Boost09
Leptonic Final States
Closing Remarks

Roger Moore, Itay Yavin, Josh Ruderman,
Natalia Toro, Philip Schuster, Andy, Haas,
Jay Wacker, Mariangela Lisanti

w/ non-local input from Yura Gershtein

Production modes

Lepton Jet + SM Jet

Jet + Dark DY

2 lepton Jets (+ MET) (+SM Jets)

Susy LSP to dark sector

Z/Z' to dark particles

Direct dark particle production

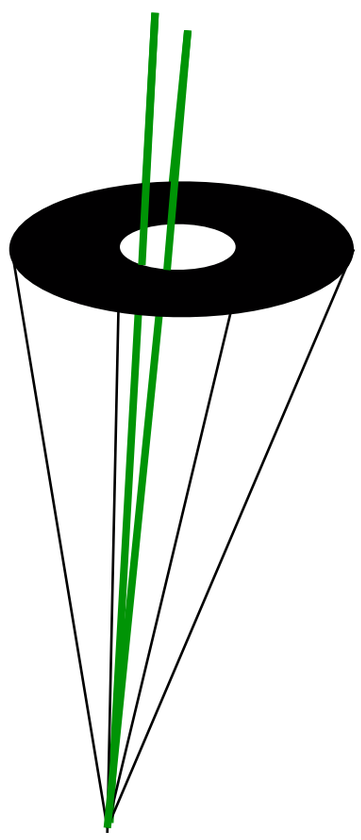
Lepton Jet + (Photon/Iso Leptons)

(Shih &Thomas to appear)

