

Freeze-in production of FIMP dark matter

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Lawrence Hall and Karsten Jedamzik

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Freeze-in overview

- Freeze-in is relevant for particles that are feebly coupled
(Via renormalisable couplings) - λ
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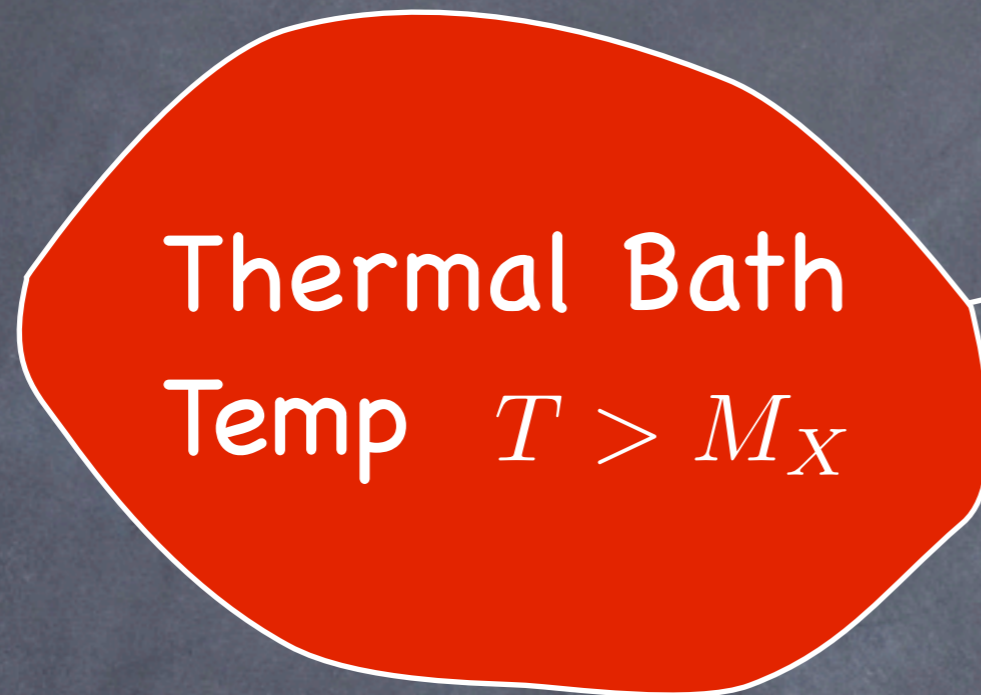
