

Micromachining planar millimeter-wave cavity structures by using deep x-ray lithography

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A feasibility study of micromachining planar millimeter-wave cavity structures by using DXL (deep x-ray lithography) has been performed at the APS. The planar mm-wave cavity structure can be used for linear accelerators, free-electron lasers, and mm-wave undulators. A complete cavity structure consists of two planar half structures combined with spacers in between to have gaps for vacuum pumping. Investigations have been made on the construction and alignment of the 2-D processed structure while satisfying requirements for radio frequency (RF) and electron beam, such as reliable RF coupling, easy cavity frequency tuning, low beam impedance, and efficient cooling at high RF power dissipation. Designs of various input/output structures and couplers have been computer simulated and properties for $2\pi/3$ -mode 94 GHz operation have been compared.