NITheCS

National Institute for Theoretical and Computational Sciences

MINI-WORKSHOP:

Exploring Theoretical Work at the Joint Institute for Nuclear Research (JINR)

Monday, 11 December 2023 | 14h15 – 17h00 SAST

Venue: in person* and online

** Neelsie Cinema, Stellenbosch University*

--- Cheese and wine will be served at the venue ---

PROGRAMME

14:15 - 15:00	**From a Dinuclear System to Close Binary Cosmic Objects** **Prof Nikolai Antonenko** (Bogolyubov Laboratory of Theoretical Physics, JINR, Russia) Applying the ideas from microscopic objects to macroscopic stellar and galactic systems, the evolution of compact di-stars and di-galaxies is studied in the mass asymmetry coordinate. The formation of stable binary systems is analyzed. The role of symmetrization of an initially asymmetric binary system is revealed in the transformation of gravitational energy into internal energy of stars or galaxies accompanied by the release of a huge amount of energy. For the contact binary stars, the change of the orbital period is explained by evolution to symmetry in mass asymmetry coordinates.
15:00-15h30	**Coffee / tea**
15:30 - 16:15	**Induced Magnetization in Anisotropic Environment** **Dr Gurgen Adamian** (Bogolyubov Laboratory of Theoretical Physics, JINR, Russia) The non-Markovian dynamics of a two-dimensional charged harmonic oscillator linearly coupled to a neutral bosonic heat bath is investigated in a linear-polarized electric field. The analytical expressions for the time-dependent and asymptotic magnetic moment are derived for the Markovian and non-Markovian dynamics. It is predicted that the linear-polarized electric field generates strong orbital currents and magnetization in a symmetric harmonic oscillator embedded into anisotropic heat bath. As shown, the magnetization of a parabolic quantum dot is quite large at very weak friction coefficients corresponding to very low temperatures.
16:15 - 17:00	**Calculating the width of an ultra-narrow resonance** **Prof Sergei Rakitianski** (University of Pretoria) A reliable way of calculating the width, Γ, of an extremely narrow quantum resonance is suggested. The proposed method is based on expanding the Jost function in the Taylor series around the real resonance energy, E_r, and looking for its zero at the nearby complex point $E_r - i\Gamma/2$. The coefficients of such an expansion can be obtained by solving a set of coupled differential equations of the first order. Using a simple exactly solvable model, it is demonstrated that the method is efficient and accurate.

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