ROBL-CRG	**Experiment title:** **Investigation of the lateral ordering and chemical composition in lattice matched A_3B_5 quaternary and ternary superlattices**	**Experiment number**: 20_02_037 (b) EU-M01
Beamline: BM 20	**Date of experiment**: from: 24 11 2000 to: 25 11 2000	**Date of report**: 22 01 2001
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Report:

The aim of the experiment was to continue investigations of the structural properties of the InGaAsP/InP layers, heterostructures and superlattices grown on (001) InP substrate crystals. To this end both the θ/2θ and ω scans have been performed to obtain information on the crystal structure as well in the growth direction in the direction parallel to the interface.

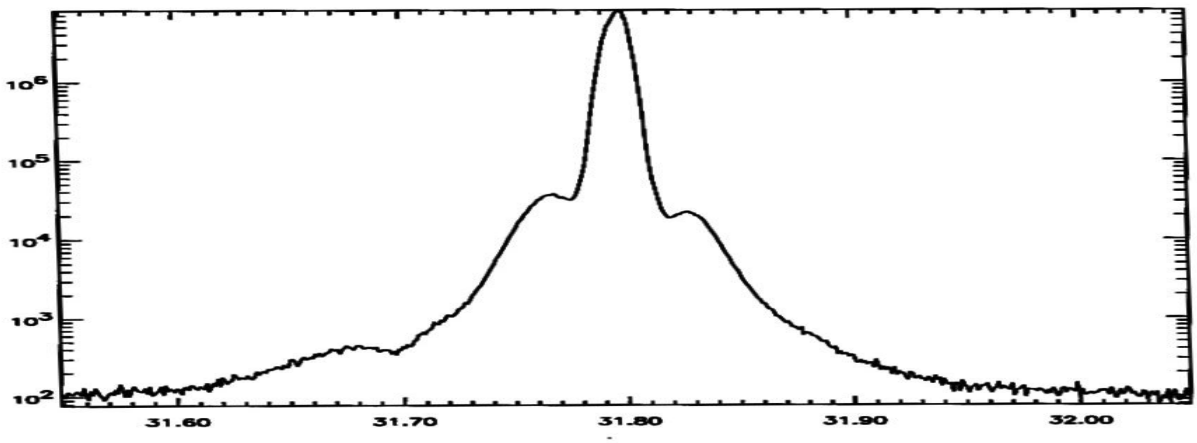

Fig. 1) The ω scan for the sample with layer thickness t=3000A

$In_{0.47}Ga_{0.53}As$ epitaxial single layers grown on (001) InP substrate with thickness: 2000A, 3000A and 4000A were investigated. Intensity profiles of the diffuse scattered radiation for ω scans were measured to determine the density of misfit dislocations (Figs 1). For these three samples the lattice misfit $\Delta a/a$ (relaxed state) was calculated to be: 4.33 10^{-3}, 4.79 10^{-3} and 4.33 10^{-3}, respectively. The In concentration for samples with thickness 2000 Å and 4000 Å amounts to x = 46,9%, and x = 46.27% for the sample with the thickness of

Two heterostructures containing 10nm $In_{0.14}Ga_{0.86}As$ active buried layer grown on 001 GaAs substrate, deposited at different growth rate (2 ML/sec and 0.5 ML/sec), were also investigated. In order to determine the shape of the interface regions, the $\theta/2\theta$ profiles were registered (Fig 2).

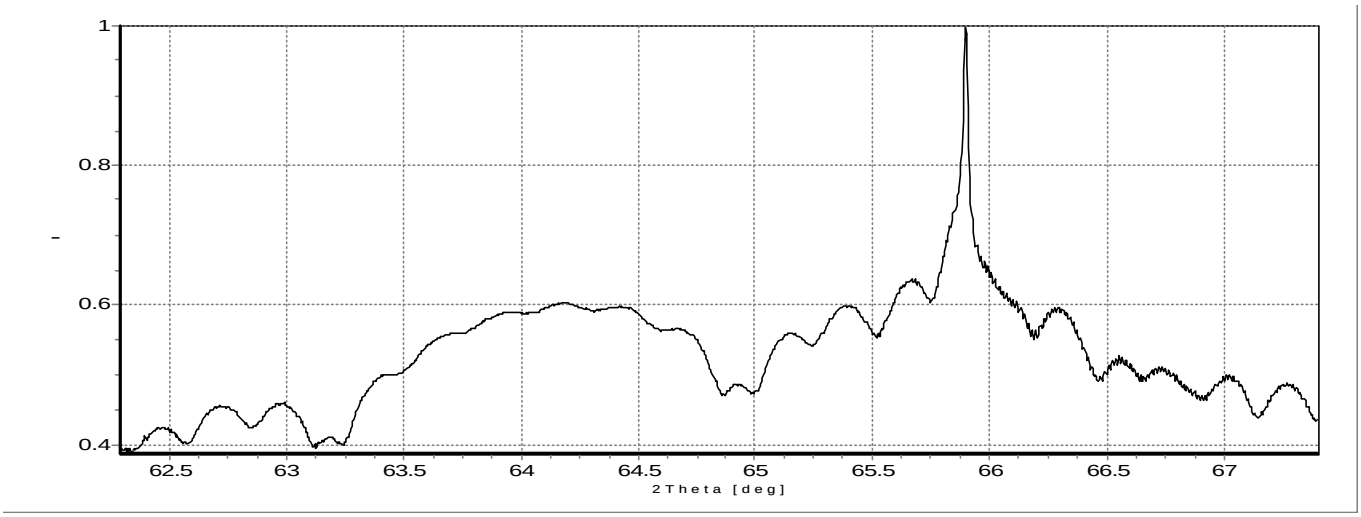

Fig. 2) The $\theta/2\theta$ scan for the heterostructure with 2ML/sec growth rate.

Two 20 periods InGaAsP/InP superlattice crystals with small (1000 ppm) and large (-10000 ppm) lattice misfits produced by 2 MeV As-ion implantation with doses $4x10^{13}$ and $6x10^{13}$ cm^{-2} were investigated. The $\theta/2\theta$ profiles were measured to determine the chemical composition and interplanar spacing profiles. Map of a region of the reciprocal space in the vicinity to the 004 InP substrate reflection was registered that showed high lateral homogeneity investigated samples.