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Variation of Losses with Detuning in Bragg Gratings SERGIY MOKHOV, DERREK DRACHENBERG, GEORGE VENUS, BORIS ZELDOVICH, LEONID GLEBOV, CREOL, The College of Optics and Photonics, UCF — The optical losses due to small scattering and absorption in Bragg gratings are proportional to the loss coefficient, and also depend on the integral of optical power over grating length. At different resonant conditions this integral of stored optical power inside a grating differs from the product of power by length for transmitted beams far from resonance. We have found an analytical expression for the relative value of this integral in the case of a uniform grating. If it equals unity for a beam propagating out of resonance, then for a grating in Bragg resonance with reflectance of 99% it equals 0.332 due to exponential decay of reflected and transmitted power inside the grating and grows up to 2.027 near the first zero of the reflection spectrum due to increased resonant capacity of the grating similar to a Fabry-Perot resonator. Also, we have found analytically that in the case of spatially modulated grating losses with Bragg period the odd-functional term will be present in the expression for relative losses in addition to the term for averaged losses. We have measured this variation of losses in volume Bragg grating at a small incidence angle, and in this case can resolve the incident and reflected beams and precisely measure the power balance in the experimental setup, and the results show good agreement with theory.

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