- $Z_i \sim \mathcal{N}(0, N_i)$ and Z_i, $1 \le i \le k$ are independent.

- Total input power constraint: $E\sum_{i=1}^{k} X_i^2 \le P$.

- $$C(P) = \sup_{F(\mathbf{x}):E\sum_i X_i^2 \le P} I(\mathbf{X};\mathbf{Y})$$

- Intuitively,

$$C(P) = \max_{P_1, P_2, \cdots, P_k : \sum_i P_i = P} \frac{1}{2}\sum_{i=1}^{k} \log\left(1 + \frac{P_i}{N_i}\right)$$

  where $X_i \sim \mathcal{N}(0, P_i)$ and $X_1, X_2 \cdots, X_k$ are mutually independent.

- Note that
$$\frac{1}{2}\log\left(1 + \frac{P_i}{N_i}\right)$$
  is the capacity of the ith channel when the input power is P_i.