$|V_{ub}|$ measurement from exclusive $B \to \rho l \nu$: status update

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Introduction to analysis

- Goal: measure $|V_{ub}|$ from $B \to \rho l \nu$
  - Split for B^0 and $B^\pm$
  - Split for $e^\pm$ and $\mu^\pm$
- Untagged analysis for phase III data
- Svenja does $B \to \pi l \nu$ in a similar way
- ρ challenging
  - Small branching fraction
  - Two π final state
  - Large background

Decays

- $B^0 \to \rho^\pm \to (\pi^\pm \pi^0) l^\mp \nu$
- $B^\pm \to \rho^0 \to (\pi^\pm \pi^\mp) l^\pm \nu$

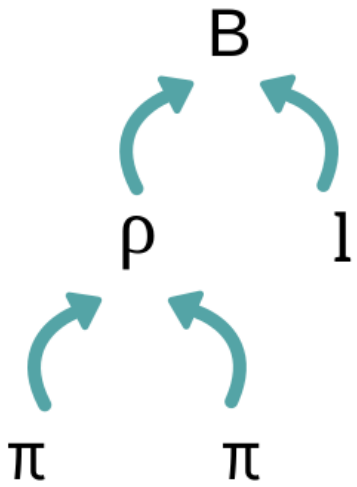
Analysis strategy

- Inspect signal
- Remove background
  - PID selection
  - p_l^* selection
- ROE selection
- Continuum suppression
- Signal extraction fit
  - Different potential parameters
  - m_ρ, p_l^*, $\cos\theta_{BY}$
  - m_{BC}, ΔE

Approach

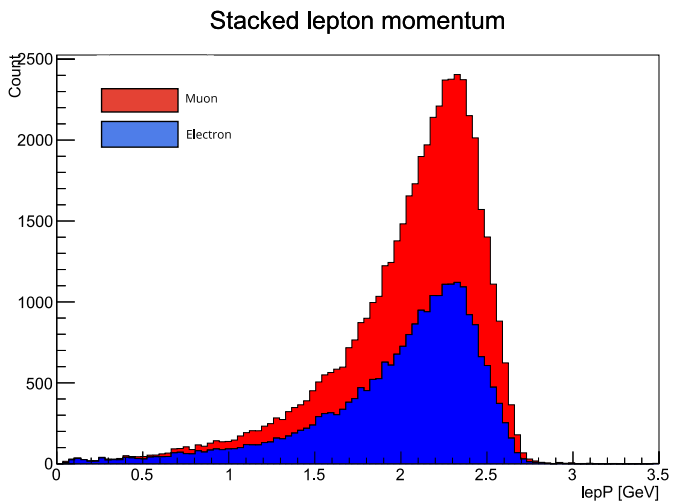
- Started with signal MC
  - 1 'signal' B, 1 generically decaying B
  - Reconstructed using std. particle lists
  - Corrected for FSR
- Truth matching
  - Use framework parameters
  - Reconstruct bottom-up

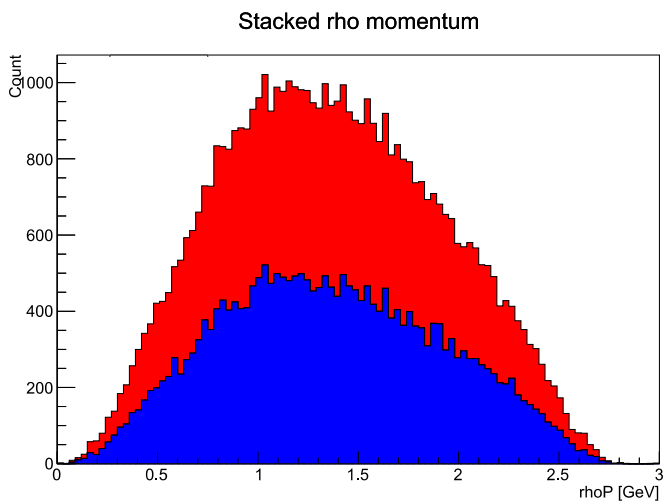
True ρ and l,
same mother (index),
mother PDG = B

