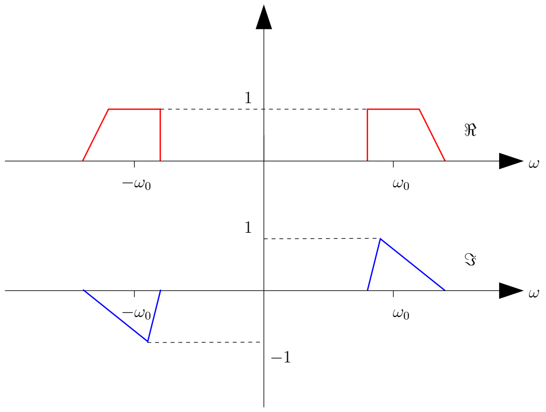
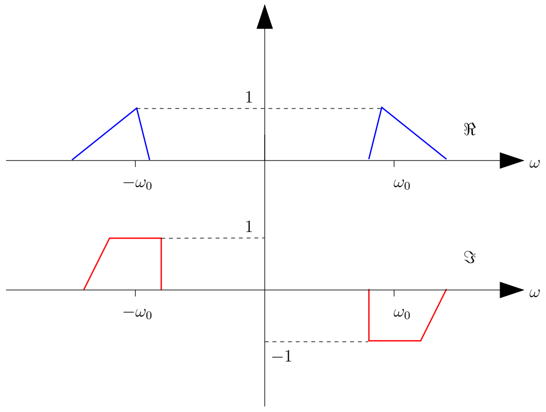
Relations entre les spectres

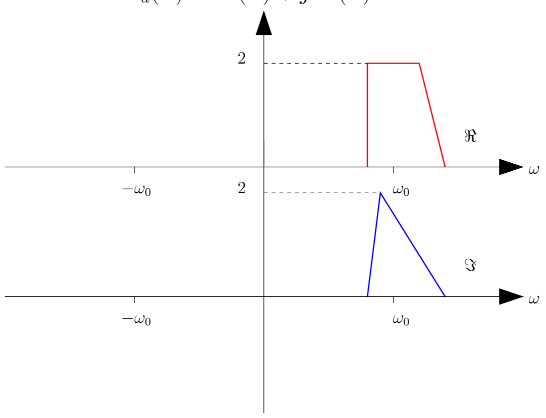
$X(\omega)$



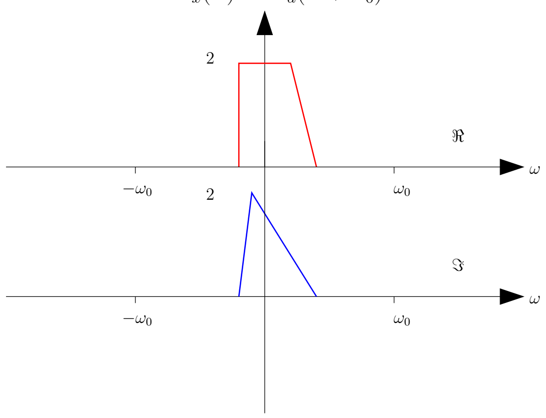
$\hat{X}(\omega) = -j\,\mathrm{sgn}(\omega)\,X(\omega)$



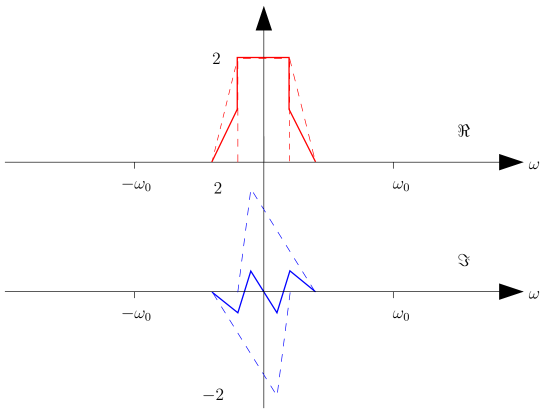
$X_a(\omega) = X(\omega) + j\,\hat{X}(\omega)$



