

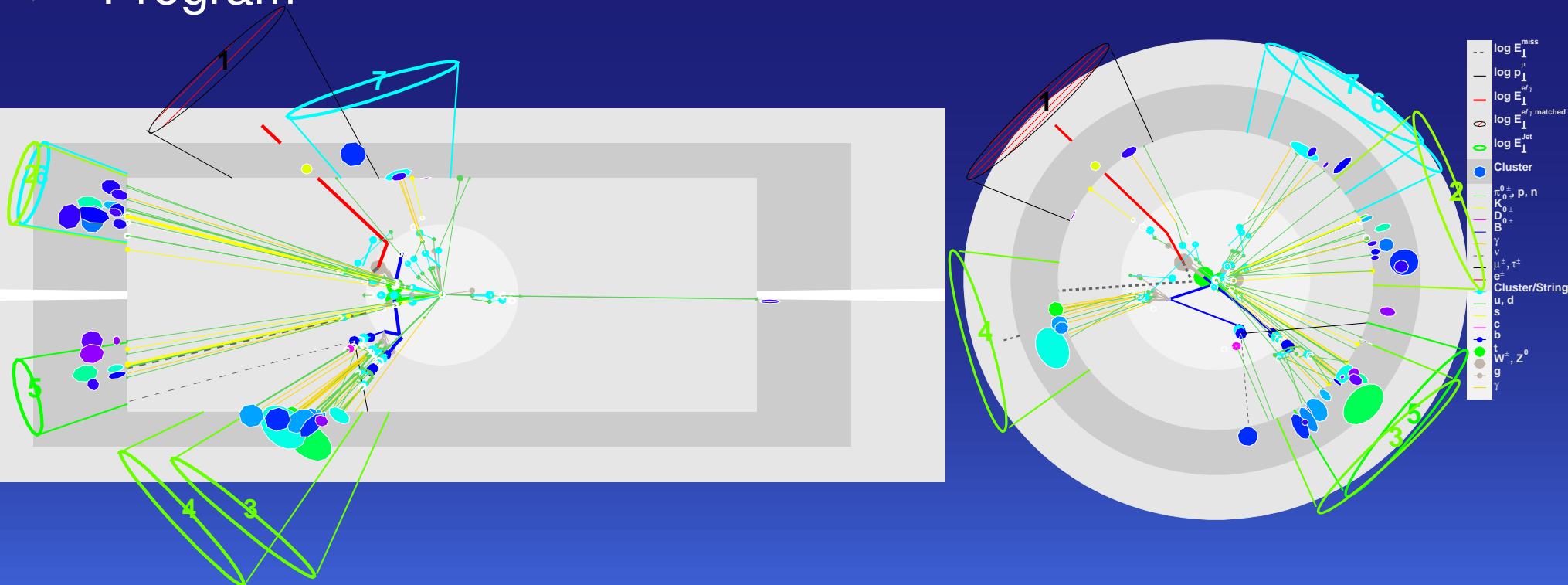
LHC-D Top-Workshop Introduction (Experimental)

II. LHC-D Top-Physics Workshopn

Sven Menke, MPI München

26.-27. Jan 2007, Bad Honnef

- ▶ Summary of 1. LHC-D Top-Physics Workshop (Experimental)
- ▶ Open Questions
- ▶ Program



- ▶ Introduction by Arnulf Quadt outlined the issues relevant for top-physics
 - ▶ Measurements are already limited by systematics

b-fraction in W+2 Jet Events

- LO vs. NLO
- W+jets modelling
- jet-parton matching
- jet-energy scale (light jets, b-jets)

