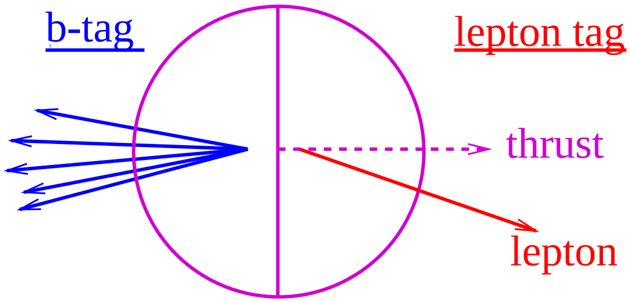
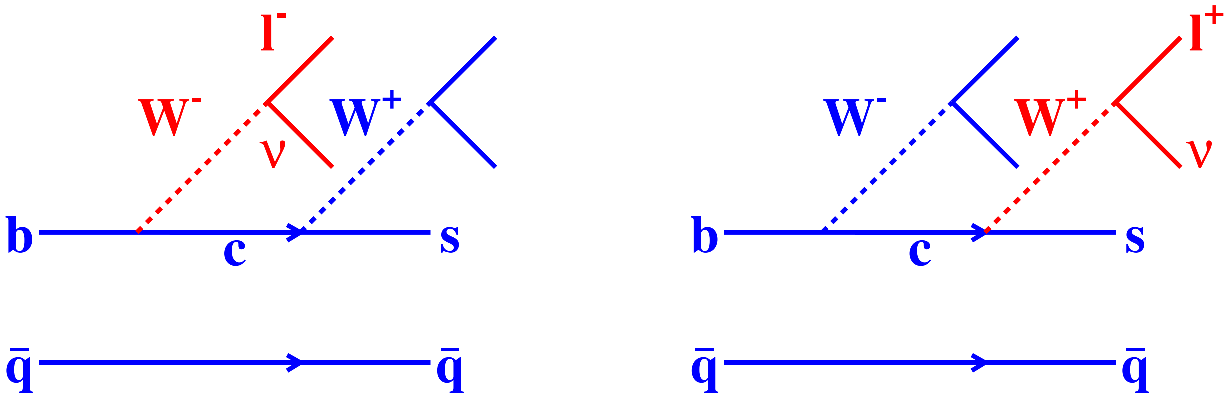
Recent new results on $\mathrm{BR}(\mathrm{b} \longrightarrow \ell \mathrm{X})$



- Select $\mathrm{b\bar{b}}$ events using a lifetime b-tagging technique
- Search hemisphere opposite a b-tag for prompt leptons

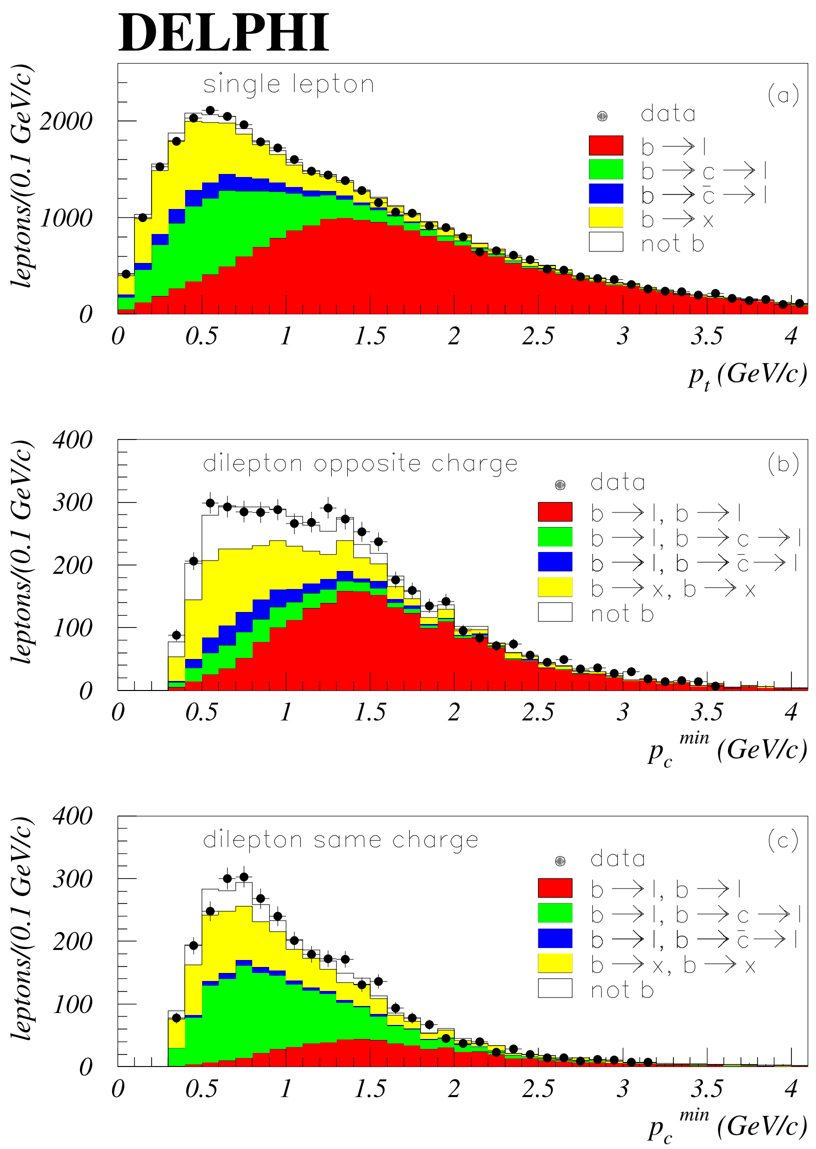
This mostly selects two types of events:

$\mathrm{b} \longrightarrow \ell$ $\qquad$ $\mathrm{b} \longrightarrow \mathrm{c} \longrightarrow \ell$



1. **DELPHI**: Use p and p_T for single leptons; charge correlations and $p_c = \sqrt{p_T^2 + p^2/100}$ for dileptons
2. **OPAL**: Use two neural networks trained to separate $\mathrm{b} \longrightarrow \ell$ and $\mathrm{b} \longrightarrow \mathrm{c} \longrightarrow \ell$ events from backgrounds (info from p, p_t, jet shape and charge correlations)

DELPHI: Lepton p_T and p_c spectra



$$\mathrm{BR}(\mathrm{b} \to \ell \mathrm{X}) = (10.66 \pm 0.11 \pm 0.24^{+0.42}_{-0.25}\ (\mathrm{model}))\%$$

$$\mathrm{BR}(\mathrm{b} \to \mathrm{c} \to \ell \mathrm{X}) = (8.08 \pm 0.37 \pm 0.38^{+0.23}_{-0.31}\ (\mathrm{model}))\%$$

DELPHI: three other analyses used

All methods give very consistent results

- **Single leptons and jet-charge:**

  $\surd$ fit for lepton momentum in b hadron rest frame

- **Flavour deconvolution**

  $\surd$ use p, p_T (with ℓ), p_T (no ℓ) to find $\mathrm{b} \to \ell$

- **Separate b from $\bar{b}$ hemispheres**

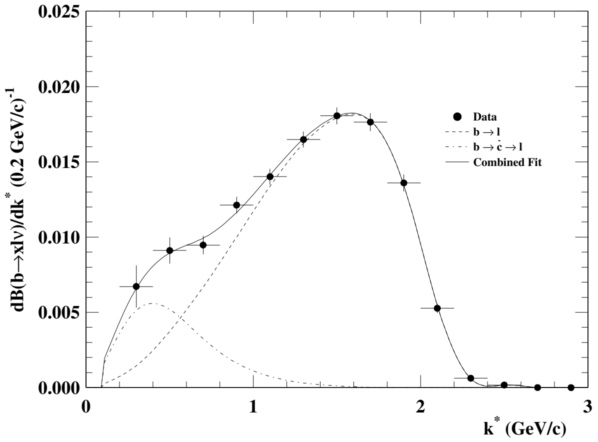
  $\surd$ reconstruct B vertex in b-tagged events