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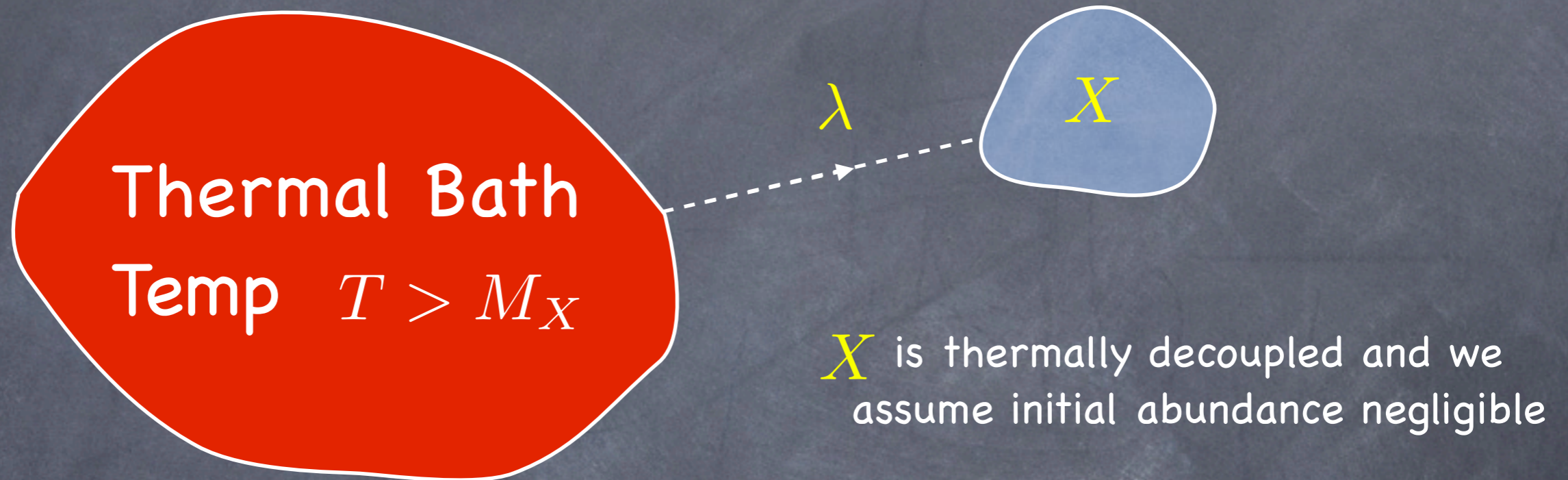
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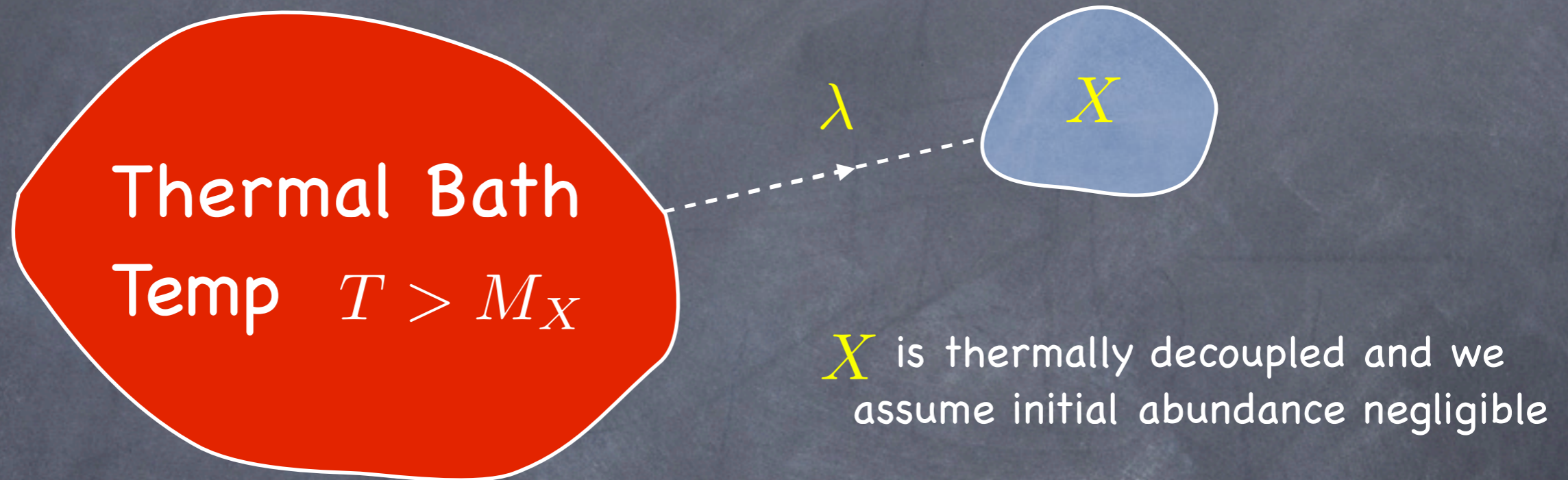
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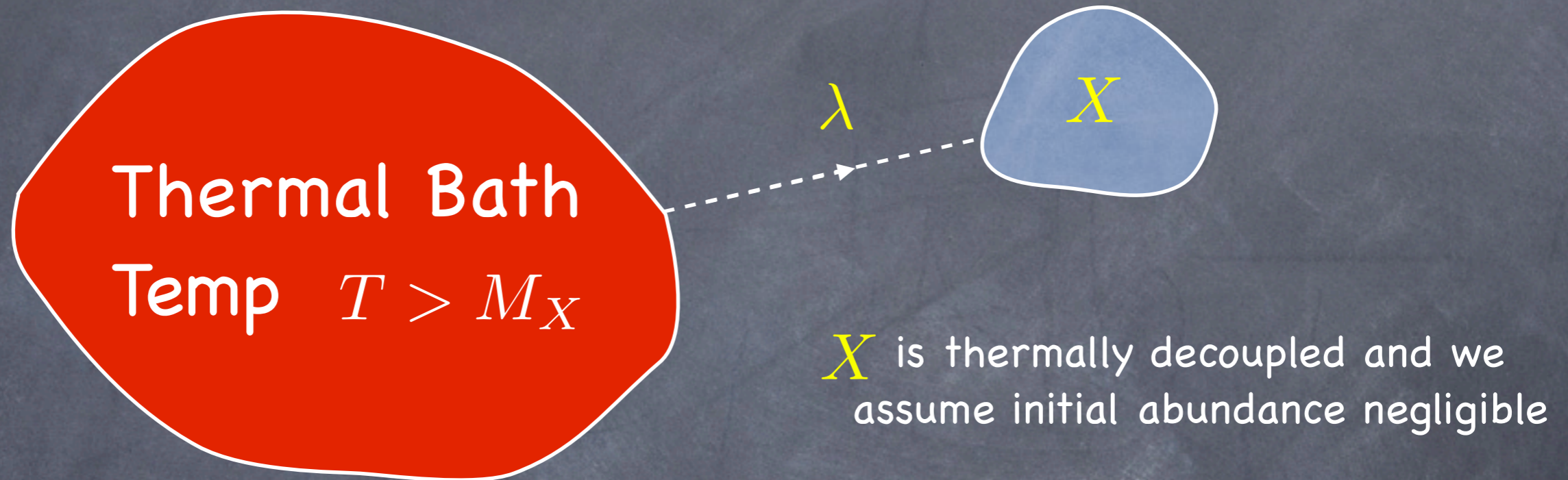
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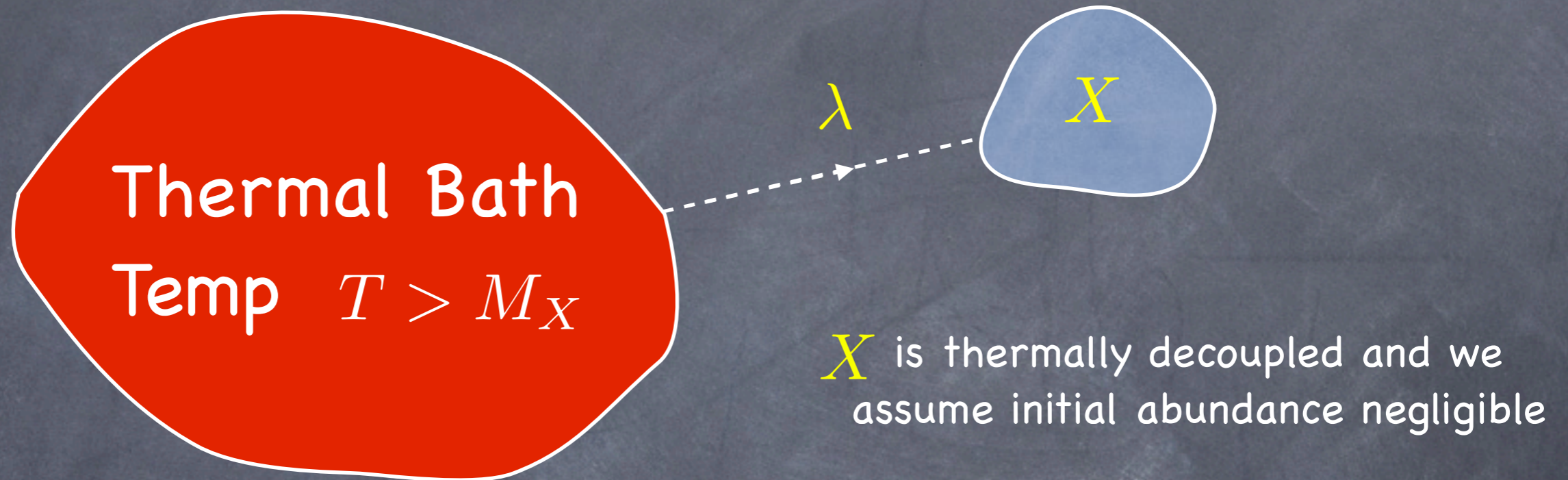
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opposite to Freeze-out...

