

# Whitepaper kickoff meeting

## Dark matter $t$ -channel mediator models

### Long-lived particle signatures

Contributors (so far):

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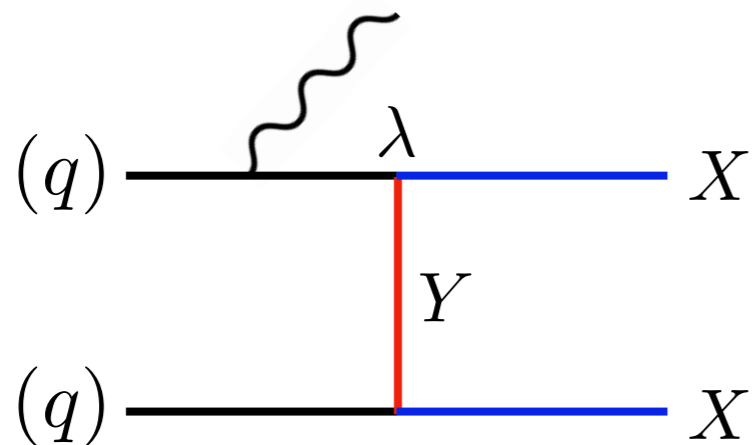


Jan Heisig (UVA)

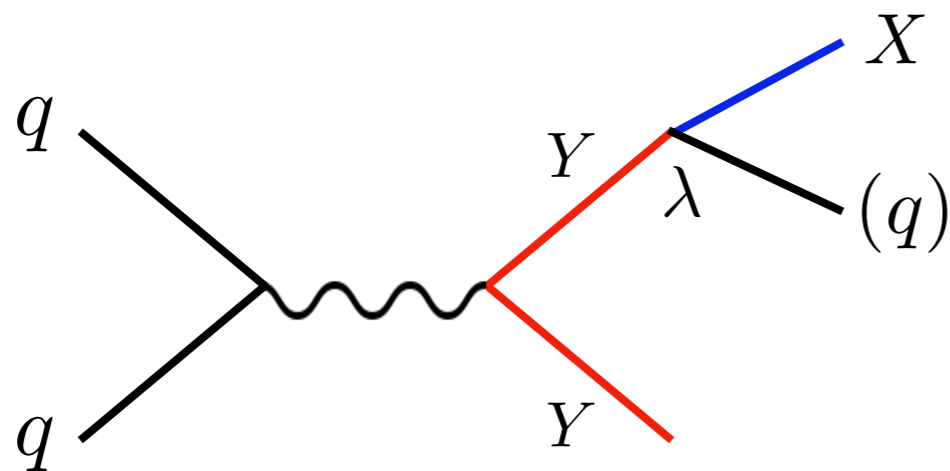
Unterstützt von / Supported by



# Why long-lived particles



⇒ MET signature



⇒ LLPs if:

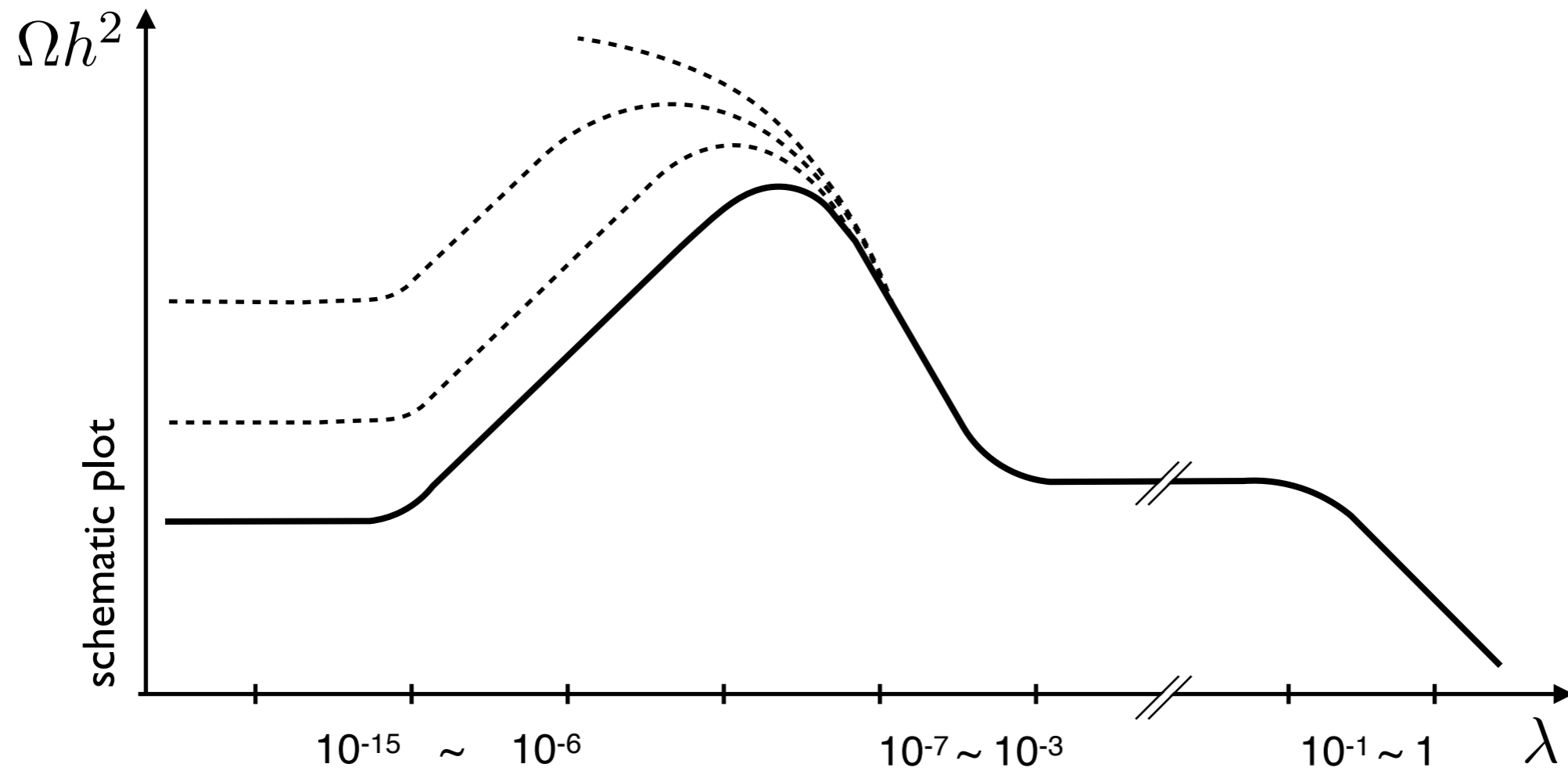
- $\lambda$  small or/and
- Mass splitting small, in particular:

$$\Delta m = m_Y - m_X < m_{(q)}$$

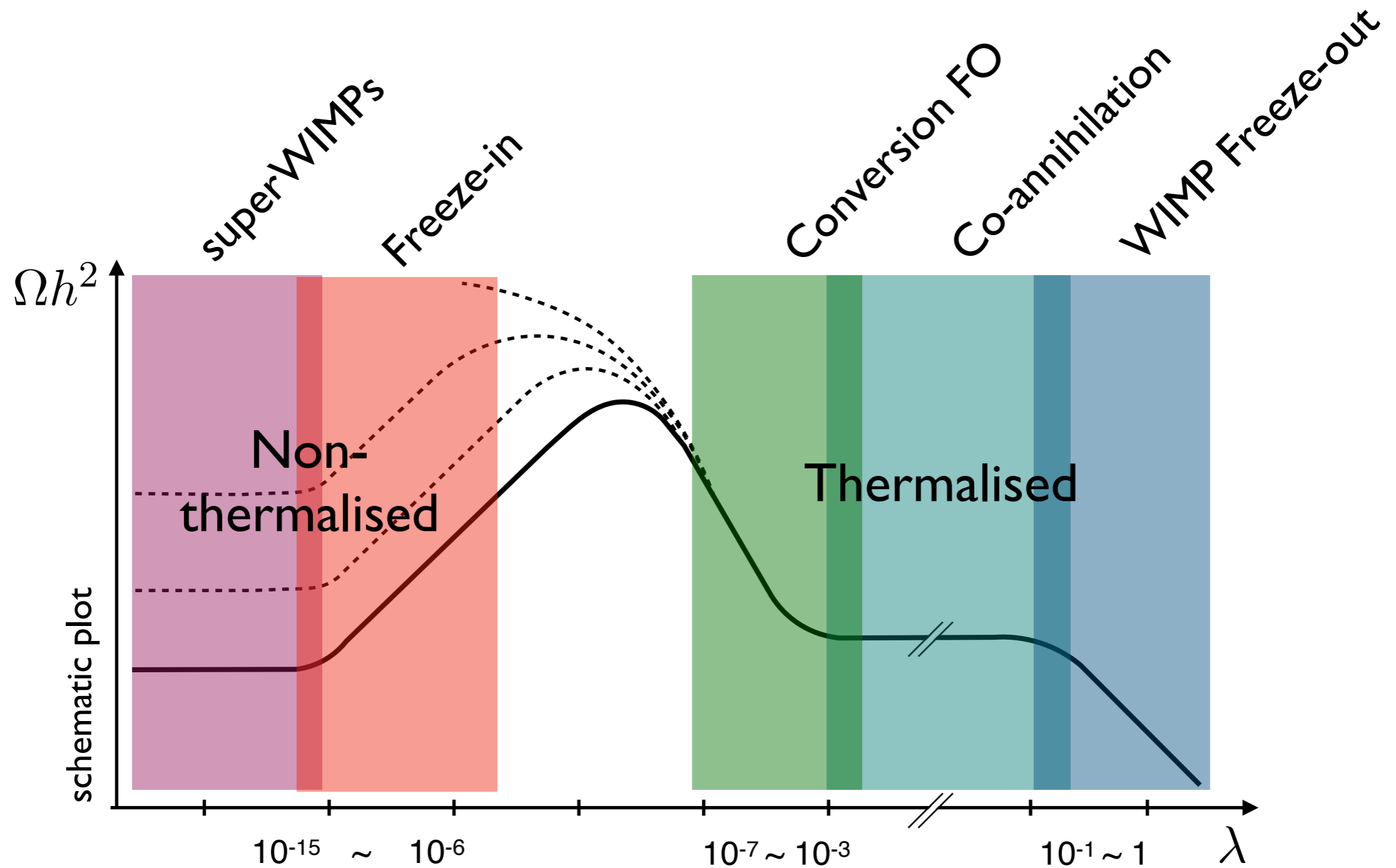
# Distinguish by dark matter genesis mechanism

- Freeze-out (thermalized dark matter)  
coannihilation / conversion-driven
  
- Freeze-in / superWIMP (non-thermalized dark matter)

