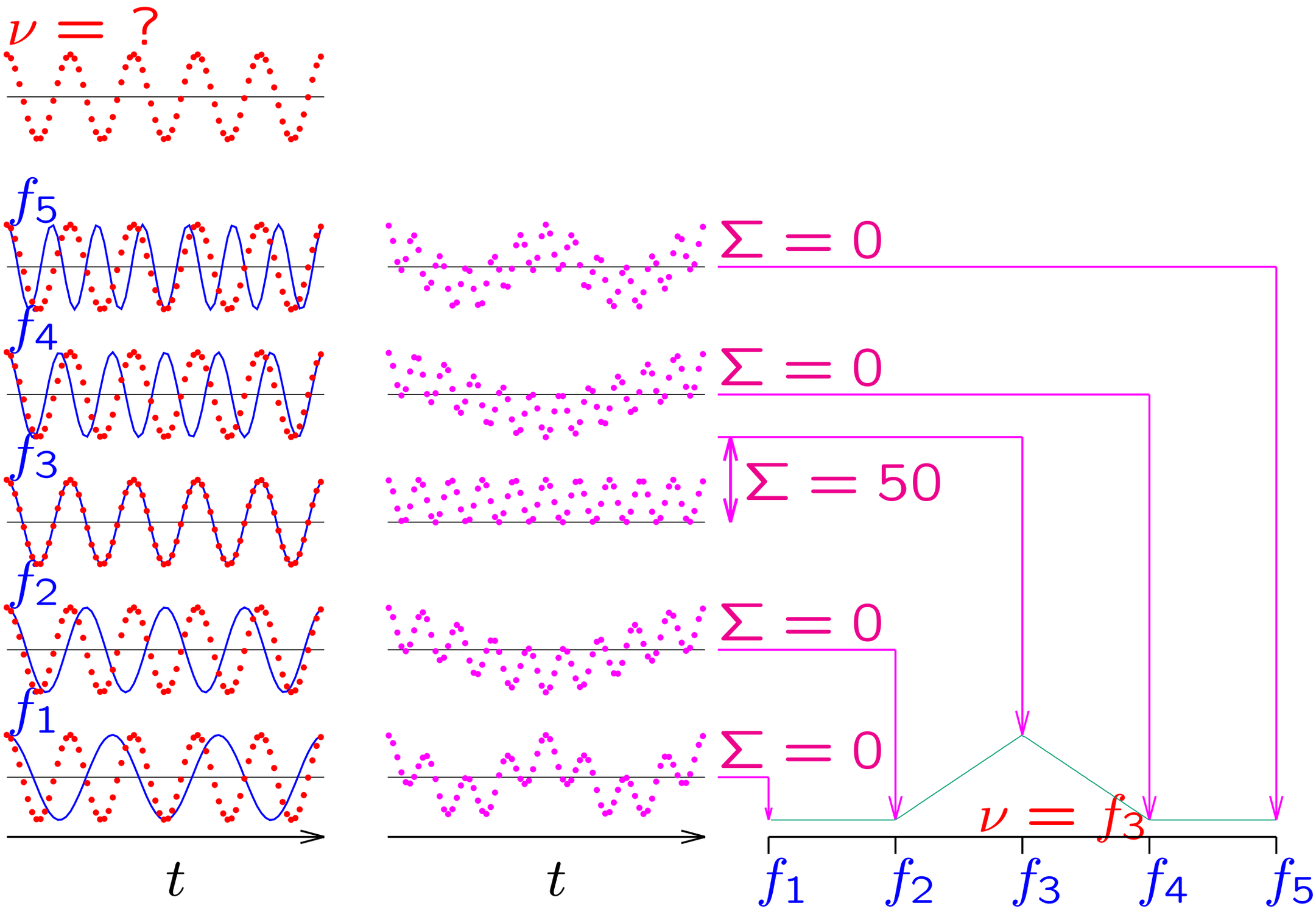
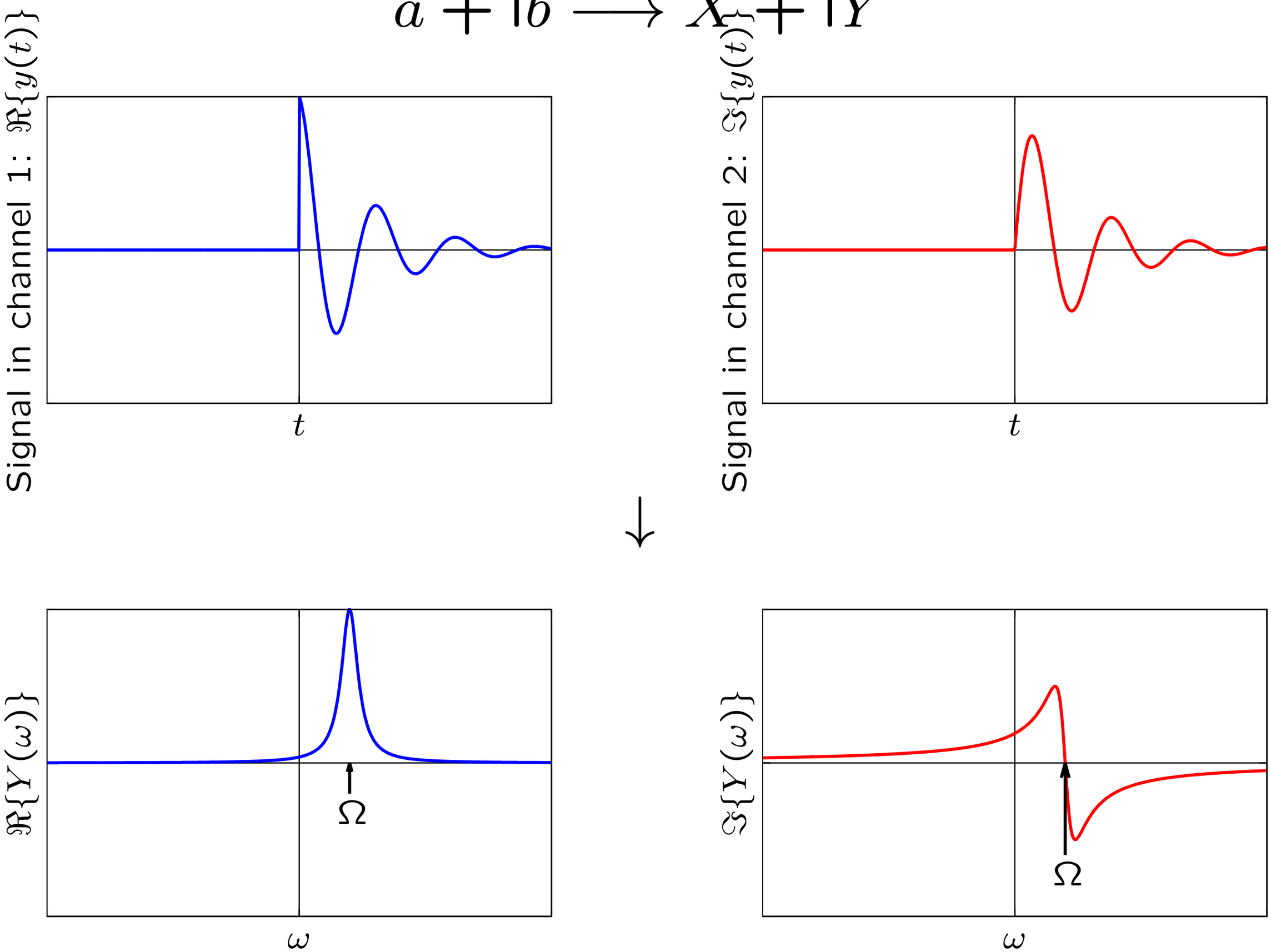
Lecture 3: Signal acquisition and processing