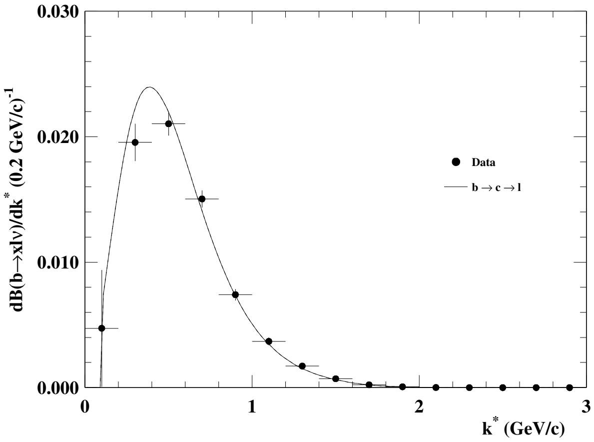
  $\surd$ find prob. for tracks to come from primary vertex

  $\surd$ use NN to separate b from $\bar{b}$ hemispheres

  $\surd$ fit lepton momentum in b hadron rest frame

same sign **opposite sign**



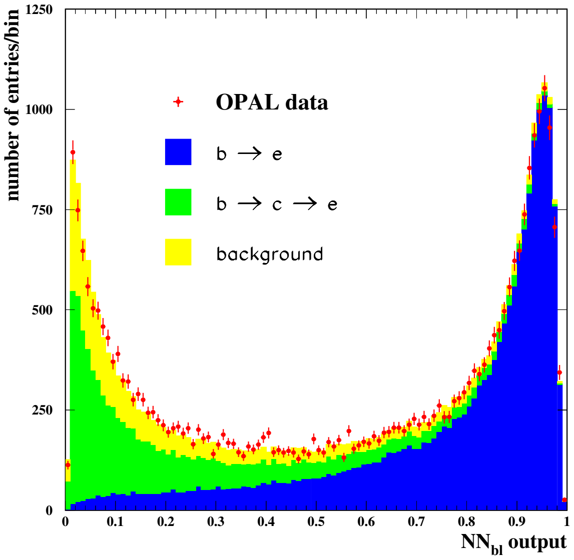


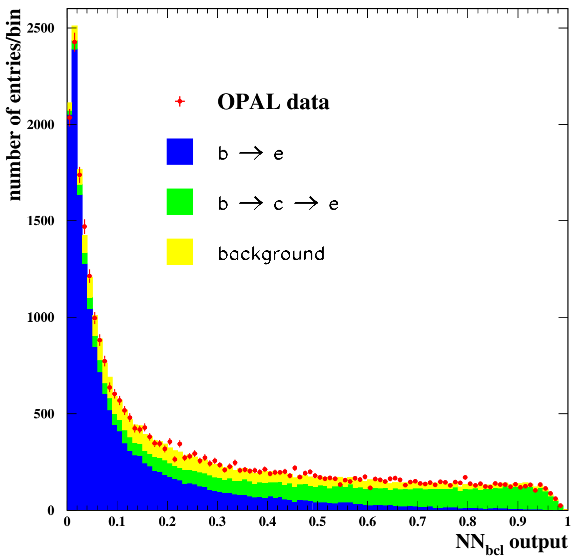
OPAL: final result for $\mathrm{BR}(\mathrm{b} \to \ell \mathrm{X})$

Fit to shape of NN output variables to get fractions of

$\mathrm{b} \to \ell$, $\mathrm{b} \to \mathrm{c} \to \ell$ and backgrounds:

$\mathrm{NN_{be}}$ $\mathrm{NN_{bce}}$





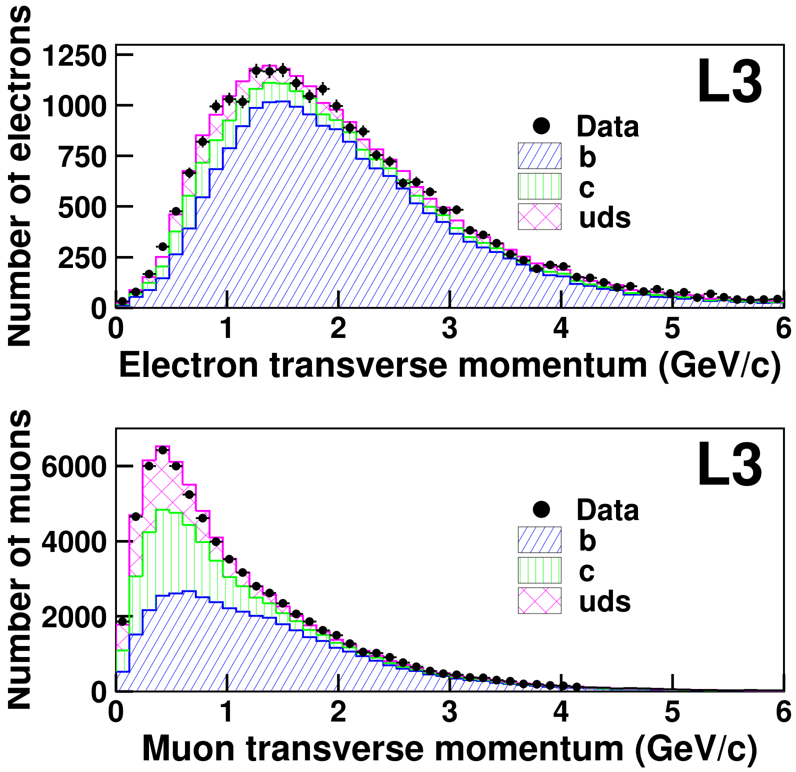
Modelling error reduced with two NN and charge correlations

Final results, now including both e and μ:

$$\mathrm{BR}(\mathrm{b} \to \ell \mathrm{X}) = 10.83 \pm 0.10 \pm 0.20^{+0.20}_{-0.13}\ (\mathrm{model})\%$$
$$\mathrm{BR}(\mathrm{b} \to \mathrm{c} \to \ell \mathrm{X}) = 8.40 \pm 0.16 \pm 0.21^{+0.33}_{-0.29}\ (\mathrm{model})\%$$

New result from L3

- Select $\mathrm{b\bar{b}}$: impact parameter or high-p_T lepton
- leptons selected with $p > 3$ GeV, $p_T > 1$ GeV
- lepton efficiency determined from data in double tags
- measure R_{b} and $\mathrm{BR(b \to \ell X)}$ simultaneously
- errors on lepton modelling and fragmentation set differently



