L3 Electrons, Jets, MET with Vertex Z-position and NLC

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(with slides from Markus Klute)

L3 meeting, 04/02/03

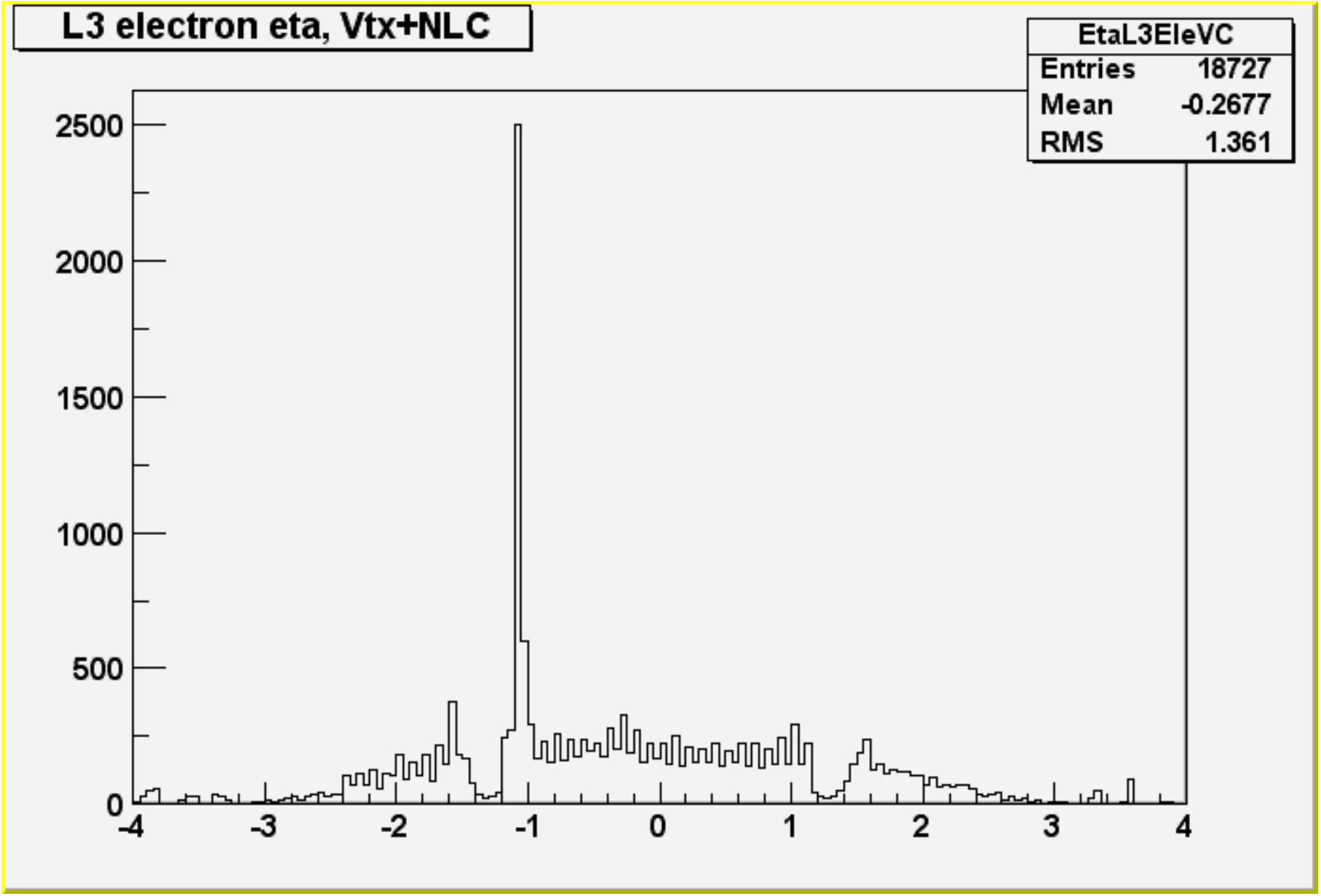
Current L3 Cal Filters

- ELE_LOOSE (SH_T, etc)
  - VTX_NULL
  - CALIB=0
  - NADA=0
- SCJET_9
  - VTX_NULL
  - CALIB=0
  - NADA=0
- CalMEt_PvtxZ
  - PvtxZ, (NADA)
  - CALIB=0

Data Study

- Data set:
  - Special EM trigger run (~57000 evts)
  - Run trigsim with new filters
  - There is a hot cell in the EM part
    - 20% of L3 electrons are at eta=-1
- Study turn-on
  - Compared to offline electrons
    - EMID 10 or 11
  - Compared to offline Jets
    - JCCB (0.5 cone)
    - No JES correction

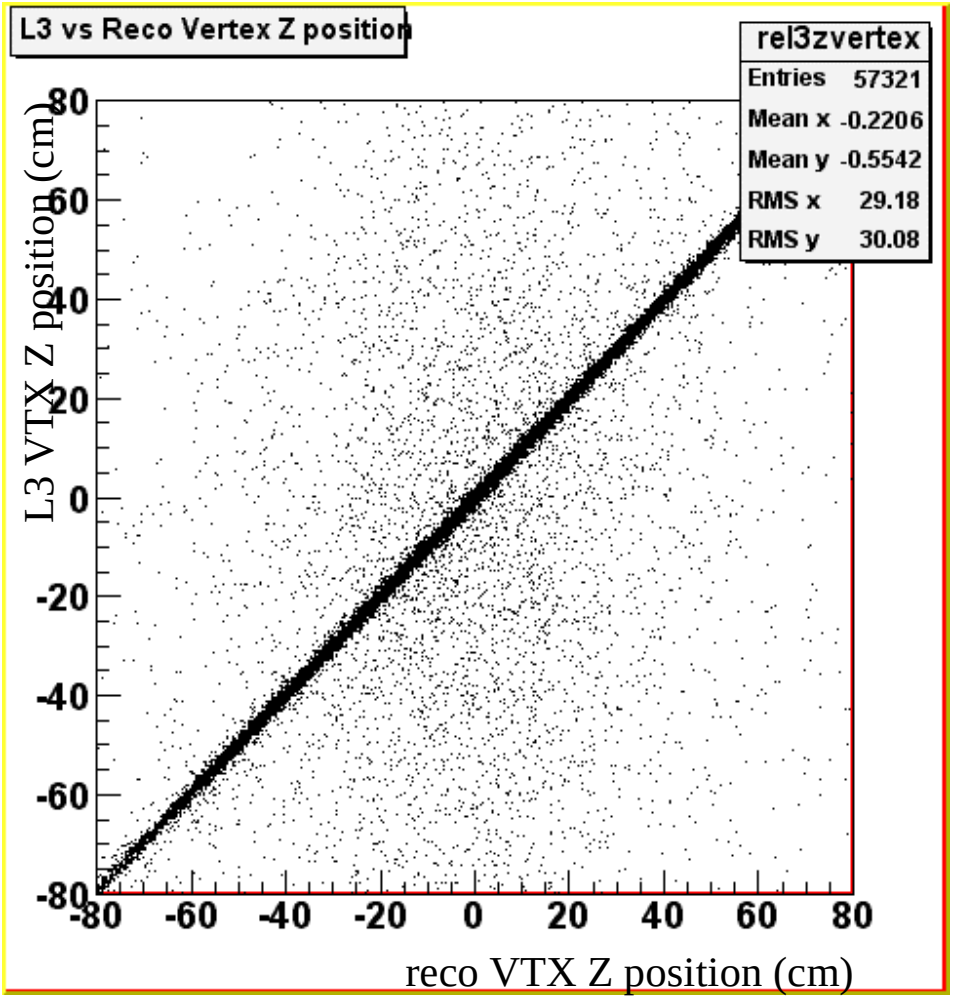
Calorimeter Hot Cell

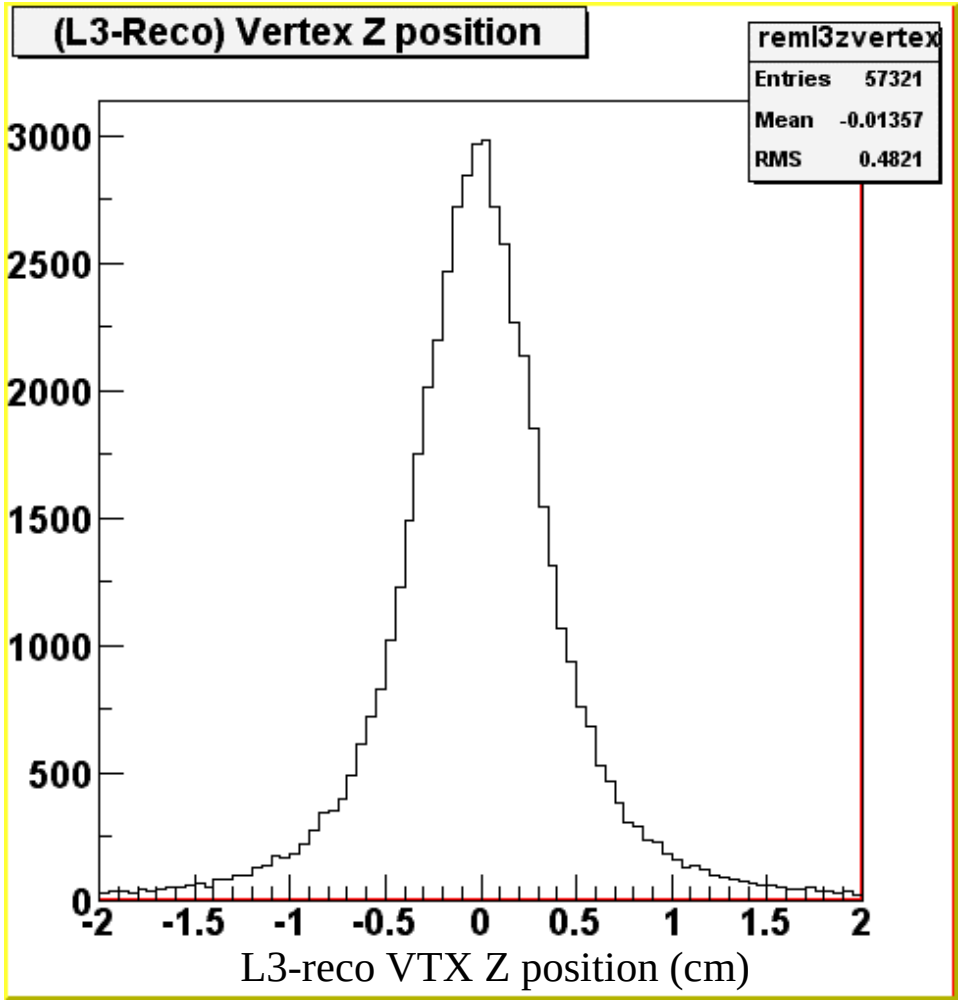


L3 Vertex Z-position

- Studied for
  - all-jets (Andy Haas)
  - MET, μ+jets (Markus Klute)
  - e+jets (RS)

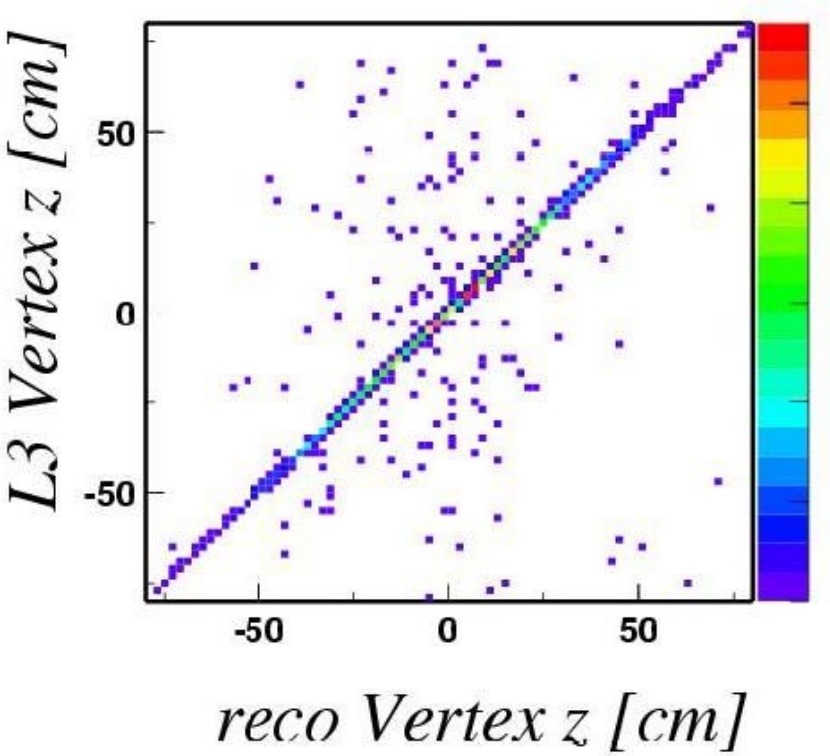
L3 vs Reco Z-vertex
(EM special run data)

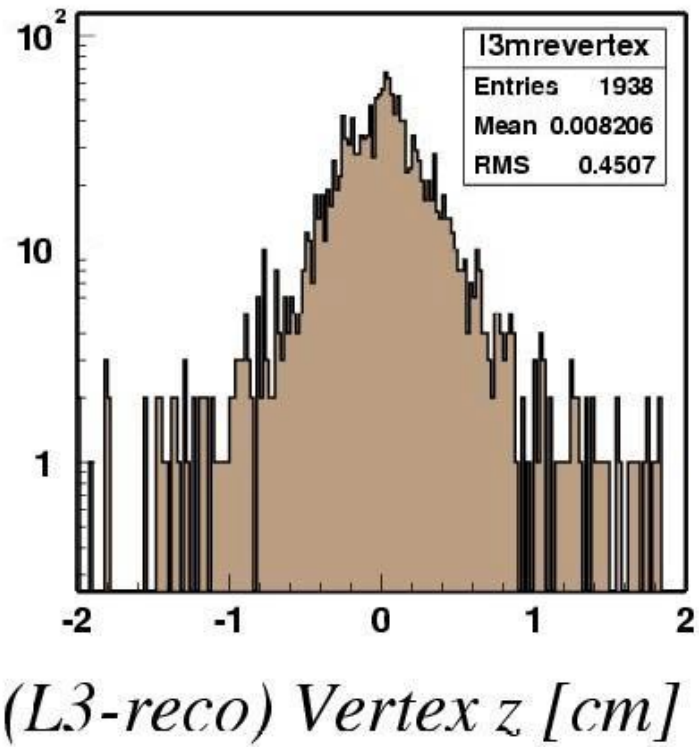




L3 Vtx in μ+jets (Markus)

- In mu1ptxatxx_CJT(1,5) events
- Vertex found in 93.7% of events





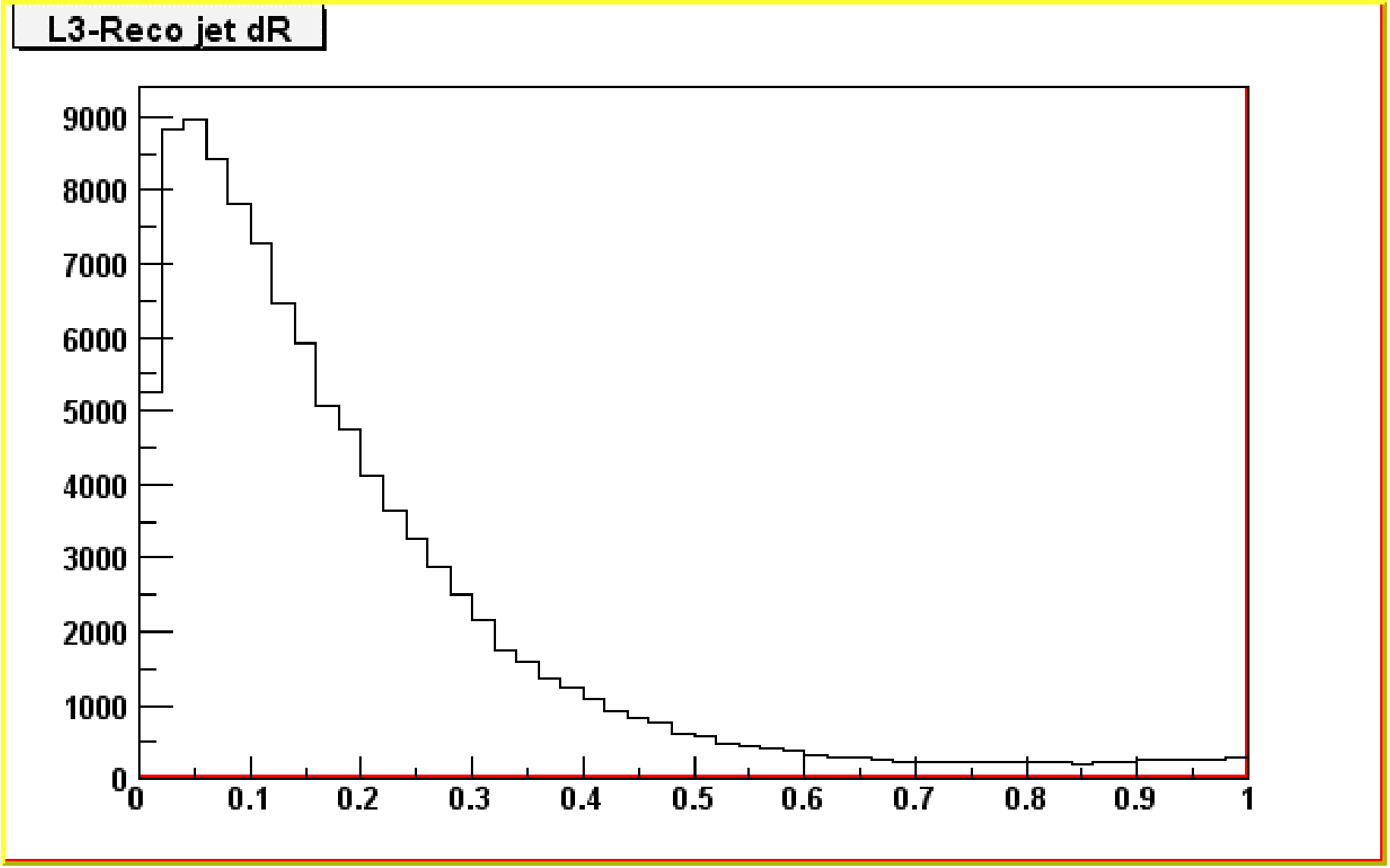
Turn-On-Curves

- Turn-on curves for L3 jets and electrons
  - L3 jets (SCJET_9…)
  - L3 electrons (ELE_LOOSE…)
  - Find L3 objects within 1.0 dR window of reco object
    - Plot dR for reco obj >15GeV and L3 obj >10GeV
- L3 20GeV PT cut
  - No L1/L2 requirements
- vs uncorrected reco PT
- Efficiency calculated in plateau region
- Erf function fit with 2 parameters:
  slope, turn-on point
- Compare to single-top MC

