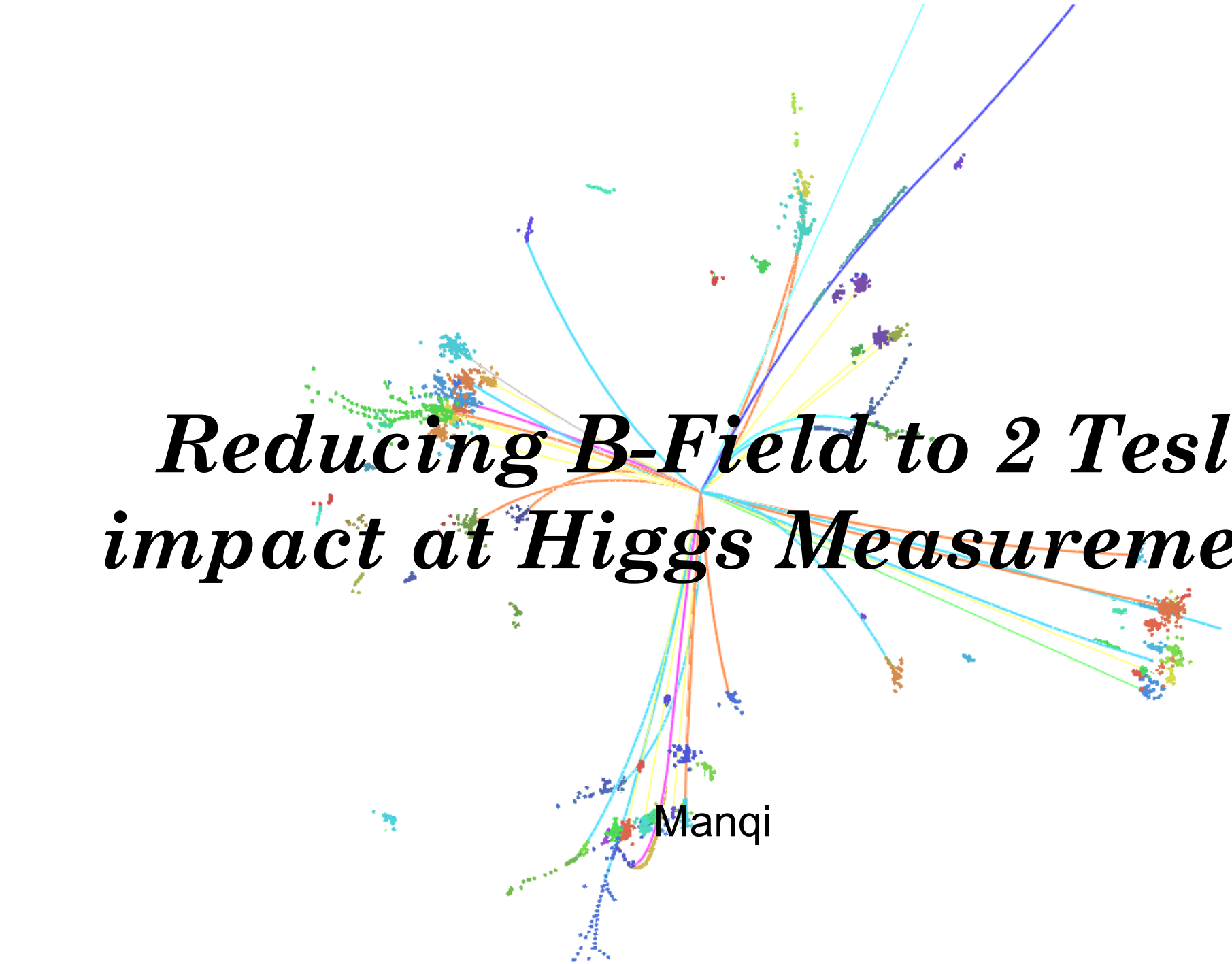


Reducing B-Field to 2 Tesla: impact at Higgs Measurements

Manqi

Objects

- Track
  - Degrades the momentum resolution by 50% (Slightly more for TPC)
- BMR (Jets)
  - Degrades BMR by 2.5% (relatively)
- VTX
  - May affect the positioning of VTX inner most layer – needs MDI input
- Narrow Resonance for Flavor Physics

