The 2nd international conference on particle physics and astrophysics

Contribution ID : 25

Type : Plenary/section talk

Global geometry of the Vaidya metric

Tuesday, 11 October 2016 13:15 (15)

We find the exact analytical expressions for metric functions of the classical Vaidya metric in the diagonal coordinates in the case of the linear mass function. By using these coordinates, we elaborate the maximum analytic extension of the Vaidya metric with a linear growth of the black hole mass and construct the corresponding Carter-Penrose diagrams for different specific cases. The derived global geometry seemingly is valid also for a more general behavior of the black hole mass in the Vaidya metric.

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Session Classification : Nuclear physics and particle physics - parallel II

Track Classification : Nuclear physics and particle physics