

Searches for New Forces at the GeV-scale



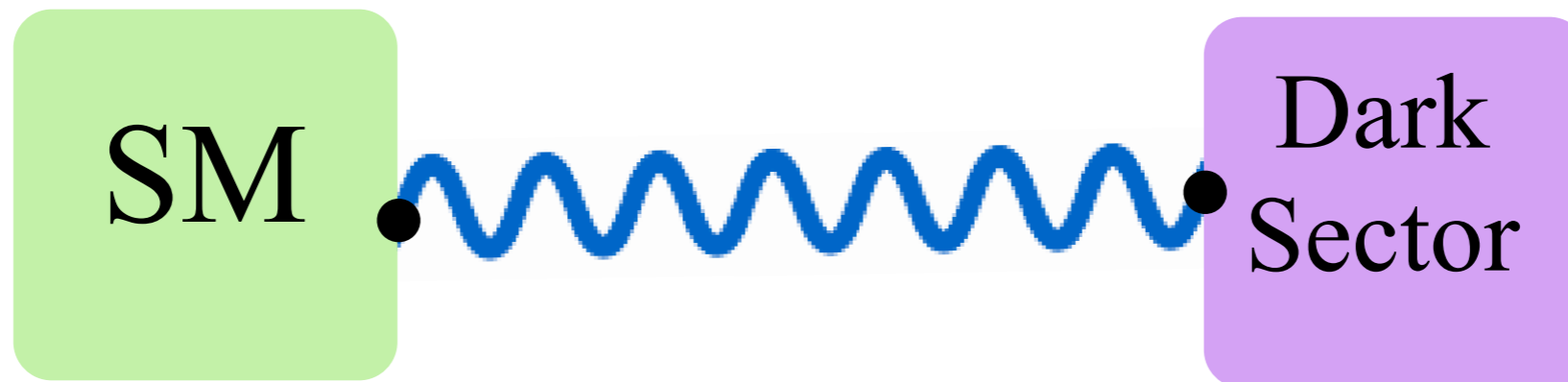
Introduction to the Working Groups

Philip Schuster

on behalf of the organizers:

R. Essig, M. Graham, M. Peskin, A. Roodman, P. Schuster, N. Toro, J. Wacker

Link to a Dark Sector



Weakly coupled new force

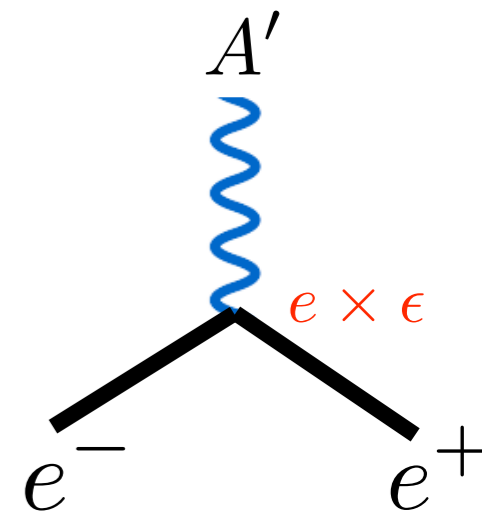
New force carrier
associated with a low energy dark sector