Optimization study w.r.t the TPC/Tracker radius & resolution

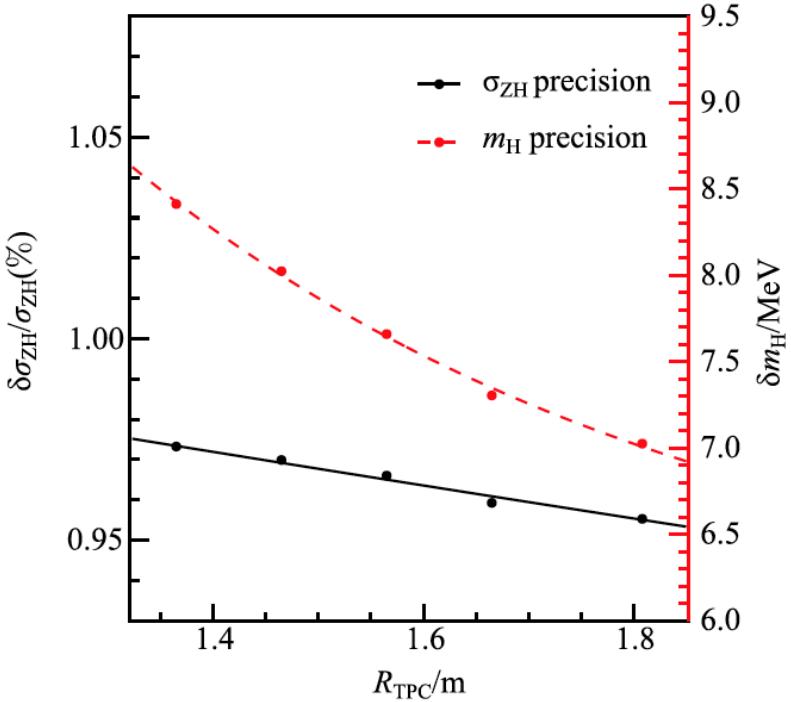
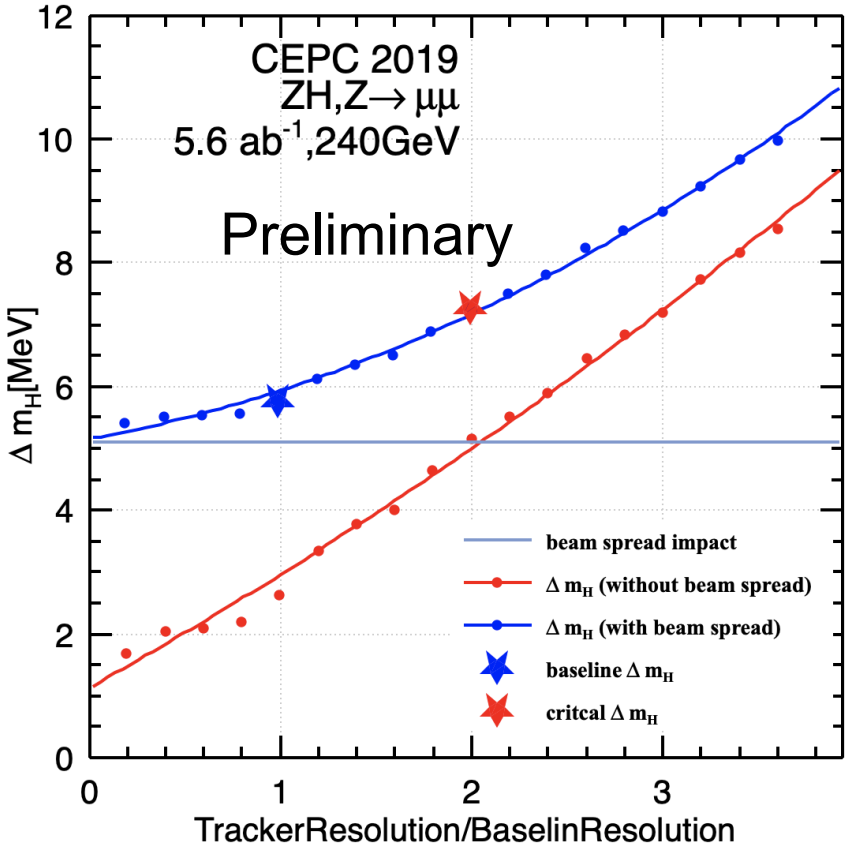


