



Rivelatori e Apparati

2

Capacita' Vs V_R

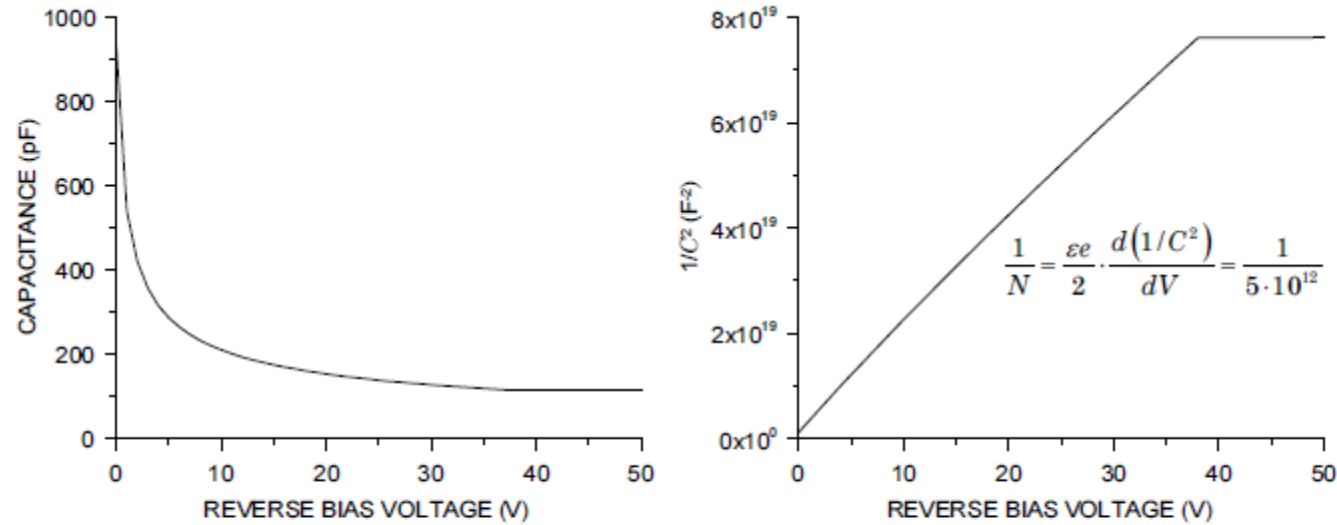


FIG. 2.23. The diode capacitance decreases as the reverse bias voltage is raised until the diode is fully depleted (left). This is more apparent in a plot of $1/C^2$ vs. V (right), which also yields the doping level.

