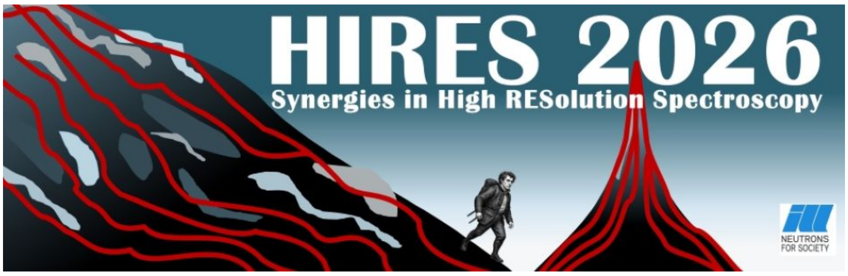

Contribution ID: **16**

Type: **Oral**

ZETA+ : First successes

Neutron resonance spin echo (NRSE) was invented nearly thirty years ago and initially developed to study the lifetime of crystal lattice excitations. It was subsequently used to determine the distribution and mosaicism of a crystal. This technique also allows the measurement of small crystallographic distortions and micro-gaps (a few tenths of a μeV) between different excitations. These measurements can be performed on the crystallographic or magnetic responses of the crystal.

Recently, a third generation of NRSE ($ZETA^+$), was installed on IN22. Compared to the previous generation, it allows measurements down to zero Fourier time or Larmor phase, thus opening the way to exploring new domains for obtaining new information.

The first measurement performed with this new option was the determination of the relatively short lifetime of a phonon in $SrTiO_3$. The result obtained is a phono width of 337 μeV (τ = 3.9 ps) with an energy gap of 2.1 meV. This result could not be obtained with cold triple-axis or time-of-flight spectrometers because the excitation is located near the Γ-point, and therefore too close to different nuclear contributions, and the excitation width is to small. Furthermore, most of the NRSE signal exists only for short Fourier times, making any measurement impossible with previous NRSEs.

The second measurement consisted of determining the distortion of TbB_4 during its transition to its second magnetic phase below 24 K where the structure is expected to change from tetragonal to orthorhombic. Measuring the crystal distortion by Larmor diffraction at the nuclear Bragg peak Q = (400) reveals that the difference between $d_{(400)}$ and $d_{(040)}$ is $4.59(12)\times10^{-4}$.

These examples illustrate the capabilities of $ZETA^+$.

Session

Instrumentation

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