

Something about me ...

Hi, I'm Giulio! 😊

Bachelor & Master degree in Florence w/ Andrea Tesi

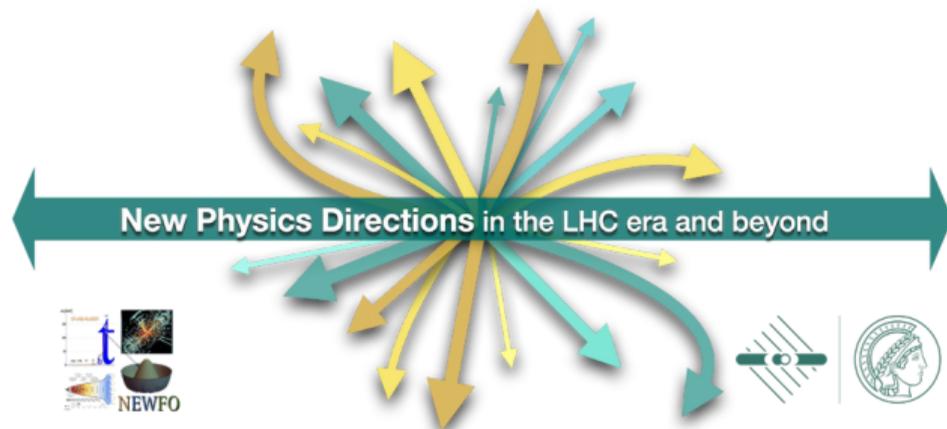
PhD @ SISSA, Trieste w/Aleksander Azatov

Project: Ultrarelativistic FOPTs in the Early Universe & their cosmological consequences

Moving soon to IFT, Madrid →



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Física
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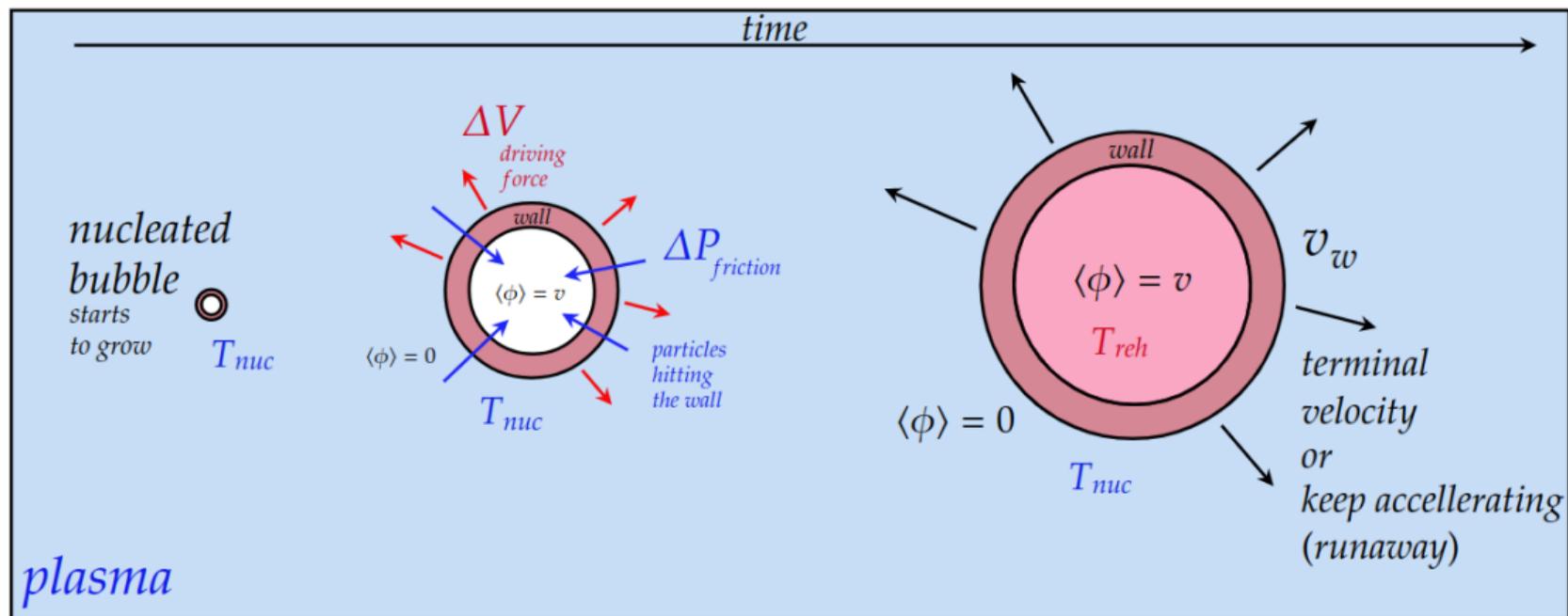


