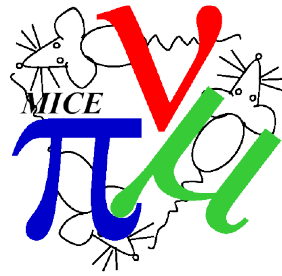


MCS in LH2 (field-off)

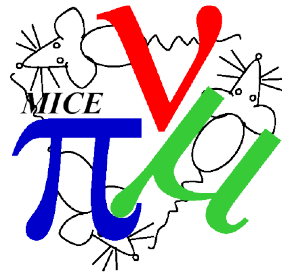


Content

PID using ROOT::TMVA

- Discrimination of pions and electrons is required to proceed with MCS analysis
- ROOT6 & TMVA installed and operational
- Currently testing the operation of MVA routines
- MC used to train and test a chosen algorithm (LDA)
 - Determine performance
 - Investigate viability of training with data
 - Data from muon beam mode,
 - Or different momentum
 - Identify algorithm limitations

MCS in LH2 (field-off)

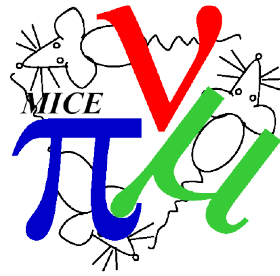


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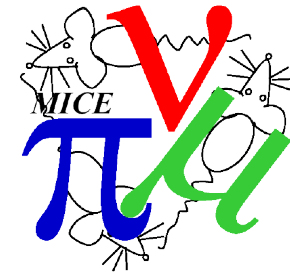
MCS in LH2 (field-off) – Feature selection



Discriminating Features

EMR range (mm)
EMR p. density (%)
dt _{TOF01} (ns)
dt _{TOF12} (ns)
Npe _{CkovA}
Npe _{CkovB}
ADC _{KL}

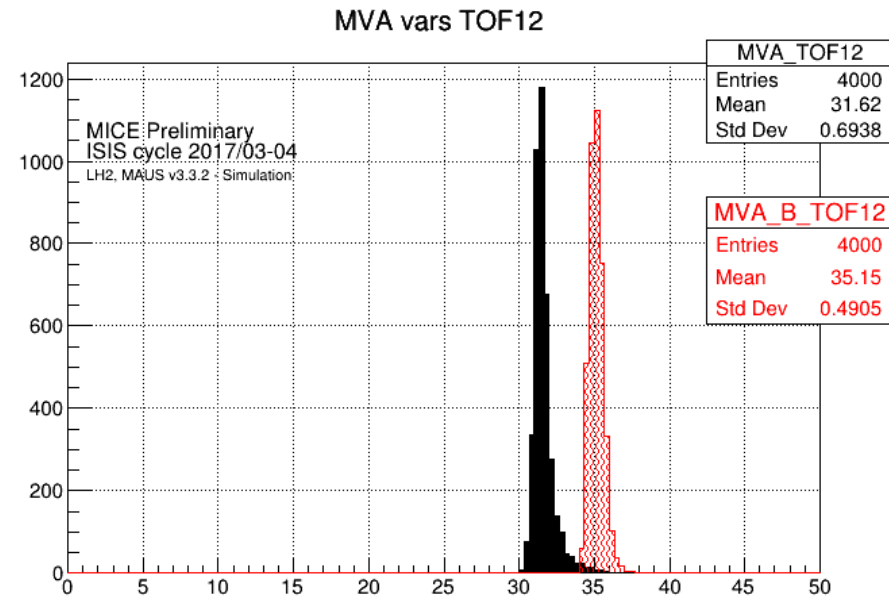
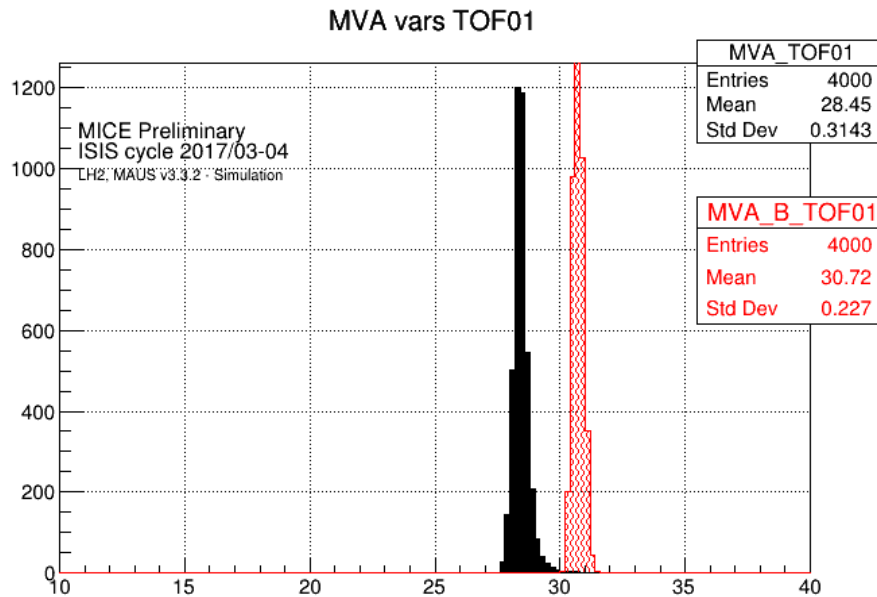
MCS in LH2 (field-off) – Training-set selection



