Fall 11-23-2011

Temperature Dependence of SiO2 Electron-Induced Luminescence

Amberly Evans Jensen
Utah State University

Gregory Wilson
Utah State University

JR Dennison
Utah State University

Temperature Dependence of SiO_2 Electron-Induced Luminescence

Amberly Evans, Greg Wilson, JR Dennison

Physics Department, Utah State University

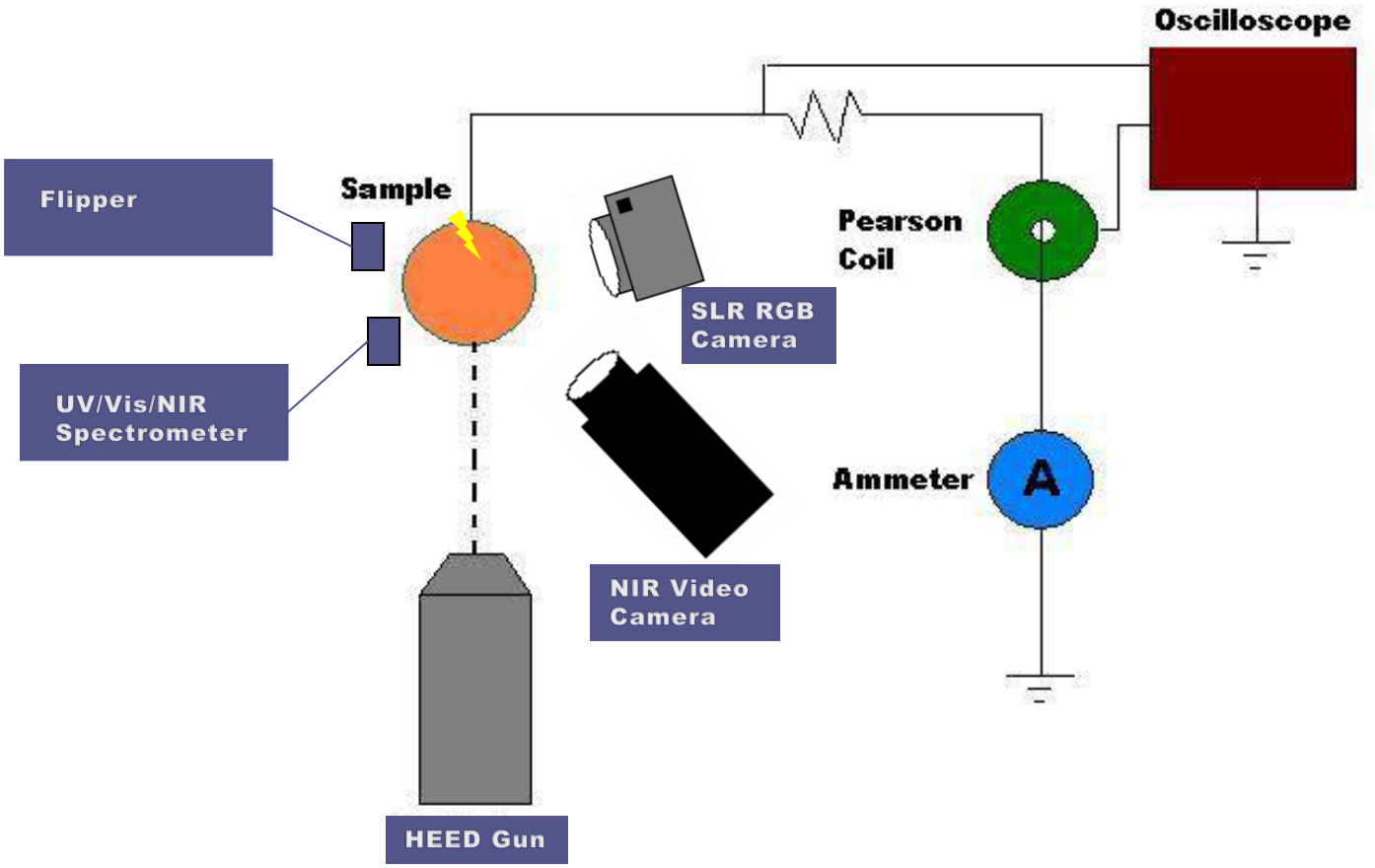
Utah State University
DEPARTMENT OF PHYSICS

Motivation

- Space telescope optical instrumentation

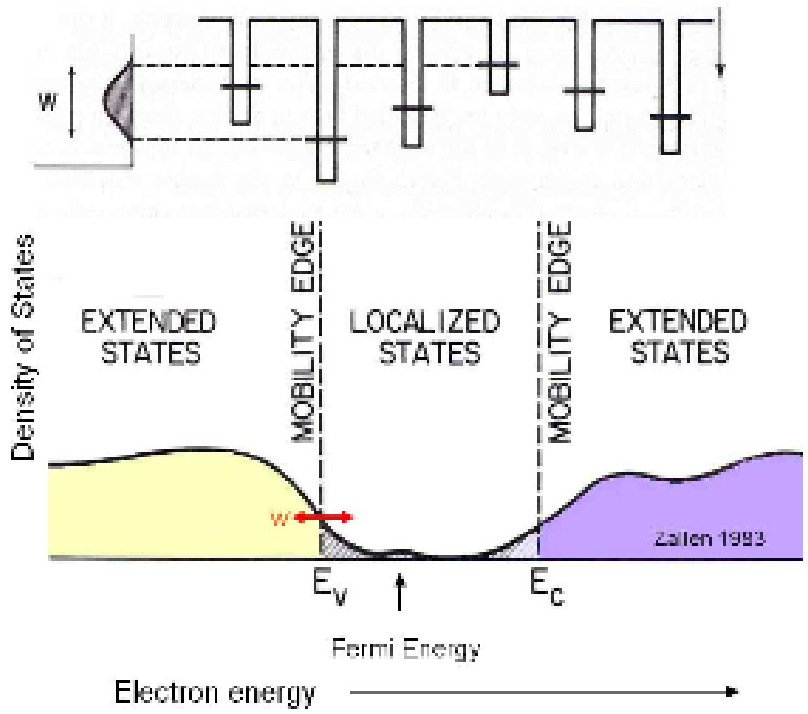
- Wilson, **Electron Energy Dependent Charging Effects of Multilayered Dielectric Materials,** Session M3

