UNIVERSITÀ
DEGLI STUDI
DI TORINO

Laboratorio di Elettronica

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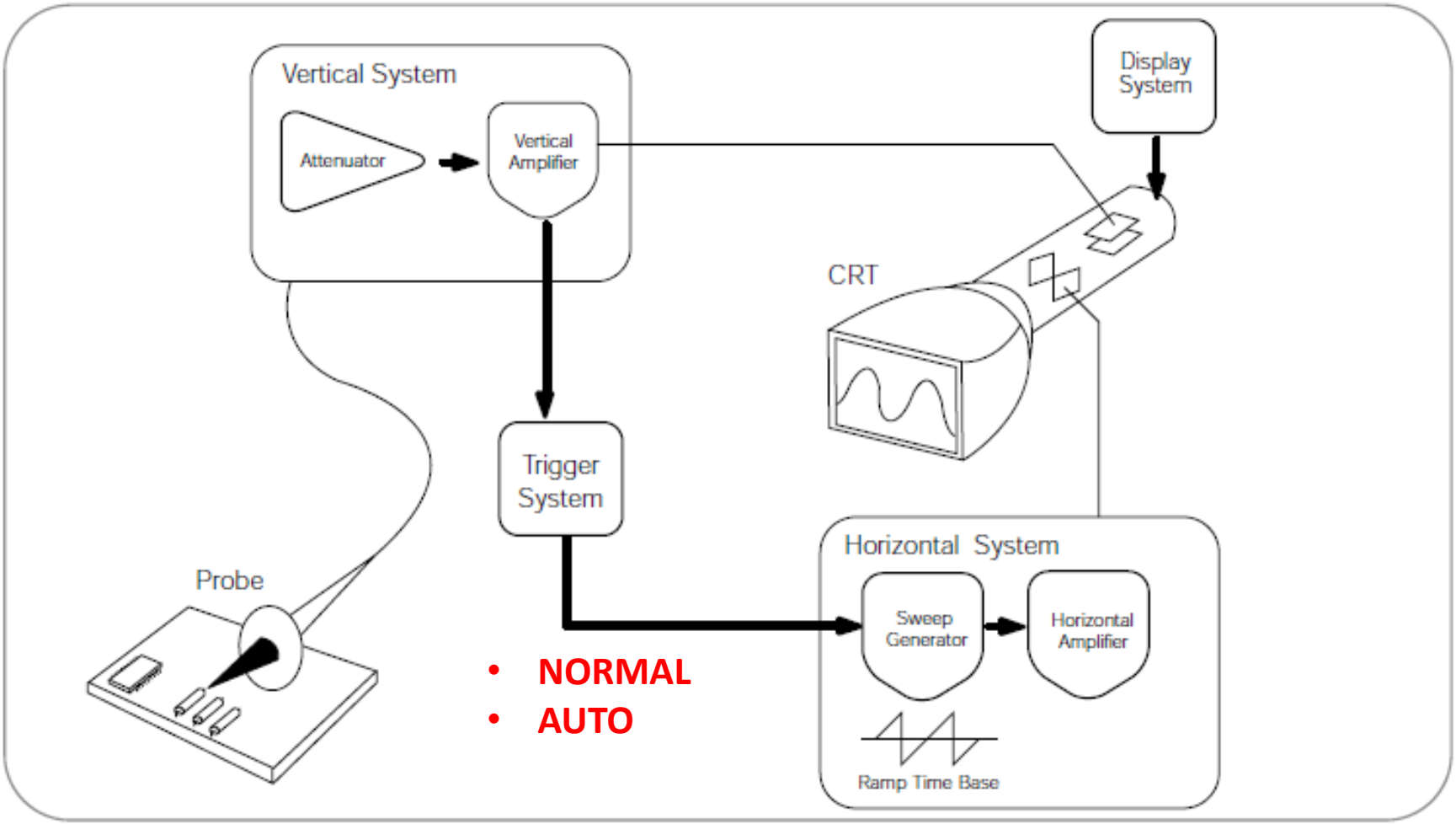
CFU 6 - A.A. 2021/22

