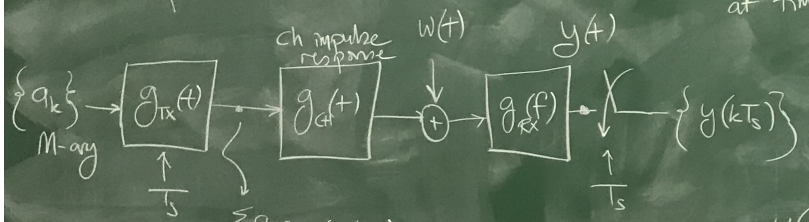
21 Jan 2020

Minimum BW signalling

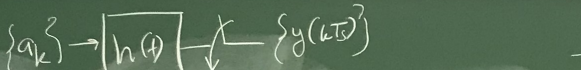
$BW \propto \frac{1}{T_s}$

$BW = \beta \frac{1}{T_s}$

What is $\beta_{min}$?




• Assume $w(t) = 0$




$h(t) = g_{Tx}(t) * g_{ch}(t) * g_{Rx}(t)$

$y(t) = \sum a_k h(t-kT_s)$

at time $t = lT_s$

$y(lT_s) = a_l$

$\therefore$ perfect operation

$y(lT_s) = y(t)\Big|_{t=lT_s} = \sum a_k \underbrace{h(lT_s - kT_s)}_{h([l-k]T_s)}$

$l$ | $y(0)$

$l=0 \rightarrow \sum a_k h(-kT_s)$

$= \ldots + a_{-1}h(T_s) + a_0 h(0) + a_1 h(-T_s) + \ldots$

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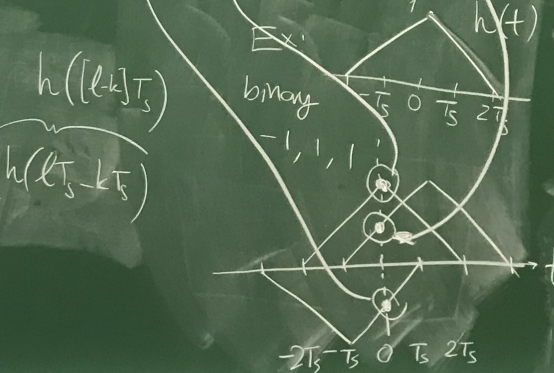
$l=1 \rightarrow \sum a_k h((1-k)T_s)$

$= \ldots + a_{-1}h(2T_s) + a_0 h(T_s) + a_1 h(0) + \ldots$

Ex:




Want

$$h(t) = \begin{cases} 1, & t=0 \\ 0, & t=\pm T_s, \pm 2T_s, \ldots \end{cases}$$

Ex: