

BAND Efficiency Study with RGM Data

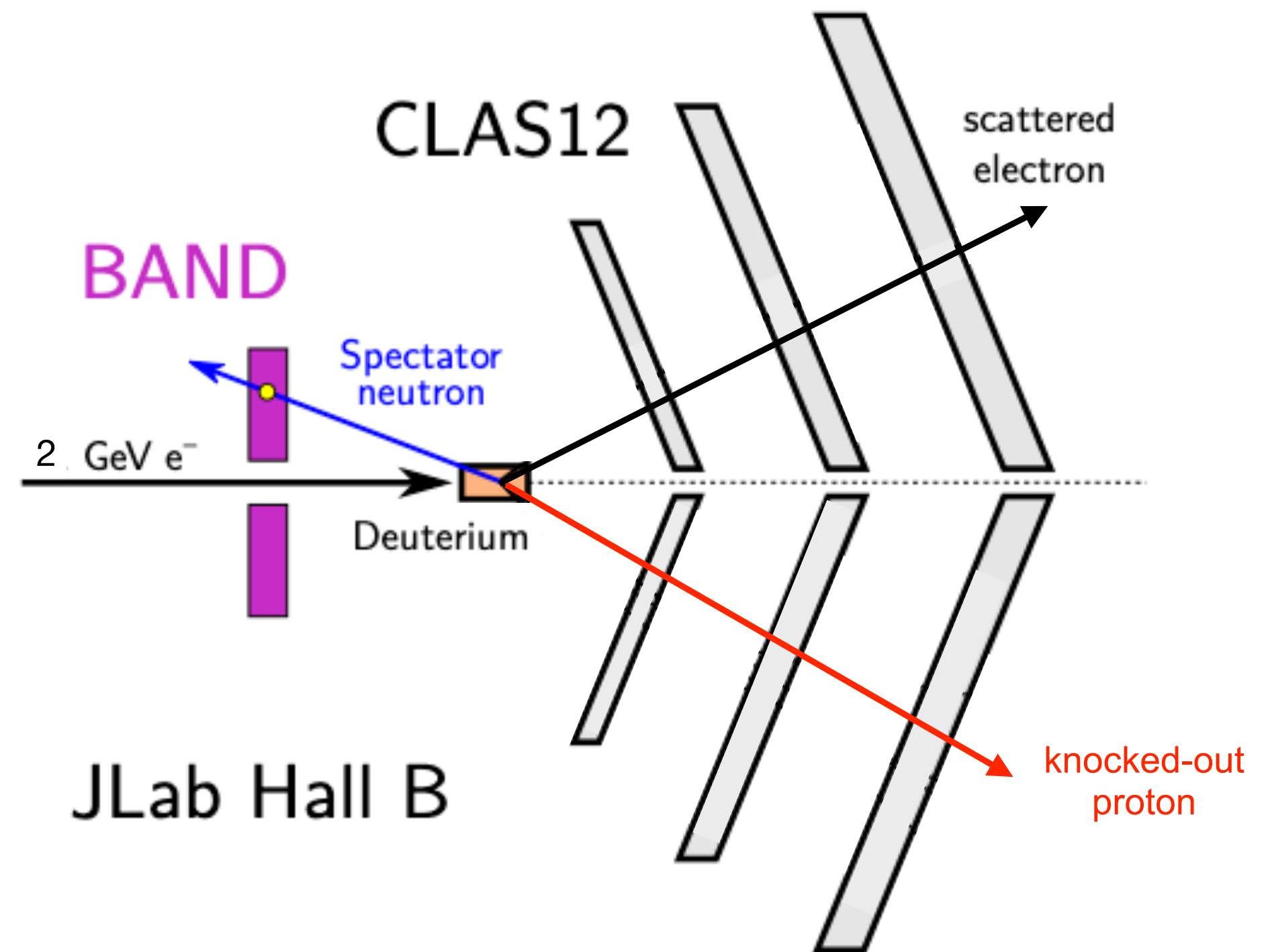
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SRC Collaboration Meeting
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Efficiency Goal

- This work is preliminary
- Make an independent check of previous BAND efficiency studies
- Goal is to get BAND efficiency as function of neutron momentum — don't have this yet

Extracting Efficiency

- Quasielastic proton knock-out
- $(e, e'pn)/(e, e'p)n$ points-to-BAND



Extracting Efficiency

- Need to address background
- Look at missing mass distributions and do background subtraction
- Determine efficiency with remaining signal events

RGM efficiency status

- Using low energy RGM deuterium data, 10 runs
- Data run through quasi elastic skimmer (bandsoft_tools/skimmers/quasielastic), which applies DC fiducial cuts on the electron
- Skimmed results run through resolution program (bandsoft_ana/efficiency/resolution), which applies kinematic cuts in stages
- Use missing mass distribution to address background and get signal event counts for $(e,e'p)n$ and $(e,e'pn)$
- Efficiency given by $(e,e'pn)/(e'p)n$

