Micro-Photoluminescence for Optoelectronic Material Characterization

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Photoluminescence (PL)

- Luminescence is emission of photons
- Photoluminescence is a specific type of luminescence where the process is triggered by incident photons

ref [9]

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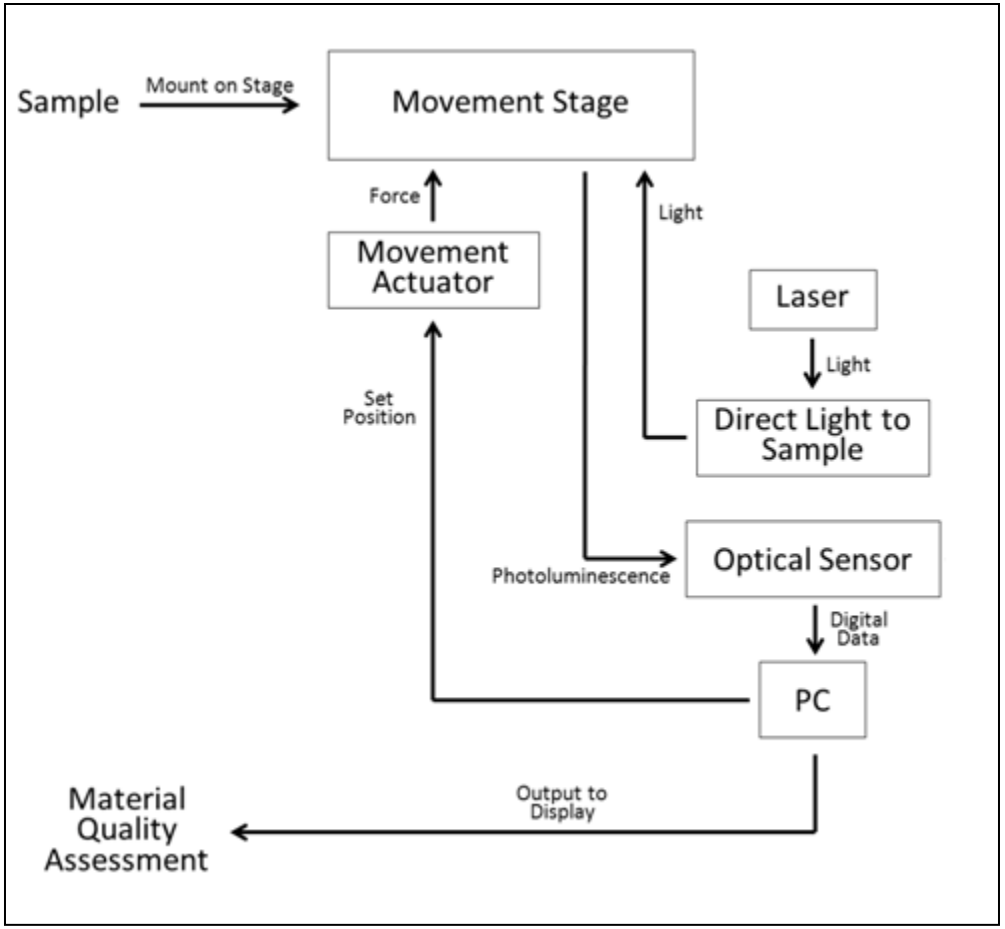
Photoluminescence (PL)

- PL Spectroscopy
  - Nondestructive method for material quality & electronic structure assessment
  - Useful for determining bandgap energy
  - PL amplitude is correlated with minority carrier lifetime

- Micro-PL
  - PL spectroscopy of sample over an area
  - Especially useful for identifying structural defects & profiles

Operational Description



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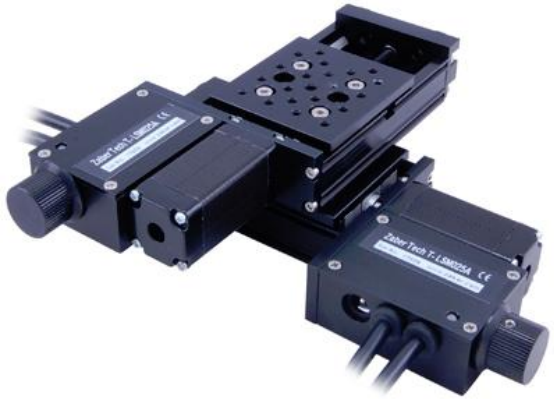
Capabilities



ref [10]

