

Measurement of the inductance of an HOLLOW rivet with the HP 8753B

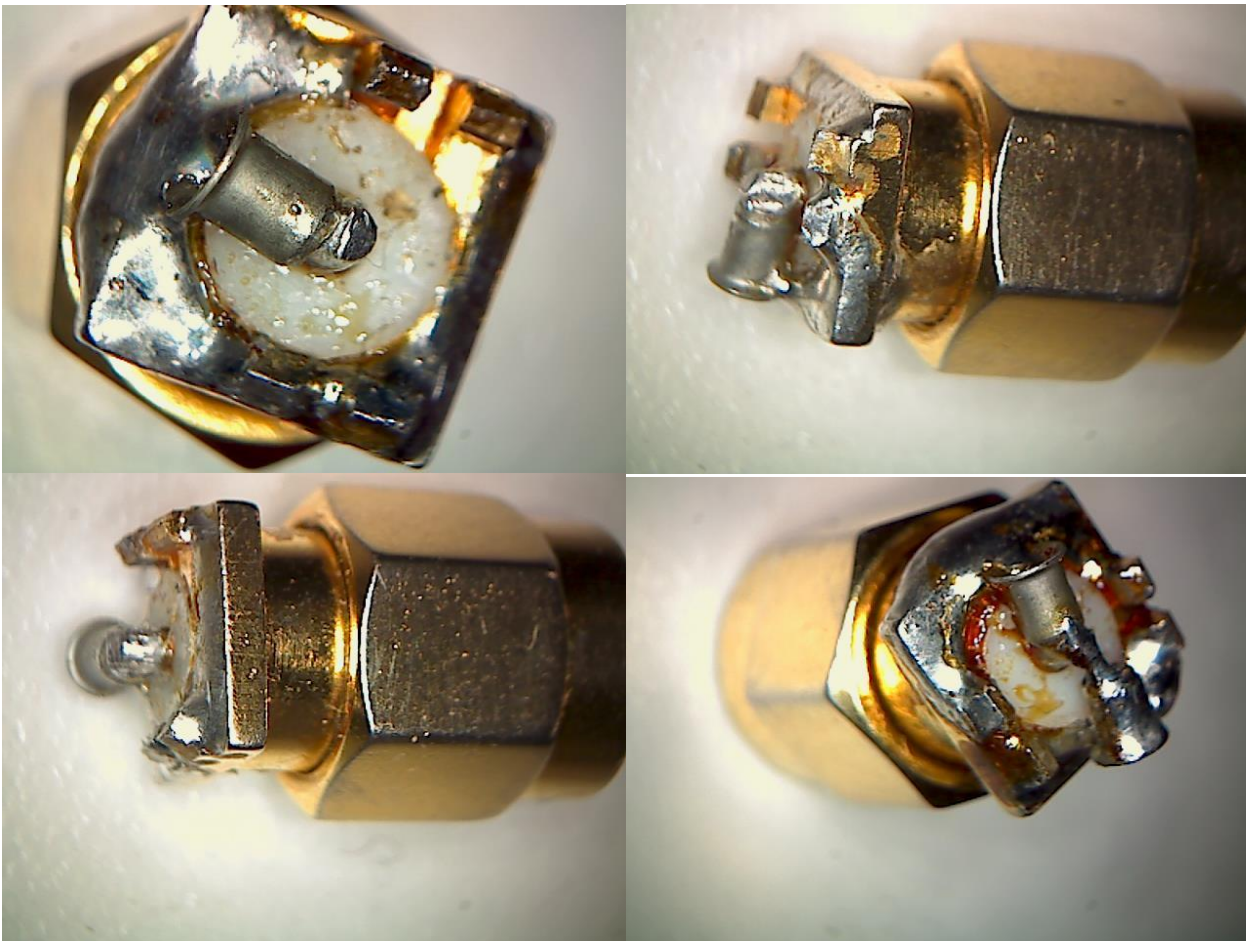
Objective: To measure the inductance of a Hollow rivet with the HP 8753B to use the value in the grounding process of a power transistor in an amplifier.

