Some single top-Higgs studies

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Problem tackled

Many possible signatures

- Top decays
  - 1 lepton, 1 b-jet, 1 light jet
  - 0 charged lepton, 1 b-jet, 2 light jets
  - Taus ignored (at the moment)
- Higgs decays
  - bb:
  - WW:
    - ★2 leptons + MET;
    - ★1 lepton + 2 jets + MET;
    - ★ 4 jets
  - ZZ:
    - ★ 4 leptons;
    - ★ 2 leptons + 2 b-jets; 2 leptons + 2 light jets; 2 leptons + MET;
    - ★ 2 light jets + 2 b-jets; 2 light jets + MET; 2 b-jets + MET; 4 light jets; invisible
  - Other decays ignored (at the moment)

1 charged lepton is always demanded

Combining all the modes

- Idea: make use of all the information to simultaneously probe all regions
  - Leptons, jets and b-jets multiplicities
  - Missing energy
  - Particle (top, Higgs, weak bosons) reconstruction when possible

First results

Many possible signatures

- Samples (random choice)
  - ZZ→ 4l: 67773 events (σ = 14.15 pb)
  - ttZZ→ (semilept) (4l): 99990 events (σ = 1.84 fb)

Temporary results

	1l										
	≥5j ($3b_L$)	≥5j ($1b_T$)	≥5j ($1b_M$)	≥5j ($1b_L$)	≥3j ($3b_L$)	≥3j ($1b_T$)	≥3j ($1b_M$)	≥3j ($1b_L$)	≥1j ($1b_T$)	≥1j ($1b_M$)	≥1j ($1b_L$)
ZZ	0.00	1.06	4.03	33.31	0.00	15.70	21.21	226.56	44.34	65.55	739.30
$t\bar{t}+X$	0.00	0.07	0.10	0.13	0.00	0.56	0.20	0.27	0.62	0.22	0.29

	2l		
	≥3j ($1b_T$)	≥3j ($1b_M$)	≥3j ($1b_L$)
ZZ	0.00	0.00	153.80
$t\bar{t}+X$	0.00	0.00	0.32

	3l							4l+		
	≥3j ($3b_L$)	≥3j ($1b_T$)	≥3j ($1b_M$)	≥3j ($1b_L$)	≥1j ($1b_T$)	≥1j ($1b_M$)	≥1j ($1b_L$)	≥1j ($1b_T$)	≥1j ($1b_M$)	≥1j ($1b_L$)
ZZ	0.00	2.97	6.15	53.25	7.42	26.09	245.23	2.33	9.97	65.76
$t\bar{t}+X$	0.00	0.13	0.18	0.24	0.14	0.21	0.27	0.09	0.13	0.16

The 3b channels still need to be split (loose/medium/tight)

No MET information used

No particle information used

No hadronic top decays included