

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Description of a primitive valley scattering unit cell to understand anisotropic inter-valley scattering in AIAs quantum wells S. PRABHU-GAUNKAR, M. GRAYSON, Northwestern University — Valley degenerate systems have an extra scattering channel not present in single valley systems, namely inter-valley scattering. To help classify anisotropic inter-valley scattering in degenerate multi-valley systems, such as AIAs quantum wells (QWs), we define a valley scattering primitive unit cell in momentum space which allows one to distinguish purely in-plane momentum scattering from scattering requiring an out-of-plane momentum component. The standard depiction of a 2D Brillouin zone of a quantum confined valley-degenerate system projects all valleys to a single plane and this depiction loses information about the momentum scattering component that was projected out. Because QW confinement potentials are inherently anisotropic, the disorder potential characteristic of quantum confinement can create anisotropic short-wavelength inter-valley scattering potentials favoring in-plane momentum scattering. We demonstrate that the valley scattering cell for AIAs QWs grown along various orientations is particularly useful in identifying relevant scattering vectors. Initial estimates will be shown of the role of strong electron-electron interactions in AIAs QWs on inter-valley scattering parameters such as inter-valley scattering time, probabilities and rates.

S. Prabhu-Gaunkar
Northwestern University

Date submitted: 22 Nov 2010

Electronic form version 1.4