符合测量

Coincidence Measurement

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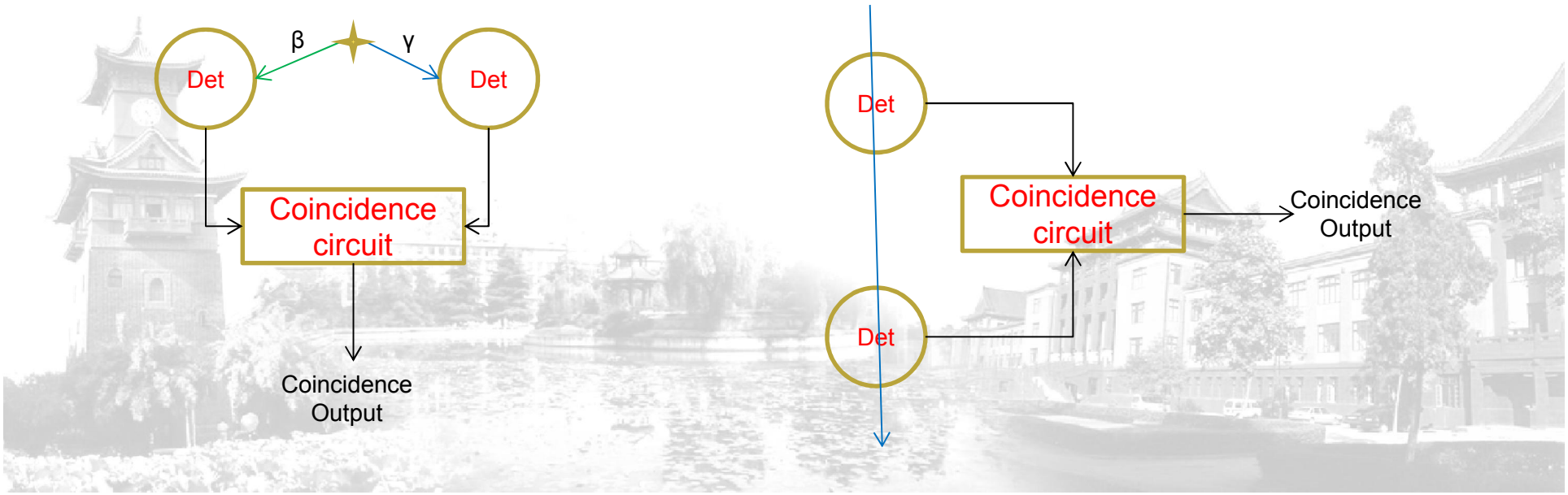
Outline

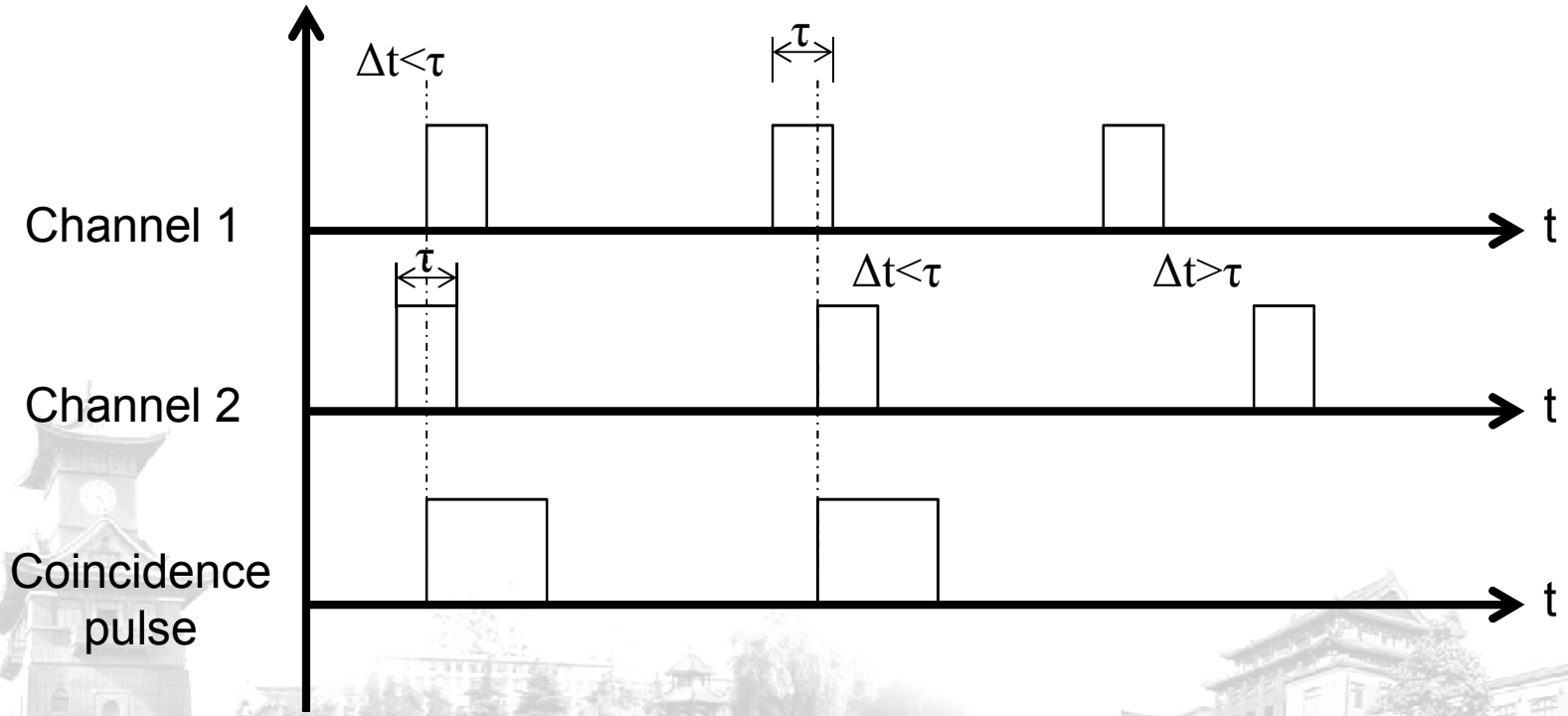
- Principle of Coincidence
- Time Discrimination

