Short report on the measurements performed at DUBBLE
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Proposal Title "Characterizing the components of interstellar dust particles"
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In order to explore the possibility of current and future astronomical X-ray space observatories, containing high resolution X-ray spectrographs, to resolve the structure of interstellar dust particles, we like to obtain NEXAFS and EXAFS absorption structures of interstellar dust representatives.

Direct aim of these measurements was to explore the suitability of the DUBBLE beamline for obtaining these X-ray absorption structures around the Fe-K edge. For this we measured two different chemical compounds (olivines) , in crystalline and amorphous form (a total of four samples).

In addition we measured a similar earthly olivine reference sample and we measured a blank (Boron-Nitride) sample, to obtain some idea of possible systematic errors.

Figures 1 and 2 show some first (raw) results. Both plots show the Fe-K absorption edge for similar chemicals, but with different spatial structure. The difference in high frequency EXAFS absorption structure is striking. Such observed differences are clearly within the capabilities of future astronomical missions (like e.g. the ASTRO-H calorimeter) to resolve.

These measurements show that further exploration of a host of different interstellar dust representatives with the DUBBLE beamline is certainly of crucial importance. The goal is to have a number of measurements which are representative of dust in the interstellar space and implement them into models for astronomical data.

Resolving the spatial structure of interstellar dust particles may resolve key questions about the generation, growth and decay of these nuclei of stars and planet formation.

The results at this stage in line with the expected results as mentioned on the project proposal. Within the framework of exploration of possible instrumental setups suitable for determining X-ray absorption characteristics of interstellar dust representative samples we plan (and currently performing) other measurements of our samples at different energies, in order to explore absorption by the olivine constituents (O, Fe, Mg, Si) in the whole X-ray band (~0.3-10 keV). In combination with these complementary results, the experiments carried out at DUBBLE will be the subject of future publication(s).

Fig 1: Raw data of crystalline sample.

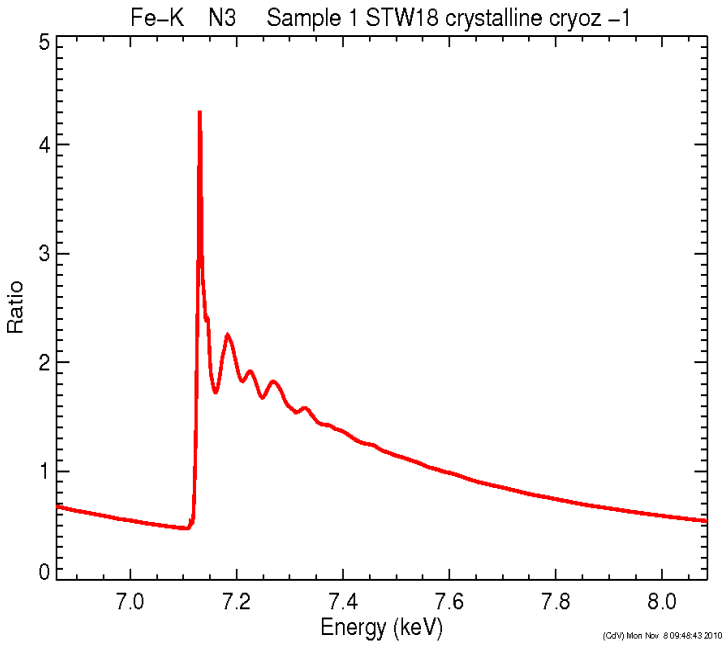

Fig 2: Raw data of amorphous sample.