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Temperature Dependence of SiO₂ Electron-Induced Luminescence

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Temperature Dependence of SiO₂ Electron-Induced Luminescence

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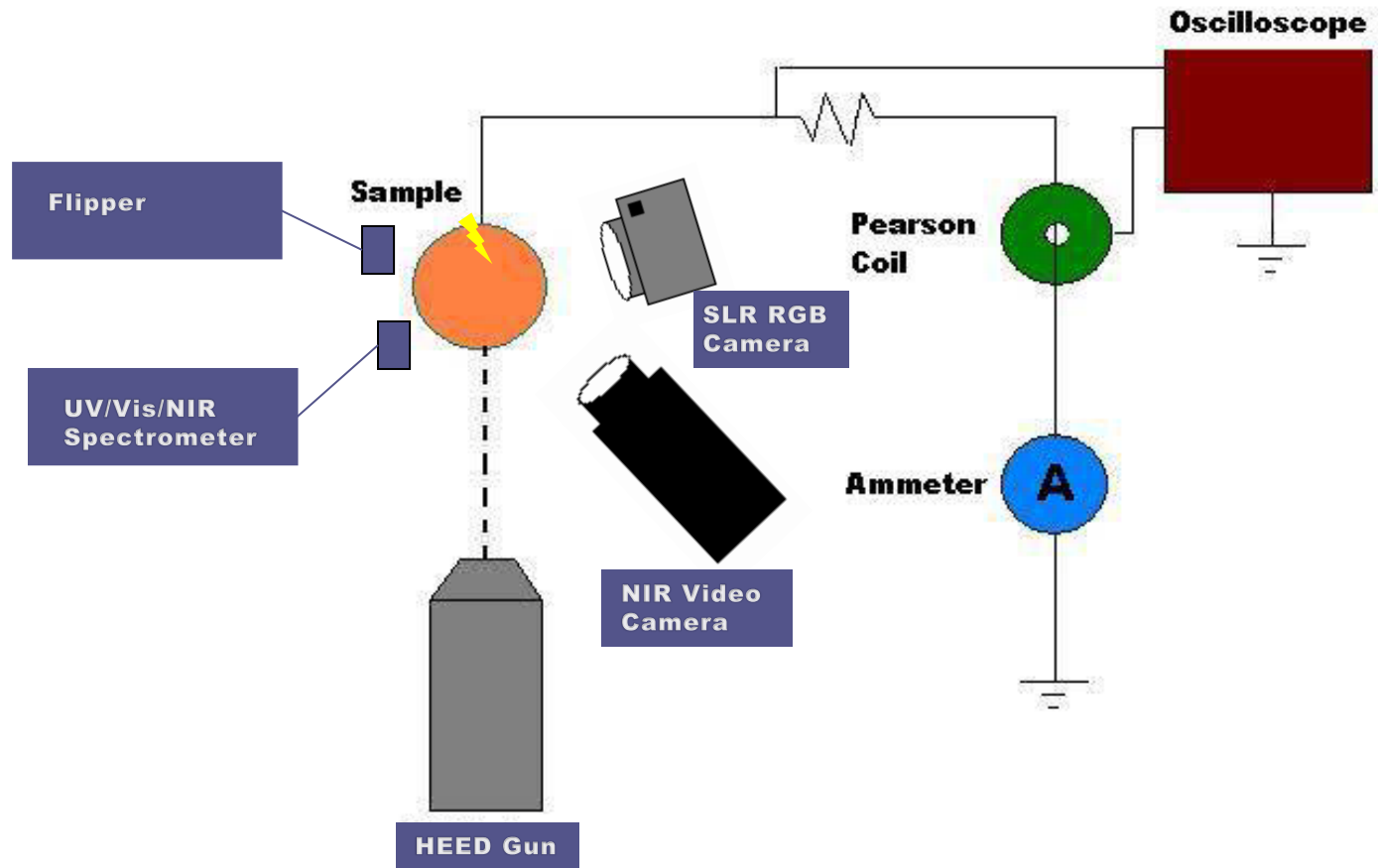
Motivation

- Space telescope optical instrumentation



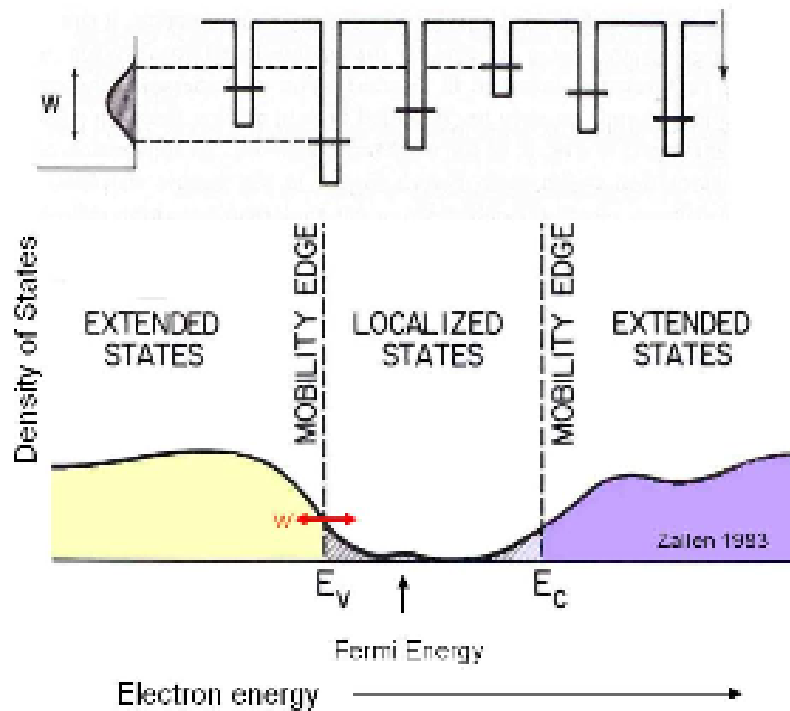
- Wilson, **Electron Energy Dependent Charging Effects of Multilayered Dielectric Materials**, Session M3

