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Bubble bag end: a bubbly resolution of curvature singularity. (English) Zbl 1476.83015  

Summary: We construct a family of smooth charged bubbling solitons in $M^4 \times T^2$, four-dimensional Minkowski with a two-torus. The solitons are characterized by a degeneration pattern of the torus along a line in $M^4$ defining a chain of topological cycles. They live in the same parameter regime as non-BPS non-extremal four-dimensional black holes, and are ultracompact with sizes ranging from microscopic to macroscopic scales. The six-dimensional framework can be embedded in type IIB supergravity where the solitons are identified with geometric transitions of non-BPS D1-D5-KKm bound states. Interestingly, the geometries admit a minimal surface that smoothly opens up to a bubbly end of space. Away from the solitons, the solutions are indistinguishable from a new class of singular geometries. By taking a limit of large number of bubbles, the soliton geometries can be matched arbitrarily close to the singular spacetimes. This provides the first classical resolution of a curvature singularity beyond the framework of supersymmetry and supergravity by blowing up topological cycles wrapped by fluxes at the vicinity of the singularity.

MSC:

83C15 Exact solutions to problems in general relativity and gravitational theory  
83E50 Supergravity  
83C75 Space-time singularities, cosmic censorship, etc.  
35Q51 Soliton equations

Keywords:  
black holes in string theory; black holes; classical theories of gravity; spacetime singularities

Full Text: DOI arXiv

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