

# Rb measurement updates



## Systematics on probability of btagging (pb)

Vary the probability according a shifted Gaussian error

$$p_b \Rightarrow p_b \times \{1 \pm \epsilon \times [\text{rand}(\text{Gaussian}(1, 1))]\}$$

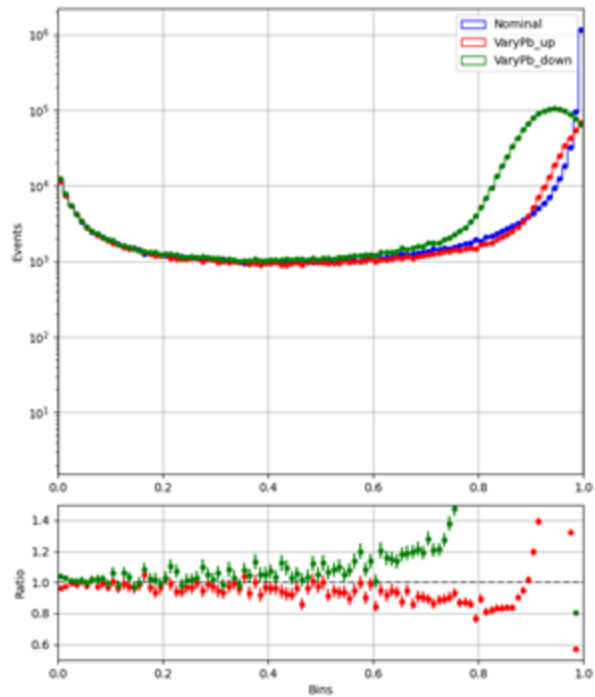
pc and pq also varied to have sum of probability to be 1

Try  $\epsilon = 0.05$  first

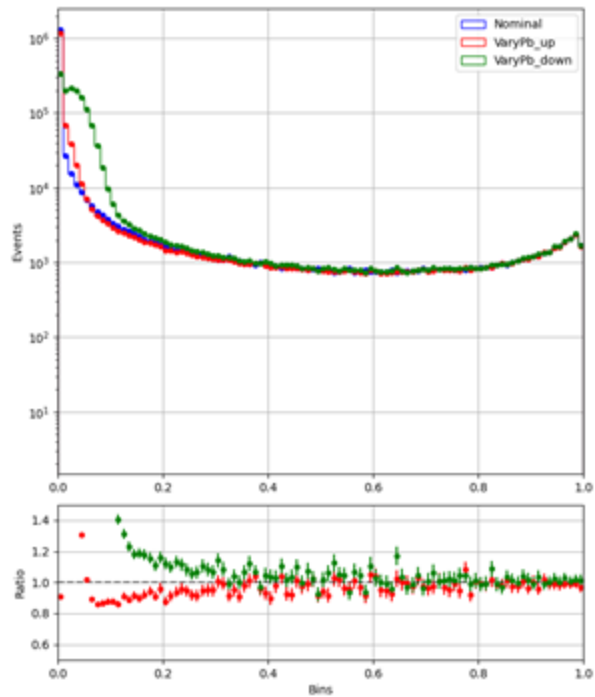
After varying the pb/pc/pq, tag both jets with