Experimental Set-Up

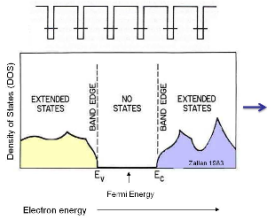


Band Theory Model

Crystal with defects

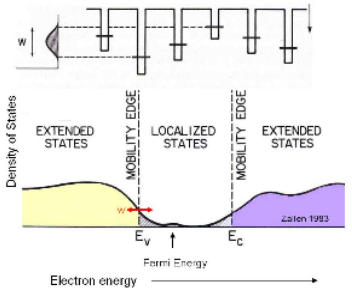


Crystalline Structure

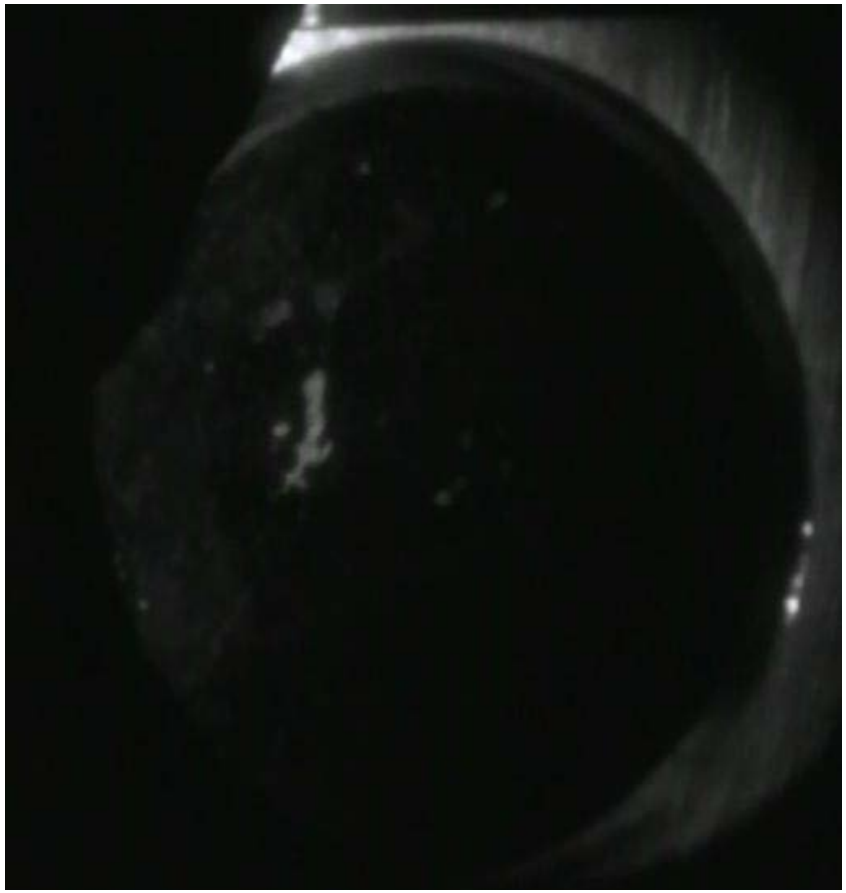


SiO_2: 8.9 eV ~Transparent

