

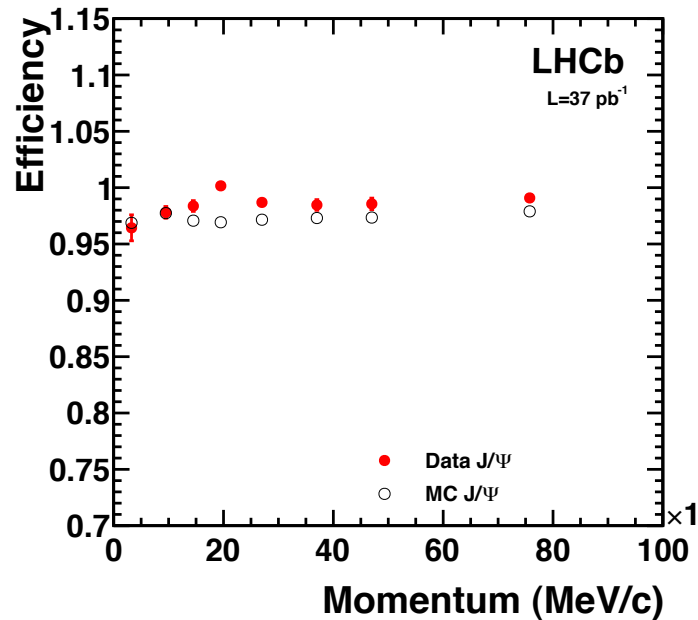


Search for the rare decays
 $B_s^0 \rightarrow \mu^+ \mu^-$ and $B^0 \rightarrow \mu^+ \mu^-$

Additional plots for presentations

The Bs2mumu group of LHCb

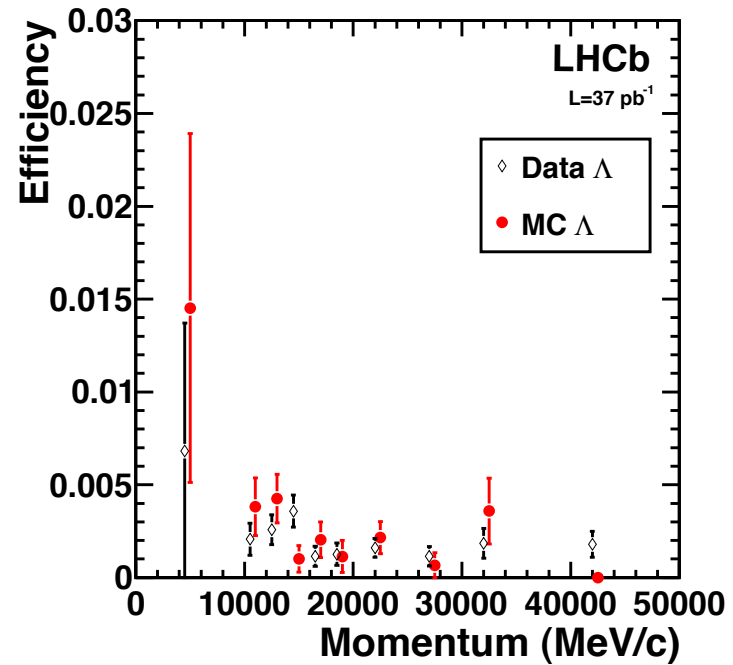
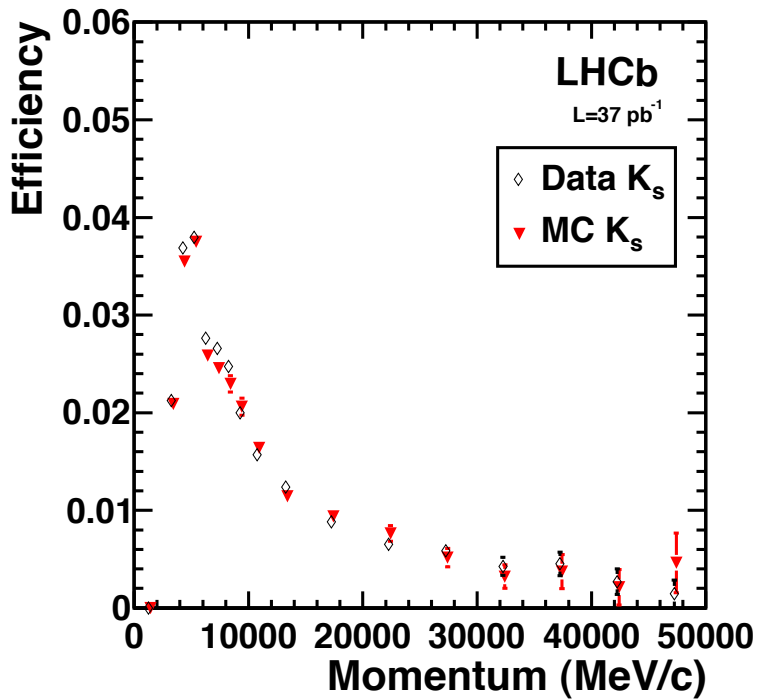
arXiv:1103.2465



Muon ID efficiency evaluated with the tag-and-probe method as a function of the momentum of the probe muon, comparison of data (open black) and MC (closed red).

