

ILC Asian Physics and Software meeting

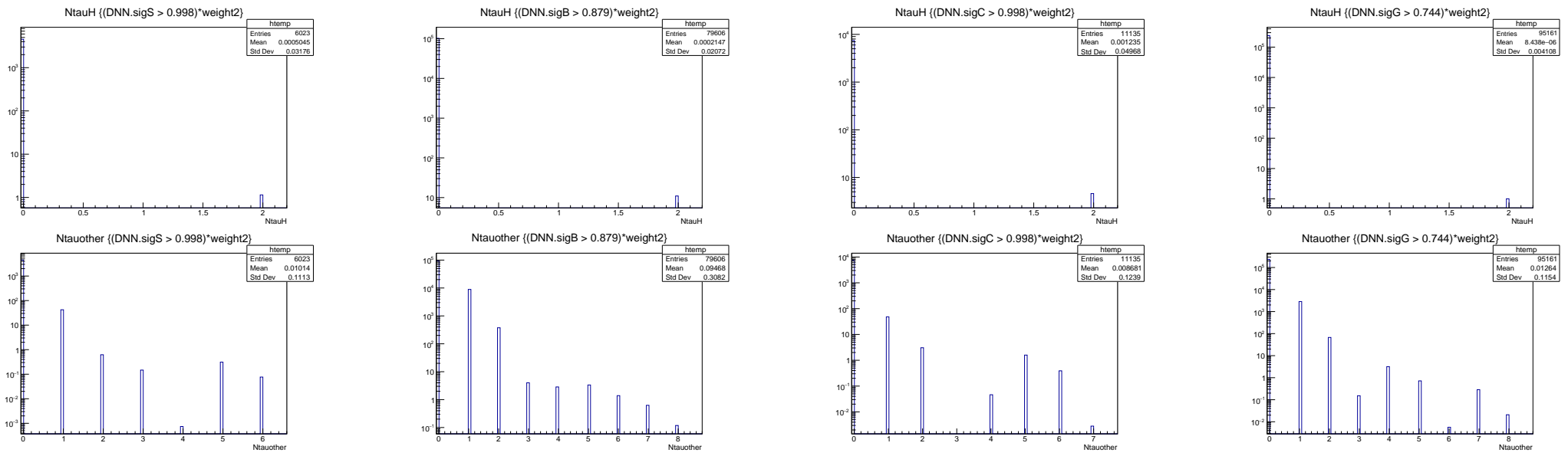
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2026/4/20

tau event chk

- checked tau particle existence in events survived DNN best cut.
 - using full MCtruth information was difficult.
 - simply checked the number of tau particles in array(PDG_mct) in each event.
 - As a first chk, looked only if the tau particles are from Higgs or not.

weighted entries



- the ratio of # events with tau is 10% - less than sub per-cent.

- comparison with/without cut on # of tau particles:

	Hss			Hbb			Hcc			Hgg		
	sig	bkg total	significance	sig	bkg total	significance	sig	bkg total	significance	sig	bkg total	significance
DNN bestcut	1.98	4531	0.0294	43102	59217	134.7	474.3	6971	5.5	4778	233396	9.8
DNN + # tau = 0	1.9	4488	0.0286	39275	53772	128.8	470.2	6923	5.5	4686	230559	9.7

- → slight degradation in significance was seen in every category.
- even when assuming ideal case where no signal events were cut and all bkg events with tau were cut, the significance will improve only by:
 - ▶ ~3% for Hbb category
 - ▶ less than 1% for Hss/Hcc/Hgg category

no much improve can be expected by tagging tau particle.

charge check

- go on to checking the quality of my jet-pairing method using charge information.
 - since H/Z are neutral, paired jets must have opposite charges or both be neutral.
- but I didn't keep jet charge information, so tried to reconstruct charge from flavor tag score.

calculate **Expected charge for jet i+j**:

$$Q(i, j) = \sum_{f_i, f_j} P(f_i)P(f_j) \cdot (Q_{f_i} + Q_{f_j})$$

where f_i, f_j are flavor, $P(f)$ is flavortag score, Q_f is charge of flavor f , and compute chi square

$$\chi^2 = \frac{Q_H^2 + Q_Z^2}{2\sigma^2}$$

(currently I'm not sure how to determine the sigma value...)

again, optimizing threshold values for jet pairing will be necessary.

- as a test, $\sigma = 0.3$:

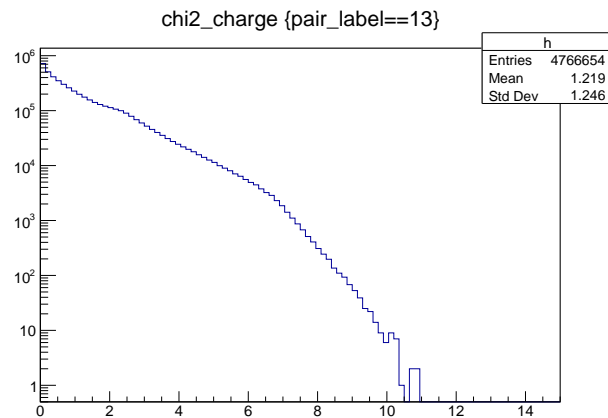


Figure 1: mass based

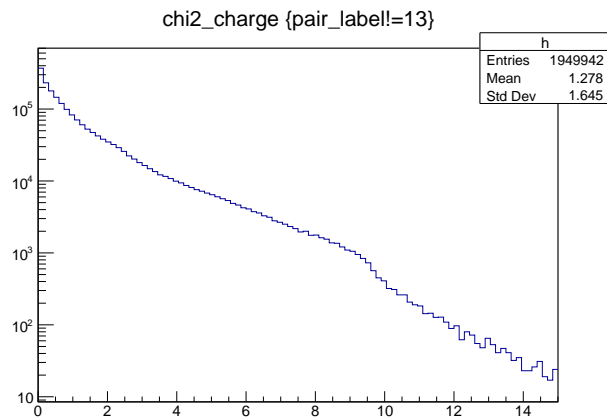


Figure 2: flavor based