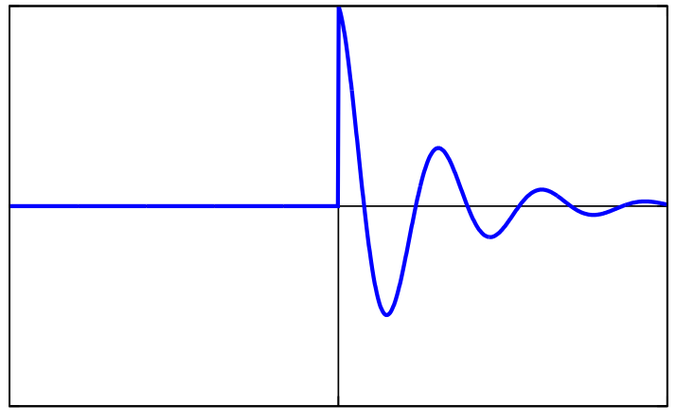

$\nu = ?$
f_5
f_4
f_3
f_2
f_1
t
$\Sigma = 0$
$\Sigma = 0$
$\Sigma = 50$
$\Sigma = 0$
$\Sigma = 0$
t
$\nu = f_3$
f_1
f_2
f_3
f_4
f_5

Two channels, complex Fourier transformation

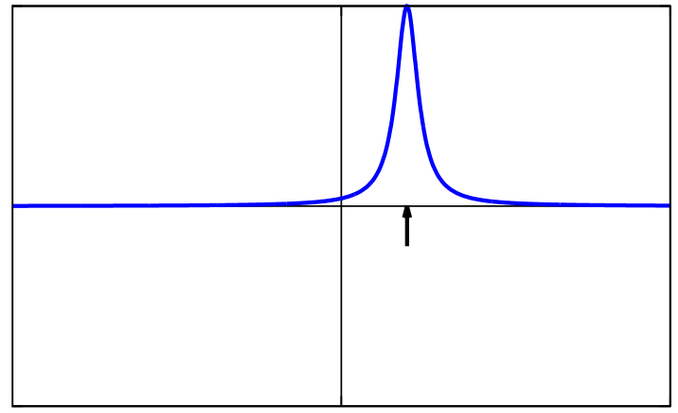
$$a + \mathrm{i}b \longrightarrow X + \mathrm{i}Y$$