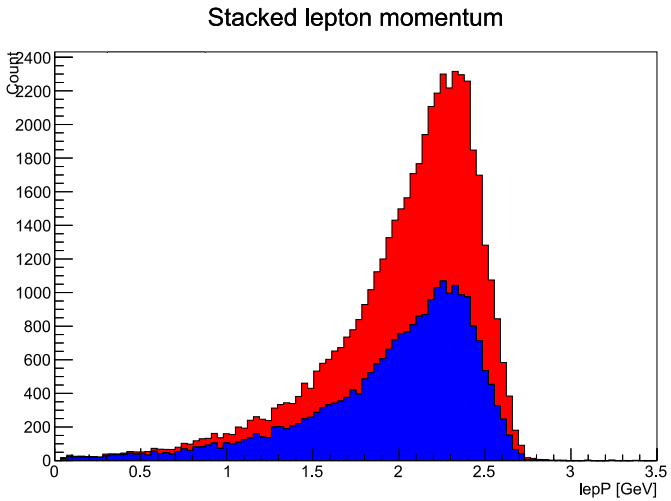


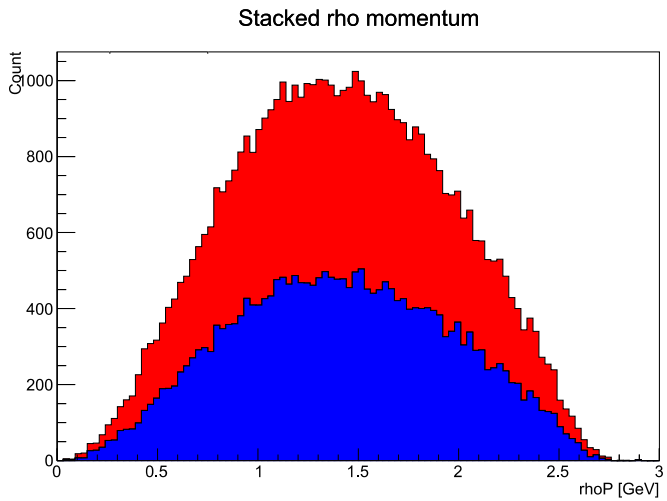
True π's,
same mother (index),
mother PDG = ρ,
Gmother PDG = B

