UNIVERSITY OF TORONTO

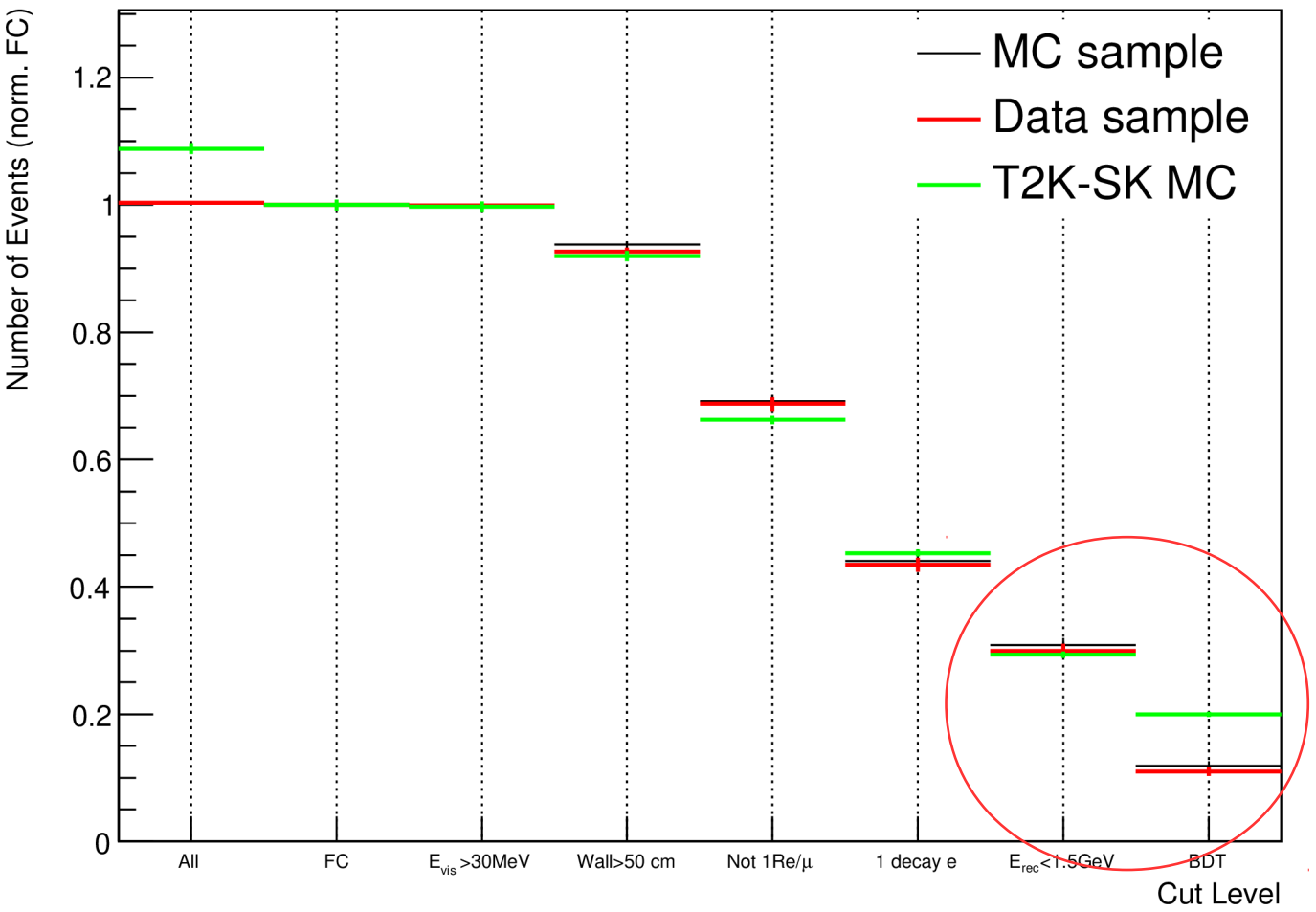
ν_e CCQE/CC1π^+ Selection Studies

Trevor Towstego

ν_e CCQE/CC1π^+ Meeting

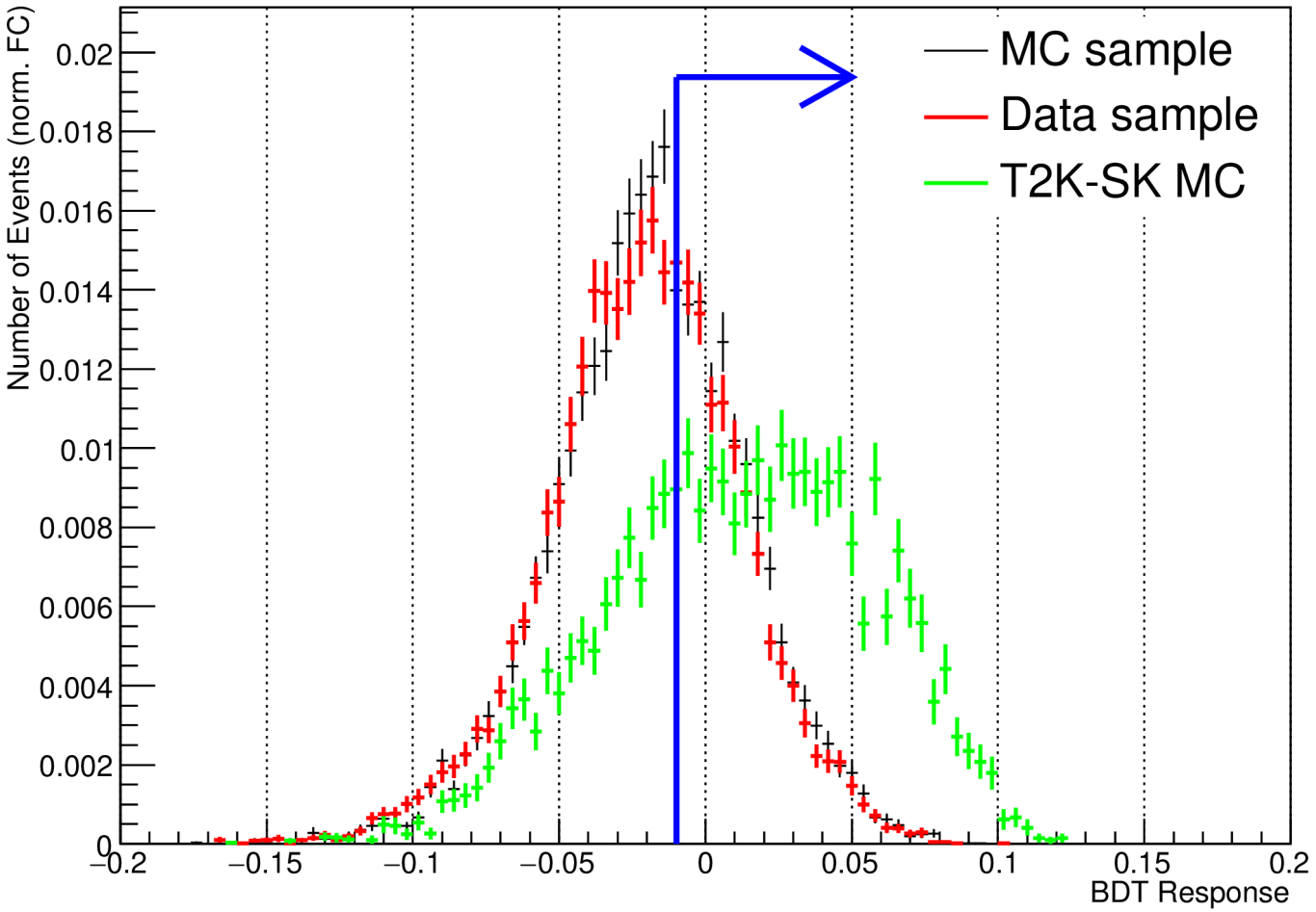
August 7, 2019

Reminder: Hybrid Sample BDT Cut Discrepancy