Missing Mass Distributions

(e,e') Cuts

$V > 15$
 $W > 15$
 $0.17 < E_oP < 0.3$
 $1 < p_e < p_{beam}$
 $-1 < Vtz < -5$

(e,e'p) Cuts

(e,e') Cuts
 Proton detected in FTOF

(e,e'p)n Cuts

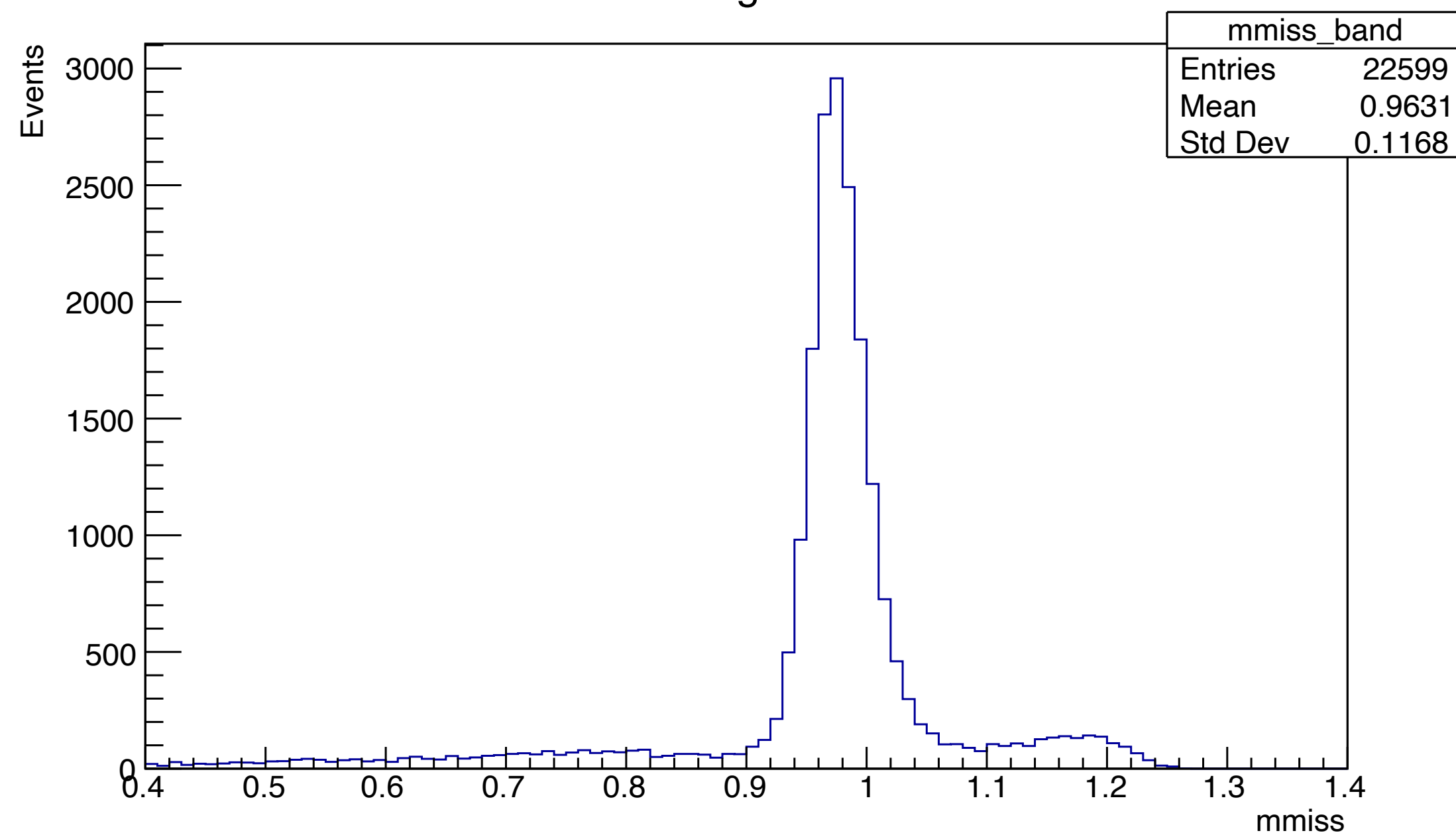
(e,e'p) Cuts
 $p_{miss} > .25 \text{ GeV}$
 $v_{miss_theta} < 90 \text{ deg}$
 Points to BAND!!

