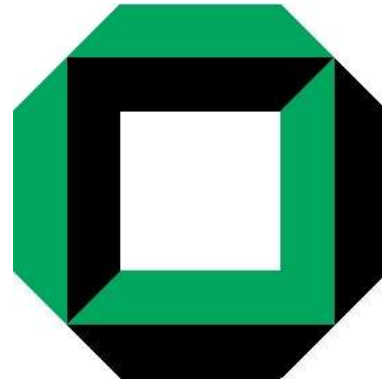


Plug Electron ID using Neural Network techniques



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EWK meeting

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Variables for plug electron ID

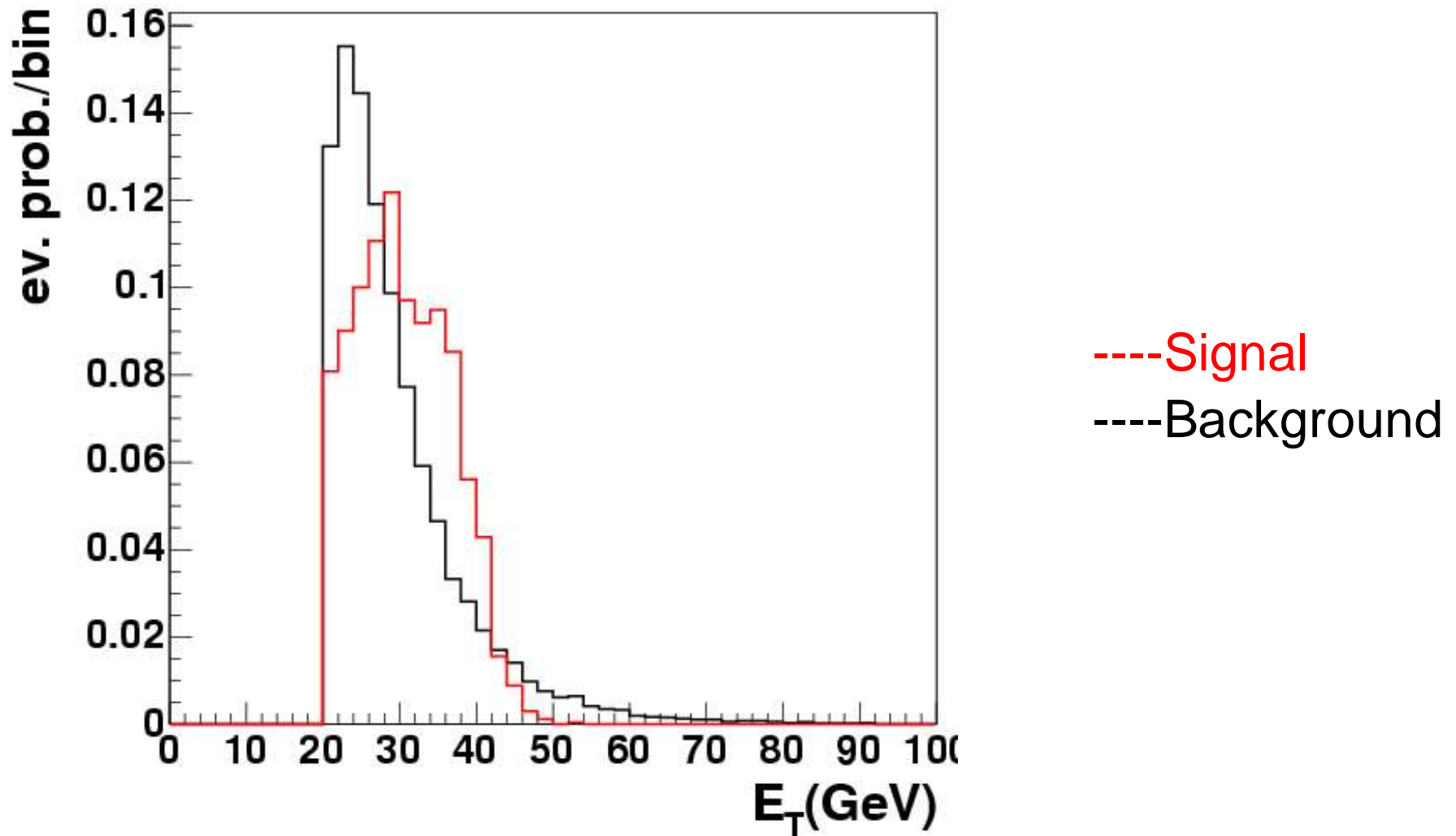
- ◆ Fiducial cut: $1.2 < |\eta| < 2.8$
- ◆ EmE_{τ}
- ◆ HadE/EmE (sliding cut)
- ◆ Isolation Ratio
- ◆ PEM χ^2 (comparison with test beam data)
- ◆ PES 5by9 u/v (Shower profile in PES in u and v direction)

