Short status update

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Outline

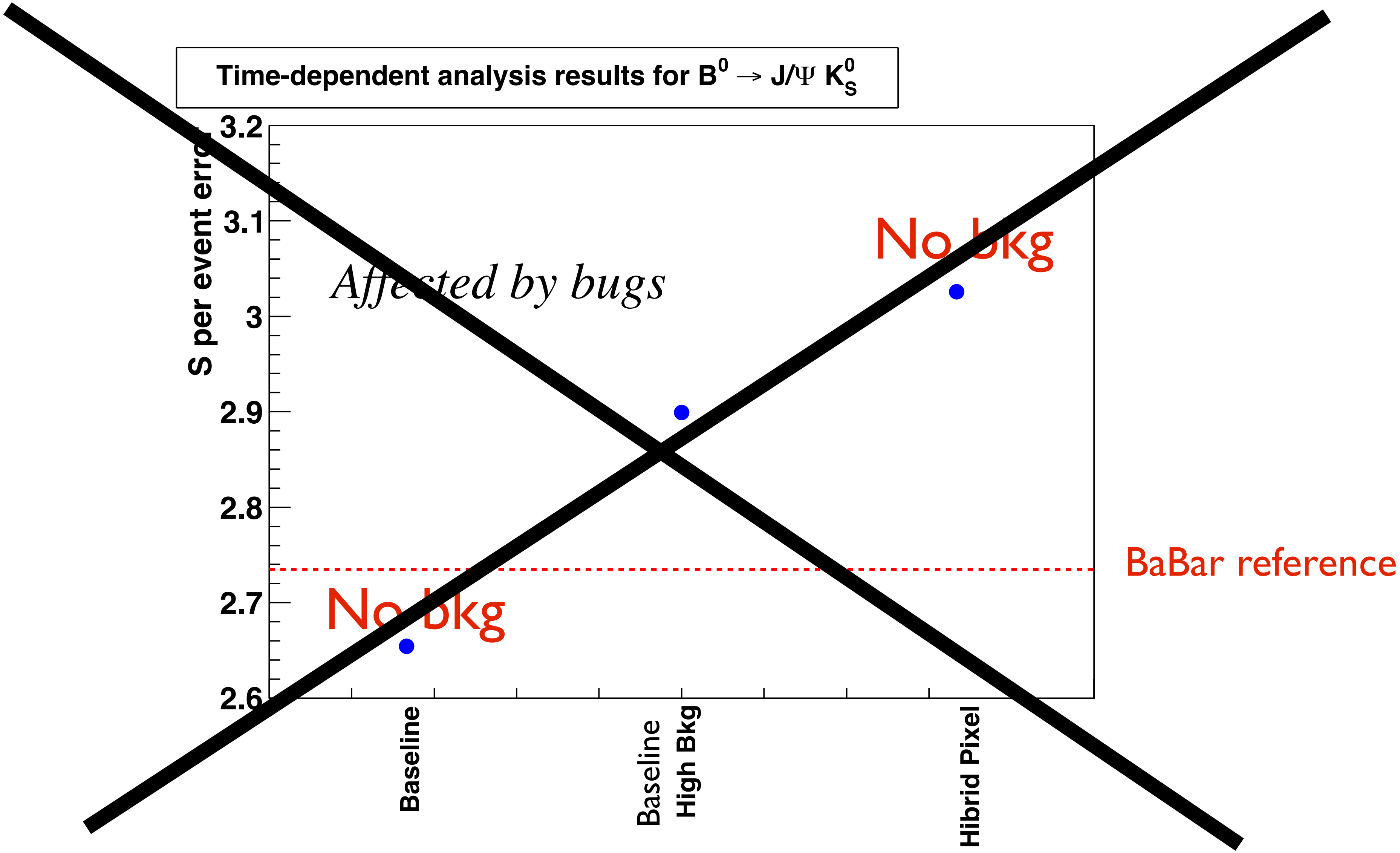
- Present status of QED bkg in FastSim
- Comparison between FastSim and FullSim geometries and impact on bkg rates
- Next steps

- Cross section for QED Pairs in FastSim was found to be about 10 times higher wrt to the nominal value.

- Average number of events per bunch crossing was 36 instead of 3.5.

