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Thin shell model for Majumdar Papapetrou spacetimes

N. I. Dilini* and N. A. S. N. Wimaladharma

Department of Mathematics, Faculty of Science,
University of Kelaniya, Sri Lanka
Email: imeshadilini20@gmail.com

Einstein – Maxwell field equations are nonlinear partial differential equations which are difficult to solve. Therefore different assumptions are needed to solve them. Also it is very hard to find properties of the matter distributions with black holes.

An exact solution to Einstein-Maxwell filed equations describing gravitational fields of the extremely charged thin spherical shells has been found in a Majumdar Papapetrou spacetime. The boundary conditions are applied considering the facts that the metric must be continuous across the shell and the absence of matter in the thin shell and outside of the shell.

The metric for the exterior vacuum region of the thin shell is in the same form of conventional Extreme Reissner Nordstorm (ERN) metric which describes the exterior region of a black hole. Therefore, by replacing the black hole by a thin shell so that the centre of the thin shell is on the point of existence of black hole, the singularities of ERN metric can be removed in a Majumdar Papapetrou spacetime. This process has been generalized for N-ERN black holes with any finite number of black holes in Majumdar-Papapetrou spacetimes.

In the case of two ERN black holes, the matter densities of each shell which were located on the points of singularities have been calculated. Two spherical shells with different radii and center locations are considered.

Calculating the redshift of a light pulse emitted at a point on the interior flat region of the thin shell as observed by an observer at infinity, it is shown that the solution is physically acceptable.

Keywords: Black holes, Extreme *Reissner Nordstram* metric, *Majumdar-Papapetrou* spacetimes