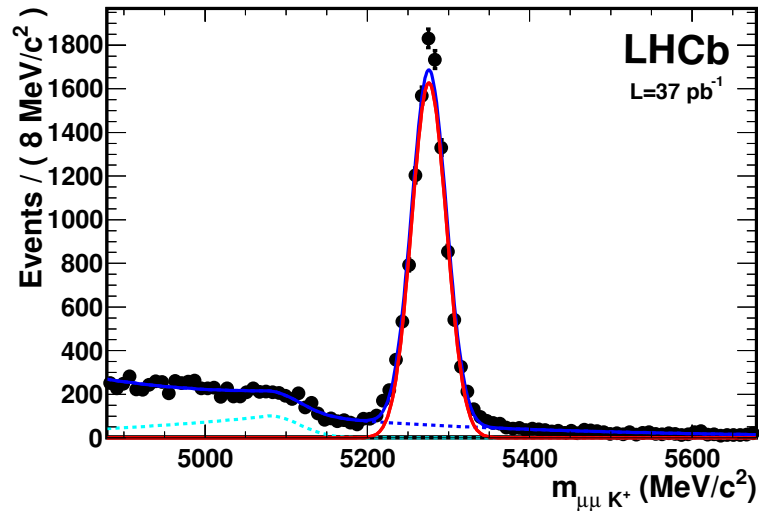
Fig1_MuID_efficiency.pdf / png

MuonID: fake rate Vs momentum



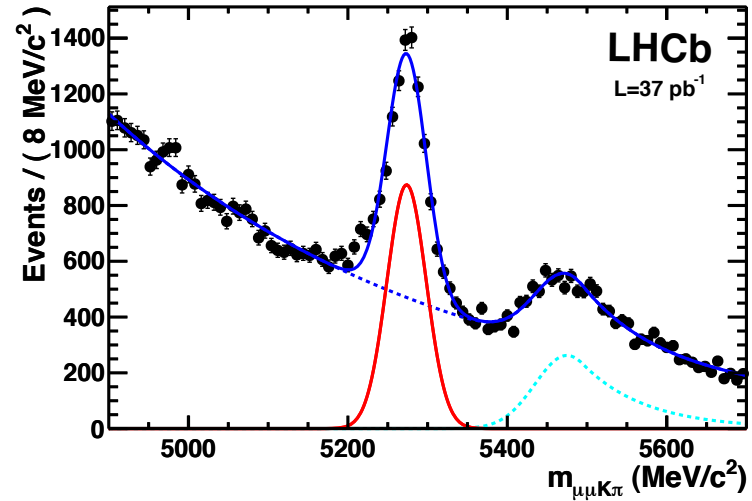
Fake rate probability vs momentum. Left: $\varepsilon(\pi \rightarrow \mu)$ from $K_s \rightarrow \pi\pi$, right: $\varepsilon(p \rightarrow \mu)$ from $\Lambda \rightarrow p\pi$. Open markers: data, filled markers: MC

Xcheck: Acceptance from data



(a) $B^+ \rightarrow J/\psi K^+$

Yield: 10939 ± 113

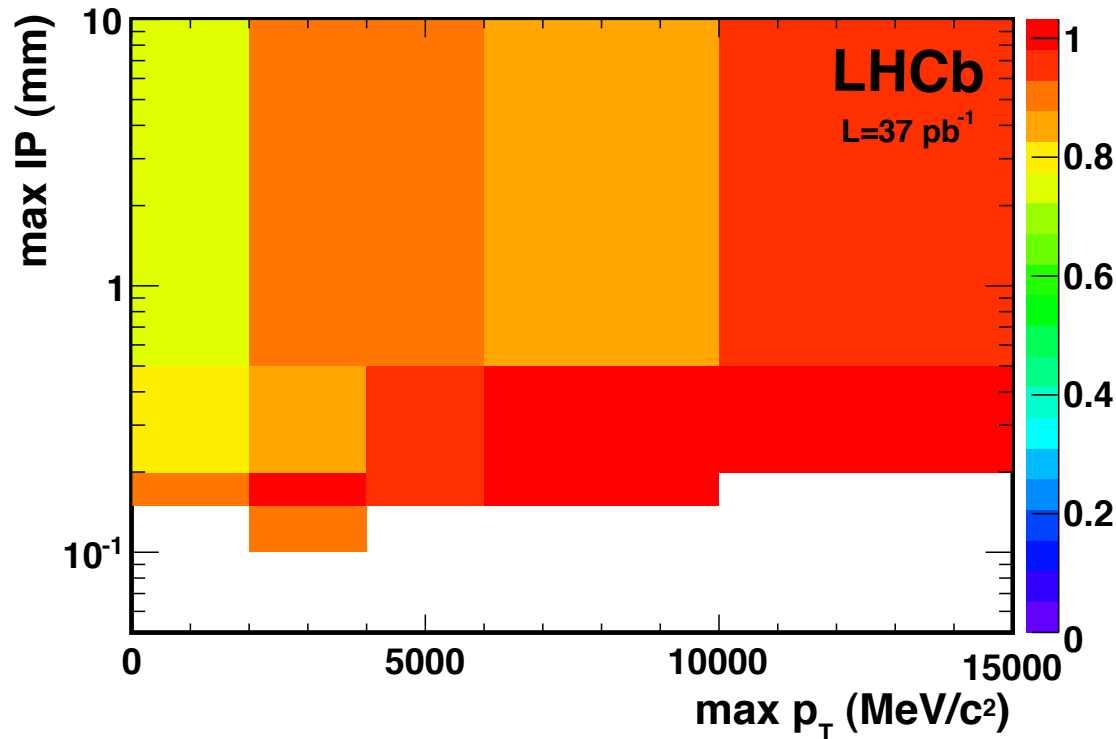


(b) $B_d^0 \rightarrow J/\psi K^{*0}$

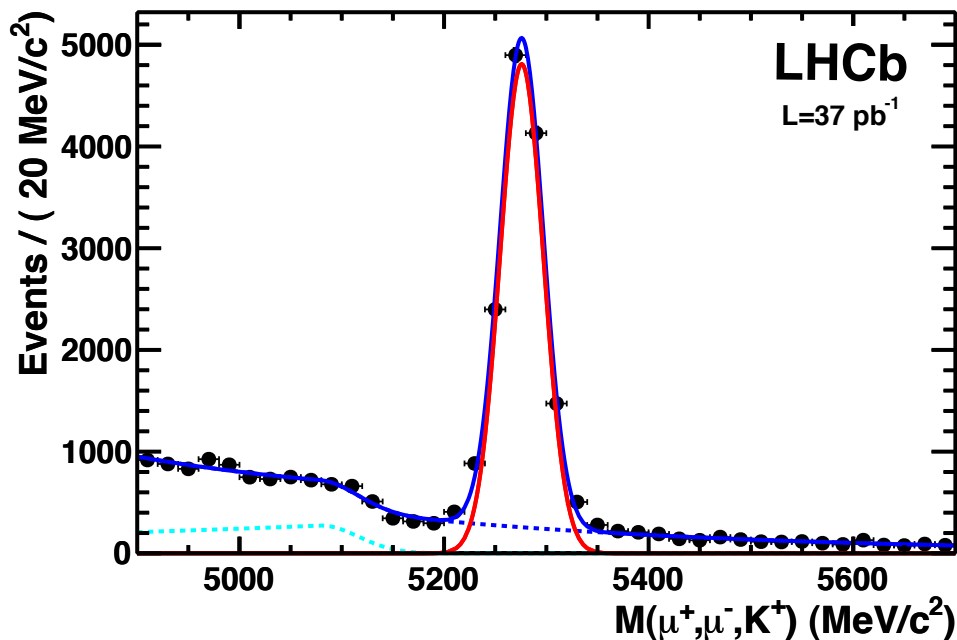
Yield: 6176 ± 76

Mass peaks using a tighter selection ($VDS > 25$ instead of 15, else selection as described in the paper) for the determination of the ratio of acceptance and reconstruction efficiencies.

