

Selection of $\tau^+ \tau^-$ events

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December 19, 2018

- $e^+e^- \rightarrow \tau^+\tau^-$ at 500 GeV

- Study coupling of $\tau_{L,R}$ to Z, γ

- compare Large & Small detectors

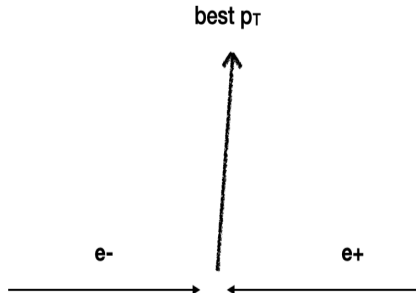
Signal: $e^+e^- \rightarrow \tau^+\tau^-$

- High mass $\tau\tau$: $m(\tau\tau) > 480$ [GeV]
- Low mass $\tau\tau$: $m(\tau\tau) < 480$ [GeV]

Method

1: Find first τ seed

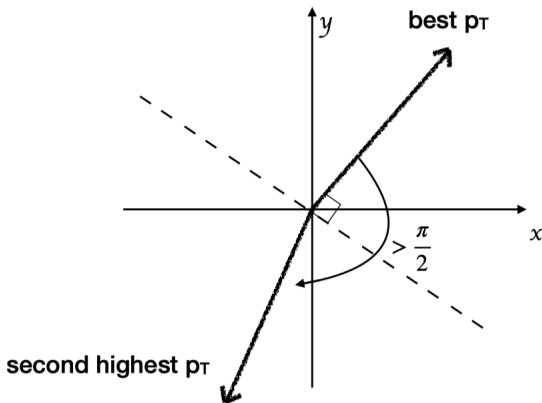
- charged PFO with highest p_T



Method

2: Find second τ seed

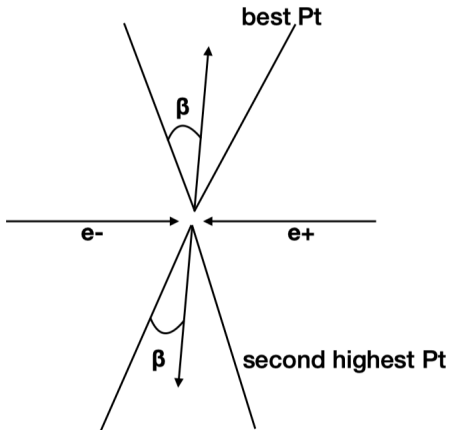
- charged PFO with second highest p_T and $\delta\phi > \pi/2$



Method

3: Make cones

- Make cones to find τ jets



- Cut 1: visible τ jet mass < 2.5 [GeV]
- Cut 2: acolinearity between τ jet seed tracks < 0.15 [rad]
- Cut 3: energy sum of pfos outside cones < 40 [GeV]
 p_T sum of pfos outside cones < 20 [GeV]
- Cut 4: Cone 1 particle's charge \times Cone 2 particle's charge = -1
- Cut 5: High energy $\mu^+\mu^-$ & e^+e^- cut
- Cut 6: visible mass of 2 τ jet system < 400 GeV
- Cut 7: angle between τ jet axes > 3.05 [rad]
- Cut 8: total number of PFOs < 12

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Cut table

Beam Polarisation = (-80, +30), Integrated Lumi = 1800.0 selected events/1000

PROCESS	ttHiMass	ttLoMass	mumu	4f_ZZ_WW_Mix_L	4fZZleptonic
UNCUT	593.21	2310.53	3211.59	864.47	65.52
CUT 1	492.65	1787.35	2637.14	684.99	47.76
CUT 2	482.91	272.37	873.61	119.57	4.55
CUT 3	451.89	215.55	778.98	104.84	2.01
CUT 4	428.37	197.76	764.75	96.83	1.17
CUT 5	428.35	197.76	86.20	87.72	0.83
CUT 6	427.45	197.63	24.78	70.01	0.71
CUT 7	425.51	132.11	14.05	27.50	0.48
CUT 8	425.38	132.00	14.05	27.49	0.48

PROCESS	4fsingleZee	2fZhadronic	4f_sZ_sW_Mix_L	4fWWleptonic	4fsingleWleptonic	4fsingleZnu
UNCUT	8090.16	35325.10	1066.31	832.88	2744.43	294.51
CUT 1	5164.76	5060.10	781.16	667.61	2071.75	184.71
CUT 2	355.88	73.24	74.44	115.51	263.39	4.39
CUT 3	159.89	8.54	59.45	101.09	221.57	3.38
CUT 4	112.08	0.73	53.05	92.18	201.93	1.72
CUT 5	104.91	0.73	50.76	92.08	201.93	1.72
CUT 6	73.81	0.73	37.21	91.06	162.92	1.71
CUT 7	48.69	0.71	14.71	37.81	65.97	0.76
CUT 8	48.69	0.71	14.71	37.81	65.97	0.76

4f_ZZ_WW_Mix_L:4fZZWWMixLeptonic
4f_sZ_sW_Mix_L:4fsingleZsingleWWMixLeptonic

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PROCESS	ttHiMass	ttLoMass	mumu	4f_ZZ_WW_Mix_L	4fZZLeptonic
UNCUT	487.48	1813.02	2624.14	71.68	42.57
CUT 1	397.16	1383.07	2116.78	53.82	30.61
CUT 2	390.28	215.76	751.75	7.62	3.30
CUT 3	366.87	168.52	676.77	6.63	1.53
CUT 4	347.93	155.67	663.04	6.07	0.92
CUT 5	347.65	155.67	80.41	5.52	0.61
CUT 6	346.23	155.58	22.49	4.46	0.51
CUT 7	345.02	105.17	12.62	1.75	0.39
CUT 8	344.83	105.16	12.62	1.75	0.39

PROCESS	4fsingleZee	2fZhadronic	4f_sZ_sW_Mix_L	4fWWLeptonic	4fsingleWLeptonic	4fsingleZnu
UNCUT	7941.63	20994.06	93.76	54.21	172.98	33.20
CUT 1	5031.71	3505.42	65.74	43.74	131.62	20.24
CUT 2	335.33	56.75	5.24	7.15	16.22	0.49
CUT 3	155.12	5.44	4.06	6.26	13.65	0.36
CUT 4	108.04	0.80	3.60	5.71	12.46	0.18
CUT 5	100.86	0.80	3.46	5.71	12.46	0.18
CUT 6	67.07	0.80	2.64	5.65	10.12	0.18
CUT 7	46.38	0.42	1.02	2.34	4.08	0.08
CUT 8	46.38	0.42	1.02	2.34	4.08	0.08

4f_ZZ_WW_Mix_L:4fZZWWMixleptonic

4f_sZ_sW_Mix_L:4fsingleZsingleWMixleptonic

Summary and Plan

- Cut table including major backgrounds were made.
- After including all cuts, most of the backgrounds and Low mass $\tau\tau$ are rejected
- Next, I want to compare Large and Small detector models.
- Also, I want to measure τ polarization.