Filtered Dark Matter

Michael J. Baker

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MJB, Joachim Kopp, Andrew Long

• Outline

- Motivation
- Model
- 1 - Cartoon
- 2 - Analytic approximation
- 3 - Numerical calculation
- Parameter space and constraints

Why new DM production mechanisms?

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- We present a new mechanism which has a large viable parameter space and goes beyond the GK bound

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ϕ	0	$+1$	GeV – EeV
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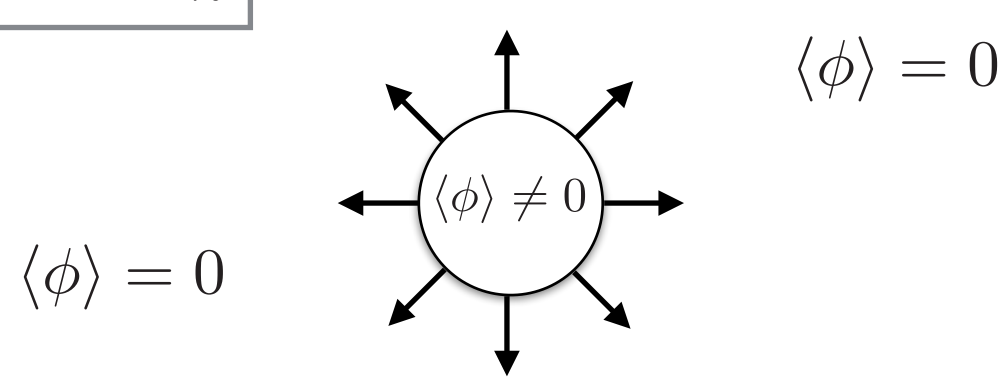

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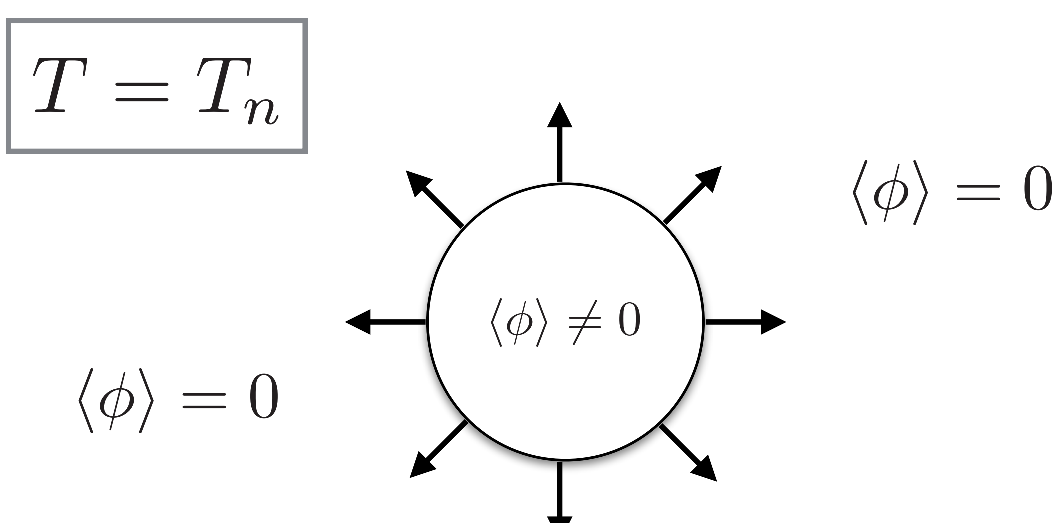

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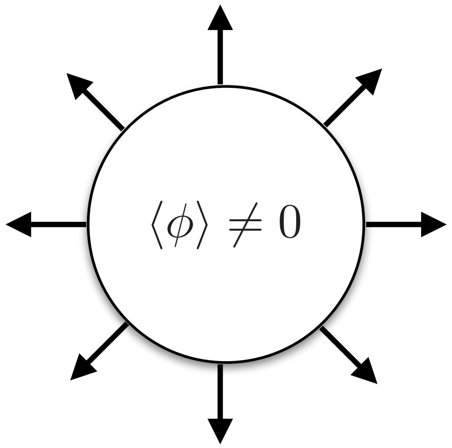

$\langle\phi\rangle = 0$

$$y_\chi \langle\phi\rangle = m_\chi^{\text{eff}}$$

Cartoon

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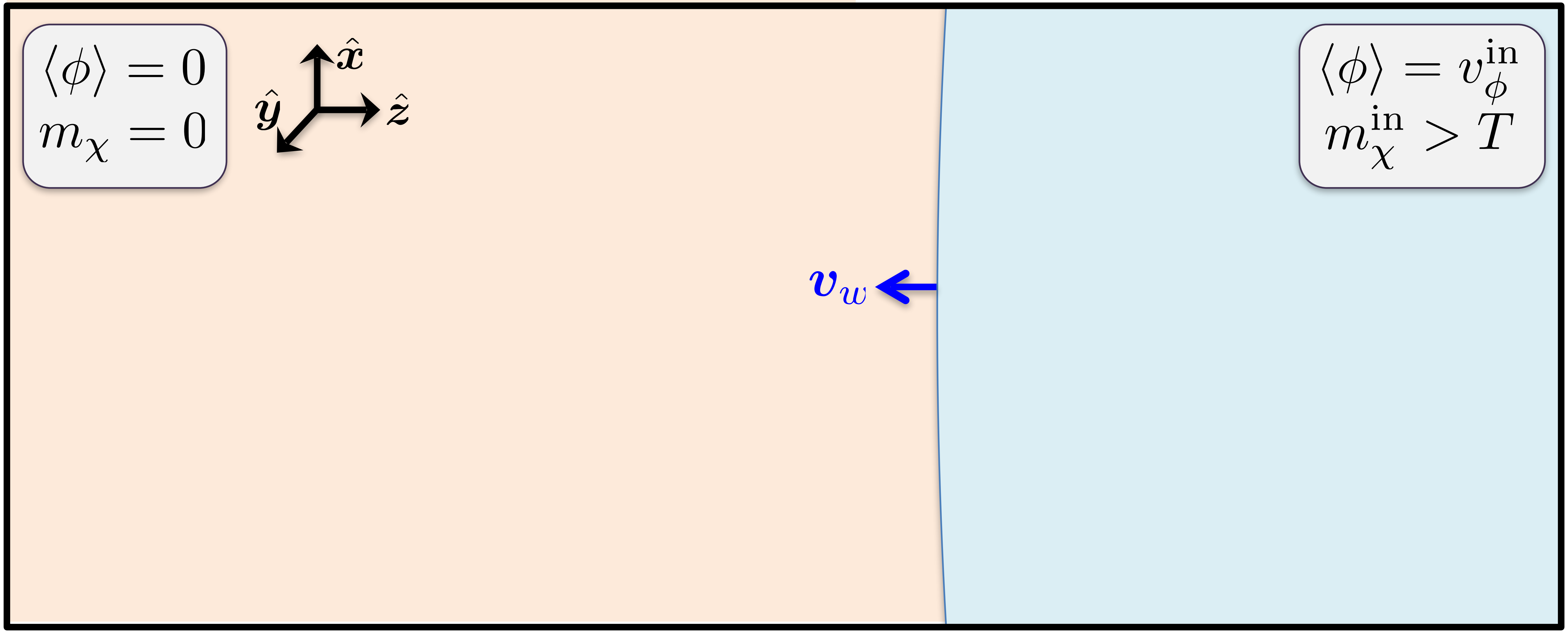
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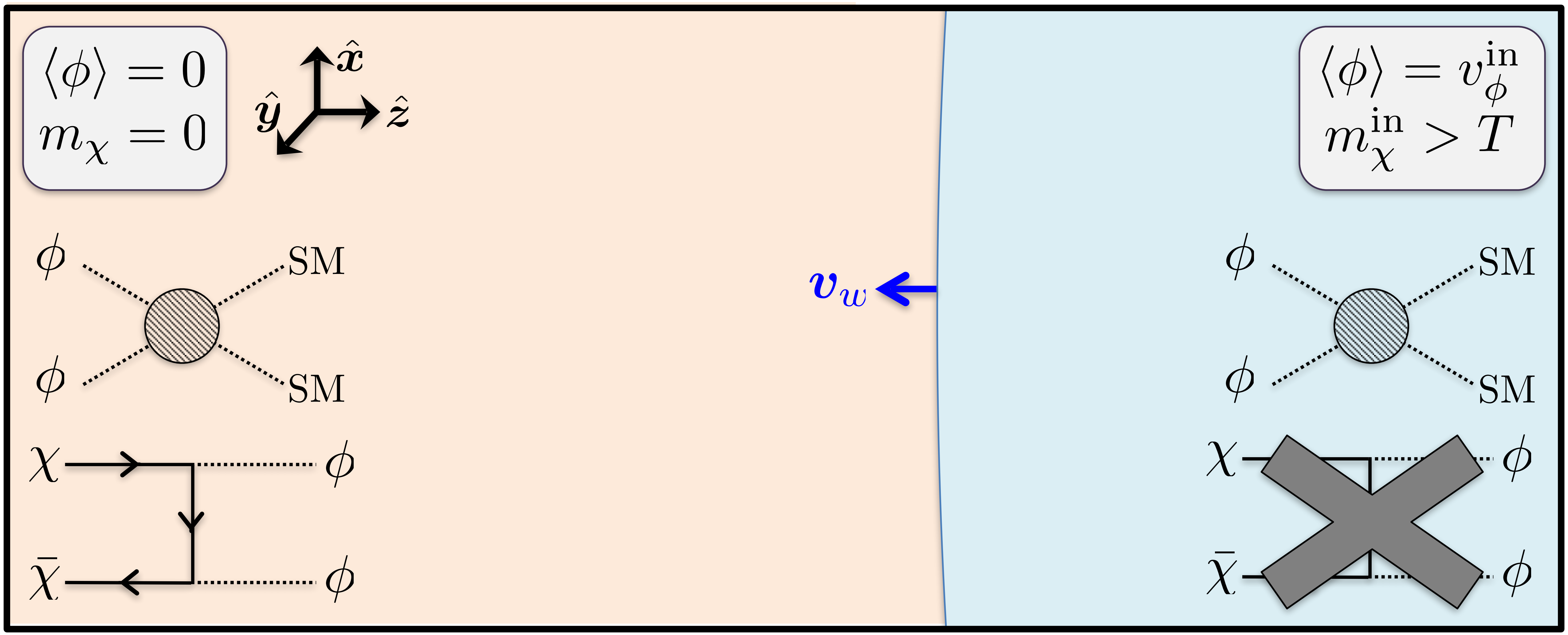