Experimental Set-Up

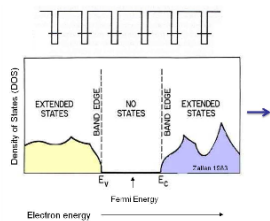


Band Theory Model

Crystal with defects

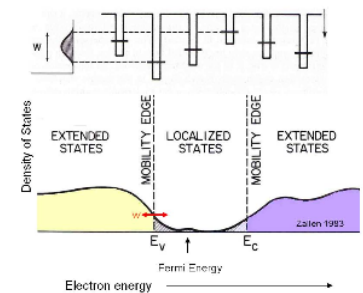


Crystalline Structure

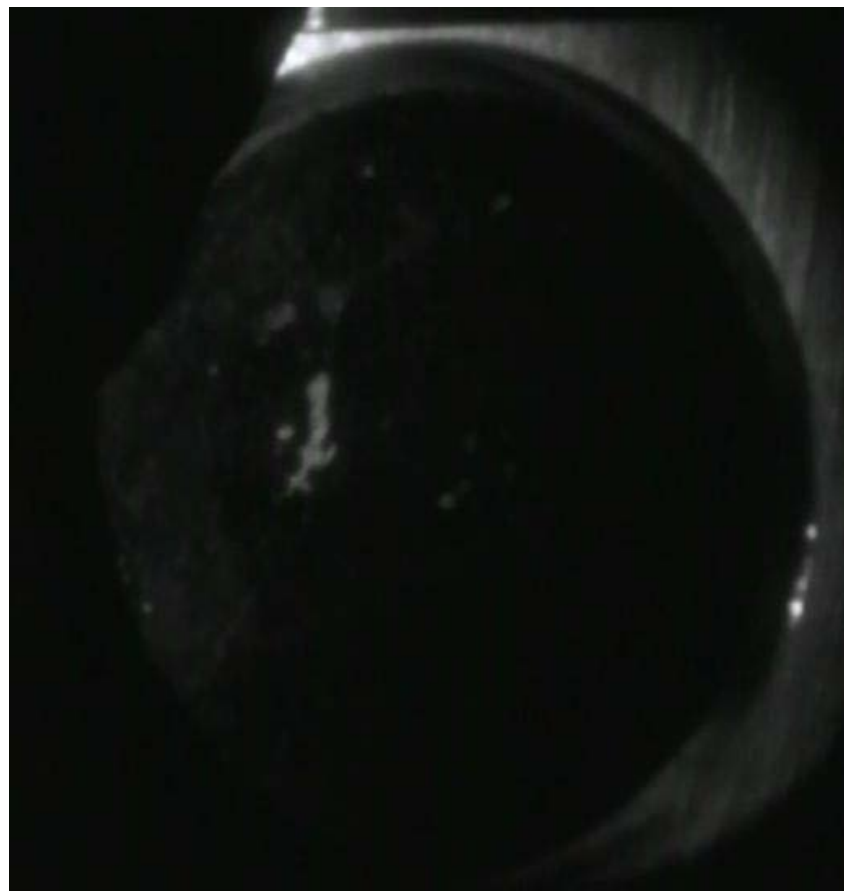


SiO₂: 8.9 eV ~ Transparent

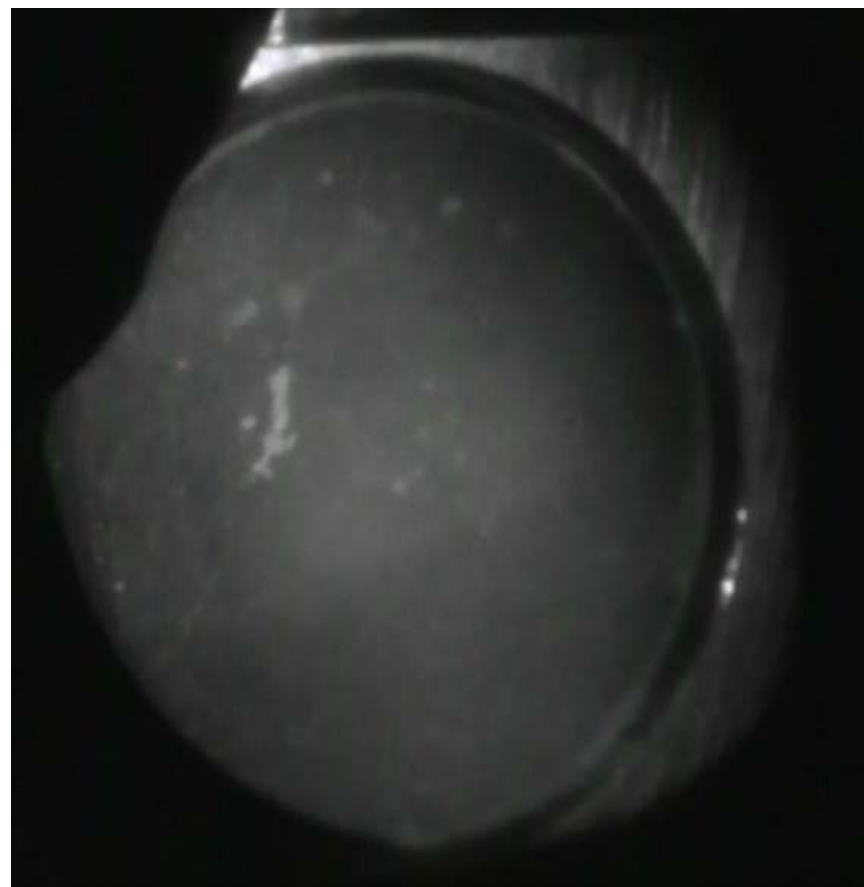
Crystal with defects



Electron-Induced Luminescence of SiO₂ Mirror

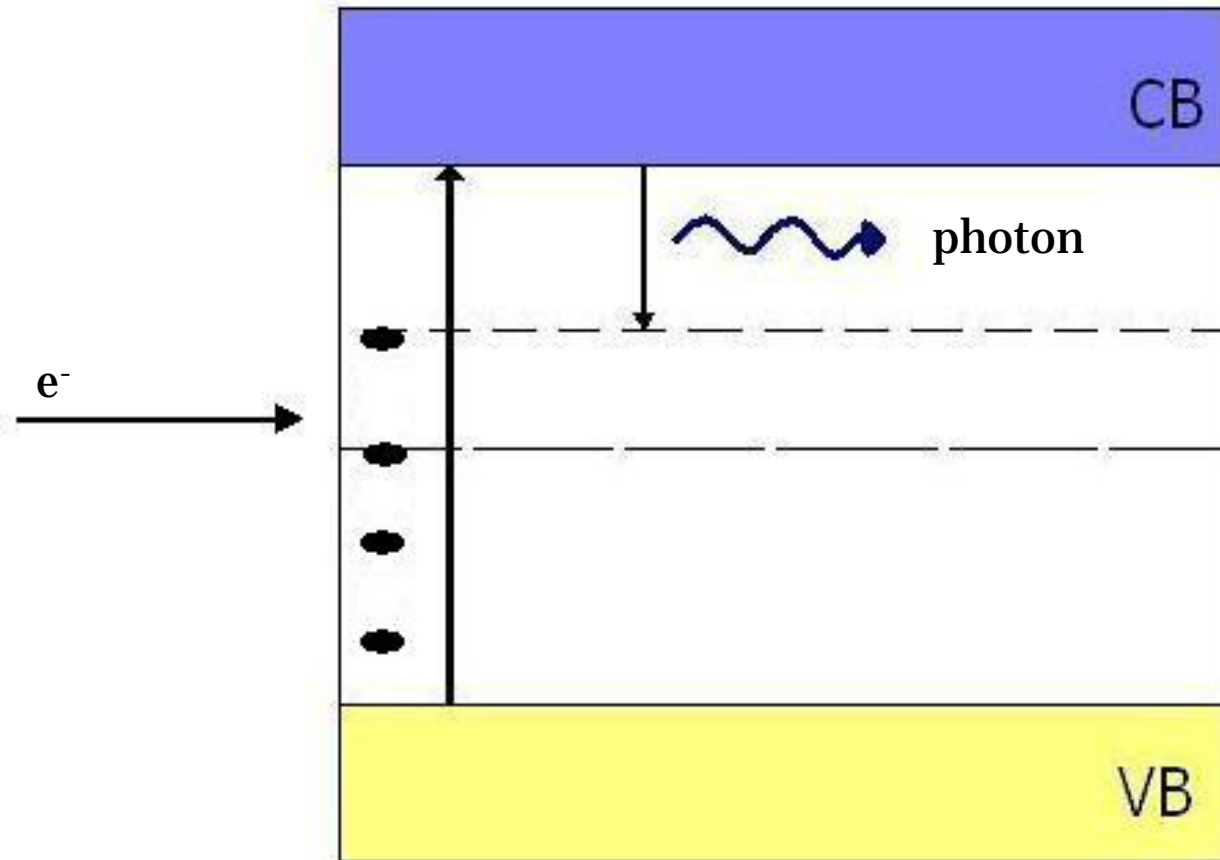