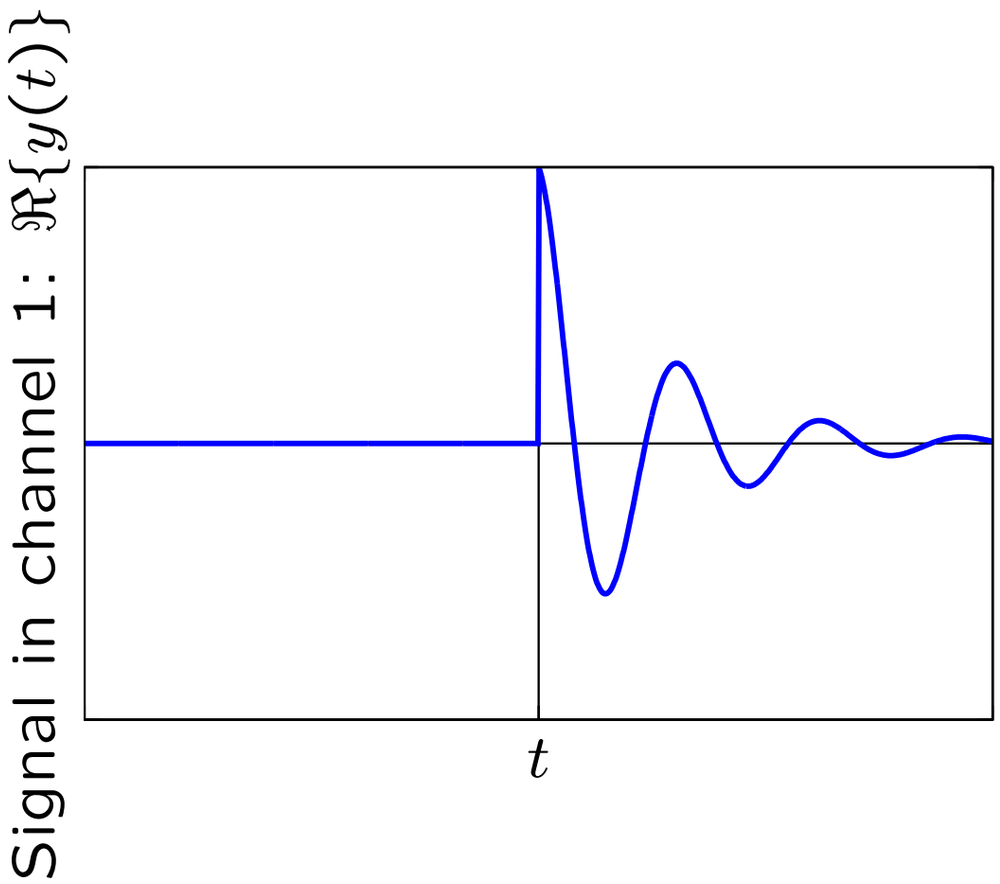
$$e^{-R_2 t} e^{i\Omega t} =$$

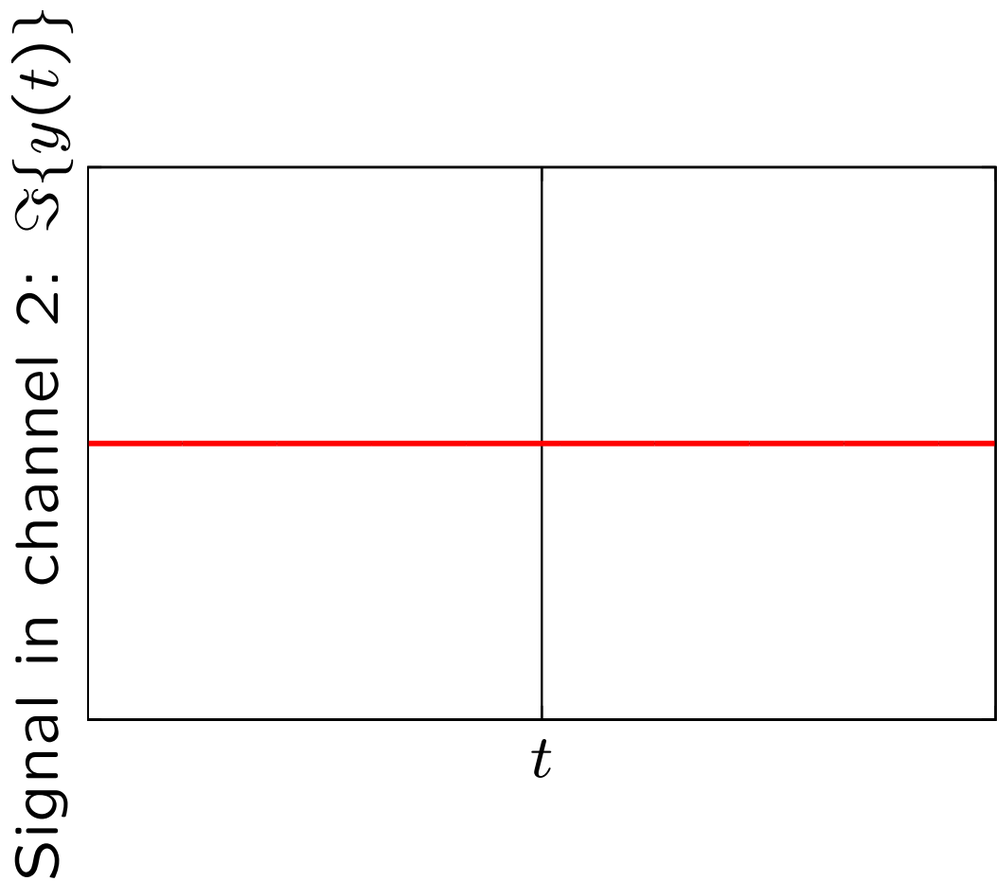


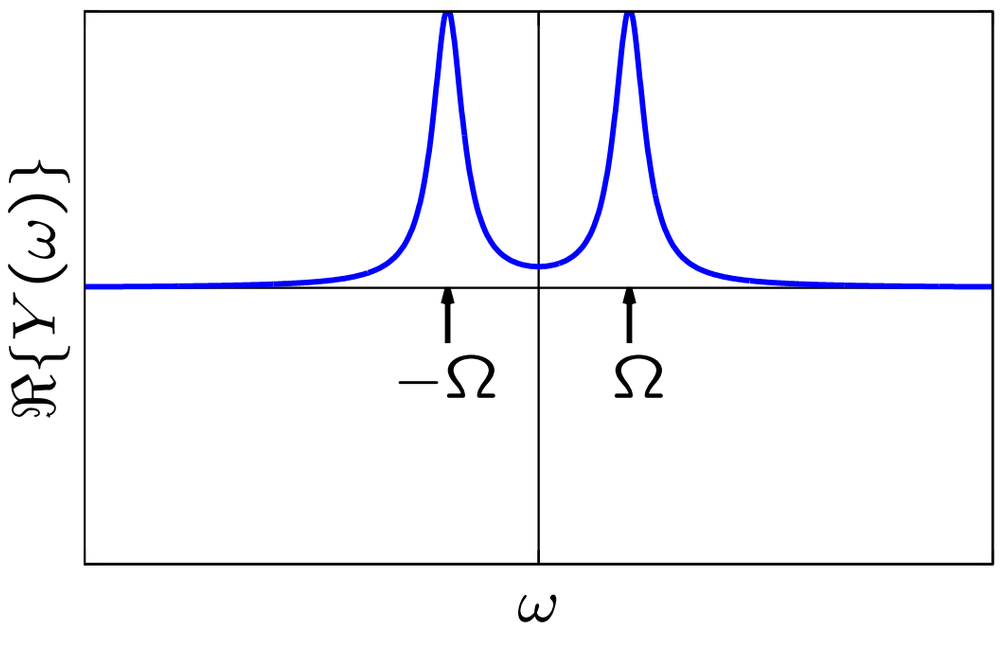