Capacita' Vs V_R

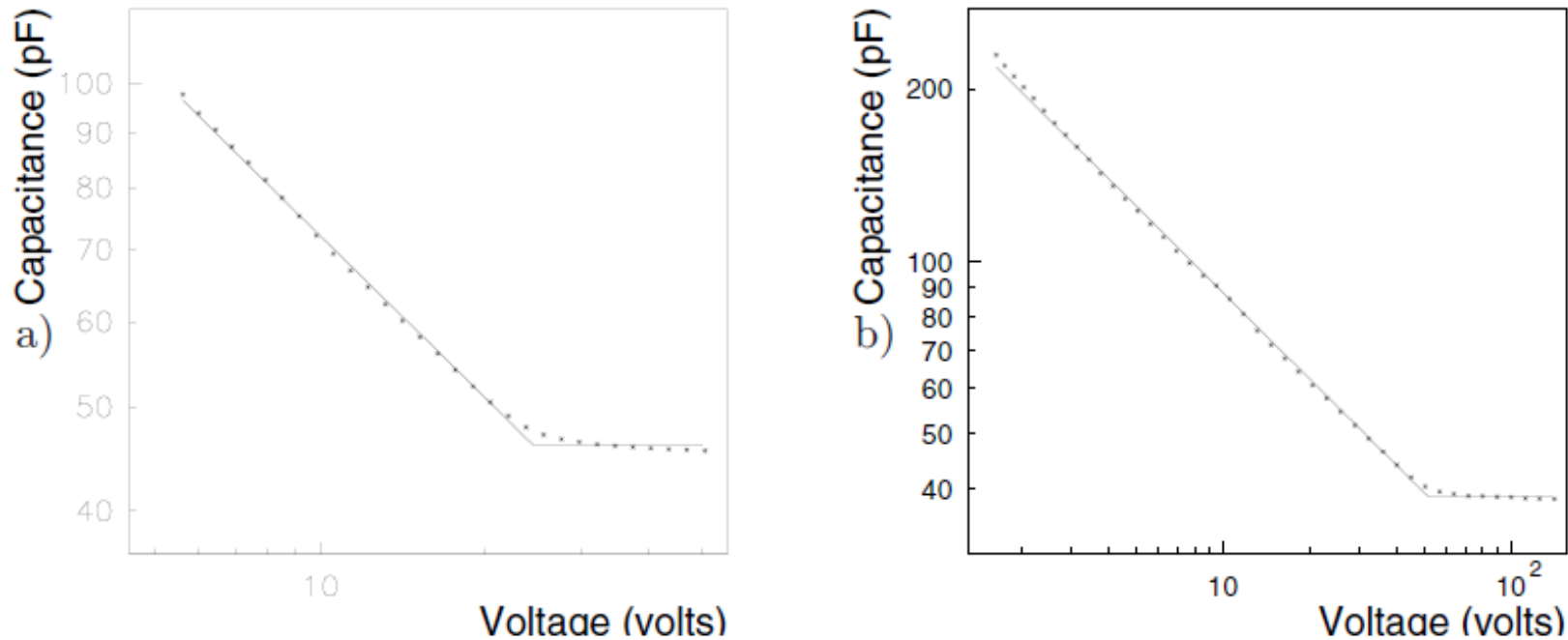


Fig. 6.3 Capacitance (in pF) curves as a function of applied voltage (in V) for two detectors of 1 cm^2 area [Leroy (1998)]: (a) resistivity of $\rho = 8 \text{ k}\Omega\text{cm}$ and thickness $w = 247 \mu\text{m}$; (b) resistivity of $\rho = 6 \text{ k}\Omega\text{cm}$ and thickness $w = 300 \mu\text{m}$. The curve represents a fit of Eq. (6.34) to the data points.