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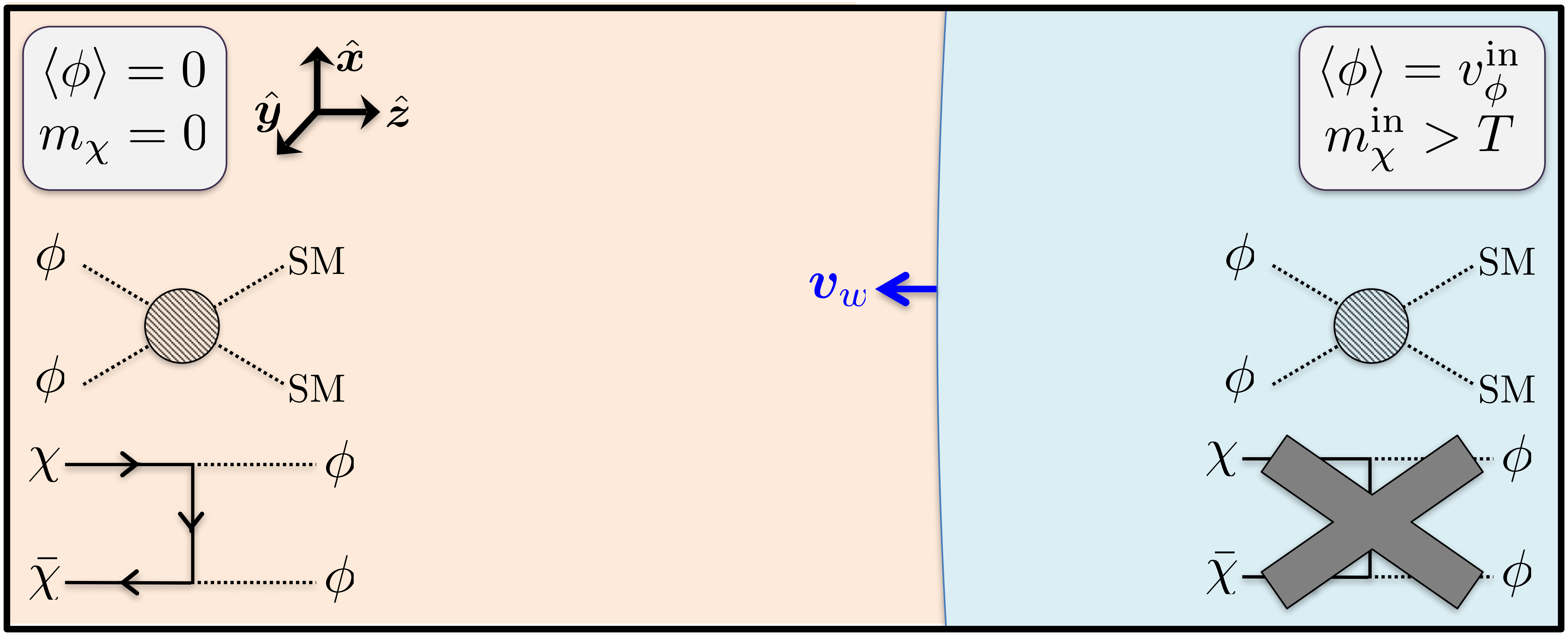
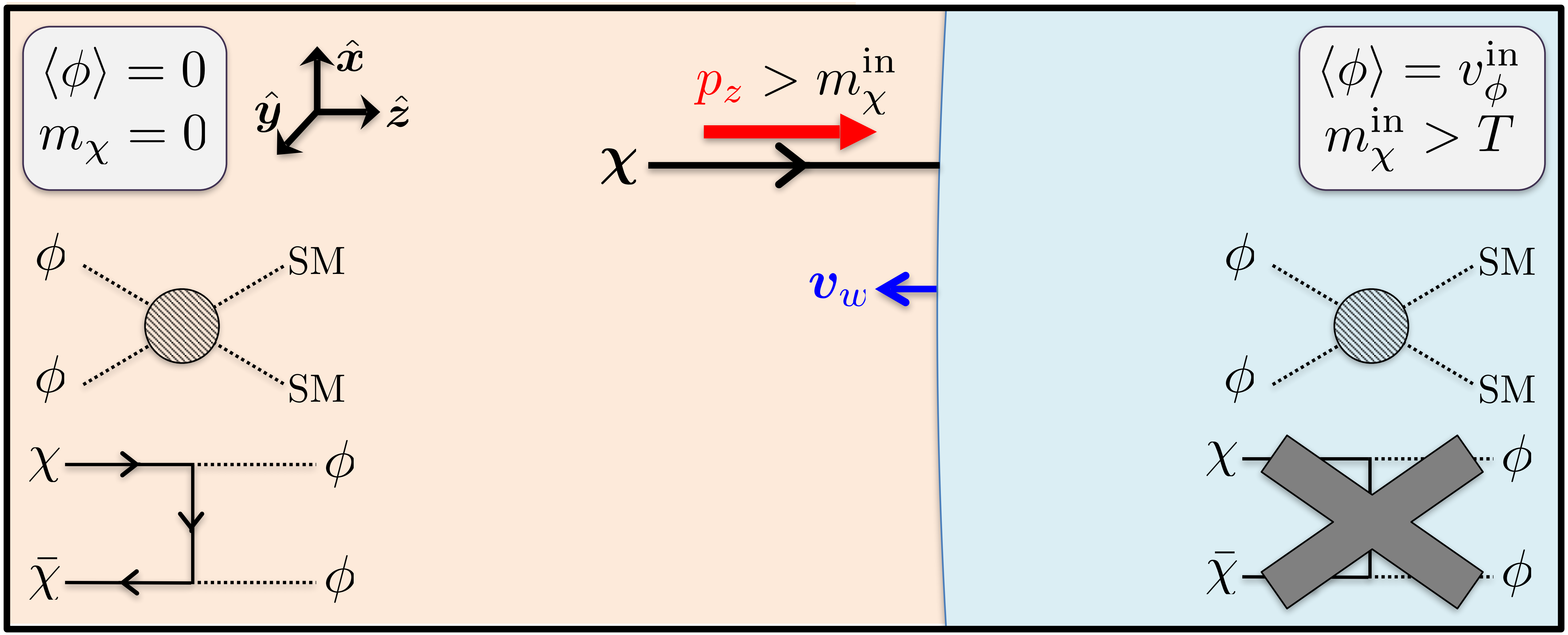


