Study of m_t using the double resonance method

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MPP top meeting, 20.11.09

Top-antitop sample

- MCatNLO version 3.4
  - $t\bar{t}$ → lepton+jets mode
  - HERWIG 6510, homebrew interface to ROOT
  - No underlying event (Jimmy)
  - 50 k events each sample
- Jetfinding at particle level
  - FastJet (fastjet.fr), interfaced to PyROOT
  - k_t, anti-k_t, SIS-cone

Truth matching

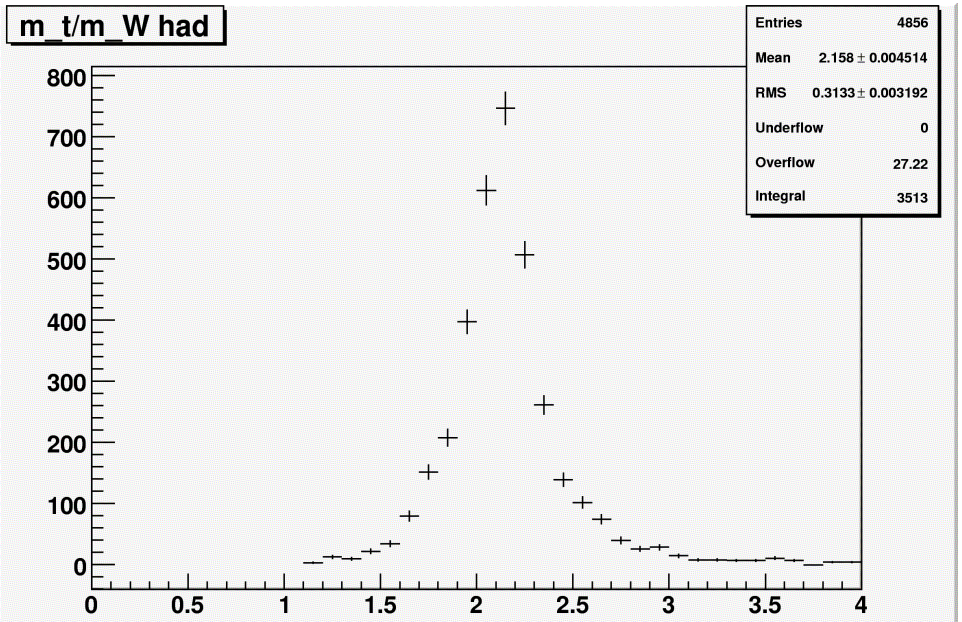
- Trace back origin of each stable particle
  - Assign to "parton" t, b, W, udsc and c.c.
  - Navigate HERWIG clusters to more energetic parent
- Jet truth tagging
  - Intermediate (t, W): $> 0.75\ E_{jet}$ is tagged to parton
  - Final (b, udsc): ΔR tagged particles - jet < 0.15