Quantisation Across Bubble Walls and Friction

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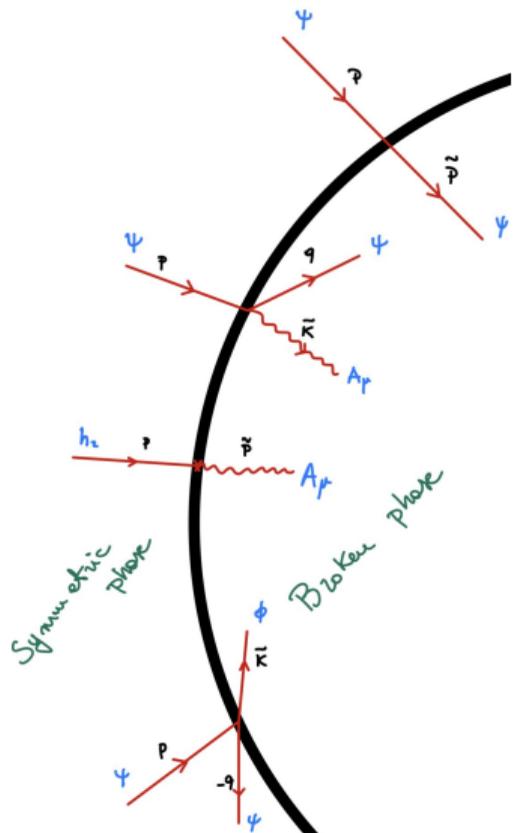
based on [2310.06972] with *Aleksandr Azatov, Rudin Petrossian-Byrne and Miguel Vanvlasselaer*

Setting the stage: Bubble dynamic in the EU



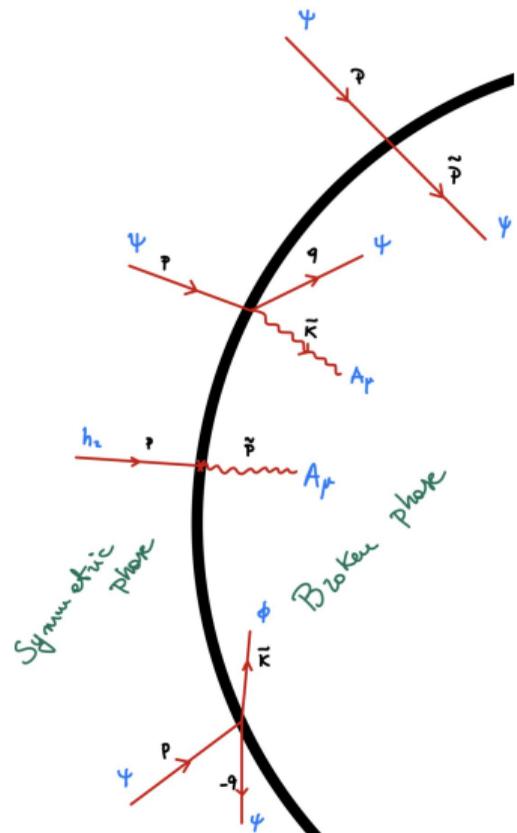
Would be outline...

