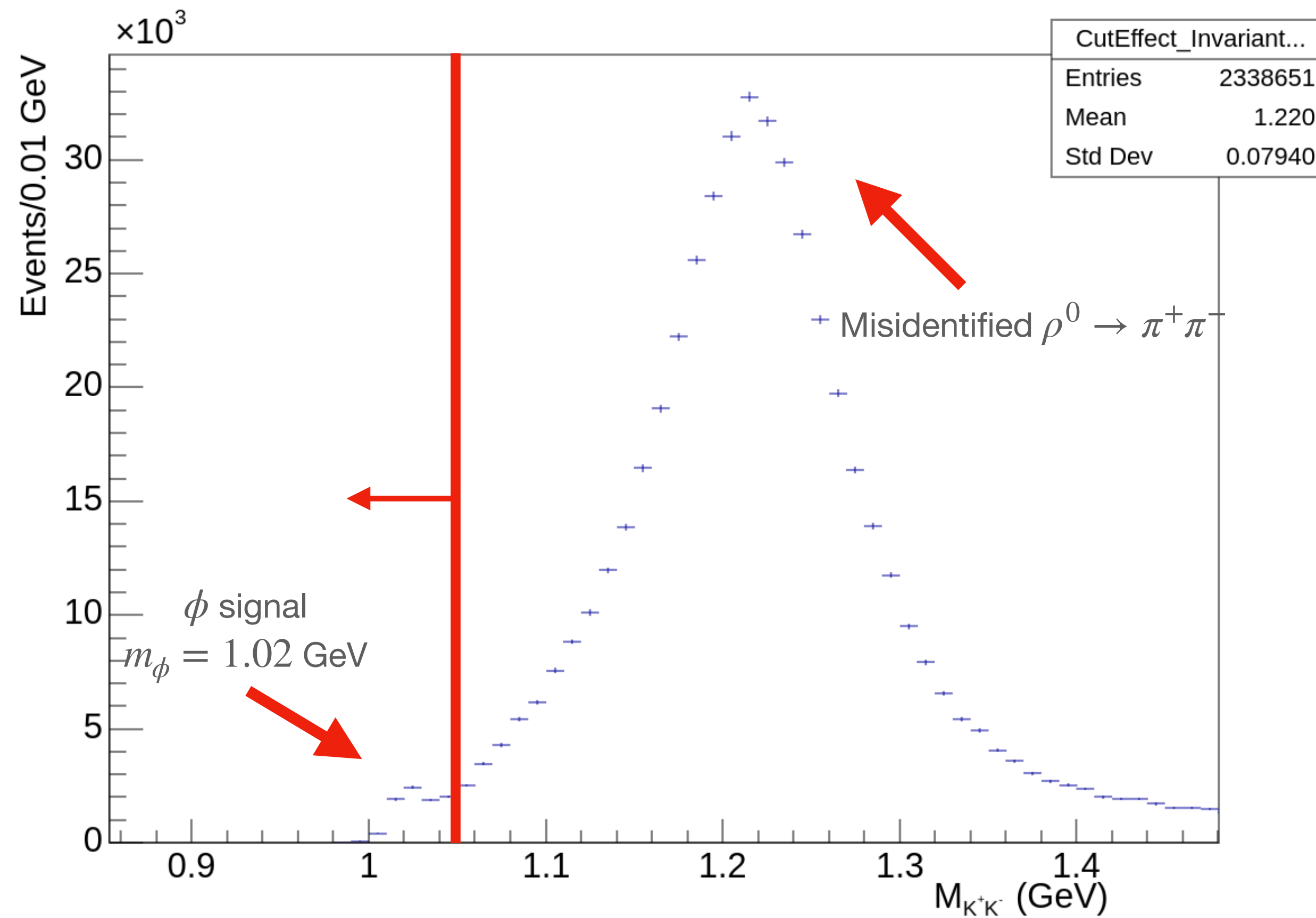# Coherent phi production on deuterium

- Reaction: $\gamma d \rightarrow \phi d \rightarrow K^+ K^- d$

- Event selection

  -1 positive and 1 negative tracks, no extra tracks or showers

  -kinematic fitting with P4 and vertex constraint, confidence level > 0.001

  -Energy balance cut: $|E_{missing} - m_d| < 1$ GeV

  -standard GlueX PID cuts (timing and dE/dx)