Selection of the samples

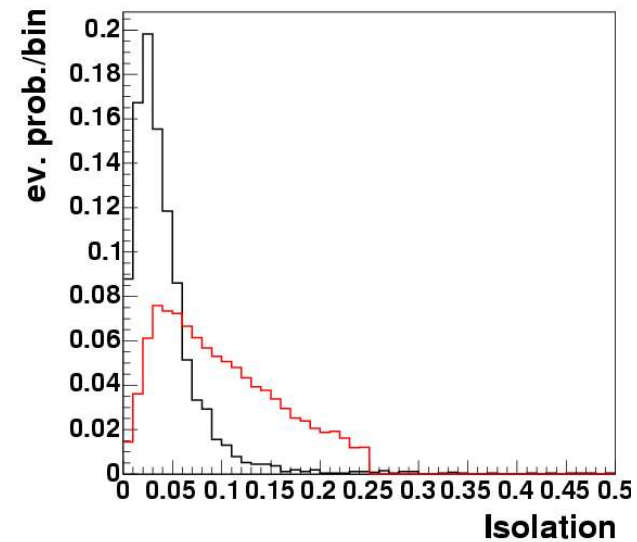
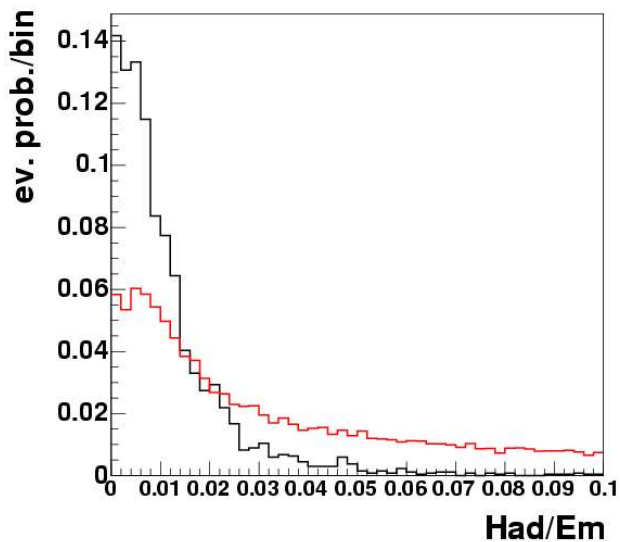
- ◆ Signal sample:
 - ◆ 1 tight central electron
 - ◆ Another electron candidate in plug (Z-Candidate)
 - ◆ Cut to be independent of trigger cuts
 - ◆ ~3000 events remain
- ◆ Background sample:
 - ◆ 2 balanced jets (1 central, 1 plug)
 - ◆ Several preselection cuts
 - ◆ ~15000 events remain

Both samples taken from data! (bpe108)