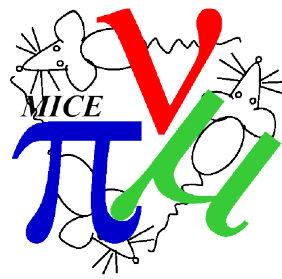
Test (4,000 events)

- Sig
- Bkg

- US track reconstructed
 - Full reconstruction in feature sources
 - With values within physical limits.
- 1 SP in TOFs
 - >0 tracks in EMR
 - >0 cell hits in KL



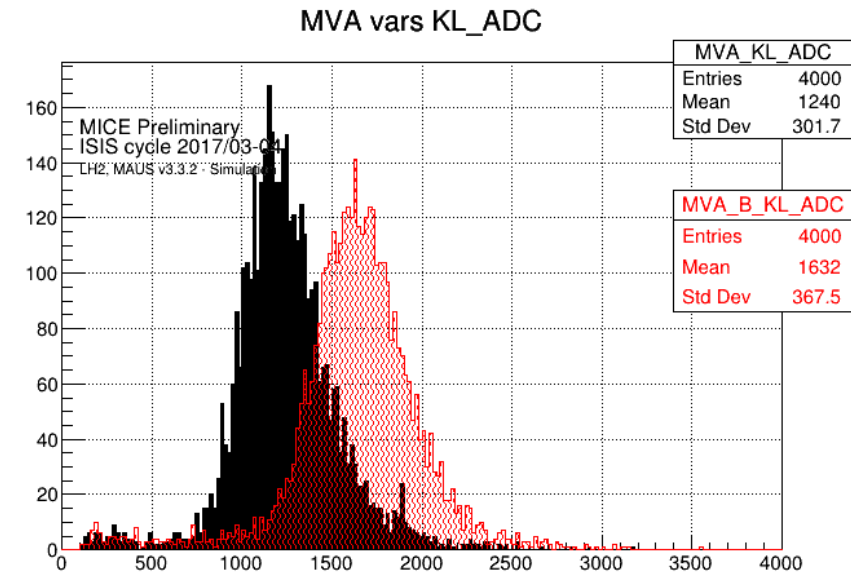
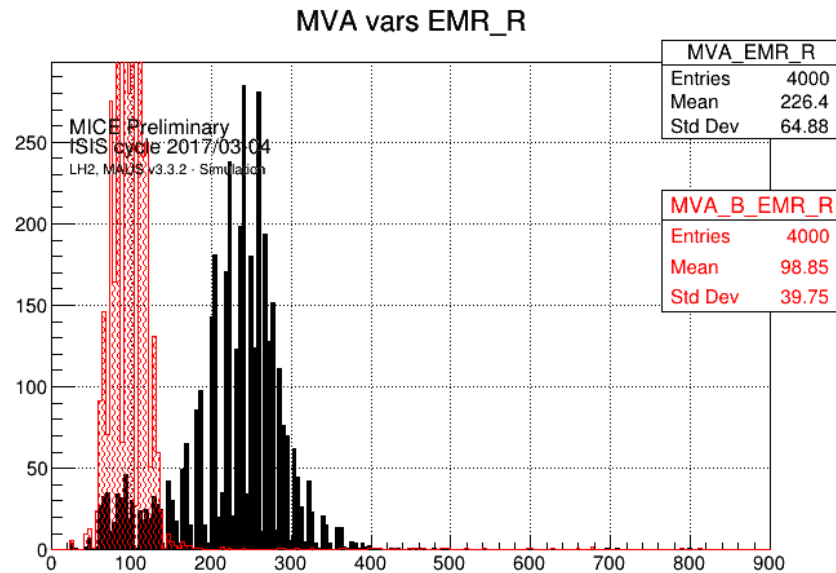
MCS in LH2 (field-off) – Training-set selection



