XMaS the UK-CRG	**Experiment title:** X-ray scattering from Fe/Au multilayers.	**Experiment number:** 28-01-02
Beamline: **BM 28**	**Date of experiment:** from: 25/4/98 to: 28/4/98	**Date of report:** 7/10/98
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Report:

The Fe/Au multilayer system may provide the first experimental observation of electron channelling, a phenomenon which can considerably enhance the GMR. The multilayers were grown on MgO (100) and Sapphire (1120) substrates, by MBE, at the University of Leeds.

Low angle X-ray reflectivity measurements already performed elsewhere have enabled a detailed structural characterisation of the multilayer structure. These measurements then need to be consolidated with high angle diffraction measurements in order to study the degree of epitaxial growth and crystallographic texture in such systems. The secondary aim of the work on Fe/Au is to study the two defect model, proposed by Holý et al [1], which suggests that the FWHM of rocking curves taken through the satellite peak positions in the $\theta/2\theta$ scan should vary parabolically with satellite order. The nature of this experiment makes it crucial to obtain $\theta/2\theta$ scans with a good signal to noise ratio in order to be able to locate a large number of well defined satellite peak positions out to high order.

In figure 1 a high angle diffraction scan performed on the XMaS beamline is contrasted with an identical scan performed on Station 16.3, SRS Daresbury. The increased incident flux generated by the focusing optics on XMaS enables a larger number of satellite peak positions at higher order to be located. The satellite peak positions are observed to be symmetric in angular position about the zero order peak.

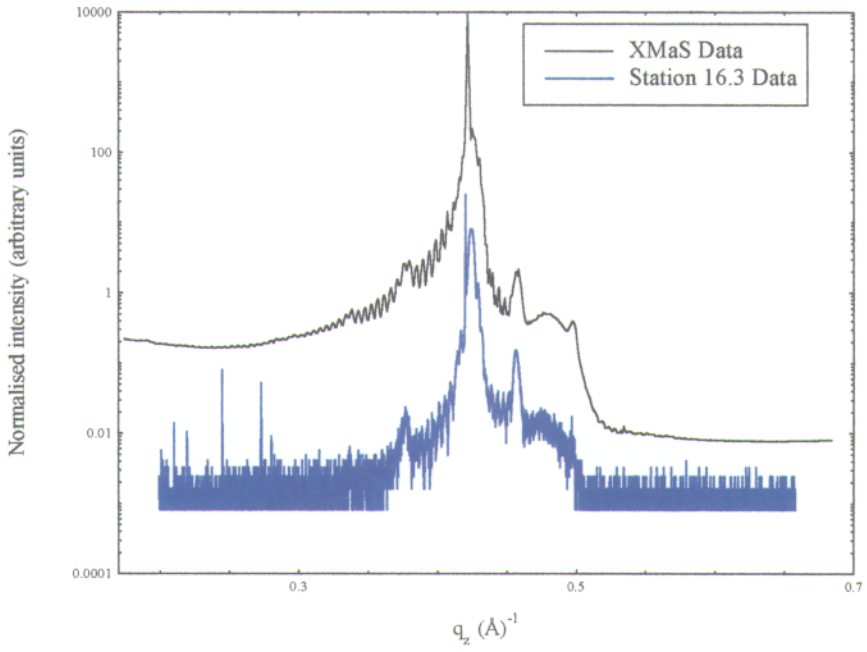

Figure 1. High angle θ/2θ scan for Fe/Au grown on a sapphire substrate.

Fitting of the rocking curves using Lorentzian squared functions, figure 2, reveals two major length scales relating to the mosaic and roughness defect models proposed by Holý et al. Early indications are that the FWHM does indeed vary parabolically with satellite order although further questions relating to the model still need to be addressed.

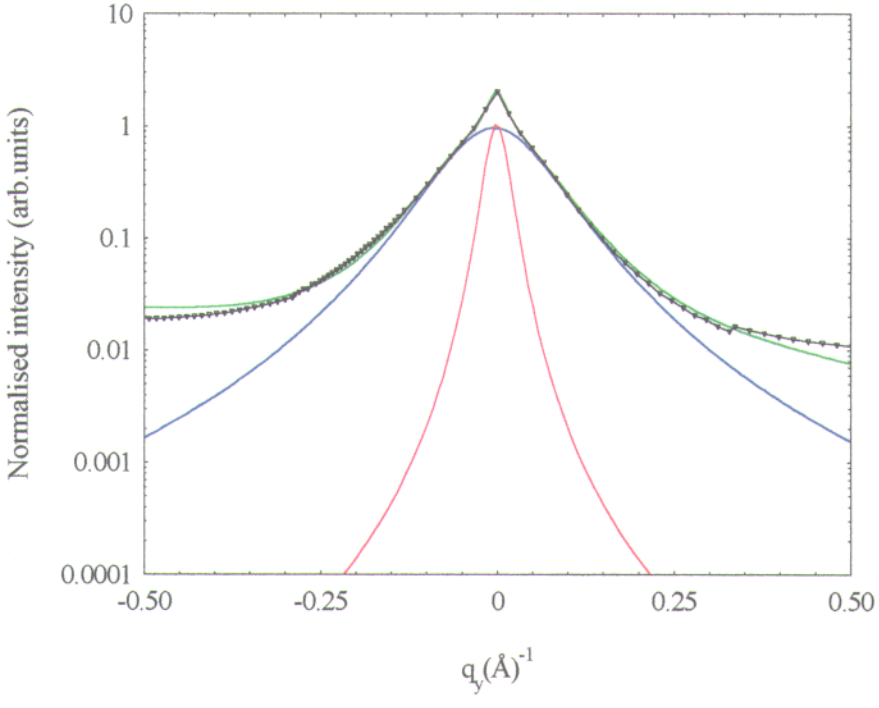

Figure 2. Rocking curve taken through the +1 satellite position.

1. V. Holý, J.Kubena, E.Abramof, A.Pesek, E. Koppensteiner. J.Phys.D 26 (1993) A 146-A 150.