The order of the QCD chiral phase transition for different numbers of flavours

in collaboration with
Owe Philipsen, Reinhold Kaiser, Jan Philipp Klinger
Ongoing work: arXiv:2603.20099

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CRC Retreat 2026
Bonn 25.03.2026

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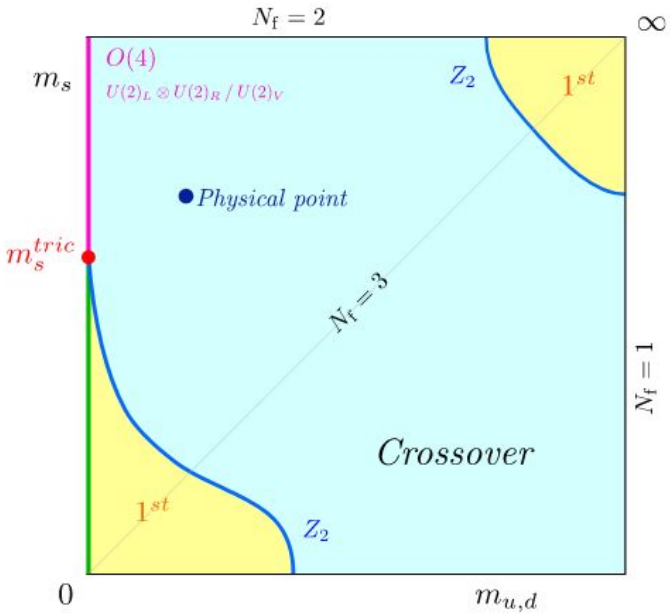
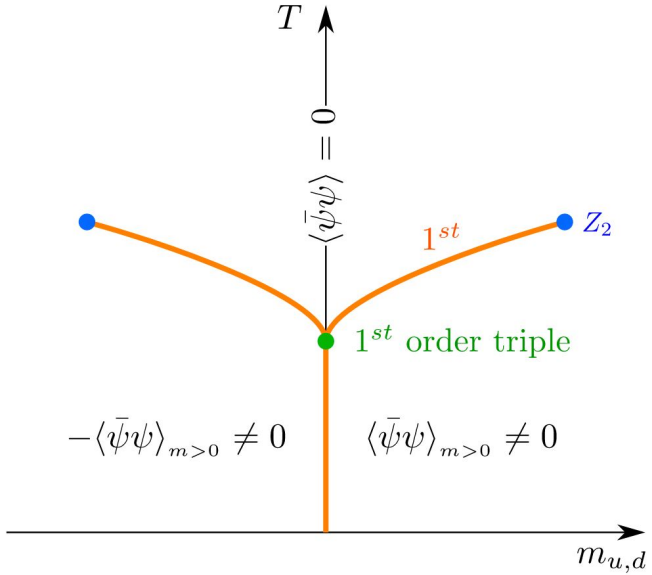
CRC-TR 211
Strong-interaction matter under extreme conditions

Tricritical scaling



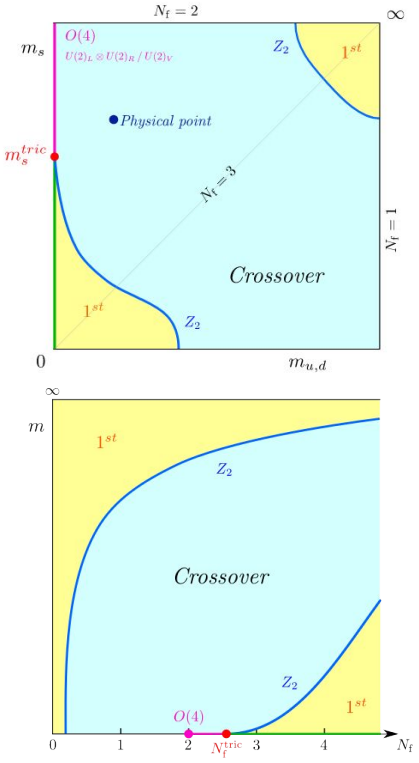
[Cuteri, Philipsen, Sciarra 2021]