Corso di laurea in Fisica

ANALOGICO

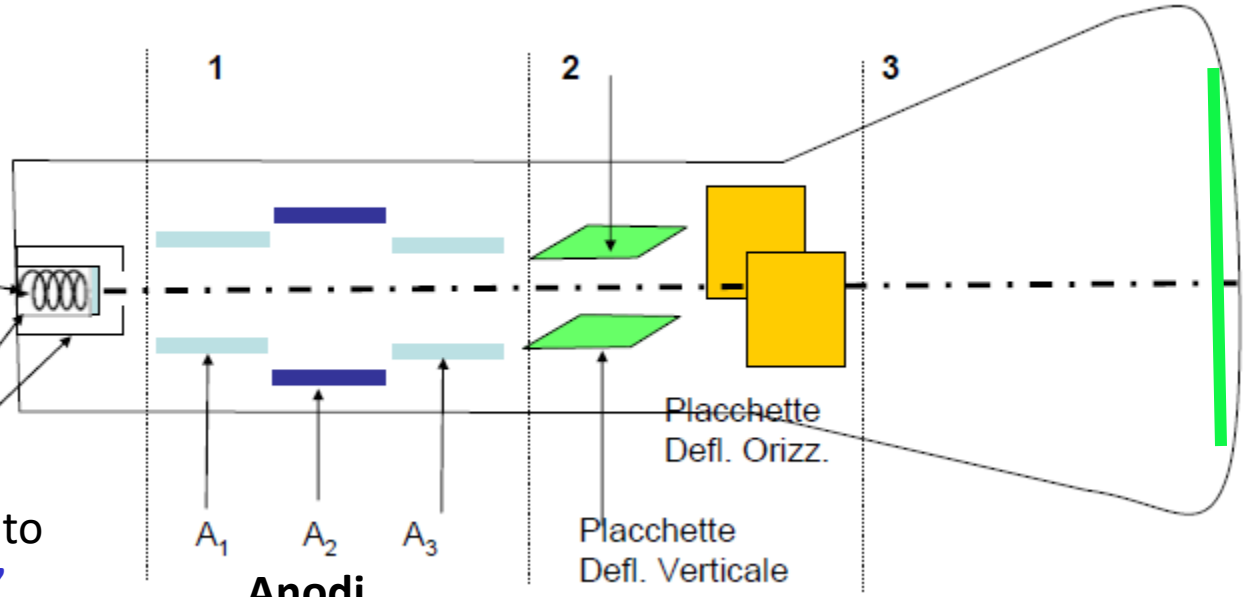
DIGITALE

Oscilloscopio Analogico



- **NORMAL**
- **AUTO**

Oscilloscopio Analogico



Catodo
Ni + Ba,Sr
800° -1000°
(V~ - kV)

Griglia
Allineamento
Intensita'
$-V_a$

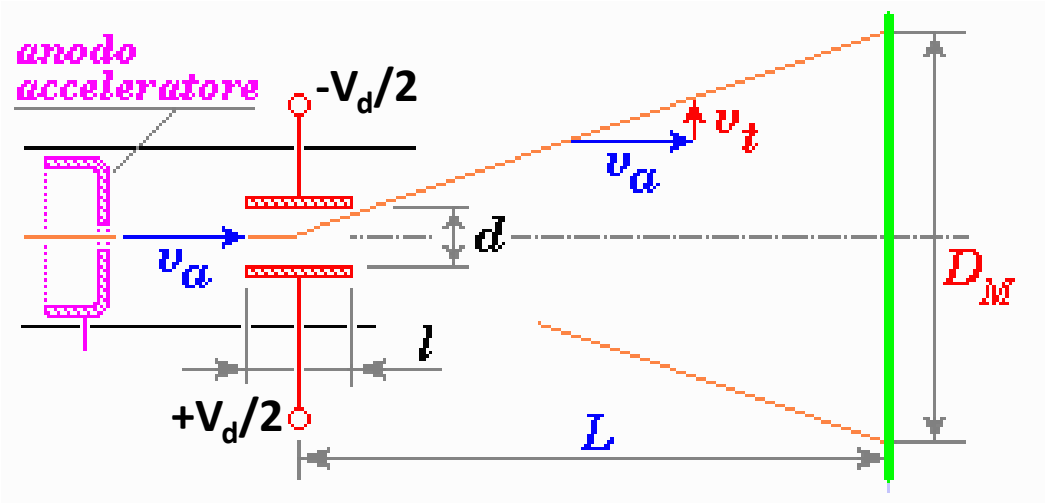
Anodi
Accelerazione
Focalizzazione
A_3 @ GND
Fuoco

