ESRF

	Experiment title: Coherent inelastic scattering on MgZnY single quasicrystals	Experiment number: HS-1500
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Shifts: 18	**Local contact(s)**: Dr. A. Mermet, Dr. M. Krisch	*Received at ESRF:*

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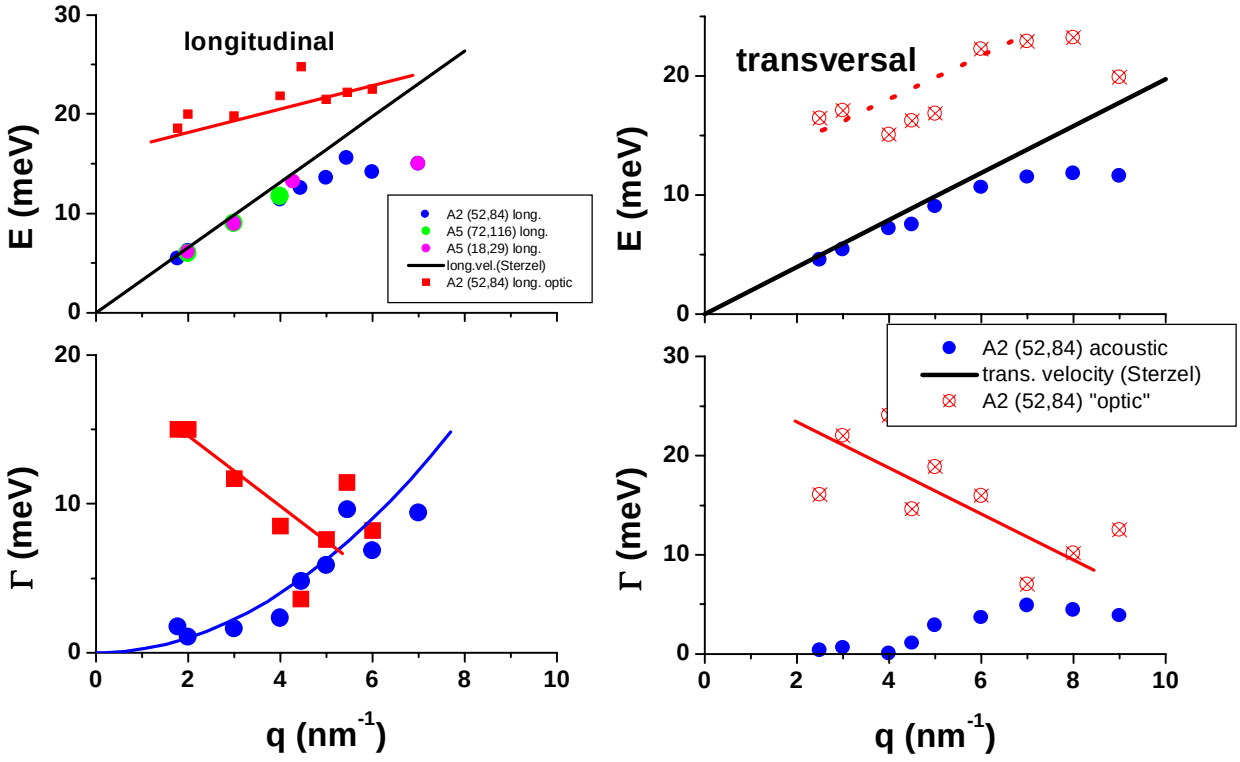
Report:

We have studied the phonon dispersion relation E(k) on two different i-MgZnY icosahedral single quasicrystals using inelastic X-ray scattering (IXS) on ID28. Two single grain samples were oriented, one with the 2-fold (A2), the other with the 5-fold (A5) axis, along the goniometer axis, and polished to produce a perpendicular scattering surface. The samples were mounted with these axis in the scattering plane. We have studied these two samples, measuring the inelastic spectra starting from several different strong reflections along the respective axis: (52,84) along A2 as well as (72,116) and (18,29) along A5. In our experience,measurements along A2 were easier because of less interference with weaker reflections. In both cases we observe an acoustic mode whose speed of sound agrees very well with the measured sound velocity at small reduced wave vectors q, but becomes non-dispersive (or less dispersive) near q ~ 4 nm^{-1}. The linewidth of the transversal mode increases abruptly at this point, while that of the longitudinal one seems to be more progressive, perhaps quadratic in q. A second "optic" mode, showing little dispersion over the whole spanned q-range, can be clearly identified both in longitudinal and transverse geometry. The linewidth of this mode decreases rather than

increases with increasing q. This mode is significantly difference to that found in the case of i-AlPdMn, where for both inelastic neutron scattering (INS) and IXS, a second "optic" mode is seen only in the transversal geometry. Moreover, deviations of the experimental data with respect to a damped harmonic oscillator model function suggest the presence of additional excitations, as we have previously found for i-AlPdMn.



The figures show the dispersion curves for longitudinal and transversal geometries as measured from different reflections along the A2 and A5 axes. It was our experience that measurements along A2 were easier because of less interference with weaker reflections.