

- Let P' be the average energy (i.e., the second moment) of the X'_i s.
- Since $\psi_i(t)$, $-\infty < i < \infty$ are orthonormal, each has unit energy and their energy adds up.
- Therefore, $X'(t)$ accumulates energy from the samples at a rate equal to $(2W)P'$.
- By considering

$$(2W)P' \leq P,$$

where P is the average power constraint on the input process $X'(t)$, we obtain

$$P' \leq \frac{P}{2W}.$$