III.C.2.b. Converting length to time dependence

The relationship between energy *E*, flight time *t*, and flight-path length *l* may be used to convert from a function of l to a function of t (assuming *E* is fixed):

$$E = \frac{m}{2}\frac{l^2}{t^2} \quad , \tag{III C2 b.1}$$

which may be rearranged to give

$$l = \sqrt{\frac{2E}{m}}\, t = bt \quad , \tag{III C2 b.2}$$

in which we have defined *b* as the square root of $2E/m$. A distribution function in *l* may then be converted to a distribution function in *t* by (a) replacing l by bt everywhere and (b) replacing *dl* by *b dt*. In particular, the distances x'_i (tantalum target) translate to the time dimension via

$$x_i = x'_i / b \quad , \tag{III C2 b.3}$$

and, similarly, δ (NE110 detector) translates via

$$d = \delta / b \quad . \tag{III C2 b.4}$$

For the NE110 detector, we also define f via

$$f = \lambda \sigma b \quad . \tag{III C2 b.5}$$