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Helical magnetic fields from inflation and their evolution.

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I discuss the generation of helical magnetic fields in single field inflation induced by an axial coupling of the electromagnetic field to the inflaton. In slow roll, such a coupling always leads to a blue spectrum, $P_B \sim k$, while a short deviation does not result in strong modifications to the shape of the spectrum. Then I consider the subsequent evolution of the spectrum during the inverse cascade and viscous damping of the helical magnetic fields. Although power is moved from small to larger scales, the magnetic fields in this scenario are too weak to provide the seeds for the observed fields in galaxies and clusters; except for low scale inflation with very strong axial coupling, a case where the perturbative treatment of the theory may break down. If time permits, I discuss possible ways of amplification of primordial seed magnetic fields at late times through an axial coupling of electromagnetism to a dark energy scalar field.

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