Constraints on the production of artificial gravitational fields

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There is a clear public interest in the artificial generation of gravitational fields, with supposed applications extending to reactionless or superluminal propulsion technologies. Despite this enthusiasm, the paradigms of modern physics are expected to impose severe constraints on such technologies. The public understanding of these constraints appears to be very limited, establishing the case for a clear commentary on the topic. In this whitepaper we offer a narrow perspective – from within the physics community – on the outlook for artificial gravity.

Public interest **—** The

General relativity **—**

Viability of recent patents **—**

Gertsenshtein done properly **—** We will use a convention where the initial and final states run left to right. Obviously there is no vertex that allows direct conversion, since the photon and graviton have different spins. The first vertex which exists is  , not only because of the spins but also because there is certainly a Maxwell stress-energy tensor on Minkowski spacetime. However the existence of a centre of momentum frame precludes this vertex from becoming a diagram. At next-to-leading order away from the Minkowski background, there is probably a so-called 'seagull' vertex  , and this can be a diagram. However it is not clear that the Gertsenshtein effect can be interpreted as a massless two-to-two scattering process when you read [1], because the process strictly relies on the presence of a uniform magnetic field in the background. In case an electric field in the background is not allowed, then we will have a problem: the external legs of the seagull must be asymptotic states, and there is no frame in which either of these states looks purely magnetic. The magnetic field must come from somewhere: most likely it is sourced by an electron current. This is the point where we begin to suspect that the Gertsenshtein effect is

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Modified gravity **—**

[1] A. Palessandro and T. Rothman, A simple derivation of the Gertsenshtein effect, Phys. Dark Univ. **40**, 101187 (2023), arXiv:2301.02072 [gr-qc].