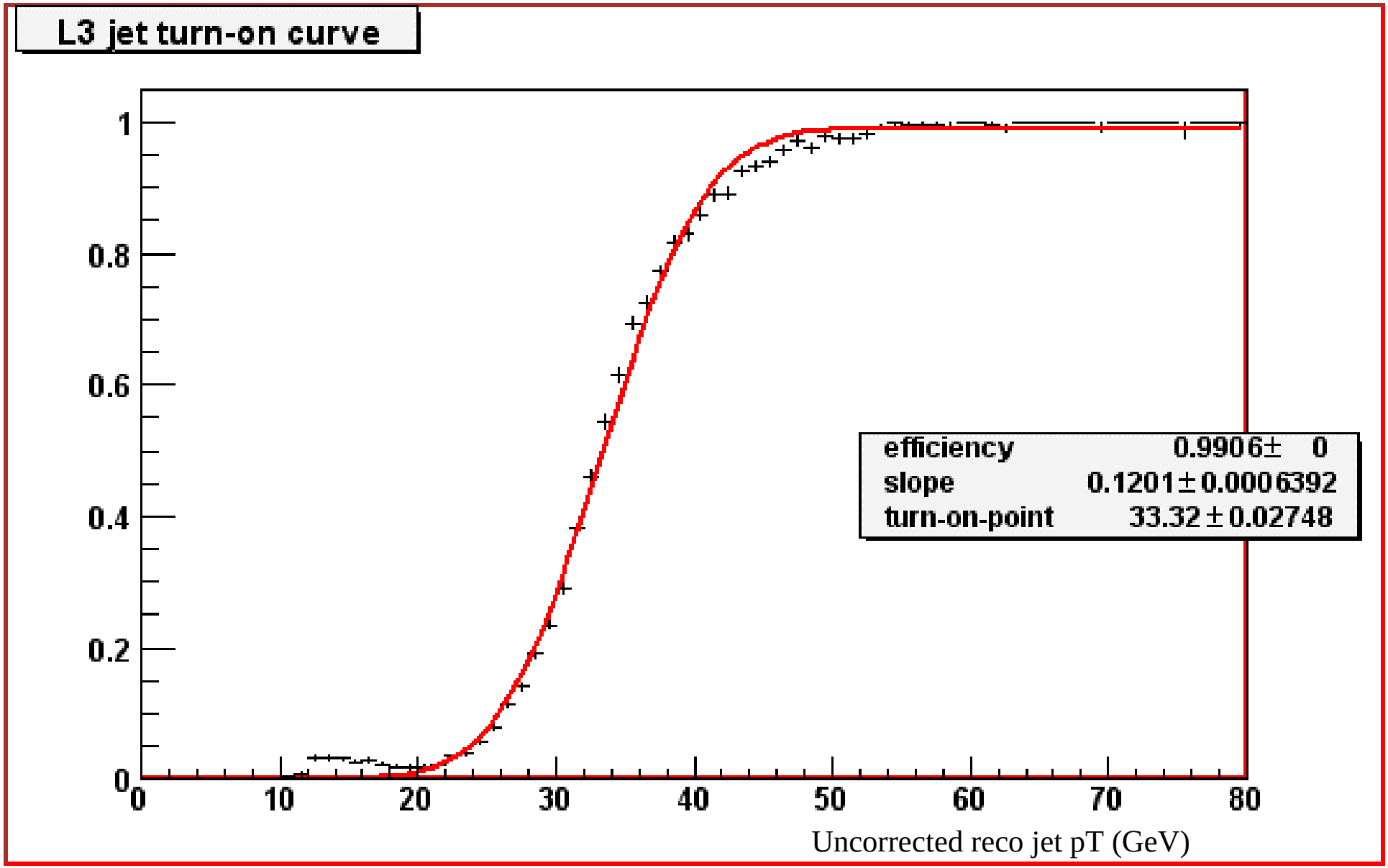
L3 Jets

- Existing: SCJET_9, SCJET_15
  - 0.7 cone jets, no calib, NULL_VTX
- Study:
  - SCJET_9_VTX
    - L3 Z vertex , no calib, 0.7 cone
  - SCJET_9_VTX_CALIB
    - L3 Z vertex, NLC, 0.7 cone
  - SCJET5_9_VTX_CALIB
    - L3 Z vertex, NLC, 0.5 cone

