Pharos
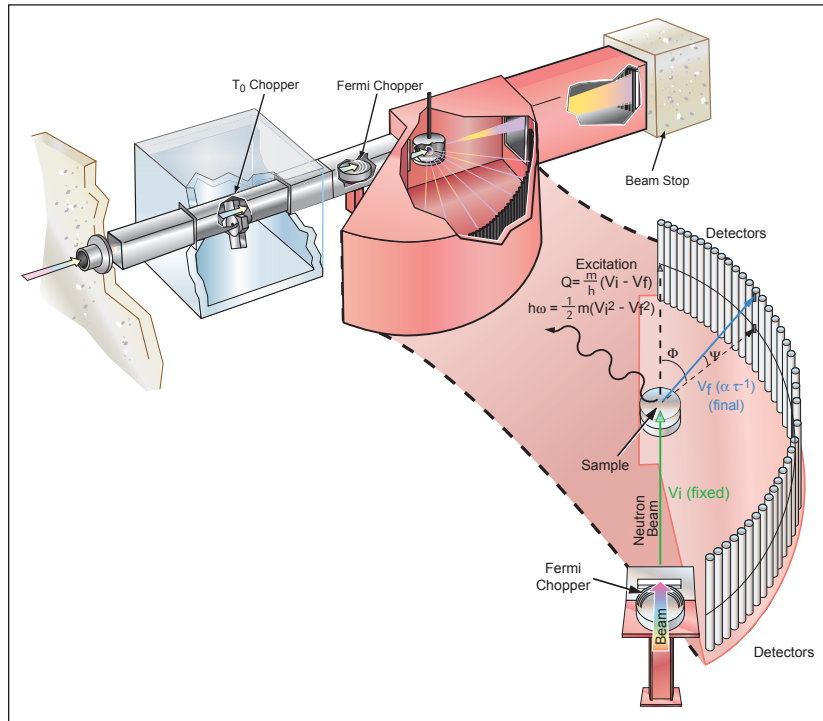
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Pharos is designed for studies of fundamental excitations in condensed-matter systems. The instrument provides 2% to 4% incident energy resolution and uses a high-speed Fermi chopper to obtain monochromatic incident energies in the range from 10 meV to 2 eV. The sample is positioned 20 m from a chilled-water moderator. The spectrometer consists of an evacuated, shielded flight path with 10 m^2 of meter-long position-sensitive detectors located at a distance of 4 m from the sample and covering scattering angles between -10° and 145°. Pharos can accommodate the full range of inelastic scattering experiments on liquid, polycrystalline, and single-crystal samples. This includes phonon and spin-wave dispersions, phonon density of states, magnetic excitations, momentum distributions, spin-orbit and crystal-field levels, chemical spectroscopy, and measurements of $S(Q,\omega)$ in disordered systems. In addition, the low-angle detectors are available for use at distances between 4 and 10 m with scattering angles down to 0.65°, thus making it suitable for high-resolution inelastic studies (< 1% resolution) at low Q.

Specifications	
Incident energy resolution	$\Delta E_i/E_i$ = 2% to 4%
Moderator-chopper distance	18 m
Chopper-sample distance	2 m
Moderator	Chilled water at 283 K
Fermi chopper frequency	60–600 Hz
Fermi chopper diameter	10 cm
Fermi chopper slit spacing	1 mm or more
Sample size	up to 5 cm x 7.5 cm
Detectors	10 m2 of meter-long position-sensitive detectors at 4 m from the sample and scattering angles between -10º and 145º; 1 m2 of detectors in forward scattering position can be moved up to 10 m from the sample
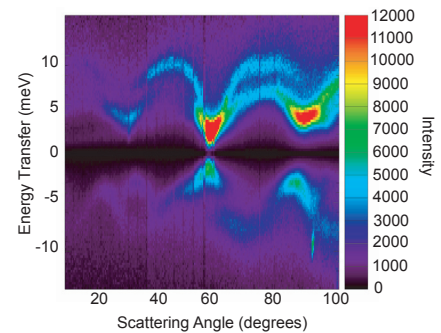
Phonon dispersion of Pb at room temperature as measured by Pharos. The intensity of phonon branches are shown as a function of energy transfer and scattering angle. The data can be used to obtain the forces between Pb atoms and verify first-principles electronic-band structure calculations used in equation-of-state efforts.