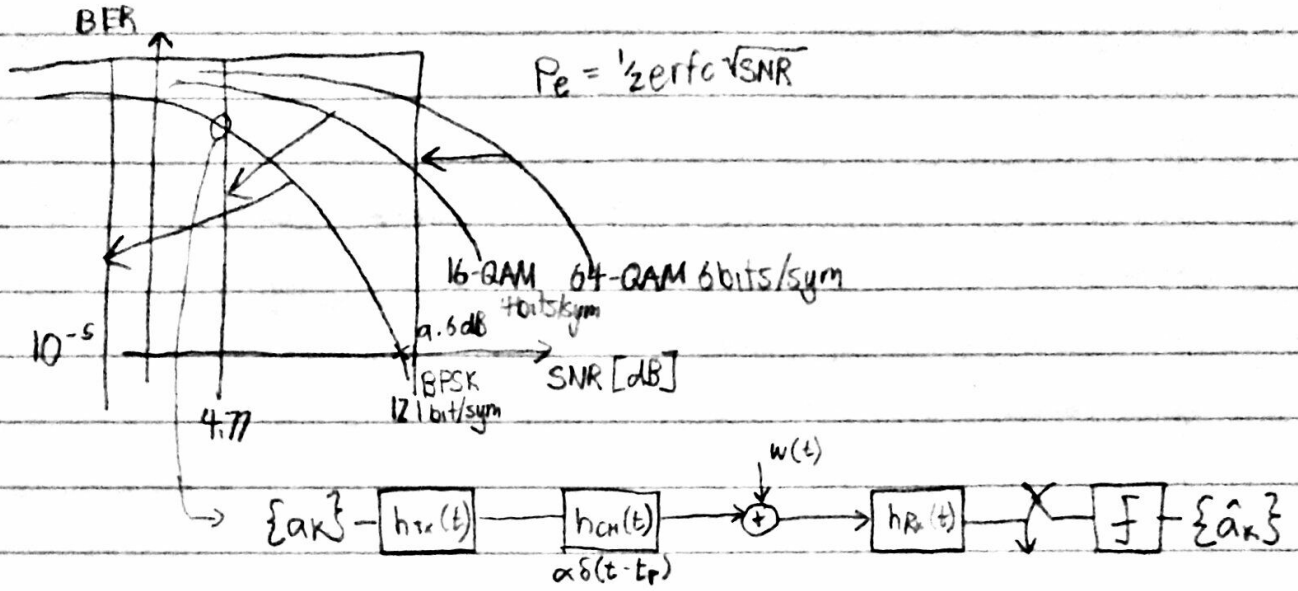
Lecture 16

11/09/15

max packing rate : $\log_2(1+SNR)$ bits/sym (Shannon) } with arbitrarily low BER → max SE_b

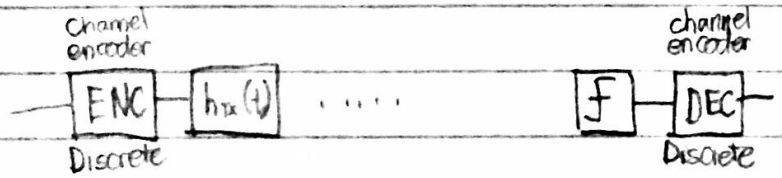
max SE_{sym} : 1 sym/sec/Hz (Hartley-Nyquist)

