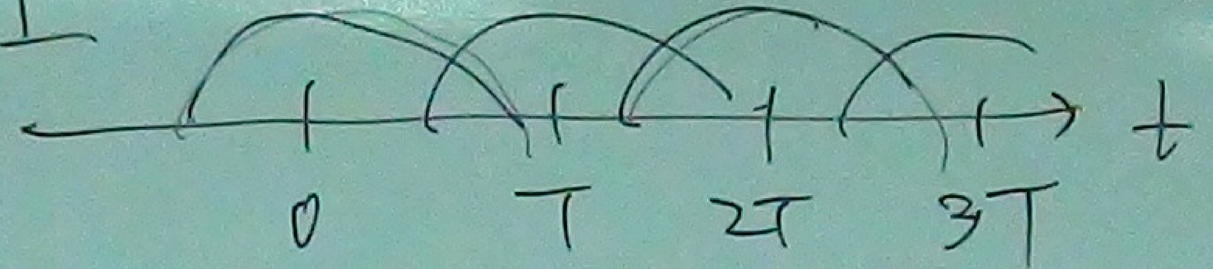
EECE 695M CM#27a

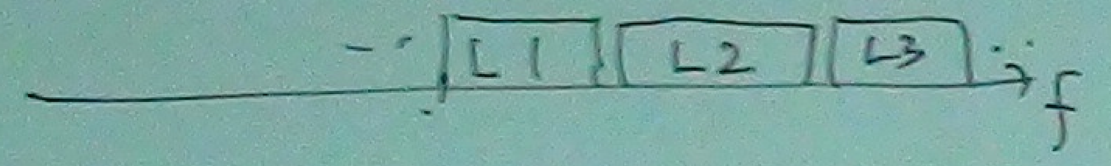
• T-COM 2010. 5月

An optimal Orthogonal Overlay for a Cyclostationary Legacy Signal.