$$\rightarrow$$

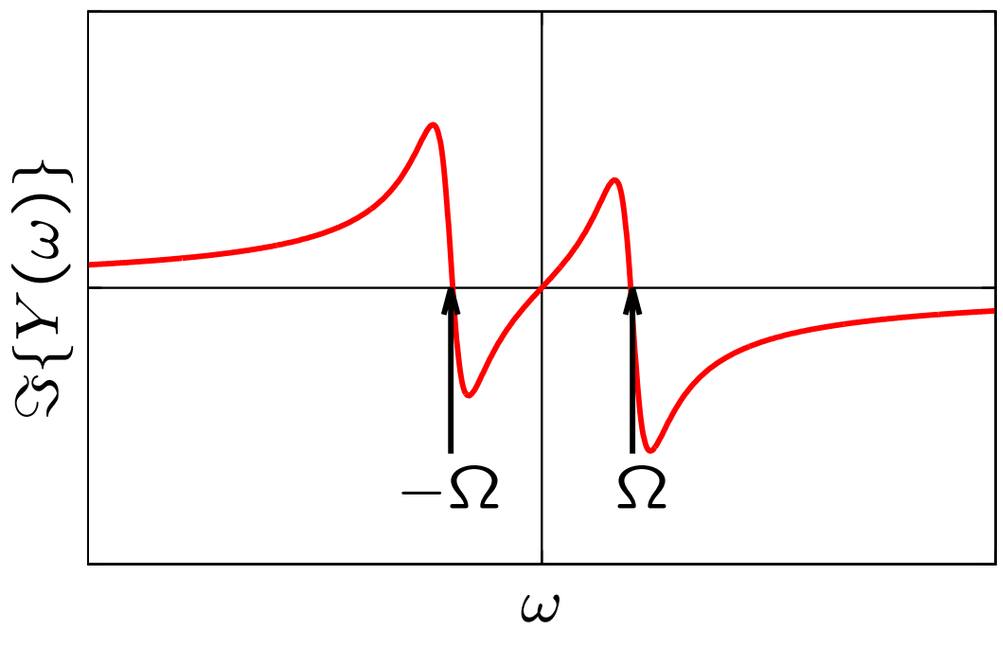


One channel, cosine Fourier transformation

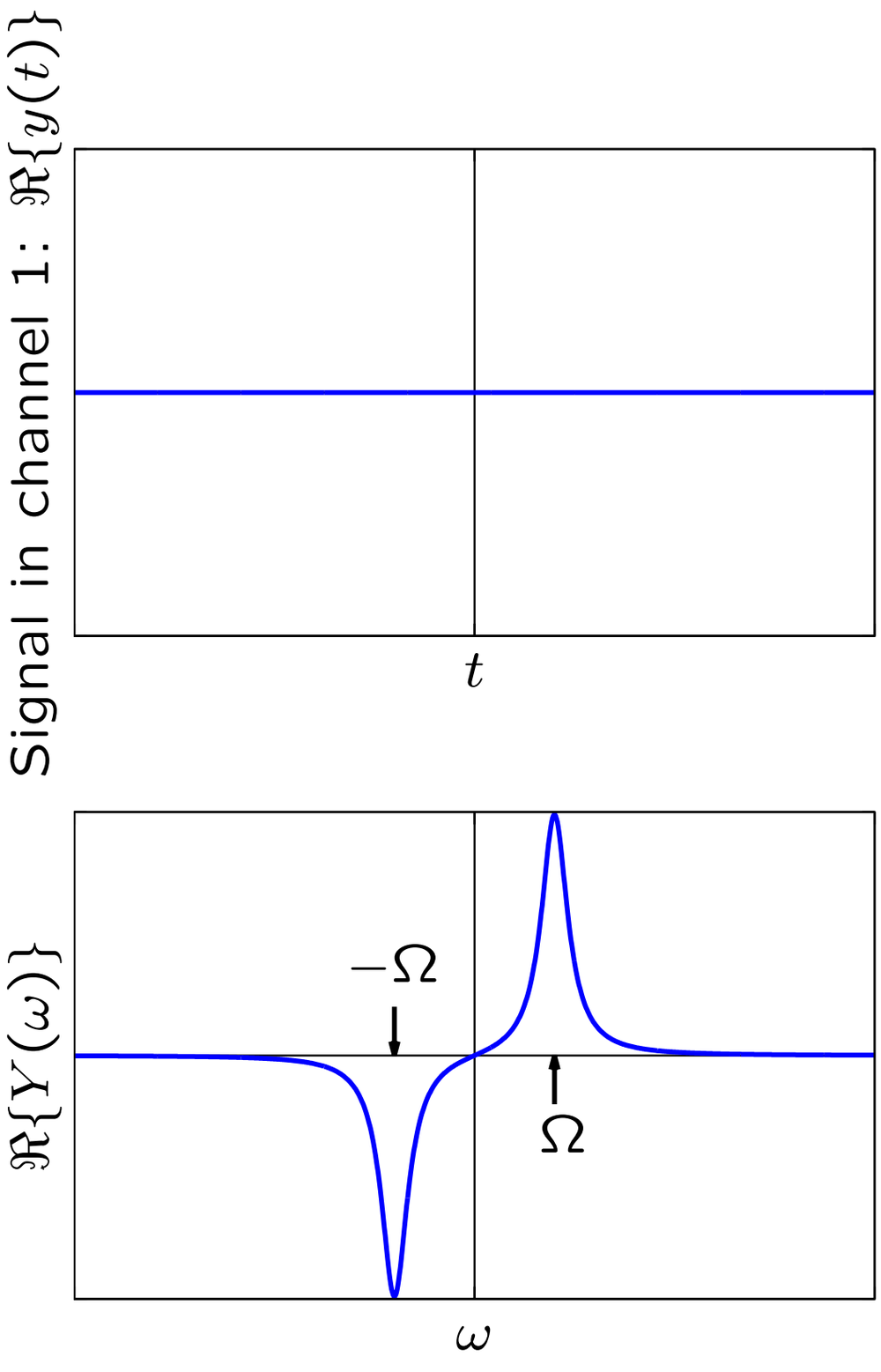