Carica raccolta Vs V

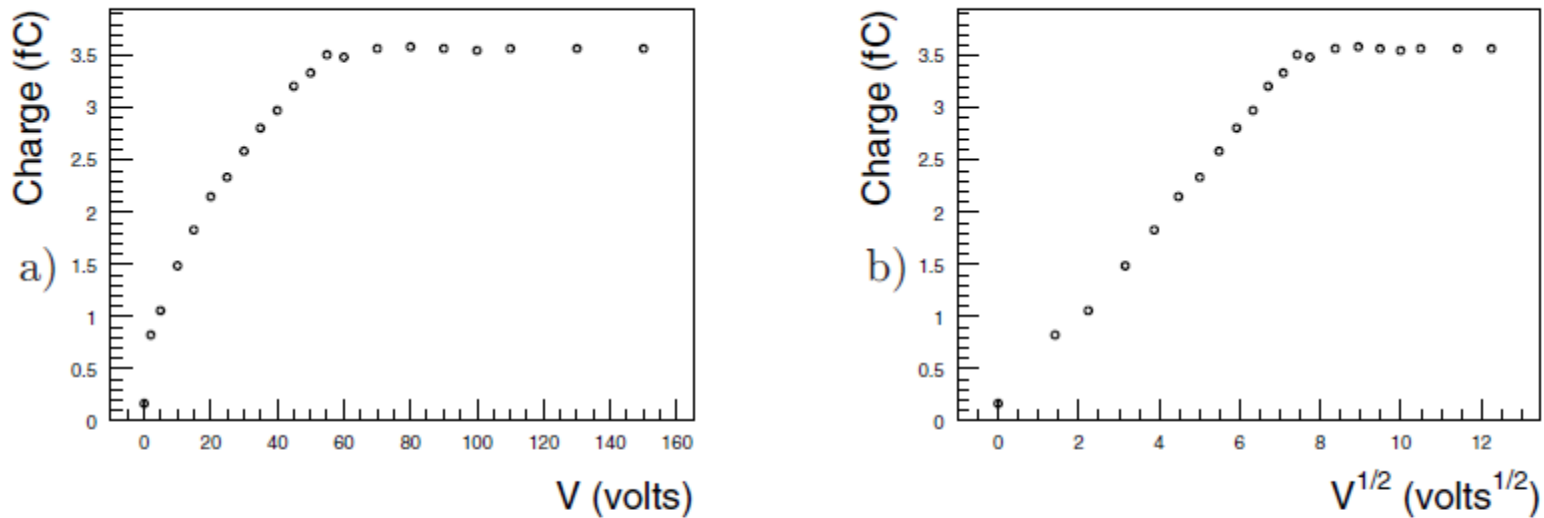


Fig. 6.4 Charge collected with a silicon detector $300\mu\text{m}$ thick, area 1cm^2 , exposed to incoming electrons of energy larger than 2MeV , as a function of the applied bias (a) and as a function of the square root of the applied voltage (b). The value of the full depletion voltage is 60volts which corresponds to a collected charge of 3.5fC , as expected from the most probable energy deposited by relativistic electrons in this detector [Leroy (1998)].

Segnale raccolto in funzione del tempo

Esempi:

giunzione p+n

$d=300 \mu\text{m}$

$A=1 \text{ cm}^2$

$\rho=23 \text{ k}\Omega \text{ cm}$

$N_{\text{eff}} = 2.1 \times 10^{11} \text{ cm}^{-3}$

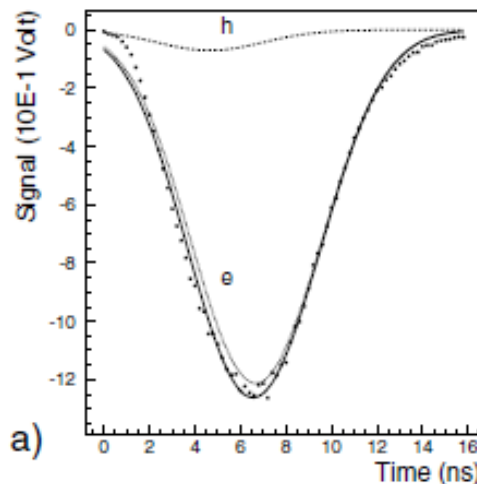
Nota:

- α totalmente assorbita in qualche decina di μm : la carica generata e' localizzata da una o dall'altra parte della giunzione \rightarrow contributi alla carica di e^- e h^+ differiscono a seconda della distanza dall'elettrodo:
- $Q_e = \frac{q}{w} * (w - x_0)$ $Q_h = \frac{q}{w} * x_0$
- e^- MIP rilascia cariche lungo lo spessore
- picco delle lacune piu' esteso della distribuzione degli e^- perche' mobilita' minore

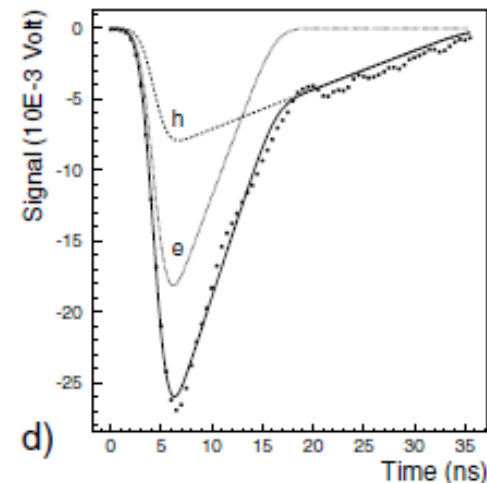
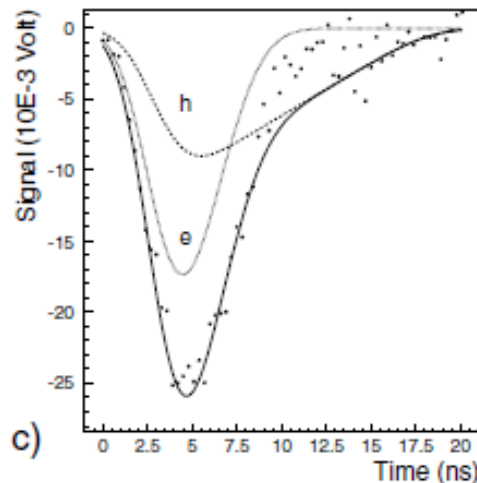
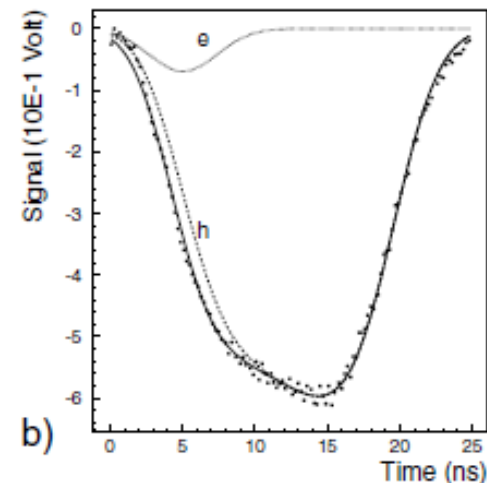
Particella α
Emessa da
sorgente Am
 $E = 5.45 \text{ MeV}$

