

Frequency response measurement

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Equations

Digitizer: amplitude $D(f)$, gain $G(f)$.

ACDC: DC voltage U , gain $\Delta(f)$.

Source: Amplitude $Z(f, t)$.

Given equations:

$$D(f, t) = Z(f, t) \cdot G(f) \quad (1)$$

$$U(f, t) = Z(f, t) \cdot \Delta(f) \quad (2)$$

Assuming:

$$t_H \approx t_L \implies Z|_{t_H} = Z t_L \quad (3)$$

Then:

$$D(f) = Z(f) \cdot G(f) \quad (4)$$

$$U(f) = Z(f) \cdot \Delta(f) \quad (5)$$

Measurements:

$$G_H = \frac{D_H}{Z_H}, \quad G_L = \frac{D_L}{Z_L} \quad (6)$$

$$Z_H = \frac{U_H}{\Delta_H}, \quad Z_L = \frac{U_L}{\Delta_L} \quad (7)$$

Combining the equations:

$$\frac{G_H}{G_L} = \frac{D_H \cdot \Delta_H}{U_H} \cdot \frac{U_L}{D_L \cdot \Delta_L} \quad (8)$$

DC offset is not result of measurement and processing!

AC-DC measurements:

$$\Delta_L = 1 + \delta(f) \quad (9)$$

$$U_{\text{ACin}} = U_{\text{DCin}} \cdot (1 + \delta \cdot 10^{-1}) \quad (10)$$

With:

$$\delta_{792} = \frac{U_{\text{outAC}} - U_{\text{outDC}}}{n \cdot U_{\text{outDC}}} \quad (11)$$