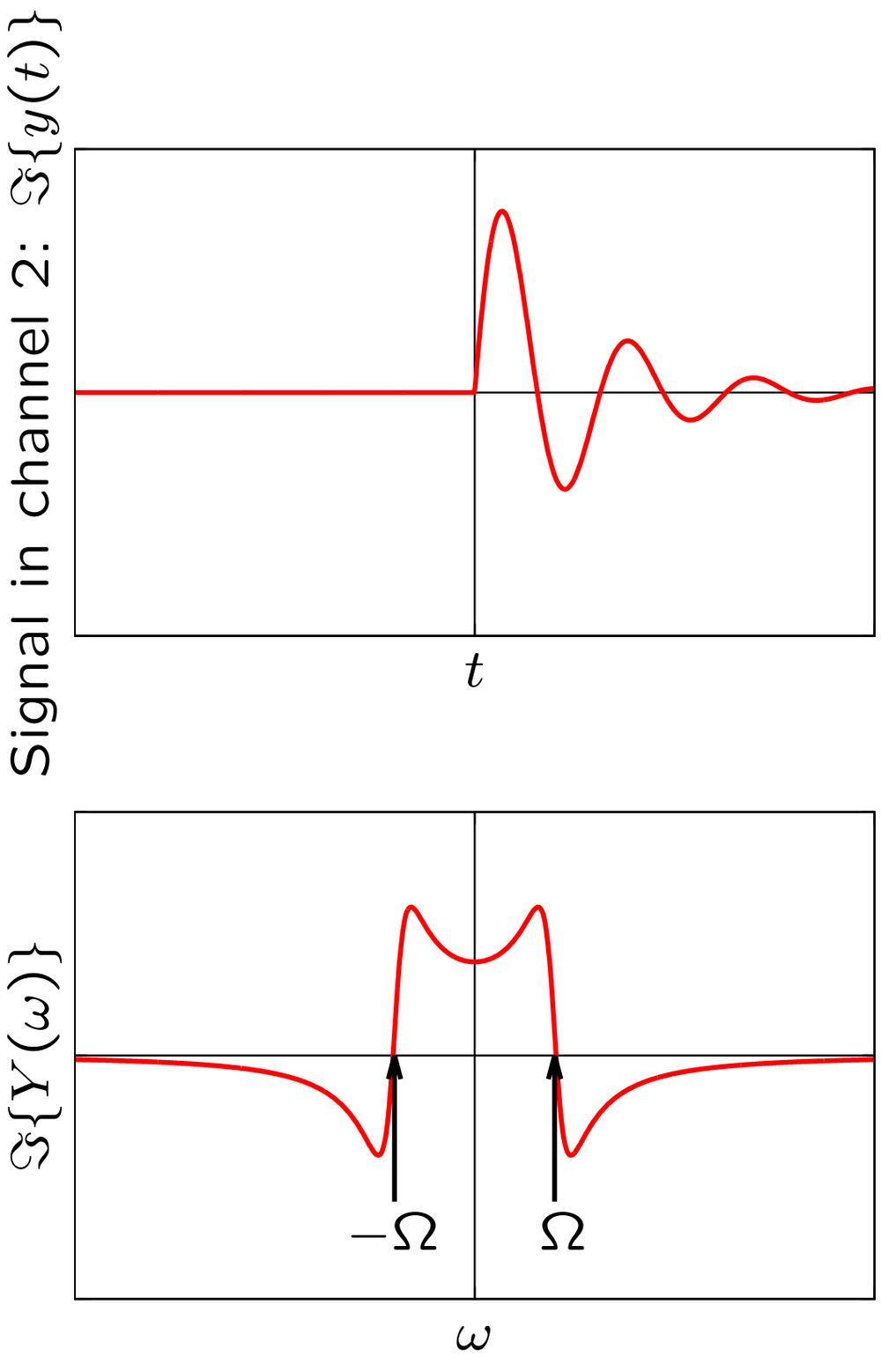




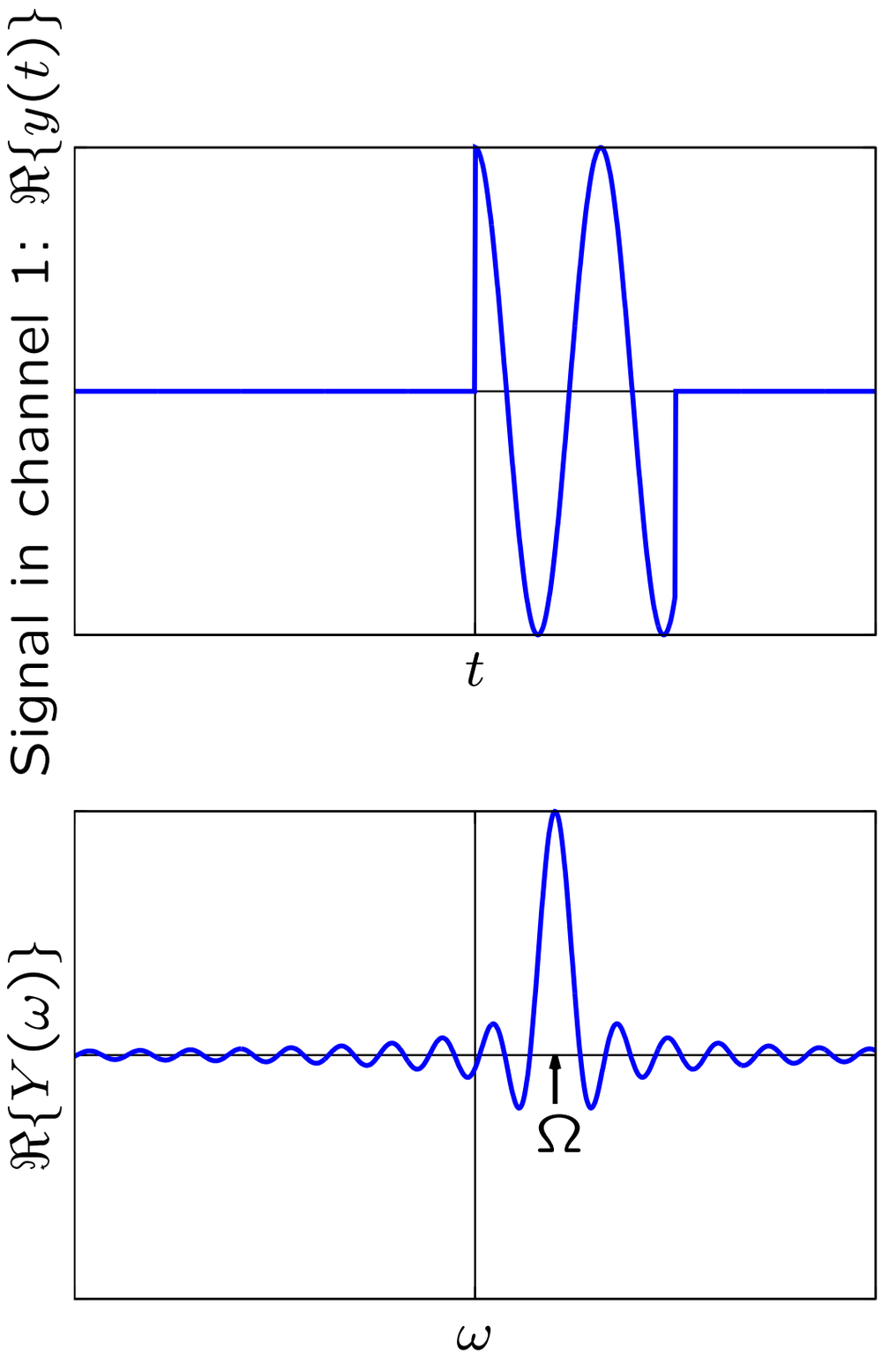


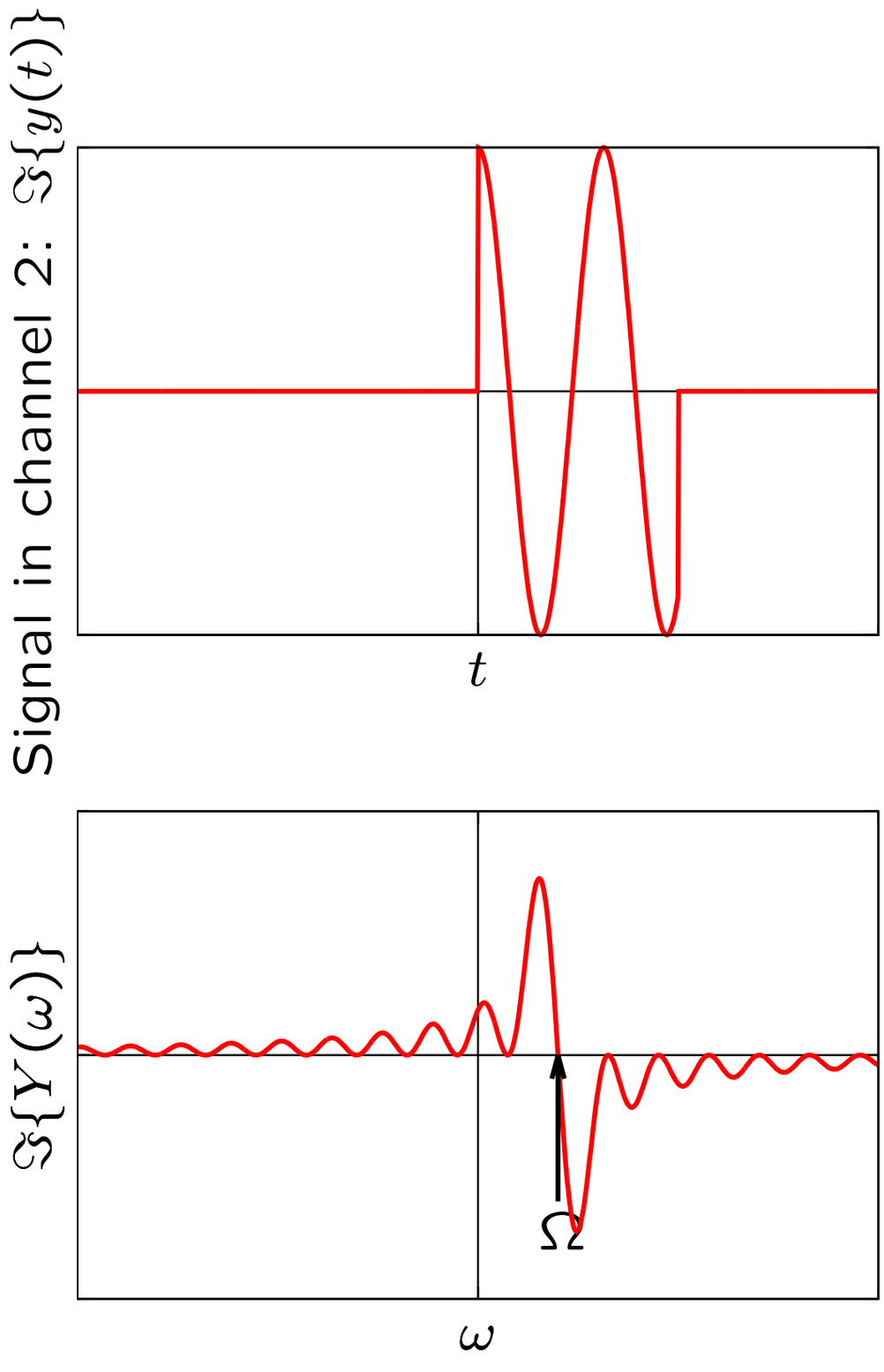
One channel, sine Fourier transformation