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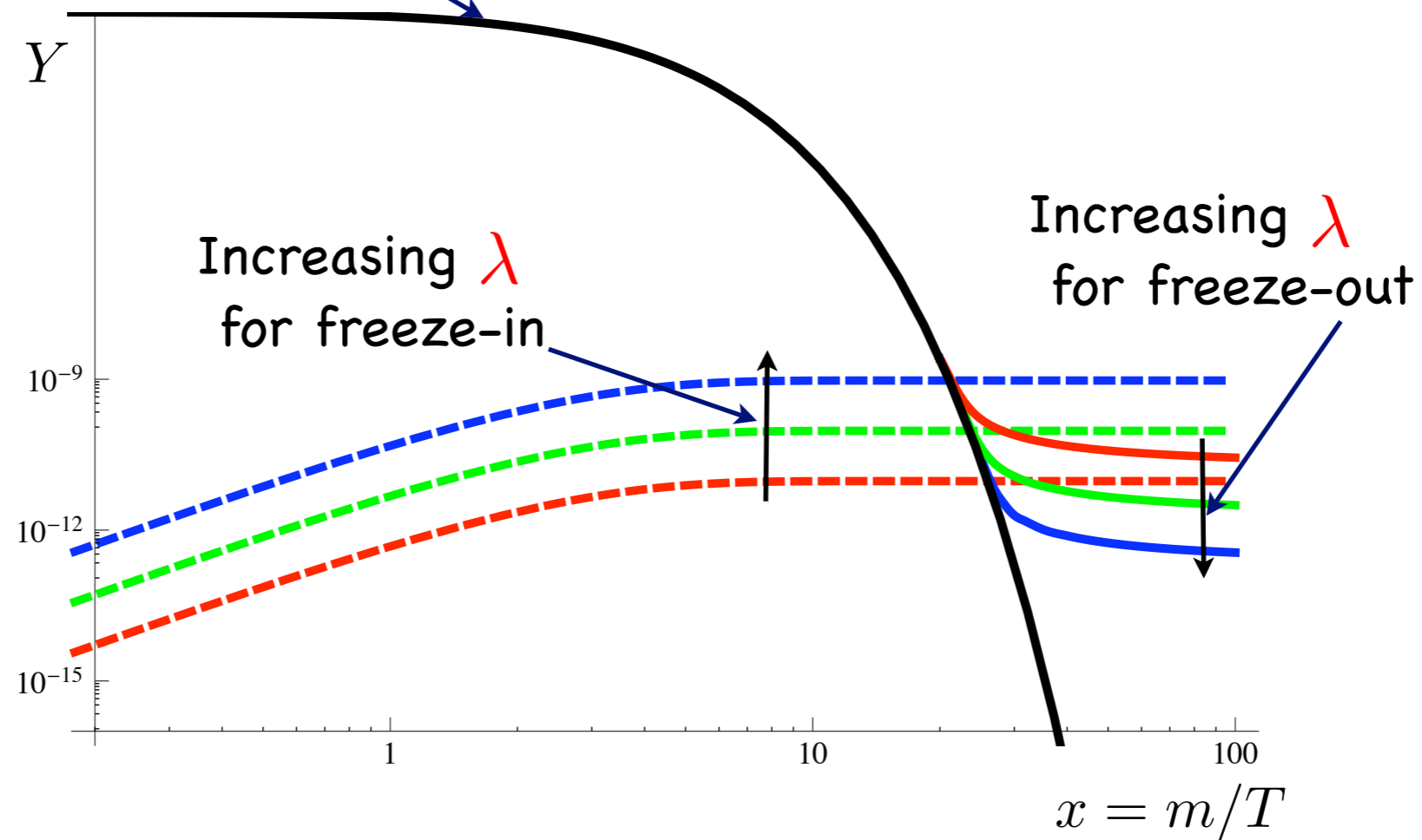
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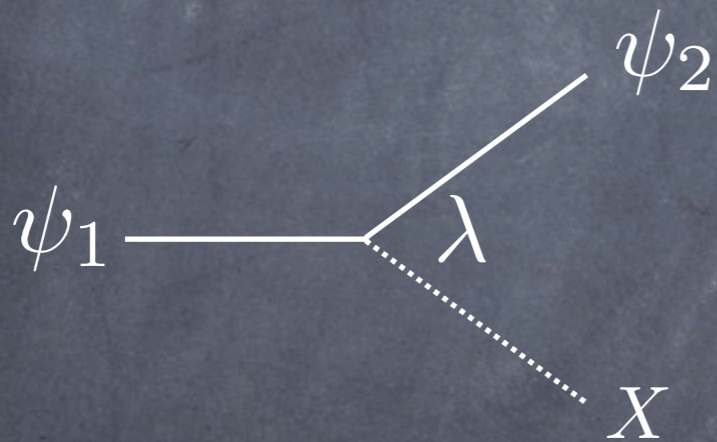
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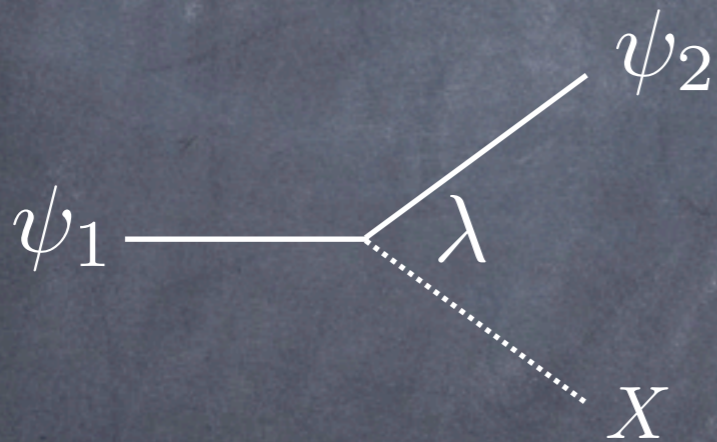
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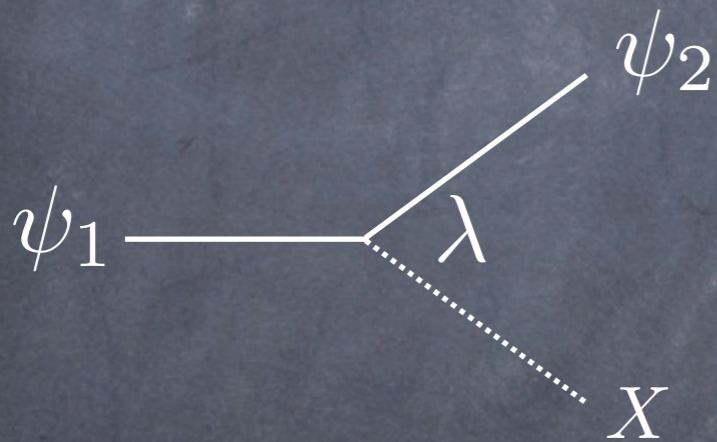