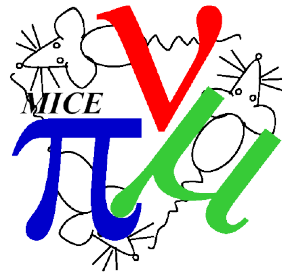
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MCS in LH2 (field-off) – Training-set selection

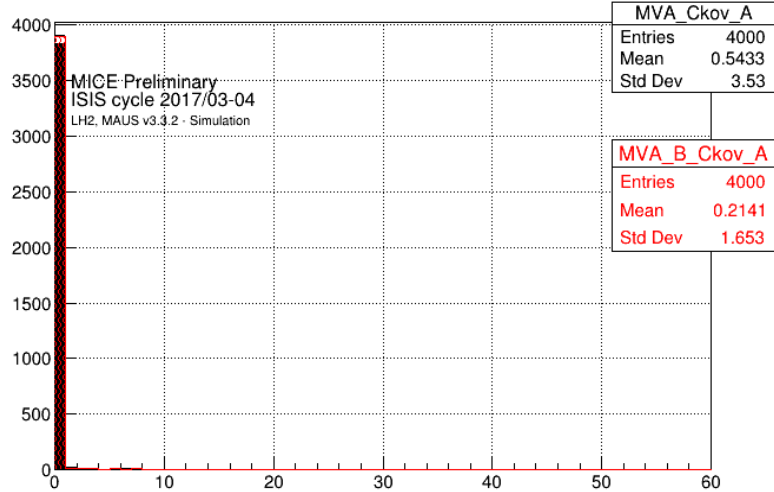


Test (4,000 events)

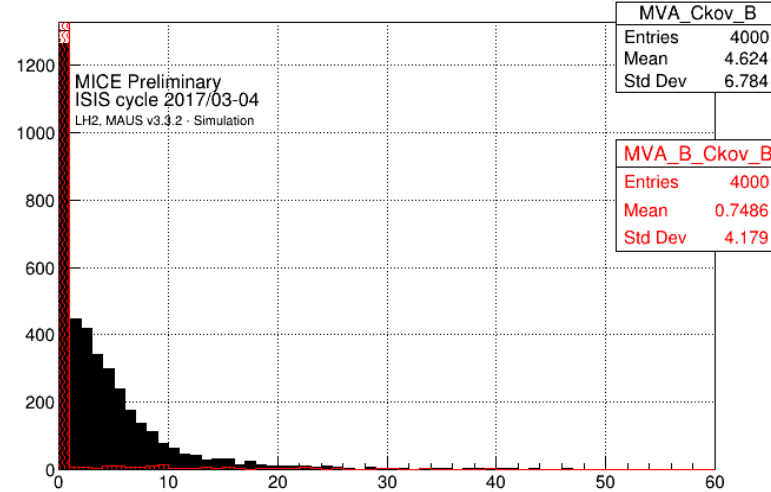
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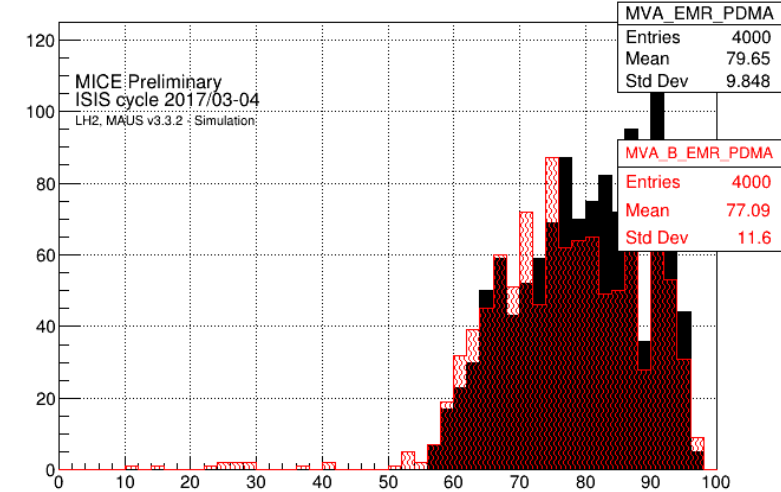
MVA vars Ckov_A