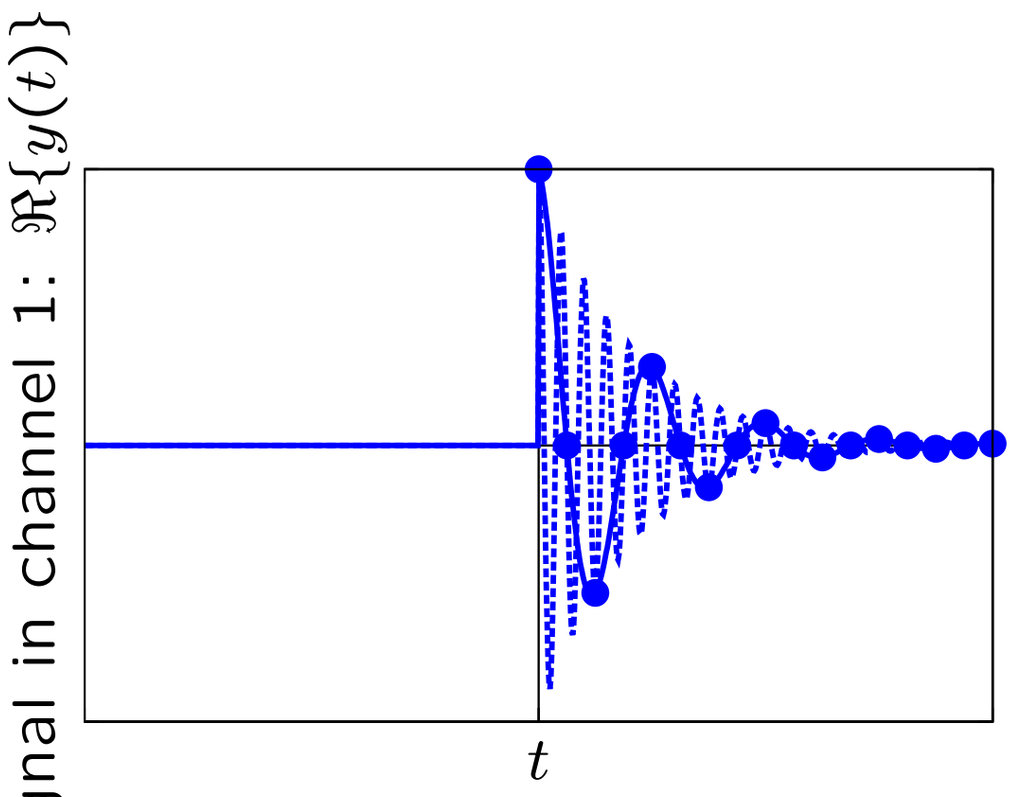


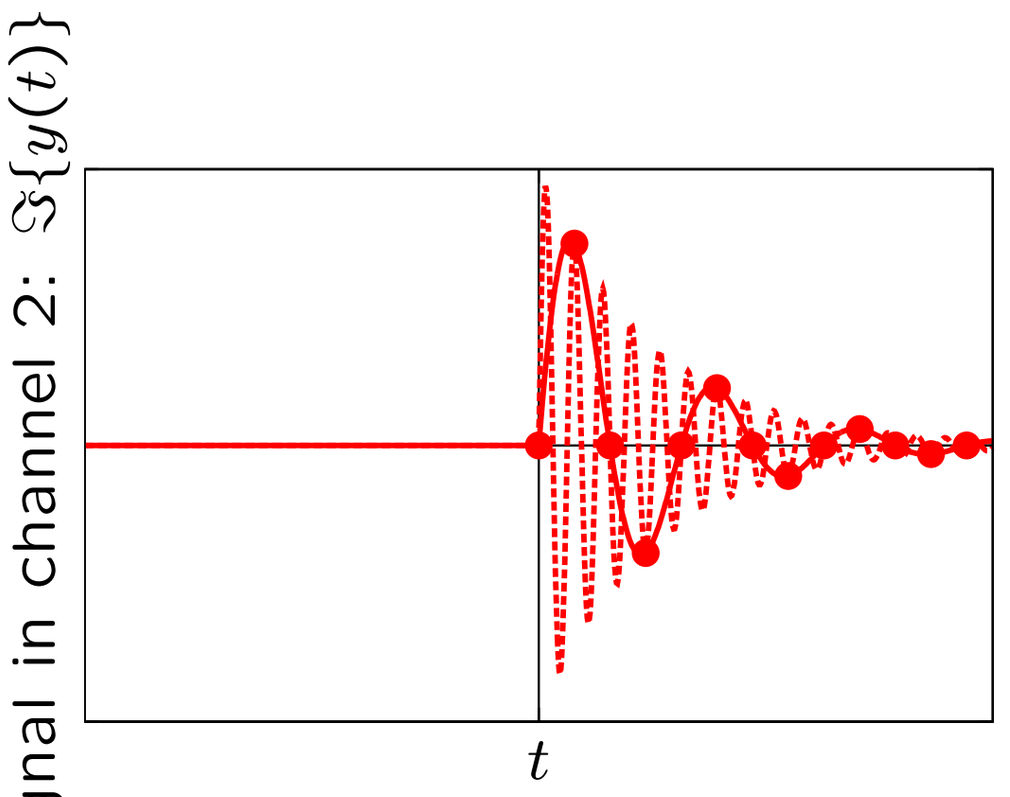
Finite signal $\longrightarrow$ Truncation artifacts