Trigger efficiency map

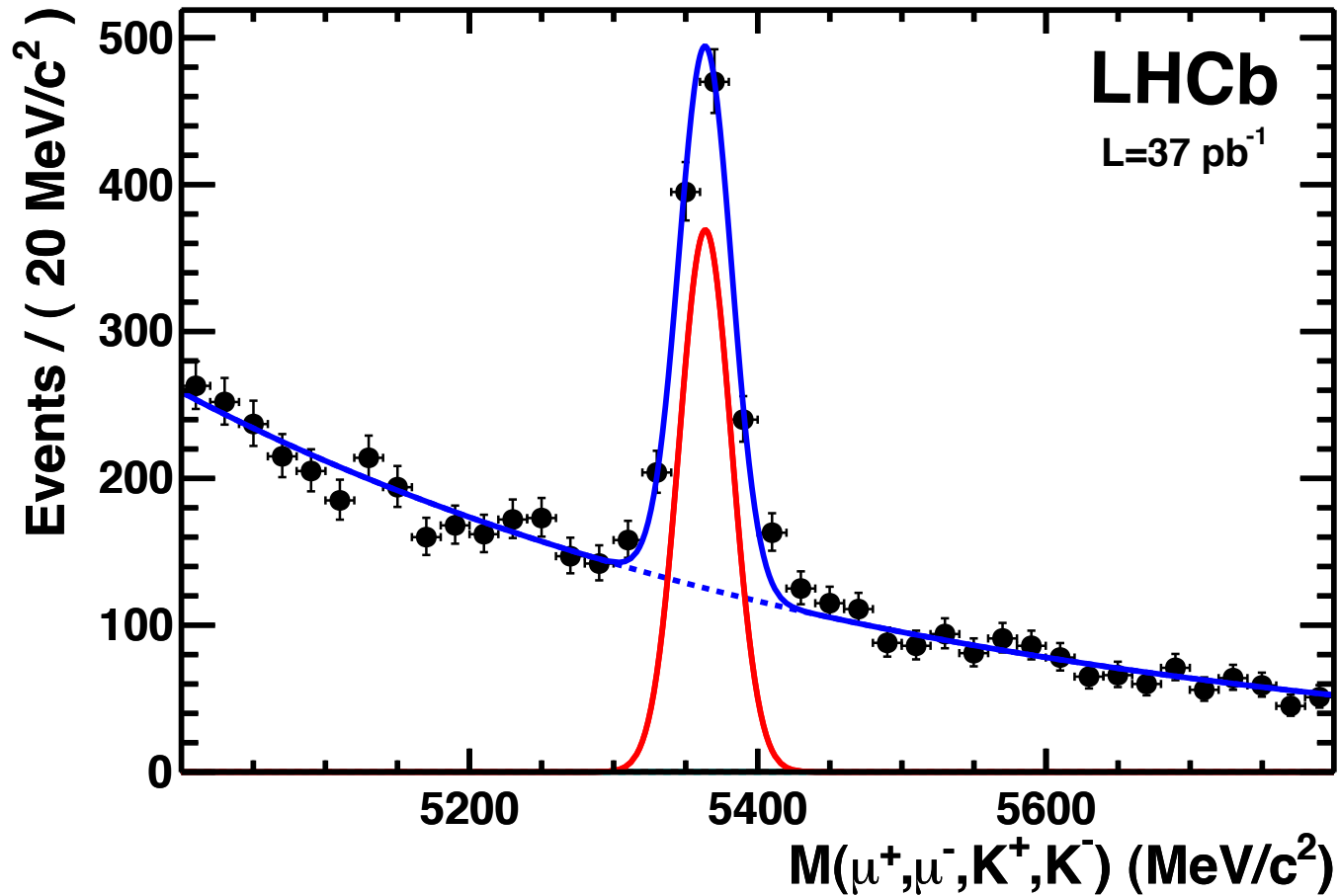


Trigger efficiency map determined from an inclusive J/ψ sample as a function of the maximal p_T and IP of the two final state muons.



Invariant mass of the $B^+ \rightarrow J/\psi K^+$ candidates.

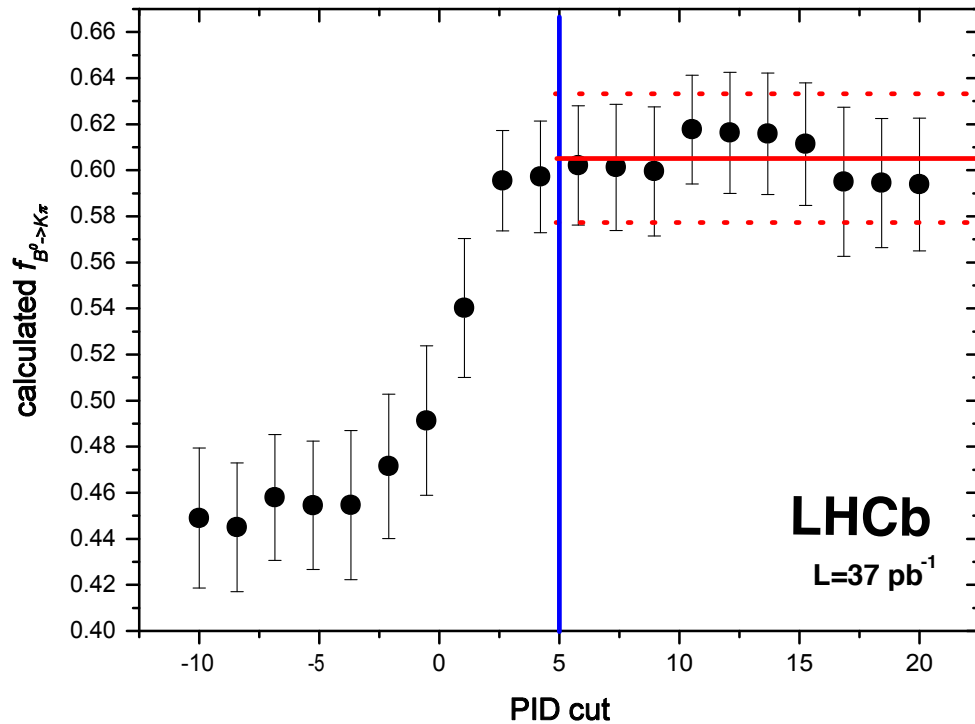
Yield: $12366 \pm 184(\text{stat}) \rightarrow$ enters in normalization factor