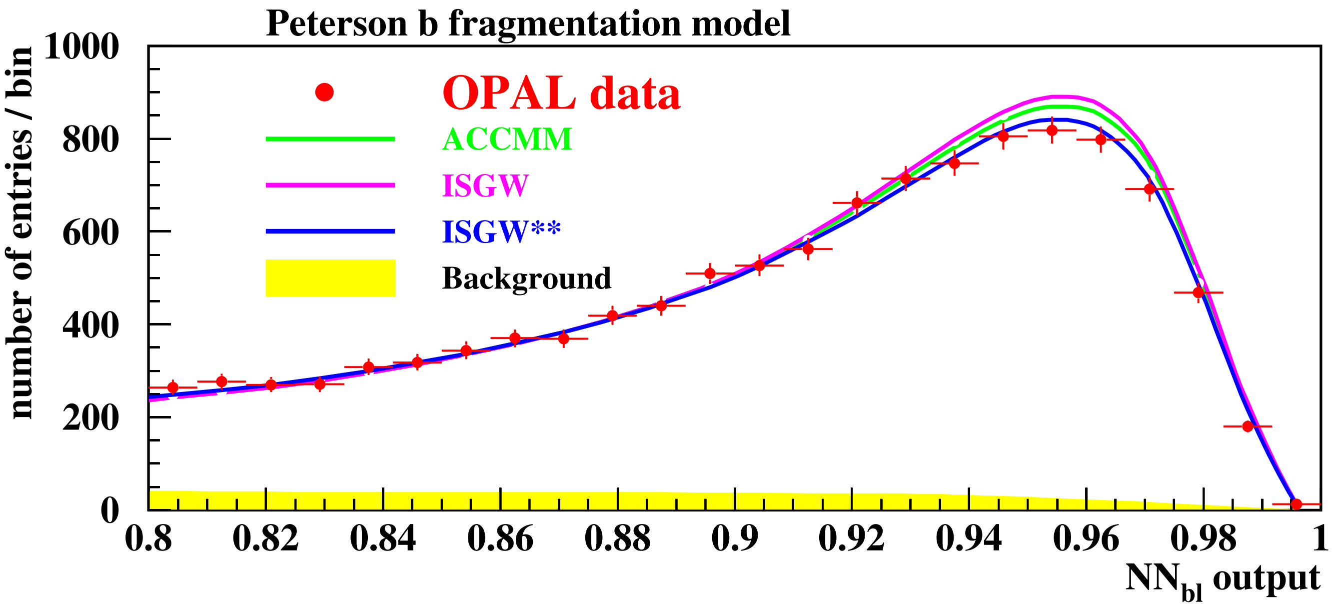
$p_T > 1$ GeV

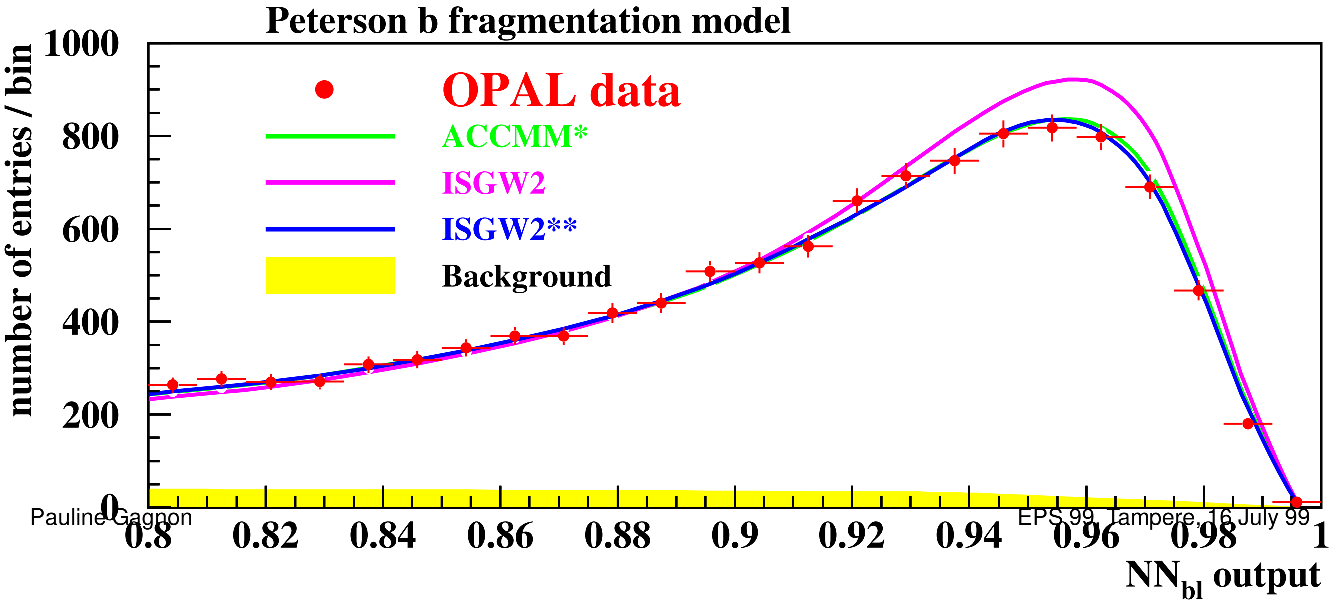
cut not shown

$$\mathrm{BR(b \to \ell X)} = (10.16 \pm 0.13\,(\mathrm{stat}) \pm 0.29\,(\mathrm{syst}))\%$$

