ESRF	**Experiment title:** Mechanical Interaction of X-rays with Nano Electro-Mechanical Systems (NEMS)	**Experiment number**: ME-838
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Report:

The mechanical interaction between a tiny germanium block glued to the extremity of an AFM cantilever and an X-ray beam has been studied by measuring the displacement of the cantilever via a Fabry-Perot interferometer coupled to its back. The experimental arrangement is shown on Figure 1. The blue vertical blade is the cantilever (350x35x5 micron), the Ge block is represented in red, the X-ray beam in green and the Fabry-Perot optical fiber in grey with an orange core. The X-ray beam is chopped at the natural frequency of the cantilever-Ge system (2-3 kHz following the type of cantilever) and the Fabry-Perot output is measured via a lock-in amplifier. The aim of the experiment is to mechanically couple the micro-cantilever to the X-ray beam through a well-identified electronic transition: the germanium K-edge threshold. The energy of the impinging beam is then swept through the 1s absorption edge at 11100 eV while the amplitude of the cantilever oscillation is recorder by the interferometer.

As shown in Figure 2, the oscillation amplitude well reproduces the EXAFS features. The error bar is of 5 picometers over a “mechanical edge jump” of about 200 picometers. In this first experiment the excitation is due to mechano-elastic coupling to the X-ray beam. Future experiments will be in position to disentangle these effects from those due purely to radiation pressure.

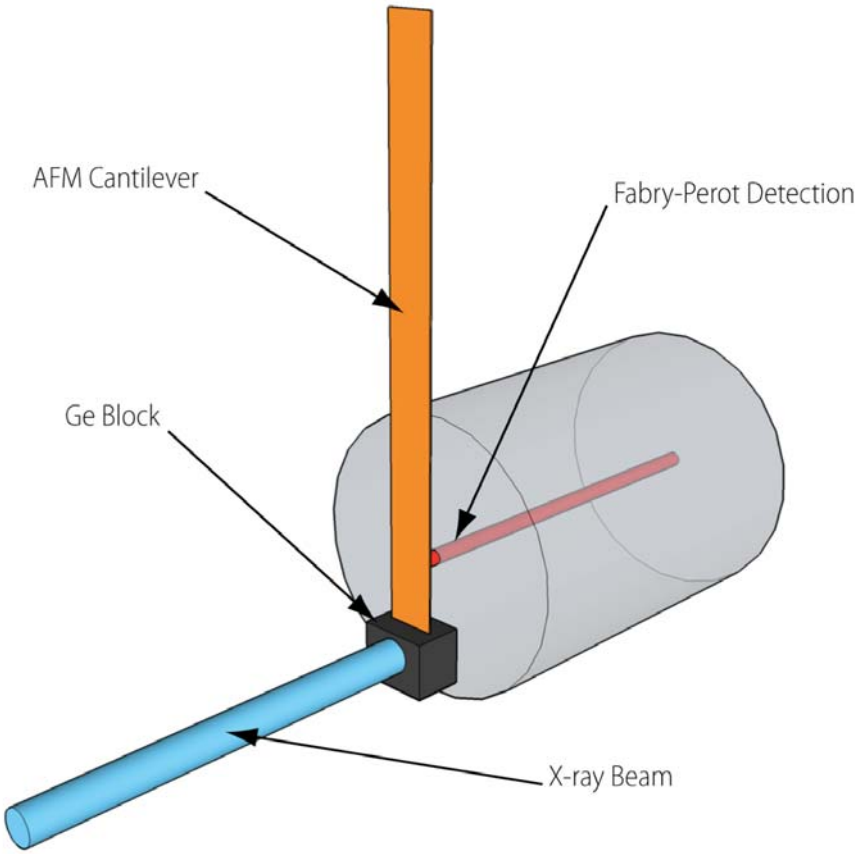

Fig. 1: Schematic of the experimental set-up. Blue: cantilever (350 × 35 × 5 μm); red: germanium block; green: X-ray beam; grey with orange core: Fabry—Perot optical fibre.

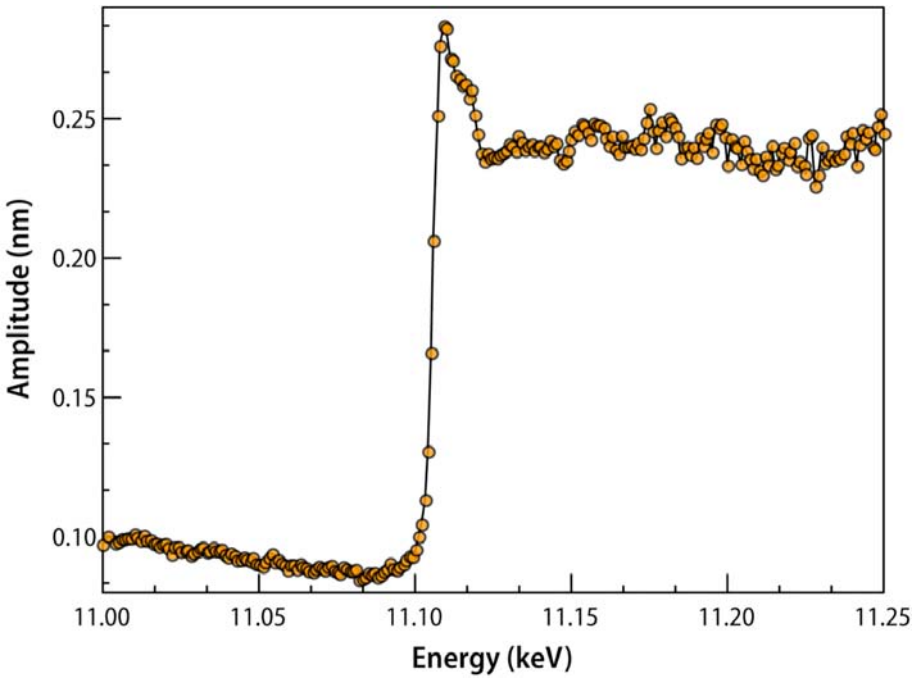

Fig 2: Oscillation amplitude of the cantilever versus the photons energy of the X-ray beam.