Invariant mass of the $B_s \rightarrow J/\psi\phi$ candidates.
 Yield: $822 \pm 36(\text{stat}) \rightarrow$ enters in normalization factor

Fig8_Norm_Bs2JPsiPhi.png / png

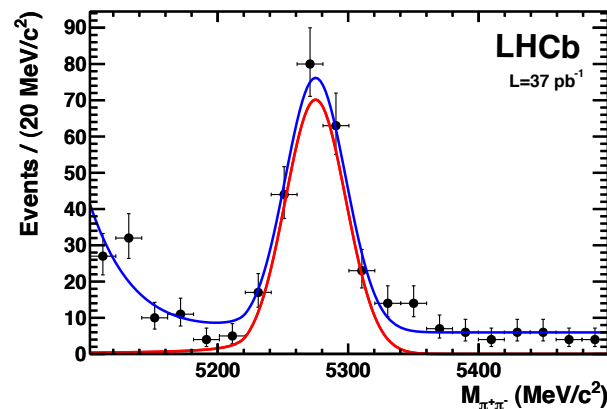
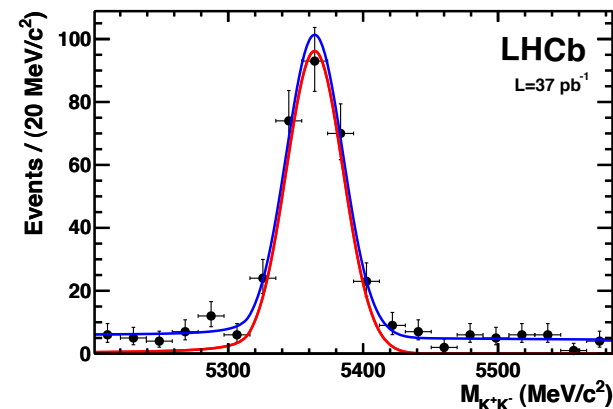
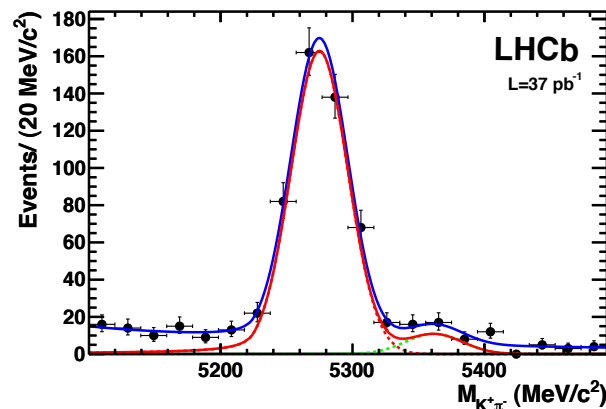
Normalization factor 3: fraction B2KPi



$f_{K\pi}$ (fraction of $B \rightarrow K\pi$ in the inclusive $B \rightarrow hh'$ sample) calculated using different PID cuts. The blue vertical line shows the start of the “plateau”. The red line shows the average value of $f_{K\pi}$ in the plateau and the dotted line the estimated uncertainty.

Fig9_f_BdKpi.png / png

Normalization factor 3: fraction B2KPi (2)

