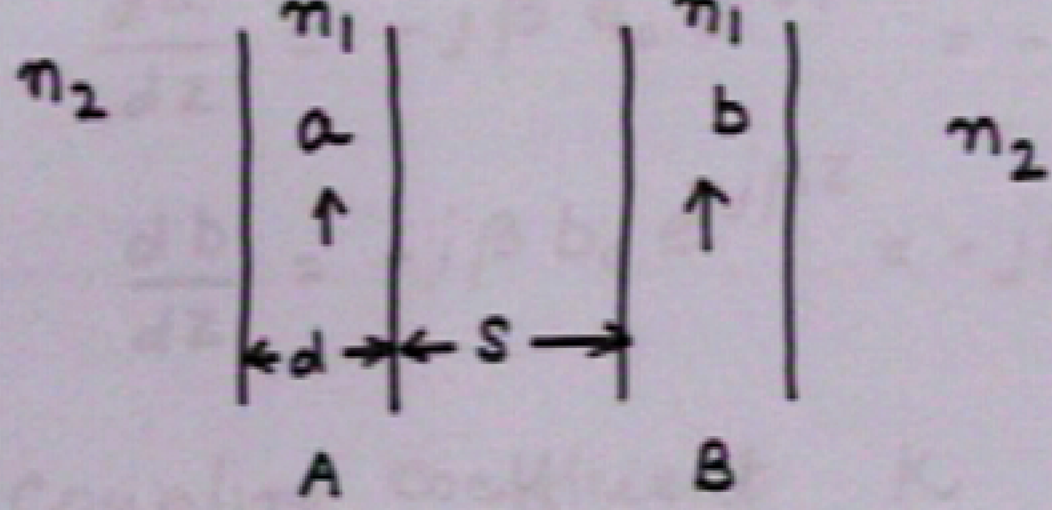


Phase constant β for an isolated wave guide

$$a = a_0 e^{-j\beta z}$$

$$b = b_0 e^{-j\beta z}$$

$$\frac{da}{dz} = -j\beta a_0 e^{-j\beta z} = -j\beta a$$

$$\frac{db}{dz} = -j\beta b_0 e^{-j\beta z} = -j\beta b$$

Coupling coefficient κ

(overlap integral)

$$\kappa = f(d, s, n_1, n_2, \lambda)$$

$$\boxed{\begin{aligned} \frac{da}{dz} &= -j\beta a - j\kappa b \\ \frac{db}{dz} &= -j\beta b - j\kappa a \end{aligned}}$$

$$\frac{d^2a}{dz^2} = -j\beta\frac{da}{dz} - jK\frac{db}{dz}$$

$$= -j\beta\frac{da}{dz} - jK(-j\beta b - jKa)$$

$$= -j\beta\frac{da}{dz} - jKb(-j\beta) - K^2a$$

$$= -j\beta\frac{da}{dz} + \left(\frac{da}{dz} + j\beta a\right)(-j\beta) - K^2a$$

