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Optical Resonant Cavities in Volume Bragg Gratings SERGIY MOKHOV, LEONID GLEBOV, JULIEN LUMEAU, CREOL, The College of Optics and Photonics, UCF, VADIM SMIRNOV, OptiGrate Corp., Orlando, FL, BORIS ZELDOVICH, CREOL, The College of Optics and Photonics, UCF — We propose narrow-band filter in volume Bragg grating (VBG) with bandwidth less than ten picometers. Two recorded Bragg gratings with the same modulation amplitudes and slightly different resonant wavelengths form moiré pattern with average carrier spatial frequency and slowly varying envelope of modulation amplitude. Each semi-period of modulation is just apodized reflective VBG; however two of them together form narrow-band transmission Fabry-Perot cavity due to phase π-shift as result of sign change of slowly varying envelope. We fabricated first moiré VBG filter in photo-thermo-refractive glass with resonance wavelength near 1550 nm, aperture size 5 mm, bandwidth 50 pm and 95% maximum transmittance. We considered also case when carrier Bragg grating wave vector does not coincide with moiré pattern wave vector which allows creating filters with tunable one-period envelope profile from sinusoidal function to cosinusoidal one. Doubled resonant cavity with cosinusoidal profile demonstrates flattop transmission peak. Analytical expression for tunable bandwidth was found. Robust solid-state moiré VBG filters tolerant to high-power laser irradiation with tunable filtering characteristics are suggested as optical elements for laser design and spectroscopy applications.

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