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(SUMMARIES)

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# N-P CONSTANTS

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One of the results of the asymptotic analysis of asymptotically flat space-times has been the emergence of a new class of conservation law. For a space-time which is vacuum near $\mathcal{J}^+$ there are five complex (or ten real) N-P constants. Unlike energy and momentum, these quantities remain unaltered when gravitational radiation is emitted by the source. They can be evaluated by examining $r^{-6}$ parts of the curvature. (By comparison, energy-momentum involves $r^{-3}$ parts). If the appropriate correction terms are included, they remain absolutely constant even when electromagnetic or neutrino radiation occurs. These gravitational N-P constants involve a quadratic moment combination of the general form: mass x (quadrupole moment) - (dipole moment)$^2$, where angular momentum contributions occur as imaginary parts. The N-P constants also involve linear terms which measure what appears, at each retarded time, to be the asymptotic incoming field. For a retarded field these terms arise from back-scattered radiation.

There are also three complex (i.e. six real) N-P constants definable for the asymptotic electromagnetic field (arising from $r^{-4}$ parts of the field). These are constant irrespective of gravitational, electromagnetic or even "charged neutrino" radiation. The stationary contribution is: mass x (electromagnetic dipole) - charge x (gravitational dipole); and again incoming field contributes. There are two complex N-P constants for the neutrino field (treated as a "classical" field). There are also conserved scalar quantities constructable from N-P constants (two complex quantities in the gravitational case and one in the electromagnetic case). N-P constants have not as yet proved very useful in classical relativity. Perhaps they have some significance for quantized theory.

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