- Another bug was found. A TParticle was produced for each hit in the SVT sensors instead for the first hit only. Very long tails in the distribution of number of particles per bunch crossing.

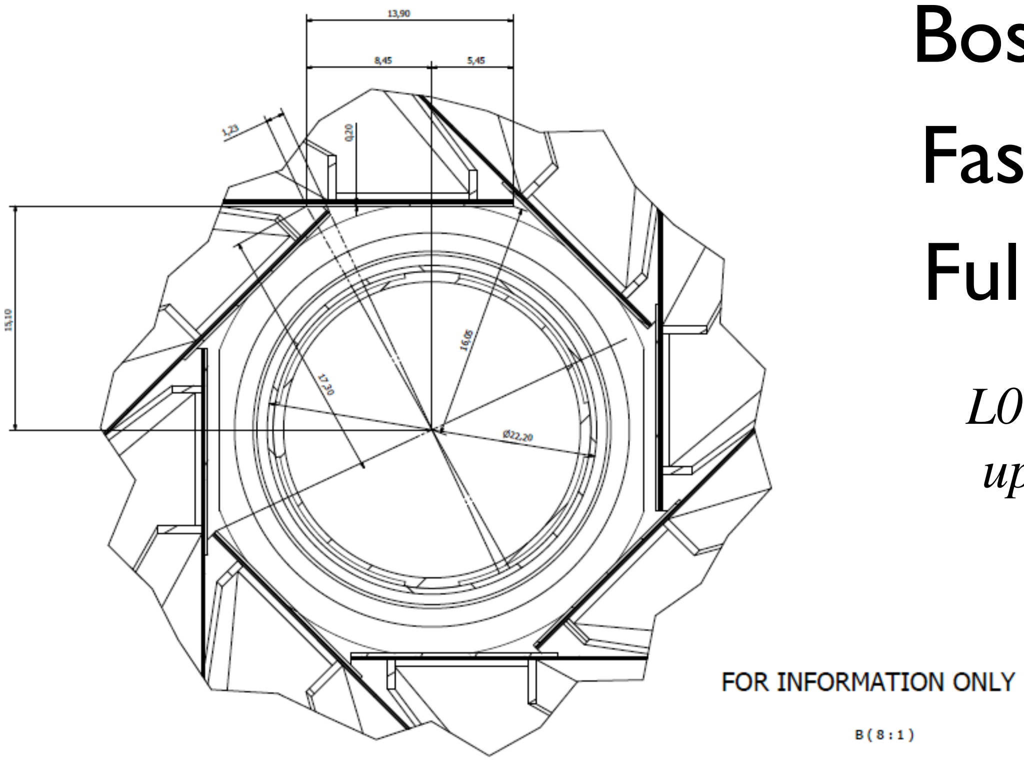
- Alejandro Perez has worked very hard and fixed it. He is still working for understanding discrepancies between FastSim and FullSim bkg rates. Almost a factor 3 difference.



These results should be considered as not reliable for the reasons explained in the previous slide