Schermo
Fosfori Zn, Cd
Fluorescenza
($I \propto E_{cin}$ $\varepsilon \sim 10\%$)
Fosforescenza
(tempo di
persistenza μs)

$$V_a\, e = \frac{1}{2} m\, v_a^{\,2}$$

$$v_a = \sqrt{\frac{2e}{m} V_a}$$

Sensibilita’



$$E_d = \frac{V_d}{d} \qquad F_d = e \cdot E_d$$

$$a_t = \frac{F_d}{m} \qquad \tau = \frac{l}{v_a}$$

$$v_t = \frac{eE_d}{m} \cdot \frac{l}{v_a}$$

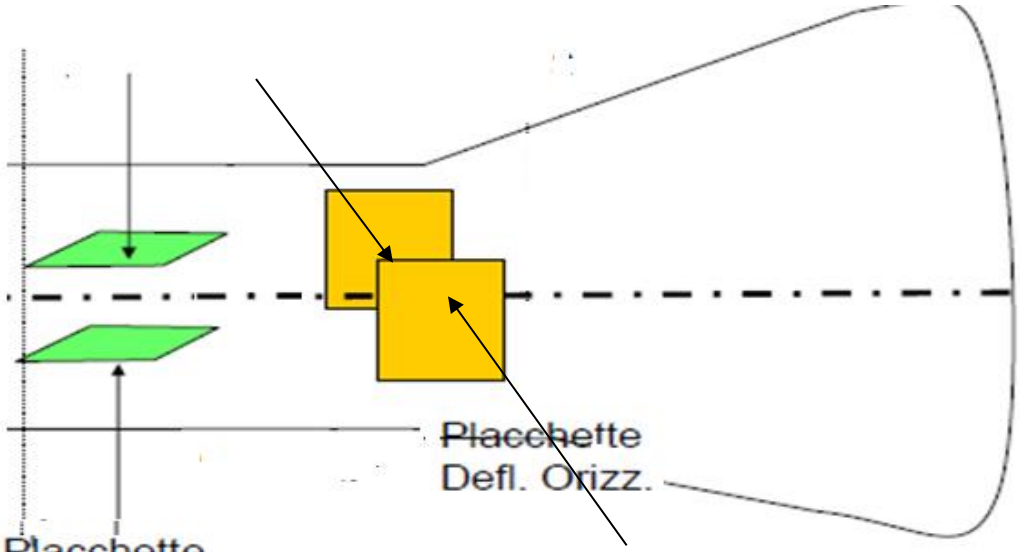
$$2v_t : v_a = D_M : L \Rightarrow D_M = 2\frac{v_t}{v_a} \cdot L$$

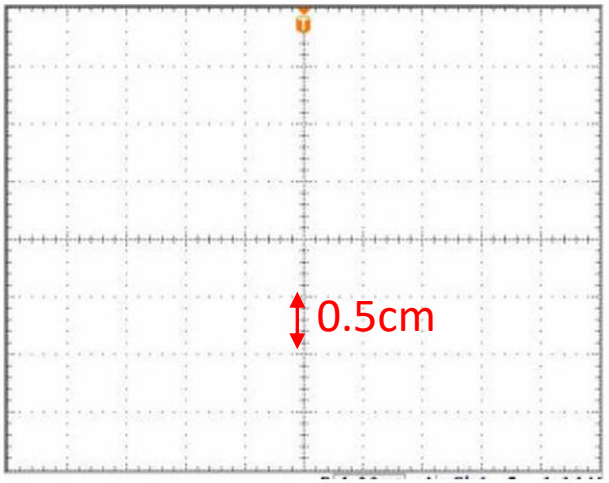
Si definisce ‘**sensibilita**’’ **s** del tubo a raggi catodici (CRT) il rapporto tra lo spostamento e la tensione applicata alle placche

$$s = D_M / V_d \qquad s = \frac{l\,L}{d\,V_a}$$

e’ dell’ordine del mm per volt applicato

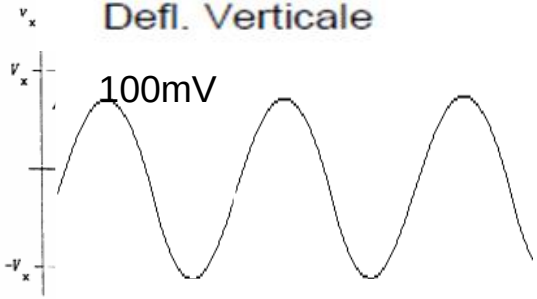
Banda Passante



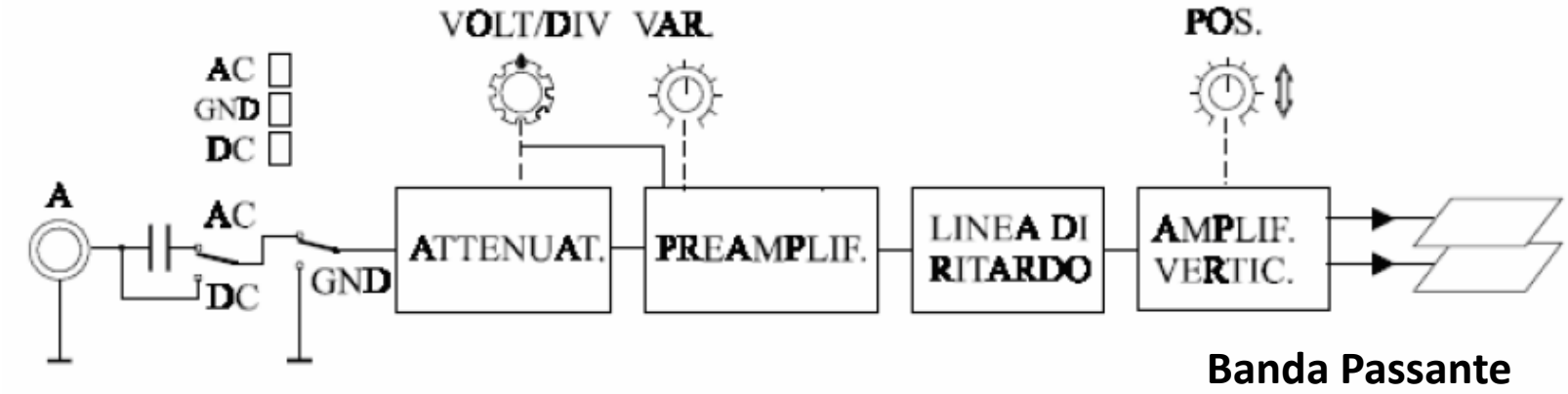


VOLT/DIV = 50mV

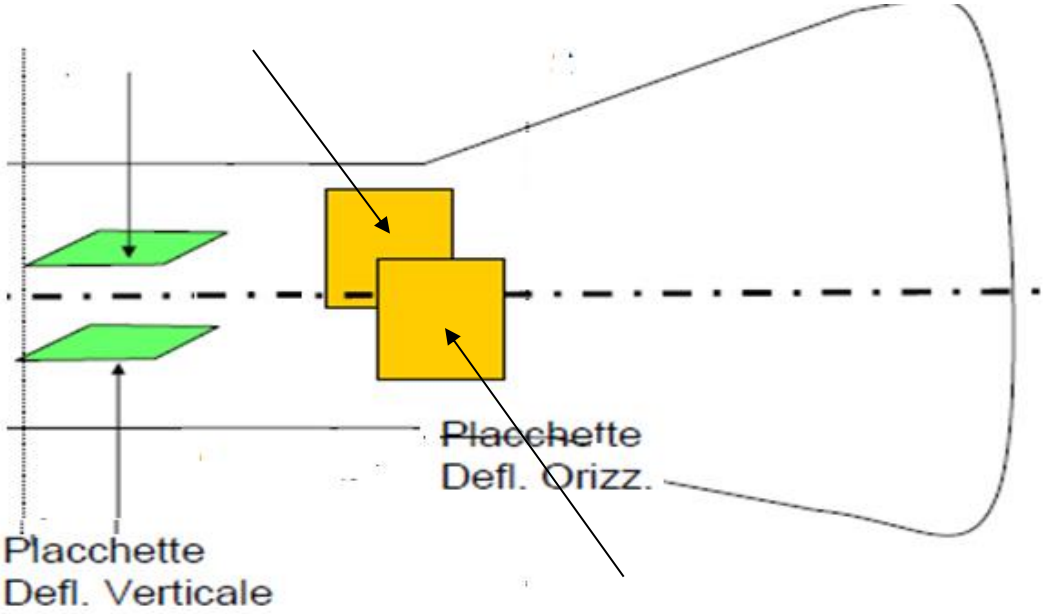
(10mV/mm.)

