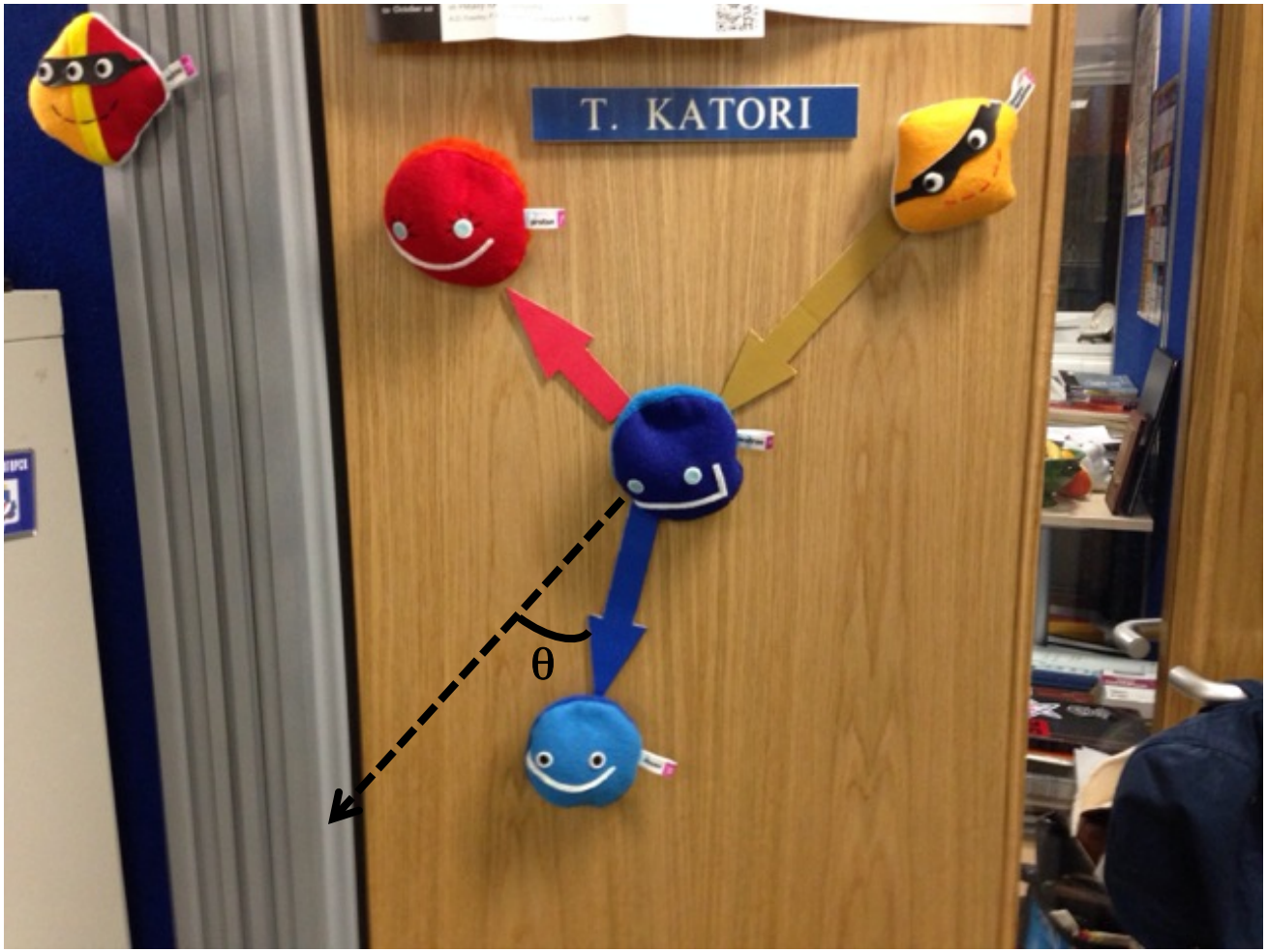
Importance of low momentum transfer (for theorists) and high angle measurements (for experimentalists)



Teppei Katori
Queen Mary University of London
INT workshop, Seattle, USA, Dec. 12, 2013

