

## Units of $LC$

What are the units of  $LC$ ? They are of course “henry farads”:

HF.

But because  $L = \Phi_B/i$ , a henry is a “tesla meter<sup>2</sup>/ampere”, and because  $C = Q/\Delta V$ , a farad is a “coulomb/volt”, and the units of  $LC$  are

$$\frac{\text{Tm}^2 \text{C}}{\text{A} \text{V}}.$$

But because the magnetic force is  $\vec{F} = q\vec{v} \times \vec{B}$ , a tesla is a “newton/(coulomb meter/second)”, and the units of  $LC$  are

$$\frac{\text{Ns} \text{m}^2 \text{C}}{\text{Cm} \text{A} \text{V}} = \frac{\text{Nsm}}{\text{AV}}.$$

But an ampere is a “coulomb/second” and a volt is a “joule/coulomb”, so AV is the non-electrical unit of “joule/second”, and the units of  $LC$  are

$$\frac{\text{Nsm}}{\text{J/s}},$$

a completely non-electrical unit! Now a joule is a “newton meter”, so the units of  $LC$  are nothing but

$$\text{s}^2.$$

Improbable as it may seem, a “henry farad” is a “second<sup>2</sup>”.