- Triple points at $m = 0$: 3-state coexistence
- End of triple line: Tricritical point
- Z2 second order line



[Cuteri, Philipsen, Sciarra 2021]

Columbia plot for different lattice spacings



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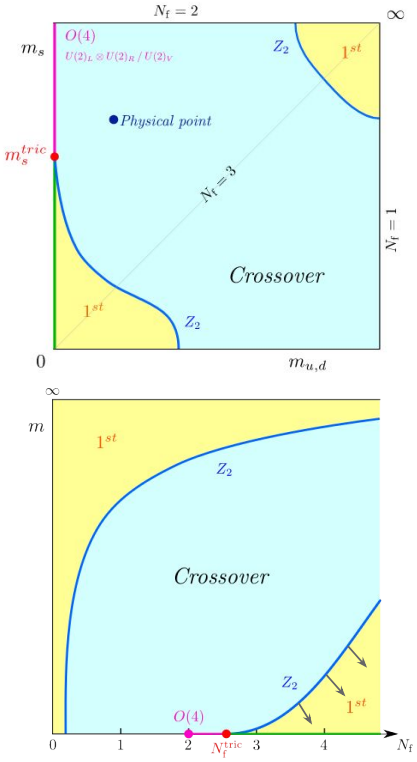

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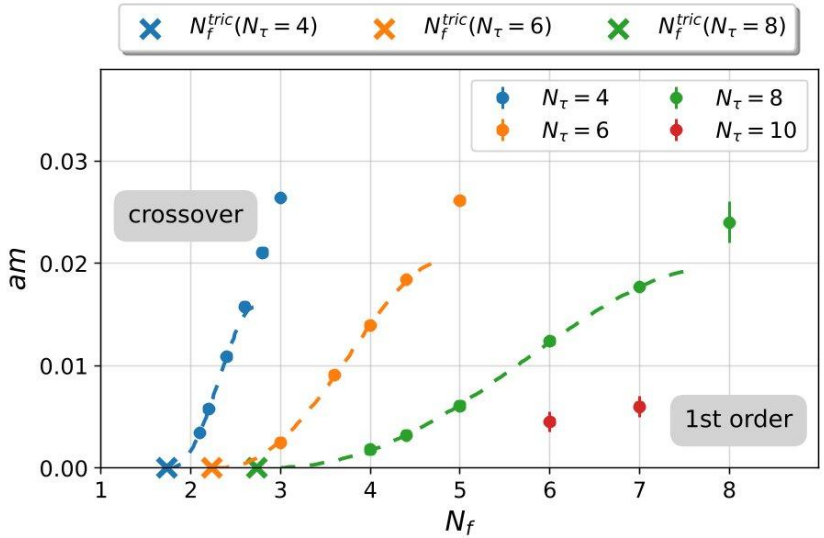