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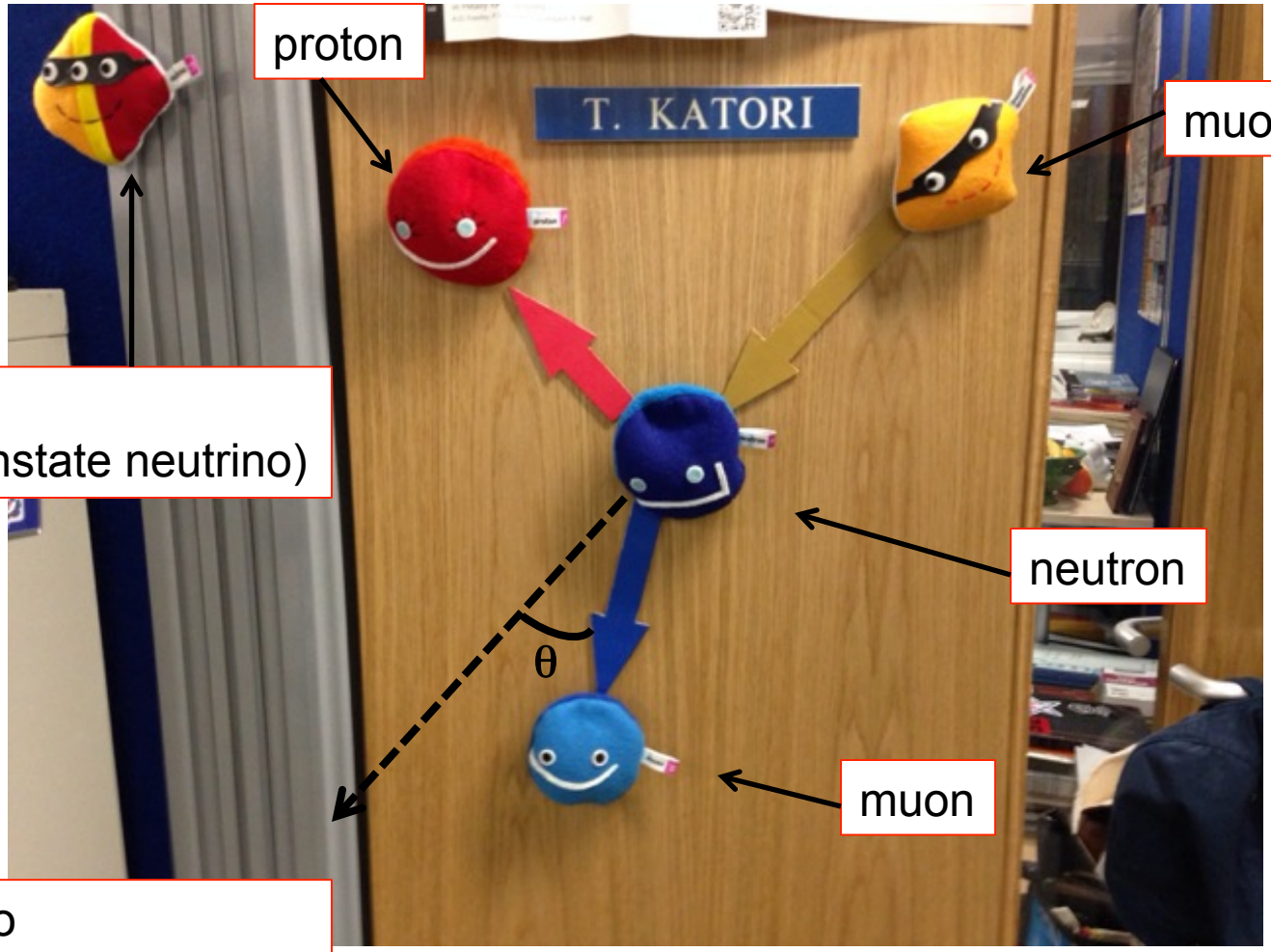
Importance of low momentum transfer (for theorists) and high angle measurements (for experimentalists)



