ESRF	**Experiment title:** Anisotropic in-plane strain in Y/Dy/Y epitaxial trilayer.	**Experiment number**: 25-02-673
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Shifts: 17	**Local contact(s)**: Javier Garcia barriocanal	*Received at ESRF:*

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Report:

The main achievement reached at the end of this experiment was the precise determination of the orientation matrix for our particular sample structure. The process lasted several days due to the non very usual orientation of the hexagonal sapphire substrate and to the relative alignment existing among the different layers. Our sapphire substrate had a-cut plane (c-axis in the plane) and not the more common c-cut. Because of this, the initial orientation that we performed, including the beam alignments, lasted two days, even though we only found three peaks of sapphire to define the orientation matrix. Then, the third day, we initiated the search for some presumably intense Bragg peaks of Nb, Y and Dy layers, but we were not successful. We recognized that something was wrong in the determination of the orientation matrix and we started the process again.

Not to waste the beamtime while we analyzed the form to find out the orientation matrix correctly, we employed a day performing determinations of in-plane lattice parameters in a series of Cu/Ni/Cu trilayers, continuation of a previous experiment (25-02-655).

At the end of the fourth day we finally found the correct choice of axes to obtain the orientation matrix (the reciprocal vectors b and c of the sapphire in the sample plane and the third one, another b axis, at 60 deg from the first b and orthogonal to c). In this way, we got 2 sapphire Bragg peaks and refined the orientation with other 9 more.

The rest of the time, practically one day, was employed looking for different RE Bragg peaks. We located only a broad peak at a position compatible with the Nb layer. However, this was during the last day and, probably, having had one or two more days we would have found the RE peaks and determined the in-plane lattice parameters, which was the purpose of the proposal. It should be taken into account that the epitaxial relationships among the sapphire, Nb and RE layers were such as the basal plane main symmetry directions of the Dy and Y were not parallel to the axes to which the orientation matrix was referred, but formed an angle of 5.3º, posing an additional difficulty in the peak search process.