



## Abstract

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## 1. Introduction and Formalism

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$$\begin{aligned} \text{Diagram} &= -\frac{M^2}{8NF^2} \left[ \text{Diagram 1} + \frac{1}{2} \text{Diagram 2} + \frac{5}{16} \text{Diagram 3} \right. \\ &\quad \left. + \frac{7}{32} \text{Diagram 4} + \dots + 8(-1)^{k+1} \binom{1/2}{k+2} \text{Diagram 5}^k \right] = -\frac{M^2}{8NF^2} g\left(\frac{G_1}{F^2}\right) \end{aligned}$$

This vertex takes into account all possible insertions of thermal tadpoles coming from diagrams with six or more external legs. Its Feynman rule is written in terms of a function  $g(x)$  that reads

$$g(x) = -\frac{8}{x^2} \left[ \sqrt{1-x} - 1 + \frac{x}{2} \right] = -8 \sum_{k=0}^{\infty} (-1)^k \binom{1/2}{k+2} x^k = 1 + \frac{x}{2} + \frac{5}{16}x^2 + \dots \quad (1)$$

$G_1(M, T)$  is taken as in [3]. Since this is not a scattering approach, we do not consider any combinatory factor linked with the way the pion lines are attached either with external legs or loops. Now, we are able to diagrammatically construct the partition function for  $N$  massless pions.

## 2. Free Energy and Order Parameters

### 2.1 Free Energy

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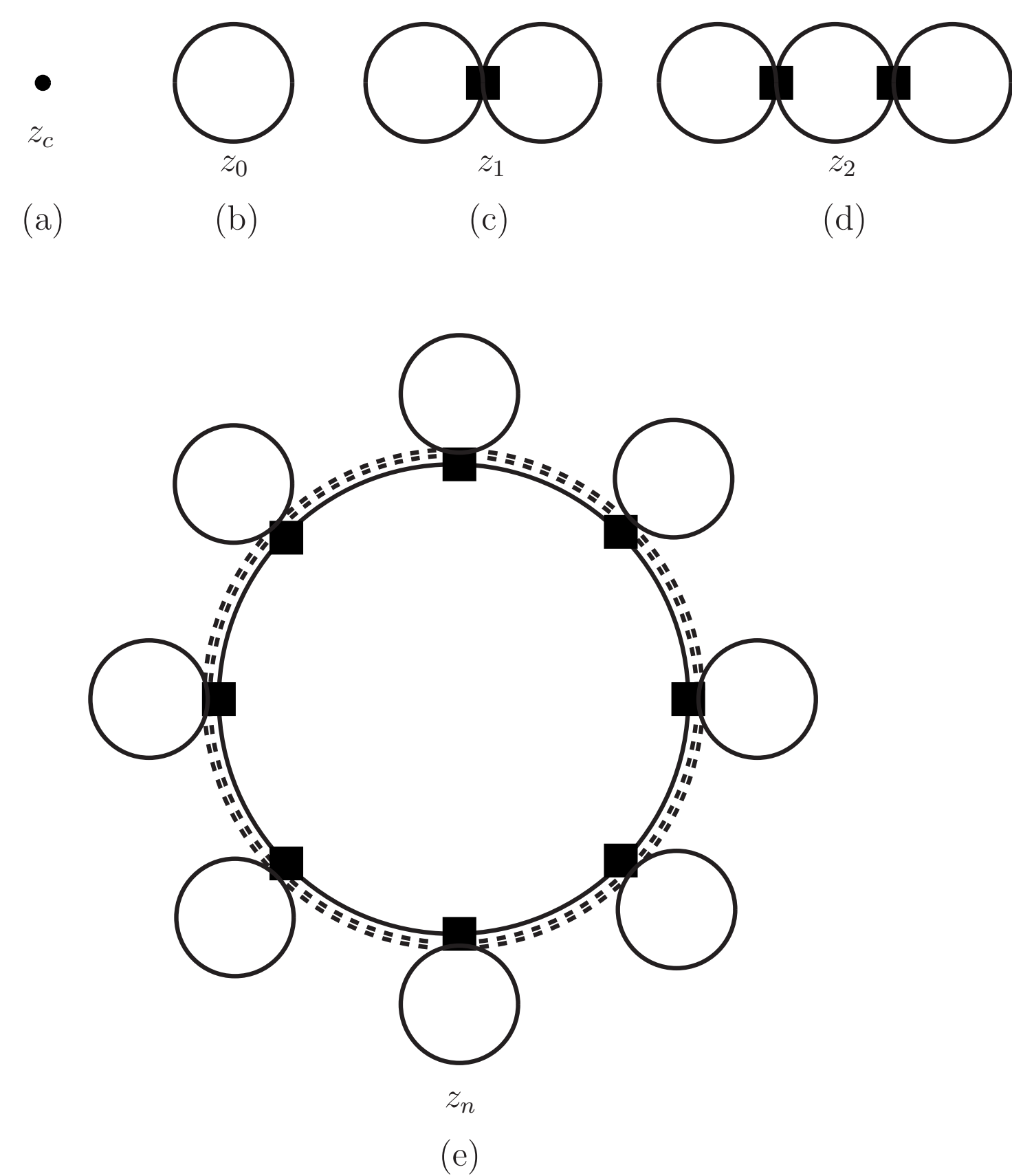
First item in a list

