Contribution ID : **9** Type : **Oral Presentation**

Can non-linear boundary conditions lead to new non-perturbative physics?

Monday, 1 December 2025 11:40 (0:20)

Content

We hope the answer is yes.
We consider the case of a free massive bulk scalar living in R^4 and we embed two parallel plates as interfaces on which we impose non-linear boundary conditions, either Dirichlet- or Neumann-like, parameterized by a new coupling constant g. This is a toy model for the case of non-Abelian gauge theories supplemented with boundary conditions on surfaces embedded in the bulk. We present first evidence for a non-perturbative 1/g^2 correction to the standard Casimir energy. This becomes possible by incorporating dynamical corrections to the effective boundary fields used to build in the boundary conditions directly at the action level.

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