Outside, DM in thermal equilibrium, orders of magnitude too much DM



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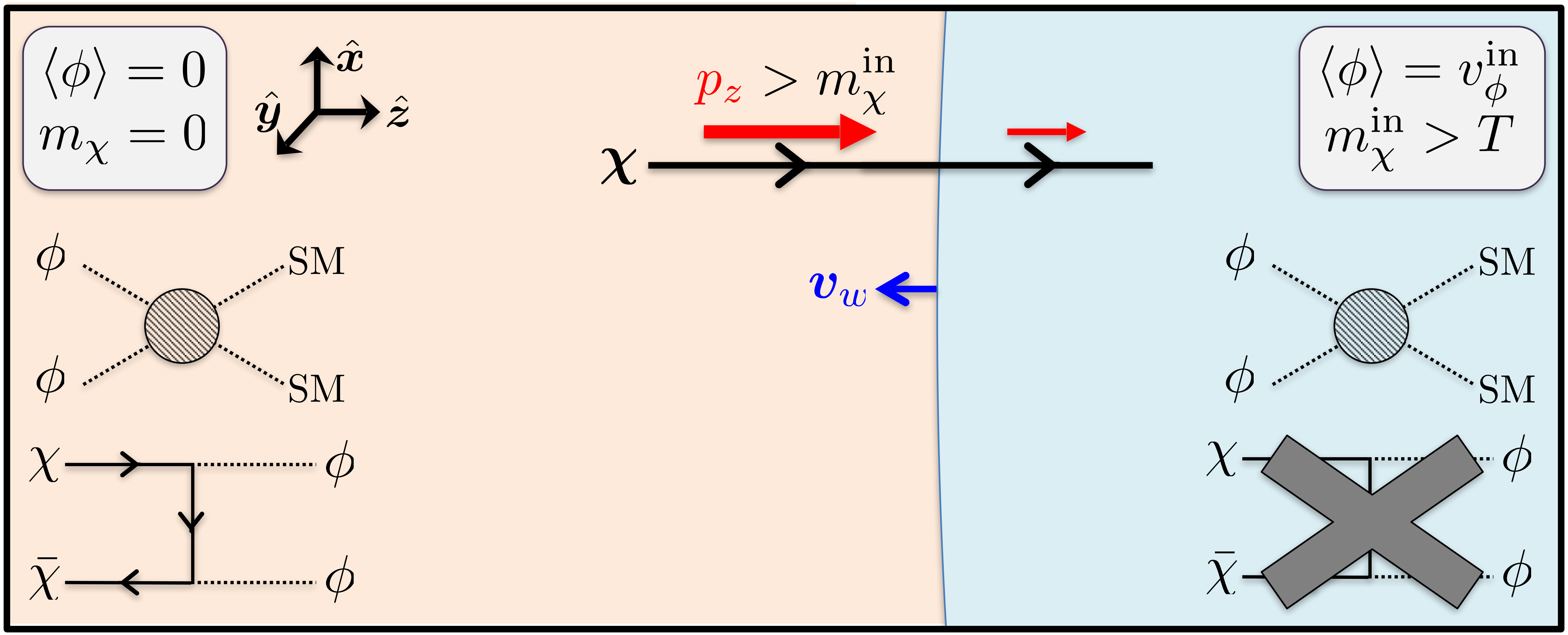

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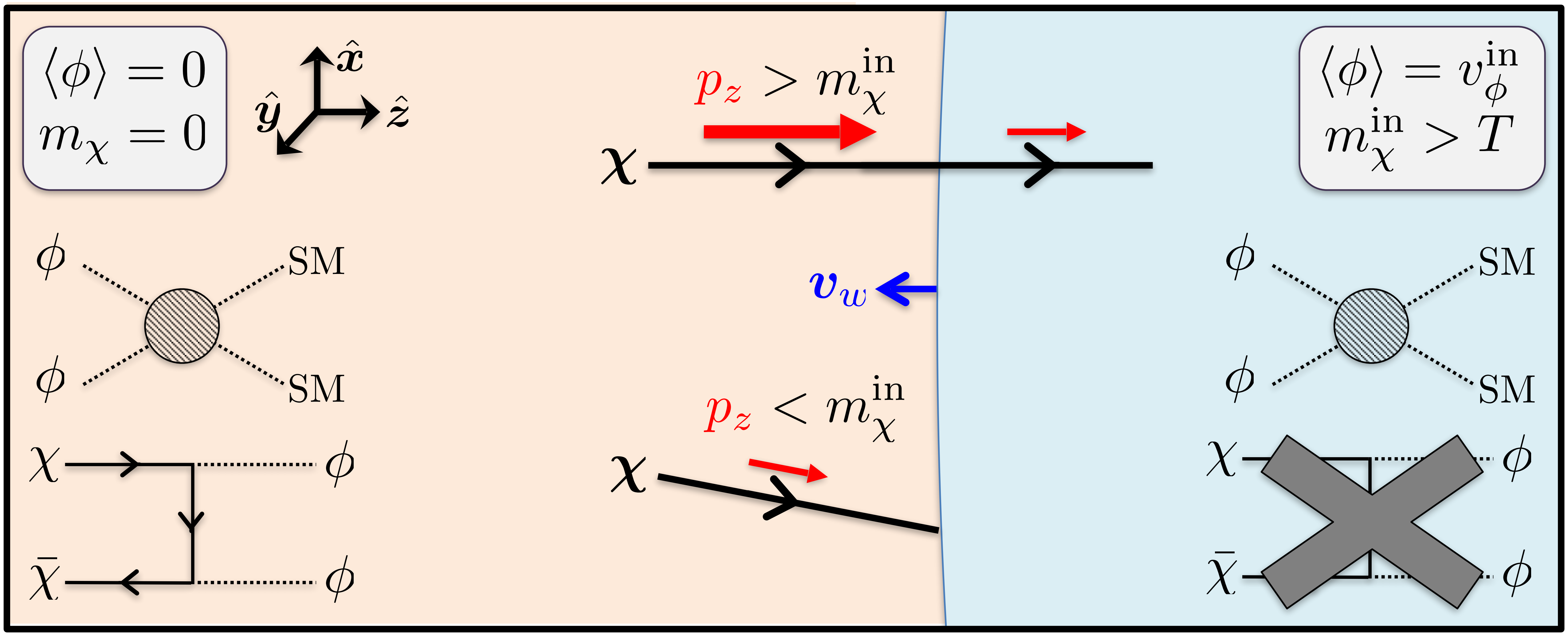