Orthogonal to Legacy

no ISI



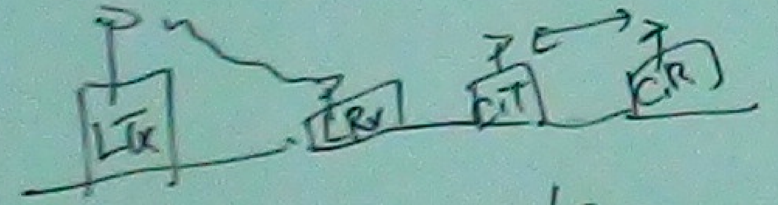



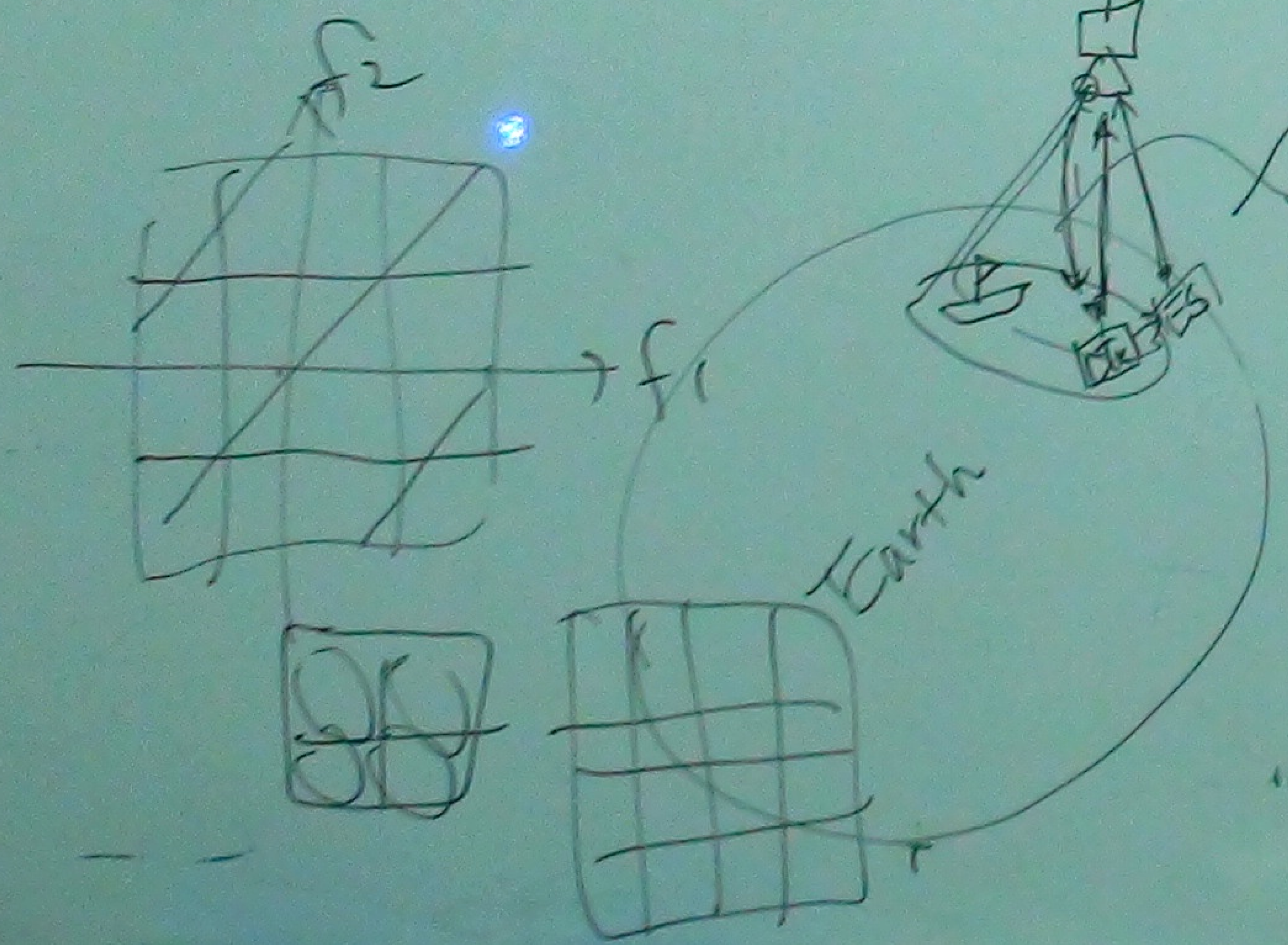

white space

