Abstract Submitted
for the APR05 Meeting of
The American Physical Society

Kepler's Law in Relativistic Field Theories CHRISTOPHER BEETLE, KONSTANTIN YAKUNIN, Florida Atlantic University — An important current problem in gravitational physics is that of modeling the orbits of binary systems. Among such systems, those comprising a pair of black holes are particularly important due to the relative strength of the gravitational radiation they produce. As a result, many clever techniques are being invented to generate initial data sets for general relativity describing binary black holes. However, it may not be entirely clear which of these data sets are physical. In Newtonian theory, Kepler's law ties together the basic orbital parameters — the masses, separation and velocities of the two objects — by demanding dynamical stability of the orbit itself. However, a similar analysis in general relativity would be considerably more subtle. This presentation investigates how one might derive a modified version of Kepler's law which applies to binary black hole systems in full, non-linear general relativity. This investigation is conducted using a much- simplified toy model, and possible pitfalls in extending its results to general relativity will be discussed.

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Date submitted: 20 Jan 2005

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