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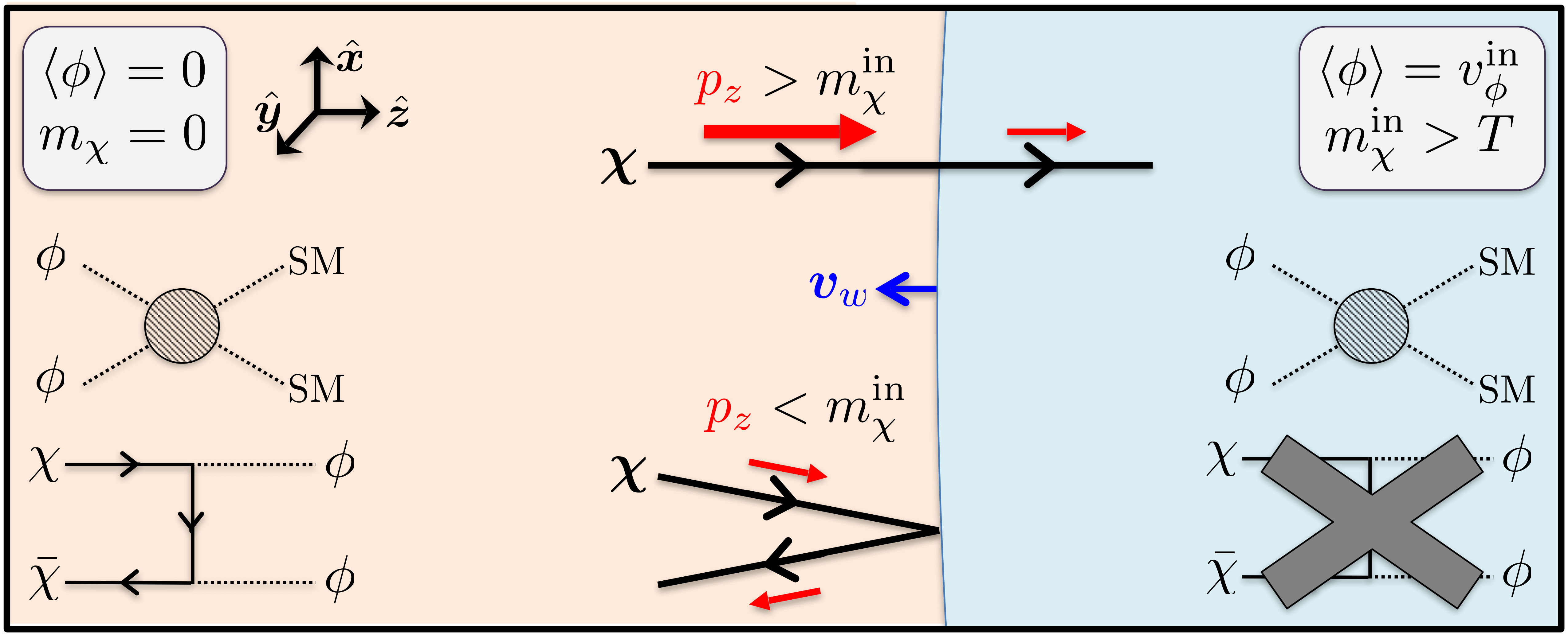

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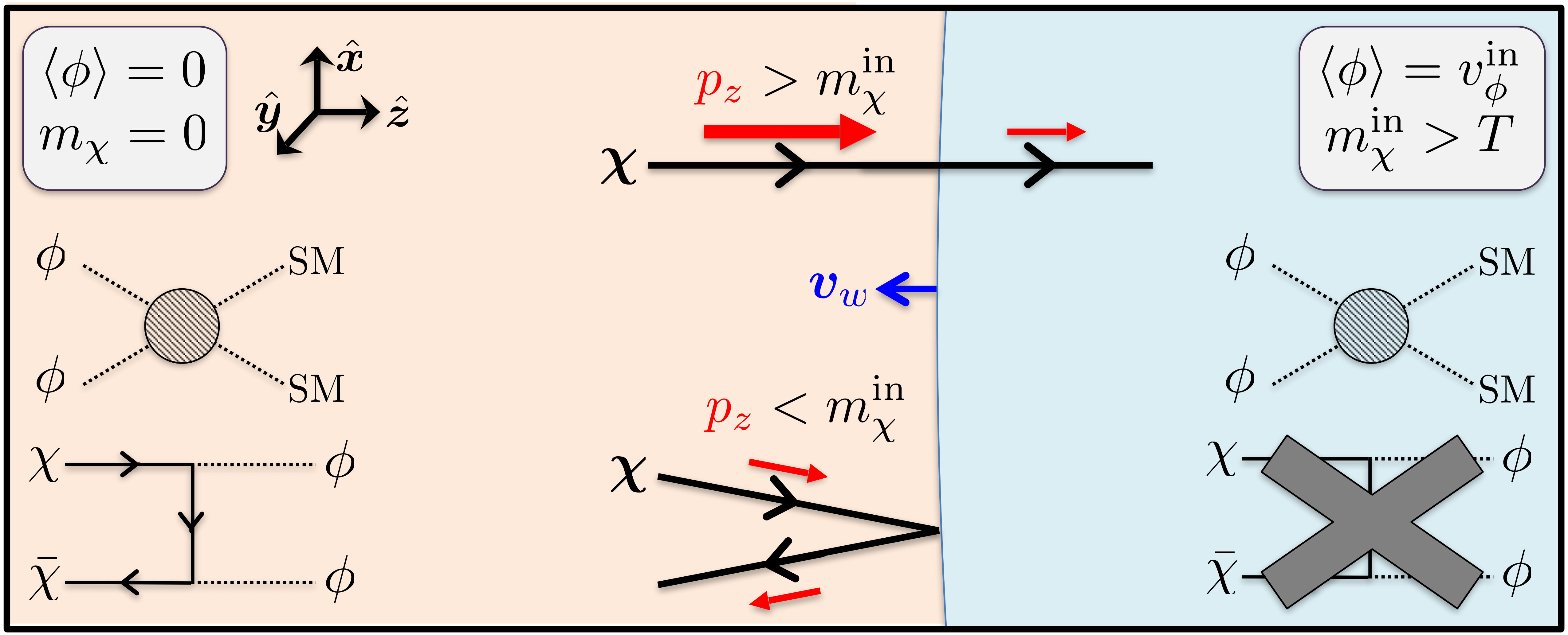

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Only high momentum DM penetrate bubble, reduces abundance

Analytic Approximation

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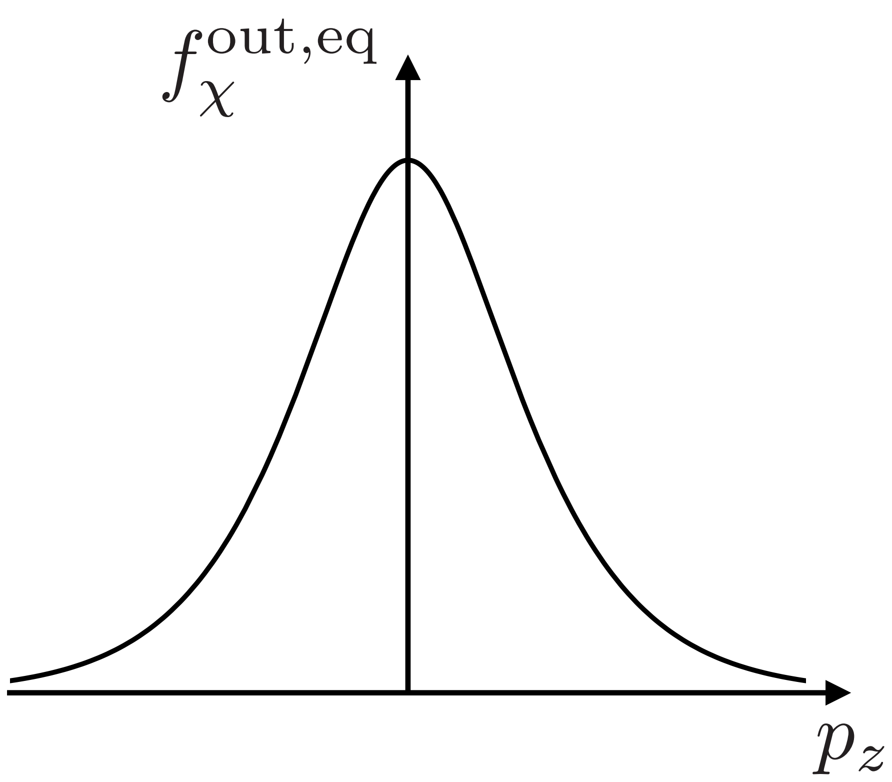
Find number of particles with $p_z > m_\chi^{\text{in}}$

$$n_\chi^{\text{in}} \approx g_\chi \int \frac{d^3\vec{p}}{(2\pi)^3}\, \Theta(p_z - m_\chi^{\text{in}}) f_\chi^{\text{out,eq}}$$