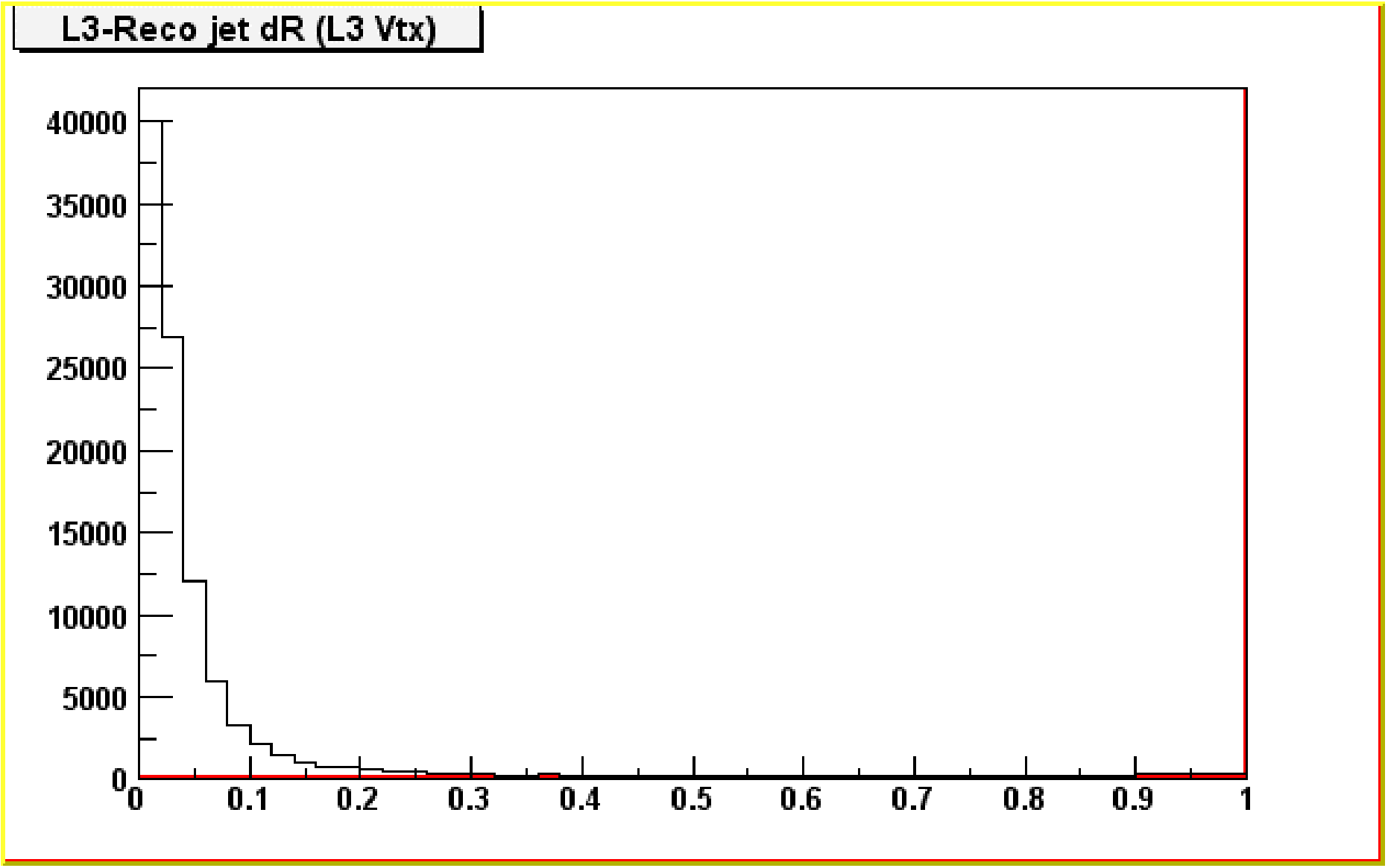
dR between Reco and L3 jets SCJET_9



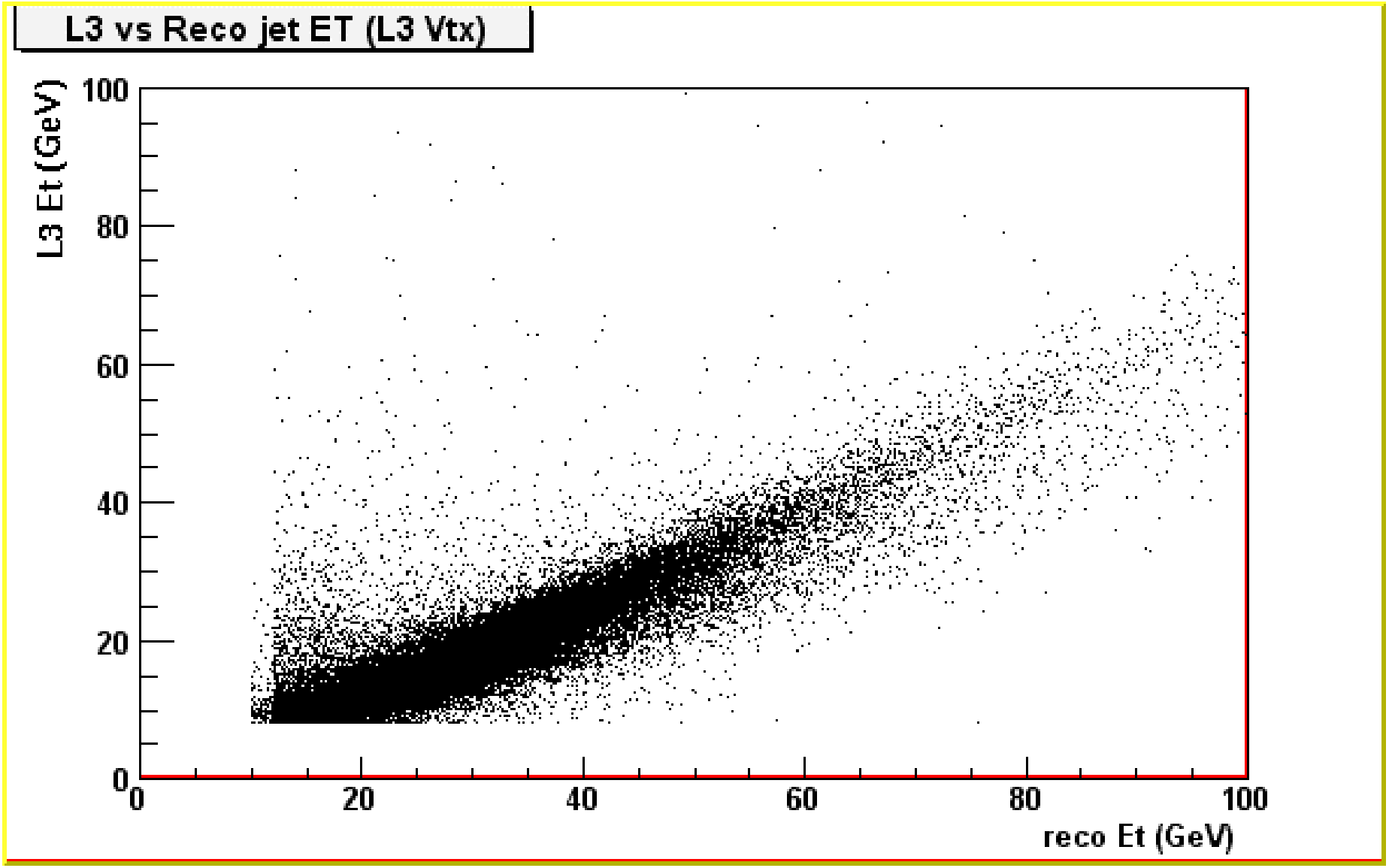
SCJET_9 turn-on



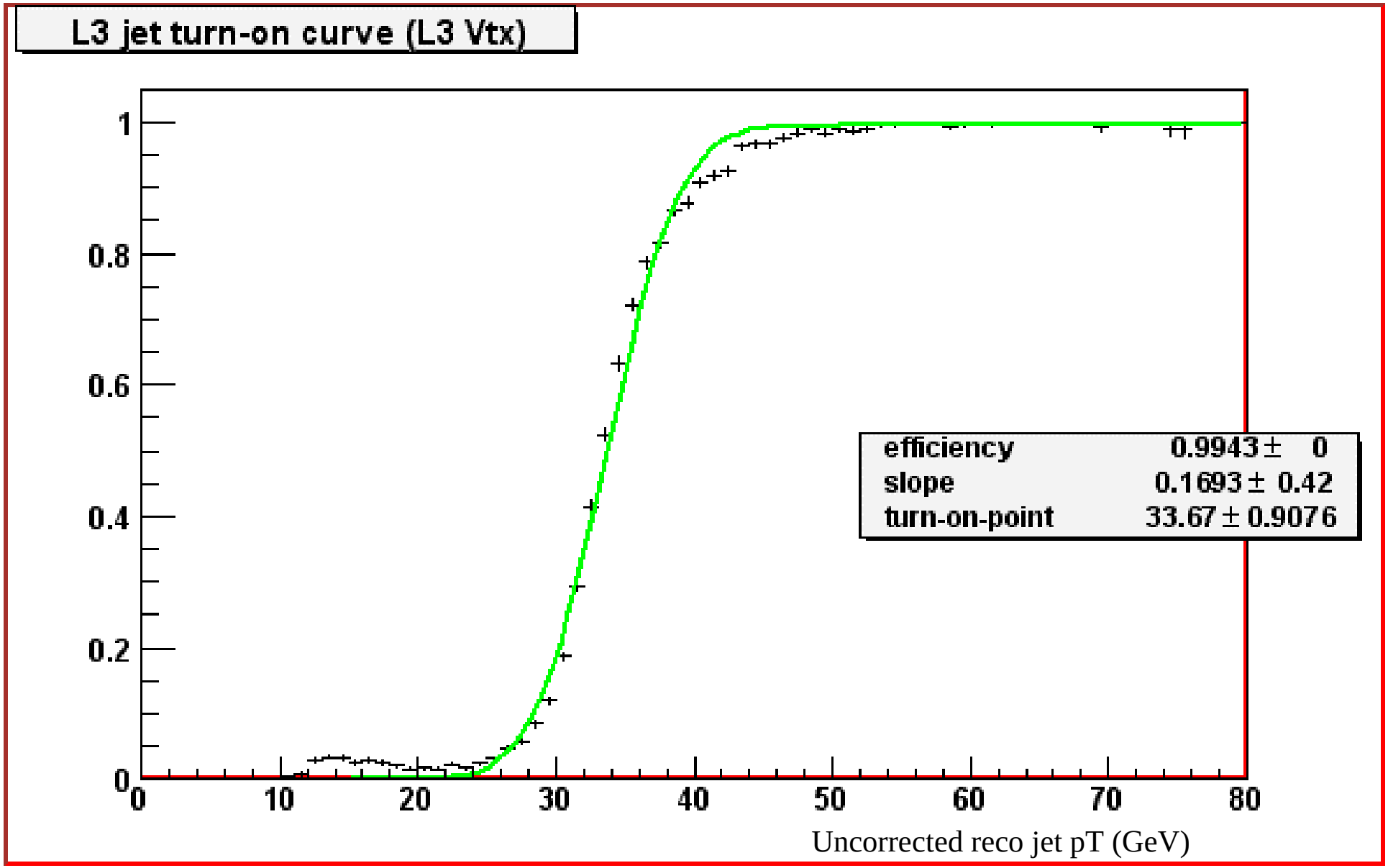
dR between Reco and L3 jets SCJET_9_VTX



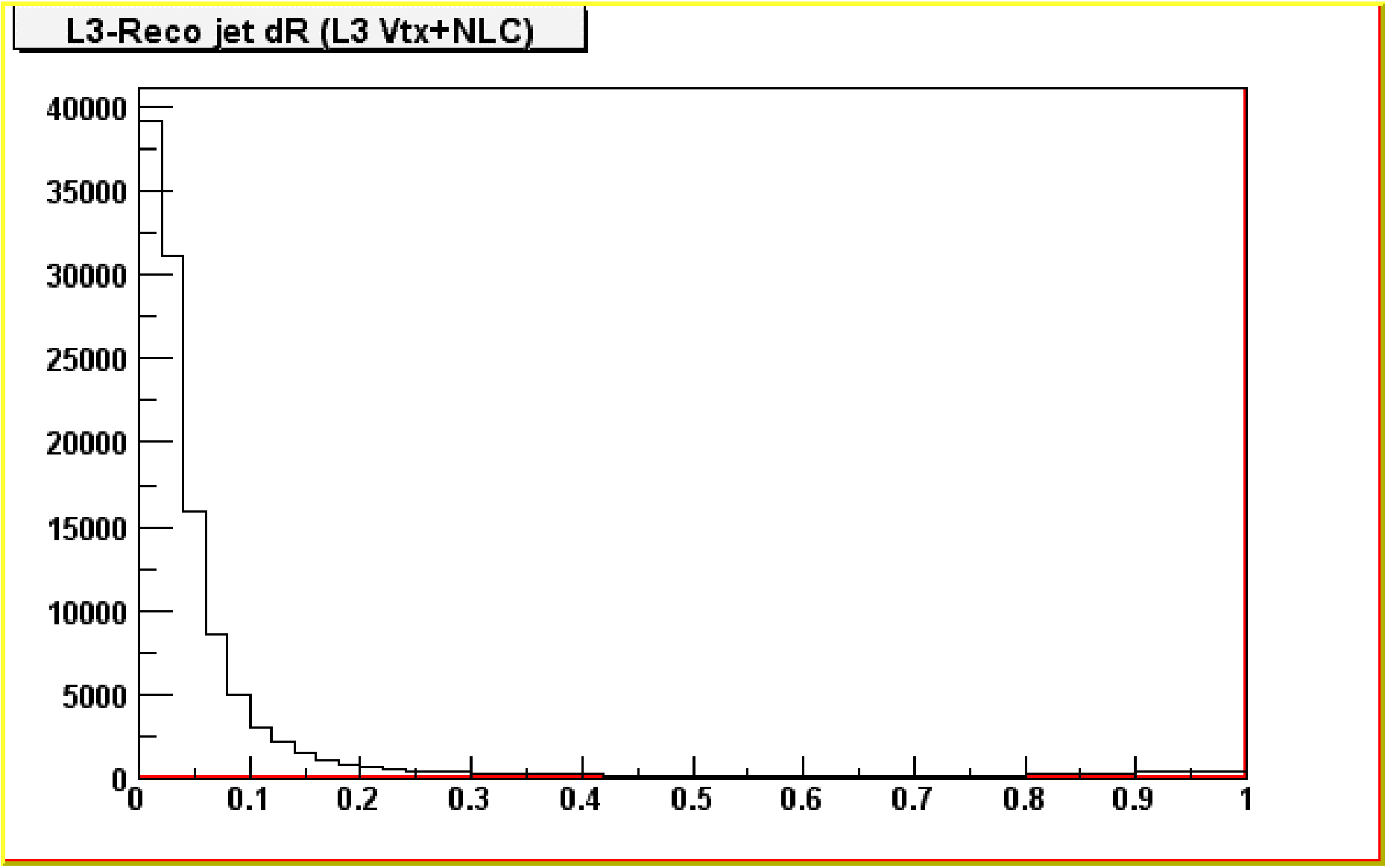
Jet ET: Reco vs L3 jets
SCJET5_9_VTX



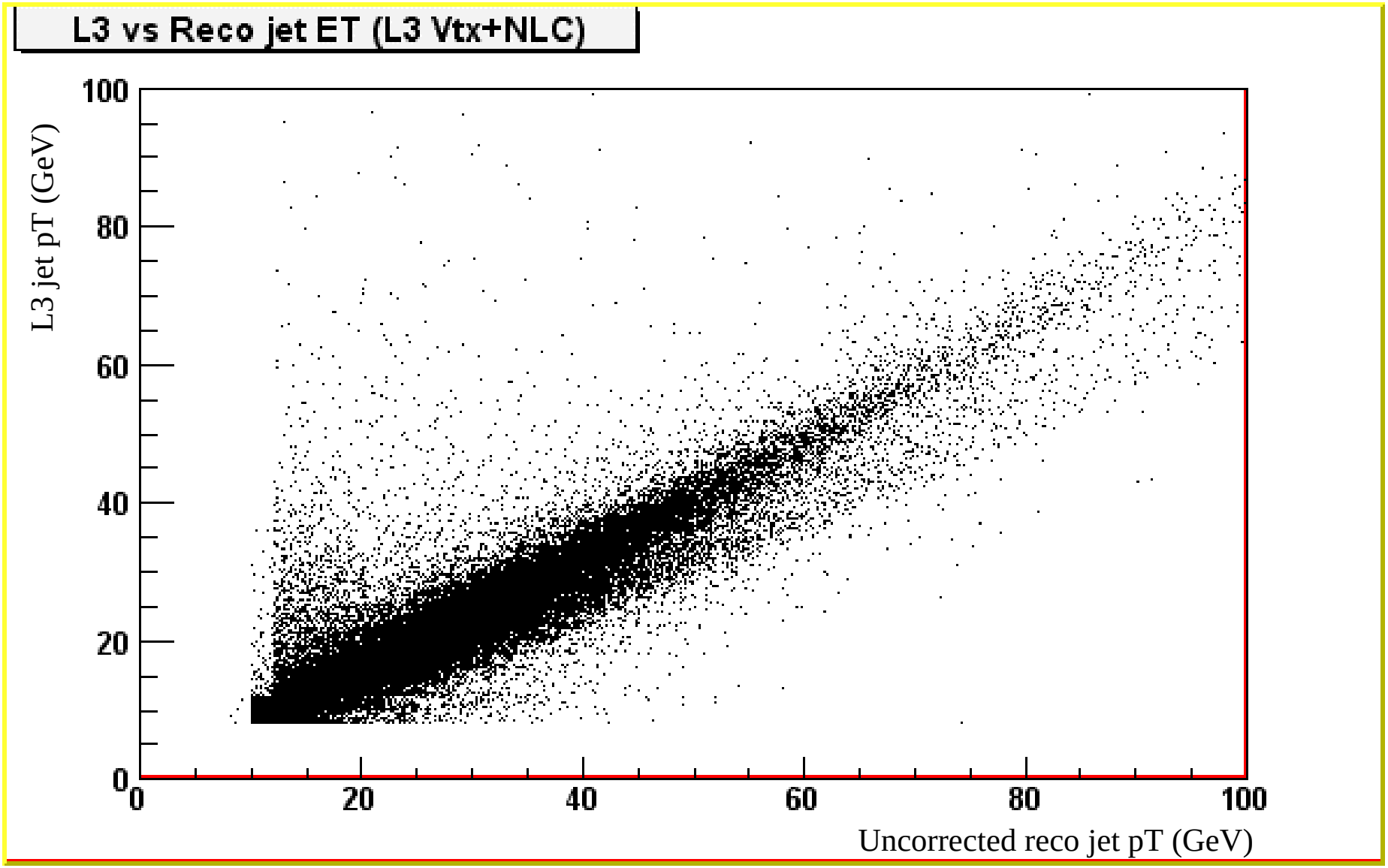
SCJET_9_VTX turn-on



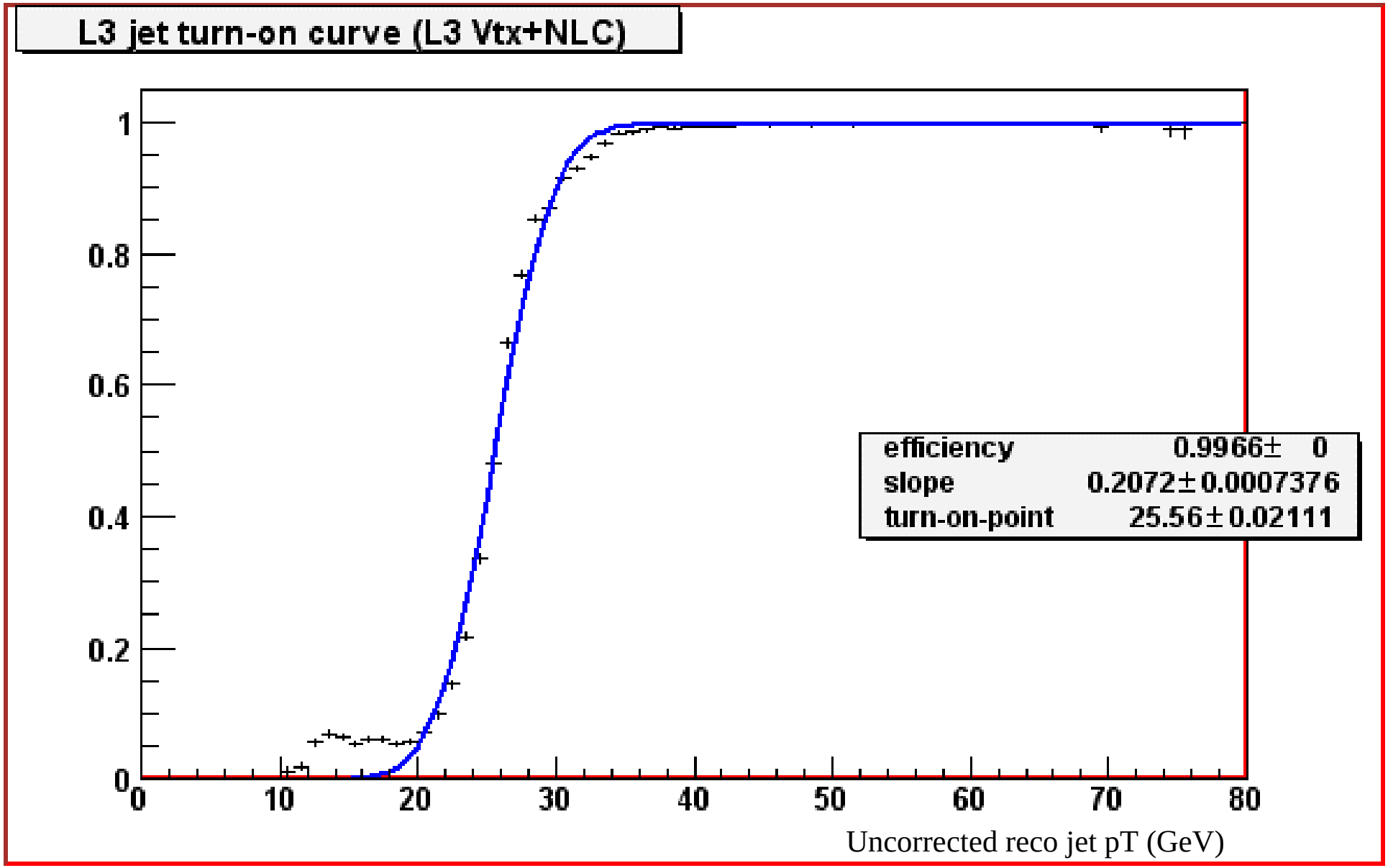
dR between Reco and L3 jets
SCJET_9_VTX_CALIB



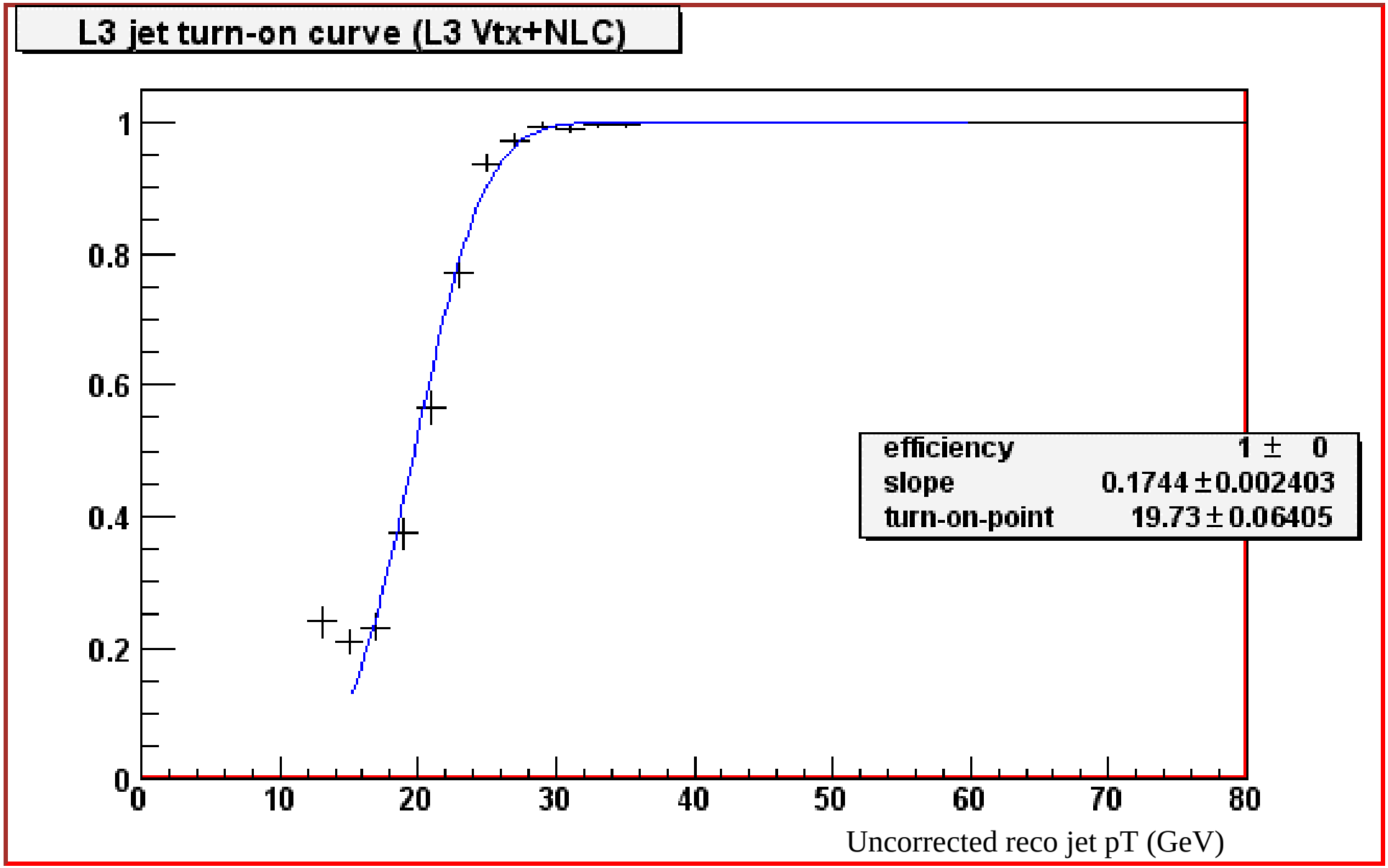
Jet ET: Reco vs L3 jets
SCJET_9_VTX_CALIB



