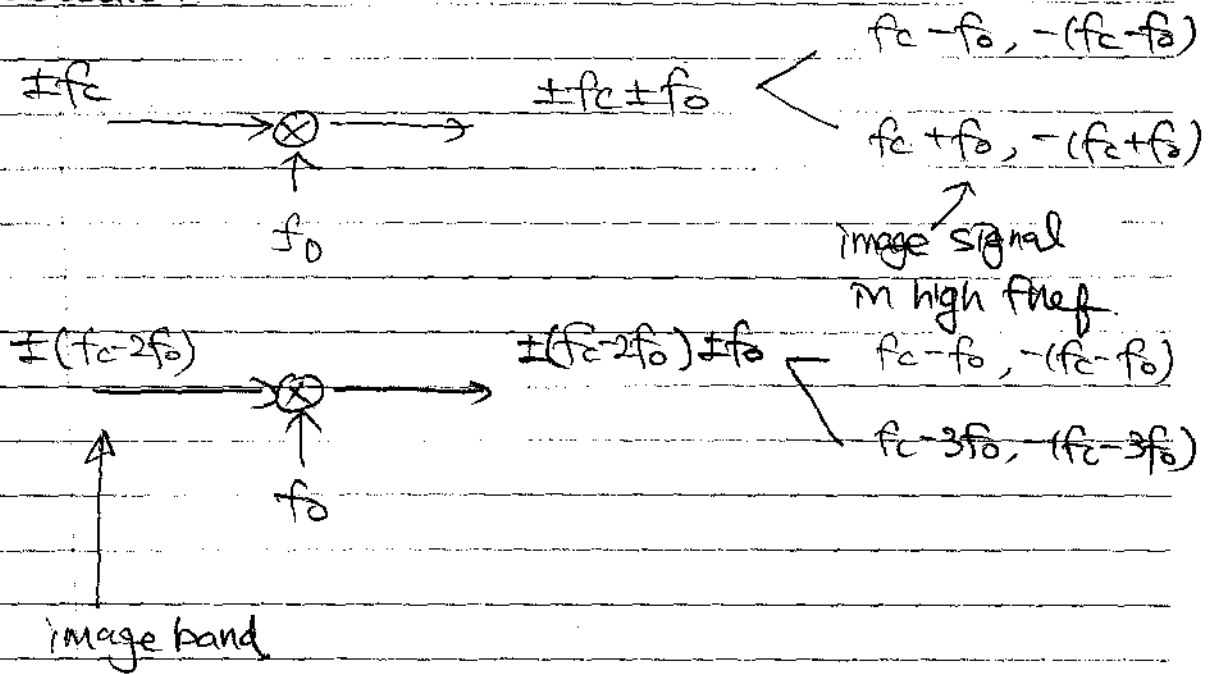
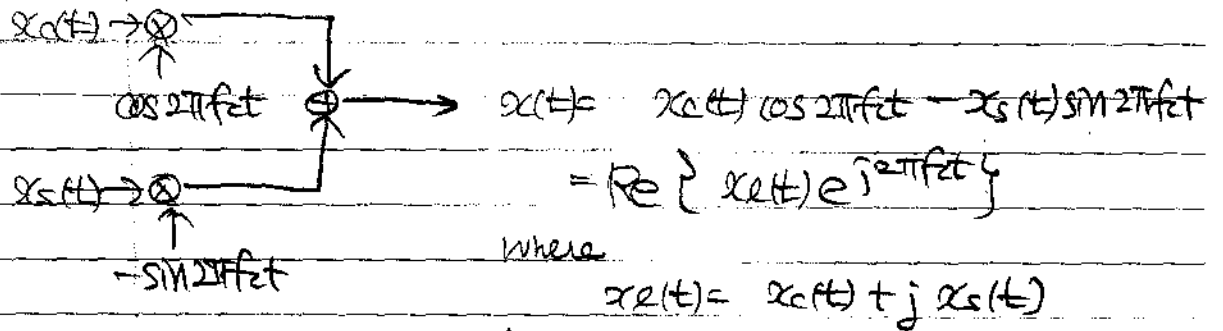


0 Review of Lec. #3

- When the input to a mixer that down converts the signal to IF contains unwanted signals, the image band must be carefully taken into consideration