e^- relativistico
Emesso da Ru
MIP
 $E_i = 80 \text{ keV}$

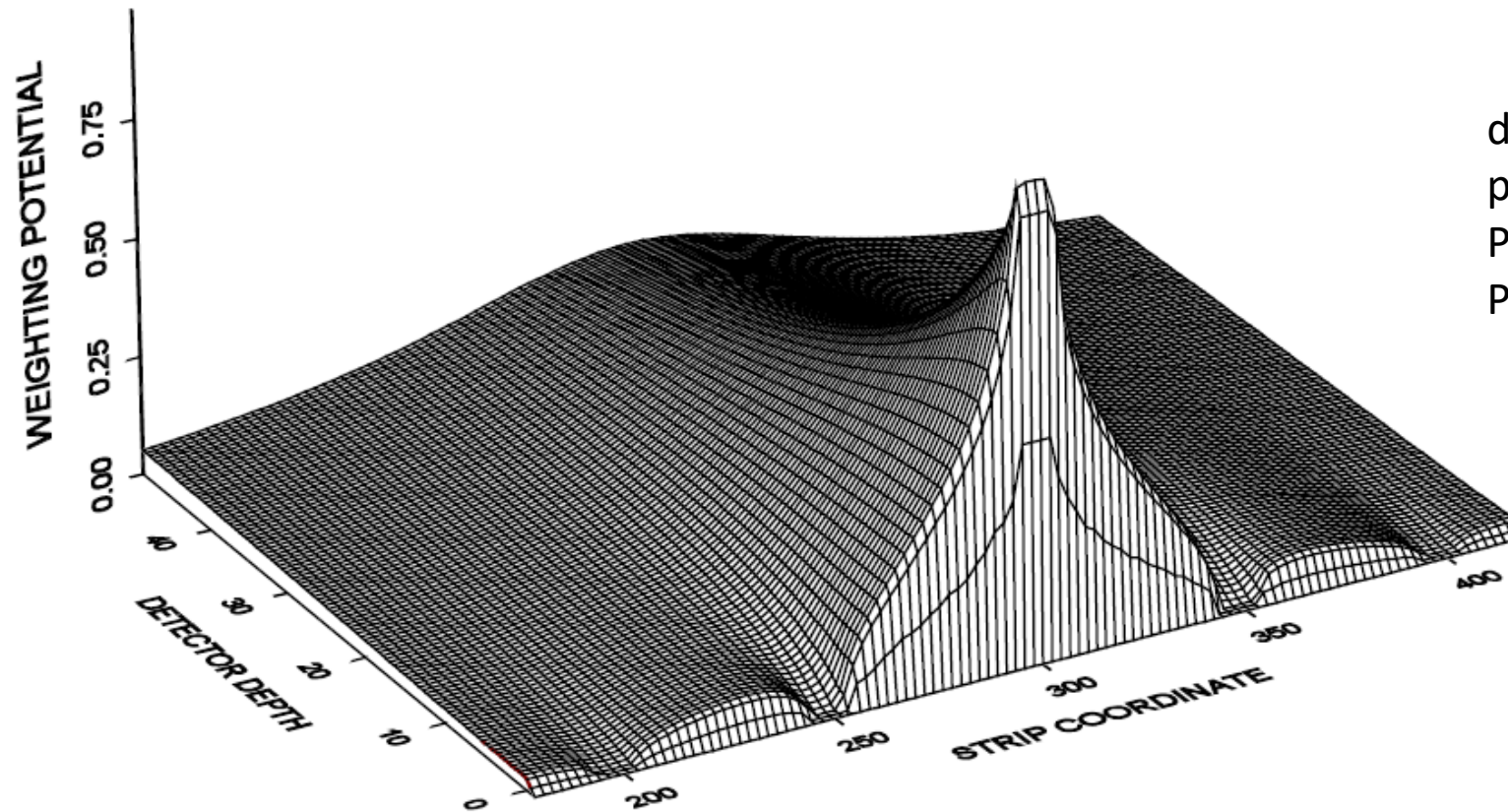
Entranti da p
Catodo (negativo)



