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Josephson junctions and arrays fabricated via nanolithography and ion damage SHANE CYBART, JOHN CLARKE, ROBERT DYNES, University of California Berkeley, KE CHEN, YI CUI, QI LI, XIAOXING XI, Penn State University — In the years to come, the size and cost of cryo-coolers will get smaller and the demand for a VLSI Josephson junction technology will increase. One possible candidate to fill this need is the "ion-damage" Josephson junction. These junctions are fabricated by using ion bombardment to create localized narrow regions of defects in the plane of a thin film of superconductor. These regions have a superconducting transition temperature lower than that of the bulk film and act as hysteretic Josephson junctions. The advantage of these junctions over other technologies is that they have no interfaces between different materials, and can be placed over 10 times closer to each other in comparison to competing techniques. Individual junctions and series arrays were fabricated from YBCO and magnesium diboride. Junction current-voltage characteristics near the critical temperature follow the resistively shunted junction model however at lower temperatures the barrier becomes strongly coupled and flux flow behavior is evident. Series arrays of up to 20 junctions have been fabricated with sufficient parameter uniformity to achieve giant Shapiro steps under microwave radiation.

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