

# *A Sufficient Condition for Further Reduction of Unknowns in the Einstein-Maxwell Field Equations in the Case of the Characteristic [(11)11].*

S. ISAAK

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In a paper by Hlavatý (see [2]) it was shown that for the characteristic [(11)11] the number  $N$  of unknowns on which  $g_{\lambda\mu}$  depends can be reduced to 5 while the number  $C$  of Cauchy data can be reduced to 8.

The purpose of this paper is to establish a sufficient condition for further reduction such that  $N = 4$  and  $C = 6$ . The results obtained by Hlavatý in [1] and [2] will be used freely throughout this paper. We shall also adopt the same notation unless otherwise specified.

For the benefit of the reader we repeat some agreements regarding the symbolism used in the paper. The Greek indices  $\xi, \eta, \zeta, \tau$  have always the range I, II, III while any other Greek index has the range I, II, III, IV. Latin non-primed indices have the range 1, 2, 3, 4 unless stated explicitly otherwise. Primed Latin indices have the range 1, 2 and double primed Latin indices have the range 3, 4. With the exception of  $x$  and  $y$ , all indices follow the usual summation convention. Any exception to the rules mentioned above will be stated explicitly.

We consider the fields equations

$$(1) \quad \text{a) } R'_\lambda - \frac{1}{2}R\delta'_\lambda = P'_\lambda \quad \text{b) } P'_\lambda = \mu u_\lambda u' + F'_\lambda + p \delta'_\lambda$$

where  $\mu$  is the rest mass,  $u'$  the time-like unit velocity vector,  $F'_\lambda$  the momentum energy tensor of  $k_{\lambda\mu}$  and  $p$  the pressure. The tensor  $P'_\lambda$  is the momentum energy tensor of matter and electromagnetism.

For the characteristic [(11)11] the tensor  $P'_\lambda$  may be expressed in terms of eigenvectors  $P'_\lambda = \pi'_\lambda$  where  $\pi = \pi_1 \pi_2$ . The following lemma concerning the structure of the metric tensor  $g_{\lambda\mu}$  was proved in [2].