Geometries for striplet detectors

Courtesy of Filippo Bosi



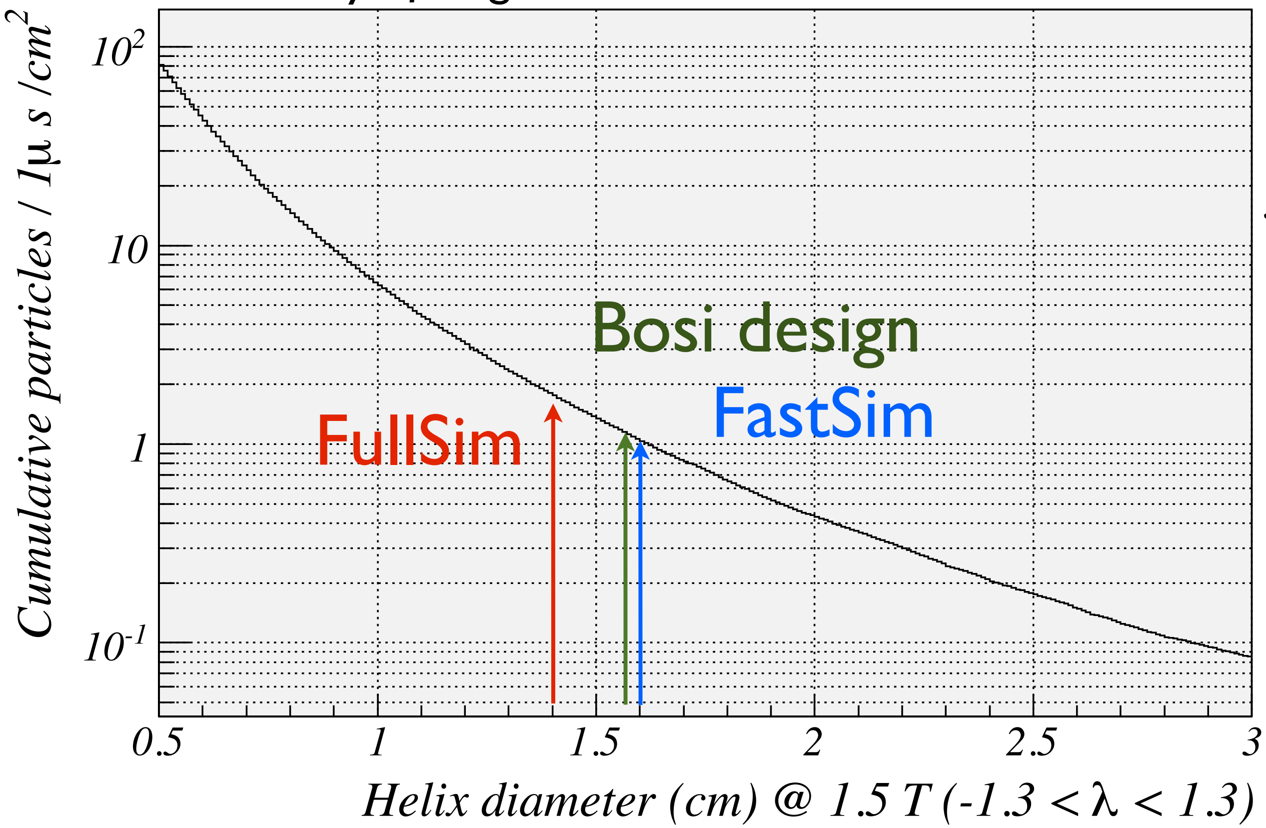
Dimensioni sensore 0.2 x 13.9 x 104 mm

	Average radius
Bosi design	15.64 mm
FastSim	16.00 mm
FullSim	14.02 mm

L0 parameters in simulations need to be updated according to new Bosi design.