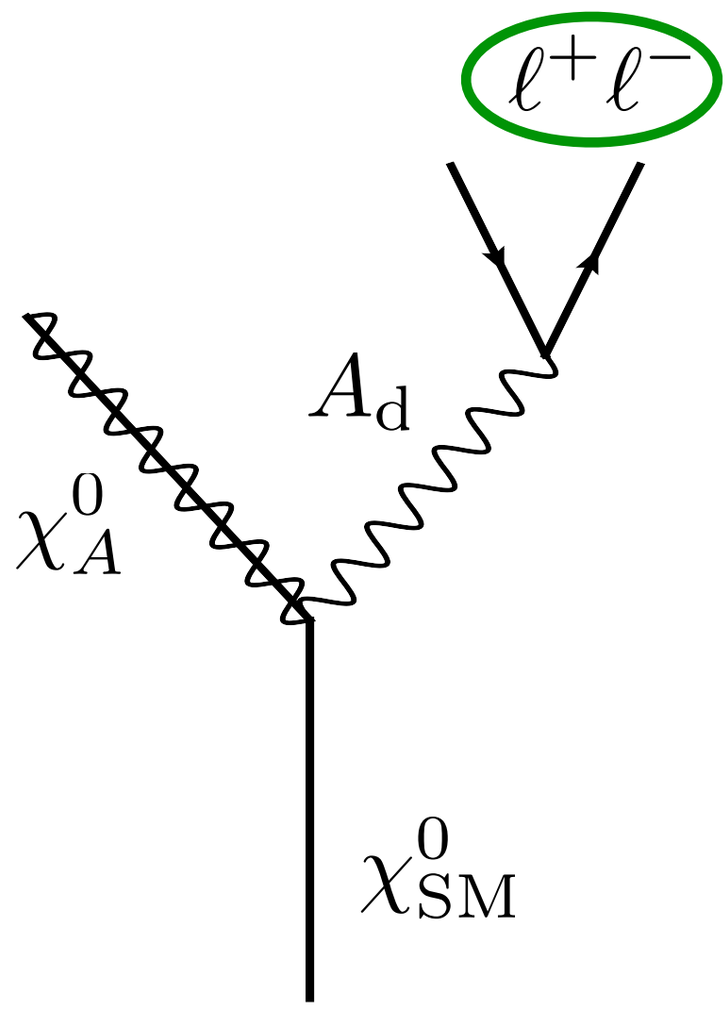
Two-Lepton Lepton Jets

2 oppositely signed leptons in a small cone

Need more handles to get away from backgrounds

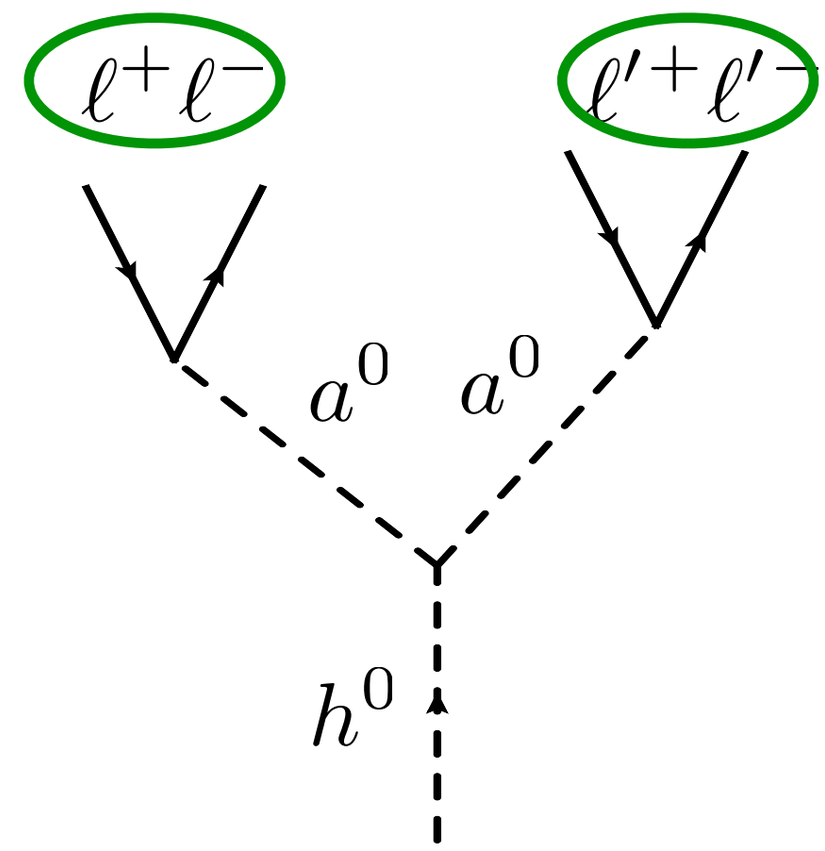


Flavor universal



Susy-like

Heavy Flavor dominated

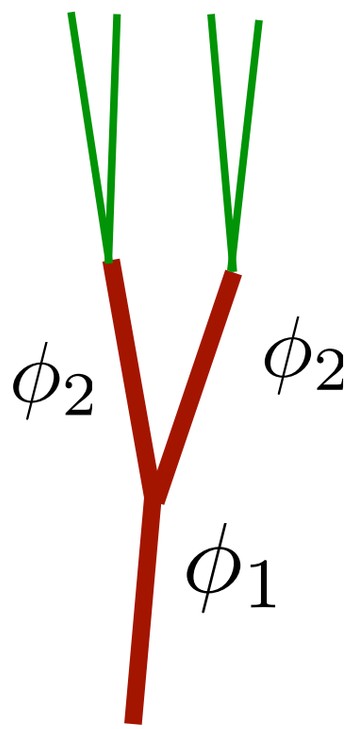


Higgs-like

ditau identification ?

4-lepton lepton jet (single core)