Characteristic of the hollow rivet diameter: 1,5mm length: 2 mm: 267,43 pH

$$L_{via} = \frac{\mu_0}{2\pi} \cdot \left[h \cdot \ln \left(\frac{2h + \sqrt{r^2 + (2h)^2}}{r} \right) + \frac{3}{2} \left(r - \sqrt{r^2 - h^2} \right) \right] \text{ (picohenries)}$$

Equation 3.0

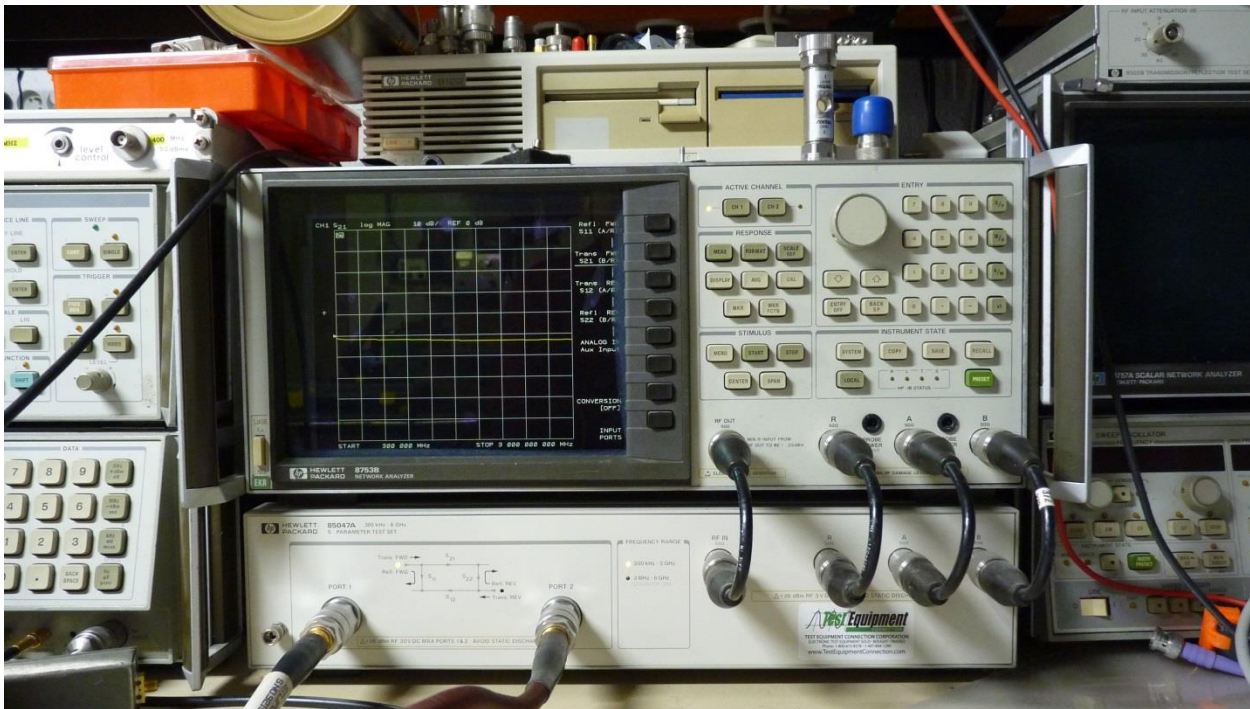
Again the theory is interesting but the how can I measure this?



The normal way to measure a so small inductance is to use a VNA

Let's see what is happening

The VNA , HP 8753B



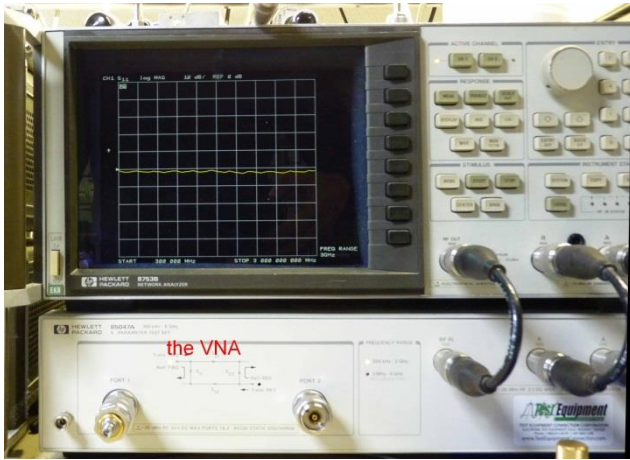
The calibration kit from Dr Kirkby (measured and define by)



Those calibers have been controlled and measured by Dr. Kirkby and used as User Kit in the VNA HP 8753B.

Now let's Go.

First we do a S11 calibration with the user kit.



First step USER KIT downloaded from VNA Calkit Manager.



