MARATHON PID Check

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Marathon Weekly Meeting

Regular Way to Check PID

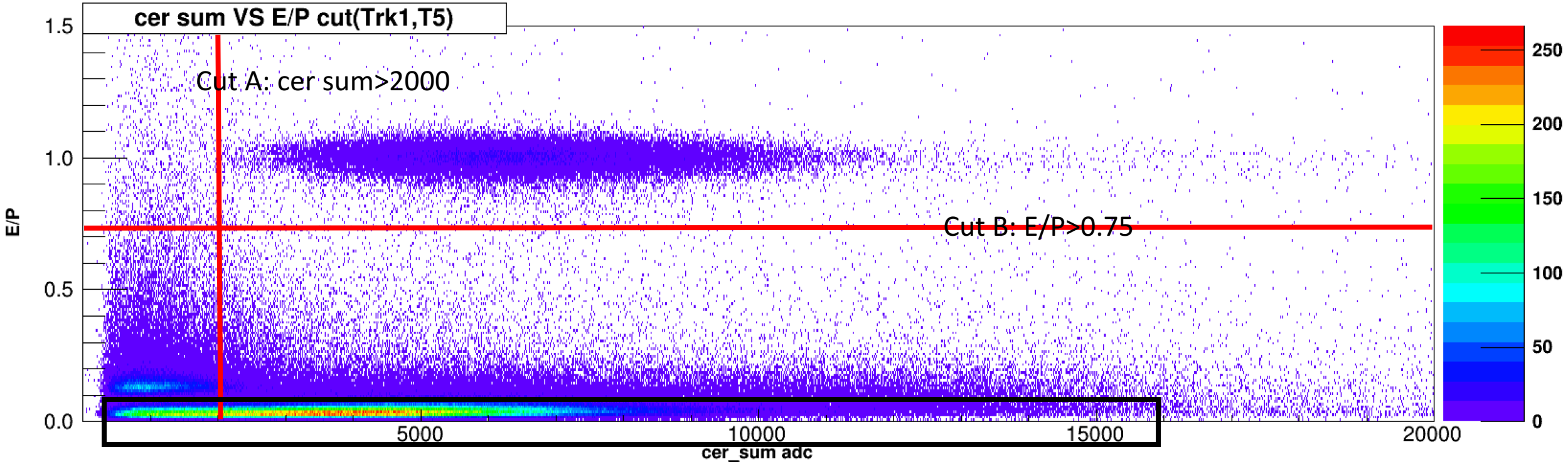
- 2 PID detectors : Cherenkov and Calorimeter
- Both PID detectors should be more sensitive to electron compare with pion
- Select a pure electron /pion sample from one of the detectors and check the performance in the other one