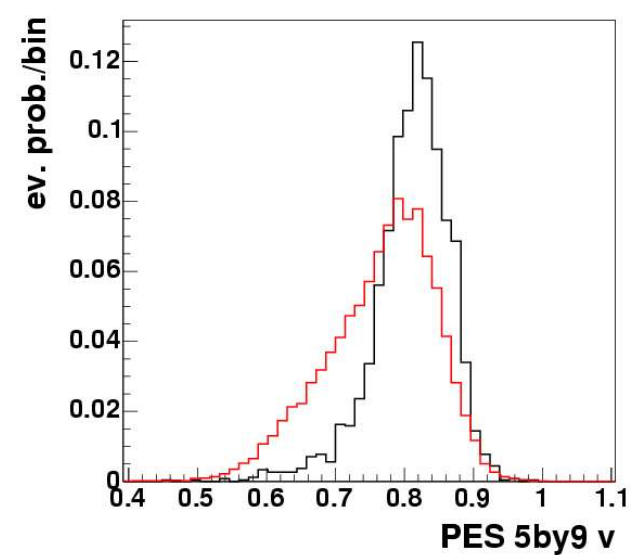
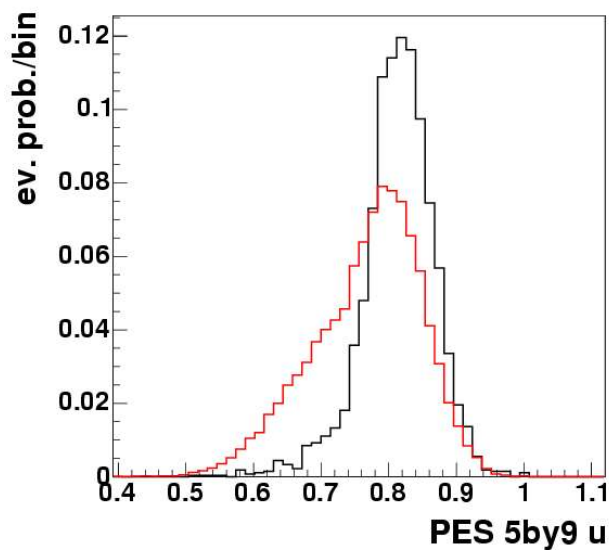
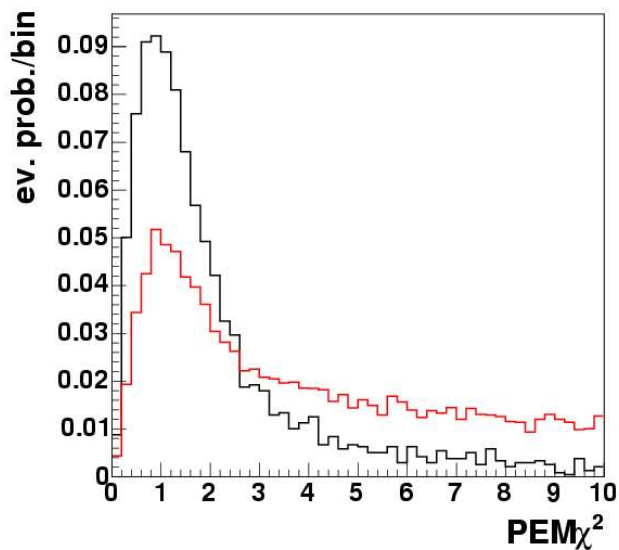
Control plot: E_T of plug electron



