OPTIMIZATION OF GRID FINGER DESIGN AND FABRICATION FOR III-V BASED SOLAR CELLS. ***M. Kassis.****S. Hubbard, R. Raffaelle*, Nanopower Research Laboratories, msk6556@rit.edu, smhsps@rit.edu, rprsps@rit.edu.*

With the ever increasing desire to reduce the dependency on fossil fuels, an emerging solution is to harvest and convert solar energy into electricity. One attractive technique is using III-V based solar cells due their direct bandgap, wide spectral absorption and high efficiencies. When designing solar cell grid contacts there is a tradeoff between light shadowing and grid finger resistance that can be balanced to yield the optimal performance. For a given design technology, deviations from the optimal grid finger size, resulting from fabrication non-uniformities, can reduce the power output of the device. In the interest of having accurate and reproducible grid finger widths, the photolithographic process used to pattern the surface of solar cell structures was optimized. The grid finger design was patterned in a stack consisting of two layers of non-photoactive lift-off resist (LOR) followed by a single layer of photoactive resist. Optimization of the photolithographic process consisted of characterizing the LOR bake temperature, as well as the exposure dose and development time of the photoactive resist. The wafers were prepared by spin coating the LOR and varying the bake temperature while keeping a constant bake time. Samples were developed at various times and thickness measurements were taken using contact profilometry. To find optimum exposure dose, wafers were coated with Shipley 1813 and exposed at various times while keeping the irradiance constant. A calibration of the Karl Suss 55 Contact Aligner was performed to achieve uniform contact across the wafer. This, coupled with the aforementioned studies, produced uniform grid finger line widths across the surface of the wafer. Results of this work have reduced the overall shadowing of the cell's grid fingers by over 12 %. The effect of this optimization on a fabricated GaAs solar cell's efficiency and fill factor will be presented.