Beam off

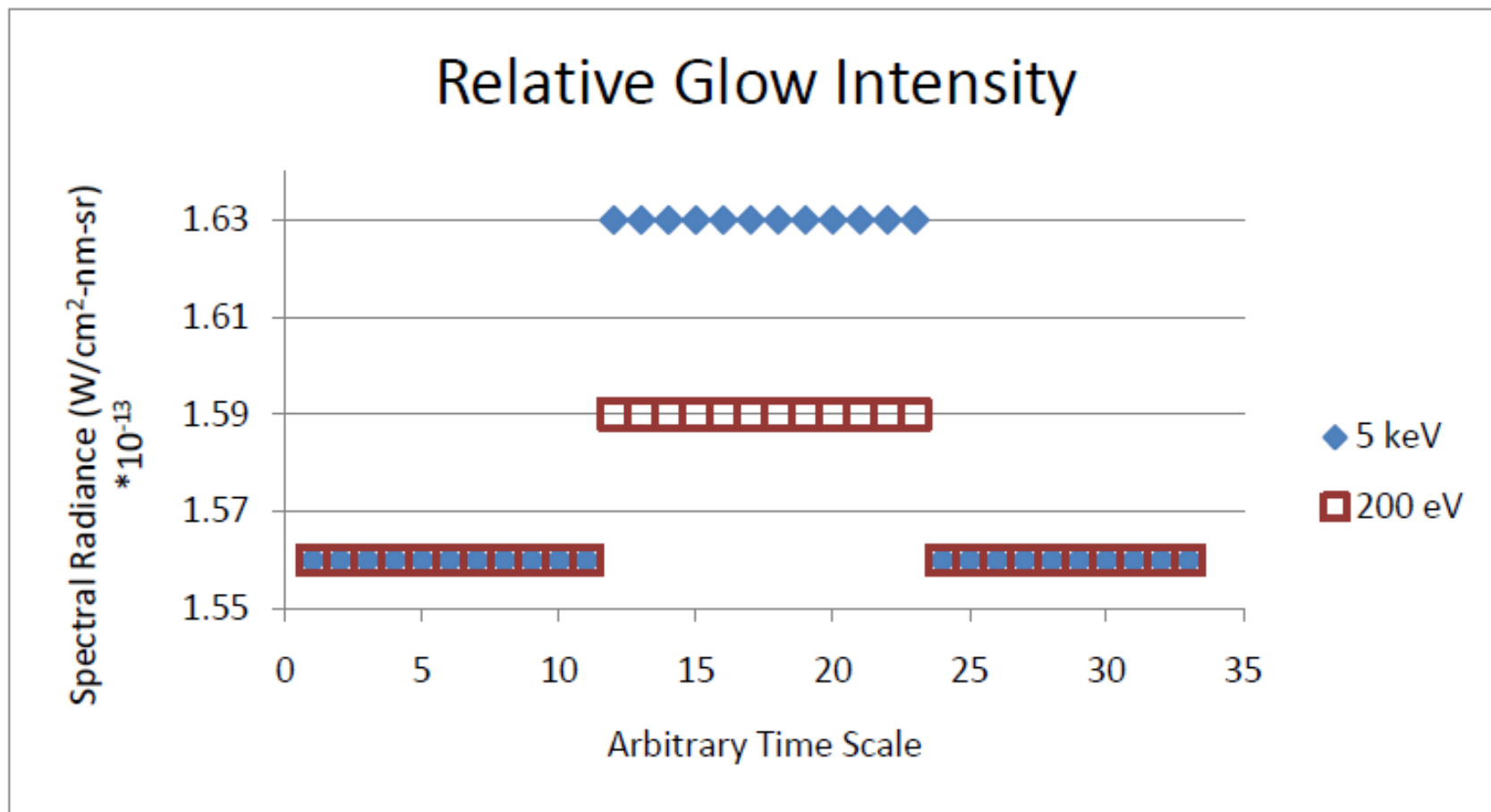


Beam on

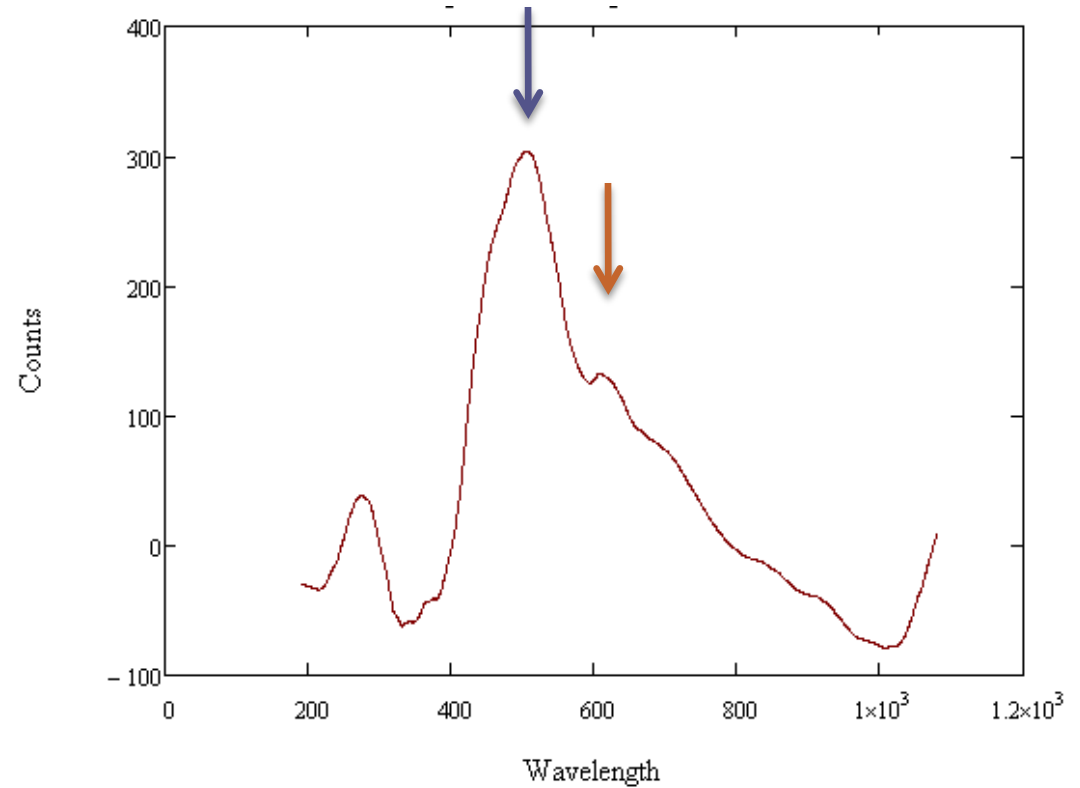
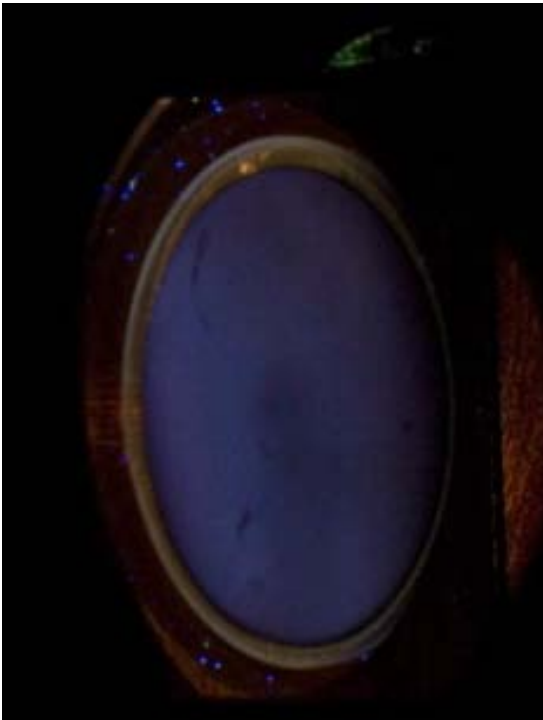
Excitation and Relaxation



