

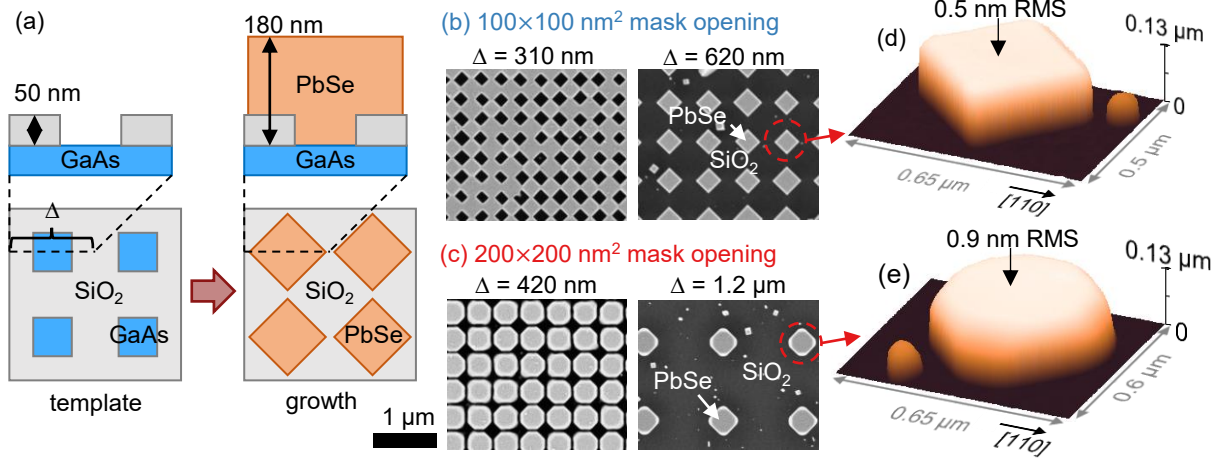


Figure 1. (a) Schematic of (top) cross-section and (bottom) planview of mask template design and subsequent PbSe selective area growth (SAG) on a patterned SiO₂ template on GaAs. (b-c) Planview scanning electron microscope (SEM) images show growth morphology of (b) 100 nm and (c) 200 nm wide squares spaced periodically by specified lengths, Δ , after 180 nm of PbSe growth at 365°C on (001) nGaAs and (d,e) their respective atomic force microscopy scans, showing sub-1nm root-mean-square (RMS) roughnesses.

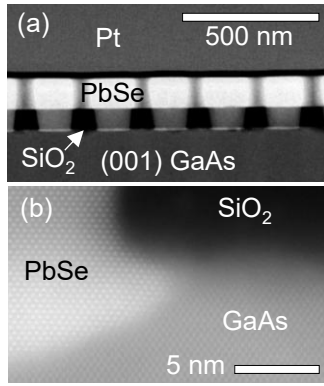


Figure 2. (a) Cross-sectional high angle annular dark field scanning transmission electron microscopy showing growth of single-crystalline islands with embedded SiO₂ after 180 nm PbSe SAG at 365°C and the (b) growth/oxide interface.

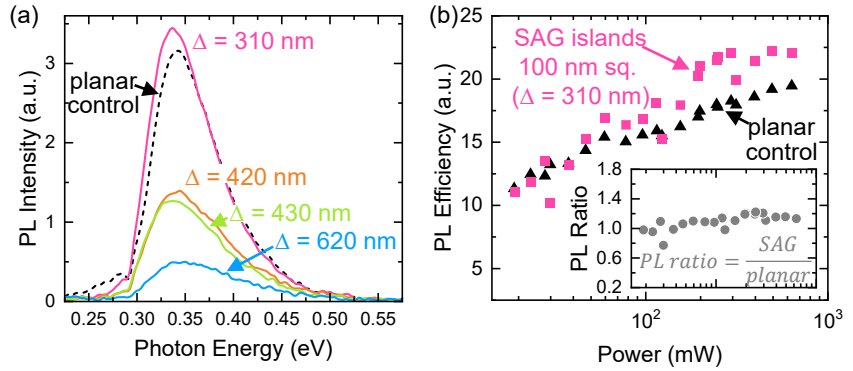


Figure 3. (a) Room temperature photoluminescence (PL) spectra of 100 nm square arrays, spaced periodically by pitch Δ showing no degradation in optical quality. Decreasing pitch results in a higher PL signal due to increased PbSe island density. (b) Graph of PL efficiency with respect to excitation power for the highest density 100 nm SAG array compared to planar film. Inset graph shows PL ratio versus incident laser power and its constant slope indicates no significant changes in nonradiative pathways.

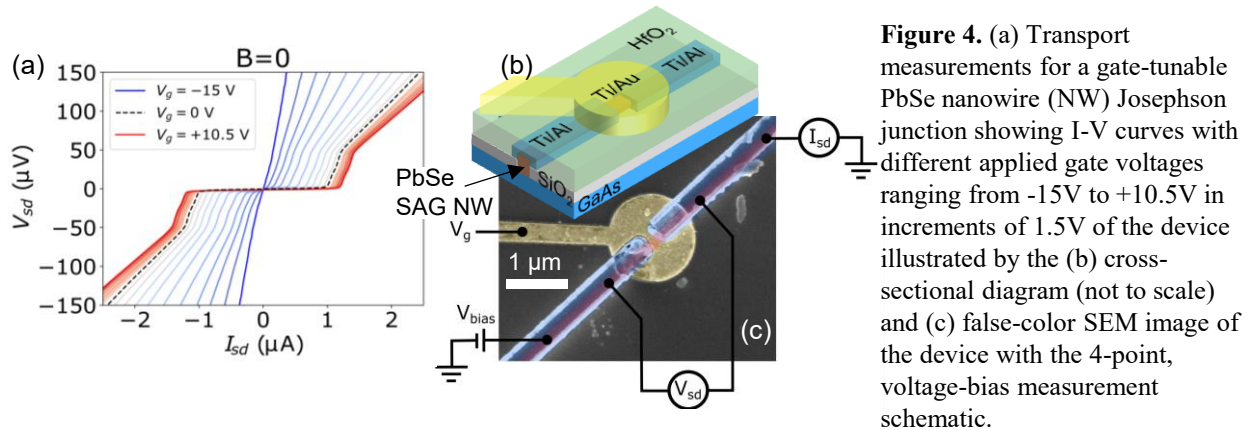


Figure 4. (a) Transport measurements for a gate-tunable PbSe nanowire (NW) Josephson junction showing I-V curves with different applied gate voltages ranging from -15V to +10.5V in increments of 1.5V of the device illustrated by the (b) cross-sectional diagram (not to scale) and (c) false-color SEM image of the device with the 4-point, voltage-bias measurement schematic.