Light DM @ Accelerators
Closeout Session

Dark Sectors Workshop SLAC, April 30, 2016
LDM @ Accelerators

Technique #1

Inferred DM observation

Detection based on other objects

Can be production in proton or electron fixed target or collider
LDM @ Accelerators

Technique #2

Production + Direct measurement

1. make DM

2. observe scatter etc.

Two-step detection using LDM itself

Can be production in proton or electron fixed target or collider
## Large DMA Landscape

<table>
<thead>
<tr>
<th></th>
<th>Electron beam</th>
<th>Proton beam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detect</strong></td>
<td>SLAC BDX</td>
<td>FNAL (SeaQuest, μB, LBNF, DUNE, μUD?), Daedalus, T2K, Minos, NovA, SNS, SHiP?</td>
</tr>
<tr>
<td></td>
<td>JLAB BDX, Mainz MAMI/MESA, Cornell?</td>
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<tr>
<td><strong>Infer</strong></td>
<td>Cornell, Frascati, Padme, VEPP3, DarkLight, DarkLight, JLAB, LDMX, NA64, NA64, BaBar, BaBar, Belle II, Belle II, LEP</td>
<td>LHC, Tevatron, NA62, SHiP, SHiP, SeaQuest?</td>
</tr>
</tbody>
</table>
LDM @ Accelerators
Physically motivated targets... others?

\[ y \equiv \epsilon^2 \alpha_D \left( \frac{m_\chi}{m_{A'}} \right)^4 \]
LDM @ Accelerators
Physically motivated targets... others?

\[ y \equiv \epsilon^2 \alpha_D \left( \frac{m_\chi}{m_{A'}} \right)^4 \]

\[ \times m^2_\chi \times \frac{1}{m^2_\chi} \]

Saturday, April 30, 16
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Physically motivated targets... others?

$$\sigma v \sim \alpha_D \epsilon^2 \alpha \times \frac{m^2_\chi}{m_{A'}^4} \times m^2_\chi \times \frac{1}{m^2_\chi}$$

Dimensionless rate parameter

$$y \equiv \epsilon^2 \alpha_D \left( \frac{m_\chi}{m_{A'}} \right)^4$$
LDM @ Accelerators
Physically motivated targets... others?

Scalar Thermal Relic DM

Pseudo–Dirac Thermal Relic DM

Dark photon invisibly decaying to LDM
Thus far, emphasis on “parasitic/symbiotic” experiments

Is this reasonable given the community size and physics case?

DMA community ready for dedicated experiments to decisively probe much of LDM

Strong DM priority in Snowmass, P5
Many next generation experiments will be dedicated