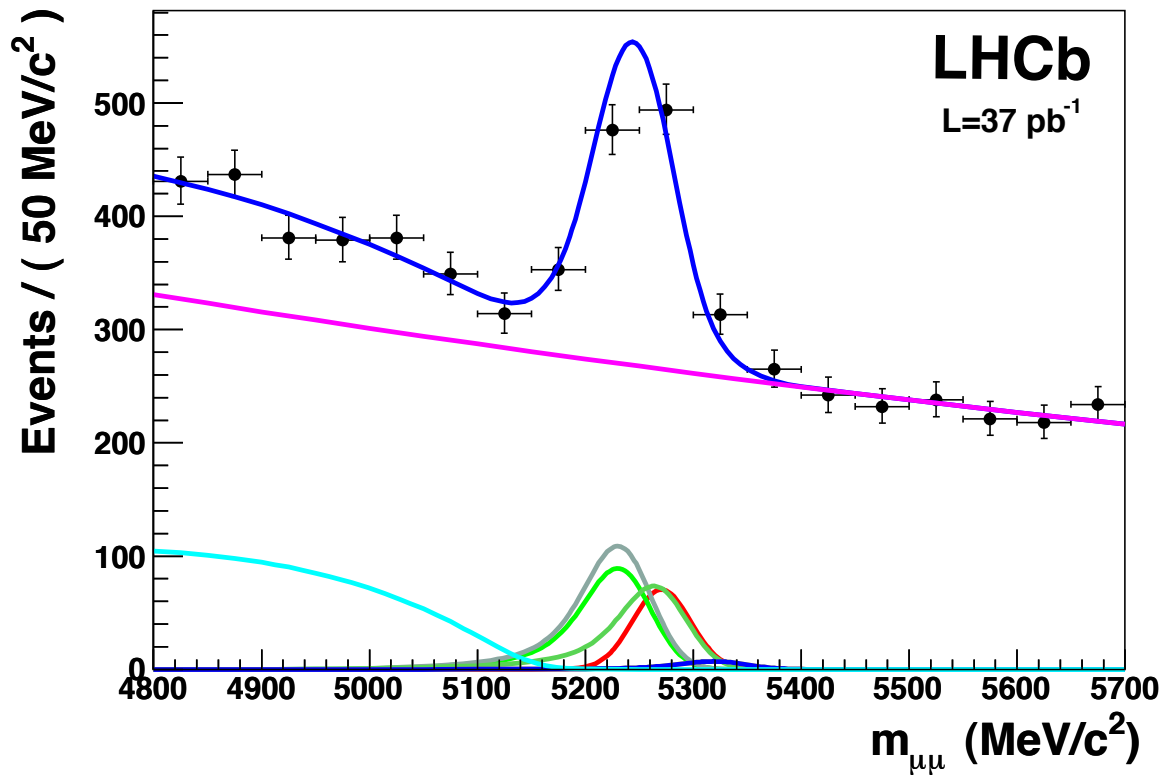


Invariant mass distributions for the different daughter mass hypotheses for $B \rightarrow hh'$. A $DLL(K-\pi) > 10$ is applied to identify the K and π candidates.

