Characterization of AlGaAs/GaAs based QWIPs

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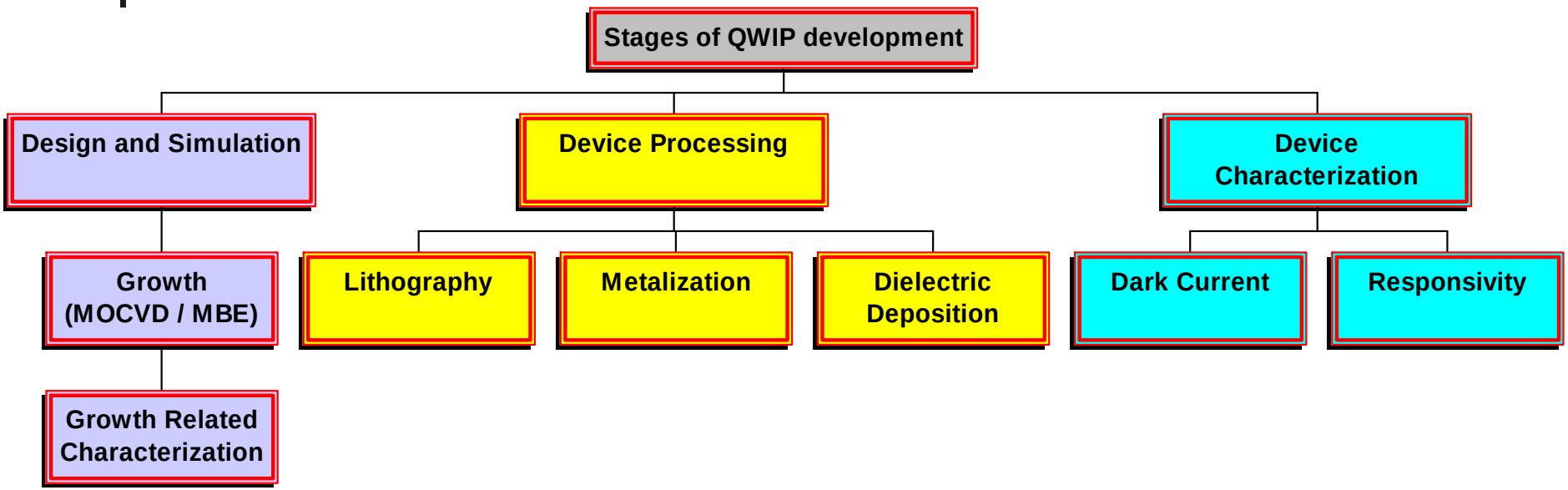
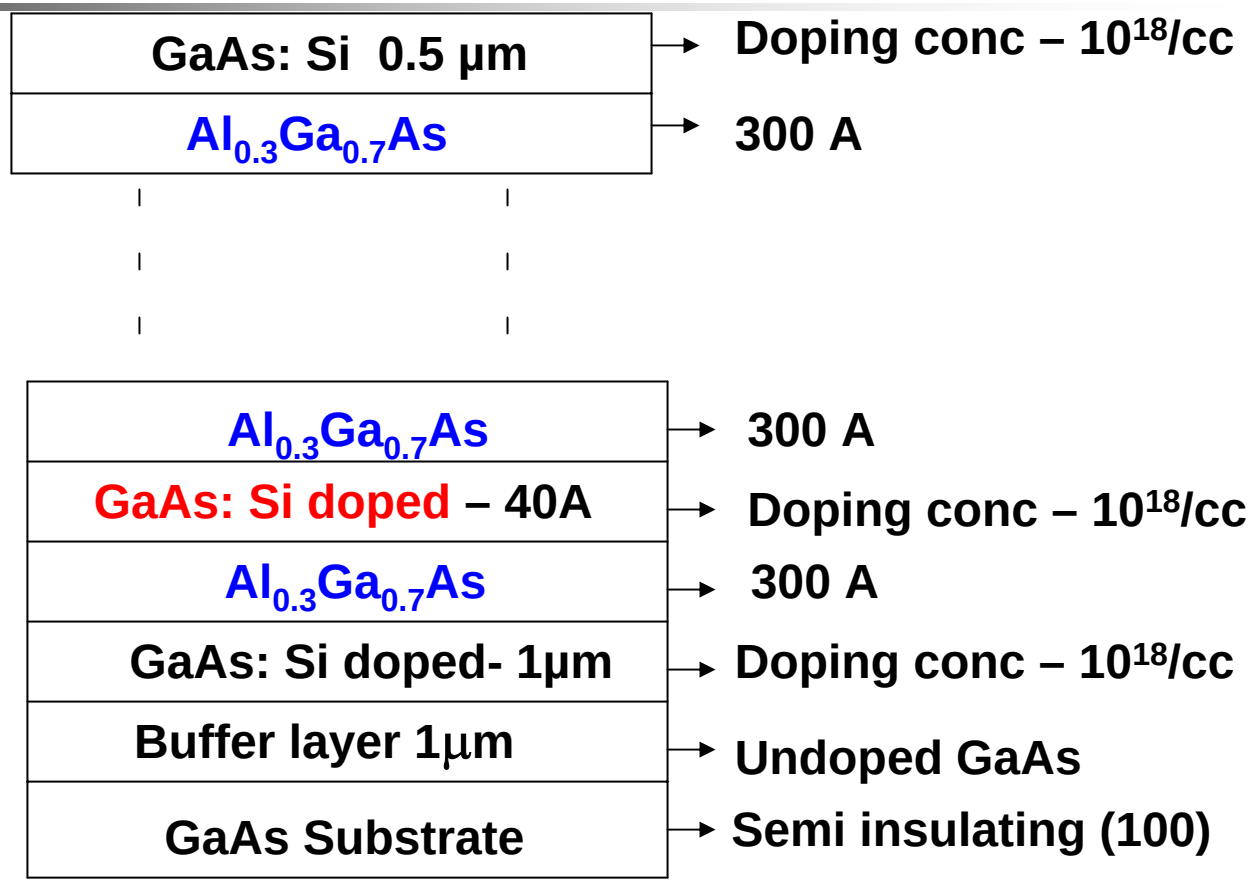
Outline

- **Short introduction**
- **Our activity**
- **Characterization**

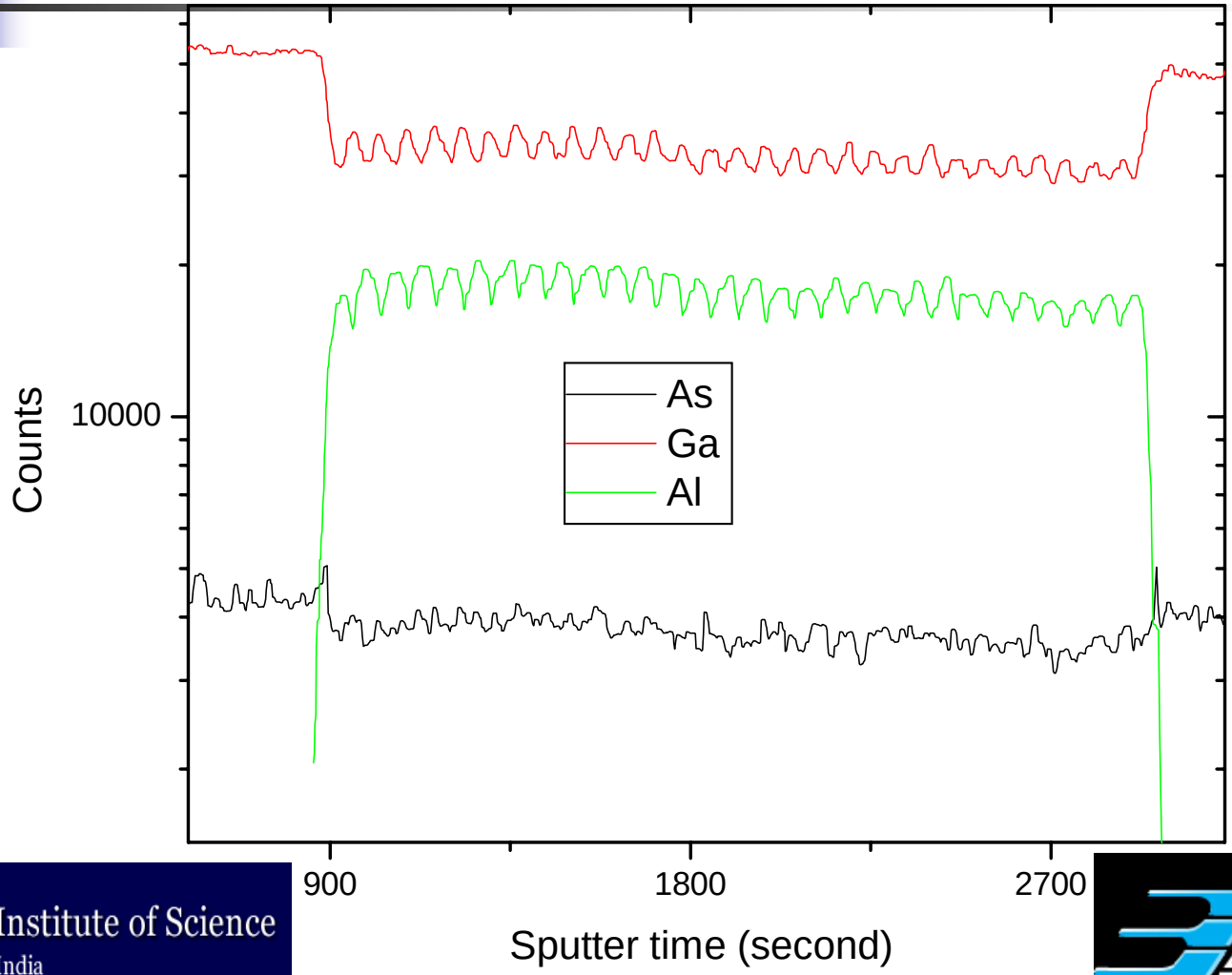
Our Activity



Structure of the MQW (28 - wells)



SIMS Profile of GaAs/AlGaAs QWIP Structure (28 Periods)



