

## Detector Outlook

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# How are we doing ?

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- ▶ Lots of progress in all areas
- ▶ Continuously growing detector group
- ▶ Still many areas (especially the not glamorous ones) need coverage
- ▶ TDR Progressing rapidly and could be completed in spring 2012 except for:
  - ▶ Some outstanding issues in subsystems. Likely to be addenda for missing pieces.
  - ▶ Cost and schedule require matching to the accelerator development
  - ▶ Financial contributions are not defined and require more time to be understood

# TDR

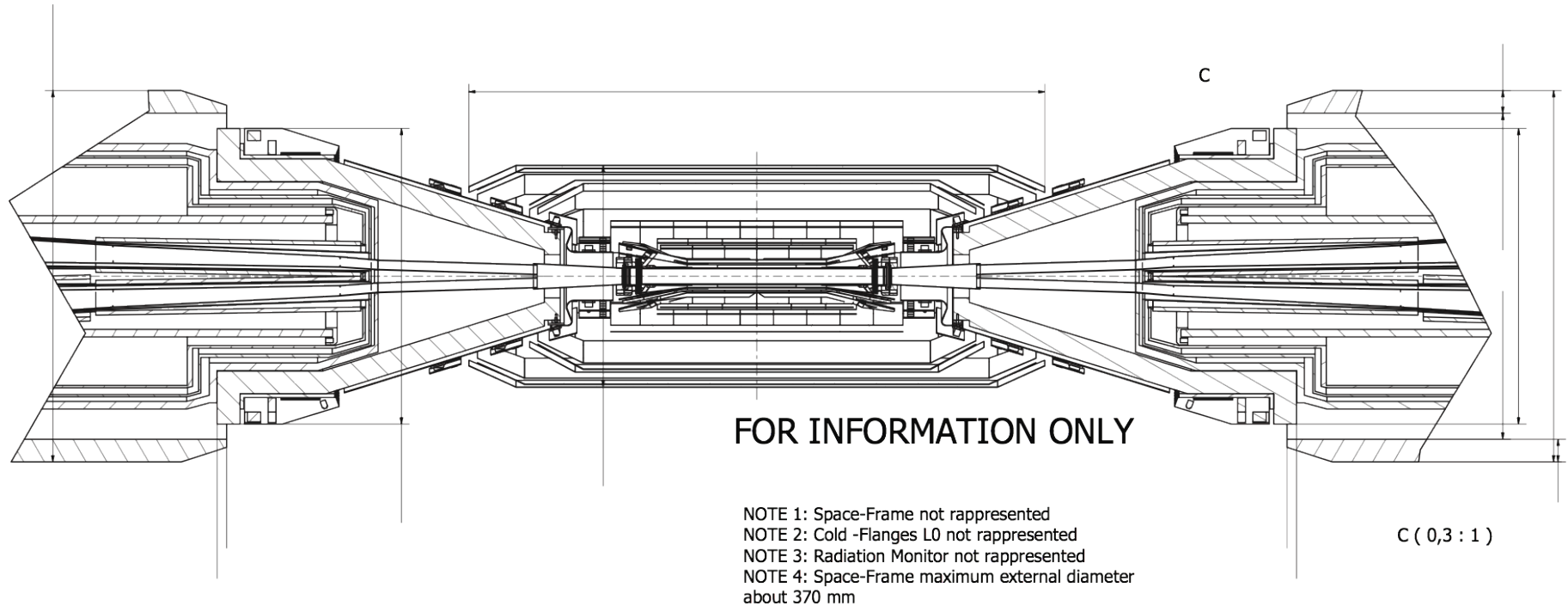
## SuperB Detector Technical Design Report

- Full index. Now about 180 pages. Projected to about 6-700 pages.
- [http://mailman.fe.infn.it/superbwiki/index.php/Detector\\_Technical\\_Design\\_Report](http://mailman.fe.infn.it/superbwiki/index.php/Detector_Technical_Design_Report)

