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ESRF	**Experiment title: Anisotropic in-plane strain in Y/Dy/Y epitaxial trilayers**	**Experiment number:** **25-02-694**
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Shifts: 12	**Local contact(s):** Dr. Ivan DA SILVA	*Received at ESRF:*

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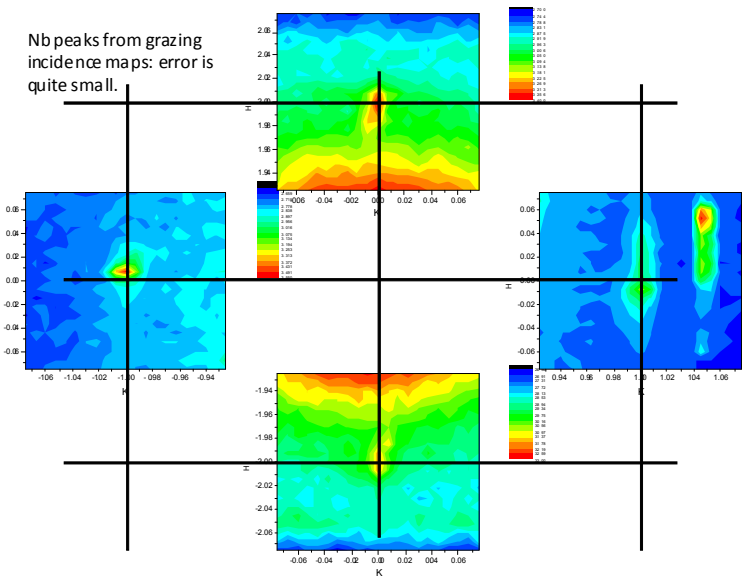
Report:

This experiment was the continuation of the 25-02-673, in which we obtained the orientation matrix of the sample (a hard task considering the non very usual orientation of the hexagonal sapphire substrate and the relative alignment existing among the different Nb and Y/Dy layers; our sapphire substrate had a-cut plane, c-axis in the plane, and not the more common c-cut).

Having this preliminar data, the present experiment started with the identification of

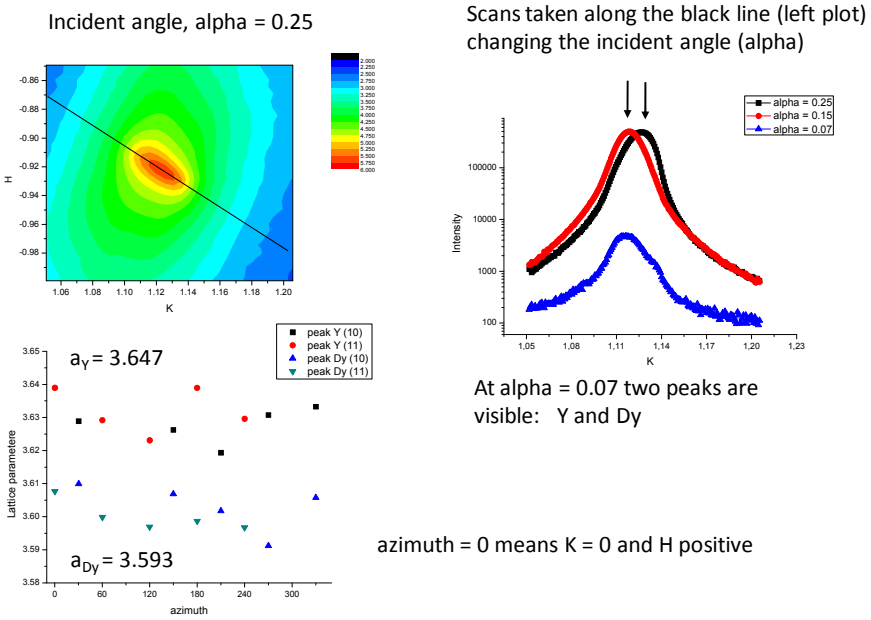


some intense Bragg peaks of Nb (figure below shows the reciprocal space maps of areas around the (010), (0-10), (200) and (-200) Bragg reflections of the Nb buffer layer. The sample was: Sapphire/Nb(100nm)/Y(50nm)/Dy(290nm)/Y(50nm)

After that, we looked for reflections corresponding to the Dy layer by making **hk** scans at low **l**, for different incidence angles, alpha, in order to be able to separate the signal coming from the Y cap layer from that due to the Dy layer, where we wanted to see any anisotropy in tha basal plane lattice parameter.

hk scans, at **l** = 0.15 near the (110) and (100) reflections of Dy (and Y) were made at three different alpha values (0.07, 0.15 and 0.265). The scans were also performed at different azimuth, theta, values, 60º apart.

The figures below summarize the main results obtained from the analyses of the experimental data. As an example, the left upper figure shows a peak which can be attributed to both, the Y cap layer and the Dy layer. From measurements at low alpha, where the Dy contribution should be smaller than that of Y, we deduced the value of the basal plane lattice parameter for Y. Then we tried to separate, form the measurements at higher alpha values, the lattice parameter of the Dy film, but the process was not accurate enough to obtain it with the precision needed to observe a clear dependence on the basal-plane lattice parameter of Dy the azimuthal angle, as it can be observed in the lower left figure.



The final conclusion from the experiment is that, in the determination of the basal plane lattice parameter along different in-plane directions, we could not achieve the precision needed to account for the anisotropy observed in the magnetic measurements, which requires to resolve the lattice parameter with an error smaller than 0.01 pm.