max SE_b : $\log_2(1+SNR)$ bits/sec/Hz

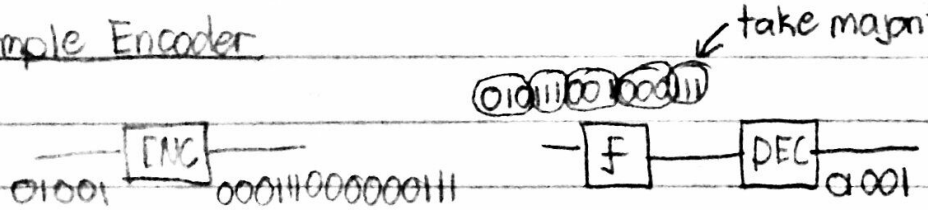


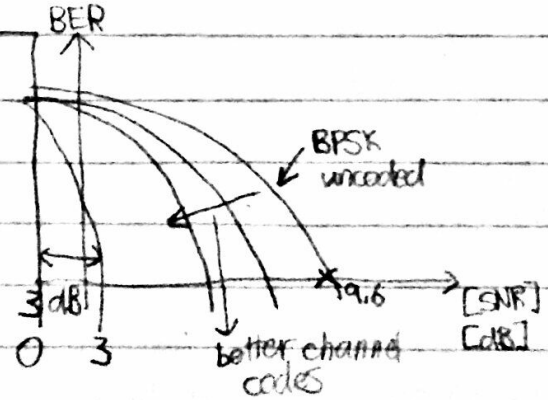
$\log_2(1+SNR) = \begin{cases} 1, SNR = 1 = 0\,dB \\ 4, SNR = 3 = 4.77\,dB \\ 16, SNR = 15 = 12\,dB \end{cases}$

non constructive existance theorem

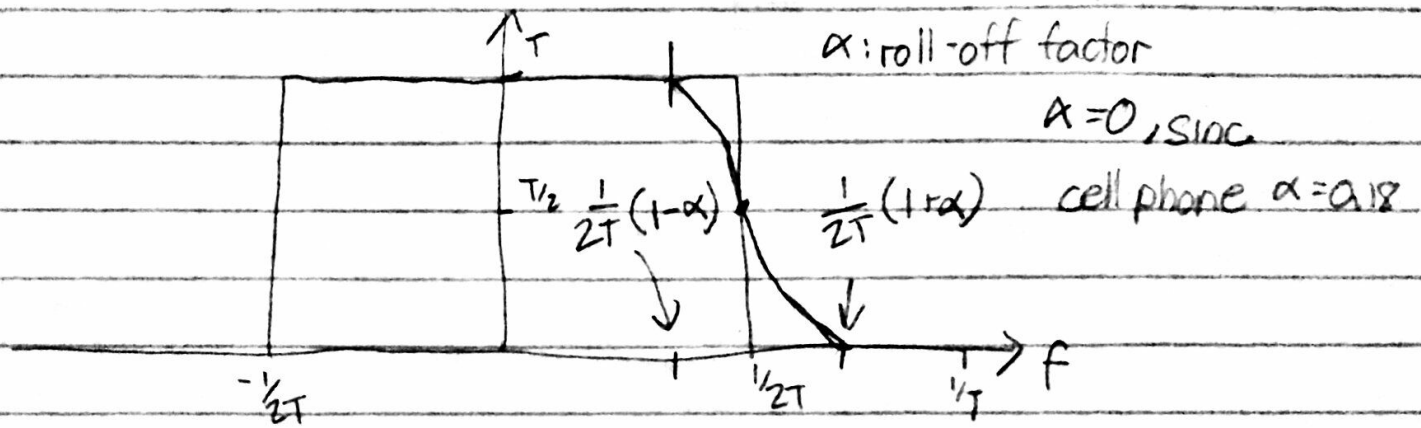


Simple Encoder





- convolutional codes } approaching Shannon capacity
- 1993, turbo codes
- late 1990s, LDPC
- 2008, polar codes: @ the shannon capacity



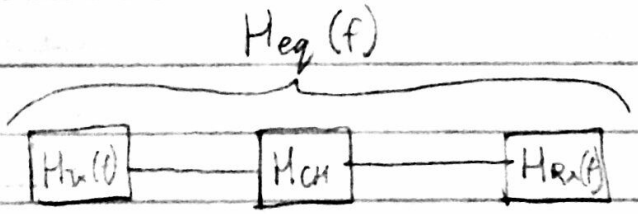
α: roll-off factor

$\alpha = 0$, sinc

cell phone $\alpha = 0.18$

max packing: $\log_2(1+SNR)$ bits/sym

realistic SE: $\frac{1}{1+\alpha}$ sym/sec/Hz



$\frac{\log_2(1+SNR)}{1+\alpha}$ b/s/Hz

$H_{eq}(f) = H_{Tx}(f) H_{CH}(f) H_{Rx}(f)$

if $H_{eq}(f) = \underbrace{P(f)}_{\text{no ISI}}$

special case: $H_{CH}(f) = 1$

$H_{Tx}(f) H_{Rx}(f) = P(f)$

$\therefore |H_{Tx}(f)| = |H_{Rx}(f)| = \sqrt{P(f)}$

RRC = SRRC