  -tagger accidental subtracted with 4 beam bunches on each side

  -cuts on vertex to constrain to the target region

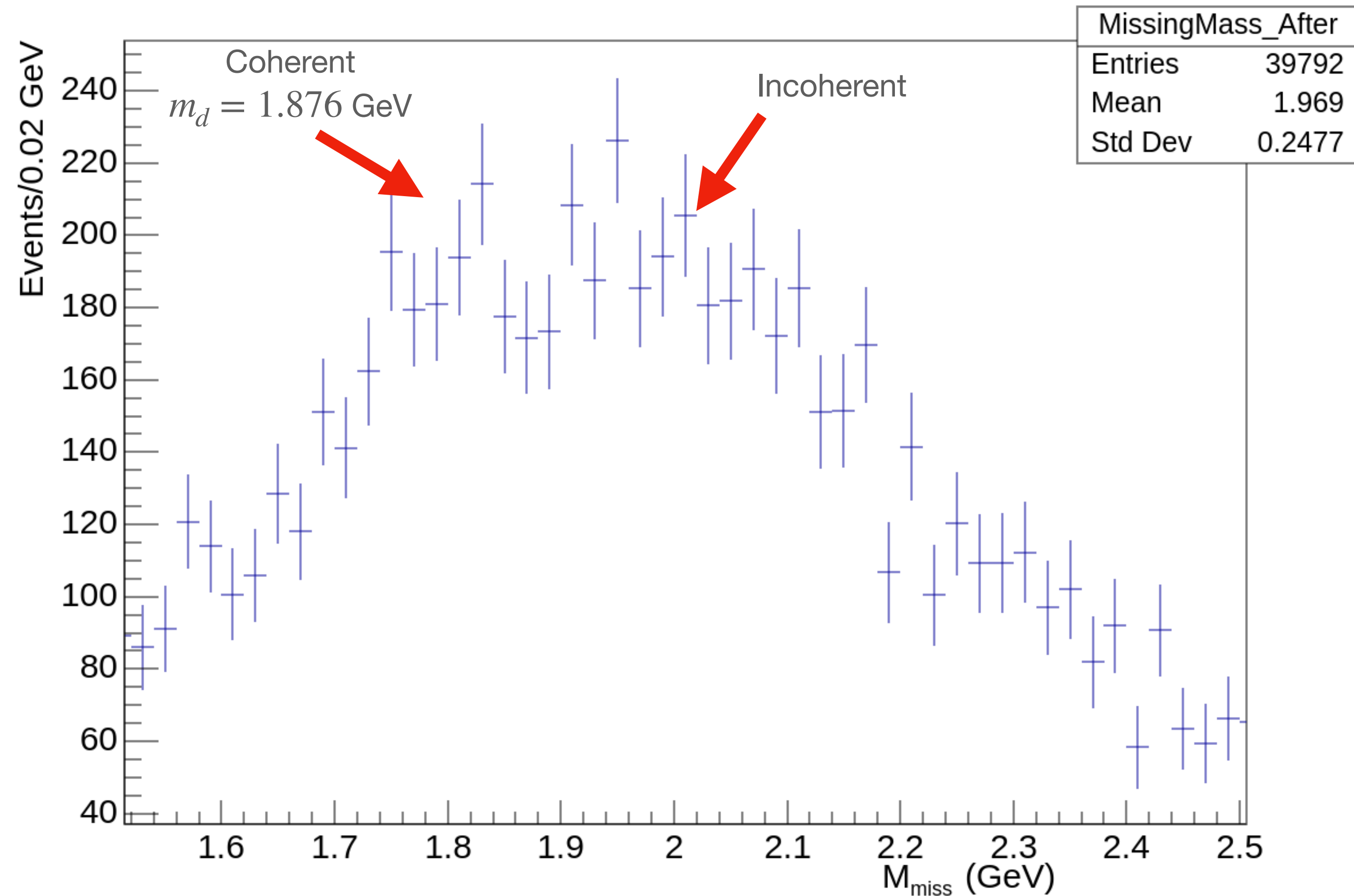 -photon energy: 6.0 GeV $< E_\gamma < 10.8$ GeV