SM is “milli-charged” under new force

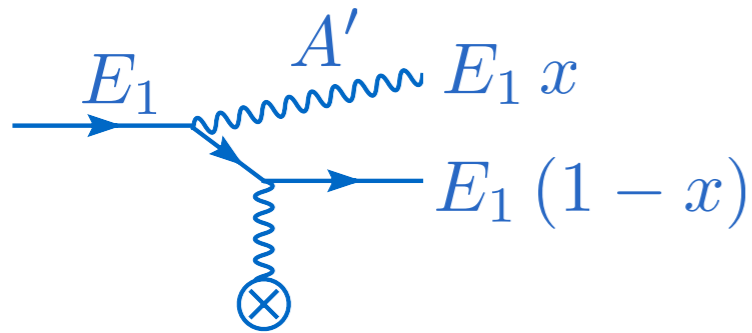
Two Strategies

Produce the force carrier directly

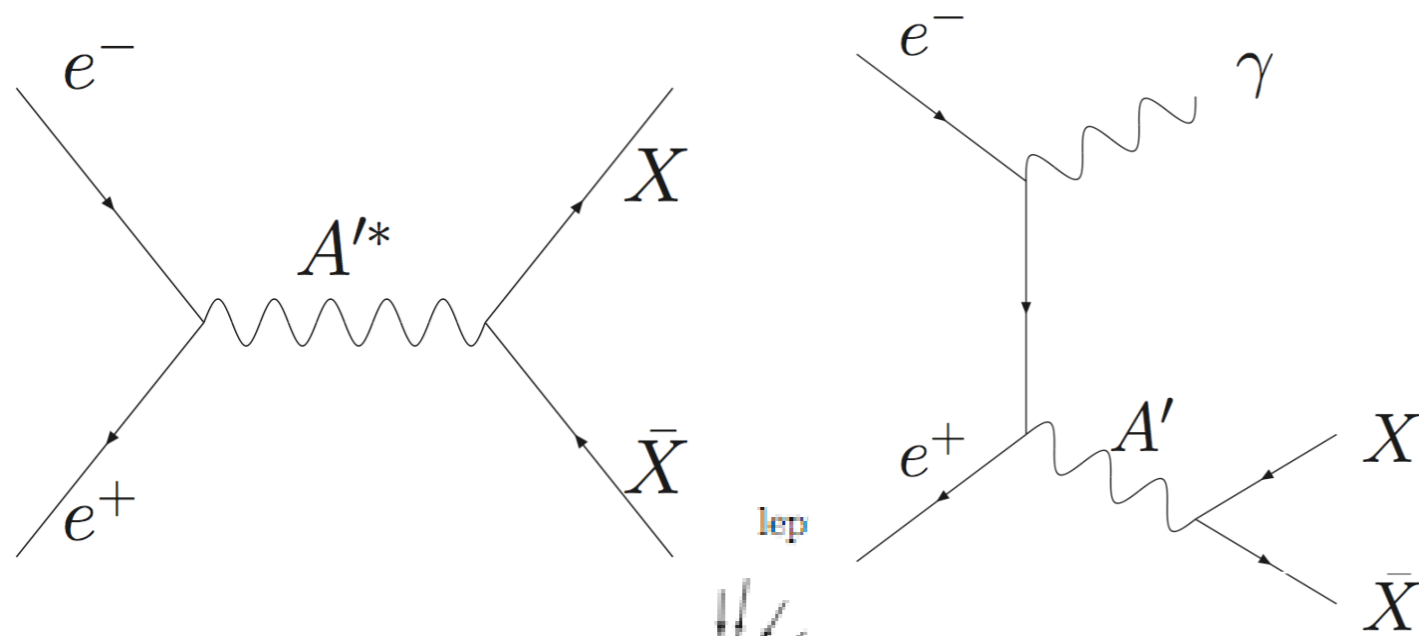
Produce particles that decay into the force carrier



