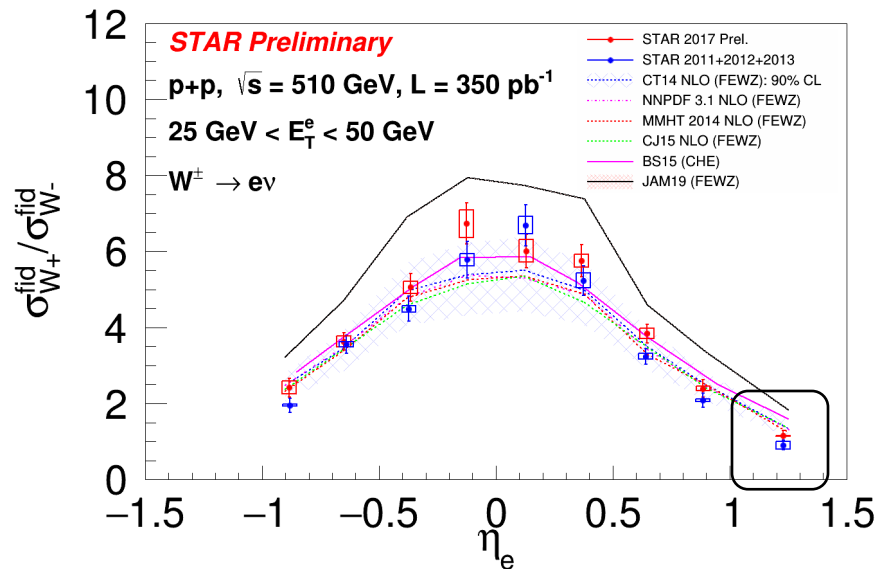


W^+ / W^- ratio analysis STAR Run 2017

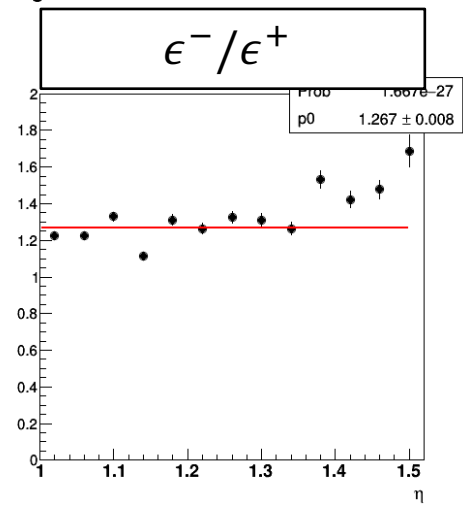
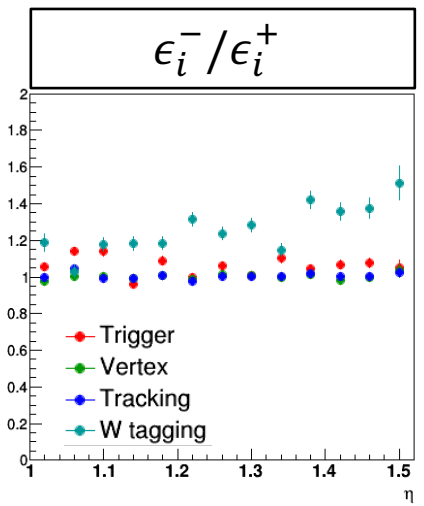
Jae D. Nam
Temple Univ.



Recap



- RW measurement in the endcap region.
 - Incorrect EEMC calibration.
 - Without charge/efficiency corrections.
 - Without systematic uncertainty.

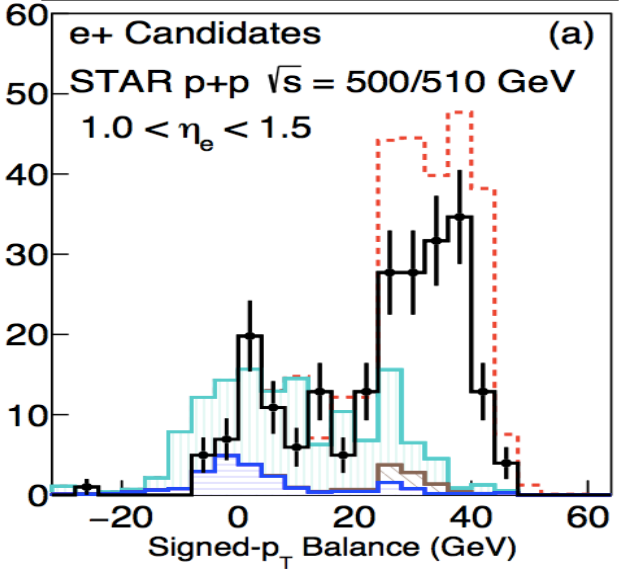


- Efficiency ratio.
 - Correct EEMC calibration.
 - Computed without the E_T cut.
 - Only consider L2EW triggering events.
 - 20~30% charge dependence.