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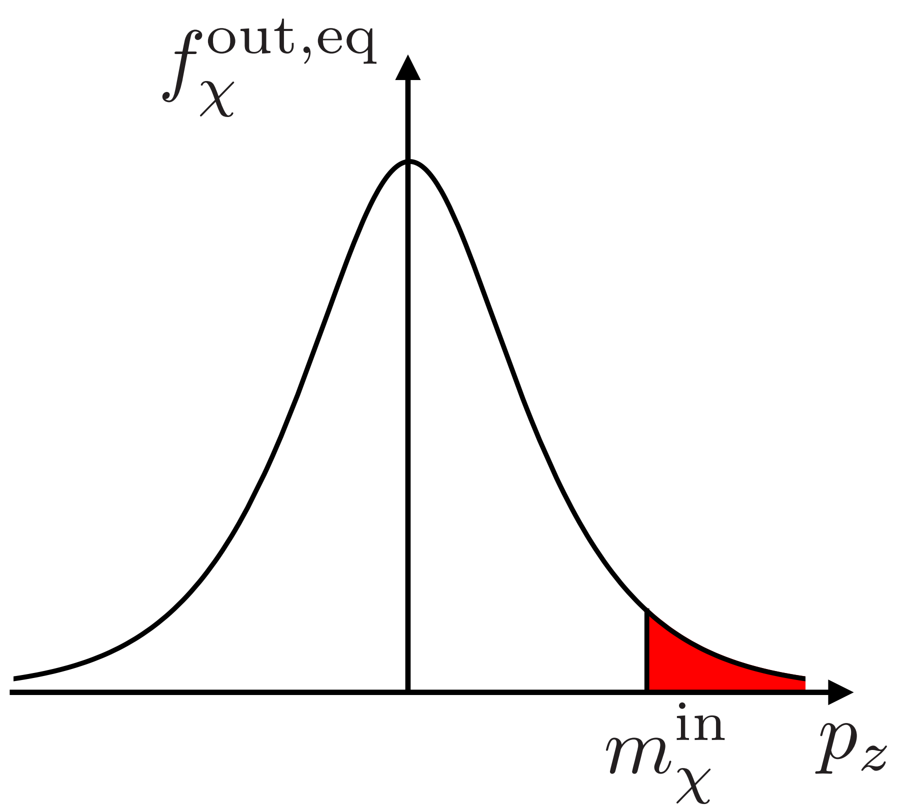

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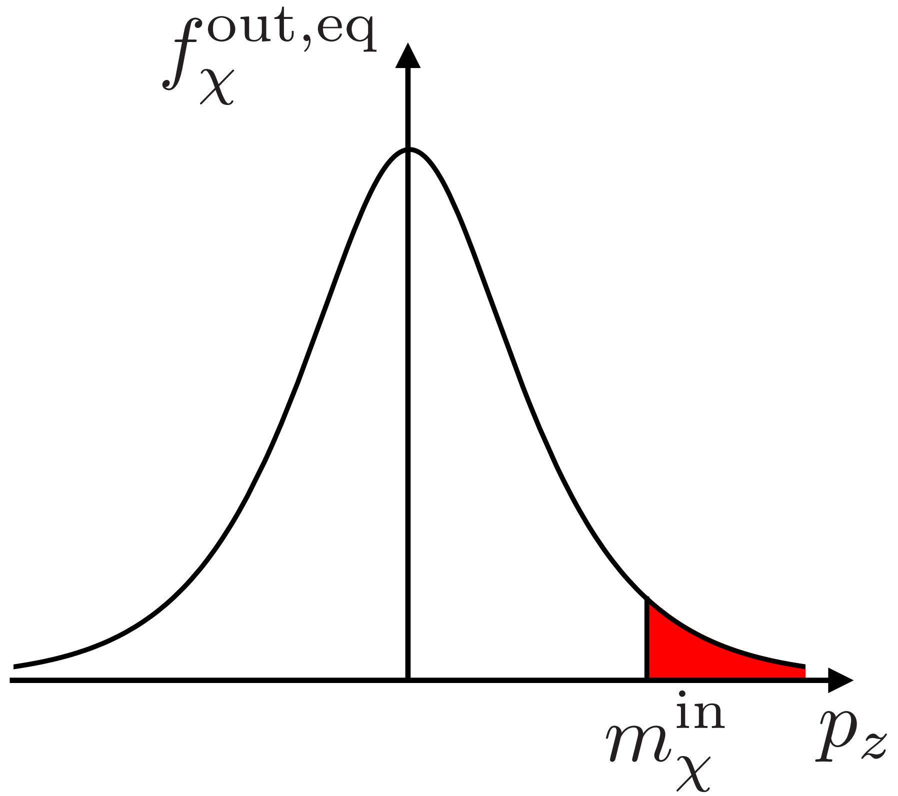

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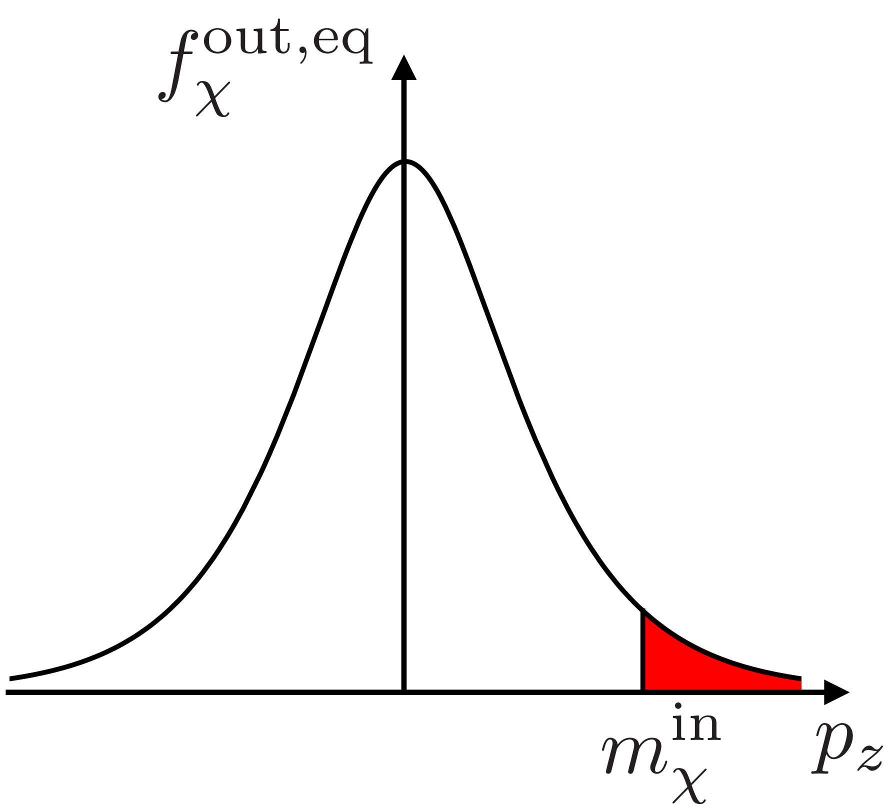