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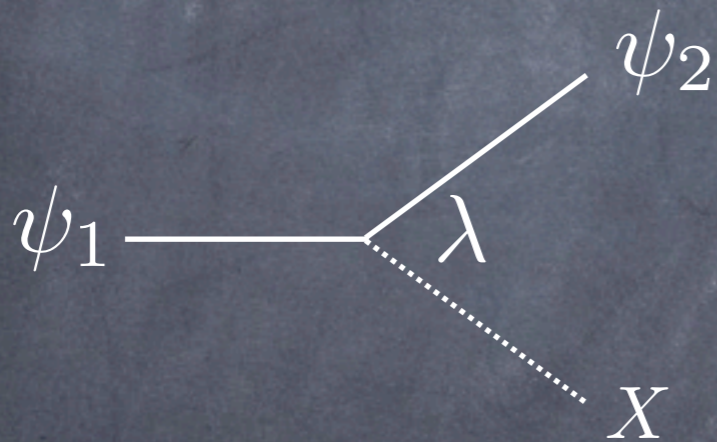
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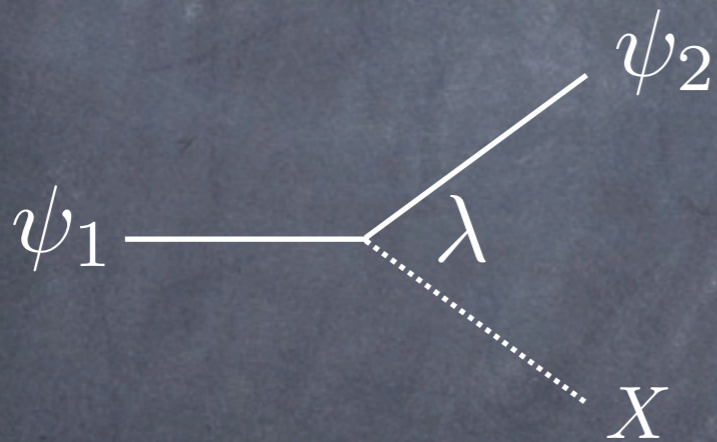
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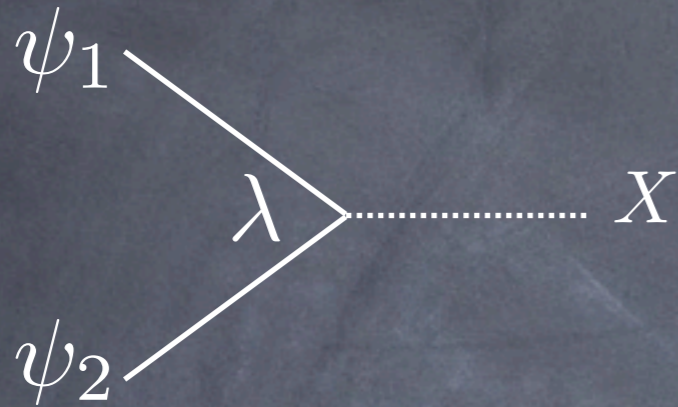
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- Lifetime of LOSP is long – signals at LHC, BBN...