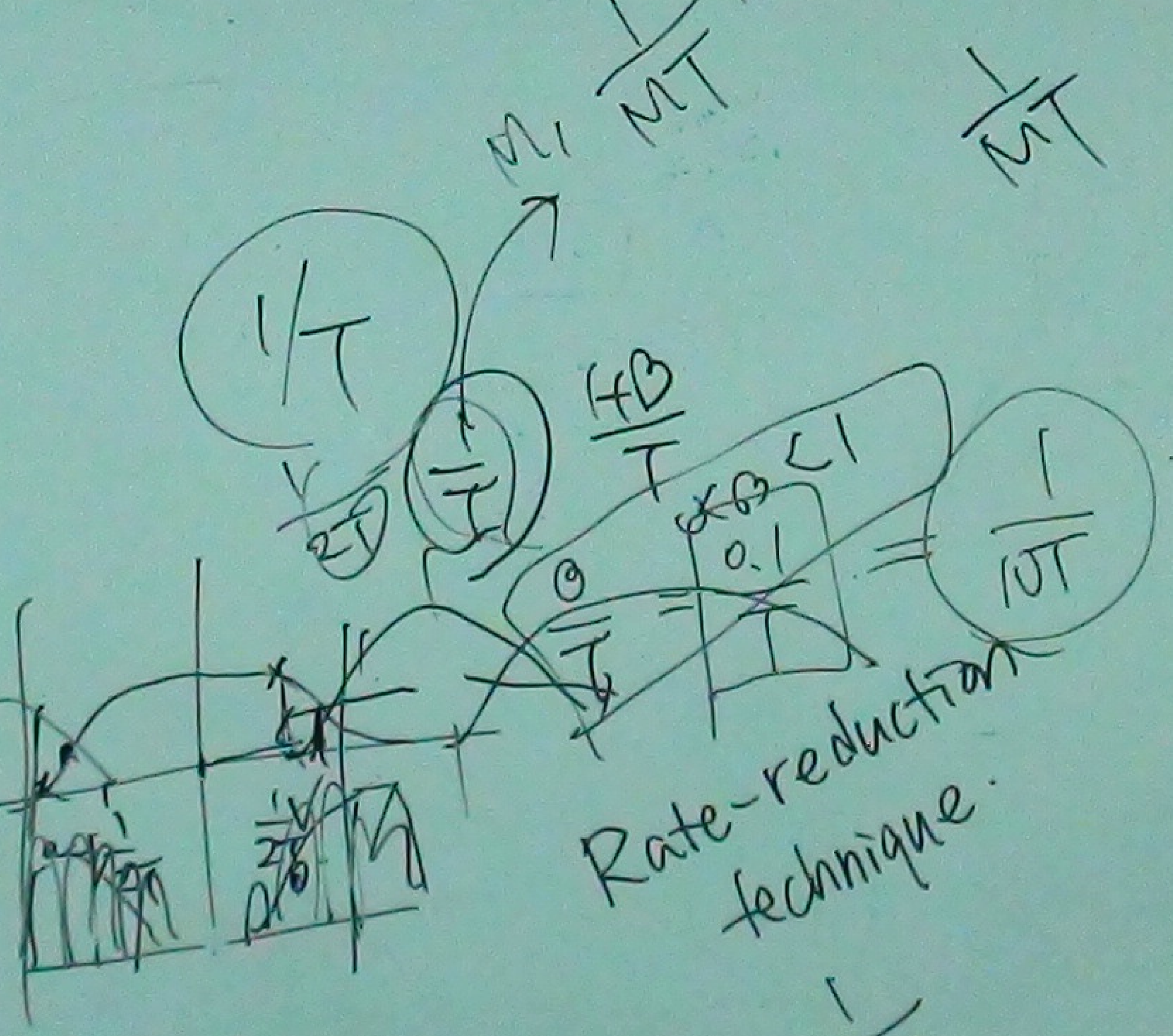
undelay

overlay

interweaving

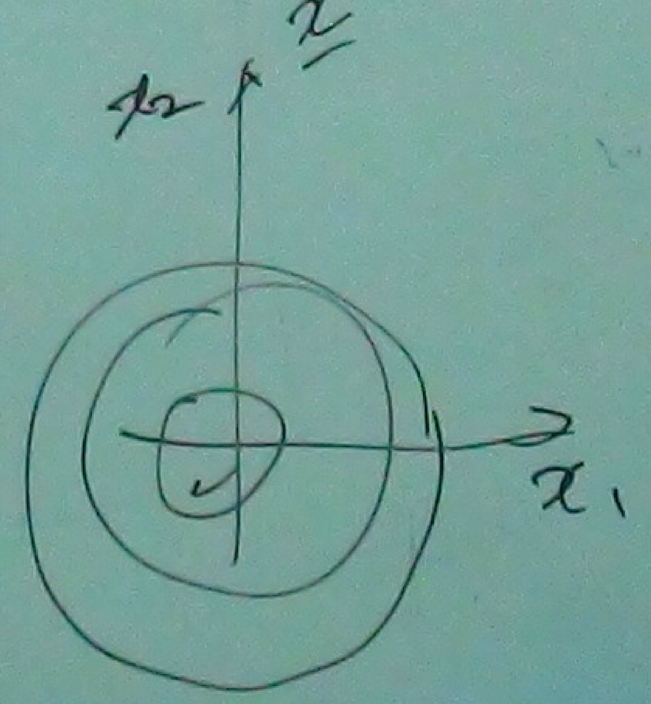