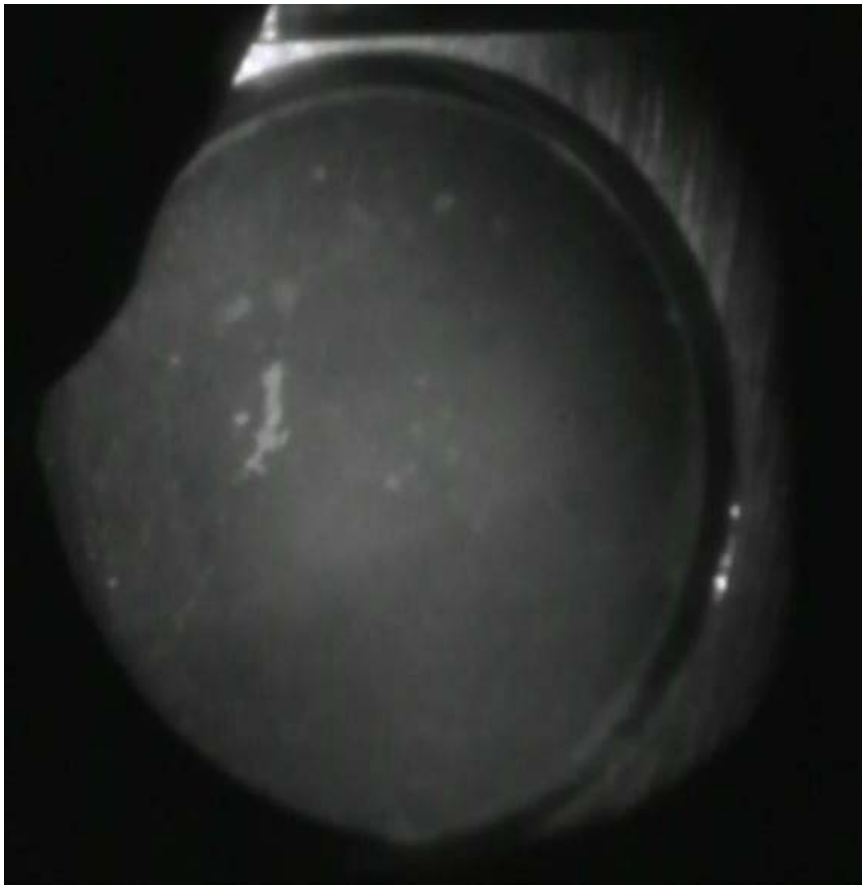
Crystal with defects



Electron-Induced Luminescence of SiO_2 Mirror

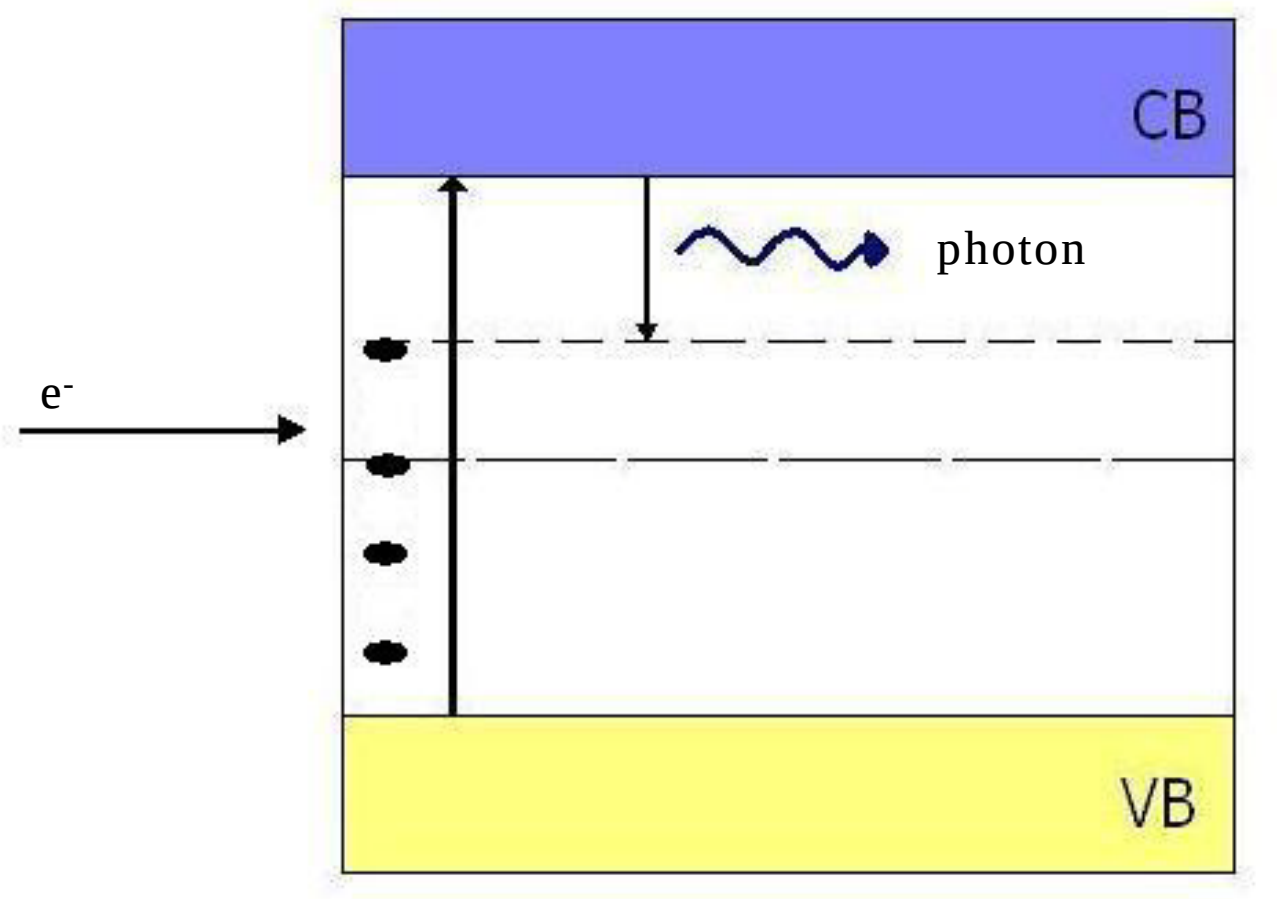


Beam off

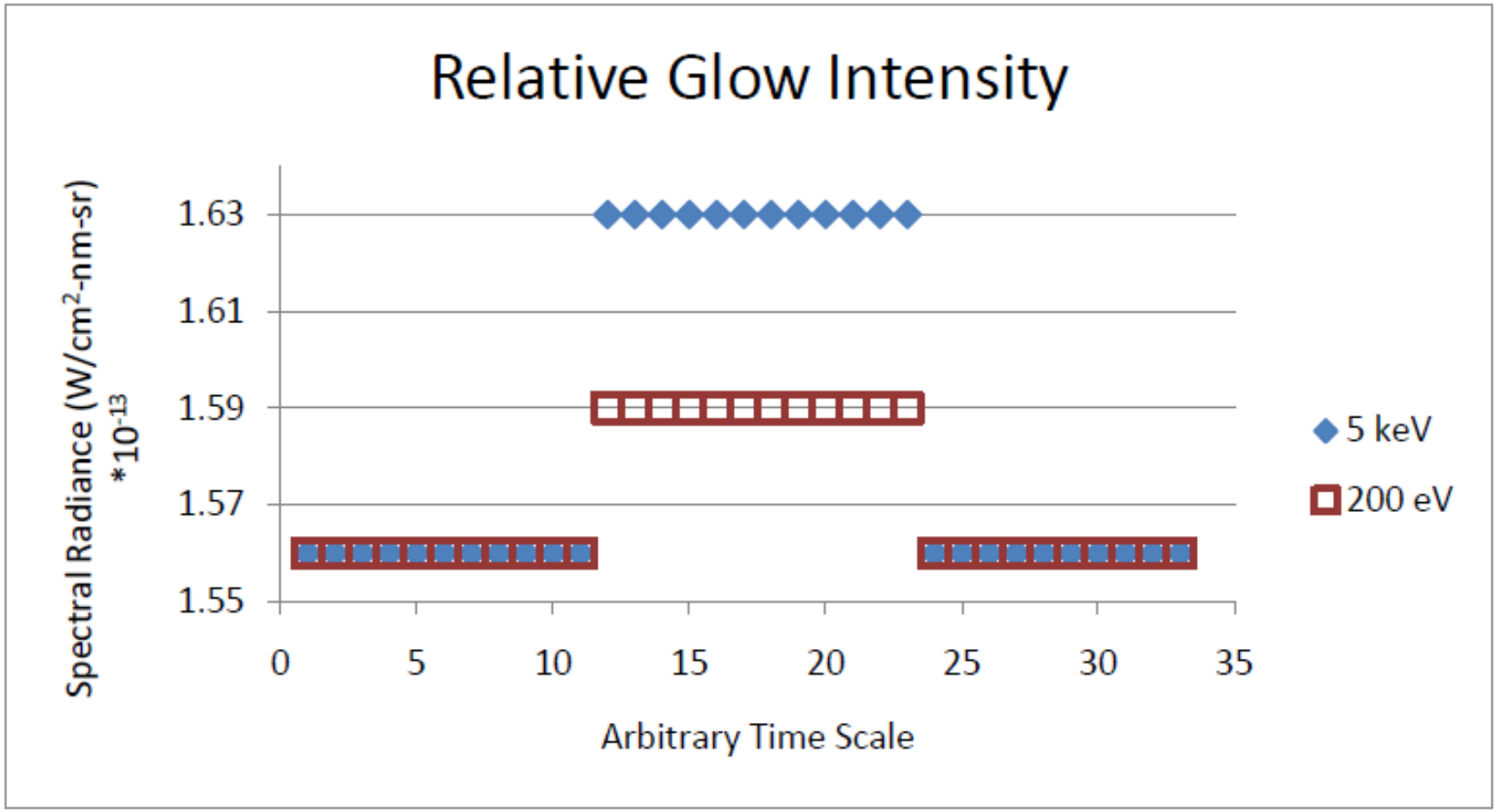


Beam on

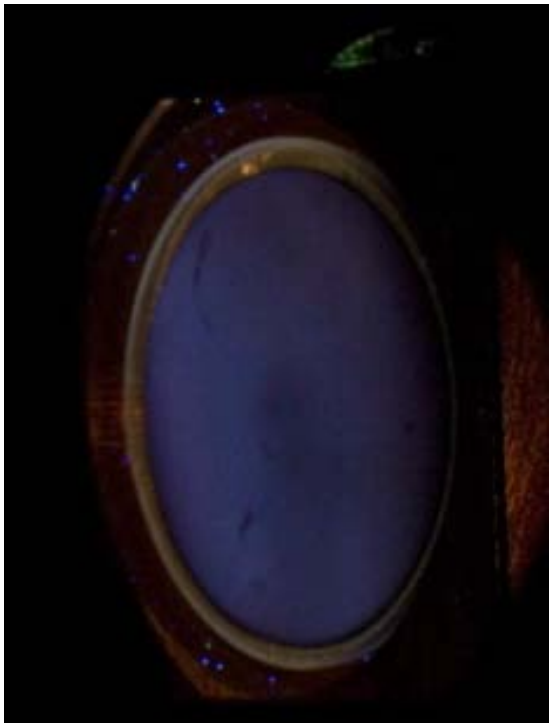