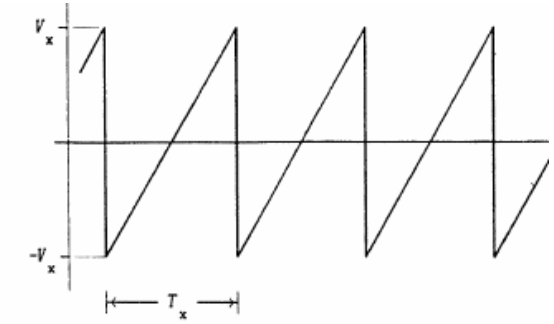


Se la sensibilita' e ' 1mm/volt allora con questa scala verticale prima delle placchette di deflessione verticale ci sara' una amplificazione circa 100



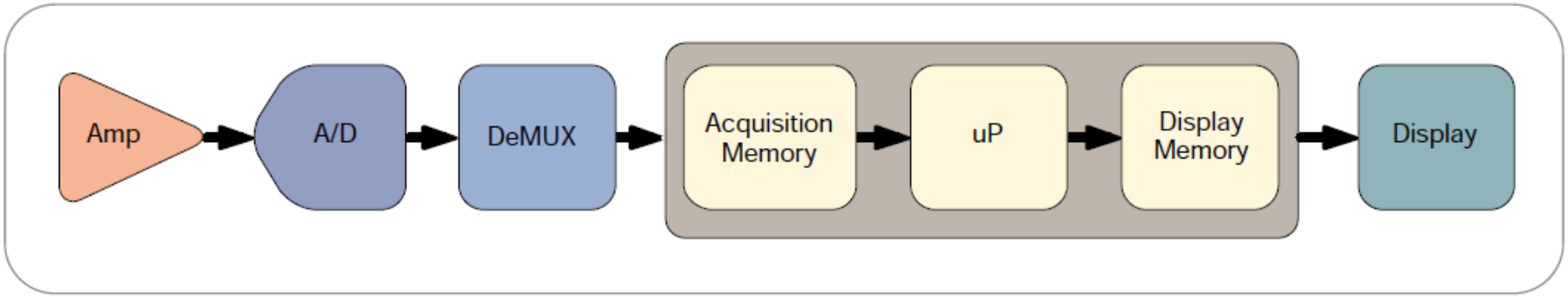
Banda Passante

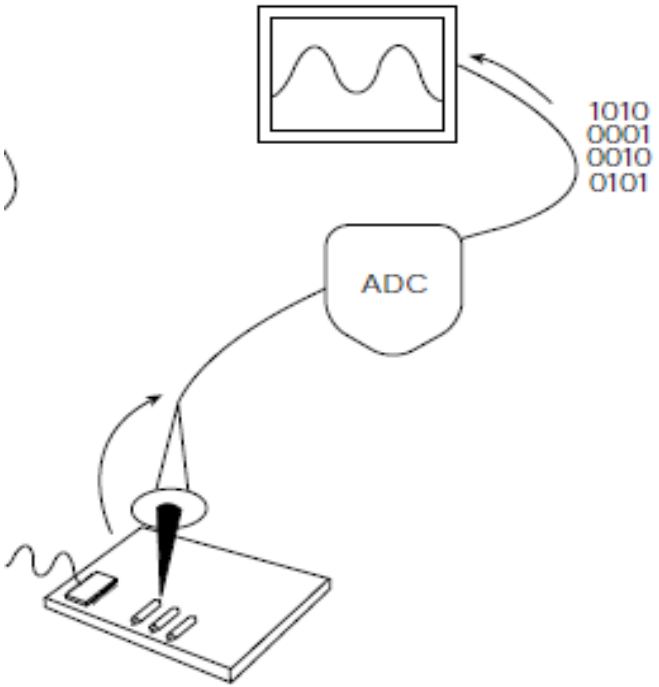




L' ampiezza della rampa di salita e' tale da effettuare spostamenti orizzontali su tutto lo schermo.
La **pendenza** determina il tempo impiegato per una spazzata e si puo' variare attraverso il selettore **TIME/DIV**

