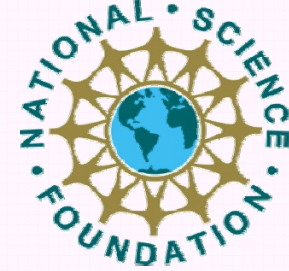


***Fourier Analysis and X Ray  
Diffraction and their Applications  
to the Growth Quality  
Characterizations in Quantum  
Cascade Lasers***

**Ruth Choa, Centennial High School**  
**Jacob Khurgin, Johns Hopkins University**  
**Fow-Sen Choa, University of Maryland  
Baltimore County**

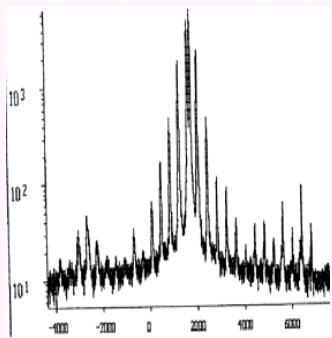




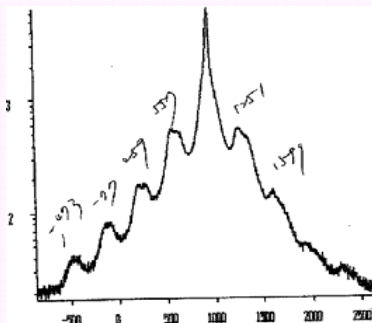
# Motivations

**X-ray diffraction pattern is a Fourier transform of the material layer-structure. By applying the concept of Fourier analysis we hope we can better understand what may have happened during a QCL growth. For Examples:**

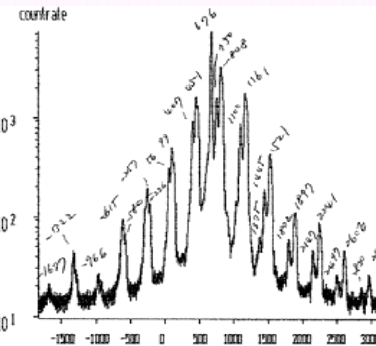
**Missing satellite peaks**



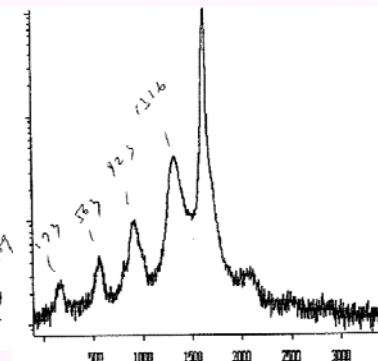
**Broadening and Degradation**



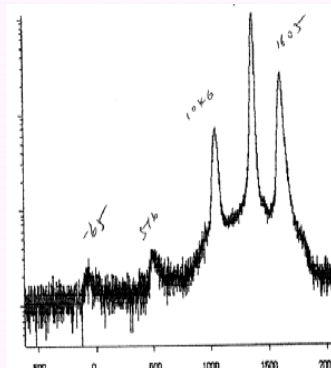
**Double peaks**

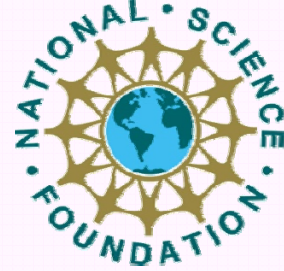


**Asymmetry**



**Background grow up**





# *Issues We Are Interested In*

- 1. Material quality (broadening)*
- 2. Layer thickness reproducibility*
- 3. Interface quality*
- 4. Their effects on the QCL performance*

