KELVIN BIAS TEE vs. REGULAR BIAS TEE

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OVERVIEW

A bias tee is a three-port device that is commonplace in the test and measurement world. Its application includes scenarios which need DC bias, voltage or current, injected onto the RF transmission line to bias components such as photo diodes, active antennas, and amplifiers. The bias voltage or current is supplied to the DC port of the bias tee and passes through a series of coils that has inherent DC resistance which results in a voltage drop across the coils, resulting in a lower bias voltage at device under test (DUT) than intended. A Kelvin bias tee is a four-port device that adds a sense port to the standard bias tee. This special variation enables the user to precisely measure the DC voltage at the DUT, thus eliminating biasing errors. This measurement is accomplished using a separate sense coil, which can be connected to a high impedance voltage meter to monitor the true bias voltage at the DUT. Figure 1 below shows the difference between the two variations of bias tee circuits.

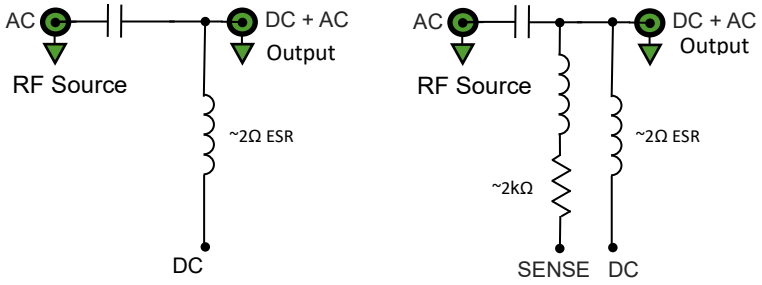

Figure 1: (Left) regular bias tee vs. (Right) Kelvin bias tee

Example Application

A straightforward application of the Kelvin bias tee, such as Hyperlabs HL8477, in a measurement setup is shown in Figure 2. The example assumes a DUT whose operating point needs to be precisely +5.0V while drawing 100mA of current. As the DC input coil resistance contributes to the voltage drop, the sense line of the Kelvin bias tee allows the user to measure the true voltage at the DC + AC port of the bias tee. Without the sense line, the voltage supplied to the DUT would be lower than desired, but through adjusting the DC input to +5.2V the DUT bias requirement is achieved.

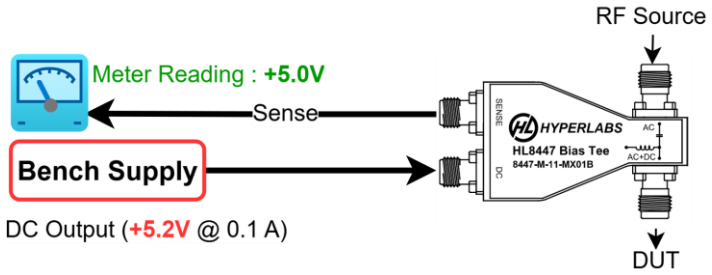

Figure 1: Kelvin bias tee example application

CONCLUSION

In applications where precise DC bias voltages are required, a Kelvin bias tee can be implemented to eliminate uncertainty about the DC bias voltage applied at the DUT.

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