$$\text{b-tagged} \leftarrow \max(p_b, p_c, p_q) = p_b$$

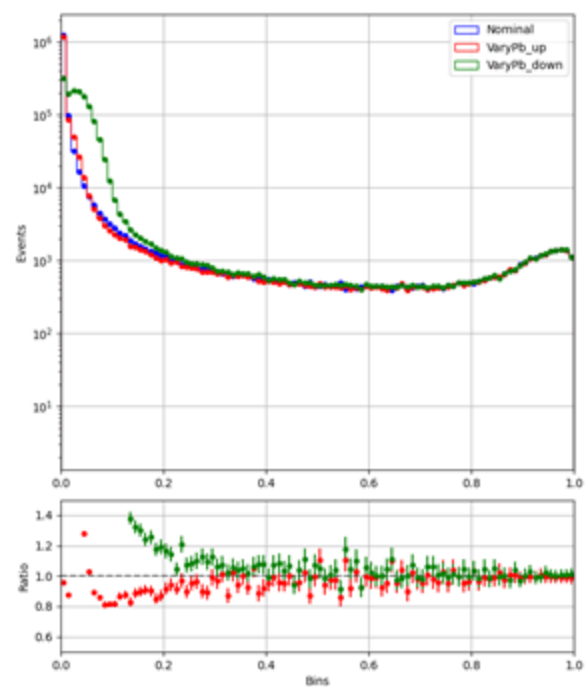
pb



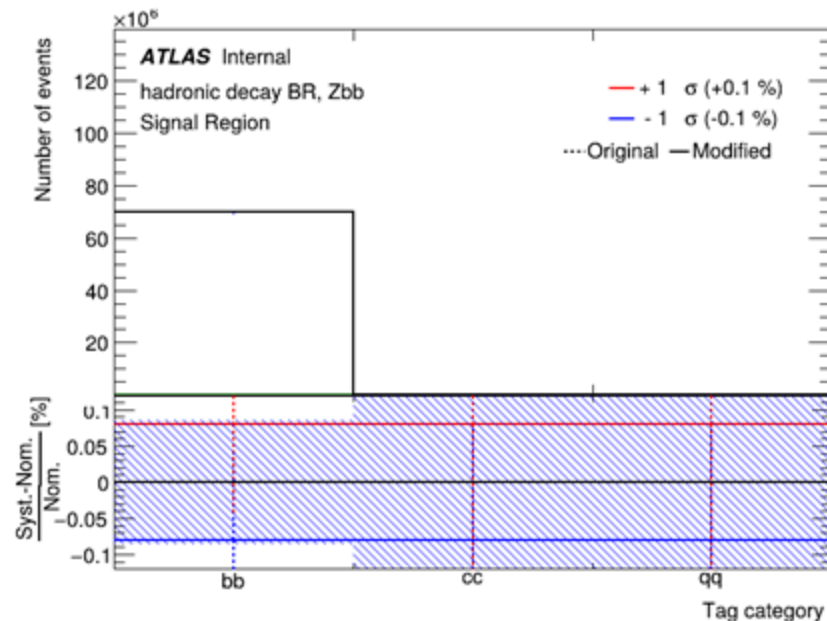
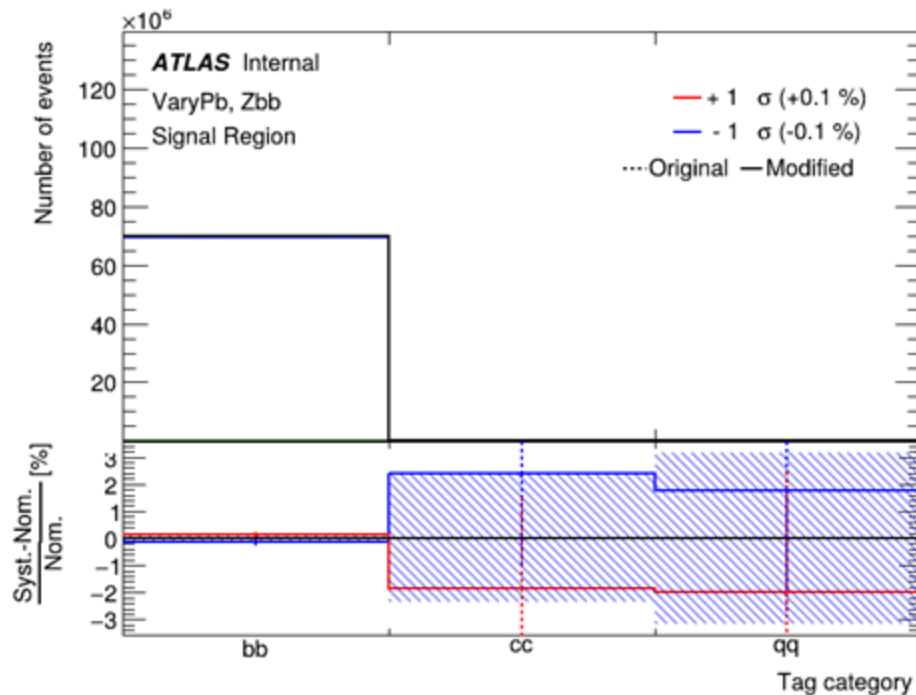
pc



pq



# Impact on fit input variables



Roughly the same size of hadronic branching fraction uncertainty (from PDG)

## Impact on fit results

- Scale to have 1e8 Z bosons for fit stability
- Binned likelihood fit with three bins
- Systematic uncertainty include Rhad(hadronic branching fraction, from PGD), VaryPb

$$\mathcal{L}(N_{\text{obs}}^{ii} | R_b, R_c, \vec{\theta}) = \prod_{i=b,c,q} \text{Pois}(N_{\text{obs}}^{ii} | \nu^{ii}) \times \prod_{\theta} \text{Gaus}(0 | \theta)$$

$$\nu^{bb} = \textcolor{red}{R}_b N_{bb}(\vec{\theta}) + \textcolor{red}{R}_c N_{cc}(\vec{\theta}) + R_q N_{qq}(\vec{\theta})$$

# Fit results

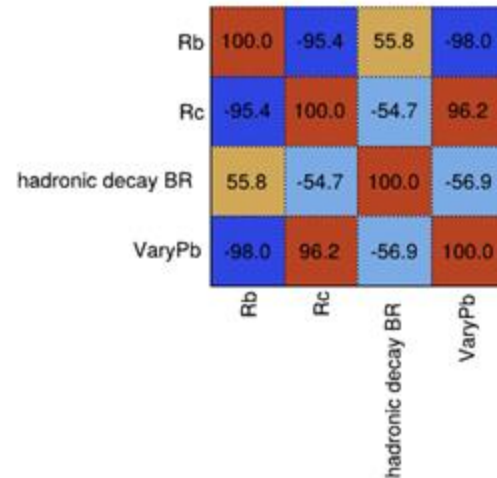
Rb

Total uncertainty	0.0002435
Statistical	9.74615e-05
Rhad	2.44005e-05
VaryPb	0.000221806

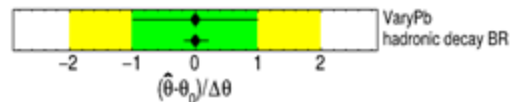
Rc

Total uncertainty	0.000160637
Statistical	7.03401e-05
Rhad	1.5789e-05
VaryPb	0.000143552

ATLAS Internal



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## Next step

- Try smaller pb variation.
- Add pc variations
- Try to understand impact from input variables