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Geometrization conditions for perfect fluids, scalar fields, and electromagnetic fields[1] CHARLES TORRE, DIONISIOS KRONGOS, Utah State Univ — The classical Rainich conditions are a system of geometric conditions, expressed purely in terms of the spacetime metric, which are necessary and sufficient for the metric to define a solution to the Einstein-Maxwell equations with a non-null electromagnetic field. We obtain analogous "geometrization" conditions for other matter sources. Specifically, we find geometric conditions which are necessary and sufficient for a metric to define a solution to the Einstein equations with a perfect fluid source, and to define a solution to the Einstein-scalar field equations. These conditions work in any dimension, allow for a cosmological constant, and allow for an arbitrary self-interaction potential in the scalar field case. We also generalize the classical Rainich conditions to include a cosmological constant and we obtain geometrization conditions which are applicable to the case of null electromagnetic fields.

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