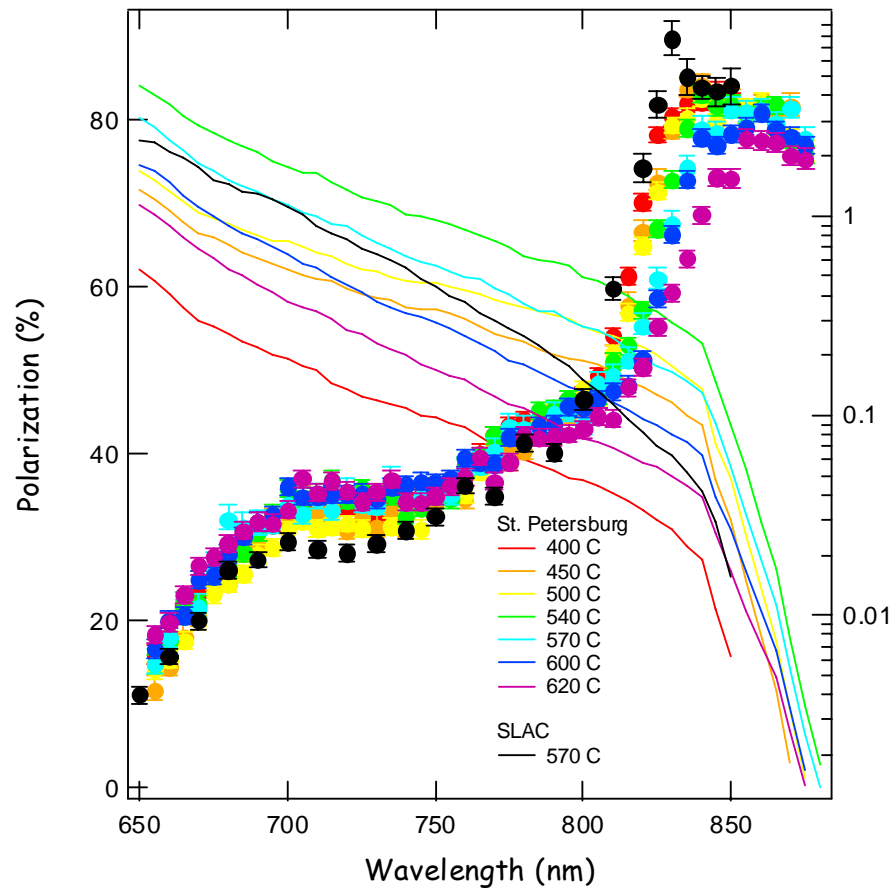


Photocathode R&D

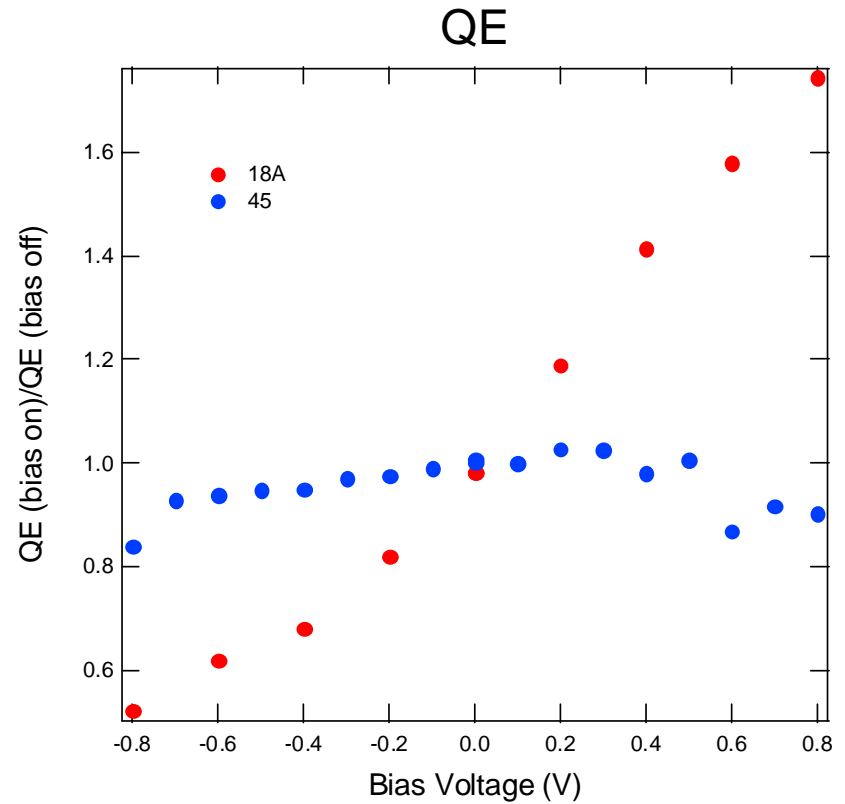
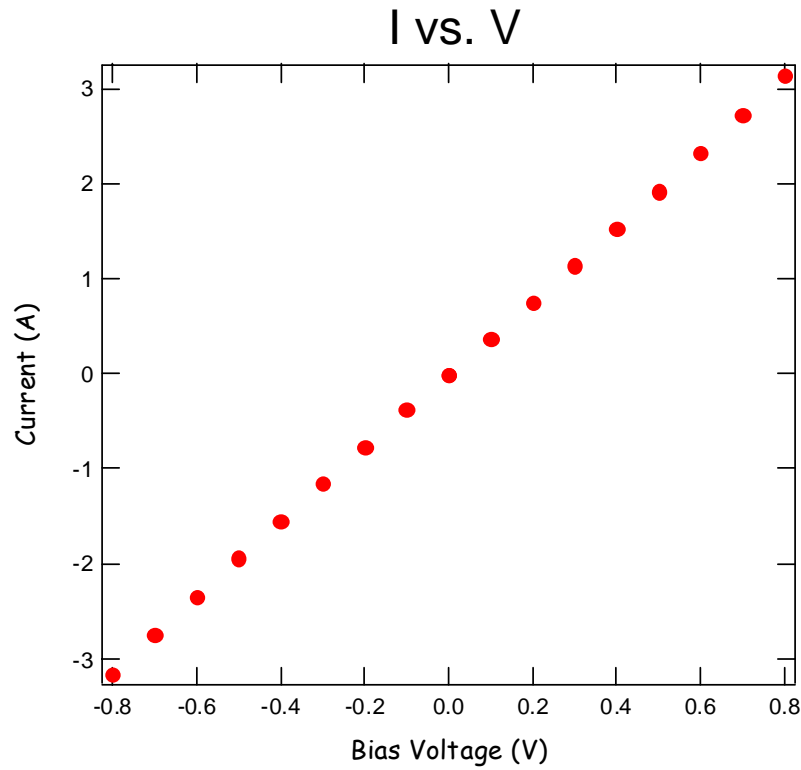
- InAlGaAs-GaAs strained-superlattice
 - St. Petersburg observed 92% polarization.
 - SLAC/Wisconsin ordered three wafers from SVT to duplicate the structure.
 - CTS measurements were completed with 85% peak polarization.
 - Sent two SVT samples to St. Petersburg for cross-check.
 - St. Petersburg does not have solvents to clean samples.
 - Samples cleaned at SLAC, double bagged in N₂ gas, FedExed to France, and hand-carried to St. Petersburg.
 - Measurements were made ~6 months later.
- Saxet SBIR
 - Saxet can deposit thick (~1 um) tungsten lines.
 - >> We now have a better understanding of how to grow the *****thick***** tungsten films so that they do not buckle due to compressive strain (thin films < 60 nm or so don't show this effect). It is quite dramatic and pretty to see under the microscope (though undesirable). Essentially the proper pressure/power settings have to be found in parameter space to move just past compressive strain to zero strain or slightly tensile strain. We expect to have the first samples out by early week after next since we still need to grow solid films for conductivity characterization and perform activation tests here.
 - First bulk GaAs sample measured
- New Grower