Selection variables



----Signal ----Background



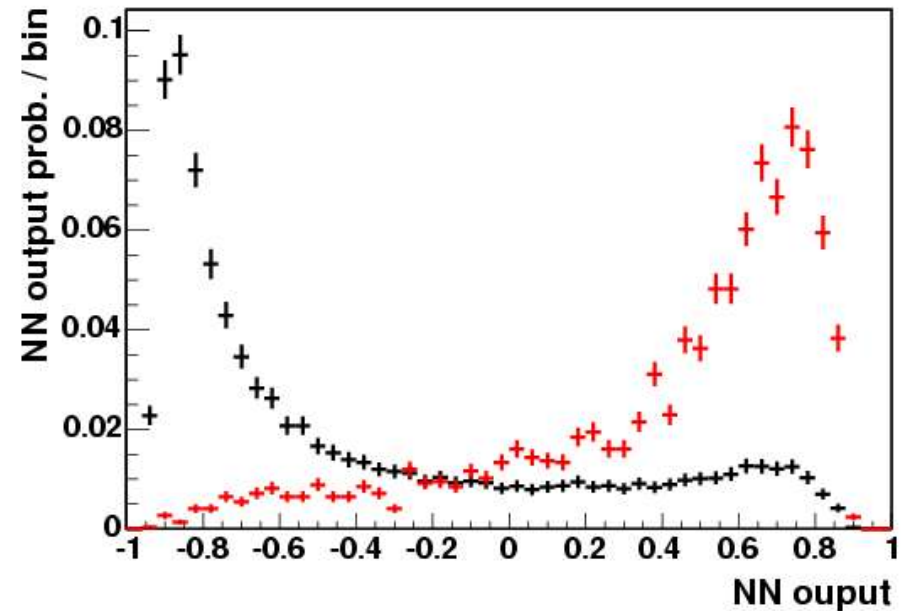
Cuts: selection

	Signal		Background	
Total	2926	100.00%	15133	100.00%
Plug-e:HadEm < .05+0.026ln(EmE/100)	2884	98.53%	12147	80.27%
Iso < 0.1	2740	93.64%	7364	48.66%
PEM Chi2 < 10	2496	85.30%	5132	33.91%
PES 5by9 u > 0.65	2468	84.34%	4824	31.88%
PES 5by9 v > 0.65	2441	83.42%	4595	30.36%
Comparision with CDF note 6789		84.60%		

Room for optimization?

Artificial Neural Network

- ◆ 5 variables
 - ◆ Had/Em
 - ◆ Isolation
 - ◆ PEM chi2
 - ◆ PES 5/9 u/v
- ◆ 10 nodes in intermediate layer
- ◆ Binary classification (-1 background, 1 signal)
- ◆ 200 iterations



NN cut	Signal	Background
0	84%	21%
-0.3	91%	30%
Cutbased:	84%	30%

Correlation matrix

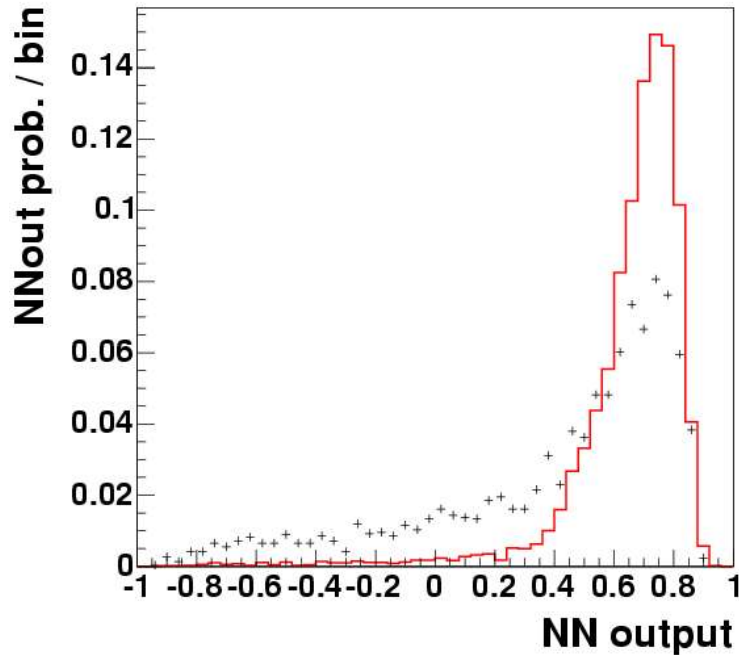
	Target	HadEm	Iso	PEM chi2	PES 5/9 u	PES 5/9 v
Target	100.0%	-22.9%	-50.8%	39.2%	29.3%	29.7%
HadEm	-22.9%	100.0%	36.0%	24.2%	-9.6%	-7.7%
Iso	-50.8%	36.0%	100.0%	51.6%	-25.4%	-24.2%
PEM chi2	39.2%	24.2%	51.6%	100.0%	-29.3%	-28.6%
PES 5/9 u	29.3%	-9.6%	-25.4%	-29.3%	100.0%	40.7%
PES 5/9 v	29.7%	-7.7%	-24.2%	-28.6%	40.7%	100.0%

