ABSTRACTS - Participants' sessions I

Invariants of the Szekeres system

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The Szekeres system of ODEs is derived from a cosmologicalmodel of irrotational dust spacetime with Weyl tensor purely electric. It has been used in modelling the early Universe and the evolution of galaxy super clusters. With prof. Z. A. Golda, we proved that it is completely solvable. I will present the invariants of the system and some of its special solutions with physical interpretation.

Dark fluid or cosmological constant: Why there are different de Sitter-type space-times?

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Many different forms of the de Sitter metric in different coordinate systems are used in the general relativity literature. Two of them are the most common: the static form and the cosmological (exponentially expanding) form. The staticity and nonstationarity of these two different forms are traced back to the noncomoving and comoving nature of the corresponding coordinate systems.

What are two-point diagnostics telling us in light of H(z) data?

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Two-point diagnostics have been introduced as an interesting tool for testing the validity of the ΛCDM model. Quite recently, Sahni, Shafieloo &; Starobinsky (2014) combined two independent measurements of H(z) from BAO data with the value of the Hubble constant H0, and used the second of these diagnostics to test the ΛCDM model. Their result indicated a considerable tension between observations and predictions of the ΛCDM model. Since reliable data concerning expansion rates of the Universe at different redshifts H(z) are crucial for the successful application of this method, we investigate both two-point diagnostics on the most comprehensive set of N=36 measurements of H(z) coming from the BAO and differential ages (DA) of passively evolving galaxies. We discuss the uncertainties of two-point diagnostics and find that they are strongly non-Gaussian and follow the patterns deeply rooted in their very construction. Therefore we propose that non-parametric median statistics is the most appropriate way of treating this problem. Our results support the claims that ΛCDM is in tension with H(z) data according to the two-point diagnostics developed by Shafieloo, Sahni and Starobinsky. However, other alternatives to the ΛCDM, such as wCDM or CPL models perform even worse. We also notice that there are serious systematic differences between BAO and DA methods which ought to be better understood before

H(z) measurements can become competitive to the other probes.

Numerical methods for the topological analysis of the large-scale structure of the Universe

Piotr Konorski (rupikon@gmail.com)

Numerical model of satellite movement around irregular shaped asteroids

Mateusz Narożnik (mateusznaroznik1@gmail.com)

Motion of the body in central gravitational field is well known and described by three Kepler's law. We know that this is ideal model and is vary rarely encountered. That's why we use several different approaches to calculate gravitational potential. In my presentation, I will introduce the theme of evaluating gravitational potential especially around elongated-shaped asteroids.

Gravitational microlensing and its capabilities for research the dark matter

Liudmyla Berdina (laberdina@gmail.com)

Analysis of the micro lensing effect taking into account the influence of gravitational field of brown dwarfs and gravitational field of galaxy will be the object of presentation. Visualization of the results was carried out by constructing intensity contours of images and light curve. The results of analyses can be useful for the interpretation of observational data and research the dark matter.