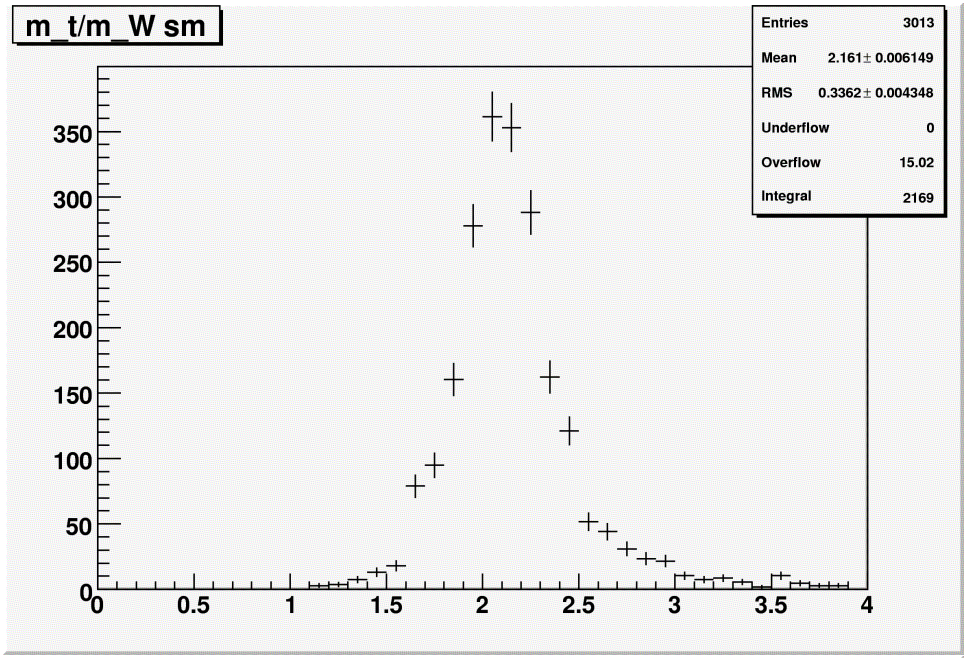
Smearing and Selection

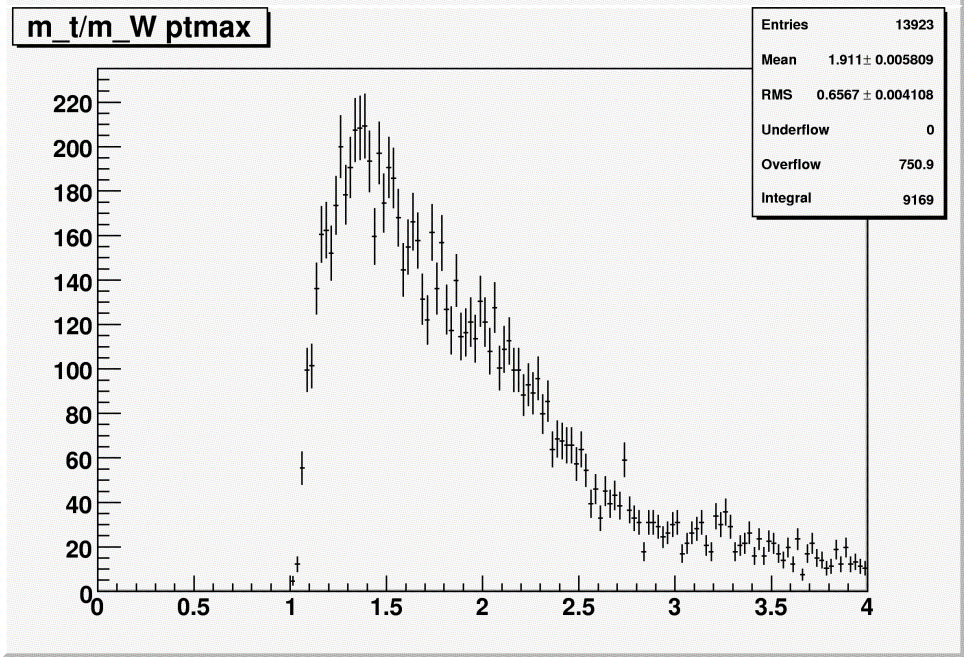
- Jets
  - $100\% / \sqrt{E_{jet}}$
  - Drop neutrinos
- B-Jets
  - Same smearing
  - Drop neutrinos
  - B-tag eff. 70%, 1% fakes
- Leptons (m, e)
  - Leave unchanged

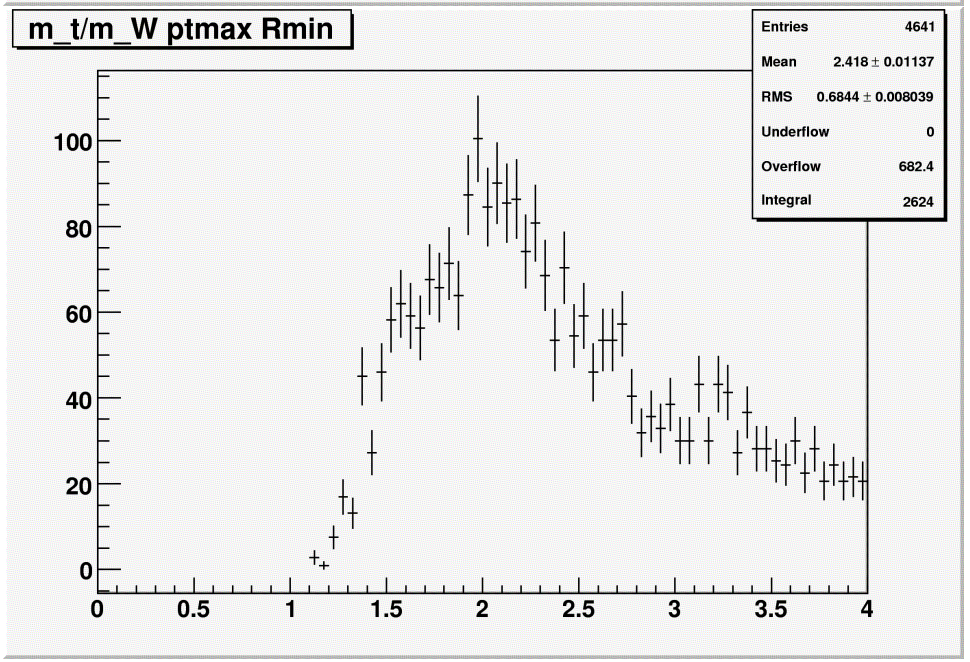
- Canonical selection
  - 4 jets pt>20, $\eta < 2.5$
  - 1 jet pt>40, "
  - Lepton pt>40, "