Coherent phi production on deuterium

- Invariant mass of kaon pair

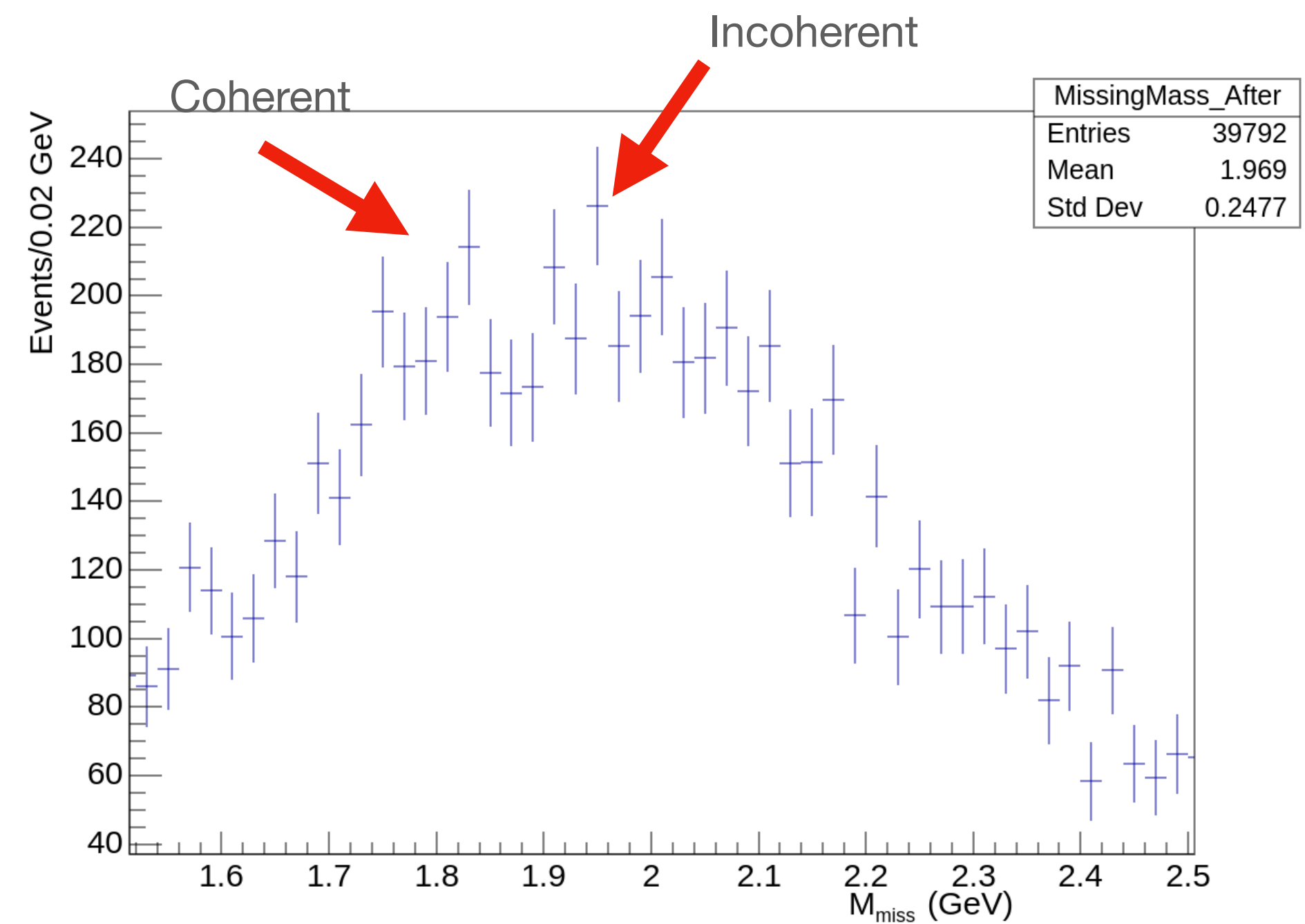