Excitation and Relaxation

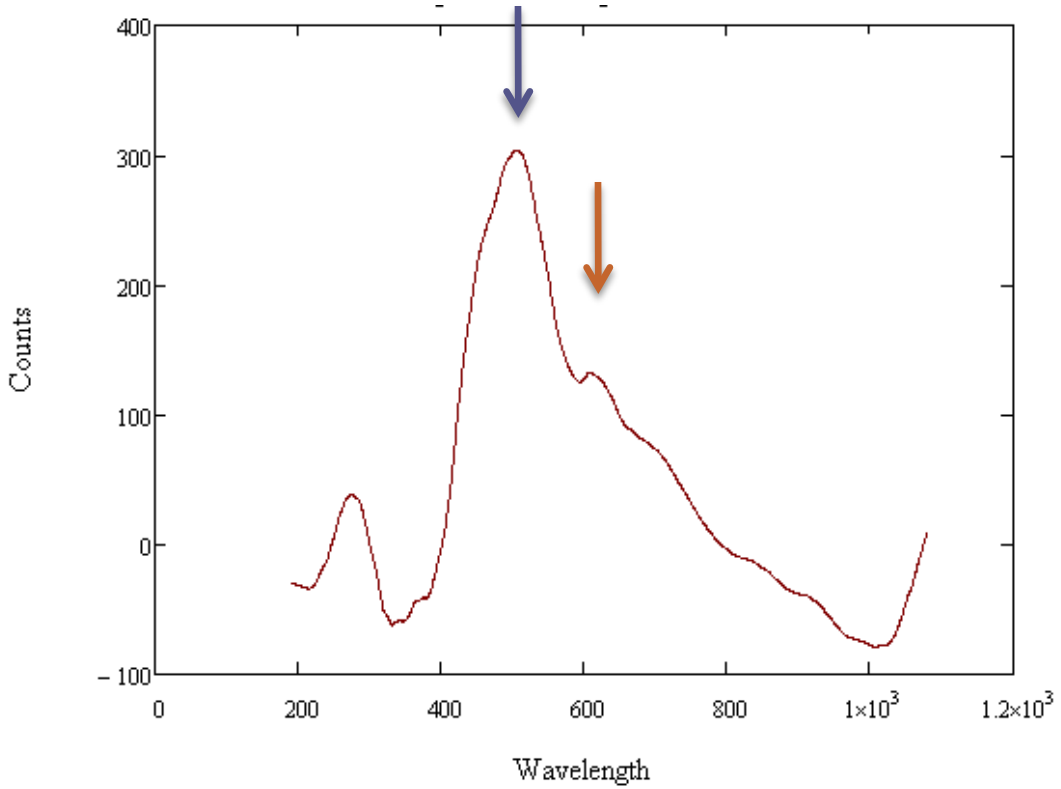


Effect of Beam Energy

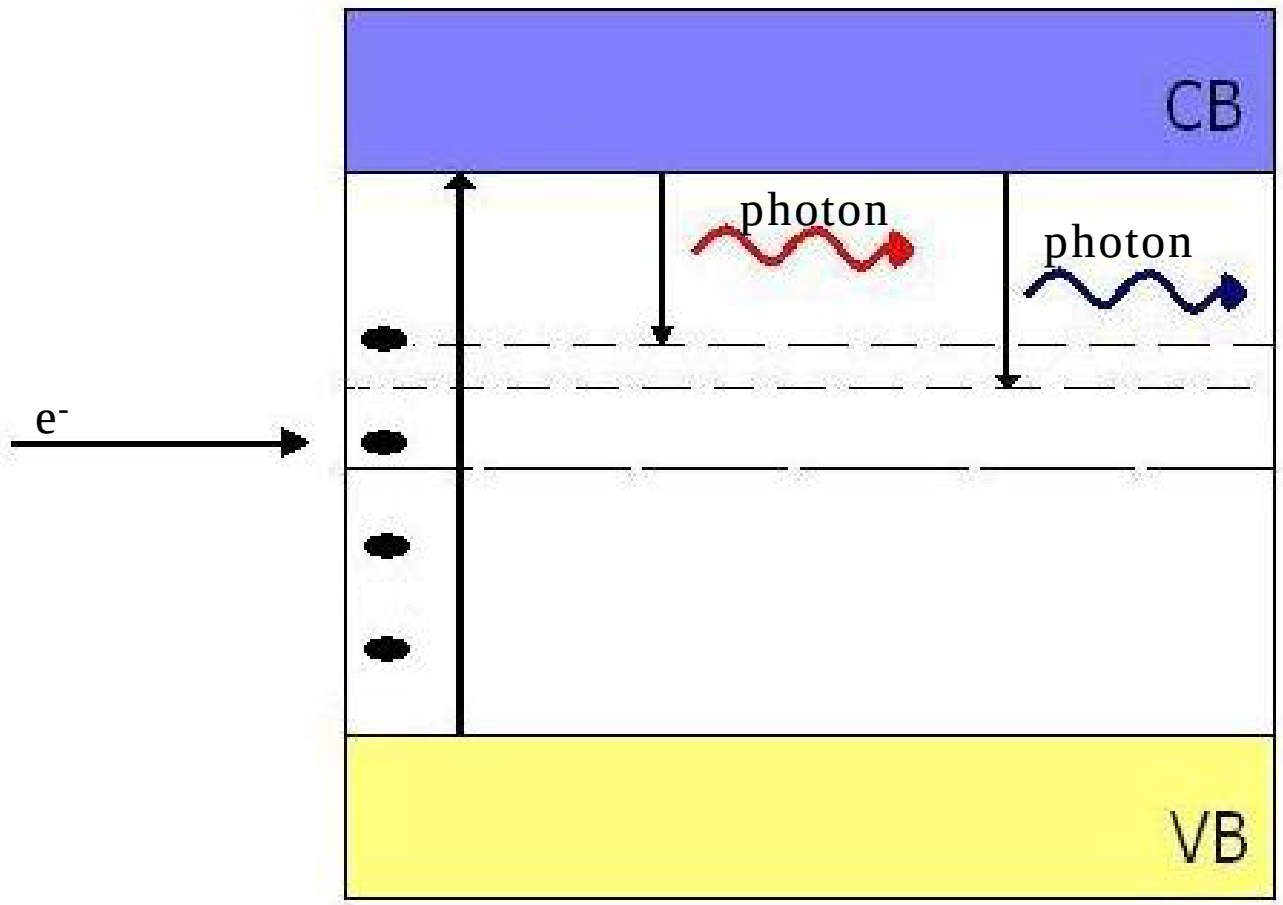


Multi-Photon Luminescence

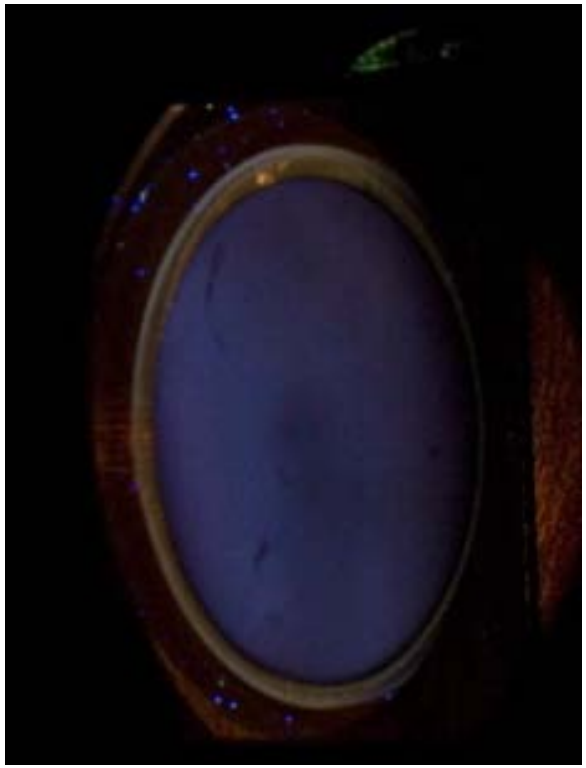




Multi-Photon Relaxation



