RA2: Inclusive ≥ 3 jet analysis

Status of basic selections, skims, triggers, and synchronization

U.Iowa, U.C.Riverside, Vienna, FSU, Fermilab, IPM, Rockefeller, U.Texas

and U.Hamburg:

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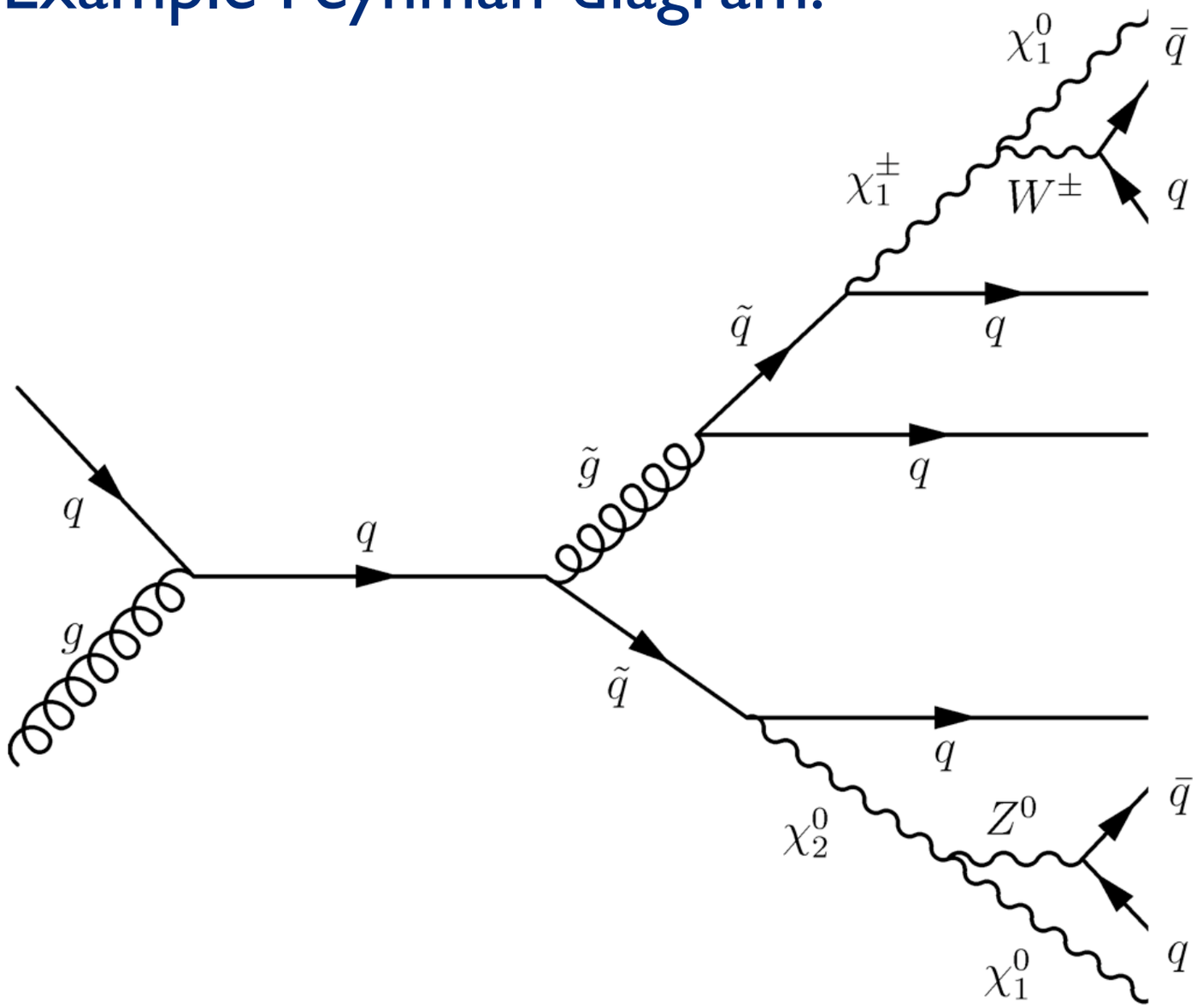
RA2: Inclusive ≥ 3 jet analysis

Example Feynman-diagram:



- High branching ratio for the hadronic decay of SUSY particles
  - RA2 requires three high-energetic jets (pT> 50 GeV)

- The two LSP's are invisible for the detector
  - We expect a signature with large missing ET

RA2: Basic selection

Decide on common object definitions for RA2:

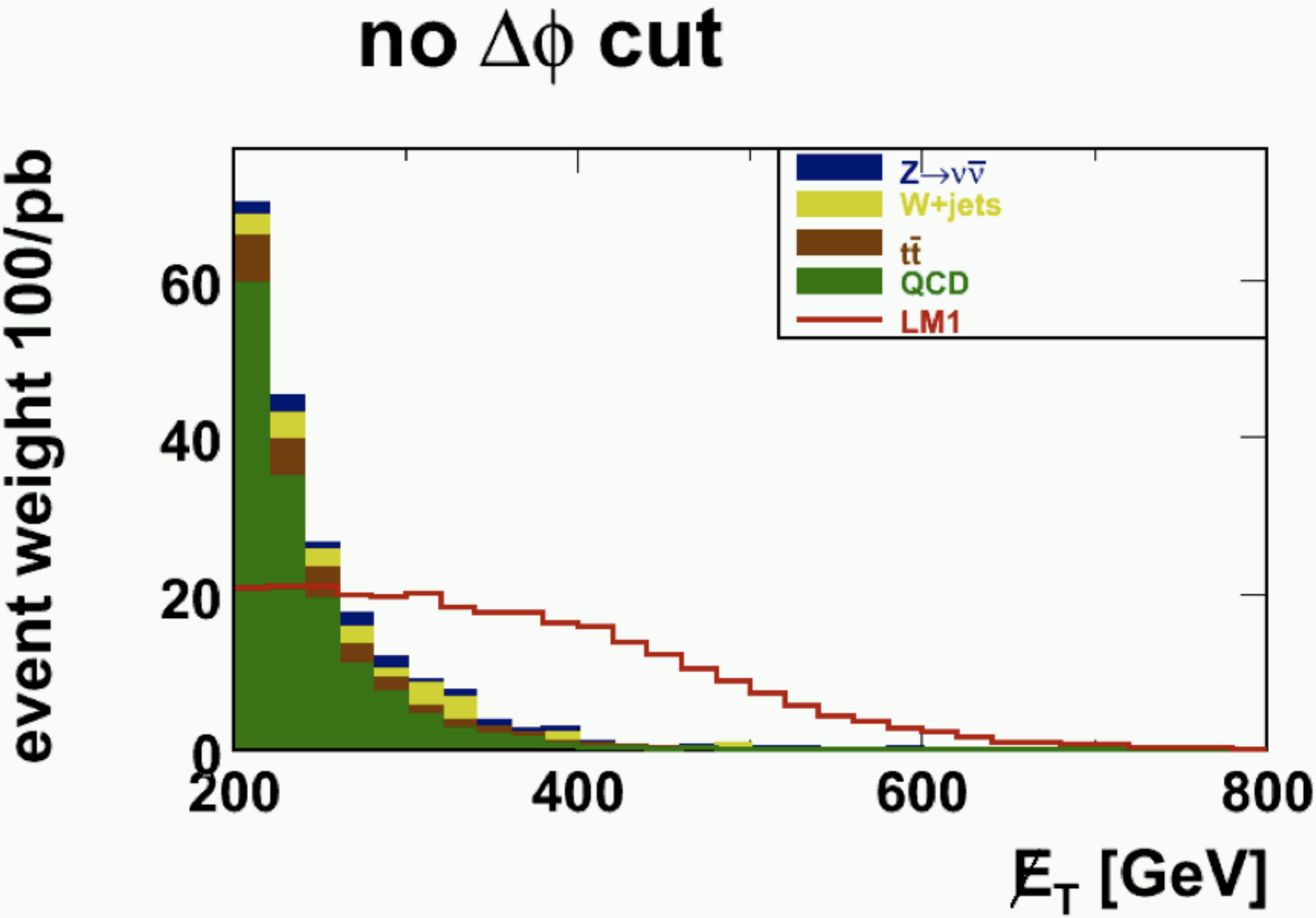
- **Jet Definition: siscone algorithm using a ΔR=0.5 cone and energy correction Offset (L1), Relative (L2) and Absolute (L3).**
- **MET definition: Negative vectorial sum of calorimeter cells corrected for jet energy corrections (Level 1 correction)**
- **Muon Definition (for Veto and Background Control)**
- **Electron Definition (for Veto and Background Control)**

Baseline selection for synchronization exercise:

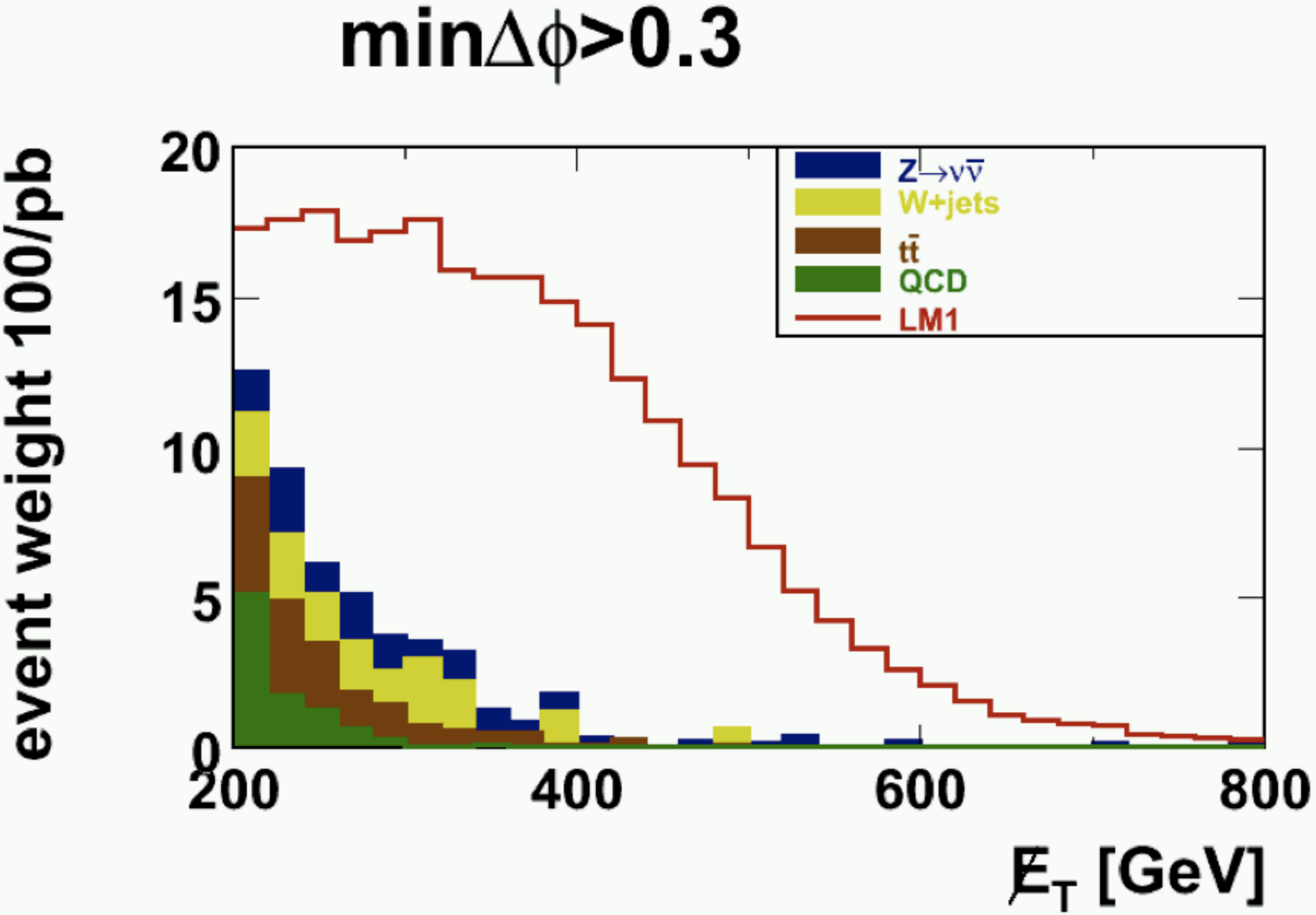
- **1st jet: pT > 180 GeV, |η| < 2.5, 0.05 < EM fraction < 0.95**
- **2nd jet: pT > 150 GeV, |η| < 2.5, 0.05 < EM fraction < 0.95**
- **3rd jet: pT > 50 GeV, |η| < 2.5, 0.05 < EM fraction < 0.95**
- **Veto on muons and electrons**
- **MET > 200 GeV**
- **min Δφ (jet 1-3, MET) > 0.3**

- **https://twiki.cern.ch/twiki/bin/view/CMS/SusyRA2InclusiveNJetProjectTable**

RA2: Background Missing ET distribution



RA2: Background Missing ET distribution



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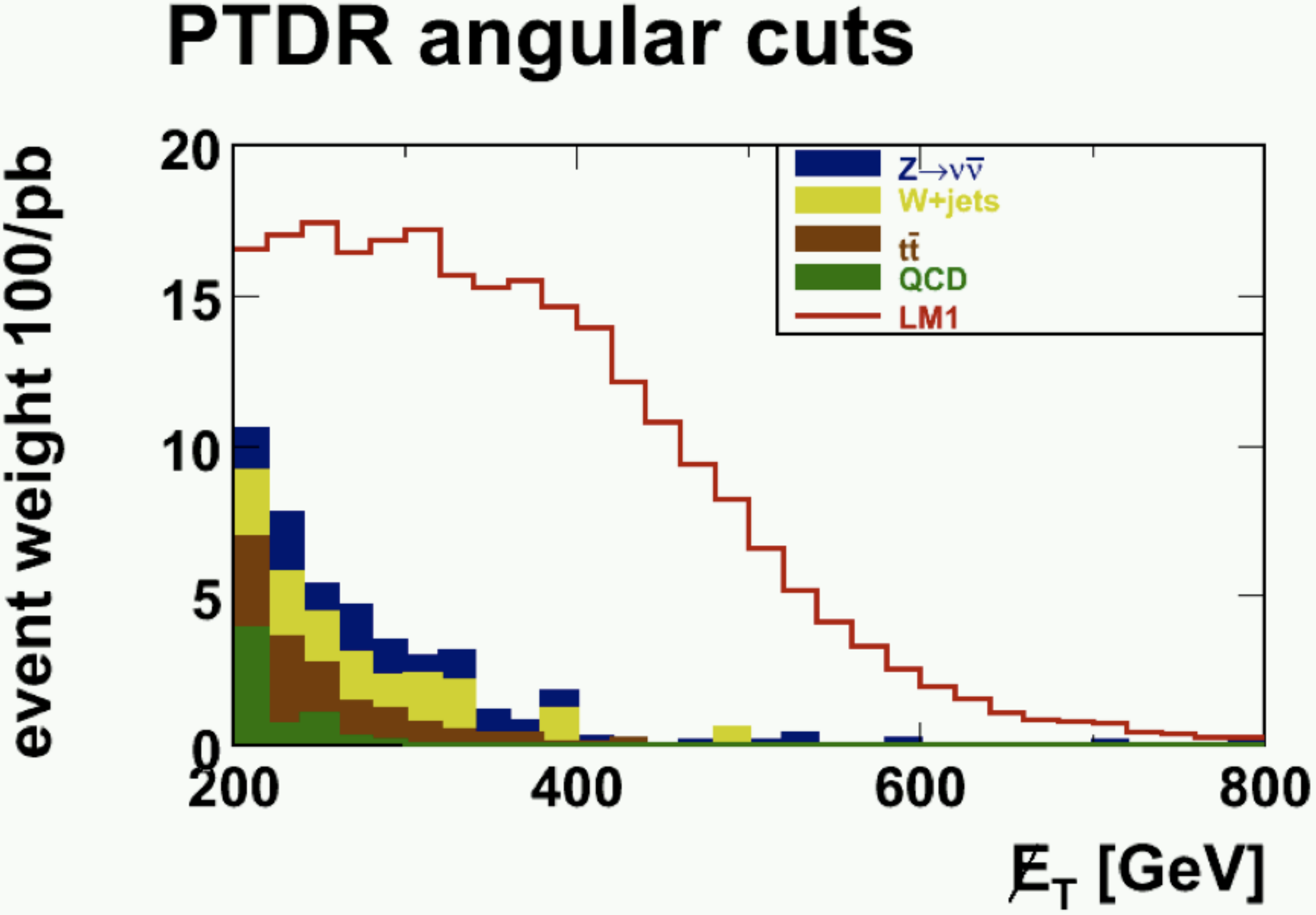
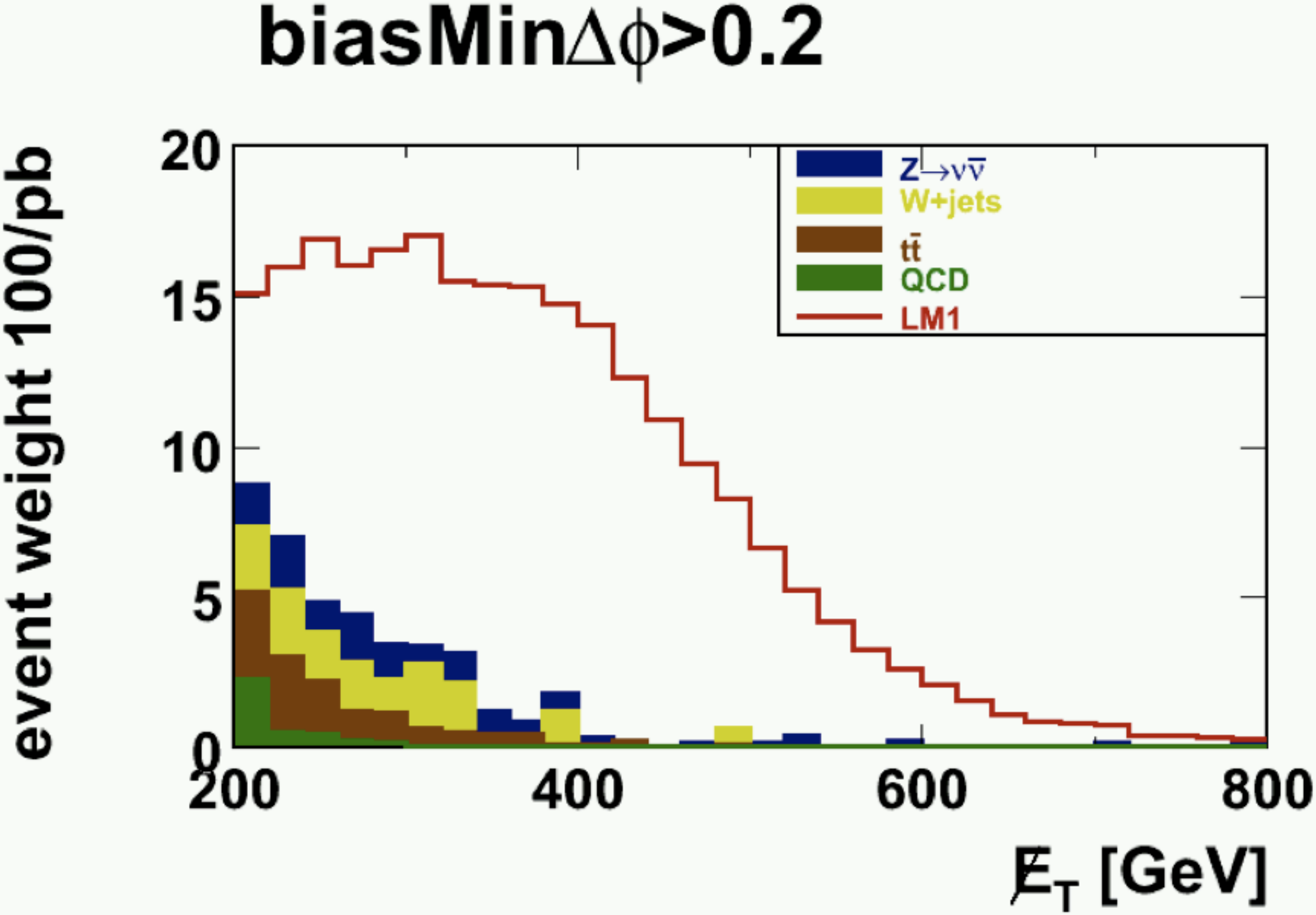
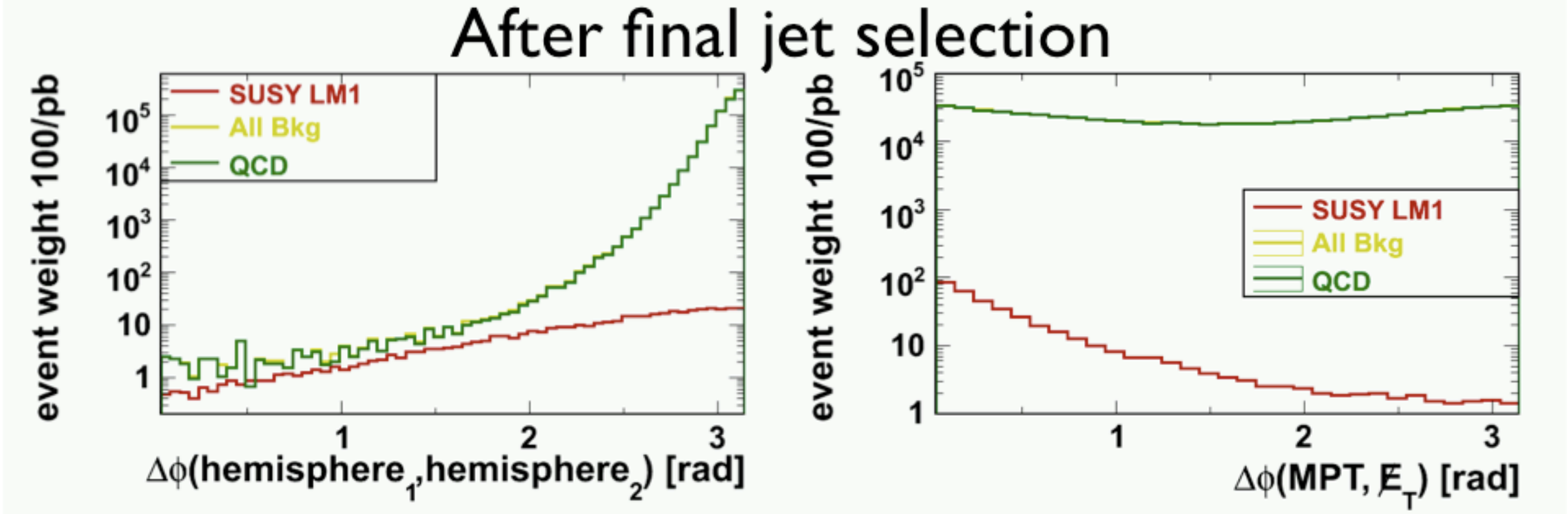