- 1 FOPT: Why, What & bubbles dynamic
- 2 Part I: **First principles** transition radiation from scalar emission
 - 1 Complete basis of solution to the spatially dependent EOM
 - 2 Quantisation & construction of 'In' and 'out' asymptotic states
 - 3 Amplitudes
 - 4 Approxiamtions (Step wall and WKB)
- 3 Part II: **Gauge-fixing** and spin-interpolation
 - 1 EOM + gauge fixing
 - 2 Interpolation between Higgs and longitudinal polarisation
- 4 Results & Conclusions



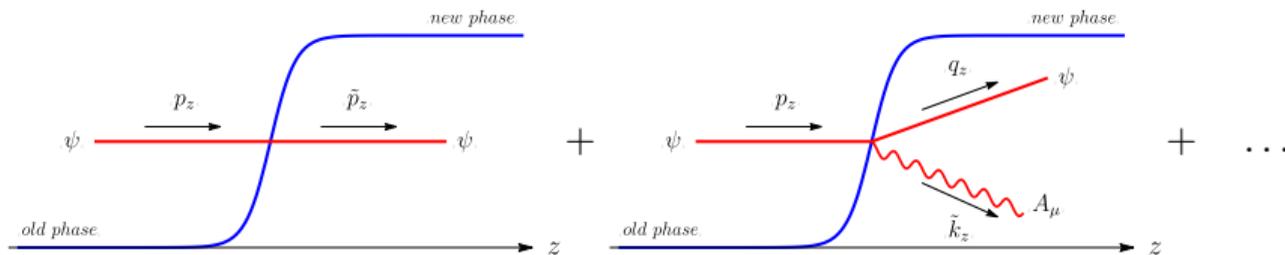
Actual outline!

- 1 Computing friction
- 2 Results & Conclusions



FOPT: Computing friction

Incoming flux
 $\gamma_w n v_w$



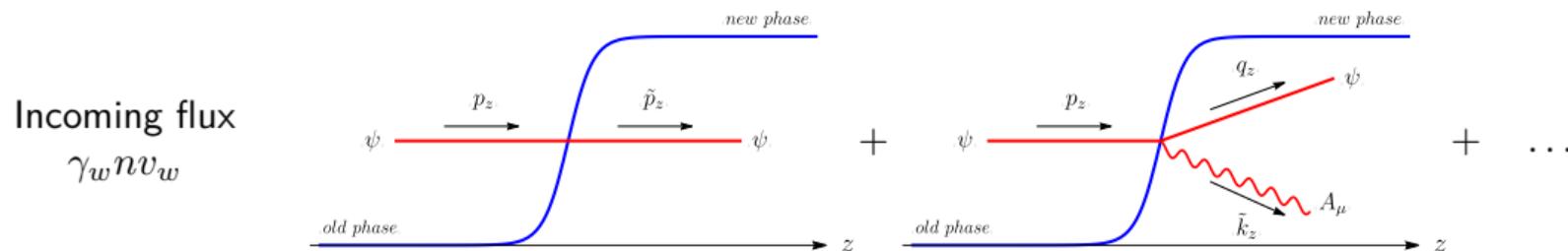
$$\mathcal{P} \simeq (\gamma_w n v_w) \langle \Delta p \rangle$$

constant as $\gamma_w \rightarrow \infty$
 Bödeker, Moore ['09]

$$\sim \frac{1}{16\pi^2} g^2 m_V \gamma_w T_{\text{nuc}}^3$$

Bödeker, Moore ['17]
 Azatov, Vanvlasselaer ['20]
 Gouttenoire, Jinno, Sala ['21]