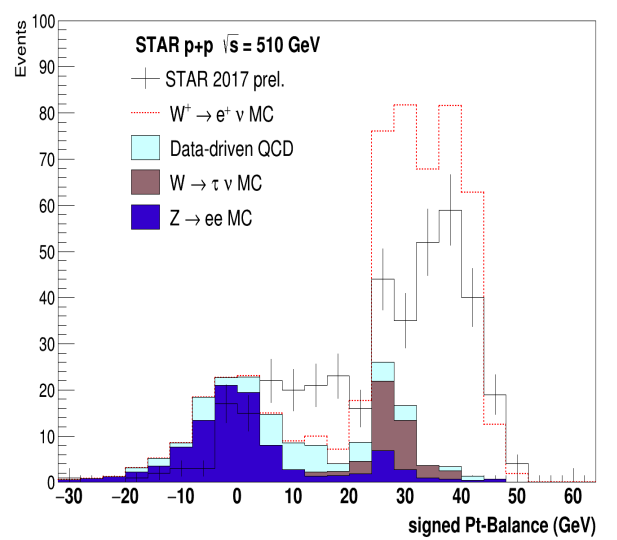


W tagging with EEMC calibration

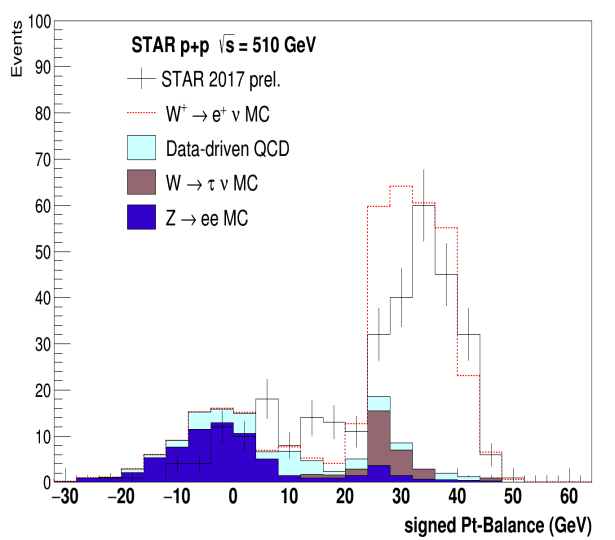
Run 13 (top:W+, bottom: W-)