Signal histogram examples









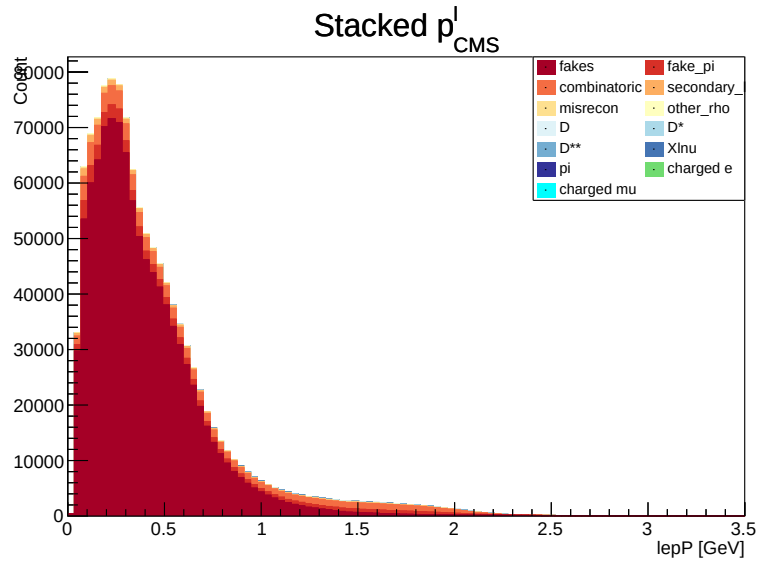
Background identification

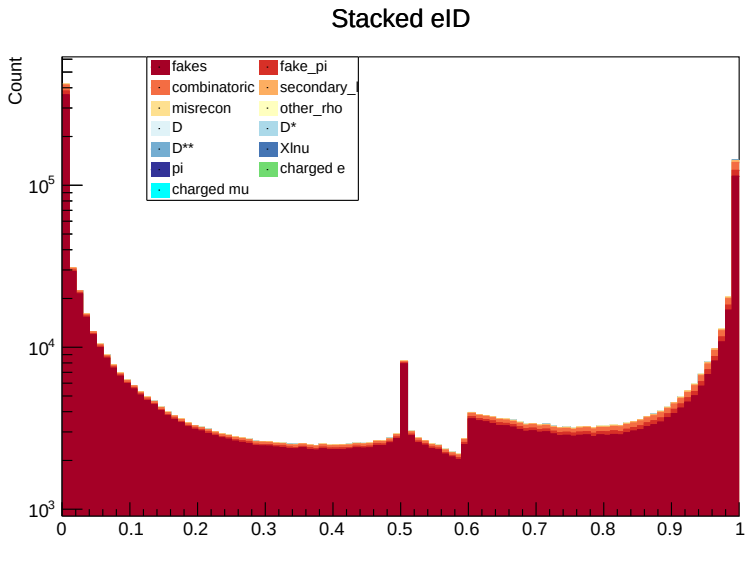
- Switch to generic MC
  - 2 generically decaying B's
  - Find dominant backgrounds
- Standard lists
  - Highest ϵ available
  - Used to include all candidates
  - Barely any selection
  - π_0: checked 60% vs 40%

