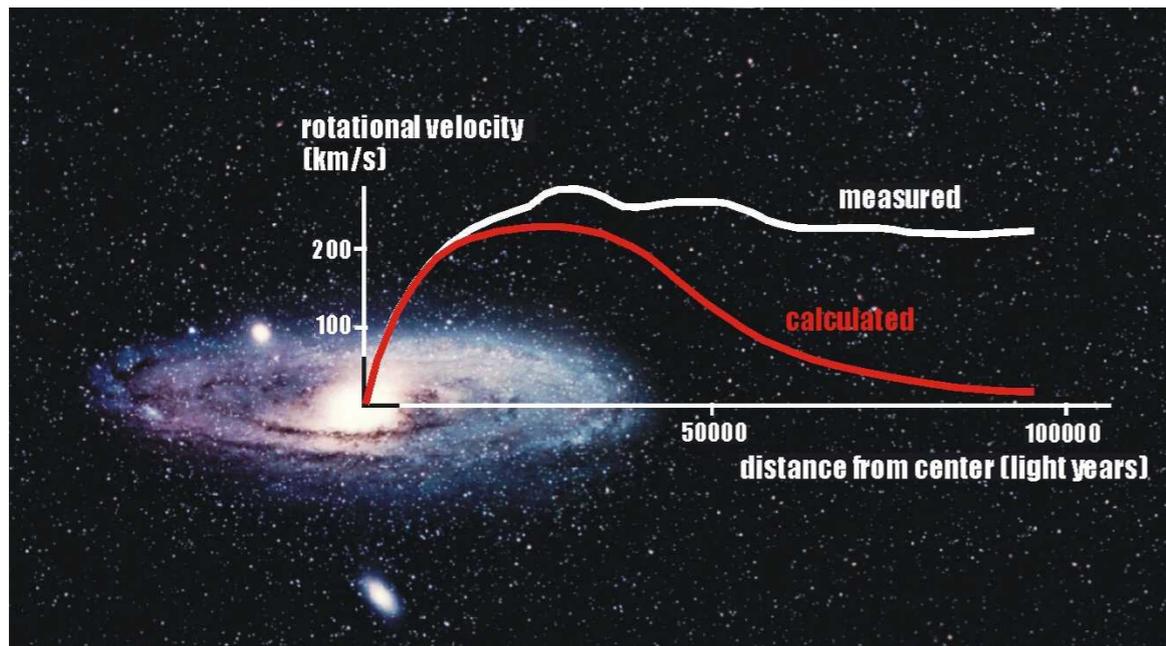


Pedro Schwaller

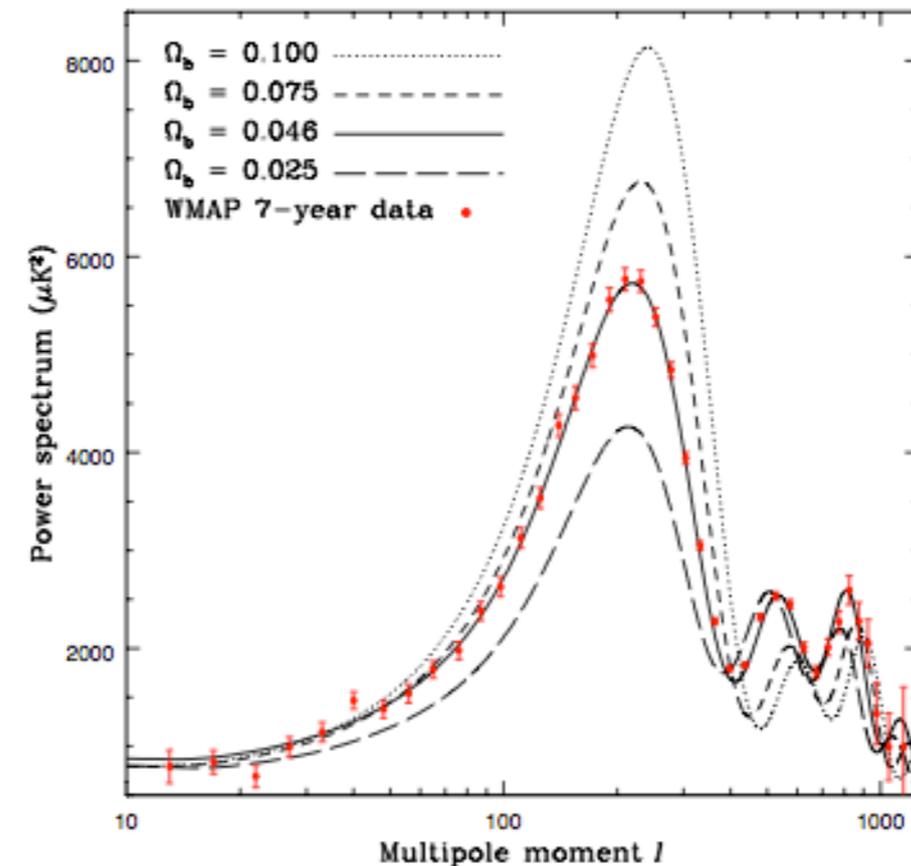
theory retreat, 2014

BSM physics and Cosmology

- Important open questions:



dark matter



baryogenesis

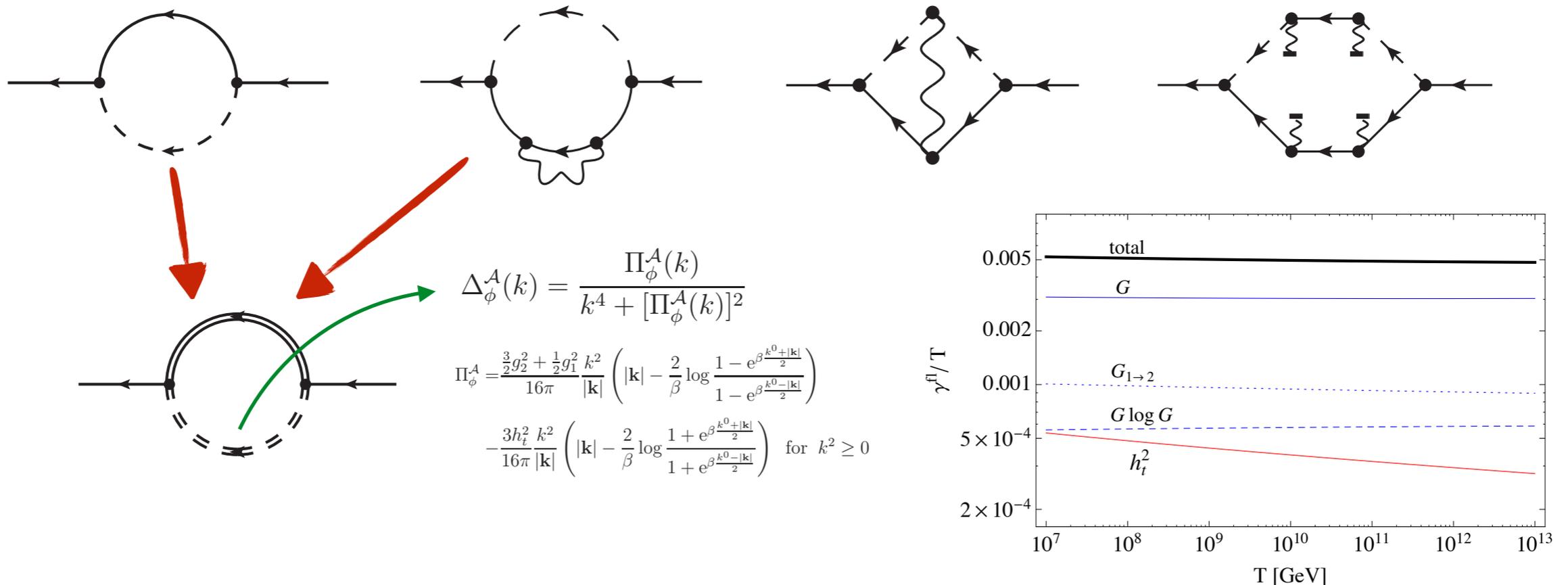
recent & current work

- Theoretical understanding of Baryogenesis
 - ▶ Finite temperature scattering rates
 - ▶ Spectator effects
 - Collider dark matter searches
 - ▶ Monojet for Higgsinos, Winos
 - Non-WIMP dark matter
 - ▶ dark QCD
 - ▶ Emerging jets
- } Leptogenesis

