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New Conformally Flat Initial Data for Spinning Black Holes

YOSEF ZLOCHOWER, CARLOS LOUSTO, HIROYUKI NAKANO, MANUELA CAMPANELLI, BRUNO MUNDIM, Rochester Institute of Technology — We study conformally-flat initial data for an arbitrary number of spinning black holes with exact analytic solutions to the momentum constraints that combine the classical Bowen-York solution with the conformal Kerr extrinsic curvature by taking a weighted average of the Kerr and Bowen-York extrinsic curvatures, and varying the weight. We find that the curvature leading to the largest intrinsic spin, i.e. $\alpha = S/M_{\text{ADM}}^2$, is neither the Kerr nor the Bowen-York extrinsic curvatures, but lies in between the two. We obtain a maximum intrinsic spin of $\alpha_{\text{max}} = 0.9324$. We present formulas for this new extrinsic curvature in a way that is as straightforward to code in a numerical initial data solver as the Bowen-York extrinsic curvature.

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