MARATHON PID difficulty

- More than one kind of “particles” can active the Cherenkov

- Sample Selecting

	Cherenkov	Calorimeter
Electron	X	✔
Pion	X	difficult
Something like μ	X	difficult



A Compromised Solution

- Treat all the non-electron events as whole

	Cherenkov	Calorimeter
electrons	X	✔
Non-electrons	X	✔

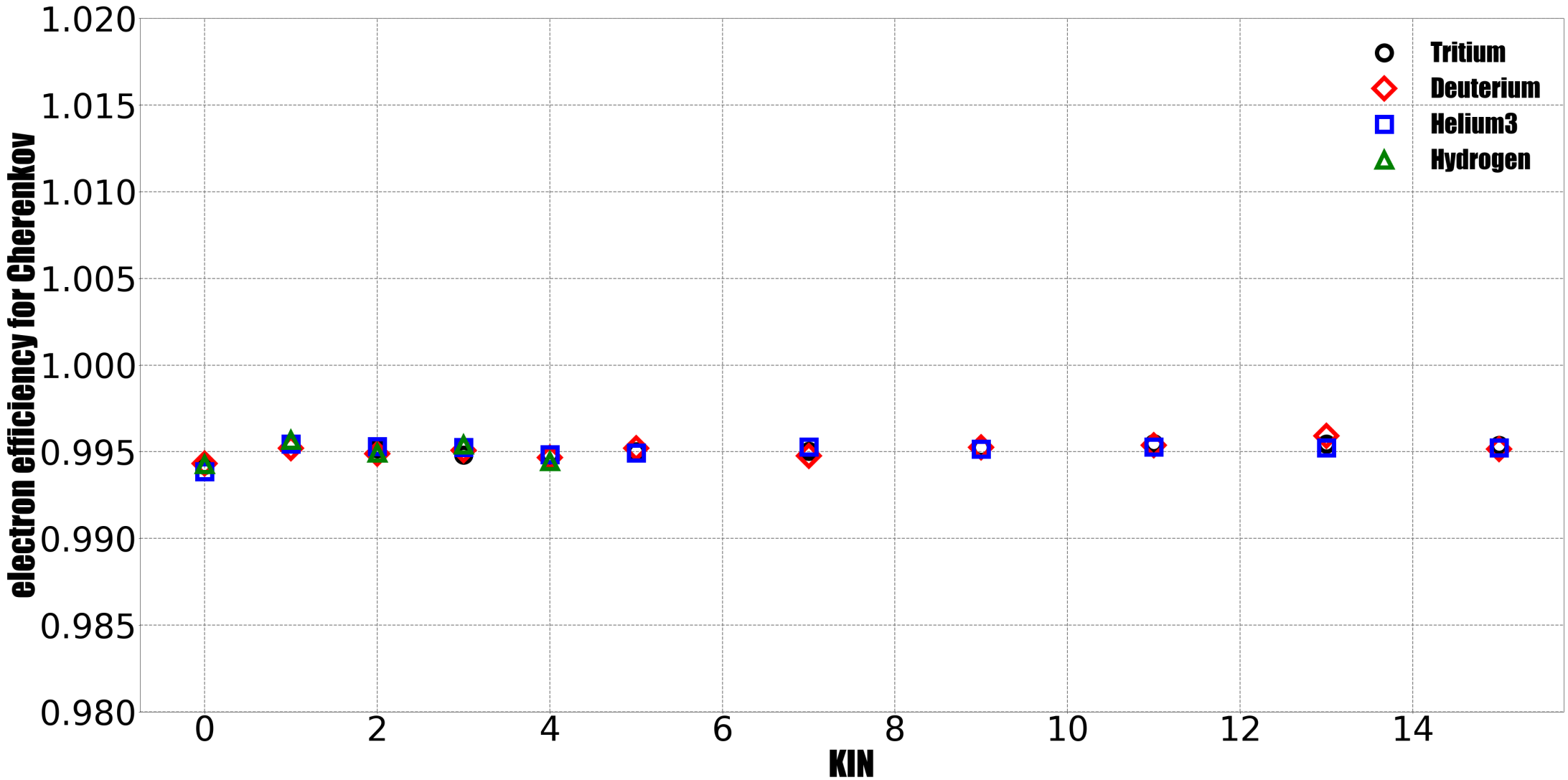
- $\begin{cases} \boldsymbol{P_x^A}: \text{Probality for non} - \text{electron pass cer cut} \\ \boldsymbol{P_e^A}: \text{Probality for electron pass cer cut} \\ \boldsymbol{P_x^B}: \text{Probality for non} - \text{electron pass ep cut} \\ \boldsymbol{P_e^B}: \text{Probality for electron pass ep cut} \end{cases}$
- Since clean sample can be selected from Calorimeter, so P^A_x P^A_e can be calculated