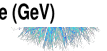
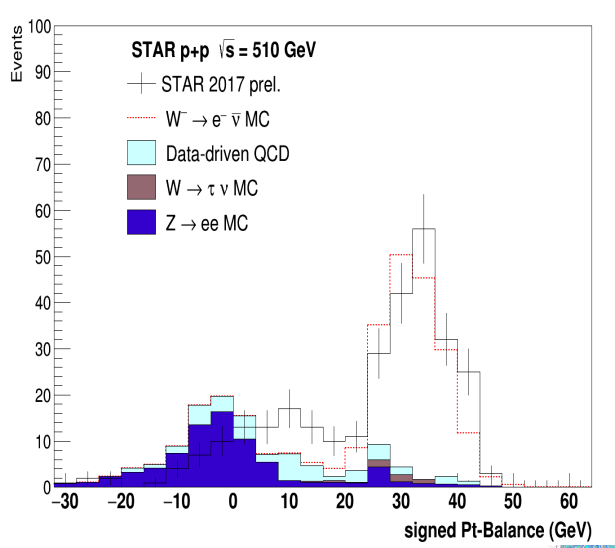
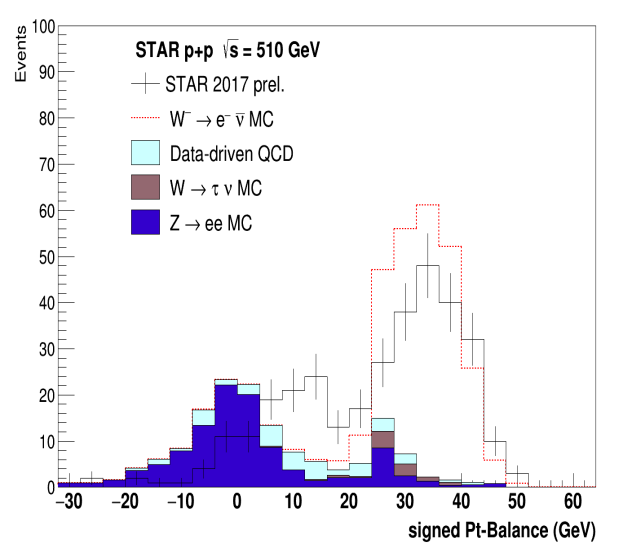
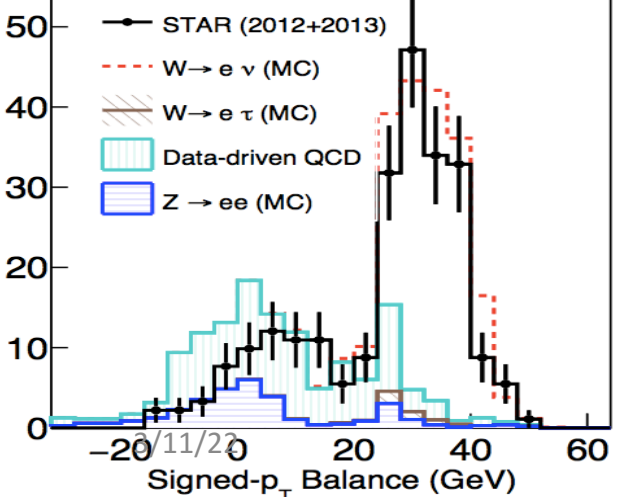
Run 17 (incorrect calibration)



