Comments on the proof for representation of bandpass systems (Jan-17, 2014)

We proved in the class that

$$y(t) = \mathrm{Re}\left\{ \left(\frac{1}{2} \int \tilde{h}(\tau)\, \tilde{x}(t-\tau)\, d\tau \right) \cdot e^{j2\pi f_c t} \right\} \quad \text{— (1)}$$

We then compared this with

$$y(t) = \mathrm{Re}\left\{ \tilde{y}(t)\, e^{j2\pi f_c t} \right\} \quad \text{— (2)}$$

and concluded that

$$\tilde{y}(t) = \frac{1}{2} \int \tilde{h}(\tau)\, \tilde{x}(t-\tau)\, d\tau \quad \text{— (3)}$$

After the class, Siddharth asked me, if the derivation of (3) from (1) and (2) is really correct since it seems that we have the situation

$\mathrm{Re}\{a(t)\} = \mathrm{Re}\{b(t)\}$, ~~and~~ using which we seem to be claiming that $a(t) = b(t)$.