(e,e'pn) Cuts

(e,e'p)n Cuts
 Neutron detected in BAND

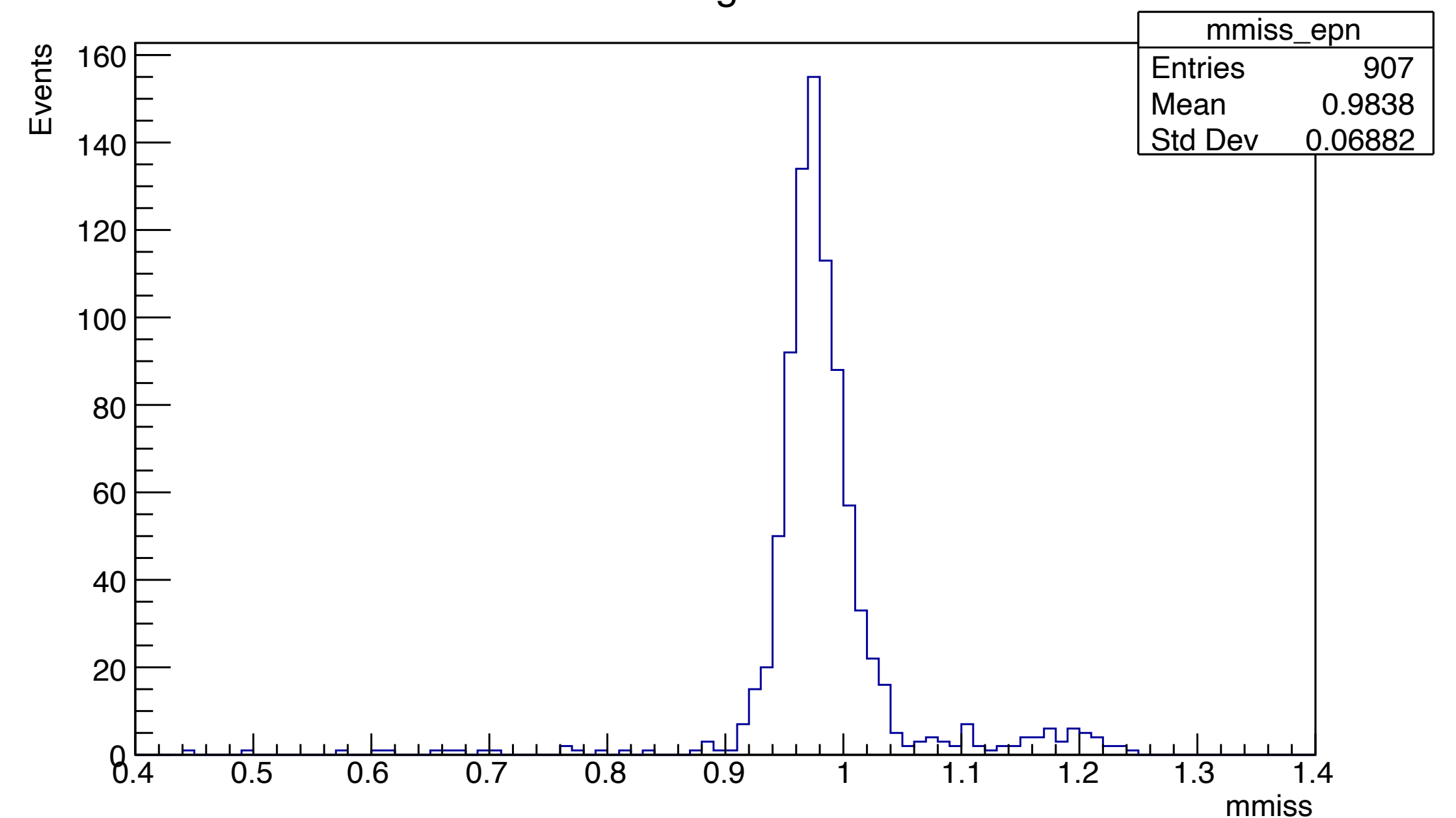
(e,e'p)n

Missing Mass

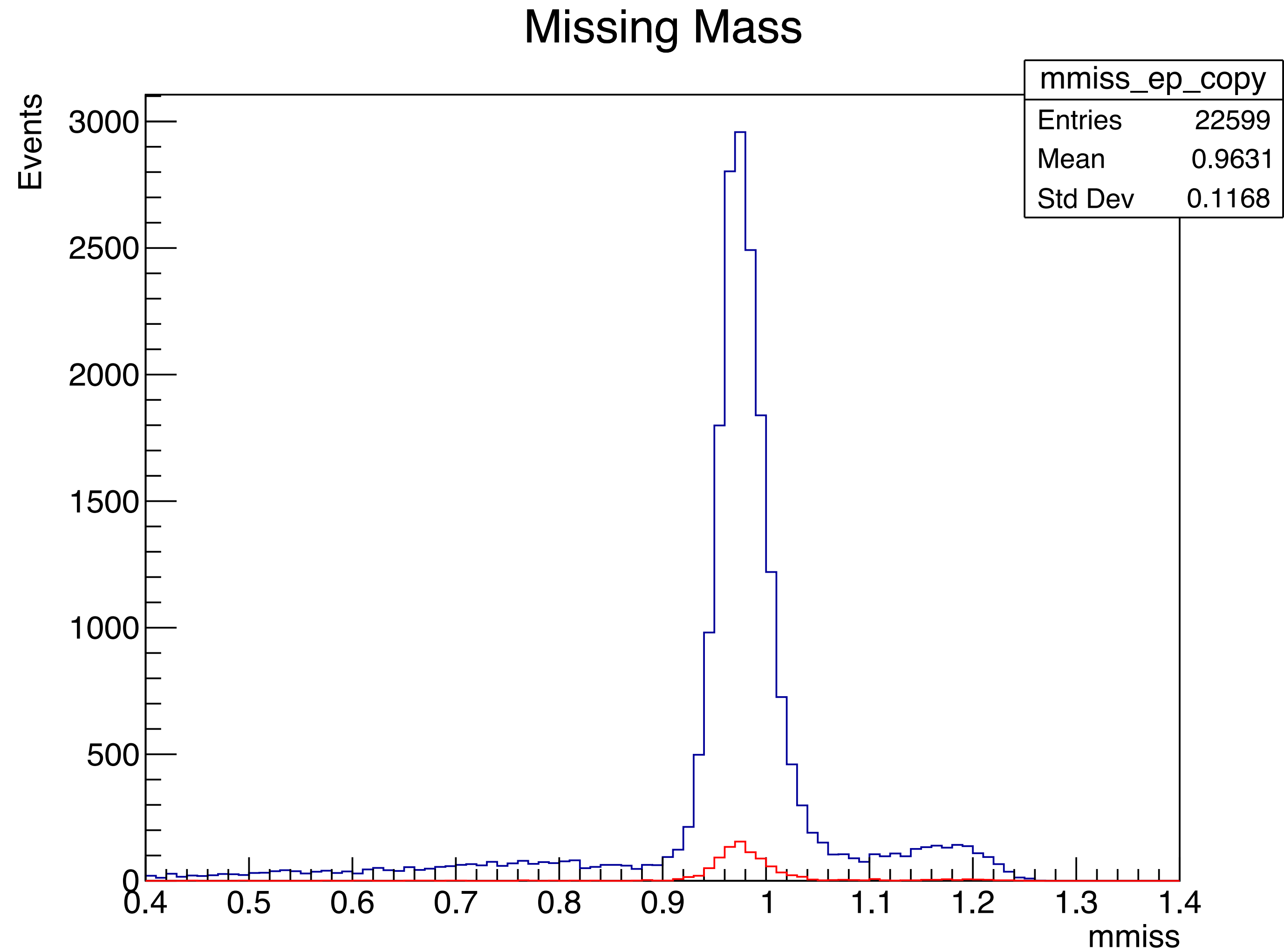


(e,e'pn)

