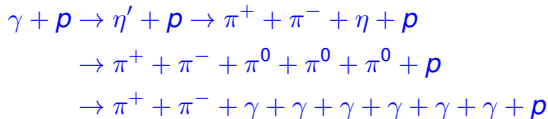# DSelector Uniqueness Tests Bug Fix

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Bug Fix in DSelector usage

The DSelector method `Get_NumNeutralHypos()` does not return the total number of reconstructed photons in the event. It returns the total number of independent photons used collectively for all combos. In order to get the total number of reconstructed photons for a given event as seen by the reaction filter in the REST file one has to use the ComboWrapper method `Get_NumUnusedShowers()` and add this number to the total number of photons required for the reaction. In the case of the reaction
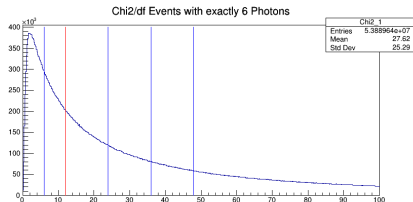
$$\gamma + p \rightarrow \eta' + p \rightarrow \pi^+ + \pi^- + \eta + p$$
$$\rightarrow \pi^+ + \pi^- + \pi^0 + \pi^0 + \pi^0 + p$$
$$\rightarrow \pi^+ + \pi^- + \gamma + \gamma + \gamma + \gamma + \gamma + \gamma + p$$

the total number of reconstructed photons in a given event is
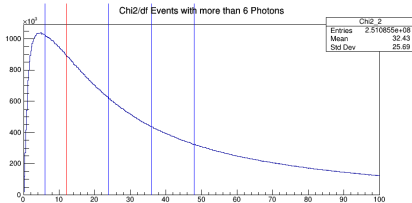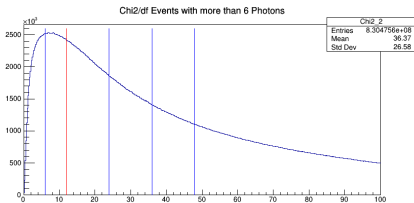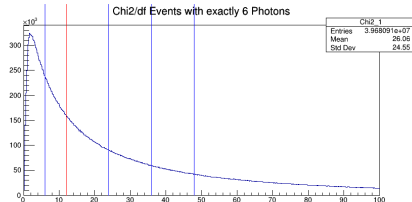6 + `dComboWrapper->Get_NumUnusedShowers()`

Chi2 distribution

This misconception manifests itself for example in the chi2 distribution of events with exatly 6 reconstructed photons and more than 6 reconstructed photons.

Chi2/NDF with OLD code:

Chi2/NDF with NEW code:

Statistics consequences

As a consequence the statistics of events with exately 6 FS photons is reduced relative to the events with more than 6.

χ^2/NDF	Weight	pos(6)	$\sigma(6)$	I(6)	pos(7,8)	$\sigma(7,8)$	I(7,8)
Chi2/NDF < 48	0	0.958	0.017	696.1	0.961	0.022	768.0
Chi2/NDF < 48	1	0.958	0.017	696.6	0.961	0.023	770.4
Chi2/NDF < 48	2	0.958	0.017	694.9	0.961	0.023	771.4
Chi2/NDF < 36	0	0.958	0.017	685.5	0.960	0.022	734.8
Chi2/NDF < 36	1	0.958	0.017	685.7	0.960	0.022	735.2
Chi2/NDF < 36	2	0.958	0.016	684.2	0.960	0.022	734.5
Chi2/NDF < 24	0	0.958	0.016	678.3	0.961	0.022	667.1
Chi2/NDF < 24	1	0.958	0.016	678.7	0.960	0.021	667.0
Chi2/NDF < 24	2	0.958	0.016	677.7	0.960	0.022	664.8
Chi2/NDF < 12	0	0.958	0.016	647.1	0.959	0.019	560.1
Chi2/NDF < 12	1	0.958	0.016	647.4	0.959	0.019	559.4
Chi2/NDF < 12	2	0.958	0.016	646.6	0.959	0.019	555.8
Chi2/NDF < 06	0	0.958	0.015	566.6	0.958	0.018	490.2
Chi2/NDF < 06	1	0.958	0.015	566.6	0.958	0.018	490.1
Chi2/NDF < 06	2	0.958	0.015	565.5	0.958	0.018	488.9

Fit of η'

left: $N_\gamma = 7\,or\,8$, right: $N_\gamma = 6$