m_t/m_W Distributions

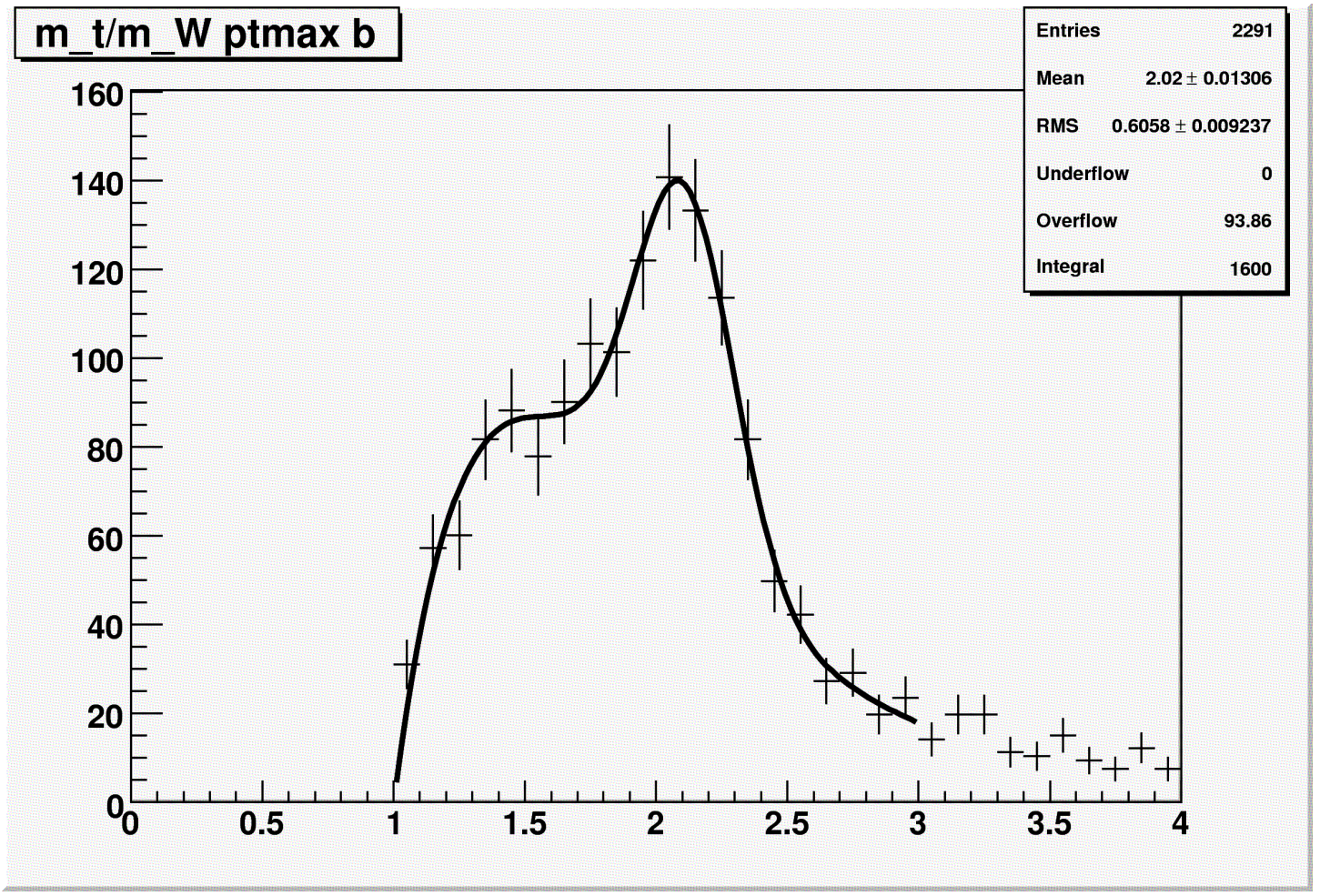








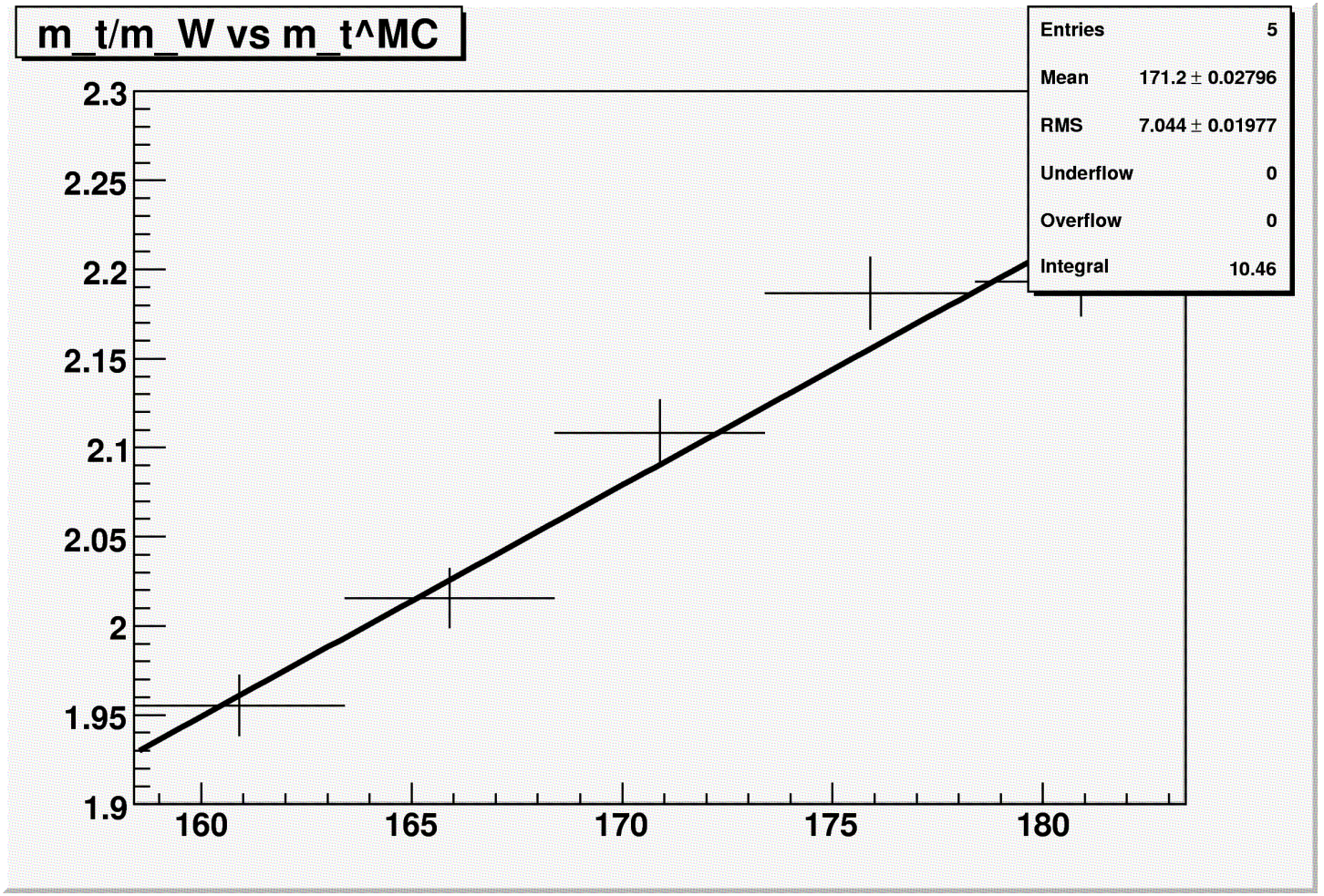
m_t/m_W Distributions



Require b-tag in p_t^{max} jet triplett

Fit $a(x-1)\,e^{-bx}\,g(N,\mu,\sigma)$ to extract m_t/m_W