Missing Mass

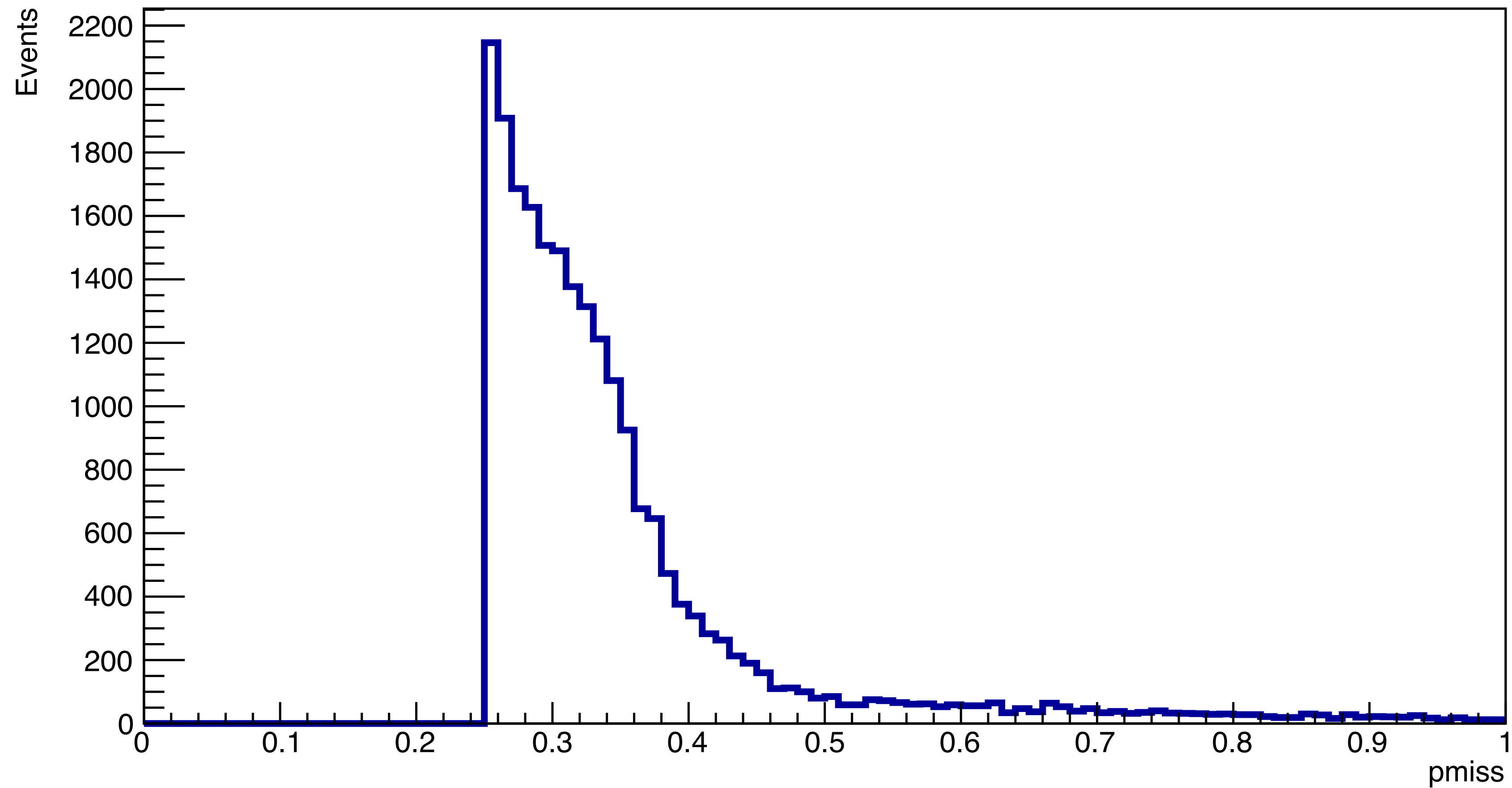


Missing Mass Distributions



