



Canadian Association
of Physicists

Association canadienne
des physiciens et physiciennes

Contribution ID: 144

Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

Magnetic Modes of Gravitational Collapse

Monday, 7 June 2021 15:57 (3 minutes)

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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Session Classification: M3-4 Black Holes (DTP) / Trous noirs (DPT)

Track Classification: Theoretical Physics / Physique théorique (DTP-DPT)