| ESRF | **Experiment title:** Elucidating the structure of synthetic FeNi in the L10 phase | **Experiment number:** HC-2378 |
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Report:
The results from this beam time are summarized and published in:

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## Abstract

FeNi thin films in the $L1_0$ phase were successfully grown by magnetron sputtering on HF-etched Si(001) substrates on $Cu/Cu_{100-x}Ni_x$ buffers. The strain of the FeNi layer, $(c/a)_{FeNi}$, was varied in a controlled manner by changing the Ni content of the $Cu_{100-x}Ni_x$ buffer layer from $x = 0$ at.% to $x = 90$ at.%, which influenced the common in-plane lattice parameter of the CuNi and FeNi layers. The presence of the $L1_0$ phase was confirmed by resonant x-ray diffraction measurements at various positions in reciprocal space. The uniaxial magnetocrystalline anisotropy energy $K_U$ is observed to be smaller (around $0.35\,MJ\,m^{-3}$) than predicted for a perfect FeNi $L1_0$ sample, but it is larger than for previously studied films. No notable variation in $K_U$ with strain state $(c/a)_{FeNi}$ is observed in the range achieved ($0.99 \lesssim (c/a)_{FeNi} \lesssim 1.02$), which is in agreement with theoretical predictions.