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Magnetic Modes of Gravitational Collapse

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The observation of supermassive black holes (SMBHs) of mass over a billion solar masses within the first billion years after the Big Bang challenges standard models of the growth of massive objects. Direct collapse black holes arising from a short-lived supermassive star phase have been proposed as a means to form the SMBHs in the required time. In this work we show that a weak cosmological magnetic field may be sufficient to allow direct collapse into very massive objects, overcoming the normal barrier of angular momentum. A dynamo action in the accretion phase emphasizes the effect of the magnetic field. I also review generally the four distinct modes of gravitational collapse with magnetic fields: strong field/strong coupling, weak field/strong coupling (emphasized here), strong field/weak coupling, and weak field/weak coupling.

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