STARS2013 - 2nd Caribbean Symposium on Cosmology, Gravitation, Nuclear and Astroparticle Physics / SMFNS2013 - 3rd International Symposium on Strong Electromagnetic Fields and Neutron Stars

Contribution ID: **27** Type: **Talk**

Weighed scalar averaging over inhomogeneous cosmological models

Tuesday 1 July 2014 16:45 (30 minutes)

Averaging the fully tensorial Einstein equations and their solutions (spacetimes) is an open problem in General Relativity. I present and discuss the proper 3-volume scalar averaging formalism endowed with a non-trivial weight factor, and its application to inhomogeneous cosmologies (LTB and Szekeres models). This formalism leads to a fully determined system of evolution equations for the averaged covariant scalars and their fluctuations and perturbations, allowing for a deeper coordinate independent theoretical understanding of the deviation from FLRW homogeneity, either in terms of a rigorous formalism of exact perturbations over an FLRW abstract background, or through a definition of gravitational entropy in a phase space made by weighed averages of the density and Hubble scalar velocity. I discuss how this weighed scalar averaging can be applied to more general geometries and to various theoretically relevant issues in GR.

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Track Classification: STARS2013