2. The critical current is

$$I_c = \frac{\pi B d}{\mu_0} = 500 \text{ A},$$

hence the critical current density is

$$j_c = \frac{4B}{\mu_0 d} = 6.37 \cdot 10^8 \text{ A/m}^2.$$

For the tinobium wire the parameters are $I_c = 61.3$ kA and $j_c = 7.80 \cdot 10^{10}$ A/m^2.

3. The conducting plane creates three image charges, which attract the initial charge with a force

$$F = \frac{q^2}{4\pi\varepsilon_0}\left(\frac{1}{4p^2} + \frac{4p^3a^3}{\left(p^4 - a^4\right)^2}\right).$$

4. The seismic mass may be defined from the density of steel $\rho = 7800$ kg/m^3 and is equal to $m = 6.13$ g. The spring constant of the piezodisk is $k = E\pi r^2/d = 1.39{\cdot}10^9$ N/m, its capacitance is $C = \varepsilon_r\varepsilon_0\pi r^2/d = 7.82 \cdot 10^{-11}$ F. So, the displacement of the disk is $x = m(g+a)/k$, and the voltage on it is

$$V = \frac{d_{yy}x}{C} = \frac{m(g+a)d_{yy}}{Ck}.$$

So, the vertical acceleration of the seismic mass is

$$a = \frac{kCV}{md_{yy}} - g.$$