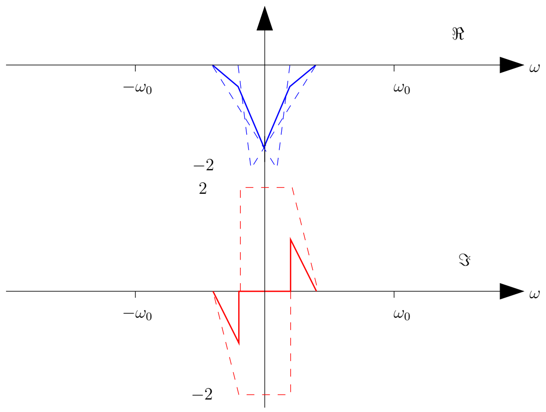
$E_x(\omega) = X_a(\omega + \omega_0)$



$X_1(\omega) = \frac{E_x(\omega) + E_x^*(-\omega)}{2}$

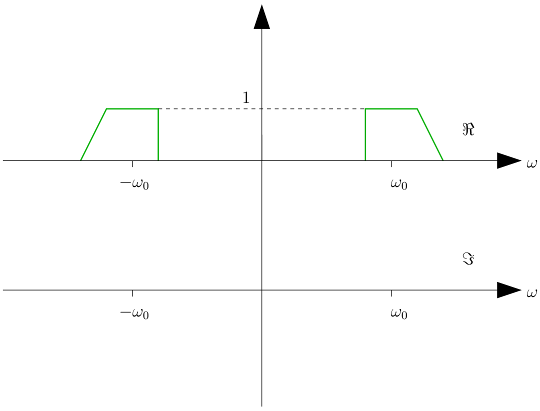


$X_2(\omega) = j\,\frac{E_x(\omega) - E_x^*(-\omega)}{2}$

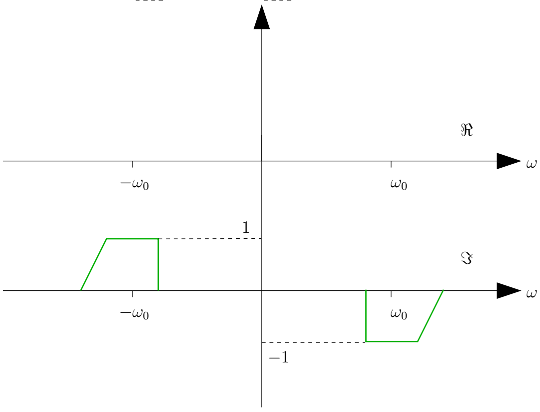


Relations entre les PSD

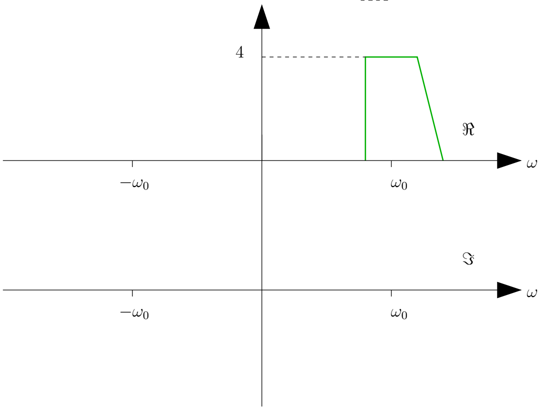
$$\gamma_X(\omega) = \gamma_{\hat{X}}(\omega)$$



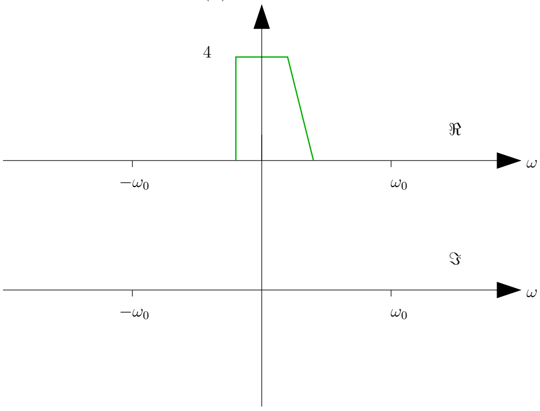
$$\gamma_{\hat{X}X}(\omega) = -\gamma_{X\hat{X}}(\omega) = -j\,\mathrm{sgn}(\omega)\,\gamma_X(\omega)$$



