ESRF	**Experiment title:** Diffuse scattering in AlPdMn single domain icosahedral phase	**Experiment number:** HS-286
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Report:

18 shifts were allocated for the study of the diffuse scattering intensity in a single-grain of an icosahedral-AlPdMn. The aim of this study was to determine the diffuse scattering intensity avoiding the weak Bragg peak intensity integration that implies the use of a low resolution configuration. This study was allowed by the high flux of the ID0l-ESRF beamline.

In figure 1 it can be observed the diffuse shape obtained in a k-space region close to a 2-fold axis direction. The measured k-space length was limited for the long time that took the goniometer motor moving, problem that now is solved in this beam line. In this figure it can be observed:

l- the diffuse shape is along the 3-fold direction of the quasicrystal structure.
2- the diffuse shape change for each Bragg peak. (it can be observed that the small peak are along the opposite 3-fold direction to the bigger ones)
3- the diffuse intensity is very weak compared to the Bragg peak intensity (1e6 times lower) obtaining the background signal (6 counts) in several k-space zones.

This diffusion diagram could be compared with the obtained for a sample that has suffered the same thermal treatment but which has a composition tinny different (figure 2). It can be observed that for the same Bragg peak intensity the diffuse scattering is two order of magnitude higher (notice that the intensity scale is the same in both figures). However, the diffuse shape does not change.

This diffuse intensity depends in the sample composition and does not depend on the quality of the icosahedral structure (for the same Bragg peak intensity the diffuse scattering is 50 times lower preserving their shape). This is a very interesting point that open the door for finding a perfect icosahedral structure and composition. Determining this diffusion-free structure should allow to improve in the knowledge of the origin of this quasiperiodical structure, as it is detailed in the proposal that joint this report in order to continue with this study.

It can be observed that this diffuse scattering can have so low intensity with k-space distribution so characteristic for each peak that in order to a ulterior modeling of the intensity it is necessary to o these studies through mapping intensity in the k-space.