Coincidence Events

- Two or more events which occurred synchronously
- Time interval of two or more events is less than coincidence resolving time

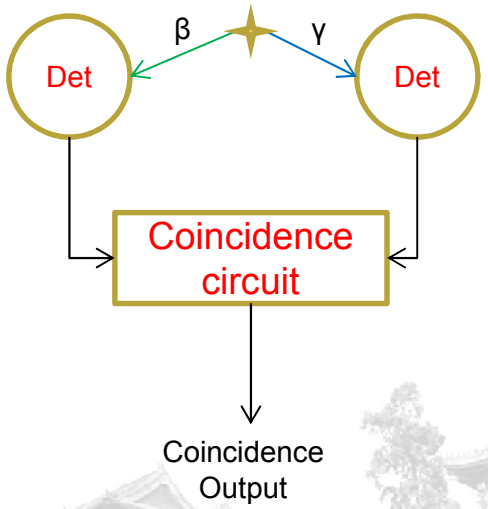


Coincidence Pulse

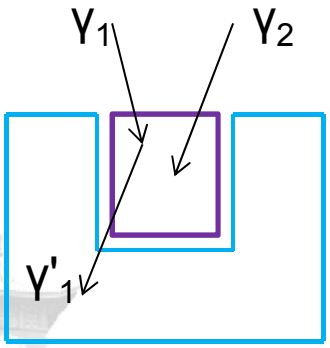


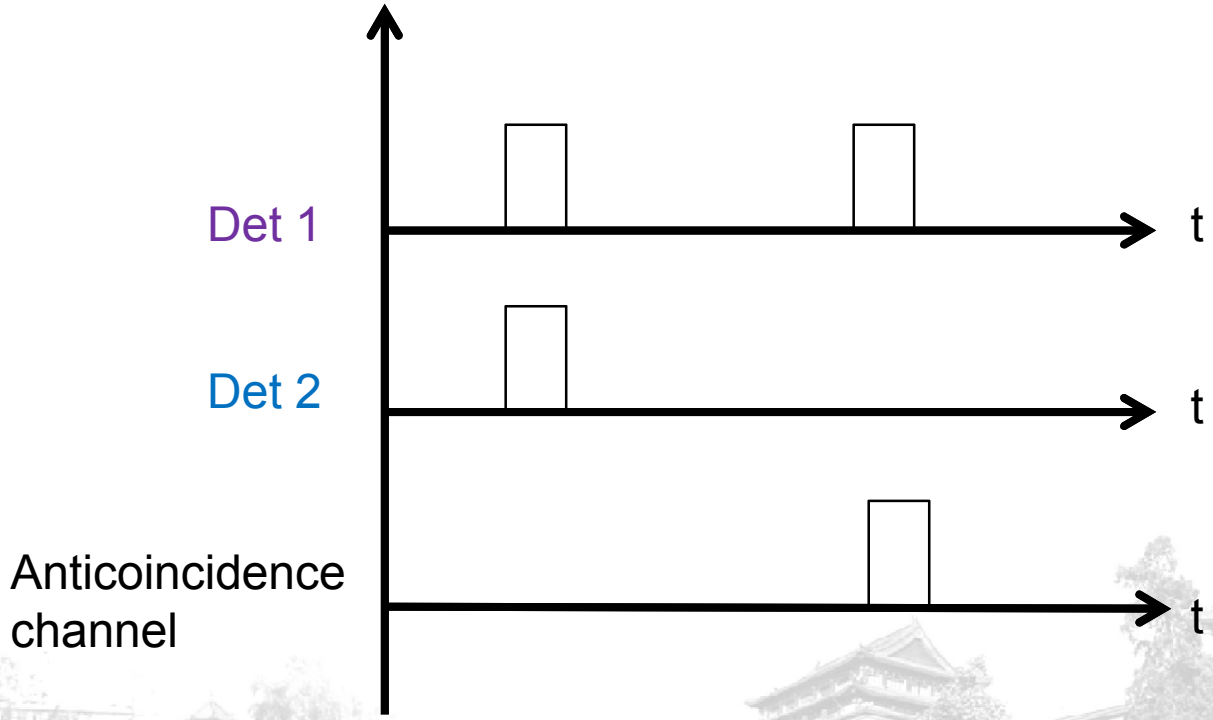
True Coincidence and Random Coincidence

- True coincidence
  - A coincidence pulse caused by two events which have correlation with each other. For example, β and γ are from the same nucleus.
- Random coincidence
  - A coincidence pulse caused by chance. for example, β from one nucleus and γ from the other.



