EUROPEAN SYNCHROTRON RADIATION FACILITY
INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

	Experiment title: In situ studies of alternative raw mixtures for green Portland cement clinkers	**Experiment number**: MA2681
Beamline: ID22	**Date of experiment**: from: 24/02/2016 to: 28/02/2016	**Date of report**: 1/09/2016
Shifts: 12	**Local contact(s)**: Carlotta Giacobbe	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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Report:

The experiment was a tricky one, due to the fact that very high temperatures were needed (at least 1450° C) on samples sealed in Pt capillaries because they were air sensitive.
The beamline offers a very nice heater, based on halogen lamps that have their focus on the sample. It is fairly simple to use, and to mantain (the lamp change can be easily performed by the users); the control on the temperature is made possible through a calibration (applied Volts vs temperature, obtained from the thermal expansion of the platinum capillary), that was given to us by the local contact. Unfortunately, the temperature experienced by the sample changes with the usage time of the lamp, but this can easily be solved by 'changing the setpoint (in V) during the heating ramp. Our samples were particularly problematic in this sense, because, if the maximum temperature is not reached, the clinker does not fully form (no fluid phase is produced) and therefore the whole ramp needs to be done again on a fresh sample. It was necessary to check the real temperature of the sample (with the thermal expansion of the Pt capillary) at some temperatures below the maximum one, to be able to

introduce the needed setpoint for 1450° C. Despite this, everything went fine, and we were able to measure all the samples that we planned to measure.
The results are part of a PhD thesis (Matteo Galimberti is the PhD student) and they are not published yet. They certainly will be after the discussion (February 2017).
In the figure, an example of the results: the maximum voltage corresponds to about 1450° C. The legend is as follows: star = SiO2; circle = CaO; open triangle = C2S alfa' L; half-full traingle = C2S alfa'H; full triangle = C2S alfa; square = C3S rhombo
As it can be seen, it was possible to discriminate between the different polymorphs of C2S and C3S, due to the extremely good resolution of the beamline.