On the one-way solution for Maxwell equations in the Kerr space-time with a regular component of the energy-momentum tensor

Y. V. Taistra[1,2]

[1]Pidstryhach Institute for Applied Problems of Mechanics and Mathematics NAS of Ukraine, Lviv, Ukraine

[2]Lviv Polytechnic National University, Lviv, Ukraine

vpelykh@gmail.com, ythelloworld@gmail.com

System of equations for outgoing one-way null Maxwell field in the Kerr space-time is the system of two PDE's for one complex function. It describes right or left circularly polarized outgoing waves with the frequency ω and the azimuthal number m. We consider theese equations with conditions of the ingoing character of radiation on the horizon and regularity of the normal pressure component of the energy-momentum tensor. These conditions bound frequency

$$\omega < -\frac{am}{2Mr_+}$$

and define azimuthal number $m = \pm 1$ [1]. M is a Kerr mass parameter, a is an angular momentum per unit mass, $r_+ = M + \sqrt{M^2 - a^2}$ is a Kerr black hole horizon. Geometrized units are used ($c = G = 1$).

Such a problem may be a mathematical model for consideration of Penrose process in wave approach.

1. Pelykh V. O., Taistra Y. V. On the null one-way solution to Maxwell equations in the Kerr space-time. Math. Model. Comput., 2018, Vol. 5, No. 2., pp. 201-206.