the squared in eq. (4)

\[ A(t, f) = A^2(t, f) = \frac{A S^2(f_s, t_s)}{2\pi h r'(t)} e^{-2\alpha(f)r'(t)}, \]

\[ A(t, f) = A'(t, f) = \frac{A S^2(f_s, t_s)}{2\pi h (R - |r'(t)|)} e^{-2\alpha(f)R} e^{2\alpha(f)r(t)} \]

\[ A(t, f) = K'(t, f) e^{\beta't}, \]

**identifying the terms between theoretical and real spectrograms**

\[ K'(t, f) = \frac{A S^2(f_s, t_s)e^{-2\alpha(f)R}}{2\pi h (R - |r'(t)|)} \]

\[ \beta' = \beta = 2\alpha(f) v_m(t) \]

\[ A(t, f) = K'(t, f) e^{\beta't}, \]

\[ f(t) = b + at \]

\[ F'(t, f) = \ln K'(t, f) + \beta'(t, f) t \]

\[ F'(t, f) = \ln K + \beta t \]