



On gauge conditions for a selfgravitating spherically symmetric charged scalar field

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Abstract. We consider complex scalar field minimally coupled to gravity and to electromagnetism. This note provides an examination of the spherically symmetric Einstein-Maxwell-Klein-Gordon system in a sufficiently general form supporting the maximal gauge freedom for metric functions and the electromagnetic potential. We study in detail gauge invariance and gauge transformations in the spherically symmetric case. Our method of reduction is based on the characteristic function, which is invariantly defined, up to sign, as the squared norm of the differential of the 'area' metric function. For static configuration, one can extract a subsystem of three equations for the characteristic function, the electromagnetic potential, and the modulus of a scalar field.

Keywords: complex scalar field, gauge invariance, Einstein equations

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