$$\frac{d^2a}{dz^2} = -j2\beta\frac{da}{dz} + (\beta^2 - K^2)a$$

$$\frac{d^2a}{dz^2} + j2\beta\frac{da}{dz} + (K^2 - \beta^2)a = 0$$

$$\frac{d^2b}{dz^2} + 2j\beta\frac{db}{dz} + (K^2 - \beta^2)b = 0$$

$$a(z) = \{A_1 \cos K_v z + A_2 \sin k_v z\} e^{-j\beta z}$$

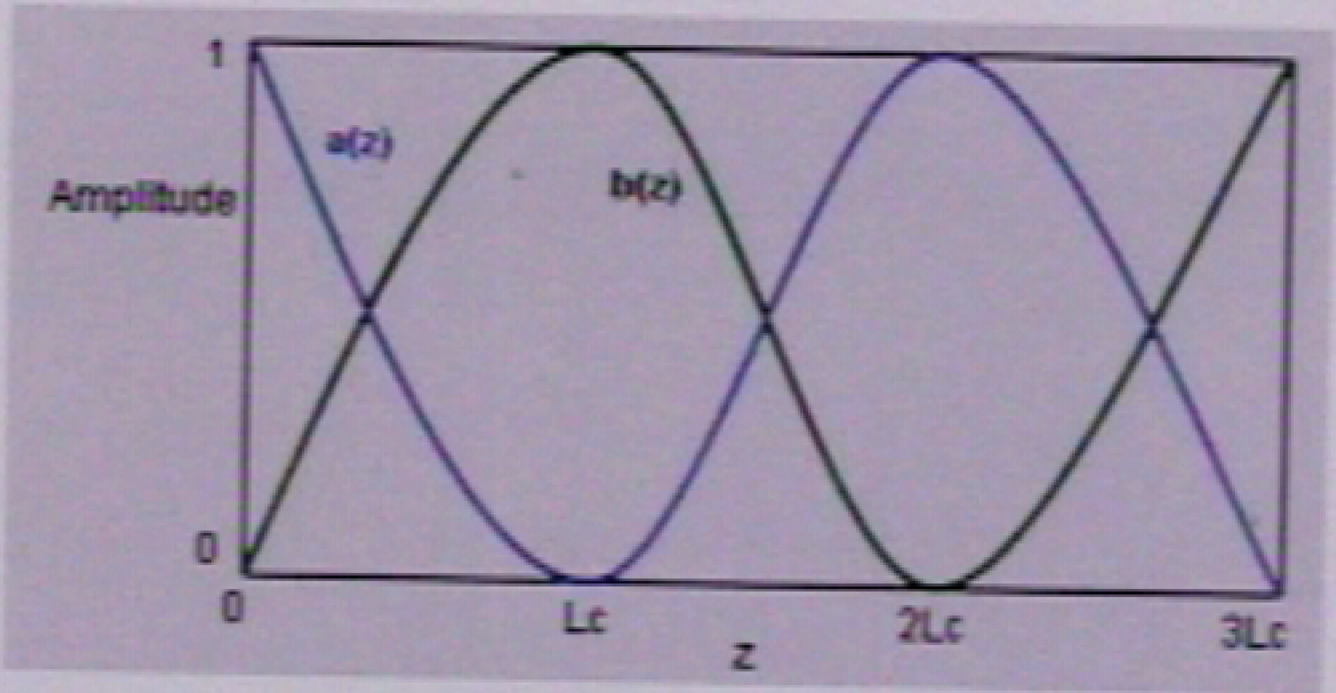
$$b(z) = \{B_1 \cos K_v z + B_2 \sin K_v z\} e^{-j\beta z}$$

Initial conditions :

At $z = 0$, $a(0) = 1$, $b(0) = 0$

$$a(z) = \cos K_v z \, e^{-j\beta z}$$

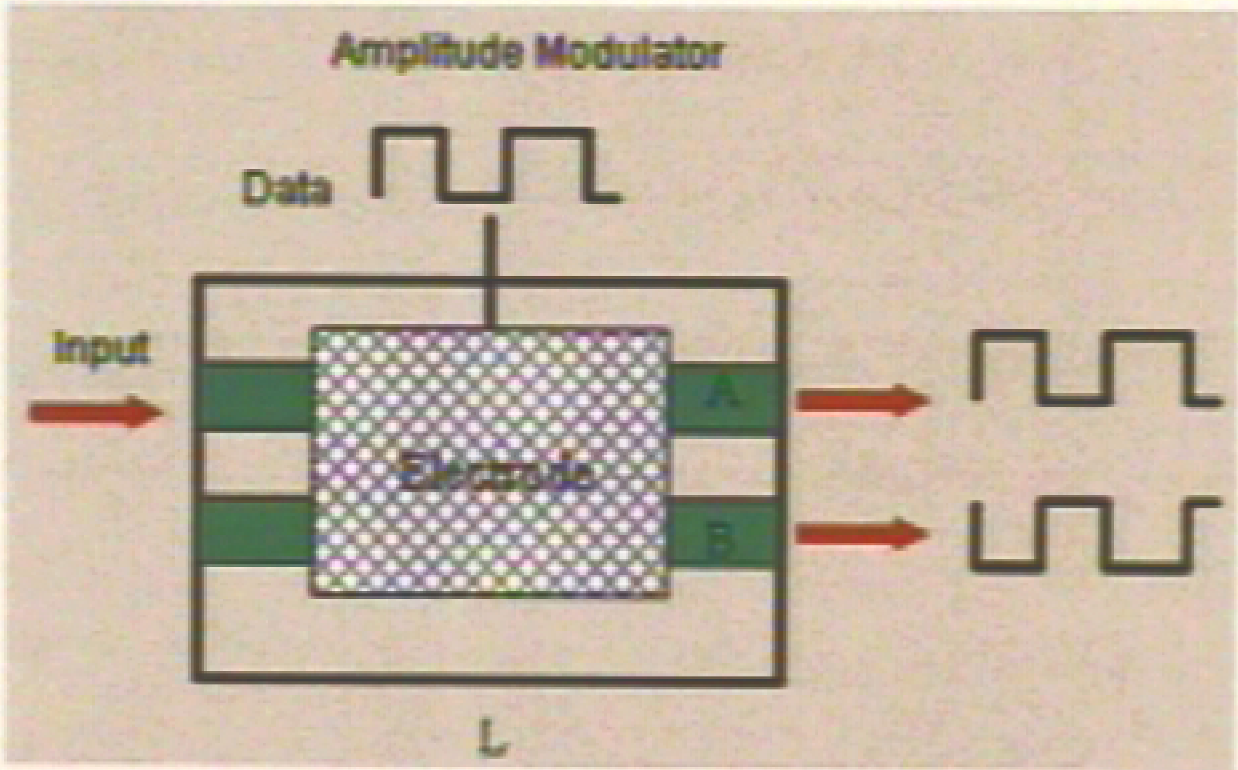
$$b(z) = -j \sin K_v z \, e^{-j\beta z}$$