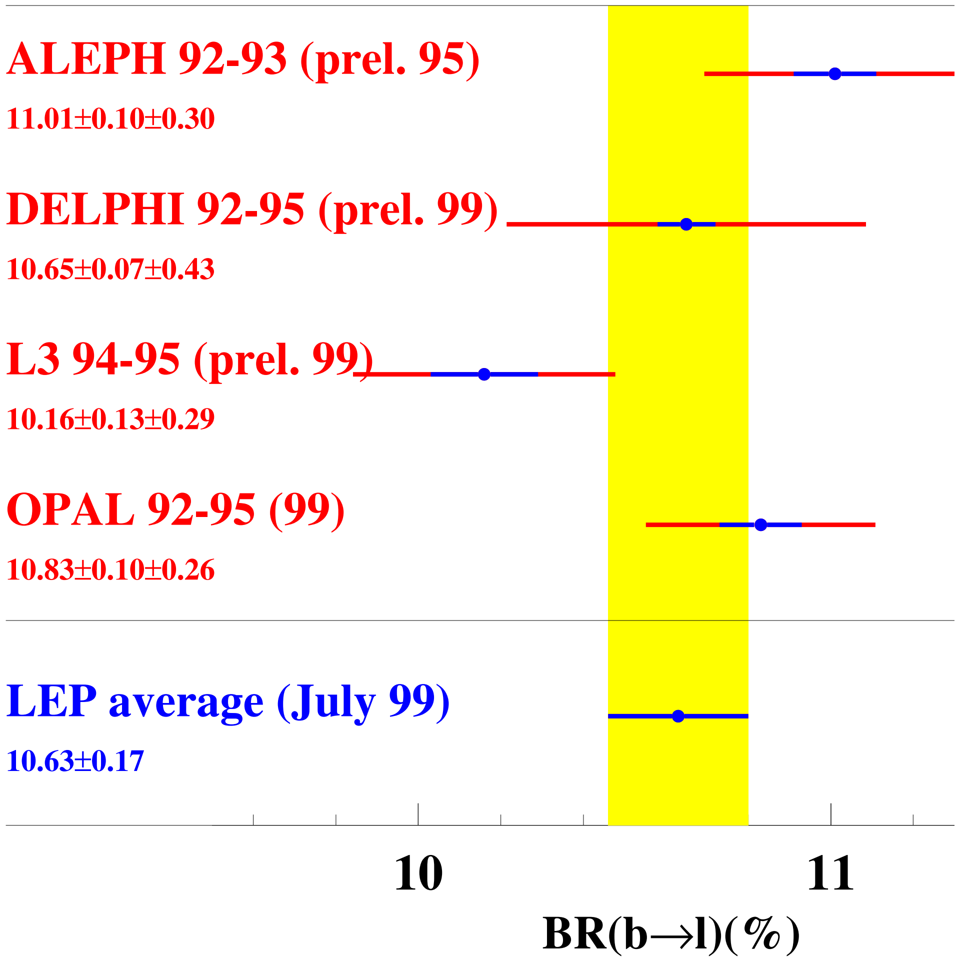
Lepton spectrum models at OPAL

central	ACCMM	$p_f = 298$ MeV, $m_c = 1673$ MeV/c^2
$+1\sigma$	IGSW	with 11% D^{**} (model prediction)
-1σ	IGSW**	with 32% D^{**} (CLEO fit)
test	ACCMM*	$p_f = 837 \pm 210$ MeV, $m_c = 1287 \pm 139$
test	IGSW2	with 9% D^{**} (model prediction)
test	IGSW2**	with 45% D^{**} (OPAL fit)





New average for $\mathrm{BR}(\mathrm{b} \to \ell\mathrm{X})$



- New EW fit does not include old lepton fits
  $\to N_{\mathrm{lepton}} = (\mathrm{BR}(\mathrm{b} \to \ell\mathrm{X}) \cdot R_{\mathrm{b}})/\epsilon_\ell$
  $\to -0.95$ correlation between $\mathrm{BR}(\mathrm{b} \to \ell\mathrm{X})$ and R_{b}

- Include only b-tagged measurements in global EW fit

- Constraint from A_{fb} reduces modelling error
  $\to \pm 0.09 \to \pm 0.11$ without A_{fb} in fit

New LEP-SLD average: $\mathrm{BR}(\mathrm{b} \to \mathrm{X}\ell) = (10.63 \pm 0.17)\%$

Error breakdown for $\mathrm{BR}(\mathrm{b} \longrightarrow \ell \mathrm{X})$

statistical	± 0.071
lepton id, tracking	± 0.124
$\mathrm{b} \longrightarrow \ell$ spectrum	± 0.084
$\mathrm{b} \longrightarrow \mathrm{c} \longrightarrow \ell$ spectrum	± 0.065
b fragmentation	± 0.022
$\mathrm{b} \longrightarrow \tau \longrightarrow \ell$	± 0.012
$\mathrm{b} \longrightarrow \bar{\mathrm{c}} \longrightarrow \ell$	± 0.010
MC statistics	± 0.009
others	± 0.032
total systematics	± 0.169

$$\mathbf{BR_{sl}^{Z^o} = (10.63 \pm 0.07\ (stat.) \pm 0.17\ (syst.))\%}$$