work on:
- improvements, alternatives
- optimize mechanical coupling

Front end electronics

Optimize performances and design

superB IFR - work in progress

Simulation and detector optimization

Study different detector configurations

Mechanics

Complete the cost evaluation of the BaBar iron reuse

Prototype design

CRITICAL ISSUES AT THE END OF PERUGIA MEETING

- Complete the R&D studies on different readout layouts.

- Impact on performances of different iron layouts.

- Need to finalize the reconstruction code and optimize the detector (geometry, iron, noise tolerance).

- Need to incorporate modifications (due to R&D studies) into the prototype design.

- Neutron background damages on SiPM performances and possible remediation.

FROM PERUGIA TO HERE

- Complete the R&D studies on different readout layouts.

  baseline established

- Impact on performances of different iron layouts.

  preliminary results

- Need to finalize the reconstruction code and optimize the detector (geometry, iron, noise tolerance).

- Need to incorporate modifications (due to R&D studies) into the prototype design.

  many progresses - discussion at this meeting

- Neutron background damages on SiPM performances and possible remediation.

  more analysis needed

GOAL FOR THIS MEETING

Review advancements and achievements in all the development areas

☑ Particular focus on:

➡ detector optimization: preliminary result are expected

➡ prototype design and construction.

☑ Plan for further studies and possible remediation of the effect of the neutron background on the photon detectors.

☑ Review the TDR preparation process and prioritize the short and medium term activities.

TOWARD THE TDR

Now   order scintillators for prototype construction (needed simulation results first)

Fall 2009   finalize prototype design (mechanics and electronics) and begin construction.

January 2010   begin prototype assembly

Spring 2010   prototype test with cosmics

Summer 2010   test beam

A very hot season is waiting for us!

TO MATCH THIS SCHEDULE

- We need to

  - Order scintillators, fibers, SiPM, iron, electronics.

  - Converge on prototype design

  - identify responsible and people for each task (place the orders, prototype design, small parts design, construction, integration, electronics, ...) and assign to each one a precise time schedule. Some of them are clear, other less.

- The sooner the better!

A very hot season is waiting for us!

IFR SESSIONS

16:00->17:30 Parallel - IFR I (Convener: Roberto Calabrese (*FE*))
Description:
Location: Alexander Conference Room
Bldg 280C, Room 206
Meeting ID: 6029
Phone Number: 510-665-5437

16:00 General Overview (15')	Gianluigi Cibinetto (*FE*)
16:20 Status of mechanics for the prototype (10')	Massimo Benettoni (*PD*)
16:35 Status of mechanics for the IFR detector (10')	Massimo Benettoni (*PD*)
16:50 Discussion about prototype construction and test (20')	

08:30->10:00 Parallel - IFR II (Convener: Roberto Calabrese (*FE*))
Description:
Location: Madrone/Pine Conference Room
Bldg 48, Room 224
Meeting ID: 4722
Phone Number: 510-665-5437

08:30 Outline of the IFR prototype electronics (10')	Angelo Cotta Ramusino (*FE*)
08:45 Outline of the IFR DAQ electronics (10')	Angelo Cotta Ramusino (*FE*)
09:00 IFR R&D status in Padova (15')	Flavio Dal Corso (*PD*)
09:20 Fast simulation status (15')	Marcello Rotondo (*PD*)
09:40 Full simulation status (15')	Mauro Munerato (*FE*)

10:30->12:00 Parallel - IFR III (Convener: Roberto Calabrese (*FE*))
Description:
Location: Madrone/Pine Conference Room
Bldg 48, Room 224
Meeting ID: 2115
Phone Number: 510-665-5437

10:30 IFR R&D status in Ferrara (20')	Wander Baldini (*FE*)
10:55 Detector optimization (15')	Gianluigi Cibinetto (*FE*)
11:15 Discussion about detector optimization (15')	

THURSDAY

08:30->10:00 Parallel - Full Simulation (Convener: Fabrizio Bianchi (*TO*) , Andrea Di Simone (*RM2*))
Description:
Location: Madrone/Pine Conference Room
Bldg 48, Room 224
Meeting ID: 6527
Phone Number: 510-665-5437

08:30 Status of core developments (20')	Andrea Di Simone (*RM2*)
08:50 Background tools and recent studies for SVT and DCH (20')	Riccardo Cenci (*PI*)
09:10 IFR simulation status (15')	Mauro Munerato (*PhD student*)
09:25 Planning of future developments (30')	Fabrizio Bianchi (*TO*) , Andrea Di Simone (*RM2*)

08:30->10:00 Parallel - ETD/DAQ ONLINE II (Convener: Dominique Breton (*LAL ORSAY*) , Umberto Marconi (*INFN*) , Steffen Luitz (*SLAC*))
Description:
Location: Redwood C/D
Bldg 48, Room 112C and D
Meeting ID: 3834
Phone Number: 510-665-5437

08:30 Front-end electronics for EMC (15')	Pasquale Lubrano
08:45 Front-end electronics for DCH (15')	Michael Roney (*University of Victoria*)
09:00 Front-end electronics for SVT (15')	Mauro Citterio (*MI*) , Giuliana Rizzo (*PI*)
09:15 Front-end electronics for PID (15')	Christophe Beigbeder (*LAL*)
09:30 Front-end electronics for IFR (15')	Angelo Cotta Ramusino

13:30->15:30 Parallel - DGWG (Convener: Matteo Rama (*LNF*) , Achille Stocchi (*LAL - Univeriste Paris Sud and IN2p3/CNRS*))
Description:
Location: Panofsky Auditorium
Meeting ID: 8052
Phone Number: 510-665-5437

13:30 internal geometry of SVT (20')	Nicola Neri (*Universita' di Pisa & INFN*)
13:50 update on B->tau nu (20')	Alexander Rakitin (*Caltech*)
14:10 G4 studies of forward EMC (TBC) (20')	Stefano Germani (*PG*)
14:30 IFR (20')	Gianluigi Cibinetto (*FE*)

FRIDAY

08:30->10:00 Parallel - Summaries Detector (Convener: Francesco Forti (*PI*) , Blair Ratcliff (*SLAC*))
Description:
Location: Panofsky Auditorium
Meeting ID: 3827
Phone Number: 510-665-5437

08:30 SVT (15')	Giuliana Rizzo (*PI*)
08:45 DCH (15')	Giuseppe Finocchiaro (*INFN - LNF*) , Michael Roney (*University of Victoria*)
09:00 PID (15')	Jerry Va'vra (*SLAC*) , NICOLAS ARNAUD (*LAL ORSAY CNRS-IN2P3*)
09:15 EMC (15')	Frank Porter (*Caltech*) , Claudia Cecchi (*PG*)
09:30 IFR (15')	Roberto Calabrese (*FE*)
09:45 Assembly & Integration (15')	William Wisniewski (*SLAC*)