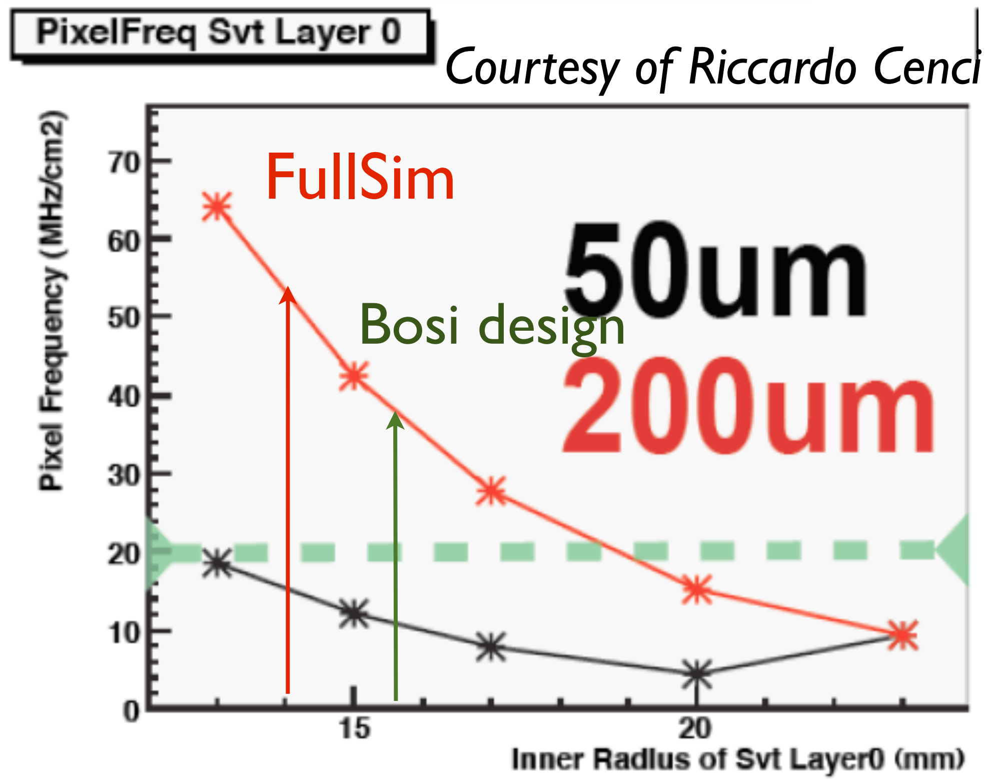
QED Pairs Bkg rates vs L0 radius

Courtesy of Eugenio Paoloni



Bkg rates evaluated with FullSim for striplets are overestimated so far. Should be evaluated with new Bosi geometry.

Tentative extrapolation for QED bkg rates in L0



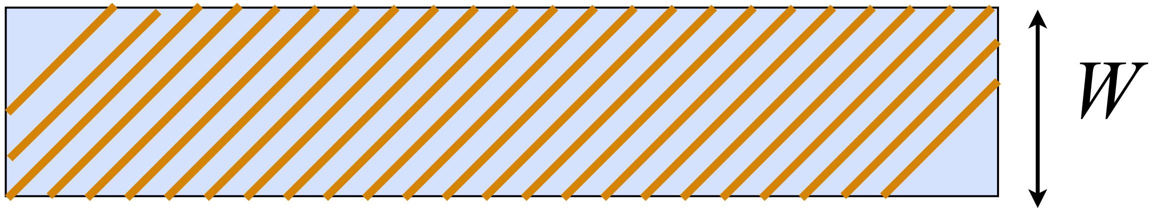
Rate at 14.0 mm ~ 52 MHz/cm^2
Rate at 15.6 mm ~ 38 MHz/cm^2

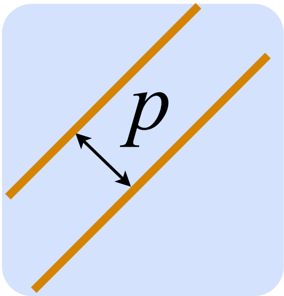
Correction factor ~ 38/52=0.7

QED pairs bkg rates with correction applied

Track Rate 4.52MHz/cm^2*0.70=3.16 MHz/cm^2
Strip Rate 24.3MHz/cm^2*0.70=17.0 MHz/cm^2

Estimate for L0 striplets occupancy





$Occ = B\cdot T\cdot p\sqrt{2}\cdot W = 0.8\%$ at radius 15.64 mm

B = *hit rate/Area = 17 MHz/cm*^{2}
T = *50 ns (L0 sensitive window)*
p = *50 μm (pitch)*
W = *13.9 mm (detector width)*