$$N_f^c(am) = N_f^{tric} + A \cdot (am)^{2/5} + B \cdot (am)^{4/5}$$

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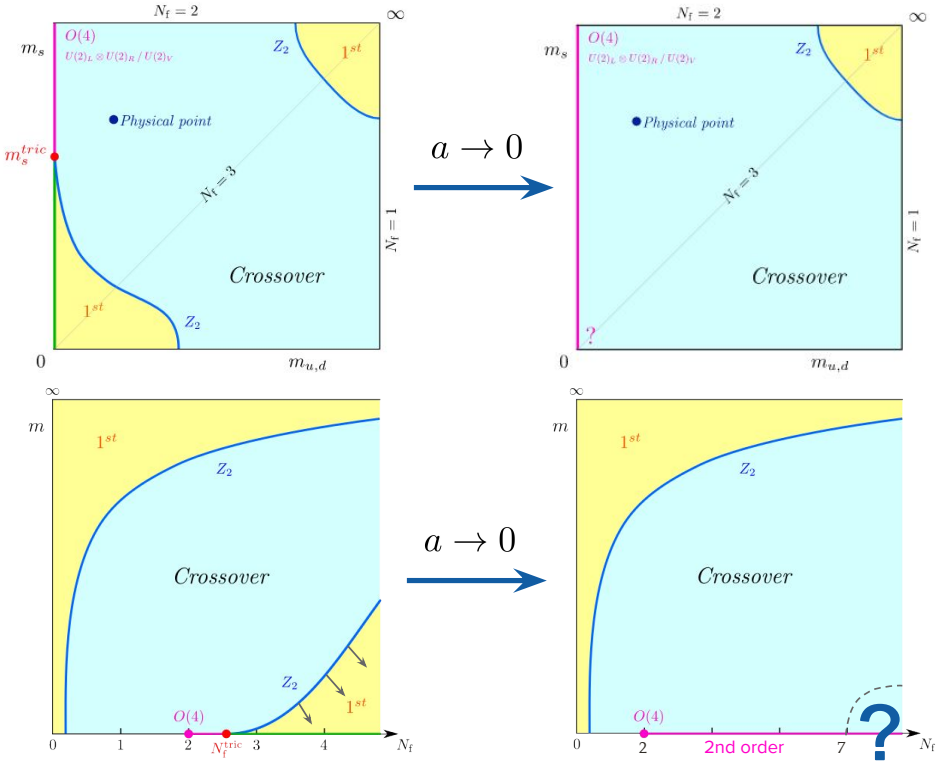

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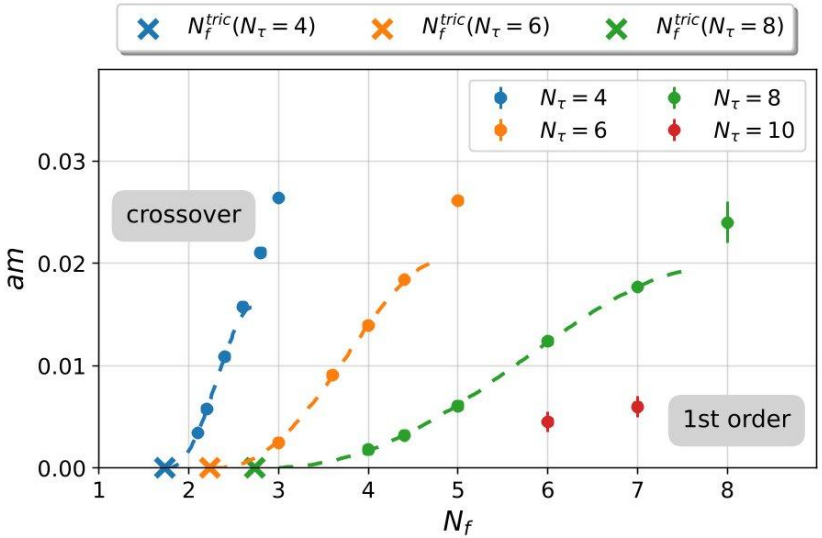