Particle Zoo
http://www.particlezoo.net/

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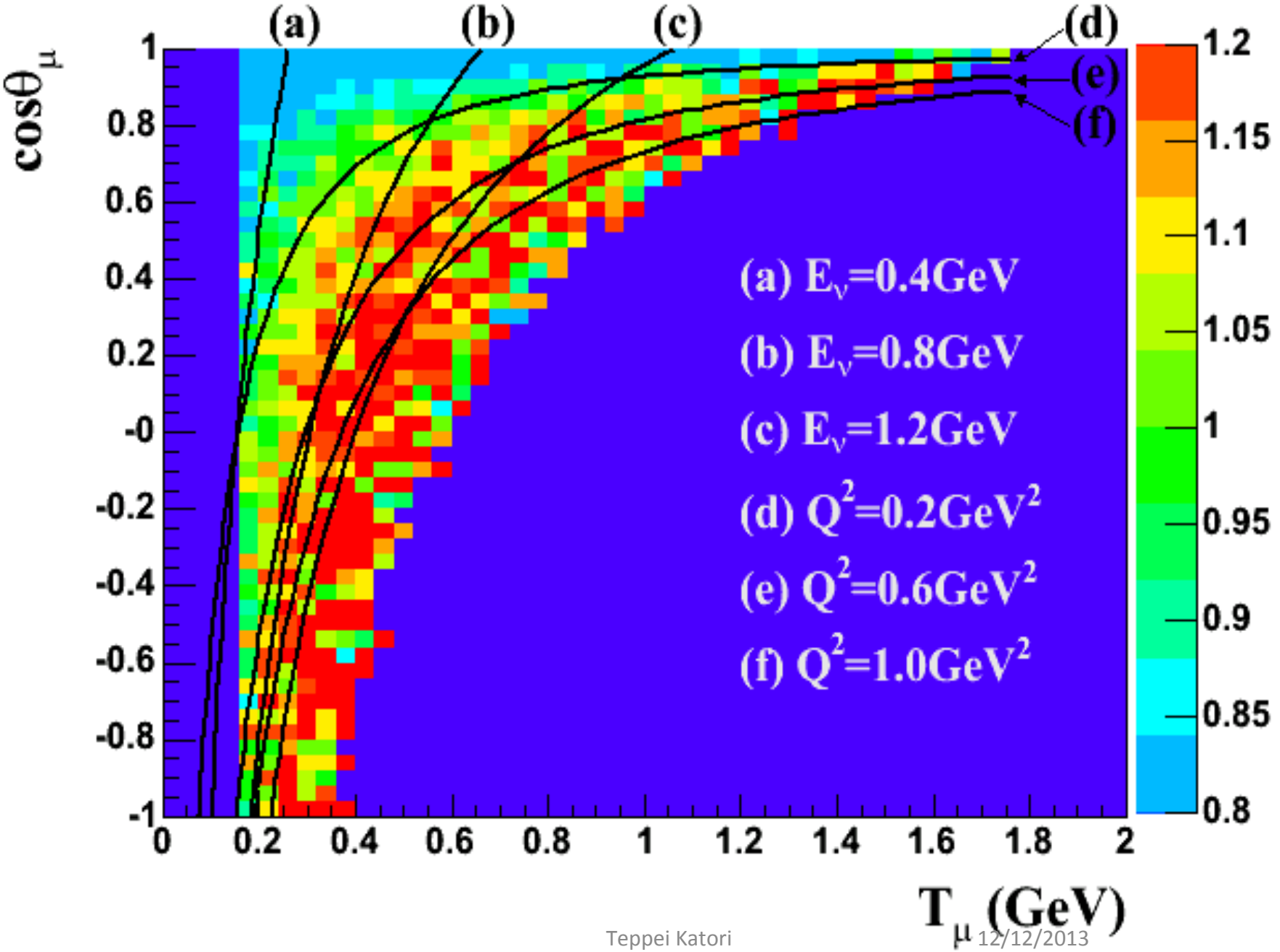