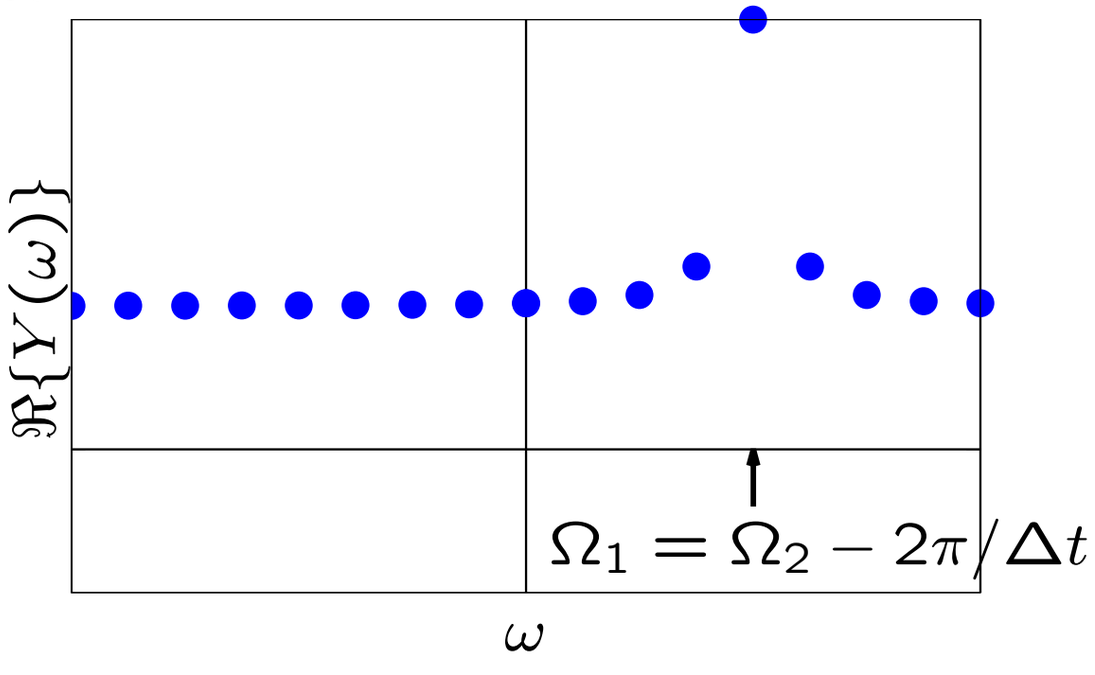


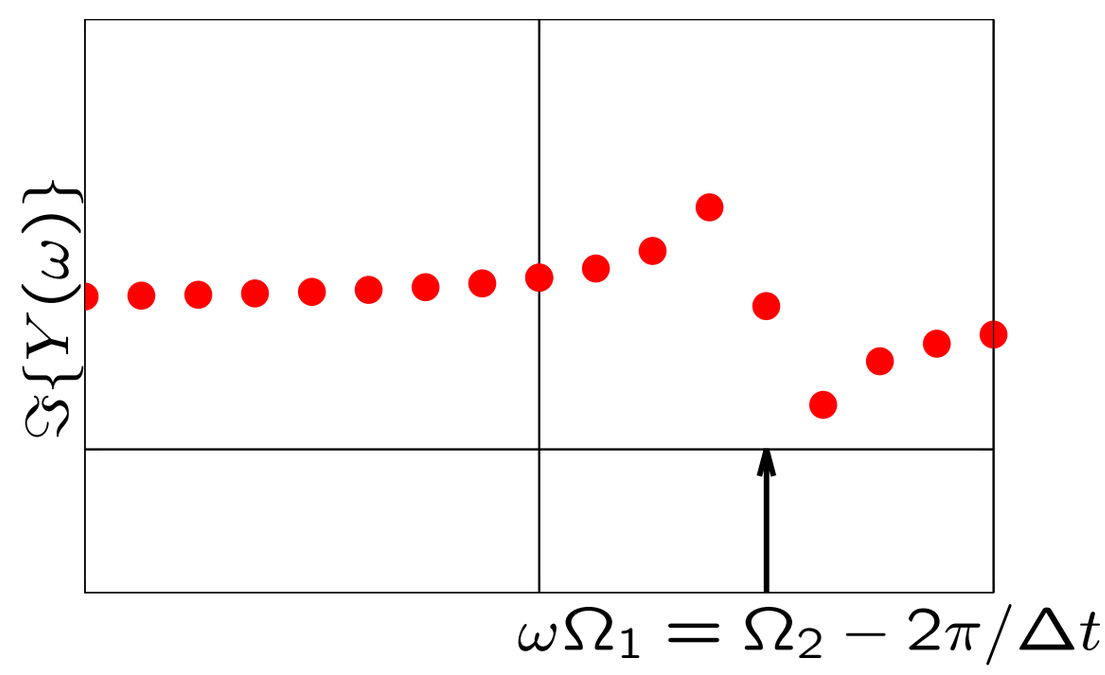


Discrete signal $\longrightarrow$ Aliasing

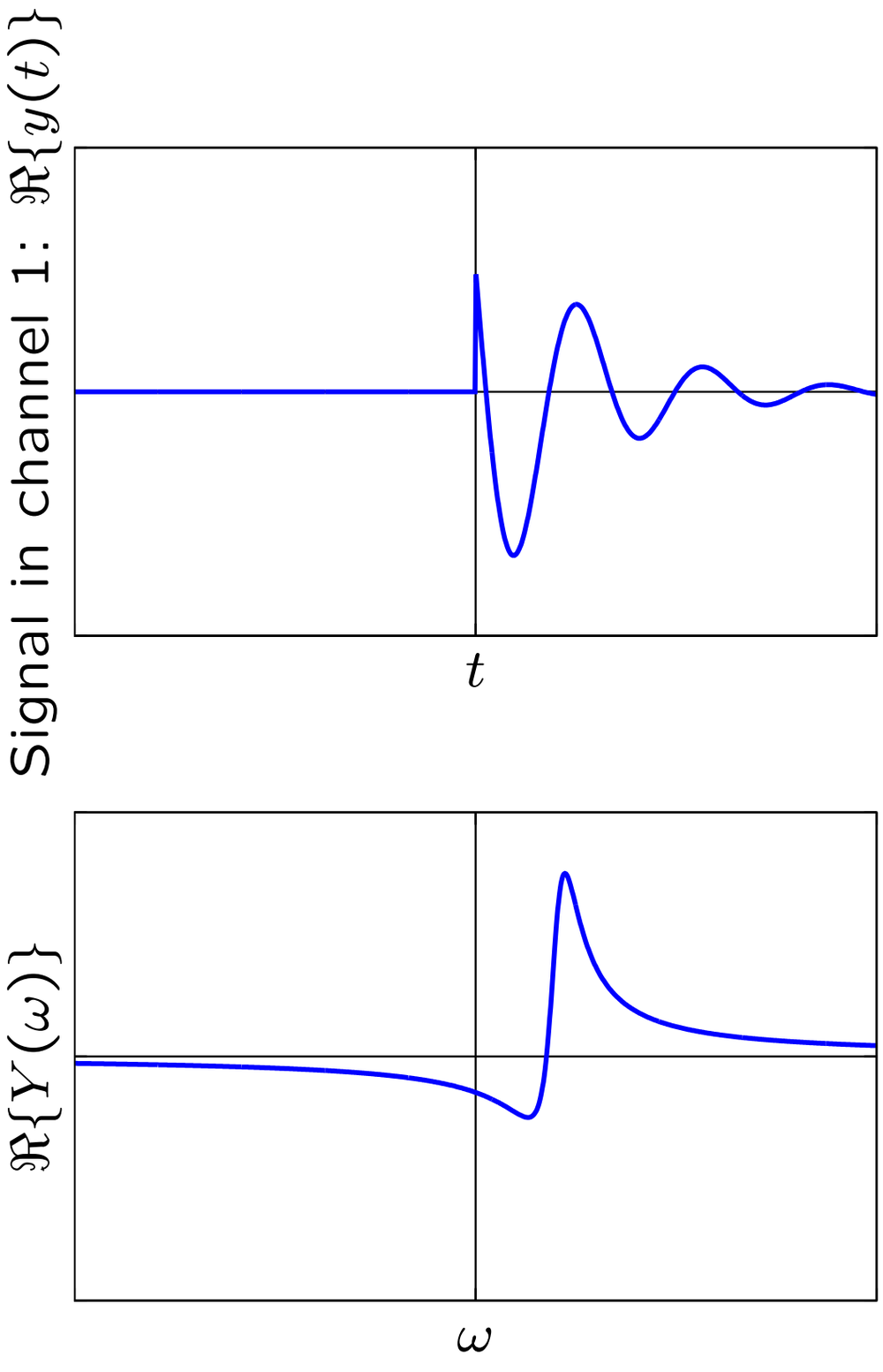


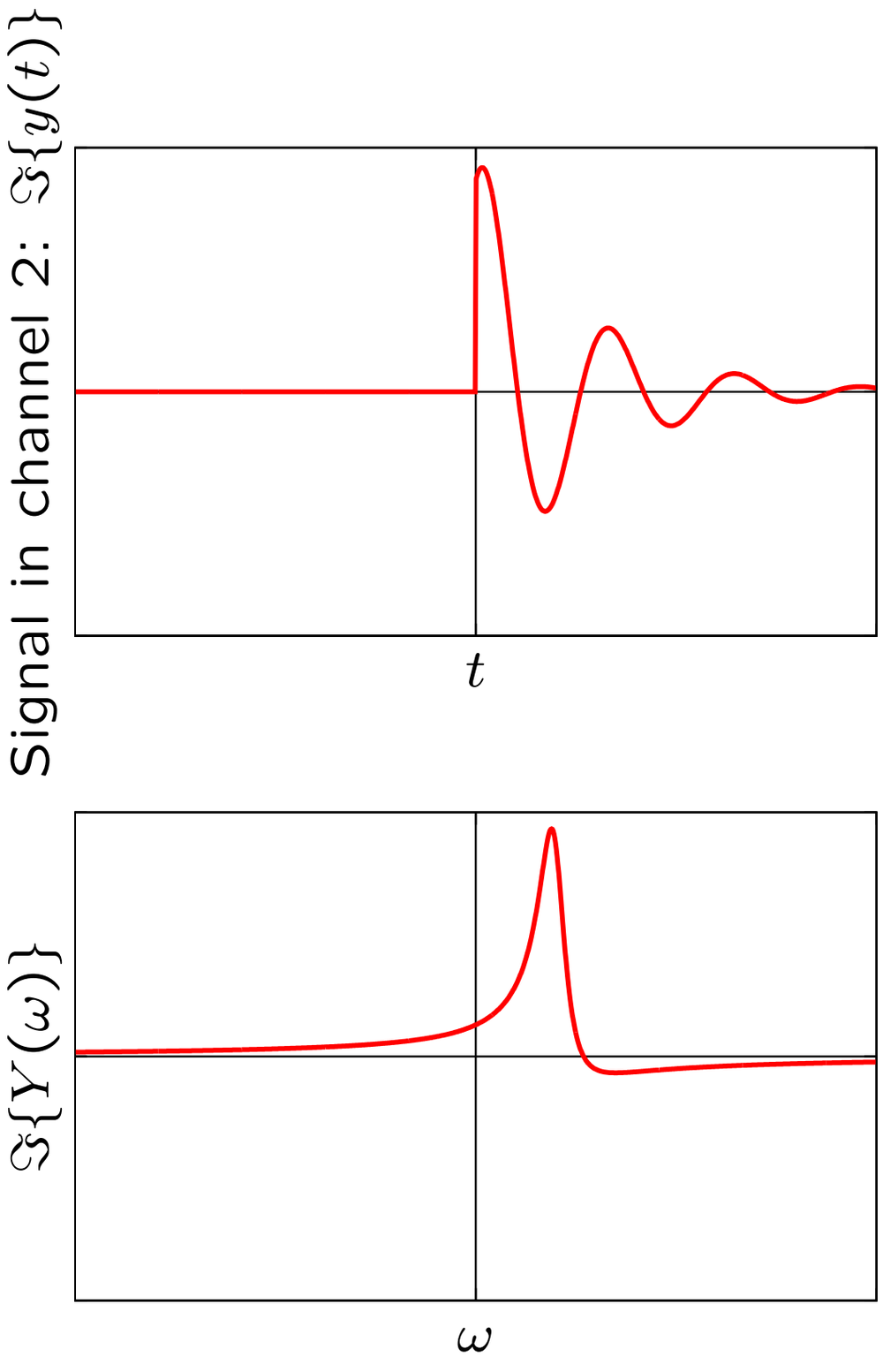




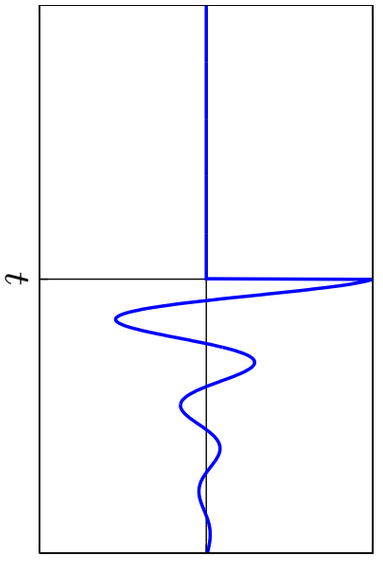


Unknown phase $\longrightarrow$ Phase correction needed

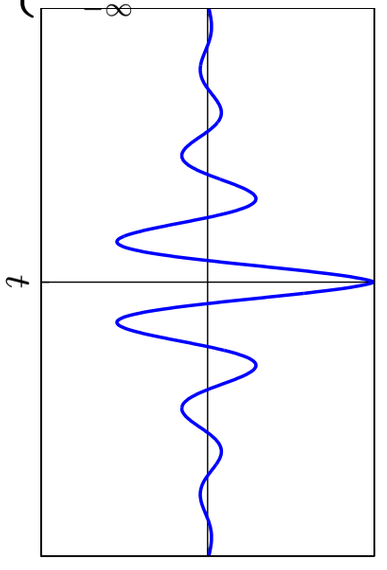




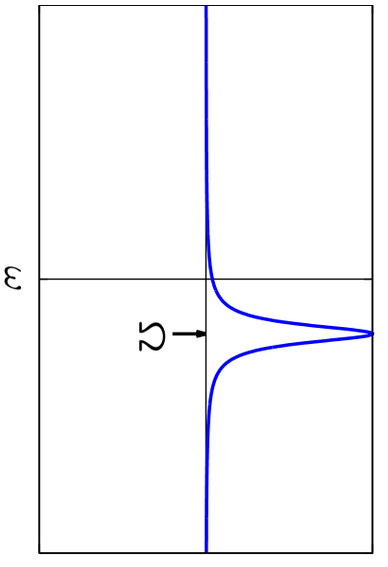
Signal in channel 1: $\Re\{y(t)\}$



