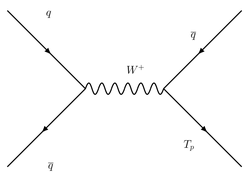
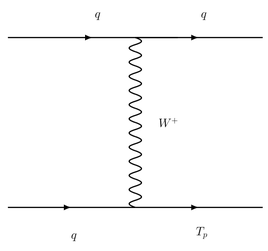
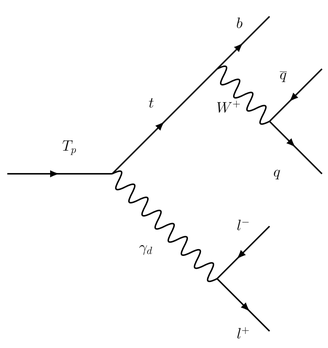
Hitting two BSM particles with one lepton-jet: search for a top partner decaying to a dark photon, resulting in a lepton-jet

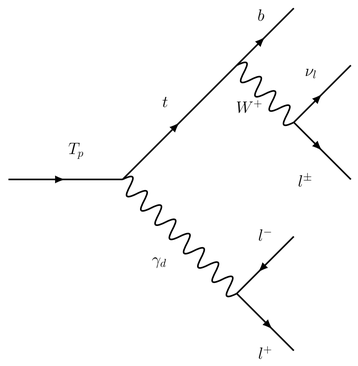
Production





Decay





Two modes: hadronic and leptonic decay of the top quark:

Dark photon mass = 100 MeV -> 100% e+e- BR

Hadronic: major backgrounds are multijet and all-hadronic ttbar, with a lepton misidentified as the (lepton-) jet

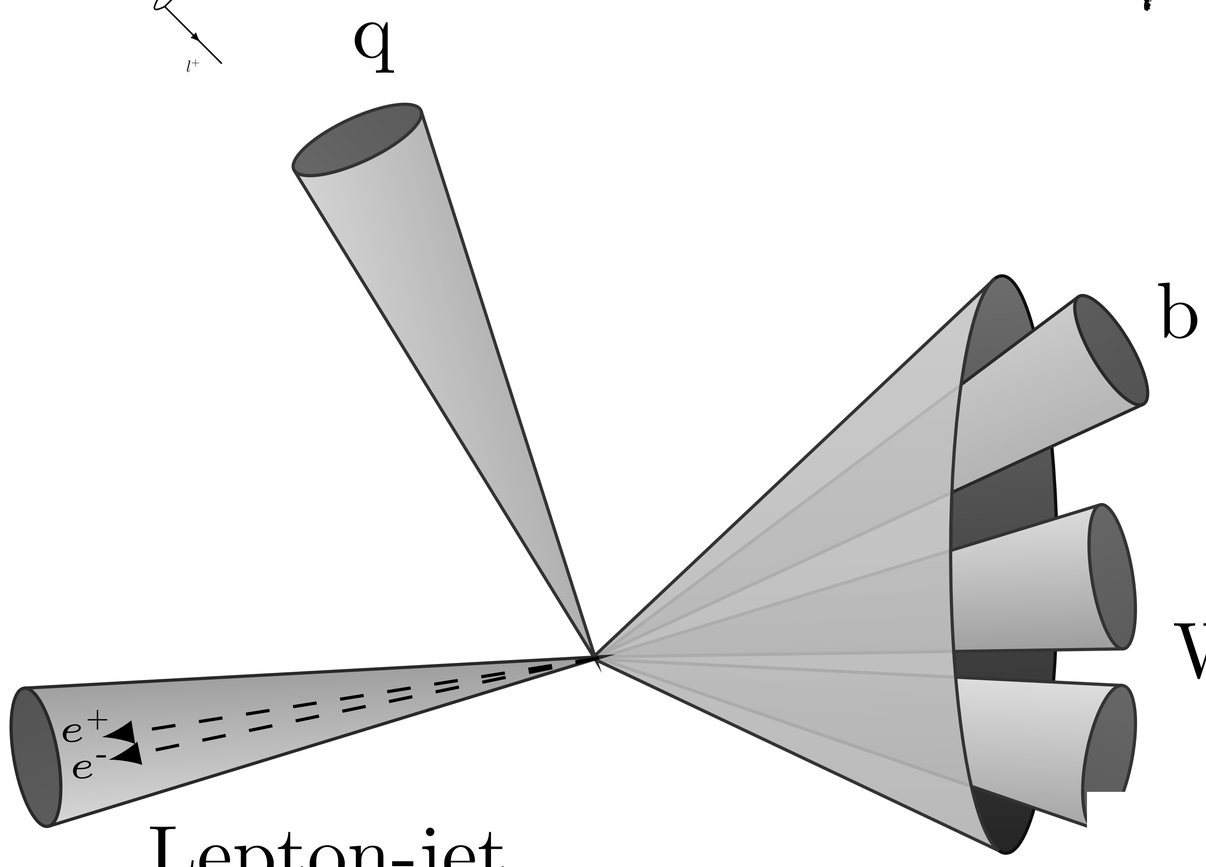
Leptonic: major backgrounds are semileptonic and dileptonic ttbar, lepton multiplicity being the key point

