



	Experiment title: Acoustic mismatch due to nanoprecipitates in thermoelectric LAST alloys	Experiment number: HC-1666
Beamline: ID18	Date of experiment: from:09/10/2014 to: 09/15/2014	Date of report: 02/10/2015
Shifts: 21	Local contact(s): Dr.Dimitrios Bessas (email: bessas@esrf.fr)	<i>Received at ESRF:</i>
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Report:

In the allocated beamtime we aimed to determine the influence of Te and Sb nanostructures in the $\text{AgPb}_m\text{SbTe}_{2+m}$ (LAST-m) compounds. Nuclear Inelastic Scattering (NIS) measurement utilizing high resolution monochromator provided us density of phonon states for both ^{125}Te and ^{121}Sb resonances.

Since the resolution function is an important parameter for quality of results, we tried to improve the instrumental function of sapphire backscattering monochromator. In this experiment we obtain the instrumental function with $\text{FWHM}=0.7$ meV for both ^{121}Sb and ^{125}Te nuclear resonance with energies of 37.13 And 35.40 keV, respectively.

Analysis of reduced density of phonon state (DPS), $g(E)/E^2$ allows us to find out the acoustic mismatch between PbTe matrix and Ag/Sb precipitates. We carried out experiment on one LAST3 (AgSbTe_2)+(PbTe)₃, and two LAST18: (AgSbTe_2)+(PbTe)₁₈ samples obtained from different sources at two desired nuclear resonance of ^{125}Te and ^{121}Sb . Understanding behaviour of these compounds demands further investigation and analysis.

1. MaJ, et al., Nat Nano, 2013. **8**(6): p. 445-451.
2. Pereira, P.B., et al., Solidi B-Basic Solid State Physics, 2013. **250**(7): p. 1300-1307.

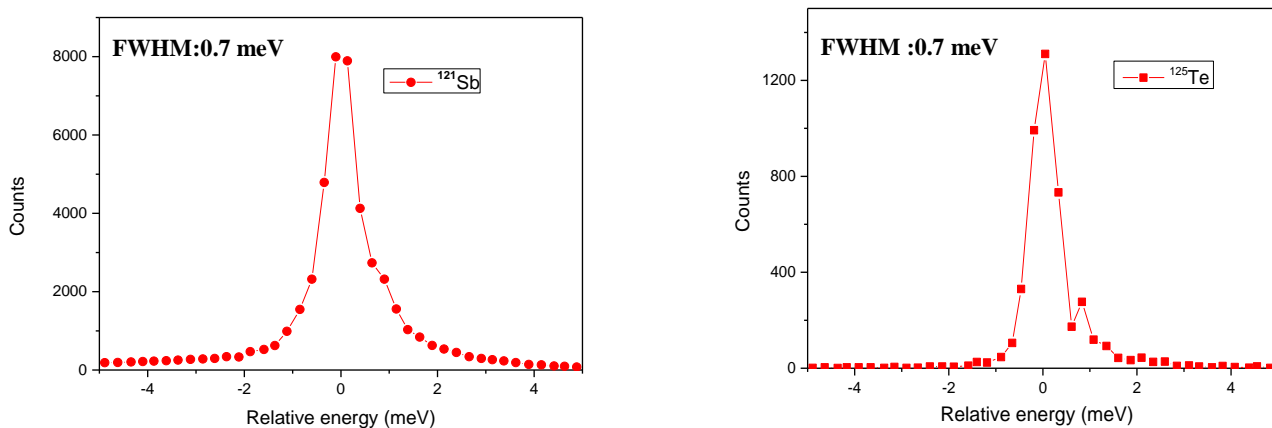


Figure 1. Instrumental functions for ^{121}Sb and ^{125}Te .

