# Fourier Analysis and X-Ray Diffraction and Their Applications to the Growth Quality Characterizations Quantum Cascade Lasers

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X-ray diffraction pattern can be described quantitatively by Fourier analysis. The analysis can be applied to either 1-D or 2-D diffraction patterns. For example, in a 1-D superlattice the gradual change of a superlattice period can be observed in the Fourier space as a reduction of the convolution length. The degradation of the superlattice periodicity eventually affects envelop of all the satellite peaks. In this work, we study how different superlattice growth results affect the x-ray diffraction pattern. These include the growth interface defects, the lattice mismatch, and the periodicity of the over all superlattice growth. By comparing simulation results with experimentally measured x-ray data of quantum cascade lasers (QCLs), we expect to able to identify issues or problems in the long QCL growths.