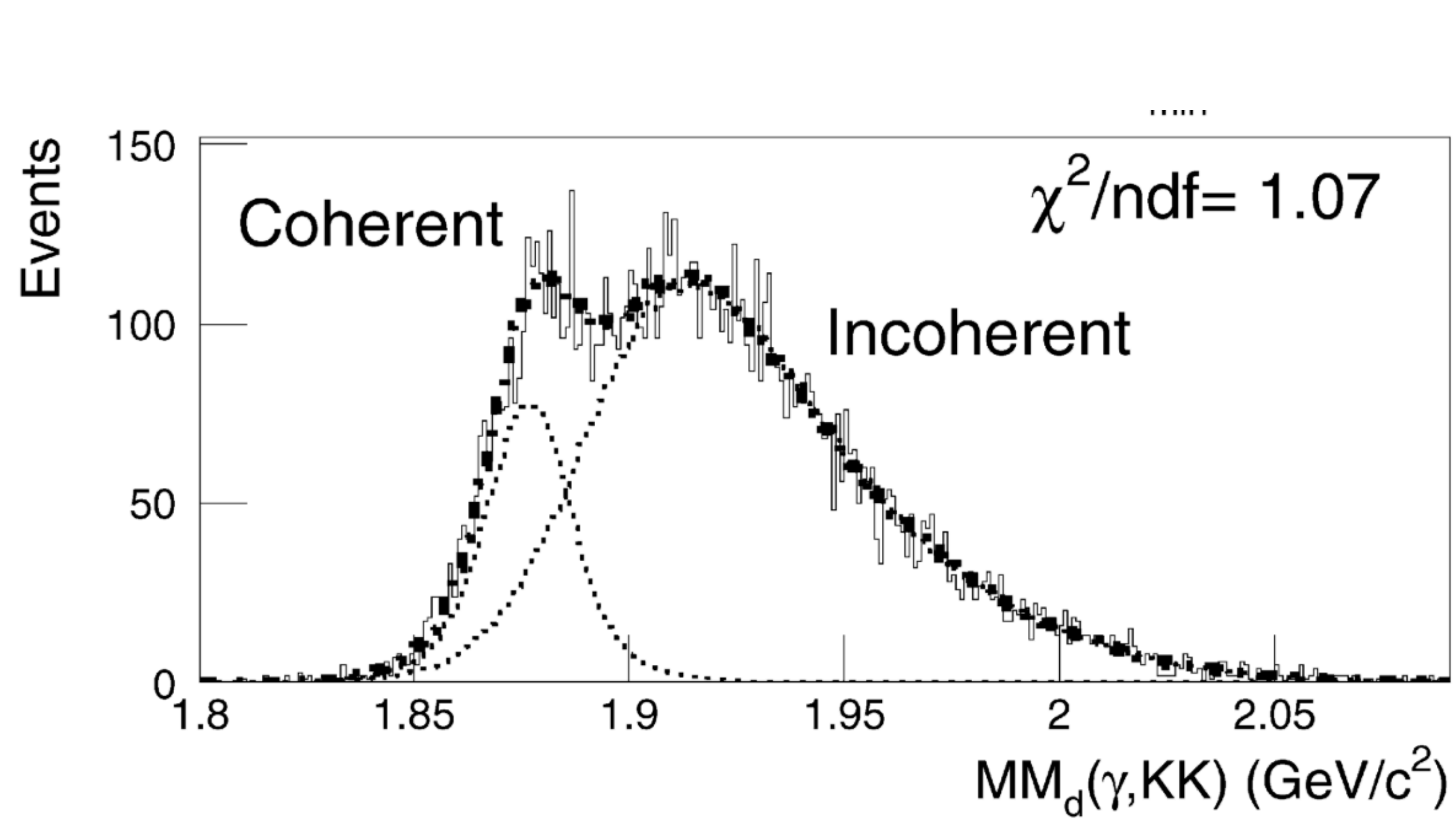- Cut on 1.05 GeV, but still huge background present