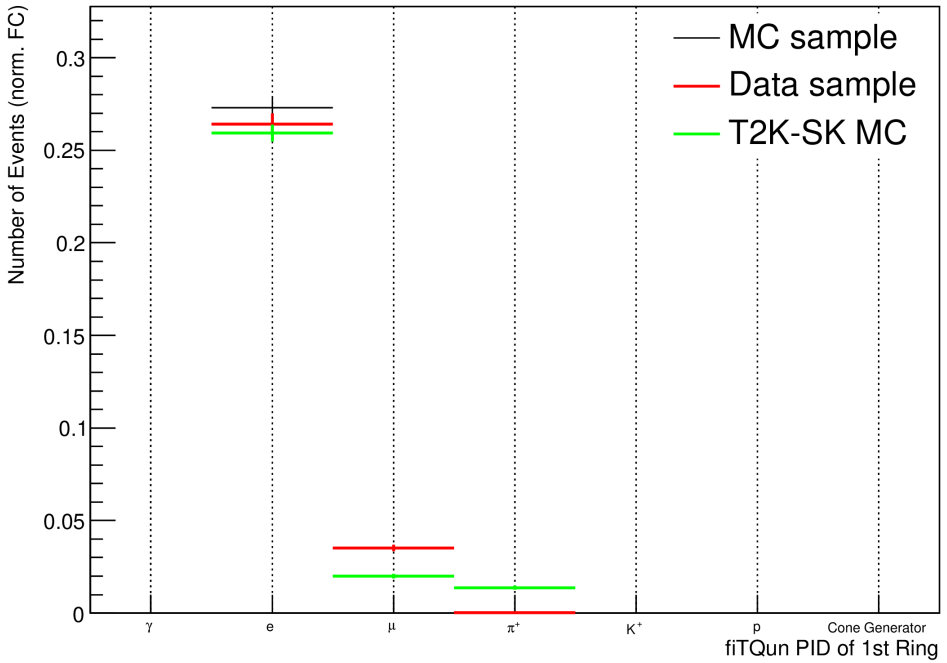
- Now oscillating hybrid sample
- T2K-SK events shown here are 1e1π^+
  - Same final state definition used when constructing hybrid sample
- Still see efficiency discrepancy at BDT cut