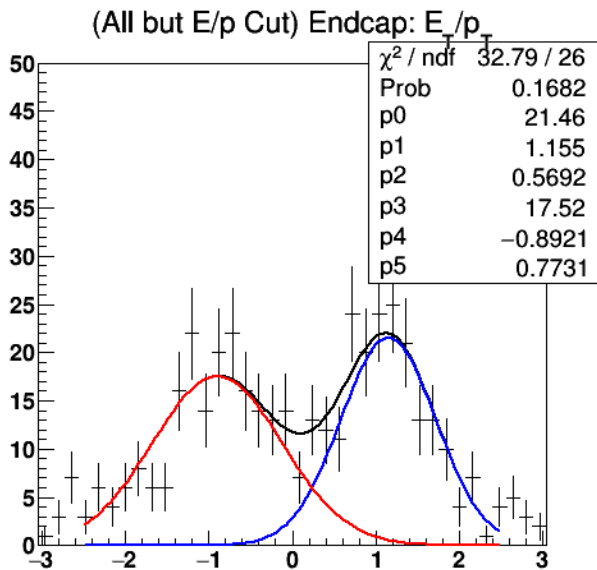
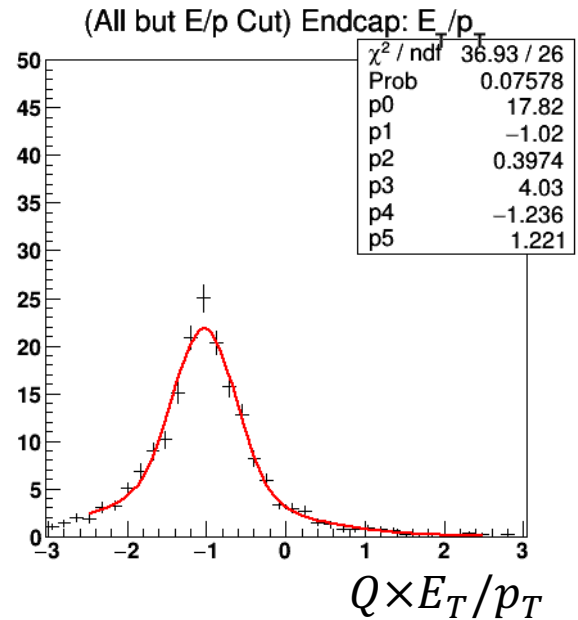
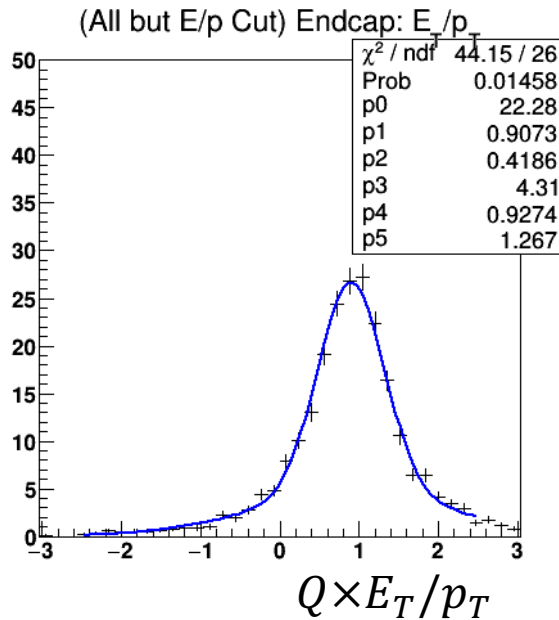
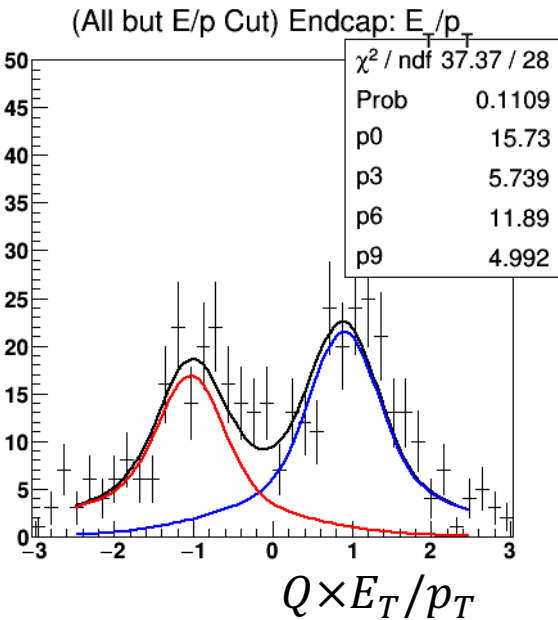
Run 17 (correct calibration)