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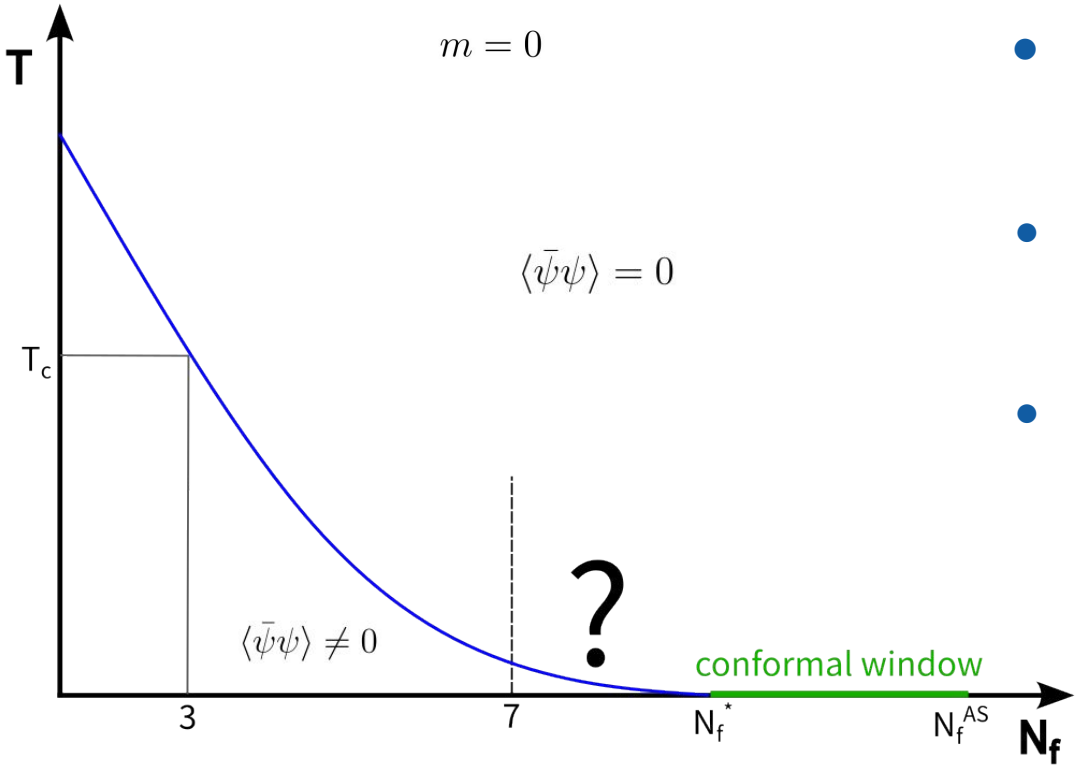
Lattice phase diagram for different numbers of massless flavours



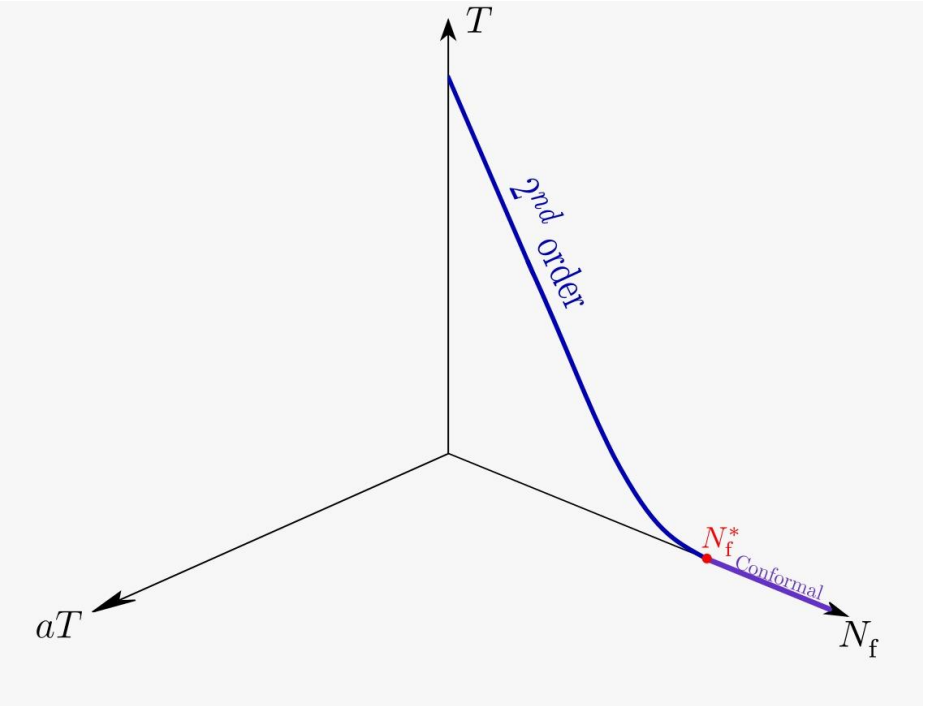
- The chiral transition is of 2nd order for $N_f \leq 7$ [Cuteri, Philipsen, Sciarra 2021]
- Goal: determine order of phase transition up to Nf*
- Nf*: onset of the conformal window and the end of chiral symmetry breaking