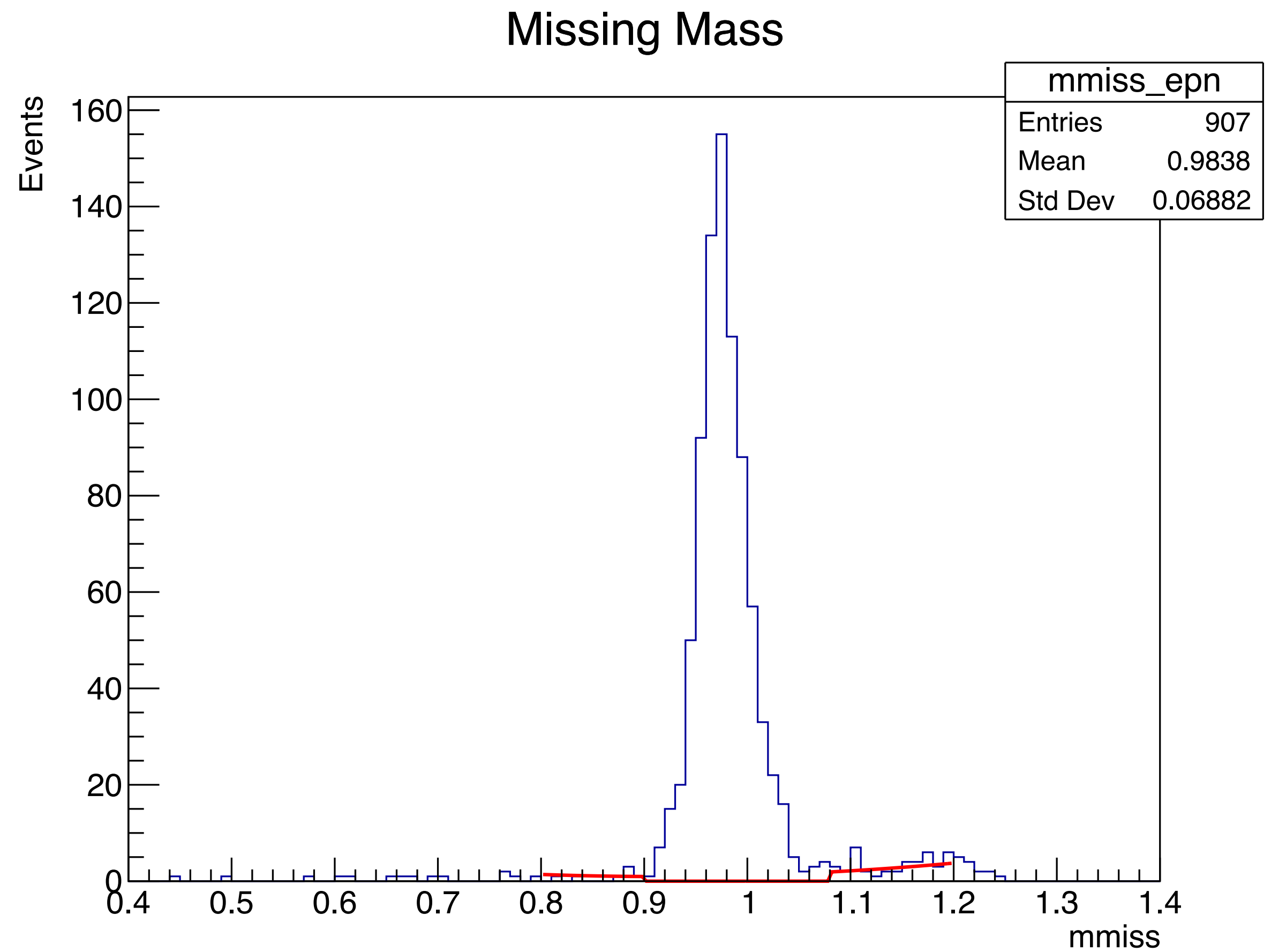
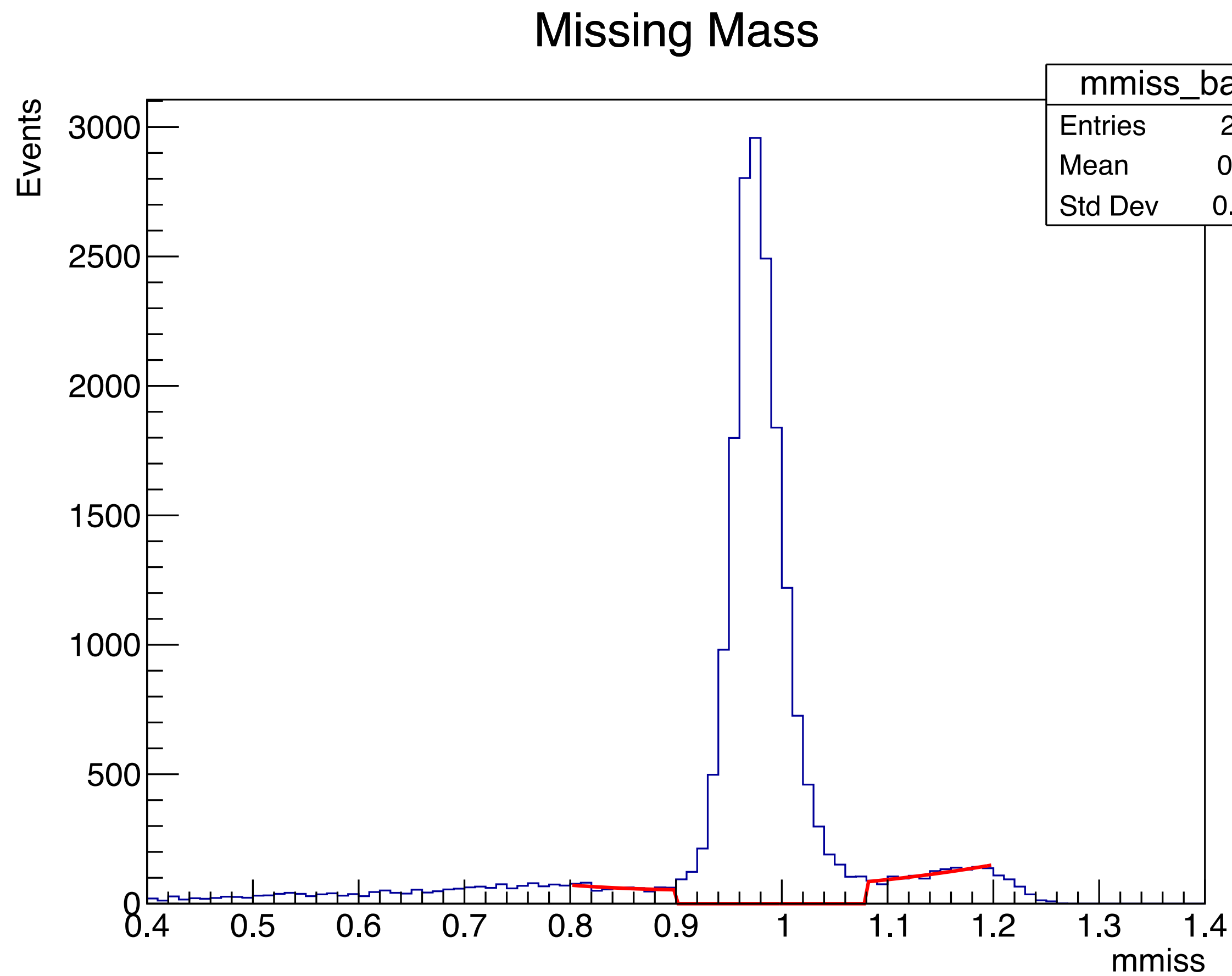
Missing Momentum Distribution