(b) e- Candidates



Charge correction



- 4-Gaus method

- MC distributions were fitted to a 2-Gaus.
- The width and mean of these Gaus's were fed to the 4-Gaus function.
- $C_{charge} = \frac{N_{cor}^- / N^-}{N_{cor}^+ / N^+} = \frac{109/144}{137/173} = \frac{0.76}{0.79} = 0.95$

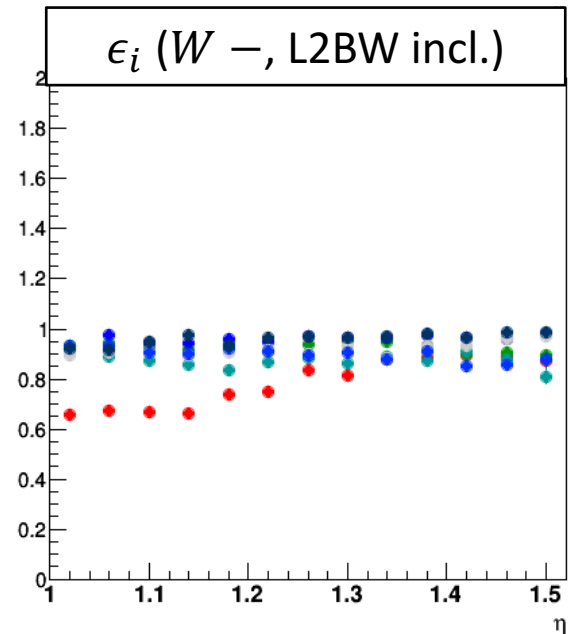
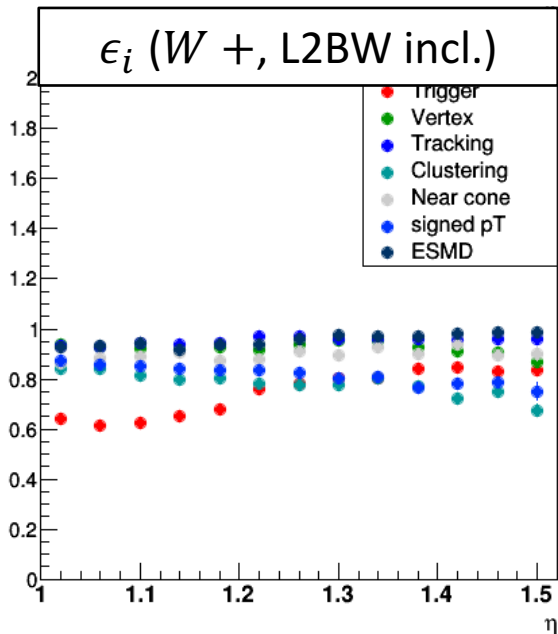
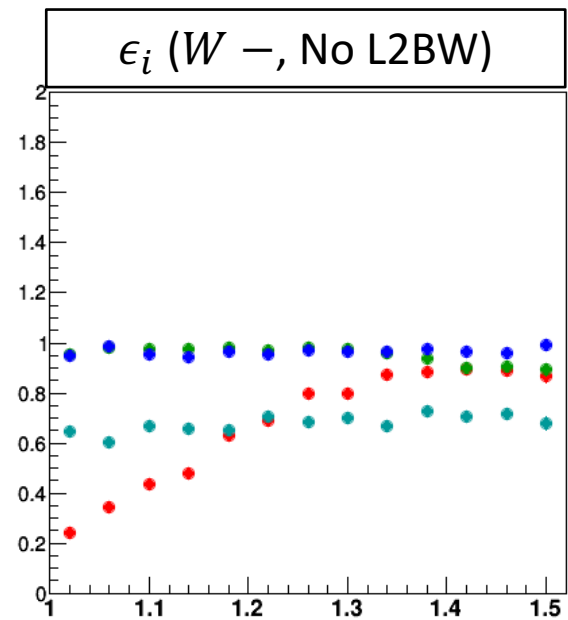
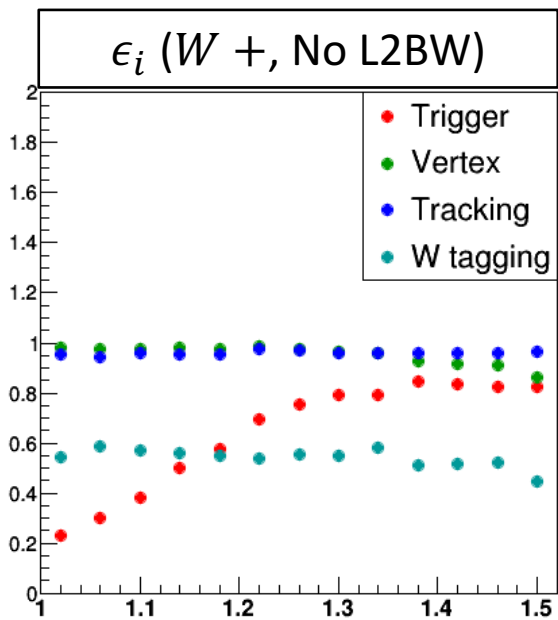
- 2-Gaus method

- Log-likelihood method was used to fit the data distribution to a 2-Gaus function.
- The mean of the two Gaus's were required to be within the range $1(-1) \pm 0.5$.
- $C_{charge} = \frac{131/144}{149/173} = \frac{0.91}{0.86} = 1.06$

- The publication takes the difference in the correction factor as the systematic uncertainty associated with charge separation.



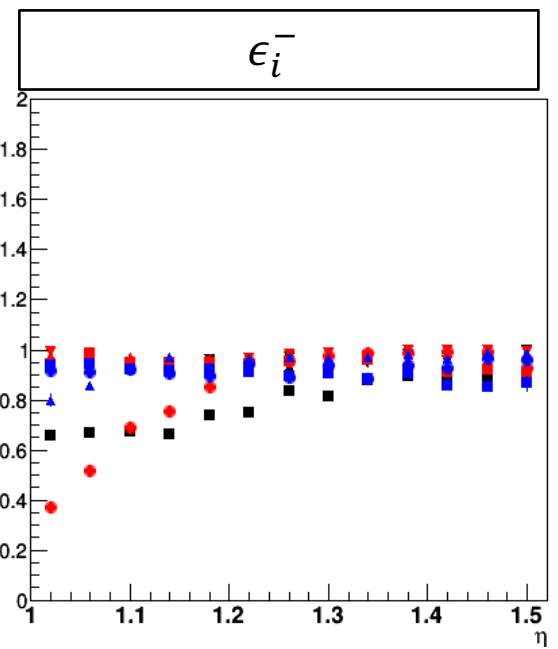
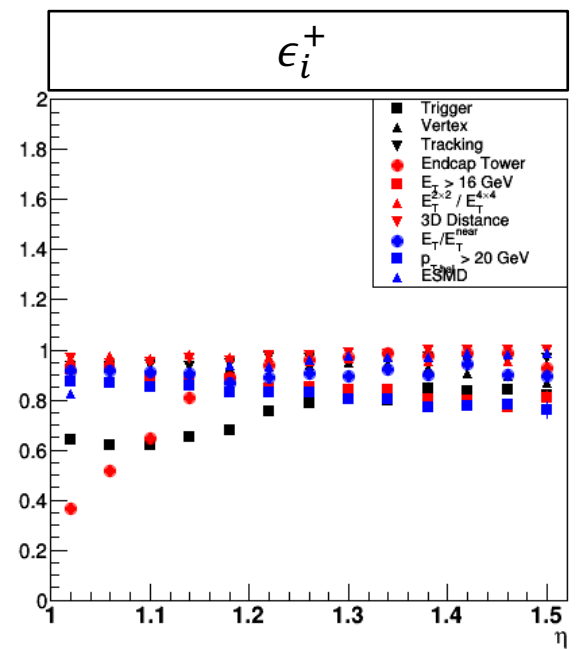
Efficiency correction