Anticoincidence





Delay Coincidence

- The second event occurred after a certain length of time after the first event.
- So we can delay the signal of the first event a fixed time so that it can coincide with the first event.

Count Rate of Random Coincidence

- $n_{rc}=2\tau n_1 n_2$
- $n_{rc}=i\tau^{i-1} n_1 n_2 \ldots n_i$

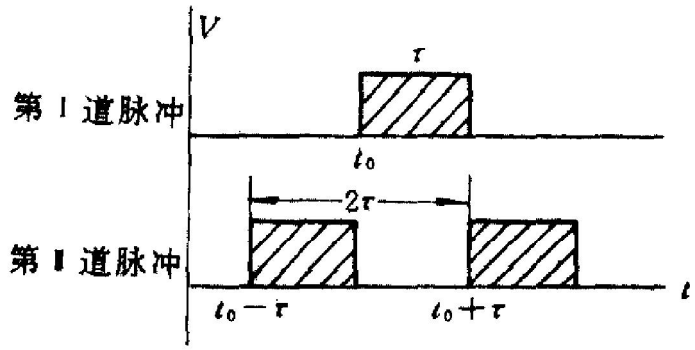


图 7.4　发生符合的脉冲间隔

True-to-random Coincidence Ratio

$$n_\beta = A\Omega_\beta\varepsilon_\beta, n_\gamma = A\Omega_\gamma\varepsilon_\gamma$$

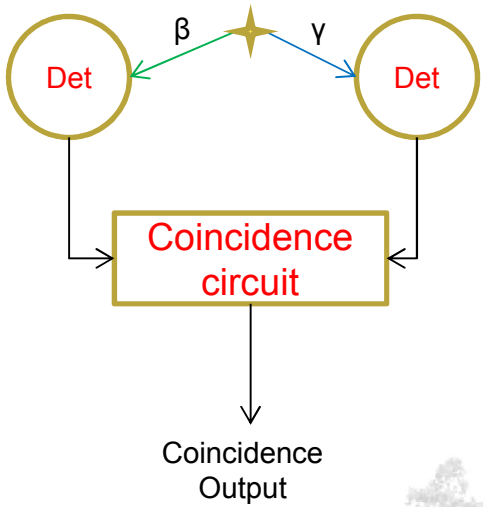
$$n_{tc} = A\Omega_\beta\Omega_\gamma\varepsilon_\beta\varepsilon_\gamma$$

$$n_{rc} = 2\tau n_\beta n_\gamma = 2\tau A^2\Omega_\beta\Omega_\gamma\varepsilon_\beta\varepsilon_\gamma$$