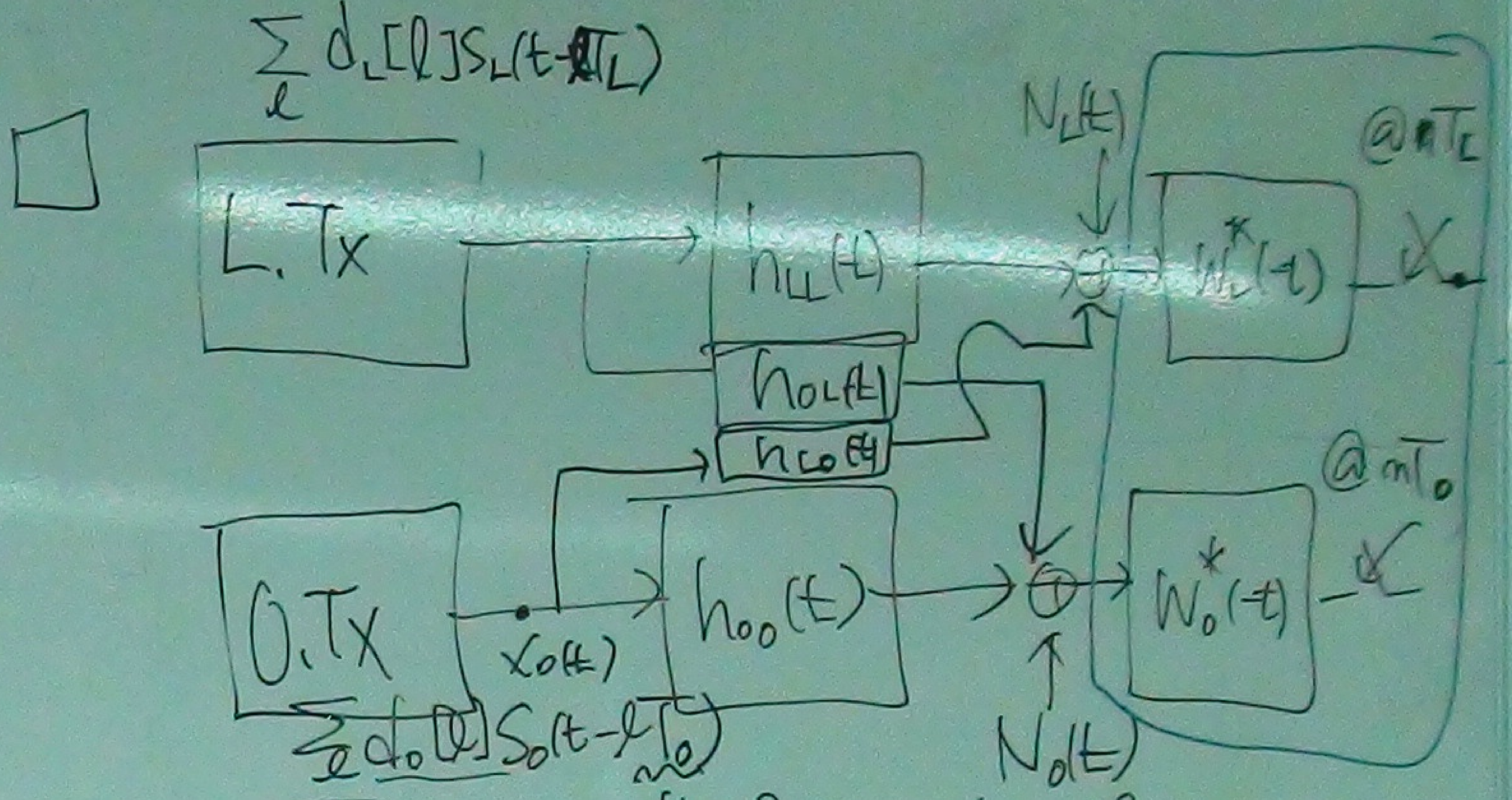




Rate-reduction technique.

$$\frac{0.4}{T} > \frac{1}{5T}$$




Two-user interference channel.