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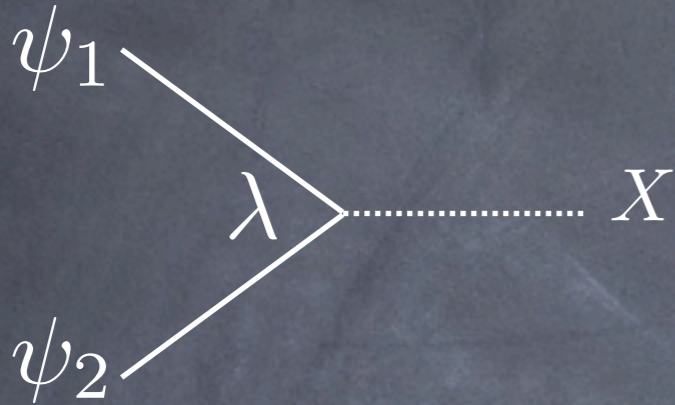
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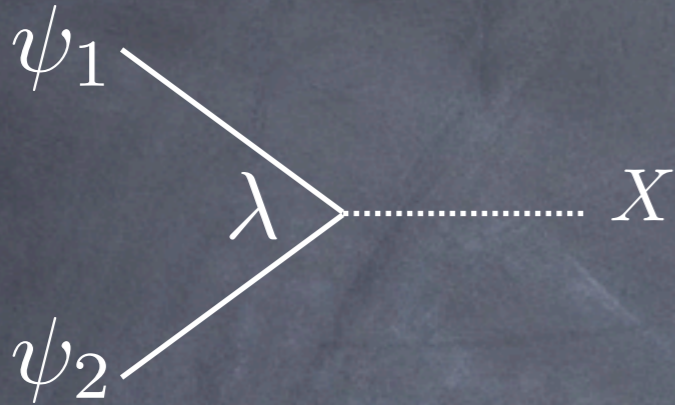