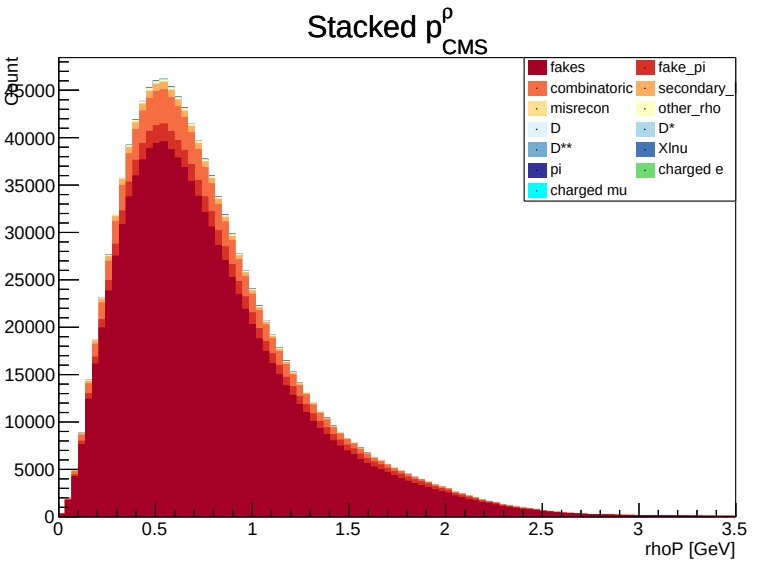
Used particle lists

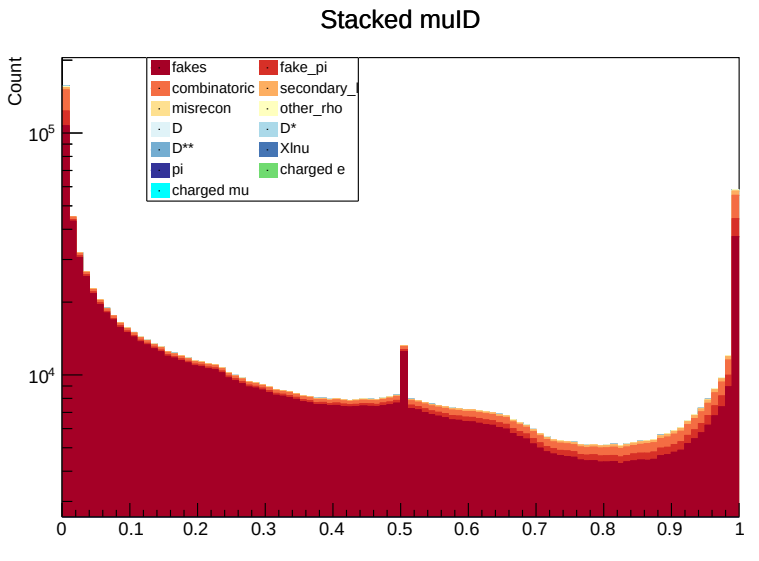
- e: 95% eff
- μ: 95% eff
- $\pi^{\pm}$: 85% eff
- π^0: 40% eff

Stacks


Stacked p^{l}_{CMS}
Count
lepP [GeV]
fakes
fake_pi
combinatoric
secondary_
misrecon
other_rho
D
D*
D**
Xlnu
pi
charged e
charged mu


Stacked eID
Count
fakes
fake_pi
combinatoric
secondary_
misrecon
other_rho
D
D*
D**
Xlnu
pi
charged e
charged mu

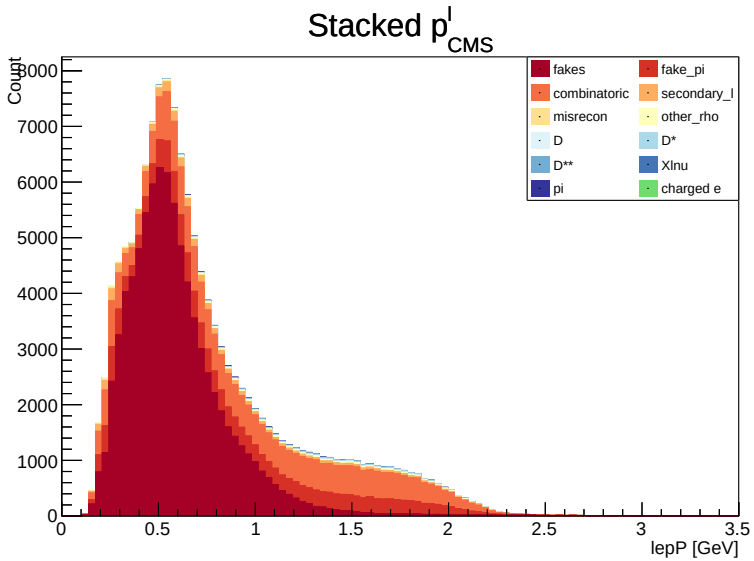

Stacked p^{ρ}_{CMS}
Count
rhoP [GeV]
fakes
fake_pi
combinatoric
secondary_
misrecon
other_rho
D
D*
D**
Xlnu
pi
charged e
charged mu

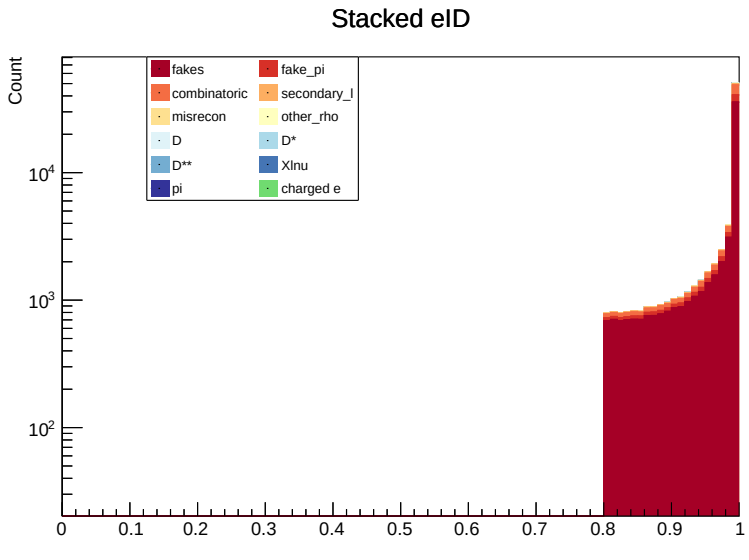

Stacked muID
Count
fakes
fake_pi
combinatoric
secondary_
misrecon
other_rho
D
D*
D**
Xlnu
pi
charged e
charged mu