Approximate relic abundance

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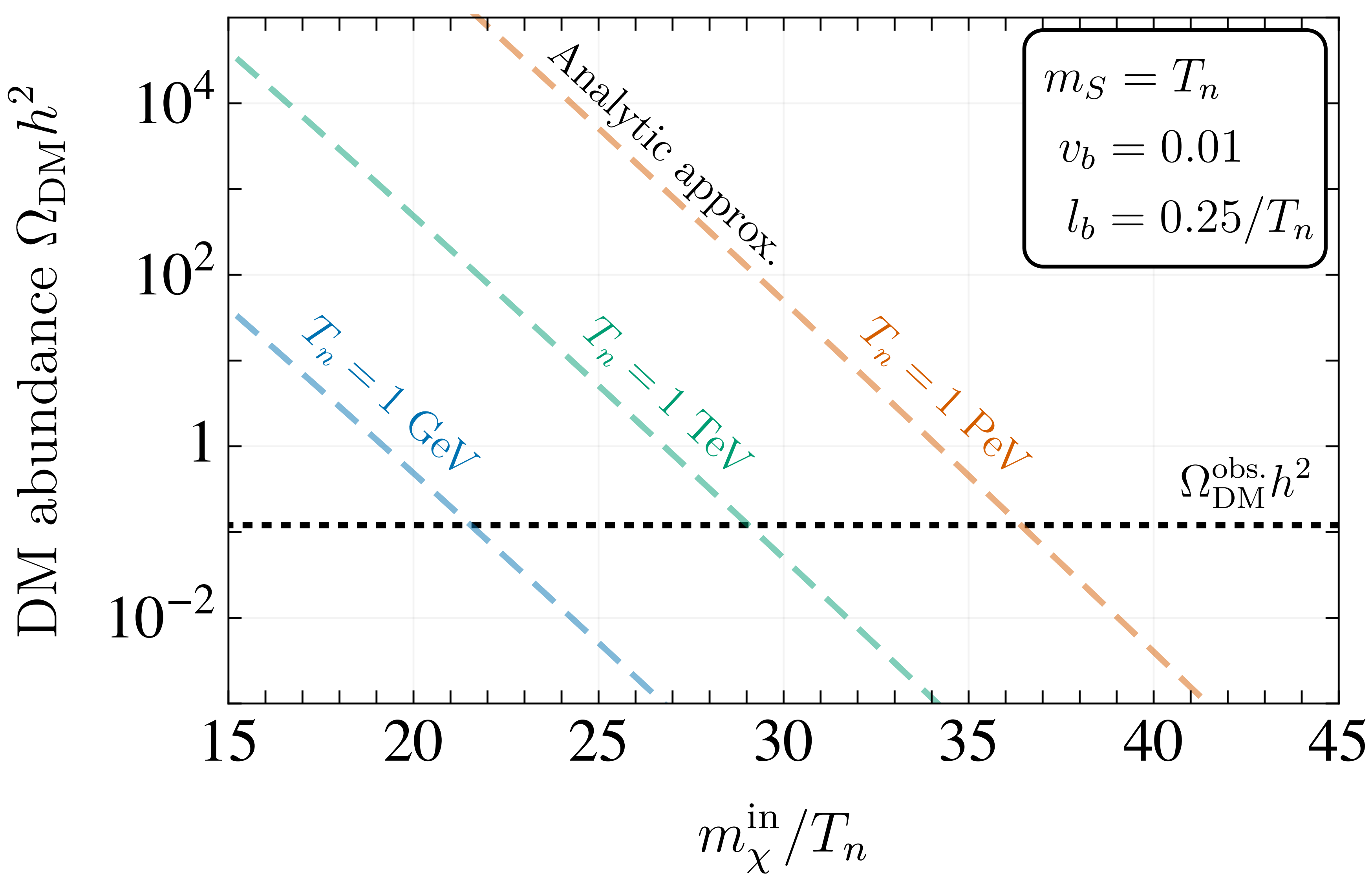

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We leave z-momentum un-integrated, and look for stationary solution

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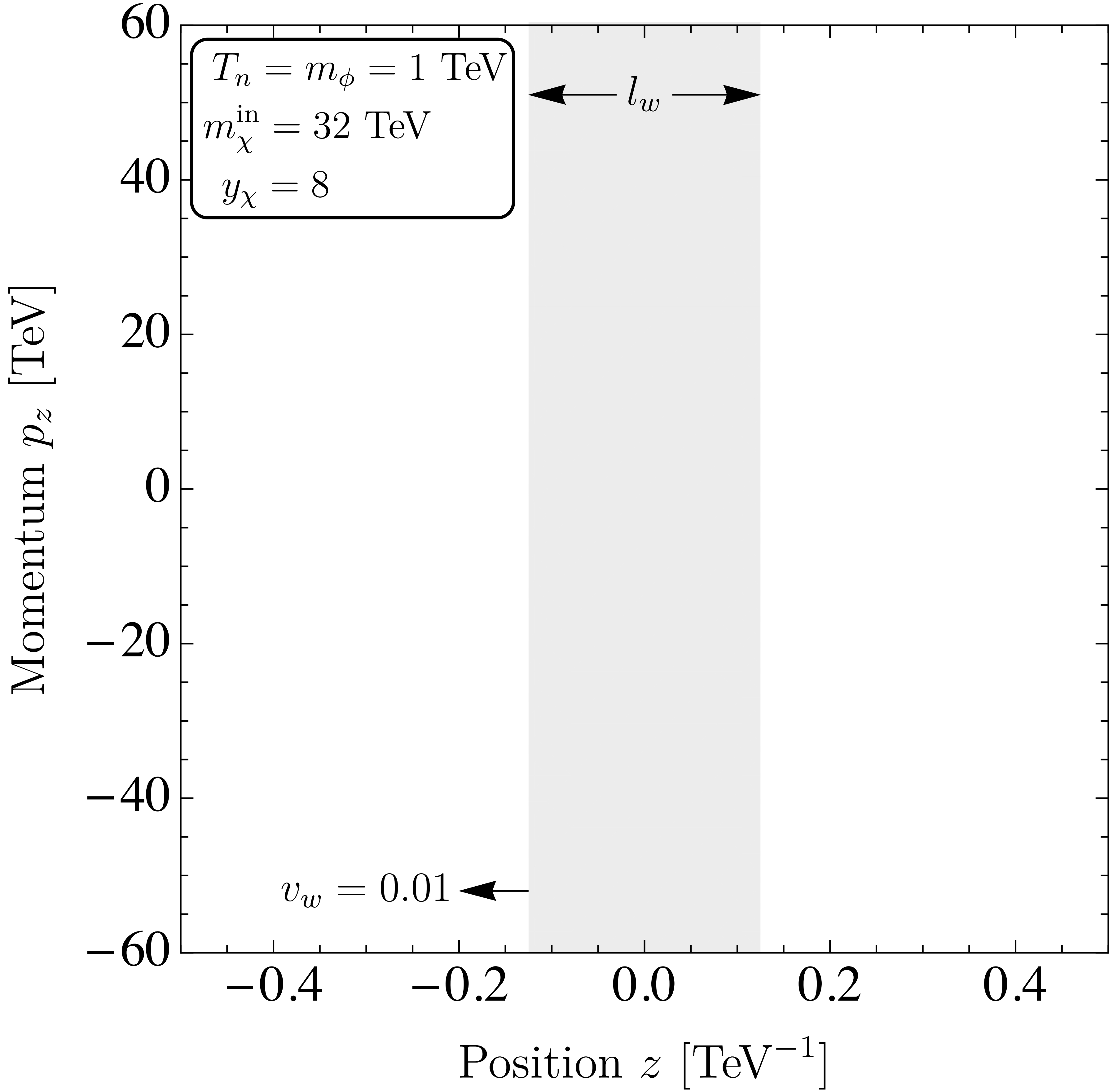