Temperature Dependent Luminescence

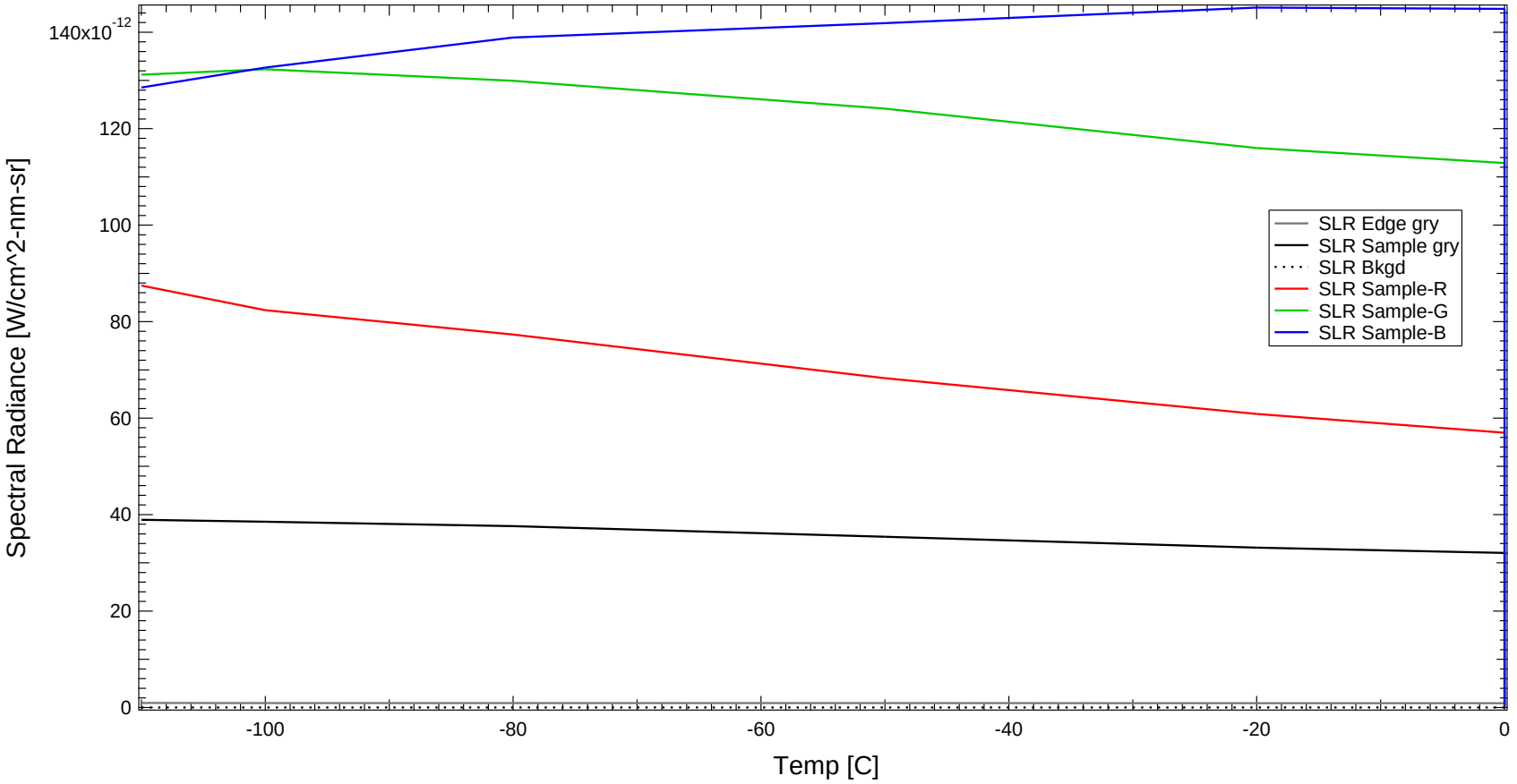


-4 C

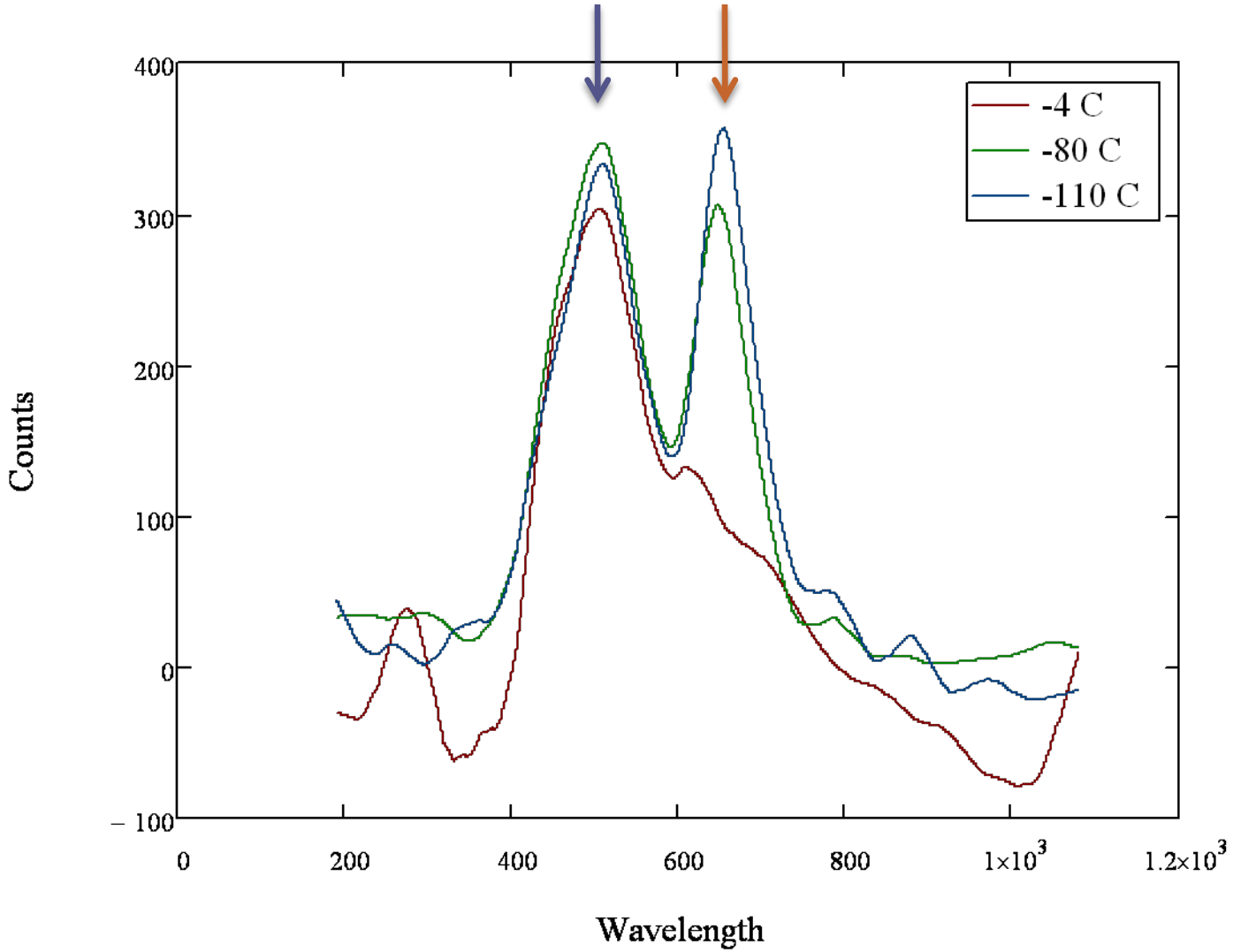
-80 C

-110 C

SLR Spectral Radiance vs Temperature

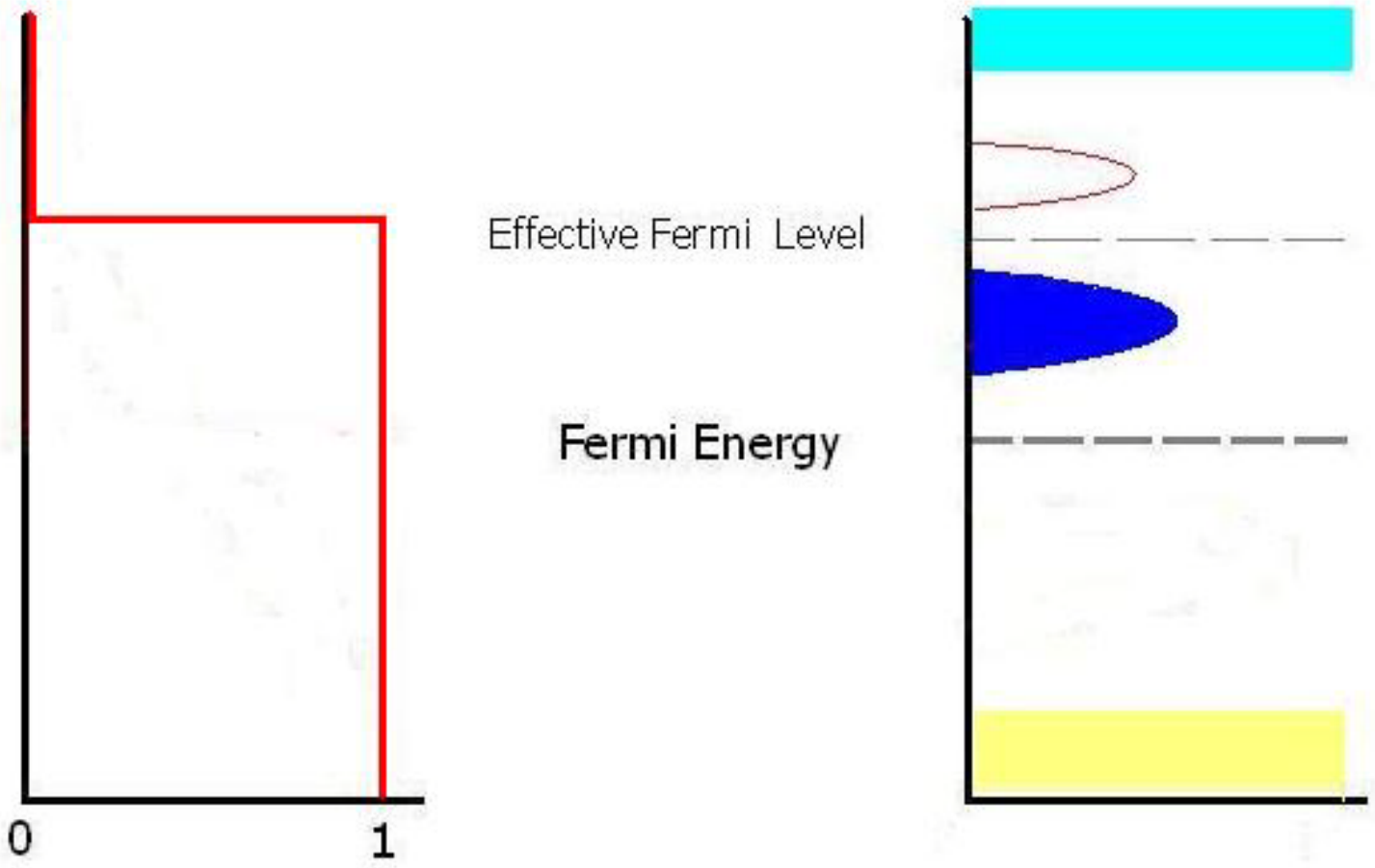


