

CIMPA Research in Pairs (report)

I. Information

Name: **Muhammad Sharif**

First name: **Muhammad**

Home Institution: **The University of Lahore**

Total duration of the stay: **Five Weeks (May 26- June 27, 2025)**

Host colleague (first name, last name, city, country): **Sigbjørn, Hervik, Stavanger, Norway**

II. Activity Report

During my stay here, I have worked on the proposal submitted to CIMPA with my application. The summary of my work is as follows.

“In this work, we investigate the construction of wormhole solutions within the framework of Rastall gravity by employing the minimal gravitational decoupling approach. We begin by formulating the modified field equations of Rastall theory. Utilizing this scheme, we decouple these equations and construct a minimally deformed Schwarzschild black hole solution. This deformed black hole is then linked to a wormhole geometry, and the resulting configuration is analyzed in detail. We examine key physical and geometrical properties of the wormhole, including the violation of the null energy conditions, the behavior of the active gravitational mass, the volume integral quantifier, and the embedding diagram. Our analysis reveals that the wormhole throat emerges naturally in the deformed geometry and satisfies the necessary flare-out condition. The effective energy conditions are plotted for various values of the Rastall parameter, confirming the presence of exotic matter near the throat. The results demonstrate that the amount of exotic matter required to sustain the wormhole can be minimized through appropriate geometric configurations, thereby supporting the viability of traversable wormholes in Rastall gravity.”

The outcome of this work will be submitted for publication very soon. Furthermore, I have planned some more work following this line of action and other related work. I hope our collaboration will result some more work in the direction of research supervision of students as well as some joint conferences etc.

I must thank CIMPA as well as its related people for facilitating throughout wherever it was needed. This is a very good opportunity from CIMPA to work in an excellent environment.

III. Feedbacks

The CIMPA-ICTP Research in Pairs program is an excellent program for third world countries people. We have usually very restricted facilities for research in our countries. For the future laureates, I would advise about the accommodation. If there is no alternative then Airbnb is the best option to find a reasonable accommodation according to the budget. One more advice, always plan your program with sufficient time ahead. This is very good that CIMPA informs the selected laureates about an year earlier.