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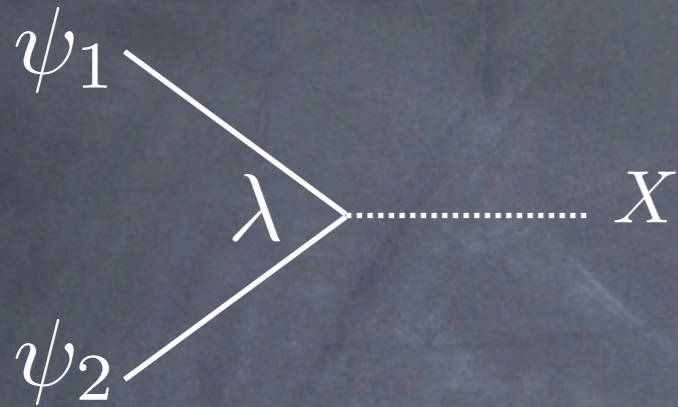
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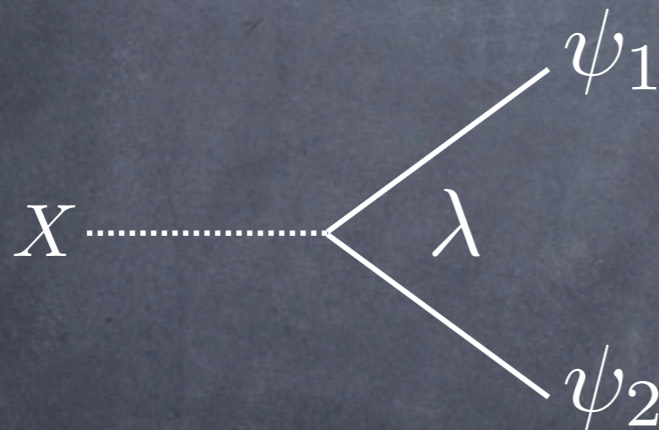
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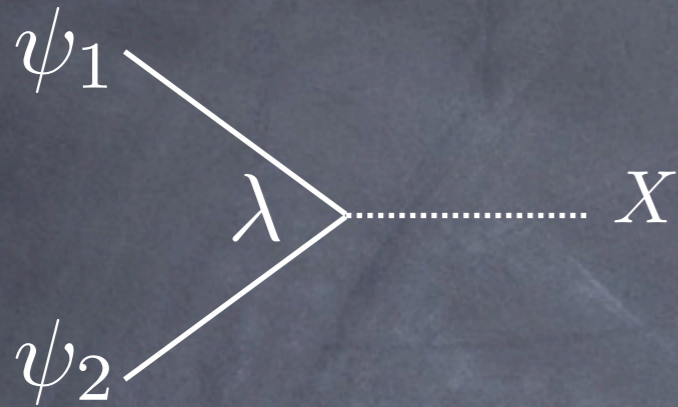
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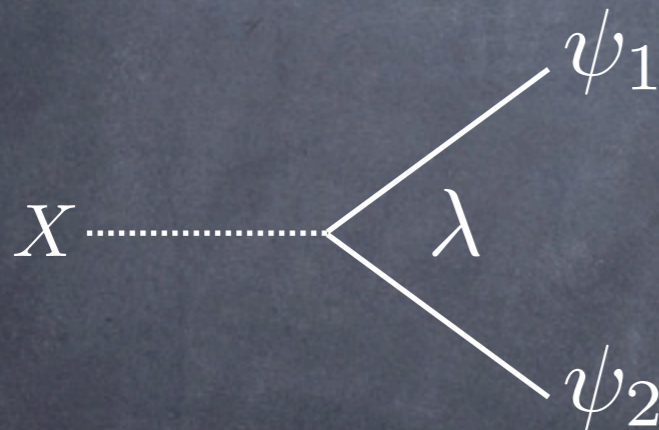
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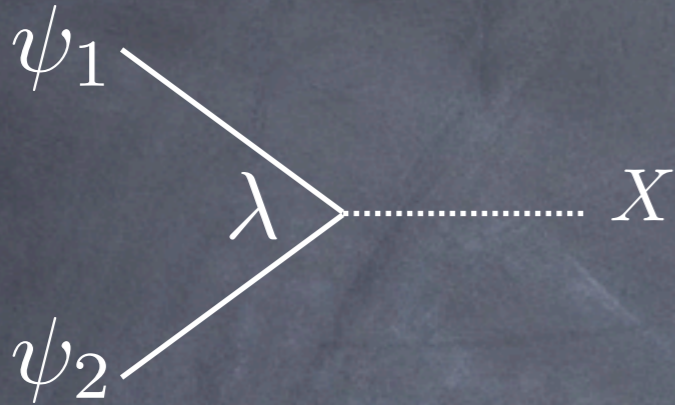