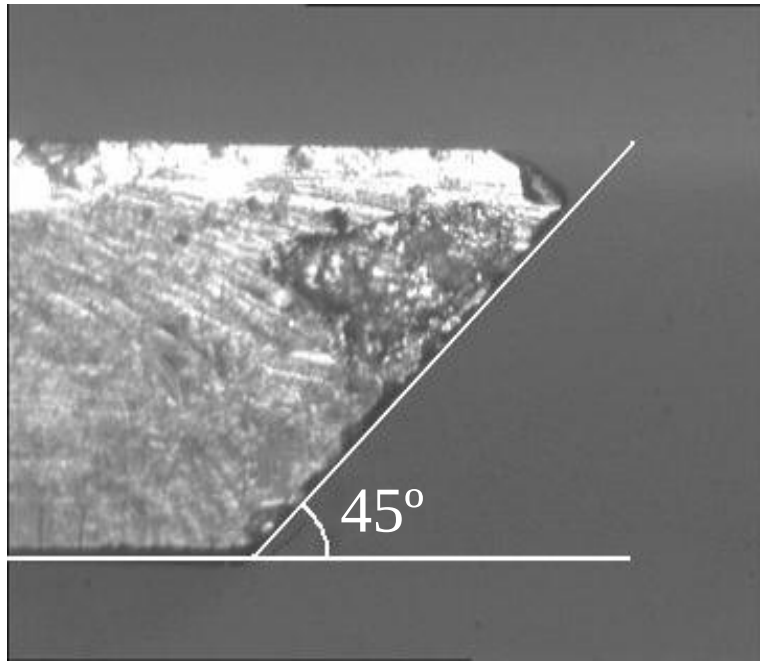
Device processing and Characterization:

- OPTICAL MICROSCOPE
- SEM
- AFM & DEKTAK

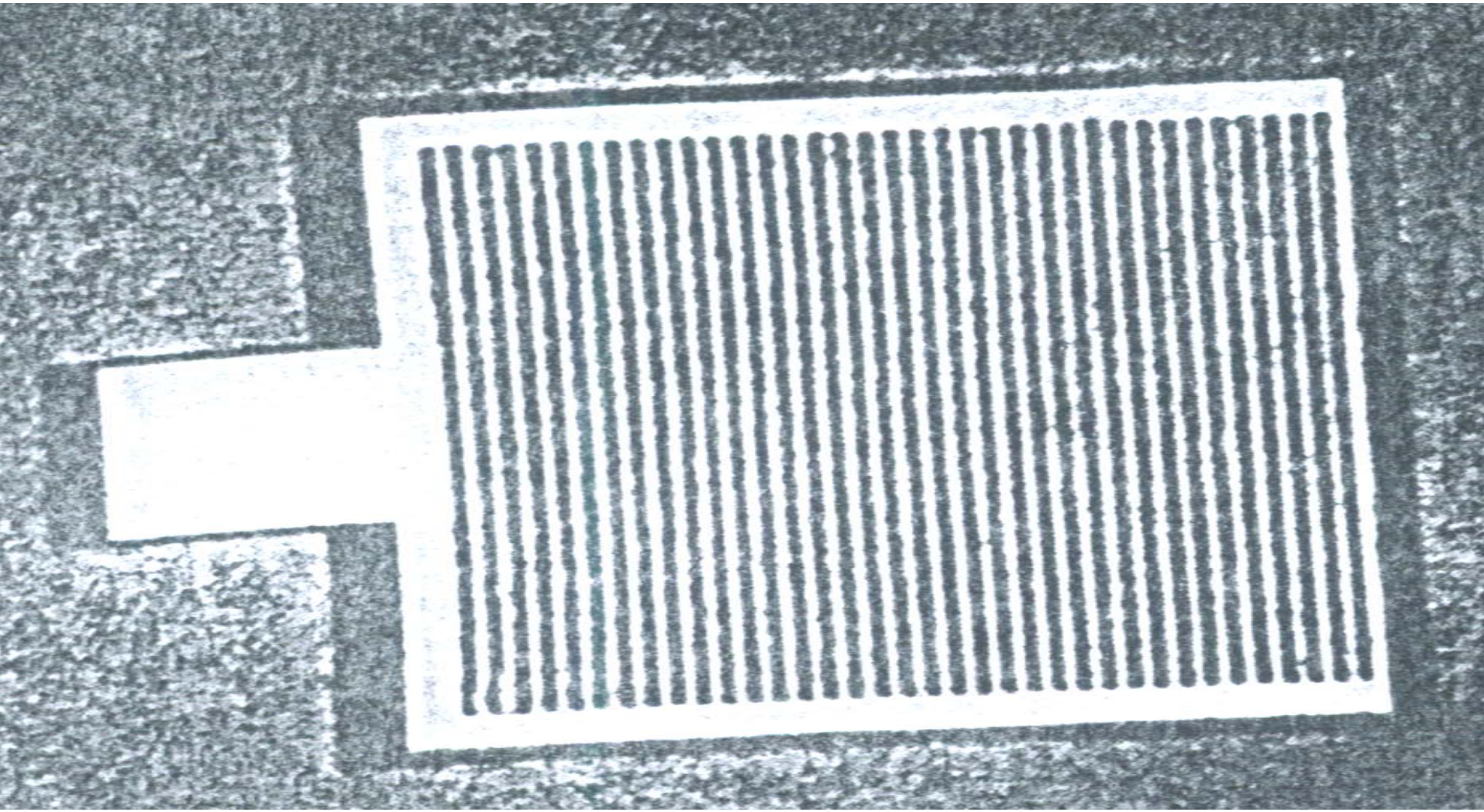
45° EDGE FACET
NORMAL INCIDENCE GRATINGS
C-QWIP