Entranti da n^+
Anodo (positivo)



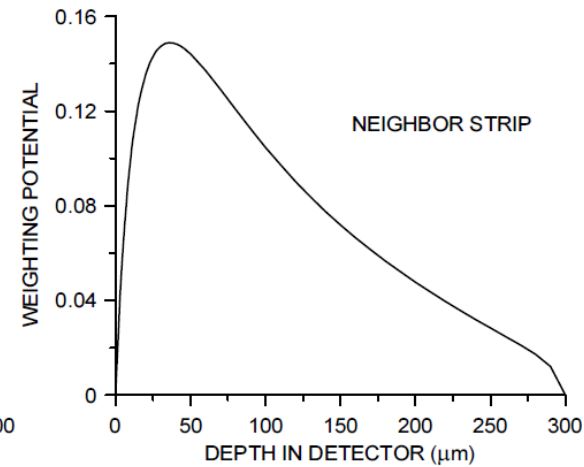
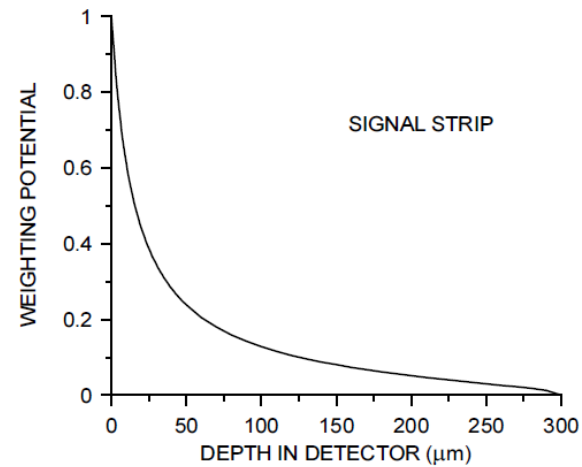
Campo Peso in sensore a microstrisce



$d = 300 \text{ um}$
passo = 50 um
Potenziale = 1 sulla strip letta
Potenziale = 0 sulle altre

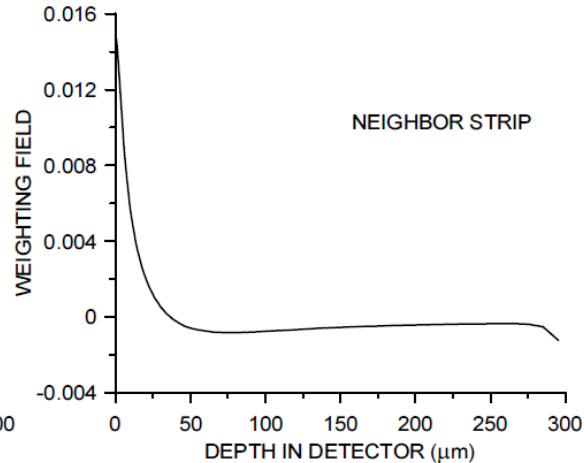
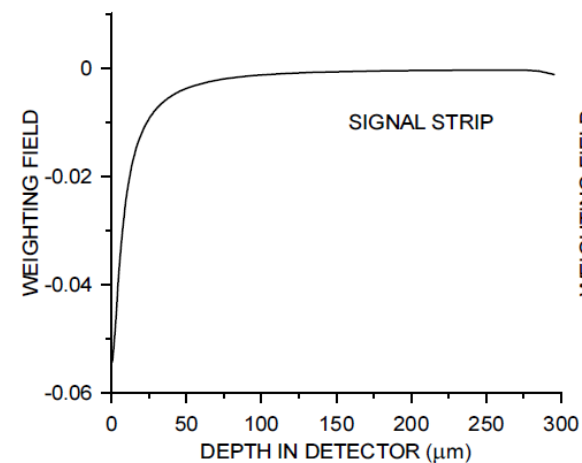
Sezione trasversa del p. e c. peso in strip detector

