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Single Crystal Si Passive Optical Components for *mm*-Astronomy
ARI BROWN, Goddard Space Flight Center, JAMES CHERVENAK, DAVID CHUSS, EDWARD WOLLACK, ROSS HENRY, S. HARVEY MOSELEY — Construction of ultrasensitive, cryogenic-focal-planes for *mm*-radiation detection requires simultaneous maximization of detector quantum efficiency and minimization of stray light effects, e.g., optical "ghosting". To achieve this task in the focal plane detector arrays of the Atacama Cosmology Telescope, integration of two technologies are envisioned; (1) an antireflective (AR) coating for reducing ghosting from the reflected component and increasing absorption at the focal plane, and (2) a backside absorber for suppressing reflections of the transmitted component. We propose a novel approach, involving single crystal Si components, to fabricate AR coatings and backside absorbers. AR coatings are made from Si dielectric honeycombs, in which their dielectric constant may be tuned via honeycomb dimension and wall thickness. Backside absorbers consist of AR Si honeycomb coated-resistors, and the resistors consist of P-implanted Si wafers. This approach enables us to circumvent the mechanical complexities arising from thermal expansion effects, because the detector array, back-short, and AR coating are fabricated out of the same material. We also extend the functionality of single crystal Si in the field of *mm*-radiation detection by fabricating curved, low-loss, broadband waveguides. These waveguides may enable compact structures for applications requiring variable pathlength, e.g., interferometric spectroscopy.

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