<u>An Example of the Musical Use of the Doppler Effect - The Leslie Speaker Cabinet</u>:

The Leslie speaker cabinet, developed by Don Leslie in ~ 1940 – most frequently used in conjunction with the venerable Hammond B3 organ (but which also can be used with guitar, bass, vocals, harmonica, …) is a 2-way, 2-speed (fast/slow) <u>rotating</u> speaker system (with passive cross-over network) - highs (f_{hi} > 800 Hz) come out of a rotating horn, lows (f_{low} < 800 Hz) emanate from a (fixed, non-rotating) 15" woofer with rotating rotor (black cloth-covered cylinder below the 15" woofer), as shown in the 3 pix below of the back/inside of a Leslie cabinet:



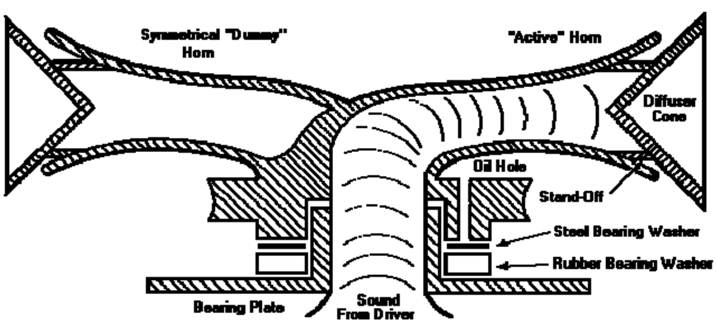

Figure 1. Plan-view of the Leslie Treble Rotor

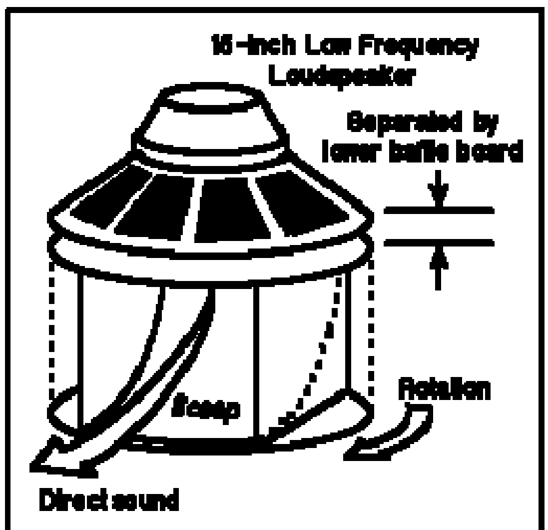

Figure 8. The Leslie Bass Rotor

The single-opening/mouth of the rotating high-frequency horn and the single-opening/mouth of the rotating rotor for the woofer act/behave as (independently) <u>rotating</u> sound sources, rotating at angular frequencies ω_{hi} and ω_{lo}, respectively. Since the tangential velocity of a rotating object of radial size r is given by $\vec{v}_t = \vec{\omega} \times \vec{r}$, and $v_t = |\vec{v}_t| = |\vec{\omega} \times \vec{r}| = \omega r \sin\Theta = \omega r$ (since $\Theta = 90^o$ = angle between the $\vec{\omega}$ and $\vec{r}$ vectors – *i.e.* they are perpendicular to each other), the respective hi/lo frequency rotor tangential speeds are thus $v_{hi} = \omega_{hi} r_{hi}$ and $v_{lo} = \omega_{lo} r_{lo}$.