

Physics considerations

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Introduction

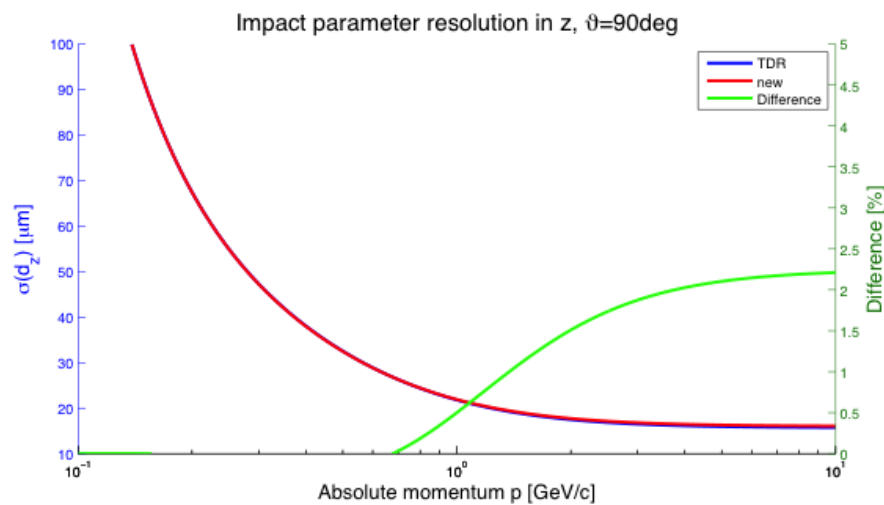
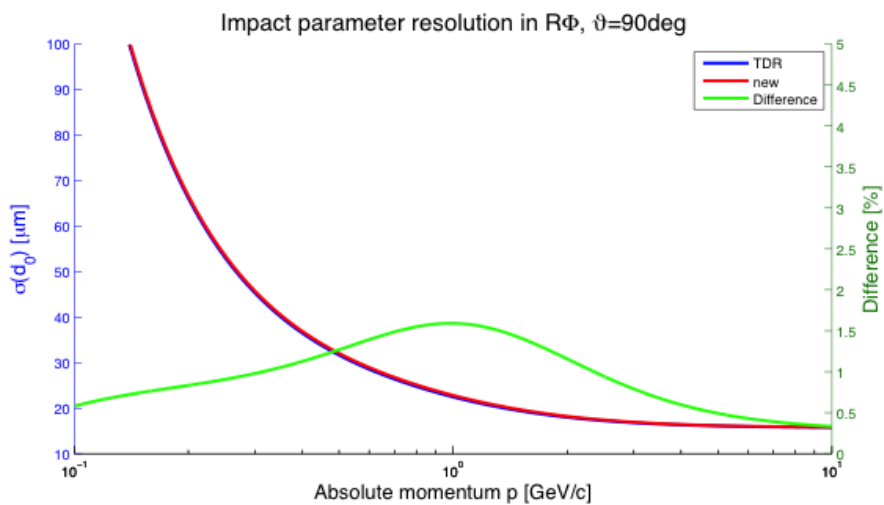
- I have tried to quickly assess the impact on physics performance of a layer 6 radius reduction from 140 mm to 135 mm
- If it is possible to build layer 6 with 140 mm radius my talk is obsolete

Proposed design

Layer	Radius TDR (mm)	Radius new (mm)
6	140	135
5	115	105
4	80	80
3	38	38

Impact parameter performance

- Most important parameter for physics performance (vertexing)
- Reduction of SVD L6 radius only deteriorates vertexing performance but can be recovered by a reduction of L5 radius (simulation by Manfred Valentan)

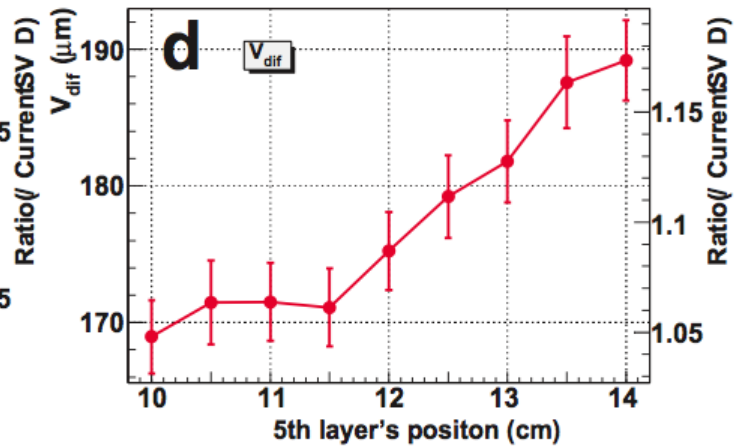
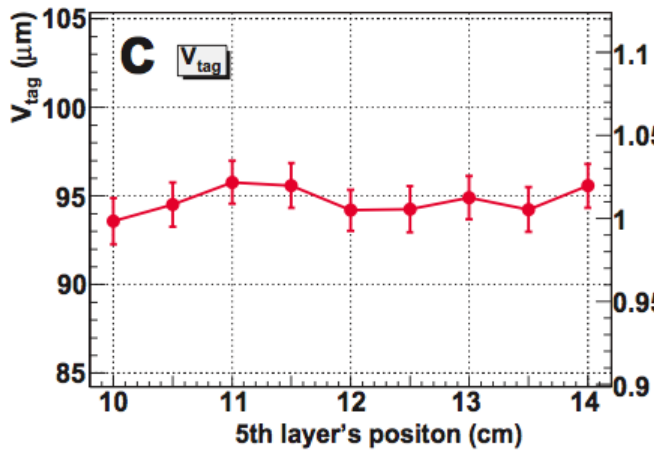
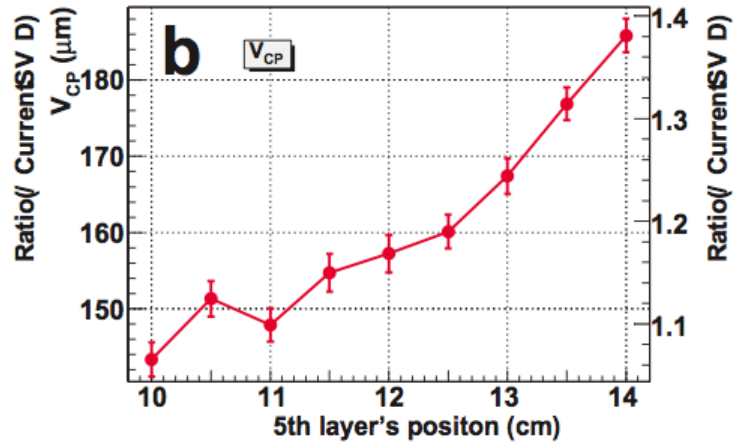


Difference TDR-new $\sim 1\%$

TCPV in $B \rightarrow K^{*0}(K_S^0\pi^0)\gamma$

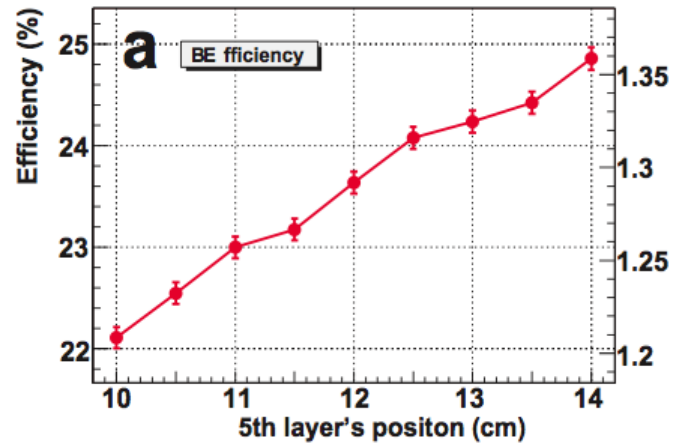
- Search for right-handed photons from $b \rightarrow s\gamma$
- Studied in 2004 Lol (KEK report 2004-4) and in the sBelle design report (KEK report 2008-7)
- No charged tracks from CP-side vertex, only feasible if K_S daughters have hits in the SVD \rightarrow location of SVD layers important
- Hara-san studied the measurement of TCPV in $B \rightarrow K^{*0}(K_S^0\pi^0)\gamma$ as a function of layer 5 position

Plots from Hara-san's simulation:



Δz resolution improves as layer 5 radius decreases.

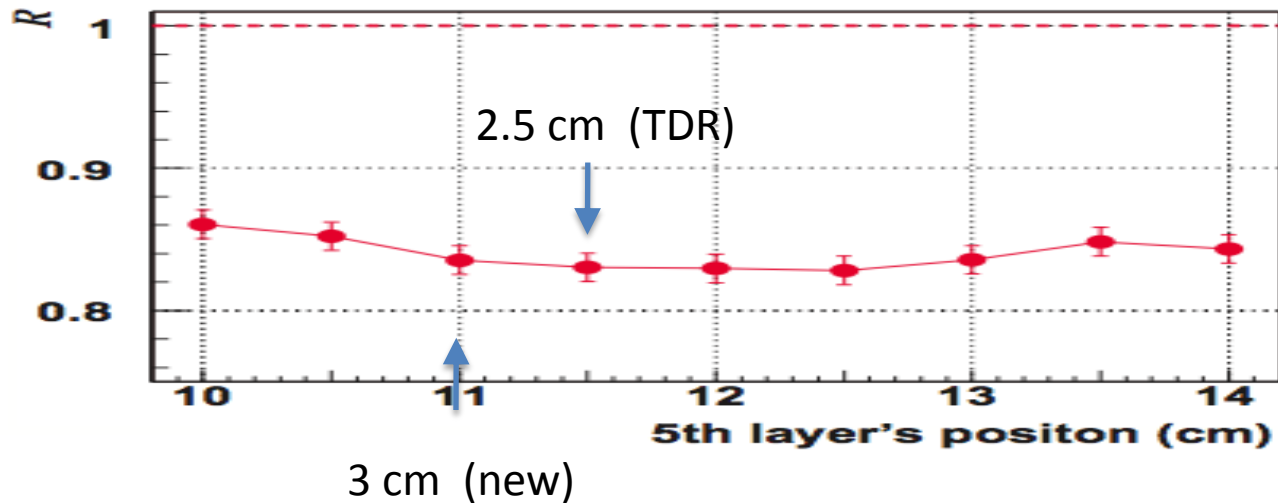
Plot from Hara-san's simulation:



$B \rightarrow K^{*0}(K^0_S \pi^0)\gamma$ efficiency increases with increasing layer 5 radius as two SVD hits for each K_S daughter are required

Figure-of-merit

- Shallow optimum, virtually no difference in performance between a layer 5-6 difference of 2.5 cm (TDR) and 3 cm (new)



Summary

- Reduction of SVD L6 radius has an impact on the vertexing performance but can be recovered by reducing L5 radius
- According to the simulation done in 2008, TCPV in $B \rightarrow K^{*0}(K^0_S \pi^0)\gamma$ performance is virtually identical for TDR and modified design