Due to the intrinsically larger mass {and physical size} associated with the thin corrugated metal ribbon, the frequency and phase response of a ribbon-type differential pressure microphone is usually not as good as *e.g.* the modern, compact high-tech electret-type differential microphones; ribbon microphones are therefore not often thought of as laboratory / research-grade quality devices. Still, ribbon mics have many storied uses in the now ~ century long history of sound recording.

Note that the frequency response of a ***differential*** pressure microphone of characteristic size d is ***not*** flat. The (complex) response function of the differential microphone as a function of (angular) frequency ω and wavenumber-differential mic axis opening angle Θ is given by:

$$\tilde{H}_{diff-mic}(\omega,\Theta) = 1 - e^{-i\vec{k}\cdot\vec{d}} = 1 - e^{-ikd\left(\hat{k}\cdot\hat{n}\right)} = 1 - e^{-ikd\cos\Theta} = 1 - e^{i(\omega/c)d\cos\Theta}$$
$$= 1 - \cos\left[(\omega/c)d\cos\Theta\right] + i\sin\left[(\omega/c)d\cos\Theta\right]$$

For $kd = (\omega/c)d \ll 1$ (*i.e.* $\omega \ll c/d$) then:

$$\tilde{H}_{diff-mic}(\omega,\Theta) \simeq \cancel{1 - \cos 0} + i(\omega/c)d\cos\Theta = +i(\omega/c)d\cos\Theta$$

Thus, for $kd = (\omega/c)d \ll 1$ (*i.e.* $\omega \ll c/d$) the frequency response of a ***differential*** pressure microphone is such that it increases ***linearly*** with frequency (*n.b.* its response $\tilde{H}_{diff-mic}(\omega,\Theta) = 0$ at $\omega = 2\pi f = 0$). We also see that for $kd = (\omega/c)d \ll 1$ a ***differential*** pressure microphone has a ***frequency-independent*** phase shift of +90° relative to the incident sound wave (for $0 \le \Theta \le 90^{o}$).

As discussed above, it is necessary to ***integrate*** the signal output from a ***differential*** pressure microphone in order to obtain a signal that is proportional to the component of the particle velocity parallel to the $\hat{n}$-axis of the device. This can be achieved electronically using a simple integrating op-amp preamplifier circuit, as shown in the figure below: