

# Geometric Inequalities for Axially Symmetric Initial Data Sets

Ye Sle Cha(ycha@zedat.fu-berlin.de)

Freie Universität Berlin

## Abstract

Over the past decade, the geometric inequalities in general relativity which relate mass and other physical quantities, such as angular momentum and charge of the initial data set for the Einstein-Maxwell equations, have been intensively studied. In particular, Dain et al., proved the mass-angular momentum inequality for 3 dimensional, axially symmetric, and maximal initial data sets for the Einstein equations, under the suitable energy conditions. Moreover, Alaei, Khuri, Kunduri recently extended the proof to show that the analogous inequality holds for 4 dimensional, bi-axisymmetric, maximal initial data sets. In this talk, I would like to present the strategy for reducing the general non-maximal case to the known maximal case, and the recent progress in that direction, on the near maximal cases.

**Keywords:** *Mass-angular momentum inequality, Mass-angular momentum-charge inequality*

## References

- [ 1 ] S. Dain, Proof of the angular momentum-mass inequality for axisymmetric black hole, J. Differential Geom., 79 (2008), 33-67.
- [ 2 ] A. Alaei, M. Khuri, and H. Kunduri, Proof of the mass-angular momentum inequality for bi-axisymmetric black holes with spherical topology, Adv. Theor. Math. Phys., 20 (2016), no. 6, 1397-1441.
- [ 3 ] Y.-S. Cha, and M. Khuri, Deformations of axially symmetric initial data and the mass-angular momentum inequality, Ann. Henri Poincaré, 16 (2015), no. 3, 841-896.
- [ 4 ] Y.-S. Cha, and M. Khuri, Deformations of charged axially symmetric initial data and the mass-angular momentum-charge inequality, Ann. Henri Poincaré, 16 (2015), no. 12, 2881-2918.

## Biography

From March 2015, I have been working as a postdoctoral researcher in mathematics in the geometric analysis group at the Freie Universität Berlin, under the support of Dahlem Research School Postdoc Fellowships. Before coming to Berlin, I was a visiting researcher at the mathematical institute of the University of Oxford as a LMS Grace Chisholm Young Fellow in Mathematics. I gained my Ph.D. in mathematics from Stony Brook University, under the supervision of Dr. Marcus Khuri.