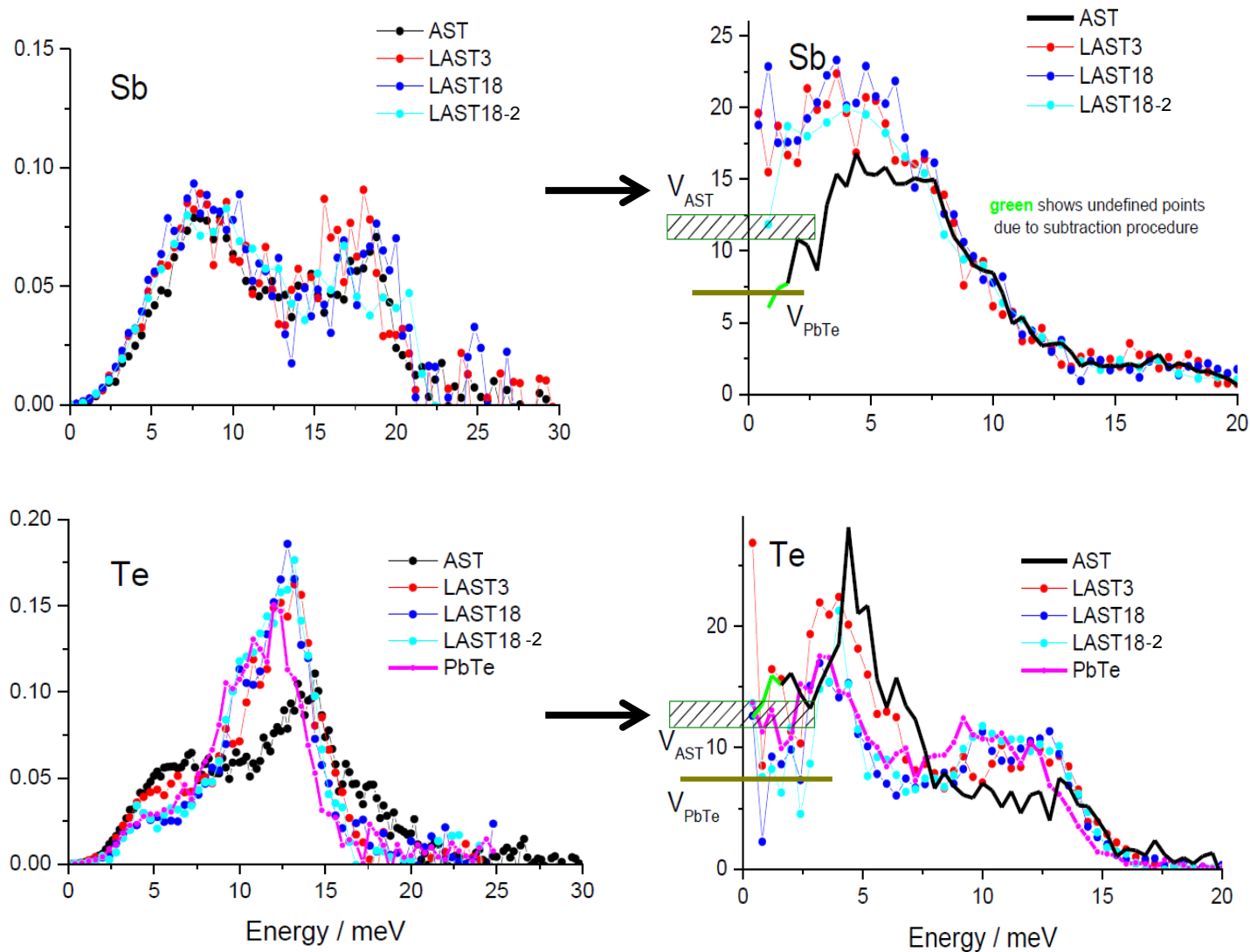


Figure 2. Partial Sb DPS of LAST and AST compounds at (top-left) and their corresponding reduced DPS (top-right). Partial DPS of LAST, AST [1] and PbTe [2] (bottom-left) and corresponding reduced DPS (bottom-right).

Estimated Debye levels of AST[1] and PbTe [2] are shown as filled box and green line, respectively.