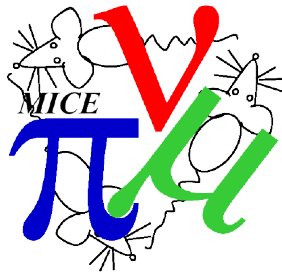
MVA vars Ckov_B



MVA vars EMR_PDMA



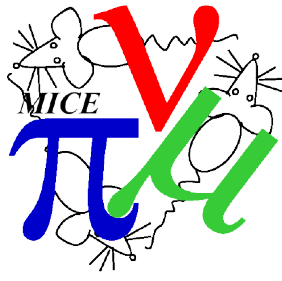
MCS in LH2 (field-off) – LDA



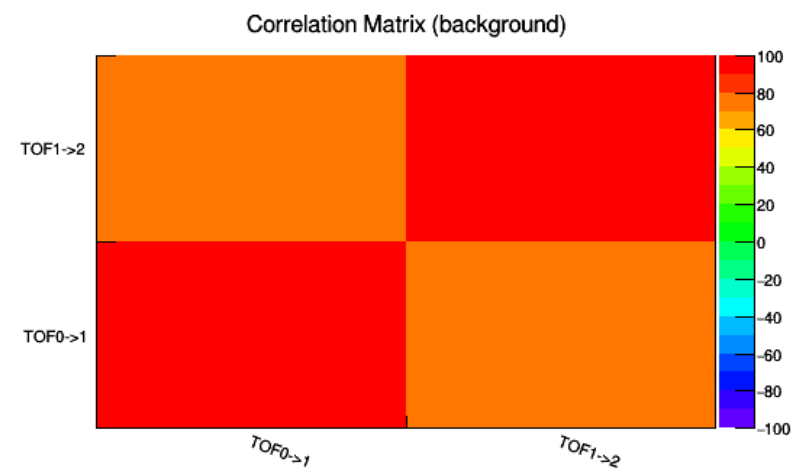
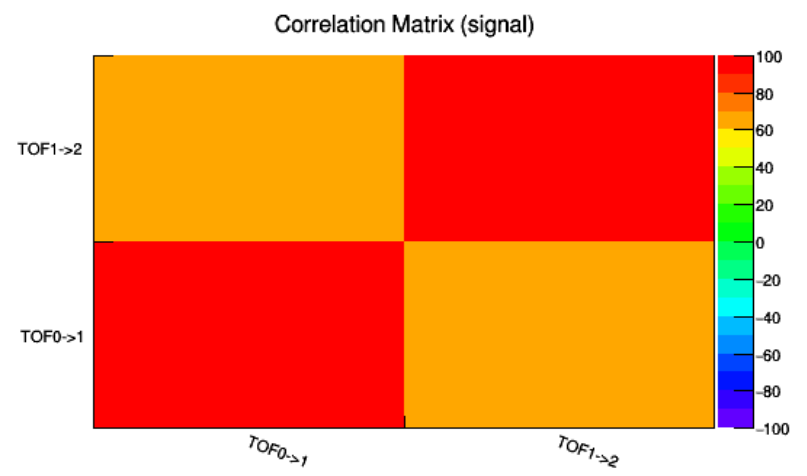
Linear Discriminant Analysis assumptions

- Gaussian variables
- The same covariance between variables for each class
- Moderate linear correlation
- Independence between events

