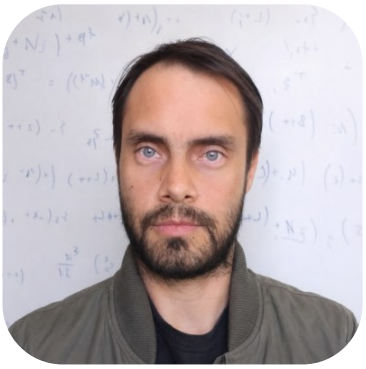
NITheCS
National Institute for
Theoretical and Computational Sciences

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

S E M I N A R

Recent advances in non-linear electrodynamics (NLED) and analogue gravity



Prof Eduardo Bittencourt
(UNIFEI-Brazil)

ABSTRACT

Nonlinear electrodynamics provides a rich arena where light does not merely propagate through spacetime, but can experience an effective geometry generated by electromagnetic fields themselves. In this talk, I will discuss recent advances connecting NLED, analogue gravity, and emergent spacetime structures. I will first introduce the idea that small electromagnetic perturbations in a nonlinear theory propagate according to an optical metric, whose causal cones depend on the background field.

I will then present three complementary developments: the construction of photon traps in NLED, an analogue model of a rotating black hole, and a more recent geometrical result involving the full principal symbol of the theory. Together, these results suggest that nonlinear electromagnetic media can provide not only analogues of black-hole kinematics, but also a controlled framework for exploring causality, wave propagation, and quantum-field-theoretic ideas beyond the geometrical-optics limit.

Eduardo Bittencourt is a Professor in the Institute of Physics and Chemistry at the Federal University of Itajubá (UNIFEI) in Brazil, and a Visiting Professor at the University of Cape Town.

Date:
Thursday, 13 August 2026

Time:
11h30-12h30 SAST

Venues:

- NITheCS Seminar Room
  University of KwaZulu-Natal
  Westville Campus
  3rd Floor, H-Block,
  School of Chemistry and Physics
- Online

WHO SHOULD ATTEND?
All are welcome.

ENQUIRIES:
Email Dr Cerene Rathilal:
RathilalC@ukzn.ac.za

REGISTER: https://bit.ly/3QLwAJv

science, technology & innovation
Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA

NRF National Research Foundation