Fig. 6. The precisions of σ_{ZH} and m_{H} measurements versus different TPC radii. The solid line represents the precision of σ_{ZH}, and the dashed line is for m_{H}.

$$\frac{\delta\sigma_{\mathrm{ZH}}}{\sigma_{\mathrm{ZH}}} = 0.52 \times \left(1+\mathrm{e}^{-0.09\cdot R_{\mathrm{TPC}}}\right), \qquad (4)$$

$$\delta m_{\mathrm{H}} = 5.85 \times \left(1+5.19\times\mathrm{e}^{-1.81\cdot R_{\mathrm{TPC}}}\right)\ \mathrm{MeV}. \qquad (5)$$



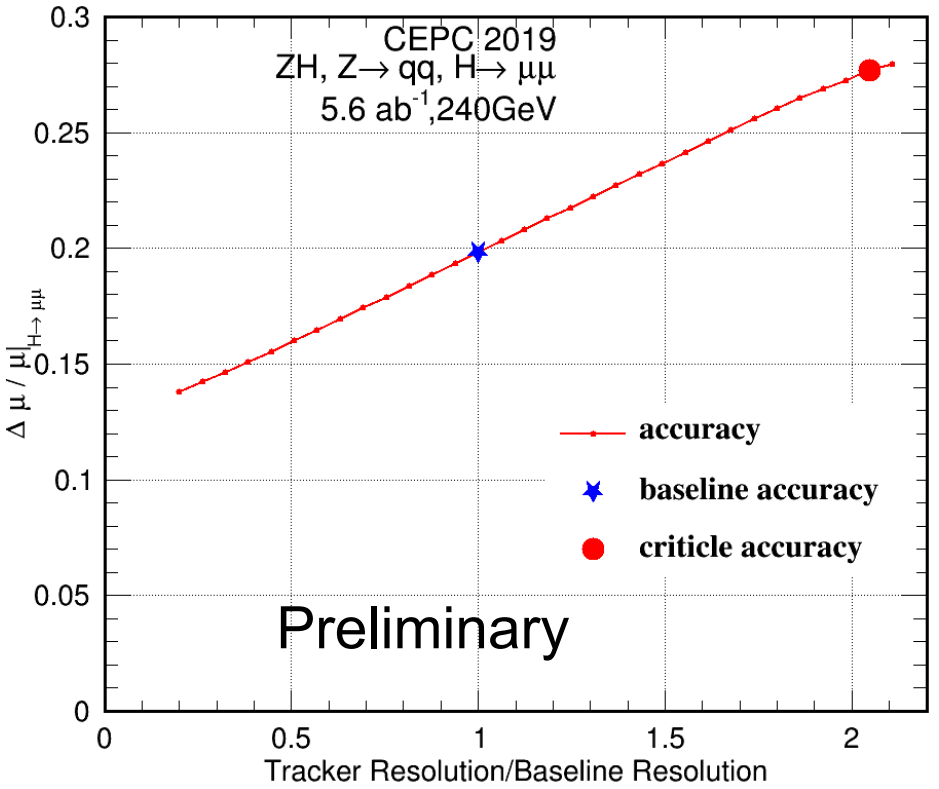
Note: Higgs mass is more accurately measured From Model-dependent analysis, which is used In the analysis show in the right side