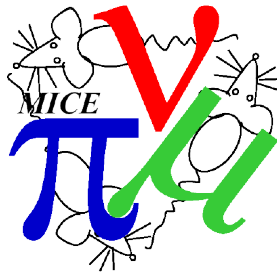
MCS in LH2 (field-off) – LDA



- Features used: TOF01 & TOF12

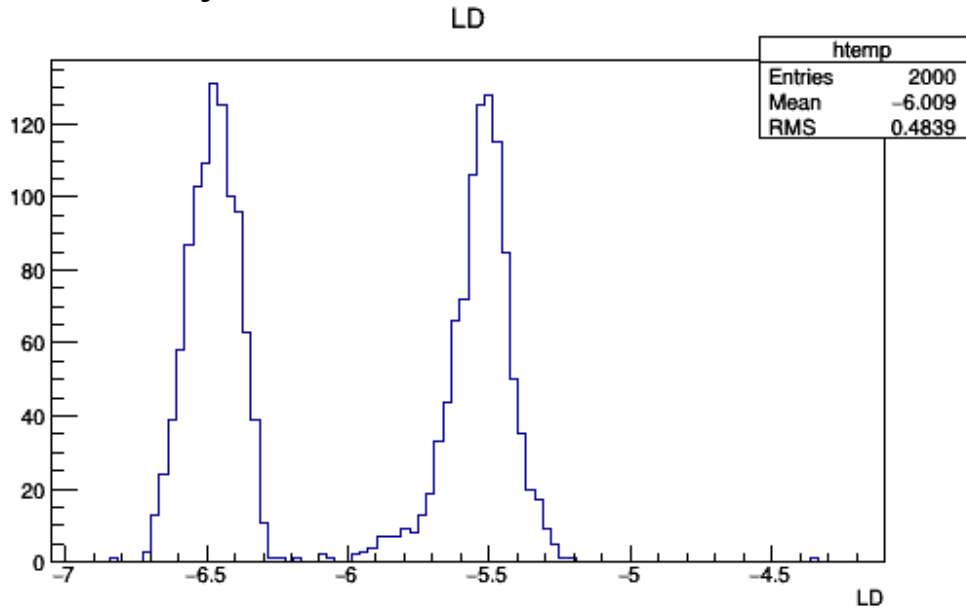


MCS in LH2 (field-off) – LDA

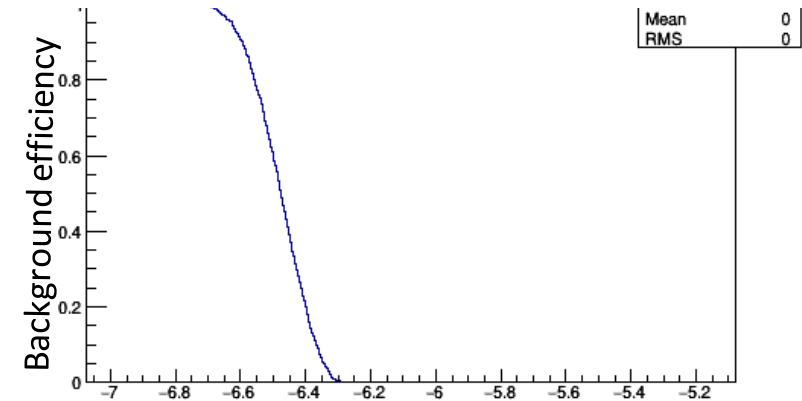
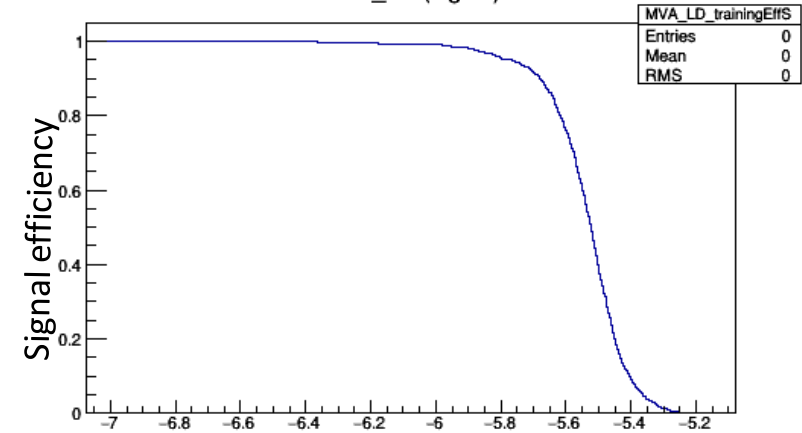


