



	Experiment title: Low temperature Mössbauer study of the high-pressure Fe ₃ O ₄ phase	Experiment number: HC-5147
Beamline: ID 18	Date of experiment: from: 04.10.2022 to: 10.10.2022	Date of report: 03.03.2023
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Report:

The goal of this experiment was to study the low-temperature behavior of the HP-Fe₃O₄ phase with Mössbauer spectroscopy. The phase had to be obtained *in situ* in the diamond anvil cell (DAC) with laser heating. Because the required heating temperature is below 1100 K, the spectroradiometry detection limit, one needs to heat the sample only relying on his experience and feelings and the results of the heating need to be controlled *in situ* with Synchrotron Mössbauer Source. This imposed a big challenge to the experiment since we had to use different setups, the laser one for the sample synthesis and cryostat for the actual measurements, and switch between them in the course of the beamtime.

The good single-phase HP-Fe₃O₄ sample was successfully synthesized at 20 GPa. Despite our experience gained from the previous experiments HC-4508 and ES-1188, it took three different DACs before we obtained a pure enough sample without admixture of other phases (see the experimental report from HC-4508 about the difficulties of laser heating of this system). After switching to the cryostat setup the rest of the experiment went smoothly. We collected Mössbauer data upon cooling cycles from room temperature down to 10 K at two pressure points at 20 and 40 GPa below spin transition and one pressure point at 65 GPa above spin transition. Therefore we managed to successfully execute the experimental plan and complete the research program which started more than a year ago with the HC-4508 experiment. The data are being processed now and soon a paper will be published based on these results.