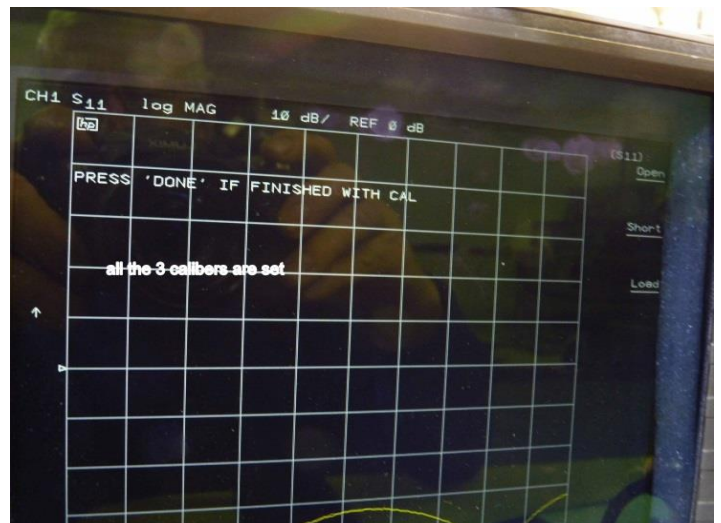
Calibration S11 ONE PORT

OPEN connected and measured



SHORT caliber connected and measured

LOAD caliber connected and set



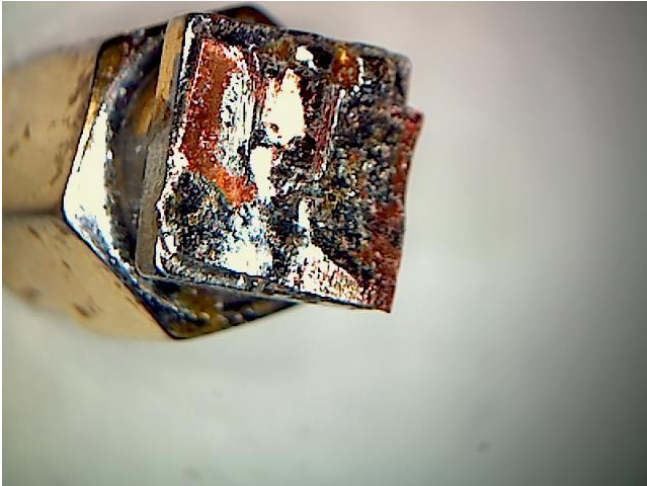
The calibration is verified



So is the LOAD



A male SMA shorted at the reference is placed at PORT1 the reference plane is located with the SMA SHORT MALE



Before measuring the DUT do an extension of the port 1 where the measure take place to obtain a dot at the calibration point.

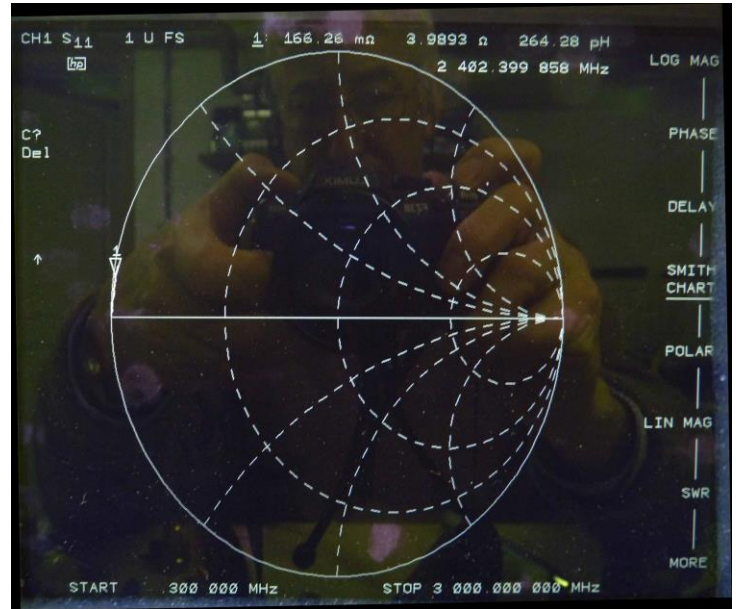


place the short SMA with a Cu plate at the reference plane at PORT, 1, we do an extension with the appropriate menu in the VNA

The DUT is connected to port 1



The value is displayed



The right picture show the arc created by the inductance of the 2 hollow rivets on the PORT 1 ,the value displayed is 264 pF the actual value would normally be $264 - 10\text{pF} = 254\text{ pF}$ (value left in the circuit with the port extension realized)

To avoid all the steps to do an extension port , I have done the same measurement with the APC connector as I do have an APC7 calibration kit , the measured value was(for one HOLLOW rivet) 500 pF so if I place two inductances in parallel The value must be halved.

ON1EV

Wednesday, December 10, 2014