Leeson's equation

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Leeson's equation is an expression that describes an oscillator's phase noise spectrum.

Leeson's expression[1] for single-sideband (SSB) phase noise in dBc/Hz (decibels relative to output level per Hertz) is[2]

$$L(f_m) = 10 \log \left[\frac{1}{2} \left(\left(\frac{f_0}{2Q_l f_m} \right)^2 + 1 \right) \left(\frac{f_c}{f_m} + 1 \right) \left(\frac{FkT}{P_s} \right) \right]$$

where f_0 is the output frequency, Q_l is the loaded Q, f_m is the offset from the output frequency (Hz), f_c is the 1/*f* corner frequency, F is the noise factor of the amplifier, k is Boltzmann's constant, T is absolute temperature in Kelvins, and P_s is the oscillator output power.

References

1. ^ Leeson, D. B. (February 1966), "A Simple Model of Feedback Oscillator Noise Spectrum", *Proceedings of the IEEE* **54** (2): 329–330, doi:10.1109/PROC.1966.4682 (http://dx.doi.org/10.1109%2FPROC.1966.4682)
2. ^ Rhea 1997, p. 115

- Rhea, Randall W. (1997), *Oscillator Design & Computer Simulation* (Second ed.), McGraw-Hill, ISBN 0-07-052415-7

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