



## 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 using the **Electronic Report Submission Application:**

<http://193.49.43.2:8080/smis/servlet/UserUtils?start>

### ***Reports supporting requests for additional beam time***

Reports can now be submitted independently of new proposals – it is necessary simply to indicate the number of the report(s) supporting a new proposal on the proposal form.

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.

### **Deadlines for submission of Experimental Reports**

- 1st March for experiments carried out up until June of the previous year;
- 1st September for experiments carried out up until January of the same year.

### **Instructions for preparing your Report**

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal 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.



spatial resolution of this technique (about 1 $\mu$ m). In the case of quasi-monochromatic beam topography both types of contrasts (two lobes and loop-shaped) changed considerably as a function of the position of the working point on the rocking curves which indicates that the related defects are highly complex. The analysis of the extinction conditions of these contrasts, using more than ten different diffraction vectors, has shown that two-lobe ones never disappeared while it was possible to confirm that a displacement vector component, along a two fold axis of the real space, can be assigned to the defects related to loop-shaped contrasts [5]. Despite simulations are needed (under development) for a full characterization of these two kinds of contrasts, it can be said that two-lobe contrasts correspond to a nearly spherical strain field in the close vicinity of pores, while loop-shaped contrasts results from the spreading of the strain field around pores, precipitates ... during high temperature annealing.

### 2/ Anomalous transmission effect and structural perfection [6][7].

The existence of anomalous transmission of X-rays has been confirmed in small quasicrystal grains, but we have shown in addition that it was discernible despite of the presence of numerous defects at the microscopic level [6]. By coupling X-ray imaging observations with high resolution diffraction, coherent diffraction and diffuse scattering measurements, carried out together with the team of Marc de Boissieu on the same samples, it appeared that the structural perfection of icosahedric quasicrystals is quite comparable to that of metallic crystals. However, this perfection is considerably featured by either uniform phason strains which can destroy the quasiperiodic long-range order, or by long wavelength phasons fluctuations leading to diffuse scattering. The structural perfection was also found extremely variable across as-grown quasicrystal grains and dependent on the presence and characteristics of inhomogeneities often included in the quasicrystal matrix. Regarding the grains that we disposed, it has been impossible to distinguish a clear influence of either the type of alloy or the growth method [7].

### 3/ Effect of annealing on defects and structural perfection

The effect of annealing (up to 800°C) on the structural perfection of stable quasicrystals has been studied, for the first time, in large grains of the icosahedral phase of AlPdMn alloys. The investigation of annealed samples, at room temperature, by combining X-ray imaging techniques (Phase contrast radiography and X-ray topography) and diffractometry has shown that the quasicrystalline quality is improving during annealing, provided that no precipitate is nucleated. The improvement has been mainly ascribed to the relaxation of the strain field around pores [8]. The first results of an "insitu" annealing carried out in the same conditions of temperature and vacuum (UHV) have revealed that this relaxation occurs soon during the first temperature rising while pores start shrinking. Moreover it appeared that the relaxation state was partially maintained during the cooling and could be extended during further annealing cycles, as long as no precipitate was formed. The pore shrinking has been interpreted by a vacancy migration mechanism and a tentative explanation of the relaxation of the strain field around pores has been given [9].

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[2] GASTALDI, J., REINIER, E., JOURDAN, C., GRANGE, G., QUIVY, A. and BOUDARD, M., 1995, *Phil. Mag. Lett.*, **72**, 311.

[3] REINIER, E., GASTALDI, J., MANCINI, L., HÄRTWIG, J., BARUCHEL, J and BALUC, N., 1998 *Physica B*, p 61.

[4] KLEIN, H., AGLIOZZO, S., MANCINI, L., WANG, J., GASTALDI, J., HÄRTWIG, J., BARUCHEL, J., 2001, *J. Phys. D: Appl. Phys.*, 2001, **34**, A98.

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[7] J. GASTALDI, S. AGLIOZZO, A. LETOUBLON, J. WANG, L. MANCINI, H. KLEIN, J. HÄRTWIG, J. BARUCHEL, I.R. FISHER, T. SATO, A.P. TSAI, M. de BOISSIEU (submitted to *Phil. Mag. A* 2002)

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[9] AGLIOZZO, S., Thesis, University of Grenoble, 2002