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Electric and magnetic Weyl tensors in higher dimensions

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The splitting of the Weyl tensor into its electric and magnetic parts relative to an observer is considered in higher dimensions, and purely electric (PE) or magnetic (PM) spacetimes are studied. Several results previously known in four dimensions are generalized, and new features of higher dimensions discussed. For example, we show that the only permitted Weyl types are G, I_i and D, and provide other invariant conditions that characterize PE/PM metrics. In particular, we present conditions under which direct (or warped) products are PE/PM, and discuss various classes of PE spacetimes. PM solutions, however, prove to be more elusive: for instance, PM Einstein spacetimes of type D do not exist. Nevertheless, some examples of PM spacetimes in higher dimensions are also provided. Corresponding results for the electric/magnetic parts of the Riemann tensor will be briefly mentioned.