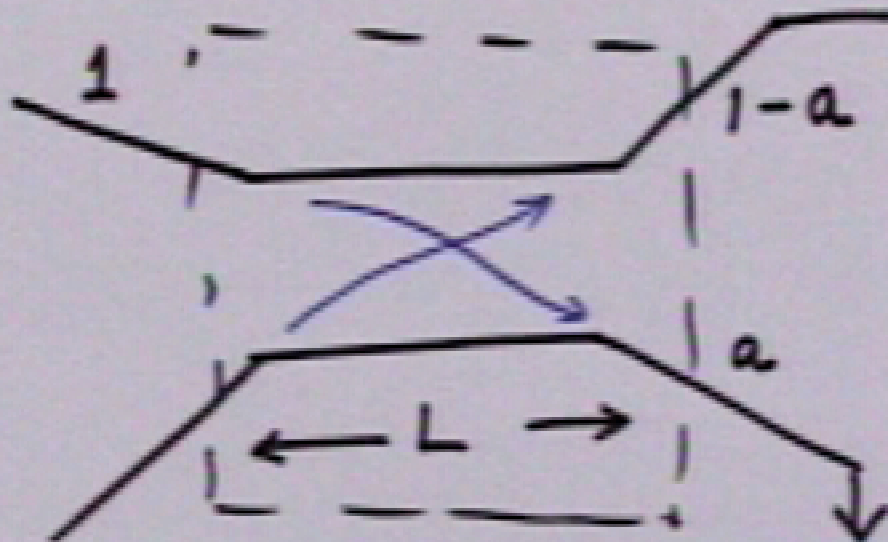


$$\kappa Z = \pi/2$$

$$= L_c \leftarrow \text{coupling length}$$

$$\kappa = \pi/2L_c$$