$T_0 = MT_s$

$$\min_{s_0(t)} \left( \min_{w_0(t)} LMSE_0 \right)$$

s.t. $\begin{cases} P_{x_0 x_0} \le P_0 \\ \text{Orthogonal at L Rx sample.} \end{cases}$

$$\max_{\underline{s}} \frac{\underline{s}^H C \underline{s}}{\underline{s}^H \underline{s}}$$

s.t. $H^H \underline{s} = \underline{0}$

$$P = H(H^H H)^{-1} H^H$$

$$P^{\perp} = I - P$$

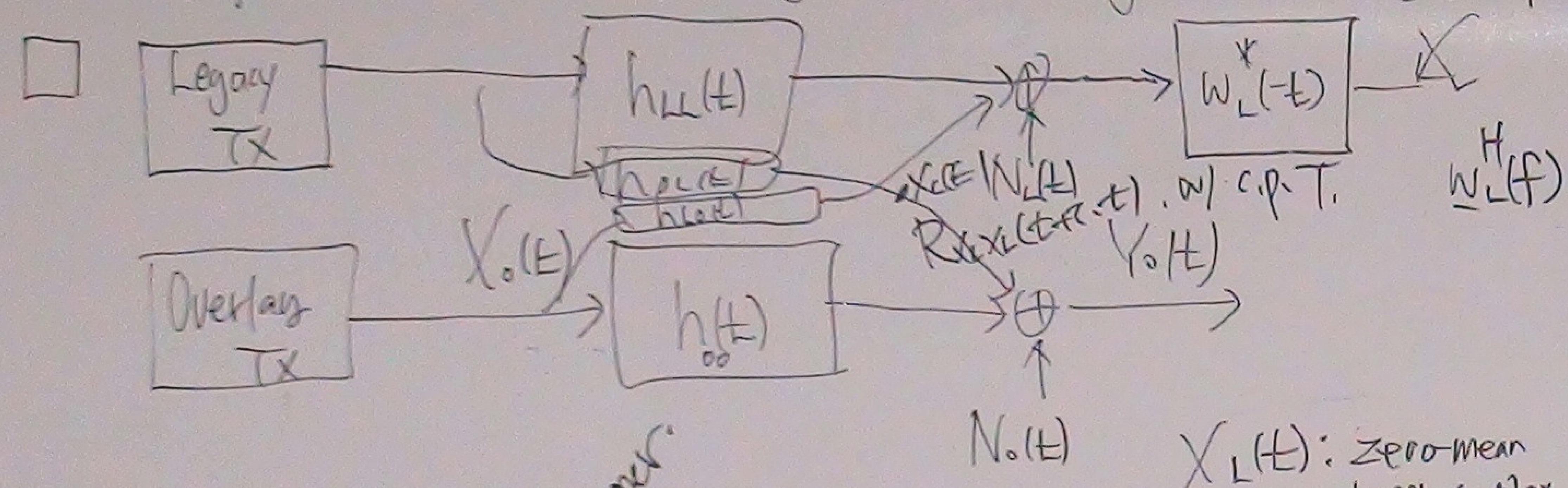
$h$ $\quad \frac{\underline{h}\,\underline{h}^H}{\underline{h}^H \underline{h}}$

$$\max_{\underline{s}} \frac{\underline{s}^H P^H C P \underline{s}}{\underline{s}^H \underline{s}}$$

EECE 695M CM#27b

☐ T-WC 2015 11月

Capacity of an Orthogonal Overlay Channel




$X_L(t)$: zero-mean proper-complex Gaussian r.p. w/ SOCS WSCS

$R_{X_LX_L}(t+\tau,t) = R_{X_LX_L}(t+T+\tau, t+T)$, $\forall t,\tau$.