Oscilloscopio Digitale



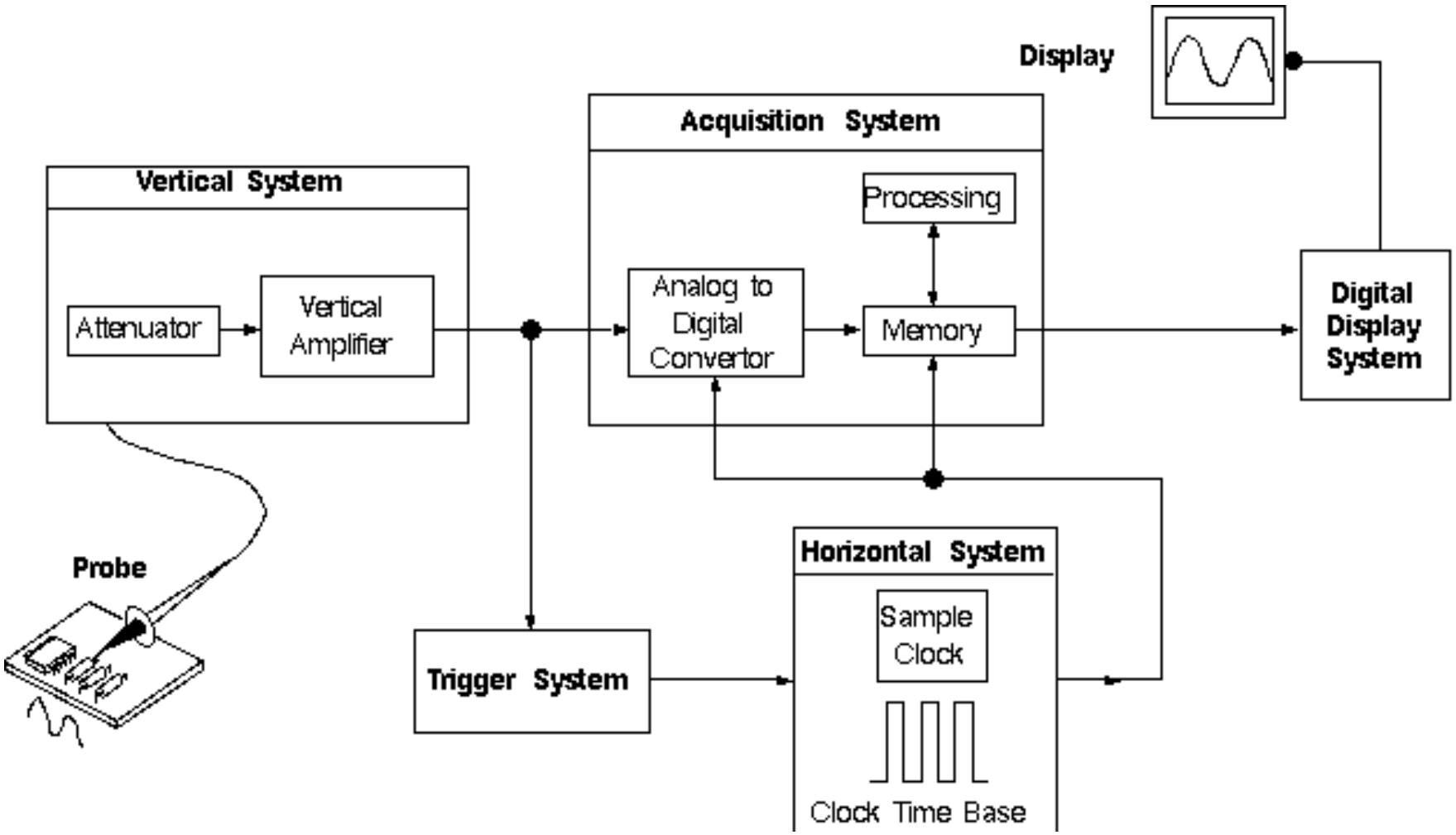


Digital Oscilloscopes Samples Signals and Construct Displays

A digital oscilloscope samples the waveform and uses an analog-to-digital converter (or ADC) to convert the voltage being measured into digital information. It then uses this digital information **to reconstruct** the waveform on the screen.

Digital oscilloscopes allow you to capture and view events that may happen only once. They can process the digital waveform data or send the data to a computer for processing. Also, they can store the digital waveform data for later viewing and printing.