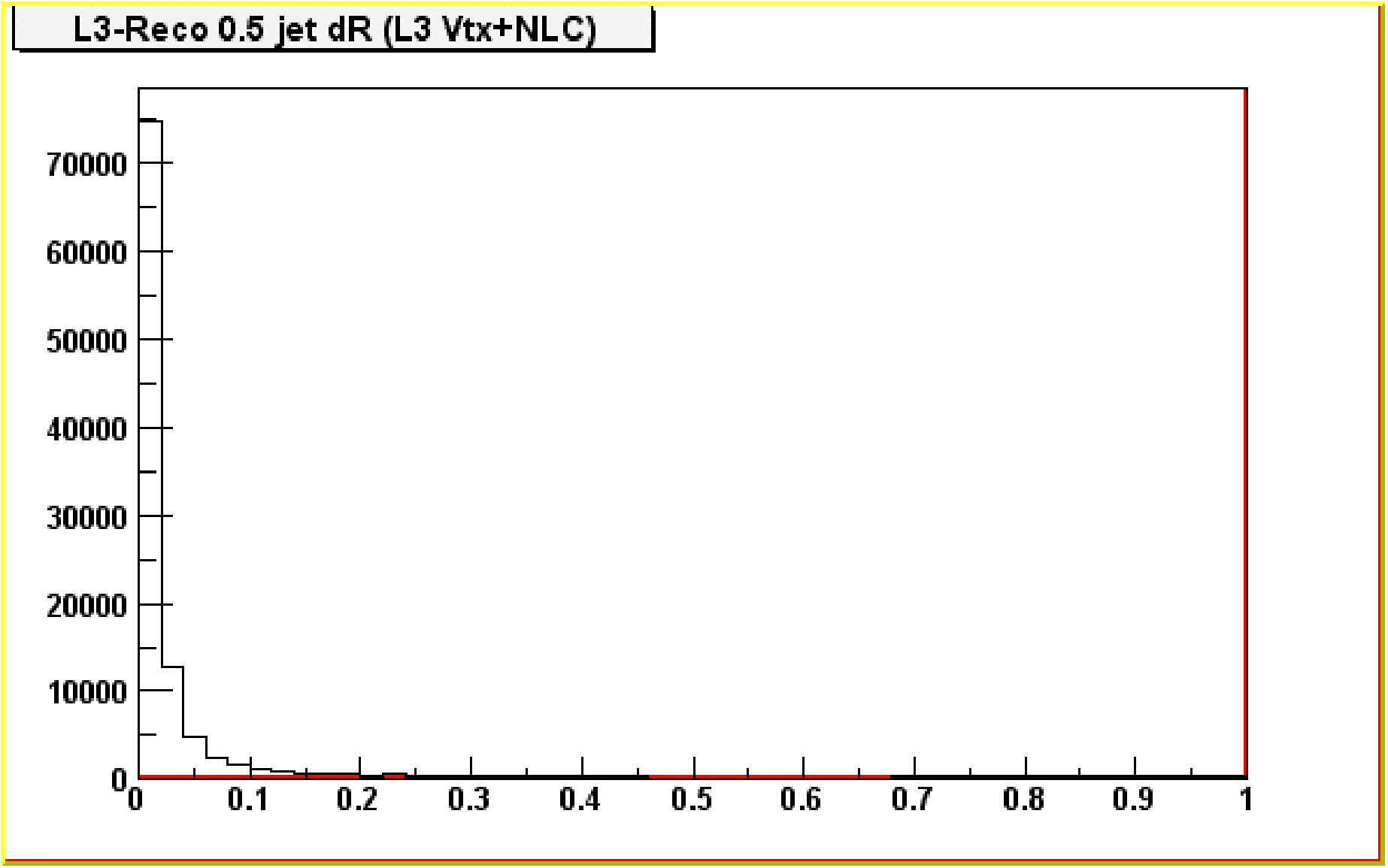
SCJET_9_VTX_CALIB turn-on



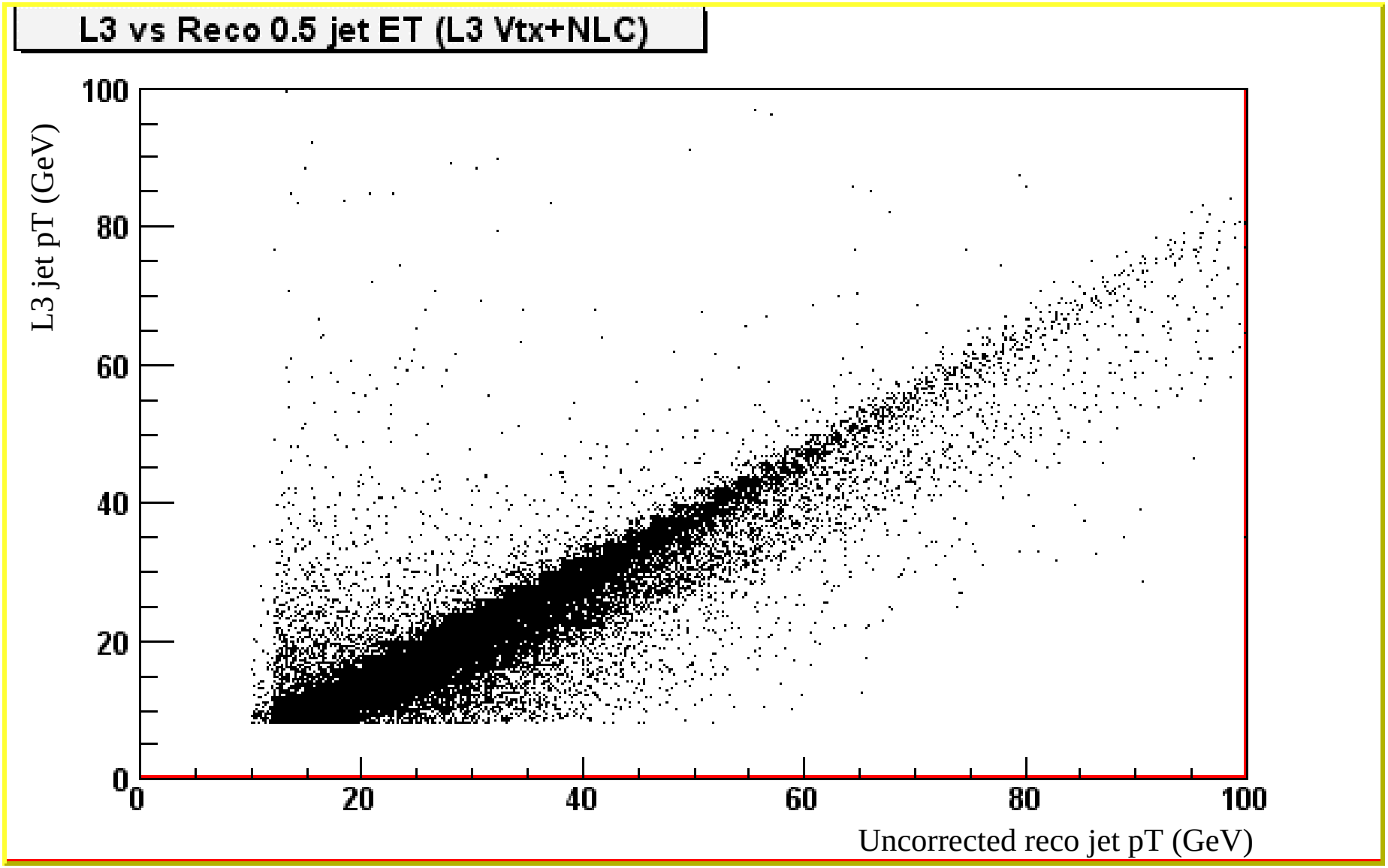
SCJET_9_VTX_CALIB
MC turn-on



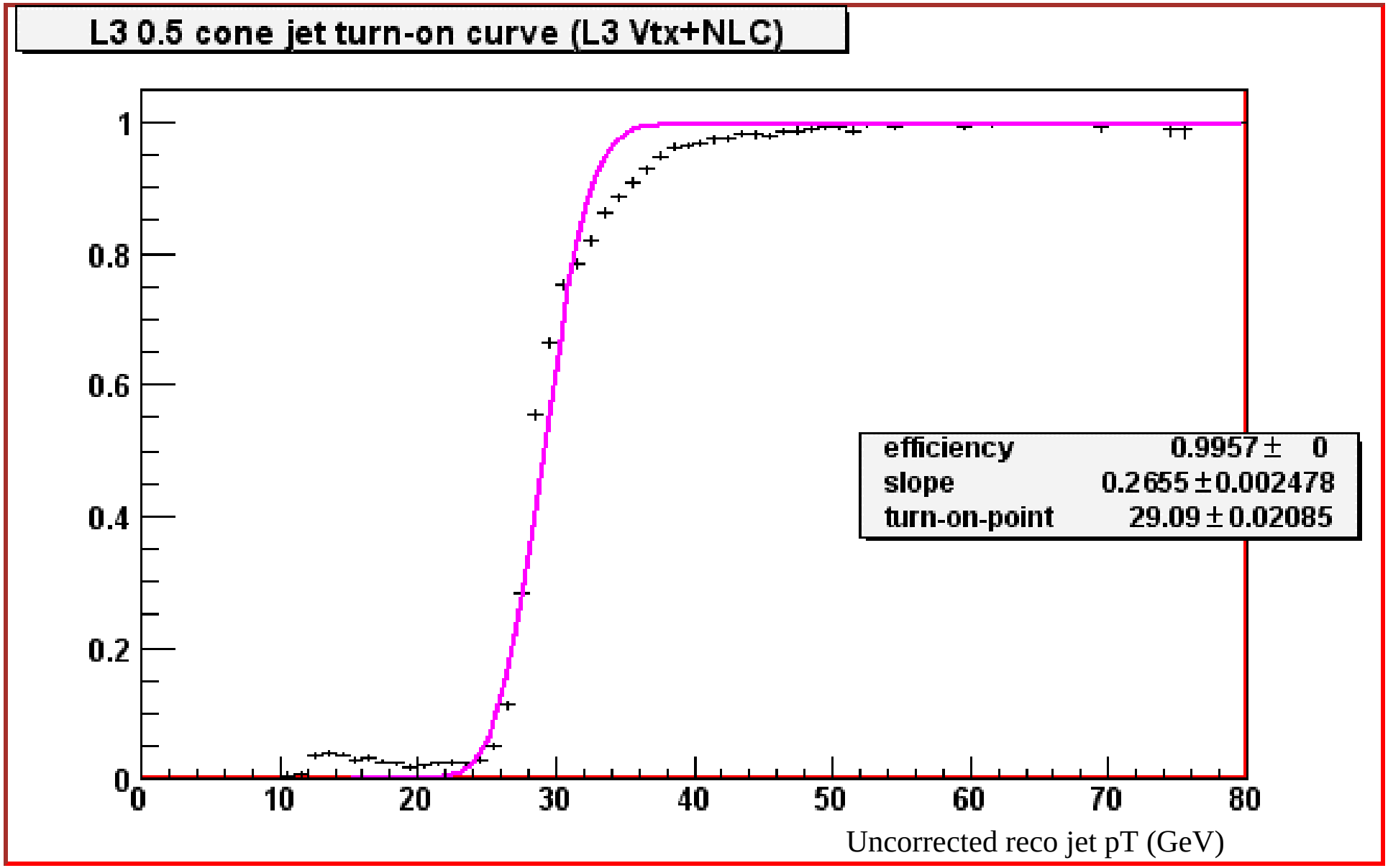
dR between Reco and L3 jets SCJET5_9_VTX_CALIB