Decay Topology



Relevant Parameters

$$p_{T\phi_1}$$

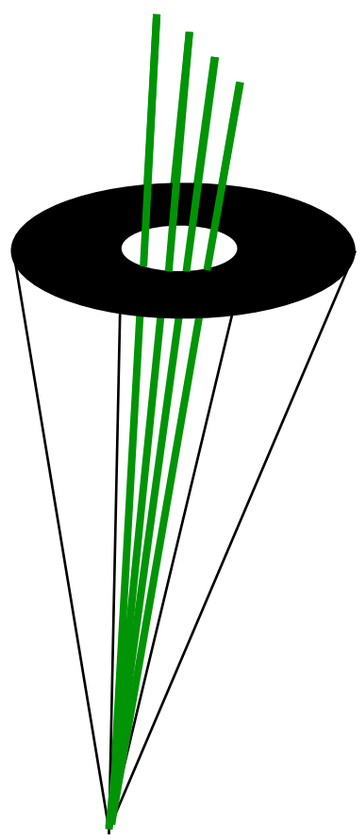
$$m_{\phi_1} \quad m_{\phi_2}$$

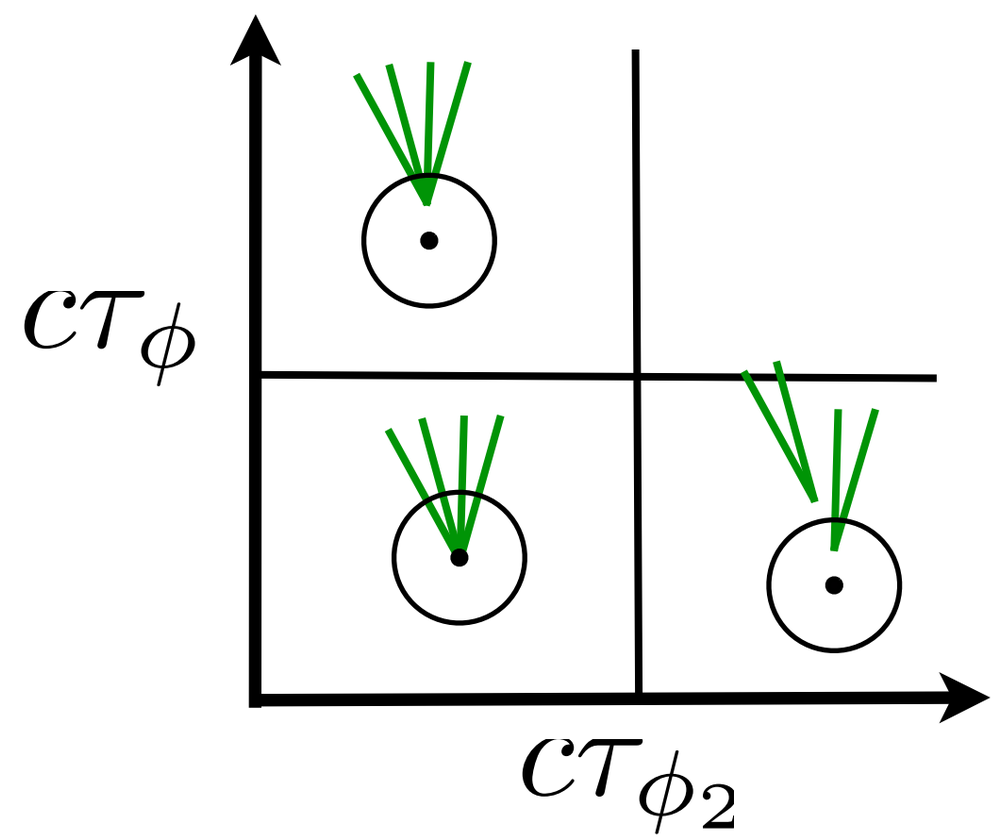
$$c\tau_{\phi} \quad c\tau_{\phi_2}$$

$$\Delta R_{\text{Signal}} \lesssim 0.1$$

$$0.1 \lesssim \Delta R_{\text{Iso}} \lesssim 0.4$$

Had Iso vs EM Iso