$$C = \int_{-\frac{1}{2T}}^{\frac{1}{2T}} \log\det\left(I + R_{NN}^{-\frac{1}{2}}(f) H(f) R_{XX}(f) H^H(f) R_{NN}^{-\frac{1}{2}}(f)\right) df \qquad \frac{1}{\sigma} I$$

$$\max_{R_{XX}(f)} \int \log\det\left(I + R_{NN}^{-\frac{1}{2}}(f) H(f) R_{XX}(f) H^H(f) R_{NN}^{-\frac{1}{2}}(f)\right) df$$

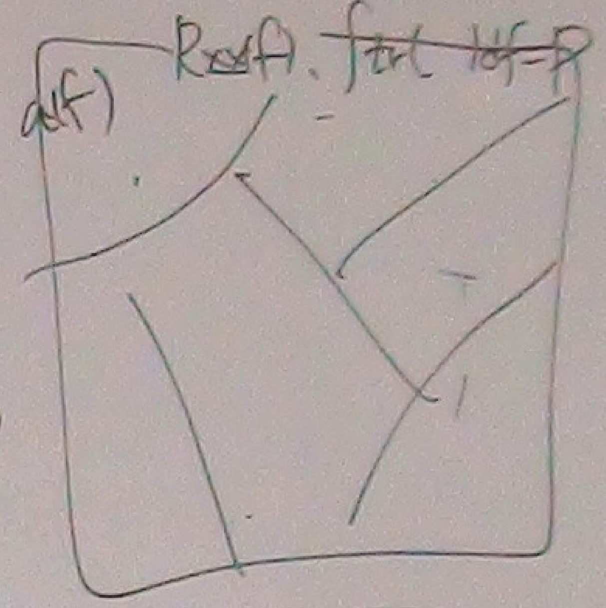
s.t. $R_{XX}^H(f) = R_{XX}(f) \geq 0$, $\forall f \in [-\frac{1}{2T}, \frac{1}{2T}]$

$\int_{-\frac{1}{2T}}^{\frac{1}{2T}} \underbrace{tr\{R_{XX}(f)\}}_{a(f)\geq 0} df \leq P$.

$w_L^H(f) \left( H_{Lo}(f) R_{X_oX_o}(f) H_{Lo}^H(f) \right) w_L(f) = 0$, $\forall f$

