

A U S H A N G

FREIE UNIVERSITÄT BERLIN Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

DISPUTATION

Mittwoch, 22. Januar 2014, 12.15 Uhr

Ort: Großer Hörsaal, Arnimallee 22, FU Berlin

Disputation über die Doktorarbeit von

Herrn Nishanth Abu Gudapati

**Thema der Dissertation:
On the Cauchy Problem
for Energy Critical Self-Gravitating Wave Maps**

**Thema der Disputation:
The Short Pulse Method and its Applications
in Characteristic Initial Value Problem in General Relativity**

Die Arbeit wurde unter der Betreuung von **Prof. Dr. G. Huisken** durchgeführt.

Abstract: In 1965, Roger Penrose [5] introduced the notion of a closed trapped surface which paved the way for the mathematical definition of a black hole spacetime in the context of the Cauchy problem for general relativity. The subsequent singularity theorems of Penrose and Hawking [2] furthered our mathematical understanding of black holes and their topology, and eventually resulted in the famous cosmic censorship conjectures.

However, the fundamental question whether trapped surfaces form in the evolution of an initial data without a trapped surface has been open until 2009 when Christodoulou, in a seminal and voluminous monograph [1], proved that a characteristic initial value problem of Einstein's equations with short pulse initial data forms a trapped surface in its causal future. In this talk we shall present the framework of the problem and key estimates in its proof before discussing more recent improvements [4, 3].

In the second part of the talk we shall present my PhD work on critical selfgravitating wave maps. The main result of the work is the proof of non-concentration of energy of critical equivariant self-gravitating wave maps. The central techniques in the proof arise from the vector fields method and the conservation of the geometric mass of the system.

References

- [1] D. Christodoulou. The formation of black holes in general relativity. EMS Monographs in Mathematics, 2009.
- [2] S.W. Hawking and G.F.R Ellis. The large scale structure of spacetime. Cambridge University Press, 1973.
- [3] S. Klainerman, J. Luk, and I. Rodnianski. A fully anisotropic mechanism for formation of trapped surfaces in vacuum. preprint, 1302.5951, 2013.
- [4] S. Klainerman and I. Rodnianski. On the formation of trapped surfaces. preprint, 0912.5097, 2009.
- [5] R. Penrose. Gravitational collapse and spacetime singularities. Phys. Rev. Lett, 14:57–59, 1965.

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.

Interessierte werden hiermit herzlich eingeladen

Der Vorsitzende der Promotionskommission
Prof. Dr. G. Huisken