Results

- 1st order region only for large lattice spacings

- For $N_f \geq 8$:
  - ➟ 1st order merges in an unphysical bulk phase
  - ➟ 1st order not connected to continuum

- The continuum chiral phase transition is 2nd order for all Nf < Nf*



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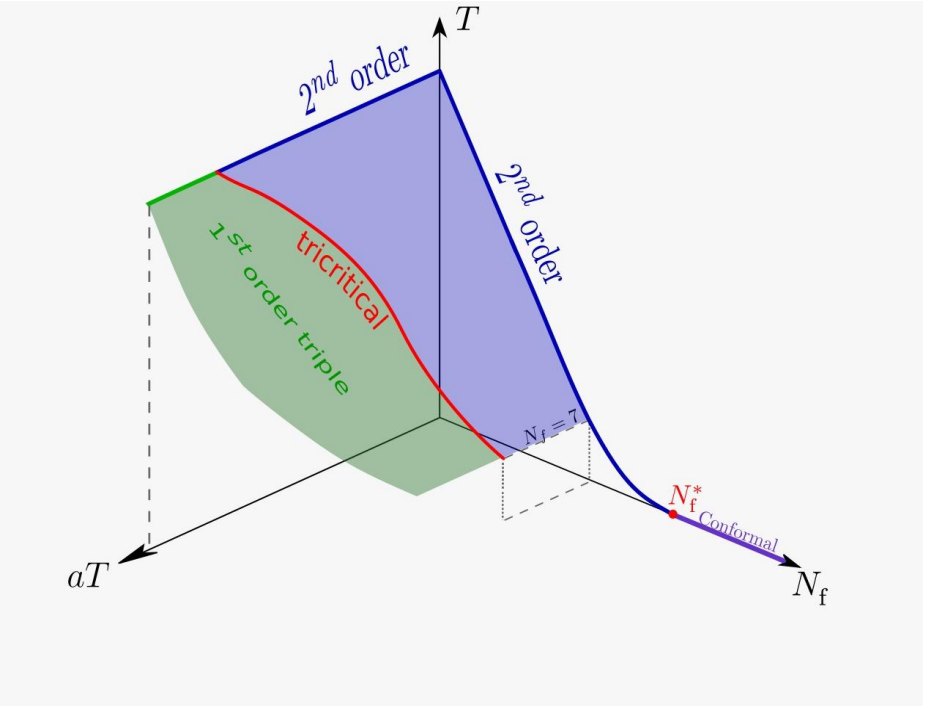