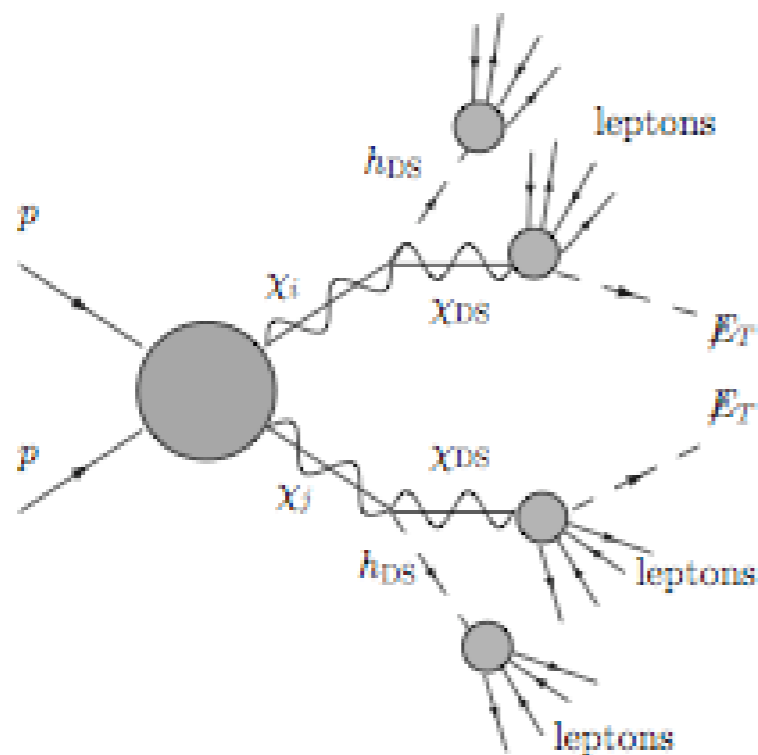
Production Mechanisms



Fixed-Target: Electron or Proton collisions, A' decays to di-lepton, pions, multiple channels



Colliding e^+e^- : On- or Off- shell A' , X =dark sector or leptons & pions



High Energy Hadron Colliders: New heavy particles decaying into dark sector (lepton jets)

A Complementarity of Techniques

Exploring vast parameter space & signatures

5 decades in mass

10 decades in cross section

e⁺e⁻ Colliders: BELLE, BaBar, BESS-III, KLOE, CLEO

Fixed-Target: Jefferson Lab (Hall A, Hall B/CLAS), SLAC, MAMI (Mainz), ELSA (Bonn), XFEL (DESY), COMPASS (CERN), FNAL

Hadron Colliders: CDF & D0

Axion searches: JLab FEL, ADMX, many others...

Most of the above experiments/labs represented at this workshop

Working Groups

Main Topics:

Searches in existing data?

New experiments with existing equipment?

Future experiments?

Working Groups

Fixed-Target WG: 2-3:30pm, **Main ROB room**

Chairs: James Bjorken and John Jaros

Continued: 10:40-12:30 Fri (ROB A/B), 11:15-12:30 Sat. (Main ROB)

e^+e^- WG: 2-3:30pm, **Kavli Auditorium**

Chairs: Matt Graham and Adam Ritz

Continued: 10:40-12:30 Fri (ROB C/D), 11:15-12:30 Sat. (ROB Pine/Madrone)

Hadron Collider WG: 2-3:30pm, **ROB Pine/Madrone**

Chairs: Andy Haas and Jay Wacker

Continued: 10:40-12:30 Fri (Green Room)

Colliding Electron Beam WG

1) Existing limits and results

- What phenomena has been probed?

2) Future searches

- What are the most important searches to be done?
- How to make broadly sensitive searches?

3) Differences among facilities

- What are the advantages of Phi/Charm factories vs. B-factories?
- Improvements at future colliders?

4) Theoretical topics

- New models and signatures

Fixed-Target WG

- 1) Parameter ranges of sensitivity for different proposals
 - Existing constraints from old data
 - Existing equipment
 - New experiments

- 2) Possible facilities for new experiments
 - Electron and positron beams
 - Proton beams
 - Muon beams

- 3) Background limitations, rejection of backgrounds

Hadron Collider WG

1) Production mechanisms: prompt dark-photon (jet+lepton-jet), Z decays, EW-ino production + strong SUSY production

- Other models?
- What to focus on first?
- Important to consider various SUSY models?

2) Simulation

- Review the available tools/methods for production, showering, and decays
- What is missing?

3) Analyses

- Are lepton-jet (lj) definitions (e.g. 0909.0290) adequate? (where do they fail)
- Possible to do jet + single lj search? (how to measure background?)
- Priority for long-lived lj search? (how constraining are previous searches?)

Summaries and Discussion

There will be summary talks and discussion time for the entire group

Hadron Collider Summary and Discussion:

Fri, 5:20-6:00pm

Fixed-Target Summary and Discussion:

Sat, 3:00-4:00pm

e^+e^- Summary and Discussion:

Sat, 4:00-5:00pm

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