Fig10_Exclusive_Bd2Kpi.png / png

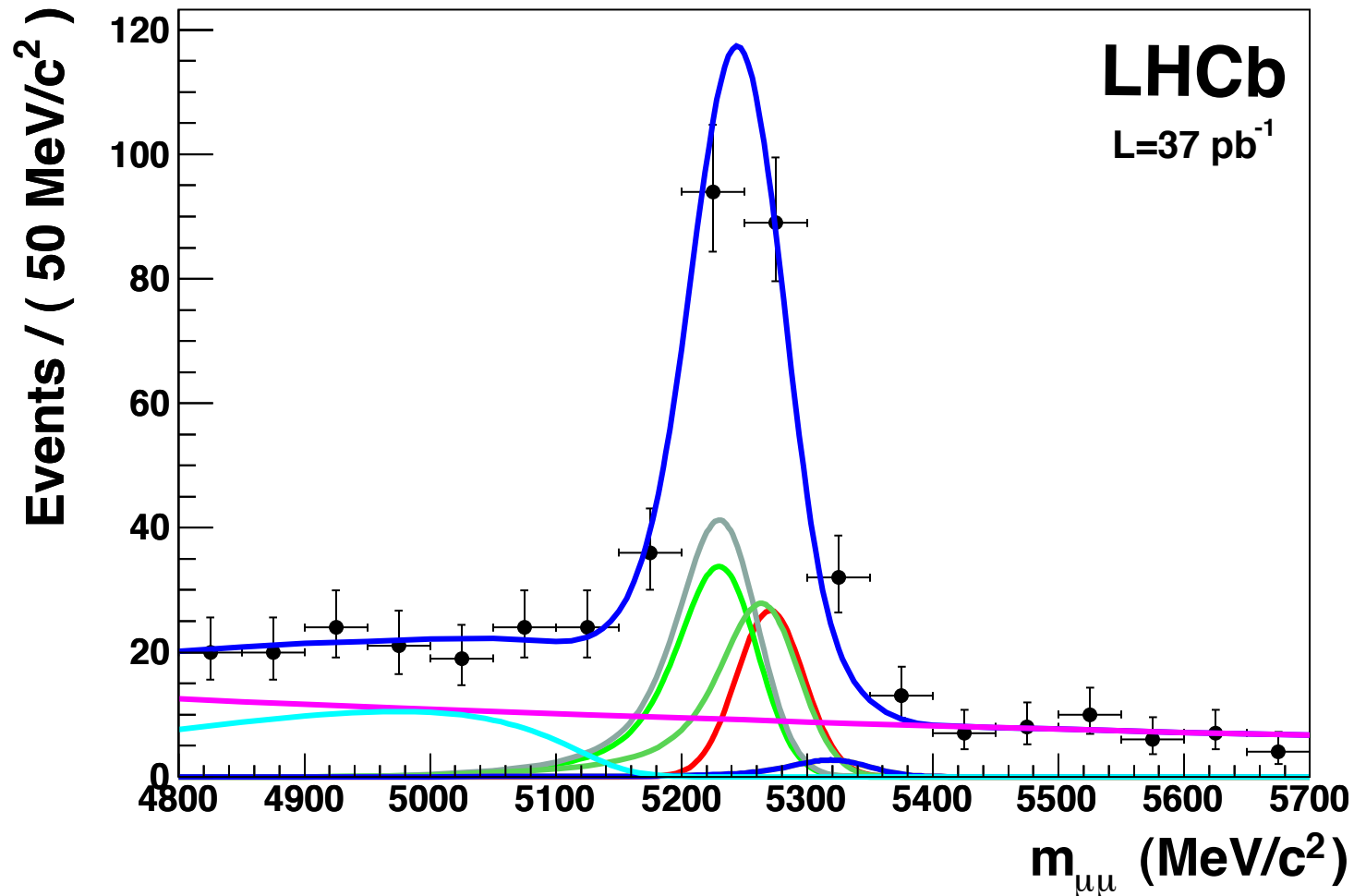
Fig11_Exclusive_Bs2KK.png / png

Fig12_Exclusive_Bd2pipi.pdf / png



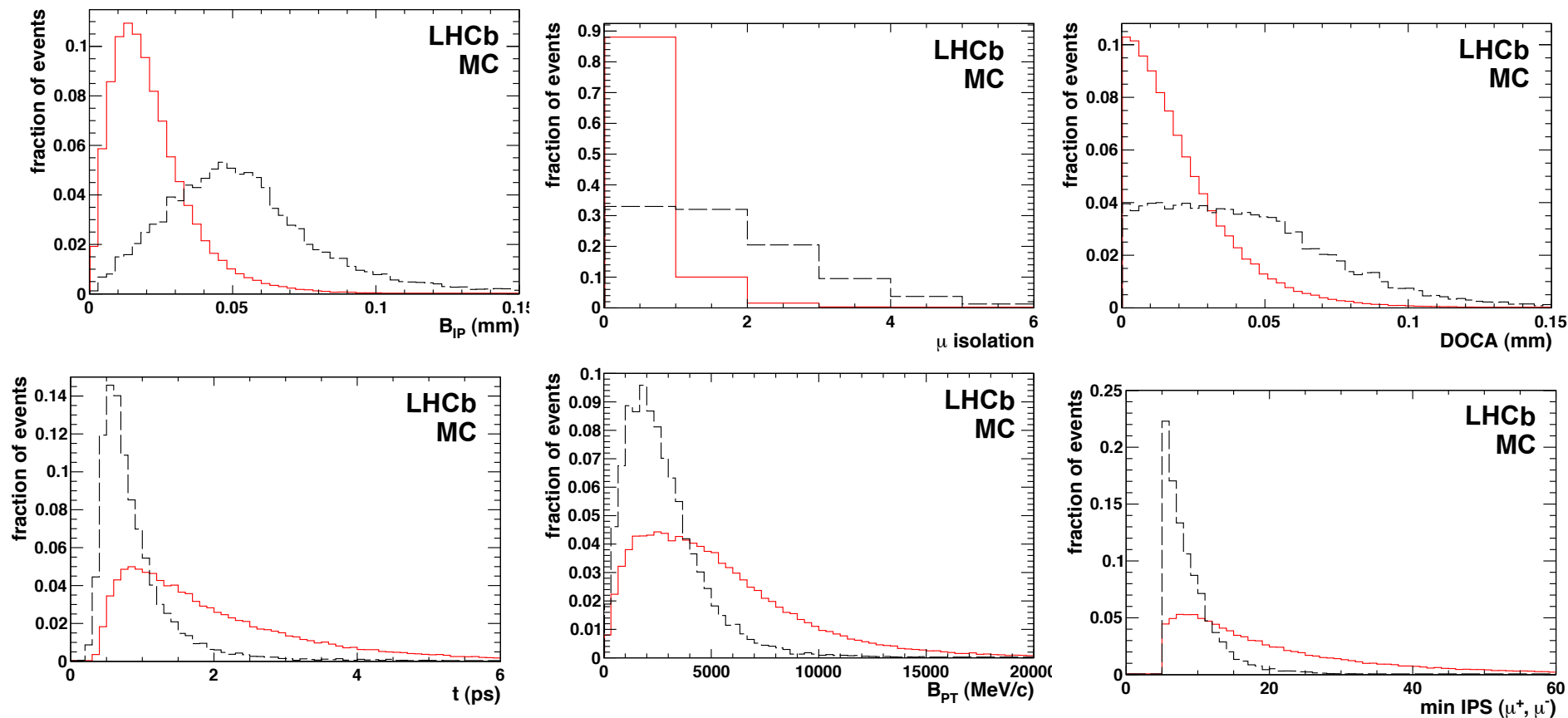
Invariant mass of the $B \rightarrow hh'$ candidates triggered independent of signal.
Yield: 611 ± 56 (stat) \rightarrow enters in normalization factor

Fig13_Norm_GLCalib_B2hh_TIS_allGL.png / png



Invariant mass of the $B \rightarrow hh'$ candidates triggered independent of signal. Shown is the GL range [0.75,1].

GL training from MC



MC input distributions for GL definition. Shown is the signal $B_s \rightarrow \mu\mu$ and the background $bb \rightarrow \mu\mu X$

[Fig15_GL_input_Bip.pdf / png](#)

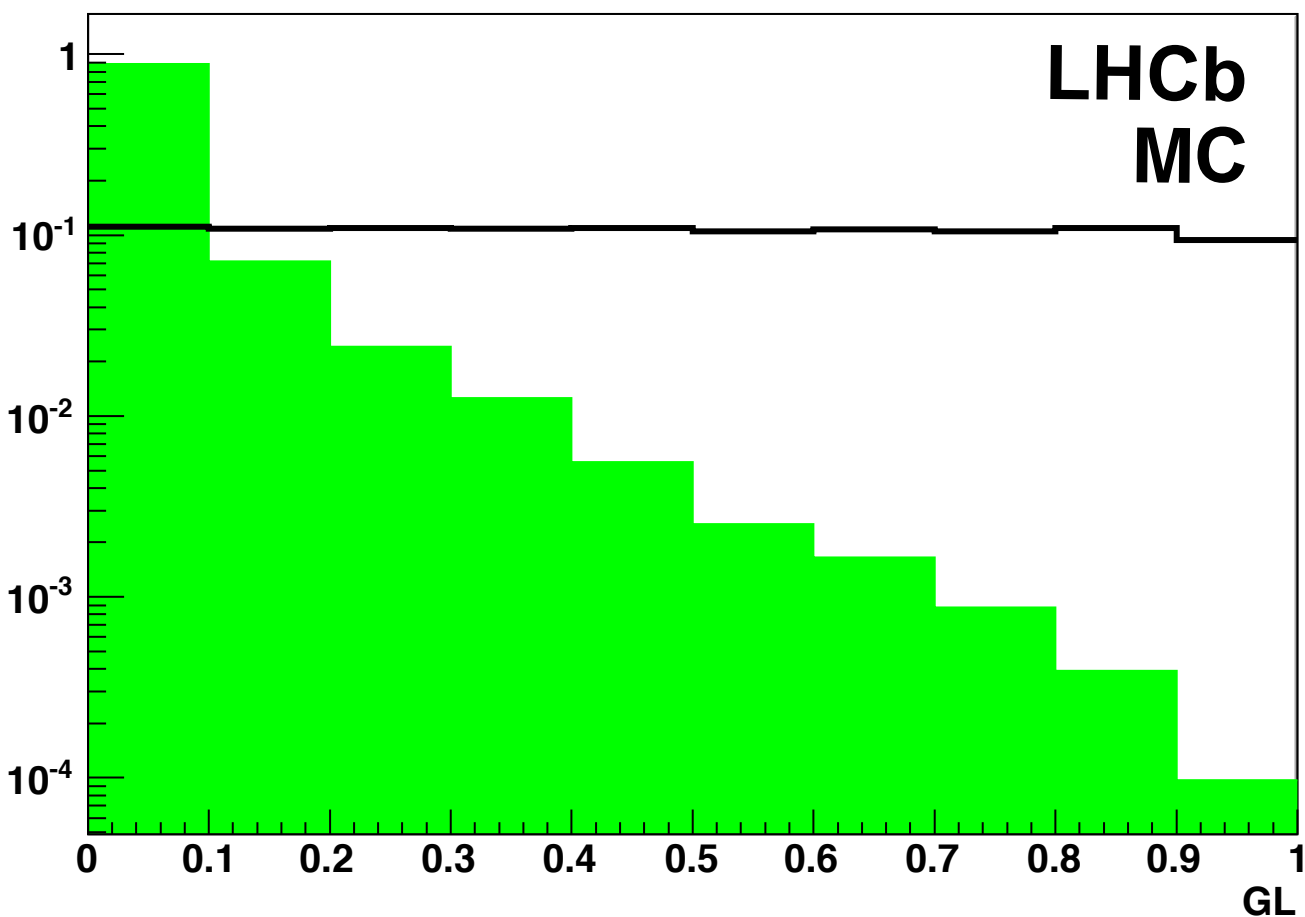
[Fig16_GL_input_isolation.pdf / png](#)

