Search for Dark Matter in the Monojet and Hadronic Mono-V Final States at CMS

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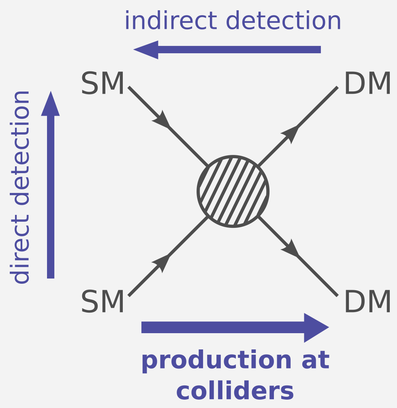
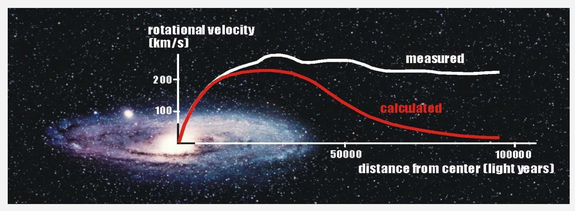
Dark Matter @ LHC



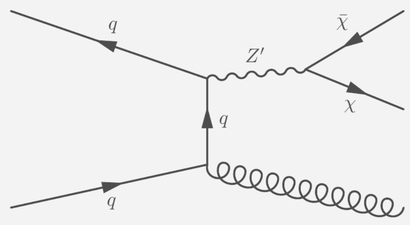
Evidence for Dark Matter:



Models

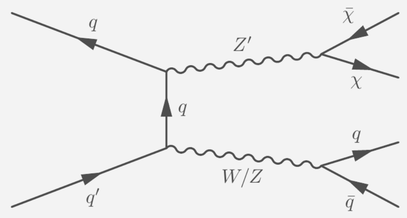
- Pair of dark matter particles
- Coupling to vector or axial-vector mediator

Monojet



- Standard Model Higgs boson decaying to invisible particles

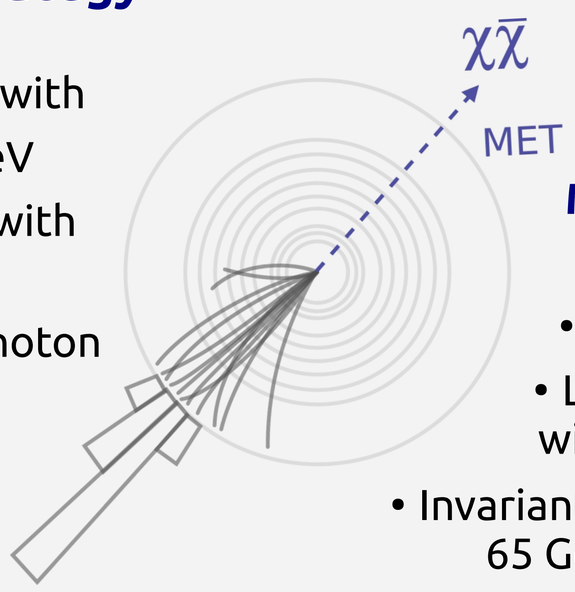
Mono-V



Analysis Strategy

Select events with

- MET > 200 GeV
- at least 1 jet with p_T > 100 GeV
- lepton and photon veto



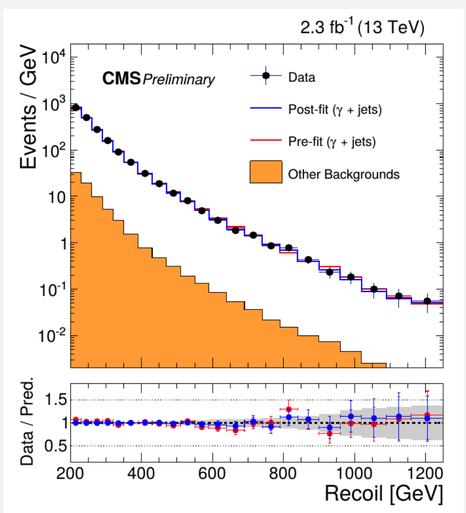
Select Mono-V events:

- V-tagging
- MET > 250 GeV
- Leading wide jet with p_T > 250 GeV
- Invariant mass between 65 GeV and 105 GeV

- Events that fail any of the mono-V selection requirements but pass all other cuts are put in the **monojet category**
- Main **backgrounds** and QCD background estimated from data. Subdominant background estimated from simulation.
- **Combined fit** of hadronic recoil in control regions and MET in signal region to extract results and background estimation

