

Reduction of Unknowns in Einstein-Maxwell Field Equations

*III Appendix**

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1. Introduction. In two previous papers of the same title [1], [2] we discussed the Cauchy data for the Einstein-Maxwell equations

$$(1.1) \quad R_{\lambda}{}^{\nu} - \frac{1}{2}R\delta_{\lambda}{}^{\nu} = P_{\lambda}{}^{\nu},$$

with the *given* stress-energy tensor

$$(1.2) \quad P_{\lambda}{}^{\nu} \stackrel{\text{def}}{=} \mu u_{\lambda} u^{\nu} + F_{\lambda}{}^{\nu} + p\delta_{\lambda}{}^{\nu},$$

where $F_{\lambda}{}^{\nu}$ is the momentum energy tensor of an electromagnetic field of the first or second class (*i.e.* not a null field). (The problem of Cauchy data for a special case of the equation (1.1) concerning the third class was considered in [3].) The stress-energy tensor (1.2) appearing in (1.1) can have only the following *real* characteristics

$$(1.3) \quad [1111], [112], [(11)11], [(111)1].$$

The equation (1.1) represents 10 differential equations for 10 unknown potentials $g_{\lambda\mu}$. It was shown in [1], [2] that the number 10 can be reduced to $N \cong 6$ *scalar functions*. The following table indicates the corresponding results

Ch	N	C
[1111]	4	6
[112]	4	6
[(11)11]	5	8
[(111)1]	6	12

(1.4)†

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† The column heads Ch , N , C resp. denote the characteristic, the number of unknowns and the number of Cauchy data.