$$\frac{n_{tc}}{n_{rc}} = \frac{1}{2\tau A}$$

$$A = n_\beta n_\gamma / n_{tc}$$

$$n_c = n_{tc} + n_{rc}$$

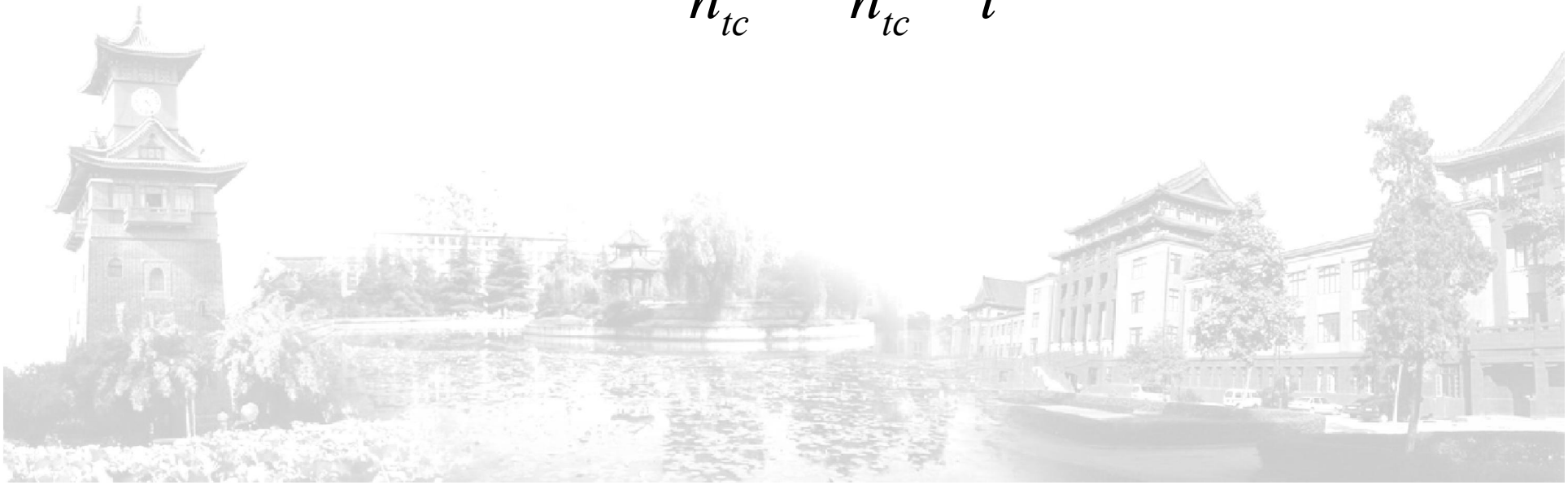


Error of Coincidence Counts

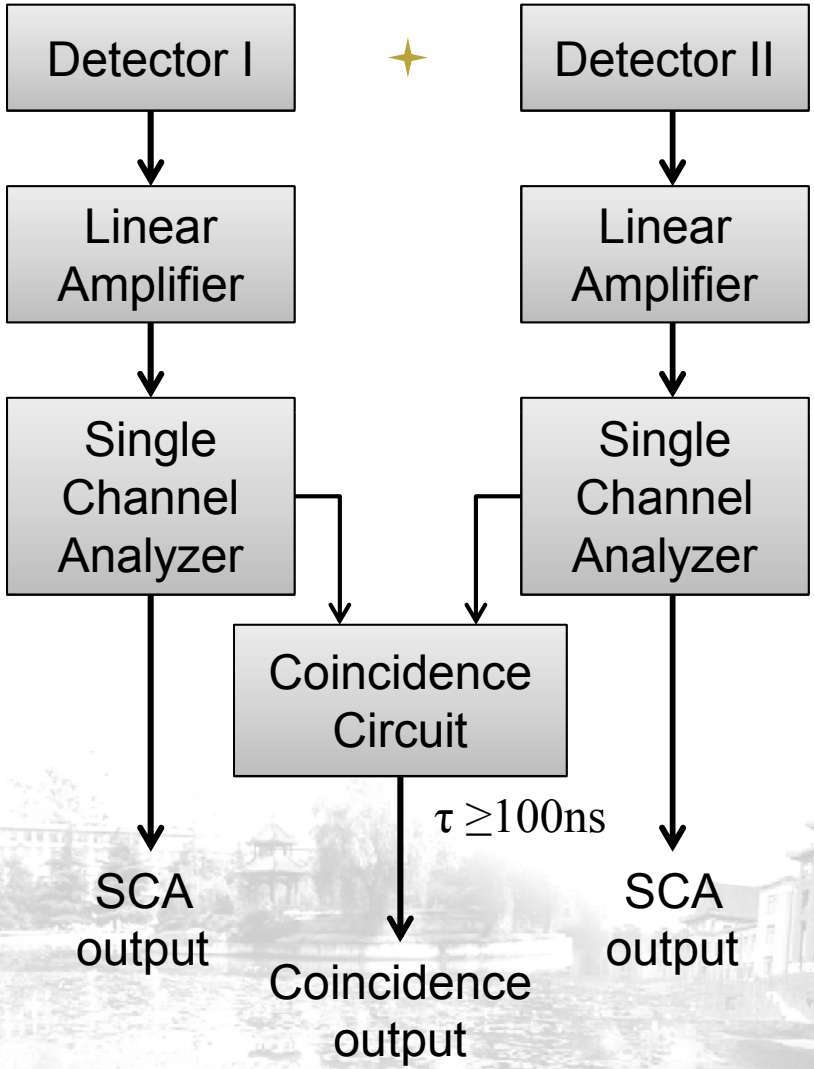
$$n_c = n_{tc} + n_{rc}$$

$$\sigma_{tc}^2 = \sigma_c^2 + \sigma_{rc}^2 = \frac{n_c}{t} + \frac{n_{rc}}{t} = \frac{n_{tc} + 2n_{rc}}{t}$$

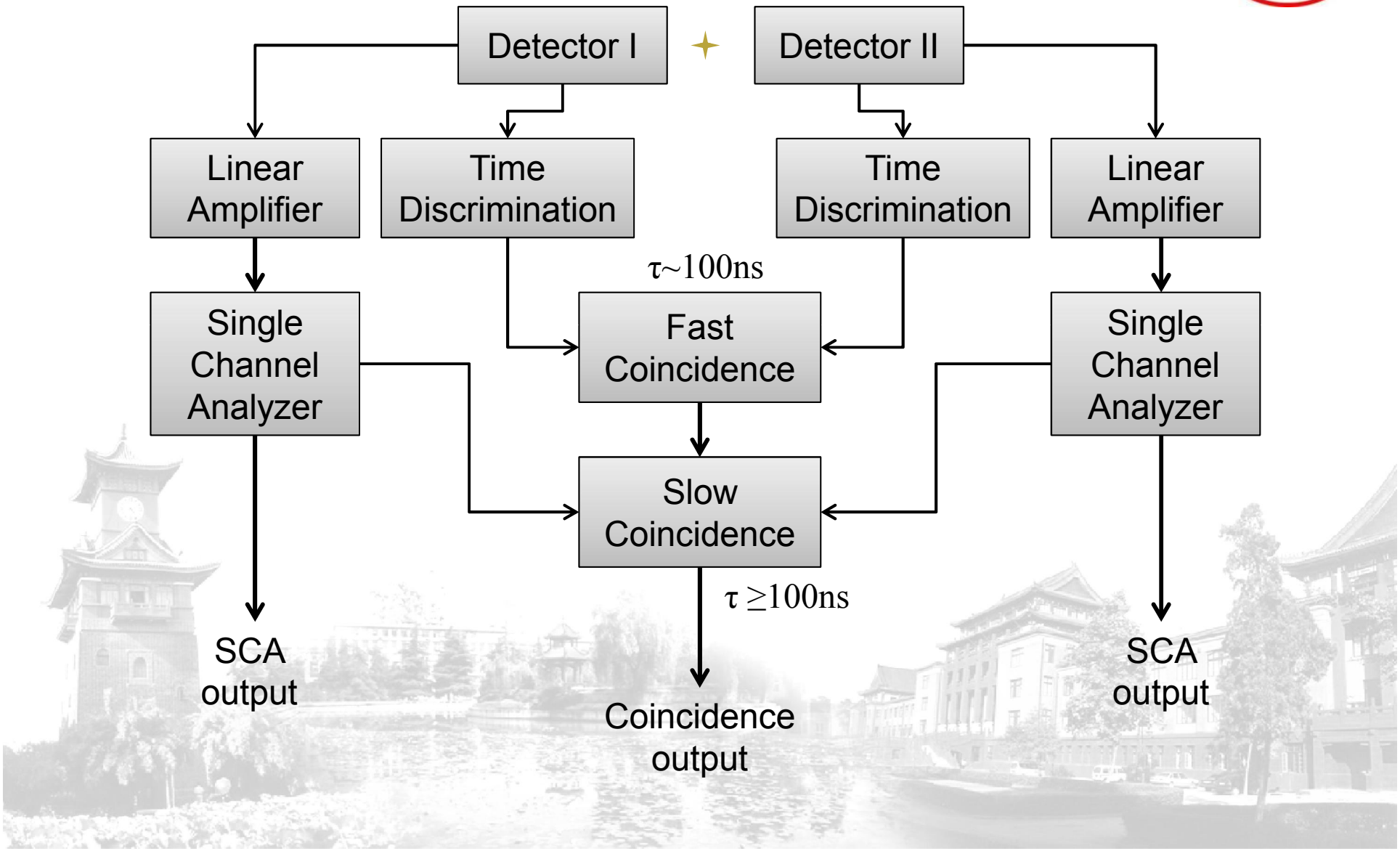
$$\nu_{tc}^2 = \left(\frac{1}{n_{tc}} + \frac{2n_{rc}}{n_{tc}^2}\right)\frac{1}{t}$$



