



# effect of high occupancy on SVT performances

## translation of the BaBar study to SuperB

**BaBar AD 707: Final Report of the SVT Long Term Task Force (2004).**

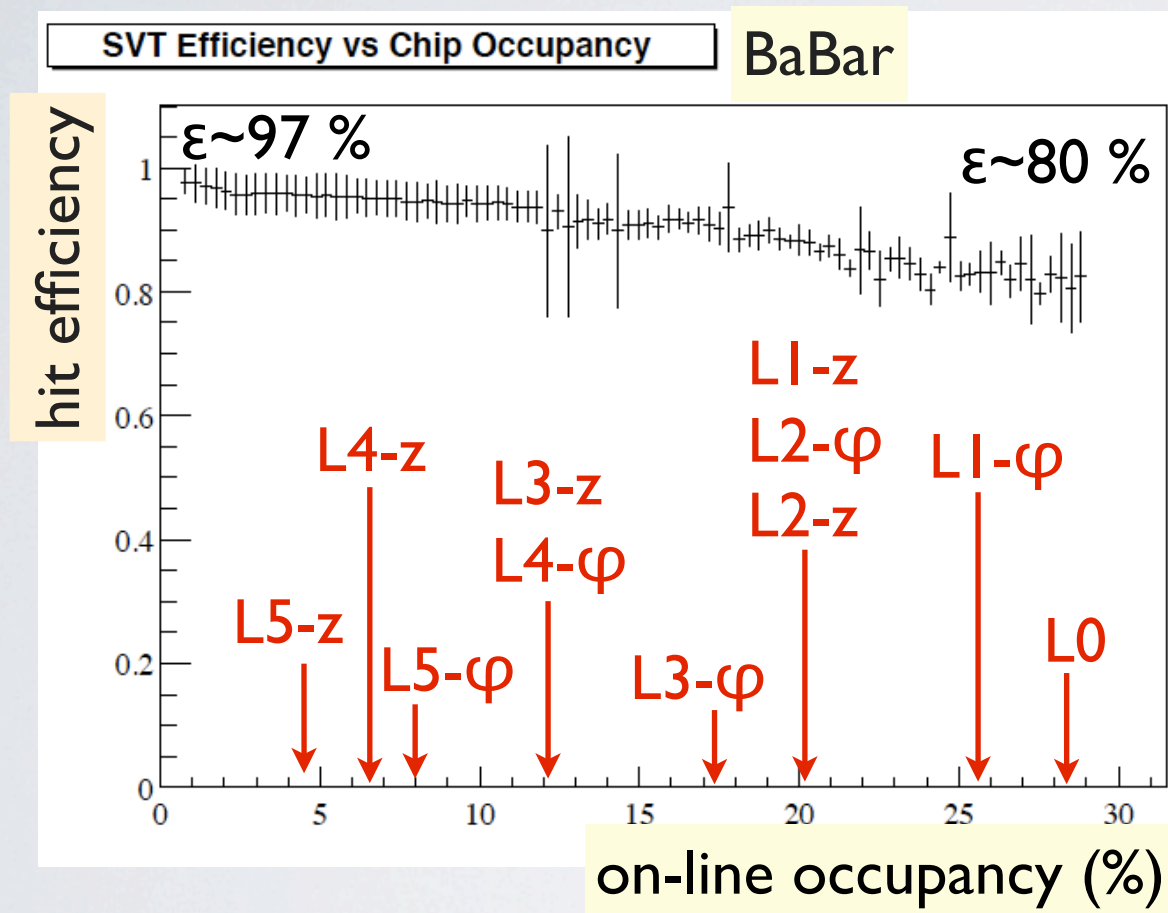
Study with **BaBar dimuon data** taken between Jan. and June 2003 (inst. luminosity increasing),  
of **hit efficiency** as a function of **chip on-line occupancy**.

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# on-line occupancy

$$\text{on-line occupancy} = \text{offline-occupancy} \times \text{online-time} / \text{offline-time}$$



SuperB: knowledge of the off-line strip occupancy

Layer	on-line time window (ns)	off-line time window ( $5 \times \sigma_{t0}$ ) (ns)
0	300	50
1	300	75
2	300	75
3	300	100
4	1000	250
5	1000	450