Leptogenesis

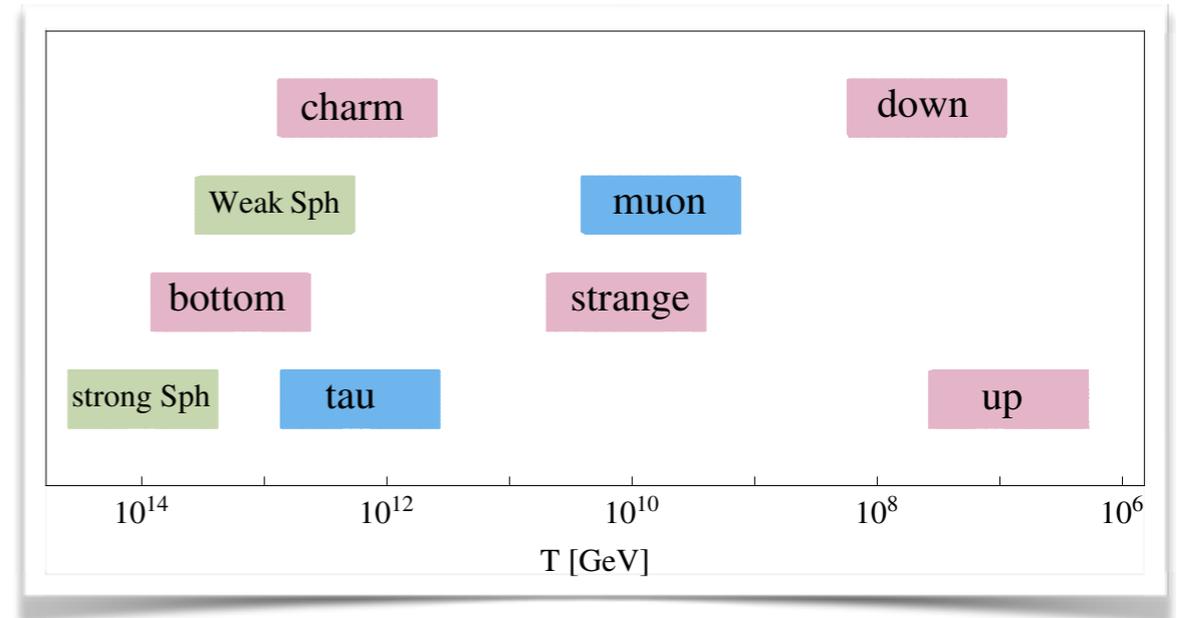
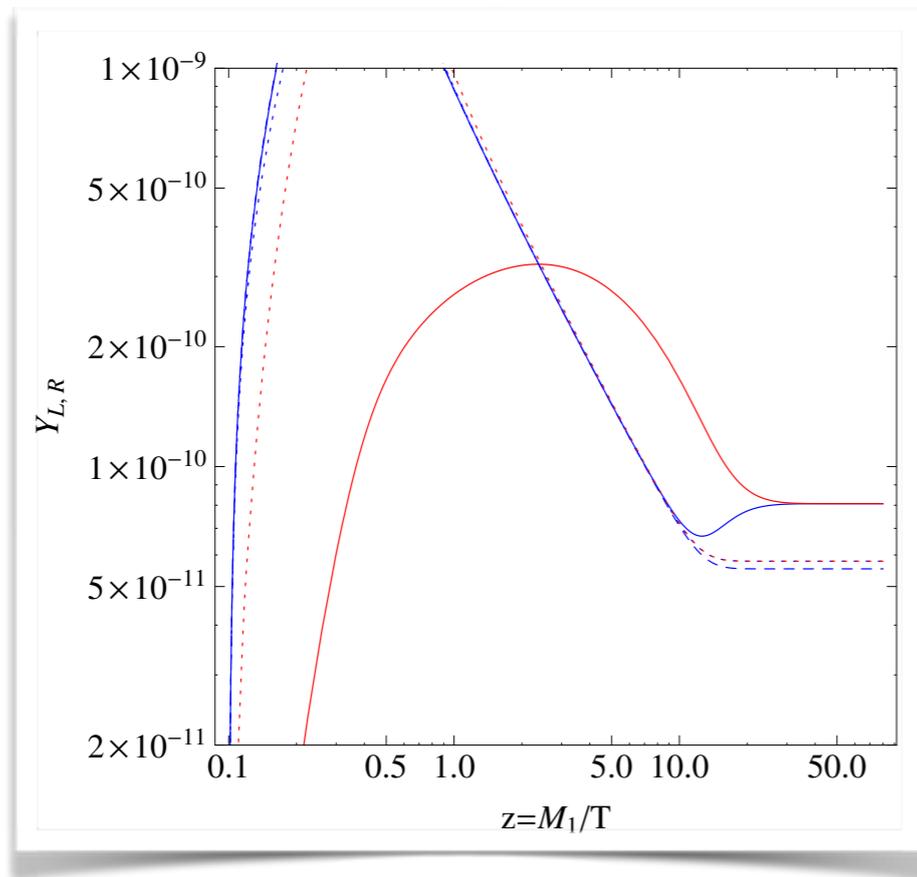
- LG: Generates baryon asymmetry from CPV decays of heavy RH neutrinos
 - Consistent with observed neutrino masses → maybe the most convincing baryogenesis scenario we have
 - Solid understanding of LG dynamics desirable
- Finite temperature scattering rates