- Dual axis movement stage
- 5 μm resolution
- 1 inch^2 range

- 0.5 nm resolution
- 350-1800 nm range

ref [11]

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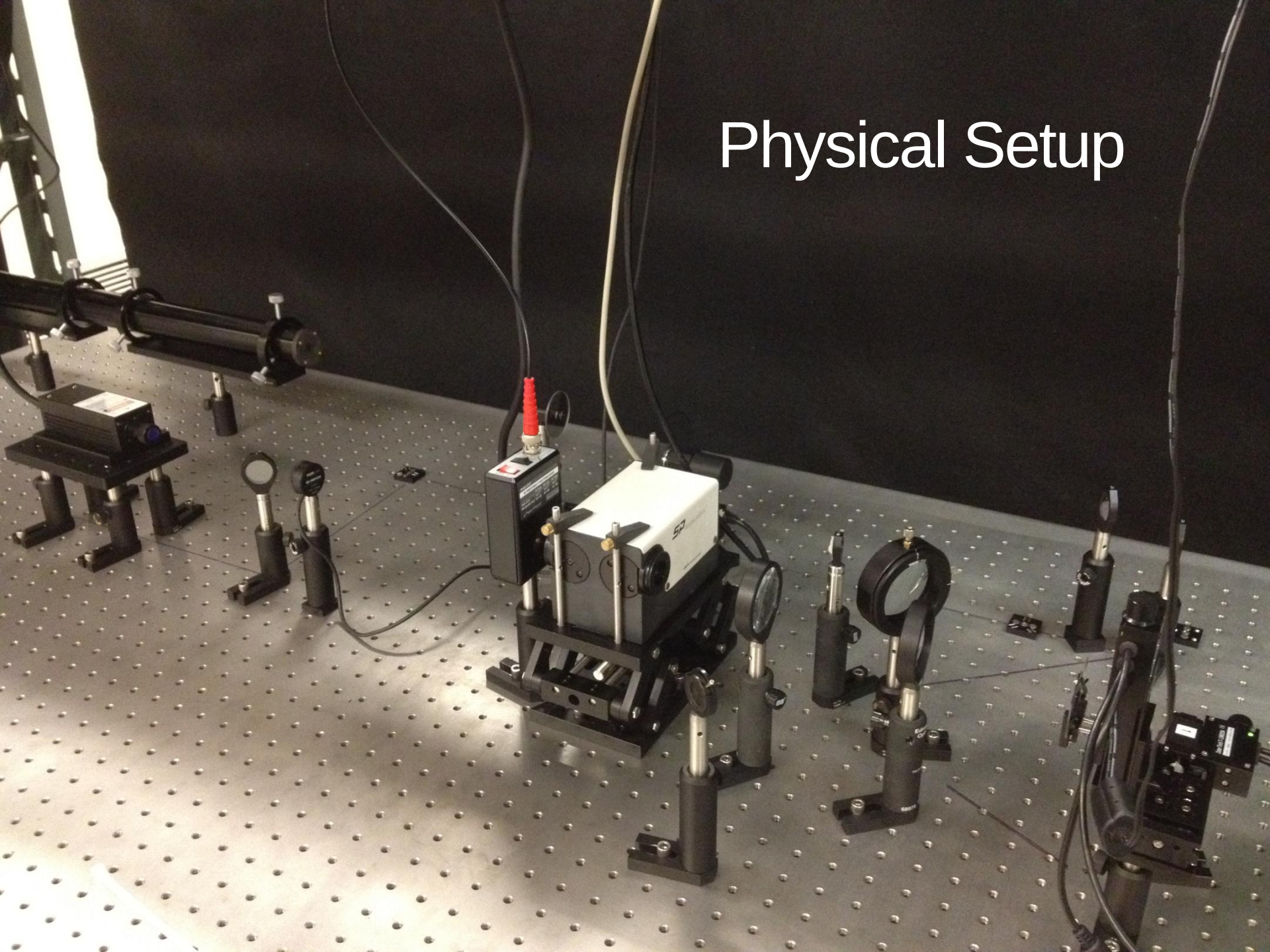
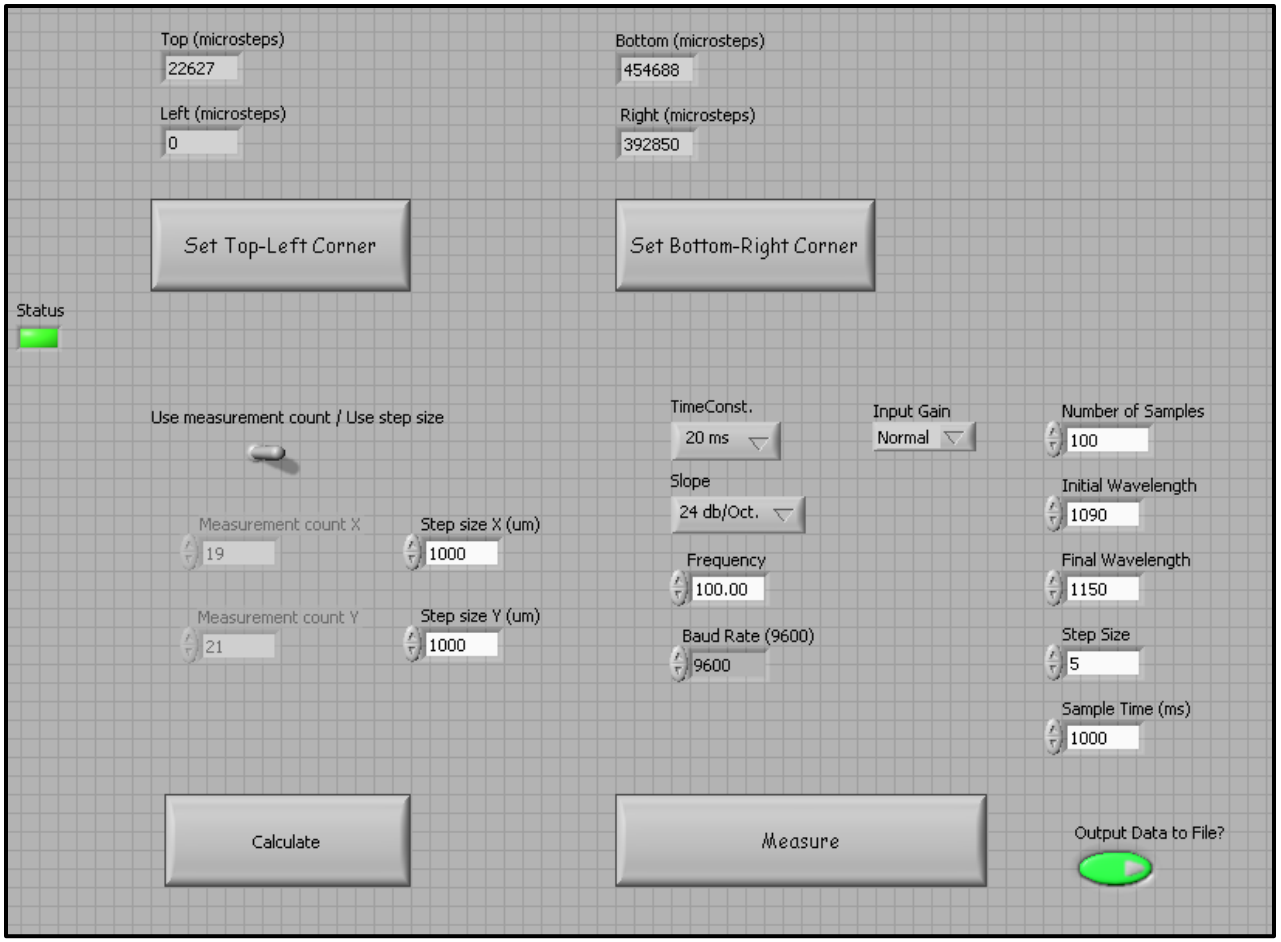

