अंतर-विश्वविद्यालय केंद्र : खगोलविज्ञान और खगोलभौतिकी IUCAA

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Professor Ranjeev Misra

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*Report on the thesis titled "***Selected aspects of low angular momentum accretion onto a black hole***" submitted by* ***Ishika Palit*** *for the partial fulfillment of the requirements for the degree of Doctor of Philosophy in Physics.*

Understanding the accretion flow onto black holes is critical to our knowledge of black hole systems and to test the General theory of relativity in the strong field limit. Moreover since back hole systems exhibit variability in all time-scales, it is necessary to study the temporal nature of these accreting flows. This thesis makes important contribution to this field by performing an in-depth analysis of two situations pertaining to low angular momentum flow using numerical codes.

After a fairly comprehensive and pertinent introduction to black holes, GR and the different kinds of accretion flows, the thesis presents an educative description of the numerical codes used in the work in the second chapter.

The core of the thesis is two different works which explore the accretion flow dynamics onto a black hole. In the first work, low angular momentum flow is investigated with the new aspect the fluid maybe a relativistic one and hence will have an adiabatic index of 4/3 and a comprehensive study of the flow for different parameters has been undertaken. Of particular interest is the study of the time dependent behavior of the system. In the second work, the effect of a clumpy wind accretion on the rapid temporal variation of the flow is studied in detail. This is relevant to accretion onto the prototype black hole system, Cygnus X-1 and the results show that indeed the rapid variability observed in this source could have its origin in the clumpiness of the wind from the companion.

For future work, it is proposed to study the effect of non-axisymmeteric perturbations which would be an important and natural extension of the thesis work. The candidate would also like to work on a rather different topic on the collapsing stars giving rise to Gamma-Ray bursts, which is a challenging and important subject.

The thesis presents significant new results which will eventually lead to improved understanding of the nature of variability of accretion onto black holes. The original work described in the thesis has already been published in a couple of papers in reputed international journals.

Given the high quality, originality and importance of the work done, I recommend that the thesis be accepted in its present form for the award of a Ph. D.

Mailing Address: IUCAA, Post Bag 4, Ganeshkhind, Pune 411 007, India
Tel.: +91 20 2560 4116(direct) :: 2560 4100 (operator) ***Fax:*** +91 20 2560 4699
Email: rmisra@iucaa.in ***URL***: http://www.iucaa.in