45° Edge Polishing

Al_2O_3 powder ~ 5 - 0.3 µm

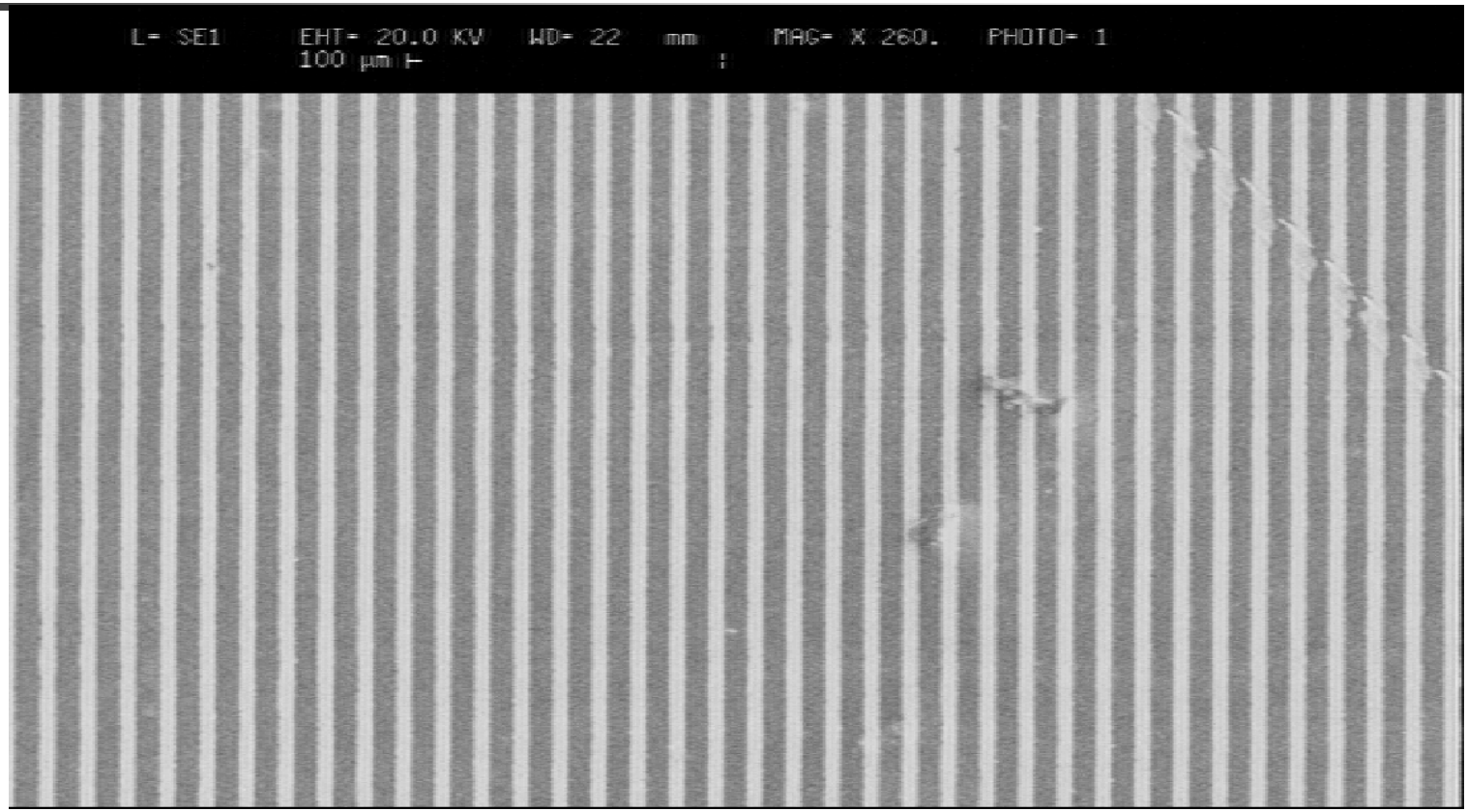


METAL GRATING COUPLER

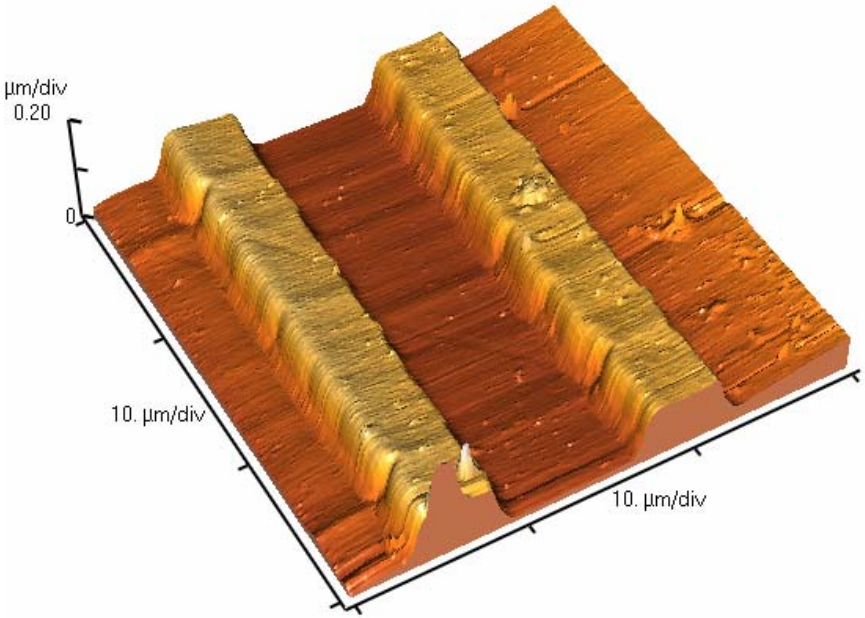


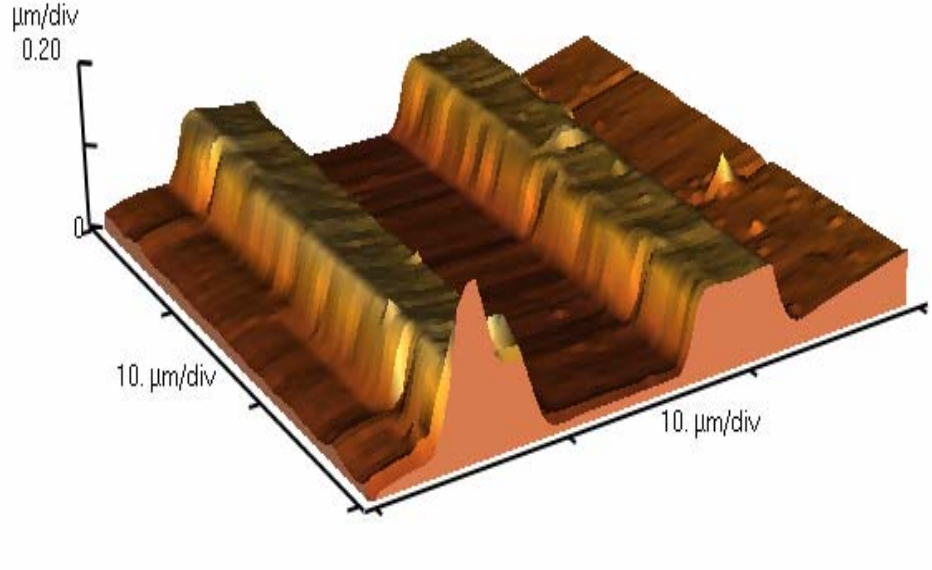
Under-cut profile of S1813 photoresist after image reversal used for lift-off