Name: Method: ROC-integral
TOF012 LD : 1.000

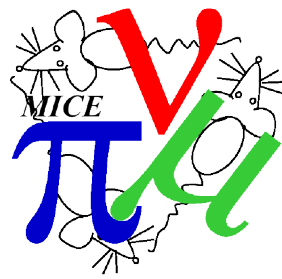
1D Projection of TOF01 & TOF12



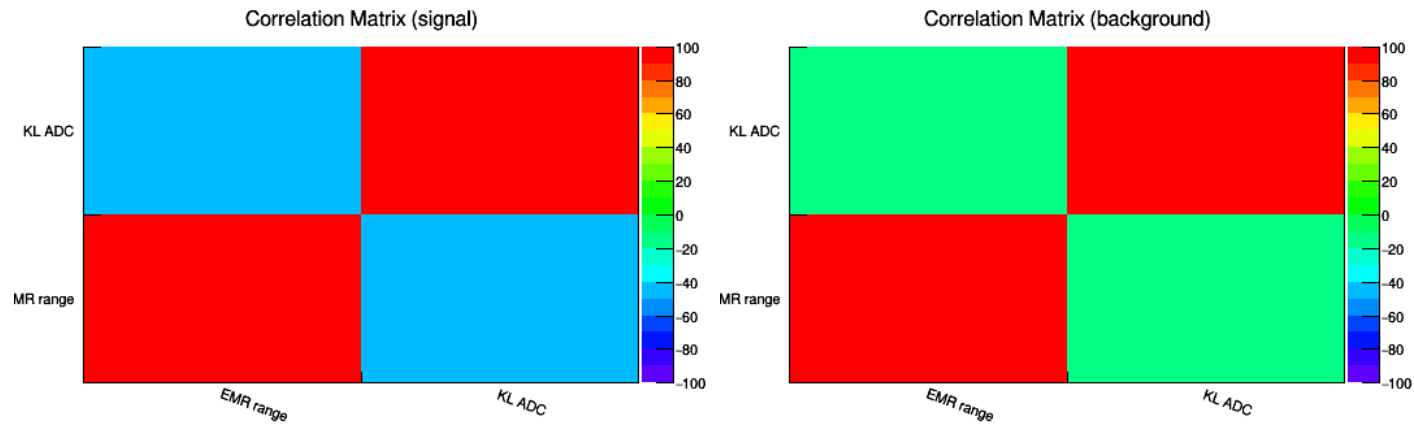
MVA_LD (signal)