Temperature Dependent UV-Vis Spectra



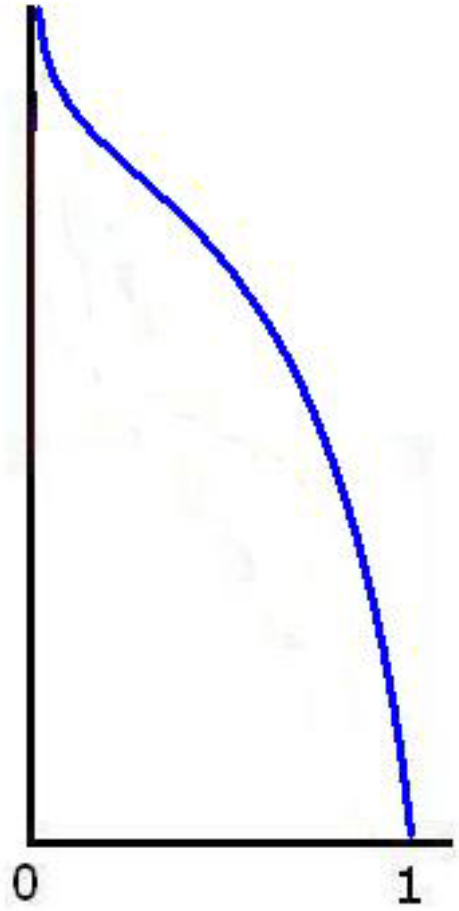
Temperature Model

T = 0



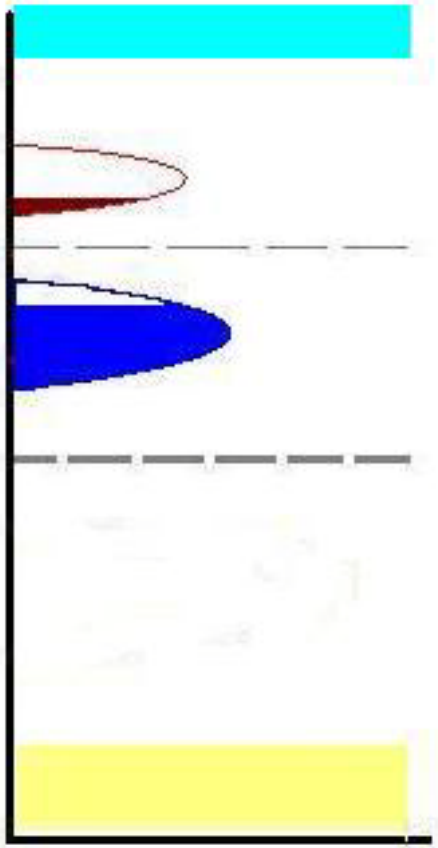
Temperature Model

Low T



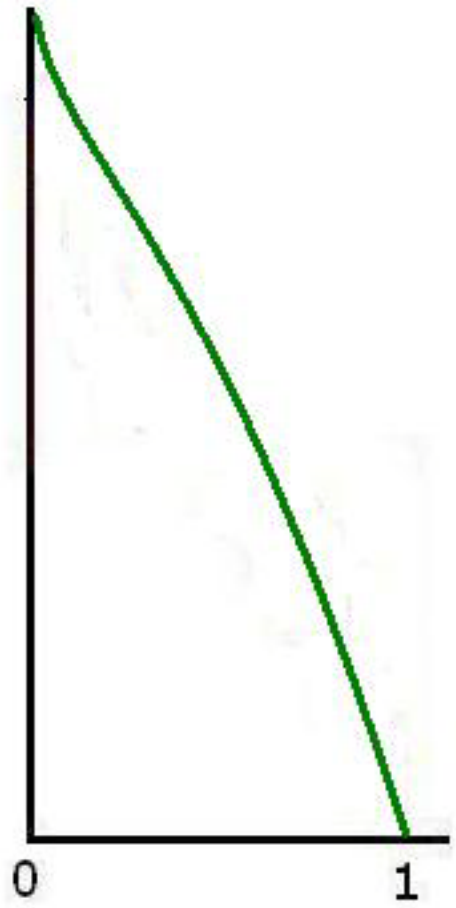
Effective Fermi Level

