

Amplifier (Complex) Noise Measurements

In most cases an amplifier's noise performance is characterised by its noise figure. What is often not realised is that this is an incomplete description and that a full description involves four numbers. These are usually given as two real numbers and one complex number. There are at least three different ways of presenting these numbers but it is possible to convert from any representation to another. At NPL we prefer to present the complex noise information as two real noise temperatures (representing the input and output noise temperatures) and a complex correlation coefficient which represents the correlation between the emergent noise waves from the two ports.

Calibration of an amplifier's complex noise involves presenting a series of different reflection coefficients and at least two different noise sources at the input of the amplifier. NPL offers a measurement capability for complex noise in the 10 MHz to 18 GHz range and is developing extended coverage eventually up to 40 GHz.

Details of amplifier noise characterisation capability

Frequency Range	Calibration uncertainty at 95% CL (example only) \pm	Medium
0.01 - 18 GHz	Tr 15% Tb 0.5% Tc 10% < Tc 5%	Coaxial
18 - 26.5 GHz	under development	Coaxial
26.5 - 40 GHz	under development	Coaxial