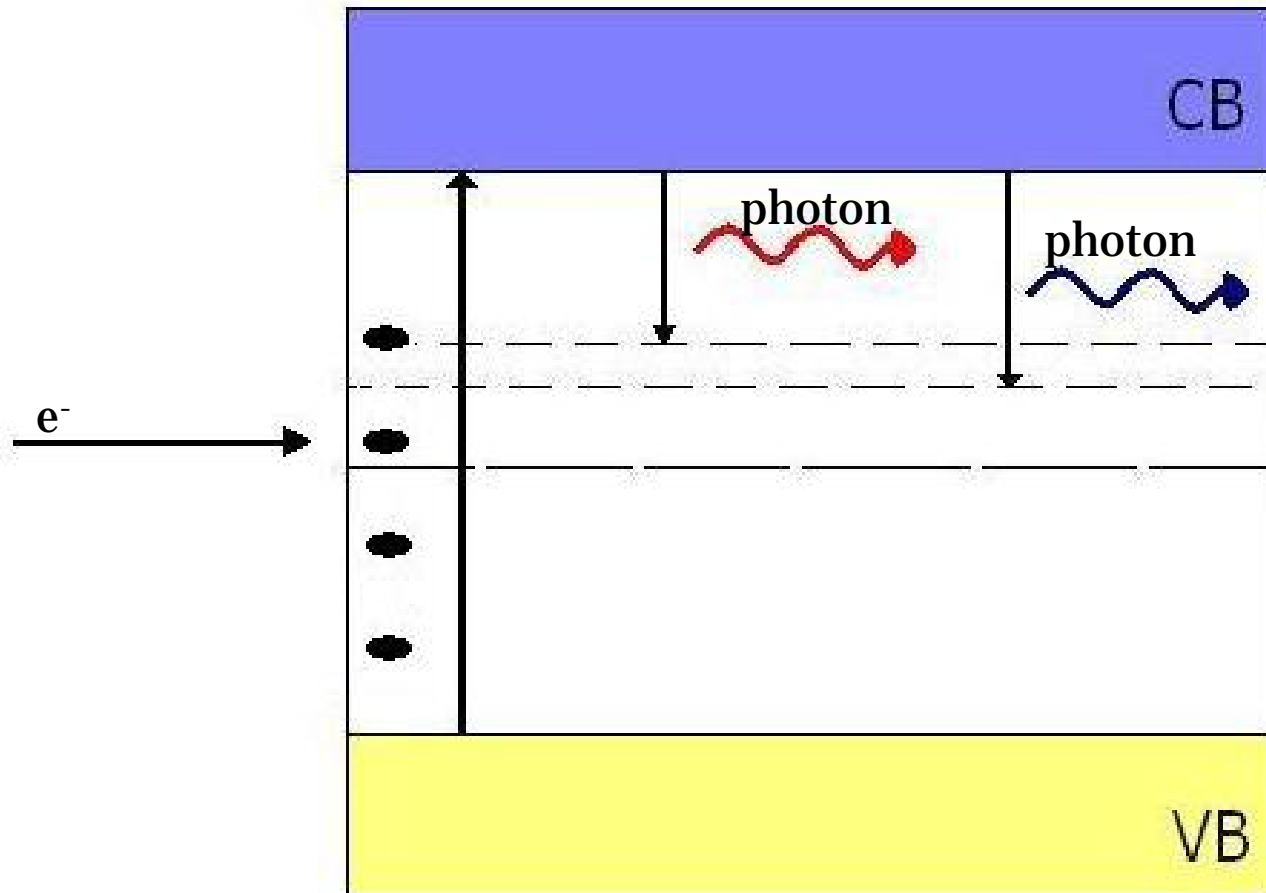
Effect of Beam Energy



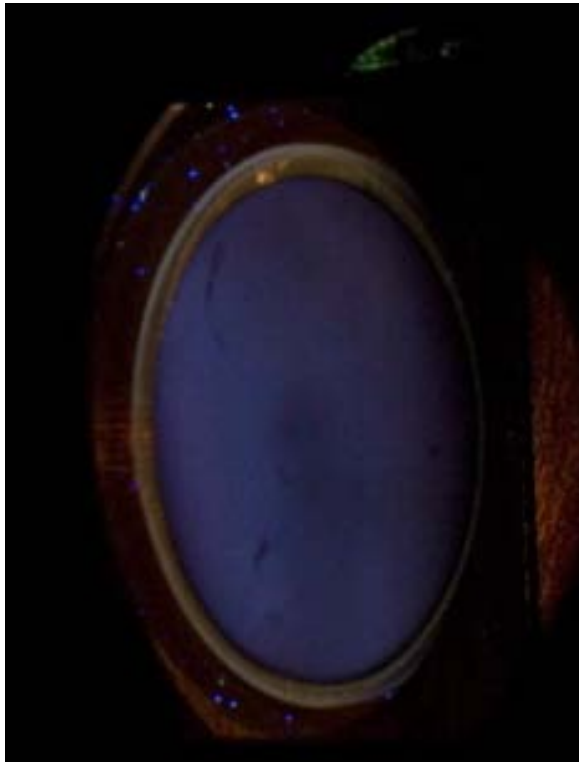
Multi-Photon Luminescence



Multi-Photon Relaxation



Temperature Dependent Luminescence



-4 C

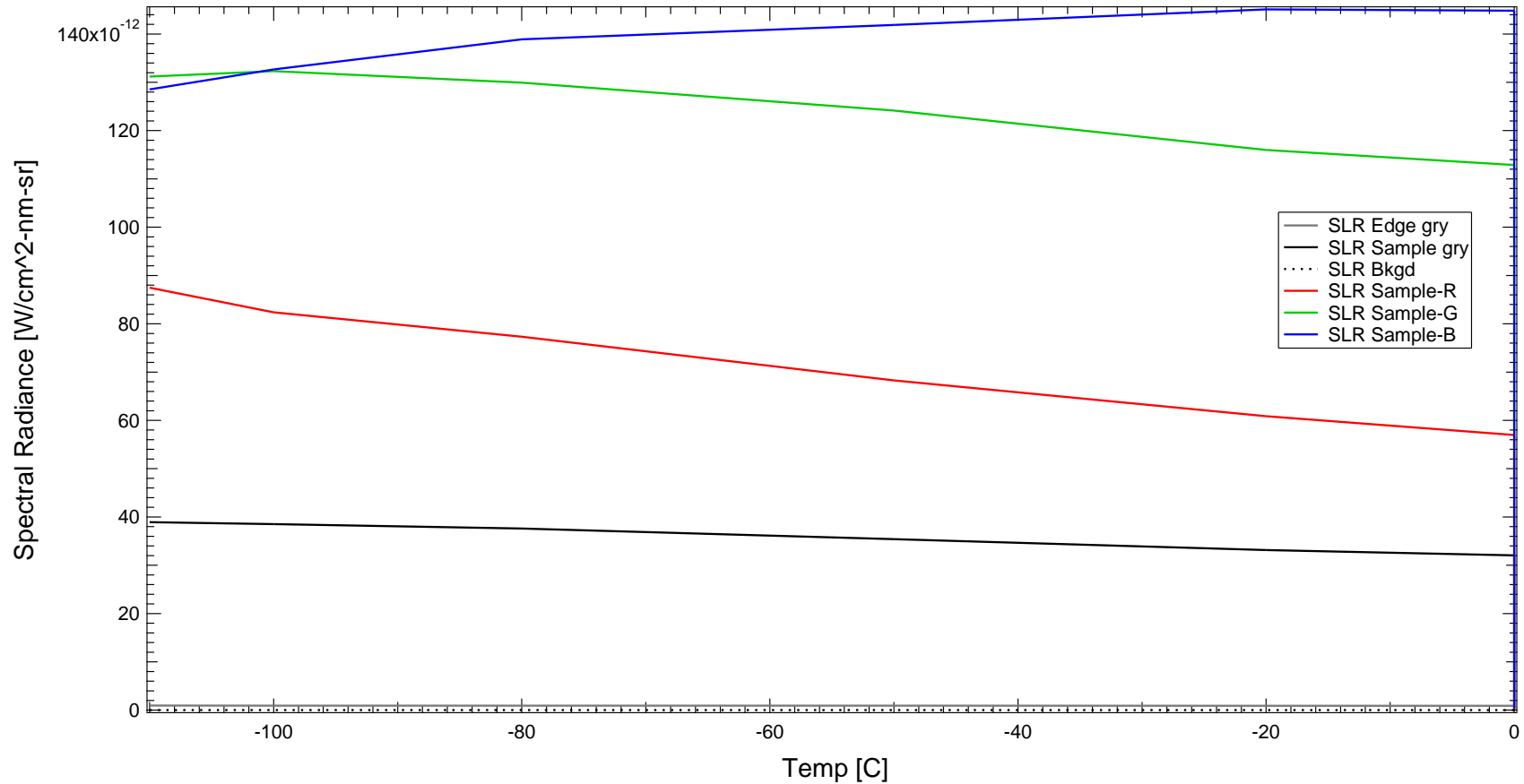