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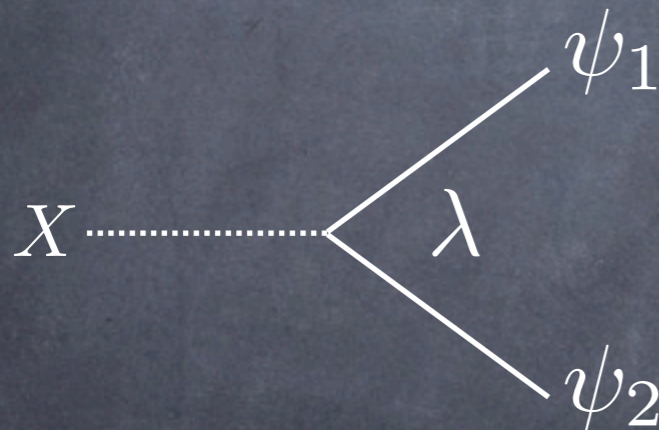
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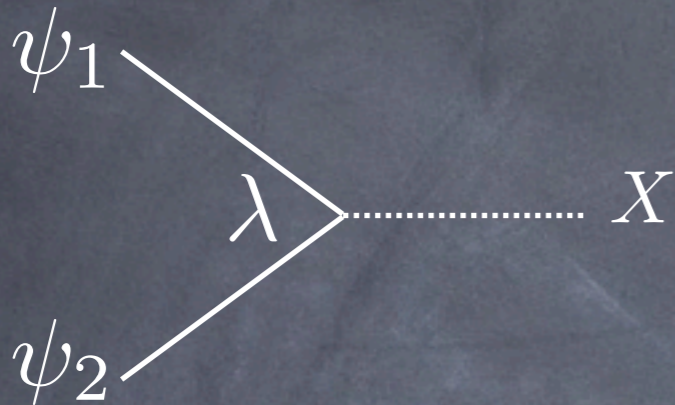
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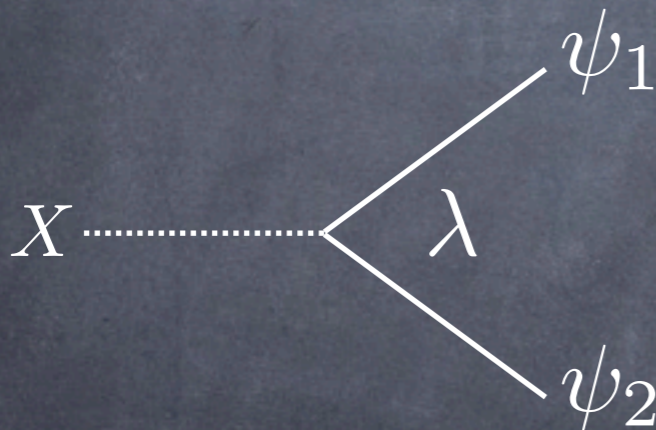
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- **X** lifetime can be long – implications for BBN, indirect DM detection