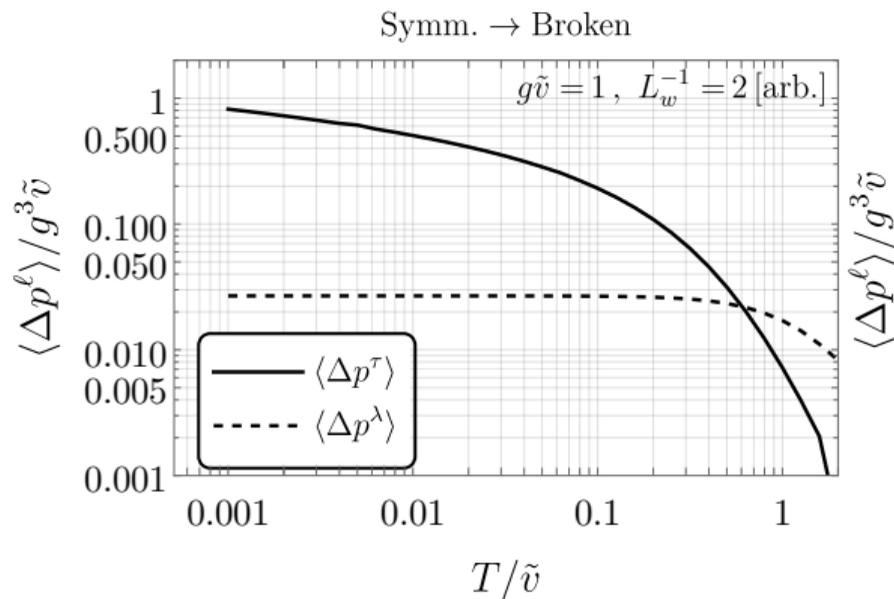
FOPT: Computing friction



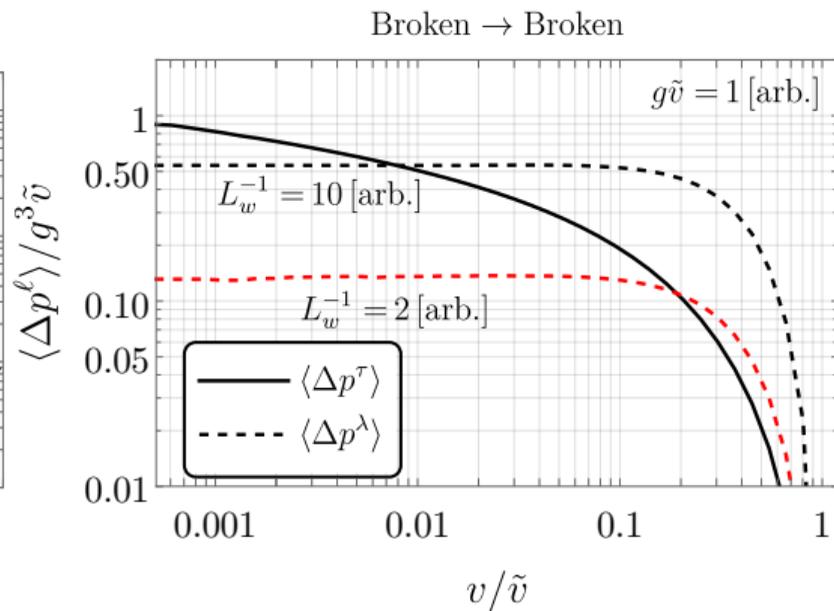
Weaknesses: { WKB approx. despite IR dominated emission
Longitudinal pol. not properly considered

Results: $\langle \Delta p \rangle$ in the asymptotic limit $\gamma_w \rightarrow \infty$

Relative importance of τ and λ contributions

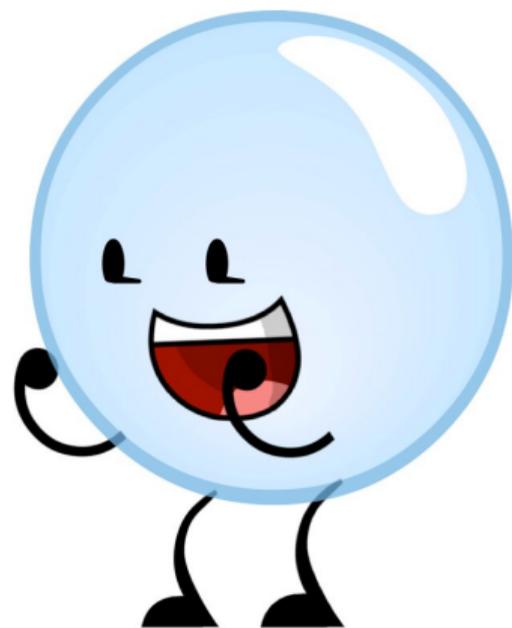


Relative importance of τ and λ contributions



Main conclusions

- ① We computed the **transition radiation emission on much more solid basis**, account for **longitudinal emission**, and extend the analysis to **broken to broken phase transitions**.
- ② We computed the **friction from transition radiation** in the most **minimal theory** (scalars) and in a **spontaneously broken Abelian gauge theory**.
- ③ We developed the tools for computing any particle process in such a background.
(A step towards systematically studying QFT (EFT?) for broken translations)



Thanks for your attention!

Backup slides

Results: Broken \rightarrow Broken with transient regimes

We are also able to capture transient regimes \rightarrow ultimately matters to determine equilibrium velocity