Front grid pattern *(Lift-Off Lithography)*

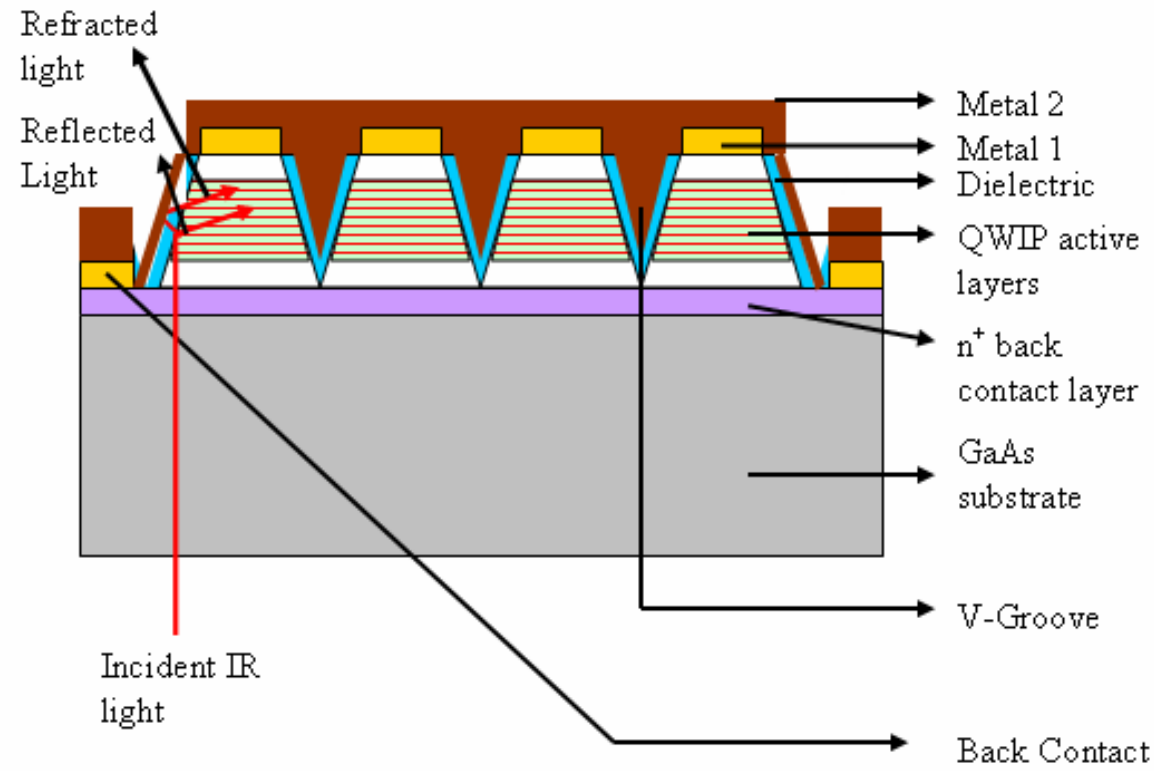


AFM surface topography study: 3D view of two fingers

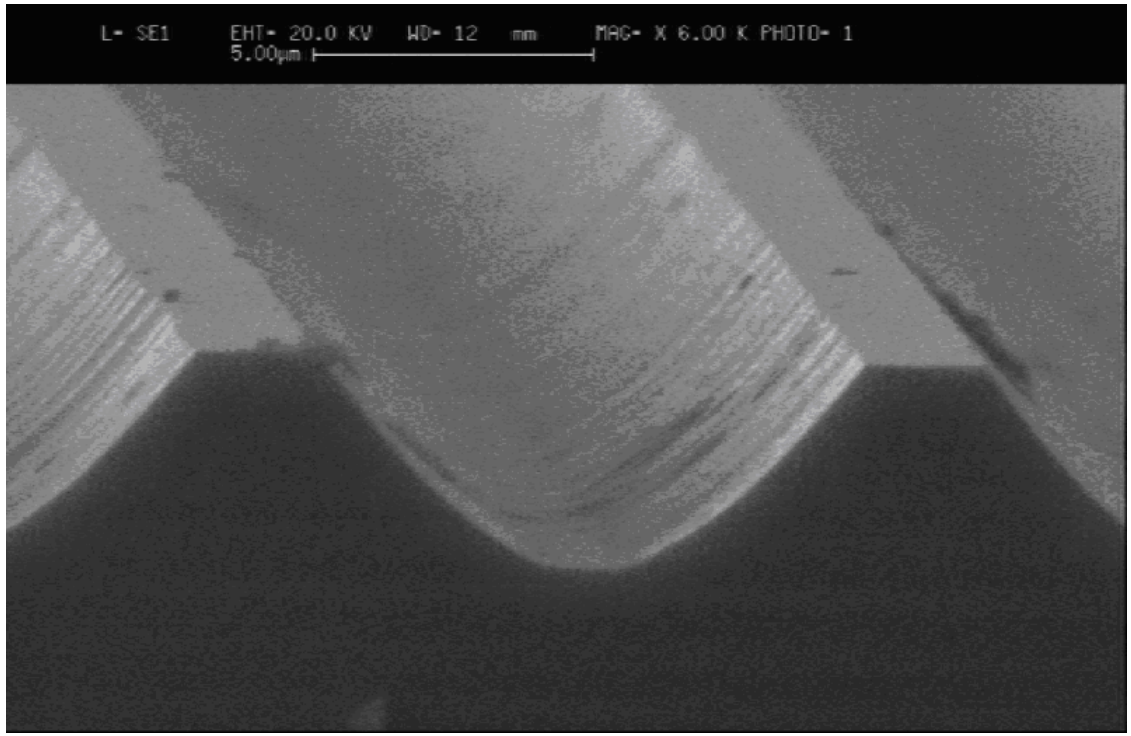




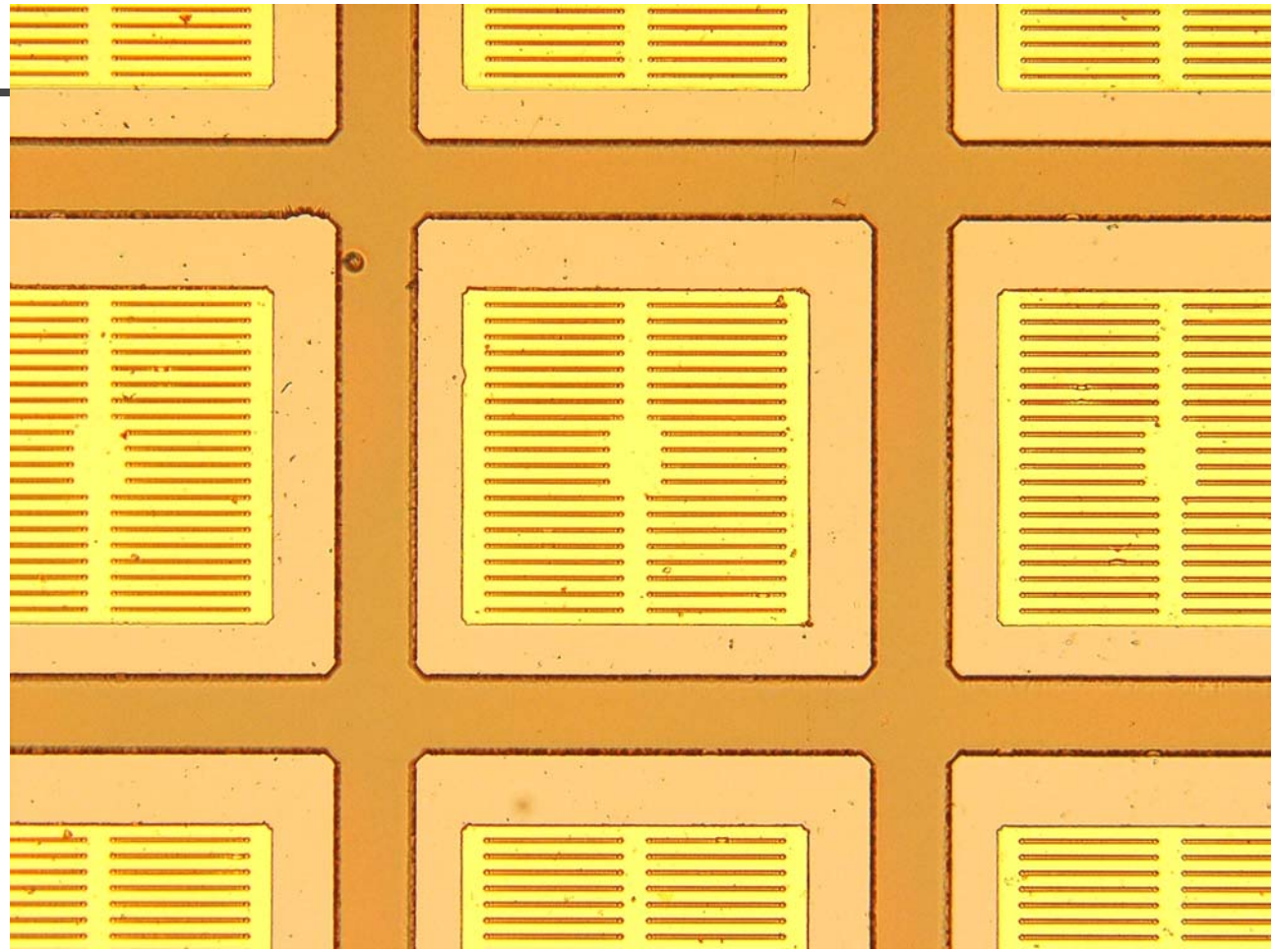
Cross-sectional View of the C-QWIP



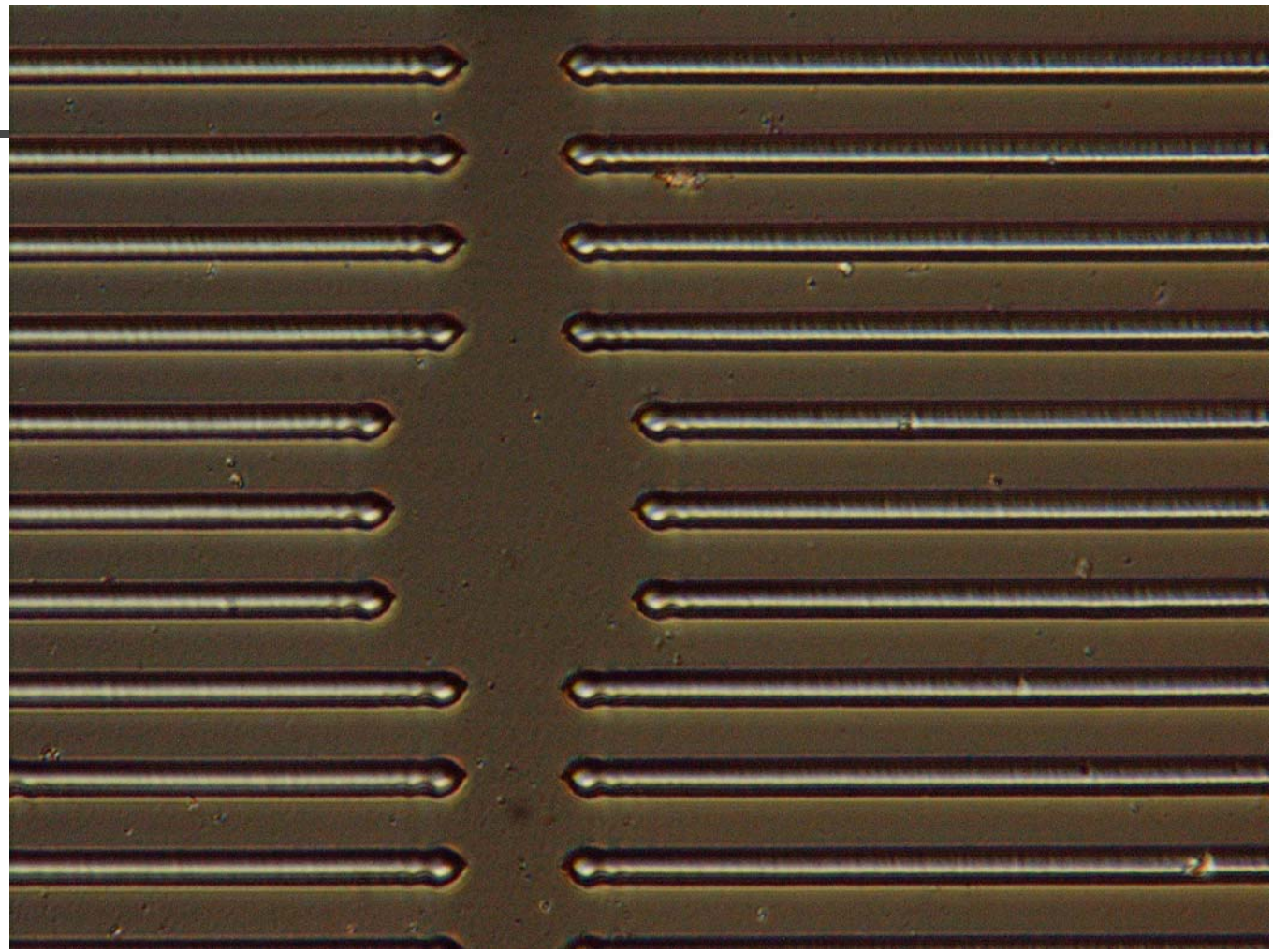
C-QWIP angle determination from SEM



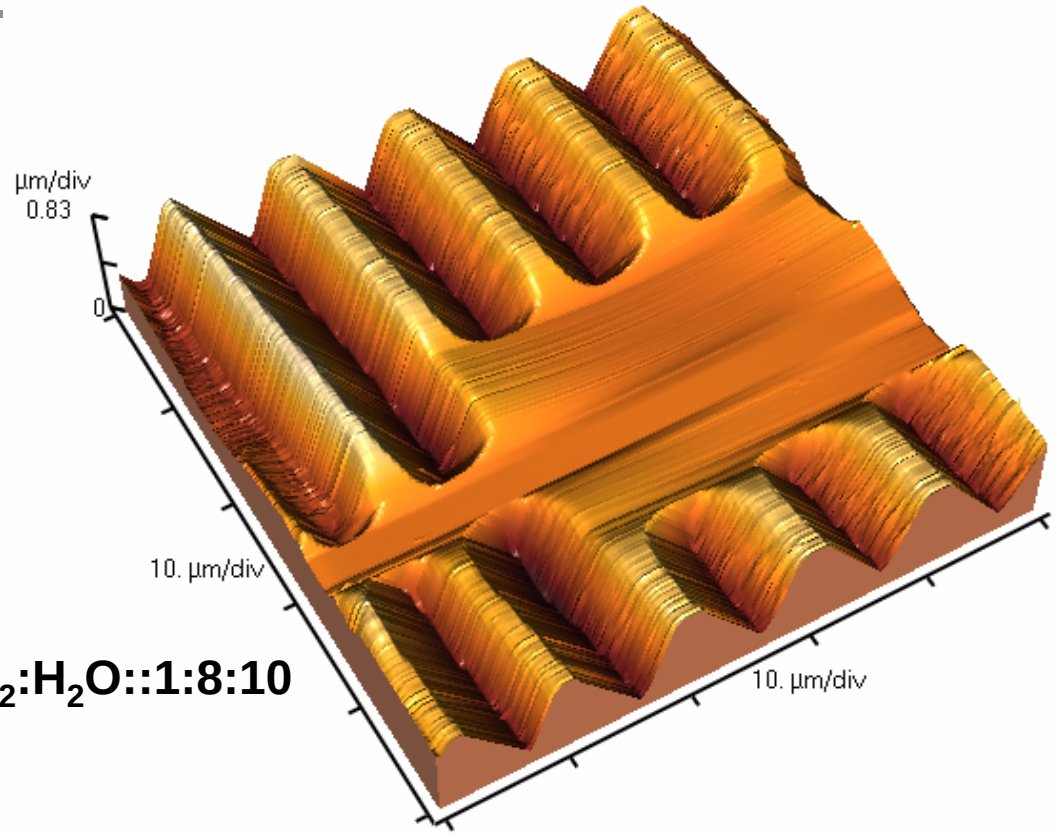
Bright field optical microscope view of the section of the fabricated C-QWIP array (100X)



Dark Field Optical Microscope image of C-QWIP (500X)



AFM Micrograph of the V- groove structure (C-QWIP)