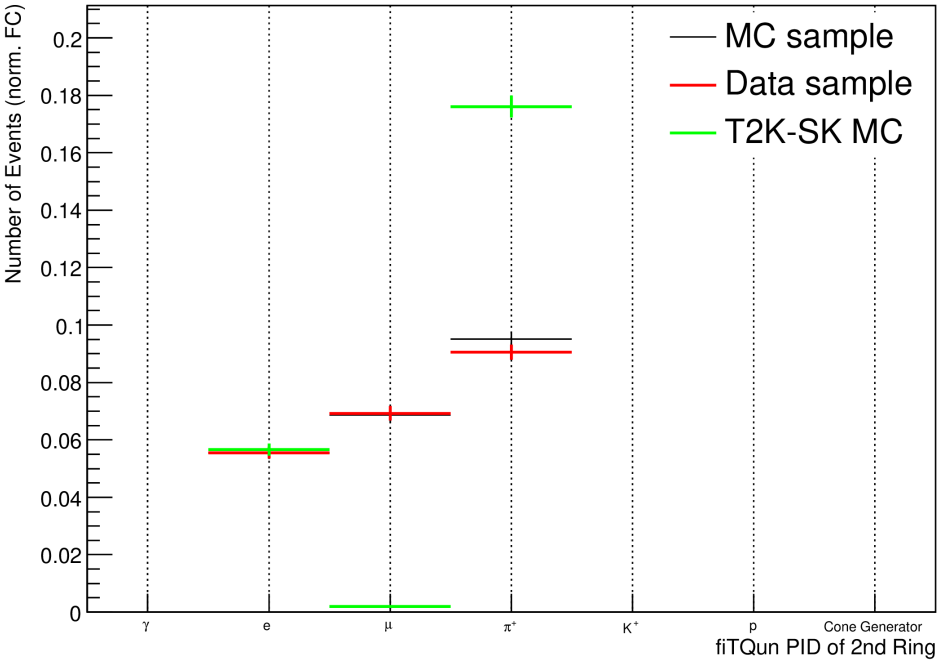
BDT Response > -0.0100



fiTQun PID of 1st and 2nd ring

events before BDT cut





- 1st and 2nd ring PIDs vary greatly between fiTQun v4 (T2K-SK MC) and fiTQun v5 (hybrid sample)
- Cris Vilela is investigating this discrepancy (no updates since last week)

Running fiTQun v4

- Currently running fiTQun v4 on hybrid samples
- Turned off gain correction since hybrid sample is constructed with SK16c libraries (which already take gain correction into account)
  - Had to modify fiTQun code in order to do this
    - Edited `SKTVarConsts.cc` such that `GetGainFact(int iRuntmp)` always returns `1.0`

```
double SKTVarConsts::GetGainFact(int iRuntmp){

  const double gainRef = 1.02681828571429; // April 2009 average

  double tmp = 1.0;
  // turn off gain correction (for hybrid epi+ sample)
  /*
  for (int i=1; i<nruns; i++) {
    tmp = darkgain[i];
    if (irun[i]<iRuntmp) continue;
    else if (irun[i]>iRuntmp) { // interpolate
      tmp = (darkgain[i-1]+darkgain[i])/2.;
      break;
    }
    else break; // Run number matched
  }

  tmp/=gainRef;
  */
  return tmp;
}
```

T2K Tech Note

T2K-TN-389

- Currently writing a tech note for the hybrid ν_e CC1π^+ sample
- Will send out the draft to the hybrid pion group once it is done

Construction of Hybrid ν_e CC1π^+ Samples for SK Detector Systematic Error Estimation

Trevor Towstego (University of Toronto)
Tomoyo Yoshida (Tokyo Institute of Technology)
Guang Yang (Stony Brook University)
Shunichi Mine (University of California Irvine)
Thomas Mueller (Ecole Polytechnique, IN2P3-CNRS)

August 7, 2019

Abstract

At T2K beam energies, CC1$\pi^{\pm}$ interactions are the second-most dominant interaction mode (after CCQE). To increase statistics at the far detector for ν_e appearance studies, a new 2-ring ν_e CC1π^+ sample is being developed. Systematic uncertainties of this sample must therefore be studied. In order to estimate detector systematics at the Super Kamiokande (SK) detector, hybrid ν_e CC1π^+ samples will be used. These hybrid samples consist of atmospheric e-like rings (from either data or MC) merged with MC-generated π^+ rings. This technical note outlines the construction of these new hybrid samples and their potential to be used for systematic error estimation.

Backup