ESRF	**Experiment title:** Phase sequence in aluminium up to 0.5 TPa	**Experiment number**: HC-3682
Beamline: ID27	**Date of experiment**: from: 02/03/2018 to 06/03/2018	**Date of report**: 13/03/2020
Shifts: 12	**Local contact(s)**: Volodymir Svitlyk	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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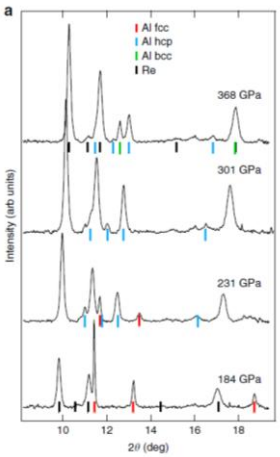
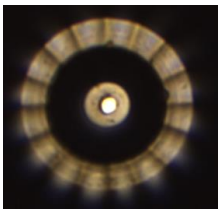
Report:

The aim of the proposal was to observe the sequence of phase transition in the simple metal Aluminium. Several works over the past 30 years have predicted a sequence of phase transition hcc-hcp-bcc below 500 GPa. The fcc-hcp transition had been observed at 217 GPa. The observation of the bcc had remained outside the reach of the standard DAC. With the new design of the toroidal-shape for the diamond anvil tips, pressures up to 600 GPa could be achieved on Au and its equation of state measured.
2 Toroidal DACS were prepared for this project. The first one with a 16 µm diameter culet and the other one with a 25 µm culet. For the 16 µm culet, the sample was to big and become unstable around 120 GPa. In the toroidal-DAC with 25 µm culet , the sample could be compressed up to abpobe 400 GPa.





Sequence of phase transition fcc- hcp - bcc in aluminium under pressure. The photo of the sample at loading is shown.

The sequence of phase transition fcc-hcp-bcc was clearly observed as seen in the figure .

These measuremets have been published in Nature Communication 9, 2913 (2018).