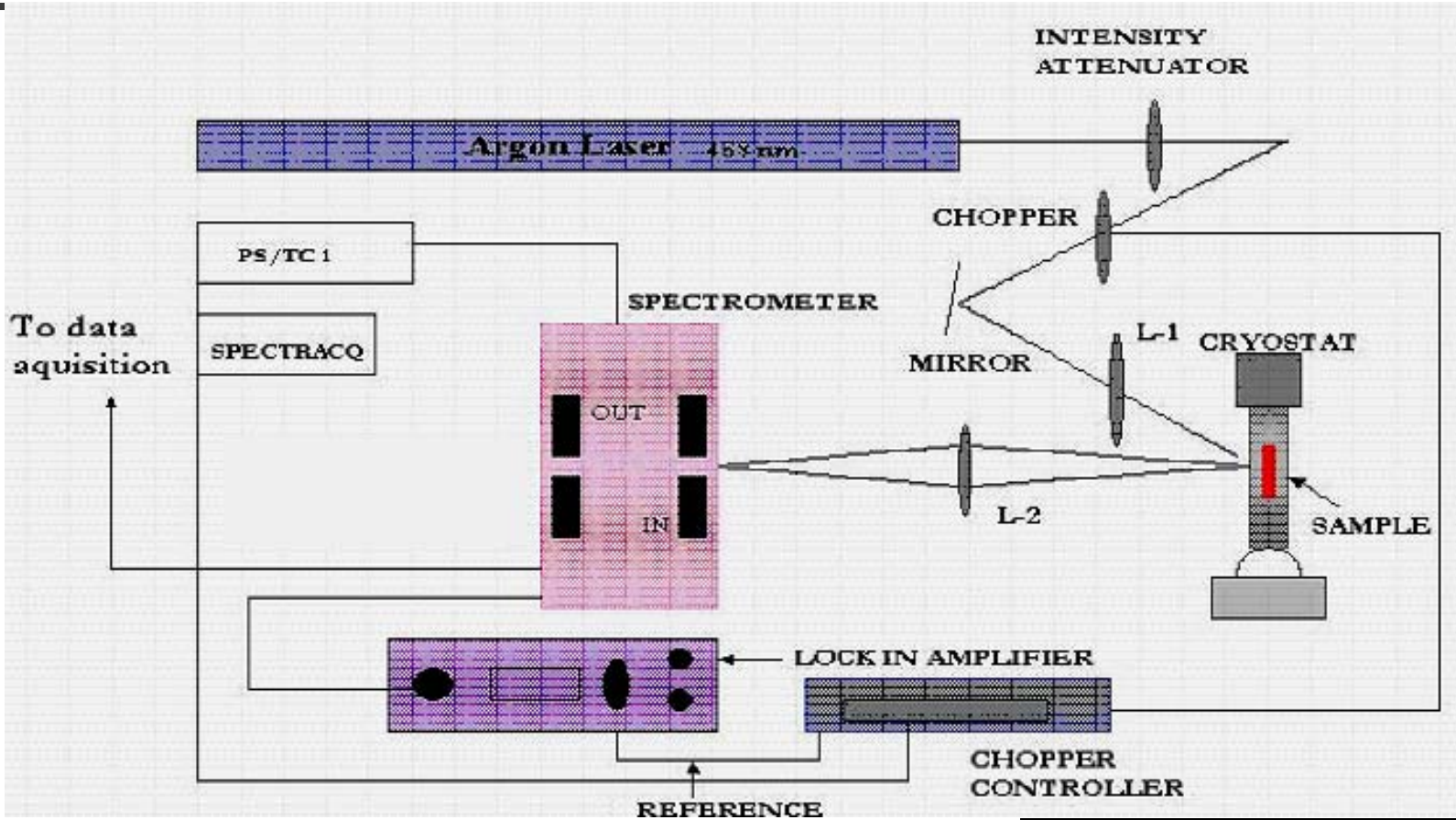


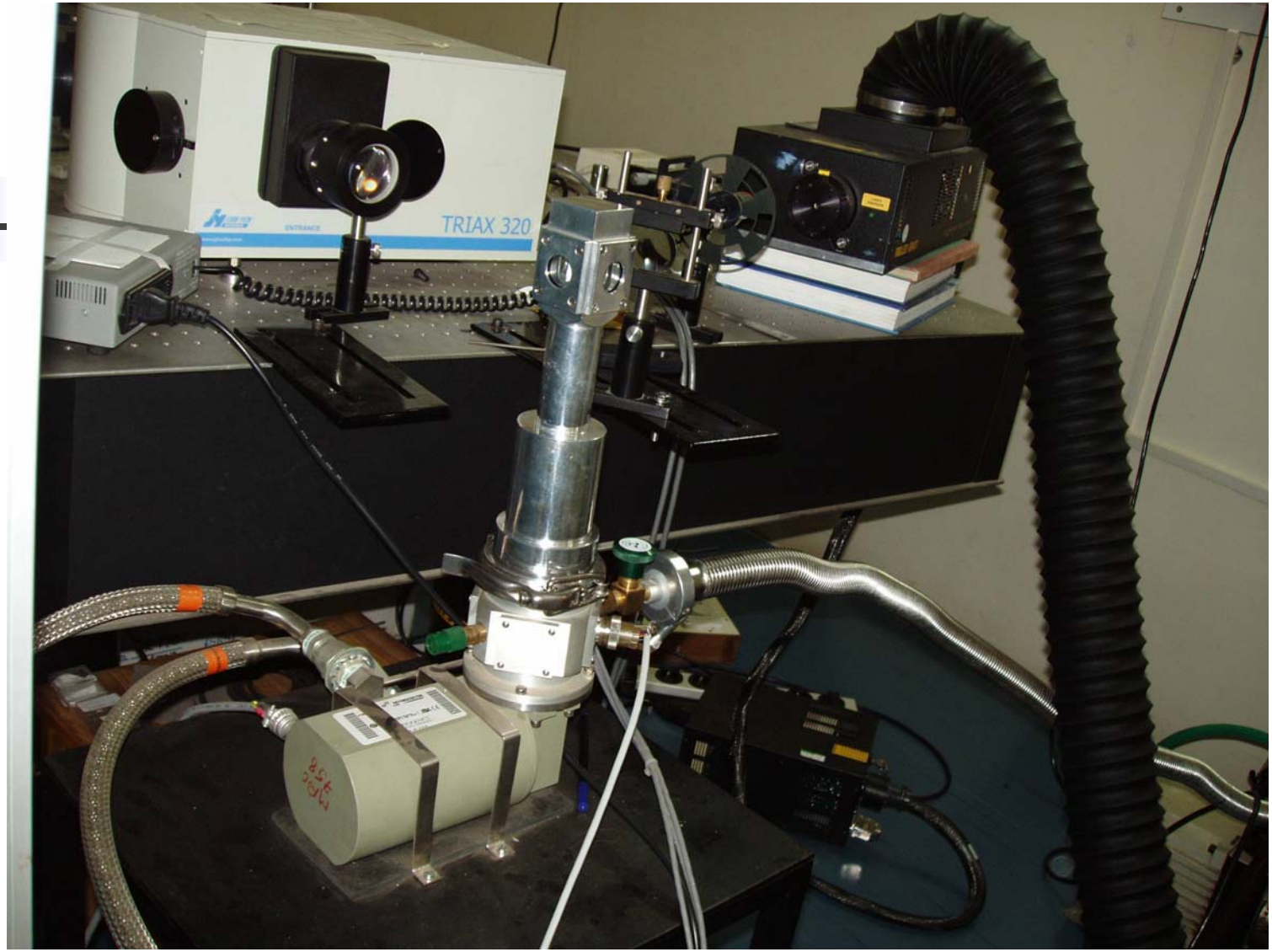
Periodicity : 10 µm
Etching solution : H_2SO_4:H_2O_2:H_2O::1:8:10
Etching time: 20 sec

Device characterization

- Dark current measurement
- Illuminated current measurement
- Spectral Response measurement

