Analysis of TRD beam test data 2011 in CBMROOT

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Transition Radiation Detector (TRD) prototypes from Frankfurt [1] and Münster [2] groups were tested at CERN PS/T9 beam line in October 2011. In this report we present some results of data analysis employing electron identification algorithms developed in the CBMROOT framework.

An example of energy loss spectra for electrons and pions for the foam radiator is shown in Figure 1. The energy loss data for our study was generated from energy loss distribution histograms assuming that all TRD layers are identical with respect to energy loss measurements.

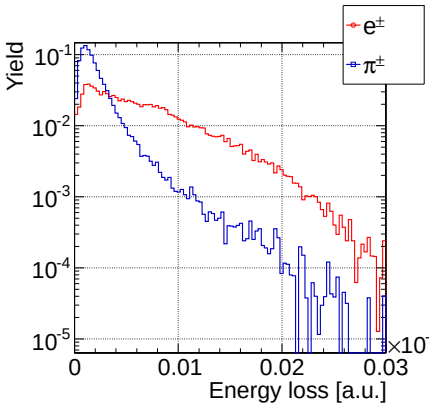

Figure 1: Energy loss spectra for electrons and pions.

Several electron identification algorithms were developed in CBMROOT including algorithm based on the artificial neural network (ANN) [3], algorithm based on boosted decision tree (BDT) [4], Likelihood method, threshold on the mean value, threshold on the median value.

Number of TRD layers required to achieve necessary pion suppression level is a crucial parameter for TRD. We studied the algorithms to evaluate required number of layers. Results are shown in Figure 2. Pion suppression efficiency is shown assuming 90% of electron identification efficiency. According to our results required pion suppression level can be achieved with 9-10 TRD layers for regular foiled radiator as well as for irregular foam radiators.

Different radiator types were investigated on the TRD prototypes. Here we present the results for selected radiators tested by Münster group (**B, F** - regular foil radiator, **H++** - irregular foam, **G30** - fiber) and by Frankfurt group (**5mm_fibre** - a fiber radiator as used in the ALICE TRD, **4mm_foam** - a polypropylene foam radiator, **4mm_f350** - regular foil radiator). The best results were achieved for regular foil type radiator (see Figure 3). Such radiators usually require a significant external support frame to keep

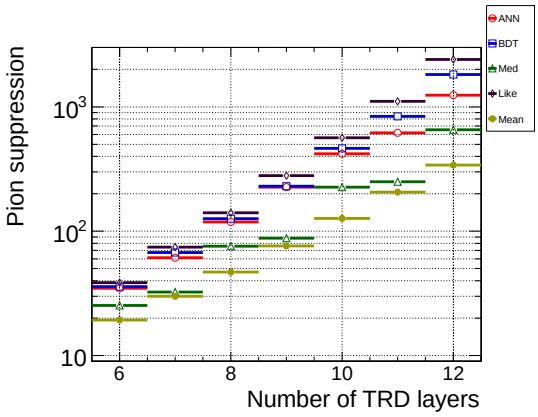

Figure 2: Pion suppression level in dependence on number of TRD layers for **4mm_foam** radiator from Frankfurt group.

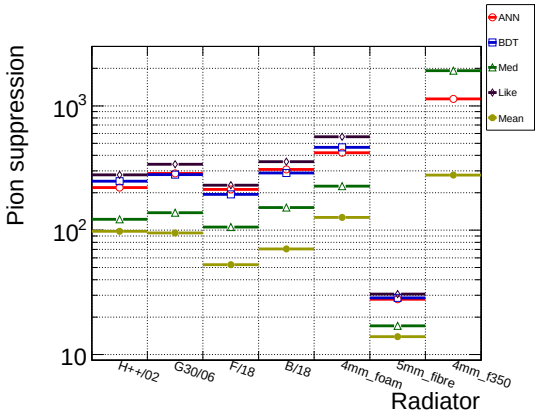

Figure 3: Pion suppression level for different radiator types.

the foils. But the reasonable pion suppression can also be achieved with irregular foam radiator. These radiators are self supporting and much cheaper than regular ones.

The best performance as expected showed three methods: Likelihood, ANN and BDT.

References

[1] A. Arend et al., GSI Progress Report 2011, p.48

[2] C. Bergmann et al., GSI Progress Report 2011, p.47

[3] E.P. Akishina et al., CBM Progress Report 2009, p.82

[4] S.Lebedev et al J. Phys.: Conf. Ser. **396** 022029, 2012