Background Estimation

- Main backgrounds: **Z(νν)+jets**
  W(lν)+jets
- **Control regions**: single lepton
  di-lepton
  γ+jets

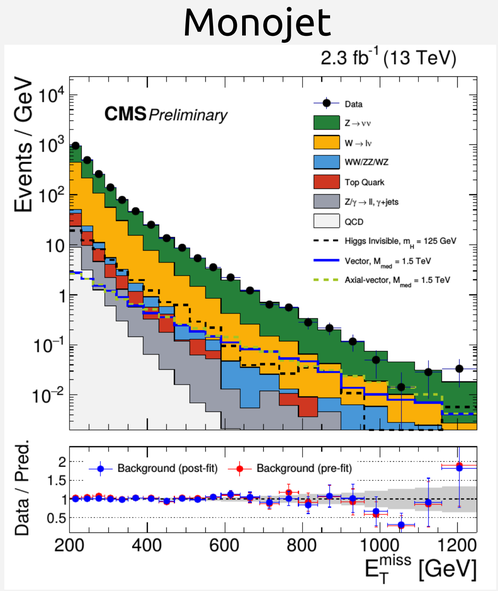


- Use **p_T-dependent transfer factors** to connect control regions and Z(νν)+jets background prediction, taking into account
  - Acceptance
  - Efficiency
  - Difference in branching fraction
  - Difference in production cross section

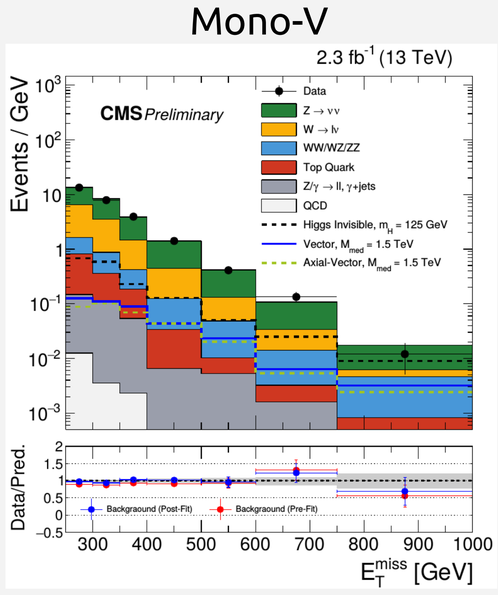
Signal Region

- Good agreement between prediction and data

Monojet

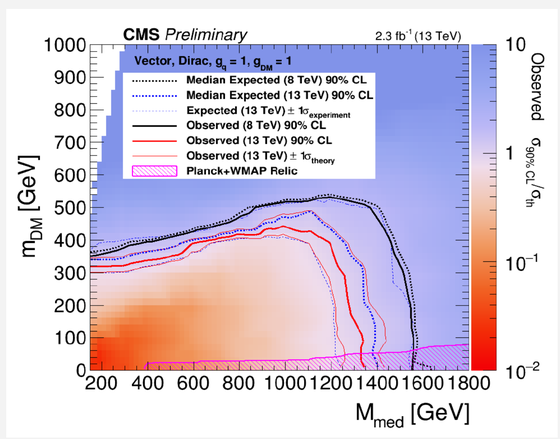


Mono-V

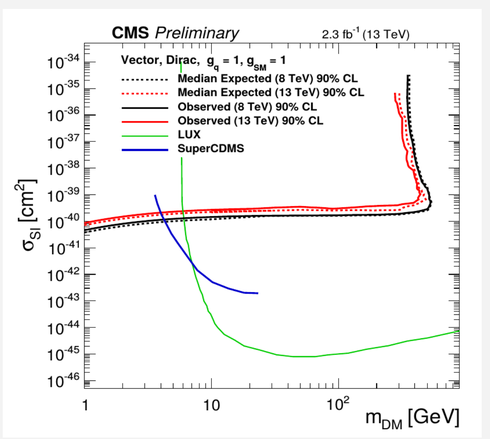


Conclusions and Limits

- No significant excess w.r.t. SM backgrounds
- **Mediator masses up to 1.3 TeV are excluded**
- Observed (expected) **upper limit of 0.85** (0.84) at a 95% CL **on H(inv) branching fraction**



m_{med} - m_{DM} 2D scan



translated to m_{DM} - σ_{SI} plane for comparison with direct detection