Garbrecht, Glowna, PS, NPB 2013.



Spectator effects

- Interactions that are in thermal equilibrium during leptogenesis, but don't change L
- What if they reach equilibrium during LG?

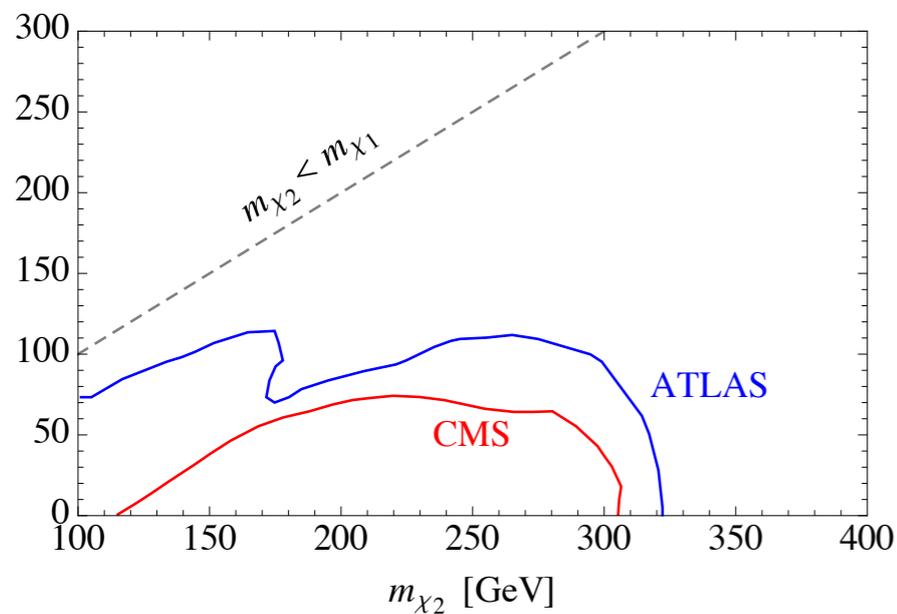
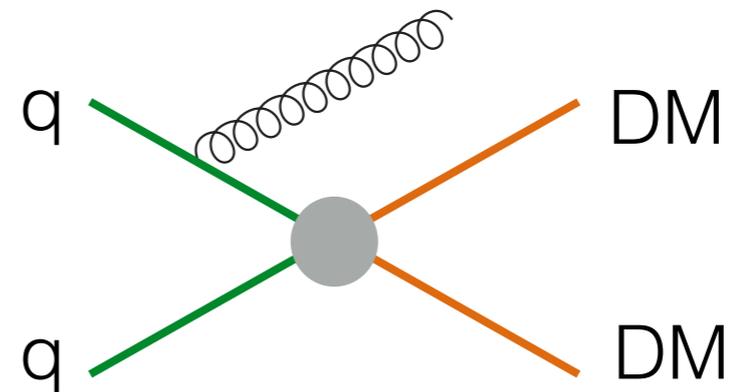