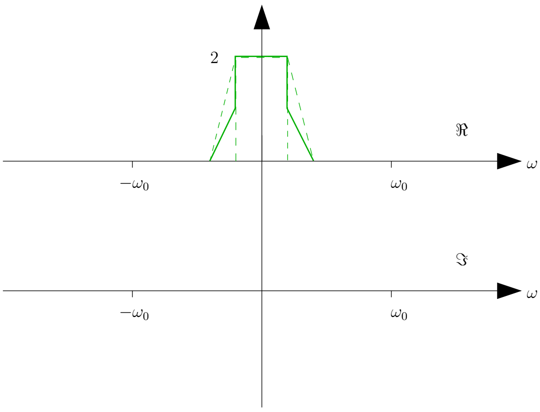
$$\gamma_{X_a}(\omega) = 2\gamma_X(\omega) + 2j\,\gamma_{\hat{X}X}(\omega)$$



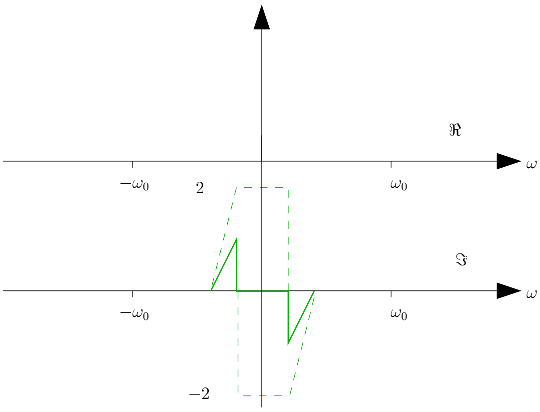
$$\gamma_{E_x(\omega)} = \gamma_{X_a}(\omega + \omega_0)$$



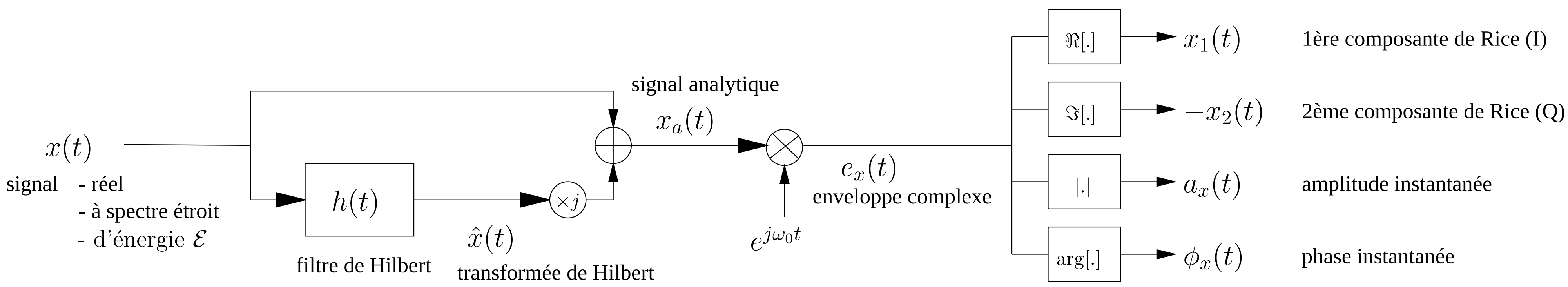
$$\gamma_{X_1}(\omega) = \gamma_{X_2}(\omega) = \frac{\gamma_{E_x}(\omega)+\gamma^*_{E_x}(-\omega)}{4}$$



$$\gamma_{X_1X_2}(\omega) = -\gamma_{X_2X_1}(\omega) = -j\,\frac{\gamma_{E_x}(\omega)-\gamma^*_{E_x}(-\omega)}{4}$$

