INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student	:	Joy Prakash Das
Roll Number	:	146121021
Programme of Study	:	Ph. D.
Thesis Title	:	Non chiral bosonization of a Luttinger liquid
Name of Thesis Supervisor(s)	:	Prof. Girish S. Setlur
Thesis Submitted to the Department/ Center	:	Yes (on 17/09/2019)
Date of completion of Thesis Viva-Voce Exam	:	13/09/2019
Key words for description of Thesis Work	:	Bosonization, Luttinger liquids, Green functions

SHORT ABSTRACT

In this work, the powerful Non-chiral bosonization technique (NCBT) is introduced, which is a non-trivial modification of the standard Fermi-Bose correspondence in one spatial dimension made in order to facilitate the study of strongly inhomogeneous Luttinger liquids (LL) where the properties of free fermions plus the source of inhomogeneities are reproduced exactly. The formalism is applied to obtain the correlation functions of translationally non-invariant systems like LL with a cluster of impurities (barriers/wells) around an origin, a one step fermionic ladder, slowly moving impurities in a Luttinger liquid, etc. The obtained correlation functions are used to study various physical phenomena like Friedel oscillations, resonant tunneling, dynamical density of states, conductance, mobility (in case of mobile impurities) and so on. The results are validated using the Schwinger Dyson equation and perturbative methods. The present method is superior to the conventional bosonization methods (g-ology methods) which requires additional tools like re-normalization, etc. to deal with impurities.