Optical Characterization Set-Up





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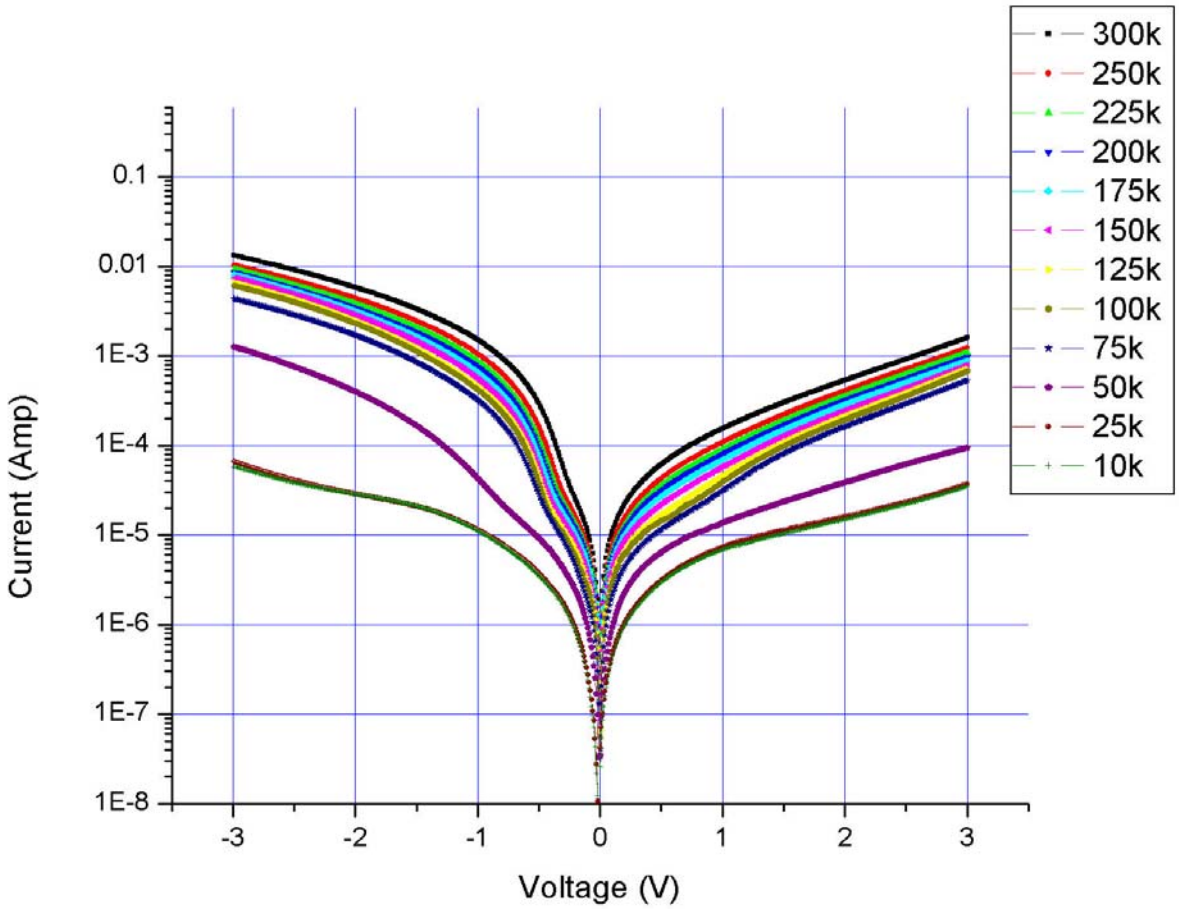
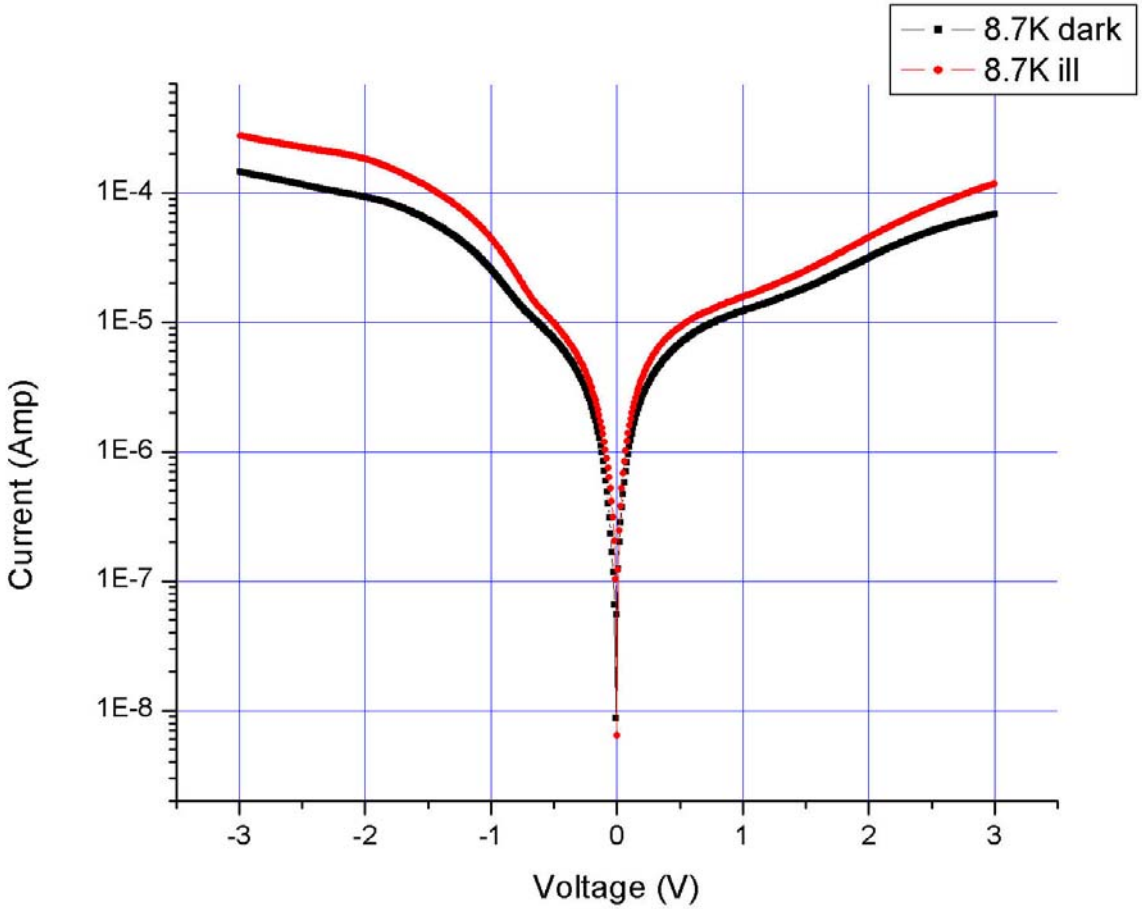
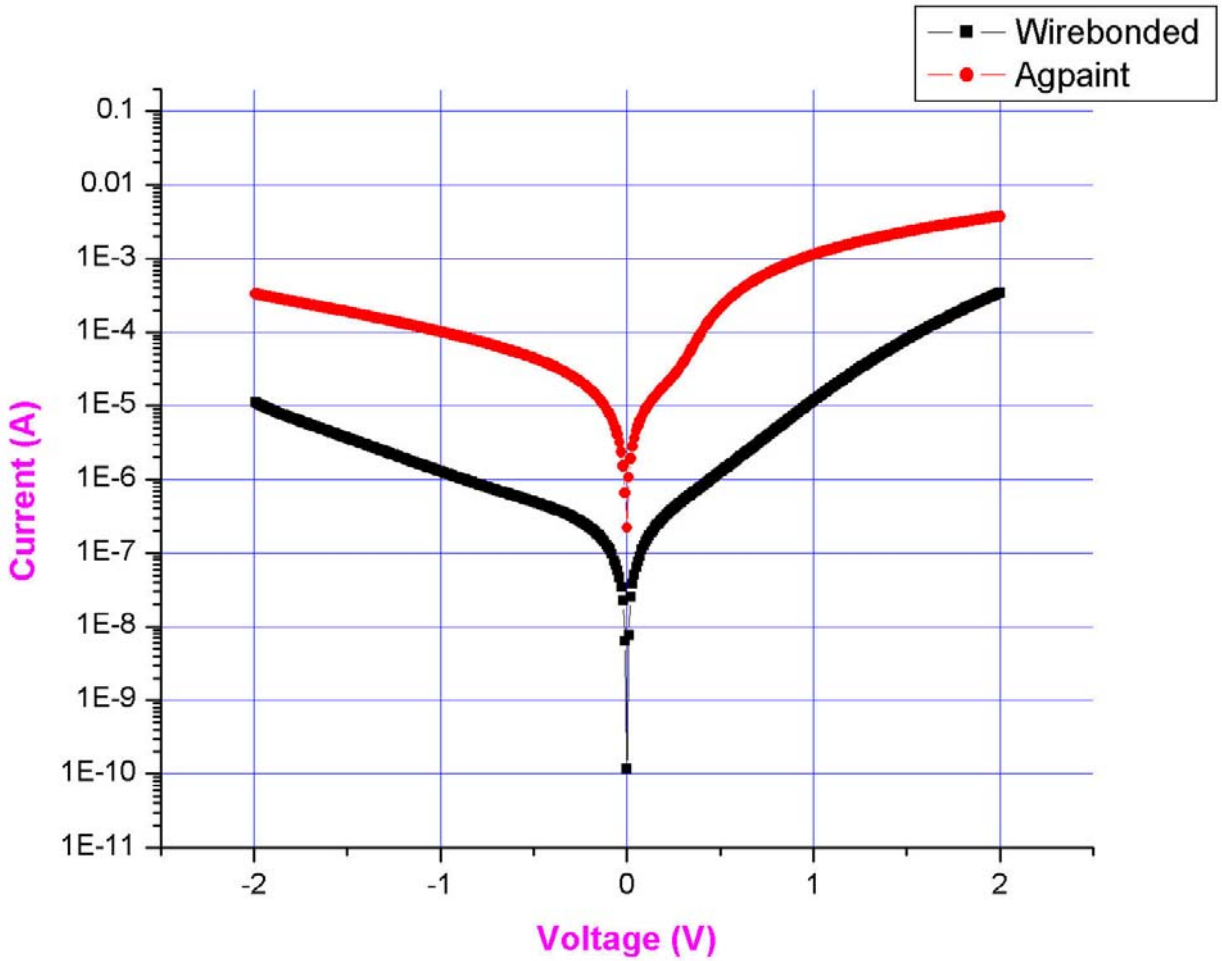
Dark current measurement as a function of temperature



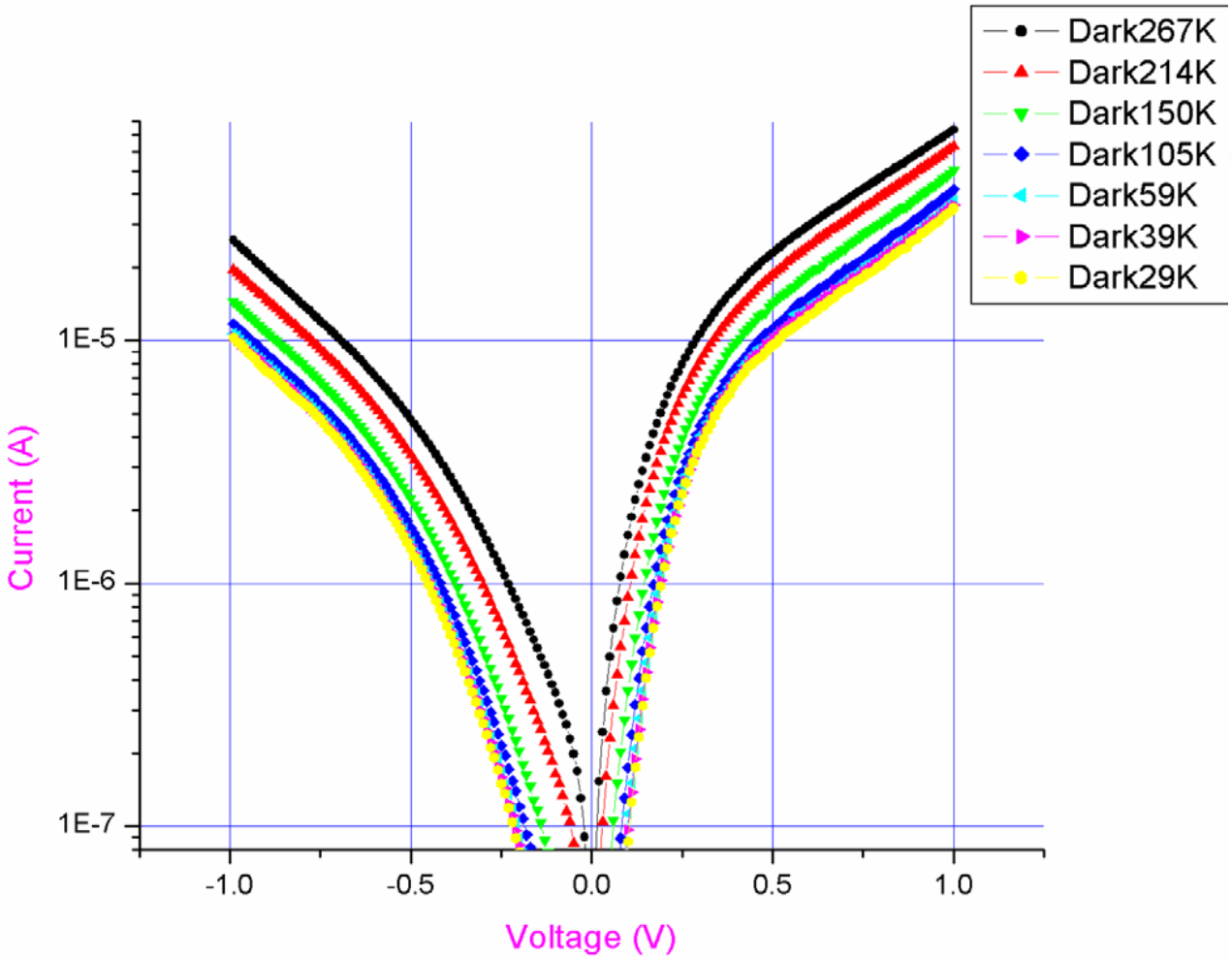
Dark & Illuminated current obtained at 8.7 K