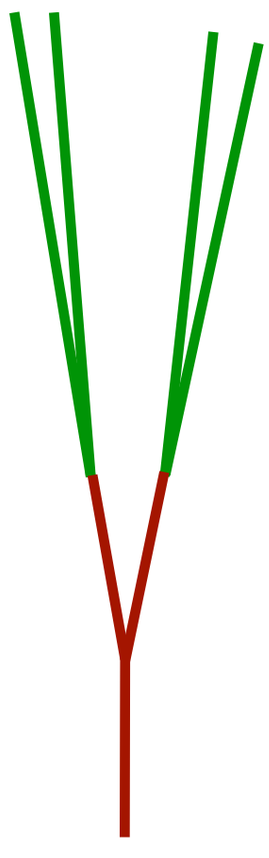


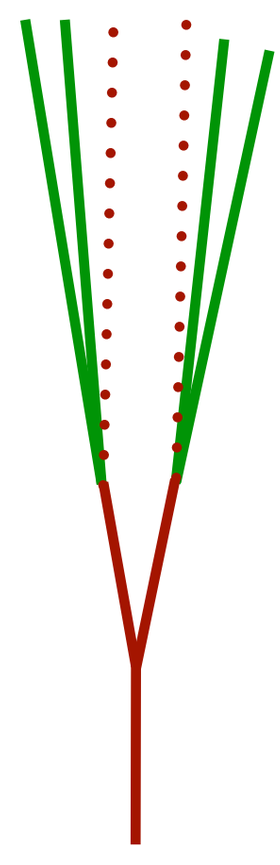
Usefulness/Danger of invariant masses

Taking pairwise invariant masses, total invariant mass

Gets away from SM continuum backgorund

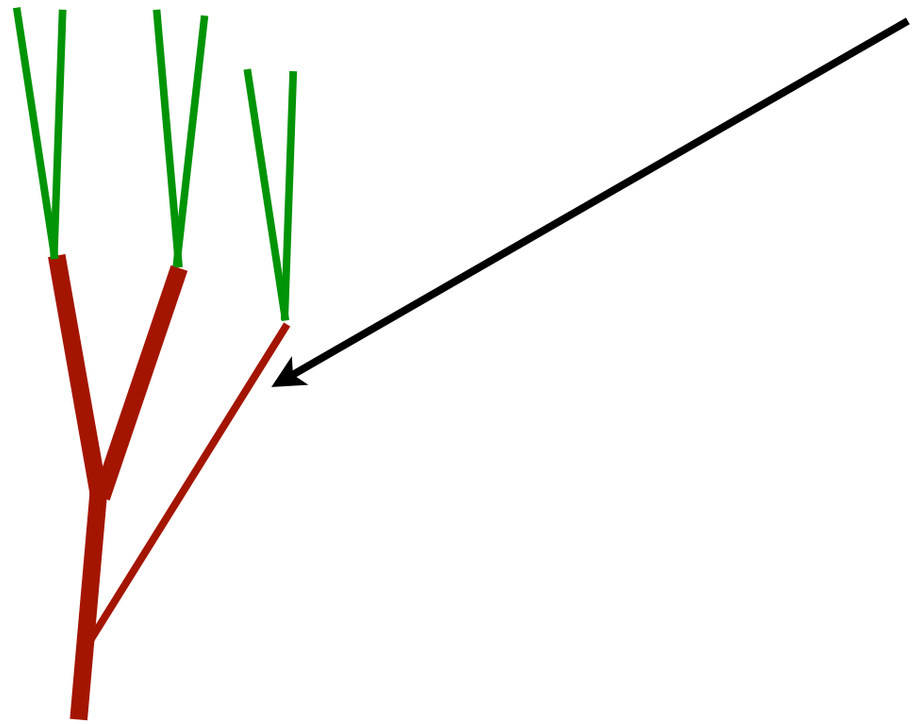
But may be multiple resonances &/or missing particles



