Practical receivers demodulate using an intermediate frequency (IF). This allows most of the electronics for the demodulation to be optimized at the IF.
Example:

AM signal @ $f_c = 850 \text{ kHz}$

$f_{LO}$ on high side of $f_c$

let $f_{IF} = 455 \text{ kHz}$

$f_{LO} = f_c + f_{IF} = 850 + 455 = 1305 \text{ kHz}$

Mixed with $f_{LO} = (1 + m(t)) \cos \omega_{2f_{IF}} + M(f) \cos \frac{1}{2} \cos \omega_{A-B}$

$\cos A \cos B = \frac{\cos(A-B) + \cos(A+B)}{2}$
$H_2(f)$

$S_{IF}(f)$

$-455K$

$455K$

Mix with $f_{IF}$

$S_{IF}(f)$

$H_3(f)$

$-B$

$B$

$H_3(f)$ suppresses carrier and side spectra at $2 \times 455K$

Baseband