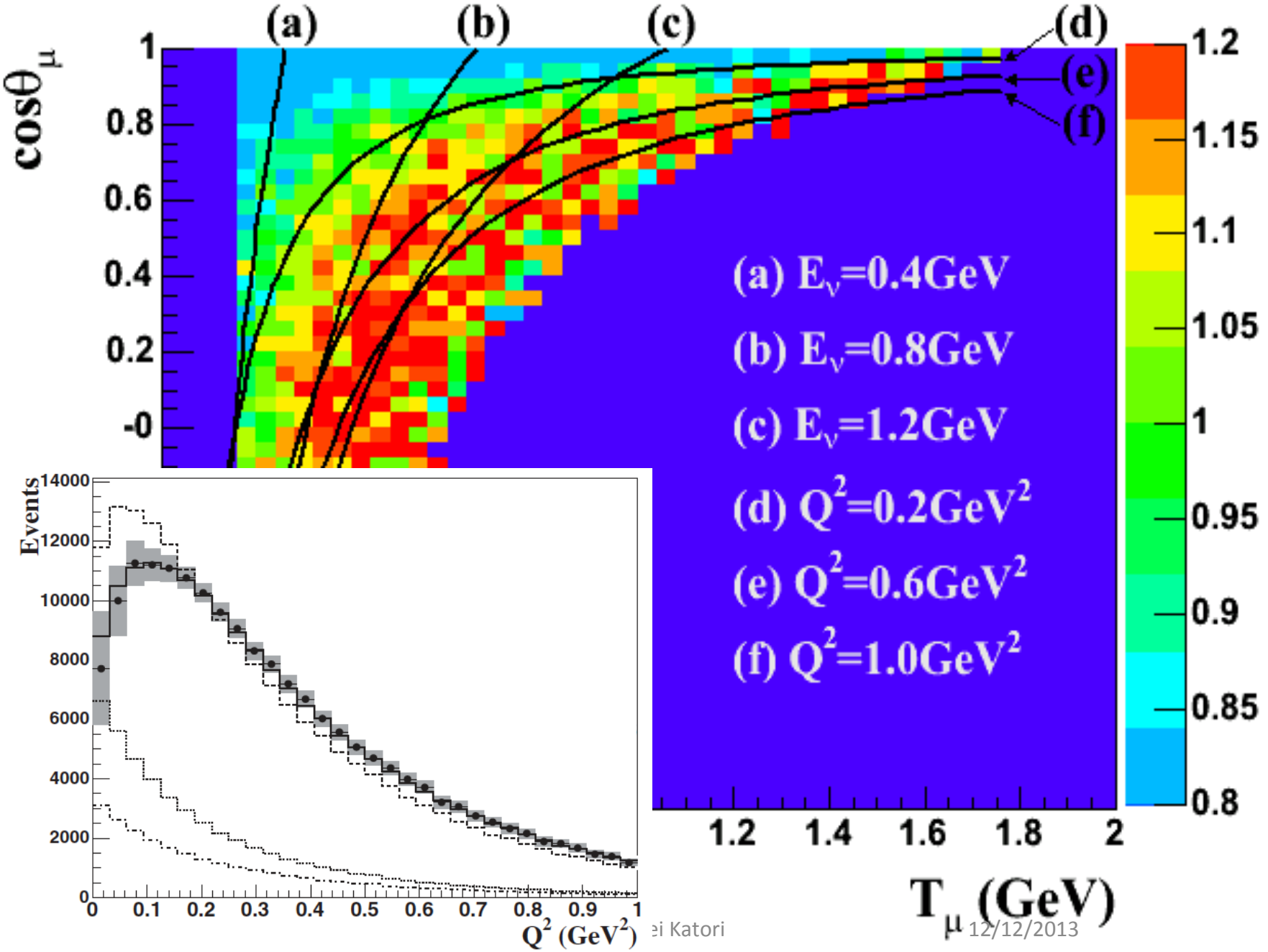
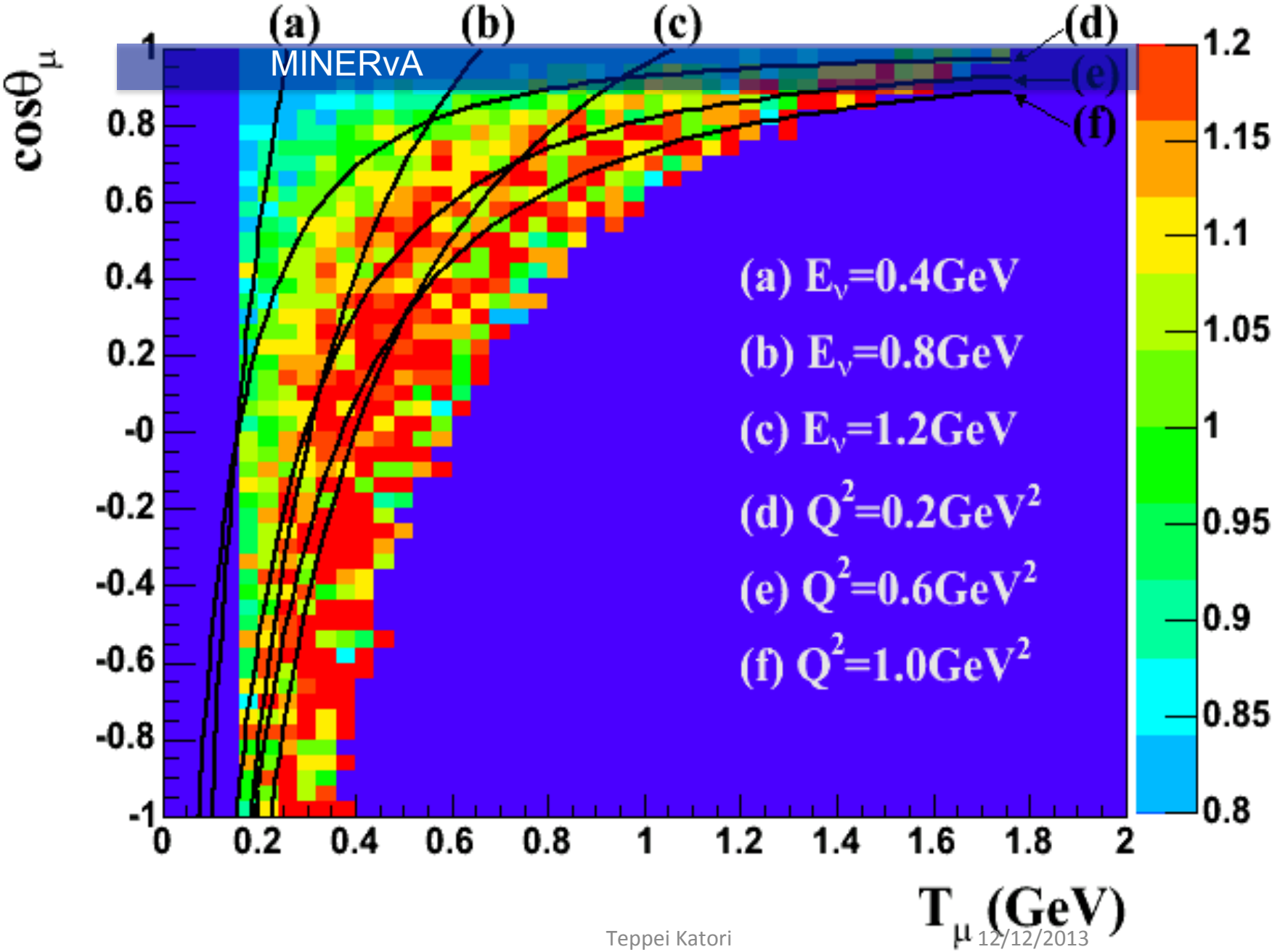
MiniBooNE,PRL100(2008)032301



