A comparison of magnetic flux tube and cosmic string behavior in Kerr metric

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Cosmic strings are topological defects which were generated at a transition phase of the very early Universe and are probably responsible for large-scale structure forming. However, they may pull through all history and exist in recent epoch. Thus they can have influence for the recent Universe interacting with different objects. We consider the cosmic string behavior in the vicinity of a spinning black hole by means of numerical simulation. Here we present our preliminary results of this work via a comparison of cosmic string and test magnetic flux tube behavior in the Kerr metric. Such an approach follows from the similarity of the equations which describe these objects. Therefore some aspects of this behavior may be comparable.

It turns out, that the cosmic string behavior at an early stage copies the flux tube movement in some degree. Involved in differential rotation, the central part of the cosmic string starts to lose energy and angular momentum by means of string braking. Stretching and twisting around the event horizon, the central part of the string gains negative energy in the ergosphere. To compensate this losses, positive energy is subsequently generated and apparently can be extracted from the ergosphere as in the flux tube case. Because of an increase of the numerical error near the event horizon, our code breaks down and we can observe only initial stages of negative energy creation. In comparison with cosmic string further simulation of flux tube

behavior clearly demonstrates energy extraction processes which are attended by relativistic jet forming. Consequently, within the frame of direct analogy, we consider our result as the very beginning of cosmic string jet formation in Kerr geometry.