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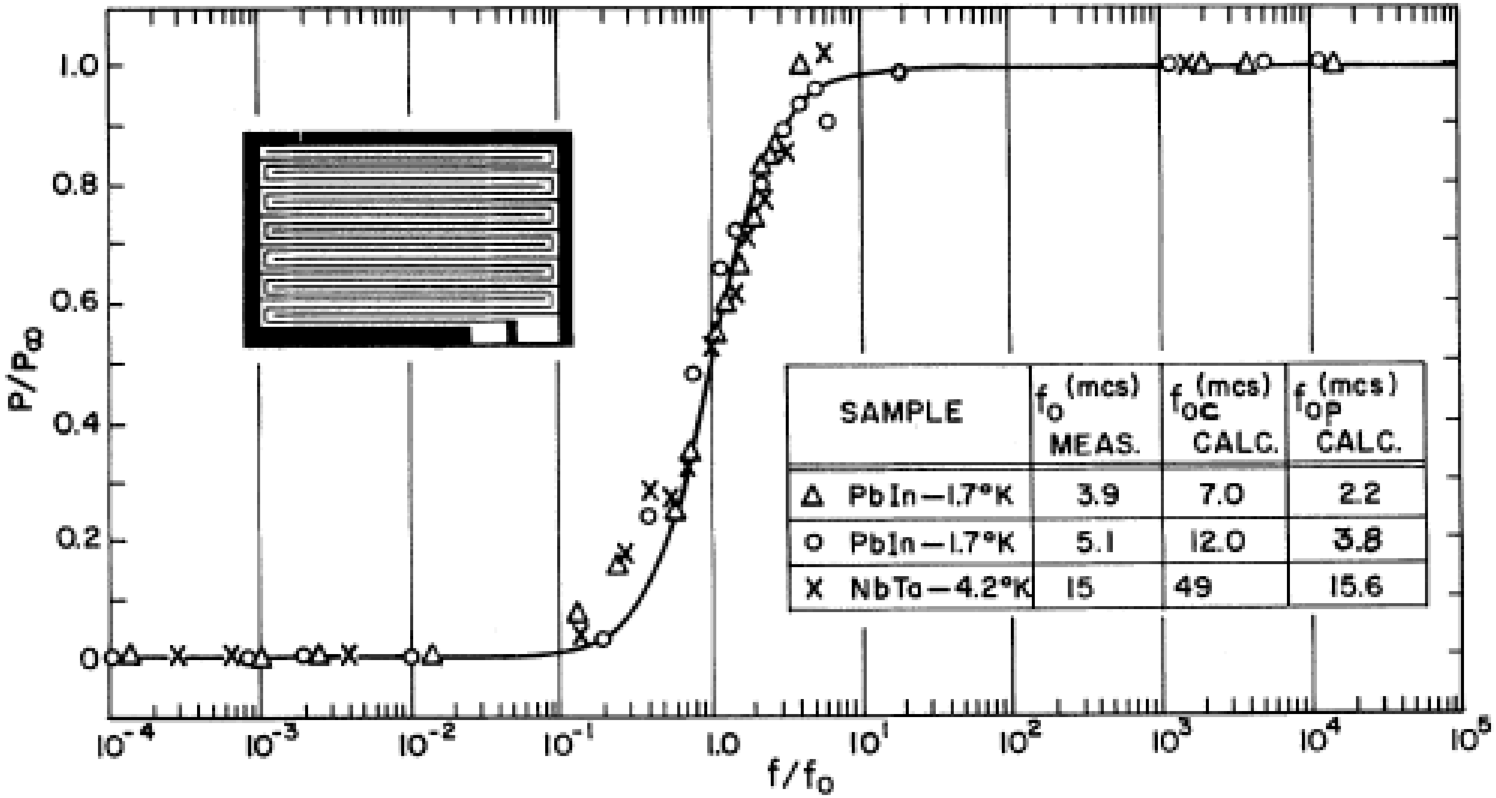
EQUATION OF MOTION

The equation of motion of a typical flux tube in the rigid lattice can now be written

$$m\ddot{x}+\eta\dot{x}+(\alpha\phi_0/cH)\,\sin 2\pi x/d=(1/c)\,J\phi_0, \qquad (1)$$

where m is the effective mass of a flux tube, $\eta=\phi_0 H_{c2}/c^2\rho_n$ the viscosity,[5] and J is the transport current, which we take perpendicular to the applied magnetic field. In



SAMPLE	f_o (mcs) MEAS.	f_{oc} (mcs) CALC.	f_{op} (mcs) CALC.
△ PbIn—1.7°K	3.9	7.0	2.2
o PbIn—1.7°K	5.1	12.0	3.8
X NbTa—4.2°K	15	49	15.6

With oscillating currents applied,

$$J=J_0 e^{i\omega t}, \quad \dot{x}=\dot{x}_0 e^{i\omega t};$$

The dissipated power becomes:

$$P(\omega)=\tfrac{1}{2}\,\mathrm{Re}\left[\frac{J_0{}^{*}H_0}{c}\dot{x}_0\right]=\frac{J_0{}^2\varphi_0 H_0\eta\omega^2}{2c^2[\omega^2\eta^2+(\omega^2 m-k)^2]}.$$

$$2\pi f_0\equiv\omega_0\equiv k/\eta$$

Low Frequency - pinning force dominates
High Frequency – viscous force dominates

$f_0=$ De-pinning Frequency