Jet ET: Reco vs L3
SCJET5_9_VTX_CALIB

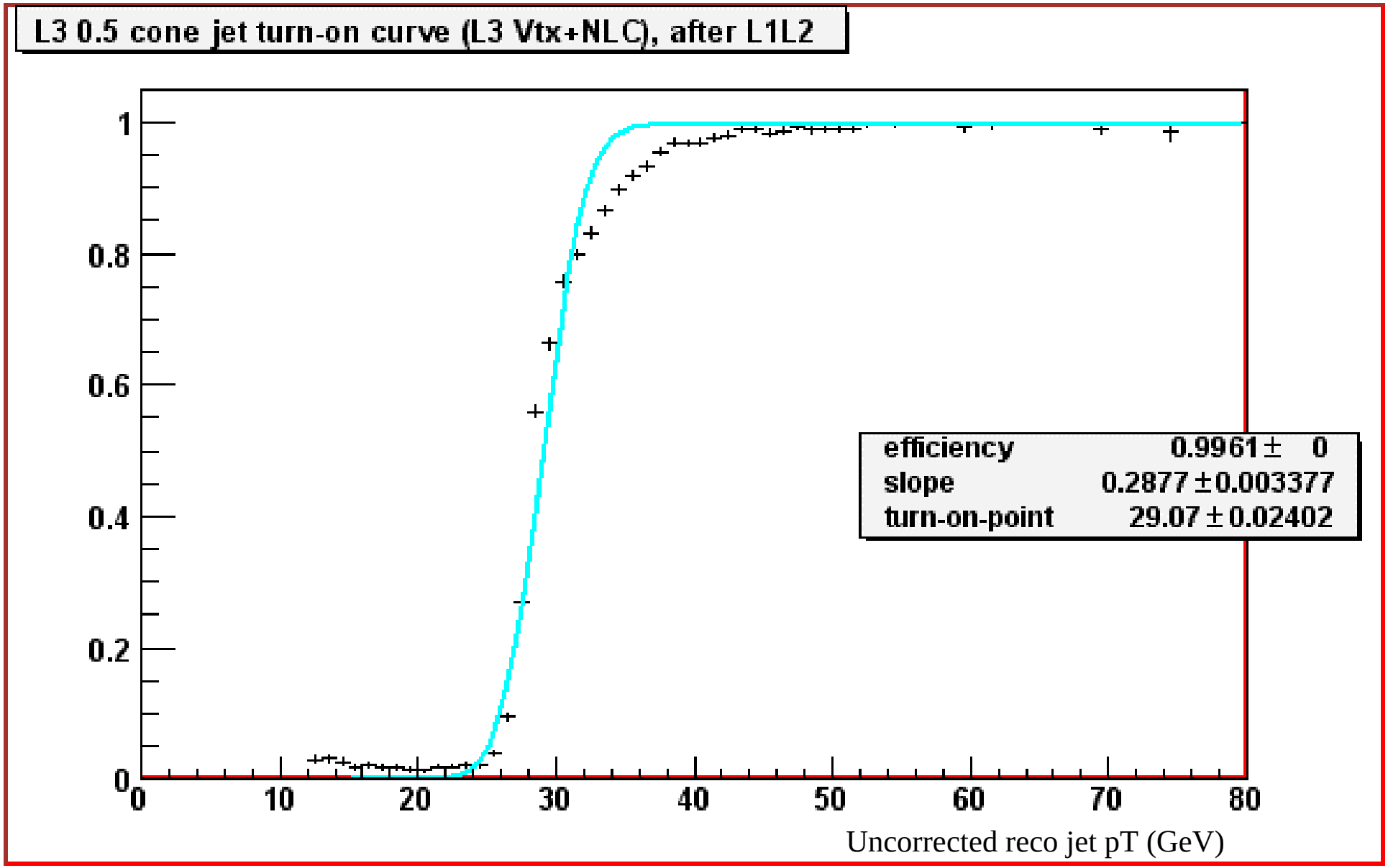


SCJET5_9_VTX_CALIB turn-on

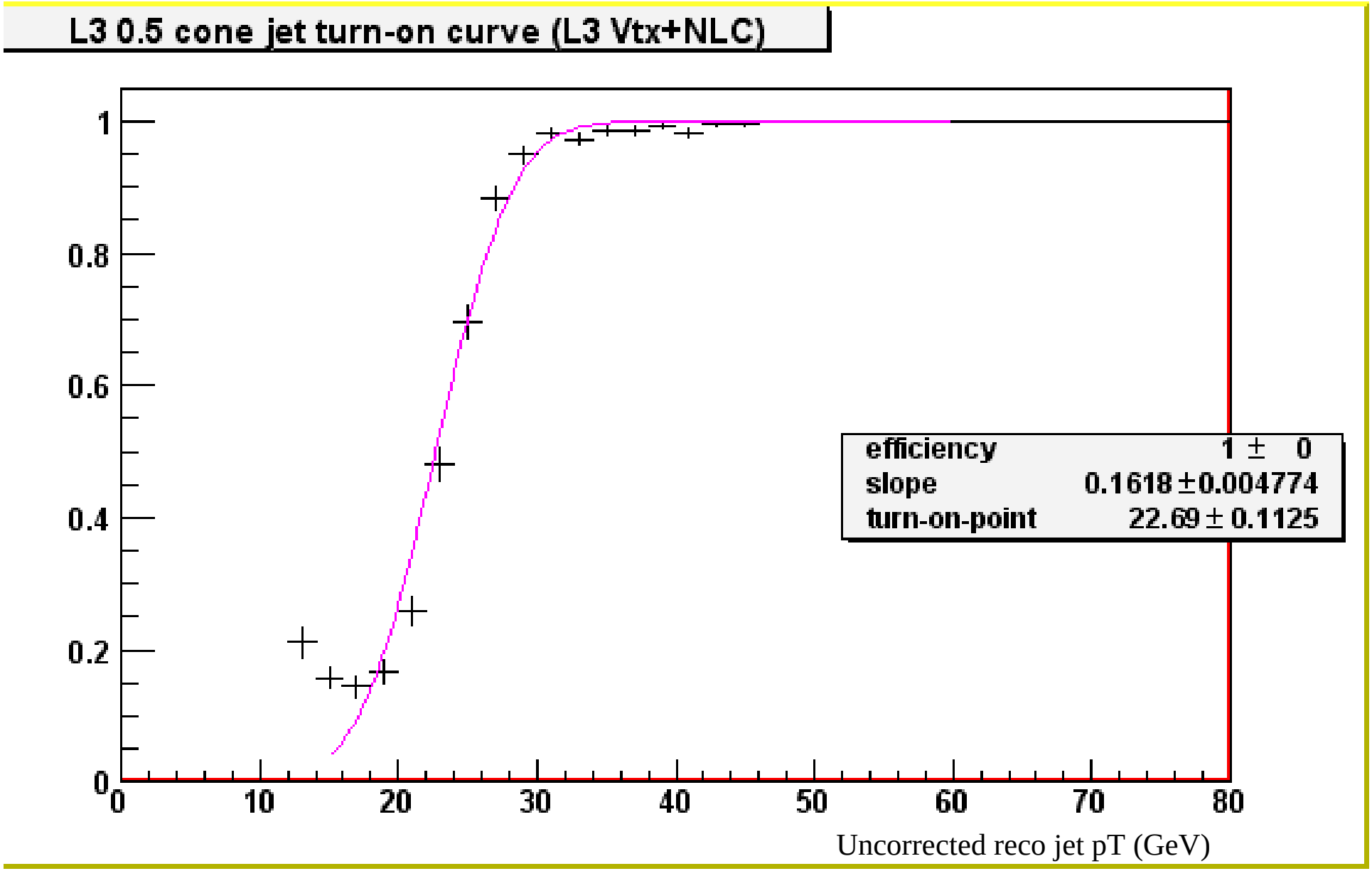


SCJET5_9_VTX_CALIB turn-on

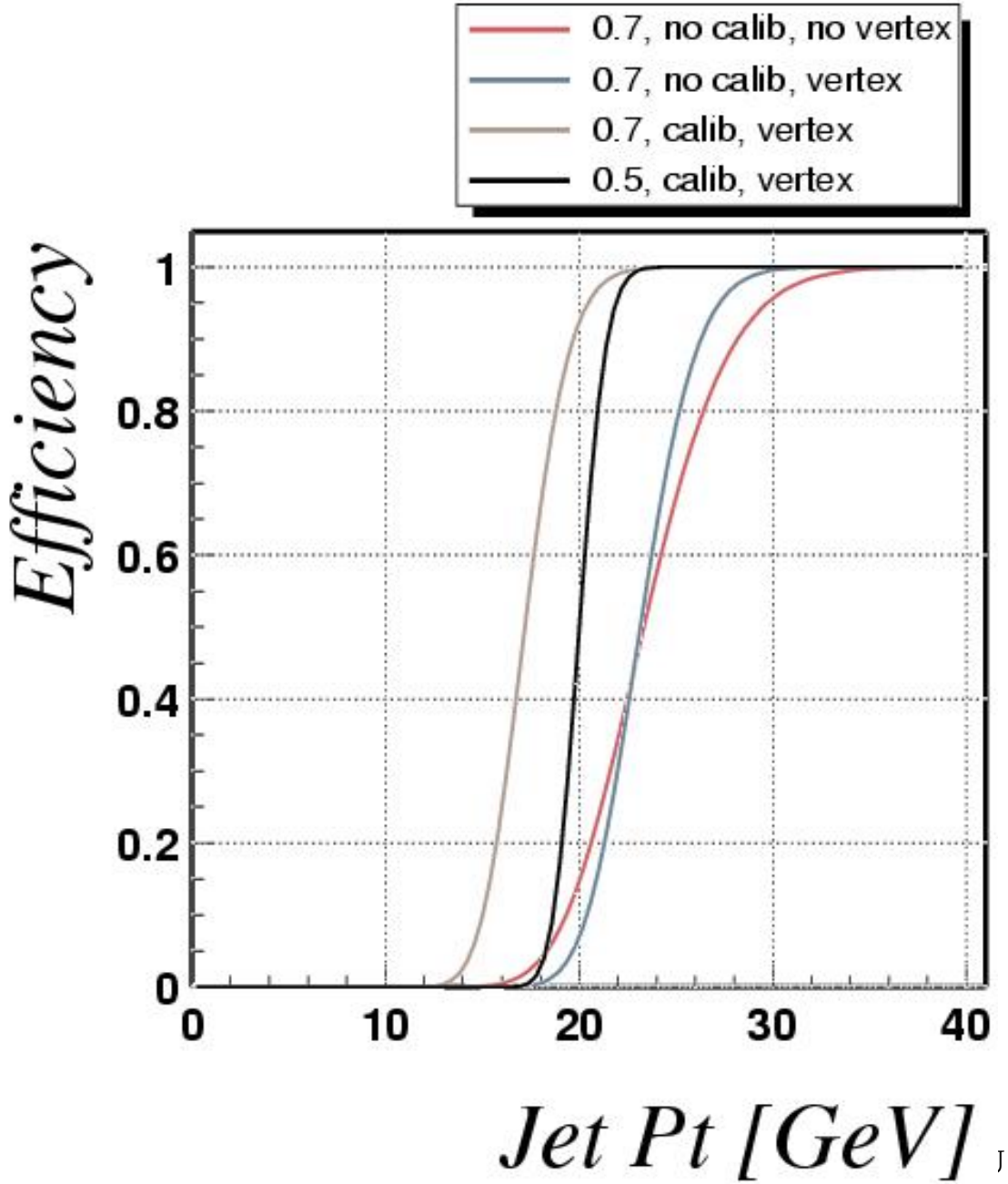
after requiring L2 12GeV jet



SCJET5_9_VTX_CALIB
MC turn-on



L3 Jet turn-on in μ+jets



- 20GeV L3 jet cut
- From hand-picked mu1ptxatxx_CJT5 events

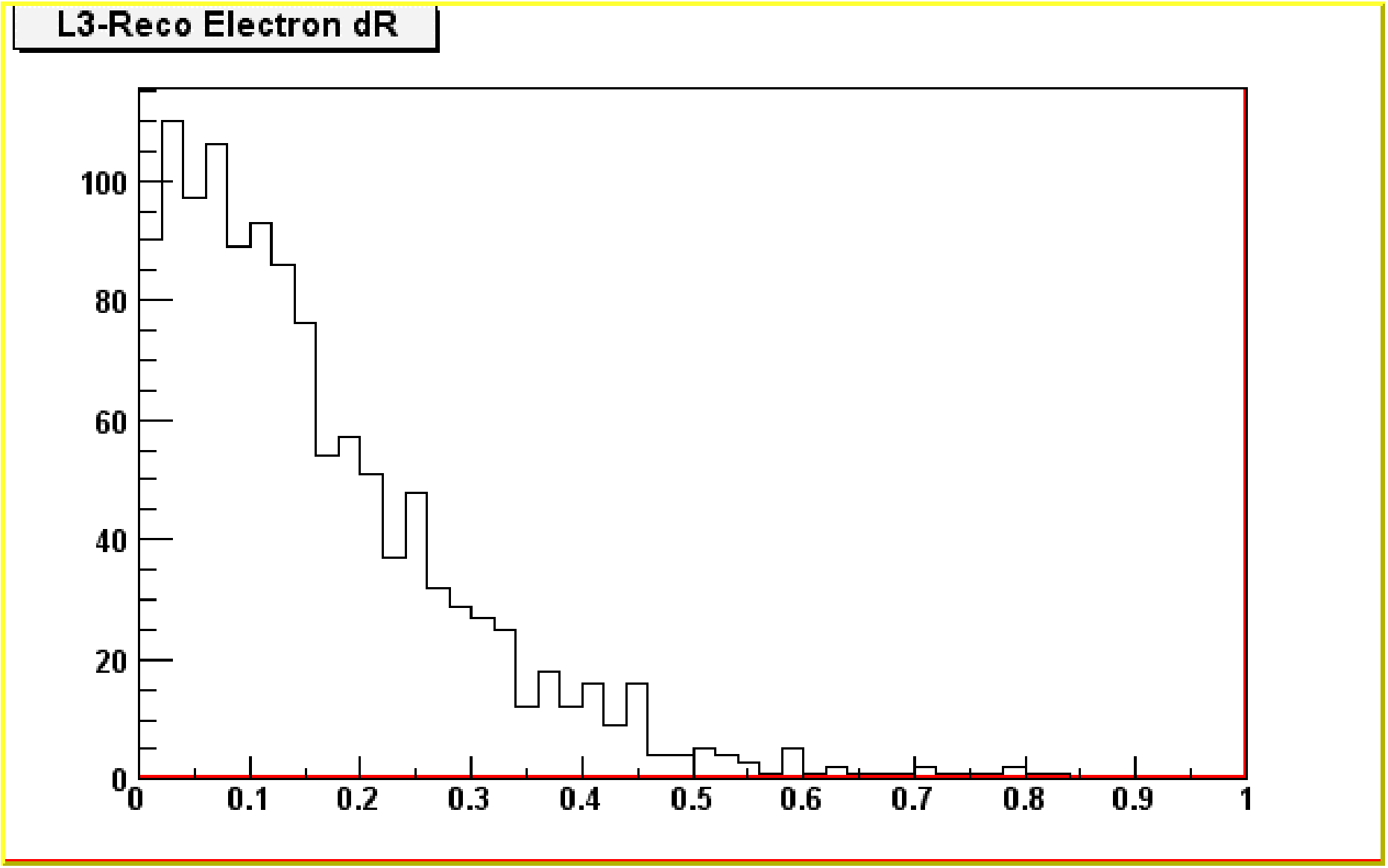
L3 Jet Turn-On Conclusions

- All filters have >99% efficiency
- L3 vertex position improves turn-on slope
- NLC (Calib)
  - shifts turn-on point down (42GeV→34GeV)
  - Improves slope slightly
- Using cone size 0.5
  - Shifts turn-on curve slightly (→ ~34GeV)
  - Improves slope in low-efficiency region
  - Slight efficiency loss in 30-40GeV region
- poor agreement between MC and data

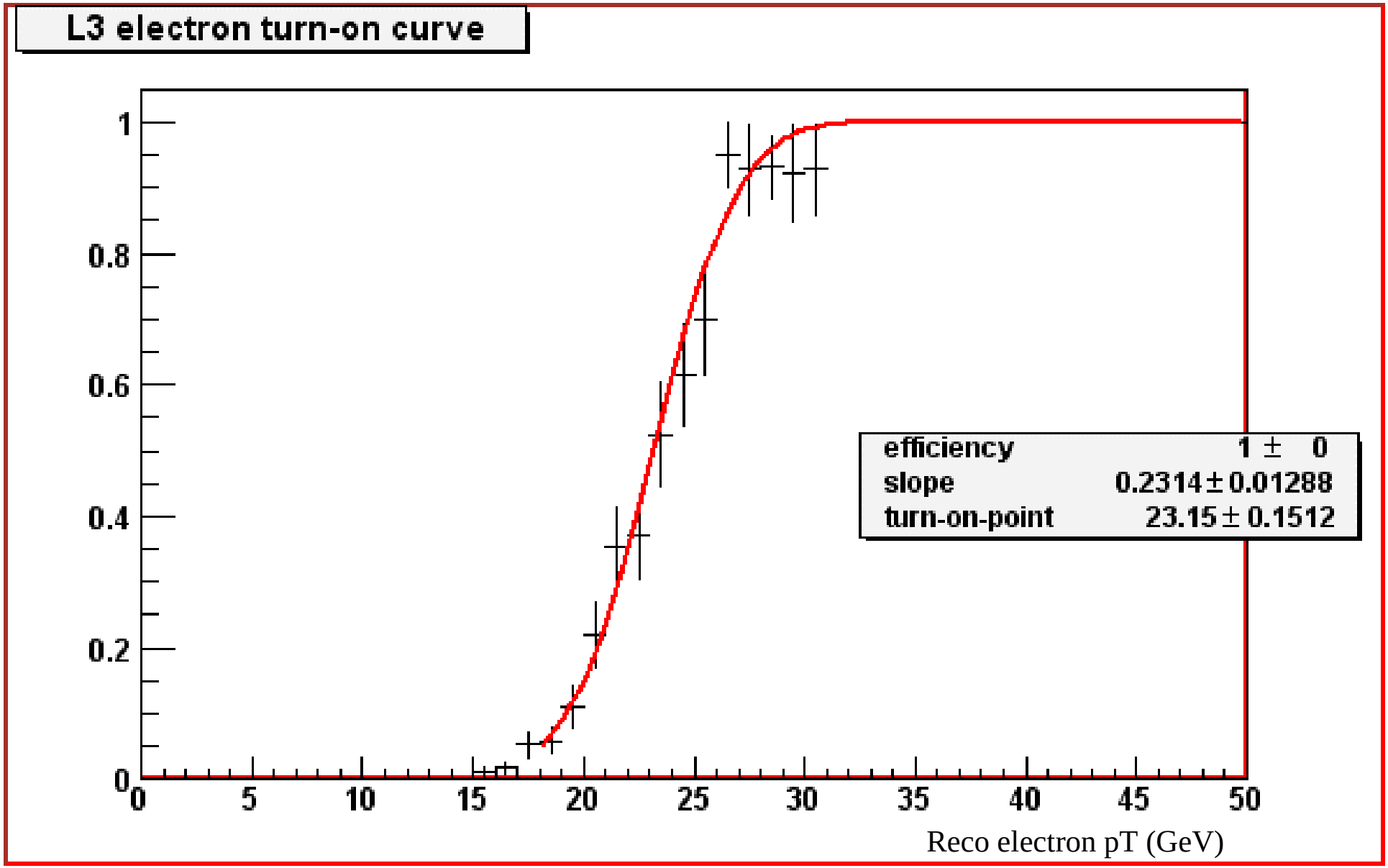
L3 Electrons

- Focus on: ELE_LOOSE
  - Others exist
  - 0.4 cone, no calib, NULL_VTX
- Study:
  - ELE_LOOSE_VTX
    - L3 Z vertex , no calib
  - ELE_LOOSE_VTX_CALIB
    - L3 Z vertex, NLC
  - Turn-on curves for 20GeV cut
  - Compare to single-top e+jets MC
    - (i.e. one “real” electron per event)

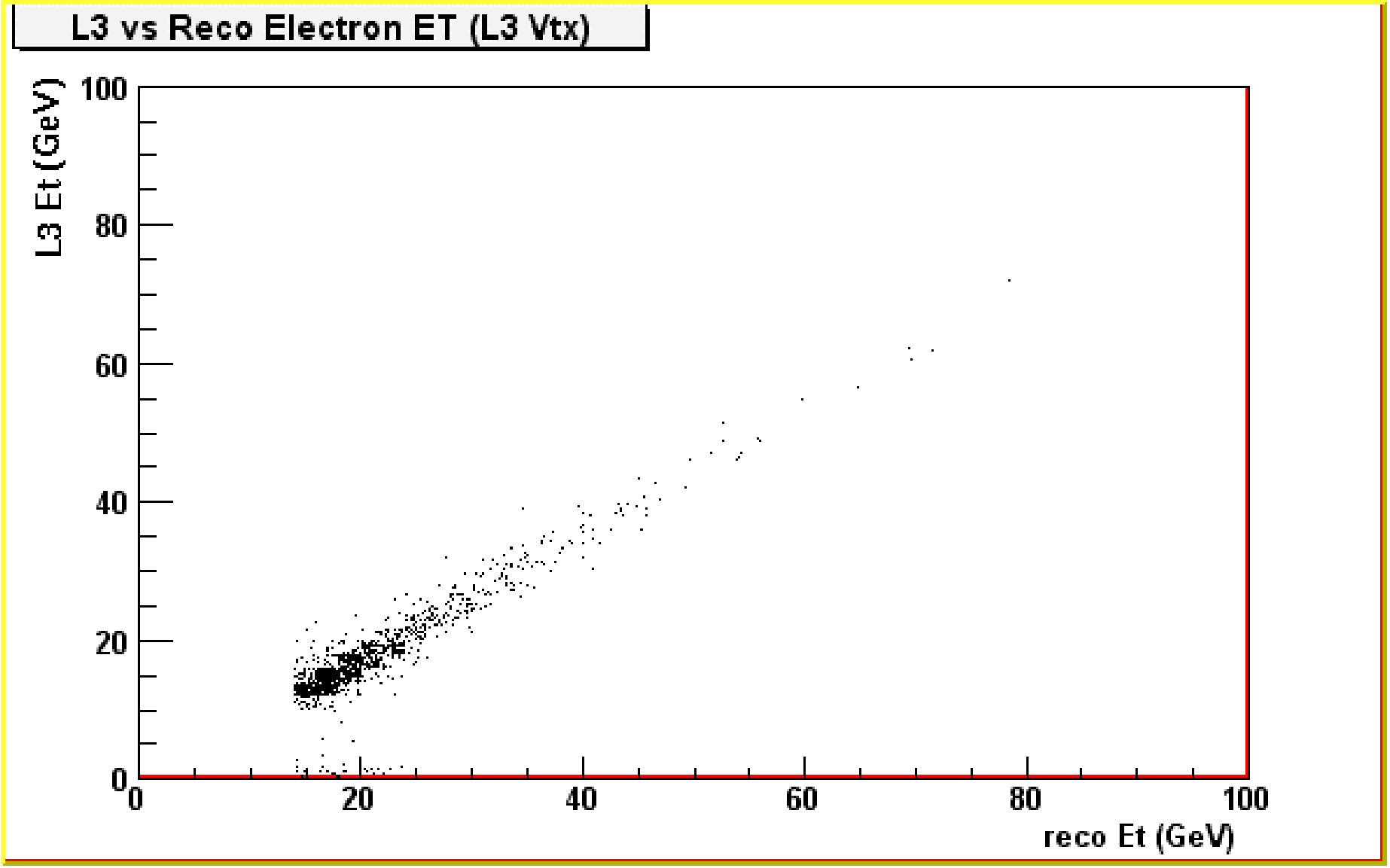
dR between Reco and L3 jets ELE_LOOSE



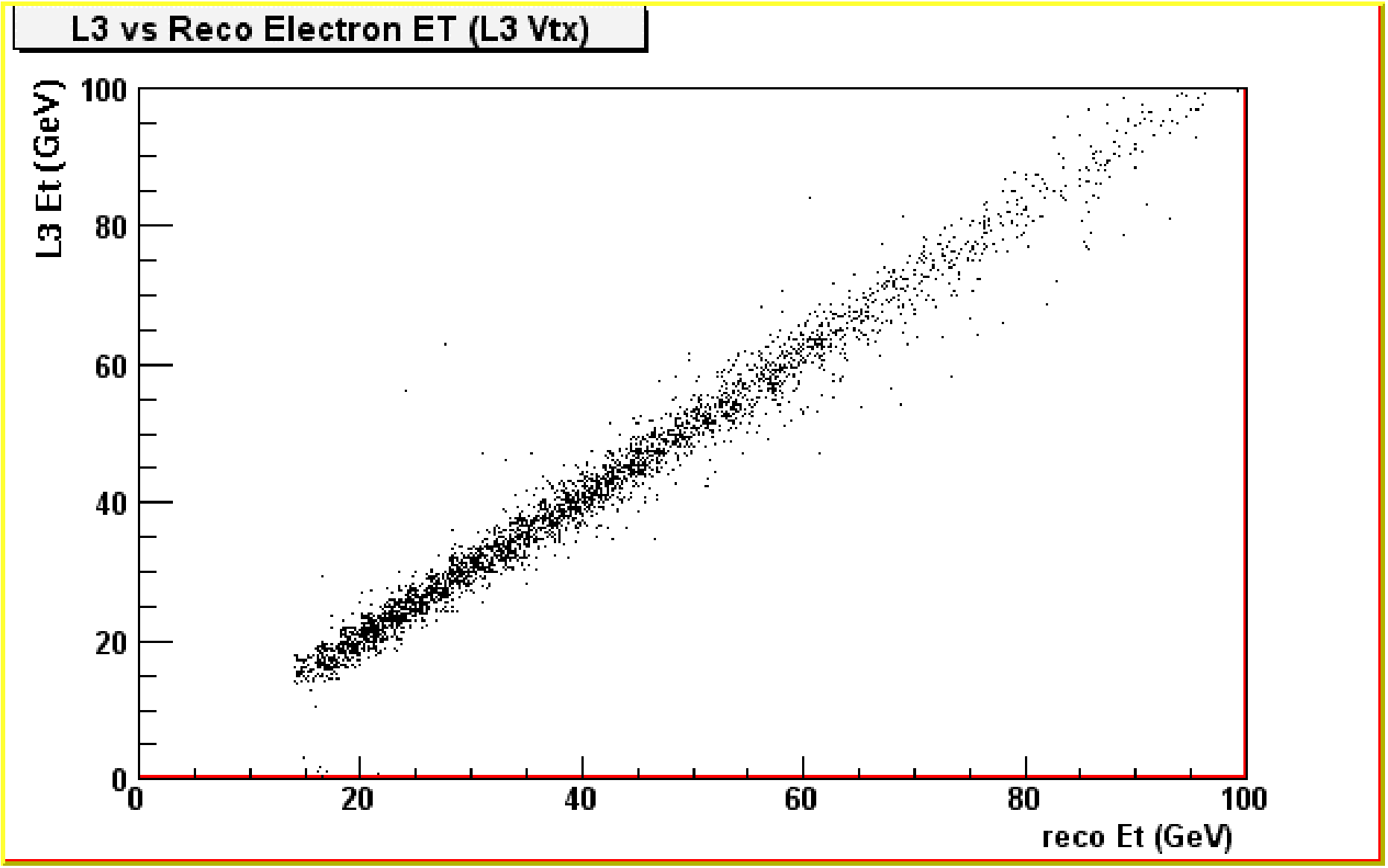
ELE_LOOSE turn-on



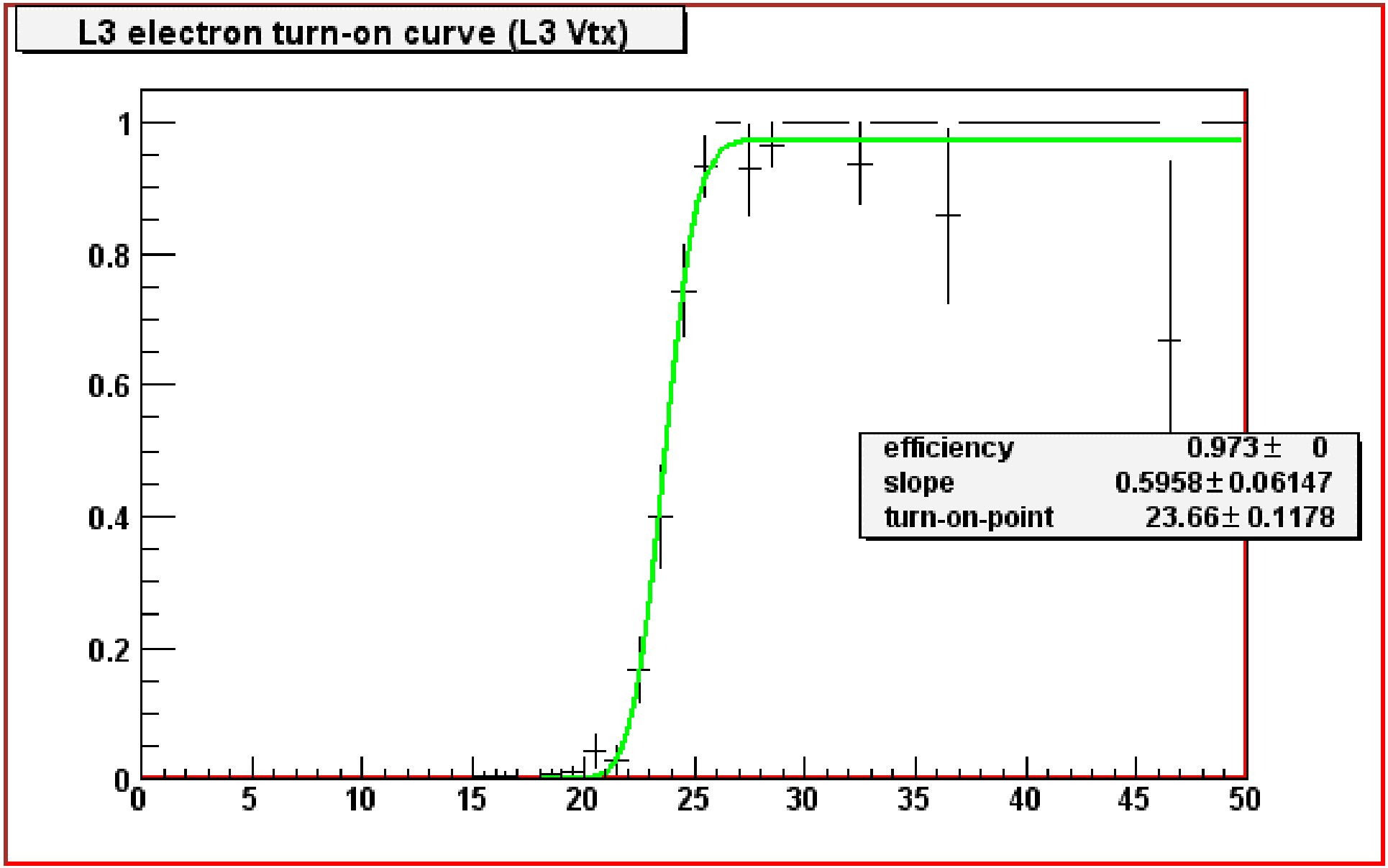
ET: Reco vs L3 electrons
ELE_LOOSE_VTX



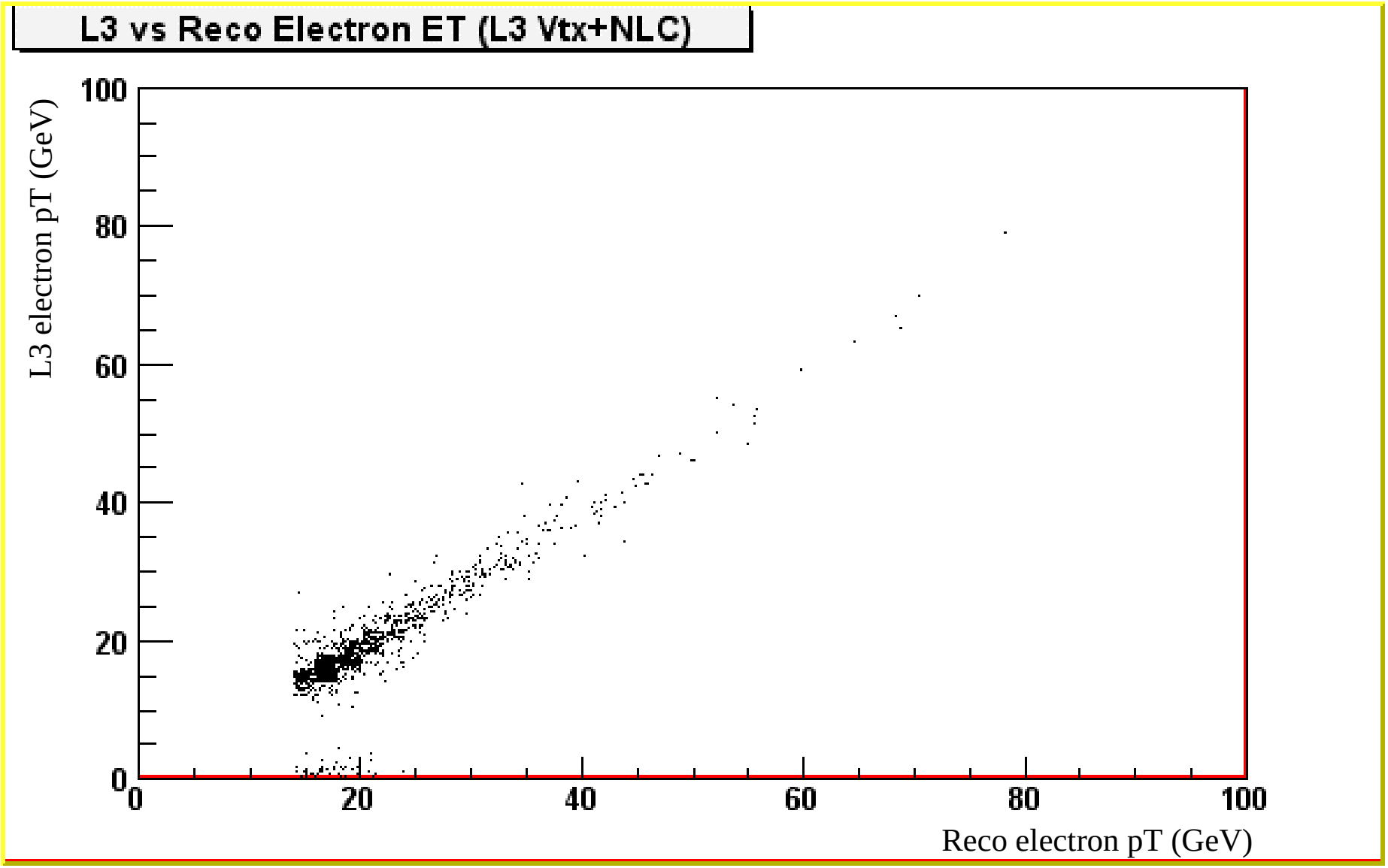
ET: Reco vs L3 electrons
ELE_LOOSE_VTX - MC



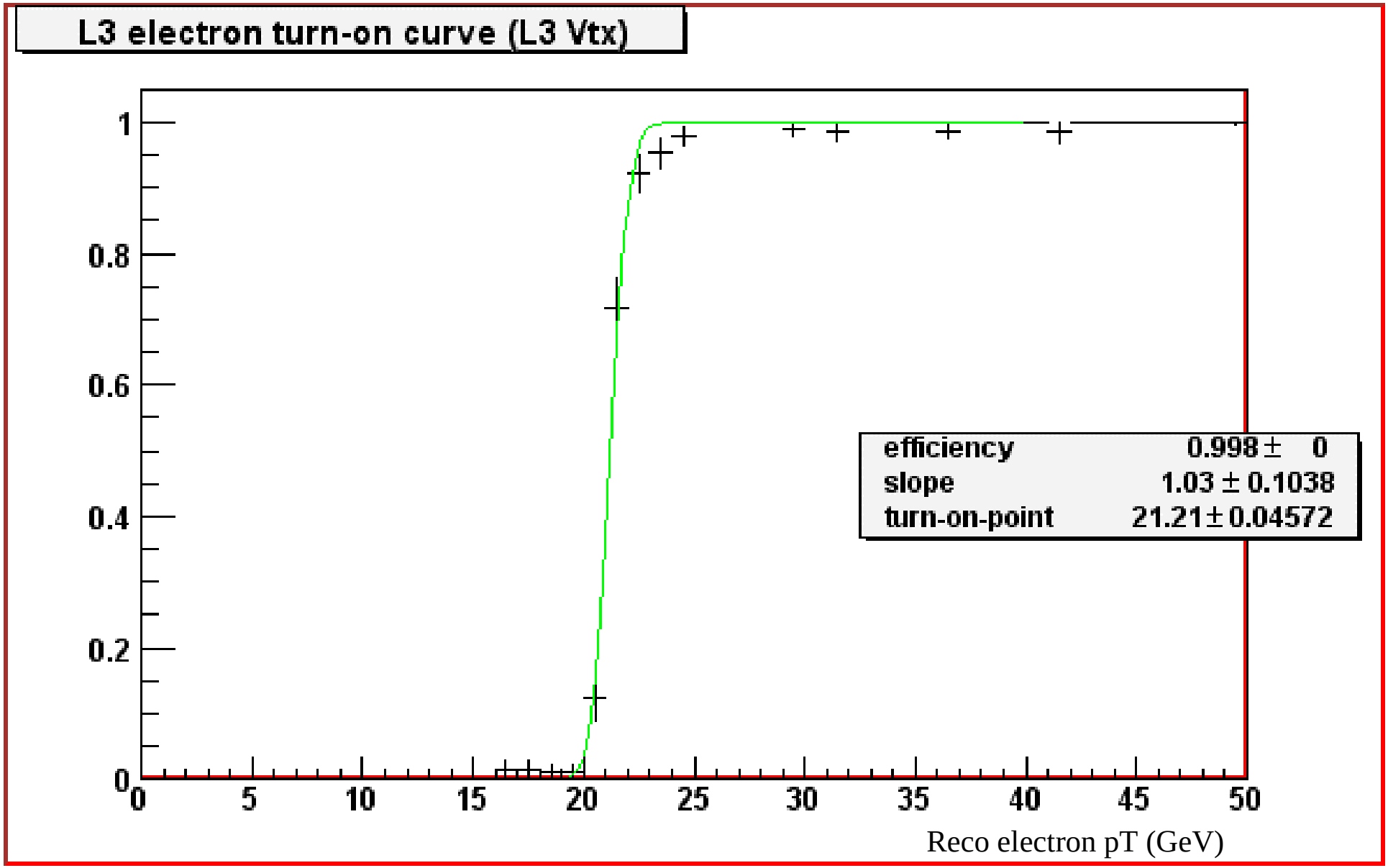
ELE_LOOSE_VTX turn-on



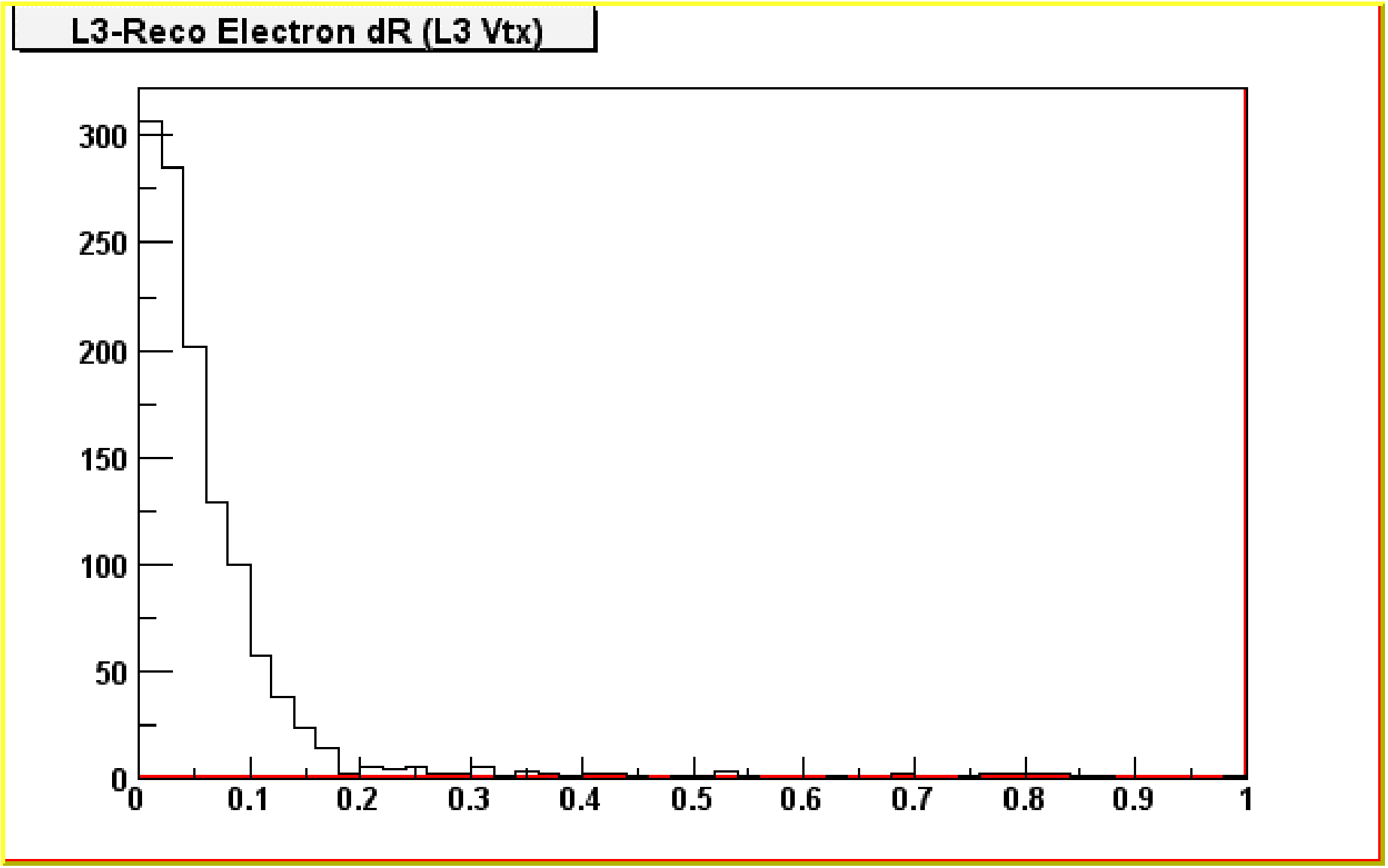
ET: Reco vs L3 electrons
ELE_LOOSE_VTX_CALIB