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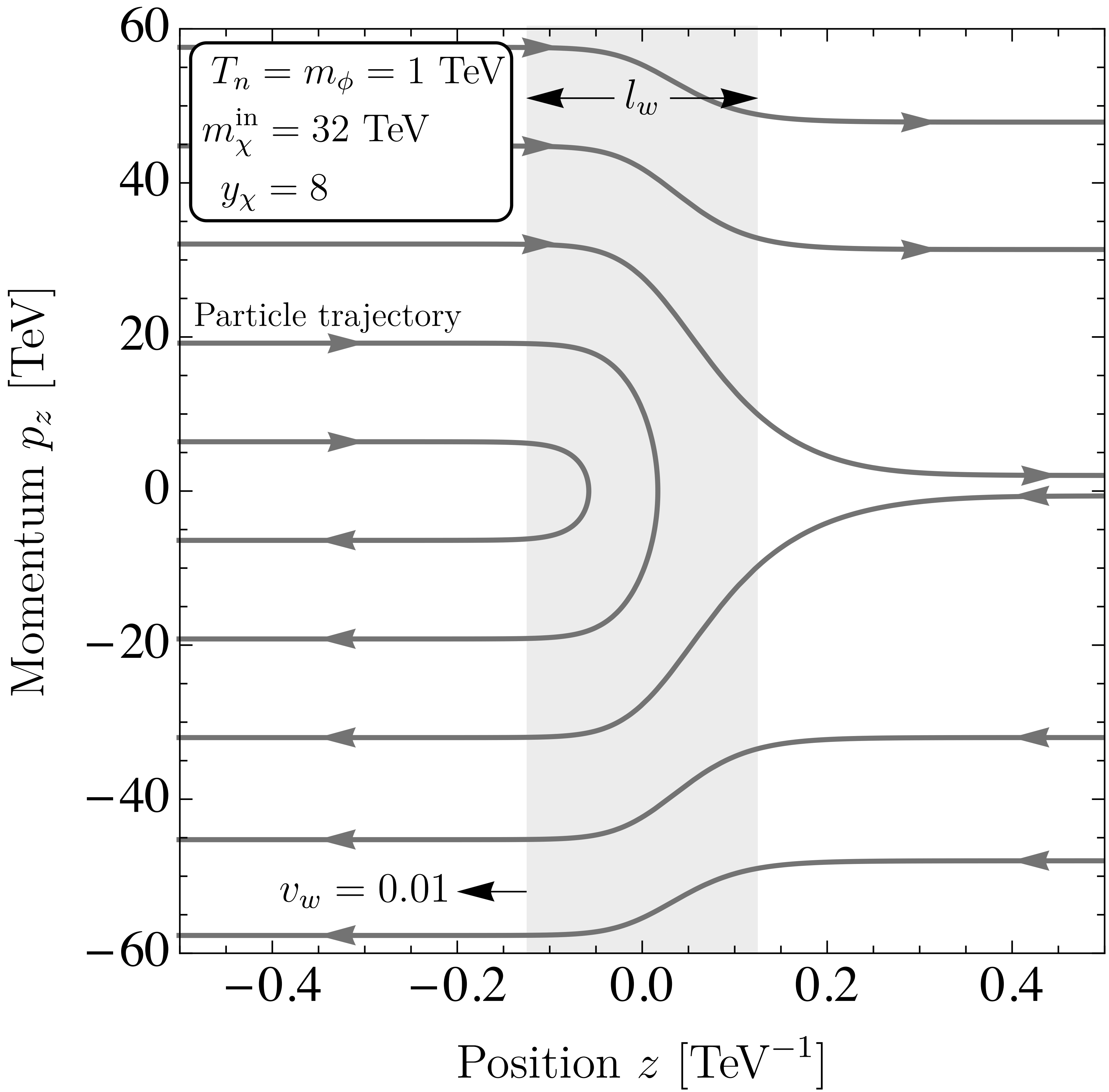

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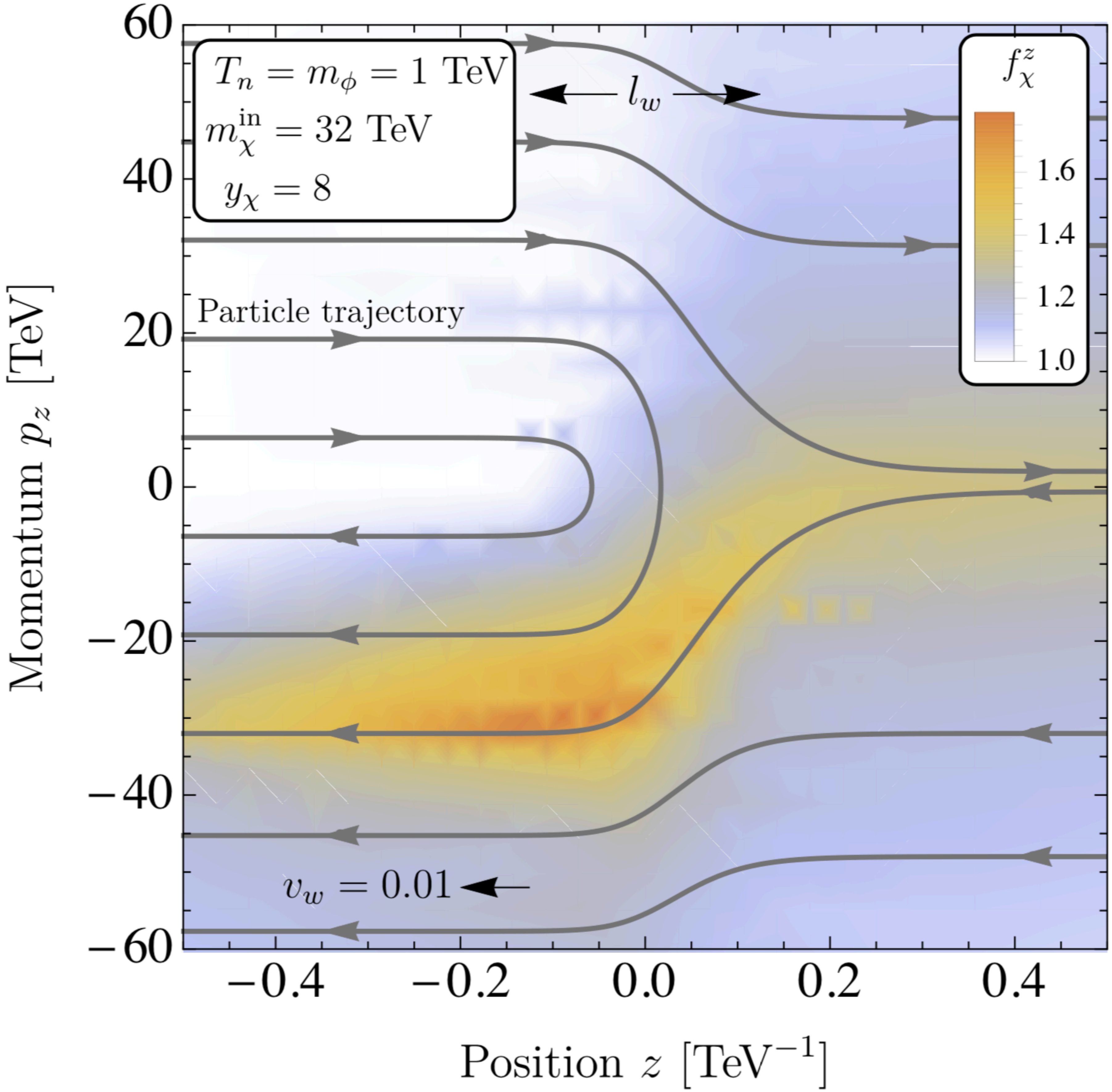