Coherent phi production on deuterium
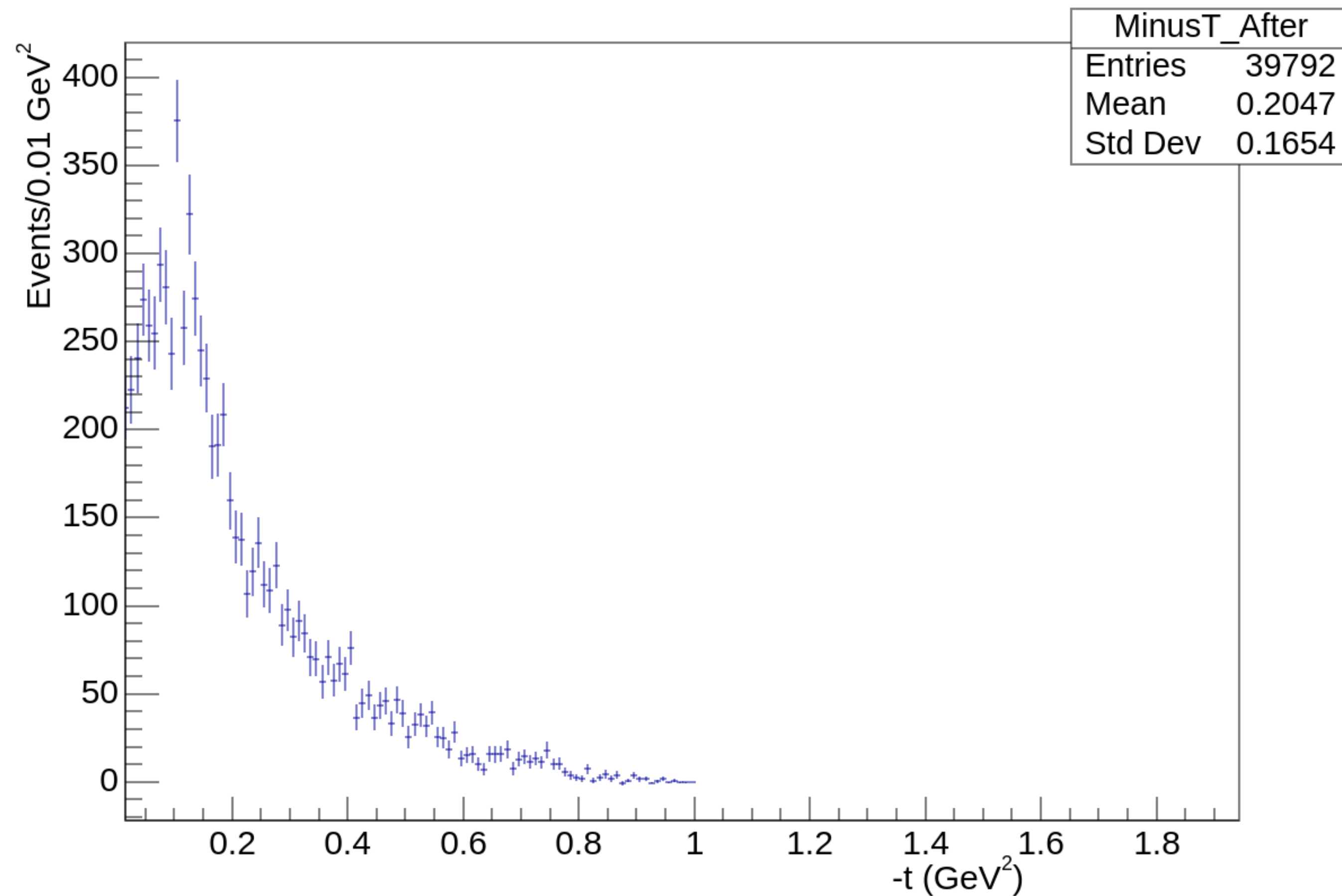
- Missing mass (5% deuterium data)

