Impedance Matching for High Power Devices

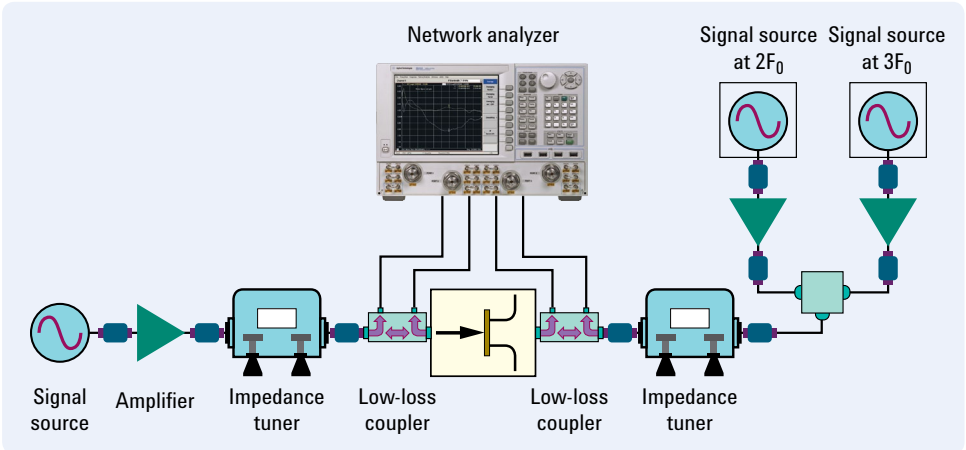
Agilent Technologies and Maury Microwave

Impedance match your high power devices with active and hybrid load pull

Load pull measurements are used to study the response of a device-under-test (DUT) under multiple source and load impedances. By using these techniques designers can develop impedance matching networks for high power, non-linear devices, maximizing their power transfer, output power, gain and efficiency over a broad range of frequencies.

Traditional load pull measurements utilize a passive mechanical tuner to vary the impedance seen by the DUT. Mechanical tuners are simple, low cost and can handle high power. However they may be relatively slow to use, especially when multiple frequencies are to be investigated, and are intrinsically limited due to the losses incurred in the signal path. Since they can be physically large they may also be more difficult to integrate with on-wafer measurement systems.

Active load pull measurements use an external signal source to inject a signal into the output of the DUT in order to emulate the effect of a reflected signal. The system overcomes the problems encountered with mechanical tuners. However, these advantages come with a cost penalty due to the need for high power amplifiers in the tuning chain.



- ***Impedance match for optimum device performance***
- ***Use load pull for impedance matching of high power devices***
- ***Overcome limitations of traditional load pull techniques***
- ***Combine active and passive techniques in hybrid load pull***
- ***Uses Agilent PNA-X network analyzer and Maury tuners***
- ***Develop impedance matching networks for high power, large signal devices***

Agilent Technologies

Impedance Matching for High Power Devices

The solution is to use a combination of the two techniques, or hybrid load pull. A mechanical tuner is used to handle the high power levels at the fundamental frequency while active devices are used for the lower power harmonic frequencies.

Maury Microwave provides a range of passive, active and hybrid load pull solutions that utilize test instruments from Agilent Technologies, including the PNA-X microwave network analyzer. The PNA-X has wide power range, fast and accurate control of source phase, clean harmonics, wide frequency coverage from 10 MHz to 50 GHz and a flexible test set to allow the connection of ancillary components.

By utilizing the advanced features of the Agilent PNA-X, Maury Microwave can provide cost-effective active and hybrid load pull systems to allow you to optimize the performance of your large signal, high power devices.

System Components

Agilent Technologies

N524xA PNA-X microwave network analyzer

Maury Microwave

MT930A IVCAD, Base application
MT930B IVCAD, Visualization
MT930C IVCAD, Vector-receiver load pull
MT930H IVCAD, Active load pull addition

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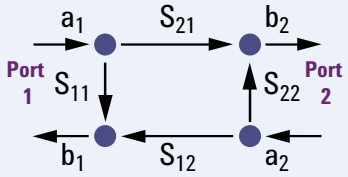
Impedance Measurements

The impedance presented at a DUT can be stated in various formats: Z_L, VSWR and reflection coefficient, Γ_L. In the case of a two port device the magnitude of the reflection coefficient, Γ_L, is given by the ratio of the forward to the reflected travelling wave at port 2 (a_2/b_2).



Two-port scattering parameter model

With a passive load pull system the losses incurred in the mechanical tuner mean that the reflection coefficients that can be measured will always be less than 1 and typically in the range 0.8 and 0.92. An active load pull system overcomes this issue since the reflected signal is injected directly into the return path at point a_2. As a result reflection coefficients of unity (and theoretically greater than unity) can be achieved.

To learn how this solution can address your specific needs please contact Agilent's solutions partner, Maury Microwave

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Maury Microwave has been in business for 50+ years and has become the world's leading manufacturer of laboratory devices and system components, with an emphasis on device characterization and automated tuning systems.
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