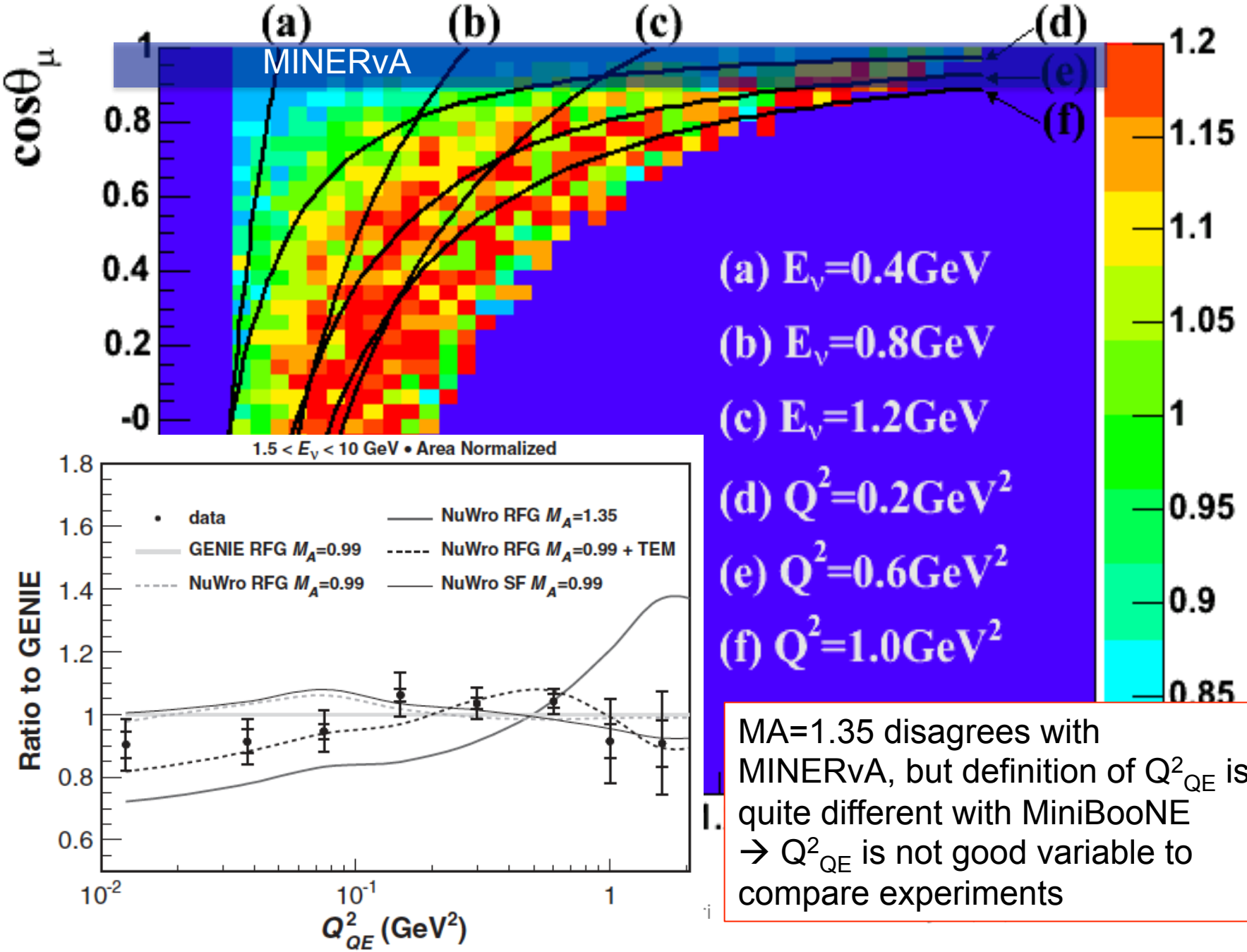
MiniBooNE,PRL100(2008)032301



MINERvA,PRL111(2013)022502

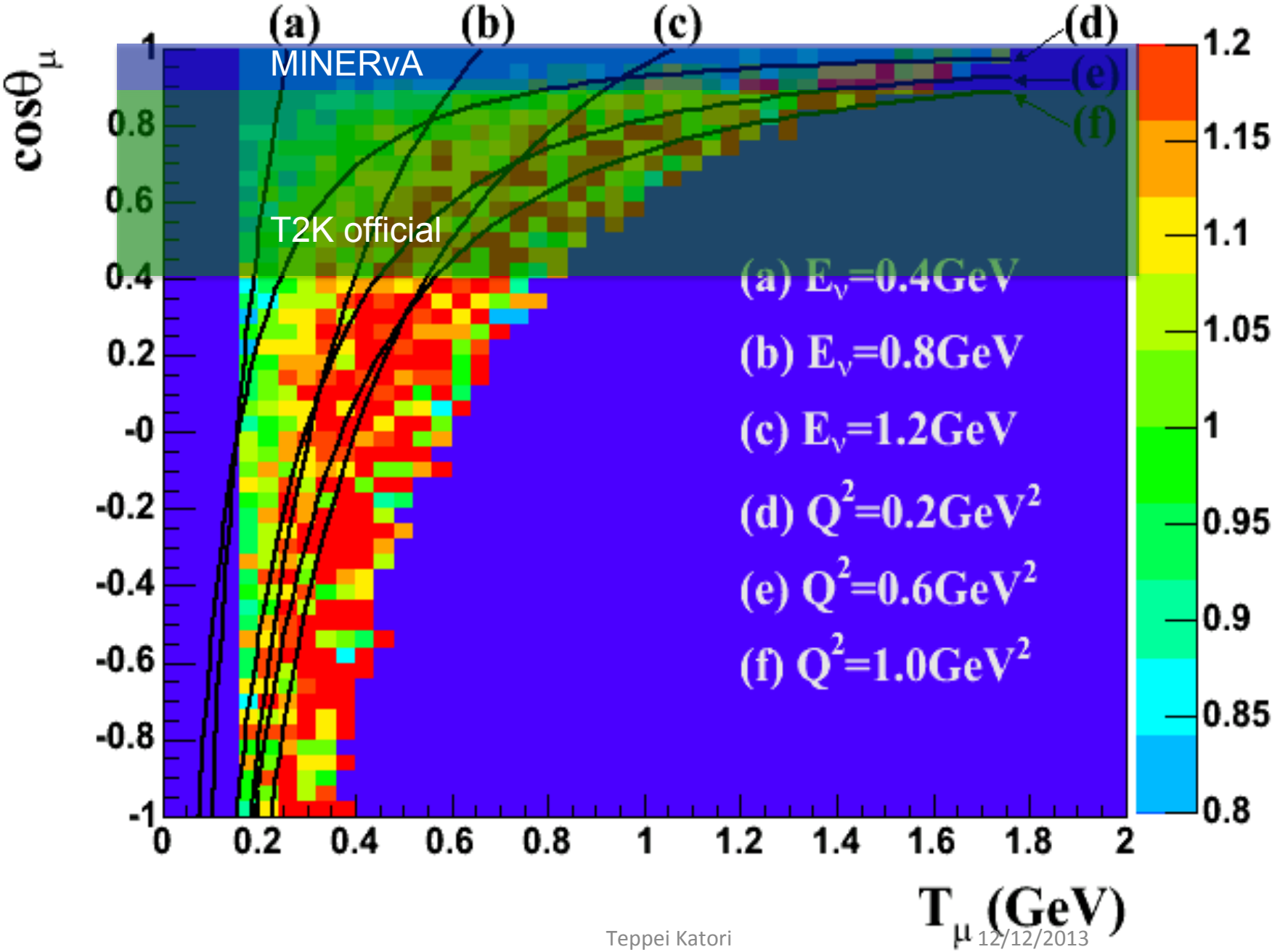


MINERvA,PRL111(2013)022502

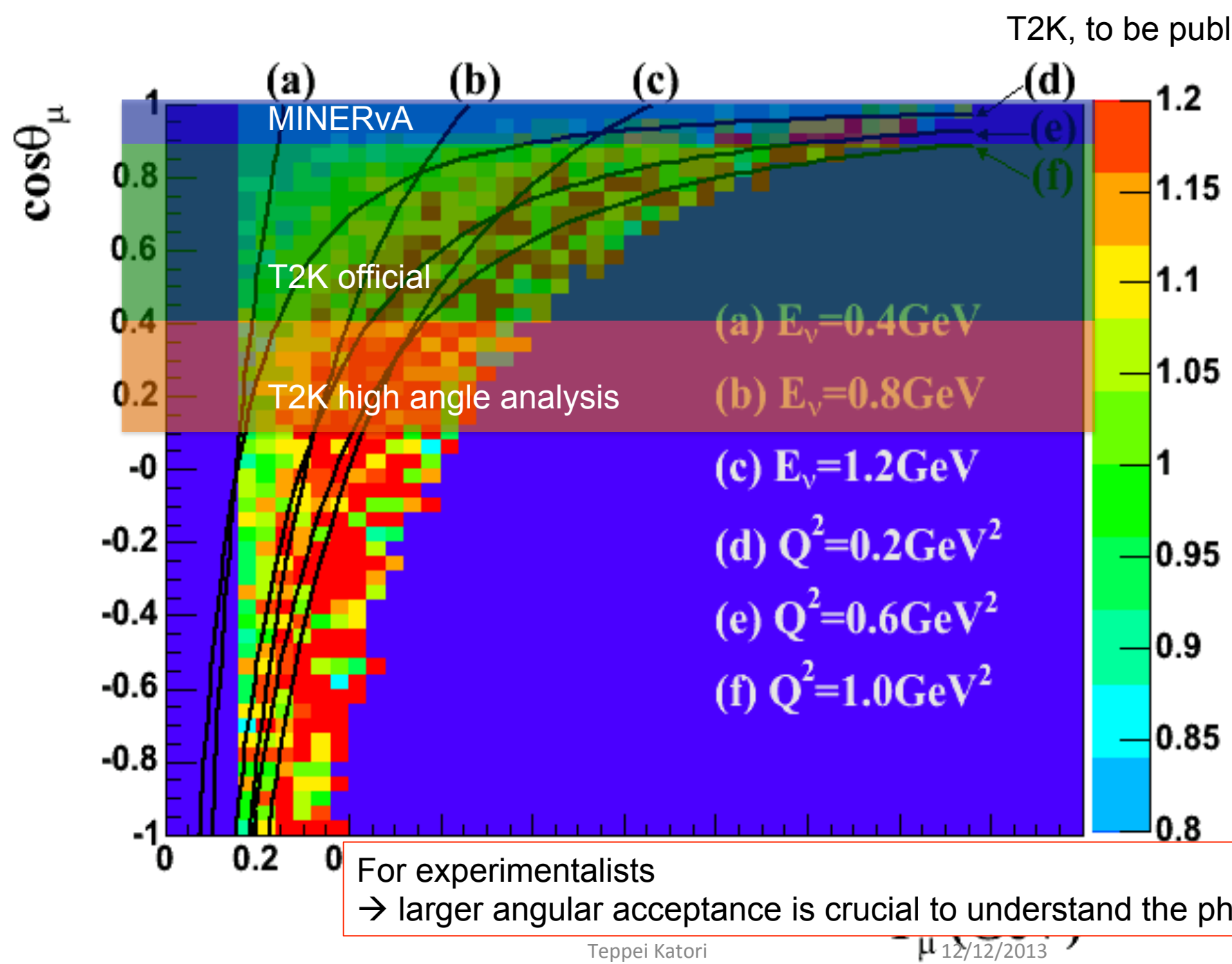


MA=1.35 disagrees with MINERvA, but definition of Q^2_{QE} is quite different with MiniBooNE
→ Q^2_{QE} is not good variable to compare experiments

T2K,PRD87(2013)092003



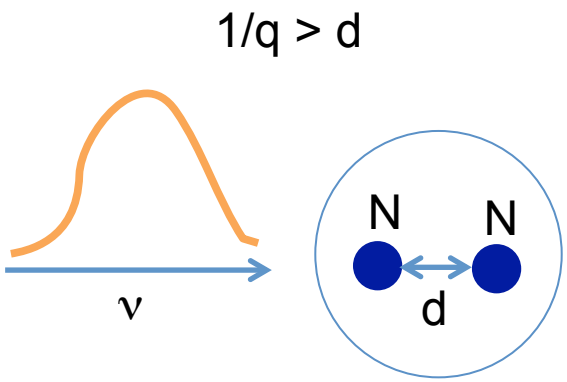
T2K, to be published