Missing Momentum for (e,e'p) pointing to BAND



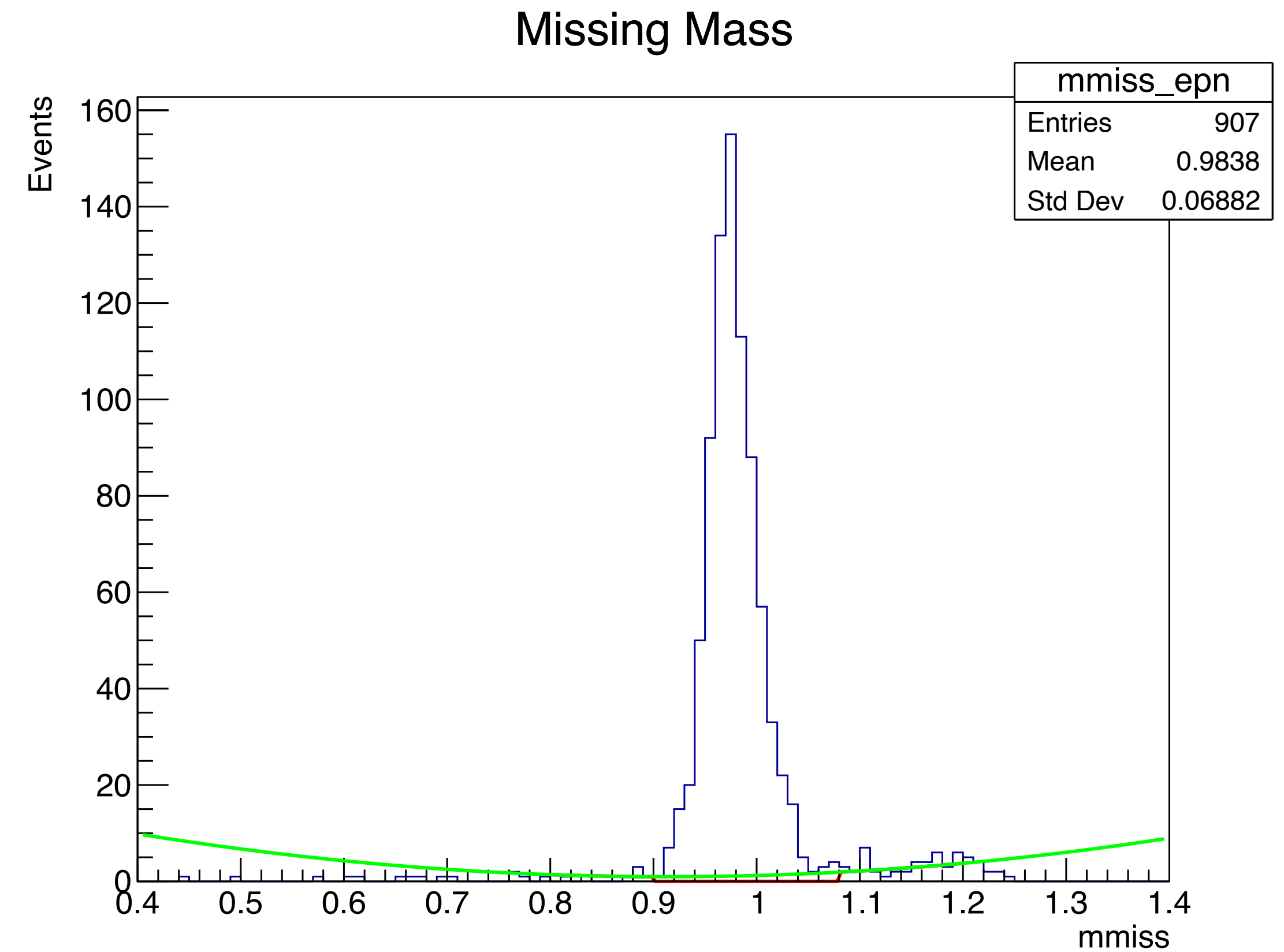
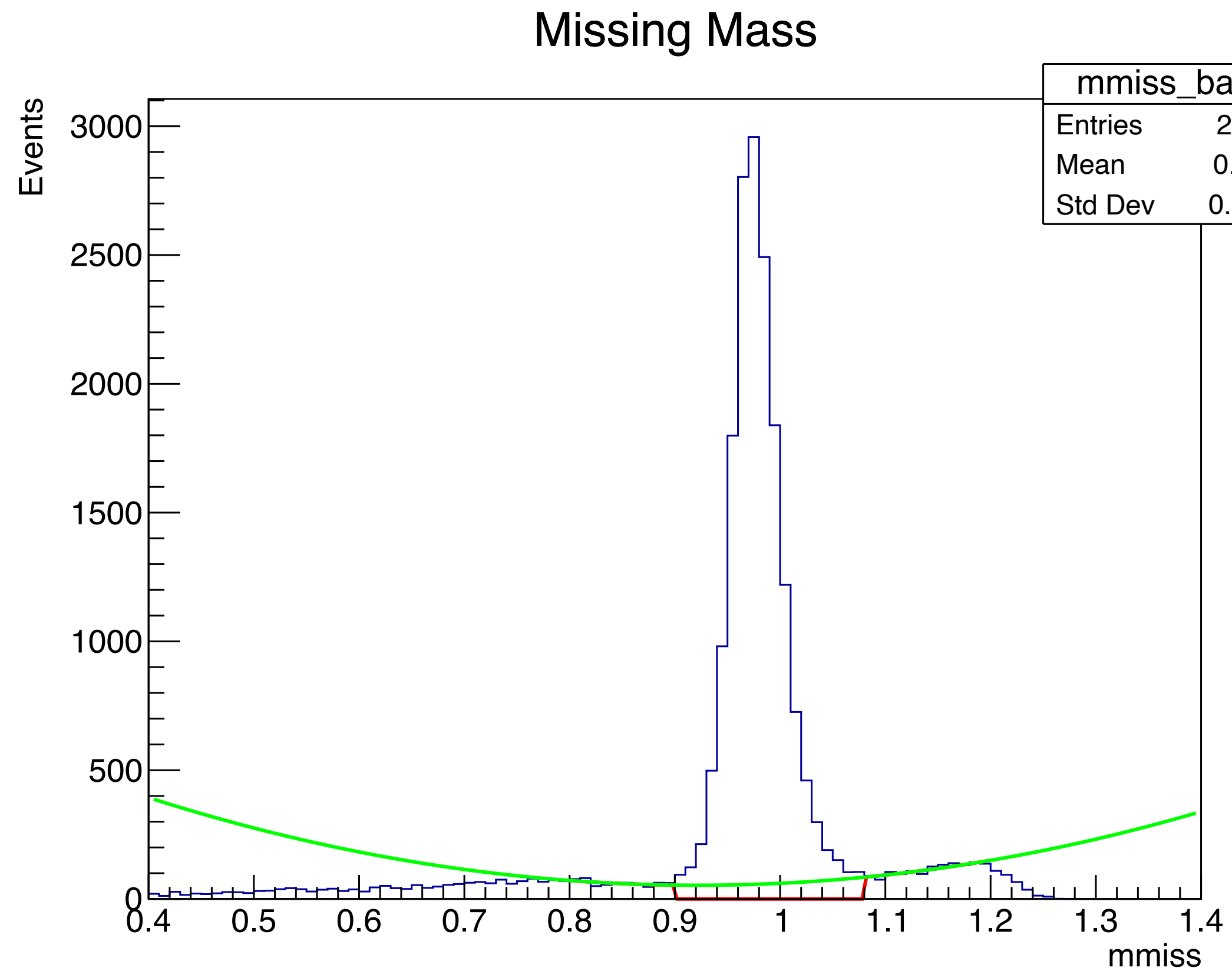
Background Fits