Strip letta
Potenziale a 1



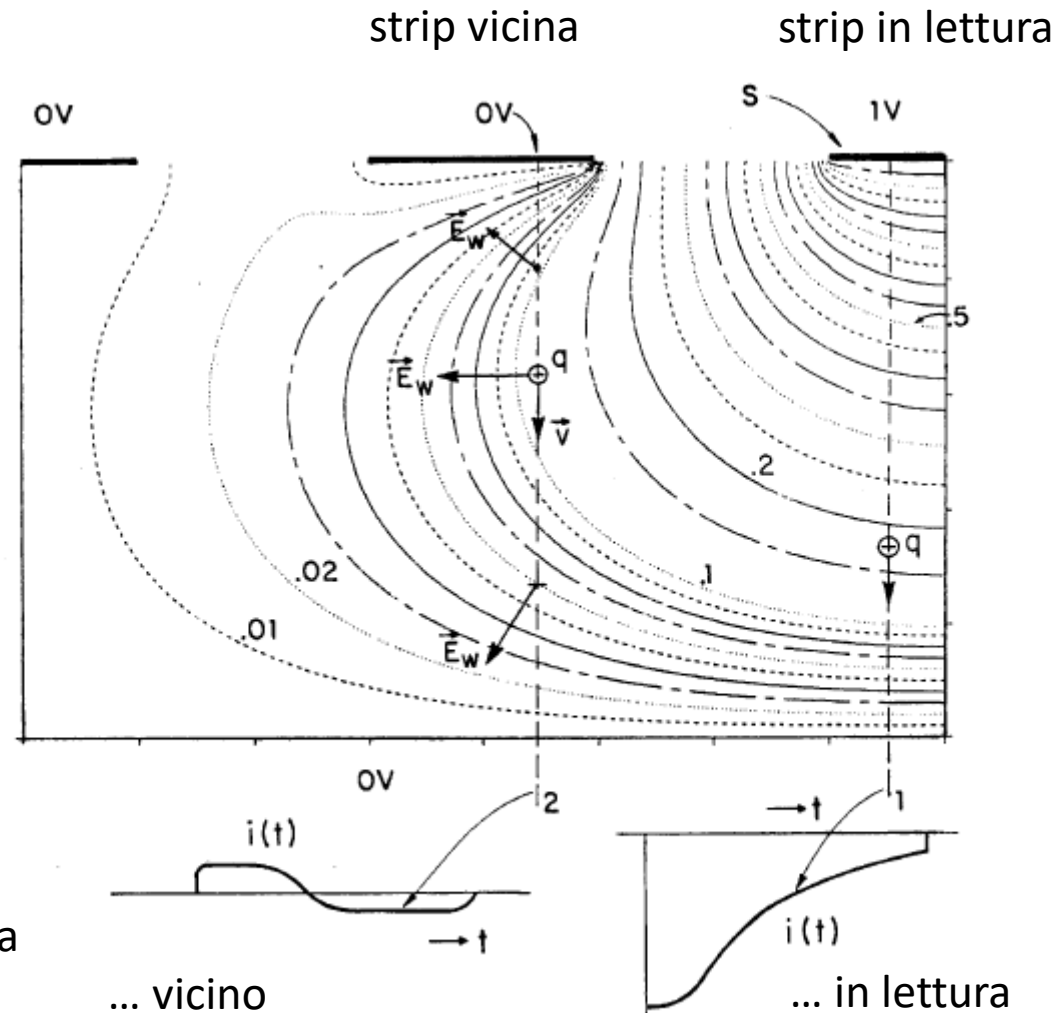
Strip vicina
Potenziale a 0

E_F aumenta monotono
Il segnale aumenta
mano a mano che la
carica si avvicina
all'elettrodo



E_F scende fino a diventare
negativo intorno a 40 μm
dall'elettrodo. Il segnale
prima aumenta poi si
inverte: l'integrale e' nullo

Campo-peso in un sensore a microstrisce



Corrente indotta da una carica
che termina sull'elettrodo ...

