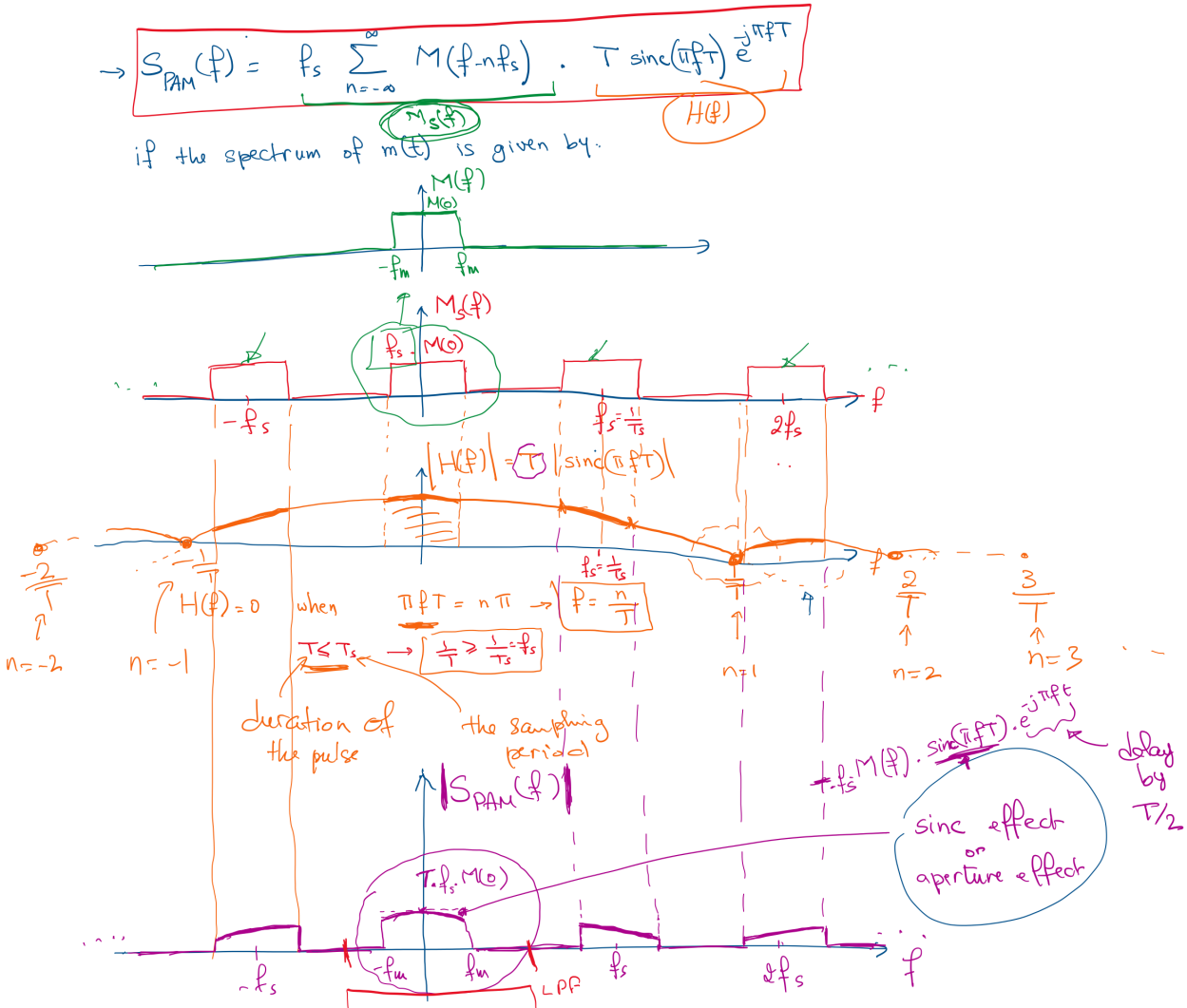
Online Lecture # 10 - Digital Baseband Modulation - Pulse Amplitude Demodulation

Monday, April 13, 2020
8:59 AM

$$\rightarrow S_{PAM}(f) = f_s \sum_{n=-\infty}^{\infty} M(f - n f_s) \cdot T \,\mathrm{sinc}(\pi f T)\, e^{j\pi f T}$$

$M_s(f)$; $H(f)$

if the spectrum of $m(t)$ is given by:



The spectrum of the PAM signal has:

* a main replica around 0 Hz (contains most of the information)
* higher frequency replicas with lower amplitude

→ the multiplication by $H(f)$ results in a distortion to the shape of the amplitude of the frequency spectrum of $S_{PAM}(t)$ compared to $M(f)$.

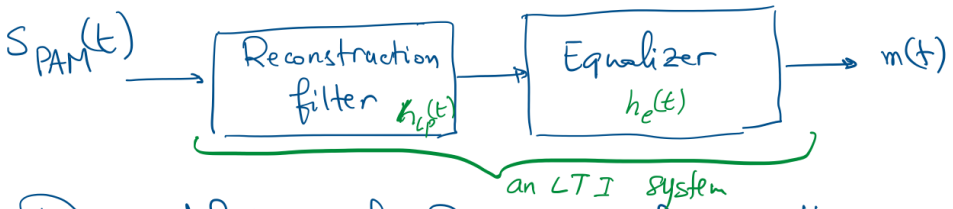
→ this distortion affects the signal quality if not corrected in the receiver side.

to recover the original message $m(t)$ from a PAM signal.

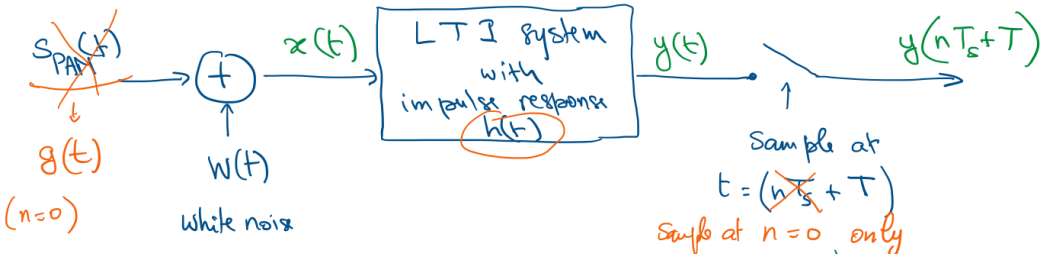
* remove the high frequency replicas → LPF (reconstruction filter) with Passband = $[-f_s/2 \to \frac{f_s}{2}]$
* Compensate for the aperture effect → multiply in freq. domain by:

$$|H_e(f)| = \frac{1}{|\mathrm{sinc}(\pi f T)|}$$

(Equalizing filter) or Equalizer



* Demodulation of PAM Signals in the presence of noise:



objective is to choose $h(t)$ so that $y(nT_s+T)$ has the highest ratio of signal to noise

To do the analysis in time-domain of the effect of noise on PAM demodulation. we will consider only one pulse $g(t)$