-80 C

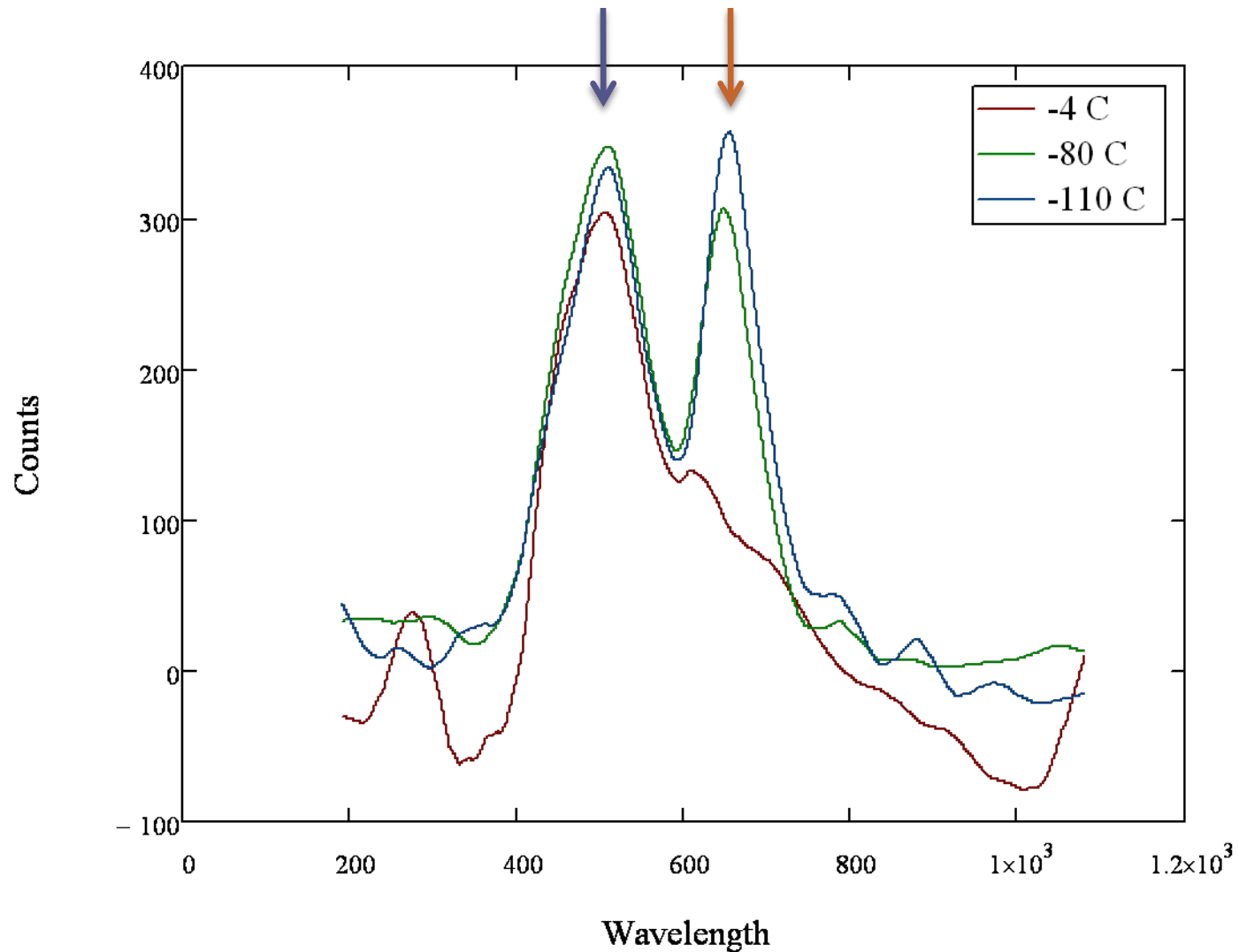


-110 C

SLR Spectral Radiance vs Temperature



Temperature Dependent UV-Vis Spectra



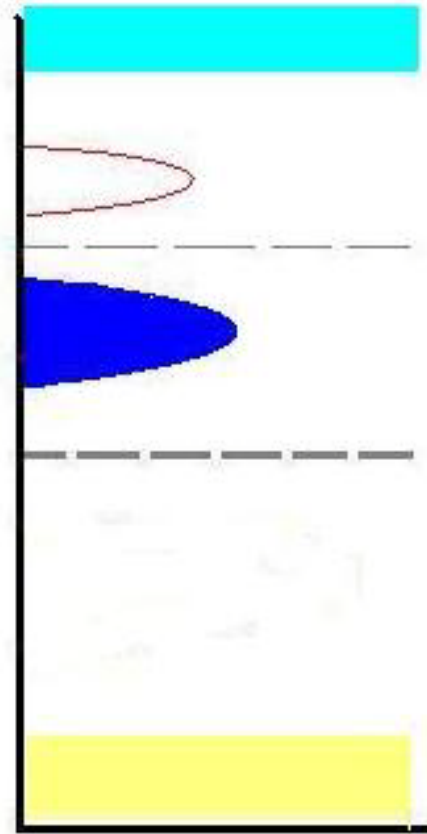
Temperature Model

$$T = 0$$



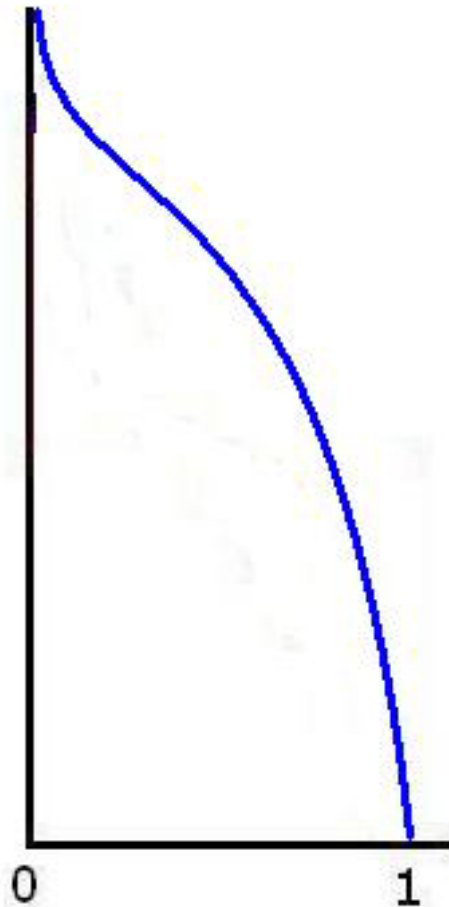
Effective Fermi Level

Fermi Energy



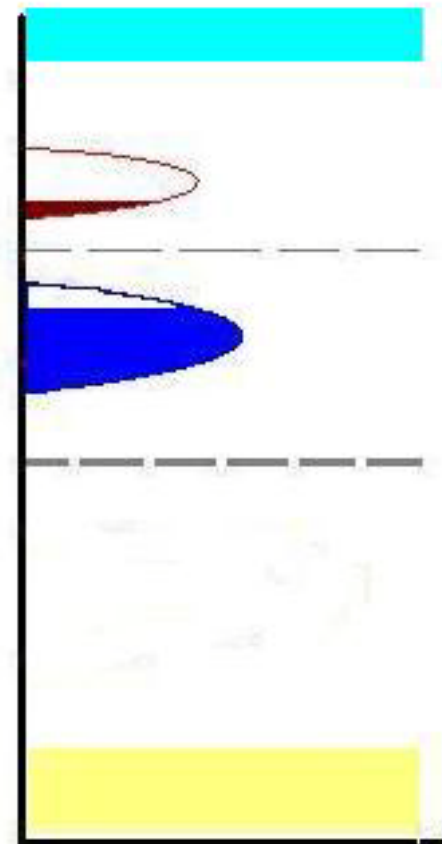
Temperature Model

Low T



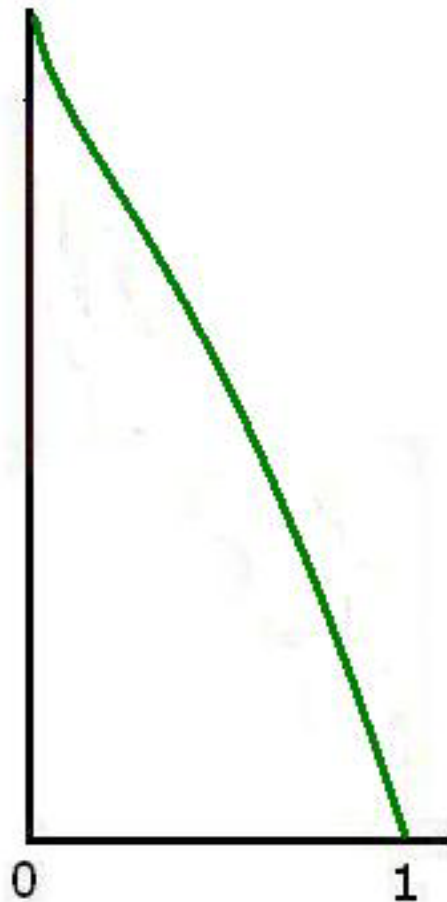
Effective Fermi Level

Fermi Energy



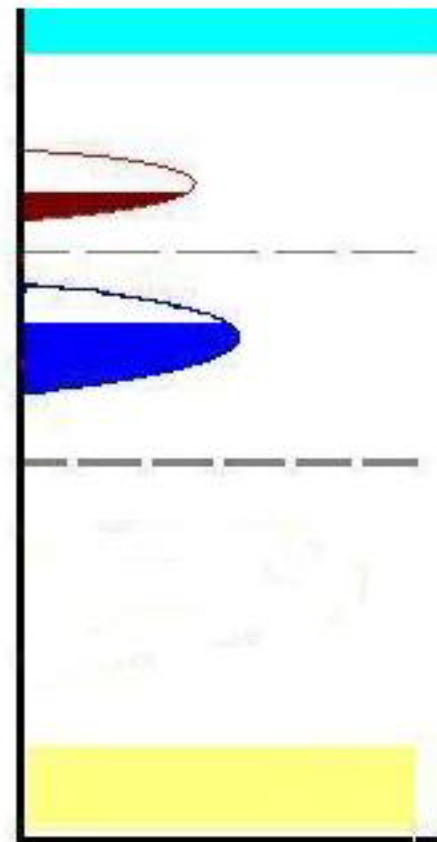
