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**Quantitative examination of out-of-phase mixed holographic gratings**[1] KAY-MICHAEL VOIT, HAUKE BRUENING, MIRCO IMLAU, Department of Physics, University of Osnabrueck, Osnabrueck, Germany — Modern holographic applications require advanced photosensitive materials that particularly obey alterations of the complex permittivity with pronounced amplitudes of both real and imaginary parts on the sub-ps-time scale. Promising candidates such as amorphous and crystalline materials remarkably show a mutual phase-shift between phase and absorption gratings that complicates the analysis of the underlying wave-coupling mechanisms. Hence, theoretical descriptions that are simply based on Kogelnik's coupled-wave theory can not be applied, i.e., a formal approach to systematically derive the full parameter space of the gratings from diffraction efficiency measurements is missing in literature. We revised the analysis of the wave-coupling theory omitting former approximations or applying them later. As a result we derived a formal description for mixed gratings allowing for a full description of beam-coupling experiments. Both the modulations of the refractive index and the absorption coefficient as well as the phase shift between these gratings can be determined through measurements of the angular dependent diffraction efficiency around the positive and the negative Bragg angle. Our approach and results are demonstrated along a mixed grating with a most common parameter set.

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