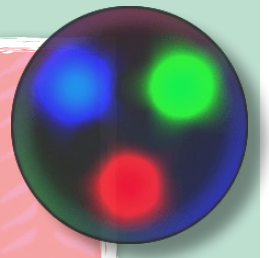
PhD Journal Club
Marzo 2024

ROMA TRE
UNIVERSITÀ DEGLI STUDI

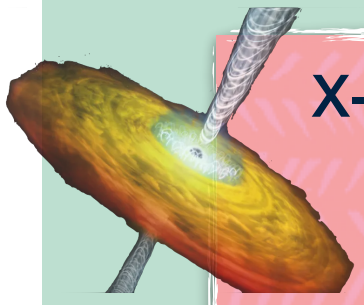
Speakers



The SIDDHARTA-2 Experiment at DAΦNE

Francesco Artibani

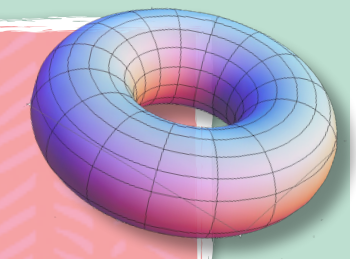
The strong interaction in the Standard Model is described by the Quantum ChromoDynamics (QCD). At low energies (below ~1 GeV), the strong coupling, , diverges, and the theory becomes non-treatable perturbatively. For this reason, phenomenological models are an appropriate method to understand how hadrons interact at low energy. The experimental studies on kaonic atoms play a key role since they can directly probe the strong interactions in the strangeness sector at threshold, in order to test and provide inputs to phenomenological models. The SIDDHARTA-2 experiment, now taking data at the DAΦNE collider, aims to the precise measurement of the shift and the width induced on the 1s level of kaonic deuterium, two important observables strictly liked to fully disentangle the iso-scalar and iso-vector scattering lengths, key parameters on which many models now disagree. Parallel measurements will be crucial for a deeper understanding of the kaon-nucleons interactions in function of the nuclear density, and to solve the kaon mass puzzle, that alters many measurements in particle physics.



X-ray study of optically selected dual AGN

Lorenzo Battistini

Galaxy merging phenomena at pc–tens of kpc scales are subjects of interest in modern Astrophysics, since they could cause the triggering of the Active Galactic Nuclei (AGNs) and the formation of Super Massive Black Holes (SMBHs) at the center of the galaxies, as several studies suggest. When two interacting galaxies host two AGNs (one each), we refer to them as dual AGN. However, multi-waveband observations are needed in order to properly identify and characterize dual AGN systems. X-rays are a powerful method with which we can detect AGNs and study their properties, such as the absorption caused by a dusty material which obscures the inner regions of the AGN. We focused on the X-ray analysis of a sample of 28 dual AGN candidates which were selected in the optical band, and we found some important absorption properties which confirm the higher absorption regime when looking at dual systems, with respect to the isolated ones.



A simplest flavour model for leptons: the revival of modular S_3

Matteo Parriciatu

Traditional flavour symmetry models proved to be quite unsatisfactory in the aim of producing predictive neutrino mass models. In 2017, a new 'bottom-up' approach based on modular invariance was suggested, wherein the Yukawa couplings of the Standard Model become modular forms. Is it possible to employ the smallest and most minimal modular group S_3 to construct predictive neutrino mass models? As demonstrated in our work, the answer is affirmative if we assume a certain set of guiding principles that fully exploit modular invariance. Among other observables, the model is able to predict a normal ordering of neutrino masses and a Dirac CP-phase near maximal violation.

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