Coherent phi production on deuterium
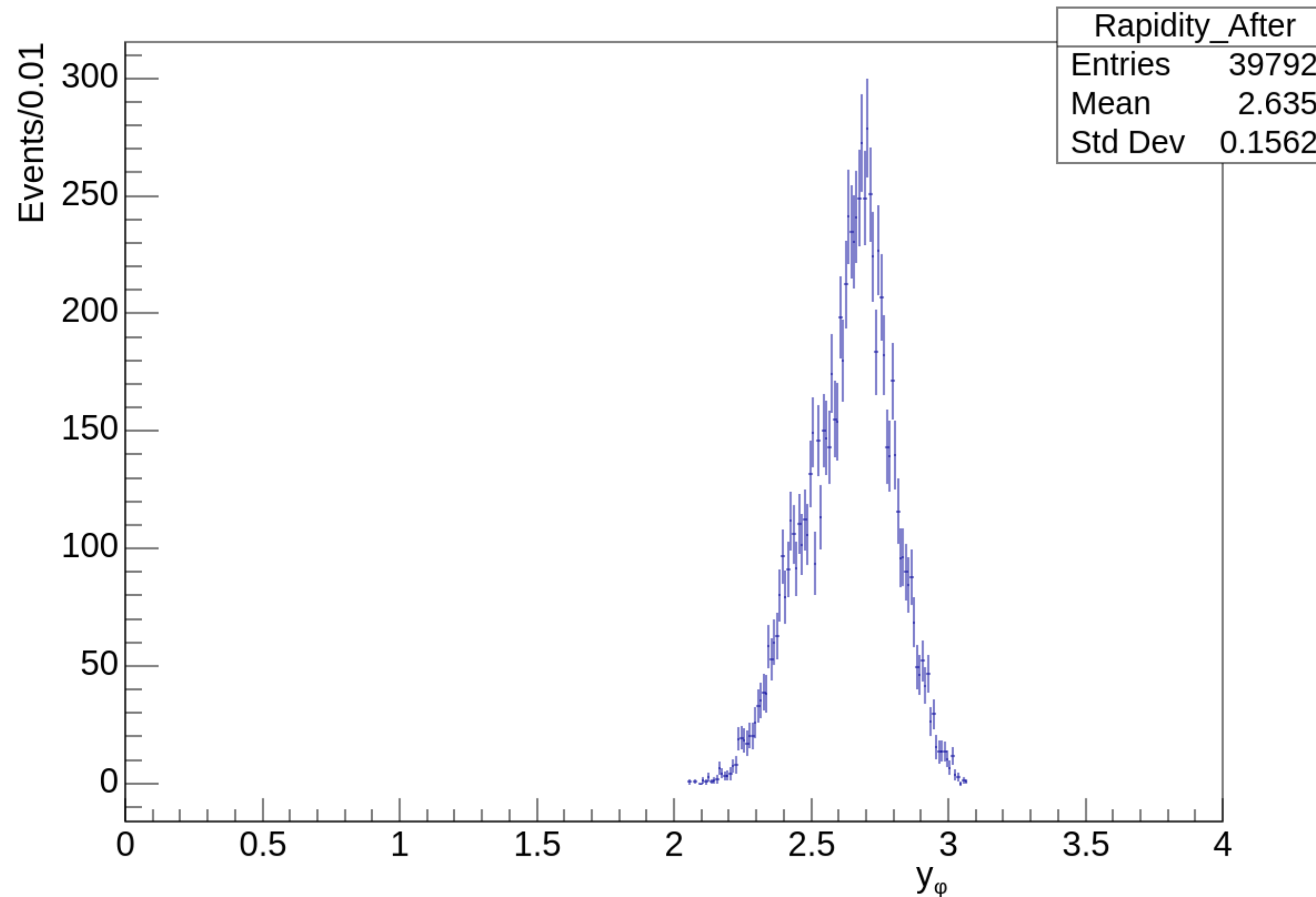
- Compared with LEPS results