Xsec & recoil mass: from mumuH

- Xsec accuracy degrading: ~ 2% (from relative accuracy of 0.92% to 0.94%)

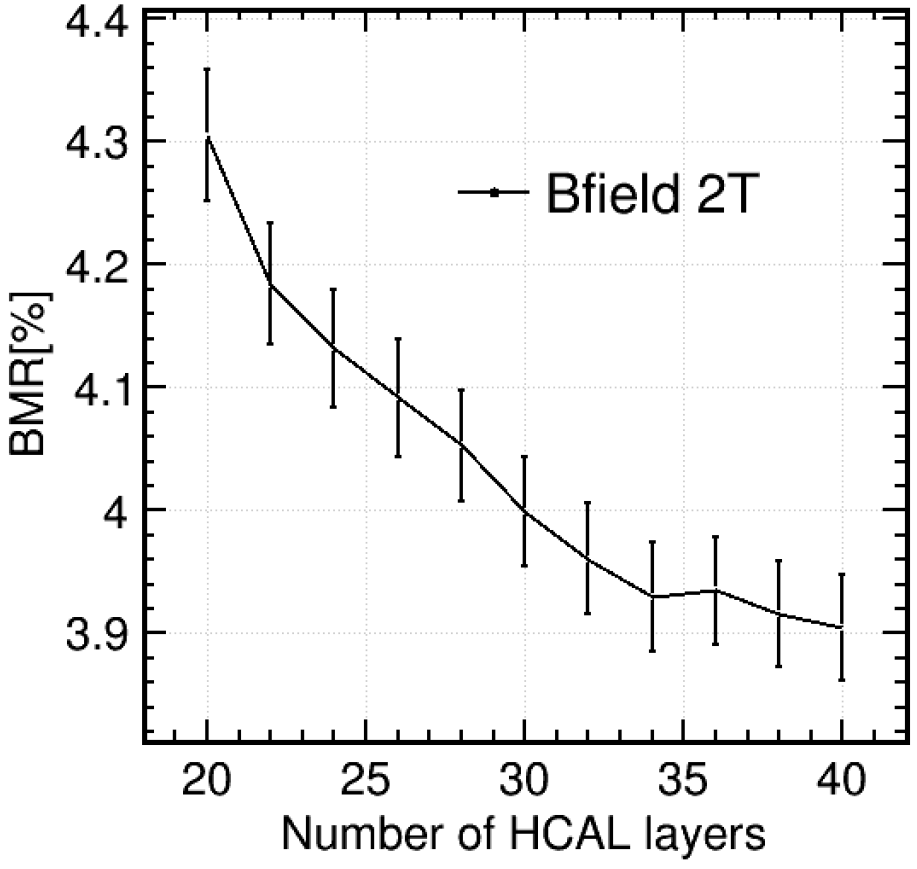
- Recoil mass degrading: ~ 10% (from 5.9 MeV to 6.5 MeV)