Fit mmiss surrounding signal region with quadratic function

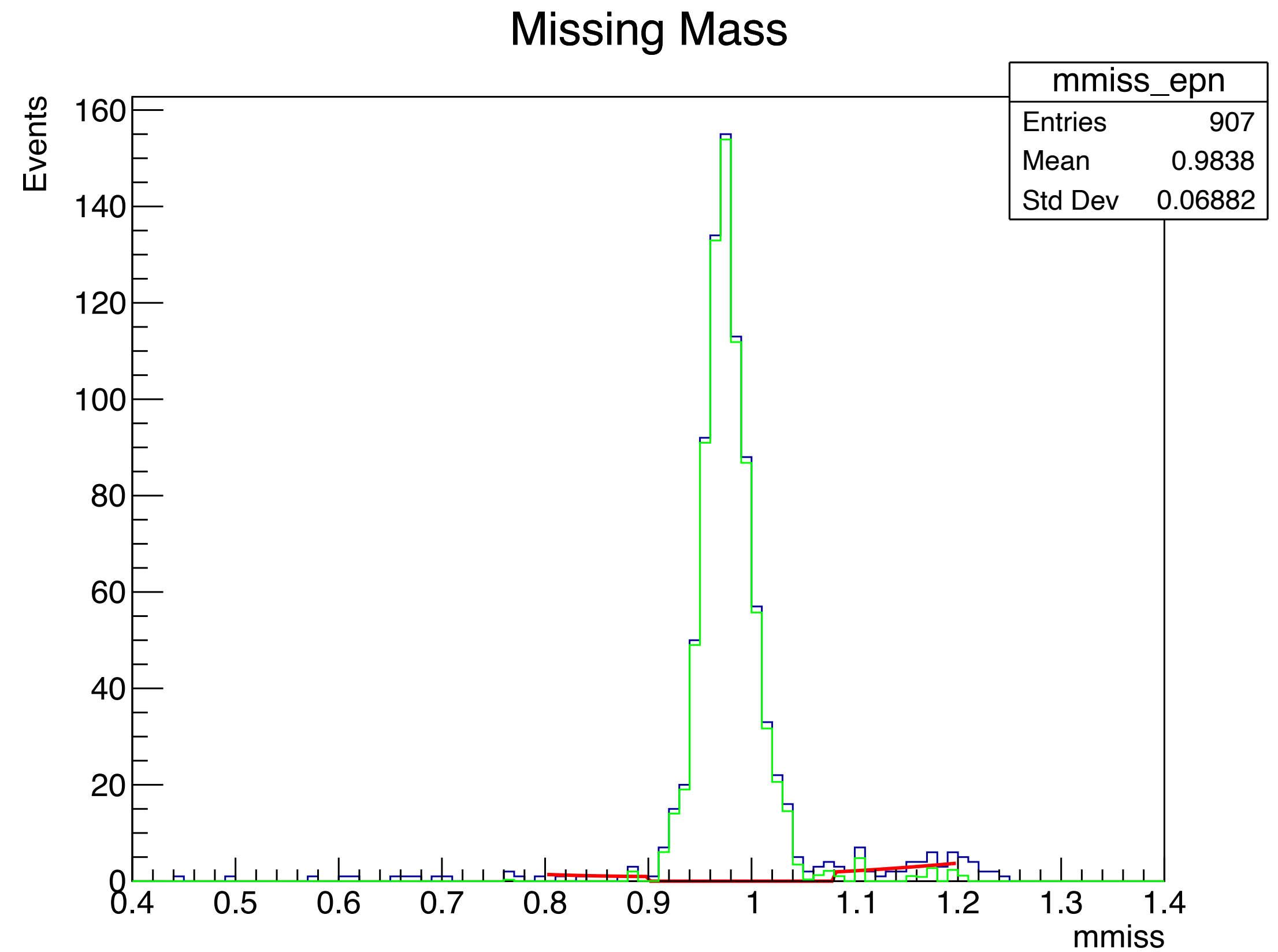
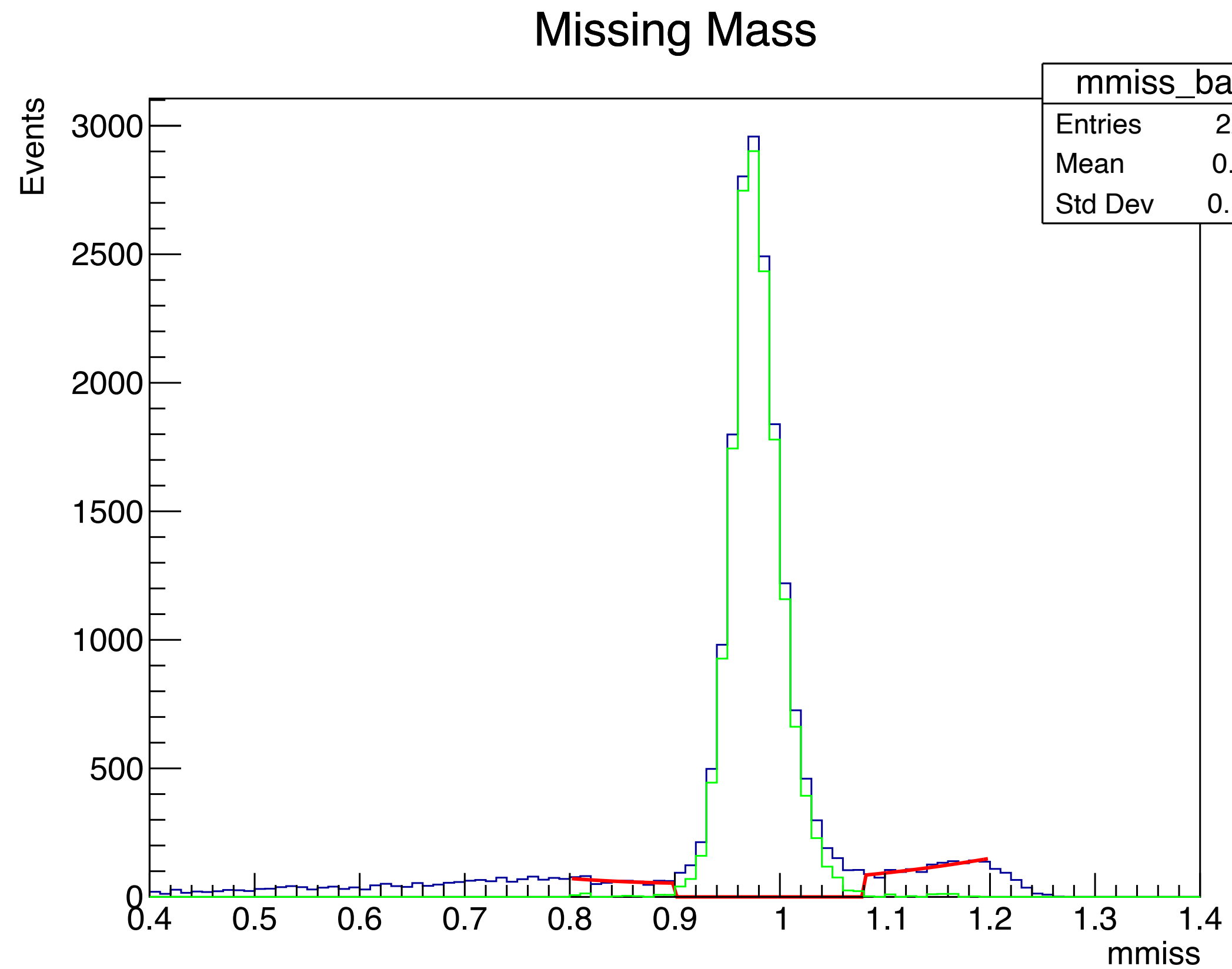