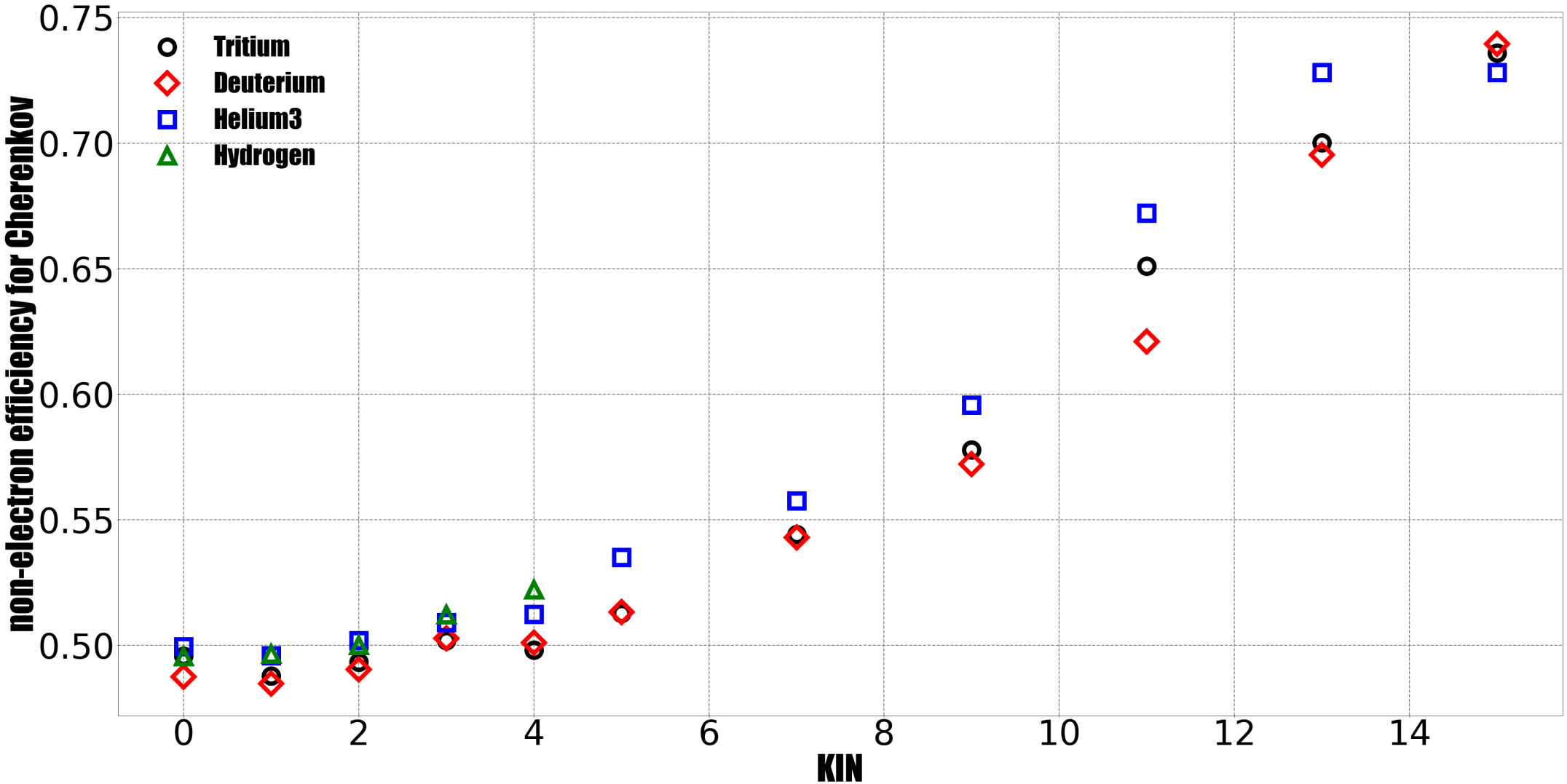
A Compromised Solution

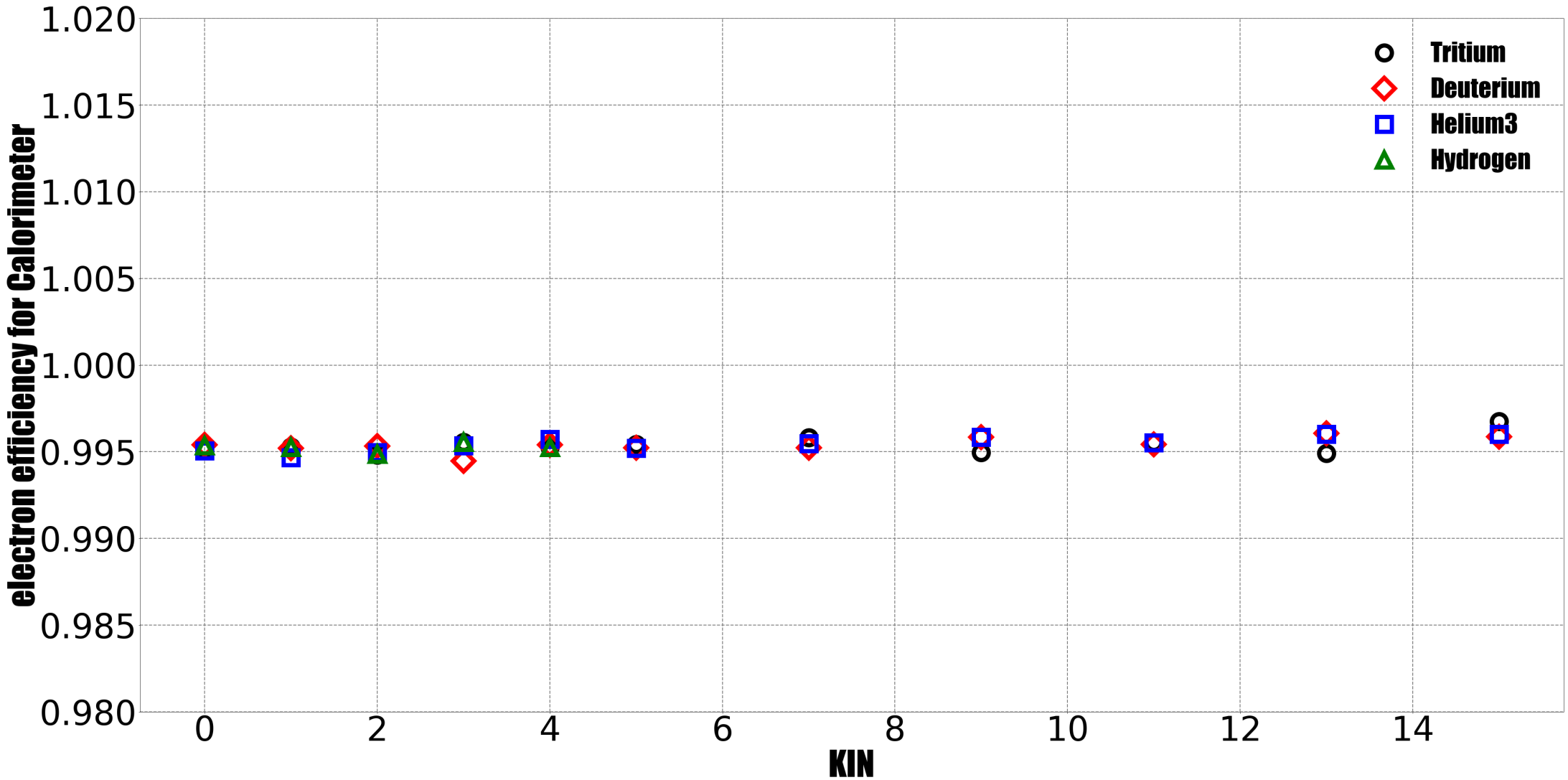
- x: number of the non-electron
- e: number of the electron
- $N_{i:}$ number of events with different cut