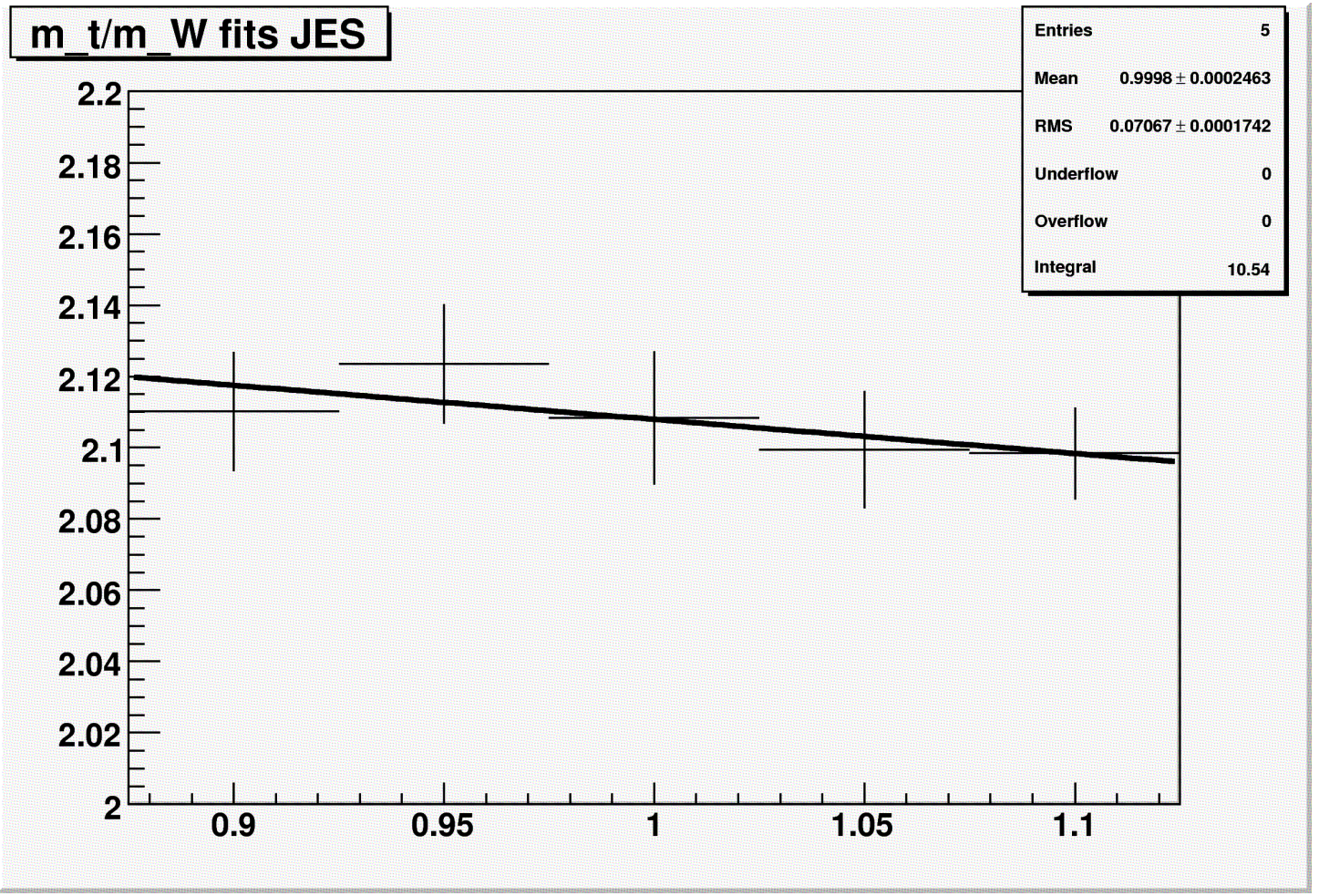
m_t Sensitivity



Generate with m_t = 160.9, 165.9, 170.7, 175.9, 180.9 GeV

Repeat fits

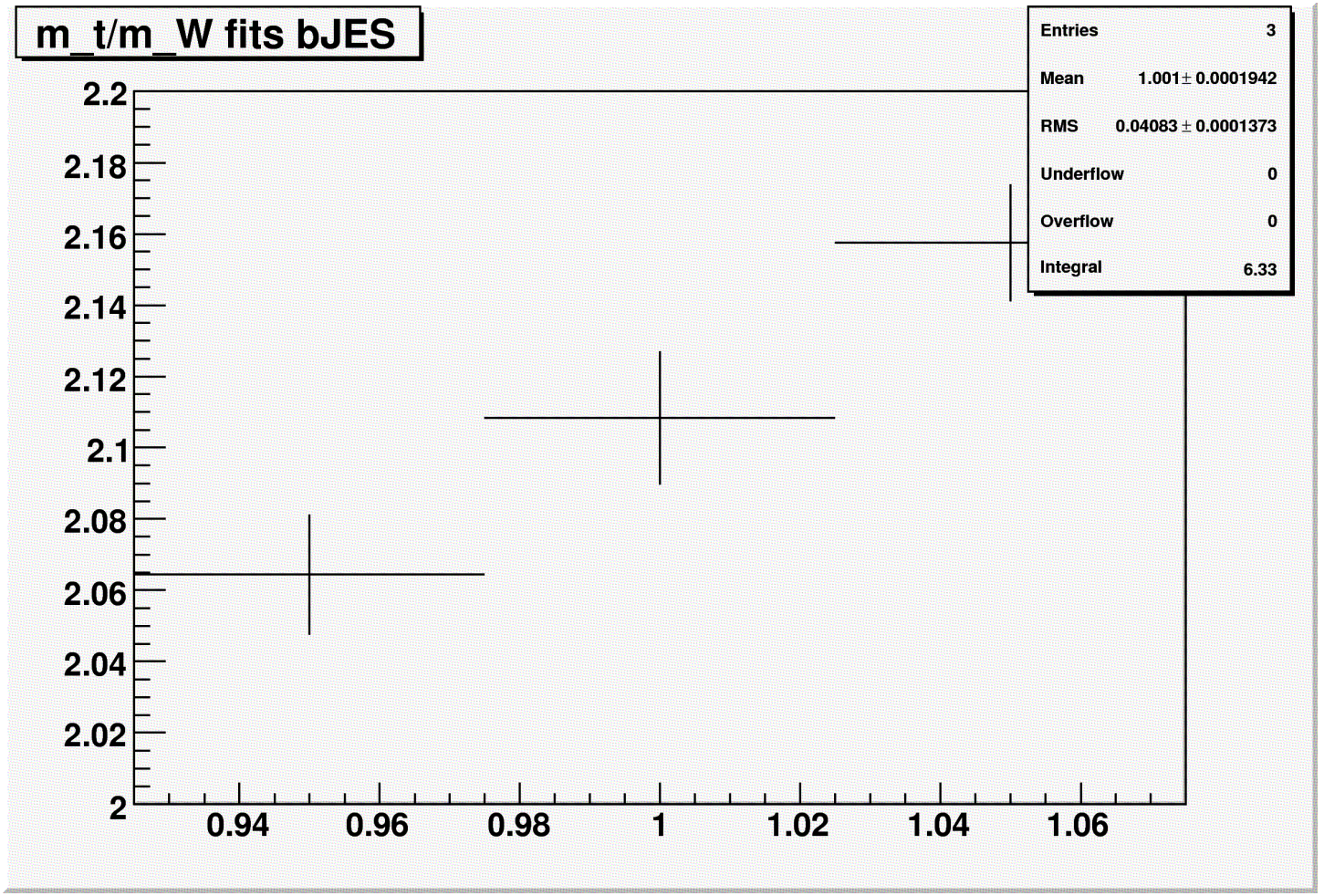
JES Dependence



Global JES varied by ± 5 or 10%

⇒ 0.2 % systematic on m_t

b-JES Dependence



Vary b-JES by ± 2.5%

⇒ 1.2 % systematic on m_t

Result

m_t = 169.5 +/- 1.5(stat) +/- 0.4(JES) +/- 1.9(bJES)

Input was m_t = 170.9

Relative precision 1.4%

Other systematics (b-tag efficiency, jet algorithm) small

MC uncertainties (μ_R, μ_F, ISR/FSR, etc.) expected to be small

Background effects expected to be small (non-resonant)