$T_b = T_e + T_c$ is the bubble lifetime

R_o is the maximum bubble radius

The depth of the pressure well is seen to be $\Delta p = p_{LO} - p_m$.

As argued in [1,4,6] the resulting noise spectrum originates from two sources:

- noise originating from the slow variations of the bubble volume. This may be modelled as noise emitted from an acoustic monopole.

- a shock wave emanating either from finite amplitude wave propagation or from the bubble collapse. A description of shock waves requires non-linear acoustic analysis.

The energy spectrum $S(\omega)$ of a monopole is:

$$S(\omega) = \left(\frac{\rho}{4\pi r}\right)^2 \omega^4 \left| \int_{-\infty}^{\infty} V(t) e^{-j\omega t} dt \right|^2 \qquad (1)$$

The bubble volume $V(t)$ is positive during its lifetime T_b, and essentially zero after. At frequencies well below the reciprocal of the lifetime the magnitude of the Fourier transform of the bubble volume is to a first approximation constant. Thus at low frequencies $S(\omega)$ will increase with the 4th power of the frequency.

The spectrum will have a maximum at a frequency called the bubble frequency and then decrease with increasing frequency. The decrease just above the bubble frequency is found from