RA2: Background Missing ET distribution



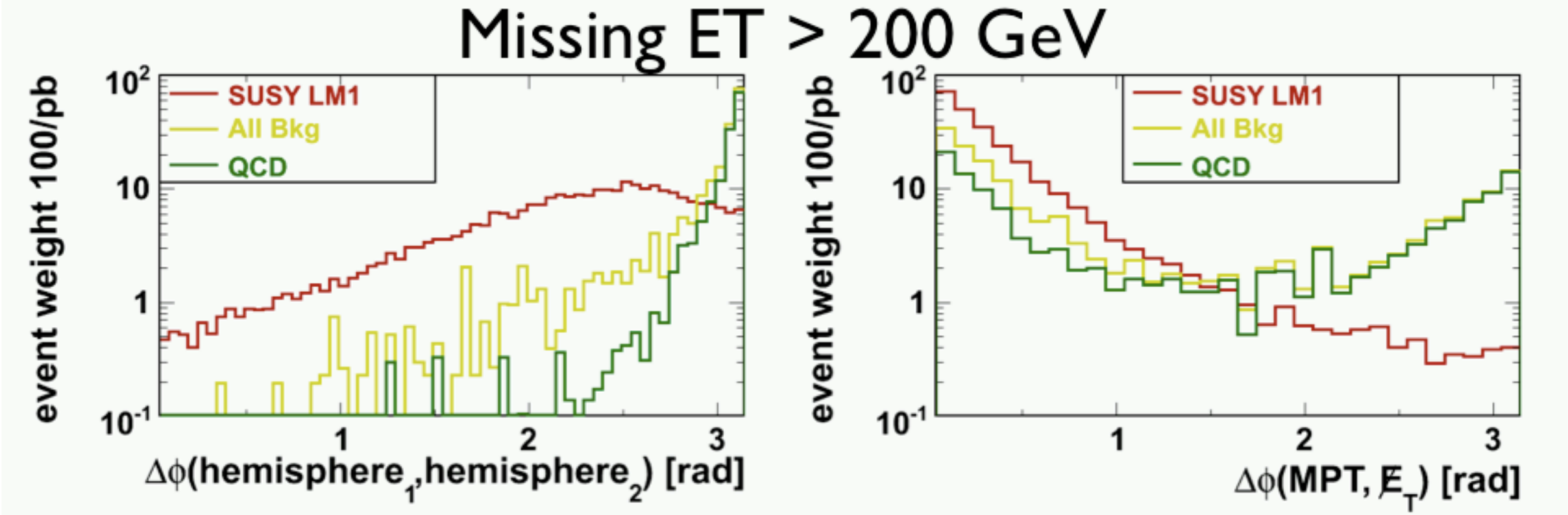
RA2: More angular variables



Definition of the variables:

- Δφ(hemi1, hemi2)
- Δφ(MPT,MET)
- biased Δφ

RA2: More angular variables



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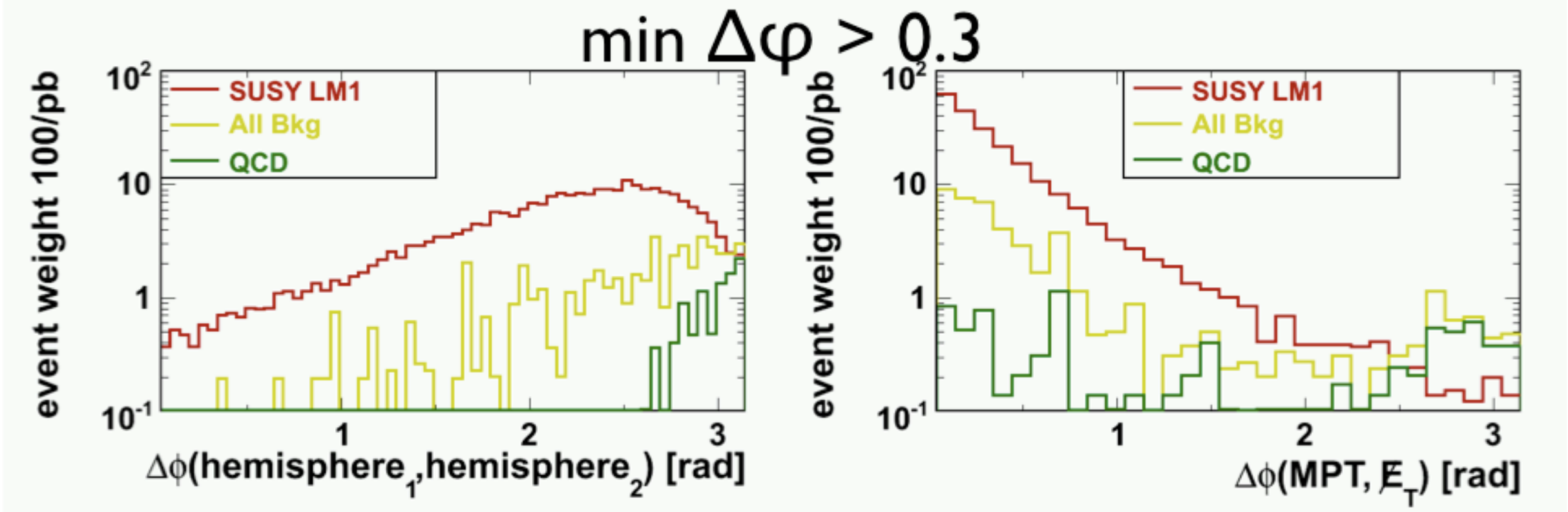

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RA2: Background estimation methods

We need data-driven background estimations for:

QCD:

ABCD background estimation, jet smearing

TTbar and W+jets:

Scale by μ inefficiency

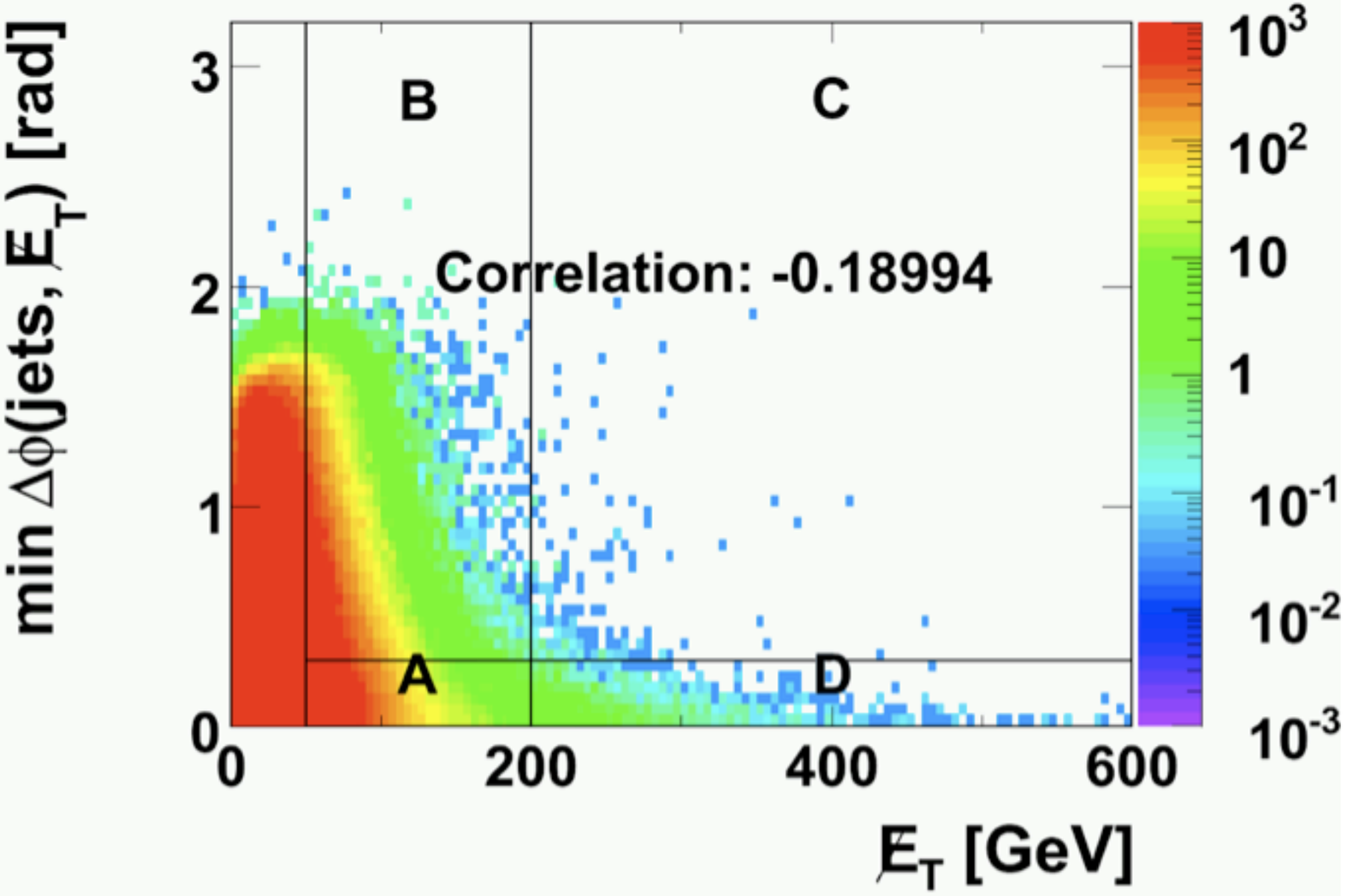
Zinvisible:

W+jets, photon+jets

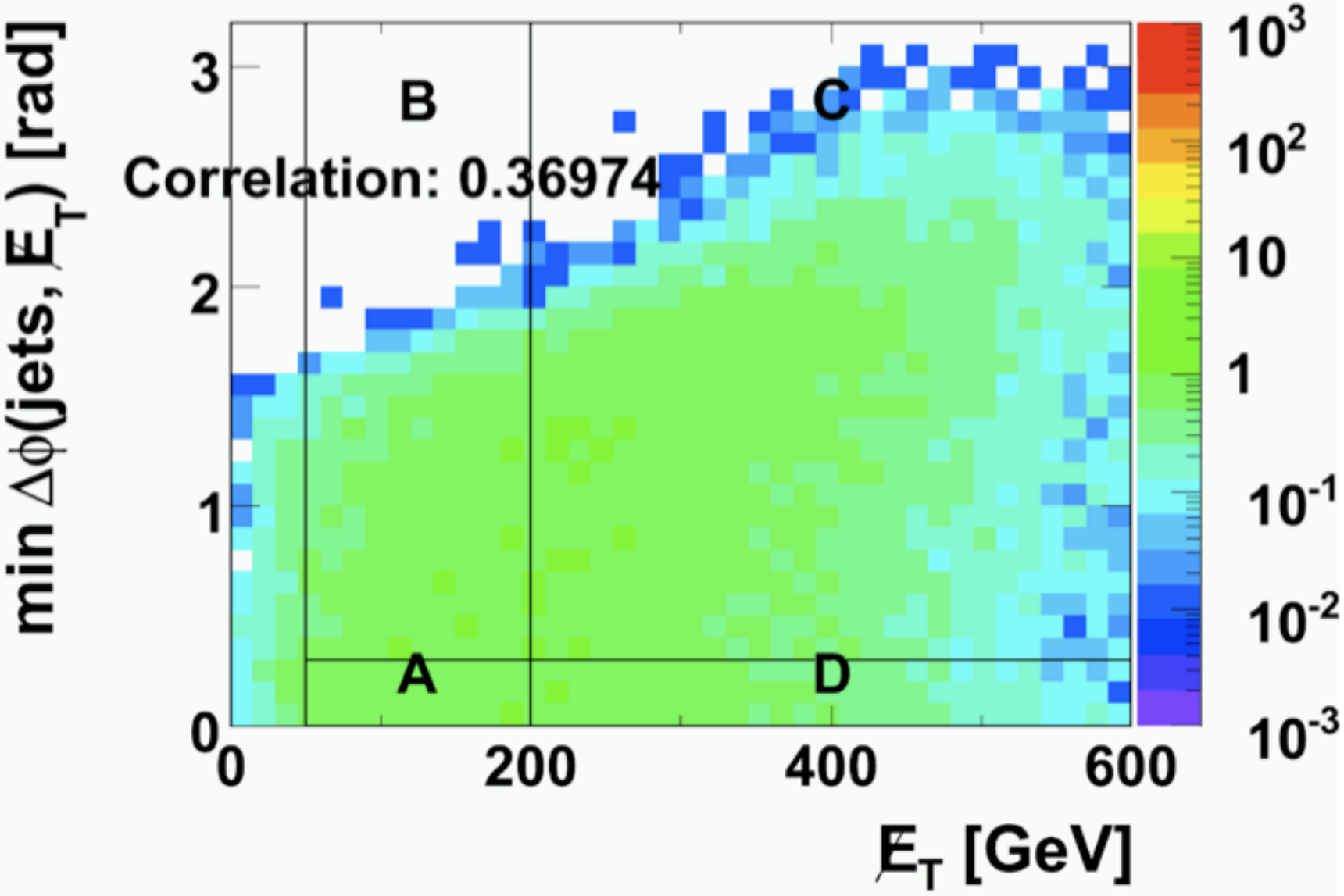
$Z \rightarrow \mu\mu$

from Z +Nj /Z+(Nj+1j)

