Forward-Backward Asymmetry in B->K*ll

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Branching fractions

- Both BABAR and Belle has presented new Br Fr meas.:

BABAR:

$$Br(B \to K^* l^+ l^-) = (0.88 \pm 0.31 \pm 0.10) \times 10^{-6}$$

$$Br(B \to K l^+ l^-) = (0.65 \pm 0.14 \pm 0.04) \times 10^{-6}$$

Belle:

$$Br(B \to K^* l^+ l^-) = (1.15 \pm 0.25 \pm 0.08 \pm 0.02) \times 10^{-6}$$

$$Br(B \to K l^+ l^-) = (0.48 \pm 0.10 \pm 0.03 \pm 0.01) \times 10^{-6}$$

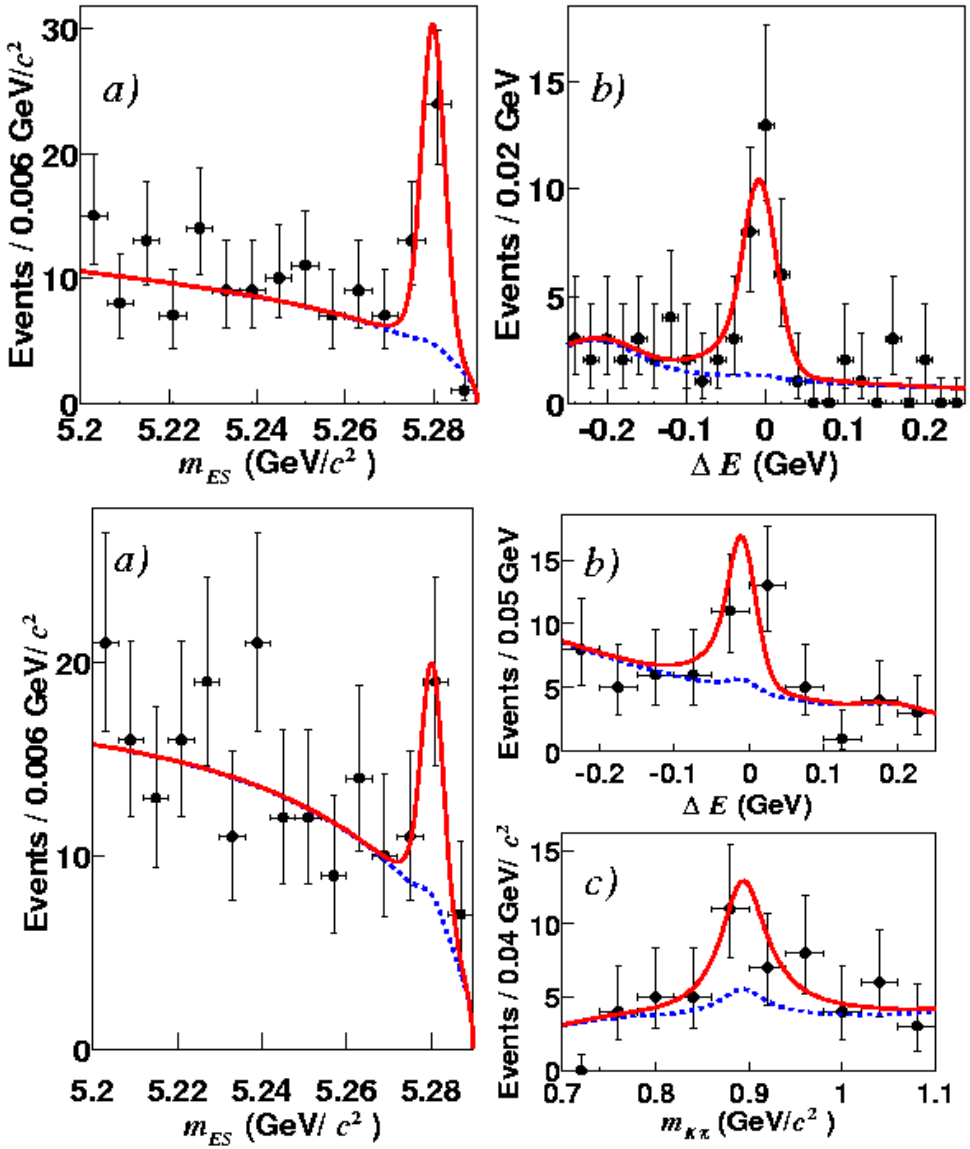
Average:

$$Br(B \to K^* l^+ l^-) = (1.04 \pm 0.204) \times 10^{-6}$$

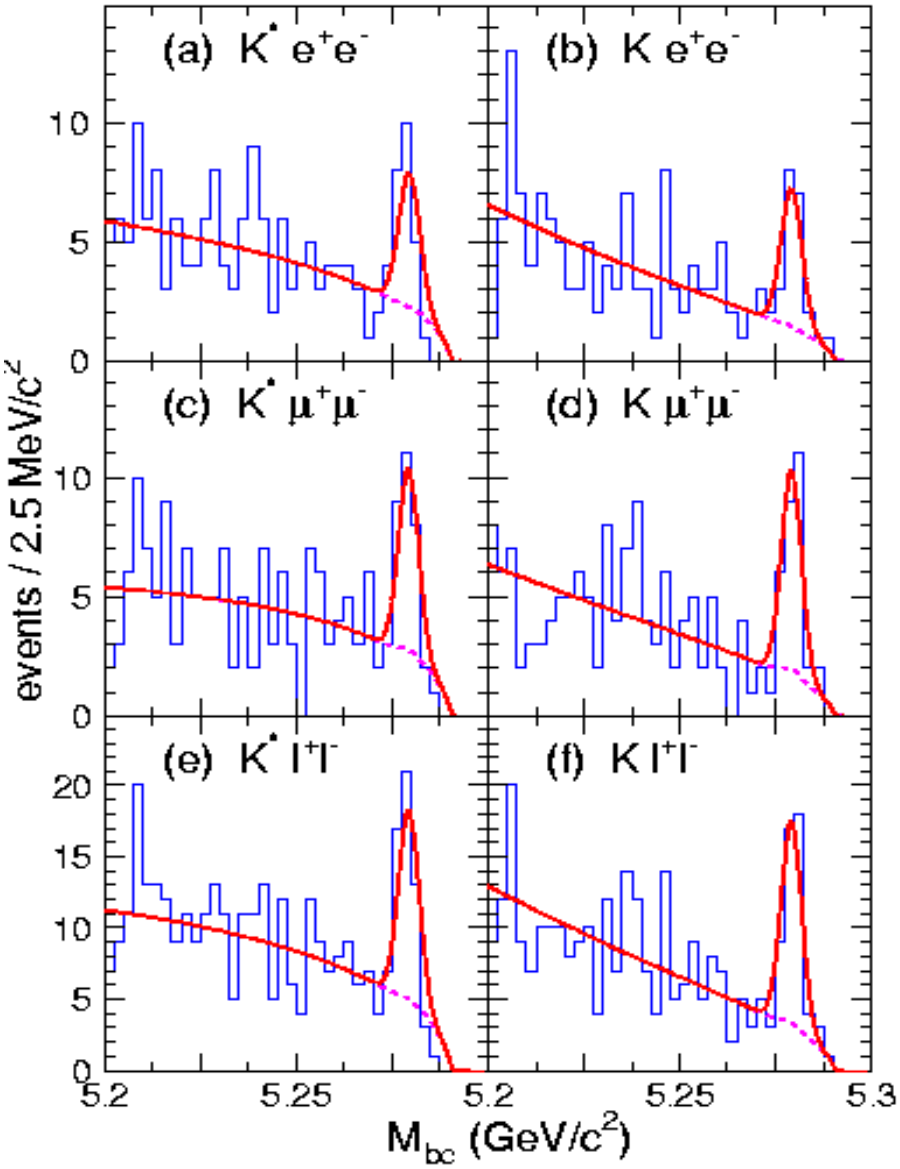
$$Br(B \to K l^+ l^-) = (0.54 \pm 0.08) \times 10^{-6}$$

K(*)ll signals

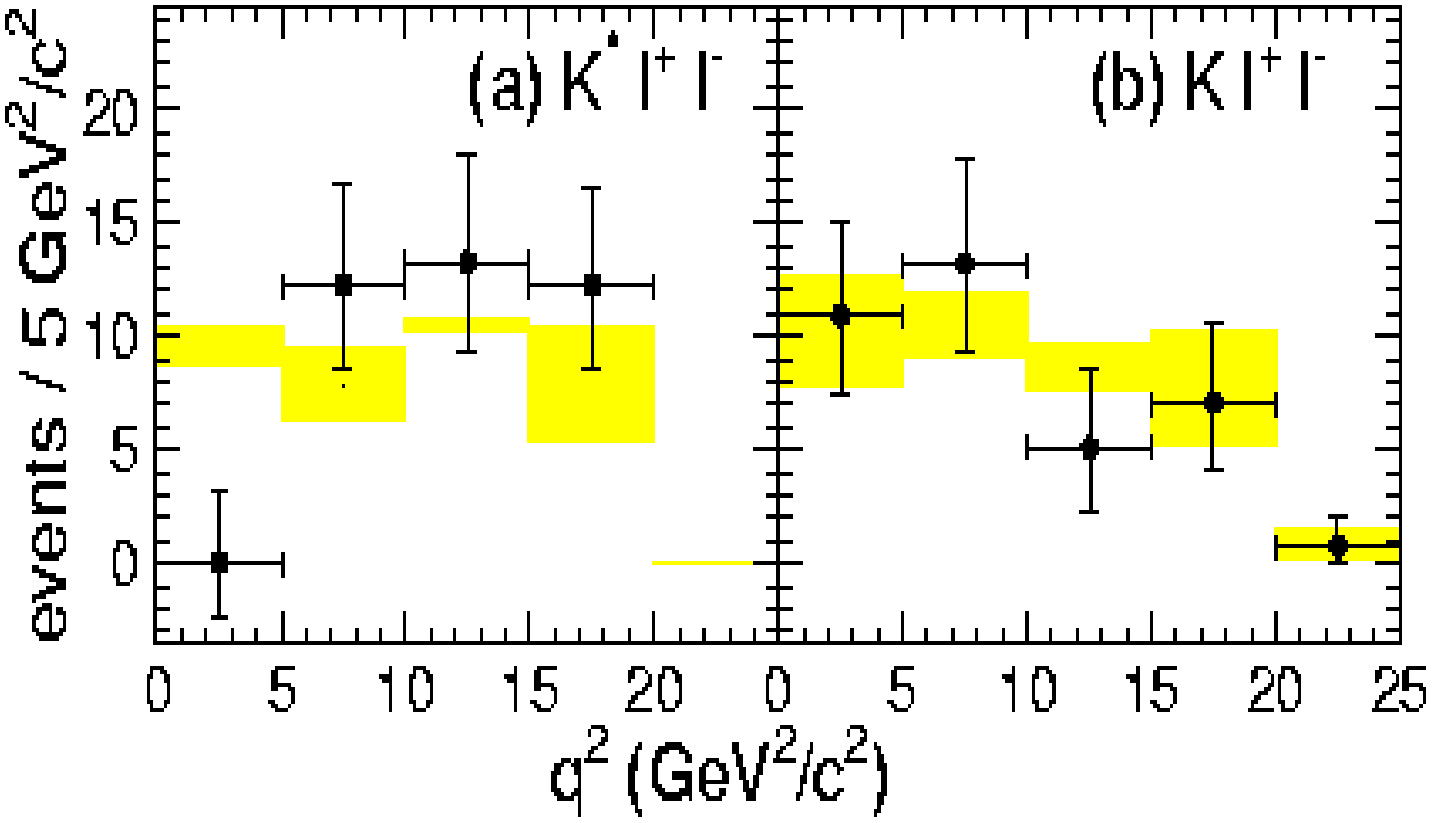
BABAR (121/fb)



Belle (140/fb)



Belle q2 distributions



Model predictions

Authors	$\mathcal{B}(B\to Kl^+l^-)$ $/10^{-6}$	$\mathcal{B}(B\to K^*\mu^+\mu^-)$ $/10^{-6}$	$\mathcal{B}(B\to K^*e^+e^-)$ $/10^{-6}$
Ali *et al.* (2000)	$0.57^{+0.17}_{-0.10}$	$1.9^{+0.5}_{-0.4}$	$2.3^{+0.7}_{-0.5}$
Ali *et al.* (2001) [NNLO]	0.35 ± 0.12	1.19 ± 0.39	1.58 ± 0.49
Aliev *et al.* (1997)	0.31 ± 0.09	1.4	
Colangelo *et al.* (1996)	0.3	1.0	
Faessler *et al.* (2002)	0.55	0.81	
Geng and Kao (1996)	0.5	1.4	
Melikhov *et al.* (1998)	0.44	1.15	1.50
Zhong *et al.* (2002)	$0.69^{+0.28}_{-0.25}$	$1.98^{+0.66}_{-0.71}$	$2.01^{+0.65}_{-0.73}$

- $\mathcal{B}(B\to K\ell^+\ell^-) =$
  $(0.35 \pm 0.11(\text{form fac.}) \pm 0.04(\mu_b) \pm 0.02(m_{t,\text{pole}}) \pm 0.0005(m_c/m_b)) \times 10^{-6}$
  [Ali, Lunghi, Greub, Hiller, hep-ph/0112300, 2001]

Some Assumptions

- Study based on full G4 BABAR MC (SP4/SP5)
- Selection criteria are same as in published result:
- I assumed the following branching fractions

$$Br(B \to K^* e^+ e^-) = 1.4 \times 10^{-6}$$

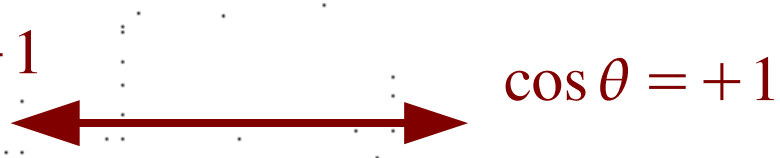
$$Br(B \to K^* \mu^+ \mu^-) = 1.0 \times 10^{-6}$$

- Per 1/ab we produce 1,500 K*ee and 1,100 K*mm events
- With the signal efficiencies of 14%(K*0ee) and 6%(K*0mm) we would reconstruct 140 K*ee events and 44 K*mm events per 1/ab. (Includes 2/3 for K*)
- However, the muon efficiency should be better as BABAR has problems with the muon system. Hence, I will use 10% which gives 73 events per 1/ab. (Belle infact has a higher efficiency for the muons than electrons).
- Can gain some statistics using the K*+ modes.

Lepton forward-backward asymmetry

$$\overline{B} \to K^{*} \mu^{+} \mu^{-}$$

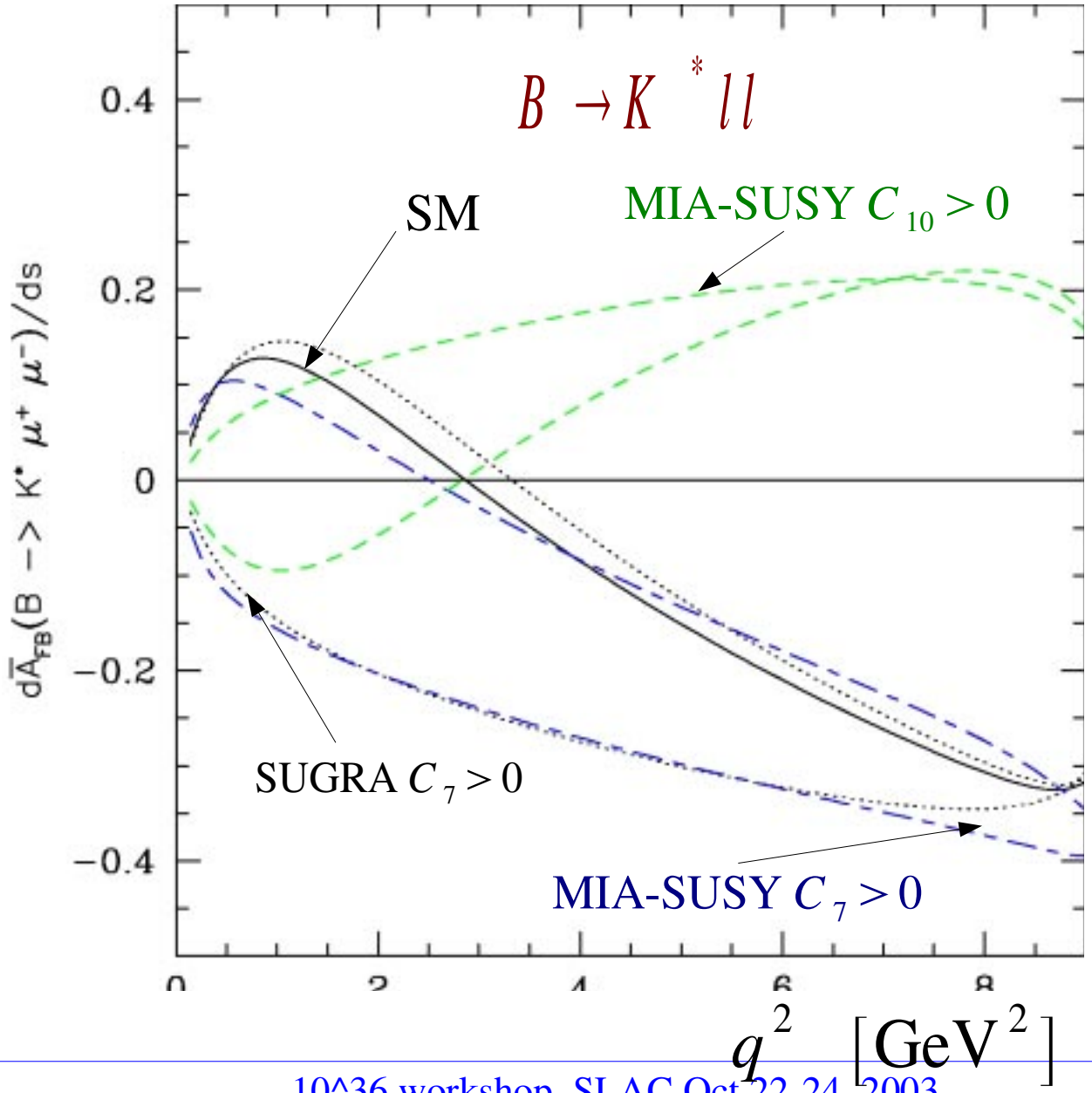
q^2



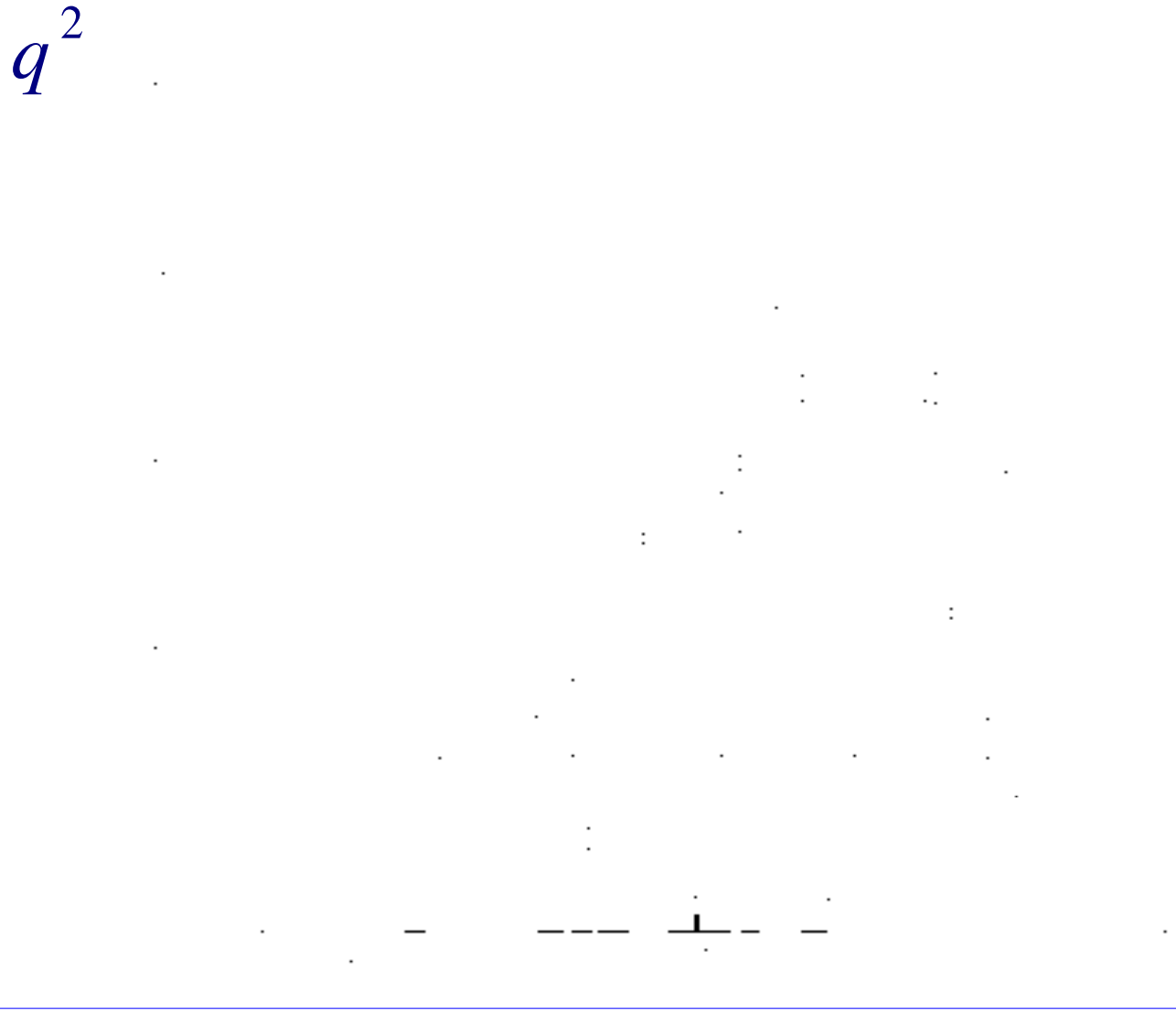
$$\frac{d\Gamma}{d\cos\theta} \propto 1 + a\cos\theta + b\cos^2\theta$$

E_{l^-}

Lepton forward-backward asymmetry

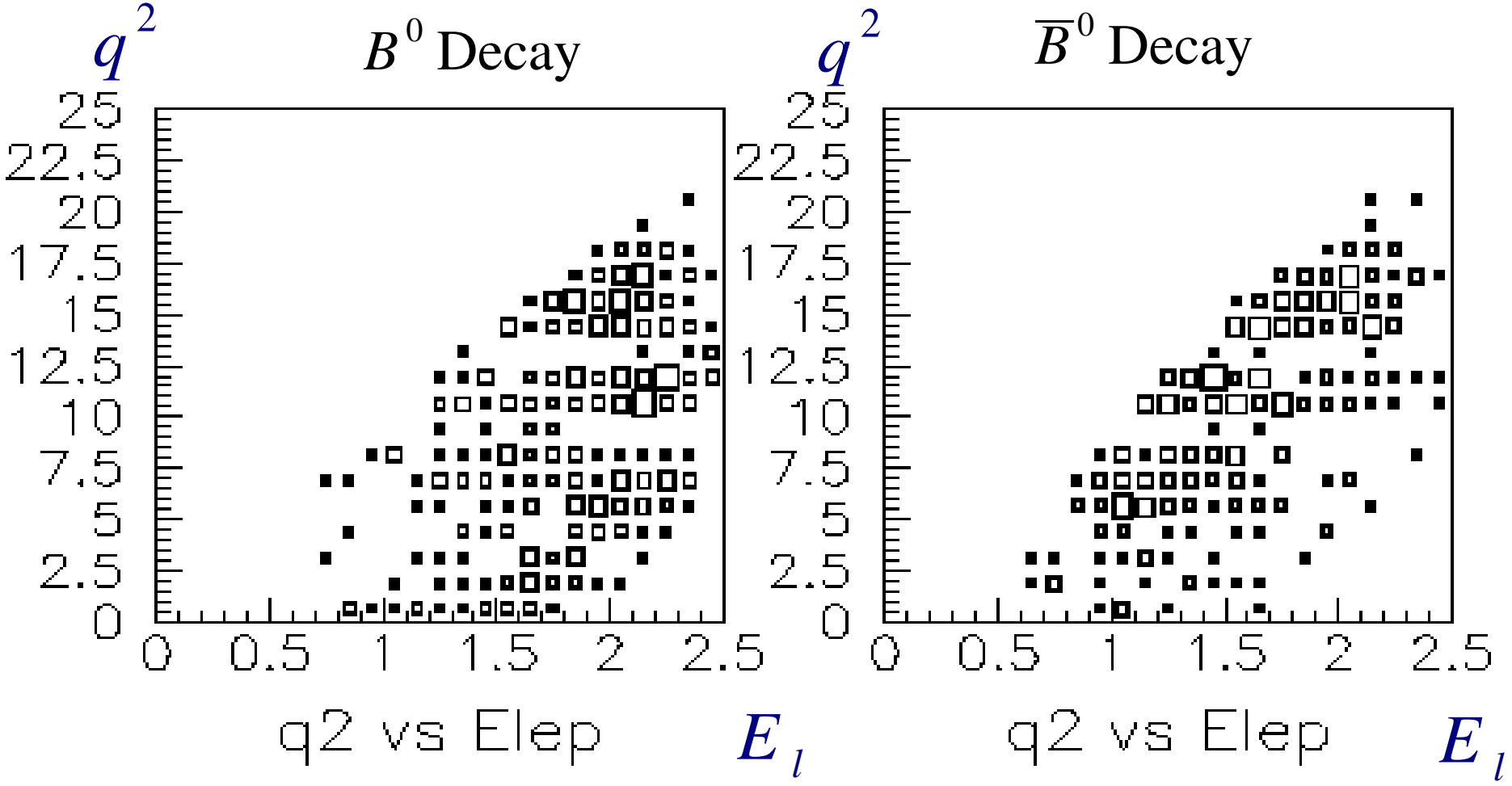


Accepted events K*ee



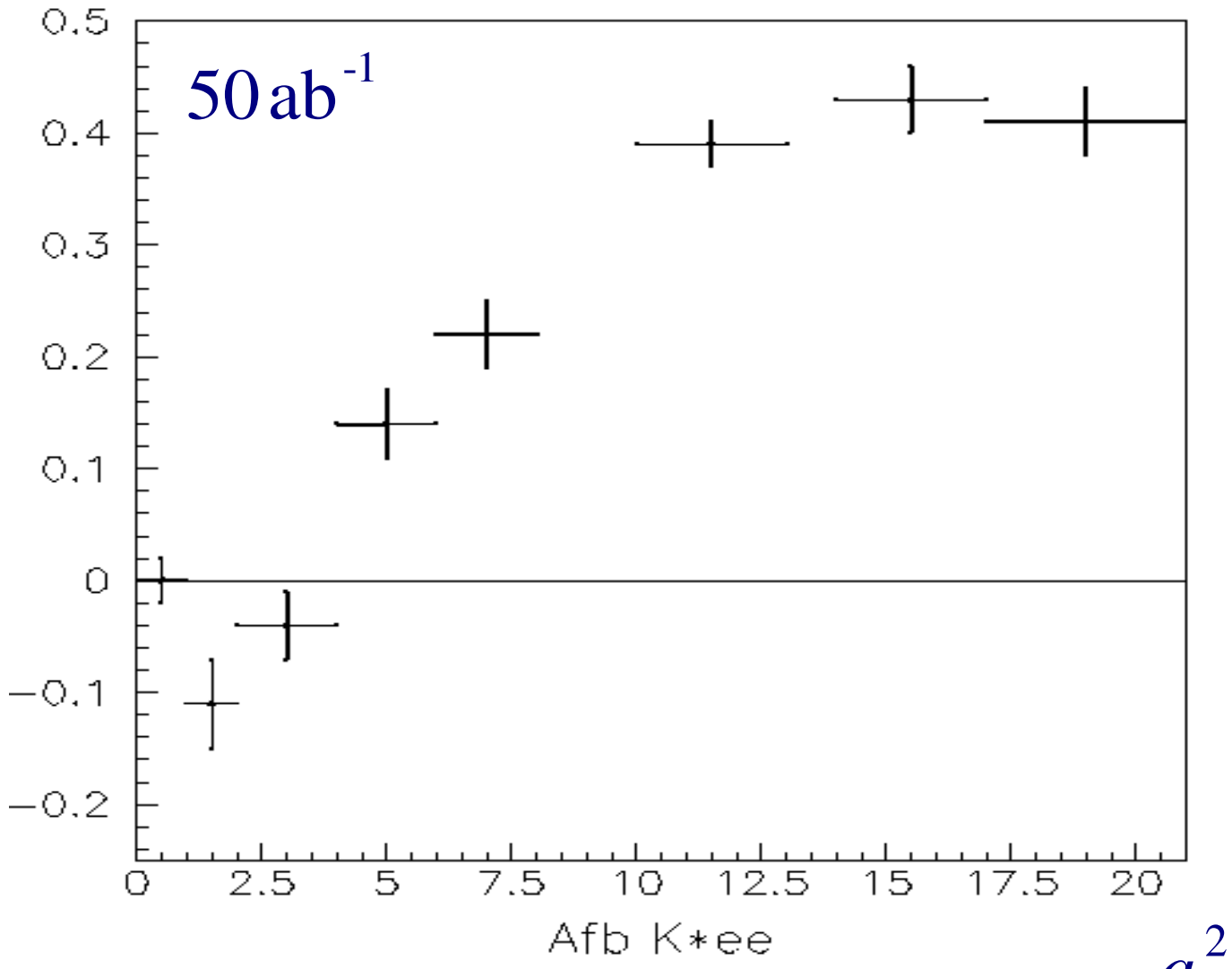
Accepted events K*mm

BB backgrounds in K*ee

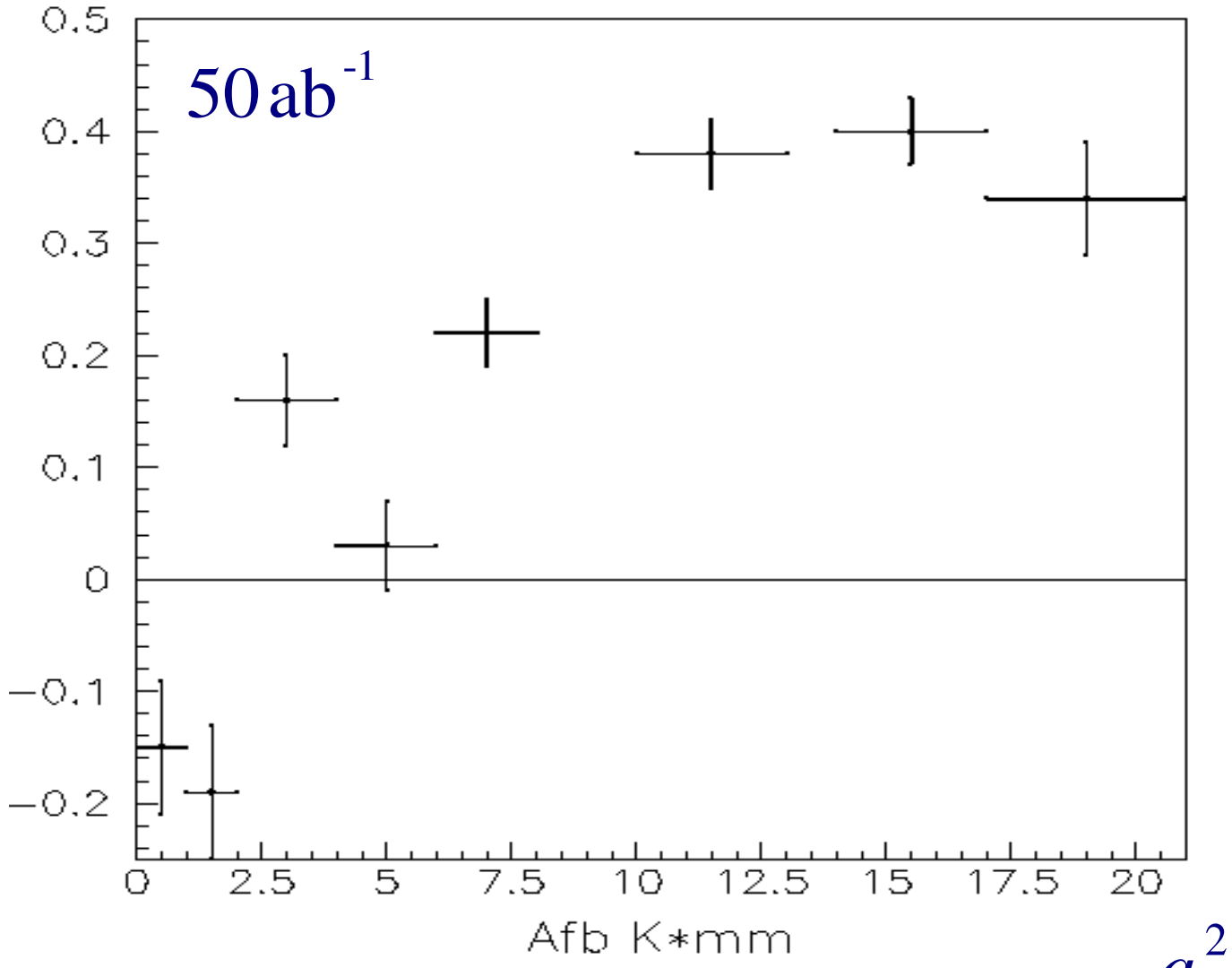


Asymmetric BB backgrounds, should not be a problem as it does not peak

A_{FB} in K*ee 50/ab



A_{FB} in K*mm 50/ab



Conclusions

- Will reconstruct about 1400 K*ee events per year (10/ab)
  - or 7000 events in 50/ab.
  - LHCb would record 8000 events per year.
- This allows a measurement of the 0 of A_{FB} in K*ee
  - Muon modes have a hard time measuring the zero due to acceptance of low momentum muon identification.