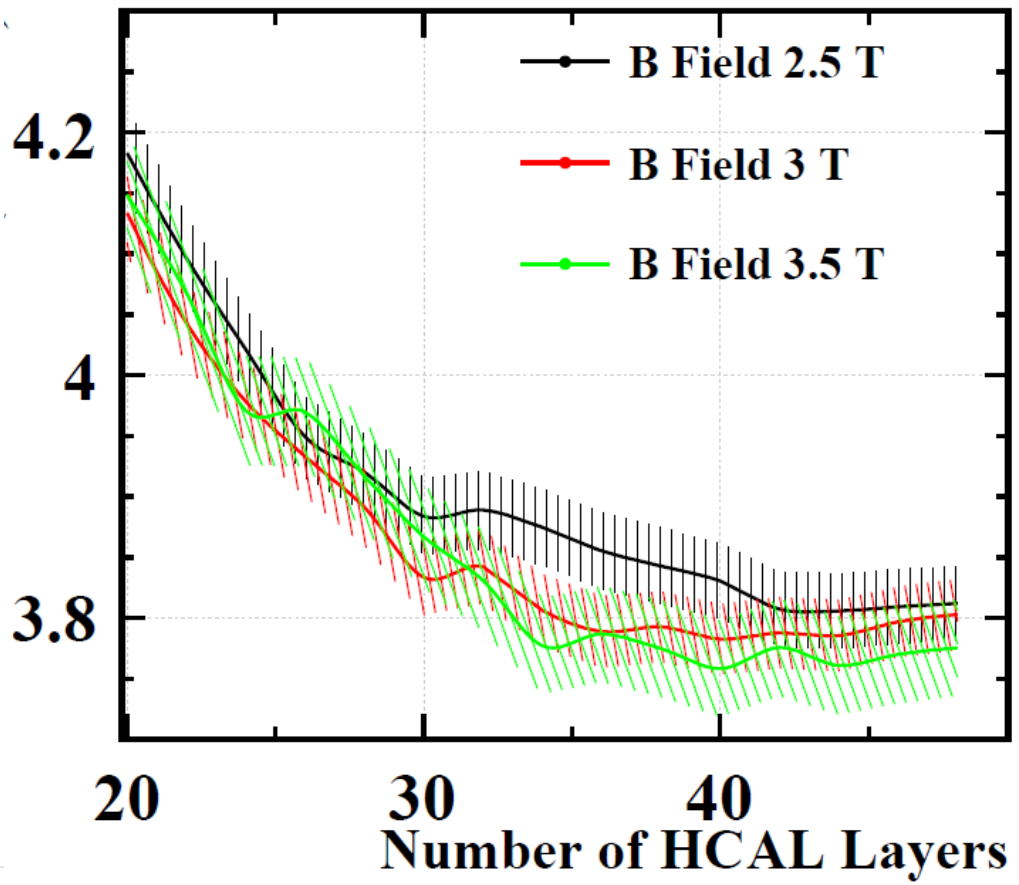
μ(H→μμ) measurement at qqH event



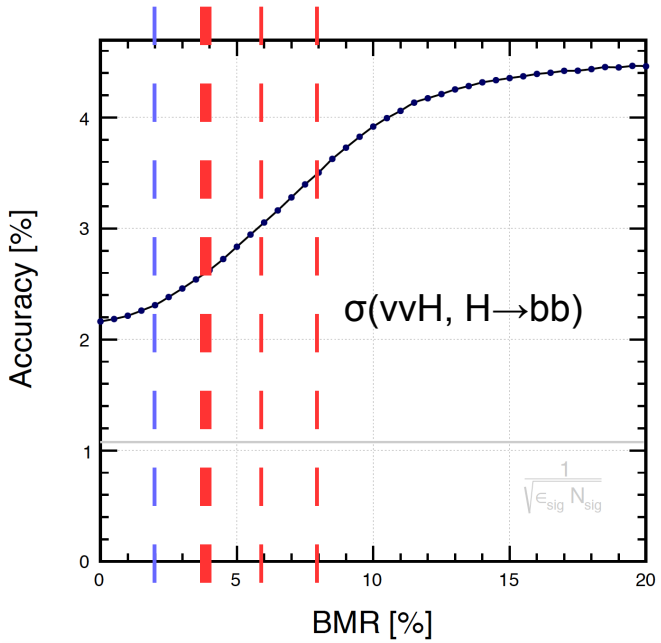
- Degrading the tracking resolution by 2 times leads to a degrading of 40% in the signal strength measurement
- Degrading by 20% once B-Field is reduced from 3 to 2 Tesla

