

## Redundancy of negative frequencies for real-valued signals

Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be real valued signal ( $f \in L^2(\mathbb{R})$ )

$$C_\omega = \hat{f}(\omega) = \int_{t \in \mathbb{R}} f(t) \exp(-2\pi i \omega t) dt$$

Then  $C_{-\omega} = \overline{C_\omega}$

Proof:  $C_{-\omega} = \int_{t \in \mathbb{R}} f(t) \exp(2\pi i \omega t) dt$

$f$  real valued  $= \int_{t \in \mathbb{R}} \overline{f(t)} \overline{\exp(-2\pi i \omega t)} dt$

$$= \overline{\int_{t \in \mathbb{R}} f(t) \exp(-2\pi i \omega t) dt}$$

$$= \overline{C_\omega}$$