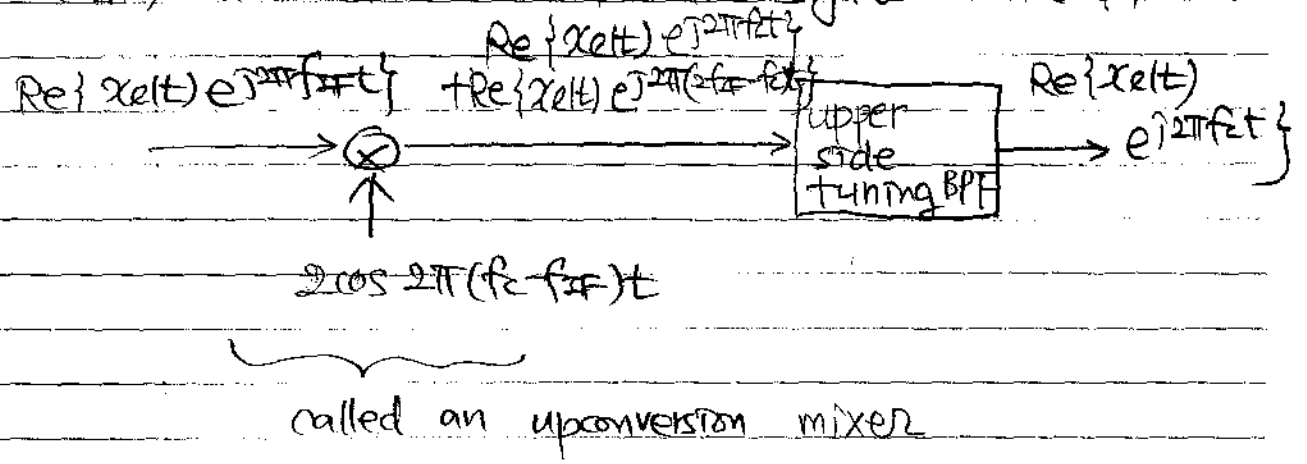
- To reject signal in the image band before mixing, we use an IR (image reject) filter.



called an IQ modulator or a quadrature modulator

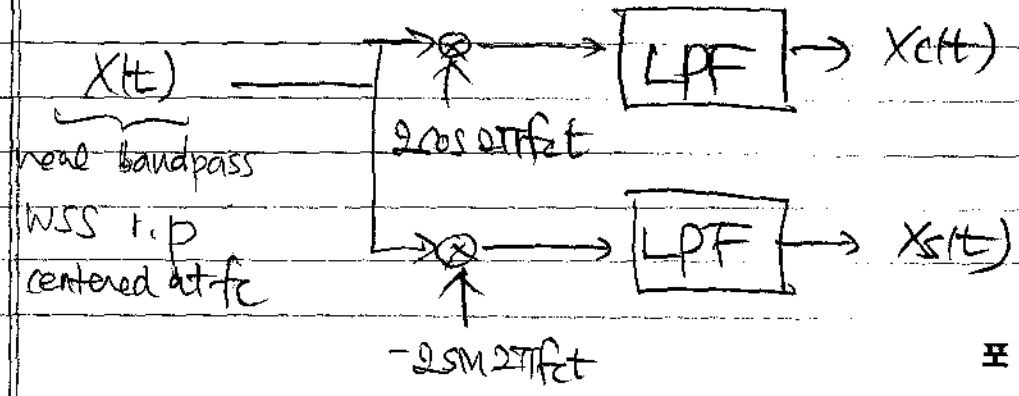
Direct upconversion from baseband to RF may have some problems. cos & sin signal may have difficulty in having perfect 90° phase difference at high freq.
 ⇒ We need lower freq. in the use of a quadrature modulator.

Then, how can we shift the signal to an RF?



Complex baseband representation of real-valued bandpass
 signal system random process

Q. What are the statistical properties of $X_c(t)$ and $X_s(t)$ in



A. In the time domain,

$X_c(t)$ & $X_s(t)$ are real baseband random processes s.t.

$$(i) E[X_c(t)] = E[X_s(t)] = 0, \quad \forall t \quad (\Rightarrow \text{WSS bandpass r.p. has always mean zero.})$$

$$(ii) E[X_c(t)X_c(t+\tau)] = E[X_s(t)X_s(t+\tau)] = R_{X_c X_c}(\tau), \quad \forall t, \tau$$

$$(iii) E[X_c(t)X_s(t+\tau)] = R_{X_c X_s}(\tau) = -R_{X_s X_c}(\tau), \quad \forall t, \tau$$

(i), (ii), & (iii) \Rightarrow $X_c(t)$ & $X_s(t)$ are zero-mean jointly WSS with identical autocorrelation fct & odd symmetric cross correlation fct.

In the freq. domain, ?