St. Petersburg measurements



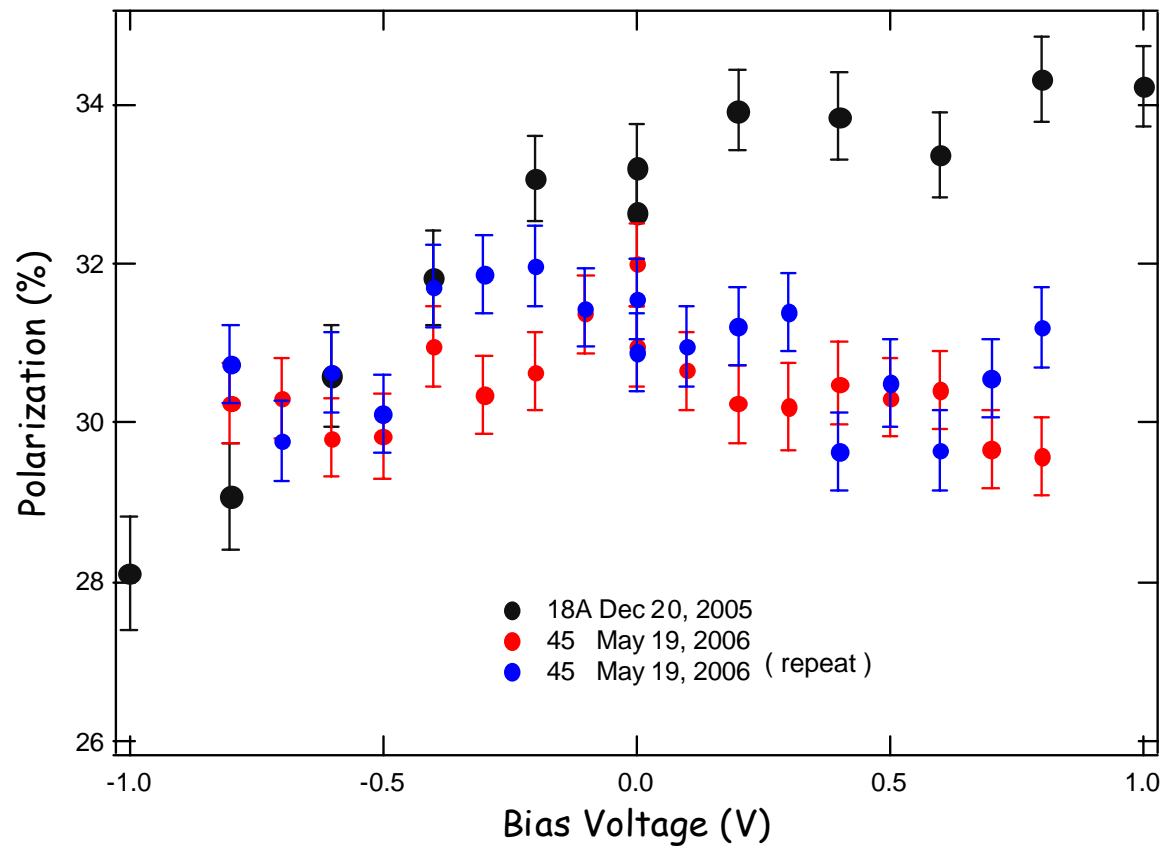
- Peak QE at 540 C – cathode can be activated ~6 months after cleaning.
- Peak polarization 83% - consistent with CTS measurement.
- As the heat-cleaning temperature is raised, the peak polarization decreases and shifts to longer wavelength.

SAXET SBIR



Over all resistance is 0.25Ω ;
1/4 of previous thinner grids/lines.

Polarization vs. bias voltage



- Polarization is constant within ~1%.

New Grower

- SVT has been our key grower in the last five years. However, SVT's capability seems to be breaking down. It took ~6 months to deliver InAlGaAs/GaAs wafers. It has not delivered SBIR Phase I wafers after ~8 months.
- Started looking for an alternate grower.
- Possible growers
 - Bandwidth Semiconductor
 - IQE
 - MBE – Saxet wafers are grown.
 - MOCVD – decline to quote for GaAsP/GaAs superlattice
 - Multiplex Inc
 - MOCVD – decline to quote for GaAsP/GaAs superlattice
 - Canadian Photonic Fabrication Centre
 - MOCVD – an order has been placed to grow InGaP/GaAs superlattice (SVT SBIR Phase I structure)

Photocathode wafers are very different from industry standards.

Very skeptical about lattice-mismatched layer growth.

Short-period superlattice growth is not trivial.

Phosphorus requires MOCVD or gas-source MBE.