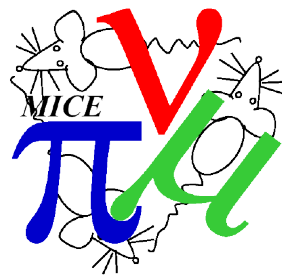
MCS in LH2 (field-off) – LDA



- Features: EMR range & KL ADC

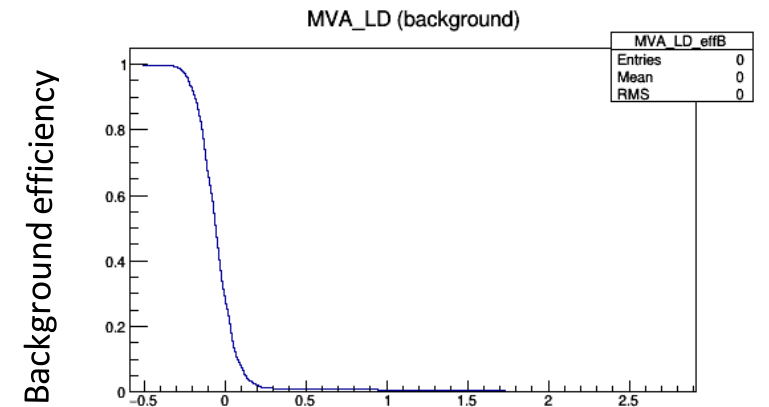
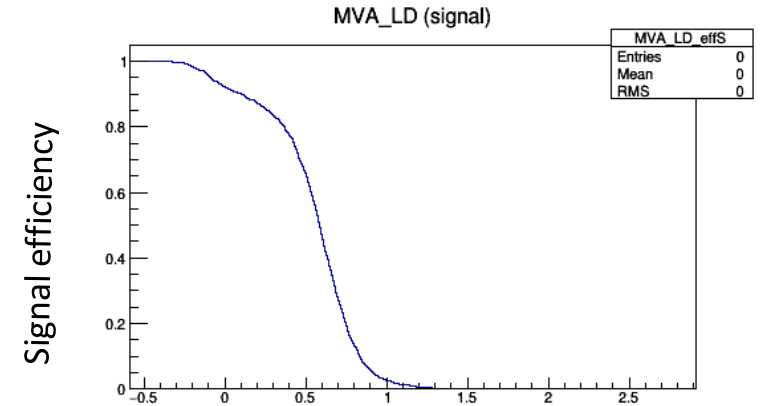
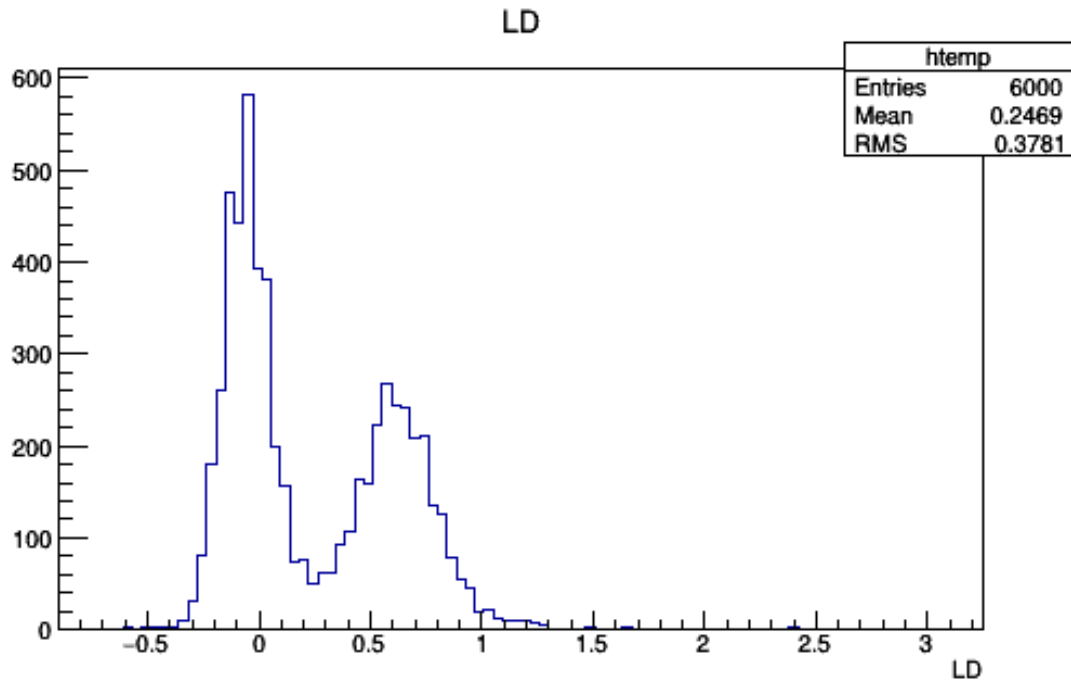


MCS in LH2 (field-off) – LDA

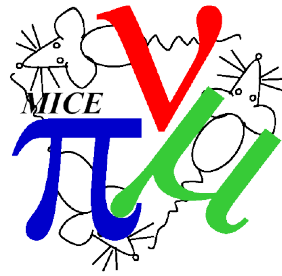


Name: EMR&KL Method: LD ROC-integral: 0.934

1D Projection of EMR range & KL ADC



MCS in LH2 (field-off) – Conclusions



- Issues of TMVA installation have been resolved
- I am only now beginning to explore available functionalities and options
- The algorithm choice will be decided by simplicity and performance
- The next job is exploring the options for data training:
 - Use muonic beam data
 - Different absorber material, EMR & KL data will be shifted
 - Lower momentum to keep species apart in TOF distribution
 - Everything will be shifted