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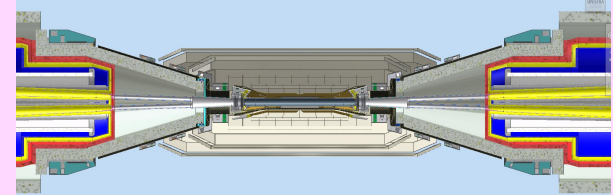
# MDI To Do List



- ➔ Shields optimization: likely be ready by February 2012
- ➔ Neutron cloud simulation: hopefully be improved by February 2012
- ➔ Quick demounting design: at least 1 - 2 engineer x months needed

# SVT toward TDR

- ▶ Impressive progress since London meeting in many areas: mechanics, front-end chips, sensor & fanouts.
- ▶ Some items still requires some engineering work:
  - ▶ quick demounting procedure
  - ▶ peripheral electronics
- ▶ New background production, with most of the sources, now available. Need some time to carefully analyze and “digest” new numbers!
- ▶ TDR writing has started & work for TDR design can be completed by the end of Feb.



## Which Layer0 technology as baseline in TDR?

Baseline = installed for the start of data taking

- ▶ Two main options (striplets and hybrid pixel) mature enough and viable, but with different levels of performance & readiness and at this stage.
- ▶ Effect of high background on performance is crucial for a decision on Layer0 baseline, but study not yet ready and timeline not clear. With these conditions wise to postpone decision after TDR.
- ▶ In TDR present both options as viable, even if described with different level of details, saying that decision on Layer0 will be taken later considering more carefully performance, readiness for the start of data taking, etc etc
  - ▶ More advanced thinner pixel options (MAPS or thin high resistivity pixels) less mature, will be described in TDR since considered for a second phase Layer0 upgrade.
- ▶ Addendum to TDR with details on Layer0 after decision ~1 yr later.

# *DCH Open issues*

- Finalize background evaluation – needed to finalize baseline design in TDR:
  - radial distribution of stereo and axial superlayers
  - cell dimensions vs radial position
- Inner radius? determined by cryo. (recently lost another 15mm)
- Physics studies to quantify expected gains in physics performance from cluster counting
- Analysis of single-cell prototype TRIUMF test beam data collected in Nov, Dec. by spring
- Proto-2 test beam at LNF - scheduled for end of January – analysis by spring
  - maybe Proto-2 test beam at TRIUMF (beyond TDR deadline)
- For TDR: will describe necessary conditions for a decision on cluster counting
  - TDR will have both digitization strategies – cluster counting + integrated signal vs integrated only
  - cluster counting impacts number of digitization channels/card: 64 vs 16 -> 32 crates vs 8 crates
  - high BW preamp design in TDR
  - wire selection W vs molybdenum
- Routing of preamp analog cables from backward end of SuperB
- routing of HV cables – from front end of SuperB
- Location of off-detector electronics in experimental hall (10m cables); neutron shielding
- others... mechanical engineering related to stringing; feedthroughs; ... no details for TDR

# PID items not resolved by the time TDR is out

- FDIRC test @ SLAC will be going on for many months  
→ Optics will still be tested and electronics won't be final
- Integration issues:  
→ FDIRC background shielding geometry
- Detector issues:  
→ Motherboard, optical coupling between the FBLOCK and the PMTs.
- Longer-term tasks:  
→ Bar boxes shipment to Italy, detailed project planning
- No firm commitment from funding agencies
- No final decision on the FTOF

# Open Issues – EMC

Answered  
by TDR?

- |  |         |
|--|---------|
| ▶ Shipping/refurbishing of barrel  |         |
| ▶ Does it need to be disassembled for shipping (no, in baseline)?          | unknown |
| ▶ Do we need to change preamps (this is baseline)?                         | yes     |
| ▶ Do we need to change PIN diodes (this is not baseline)?                  | yes     |
| ▶ Optimal shaping time?  | yes     |
| ▶ Add row of crystals in backward end?                                     | no      |
| ▶ Backward EMC beam test   | no      |
| ▶ Does backward EMC capture beampipe (this is baseline)?                   | no      |
| ▶ Can backward EMC do TOF?   | no      |
| ▶ What should we include in TDR for alternative forward technology?        | yes     |
| ▶ Which alternative forward strategy if can't afford baseline LYSO design? | no      |



# IFR status

## Critical issues for final detector design

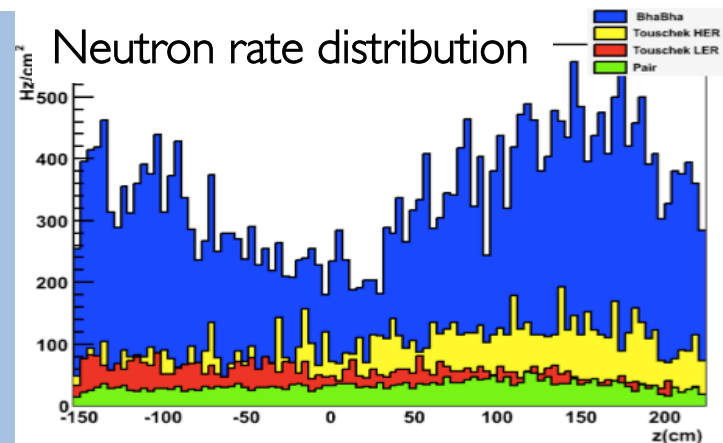
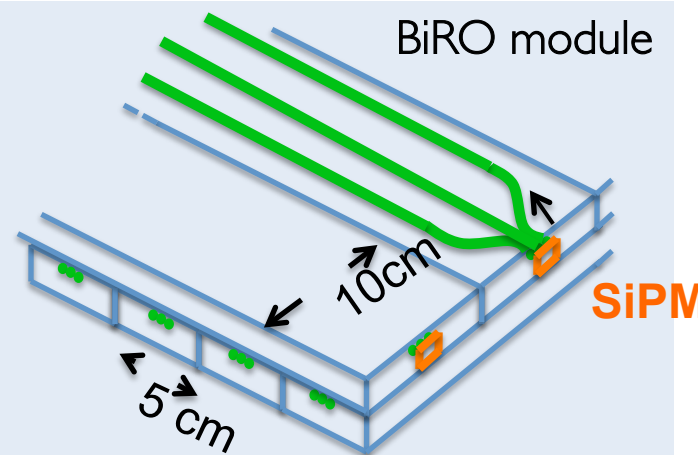
✓ Binary readout vs time readout for the barrel → **Binary readout is now our baseline**

□ Number of active layers: 8 vs 9 → **9 active layers will be the baseline for the TDR, but the 8-layer option is not discharged**

□ Amount of absorber and flux return configuration → **92cm of iron is the current baseline for the TDR. BaBar iron will be reused. Complete filling of the available gaps or addition of 10 cm of iron outside the barrel.**

✓ Position of the photodetectors

**SiPM will be placed at the end of the scintillators inside the gaps. Neutron rate is high (up to some 100Hz/cm<sup>2</sup>) but with the binary readout it's possible to rise the thresholds to reduce the increasing of the noise.**



# Global Issues

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- ▶ IR Region and MDI design
- ▶ IR Hall and services design (Cryo, power, cooling, etc.)
- ▶ Shielding strategy – self-shielding question
- ▶ SLAC components transportation, storage, and refurbishing
- ▶ IR Hall availability for magnetic mapping, assembly, etc.
- ▶ Commissioning / Background detector
- ▶ Detector/Accelerator control and interface
  
- ▶ Detailed project planning, cost and schedule
- ▶ Commitments from funding agencies

# Towards a fully organized collaboration

28 Nov 2011

