Summary of the Dark Showers working group

Goals

Jessie Shelton:

1. To establish search strategies for dark showers that are flexible and general enough to pick up any new physics of this type -- i.e., leave no sensitivity holes

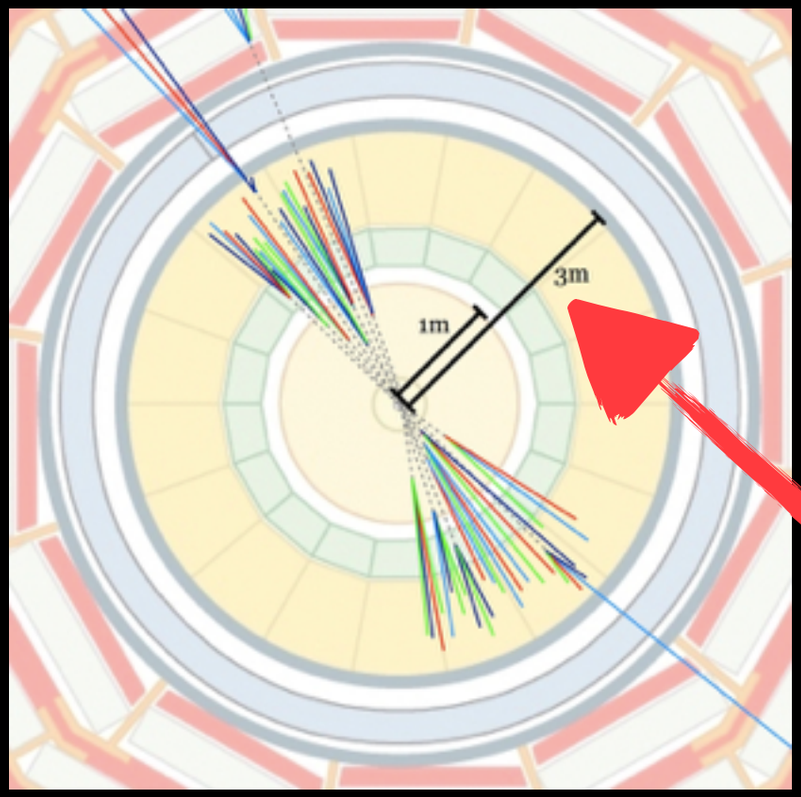
2. To identify and address the major experimental hurdles in these kinds of searches

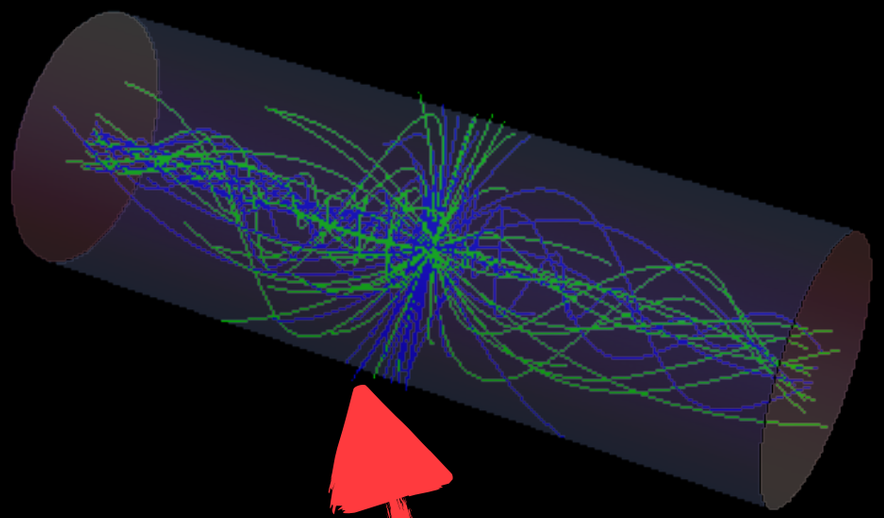
Pedro Schwaller:

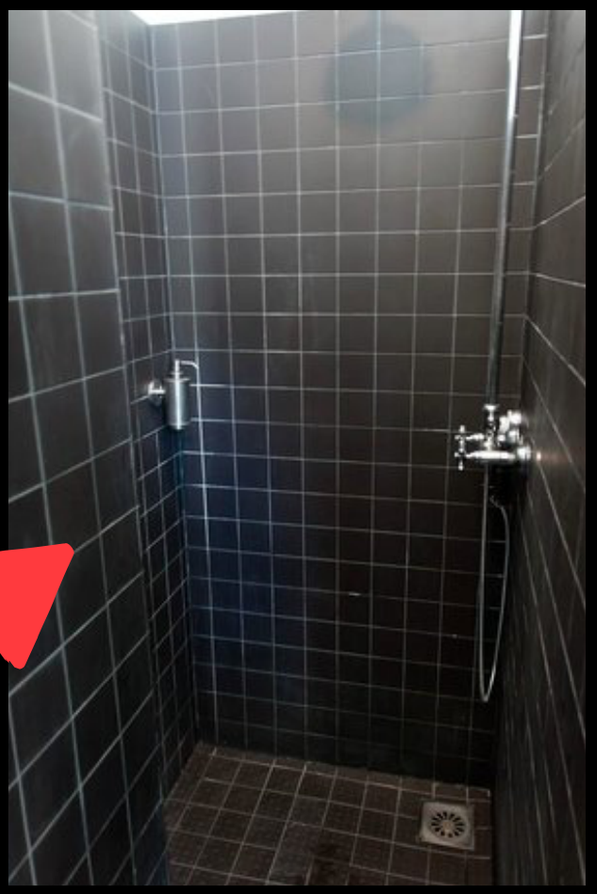
1. Classify the different types of signatures that should be distinguished a the most basic level.

2. And then we need a good strategy how to get events generated.

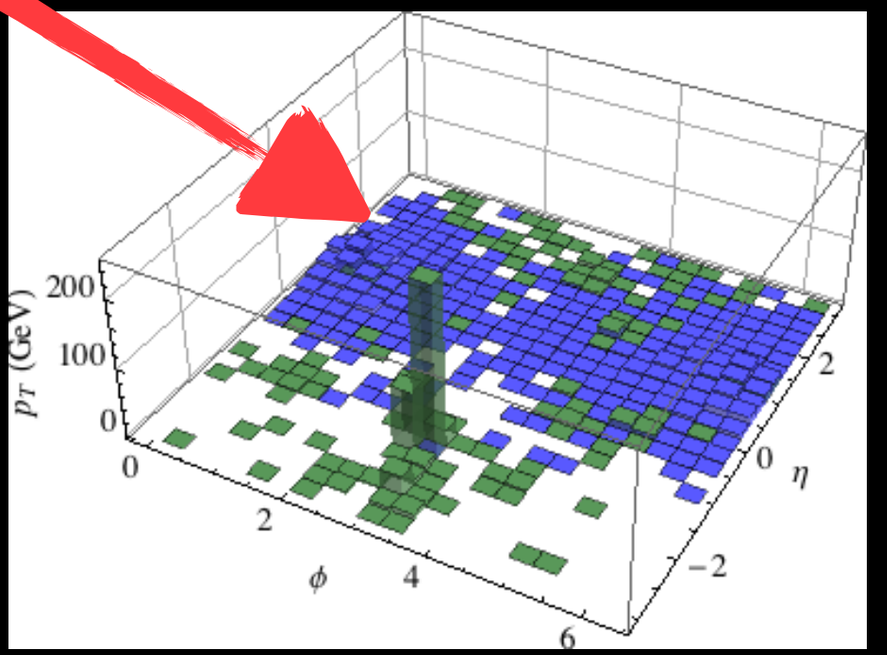
3. Classification of mediators and hidden sectors and how combined they give rise to different sets of signatures







Dark Showers



Developing a common language:

1. Describe features theorists can imagine they can realize in models.

2. These features should be mappable objects experimentalists can measure.

3. Allow for a “full” (but not necessarily orthonormal) basis that spans the notion.

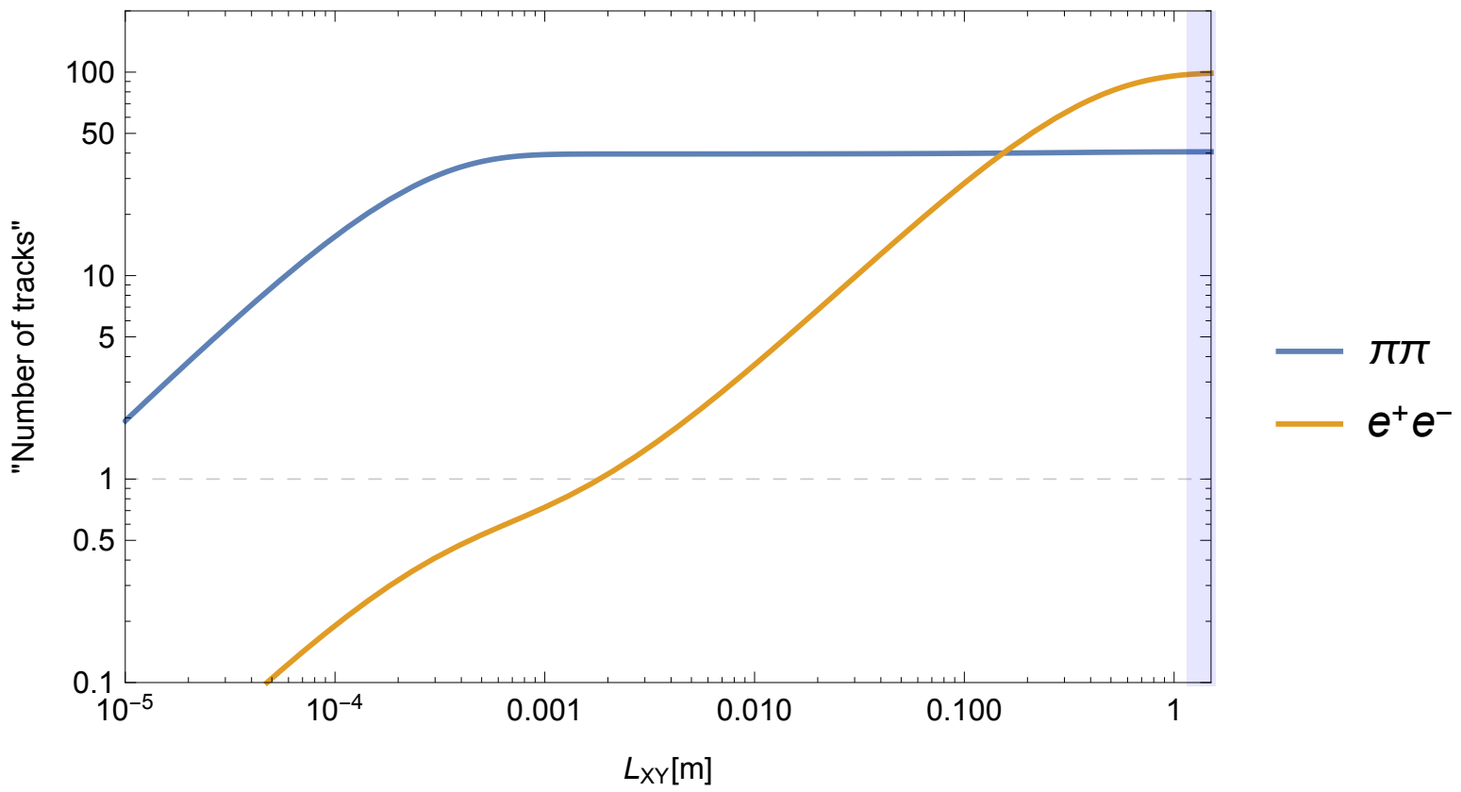
Classifiers

I. Typical width of the jet (cone size)

II. Number of “emerging jets” (depending on jet definition)

III. SM composition within the jet: Fraction of the jet carried by some SM particle at a given Lxy (light hadrons, heavy hadrons, electrons, muons…)

IV. Typical number of particles per jet (as a function of Lxy)



Classifiers: Experiment

1. Energy deposited within the jet (Lxy): connected to (III) and (IV)

2. High density of hits in regions / i.e. sliding window (triggering, seed)

3. Number of reconstructed vertices (within jet (clustering-dependent) or whole event): connected to (I) and (III) (and (IV)..)

4. Try to give an efficiency for reconstructing such jets … need cuts (e.g. isolation) to justify assumption that reconstruction efficiency of each vertex is independent

Classifiers: Theory

1. How can we design benchmarks such that we cover the range of behaviors in these categories:

   I. Typical width of the jet (cone size)

   II. Number of “emerging jets” (depending on jet definition)

   III. SM composition within the jet: Fraction of the energy of the jet carried by some SM particle at a given Lxy (light hadrons, heavy hadrons, electrons, muons…)

   IV. Typical number of particles per jet (as a function of Lxy)

Next Steps

- Need clear road map, to be determined in stages.
- Yesterday we laid the groundwork, and should meet regularly to make progress by October.
- Next meeting TBD (will send a doodle, send me an email if interested)

Tasks for the experimentalists

- Secondary vertex efficiency in ATLAS and CMS
- How Jet cleaning cuts (or a MET cut, if we were to do one) affect emerging jet efficiencies cuts
- Get SUEP lhe files from Simon Knapen, et al., and simulate, estimate efficiencies
- Investigate dedicated triggers (ATLAS: FTK, photon-jets, inner tracker hit multiplicity, etc.)

Tasks for the theorists

- Vary particle multiplicity in existing MCs and check effect
- Benchmark models <= can we populate the classifications we have outlined above
- What gives us wide jets? (Nf, Kinematics -- How to MC this?): (how to interpolate between Emergent Pencil jets and SUEP)
- Pedro and Dan add multiple lifetimes for dark pions
- Doodle a meeting for theorist discussion of these things.

Discussion