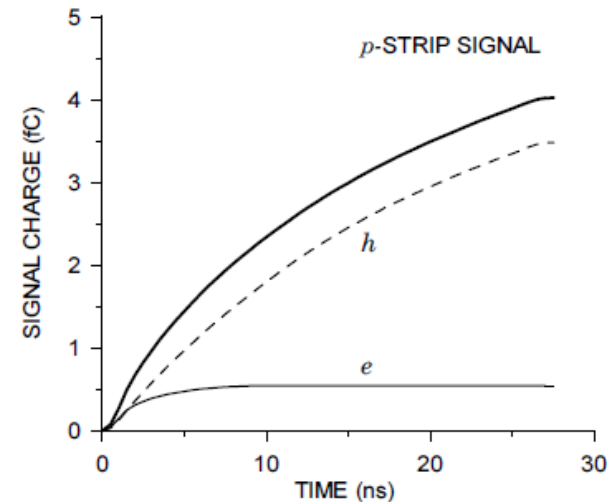
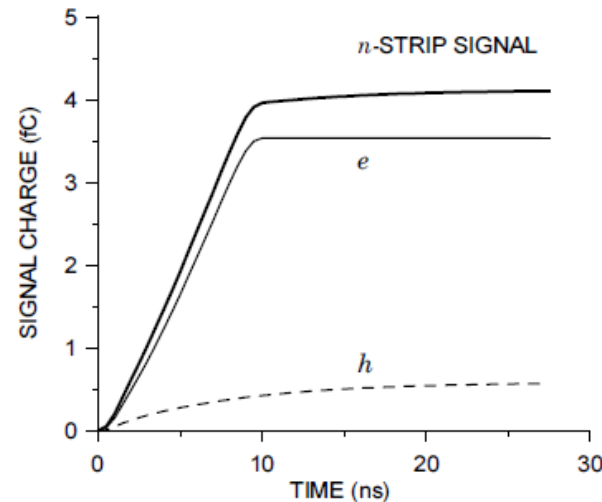
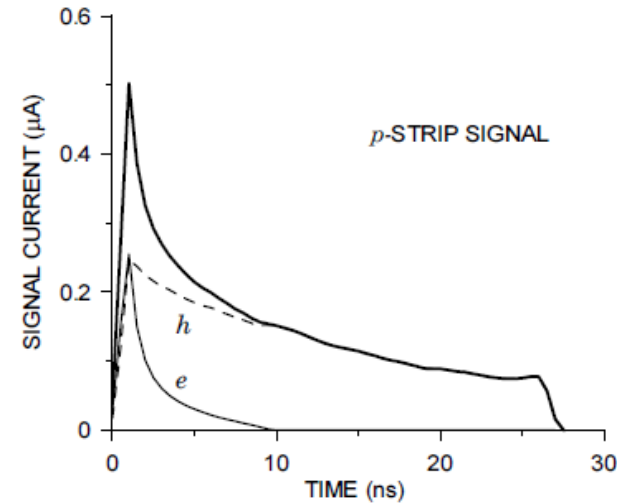
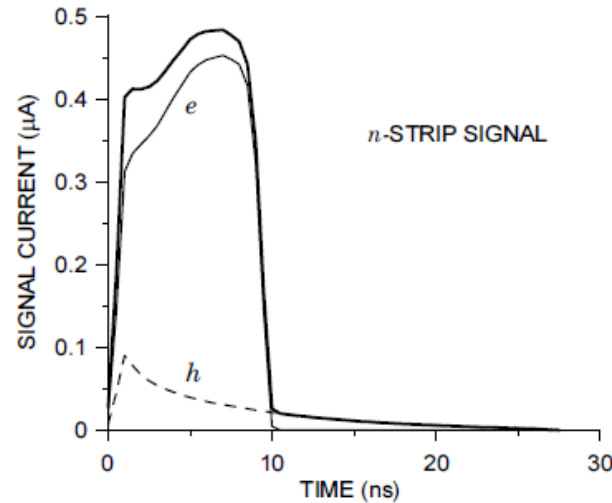
... vicino

... in lettura

Segnale indotto da e^- e h^+ su n ed p

Corrente nel tempo

Su n dominano gli e^- con segnale veloce, su p dominano le buche con segnale piu' lento. Durata totale e' equivalente e dipende solo dal tempo di raccolta delle cariche