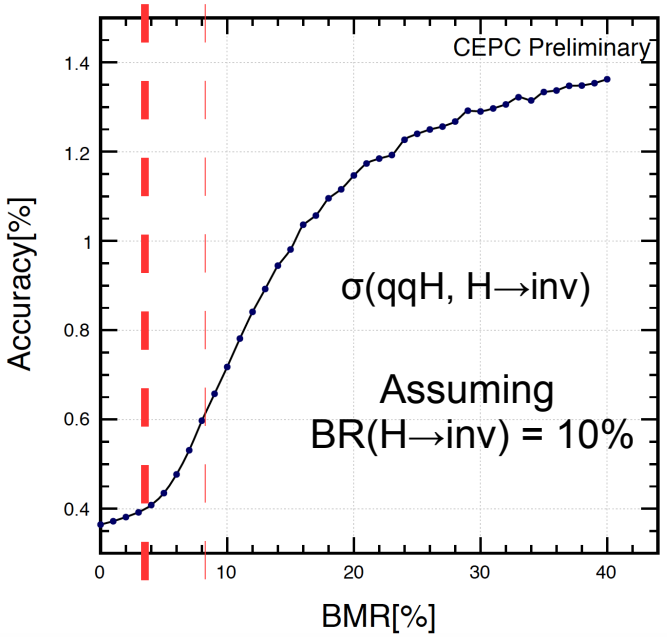
BMR: degrade from 3.8% to 3.9% once B Field Reduced from 3 to 2 Tesla

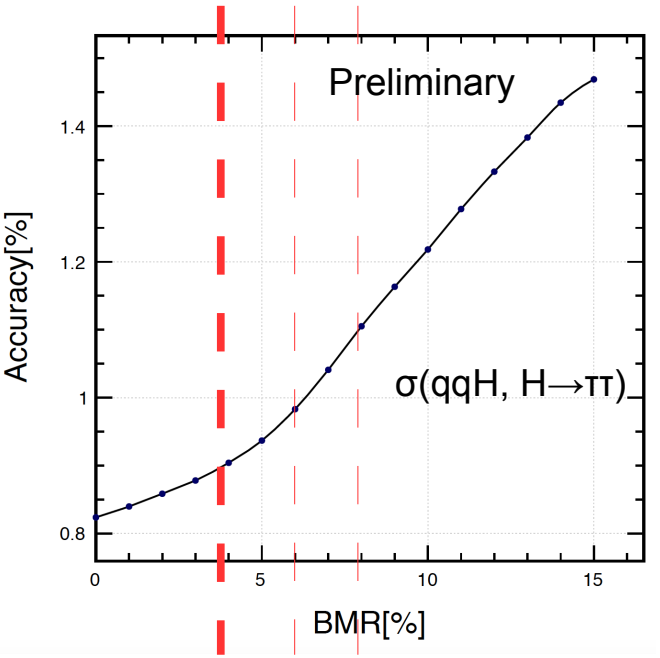




Requirement from benchmark analysis: BMR < 4%







	BMR = 2%	4%	6%	8%
σ(vvH, H→bb)	2.3%	2.6%	3.0%	3.4%
σ(vvH, H→inv)	0.38%	0.4%	0.5%	0.6%
σ(qqH, H→ττ)	0.85%	0.9%	1.0%	1.1%

Once B-Field reduced by 50%

Degrading ~ 0.2 - 0.5%

g(Hcc) measurement: impact unclear

$$\epsilon \cdot p = 0.095(1 - 0.14\frac{\Delta x_{\text{material}}}{x_{\text{material}}})(1 - 0.09\frac{\Delta x_{\text{resolution}}}{x_{\text{resolution}}})(1 - 0.23\frac{\Delta x_{\text{radius}}}{x_{\text{radius}}}) \qquad (4.1)$$