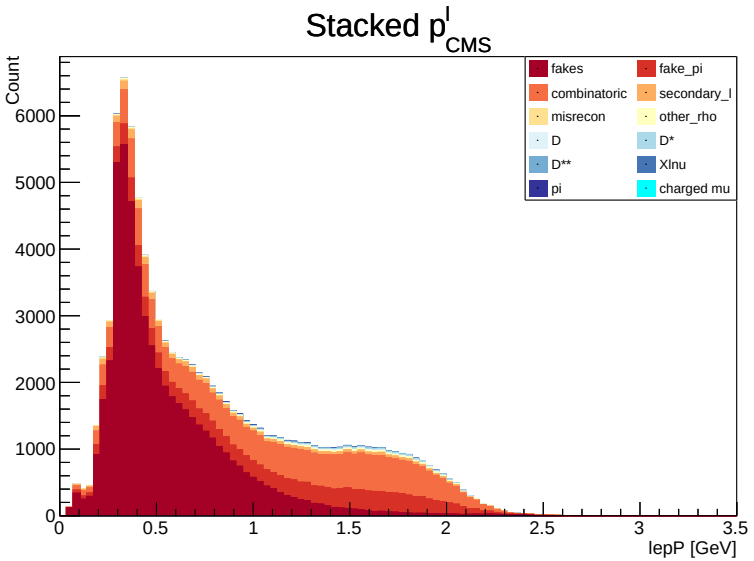
First selections

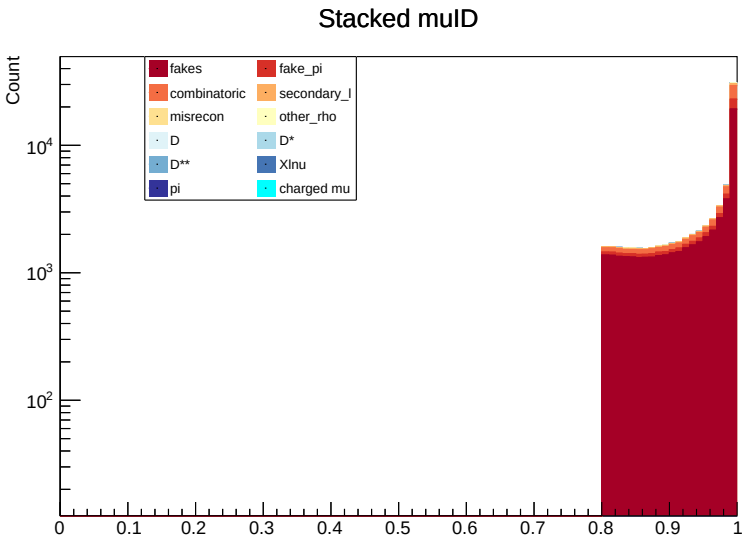
- Background dominated by fake leptons
- Signal not even visible
- Cut on PIDs of e and μ
  - e: eID≥ 0.8 and muID < 0.2
  - μ: eID < 0.2 and muID ≥ 0.2
- Cut away $\approx 85\%$ of fake leptons
  - Lose $\approx 42\%$ of true leptons
- Signal efficiency $\approx 95\%$
- Still dominated by fakes (2/3)

Stacks after selection









What's next?

- Further inspect high PID fake leptons
  - Surprising amount of protons
  - Look at dr and dz
  - Look at p_T^l
- Cut on $p_l^* \geq 1.0$ GeV
- Find efficiencies for cuts
- Further reduce background