$X(t)$ vector WSS proper zero-mean Gaussian

$\int_{-\frac{1}{2T}}^{\frac{1}{2T}} a(f)\, df = P$




$= \max_{a(f)} \max \log\det(\ )$

$R_{XX}(f) = R_{XX}^H(f) \geq 0$

$tr\{R_{XX}(f)\} = a(f)$

s.t. $\int_{-\frac{1}{2T}}^{\frac{1}{2T}} a(f)\, df = P$

$\log\det\left(I + \frac{H R_{XX} H^H}{\sigma^2}\right)$

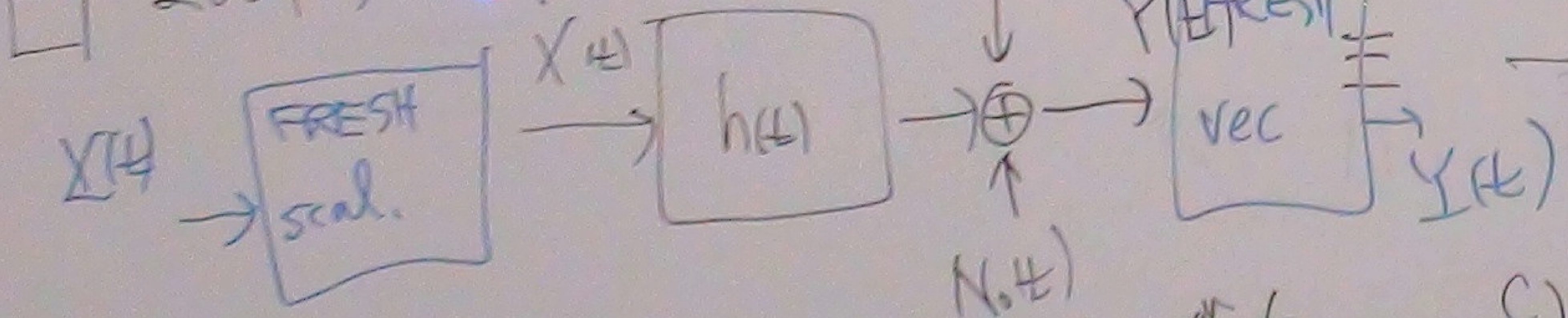
$H = U \Lambda V^H$

$\{X_1(f), X_2(f), \cdots\}$, $f \in [-\frac{1}{2T}, \frac{1}{2T}]$

zero-mean proper WSCS Gaussian r.p.

Cyclic WF.

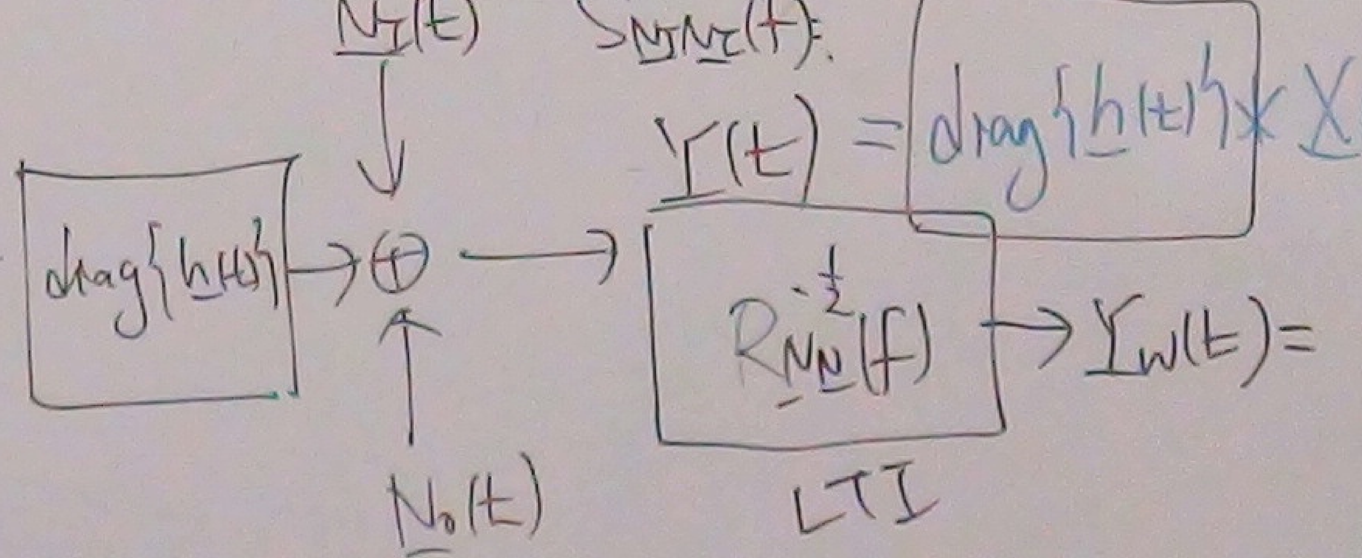
☐ 2004 →




zero-mean proper WSS Gaussian

$R_{N_oN_o}(\tau) \leftrightarrow S_{N_oN_o}(f)$.

$\underline{X}(t)$




$S_{N_IN_I}(f)$.

$H(t)$

$\underline{Y}(t) = \boxed{diag\{\underline{h}(t)\}} * \underline{X}(t) + \underbrace{\underline{N}_o(t) + \underline{N}_I(t)}_{\underline{N}(t)}$.

$\underline{N}(t) \overset{\mathcal{F}}{\leftrightarrow} R_{NN}(f)$

$S_{N_oN_o}(f) = diag\{S_{N_oN_o}(f)\}$