Search for monotops at the LHC
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**Flavor Changing Neutral Current (FCNC)**

- $V$: vector invisible BSM particle (DM candidate)

**Theoretical context**

- Monotop = top + missing transverse energy (MET)
- Monotop production modes via an effective theory

**Phenomenology**

Delphes fast simulation (CMS-like detector) at $\sqrt{s} = 8\text{TeV}$ assuming 20 fb$^{-1}$ of collisions.

**Hadronic channel**

- Event selection:
  - Jets: 2 or 3 lights, 1 b-tagged
  - Veto on isolated $\mu$ or $e$
  - $M_{(W)} \in [50, 105]\text{GeV}$
  - Missing $E_T > 150\text{GeV}$
  - Top mass reconstruction ($bj_{jj}$): $\Delta m (\text{miss. p}_T; bj_{jj}) \in [1.5]$ 
  - $M_{(bj_{jj})} \in [140, 195]$ 

**Leptonic channel**

- Event selection:
  - 1 muon or electron
  - Jets: 1 b-tagged
  - $P_T \text{(leading jet)} > 75\text{GeV}$
  - $M_{(W)} > 115\text{GeV}$
  - Cut on missing $E_T$ optimized per benchmark

**Search** @ 8 TeV

- Hadronic channel with 19.7 fb$^{-1}$ of pp collisions at $\sqrt{s} = 8\text{TeV}$.

**Online trigger**: $MET > 150\text{GeV}$

**Event selection**

- Jets: $p_T (\text{3 leading jets}) > 60, 60, 40\text{GeV}$ with one b-tagged
- Veto on event with isolated (iso < 0.2) muon or electron
- $M(bj_{jj}) < 250\text{GeV}$
- Missing $E_T > 350\text{GeV}$

**Main backgrounds**

- $t\bar{t}$ where a charged lepton from the $W$ decay fails the selection or the detection.
- $QCD$ where mis-reconstructed jets induce large missing $E_T$.
- $Z +$ jets where the $Z$ boson decays into a pair of neutrinos.

**Results**

- V+jets background contamination is estimated from data in its $\mu$-enriched region.
- QCD-multijets background is also estimated from data using a control region with zero b-tagged jets.

Remaining backgrounds are then compared to the data in a region where the signal is expected to live.

A cut&count experiment is proceeded to set limits at 95% Confidence Level (CL).

**References**


**Interpretation**: vector DM candidates with masses below 600 GeV can be excluded even with a moderate coupling strength $a = 0.1$ for both channels.

**Interpretation**: vector DM candidates with masses below 650 GeV are excluded for hadronic channel (with $a = 0.1$).