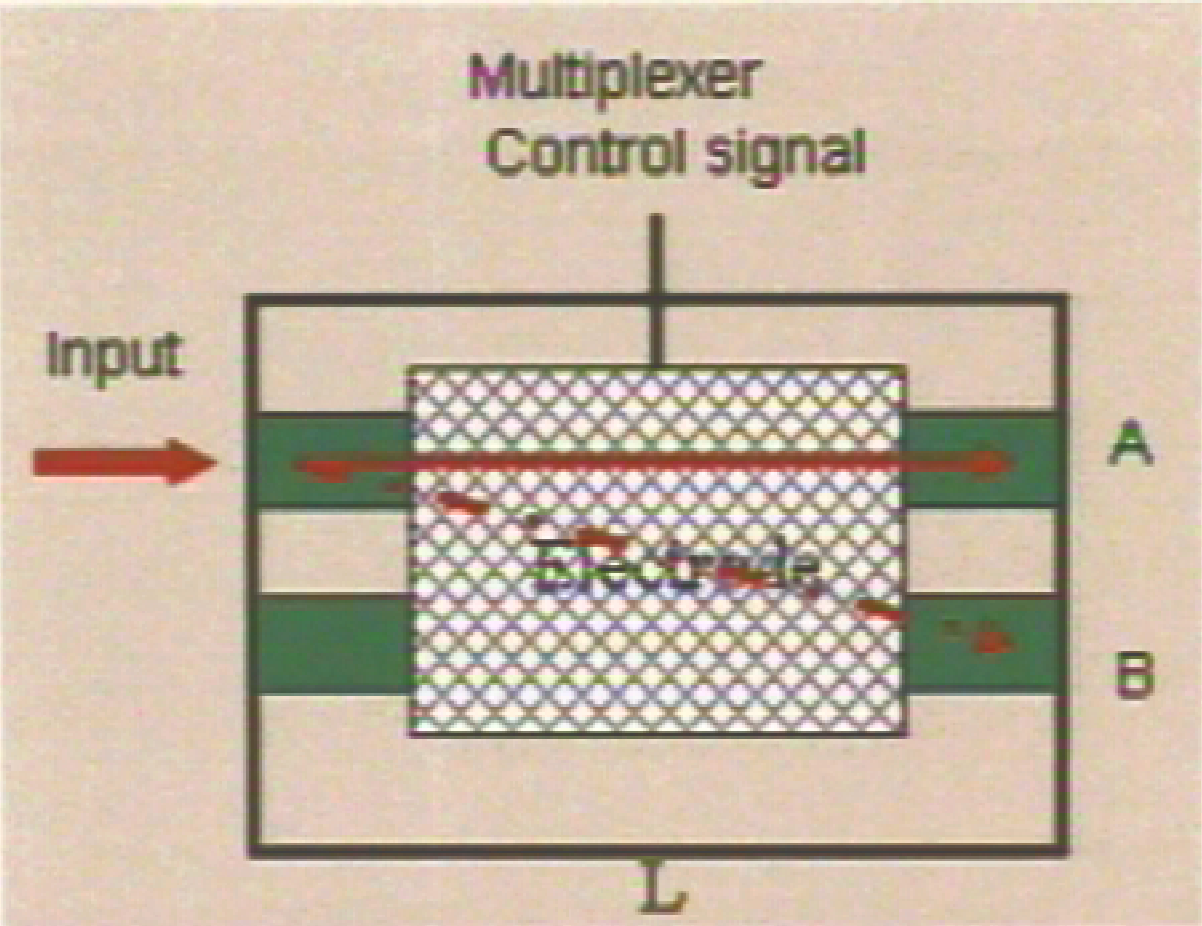

Amplitude Modulator
Data
Input
A
B
L



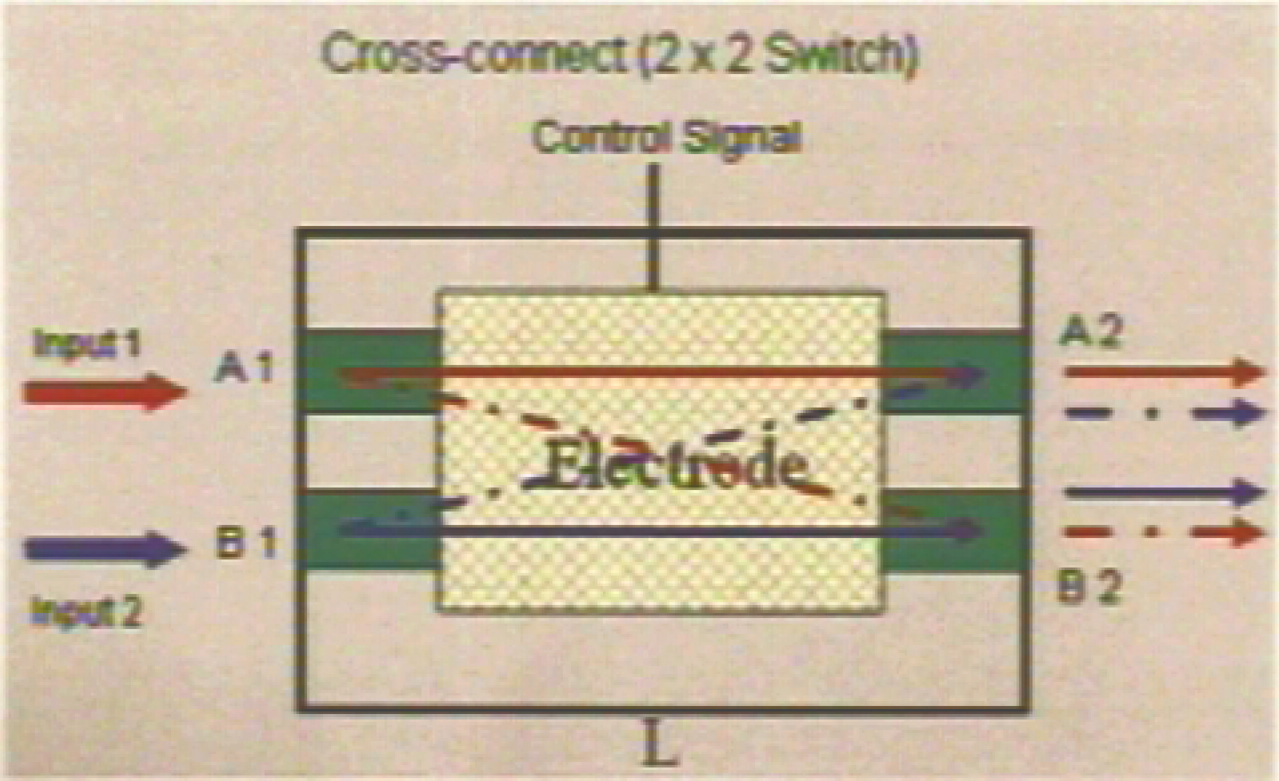
1. $L << L_c$ → Tapping signals.

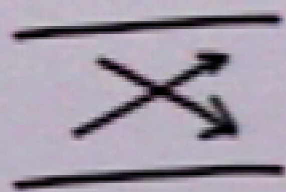
2. $L = L_c/2$ → 3-dB Power Divider.

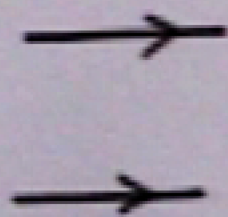
3 $L = L_c$ → Cross-over.



Multiplexer
Control signal
Input
Electrode
A
B
L

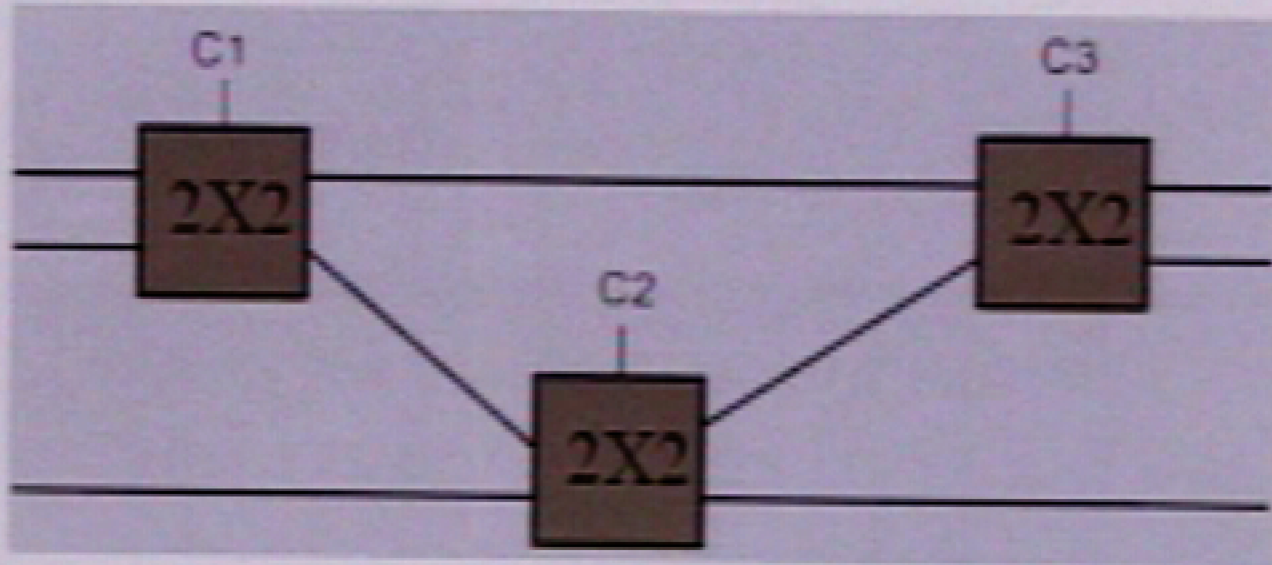

Cross-connect (2 x 2 Switch)
Control Signal
Input 1
A 1
B 1
Input 2
Electrode
A 2
B 2
L

