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Low-frequency magnetic noise in terrestrial GW detectors: the case study of AdV+ Faraday isolator

The coupling of environmental magnetic fields is a limiting factor for the lowfrequency sensitivity of future ground-based interferometers. Coupling can occur at various locations, such as actuation magnets of the mirror and optical benches isolation systems. Eddy currents in conductive parts can locally warp magnetic fields and enhance magnetic forces. A major goal for future detectors is to reduce magnetic fields and coupling with specific interferometer components. A characteristic example is the optical Faraday isolators, which are used to block reflected light beams by means of a magneto-optic crystal immersed in an intense static magnetic field. We present the study of a passive magnetic shield for the F I of the suspended detection bench of the AdV+ phase II detector. We illustrate the design optimization process and highlight critical points we faced and solved. We propose a procedure to measure the displacement of the bench due to an injected magnetic field coupling to the Faraday isolator.

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