Target is -1 for background, 1 for signal

Relevance

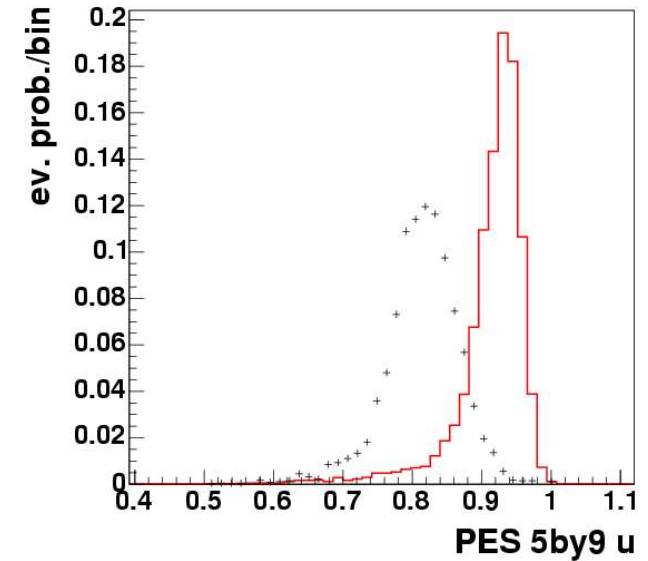
Rank	Variable	Correlation (%)	Correlation (sigma)
1	Iso	50.80%	57.12
2	PES 5/9 v	17.91%	20.14
3	PEM Chi2	11.93%	13.41
4	PES 5/9 u	9.60%	10.79
5	Had/Em	4.30%	4.83

Data vs MC (quick check)



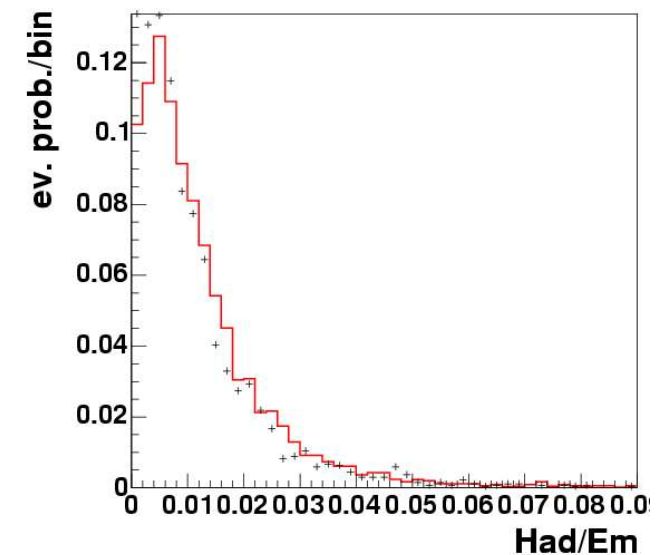
+ Data

---- MC



NN cut	Data eff.	MC eff.
0.0	84%	98%
-0.3	91%	99%

→ Correction factor for MC
(or better MC simulation)



Conclusion, outlook

- ◆ Correlations between selection variables
- ◆ ANN can improve selection and ID

- ◆ Use more variables
- ◆ Use tracking information
- ◆ Test with analysis