Institute for Research in Fundamental Sciences

School of Physics

Ph.D. Defense Session

Title:

Deformation of Asymptotic Symmetry Algebras and Their Physical Realizations

Candidate:

Hamid Reza Safari, IPM

Virtual Room:

www.skyroom.online/ch/schoolofphysics/defense

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Abstract:

This thesis is devoted to the study of the deformation and rigidity of infinite dimensional Lie algebras which are not subject to the Hochschild-Serre factorization theorem. In particular, we consider bms_3, $u(1)$ current Kac-Moody and bms_4 algebras and their central extensions which are respectively obtained as asymptotic and/or near horizon symmetry algebras for Einstein gravity on $3d$ flat, AdS_3 and $4d$ flat spacetimes. We also explore possible deformations of the Maxwell-BMS algebra Max_3, which is obtained as asymptotic symmetry algebra of the Chern-Simons gravity theory invariant under the $2+1$ dimensional Maxwell algebra. We find that these algebras are not rigid and can be deformed into new non isomorphic infinite dimensional (family of) algebras. We study these deformations by direct computations and also by cohomological analysis. We then classify all the algebras obtained through deformation of these algebras as well as all possible central extensions thereof. We propose/conjecture an extension of the Hochschild-Serre factorization theorem for infinite dimensional algebras as well as introducing a new notion of rigidity for family algebras obtained through deformation. We also explore physical realizations and significance of the family of algebras we obtain through the deformation procedure.

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