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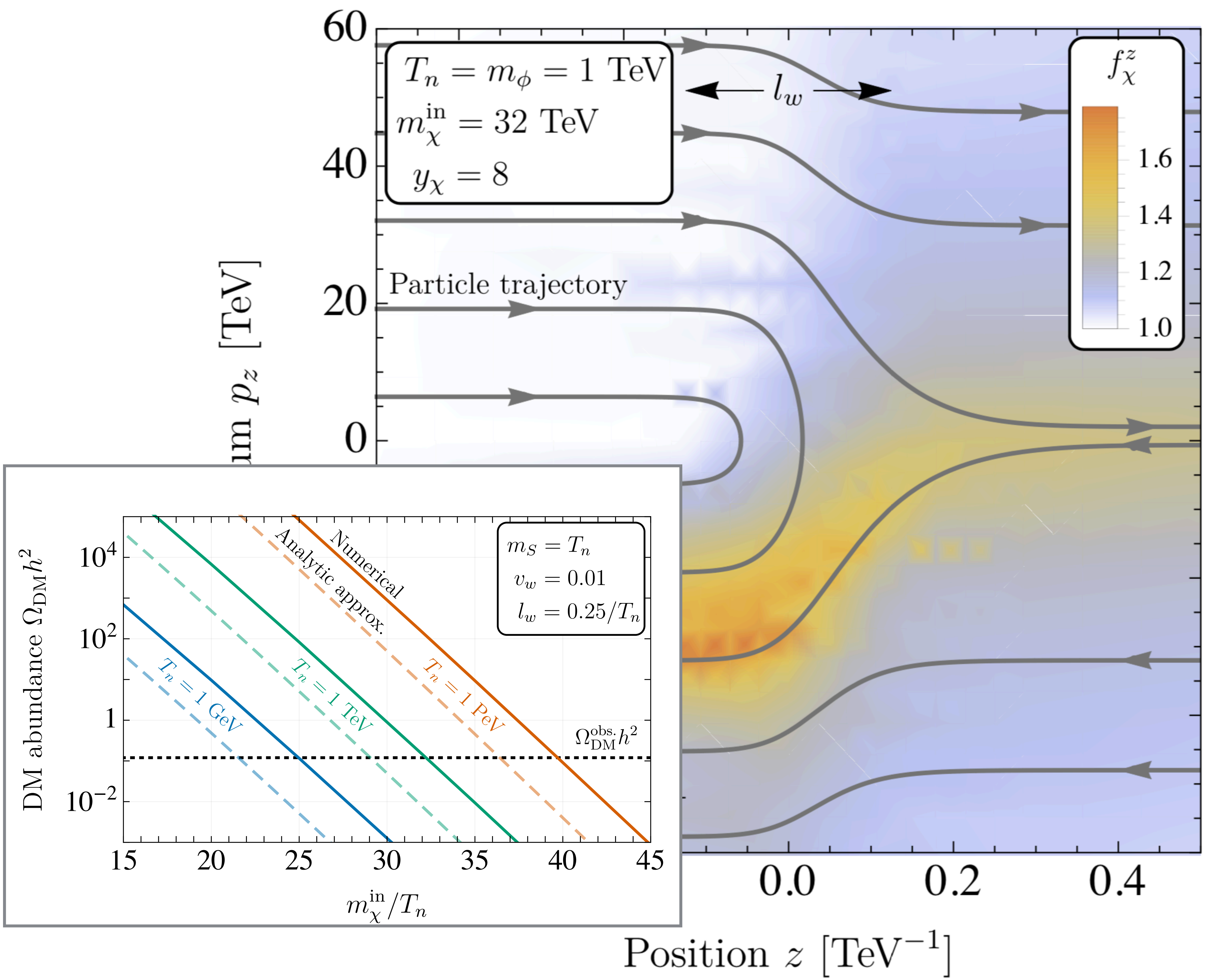

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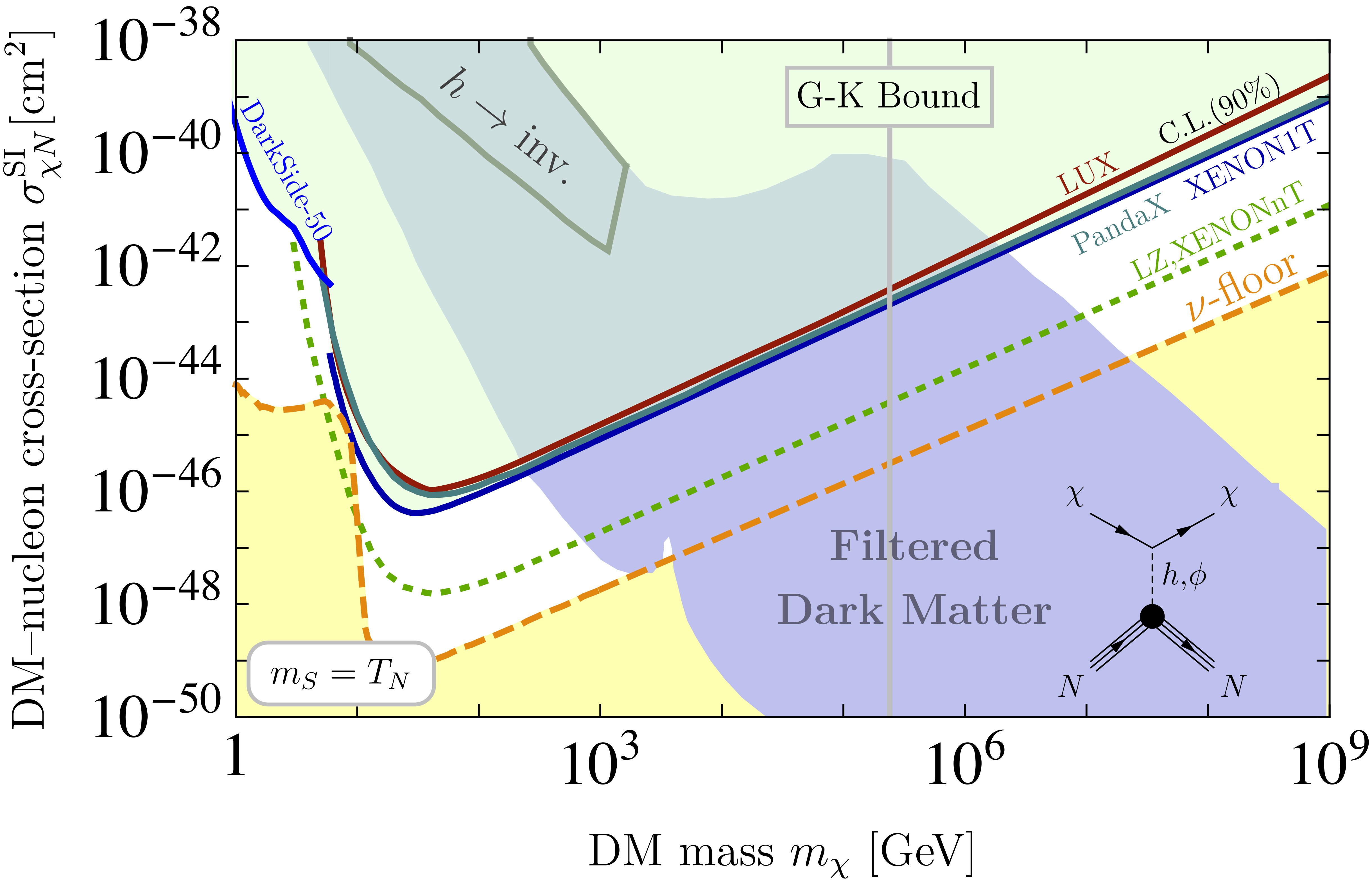

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