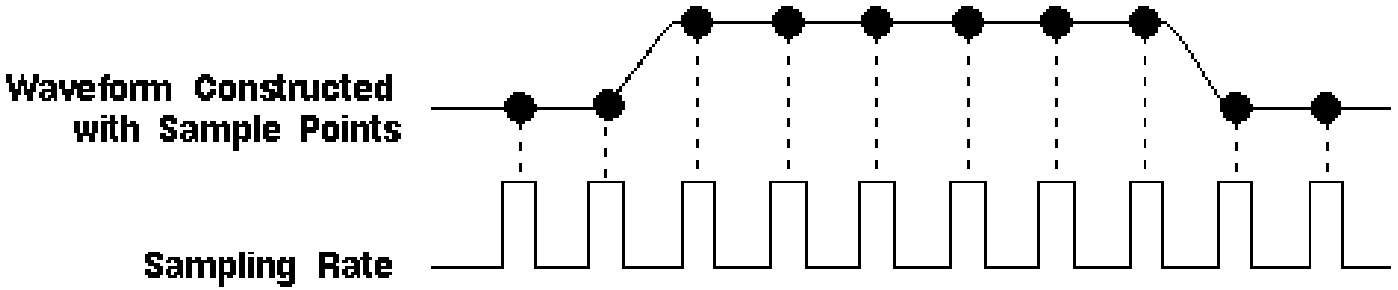
Oscilloscopio Digitale



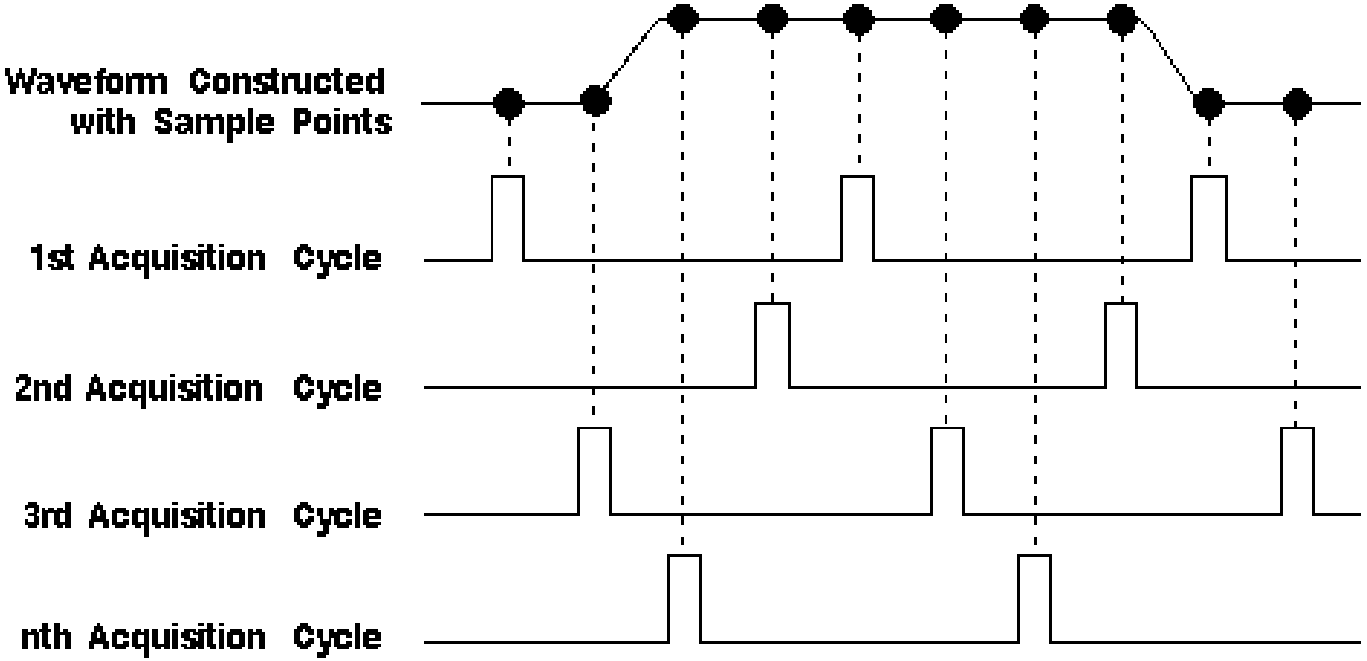
Oscilloscopio Digitale

ADC

Real - time Sampling

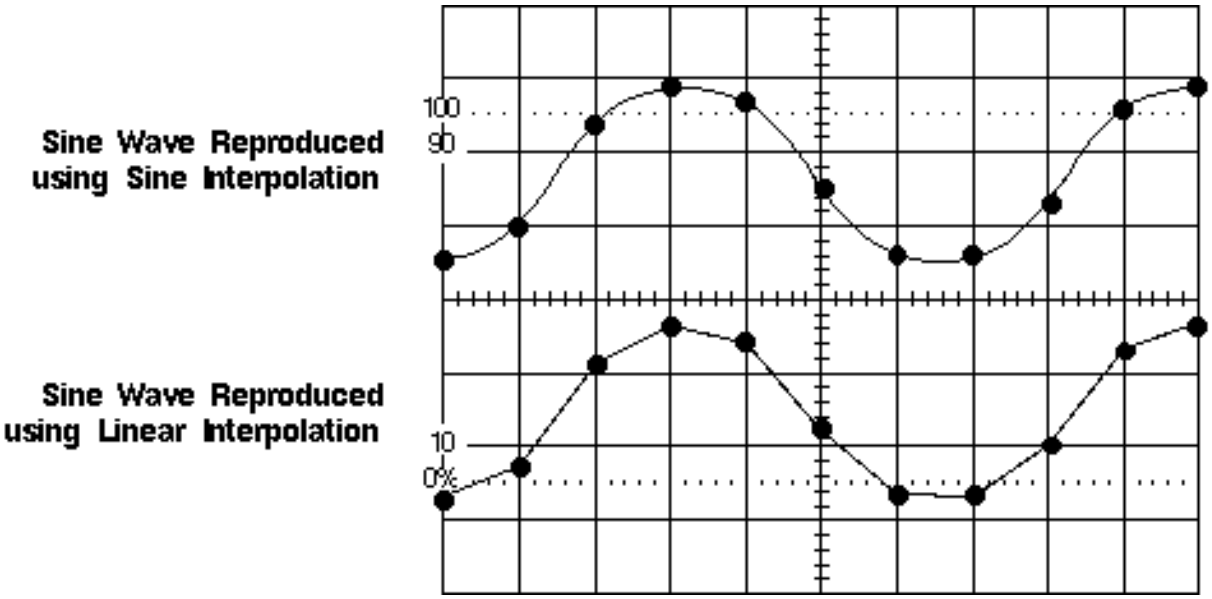


Equivalent - time Sampling (repetitive signals)



Oscilloscopio Digitale

Linear and sine interpolation -



Sonda passiva

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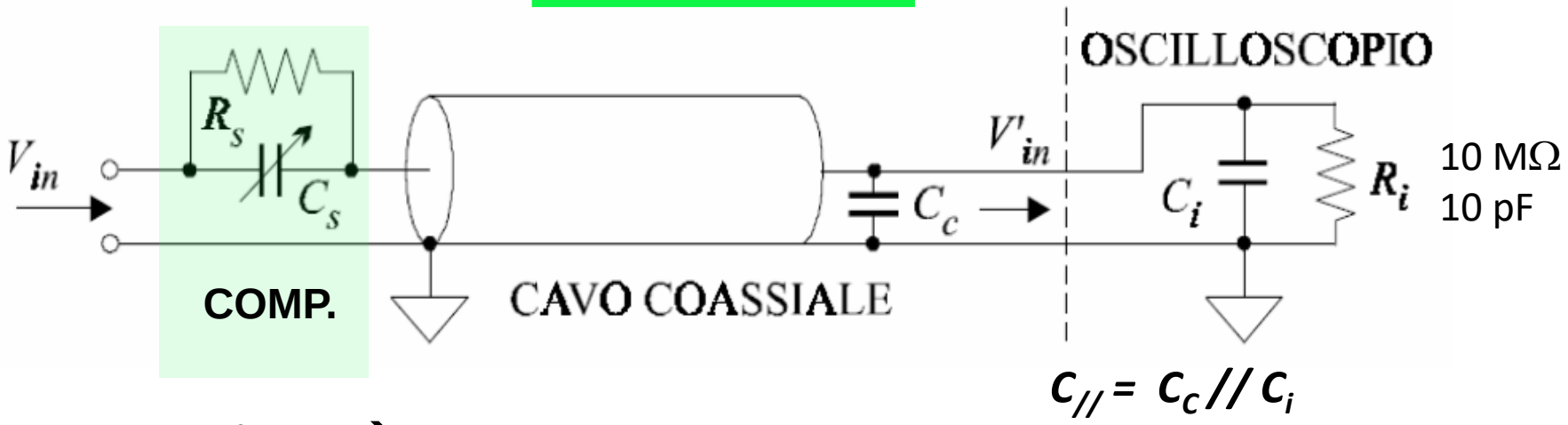

$C_{//} = C_c // C_i$

Compensazione → $R_S C_S = R_i C_{//}$

$$V_i' = V_i \frac{Z_i}{Z_i + Z_s} \quad \text{dove} \quad Z_s = \frac{\frac{R_s}{j\omega C_s}}{R_s + \frac{1}{j\omega C_s}} = \frac{R_s}{j\omega R_s C_s + 1} \quad \text{e} \quad Z_i = \frac{R_i}{j\omega R_i C_{//} + 1}$$

Compensazione → $R_S C_S = R_i C_{//} = RC$

$$V_i' = V_i \frac{\frac{R_i}{j\omega RC + 1}}{\frac{R_i + R_s}{j\omega RC + 1}} = V_i \frac{R_i}{R_i + R_s}$$

Non dipende dalla frequenze → non c'e' distorsione

Se R_s=9Ri si ha una sonda che attenua 10