- Spectator DoF “hide” asymmetry from washout
- Up to 50% correction to final asymmetry

Next:
Dependence on initial conditions

Mono-jet searches for DM

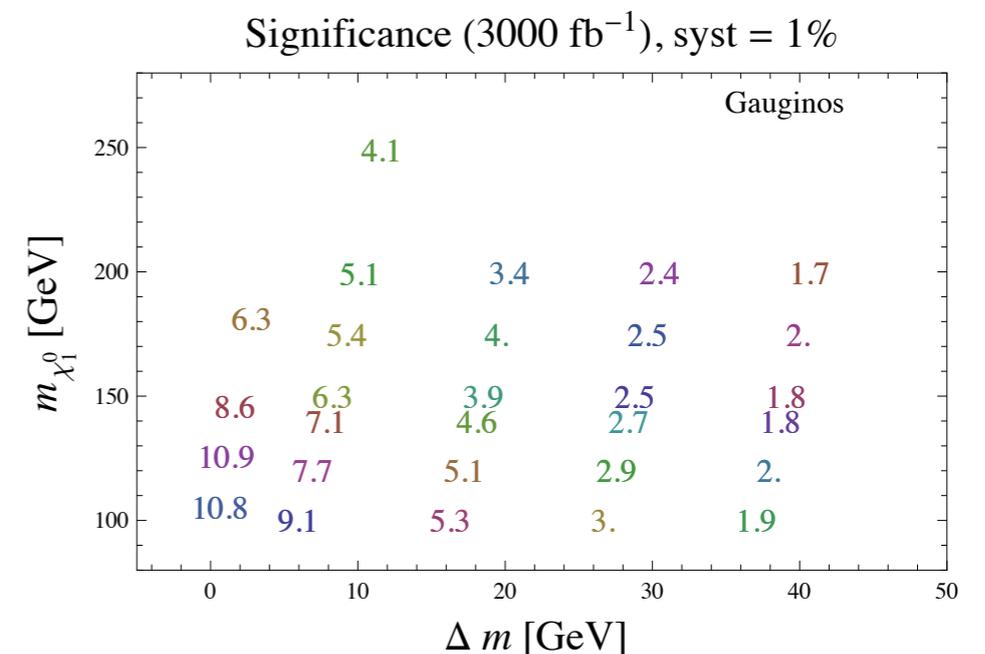
- One way to observe invisible particles:
 - Sensitive to electroweakly produced states?
 - Close the gap in SUSY searches?



PS, Zurita, JHEP 2014.