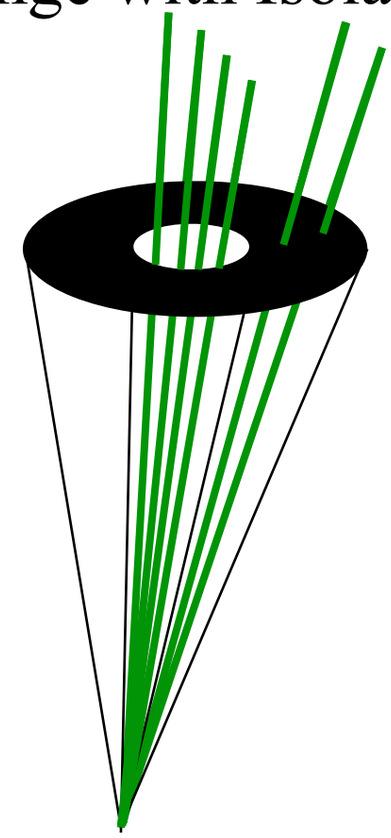


Additional Radiation

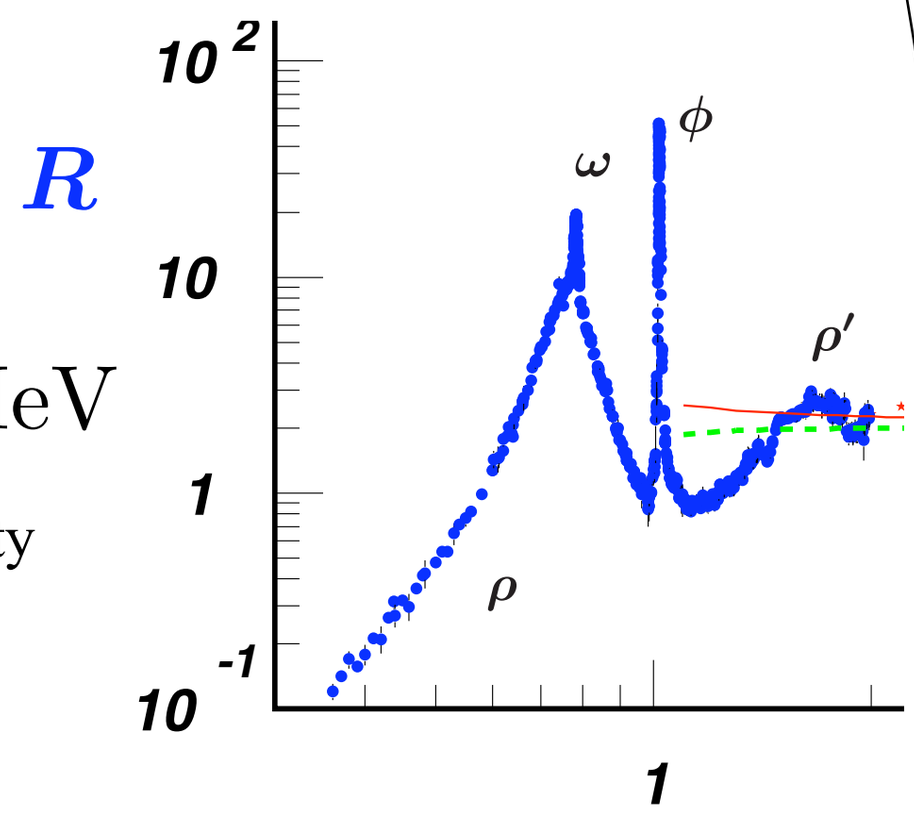
J. Ruderman (to appear)