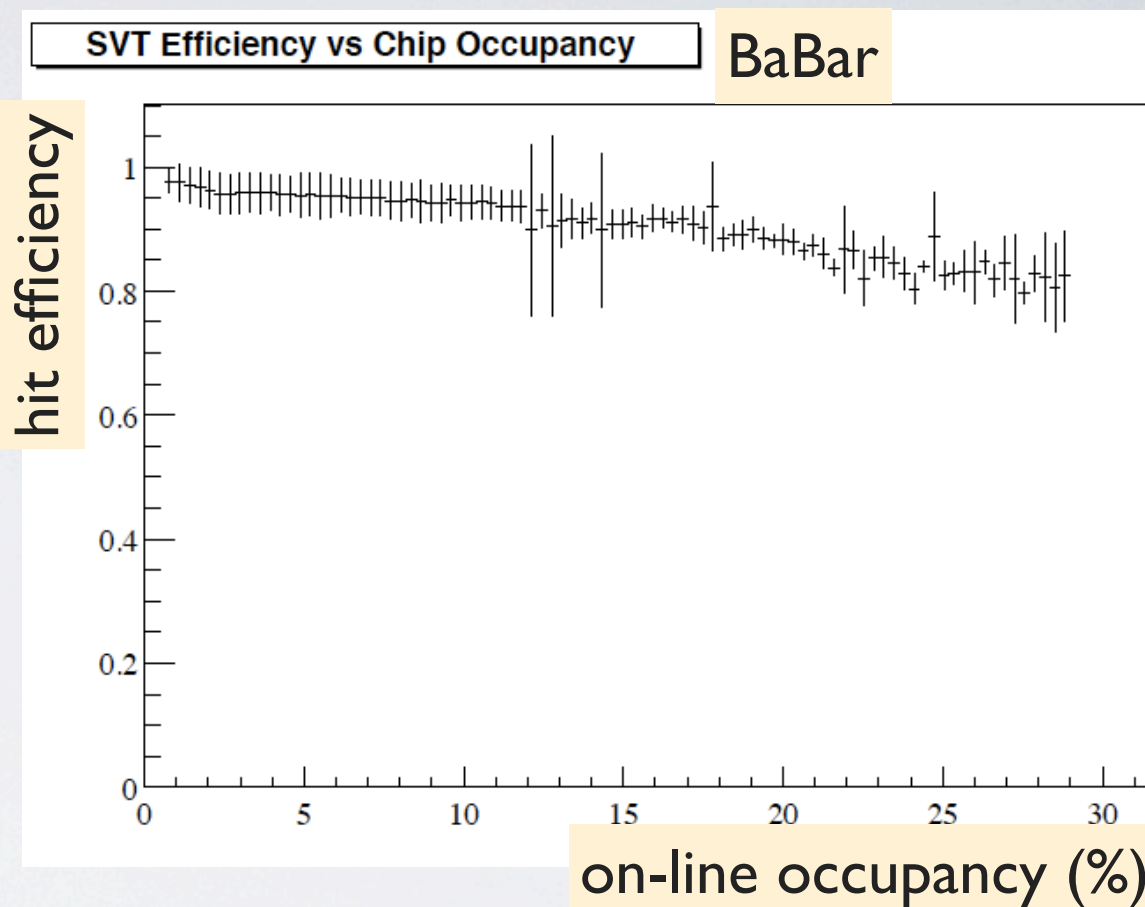
Layer	offline strip occupancy (x5 included)
0 (u)	0.047
0 (v)	0.047
1 $\phi$	0.064
1 z	0.050
2 $\phi$	0.050
2 z	0.050
3 $\phi$	0.058
3 z	0.039
4 $\phi$	0.031
4 z	0.017
5 $\phi$	0.036
5 z	0.020

→ on-line occupancy in SuperB is 2 to 10x higher than in BaBar.

# hit efficiency (I)

$$\begin{aligned} \text{hit efficiency} &= \\ &\text{hit-to-track matching efficiency} \\ &\times \\ &\text{hit detection efficiency} \end{aligned}$$

→ translate BaBar hit detection efficiency (loss due to shadowing effects) to SuperB hit detection efficiency to shift the hit efficiency curve to the correct value.



This assumes that DCH tracking in SuperB is as good as in BaBar (hit-to-track matching depends on the track extrapolation resolution):

$$P_{\text{match}} = \frac{1}{1 + 2\pi \sigma_{\phi, \text{eff}} \sigma_{Z, \text{eff}} \rho}$$

$\sigma_{\phi, \text{eff}}$  and  $\sigma_{Z, \text{eff}}$  point to **intrinsic resolution**  
 $\rho$  points to **hit density**  
 $\rho$  also points to **~ integration time**

⊕ track extrapolation



# hit efficiency (2)

$$\begin{array}{c} \text{Superb hit efficiency} \\ = \\ \text{SuperB hit detection efficiency} \\ \times \\ \text{SuperB hit-to-track matching efficiency} \end{array}$$

Depends on the tracking resolution  
and the detector occupancy  
→ same as in BaBar for the same  
occupancy.

Depends on the electronics (shadowing)  
→ **use Nicola's efficiencies ?**  
(SVT presentation 04/27/2012)

Layer	Peaking time (ns)	Bkg x5 (%) (r-φ/z)
L0	25	96/96
L1	100	88/89
L2	100	89/89
L3	200	77/86
L4	500	89/93
L5	1000	86/91

$$\text{Superb hit efficiency} = \text{SuperB hit detection efficiency} \times \frac{\text{BaBar hit efficiency}}{\text{BaBar hit detection efficiency}}$$

known  
(fig. 12 from BaBar AD 7070)

**evaluation of the  
shadowing in BaBar?**