Appunti laboratori SETM

06/10/2022 Fatto "OscilloscopioDigitale" fino a 2.3

1.2

misurato $y_1 = -2.5$ div $\quad y_2 = 2.5$ div
@ $K_v = 200$ mV/div

$$\delta x_i = \frac{\text{resolution}}{2} = \frac{1}{10} \text{ div}$$

$$\boxed{V_{pp}} = (y_2 - y_1) k_v = (5 \cdot 200) \text{mV} = \boxed{1 \text{ V}}$$

$$\boxed{\delta V_{pp}} = \left|\frac{\partial V_{pp}}{\partial y_1}\right| \delta y_1 + \left|\frac{\partial V_{pp}}{\partial y_2}\right| \delta y_2 + \left|\frac{\partial V_{pp}}{\partial k_v}\right| \delta k_v =$$

$$= |-k_v| \delta y_1 + |k_v| \delta y_2 + (y_2 - y_1) \delta k_v =$$

$$= \boxed{k_v (\delta y_1 + \delta y_2) + (y_2 - y_1) \delta k_v} \rightarrow \text{data sheet}$$

DC Gain Accuracy	< 10 mV: ±4% full scale ≥10 mV: ±3% full scale

↳ incertezza ridotta

$$3 = 100 \cdot \frac{\delta k_v}{V_{FS}} \rightarrow \text{qui } \delta k_v \text{ perché ho 8 divisioni verticali}$$

$$\frac{3}{100} \cdot 8 \text{div} \cdot 200 \frac{\text{mV}}{\text{div}} = \delta k_v = 0.048 \frac{\text{mV}}{\text{div}}$$

$$= 200 \frac{\text{mV}}{\text{div}} \left({}^2/_{10} \text{ div} \right) + (5 \text{ div}) \frac{3}{100} \cdot 8 \cdot 200 \frac{\text{mV}}{\text{div}} =$$

$$= 40 \text{ mV} + 48 \text{ mV} = \boxed{88 \text{ mV}}$$

$$\Rightarrow \boxed{V_{pp} = (1.000 \pm 0.088) \text{ V}}$$

$$V_{eff} = \frac{V_{pp}}{2} \cdot \frac{1}{\sqrt{2}} = \frac{1}{2\sqrt{2}} \text{ V} = 0.35355 \text{ V}$$

$$\delta_{eff} = \left|\frac{\partial V_{eff}}{\partial V_{pp}}\right| \partial V_{pp} = \frac{1}{2\sqrt{2}} \cdot 0.088 \text{ V} = 0.03111 \text{ V}$$

$$\boxed{V_{eff} = (0.35355 \pm 0.03111) \text{V}}$$

1.3

Misurato $\quad x_1 = -5$ div
@$K_o = 100 \mu s$ $\quad x_2 = 5$ div

$$T = (x_2 - x_1) k_o = 10 \text{div} \cdot 100 \frac{\mu s}{\text{div}} = 0.001 \text{ s}$$

$$\delta T = \left|\frac{\partial T}{\partial x_1}\right| \delta x_1 + \left|\frac{\partial T}{\partial x_2}\right| \delta x_2 + \cancel{\left|\frac{\partial T}{\partial k_o}\right| \delta k_o} \rightarrow \text{TRASCURABILE}$$

$$\delta T = K_o (\delta x_2 + \delta x_1) =$$

$$= 100 \frac{\mu s}{\text{div}} \left(\frac{2}{10} \text{ div} \right) = 20 \mu s = 2 \cdot 10^{-5} \text{ s}$$

$$\boxed{T = (0.00100 \pm 0.00002) \text{ s}}$$

$$f = \frac{1}{T} = \frac{1}{0.001 \text{s}} = 1000 \text{ Hz}$$

$$\delta f = \left|\frac{\partial f}{\partial T}\right| \cdot \delta T = \left|-\frac{1}{T^2}\right| \delta T = \frac{2 \cdot 10^{-5} \text{ s}}{10^{-6} \text{ s}^2} = 20 \text{ Hz}$$

$$\boxed{f = (1000 \pm 20) \text{ Hz}}$$

1.4

$V_{eff_{DMM}} = 0.35732\,V$

0.06% valore letto + 0.03% ("full range")

$\delta V_{eff_{DMM}} =$ da data sheet, $0.06 + 0.03 =$

$= 0.06\% \,(0.35732V) + 0.03\% \,(\underbrace{1\,V}_{\text{"range"}}) =$

"range": l'amplitude del segnale attuale che esce dal gen. di f. (V_{pp})

$= 0.00051\,V$

$$\boxed{V_{eff_{DMM}} = (0.35732 \pm 0.00051)\,V}$$

$f_{DMM} = 1000\,Hz$

$\delta f_{DMM} = 0.01 \rightarrow 0.01\% \,(1000\,Hz) = 0.1\,Hz$

$f_{DMM} = (1000.0 \pm 0.1)\,Hz$

Le misure sono compatibili

2.