Challenge with Isolation



Motivates studying Had Iso vs EM Iso

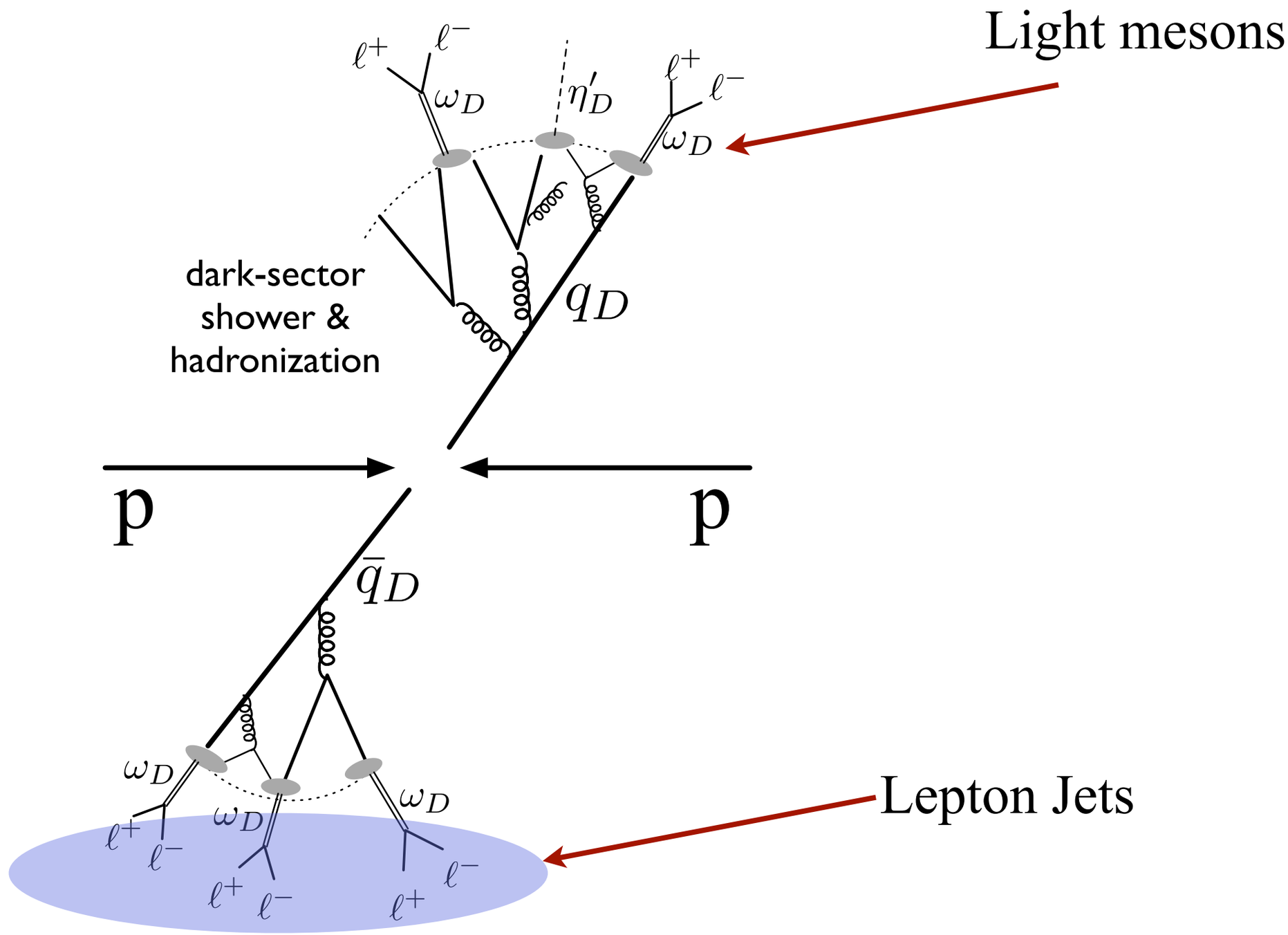


Caveats for $m_\phi \gtrsim 700$ MeV

Combinatorics could hurt sensitivity

New Strong Sectors

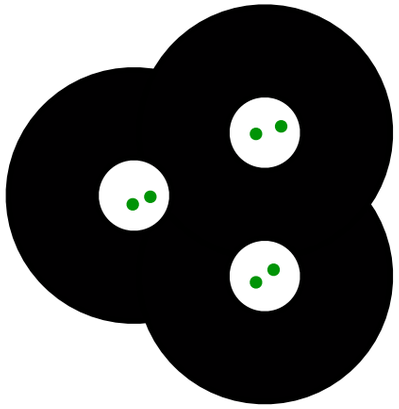
High multiplicity final states



Other preliminary techniques/definitions

Multicore lepton jets (muon only)