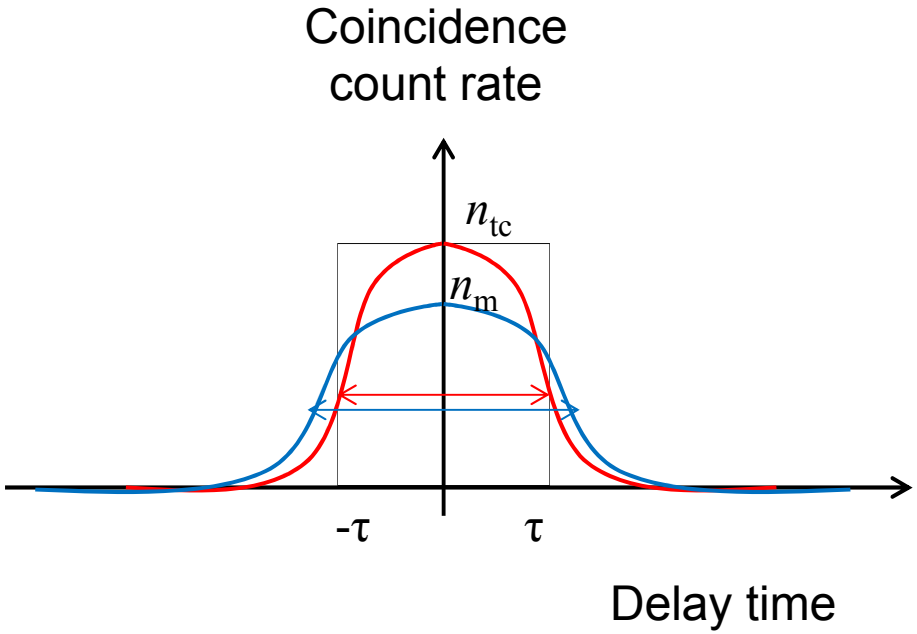
Slow Coincidence



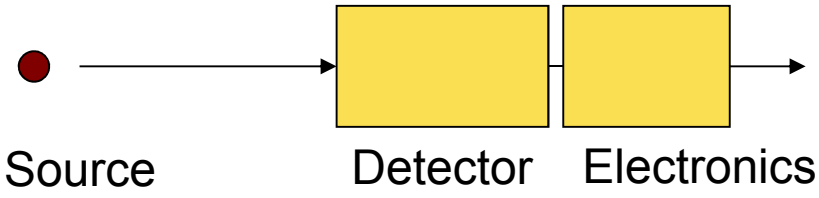
Fast-slow Coincidence

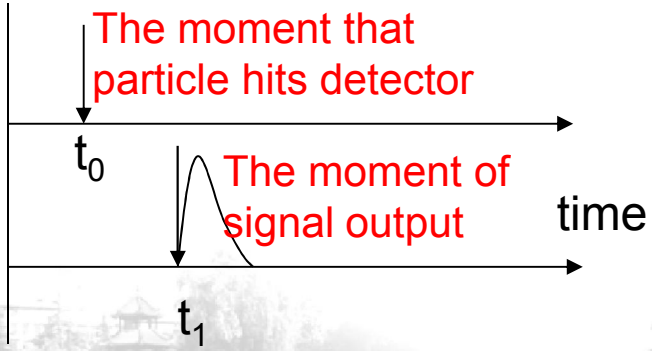


Prompt Coincidence Curve

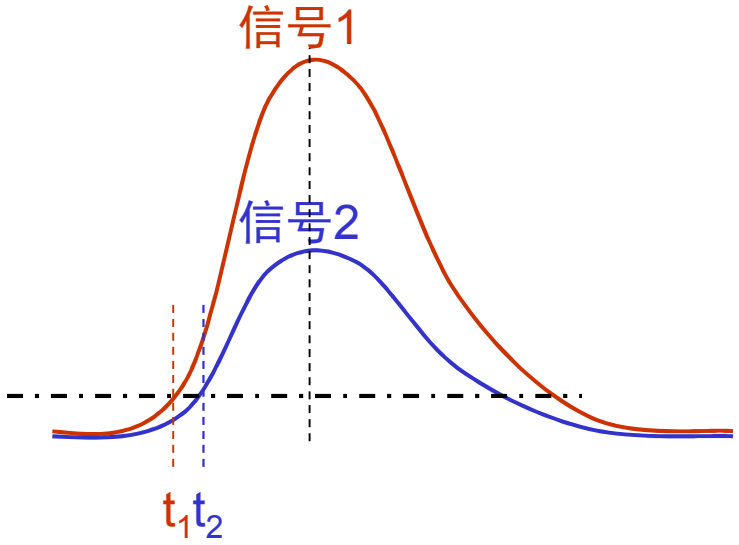


Time Discriminationg

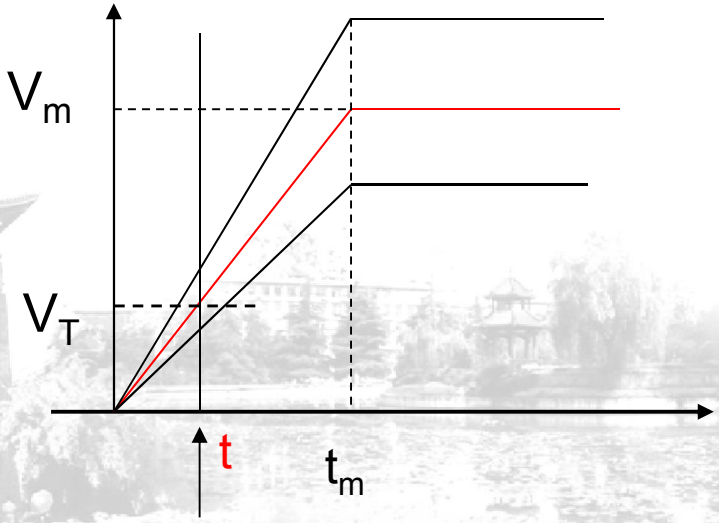




