Cargese 2025

Dark Matter in Composite Higgs

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- **Composite Higgs in a nutshell**

QCD	**Composite Higgs**
•Quarks	•Techniquarks
•Color	•Technicolor
•Λ_{QCD}	•Λ_{NP}
•$SU(2)_L \times SU(2)_R \to SU(2)_I$	•$\mathscr{G} \to \mathscr{H}$
•π^a	•H

- **Question to address**

Can the Dark Matter be a barion made of techniquarks?

Assumptions:

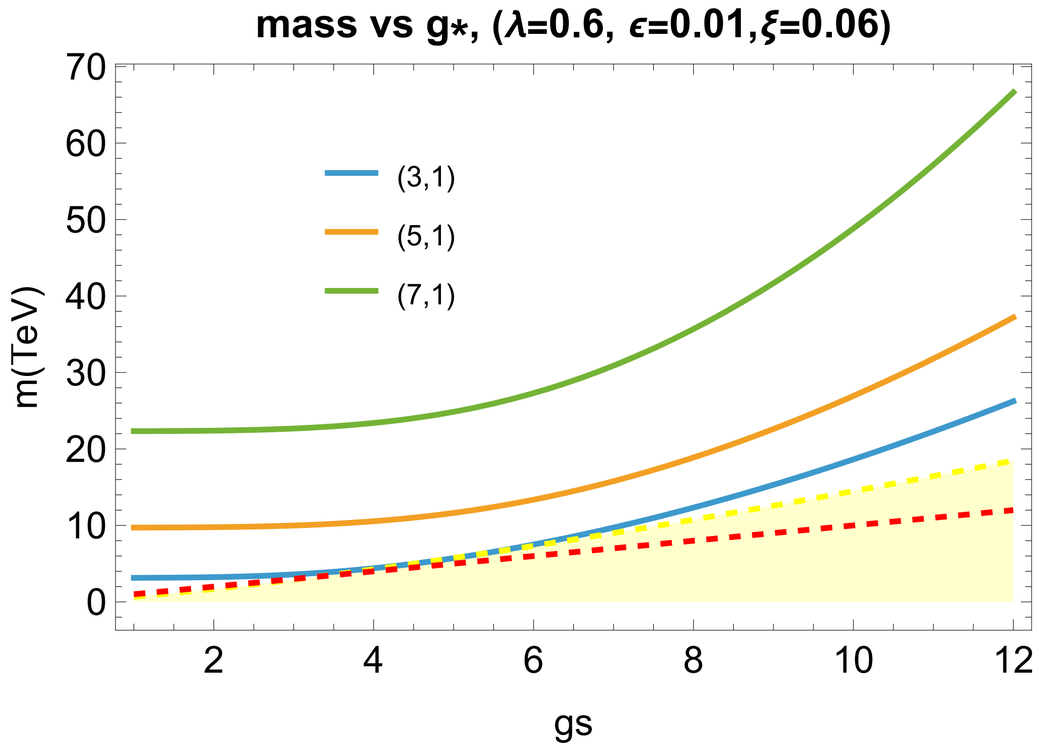
- Minimal Composite Higgs: $SO(5)/SO(4) \simeq SU(2)_L \times SU(2)_R$
- Separation of scales: $\frac{m_\chi}{m_*} \equiv \lambda$
- EFT: DM+H+SM+Symmetries → Annihilation Cross Section

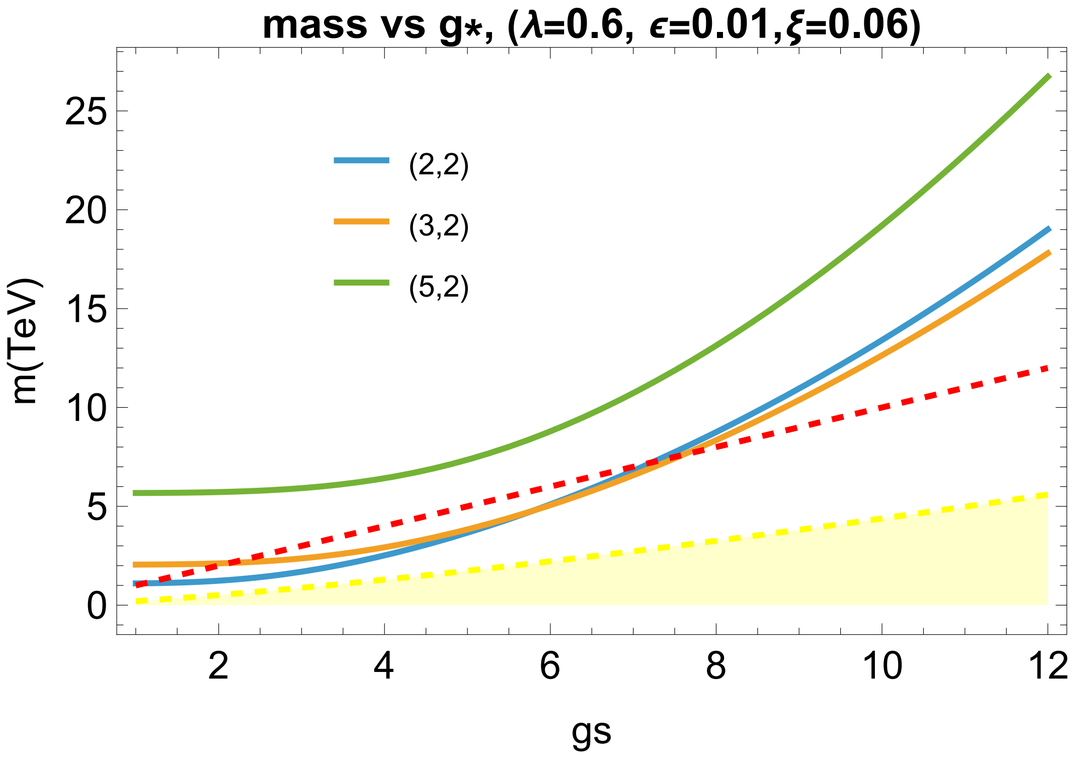
Lagrangian:

$$\mathscr{L} = Tr[\bar{\chi} \not{D} \chi] + c_1 \frac{g_*^2}{m_*^3} Tr[\bar{\chi}\chi] Tr[\partial_\mu H^\dagger \partial^\mu H] + \epsilon \frac{g_*^2}{m_*} Tr[\bar{\chi}\chi] Tr[H^\dagger H]$$

Gauge | *$\mathscr{G}$ preserving* | *Explicit $\mathscr{G}$ breaking*

• Results





- Take home message: *even though the freeze-out dynamics and the couplings are not sensitive to naturalness,* ***the result points to a Composite Higgs scenario with minimal tuning***

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Thank you!