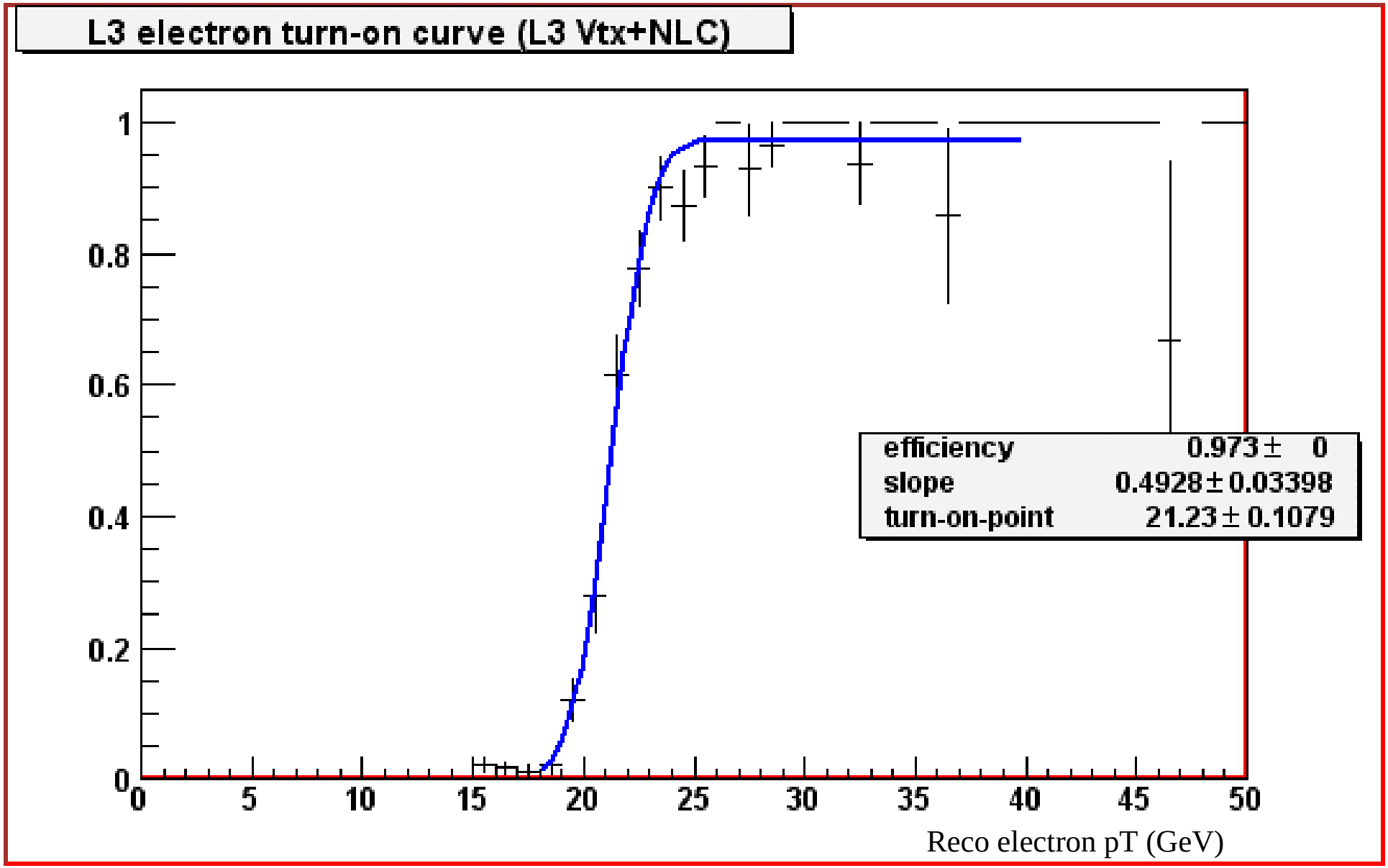
ELE_LOOSE_VTX MC turn-on



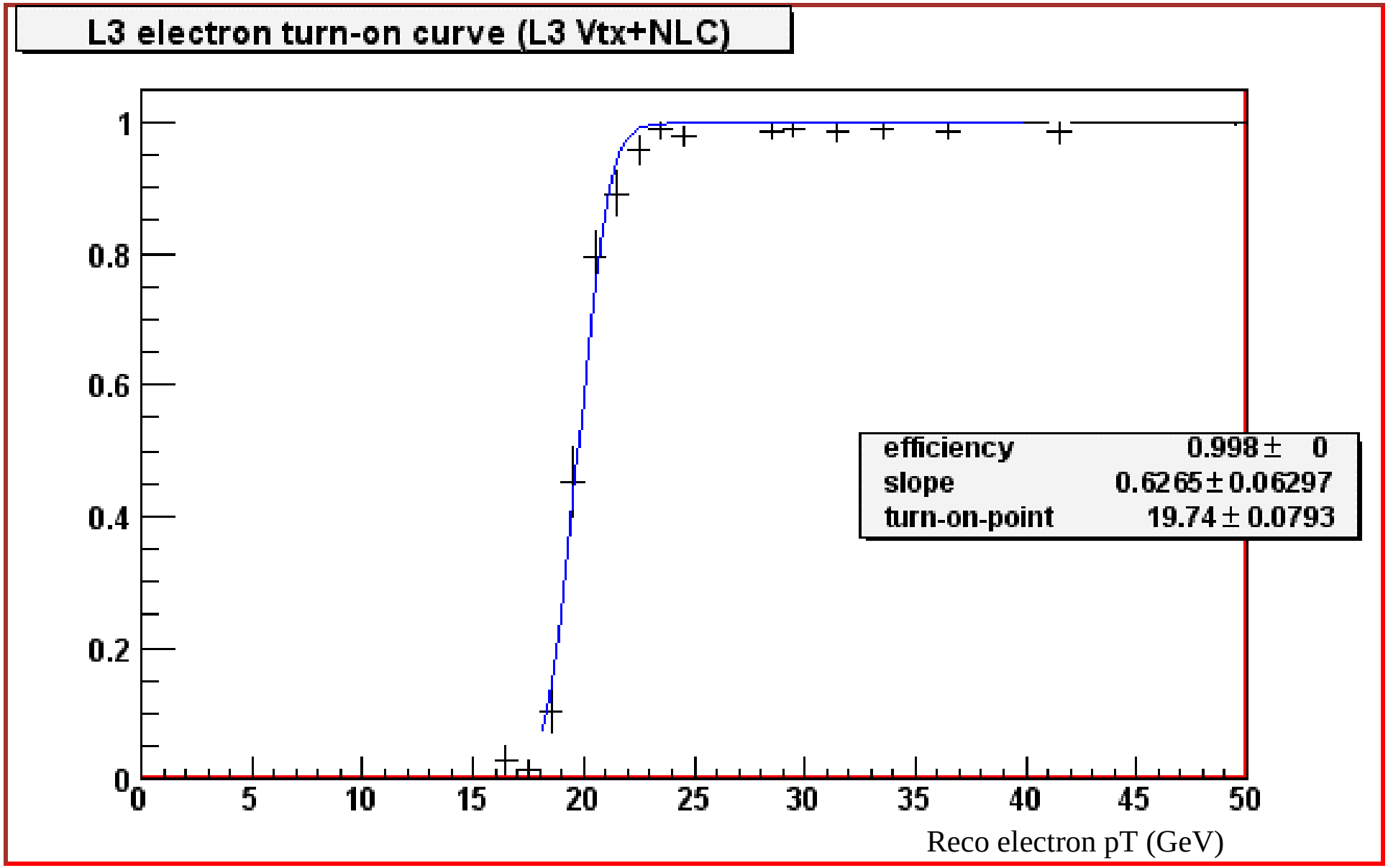
dR between Reco and L3 jets
ELE_LOOSE_VTX



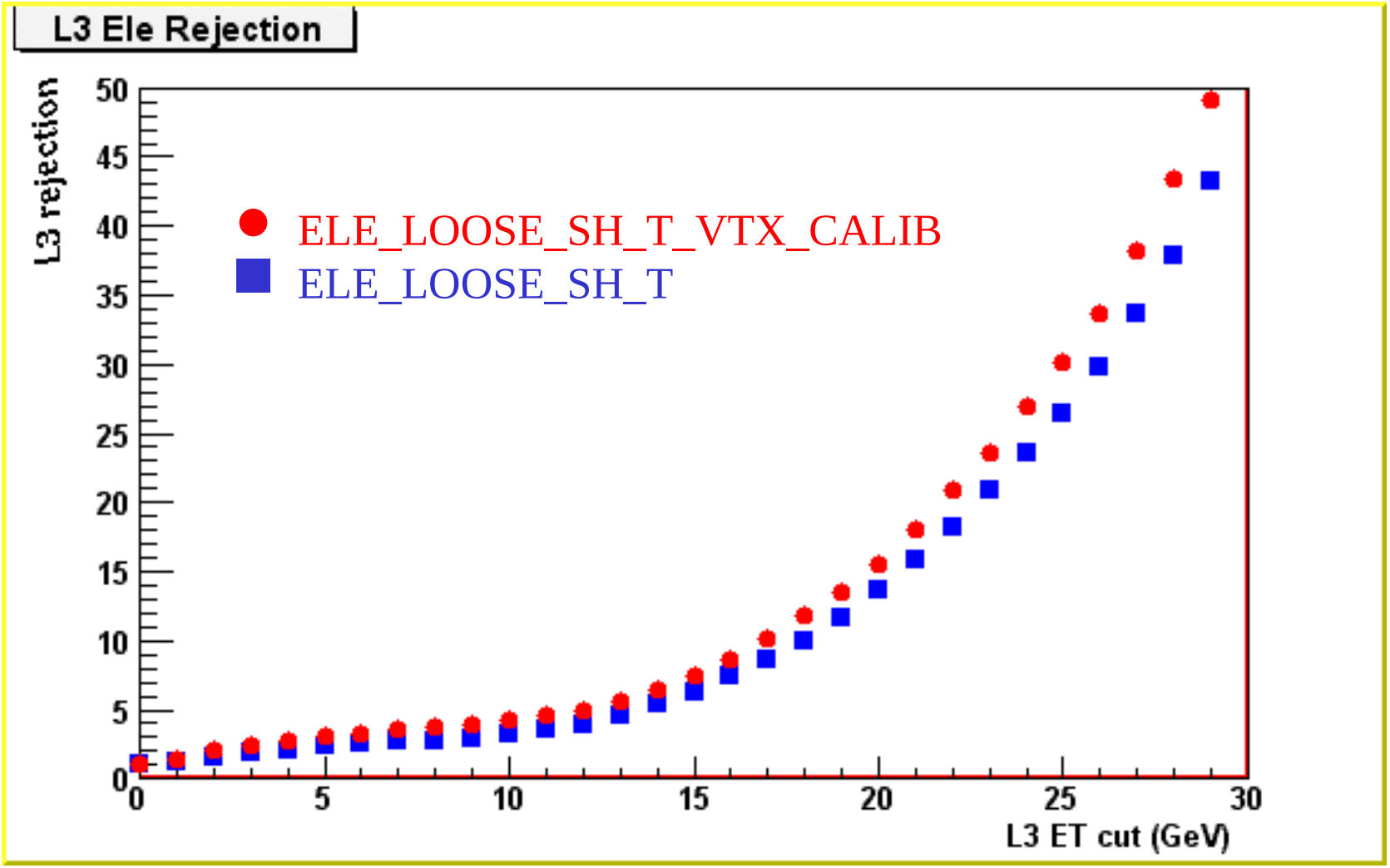
ELE_LOOSE_VTX_Calib turn-on



ELE_LOOSE_VTX_Calib
MC turn-on



L3 rejection: ELE_LOOSE_SH_T



- Rejection over CEM_OR (base 12)
- Nominal (TB spreadsheet 10.35) rejection: 21
  - Difference due to hot cell?

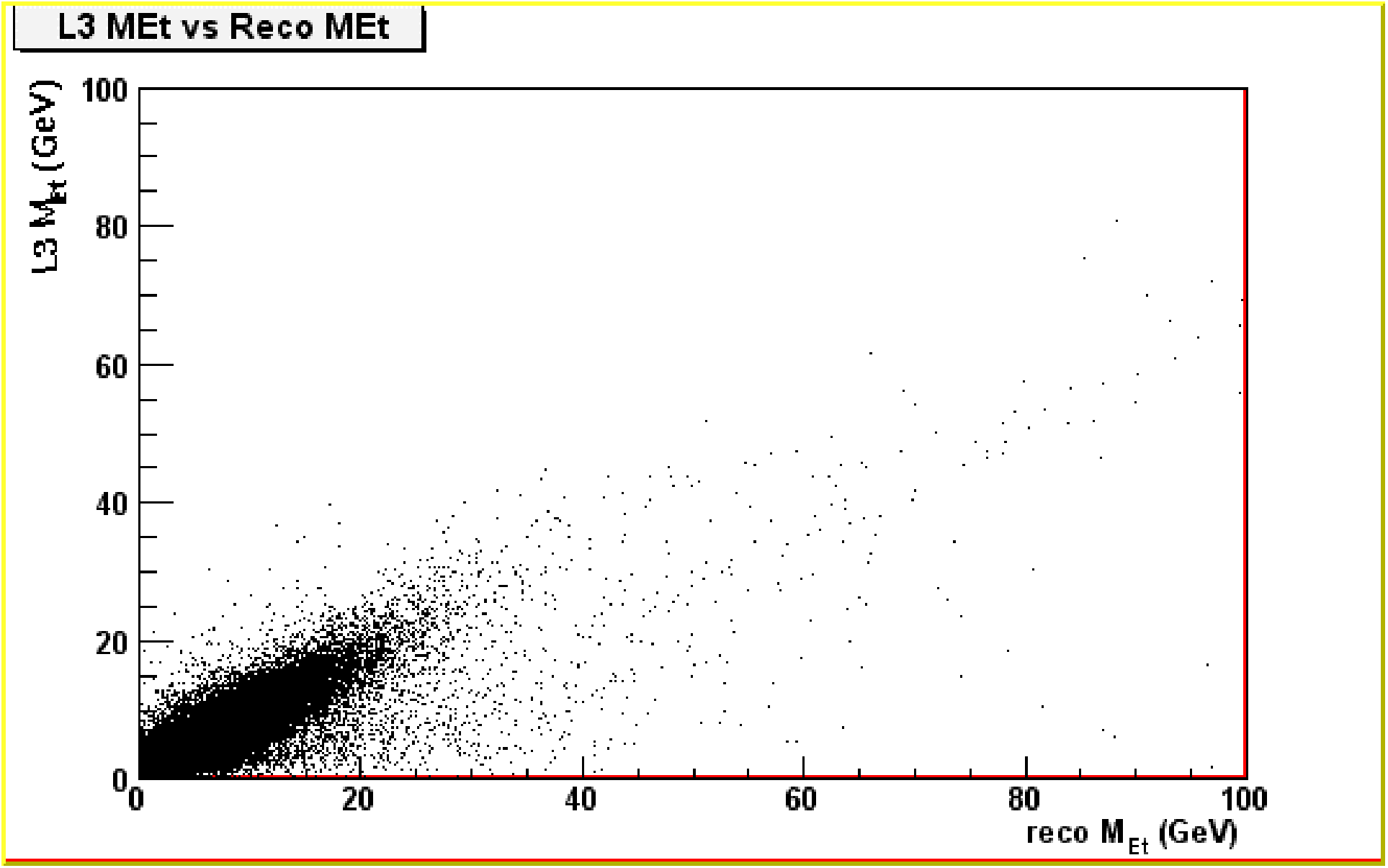
L3 Electron Conclusions

- All filters have >97% efficiency
  - Compared to loose reco electrons
- L3 vertex position improves turn-on slope
- NLC (Calib)
  - shifts turn-on point down
  - Improves slope
- Comparison Data-Reco improves with Vtx and Calib
- Rejection improvement:
  - 20GeV cut:
    - Existing EM_HI_SH turns on (99%) at 30GeV
    - New EM_HI_SH_VC turns on (99%) at 25GeV
  - 25GeV cut: EM_HI_SH_VC has factor 2.3 more rejection

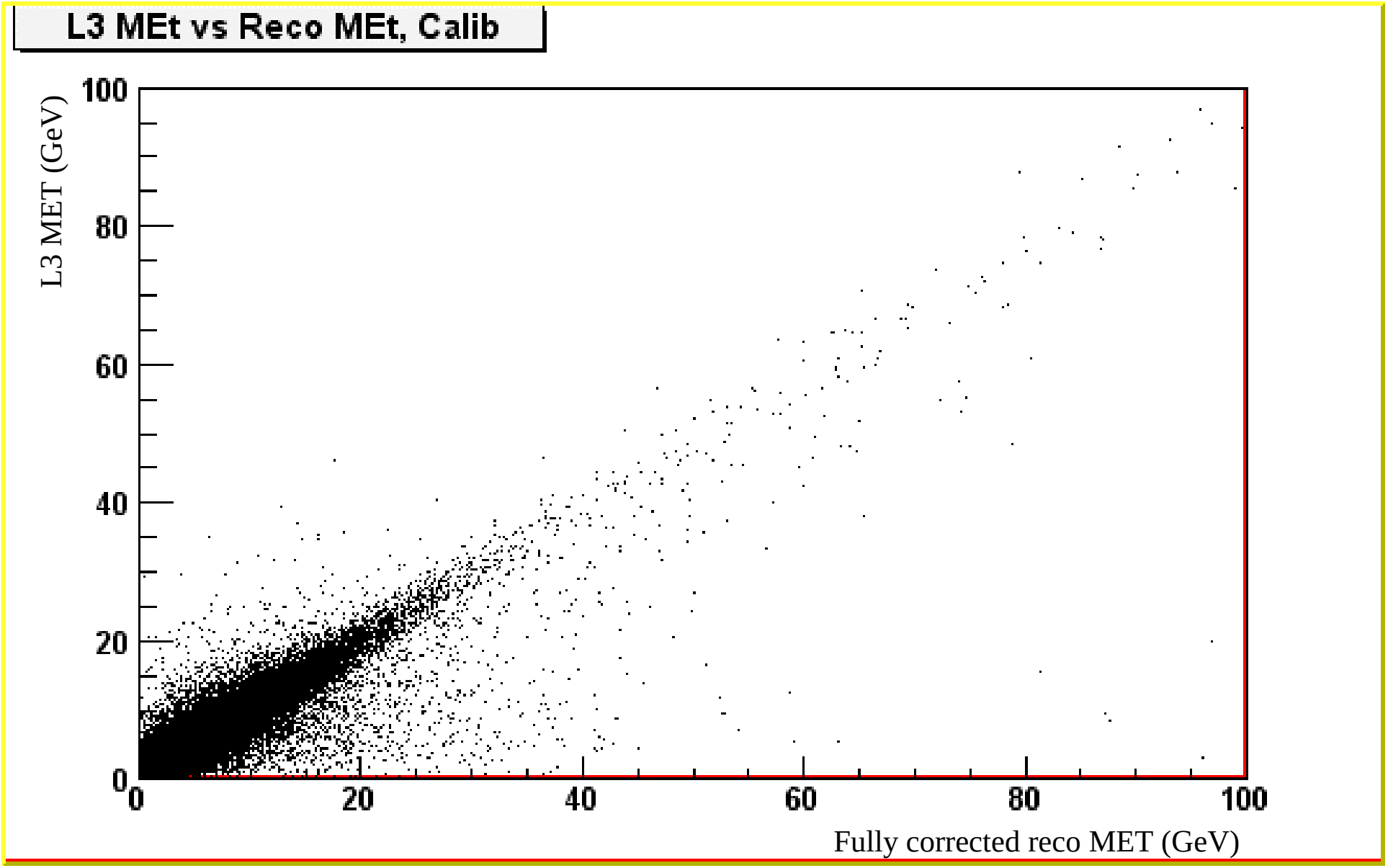
L3 MET

- Already uses L3 Z vertex
- Could use L3 Nada
  - After Markus' fix
    - Use fix in this study
- Test L3 NLC
- Compare to Reco MET
  - Fully corrected
  - 10GeV L3 MET cut
  - Remember hot cell