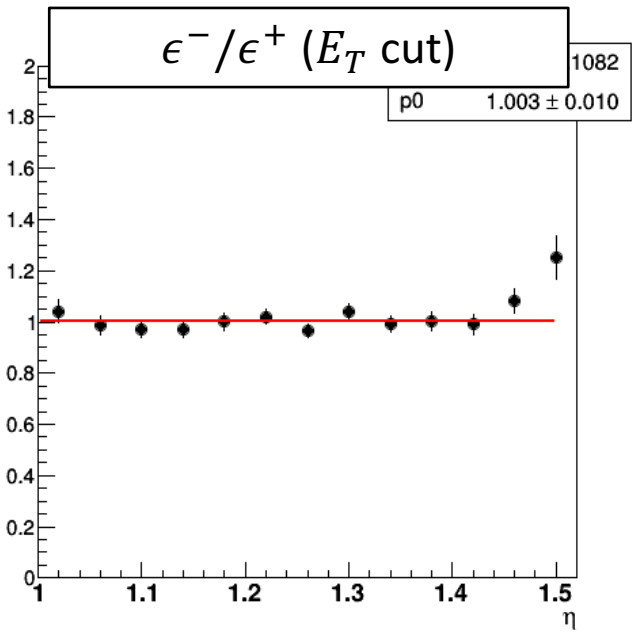
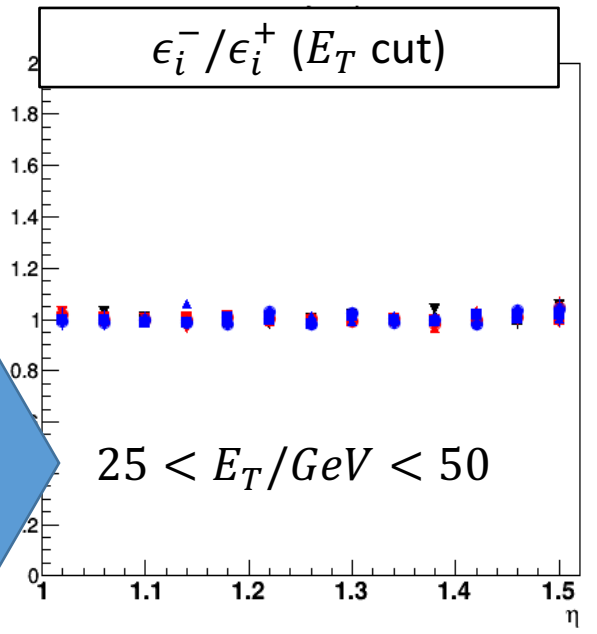
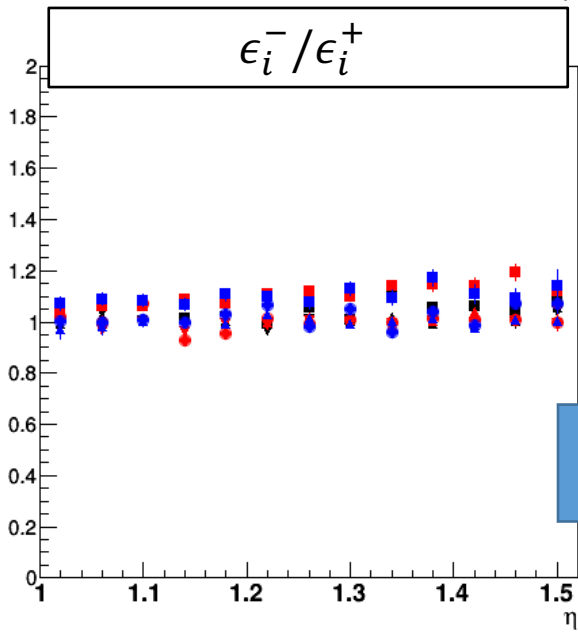
- L2BW triggering events were also considered in order to alleviate some of the asymmetry seen at the triggering stage.



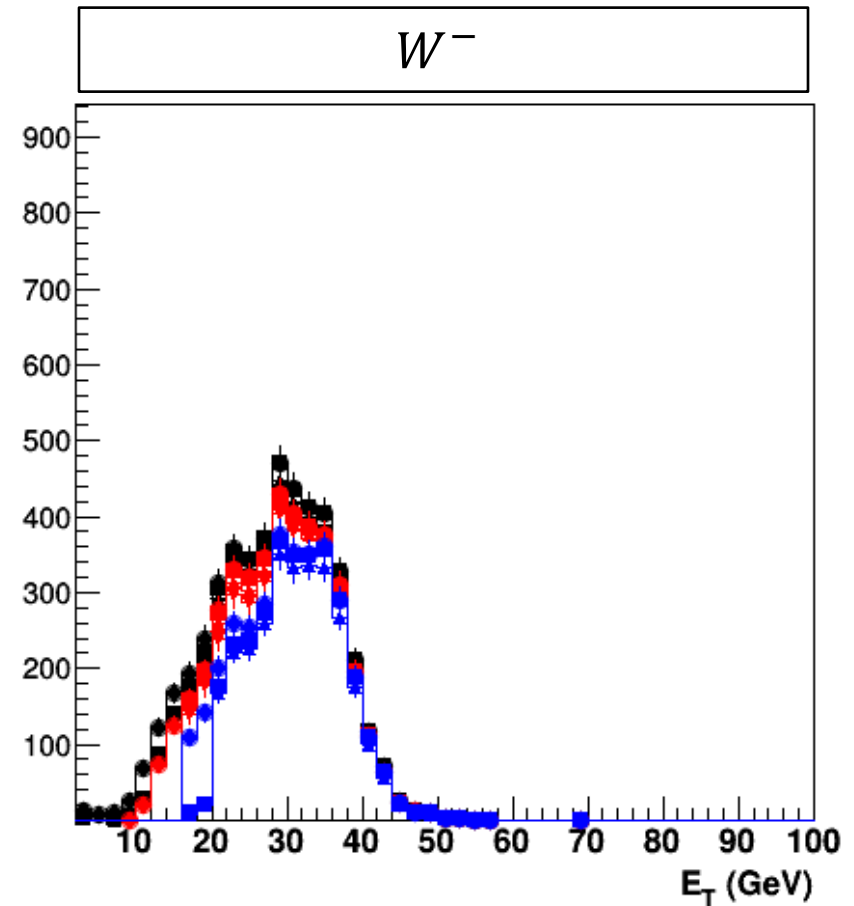
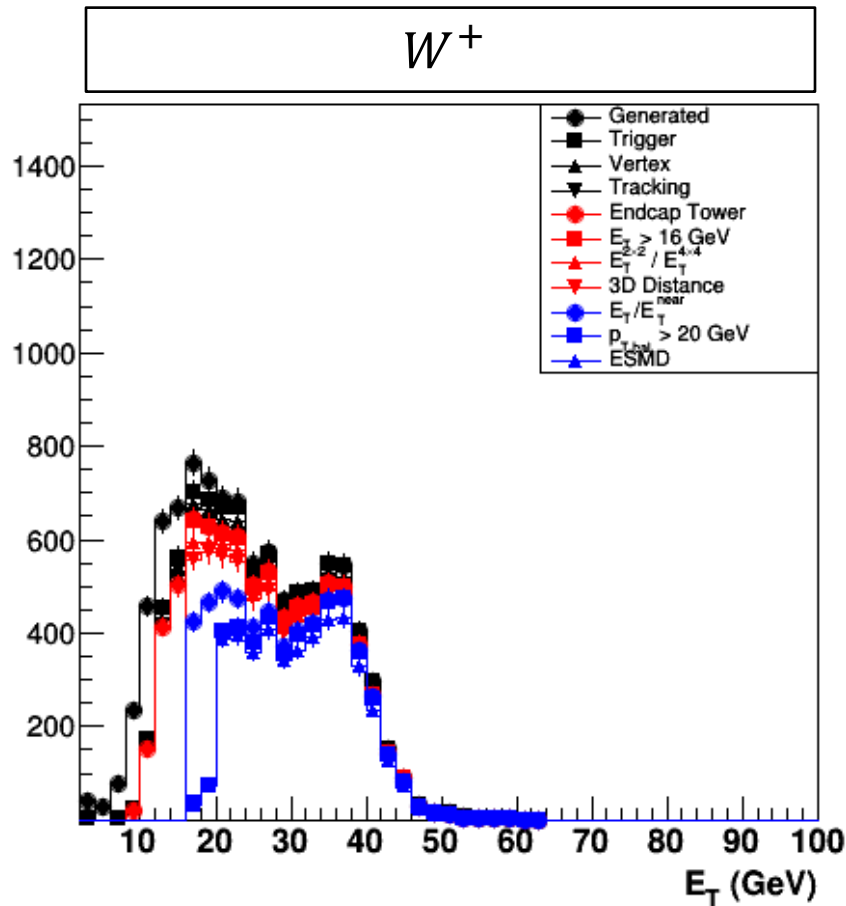
Efficiency correction