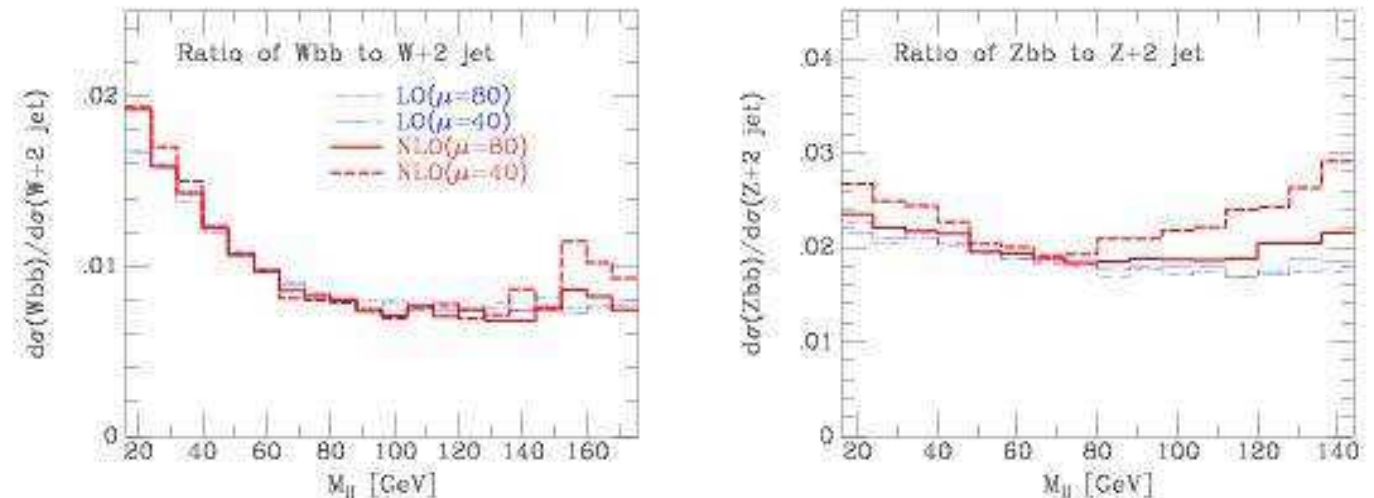


Figure 2.18: Ratio of W/Z+2 b-jets to W/Z+2 jet events in LO and NLO at two different factorisation scales. From Reference [182].

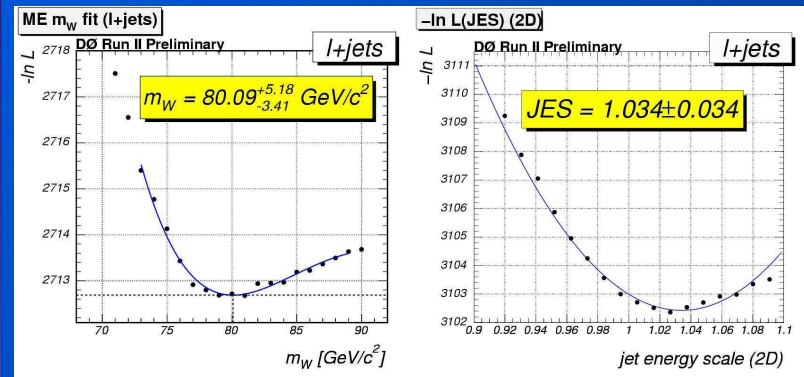
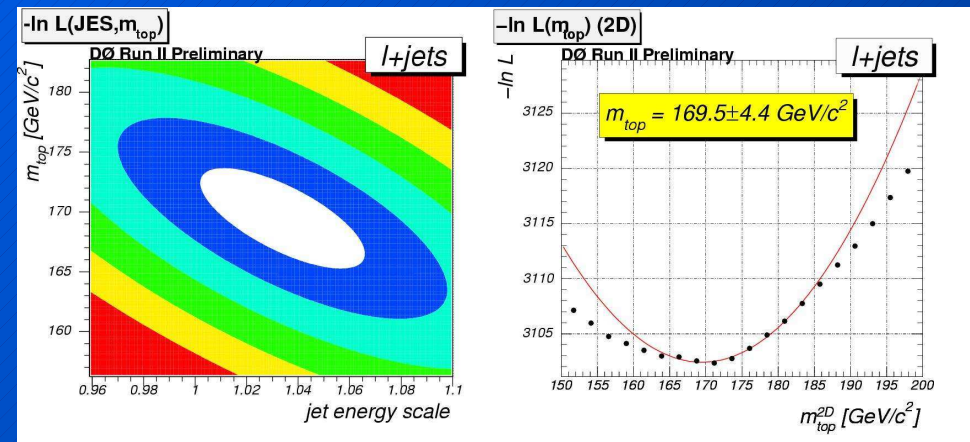
Flavour fractions and shapes agree in LO and NLO reasonably well for W+2 Jets
first studies for W+4 jets indicate less agreement ↗ need more studies here
first experimental data indicate factor $\sim 1.5 \pm 0.4$ higher b-fraction ↗ need more data

- ▶ Jet energy scale of dominant importance in top-mass measurements

- only light jets in-situ calibrated from top-events
- calibration efforts outside top-events are important

2-dimensional fits to reduce jet energy scale uncertainty
 ↳ *in situ* calibration

Top Mass in L+Jets



- does not constrain b-JES
- most of the improvement in 2005 from studies of external JES !!!