Background Fit

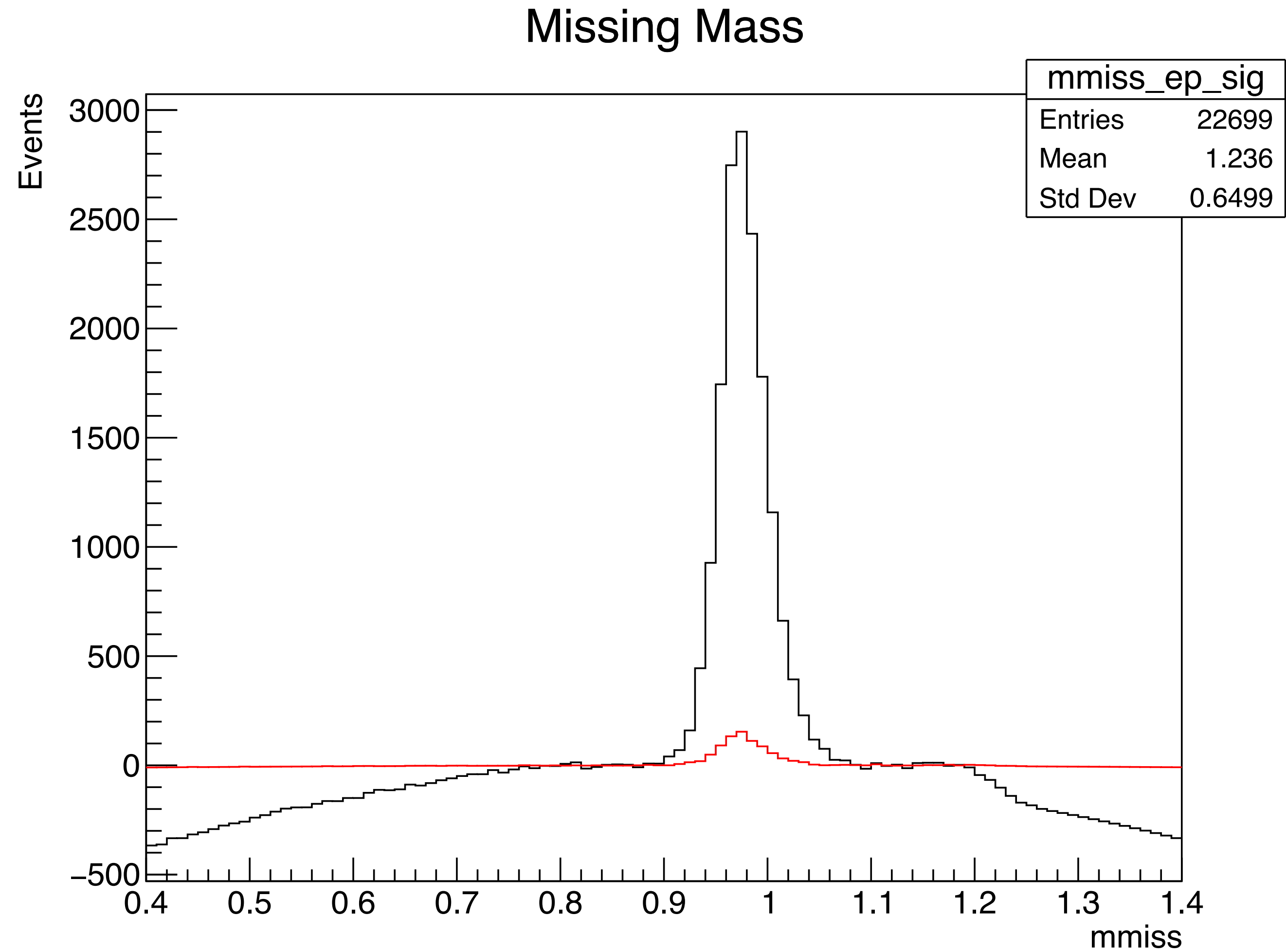
Fit mmiss surrounding signal region with quadratic function



Background Subtraction

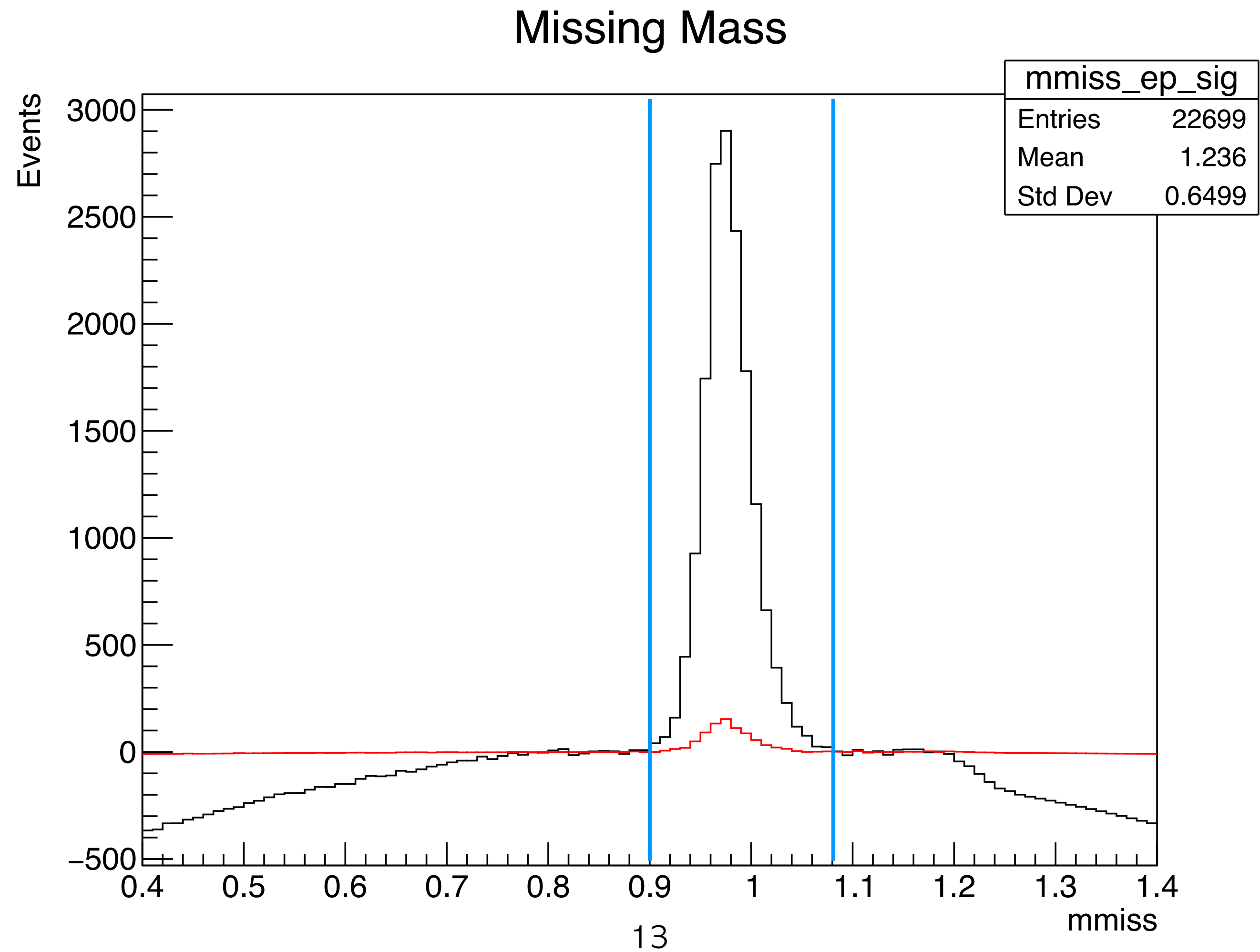


Background Subtraction



Efficiency Extraction

$(e,e'pn) / (e,e'p)n = 4.986\%$



Upcoming

- Bin in p_{miss} to look at impact on efficiency
- Study impact of forward detector's resolution on efficiency

Upcoming

Resolution Effects

- Imperfect resolution in forward detector makes points-to-BAND function sometimes inaccurate
- This hurts our efficiency
- Use simulation to look at difference btwn true and reconstructed hit location and its relationship with different kinematic variables
- Adjust cuts within points-to-BAND function