Coherent phi production on deuterium

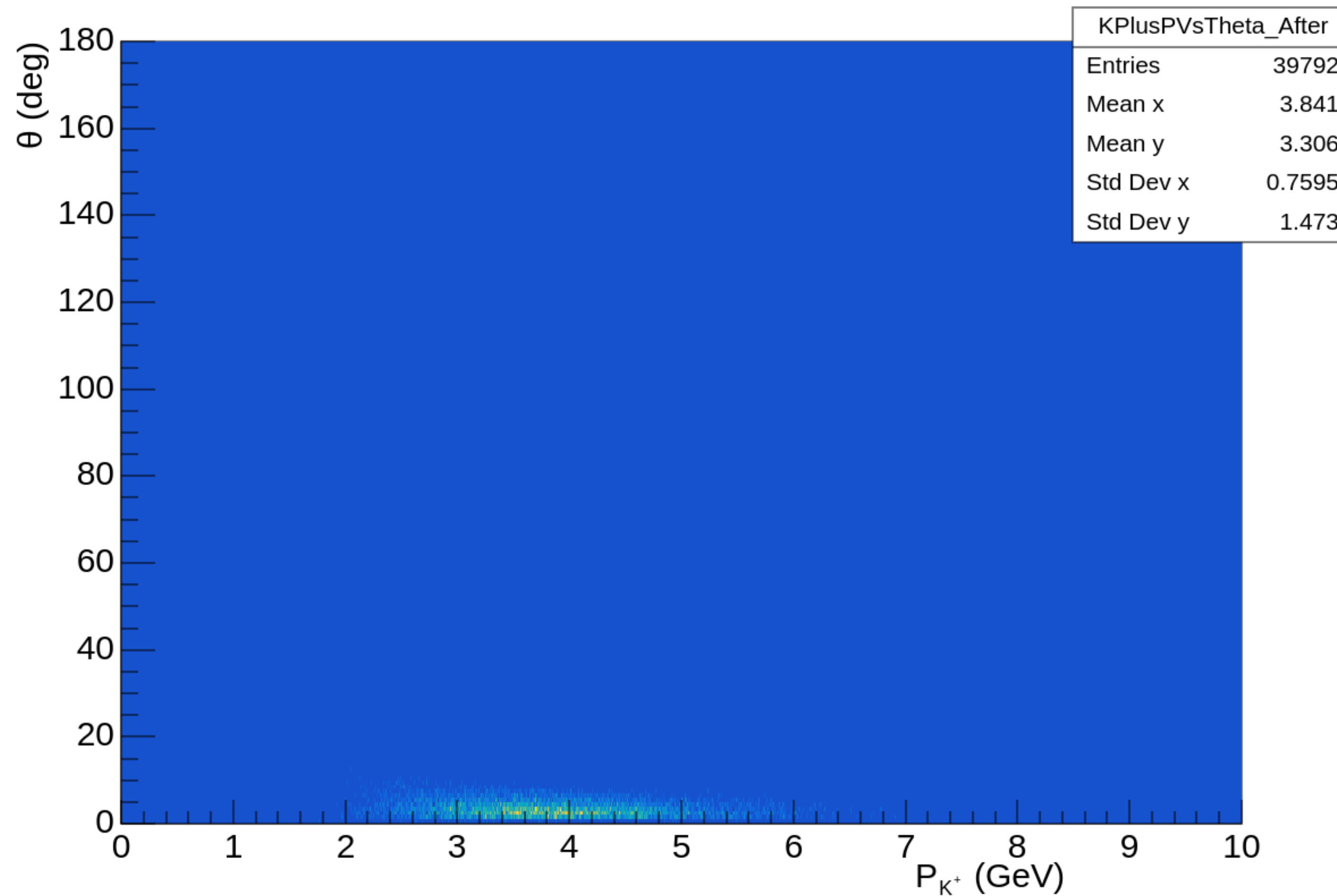- Momentum transfer squared: very forward angle dominated