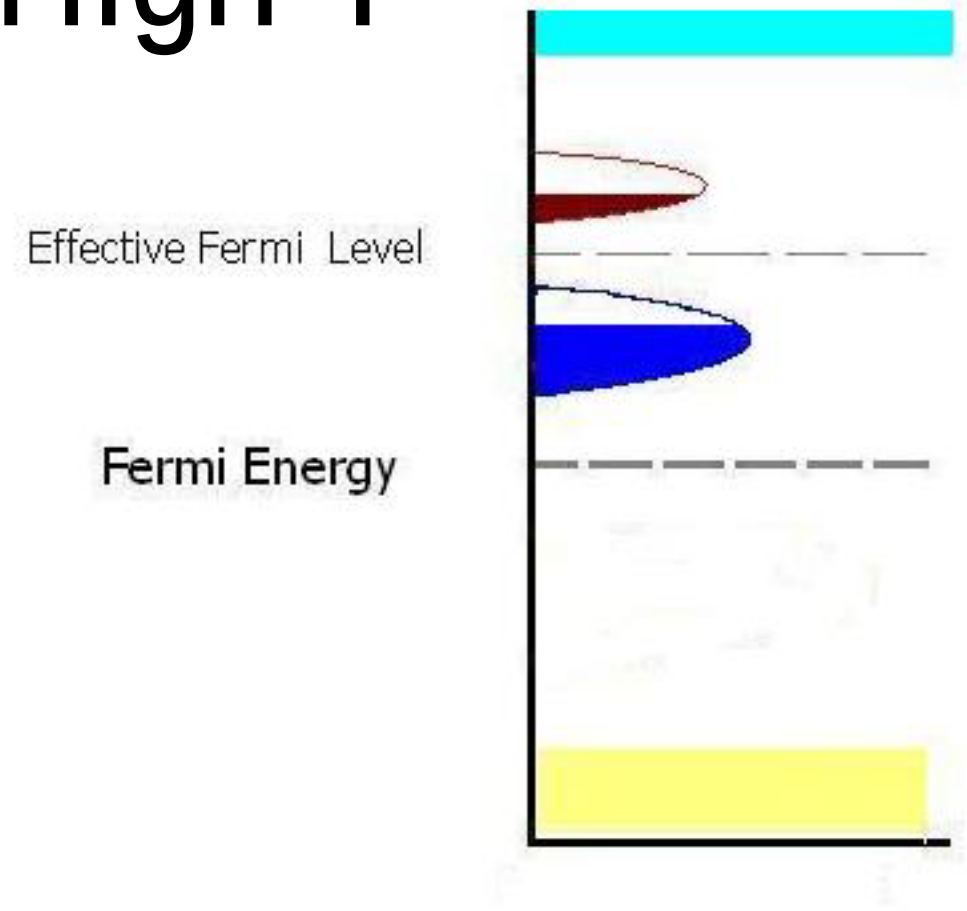
Fermi Energy



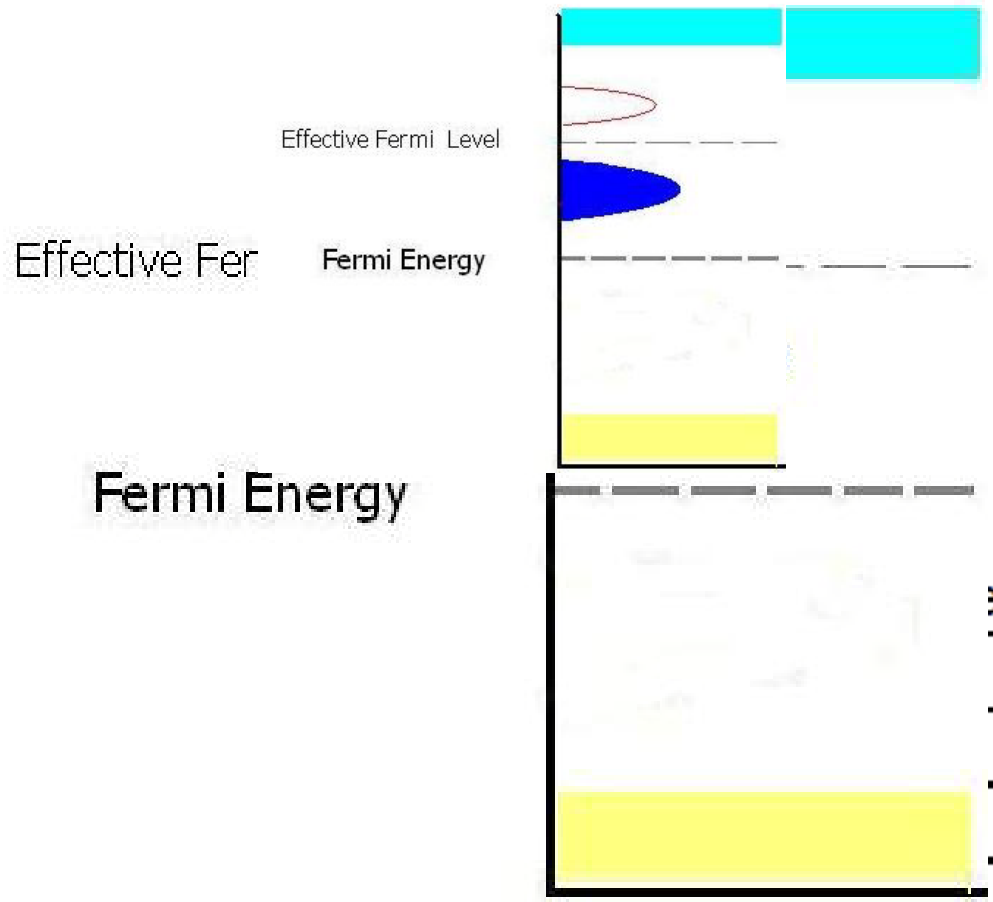
Temperature Model

High T

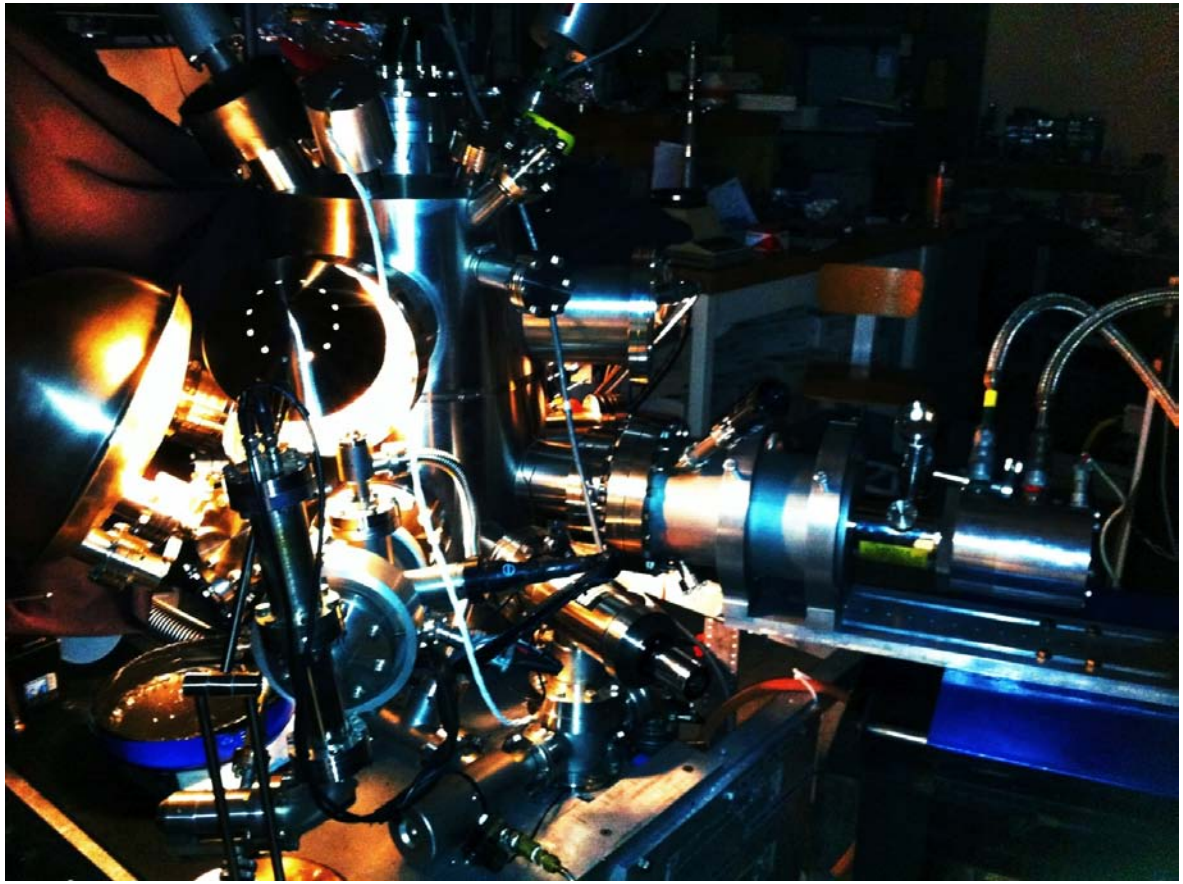




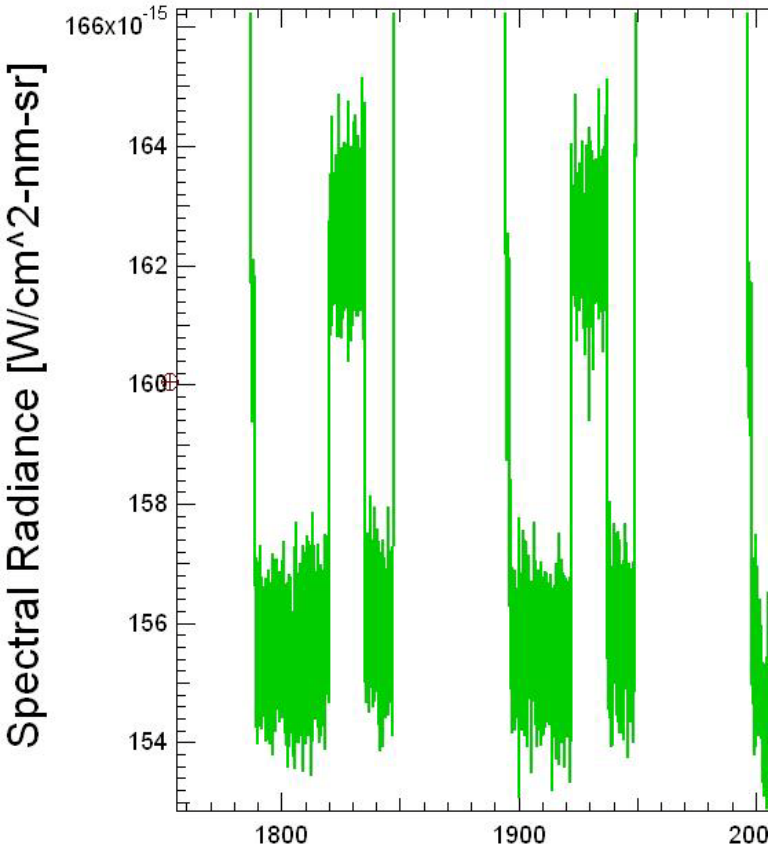
Conclusions

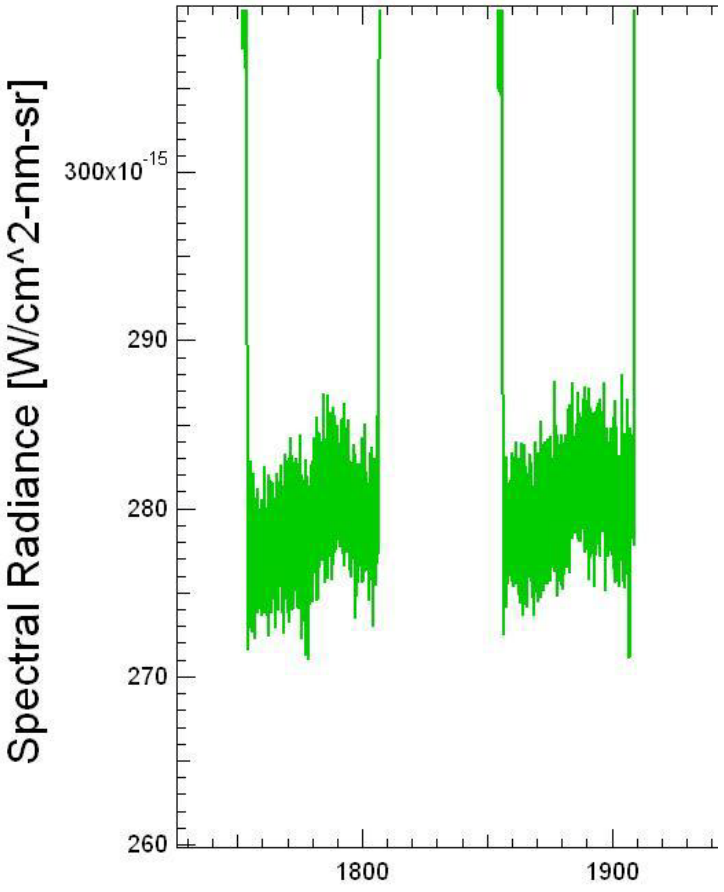


Future Work



Acknowledgement
Funding from NASA Goddard Space Flight Center


Spectral Radiance [W/cm^2-nm-sr]
166x10^-15
164
162
160
158
156
154
1800
1900
200


Spectral Radiance [W/cm^2-nm-sr]
300x10^-15
290
280
270
260
1800
1900