For experimentalists
→ larger angular acceptance is crucial to understand the physics

Ankowski,Benhar,Farina,PRD82(2010)013002

Impulse Approximation is broken at low Q^2 (or low |q|)



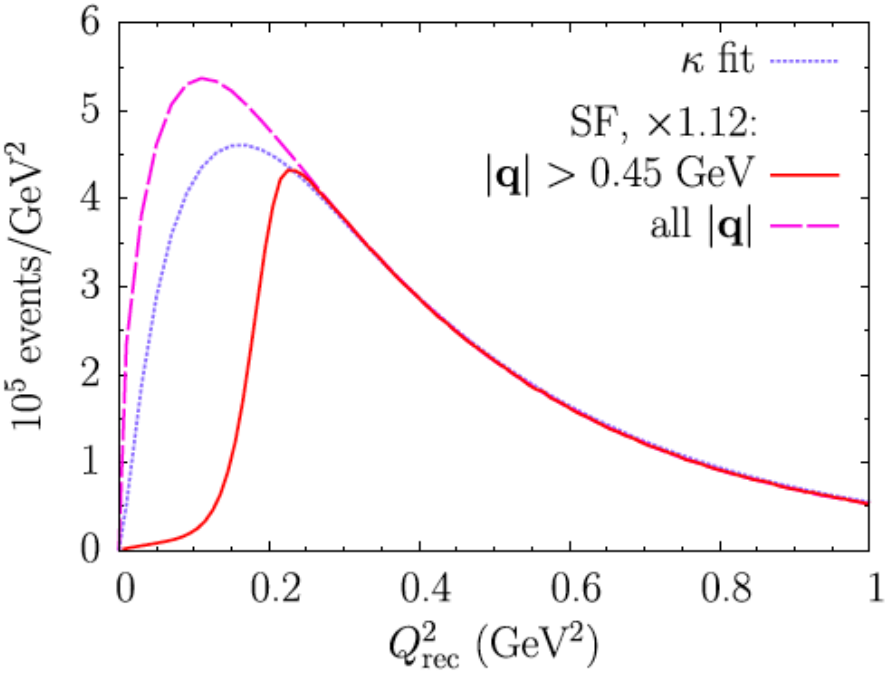


FIG. 6 (color online). Comparison of the MiniBooNE parametrization of the data (dotted line), labeled as the κ fit, to the spectral function calculation (dashed line). The solid line depicts the contribution to the latter from the region where the IA is expected to be valid. The SF results are multiplied by a factor 1.12 to make them match the κ fit.

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Juszczak,Sobczyk,Zmuda,PRC82(2010)045502

For MiniBooNE, you can throw away the region |q|<400 MeV, but for small angular acceptance experiments (MINERvA, T2K, NOvA, MicroBooNE, all current and future experiments!), |q| <400 MeV is significant fraction of data and we cannot throw away

