ESRF	**Experiment title:** **High resolution x-ray diffraction of InGaAs/InP short period superlattices**	**Experiment number:** HC-595
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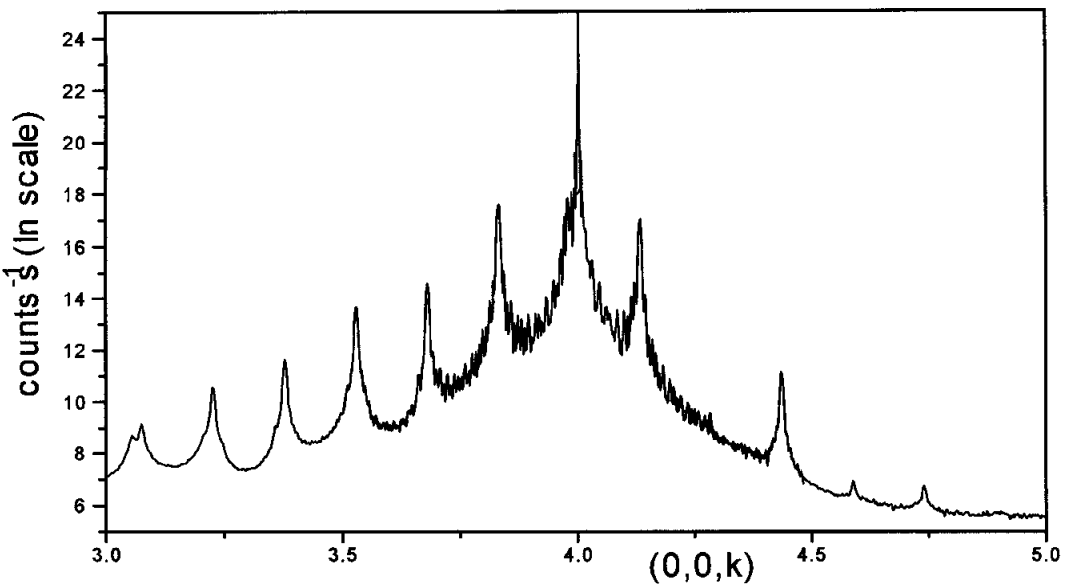
Report:

This experiment represents a further step of an ongoing research program dedicated to the characterization of InP-based multi quantum wells (MQW) by both conventional and syncbrotron radiation (SR) techniques [l-8]. In particular we have used 4 K photoluminescence, high resolution TEM, EXAFS, x-ray standing waves and high resolution X-ray diffraction (HRXRD) to obtain information on the interface structure both **from** a local and from a long range viewpoint.

The target of the present measurements was to determine the atomic composition, along both growth direction and growth plane of a set of short period (30-60 Å) InGaAs/InP superlattices (SPLS) by high resolution XRD. The interest of SPLs's consists in the realization of Wannier-Stark modulators, of confining layers for wave-guides and of cladding layers for lasers the refraction index of which can be varied by changing the well to barrier width ratio; SPSLs are nearly composed only by interface layers and an accurate characterization at the monolayer level is thus of primary importance.

We have measured 6 samples on both (004) and (115) reflections; the obtained XRD patterns are characterized by an excellent angular resolution and a very good signal/ noise ratio, which has allowed to measure even high order SL satellites (characterized by an intensity several orders of magnitude lower of that of the substrate peak). As an example, the figure reports pattern of sample FMQW384 along the (004) reflection.

From the observed angular spacing between satellite peaks we confirm the desired period of the growth as well as the good reproducibility of the hetereostructures, which are state of the art growths for such small periods. The analysis, in the framework of the dynamical theory of diffraction [l-3,6b,l0] is still in progress, but preliminary results indicate that two undesired layers of $InAs_xP_{1-x}$ and $In_{0.53}Ga_{0.47}As_yP_{1-y}$ are present at the InP to $In_{0.53}Ga_{0.47}As$ interface and at the $In_{0.53}Ga_{0.47}As$ to InP interface respectively. The relative importance of these undesired layers increases with the decrease of the period. This picture is in full agreement with a parallel EXAFS study, where the variation of both Ga-P and As-In coordination numbers confirm this model [11]. We are indebted with all the BM2 (D2AM) staff who have enabled us to work under optimal conditions.



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