[Fig17_GL_input_DOCA.pdf / png](#)

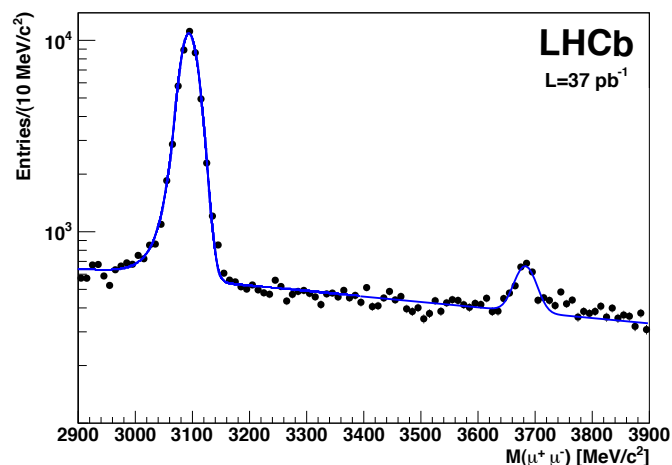
[Fig18_GL_input_Blifetime.pdf / png](#)

[Fig19_GL_input_Bpt.pdf / png](#)

[Fig20_GL_input_minMuIPS.pdf / png](#)



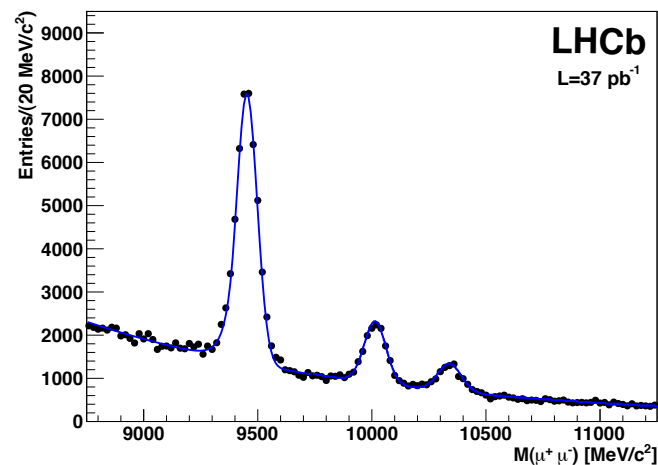
MC: GL distribution for signal (black) and $bb \rightarrow \mu\mu X$ background (green, filled).



Invariant mass for J/ψ and ψ(2S) candidates.

Fit chi2/ndf: 436/90

Fig22_Mass_JPsi.pdf / png

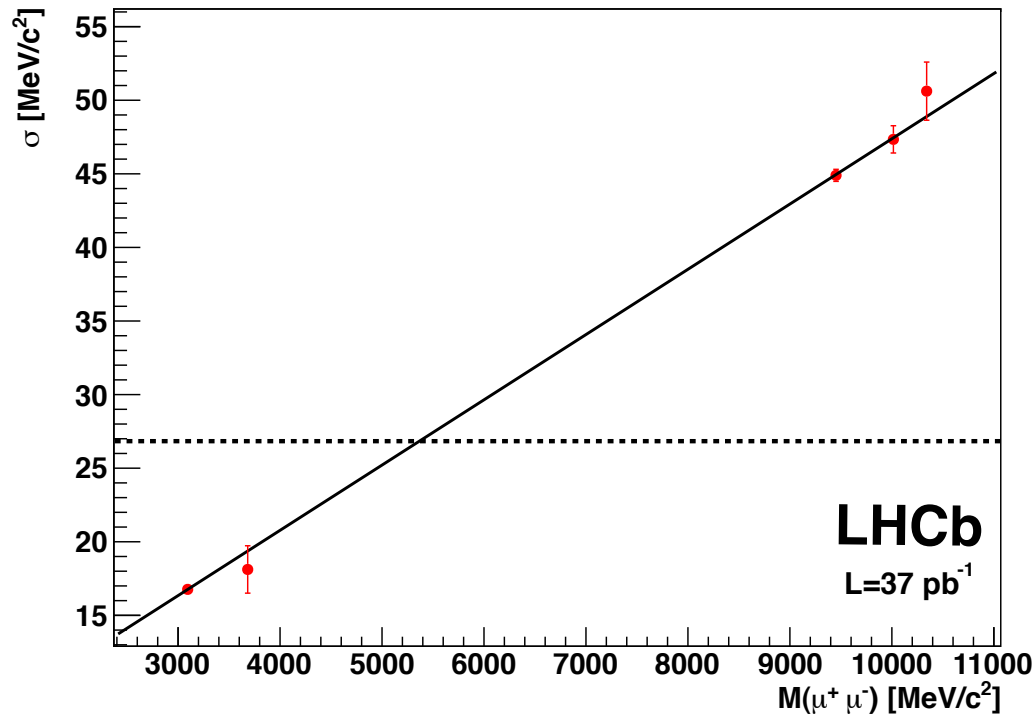


Invariant mass Y(1-3S) candidates.