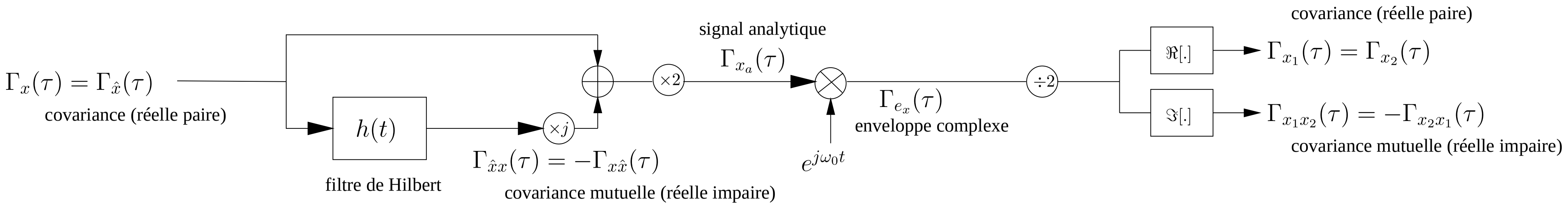


Relations entre les signaux



	$f\left[x(t), \hat{x}(t)\right]$	$f\left[x_a(t)\right]$	$f\left[e_x(t)\right]$	$f\left[x_1(t), x_2(t)\right]$	$f\left[a_x(t), \phi_x(t)\right]$
$x(t) =$	$-\hat{x}(t) \otimes h(t)$	$\Re\left[x_a(t)\right]$	$\Re\left[e_x(t) e^{j\omega_0 t}\right]$	$x_1(t)\cos(\omega_0 t) + x_2(t)\sin(\omega_0 t)$	$a_x(t)\cos(\omega_0 t + \phi_x(t))$
$\hat{x}(t) =$	$x(t) \otimes h(t)$	$\Im\left[x_a(t)\right]$	$\Im\left[e_x(t) e^{j\omega_0 t}\right]$	$x_1(t)\sin(\omega_0 t) - x_2(t)\cos(\omega_0 t)$	$a_x(t)\sin(\omega_0 t + \phi_x(t))$
$x_a(t) =$	$x(t) + j\hat{x}(t)$	$x_a(t)$	$e_x(t) e^{j\omega_0 t}$	$\left[x_1(t) - jx_2(t)\right] e^{j\omega_0 t}$	$a_x(t) e^{j(\omega_0 t + \phi_x(t))}$
$e_x(t) =$	$e^{-j\omega_0 t}\left[x(t) + j\hat{x}(t)\right]$	$e^{-j\omega_0 t} x_a(t)$	$e_x(t)$	$x_1(t) - jx_2(t)$	$a_x(t) e^{j\phi_x(t)}$
$x_1(t) =$	$x(t)\cos(\omega_0 t) + \hat{x}(t)\sin(\omega_0 t) = [2x(t)\cos(\omega_0 t)] \otimes f(t)$	$\Re\left[e^{-j\omega_0 t} x_a(t)\right]$	$\Re\left[e_x(t)\right]$	$x_1(t)$	$a_x(t)\cos(\phi_x(t))$
$x_2(t) =$	$x(t)\sin(\omega_0 t) - \hat{x}(t)\cos(\omega_0 t) = [2x(t)\sin(\omega_0 t)] \otimes f(t)$	$-\Im\left[e^{-j\omega_0 t} x_a(t)\right]$	$-\Im\left[e_x(t)\right]$	$x_2(t)$	$-a_x(t)\sin(\phi_x(t))$
$a_x(t) =$	$\sqrt{x^2(t) + \hat{x}^2(t)}$	$\lvert x_a(t)\rvert$	$\lvert e_x(t)\rvert$	$\sqrt{x_1^2(t) + x_2^2(t)}$	$a_x(t)$
$\phi_x(t) =$	$\arctan\left[\frac{\hat{x}(t)}{x(t)}\right] - \omega_0 t$	$\arg\left[x_a(t)\right] - \omega_0 t$	$\arg\left[e_x(t)\right]$	$-\arctan\left[\frac{x_2(t)}{x_1(t)}\right]$	$\phi_x(t)$
$\mathcal{E} =$	$\int_{-\infty}^{+\infty} x^2(t)\, dt$	$\frac{1}{2}\int_{-\infty}^{+\infty} \lvert x_a(t)\rvert^2\, dt$	$\frac{1}{2}\int_{-\infty}^{+\infty} \lvert e_x(t)\rvert^2\, dt$	$\frac{1}{2}\int_{-\infty}^{+\infty} x_1^2(t) + x_2^2(t)\, dt$	$\frac{1}{2}\int_{-\infty}^{+\infty} a_x^2(t)\, dt$

Relations entre les covariances



Système passe-bande

$$\begin{aligned} y(t) &= x(t) \otimes h(t) \\ e_y(t) &= \frac{1}{2}\left[e_x(t) \otimes e_y(t)\right] \end{aligned}$$

Canal idéal

$$\begin{aligned} h(t) &= A\,\delta(t-\tau) \\ H(\omega) &= A\,e^{-j\omega\tau} \\ |H(\omega)| &= A \\ \tau_G(\omega) &= -\frac{d\arg\left[H(\omega)\right]}{d\omega} = \tau \end{aligned}$$