ESRF	**Experiment title:** Diffraction Anomalous Fine Structure of Super-ordered GaInP Alloy	**Experiment number:** HS-1109
Beamline: BM02	**Date of experiment:** from: 31-05-00 to: 06-06-00	**Date of report:** 23-06-00
Shifts: 18	**Local contact(s):** J. F. Berar	*Received at ESRF:*

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Report:

Samples had been provided, from NRE Laboratory (Golden, CO, U.S.A.), for the experiment of Diffraction Anomalous Fine Structure around the Gallium K-edge of $In_{1-x}Ga_xP$ lattice matched with the GaAs substrate with miscut angles of 0°, 6°, with respect to the (001) direction, undoped, n-doped (Se) and p-doped (Zn) at different doping levels. All the samples were previously extensively characterized by different spectroscopic tecniques and a X-ray Diffraction characterization has been expressely carried out for the DAFS experiment (by R. Forrest at UCLA University, CA, U.S.A.), in order to check the samples cristallinity and the intensity of the "forbidden" reflection, where present.

The experiment can be divided mainly in two sets of measures.

The **first set** includes a number of DAFS spectra recorded in order to optimize the choice of the **allowed reflection**. To obtain a good signal to noise ratio it is possible to record a high intensity reflection with good counting rate, and low background while the DAFS contrast (percentage of DAFS signal with respect to total reflection intensity)

is maximize in connection with low absorption corrections, mainly.

We recorded spectra both for the very intense 0 0 4 reflection and for the "partially forbidden" 0 0 6 for doped and undoped samples for both the epi-layer and the substrate. We also tested the 2 2 2 reflection: the contrast was expected to be high in this case and the geometry was the same as for the forbidden 5/2, 5/2, 5/2. Main advantages would have been : *i)* to extract data from parallel crystallographic planes for the allowed and the forbidden and *ii)* to allow an easy path between the two reflection geometries. The attempt was not successfully, because the epy-layer and substrate peaks are not separated enough throught the energy range necessary for the DAFS analysis. As expected the best DAFS result (good contrast) has been obtained for the 0 0 6 reflection.The resulting spectrum for the 0 0 6 reflection is illustrated in **Fig.1** where epi-layer and substrate DAFS are reported.The opposite shape of the DAFS cuspide, due to the geometry of the Gallium site, has been verified.

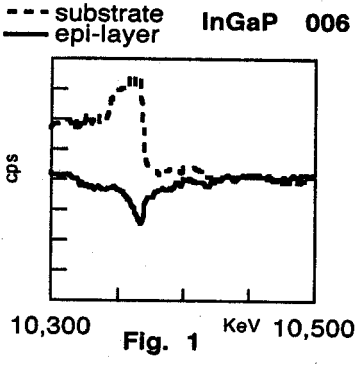

Fig. 1

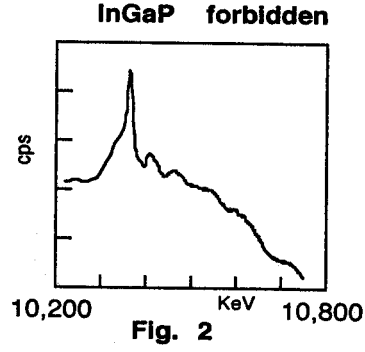

Fig. 2

The **second set** of measures concerns DAFS spectra of the **"forbidden" reflection** 5/2 5/2 5/2 .The measures were recorded using two different procedures in order to test the reproducibility and the signal to noise ratio achievable. Top Scan procedure and acquisition of the whole Bragg spectrum gave comparable results.

In **Fig.2** a tipical example of DAFS for the forbidden is reported.

The beam time allocation for the experiment (18 shifts) would have been enough to complete the study for two samples, taking into account the geometrical diffuculty of the experiment, but a ring major fault left us with no beam for the last three shifts (05/06/00).