



# ON THE PRE-METRIC FORMULATION AND NONLINEARIZATION OF CHARGE-FREE ELECTRODYNAMICS

STOIL DONEV AND MARIA TASHKOVA

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**Abstract.** The purpose of this paper is to give a coordinate free pre-metric formulation of charge free electrodynamics, appropriate, in our view, for non-linearization of Maxwell equations in order to obtain pre-metric description of spatially finite electromagnetic field objects of photon-like nature. First we introduce some formal relations from multilinear algebra and differential geometry to be used further. Then we recall and appropriately modify the existing pre-metric formulation of linear charge free electrodynamics in pre-relativistic and relativistic forms as preparation to turn to corresponding pre-metric non-linearization. Then after some preliminary examples and notes on non-linearization, we motivate our view for existence and explicit formulation of time stable subsystems of the physical objects considered. Section 5 presents the formal results of our approach on the pre-metric nonlinear formulations in static case, in time-dependent case, and in space-time formulation. In the Conclusion we give our general view on “why and how to non-linearize”.

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