Physical Setup

User Interface



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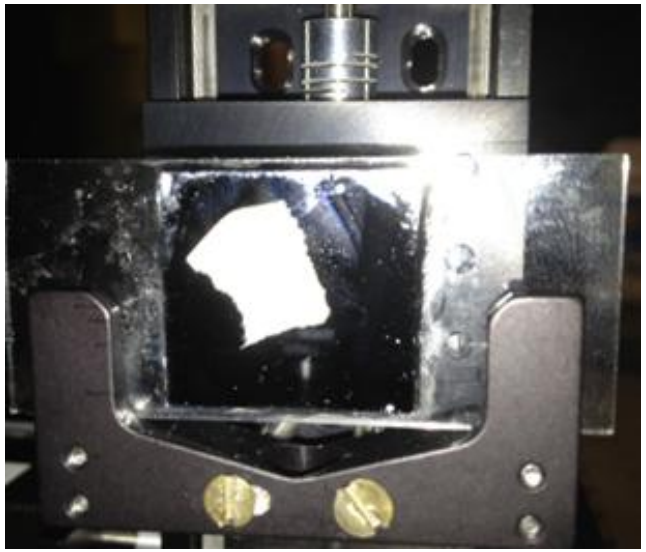
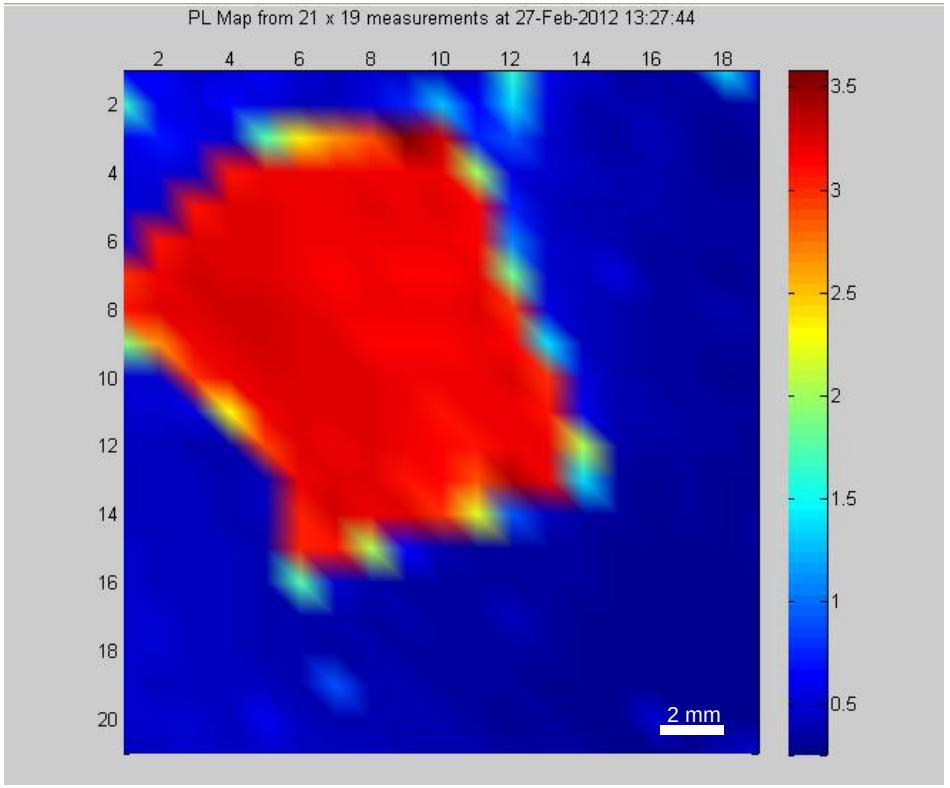
Preliminary Tests





