

HTS Josephson Junction Cantilever Microscopy of Microwave Devices

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Abstract—Josephson junctions from the high-temperature superconductor $\text{YBa}_2\text{Cu}_3\text{O}_7$ are routinely used on a cantilever to detect spatially resolved microwave emission from room temperature microwave devices. The Josephson junctions are operated in a temperature range between 40 K to 80 K cooled by a cryo-cooler. Near field imaging is accomplished with operating distances of the cooled Josephson cantilever to the surface of the device under test down to 15 μm . Due to the realization as an active cantilever, a topographic image of the device under test as well as the microwave power distribution can be obtained. We discuss measurements of the three-dimensional radiation distribution above the chip surface under investigation at frequencies ranging from 14 to 762 GHz. We demonstrate characterization of passive microwave devices by measurements of an edge coupled filter, a branch-line coupler and an oversized waveguide.

Index Terms—Josephson junctions, Josephson radiation detectors, Microscopy, Microwave circuits

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