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A broadband reflective filter for applying dc biases to high-Q superconducting microwave cavities[1] YU HAO, FRANCISCO ROUXINOL, MATT LAHAYE, Syracuse Univ — The integration of dc-bias circuitry into low-loss microwave cavities is an important technical issue for topics in many fields that include research with qubit- and cavity-coupled mechanical system, circuit QED and quantum dynamics of nonlinear systems. The applied potentials or currents serve a variety of functions such as maintaining the operating state of device or establishing tunable electrostatic interactions between devices (for example, in order to couple a nanomechanical resonator to a superconducting qubit to generate and detect quantum states of a mechanical resonator). Here we report a bias-circuit design that utilizes a broadband reflective filter to connect to a high-Q superconducting coplanar waveguide (CPW) cavity. Our design allows us to apply dc-voltages to the center trace of CPW, with negligible changes in loaded quality factors of the fundamental mode. Simulations and measurements of the filter demonstrate insertion loss greater than 20 dB in the range of 3 to 10 GHz. Transmission measurements of the voltage-biased CPW show that loaded quality factors exceeding 10^5 can be achieved for dc-voltages as high as V= $\pm$ 20V for the cavity operated in the single photon regime.

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