



Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.

Once completed, the report should be submitted electronically to the User Office via the User Portal:

<https://www.esrf.fr/misapps/SMISWebClient/protected/welcome.do>

Deadlines for submission of Experimental Reports

Experimental reports must be submitted within the period of 3 months after the end of the experiment.

Experiment Report supporting a new proposal (“relevant report”)

If you are submitting a proposal for a new project, or to continue a project for which you have previously been allocated beam time, you must submit a report on each of your previous measurement(s):

- even on those carried out close to the proposal submission deadline (it can be a “*preliminary report*”),
- even for experiments whose scientific area is different from the scientific area of the new proposal,
- carried out on CRG beamlines.

You must then register the report(s) as “relevant report(s)” in the new application form for beam time.

Deadlines for submitting a report supporting a new proposal

- 1st March Proposal Round - **5th March**
- 10th September Proposal Round - **13th September**

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

Reports on experiments relating to long term projects

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

Published papers

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report in English.
- include the experiment number to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.



Experiment title: Earth's transition zone and lower mantle through inclusions in diamonds	Experiment number: ES-1331	
Beamline:	Date of experiment: from: 18.01.2023 to: 23.01.2023	Date of report:
Shifts:	Local contact(s): Georgios Aprilis	<i>Received at ESRF:</i>

Names and affiliations of applicants (* indicates experimentalists):

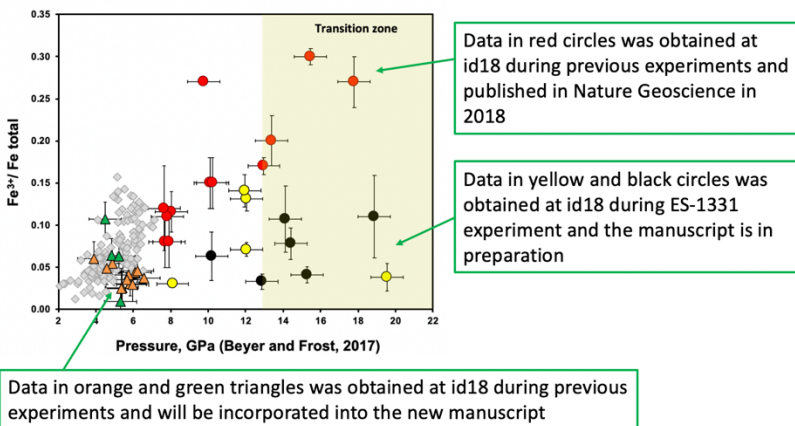
Dr Ekaterina Kiseeva
Dr Leonid Dubrovinsky

Report:

This was the first experiments of my group after the pandemics and I attended in in person, accompanied by Ms Alena Aslandukova and Dr. Denis Vasyukov. During these shifts we analysed a set of majoritic inclusions in diamonds (~11 inclusions) and a few ferropericlase inclusions. Currently, the PI is working on a manuscript using majoritic inclusions.

Scientific report

The data obtained at id8 is summarised in the figure below.



Majoritic garnets are shown in circles and these are the only measured inclusions up to date. The data from Jagersfontein mine (red circles) was published in Nature Geoscience in 2018 (Kiseeva et al. 2018) and this

article is well-referenced. The data in black and yellow circles are majoritic inclusions from Juina, Brazil, and Cullinan, South Africa. The new data allows to expand on the initial study to incorporate different majoritic garnet compositions and different cratons.

The data in triangles shows lithospheric garnet inclusions in diamonds, which are more common than sublithospheric. These are the first measurements of such inclusions. Yet, the team decided that these measurements alone are not enough for a high-impact paper, therefore they will be incorporated into a manuscript together with the majoritic garnets or using the data from subsequent experiments at id14.

As a result of this study we attempted to calculate the oxidation state of the mantle transition zone, addressing the oxygen fugacity of these samples.

The corresponding oxygen fugacities for all majoritic garnets were calculated using an equilibrium involving garnet components (grossular, almandine, pyrope, andradite, Mg-majorite) and SiO_2 . Given reasonable assumptions about SiO_2 activity, $f\text{O}_2$ values are all well above the IW buffer. This result runs contrary to the common assumption that Fe-rich metal is stable in the transition zone.

We suggest that subducting slabs have an important oxidising effect on the TZ and that this region may be more oxidised than previously thought.