 = cross - state

 : Bar - state

a_1

b_1



a_2

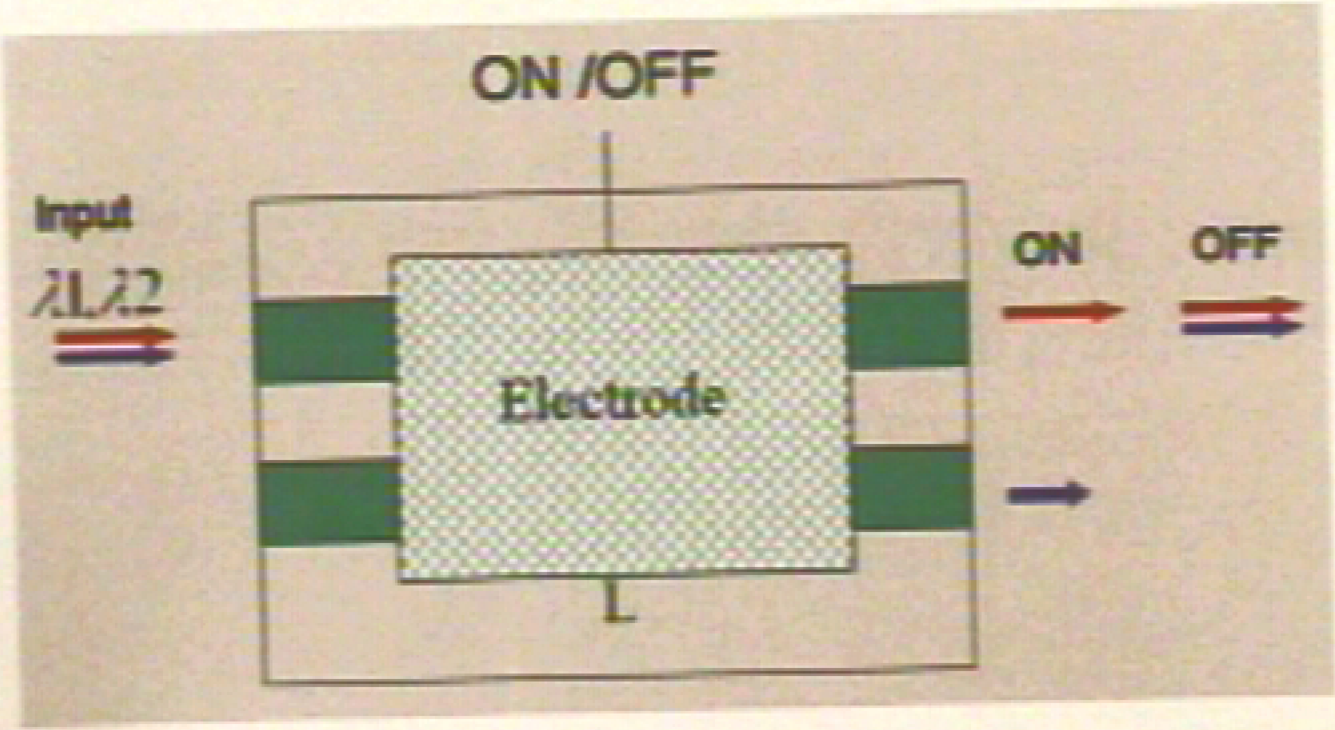
b_2

c_1 $\begin{cases} c_1 \to = \\ c_2 \to = \\ c_3 \to = \end{cases}$ $\quad a_1 \to a_2$, $\quad b_1 \to b_2$, $\quad c_1 \to c_2$ $\quad c_2$

$c_1 \to \times \qquad a_1 \to b_2$

$c_2 \to = \qquad b_1 \to a_2$

$c_3 \to = \qquad c_1 \to c_2$


ON /OFF
Input
λ1λ2
Electrode
L
ON
OFF