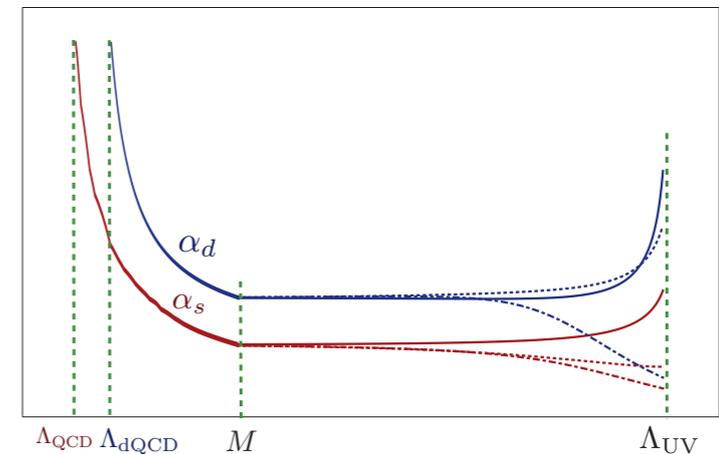
Important:
Soft leptons
Relax vetoes



Currently:
Optimize for 100 TeV

Composite (asymmetric) Dark Matter

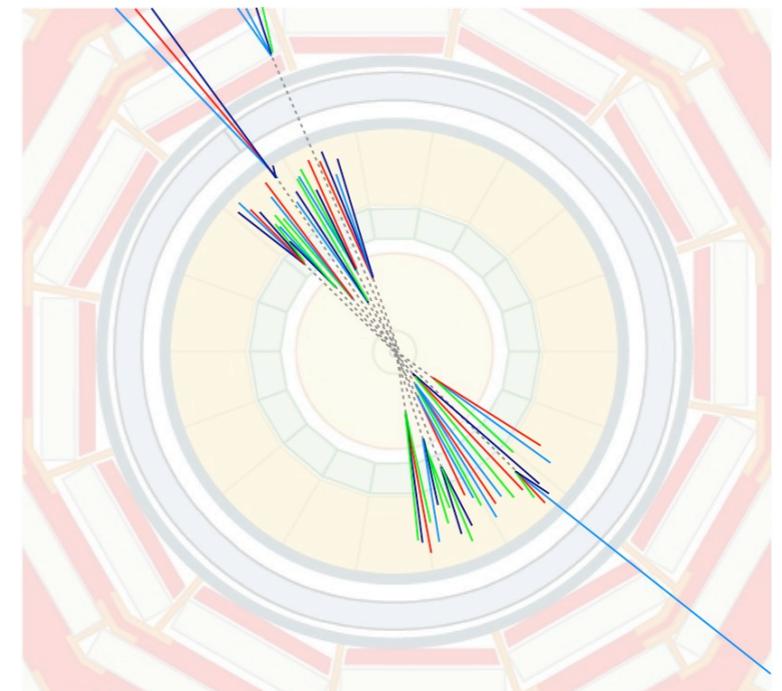
- **Dark QCD:** DM is “proton” of QCD like dark sector Bai, PS, PRD 2014
 - ▶ Explain DM mass, stability
 - ▶ Efficient annihilation of symmetric relic density



- New collider signature of DM: **Emerging Jets**

PS, Stolarski, Weiler
almost done!

	Model A	Model B	QCD 4-jet
Tree level	14.6	14.6	410,000
≥ 4 jets, $ \eta < 2.5$ $p_T(\text{jet}) > 200$ GeV $H_T > 1000$ GeV	7.1	9.2	48,000
$E(1 \text{ GeV}, 0, 10 \text{ mm}) \geq 1$	5.9	4.1	41
$E(1 \text{ GeV}, 0, 10 \text{ mm}) \geq 2$	2.6	0.7	~ 0.08



Other stuff/Outlook

- Higgs and BSM (2011-2013)
 - Higgs portal DM
 - Probing Higgs CP violation
 - Vector-like leptons
- Electroweak Baryogenesis
- Aspects of composite DM
 - self interactions
 - bound states
 - model building
- Production of self-interacting sterile neutrinos
- Strong coupling measurements to constrain new physics