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Relaxing the limits on inflationary magnetogenesis

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Inflation has long been thought as the best way of producing large-scale primordial magnetic fields. To achieve fields strong enough to seed the galactic dynamo, most of the generation mechanisms operate outside conventional electromagnetic theory, which is typically restored after the end of the de Sitter phase. Breaking away from standard electromagnetism can lead to substantially stronger magnetic fields at the end of inflation and thus compensate for their subsequent adiabatic depletion. We argue that the drastic magnetic enhancements during the de Sitter era may not be necessary. In particular, we use causality arguments to claim that, contrary to the common belief, superhorizon-sized magnetic fields are not necessarily frozen into the matter after inflation. On these super-Hubble scales the magnetic decay can slow down considerably, and thus make it much easier to produce primordial fields of astrophysical interest today.

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