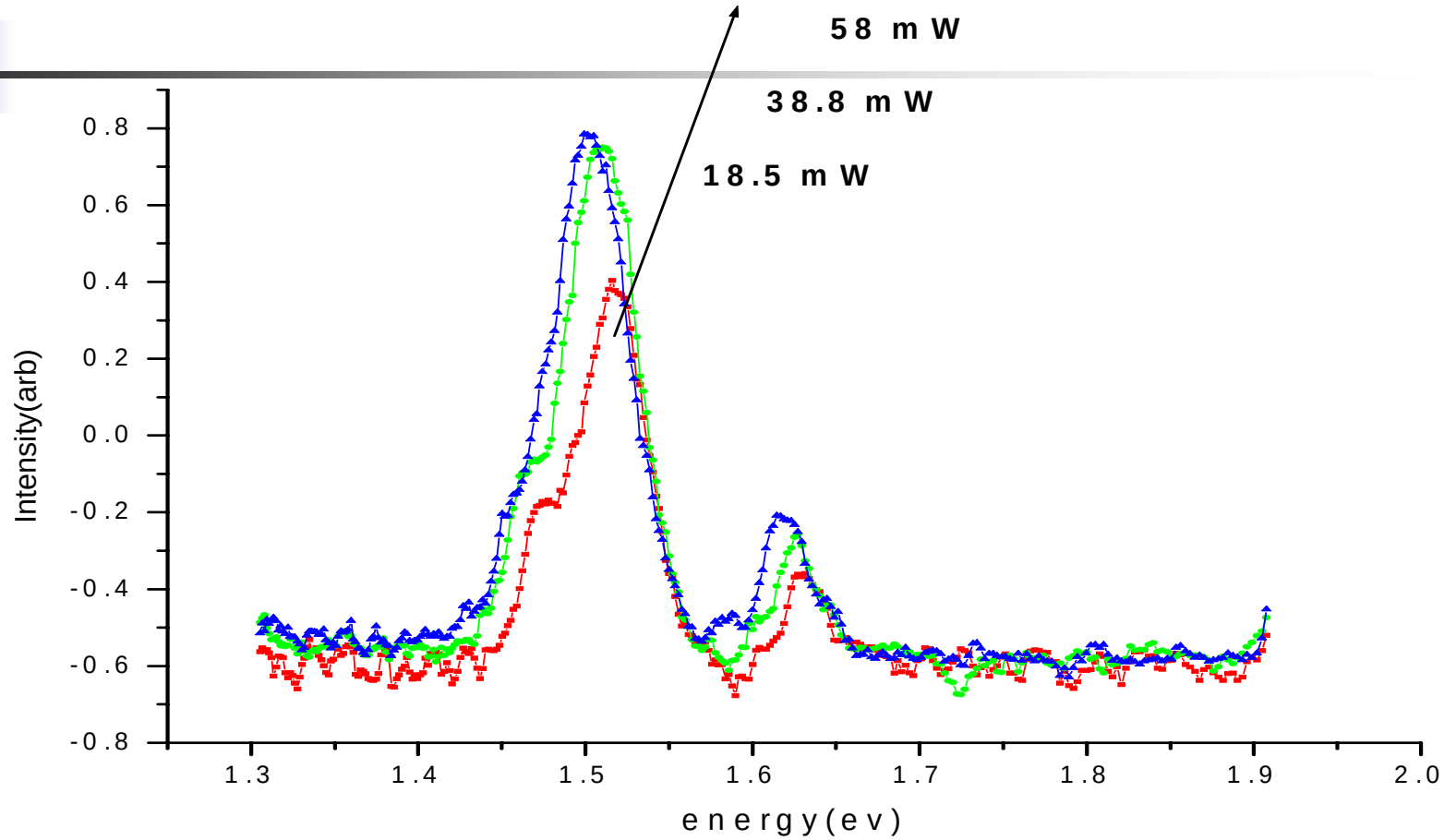
Effect of wire-bonded contact on dark current



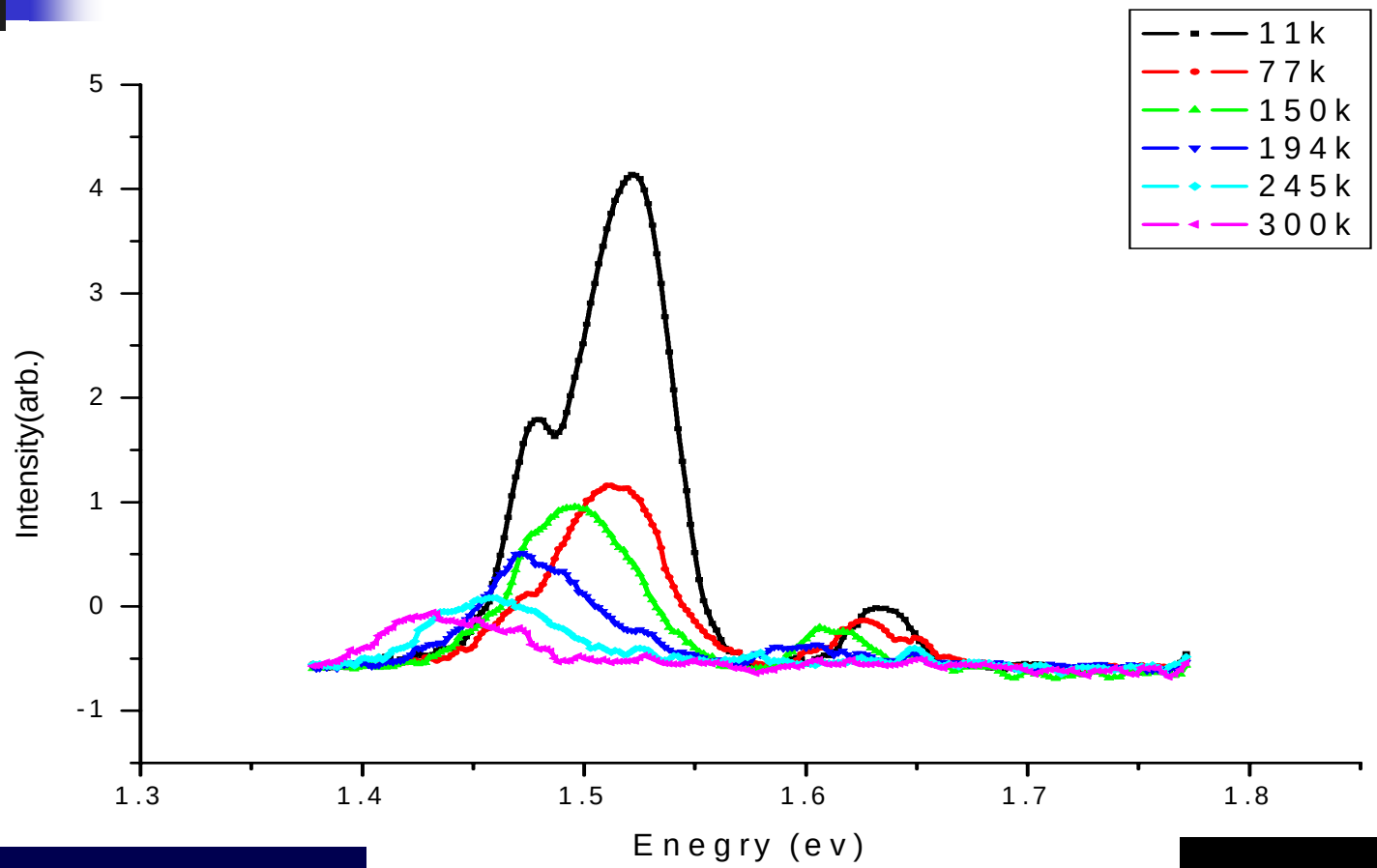
Dark current as a function of temperature (wire-bonded)