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- FIMPs from kinetic mixing: hidden sector particles coupling to the MSSM via mixing of $U(1)_Y$ and hidden $U(1)$ tiny mixing tiny coupling

- Others...

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- **Signals for BBN:** FIMPs or LOSPs decaying late could have implications for BBN
- **Enhanced indirect and direct detection:** Relic abundance and DM annihilation cross section no longer related. Freeze-in dominantly produces DM abundance annihilation cross section must be large – freeze-out abundance is small

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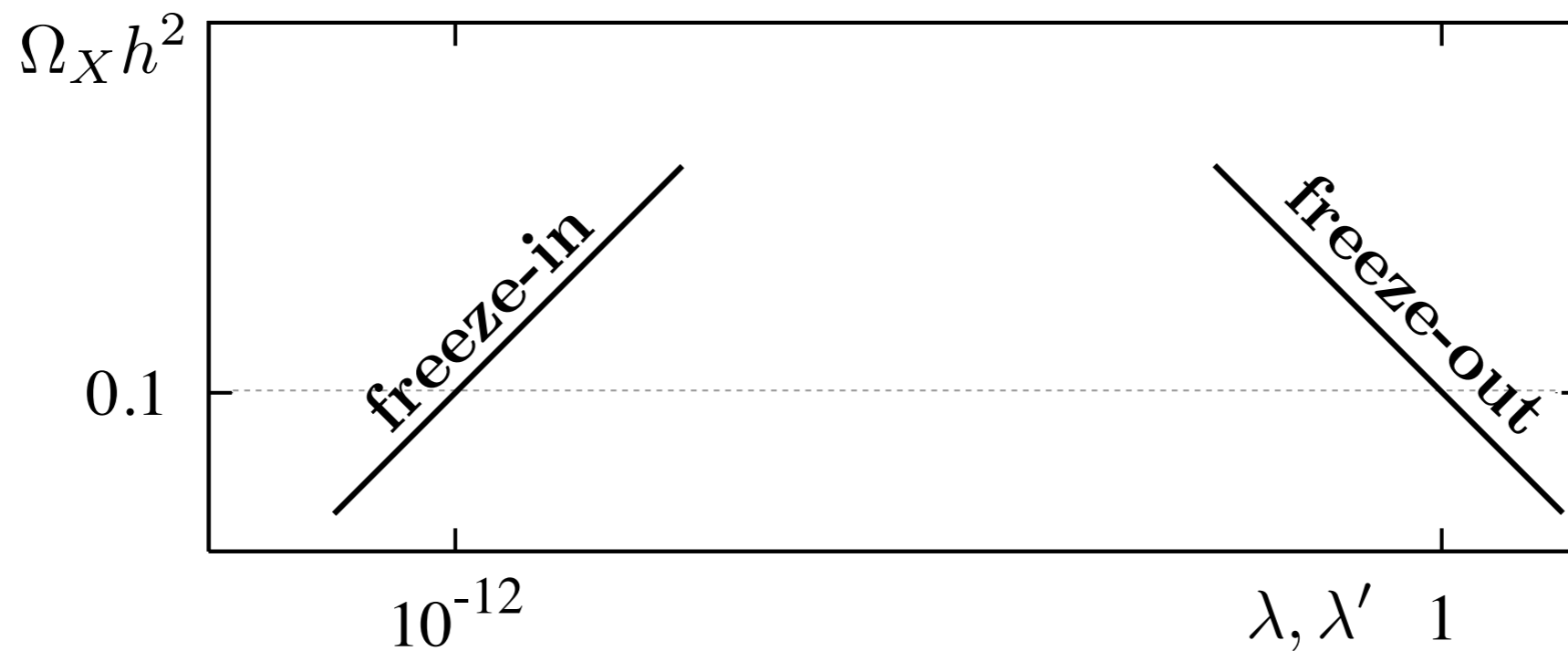
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Much more to come...

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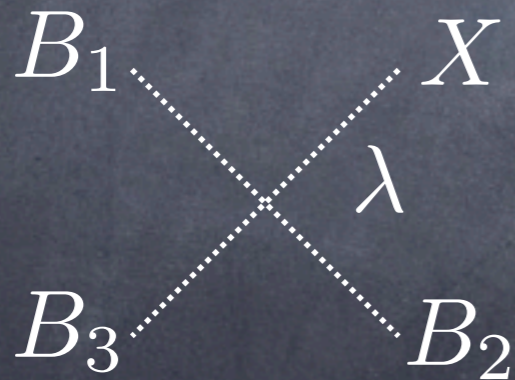
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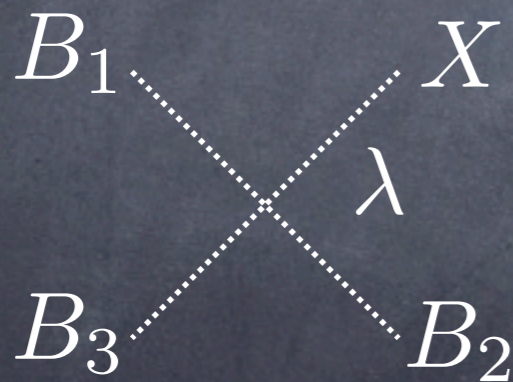


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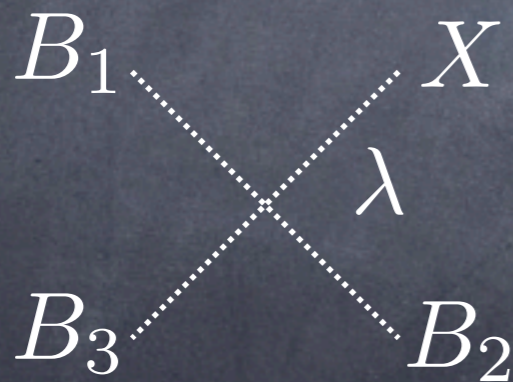


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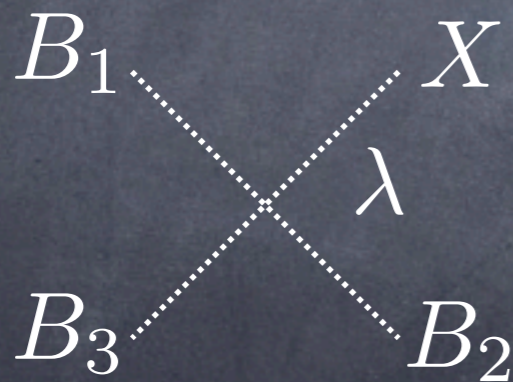
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For correct DM
abundance $\Rightarrow \lambda \sim 10^{-11}$

- NOTE: Abundance in this case is **independent of the FIMP mass**