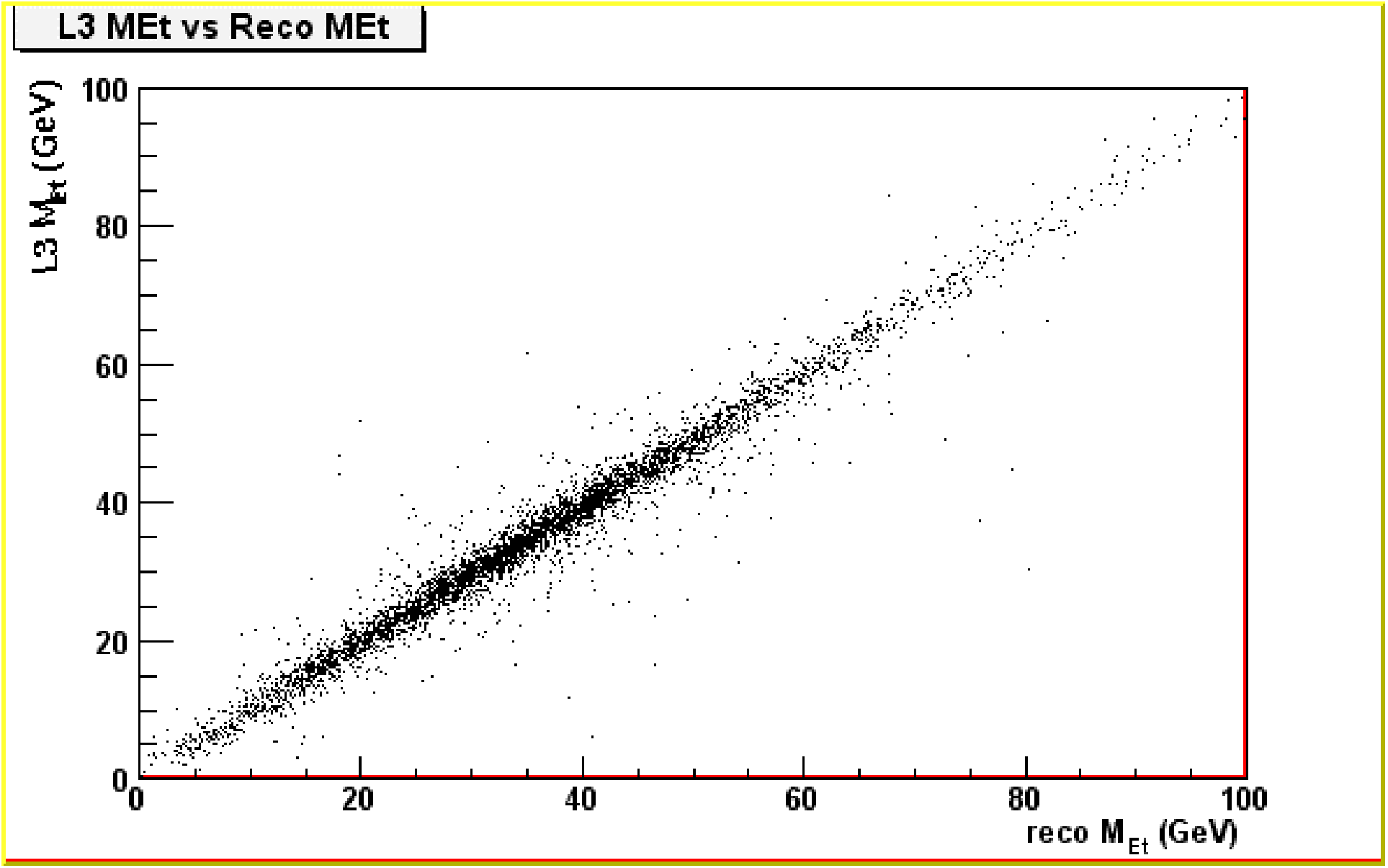
MET: Reco vs L3



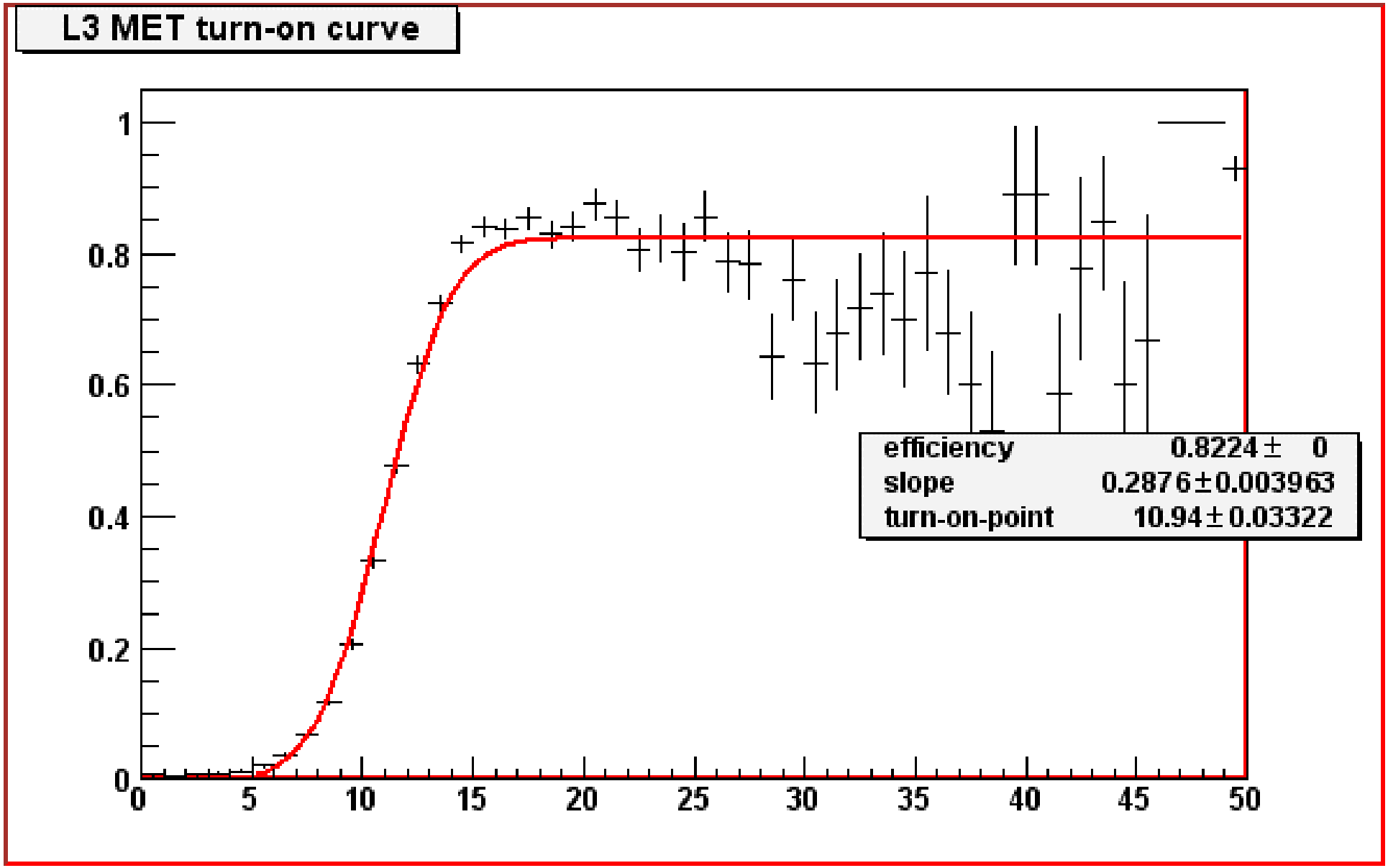
MET: Reco vs L3, NLC



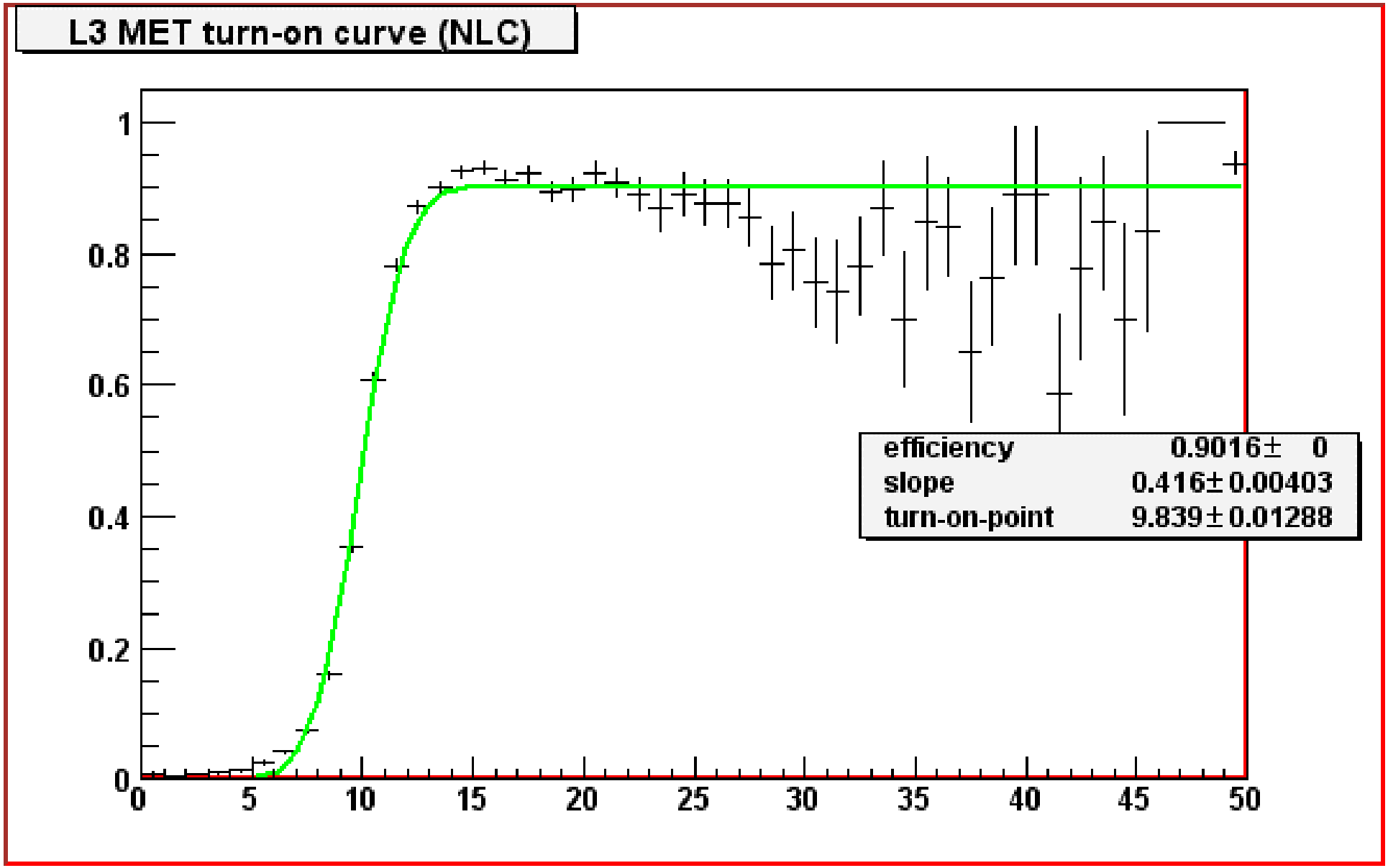
MET: Reco vs L3 MC



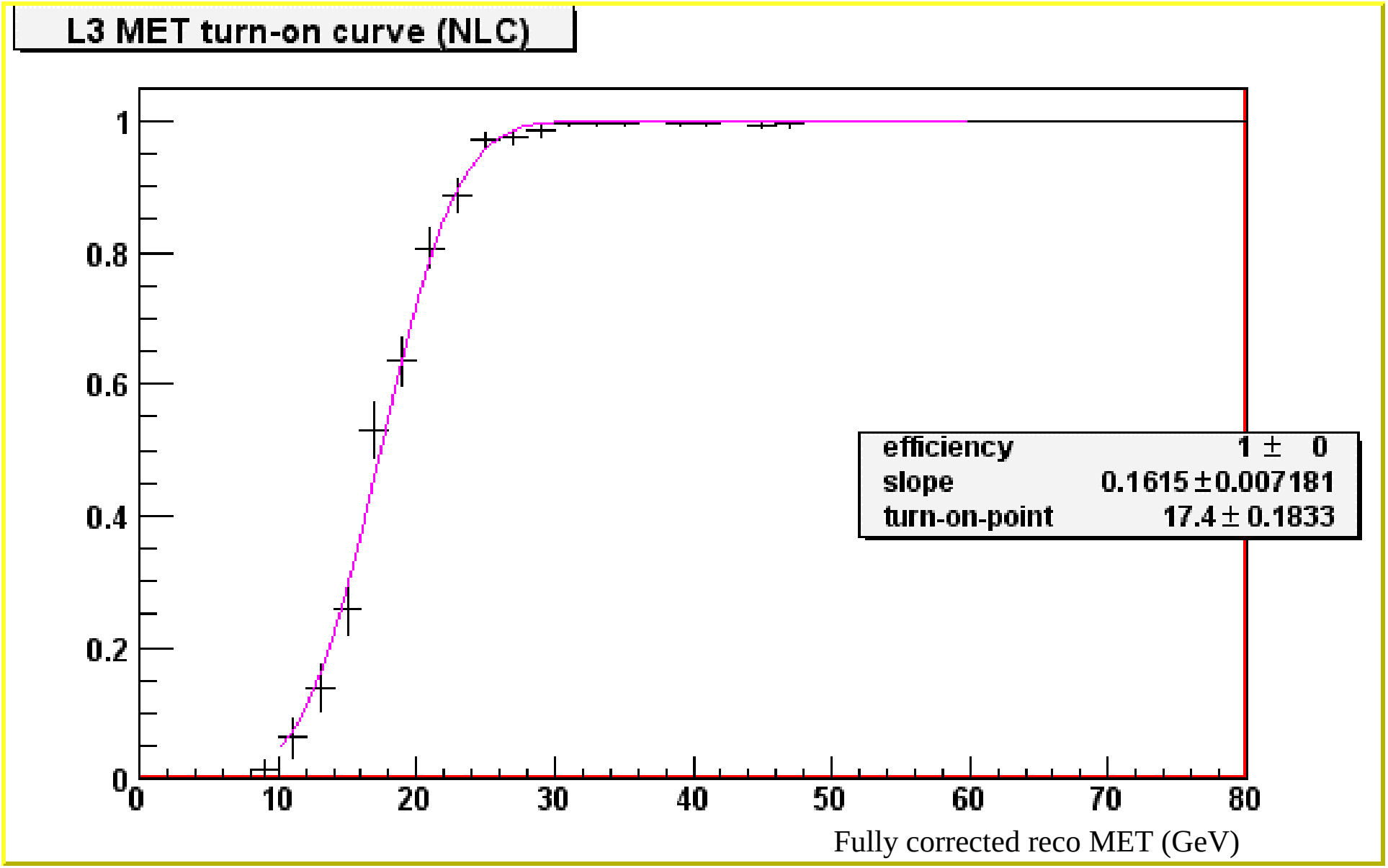
L3 MET turn-on



L3 MET turn-on (with NLC)



L3 MET turn-on (with NLC) - MC



Conclusions/Outlook

- L3 vertex Z-position
  - Is found efficiently, accurately
  - Improves turn-ons for electrons, jets
- L3 non-linearity corrections
  - Improve L3-reco ET relation
  - Improve turn-ons for electrons, jets, MET
- Both improve data-MC comparison
  - But still not very good, especially MET
- We will use both for top signal triggers
- L3 Nada
  - Can be used (after bug-fix) in L3 MET
  - Needs code update to be used for electrons, jets