General technique for collimated muons



Loosening isolation for high multiplicity muon jets

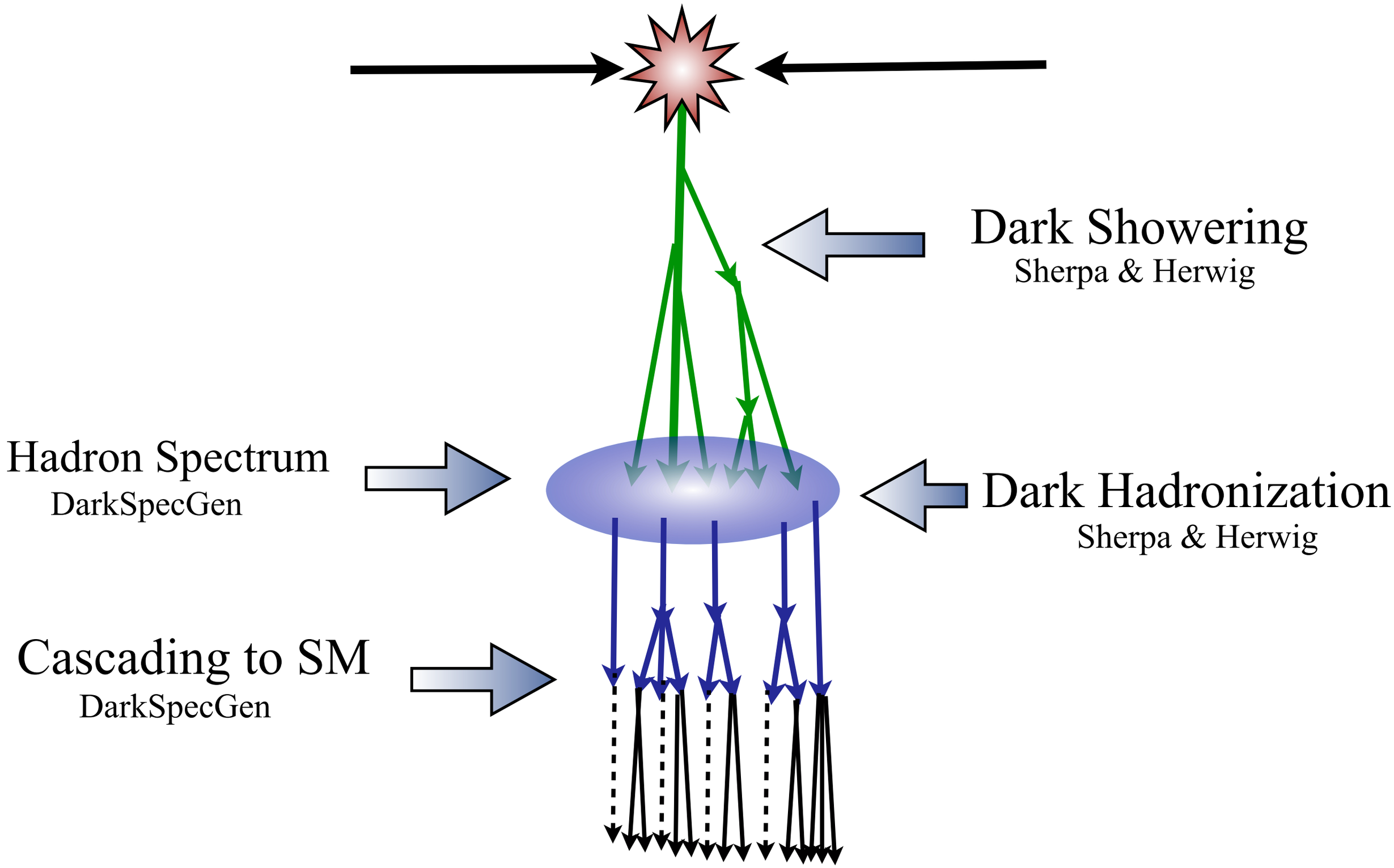
$$N_\mu \geq 4 \ ??$$

$$E_{T\mathrm{had}} \lesssim \sum p_{T\mu}$$

New Tools

New Strong Signal Simulation

(J. Wacker w/ S. Schumann, P. Richardson, F. Krauss)



Advances to improve theoretical prediction

Showering & Hadronization
(Abelian & Non-Abelian)

Parameterization/Categorization of Lepton jets &
Production modes for benchmarks

Implementation of benchmarks into MCs

highlighting sensitivity differences between
Tevatron/LHC/B-factories/Fixed Target/LHCb

Advances to improve experimental sensitivity

Tuning selection criteria to
improve sensitivity of benchmark
4-lepton lepton jet parameterization

Separating electron lepton jets from EM rich QCD jets

Mixed 2mu+2e lepton jet study

Hadronic isolation to prevent losses from
additional dark radiation

Scanning for di-mu resonances in hadronic events (Zurek & Gershetin)

Late Tevatron/LEP or Early LHC Analyses and Measurements

Measuring J/Psi production & pT spectrum

Rate of muons from in-flight decays

Measuring resolution/efficiency at small separation

Summary

Still making operative definitions of lepton Jets

New signals + tools appearing

Important searches to be done at Tevatron

Early searches possible at LHC

B-Physics & Fixed Targets Experiments