

# On $p$ -adic string amplitudes in the limit $p$ approaches to one

Miriam Bocado, Hugo García Compeán  
(Joint work with W. A. Zúñiga-Galindo)

*Centro de Investigación y de Estudios Avanzados  
del Instituto Politécnico Nacional*

In this talk we will discuss the limit  $p$  approaches to one of tree-level  $p$ -adic open strings amplitudes through its connection with local zeta functions. There is an empirical evidence that the  $p$ -adic strings are related to the ordinary strings in the  $p \rightarrow 1$  limit. In [1], we established that  $p$ -adic Koba-Nielsen string amplitudes are finite sums of Igusa's local zeta functions, and that they are convergent integrals admitting meromorphic continuations as rational functions. Denef and Loeser established that the limit  $p \rightarrow 1$  of Igusa's local zeta functions give rise to new objects, that they called topological zeta functions. By using Denef-Loeser's theory of topological zeta functions, we show that limit  $p \rightarrow 1$  of a tree-level  $p$ -adic open strings amplitudes give rise to a new amplitudes, which we have called string amplitudes underlying topological zeta functions. Gerasimov and Shatashvili showed that, up to second order derivatives, the effective Lagrangian in the Witten's boundary open string field theory is equal to the limit  $p \rightarrow 1$  of the effective Lagrangian of the  $p$ -adic strings. In [2], we showed that the Feynman amplitudes of this last Lagrangian are precisely the string amplitudes underlying topological zeta functions, which correspond to the amplitudes of the mentioned Witten's theory.

## References

- [1] Bocado-Gaspar, Miriam, García-Compeán, H., W. A. Zúñiga-Galindo, *Regularization of  $p$ -adic String Amplitudes, and Multivariate Local Zeta Functions*, arXiv:1611.03807 (2017).
- [2] Bocado-Gaspar, Miriam, García-Compeán, H., W. A. Zúñiga-Galindo, *On  $p$ -adic string amplitudes in the limit  $p$  approaches to one*. Preprint 2017.