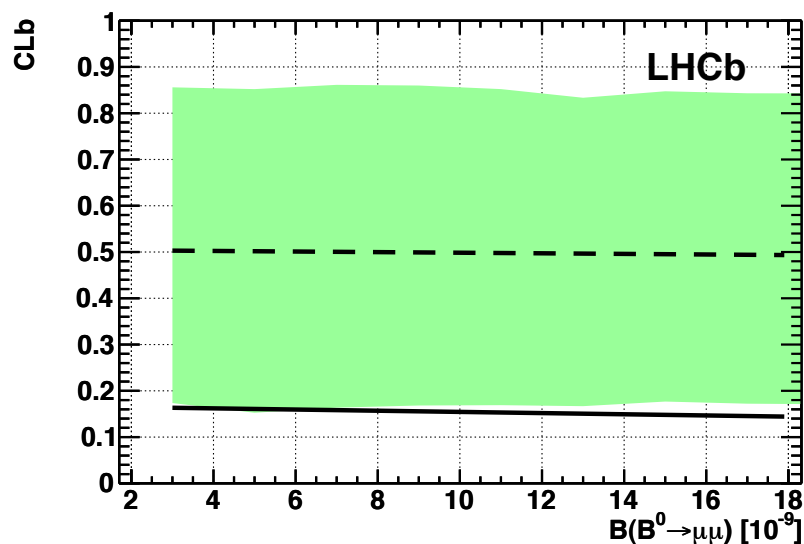
Fit chi2/ndf: 298/112

Fig23_Mass_Y.pdf / png

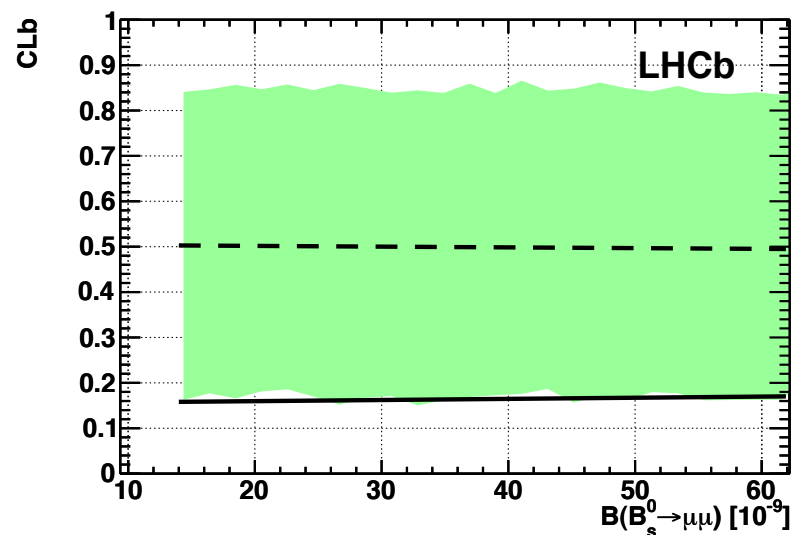
Mass resolution: linear interpolation



Linear interpolation of mass resolution between J/ψ , $\psi(2S)$ and $Y(1-3S)$ candidates. The vertical line indicates the resolution at the B_s mass.



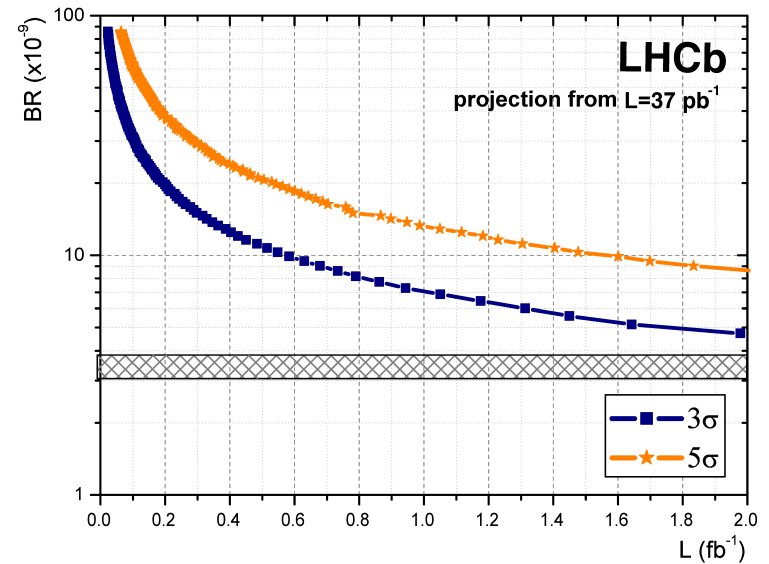
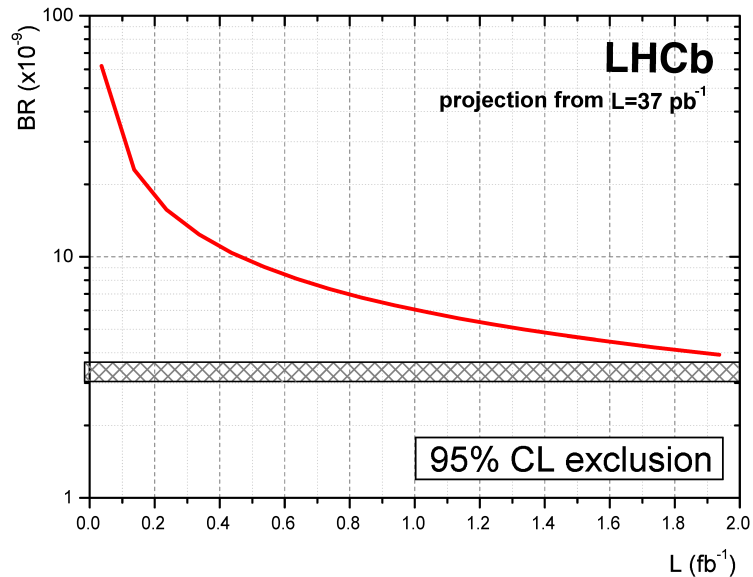
$B^0 \rightarrow \mu\mu$



$B_s \rightarrow \mu\mu$

The dashed line is the background only expectation, the full line the observed data and the green area is the ± 1 sigma area of compatible experiments.

Prospects: Extrapolation to 2fb-1



Projection of the Expected limit with 37 pb^{-1} to higher luminosities and observation prospects.