References

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Appendix: explicit coordinate expressions

One of the main features of the Kozameh-Newman formalism is the use of the 4 functions $Z^{AA'} = \eth^A \eth^{A'} Z$ at some fixed $\pi_{A'}$, $\bar\pi_A$ as coordinates on $\mathcal{M}$. The 0^{th} and 1^{st} derivatives of Z are determined from $Z^{AA'}$ by $Z = \pi_{A'}\bar\pi_A Z^{AA'}$ and $Z^{A'} = \bar\pi_A Z^{AA'}$ (these follow from the homogeneity of Z) so $Z^{AA'}$ is the part of the second jet of Z as a function of $\pi_{A'}$, $\bar\pi_A$ containing only the mixed second derivatives. In flat space Z can be taken to be $Z = x^{AA'}\pi_{A'}\bar\pi_A$ where $x^{AA'}$ are affine coordinates on Minkowski space, so $Z^{AA'} = x^{AA'}$.

Note that if a quantity f has homogeneity n in $\pi_{A'}$, then $\pi_{A'}\partial^{A'}\partial^{A'_1}\ldots\partial^{A'_n} f = 0$ by homogeneity so that $\partial^{A'}\partial^{A'_1}\ldots\partial^{A'_n} f = \pi^{A'}\pi^{A'_1}\ldots\pi^{A'_n}\eth^{n+1} f$ for some quantity $\eth^{n+1} f$ of weight $-n-2$. Transfering $\Lambda = \eth^2 Z$, and $\Lambda^A = \partial^A \eth^2 Z$ to the $Z^{AA'}$ coordinate system, we find that $(*)$ becomes:

$$0 = g^{A(A'B')B} + \bar\pi^A\bar\pi^B\bar\pi_D\partial_{\underline{c}}\bar\Lambda^{(A'}g^{B')D\underline{c}} + \pi^{A'}\pi^{B'}\pi_{D'}\partial_{\underline{c}}\Lambda^{(A}g^{B)D'\underline{c}}$$

$$+\tfrac{1}{2}\pi^{A'}\pi^{B'}\bar\pi^A\bar\pi^B(\pi_{C'}\bar\pi_C\partial_{\underline{d}}\eth^2\bar\eth^2 Z + \partial_{\underline{c}}\Lambda\partial_{\underline{d}}\bar\Lambda)g^{\underline{cd}}$$

where $\underline{c}$, $\underline{d}$ are the concrete indices associated to the $Z^{AA'}$ coordinate system; $\underline{c} = CC'$ etc.. If we adjoin to this the equation $g^{A[A'B']B} = \Omega^2\epsilon^{AB}\epsilon^{A'B'}$ where Ω is the undetermined conformal factor, one can solve for g^{ab} provided $(\pi^{A'}\bar\pi^A\partial_{AA'}\Lambda$ $\pi^{A'}\bar\pi^A\partial_{AA'}\bar\Lambda) \neq 1$.