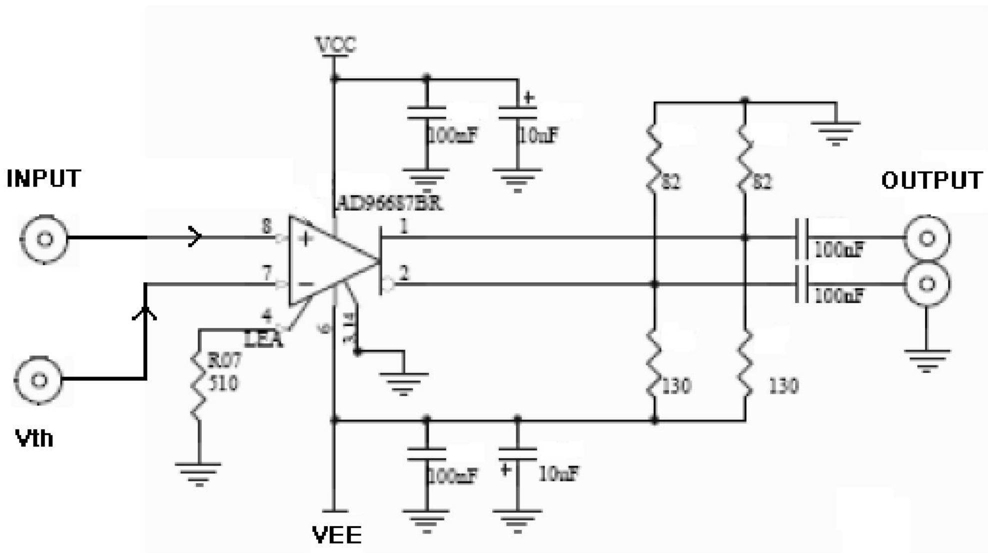
Discrimination by Leading Edge

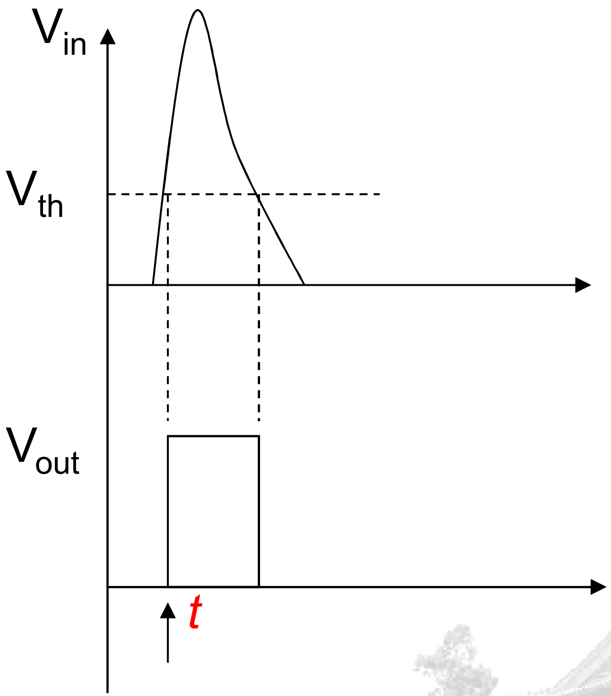


$$t = \frac{V_T}{V_m} t_m$$

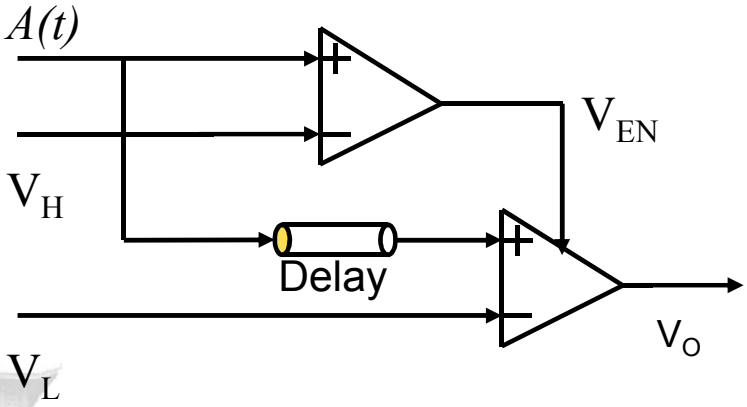


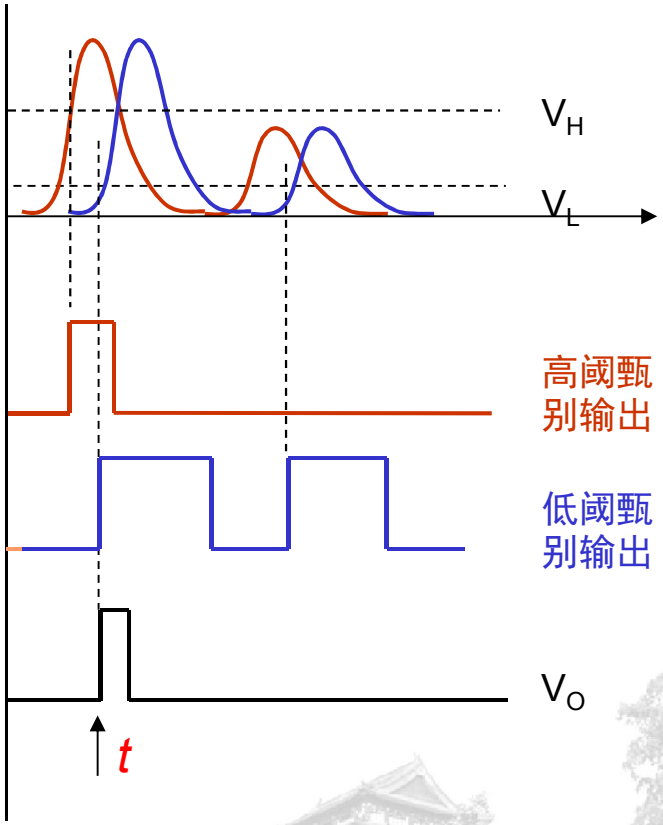
$$\Delta t = \frac{V_T}{V_m^2} t_m \Delta V_m$$