Comparison with occupancy for Layer1 of the BaBar SVT

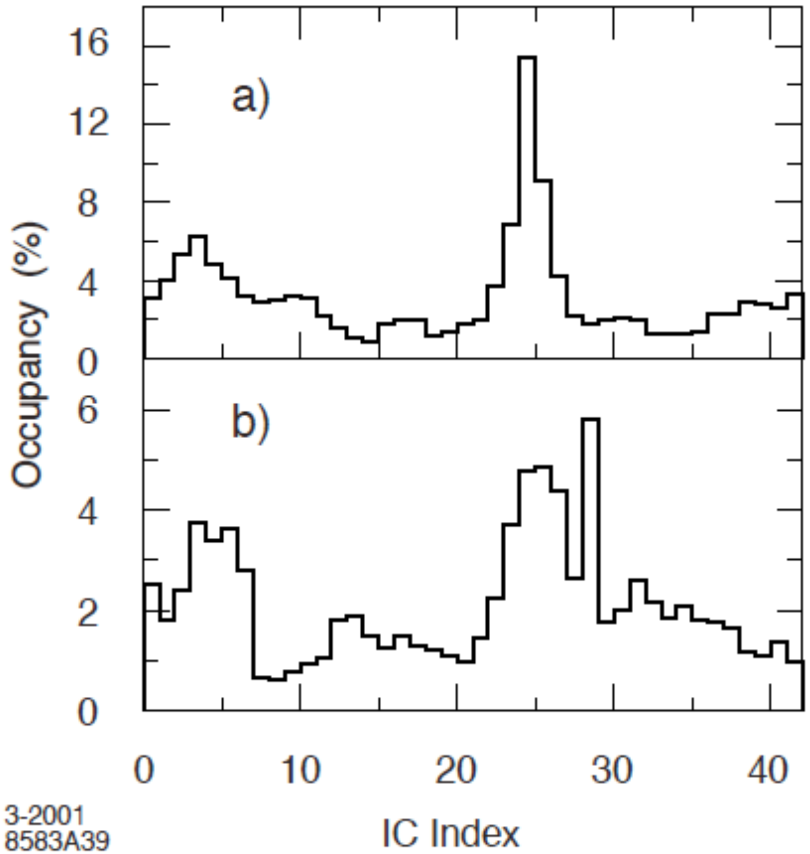


Figure 23. Typical occupancy in percent as a function of IC index in layer 1, ϕ side for a) forward half-modules and b) backward half-modules. The IC index increases with azimuthal angle and the higher occupancy in the horizontal plane is visible near chip indices 3 and 25.

Under normal running conditions, the average occupancy of the SVT in a time window of 1 μs is about 3% for the inner layers, with a significant azimuthal variation due to beam-induced backgrounds, and less than 1% for the outer layers, where noise hits dominate. Figure 23 shows

The offline time window cut in BaBar was 200ns. Hence, the offline average occupancy for L1 was ~0.6%, to be compared with ~0.8% occupancy for L0 striplets detector of SuperB.

Present status and next steps

- L0 parameters should be updated in the FastSim and FullSim simulation according to new Bosi design.
- Estimates for bkg rates of QED pairs should be evaluated according to new Bosi design.
- Tentative estimates show a reduction in rates for QED pairs bkg. An offline occupancy value of 0.8%, comparable with the one of BaBar L1 of 0.6%, seems to be achievable for L0 striplets detector of SuperB.
- The impact of QED bkg on SVT performances should be moderate under these hypotheses and according to BaBar experience. Still to be estimated.
- Evaluate performance for L0 striplets and compare with other pixel technologies with new geometry configurations.
- Working on studies to be included in TDR.

6 Silicon Vertex Tracker

Rizzo. Pages ??

6.1 Vertex Detector Overview G.Rizzo - 12 pages

6.2 Backgrounds R.Cenci - 4 pages

6.3 Detector Performance Studies N.Neri - 6 pages

6.3.1 Introduction *(about 1/2 page)*

- write some considerations about the main differences between BaBar and SuperB (i.e. luminosity, boost, beampipe, beamspot);
- describe the main idea behind the new detector design focusing on performances;
- cite BaBar TDR and BaBar NIM paper as reference for strip detectors.

6.3.2 Impact of Layer0 on detector performances *(about 2 pages)*

- definition of Layer0 requirements for physics (material budget, inner radius vs boost, outer radius, intrinsic resolution, coverage);
- B^0 decay and tag vertex and B^0 proper time resolution for different solutions;
- baseline solution performances;
- discussion of pro and cons.

6.3.3 Sensitivity studies for time-dependent analyses *(about 2 pages)*

- studies of benchmark channels $B^0 \to \phi K^0_S$, $B^0 \to \pi^+\pi^-$, etc.;
- include time-dependent sensitivity studies at charm threshold?
- impact of background on detector performances.

6.3.4 Vertexing and Tracking performances *(about 1 pages)*

- track parameter resolutions;
- considerations for pattern recognition, efficiency vs numbers of layers, reconstruction capabilities for low momentum tracks, K^0_S reconstruction.

6.3.5 Particle Identification *(about 1/2 pages)*

- dE/dx resolution and relevance for QED pairs suppression.
- discussion of relevance of ToT information and number of bits of the FEE.

6.4 Silicon Sensors L. Bosisio - 8 pages

(Striplets will be discussed together with the other sensors)

Short introduction (a few lines).