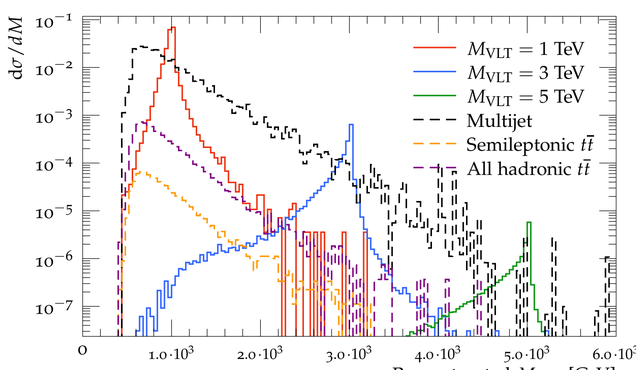
Hadronic selections

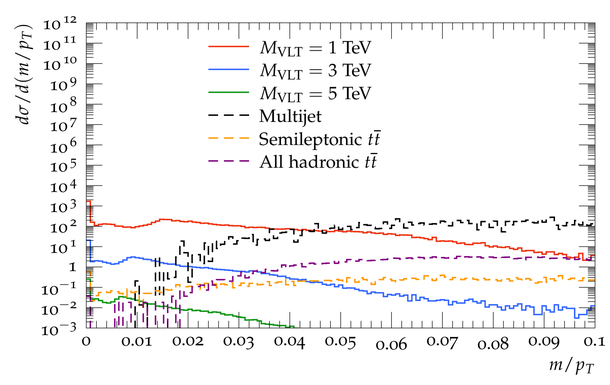
Lepton multiplicity,
Akt4 & 10 multiplicity,
Top mass window,
$n_{b\text{-jets}}$,
Lepton jet pt,
Top jet pt,
B-jet containment

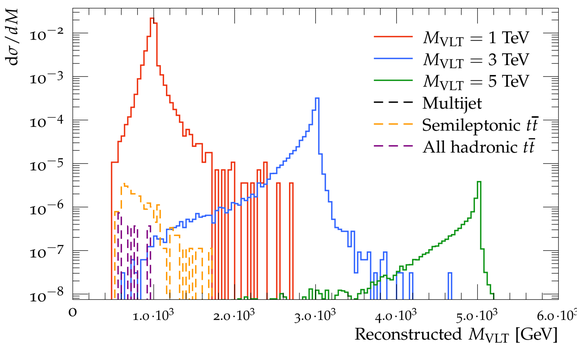
Leptonic selections

Lepton multiplicity,
Akt4 multiplicity,
Top mass,
Lepton jet pt,
Top jet pt,
B-jet containment

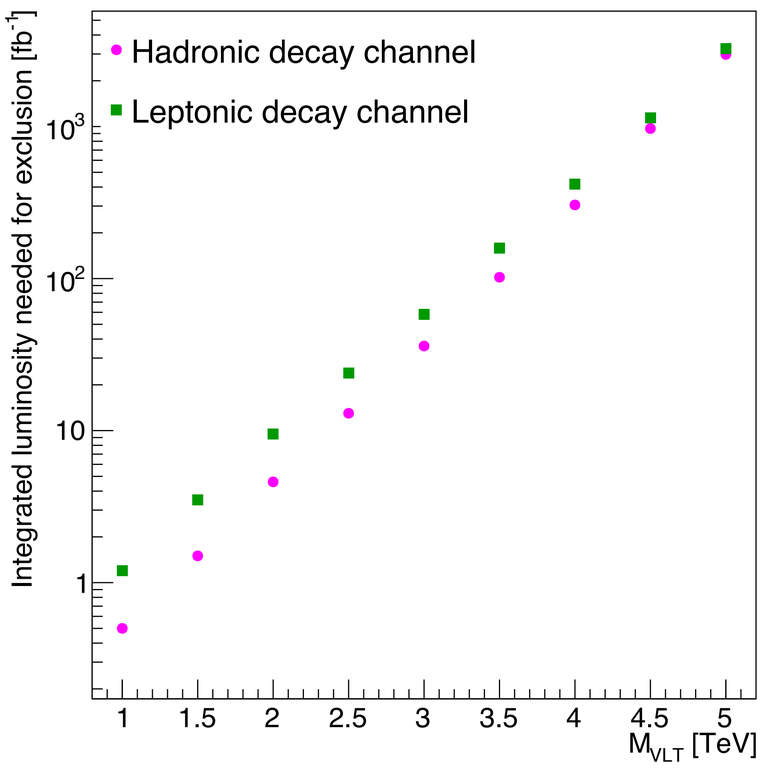








Almost a zero background search after this requirement!



Already sensitive at the LHC!

K. du Plessis, M. M. Flores, D. Kar, S. Sinha, H. van der Schyf

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