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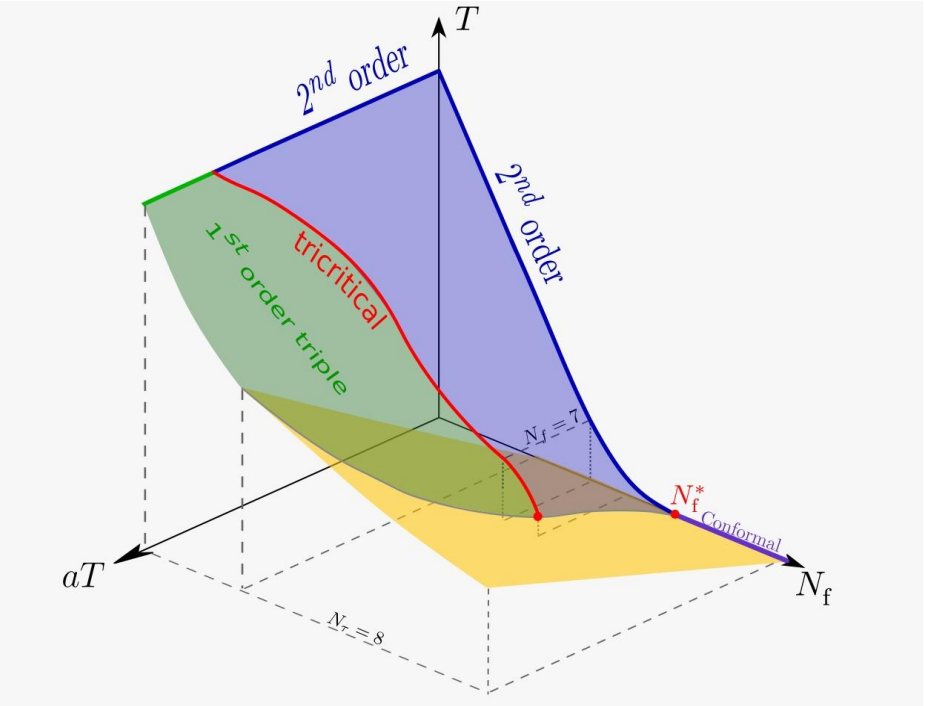
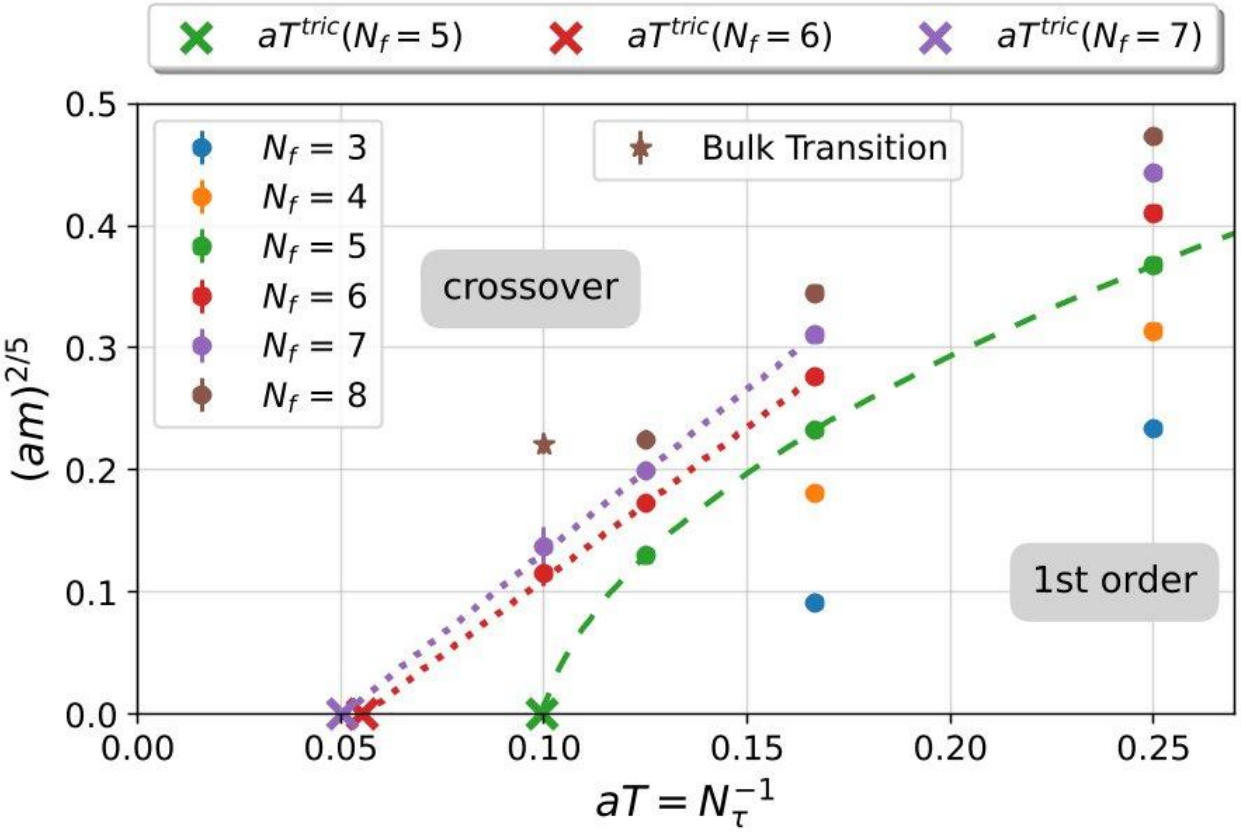


Thank You

Backup

Leading order scaling in aT