

(5)(5)

$$O_p [|Y|^2 - \bar{G} Y \bar{U} - G \bar{Y} U + |G|^2 |U|^2]$$

$$= O_p [|Y|^2 - \bar{G}_0 Y \bar{U} - \epsilon K \bar{Y} \bar{U} - G_0 \bar{Y} U - \epsilon K G_0 \bar{Y} U + |G_0|^2 |U|^2 + \epsilon K G_0 |U|^2 + \epsilon \bar{K} G_0 |U|^2 + |K|^2 \epsilon^2 |U|^2]$$

$$\left. \frac{\partial}{\partial \epsilon} \right|_{\epsilon=0} = \phi$$

$$-\bar{K} Y \bar{U} - K \bar{Y} U + K \bar{G}_0 |U|^2 + \bar{K} G_0 |U|^2 = \phi$$

$$\bar{K} (G_0 |U|^2 - Y \bar{U}) + K (\bar{G}_0 |U|^2 - \bar{Y} U) = \phi$$

$$O_p [2 \operatorname{Re} (K (G_0 |U|^2 - Y \bar{U}))] = \phi \quad K \text{ ARBITRARY!}$$

$$\begin{cases} \hat{G}_0 = \frac{E\{Y \bar{U}\}}{E\{|U|^2\}} \\ \hat{G}_0 = \frac{\frac{1}{M} \sum Y_n^{(k)} \bar{U}_n^{(k)}}{\frac{1}{M} \sum |U_n^{(k)}|^2} \end{cases}$$

FRF (ETFE) MEASUREMENTS WITH PERIODIC EXCITATIONS

- BAND-LIMITED MEASUREMENTS (SHANNON THEOREM)
- INTEGER # OF PERIODS MEASURED (NO LEAKAGE ERRORS)

$$G(j\omega_k) = Y(k) / U(k)$$

$$Y(k) = Y_0(k) + N_Y(k)$$

$$U(k) = U_0(k) + N_U(k)$$

NOISES:

$$E\{N_U(k)\} = \phi$$

$$E\{N_U^2(k)\} = \phi$$

(SAME FOR N_Y)

(CIRCULAR COMPLEX GAUSSIAN)

$$E\{|N_U(k)|^2\} = \sigma_U^2(k)$$

$$E\{|N_Y(k)|^2\} = \sigma_Y^2(k)$$

(N1)

$$E\{N_Y(k) \bar{N}_U(k)\} = \sigma_{YU}^2(k) = \sigma_{UY}^2(k)$$

$$E\{N_Y(k) N_U(k)\} = \phi$$

N_U, N_Y INDEPENDENT FROM U_0, Y_0 (N2)