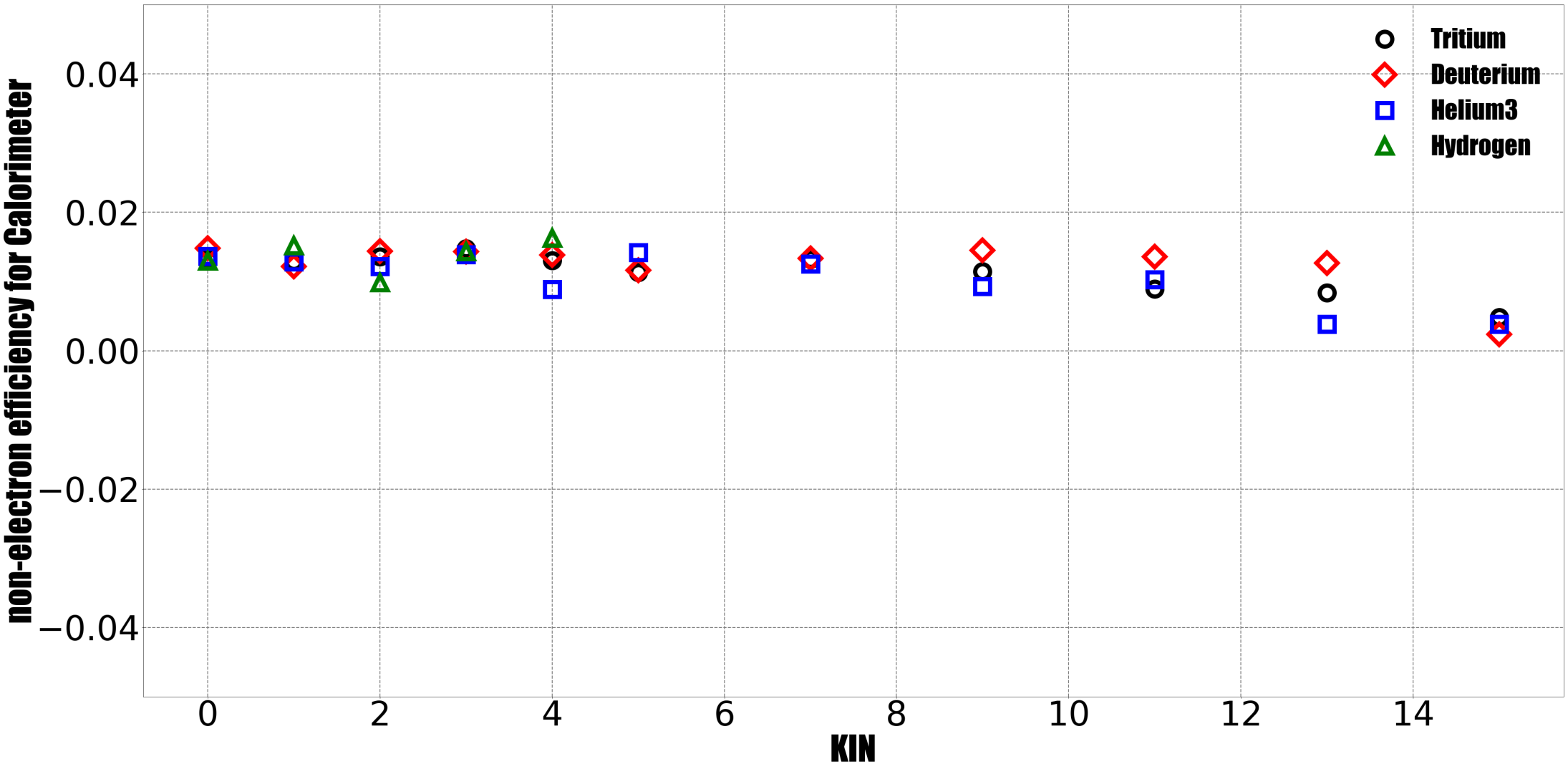
Cut A	Cut B	Relations *
X	X	$x + e = N_0$
✔	X	$P_x^A x + P_e^A e = N_1$
X	✔	$P_x^B x + P_e^B e = N_2$
✔	✔	$P_x^A P_x^B x + P_e^A P_e^B e = N_4$