Second item in a list

Third item in a list

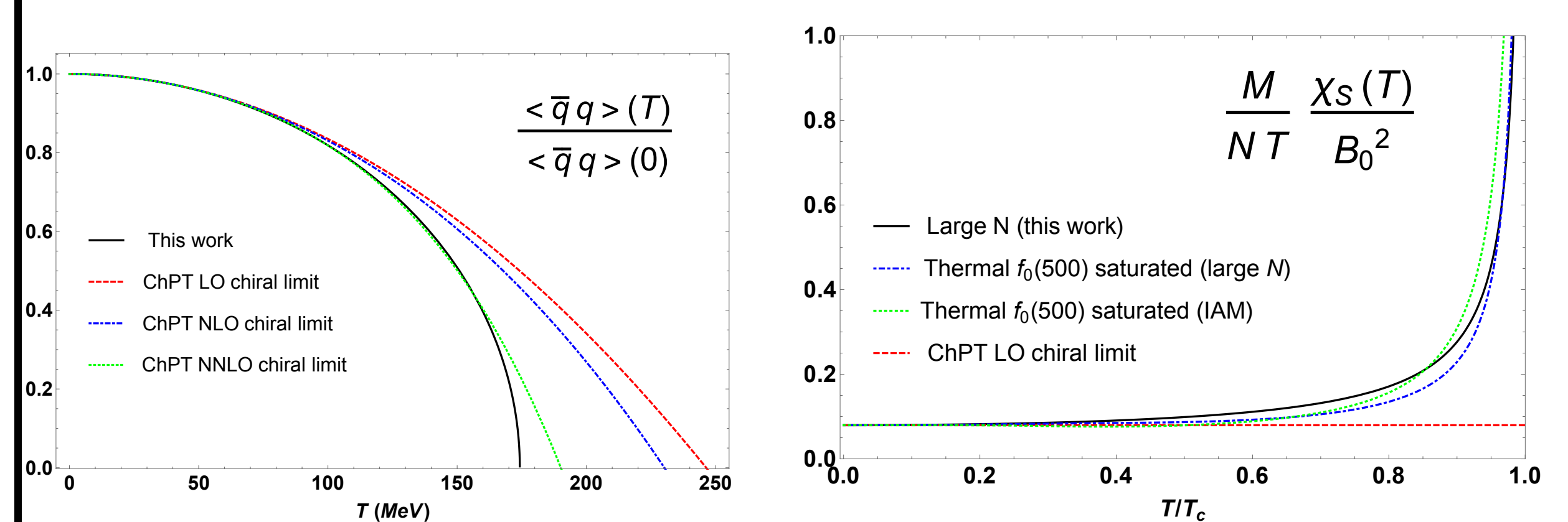
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### 2.2 Scalar Quark Condensate and Susceptibility

The chiral limit  $M \rightarrow 0^+$  is plotted in the following figures [4].



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## 3. Conclusions

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## References

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[5] S. Cortés, A. Gómez Nicola and J. Morales, Phys. Rev. D **93**, no. 3, 036001 (2016).