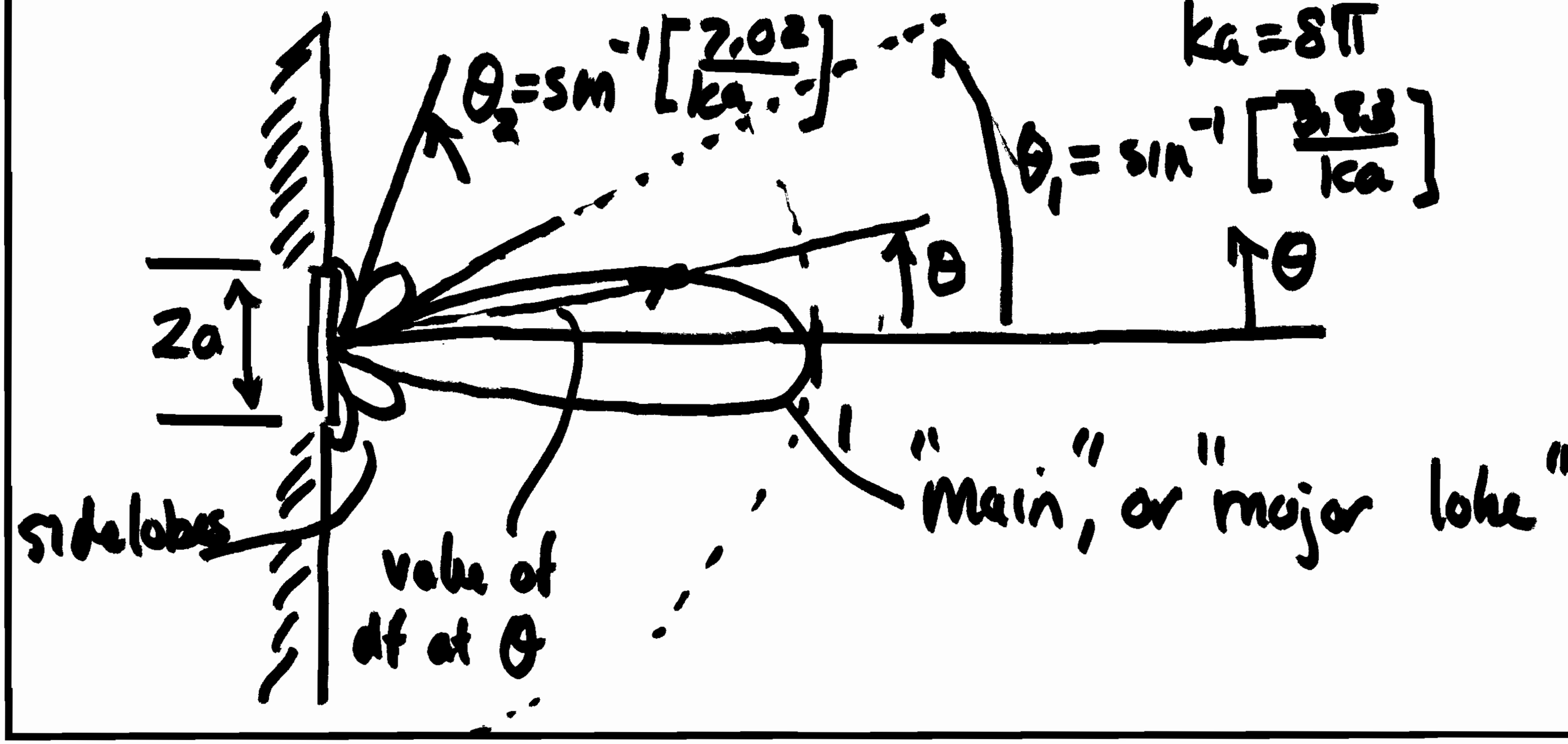
~~(r,θ)~~ θ behavior of acoustic pressure amplitude

$\frac{J_1(ka\sin\theta)}{ka\sin\theta}$ is graphically displayed by a

"beam" or "directivity pattern"



~~As~~ One definition of the angular width of the major lobe is $2\theta_1$.

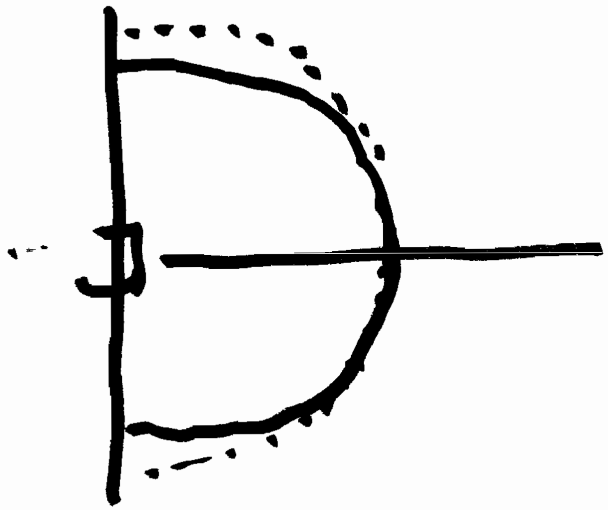
$$\theta_1 = \sin^{-1}\left[\frac{3.83}{ka}\right]$$

Now, what is the influence of ka on the width of the major lobe??

Numerical examples: (in air)

12" diameter audio speaker; $f = 1000$ Hz

$ka = 2.792 < \pi$, no near field



12" dia audio speaker, f = 5000 Hz

$ka = 13.96$, $r_{far} = 0.321$ m, 2a = speaker dia.

$\theta_1 = \sin^{-1}\left[\frac{3.83}{13.96}\right] = 16.9°$ $2\theta_1 = 31.85°$

$\theta_2 = \sin^{-1}\left[\frac{7.02}{13.96}\right]$ exists, "more than one sidelobe"

" tweeter @ 5 kHz

$ka = 3.29 > \pi$, $r_{far} = 0.158$ in

$\theta_1 = \sin^{-1}\left[\frac{3.83}{3.29}\right]$ does not exist.

" tweeter @ 10 kHz

$ka = 6.98$; $r_{far} = 1.329$ in

$2\theta_1 = 66.57°$

oroid electrostatic transducer: $2a = 1.513"$, $f = 50$ kHz

$ka = 17.59$; $r_{far} = 2.05"$; $2\theta_1 = 25.14°$, $\lambda = 6.86$ mm