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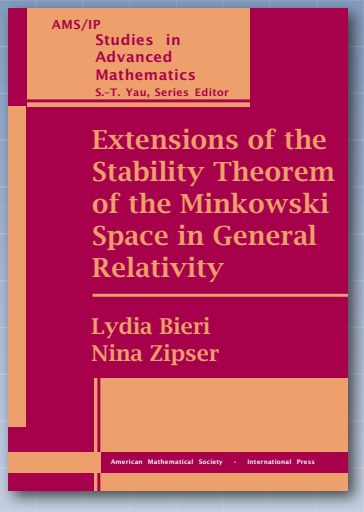

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Extensions of the Stability Theorem of the Minkowski Space in General Relativity

Lydia Bieri and **Nina Zipser**, *Harvard University, Cambridge, MA*

This book consists of two independent works: Part I is "Solutions of the Einstein Vacuum Equations", by Lydia Bieri. Part II is "Solutions of the Einstein-Maxwell Equations", by Nina Zipser.

A famous result of Christodoulou and Klainerman is the global nonlinear stability of Minkowski spacetime. In this book, Bieri and Zipser provide two extensions to this result. In the first part, Bieri solves the Cauchy problem for the Einstein vacuum equations with more general, asymptotically flat initial data, and describes precisely the asymptotic behavior. In particular, she assumes less decay in the power of r and one less derivative than in the Christodoulou–Klainerman result. She proves that in this case, too, the initial data, being globally close to the trivial data, yields a solution which is a complete spacetime, tending to the Minkowski spacetime at infinity along any geodesic. In contrast to the original situation, certain estimates in this proof are borderline in view of decay, indicating that the conditions in the main theorem on the decay at infinity on the initial data are sharp.

In the second part, Zipser proves the existence of smooth, global solutions to the Einstein–Maxwell equations. A nontrivial solution of these equations is a curved spacetime with an electromagnetic field. To prove the existence of solutions to the Einstein–Maxwell equations, Zipser follows the argument and methodology introduced by Christodoulou and Klainerman. To generalize the original results, she needs to contend with the additional curvature terms that arise due to the presence of the electromagnetic field F; in her case the Ricci curvature of the spacetime is not identically zero but rather represented by a quadratic in the components of F. In particular the Ricci curvature is a constant multiple of the stress-energy tensor for F. Furthermore, the traceless part of the Riemann curvature tensor no longer satisfies the homogeneous Bianchi equations but rather inhomogeneous equations including components of the spacetime Ricci curvature. Therefore, the second part of this book focuses primarily on the derivation of estimates for the new terms that arise due to the presence of the electromagnetic field.

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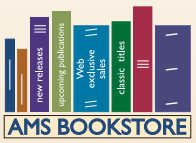

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