Tachyonic Scalar fields and Black hole geometry

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Scalar Fields have been of considerable interest in Physics. Mathematically, a scalar field associates a scalar quantity to each point in space (space-time). In the context of black hole physics, scalar fields are a subject of interest for some particular reasons. The Black hole No Hair Theorem, first proposed by Wheeler, states that black holes are completely characterized by only three conserved quantities namely, mass, angular momentum and charge. All other matter fields present in the black hole space-time should vanish inside the black hole, or be radiated off to infinity. In order to verify the validity of this theorem completely and to understand black holes better, it is necessary to explore many different field contents. Many modified theories of gravity have a scalar field associated with them. If the presence of scalar fields modify the black hole space-times than that of General Theory of Relativity. Such deviations might be detected in astrophysical observations.

It is known that Kerr Solution is the only stationary, asymptotically flat, single black hole solution of the Einstein equations with realistic matter sources. Also, no stationary, asymptotically flat black holes exist with scalar hair for canonical scalar fields. But not much comprehensive results exist to infer the same for non canonical scalar fields.

In the present work we investigate the Black-hole space time in presence of non canonical tachyonic fields