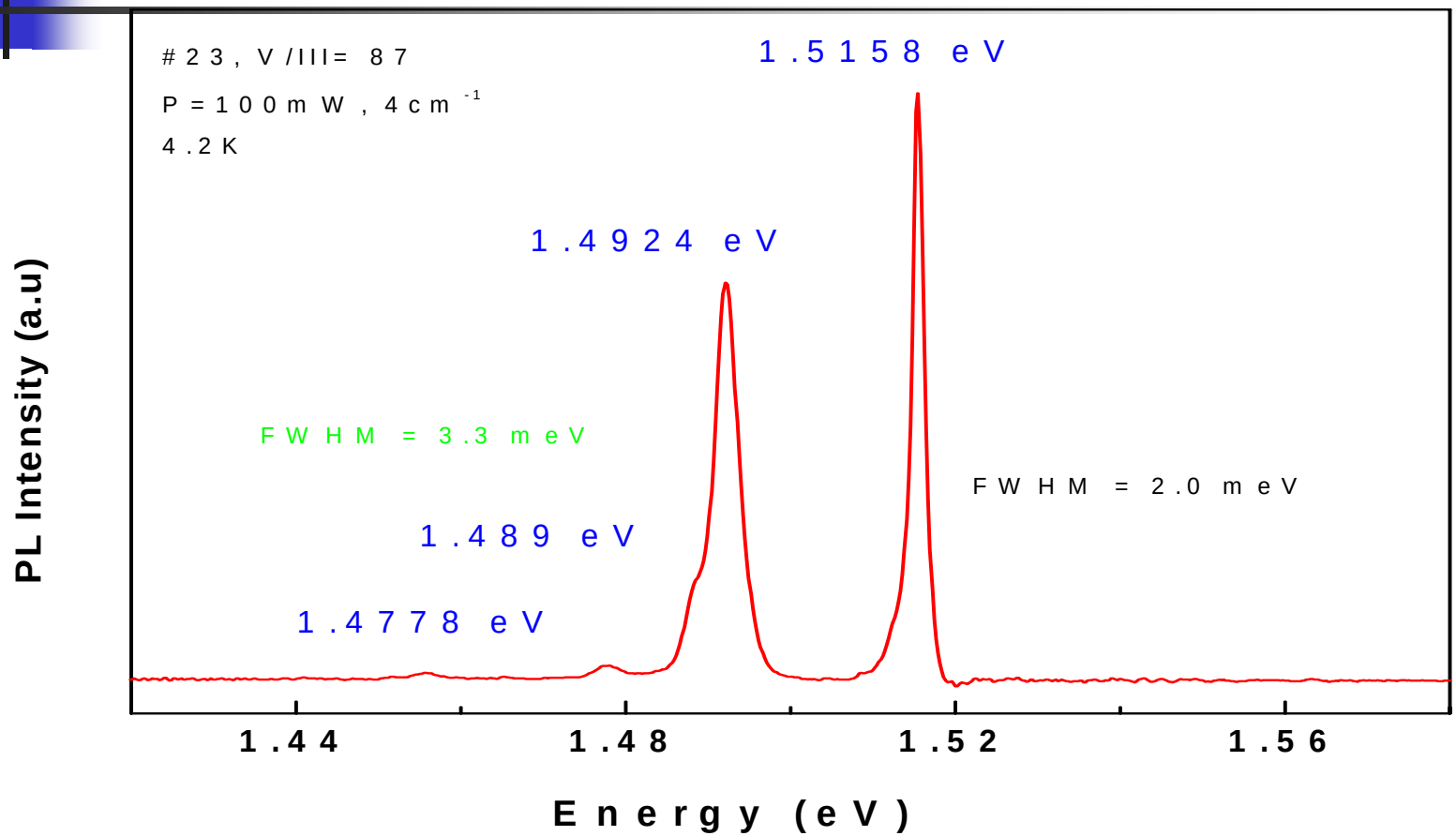
PL as a function of power of excitation source



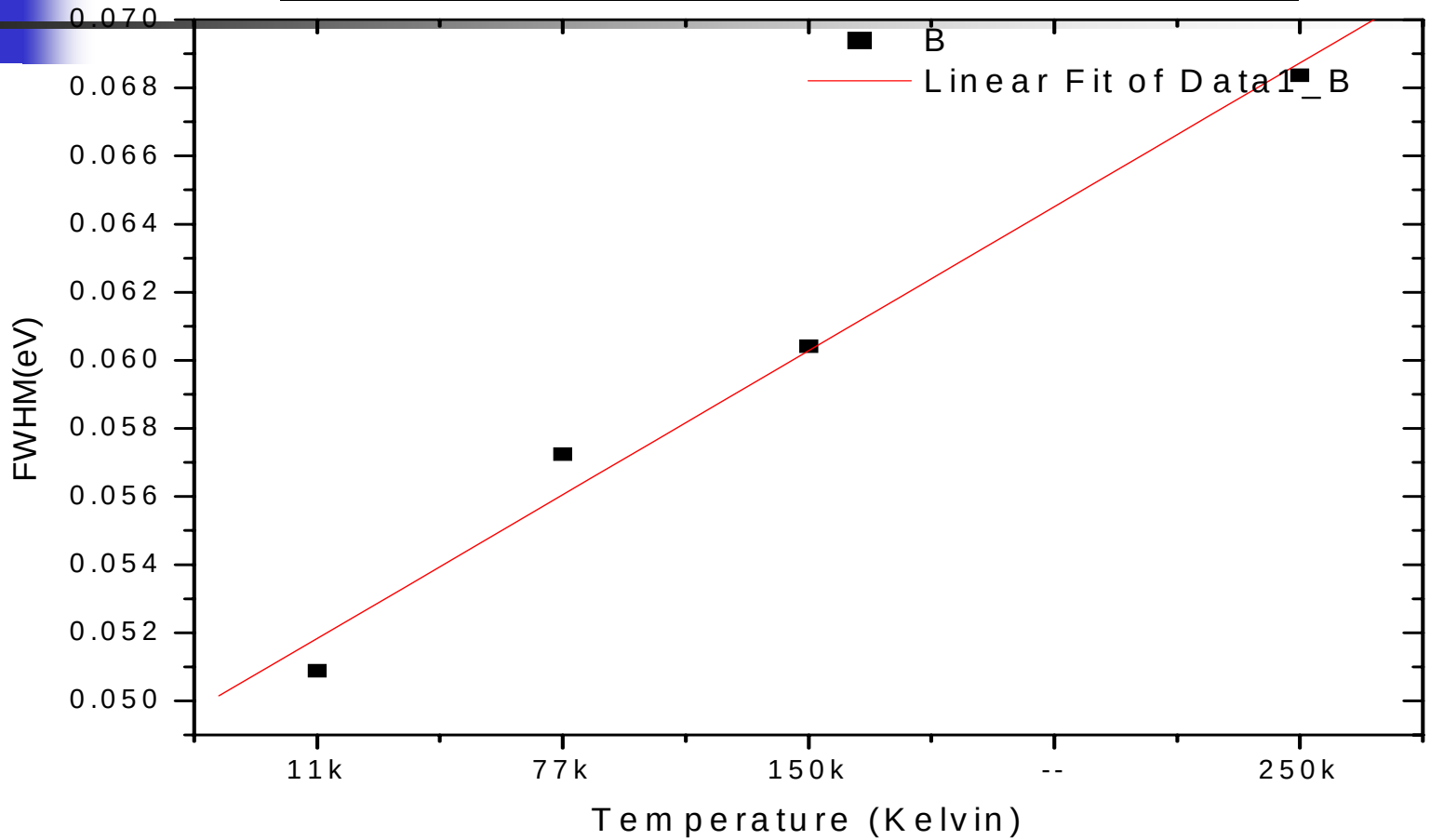
PL spectra as a function of temperature



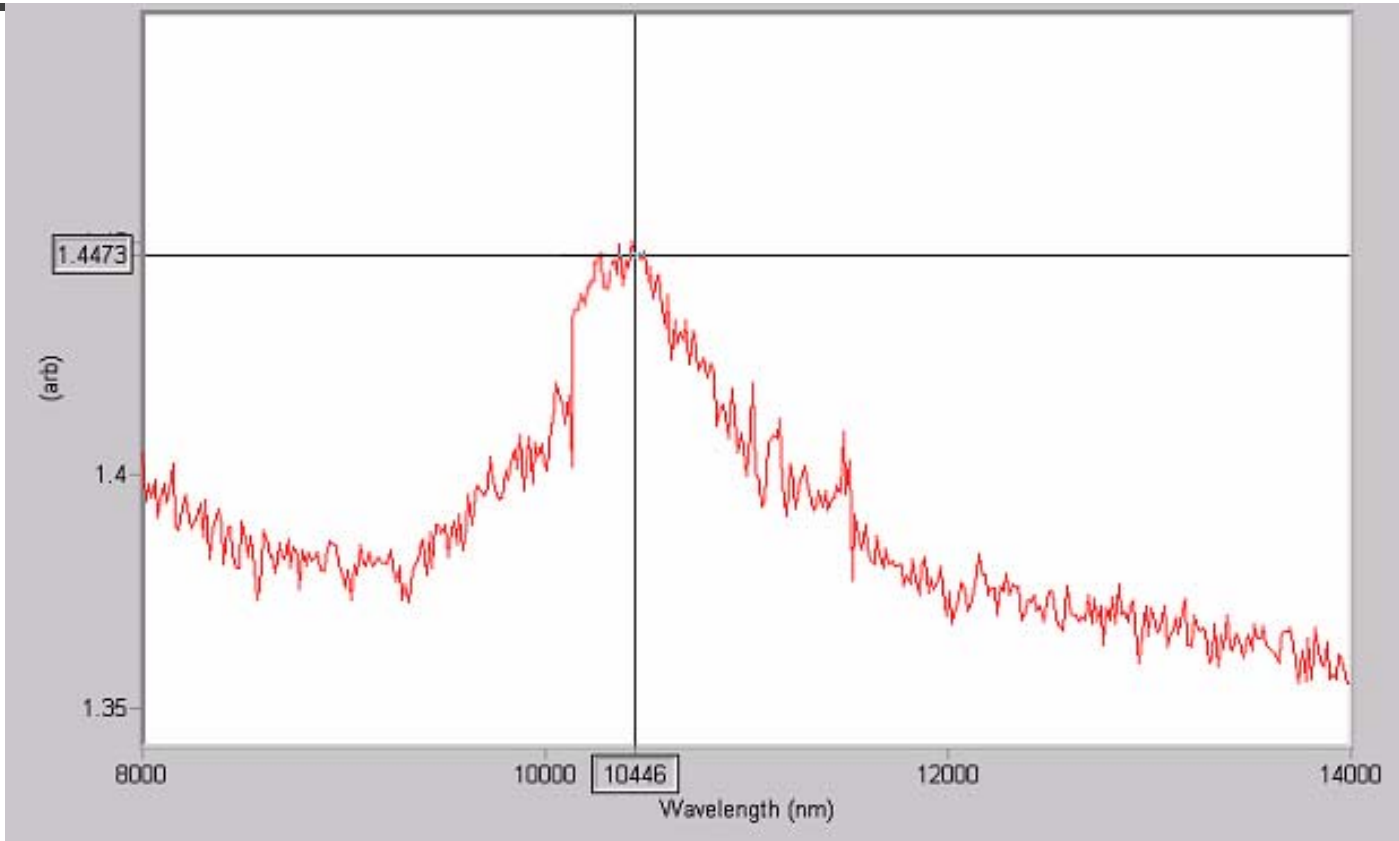
PL spectrum of undoped GaAs:



FWHM as a function of temperature



Spectral Response at 25 K



Summary

Material characterization, device processing step characterization, electrical and optical characterization were carried out for n-type GaAs/AlGaAs based QWIPs.

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