What are Load Pull Measurements?

Load Pull is a measurement technique in which the characteristics of a DUT (Device Under Test) are measured while the Load (or Source) impedance is modified using an impedance tuning system (such as passive, active or a combination device). In the case of Load Pull part of the signal generated by the DUT, such as a transistor, at its output port is reflected at the tuning system and returned with a modified amplitude and phase to interacts with the departing signal, modifying its operation (and Gain) in this way. The most usual tuning condition is 'impedance matching', in which case the returned power is zero (the transistor is power matched).

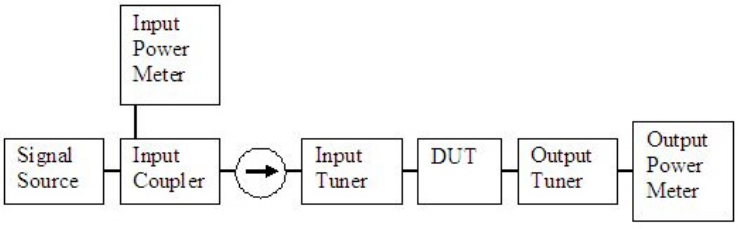
In the case of Source Pull the situation is slightly different, because in this case the signal is not generated by the DUT, it is injected by the signal source. In this case Source Pull is simply the changing of the impedance seen by the DUT when looking into the source.

A traditional Load Pull system measures the power injected (available) into the input of the DUT (Pin.av), the power extracted (delivered) at its output (P.out.del) and the transducer gain Gt. Assuming the coupling factor of the input coupler to be "C" (>1), the available loss of the section between the coupler input and the DUT input to be L.in.av (>1) and the power loss of the section between DUT output and output power meter to be L.out.p (>1), and by measusing Pin.mes at the input power meter and Pout.mes at the output power meter, one can compute the transducer Gain, G.t, and the delivered DUT output power P.out.del as follows:

P.out.del = Pout.mes * L.out.p {1}

G.t = P.out.del/Pin.av = (P.out.mes * L.out.p * L.in.av)/(Pin.mes * C) {2}

All setup quantities (L.in.av, L.out.p and C) can be calculated from s-parameters measured using a VNA.



Load Pull (and Noise) Measurements are Impedance related measurements. This means that the independent parameter (or stimulus) of the measurement is not Frequency, Power, Bias or even Temperature, Vibration or Pressure, but the Source or Load Impedance (or Reflection Factor) at the fundamental and any harmonic frequency, presented to the Device Under Test (DUT). In all cases the tuner positions (=Impedances or Tuner States) are set by a controlling computer, which also talks to GPIB instruments, collects, saves and processes data, and generates printouts.