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## Modelling the coherent THz radiation from $Bi_2Sr_2CaCu_2O_{8+\delta}$ mesas of various geometries RICHARD KLEMM, University of Central Florida

Mesa structures of the high-temperature superconductor  $Bi_2Sr_2CaCu_2O_{8+\delta}$  have been prepared in a variety of ways. Groove mesas have so far been made in rectangular, square, circular, triangular, and pentagonal shapes. There are distinct differences in the properties of the radiation that depend strongly on the type and shape of the mesas. Two types of experiments have provided information regarding the mechanism of the coherent radiation: Angular distribution studies and frequency spectrum measurements. In analyzing the angular distribution measurements, we used the Love equivalence principles to model the radiation as arising from two effective sources: the uniform *ac* Josephson current source, and the radiation from the excitation of an EM cavity mode, and modelled the substrate by a simple image model. We generally found the fractions of the output from these two sources to be comparable in magnitude, implying that the quality factor Q of the EM cavity is very low, allowing for a high degree of output frequency tunability. The largest tunability observed to date from the outer current-voltage characteristic branch was found for an acute isosceles triangular mesa shape. In several geometries, radiation was observed at frequencies far from EM cavity mode frequencies.