XMaS the UK-CRG	**Experiment title:** The Structrure of GaSb thin films and of InSb Quantum Dots on GaSb	**Experiment number:** 28.01.32
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Shifts: 18	**Local contact(s):** A. Stunault	*Received at XMaS:*

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Report:

The structure of a series of GaSb thin films grown on GaAs substrates was studied. Scattering was observed, fig 1, from a regular Lomer dislocation lattice from all of the samples. The dislocations are perpendicular to [110] directions and have slightly different spacings in the [110] and [1,-1,0] directions leading to an orthorhombic crystal structure for the thin films. The distortions due to the dislocations penetrate 30Å into the thin films and a similar amount into the substrates showing that they are localised at the interface. The spacing between the dislocations decreases slightly with the film thickness. The scattering also shows a broadened peak centred at the Bragg position, fig 2. For thin films, the width of the peak gives the size of the islands growing on top of a thin layer, while for the thicker films the islands have coalesed and the scattering gives the size of the domains between the threading dislocations. The results show that the islands are anisotropic being longer along the [110] direction than along the [1,-1,0] direction. The evolution of the different features has been studied as the thickness of the films is varied and the qualitative picture is consistent with electron microscopy and atomic force microscopy. The x-ray scattering results do however provide much greater precision particularly for the average strain and domain sizes.

Experiment on the quantum dots were not attempted because the requested beam time was 24 shifts and 18 were allocated but due to synchrotron problems only 15 were useable. The X-Mas instrument operated very well.

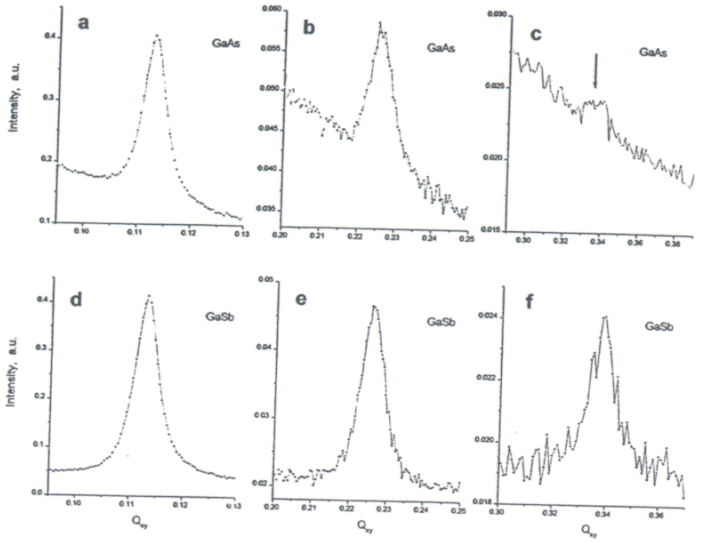

Figure 1 The scattering from the dislocation lattice of a thin film of GaSb on GaAs. The peaks show the first 3 harmonics of the scattering from the distortions in the GaSb and GaAs layers.

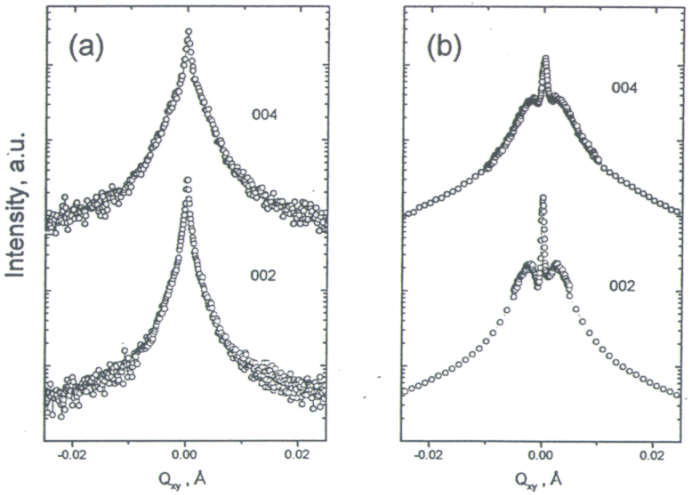

Figure 2. The scattering observed when the wave vector was varied through the (002) and (004) refections of a GaSb film along the [110] and [1,-1,0] directions