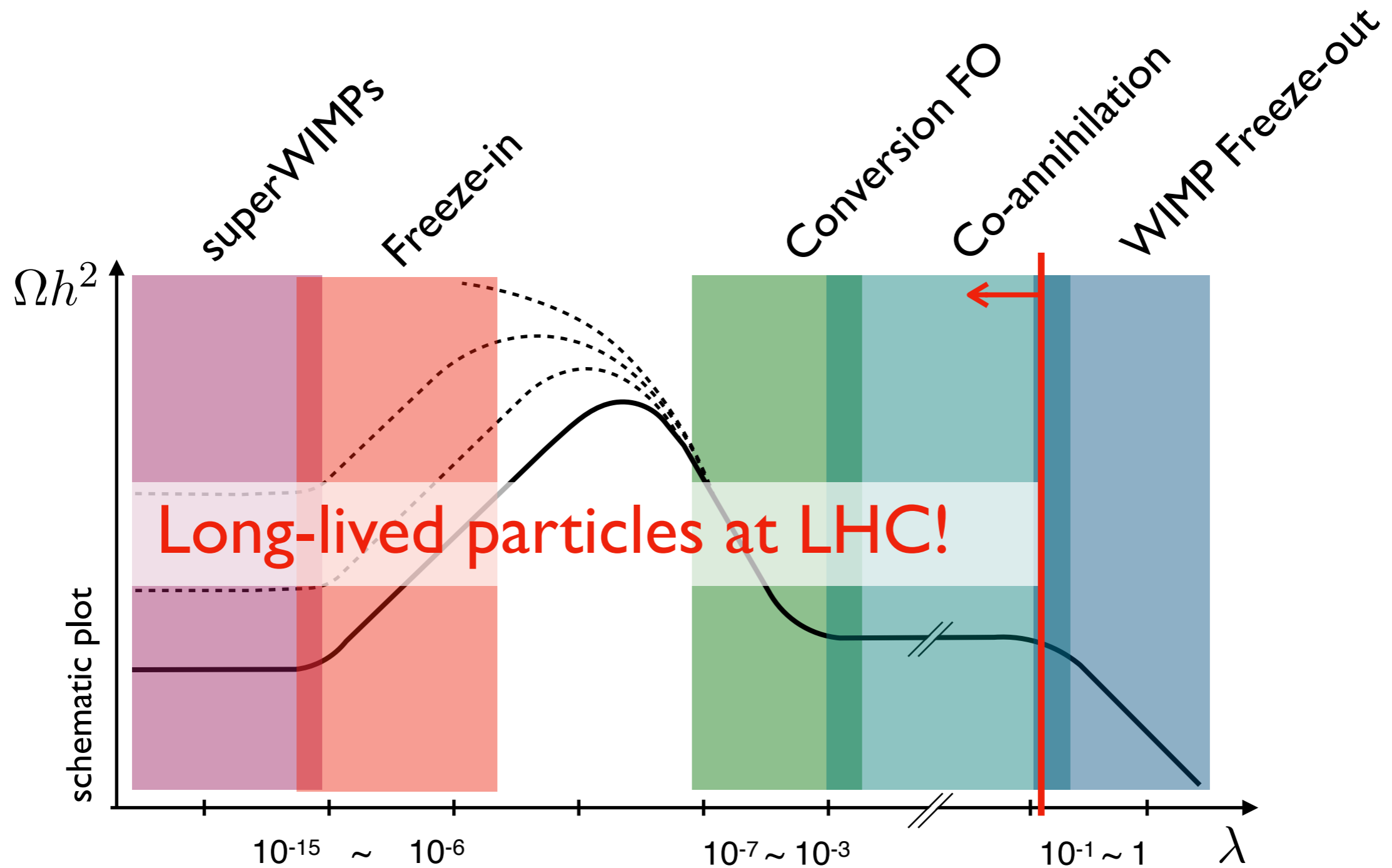
# Matching the relic density



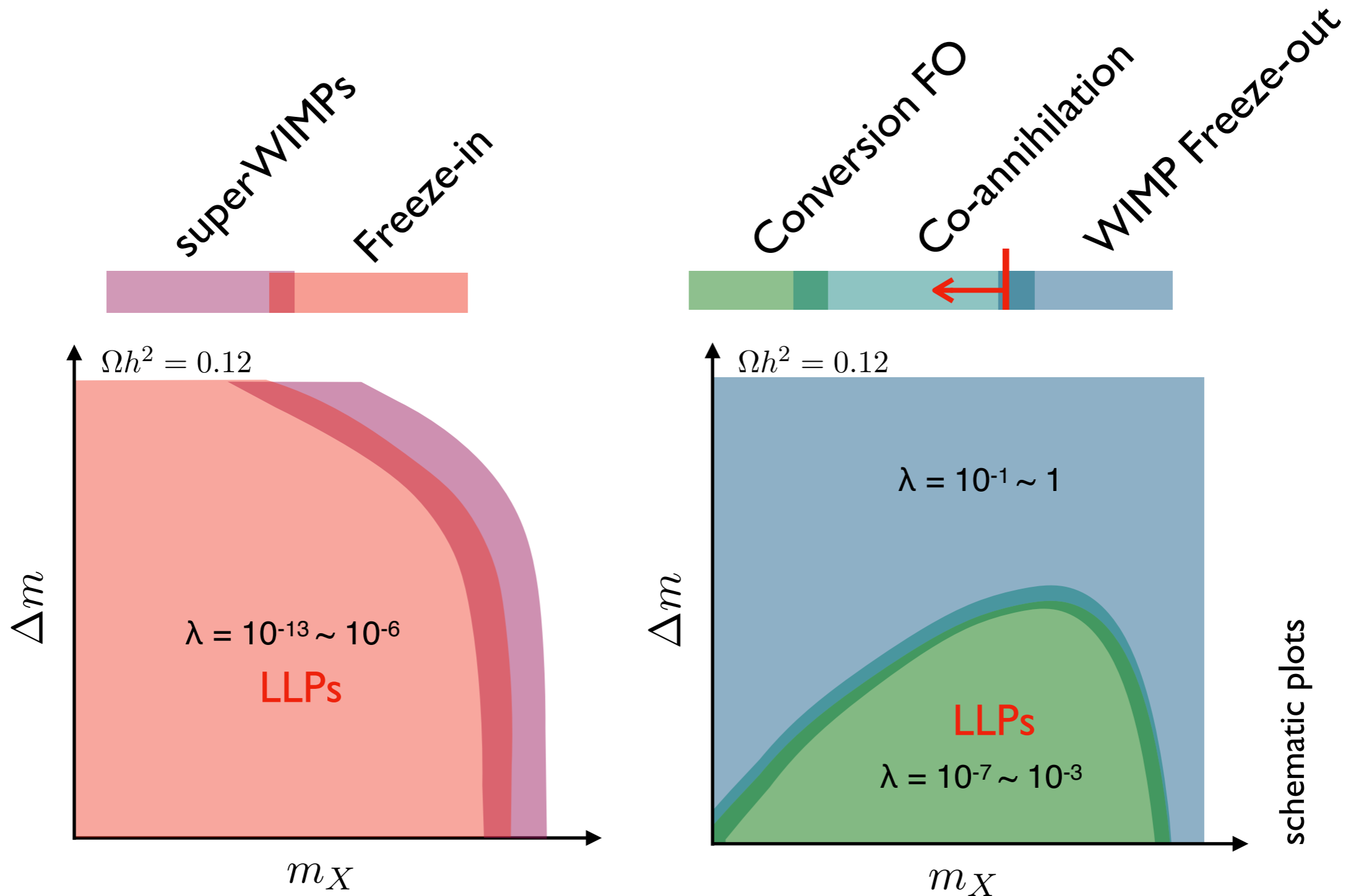
# Matching the relic density



# Matching the relic density



# Matching the relic density



schematic plots

# Distinguish by dark matter genesis mechanism

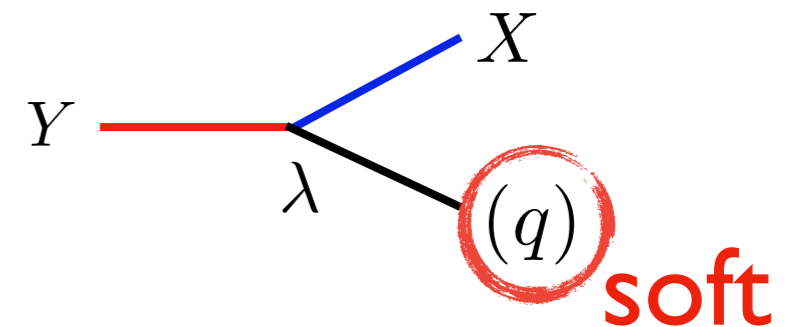
- Freeze-out (thermalized dark matter)  
coannihilation / conversion-driven
  - Small mass splittings ✓
  - Small couplings (✓)
- Freeze-in / superWIMP (non-thermalized dark matter)
  - Small mass splittings ✗
  - Small couplings ✓