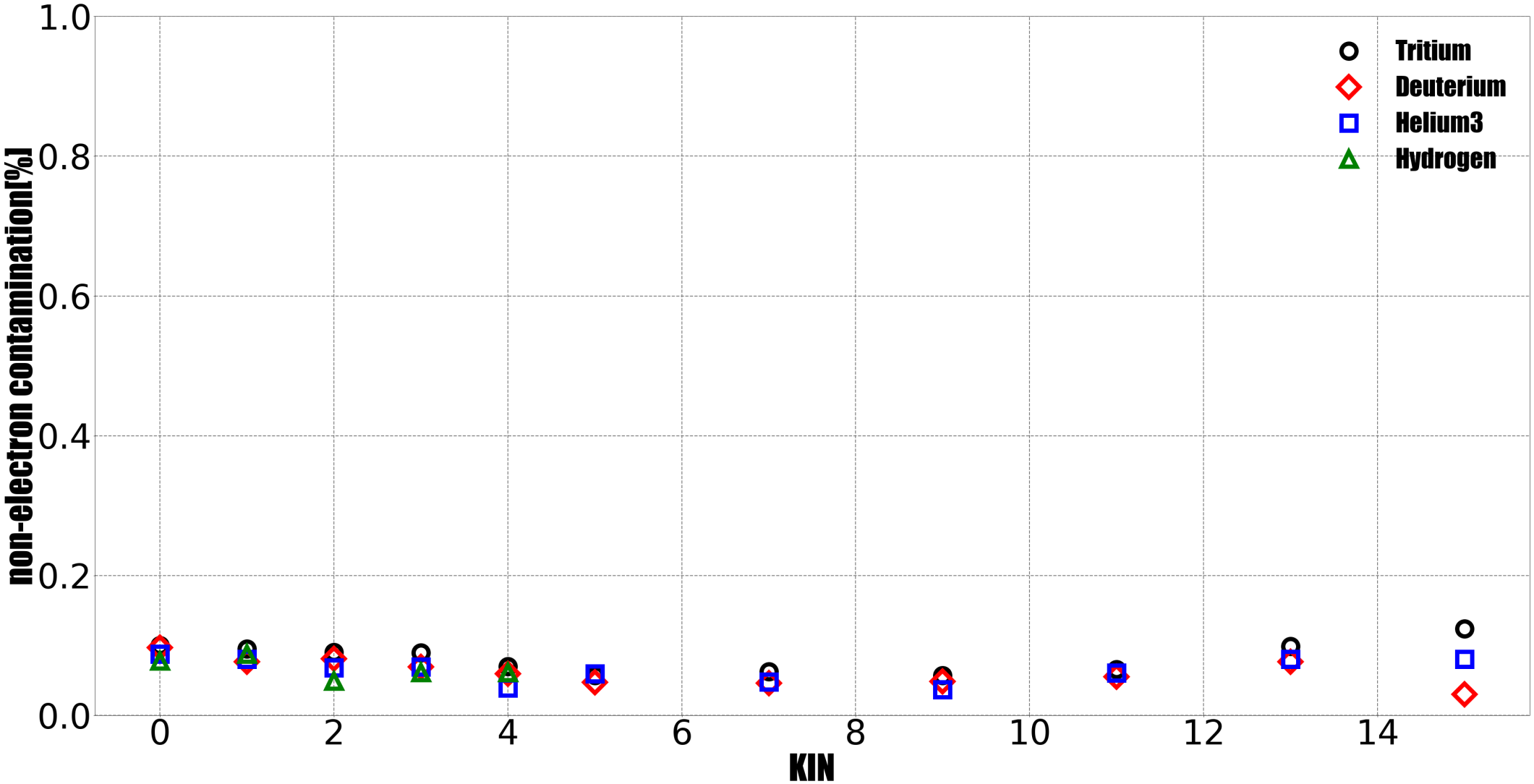
* General Good Electron Cut has been applied


electron efficiency for Cherenkov
1.020
1.015
1.010
1.005
1.000
0.995
0.990
0.985
0.980
0
2
4
6
8
10
12
14
KIN
Tritium
Deuterium
Helium3
Hydrogen


Tritium
Deuterium
Helium3
Hydrogen
non-electron efficiency for Cherenkov
KIN
0.75
0.70
0.65
0.60
0.55
0.50
0
2
4
6
8
10
12
14


electron efficiency for Calorimeter
1.020
1.015
1.010
1.005
1.000
0.995
0.990
0.985
0.980
0
2
4
6
8
10
12
14
KIN
Tritium
Deuterium
Helium3
Hydrogen


non-electron efficiency for Calorimeter
0.04
0.02
0.00
−0.02
−0.04
0
2
4
6
8
10
12
14
KIN
Tritium
Deuterium
Helium3
Hydrogen


1.0
0.8
0.6
0.4
0.2
0.0
non-electron contamination[%]
0
2
4
6
8
10
12
14
KIN
Tritium
Deuterium
Helium3
Hydrogen

Conclusion

- The efficiency for the two detectors are high and stable for electrons
- Non-electron contamination are low(≈0.1%) and stable for different target
- Seems we donot need to take care of the PID correction