HJF
July 10, 2000

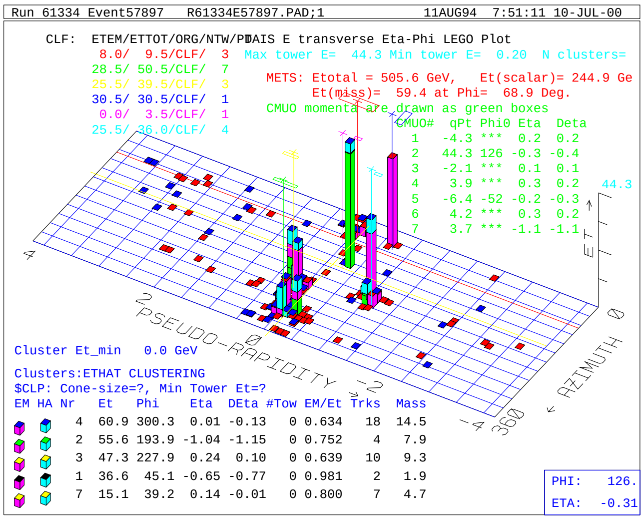
First Observation of $t\bar{t}\gamma$ Production?

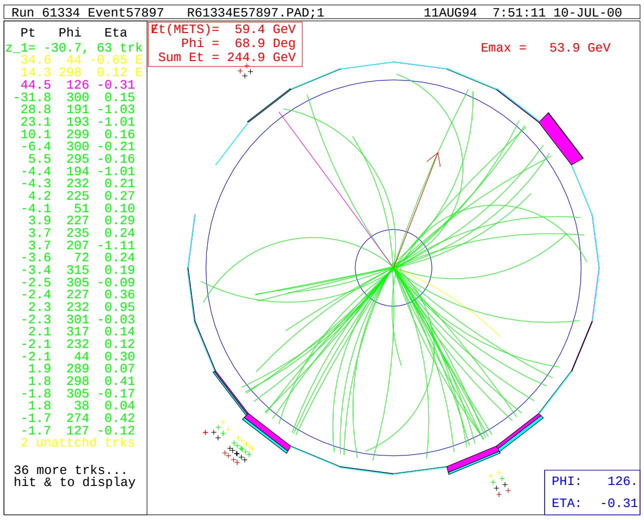
Run 61334 Event 57897

- Highest H_T and the highest $\not\!\!E_{\mathrm{T}}$ in photon-lepton sample.
- Muon with $\mathrm{p_T} = 51$ GeV
- Photon with $\mathrm{E_T} = 34$ GeV
- $\not\!\!E_{\mathrm{T}}$=85 GeV
- 4 jets of $Et = 94$, 79, 64,and 24 GeV.
- $H_T = 445$ GeV
- The minimum invariant mass of the event is 475 GeV.

Three of the jets form a mass of 174 GeV, with a subset of two of them having an invariant mass of 77 GeV, consistent with a SM decay of a top quark to Wb. The muon, $\not\!\!E_{\mathrm{T}}$, and remaining jet have an invariant mass of 196 GeV, compatible with a second top quark.

If one includes the photon the mass of the system is 227 GeV, somewhat high for the second top. The event seems compatible with $t\bar{t}\gamma$ production with both top quarks decaying via the SM decay. The vertex is (just) outside the SVX, and so unfortunately there is no SVX tagging information to verify the b-jets.





Run 61334/Event 57897 ($\mu\gamma$-12)			
System	Mass (GeV)	P_T(sys.) (GeV)	Comment
$\mu\gamma$	56	65	
$\mu\not{E}_t$	100	94	$> M_W$?
$\gamma\not{E}_t$	38	118	
$\mu\gamma\not{E}_t$	121	126	$>> M_W$
j_1j_2	165	103	
j_1j_3	85	113	W?
j_1j_4	66	75	
j_2j_3j	114	151	
j_2j_4	107	74	
j_3j_4	77	41	W??
$j_1j_2j_3$	218	166	Top?
$j_1j_3j_4$	132	98	
$j_1j_2j_4$	207	82	
$j_2j_3j_4$	174	129	Top??
$\mu\gamma\not{E}_tj_1$	226	114	Top?
$\mu\gamma\not{E}_tj_2$	275	86	
$\mu\gamma\not{E}_tj_3$	234	65	
$\mu\gamma\not{E}_tj_4$	132	148	
$\mu\not{E}_tj_1$	197	84	Top?
$\mu\not{E}_tj_2$	243	76	
$\mu\not{E}_tj_3$	200	36	
$\mu\not{E}_tj_4$	111	115	
$\mu\not{E}_tj_1j_2j_3j_4$	435	51	$t\bar{t}$??
$\mu\gamma\not{E}_tj_1j_2j_3j_4$	474	18	$t\bar{t}$?

Table 1: The invariant mass and p_T for subsystems of Run 61334/Event 57897.