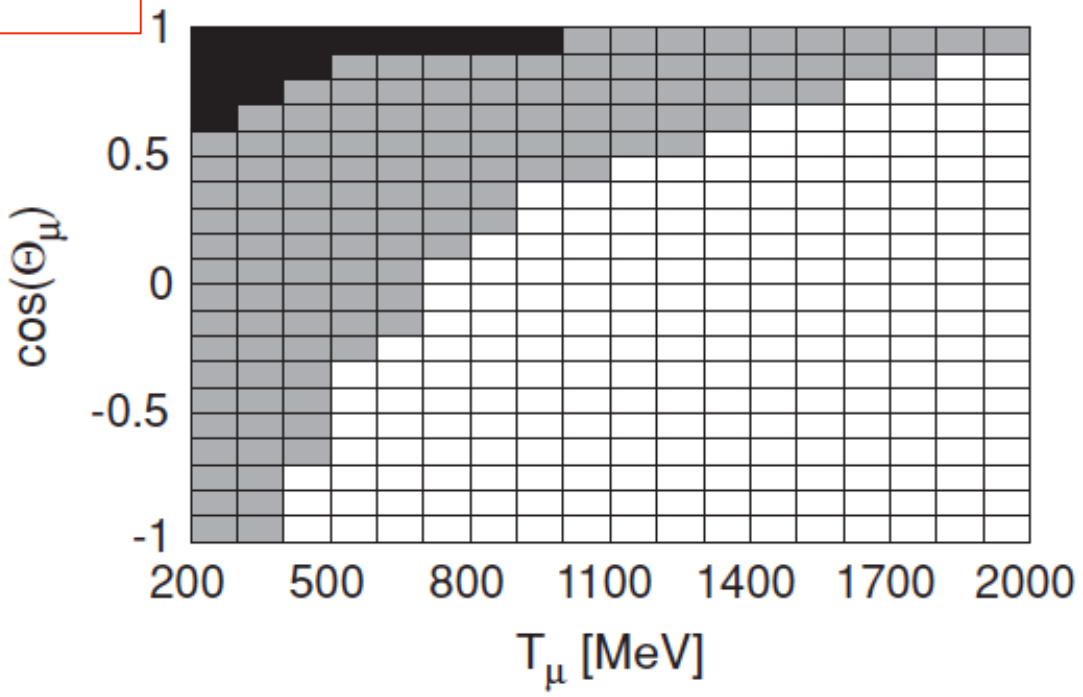
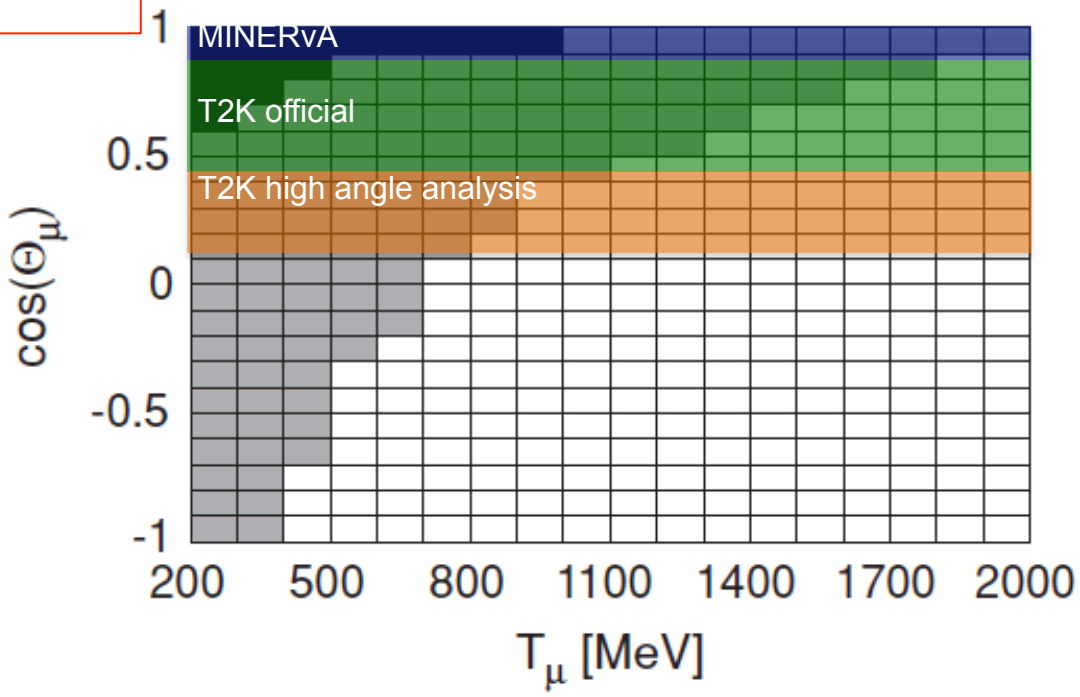


FIG. 3. Bins excluded from the fitting procedure for $q_{\text{cut}} = 400$ MeV/c are shown in black. Bins with a nonzero cross section measured by MiniBooNE are shown in gray.

Juszczak,Sobczyk,Zmuda,PRC82(2010)045502

For MiniBooNE, you can throw away the region |q|<400 MeV, but for small angular acceptance experiments (MINERvA, T2K, NOvA, MicroBooNE, all current and future experiments!), |q| <400 MeV is significant fraction of data and we cannot throw away



For theorists
→ low |q| is very important to utilize data of next generation experiments (seems to me RPA or similar treatment is essential)

QE+2p-2h+RPA kills three birds with one stone

- 1st bird = high Q^2 problem
- 2nd bird = normalization
- 3rd bird = low Q^2 problem