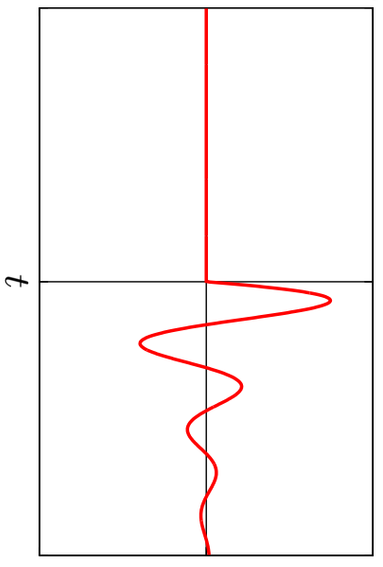
$\Re\left\{\frac{1}{2\pi}\int_{-\infty}^{\infty}\Re\{Y(\omega)\}\mathrm{e}^{\mathrm{i}\omega t}\mathrm{d}\omega\right\}$



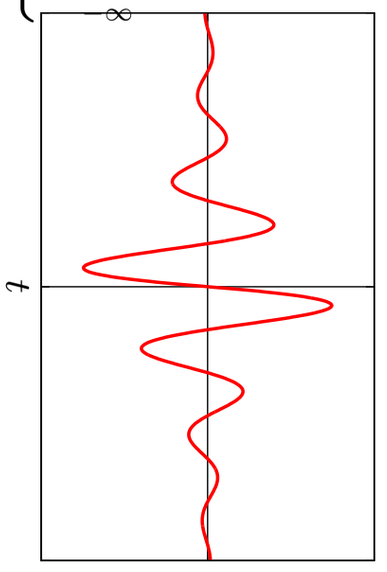
$\Re\{Y(\omega)\}$



Signal in channel 2: $\Im\{y(t)\}$



$\Re\left\{\frac{1}{2\pi}\int_{-\infty}^{\infty}\Re\{Y(\omega)\}\mathrm{e}^{\mathrm{i}\omega t}\mathrm{d}\omega\right\}$



$\Im\{Y(\omega)\}$