Si over 1090-1150nm

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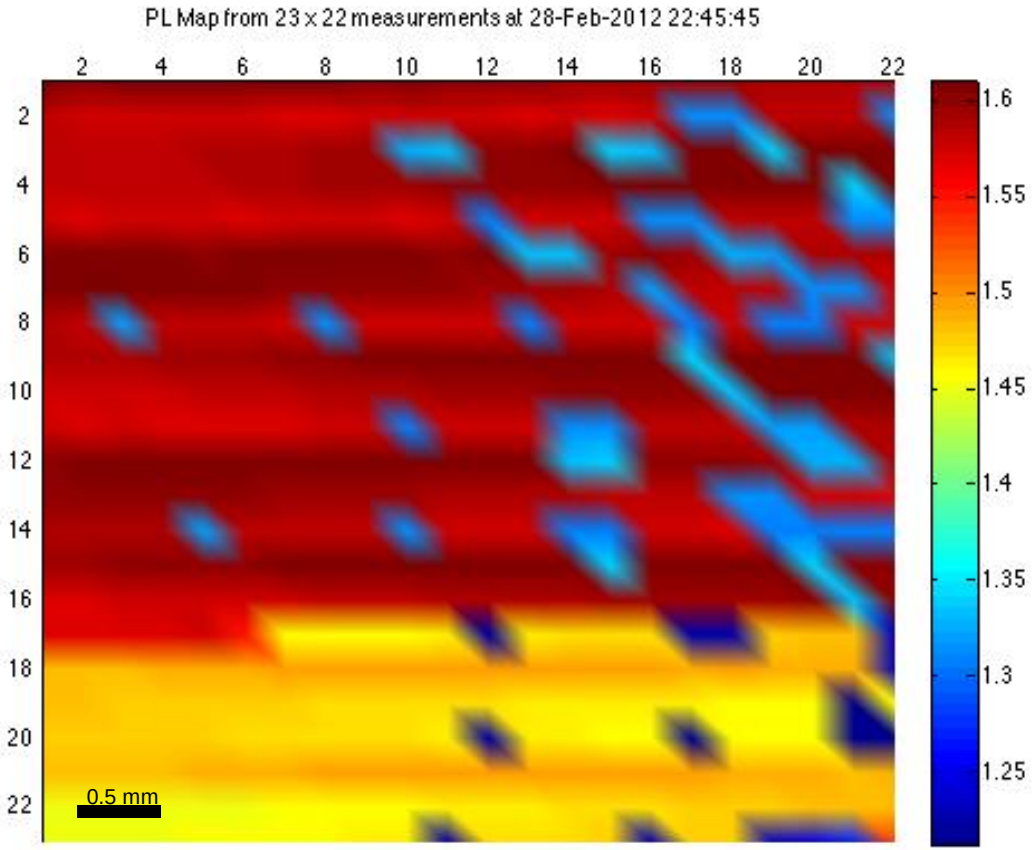
Demonstration



GaAs over 820-835nm

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Conclusion

- Demonstrated proof of concept
- Slow measurements
  - 20x20 grid measurement requires 1.5 hours
- Moving forward
  - Obtain higher resolution maps of larger samples
  - Validate against samples with known defects
  - Determine normalization scheme for amplitude

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Acknowledgements

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Extra Images

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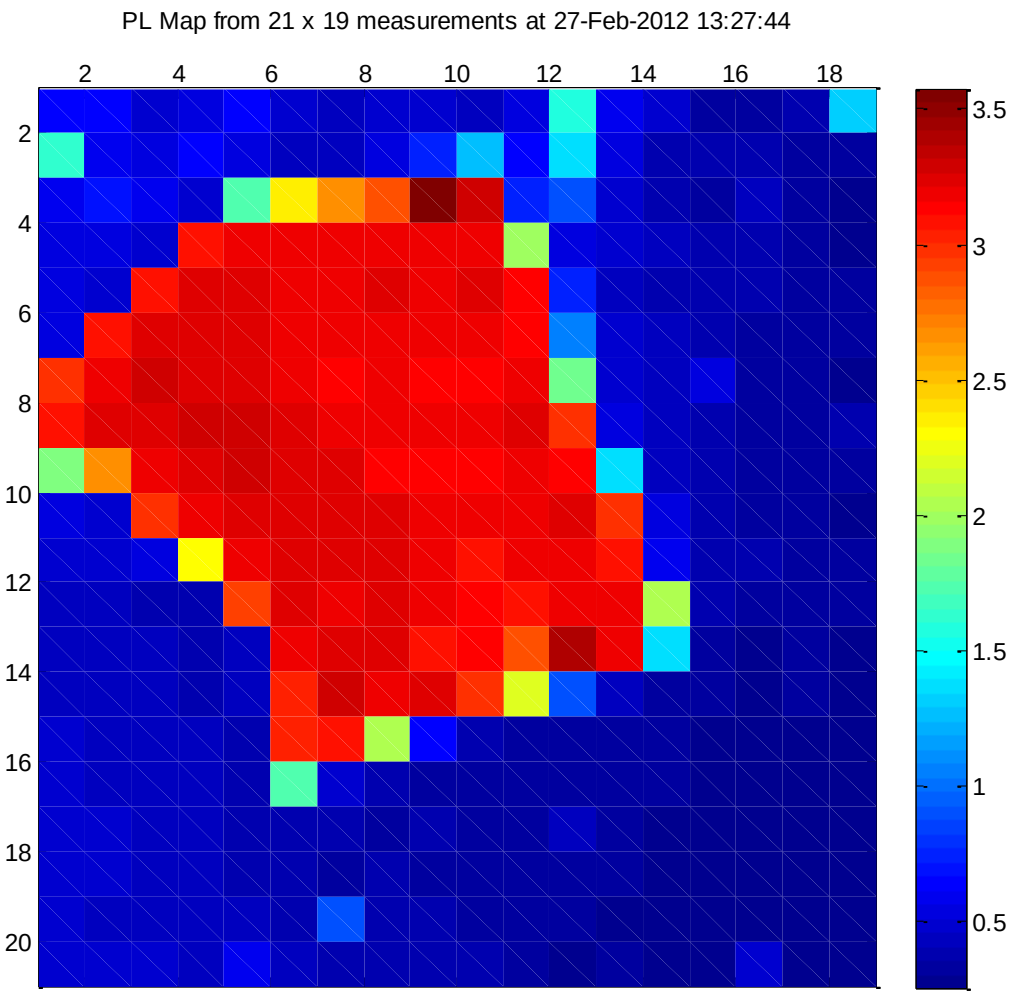
Si sample – non interpolated