VCC
100nF
10uF
INPUT
AD96687BR
8
7
4
LEA
1
2
R07
510
Vth
82
82
130
130
100nF
100nF
OUTPUT
VEE

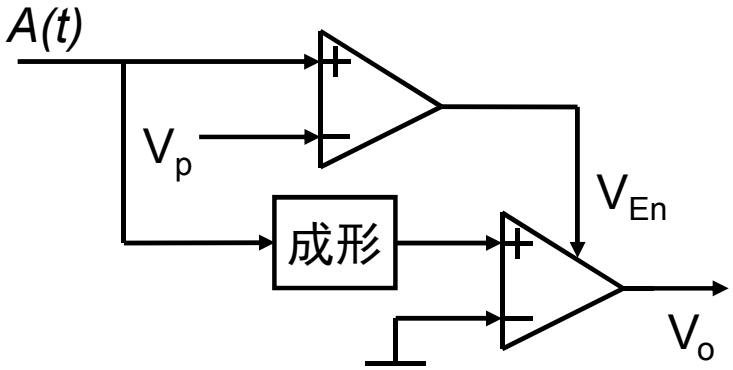

V_{in}
V_{th}
V_{out}
t

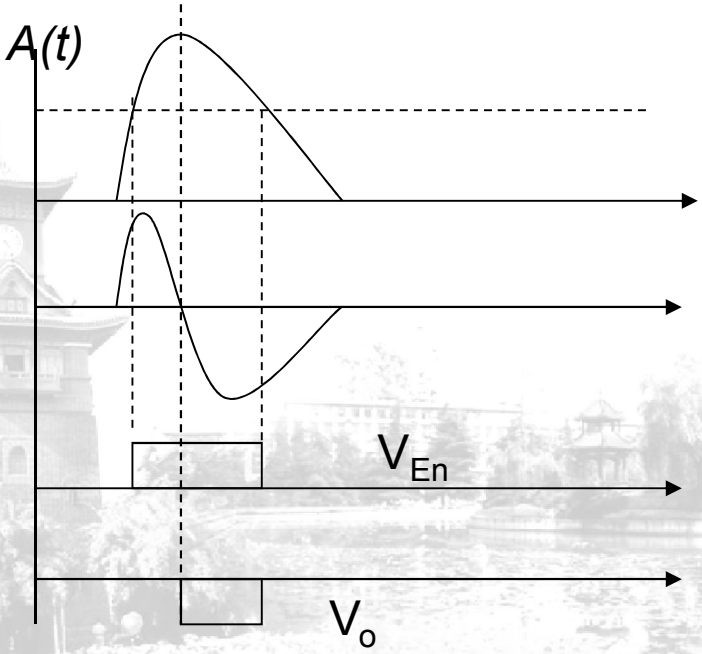
Double Threshold Discrimination

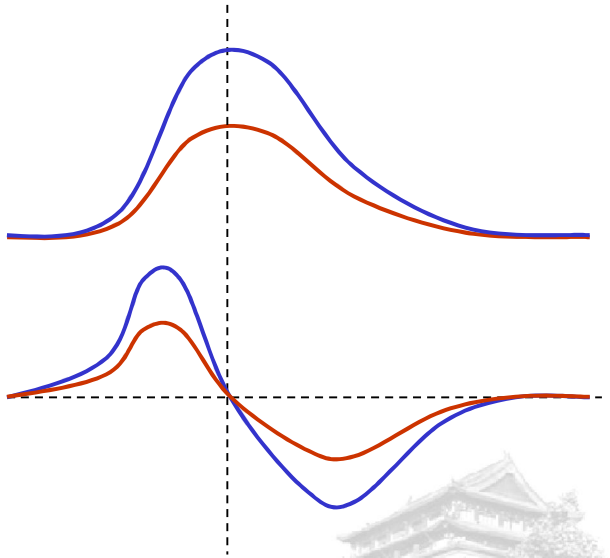




Zero Cross Discrimination



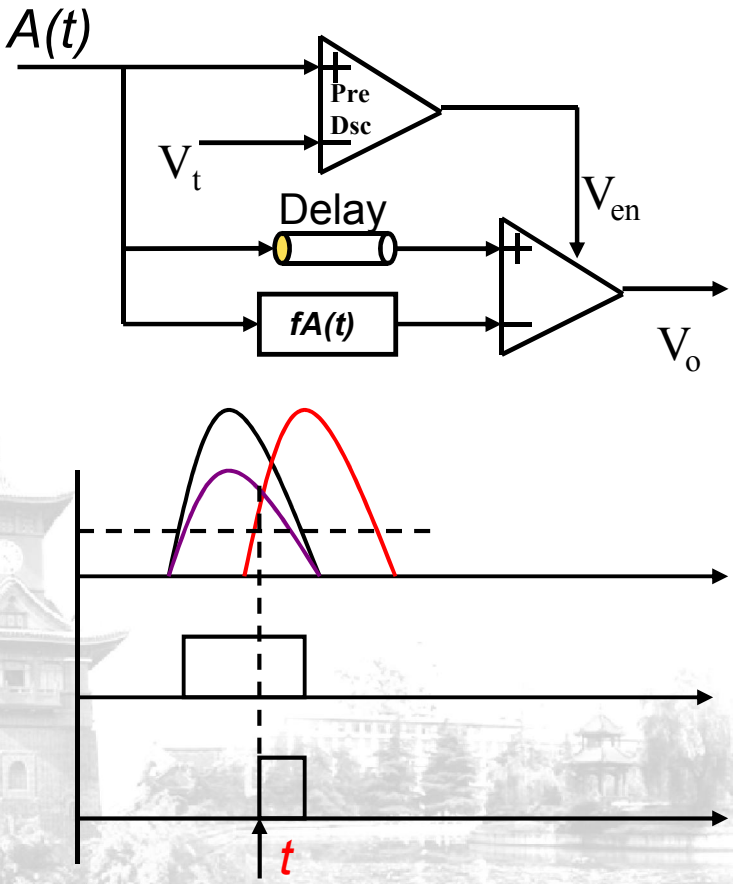


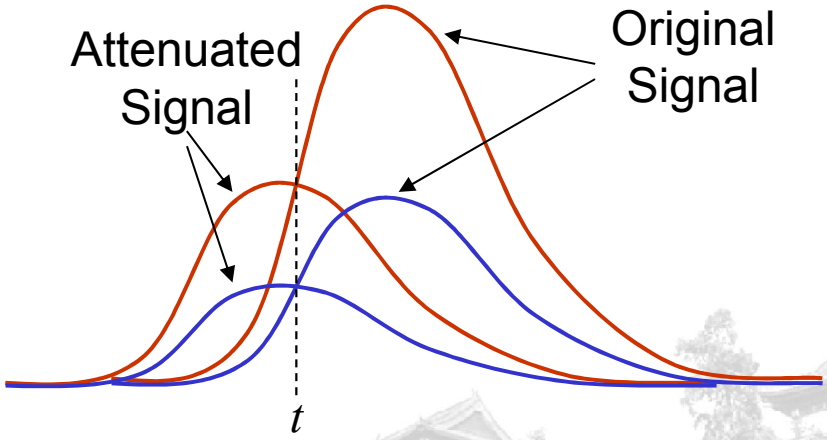


Original Signal

Shaped Signal

Constant Fraction Discrimination





Homework

- P1,2,3,4