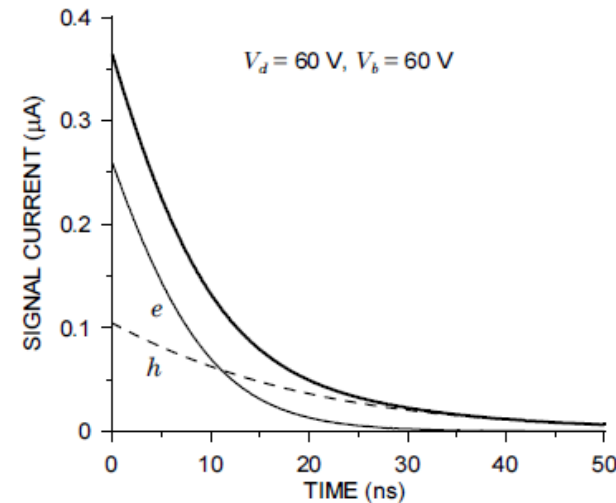
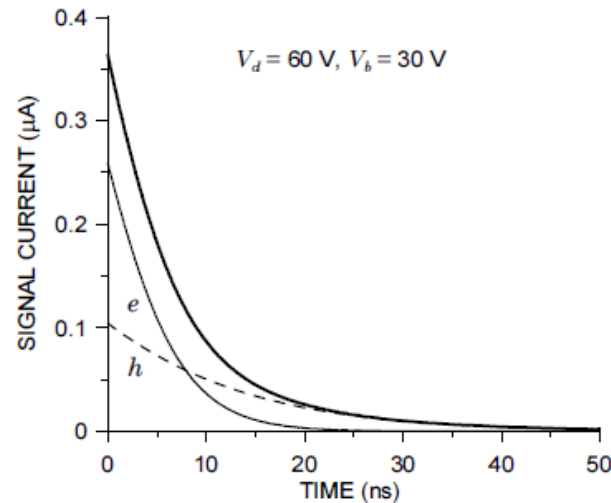
Carica nel tempo

Su n quasi tutto il segnale e' misurato nei primi 10ns. Su p il segnale cresce quasi linearmente nel tempo, si deve aspettare che termini la raccolta di h^+

Forma del segnale in funzione della V applicata

Piani paralleli

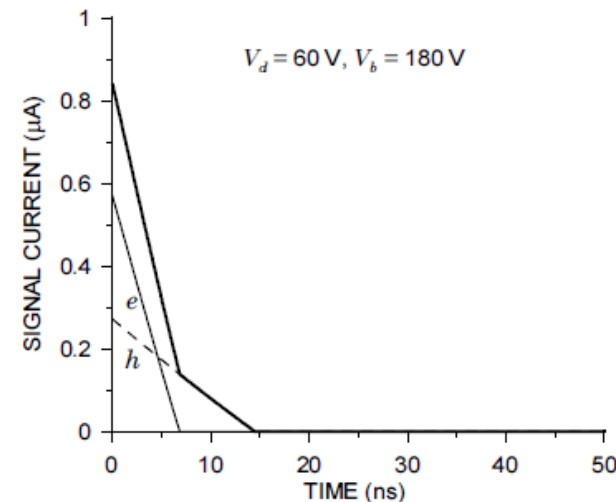
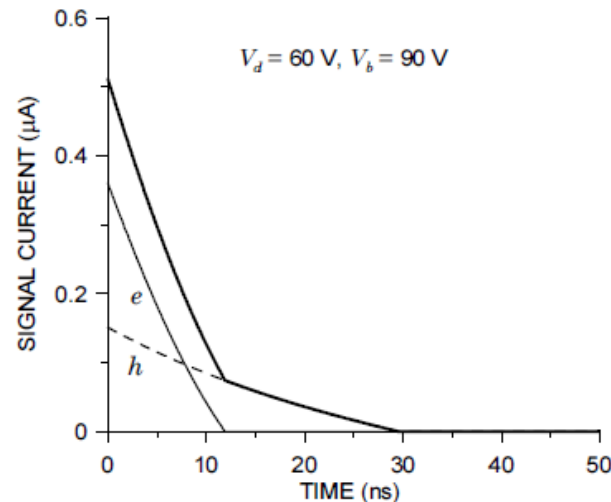
Svuotamento parziale



Svuotamento totale

Stessa forma, tempi quasi invariati (eccetto dipendenza di mobilita' dal campo)

Sovra-svuotamento



Tempi molto abbreviati da sovra-tensione