Coherent phi production on deuterium

- Rapidity of phi meson: $y = \dfrac{1}{2} ln(\dfrac{E + P_z}{E - P_z})$
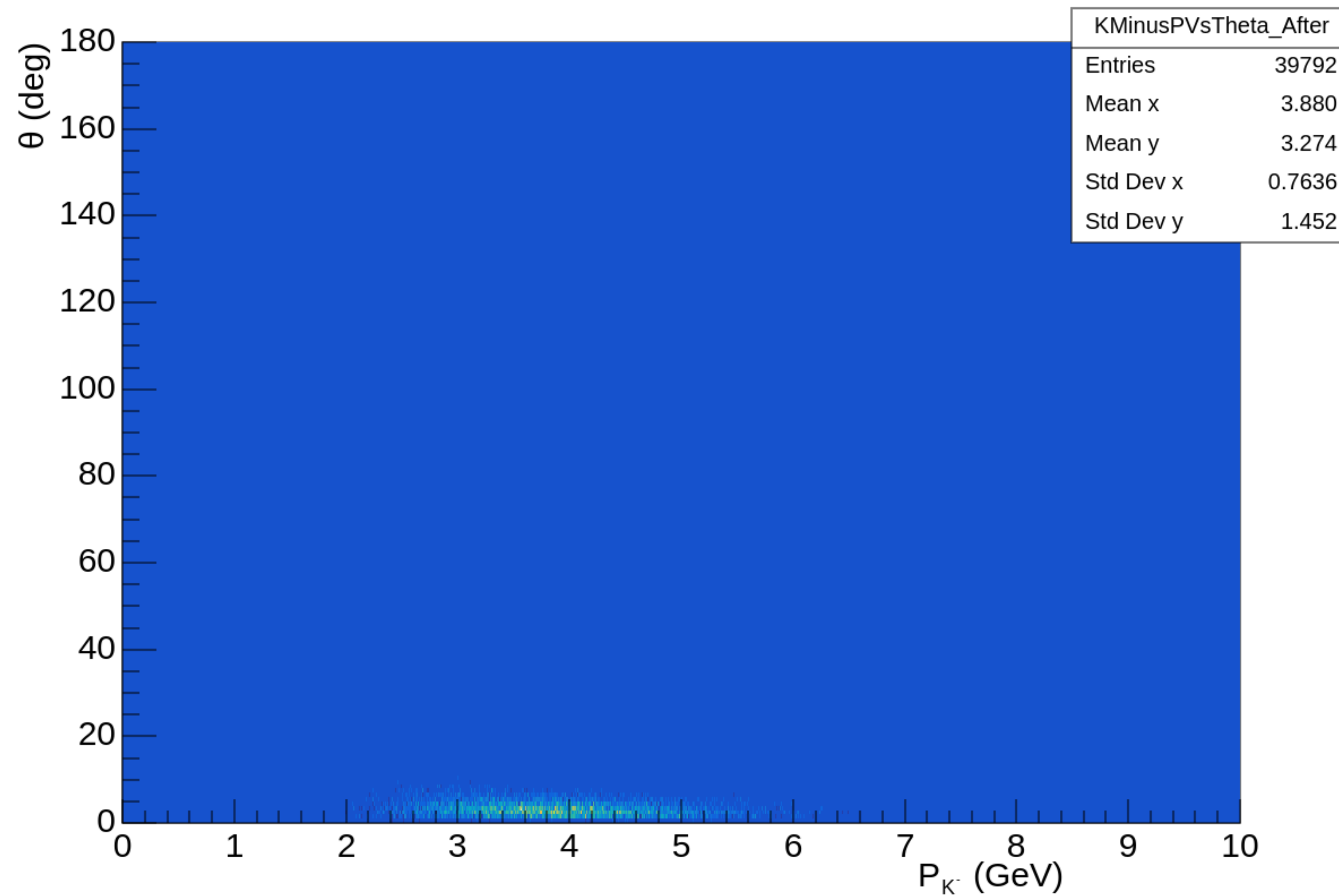
Coherent phi production on deuterium

- Kinematics of K^+

Coherent phi production on deuterium

- Kinematics of K^-

Coherent phi production on deuterium

- Next steps:

- Improve PID between kaon and pion

- Background study

- Coherent production generator

- Work on helium target as it may have better separation from incoherent production

- Neutron detection capabilities