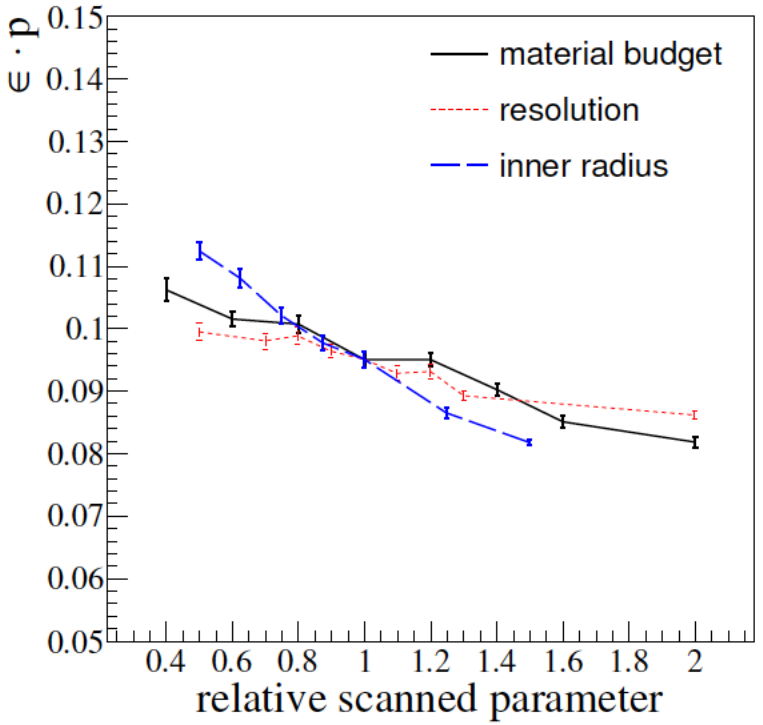
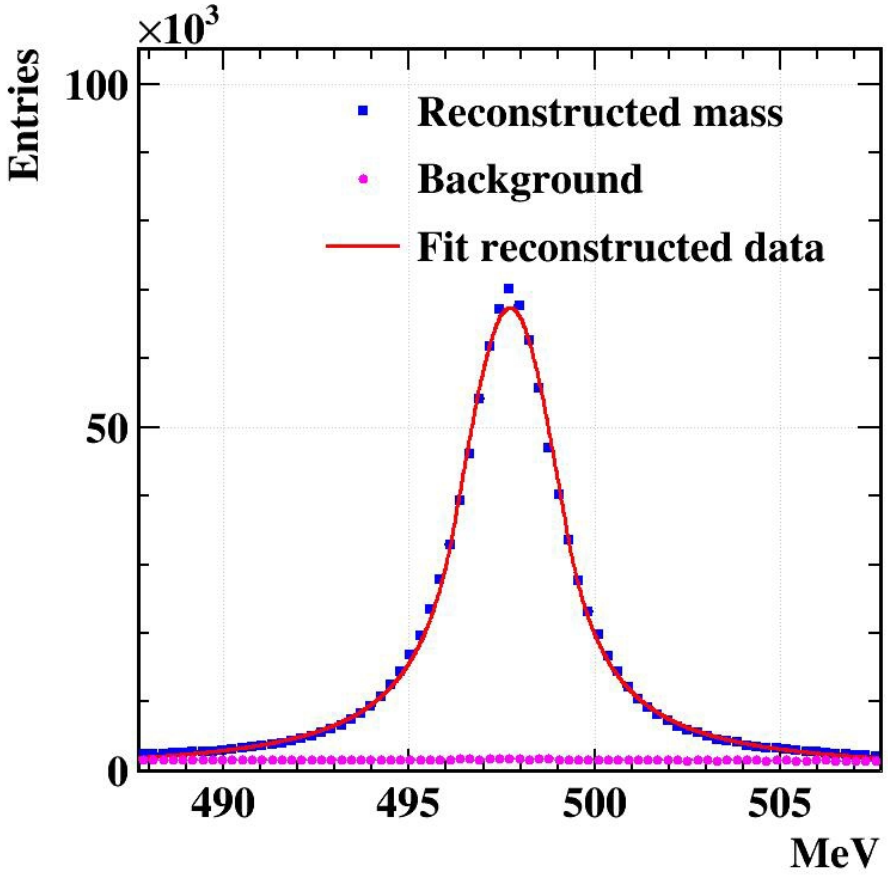
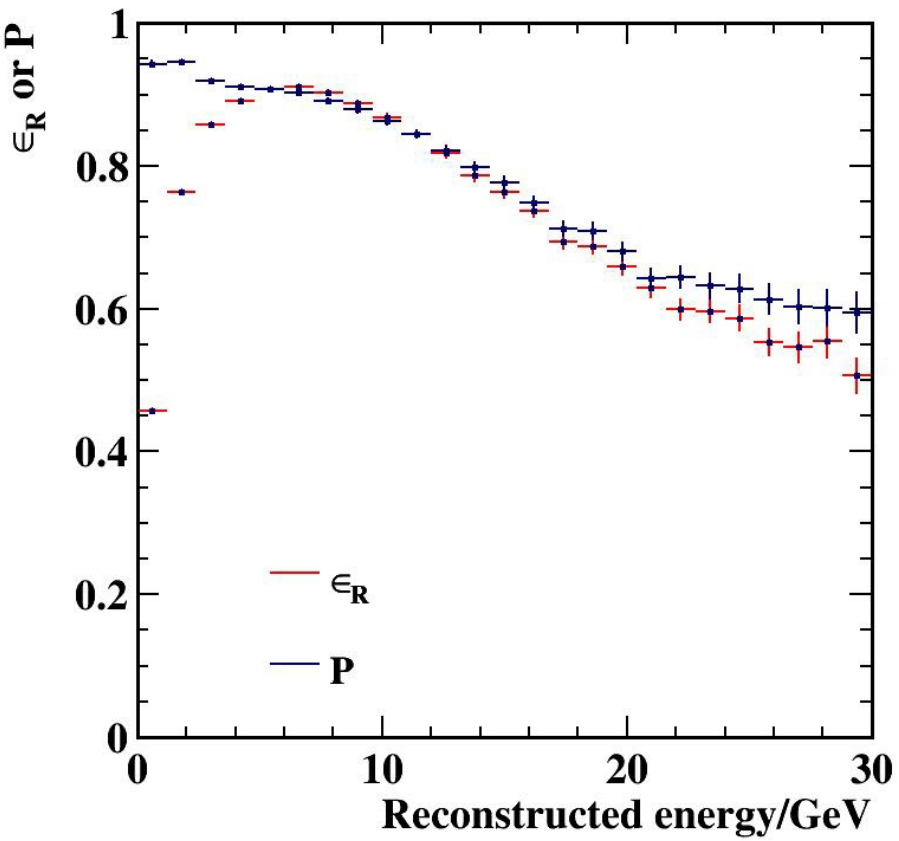


Figure 4. *C*-tagging performance with parameter scan on the basis of the scenario B.

In addition: Flavor Tagging Performance is sensitive to the B-Field – as affect the Impact Para/VTX reconstruction. Need Qualification.

Flavor Signature





- At the same efficiency, the impurity can increased up to 50%
- K_s reconstruction at Z pole: at inclusive reco eff ~ 40%, the purity will be degraded from 90% to 85%

Conclusion

- Reducing the B-Field from 3 to 2 Tesla
  - Significantly degrade the μ(H→μμ) and recoil mass: by 20/10% respectively
  - Degrade the Xsec measurement of μμH by 2%
  - BMR reduced by 2.5%. As a result, leads the three 2-jet benchmarks reduced by 0.2 – 0.5%, respectively
  - g(Hcc): impact unknown, to be qualified
  - Flavor Physics Signature finding: typical impurity can increase by 50% (if narrow mass & decay into fully charged final state)

- Personal preference:
  - 2 T for Z pole (double the Luminosity is truly intriguing! in fact, 50% of luminosity increase is sufficient to compensate all the purity lose in the most stringent case)
  - Treat 2T with 3T by 10% luminosity increase for Higgs