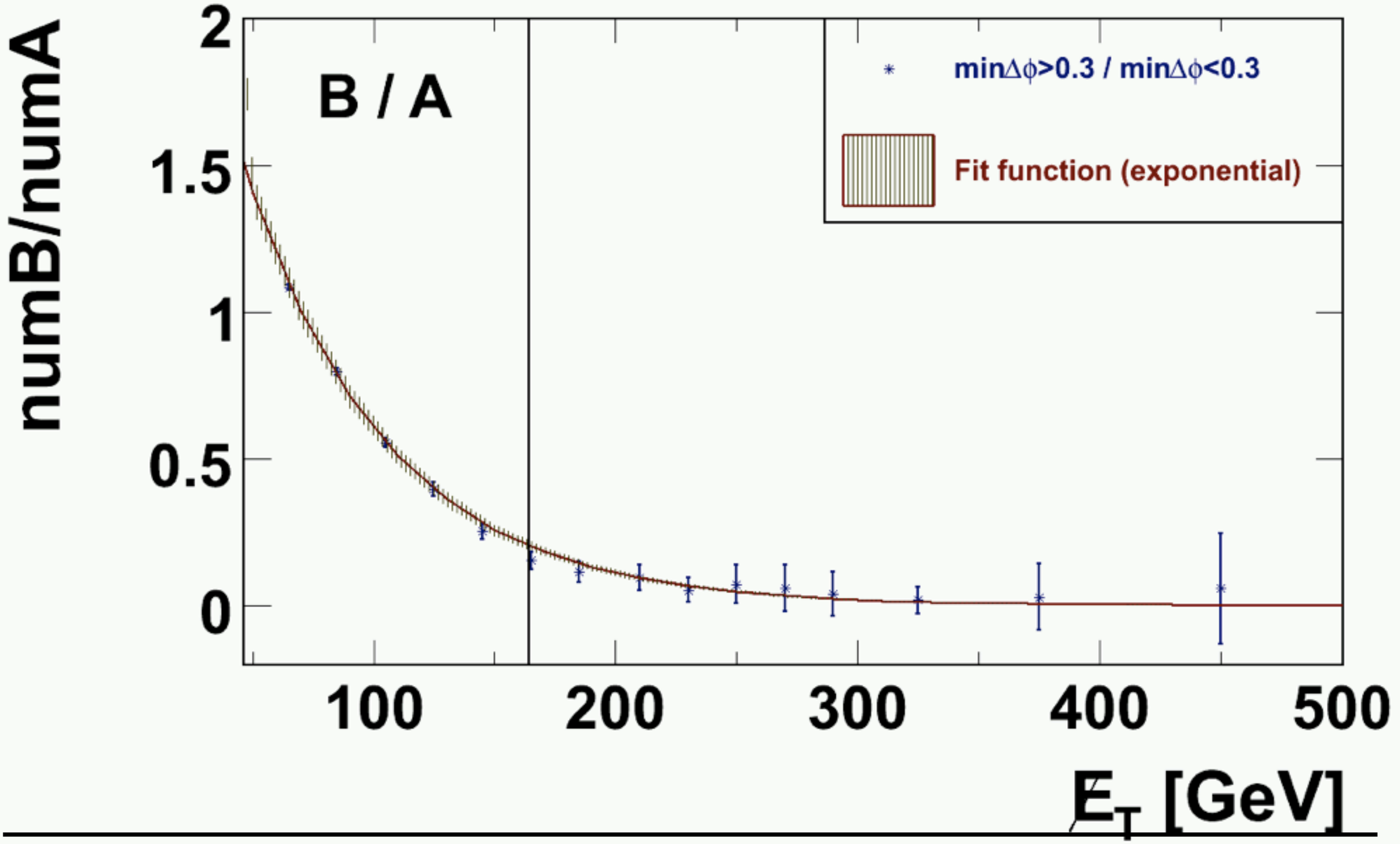
RA2: QCD background estimation



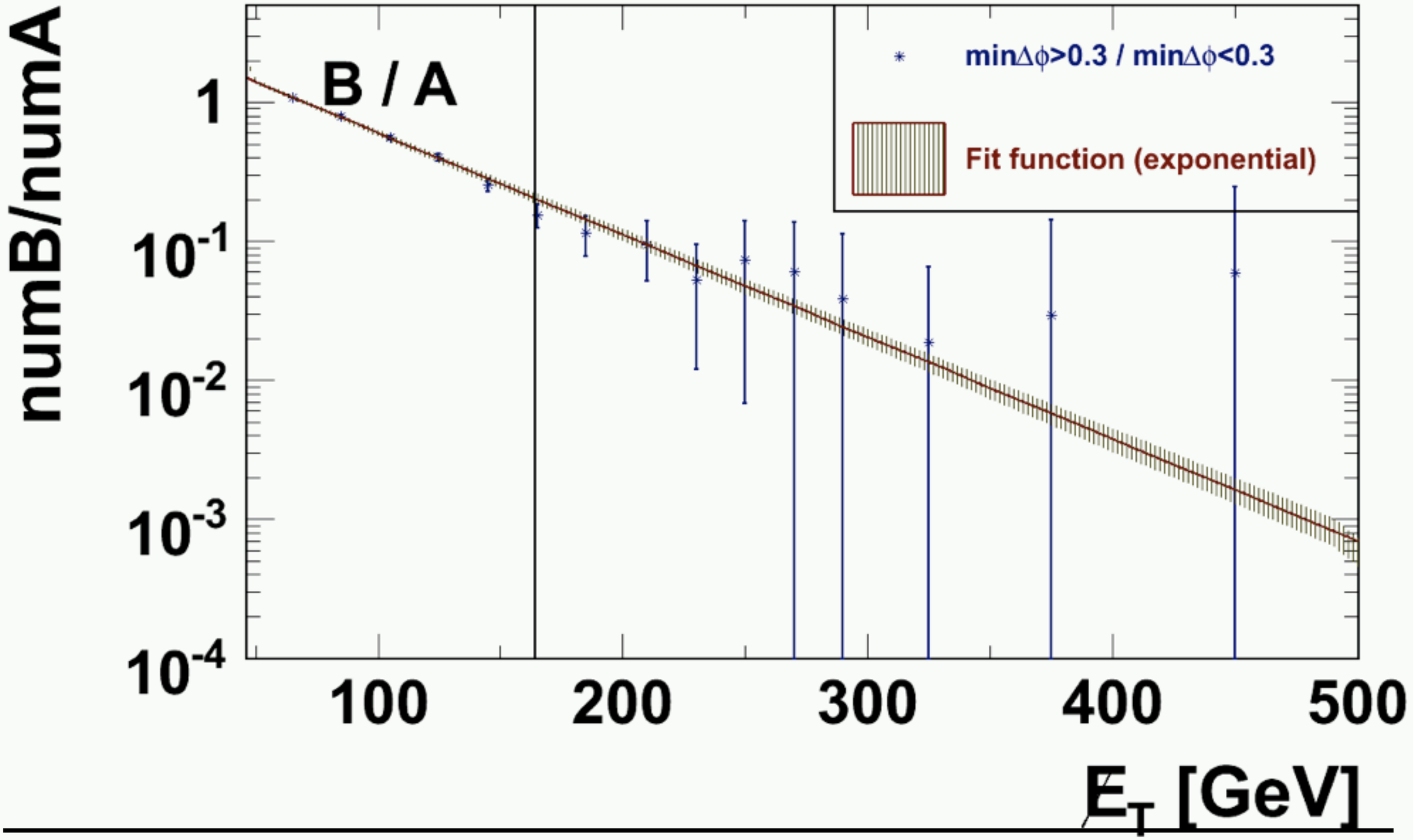
RA2: QCD background estimation



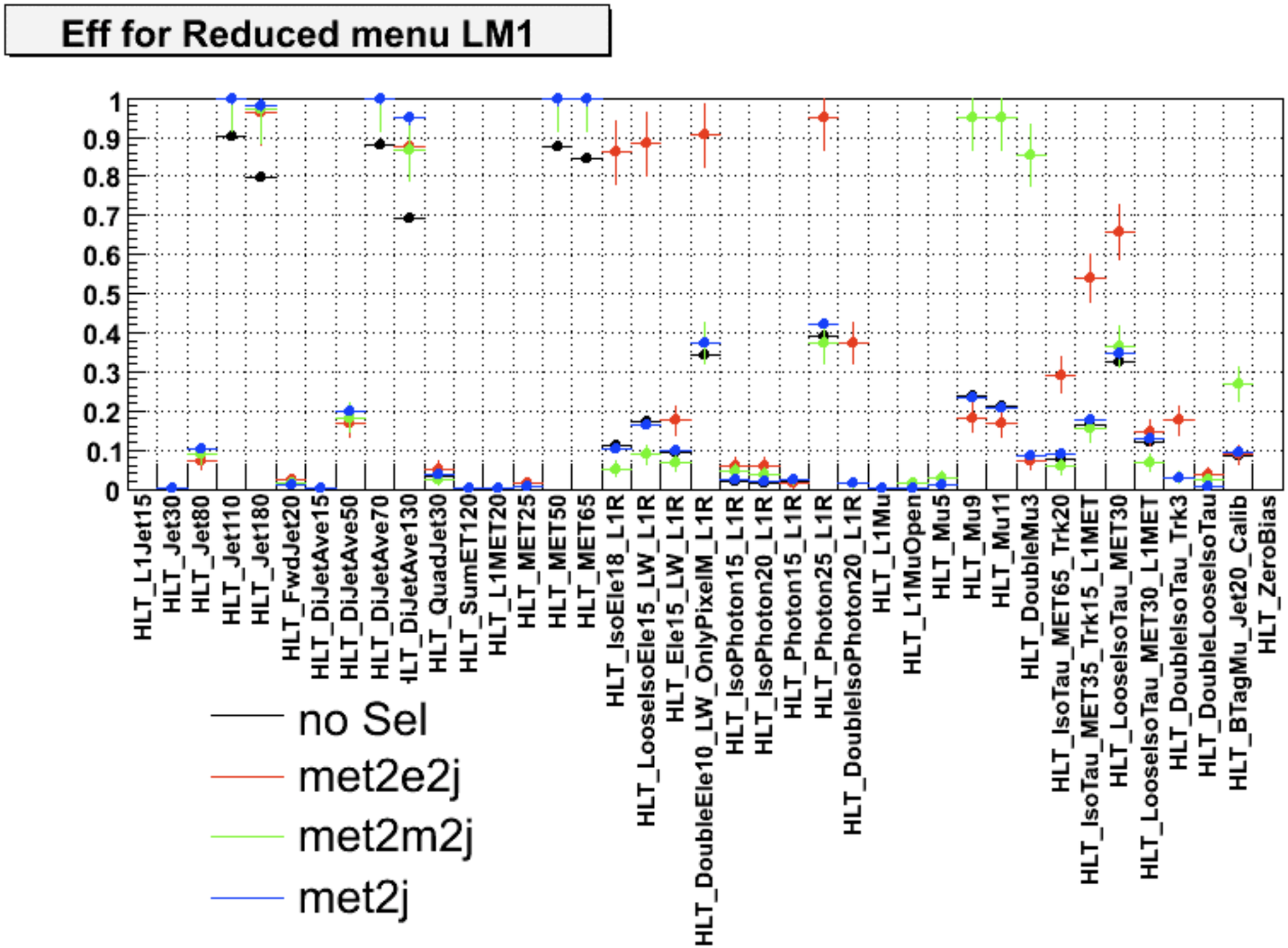
RA2: QCD background estimation



RA2: QCD background estimation



RA2: Signal Triggers & Skims



RA2: Background Triggers

RA2: Synchronization exercise

Cut Flow and Synchronization exercize

Cut Flow for 100/pb (Hamburg)

Quantity	LM0	LM1	QCD (Herwig++)	QCD (Madgraph)	QCD (Pythia)	TTbar (Madgraph)	Wjets (Madgraph)	Z->invisible (Madgraph)
All Events 100 pb-1 (effective Luminosity)	11006 (1.8 fb-1)	1606 (6.5 fb-1)	1.477E+11	4.154E+7	1.444E+11	31711 (3 fb-1)	4.000E+6 (0.2 fb-1)	199718 (0.5 fb-1)
Jets Preselection	9230 (83.9%)	1240 (77.2%)	2.228E+8	3.051E+7	2.508E+8	27395	38871	2515
Direct Lepton Veto	6903 (62.7%)	935 (58.2%)	2.218E+8	3.038E+7	2.499E+8	19808	23235	2497
Final Jet Selection	1855 (16.9%)	421 (26.2%)	1.154E+6	7.523E+5	1.157E+6	1151	322	82
MET > 200 GeV	663 (6.0%)	291 (18.1%)	445	146	225	24	19	14
min deltaPhi(jet1,2,3, MET) > 0.3	519 (4.7%)	254 (15.8%)	36	9	12	15	14	12

RA2: Summary of Status