- We had 9 presentations by experimental groups from D0, CDF, ATLAS and CMS in the 1. workshop
 - Tevatron analyses reached a very mature level
 - many LHC groups just started with top-physics
 - we asked the groups to present their status, plans and expertise relevant for top-physics
- Followed by discussions between theorists and experimentalists
 - list of open questions to address by theory and/or experiment
 - <https://indico.desy.de/materialDisplay.py?contribId=13&materialId=slides&confId=45>

- ▶ Find observables suitable for precision measurements
 - with little dependency on knowledge of NLO effects
 - not depending on detector effects
 - ▶ ratios of cross-sections?
- ▶ Understanding of background processes
 - if not known in NLO we need to measure them first
- ▶ Properties of the top
 - charge of the top-quark really $2/3$?
 - ▶ need $t\bar{t}\gamma$ and $t\bar{t}Z$ events
 - possible sub-structure of the top-quark?
 - Measurements of the top-Yukawa coupling in $t\bar{t}H$
- ▶ How to reduce the dominant error on jet-energy scale?
 - Separate calibration and choice of jet-algorithm
 - Use infrared-safe and collinear-safe jet algorithms
 - Make use of energy flow methods or similar to account for the jet composition
- ▶ Some thoughts about “NLO safe” observables
 - counter example: $p_{\perp}(t\bar{t})$ is only present in NLO
 - $m(t\bar{t})$ to find new physics
 - ▶ experimental resolution a problem?
 - angular distributions in the W- and t-Rest-frames
 - ▶ W-helicity, spin-correlations

▶ Session I

(Chair: Martin Erdmann)

- 13:30 Introduction (Experiment) (Sven Menke)
- 13:45 Introduction (Theory) (Werner Bernreuther)
- 14:00 MC Generators for top events at LHC (Stefan Gieseke)
- 14:45 An Analysis-Factory for top-physics with D0 (Matthias Kirsch)
- 15:00 Search for Single-Top Production at CDF (Wolfgang Wagner)

▶ 15:40

Coffee

▶ Session II

(Chair: Werner Bernreuther)

- 16:00 $t\bar{t}$ +jet production at next-to-leading order (Peter Uwer)
- 16:20 Top Physics with ATLAS at MPI Munich (Nabil Ghodbane)
- 16:35 Top Physics with CMS in Aachen (Markus Duda)
- 16:50 QCD background in semi-leptonic and hadronic top-pair decays at ATLAS (Raphael Mameghani)
- 17:05 Polarization effects in top quark decays at NLO (Juergen Koerner)
- 17:20 Discussion

▶ 18:30

Dinner

- ▶ 08:00 Breakfast
- ▶ Session III (Chair: Sven Menke)
 - 09:00 Weak effects in top quark pair production at LHC (Andreas Scharf)
 - 09:15 W-helicity in top decays at CDF and CMS (Dominic Hischbuehl)
 - 09:30 Top quark mass: Fitting, Threshold and Reconstruction (André Hoang)
 - 09:50 Top Physics with ATLAS in Dortmund (Joerg Walbersloh)
- ▶ 10:25 Coffee
- ▶ Session IV (Chair: Peter Uwer)
 - 10:45 Top Quark Hadroproduction at Higher Orders (Sven-Olaf Moch)
 - 11:05 Top Physics with ATLAS in Wupertal (Daniel Wicke)
 - 11:20 SUSY QCD one-loop effects in (un)polarized top-pair production at hadron colliders (Stefan Berge)
 - 11:35 Top Physics with ATLAS in Bonn (Duc Bao Ta)
 - 11:50 Discussion and Summary
- ▶ 12:30 Lunch