Temperature Model

High T

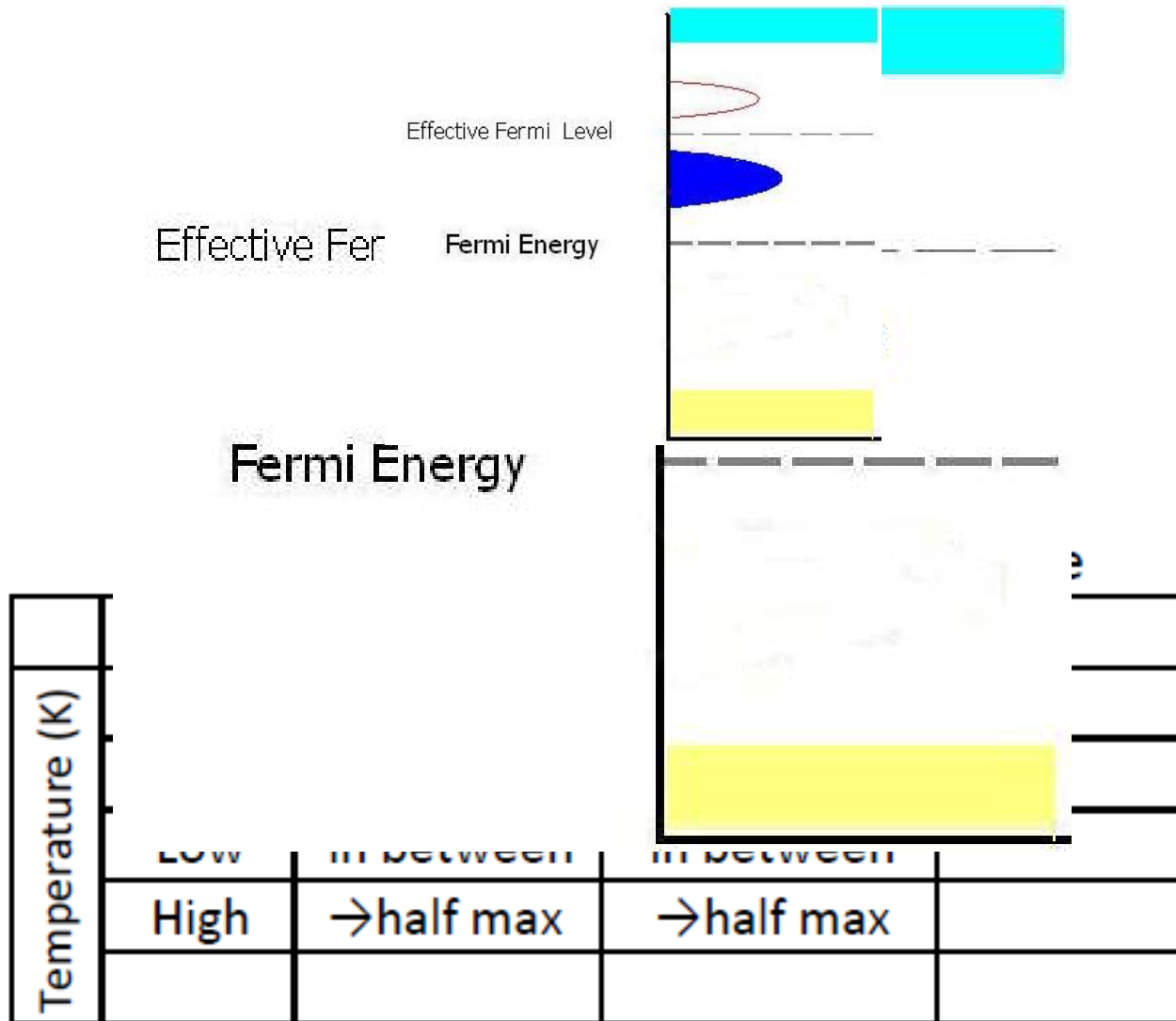


Effective Fermi Level

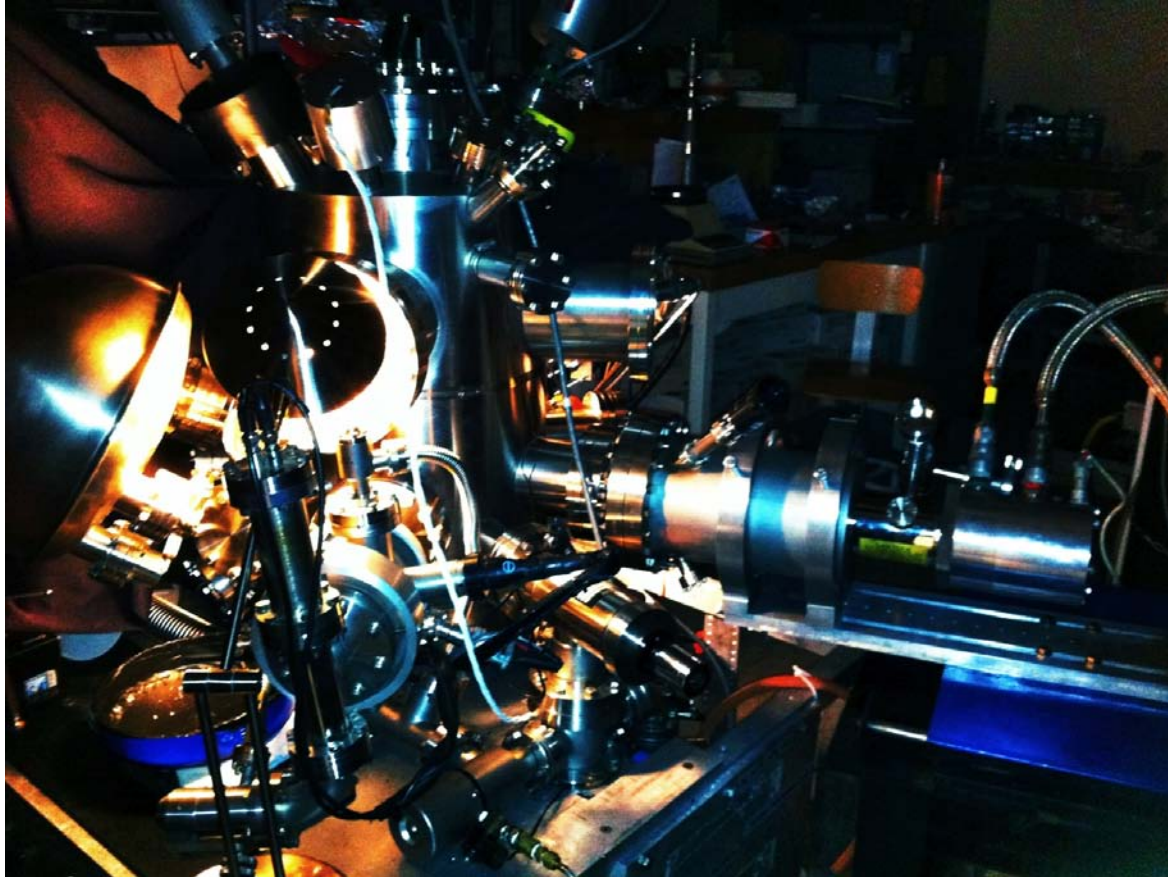
Fermi Energy



Conclusions



Future Work



Acknowledgement

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