

# SNR DELLA SINUSOIDE



$$V_e = \sqrt{\frac{1}{T} \int_0^T f^2(x) \cdot dx}$$

$$N^2 = \frac{1}{Q} \int_{-\frac{Q}{2}}^{\frac{Q}{2}} f^2(x) dx = \frac{Q^2}{12}$$

Potenza  
del rumore  
 $N^2$

$$s \triangleq A \sin(\omega t)$$

$$S_{RMS}^2 = \frac{1}{2\pi} \int_0^{2\pi} A^2 \sin^2(\omega t) dt = \frac{A^2}{2} \quad S^2 \equiv V_{RMS}$$

$$SNR = 20 \log_{10} \left( \frac{V_{RMS}}{N_{RMS}} \right)$$

$$SNR = 20 \log_{10} \left( \frac{V_{RMS}^2}{N_{RMS}^2} \right)^{\frac{1}{2}}$$

$$= 10 \log_{10} \left( \frac{V_{RMS}^2}{N_{RMS}^2} \right)$$

①

$$SNR = 10 \log_{10} \frac{S^2}{N^2} = 10 \log_{10} \left( \frac{\frac{A^2}{2}}{\frac{Q^2}{12}} \right)$$

$$\rightarrow N^2 = \left( \frac{\frac{A^2}{2(n-1)}}{2} \right) = \frac{A^2}{12 \cdot 2^{(n-1)}} = \frac{A^2}{1 \cdot 2 \cdot 2^{2n} \cdot \frac{1}{4}}$$

$$= \frac{A^2}{3 \cdot 2^{2n}}$$

$$= 10 \log_{10} \frac{\frac{A^2}{2}}{\frac{A^2}{3 \cdot 2^{2n}}} = 10 \log_{10} \frac{3 \cdot 2^{2n}}{2} = 10 \log_{10} \left( \frac{3}{2} \right) + 10 \log_{10} (2^n) = 1.76 \text{ dB} + n \cdot 10 \log_{10} (2)$$

1.76dB + 6.02dB

$$\rightarrow SNR = 1.76 \text{ dB} + N \cdot 6.02 \text{ dB}$$

$$q = \frac{FS}{2^n}$$

$$FS = 2A \Rightarrow q = \frac{2A}{2^n} = \frac{2A}{2 \cdot 2^{n-1}} = \frac{A}{2^{n-1}}$$

$$q^2 = \frac{A^2}{(2^{n-1})^2} = \frac{A^2}{2^{2(n-1)}}$$

## SINAD

$$SINAD = 20 \log_{10} \frac{V_{RMS}}{N_{RMS} + D_{RMS}} \leftarrow \text{Distorsione}$$