[ref.] mobility and mean free time relationship

Force that n electrons receive is

$$-nqℇ\_{x}=n\frac{dP\_{x}}{dt}$$

($P\_{x} :momentum of x direction $)

Let’s integrate $P\_{x}$ in terms of time,

then mean momentum is

$$<P\_{x}> = -q\overbar{t}ℇ\_{x}$$

Also, $J\_{x}= -qn<v\_{x}> $, $<v\_{x}> = \frac{P\_{x}}{m\_{n^{\*}}}$

So, $J\_{x}= \frac{nq^{2}\overbar{t}}{m\_{n^{\*}}}ℇ\_{x}$

Because of $J\_{x}= σℇ\_{x}=(qnμ\_{n})ℇ\_{x}$

-> $μ\_{n}= \frac{q\overbar{t}}{m\_{m^{\*}}}$