# Distinguish by dark matter genesis mechanism

- Freeze-out (thermalized dark matter)  
coannihilation / conversion-driven

- Small mass splittings ✓
- Small couplings (✓)



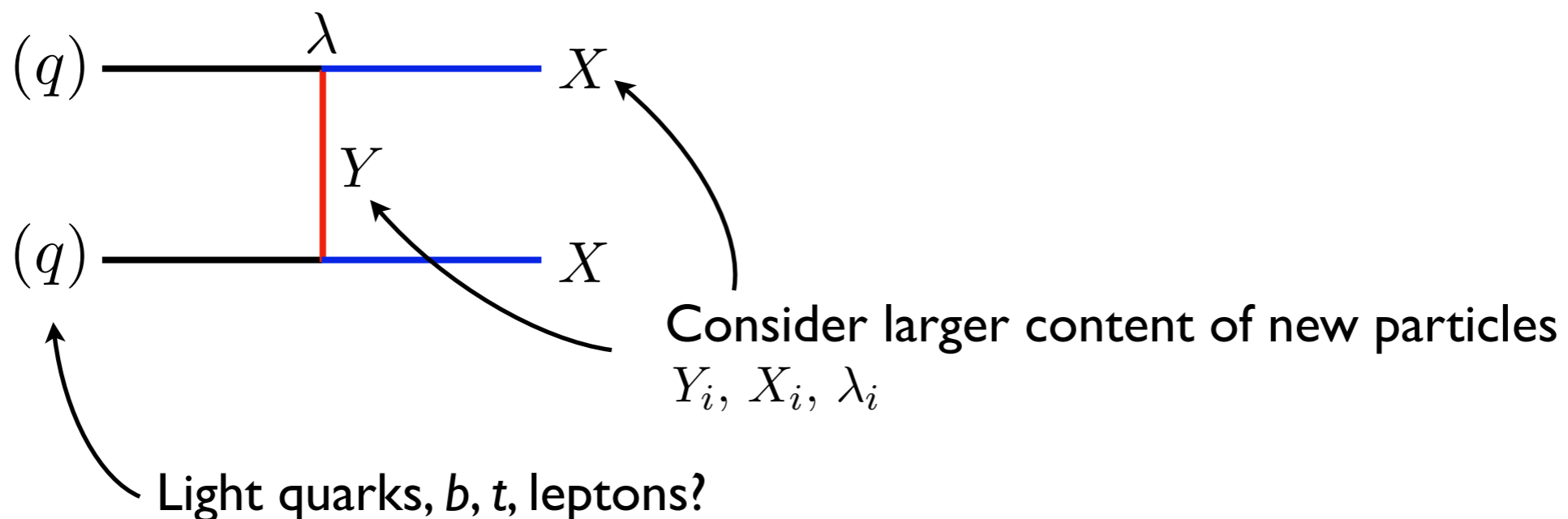
- Freeze-in / superWIMP (non-thermalized dark matter)

- Small mass splittings ✗
- Small couplings ✓

## Potentially interesting signatures:

- highly-ionising tracks / ToF
- Disappearing tracks / displaced vertices / kinked tracks / delayed objects
- Searches for bound state resonance (not LLPs though)

## Variants of $t$ -channel models:



## Goals:

- Map put parameter space: benchmark scenarios
- Close gaps  $\Rightarrow$  Propose new/refined searches
- Address reinterpretability

## Next steps:

- Discuss and decide on relevant models
- Overview literature
- Next meeting: fill doodle

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