General Relativity and Quantum Cosmology

Gravitational field of twisted Baby Skyrmion strings and loops

Eugen Simanek

(Submitted on 28 Jan 2010)

We consider the gravitational field of infinite straight and stationary twisted Baby Skyrmion cosmic string. Using the approximate solution of Einstein equations, it is shown that the internal phase rotation (twist) along the string axis is responsible for a long-range gravitational acceleration resembling that of massive cylindrical shell. We also study the stability and gravitational field of circular loops. When the loop radius becomes comparable with the string width, the rigidity energy tends to stabilize small loops against radial collapse. The nucleon scale-toroidal knot with Hopf charge Q=1 is found to decay very rapidly on the scale of the age of the universe due to low energy cost to flux lines crossings. Such knot is therefore excluded from the dark matter scenario of Spergel and Steinhardt. However, the Q = 0 loop, stabilized by rigidity, could be a candidate for this scenario. In contrast, the electroweak strings are prevented from intercommuting due to much larger energy cost to intersection. This makes them a possible candidate for the solid dark matter scenario of Bucher and Spergel.

Comments:	18 pages
Subjects:	**General Relativity and Quantum Cosmology (gr-qc)**
Cite as:	**arXiv:1001.5061v1 [gr-qc]**

Submission history

From: Eugen Simanek [view email]
[v1] Thu, 28 Jan 2010 20:49:55 GMT (15kb)

Which authors of this paper are endorsers?