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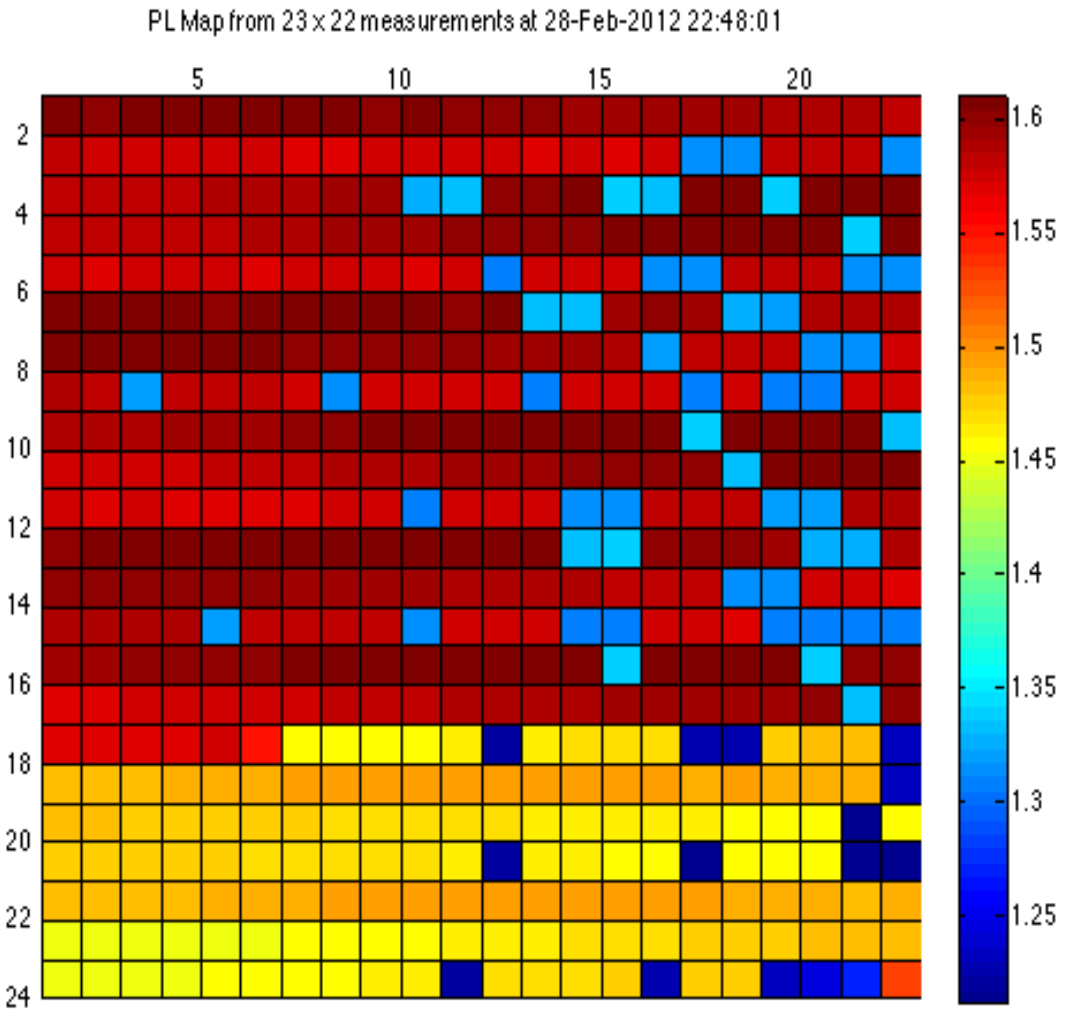
GaAs sample – non interpolated



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