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Critical Phenomena in the Gravitational Collapse of Electromagnetic Waves THOMAS BAUMGARTE, Bowdoin College, Brunswick, Maine, USA, CARSTEN GUNDLACH, University of Southampton, UK, DAVID HILDITCH, Instituto Superior Tecnico, Lisbon, Portugal — Critical phenomena in the collapse of vacuum gravitational waves remain mysterious even 25 years after they were first reported. This case differs qualitatively from other, better understood examples of critical collapse in that the critical solution cannot be spherically symmetric. I will report on critical phenomena in the gravitational collapse of electromagnetic waves, which also do not allow spherically symmetric solutions. Fine-tuning numerical evolution calculations to the black-hole threshold we find both approximate power-law scaling as well as a critical solution with approximately discrete self-similarity, but neither the power-law scaling nor the self-similarity are exact. The absence of an exactly discrete self-similarity might be caused by the interplay of electromagnetic and gravitational wave degrees of freedom, or the presence of higher-order angular multipoles. I will also discuss implications of these findings for the critical collapse of vacuum gravitational waves.

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