- Efficiency ratio evaluated within the E_T range, $25 \text{ GeV} < E_T < 50 \text{ GeV}$
- $\frac{\epsilon^-}{\epsilon^+} = \frac{0.929}{0.928} = 1.00$
- Efficiency correction consistent with the publication, but the values of efficiencies are not.



E_T distributions of $W \rightarrow e\nu$ Embeddings



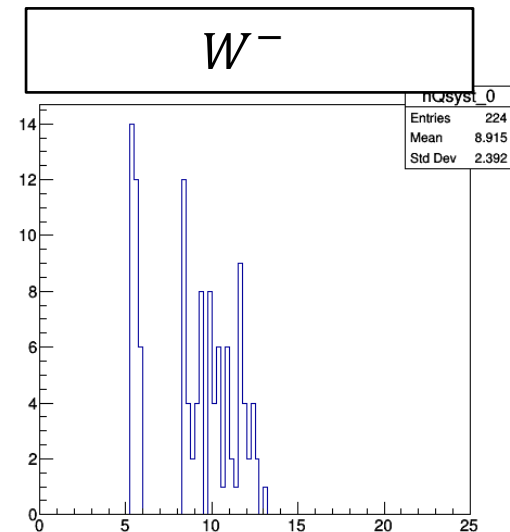
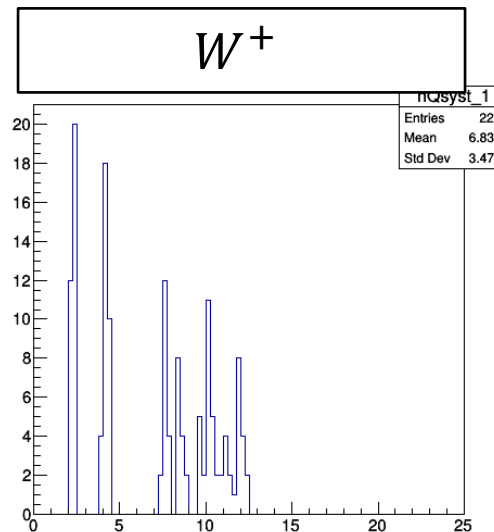
- Electron tracks projected onto the EEMC to obtain cluster- E_T .

Systematic uncertainty

- Charge correction method
 - Evaluated at the difference in C_{charge} between 4-Gaus and 2-Gaus methods.
- Charge selection
 - The lower and upper bounds of charge selection cut ($0.4 < |Q \times E_T / p_T| < 1.8$) was varied by ± 0.3 .
 - The systematic uncertainty was taken from the largest deviation from the nominal value.

x_{low}	0.4	0.1	0.7	0.4	0.4	Largest
x_{high}	1.8	1.8	1.8	1.5	2.1	Difference
4-Gaus	0.95	0.87	1.11	0.89	0.97	0.15
2-Gaus	1.06	1.08	1.06	1.05	1.05	0.01

- QCD background description
 - Systematic uncertainty estimated by varying the upper R_{ESMD} limit for QCD background from 0.4 to 0.55 in steps of 0.01 (shape) and $sp_{T,bal}$ upper limit from $-4 GeV$ to $22 GeV$ in steps of $2 GeV$ (normalization).
 - The value was taken from the RMS of QCD contribution.



Results

