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**Introduction to Load-Pull Systems and their Applications**

 This is an introduction of the Load Pull system and it's application. Also, there will be an explanation of where this application can be use and how efficient it can be in the improvement of transmission system. This system ( Load Pull) is the most know method around the world for Radio Frequencies (RF) and Power Amplifier system develop.

This system has been used for over four decades and has been proved to be one of the most useful when we talk about optimizing a device performance of non-liner applications. This method or process consist in applying a systematically varying in the impedance present to a device under test (dut), in other words we can say the term "Load pull" it just a impedance variation at the load or at any port including the input port.

One of the main purposes of this system is to measure how effective are the devices related to load impedances. The DUT has a two port devices because the formula given is ΓL = a2/b2 where a2 = (ZL-Z0) and b2 = ( ZL+Z0). The formula is expressing the incident and reflected traveling waves located at the output port and ΓL is a reflection coefficient.

Load pull implies the variation of the impedance at the load port but this variation of the impedance also can be seen at any DUT port, these variations happen most of the time at the source. Load-pull is used in the circumstances where a linearity breaks down, for example, any problem or manifestations of non-linearity or even an under a large signal operating condition associated with substantial harmonic generation.

This load pull system has common techniques and it is used for 2 types of tuners. Therefore, there are 2 types of impedances tuner, one is an active impedance tuner and the second is a passive impedance tuner, both of them have to be set precisely to achieve the maximum desired impedance. The passive tuner or also known as passive load pull is used in high speed measurement which is highly recommended to get the best result and optimizing the devices. In the other hand ,the active tuner is also called “ active load pull” , this is well known and its commonly utilized more often in application requiring high reflection coefficient values.

The active load pull has some advantages in its used such as: low maintenance cost, rapid impedance synthesis, ease of usage and relatively higher power handling capacity and measurement of high power devices, etc.

The active load pull has a disadvantage in its reflection coefficients; this happens because the synthesized impedances is limited and is not able to achieve the maximum magnitude of reflection coefficient. Moreover, it is impossible to achieve the right impedance for DUTs having low output impedances below 2Ω.

 When we talk about active load pull there are some techniques that we can used such as: signal injection and this one is located at the load port of the DUT. Therefore, the techniques are divided in two sections the first one is open loop and the second is closed loop.

This technique helps us to synthesize reflection coefficients near and the boundary of the smith chart. Moreover the Smith Chart is a huge help to synthesize small impedances for matching DOTs. When we control the complex gain around any active structure the reflection coefficients is synthesized at the DUR access and this can be done in both techniques the active load pull.To set up the load pull and make it more easy and practical some action were taken. some changes were done in order to have a efficient load pull .Also, having a continuous advancement in the original Load Pull set up architecture, helps to have a better result . One of the majors changes in the passive load set up configuration has been made to enhance the maximum achievable load reflection coefficient. So, the main purpose is to improve the set up and requirement on loop amplifier gain to be reduced.

One of the most popular passive load is The pre-matched load pull technique. In this configuration two probes and tuning are placed side by side on the center conductor lines, this is very efficient method to generate smaller reflection coefficients. On the other hand, this technique is limited in some applications where is require a impedances less than one.

Lastly, the engineering have been doing several advancements in both the passive and actives load-pull techniques. Among the main advancement there is one that is called enhanced loop passive load pull technique. The technique consists on an impedance tuner and passive load cascaded together. So the impedances tuner is a low loss passive tuner which is standard.

The smith chart has been used for years and it’s the best way to the reflect coefficient using the simple methods describe previously.